

Date: ESPOO 31.01.2007

Page: 1 (29)

Appendices -

Number:  
No. 1 / 1

**80106R1**

Date of handing in: 23.01.2007

Measured by:



Timo Hietala, Test Engineer

Reviewed by:



Jyrki Leino, Manager

**SORT OF EQUIPMENT:**

**WCDMA Base Station RF module**

**MARKETING NAME:**

**Nokia Flexi BTS RF module 1.7GHz/2.1GHz**

**TYPE:**

**FRIA**

**MANUFACTURER:**

**Nokia Corporation**

**FCC ID:**

**UAFFRIA-01**

**CLIENT:**

**Nokia Corporation**

**ADDRESS:**

**P.O.Box 319, FI-90651 OULU, FINLAND**

**TELEPHONE:**

**+358 7180 08000**

**TEST LABORATORY:**

**NET/IMN Oulu**

**FCC REG. NO.**

**411251**

**REFERENCE:**

**FCC Part 27, SUBPART L**

## SUMMARY:

In regard to the performed tests the equipment under test fulfils the requirements defined in the test specifications, see page 4 for details

The test results are valid for the tested unit only. Without a written permission of Nemko Oy it is allowed to copy this report as a whole, but not partially.

## Contents

1. EUT and Accessory Information .....	3
1.1 EUT description .....	3
1.2 EUT and accessories.....	3
Summary of Test Data .....	4
2. General Equipment Specification .....	5
3. RF Power Output .....	7
4. Spurious Emissions at Antenna Terminals .....	10
5. Field Strength of Spurious .....	21
6. List of test equipment.....	24
7. Photographs of Test Setup .....	25
8. ANNEX A, TEST DETAILS .....	26
9. ANNEX B, TEST DIAGRAMS.....	28

## 1. EUT and Accessory Information

### 1.1 EUT description

The EUT is a WCDMA Base station RF module 1.7GHz/2.1GHz with 2 power amplifiers.

### 1.2 EUT and accessories

Manufacturer: Nokia  
Model: FRIA, s/n: L6064908779  
Other Units: System module, FSMB  
Transmission module, FTIA

General: All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 27, Subpart L.

<input type="checkbox"/>	New Submission	<input checked="" type="checkbox"/>	Production Unit
<input checked="" type="checkbox"/>	Class I Permissive Change	<input type="checkbox"/>	Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE. **NONE**

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This report applies only to the items tested.

## Summary of Test Data

NAME OF TEST	SECTION IN CFR 47	SPEC.	RESULT
RF Power Output	27.50 (d), 2.1046	100 W	<b>Complies</b>
99% Occupied Bandwidth	2.1049, (i)	Unspecified	<b>Not Tested</b>
Spurious Emissions at Antenna Terminals	27.53(g), 2.1051	- 13 dBm	<b>Complies</b>
Field Strength of Spurious Emissions	27.53(g), 2.1053	- 13 dBm E.I.R.P	<b>Complies</b>
Frequency stability	27.54, 2.1055	$\pm 0.05$ ppm <sup>1)</sup>	<b>Not Tested</b>

Note <sup>1)</sup> Limit is the manufacturer's specification

**Measurement uncertainty is expressed to a confidence level of 95%.**

## 2. General Equipment Specification

<b>Supply Voltage Input:</b>	48 Vdc		
<b>Frequency Bands: TX:</b>	<input checked="" type="checkbox"/>	Block A : 2110 – 2120 MHz	
	<input checked="" type="checkbox"/>	Block B : 2120 – 2130 MHz	
	<input checked="" type="checkbox"/>	Block C : 2130 – 2135 MHz	
	<input checked="" type="checkbox"/>	Block D : 2135 – 2140 MHz	
	<input checked="" type="checkbox"/>	Block E : 2140 – 2155 MHz	
<b>Frequency Bands: RX:</b>	<input checked="" type="checkbox"/>	Block A : 1710 – 1720 MHz	
	<input checked="" type="checkbox"/>	Block B : 1720 – 1730 MHz	
	<input checked="" type="checkbox"/>	Block C : 1730 – 1735 MHz	
	<input checked="" type="checkbox"/>	Block D : 1735 – 1740 MHz	
	<input checked="" type="checkbox"/>	Block E : 1740 – 1755 MHz	
<b>Type of Modulation and Designator:</b>	<b>W-CDMA (5M00F9W)</b> <input checked="" type="checkbox"/>	<b>GSM (200KG7W)</b> <input type="checkbox"/>	<b>NADC 40K0DXW)</b> <input type="checkbox"/>
<b>Maximum No. of Carriers:</b>	2		
<b>Output Impedance:</b>	50 ohms.		
<b>RF Output:</b>	Per channel: 40 W or 2x20W.		
<b>Band Selection:</b>	<b>Software</b> <input checked="" type="checkbox"/>	<b>Duplexer</b> <input type="checkbox"/>	<b>Fullband</b> <input type="checkbox"/>

## System Description

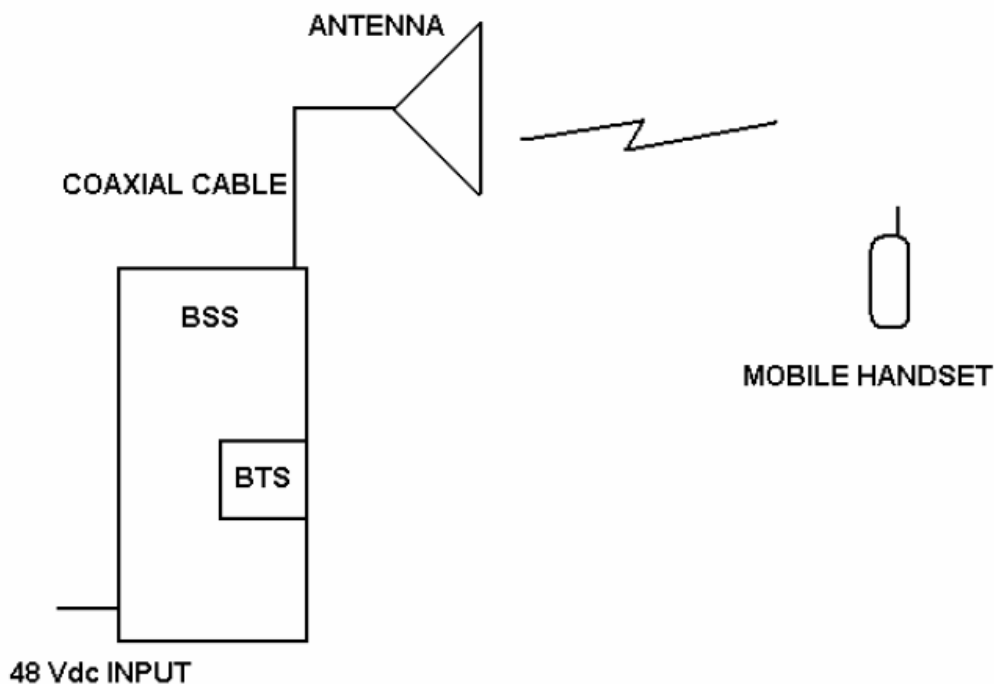
The BTS performs the radio function of the Base Station System (BSS), and is connected to the Radio Network Controller (RNC) via the Iub interface, and to Mobile Stations (MS) via the Air interface (Antenna). The RNC is further connected to Serving GPRS Support Node (SGSN) or it can be connected to the Mobile Switching Centre (MSC) via IWU (Inter Working Unit).

Setup for testing single carrier: The transmitter was set up according to 3GPP TS 25.141 Test Model 1 and 5 for all tests. Test model 1: 64 DPCHs at 30 kbps (SF=128) distributed randomly across the code space, at random power levels and random timing offsets, were defined to simulate a realistic operating scenario which may have high PAR (Peak-to-Average Ratio). Test model 5: 30 DPCHs at 30 kbps (SF=128) together with 8 HS-PDSCHs at 240 kbps (SF=16). Each DPCH is modulated by QPSK and each HS-PDCH is modulated by 16QAM modulation.

Setup for testing multi carrier:

The transmitter was set up according to 3GPP TS 25.141 Test Model 1 and 5 for all tests. Test model 1: 32 DPCHs at 30 kbps (SF=128) distributed randomly across the code space, at random power levels and random timing offsets, were defined to simulate a realistic operating scenario which may have high PAR (Peak-to-Average Ratio). Test model 5: 14 DPCHs at 30 kbps (SF=128) together with 4 HS-PDSCHs at 240 kbps (SF=16). Each DPCH is modulated by QPSK and each HS-PDCH is modulated by 16QAM modulation.

## System Diagram



### 3. RF Power Output

<b>NAME OF TEST: RF Power Output</b>	<b>PARA.NO.: 27.50 (d) &amp; 2.1046</b>
<b>TESTED BY: Timo Hietala</b>	<b>DATE: 23/01/2007</b>

**Test Results:** Complies.

**Measurement Data:** Refer to attached plot.

#### Multi carrier

Modulation Type	Frequency (MHz)	Measured Output		Total power (dBm) / (W)
		Power/carr. (dBm)	Power/carr. (W)	
QPSK	2112.6 / 2117.6	42.35 / 42.52	17.18 / 17.86	45.45 / 35.04
QPSK	2132.5 / 2137.5	42.61 / 42.59	18.24 / 18.16	45.61 / 36.40
QPSK	2147.4 / 2152.4	42.46 / 42.61	17.62 / 18.24	45.55 / 35.86
16QAM	2112.6 / 2117.6	42.58 / 42.87	18.11 / 19.36	45.74 / 37.47
16QAM	2132.5 / 2137.5	42.61 / 42.58	18.24 / 18.11	45.61 / 36.35
16QAM	2147.4 / 2152.4	42.59 / 42.72	18.16 / 18.71	45.67 / 36.87

