FCC SAR Test Report

APPLICANT	:	TCL Communication Ltd.
EQUIPMENT	:	USB Connect 5G (NA)
BRAND NAME	:	Vodafone
MODEL NAME	:	IK512US
FCC ID	:	2ACCJSCD002
STANDARD	:	FCC 47 CFR Part 2 (2.1093)

We, Sporton International Inc. (Shenzhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Shenzhen), the test report shall not be reproduced except in full.

Si Zhang

Approved by: Si Zhang

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA450613	Rev. 01	Initial issue of report	Aug. 15, 2024

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **TCL Communication Ltd., USB Connect** 5G (NA)**, IK512US**, are as follows.

Highest 1g SAR Summary			
Equipment Class	Frequency Band		Body (Separation 5mm) 1g SAR (W/kg)
Licensed	LTE	LTE Band 25/2	**0.99**
		LTE Band 7	**0.99**
		LTE Band 12/17	0.87
		LTE Band 14	0.70
		LTE Band 26/5	0.63
		LTE Band 30	0.98
		LTE Band 66/4	0.97
		LTE Band 71	0.85
		LTE Band 41/38	0.78
		LTE Band 48	0.93
	5G NR	FR1 n5	0.67
		FR1 n12	**0.99**
		FR1 n14	0.80
		FR1 n25/2	0.98
		FR1 n30	0.93
		FR1 n66	0.98
		FR1 n70	0.70
		FR1 n71	0.86
		FR1 n41/38	**0.99**
		FR1 n48	**0.99**
		FR1 n77/78	0.96
Date of Testing:			2024/7/10 ~ 2024/8/8

Remark:

1. This device supports LTE B2 / B4 / B5 / B17 / B38 and B25 / B66 / B26 / B12 / B41. Since the supported frequency span for LTE B2 / B4 / B5 / B17 / B38 falls completely within the supports frequency span for LTE B25 / B66 / B26 / B12 / B41, both LTE bands have the same target power, and both LTE bands share the same transmission path; therefore, SAR was only assessed for LTE B25 / B66 / B26 / B12 / B41.
2. This device supports 5GNR n2/n38/n78 and n25/n41/n77. Since the supported frequency span for 5GNR n2/n38/n78 falls completely within the supports frequency span for n25/n41/n77, both 5GNR bands have the same target power, and both 5GNR bands share the same transmission path; therefore, SAR was only assessed for n25/n41/n77.

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

2. Administration Data

Sporton International Inc. (Shenzhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Testing Laboratory			
Test Firm	Sporton International Inc. (Shenzhen)		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR03-SZ	CN1256	421272

Applicant	
Company Name	TCL Communication Ltd.
Address	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong

Manufacturer	
Company Name	Vodafone Procurement Company S.à.r.l.
Address	15 rue Edward Steichen, L-2540 Luxembourg, Grand-Duché de Luxembourg

3. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 447498 D02 SAR Procedures for Dongle Xmtr v02r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	USB Connect 5G (NA)
Brand Name	Vodafone
Model Name	IK512US
FCC ID	2ACCJSCD002
IMEI Code	352912230200248
Wireless Technology and Frequency Range	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz LTE Band 48: 3550 MHz ~ 3700 MHz 5G NR n2: 1850 MHz ~ 1910 MHz 5G NR n5: 824 MHz ~ 849 MHz 5G NR n12: 699 MHz ~ 716 MHz 5G NR n14: 788 MHz ~ 798 MHz 5G NR n25: 1850 MHz ~ 1915 MHz 5G NR n30: 2305 MHz ~ 2315 MHz 5G NR n38: 2570 MHz ~ 2620 MHz 5G NR n41: 2496 MHz ~ 2690 MHz 5G NR n48: 3550 MHz ~ 3700 MHz 5G NR n66: 1710 MHz ~ 1780 MHz 5G NR n70: 1695 MHz ~ 1710 MHz 5G NR n71: 663 MHz ~ 698 MHz 5G NR n77: 3450 MHz ~ 3550 MHz; 3700 MHz ~ 3980 MHz 5G NR n78: 3450 MHz ~ 3550 MHz; 3700 MHz ~ 3800 MHz
Mode	LTE: QPSK, 16QAM, 64QAM, 256QAM 5G NR: CP-OFDM / DFT-s-OFDM, PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM
HW Version	V3.0
SW Version	IK512US_ZZ_01.00_04
EUT Stage	Production Unit

Remark:

1. The device implements proximity sensor detection for SAR compliance at different exposure conditions (body) and the Qualcomm smart transmit will manage to ensure the power level not exceeding the associated power table. Details about the sensor detection are provided in the operational description. And the device will invoke corresponding work scenarios power level base on frequency bands/antennas, which can refer to power table at appendix E.
2. 5GNR n41/n77/n78 supports HPUE, HPUE power and SAR testing performed separately.
3. 5GNR n41/n77/n78 HPUE with higher power, 5GNR n41/n77/n78 HPUE SAR can represent power class 3 level SAR.
4. 5GNR n77/n78 supports UL MIMO.
5. This device has two USB Cables, USB Cable 2 is longer than USB Cable 1, so USB Cable 2 was chosen to perform full SAR testing and USB Cable 1 verified the worst case of USB Cable 2.
6. For 5G NR test, using FTM (Factory Test Mode) to perform SAR with default 100% transmission.
7. This device supports 5GNR FR1 bands as following table, including NSA mode and SA mode.

<5G NR>

Mode	Band	Duplex	SCS(KHz)	Bandwidths(BW)
NSA	n2	FDD	15	5, 10, 15, 20
	n5	FDD	15	5, 10, 15, 20
	n25	FDD	15	5, 10, 15, 20, 25, 30, 35, 40
	n66	FDD	15	5, 10, 15, 20, 25, 30, 35, 40
	n71	FDD	15	5, 10, 15, 20
	n41	TDD	30	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100
	n77	TDD	30	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100
	n78	TDD	30	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100
SA	n2	FDD	15	5, 10, 15, 20
	n5	FDD	15	5, 10, 15, 20
	n12	FDD	15	5, 10, 15
	n14	FDD	15	5, 10
	n25	FDD	15	5, 10, 15, 20, 25, 30, 35, 40
	n30	FDD	15	5, 10
	n66	FDD	15	5, 10, 15, 20, 25, 30, 35, 40
	n70	FDD	15	5, 10, 15
	n71	FDD	15	5, 10, 15, 20
	n38	TDD	30	10, 15, 20, 30, 40
	n41	TDD	30	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100
	n48	TDD	30	10, 15, 20, 30, 40
	n77	TDD	30	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100
	n78	TDD	30	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100

4.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	2ACCJSCD002
Equipment Name	USB Connect 5G (NA)
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz
Channel Bandwidth	LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 14: 5MHz, 10MHz LTE Band 17: 5MHz, 10MHz LTE Band 25:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 26:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz LTE Band 30: 5MHz, 10MHz LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 48: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 66:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 71: 5MHz, 10MHz, 15MHz, 20MHz
Uplink Modulations used	QPSK / 16QAM / 64QAM / 256QAM
LTE Voice / Data requirements	Data only
LTE Release Version	R16
CA Support	Yes, Uplink and Downlink
LTE MPR permanently built-in by design	**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

LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.
Power reduction applied to satisfy SAR compliance	Yes, when operating in Proximity sensors detect mechanism; body will trigger reduced power for some bands applied to satisfy SAR compliance, the detail please referred to section 14.
LTE Carrier Aggregation Combinations	Intra-Band and Inter-Band possible combinations and the detail power verification please referred to section 14.
LTE Carrier Aggregation Additional Information	(1) This device supports LTE Carrier Aggregation (CA) in the uplink for intra-band and inter-band with two component carriers in the uplink. SAR Measurements and conducted powers were evaluated per FCC Guidance. (2) This device supports maximum of 4 carriers in the downlink and 2 carriers in the uplink.

Transmission (H, M, L) channel numbers and frequencies in each LTE band

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900

LTE Band 4

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745

LTE Band 5

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

LTE Band 7

	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

LTE Band 12

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711

LTE Band 14

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Channel #	Channel #	Freq.(MHz)
L	23305	790.5	23330	793
M	23330	793		
H	23355	795.5		

LTE Band 17

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq. (MHz)
L	23755	706.5	23780	709
M	23790	710	23790	710
H	23825	713.5	23800	711

LTE Band 25

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26047	1850.7	26055	1851.5	26065	1852.5	26090	1855	26115	1857.5	26140	1860
M	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880
H	26683	1914.3	26675	1913.5	26665	1912.5	26640	1910	26615	1907.5	26590	1905

LTE Band 26

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26697	814.7	26705	815.5	26715	816.5	26740	819	26765	821.5
M	26865	831.5	26865	831.5	26865	831.5	26865	831.5	26865	831.5
H	27033	848.3	27025	847.5	27015	846.5	26990	844	26965	841.5

LTE Band 30				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	27685	2307.5	27710	2310
M	27710	2310		
H	27735	2312.5		

LTE Band 38								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	37775	2572.5	37800	2575	37825	2577.5	37850	2580
M	38000	2595	38000	2595	38000	2595	38000	2595
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610

LTE Band 41								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	39675	2498.5	39700	2501	39725	2503.5	39750	2506
LM	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5
M	40620	2593	40620	2593	40620	2593	40620	2593
HM	41093	2640.3	41080	2639	41068	2637.8	41055	2636.5
H	41565	2687.5	41540	2685	41515	2682.5	41490	2680

LTE Band 48								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	55265	3552.5	55290	3555	55315	3557.5	55340	3560
LM	55810	3607	55815	3607.5	55820	3608	55830	3609
MH	56170	3643	56165	3642.5	56160	3642	56150	3641
H	56715	3697.5	56690	3695	56665	3692.5	56640	3690

LTE Band 66												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	131979	1710.7	131987	1711.5	131997	1712.5	132022	1715	132047	1717.5	132072	1720
M	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745
H	132665	1779.3	132657	1778.5	132647	1777.5	132622	1775	132597	1772.5	132572	1770

LTE Band 71								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	133147	665.5	133172	668	133197	670.5	133222	673
M	133247	675.5	133272	678	133297	680.5	133322	683
H	133447	695.5	133422	693	133397	690.5	133372	688

<For LTE SA Overlap Bands Description>

1) LTE Bands BW

Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
LTE Band 2	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 25	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 4	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 66	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 5	Yes	Yes	Yes	Yes		
LTE Band 26	Yes	Yes	Yes	Yes	Yes	
LTE Band 12	Yes	Yes	Yes	Yes		
LTE Band 17			Yes	Yes		
LTE Band 38			Yes	Yes	Yes	Yes
LTE Band 41			Yes	Yes	Yes	Yes

2) LTE Bands tune up:

Band	Ant	DSI 0	DSI 1	Band	Ant	DSI 0	DSI 1
		Tune-up Limit	Tune-up Limit			Tune-up Limit	Tune-up Limit
LTE Band 2	Ant 1	24.0	19.0	LTE Band 12	Ant 1	24.0	22.0
LTE Band 25	Ant 1	24.0	19.0	LTE Band 17	Ant 1	24.0	22.0
LTE Band 4	Ant 1	24.0	20.0	LTE Band 4	Ant 2	24.0	18.0
LTE Band 66	Ant 1	24.0	20.0	LTE Band 66	Ant 2	24.0	18.0
LTE Band 5	Ant 1	24.0	22.0	LTE Band 38	Ant 2	24.0	21.0
LTE Band 26	Ant 1	24.0	22.0	LTE Band 41	Ant 2	24.0	21.0

4.3 General 5G NR SAR Test and Reporting Considerations

5G NR Information	
Operating Frequency Range of each 5G NR transmission band	5G NR n2: 1850 MHz ~ 1910 MHz 5G NR n5: 824 MHz ~ 849 MHz 5G NR n12: 699 MHz ~ 716 MHz 5G NR n14: 788 MHz ~ 798 MHz 5G NR n25: 1850 MHz ~ 1915 MHz 5G NR n30: 2305 MHz ~ 2315 MHz 5G NR n38: 2570 MHz ~ 2620 MHz 5G NR n41: 2496 MHz ~ 2690 MHz 5G NR n48: 3550 MHz ~ 3700 MHz 5G NR n66: 1710 MHz ~ 1780 MHz 5G NR n70: 1695 MHz ~ 1710 MHz 5G NR n71: 663 MHz ~ 698 MHz 5G NR n77: 3450 MHz ~ 3550 MHz; 3700 MHz ~ 3980 MHz 5G NR n78: 3450 MHz ~ 3550 MHz; 3700 MHz ~ 3800 MHz
Channel Bandwidth	The detail please refers to section 4.1 5GNR FR1 bands table.
SCS	FDD: SCS15KHz, TDD: SCS30KHz
uplink modulations used	DFT-s-OFDM: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM CP-OFDM QPSK / 16QAM / 64QAM / 256QAM
A-MPR (Additional MPR) disabled for SAR Testing?	Yes
LTE Anchor Bands for n5	LTE B2/30/66
LTE Anchor Bands for n2	LTE B5/12/14/30/66
LTE Anchor Bands for n25	LTE B66
LTE Anchor Bands for n66	LTE B2/12/14/30
LTE Anchor Bands for n71	LTE B2/7/66
LTE Anchor Bands for n41	LTE B2/66
L TE Anchor Bands for n77	LTE B2/5/12/14/30/66
L TE Anchor Bands for n78	LTE B7/66

Transmission (H, M, L) channel numbers and frequencies in each 5G NR band

NR Band 2

	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	370500	1852.5	371000	1855	371500	1857.5	372000	1860
M	376000	1880	376000	1880	376000	1880	376000	1880
H	381500	1907.5	381000	1905	380500	1902.5	380000	1900

NR Band 5

	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	165300	826.5	165800	829	166300	831.5	166800	834
M	167300	836.5	167300	836.5	167300	836.5	167300	836.5
H	169300	846.5	168800	844	168300	841.5	167800	839

NR Band 12

	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	140300	701.5	140800	704	141300	706.5
M	141500	707.5	141500	707.5	141500	707.5
H	142700	713.5	142200	711	141700	708.5

NR Band 14

	Bandwidth 5MHz		Bandwidth 10MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	158100	790.5	158600	793
M	158600	793		
H	159100	795.5		

NR Band 25

	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 25MHz		Bandwidth 30MHz		Bandwidth 40MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	370500	1852.5	371000	1855	371500	1857.5	372000	1860	372500	1862.5	373000	1865	374000	1870
M	376500	1882.5	376500	1882.5	376500	1882.5	376500	1882.5	376500	1882.5	376500	1882.5	376500	1882.5
H	382500	1912.5	382000	1910	381500	1907.5	381000	1905	380500	1902.5	380000	1900	379000	1895

NR Band 30				
	Bandwidth 5MHz		Bandwidth 10MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	461500	2307.5	462000	2310
M	462000	2310		
H	462500	2312.5		

NR Band 66																
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 25MHz		Bandwidth 30MHz		Bandwidth 35MHz		Bandwidth 40MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	342500	1712.5	343000	1715	343500	1717.5	344000	1720	344500	1722.5	345000	1725	345500	1727.5	346000	1730
M	349000	1745	349000	1745	349000	1745	349000	1745	349000	1745	349000	1745	349000	1745	349000	1745
H	355500	1777.5	355000	1775	354500	1772.5	354000	1770	353500	1767.5	353000	1765	352500	1762.5	352000	1760

NR Band 70						
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	339500	1697.5	340000	1700	340500	1702.5
M	340500	1702.5	340500	1702.5		
H	341500	1707.5	341000	1705		

NR Band 71								
	Bandwidth 5MHz		Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	133100	665.5	133600	668	134100	670.5	134600	673
M	136100	680.5	136100	680.5	136100	680.5	136100	680.5
H	139100	695.5	138600	693	138100	690.5	137600	688

NR Band 38										
	Bandwidth10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 30MHz		Bandwidth 40MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	515004	2575.02	515502	2577.51	516000	2580	517002	2585.01	518004	2590.02
M	519000	2595	519000	2595	519000	2595	519000	2595	519000	2595
H	522996	2614.98	522498	2612.49	522000	2610	520998	2604.99	519996	2599.98

NR Band 41																						
	Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 30MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 70MHz		Bandwidth 80MHz		Bandwidth 90MHz		Bandwidth 100MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	500202	2501.01	500700	2503.5	501204	2506.02	502200	2511	503202	2516.01	504204	2521.02	505200	2526	500202	2501.01	507204	2536.02	508200	2541	509202	2546.01
M	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99	518598	2592.99
H	537000	2685	536496	2682.48	535998	2679.99	534996	2674.98	534000	2670	532998	2664.99	531996	2659.98	537000	2685	529998	2649.99	528996	2644.98	528000	2640

NR Band 48										
	Bandwidth 10MHz		Bandwidth15MHz		Bandwidth 20MHz		Bandwidth 30MHz		Bandwidth 40MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	637000	3555	637168	3557.52	637334	3560.01	637668	3565.02	638000	3570
M	641666	3624.99	641666	3624.99	641666	3624.99	641666	3624.99	641666	3624.99
H	646332	3694.98	646166	3692.49	646000	3690	645666	3684.99	645332	3679.98

NR Band 77																						
	Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 30MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 70MHz		Bandwidth 80MHz		Bandwidth 90MHz		Bandwidth 100MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	647000	3705	647168	3707.52	647334	3710.01	647668	3715.02	648000	3720	648334	3725.01	648668	3730.02	649000	3735	649334	3740.01	649668	3745.02	650000	3750
M	656000	3840	656000	3840	656000	3840	656000	3840.00	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840	656000	3840
H	665000	3975	664832	3972.48	664666	3969.99	664332	3964.98	664000	3960	663666	3954.99	663332	3949.98	663000	3945	662666	3939.99	662332	3934.98	662000	3930

NR Band 78																						
	Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 30MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 70MHz		Bandwidth 80MHz		Bandwidth 90MHz		Bandwidth 100MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	647000	3705	647168	3707.52	647334	3710.01	647668	3715.02	648000	3720	648334	3725.01	648668	3730.02	649000	3735	649334	3740.01	649668	3745.02		
M	650000	3750	650000	3750	650000	3750	650000	3750.00	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750	650000	3750
H	653000	3795	652834	3792.51	652668	3790.02	652334	3785.01	652000	3780	651668	3775.02	651334	3770.01	651000	3765	650668	3760.02	650334	3755.01		

For <3450 MHz ~ 3550 MHz >

NR Band 77																						
	Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 30MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 70MHz		Bandwidth 80MHz		Bandwidth 90MHz		Bandwidth 100MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	630334	3455.01	630500	3457.5	630668	3460.02	631000	3465	631334	3470.01	631668	3475.02	632000	3480	632334	3485.01	632668	3490.02	633000	3495		
M	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01
H	636334	3545.01	636168	3542.52	636000	3540	635668	3535.02	635334	3530.01	635000	3525	634668	3520.02	634334	3515.01	634000	3510	633668	3505.02		

NR Band 78																						
	Bandwidth 10MHz		Bandwidth 15MHz		Bandwidth 20MHz		Bandwidth 30MHz		Bandwidth 40MHz		Bandwidth 50MHz		Bandwidth 60MHz		Bandwidth 70MHz		Bandwidth 80MHz		Bandwidth 90MHz		Bandwidth 100MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	630334	3455.01	630500	3457.5	630668	3460.02	631000	3465	631334	3470.01	631668	3475.02	632000	3480	632334	3485.01	632668	3490.02	633000	3495		
M	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01	633334	3500.01
H	636334	3545.01	636168	3542.52	636000	3540	635668	3535.02	635334	3530.01	635000	3525	634668	3520.02	634334	3515.01	634000	3510	633668	3505.02		

<For NR Overlap Bands Description>

1) NR Bands BW

Band	Duplex	SCS(KHz)	Bandwidths(BW)
n2	FDD	15	5, 10, 15, 20
n25	FDD	15	5, 10, 15, 20, 25, 30,35,40
n38	FDD	30	10,15,20, 30, 40
n41	FDD	30	10,15,20,30,40,50,60,70,80,90,100
n77	TDD	30	10,15,20,30,40,50,60,70,80,90,100
n78	TDD	30	10,15,20,30,40,50,60,70,80,90,100

2) NR Bands Tune up:

Band	Antenna	DSI 0	DSI 1
		Tune-up Limit	Tune-up Limit
n2	Ant 1	24.0	19.4
n25		24.0	19.4
n2	Ant 2	24.0	17.0
n25		24.0	17.0
n38 PC3	Ant 2	24.0	20.0
n41 PC3		24.0	20.0
n41 PC2	Ant 2	27.0	20.0

Band	Antenna	DSI 0	DSI 1
		Tune-up Limit	Tune-up Limit
n77 PC3	Ant 4	24.0	19.0
n78 PC3		24.0	19.0
n77 PC2		27.0	19.0
n78 PC2		27.0	19.0
n77 PC3	Ant 6	24.0	17.2
n78 PC3		24.0	17.2
n77 PC2		27.0	17.2
n78 PC2		27.0	17.2

5. Smart Transmit feature for RF Exposure compliance

The FCC RF exposure limit is defined based on time-averaged RF exposure. The product implements Qualcomm Smart Transmit feature which controls the instantaneous transmitting power for WWAN transmitter to ensure the product in compliance with FCC RF exposure limit over a defined time window, for SAR (transmit frequency ≤ 6GHz). To control and manage transmitting power in real time and to ensure at all times the time-averaged RF exposure is compliant to the regulation requirement.

This report describes the procedures for the SAR char generation, and the parameters obtained from SAR characterization (referred to as SAR char, respectively) will be used as input for Smart Transmit. SAR char will be entered via the Embedded File System (EFS) version 19 to enable the Smart Transmit GEN1 Feature.

<Terminologies in this report>

P_{limit}	The time-averaged RF power which corresponds to SAR_design_target.
P_{max}	Maximum target power level
SAR_design_target:	The design target for SAR compliance. It should be less than regulatory SAR limit to account for all device design related uncertainty.
SAR char	P_{limit} for all the technologies/bands for all applicable DSI

<SAR Characterization>

SAR char must be generated to cover all radio configurations and usage scenarios that the wireless device supports for operating at 6 GHz or below. It will then be used as input for Smart Transmit to control and manage RF exposure for f < 6 GHz.

<SAR design target and uncertainty>

Item	Uncertainty dB (k=2)
Total uncertainty	1.0

To account for total uncertainty, SAR_design_target should be determined as:

$$SAR_design_target < SAR_{regulatory_limit} \times 10^{\frac{-total\ uncertainty}{10}}$$

The Smart Transmit algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of SAR_design_target, below the predefined time-averaged power limit, for each characterized technology and band.

Smart Transmit allows the device to transmit at higher power instantaneously, as high as Pmax, when needed, but enforces power limiting to maintain time-averaged transmit power to Plimit. Below table shows Plimit EFS settings and maximum tune up output power Pmax configured for this EUT for various transmit conditions (Device State Index DSI).

