

Test report No:
2540846R.709B

FCC TEST REPORT

Product Name	Tablet PC
Model and /or type reference	TR54, GT40
Trademark	N/A
FCC ID	V2X-TR54
Applicant's name / address	POINT MOBILE Co., Ltd. A-26F, Building Gasan Publik 178, Digital-ro, Geumcheon-gu Seoul, 08513 Republic of Korea
Test method requested, standard	47 CFR FCC Part 2 (Section 2.1093) IEEE Std 1528-2013 EN IEC/IEEE 62209-1528:2021 ANSI C95.1-2019
Verdict Summary	IN COMPLIANCE
Documented by (name / position & signature)	Tim Cao / Project Manager 
Approved by (name / position & signature)	Frank He / Technical Manager 
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COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

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The results presented in this Test Report apply only to the particular item under test established in this document.

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GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Jun. 13, 2025
Date (start test)	Jun. 18, 2025
Date (finish test)	Aug. 15, 2025

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
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ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	18 °C – 25 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	: Equipment Under Test
QP	: Quasi-Peak
CAV	: CISPR Average
AV	: Average
CDN	: Coupling Decoupling Network
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
BW	: Bandwidth
AM	: Amplitude Modulation
PM	: Pulse Modulation
HCP	: Horizontal Coupling Plane
VCP	: Vertical Coupling Plane
U_N	: Nominal voltage
Tx	: Transmitter
Rx	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2540846R.709B	V1.0	Initial issue of report.	2025-08-28
2540846R.709B	V1.1	Supplement the test data for WiFi 6G and update C95.1 to the 2019 version.	2025-09-22

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with FCC 47CFR §2.1093, IEEE Std. 1528-2013, EN IEC/IEEE 62209-1528:2021, ANSI C95.1-2019.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
4. The test results presented in this report relate only to the object tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
 - Chapter 1 General Information.

STATEMENT OF COMPLIANCE

The maximum results of Specific Absorption Rate (SAR) and Power Density found during testing for Tablet PC, TR54, GT40, are as follows.

Equipment Class	Frequency Band		Maximum SAR (W/kg)
			Body SAR
Licensed	WCDMA	WCDMA Band II	0.639
		WCDMA Band IV	0.702
		WCDMA Band V	0.735
	LTE	LTE Band 4	0.782
		LTE Band 7	0.744
		LTE Band 12&17	0.793
		LTE Band 13	0.725
		LTE Band 25&2	0.799
		LTE Band 26&5	0.689
		LTE Band 41&38	0.725
DSS	2.4GHz Band	Bluetooth	0.089
DTS	WLAN	WLAN 2.4G	0.763
NII		WLAN 5G	0.702
6XD		WLAN 6G	0.376
DXX	NFC	13.56MHz	0.008
SAR Limited(W/kg)			1.60
Equipment Class	Frequency Band	Frequency Band	Total psPD(W/m^2)
6XD	WLAN	WLAN 6G	9.83
PD Limited(W/m^2)			10
Maximum Simultaneous Transmission SAR (W/kg)			
Scenario			Body SAR
Sum SAR			1.59
Limited			1.60

USED EQUIPMENT

SAR Test and Power Density Test / TR6

Instrument	Manufacturer	Model No.	Serial No.	Next Cal. Date
Stäubli Robot TX60L	Stäubli	TX60L	F10/5C90A1/A/01	N/A
Controller	Stäubli	SP1	S-0034	N/A
Dipole Validation Kits	Speag	CAL13	1048	2027.10.06
Dipole Validation Kits	Speag	D750V3	1086	2026.03.20
Dipole Validation Kits	Speag	D835V2	4d094	2028.03.17
Dipole Validation Kits	Speag	D1800V2	2d179	2028.03.17
Dipole Validation Kits	Speag	D1900V2	5d121	2028.03.16
Dipole Validation Kits	Speag	D2300V2	1069	2028.03.19
Dipole Validation Kits	Speag	D2450V2	839	2028.03.17
Dipole Validation Kits	Speag	D2600V2	1029	2028.03.12
Dipole Validation Kits	Speag	D5GHzV2	1078	2028.03.13
Dipole Validation Kits	Speag	D6.5GHzV2	1084	2025.09.11
Dipole Validation Kits	Speag	5G Verification Source 10GHz	1055	2027.09.13
SAM Twin Phantom	Speag	SAM	TP-1562	N/A
Device Holder	Speag	SD 000 H01 HA	N/A	N/A
Data Acquisition Electronic	Speag	DAE4	1220	2026.03.13
E-Field Probe	Speag	EX3DV4	7761	2025.09.18
E-Field Probe	Speag	EUmmWV4	9681	2025.09.15
SAR Software	Speag	DASY6	V5.2 Build 162	N/A
Power Amplifier	MVE	MPC1018.50	C30002D	2026.05.16
Dual Directional Coupler	woken	0110A05A82Z-20	CMLC66W1A1	2026.05.16
Tissue fluid test probe	SPEAG	DAK 3.5	1308	N/A
Tissue fluid test probe	SPEAG	DAK 12.0	1204	N/A
Vector Network	Agilent	E5071C	MY46103316	2026.07.24
Signal Generator	R&S	SMBV100A	263697	2026.05.09
Power Meter	Keysight	N1912A	MY60300004	2026.05.16
Radio Communication Analyzer	Anritsu	MT8821C	6262297906	2025.12.13
Temperature/Humidity Meter	Rites	RTS-1909	THM-034	2026.04.29
Temperature/Humidity Meter	Rites	RTS-1909	THM-035	2026.04.29
Temperatuer	LKM	DTM3000	3777	2026.05.18

SAR Test and Power Density Test / TR6

Instrument	Manufacturer	Model No.	Serial No.	Firmware Version	Software Version
SAR Software	Speag	DASY6	V5.2 Build 162	N/A	V16.2.4.2448
Power Amplifier	MVE	MPC1018.50	C30002D	A.14.03	N/A
Vector Network	Agilent	E5071C	MY46103316	A.11.31	N/A
Signal Generator	R&S	SMBV100A	263697	V4.15.125.49	N/A
Power Meter	Keysight	N1912A	MY60300004	A2.06.01	N/A

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95% .

Uncertainty for System Validation 4MHz – 300 MHz								
Error Description	Unc. ±%	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(vi) veff
Measurement System								
Probe Calibration	±13.3%	N	2	1	1	±6.65%	±6.65%	∞
Axial Isotropy	±0.5%	R	$\sqrt{3}$	0.7	0.7	±0.2%	±0.2%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±0.6%	R	$\sqrt{3}$	1	1	±0.4%	±0.4%	∞
Modulation	±2.4%	R	$\sqrt{3}$	1	1	±1.4%	±1.4%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.0%	R	$\sqrt{3}$	1	1	±0.0%	±0.0%	∞
Integration Time	±0.0%	R	$\sqrt{3}$	1	1	±0.0%	±0.0%	∞
RF Ambient Noise	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
RF Ambient Reflections	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Probe Positioner	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Probe Positioning	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Max. SAR Eval.	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Dipole Related								
Deviation from exp. dipole	±5.5%	R	$\sqrt{3}$	0	0	±0.0%	±0.0%	∞
Dipole axis to liquid distance	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Dipole input power and SAR drift	±3.4%	R	$\sqrt{3}$	1	1	±2.0%	±2.0%	∞
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
SAR correction for deviations in conductivity and permittivity(target)	±5%	R	$\sqrt{3}$	1	0.84	±2.9%	±2.4%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.78	0.71	±2.0%	±1.8%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.26	0.26	±0.6%	±0.7%	∞
Liquid conductivity - temperature uncertainty	±1.7%	R	$\sqrt{3}$	0.78	0.71	±0.8%	±0.7%	
Liquid permittivity - temperature uncertainty	±0.3%	R	$\sqrt{3}$	0.23	0.26	±0.0%	±0.0%	
Combined Std. Uncertainty						±10.6%	±10.4%	
Expanded Std. Uncertainty						±21.2%	±20.9%	

DASY6 SAR Uncertainty								
Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram / 10 gram.								
Error Description	Uncert. value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(vi) v _{eff}
Measurement System								
Probe Calibration	±5.5%	N	1	1	1	±5.5%	±5.5%	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	$\sqrt{3}$	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.78	0.71	±2.0%	±1.8%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.26	0.26	±0.6%	±0.7%	∞
Combined Std. Uncertainty						±10.6%	±10.5%	361
Expanded STD Uncertainty						±21.2%	±21.1%	

DASY6 SAR Uncertainty								
Measurement uncertainty for 3 GHz to 6 GHz averaged over 1 gram / 10 gram.								
Error Description	Uncert. value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(vi) v _{eff}
Measurement System								
Probe Calibration	±6.65%	N	1	1	1	±6.65%	±6.65%	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Probe Positioning	±6.7%	R	$\sqrt{3}$	1	1	±3.9%	±3.9%	∞
Max. SAR Eval.	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.78	0.71	±2.0%	±1.8%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.26	0.26	±0.6%	±0.7%	∞
Combined Std. Uncertainty						±12.0%	±12.0%	784
Expanded STD Uncertainty						±24.0%	±23.9%	

DASY6 SAR Uncertainty (Frequency band: 6 GHz–10 GHz range)								
Symbol	Error Description	Uncert. value	Prob. Dist.	Div.	(ci) (1 g)	(ci) (10 g)	Std. Unc. (1 g)	Std. Unc. (10 g)
Measurement System Errors								
CF	Probe Calibration	±18.6%	N	2	1	1	±9.3%	±9.3%
CF _{drift}	Probe Calibration Drift	±1.7%	R	√3	1	1	±1.0%	±1.0%
LIN	Probe Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%
BBS	Broadband Signal	±2.8%	R	√3	1	1	±1.6%	±1.6%
ISO	Probe Isotropy	±7.6%	R	√3	1	1	±4.4%	±4.4%
DAE	Other Probe+Electronic	±2.4%	N	1	1	1	±2.4%	±2.4%
AMB	RF Ambient	±1.8%	N	1	1	1	±1.8%	±1.8%
Δ _{sys}	Probe Positioning	±0.005 mm	N	1	0.5	0.5	±0.25%	±0.25%
DAT	Data Processing	±3.5%	N	1	1	1	±3.5%	±3.5%
Phantom and Device Errors								
LIQ(σ)	Conductivity (meas.) <i>DAK</i>	±2.5%	N	1	0.78	0.71	±2.0%	±1.8%
LIQ(Tσ)	Conductivity (temp.) <i>BB</i>	±2.4%	R	√3	0.78	0.71	±1.1%	±1.0%
EPS	Phantom Permittivity	±14.0%	R	√3	0.5	0.5	±4.0%	±4.0%
DIS	Distance DUT – TSL	±2.0%	N	1	2	2	±4.0%	±4.0%
D	Device Positioning	±1.0%	N	1	1	1	±1.0%	±1.0%
H	Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%
MOD	DUT Modulation <i>m</i>	±2.4%	R	√3	1	1	±1.4%	±1.4%
TAS	Time-average SAR	±1.7%	R	√3	1	1	±1.0%	±1.0%
RF _{drift}	DUT drift	±2.5%	N	1	1	1	±2.5%	±2.5%
VAL	Val Antenna Unc. <i>val</i>	±0.0%	N	1	1	1	±0%	±0%
RF _{in}	Unc. Input Power <i>val</i>	±0.0%	N	1	1	1	±0%	±0%
Correction to the SAR results								
C(ε, σ)	Deviation to Target	±1.9%	N	1	1	0.84	±1.9%	±1.6%
C(R)	SAR scaling <i>p</i>	±0%	R	√3	1	1	±0%	±0%
u	Random uncertainty	±0.6% for 1g and ±0.5% for 10g	N	1	1	1	±0.6%	±0.5%
u(ΔSAR)	Combined Uncertainty						±14.2%	±13.9%
U	Expanded Uncertainty						±28.4%	±28.3%

cDASY6 Module mmWave Uncertainty Budget
Evaluation Distances to the Antennas > $\lambda/2\pi$
In Compliance with IEC/IEEE 63195

Symbol	Error Description	Uncertainty Value ($\pm$ dB)	Probability	Divisor	(Ci)	Standard Uncertainty ($\pm$ dB)
Uncertainty terms dependent on the measurement system						
CAL	Probe Calibration	0.49	N	1	1	0.49
COR	Probe correction	0.00	R	1.732	1	0.00
FRS	Frequency response	0.20	R	1.732	1	0.12
SCC	Sensor cross coupling	0.00	R	1.732	1	0.00
ISO	Isotropy	0.50	R	1.732	1	0.29
LIN	Linearity	0.20	R	1.732	1	0.12
PSC	Probe scattering	0.00	R	1.732	1	0.00
PPO	Probe positioning offset	0.30	R	1.732	1	0.17
PPR	Probe positioning repeatability	0.04	R	1.732	1	0.02
SMO	Sensor mechanical offset	0.00	R	1.732	1	0.00
PSR	Probe spatial resolution	0.00	R	1.732	1	0.00
FLD	Field impedance dependence	0.00	R	1.732	1	0.00
APD	Amplitude and phase drift	0.00	R	1.732	1	0.00
APN	Amplitude and phase noise	0.04	R	1.732	1	0.02
TR	Measurement area truncation	0.00	R	1.732	1	0.00
DAQ	Data acquisition	0.03	N	1	1	0.03
SMP	Sampling	0.00	R	1.732	1	0.00
REC	Field reconstruction	2.00	R	1.732	1	1.15
TRA	Forward transformation	0.00	R	1.732	1	0.00
SCA	Power density scaling	0.00	R	1.732	1	0.00
SAV	Spatial averaging	0.10	R	1.732	1	0.06
SDL	System detection limit	0.04	R	1.732	1	0.02
Uncertainty terms dependent on the DUT and environmental factors						
PC	Probe coupling with DUT	0.00	R	1.732	1	0.00
MOD	Modulation response	0.40	R	1.732	1	0.23
IT	Integration time	0.00	R	1.732	1	0.00
RT	Response time	0.00	R	1.732	1	0.00
DH	Device holder influence	0.10	R	1.732	1	0.06
DA	DUT alignment	0.00	R	1.732	1	0.00
AC	RF ambient conditions	0.04	R	1.732	1	0.02
AR	Ambient reflections	0.04	R	1.732	1	0.02
MSI	Immunity / secondary reception	0.00	R	1.732	1	0.00
DRI	Drift of the DUT	0.00	R	1.732	1	0.00
u	Random uncertainty	0.00	N	1	1	0.00
u(P D)	Combined Std. Uncertainty					1.34
U	Expanded STD Uncertainty (95%)					2.68

TEST FACILITY

Tset Location : FCC Designation Number: CN1199

1 GENERAL INFORMATION

Product Name	Tablet PC	
Base Model	TR54	
Multiple Model	GT40	
Trademark	N/A	
FCC ID	V2X-TR54	
Power Supply	3.85Vdc, EUT is equipped with an adapter to power it via AC/DC.	
Hardware Version	MP	
Software Version	TR54G15.00	
Manufacturer	POINT MOBILE Co., Ltd.	
Manufacturer Address	A-26F, Building Gasan Publik 178, Digital-ro, Geumcheon-gu Seoul, 08513 Republic of Korea	
Model Difference	Multiple Models are identical to the TR54. The difference between models are model name and marketing areas.	
Test Matrix/ IMEI	# 6	IMEI1: 358918680004695 IMEI2: 358918680005106
	# 7	IMEI1: 358918680005957 IMEI2: 358918680001063
Wireless specification	WCDMA	
Support Band(s)	Band 2, Band 4, Band 5	
Uplink Frequency	Band 2: 1850-1910 MHz Band 4: 1710-1755 MHz Band 5: 824-849 MHz	
Downlink Frequency	Band 2: 1930-1990 MHz Band 4: 2110-2155 MHz Band 5: 869-894 MHz	
Type of Modulation	Downlink modulation: QPSK & 16QAM & 64QAM Uplink modulation: QPSK & 16QAM	
Wireless specification	LTE	
Support Band(s)	Band2/4/5/7/12/13/17/25/26/38/41	
Uplink Frequency	Band 2: 1850-1910 MHz Band 4: 1710-1755 MHz Band 5: 824-849 MHz Band 7: 2500-2570 MHz Band 12: 699-716 MHz Band 13: 746-756 MHz Band 17: 704-716 MHz Band 25: 1850-1915 MHz Band 26: 814-824MHz, 824-849 MHz Band 38: 2570-2620 MHz Band 41: 2496-2690 MHz	
Downlink Frequency	Band 2: 1930-1990 MHz Band 4: 2110-2155 MHz Band 5: 869-894 MHz Band 7: 2620-2690 MHz Band 12: 729-746 MHz	

	Band 13: 777-787 MHz Band 17: 734-746 MHz Band 25: 1930-1995 MHz Band 26: 859-869 MHz, 869-894 MHz Band 38: 2570-2620 MHz Band 41: 2496-2690 MHz					
Type of Modulation	Downlink modulation: QPSK & 16QAM & 64QAM Uplink modulation: QPSK & 16QAM & 64QAM					
Antenna Delivery	☒	1TX + 1RX				
	☒	1TX + 2RX				
Antenna technology	☒	SISO				
	☐	MIMO				
Wireless specification	802.11b / g / n / ax					
Operating frequency	2412~2462MHz					
Type of Modulation	DSSS / OFDM / OFDMA					
Smart System	☒	SISO				
	☐	MIMO-CDD				
Wireless specification	802.11a / n / ac / ax					
Frequency Range	U-NII-1: 5150 MHz to 5250 MHz					
	U-NII-2A: 5250 MHz to 5350 MHz					
	U-NII-2C: 5470 MHz to 5725 MHz					
	U-NII-3: 5725 MHz to 5850 MHz					
Channel Bandwidth	802.11a 20 MHz 802.11n 20 MHz, 40 MHz 802.11ac 20 MHz, 40 MHz, 80 MHz, 160 MHz 802.11ax 20 MHz, 40 MHz, 80 MHz, 160 MHz					
Modulation technology	OFDM / OFDMA					
Smart System	☒	SISO				
	☐	MIMO-CDD				
Wireless specification	802.11ax					
Frequency Range	U-NII-5: 5925 MHz to 6425 MHz					
	U-NII-6: 6425 MHz to 6525 MHz					
	U-NII-7: 6525 MHz to 6875 MHz					
	U-NII-8: 6875 MHz to 7125 MHz					
Channel Bandwidth	802.11ax 20 MHz, 40 MHz, 80 MHz, 160 MHz					
Product Type	Indoor Client: 6XD					
Modulation technology	OFDM / OFDMA					
Smart System	☒	SISO				
	☐	MIMO-CDD				
Wireless specification	Bluetooth (BR/EDR)					
Operating frequency range(s)	2402~2480MHz					
Type of Modulation	GFSK & DPSK					
PHYs	☒	GFSK	☒	Pi/4 DQPSK	☒	8DPSK
Data Rate	☒	1Mbit/s	☒	2Mbit/s	☒	3Mbit/s
Number of channels	79					

Wireless specification	Bluetooth (LE)					
Operating frequency range(s)	2402~2480MHz					
Type of Modulation	GFSK & DPSK					
PHYs	☒	LE 1M	☒	LE 2M	☒	LE Coded S=2/8
Data Rate	☒	1Mbit/s	☒	2Mbit/s	☒	500/125 Kbit/s
Number of channels	40					
Wireless Specification	NFC					
Operating frequency range(s)	13.56 MHz					
Type of modulation	ASK					

1.1 DUT Antenna Locations

Note: The DUT Antenna Locations please see appendix.

