

longsung Technology (Shanghai) Co.,Ltd

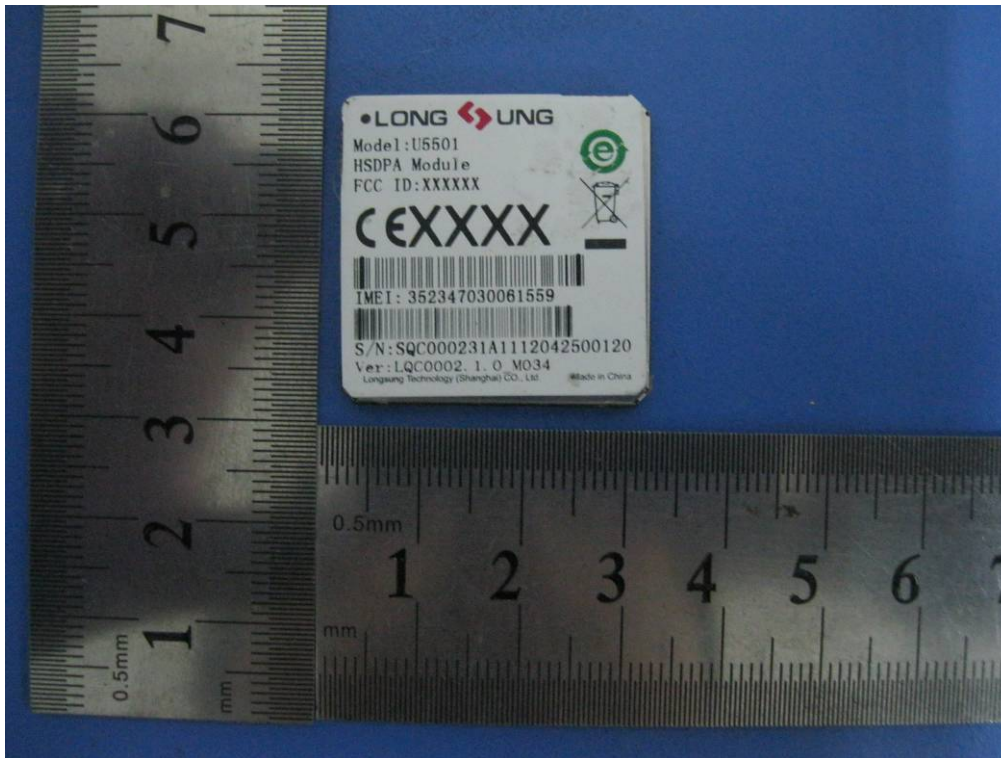
HSDPA Module

Main Model: U5501

Serial Model: N/A

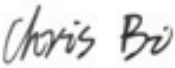


August 24, 2012

Report No.: 12050061-FCC-R1
(This report supersedes NONE)



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

		
Chris Bi Compliance Engineer	Alex Liu Technical Manager	

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Test result presented in this test report is applicable to the representative sample only.

RF Test Report

To: FCC Part 22(H) & FCC Part 24(E): 2012, ANSI/TIA-603-C-2004

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Country/Region	Accreditation Body	Scope
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Canada	IC, A2LA, NIST	EMC, RF/Wireless , Telecom
Taiwan	BSMI , NCC , NIST	EMC, RF, Telecom , Safety
Hong Kong	OFTA , NIST	RF/Wireless ,Telecom
Australia	NATA, NIST	EMC, RF, Telecom , Safety
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Europe	A2LA, NIST	EMC, RF, Telecom , Safety

Accreditations for Product Certifications

Country/Region	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC , RF , Telecom
Canada	IC FCB , NIST	EMC , RF , Telecom
Singapore	iDA, NIST	EMC , RF , Telecom
EU	NB	EMC & R&TTE Directive
Japan	MIC, (RCB 208)	RF , Telecom
Hong Kong	OFTA (US002)	RF , Telecom

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1. EXECUTIVE SUMMARY & EUT INFORMATION

The purpose of this test programmed was to demonstrate compliance of the longsung Technology (Shanghai) Co.,Ltd HSDPA Module and model: U5501 against the current Stipulated Standards. The HSDPA Module has demonstrated compliance with the FCC Part 22(H) & FCC Part 24(E): 2012.

EUT Information

EUT Description	: HSDPA Module
Main Model	: U5501
Serial Model	: N/A
Antenna Gain	: GSM850: 1.2dBi; PCS1900: 1.2dBi;
Input Power	: DC 3.3~4.2V
Maximum Conducted Peak Power to Antenna	: GSM850: 32.65 dBm : PCS1900: 28.70 dBm
Maximum Radiated ERP/EIRP	: GSM850: 28.39 dBm / ERP : PCS1900: 27.02 dBm / EIRP
Classification Per Stipulated Test Standard	: FCC Part 22(H) & FCC Part 24(E): 2012 : ANSI/TIA-603-C-2004

2. TECHNICAL DETAILS

Purpose	Compliance testing of HSDPA Module with stipulated standard
Applicant / Client	longsung Technology (Shanghai) Co.,Ltd Bldg.5, 299 BiSheng Rd, Zhangjiang Hi-Tech Park, Pudong, Shanghai, P.R. China
Manufacturer	longsung Technology (Shanghai) Co.,Ltd Bldg. 5, Lane 299, Bisheng Rd., Zhangjiang Hi-Tech Park, Pudong District, Shanghai, P.R. China
Laboratory performing the tests	SIEMIC Nanjing (China) Laboratories NO.2-1,Longcang Dadao, Yuhua Economic Development Zone, Nanjing, China Tel:+86(25)86730128/86730129 Fax:+86(25)86730127 Email:info@siemic.com
Test report reference number	12050061-FCC-R1
Date EUT received	August 13, 2012
Standard applied	FCC Part 22(H) & FCC Part 24(E): 2012 ANSI/TIA-603-C-2004
Dates of test	August 15, 2012 to August 23, 2012
No of Units	#1
Trade Name	Longsung
RF Operating Frequency (ies)	GSM850 TX : 824.2 ~ 848.8 MHz; RX : 869.2 ~ 893.8 MHz PCS1900 TX : 1850.2 ~ 1909.8 MHz; RX : 1930.2 ~ 1989.8 MHz
Number of Channels	299CH (PCS1900) and 124CH (GSM850)
Modulation	GSM / GPRS: GMSK EDGE: 8PSK
GPRS Multi-slot class	8/10/12
FCC ID	XHZU5501

3. MODIFICATION

NONE

4. TEST SUMMARY

**The product was tested in accordance with the following specifications.
 All testing has been performed according to below product classification:**

Test Results Summary

Test Standard	Description	Product Class	Pass / Fail
§ 1.1307, § 2.1093	RF Exposure (SAR)	See Above	Pass
§ 2.1046; § 22.913 (a); § 24.232 (c)	RF Output Power	See Above	Pass
§ 2.1047	Modulation Characteristics	See Above	N/A
§ 2.1049; § 22.905 § 22.917; § 24.238	99% & -26 dB Occupied Bandwidth	See Above	Pass
§ 2.1051, § 22.917 (a); § 24.238 (a)	Spurious Emissions at Antenna Terminal	See Above	Pass
§ 2.1053 § 22.917 (a); § 24.238 (a)	Field Strength of Spurious Radiation	See Above	Pass
§ 22.917 (a); § 24.238 (a)	Out of band emission, Band Edge	See Above	Pass
§ 2.1055 § 22.355; § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	See Above	Pass

Note: Testing was performed by configuring EUT to maximum output power status, the declared output power class for different.

5. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

5.1 §1.1307, §2.1093- RF Exposure (SAR)

Test Result: N/A

FCC §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to §1.1307(b)(1), 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 level in excess of the Commission’s guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Test Data

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

Where: S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

GSM 850

Maximum peak output power at antenna input terminal: 32.65 (dBm)
Maximum peak output power at antenna input terminal: 1840.772 (mW)

Prediction distance: >20 (cm)
Predication frequency: 836.6 (MHz)
Antenna Gain (typical): 1.2 (dBi)
Antenna Gain (typical): 1.318 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.483 (mW/cm²)
MPE limit for general population exposure at prediction frequency: 0.558 (mW/cm²)

0.483 (mW/cm²) < 0.549 (mW/cm²)

PCS 1900

Maximum peak output power at antenna input terminal: 28.7 (dBm)
Maximum peak output power at antenna input terminal: 741.310 (mW)

Prediction distance: >20 (cm)
Predication frequency: 1850 (MHz)
Antenna Gain (typical): 1.2 (dBi)
Antenna Gain (typical): 1.318 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.194 (mW/cm²)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm²)

0.194 (mW/cm²) < 1 (mW/cm²)

Result: Pass

5.2 §2.1046;§22.913 (a); §24.232 (c)- RF Output Power

1. Conducted Measurement
EUT was set for low, mid, high channel with modulated mode and highest RF output power.
The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is $\pm 1.5\text{dB}$.
3. Environmental Conditions

Temperature	23°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
4. Test date : August 15 , 2012
Tested By : Chris Bi

Procedures:

For Conducted Power:

1. The transmitter output port was connected to base station.
2. Set EUT at maximum power through base station.
3. Select lowest, middle, and highest channels for each band and different test mode.

For ERP/EIRP:

1. The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = $10 \lg(\text{TXpwr in Watts}/0.001)$ – the absolute level

Spurious attenuation limit in dB = $43 + 10 \text{Log}_{10}(\text{power out in Watts})$

Test Result: Pass

Remark: Conducted Burst Average power for reporting purposes only

Conducted Power

Burst Average Power (dBm)								
Band	GSM850				GSM1900			
Channel	128	190	251	Tune up Power tolerant	512	661	810	Tune up Power tolerant
Frequency (MHz)	824.2	836.6	848.8	/	1850.2	1880	1909.8	/
GSM Voice (1 uplink)	32.58	32.65	32.60	33±1	28.70	28.45	28.33	29±1
GPRS Multi-Slot Class 8 (1 uplink)	32.60	32.61	32.57	33±1	28.62	28.42	28.54	29±1
GPRS Multi-Slot Class 10 (2 uplink)	29.84	29.97	29.90	30±1	26.00	26.23	26.25	27±1
GPRS Multi-Slot Class 12 (4 uplink)	26.97	27.00	26.99	27±1	23.11	23.30	23.62	24±1
EDGE Multi-Slot Class 8 (1 uplink)	27.68	27.98	27.70	27±1	27.86	27.88	27.92	27±1
EDGE Multi-Slot Class 10 (2 uplink)	24.84	24.82	24.85	24±1	24.79	24.88	24.91	24±1
EDGE Multi-Slot Class 12 (4 uplink)	23.89	23.82	23.95	23±1	22.91	23.14	23.14	23±1
Remark : GPRS, CS1 coding scheme. Multi-Slot Class 8 , Support Max 4 downlink, 1 uplink , 5 working link Multi-Slot Class 10 , Support Max 4 downlink, 2 uplink , 5 working link Multi-Slot Class 12 , Support Max 4 downlink, 4 uplink , 5 working link								

Note: Since GSM mode has higher power, so the test items below were not performed to GPRS and EDGE mode.

ERP & EIRP (worst case)

ERP for Cellular Band (Part 22H)

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
824.2	23.71	V	6.2	1.67	28.24	38.45
824.2	21.66	H	6.2	1.67	26.19	38.45
836.6	23.73	V	6.2	1.67	28.26	38.45
836.6	21.72	H	6.2	1.67	26.25	38.45
848.8	23.76	V	6.3	1.67	28.39	38.45
848.8	21.8	H	6.3	1.67	26.43	38.45

EIRP for PCS Band (Part 24E)

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
1850.2	20.76	V	8.6	2.66	26.7	33
1850.2	19.53	H	8.6	2.66	25.47	33
1880	20.6	V	8.6	2.34	26.86	33
1880	19.66	H	8.6	2.34	25.92	33
1909.8	20.59	V	8.6	2.17	27.02	33
1909.8	19.77	H	8.6	2.17	26.2	33

Note: Factors= Antenna Gain Correction-Cable Loss

5.3 §2.1047 - Modulation Characteristic

According to FCC § 2.1047(d), Part 22H & 24E there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

5.4 §2.1049, §22.917, §22.905 & §24.238 - Occupied Bandwidth

1. Conducted Measurement
EUT was set for low, mid, high channel with modulated mode and highest RF output power.
The spectrum analyser was connected to the antenna terminal.
2. Environmental Conditions

Temperature	23°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
3. Conducted Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
4. Test date : August 22 , 2012
Tested By : Chris Bi

Procedures:

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The 99% and 26 dB occupied bandwidth (BW) of the middle channel for the highest RF powers.

Test Results: Pass

GSM Mode

Cellular Band (Part 22H)

	Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
GSM Mode	128	824.2	240	306
	190	836.6	240	304
	251	848.8	240	304
GPRS Mode	128	824.2	246	322
	190	836.6	244	322
	251	848.8	242	322
EDGE Mode	128	824.2	244	318
	190	836.6	246	312
	251	848.8	244	310

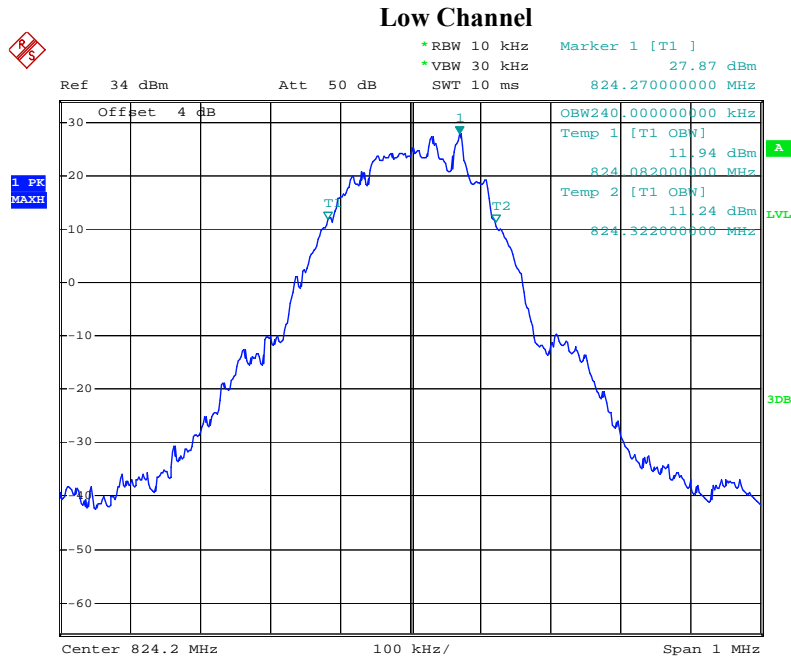
PCS Band (Part 24E)

	Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
GSM Mode	512	1850.2	242	304
	661	1880.0	242	304
	810	1909.8	240	306
GPRS Mode	512	1850.2	244	316
	661	1880.0	246	320
	810	1909.8	246	322
EDGE Mode	512	1850.2	246	316
	661	1880.0	248	318
	810	1909.8	250	320

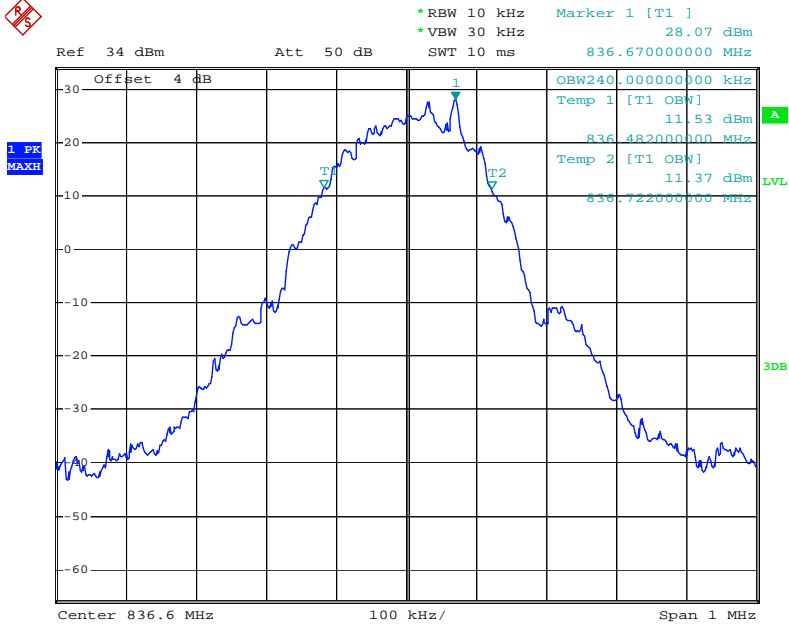
Please refer to the following plots.

