FCC/IC Test Report

Report No.: 68.950.15.199.01

FCC ID	**:**	**2AFVQ-TT1A**
IC ID	**:**	**20743-TT1A**
Application Purpose	:	**Original Equipment**
Product Designation	:	**GSM Wristphone**
Brand Name	:	**tinitell**
Model Name	:	**TT1**
Client Name	:	**Tinitell AB**
Date Of Issue	:	**October 15, 2015**
Standard(S)	:	**FCC Part 22H & 24E Rules** **IC RSS-Gen, RSS-132, RSS-133 Rules**
Report Version	:	**V1.0**

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	October 15, 2015	Valid	Original Report

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1.VERIFICATION OF COMPLIANCE

Applicant	Tinitell AB
Address	Hollandarsgatan 20, 11160 Stockholm, Sweden
Manufacturer	Tinitell AB
Address	Hollandarsgatan 20, 11160 Stockholm, Sweden
Factory	Shenzhen Galapad Technology Limited Bao'an Branch
Address	Hequn Community, Lingxia Road, the Fourth Industrial District of Phoenix, Fuyong Town, Bao'an District, Shenzhen
Product Designation	GSM Wristphone
Brand Name	tinitell
Test Model	TT1
Date of test	August 19, 2015 to October 15, 2015
Deviation	None
Condition of Test Sample	Normal

We hereby certify that:

The above equipment was tested by TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch. The data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C 63.4:2003 and TIA/EIA 603. The sample tested as described in this report is in compliance with the FCC Rules Part 22H, 24E, IC Rules RSS-132, RSS-133.
The test results of this report relate only to the tested sample identified in this report.

Reviewed by:

John Zhi
EMC Project Manager

Supervised by:

Simon Wang
EMC Project Engineer

2. GENERAL INFORMATION

2.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

Product Designation:	GSM Wristphone
Hardware version:	LM03_MBV20
Software version:	MAUI.11C.W14.18.SP4.V16.F4
Frequency Bands:	☒GSM 850 ☒PCS 1900 (U.S. Bands) ☒GSM 900 ☒DCS 1800 (Non-U.S. Bands) ☐UMTS FDD Band II ☐UMTS FDD Band V (U.S. Bands) ☐UMTS FDD Band I ☐UMTS FDD Band VIII (Non-U.S. Bands)
Antenna:	Intergra Antenna
Type of Modulation	GSM / GPRS : GMSK
Antenna gain(GSM):	-1dBi(GSM850), -1dBi (PCS1900)
Power Supply:	DC 3.7V by Battery
Battery parameter:	DC3.7V/400 mAh
Adapter Input:	N/A
Adapter Output:	N/A
Single/Dual Card:	GSM Card Slot
GPRS Class	12
Extreme Vol. Limits:	DC 3.3 V to 4.2 V (Normal: DC3.7 V)
Extreme Temp. Tolerance	-10℃ to +50℃
*** Note: The High Voltage DC4.2V and Low Voltage DC3.3V were declared by manufacturer, The EUT couldn't be operating normally with higher or lower voltage.	

***** Note:** The maximum power levels are GSM for MCS-4: GMSK link, only these modes were used for all tests. We found out the test mode with the highest power level after we analyze all the data rates. So we chose worst case as a representative.

GSM Card Slot:

	Maximum ERP/EIRP (dBm)	Max. Conducted Power (dBm)
GSM 850	31.85	32.85
GPRS850	31.83	32.83
PCS 1900	29.21	30.21
GPRS1900	29.20	30.20

2.2 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for ID: 2AFVQ-TT1A, IC: 20743-TT1A, filing to comply with the FCC Part 22H&24E, IC Rules RSS-132, RSS-133 requirements.

2.3 TEST METHODOLOGY

The radiated emission testing was performed according to the procedures of ANSI C 63.4: 2003; TIA/EIA 603 and FCC CFR 47 Rules of 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057 KDB 971168 D01 Power Meas License Digital Systems v02r01 and IC rules. RSS-132,RSS-133, RSS-GEN.

2.4 TEST FACILITY

CTTL, Telecommunication Technology Labs, Academy of Telecommunication Research, MIIT
No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191.
Tel:+86(0)10-62304633-2512, Fax:+86(0)10-62304633-2504
FCC register No.: 342690

2.5 MEASUREMENT INSTRUMENTS

NAME OF EQUIPMENT	TYPE	SERIAL NUMBER	MANUFACTURE	Calibration Due Date
Test Receiver	ESCI	100701	R&S	2016.08.10
BiLog Antenna	VULB9163	9163 329	Schwarzbeck	2017.01.20
Horn Antenna	3117	00066577	ETS-Lindgren	2016.04.01
Universal Radio Communication	CMU200	114544	R&S	2016.09.10
Universal Radio Communication Tester	CMW500	152499	R&S	2016.07.23
Spectrum Analyser	FSP40	100378	R&S	2015.12.19
Universal Radio Communication Tester	CMU200	114828	R&S	2016.01.03
Spectrum Analyzer	FSU	200679	R&S	2016.01.03
Temperature Chamber	SH-241	92007516	ESPECs	2016.01.08
DC Power Supply	U3606A	MY50450012	Agilent Technologies	2015.11.11
RF Switch Matrix	OSP130	100259	R&S	2016.01.03
Vector Signal Generator	SMU200A	104072	R&S	2016.01.03
MXG Analog Signal Generator	N5183A	MY50140012	Agilent Technologies	2016.01.03

2.6 SPECIAL ACCESSORIES

The USB Cable supplied by the applicant were used as accessories and being tested with EUT intended for FCC grant together.

2.7 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

3. SYSTEM TEST CONFIGURATION

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The Transmitter was operated in the maximum output power mode through Communication Tester. The TX frequency was fixed which was for the purpose of the measurements.

3.3 GENERAL TECHNICAL REQUIREMENTS

Item Number	Item Description		FCC Rules	IC Rules
1	Output Power	Conducted output power	2.1046/22.913(a) (2) / 24.232 (c)	RSS-132 Clause4.4 RSS-133 Clause6.4
		Radiated output power		
2	Peak-to-Average Ratio	Peak-to-Average Ratio	24.232(d)	RSS-132 Clause5.4 RSS-133 Clause6.4
3	Spurious Emission	Conducted spurious emission	2.1051 / 22.917 / 24.238	RSS-132 Clause4.5 RSS-133 Clause6.5
		Radiated spurious emission		
4	Mains Conducted Emission		15.107 / 15.207	RSS-132 Clause4.5 RSS-133 Clause6.5
5	Frequency Stability		2.1055/22.355 /24.235	RSS-132 Clause4.3 RSS-133 Clause6.3
6	Occupied Bandwidth		2.1049 (h)(i)	RSS-132 Clause4.1/4.6.1 RSS-133 Clause4.1/4.6.1
7	Emission Bandwidth		22.917(a)/24.238(a)	RSS-132 Clause4.6.1 RSS-133 Clause4.6.1
8	Band Edge		22.917(a)/24.238(a)	RSS-132 Clause4.5 RSS-133 Clause6.5

