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MPE test on Ericsson mRRUS 12 B4

(3 appendices)

Test object

Product name: mRRUS 12 B4

Product number: KRC 161 326/X, see appendix 1 for details.

See appendix 1 for the tested hardware configuration and general information.

See appendix 3 for photos.

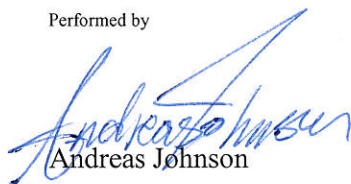
Summary

Standard	Compliant	Appendix	Remarks
FCC 47 CFR 2.1091 Radiofrequency radiation exposure evaluation: mobile devices	Yes	-	-
RSS-102 Radio Frequency Exposure compliance of Radio communication Apparatus, Issue 4	Yes	2	-
OET Bulletin 65/KDB447498 ver 05 rev 1	Yes	2	-

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Electronics - EMC

Performed by


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Appendix 1

Measurement equipment

	Calibration Due	SP number
Test site Tesla	2014-01	503 881
Measurement software: Antennkalibrering V1.20	-	-
Calculation software: EMF 1.0	-	-
Laser probe AR FL7006	2014-06	901 500
Testo 625 Temperature and humidity meter	2014-06	504 188

Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation "SP-QD 10885". The measurement uncertainties can be found in the table below. The uncertainties are calculated with a coverage factor $k=2$ (95% level of confidence).

Standard	Method	Uncertainty
FCC 47 CFR 2.1091	RF exposure evaluation	10 %, Note

Note: Stated uncertainty refers to the calculated distance.

Compliance evaluation is based on a shared risk principle with respect to the measurement uncertainty.

Purpose of test

The tests were performed to verify that the radio frequency exposure of the mRRUS 12 B4 meets the requirements of 47 CFR 2.1091 and RSS-102.

Description of the test object

The test object is a WCDMA/ LTE Multi Standard capable micro Remote Radio Unit configured in Single RAT mode for both WCDMA and LTE base stations and designed to provide mobile users with a connection to a mobile network.

Equipment:

- Product name: mRRUS 12 B4
- Product number: KRC 161 326/1, 110-240 VAC internal antenna
- Product number: KRC 161 326/2, -48 VDC internal antenna
- Product number: KRC 161 326/3, 110-240 VAC no internal antenna
- Product number: KRC 161 326/4, -48 VDC no internal antenna
- FCC ID TA8AKRC161326
- IC 287AB-AS161326
- IC model numbers:
- IC MODEL NO: AS1613261
- IC MODEL NO: AS1613262
- IC MODEL NO: AS1613263
- IC MODEL NO: AS1613264

Appendix 1

Delivery of test object

The test object was delivered: 2013-05-06.

Test facility

The used test site (503 881) is compliant with the requirements of section 2.948 of the FCC rules and listed, registration number 93866, as a facility accepted for certification under parts 15 and 18. The site complies with RSS-Gen, Issue 3 and is accepted by Industry Canada for the performance of radiated measurements, file no: IC 3482A-1.

Reservation

The test results in this report apply only to the particular test object as declared in the report.

Appendix 1

Operational test mode

For WCDMA the mRRUS unit was activated for maximum transmit power. TM5:8 HS-PDSCH at 240 ksps + 30 DPCH:s at 30 ksps (SF=128) defined in ETSI TS 125 141/ 3GPP TS 25.141 was used in all cells. The channel type “3GPP Reference channel 12.2 ksps slotformat 10” was used in all cells with DPCH = 30.

The test object was configured in MIMO mode with both RF paths allocated to the following UARFCN:

Configuration: WCDMA

	DL	UL
UARFCN	1537	1312
Freq.	2112.4 MHz	1712.4 MHz
Channel bandwidth	5 MHz	5 MHz

For LTE the mRRUS 12 B4 unit was activated for maximum transmit power transmitting test model E-TM1.1 as defined in ETSI TS 136 141/ 3GPP TS 36.141.

The test object was configured in MIMO mode with both RF paths allocated to the following EARFCN:

Configuration: LTE 5 MHz

	DL	UL
EARFCN	2175	20175
Freq.	2132.5 MHz	1732.5 MHz
Channel bandwidth	5 MHz	5 MHz

Configuration: LTE 20 MHz

	DL	UL
EARFCN	2300	20300
Freq.	2145.0 MHz	1745.0 MHz
Channel bandwidth	20 MHz	20 MHz

Appendix 1

Tested configuration

RF A configuration: 1x 37.0 dBm (1x 5 W)
RF B configuration: 1x 37.0 dBm (1x 5 W)
SFP module: Avago, AFCT-5710APZ, s/n: AD0916T12GM
OIL: Opto fibre, single mode, 2.5 Gbit/s
Power configuration: -48 VDC