Cellular Band (Part 22H)
GSM Mode:

99% Occupied Bandwidth

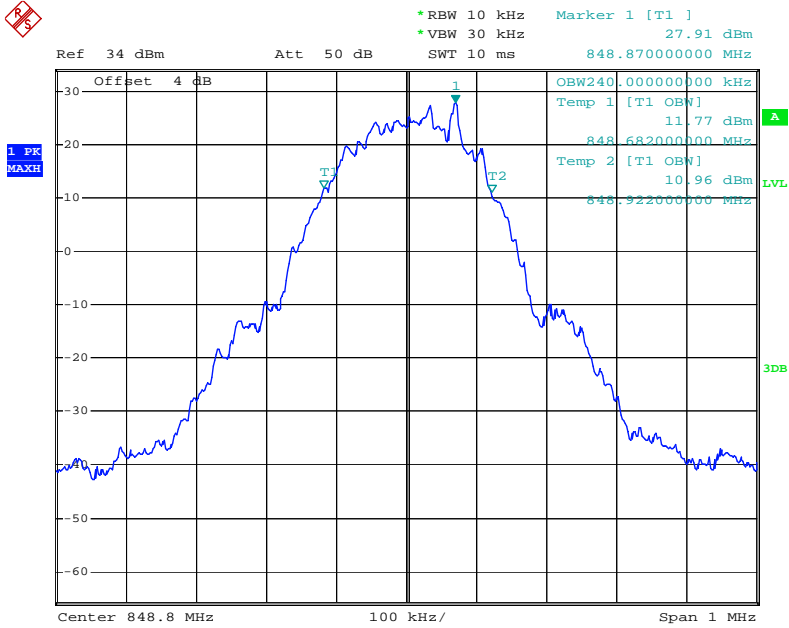


Middle Channel



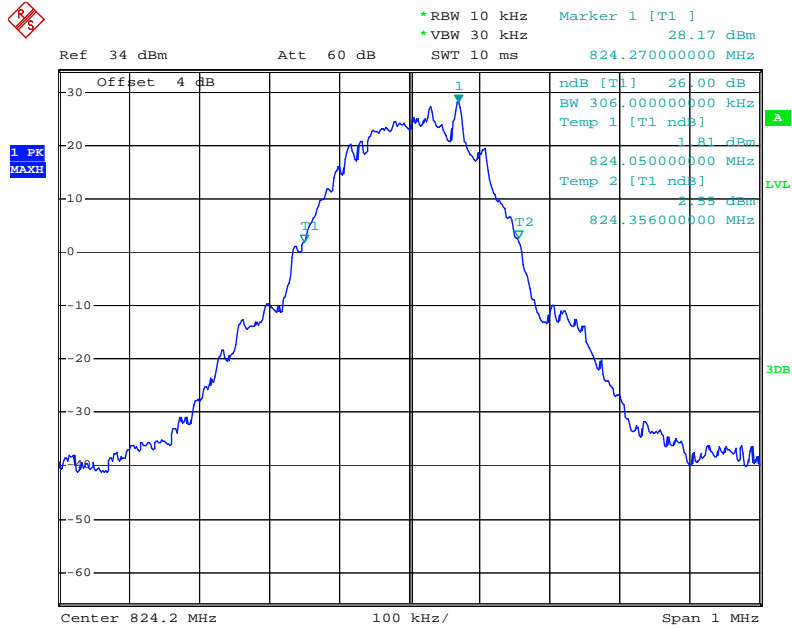
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High Channel



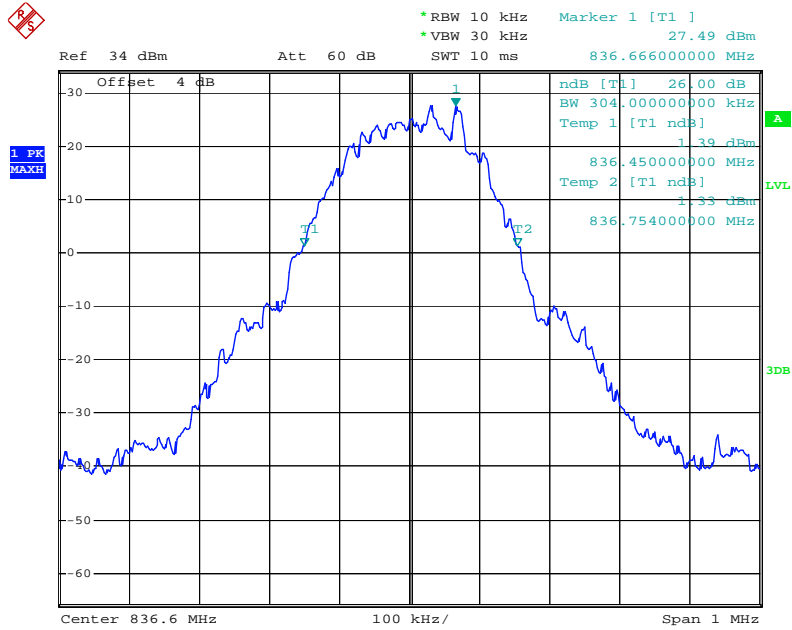
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26 dB Bandwidth Low Channel



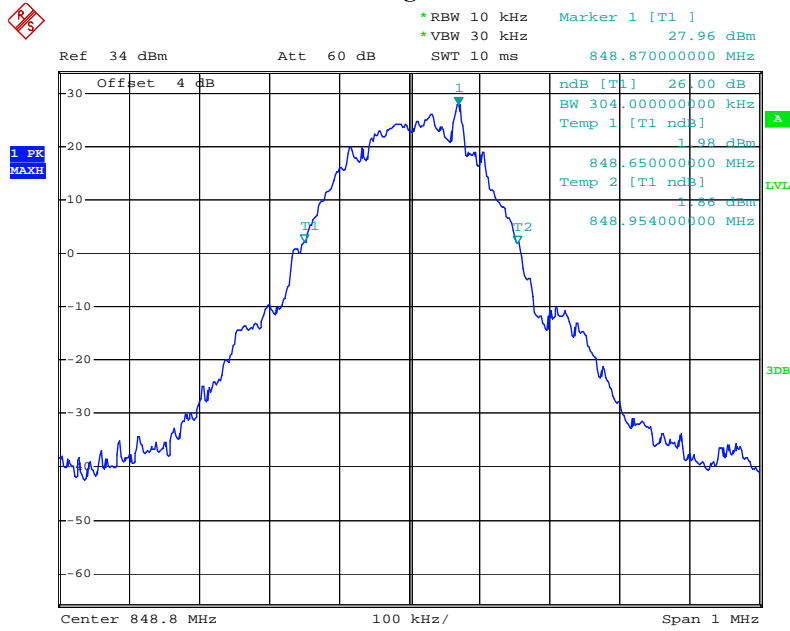
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Middle Channel



Date: 22.AUG.2012 23:39:07

High Channel

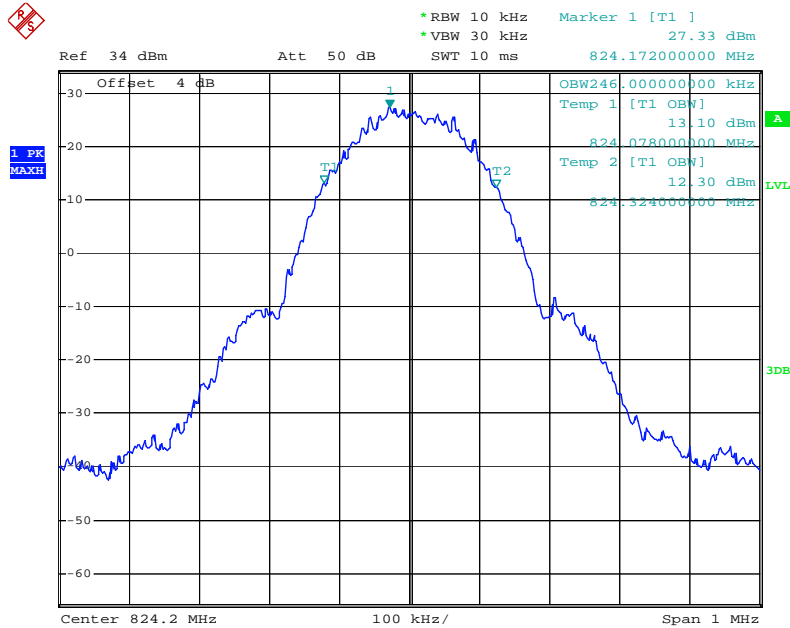


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GPRS Mode:

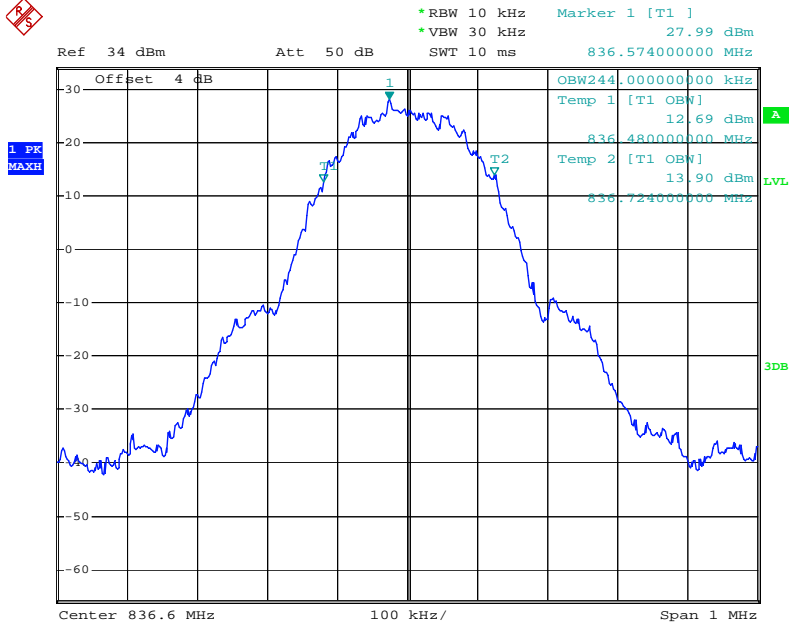
99% Occupied Bandwidth

Low Channel



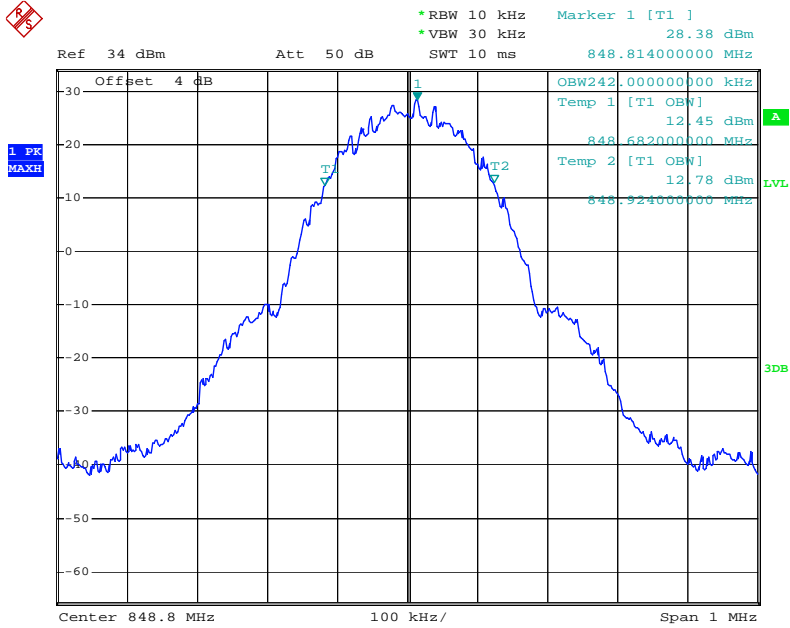
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Middle Channel



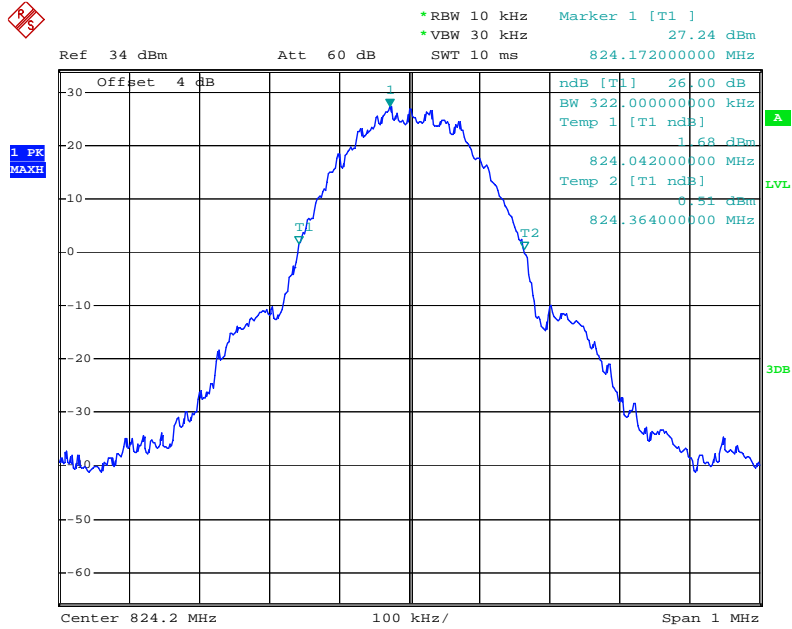
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High Channel



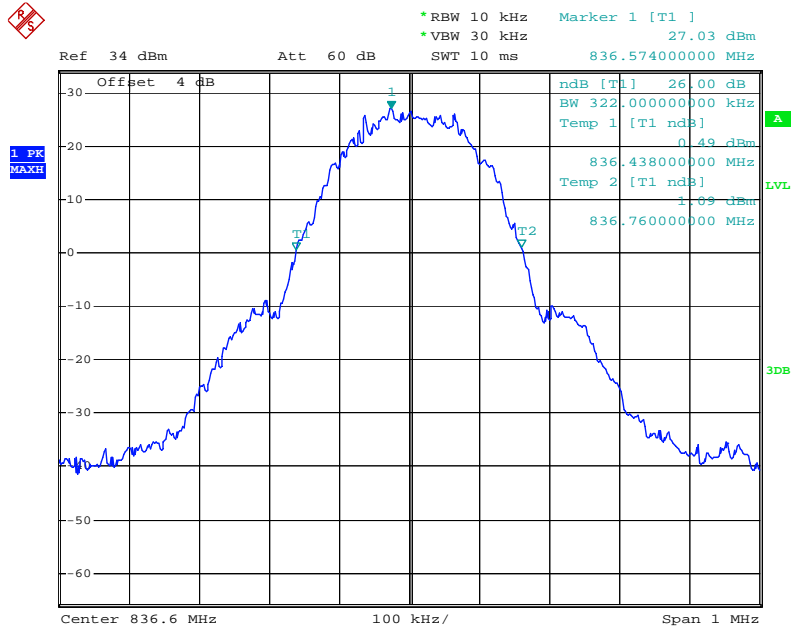
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26 dB Bandwidth Low Channel