3.4 CONFIGURATION OF EUT SYSTEM

Fig. 2-1 Configuration of EUT System

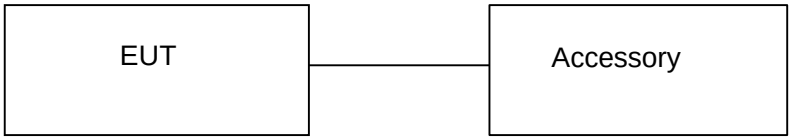


Table 2-1 Equipment Used in EUT System

4. SUMMARY OF TEST RESULTS

Item Number	Item Description		FCC Rules	Result
1	Output Power	Conducted Output Power	2.1046/22.913(a) (2) / 24.232 (c)	Pass
		Radiated Output Power		
2	Peak-to-Average Ratio	Peak-to-Average Ratio	24.232(d)	Pass
3	Spurious Emission	Conducted Spurious Emission	2.1051 / 22.917 / 24.238	Pass
		Radiated Spurious Emission		
4	Mains Conducted Emission		15.107 / 15.207	Pass
5	Frequency Stability		2.1055/22.355/24.235	Pass
6	Occupied Bandwidth		2.1049 (h)(i)	Pass
7	Emission Bandwidth		22.917(a)/24.238(a)	Pass
8	Band Edge		22.917(a)/24.238(a)	Pass

5. DESCRIPTION OF TEST MODES

During the testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication Tester (CMU 200) to ensure max power transmission and proper modulation. Three channels (The top channel, the middle channel and the bottom channel) were chosen for testing on both GSM and PCS frequency band.

***Note:** GSM/GPRS 850, GSM/GPRS 1900, WCDMA/HSPA band V, mode have been tested during the test.

The worst condition was recorded in the test report if no other modes test data.

6. OUTPUT POWER

6.1 Conducted Output Power

6.1.1 MEASUREMENT METHOD

The transmitter output port was connected to base station.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

Measure the maximum burst average power and average power for other modulation signal.

The EUT was setup for the max output power with pseudo random data modulation. Power was measured with Spectrum Analyzer. The measurements were performed on all modes (GSM/GPRS850, GSM/GPRS1900, WCDMA/HSPA band V) at 3 typical channels (the Top Channel, the Middle Channel and the Bottom Channel) for each band.

6.1.2 MEASUREMENT RESULT

Conducted Output Power Limits for GSM85 band		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
GSM	33 dBm (2W)	- 2
Conducted Output Power Limits for PCS1900 band		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
GSM	30 dBm (1W)	- 2

GSM 850:

Mode	Frequency (MHz)	Reference Power	Peak Power	Tolerance	Avg.Burst Power	Duty cycle Factor(dB)	Frame Power(dBm)
GSM850	824.2	33	32.85	-0.91	31.94	-9	22.94
	836.6	33	32.83	-0.75	**32.08**	-9	23.08
	848.8	33	32.81	-0.87	31.94	-9	22.94
GPRS850 (1 Slot)	824.2	33	32.74	-0.96	31.78	-9	22.78
	836.6	33	32.69	-0.89	31.80	-9	22.80
	848.8	33	32.63	-0.97	31.66	-9	22.66
GPRS850 (2 Slot)	824.2	30	31.93	-0.56	31.37	-6	25.37
	836.6	30	31.95	-0.78	31.17	-6	25.17
	848.8	30	31.93	-0.54	31.39	-6	25.39
GPRS850 (3 Slot)	824.2	28.23	30.19	-0.89	29.30	-4.26	25.04
	836.6	28.23	30.26	-0.80	29.46	-4.26	25.20
	848.8	28.23	30.32	-0.91	29.41	-4.26	25.15
GPRS850 (4 Slot)	824.2	27	29.41	-0.65	28.76	-3	25.76
	836.6	27	29.49	-0.52	28.97	-3	25.97
	848.8	27	29.55	-0.79	28.76	-3	25.76

PCS 1900:

Mode	Frequency (MHz)	Reference Power	Peak Power	Tolerance	Avg.Burst Power	Duty cycle Factor(dB)	Frame Power(dBm)
GSM1900	1850.2	30	30.19	-0.92	29.27	-9	20.27
	1880	30	30.20	-0.84	29.36	-9	20.36
	1909.8	30	30.21	-0.81	29.40	-9	20.40
GPRS1900 (1 Slot)	1850.2	30	29.51	-0.84	28.67	-9	19.67
	1880	30	29.51	-0.93	28.58	-9	19.58
	1909.8	30	29.53	-0.86	28.67	-9	19.67
GPRS1900 (2 Slot)	1850.2	27	29.06	-0.67	28.39	-6	22.39
	1880	27	29.01	-0.73	28.28	-6	22.28
	1909.8	27	28.92	-0.65	28.27	-6	22.27
GPRS1900 (3 Slot)	1850.2	25.23	27.63	-0.81	26.82	-4.26	22.56
	1880	25.23	27.80	-0.70	27.10	-4.26	22.84
	1909.8	25.23	27.45	-0.79	26.66	-4.26	22.40
GPRS1900 (4 Slot)	1850.2	24	26.83	-0.57	26.26	-3	23.26
	1880	24	26.92	-0.74	26.18	-3	23.18
	1909.8	24	26.67	-0.68	25.99	-3	22.99

According to 3GPP 25.101 sub-clause 6.2.2 , the maximum output power is allowed to be reduced by following the table.

Table 6.1aA: UE maximum output power with HS-DPCCH and E-DCH

UE Transmit Channel Configuration	CM(db)	MPR(db)
For all combinations of ,DPDCH,DPCCH HS-DPDCH,E-DPDCH and E-DPCCH	0≤ CM≤3.5	MAX(CM-1,0)
Note: CM=1 for β_c/β_d=12/15, β_{hs}/β_c=24/15.For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.		

The device supports MPR to solve linearity issues (ACLR or SEM) due to the higher peak-to average ratios (PAR) of the HSUPA signal. This prevents saturating the full range of the TX DAC inside of device and provides a reduced power output to the RF transceiver chip according to the Cubic Metric (a function of the combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH).

When E-DPDCH channels are present the beta gains on those channels are reduced firsts to try to get the power under the allowed limit. If the beta gains are lowered as far as possible, then a hard limiting is applied at the maximum allowed level.

The SW currently recalculates the cubic metric every time the beta gains on the E-DPDCH are reduced. The cubic metric will likely get lower each time this is done .However, there is no reported reduction of maximum output power in the HSUPA mode since the device also provides a compensate for the power back-off by increasing the gain of TX_AGC in the transceiver (PA) device.

The end effect is that the DUT output power is identical to the case where there is no MPR in the device.

6.2 RADIATED OUTPUT POWER

6.2.1 MEASUREMENT METHOD

The measurements procedures specified in TIA-603C-2004 were applied.

1 In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference centre of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.

2 The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established as ARpl=Pin + 2.15 - Pr. The ARpl is the attenuation of “reference path loss”, and including the gain of receive antenna, the cable loss and the air loss. The measurement results are obtained as described below: Power=PMea+ARpl

3 The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern.

4 From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.

5 The EUT is then put into continuously transmitting mode at its maximum power level.

6 Power mode measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in Rule 24.232 (b) and (c). The "reference path loss" from Step1 is added to this result.

7 This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power (Pin).

8 ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi..

