



# REPORT

issued by an FCC listed Laboratory Reg. no. 93866.  
The test site complies with RSS-Gen, file no: IC 3482A

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## MPE test on Ericsson mRRUS 12 B2

(3 appendices)

### Test object

Product name: mRRUS 12 B2  
Product number: KRC 161 328/X, see appendix 1 for details.

See appendix 1 for the tested hardware configuration and general information.  
See appendix 3 for photos.

### Summary

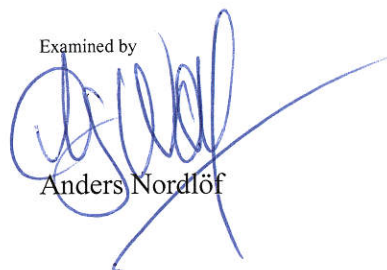
Standard	Compliant	Appendix	Remarks
FCC 47 CFR 2.1091 Radiofrequency radiation exposure evaluation: mobile devices	Yes	-	-
RSS-102 Radio Frequency Exposure compliance of Radio communication Apparatus, Issue 4	Yes	2	-
OET Bulletin 65/KDB447498 ver 05 rev 1	Yes	2	-

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## Appendix 1

### Measurement equipment

	Calibration Due	SP number
Test site Edison	2013-11	504 114
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	504 117

### 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 radiofrequency exposure of the mRRUS 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.

The test scope covers the following models of test object:

- Product number: KRC 161 328/1, 110-240 VAC internal antenna
- Product number: KRC 161 328/2, -48 VDC internal antenna
- Product number: KRC 161 328/3, 110-240 VAC no internal antenna
- Product number: KRC 161 328/4, -48 VDC no internal antenna

FCC ID TA8AKRC161328  
IC 287AB-AS161328

IC model numbers:  
IC MODEL NO: AS1613281  
IC MODEL NO: AS1613282  
IC MODEL NO: AS1613283  
IC MODEL NO: AS1613284

## Appendix 1

### **Delivery of test object**

The test object was delivered: 2013-10-21.

### **Test facility**

The used test site (504 114) 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-2.

### **Reservation**

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

### **Test engineers**

Hyder Khalaf, Tomas Isbring and Andreas Johnson, SP.

### **Test participant**

Mihai Simon, Ericsson AB.

## 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: Delta, LCP-2488B4HDRT-E, s/n: 103606100011  
 Delta, LCP-2488B4HDRT-E, s/n: 103506100558  
 OIL: Opto fibre, single mode, 2.5 Gbit/s  
 Power configuration: -48 VDC

### Operational test mode

For WCDMA the mRRUS unit was activated for maximum transmit power transmitting test model TM5 as defined in ETSI TS 125 141/ 3GPP TS 25.141. The channel type “3GPP Reference channel 12.2 kps 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:

UARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
9662	1932.4	B	Single carrier TX bottom frequency
9800	1960.0	M	Single carrier TX mid frequency
9938	1987.6	T	Single carrier TX top frequency

