FCC SAR TEST REPORT

Test File No : F690501/RF-SAR002439-A1

Equipment Under Test	LED View Cover
Model Name	EF-NG955
Applicant	SAMSUNG ELECTRONICS Co., Ltd.
Address of Applicant	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677 Republic of Korea
FCC ID	A3L-EFNG955
Cell Phone FCC ID	A3LSMG955U
Exposure Category	General Population/Uncontrolled Exposure
Standards	FCC 47 CFR Part 2 (2.1093) IEEE 1528, 2013 ANSI/IEEE C95.1, C95.3
Date of Test(s)	2017-03-18
Date of Issue	2017-03-29

In the configuration tested, the EUT complied with the standards specified above.

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.
This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS Korea Co., Ltd. or testing done by SGS Korea Co., Ltd. in connection with distribution or use of the product described in this report must be approved by SGS Korea Co., Ltd. in writing.

Report prepared by /
Jongho Park
Test Engineer

Approved by /
Minhyuk Han
Technical Manager

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Revision history

Revision	Date of issue	Revisions	Revised By
-	March 22, 2017	Initial issue	-
A1	March 29, 2017	Revision Update - Revised FCC ID - Updated the Original Cell Phone Worst Case Mode Test in page 19	Jongho Park

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Contents

1 Testing Laboratory 4
2 Details of Manufacturer 4
3 Description of EUT(s) 4
4 Information of Attached Cell Phone 4
5 The Highest Reported SAR Values 4
6 Test Methodology 5
7 Test Environment 5
8 Specific Absorption Rate (SAR) 6
8.1 Introduction 6
8.2 SAR Definition 6
8.3 Test Standards and Limits 6
9 The SAR Measurement System 8
10 System Components 9
10.1 Probe 9
10.2 SAM Phantom 9
10.3 Device Holder 10
11 SAR Measurement Procedures 11
11.1 Normal SAR Measurement Procedure 11
12 SAR System Verification 13
13 Tissue Simulant Fluid for the Frequency Band 14
14 Instruments List 15
15 FCC Power Measurement Procedures 16
16 Measured and Reported SAR 16
17 Maximum Output Power Specifications 16
18 RF Conducted Power Measurement 18
19 SAR Data Summary 19
Appendixes List 20
Appendixes A.1 21
Appendixes A.2 22
Appendixes A.3 23
Appendixes A.4 24
Appendixes A.5 25
Appendixes A.6 26
Appendixes A.7 27
Appendixes A.8 28
Appendixes A.9 29
Appendixes A.10 30
Appendixes A.11 31
Appendixes B.1 32
Appendixes C.1 33
Appendixes C.2 71
Appendixes C.3 76
END 99

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

1 Testing Laboratory

Company Name	SGS Korea Co., Ltd. (Gunpo Laboratory)
Address	Wireless Div. 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, 15807 Republic of Korea
Telephone	+82 +31 428 5700
FAX	+82 +31 427 2371

2 Details of Manufacturer

Applicant	SAMSUNG ELECTRONICS Co., Ltd. Co., Ltd
Address	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677 Republic of Korea
Email	kangho.ko@samsung.com
Phone No.	+82-31-301-1107

3 Description of EUT(s)

EUT Type	LED View Cover
Model Name	EF-NG955
Serial Number	#1
Mode of Operation	NFC
Tx Frequency Range	NFC (13.56 MHz)

4 Information of Attached Cell Phone

EUT Type	Portable Handset
Model Name	SM-G955U
Additional Model	SM-G955U1, SM-G955W
Serial Number	218FC
Mode of Operation	PCS CDMA/EVDO / WCDMA IV / LTE Band 25 / 2.4 GHz WLAN
Tx Frequency Range	PCS CDMA/EVDO (1851.25 MHz ~ 1908.75 MHz) WCDMA IV (1712.4 MHz ~ 1752.6MHz) LTE Band 25 (1805.7 MHz ~ 1914.3 MHz) 2.4 GHz WLAN (2412 MHz ~ 2462 MHz)

5 The Highest Reported SAR Values

Equipment Class	Band	Highest Reported SAR			
		Head 1g (W/kg)	Body Worn 1g (W/kg)	Hotspot 1g (W/kg)	Phablet 10g (W/kg)
PCE	Original WCDMA IV	-	1.07	-	-
	Attached LED Cover WCDMA IV	-	0.88	-	-
	Original LTE Band 25	-	-	0.99	-
	Attached LED Cover LTE Band 25	-	-	0.96	-
	Original PCS CDMA/EVDO	-	-	-	3.23
	Attached LED Cover PCS CDMA/EVDO	-	-	-	3.12
DTS	Original 2.4 GHz WLAN	0.30	-	-	-
	Attached LED Cover 2.4 GHz WLAN	0.07	-	-	-
Simultaneous SAR per KDB 690783 D01v01r03		N/A			

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

6 Test Methodology

ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. It specifies the maximum exposure limit of 1.6 W/kg as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

Test tests documented in this report were performed in accordance with IEEE Standard 1528-2013 and the following published KDB procedures.

In additions;

☒	**KDB 865664 D01v01r04**	**SAR Measurement Requirements for 100 MHz to 6 GHz**
☒	**KDB 447498 D01v06**	**Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies**
☐	KDB 447498 D02v02r01	SAR Measurement Procedures for USB Dongle Transmitters
☒	**KDB 248227 D01v02r02**	**SAR Guidance For IEEE 802.11 (Wi-Fi) Transmitters**
☐	KDB 615223 D01v01r01	802.16e/WiMax SAR Measurement Guidance
☐	KDB 616217 D04v01r02	SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers
☐	KDB 643646 D01v01r03	SAR Test Reduction Considerations for Occupational PTT Radios
☒	**KDB 648474 D03v01r03**	**Evaluation and Approval Considerations for Handsets with Specific Wireless Charging Battery Covers**
☒	**KDB 648474 D04v01r03**	**SAR Evaluation Considerations for Wireless Handsets**
☐	KDB 680106 D01v02	RF Exposure Considerations for Low Power Consumer Wireless Power Transfer Applications
☒	**KDB 941225 D01v03r01**	**3G SAR Measurement Procedures**
☒	**KDB 941225 D05v02r04**	**SAR Evaluation Considerations for LTE Devices**
☒	**KDB 941225 D06v02r01**	**SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities**
☐	KDB 941225 D07v01r02	SAR Evaluation Procedures for UMPC Mini-Tablet Devices

7 Testing Environment

Ambient temperature	: 18°C ~ 25°C
Relative humidity	: 30% ~ 70%
Liquid temperature of during the test	: <

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

8 Specific Absorption Rate (SAR)

8.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled

8.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\mathbf{SAR} = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\mathbf{dm}}\right) = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\boldsymbol{\rho}\mathbf{dv}}\right)$$

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by

$$\mathbf{SAR} = \mathbf{C}\left(\frac{\boldsymbol{\delta}\mathbf{T}}{\boldsymbol{\delta}\mathbf{t}}\right)$$

Where: C is the specific head capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

$$\mathbf{SAR} = \frac{\boldsymbol{\sigma}|\mathbf{E}|^2}{\boldsymbol{\rho}}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

8.3 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate ("SAR") in Section 4.2 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

9 The SAR Measurement System

A block diagram of the SAR measurement System is given in Fig. 1. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY5 professional system). The model EX3DV4 field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ ($|Ei|^2$)/ ρ where σ and ρ are the conductivity and mass density of the tissue-simulant.

The DASY 5 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Staubli TX family) with controller, teach pendant and software. An arm extension is for accommodating the data acquisition electronics (DAE).
- A dosimeter probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- Data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

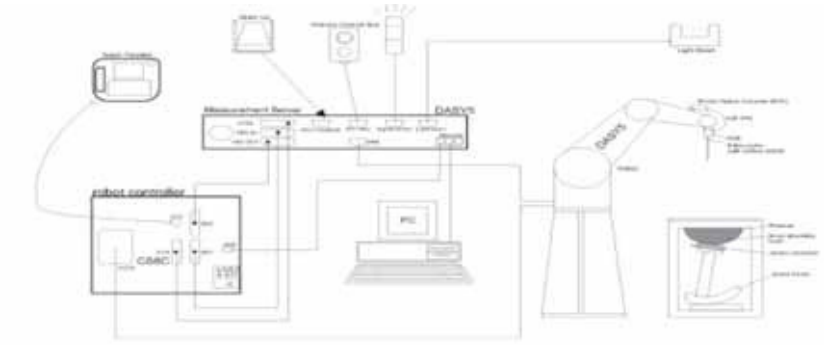


Fig a. The microwave circuit arrangement used for SAR system verification

- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7.
- DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Verification dipole kits allowing to validate the proper functioning of the system.

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10 System Components

10.1 Probe

Construction	:	Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	:	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 835 and HSL1900. Additional CF-Calibration for other liquids and frequencies upon request.
Frequency	:	10

EX3DV4 E-Field Probe

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10.3 Device Holder

Construction: : In combination with the Twin SAM PhantomV4.0/V4.0C or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Device Holder

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

11 SAR Measurement Procedures

11.1 Normal SAR Measurement Procedure

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 1.4

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

< Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04 >

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the area scan based *1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

12 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. 1. The daily system accuracy verification occurs within the flat section of the ELI phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. These tests were done at 1750 / 1900 / 2450

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

13 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this simulant fluid were measured by using the Speag Model DAK-3.5 Dielectric Probe in conjunction with Agilent E5071C Network Analyzer(300

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

14. Instruments List

Test Platform	SPEAG DASY5 Professional				
Location	SGS Korea Co., Ltd. 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, E&E Lab				
Manufacture	SPEAG				
Description	SAR Test System (Frequency range 300 MHz – 6 GHz)				
Software Reference	DASY52: 52.8.8(1258) SEMCAD X: 14.6.10(7373)				
Equipment	**Type**	**Serial Number**	**Cal Date**	**Cal Interval**	**Cal Due**
Robot	TX90XL	F12/5LP8A1/A/01	N/A	N/A	N/A
Phantom	SAM Phantom	TP-1720	N/A	N/A	N/A
Phantom	SAM Phantom	TP-1721	N/A	N/A	N/A
Verification Dipole	D1750V2	1070	2016-07-21	Biennial	2018-07-21
Verification Dipole	D1900V2	5d033	2016-05-26	Biennial	2018-05-26
Verification Dipole	D2450V2	734	2016-05-24	Biennial	2018-05-24
Dielectric Assessment Kit	DAK-3.5	1224	2016-11-17	Annual	2017-11-17
DAE	DAE4	1340	2016-05-30	Annual	2017-05-30
E-Field Probe	EX3DV4	7413	2016-06-29	Annual	2017-06-29
Network Analyzer	E5071C	MY46111535	2016-05-24	Annual	2017-05-24
Power Meter	E4419B	GB43311125	2016-06-20	Annual	2017-06-20
Power Meter	E4416A	GB41292123	2016-12-16	Annual	2017-12-16
Power Sensor	E9300H	MY41495307	2016-06-21	Annual	2017-06-21
Power Sensor	E9300H	MY41495314	2016-06-11	Annual	2017-06-11
Power Sensor	E9327A	US40441371	2016-12-16	Annual	2017-12-16
Signal Generator	E8247C	MY43321024	2016-06-20	Annual	2017-06-20
Power Amplifier	AMP2027	10008	2016-07-12	Annual	2017-07-12
Dual Directional Coupler	778D	MY52180497	2016-06-21	Annual	2017-06-21
Dual Directional Coupler	772D	MY52180226	2016-08-19	Annual	2017-08-19
LP Filter	LA-15N	LF02	2016-06-21	Annual	2017-06-21
LP Filter	LA-30N	LF03	2016-06-21	Annual	2017-06-21
Attenuator	05AS102-K03	A1	2016-12-15	Annual	2017-12-15
Attenuator	05AS102-K20	A3	2016-12-15	Annual	2017-12-15
Attenuator	05AS102-K20	A4	2016-12-15	Annual	2017-12-15
Digital Hygro-Thermometer	BJ5478	12091382-1	2016-06-21	Annual	2017-06-21
Digital Thermometer	DTM3000	3027	2016-06-22	Annual	2017-06-22
Communication Tester	MT8821C	6201462738	2016-08-17	Annual	2017-08-17
Communication Tester	E5515C	G843345198	2017-03-16	Annual	2018-03-16
Spectrum Analyzer	E4445A	MY44020523	2016-06-20	Annual	2017-06-20

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

15 FCC Power Measurement Procedures

The SAR measurement Software calculates a reference point at the start and end of the test to check for power drifts. If conducted power deviations of more than 5 % occurred, the tests were repeated.

16 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, When SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported SAR. Test highest reported SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

17 Maximum Output Power Specifications (Attached Cell Phone)

This device operates using the following maximum output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06

Maximum Power

Mode / Band		**Modulated Average**
WCDMA IV	**Maximum**	**25.0**
	Nominal	24.5

Reduced Power

Mode / Band		**Modulated Average**
PCS CDMA/EVDO	**Maximum**	**22.5**
	Nominal	22.0
LTE Band 25	**Maximum**	**20.5**
	Nominal	20.0
IEEE 802.11b (2.4 GHz)	**Maximum**	**16.5**
	Nominal	16.0

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

18 RF Conducted Power Measurement (Attached Cell Phone)

Mode / Band	Frequency (

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

19. SAR Data Summary

Original Cell Phone Worst Case Mode Test WLAN	Ambient Temperature (°C)	22.8
	Liquid Temperature (°C)	21.6
	Date	2017-03-18

EUT Position	Mode	Antenna Config.	Traffic Channel	Power(dBm)	Peak SAR of Area Scan(W/kg)	1-g SAR (W/kg))	Scaling Factor (Power)	Scaling Factor (Duty cycle)	1-g Scaled SAR (W/kg)	Plot No
			Frequency (							

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Original Cell Phone Worst Case Mode Test **LTE Band 25 Hotspot**	Ambient Temperature (°C)	22.8
	Liquid Temperature (°C)	21.6
	Date	2017-03-18

EUT Position	Mode	Bandwidth (MHz)	Distance (mm)	Traffic Channel		Ant State	Modulation	RB Size	RB Offset	Power(dBm)	Peak SAR of Area Scan(W/kg)	1-g SAR (W/kg))	Scaling Factor (Power)	1-g Scaled SAR (W/kg)	Plot No
				Frequency (											

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendixes List

Appendix A	A.1 Verification Test Plots for 1750MHz A.2 Verification Test Plots for 1900MHz A.3 Verification Test Plots for 2450MHz A.4 SAR Test Plots for Original Worst Case WLAN A.5 SAR Test Plots for Cell Phone + LED Cover WLAN A.6 SAR Test Plots for Original Worst Case WCDMA IV A.7 SAR Test Plots for Cell Phone + LED Cover WCDMA IV A.8 SAR Test Plots for Original Worst Case LTE Band 25 A.9 SAR Test Plots for Cell Phone + LED Cover LTE Band 25 A.10 SAR Test Plots for Original Worst Case PCS CDMA/EVDO A.11 SAR Test Plots for Cell Phone + LED Cover PCS CDMA/EVDO
Appendix B	B.1 Uncertainty Analysis
Appendix C	C.1 Calibration certificate for Probe C.2 Calibration certificate for DAE C.3 Calibration certificate for Dipole

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix A.1 Verification Test Plots for 1750 MHz

Date: 2017-03-18

Test Laboratory : SGS Korea (Gunpo Laboratory)
File Name: 1750MHz Verification.da53:0

Input Power : 100 mW

Ambient Temp : 22.8 ℃ Tissue Temp : 22.0 ℃

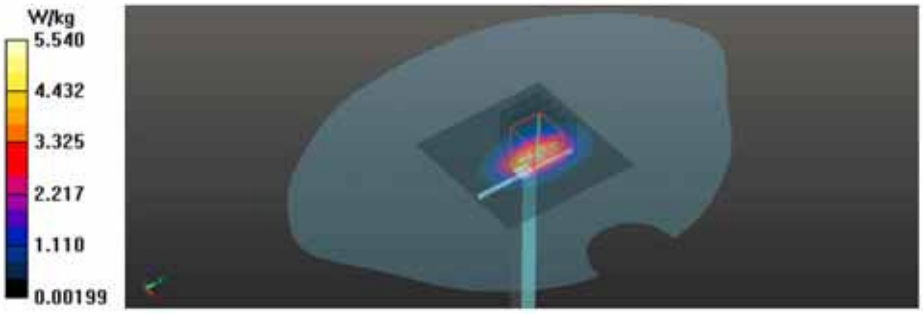
DUT: Dipole 1750 MHz D1750V2; Type: D1750V2; Serial: D1750V2 - SN:1070

Communication System: UID 0, CW (0); Frequency: 1750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1750 MHz; σ = 1.513 S/m; ε_r = 51.974; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY52 Configuration:
- Probe: EX3DV4 - SN7413; ConvF(7.66, 7.66, 7.66); Calibrated: 2016-06-29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1340; Calibrated: 2016-05-30
- Phantom: SAM with CRP; Type: SAM; Serial: TP:1720
- DASY52 52.8.8(1258)SEMCAD X 14.6.10(7373)

Verification/1750MHz Verification/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 5.54 W/kg

Verification/1750MHz Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 57.09 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 6.66 W/kg
SAR(1 g) = 3.72 W/kg; SAR(10 g) = 1.98 W/kg
Maximum value of SAR (measured) = 5.61 W/kg



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix A.2 Verification Test Plots for 1900 MHz

Date: 2017-03-18

Test Laboratory : SGS Korea (Gunpo Laboratory)
File Name: 1900MHz Verification.da53:0

Input Power : 100 mW

Ambient Temp : 22.8 ℃ Tissue Temp : 21.6 ℃

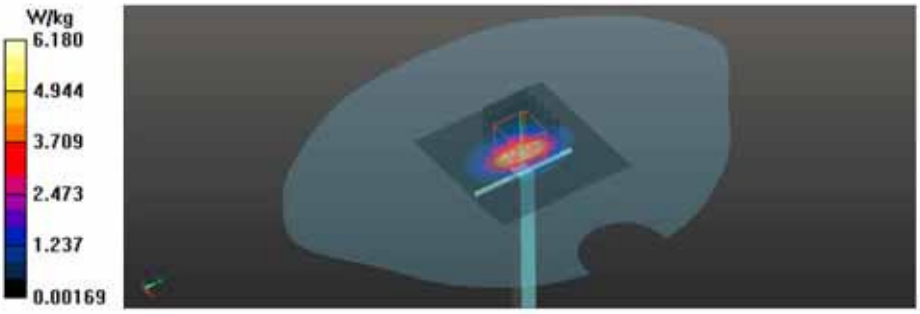
DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:5d033

Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.579 S/m; ε_r = 54.038; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY52 Configuration:
- Probe: EX3DV4 - SN7413; ConvF(7.44, 7.44, 7.44); Calibrated: 2016-06-29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1340; Calibrated: 2016-05-30
- Phantom: SAM with CRP v5.0_TP-1721; Type: QD000P40CD; Serial: TP-1721
- DASY52 52.8.8(1258)SEMCAD X 14.6.10(7373)

Verification/1900MHz Verification/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 6.18 W/kg

Verification/1900MHz Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 65.69 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 7.21 W/kg
SAR(1 g) = 4.08 W/kg; SAR(10 g) = 2.12 W/kg
Maximum value of SAR (measured) = 6.02 W/kg



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix A.3 Verification Test Plots for 2450 MHz

Date: 2017-03-18

Test Laboratory : SGS Korea (Gunpo Laboratory)
File Name: 2450MHz Verification.da53:0