Test engineers

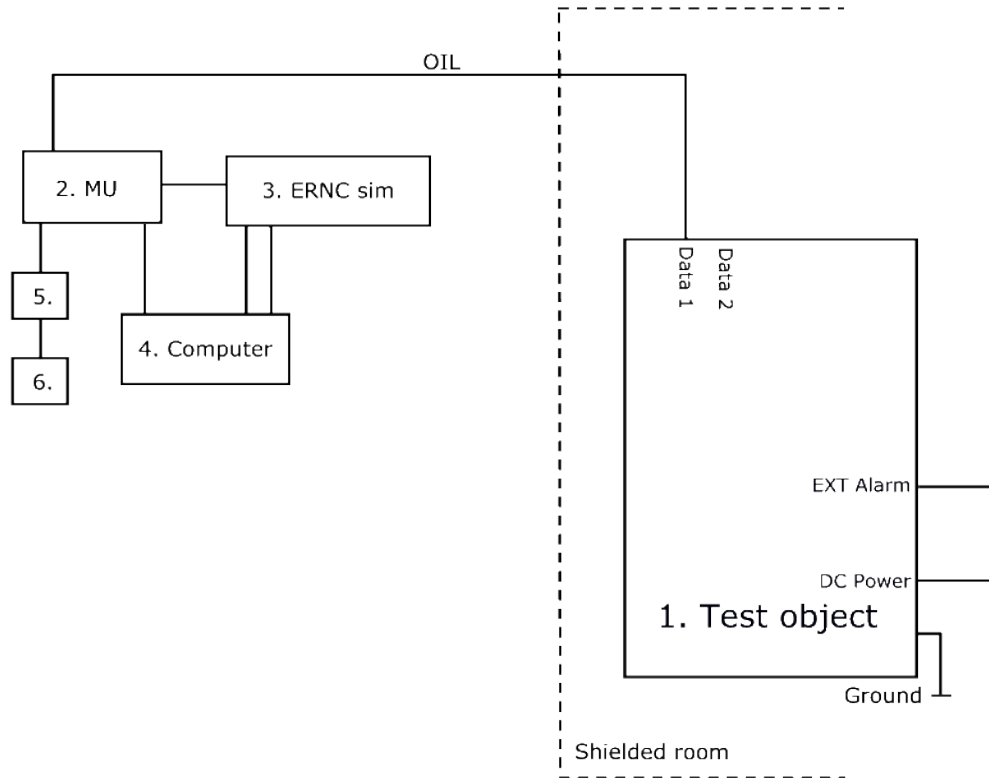
Andreas Johnson and Tomas Isbring, SP.

Test participant

None.

Appendix 1

Test setup Configuration WCDMA:



1.	mRRUS 12 B4, KRC 161 326/2, rev. R1A, s/n: C826925910 software CXP 901 3268/9, Rev. R51MD06
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Functional test equipment:

2.	DUW 41 01 KDU 127 174/4 R2C, s/n: A402007255, hosted in SUP 6601 1/BFL 901 009/4, rev. R1D, s/n. BW98450216
3.	ERNC-SIM 130, BAMS – 1000660991 Netgear Switch FS726T
4.	Computer HP Elitebook 8560w, BAMS – 1001236856
5.	GPS 02 01, NCD 901 41/1, rev. R1D, s/n: TU8K356428
6.	GPS Active Antenna, KRE 101 2082/1