Note:

- 1) The test device is a Tablet Computer. The overall dimensions of this equipment are 273*172mm in length and width. Per KDB 616217 D04, because the diagonal distance of this device is $\geq 200\text{mm}$, Therefore, tests should be conducted at intervals of 0mm.

According to the distance between WWAN/Wi-Fi antennas and the sides of the EUT we can draw the conclusion that:

EUT Sides for SAR Testing						
Mode	Exposure Condition	Back	Left Side	Right Side	Top Side	Bottom Side
WWAN Antenna	Product specific 1g SAR	Yes	Yes	Yes	Yes	Yes
WLAN Antenna	Product specific 1g SAR	Yes	Yes	Yes	Yes	Yes

Note:

- 1) When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.

1.2 Power reduction specification

This device uses a single fixed level of power reduction through static table look-up for SAR compliance and it is triggered by a single event or operation

- 1) A fixed level power reduction is applied for some frequency bands when hotspot mode becomes active. When the hotspot is disabled, the power value will be recovered.
- 2) A fixed level power reduction is applied for some frequency bands when simultaneously transmitting with the other antennas in certain simultaneous transmission conditions. The standalone SAR compliance still uses the standalone SAR results tested at the maximum output power level without any power reduction
- 3) A fixed level power reduction is applied for some frequency bands when handset operate "held to the ear" condition, the power reduction triggered by audio receiver detection. The audio receiver detection is used to determine head or body scenario.
- 4) The proximity sensor is used to indicate when the device is held close to a user's body exposure condition. It utilizes the proximity sensor to reduce the output power in specific wireless and operating modes of main antenna to ensure SAR compliance(Refer to section 5.4 for detailed proximity Sensor information and validation data per KDB 616217).

The following tables summarize the key power reduction information. The detailed full power which is the Max. power the state can use and reduced tune-up specifications and conducted power measurement results are provided in Section 8 of this report.

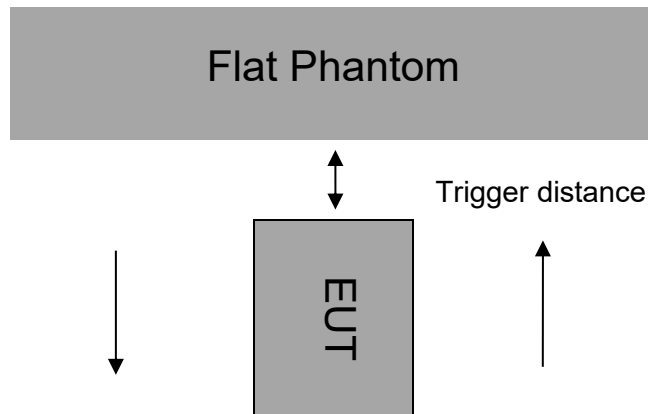
Tune-up Output Power				
Mode	Band	Full Power	Body SAR 0mm	Power needs to be reduced
		SAR SENSOR OFF	SAR SENSOR ON	
UMTS	BAND2	24.50	16.00	8.50
	BAND4	24.50	16.00	8.50
	BAND5	24.50	20.00	4.50
LTE	FDD Band 2	24.50	16.50	8.00
	FDD Band 4	24.50	15.50	9.00
	FDD Band 5	24.50	20.50	4.00
	FDD Band 7	24.50	13.00	11.50
	FDD Band 12	24.50	19.50	5.00
	FDD Band 13	24.50	19.50	5.00
	FDD Band 17	24.50	19.50	5.00
	FDD Band 25	24.50	16.50	8.00
	FDD Band 26	24.50	20.50	4.00
	TDD Band 38	24.50	14.00	10.50
	TDD Band 41	24.50	14.00	10.50
Bluetooth	Bluetooth	10.00	10.00	0.00
WLAN	WLAN 2.4G	14.00	14.00	0.00
	WLAN 5.2G	12.00	12.00	0.00
	WLAN 5.3G	12.00	12.00	0.00
	WLAN 5.6G	11.00	11.00	0.00
	WLAN 5.8G	11.00	11.00	0.00
	WLAN 6G	15.00	15.00	0.00

Note: There are 2 antennas embedded in the Tablet. It has embedded a capacitive proximity sensor for the power reduction of antenna in order to comply with SAR requirement. The WWAN antenna is used as the sensor pad.

1.3 Proximity Sensor Triggering Test

Proximity sensor triggering distances :

The Proximity sensor triggering was applied to WWAN Antenna. Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed.



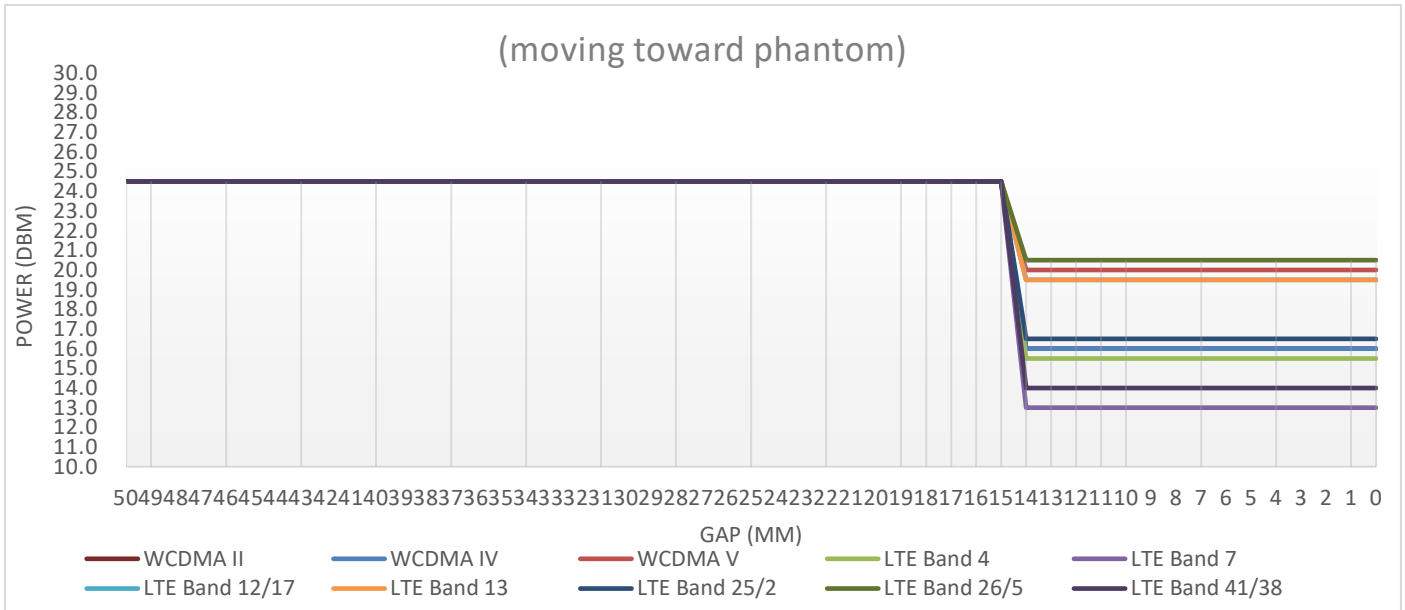
Target Power reduction applied for each wireless mode and orientation

Exposure Position / wireless mode	Back (dBm)	Left Side (dBm)	Right Side (dBm)	Bottom Side (dBm)	Top Side (dBm)
WCDMA 2	8.50	0.0	8.50	0.0	8.50
WCDMA 4	8.50	0.0	8.50	0.0	8.50
WCDMA 5	4.50	0.0	4.50	0.0	4.50
FDD Band 4	9.00	0.0	9.00	0.0	9.00
FDD Band 7	11.50	0.0	11.50	0.0	11.50
FDD Band 12/17	5.00	0.0	5.00	0.0	5.00
FDD Band 13	5.00	0.0	5.00	0.0	5.00
FDD Band 25/2	8.00	0.0	8.00	0.0	8.00
FDD Band 26/5	4.00	0.0	4.00	0.0	4.00
TDD Band 41/38	10.50	0.0	10.50	0.0	10.50

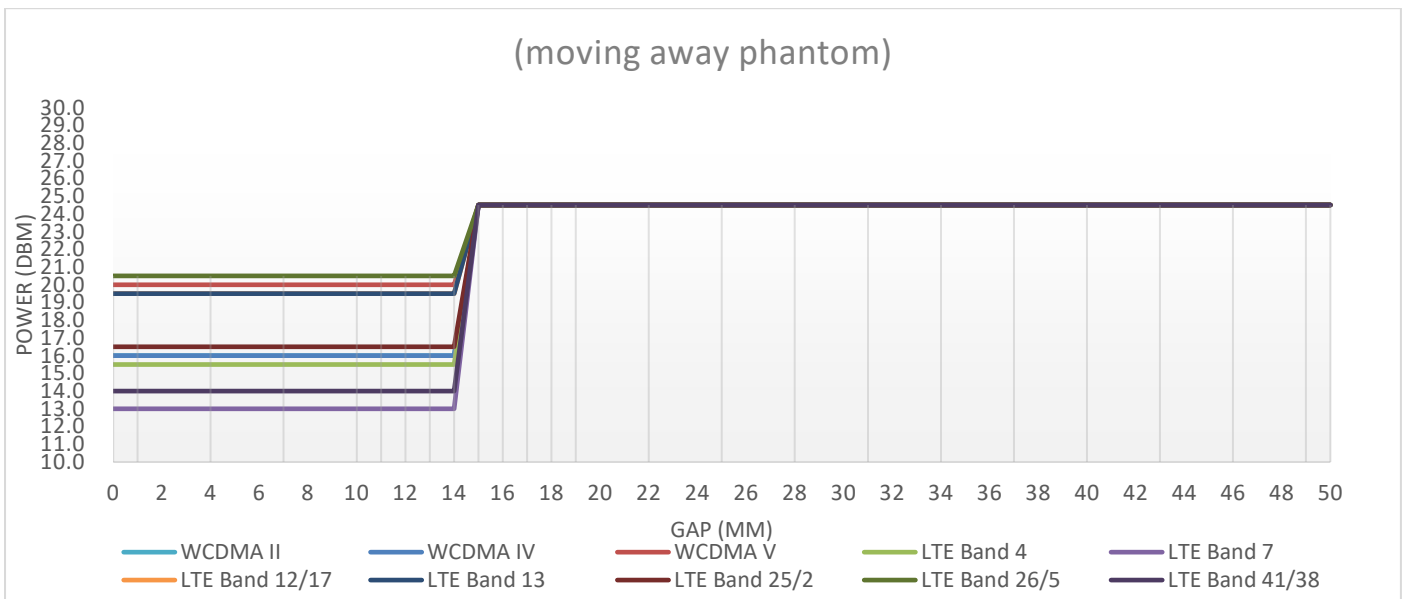
Note:

- (1): Reduced maximum limit applied by activation of proximity sensor.
- Power reduction triggered via proximity sensor is implemented for SAR compliance when users approach the device. The power reduction level is a single fixed level for each frequency band.
- Power reduction is enabled solely upon a proximity sensor trigger event, at the user-EUT distance equal or smaller than the trigger distance. The power reduction is of the highest priority of this device, and will not be overridden by the request of the base station (ex: poor RSSI, etc.), and will be overridden by any other event (ex: low battery, AC-plugged, etc.) or any user intervention. There is no software setting or any 3rd party software can disable the mechanism.
- Move the device from the flat model to the 5 mm of the trigger distance, and then move the device toward the model again every 1 mm Until it touches or moves away from the phantom. Ensure that the power remains reduced after the device exceeds the trigger point.

● DUT Moving Toward (Trigger) the Phantom



● DUT Moving Away (Release) from the Phantom



Proximity sensor coverage

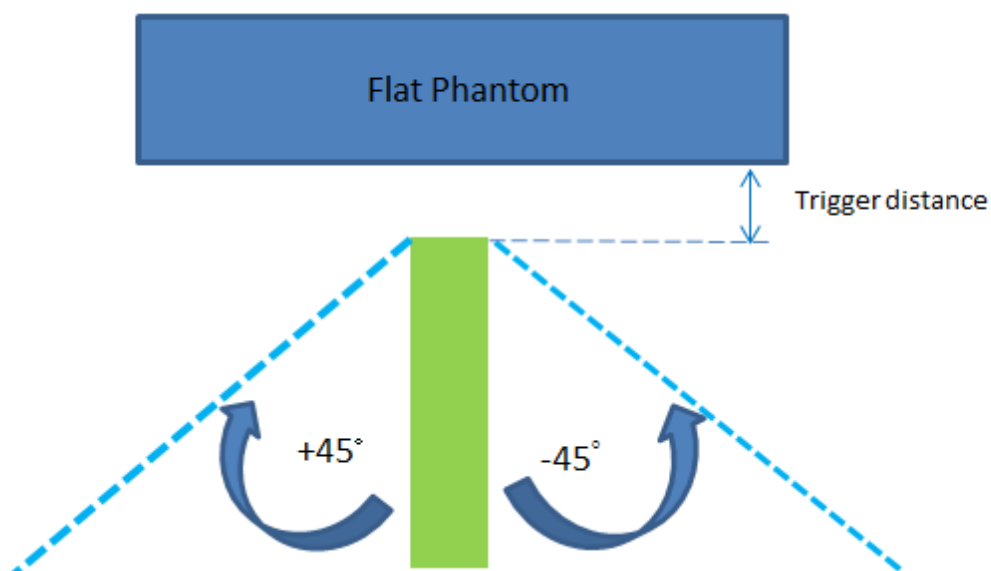
If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. For p-sensor coverage testing, the device is moved and “along the direction of maximum antenna and sensor offset”.

The proximity sensor and main antenna use same metallic electrode, so there is no spatial offset.

Device tilt angle influences to proximity sensor triggering

The influence of device tilt angles to proximity sensor triggering was determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, at 14mm separation.

Rotating the Mobile Router around the edge next to the phantom in $\leq 10^\circ$ increments until the tablet is $\pm 45^\circ$ from the vertical po



Summary of Mobile Router Tilt Angle Influence to Proximity Sensor Triggering for Side													
Antenna	Exposure Position	Minimum trigger distance at which power reduction was maintained over $\pm 45^\circ$	Power Reduction Status										
			-45°	-35°	-25°	-15°	-5°	0°	5°	15°	25°	35°	45°
WWAN Ant	Right Side Top Side	14mm	on	on	on	on	on	on	on	on	on	on	on

SAR test plan:

For the Back / Right Side / Top Side of WWAN Antenna the worst trigger distance of proximity sensor is 14mm, thus we test Back / Right Side / Top Side SAR in 13mm without power reduction and 0mm with power reduction.