Input Power : 100 mW

Ambient Temp : 22.8 ℃ Tissue Temp : 21.6 ℃

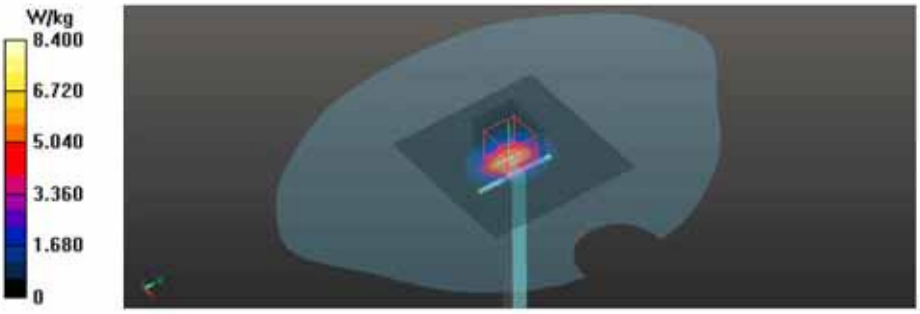
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:734

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.828 S/m; ε_r = 37.986; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY52 Configuration:
- Probe: EX3DV4 - SN7413; ConvF(6.98, 6.98, 6.98); Calibrated: 2016-06-29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1340; Calibrated: 2016-05-30
- Phantom: SAM with CRP v5.0_TP-1721; Type: QD000P40CD; Serial: TP-1721
- DASY52 52.8.8(1258)SEMCAD X 14.6.10(7373)

Verification/2450MHz Verification/Area Scan (101x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 8.40 W/kg

Verification/2450MHz Verification/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 68.26 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 10.5 W/kg
SAR(1 g) = 4.91 W/kg; SAR(10 g) = 2.25 W/kg
Maximum value of SAR (measured) = 8.43 W/kg



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix A.4 SAR Test Plots for Original Worst Case WLAN

Date: 2017-03-18

Test Laboratory : SGS Korea (Gunpo Laboratory)
File Name: 2.45GHz_WLAN_802.11b_Right Touch_CH6_Ant1_With Cover.da53:0

Ambient Temp : 22.8 ℃ Tissue Temp : 21.6 ℃

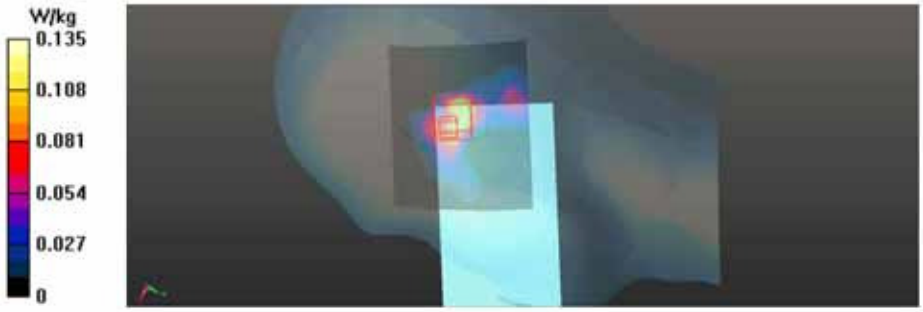
DUT: SM-G955U & EF-NG955; Type: Portable Handset & LED Cover; Serial: 218FC & #1

Communication System: UID 0, WLAN 2.45GHz (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.814 S/m; ε_r = 38.037; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY52 Configuration:
- Probe: EX3DV4 - SN7413; ConvF(6.98, 6.98, 6.98); Calibrated: 2016-06-29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1340; Calibrated: 2016-05-30
- Phantom: SAM with CRP v5.0_TP-1721; Type: QD000P40CD; Serial: TP-1721
- DASY52 52.8.8(1258)SEMCAD X 14.6.10(7373)

Head/2.45GHz_WLAN_802.11b_Right Touch_CH6_Ant1_With Cover/Area Scan (81x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.135 W/kg

Head/2.45GHz_WLAN_802.11b_Right Touch_CH6_Ant1_With Cover/Zoom Scan (8x9x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.659 V/m; Power Drift = 0.20 dB
Peak SAR (extrapolated) = 0.188 W/kg
SAR(1 g) = 0.067 W/kg; SAR(10 g) = 0.029 W/kg
Maximum value of SAR (measured) = 0.132 W/kg



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix A.5 SAR Test Plots for Cell Phone + LED Cover WLAN

Date: 2017-03-18

Test Laboratory : SGS Korea (Gunpo Laboratory)
File Name: 2.45GHz_WLAN_802.11b_Right Touch_CH6_Ant1_With Cover.da53:0

Ambient Temp : 22.8 ℃ Tissue Temp : 21.6 ℃

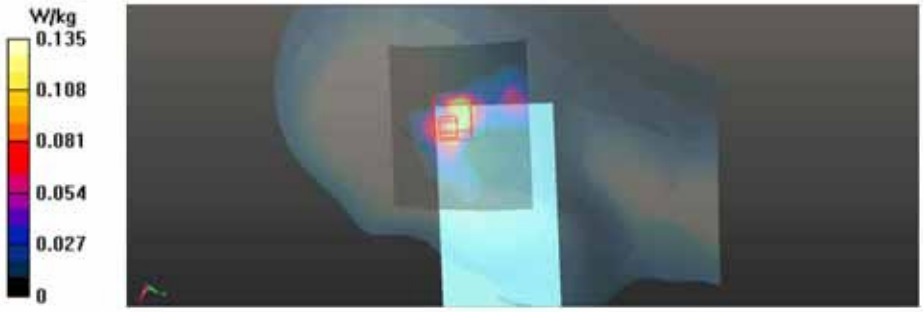
DUT: SM-G955U & EF-NG955; Type: Portable Handset & LED Cover; Serial: 218FC & #1

Communication System: UID 0, WLAN 2.45GHz (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.814 S/m; ε_r = 38.037; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY52 Configuration:
- Probe: EX3DV4 - SN7413; ConvF(6.98, 6.98, 6.98); Calibrated: 2016-06-29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1340; Calibrated: 2016-05-30
- Phantom: SAM with CRP v5.0_TP-1721; Type: QD000P40CD; Serial: TP-1721
- DASY52 52.8.8(1258)SEMCAD X 14.6.10(7373)

Head/2.45GHz_WLAN_802.11b_Right Touch_CH6_Ant1_With Cover/Area Scan (81x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.135 W/kg

Head/2.45GHz_WLAN_802.11b_Right Touch_CH6_Ant1_With Cover/Zoom Scan (8x9x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.659 V/m; Power Drift = 0.20 dB
Peak SAR (extrapolated) = 0.188 W/kg
SAR(1 g) = 0.067 W/kg; SAR(10 g) = 0.029 W/kg
Maximum value of SAR (measured) = 0.132 W/kg



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix A.6 SAR Test Plots for Original Worst Case WCDMA VI

Date: 2017-03-18

Test Laboratory : SGS Korea (Gunpo Laboratory)
File Name: WCDMA IV_Rear_CH1312.da53:0

Ambient Temp : 22.8 ℃ Tissue Temp : 21.6 ℃

DUT: SM-G955U; Type: Portable Handset; Serial: 218FC

Communication System: UID 0, WCDMA4 (0); Frequency: 1712.4 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1712.4 MHz; σ = 1.468 S/m; ε_r = 52.122; ρ = 1000 kg/m^3
Phantom section: Flat Section

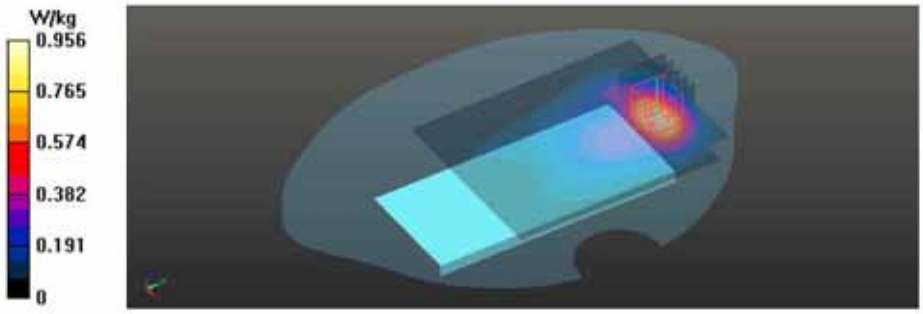
DASY52 Configuration:
- Probe: EX3DV4 - SN7413; ConvF(7.66, 7.66, 7.66); Calibrated: 2016-06-29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1340; Calibrated: 2016-05-30
- Phantom: SAM with CRP; Type: SAM; Serial: TP:1720
- DASY52 52.8.8(1258)SEMCAD X 14.6.10(7373)

Body/WCDMA IV_Rear_CH1312/Area Scan (81x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.956 W/kg

Body/WCDMA IV_Rear_CH1312/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.387 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 1.12 W/kg
SAR(1 g) = 0.728 W/kg; SAR(10 g) = 0.439 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.998 W/kg



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix A.7 SAR Test Plots for Cell Phone + LED Cover WCDMA IV

Date: 2017-03-18

Test Laboratory : SGS Korea (Gunpo Laboratory)
File Name: WCDMA IV_Rear_CH1312_With Cover.da53:0

Ambient Temp : 22.8 ℃ Tissue Temp : 21.6 ℃

DUT: SM-G955U & EF-NG955; Type: Portable Handset & LED Cover; Serial: 218FC & #1

Communication System: UID 0, WCDMA4 (0); Frequency: 1712.4 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1712.4 MHz; σ = 1.468 S/m; ε_r = 52.122; ρ = 1000 kg/m^3
Phantom section: Flat Section

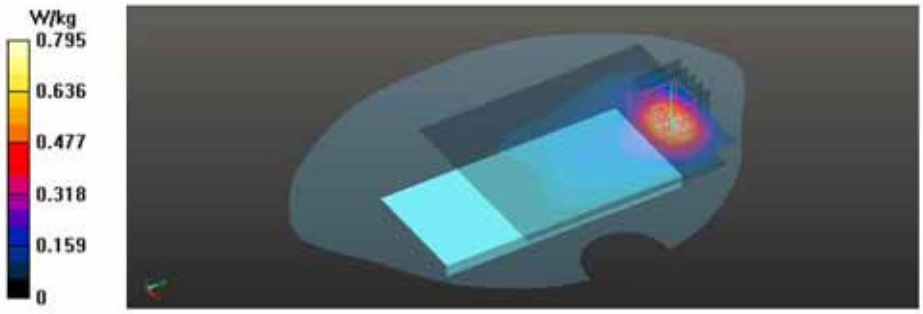
DASY52 Configuration:
- Probe: EX3DV4 - SN7413; ConvF(7.66, 7.66, 7.66); Calibrated: 2016-06-29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1340; Calibrated: 2016-05-30
- Phantom: SAM with CRP; Type: SAM; Serial: TP:1720
- DASY52 52.8.8(1258)SEMCAD X 14.6.10(7373)

Body/WCDMA IV_Rear_CH1312_With Cover_13/Area Scan (81x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.795 W/kg

Body/WCDMA IV_Rear_CH1312_With Cover_13/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.925 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.925 W/kg
SAR(1 g) = 0.598 W/kg; SAR(10 g) = 0.363 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.819 W/kg



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix A.8 SAR Test Plots for Original Worst Case LTE Band 25

Date: 2017-03-18

Test Laboratory : SGS Korea (Gunpo Laboratory)
File Name: LTE Band 25_20MHz_1RB_0 Offset_QPSK_Bottom_CH26590.da53:0

Ambient Temp : 22.8 ℃ Tissue Temp : 21.6 ℃

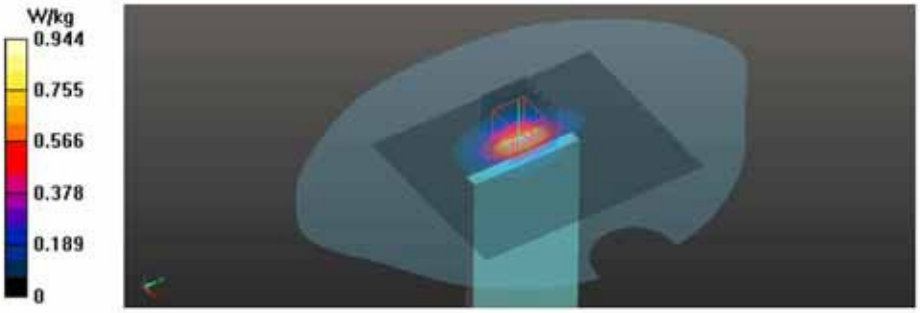
DUT: SM-G955U; Type: Portable Handset; Serial: 218FC

Communication System: UID 0, LTE Band 25 (0); Frequency: 1905 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1905 MHz; σ = 1.585 S/m; ε_r = 54.021; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY52 Configuration:
- Probe: EX3DV4 - SN7413; ConvF(7.44, 7.44, 7.44); Calibrated: 2016-06-29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1340; Calibrated: 2016-05-30
- Phantom: SAM with CRP v5.0_TP-1721; Type: QD000P40CD; Serial: TP-1721
- DASY52 52.8.8(1258)SEMCAD X 14.6.10(7373)

Body/LTE Band 25_20MHz_1RB_0 Offset_QPSK_Bottom_CH26590/Area Scan (81x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.944 W/kg

Body/LTE Band 25_20MHz_1RB_0 Offset_QPSK_Bottom_CH26590/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.91 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.791 W/kg; SAR(10 g) = 0.428 W/kg
Maximum value of SAR (measured) = 1.15 W/kg



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix A.9 SAR Test Plots for Cell Phone + LED Cover LTE Band 25

Date: 2017-03-18

Test Laboratory : SGS Korea (Gunpo Laboratory)
File Name: LTE Band 25_20MHz_1RB_0 Offset_QPSK_Bottom_CH26590_With Cover.da53:0

Ambient Temp : 22.8 ℃ Tissue Temp : 21.6 ℃

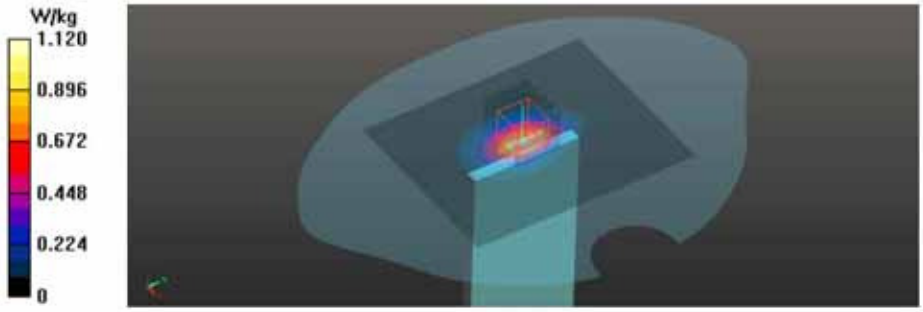
DUT: SM-G955U; Type: Portable Handset; Serial: 218FC

Communication System: UID 0, LTE Band 25 (0); Frequency: 1905 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1905 MHz; σ = 1.585 S/m; ε_r = 54.021; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY52 Configuration:
- Probe: EX3DV4 - SN7413; ConvF(7.44, 7.44, 7.44); Calibrated: 2016-06-29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1340; Calibrated: 2016-05-30
- Phantom: SAM with CRP v5.0_TP-1721; Type: QD000P40CD; Serial: TP-1721
- DASY52 52.8.8(1258)SEMCAD X 14.6.10(7373)

Body/LTE Band 25_20MHz_1RB_0 Offset_QPSK_Bottom_CH26590_With Cover/Area Scan (81x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.12 W/kg

Body/LTE Band 25_20MHz_1RB_0 Offset_QPSK_Bottom_CH26590_With Cover/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.55 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 1.26 W/kg
SAR(1 g) = 0.766 W/kg; SAR(10 g) = 0.423 W/kg
Maximum value of SAR (measured) = 1.09 W/kg



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix A.10 SAR Test Plots for Original Worst Case PCS CDMA/EVDO

Date: 2017-03-18

Test Laboratory : SGS Korea (Gunpo Laboratory)
File Name: EVDO_Bottom_CH25.da53:0

Ambient Temp : 22.8 ℃ Tissue Temp : 21.6 ℃

DUT: SM-G955U; Type: Portable Handset; Serial: 218FC

Communication System: UID 0, CDMA PCS 1xRTT/EVDO (0); Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1851.25 MHz; σ = 1.521 S/m; ε_r = 54.207; ρ = 1000 kg/m^3
Phantom section: Flat Section

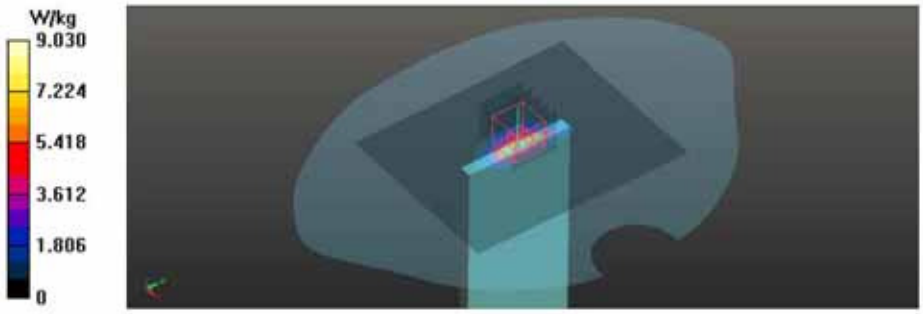
DASY52 Configuration:
- Probe: EX3DV4 - SN7413; ConvF(7.44, 7.44, 7.44); Calibrated: 2016-06-29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1340; Calibrated: 2016-05-30
- Phantom: SAM with CRP v5.0_TP-1721; Type: QD000P40CD; Serial: TP-1721
- DASY52 52.8.8(1258)SEMCAD X 14.6.10(7373)

Body/EVDO_Bottom_CH25/Area Scan (81x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 9.03 W/kg

Body/EVDO_Bottom_CH25/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.31 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 11.0 W/kg
SAR(1 g) = 5.58 W/kg; SAR(10 g) = 2.61 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 9.35 W/kg



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix A.11 SAR Test Plots for Cell Phone + LED Cover PCS CDMA/EVDO

Date: 2017-03-18

Test Laboratory : SGS Korea (Gunpo Laboratory)
File Name: EVDO_Bottom_CH25_With Cover.da53:0

Ambient Temp : 22.8 ℃ Tissue Temp : 21.6 ℃

DUT: SM-G955U & EF-NG955; Type: Portable Handset & LED Cover; Serial: 218FC & #1

Communication System: UID 0, CDMA PCS 1xRTT/EVDO (0); Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1851.25 MHz; σ = 1.521 S/m; ε_r = 54.207; ρ = 1000 kg/m^3
Phantom section: Flat Section

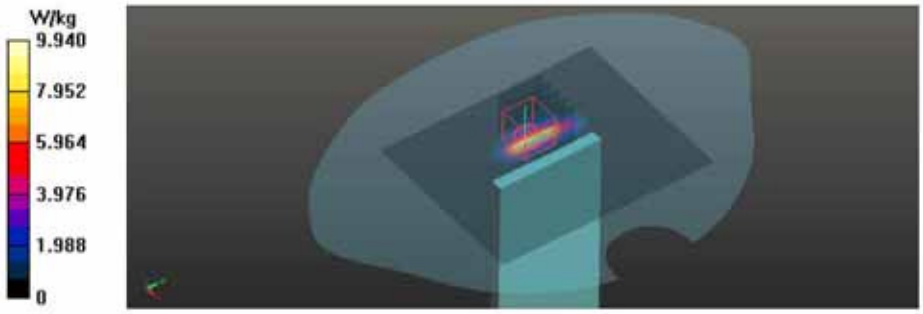
DASY52 Configuration:
- Probe: EX3DV4 - SN7413; ConvF(7.44, 7.44, 7.44); Calibrated: 2016-06-29;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1340; Calibrated: 2016-05-30
- Phantom: SAM with CRP v5.0_TP-1721; Type: QD000P40CD; Serial: TP-1721
- DASY52 52.8.8(1258)SEMCAD X 14.6.10(7373)

Body/EVDO_Bottom_CH25/Area Scan (81x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 9.94 W/kg

Body/EVDO_Bottom_CH25/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.07 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 11.9 W/kg
SAR(1 g) = 5.59 W/kg; SAR(10 g) = 2.52 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 10.1 W/kg



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

B.1 Uncertainty Analysis

Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram

a

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix C.1 Calibration certificate for Probe(S/N 7413)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client SGS Korea (Dymstec)

Certificate No: EX3-7413_Jun16

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:7413
Calibration procedure(s)	QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date	June 29, 2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: S5277 (20x)	05-Apr-16 (No. 217-02293)	Apr-17
Reference Probe ES3DV2	SN: 3013	31-Dec-15 (No. ES3-3013_Dec15)	Dec-16
DAE4	SN: 660	23-Dec-15 (No. DAE4-660_Dec15)	Dec-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-16)	In house check: Jun-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 29, 2016

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: EX3-7413_Jun16 Page 1 of 38

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z*: Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*
- *DCPx,y,z*: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR*: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z*: *A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters*: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Certificate No: EX3-7413_Jun16 Page 2 of 30

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Probe EX3DV4

SN:7413

Manufactured: March 10, 2016
Calibrated: June 29, 2016

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7413

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.46	0.60	0.43	± 10.1 %
DCP (mV)[B]	119.6	99.6	97.1	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	118.1	±3.5 %
		Y	0.0	0.0	1.0		137.1	
		Z	0.0	0.0	1.0		146.6	

Note: For details on UID parameters see Appendix.

