

Radio Test report – Radiated Emissions

315861-1TRFEMC

Date of issue: [Click here to enter a date.](#)

Applicant:

Ericsson Canada

Product:

Radio DOT Transceiver

Model:

RD 2242 B4

Part number:

KRY 901 309/1

Requirements/Summary:

Standard	Clause	Compliance
RSS-139 Issue 3 — Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710-1780 MHz and 2110-2180 MHz	6.6 Transmitter Unwanted Emissions ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least $43 + 10 \log_{10} p$ (watts) dB.	Yes
FCC CFR 47 Part 15, Subpart B	§15.109 Radiated emission limits.	Yes
FCC 47 CFR Part 27 – Miscellaneous Wireless Communications Services	§27.53 Emission limits. (9) (h) <i>AWS emission limits—(1) General protection levels.</i> Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB.	Yes

Lab and test locations

Company name	Nemko Canada Inc.		
Designation number	CA2040		
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Tested by	Predrag Golic, EMC Specialist,		
Reviewed by	David Duchesne, Senior EMC/Wireless Specialist		
Review date	September 29, 2016		
Reviewer signature			

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Table of Contents

Table of Contents	3
Section 1 Report summary	4
1.1 Test specifications	4
1.2 Exclusions.....	4
1.3 Statement of compliance.....	4
1.4 Test report revision history	4
Section 2 Summary of test results	5
2.1 Results	5
Section 3 Equipment under test (EUT) details	6
3.1 Applicant/Manufacturer	6
3.2 Sample information.....	6
3.3 EUT information	7
3.4 Test Frequencies	9
3.5 EMC Test Bed Test Parameters	9
3.6 EUT setup details.....	10
Section 4 Engineering considerations	11
4.1 Modifications incorporated in the EUT	11
4.2 Technical judgment.....	11
4.3 Deviations from laboratory tests procedures	11
Section 5 Test conditions	12
5.1 Atmospheric conditions	12
5.2 Power supply range.....	12
Section 6 Measurement uncertainty	13
6.1 Uncertainty of measurement	13
Section 7 Testing data	14
7.1 FCC §27.53 (9)(h) and RSS-139 Clause 6.6 (ii) and FCC §15.109 – Radiated emissions.....	14

Section 1 Report summary

1.1 Test specifications

RSS-139 Issue 3	Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710-1780 MHz and 2110-2180 MHz
FCC 47 CFR Part 27	Miscellaneous Wireless Communications Services
FCC CFR 47 Part 15, Subpart B	Title 47: Telecommunication; Part 15—Radio Frequency Devices

1.2 Exclusions

As per Nemko quote Q102106329 only Radiated emissions are performed. Client requested a scan from 30 to 220000 MHz

1.3 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.2 above. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.4 Test report revision history

Table 1.4-1: Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued

Section 2 Summary of test results

2.1 Results

Table 2.1-1: RSS-139 results

Part	Test description	Verdict
6.6 (ii)	Transmitter Unwanted Emissions	Pass

Notes: None

Table 2.1-2: FCC 47 CFR Part 15, Subpart B results

Part	Test description	Verdict
§15.109	Radiated emission limits (Class B)	Pass

Notes: None

Table 2.1-3: FCC Part 27 results

Part	Test description	Verdict
§27.53 (9) (h)	Out of band emissions	Pass

Notes: None

Section 3 Equipment under test (EUT) details

3.1 Applicant/Manufacturer

Company name	Ericsson Canada Inc.
Address	349 Terry Fox Drive, Ottawa, ON, Canada, K2K 2V6

3.2 Sample information

Receipt date	September 7, 2016
Nemko sample ID number	133-002481

3.3 EUT information

Product name	Radio DOT Transceiver
Model	RD 2242 B4
Part number	KRY 901 309/1
Revision	R2A
Serial number	C828676643
Antenna ports	2 TX/RX Ports
IBW	40 MHz
Frequency:	TX (DL): 2110 - 2155MHz
	RX (UL): 1710 – 1755MHz
Nominal O/P per Antenna Port:	Single Carrier: 1 x 50mW (17dBm)
	Multi-Carrier: 2 x 25mW (14dBm)
	Multi-Carrier: 3 x 16.7mW (12.2dBm)
	Multi-Carrier: 4 x 12.5mW (11dBm)
	Multi-Carrier: 5 x 10mW (10dBm)
	Multi-Carrier: 6 x 8.3mW (9.2dBm)
Accuracy (Nominal):	+/- 0.1 PPM
Nominal Voltage:	-48 VDC @ 0.5A
RAT:	LTE: SC, MC
	WCDMA: SC, MC
	Multi RAT W + L: SC, MC
Modulation:	LTE: QPSK, 16QAM, 64QAM
	WCDMA: QPSK, 16QAM, 64QAM
Channel Bandwidth:	LTE: 5, 10, 15, 20MHz
	WCDMA: 4.2 to 5MHz
Maximum Combined OBW per Port:	40MHz
IF Interface:	DL: 110 – 150MHz
	UL: 40 - 80MHz
Channel Raster:	LTE: 100kHz, WCDMA: 200kHz
Regulatory Requirements	FCC: CFR 47 Part2, 27
	EMC: CFR 47 Part 15
	IC: RSS-GEN, RSS-139
	EMC: ICES-003
Multi-carrier:	Single Antenna, Tx Diversity, MIMO 2 x 2
Operating Temperature:	5°C to +40°C
Total Power based on IBW:	2 x 50mW
WCDMA Supported Carrier Configurations:	5MHz (1-4)
Supported Carrier Configurations:	LTE BW=5, 10, 15, 20 (1-2), WCDMA= (1-4)

3.3 EUT information, continued

Description/theory of operation	The test object is an RD 2242 B4 (Radio DOT) designed for use in LTE Radio Base Station (RBS) equipment. The RD 2242 product provides radio access for mobile and fixed devices and is intended for the indoor environment. The RD 2242 is a Radio Unit (RU) forming part of the Ericsson RBS equipment and RDS (Radio DOT System) RBS consisting of a Digital Unit (DU), an IRU 2242 (Indoor Radio Unit) and Radio DOT (RD 2242). The IRU and RD are connected over a CAT 6 Interface (Radio DOT Interface (RDI)) with a capacity of 8 DOTs per IRU. The IRU provides DC, control and the baseband to IF conversion while the RD 2242 provides the IF to RF conversion and wireless transceiver functions. The RD supports two TX/RX RF-branches. The Band 4 RD (KRY 901 309/1) “RD 2242 B4” operates in FDD mode at a maximum RF output of 2 x 17dBm. The RDS IRU 2242 (KRC 161 444/2) can support either TDD or FDD operation, but not simultaneously.																		
Operational frequencies	<table><tr><th colspan="2">Clocks / Oscillators</th></tr><tr><td>10 MHz</td><td>SYNC</td></tr><tr><td>40 MHz</td><td>MCU</td></tr><tr><td>153.6 MHz</td><td>REF</td></tr><tr><td>12.5 MHz</td><td>AGC</td></tr><tr><td>16.67 MHz</td><td>AGC</td></tr><tr><td>230 MHz</td><td>FSK Modem</td></tr><tr><td></td><td>TX LO</td></tr></table>			Clocks / Oscillators		10 MHz	SYNC	40 MHz	MCU	153.6 MHz	REF	12.5 MHz	AGC	16.67 MHz	AGC	230 MHz	FSK Modem		TX LO
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Antenna A/B	RF Probe																		
Physical	<table><tr><td>Dimensions</td><td colspan="2">120 x 109 x 109 mm [H x W x D] (Including mounting HW)</td></tr><tr><td>Weight</td><td colspan="2">300 g</td></tr><tr><td>Cooling</td><td colspan="2">Convection</td></tr><tr><td>Mounting</td><td colspan="2">Ceiling Mount</td></tr></table>			Dimensions	120 x 109 x 109 mm [H x W x D] (Including mounting HW)		Weight	300 g		Cooling	Convection		Mounting	Ceiling Mount					
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Weight	300 g																		
Cooling	Convection																		
Mounting	Ceiling Mount																		
Software details	CXP 901 13268/ 14 R64DC																		

3.4 Test Frequencies

WCDMA Single Carrier												
Bandwidth	Transmit / DL (MHz)						Receive / UL (MHz)					
	B		M		T		B		M		T	
MHz	ARFCN	Frequency	ARFCN	Frequency	ARFCN	Frequency	ARFCN	Frequency	ARFCN	Frequency	ARFCN	Frequency
5.0	1537	2112.4	1637	2132.4	1738	2152.6	1312	1712.4	1412	1732.4	1513	1752.6