<P_{limit} for supported technologies and bands (P_{limit} in EFS file)>

Band	Antenna	DSI0	DSI1	Pmax*
LTE Band 2	Ant 2	23.0	16.0	23.0
LTE Band 7	ANT1	23.0	18.2	23.0
LTE Band 7	Ant 2	23.0	19.3	23.0
LTE Band 12/17	ANT1	23.0	21.0	23.0
LTE Band 14	ANT1	23.0	21.0	23.0
LTE Band 25/2	ANT1	23.0	18.0	23.0
LTE Band 26/5	ANT1	23.0	21.0	23.0
LTE Band 30	ANT1	22.0	17.4	22.0
LTE Band 30	Ant 2	22.0	18.8	22.0
LTE Band 66/4	ANT1	23.0	19.0	23.0
LTE Band 66/4	Ant 2	23.0	17.0	23.0
LTE Band 71	ANT1	23.0	21.0	23.0
LTE Band 41/38	ANT2	21.0	18.0	21.0
LTE Band 48	ANT4	18.5	18.0	18.5
FR1 n5	ANT1	23.0	21.0	23.0
FR1 n12	ANT1	23.0	21.0	23.0
FR1 n14	ANT1	23.0	21.0	23.0
FR1 n25/2	ANT1	23.0	18.4	23.0
FR1 n25/2	Ant 2	23.0	16.0	23.0
FR1 n30	ANT1	21.5	16.6	21.5
FR1 n66	ANT1	23.0	19.0	23.0
FR1 n66	Ant 2	23.0	17.4	23.0
FR1 n70	ANT1	23.0	19.0	23.0
FR1 n71	ANT1	23.0	21.0	23.0
FR1 n38	ANT2	23.0	19.0	23.0
FR1 n41(PC3)	ANT2	23.0	19.0	23.0
FR1 n41(PC2)	ANT2	26.0		26.0
FR1 n48	ANT4	20.5	17.8	20.5
FR1 n77/78(PC3)	ANT4	23.0	18.0	23.0
FR1 n77/78(PC2)	ANT4	26.0		26.0
FR1 n77/78(PC3)	ANT6	23.0	16.2	23.0
FR1 n77/78(PC2)	ANT6	26.0		26.0

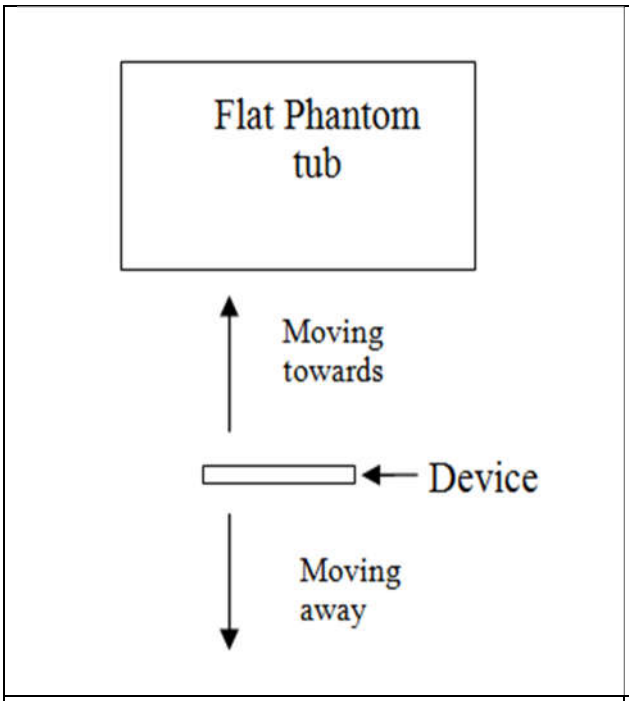
Note:

1. *P_{max} is used for RF tune up procedure. The maximum allowed output power is equal to Pmax + 1dB uncertainty.
2. **All P_{limit} power levels entered in the Table correspond to average power levels after accounting for duty cycle in the case TDD modulation schemes (for e.g., LTE TDD & NR TDD).
3. The max allowed output power is the P_{limit} + 1dB device uncertainty, and if P_{limit} is higher than P_{max}, the device output power will be P_{max} instead.

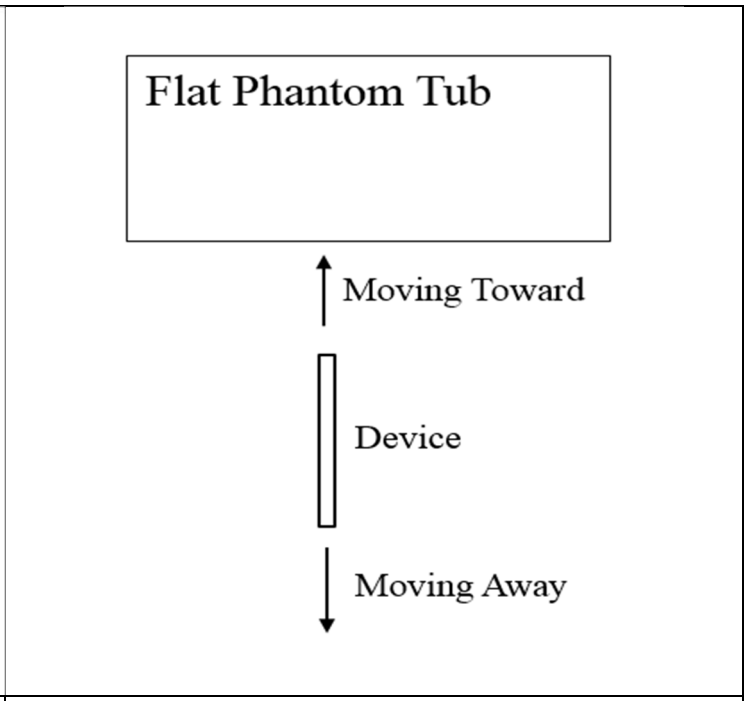
6. Proximity Sensor Triggering Test

<Proximity Sensor Triggering Distance>:

1. 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 and the tissue-equivalent medium for highest frequency (3980MHz) and lowest (750MHz) frequency was used for proximity sensor triggering testing.
2. Capacitive proximity sensors placed coincident with antenna elements at the top and bottom ends of the device are utilized to determine when the device comes in proximity of the user's body or finger or hand at the front/back/top /left/right side of the device.
3. The device employs proximity sensors also can detect the presence of the user's a finger or hand when handheld state at the front/back/top/left/right sides of the device. When front/back/top/left/right sides of handheld condition is detected reduced power will be active. The trigger distance shown in the sections below.
4. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance -1mm was performed.



Sensor/Handheld detection test set-up, Front and Back sides



Handheld detection test set-up, Left Side, Right Side and Top Side

<P-Sensor for ANT1&ANT2&ANT4&ANT6>

Proximity Sensor Triggering Distance (mm)										
Position	Front		Back		Left Side		Right Side		Top Side	
	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away	Moving towards	Moving away
Minimum	23	23	20	20	20	20	16	16	20	20

7. RF Exposure Limits

7.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

7.2 Controlled Environment

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). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

8. Specific Absorption Rate (SAR)

8.1 Introduction

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

8.2 SAR Definition

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

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

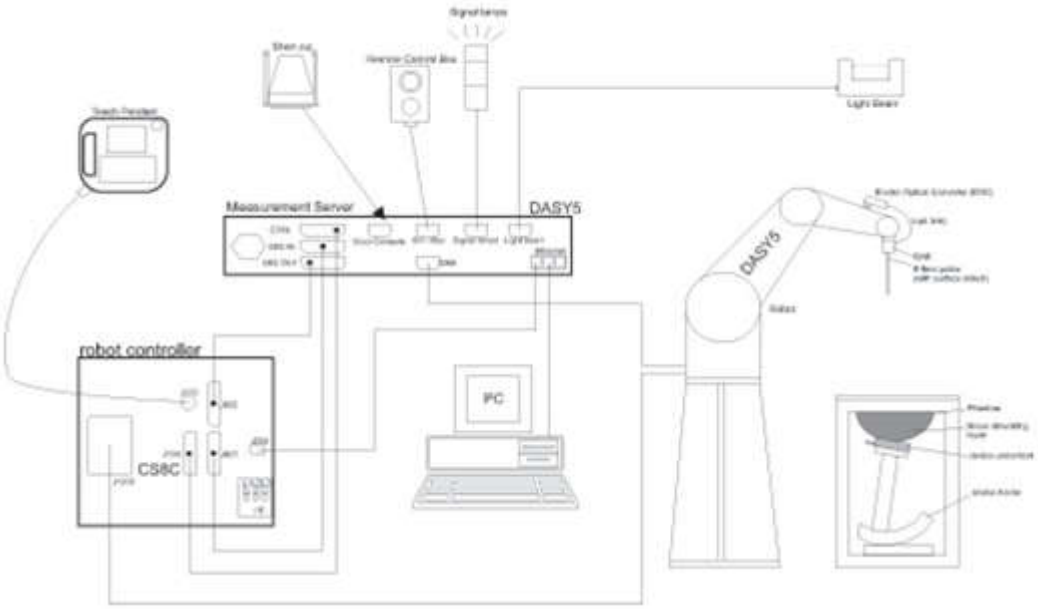
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

9. System Description and Setup

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- 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.
- 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.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

9.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	4 MHz – 10 GHz Linearity: ±0.2 dB (30 MHz – 10 GHz)
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 μW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 μW/g)
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

9.2 Data Acquisition Electronics (DAE)

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 DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Photo of DAE

9.3 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, 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>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)
Filling Volume	Approx. 30 liters
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm

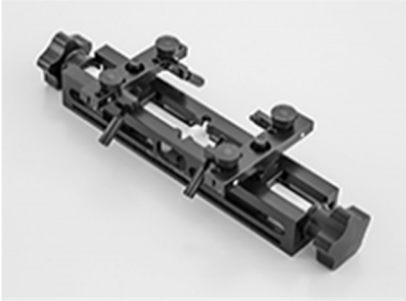
The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices or for evaluating transmitters operating at low frequencies. ELI is fully compatible with standard and all known tissue simulating liquids.

9.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body Transmitters>

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.

Mounting Device for Laptops

10. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

10.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

10.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

10.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

10.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

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

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

10.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

10.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

11. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1099	Dec. 15, 2021	Dec. 13, 2024
SPEAG	835MHz System Validation Kit	D835V2	4d162	Dec. 17, 2021	Dec. 15, 2024
SPEAG	1750MHz System Validation Kit	D1750V2	1137	Oct. 19, 2021	Oct. 17, 2024
SPEAG	1900MHz System Validation Kit	D1900V2	5d182	Dec. 20, 2021	Dec. 18, 2024
SPEAG	2300MHz System Validation Kit	D2300V2	1056	Oct. 20, 2021	Oct. 18, 2024
SPEAG	2600MHz System Validation Kit	D2600V2	1070	Dec. 20, 2021	Dec. 18, 2024
SPEAG	3500MHz System Validation Kit	D3500V2	1037	Nov. 20, 2023	Nov. 19, 2024
SPEAG	3700MHz System Validation Kit	D3700V2	1008	Nov. 20, 2023	Nov. 19, 2024
SPEAG	3900MHz System Validation Kit	D3900V2	1022	Aug. 18, 2022	Aug. 16, 2025
SPEAG	Data Acquisition Electronics	DAE4	1210	Jan. 15, 2024	Jan. 14, 2025
SPEAG	Dosimetric E-Field Probe	EX3DV4	7641	Jun. 03, 2024	Jun. 02, 2025
SPEAG	Dosimetric E-Field Probe	EX3DV4	7577	Dec. 13, 2023	Dec. 12, 2024
SPEAG	SAM Twin Phantom	QD 000 P40 CD	1795	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio communication analyzer	MT8820C	6201563813	Dec. 28, 2023	Dec. 27, 2024
Anritsu	Radio communication analyzer	MT8821C	6272416846	Apr. 08, 2024	Apr. 07, 2025
Anritsu	Radio communication analyzer	MT8821C	6272416863	Apr. 08, 2024	Apr. 07, 2025
Keysight	Network Analyzer	E5071C	MY46523671	Oct. 16, 2023	Oct. 15, 2024
Speag	Dielectric Assessment KIT	DAK-3.5	1071	Feb. 19, 2024	Feb. 18, 2025
Agilent	Signal Generator	N5181A	MY50145381	Dec. 28, 2023	Dec. 27, 2024
R&S	Signal Generator	SMB100A	175779	Dec. 28, 2023	Dec. 27, 2024
Anritsu	Power Senor	MA2411B	1306099	Oct. 16, 2023	Oct. 15, 2024
Anritsu	Power Meter	ML2495A	1349001	Oct. 16, 2023	Oct. 15, 2024
Anritsu	Power Sensor	MA2411B	1542004	Dec. 28, 2023	Dec. 27, 2024
Anritsu	Power Meter	ML2495A	1339473	Dec. 28, 2023	Dec. 27, 2024
R&S	Spectrum Analyzer	FSP7	100818	Jul. 04, 2024	Jul. 03, 2025
TES	Hygrometer	1310	200505600	Jul. 08, 2024	Jul. 07, 2025
Anymetre	Thermo-Hygrometer	JR593	2015030903	Jan. 02, 2024	Jan. 01, 2025
AR	Amplifier	5S1G4	0333096	Note 1	
Mini-Circuits	Amplifier	ZVE-3W-83+	599201528	Note 1	
Mini-Circuits	Amplifier	ZVA-183W-S+	726202215	Note 1	
SPEAG	Device Holder	N/A	N/A	Note 1	
ARRA	Power Divider	A3200-2	N/A	Note 1	
ET Industries	Dual Directional Coupler	C-058-10	N/A	Note 1	
Jinkexinhua	Attenuator	10db-8G	N/A	Note 1	

Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. The dipole calibration interval can be extended to 3 years with justification according to KDB 865664 D01. The dipoles are also not physically damaged, or repaired during the interval. The justification data in appendix C can be found which the return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration for each dipole.

12. System Verification

12.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.2.

Fig 10.2 Photo of Liquid Height for Body SAR

12.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	Head	22.4	0.886	42.969	0.89	41.90	-0.45	2.55	±5	2024/7/10
835	Head	22.3	0.942	42.874	0.90	41.50	4.67	3.31	±5	2024/7/12
1750	Head	22.1	1.352	41.215	1.37	40.10	-1.31	2.78	±5	2024/7/11
1900	Head	22.5	1.434	39.412	1.40	40.00	2.43	-1.47	±5	2024/7/15
2300	Head	22.3	1.709	38.879	1.67	39.50	2.34	-1.57	±5	2024/7/13
2600	Head	22.5	1.897	39.845	1.96	39.00	-3.21	2.17	±5	2024/7/14
3500	Head	22.2	2.851	37.179	2.91	37.90	-2.03	-1.90	±5	2024/7/16
3700	Head	22.4	3.006	36.927	3.12	37.70	-3.65	-2.05	±5	2024/7/17
3900	Head	22.3	3.259	36.702	3.33	37.51	-2.13	-2.15	±5	2024/7/18
750	Head	22.2	0.910	40.325	0.89	41.90	2.25	-3.76	±5	2024/7/23
835	Head	22.3	0.934	41.564	0.90	41.50	3.78	0.15	±5	2024/7/25
1750	Head	22.4	1.341	38.422	1.37	40.10	-2.12	-4.18	±5	2024/8/1
1900	Head	22.2	1.450	38.401	1.40	40.00	3.57	-4.00	±5	2024/8/8
2300	Head	22.1	1.694	40.217	1.67	39.50	1.44	1.82	±5	2024/7/29
2600	Head	22.2	1.961	39.760	1.96	39.00	0.05	1.95	±5	2024/7/19
3500	Head	22.1	2.856	36.514	2.91	37.90	-1.86	-3.66	±5	2024/7/27
3700	Head	22.4	3.008	36.210	3.12	37.70	-3.59	-3.95	±5	2024/7/28
3900	Head	22.3	3.255	35.972	3.33	37.51	-2.25	-4.10	±5	2024/7/26

12.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2024/7/10	750	Head	250	1099	7577	1210	2.150	8.540	8.6	0.70
2024/7/12	835	Head	250	4d162	7577	1210	2.630	9.640	10.52	9.13
2024/7/11	1750	Head	250	1137	7577	1210	9.050	36.500	36.2	-0.82
2024/7/15	1900	Head	250	5d182	7577	1210	10.500	39.600	42	6.06
2024/7/13	2300	Head	250	1056	7641	1210	12.500	48.800	50	2.46
2024/7/14	2600	Head	250	1070	7577	1210	14.600	56.200	58.4	3.91
2024/7/16	3500	Head	100	1037	7577	1210	6.330	65.400	63.3	-3.21
2024/7/17	3700	Head	100	1008	7577	1210	6.590	67.200	65.9	-1.93
2024/7/18	3900	Head	100	1022	7577	1210	6.550	66.400	65.5	-1.36
2024/7/23	750	Head	250	1099	7577	1210	2.250	8.540	9	5.39
2024/7/25	835	Head	250	4d162	7577	1210	2.580	9.640	10.32	7.05
2024/8/1	1750	Head	250	1137	7577	1210	9.070	36.500	36.28	-0.60
2024/8/8	1900	Head	250	5d182	7577	1210	10.500	39.600	42	6.06
2024/7/29	2300	Head	250	1056	7641	1210	12.200	48.800	48.8	0.00
2024/7/19	2600	Head	250	1070	7577	1210	14.000	56.200	56	-0.36
2024/7/27	3500	Head	100	1037	7577	1210	6.520	65.400	65.2	-0.31
2024/7/28	3700	Head	100	1008	7577	1210	6.930	67.200	69.3	3.12
2024/7/26	3900	Head	100	1022	7577	1210	6.810	66.400	68.1	2.56

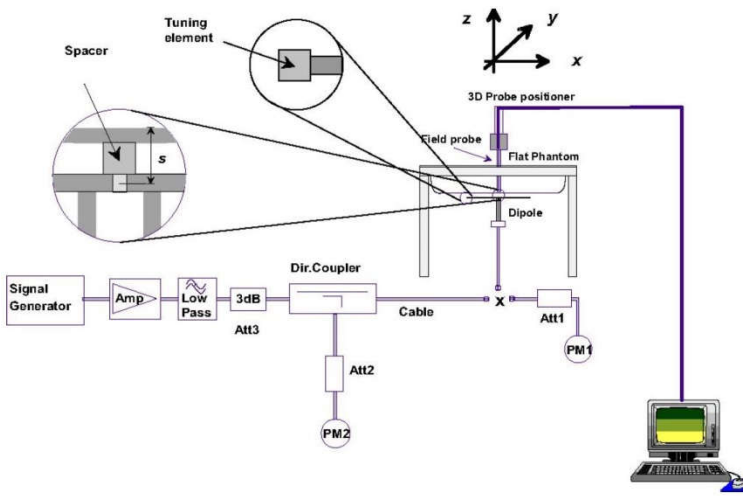


Fig 10.3.1 System Performance Check Setup

Fig 10.3.2 Setup Photo

13. RF Exposure Positions

This EUT was tested in different USB cable configurations. Both direct laptop plug-in and USB cable plug-in test configurations are tested with 5 cm separation between the particular dongle orientation and the flat phantom. Please refer to Appendix D for the test setup photos.

(a) To position the device parallel to the phantom surface with all surfaces of the device.

(b) To adjust the device parallel to the flat phantom.

(c) To adjust the distance between the device surface and the flat phantom to 5mm.

14. Conducted RF Output Power (Unit: dBm)

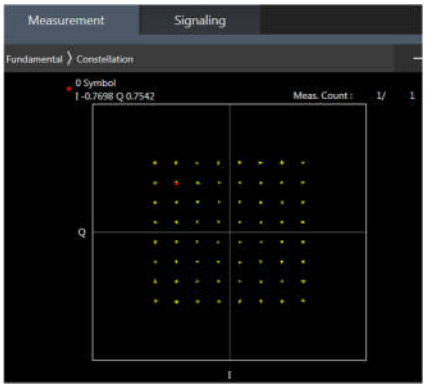
The detailed conducted power table can refer to Appendix E.

<LTE Conducted Power>

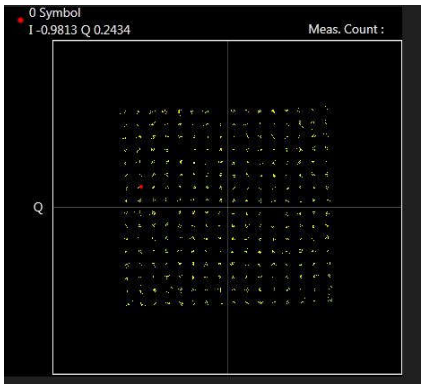
General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
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. Per KDB 941225 D05v02r05, 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.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, 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 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.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > not ½ 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; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE 4 / B5 / B12 / B17 / B26 / B38 / B71 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
9. LTE B2 /B4 /B5 / B17 / B38 SAR test was covered by B25 / B66 / B26 / B12 / B41; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
   b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band
10. According to May 2017 TCB workshop, for 16QAM and 64QAM, 256QAM should be verified by checking the signal constellation with a call box to avoid incorrect maximum power levels due to MPR and other requirements associated with signal modulation, and the following figure is taken from the "Fundamental Measurement >> Modulation Analysis >> constellation" mode of the device connect to the MT8821C base station, therefore, the device 256QAM, 64QAM and 16QAM signal modulation are correct.

16QAM



64QAM



256QAM

<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

SAR was tested with a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by 3GPP.

a. 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations
b. "special subframe S" contains both uplink and downlink transmissions, it has been taken into consideration to determine the transmission duty factor according to the worst case uplink and downlink cyclic prefix requirements for UpPTS
c. Establishing connections with base station simulators ensure a consistent means for testing SAR and recommended for evaluating SAR. The Anritsu MT8820C (firmware: #22.52#004) was used for LTE output power measurements and SAR testing.

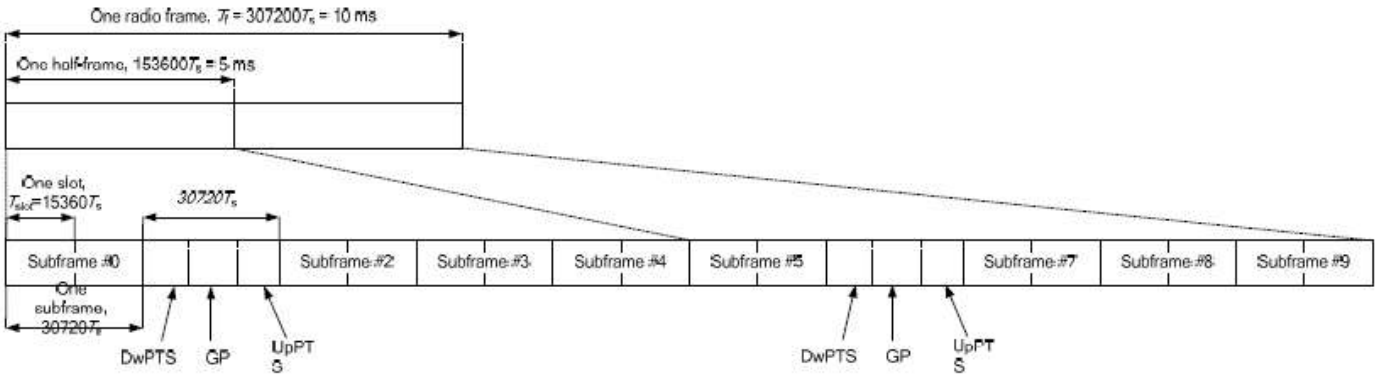


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: 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

Table 4.2-1: 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	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$		
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-

Special subframe (30720·T_s): Normal cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~4**	7.13%	8.33%
	5~9	14.3%	16.7%

Special subframe(30720·T_s): Extended cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~3**	7.13%	8.33%
	4~7	14.3%	16.7%

The highest duty factor is resulted from:

For LTE TDD Power class 3

i. Uplink-downlink configuration: 0. In a half-frame consisted of 5 subfames, uplink operation is in 3 uplink subframes and 1 special subframe.

ii. special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink

iii. for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.167)/5 = 63.3%

iv. for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.143)/5 = 62.9%

v. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The scaled TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.

<LTE Carrier Aggregation>

The detailed LTE Carrier Aggregation conducted power table can refer to Appendix F.

General Note:

1. This device supports Carrier Aggregation on downlink for inter and intra band. For the device supports bands and bandwidths and configurations are provided as follow table was according to 3GPP.
2. In applying the existing power measurement procedures of KDB 941225 D05A for DL CA SAR test exclusion, only the subset with the largest number of combinations of frequency bands and CCs in each row need combination, and for this device that all the configurations were choose to power measurement.
3. The gray color table is covered by other combinations and no need to verify power.
4. All permutations exist, no restrictions on Pcell & Scell combinations but Only LTE Band 29A is limited to Scell.