Sensor Model Parameters

	C1 fF	C2 fF	α V^{-1}	T1 $ms.V^{-2}$	T2 $ms.V^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
X	51.84	351.8	30.35	15.19	0.528	4.987	0.328	0.295	0.994
Y	50.91	381	35.76	14.85	0.972	5.02	1.629	0.199	1.007
Z	54.25	410.3	36.43	15.21	1.066	5.005	0.612	0.491	1.005

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7413

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	41.9	0.89	9.74	9.74	9.74	0.44	0.80	± 12.0 %
835	41.5	0.90	9.28	9.28	9.28	0.48	0.80	± 12.0 %
900	41.5	0.97	9.15	9.15	9.15	0.30	1.01	± 12.0 %
1750	40.1	1.37	7.94	7.94	7.94	0.31	0.80	± 12.0 %
1900	40.0	1.40	7.70	7.70	7.70	0.37	0.80	± 12.0 %
2000	40.0	1.40	7.67	7.67	7.67	0.26	0.80	± 12.0 %
2300	39.5	1.67	7.34	7.34	7.34	0.33	0.80	± 12.0 %
2450	39.2	1.80	6.98	6.98	6.98	0.27	0.93	± 12.0 %
2600	39.0	1.96	6.82	6.82	6.82	0.29	0.80	± 12.0 %
5200	36.0	4.66	5.41	5.41	5.41	0.35	1.80	± 13.1 %
5300	35.9	4.76	5.15	5.15	5.15	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.54	4.54	4.54	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.58	4.58	4.58	0.45	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7413

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	55.5	0.96	9.31	9.31	9.31	0.42	0.82	± 12.0 %
835	55.2	0.97	9.34	9.34	9.34	0.47	0.83	± 12.0 %
1750	53.4	1.49	7.66	7.66	7.66	0.39	0.80	± 12.0 %
1900	53.3	1.52	7.44	7.44	7.44	0.40	0.89	± 12.0 %
2450	52.7	1.95	7.07	7.07	7.07	0.42	0.80	± 12.0 %
2600	52.5	2.16	6.84	6.84	6.84	0.36	0.80	± 12.0 %
5200	49.0	5.30	4.68	4.68	4.68	0.45	1.90	± 13.1 %
5300	48.9	5.42	4.44	4.44	4.44	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.85	3.85	3.85	0.50	1.90	± 13.1 %
5800	48.2	6.00	4.16	4.16	4.16	0.50	1.90	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

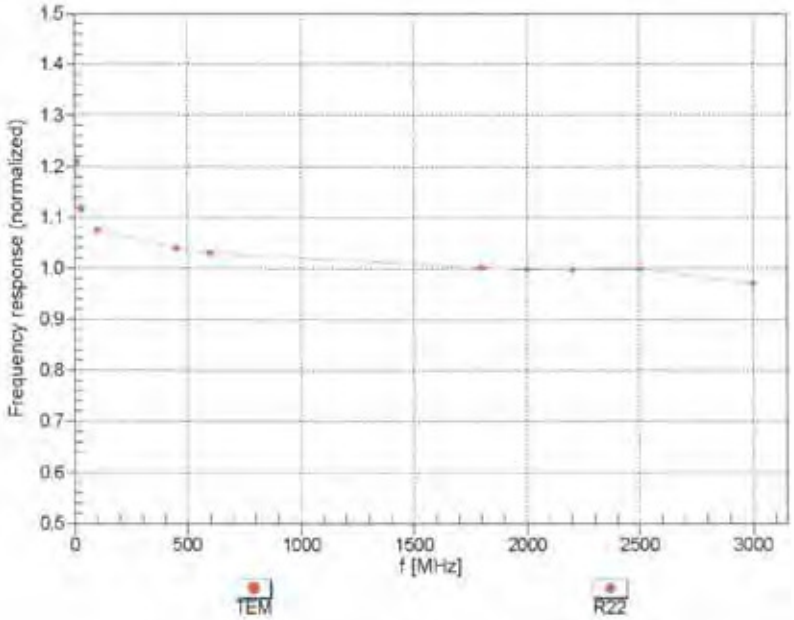
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

EX3DV4– SN:7413 June 29, 2016

Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



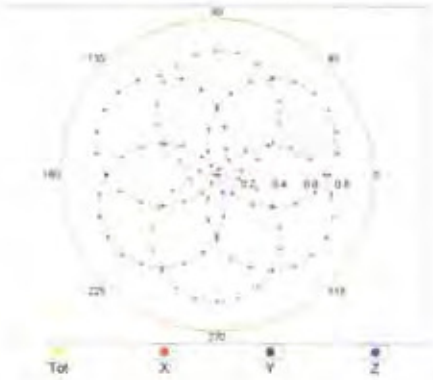
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

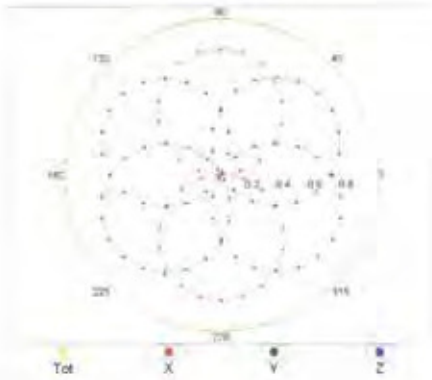
EX3DV4– SN:7413 June 29, 2016

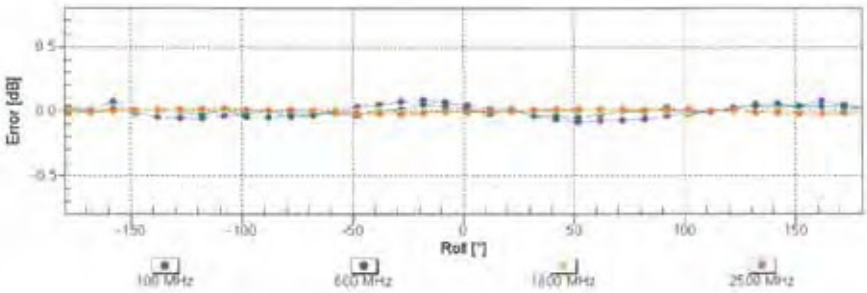
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22





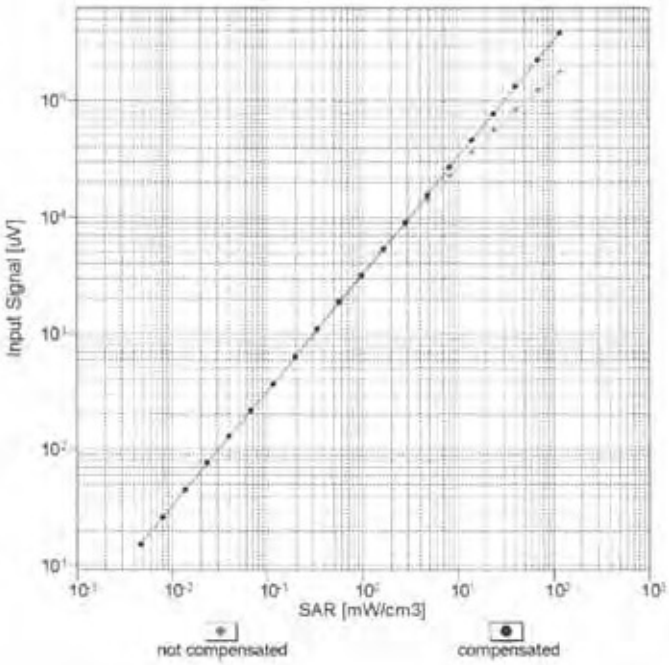
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

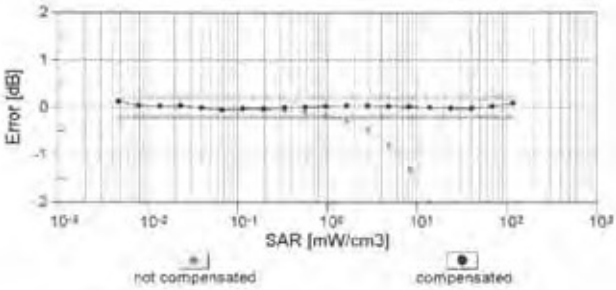
Certificate No: EX3-7413_Jun16 Page 8 of 38

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

EX3DV4– SN:7413 June 29, 2016

Dynamic Range f(SAR$_{head}$)
(TEM cell , f_{eval}= 1900 MHz)





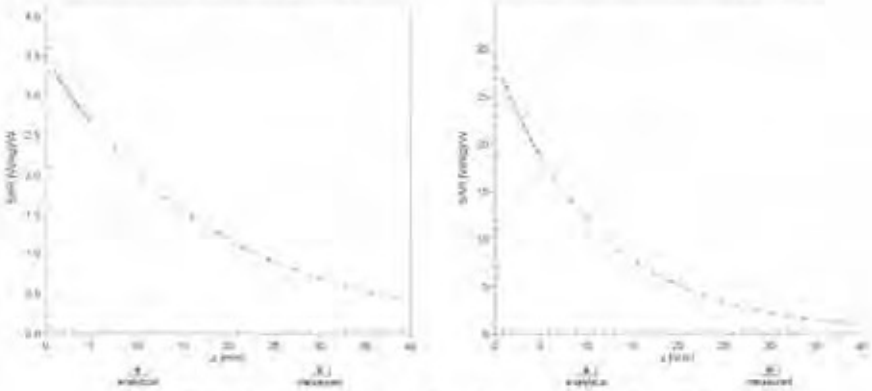
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

EX3DV4– SN:7413 June 29, 2016

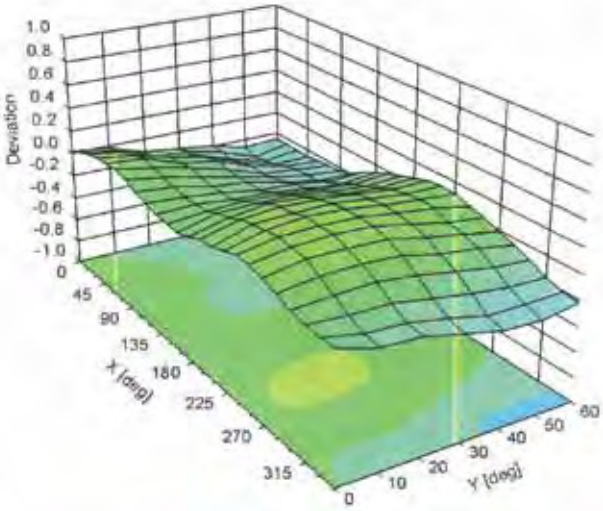
Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF) f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: EX3-7413_Jun16 Page 10 of 38