WCDMA Multi Carrier (Spurious Emissions)												
Bandwidth	Transmit / DL (MHz)				Transmit / DL (MHz)				Transmit / DL (MHz)			
	B1	B2	B3	B4	M1	M2	M3	M4	T1	T2	T3	T4
5.0	2112.4	2117.4	2142.6	2147.6	2115.0	2120.0	2145.0	2150.0	2117.4	2122.4	2147.6	2152.6
ARFCN	1537	1562	1688	1713	1550	1575	1700	1725	1562	1587	1713	1738

For W+L six carrier RE test, add the following M5 and M6 carriers to the M1 and M2 carriers												
Bandwidth	Transmit / DL (MHz)				Transmit / DL (MHz)				Transmit / DL (MHz)			
	B1	B2	B3	B4	M1	M2	M3	M4	T1	T2	T3	T4
5.0					2125.0	2130.0						
ARFCN					1600	1625						

LTE Single Carrier												
Bandwidth	Transmit / DL (MHz)						Receive / UL (MHz)					
	B		M		T		B		M		T	
MHz	ARFCN	Frequency	ARFCN	Frequency	ARFCN	Frequency	ARFCN	Frequency	ARFCN	Frequency	ARFCN	Frequency
5.0	1975	2112.5	2175	2132.5	2375	2152.5	19975	1712.5	20175	1732.5	20375	1752.5

LTE Multi-Carrier (Spurious Emissions)												
Bandwidth	Transmit / DL (MHz)											
	EARFCN	B1	EARFCN	B2	EARFCN	M1	EARFCN	M2	EARFCN	T1	EARFCN	T2
5.0	1975	2112.5	2325	2147.5	2000	2115.0	2350	2150.0	2025	2117.5	2375	2152.5

3.5 EMC Test Bed Test Parameters

RAT	Modulation	Test Model / Configuration
LTE	QPSK	E-TM1.1
WCDMA	16QAM	TM5

3.6 EUT setup details

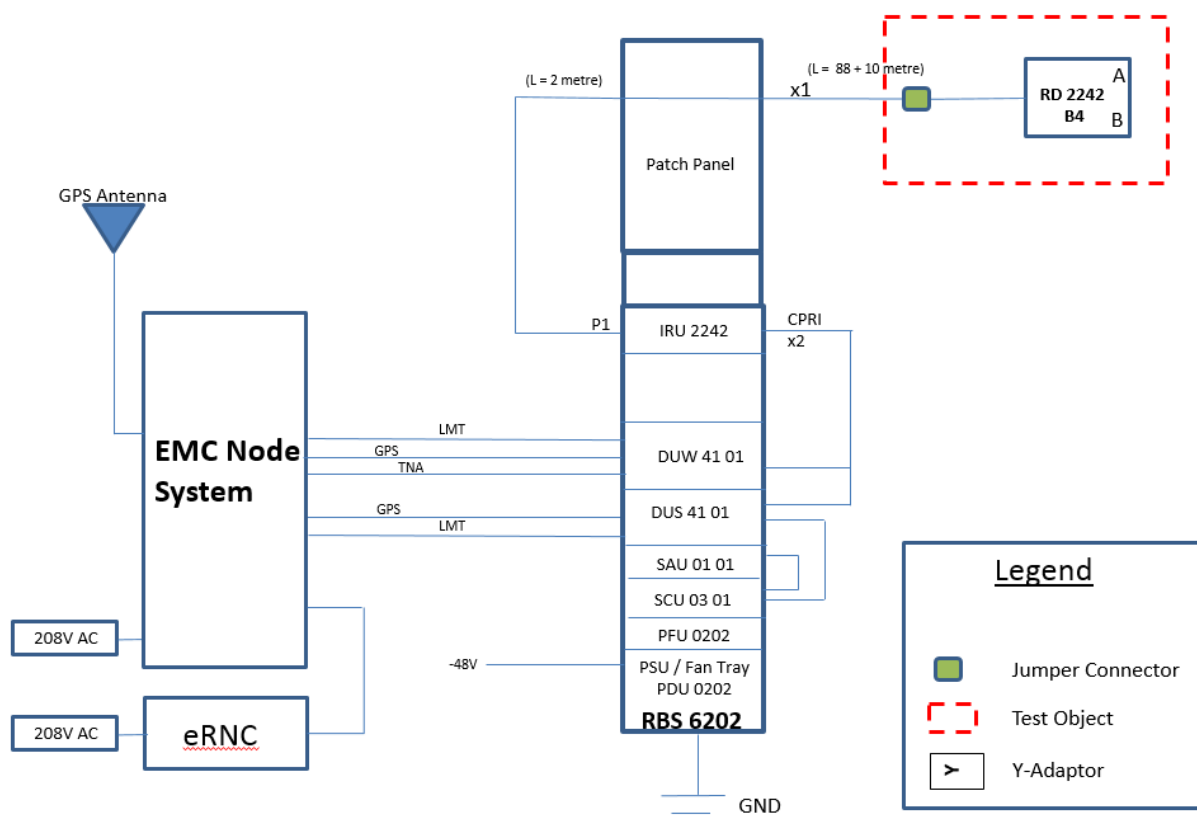


Figure 3.6-1: Setup diagram

Test Object:	<table><tr><th>Product Name</th><th>Model Number</th><th>R-State</th><th>Serial Number</th></tr><tr><td>RD 2242 B4</td><td>KRY 901 309/1</td><td>R2A</td><td>C828676643</td></tr></table>				Product Name	Model Number	R-State	Serial Number	RD 2242 B4	KRY 901 309/1	R2A	C828676643																																								
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RD 2242 B4	KRY 901 309/1	R2A	C828676643																																																	
Associated Equipment:	<table><tr><th>Product Name</th><th>Model Number</th><th>R-State</th><th>Serial Number</th></tr><tr><td>RBS-6202(RE/CE)</td><td>INX 106 0191/1</td><td>R1C</td><td>C827635858</td></tr><tr><td>PDU 02 02</td><td>BMG 980 336/5</td><td>R1V</td><td>C941678186</td></tr><tr><td>SCU 03 01</td><td>BGM 136 1006/3</td><td>R1B</td><td>CR98104694</td></tr><tr><td>PFU 02 02</td><td>KFE 101 1162/3</td><td>R1C</td><td>R82763452</td></tr><tr><td>SAU 01 01</td><td>ZHY 601 17/1</td><td>R1D</td><td>CD30339080</td></tr><tr><td>Fan Unit</td><td>BKV 106 135/2</td><td>R1D</td><td>BW99068579</td></tr><tr><td>DUS 41 01</td><td>KDU 137 624/1</td><td>R7B</td><td>CD38327591</td></tr><tr><td>DUW 4101</td><td>KDU 127 174/4</td><td>R2E</td><td>TU8XP27772</td></tr><tr><td>IRU 2242</td><td>KRC 161 444/2</td><td>R2A</td><td>C829960699</td></tr><tr><td>EMC Node System-1</td><td>LTM 902 676/1</td><td></td><td></td></tr><tr><td>eRNC</td><td></td><td></td><td></td></tr></table>				Product Name	Model Number	R-State	Serial Number	RBS-6202(RE/CE)	INX 106 0191/1	R1C	C827635858	PDU 02 02	BMG 980 336/5	R1V	C941678186	SCU 03 01	BGM 136 1006/3	R1B	CR98104694	PFU 02 02	KFE 101 1162/3	R1C	R82763452	SAU 01 01	ZHY 601 17/1	R1D	CD30339080	Fan Unit	BKV 106 135/2	R1D	BW99068579	DUS 41 01	KDU 137 624/1	R7B	CD38327591	DUW 4101	KDU 127 174/4	R2E	TU8XP27772	IRU 2242	KRC 161 444/2	R2A	C829960699	EMC Node System-1	LTM 902 676/1			eRNC			
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	Fan Unit	BKV 106 135/2	R1D	BW99068579																																																
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	EMC Node System-1	LTM 902 676/1																																																		
	eRNC																																																			

Section 4 Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5 Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	86–106 kPa

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$, for which the equipment was designed.

Section 6 Measurement uncertainty

6.1 Uncertainty of measurement

Nemko Canada Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 "Uncertainty in EMC measurements." Measurement uncertainty was calculated using the methods described in CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC measurements; as well as described in UKAS LAB34: The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of $K=2$ with 95% certainty.