**Equipment used:** 1, 2, 4, 7, 8, 9.

**Measurement  
Uncertainty:** ± 0.7 dB.

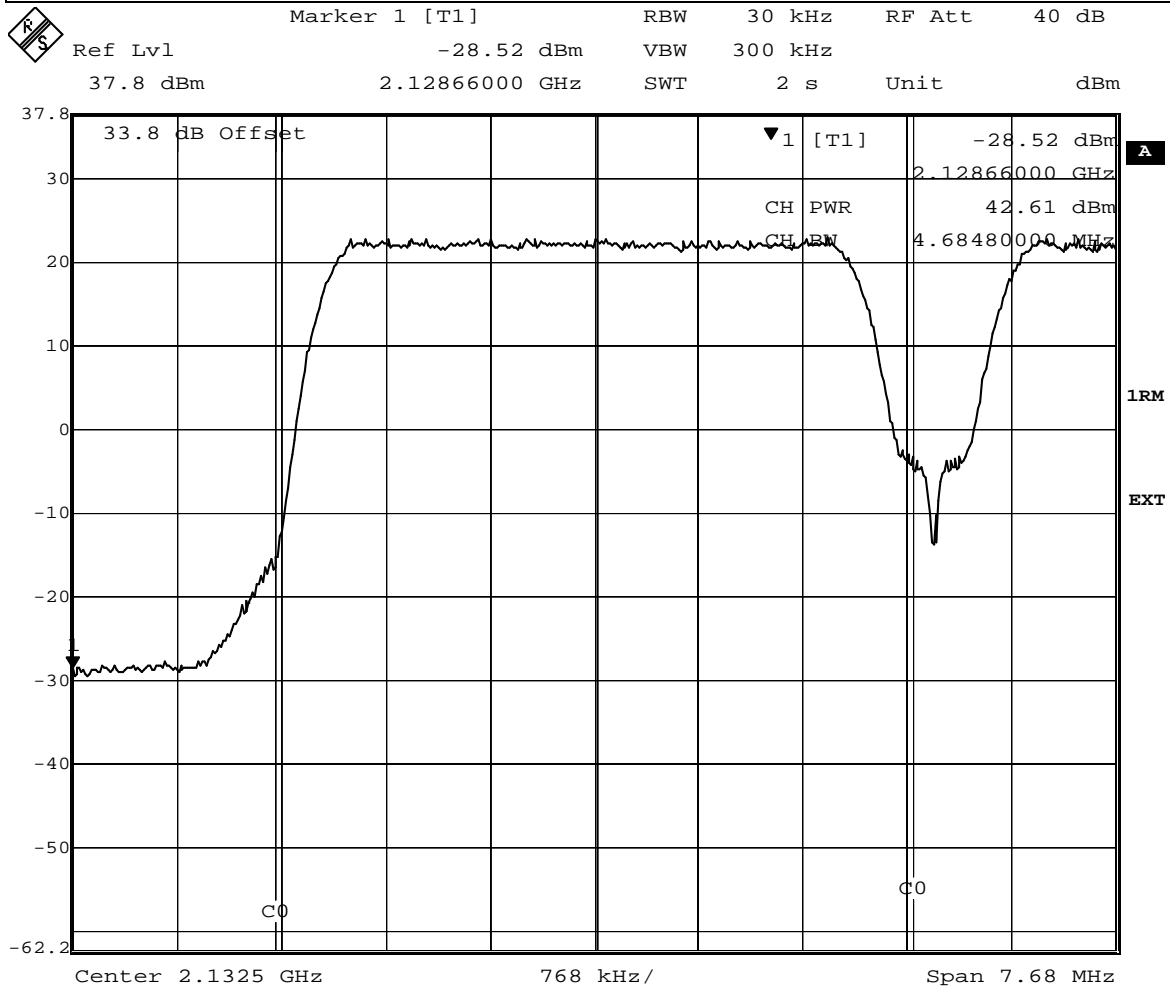
**Temperature:** 23 °C.

**Relative  
Humidity:** 10 %.

**Test Data – RF Power Output**

Nemko Oy, Finland

Data Plot		RF POWER OUTPUT		Complete
Page 1 of 2				<u>  x  </u>
Job No.: 80105		Date: <u>23/01/2007</u>		Preliminary: <u>      </u>
Specification: PT27		Temperature (°C): <u>23</u>		
Tested By: <u>Timo Hietala</u>		Relative Humidity (%): <u>10</u>		
E.U.T.: <u>WCDMA TRANSMITTER</u>				
Configuration: <u>TX FULL POWER CENTER CHANNEL, multi carrier</u>				
Sample Number: <u>1</u>				
Location: <u>NET/IMN Oulu</u>		RBW: <u>Refer to plots</u>	Measurement	
Detector type: <u>Rms</u>		VBW: <u>Refer to plots</u>	Distance: <u>N/A</u> m	
<b>Test Equipment Used</b>				
Antenna: <u>                    </u>		Directional Coupler: <u>                    </u>		
Pre-Amp: <u>                    </u>		Cable #1: <u>                    </u>		
Filter: <u>                    </u>		Cable #2: <u>                    </u>		
Receiver: <u>1</u>		Cable #3: <u>                    </u>		
Attenuator #1: <u>7</u>		Cable #4: <u>                    </u>		
Attenuator #2: <u>                    </u>		Mixer: <u>                    </u>		
Additional equipment used: <u>                    </u>				
Measurement Uncertainty: <u>±0.7 dB</u>				



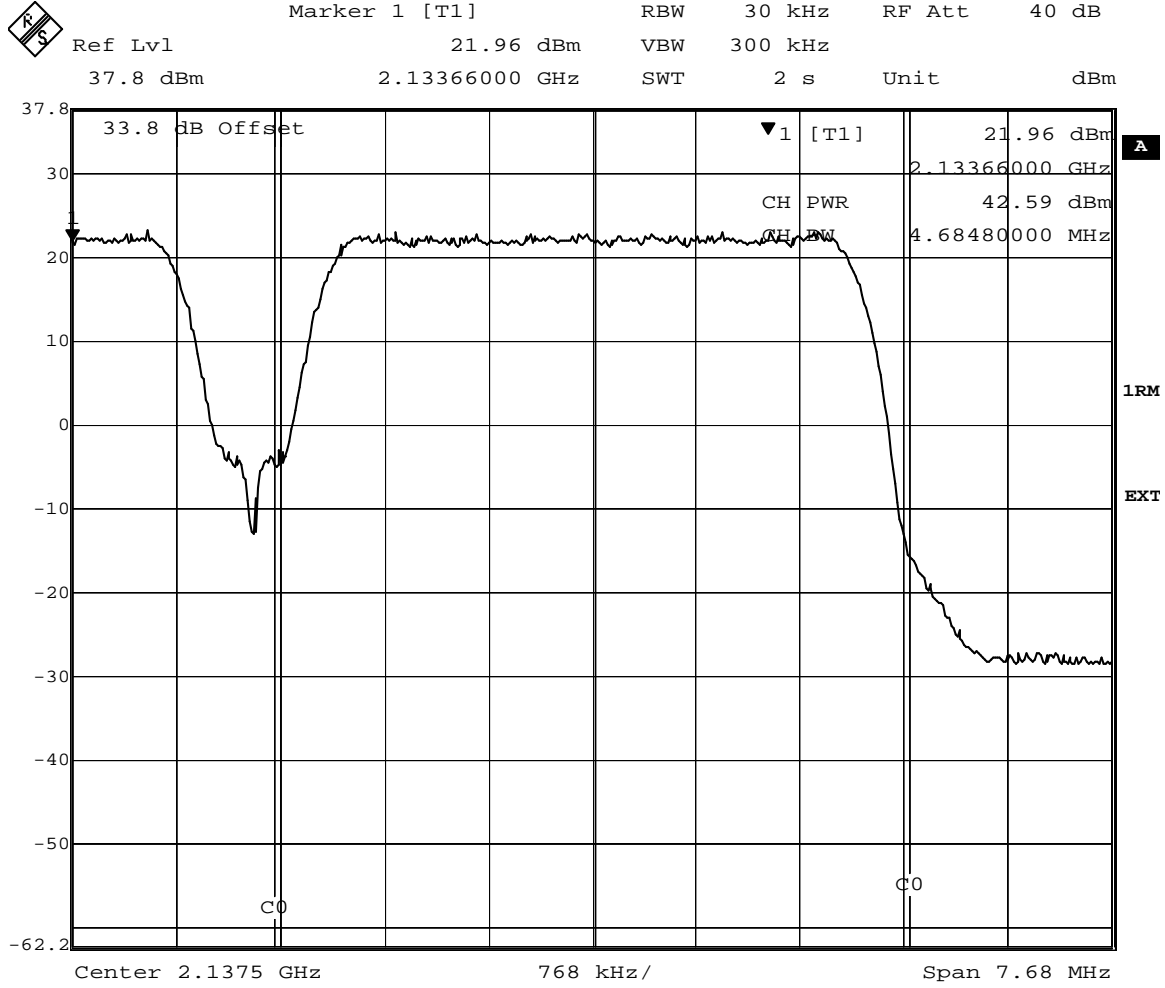
Date: 23.JAN.2007 11:16:57

**Notes: Carrier 1 QPSK 2132.5 MHz**



Nemko Oy, Finland

<b>Data Plot</b>		<b>RF POWER OUTPUT</b>	
Page 2 of 2			
Job No.:	80105	Date:	23/01/2007
Specification:	PT27	Temperature (°C):	23
Tested By:	Timo Hietala	Relative Humidity (%):	10
E.U.T.:	WCDMA TRANSMITTER		
Configuration:	TX FULL POWER CENTER CHANNEL, multi carrier		



Date: 23.JAN.2007 11:17:50

**Notes: Carrier 2 QPSK 2137.5 MHz**

#### 4. Spurious Emissions at Antenna Terminals

**NAME OF TEST:** Spurious Emissions @ Antenna Terminals **PARA.NO.:** 27.53(g), 2.1051

**TESTED BY:** Timo Hietala

**DATE:** 23/01/2007

**Test Results:** Complies.

**Test Data:** See attached plots.

##### Multi carrier

Frequency (MHz)	Modulation	Spurious Emission (dBm) rms det.
All	QPSK	More than 20 dB below limit -13 dBm
All	16QAM	More than 20 dB below limit -13 dBm

##### Lower Band Edge

##### Multi carrier

Frequency (MHz)	Modulation	Peak Emission Level (dBm) rms det.
2110.000	QPSK	-19.70
2110.000	16QAM	-20.99

##### Upper Band Edge

##### Multi carrier

Frequency (MHz)	Modulation	Peak Emission Level (dBm) rms det.
2155.020	QPSK	-21.68
2155.020	16QAM	-21.37