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7413

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	62
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix: Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max Unc[E] (k=2)
0	CW	X	0.00	0.00	1.00	0.00	118.1	± 3.5 %
		Y	0.00	0.00	1.00		137.1	
		Z	0.00	0.00	1.00		146.6	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	2.41	64.88	9.47	10.00	20.0	± 9.6 %
		Y	3.52	69.66	12.77		20.0	
		Z	3.04	67.77	11.85		20.0	
10011-CAB	UMTS-FDD (WCDMA)	X	1.52	75.62	19.74	0.00	150.0	± 9.6 %
		Y	1.06	67.55	15.45		150.0	
		Z	1.01	66.54	14.85		150.0	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	1.26	66.46	16.91	0.41	150.0	± 9.6 %
		Y	1.20	63.91	15.26		150.0	
		Z	1.17	63.46	14.93		150.0	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	4.85	66.98	16.96	1.46	150.0	± 9.6 %
		Y	4.91	66.60	17.02		150.0	
		Z	4.92	66.40	16.90		150.0	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	27.40	92.23	20.37	9.39	50.0	± 9.6 %
		Y	100.00	113.97	27.83		50.0	
		Z	38.89	100.98	24.44		50.0	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	16.64	86.51	18.78	9.57	50.0	± 9.6 %
		Y	77.35	110.48	27.03		50.0	
		Z	24.41	94.85	22.81		50.0	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	100.00	104.59	22.12	6.56	60.0	± 9.6 %
		Y	100.00	112.13	25.89		60.0	
		Z	100.00	110.44	25.10		60.0	
10025-DAB	EDGE-FDD (TDMA, 8PSK, TN 0)	X	4.97	73.74	26.31	12.57	50.0	± 9.6 %
		Y	12.62	102.74	40.61		50.0	
		Z	4.97	72.63	26.35		50.0	
10026-DAB	EDGE-FDD (TDMA, 8PSK, TN 0-1)	X	12.64	96.71	32.82	9.56	60.0	± 9.6 %
		Y	13.79	100.77	35.59		60.0	
		Z	9.58	90.06	31.02		60.0	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	100.00	104.57	21.47	4.80	80.0	± 9.6 %
		Y	100.00	112.09	25.09		80.0	
		Z	100.00	109.64	23.98		80.0	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	100.00	106.09	21.56	3.55	100.0	± 9.6 %
		Y	100.00	113.22	24.91		100.0	
		Z	100.00	109.92	23.45		100.0	
10029-DAB	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	X	7.64	85.93	27.95	7.80	80.0	± 9.6 %
		Y	7.47	86.25	29.10		80.0	
		Z	6.36	81.43	26.65		80.0	
10030-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH1)	X	100.00	103.49	21.24	5.30	70.0	± 9.6 %
		Y	100.00	110.65	24.75		70.0	
		Z	100.00	108.68	23.85		70.0	
10031-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH3)	X	100.00	109.31	21.77	1.88	100.0	± 9.6 %
		Y	100.00	113.43	23.69		100.0	
		Z	100.00	108.52	21.62		100.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	100.00	126.66	27.83	1.17	100.0	± 9.6 %
		Y	100.00	120.12	25.51		100.0	
		Z	100.00	112.50	22.40		100.0	
10033-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)	X	30.77	106.01	27.67	5.30	70.0	± 9.6 %
		Y	10.48	91.31	24.34		70.0	
		Z	7.05	84.65	21.99		70.0	
10034-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)	X	11.35	96.03	24.45	1.88	100.0	± 9.6 %
		Y	3.10	76.93	18.26		100.0	
		Z	2.57	73.97	17.07		100.0	
10035-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)	X	6.32	89.72	22.67	1.17	100.0	± 9.6 %
		Y	2.14	73.16	16.62		100.0	
		Z	1.87	71.01	15.72		100.0	
10036-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH1)	X	64.87	117.23	30.56	5.30	70.0	± 9.6 %
		Y	13.64	95.62	25.73		70.0	
		Z	8.59	87.89	23.14		70.0	
10037-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH3)	X	9.46	93.52	23.68	1.88	100.0	± 9.6 %
		Y	2.94	76.28	17.98		100.0	
		Z	2.45	73.44	16.83		100.0	
10038-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH5)	X	6.74	91.05	23.22	1.17	100.0	± 9.6 %
		Y	2.16	73.51	16.87		100.0	
		Z	1.89	71.33	15.96		100.0	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	13.14	102.35	26.80	0.00	150.0	± 9.6 %
		Y	1.91	72.32	16.12		150.0	
		Z	1.83	71.35	15.82		150.0	
10042-CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate)	X	31.53	91.97	19.04	7.78	50.0	± 9.6 %
		Y	100.00	110.31	25.33		50.0	
		Z	32.46	96.48	21.73		50.0	
10044-CAA	IS-91/EIA/TIA-553 FDD (FDMA, FM)	X	0.00	108.02	0.06	0.00	150.0	± 9.6 %
		Y	0.00	94.69	0.00		150.0	
		Z	0.00	99.36	5.55		150.0	
10048-CAA	DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)	X	7.23	74.46	16.06	13.80	25.0	± 9.6 %
		Y	13.30	84.94	21.38		25.0	
		Z	9.90	80.57	19.85		25.0	
10049-CAA	DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)	X	7.54	76.74	15.84	10.79	40.0	± 9.6 %
		Y	17.29	90.16	21.90		40.0	
		Z	11.09	83.84	19.77		40.0	
10056-CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	X	19.62	94.10	24.27	9.03	50.0	± 9.6 %
		Y	16.22	93.30	25.22		50.0	
		Z	10.88	86.41	22.83		50.0	
10058-DAB	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	X	5.67	80.40	25.18	6.55	100.0	± 9.6 %
		Y	5.38	79.49	25.62		100.0	
		Z	4.93	76.78	24.05		100.0	
10059-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	X	1.35	68.10	17.67	0.61	110.0	± 9.6 %
		Y	1.25	65.06	15.85		110.0	
		Z	1.22	64.48	15.43		110.0	
10060-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	X	100.00	137.85	35.53	1.30	110.0	± 9.6 %
		Y	14.13	106.80	28.14		110.0	
		Z	4.75	89.77	22.92		110.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10061-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	X	7.36	95.47	26.77	2.04	110.0	± 9.6 %
		Y	3.17	80.64	22.01		110.0	
		Z	2.63	76.91	20.28		110.0	
10062-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	X	4.70	67.21	16.59	0.49	100.0	± 9.6 %
		Y	4.72	66.61	16.48		100.0	
		Z	4.73	66.46	16.40		100.0	
10063-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)	X	4.71	67.26	16.66	0.72	100.0	± 9.6 %
		Y	4.73	66.69	16.57		100.0	
		Z	4.75	66.53	16.48		100.0	
10064-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)	X	5.00	67.47	16.83	0.86	100.0	± 9.6 %
		Y	5.03	66.98	16.81		100.0	
		Z	5.06	66.83	16.73		100.0	
10065-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)	X	4.86	67.35	16.90	1.21	100.0	± 9.6 %
		Y	4.90	66.87	16.89		100.0	
		Z	4.92	66.71	16.79		100.0	
10066-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)	X	4.86	67.32	17.01	1.46	100.0	± 9.6 %
		Y	4.92	66.90	17.05		100.0	
		Z	4.93	66.72	16.94		100.0	
10067-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)	X	5.12	67.28	17.31	2.04	100.0	± 9.6 %
		Y	5.20	67.03	17.47		100.0	
		Z	5.21	66.80	17.32		100.0	
10068-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)	X	5.17	67.36	17.50	2.55	100.0	± 9.6 %
		Y	5.27	67.16	17.73		100.0	
		Z	5.28	66.94	17.56		100.0	
10069-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	X	5.24	67.26	17.64	2.67	100.0	± 9.6 %
		Y	5.35	67.14	17.91		100.0	
		Z	5.36	66.89	17.73		100.0	
10071-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	X	4.93	67.00	17.19	1.99	100.0	± 9.6 %
		Y	5.01	66.69	17.32		100.0	
		Z	5.01	66.48	17.17		100.0	
10072-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	X	4.91	67.35	17.39	2.30	100.0	± 9.6 %
		Y	5.00	67.04	17.53		100.0	
		Z	5.00	66.81	17.37		100.0	
10073-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	X	4.96	67.43	17.64	2.83	100.0	± 9.6 %
		Y	5.06	67.21	17.85		100.0	
		Z	5.06	66.94	17.65		100.0	
10074-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	X	4.93	67.30	17.76	3.30	100.0	± 9.6 %
		Y	5.04	67.11	18.01		100.0	
		Z	5.03	66.82	17.79		100.0	
10075-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	X	4.98	67.44	18.05	3.82	90.0	± 9.6 %
		Y	5.10	67.31	18.35		90.0	
		Z	5.09	67.00	18.12		90.0	
10076-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	X	4.96	67.15	18.10	4.15	90.0	± 9.6 %
		Y	5.10	67.08	18.46		90.0	
		Z	5.08	66.74	18.19		90.0	
10077-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	X	4.98	67.20	18.19	4.30	90.0	± 9.6 %
		Y	5.13	67.15	18.55		90.0	
		Z	5.11	66.79	18.28		90.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10081-CAB	CDMA2000 (1xRTT, RC3)	X	2.18	81.13	20.04	0.00	150.0	± 9.6 %
		Y	0.89	66.39	13.08		150.0	
		Z	0.87	65.70	12.80		150.0	
10082-CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate)	X	0.84	60.00	4.53	4.77	80.0	± 9.6 %
		Y	0.87	60.00	5.05		80.0	
		Z	0.73	58.47	3.99		80.0	
10090-DAB	GPRS-FDD (TDMA, GMSK, TN 0-4)	X	100.00	104.61	22.14	6.56	60.0	± 9.6 %
		Y	100.00	112.15	25.92		60.0	
		Z	100.00	110.47	25.13		60.0	
10097-CAB	UMTS-FDD (HSDPA)	X	2.23	72.19	18.20	0.00	150.0	± 9.6 %
		Y	1.85	67.61	15.74		150.0	
		Z	1.82	67.08	15.48		150.0	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	2.19	72.15	18.18	0.00	150.0	± 9.6 %
		Y	1.81	67.58	15.71		150.0	
		Z	1.78	67.02	15.44		150.0	
10099-DAB	EDGE-FDD (TDMA, 8PSK, TN 0-4)	X	12.73	96.81	32.84	9.56	60.0	± 9.6 %
		Y	13.87	100.85	35.61		60.0	
		Z	9.62	90.12	31.04		60.0	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	3.87	74.78	18.70	0.00	150.0	± 9.6 %
		Y	3.19	70.44	16.76		150.0	
		Z	3.15	70.02	16.53		150.0	
10101-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	X	3.46	69.47	16.86	0.00	150.0	± 9.6 %
		Y	3.29	67.58	15.98		150.0	
		Z	3.29	67.37	15.86		150.0	
10102-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	X	3.57	69.38	16.93	0.00	150.0	± 9.6 %
		Y	3.39	67.52	16.06		150.0	
		Z	3.39	67.35	15.96		150.0	
10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	7.54	78.19	20.78	3.98	65.0	± 9.6 %
		Y	6.37	75.10	20.03		65.0	
		Z	6.36	74.71	19.73		65.0	
10104-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	X	6.93	75.13	20.40	3.98	65.0	± 9.6 %
		Y	6.62	74.13	20.48		65.0	
		Z	6.48	73.31	19.98		65.0	
10105-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	X	6.64	74.32	20.39	3.98	65.0	± 9.6 %
		Y	6.06	72.29	19.97		65.0	
		Z	6.20	72.39	19.89		65.0	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	3.33	73.74	18.49	0.00	150.0	± 9.6 %
		Y	2.79	69.63	16.58		150.0	
		Z	2.77	69.23	16.34		150.0	
10109-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	3.15	69.55	16.96	0.00	150.0	± 9.6 %
		Y	2.94	67.40	15.88		150.0	
		Z	2.95	67.18	15.77		150.0	
10110-CAC	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	2.70	72.75	18.23	0.00	150.0	± 9.6 %
		Y	2.27	68.73	16.21		150.0	
		Z	2.25	68.25	15.94		150.0	
10111-CAC	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	3.05	71.57	17.96	0.00	150.0	± 9.6 %
		Y	2.65	68.09	16.14		150.0	
		Z	2.66	67.88	16.07		150.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10112-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	3.27	69.43	16.95	0.00	150.0	± 9.6 %
		Y	3.07	67.37	15.93		150.0	
		Z	3.07	67.18	15.83		150.0	
10113-CAC	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	3.20	71.52	17.99	0.00	150.0	± 9.6 %
		Y	2.80	68.21	16.26		150.0	
		Z	2.82	68.03	16.21		150.0	
10114-CAB	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	5.15	67.86	16.59	0.00	150.0	± 9.6 %
		Y	5.16	67.18	16.44		150.0	
		Z	5.18	67.08	16.39		150.0	
10115-CAB	IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)	X	5.45	67.98	16.64	0.00	150.0	± 9.6 %
		Y	5.48	67.38	16.55		150.0	
		Z	5.53	67.37	16.55		150.0	
10116-CAB	IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)	X	5.25	68.06	16.61	0.00	150.0	± 9.6 %
		Y	5.27	67.40	16.48		150.0	
		Z	5.30	67.33	16.44		150.0	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	5.13	67.81	16.59	0.00	150.0	± 9.6 %
		Y	5.14	67.08	16.40		150.0	
		Z	5.17	67.01	16.38		150.0	
10118-CAB	IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)	X	5.51	68.08	16.70	0.00	150.0	± 9.6 %
		Y	5.56	67.57	16.65		150.0	
		Z	5.61	67.55	16.64		150.0	
10119-CAB	IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)	X	5.22	68.00	16.60	0.00	150.0	± 9.6 %
		Y	5.24	67.33	16.45		150.0	
		Z	5.27	67.26	16.42		150.0	
10140-CAB	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	X	3.61	69.35	16.83	0.00	150.0	± 9.6 %
		Y	3.43	67.53	15.98		150.0	
		Z	3.43	67.35	15.88		150.0	
10141-CAB	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	X	3.73	69.40	16.97	0.00	150.0	± 9.6 %
		Y	3.55	67.60	16.14		150.0	
		Z	3.56	67.45	16.05		150.0	
10142-CAC	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	X	2.60	73.76	18.49	0.00	150.0	± 9.6 %
		Y	2.05	68.71	15.92		150.0	
		Z	2.03	68.18	15.67		150.0	
10143-CAC	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	X	3.24	74.09	18.60	0.00	150.0	± 9.6 %
		Y	2.52	68.83	15.92		150.0	
		Z	2.53	68.59	15.89		150.0	
10144-CAC	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	X	2.63	69.71	16.09	0.00	150.0	± 9.6 %
		Y	2.31	66.75	14.43		150.0	
		Z	2.32	66.45	14.36		150.0	
10145-CAC	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	2.58	76.48	17.82	0.00	150.0	± 9.6 %
		Y	1.33	65.87	12.56		150.0	
		Z	1.36	65.82	12.72		150.0	
10146-CAC	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	1.64	64.90	10.89	0.00	150.0	± 9.6 %
		Y	2.28	67.92	12.65		150.0	
		Z	2.14	66.83	12.42		150.0	
10147-CAC	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	X	1.89	66.60	11.89	0.00	150.0	± 9.6 %
		Y	2.79	70.42	13.92		150.0	
		Z	2.50	68.84	13.52		150.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10149-CAB	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	X	3.17	69.65	17.02	0.00	150.0	± 9.6 %
		Y	2.95	67.45	15.93		150.0	
		Z	2.96	67.24	15.81		150.0	
10150-CAB	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	X	3.28	69.51	17.01	0.00	150.0	± 9.6 %
		Y	3.07	67.42	15.97		150.0	
		Z	3.08	67.23	15.87		150.0	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	8.00	80.53	21.76	3.98	65.0	± 9.6 %
		Y	6.93	78.02	21.29		65.0	
		Z	6.56	76.58	20.57		65.0	
10152-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	X	6.45	75.03	20.11	3.98	65.0	± 9.6 %
		Y	6.16	74.09	20.19		65.0	
		Z	5.98	73.11	19.63		65.0	
10153-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	X	6.94	76.27	21.02	3.98	65.0	± 9.6 %
		Y	6.51	74.92	20.91		65.0	
		Z	6.35	74.05	20.42		65.0	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	2.86	73.81	18.77	0.00	150.0	± 9.6 %
		Y	2.32	69.12	16.46		150.0	
		Z	2.31	68.72	16.24		150.0	
10155-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	X	3.05	71.55	17.95	0.00	150.0	± 9.6 %
		Y	2.65	68.11	16.16		150.0	
		Z	2.66	67.89	16.08		150.0	
10156-CAC	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	X	2.62	75.28	19.00	0.00	150.0	± 9.6 %
		Y	1.90	68.84	15.77		150.0	
		Z	1.88	68.32	15.55		150.0	
10157-CAC	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	X	2.68	71.76	16.89	0.00	150.0	± 9.6 %
		Y	2.15	67.35	14.52		150.0	
		Z	2.15	67.02	14.45		150.0	
10158-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	X	3.22	71.63	18.05	0.00	150.0	± 9.6 %
		Y	2.81	68.26	16.30		150.0	
		Z	2.82	68.09	16.26		150.0	
10159-CAC	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	X	2.93	72.88	17.46	0.00	150.0	± 9.6 %
		Y	2.26	67.79	14.79		150.0	
		Z	2.27	67.53	14.78		150.0	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	3.07	71.36	17.69	0.00	150.0	± 9.6 %
		Y	2.78	68.62	16.33		150.0	
		Z	2.77	68.29	16.14		150.0	
10161-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	X	3.19	69.55	17.03	0.00	150.0	± 9.6 %
		Y	2.97	67.35	15.90		150.0	
		Z	2.98	67.15	15.82		150.0	
10162-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	X	3.30	69.58	17.07	0.00	150.0	± 9.6 %
		Y	3.08	67.47	16.00		150.0	
		Z	3.09	67.26	15.91		150.0	
10166-CAC	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	X	3.25	68.13	17.75	3.01	150.0	± 9.6 %
		Y	3.70	70.04	19.37		150.0	
		Z	3.64	69.02	18.72		150.0	
10167-CAC	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	X	3.83	70.28	17.95	3.01	150.0	± 9.6 %
		Y	4.77	73.90	20.20		150.0	
		Z	4.50	71.81	19.15		150.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10168-CAC	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	X	4.31	72.71	19.43	3.01	150.0	± 9.6 %
		Y	5.34	76.31	21.55		150.0	
		Z	5.00	74.11	20.51		150.0	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	2.59	67.50	17.43	3.01	150.0	± 9.6 %
		Y	3.16	70.49	19.62		150.0	
		Z	3.10	69.08	18.71		150.0	
10170-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	X	3.46	73.11	19.77	3.01	150.0	± 9.6 %
		Y	4.97	79.09	22.88		150.0	
		Z	4.39	75.29	21.13		150.0	
10171-AAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	X	2.73	68.39	16.58	3.01	150.0	± 9.6 %
		Y	3.85	73.76	19.71		150.0	
		Z	3.52	70.70	18.17		150.0	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	6.92	84.75	24.17	6.02	65.0	± 9.6 %
		Y	10.46	94.74	29.37		65.0	
		Z	8.03	87.14	26.09		65.0	
10173-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	X	9.25	86.12	22.76	6.02	65.0	± 9.6 %
		Y	31.50	109.27	31.36		65.0	
		Z	11.70	90.10	25.29		65.0	
10174-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	X	7.05	81.04	20.53	6.02	65.0	± 9.6 %
		Y	15.68	96.07	27.03		65.0	
		Z	9.37	85.45	23.26		65.0	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	2.55	67.14	17.14	3.01	150.0	± 9.6 %
		Y	3.12	70.16	19.37		150.0	
		Z	3.06	68.73	18.44		150.0	
10176-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	3.46	73.13	19.78	3.01	150.0	± 9.6 %
		Y	4.97	79.12	22.89		150.0	
		Z	4.39	75.31	21.15		150.0	
10177-CAE	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	2.58	67.33	17.26	3.01	150.0	± 9.6 %
		Y	3.15	70.32	19.46		150.0	
		Z	3.09	68.91	18.55		150.0	