2CC Downlink Carrier Aggregation				3CC Downlink Carrier Aggregation				4CC Downlink Carrier Aggregation			
Number	Combination	4X4 MIMO	Covered by Measurement Superset	Number	Combination	4X4 MIMO	Covered by Measurement Superset	Number	Combination	4X4 MIMO	Covered by Measurement Superset
1	CA_2A-2A	2A-2A	3CC-1	1	CA_2A-2A-66A	2A-2A-4A	4CC-2	1	CA_2A-2A-4A-4A	4A-4A, 2A-2A	
2	CA_2A-4A	2A-4A	3CC-2	2	CA_2A-4A-4A	2A-4A-4A	4CC-1	2	CA_2A-2A-66A-66A	66A-66A, 2A-2A	
3	CA_2A-5A	2A	3CC-3	3	CA_2A-4A-5A	2A-4A		3	CA_2A-2A-66C	66C, 2A-2A	
4	CA_2A-66A	2A-66A	3CC-4	4	CA_2A-5A-66A	2A-66A		4	CA_5A-5A-66A-66A	66A-66A	
5	CA_4A-4A	4A-4A	3CC-2	5	CA_2A-5B	2A		5	CA_2A-2A-66B	66B, 2A-2A	
6	CA_4A-5A	4A	3CC-3	6	CA_2A-66A-66A	2A-66A-66A	4CC-2	6	CA_2A-2A-4A-12A	2A-2A, 4A	
7	CA_5A-66A	66A	3CC-4	7	CA_2A-66C	2A-66C	4CC-3	7	CA_2A-2A-12A-66A	2A-2A, 66A	
8	CA_66A-66A	66A-66A	3CC-6	8	CA_4A-5B	4A		8	CA_2A-4A-12B	2A-4A	
9	CA_66B	66B	3CC-11	9	CA_4A-48C	4A-48C		9	CA_2A-12A-66A-66A	66A-66A, 2A	
10	CA_66C	66C	3CC-7	10	CA_5A-66A-66A	66A-66A	4CC-4	10	CA_2A-66C-71A	66C, 2A	
11	CA_2A-71A	2A	3CC-20	11	CA_2A-66B	2A-66B	4CC-5	11	CA_4A-4A-12B	4A-4A	
12	CA_4A-71A	4A	3CC-20	12	CA_66A-66A-66A	66A-66A-66A		12	CA_12B-66A-66A	66A-66A	
13	CA_12B		3CC-18	13	CA_66A-66C	66A-66C		13	CA_2A-2A-4A-71A	2A-2A, 4A	
14	CA_66A-71A	66A	3CC-21	14	CA_2A-2A-12A	2A-2A	4CC-6	14	CA_2A-2A-66A-71A	2A-2A, 66A	
15	CA_41C	41C		15	CA_2A-4A-12A	2A-4A	4CC-6	15	CA_2A-66A-66A-71A	66A-66A, 2A	
16	CA_4A-12A	4A	3CC-17	17	CA_2A-12A-66A	2A-66A	4CC-7	16	CA_2A-12A-66C	66C, 2A	
17	CA_12A-66A	66A	3CC-16	17	CA_4A-4A-12A	4A-4A	4CC-17	17	CA_2A-4A-4A-12A	4A-4A, 2A	
18	CA_2A-12A	2A	3CC-16	18	CA_4A-12B	4A	4CC-8	18	CA_2C-66A-66A	66A-66A, 2C	
19	CA_2C	2C	3CC-27	19	CA_12A-66A-66A	66A-66A	4CC-9	19	CA_7C-66A-66A	66A-66A	
20	CA_2A-30A	2A-30A	3CC-31	20	CA_2A-4A-71A	2A-4A	4CC-13	20			
21	CA_4A-30A	4A-30A	3CC-33	21	CA_2A-66A-71A	2A-66A	4CC-14	21			
22	CA_5A-30A	30A	3CC-32	22	CA_66A-66A-71A	66A-66A	4CC-15	22			
23	CA_12A-30A	30A	3CC-33	23	CA_66C-71A	66C	4CC-10	23			
24	CA_30A-66A	30A-66A	3CC-35	24	CA_2A-2A-71A	2A-2A	4CC-13	24			
25	CA_4A-7A	4A		25	CA_4A-4A-71A	4A-4A		25			
26	CA_7C		4CC-20	26	CA_12A-66C	66C	4CC-16	26			
27	CA_2A-29A	2A	3CC-39	27	CA_2C-66A	2C-66A	4CC-18	27			
28	CA_4A-29A	4A	3CC-40	28	CA_5A-7A-66A	66A		28			
29	CA_29A-30A	30A	3CC-39	29	CA_2A-12A-30A	2A-30A		29			
30	CA_29A-66A	66A		30	CA_2A-5A-30A	2A-30A		30			
31				31	CA_4A-12A-30A	4A-30A		31			
32				32	CA_4A-5A-30A	4A-30A		32			
33				33	CA_5A-30A-66A	30A-66A		33			

34				34	CA_12A-30A-66A	30A-66A		34			
35				35	CA_7A-66A-66A	66A-66A		35			
36				36	CA_2A-2A-4A	2A-2A-4A	4CC-1	36			
37				37	CA_2A-29A-30A	2A-30A		37			
38				38	CA_4A-29A-30A	4A-30A		38			
39				39				39			

LTE Carrier Aggregation Conducted Power (Downlink)

i. According to KDB941225 D05A v01r02, Uplink maximum output power measurement with downlink carrier aggregation active should be measured, using the highest output channel measured without downlink carrier aggregation, to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output measured without downlink carrier aggregation active.

ii. Uplink maximum output power with downlink carrier aggregation active does not show more than ¼ dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded.

iii. The device supports downlink four carrier aggregation. For power measurement were control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.

iv. Selected highest measured power when downlink carrier aggregation is inactive for conducted power comparison with downlink carrier aggregation is active, 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 ¼ dB higher than the maximum output power measured when downlink carrier aggregation inactive.

v. For inter-band CA, the SCC selected highest bandwidth and near the middle of its transmission band. For SCC DL RB size and offset will base on the PCC corresponding RB allocation.

vi. For non-contiguous intra-band CA, the SCC selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band.

vii. For Intra-band, contiguous CA, 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.

$$\text{Nominal channel spacing} = \left\lfloor \frac{BW_{Channel(1)} + BW_{Channel(2)} - 0.1\left|BW_{Channel(1)} - BW_{Channel(2)}\right|}{0.6} \right\rfloor 0.3 \ \ [\text{MHz}]$$

LTE 4x4 MIMO (Downlink)

This device supports downlink 4x4 MIMO operations for LTE Band 2/4/66/7/41/30/48 only. Uplink transmission is limited to a single output stream. Power measurements were performed with downlink 4x4 MIMO active for the configuration with highest measured maximum conducted power with 4x4 downlink MIMO inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band.

Per FCC Guidance, SAR for downlink 4x4 MIMO was not needed since the maximum average output power in 4x4 downlink MIMO mode was not > 0.25 dB higher than the maximum output power with downlink 4x4 MIMO inactive. When carrier aggregation is applicable, power measurements were performed with the downlink carrier aggregation and 4x4 DL MIMO active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band.

4X4 MIMO	Band
	LTE Band 2/4/66/7/41/30/48

LTE Carrier Aggregation Conducted Power (Uplink)

LTE Uplink CA	2CC Uplink Carrier Aggregation
Intra-band	Antenna Tx
CA_2C	Ant 1
CA_5B	Ant 1
CA_7C	Ant 1
CA_12B	Ant 1
CA_66B	Ant 1
CA_66C	Ant 1
CA_41C	Ant 2

<Intra-band>

General Note:

i. The device supports intra-band uplink carrier aggregation for LTE B2/5/7/12/66/B41 with a maximum of two component carriers. For intra band contiguous carrier aggregation scenarios, 3GPP 36.101 table 6.2.2A-1 specifies that the aggregate maximum allowed output power is equivalent to the single carrier scenario. 3GPP 36.101 6.2.3A allows for several dB of MPR to be applied when not-contiguous RB allocation is implemented. The conducted power and MPR setting in this device are permanently implemented pre 3GPP requirement.

ii. The device supports uplink carrier aggregation with a maximum of two component carriers. For intra band contiguous carrier aggregation scenarios, 3GPP 36.101 table 6.2.2A-1 specifies that the aggregate maximum allowed output power is equivalent to the single carrier scenario. 3GPP 36.101 6.2.3A allows for several dB of MPR to be applied when not-contiguous RB allocation is implemented. The conducted power and MPR setting in this device are permanently implemented pre the 3GPP requirement.

iii. According Nov. 2017 TCB workshop, the output power with uplink CA active was measured for the configuration with the highest reported SAR with single carrier for each exposure condition. The power was measured with wideband signal integration over both component carriers.

iv. Additional SAR measurement for LTE UL CA whit other DL CA combinations active were not required since the maximum output power for this configuration was not > 0.25dB higher than the maximum output power for UL CA active.

v. LTE CA_66B test was covered by CA_66C; therefore, SAR was only assessed for CA_66C.

<Inter-band>

2CC Uplink Carrier Aggregation					
Inter-band	PCC	SCC	Inter CA	PCC	SCC
	TX Ant			TX Ant	
CA_2A-4A	Ant 1	Ant 2	CA_4A-2A	Ant 1	Ant 2
CA_2A-5A	Ant 2	Ant 1	CA_5A-2A	Ant 1	Ant 2
CA_2A-12A	Ant 2	Ant 1	CA_12A-2A	Ant 1	Ant 2
CA_2A-30A	Ant 1	Ant 2	CA_30A-2A	Ant 1	Ant 2
CA_2A-66A	Ant 1	Ant 2	CA_66A-2A	Ant 1	Ant 2
CA_2A-71A	Ant 2	Ant 1	CA_71A-2A	Ant 1	Ant 2
CA_4A-5A	Ant 2	Ant 1	CA_5A-4A	Ant 1	Ant 2
CA_4A-7A	Ant 1	Ant 2	CA_7A-4A	Ant 1	Ant 2
CA_4A-12A	Ant 2	Ant 1	CA_12A-4A	Ant 1	Ant 2
CA_4A-30A	Ant 1	Ant 2	CA_30A-4A	Ant 1	Ant 2
CA_4A-71A	Ant 2	Ant 1	CA_71A-4A	Ant 1	Ant 2
CA_5A-7A	Ant 1	Ant 2	CA_7A-5A	Ant 2	Ant 1
CA_5A-30A	Ant 1	Ant 2	CA_30A-5A	Ant 2	Ant 1
CA_5A-66A	Ant 1	Ant 2	CA_66A-5A	Ant 2	Ant 1
CA_7A-66A	Ant 1	Ant 2	CA_66A-7A	Ant 2	Ant 1
CA_12A-30A	Ant 1	Ant 2	CA_30A-12A	Ant 2	Ant 1
CA_12A-66A	Ant 1	Ant 2	CA_66A-12A	Ant 2	Ant 1
CA_30A-66A	Ant 1	Ant 2	CA_30A-66A	Ant 1	Ant 2
CA_66A-71A	Ant 2	Ant 1	CA_71A-66A	Ant 1	Ant 2

General Note:

1. The single carrier of inter band CA uplink power level is the same as Non-CA standalone LTE power level.
2. The product implements Qualcomm Smart Transmit feature which controls the instantaneous transmitting power for WWAN transmitter to ensure the product in compliance with FCC RF exposure limit over a defined time window, for SAR (transmit frequency ≤ 6GHz). To control and manage transmitting power in real time and to ensure at all times the time-averaged RF exposure is compliant to the regulation requirement.
3. For LTE inter-band CA mode, Qualcomm Smart Transmit algorithm in WWAN adds directly the time-averaged RF exposure between two LTE bands. Smart Transmit algorithm controls the total RF exposure base on LTE inter CA bands to not exceed FCC limit.

5G NR Output Power (Unit: dBm)

General Note:

1. 5G NR n2/n5/n12/n14/n25/n30/n66/n70/n71/n38/n41/n48/n77/n78 is SA mode.
2. 5G NR n2/n5/n25/n66/n71/n41/n77/n78 is NSA mode.
3. For 5G NR test procedure was following step similar FCC KDB 941225 D05:
   a. For DFT-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class2 and 3, the CP-OFDM mode will not higher than DFT-OFDM mode, therefore, similar FCC KDB 941225 D05 procedure for other modulation output power for each RB allocation configuration is > not ½ dB higher than the same configuration in DFT-QPSK and the reported SAR for the DFT-QPSK configuration is ≤ 1.45 W/kg; CP-OFDM testing is not required.
   b. For DFT-OFDM output power measurement reduction, according to 38.101 maximum power reduction for power class2 and 3, for 16QAM/64QAM/256QAM and smaller bandwidth output power will spot check largest channel bandwidth worst RB configuration to ensure the 16QAM/64QAM/256QAM and smaller bandwidth output power will not ½ dB higher than the same configuration in the 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. PI/2 BPSK/16QAM/64QAM/256QAM output powers according to 3GPP MPR will not ½ dB higher than the same configuration in QPSK, also reported SAR for the QPSK configuration is less than 1.45 W/kg, PI/2 BPSK/16QAM /64QAM/256QAM SAR testing are not required.
   g. Smaller bandwidth output power for each RB allocation configuration for this device will not ½ 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
4. For 5G NR test, using FTM (Factory Test Mode) to perform SAR with default 100% transmission.
5. NSA and SA mode should perform SAR separately. For the maximum power of NSA mode is the same as SA total power level, so SA SAR can represent NSA mode SAR.
6. 5GNR NSA mode, the power level is the same as 5GNR SA mode, so 5GNR NSA mode and SA mode power table only show one time.
7. 5G NR supports CP-OFDM and DFT-s-OFDM modulation, for DFT-s-OFDM power is higher than CP-OFDM, so only show DFT-s-OFDM power table and chose DFT-s-OFDM to perform SAR testing.
8. For DFT-s-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for the CP-OFDM mode will not higher than DFT-s-OFDM mode, therefore, CP-OFDM measurement is unnecessary.
9. 5GNR n41/n77/n78 supports HPUE, HPUE power and SAR testing performed separately.
10. 5G NR n41/n77/n78 HPUE with higher power, so 5GNR n41/n77/n78 HPUE SAR can represent power class 3 level SAR.
11. 5G NR n77/78 supports UL MIMO.

<3GPP 38.101 MPR for EN-DC>

Table 6.2.2-1 Maximum power reduction (MPR) for power class 3

Modulation		MPR (dB)		
		Edge RB allocations	Outer RB allocations	Inner RB allocations
DFT-s-OFDM	Pi/2 BPSK	≤ 3.5[1]	≤ 1.2[1]	≤ 0.2[1]
		≤ 0.5[2]	≤ 0.5[2]	0[2]
	QPSK	≤ 1		0
	16 QAM	≤ 2		≤ 1
	64 QAM	≤ 2.5		
	256 QAM	≤ 4.5		
CP-OFDM	QPSK	≤ 3		≤ 1.5
	16 QAM	≤ 3		≤ 2
	64 QAM	≤ 3.5		
	256 QAM	≤ 6.5		

NOTE 1: Applicable for UE operating in TDD mode with Pi/2 BPSK modulation and UE indicates support for UE capability *powerBoosting-pi2BPSK* and if the IE *powerBoostPi2BPSK* is set to 1 and 40 % or less slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79. The reference power of 0 dB MPR is 26 dBm.

NOTE 2: Applicable for UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79 with Pi/2 BPSK modulation and if the IE *powerBoostPi2BPSK* is set to 0 and if more than 40 % of slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79.

Table 6.2.2-2 Maximum power reduction (MPR) for power class 2

Modulation		MPR (dB)		
		Edge RB allocations	Outer RB allocations	Inner RB allocations
DFT-s-OFDM	Pi/2 BPSK	≤ 3.5	≤ 0.5	0
	QPSK	≤ 3.5	≤ 1	0
	16 QAM	≤ 3.5	≤ 2	≤ 1
	64 QAM	≤ 3.5	≤ 2.5	
	256 QAM	≤ 4.5		
CP-OFDM	QPSK	≤ 3.5	≤ 3	≤ 1.5
	16 QAM	≤ 3.5	≤ 3	≤ 2
	64 QAM	≤ 3.5		
	256 QAM	≤ 6.5		

<EN-DC combination>:

ENDC	Antenna Tx	
	LTE TX	NR TX
DC_2A_n5A	Ant 2	Ant 1
DC_2A_n66A	Ant 1	Ant 2
DC_2A_n71A	Ant 2	Ant 1
DC_2A_n41A	Ant 1	Ant 2
DC_2A_n77A	Ant 1	Ant 4
DC_5A_n2A	Ant 1	Ant 2
DC_5A_n77A	Ant 1	Ant 4
DC_7A_n71A	Ant 2	Ant 1
DC_7A_n78A	Ant 1	Ant 4
DC_12A_n2A	Ant 1	Ant 2
DC_12A_n66A	Ant 1	Ant 2
DC_12A_n77A	Ant 1	Ant 4
DC_14A_n2A	Ant 1	Ant 2
DC_14A_n66A	Ant 1	Ant 2
DC_14A_n77A	Ant 1	Ant 4
DC_30A_n2A	Ant 1	Ant 2
DC_30A_n5A	Ant 2	Ant 1
DC_30A_n66A	Ant 1	Ant 2
DC_30A_n77A	Ant 1	Ant 4
DC_66A_n2A	Ant 1	Ant 2
DC_66A_n5A	Ant 2	Ant 1
DC_66A_n25A	Ant 1	Ant 2
DC_66A_n71A	Ant 2	Ant 1
DC_66A_n41A	Ant 1	Ant 2
DC_66A_n77A	Ant 1	Ant 4
DC_66A_n78A	Ant 1	Ant 4

NR UL MIMO Bands Configuration:

NR UL MIMO	TX Ant
FR1 n77	Ant 4+6
FR1 n78	Ant 4+6

15. Antenna Location

The detailed antenna location information can refer to SAR Test Setup Photos.

16. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   c. For TDD LTE SAR measurement of power class 3, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The reported TDD LTE SAR (W/kg) = Measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
4. The device implements proximity sensor detection for SAR compliance at different exposure conditions (body) and the Qualcomm smart transmit will manage to ensure the power level not exceeding the associated power table. Details about the sensor detection are provided in the operational description. And the device will invoke corresponding work scenarios power level base on frequency bands/antennas, which can refer to power table at appendix E.
5. Although the distance 1gSAR is greater than 0.8 W/kg at body exposure conditions, the distance SAR verified the worst of the non-distance SAR and less than non-distance SAR, so there is no need to be tested other channels.
6. According to Nov. 2017 TCB workshop, when the reported 1gSAR for UL CA configuration is <1.2 W/kg, UL CA 1gSAR is not required for all required test channels (PCC based).
7. SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 447498 D01v06.
8. The following table “n/a” in the result means the SAR cube is too small to be detected.

LTE Note:

1. Per KDB 941225 D05v02r05, 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.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, 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 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. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > not ½ 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; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B4 / B5 / B12 / B17 / B38 / B71 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
7. LTE B2 /B4 /B5 / B17 / B38 SAR test was covered by B25 / B66 / B26 / B12 / B41; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if.
   a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
   b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band

5G NR Note:

For 5G NR test procedure was following step similar FCC KDB 941225 D05:

a. 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.

b. 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure

c. 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.

d. PI/2 BPSK/16QAM/64QAM/256QAM output powers according to 3GPP MPR will not ½ dB higher than the same configuration in QPSK, also reported SAR for the QPSK configuration is less than 1.45 W/kg, PI/2 BPSK/16QAM /64QAM/256QAM SAR testing are not required.

e. Smaller bandwidth output power for each RB allocation configuration for this device will not ½ 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.

f. For 5G FR1 n5/n66/n38/n41/n77 the maximum bandwidth does not support three non-overlapping channels, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

DSI status description:

The device has the following DSI state which used at different exposure condition.

This WWAN bands enabled with Qualcomm Smart Transmit feature which located at chapter 5. The default power is Pmax power, When Plimit power higher than Pmax power, the output power will be limited at pmax, so the SAR will be used pmax power to do the testing.