Remark:

As above information is provided and confirmed by the applicant. DEKRA is not liable to the accuracy, suitability, reliability or/and integrity of the information.

1.4 Test Specification

Identity	Document Title
FCC 47CFR §2.1093	Radio frequency Radiation Exposure Evaluation: Portable Devices
IEC TR 63170	Measurement procedure for the evaluation of power density related to human exposure to radio frequency fields from wireless communication devices operating between 6 GHz and 100 GHz
IEC/IEEE 63195-1	Assessment of power density of human exposure to radio frequency fields from wireless devices in close proximity to the head and body (frequency range of 6 GHz to 300 GHz) – Part 1: Measurement procedure
IEC/IEEE 63195-2	Assessment of power density of human exposure to radio frequency fields from wireless devices in close proximity to the head and body (frequency range of 6 GHz to 300 GHz) – Part 2: Computational procedure
ANSI/IEEE C95.1-1992	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.
IEEE 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
EN IEC/IEEE 62209-1528	Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz) (IEC/IEEE 62209-1528)
KDB 941225 D05	SAR for LTE Devices v02r05
KDB 941225 D05A	LTE Rel.10 KDB Inquiry Sheet v01r02
KDB 941225 D06	Hotspot Mode SAR v02r01
KDB 248227 D01	SAR Guidance for IEEE 802.11 Wi-Fi SAR v02r02
KDB 648474 D04	Handset SAR v01r03
KDB447498 D01	General RF Exposure Guidance v06
KDB 865664 D01	SAR Measurement 100 MHz to 6 GHz v01r04
KDB 865664 D02	RF Exposure Reporting v01r02
KDB 690783 D01	SAR Listings on Grants v01r03
KDB 616217 D04	SAR for laptop and tablets v01r02

1.5 RF exposure limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimetres of the body of the user.

Limit for General Population/Uncontrolled exposure should be applied for this device; it is 1.6 W/kg as averaged over any 1 gram of tissue.

SAR Exposure Limit		
	General Population / Uncontrolled Exposure ¹ (W/kg)	Occupational / Controlled Exposure ² (W/kg)
Spatial Peak SAR ³ (head or Body)	1.60	8.00
Spatial Peak SAR ⁴ (Whole Body)	0.08	0.40
Spatial Peak SAR ⁵ (Hands / Feet / Ankle / Wrist)	4.00	20.00
Power Density Exposure Limit (1,500 - 100,000 MHz)		
	General Population / Uncontrolled Exposure (mW/cm²) ⁶	Occupational / Controlled Exposure (mW/cm²)
Power Density (S)	1.0	5.0

Notes:

1. **General Population / Uncontrolled Environments** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.
2. **Occupational / Controlled Environments** are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation).
3. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
4. The Spatial Average value of the SAR averaged over the whole body.
5. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
6. 1 mW/cm² = 10 W/m²,

2 SAR MEASUREMENTS SYSTEM CONFIGURATION

SAR Definition

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.

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 (p). The equation description is as below:

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

SAR measurement can be related to the electrical field in the tissue by

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

Where:

σ = conductivity of the tissue (S/m)

ρ = mass density of the tissue (kg/m³)

E = RMS electric field strength (V/m)

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

Power Tensity Definition

The power density for an electromagnetic field represents the rate of energy transfer per unit area. The local power density (i.e. Poynting vector) at a given spatial point is deduced from electromagnetic fields by the following formula:

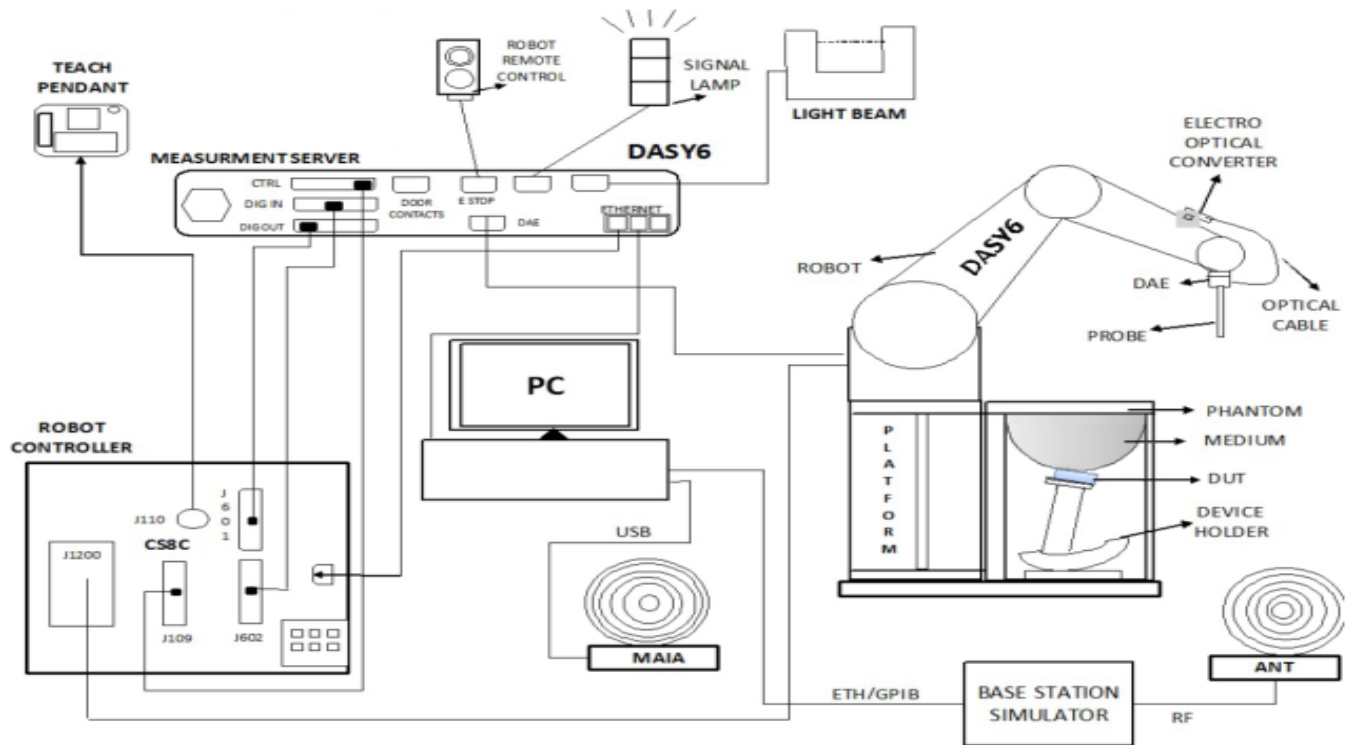
$$S = \frac{1}{2} \text{Re}\{E \times H^*\} \cdot \vec{n}$$

Where: E is the complex electric field peak phasor and H is the complex conjugate magnetic field peak phasor.

The spatial-average power density distribution on the evaluation surface is determined per the IEC TR 63170. The spatial area, A is specified by the applicable exposure limit or regulatory requirements. The circular shape was used.

$$S_{av} = \frac{1}{2A} \Re \left(\int E \times H^* \cdot \hat{n} dA \right)$$

2.1 DASY6 SAR System Description

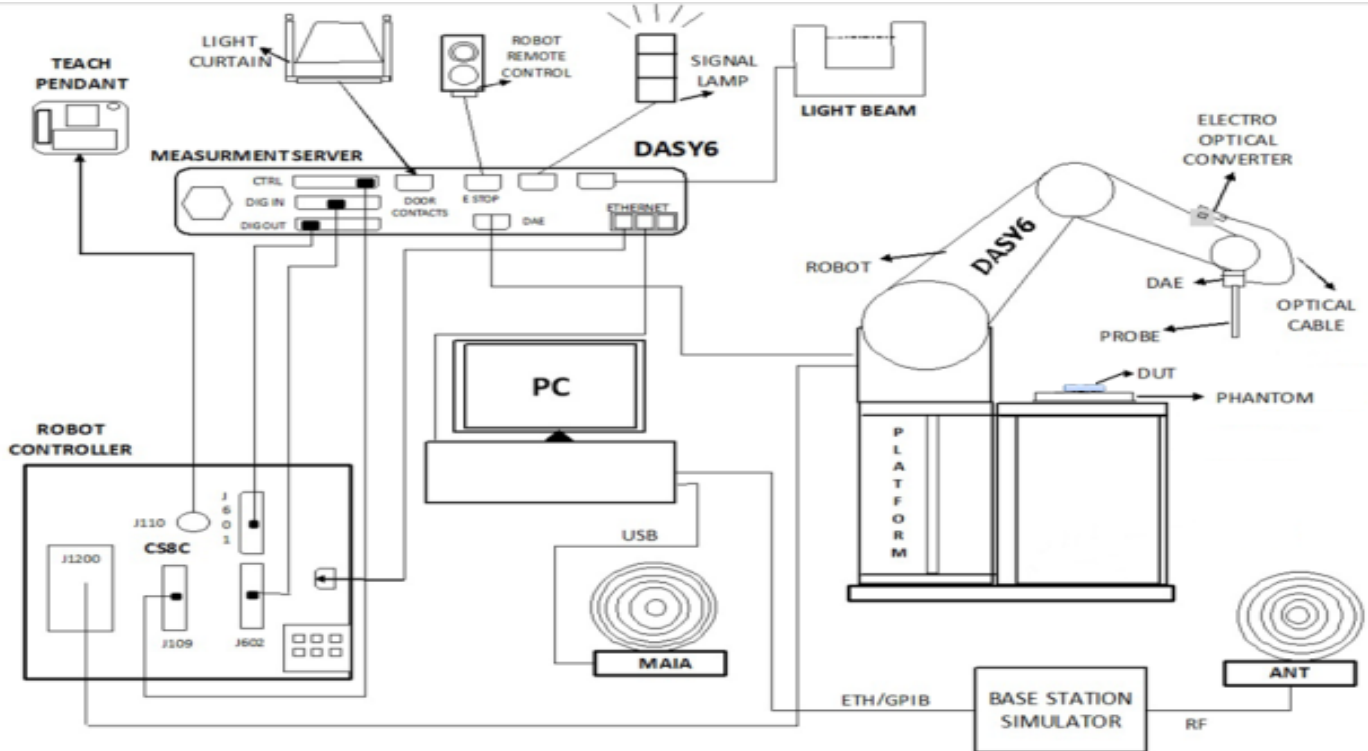


The DASY6 system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A 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.
3. The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
4. The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
5. A computer running Windows 11 and the DASY6 software.
6. Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
7. The phantom, the device holder and other accessories according to the targeted measurement.

2.2 DASY6 Power Density System Description

Power density measurements for mmWave frequencies were performed using SPEAG DASY6 with cDASY6 5G module. The DASY6 included a high precision robotics system (Staubli), robot controller, desktop computer, near-field probe, probe alignment sensor, and the 5G phantom cover.



EUmmWVx probe:

The EUmmWVx probe is based on the pseudo-vector probe design, which not only measures the field magnitude but also derives its polarization ellipse. The design entails two small 0.8mm dipole sensors mechanically protected by high-density foam, printed on both sides of a 0.9mm wide and 0.12mm thick glass substrate. The body of the probe is specifically constructed to minimize distortion by the scattered fields. The probe consists of two sensors with different angles (1 and 2) arranged in the same plane in the probe axis. Three or more measurements of the two sensors are taken for different probe rotational angles to derive the amplitude and polarization information. The probe design allows measurements at distances as small as 2mm from the sensors to the surface of the device under test (DuT). The typical sensor to probe tip distance is 1.5 mm. The exact distance is calibrated. A 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.

2.3 Applications

Predefined procedures and evaluations for automated compliance testing with all worldwide standards, e.g., IEC/IEEE 62209-1528 others.

2.4 Area & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures points and step size follow as below. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution. The measure settings are referred in IEEE Std 1528-2013.

			≤3GHz	>3GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5±1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ 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: Δz Zoom (n)		≤ 5 mm	3–4 GHz: ≤ 4 mm
				4–5 GHz: ≤ 3 mm
				5–6 GHz: ≤ 2 mm
	graded grid	Δz Zoom (1): between 1st two points closest to phantom surface	≤ 4 mm	3–4 GHz: ≤ 3 mm
				4–5 GHz: ≤ 2.5 mm
		Δz Zoom (n>1): between subsequent points	≤ 1.5·Δz 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:

1. δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
2. * 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 3GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

2.5 Uncertainty of Inter-/Extrapolation and Averaging

To evaluate the uncertainty of the interpolation, extrapolation and averaged SAR calculation algorithms of the Postprocessor, DASY6 allows the generation of measurement grids which are artificially predefined by analytically based test functions. Therefore, the grids of area scans and zoom scans can be filled with uncertainty test data, according to the SAR benchmark functions of IEC/IEEE 62209-1528. The three analytical functions shown in equations as below are used to describe the possible range of the expected SAR distributions for the tested handsets. The field gradients are covered by the spatially flat distribution f1, the spatially steep distribution f3 and f2 accounts for H-field cancellation on the phantom/tissue surface.

$$f_1(x, y, z) = A e^{-\frac{z}{2a}} \cos^2 \left(\frac{\pi}{2} \frac{\sqrt{x'^2 + y'^2}}{5a} \right)$$

$$f_2(x, y, z) = A e^{-\frac{z}{a}} \frac{a^2}{a^2 + x'^2} \left(3 - e^{-\frac{2z}{a}} \right) \cos^2 \left(\frac{\pi}{2} \frac{y'}{3a} \right)$$

$$f_3(x, y, z) = A \frac{a^2}{\frac{a^2}{4} + x'^2 + y'^2} \left(e^{-\frac{2z}{a}} + \frac{a^2}{2(a + 2z)^2} \right)$$

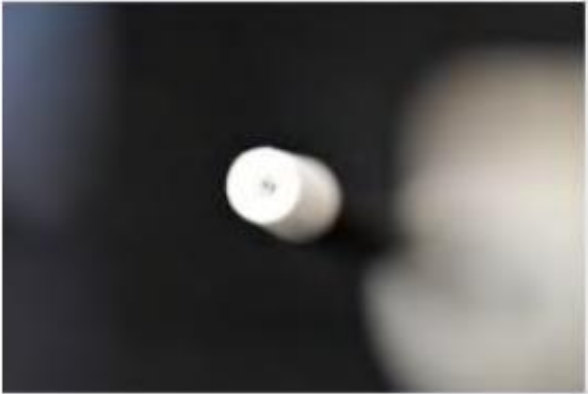
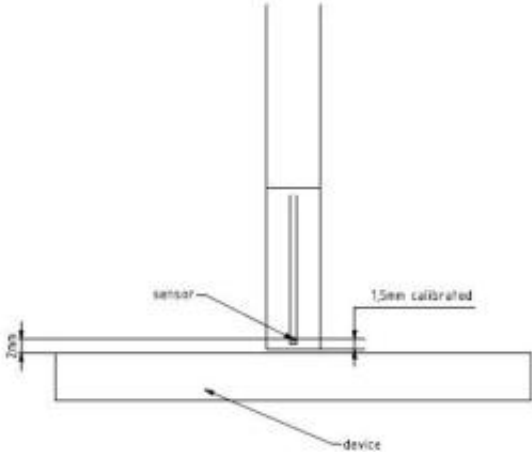
2.6 DASY6 E-Field Probe & EUmmWV Probe

The SAR measurement is conducted with the diametric probe manufactured by SPEAG. The probe is specially designed and calibrated for use in liquid with high permittivity. The diametric probe has special calibration in liquid at different frequency.

SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEC/IEEE 62209-1528, etc.) under ISO 17025. The calibration data are in Appendix D.

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	4 MHz to 10 GHz Linearity: ± 0.2 dB (30 MHz to 10 GHz)
Directivity	±0.1 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Calibration	ISO/IEC 17025 calibration service available
 	
EX3DV4 E-Field ProbeProbe setup on robot	

The EUmmWV3 probe is based on the pseudo-vector probe design, which not only measures the field magnitude but also derives its polarization ellipse. This probe concept also has the advantage that the sensor angle errors or distortions of the field by the substrate can be largely nullified by calibration. This is particularly important as, at these very high frequencies, field distortions by the substrate are dependent on the wavelength. It has two dipoles optimally arranged to obtain pseudo-vector information. It has minimum 3 measurements/point, 120° rotated around probe axis. Sensors (0.8 mm length) printed on glass substrate protected by high density foam. Low perturbation of the measured field. Requires positioner which can do accurate probe rotation.