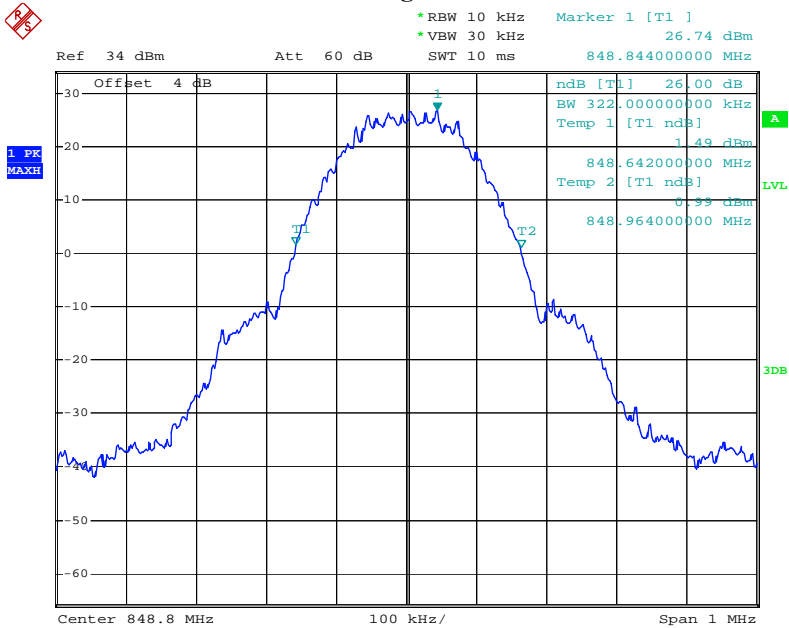
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Middle Channel



Date: 22.AUG.2012 23:46:46

High Channel

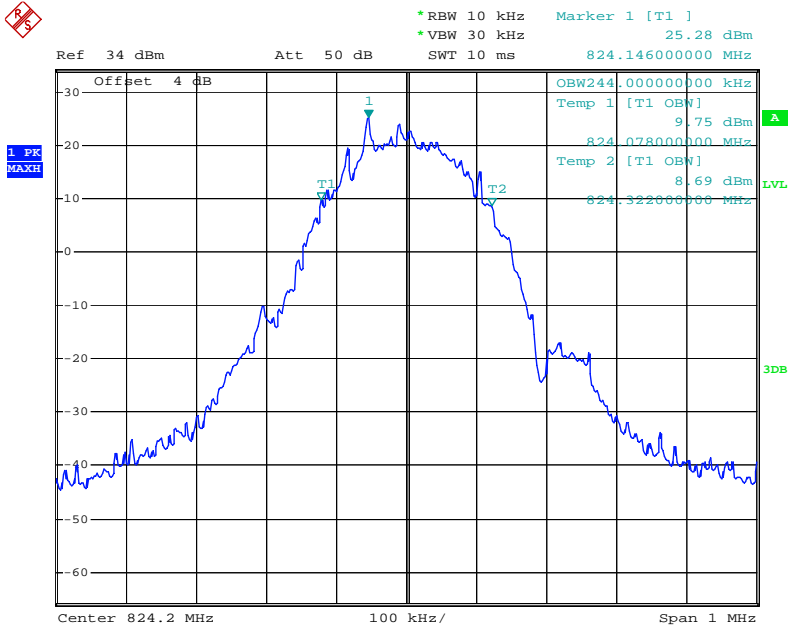


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EDGE Mode:

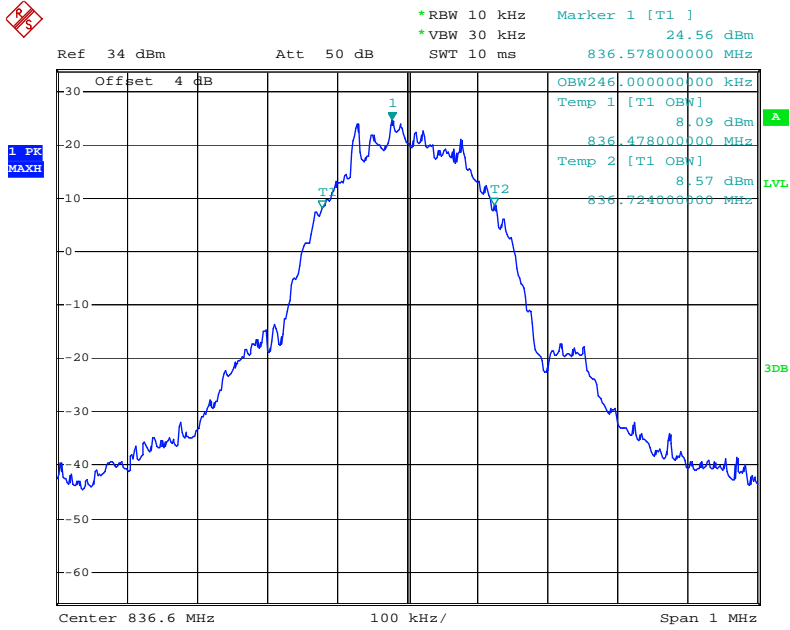
99% Occupied Bandwidth

Low Channel



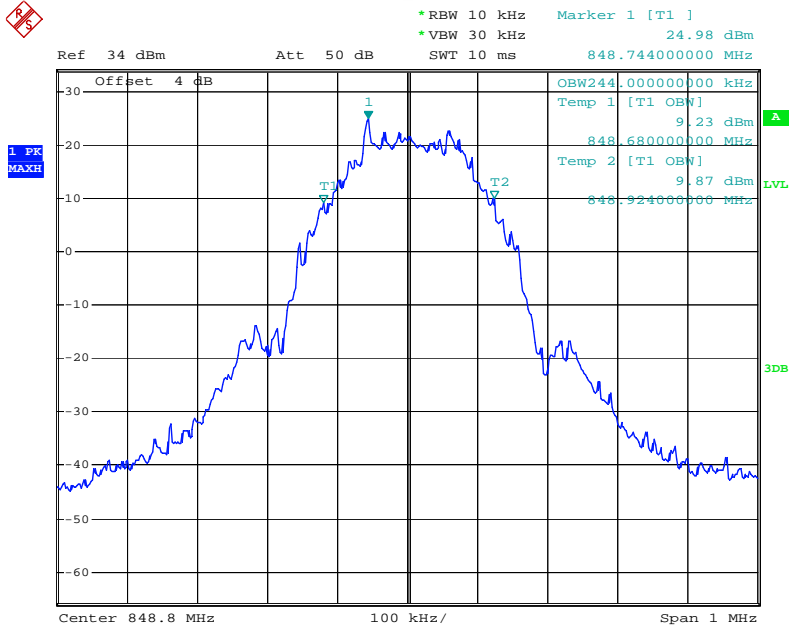
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Middle Channel



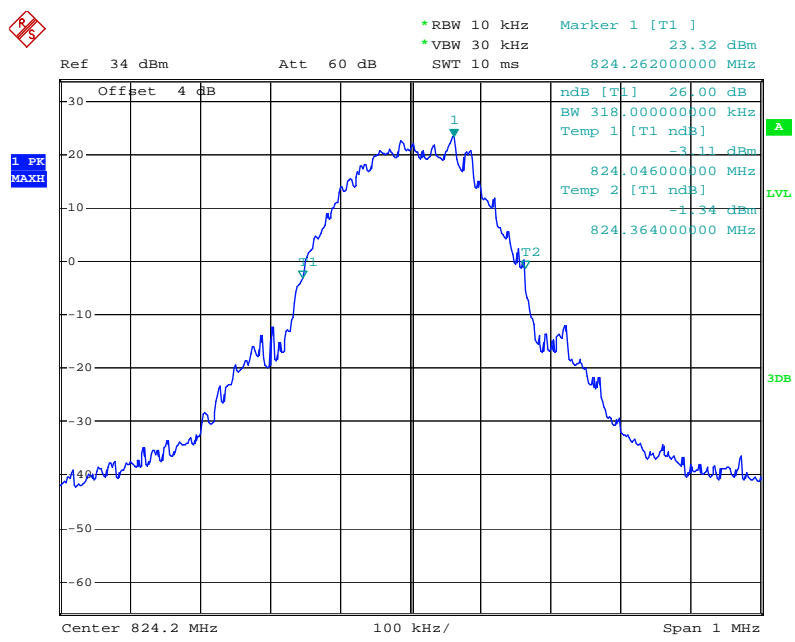
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High Channel



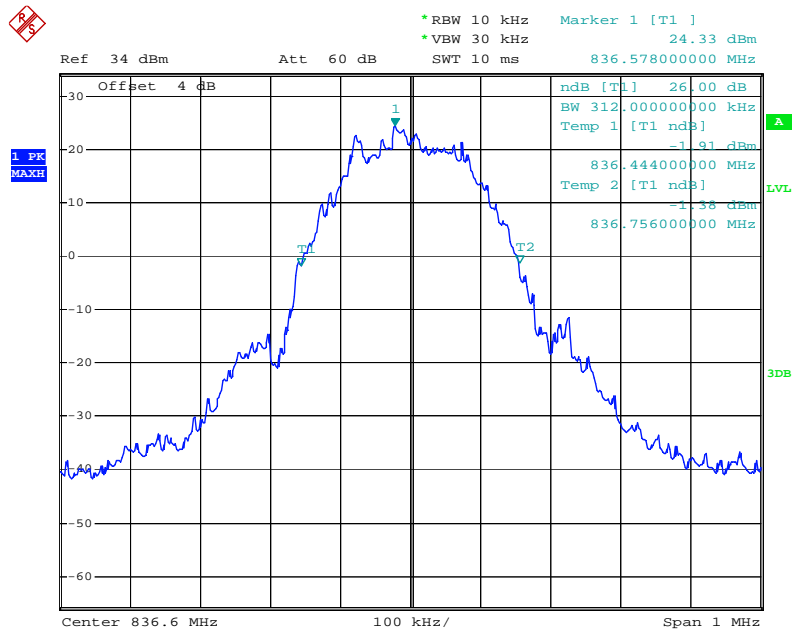
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26 dB Bandwidth Low Channel



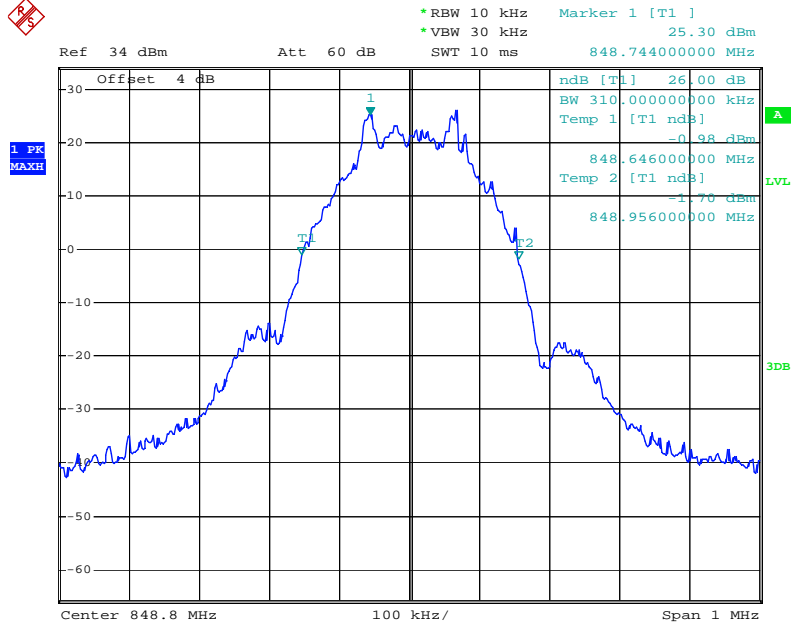
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Middle Channel



Date: 22.AUG.2012 23:52:03

High Channel



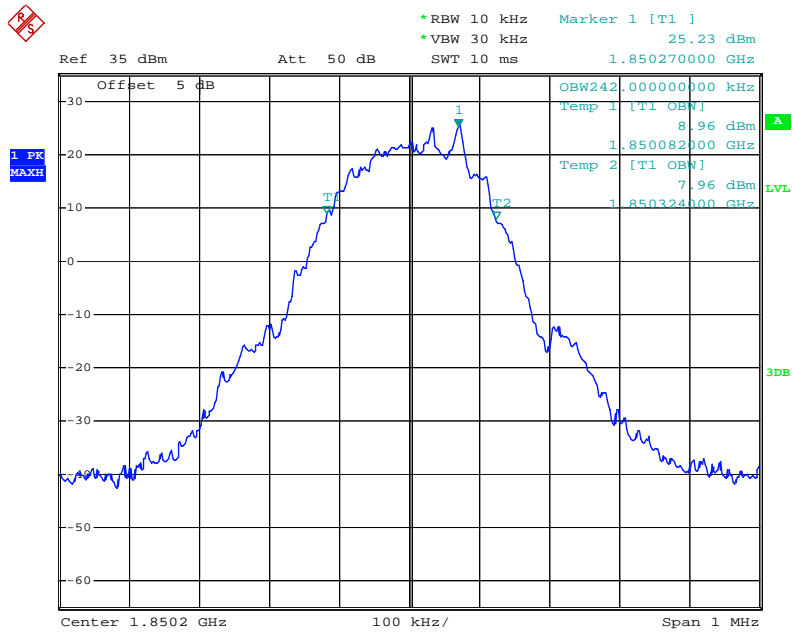
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PCS Band (Part 24E)

GSM Mode:

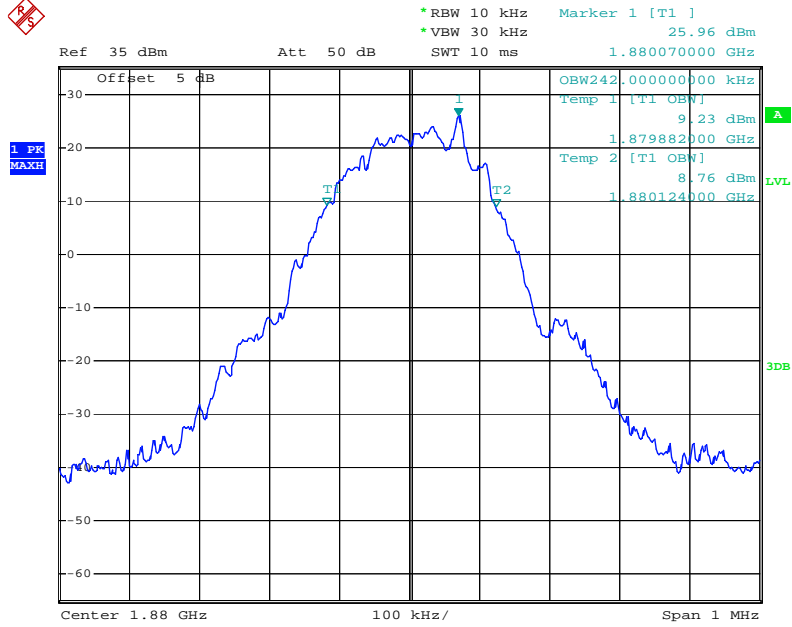
99% Occupied Bandwidth

Low Channel



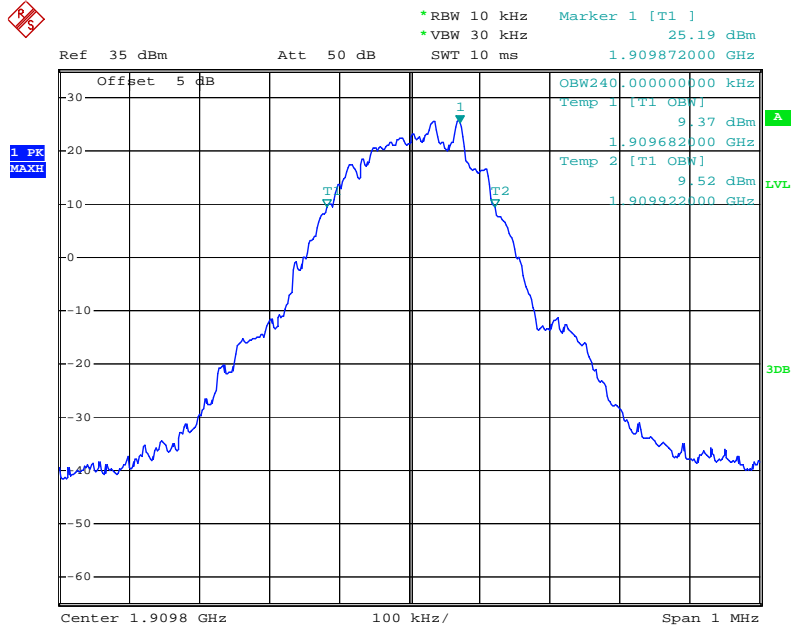
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Middle Channel