Exposure Condition	DSI	Trigger conditions
Body Mode SAR	DSI 1	Sensor On
Sensor off SAR	DSI 0	Sensor Off

16.1 Body SAR

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	USB cable	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
750MHz																					
01	LTE Band 71	20M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	133297	680.5	USB Cable2	20.75	22.00	1.334	-	-	0.08	0.640	**0.853**
	LTE Band 71	20M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	133297	680.5	USB Cable1	20.75	22.00	1.334	-	-	0.05	0.570	0.760
	LTE Band 71	20M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	133297	680.5	USB Cable2	20.75	22.00	1.334	-	-	0.14	0.563	0.751
	LTE Band 71	20M	QPSK	1	0	-	Left Side	5mm	Ant 1	DSI 1	133297	680.5	USB Cable2	20.75	22.00	1.334	-	-	0.05	0.237	0.316
	LTE Band 71	20M	QPSK	1	0	-	Right Side	5mm	Ant 1	DSI 1	133297	680.5	USB Cable2	20.75	22.00	1.334	-	-	-0.12	0.404	0.539
	LTE Band 71	20M	QPSK	1	0	-	Top Side	5mm	Ant 1	DSI 1	133297	680.5	USB Cable2	20.75	22.00	1.334	-	-	-0.12	0.306	0.408
	LTE Band 71	20M	QPSK	1	0	-	Front	22mm	Ant 1	DSI 0	133297	680.5	USB Cable2	23.01	24.00	1.256	-	-	-0.17	0.219	0.275
	LTE Band 71	20M	QPSK	1	0	-	Back	19mm	Ant 1	DSI 0	133297	680.5	USB Cable2	23.01	24.00	1.256	-	-	0.11	0.222	0.279
	LTE Band 71	20M	QPSK	1	0	-	Left Side	19mm	Ant 1	DSI 0	133297	680.5	USB Cable2	23.01	24.00	1.256	-	-	-	n/a	n/a
	LTE Band 71	20M	QPSK	1	0	-	Right Side	15mm	Ant 1	DSI 0	133297	680.5	USB Cable2	23.01	24.00	1.256	-	-	-0.06	0.176	0.221
	LTE Band 71	20M	QPSK	1	0	-	Top Side	19mm	Ant 1	DSI 0	133297	680.5	USB Cable2	23.01	24.00	1.256	-	-	-0.17	0.084	0.106
	LTE Band 71	20M	QPSK	50	0	-	Front	5mm	Ant 1	DSI 1	133297	680.5	USB Cable2	20.50	22.00	1.413	-	-	0.08	0.600	0.848
	LTE Band 71	20M	QPSK	50	0	-	Back	5mm	Ant 1	DSI 1	133297	680.5	USB Cable2	20.50	22.00	1.413	-	-	-0.06	0.546	0.771
	LTE Band 71	20M	QPSK	50	0	-	Left Side	5mm	Ant 1	DSI 1	133297	680.5	USB Cable2	20.50	22.00	1.413	-	-	0.13	0.243	0.343
	LTE Band 71	20M	QPSK	50	0	-	Right Side	5mm	Ant 1	DSI 1	133297	680.5	USB Cable2	20.50	22.00	1.413	-	-	-0.05	0.413	0.583
	LTE Band 71	20M	QPSK	50	0	-	Top Side	5mm	Ant 1	DSI 1	133297	680.5	USB Cable2	20.50	22.00	1.413	-	-	-0.11	0.313	0.442
	LTE Band 71	20M	QPSK	100	0	-	Front	5mm	Ant 1	DSI 1	133297	680.5	USB Cable2	20.52	22.00	1.406	-	-	-0.13	0.597	0.839
02	LTE Band 12	10M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	23095	707.5	USB Cable2	20.93	22.00	1.279	-	-	-0.17	0.678	**0.867**
	LTE Band 12	10M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	23095	707.5	USB Cable1	20.93	22.00	1.279	-	-	0.08	0.633	0.810
	LTE Band 12B	10M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	23048 23120	702.8 710	USB Cable2	20.49	22.00	1.416	-	-	0.15	0.611	0.865
	LTE Band 12	10M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	23095	707.5	USB Cable2	20.93	22.00	1.279	-	-	-0.08	0.626	0.801
	LTE Band 12	10M	QPSK	1	0	-	Left Side	5mm	Ant 1	DSI 1	23095	707.5	USB Cable2	20.93	22.00	1.279	-	-	0.13	0.353	0.452
	LTE Band 12	10M	QPSK	1	0	-	Right Side	5mm	Ant 1	DSI 1	23095	707.5	USB Cable2	20.93	22.00	1.279	-	-	-0.12	0.380	0.486
	LTE Band 12	10M	QPSK	1	0	-	Top Side	5mm	Ant 1	DSI 1	23095	707.5	USB Cable2	20.93	22.00	1.279	-	-	0.03	0.369	0.472
	LTE Band 12	10M	QPSK	1	0	-	Front	22mm	Ant 1	DSI 0	23095	707.5	USB Cable2	22.85	24.00	1.303	-	-	-0.04	0.204	0.266
	LTE Band 12	10M	QPSK	1	0	-	Back	19mm	Ant 1	DSI 0	23095	707.5	USB Cable2	22.85	24.00	1.303	-	-	-0.05	0.200	0.261
	LTE Band 12	10M	QPSK	1	0	-	Left Side	19mm	Ant 1	DSI 0	23095	707.5	USB Cable2	22.85	24.00	1.303	-	-	-	n/a	n/a
	LTE Band 12	10M	QPSK	1	0	-	Right Side	15mm	Ant 1	DSI 0	23095	707.5	USB Cable2	22.85	24.00	1.303	-	-	0.04	0.204	0.266
	LTE Band 12	10M	QPSK	1	0	-	Top Side	19mm	Ant 1	DSI 0	23095	707.5	USB Cable2	22.85	24.00	1.303	-	-	-0.14	0.089	0.116
	LTE Band 12	10M	QPSK	25	0	-	Front	5mm	Ant 1	DSI 1	23095	707.5	USB Cable2	20.91	22.00	1.285	-	-	-0.02	0.673	0.865
	LTE Band 12	10M	QPSK	25	0	-	Back	5mm	Ant 1	DSI 1	23095	707.5	USB Cable2	20.91	22.00	1.285	-	-	-0.16	0.620	0.797
	LTE Band 12	10M	QPSK	25	0	-	Left Side	5mm	Ant 1	DSI 1	23095	707.5	USB Cable2	20.91	22.00	1.285	-	-	-0.14	0.361	0.464
	LTE Band 12	10M	QPSK	25	0	-	Right Side	5mm	Ant 1	DSI 1	23095	707.5	USB Cable2	20.91	22.00	1.285	-	-	-0.05	0.389	0.500
	LTE Band 12	10M	QPSK	25	0	-	Top Side	5mm	Ant 1	DSI 1	23095	707.5	USB Cable2	20.91	22.00	1.285	-	-	0.01	0.378	0.486
	LTE Band 12	10M	QPSK	50	0	-	Front	5mm	Ant 1	DSI 1	23095	707.5	USB Cable2	20.83	22.00	1.309	-	-	0.05	0.649	0.850
	LTE Band 12	10M	QPSK	50	0	-	Back	5mm	Ant 1	DSI 1	23095	707.5	USB Cable2	20.83	22.00	1.309	-	-	-0.04	0.603	0.789
03	LTE Band 14	10M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	23330	793	USB Cable2	21.08	22.00	1.236	-	-	0.16	0.566	**0.700**
	LTE Band 14	10M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	23330	793	USB Cable1	21.08	22.00	1.236	-	-	0.01	0.514	0.635
	LTE Band 14	10M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	23330	793	USB Cable2	21.08	22.00	1.236	-	-	0.19	0.519	0.641
	LTE Band 14	10M	QPSK	1	0	-	Left Side	5mm	Ant 1	DSI 1	23330	793	USB Cable2	21.08	22.00	1.236	-	-	0.19	0.293	0.362
	LTE Band 14	10M	QPSK	1	0	-	Right Side	5mm	Ant 1	DSI 1	23330	793	USB Cable2	21.08	22.00	1.236	-	-	-0.01	0.323	0.399
	LTE Band 14	10M	QPSK	1	0	-	Top Side	5mm	Ant 1	DSI 1	23330	793	USB Cable2	21.08	22.00	1.236	-	-	-0.05	0.308	0.381
	LTE Band 14	10M	QPSK	1	0	-	Front	22mm	Ant 1	DSI 0	23330	793	USB Cable2	23.09	24.00	1.233	-	-	-0.11	0.210	0.259
	LTE Band 14	10M	QPSK	1	0	-	Back	19mm	Ant 1	DSI 0	23330	793	USB Cable2	23.09	24.00	1.233	-	-	0.04	0.200	0.247
	LTE Band 14	10M	QPSK	1	0	-	Left Side	19mm	Ant 1	DSI 0	23330	793	USB Cable2	23.09	24.00	1.233	-	-	-	n/a	n/a
	LTE Band 14	10M	QPSK	1	0	-	Right Side	15mm	Ant 1	DSI 0	23330	793	USB Cable2	23.09	24.00	1.233	-	-	0.12	0.159	0.196
	LTE Band 14	10M	QPSK	1	0	-	Top Side	19mm	Ant 1	DSI 0	23330	793	USB Cable2	23.09	24.00	1.233	-	-	-0.02	0.066	0.081
	LTE Band 14	10M	QPSK	25	0	-	Front	5mm	Ant 1	DSI 1	23330	793	USB Cable2	21.05	22.00	1.245	-	-	0.05	0.545	0.678
	LTE Band 14	10M	QPSK	25	0	-	Back	5mm	Ant 1	DSI 1	23330	793	USB Cable2	21.05	22.00	1.245	-	-	0.08	0.537	0.668

	LTE Band 14	10M	QPSK	25	0	-	Left Side	5mm	Ant 1	DSI 1	23330	793	USB Cable2	21.05	22.00	1.245	-	-	-0.05	0.303	0.377
	LTE Band 14	10M	QPSK	25	0	-	Right Side	5mm	Ant 1	DSI 1	23330	793	USB Cable2	21.05	22.00	1.245	-	-	-0.11	0.334	0.416
	LTE Band 14	10M	QPSK	25	0	-	Top Side	5mm	Ant 1	DSI 1	23330	793	USB Cable2	21.05	22.00	1.245	-	-	-0.1	0.319	0.397
04	FR1 n71	20M	QPSK	1	1	DFT-15	Front	5mm	Ant 1	DSI 1	136100	680.5	USB Cable2	21.04	22.00	1.247	-	-	0.07	0.688	**0.858**
	FR1 n71	20M	QPSK	1	1	DFT-15	Front	5mm	Ant 1	DSI 1	136100	680.5	USB Cable1	21.04	22.00	1.247	-	-	0.17	0.659	0.822
	FR1 n71	20M	QPSK	1	1	DFT-15	Back	5mm	Ant 1	DSI 1	136100	680.5	USB Cable2	21.04	22.00	1.247	-	-	-0.03	0.636	0.793
	FR1 n71	20M	QPSK	1	1	DFT-15	Left Side	5mm	Ant 1	DSI 1	136100	680.5	USB Cable2	21.04	22.00	1.247	-	-	-0.11	0.405	0.505
	FR1 n71	20M	QPSK	1	1	DFT-15	Right Side	5mm	Ant 1	DSI 1	136100	680.5	USB Cable2	21.04	22.00	1.247	-	-	0.13	0.510	0.636
	FR1 n71	20M	QPSK	1	1	DFT-15	Top Side	5mm	Ant 1	DSI 1	136100	680.5	USB Cable2	21.04	22.00	1.247	-	-	-0.14	0.474	0.591
	FR1 n71	20M	QPSK	1	1	DFT-15	Front	22mm	Ant 1	DSI 0	136100	680.5	USB Cable2	23.04	24.00	1.247	-	-	-0.09	0.124	0.155
	FR1 n71	20M	QPSK	1	1	DFT-15	Back	19mm	Ant 1	DSI 0	136100	680.5	USB Cable2	23.04	24.00	1.247	-	-	-0.17	0.134	0.167
	FR1 n71	20M	QPSK	1	1	DFT-15	Left Side	19mm	Ant 1	DSI 0	136100	680.5	USB Cable2	23.04	24.00	1.247	-	-	-0.02	0.099	0.123
	FR1 n71	20M	QPSK	1	1	DFT-15	Right Side	15mm	Ant 1	DSI 0	136100	680.5	USB Cable2	23.04	24.00	1.247	-	-	0.19	0.101	0.126
	FR1 n71	20M	QPSK	1	1	DFT-15	Top Side	19mm	Ant 1	DSI 0	136100	680.5	USB Cable2	23.04	24.00	1.247	-	-	-	n/a	n/a
	FR1 n71	20M	QPSK	50	28	DFT-15	Front	5mm	Ant 1	DSI 1	136100	680.5	USB Cable2	21.02	22.00	1.253	-	-	0.11	0.672	0.842
	FR1 n71	20M	QPSK	50	28	DFT-15	Back	5mm	Ant 1	DSI 1	136100	680.5	USB Cable2	21.02	22.00	1.253	-	-	-0.06	0.622	0.779
	FR1 n71	20M	QPSK	50	28	DFT-15	Left Side	5mm	Ant 1	DSI 1	136100	680.5	USB Cable2	21.02	22.00	1.253	-	-	-0.1	0.396	0.496
	FR1 n71	20M	QPSK	50	28	DFT-15	Right Side	5mm	Ant 1	DSI 1	136100	680.5	USB Cable2	21.02	22.00	1.253	-	-	-0.19	0.498	0.624
	FR1 n71	20M	QPSK	50	28	DFT-15	Top Side	5mm	Ant 1	DSI 1	136100	680.5	USB Cable2	21.02	22.00	1.253	-	-	-0.19	0.463	0.580
	FR1 n71	20M	QPSK	100	0	DFT-15	Front	5mm	Ant 1	DSI 1	136100	680.5	USB Cable2	20.98	22.00	1.265	-	-	0.19	0.633	0.801
05	FR1 n12	15M	QPSK	1	1	DFT-15	Front	5mm	Ant 1	DSI 1	141500	707.5	USB Cable2	21.05	22.00	1.245	-	-	0.12	0.793	**0.987**
	FR1 n12	15M	QPSK	1	1	DFT-15	Front	5mm	Ant 1	DSI 1	141500	707.5	USB Cable1	21.05	22.00	1.245	-	-	0.17	0.755	0.940
	FR1 n12	15M	QPSK	1	1	DFT-15	Back	5mm	Ant 1	DSI 1	141500	707.5	USB Cable2	21.05	22.00	1.245	-	-	-0.05	0.669	0.833
	FR1 n12	15M	QPSK	1	1	DFT-15	Left Side	5mm	Ant 1	DSI 1	141500	707.5	USB Cable2	21.05	22.00	1.245	-	-	0.1	0.334	0.416
	FR1 n12	15M	QPSK	1	1	DFT-15	Right Side	5mm	Ant 1	DSI 1	141500	707.5	USB Cable2	21.05	22.00	1.245	-	-	0.11	0.405	0.504
	FR1 n12	15M	QPSK	1	1	DFT-15	Top Side	5mm	Ant 1	DSI 1	141500	707.5	USB Cable2	21.05	22.00	1.245	-	-	0.06	0.355	0.442
	FR1 n12	15M	QPSK	1	1	DFT-15	Front	22mm	Ant 1	DSI 0	141500	707.5	USB Cable2	23.06	24.00	1.242	-	-	-0.06	0.193	0.240
	FR1 n12	15M	QPSK	1	1	DFT-15	Back	19mm	Ant 1	DSI 0	141500	707.5	USB Cable2	23.06	24.00	1.242	-	-	-0.03	0.114	0.142
	FR1 n12	15M	QPSK	1	1	DFT-15	Left Side	19mm	Ant 1	DSI 0	141500	707.5	USB Cable2	23.06	24.00	1.242	-	-	0.13	0.158	0.196
	FR1 n12	15M	QPSK	1	1	DFT-15	Right Side	15mm	Ant 1	DSI 0	141500	707.5	USB Cable2	23.06	24.00	1.242	-	-	-0.15	0.172	0.214
	FR1 n12	15M	QPSK	1	1	DFT-15	Top Side	19mm	Ant 1	DSI 0	141500	707.5	USB Cable2	23.06	24.00	1.242	-	-	-	n/a	n/a
	FR1 n12	15M	QPSK	36	22	DFT-15	Front	5mm	Ant 1	DSI 1	141500	707.5	USB Cable2	21.03	22.00	1.250	-	-	-0.02	0.766	0.958
	FR1 n12	15M	QPSK	36	22	DFT-15	Back	5mm	Ant 1	DSI 1	141500	707.5	USB Cable2	21.03	22.00	1.250	-	-	-0.19	0.693	0.866
	FR1 n12	15M	QPSK	36	22	DFT-15	Left Side	5mm	Ant 1	DSI 1	141500	707.5	USB Cable2	21.03	22.00	1.250	-	-	0.06	0.346	0.433
	FR1 n12	15M	QPSK	36	22	DFT-15	Right Side	5mm	Ant 1	DSI 1	141500	707.5	USB Cable2	21.03	22.00	1.250	-	-	-0.12	0.419	0.524
	FR1 n12	15M	QPSK	36	22	DFT-15	Top Side	5mm	Ant 1	DSI 1	141500	707.5	USB Cable2	21.03	22.00	1.250	-	-	-0.05	0.367	0.459
	FR1 n12	15M	QPSK	75	0	DFT-15	Front	5mm	Ant 1	DSI 1	141500	707.5	USB Cable2	20.92	22.00	1.282	-	-	0.07	0.729	0.935
	FR1 n12	15M	QPSK	75	0	DFT-15	Back	5mm	Ant 1	DSI 1	141500	707.5	USB Cable2	20.92	22.00	1.282	-	-	-0.08	0.631	0.809
06	FR1 n14	10M	QPSK	1	1	DFT-15	Front	5mm	Ant 1	DSI 1	158600	793	USB Cable2	21.03	22.00	1.250	-	-	-0.12	0.637	**0.796**
	FR1 n14	10M	QPSK	1	1	DFT-15	Front	5mm	Ant 1	DSI 1	158600	793	USB Cable1	21.03	22.00	1.250	-	-	-0.1	0.565	0.706
	FR1 n14	10M	QPSK	1	1	DFT-15	Back	5mm	Ant 1	DSI 1	158600	793	USB Cable2	21.03	22.00	1.250	-	-	-0.08	0.622	0.778
	FR1 n14	10M	QPSK	1	1	DFT-15	Left Side	5mm	Ant 1	DSI 1	158600	793	USB Cable2	21.03	22.00	1.250	-	-	-0.08	0.273	0.341
	FR1 n14	10M	QPSK	1	1	DFT-15	Right Side	5mm	Ant 1	DSI 1	158600	793	USB Cable2	21.03	22.00	1.250	-	-	-0.09	0.348	0.435
	FR1 n14	10M	QPSK	1	1	DFT-15	Top Side	5mm	Ant 1	DSI 1	158600	793	USB Cable2	21.03	22.00	1.250	-	-	0.18	0.315	0.394
	FR1 n14	10M	QPSK	1	1	DFT-15	Front	22mm	Ant 1	DSI 0	158600	793	USB Cable2	23.08	24.00	1.236	-	-	-0.05	0.149	0.184
	FR1 n14	10M	QPSK	1	1	DFT-15	Back	19mm	Ant 1	DSI 0	158600	793	USB Cable2	23.08	24.00	1.236	-	-	0	0.182	0.225
	FR1 n14	10M	QPSK	1	1	DFT-15	Left Side	19mm	Ant 1	DSI 0	158600	793	USB Cable2	23.08	24.00	1.236	-	-	0.02	0.145	0.179
	FR1 n14	10M	QPSK	1	1	DFT-15	Right Side	15mm	Ant 1	DSI 0	158600	793	USB Cable2	23.08	24.00	1.236	-	-	-0.12	0.149	0.184
	FR1 n14	10M	QPSK	1	1	DFT-15	Top Side	19mm	Ant 1	DSI 0	158600	793	USB Cable2	23.08	24.00	1.236	-	-	-	n/a	n/a
	FR1 n14	10M	QPSK	25	14	DFT-15	Front	5mm	Ant 1	DSI 1	158600	793	USB Cable2	21.02	22.00	1.253	-	-	-0.18	0.615	0.771
	FR1 n14	10M	QPSK	25	14	DFT-15	Back	5mm	Ant 1	DSI 1	158600	793	USB Cable2	21.02	22.00	1.253	-	-	0.05	0.601	0.753
	FR1 n14	10M	QPSK	25	14	DFT-15	Left Side	5mm	Ant 1	DSI 1	158600	793	USB Cable2	21.02	22.00	1.253	-	-	0.16	0.264	0.331
	FR1 n14	10M	QPSK	25	14	DFT-15	Right Side	5mm	Ant 1	DSI 1	158600	793	USB Cable2	21.02	22.00	1.253	-	-	-0.09	0.336	0.421
	FR1 n14	10M	QPSK	25	14	DFT-15	Top Side	5mm	Ant 1	DSI 1	158600	793	USB Cable2	21.02	22.00	1.253	-	-	0.08	0.304	0.381
835MHz																					
	LTE Band 26	15M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	26865	831.5	USB Cable2	20.95	22.00	1.274	-	-	-0.17	0.473	0.602

07	LTE Band 26	15M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	26865	831.5	USB Cable2	20.95	22.00	1.274	-	-	-0.13	0.495	**0.630**
	LTE Band 26	15M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	26865	831.5	USB Cable1	20.95	22.00	1.274	-	-	-0.11	0.429	0.546
	LTE Band 5B	10M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	20575 20476	841.5 831.6	USB Cable2	20.72	22.00	1.343	-	-	0.03	0.409	0.549
	LTE Band 26	15M	QPSK	1	0	-	Left Side	5mm	Ant 1	DSI 1	26865	831.5	USB Cable2	20.95	22.00	1.274	-	-	0.08	0.250	0.318
	LTE Band 26	15M	QPSK	1	0	-	Right Side	5mm	Ant 1	DSI 1	26865	831.5	USB Cable2	20.95	22.00	1.274	-	-	0.19	0.275	0.350
	LTE Band 26	15M	QPSK	1	0	-	Top Side	5mm	Ant 1	DSI 1	26865	831.5	USB Cable2	20.95	22.00	1.274	-	-	0.14	0.293	0.373
	LTE Band 26	15M	QPSK	1	0	-	Front	22mm	Ant 1	DSI 0	26865	831.5	USB Cable2	22.97	24.00	1.268	-	-	-0.14	0.190	0.241
	LTE Band 26	15M	QPSK	1	0	-	Back	19mm	Ant 1	DSI 0	26865	831.5	USB Cable2	22.97	24.00	1.268	-	-	0	0.186	0.236
	LTE Band 26	15M	QPSK	1	0	-	Left Side	19mm	Ant 1	DSI 0	26865	831.5	USB Cable2	22.97	24.00	1.268	-	-	-	n/a	n/a
	LTE Band 26	15M	QPSK	1	0	-	Right Side	15mm	Ant 1	DSI 0	26865	831.5	USB Cable2	22.97	24.00	1.268	-	-	-0.04	0.154	0.195
	LTE Band 26	15M	QPSK	1	0	-	Top Side	19mm	Ant 1	DSI 0	26865	831.5	USB Cable2	22.97	24.00	1.268	-	-	-	n/a	n/a
	LTE Band 26	15M	QPSK	36	0	-	Front	5mm	Ant 1	DSI 1	26865	831.5	USB Cable2	20.92	22.00	1.282	-	-	0.16	0.452	0.580
	LTE Band 26	15M	QPSK	36	0	-	Back	5mm	Ant 1	DSI 1	26865	831.5	USB Cable2	20.92	22.00	1.282	-	-	0.03	0.473	0.607
	LTE Band 26	15M	QPSK	36	0	-	Left Side	5mm	Ant 1	DSI 1	26865	831.5	USB Cable2	20.92	22.00	1.282	-	-	-0.02	0.262	0.336
	LTE Band 26	15M	QPSK	36	0	-	Right Side	5mm	Ant 1	DSI 1	26865	831.5	USB Cable2	20.92	22.00	1.282	-	-	0.15	0.272	0.349
	LTE Band 26	15M	QPSK	36	0	-	Top Side	5mm	Ant 1	DSI 1	26865	831.5	USB Cable2	20.92	22.00	1.282	-	-	-0.08	0.307	0.394
	FR1 n5	20M	QPSK	1	1	DFT-15	Front	5mm	Ant 1	DSI 1	167300	836.5	USB Cable2	21.12	22.00	1.225	-	-	-0.06	0.501	0.614
08	FR1 n5	20M	QPSK	1	1	DFT-15	Back	5mm	Ant 1	DSI 1	167300	836.5	USB Cable2	21.12	22.00	1.225	-	-	-0.05	0.546	**0.669**
	FR1 n5	20M	QPSK	1	1	DFT-15	Back	5mm	Ant 1	DSI 1	167300	836.5	USB Cable1	21.12	22.00	1.225	-	-	-0.06	0.530	0.649
	FR1 n5	20M	QPSK	1	1	DFT-15	Left Side	5mm	Ant 1	DSI 1	167300	836.5	USB Cable2	21.12	22.00	1.225	-	-	0.07	0.275	0.337
	FR1 n5	20M	QPSK	1	1	DFT-15	Right Side	5mm	Ant 1	DSI 1	167300	836.5	USB Cable2	21.12	22.00	1.225	-	-	0.13	0.312	0.382
	FR1 n5	20M	QPSK	1	1	DFT-15	Top Side	5mm	Ant 1	DSI 1	167300	836.5	USB Cable2	21.12	22.00	1.225	-	-	-0.07	0.409	0.501
	FR1 n5	20M	QPSK	1	1	DFT-15	Front	22mm	Ant 1	DSI 0	167300	836.5	USB Cable2	23.15	24.00	1.216	-	-	0.14	0.144	0.175
	FR1 n5	20M	QPSK	1	1	DFT-15	Back	19mm	Ant 1	DSI 0	167300	836.5	USB Cable2	23.15	24.00	1.216	-	-	-0.05	0.167	0.203
	FR1 n5	20M	QPSK	1	1	DFT-15	Left Side	19mm	Ant 1	DSI 0	167300	836.5	USB Cable2	23.15	24.00	1.216	-	-	-0.12	0.125	0.152
	FR1 n5	20M	QPSK	1	1	DFT-15	Right Side	15mm	Ant 1	DSI 0	167300	836.5	USB Cable2	23.15	24.00	1.216	-	-	0.1	0.139	0.169
	FR1 n5	20M	QPSK	1	1	DFT-15	Top Side	19mm	Ant 1	DSI 0	167300	836.5	USB Cable2	23.15	24.00	1.216	-	-	-	n/a	n/a
	FR1 n5	20M	QPSK	50	28	DFT-15	Front	5mm	Ant 1	DSI 1	167300	836.5	USB Cable2	21.07	22.00	1.239	-	-	-0.14	0.490	0.607
	FR1 n5	20M	QPSK	50	28	DFT-15	Back	5mm	Ant 1	DSI 1	167300	836.5	USB Cable2	21.07	22.00	1.239	-	-	-0.15	0.533	0.660
	FR1 n5	20M	QPSK	50	28	DFT-15	Left Side	5mm	Ant 1	DSI 1	167300	836.5	USB Cable2	21.07	22.00	1.239	-	-	-0.14	0.282	0.349
	FR1 n5	20M	QPSK	50	28	DFT-15	Right Side	5mm	Ant 1	DSI 1	167300	836.5	USB Cable2	21.07	22.00	1.239	-	-	0.14	0.319	0.395
	FR1 n5	20M	QPSK	50	28	DFT-15	Top Side	5mm	Ant 1	DSI 1	167300	836.5	USB Cable2	21.07	22.00	1.239	-	-	-0.02	0.418	0.518
1750MHz																					
	LTE Band 66	20M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	132322	1745	USB Cable2	18.94	20.00	1.276	-	-	0.1	0.596	0.761
	LTE Band 66	20M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	132322	1745	USB Cable1	18.94	20.00	1.276	-	-	-0.13	0.581	0.742
	LTE Band 66C	20M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	132322 132124	1745 1725.2	USB Cable2	18.63	20.00	1.371	-	-	0.06	0.533	0.731
	LTE Band 66	20M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	132322	1745	USB Cable2	18.94	20.00	1.276	-	-	0.15	0.514	0.656
	LTE Band 66	20M	QPSK	1	0	-	Left Side	5mm	Ant 1	DSI 1	132322	1745	USB Cable2	18.94	20.00	1.276	-	-	-0.09	0.111	0.142
	LTE Band 66	20M	QPSK	1	0	-	Right Side	5mm	Ant 1	DSI 1	132322	1745	USB Cable2	18.94	20.00	1.276	-	-	0.18	0.427	0.545
	LTE Band 66	20M	QPSK	1	0	-	Top Side	5mm	Ant 1	DSI 1	132322	1745	USB Cable2	18.94	20.00	1.276	-	-	-0.03	0.385	0.491
	LTE Band 66	20M	QPSK	1	0	-	Front	22mm	Ant 1	DSI 0	132322	1745	USB Cable2	22.85	24.00	1.303	-	-	-0.17	0.215	0.280
	LTE Band 66	20M	QPSK	1	0	-	Back	19mm	Ant 1	DSI 0	132322	1745	USB Cable2	22.85	24.00	1.303	-	-	0.04	0.191	0.249
	LTE Band 66	20M	QPSK	1	0	-	Left Side	19mm	Ant 1	DSI 0	132322	1745	USB Cable2	22.85	24.00	1.303	-	-	-	n/a	n/a
	LTE Band 66	20M	QPSK	1	0	-	Right Side	15mm	Ant 1	DSI 0	132322	1745	USB Cable2	22.85	24.00	1.303	-	-	0.17	0.240	0.313
	LTE Band 66	20M	QPSK	1	0	-	Top Side	19mm	Ant 1	DSI 0	132322	1745	USB Cable2	22.85	24.00	1.303	-	-	-0.13	0.082	0.107
	LTE Band 66	20M	QPSK	50	0	-	Front	5mm	Ant 1	DSI 1	132322	1745	USB Cable2	18.93	20.00	1.279	-	-	-0.13	0.581	0.743
	LTE Band 66	20M	QPSK	50	0	-	Back	5mm	Ant 1	DSI 1	132322	1745	USB Cable2	18.93	20.00	1.279	-	-	0.14	0.539	0.690
	LTE Band 66	20M	QPSK	50	0	-	Left Side	5mm	Ant 1	DSI 1	132322	1745	USB Cable2	18.93	20.00	1.279	-	-	-0.04	0.116	0.148
	LTE Band 66	20M	QPSK	50	0	-	Right Side	5mm	Ant 1	DSI 1	132322	1745	USB Cable2	18.93	20.00	1.279	-	-	0.13	0.454	0.581
	LTE Band 66	20M	QPSK	50	0	-	Top Side	5mm	Ant 1	DSI 1	132322	1745	USB Cable2	18.93	20.00	1.279	-	-	0.08	0.387	0.495
	LTE Band 66	20M	QPSK	1	0	-	Front	5mm	Ant 2	DSI 1	132322	1745	USB Cable2	16.52	18.00	1.406	-	-	-0.18	0.642	0.903
	LTE Band 66	20M	QPSK	1	0	-	Back	5mm	Ant 2	DSI 1	132322	1745	USB Cable2	16.52	18.00	1.406	-	-	0	0.422	0.593
	LTE Band 66	20M	QPSK	1	0	-	Left Side	5mm	Ant 2	DSI 1	132322	1745	USB Cable2	16.52	18.00	1.406	-	-	-0.1	0.069	0.097
	LTE Band 66	20M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	132322	1745	USB Cable2	16.52	18.00	1.406	-	-	-0.01	0.220	0.309
	LTE Band 66	20M	QPSK	1	0	-	Top Side	5mm	Ant 2	DSI 1	132322	1745	USB Cable2	16.52	18.00	1.406	-	-	0.04	0.013	0.018