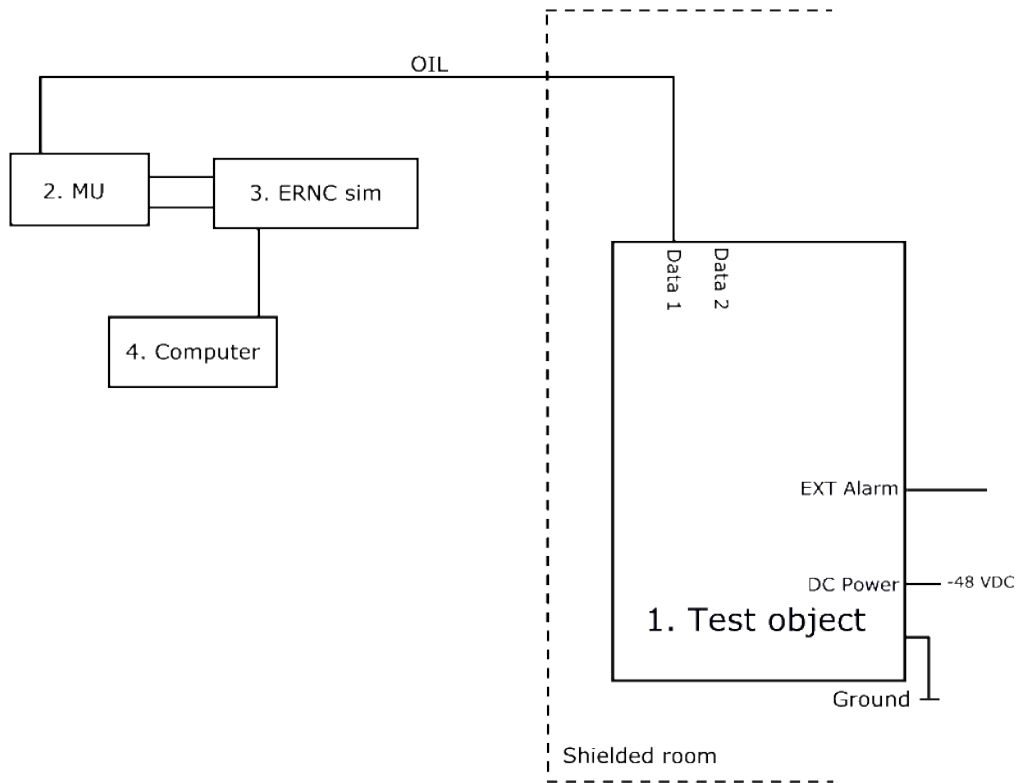
For LTE the mRRUS unit was activated for maximum transmit power transmitting test model E-TM1.1 as defined in ETSI TS 136 141/ 3GPP TS 36.141.

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

EARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
700	1940.0	B	Single carrier TX bottom frequency in 20 MHz BW configuration
900	1960.0	M	Single carrier TX mid frequency in all BW configurations (1.4 MHz - 20 MHz)
1100	1980.0	T	Single carrier TX top frequency in 20 MHz BW configuration

Appendix 1

Test setup Configuration WCDMA:



1.	mRRUS 12 B2, KRC 161 328/2, rev. R1A, s/n: D16A183069 software CXP 901 7316/2, Rev. R51NK
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**Functional test equipment:**

2.	DUW 30 01, KDU 127 161/3, rev. R4E, s/n: TU8X621359, hosted in SUP 6601 1/BFL 901 009/4, rev. R1E, s/n. BR82081105
3.	ERNc-SIM 072, BAMS – 1000579045 Netgear Switch GSM7212, BAMS – 1000517289 Symmetricom SyncServer S250, BAMS – 1000690719 Symmetricom 8040 Rubidium Frequency Standard, BAMS – 1001292861
4.	Computer I-ultra27-06 standalone, BAMS – 1000758439