Frequency Range	750 MHz - 110 GHz
Dynamic Range	< 20 V/m - 10'000 V/m with PRE-10 (min < 50 V/m - 3000 V/m)
Position Precision	< 0.2 mm
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: encapsulation 8 mm (internal sensor < 1mm) Distance from probe tip to dipole centers: < 2 mm Sensor displacement to probe's calibration point: < 0.3 mm
Applications	Electric field measurements of 5G devices and other mm-wave transmitters operating above 10 GHz in <2 mm distance from device (free-space) Power density, magnetic field, and far-field analysis using total field reconstruction (cDASY6 5G or ICEy-mmW module required)
compatibility	cDASY6 + 5G-Module SW1.0 and higher
	
E-Field mm-Wave Probe	Sensor to DUT Surface

2.7 Boundary Detection Unit and Probe Mounting Device

The DASY probes use a precise connector and an additional holder for the probe, consisting of a plastic tube and a flexible silicon ring to center the probe. The connector at the DAE is flexibly mounted and held in the default position with magnets and springs. Two switching systems in the connector mount detect frontal and lateral probe collisions and trigger the necessary software response.

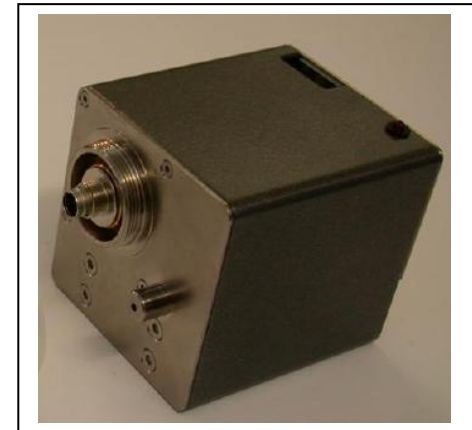


2.8 DATA Acquisition Electronics (DAE) and Measurement Server

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit.

Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE4 is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.



The DASY6 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV Celeron, 128MB chipdisk and 128MB RAM. The necessary circuits for communication with the DAE electronics box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY6 I/O board, which is directly connected to the PC/104 bus of the CPU board



2.9 Robot

The DASY6 system uses the high precision robots TX60 XL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASY6 system, the CS8C robot controller version from Stäubli is used. The XL robot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller



2.10 Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.

The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.



2.11 Device Holder

The DASY6 device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR).

Thus the device needs no repositioning when changing the angles.

The DASY6 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon_r = 3$ and loss tangent $\delta = 0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.



The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

The DASY6 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon_r = 3$ and loss tangent $\delta = 0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.



2.12 SAM Phantom

SAM Twin Phantom

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas:

- Left head
- Right head
- Flat phantom

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.



ELI Phantom

The SAM phantom is a fiberglass shell phantom with 2mm shell thickness. It has one measurement areas:

- ELI phantom

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.



3 TISSUE SIMULATING LIQUID

3.1 The composition of the tissue simulating liquid

Simulate 10MHz~10000MHz liquid, manufactured by SPEAG

Table F.1 – Suggested recipes for achieving target dielectric properties, 30 MHz to 900 MHz

Frequency (MHz)	30	50		144		450		835	900	
Recipe source number	3	3	2	2	3	2	4	2	2	4
Ingredients (% by weight)										
De-ionized water	48,30	48,30	53,53	55,12	48,30	48,53	56	50,36	50,31	56
Tween 20			44,70	43,31		49,51		48,39	48,34	
Oxidized mineral oil							44			44
Diethyleneglycol monoethylether										
Triton X-100										
Diacetin	50,00	50,00			50,00					
DGBE										
NaCl	1,60	1,60	1,77	1,57	1,60	1,96		1,25	1,35	
Additives and salt	0,10	0,10			0,10					
Measured temperature dependence										
Temp. (°C)			21	21		21	20	21	21	20
$\epsilon_{\text{liquid temp. unc.}}$ (%)	0,8	0,1			0,1	0,1		0,04	0,04	
$\sigma_{\text{liquid temp. unc.}}$ (%)	2,8	2,8			2,6	4,2		1,6	1,6	

Table F.2 – Suggested recipes for achieving target dielectric properties, 1 800 MHz to 10 000 MHz

Frequency (MHz)	1 800		2 450	4 000	5 000	5 200	5 800	6 000	8 000	10 000
Recipe source number	2	4	4	4	4	1	1	4	5	5
Ingredients (% by weight)										
De-ionized water	54,23	56	56	56	56	65,53	65,53	56	67,8	66,0
Tween	45,27								31,1	33,0
Oxidized mineral oil		44	44	44	44			44		
Diethyleneglycol monoethylether						17,24	17,24			
Triton X-100						17,24	17,24			
Diacetin										
DGBE										
NaCl	0,50									
Additives and salt										
Measured temperature dependence										
Temp. (°C)	21	20	20	20	20	22	22	20	20	20
$\epsilon_{\text{liquid temp. unc.}}$ (%)	0,4					1,7	1,8			
$\sigma_{\text{liquid temp. unc.}}$ (%)	2,3					2,7	2,6			

NOTE 1 Multiple columns under a single frequency indicate optional recipes.

NOTE 2 Recipe source numbers: 1 verified by different labs, 2 Reference [59], 3 developed by IT'IS Foundation, 4 developed by IT'IS Foundation, 5 Reference [60].

NOTE 3 The values of $\epsilon_{\text{liquid temp. unc.}}$ and $\sigma_{\text{liquid temp. unc.}}$ are liquid temperature uncertainties described in O.9.6, based on measurements of the applicable liquid recipes given above. These are not part of the original publications but have been subsequently developed by the project team.

NOTE 4 The recipes at 8 000 MHz and 10 000 MHz are sufficiently broadband that they cover the frequency range of 6 000 MHz to 10 000 MHz within a tolerance of ± 10 % for permittivity and conductivity.

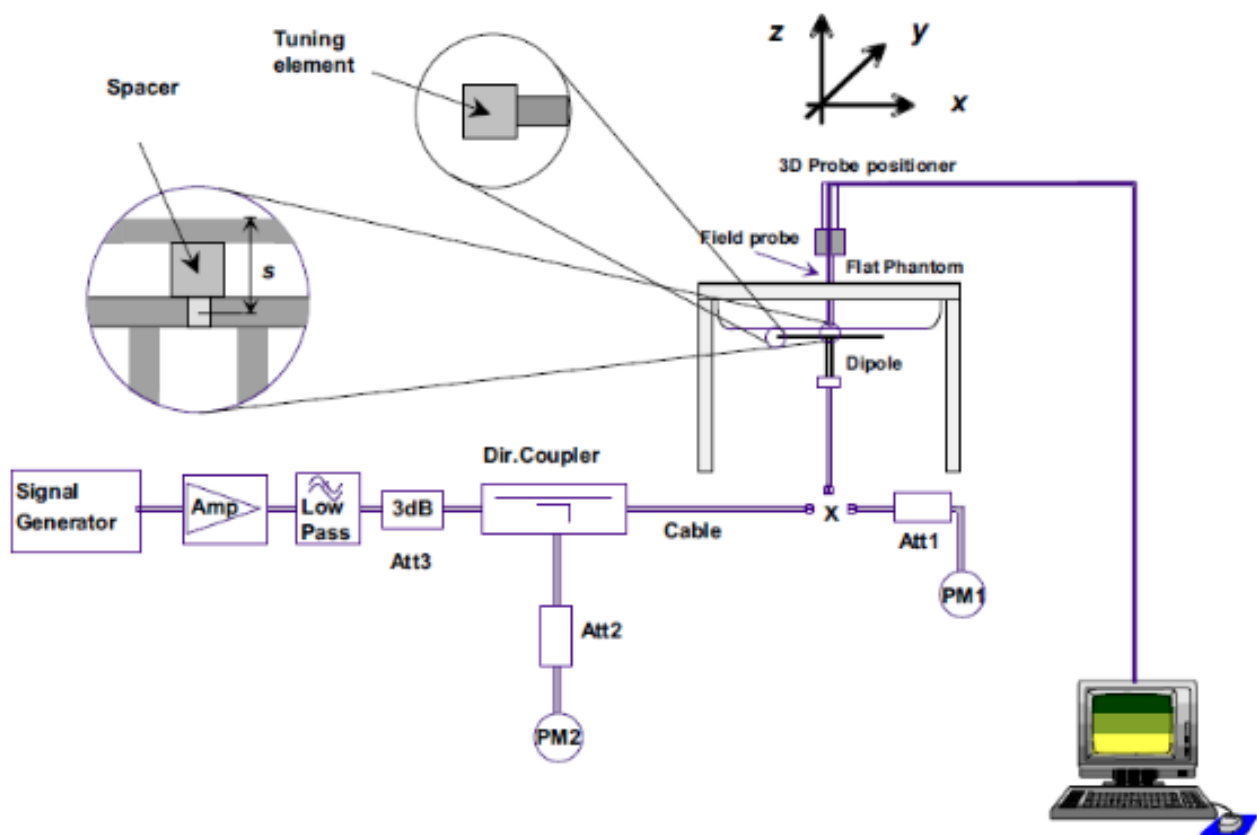
3.2 Measurement for Tissue Simulate Liquid

The dielectric properties for this Tissue Simulate Liquids were measured by using the Agilent E5071C Network Analyzer (600 KHz-10000 MHz). The Conductivity (σ) and Permittivity (ρ) are listed in below table. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was 22 ± 2 °C.

Tissue Type	Measured Frequency (MHz)	Target Tissue ($\pm 5\%$)		Measured Tissue		Liquid Temp.(°C)	Measured Date
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)		
13 Head	13.56	55.0 (52.25~57.75)	0.75 (0.71~0.78)	52.31	0.73	22.00	2025.07.09
750 Head	750	41.9 (39.81~44)	0.89 (0.85~0.94)	40.79	0.91	22.00	2025.07.10
835 Head	835	41.5 (39.43~43.58)	0.90 (0.86~0.95)	41.10	0.94	22.00	2025.07.12
1800 Head	1900	40.0 (38.00~42.00)	1.40 (1.33~1.47)	40.01	1.40	22.00	2025.07.14
1900 Head	1900	40.0 (38.00~42.00)	1.40 (1.33~1.47)	40.01	1.46	22.00	2025.07.17
2450 Head	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	39.08	1.85	22.00	2025.07.21
2600 Head	2600	39.0 (37.05~40.95)	1.96 (1.86~2.06)	39.08	1.98	22.00	2025.07.23
5250 Head	5250	35.9 (34.11~37.70)	4.71 (4.47~4.95)	35.83	4.75	22.00	2025.07.25
5600 Head	5600	35.5 (33.73~37.28)	5.07 (4.82~5.32)	35.18	5.17	22.00	2025.07.26
5750 Head	5750	35.4 (33.63~37.17)	5.22 (4.96~5.48)	34.88	5.35	22.00	2025.07.27
6500 Head	6500	34.5 (32.78~36.23)	6.07 (5.77~6.37)	34.13	6.06	22.00	2025.07.28

4 SYSTEM CHECK

The microwave circuit arrangement for system Check is sketched in F-12. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within $\pm 10\%$ from the target SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the following table (A power level of 250mW (below 3GHz) or 100mW (3-6GHz) was input to the dipole antenna). During the tests, the ambient temperature of the laboratory was in the range $22\pm 2^\circ\text{C}$, the relative humidity was in the range 60% and the liquid depth above the ear reference points was above $15\pm 0.5\text{ cm}$ in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.



F-1. The microwave circuit arrangement used for SAR system check

4.1 Justification for Extended Dipole Calibrations

1) Referring to KDB865664 D01 requirements for dipole calibration, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.

- a) There is no physical damage on the dipole;
- b) System check with specific dipole is within 10% of calibrated value;
- c) Return-loss is within 10% of calibrated measurement;
- d) Impedance is within 5Ω from the previous measurement.

2) Network analyser probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

4.2 Measurement for System Check

Validation Kit		Measured SAR 250mW		Measured SAR 1W		Normalized to 1W Target (±10%)		Liquid Temp. (°C)	Measured Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)		
CLA13	Head	0.13	0.09	0.52	0.35	0.537 (0.483~0.591)	0.333 (0.300~0.366)	22.00	2025.07.09
D750V3	Head	2.21	1.47	8.84	5.88	8.41 (7.57~9.25)	5.50 (4.95~6.05)	22.00	2025.07.10
D835V2	Head	2.35	1.68	9.40	6.72	9.56 (8.60~10.52)	6.36 (5.72~7.00)	22.00	2025.07.12
D1800V2	Head	9.87	5.22	39.48	20.88	38.80 (34.92~42.68)	20.60 (18.54~22.66)	22.00	2025.07.14
D1900V2	Head	9.73	5.11	38.92	20.44	39.50 (35.55~43.45)	20.70 (18.63~22.77)	22.00	2025.07.17
D2450V2	Head	13.00	6.08	52.00	24.32	52.80 (47.52~58.08)	24.60 (22.14~27.06)	22.00	2025.07.21
D2600V2	Head	14.10	6.32	56.40	25.28	55.50 (49.95~61.05)	24.90 (22.41~27.39)	22.00	2025.07.23
Validation Kit		Measured SAR 100mW		Measured SAR 1W		Normalized to 1W Target (±10%)		Liquid Temp.(°C)	Measured Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)		
D5GHzV2 5.25GHz	Head	8.21	2.21	82.10	22.10	77.60 (69.84~85.36)	21.60 (19.44~23.76)	22.00	2025.07.25
D5GHzV2 5.6GHz	Head	8.52	2.46	85.20	24.60	81.30 (73.17~89.43)	22.60 (20.34~24.86)	22.00	2025.07.26
D5GHzV2 5.75GHz	Head	7.82	2.26	78.20	22.60	77.40 (69.66~85.14)	21.30 (19.17~23.43)	22.00	2025.07.27
D6500V2	Head	27.90	5.40	279.00	54.00	293.0 (263.7~322.3)	54.10 (48.69~59.51)	22.00	2025.07.28

Validation Kit		Measured Max E-field 93.3 mW	Measured Power Density 93.3 mW	Measured Power Density 93.3 mW	Max E-field	Target Power Density	Target Power Density	Measured Date
		(V/m)	1cm ² Total PD (W/m ²)	4cm ² Total PD (W/m ²)	(V/m)	1cm ² Total PD (W/m ²)	4cm ² Total PD (W/m ²)	
5G Verification Source 10 GHz		150.00	60.60	53.40	152 (136.8~167.2)	60.4 (54.36~66.44)	56.1 (50.49~61.71)	2025.07.29

5 TEST CONFIGURATION

5.1 SAR Test Reduction Procedure

According to KDB 941225D01, in the following procedures, the mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode. This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as “otherwise” in the applicable procedures; SAR measurement is required for the secondary mode.

5.2 Operation Configurations

5.2.1. GSM Test Configuration

SAR tests for GSM 850 and GSM 1900, a communication link is set up with a base station by air link. Using CMW500 the power lever is set to “5” and “0” in SAR of GSM 850 and GSM 1900. The tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5. The EGPRS class is 12 for this EUT, it has at most 4 timeslots in uplink, and at most 4 timeslots in downlink, the maximum total timeslot is 5.

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

When SAR tests for EGPRS mode is necessary, GMSK modulation should be used to minimize SAR measurement error due to higher peak-to-average power (PAR) ratios inherent in 8-PSK.

The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode

5.2.2. WCDMA Test Configuration

1) . Output Power Verification

Maximum output power is verified on the high, middle and low channels according to procedures described in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all "1's" for WCDMA/HSDPA or by applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA) are required in the SAR report. All configurations that are not supported by the handset or cannot be measured due to technical or equipment limitations must be clearly identified.

2) . Head SAR

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest reported SAR configuration in 12.2 kbps RMC for head exposure

3) . Body SAR

SAR for body configurations is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreading code or DPDCHn, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When more than 2 DPDCHn are supported by the handset, it may be necessary to configure additional DPDCHn using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC.

4) . HSDPA / HSUPA / DC-HSDPA

According to KDB 941225 D01v03, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is $\leq \frac{1}{4}$ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA

a) HSDPA

HSDPA is configured according to the applicable UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms and a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors (β_c , β_d), and HS-DPCCH power offset parameters (Δ_{ACK} , Δ_{NACK} , Δ_{CQI}) are set according to values indicated in the following table. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Sub-test	β_c	Bd	β_d (SF)	β_c/β_d	β_{hs}	CM(dB)	MPR (dB)
1	2/15	15/15	64	2/15	4/15	0.0	0
2	12/15(3)	15/15(3)	64	12/15(3)	24/15	1.0	0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 8$ Ahs = $\beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$

Note2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector

Magnitude(EVM) with HS-DPCCH test in clause 5.13.1.A, and HSDPA EVM with phase

discontinuity in clause 5.13.1AA, Δ_{ACK} and $\Delta_{NACK} = 8$ (Ahs=30/15) with $\beta_{hs} = 30/15 * \beta_c$, and $\Delta_{CQI} =$

7 (Ahs=24/15) with $\beta_{hs} = 24/15 * \beta_c$.

Note3: CM=1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

The measurements were performed with a Fixed Reference Channel (FRC) and H-Set 1 QPSK.