6.2.2 PROVISIONS APPLICABLE

This is the test for the maximum radiated power from the EUT. Rule Part 24.232(b) specifies, “Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power” and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.” Rule Part 22.913(a) specifies “Maximum ERP. The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.”

Mode	Nominal Peak Power
GSM 850	<=38.45 dBm (7W)
PCS 1900	<=33 dBm (2W)

6.2.3 MEASUREMENT RESULT

Radiated Power (ERP) for GSM 850				
Mode	Frequency	Result		Conclusion
		Max. Peak ERP (dBm)	Polarization Of Max. ERP	
GSM850	824.2	31.94	Horizontal	Pass
	836.6	**32.08**	Horizontal	Pass
	848.8	31.94	Horizontal	Pass

Radiated Power (E.I.R.P) for PCS 1900				
Mode	Frequency	Result		Conclusion
		Max. Peak E.I.R.P.(dBm)	Polarization Of Max. E.I.R.P.	
GSM 1900	1850.2	29.27	Horizontal	Pass
	1880.0	29.36	Horizontal	Pass
	1909.8	**29.40**	Horizontal	Pass

Note: Above is worst mode data.

6.3. Peak-to-Average Ratio

6.3.1 MEASUREMENT METHOD

Use one of the procedures presented in 4.1 to measure the total peak power and record as PPk. Use one of the applicable procedures presented 4.2 to measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

PAPR (dB) = PPk (dBm) - PAvg (dBm).

6.3.2 PROVISIONS APPLICABLE

This is the test for the Peak-to-Average Ratio from the EUT.

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

6.3.3 MEASUREMENT RESULT

Modes	**GSM850(GSM)**		
Channel	**128**	**190**	**251**
	(Low)	**(Mid)**	**(High)**
Frequency (MHz)	**824.2**	**836.6**	**848.8**
Peak-To-Average Ratio (dB)/GSM	0.91	0.75	0.87

Modes	**PCS 1900 (GSM)**		
Channel	**512**	**661**	**810**
	(Low)	**(Mid)**	**(High)**
Frequency (MHz)	**1850.2**	**1880**	**1909.8**
Peak-To-Average Ratio (dB)/GSM	0.92	0.84	0.81

7. SPURIOUS EMISSION

7.1 CONDUCTED SPURIOUS EMISSION

7.1.1 MEASUREMENT METHOD

The following steps outline the procedure used to measure the conducted emissions from the EUT.
1, Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For GSM 850, data taken from 30 MHz to 9 GHz.
2, Determine EUT transmit frequencies: the following typical channels were chosen to conducted emissions testing.

Typical Channels for testing of GSM 850	
Channel	Frequency (MHz)
128	824.2
190	836.6
251	848.8

Typical Channels for testing of PCS 1900	
Channel	Frequency (MHz)
512	1850.2
661	1880.0
810	1909.8

7.1.2 PROVISIONS APPLICABLE

On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

7.1.3 MEASUREMENT RESULT

PLEASE REFER TO: APPENDIX I TEST PLOTS FOR CONDUCTED SPURIOUS EMISSION

Note: 1. Below 30MHZ no Spurious found and The GSM modes is the worst condition.

2. As no emission found in standby or receive mode, no recording in this report.

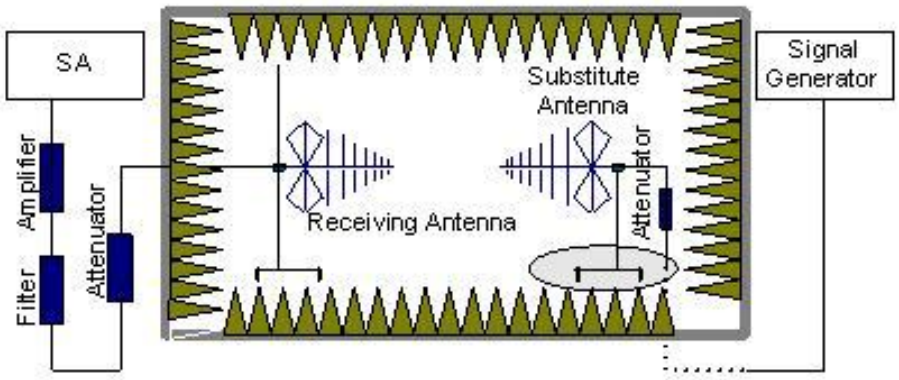
7.2 Radiated Spurious Emission

7.2.1 MEASUREMENT METHOD

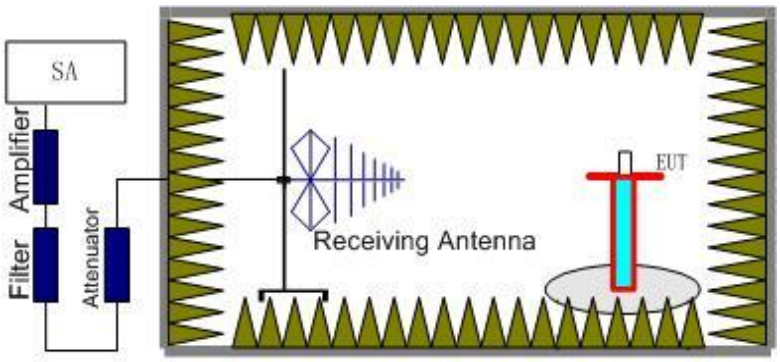
The measurements procedures specified in TIA-603C-2004 were used for testing. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set 1MHz as outlined in Part 24.238. The measurements were performed on all modes(GPRS 850, GPRS 1900) at 3 typical channels(the Top Channel, the Middle Channel and the Bottom Channel) for each band.

The procedure of radiated spurious emissions is as follows:

a) Pre-calibration With pre-calibration method, the Radiated Spurious Emissions(RSE) is calculated as, RSE=Rx（dBuV）+CL（dB）+SA（dB）+Gain（dBi）-107（dBuV to dBm）The SA is calibrated using following setup.



b) EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the test item for emission measurements. The height of receiving antenna is 0.8m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the test item and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1MHz bandwidth.



Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the PCS 1900 band (1850.2 MHz, 1880 MHz and 1909.8 MHz) ,GSM850 band (824.2MHz, 836.6MHz, 848.8MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of any band into any of the other blocks.

The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established and the A_{Rpl} is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss and the air loss. The measurement results are obtained as described below: $Power=P_{Mea}+A_{Rpl}$

7.2.2 PROVISIONS APPLICABLE

(a) On any frequency outside a licensee’s frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Note: only result the worst condition of each test mode:

7.2.3 MEASUREMENT RESULT

GSM 850:

The Worst Test Results for Channel 190/836.6 MHz					
Frequency(MHz)	Power(dBm)	ARpl (dBm)	PMea(dBm)	Limit（dBm）	Polarity
4182.38	-47.62	-6.25	-41.37	-13.00	Vertical
7072.00	-56.68	-8.95	-47.73	-13.00	Vertical
7530.00	-53.75	-9.25	-44.50	-13.00	Horizontal
8602.50	-57.10	-10.15	-46.95	-13.00	Vertical
9261.50	-57.84	-10.25	-47.59	-13.00	Vertical
9400.00	-56.74	-10.25	-46.49	-13.00	Horizontal

PCS 1900:

The Worst Test Results for Channel 661/1880.0MHz					
Frequency(MHz)	Power(dBm)	ARpl (dBm)	PMea(dBm)	Limit（dBm）	Polarity
17920.16	-50.91	-13.5	-37.41	-13.00	Horizontal
18967.78	-51.66	-15.0	-36.66	-13.00	Horizontal
19208.84	-52.46	-15.3	-37.16	-13.00	Horizontal
19309.44	-52.06	-15.0	-37.06	-13.00	Horizontal
19796.09	-52.31	-15.3	-37.01	-13.00	Horizontal
19820.56	-52.31	-15.3	-37.01	-13.00	Horizontal

Note: ARpl= Factor=Antenna Factor+ Cable loss-Amplifier gain.