	LTE Band 66	20M	QPSK	1	0	-	Front	5mm	Ant 2	DSI 1	132072	1720	USB Cable2	16.40	18.00	1.445	-	-	-0.16	0.610	0.882
09	LTE Band 66	20M	QPSK	1	0	-	Front	5mm	Ant 2	DSI 1	132572	1770	USB Cable2	16.44	18.00	1.432	-	-	0.06	0.678	**0.971**
	LTE Band 66	20M	QPSK	1	0	-	Front	5mm	Ant 2	DSI 1	132572	1770	USB Cable1	16.44	18.00	1.432	-	-	-0.01	0.633	0.907
	LTE Band 66	20M	QPSK	1	0	-	Front	22mm	Ant 2	DSI 0	132322	1745	USB Cable2	22.45	24.00	1.429	-	-	-0.14	0.117	0.167
	LTE Band 66	20M	QPSK	1	0	-	Back	19mm	Ant 2	DSI 0	132322	1745	USB Cable2	22.45	24.00	1.429	-	-	0.14	0.093	0.133
	LTE Band 66	20M	QPSK	1	0	-	Left Side	19mm	Ant 2	DSI 0	132322	1745	USB Cable2	22.45	24.00	1.429	-	-	-	n/a	n/a
	LTE Band 66	20M	QPSK	1	0	-	Right Side	15mm	Ant 2	DSI 0	132322	1745	USB Cable2	22.45	24.00	1.429	-	-	-0.16	0.080	0.114
	LTE Band 66	20M	QPSK	1	0	-	Top Side	19mm	Ant 2	DSI 0	132322	1745	USB Cable2	22.45	24.00	1.429	-	-	-	n/a	n/a
	LTE Band 66	20M	QPSK	50	0	-	Front	5mm	Ant 2	DSI 1	132322	1745	USB Cable2	16.50	18.00	1.413	-	-	0.1	0.665	0.939
	LTE Band 66	20M	QPSK	50	0	-	Back	5mm	Ant 2	DSI 1	132322	1745	USB Cable2	16.50	18.00	1.413	-	-	-0.15	0.437	0.617
	LTE Band 66	20M	QPSK	50	0	-	Left Side	5mm	Ant 2	DSI 1	132322	1745	USB Cable2	16.50	18.00	1.413	-	-	-0.12	0.071	0.100
	LTE Band 66	20M	QPSK	50	0	-	Right Side	5mm	Ant 2	DSI 1	132322	1745	USB Cable2	16.50	18.00	1.413	-	-	-0.11	0.228	0.322
	LTE Band 66	20M	QPSK	50	0	-	Top Side	5mm	Ant 2	DSI 1	132322	1745	USB Cable2	16.50	18.00	1.413	-	-	0.08	0.013	0.018
	LTE Band 66	20M	QPSK	50	0	-	Front	5mm	Ant 2	DSI 1	132072	1720	USB Cable2	16.38	18.00	1.452	-	-	-0.07	0.631	0.916
	LTE Band 66	20M	QPSK	50	0	-	Front	5mm	Ant 2	DSI 1	132572	1770	USB Cable2	16.42	18.00	1.439	-	-	0.19	0.651	0.937
	LTE Band 66	20M	QPSK	100	0	-	Front	5mm	Ant 2	DSI 1	132322	1745	USB Cable2	16.48	18.00	1.419	-	-	0.14	0.641	0.910
10	FR1 n66	40M	QPSK	1	1	DFT-15	Front	5mm	Ant 1	DSI 1	349000	1745	USB Cable2	19.08	20.00	1.236	-	-	-0.02	0.789	**0.975**
	FR1 n66	40M	QPSK	1	1	DFT-15	Front	5mm	Ant 1	DSI 1	349000	1745	USB Cable1	19.08	20.00	1.236	-	-	0.15	0.728	0.900
	FR1 n66	40M	QPSK	1	1	DFT-15	Back	5mm	Ant 1	DSI 1	349000	1745	USB Cable2	19.08	20.00	1.236	-	-	-0.01	0.714	0.882
	FR1 n66	40M	QPSK	1	1	DFT-15	Left Side	5mm	Ant 1	DSI 1	349000	1745	USB Cable2	19.08	20.00	1.236	-	-	0.09	0.158	0.195
	FR1 n66	40M	QPSK	1	1	DFT-15	Right Side	5mm	Ant 1	DSI 1	349000	1745	USB Cable2	19.08	20.00	1.236	-	-	0.14	0.597	0.738
	FR1 n66	40M	QPSK	1	1	DFT-15	Top Side	5mm	Ant 1	DSI 1	349000	1745	USB Cable2	19.08	20.00	1.236	-	-	-0.06	0.378	0.467
	FR1 n66	40M	QPSK	1	1	DFT-15	Front	22mm	Ant 1	DSI 0	349000	1745	USB Cable2	23.05	24.00	1.245	-	-	0.02	0.073	0.091
	FR1 n66	40M	QPSK	1	1	DFT-15	Back	19mm	Ant 1	DSI 0	349000	1745	USB Cable2	23.05	24.00	1.245	-	-	-0.11	0.066	0.082
	FR1 n66	40M	QPSK	1	1	DFT-15	Left Side	19mm	Ant 1	DSI 0	349000	1745	USB Cable2	23.05	24.00	1.245	-	-	-	n/a	n/a
	FR1 n66	40M	QPSK	1	1	DFT-15	Right Side	15mm	Ant 1	DSI 0	349000	1745	USB Cable2	23.05	24.00	1.245	-	-	-0.05	0.112	0.139
	FR1 n66	40M	QPSK	1	1	DFT-15	Top Side	19mm	Ant 1	DSI 0	349000	1745	USB Cable2	23.05	24.00	1.245	-	-	-	n/a	n/a
	FR1 n66	40M	QPSK	108	54	DFT-15	Front	5mm	Ant 1	DSI 1	349000	1745	USB Cable2	19.05	20.00	1.245	-	-	-0.04	0.771	0.960
	FR1 n66	40M	QPSK	108	54	DFT-15	Back	5mm	Ant 1	DSI 1	349000	1745	USB Cable2	19.05	20.00	1.245	-	-	-0.16	0.731	0.910
	FR1 n66	40M	QPSK	108	54	DFT-15	Left Side	5mm	Ant 1	DSI 1	349000	1745	USB Cable2	19.05	20.00	1.245	-	-	0.05	0.162	0.202
	FR1 n66	40M	QPSK	108	54	DFT-15	Right Side	5mm	Ant 1	DSI 1	349000	1745	USB Cable2	19.05	20.00	1.245	-	-	-0.03	0.611	0.760
	FR1 n66	40M	QPSK	108	54	DFT-15	Top Side	5mm	Ant 1	DSI 1	349000	1745	USB Cable2	19.05	20.00	1.245	-	-	-0.19	0.387	0.482
	FR1 n66	40M	QPSK	216	0	DFT-15	Front	5mm	Ant 1	DSI 1	349000	1745	USB Cable2	19.01	20.00	1.256	-	-	-0.11	0.753	0.946
	FR1 n66	40M	QPSK	216	0	DFT-15	Back	5mm	Ant 1	DSI 1	349000	1745	USB Cable2	19.01	20.00	1.256	-	-	-0.19	0.685	0.860
	FR1 n66	40M	QPSK	1	1	DFT-15	Front	5mm	Ant 2	DSI 1	349000	1745	USB Cable2	17.83	18.40	1.140	-	-	0.18	0.817	0.932
	FR1 n66	40M	QPSK	1	1	DFT-15	Front	5mm	Ant 2	DSI 1	349000	1745	USB Cable1	17.83	18.40	1.140	-	-	0.01	0.781	0.891
	FR1 n66	40M	QPSK	1	1	DFT-15	Back	5mm	Ant 2	DSI 1	349000	1745	USB Cable2	17.83	18.40	1.140	-	-	0.1	0.536	0.611
	FR1 n66	40M	QPSK	1	1	DFT-15	Left Side	5mm	Ant 2	DSI 1	349000	1745	USB Cable2	17.83	18.40	1.140	-	-	-0.18	0.052	0.059
	FR1 n66	40M	QPSK	1	1	DFT-15	Right Side	5mm	Ant 2	DSI 1	349000	1745	USB Cable2	17.83	18.40	1.140	-	-	0.07	0.266	0.303
	FR1 n66	40M	QPSK	1	1	DFT-15	Top Side	5mm	Ant 2	DSI 1	349000	1745	USB Cable2	17.83	18.40	1.140	-	-	0.01	0.019	0.022
	FR1 n66	40M	QPSK	1	1	DFT-15	Front	22mm	Ant 2	DSI 0	349000	1745	USB Cable2	22.75	24.00	1.334	-	-	0.14	0.125	0.167
	FR1 n66	40M	QPSK	1	1	DFT-15	Back	19mm	Ant 2	DSI 0	349000	1745	USB Cable2	22.75	24.00	1.334	-	-	-0.17	0.094	0.125
	FR1 n66	40M	QPSK	1	1	DFT-15	Left Side	19mm	Ant 2	DSI 0	349000	1745	USB Cable2	22.75	24.00	1.334	-	-	-	n/a	n/a
	FR1 n66	40M	QPSK	1	1	DFT-15	Right Side	15mm	Ant 2	DSI 0	349000	1745	USB Cable2	22.75	24.00	1.334	-	-	-0.09	0.071	0.095
	FR1 n66	40M	QPSK	1	1	DFT-15	Top Side	19mm	Ant 2	DSI 0	349000	1745	USB Cable2	22.75	24.00	1.334	-	-	-	n/a	n/a
	FR1 n66	40M	QPSK	108	54	DFT-15	Front	5mm	Ant 2	DSI 1	349000	1745	USB Cable2	17.76	18.40	1.159	-	-	0.07	0.775	0.898
	FR1 n66	40M	QPSK	108	54	DFT-15	Back	5mm	Ant 2	DSI 1	349000	1745	USB Cable2	17.76	18.40	1.159	-	-	-0.05	0.577	0.669
	FR1 n66	40M	QPSK	108	54	DFT-15	Left Side	5mm	Ant 2	DSI 1	349000	1745	USB Cable2	17.76	18.40	1.159	-	-	-0.04	0.057	0.066
	FR1 n66	40M	QPSK	108	54	DFT-15	Right Side	5mm	Ant 2	DSI 1	349000	1745	USB Cable2	17.76	18.40	1.159	-	-	-0.16	0.292	0.338
	FR1 n66	40M	QPSK	108	54	DFT-15	Top Side	5mm	Ant 2	DSI 1	349000	1745	USB Cable2	17.76	18.40	1.159	-	-	0.08	0.022	0.025
	FR1 n66	40M	QPSK	216	0	DFT-15	Front	5mm	Ant 2	DSI 1	349000	1745	USB Cable2	17.72	18.40	1.169	-	-	0.12	0.794	0.929
11	FR1 n70	15M	QPSK	1	1	DFT-15	Front	5mm	Ant 1	DSI 1	340500	1702.5	USB Cable2	19.01	20.00	1.256	-	-	-0.16	0.558	**0.701**
	FR1 n70	15M	QPSK	1	1	DFT-15	Front	5mm	Ant 1	DSI 1	340500	1702.5	USB Cable1	19.01	20.00	1.256	-	-	0.05	0.504	0.633
	FR1 n70	15M	QPSK	1	1	DFT-15	Back	5mm	Ant 1	DSI 1	340500	1702.5	USB Cable2	19.01	20.00	1.256	-	-	-0.18	0.433	0.544
	FR1 n70	15M	QPSK	1	1	DFT-15	Left Side	5mm	Ant 1	DSI 1	340500	1702.5	USB Cable2	19.01	20.00	1.256	-	-	-0.12	0.092	0.116
	FR1 n70	15M	QPSK	1	1	DFT-15	Right Side	5mm	Ant 1	DSI 1	340500	1702.5	USB Cable2	19.01	20.00	1.256	-	-	0	0.424	0.533

	FR1 n70	15M	QPSK	1	1	DFT-15	Top Side	5mm	Ant 1	DSI 1	340500	1702.5	USB Cable2	19.01	20.00	1.256	-	-	0.03	0.324	0.407
	FR1 n70	15M	QPSK	1	1	DFT-15	Front	22mm	Ant 1	DSI 0	340500	1702.5	USB Cable2	23.03	24.00	1.250	-	-	-0.05	0.064	0.080
	FR1 n70	15M	QPSK	1	1	DFT-15	Back	19mm	Ant 1	DSI 0	340500	1702.5	USB Cable2	23.03	24.00	1.250	-	-	0.1	0.060	0.075
	FR1 n70	15M	QPSK	1	1	DFT-15	Left Side	19mm	Ant 1	DSI 0	340500	1702.5	USB Cable2	23.03	24.00	1.250	-	-	-	n/a	n/a
	FR1 n70	15M	QPSK	1	1	DFT-15	Right Side	15mm	Ant 1	DSI 0	340500	1702.5	USB Cable2	23.03	24.00	1.250	-	-	0.03	0.089	0.111
	FR1 n70	15M	QPSK	1	1	DFT-15	Top Side	19mm	Ant 1	DSI 0	340500	1702.5	USB Cable2	23.03	24.00	1.250	-	-	-	n/a	n/a
	FR1 n70	15M	QPSK	36	22	DFT-15	Front	5mm	Ant 1	DSI 1	340500	1702.5	USB Cable2	18.96	20.00	1.271	-	-	0.05	0.545	0.692
	FR1 n70	15M	QPSK	36	22	DFT-15	Back	5mm	Ant 1	DSI 1	340500	1702.5	USB Cable2	18.96	20.00	1.271	-	-	-0.19	0.443	0.563
	FR1 n70	15M	QPSK	36	22	DFT-15	Left Side	5mm	Ant 1	DSI 1	340500	1702.5	USB Cable2	18.96	20.00	1.271	-	-	0.06	0.094	0.119
	FR1 n70	15M	QPSK	36	22	DFT-15	Right Side	5mm	Ant 1	DSI 1	340500	1702.5	USB Cable2	18.96	20.00	1.271	-	-	-0.05	0.434	0.551
	FR1 n70	15M	QPSK	36	22	DFT-15	Top Side	5mm	Ant 1	DSI 1	340500	1702.5	USB Cable2	18.96	20.00	1.271	-	-	-0.12	0.332	0.422
1900MHz																					
	LTE Band 2	20M	QPSK	1	0	-	Front	5mm	Ant 2	DSI 1	18900	1880	USB Cable2	16.12	17.00	1.225	-	-	0.01	0.745	0.912
	LTE Band 2	20M	QPSK	1	0	-	Back	5mm	Ant 2	DSI 1	18900	1880	USB Cable2	16.12	17.00	1.225	-	-	0.15	0.508	0.622
	LTE Band 2	20M	QPSK	1	0	-	Left Side	5mm	Ant 2	DSI 1	18900	1880	USB Cable2	16.12	17.00	1.225	-	-	0.12	0.084	0.103
	LTE Band 2	20M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	18900	1880	USB Cable2	16.12	17.00	1.225	-	-	-0.04	0.326	0.399
	LTE Band 2	20M	QPSK	1	0	-	Top Side	5mm	Ant 2	DSI 1	18900	1880	USB Cable2	16.12	17.00	1.225	-	-	0.08	0.074	0.091
	LTE Band 2	20M	QPSK	1	0	-	Front	5mm	Ant 2	DSI 1	18700	1860	USB Cable2	16.11	17.00	1.227	-	-	0.02	0.739	0.907
12	LTE Band 2	20M	QPSK	1	0	-	Front	5mm	Ant 2	DSI 1	19100	1900	USB Cable2	16.10	17.00	1.230	-	-	0.03	0.803	**0.988**
	LTE Band 2	20M	QPSK	1	0	-	Front	5mm	Ant 2	DSI 1	19100	1900	USB Cable1	16.10	17.00	1.230	-	-	-0.06	0.768	0.945
	LTE Band 2	20M	QPSK	1	0	-	Front	22mm	Ant 2	DSI 0	18900	1880	USB Cable2	22.66	24.00	1.361	-	-	-0.03	0.156	0.212
	LTE Band 2	20M	QPSK	1	0	-	Back	19mm	Ant 2	DSI 0	18900	1880	USB Cable2	22.66	24.00	1.361	-	-	-0.04	0.139	0.189
	LTE Band 2	20M	QPSK	1	0	-	Left Side	19mm	Ant 2	DSI 0	18900	1880	USB Cable2	22.66	24.00	1.361	-	-	-	n/a	n/a
	LTE Band 2	20M	QPSK	1	0	-	Right Side	15mm	Ant 2	DSI 0	18900	1880	USB Cable2	22.66	24.00	1.361	-	-	0.15	0.165	0.225
	LTE Band 2	20M	QPSK	1	0	-	Top Side	19mm	Ant 2	DSI 0	18900	1880	USB Cable2	22.66	24.00	1.361	-	-	-	n/a	n/a
	LTE Band 2	20M	QPSK	50	0	-	Front	5mm	Ant 2	DSI 1	18900	1880	USB Cable2	16.10	17.00	1.230	-	-	0.07	0.745	0.917
	LTE Band 2	20M	QPSK	50	0	-	Back	5mm	Ant 2	DSI 1	18900	1880	USB Cable2	16.10	17.00	1.230	-	-	-0.01	0.497	0.611
	LTE Band 2	20M	QPSK	50	0	-	Left Side	5mm	Ant 2	DSI 1	18900	1880	USB Cable2	16.10	17.00	1.230	-	-	-0.07	0.065	0.080
	LTE Band 2	20M	QPSK	50	0	-	Right Side	5mm	Ant 2	DSI 1	18900	1880	USB Cable2	16.10	17.00	1.230	-	-	0.16	0.344	0.423
	LTE Band 2	20M	QPSK	50	0	-	Top Side	5mm	Ant 2	DSI 1	18900	1880	USB Cable2	16.10	17.00	1.230	-	-	-0.14	0.069	0.085
	LTE Band 2	20M	QPSK	50	0	-	Front	5mm	Ant 2	DSI 1	18700	1860	USB Cable2	16.06	17.00	1.242	-	-	0.11	0.726	0.901
	LTE Band 2	20M	QPSK	50	0	-	Front	5mm	Ant 2	DSI 1	19100	1900	USB Cable2	16.08	17.00	1.236	-	-	-0.03	0.790	0.976
	LTE Band 2	20M	QPSK	100	0	-	Front	5mm	Ant 2	DSI 1	18900	1880	USB Cable2	16.07	17.00	1.239	-	-	-0.04	0.738	0.914
	LTE Band 25	20M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	26340	1880	USB Cable2	18.88	19.00	1.028	-	-	-0.1	0.622	0.639
	LTE Band 25	20M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	26340	1880	USB Cable2	18.88	19.00	1.028	-	-	0	0.559	0.575
	LTE Band 25	20M	QPSK	1	0	-	Left Side	5mm	Ant 1	DSI 1	26340	1880	USB Cable2	18.88	19.00	1.028	-	-	0.08	0.899	0.924
	LTE Band 25	20M	QPSK	1	0	-	Right Side	5mm	Ant 1	DSI 1	26340	1880	USB Cable2	18.88	19.00	1.028	-	-	-0.03	0.215	0.221
	LTE Band 25	20M	QPSK	1	0	-	Top Side	5mm	Ant 1	DSI 1	26340	1880	USB Cable2	18.88	19.00	1.028	-	-	0.17	0.259	0.266
	LTE Band 25	20M	QPSK	1	0	-	Left Side	5mm	Ant 1	DSI 1	26140	1860	USB Cable2	18.74	19.00	1.062	-	-	-0.01	0.857	0.910
13	LTE Band 25	20M	QPSK	1	0	-	Left Side	5mm	Ant 1	DSI 1	26590	1905	USB Cable2	18.77	19.00	1.054	-	-	-0.09	0.924	**0.974**
	LTE Band 25	20M	QPSK	1	0	-	Left Side	5mm	Ant 1	DSI 1	26590	1905	USB Cable1	18.77	19.00	1.054	-	-	0.05	0.905	0.954
	LTE Band 2C	20M	QPSK	1	0	-	Left Side	5mm	Ant 1	DSI 1	19100 18902	1900 1880.2	USB Cable2	18.56	19.00	1.107	-	-	0.12	0.850	0.941
	LTE Band 25	20M	QPSK	1	0	-	Front	22mm	Ant 1	DSI 0	26340	1880	USB Cable2	22.74	24.00	1.337	-	-	0	0.274	0.366
	LTE Band 25	20M	QPSK	1	0	-	Back	19mm	Ant 1	DSI 0	26340	1880	USB Cable2	22.74	24.00	1.337	-	-	0.02	0.232	0.310
	LTE Band 25	20M	QPSK	1	0	-	Left Side	19mm	Ant 1	DSI 0	26340	1880	USB Cable2	22.74	24.00	1.337	-	-	0.09	0.258	0.345
	LTE Band 25	20M	QPSK	1	0	-	Right Side	15mm	Ant 1	DSI 0	26340	1880	USB Cable2	22.74	24.00	1.337	-	-	0.15	0.153	0.204
	LTE Band 25	20M	QPSK	1	0	-	Top Side	19mm	Ant 1	DSI 0	26340	1880	USB Cable2	22.74	24.00	1.337	-	-	-	n/a	n/a
	LTE Band 25	20M	QPSK	50	0	-	Front	5mm	Ant 1	DSI 1	26340	1880	USB Cable2	18.81	19.00	1.045	-	-	-0.01	0.585	0.611
	LTE Band 25	20M	QPSK	50	0	-	Back	5mm	Ant 1	DSI 1	26340	1880	USB Cable2	18.81	19.00	1.045	-	-	0.14	0.547	0.571
	LTE Band 25	20M	QPSK	50	0	-	Left Side	5mm	Ant 1	DSI 1	26340	1880	USB Cable2	18.81	19.00	1.045	-	-	0.18	0.871	0.910
	LTE Band 25	20M	QPSK	50	0	-	Right Side	5mm	Ant 1	DSI 1	26340	1880	USB Cable2	18.81	19.00	1.045	-	-	-0.12	0.216	0.226
	LTE Band 25	20M	QPSK	50	0	-	Top Side	5mm	Ant 1	DSI 1	26340	1880	USB Cable2	18.81	19.00	1.045	-	-	-0.04	0.243	0.254
	LTE Band 25	20M	QPSK	50	0	-	Left Side	5mm	Ant 1	DSI 1	26140	1860	USB Cable2	18.74	19.00	1.062	-	-	0	0.842	0.894
	LTE Band 25	20M	QPSK	50	0	-	Left Side	5mm	Ant 1	DSI 1	26590	1905	USB Cable2	18.74	19.00	1.062	-	-	-0.03	0.845	0.897
	LTE Band 25	20M	QPSK	100	0	-	Left Side	5mm	Ant 1	DSI 1	26340	1880	USB Cable2	18.79	19.00	1.050	-	-	-0.15	0.861	0.904
	FR1 n25	40M	QPSK	1	1	DFT-15	Front	5mm	Ant 1	DSI 1	376500	1882.5	USB Cable2	19.15	19.40	1.059	-	-	0.04	0.739	0.783