10178-CAC	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	3.41	72.80	19.60	3.01	150.0	± 9.6 %
		Y	4.90	78.82	22.75		150.0	
		Z	4.33	75.01	20.99		150.0	
10179-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	X	3.03	70.44	17.94	3.01	150.0	± 9.6 %
		Y	4.36	76.25	21.14		150.0	
		Z	3.89	72.76	19.47		150.0	
10180-CAC	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	X	2.71	68.29	16.51	3.01	150.0	± 9.6 %
		Y	3.84	73.67	19.65		150.0	
		Z	3.51	70.61	18.11		150.0	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	2.57	67.31	17.25	3.01	150.0	± 9.6 %
		Y	3.14	70.30	19.46		150.0	
		Z	3.06	68.89	18.54		150.0	
10182-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	X	3.40	72.77	19.59	3.01	150.0	± 9.6 %
		Y	4.89	78.79	22.73		150.0	
		Z	4.32	74.99	20.98		150.0	
10183-AAA	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	X	2.71	68.27	16.50	3.01	150.0	± 9.6 %
		Y	3.83	73.64	19.64		150.0	
		Z	3.50	70.59	18.10		150.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10184-CAC	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	2.58	67.36	17.28	3.01	150.0	± 9.6 %
		Y	3.15	70.35	19.48		150.0	
		Z	3.10	68.93	18.57		150.0	
10185-CAC	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	3.42	72.85	19.63	3.01	150.0	± 9.6 %
		Y	4.92	78.88	22.78		150.0	
		Z	4.35	75.07	21.02		150.0	
10186-AAC	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	X	2.72	68.33	16.53	3.01	150.0	± 9.6 %
		Y	3.85	73.72	19.68		150.0	
		Z	3.52	70.65	18.13		150.0	
10187-CAC	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	2.59	67.39	17.33	3.01	150.0	± 9.6 %
		Y	3.16	70.40	19.54		150.0	
		Z	3.10	68.97	18.62		150.0	
10188-CAC	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	3.57	73.73	20.13	3.01	150.0	± 9.6 %
		Y	5.13	79.76	23.22		150.0	
		Z	4.52	75.87	21.46		150.0	
10189-AAC	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	X	2.79	68.79	16.84	3.01	150.0	± 9.6 %
		Y	3.97	74.27	19.99		150.0	
		Z	3.60	71.11	18.43		150.0	
10193-CAB	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	4.59	67.40	16.44	0.00	150.0	± 9.6 %
		Y	4.57	66.59	16.16		150.0	
		Z	4.59	66.48	16.13		150.0	
10194-CAB	IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)	X	4.78	67.73	16.54	0.00	150.0	± 9.6 %
		Y	4.74	66.92	16.28		150.0	
		Z	4.77	66.82	16.24		150.0	
10195-CAB	IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)	X	4.82	67.75	16.55	0.00	150.0	± 9.6 %
		Y	4.79	66.95	16.30		150.0	
		Z	4.82	66.84	16.26		150.0	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	4.60	67.48	16.46	0.00	150.0	± 9.6 %
		Y	4.57	66.67	16.19		150.0	
		Z	4.60	66.56	16.15		150.0	
10197-CAB	IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)	X	4.79	67.76	16.55	0.00	150.0	± 9.6 %
		Y	4.76	66.94	16.30		150.0	
		Z	4.79	66.84	16.26		150.0	
10198-CAB	IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)	X	4.82	67.76	16.56	0.00	150.0	± 9.6 %
		Y	4.79	66.97	16.31		150.0	
		Z	4.82	66.86	16.27		150.0	
10219-CAB	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	4.56	67.51	16.44	0.00	150.0	± 9.6 %
		Y	4.52	66.68	16.15		150.0	
		Z	4.55	66.57	16.11		150.0	
10220-CAB	IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)	X	4.79	67.73	16.54	0.00	150.0	± 9.6 %
		Y	4.75	66.92	16.29		150.0	
		Z	4.79	66.82	16.25		150.0	
10221-CAB	IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)	X	4.82	67.68	16.53	0.00	150.0	± 9.6 %
		Y	4.80	66.90	16.30		150.0	
		Z	4.83	66.79	16.26		150.0	
10222-CAB	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	5.12	67.84	16.59	0.00	150.0	± 9.6 %
		Y	5.11	67.09	16.40		150.0	
		Z	5.15	67.03	16.38		150.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10223-CAB	IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)	X	5.41	67.91	16.63	0.00	150.0	± 9.6 %
		Y	5.42	67.27	16.51		150.0	
		Z	5.46	67.23	16.50		150.0	
10224-CAB	IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)	X	5.17	67.98	16.59	0.00	150.0	± 9.6 %
		Y	5.16	67.20	16.38		150.0	
		Z	5.19	67.13	16.35		150.0	
10225-CAB	UMTS-FDD (HSPA+)	X	2.98	67.76	16.31	0.00	150.0	± 9.6 %
		Y	2.84	66.11	15.39		150.0	
		Z	2.85	65.91	15.34		150.0	
10226-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	10.02	87.49	23.32	6.02	65.0	± 9.6 %
		Y	35.25	111.42	32.05		65.0	
		Z	12.47	91.31	25.78		65.0	
10227-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	X	8.64	83.95	21.57	6.02	65.0	± 9.6 %
		Y	26.75	104.64	29.49		65.0	
		Z	11.17	88.23	24.22		65.0	
10228-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	8.18	87.83	25.28	6.02	65.0	± 9.6 %
		Y	15.31	102.19	31.73		65.0	
		Z	9.11	89.79	27.08		65.0	
10229-CAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	9.35	86.27	22.83	6.02	65.0	± 9.6 %
		Y	31.73	109.38	31.40		65.0	
		Z	11.78	90.21	25.34		65.0	
10230-CAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	X	8.10	82.91	21.13	6.02	65.0	± 9.6 %
		Y	24.40	102.98	28.94		65.0	
		Z	10.58	87.26	23.83		65.0	
10231-CAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	7.74	86.76	24.83	6.02	65.0	± 9.6 %
		Y	14.44	100.93	31.27		65.0	
		Z	8.71	88.86	26.68		65.0	
10232-CAB	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	9.33	86.24	22.81	6.02	65.0	± 9.6 %
		Y	31.71	109.38	31.40		65.0	
		Z	11.76	90.19	25.33		65.0	
10233-CAB	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	X	8.08	82.89	21.12	6.02	65.0	± 9.6 %
		Y	24.37	102.97	28.94		65.0	
		Z	10.56	87.24	23.82		65.0	
10234-CAB	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	7.35	85.71	24.35	6.02	65.0	± 9.6 %
		Y	13.68	99.69	30.77		65.0	
		Z	8.36	87.96	26.26		65.0	
10235-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	9.32	86.25	22.82	6.02	65.0	± 9.6 %
		Y	31.83	109.46	31.43		65.0	
		Z	11.77	90.21	25.34		65.0	
10236-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	X	8.14	82.97	21.14	6.02	65.0	± 9.6 %
		Y	24.77	103.21	29.00		65.0	
		Z	10.65	87.35	23.85		65.0	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	7.74	86.79	24.84	6.02	65.0	± 9.6 %
		Y	14.52	101.07	31.31		65.0	
		Z	8.72	88.91	26.70		65.0	
10238-CAB	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	X	9.30	86.21	22.80	6.02	65.0	± 9.6 %
		Y	31.66	109.37	31.40		65.0	
		Z	11.74	90.16	25.32		65.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10239-CAB	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	X	8.06	82.86	21.11	6.02	65.0	± 9.6 %
		Y	24.31	102.96	28.94		65.0	
		Z	10.53	87.22	23.81		65.0	
10240-CAB	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	7.72	86.75	24.82	6.02	65.0	± 9.6 %
		Y	14.46	101.01	31.29		65.0	
		Z	8.69	88.87	26.68		65.0	
10241-CAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	X	7.32	78.08	22.98	6.98	65.0	± 9.6 %
		Y	9.07	83.22	26.13		65.0	
		Z	8.09	79.38	24.23		65.0	
10242-CAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	X	6.82	76.72	22.33	6.98	65.0	± 9.6 %
		Y	7.76	79.93	24.73		65.0	
		Z	7.58	78.06	23.61		65.0	
10243-CAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	X	5.71	74.22	22.08	6.98	65.0	± 9.6 %
		Y	6.19	76.20	24.07		65.0	
		Z	6.19	75.06	23.19		65.0	
10244-CAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	X	5.10	72.43	16.23	3.98	65.0	± 9.6 %
		Y	6.19	75.71	18.42		65.0	
		Z	5.69	73.92	17.72		65.0	
10245-CAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	X	5.04	72.05	16.03	3.98	65.0	± 9.6 %
		Y	6.07	75.14	18.14		65.0	
		Z	5.63	73.53	17.50		65.0	
10246-CAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	7.96	82.92	21.08	3.98	65.0	± 9.6 %
		Y	5.76	77.95	19.59		65.0	
		Z	5.31	76.30	18.93		65.0	
10247-CAB	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	X	6.03	76.23	19.29	3.98	65.0	± 9.6 %
		Y	5.28	73.85	18.59		65.0	
		Z	5.13	73.04	18.25		65.0	
10248-CAB	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	X	5.91	75.38	18.92	3.98	65.0	± 9.6 %
		Y	5.30	73.41	18.39		65.0	
		Z	5.17	72.64	18.06		65.0	
10249-CAB	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	X	9.42	85.93	22.94	3.98	65.0	± 9.6 %
		Y	6.89	80.95	21.56		65.0	
		Z	6.21	78.76	20.65		65.0	
10250-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	X	6.97	78.55	21.65	3.98	65.0	± 9.6 %
		Y	6.17	76.16	21.06		65.0	
		Z	5.99	75.22	20.58		65.0	
10251-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	X	6.32	75.52	20.05	3.98	65.0	± 9.6 %
		Y	5.95	74.32	19.96		65.0	
		Z	5.76	73.30	19.43		65.0	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	8.88	84.37	23.20	3.98	65.0	± 9.6 %
		Y	7.13	80.67	22.32		65.0	
		Z	6.56	78.68	21.40		65.0	
10253-CAB	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	X	6.27	74.40	19.87	3.98	65.0	± 9.6 %
		Y	6.01	73.52	19.96		65.0	
		Z	5.85	72.57	19.42		65.0	
10254-CAB	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	X	6.71	75.52	20.68	3.98	65.0	± 9.6 %
		Y	6.35	74.32	20.61		65.0	
		Z	6.20	73.46	20.13		65.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10255-CAB	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	7.48	79.63	21.67	3.98	65.0	± 9.6 %
		Y	6.62	77.43	21.29		65.0	
		Z	6.28	76.01	20.57		65.0	
10256-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	3.98	68.95	13.73	3.98	65.0	± 9.6 %
		Y	4.84	71.85	15.80		65.0	
		Z	4.62	70.76	15.41		65.0	
10257-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	X	3.94	68.54	13.47	3.98	65.0	± 9.6 %
		Y	4.73	71.16	15.42		65.0	
		Z	4.56	70.27	15.11		65.0	
10258-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	5.85	77.84	18.46	3.98	65.0	± 9.6 %
		Y	4.44	73.69	17.10		65.0	
		Z	4.27	72.85	16.79		65.0	
10259-CAB	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	X	6.37	76.98	20.09	3.98	65.0	± 9.6 %
		Y	5.64	74.73	19.49		65.0	
		Z	5.47	73.83	19.08		65.0	
10260-CAB	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	X	6.36	76.63	19.97	3.98	65.0	± 9.6 %
		Y	5.67	74.49	19.40		65.0	
		Z	5.52	73.65	19.02		65.0	
10261-CAB	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	X	8.46	84.00	22.64	3.98	65.0	± 9.6 %
		Y	6.66	80.04	21.61		65.0	
		Z	6.08	78.02	20.72		65.0	
10262-CAB	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	6.95	78.47	21.59	3.98	65.0	± 9.6 %
		Y	6.17	76.12	21.02		65.0	
		Z	5.98	75.17	20.54		65.0	
10263-CAB	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	6.32	75.50	20.05	3.98	65.0	± 9.6 %
		Y	5.94	74.30	19.96		65.0	
		Z	5.75	73.28	19.43		65.0	
10264-CAB	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	8.75	84.09	23.08	3.98	65.0	± 9.6 %
		Y	7.07	80.50	22.23		65.0	
		Z	6.50	78.52	21.32		65.0	
10265-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	6.44	75.03	20.11	3.98	65.0	± 9.6 %
		Y	6.16	74.09	20.20		65.0	
		Z	5.98	73.11	19.64		65.0	
10266-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	6.93	76.25	21.01	3.98	65.0	± 9.6 %
		Y	6.51	74.91	20.90		65.0	
		Z	6.35	74.04	20.41		65.0	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	7.97	80.47	21.74	3.98	65.0	± 9.6 %
		Y	6.92	77.98	21.28		65.0	
		Z	6.55	76.55	20.55		65.0	
10268-CAB	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	X	7.05	74.88	20.43	3.98	65.0	± 9.6 %
		Y	6.76	73.93	20.51		65.0	
		Z	6.63	73.17	20.05		65.0	
10269-CAB	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	X	6.98	74.40	20.30	3.98	65.0	± 9.6 %
		Y	6.72	73.52	20.41		65.0	
		Z	6.60	72.80	19.96		65.0	
10270-CAB	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	7.40	77.26	20.66	3.98	65.0	± 9.6 %
		Y	6.76	75.49	20.42		65.0	
		Z	6.55	74.54	19.89		65.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	2.77	68.41	16.38	0.00	150.0	± 9.6 %
		Y	2.62	66.45	15.30		150.0	
		Z	2.60	66.13	15.17		150.0	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	2.09	73.40	18.48	0.00	150.0	± 9.6 %
		Y	1.65	67.98	15.67		150.0	
		Z	1.60	67.29	15.29		150.0	
10277-CAA	PHS (QPSK)	X	2.42	61.80	7.28	9.03	50.0	± 9.6 %
		Y	2.70	62.92	8.55		50.0	
		Z	2.70	62.80	8.53		50.0	
10278-CAA	PHS (QPSK, BW 884MHz, Rolloff 0.5)	X	5.48	73.30	15.48	9.03	50.0	± 9.6 %
		Y	5.48	73.80	16.53		50.0	
		Z	5.19	72.87	16.16		50.0	
10279-CAA	PHS (QPSK, BW 884MHz, Rolloff 0.38)	X	5.66	73.66	15.69	9.03	50.0	± 9.6 %
		Y	5.64	74.10	16.70		50.0	
		Z	5.33	73.14	16.32		50.0	
10290-AAB	CDMA2000, RC1, SO55, Full Rate	X	4.13	84.84	21.16	0.00	150.0	± 9.6 %
		Y	1.53	69.15	14.45		150.0	
		Z	1.50	68.44	14.23		150.0	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	2.02	80.05	19.63	0.00	150.0	± 9.6 %
		Y	0.88	66.15	12.95		150.0	
		Z	0.85	65.49	12.68		150.0	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	31.69	123.49	32.65	0.00	150.0	± 9.6 %
		Y	1.12	70.49	15.42		150.0	
		Z	1.04	69.09	14.85		150.0	
10293-AAB	CDMA2000, RC3, SO3, Full Rate	X	100.00	145.27	38.53	0.00	150.0	± 9.6 %
		Y	1.69	76.51	18.41		150.0	
		Z	1.50	74.53	17.70		150.0	
10295-AAB	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	X	7.78	81.06	21.76	9.03	50.0	± 9.6 %
		Y	8.55	82.70	22.99		50.0	
		Z	7.34	79.63	21.74		50.0	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	3.37	73.93	18.60	0.00	150.0	± 9.6 %
		Y	2.80	69.73	16.64		150.0	
		Z	2.78	69.34	16.41		150.0	
10298-AAB	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	2.76	77.13	18.96	0.00	150.0	± 9.6 %
		Y	1.64	67.99	14.49		150.0	
		Z	1.64	67.61	14.41		150.0	
10299-AAB	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	X	2.11	67.30	12.94	0.00	150.0	± 9.6 %
		Y	3.04	71.26	15.10		150.0	
		Z	2.68	69.19	14.38		150.0	
10300-AAB	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	X	1.69	63.89	10.55	0.00	150.0	± 9.6 %
		Y	2.18	66.11	12.03		150.0	
		Z	2.12	65.32	11.84		150.0	
10301-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC)	X	4.58	65.03	17.13	4.17	50.0	± 9.6 %
		Y	4.90	65.89	17.77		50.0	
		Z	4.71	64.70	17.13		50.0	
10302-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC, 3 CTRL symbols)	X	5.12	65.95	17.98	4.96	50.0	± 9.6 %
		Y	5.36	66.42	18.45		50.0	
		Z	5.28	65.73	18.05		50.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10303-AAA	IEEE 802.16e WiMAX (31:15, 5ms, 10MHz, 64QAM, PUSC)	X	4.88	65.60	17.84	4.96	50.0	± 9.6 %
		Y	5.11	66.11	18.32		50.0	
		Z	5.04	65.42	17.92		50.0	
10304-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, 64QAM, PUSC)	X	4.71	65.62	17.43	4.17	50.0	± 9.6 %
		Y	4.89	65.84	17.72		50.0	
		Z	4.83	65.24	17.39		50.0	
10305-AAA	IEEE 802.16e WiMAX (31:15, 10ms, 10MHz, 64QAM, PUSC, 15 symbols)	X	4.26	66.69	19.17	6.02	35.0	± 9.6 %
		Y	4.74	68.89	20.52		35.0	
		Z	4.56	67.41	19.68		35.0	
10306-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 64QAM, PUSC, 18 symbols)	X	4.59	65.87	18.72	6.02	35.0	± 9.6 %
		Y	4.95	67.33	19.78		35.0	
		Z	4.84	66.29	19.15		35.0	
10307-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, PUSC, 18 symbols)	X	4.50	66.11	18.74	6.02	35.0	± 9.6 %
		Y	4.88	67.65	19.82		35.0	
		Z	4.76	66.58	19.18		35.0	
10308-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, PUSC)	X	4.47	66.27	18.86	6.02	35.0	± 9.6 %
		Y	4.86	67.90	19.98		35.0	
		Z	4.73	66.74	19.30		35.0	
10309-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, AMC 2x3, 18 symbols)	X	4.65	66.08	18.86	6.02	35.0	± 9.6 %
		Y	5.02	67.61	19.95		35.0	
		Z	4.91	66.54	19.30		35.0	
10310-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, AMC 2x3, 18 symbols)	X	4.54	65.95	18.71	6.02	35.0	± 9.6 %
		Y	4.90	67.44	19.77		35.0	
		Z	4.79	66.38	19.14		35.0	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	3.82	73.23	18.19	0.00	150.0	± 9.6 %
		Y	3.16	69.03	16.29		150.0	
		Z	3.14	68.69	16.09		150.0	
10313-AAA	iDEN 1:3	X	4.26	73.34	15.30	6.99	70.0	± 9.6 %
		Y	3.95	73.44	16.30		70.0	
		Z	3.42	71.14	15.17		70.0	
10314-AAA	iDEN 1:6	X	13.47	92.17	24.33	10.00	30.0	± 9.6 %
		Y	5.16	79.23	21.27		30.0	
		Z	4.48	76.56	20.07		30.0	
10315-AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	1.18	66.73	17.16	0.17	150.0	± 9.6 %
		Y	1.10	63.75	15.16		150.0	
		Z	1.08	63.34	14.87		150.0	
10316-AAB	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	4.61	67.28	16.42	0.17	150.0	± 9.6 %
		Y	4.62	66.62	16.27		150.0	
		Z	4.64	66.47	16.19		150.0	
10317-AAB	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	X	4.61	67.28	16.42	0.17	150.0	± 9.6 %
		Y	4.62	66.62	16.27		150.0	
		Z	4.64	66.47	16.19		150.0	
10400-AAC	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	4.77	67.73	16.49	0.00	150.0	± 9.6 %
		Y	4.74	66.99	16.29		150.0	
		Z	4.77	66.86	16.23		150.0	
10401-AAC	IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)	X	5.34	67.52	16.40	0.00	150.0	± 9.6 %
		Y	5.42	67.15	16.44		150.0	
		Z	5.45	67.02	16.37		150.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10402-AAC	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)	X	5.67	68.17	16.58	0.00	150.0	± 9.6 %
		Y	5.68	67.50	16.46		150.0	
		Z	5.72	67.46	16.44		150.0	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.13	84.84	21.16	0.00	115.0	± 9.6 %
		Y	1.53	69.15	14.45		115.0	
		Z	1.50	68.44	14.23		115.0	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.13	84.84	21.16	0.00	115.0	± 9.6 %
		Y	1.53	69.15	14.45		115.0	
		Z	1.50	68.44	14.23		115.0	
10406-AAB	CDMA2000, RC3, SO32, SCH0, Full Rate	X	11.75	93.45	22.58	0.00	100.0	± 9.6 %
		Y	100.00	118.48	28.80		100.0	
		Z	19.61	98.98	24.92		100.0	