Test name	Measurement uncertainty, dB
Radiated electromagnetic fields	3.78

Section 7 Testing data

7.1 FCC §27.53 (9)(h) and RSS-139 Clause 6.6 (ii) and FCC §15.109 – Radiated emissions

7.1.1 Definitions and limits

FCC §27.53:

(9) (h) *AWS emission limits*—(1) *General protection levels*. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB.

RSS-139:

6.6 Transmitter Unwanted Emissions

ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least $43 + 10 \log_{10} p$ (watts) dB.

FCC §15.109:

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

7.1.2 Test summary

Verdict	Pass		
Test date	September 7, 2016 and September 19, 2016	Temperature	24 °C
Test engineer	Predrag Golic	Air pressure	1000 mbar
Test location	Ottawa	Relative humidity	35 %

7.1.3 Observations/special notes

1W+1L mode was used to test against FCC 47 CFR Part 15, Subpart B limits as the worst case during a pre-scans of all modes assessed.

7.1.4 Setup details

Test facility	3 m Semi anechoic chamber
Measuring distance (m)	3
Antenna height variation (m)	1–4
Turn table position (°)	0–360
Spectrum analyzer settings	30 MHz to 1 GHz: Spectrum analyzer bandwidth (3 dB) Settings: 100 kHz RBW and 300 kHz VBW, positive peak detector. 1 GHz to 22 GHz: Spectrum analyzer bandwidth (3 dB) Settings: 1 MHz RBW and 3 MHz VBW, positive peak detector

Table 7.1-1: Modes assessed

1W+1L
WCDMA 1 carrier
WCDMA 2 carriers

7.1.5 Test equipment list

Table 7.1-2: Equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Dec. 01/16
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Jan. 07/17
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Apr. 28/17
Horn antenna (1–18 GHz)	EMCO	3115	FA000825	1 year	Apr. 26/17
Horn antenna (18–26.5 GHz)	Electro-metrics	SH-50/60-1	FA000479	—	VOU
Pre-amplifier (1–18 GHz)	JCA	JCA118-503	FA002091	1 year	April 26/17
Pre-amplifier (18–26 GHz)	Narda	BBS-1826N612	FA001550	—	VOU
50 Ω coax cable	C.C.A.	None	FA002555	1 year	April 26/17
50 Ω coax cable	Huber + Suhner	None	FA002074	1 year	April 26/17

Notes: VOU - verify on use

7.1.6 Test data

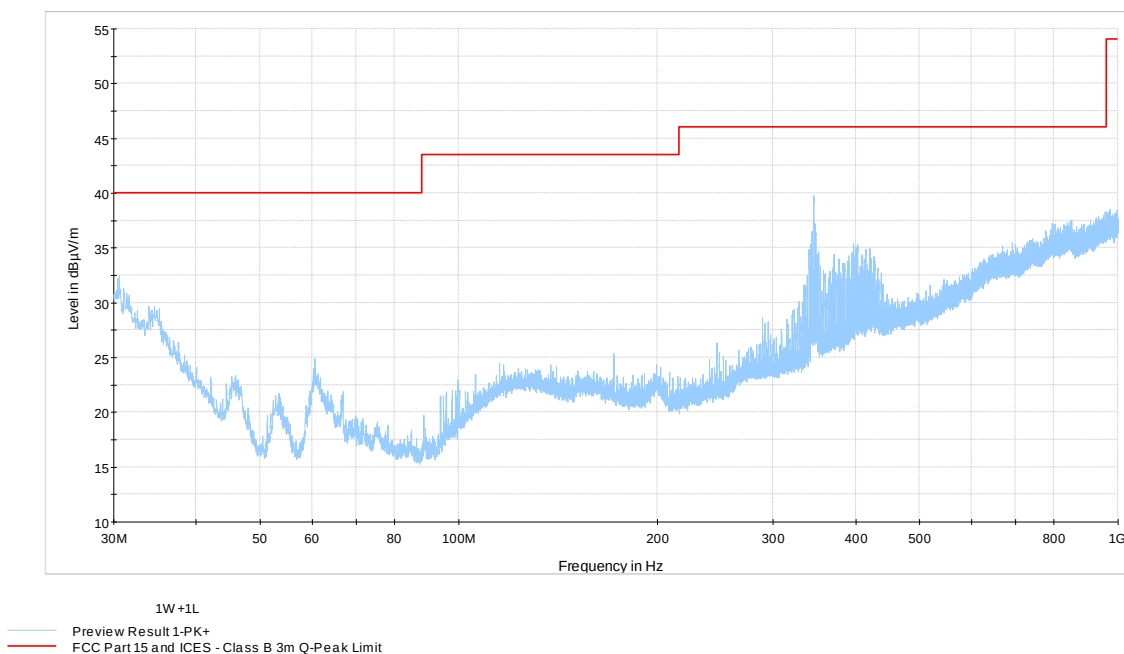


Figure 7.1-1: Radiated emissions spectral plot (30 to 1000 MHz) – FCC §15.109

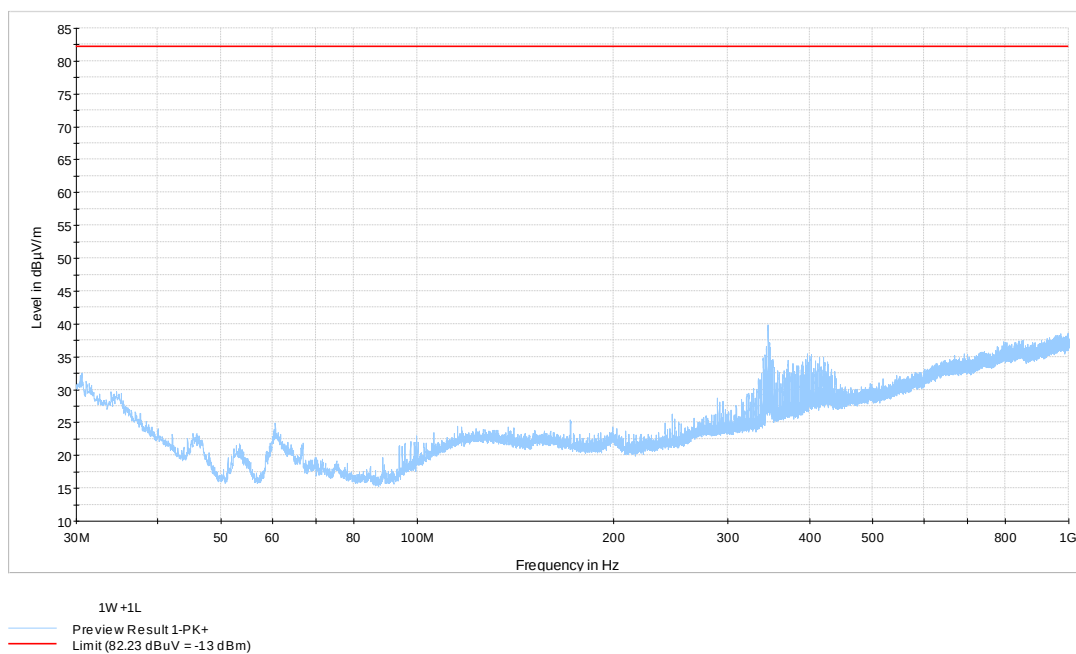


Figure 7.1-2: Radiated emissions spectral plot (30 to 1000 MHz) – FCC §27.53 and RSS-139