Parameter	Value
Nominal average inf. bit rate	534 kbit/s
Inter-TTI Distance	3 TTI"s
Number of HARQ Processes	2 Processes
Information Bit Payload	3202 Bits
MAC-d PDU size	336 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	4800 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	9600 SMLs
Coding Rate	0.67
Number of Physical Channel Codes	5

settings of required H-Set 1 QPSK acc. to 3GPP 34.121

HS-DSCH Category	Maximum HS-DSCH Codes Received	Minimum Inter-TTI Interval	Maximum H S-DSCH Transport Block Bits/HS-DSCH TTI	Total Soft Channel Bits
1	5	3	7298	19200
2	5	3	7298	28800
3	5	2	7298	28800
4	5	2	7298	38400
5	5	1	7298	57600
6	5	1	7298	67200
7	10	1	14411	115200
8	10	1	14411	134400
9	15	1	25251	172800
10	15	1	27952	172800
11	5	2	3630	14400
12	5	1	3630	28800
13	15	1	34800	259200
14	15	1	42196	259200
15	15	1	23370	345600
16	15	1	27952	345600

HSDPA UE category

b) HSUPA

Due to inner loop power control requirements in HSUPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSUPA should be configured according to the values indicated below as well as other applicable procedures described in the „WCDMA Handset“ and „Release 5 HSUPA Data Device“ sections of 3G device.

Sub-test ^o	β_c ^o	β_d ^o	β_d (SF) ^o	β_o/β_d ^o	β_{hs} (1) ^o	β_{ac} ^o	β_{ad} ^o	β_c (SF) ^o	β_{ad} (code) ^o	CM (2) ^o (dB) ^o	MP R ^o (dB) ^o	AG ⁽⁴⁾ Index ^o	E-TFC I ^o
1 ^o	11/15 ⁽³⁾ ^o	15/15 ⁽³⁾ ^o	64 ^o	11/15 ⁽³⁾ ^o	22/15 ^o	209/225 ^o	1039/225 ^o	4 ^o	1 ^o	1.0 ^o	0.0 ^o	20 ^o	75 ^o
2 ^o	6/15 ^o	15/15 ^o	64 ^o	6/15 ^o	12/15 ^o	12/15 ^o	94/75 ^o	4 ^o	1 ^o	3.0 ^o	2.0 ^o	12 ^o	67 ^o
3 ^o	15/15 ^o	9/15 ^o	64 ^o	15/9 ^o	30/15 ^o	30/15 ^o	$\beta_{ad1}:47/15$ ^o $\beta_{ad2}:47/15$ ^o	4 ^o	2 ^o	2.0 ^o	1.0 ^o	15 ^o	92 ^o
4 ^o	2/15 ^o	15/15 ^o	64 ^o	2/15 ^o	4/15 ^o	2/15 ^o	56/75 ^o	4 ^o	1 ^o	3.0 ^o	2.0 ^o	17 ^o	71 ^o
5 ^o	15/15 ⁽⁴⁾ ^o	15/15 ⁽⁴⁾ ^o	64 ^o	15/15 ⁽⁴⁾ ^o	30/15 ^o	24/15 ^o	134/15 ^o	4 ^o	1 ^o	1.0 ^o	0.0 ^o	21 ^o	81 ^o
Note 1: ΔACK , $\Delta NACK$ and $\Delta CQI=8$ $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$ Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference. Note 3 : For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$ Note 4 : For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$ Note 5 : Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g Note 6: β_{ad} can not be set directly; it is set by Absolute Grant Value.													

Subtests for UMTS Release 6 HSUPA

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCH TTI(ms)	Minimum Spreading Factor	Maximum E-DCH Transport Block Bits	Max Rate (Mbps)
1	1	4	10	4	7110	0.7296
2	2	8	2	4	2798	1.4592
	2	4	10	4	14484	
3	2	4	10	4	14484	1.4592
4	2	8	2	2	5772	2.9185
	2	4	10	2	20000	2.00
5	2	4	10	2	20000	2.00
6 (No DPDCH)	4	8	10	2SF2&2SF	11484	5.76
	4	4	2	4	20000	2.00
7 (No DPDCH)	4	8	2	2SF2&2SF	22996	?
	4	4	10	4	20000	?
NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4. UE categories 1 to 6 support QPSK only. UE category 7 supports QPSK and 16QAM. (TS25.306-7.3.0).						

HSUPA UE category

c) DC-HSDPA

SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a Second serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS 34.108 v9.5.0.

A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

Table E.5.0: Levels for HSDPA connection setup

Parameter During Connection setup	Unit	Value
P-CPICH_Ec/lor	dB	-10
P-CCPCH and SCH_Ec/lor	dB	-12
PICH_Ec/lor	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/lor	dB	-5
OCNS_Ec/lor	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13.

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

The measurements were performed with a Fixed Reference Channel (FRC) H-Set 12 with QPSK.

Parameter	Value
Nominal average inf. bit rate	60 kbit/s
Inter-TTI Distance	1 TTI's
Number of HARQ Processes	6 Processes
Information Bit Payload	120 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	960 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	3200 SMLs
Coding Rate	0.15
Number of Physical Channel Codes	1

settings of required H-Set 12 QPSK acc. to 3GPP 34.121

Note:

1. The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table above.
2. Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.

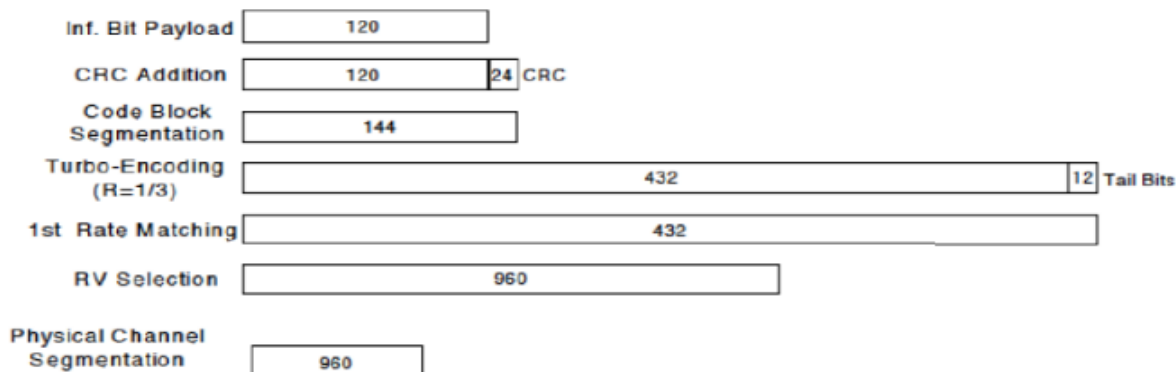


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

The following 4 Sub-tests for HSDPA were completed according to Release 5 procedures. A summary of subtest settings are illustrated below:

Sub-test [Ⓢ]	β_c [Ⓢ]	β_d [Ⓢ]	β_d (SF) [Ⓢ]	β_c/β_d [Ⓢ]	$\beta_{hs}(1)$ [Ⓢ]	CM(dB)(2) [Ⓢ]	MPR (dB) [Ⓢ]
1 [Ⓢ]	2/15 [Ⓢ]	15/15 [Ⓢ]	64 [Ⓢ]	2/15 [Ⓢ]	4/15 [Ⓢ]	0.0 [Ⓢ]	0 [Ⓢ]
2 [Ⓢ]	12/15(3) [Ⓢ]	15/15(3) [Ⓢ]	64 [Ⓢ]	12/15(3) [Ⓢ]	24/15 [Ⓢ]	1.0 [Ⓢ]	0 [Ⓢ]
3 [Ⓢ]	15/15 [Ⓢ]	8/15 [Ⓢ]	64 [Ⓢ]	15/8 [Ⓢ]	30/15 [Ⓢ]	1.5 [Ⓢ]	0.5 [Ⓢ]
4 [Ⓢ]	15/15 [Ⓢ]	4/15 [Ⓢ]	64 [Ⓢ]	15/4 [Ⓢ]	30/15 [Ⓢ]	1.5 [Ⓢ]	0.5 [Ⓢ]
Note1: ΔACK , $\Delta NACK$ and $\Delta CQI=8$ $A_{hs}=\beta_{hs}/\beta_c=30/15$ $\beta_{hs}=30/15 * \beta_c$ Note2: CM=1 for $\beta_c/\beta_d=12/15$, $\beta_{hs}/\beta_c=24/15$. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases. Note3: For subtest2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c=11/15$ and $\beta_d=15/15$							

Up commands are set continuously to set the UE to Max power.

Note:

1. The Dual Carriers transmission only applies to HSDPA physical channels
2. The Dual Carriers belong to the same Node and are on adjacent carriers.
3. The Dual Carriers do not support MIMO to serve UEs configured for dual cell operation
4. The Dual Carriers operate in the same frequency band.
5. The device doesn't support the modulation of 16QAM in uplink but 64QAM in downlink for DC-HSDPA mode.
6. The device doesn't support carrier aggregation for it just can operate in Release 8.

d) HSPA+

Per KDB941225D01, SAR is required for Rel. 7 HSPA+ when SAR is required for Rel. 6 HSPA; otherwise, the 3G SAR test reduction procedure is applied to (uplink) HSPA+ with 12.2 kbps RMC as the primary mode. Power is measured for HSPA+ that supports uplink 16 QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.

■ Table C.11.1.4: β values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM[Ⓢ]

Sub-test [Ⓢ]	β_c [Ⓢ] (Note3) [Ⓢ]	β_d [Ⓢ]	β_{hs} [Ⓢ] (Note1) [Ⓢ]	β_{ed} [Ⓢ]	β_{ed2} [Ⓢ] (2xSF2) [Ⓢ] (Note 4) [Ⓢ]	β_{ed4} [Ⓢ] (2xSF4) [Ⓢ] (Note 4) [Ⓢ]	CM [Ⓢ] (dB) [Ⓢ] (Note 2) [Ⓢ]	MPR [Ⓢ] (dB) [Ⓢ] (Note 2) [Ⓢ]	AG [Ⓢ] Index [Ⓢ] (Note 4) [Ⓢ]	E-TFCI [Ⓢ] (Note 5) [Ⓢ]	E-TFCI [Ⓢ] (boost) [Ⓢ]
1 [Ⓢ]	1 [Ⓢ]	0 [Ⓢ]	30/15 [Ⓢ]	30/15 [Ⓢ]	β_{ed1} : 30/15 [Ⓢ] β_{ed2} : 30/15 [Ⓢ]	β_{ed3} : 24/15 [Ⓢ] β_{ed4} : 24/15 [Ⓢ]	3.5 [Ⓢ]	2.5 [Ⓢ]	14 [Ⓢ]	105 [Ⓢ]	105 [Ⓢ]
Note 1: ΔACK , $\Delta NACK$ and $\Delta CQI = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$ Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0). Note 3: DPDCH is not configured, therefore the β_c is set to 1 and $\beta_d = 0$ by default. Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value. Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.											

5.2.3. LTE Test Configuration

LTE modes were tested according to FCC KDB 941225 D05 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The Anritsu MT8821C was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

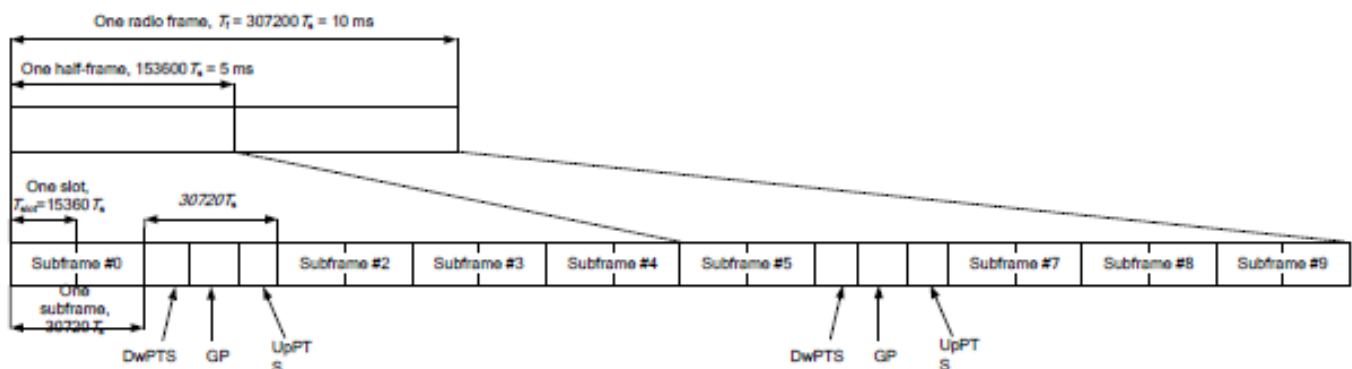
TDD LTE test consideration

For Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.

SAR was tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special subframe configuration 7.

LTE TDD Band support 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations and Table 4.2-1 for Special subframe configurations.

Frame structure type 2:



Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	6592.Ts	2192.Ts	2560.Ts	7680.Ts	2192.Ts	2560.Ts
1	19760.Ts			20480.Ts		
2	21952.Ts			23040.Ts		
3	24144.Ts			25600.Ts		
4	26336.Ts	4384.Ts	5120.Ts	7680.Ts	4384.Ts	5120.Ts
5	6592.Ts			20480.Ts		
6	19760.Ts			23040.Ts		
7	21952.Ts			25600.Ts		
8	24144.Ts			-	-	-
9	13168.Ts			-	-	-

Uplink-downlink configurations.

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

Calculated Duty Cycle=[Extended cyclic prefix in uplink x (Ts) x # of S + # of U]/10ms

Uplink-Downlink Configuration	Downlink-to-Uplink Switch-point Periodicity	Subframe Number										Calculated Duty Cycle (%)
		0	1	2	3	4	5	6	7	8	9	
0	5 ms	D	S	U	U	U	D	S	U	U	U	63.33
1	5 ms	D	S	U	U	D	D	S	U	U	D	43.33
2	5 ms	D	S	U	D	D	D	S	U	D	D	23.33
3	10 ms	D	S	U	U	U	D	D	D	D	D	31.67
4	10 ms	D	S	U	U	D	D	D	D	D	D	21.67
5	10 ms	D	S	U	D	D	D	D	D	D	D	11.67
6	5 ms	D	S	U	U	U	D	S	U	U	D	53.33

A) Spectrum Plots for RB Configurations

A properly configured base station simulator was used for SAR tests and power measurements. Therefore, spectrum plots for RB configurations were not required to be included in this report.

B) MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3

Modulation	Channel bandwidth / Transmission bandwidth (N _{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

C) A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

D) Largest channel bandwidth standalone SAR test requirements

1) QPSK with 1 RB allocation

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle

and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

2) QPSK with 50% RB allocation

The procedures required for 1 RB allocation in 1) are applied to measure the SAR for QPSK with 50% RB allocation.

3) QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in 1) and 2) are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

4) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is $> \frac{1}{2}$ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

E) Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is $> \frac{1}{2}$ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

LTE Downlink CA consideration

The device supports the carrier aggregation in the downlink. Uplink maximum output power is measured with downlink carrier aggregation active only for the channel with highest measured maximum output power when downlink carrier aggregation is inactive, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up tolerance limits and not more than % dB higher than the maximum output power measured when downlink carrier aggregation inactive. The downlink channels selected to perform the uplink power measurement must satisfy 3GPP channel spacing (5.4.1A of 3GPP TS 36.521 or equivalent) and channel bandwidth (5.4.2A) requirements. The nominal channel spacing is determined by $[BW1 + BW2 - 0.1 \cdot |BW1 - BW2|]$ MHz where BW1 and BW2 are the channel bandwidths of the CC in a 2-CC aggregation configuration. The downlink PCC channel should be paired with the uplink channel according to normal configurations, as if there is no carrier aggregation. The downlink SCC should be adjacent to the PCC and remain within the downlink transmission band for contiguous intra-band CA. For non-contiguous intra-band CA, the SCC should be selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band. For inter-band CA, the SCC should be near the middle of its transmission band. When downlink carrier aggregation is active uplink maximum output power remain within the specified tune-up tolerance limits and not more than $\frac{1}{4}$ dB higher than the maximum output power measured when downlink carrier aggregation inactive, so SAR evaluation is not required for downlink carrier aggregation.

LTE intra-band UL CA(contiguous)

The device supports LTE intra-band contiguous UL CA. The maximum output power is measured for each UL Configuration for the required test channels. UL PCC configuration is determined by the required test channel. SCC and subsequent CCs are added alternatively to either side of the PCC or within the transmission band for channels at the ends of frequency band. SAR for UL CA is required in highest standalone head/body test position and frequency band combination. Since the maximum output for UL CA is < standalone LTE mode (without CA), PCC is configured according to the highest standalone SAR configuration tested, SCC and subsequent CCs are configured according to procedures used for power measurement and parameters (BW, RB etc.) similar to that used for the PCC.

5.2.4. NR Test Configuration

SAR tests for NR bands and LTE anchor bands were performed separately due to limitations in SAR probe calibration factor. Due to test setup limitation, SAR testing for NR was performed using factory test mode software to establish the connection.

5G NR Power/SAR procedure is similar with KDB 941225 D05.