10410-AAA	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	24.11	60.63	1.60	2.23	80.0	± 9.6 %
		Y	0.74	60.00	3.86		80.0	
		Z	0.79	60.00	4.26		80.0	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	1.08	65.70	16.62	0.00	150.0	± 9.6 %
		Y	1.02	62.98	14.66		150.0	
		Z	1.01	62.61	14.40		150.0	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	4.59	67.43	16.48	0.00	150.0	± 9.6 %
		Y	4.57	66.64	16.23		150.0	
		Z	4.60	66.52	16.18		150.0	
10417-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	4.59	67.43	16.48	0.00	150.0	± 9.6 %
		Y	4.57	66.64	16.23		150.0	
		Z	4.60	66.52	16.18		150.0	
10418-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preambule)	X	4.59	67.62	16.52	0.00	150.0	± 9.6 %
		Y	4.56	66.79	16.24		150.0	
		Z	4.58	66.66	16.19		150.0	
10419-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preambule)	X	4.61	67.55	16.51	0.00	150.0	± 9.6 %
		Y	4.58	66.74	16.24		150.0	
		Z	4.60	66.62	16.20		150.0	
10422-AAA	IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)	X	4.72	67.51	16.49	0.00	150.0	± 9.6 %
		Y	4.70	66.74	16.26		150.0	
		Z	4.73	66.63	16.21		150.0	
10423-AAA	IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)	X	4.91	67.84	16.61	0.00	150.0	± 9.6 %
		Y	4.87	67.07	16.38		150.0	
		Z	4.91	66.97	16.34		150.0	
10424-AAA	IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)	X	4.82	67.81	16.59	0.00	150.0	± 9.6 %
		Y	4.79	67.02	16.35		150.0	
		Z	4.82	66.91	16.31		150.0	
10425-AAA	IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)	X	5.34	67.87	16.59	0.00	150.0	± 9.6 %
		Y	5.38	67.33	16.52		150.0	
		Z	5.42	67.27	16.49		150.0	
10426-AAA	IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)	X	5.35	67.89	16.60	0.00	150.0	± 9.6 %
		Y	5.39	67.34	16.52		150.0	
		Z	5.42	67.27	16.49		150.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10427-AAA	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	X	5.37	67.92	16.61	0.00	150.0	± 9.6 %
		Y	5.40	67.33	16.51		150.0	
		Z	5.44	67.26	16.48		150.0	
10430-AAA	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)	X	4.95	74.23	19.98	0.00	150.0	± 9.6 %
		Y	4.23	70.36	18.00		150.0	
		Z	4.36	70.73	18.32		150.0	
10431-AAA	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)	X	4.34	68.18	16.66	0.00	150.0	± 9.6 %
		Y	4.26	67.18	16.24		150.0	
		Z	4.29	67.04	16.19		150.0	
10432-AAA	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)	X	4.61	67.93	16.61	0.00	150.0	± 9.6 %
		Y	4.56	67.06	16.30		150.0	
		Z	4.59	66.94	16.26		150.0	
10433-AAA	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)	X	4.84	67.86	16.62	0.00	150.0	± 9.6 %
		Y	4.81	67.05	16.37		150.0	
		Z	4.84	66.95	16.33		150.0	
10434-AAA	W-CDMA (BS Test Model 1, 64 DPCH)	X	5.37	76.04	20.39	0.00	150.0	± 9.6 %
		Y	4.32	71.16	17.97		150.0	
		Z	4.48	71.59	18.33		150.0	
10435-AAA	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	23.03	60.77	1.67	2.23	80.0	± 9.6 %
		Y	0.74	60.00	3.85		80.0	
		Z	0.79	60.00	4.25		80.0	
10447-AAA	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	X	3.73	68.71	16.41	0.00	150.0	± 9.6 %
		Y	3.56	67.19	15.60		150.0	
		Z	3.59	67.02	15.59		150.0	
10448-AAA	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clippin 44%)	X	4.18	68.00	16.55	0.00	150.0	± 9.6 %
		Y	4.10	66.96	16.10		150.0	
		Z	4.12	66.81	16.05		150.0	
10449-AAA	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Cliping 44%)	X	4.42	67.83	16.56	0.00	150.0	± 9.6 %
		Y	4.37	66.89	16.20		150.0	
		Z	4.39	66.77	16.15		150.0	
10450-AAA	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	X	4.60	67.69	16.52	0.00	150.0	± 9.6 %
		Y	4.56	66.82	16.22		150.0	
		Z	4.58	66.71	16.18		150.0	
10451-AAA	W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)	X	3.70	69.22	16.26	0.00	150.0	± 9.6 %
		Y	3.46	67.39	15.25		150.0	
		Z	3.50	67.24	15.27		150.0	
10456-AAA	IEEE 802.11ac WiFi (160MHz, 64-QAM, 99pc duty cycle)	X	6.18	68.42	16.70	0.00	150.0	± 9.6 %
		Y	6.24	67.88	16.67		150.0	
		Z	6.28	67.84	16.65		150.0	
10457-AAA	UMTS-FDD (DC-HSDPA)	X	3.81	66.07	16.24	0.00	150.0	± 9.6 %
		Y	3.81	65.27	15.94		150.0	
		Z	3.82	65.15	15.89		150.0	
10458-AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	X	3.48	68.28	15.61	0.00	150.0	± 9.6 %
		Y	3.29	66.78	14.72		150.0	
		Z	3.32	66.55	14.72		150.0	
10459-AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	X	4.52	66.07	16.11	0.00	150.0	± 9.6 %
		Y	4.52	65.63	15.92		150.0	
		Z	4.43	64.88	15.61		150.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10460-AAA	UMTS-FDD (WCDMA, AMR)	X	1.56	80.13	22.34	0.00	150.0	± 9.6 %
		Y	0.92	68.16	16.20		150.0	
		Z	0.87	66.99	15.51		150.0	
10461-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.93	69.49	13.87	3.29	80.0	± 9.6 %
		Y	51.71	114.41	29.02		80.0	
		Z	5.52	82.54	20.04		80.0	
10462-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	0.91	60.00	6.95	3.23	80.0	± 9.6 %
		Y	1.68	65.15	10.62		80.0	
		Z	1.49	63.07	9.94		80.0	
10463-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	0.95	60.00	6.51	3.23	80.0	± 9.6 %
		Y	1.15	61.32	8.39		80.0	
		Z	1.22	60.87	8.44		80.0	
10464-AAA	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.48	66.41	12.06	3.23	80.0	± 9.6 %
		Y	35.76	107.35	26.57		80.0	
		Z	4.21	78.46	18.15		80.0	
10465-AAA	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	0.91	60.00	6.88	3.23	80.0	± 9.6 %
		Y	1.50	64.07	10.08		80.0	
		Z	1.40	62.47	9.59		80.0	
10466-AAA	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	0.95	60.00	6.47	3.23	80.0	± 9.6 %
		Y	1.09	60.86	8.12		80.0	
		Z	1.18	60.54	8.22		80.0	
10467-AAA	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.52	66.74	12.23	3.23	80.0	± 9.6 %
		Y	44.94	110.43	27.34		80.0	
		Z	4.47	79.28	18.46		80.0	
10468-AAA	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	0.91	60.00	6.89	3.23	80.0	± 9.6 %
		Y	1.53	64.33	10.21		80.0	
		Z	1.42	62.61	9.67		80.0	
10469-AAA	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	0.95	60.00	6.46	3.23	80.0	± 9.6 %
		Y	1.09	60.87	8.12		80.0	
		Z	1.18	60.55	8.22		80.0	
10470-AAA	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.51	66.70	12.20	3.23	80.0	± 9.6 %
		Y	45.60	110.63	27.38		80.0	
		Z	4.45	79.26	18.45		80.0	
10471-AAA	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	0.91	60.00	6.88	3.23	80.0	± 9.6 %
		Y	1.52	64.26	10.17		80.0	
		Z	1.42	62.57	9.64		80.0	
10472-AAA	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	0.95	60.00	6.45	3.23	80.0	± 9.6 %
		Y	1.09	60.83	8.08		80.0	
		Z	1.18	60.52	8.20		80.0	
10473-AAA	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.51	66.68	12.19	3.23	80.0	± 9.6 %
		Y	45.41	110.55	27.35		80.0	
		Z	4.44	79.22	18.43		80.0	
10474-AAA	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	0.91	60.00	6.88	3.23	80.0	± 9.6 %
		Y	1.52	64.23	10.16		80.0	
		Z	1.41	62.55	9.63		80.0	
10475-AAA	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	0.95	60.00	6.45	3.23	80.0	± 9.6 %
		Y	1.08	60.81	8.08		80.0	
		Z	1.17	60.51	8.19		80.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10477-AAA	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	0.91	60.00	6.86	3.23	80.0	± 9.6 %
		Y	1.48	64.00	10.03		80.0	
		Z	1.39	62.43	9.55		80.0	
10478-AAA	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	0.95	60.00	6.44	3.23	80.0	± 9.6 %
		Y	1.08	60.78	8.05		80.0	
		Z	1.17	60.48	8.17		80.0	
10479-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	0.95	60.00	5.70	1.99	80.0	± 9.6 %
		Y	0.96	60.00	6.66		80.0	
		Z	1.01	60.00	6.94		80.0	
10480-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	1.29	60.00	5.07	1.99	80.0	± 9.6 %
		Y	1.28	60.00	5.73		80.0	
		Z	1.31	60.00	6.25		80.0	
10481-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	1.39	60.00	4.83	1.99	80.0	± 9.6 %
		Y	1.33	60.00	5.49		80.0	
		Z	1.35	60.00	6.03		80.0	
10482-AAA	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	5.61	80.41	19.03	1.99	80.0	± 9.6 %
		Y	2.54	69.54	14.99		80.0	
		Z	2.30	67.89	14.32		80.0	
10483-AAA	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	2.19	64.58	11.70	1.99	80.0	± 9.6 %
		Y	3.37	69.65	14.64		80.0	
		Z	2.93	67.40	13.74		80.0	
10484-AAA	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	2.19	64.38	11.65	1.99	80.0	± 9.6 %
		Y	3.24	68.94	14.38		80.0	
		Z	2.88	66.99	13.59		80.0	
10485-AAA	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	6.24	82.78	20.91	1.99	80.0	± 9.6 %
		Y	3.21	72.72	17.32		80.0	
		Z	2.83	70.50	16.37		80.0	
10486-AAA	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.05	73.34	17.24	1.99	80.0	± 9.6 %
		Y	2.92	68.11	15.06		80.0	
		Z	2.79	67.15	14.67		80.0	
10487-AAA	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.94	72.61	16.96	1.99	80.0	± 9.6 %
		Y	2.92	67.77	14.92		80.0	
		Z	2.81	66.91	14.57		80.0	
10488-AAA	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	5.29	79.12	20.43	1.99	80.0	± 9.6 %
		Y	3.63	72.76	18.17		80.0	
		Z	3.32	70.95	17.31		80.0	
10489-AAA	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.99	72.10	18.02	1.99	80.0	± 9.6 %
		Y	3.38	68.80	16.71		80.0	
		Z	3.26	67.91	16.26		80.0	
10490-AAA	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.03	71.64	17.86	1.99	80.0	± 9.6 %
		Y	3.47	68.64	16.68		80.0	
		Z	3.37	67.80	16.26		80.0	
10491-AAA	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.78	75.35	19.23	1.99	80.0	± 9.6 %
		Y	3.80	71.14	17.74		80.0	
		Z	3.59	69.86	17.08		80.0	
10492-AAA	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.13	70.50	17.68	1.99	80.0	± 9.6 %
		Y	3.74	68.21	16.84		80.0	
		Z	3.66	67.52	16.46		80.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10493-AAA	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.17	70.22	17.58	1.99	80.0	± 9.6 %
		Y	3.81	68.08	16.81		80.0	
		Z	3.73	67.43	16.45		80.0	
10494-AAA	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	5.77	78.25	20.07	1.99	80.0	± 9.6 %
		Y	4.16	72.67	18.15		80.0	
		Z	3.88	71.19	17.41		80.0	
10495-AAA	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.24	71.18	17.96	1.99	80.0	± 9.6 %
		Y	3.78	68.64	17.03		80.0	
		Z	3.69	67.93	16.64		80.0	
10496-AAA	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.26	70.66	17.79	1.99	80.0	± 9.6 %
		Y	3.85	68.36	16.97		80.0	
		Z	3.78	67.71	16.60		80.0	
10497-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	2.78	71.14	14.64	1.99	80.0	± 9.6 %
		Y	1.60	64.00	11.51		80.0	
		Z	1.57	63.54	11.40		80.0	
10498-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	1.59	62.28	9.87	1.99	80.0	± 9.6 %
		Y	1.37	60.14	8.66		80.0	
		Z	1.44	60.36	8.95		80.0	
10499-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	1.53	61.65	9.43	1.99	80.0	± 9.6 %
		Y	1.38	60.00	8.45		80.0	
		Z	1.43	60.06	8.67		80.0	
10500-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	5.38	80.15	20.39	1.99	80.0	± 9.6 %
		Y	3.34	72.50	17.61		80.0	
		Z	2.99	70.46	16.69		80.0	
10501-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.02	72.80	17.53	1.99	80.0	± 9.6 %
		Y	3.14	68.52	15.77		80.0	
		Z	3.01	67.55	15.34		80.0	
10502-AAA	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.04	72.44	17.35	1.99	80.0	± 9.6 %
		Y	3.19	68.35	15.65		80.0	
		Z	3.07	67.44	15.26		80.0	
10503-AAA	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	5.14	78.69	20.26	1.99	80.0	± 9.6 %
		Y	3.58	72.55	18.07		80.0	
		Z	3.27	70.74	17.20		80.0	
10504-AAA	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.95	71.93	17.93	1.99	80.0	± 9.6 %
		Y	3.36	68.71	16.66		80.0	
		Z	3.24	67.81	16.21		80.0	
10505-AAA	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.99	71.48	17.78	1.99	80.0	± 9.6 %
		Y	3.45	68.54	16.62		80.0	
		Z	3.35	67.70	16.20		80.0	
10506-AAA	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	5.65	77.94	19.95	1.99	80.0	± 9.6 %
		Y	4.13	72.52	18.08		80.0	
		Z	3.84	71.03	17.34		80.0	
10507-AAA	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.21	71.08	17.90	1.99	80.0	± 9.6 %
		Y	3.77	68.58	17.00		80.0	
		Z	3.67	67.87	16.60		80.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10508-AAA	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.23	70.54	17.73	1.99	80.0	± 9.6 %
		Y	3.84	68.29	16.93		80.0	
		Z	3.76	67.64	16.56		80.0	
10509-AAA	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	5.44	75.05	18.94	1.99	80.0	± 9.6 %
		Y	4.39	71.08	17.58		80.0	
		Z	4.19	70.05	17.03		80.0	
10510-AAA	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.61	70.37	17.71	1.99	80.0	± 9.6 %
		Y	4.25	68.34	17.03		80.0	
		Z	4.18	67.79	16.71		80.0	
10511-AAA	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.62	69.95	17.59	1.99	80.0	± 9.6 %
		Y	4.30	68.08	16.98		80.0	
		Z	4.24	67.56	16.67		80.0	
10512-AAA	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	6.34	78.05	19.83	1.99	80.0	± 9.6 %
		Y	4.63	72.68	18.02		80.0	
		Z	4.34	71.36	17.36		80.0	
10513-AAA	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.56	70.92	17.91	1.99	80.0	± 9.6 %
		Y	4.15	68.64	17.14		80.0	
		Z	4.07	68.05	16.78		80.0	
10514-AAA	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.50	70.25	17.71	1.99	80.0	± 9.6 %
		Y	4.16	68.21	17.03		80.0	
		Z	4.09	67.66	16.70		80.0	
10515-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	X	1.05	66.12	16.84	0.00	150.0	± 9.6 %
		Y	0.99	63.17	14.72		150.0	
		Z	0.97	62.76	14.44		150.0	
10516-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)	X	2.44	101.37	30.94	0.00	150.0	± 9.6 %
		Y	0.62	70.29	17.34		150.0	
		Z	0.54	67.97	15.98		150.0	
10517-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)	X	1.01	70.74	19.00	0.00	150.0	± 9.6 %
		Y	0.84	65.07	15.36		150.0	
		Z	0.81	64.38	14.88		150.0	
10518-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	X	4.59	67.52	16.47	0.00	150.0	± 9.6 %
		Y	4.56	66.71	16.20		150.0	
		Z	4.59	66.59	16.16		150.0	
10519-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)	X	4.79	67.74	16.57	0.00	150.0	± 9.6 %
		Y	4.75	66.95	16.33		150.0	
		Z	4.79	66.85	16.29		150.0	
10520-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)	X	4.65	67.76	16.53	0.00	150.0	± 9.6 %
		Y	4.60	66.91	16.25		150.0	
		Z	4.64	66.82	16.21		150.0	
10521-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)	X	4.59	67.80	16.54	0.00	150.0	± 9.6 %
		Y	4.54	66.91	16.23		150.0	
		Z	4.57	66.81	16.19		150.0	
10522-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)	X	4.64	67.81	16.59	0.00	150.0	± 9.6 %
		Y	4.60	66.99	16.32		150.0	
		Z	4.63	66.86	16.26		150.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10523-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)	X	4.52	67.76	16.48	0.00	150.0	± 9.6 %
		Y	4.48	66.86	16.16		150.0	
		Z	4.50	66.73	16.11		150.0	
10524-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)	X	4.58	67.74	16.56	0.00	150.0	± 9.6 %
		Y	4.54	66.91	16.28		150.0	
		Z	4.57	66.79	16.23		150.0	
10525-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	X	4.57	66.86	16.20	0.00	150.0	± 9.6 %
		Y	4.52	65.96	15.87		150.0	
		Z	4.54	65.83	15.82		150.0	
10526-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	X	4.75	67.24	16.33	0.00	150.0	± 9.6 %
		Y	4.70	66.33	16.02		150.0	
		Z	4.73	66.21	15.97		150.0	
10527-AAA	IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)	X	4.68	67.24	16.30	0.00	150.0	± 9.6 %
		Y	4.62	66.29	15.96		150.0	
		Z	4.64	66.18	15.91		150.0	
10528-AAA	IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)	X	4.69	67.25	16.33	0.00	150.0	± 9.6 %
		Y	4.63	66.31	15.99		150.0	
		Z	4.66	66.19	15.95		150.0	
10529-AAA	IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)	X	4.69	67.25	16.33	0.00	150.0	± 9.6 %
		Y	4.63	66.31	15.99		150.0	
		Z	4.66	66.19	15.95		150.0	
10531-AAA	IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)	X	4.70	67.39	16.36	0.00	150.0	± 9.6 %
		Y	4.63	66.42	16.01		150.0	
		Z	4.66	66.31	15.96		150.0	
10532-AAA	IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)	X	4.56	67.29	16.32	0.00	150.0	± 9.6 %
		Y	4.48	66.27	15.94		150.0	
		Z	4.51	66.17	15.90		150.0	
10533-AAA	IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)	X	4.71	67.30	16.32	0.00	150.0	± 9.6 %
		Y	4.64	66.35	15.98		150.0	
		Z	4.67	66.23	15.93		150.0	
10534-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	X	5.18	67.23	16.28	0.00	150.0	± 9.6 %
		Y	5.16	66.42	16.05		150.0	
		Z	5.19	66.35	16.02		150.0	
10535-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	X	5.24	67.37	16.33	0.00	150.0	± 9.6 %
		Y	5.23	66.58	16.12		150.0	
		Z	5.26	66.50	16.08		150.0	
10536-AAA	IEEE 802.11ac WiFi (40MHz, MCS2, 99pc duty cycle)	X	5.13	67.41	16.34	0.00	150.0	± 9.6 %
		Y	5.10	66.54	16.08		150.0	
		Z	5.12	66.46	16.05		150.0	
10537-AAA	IEEE 802.11ac WiFi (40MHz, MCS3, 99pc duty cycle)	X	5.18	67.34	16.31	0.00	150.0	± 9.6 %
		Y	5.15	66.51	16.07		150.0	
		Z	5.18	66.43	16.04		150.0	
10538-AAA	IEEE 802.11ac WiFi (40MHz, MCS4, 99pc duty cycle)	X	5.26	67.32	16.33	0.00	150.0	± 9.6 %
		Y	5.25	66.54	16.12		150.0	
		Z	5.29	66.48	16.10		150.0	
10540-AAA	IEEE 802.11ac WiFi (40MHz, MCS6, 99pc duty cycle)	X	5.19	67.32	16.35	0.00	150.0	± 9.6 %
		Y	5.18	66.55	16.14		150.0	
		Z	5.20	66.46	16.10		150.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