7.1.6 Test data, continued

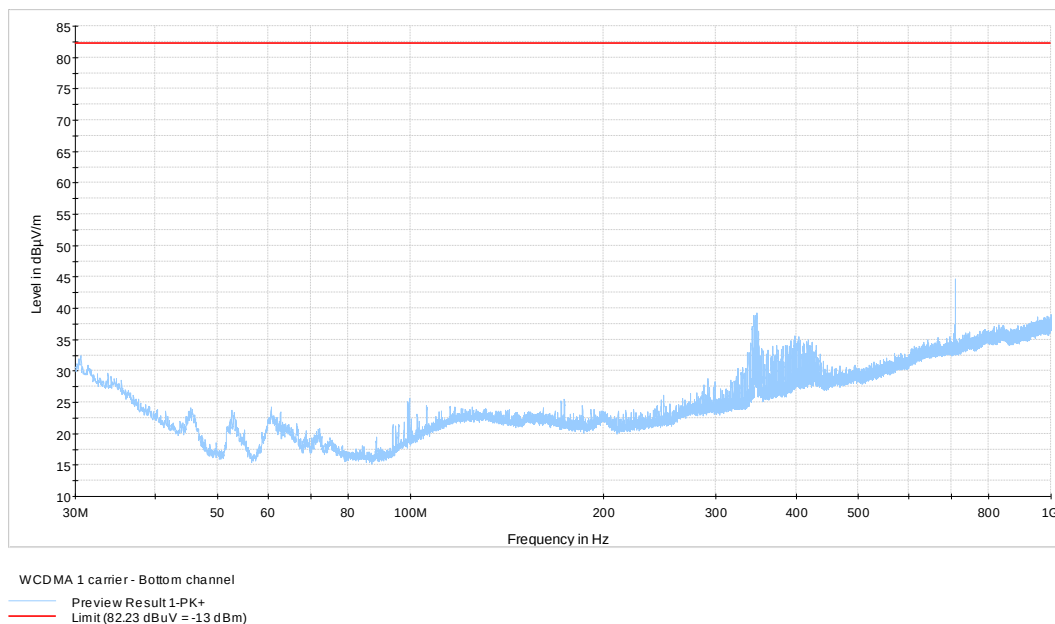


Figure 7.1-3: Radiated emissions spectral plot (30 to 1000 MHz) – FCC §27.53 and RSS-139

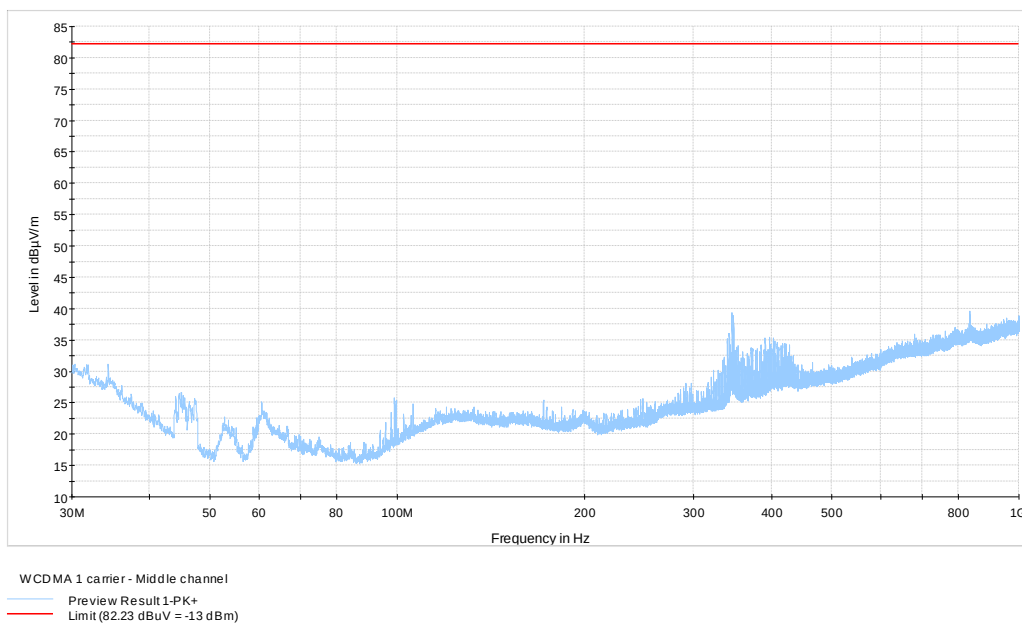


Figure 7.1-4: Radiated emissions spectral plot (30 to 1000 MHz) – FCC §27.53 and RSS-139

7.1.6 Test data, continued

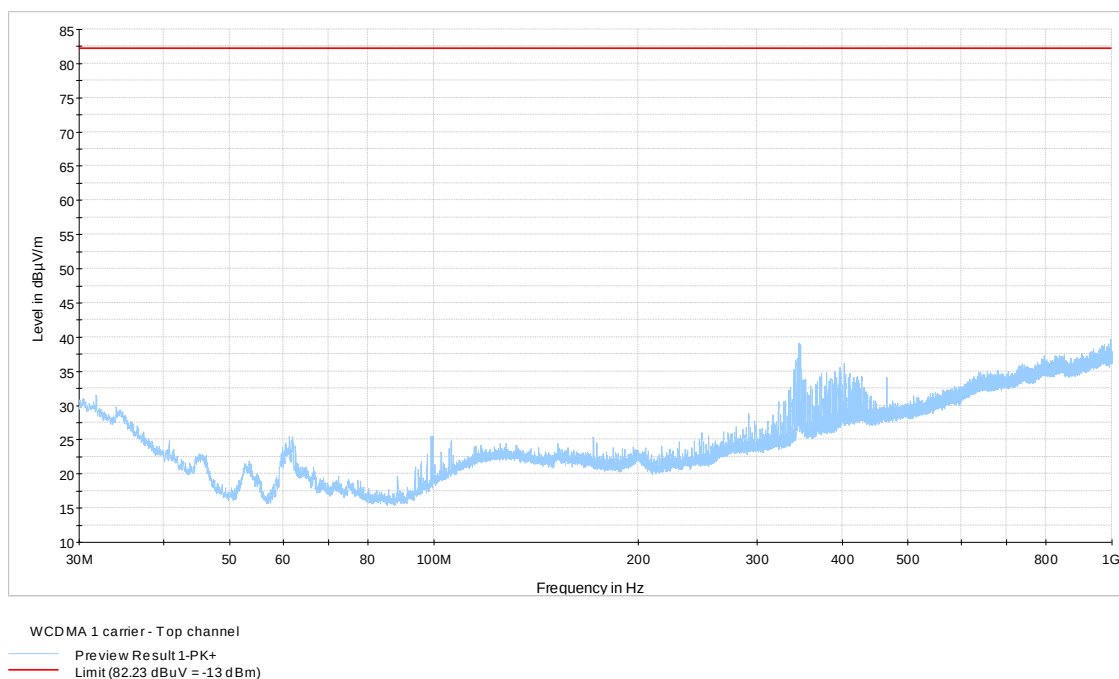


Figure 7.1-5: Radiated emissions spectral plot (30 to 1000 MHz) – FCC §27.53 and RSS-139

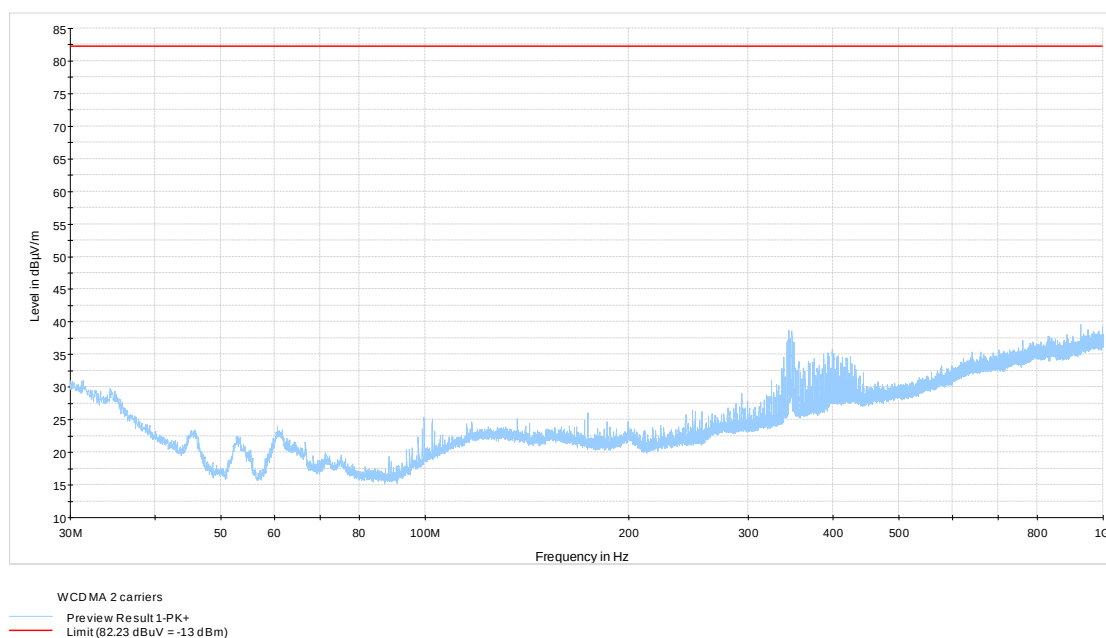


Figure 7.1-6: Radiated emissions spectral plot (30 to 1000 MHz) – FCC §27.53 and RSS-139