- A)** For power measurement reduction of DFT-s-OFDM and CP-OFDM, CP-OFDM will not higher than DFT-OFDM based on 3GPP MPR table, so CP-OFDM QPSK power measurement is spot check for 1RB allocation/1 RB offset configuration to ensure the output power will not $\frac{1}{2}$ dB higher than $P_{i/2}$ BPSK and QPSK.
- B)** For power measurement reduction Of DFT-S-OFDM, 16QAM/64QAM/256QAM will not higher than $P_{i/2}$ BPSK and QPSK based on 3GPP MPR table, so $P_{i/2}$ BPSK and QPSK are measured fully, and 16QAM is spot check 1RB allocation/1 RB offset configuration to ensure the output power will not % dB higher than $P_{i/2}$ BPSK and QPSK. Smaller bandwidth output power will also follow the largest bandwidth to ensure output power will not $\frac{1}{2}$ dB higher than largest supported bandwidth.
- C)** SAR testing start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
- D)** 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
- E)** QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
- F)** 16QAM/64QAM/256QAM output powers according to 3GPP MPR will not $\frac{1}{2}$ dB higher than the same configuration in QPSK, also reported SAR for the QPSK configurations than 1.45W/kg, 16QAM/64QAM/256QAM SAR testing are not required.
- G)** Smaller bandwidth output power for each RB allocation configuration for this device will not $\frac{1}{2}$ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg, smaller bandwidth SAR testing is not required for this device.

5.2.5. Wi-Fi Test Configuration

DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures. The initial test position procedure is described in the following:

- 1) . When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).
- 2) . When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest extrapolated or estimated 1-g SAR conditions determined by area scans or next closest/smallest test separation distance and maximum RF coupling test positions based on manufacturer justification, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions (left, right, touch, tilt or subsequent surfaces and edges) are tested.
- 3) . For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested. a) Additional power measurements may be required for this step, which should be limited to those necessary for identifying the subsequent highest output power channels.

Initial Test Configuration Procedures

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required. SAR test reduction for subsequent highest output test channels is determined according to *reported* SAR of the initial test configuration.

For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration. When the *reported* SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until *reported* SAR is ≤ 1.2 W/kg or all required channels are tested.

Subsequent Test Configuration Procedures

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. The initial test position procedure is applied to next to the ear, UMPC mini-tablet and hotspot mode configurations. When the same maximum output power is specified for multiple transmission modes, additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. The subsequent test configuration and SAR measurement procedures are described in the following.

- 1) . When SAR test exclusion provisions of KDB Publication 447498 are applicable and SAR measurement is not required for the initial test configuration, SAR is also not required for the next highest maximum output power transmission mode subsequent test configuration(s) in that frequency band or aggregated band and

exposure configuration.

- 2) . When the highest *reported* SAR for the initial test configuration (when applicable, include subsequent highest output channels), according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.
- 3) . The number of channels in the initial test configuration and subsequent test configuration can be different due to differences in channel bandwidth. When SAR measurement is required for a subsequent test configuration and the channel bandwidth is smaller than that in the initial test configuration, all channels in the subsequent test configuration that overlap with the larger bandwidth channel tested in the initial test configuration should be used to determine the highest maximum output power channel. This step requires additional power measurement to identify the highest maximum output power channel in the subsequent test configuration to determine SAR test reduction.
 - a) SAR should first be measured for the channel with highest measured output power in the subsequent test configuration.
 - b) SAR for subsequent highest measured maximum output power channels in the subsequent test configuration is required only when the *reported* SAR of the preceding higher maximum output power channel(s) in the subsequent test configuration is > 1.2 W/kg or until all required channels are tested. i) For channels with the same measured maximum output power, SAR should be measured using the channel closest to the center frequency of the larger channel bandwidth channel in the initial test configuration.
- 4) . SAR measurements for the remaining highest specified maximum output power OFDM transmission mode configurations that have not been tested in the initial test configuration (highest maximum output) or subsequent test configuration(s) (subsequent next highest maximum output power) is determined by recursively applying the subsequent test configuration procedures in this section to the remaining configurations according to the following:
 - a) replace “subsequent test configuration” with “next subsequent test configuration” (i.e., subsequent next highest specified maximum output power configuration)
 - b) replace “initial test configuration” with “all tested higher output power configurations”

2.4 GHz WiFi SAR Procedures

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions. When SAR measurement is required for an OFDM configuration, the initial test configuration, subsequent test configuration and initial test position procedures are applied. The SAR test exclusion requirements for 802.11g/n OFDM configurations are described in following.

• 802.11b DSSS SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

- 1) . When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
- 2) . When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

• 2.4 GHz 802.11g/n OFDM&OFDMA SAR Test Exclusion Requirements

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3, including sub-sections). SAR is not required for the following 2.4 GHz OFDM conditions.

- 1) . When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
- 2) . When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum

output power and the adjusted SAR is ≤ 1.2 W/kg.

- **SAR Test Requirements for OFDM&OFDMA configurations**

When SAR measurement is required for 802.11 g/n OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

5 GHz WiFi SAR Procedures

- **U-NII-1 and U-NII-2A Bands**

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following :

- 1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.
- 2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.
- 3) The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

- **U-NII-2C and U-NII-3 Bands**

The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. when Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement procedures.

When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe

calibration frequency points requirements.

- **OFDM&OFDMA Transmission Mode SAR Test Configuration and Channel Selection Requirements**

The initial test configuration for 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

- 1) The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.
- 2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
- 3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.
- 4) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n. After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.
 - a) The channel closest to mid-band frequency is selected for SAR measurement.
 - b) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

- **SAR Test Requirements for OFDM&OFDMA configurations**

When SAR measurement is required for 802.11 a/n/ac OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. When the same transmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction applies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 band are supported, the highest maximum output power transmission mode configuration and maximum output power channel across the bands must be used to determine SAR test reduction, according to the initial test configuration and subsequent test configuration requirements. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

6 GHz WiFi SAR Procedures

Initial Test Configuration: An initial test configuration is determined for OFDMA transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. When the reported SAR of the initial test configuration is $> 0.8 \text{ W/kg}$, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the reported SAR is $\leq 1.2 \text{ W/kg}$ or all required channels are tested. Since the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is $\leq 1.2 \text{ W/kg}$, SAR is not required for subsequent test configuration.

- **Power Density Test Requirements**

Per October 2020 & April 2021 TCB Workshop interim procedures and FCC guidance, start instead with a minimum of 5 test channels across the fullband, then adapt and apply conducted power and SAR test reduction procedures of KDB Pub.248227 v02r02. WLAN 6GHz SAR is measured by using 6-7GHz parameters per IEC/IEEE 62209-1528:2020 and report also estimated absorbed PD (for reference purposes only, not specifically for compliance). For the highest SAR test configurations also measure incident PD (total) using mmW near-field probe and total-field/power-density reconstruction method.

- 1) Per equipment manufacturer guidance, power density was measured at $d=2\text{mm}$ with the grid step (0.0625λ) for determining compliance at $d=2\text{mm}$.
- 2) According to October 2020 TCB Workshop Interim procedures power density results were scaled according to IEC 62479:2010 for the portion of the measurement uncertainty $> 30\%$. Total expanded uncertainty of 2.68 dB (85%) was used to determine the psPD measurement scaling factor.
- 3) Per FCC guidance, for simultaneous transmission evaluation, using SAR sum and SPLSR for simultaneous transmit exclusion analyses and evaluations

6 DESCRIPTION OF TEST POSITION

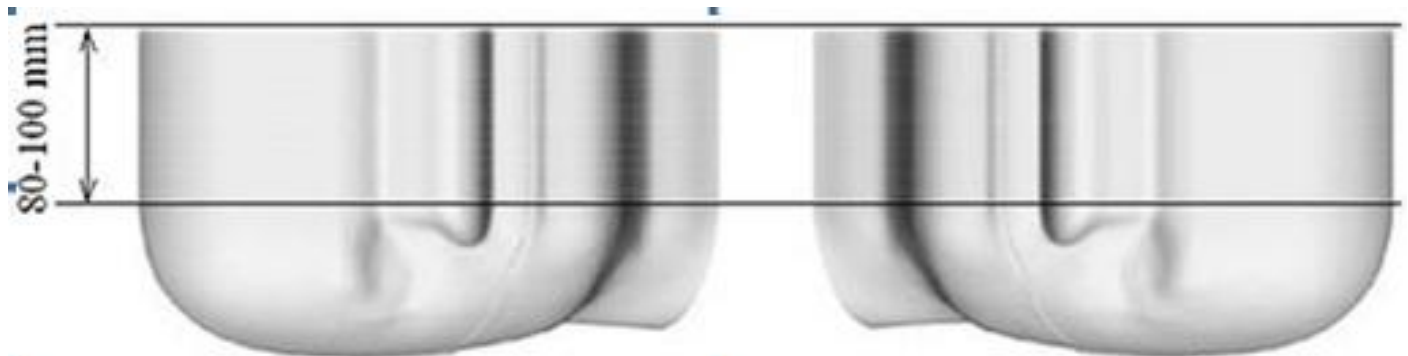
6.1 SAR Test Reduction Procedure

6.1.1. Head Test Position Conditions

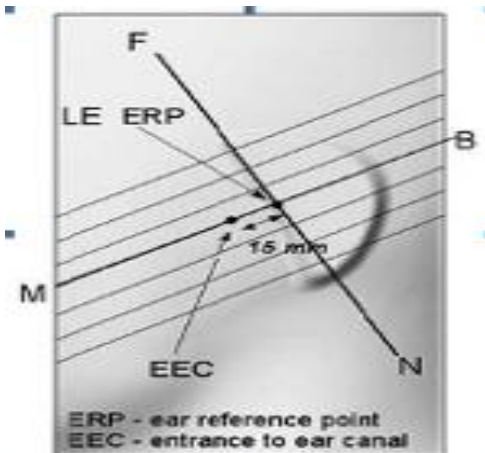


Front, back, and side views of SAM (model for the phantom shell). Full-head model is for illustration purposes only—procedures in this recommended practice are intended primarily for the phantom setup.

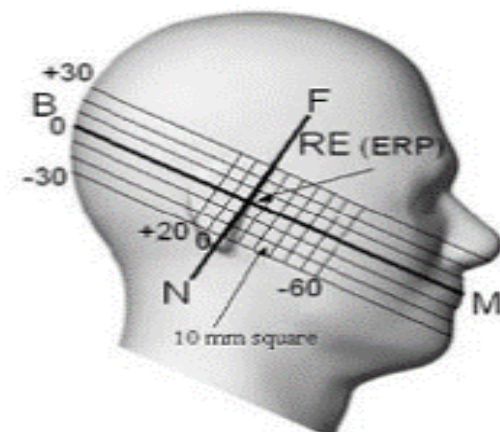
Note: The centre strip including the nose region has a different thickness tolerance.



Sagittally bisected phantom with extended perimeter (shown placed on its side as used for SAR measurements)



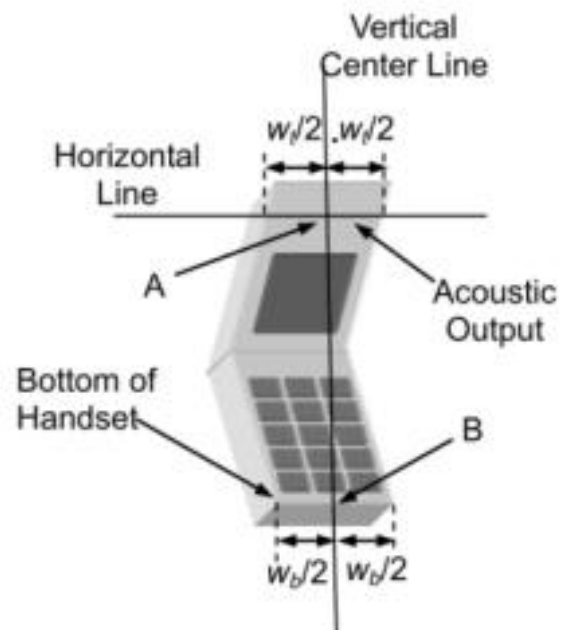
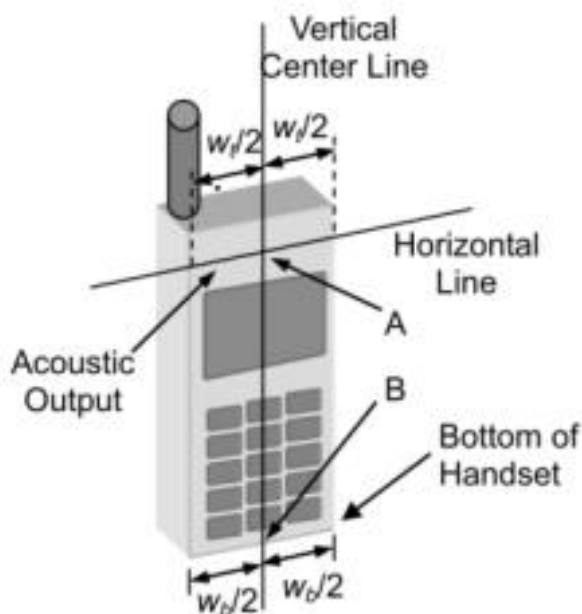
Close-up side view of phantom, showing the ear region, N-F and B-M lines, and seven cross-sectional plane locations



Side view of the phantom showing relevant markings and seven cross-sectional plane locations

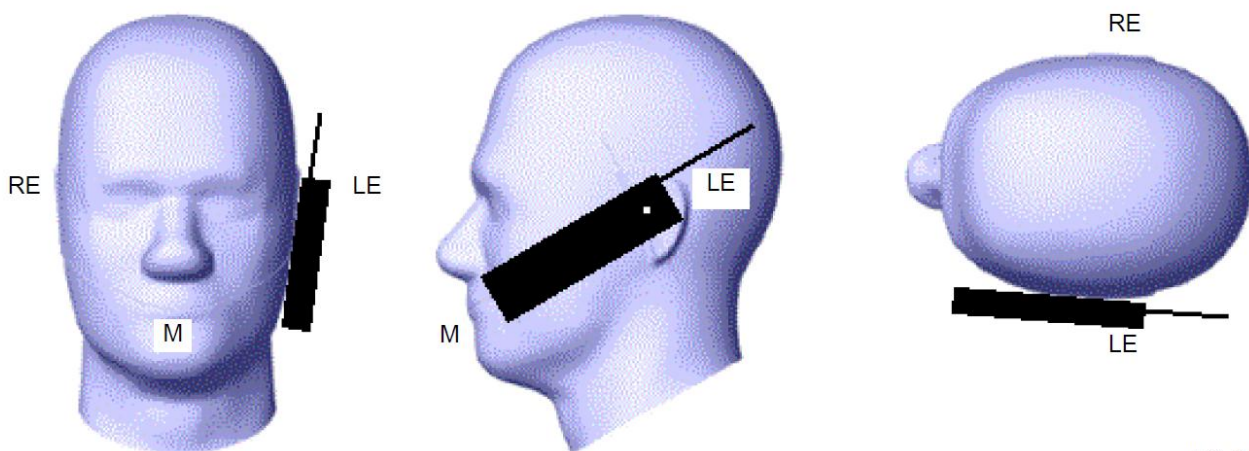
EUT constructions

- (a) The vertical center line passes through two points on the front side of the handset - the midpoint of the width w_t of the handset at the level of the acoustic output, and the midpoint of the width w_b of the bottom of the handset.
- (b) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.
- (c) The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical center line is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.



Cheek Position

- To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.
- To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost.



IEC 226/05

Tilted Position

- To position the device in the “cheek” position described above.
- While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost.

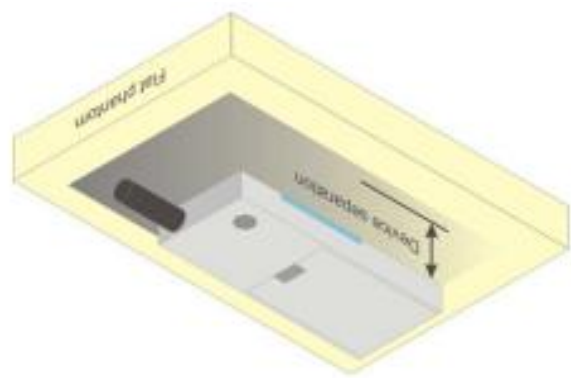
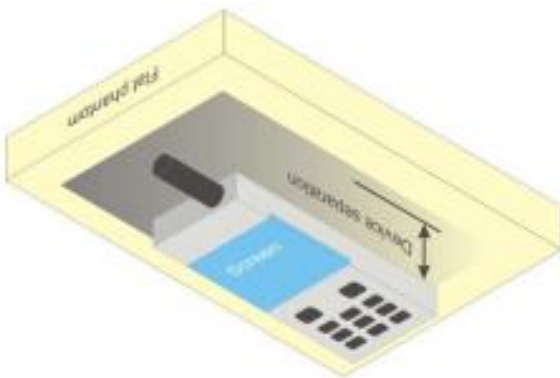


6.1.2. Body-worn Test Position Conditions

Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in KDB 447498 are used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode. When the reported SAR for a body-worn accessory.