The “Factor” value can be calculated automatically by software of measurement system.

Below 30MHZ no Spurious found and The GSM modes is the worst condition.

9. FREQUENCY STABILITY

9.1 MEASUREMENT METHOD

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1 , Measure the carrier frequency at room temperature.

2 , Subject the EUT to overnight soak at -10℃.

3 , With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on channel 661 for PCS 1900 band , channel 190 for GSM 850 band, channel 9400 for UMTS band II and channel 4175 for UMTS band V measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.

4 , Repeat the above measurements at 10℃ increments from -10℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

5 , Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.

6 , Subject the EUT to overnight soak at +50℃.

7 , With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.

8 , Repeat the above measurements at 10℃ increments from +50℃ to -10℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

9 , At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

9.2 PROVISIONS APPLICABLE

9.2.1 For Hand carried battery powered equipment

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 6.3VDC and 8.5VDC, with a nominal voltage of 7.4VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -10 % and +12.5 %. For the purposes of measuring frequency stability these voltage limits are to be used.

9.2.2 For equipment powered by primary supply voltage

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment, the normal environment temperature is 20°C.

9.3 MEASUREMENT RESULT (WORST)

Frequency Error Against Voltage for GSM850 band		
Voltage(V)	GSM	
	Frequency error(Hz)	Frequency error(ppm)
3.15	-29	0.035
3.7	-18	0.022
4.26	-20	0.024

Frequency Error Against Temperature for GSM850 band		
temperature(℃)	GSM	
	Frequency error(Hz)	Frequency error(ppm)
-10	-29	0.035
0	-22	0.026
10	-19	0.023
20	-17	0.020
30	-24	0.029
40	-31	0.037
50	-26	0.031

Note: The EUT doesn't work below -10℃

Frequency Error Against Voltage for PCS1900 band		
Voltage(V)	GSM	
	Frequency error(Hz)	Frequency error(ppm)
3.15	-47	0.025
3.70	-31	0.016
4.26	-24	0.013

Frequency Error Against Voltage for PCS1900 band		
temperature(℃)	GSM	
	Frequency error(Hz)	Frequency error(ppm)
-10	-52	0.028
0	-48	0.026
10	-39	0.021
20	-33	0.018
30	-36	0.019
40	-31	0.016
50	-25	0.013

Note: The EUT doesn't work below -10℃

10. OCCUPIED BANDWIDTH

10.1 MEASUREMENT METHOD

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

10.2 PROVISIONS APPLICABLE

The emission bandwidth is defined as two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power

10.3 MEASUREMENT RESULT

Occupied Bandwidth (99%) for GSM850 band			
GSM	Mode	Frequency(MHz)	Occupied Bandwidth (99%)(kHz)
	Low Channel	824.2	245.19
	Middle Channel	836.6	248.40
	High Channel	848.8	241.99

Occupied Bandwidth (99%) for PCS1900 band			
GSM	Mode	Frequency(MHz)	Occupied Bandwidth (99%)(kHz)
	Low Channel	1850.2	245.19
	Middle Channel	1880.0	245.19
	High Channel	1909.8	246.79

11. EMISSION BANDWIDTH

11.1 MEASUREMENT METHOD

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

11.2 PROVISIONS APPLICABLE

The emission bandwidth is defined as two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power

11.3 MEASUREMENT RESULT

Emission Bandwidth (-26dBc) for GSM850 band			
GSM	Mode	Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)
	Low Channel	824.2	320.51
	Middle Channel	836.6	323.72
	High Channel	848.8	320.51

Emission Bandwidth (-26dBc) for PCS1900 band			
GSM	Mode	Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)
	Low Channel	1850.2	317.31
	Middle Channel	1880.0	323.72
	High Channel	1909.8	318.91

12. BAND EDGE

12.1 MEASUREMENT METHOD

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

12.2 PROVISIONS APPLICABLE

As Specified in FCC rules of 22.917(a) and 24.238(a)

12.3 MEASUREMENT RESULT

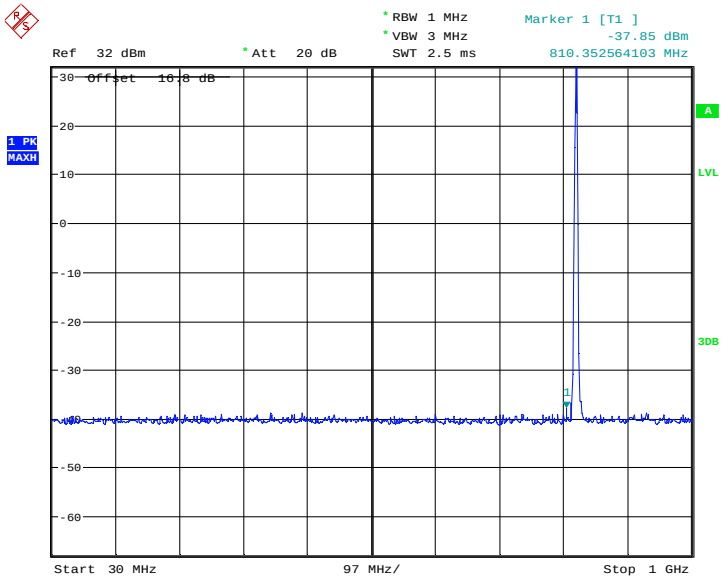
Please refers to Appendix III for compliance test plots for band edges