**Integrated antenna**

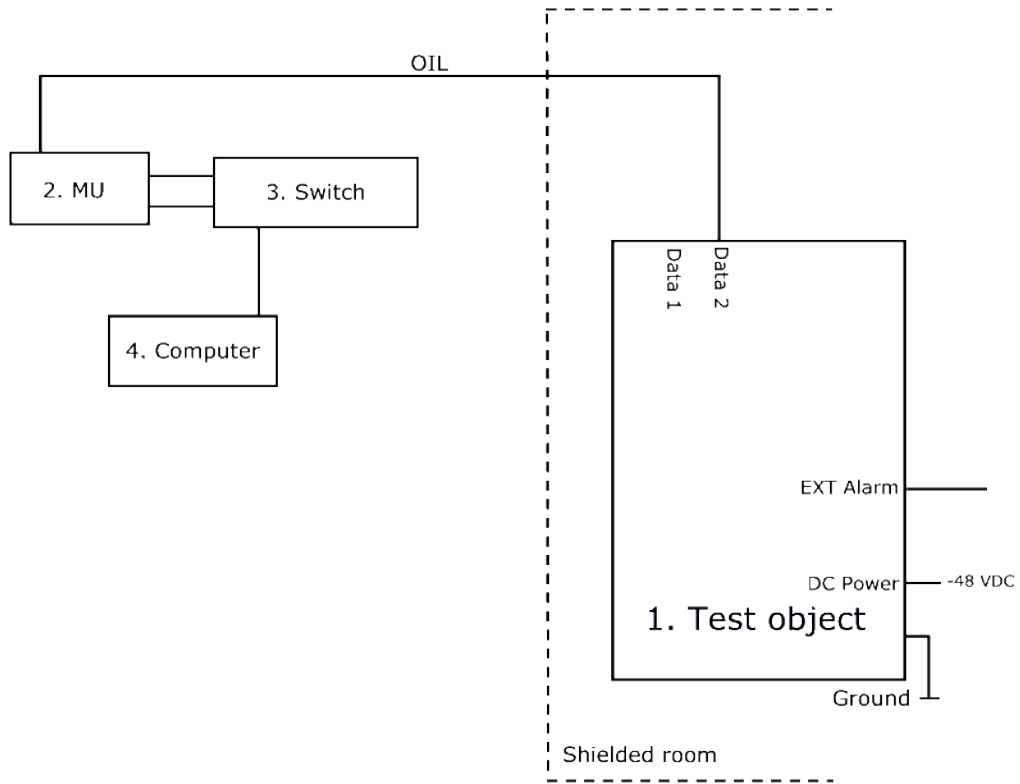
Sector antenna, KRE 101 2141/1, rev. R1B, s/n: T89U100470  
Representing version: KRC 161 328/2

**Semi-integrated omni antenna**

VPol Omni, KRE 101 2233/1, s/n: DEG2731605  
VPol Omni, KRE 101 2233/1, s/n: DEG2731516  
Representing version: KRC 161 328/4

Appendix 1

Test setup Configuration LTE:



1.	mRRUS 12 B2, KRC 161 328/2, rev. R1A, s/n: D16A183069 software CXP 901 7316/2, Rev. R51NK
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**Functional test equipment:**

2.	DUS 41 01 KDU 137 624/1 R5A, s/n: D168382143, hosted in SUP 6601 1/BFL 901 009/4, rev. R1E, s/n. BR88237597
3.	Netgear Switch GSM7212, BAMS – 1000517289
4.	Computer I-ultra27-06 standalone, BAMS – 1000758439

**Integrated antenna**

Sector antenna, KRE 101 2141/1, rev. R1B, s/n: T89U100470  
Representing version: KRC 161 328/2

**Semi-integrated omni antenna**

VPol Omni, KRE 101 2233/1, s/n: DEG2731605  
VPol Omni, KRE 101 2233/1, s/n: DEG2731516  
Representing version: KRC 161 328/4

Appendix 1

<b>Interface:</b>	<b>Type of port:</b>
Power: -48 VDC	DC Power
Data 1, optical interface	Signal
Data 2, optical interface	Signal
Ext Alarm, shielded multi wire	Signal
Ground wire	Ground

**RBS software**

WCDMA

	<b>Software</b>	<b>Revision</b>
DUW 30 01	CXP 902 1719	R4G03

LTE

	<b>Software</b>	<b>Revision</b>
DUS 41 01	CXP 102 051/19	R28AT



Appendix 2

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

Date	Temperature	Humidity
2013-10-25	23 °C ± 3 °C	36 % ± 5 %
2013-10-26	23 °C ± 3 °C	40 % ± 5 %
2013-10-27	23 °C ± 3 °C	44 % ± 5 %
2013-10-28	24 °C ± 3 °C	43 % ± 5 %
2013-10-29	23 °C ± 3 °C	42 % ± 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.