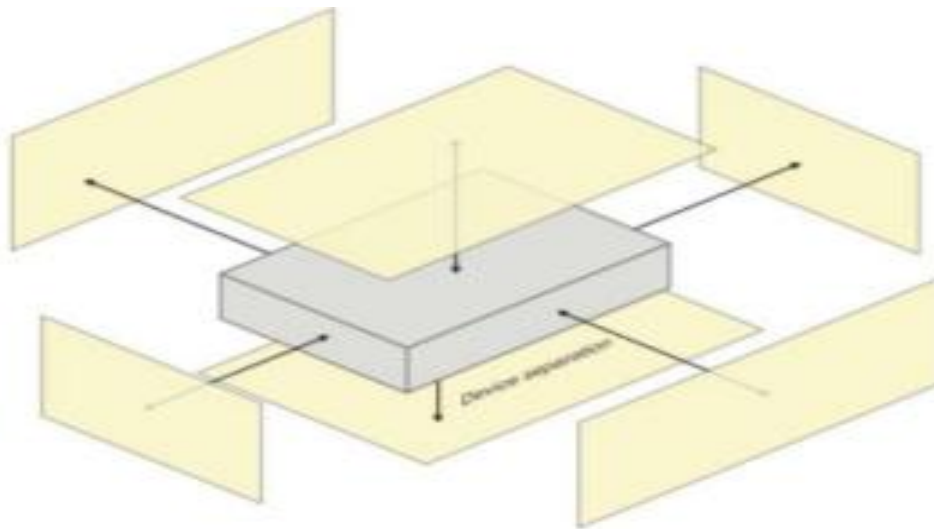
Body-worn accessories that do not contain metallic or conductive components may be tested according to worst-case exposure configurations, typically according to the smallest test separation distance required for the group of body-worn accessories with similar operating and exposure characteristics. All body-worn accessories containing metallic components are tested in conjunction with the host device.

Body-worn accessory SAR compliance is based on a single minimum test separation distance for all wireless and operating modes applicable to each body-worn accessory used by the host, and according to the relevant voice and/or data mode transmissions and operations. If a body-worn accessory supports voice only operations in its normal and expected use conditions, testing of data mode for body-worn compliance is not required. A conservative minimum test separation distance for supporting off-the-shelf body-worn accessories that may be acquired by users of consumer handsets is used to test for body-worn accessory SAR compliance. This distance is determined by the handset manufacturer, according to the requirements of Supplement C 01-01. Devices that are designed to operate on the body of users using lanyards and straps, or without requiring additional body-worn accessories, will be tested using a conservative minimum test separation distance ≤ 5 mm to support compliance.



6.1.3. Hotspot Mode Test Position Conditions

For handsets that support hotspot mode operations, with wireless router capabilities and various web browsing functions, the relevant hand and body exposure conditions are tested according to the hotspot SAR procedures in KDB 941225. A test separation distance of 10 mm is required between the phantom and all surfaces and edges with a transmitting antenna located within 25 mm from that surface or edge. When the form factor of a handset is smaller than 9 cm x 5 cm, a test separation distance of 5 mm (instead of 10 mm) is required for testing hotspot mode. When the separation distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, in the same wireless mode and for the same surface of the phone, the hotspot mode SAR data may be used to support body-worn accessory SAR compliance for that particular configuration (surface).

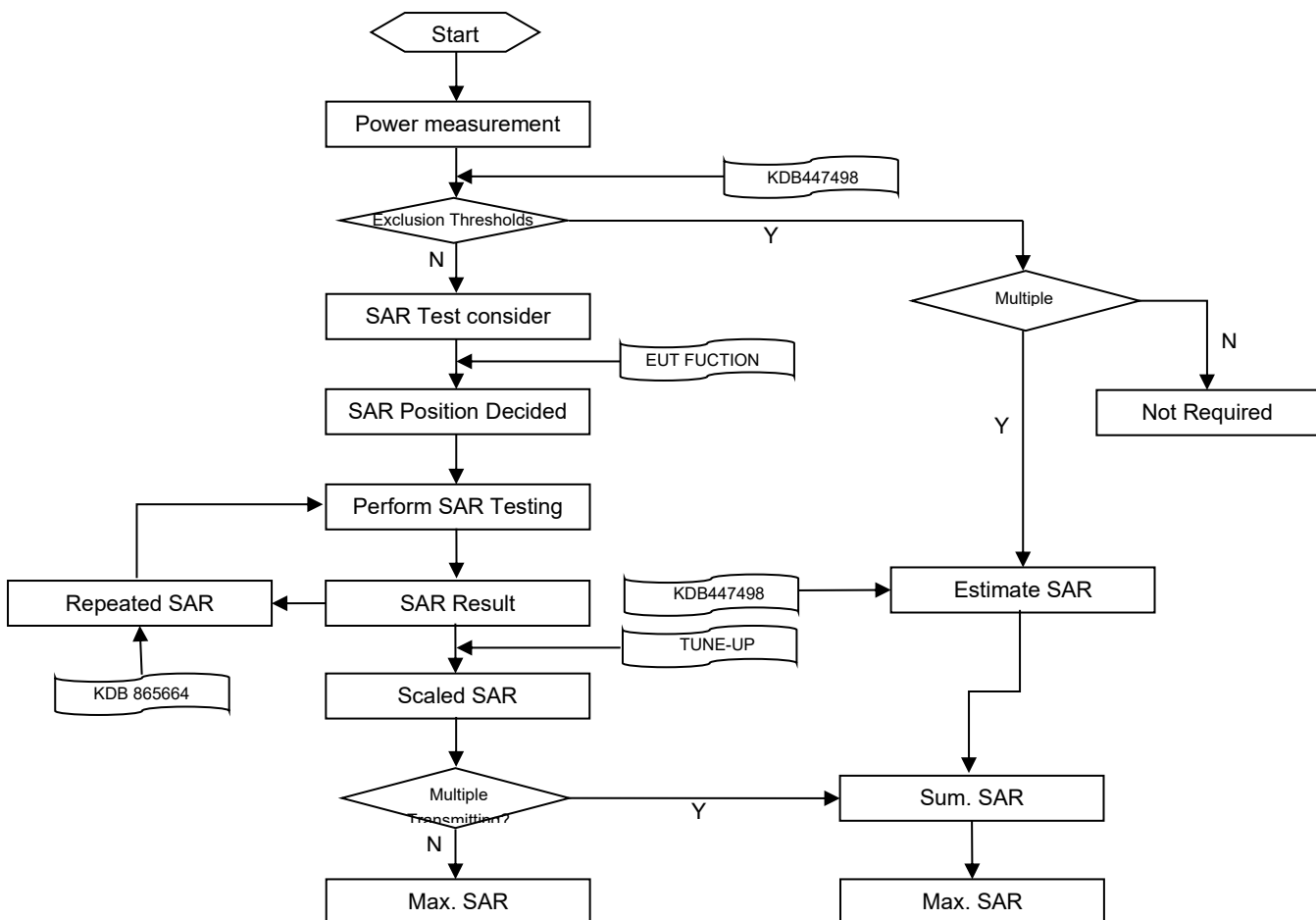


6.2 Product Specific 10g Exposure Consideration

According with FCC KDB 648474 D04, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, unless it is confirmed otherwise through KDB inquiries, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modems and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance;

The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions. The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

6.3 Measurement Process Diagram



7 TEST RESULT

7.1 Measurement of RF conducted Power

Note: The detailed conducted power table can refer to Appendix.

7.2 Measurement of SAR and Power Density Test Results

7.2.1. Measurement of SAR Test Data

W B2 SAR Test Record									
Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	RMC	9400/1880	1:1	0.503	-0.02	15.03	16.00	1.250	0.629
Back side	RMC	9262/1852.4	1:1	0.522	0.04	15.12	16.00	1.225	0.639
Back side	RMC	9538/1907.6	1:1	0.498	0.01	14.94	16.00	1.276	0.636
Left side	RMC	9400/1880	1:1	0.028	0.04	23.66	24.50	1.213	0.034
Right side	RMC	9400/1880	1:1	0.149	-0.11	15.12	16.00	1.225	0.182
Top side	RMC	9400/1880	1:1	0.231	0.03	15.12	16.00	1.225	0.283
Bottom side	RMC	9400/1880	1:1	0.050	0.06	23.66	24.50	1.213	0.061
Body SAR Test data(Separate 13mm)									
Back side	RMC	9400/1880	1:1	0.385	-0.11	23.66	24.50	1.213	0.467
Right side	RMC	9400/1880	1:1	0.101	0.03	23.66	24.50	1.213	0.123
Top side	RMC	9400/1880	1:1	0.198	-0.03	23.66	24.50	1.213	0.240

W B4 SAR Test Record									
Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	RMC	1413/1732.6	1:1	0.533	-0.01	15.01	16.00	1.256	0.669
Back side	RMC	1413/1732.6	1:1	0.581	0.07	15.18	16.00	1.208	0.702
Back side	RMC	1513/1752.6	1:1	0.552	0.06	15.08	16.00	1.236	0.682
Left side	RMC	1413/1732.6	1:1	0.112	0.03	23.65	24.50	1.216	0.136
Right side	RMC	1413/1732.6	1:1	0.201	0.01	15.18	16.00	1.208	0.243
Top side	RMC	1413/1732.6	1:1	0.239	0.08	15.18	16.00	1.208	0.289
Bottom side	RMC	1413/1732.6	1:1	0.146	0.02	23.65	24.50	1.216	0.178
Body SAR Test data(Separate 13mm)									
Back side	RMC	1413/1732.6	1:1	0.423	0.09	23.65	24.50	1.216	0.514
Right side	RMC	1413/1732.6	1:1	0.102	0.12	23.65	24.50	1.216	0.124
Top side	RMC	1413/1732.6	1:1	0.203	0.03	23.65	24.50	1.216	0.247

W B5 SAR Test Record									
Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	RMC	4182/836.4	1:1	0.633	-0.03	19.65	20.00	1.084	0.686
Back side	RMC	4132/826.4	1:1	0.680	0.01	19.66	20.00	1.081	0.735
Back side	RMC	4233/846.6	1:1	0.641	0.02	19.58	20.00	1.102	0.706
Left side	RMC	4182/836.4	1:1	0.058	0.06	23.59	24.50	1.233	0.072
Right side	RMC	4182/836.4	1:1	0.360	-0.09	19.66	20.00	1.081	0.389
Top side	RMC	4182/836.4	1:1	0.536	0.02	19.66	20.00	1.081	0.580
Bottom side	RMC	4182/836.4	1:1	0.015	-0.01	23.59	24.50	1.233	0.018
Body SAR Test data(Separate 13mm)									
Back side	RMC	4182/836.4	1:1	0.235	0.03	23.59	24.50	1.233	0.290
Right side	RMC	4182/836.4	1:1	0.101	0.01	23.59	24.50	1.233	0.125
Top side	RMC	4182/836.4	1:1	0.215	0.02	23.59	24.50	1.233	0.265

LTE Band 4 BW20 SAR Test Record									
Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	QPSK 1_0	20175/1732.5	1:1	0.618	-0.03	14.48	15.50	1.265	0.782
Back side	QPSK 50_24	20175/1732.5	1:1	0.598	0.06	14.47	15.50	1.268	0.758
Left side	QPSK 1_0	20175/1732.5	1:1	0.084	0.01	23.51	24.50	1.256	0.106
Left side	QPSK 50_24	20175/1732.5	1:1	0.051	-0.05	22.71	23.50	1.199	0.061
Right side	QPSK 1_0	20175/1732.5	1:1	0.178	0.05	14.48	15.50	1.265	0.225
Right side	QPSK 50_24	20175/1732.5	1:1	0.166	0.07	14.47	15.50	1.268	0.210
Top side	QPSK 1_0	20175/1732.5	1:1	0.193	-0.01	14.48	15.50	1.265	0.244
Top side	QPSK 50_24	20175/1732.5	1:1	0.182	-0.06	14.47	15.50	1.268	0.231
Bottom side	QPSK 1_0	20175/1732.5	1:1	0.154	-0.04	23.51	24.50	1.256	0.193
Bottom side	QPSK 50_24	20175/1732.5	1:1	0.123	0.05	22.71	23.50	1.199	0.148
Body SAR Test data(Separate 13mm)									
Back side	QPSK 1_0	20175/1732.5	1:1	0.351	-0.03	23.51	24.50	1.256	0.441
Right side	QPSK 1_0	20175/1732.5	1:1	0.123	0.07	23.51	24.50	1.256	0.154
Top side	QPSK 1_0	20175/1732.5	1:1	0.154	0.12	23.51	24.50	1.256	0.193

LTE Band 7 BW20 SAR Test Record									
Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	QPSK 1_0	21100/2535	1:1	0.583	-0.02	11.94	13.00	1.276	0.744
Back side	QPSK 50_0	21100/2535	1:1	0.562	-0.06	11.83	13.00	1.309	0.736
Left side	QPSK 1_0	21100/2535	1:1	0.064	0.04	23.66	24.50	1.213	0.078
Left side	QPSK 50_0	21100/2535	1:1	0.051	-0.02	22.62	23.50	1.225	0.062
Right side	QPSK 1_0	21100/2535	1:1	0.312	0.08	11.94	13.00	1.276	0.398
Right side	QPSK 50_0	21100/2535	1:1	0.297	-0.01	11.83	13.00	1.309	0.389
Top side	QPSK 1_0	21100/2535	1:1	0.342	-0.03	11.94	13.00	1.276	0.437
Top side	QPSK 50_0	21100/2535	1:1	0.339	-0.01	11.83	13.00	1.309	0.444
Bottom side	QPSK 1_0	21100/2535	1:1	0.358	-0.06	23.66	24.50	1.213	0.434
Bottom side	QPSK 50_0	21100/2535	1:1	0.344	0.05	22.62	23.50	1.225	0.421
Body SAR Test data(Separate 13mm)									
Back side	QPSK 1_0	21100/2535	1:1	0.579	0.03	23.66	24.50	1.213	0.703
Right side	QPSK 1_0	21100/2535	1:1	0.291	0.12	23.66	24.50	1.213	0.353
Top side	QPSK 1_0	21100/2535	1:1	0.302	0.04	23.66	24.50	1.213	0.366

LTE Band 12&17 BW10 SAR Test Record

Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	QPSK 1_0	23095/707.5	1:1	0.712	-0.02	19.03	19.50	1.114	0.793
Back side	QPSK 25_0	23095/707.5	1:1	0.665	0.04	18.81	19.50	1.172	0.780
Left side	QPSK 1_0	23095/707.5	1:1	0.053	-0.01	23.85	24.50	1.161	0.062
Left side	QPSK 25_0	23095/707.5	1:1	0.044	0.07	23.10	23.50	1.096	0.048
Right side	QPSK 1_0	23095/707.5	1:1	0.098	-0.01	19.03	19.50	1.114	0.109
Right side	QPSK 25_0	23095/707.5	1:1	0.089	0.04	18.81	19.50	1.172	0.104
Top side	QPSK 1_0	23095/707.5	1:1	0.323	-0.01	19.03	19.50	1.114	0.360
Top side	QPSK 25_0	23095/707.5	1:1	0.314	0.07	18.81	19.50	1.172	0.368
Bottom side	QPSK 1_0	23095/707.5	1:1	0.050	-0.01	23.85	24.50	1.161	0.058
Bottom side	QPSK 25_0	23095/707.5	1:1	0.033	-0.07	23.10	23.50	1.096	0.036
Body SAR Test data(Separate 13mm)									
Back side	QPSK 1_0	23095/707.5	1:1	0.332	-0.02	23.85	24.50	1.161	0.386
Right side	QPSK 1_0	23095/707.5	1:1	0.085	0.03	23.85	24.50	1.161	0.099
Top side	QPSK 1_0	23095/707.5	1:1	0.183	0.01	23.85	24.50	1.161	0.213

LTE Band 13 BW10 SAR Test Record									
Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	QPSK 1_0	23230/782	1:1	0.648	0.07	19.01	19.50	1.119	0.725
Back side	QPSK 25_0	23230/782	1:1	0.601	0.06	18.78	19.50	1.180	0.709
Left side	QPSK 1_0	23230/782	1:1	0.055	-0.01	23.83	24.50	1.167	0.064
Left side	QPSK 25_0	23230/782	1:1	0.045	-0.06	22.55	23.50	1.245	0.056
Right side	QPSK 1_0	23230/782	1:1	0.133	-0.07	19.01	19.50	1.119	0.149
Right side	QPSK 25_0	23230/782	1:1	0.129	0.03	18.78	19.50	1.180	0.152
Top side	QPSK 1_0	23230/782	1:1	0.423	0.06	19.01	19.50	1.119	0.474
Top side	QPSK 25_0	23230/782	1:1	0.411	0.04	18.78	19.50	1.180	0.485
Bottom side	QPSK 1_0	23230/782	1:1	0.049	-0.05	23.83	24.50	1.167	0.057
Bottom side	QPSK 25_0	23230/782	1:1	0.033	-0.06	22.55	23.50	1.245	0.041
Body SAR Test data(Separate 13mm)									
Back side	QPSK 1_0	23095/707.5	1:1	0.361	0.06	23.85	24.50	1.161	0.419
Right side	QPSK 1_0	23095/707.5	1:1	0.103	0.12	23.85	24.50	1.161	0.120
Top side	QPSK 1_0	23095/707.5	1:1	0.231	0.07	23.85	24.50	1.161	0.268