APPENDIX A

TEST PLOTS FOR CONDUCTED SPURIOUS EMISSION

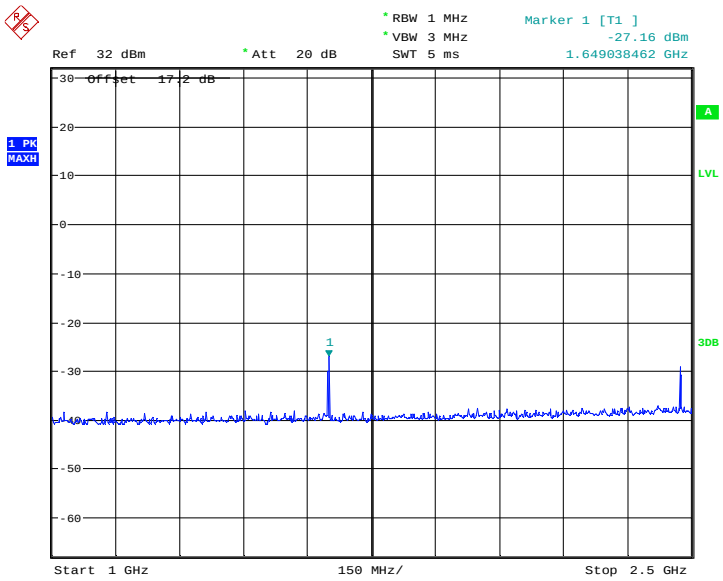
CONDUCTED EMISSION IN GSM850 BAND

Conducted Emission Transmitting Mode CH 128 30MHz – 1GHz



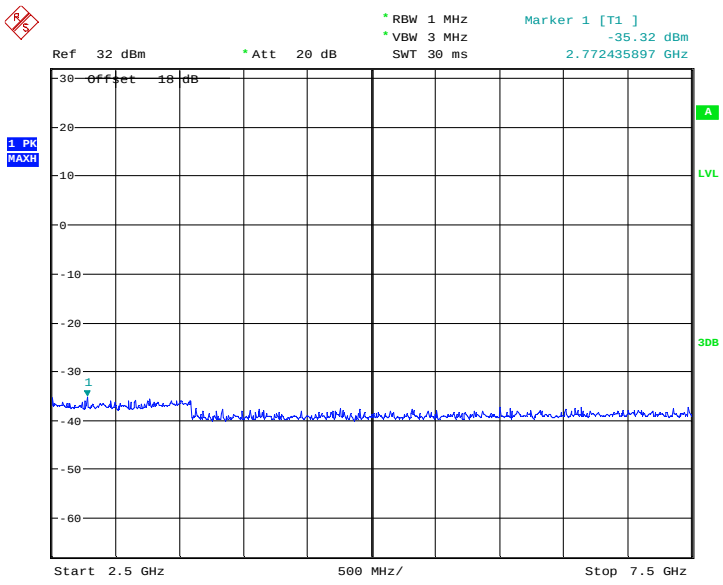
Date: 28.SEP.2015 05:32:46

Conducted Emission Transmitting Mode CH 128 1GHz – 2.5GHz



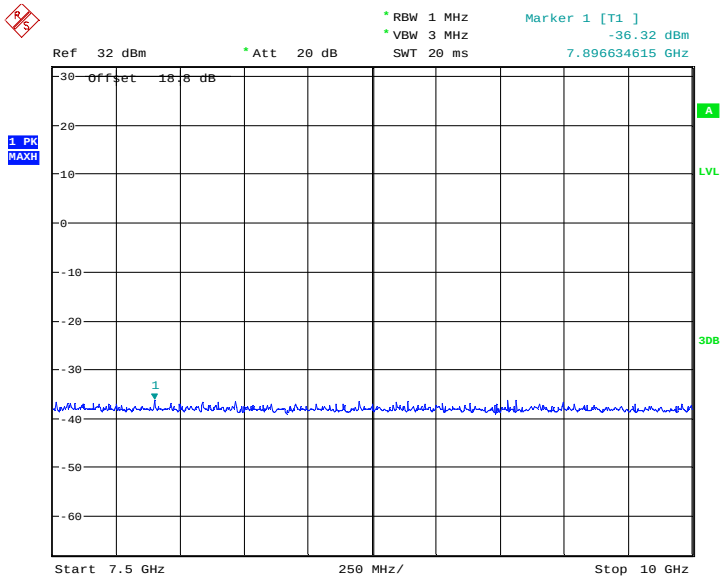
Date: 28.SEP.2015 05:39:33

Conducted Emission Transmitting Mode CH 128 2.5GHz – 7.5GHz



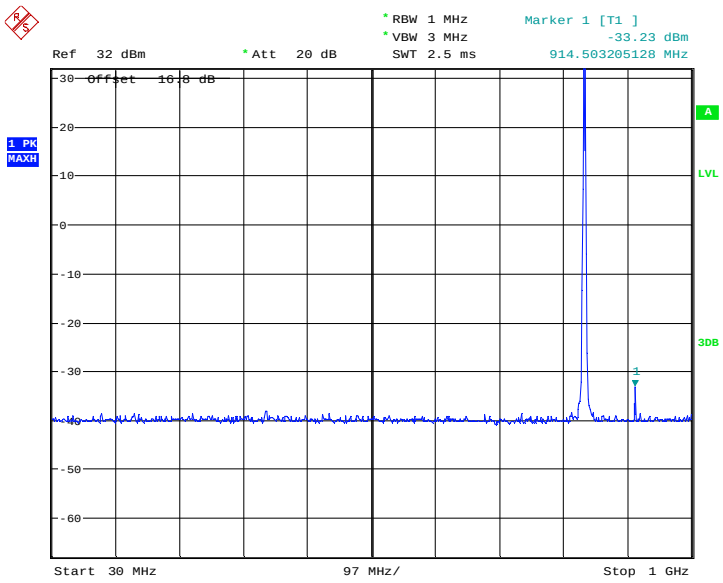
Date: 28.SEP.2015 05:40:40

Conducted Emission Transmitting Mode CH 128 7.5GHz – 10GHz



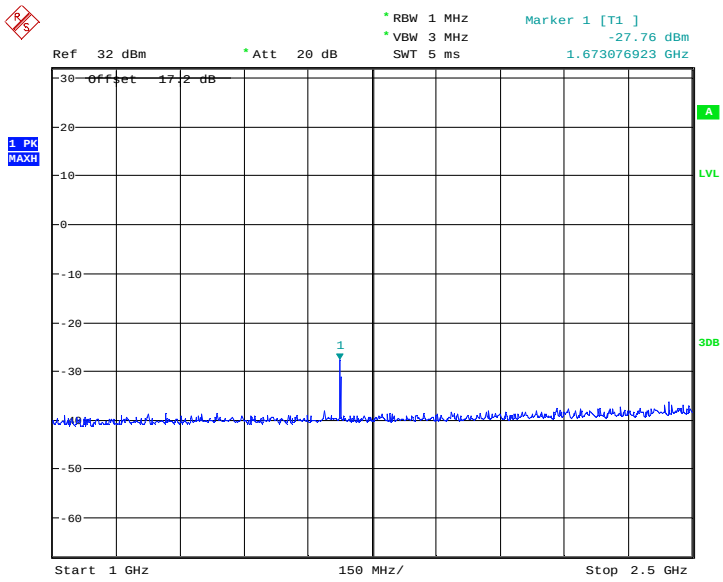
Date: 28.SEP.2015 05:45:26

Conducted Emission Transmitting Mode CH 190 30MHz – 1GHz



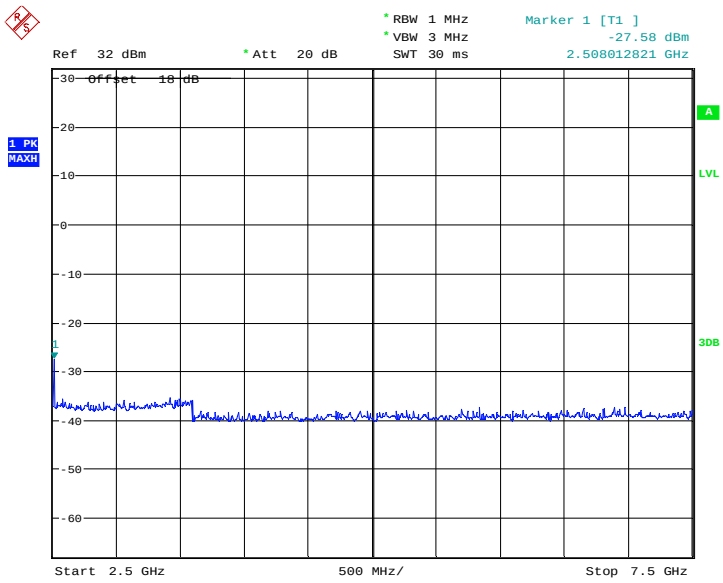
Date: 28.SEP.2015 05:35:50

Conducted Emission Transmitting Mode CH 190 1GHz – 2.5GHz