Integrated antenna

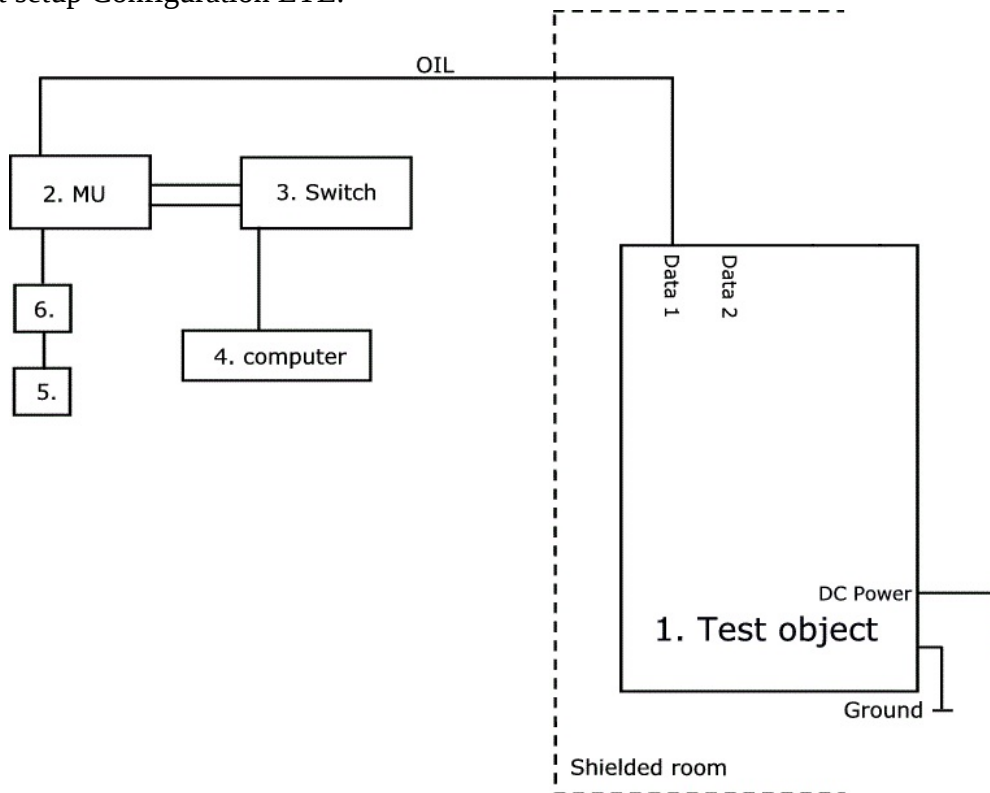
Sector antenna, KRE 101 2141/1, rev. R1A, s/n: T89U100001
Representing version: KRC 161 326/2

Semi-integrated omni antenna

VPol Omni 1710-2700, KRE 101 2024/1, s/n: DEF4310198
Representing version: KRC 161 326/4

Appendix 1

Test setup Configuration LTE:



1.	mRRUS 12 B4, KRC 161 326/2, rev. R1A, s/n: C826925910 software CXP 901 3268/9, Rev. R51MD06
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Functional test equipment:

2.	DUS 41 01 KDU 137 624/1 R5A, s/n: D165724698, hosted in SUP 6601 1/BFL 901 009/4, rev. R1D, s/n. BR82081105
3.	Netgear Switch FS726T
4.	Computer HP Elitebook 8560w, BAMS – 1001236856
5.	GPS Active Antenna, KRE 101 2082/1
6.	GPS 02 01, NCD 901 41/1, rev. R1D, s/n: TU8K356428

Integrated antenna

Sector antenna, KRE 101 2141/1, rev. R1A, s/n: T89U100001
Representing version: KRC 161 326/2

Semi-integrated omni antenna

VPol Omni 1710-2700, KRE 101 2024/1, s/n: DEF4310198
Representing version: KRC 161 326/4

Appendix 1

Interface:	Type of port:
Power: -48 VDC	DC Power
Data 1, optical interface	Signal
Data 2, optical interface	Signal
Ext Alarm, unshielded multi wire	Signal
Ground wire	Ground

RBS software

WCDMA

	Software	Revision
DUW 41 01	CXP 902 171/9	R1CA23

LTE

	Software	Revision
DUS 41 01	CXP 102 151/18	R25Y

Appendix 2

RF exposure evaluation: 2.1091 Mobile devices / RSS-102 4.2

Date	Temperature	Humidity
2013-05-22	23 °C ± 3 °C	47 % ± 5 %
2013-05-23	23 °C ± 3 °C	29 % ± 5 %
2013-05-24	22 °C ± 3 °C	31 % ± 5 %
2013-05-27	23 °C ± 3 °C	38 % ± 5 %
2013-06-11	23 °C ± 3 °C	38 % ± 5 %
2013-06-25	23 °C ± 3 °C	49 % ± 5 %

Procedure

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

Test setup and procedure

1. The test object is measured in twelve directions (in 30° steps) with the field probe continuously scanning from 0.1 – 2 m in height.
2. Measuring distance was 20 cm from the centre of the test object, step 1 is repeated with a distance increment of 20 cm until the measured field strength is compliant.

The distance for compliance for Adult is derived from spatial average over the full scan height. The distance for compliance for Child is derived from spatial average over ± 45 cm from the height where the highest level was detected.

The nominal power stated by the manufacturer is 2x 5 W (2x 37 dBm), with a tolerance of ± 1 dB.