EX3DV4– SN:7413 June 29, 2016

10541-AAA	IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)	X	5.17	67.25	16.31	0.00	150.0	± 9.6 %
		Y	5.15	66.42	16.07		150.0	
		Z	5.18	66.35	16.04		150.0	
10542-AAA	IEEE 802.11ac WiFi (40MHz, MCS8, 99pc duty cycle)	X	5.32	67.25	16.32	0.00	150.0	± 9.6 %
		Y	5.30	66.49	16.12		150.0	
		Z	5.34	66.42	16.09		150.0	
10543-AAA	IEEE 802.11ac WiFi (40MHz, MCS9, 99pc duty cycle)	X	5.40	67.27	16.34	0.00	150.0	± 9.6 %
		Y	5.38	66.52	16.16		150.0	
		Z	5.42	66.45	16.12		150.0	
10544-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	5.47	67.33	16.25	0.00	150.0	± 9.6 %
		Y	5.47	66.54	16.04		150.0	
		Z	5.49	66.46	16.01		150.0	
10545-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	5.63	67.60	16.32	0.00	150.0	± 9.6 %
		Y	5.65	66.93	16.19		150.0	
		Z	5.69	66.87	16.16		150.0	
10546-AAA	IEEE 802.11ac WiFi (80MHz, MCS2, 99pc duty cycle)	X	5.54	67.56	16.32	0.00	150.0	± 9.6 %
		Y	5.53	66.75	16.12		150.0	
		Z	5.57	66.70	16.10		150.0	
10547-AAA	IEEE 802.11ac WiFi (80MHz, MCS3, 99pc duty cycle)	X	5.61	67.57	16.32	0.00	150.0	± 9.6 %
		Y	5.60	66.79	16.12		150.0	
		Z	5.65	66.76	16.11		150.0	
10548-AAA	IEEE 802.11ac WiFi (80MHz, MCS4, 99pc duty cycle)	X	5.71	68.01	16.51	0.00	150.0	± 9.6 %
		Y	5.84	67.67	16.54		150.0	
		Z	5.91	67.72	16.56		150.0	
10550-AAA	IEEE 802.11ac WiFi (80MHz, MCS6, 99pc duty cycle)	X	5.57	67.55	16.32	0.00	150.0	± 9.6 %
		Y	5.56	66.75	16.13		150.0	
		Z	5.59	66.69	16.10		150.0	
10551-AAA	IEEE 802.11ac WiFi (80MHz, MCS7, 99pc duty cycle)	X	5.57	67.57	16.30	0.00	150.0	± 9.6 %
		Y	5.57	66.81	16.11		150.0	
		Z	5.60	66.74	16.09		150.0	
10552-AAA	IEEE 802.11ac WiFi (80MHz, MCS8, 99pc duty cycle)	X	5.50	67.43	16.25	0.00	150.0	± 9.6 %
		Y	5.48	66.61	16.02		150.0	
		Z	5.51	66.53	15.99		150.0	
10553-AAA	IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)	X	5.58	67.46	16.28	0.00	150.0	± 9.6 %
		Y	5.57	66.65	16.07		150.0	
		Z	5.60	66.58	16.05		150.0	
10554-AAA	IEEE 1602.11ac WiFi (160MHz, MCS0, 99pc duty cycle)	X	5.85	67.64	16.30	0.00	150.0	± 9.6 %
		Y	5.87	66.90	16.13		150.0	
		Z	5.89	66.84	16.11		150.0	
10555-AAA	IEEE 1602.11ac WiFi (160MHz, MCS1, 99pc duty cycle)	X	5.97	67.89	16.39	0.00	150.0	± 9.6 %
		Y	5.99	67.19	16.25		150.0	
		Z	6.02	67.14	16.23		150.0	
10556-AAA	IEEE 1602.11ac WiFi (160MHz, MCS2, 99pc duty cycle)	X	5.99	67.93	16.41	0.00	150.0	± 9.6 %
		Y	6.02	67.24	16.27		150.0	
		Z	6.04	67.18	16.25		150.0	
10557-AAA	IEEE 1602.11ac WiFi (160MHz, MCS3, 99pc duty cycle)	X	5.97	67.89	16.41	0.00	150.0	± 9.6 %
		Y	5.99	67.16	16.25		150.0	
		Z	6.02	67.11	16.23		150.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10558-AAA	IEEE 1602.11ac WiFi (160MHz, MCS4, 99pc duty cycle)	X	6.01	68.01	16.48	0.00	150.0	± 9.6 %
		Y	6.03	67.31	16.35		150.0	
		Z	6.07	67.27	16.33		150.0	
10560-AAA	IEEE 1602.11ac WiFi (160MHz, MCS6, 99pc duty cycle)	X	6.03	67.92	16.47	0.00	150.0	± 9.6 %
		Y	6.03	67.18	16.31		150.0	
		Z	6.07	67.12	16.29		150.0	
10561-AAA	IEEE 1602.11ac WiFi (160MHz, MCS7, 99pc duty cycle)	X	5.93	67.84	16.47	0.00	150.0	± 9.6 %
		Y	5.95	67.14	16.33		150.0	
		Z	5.98	67.08	16.31		150.0	
10562-AAA	IEEE 1602.11ac WiFi (160MHz, MCS8, 99pc duty cycle)	X	6.02	68.12	16.61	0.00	150.0	± 9.6 %
		Y	6.08	67.52	16.52		150.0	
		Z	6.12	67.50	16.52		150.0	
10563-AAA	IEEE 1602.11ac WiFi (160MHz, MCS9, 99pc duty cycle)	X	6.25	68.38	16.68	0.00	150.0	± 9.6 %
		Y	6.33	67.88	16.66		150.0	
		Z	6.45	68.06	16.74		150.0	
10564-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)	X	4.88	67.42	16.50	0.46	150.0	± 9.6 %
		Y	4.89	66.80	16.37		150.0	
		Z	4.91	66.66	16.30		150.0	
10565-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty cycle)	X	5.14	67.94	16.85	0.46	150.0	± 9.6 %
		Y	5.12	67.24	16.68		150.0	
		Z	5.16	67.14	16.64		150.0	
10566-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc duty cycle)	X	4.97	67.79	16.67	0.46	150.0	± 9.6 %
		Y	4.95	67.09	16.50		150.0	
		Z	4.99	66.98	16.45		150.0	
10567-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc duty cycle)	X	5.03	68.35	17.13	0.46	150.0	± 9.6 %
		Y	4.98	67.45	16.83		150.0	
		Z	5.02	67.40	16.82		150.0	
10568-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc duty cycle)	X	4.85	67.41	16.35	0.46	150.0	± 9.6 %
		Y	4.87	66.88	16.28		150.0	
		Z	4.89	66.70	16.18		150.0	
10569-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty cycle)	X	4.99	68.46	17.20	0.46	150.0	± 9.6 %
		Y	4.93	67.52	16.87		150.0	
		Z	4.96	67.44	16.85		150.0	
10570-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc duty cycle)	X	5.01	68.21	17.08	0.46	150.0	± 9.6 %
		Y	4.97	67.38	16.82		150.0	
		Z	5.01	67.30	16.79		150.0	
10571-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)	X	1.27	67.16	17.22	0.46	130.0	± 9.6 %
		Y	1.18	64.33	15.45		130.0	
		Z	1.16	63.83	15.08		130.0	
10572-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)	X	1.31	68.13	17.79	0.46	130.0	± 9.6 %
		Y	1.20	64.86	15.77		130.0	
		Z	1.17	64.34	15.40		130.0	
10573-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)	X	100.00	156.68	42.65	0.46	130.0	± 9.6 %
		Y	1.76	82.46	22.02		130.0	
		Z	1.29	76.91	19.62		130.0	
10574-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)	X	2.02	80.92	23.70	0.46	130.0	± 9.6 %
		Y	1.28	70.02	18.39		130.0	
		Z	1.24	69.25	17.91		130.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10575-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	X	4.65	67.14	16.48	0.46	130.0	± 9.6 %
		Y	4.67	66.54	16.37		130.0	
		Z	4.69	66.39	16.29		130.0	
10576-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)	X	4.69	67.35	16.58	0.46	130.0	± 9.6 %
		Y	4.69	66.70	16.43		130.0	
		Z	4.71	66.55	16.36		130.0	
10577-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)	X	4.90	67.64	16.74	0.46	130.0	± 9.6 %
		Y	4.90	67.00	16.60		130.0	
		Z	4.93	66.88	16.55		130.0	
10578-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)	X	4.82	67.92	16.92	0.46	130.0	± 9.6 %
		Y	4.79	67.13	16.69		130.0	
		Z	4.83	67.04	16.65		130.0	
10579-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)	X	4.54	66.99	16.09	0.46	130.0	± 9.6 %
		Y	4.56	66.47	16.04		130.0	
		Z	4.58	66.29	15.93		130.0	
10580-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)	X	4.58	66.95	16.07	0.46	130.0	± 9.6 %
		Y	4.61	66.51	16.07		130.0	
		Z	4.63	66.30	15.94		130.0	
10581-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)	X	4.72	67.99	16.87	0.46	130.0	± 9.6 %
		Y	4.69	67.15	16.62		130.0	
		Z	4.72	67.06	16.57		130.0	
10582-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)	X	4.47	66.63	15.81	0.46	130.0	± 9.6 %
		Y	4.51	66.25	15.85		130.0	
		Z	4.53	66.04	15.71		130.0	
10583-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	X	4.65	67.14	16.48	0.46	130.0	± 9.6 %
		Y	4.67	66.54	16.37		130.0	
		Z	4.69	66.39	16.29		130.0	
10584-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)	X	4.69	67.35	16.58	0.46	130.0	± 9.6 %
		Y	4.69	66.70	16.43		130.0	
		Z	4.71	66.55	16.36		130.0	
10585-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)	X	4.90	67.64	16.74	0.46	130.0	± 9.6 %
		Y	4.90	67.00	16.60		130.0	
		Z	4.93	66.88	16.55		130.0	
10586-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc duty cycle)	X	4.82	67.92	16.92	0.46	130.0	± 9.6 %
		Y	4.79	67.13	16.69		130.0	
		Z	4.83	67.04	16.65		130.0	
10587-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc duty cycle)	X	4.54	66.99	16.09	0.46	130.0	± 9.6 %
		Y	4.56	66.47	16.04		130.0	
		Z	4.58	66.29	15.93		130.0	
10588-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 90pc duty cycle)	X	4.58	66.95	16.07	0.46	130.0	± 9.6 %
		Y	4.61	66.51	16.07		130.0	
		Z	4.63	66.30	15.94		130.0	
10589-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc duty cycle)	X	4.72	67.99	16.87	0.46	130.0	± 9.6 %
		Y	4.69	67.15	16.62		130.0	
		Z	4.72	67.06	16.57		130.0	
10590-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 90pc duty cycle)	X	4.47	66.63	15.81	0.46	130.0	± 9.6 %
		Y	4.51	66.25	15.85		130.0	
		Z	4.53	66.04	15.71		130.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

EX3DV4– SN:7413 June 29, 2016

10591-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	X	4.80	67.21	16.58	0.46	130.0	± 9.6 %
		Y	4.82	66.60	16.47		130.0	
		Z	4.84	66.47	16.40		130.0	
10592-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)	X	4.97	67.56	16.71	0.46	130.0	± 9.6 %
		Y	4.97	66.94	16.60		130.0	
		Z	5.00	66.81	16.53		130.0	
10593-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc duty cycle)	X	4.89	67.46	16.59	0.46	130.0	± 9.6 %
		Y	4.90	66.85	16.48		130.0	
		Z	4.92	66.72	16.42		130.0	
10594-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc duty cycle)	X	4.95	67.66	16.77	0.46	130.0	± 9.6 %
		Y	4.95	67.01	16.63		130.0	
		Z	4.98	66.89	16.57		130.0	
10595-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc duty cycle)	X	4.91	67.59	16.65	0.46	130.0	± 9.6 %
		Y	4.92	66.96	16.53		130.0	
		Z	4.95	66.83	16.46		130.0	
10596-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS5, 90pc duty cycle)	X	4.85	67.58	16.64	0.46	130.0	± 9.6 %
		Y	4.85	66.96	16.53		130.0	
		Z	4.88	66.82	16.46		130.0	
10597-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS6, 90pc duty cycle)	X	4.80	67.49	16.54	0.46	130.0	± 9.6 %
		Y	4.80	66.87	16.42		130.0	
		Z	4.83	66.73	16.35		130.0	
10598-AAA	IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc duty cycle)	X	4.80	67.85	16.88	0.46	130.0	± 9.6 %
		Y	4.78	67.08	16.66		130.0	
		Z	4.81	66.99	16.62		130.0	
10599-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)	X	5.43	67.64	16.68	0.46	130.0	± 9.6 %
		Y	5.48	67.15	16.67		130.0	
		Z	5.51	67.05	16.61		130.0	
10600-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)	X	5.51	67.84	16.74	0.46	130.0	± 9.6 %
		Y	5.61	67.54	16.84		130.0	
		Z	5.67	67.52	16.82		130.0	
10601-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)	X	5.44	67.75	16.72	0.46	130.0	± 9.6 %
		Y	5.50	67.31	16.74		130.0	
		Z	5.54	67.24	16.70		130.0	
10602-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc duty cycle)	X	5.51	67.66	16.58	0.46	130.0	± 9.6 %
		Y	5.59	67.32	16.67		130.0	
		Z	5.62	67.22	16.60		130.0	
10603-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc duty cycle)	X	5.61	68.06	16.92	0.46	130.0	± 9.6 %
		Y	5.68	67.64	16.95		130.0	
		Z	5.72	67.58	16.91		130.0	
10604-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS5, 90pc duty cycle)	X	5.43	67.58	16.68	0.46	130.0	± 9.6 %
		Y	5.49	67.11	16.68		130.0	
		Z	5.51	67.01	16.62		130.0	
10605-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)	X	5.49	67.71	16.73	0.46	130.0	± 9.6 %
		Y	5.59	67.43	16.84		130.0	
		Z	5.62	67.32	16.77		130.0	
10606-AAA	IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc duty cycle)	X	5.29	67.26	16.37	0.46	130.0	± 9.6 %
		Y	5.36	66.84	16.41		130.0	
		Z	5.39	66.76	16.35		130.0	

Certificate No: EX3-7413_Jun16 Page 35 of 38

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10607-AAA	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	4.66	66.63	16.27	0.46	130.0	± 9.6 %
		Y	4.65	65.90	16.08		130.0	
		Z	4.67	65.76	16.01		130.0	
10608-AAA	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	4.86	67.05	16.44	0.46	130.0	± 9.6 %
		Y	4.84	66.31	16.25		130.0	
		Z	4.87	66.17	16.18		130.0	
10609-AAA	IEEE 802.11ac WiFi (20MHz, MCS2, 90pc duty cycle)	X	4.74	66.89	16.27	0.46	130.0	± 9.6 %
		Y	4.73	66.17	16.09		130.0	
		Z	4.75	66.01	16.01		130.0	
10610-AAA	IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)	X	4.80	67.09	16.46	0.46	130.0	± 9.6 %
		Y	4.78	66.31	16.25		130.0	
		Z	4.81	66.18	16.18		130.0	
10611-AAA	IEEE 802.11ac WiFi (20MHz, MCS4, 90pc duty cycle)	X	4.71	66.86	16.29	0.46	130.0	± 9.6 %
		Y	4.70	66.13	16.10		130.0	
		Z	4.72	65.98	16.02		130.0	
10612-AAA	IEEE 802.11ac WiFi (20MHz, MCS5, 90pc duty cycle)	X	4.72	66.99	16.31	0.46	130.0	± 9.6 %
		Y	4.71	66.29	16.15		130.0	
		Z	4.73	66.12	16.05		130.0	
10613-AAA	IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)	X	4.72	66.86	16.19	0.46	130.0	± 9.6 %
		Y	4.71	66.18	16.04		130.0	
		Z	4.74	66.02	15.95		130.0	
10614-AAA	IEEE 802.11ac WiFi (20MHz, MCS7, 90pc duty cycle)	X	4.69	67.20	16.52	0.46	130.0	± 9.6 %
		Y	4.65	66.34	16.25		130.0	
		Z	4.68	66.22	16.19		130.0	
10615-AAA	IEEE 802.11ac WiFi (20MHz, MCS8, 90pc duty cycle)	X	4.69	66.58	16.00	0.46	130.0	± 9.6 %
		Y	4.70	65.98	15.89		130.0	
		Z	4.72	65.79	15.79		130.0	
10616-AAA	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	5.28	67.04	16.39	0.46	130.0	± 9.6 %
		Y	5.30	66.40	16.28		130.0	
		Z	5.33	66.31	16.23		130.0	
10617-AAA	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	5.33	67.12	16.39	0.46	130.0	± 9.6 %
		Y	5.36	66.56	16.33		130.0	
		Z	5.39	66.43	16.26		130.0	
10618-AAA	IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)	X	5.24	67.26	16.49	0.46	130.0	± 9.6 %
		Y	5.25	66.57	16.35		130.0	
		Z	5.28	66.47	16.30		130.0	
10619-AAA	IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)	X	5.24	66.98	16.27	0.46	130.0	± 9.6 %
		Y	5.27	66.40	16.21		130.0	
		Z	5.30	66.30	16.15		130.0	
10620-AAA	IEEE 802.11ac WiFi (40MHz, MCS4, 90pc duty cycle)	X	5.33	67.02	16.34	0.46	130.0	± 9.6 %
		Y	5.36	66.45	16.28		130.0	
		Z	5.40	66.37	16.23		130.0	
10621-AAA	IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)	X	5.36	67.27	16.60	0.46	130.0	± 9.6 %
		Y	5.36	66.55	16.44		130.0	
		Z	5.39	66.47	16.41		130.0	
10622-AAA	IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)	X	5.34	67.34	16.62	0.46	130.0	± 9.6 %
		Y	5.37	66.70	16.51		130.0	
		Z	5.40	66.61	16.46		130.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

10623-AAA	IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)	X	5.22	66.85	16.25	0.46	130.0	± 9.6 %
		Y	5.25	66.26	16.17		130.0	
		Z	5.27	66.14	16.10		130.0	
10624-AAA	IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)	X	5.40	67.02	16.39	0.46	130.0	± 9.6 %
		Y	5.44	66.45	16.33		130.0	
		Z	5.47	66.36	16.28		130.0	
10625-AAA	IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)	X	5.68	67.68	16.76	0.46	130.0	± 9.6 %
		Y	5.81	67.42	16.86		130.0	
		Z	5.87	67.40	16.85		130.0	
10626-AAA	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	X	5.55	67.10	16.33	0.46	130.0	± 9.6 %
		Y	5.59	66.47	16.24		130.0	
		Z	5.61	66.37	16.19		130.0	
10627-AAA	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	X	5.74	67.46	16.46	0.46	130.0	± 9.6 %
		Y	5.82	67.00	16.47		130.0	
		Z	5.85	66.92	16.42		130.0	
10628-AAA	IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)	X	5.57	67.13	16.23	0.46	130.0	± 9.6 %
		Y	5.63	66.58	16.20		130.0	
		Z	5.65	66.49	16.14		130.0	
10629-AAA	IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)	X	5.65	67.16	16.23	0.46	130.0	± 9.6 %
		Y	5.71	66.66	16.23		130.0	
		Z	5.74	66.58	16.18		130.0	
10630-AAA	IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)	X	5.85	67.94	16.62	0.46	130.0	± 9.6 %
		Y	6.12	68.08	16.94		130.0	
		Z	6.22	68.15	16.96		130.0	
10631-AAA	IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)	X	5.95	68.39	17.06	0.46	130.0	± 9.6 %
		Y	6.03	67.88	17.02		130.0	
		Z	6.11	67.96	17.06		130.0	
10632-AAA	IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)	X	5.78	67.75	16.76	0.46	130.0	± 9.6 %
		Y	5.79	67.05	16.62		130.0	
		Z	5.82	67.00	16.60		130.0	
10633-AAA	IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)	X	5.66	67.36	16.38	0.46	130.0	± 9.6 %
		Y	5.69	66.74	16.30		130.0	
		Z	5.72	66.66	16.26		130.0	
10634-AAA	IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)	X	5.67	67.48	16.51	0.46	130.0	± 9.6 %
		Y	5.68	66.76	16.37		130.0	
		Z	5.71	66.70	16.34		130.0	
10635-AAA	IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)	X	5.50	66.58	15.75	0.46	130.0	± 9.6 %
		Y	5.57	66.15	15.82		130.0	
		Z	5.59	66.01	15.72		130.0	
10636-AAA	IEEE 1602.11ac WiFi (160MHz, MCS0, 90pc duty cycle)	X	5.94	67.41	16.37	0.46	130.0	± 9.6 %
		Y	6.00	66.84	16.33		130.0	
		Z	6.02	66.76	16.29		130.0	
10637-AAA	IEEE 1602.11ac WiFi (160MHz, MCS1, 90pc duty cycle)	X	6.07	67.70	16.49	0.46	130.0	± 9.6 %
		Y	6.15	67.21	16.50		130.0	
		Z	6.18	67.14	16.45		130.0	
10638-AAA	IEEE 1602.11ac WiFi (160MHz, MCS2, 90pc duty cycle)	X	6.07	67.68	16.46	0.46	130.0	± 9.6 %
		Y	6.15	67.19	16.47		130.0	
		Z	6.18	67.11	16.42		130.0	

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

EX3DV4– SN:7413 June 29, 2016

10639-AAA	IEEE 1602.11ac WiFi (160MHz, MCS3, 90pc duty cycle)	X	6.08	67.71	16.53	0.46	130.0	± 9.6 %
		Y	6.14	67.15	16.49		130.0	
		Z	6.17	67.09	16.46		130.0	
10640-AAA	IEEE 1602.11ac WiFi (160MHz, MCS4, 90pc duty cycle)	X	6.06	67.64	16.42	0.46	130.0	± 9.6 %
		Y	6.14	67.18	16.45		130.0	
		Z	6.18	67.11	16.40		130.0	
10641-AAA	IEEE 1602.11ac WiFi (160MHz, MCS5, 90pc duty cycle)	X	6.09	67.50	16.37	0.46	130.0	± 9.6 %
		Y	6.18	67.06	16.41		130.0	
		Z	6.20	66.95	16.34		130.0	
10642-AAA	IEEE 1602.11ac WiFi (160MHz, MCS6, 90pc duty cycle)	X	6.20	67.98	16.80	0.46	130.0	± 9.6 %
		Y	6.23	67.31	16.70		130.0	
		Z	6.26	67.27	16.68		130.0	
10643-AAA	IEEE 1602.11ac WiFi (160MHz, MCS7, 90pc duty cycle)	X	5.98	67.49	16.43	0.46	130.0	± 9.6 %
		Y	6.06	67.01	16.45		130.0	
		Z	6.09	66.92	16.39		130.0	
10644-AAA	IEEE 1602.11ac WiFi (160MHz, MCS8, 90pc duty cycle)	X	6.12	67.90	16.66	0.46	130.0	± 9.6 %
		Y	6.23	67.53	16.73		130.0	
		Z	6.28	67.50	16.70		130.0	
10645-AAA	IEEE 1602.11ac WiFi (160MHz, MCS9, 90pc duty cycle)	X	6.40	68.30	16.80	0.46	130.0	± 9.6 %
		Y	6.61	68.23	17.04		130.0	
		Z	6.73	68.38	17.09		130.0	

E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix C.2

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle:* The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information: Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.432 ± 0.02% (k=2)	404.355 ± 0.02% (k=2)	404.442 ± 0.02% (k=2)
Low Range	3.98217 ± 1.50% (k=2)	3.98122 ± 1.50% (k=2)	4.01202 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	255.5 ° ± 1 °

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	200032.26	0.73	0.00
Channel X	+ Input	20004.96	0.83	0.00
Channel X	- Input	-20004.68	0.48	-0.00
Channel Y	+ Input	200031.48	-0.44	-0.00
Channel Y	+ Input	20002.38	-1.71	-0.01
Channel Y	- Input	-20005.91	-0.69	0.00
Channel Z	+ Input	200030.52	-1.02	-0.00
Channel Z	+ Input	20002.91	-1.13	-0.01
Channel Z	- Input	-20005.99	-0.71	0.00

Low Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	2000.65	0.07	0.00
Channel X	+ Input	200.92	0.26	0.13
Channel X	- Input	-198.77	0.63	-0.32
Channel Y	+ Input	2000.35	-0.11	-0.01
Channel Y	+ Input	200.03	-0.54	-0.27
Channel Y	- Input	-199.86	-0.40	0.20
Channel Z	+ Input	2000.45	-0.03	-0.00
Channel Z	+ Input	199.23	-1.37	-0.68
Channel Z	- Input	-200.55	-1.12	0.56

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	1.46	-0.03
	- 200	2.59	-0.43
Channel Y	200	-13.76	-13.36
	- 200	12.03	12.18
Channel Z	200	-10.48	-10.89
	- 200	9.35	8.66

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	-	-0.99	-3.84
Channel Y	200	6.65	-	0.06
Channel Z	200	10.03	3.39	-