7.1.6 Test data, continued

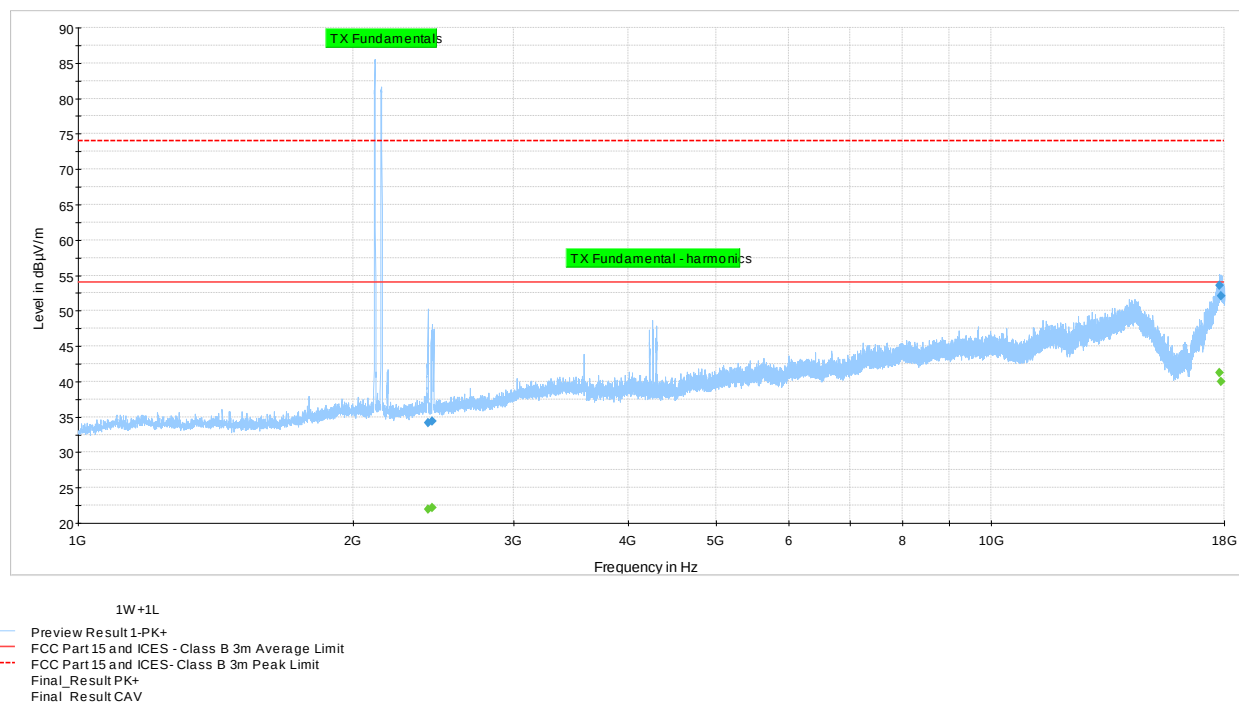


Figure 7.1-7: Radiated emissions spectral plot (1 to 18 GHz) – FCC §15.109

Table 7.1-3: Radiated disturbance (CAverage) results – FCC §15.109

Frequency (MHz)	CAverage field strength ^{1 and 3} (dBµV/m)	3 m CAverage limit (dBµV/m)	Margin (dB)	Measurement time (ms)	Bandwidth (kHz)	Antenna height (cm)	Pol. (V/H)	Turn table position (°)	Correction factor ² (dB)
17785.82	41.2	54.00	12.8	100	1000	201	H	295	19.3
17867.45	40.0	54.00	14.0	100	1000	265	V	51	18.4
2441.58	22.2	54.00	31.8	100	1000	396	V	28	-13.0
2415.78	22.0	54.00	32.0	100	1000	396	V	252	-13.0

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) – amplifier gain (dB)

³ The maximum measured value observed over a period of 15 seconds was recorded.

Sample calculation: 41.2 dBµV/m (field strength) = 21.9 dBµV (receiver reading) + 19.3 dB (Correction factor)

Table 7.1-4: Radiated disturbance (Peak) results – FCC §15.109

Frequency (MHz)	Peak field strength ^{1 and 3} (dBµV/m)	3 m Peak limit (dBµV/m)	Margin (dB)	Measurement time (ms)	Bandwidth (kHz)	Antenna height (cm)	Pol. (V/H)	Turn table position (°)	Correction factor ² (dB)
17785.82	53.5	74.00	20.5	100	1000	201	H	295	19.3
17867.45	52.1	74.00	21.9	100	1000	265	V	51	18.4
2441.58	34.4	74.00	39.6	100	1000	396	V	28	-13.0
2415.78	34.2	74.00	39.8	100	1000	396	V	252	-13.0

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factor = antenna factor ACF (dB) + cable loss (dB) – amplifier gain (dB)

³ The maximum measured value observed over a period of 15 seconds was recorded.

Sample calculation: 53.5 dBµV/m (field strength) = 34.2 dBµV (receiver reading) + 19.3 dB (Correction factor)

7.1.6 Test data, continued

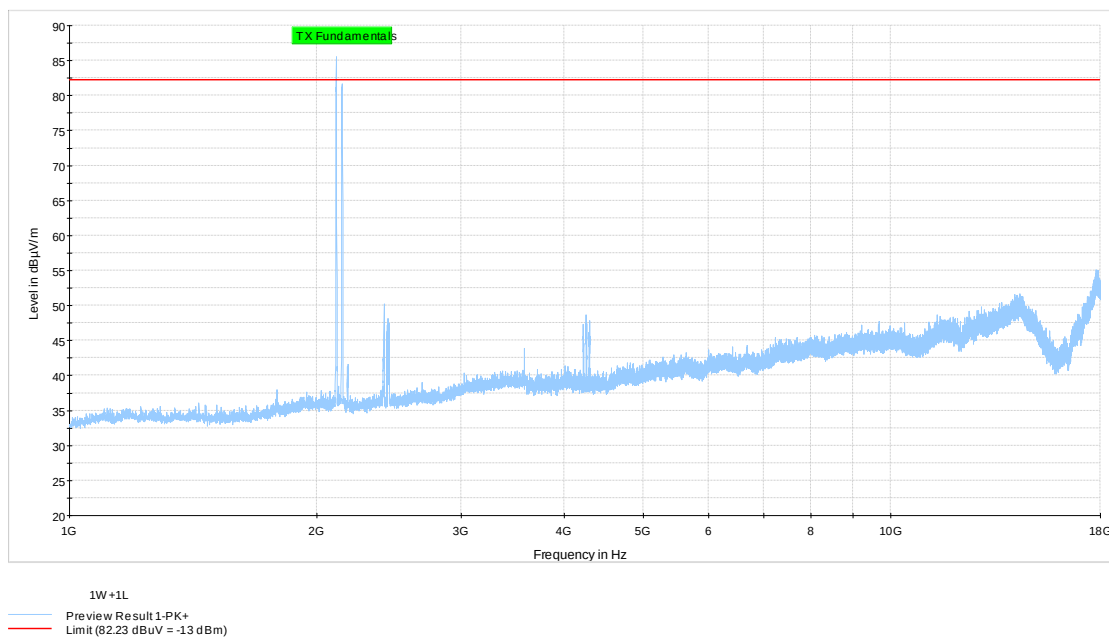


Figure 7.1-8: Radiated emissions spectral plot (1 to 18 GHz) – FCC §27.53 and RSS-139