**Equipment used:** 1, 2, 3, 4, 7, 8, 9, 12, 13, 14

**Measurement  
Uncertainty:** ± 0.7 dB.

**Temperature:** 23 °C.

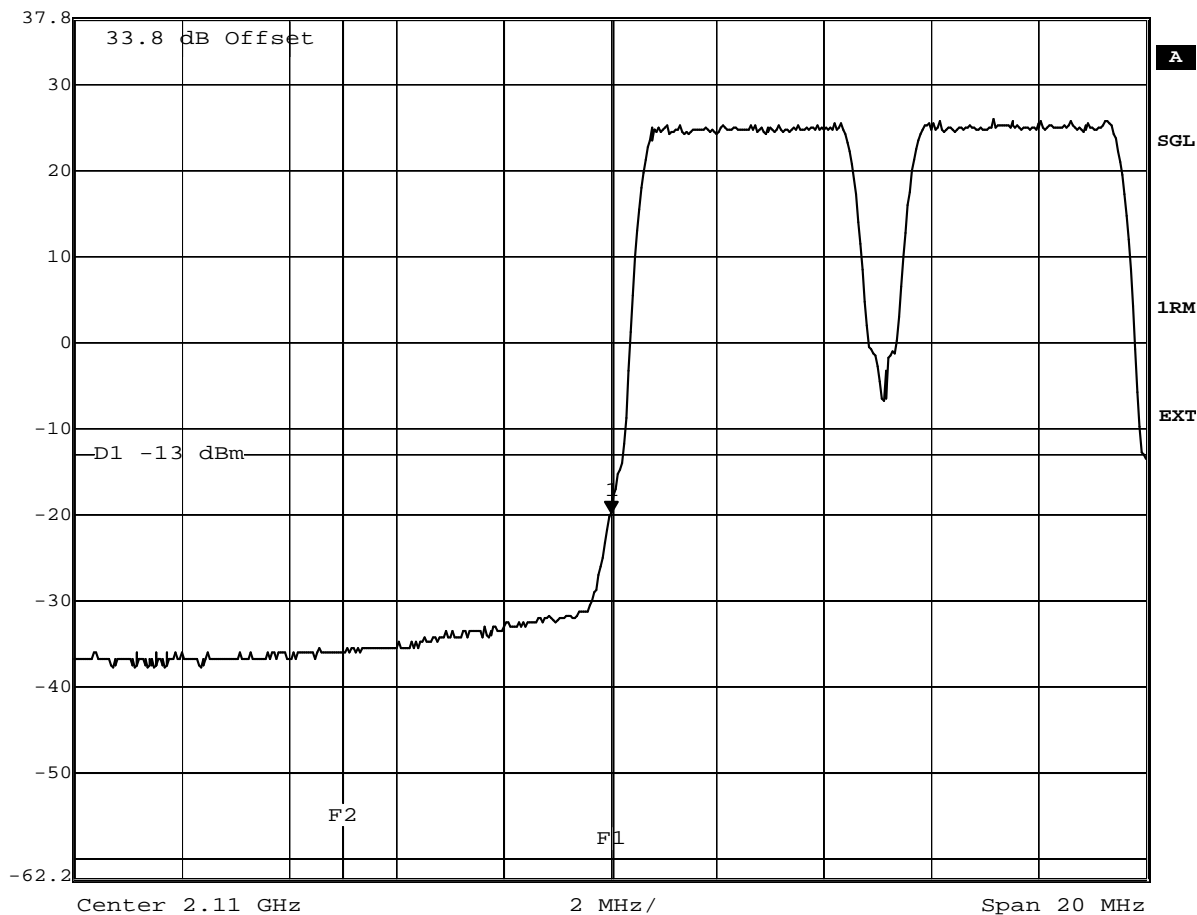
**Relative  
Humidity:** 10 %.

**Test Data – Spurious Emissions**

Nemko Oy, Finland

<b>Data Plot</b>		<b>Spurious Emissions at Antenna Terminals</b>		Complete <u>  x  </u>
Page 1 of 10		Date: <u>23/01/2007</u>		Preliminary: <u>      </u>
Job No.: <u>80105</u>		Temperature (°C): <u>23</u>		
Specification: <u>PT27</u>		Relative Humidity (%): <u>10</u>		
Tested By: <u>Timo Hietala</u>				
E.U.T.: <u>WCDMA TRANSMITTER</u>				
Configuration: <u>TX FULL POWER LOWEST CHANNEL, multi carrier</u>				
Sample Number: <u>1</u>				
Location: <u>NET/IMN Oulu</u>		RBW: <u>Refer to plots</u>		Measurement
Detector type: <u>Rms</u>		VBW: <u>Refer to plots</u>		Distance: <u>N/A</u> m
<b>Test Equipment Used</b>				
Antenna: <u>                    </u>		Directional Coupler: <u>                    </u>		
Pre-Amp: <u>                    </u>		Cable #1: <u>                    </u>		
Filter: <u>                    </u>		Cable #2: <u>                    </u>		
Receiver: <u>1</u>		Cable #3: <u>                    </u>		
Attenuator #1: <u>7</u>		Cable #4: <u>                    </u>		
Attenuator #2: <u>                    </u>		Mixer: <u>                    </u>		
Additional equipment used: <u>                    </u>				
Measurement Uncertainty: <u>± 0.7 dB</u>				

	Ref Lvl	Marker 1 [T1]	RBW	50 kHz	RF Att	25 dB
	37.8 dBm	-19.70 dBm	VBW	50 kHz		
		2.1100000 GHz	SWT	2 s	Unit	dBm



Date: 23.JAN.2007 09:41:38

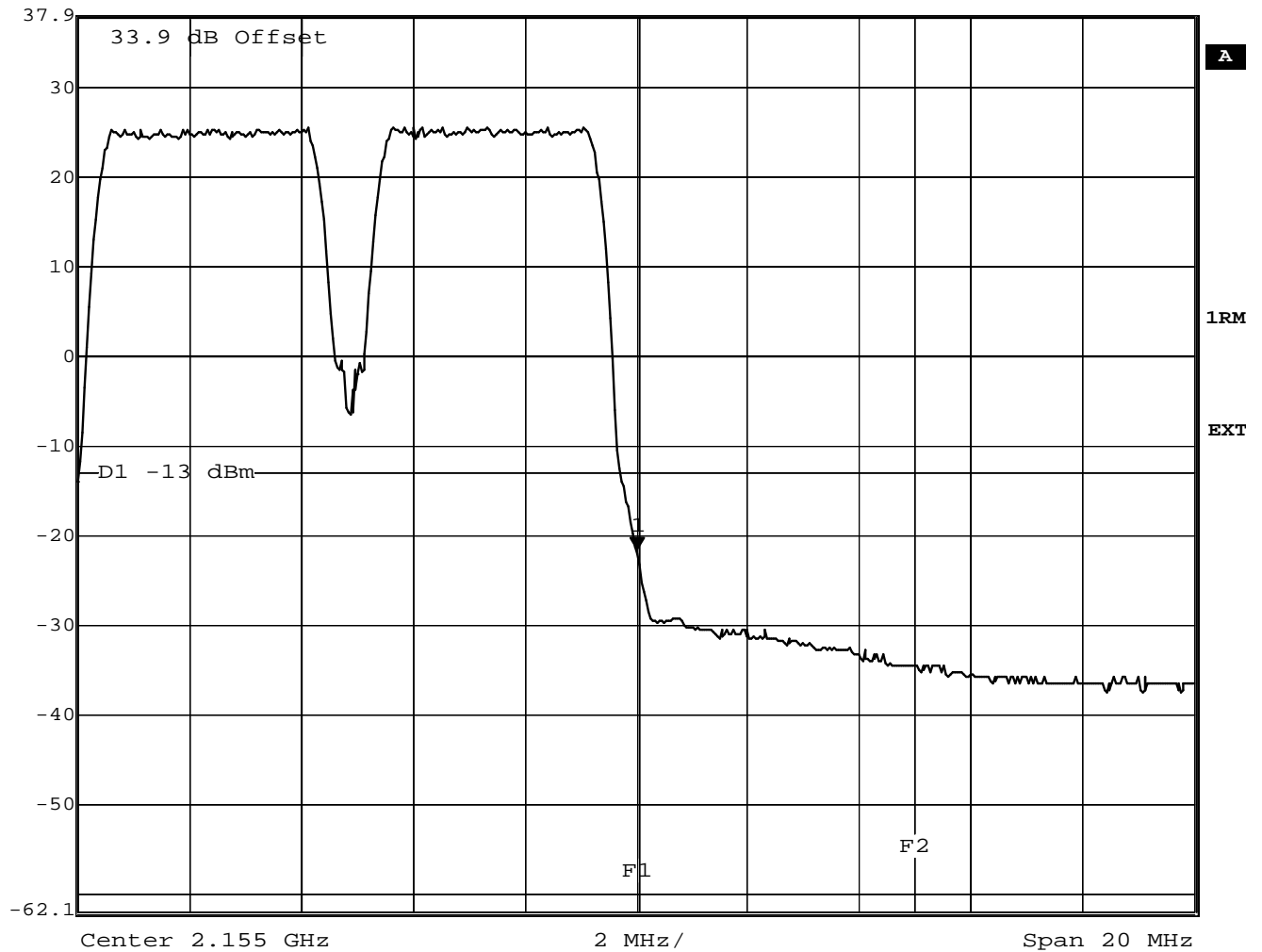
**Notes:** Tx 2112.6 and 2117.6 MHz, QPSK , LOWER BANDEDGE and 3<sup>rd</sup> order IM

**Test Data – Spurious Emissions**

Nemko Oy, Finland

<b>Data Plot</b>		<b>Spurious Emissions at Antenna Terminals</b>	
Page 2 of 10			
Job No.: 80105		Date: 23/01/2007	
Specification: PT27		Temperature (°C): 23	
Tested By: Timo Hietala		Relative Humidity (%): 10	
E.U.T.: WCDMA TRANSMITTER			
Configuration: TX FULL POWER HIGHEST CHANNEL, multi carrier			

	Marker 1 [T1]	RBW	50 kHz	RF Att	25 dB
	Ref Lvl	-21.68 dBm	VBW	50 kHz	
	37.9 dBm	2.15502004 GHz	SWT	2 s	Unit dBm