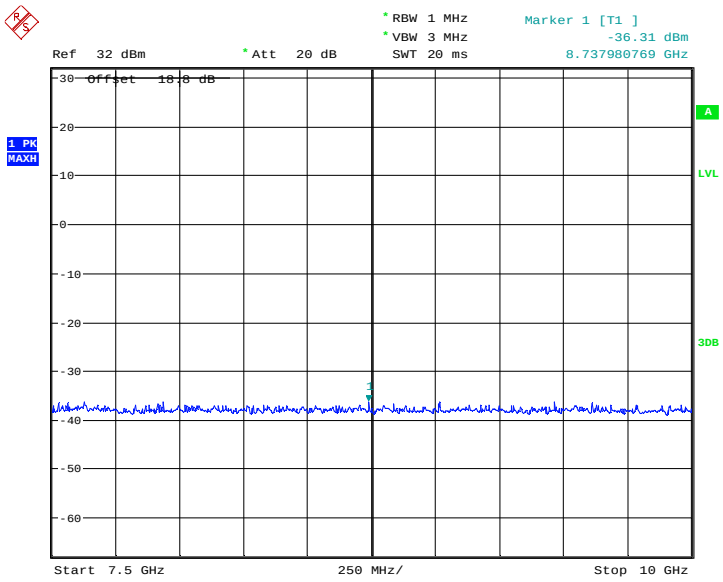
Date: 28.SEP.2015 05:38:43

Conducted Emission Transmitting Mode CH 190 2.5MHz – 7.5GHz



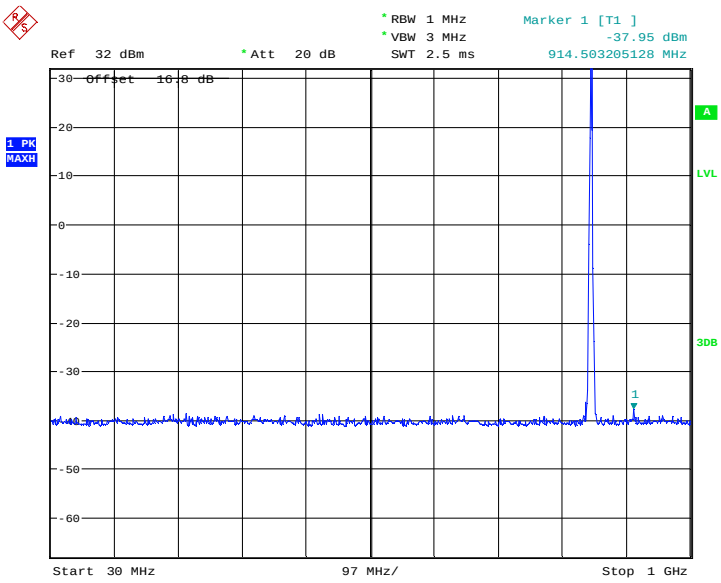
Date: 28.SEP.2015 05:41:14

Conducted Emission Transmitting Mode CH 190 7.5GHz – 10GHz



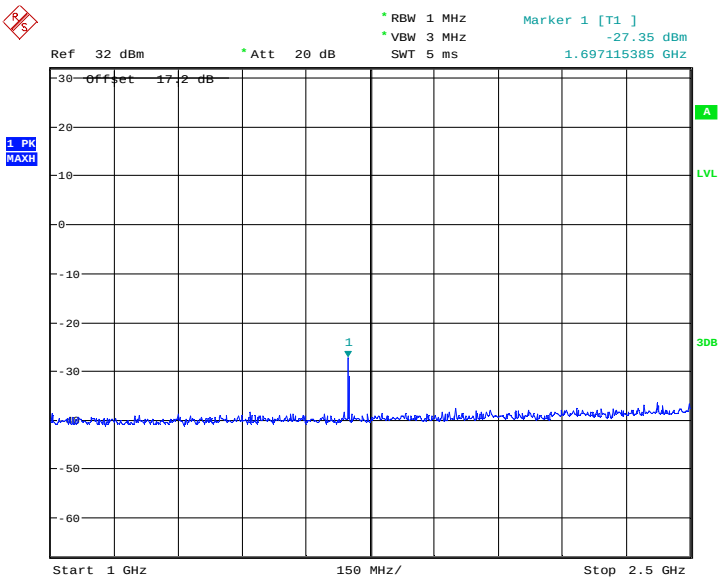
Date: 28.SEP.2015 05:44:49

Conducted Emission Transmitting Mode CH 251 30MHz – 1GHz



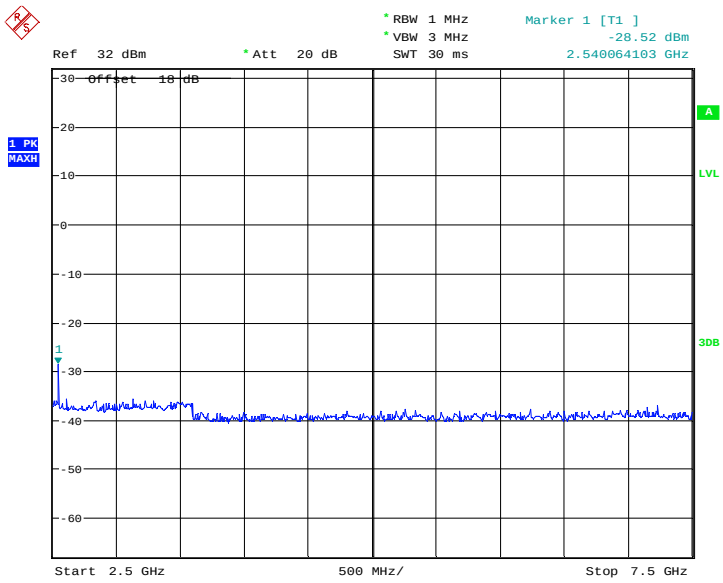
Date: 28.SEP.2015 05:36:53

Conducted Emission Transmitting Mode CH 251 1GHz – 2.5GHz



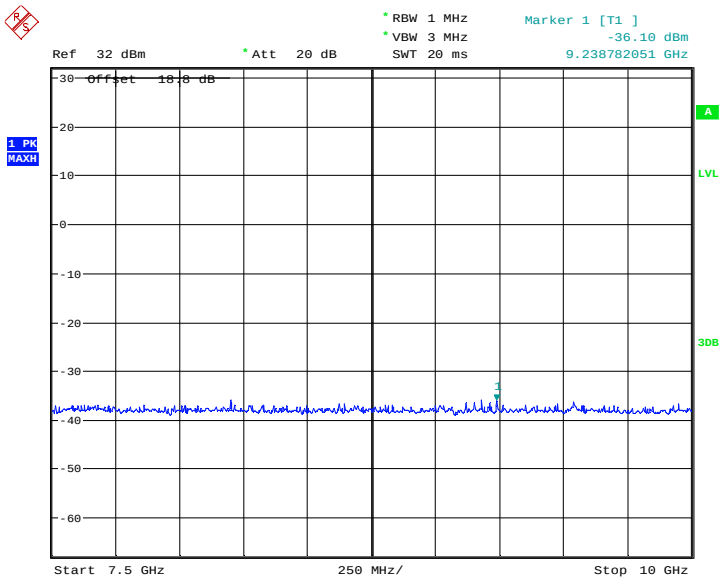
Date: 28.SEP.2015 05:38:10

Conducted Emission Transmitting Mode CH 251 2.5GHz – 7.5GHz



Date: 28.SEP.2015 05:41:40

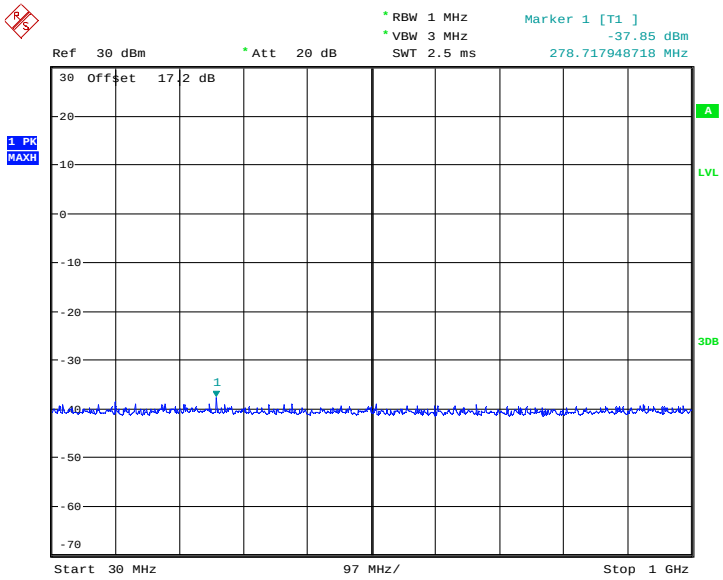
Conducted Emission Transmitting Mode CH 251 7.5GHz – 10GHz