	FR1 n25	40M	QPSK	1	1	DFT-15	Back	5mm	Ant 1	DSI 1	376500	1882.5	USB Cable2	19.15	19.40	1.059	-	-	0.18	0.651	0.690
14	FR1 n25	40M	QPSK	1	1	DFT-15	Left Side	5mm	Ant 1	DSI 1	376500	1882.5	USB Cable2	19.15	19.40	1.059	-	-	0.06	0.929	**0.984**
	FR1 n25	40M	QPSK	1	1	DFT-15	Left Side	5mm	Ant 1	DSI 1	376500	1882.5	USB Cable1	19.15	19.40	1.059	-	-	0.04	0.893	0.946
	FR1 n25	40M	QPSK	1	1	DFT-15	Right Side	5mm	Ant 1	DSI 1	376500	1882.5	USB Cable2	19.15	19.40	1.059	-	-	0.16	0.232	0.246
	FR1 n25	40M	QPSK	1	1	DFT-15	Top Side	5mm	Ant 1	DSI 1	376500	1882.5	USB Cable2	19.15	19.40	1.059	-	-	0.12	0.258	0.273
	FR1 n25	40M	QPSK	1	1	DFT-15	Front	22mm	Ant 1	DSI 0	376500	1882.5	USB Cable2	23.10	24.00	1.230	-	-	0.18	0.246	0.303
	FR1 n25	40M	QPSK	1	1	DFT-15	Back	19mm	Ant 1	DSI 0	376500	1882.5	USB Cable2	23.10	24.00	1.230	-	-	0.18	0.225	0.277
	FR1 n25	40M	QPSK	1	1	DFT-15	Left Side	19mm	Ant 1	DSI 0	376500	1882.5	USB Cable2	23.10	24.00	1.230	-	-	0.01	0.256	0.315
	FR1 n25	40M	QPSK	1	1	DFT-15	Right Side	15mm	Ant 1	DSI 0	376500	1882.5	USB Cable2	23.10	24.00	1.230	-	-	-0.04	0.230	0.283
	FR1 n25	40M	QPSK	1	1	DFT-15	Top Side	19mm	Ant 1	DSI 0	376500	1882.5	USB Cable2	23.10	24.00	1.230	-	-	-0.1	0.081	0.100
	FR1 n25	40M	QPSK	108	54	DFT-15	Front	5mm	Ant 1	DSI 1	376500	1882.5	USB Cable2	19.12	19.40	1.067	-	-	0.07	0.679	0.724
	FR1 n25	40M	QPSK	108	54	DFT-15	Back	5mm	Ant 1	DSI 1	376500	1882.5	USB Cable2	19.12	19.40	1.067	-	-	-0.14	0.649	0.692
	FR1 n25	40M	QPSK	108	54	DFT-15	Left Side	5mm	Ant 1	DSI 1	376500	1882.5	USB Cable2	19.12	19.40	1.067	-	-	-0.13	0.910	0.971
	FR1 n25	40M	QPSK	108	54	DFT-15	Right Side	5mm	Ant 1	DSI 1	376500	1882.5	USB Cable2	19.12	19.40	1.067	-	-	0.19	0.243	0.259
	FR1 n25	40M	QPSK	108	54	DFT-15	Top Side	5mm	Ant 1	DSI 1	376500	1882.5	USB Cable2	19.12	19.40	1.067	-	-	-0.01	0.260	0.277
	FR1 n25	40M	QPSK	216	0	DFT-15	Left Side	5mm	Ant 1	DSI 1	376500	1882.5	USB Cable2	19.11	19.40	1.069	-	-	0.12	0.878	0.939
	FR1 n25	40M	QPSK	1	1	DFT-15	Front	5mm	Ant 2	DSI 1	376500	1882.5	USB Cable2	16.54	17.00	1.112	-	-	-0.13	0.841	0.935
	FR1 n25	40M	QPSK	1	1	DFT-15	Front	5mm	Ant 2	DSI 1	376500	1882.5	USB Cable1	16.54	17.00	1.112	-	-	0.07	0.811	0.902
	FR1 n25	40M	QPSK	1	1	DFT-15	Back	5mm	Ant 2	DSI 1	376500	1882.5	USB Cable2	16.54	17.00	1.112	-	-	-0.15	0.566	0.629
	FR1 n25	40M	QPSK	1	1	DFT-15	Left Side	5mm	Ant 2	DSI 1	376500	1882.5	USB Cable2	16.54	17.00	1.112	-	-	0.03	0.060	0.067
	FR1 n25	40M	QPSK	1	1	DFT-15	Right Side	5mm	Ant 2	DSI 1	376500	1882.5	USB Cable2	16.54	17.00	1.112	-	-	-0.15	0.376	0.418
	FR1 n25	40M	QPSK	1	1	DFT-15	Top Side	5mm	Ant 2	DSI 1	376500	1882.5	USB Cable2	16.54	17.00	1.112	-	-	-0.03	0.072	0.080
	FR1 n25	40M	QPSK	1	1	DFT-15	Front	22mm	Ant 2	DSI 0	376500	1882.5	USB Cable2	23.03	24.00	1.250	-	-	-0.1	0.486	0.608
	FR1 n25	40M	QPSK	1	1	DFT-15	Back	19mm	Ant 2	DSI 0	376500	1882.5	USB Cable2	23.03	24.00	1.250	-	-	0.06	0.355	0.444
	FR1 n25	40M	QPSK	1	1	DFT-15	Left Side	19mm	Ant 2	DSI 0	376500	1882.5	USB Cable2	23.03	24.00	1.250	-	-	-	n/a	n/a
	FR1 n25	40M	QPSK	1	1	DFT-15	Right Side	15mm	Ant 2	DSI 0	376500	1882.5	USB Cable2	23.03	24.00	1.250	-	-	0.09	0.448	0.560
	FR1 n25	40M	QPSK	1	1	DFT-15	Top Side	19mm	Ant 2	DSI 0	376500	1882.5	USB Cable2	23.03	24.00	1.250	-	-	-	n/a	n/a
	FR1 n25	40M	QPSK	108	54	DFT-15	Front	5mm	Ant 2	DSI 1	376500	1882.5	USB Cable2	16.49	17.00	1.125	-	-	0.03	0.830	0.933
	FR1 n25	40M	QPSK	108	54	DFT-15	Back	5mm	Ant 2	DSI 1	376500	1882.5	USB Cable2	16.49	17.00	1.125	-	-	-0.17	0.590	0.664
	FR1 n25	40M	QPSK	108	54	DFT-15	Left Side	5mm	Ant 2	DSI 1	376500	1882.5	USB Cable2	16.49	17.00	1.125	-	-	-0.08	0.093	0.105
	FR1 n25	40M	QPSK	108	54	DFT-15	Right Side	5mm	Ant 2	DSI 1	376500	1882.5	USB Cable2	16.49	17.00	1.125	-	-	0.02	0.433	0.487
	FR1 n25	40M	QPSK	108	54	DFT-15	Top Side	5mm	Ant 2	DSI 1	376500	1882.5	USB Cable2	16.49	17.00	1.125	-	-	-0.05	0.081	0.091
	FR1 n25	40M	QPSK	216	0	DFT-15	Front	5mm	Ant 2	DSI 1	376500	1882.5	USB Cable2	16.48	17.00	1.127	-	-	0.12	0.821	0.925
2300MHz																					
	LTE Band 30	10M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	27710	2310	USB Cable2	18.19	18.40	1.050	-	-	-0.03	0.782	0.821
	LTE Band 30	10M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	27710	2310	USB Cable2	18.19	18.40	1.050	-	-	-0.06	0.818	0.859
	LTE Band 30	10M	QPSK	1	0	-	Left Side	5mm	Ant 1	DSI 1	27710	2310	USB Cable2	18.19	18.40	1.050	-	-	-0.01	0.129	0.135
	LTE Band 30	10M	QPSK	1	0	-	Right Side	5mm	Ant 1	DSI 1	27710	2310	USB Cable2	18.19	18.40	1.050	-	-	-0.03	0.660	0.693
15	LTE Band 30	10M	QPSK	1	0	-	Top Side	5mm	Ant 1	DSI 1	27710	2310	USB Cable2	18.19	18.40	1.050	-	-	0.02	0.932	**0.978**
	LTE Band 30	10M	QPSK	1	0	-	Top Side	5mm	Ant 1	DSI 1	27710	2310	USB Cable1	18.19	18.40	1.050	-	-	-0.07	0.851	0.893
	LTE Band 30	10M	QPSK	1	0	-	Front	22mm	Ant 1	DSI 0	27710	2310	USB Cable2	21.98	23.00	1.265	-	-	-0.1	0.235	0.297
	LTE Band 30	10M	QPSK	1	0	-	Back	19mm	Ant 1	DSI 0	27710	2310	USB Cable2	21.98	23.00	1.265	-	-	0.03	0.255	0.323
	LTE Band 30	10M	QPSK	1	0	-	Left Side	19mm	Ant 1	DSI 0	27710	2310	USB Cable2	21.98	23.00	1.265	-	-	-0.11	0.085	0.108
	LTE Band 30	10M	QPSK	1	0	-	Right Side	15mm	Ant 1	DSI 0	27710	2310	USB Cable2	21.98	23.00	1.265	-	-	0.16	0.508	0.642
	LTE Band 30	10M	QPSK	1	0	-	Top Side	19mm	Ant 1	DSI 0	27710	2310	USB Cable2	21.98	23.00	1.265	-	-	-0.18	0.388	0.491
	LTE Band 30	10M	QPSK	25	0	-	Front	5mm	Ant 1	DSI 1	27710	2310	USB Cable2	18.17	18.40	1.054	-	-	-0.05	0.771	0.813
	LTE Band 30	10M	QPSK	25	0	-	Back	5mm	Ant 1	DSI 1	27710	2310	USB Cable2	18.17	18.40	1.054	-	-	-0.03	0.811	0.855
	LTE Band 30	10M	QPSK	25	0	-	Left Side	5mm	Ant 1	DSI 1	27710	2310	USB Cable2	18.17	18.40	1.054	-	-	-0.12	0.118	0.124
	LTE Band 30	10M	QPSK	25	0	-	Right Side	5mm	Ant 1	DSI 1	27710	2310	USB Cable2	18.17	18.40	1.054	-	-	0.18	0.645	0.680
	LTE Band 30	10M	QPSK	25	0	-	Top Side	5mm	Ant 1	DSI 1	27710	2310	USB Cable2	18.17	18.40	1.054	-	-	-0.07	0.896	0.945
	LTE Band 30	10M	QPSK	50	0	-	Front	5mm	Ant 1	DSI 1	27710	2310	USB Cable2	17.97	18.40	1.104	-	-	0.09	0.712	0.786
	LTE Band 30	10M	QPSK	50	0	-	Back	5mm	Ant 1	DSI 1	27710	2310	USB Cable2	17.97	18.40	1.104	-	-	0.02	0.756	0.835
	LTE Band 30	10M	QPSK	50	0	-	Top Side	5mm	Ant 1	DSI 1	27710	2310	USB Cable2	17.97	18.40	1.104	-	-	-0.13	0.883	0.975
	LTE Band 30	10M	QPSK	1	0	-	Front	5mm	Ant 2	DSI 1	27710	2310	USB Cable2	19.27	19.80	1.130	-	-	-0.06	0.792	0.895
	LTE Band 30	10M	QPSK	1	0	-	Back	5mm	Ant 2	DSI 1	27710	2310	USB Cable2	19.27	19.80	1.130	-	-	0.1	0.528	0.597
	LTE Band 30	10M	QPSK	1	0	-	Left Side	5mm	Ant 2	DSI 1	27710	2310	USB Cable2	19.27	19.80	1.130	-	-	-0.14	0.100	0.113

	LTE Band 30	10M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	27710	2310	USB Cable2	19.27	19.80	1.130	-	-	-0.05	0.852	0.963
	LTE Band 30	10M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	27710	2310	USB Cable1	19.27	19.80	1.130	-	-	0.06	0.833	0.941
	LTE Band 30	10M	QPSK	1	0	-	Top Side	5mm	Ant 2	DSI 1	27710	2310	USB Cable2	19.27	19.80	1.130	-	-	0.12	0.083	0.094
	LTE Band 30	10M	QPSK	1	0	-	Front	22mm	Ant 2	DSI 0	27710	2310	USB Cable2	22.26	23.00	1.186	-	-	0.17	0.242	0.287
	LTE Band 30	10M	QPSK	1	0	-	Back	19mm	Ant 2	DSI 0	27710	2310	USB Cable2	22.26	23.00	1.186	-	-	0.14	0.244	0.289
	LTE Band 30	10M	QPSK	1	0	-	Left Side	19mm	Ant 2	DSI 0	27710	2310	USB Cable2	22.26	23.00	1.186	-	-	-	n/a	n/a
	LTE Band 30	10M	QPSK	1	0	-	Right Side	15mm	Ant 2	DSI 0	27710	2310	USB Cable2	22.26	23.00	1.186	-	-	-0.06	0.377	0.447
	LTE Band 30	10M	QPSK	1	0	-	Top Side	19mm	Ant 2	DSI 0	27710	2310	USB Cable2	22.26	23.00	1.186	-	-	-	n/a	n/a
	LTE Band 30	10M	QPSK	25	0	-	Front	5mm	Ant 2	DSI 1	27710	2310	USB Cable2	19.22	19.80	1.143	-	-	-0.19	0.810	0.926
	LTE Band 30	10M	QPSK	25	0	-	Back	5mm	Ant 2	DSI 1	27710	2310	USB Cable2	19.22	19.80	1.143	-	-	-0.12	0.540	0.617
	LTE Band 30	10M	QPSK	25	0	-	Left Side	5mm	Ant 2	DSI 1	27710	2310	USB Cable2	19.22	19.80	1.143	-	-	-0.03	0.102	0.117
	LTE Band 30	10M	QPSK	25	0	-	Right Side	5mm	Ant 2	DSI 1	27710	2310	USB Cable2	19.22	19.80	1.143	-	-	0.07	0.833	0.952
	LTE Band 30	10M	QPSK	25	0	-	Top Side	5mm	Ant 2	DSI 1	27710	2310	USB Cable2	19.22	19.80	1.143	-	-	-0.06	0.085	0.097
	LTE Band 30	10M	QPSK	50	0	-	Front	5mm	Ant 2	DSI 1	27710	2310	USB Cable2	19.19	19.80	1.151	-	-	-0.07	0.772	0.888
	LTE Band 30	10M	QPSK	50	0	-	Right Side	5mm	Ant 2	DSI 1	27710	2310	USB Cable2	19.19	19.80	1.151	-	-	0.03	0.829	0.954
	FR1 n30	10M	QPSK	1	1	DFT-15	Front	5mm	Ant 1	DSI 1	462000	2310	USB Cable2	17.13	17.60	1.114	-	-	0.05	0.692	0.771
	FR1 n30	10M	QPSK	1	1	DFT-15	Back	5mm	Ant 1	DSI 1	462000	2310	USB Cable2	17.13	17.60	1.114	-	-	0.01	0.722	0.805
	FR1 n30	10M	QPSK	1	1	DFT-15	Left Side	5mm	Ant 1	DSI 1	462000	2310	USB Cable2	17.13	17.60	1.114	-	-	-0.15	0.124	0.138
	FR1 n30	10M	QPSK	1	1	DFT-15	Right Side	5mm	Ant 1	DSI 1	462000	2310	USB Cable2	17.13	17.60	1.114	-	-	0.02	0.544	0.606
16	FR1 n30	10M	QPSK	1	1	DFT-15	Top Side	5mm	Ant 1	DSI 1	462000	2310	USB Cable2	17.13	17.60	1.114	-	-	-0.16	0.837	**0.933**
	FR1 n30	10M	QPSK	1	1	DFT-15	Top Side	5mm	Ant 1	DSI 1	462000	2310	USB Cable1	17.13	17.60	1.114	-	-	-0.08	0.779	0.868
	FR1 n30	10M	QPSK	1	1	DFT-15	Front	22mm	Ant 1	DSI 0	462000	2310	USB Cable2	21.60	22.50	1.230	-	-	0.01	0.255	0.314
	FR1 n30	10M	QPSK	1	1	DFT-15	Back	19mm	Ant 1	DSI 0	462000	2310	USB Cable2	21.60	22.50	1.230	-	-	0.16	0.348	0.428
	FR1 n30	10M	QPSK	1	1	DFT-15	Left Side	19mm	Ant 1	DSI 0	462000	2310	USB Cable2	21.60	22.50	1.230	-	-	-	n/a	n/a
	FR1 n30	10M	QPSK	1	1	DFT-15	Right Side	15mm	Ant 1	DSI 0	462000	2310	USB Cable2	21.60	22.50	1.230	-	-	0.12	0.441	0.543
	FR1 n30	10M	QPSK	1	1	DFT-15	Top Side	19mm	Ant 1	DSI 0	462000	2310	USB Cable2	21.60	22.50	1.230	-	-	0.16	0.356	0.438
	FR1 n30	10M	QPSK	25	14	DFT-15	Front	5mm	Ant 1	DSI 1	462000	2310	USB Cable2	17.11	17.60	1.119	-	-	0.15	0.660	0.739
	FR1 n30	10M	QPSK	25	14	DFT-15	Back	5mm	Ant 1	DSI 1	462000	2310	USB Cable2	17.11	17.60	1.119	-	-	0.07	0.714	0.799
	FR1 n30	10M	QPSK	25	14	DFT-15	Left Side	5mm	Ant 1	DSI 1	462000	2310	USB Cable2	17.11	17.60	1.119	-	-	0.17	0.115	0.129
	FR1 n30	10M	QPSK	25	14	DFT-15	Right Side	5mm	Ant 1	DSI 1	462000	2310	USB Cable2	17.11	17.60	1.119	-	-	-0.19	0.534	0.598
	FR1 n30	10M	QPSK	25	14	DFT-15	Top Side	5mm	Ant 1	DSI 1	462000	2310	USB Cable2	17.11	17.60	1.119	-	-	-0.01	0.766	0.857
	FR1 n30	10M	QPSK	50	0	DFT-15	Back	5mm	Ant 1	DSI 1	462000	2310	USB Cable2	17.08	17.60	1.127	-	-	0.08	0.677	0.763
	FR1 n30	10M	QPSK	50	0	DFT-15	Top Side	5mm	Ant 1	DSI 1	462000	2310	USB Cable2	17.08	17.60	1.127	-	-	0.03	0.776	0.875
2600MHz																					
	LTE Band 7	20M	QPSK	1	0	-	Front	5mm	Ant 1	DSI 1	21100	2535	USB Cable2	18.95	19.20	1.059	-	-	-0.01	0.557	0.590
	LTE Band 7	20M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	21100	2535	USB Cable2	18.95	19.20	1.059	-	-	-0.15	0.828	0.877
	LTE Band 7	20M	QPSK	1	0	-	Left Side	5mm	Ant 1	DSI 1	21100	2535	USB Cable2	18.95	19.20	1.059	-	-	-0.02	0.160	0.169
	LTE Band 7	20M	QPSK	1	0	-	Right Side	5mm	Ant 1	DSI 1	21100	2535	USB Cable2	18.95	19.20	1.059	-	-	0.19	0.426	0.451
	LTE Band 7	20M	QPSK	1	0	-	Top Side	5mm	Ant 1	DSI 1	21100	2535	USB Cable2	18.95	19.20	1.059	-	-	-0.07	0.357	0.378
17	LTE Band 7	20M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	20850	2510	USB Cable2	18.80	19.20	1.096	-	-	-0.03	0.904	**0.991**
	LTE Band 7	20M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	20850	2510	USB Cable1	18.80	19.20	1.096	-	-	0.1	0.861	0.944
	LTE Band 7C	20M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	20850 21048	2510 2529.8	USB Cable2	18.37	19.20	1.211	-	-	0.12	0.760	0.920
	LTE Band 7	20M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	21350	2560	USB Cable2	18.82	19.20	1.091	-	-	0.07	0.811	0.885
	LTE Band 7	20M	QPSK	1	0	-	Front	22mm	Ant 1	DSI 0	21100	2535	USB Cable2	22.64	24.00	1.368	-	-	0.09	0.236	0.323
	LTE Band 7	20M	QPSK	1	0	-	Back	19mm	Ant 1	DSI 0	21100	2535	USB Cable2	22.64	24.00	1.368	-	-	-0.08	0.288	0.394
	LTE Band 7	20M	QPSK	1	0	-	Left Side	19mm	Ant 1	DSI 0	21100	2535	USB Cable2	22.64	24.00	1.368	-	-	-	n/a	n/a
	LTE Band 7	20M	QPSK	1	0	-	Right Side	15mm	Ant 1	DSI 0	21100	2535	USB Cable2	22.64	24.00	1.368	-	-	-0.04	0.493	0.674
	LTE Band 7	20M	QPSK	1	0	-	Top Side	19mm	Ant 1	DSI 0	21100	2535	USB Cable2	22.64	24.00	1.368	-	-	-	n/a	n/a
	LTE Band 7	20M	QPSK	50	0	-	Front	5mm	Ant 1	DSI 1	21100	2535	USB Cable2	18.86	19.20	1.081	-	-	0.03	0.552	0.597
	LTE Band 7	20M	QPSK	50	0	-	Back	5mm	Ant 1	DSI 1	21100	2535	USB Cable2	18.86	19.20	1.081	-	-	0.11	0.823	0.890
	LTE Band 7	20M	QPSK	50	0	-	Left Side	5mm	Ant 1	DSI 1	21100	2535	USB Cable2	18.86	19.20	1.081	-	-	-0.08	0.166	0.180
	LTE Band 7	20M	QPSK	50	0	-	Right Side	5mm	Ant 1	DSI 1	21100	2535	USB Cable2	18.86	19.20	1.081	-	-	-0.13	0.434	0.469
	LTE Band 7	20M	QPSK	50	0	-	Top Side	5mm	Ant 1	DSI 1	21100	2535	USB Cable2	18.86	19.20	1.081	-	-	-0.09	0.368	0.398
	LTE Band 7	20M	QPSK	50	0	-	Back	5mm	Ant 1	DSI 1	20850	2510	USB Cable2	18.82	19.20	1.091	-	-	-0.03	0.897	0.979
	LTE Band 7	20M	QPSK	50	0	-	Back	5mm	Ant 1	DSI 1	21350	2560	USB Cable2	18.73	19.20	1.114	-	-	0.14	0.819	0.913
	LTE Band 7	20M	QPSK	100	0	-	Back	5mm	Ant 1	DSI 1	21100	2535	USB Cable2	18.79	19.20	1.099	-	-	0.08	0.809	0.889