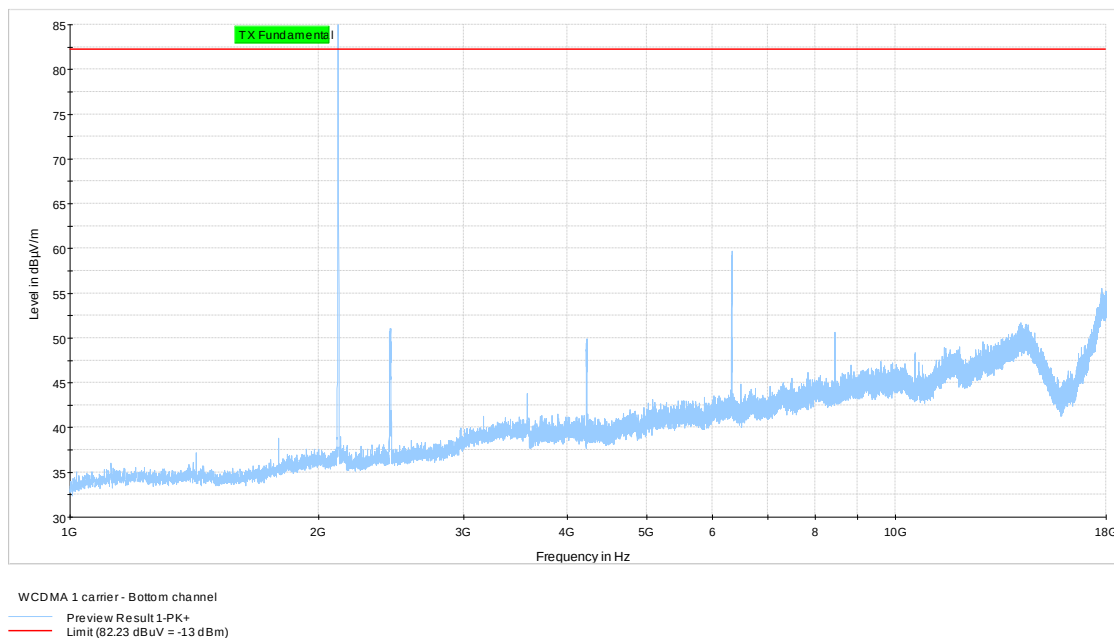


Figure 7.1-9: Radiated emissions spectral plot (1 to 18 GHz) – FCC §27.53 and RSS-139

7.1.6 Test data, continued

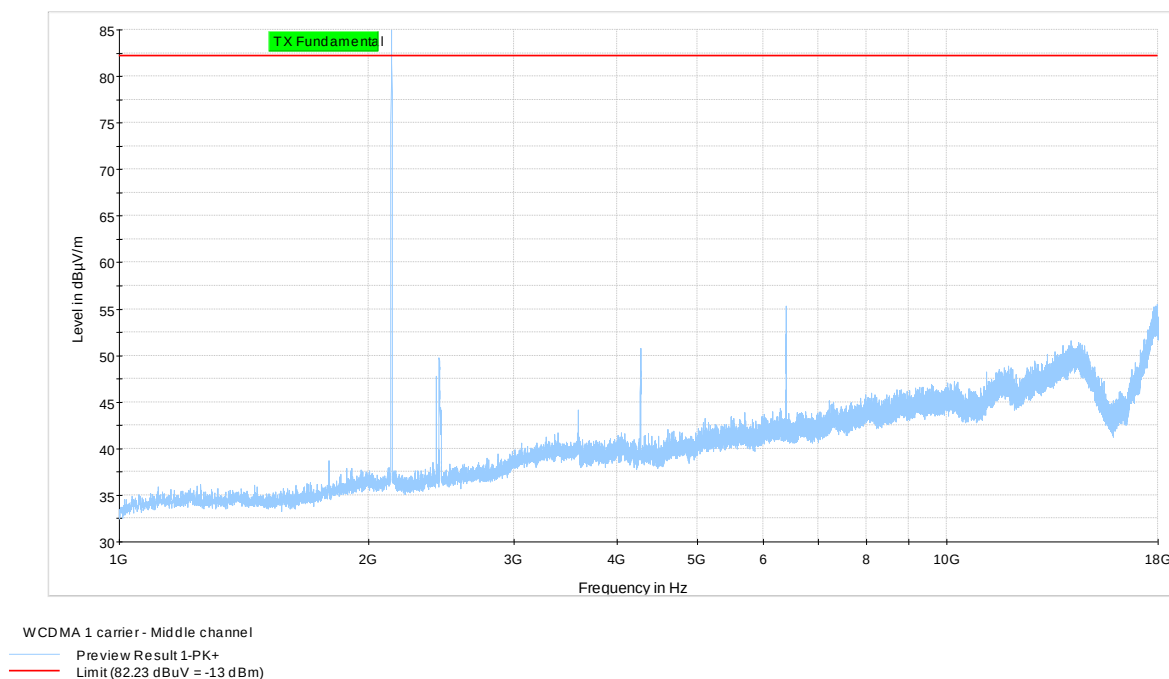


Figure 7.1-10: Radiated emissions spectral plot (1 to 18 GHz) – FCC §27.53 and RSS-139

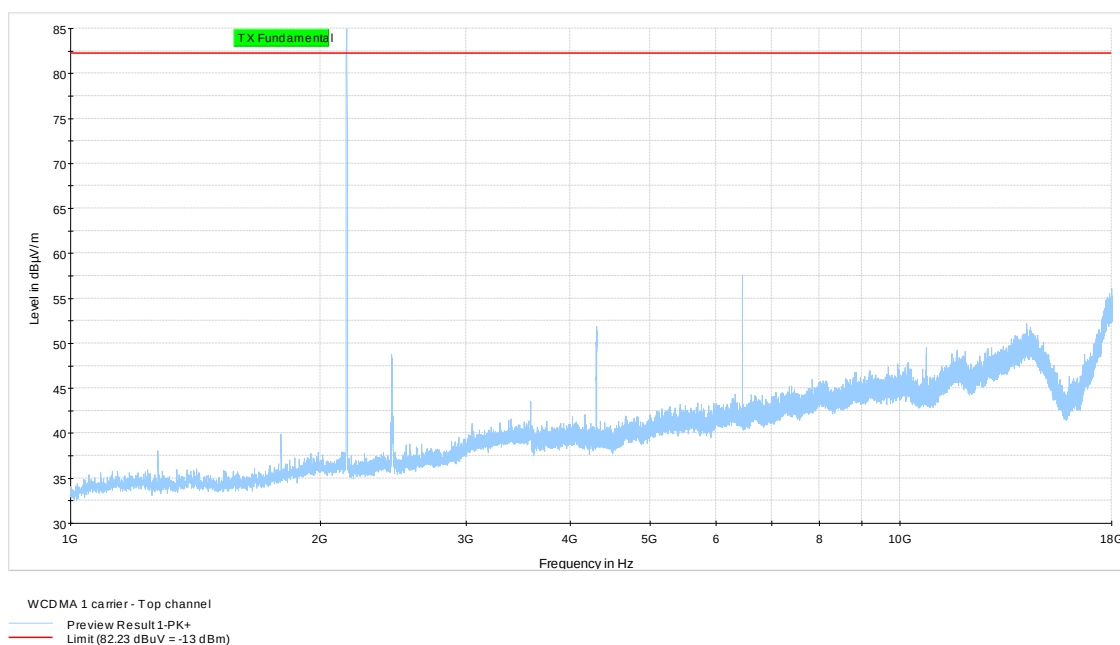


Figure 7.1-11: Radiated emissions spectral plot (1 to 18 GHz) – FCC §27.53 and RSS-139

7.1.6 Test data, continued

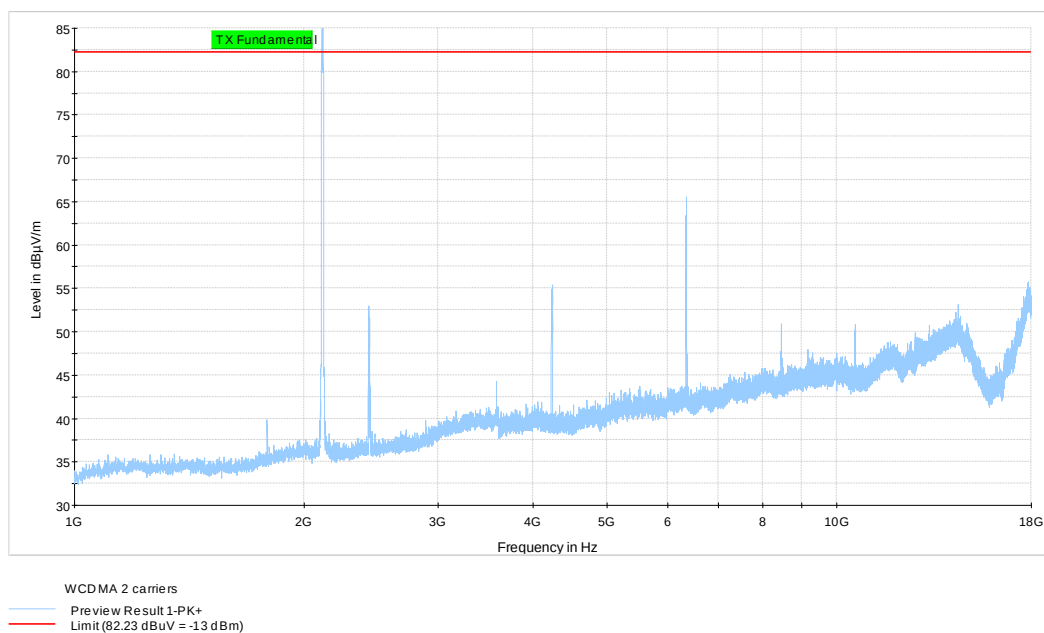


Figure 7.1-12: Radiated emissions spectral plot (1 to 18 GHz) – FCC §27.53 and RSS-139