Date: 28.SEP.2015 05:43:31

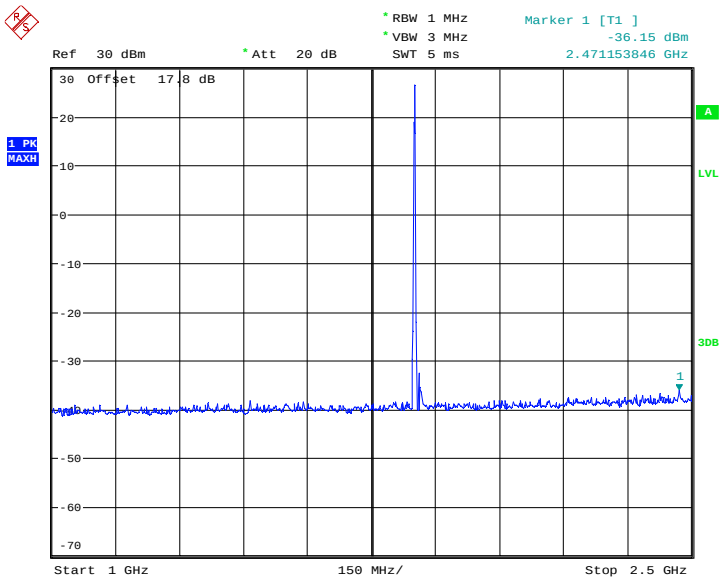
CONDUCTED EMISSION IN PCS1900 BAND

Conducted Emission Transmitting Mode CH 512 30MHz – 1GHz



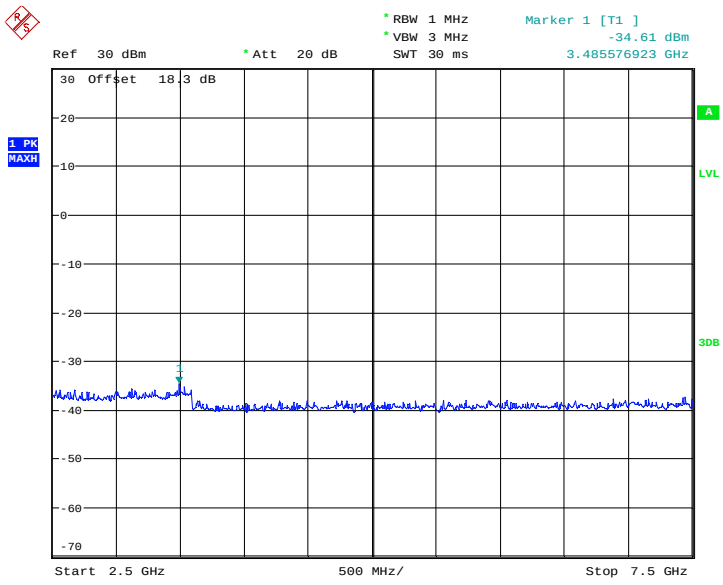
Date: 28.SEP.2015 06:20:10

Conducted Emission Transmitting Mode CH 512 1GHz – 2.5GHz



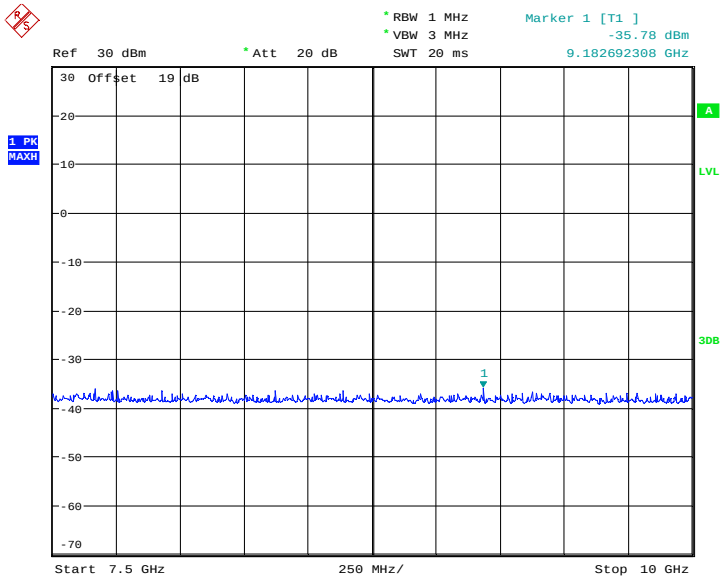
Date: 28.SEP.2015 06:23:34

Conducted Emission Transmitting Mode CH 512 2.5GHz – 7.5GHz



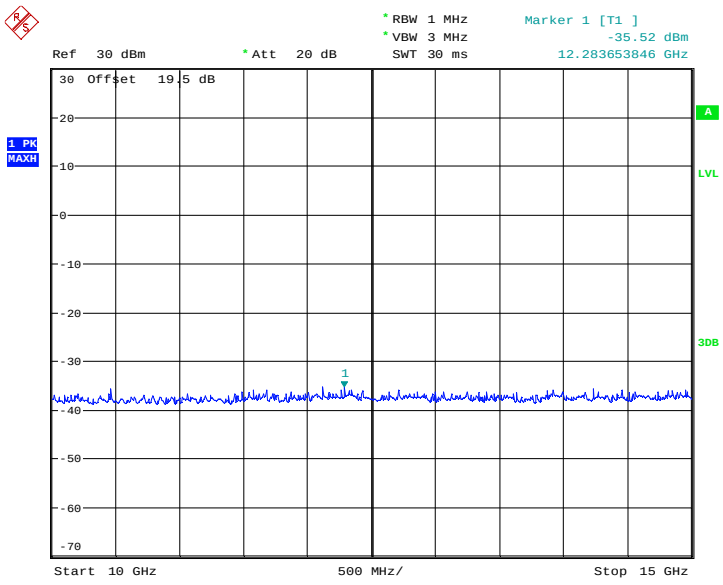
Date: 28.SEP.2015 06:24:38

Conducted Emission Transmitting Mode CH 512 7.5GHz – 10GHz