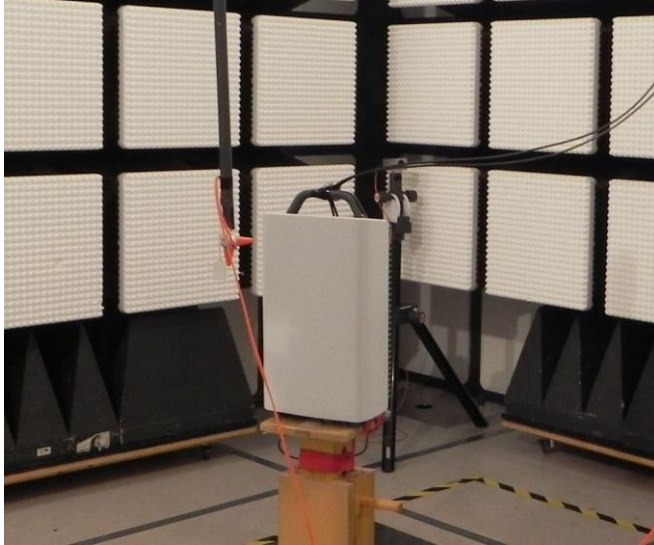
For LTE the measured output power was 5.13 W (37.1 dBm). Therefore the calculation was adjusted by 0.9 dBm to cover the highest possible output power.

For WCDMA the measured output power was 5.13 W (37.1 dBm). Therefore the calculation was adjusted by 0.9 dBm to cover the highest possible output power.

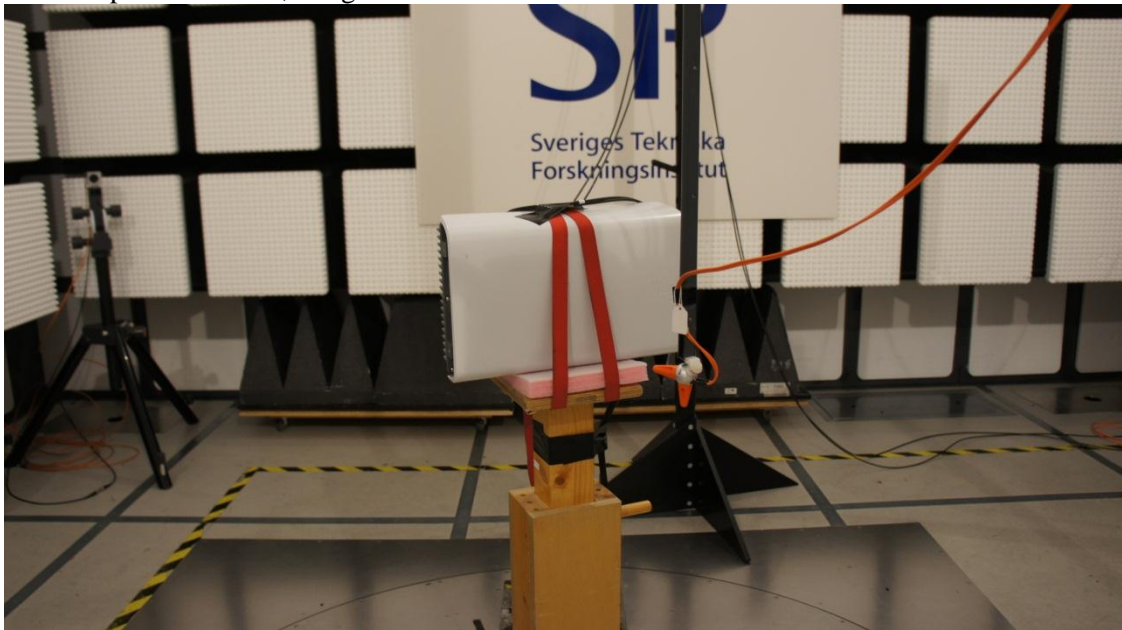
The measurement were made with an Integrated antenna and a Semi-integrated omni antenna.