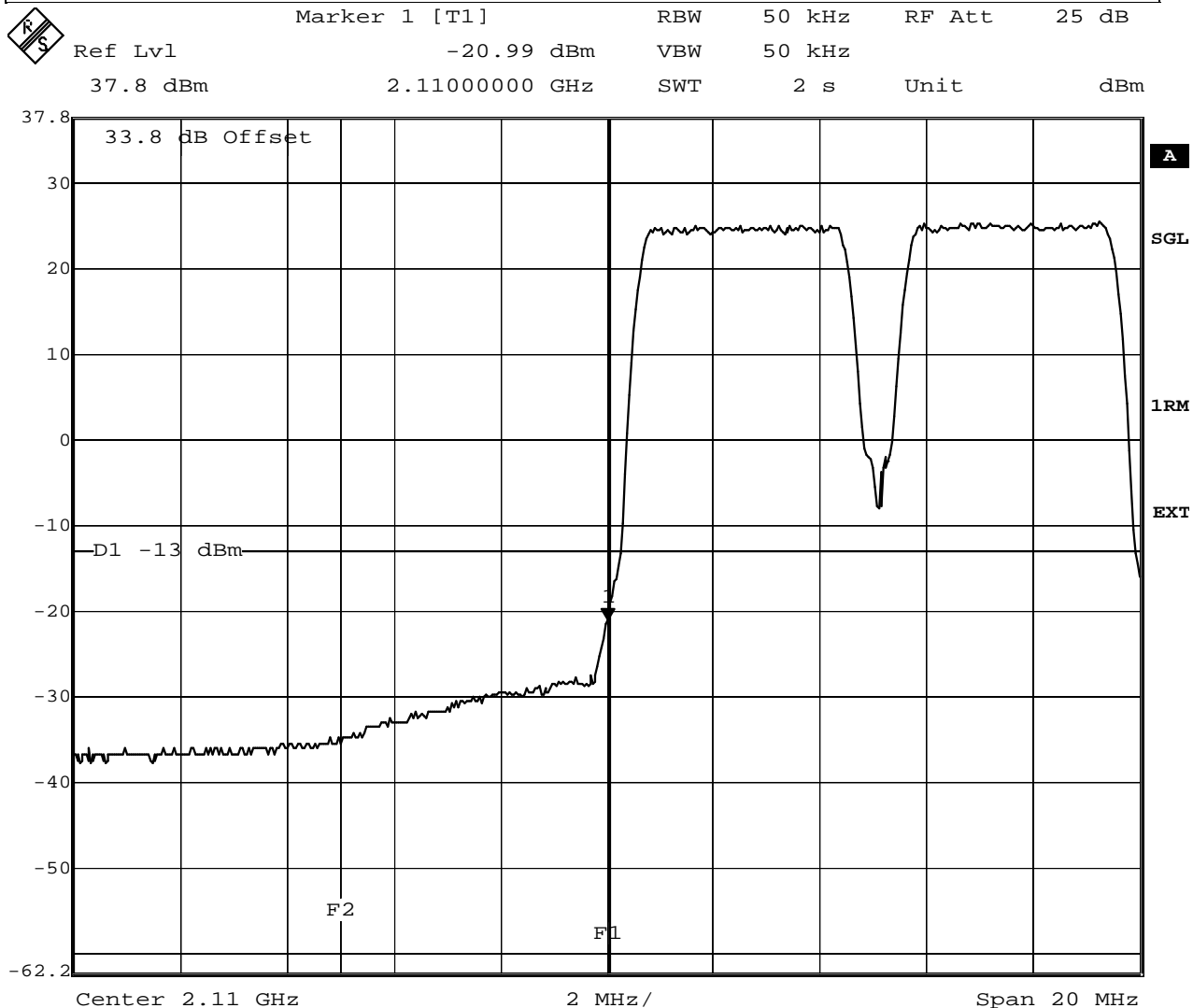
Date: 23.JAN.2007 09:32:29

**Notes:** Tx 2147.2 and 2152.4 MHz, QPSK, UPPER BANDEDGE and 3<sup>rd</sup> order IM

**Test Data – Spurious Emissions**

Nemko Oy, Finland

<b>Data Plot</b>		<b>Spurious Emissions at Antenna Terminals</b>	
Page 3 of 10			
Job No.:	80105	Date:	23/01/2007
Specification:	PT27	Temperature (°C):	23
Tested By:	Timo Hietala	Relative Humidity (%):	10
E.U.T.:	WCDMA TRANSMITTER		
Configuration:	TX FULL POWER LOWEST CHANNEL, multi carrier		



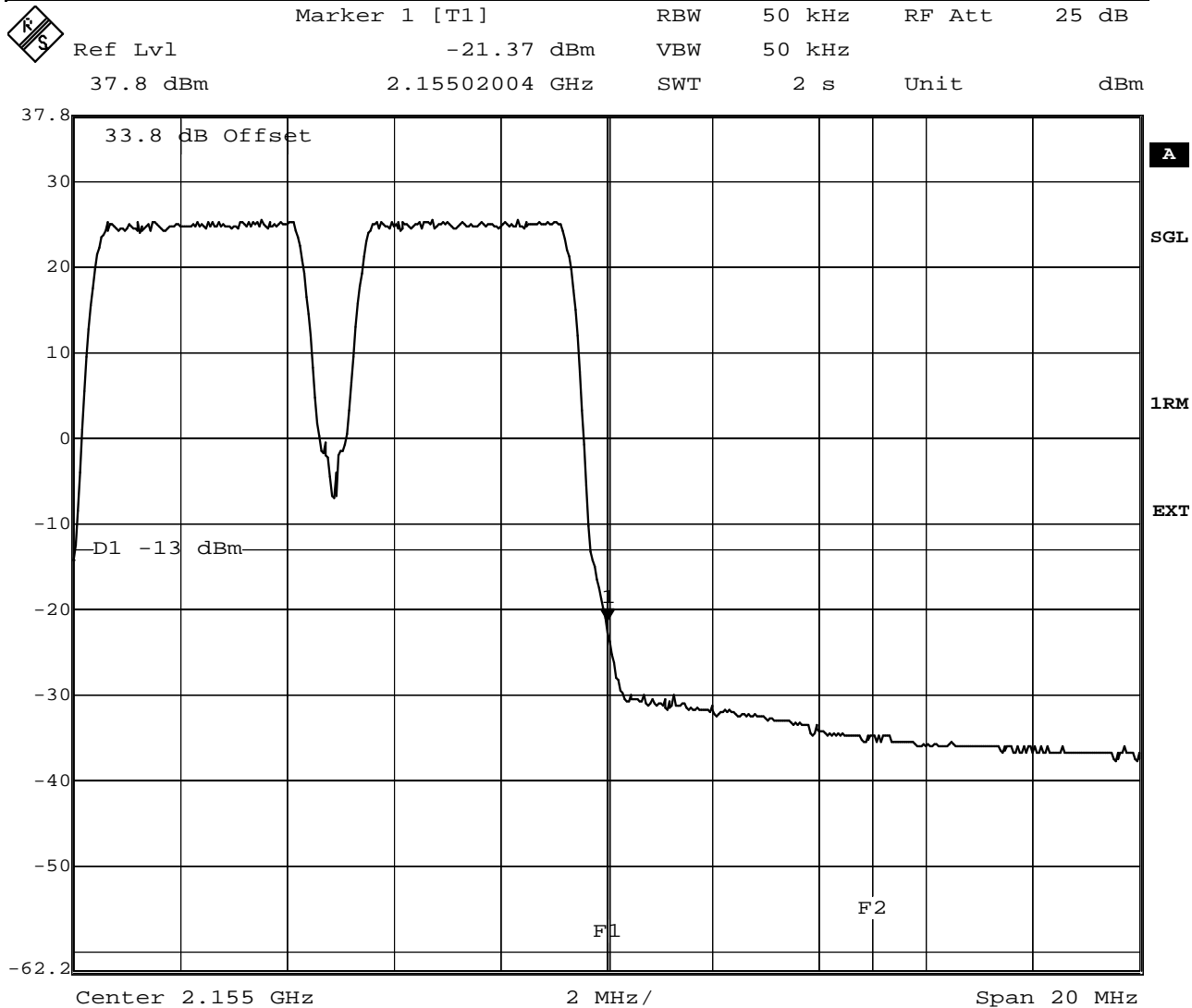
Date: 23.JAN.2007 10:45:55

**Notes:** Tx 2112.6 and 2117.6 MHz, 16QAM, LOWER BANDEDGE and 3<sup>rd</sup> order IM

**Test Data – Spurious Emissions**

Nemko Oy, Finland

<b>Data Plot</b>	<b>Spurious Emissions at Antenna Terminals</b>		
<b>Band edge and 3<sup>rd</sup> IM</b>			
Page 4 of 10			
Job No.: 80105		Date: 23/01/2007	
Specification: PT27		Temperature (°C): 23	
Tested By: Timo Hietala		Relative Humidity (%): 10	
E.U.T.: WCDMA TRANSMITTER			
Configuration: TX FULL POWER highest CHANNEL, multi carrier			