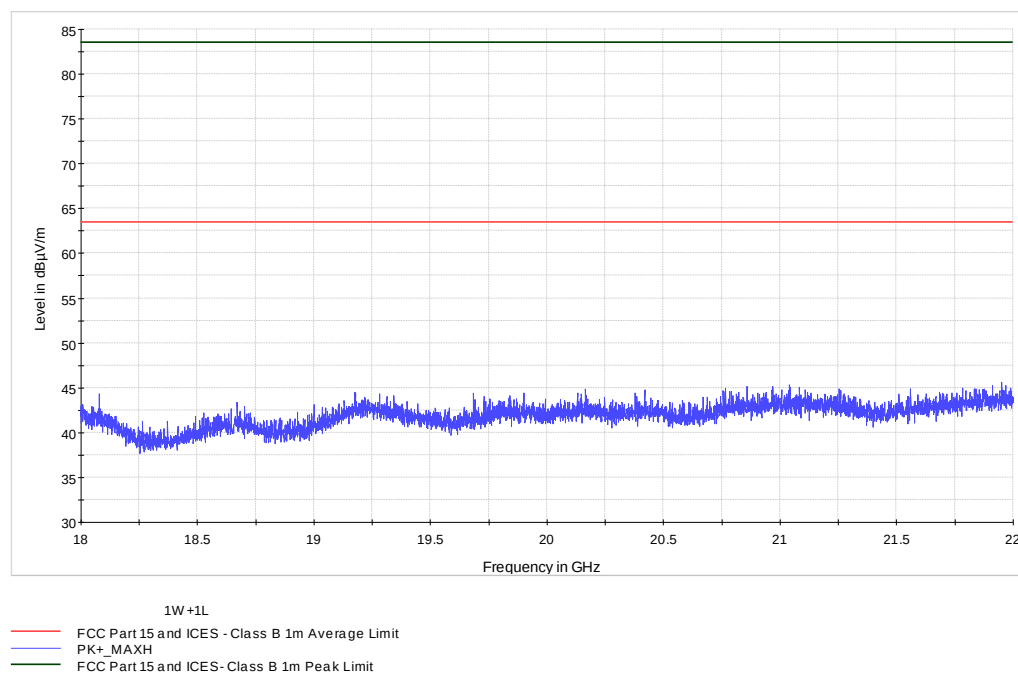


Figure 7.1-13: Radiated emissions spectral plot (18 to 22 GHz) – FCC §27.53 and RSS-139

7.1.6 Test data, continued

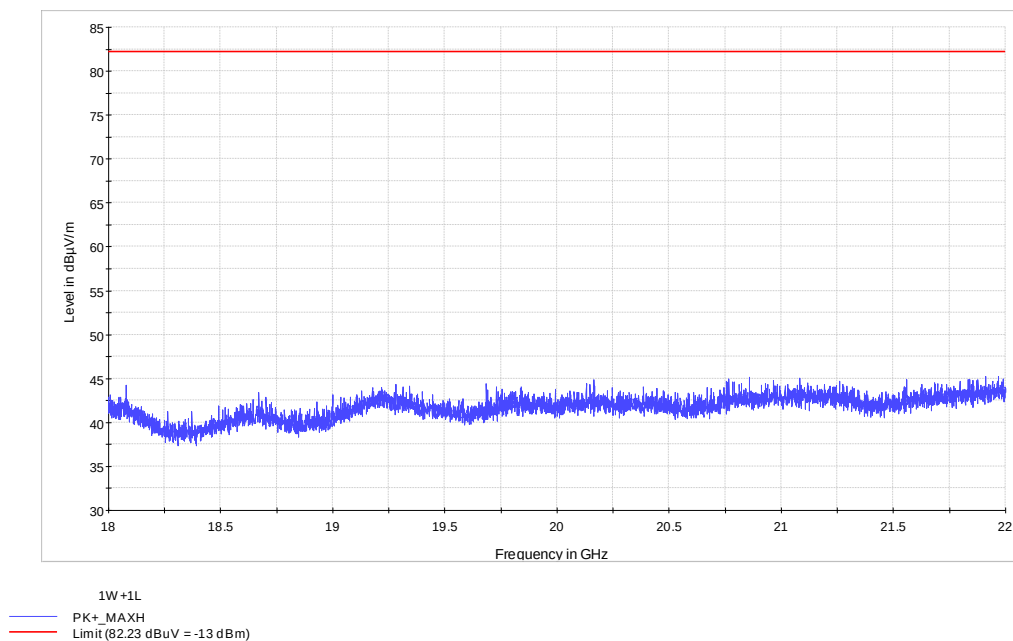


Figure 7.1-14: Radiated emissions spectral plot (18 to 22 GHz) – FCC §27.53 and RSS-139

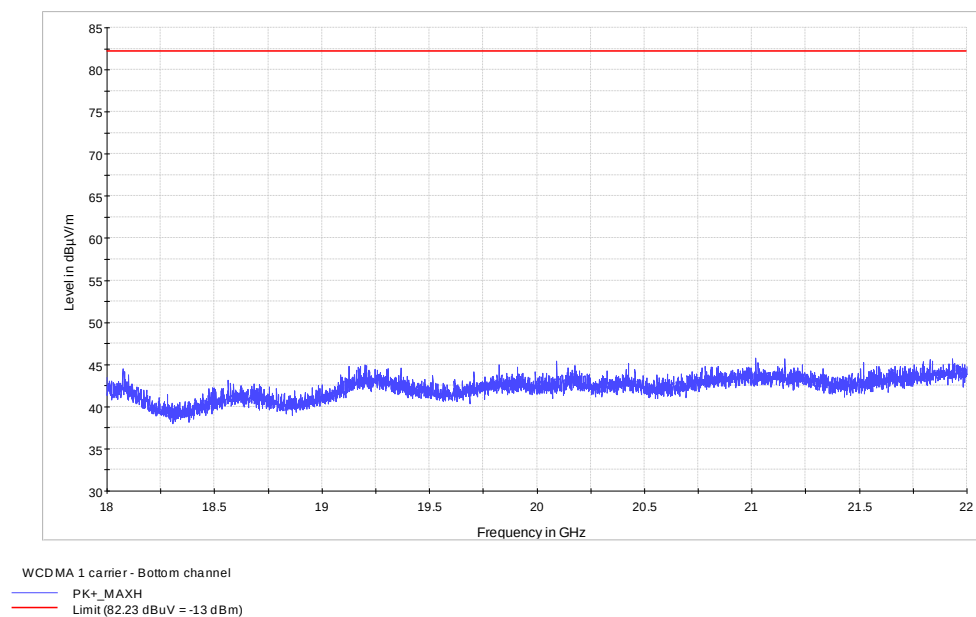


Figure 7.1-15: Radiated emissions spectral plot (18 to 22 GHz) – FCC §27.53 and RSS-139