	LTE Band 7	20M	QPSK	1	0	-	Front	5mm	Ant 2	DSI 1	21100	2535	USB Cable2	19.64	20.30	1.164	-	-	0.14	0.726	0.845
	LTE Band 7	20M	QPSK	1	0	-	Back	5mm	Ant 2	DSI 1	21100	2535	USB Cable2	19.64	20.30	1.164	-	-	-0.1	0.522	0.608
	LTE Band 7	20M	QPSK	1	0	-	Left Side	5mm	Ant 2	DSI 1	21100	2535	USB Cable2	19.64	20.30	1.164	-	-	-0.09	0.136	0.158
	LTE Band 7	20M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	21100	2535	USB Cable2	19.64	20.30	1.164	-	-	0.16	0.751	0.874
	LTE Band 7	20M	QPSK	1	0	-	Top Side	5mm	Ant 2	DSI 1	21100	2535	USB Cable2	19.64	20.30	1.164	-	-	0.04	0.022	0.026
	LTE Band 7	20M	QPSK	1	0	-	Front	5mm	Ant 2	DSI 1	20850	2510	USB Cable2	19.48	20.30	1.208	-	-	0.05	0.752	0.908
	LTE Band 7	20M	QPSK	1	0	-	Front	5mm	Ant 2	DSI 1	21350	2560	USB Cable2	19.61	20.30	1.172	-	-	0.12	0.723	0.847
	LTE Band 7	20M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	20850	2510	USB Cable2	19.48	20.30	1.208	-	-	-0.03	0.818	0.988
	LTE Band 7	20M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	20850	2510	USB Cable1	19.48	20.30	1.208	-	-	0.18	0.736	0.889
	LTE Band 7	20M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	21350	2560	USB Cable2	19.61	20.30	1.172	-	-	0.08	0.796	0.933
	LTE Band 7	20M	QPSK	1	0	-	Front	22mm	Ant 2	DSI 0	21100	2535	USB Cable2	22.59	24.00	1.384	-	-	-0.16	0.269	0.372
	LTE Band 7	20M	QPSK	1	0	-	Back	19mm	Ant 2	DSI 0	21100	2535	USB Cable2	22.59	24.00	1.384	-	-	-0.01	0.227	0.314
	LTE Band 7	20M	QPSK	1	0	-	Left Side	19mm	Ant 2	DSI 0	21100	2535	USB Cable2	22.59	24.00	1.384	-	-	0.17	0.092	0.127
	LTE Band 7	20M	QPSK	1	0	-	Right Side	15mm	Ant 2	DSI 0	21100	2535	USB Cable2	22.59	24.00	1.384	-	-	0.15	0.498	0.689
	LTE Band 7	20M	QPSK	1	0	-	Top Side	19mm	Ant 2	DSI 0	21100	2535	USB Cable2	22.59	24.00	1.384	-	-	-	n/a	n/a
	LTE Band 7	20M	QPSK	50	0	-	Front	5mm	Ant 2	DSI 1	21100	2535	USB Cable2	19.59	20.30	1.178	-	-	0.11	0.716	0.843
	LTE Band 7	20M	QPSK	50	0	-	Back	5mm	Ant 2	DSI 1	21100	2535	USB Cable2	19.59	20.30	1.178	-	-	0.08	0.510	0.601
	LTE Band 7	20M	QPSK	50	0	-	Left Side	5mm	Ant 2	DSI 1	21100	2535	USB Cable2	19.59	20.30	1.178	-	-	0.16	0.127	0.150
	LTE Band 7	20M	QPSK	50	0	-	Right Side	5mm	Ant 2	DSI 1	21100	2535	USB Cable2	19.59	20.30	1.178	-	-	0.1	0.717	0.844
	LTE Band 7	20M	QPSK	50	0	-	Top Side	5mm	Ant 2	DSI 1	21100	2535	USB Cable2	19.59	20.30	1.178	-	-	-0.18	0.021	0.025
	LTE Band 7	20M	QPSK	50	0	-	Front	5mm	Ant 2	DSI 1	20850	2510	USB Cable2	19.46	20.30	1.213	-	-	-0.17	0.745	0.904
	LTE Band 7	20M	QPSK	50	0	-	Front	5mm	Ant 2	DSI 1	21350	2560	USB Cable2	19.52	20.30	1.197	-	-	-0.01	0.703	0.841
	LTE Band 7	20M	QPSK	50	0	-	Right Side	5mm	Ant 2	DSI 1	20850	2510	USB Cable2	19.46	20.30	1.213	-	-	0.06	0.783	0.950
	LTE Band 7	20M	QPSK	50	0	-	Right Side	5mm	Ant 2	DSI 1	21350	2560	USB Cable2	19.52	20.30	1.197	-	-	-0.13	0.760	0.910
	LTE Band 7	20M	QPSK	100	0	-	Front	5mm	Ant 2	DSI 1	21100	2535	USB Cable2	19.55	20.30	1.189	-	-	-0.1	0.715	0.850
	LTE Band 7	20M	QPSK	100	0	-	Right Side	5mm	Ant 2	DSI 1	21100	2535	USB Cable2	19.55	20.30	1.189	-	-	-0.09	0.724	0.860
	LTE Band 41	20M	QPSK	1	0	-	Front	5mm	Ant 2	DSI 1	40620	2593	USB Cable2	20.59	21.00	1.099	62.9	1.006	0.03	0.405	0.448
	LTE Band 41	20M	QPSK	1	0	-	Back	5mm	Ant 2	DSI 1	40620	2593	USB Cable2	20.59	21.00	1.099	62.9	1.006	0.07	0.269	0.297
	LTE Band 41	20M	QPSK	1	0	-	Left Side	5mm	Ant 2	DSI 1	40620	2593	USB Cable2	20.59	21.00	1.099	62.9	1.006	0.1	0.031	0.034
	LTE Band 41	20M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	40620	2593	USB Cable2	20.59	21.00	1.099	62.9	1.006	0.17	0.556	0.615
	LTE Band 41	20M	QPSK	1	0	-	Top Side	5mm	Ant 2	DSI 1	40620	2593	USB Cable2	20.59	21.00	1.099	62.9	1.006	-0.13	0.022	0.024
	LTE Band 41	20M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	39750	2506	USB Cable2	20.42	21.00	1.143	62.9	1.006	0.16	0.513	0.590
	LTE Band 41	20M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	40185	2549.5	USB Cable2	20.49	21.00	1.125	62.9	1.006	0.14	0.459	0.519
	LTE Band 41	20M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	41055	2636.5	USB Cable2	20.57	21.00	1.104	62.9	1.006	0.13	0.580	0.644
18	LTE Band 41	20M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	41490	2680	USB Cable2	20.47	21.00	1.130	62.9	1.006	0.03	0.683	**0.776**
	LTE Band 41	20M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	41490	2680	USB Cable1	20.47	21.00	1.130	62.9	1.006	-0.07	0.657	0.747
	LTE Band 41C	20M	QPSK	1	0	-	Right Side	5mm	Ant 2	DSI 1	41490 41292	2680 2660.2	USB Cable2	20.38	21.00	1.153	62.9	1.006	0.17	0.647	0.751
	LTE Band 41	20M	QPSK	1	0	-	Front	22mm	Ant 2	DSI 0	40620	2593	USB Cable2	23.24	24.00	1.191	62.9	1.006	-0.06	0.163	0.195
	LTE Band 41	20M	QPSK	1	0	-	Back	19mm	Ant 2	DSI 0	40620	2593	USB Cable2	23.24	24.00	1.191	62.9	1.006	-0.03	0.176	0.211
	LTE Band 41	20M	QPSK	1	0	-	Left Side	19mm	Ant 2	DSI 0	40620	2593	USB Cable2	23.24	24.00	1.191	62.9	1.006	-	n/a	n/a
	LTE Band 41	20M	QPSK	1	0	-	Right Side	15mm	Ant 2	DSI 0	40620	2593	USB Cable2	23.24	24.00	1.191	62.9	1.006	-0.12	0.302	0.362
	LTE Band 41	20M	QPSK	1	0	-	Top Side	19mm	Ant 2	DSI 0	40620	2593	USB Cable2	23.24	24.00	1.191	62.9	1.006	-	n/a	n/a
	LTE Band 41	20M	QPSK	50	0	-	Front	5mm	Ant 2	DSI 1	40620	2593	USB Cable2	20.58	21.00	1.102	62.9	1.006	-0.02	0.424	0.470
	LTE Band 41	20M	QPSK	50	0	-	Back	5mm	Ant 2	DSI 1	40620	2593	USB Cable2	20.58	21.00	1.102	62.9	1.006	-0.1	0.265	0.294
	LTE Band 41	20M	QPSK	50	0	-	Left Side	5mm	Ant 2	DSI 1	40620	2593	USB Cable2	20.58	21.00	1.102	62.9	1.006	-0.01	0.038	0.042
	LTE Band 41	20M	QPSK	50	0	-	Right Side	5mm	Ant 2	DSI 1	40620	2593	USB Cable2	20.58	21.00	1.102	62.9	1.006	0.11	0.540	0.598
	LTE Band 41	20M	QPSK	50	0	-	Top Side	5mm	Ant 2	DSI 1	40620	2593	USB Cable2	20.58	21.00	1.102	62.9	1.006	0.01	0.024	0.027
	LTE Band 41	20M	QPSK	100	0	-	Right Side	5mm	Ant 2	DSI 1	40620	2593	USB Cable2	20.49	21.00	1.125	62.9	1.006	-0.02	0.533	0.603
	FR1 n41 HPUE	100M	QPSK	1	271	DFT-30	Front	5mm	Ant 2	DSI 1	518598	2592.99	USB Cable2	18.61	20.00	1.377	-	-	0.14	0.407	0.561
	FR1 n41 HPUE	100M	QPSK	1	271	DFT-30	Back	5mm	Ant 2	DSI 1	518598	2592.99	USB Cable2	18.61	20.00	1.377	-	-	-0.03	0.283	0.390
	FR1 n41 HPUE	100M	QPSK	1	271	DFT-30	Left Side	5mm	Ant 2	DSI 1	518598	2592.99	USB Cable2	18.61	20.00	1.377	-	-	0.13	0.074	0.102
	FR1 n41 HPUE	100M	QPSK	1	271	DFT-30	Right Side	5mm	Ant 2	DSI 1	518598	2592.99	USB Cable2	18.61	20.00	1.377	-	-	0.02	0.414	0.570
	FR1 n41 HPUE	100M	QPSK	1	271	DFT-30	Top Side	5mm	Ant 2	DSI 1	518598	2592.99	USB Cable2	18.61	20.00	1.377	-	-	-0.06	0.022	0.030
	FR1 n41 HPUE	100M	QPSK	1	271	DFT-30	Front	22mm	Ant 2	DSI 0	518598	2592.99	USB Cable2	25.66	27.00	1.361	-	-	-0.02	0.476	0.648
	FR1 n41 HPUE	100M	QPSK	1	271	DFT-30	Back	19mm	Ant 2	DSI 0	518598	2592.99	USB Cable2	25.66	27.00	1.361	-	-	-0.11	0.379	0.516
	FR1 n41 HPUE	100M	QPSK	1	271	DFT-30	Left Side	19mm	Ant 2	DSI 0	518598	2592.99	USB Cable2	25.66	27.00	1.361	-	-	-	n/a	n/a

19	FR1 n41 HPUE	100M	QPSK	1	271	DFT-30	Right Side	15mm	Ant 2	DSI 0	518598	2592.99	USB Cable2	25.66	27.00	1.361	-	-	0.08	0.730	**0.994**
	FR1 n41 HPUE	100M	QPSK	1	271	DFT-30	Right Side	15mm	Ant 2	DSI 0	518598	2592.99	USB Cable1	25.66	27.00	1.361	-	-	0.08	0.708	0.964
	FR1 n41 HPUE	100M	QPSK	1	271	DFT-30	Top Side	19mm	Ant 2	DSI 0	518598	2592.99	USB Cable2	25.66	27.00	1.361	-	-	-	n/a	n/a
	FR1 n41 HPUE	100M	QPSK	135	69	DFT-30	Front	5mm	Ant 2	DSI 1	518598	2592.99	USB Cable2	18.58	20.00	1.387	-	-	-0.08	0.416	0.577
	FR1 n41 HPUE	100M	QPSK	135	69	DFT-30	Back	5mm	Ant 2	DSI 1	518598	2592.99	USB Cable2	18.58	20.00	1.387	-	-	0.06	0.290	0.402
	FR1 n41 HPUE	100M	QPSK	135	69	DFT-30	Left Side	5mm	Ant 2	DSI 1	518598	2592.99	USB Cable2	18.58	20.00	1.387	-	-	0.05	0.076	0.105
	FR1 n41 HPUE	100M	QPSK	135	69	DFT-30	Right Side	5mm	Ant 2	DSI 1	518598	2592.99	USB Cable2	18.58	20.00	1.387	-	-	0.11	0.424	0.588
	FR1 n41 HPUE	100M	QPSK	135	69	DFT-30	Top Side	5mm	Ant 2	DSI 1	518598	2592.99	USB Cable2	18.58	20.00	1.387	-	-	-0.07	0.027	0.037
3400-4000GHz																					
	LTE Band 48	20M	QPSK	1	0	-	Front	5mm	Ant 4	DSI 1	55830	3609	USB Cable2	19.65	21.00	1.365	62.9	1.006	0.01	0.643	0.883
	LTE Band 48	20M	QPSK	1	0	-	Back	5mm	Ant 4	DSI 1	55830	3609	USB Cable2	19.65	21.00	1.365	62.9	1.006	0.01	0.516	0.708
	LTE Band 48	20M	QPSK	1	0	-	Left Side	5mm	Ant 4	DSI 1	55830	3609	USB Cable2	19.65	21.00	1.365	62.9	1.006	-0.05	0.465	0.638
	LTE Band 48	20M	QPSK	1	0	-	Right Side	5mm	Ant 4	DSI 1	55830	3609	USB Cable2	19.65	21.00	1.365	62.9	1.006	0.13	0.025	0.034
	LTE Band 48	20M	QPSK	1	0	-	Top Side	5mm	Ant 4	DSI 1	55830	3609	USB Cable2	19.65	21.00	1.365	62.9	1.006	-0.01	0.028	0.038
	LTE Band 48	20M	QPSK	1	0	-	Front	5mm	Ant 4	DSI 1	55340	3560	USB Cable2	19.58	21.00	1.387	62.9	1.006	-0.19	0.606	0.845
20	LTE Band 48	20M	QPSK	1	0	-	Front	5mm	Ant 4	DSI 1	56150	3641	USB Cable2	19.53	21.00	1.403	62.9	1.006	0.07	0.659	**0.930**
	LTE Band 48	20M	QPSK	1	0	-	Front	5mm	Ant 4	DSI 1	56150	3641	USB Cable1	19.53	21.00	1.403	62.9	1.006	-0.06	0.633	0.893
	LTE Band 48	20M	QPSK	1	0	-	Front	5mm	Ant 4	DSI 1	56640	3690	USB Cable2	19.58	21.00	1.387	62.9	1.006	-0.17	0.638	0.890
	LTE Band 48	20M	QPSK	1	0	-	Back	5mm	Ant 4	DSI 1	55340	3560	USB Cable2	19.58	21.00	1.387	62.9	1.006	-0.17	0.450	0.628
	LTE Band 48	20M	QPSK	1	0	-	Back	5mm	Ant 4	DSI 1	56150	3641	USB Cable2	19.53	21.00	1.403	62.9	1.006	-0.03	0.503	0.710
	LTE Band 48	20M	QPSK	1	0	-	Back	5mm	Ant 4	DSI 1	56640	3690	USB Cable2	19.58	21.00	1.387	62.9	1.006	-0.06	0.489	0.682
	LTE Band 48	20M	QPSK	1	0	-	Left Side	5mm	Ant 4	DSI 1	55340	3560	USB Cable2	19.58	21.00	1.387	62.9	1.006	-0.05	0.449	0.626
	LTE Band 48	20M	QPSK	1	0	-	Left Side	5mm	Ant 4	DSI 1	56150	3641	USB Cable2	19.53	21.00	1.403	62.9	1.006	0.04	0.500	0.706
	LTE Band 48	20M	QPSK	1	0	-	Left Side	5mm	Ant 4	DSI 1	56640	3690	USB Cable2	19.58	21.00	1.387	62.9	1.006	-0.04	0.488	0.681
	LTE Band 48	20M	QPSK	1	0	-	Front	22mm	Ant 4	DSI 0	55830	3609	USB Cable2	20.33	21.50	1.309	62.9	1.006	0.11	0.176	0.232
	LTE Band 48	20M	QPSK	1	0	-	Back	19mm	Ant 4	DSI 0	55830	3609	USB Cable2	20.33	21.50	1.309	62.9	1.006	-0.11	0.148	0.195
	LTE Band 48	20M	QPSK	1	0	-	Left Side	19mm	Ant 4	DSI 0	55830	3609	USB Cable2	20.33	21.50	1.309	62.9	1.006	-	n/a	n/a
	LTE Band 48	20M	QPSK	1	0	-	Right Side	15mm	Ant 4	DSI 0	55830	3609	USB Cable2	20.33	21.50	1.309	62.9	1.006	-	n/a	n/a
	LTE Band 48	20M	QPSK	1	0	-	Top Side	19mm	Ant 4	DSI 0	55830	3609	USB Cable2	20.33	21.50	1.309	62.9	1.006	-	n/a	n/a
	LTE Band 48	20M	QPSK	50	0	-	Front	5mm	Ant 4	DSI 1	55830	3609	USB Cable2	18.93	20.50	1.435	62.9	1.006	0.07	0.573	0.827
	LTE Band 48	20M	QPSK	50	0	-	Back	5mm	Ant 4	DSI 1	55830	3609	USB Cable2	18.93	20.50	1.435	62.9	1.006	0.03	0.460	0.664
	LTE Band 48	20M	QPSK	50	0	-	Left Side	5mm	Ant 4	DSI 1	55830	3609	USB Cable2	18.93	20.50	1.435	62.9	1.006	-0.03	0.414	0.598
	LTE Band 48	20M	QPSK	50	0	-	Right Side	5mm	Ant 4	DSI 1	55830	3609	USB Cable2	18.93	20.50	1.435	62.9	1.006	-0.17	0.022	0.032
	LTE Band 48	20M	QPSK	50	0	-	Top Side	5mm	Ant 4	DSI 1	55830	3609	USB Cable2	18.93	20.50	1.435	62.9	1.006	0.11	0.025	0.036
	LTE Band 48	20M	QPSK	50	0	-	Front	5mm	Ant 4	DSI 1	55340	3560	USB Cable2	18.87	20.50	1.455	62.9	1.006	0.15	0.540	0.791
	LTE Band 48	20M	QPSK	50	0	-	Front	5mm	Ant 4	DSI 1	56150	3641	USB Cable2	18.88	20.50	1.452	62.9	1.006	-0.11	0.587	0.858
	LTE Band 48	20M	QPSK	50	0	-	Front	5mm	Ant 4	DSI 1	56640	3690	USB Cable2	18.90	20.50	1.445	62.9	1.006	0.09	0.569	0.827
	LTE Band 48	20M	QPSK	50	0	-	Back	5mm	Ant 4	DSI 1	55340	3560	USB Cable2	18.87	20.50	1.455	62.9	1.006	-0.08	0.401	0.587
	LTE Band 48	20M	QPSK	50	0	-	Back	5mm	Ant 4	DSI 1	56150	3641	USB Cable2	18.88	20.50	1.452	62.9	1.006	0.04	0.448	0.654
	LTE Band 48	20M	QPSK	50	0	-	Back	5mm	Ant 4	DSI 1	56640	3690	USB Cable2	18.90	20.50	1.445	62.9	1.006	0.14	0.436	0.634
	LTE Band 48	20M	QPSK	50	0	-	Left Side	5mm	Ant 4	DSI 1	55340	3560	USB Cable2	18.87	20.50	1.455	62.9	1.006	-0.01	0.400	0.586
	LTE Band 48	20M	QPSK	50	0	-	Left Side	5mm	Ant 4	DSI 1	56150	3641	USB Cable2	18.88	20.50	1.452	62.9	1.006	-0.08	0.446	0.652
	LTE Band 48	20M	QPSK	50	0	-	Left Side	5mm	Ant 4	DSI 1	56640	3690	USB Cable2	18.90	20.50	1.445	62.9	1.006	-0.11	0.435	0.633
	LTE Band 48	20M	QPSK	100	0	-	Front	5mm	Ant 4	DSI 1	55830	3609	USB Cable2	18.84	20.50	1.466	62.9	1.006	0.15	0.549	0.809
	LTE Band 48	20M	QPSK	100	0	-	Back	5mm	Ant 4	DSI 1	55830	3609	USB Cable2	18.84	20.50	1.466	62.9	1.006	-0.07	0.441	0.650
	LTE Band 48	20M	QPSK	100	0	-	Left Side	5mm	Ant 4	DSI 1	55830	3609	USB Cable2	18.84	20.50	1.466	62.9	1.006	-0.09	0.398	0.587
21	FR1 n48	40M	QPSK	1	1	DFT-30	Front	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable2	18.13	18.80	1.167	-	-	0.11	0.845	**0.986**
	FR1 n48	40M	QPSK	1	1	DFT-30	Front	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable1	18.13	18.80	1.167	-	-	-0.09	0.821	0.958
	FR1 n48	40M	QPSK	1	1	DFT-30	Back	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable2	18.13	18.80	1.167	-	-	0.15	0.581	0.678
	FR1 n48	40M	QPSK	1	1	DFT-30	Left Side	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable2	18.13	18.80	1.167	-	-	0.09	0.538	0.628
	FR1 n48	40M	QPSK	1	1	DFT-30	Right Side	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable2	18.13	18.80	1.167	-	-	0.19	0.009	0.011
	FR1 n48	40M	QPSK	1	1	DFT-30	Top Side	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable2	18.13	18.80	1.167	-	-	-0.08	0.020	0.023
	FR1 n48	40M	QPSK	1	1	DFT-30	Front	22mm	Ant 4	DSI 0	641666	3624.99	USB Cable2	20.61	21.50	1.227	-	-	-0.15	0.363	0.446
	FR1 n48	40M	QPSK	1	1	DFT-30	Back	19mm	Ant 4	DSI 0	641666	3624.99	USB Cable2	20.61	21.50	1.227	-	-	0.11	0.288	0.354
	FR1 n48	40M	QPSK	1	1	DFT-30	Left Side	19mm	Ant 4	DSI 0	641666	3624.99	USB Cable2	20.61	21.50	1.227	-	-	-0.16	0.179	0.220
	FR1 n48	40M	QPSK	1	1	DFT-30	Right Side	15mm	Ant 4	DSI 0	641666	3624.99	USB Cable2	20.61	21.50	1.227	-	-	-	n/a	n/a