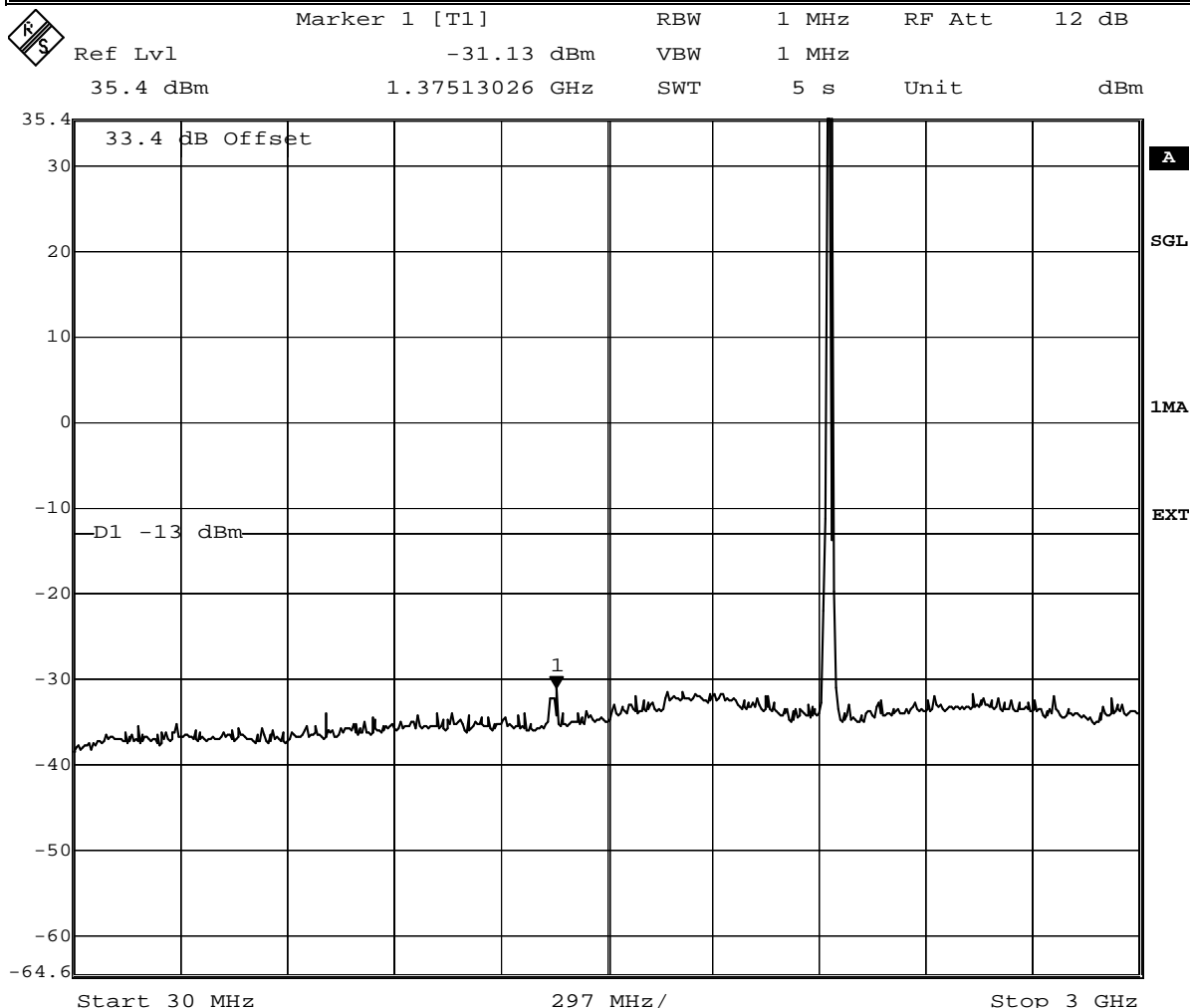
Date: 23.JAN.2007 10:52:21

**Notes:** Tx 2147.2 and 2152.4 MHz, 16QAM, UPPER BANDEDGE and 3<sup>rd</sup> order IM

**Test Data – Spurious Emissions**

Nemko Oy, Finland

<b>Data Plot</b>		<b>Spurious Emissions at Antenna Terminals</b>		Complete <u>  x  </u>
Page 5 of 10				Preliminary: _____
Job No.: 80105		Date: 23/01/2007		
Specification: PT27		Temperature (°C): 23		
Tested By: Timo Hietala		Relative Humidity (%): 10		
E.U.T.: WCDMA TRANSMITTER				
Configuration: TX FULL POWER MIDDLE CHANNEL, multi carrier				
Sample Number: 1				
Location: NET/IMN Oulu		RBW: Refer to plots		Measurement
Detector type: Peak		VBW: Refer to plots		Distance: N/A m
<b>Test Equipment Used</b>				
Antenna: _____		Directional Coupler: _____		
Pre-Amp: _____		Cable #1: _____		
Filter: _____		Cable #2: _____		
Receiver: 1		Cable #3: _____		
Attenuator #1: 13		Cable #4: _____		
Attenuator #2: _____		Mixer: _____		
Additional equipment used: _____				
Measurement Uncertainty: ± 0.7 dB				



Date: 23.JAN.2007 12:07:05

Notes: Tx 2132.5 and 2137.5 MHz QPSK




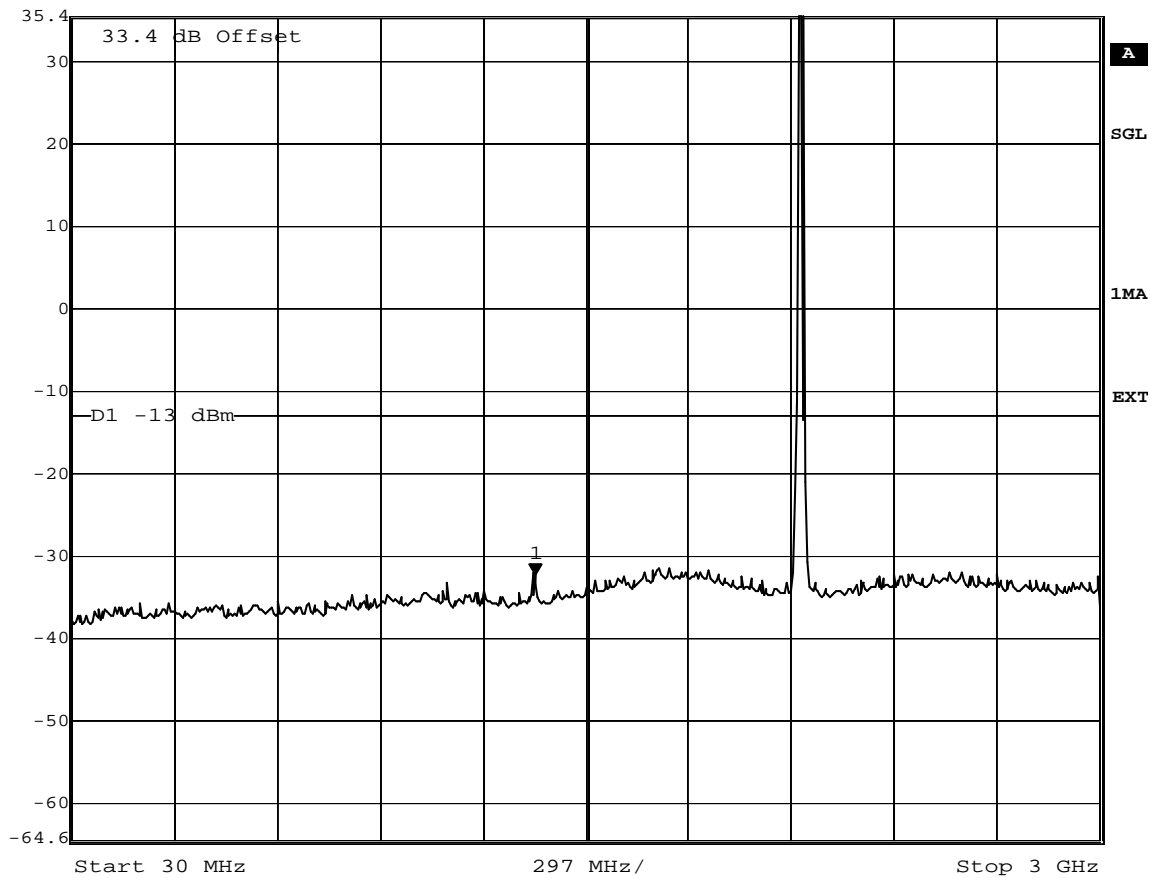


**Test Data – Spurious Emissions**

Nemko Oy, Finland

<b>Data Plot</b>		<b>Spurious Emissions at Antenna Terminals</b>		Complete <u>  x  </u>
Page 7 of 10	Job No.: 80105	Date: <u>23/01/2007</u>	Preliminary: <u>        </u>	
Specification: PT27	Temperature (°C): <u>23</u>			
Tested By: <u>Timo Hietala</u>	Relative Humidity (%): <u>10</u>			
E.U.T.: <u>WCDMA TRANSMITTER</u>				
Configuration: <u>TX FULL POWER MIDDLE CHANNEL multi carrier</u>				
Sample Number: <u>1</u>				
Location: <u>NET/IMN Oulu</u>	RBW: <u>Refer to plots</u>	Measurement		
Detector type: <u>Peak</u>	VBW: <u>Refer to plots</u>	Distance: <u>N/A</u> m		
<b>Test Equipment Used</b>				
Antenna: <u>                    </u>	Directional Coupler: <u>                    </u>			
Pre-Amp: <u>                    </u>	Cable #1: <u>                    </u>			
Filter: <u>12</u>	Cable #2: <u>                    </u>			
Receiver: <u>1</u>	Cable #3: <u>                    </u>			
Attenuator #1: <u>14</u>	Cable #4: <u>                    </u>			
Attenuator #2: <u>                    </u>	Mixer: <u>                    </u>			
Additional equipment used: <u>                    </u>				
Measurement Uncertainty: <u>± 0.7 dB</u>				

	Marker 1 [T1]	RBW	1 MHz	RF Att	12 dB
	Ref Lvl	-32.47 dBm	VBW	1 MHz	
	35.4 dBm	1.36746577 GHz	SWT	5 s	Unit
					dBm