## Appendix 2

Test setup orientation 1, Integrated antenna:



Test setup orientation 2, Integrated antenna:

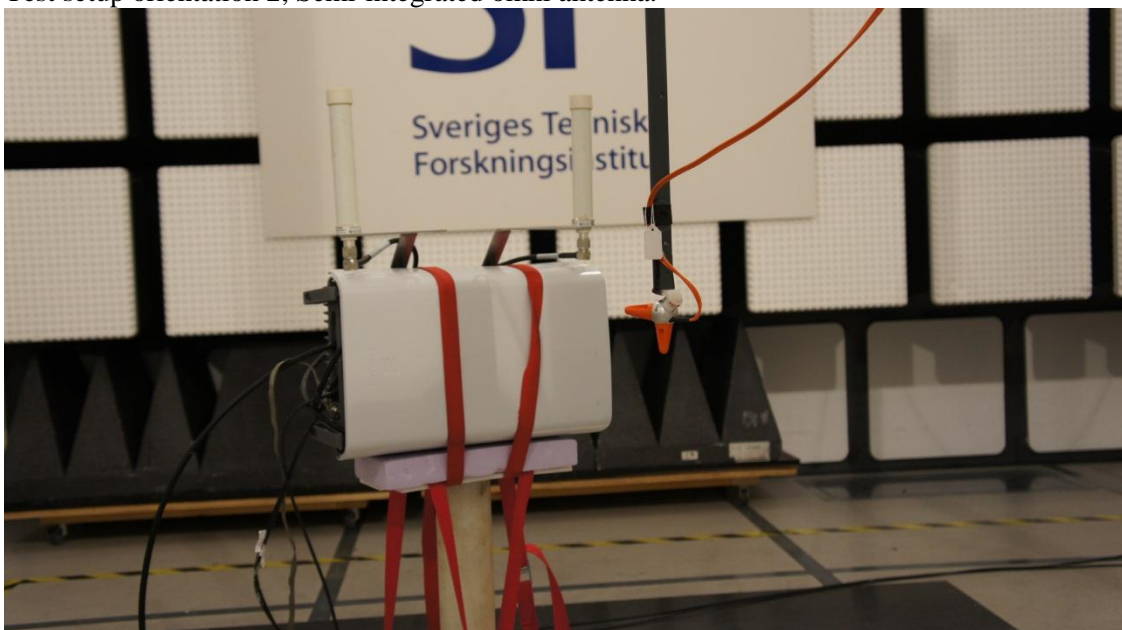


## Appendix 2

Test setup orientation 1, Semi-integrated omni antenna:



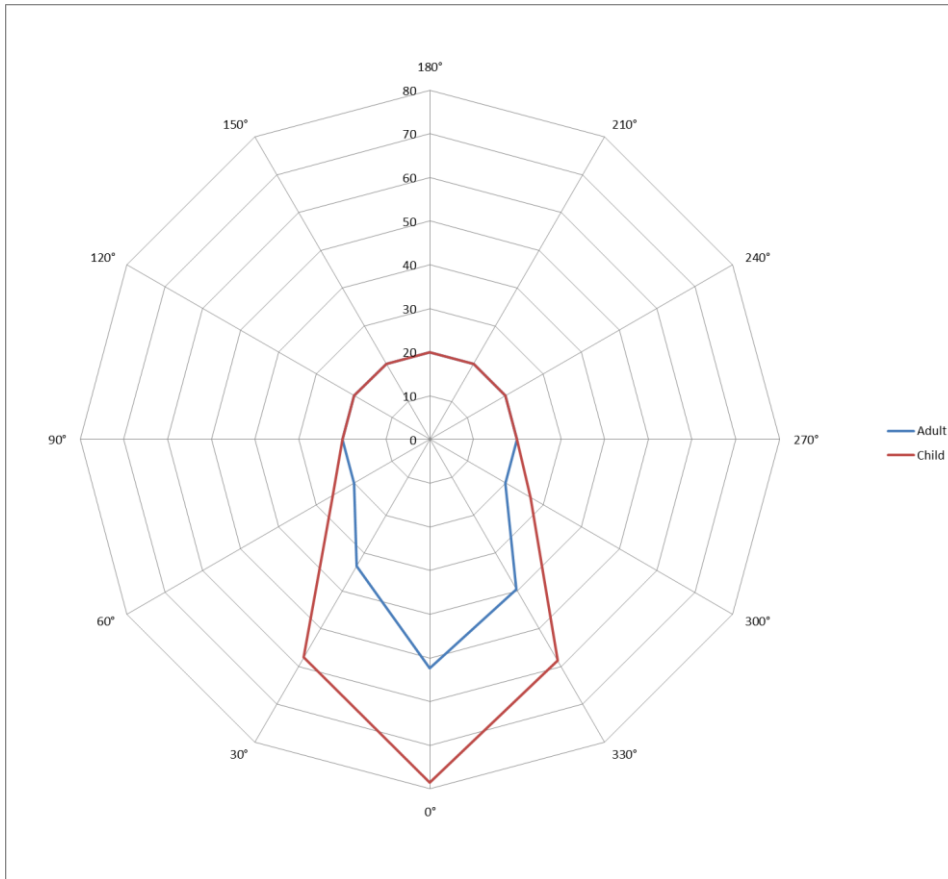
Test setup orientation 2, Semi-integrated omni antenna:



Appendix 2

**Results**

Orientation 1, Integrated antenna, worst case: LTE 20 MHz TX top frequency



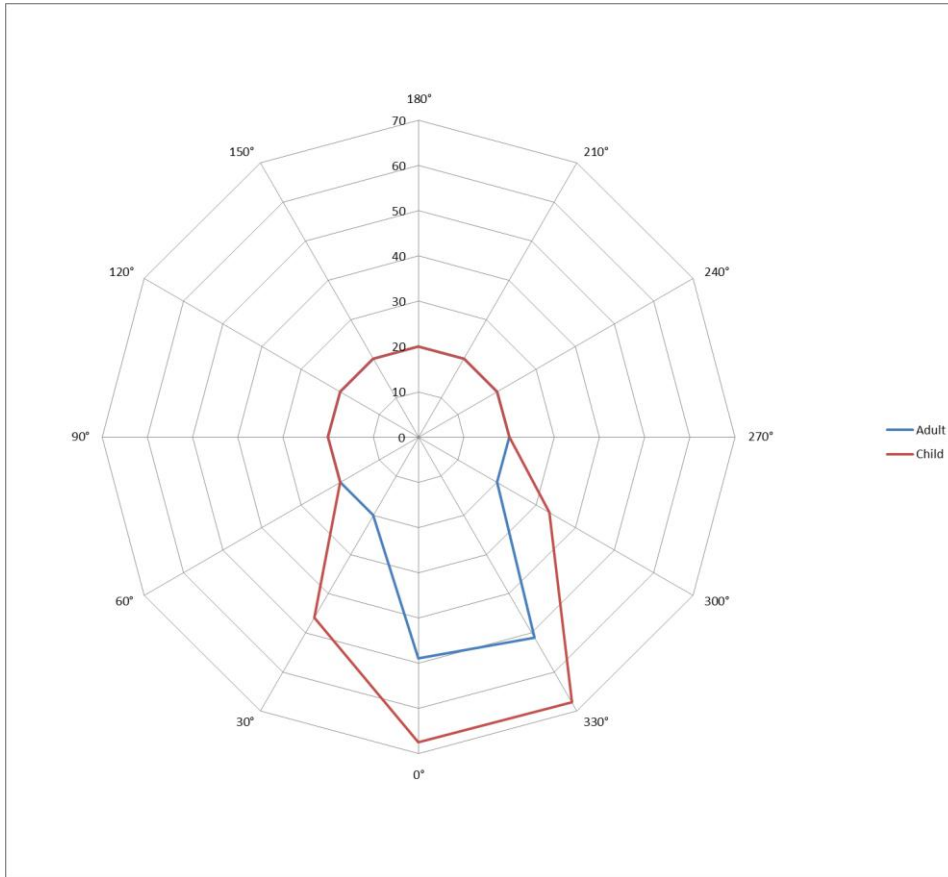
Note: The test object was placed with the front side facing 0° and the back side facing 180° as shown in the test setup photo.