7.1.6 Test data, continued

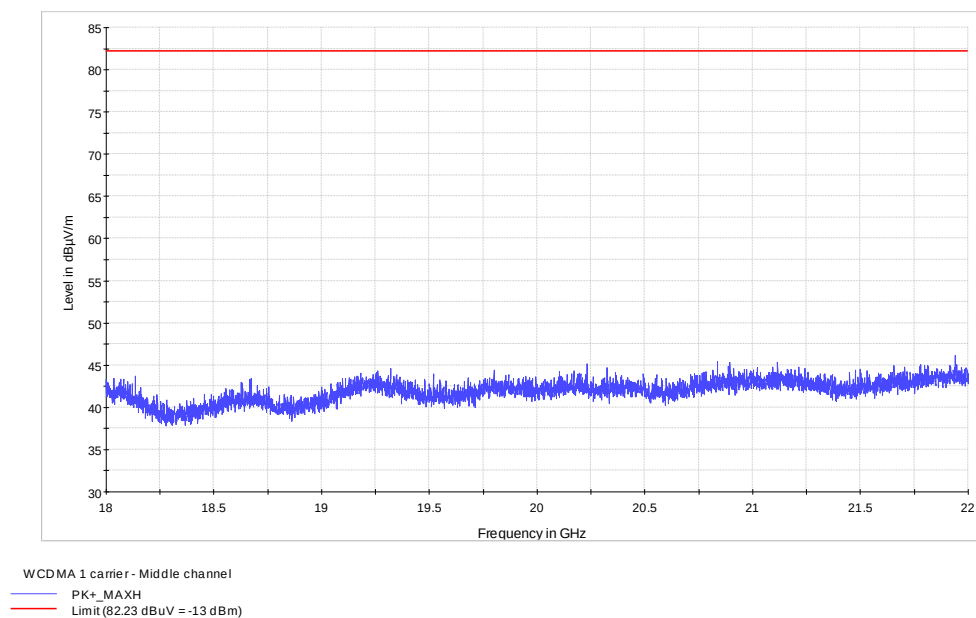


Figure 7.1-16: Radiated emissions spectral plot (18 to 22 GHz) – FCC §27.53 and RSS-139

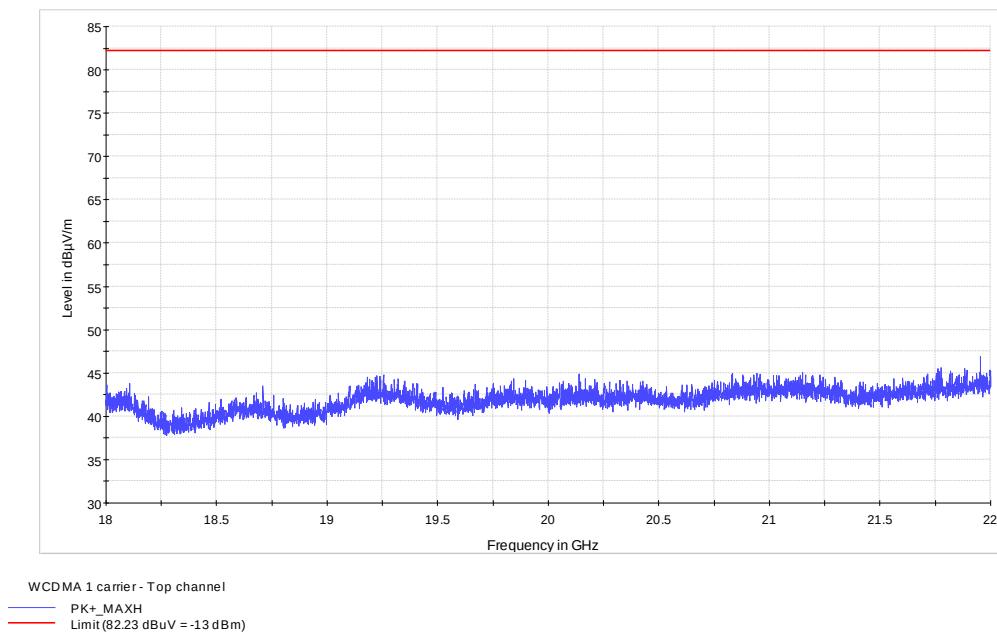
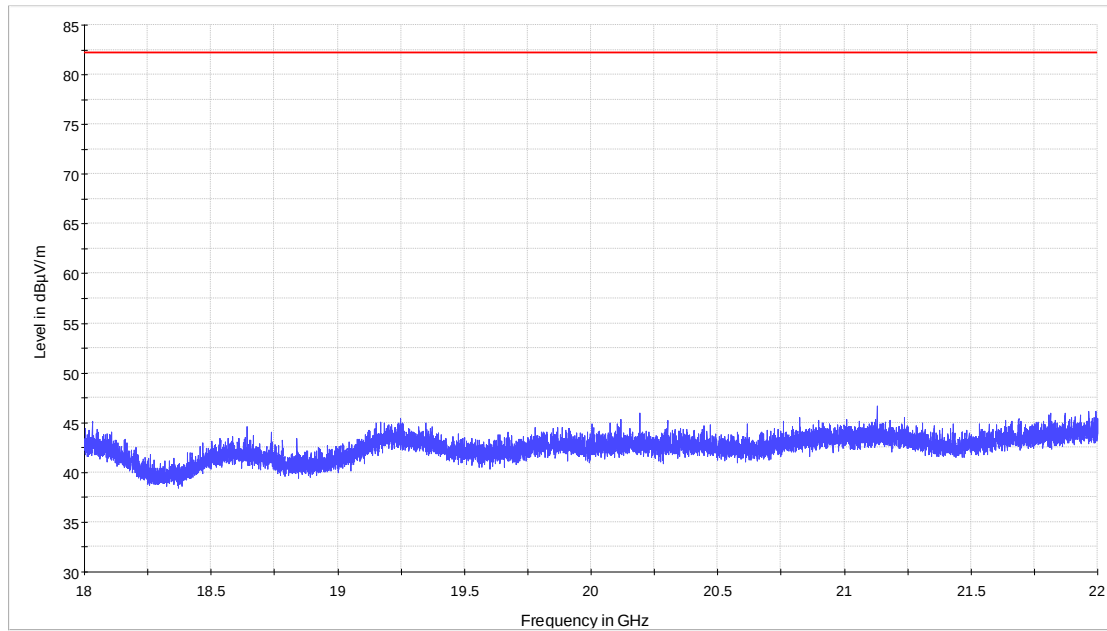


Figure 7.1-17: Radiated emissions spectral plot (18 to 22 GHz) – FCC §27.53 and RSS-139

7.1.6 Test data, continued



WCDMA 2 carriers
PK+ MAXH
Limit (82.23 dBuV = -13 dBm)

Figure 7.1-18: Radiated emissions spectral plot (18 to 22 GHz) – FCC §27.53 and RSS-139

7.1.7 Setup photos



Figure 7.1-19: Radiated emissions setup photo

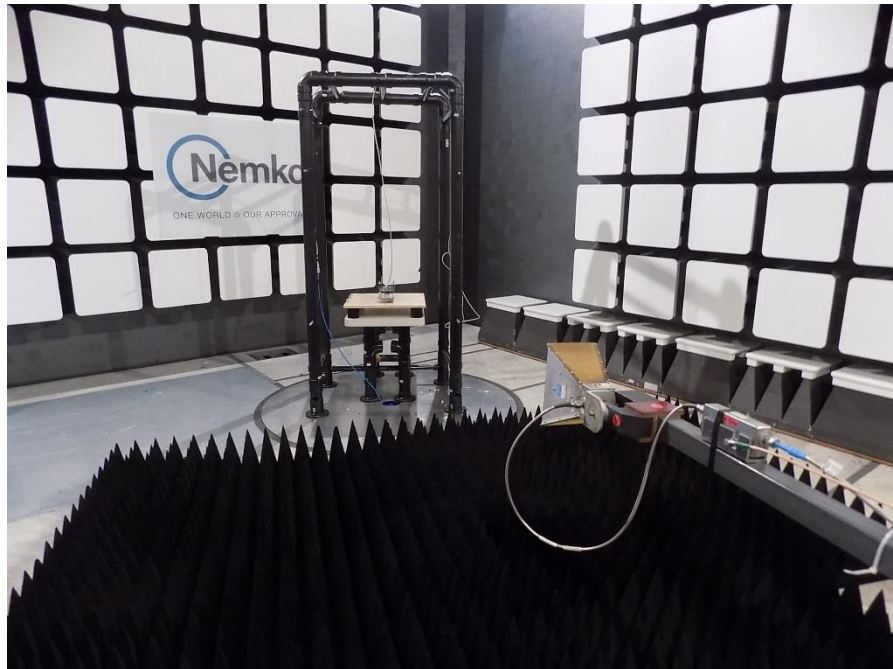


Figure 7.1-20: Radiated emissions setup photo

7.1.6 Setup photos, continued



Figure 7.1-21: Radiated emissions setup photo