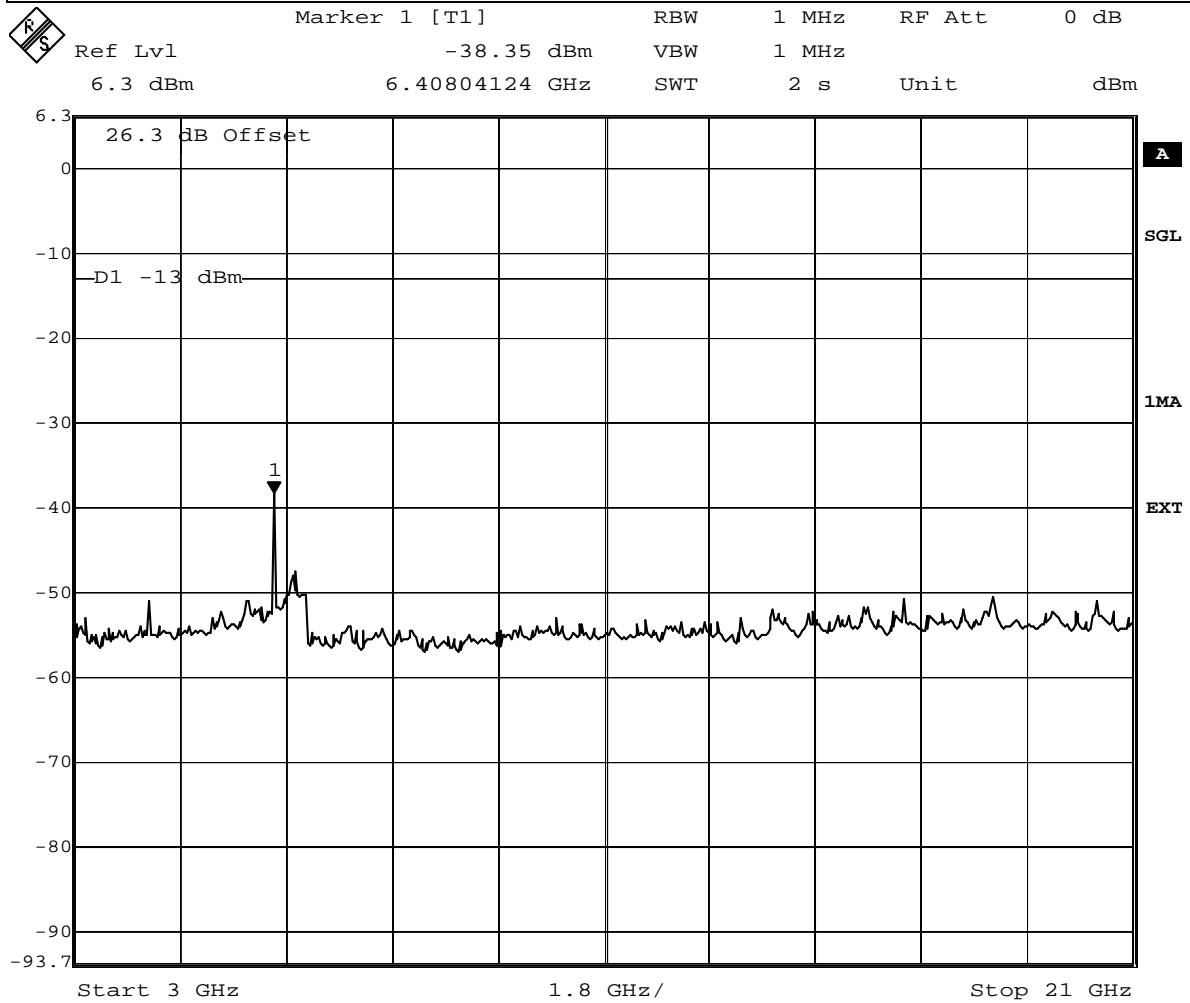
Date: 23.JAN.2007 12:11:37

Notes: Tx 2132.5 and 2137.5 MHZ 16QAM

**Test Data – Spurious Emissions**

Nemko Oy, Finland

<b>Data Plot</b>		<b>Spurious Emissions at Antenna Terminals</b>		Complete <u>  x  </u>
Page 8 of 10	Job No.: 80105	Date: 23/01/2007	Preliminary: _____	
Specification: PT27	Temperature (°C): 23			
Tested By: Timo Hietala	Relative Humidity (%): 10			
E.U.T.: WCDMA TRANSMITTER				
Configuration: TX FULL POWER MIDDLE CHANNEL, multi carrier				
Sample Number: 1				
Location: NET/IMN Oulu	RBW: Refer to plots	Measurement		
Detector type: Peak	VBW: Refer to plots	Distance: N/A	m	
<b>Test Equipment Used</b>				
Antenna: _____	Directional Coupler: _____			
Pre-Amp: _____	Cable #1: _____			
Filter: 12	Cable #2: _____			
Receiver: 1	Cable #3: _____			
Attenuator #1: 14	Cable #4: _____			
Attenuator #2: _____	Mixer: _____			
Additional equipment used: _____				
Measurement Uncertainty: ± 0.7 dB				



Date: 23.JAN.2007 12:44:02

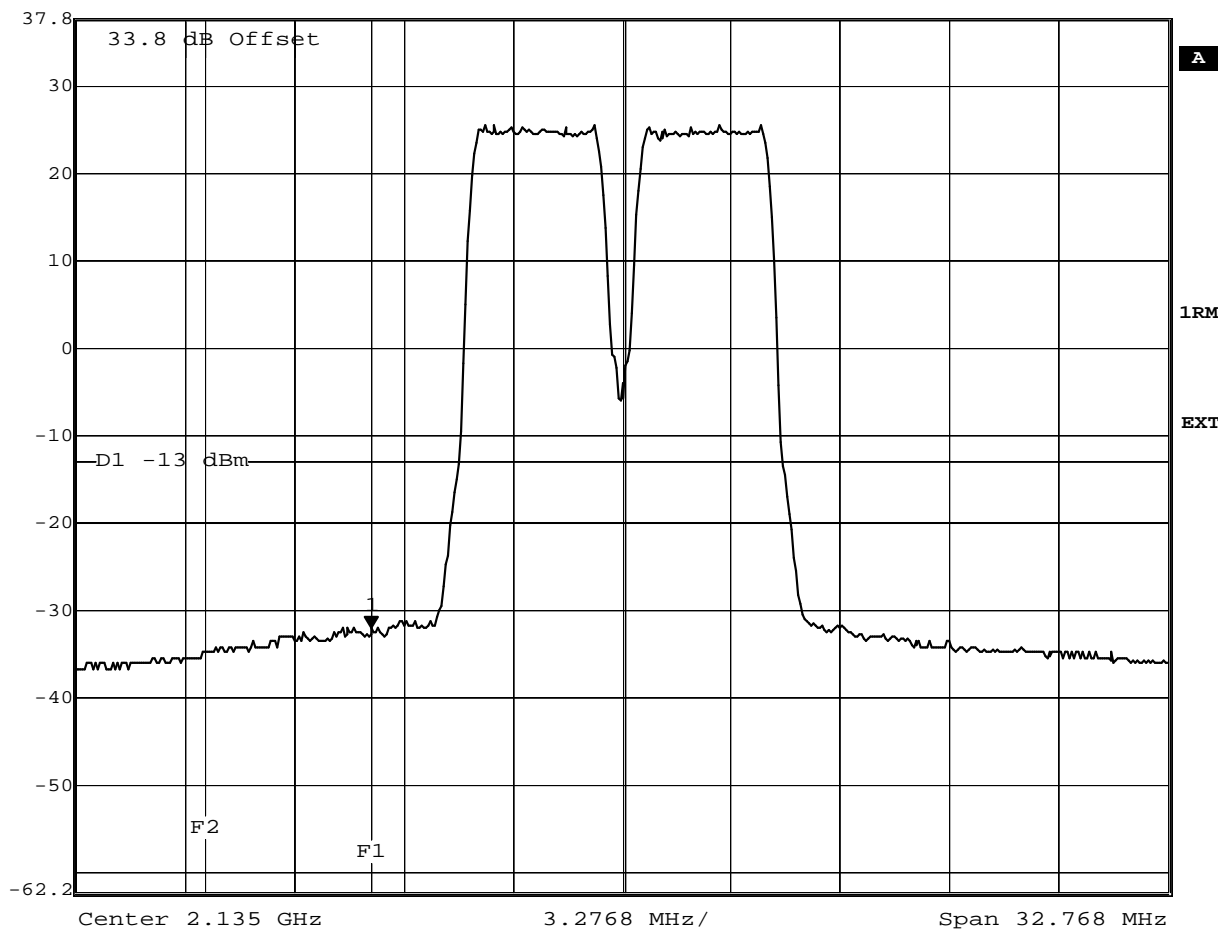
Notes: Tx 2132.5 and 2137.5 MHz 16QAM

**Test Data – Spurious Emissions**

Nemko Oy, Finland

<b>Data Plot</b>		<b>Spurious Emissions at Antenna Terminals</b>		Complete <u>  x  </u>
Page 9 of 10		<b>3<sup>rd</sup> order inband intermodulation</b>		Preliminary: <u>        </u>
Job No.:	80105	Date:	23/01/2007	
Specification:	PT27	Temperature (°C):	23	
Tested By:	Timo Hietala	Relative Humidity (%):	10	
E.U.T.:	WCDMA TRANSMITTER			
Configuration:	TX FULL POWER MIDDLE CHANNEL, multi carrier			
Sample Number:	1			
Location:	NET/IMN Oulu	RBW:	Refer to plots	Measurement
Detector type:	rms	VBW:	Refer to plots	Distance: <u>  N/A  </u> m
<b>Test Equipment Used</b>				
Antenna:		Directional Coupler:		
Pre-Amp:		Cable #1:		
Filter:	12	Cable #2:		
Receiver:	1	Cable #3:		
Attenuator #1:	14	Cable #4:		
Attenuator #2:		Mixer:		
Additional equipment used:				
Measurement Uncertainty:	± 0.7 dB			

	Marker 1 [T1]	RBW	50 kHz	RF Att	25 dB
	Ref Lvl	-32.19 dBm	VBW	50 kHz	
	37.8 dBm	2.12750000 GHz	SWT	2 s	Unit dBm