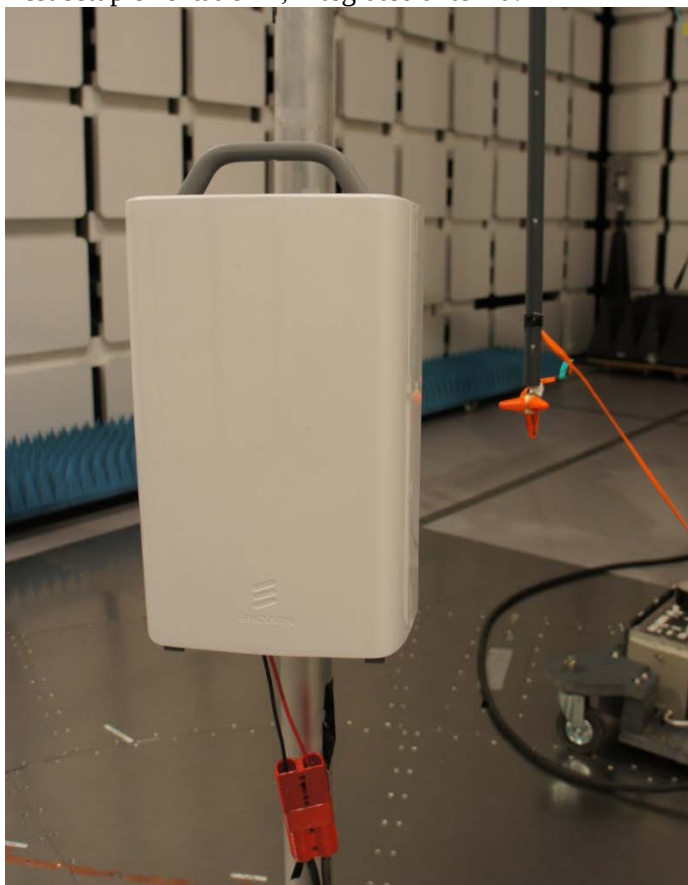
For LTE the measured output power was 4.51 W (36.54 dBm). Therefore the calculation was adjusted by 1.46 dBm to cover the highest possible output power.

For WCDMA the measured output power was 4.71 W (36.73 dBm). Therefore the calculation was adjusted by 1.27 dBm to cover the highest possible output power.

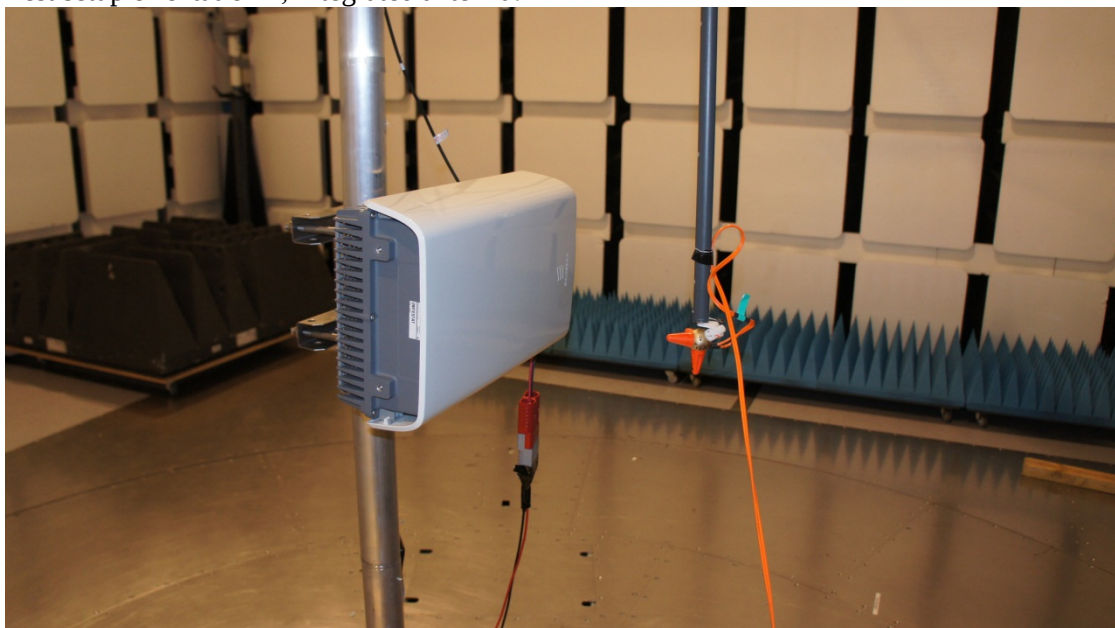
The measurements were made with an Integrated and a Semi-integrated omni antenna.