	FR1 n48	40M	QPSK	1	1	DFT-30	Top Side	19mm	Ant 4	DSI 0	641666	3624.99	USB Cable2	20.61	21.50	1.227	-	-	-	n/a	n/a
	FR1 n48	40M	QPSK	50	28	DFT-30	Front	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable2	18.10	18.80	1.175	-	-	0.17	0.824	0.968
	FR1 n48	40M	QPSK	50	28	DFT-30	Back	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable2	18.10	18.80	1.175	-	-	0.07	0.596	0.700
	FR1 n48	40M	QPSK	50	28	DFT-30	Left Side	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable2	18.10	18.80	1.175	-	-	-0.11	0.552	0.649
	FR1 n48	40M	QPSK	50	28	DFT-30	Right Side	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable2	18.10	18.80	1.175	-	-	0.05	0.009	0.011
	FR1 n48	40M	QPSK	50	28	DFT-30	Top Side	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable2	18.10	18.80	1.175	-	-	0.05	0.021	0.025
	FR1 n48	40M	QPSK	100	0	DFT-30	Front	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable2	18.08	18.80	1.180	-	-	-0.02	0.805	0.950
	FR1 n48	40M	QPSK	100	0	DFT-30	Back	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable2	18.08	18.80	1.180	-	-	0.09	0.568	0.670
	FR1 n48	40M	QPSK	100	0	DFT-30	Left Side	5mm	Ant 4	DSI 1	641666	3624.99	USB Cable2	18.08	18.80	1.180	-	-	-0.14	0.526	0.621
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Front	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable2	18.29	19.00	1.178	-	-	0.05	0.809	0.953
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Front	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable1	18.29	19.00	1.178	-	-	0.07	0.801	0.943
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Back	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable2	18.29	19.00	1.178	-	-	0.16	0.646	0.761
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Left Side	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable2	18.29	19.00	1.178	-	-	0.1	0.525	0.618
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Right Side	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable2	18.29	19.00	1.178	-	-	0	0.011	0.013
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Top Side	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable2	18.29	19.00	1.178	-	-	0.18	0.018	0.021
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Front	22mm	Ant 4	DSI 0	633332	3499.98	USB Cable2	25.95	27.00	1.274	-	-	0.05	0.707	0.900
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Back	19mm	Ant 4	DSI 0	633332	3499.98	USB Cable2	25.95	27.00	1.274	-	-	0.11	0.729	0.928
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Left Side	19mm	Ant 4	DSI 0	633332	3499.98	USB Cable2	25.95	27.00	1.274	-	-	-0.17	0.480	0.611
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Right Side	15mm	Ant 4	DSI 0	633332	3499.98	USB Cable2	25.95	27.00	1.274	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Top Side	19mm	Ant 4	DSI 0	633332	3499.98	USB Cable2	25.95	27.00	1.274	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Front	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable2	18.26	19.00	1.186	-	-	0.16	0.776	0.920
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Back	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable2	18.26	19.00	1.186	-	-	-0.05	0.587	0.696
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Left Side	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable2	18.26	19.00	1.186	-	-	0.07	0.495	0.587
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Right Side	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable2	18.26	19.00	1.186	-	-	0.1	0.010	0.012
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Top Side	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable2	18.26	19.00	1.186	-	-	0.16	0.016	0.019
	FR1 n77 HPUE	100M	QPSK	270	0	DFT-30	Front	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable2	18.16	19.00	1.213	-	-	0.16	0.747	0.906
	FR1 n77 HPUE	100M	QPSK	270	0	DFT-30	Back	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable2	18.16	19.00	1.213	-	-	-0.02	0.555	0.673
	FR1 n77 HPUE	100M	QPSK	270	0	DFT-30	Left Side	5mm	Ant 4	DSI 1	633332	3499.98	USB Cable2	18.16	19.00	1.213	-	-	0.07	0.501	0.608
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Front	5mm	Ant 4	DSI 1	656000	3840	USB Cable2	18.45	19.00	1.135	-	-	0.16	0.840	0.953
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Front	5mm	Ant 4	DSI 1	656000	3840	USB Cable1	18.45	19.00	1.135	-	-	0.16	0.826	0.938
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Back	5mm	Ant 4	DSI 1	656000	3840	USB Cable2	18.45	19.00	1.135	-	-	-0.01	0.678	0.770
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Left Side	5mm	Ant 4	DSI 1	656000	3840	USB Cable2	18.45	19.00	1.135	-	-	-0.06	0.619	0.703
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Right Side	5mm	Ant 4	DSI 1	656000	3840	USB Cable2	18.45	19.00	1.135	-	-	-0.03	0.014	0.016
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Top Side	5mm	Ant 4	DSI 1	656000	3840	USB Cable2	18.45	19.00	1.135	-	-	0.13	0.027	0.031
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Front	22mm	Ant 4	DSI 0	656000	3840	USB Cable2	26.14	27.00	1.219	-	-	-0.17	0.749	0.913
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Back	19mm	Ant 4	DSI 0	656000	3840	USB Cable2	26.14	27.00	1.219	-	-	-0.19	0.708	0.863
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Left Side	19mm	Ant 4	DSI 0	656000	3840	USB Cable2	26.14	27.00	1.219	-	-	0.02	0.718	0.875
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Right Side	15mm	Ant 4	DSI 0	656000	3840	USB Cable2	26.14	27.00	1.219	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Top Side	19mm	Ant 4	DSI 0	656000	3840	USB Cable2	26.14	27.00	1.219	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Front	5mm	Ant 4	DSI 1	656000	3840	USB Cable2	18.31	19.00	1.172	-	-	-0.16	0.802	0.940
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Back	5mm	Ant 4	DSI 1	656000	3840	USB Cable2	18.31	19.00	1.172	-	-	-0.03	0.647	0.758
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Left Side	5mm	Ant 4	DSI 1	656000	3840	USB Cable2	18.31	19.00	1.172	-	-	0.09	0.591	0.693
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Right Side	5mm	Ant 4	DSI 1	656000	3840	USB Cable2	18.31	19.00	1.172	-	-	0.16	0.013	0.015
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Top Side	5mm	Ant 4	DSI 1	656000	3840	USB Cable2	18.31	19.00	1.172	-	-	-0.05	0.026	0.030
22	FR1 n77 HPUE	100M	QPSK	270	0	DFT-30	Front	5mm	Ant 4	DSI 1	656000	3840	USB Cable2	18.26	19.00	1.186	-	-	-0.06	0.812	**0.963**
	FR1 n77 HPUE	100M	QPSK	270	0	DFT-30	Back	5mm	Ant 4	DSI 1	656000	3840	USB Cable2	18.26	19.00	1.186	-	-	0.06	0.618	0.733
	FR1 n77 HPUE	100M	QPSK	270	0	DFT-30	Left Side	5mm	Ant 4	DSI 1	656000	3840	USB Cable2	18.26	19.00	1.186	-	-	0.06	0.592	0.702
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Front	5mm	Ant 6	DSI 1	633332	3499.98	USB Cable2	17.09	17.20	1.026	-	-	0.01	0.802	0.823
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Back	5mm	Ant 6	DSI 1	633332	3499.98	USB Cable2	17.09	17.20	1.026	-	-	0.06	0.513	0.526
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Left Side	5mm	Ant 6	DSI 1	633332	3499.98	USB Cable2	17.09	17.20	1.026	-	-	0.07	0.424	0.435
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Right Side	5mm	Ant 6	DSI 1	633332	3499.98	USB Cable2	17.09	17.20	1.026	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Top Side	5mm	Ant 6	DSI 1	633332	3499.98	USB Cable2	17.09	17.20	1.026	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Front	22mm	Ant 6	DSI 0	633332	3499.98	USB Cable2	26.05	27.00	1.245	-	-	0.06	0.738	0.918
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Front	22mm	Ant 6	DSI 0	633332	3499.98	USB Cable1	26.05	27.00	1.245	-	-	0.04	0.704	0.876
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Back	19mm	Ant 6	DSI 0	633332	3499.98	USB Cable2	26.05	27.00	1.245	-	-	0.06	0.663	0.825
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Left Side	19mm	Ant 6	DSI 0	633332	3499.98	USB Cable2	26.05	27.00	1.245	-	-	-0.05	0.365	0.454

	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Right Side	15mm	Ant 6	DSI 0	633332	3499.98	USB Cable2	26.05	27.00	1.245	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Top Side	19mm	Ant 6	DSI 0	633332	3499.98	USB Cable2	26.05	27.00	1.245	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Front	5mm	Ant 6	DSI 1	633332	3499.98	USB Cable2	17.03	17.20	1.040	-	-	-0.06	0.754	0.784
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Back	5mm	Ant 6	DSI 1	633332	3499.98	USB Cable2	17.03	17.20	1.040	-	-	0.06	0.497	0.517
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Left Side	5mm	Ant 6	DSI 1	633332	3499.98	USB Cable2	17.03	17.20	1.040	-	-	0.03	0.386	0.401
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Right Side	5mm	Ant 6	DSI 1	633332	3499.98	USB Cable2	17.03	17.20	1.040	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Top Side	5mm	Ant 6	DSI 1	633332	3499.98	USB Cable2	17.03	17.20	1.040	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	270	0	DFT-30	Front	5mm	Ant 6	DSI 1	633332	3499.98	USB Cable2	16.82	17.20	1.091	-	-	0.06	0.709	0.774
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Front	5mm	Ant 6	DSI 1	656000	3840	USB Cable2	17.04	17.20	1.038	-	-	-0.02	0.898	0.932
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Front	5mm	Ant 6	DSI 1	656000	3840	USB Cable1	17.04	17.20	1.038	-	-	0.18	0.844	0.876
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Back	5mm	Ant 6	DSI 1	656000	3840	USB Cable2	17.04	17.20	1.038	-	-	-0.12	0.719	0.746
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Left Side	5mm	Ant 6	DSI 1	656000	3840	USB Cable2	17.04	17.20	1.038	-	-	-0.19	0.568	0.589
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Right Side	5mm	Ant 6	DSI 1	656000	3840	USB Cable2	17.04	17.20	1.038	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Top Side	5mm	Ant 6	DSI 1	656000	3840	USB Cable2	17.04	17.20	1.038	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Front	22mm	Ant 6	DSI 0	656000	3840	USB Cable2	26.08	27.00	1.236	-	-	-0.15	0.678	0.838
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Back	19mm	Ant 6	DSI 0	656000	3840	USB Cable2	26.08	27.00	1.236	-	-	-0.01	0.656	0.811
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Left Side	19mm	Ant 6	DSI 0	656000	3840	USB Cable2	26.08	27.00	1.236	-	-	0.03	0.588	0.727
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Right Side	15mm	Ant 6	DSI 0	656000	3840	USB Cable2	26.08	27.00	1.236	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	1	1	DFT-30	Top Side	19mm	Ant 6	DSI 0	656000	3840	USB Cable2	26.08	27.00	1.236	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Front	5mm	Ant 6	DSI 1	656000	3840	USB Cable2	16.99	17.20	1.050	-	-	-0.08	0.801	0.841
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Back	5mm	Ant 6	DSI 1	656000	3840	USB Cable2	16.99	17.20	1.050	-	-	0.03	0.683	0.717
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Left Side	5mm	Ant 6	DSI 1	656000	3840	USB Cable2	16.99	17.20	1.050	-	-	-0.05	0.521	0.547
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Right Side	5mm	Ant 6	DSI 1	656000	3840	USB Cable2	16.99	17.20	1.050	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	135	69	DFT-30	Top Side	5mm	Ant 6	DSI 1	656000	3840	USB Cable2	16.99	17.20	1.050	-	-	-	n/a	n/a
	FR1 n77 HPUE	100M	QPSK	270	0	DFT-30	Front	5mm	Ant 6	DSI 1	656000	3840	USB Cable2	16.68	17.20	1.127	-	-	-0.09	0.827	0.932
	FR1 n77 HPUE	100M	QPSK	270	0	DFT-30	Back	5mm	Ant 6	DSI 1	656000	3840	USB Cable2	16.68	17.20	1.127	-	-	-0.03	0.637	0.718
	FR1 n77 HPUE	100M	QPSK	270	0	DFT-30	Left Side	5mm	Ant 6	DSI 1	656000	3840	USB Cable2	16.68	17.20	1.127	-	-	-0.17	0.486	0.548

16.3 Repeated SAR Measurement

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	FR1 n66	40M	QPSK	1	1	DFT-15	Front	5mm	Ant 2	DSI 1	349000	1745	17.83	18.40	1.140	-	-	0.18	0.817	1	0.932
2nd	FR1 n66	40M	QPSK	1	1	DFT-15	Front	5mm	Ant 2	DSI 1	349000	1745	17.83	18.40	1.140	-	-	0.09	0.802	1.019	0.914
1st	FR1 n25	40M	QPSK	1	1	DFT-15	Left Side	5mm	Ant 1	DSI 1	376500	1882.5	19.15	19.40	1.059	-	-	0.06	0.929	1	0.984
2nd	FR1 n25	40M	QPSK	1	1	DFT-15	Left Side	5mm	Ant 1	DSI 1	376500	1882.5	19.15	19.40	1.059	-	-	0.01	0.908	1.023	0.962
1st	LTE Band 30	10M	QPSK	1	0	-	Top Side	5mm	Ant 1	DSI 1	27710	2310	18.19	18.40	1.050	-	-	0.02	0.932	1	0.978
2nd	LTE Band 30	10M	QPSK	1	0	-	Top Side	5mm	Ant 1	DSI 1	27710	2310	18.19	18.40	1.050	-	-	-0.04	0.908	1.026	0.953
1st	LTE Band 7	20M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	20850	2510	18.80	19.20	1.096	-	-	-0.03	0.904	1	0.991
2nd	LTE Band 7	20M	QPSK	1	0	-	Back	5mm	Ant 1	DSI 1	20850	2510	18.80	19.20	1.096	-	-	0.04	0.900	1.004	0.987
1st	FR1 n48	40M	QPSK	1	1	DFT-30	Front	5mm	Ant 4	DSI 1	641666	3624.99	18.13	18.80	1.167	-	-	0.11	0.845	1	0.986
2nd	FR1 n48	40M	QPSK	1	1	DFT-30	Front	5mm	Ant 4	DSI 1	641666	3624.99	18.13	18.80	1.167	-	-	0.06	0.829	1.019	0.967
1st	FR1 n77	100M	QPSK	1	1	DFT-30	Front	5mm	Ant 4	DSI 1	633332	3499.98	18.29	19.00	1.178	-	-	0.05	0.809	1	0.953
2nd	FR1 n77	100M	QPSK	1	1	DFT-30	Front	5mm	Ant 4	DSI 1	633332	3499.98	18.29	19.00	1.178	-	-	0.01	0.801	1.010	0.943
1st	FR1 n77	100M	QPSK	1	1	DFT-30	Front	5mm	Ant 6	DSI 1	656000	3840	17.04	17.20	1.038	-	-	-0.02	0.898	1	0.932
2nd	FR1 n77	100M	QPSK	1	1	DFT-30	Front	5mm	Ant 6	DSI 1	656000	3840	17.04	17.20	1.038	-	-	0.02	0.863	1.041	0.895

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

17. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations
1.	None

General Note:

1. EUT will choose each LTE and 5GNR according to the network signal condition; therefore, they will not operate simultaneously at any moment.
2. For EN-DC mode, Qualcomm Smart Transmit algorithm in WWAN adds directly the time-averaged RF exposure from 4G(LTE) and time-averaged RF exposure from 5G NR. Smart Transmit algorithm controls the total RF exposure from both 4G and 5G NR to not exceed SAR exposure limit.

17.1 5G NR + LTE + External radio Sim-Tx analysis

In 5G NR + LTE + external radio simultaneous transmission, 5G NR and LTE transmission are managed and controlled by Qualcomm® Smart Transmit, while the RF exposure from external radio radios is managed using legacy approach, i.e., through a fixed power back-off if needed.

Since external radios do not employ time-averaging, 1gSAR and 10gSAR measurement for external radios need to be conducted at their corresponding rated power following current FCC test procedures to determine reported SAR values.

Smart Transmit current implementation assumes hotspots from 5G NR and LTE are collocated. Therefore, for a total of 100% exposure margin, if LTE uses x%, then the exposure margin left for 5G NR is capped to (100-x)%. Thus, the compliance equation for LTE + 5G NR is

$$x\% * A + (100-x)\% * B \le 1.0,$$

Where, A is normalized reported time-averaged SAR exposure ratio from LTE, and A ≤ 1.0; B is normalized reported time-averaged exposure ratio from 5G NR (i.e., PD exposure for 5G FR2 or SAR exposure for 5G FR1), and B ≤1.0.

Let C = normalized reported SAR exposure ratio from external radio, then for compliance,

$$x\% * A + (100-x)\% * B + C \le 1.0 \qquad (1)$$

$$x\% * A + (100-x)\% * B \le x\% * \max(A, B) + (100-x)\% * \max(A, B) \le \max(A, B)$$

$$x\% * A + (100-x)\% * B + C \le \max(A, B) + C \le 1.0 \qquad (2)$$

If A + C ≤ 1.0 and B + C ≤ 1.0 can be proven, then “x% * A + (100-x)% * B + C ≤ 1.0”. Therefore simultaneous transmission analysis for 5G NR + LTE + external radio can be performed in two steps

Step 1: Prove total exposure ratio (TER) of LTE + external radio < 1
Step 2: Prove total exposure ratio (TER) of 5G NR + external radio < 1

Else, if A + C > 1.0 and/or B + C > 1.0, then the followings need to hold true for compliance:

i. A and C are decoupled based on the SPLSR criteria, and
ii. (100-x)% * B + C ≤ 1.0, and
iii. x% * A + (100-x)% * B ≤ 1.0

Note iii. is covered in Part 2 report; i. and ii. should be addressed in Part 2 report.

Above analysis is also apply to LTE inter-band uplink CA, LTE1 + LTE2 + external radio simultaneous transmission, so inter-band uplink CA no need to do additional simultaneously analysis again. Only required comply with total exposure ratio (TER) of LTE + external radio < 1.

17.2 MIMO SAR Test condition and verification

General Note:

1. Smart Transmit EFS v20 (or lower) uses SISO Plimit to calculate RF exposure from MIMO transmission scenario. Therefore, if MIMO is supported for WWAN technologies (including 5G sub6 NR), below procedure should be performed for validity of Smart Transmit operation:
   1) Below procedure should also be performed for Smart Transmit EFS v21 (or higher) if MIMO Plimit is not populated in the EFS but MIMO operation is supported for antennas belonging to the same antenna group (refer to Section 4.2.5 of of Qualcomm's document 80-W2112-4).
2. Measure SAR for supported MIMO scenarios in FTM mode with each of the MIMO antennas set to transmit continuously at *Ptest* = minimum {*Plimit(i), Pmax(i); i*=1 to *n* MIMO antennas}, where *Plimit(i)* is the power level entered in the Smart Transmit EFS for antenna *i* under the corresponding tech/band/DSI. For Smart Transmit to ensure the compliance in MIMO transmission scenario, the below criteria should be met for measured MIMO SAR (i.e., highest peak spatial-average SAR from the measurement):

   $$reported\ SAR_{MIMO} = Measured\ MIMO\ SAR_{MIMO}\ \ at\ (P_{test} + device\ total\ uncertainty) \leq calc.SAR$$

   Where $calc.SAR = \sum_{i=1}^{n}\left[SAR_design_target * 10^{\left(\frac{total\ uncertainty + P_{test} - P_{limit}(i) - backoff(i)}{10}\right)}\right]$

   Here,
   - *n* is number of MIMO antennas (in case of 2x2MIMO, n=2).
   - *Plimit(i)* is EFS *Plimit* for antenna *i* ϵ MIMO for a given tech/band/DSI. *Plimit* corresponds to *SAR_design_target.*
   - *backoff(i)* is backoff from *SAR_design_target* used for the *i*th antenna's *Plimit* to meet TER with external radios (i.e., radios outside of Smart Transmit control). If EFS *Plimit* of antenna *i* corresponds to *SAR_design_target*, then *backoff(i)* = 0 in the above equation.
   - *Ptest* (i.e., power level used for MIMO SAR measurement, MIMO.SAR @*Ptest*) = min {*Plimit(i)*, Pmax*(i)*, *i* = 1 to n MIMO antenna}. To further clarify, *Ptest* = min {*Plimit(i), SISO.Pmax(i)*, *MIMO.Pmax*, *i*= 1 to n antenna ϵ MIMO}, where, *Plimit* corresponds to *SAR_design_target*; *SISO.Pmax* and *MIMO.Pmax* correspond to the maximum output power (nominal levels without device uncertainty) that device is capable; here, *Ptest* is nominal power level, not measured level.
3. If the $reported\ SARMIMO$ does not meet the above condition, then *Plimit(i)* for each of the MIMO antenna in the Smart Transmit EFS should be reduced by *10*log10[*$reported\ SARMIMO$ */calc.SAR]* dB.
4. This test is not needed if MIMO antennas are in different AGs.
5. Per Qualcomm's document guideline, FR1 MIMO Plimit is not populated in the EFS, but FR1 MIMO operation is supported for antennas belonging to the same antenna group, the detail FR1 MIMO analysis results please referred to appendix H.
6. This test is not needed if MIMO antennas are in different AGs.

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18. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

19. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[6] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[7] FCC KDB 941225 D05A v01r02, “Rel. 10 LTE SAR Test Guidance and KDB Inquiries”, Oct 2015

[8] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[9] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.

[10] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

[11] FCC KDB 447498 D02 v02r01, “SAR Measurement Procedures for USB Dongle Transmitters”, Oct 2015.

------THE END------