Direction	Distance for compliance (cm).	
	Adult	Child
0°	52.4	78.6
30°	33.4	57.6
60°	20.0	25.6
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	26.6
330°	39.7	58.4

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 20 MHz TX mid frequency



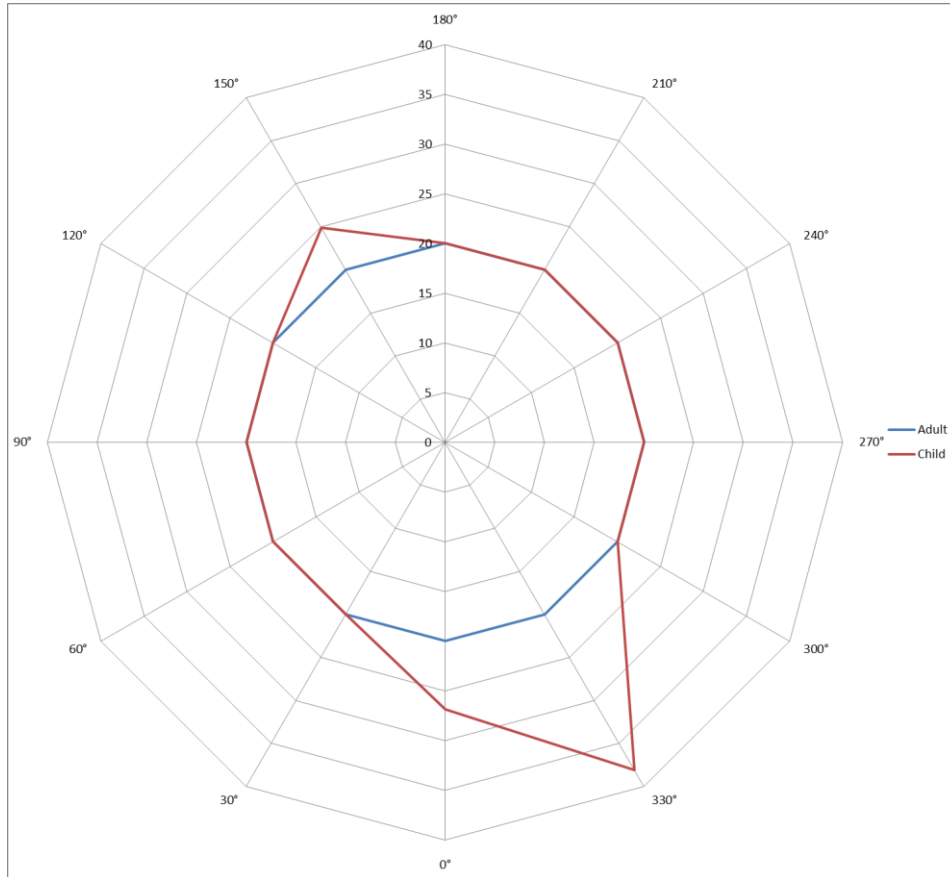
Note: The test object was placed with the front side facing 0° and the handle facing 90° as shown in the test setup photo.