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15824	16063
Channel Y	16222	14653
Channel Z	16023	14412

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	-0.40	-1.42	0.63	0.35
Channel Y	-0.91	-1.75	0.10	0.37
Channel Z	-1.24	-2.71	0.12	0.46

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	−0.01	-8	-9

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix C.3 Calibration certificate for Dipole

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client SGS Korea (Dymstec)

Certificate No: D1750V2-1070_Jul16

CALIBRATION CERTIFICATE

Object	D1750V2 - SN:1070
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date	July 21, 2016

기술 책임자

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	15-Jun-16 (No. EX3-7349_Jun16)	Jun-17
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 22, 2016

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D1750V2-1070_Jul16 Page 1 of 8

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.8 ± 6 %	1.36 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.84 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.3 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.4 ± 6 %	1.48 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**37.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.88 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.6 W/kg ± 16.5 % (k=2)**

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.3 Ω + 1.3 jΩ
Return Loss	- 34.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5 Ω + 0.3 jΩ
Return Loss	- 31.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.222 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 15, 2010

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

DASY5 Validation Report for Head TSL

Date: 21.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

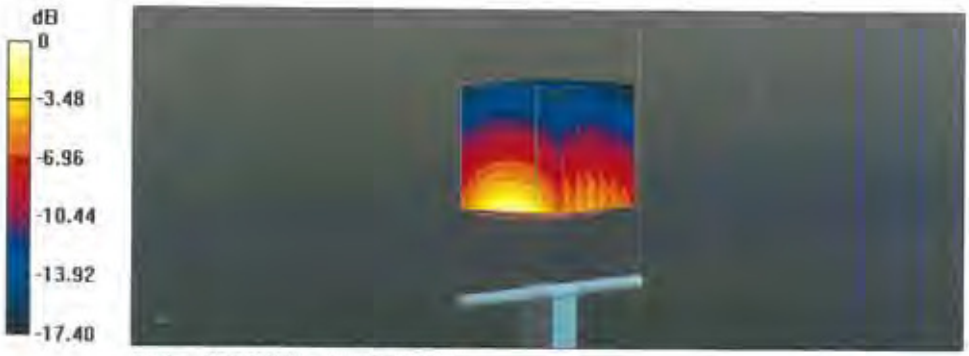
DUT: Dipole 1750 MHz D1750V2; Type: D1750V2; Serial: D1750V2 - SN:1070

Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.36 S/m; ε_r = 38.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.46, 8.46, 8.46); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

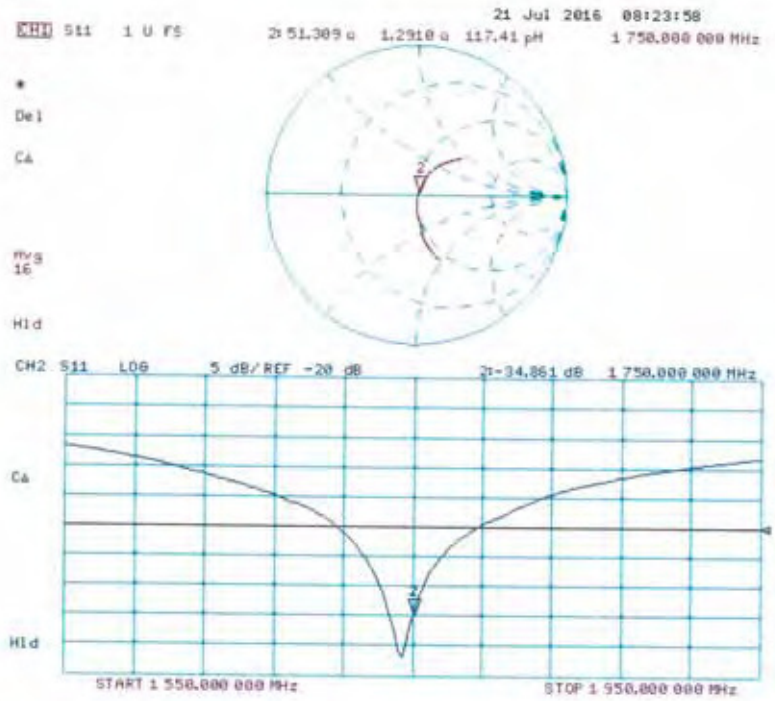
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.8 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 9.15 W/kg; SAR(10 g) = 4.84 W/kg
Maximum value of SAR (measured) = 14.0 W/kg



0 dB = 14.0 W/kg = 11.46 dBW/kg

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Impedance Measurement Plot for Head TSL



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

DASY5 Validation Report for Body TSL

Date: 21.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

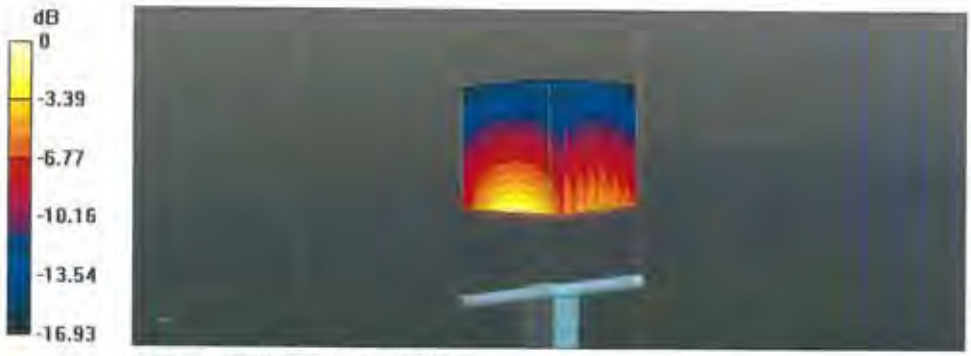
DUT: Dipole 1750 MHz D1750V2; Type: D1750V2; Serial: D1750V2 - SN: 1070

Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.48 S/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.25, 8.25, 8.25); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

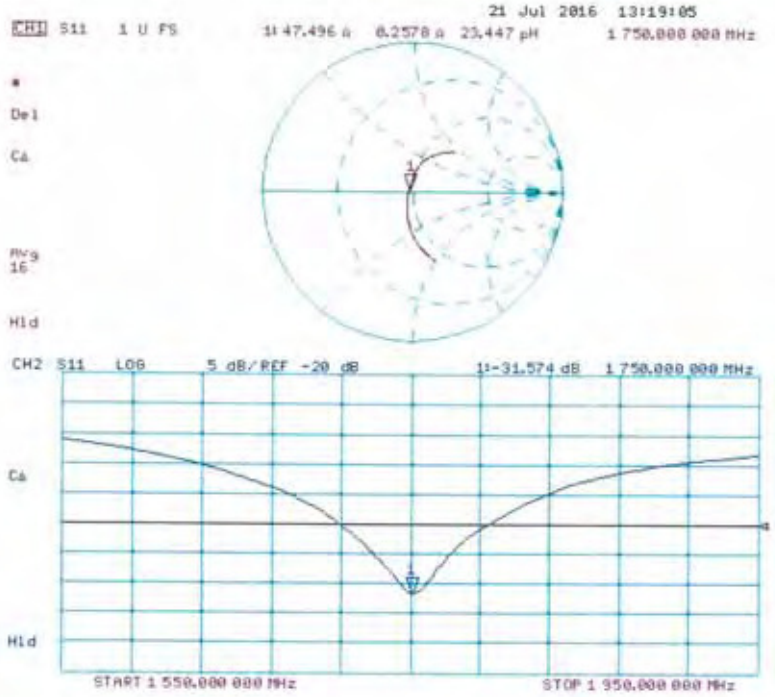
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.7 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 16.4 W/kg
SAR(1 g) = 9.21 W/kg; SAR(10 g) = 4.88 W/kg
Maximum value of SAR (measured) = 13.8 W/kg



0 dB = 13.8 W/kg = 11.40 dBW/kg

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Impedance Measurement Plot for Body TSL



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **SGS Korea (Dymstec)**

Certificate No: **D1900V2-5d033_May16**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d033
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date	May 26, 2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104776	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	31-Dec-15 (No. EX3-7349_Dec15)	Dec-16
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 26, 2016

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'etalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.1 ± 6 %	1.39 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**37.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.98 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.0 ± 6 %	1.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.38 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 W/kg ± 16.5 % (k=2)**

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.6 Ω + 4.0 jΩ
Return Loss	- 27.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.6 Ω + 3.2 jΩ
Return Loss	- 27.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.204 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 17, 2003

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

DASY5 Validation Report for Head TSL

Date: 19.05.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d033

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.39 S/m; ε_r = 40.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

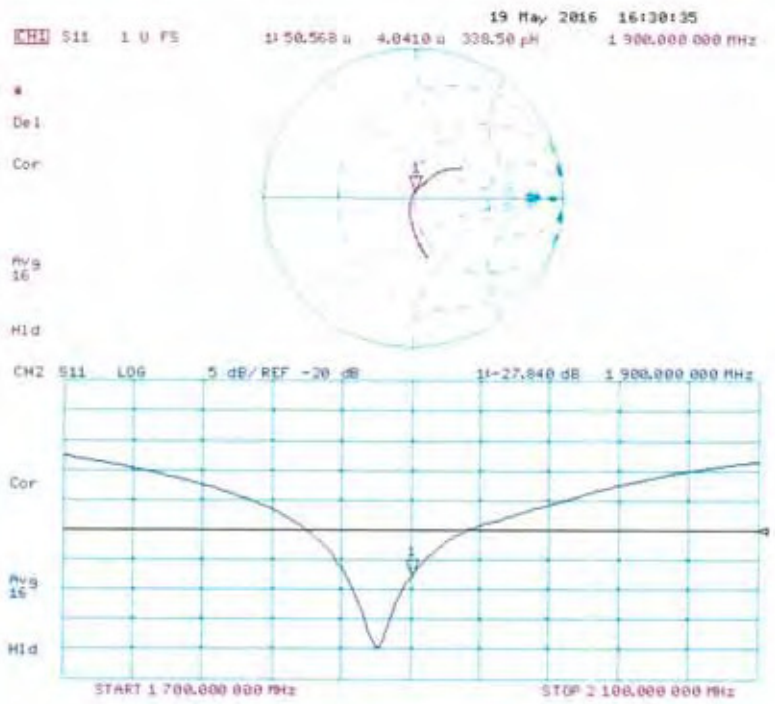
- Probe: EX3DV4 - SN7349; ConvF(8.2, 8.2, 8.2); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.2 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 9.44 W/kg; SAR(10 g) = 4.98 W/kg
Maximum value of SAR (measured) = 14.4 W/kg

0 dB = 14.4 W/kg = 11.58 dBW/kg

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Impedance Measurement Plot for Head TSL



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

DASY5 Validation Report for Body TSL

Date: 26.05.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d033

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.52 S/m; ε_r = 53; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

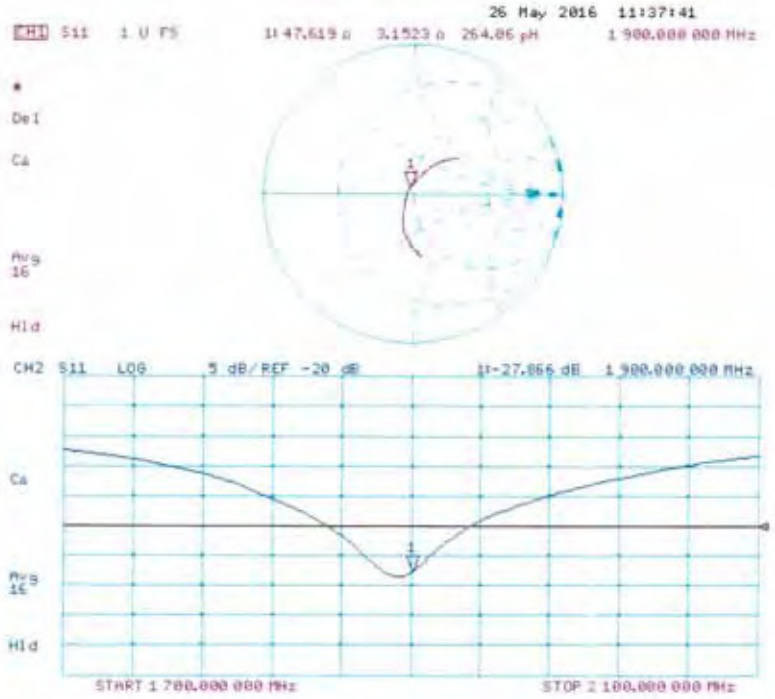
- Probe: EX3DV4 - SN7349; ConvF(8.03, 8.03, 8.03); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.0 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 17.9 W/kg
SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.38 W/kg
Maximum value of SAR (measured) = 15.2 W/kg

0 dB = 15.2 W/kg = 11.82 dBW/kg

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Impedance Measurement Plot for Body TSL



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client SGS Korea (Dymstec)

Certificate No: D2450V2-734_May16

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:734
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 24, 2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration):

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	31-Dec-15 (No. EX3-7349_Dec15)	Dec-16
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 25, 2016

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.6 ± 6 %	1.87 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.8 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**50.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.92 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.4 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.6 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.6 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**49.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.90 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.4 W/kg ± 16.5 % (k=2)**

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.6 Ω + 5.0 jΩ
Return Loss	- 23.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.7 Ω + 7.2 jΩ
Return Loss	- 22.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 07, 2003

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

DASY5 Validation Report for Head TSL

Date: 24.05.2016

Test Laboratory: SPEAG, Zurich, Switzerland

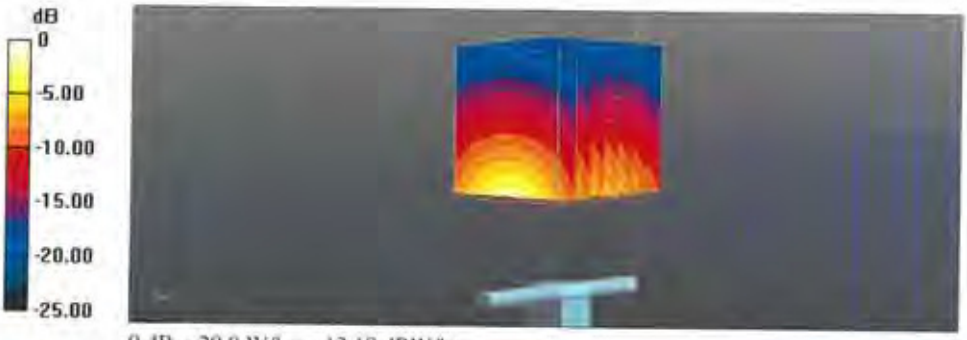
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 734

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.87 S/m; ε_r = 38.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.76, 7.76, 7.76); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

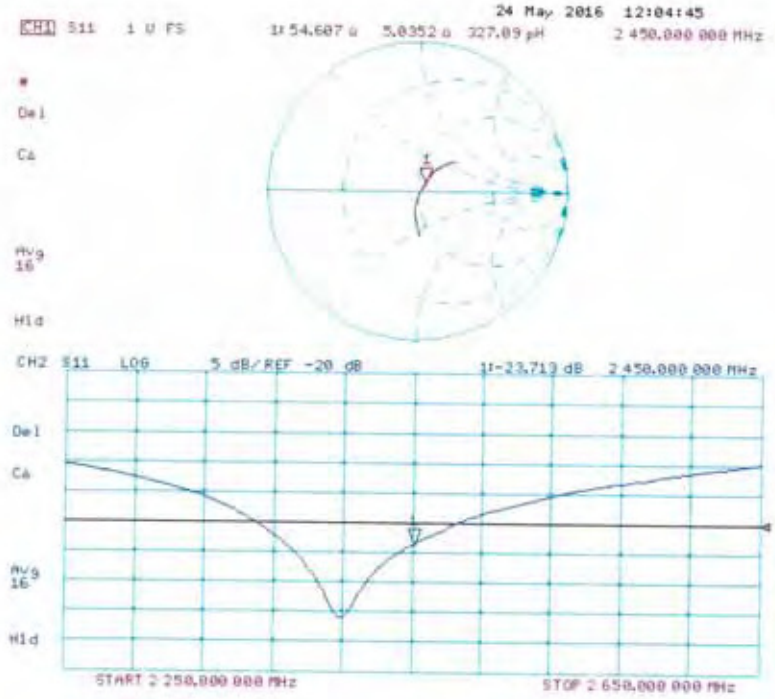
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 111.0 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 25.8 W/kg
SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.92 W/kg
Maximum value of SAR (measured) = 20.8 W/kg



0 dB = 20.8 W/kg = 13.18 dBW/kg

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Impedance Measurement Plot for Head TSL



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

DASY5 Validation Report for Body TSL

Date: 24.05.2016

Test Laboratory: SPEAG, Zurich, Switzerland

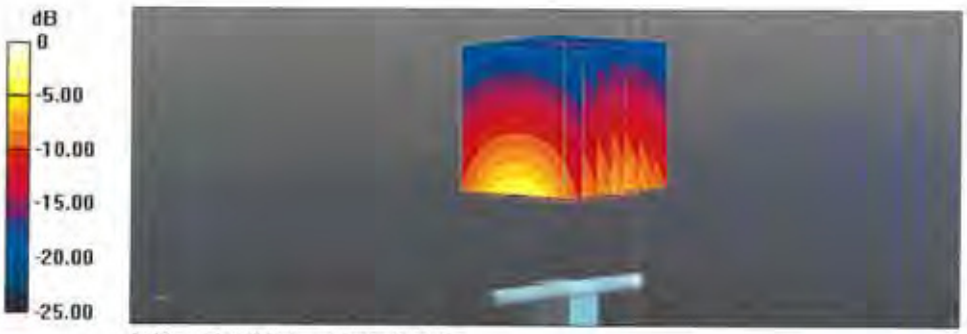
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 734

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 S/m; ε_r = 52.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.79, 7.79, 7.79); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

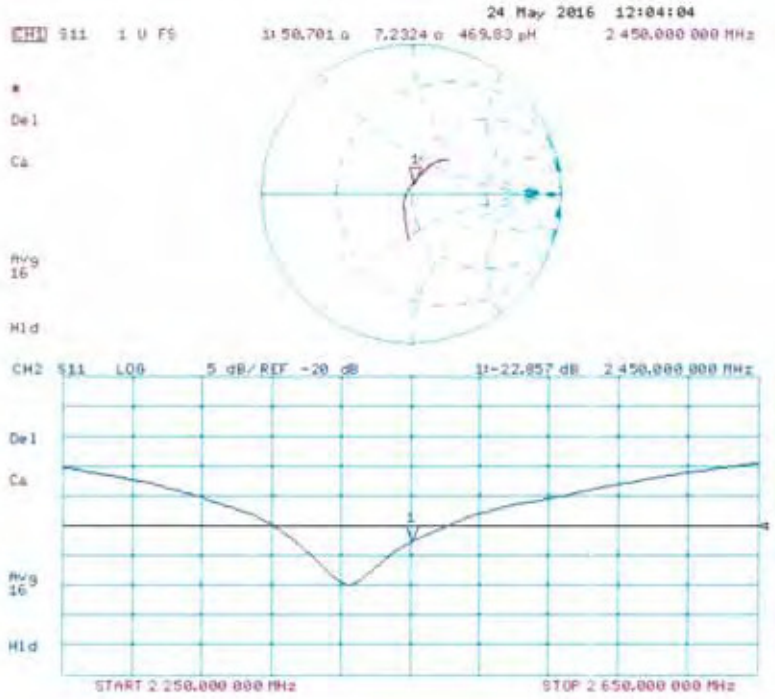
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.2 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 25.2 W/kg
SAR(1 g) = 12.6 W/kg; SAR(10 g) = 5.9 W/kg
Maximum value of SAR (measured) = 20.6 W/kg



0 dB = 20.6 W/kg = 13.14 dBW/kg

(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)

Impedance Measurement Plot for Body TSL



(All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.)