Appendix 2

Test setup orientation 1, Integrated antenna:

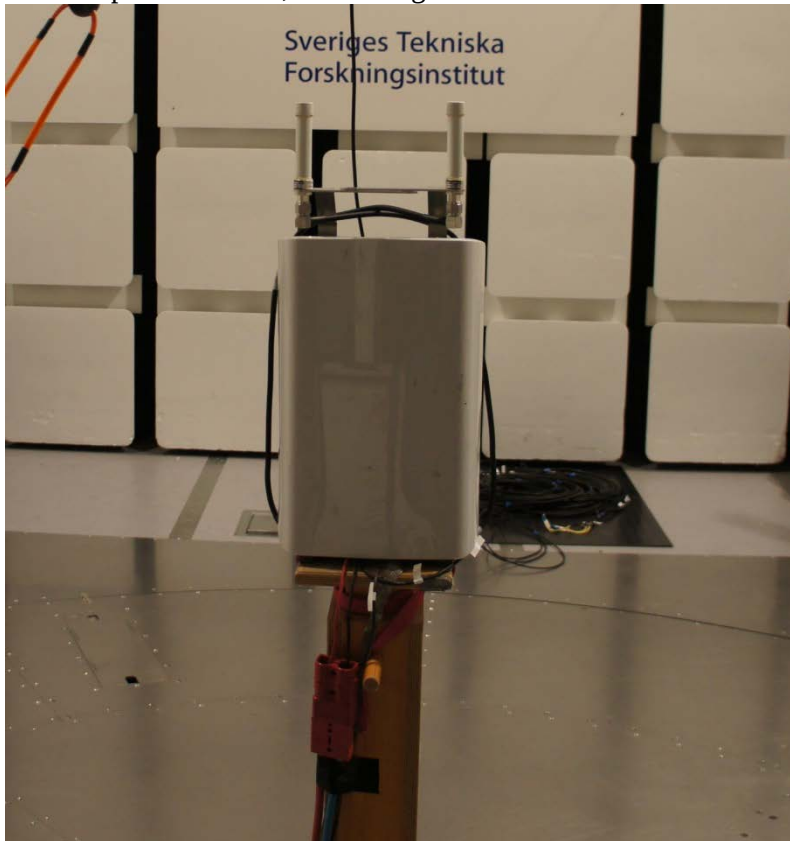


Test setup orientation 2, Integrated antenna:

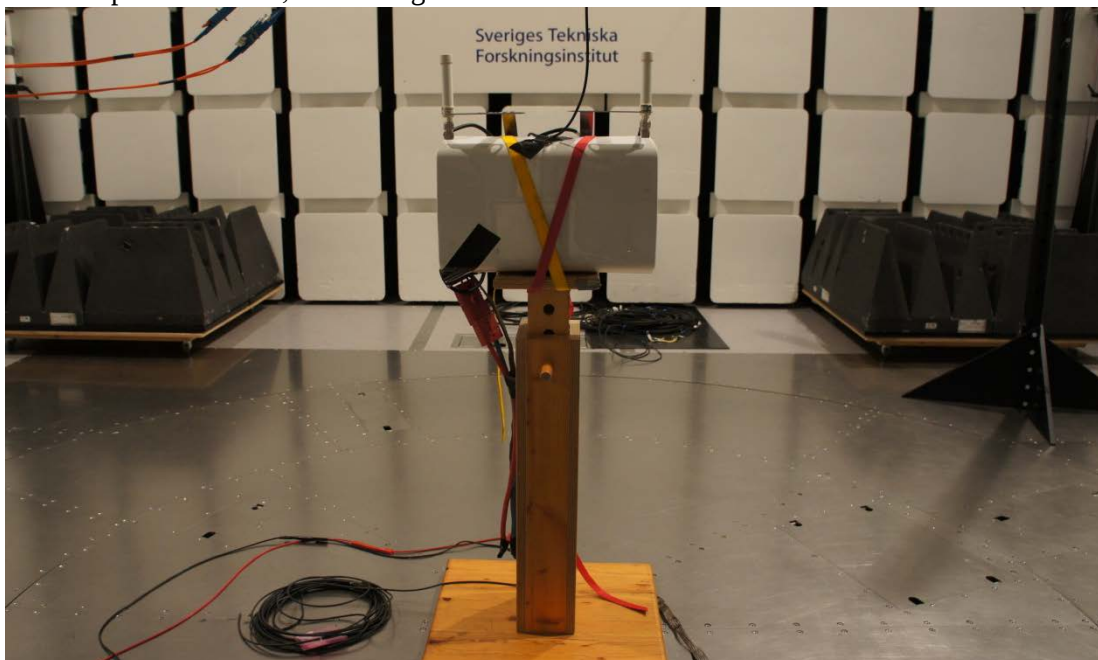


Appendix 2

Test setup orientation 1, Semi-integrated omni antenna:



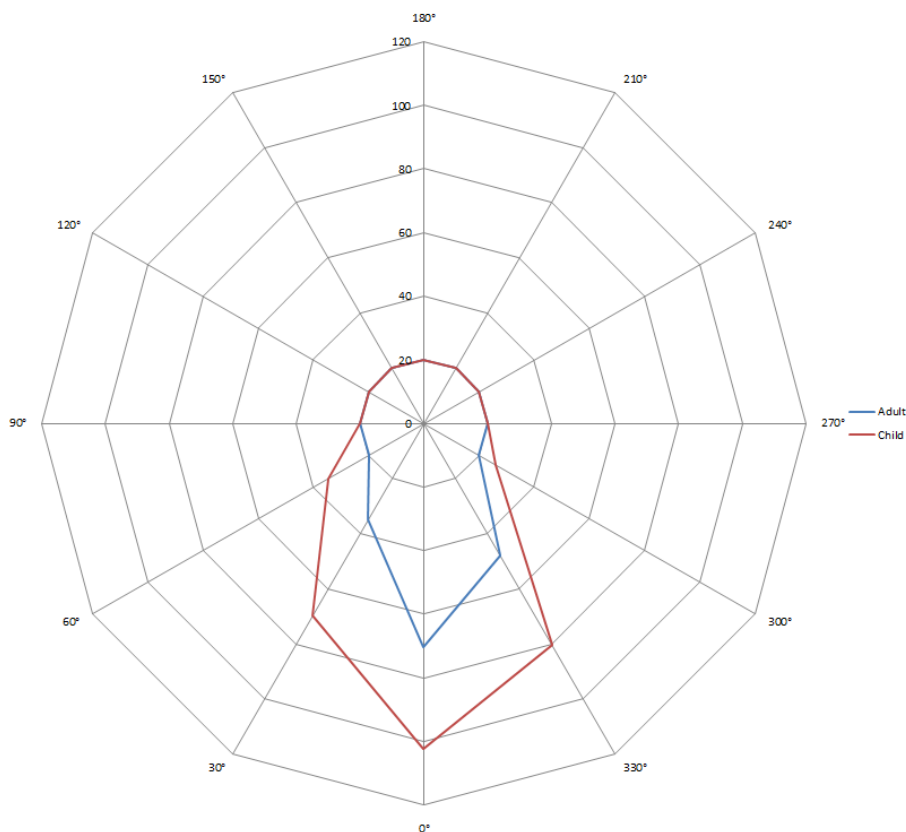
Test setup orientation 2, Semi-integrated omni antenna:



Appendix 2

Results

Orientation 1, Integrated antenna, worst case: LTE 20 MHz



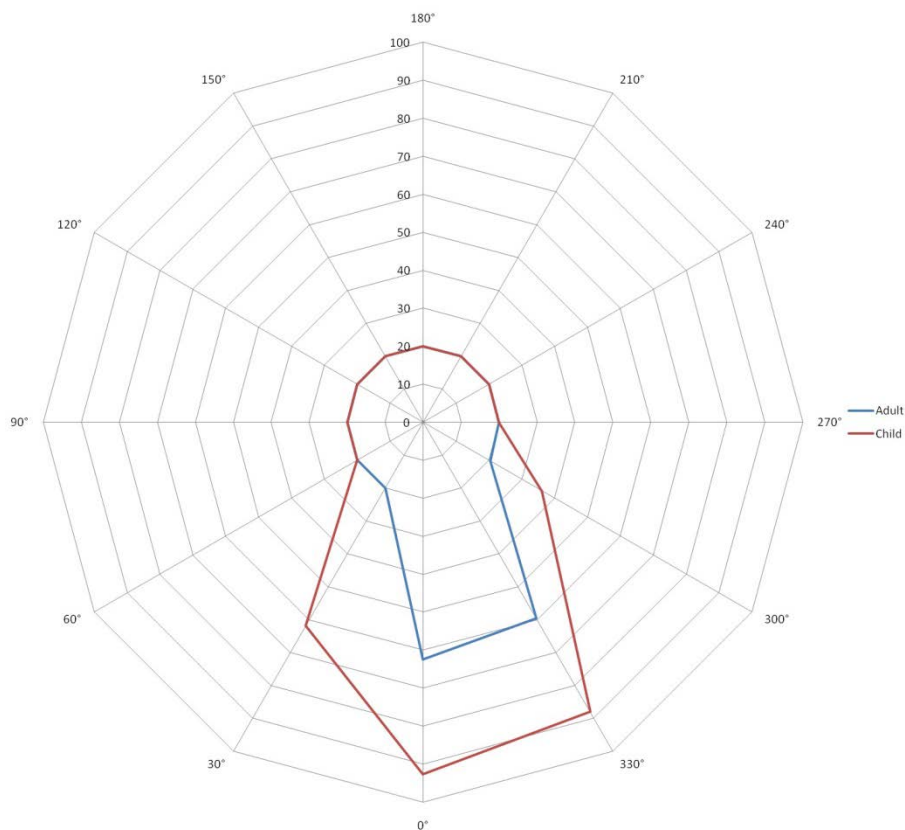
Note: The test object was placed with the front side facing 0° and the back side facing 180° as shown in the test setup photo.