LTE Band 25&2 BW20 SAR Test Record

Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	QPSK 1_0	26340/1880	1:1	0.701	0.06	15.93	16.50	1.140	0.799
Back side	QPSK 50_50	26340/1880	1:1	0.683	0.08	15.87	16.50	1.156	0.790
Left side	QPSK 1_0	26340/1880	1:1	0.042	0.06	23.65	24.50	1.216	0.051
Left side	QPSK 50_50	26340/1880	1:1	0.034	0.01	22.77	23.50	1.183	0.040
Right side	QPSK 1_0	26340/1880	1:1	0.133	-0.04	15.93	16.50	1.140	0.152
Right side	QPSK 50_50	26340/1880	1:1	0.141	0.04	15.87	16.50	1.156	0.163
Top side	QPSK 1_0	26340/1880	1:1	0.252	-0.06	15.93	16.50	1.140	0.287
Top side	QPSK 50_50	26340/1880	1:1	0.243	-0.02	15.87	16.50	1.156	0.281
Bottom side	QPSK 1_0	26340/1880	1:1	0.069	0.00	23.65	24.50	1.216	0.084
Bottom side	QPSK 50_50	26340/1880	1:1	0.062	0.04	22.77	23.50	1.183	0.073
Body SAR Test data(Separate 13mm)									
Back side	QPSK 1_0	26340/1880	1:1	0.451	-0.03	23.65	24.50	1.216	0.548
Right side	QPSK 1_0	26340/1880	1:1	0.112	0.02	23.65	24.50	1.216	0.136
Top side	QPSK 1_0	26340/1880	1:1	0.231	0.11	23.65	24.50	1.216	0.281

LTE Band 26&5 BW15 SAR Test Record

Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	QPSK 1_0	26865/831.5	1:1	0.613	-0.01	19.99	20.50	1.125	0.689
Back side	QPSK 36_0	26865/831.5	1:1	0.579	0.06	19.82	20.50	1.169	0.677
Left side	QPSK 1_0	26865/831.5	1:1	0.087	-0.07	23.71	24.50	1.199	0.104
Left side	QPSK 36_0	26865/831.5	1:1	0.067	-0.06	22.82	23.50	1.169	0.078
Right side	QPSK 1_0	26865/831.5	1:1	0.098	0.07	19.99	20.50	1.125	0.110
Right side	QPSK 36_0	26865/831.5	1:1	0.087	0.06	19.82	20.50	1.169	0.102
Top side	QPSK 1_0	26865/831.5	1:1	0.133	-0.02	19.99	20.50	1.125	0.150
Top side	QPSK 36_0	26865/831.5	1:1	0.142	0.01	19.82	20.50	1.169	0.166
Bottom side	QPSK 1_0	26865/831.5	1:1	0.046	-0.07	23.71	24.50	1.199	0.055
Bottom side	QPSK 36_0	26865/831.5	1:1	0.043	0.01	22.82	23.50	1.169	0.050
Body SAR Test data(Separate 13mm)									
Back side	QPSK 1_0	26865/831.5	1:1	0.219	0.01	23.71	24.50	1.199	0.263
Right side	QPSK 1_0	26865/831.5	1:1	0.073	0.06	23.71	24.50	1.199	0.088
Top side	QPSK 1_0	26865/831.5	1:1	0.111	0.12	23.71	24.50	1.199	0.133

LTE Band 41&38 BW20 SAR Test Record

Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	QPSK 1_0	40620/2593	1:1	0.541	0.02	13.29	14.00	1.178	0.637
Back side	QPSK 1_0	39750/2506	1:1	0.563	0.03	13.21	14.00	1.199	0.675
Back side	QPSK 1_0	40185/2549.5	1:1	0.558	0.07	13.11	14.00	1.227	0.685
Back side	QPSK 1_0	41055/2636.5	1:1	0.571	-0.03	13.26	14.00	1.186	0.677
Back side	QPSK 1_0	41490/2680	1:1	0.589	0.05	13.10	14.00	1.230	0.725
Back side	QPSK 50_24	40620/2593	1:1	0.519	0.09	13.11	14.00	1.227	0.637
Back side	QPSK 50_24	39750/2506	1:1	0.555	0.08	12.93	14.00	1.279	0.710
Back side	QPSK 50_24	40185/2549.5	1:1	0.547	0.05	13.02	14.00	1.253	0.685
Back side	QPSK 50_24	41055/2636.5	1:1	0.533	0.04	12.89	14.00	1.291	0.688
Back side	QPSK 50_24	41490/2680	1:1	0.542	-0.04	12.84	14.00	1.306	0.708
Back side	QPSK 100_0	40620/2593	1:1	0.489	0.01	13.10	14.00	1.230	0.602
Left side	QPSK 1_0	40620/2593	1:1	0.046	0.11	23.91	24.50	1.146	0.053
Left side	QPSK 50_24	40620/2593	1:1	0.053	0.15	23.17	23.50	1.079	0.057
Right side	QPSK 1_0	40620/2593	1:1	0.178	0.05	13.29	14.00	1.178	0.210
Right side	QPSK 50_24	40620/2593	1:1	0.181	-0.05	13.11	14.00	1.227	0.222
Top side	QPSK 1_0	40620/2593	1:1	0.134	0.14	13.29	14.00	1.178	0.158
Top side	QPSK 50_24	40620/2593	1:1	0.145	0.08	13.11	14.00	1.227	0.178
Bottom side	QPSK 1_0	40620/2593	1:1	0.220	-0.15	23.91	24.50	1.146	0.252
Bottom side	QPSK 50_24	40620/2593	1:1	0.212	0.09	23.17	23.50	1.079	0.229
Body SAR Test data(Separate 13mm)									
Back side	QPSK 1_0	40620/2593	1:1	0.533	0.04	23.91	24.50	1.146	0.611
Right side	QPSK 1_0	40620/2593	1:1	0.142	0.01	23.91	24.50	1.146	0.163
Top side	QPSK 1_0	40620/2593	1:1	0.122	-0.08	23.91	24.50	1.146	0.140

Bluetooth SAR Test Record									
Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	DH5	39/2441	1:1.45	0.078	0.06	9.42	10.00	1.143	0.089
Left side	DH5	39/2441	1:1.45	0.033	0.09	9.42	10.00	1.143	0.038
Right side	DH5	39/2441	1:1.45	0.022	-0.04	9.42	10.00	1.143	0.025
Top side	DH5	39/2441	1:1.45	0.023	0.06	9.42	10.00	1.143	0.026
Bottom side	DH5	39/2441	1:1.45	0.021	0.01	9.42	10.00	1.143	0.024

2.4GHz WLAN SAR Test Record									
Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	802.11b	6/2437	1:1.01	0.655	0.08	13.34	14.00	1.164	0.763
Left side	802.11b	6/2437	1:1.01	0.342	0.13	13.34	14.00	1.164	0.398
Right side	802.11b	6/2437	1:1.01	0.032	0.00	13.34	14.00	1.164	0.037
Top side	802.11b	6/2437	1:1.01	0.432	0.09	13.34	14.00	1.164	0.503
Bottom side	802.11b	6/2437	1:1.01	0.038	-0.10	13.34	14.00	1.164	0.044

5.3GHz WLAN SAR Test Record									
Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	802.11a	56/5280	1:1.03	0.563	-0.13	11.23	12.00	1.194	0.672
Left side	802.11a	56/5280	1:1.03	0.421	-0.11	11.23	12.00	1.194	0.503
Right side	802.11a	56/5280	1:1.03	0.103	-0.08	11.23	12.00	1.194	0.123
Top side	802.11a	56/5280	1:1.03	0.109	0.05	11.23	12.00	1.194	0.130
Bottom side	802.11a	56/5280	1:1.03	0.042	0.09	11.23	12.00	1.194	0.050

5.6GHz WLAN SAR Test Record									
Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	802.11a	100/5500	1:1.03	0.567	-0.03	10.52	11.00	1.117	0.633
Back side	802.11a	116/5580	1:1.03	0.611	0.04	10.42	11.00	1.143	0.698
Back side	802.11a	140/5700	1:1.03	0.621	0.11	10.47	11.00	1.130	0.702
Left side	802.11a	100/5500	1:1.03	0.502	-0.07	10.52	11.00	1.117	0.561
Right side	802.11a	100/5500	1:1.03	0.042	-0.04	10.52	11.00	1.117	0.047
Top side	802.11a	100/5500	1:1.03	0.123	-0.13	10.52	11.00	1.117	0.137
Bottom side	802.11a	100/5500	1:1.03	0.023	-0.08	10.52	11.00	1.117	0.026

5.8GHz WLAN SAR Test Record									
Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)
Body SAR Test data(Separate 0mm)									
Back side	802.11a	157/5785	1:1.03	0.619	-0.12	10.52	11.00	1.117	0.691
Back side	802.11a	149/5745	1:1.03	0.510	-0.12	10.43	11.00	1.140	0.582
Back side	802.11a	165/5825	1:1.03	0.498	0.19	10.38	11.00	1.153	0.574
Left side	802.11a	157/5785	1:1.03	0.452	-0.11	10.52	11.00	1.117	0.505
Right side	802.11a	157/5785	1:1.03	0.054	-0.16	10.52	11.00	1.117	0.060
Top side	802.11a	157/5785	1:1.03	0.463	0.02	10.52	11.00	1.117	0.517
Bottom side	802.11a	157/5785	1:1.03	0.061	0.03	10.52	11.00	1.117	0.068

6GHz WLAN SAR Test Record										
Test position	Test mode	Test ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR 1-g(W/kg)	4cm ² PsAPD (W/m ²)
Body SAR Test data(Separate 0mm)										
Back side	802.11ax-HE160	47/6185	1:1.176	0.342	0.05	14.59	15.00	1.099	0.376	4.56
Back side	802.11ax-HE160	15/6025	1:1.176	0.289	-0.03	13.91	14.50	1.146	0.331	4.22
Back side	802.11ax-HE160	79/6345	1:1.176	0.231	0.10	13.63	14.50	1.222	0.282	3.91
Back side	802.11ax-HE160	111/6505	1:1.176	0.241	0.05	13.35	14.00	1.161	0.280	3.84
Back side	802.11ax-HE160	143/6665	1:1.176	0.267	-0.03	13.32	14.00	1.169	0.312	4.11
Back side	802.11ax-HE160	175/6825	1:1.176	0.258	0.07	13.31	14.00	1.172	0.302	3.67
Back side	802.11ax-HE160	207/6985	1:1.176	0.249	0.02	13.25	14.00	1.189	0.296	3.49
Left side	802.11ax-HE160	47/6185	1:1.176	0.223	0.06	14.59	15.00	1.099	0.245	3.33
Right side	802.11ax-HE160	47/6185	1:1.176	0.066	-0.08	14.59	15.00	1.099	0.073	0.141
Top side	802.11ax-HE160	47/6185	1:1.176	0.105	-0.14	14.59	15.00	1.099	0.115	0.713
Bottom side	802.11ax-HE160	47/6185	1:1.176	0.053	0.06	14.59	15.00	1.099	0.058	0.191

RFID Test Record					
Test position	Test mode	Freq.	Duty Cycle	SAR (W/kg) 1-g	Power drift (dB)
Body SAR Test data (Separate 0mm)					
Back side	NFC	13.56	1:1	0.008	0.02
Left side	NFC	13.56	1:1	0.000	0.00
Right side	NFC	13.56	1:1	0.000	0.00
Top side	NFC	13.56	1:1	0.000	0.00
Bottom side	NFC	13.56	1:1	0.000	0.00

SAR Test Note:

1. Per KDB648474 D04y01r03, this device is considered a phablet since the display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm. Therefore, phablet SAR tests are required when wireless mode does not apply or if wireless router 1g SAR > 1.2W/kg.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. LTE Band 2/4/38 and NR n2/38/78 SAR test was covered by LTE Band 25/66/41 and NR n25/41/77, due to the output power level and have duplicate frequency range.
4. The duty cycle of Wi-Fi is 85~100%. The scaling of Wi-Fi SAR needs further consideration, with a theoretical duty cycle of 100%. The actual duty cycle is configured into the SAR DASY testing system; thus, the duty cycle scaled to 100%.
5. The ratio is the difference in percentage between original and repeated measured SAR.
6. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

7.2.2. Measurement of Power Density Test Data

WLAN Power Density Test Record											
Test position	Test mode	Test ch./Freq.	Duty Cycle	Total psPD(W/m ²)	Power drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scale d factor	Grip Step (λ)	Scaling Factor for measurement uncertainty	Scaled Total psPD(W/m ²)
Body SAR Test data (Separate 0mm) Ant 1+0											
Back side	802.11ax-HE160	47/6185	1:1.176	4.330	-0.03	14.59	15.00	1.099	0.0625	1.55	7.376
Back side	802.11ax-HE160	15/6025	1:1.176	3.910	0.02	13.91	14.50	1.146	0.0625	1.55	6.942
Back side	802.11ax-HE160	79/6345	1:1.176	3.540	0.01	13.63	14.50	1.222	0.0625	1.55	6.704
Back side	802.11ax-HE160	111/6505	1:1.176	5.460	0.06	13.35	14.00	1.161	0.0625	1.55	9.829
Back side	802.11ax-HE160	143/6665	1:1.176	5.340	0.12	13.32	14.00	1.169	0.0625	1.55	9.680
Back side	802.11ax-HE160	175/6825	1:1.176	5.080	0.03	13.31	14.00	1.172	0.0625	1.55	9.230
Back side	802.11ax-HE160	207/6985	1:1.176	4.880	0.04	13.25	14.00	1.189	0.0625	1.55	8.990
Left side	802.11ax-HE160	47/6185	1:1.176	1.960	0.08	14.59	15.00	1.099	0.0625	1.55	3.339

Power Density Test Note:

1. The test spacing is the distance between probe sensor and DUT surface.
2. $1.0 \text{ W/m}^2 = 0.1 \text{ mW/cm}^2$.
3. Wi-Fi 6E SAR and Power Density measurements were implemented according to the U-NII 6-7 GHz Interim Procedures described in Oct. 2020 TCB workshop.
4. The SAR evaluations using 6-7 GHz parameters were performed per IEC/IEEE 62209-1528, and the Absorbed Power Density (APD) were reported based on SAR measurements.
5. According to DASY Application Note, the APD is evaluated numerically using the FDTD method of Sim4Life V5.2. For comparison with the basic restrictions, the APD is averaged over square surface areas of 1 cm^2 and 4 cm^2 in the lowermost voxel layer of a flat phantom at a frequency of 6.5 GHz.

7.2.3. SAR Measurement Variability

Band	Mode	Test Position	Ch.	Freq. (MHz)	Antenna	Original 1g SAR (W/kg)	First 1g SAR (W/kg)	First Ratio SAR 1g
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Note:

According to KDB 865664 D01v01r04, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required:

1. The original highest measured Reported SAR 1-g ≥ 0.80 W/kg repeated that measurement once.
2. Perform a second repeated measurement the ratio of the largest to the smallest SAR for the original and first repeated measurements is <1.2 W/kg, or when the original or repeated measurement ≥ 1.45 W/kg (~10% from the 1-g SAR limit).

7.3 Multiple Transmitter Evaluation

7.3.1. Simultaneous SAR test evaluation

- Simultaneous Transmission Possibilities**

NO	Simultaneous TX Combination	Hotspot
1	WWAN + Wi-Fi 5G + Bluetooth	Y
2	WWAN + Wi-Fi 6G + Bluetooth	Y

7.3.2. Simultaneous Transmission SAR Summation Scenario

Simultaneous Transmission SAR Summation Scenario for Worse case WWAN + WLAN:

Exposure Position (0mm)	1	2	3	4	5	1+3+5	1+4+5	Limit 1g SAR (W/kg)	Verdict
	WWAN	2.4GHz WLAN	5GHz WLAN	6GHz WLAN	Bluetooth	Summed	Summed		
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
Back	0.799	0.763	0.702	0.376	0.089	1.59	1.26	1.6	PASS
Left Side	0.136	0.398	0.561	0.245	0.038	0.74	0.42		
Right Side	0.398	0.037	0.123	0.073	0.025	0.55	0.50		
Top Side	0.58	0.503	0.517	0.115	0.026	1.12	0.72		
Bottom Side	0.434	0.044	0.068	0.058	0.024	0.53	0.52		

8 SAR AND POWER DENSITY VALIDATION DATA

Note: The Validation Data can refer to Appendix.

9 SAR AND POWER DENSITY TEST DATA

Note: The SAR And Power Density Test Data can refer to Appendix.

10 CALIBRATION CERTIFICATE

Note: The detailed calibration certificate can refer to Appendix.

11 TEST SETUP PHOTO

Note: The Test Setup Photo please see appendix.

_____ The End _____