Direction	Distance for compliance (cm).	
	Adult	Child
0°	49.0	67.5
30°	20.0	46.1
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°	20.0	33.4
330°	51.2	67.8

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 TX top frequency



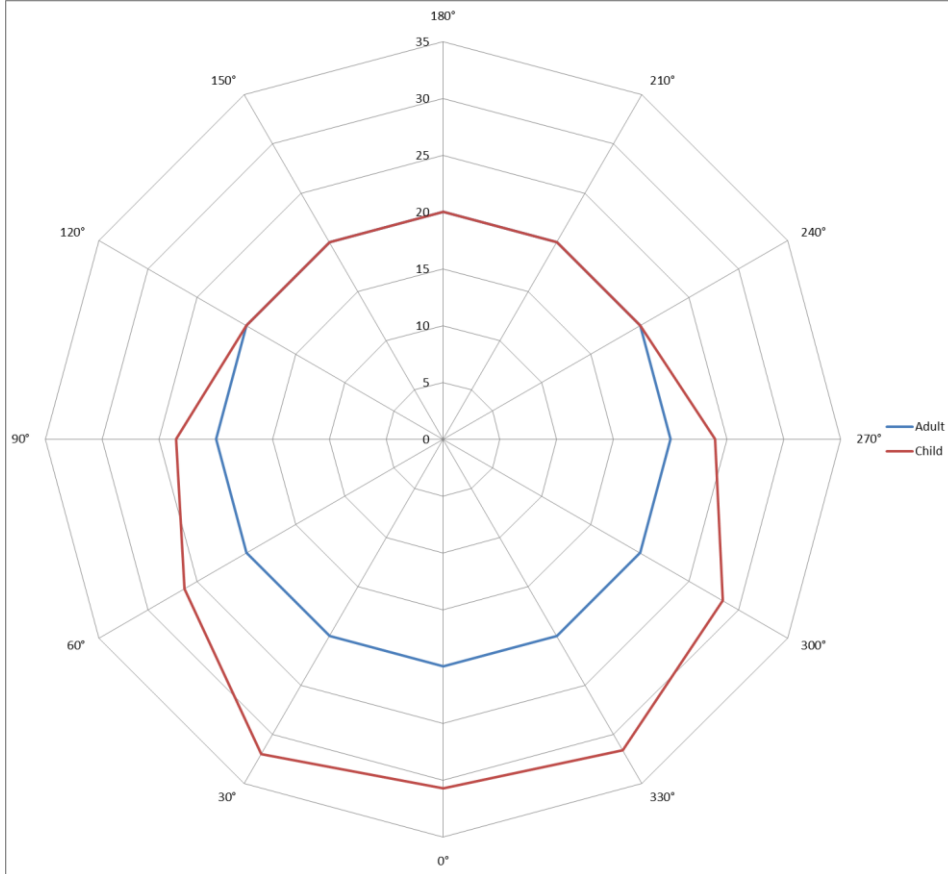
Note The test object was placed with the front facing 0° and the back side facing 180° as shown in the test setup photo.

Direction	Distance for compliance (cm).	
	Adult	Child
0°	20.0	26.9
30°	20.0	20.0
60°	20.0	20.0
90°	20.0	20.0
120°	20.0	20.0
150°	20.0	24.9
180°	20.0	20.0
210°	20.0	20.0
240°	20.0	20.0
270°	20.0	20.0
300°	20.0	20.0
330°	20.0	38.1

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 TX mid frequency



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	30.7
30°	20.0	32.0
60°	20.0	26.3
90°	20.0	23.5
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	23.9
300°	20.0	28.4
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

**Limits**

According to 47 CFR 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 <sup>2</sup> )	Averaging time  E  <sup>2</sup> ,  H  <sup>2</sup> 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 <sup>2</sup> )	Averaging time  E  <sup>2</sup> ,  H  <sup>2</sup> 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 in vertical orientation



Front side with Semi-integrated omni antenna in horizontal orientation



Appendix 3

Labels:

mRRUS 12 B2:



SFP module:

Data port 1:



Data port 2:



Integrated antenna:



Appendix 3

Semi-integrated omni antennas

Antenna 1



Antenna 2