	Distance for compliance (cm).	
Direction	Adult	Child
0°	87.3	102.3
30°	53.7	69.8
60°	20.0	34.7
90°	20.0	20.0
120°	20.0	20.0
150°	20.0	20.0
180°	20.0	20.0
210°	20.0	20.0
240°	20.0	20.0
270°	20.0	20.0
300°	20.0	26.2
330°	48.0	80.5

Note: The distance for compliance of every direction in the table above is calculated from the chassis of the test object.

Appendix 2

Orientation 2, Integrated antenna worst case LTE 5 MHz:



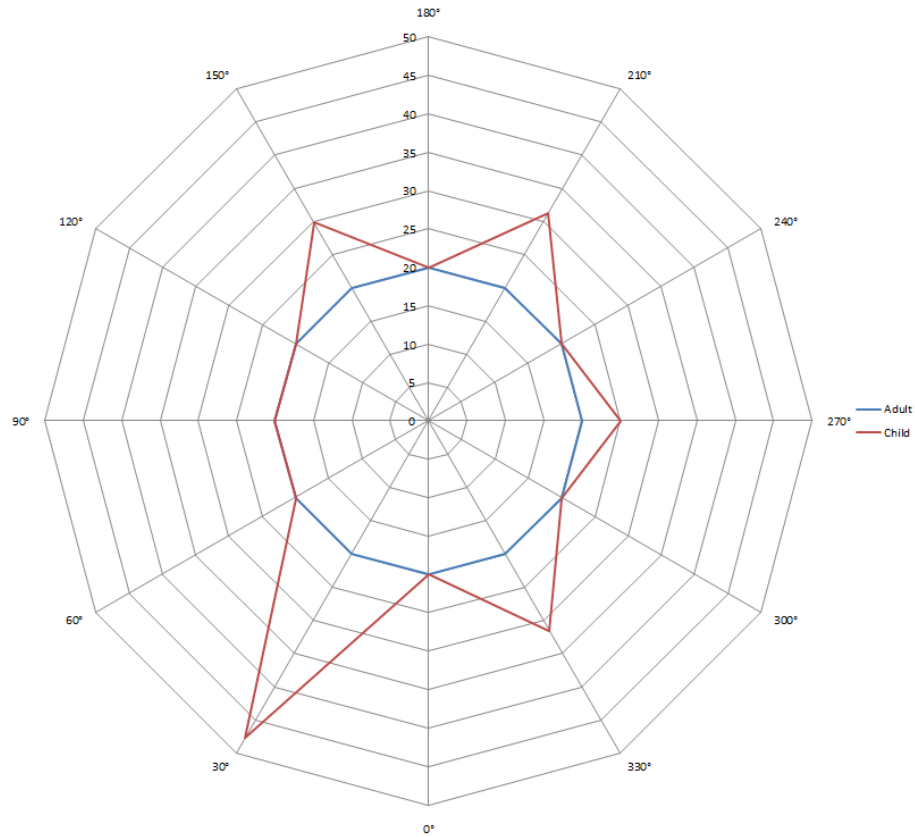
Note: The test object was placed with the front side facing 0° and the handle facing 90° as shown in the test setup photo.

Direction	Distance for compliance (cm).	
	Adult	Child
0°	62.5	92.7
30°	20.0	61.8
60°	20.0	20.0
90°	20.0	20.0
120°	20.0	20.0
150°	20.0	20.0
180°	20.0	20.0
210°	20.0	20.0
240°	20.0	20.0
270°	20.0	20.0
300°	20.5	36.2
330°	59.6	88.0

Note: The distance for compliance of every direction in the table above is calculated from the chassis of the test object.

Appendix 2

Orientation 1, Semi-integrated omni antenna worst case WCDMA:



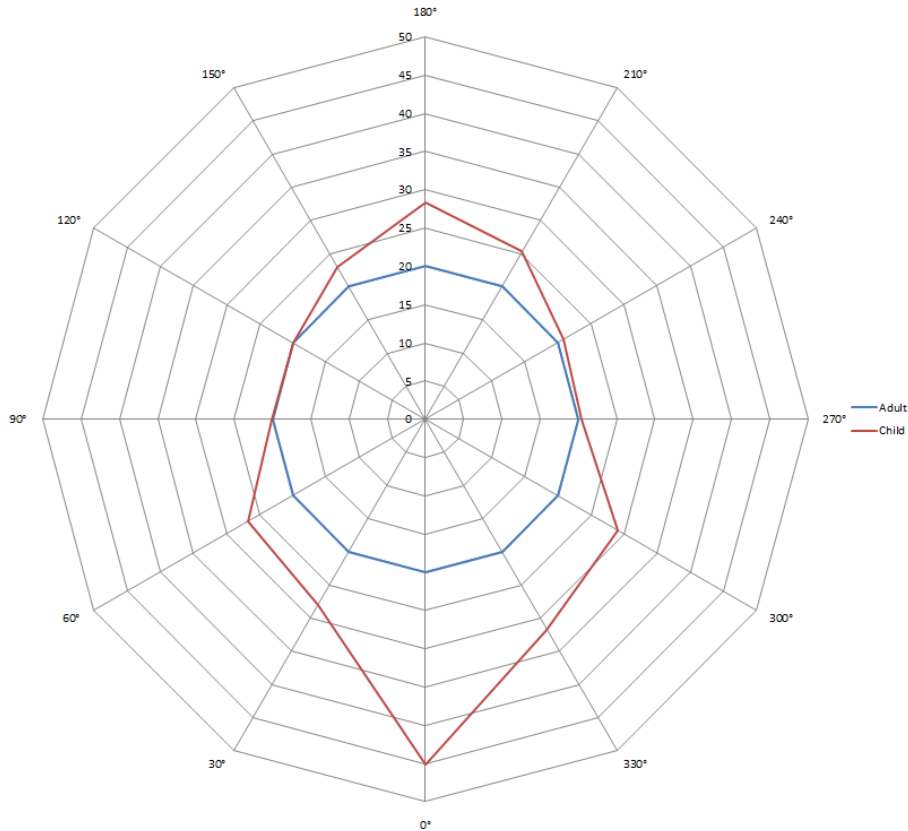
Note The test object was placed with the front facing 0° and the back side facing 180° as shown in the test setup photo.

Direction	Distance for compliance (cm).	
	Adult	Child
0°	20.0	20.0
30°	20.0	47.7
60°	20.0	20.0
90°	20.0	20.0
120°	20.0	20.0
150°	20.0	29.8
180°	20.0	20.0
210°	20.0	31.2
240°	20.0	20.0
270°	20.0	25.0
300°	20.0	20.0
330°	20.0	31.6

Note: The distance for compliance of every direction in the table above is calculated from the chassis of the test object.

Appendix 2

Orientation 2, Semi-integrated omni worst case LTE 20 MHz:



Note: The test object was placed with the front side facing 0° and the handle facing 270° as shown in the test setup photo.

Direction	Distance for compliance (cm).	
	Adult	Child
0°	20.0	45.1
30°	20.0	28.0
60°	20.0	26.7
90°	20.0	20.1
120°	20.0	20.0
150°	20.0	23.0
180°	20.0	28.4
210°	20.0	25.3
240°	20.0	20.9
270°	20.0	20.4
300°	20.0	29.0
330°	20.0	31.8

Note: The distance for compliance of every direction in the table above is calculated from the chassis of the test object.

Appendix 2

Limits

According to 47CFR 1.1310.

(B) Limits for General Population/Uncontrolled Exposure

Frequency range (MHz)	Electric field strength [E] (V/m)	Magnetic field strength [H] (A/m)	Power density [S] (mW/cm ²)	Averaging time E ² , H ² or S (minutes)
1500-100.000	-	-	1.0	(Note 1)

According to RSS-102 4.2

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency range (MHz)	Electric field strength [E] (V/m)	Magnetic field strength [H] (A/m)	Power density [S] (W/m ²)	Averaging time E ² , H ² or S (minutes)
1500-15000	-	-	10	(Note 1)

Note 1: The test was executed with the test object configured for maximum output power to represent worst case. Therefore no averaging time measurement was made.

Complies?	Yes
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Appendix 3

Photos of test object

Front side with cover:



Front side without cover:



Front side without Integrated antenna:



Left side without Integrated antenna:



Appendix 3

Right side without Integrated antenna:



Back side :



Front side with Semi-integrated omni antenna



Appendix 3

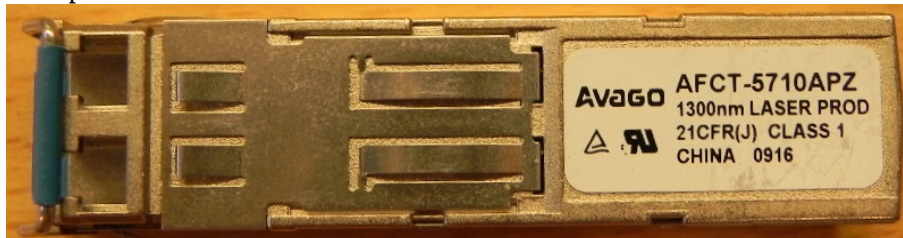
Labels:

mRRUS 12 B4:



SFP module:

Data port 1:



Integrated antenna:



Semi-integrated omni antenna