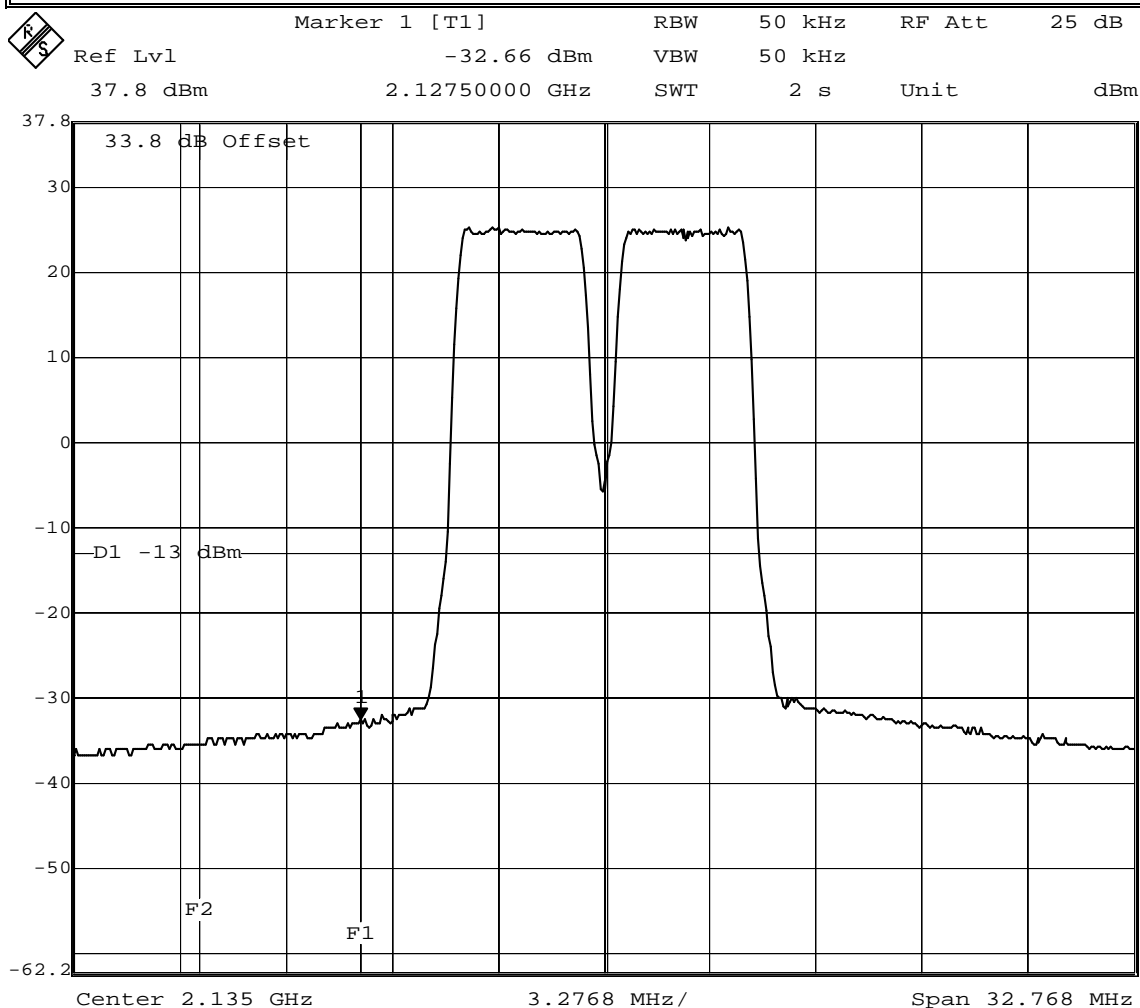
Date: 23.JAN.2007 11:34:59

**Notes:** Tx 2132.5 and 2137.5 MHZ QPSK

**Test Data – Spurious Emissions**

Nemko Oy, Finland

<b>Data Plot</b>		<b>Spurious Emissions at Antenna Terminals</b>		Complete <u>  x  </u>
Page 10 of 10		<b>3<sup>rd</sup> order inband intermodulation</b>		Preliminary: <u>      </u>
Job No.:	80105	Date:	23/01/2007	
Specification:	PT27	Temperature (°C):	23	
Tested By:	Timo Hietala	Relative Humidity (%):	10	
E.U.T.:	WCDMA TRANSMITTER			
Configuration:	TX FULL POWER MIDDLE CHANNEL, multi carrier			
Sample Number:	1			
Location:	NET/IMN Oulu	RBW:	Refer to plots	Measurement
Detector type:	rms	VBW:	Refer to plots	Distance: <u>  N/A  </u> m
<b>Test Equipment Used</b>				
Antenna:		Directional Coupler:		
Pre-Amp:		Cable #1:		
Filter:	12	Cable #2:		
Receiver:	1	Cable #3:		
Attenuator #1:	14	Cable #4:		
Attenuator #2:		Mixer:		
Additional equipment used:				
Measurement Uncertainty:	± 0.7 dB			



Date: 23.JAN.2007 11:30:20

Notes: Tx 2132.5 and 2137.5 MHz 16QAM

## 5. Field Strength of Spurious

<b>NAME OF TEST:</b> Field Strength of Spurious Emissions	<b>PARA.NO.:</b> 27.53(g), 2.1053
<b>TESTED BY:</b> Timo Hietala	<b>DATE:</b> 26/01/2007

**Test Results:** Complies.

**Test Data:** See attached table.

Frequency (MHz)	Spurious Emission EIRP (dBm) ave
All	More than 20 dB below limit -13 dBm

**Equipment used:** 15, 16, 17, 18, 19, 23, 24, 25, 26

**Measurement  
Uncertainty:** ± 5.2 dB.

**Temperature:** 23 °C.

**Relative  
Humidity:** 10 %.

**NOTE:** \_\_\_\_\_

The spectrum was searched from 30 MHz to the 10th harmonic of the carrier.

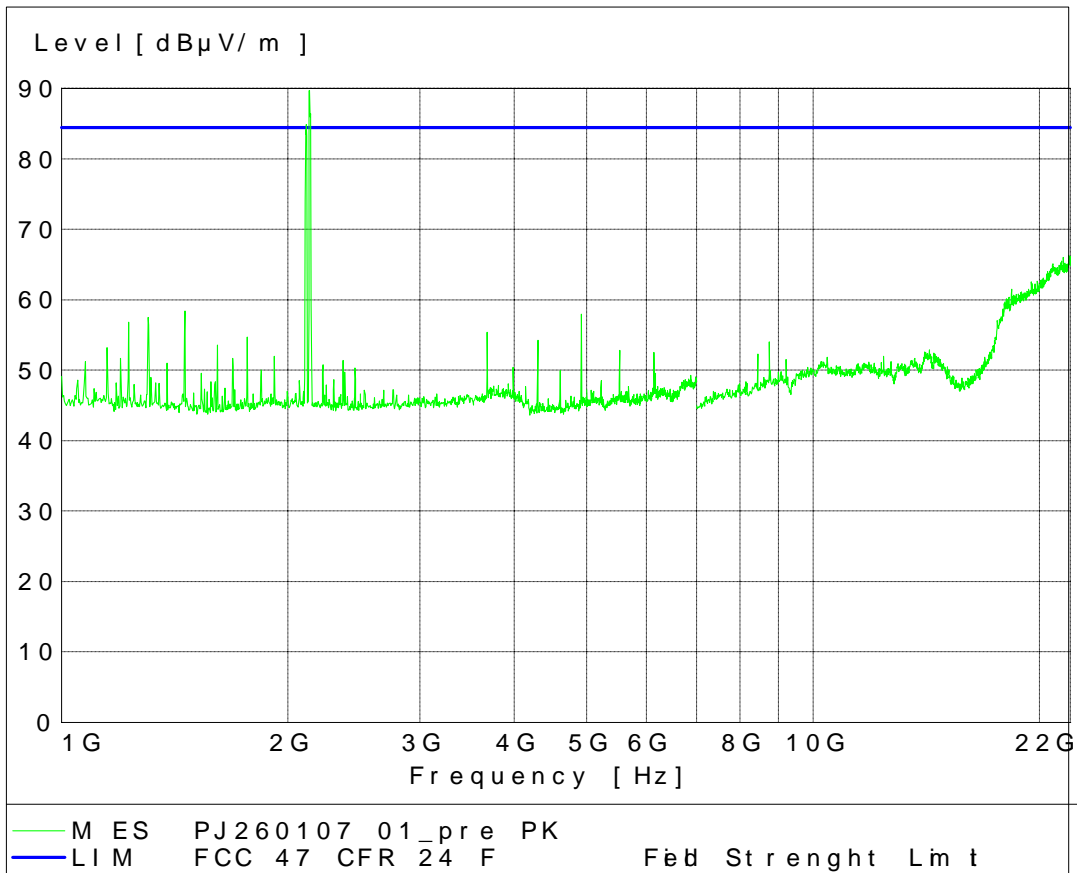
**Test Data – Radiated Emissions**

Nemko Oy, Finland

<b>Data Plot</b>	<b>Radiated Emissions Substitution Method</b>				Complete <u>  x  </u>			
Page 1 of 1	Job No.: 80105	Date: 26/01/2007			Preliminary: _____			
Specification: PT27	Temperature (°C): 23							
Tested By: Timo Hietala	Relative Humidity (%): 10							
E.U.T.: WCDMA TRANSMITTER								
Configuration: TX FULL POWER 2132.5 and 2137.5 MHz								
Sample Number: 1								
Location: NET/IMN Oulu	RBW: 1 MHz			Measurement				
Detector type: Ave	VBW: 1 MHz			Distance: 3 m				
<b>Test Equipment Used</b>								
Antenna: 17 and 18	Directional Coupler:							
Pre-Amp: 24	Cable #1:							
Filter:	Cable #2:							
Receiver: 16	Cable #3:							
Attenuator #1: -	Cable #4:							
Attenuator #2:	Mixer:							
Additional equipment used: 19,23,25 and 26								
Measurement Uncertainty: ± 5.2 dB								
Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)	Gen. Level (dBm)	Substitution Antenna Gain (dBi)	EIRP (dBm)	EIRP (µW)	Polarity	Comments

**Notes:** Pre measurement in stack installation FRIB Tx C1 2132.5 MHz and C2 2137.5 MHz and FRIA Tx C1 2112.5 MHz and C2 2117.5 MHz, transmitters full power terminated 50Ω

**Test Data – Radiated Emissions 1 GHz -22 GHz**



**Notes:** Limit line (84.4 dBuV/m) is converted from substitution limit (-13 dBm) to unit dBuV/m in 3 meter measurement distance

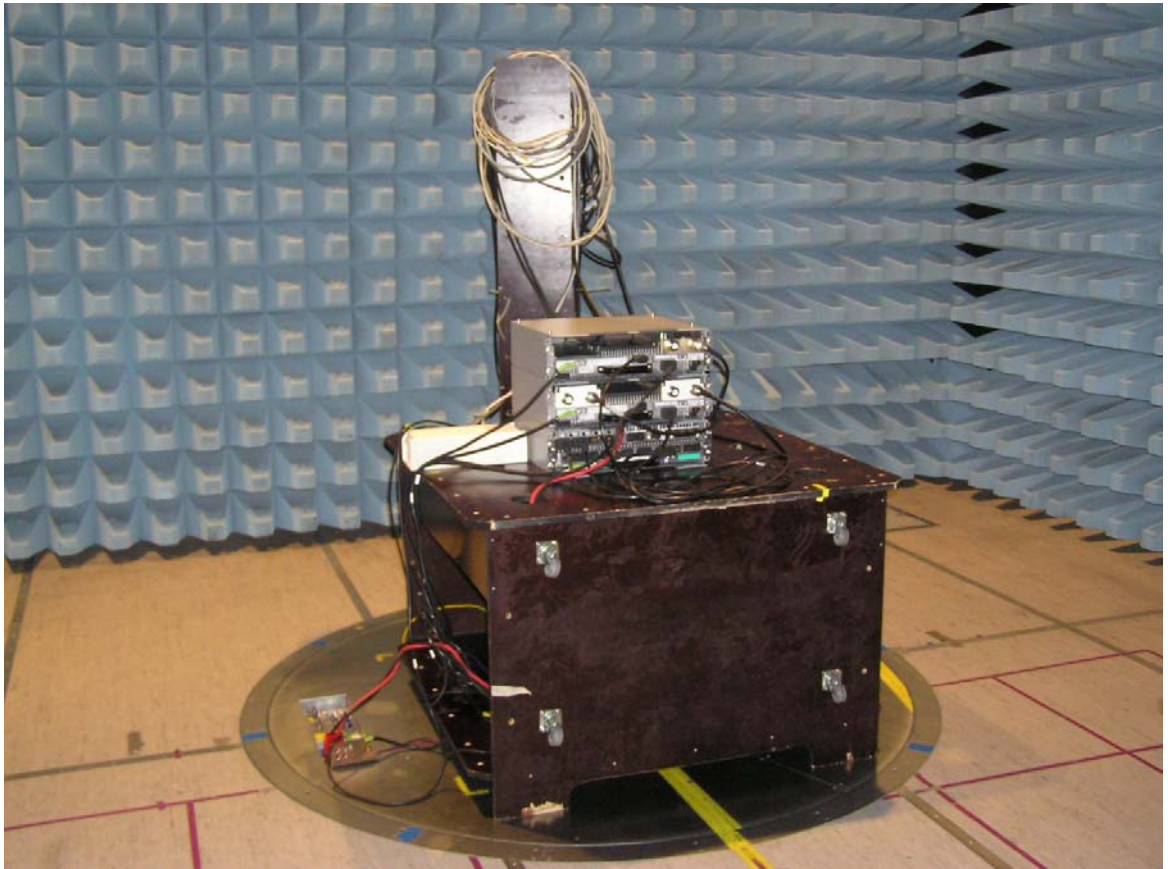
## 6. List of test equipment

Each active test equipment is calibrated annually.