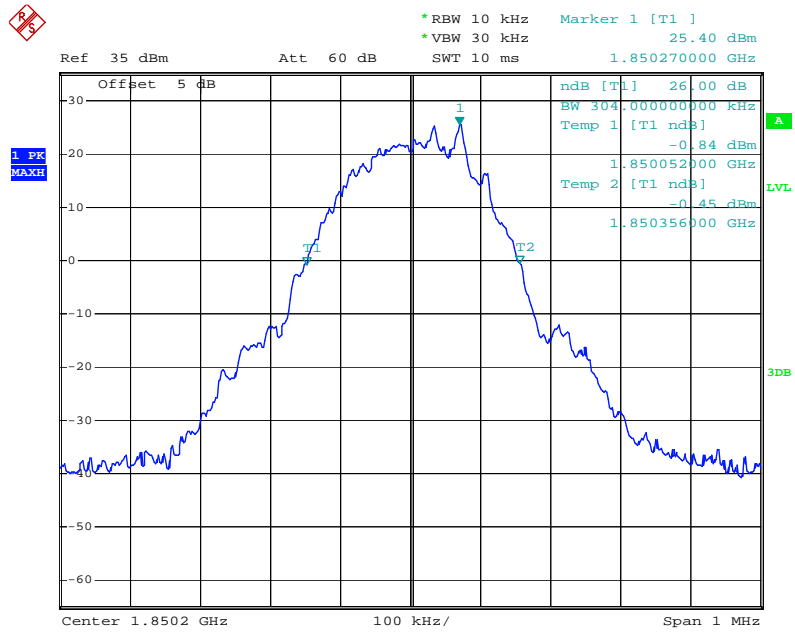
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High Channel



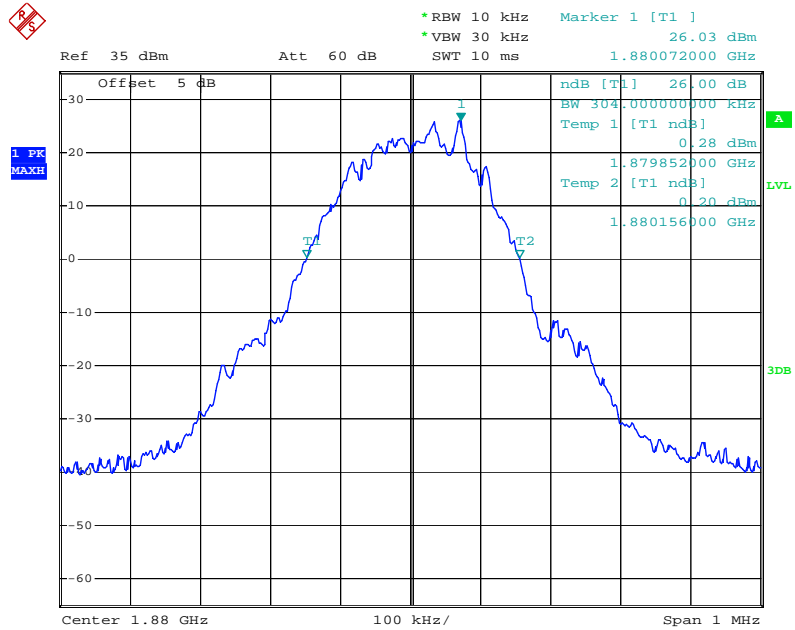
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26 dB Bandwidth Low Channel



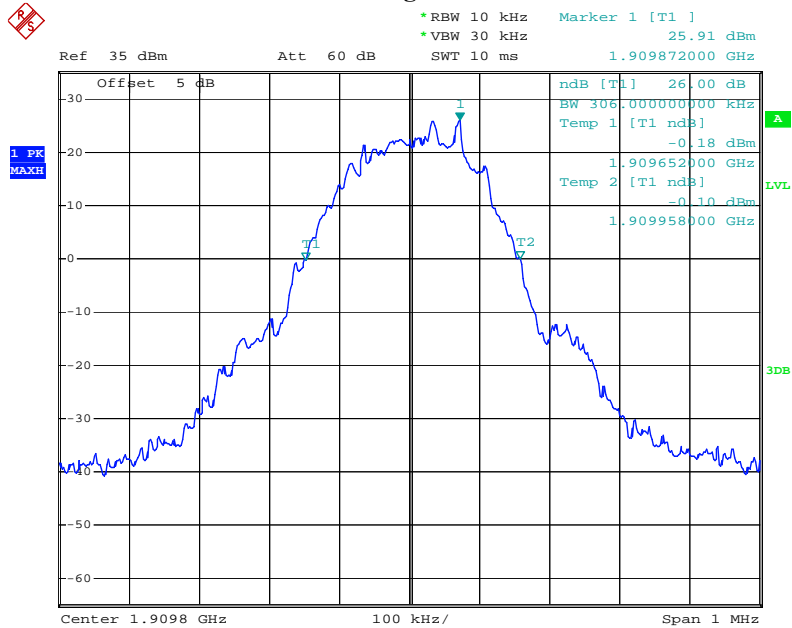
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Middle Channel



Date: 22.AUG.2012 23:34:23

High Channel

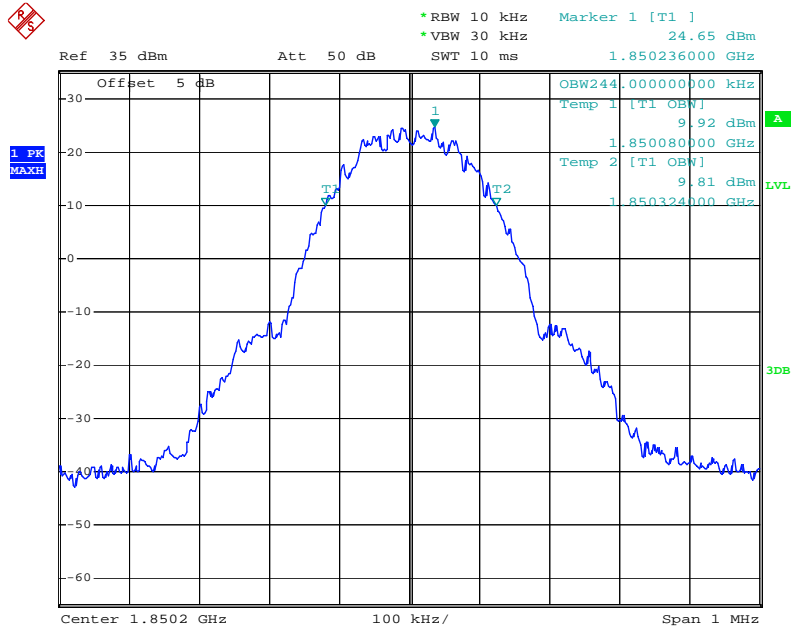


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GPRS Mode:

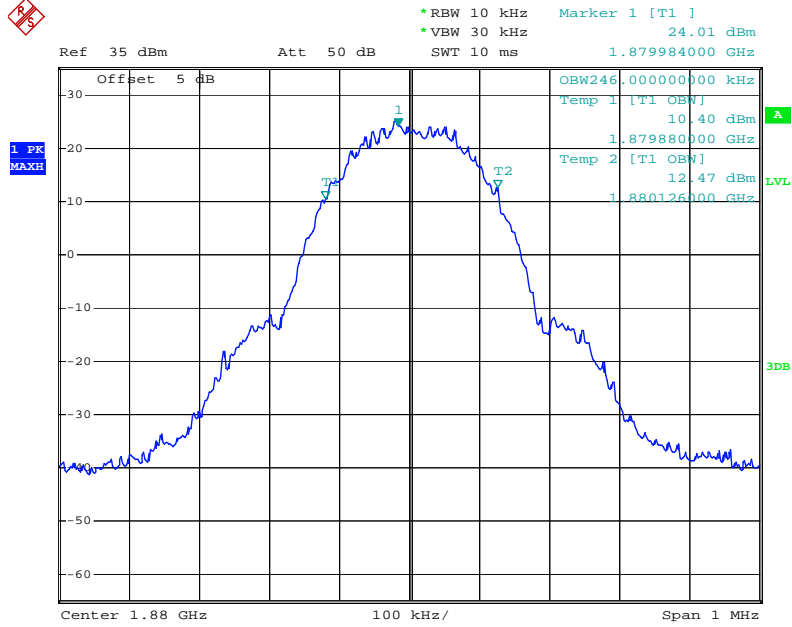
99% Occupied Bandwidth

Low Channel



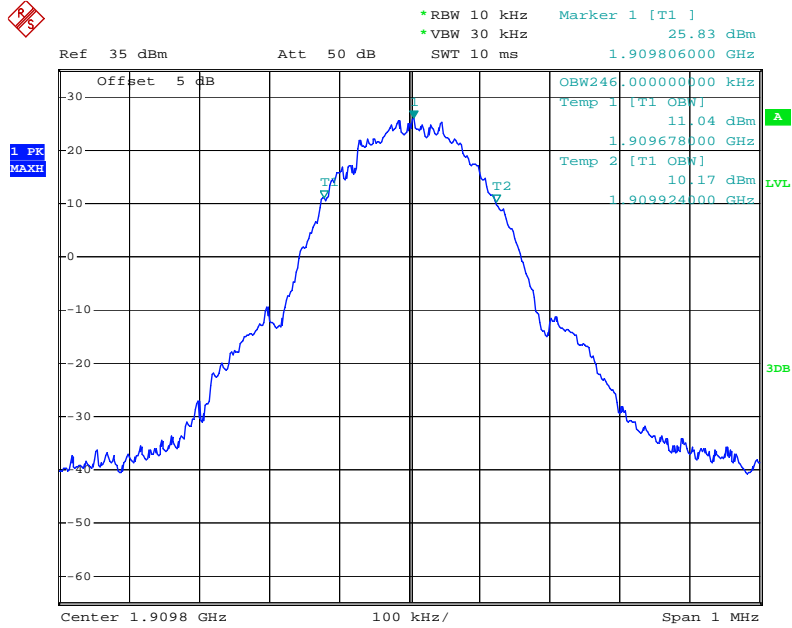
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Middle Channel



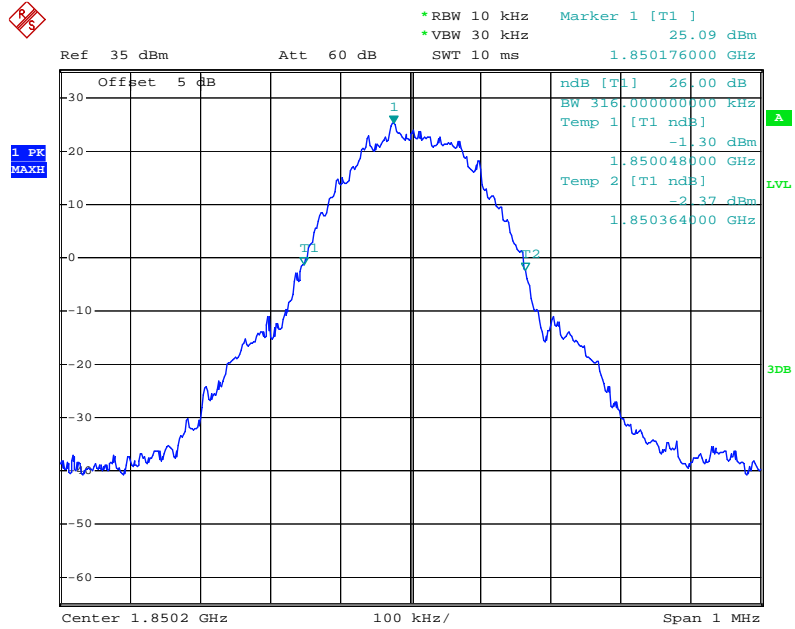
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High Channel



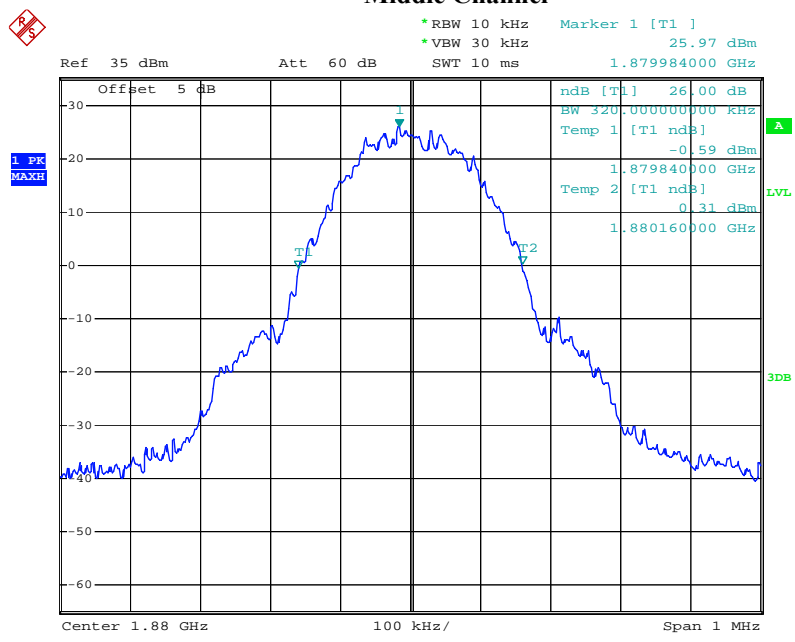
Date: 22.AUG.2012 23:26:23

26 dB Bandwidth Low Channel



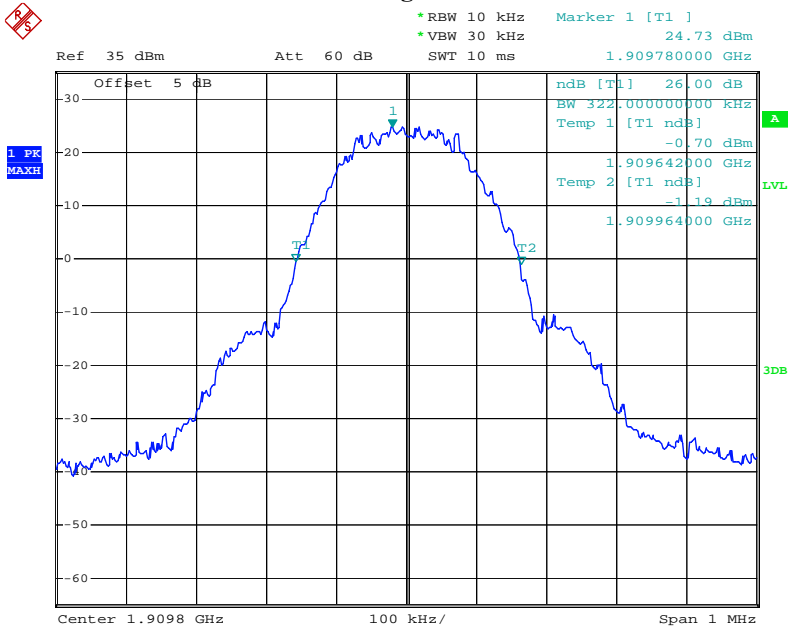
Date: 22.AUG.2012 23:30:46

Middle Channel



Date: 22.AUG.2012 23:28:17

High Channel

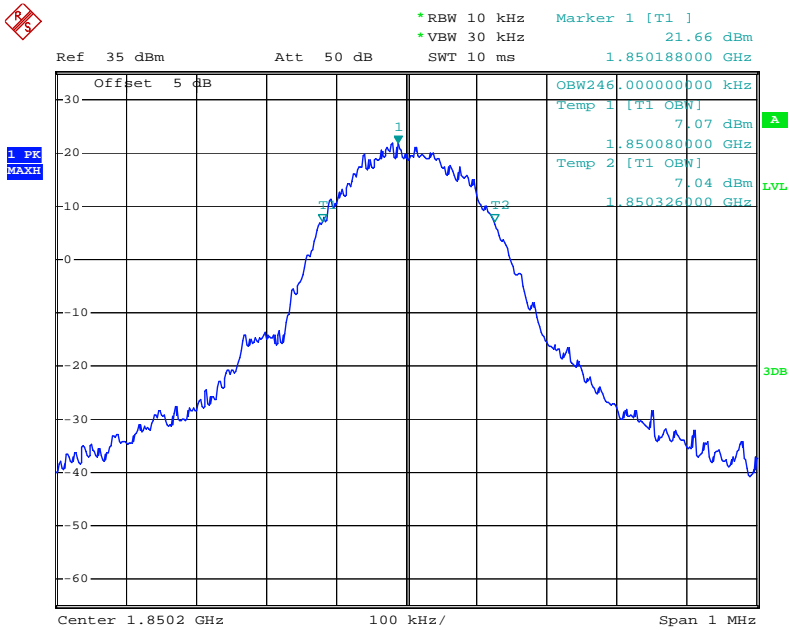


Date: 22.AUG.2012 23:27:16

EDGE Mode:

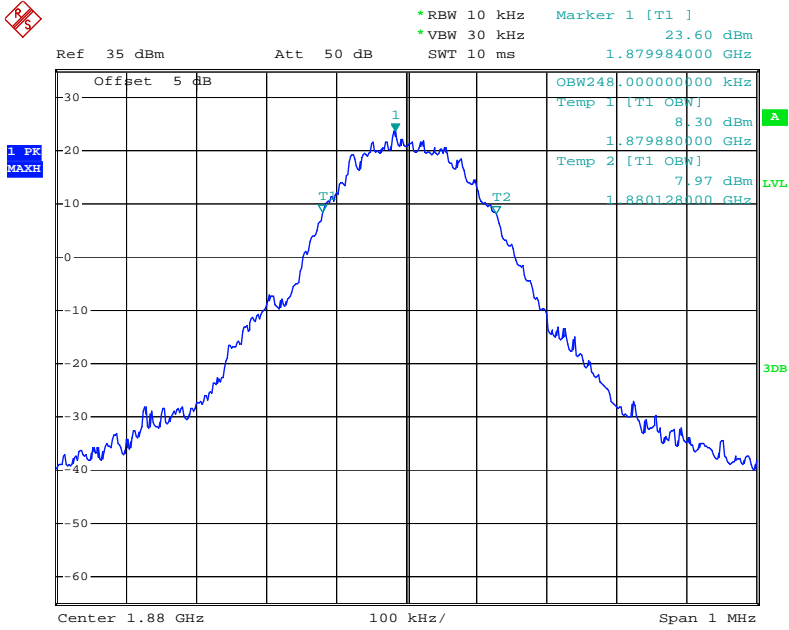
99% Occupied Bandwidth

Low Channel



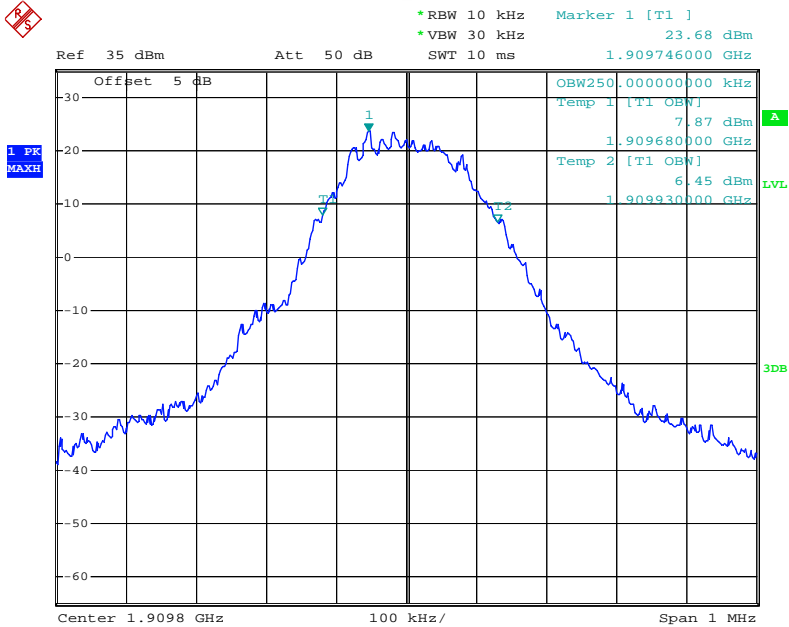
Date: 22.AUG.2012 23:19:14

Middle Channel



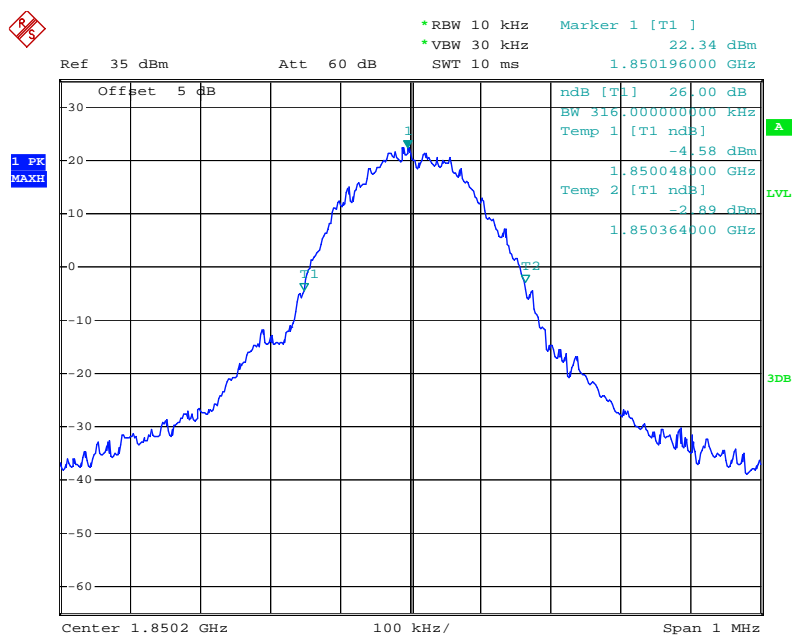
Date: 22.AUG.2012 23:20:10

High Channel



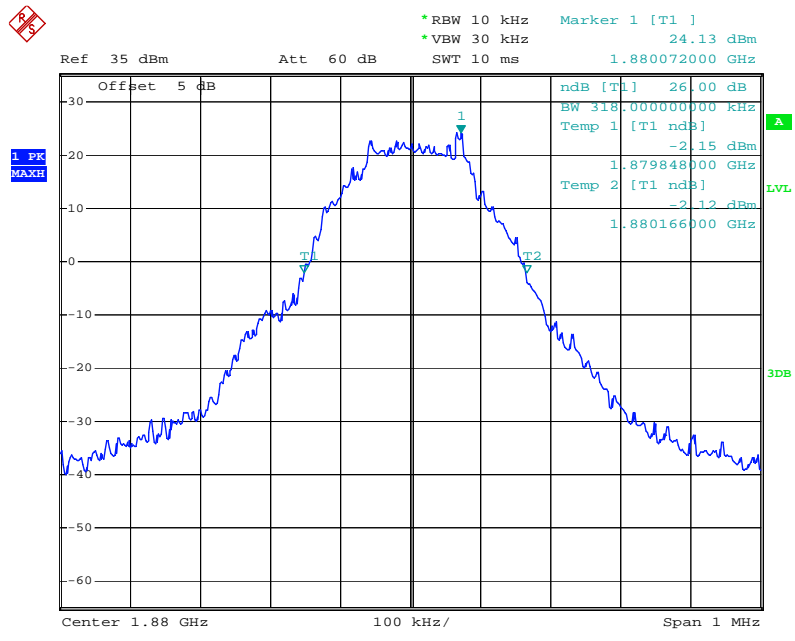
Date: 22.AUG.2012 23:25:01

26 dB Bandwidth Low Channel



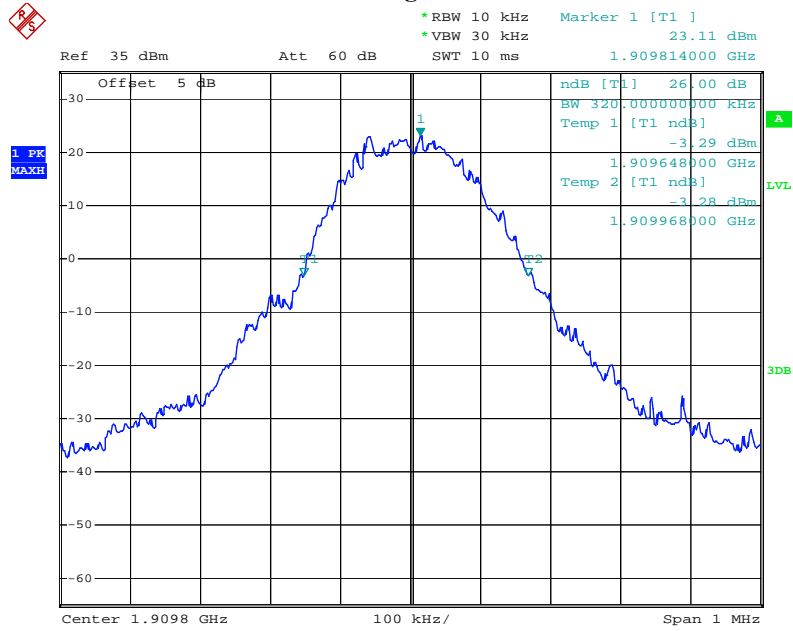
Date: 22.AUG.2012 23:18:02

Middle Channel



Date: 22.AUG.2012 23:21:46

High Channel



Date: 22.AUG.2012 23:22:54

5.5 §2.1051, §22.917(a) & §24.238(a) - Spurious Emissions at Antenna Terminals

1. Conducted Measurement
EUT was set for low, mid, high channel with modulated mode and highest RF output power. The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ± 1.5 dB.
3. Environmental Conditions

Temperature	23°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
4. Test date : August 21 , 2012
Tested By : Chris Bi

Standard Requirement:

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB.

Procedures:

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The Band Edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.

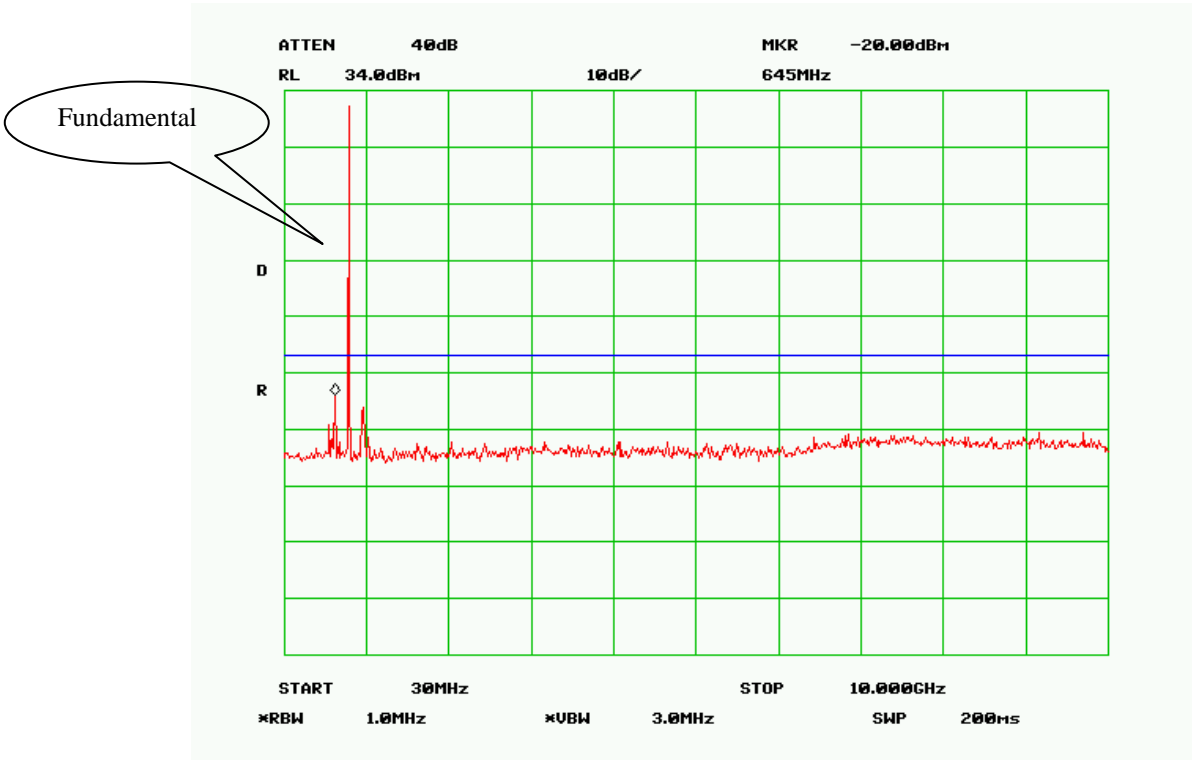
Test Result: Pass

Refer to the attached plots.

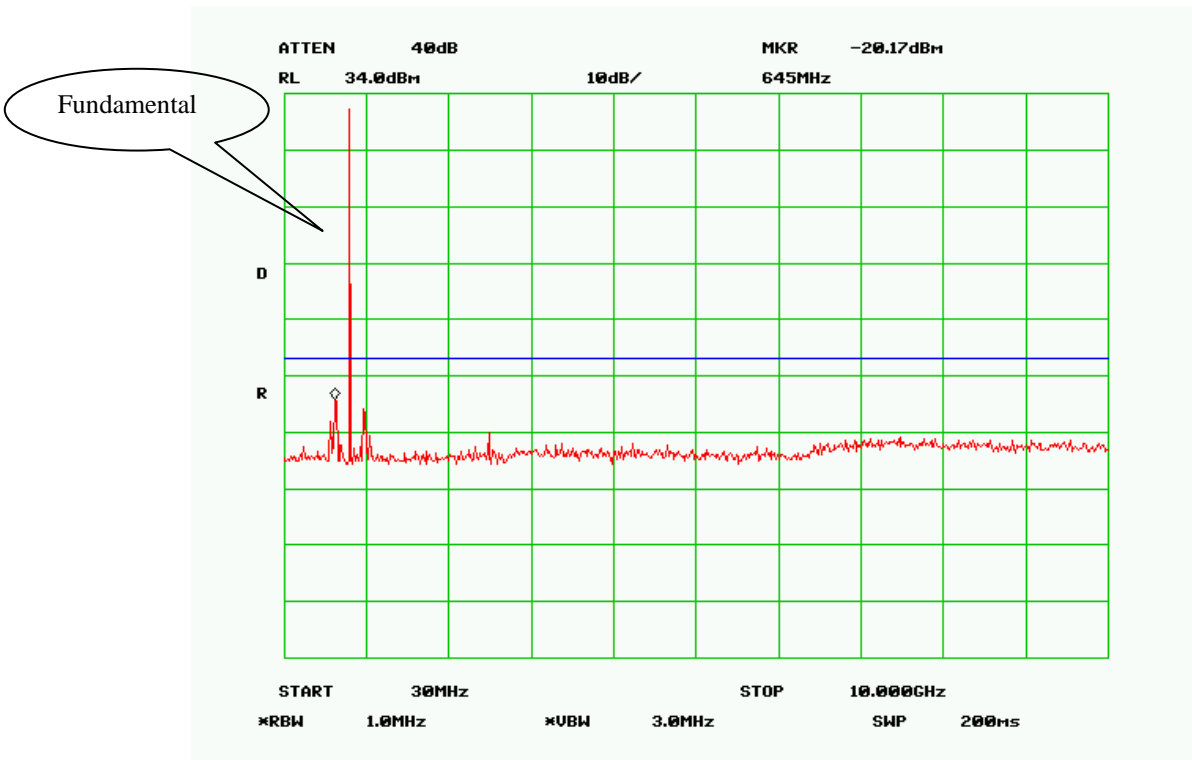
Cellular Band (Part 22H)

GSM850

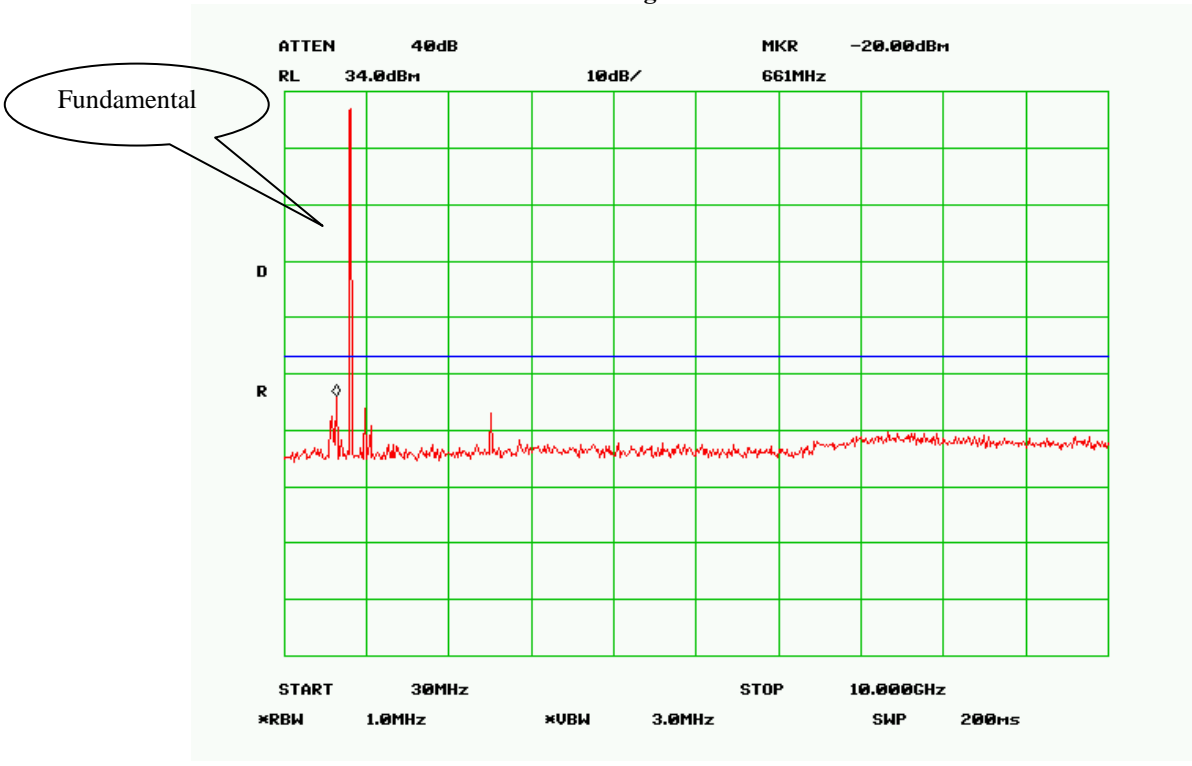
Low Channel



Middle Channel



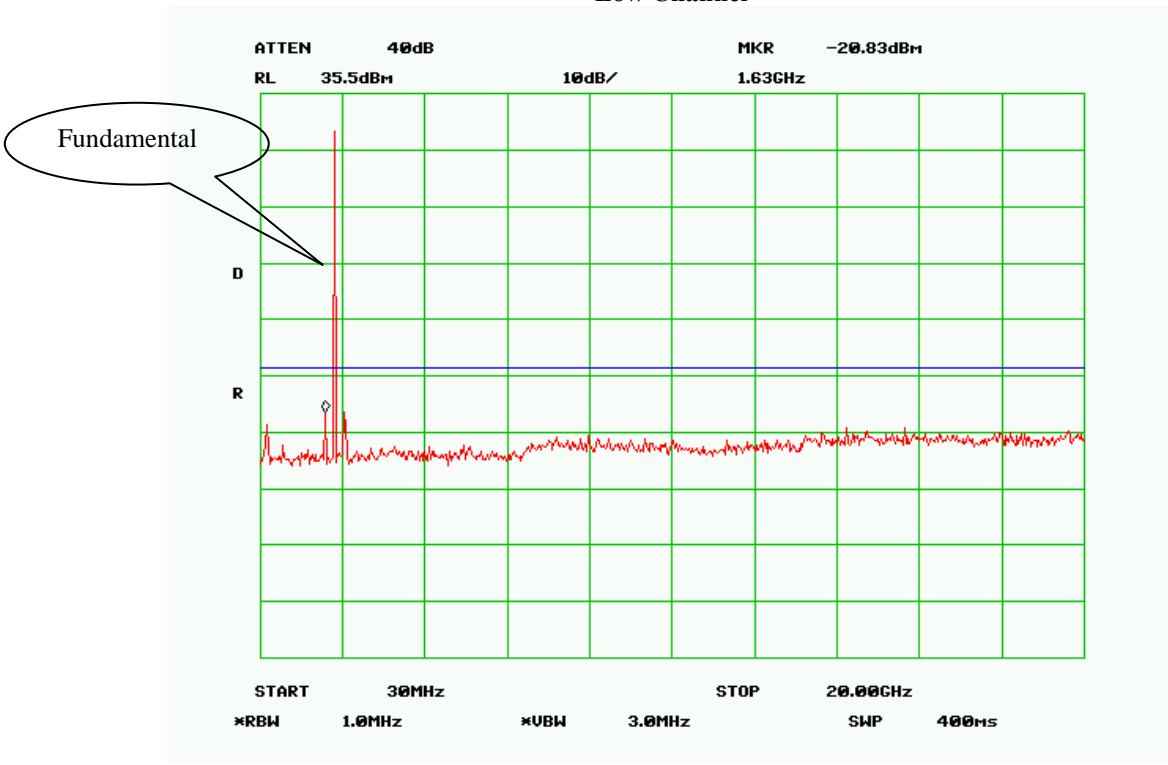
High Channel



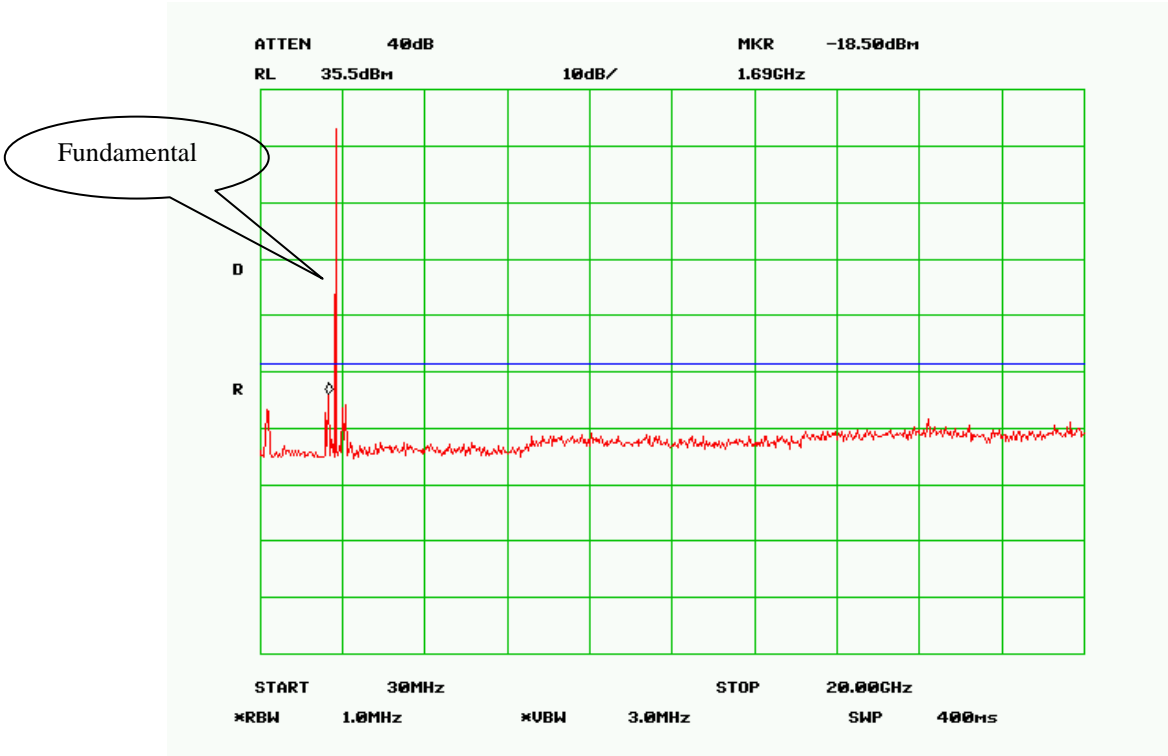
PCS Band (Part24E)

PCS1900

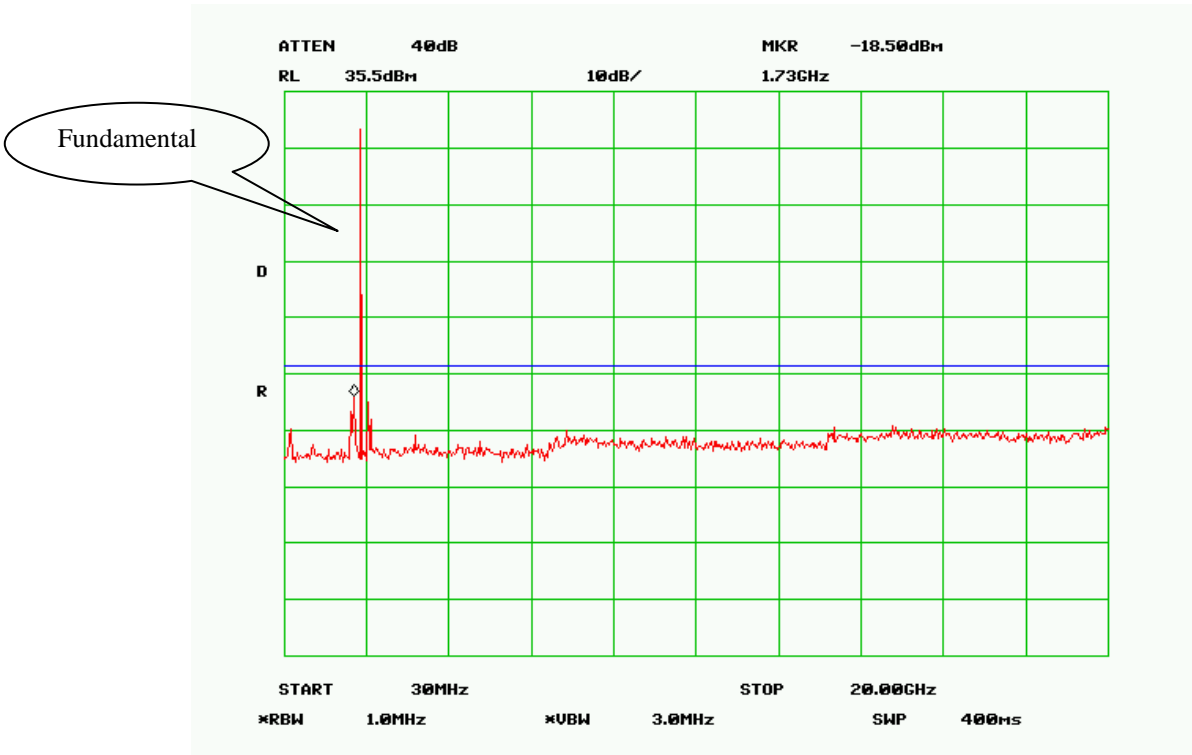
Low Channel



Middle Channel



High Channel



5.6 §2.1053, §22.917 & §24.238 - Spurious Radiated Emissions

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 1GHz – 40GH is ±6.0dB (for EUTs < 0.5m X 0.5m X 0.5m).
4. Environmental Conditions

Temperature	23°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
5. Test date : August 24 , 2012
Tested By : Chris Bi

Standard Requirement:

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

Procedures:

Equipment was setup in a semi-anechoic chamber. For measurements above 1 GHz an average measurement was taken with a 10Hz video bandwidth. The EUT was tested at low, mid and high with the highest output power. An emission was scan up to 10th harmonic of the operating frequency.

Sample Calculation:

EUT Field Strength = Raw Amplitude (dBμV/m) – Amplifier Gain (dB) + Antenna Factor (dB) + Cable Loss (dB) + Filter Attenuation (dB, if used)

Test Result: Pass

Cellular Band (Part 22H)

Low channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1648.4	-37.6	10	100	V	8.2	2.17	0	-31.57	-13	-18.57
1648.4	-38.2	180	100	H	8.2	2.17	0	-32.17	-13	-19.17
83.96	-39.88	231.9	200	V	1.4	0.67	0	-39.15	-13	-26.15
556.83	-41.03	156.8	200	H	6.3	1.5	0	-36.23	-13	-23.23

Middle channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1673.2	-38.16	90	100	V	8.2	2.17	0	-32.13	-13	-19.13
1673.2	-39.55	110	100	H	8.2	2.17	0	-33.52	-13	-20.52
729.61	-44.3	20	100	V	6.3	1.5	0	-39.5	-13	-26.5
71.95	-41.28	170	200	H	-1	0.5	0	-42.78	-13	-29.78

High channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1697.6	-38.24	150	100	V	8.2	2	0	-32.04	-13	-19.04
1697.6	-38.97	90	100	H	8.2	2	0	-32.77	-13	-19.77
556.83	-39.85	120	100	V	6.3	1.5	0	-35.05	-13	-22.05
83.96	-34.68	209.6	200	H	0.4	0.67	0	-34.95	-13	-21.95

PCS Band (Part 24E)

Low channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3700.4	-40.12	40	100	V	10	3.84	0	-33.96	-13	-20.96
3700.4	-41.69	70	100	H	10	3.84	0	-35.53	-13	-22.53
66.01	-37.55	59.6	100	V	-1.7	0.5	0	-39.75	-13	-26.75
364.77	-41.35	90	100	H	5.9	1.16	0	-36.61	-13	-23.61

Middle channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3760	-39.87	90	100	V	10	4.17	0	-34.04	-13	-21.04
3760	-40.79	100	100	H	10	4.17	0	-34.96	-13	-21.96
72.07	-38.19	270	200	V	-1	0.5	0	-39.69	-13	-26.69
90.02	-38.6	160	200	H	1.4	0.67	0	-37.87	-13	-24.87

High channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3819.6	-39.78	180	100	V	10	4	0	-33.78	-13	-20.78
3819.6	-40.33	90	100	H	10	4	0	-34.33	-13	-21.33
48.07	-38.65	100	100	V	-4.4	0.67	0	-43.72	-13	-30.72
403.21	-39.81	80	100	H	6	1.16	0	-34.97	-13	-21.97

5.7 §22.917(a) & §24.238(a) - Band Edge

1. Conducted Measurement
EUT was set for low, mid, high channel with modulated mode and highest RF output power.
The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ± 1.5 dB.
3. Environmental Conditions

Temperature	23°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
4. Test date : August 22 , 2012- August 23 , 2012
Tested By : Chris Bi

Standard Requirement:

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB.

Procedures:

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The Band Edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.

Test Result: Pass

Refer to the attached plots.