Nr.	Equipment	Name of equipment	Serial number
1	Signal analyzer	Rohde & Schwarz:FSIQ26	836702/020
2	Network analyzer	Hewlett-Packard:HP8753E	US38431868
3	Network analyzer	Hewlett-Packard:HP8720ES	US39172107
4	Calibration kit	Hewlett-Packard:HP85032B	2919A04843
5	Enviromental chamber	Weiss technick	59226012320010
6	Frequency standard	Datum 8040	23006282
7	Interface Unit	Orbis TX SSU2100A	SSU-0346-999
8	DC power	Sörensen	9950C0085
9	Temperature/humidity meter	VAISALA HMI 31	P3730008
10	Signal analyzer	Rohde & Schwarz:FSIQ26	833370/009
11	Frequency standard	Datum 8040	0041005473
12	High Pass filter	Reactel 9HSX-3/20-S11	0531
13	Attenuator	MCE/Weinschel 67-20-33	BM0633
14	Attenuator	Narda FSCM 99899	08275
15	Semianechoic chamber	Siemens Matsushita 9m × 5m × 6m (room 0039)	Product No S&M B83317- C6019-T232
16	EMI Test Receiver	R&S ESIB 26	100335
17	LogPer Antenna	R&S HL025	349048/002 (1-26 GHz)
18	Bilog Antenna	Chase CBL6112B	2694
19	Horn Antenna	Emco 3115	0102A06346
20	Biconical Antenna	R&S HK116	836891/009
21	Dipole VHF	Mess-Elektronik VHA9103	
22	Dipole UHF	Mess-Elektronik UHA9105	
23	Signal Generator	R&S SMR 20	1715
24	Amplifier	Miteq AFSX4	791117
25	Antenna Mast	Deisel HD240	2401323194
26	Mast Controller	Deisel HD100	1001331



7. Photographs of Test Setup



## 8. ANNEX A, TEST DETAILS

<b>NAME OF TEST: RF Power Output</b>	<b>PARA. NO.: 2.1046</b>
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**Minimum Standard:** Para. No. 27.50 (d). Base stations are limited to 1640 watts peak E.I.R.P. with an antenna height up to 300 meters HAAT. In no case may the peak output power of a base station transmitter exceed 100 watts.

**Method Of Measurement:**

CDMA Per ANSI/J-STD-014  
TDMA Per ANSI/J-STD-010

Detachable Antenna:

The peak power at antenna terminals is measured using an in-line peak power meter or a spectrum analyzer.

<b>NAME OF TEST: Occupied Bandwidth</b>	<b>PARA. NO.: 2.1049</b>
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**Minimum Standard:** Para. No. 2.1049. The 99% occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0.5% of the emitted power.

**Method Of Measurement:**

The 99% occupied bandwidth of the carrier emission is measured using a spectrum analyzer with Resolution Bandwidth set to 1% of the necessary bandwidth of the transmitted carrier.

<b>NAME OF TEST: Spurious Emission at Antenna Terminals</b>	<b>PARA. NO.: 2.1051</b>
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**Minimum Standard:** Para. No. 27.53(g). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least  $43 + 10 \log (P)$  dB.

**Method Of Measurement:**

Spectrum analyzer settings:

RBW: 1 MHz

VBW: 1 MHz

Within 1 MHz of the upper and lower edges of the assigned band of operation the resolution bandwidth is lowered to 1 % of the 26 dB occupied bandwidth of the transmitted carrier. A pre-measurement was performed with the max peak detector and spurious emissions closer than 20 dB to the limit was measured with rms detector.

**NAME OF TEST: Field Strength of Spurious Radiation****PARA. NO.: 2.1053**

**Minimum Standard:** Para. No.27.53(g). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least  $43 + 10 \log (P)$  dB.

**Test Method:**  
TIA/EIA-603-C-2004, Section 2.2.12

The test was performed in a semi-anechoic shielded room. The EUT was placed on a non-conductive 0.8 m high table standing on the turntable. During the test in the frequency range 30-22000 MHz the distance from the EUT to the measuring antenna was 3 m. In order to find the maximum levels of the disturbance radiation the angle of the turntable, the height of the measuring antenna were varied during the tests. The test was performed with the measuring antenna being both in horizontal and vertical polarizations.

Vertical and horizontal polarizations in the frequency range 30 – 22000 MHz was first measured by using the peak detector. During the peak detector scan the turntable was rotated from 0° to 360° with 30° step with the antenna heights 1.0 m and 2.5 m.

The limit of -13 dBm has been calculated to correspond 84.4 dB( $\mu$ V/m). Spurious emissions closer than 20 dB to the limit was measured with average detector.

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The EUT was replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator  $G_{Antenna[dBi]}$ . This antenna was fed with a signal at the spurious frequency  $P_{Gen[dBm]}$ . The level of the signal was adjusted to repeat the previously measured level. The resulting EIRP is the signal level fed to the reference antenna corrected for gain referenced to an isotropic. The formula below was used to calculate the EIRP of the EUT.

$$P_{EIRP[dbm]} = P_{Gen[dbm]} - L_{Cable[dB]} + G_{Antenna[dBi]}$$

**NAME OF TEST: Frequency Stability****PARA. NO.: 2.1055**

**Minimum Standard:** Para. No. 27.54. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

**Method Of Measurement:**  
Frequency Stability With Voltage Variation

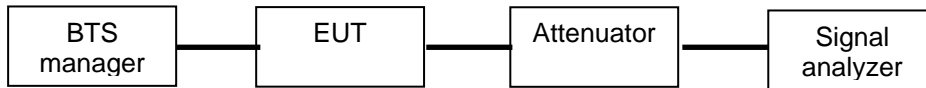
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency error is measure. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation

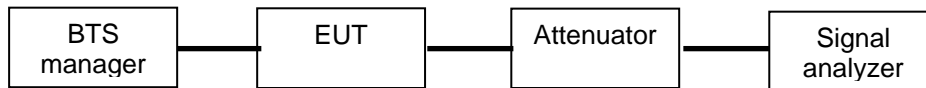
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency error is measured.

**9. ANNEX B, TEST DIAGRAMS**

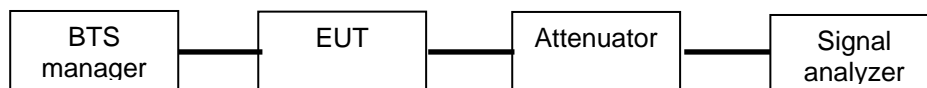
**RF Power Output PARA. NO.: 2.1046**



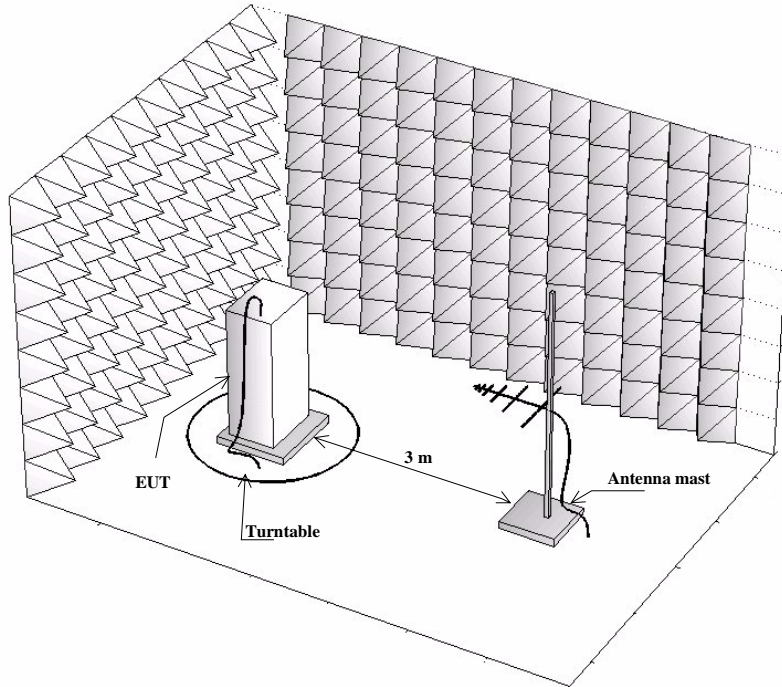
**Occupied Bandwidth PARA. NO.: 2.1049**



**Spurious Emission at Antenna Terminals PARA. NO.: 2.1051**

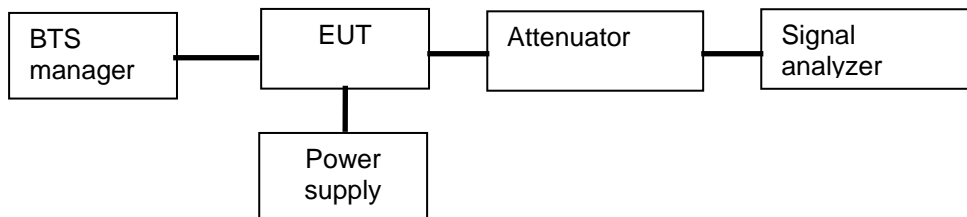


**Field Strength of Spurious Radiation PARA. NO.: 2.1053**



**Frequency Stability PARA. NO.: 2.1055**

Frequency Stability With Voltage Variation



Frequency Stability With Temperature Variation