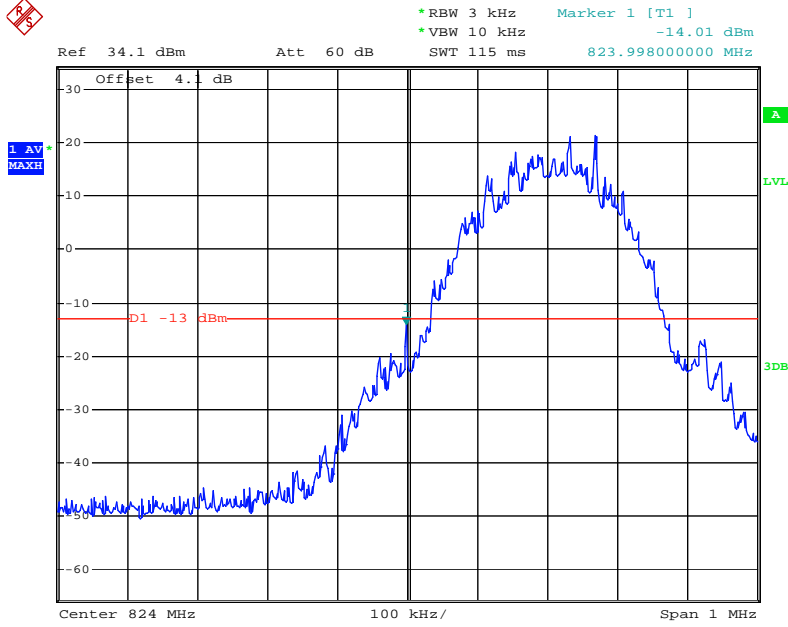
Cellular Band (Part 22H)

	Frequency (MHz)	Emission (dBm)	Limit (dBm)
GSM Mode	823.998	-14.01	-13
	849.024	-17.26	-13
GPRS Mode	823.99	-15.76	-13
	849.026	-13.76	-13
EDGE Mode	823.99	-18.02	-13
	849.024	-18.87	-13

PCS Band (Part 24E)

	Frequency (MHz)	Emission (dBm)	Limit (dBm)
GSM Mode	1849.998	-15.17	-13
	1910.020	-18.08	-13
GPRS Mode	1849.998	-17.32	-13
	1910.030	-18.37	-13
EDGE Mode	1849.998	-14.73	-13
	1910.012	-16.96	-13

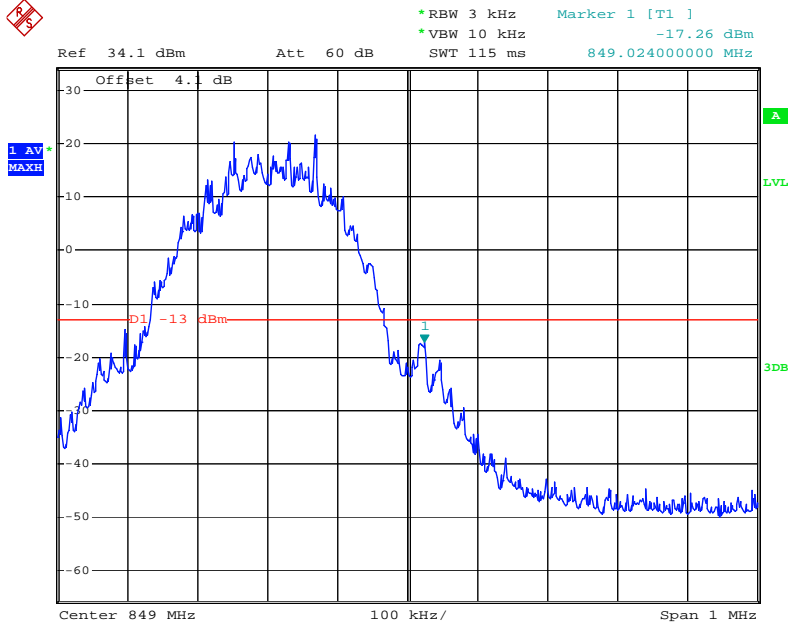
**GSM Mode:
 Cellular Band, Lowest Channel**



Date: 23.AUG.2012 00:12:14

Note: offset= cable loss + 10log (1%*26dB bandwidth/3kHz) =4.1dBm

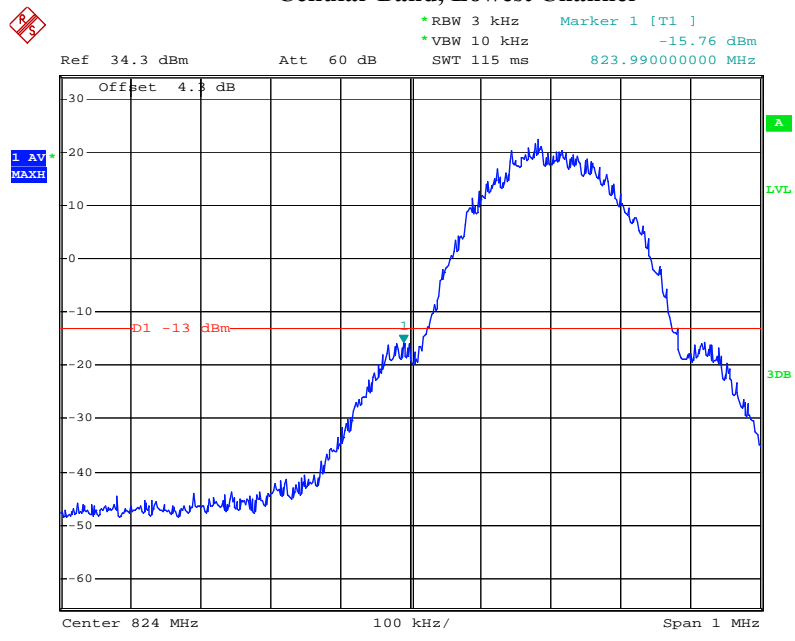
Cellular Band, Highest Channel



Date: 23.AUG.2012 00:13:24

Note: offset= cable loss + 10log (1%*26dB bandwidth/3kHz) =4.1 dBm

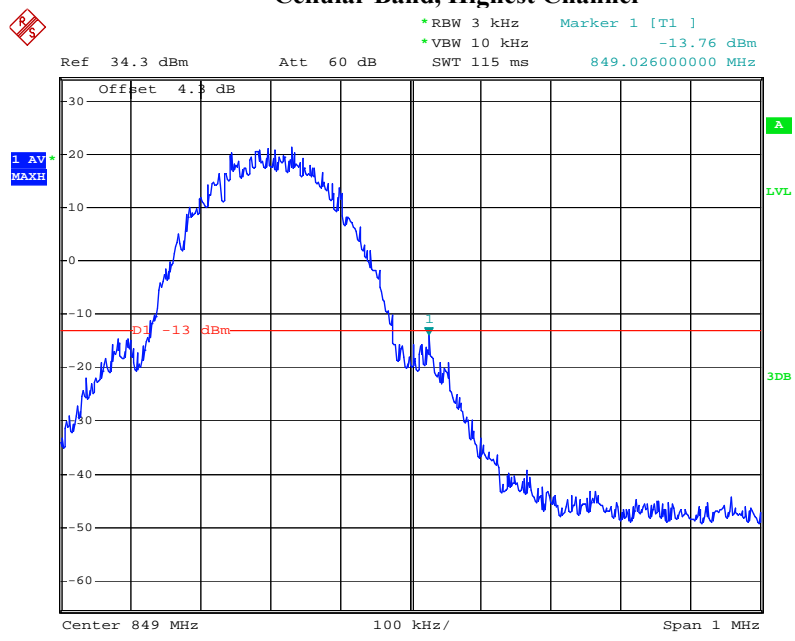
**GPRS Mode:
Cellular Band, Lowest Channel**



Date: 23.AUG.2012 00:08:09

Note: offset= cable loss + 10log (1%*26dB bandwidth/3kHz) =4.3dBm

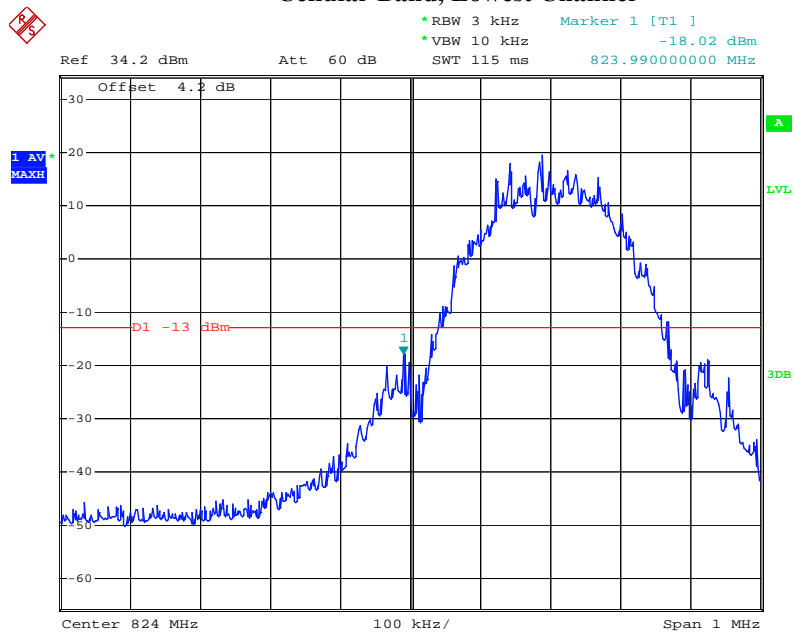
Cellular Band, Highest Channel



Date: 23.AUG.2012 00:09:24

Note: offset= cable loss + 10log (1%*26dB bandwidth/3kHz) =4.3 dBm

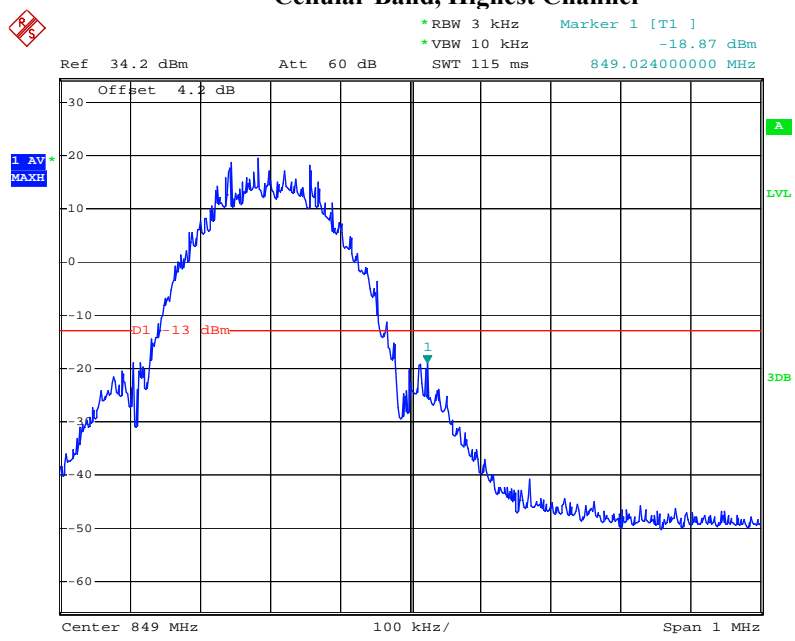
**EDGE Mode:
Cellular Band, Lowest Channel**



Date: 23.AUG.2012 00:17:45

Note: offset= cable loss + 10log (1%*26dB bandwidth/3kHz) =4.2dBm

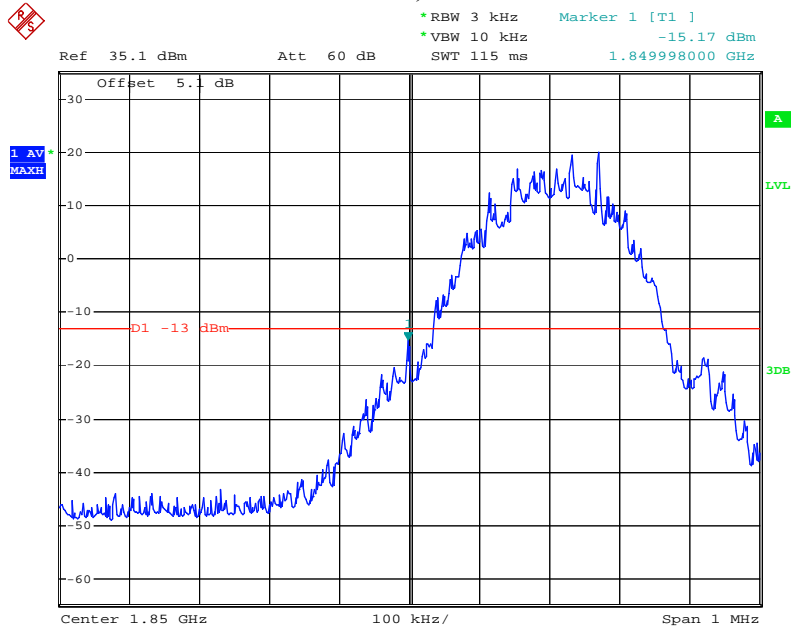
Cellular Band, Highest Channel



Date: 23.AUG.2012 00:04:56

Note: offset= cable loss + 10log (1%*26dB bandwidth/3kHz) =4.2 dBm

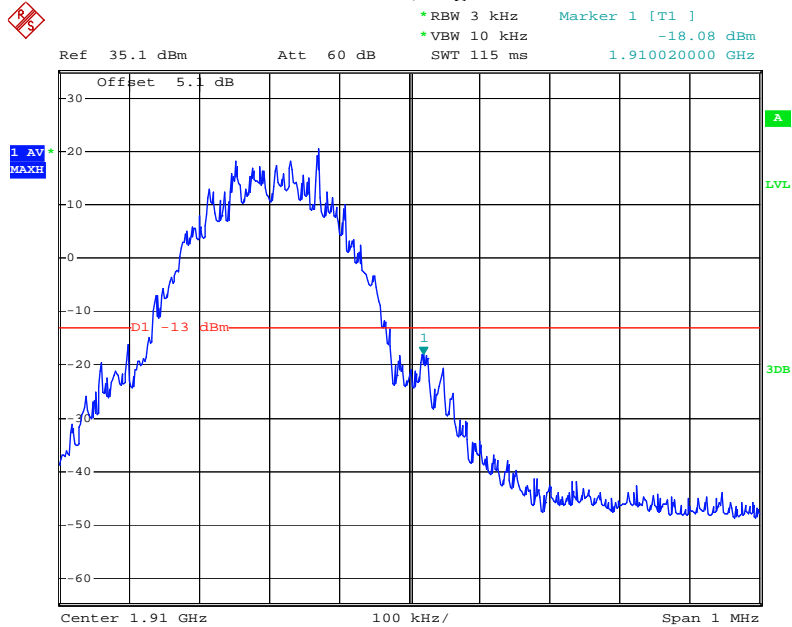
**GSM Mode:
PCS Band, Lowest Channel**



Date: 23.AUG.2012 00:37:54

Note: offset= cable loss + 10log (1%*26dB bandwidth/3kHz) =5.1dBm

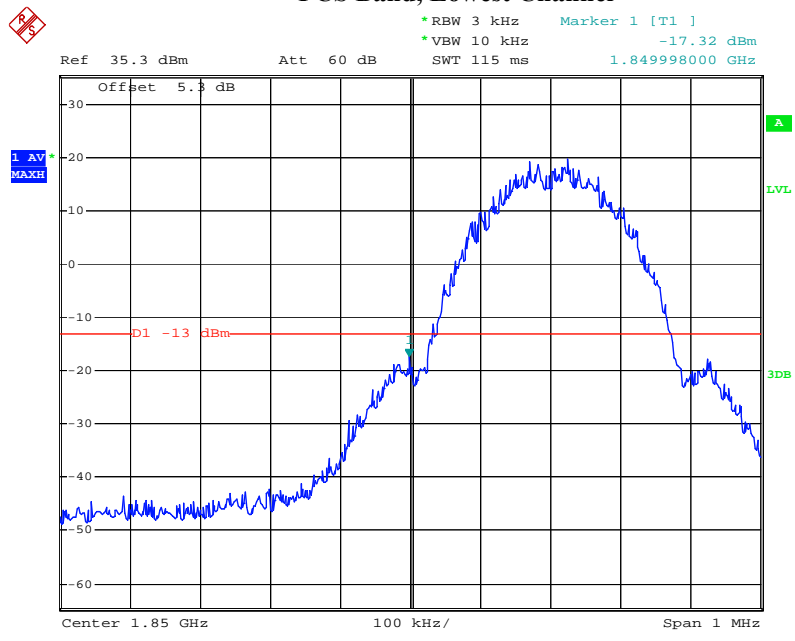
PCS Band, Highest Channel



Date: 23.AUG.2012 00:38:55

Note: offset= cable loss + 10log (1%*26dB bandwidth/3kHz) =5.1dBm

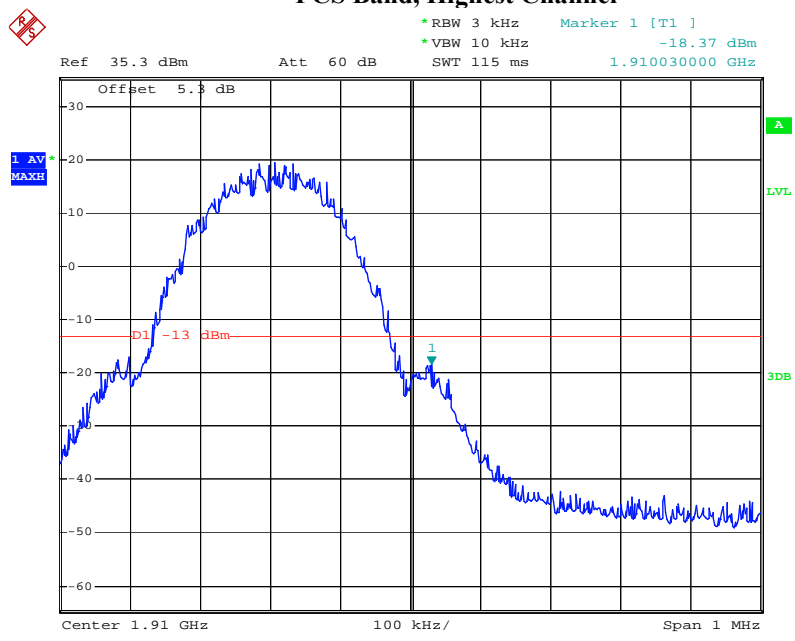
**GPRS Mode:
PCS Band, Lowest Channel**



Date: 23.AUG.2012 00:31:16

Note: offset= cable loss + 10log (1%*26dB bandwidth/3kHz) =5.3dBm

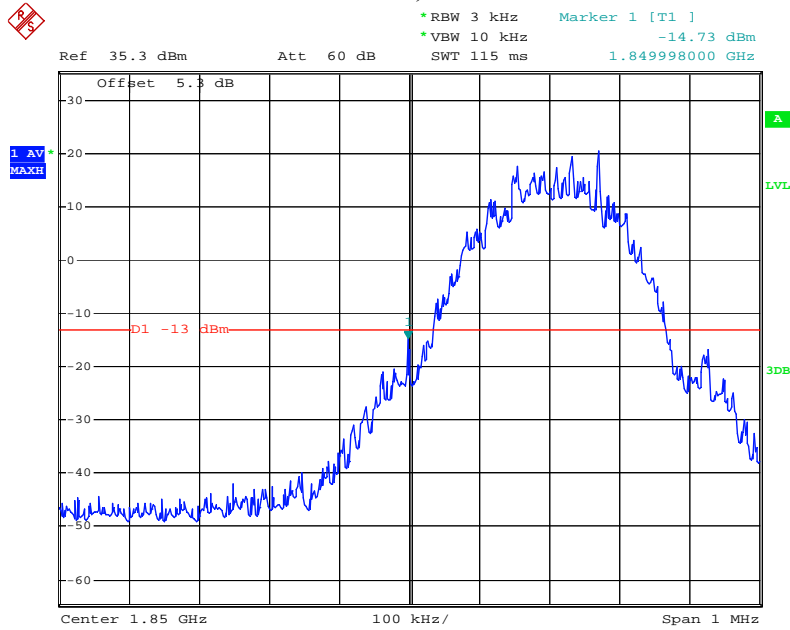
PCS Band, Highest Channel



Date: 23.AUG.2012 00:32:26

Note: offset= cable loss + 10log (1%*26dB bandwidth/3kHz) =5.3dBm

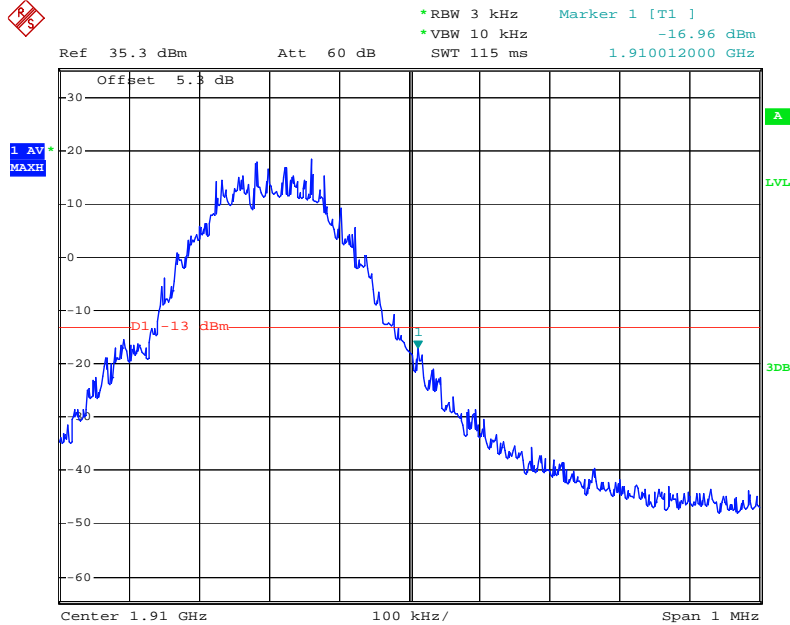
EDGE Mode: PCS Band, Lowest Channel



Date: 23.AUG.2012 00:37:05

Note: offset= cable loss + 10log (1%*26dB bandwidth/3kHz) =5.3dBm

PCS Band, Highest Channel



Date: 23.AUG.2012 00:34:33

Note: offset= cable loss + 10log (1%*26dB bandwidth/3kHz) =5.3dBm

5.8 §2.1055, §22.355 & §24.235 - Frequency Stability

- | | | | |
|----|--|----------------------|----------|
| 1. | Environmental Conditions | Temperature | 23°C |
| | | Relative Humidity | 50% |
| | | Atmospheric Pressure | 1019mbar |
| 2. | Test date : August 19 , 2012
Tested By : Chris Bi | | |

Standard Requirement:

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency Range (MHz)	Base, fixed (ppm)	Mobile ≤ 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929.	5.0	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized frequency block.

Procedures:

A communication link was established between EUT and base station. The frequency error was monitored and measured by base station under variation of ambient temperature and variation of primary supply voltage.

Limit: The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ ($\pm 2.5\text{ppm}$) of the centre frequency.

Test Results: Pass

Frequency Stability versus Temperature: The Frequency tolerance of the carrier signal shall be maintained within 2.5ppm of the operating frequency over a temperature variation of -10°C to +55°C at normal supply voltage.

Cellular Band (Part 22H)

Middle Channel, $f_0 = 836.6$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-20	3.8	20	0.0239	2.5
-10		18	0.0215	2.5
0		19	0.0227	2.5
10		16	0.0191	2.5
20		11	0.0131	2.5
30		13	0.0155	2.5
40		16	0.0191	2.5
50		14	0.0167	2.5
25	4.2	17	0.0203	2.5
	3.3	18	0.0215	2.5

PCS Band (Part 24E)

Middle Channel, $f_0 = 1880$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-20	3.8	19	0.0101	2.5
-10		17	0.0090	2.5
0		13	0.0069	2.5
10		15	0.0080	2.5
20		12	0.0064	2.5
30		11	0.0059	2.5
40		13	0.0069	2.5
50		15	0.0080	2.5
25	4.2	17	0.0090	2.5
	3.3	14	0.0074	2.5

Annex A. TEST INSTRUMENT & METHOD

Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES

Instrument	Model	Calibration Date	Calibration Due Date
RF Conducted Test			
Agilent ESA-E SERIES SPECTRUM ANALYZER	E4407B	10/25/2011	10/25/2012
Power Splitter	1#	02/02/2012	02/02/2013
Universal Radio Communication Tester	CMU200	03/01/2012	02/28/2013
Temperature/Humidity Chamber	1007H	01/08/2012	01/08/2013
DC Power Supply	PS-305D	02/22/2012	02/22/2013
R&S EMI Receiver	ESPI3	08/26/2011	08/25/2012
Radiated Emissions			
Hp Spectrum Analyzer	8563E	01/10/2012	01/10/2013
Agilent ESA-E SERIES SPECTRUM ANALYZER	E4407B	10/25/2011	10/25/2012
R&S EMI Receiver	ESPI3	08/26/2011	08/25/2012
Antenna (30MHz~2GHz)	JB1	10/04/2011	10/03/2012
ETS-Lindgren Antenna(1 ~18GHz)	3115	10/04/2011	10/03/2012
A-INFOMW Antenna(1 ~18GHz)	JXTXLB-10180	06/15/2012	06/15/2013
Horn Antenna (18~40GHz)	AH-840	07/23/2012	07/23/2013
Microwave Pre-Amp (18~40GHz)	PA-840	Every 2000 Hours	
Hp Agilent Pre-Amplifier	8447F	05/25/2012	05/25/2013
MITEQ Pre-Amplifier(1 ~ 18GHz)	AMF-7D-00101800-30-10P	05/25/2012	05/25/2013
Universal Radio Communication Tester	CMU200	03/01/2012	02/28/2013
Chamber	3m	04/13/2012	04/13/2013

Annex A. ii. RADIATED EMISSIONS TEST DESCRIPTION

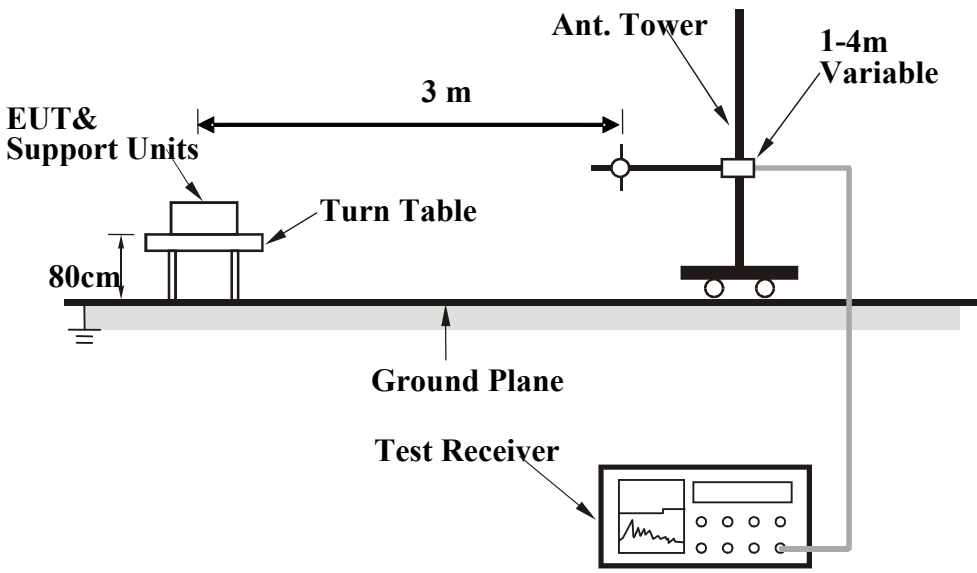
EUT Characterisation

EUT characterisation, over the frequency range from 30MHz to 1GHz (for FCC tests, until the 10th harmonic for operating frequencies $\geq 108\text{MHz}$), was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer/receiver with the appropriate broadband antenna placed 3m or 10m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable manually, changing the antenna polarisation and manipulating the EUT cables while observing the frequency profile on the spectrum analyzer / receiver. Frequency points at which maximum emissions occurred, clock frequencies and operating frequencies were then noted for the formal radiated emissions test at the Open Area Test Site (OATS) or EMC 3m chamber.

Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.



Test Method

The following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

Final Radiated Emission Measurement

1. Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site or EMC 10m chamber. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Peak	100 kHz	100 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

Description of Radiated Emission Program

This EMC Measurement software run LabView automation software and offers a common user interface for electromagnetic interference (EMI) measurements. This software is a modern and powerful tool for controlling and monitoring EMI test receivers and EMC test systems. It guarantees reliable collection, evaluation, and documentation of measurement results. Basically, this program will run a pre-scan measurement before it proceeds with the final measurement. The pre-scan routine will run the scan on four different antenna heights, 2 antenna polarity, and 360 degrees table rotation. For example, the program was set to run 30 MHz to 1 GHz scan; the program will first start from a meter antenna height and divide the 30 MHz to 1 GHz into 10 separate parts of maximum hold sweeps. Each parts of maximum hold sweep, the program will collect the data from 0 degree to 360 degrees table rotation. After the program complete the 1m scan, the antenna continues to rise to 2m and continue the scan. The step will repeated for all specified antenna height and polarity. This program will perform the Quasi Peak measurement after the signal maximization process and pre-scan routine. The final measurement will be base on the pre-scan data reduction result.

Sample Calculation Example

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

where

$$\text{Corr. Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain (if any)}$$

And the average value is

$$\text{Average} = \text{Peak Value} + \text{Duty Factor or}$$

$$\text{Set RBW} = 1\text{MHz, VBW} = 10\text{Hz.}$$

Note:

If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.

Annex B. EUT AND TEST SETUP PHOTOGRAPHS

Please see the attachment

Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

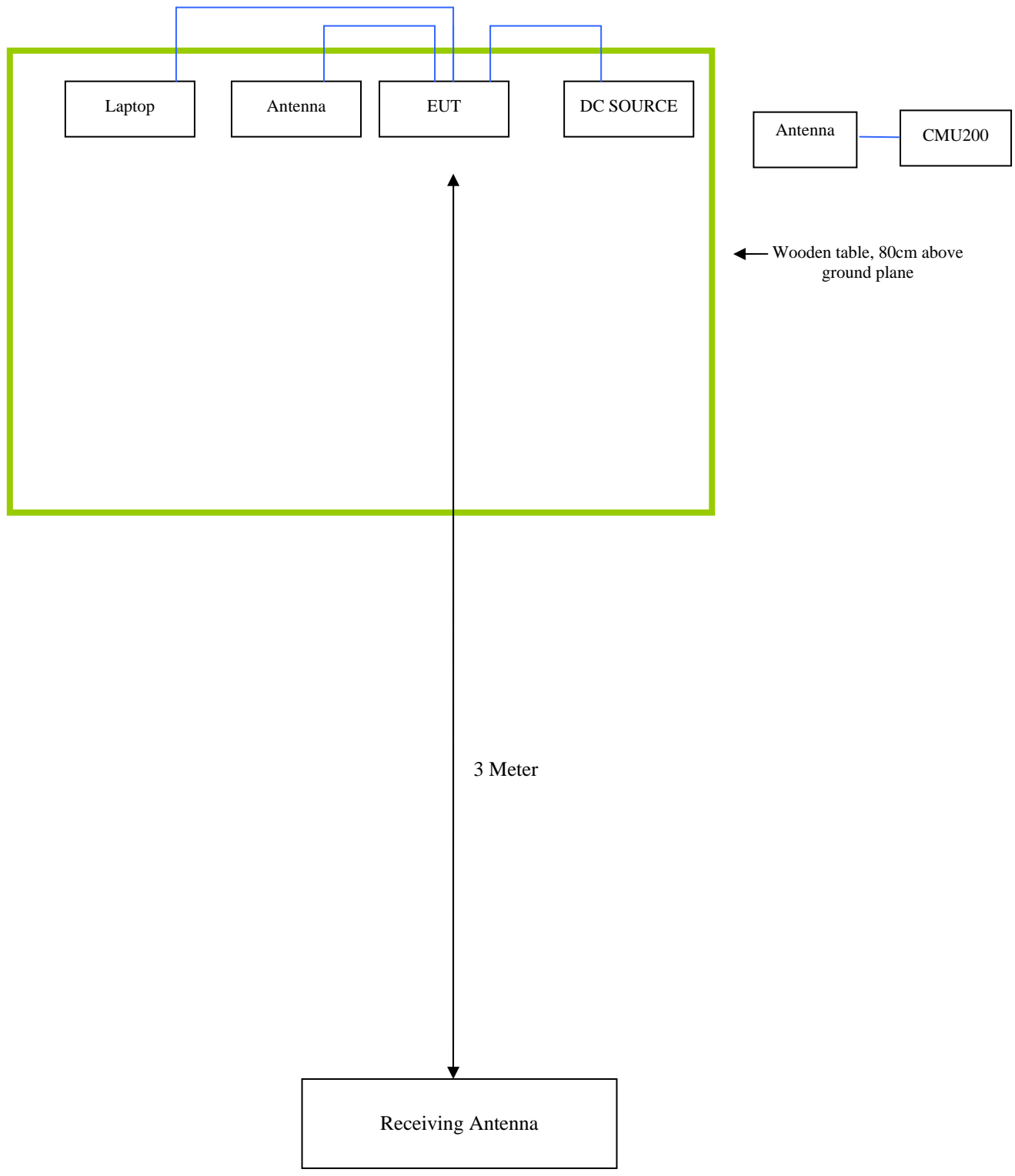
EUT TEST CONDITIONS

Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

Equipment Description (Including Brand Name)	Model & Serial Number	Cable Description (List Length, Type & Purpose)
Gateway Laptop	MS2288 & LXWHF02013951C3CA92200	N/A
DC source	1786B&N/A	N/A

Block Configuration Diagram for Radiated Emissions



Annex C.ii. EUT OPERATING CONDITIONS

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
Emissions Testing	The EUT was communicating with base station and set to work at maximum output power.
Others Testing	The EUT was communicating with base station and set to work at maximum output power.

Annex D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PART LIST

Please see attachment

Annex E. DECLARATION OF SIMILARITY

N/A