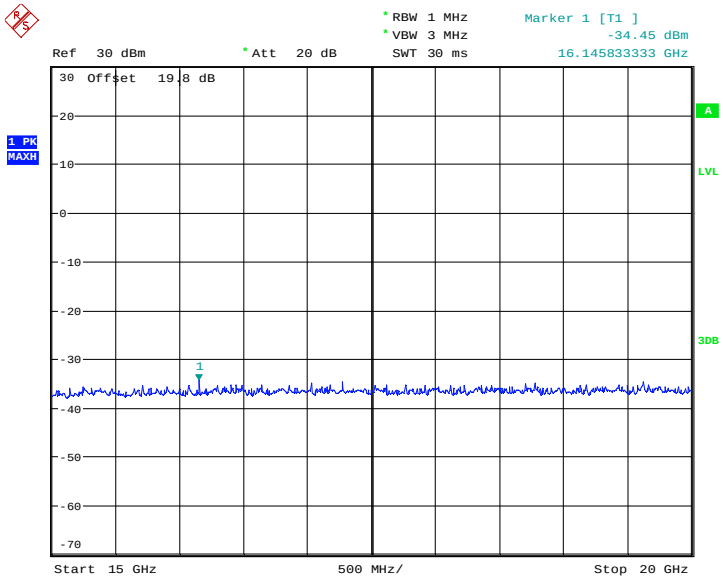
Date: 28.SEP.2015 06:27:53

Conducted Emission Transmitting Mode CH 512 10GHz – 15GHz



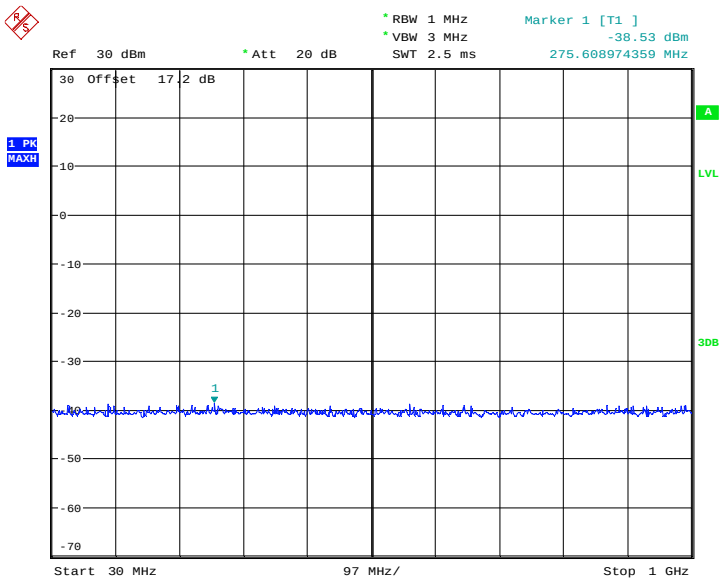
Date: 28.SEP.2015 06:28:43

Conducted Emission Transmitting Mode CH 512 15GHz – 20GHz



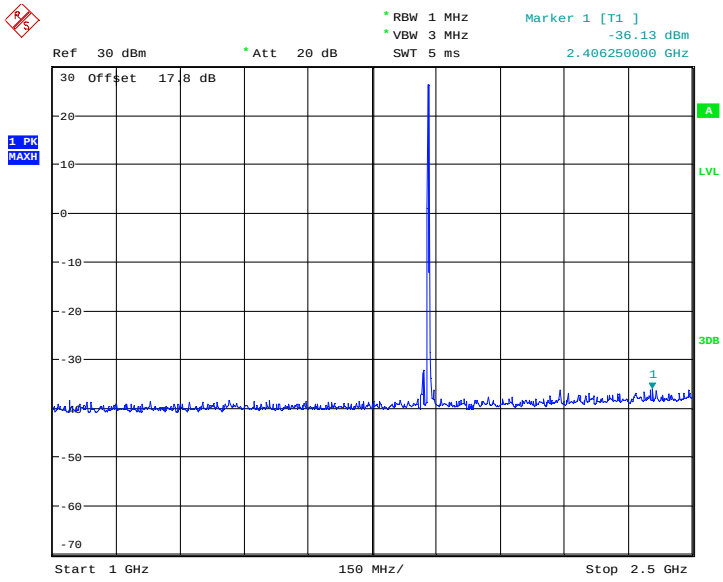
Date: 28.SEP.2015 06:31:14

Conducted Emission Transmitting Mode CH 661 30MHz – 1GHz



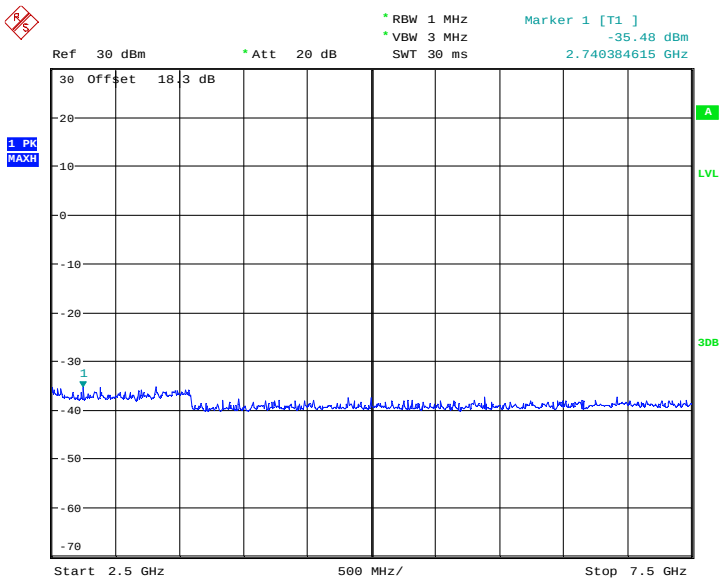
Date: 28.SEP.2015 06:20:53

Conducted Emission Transmitting Mode CH 661 1GHz – 2.5GHz



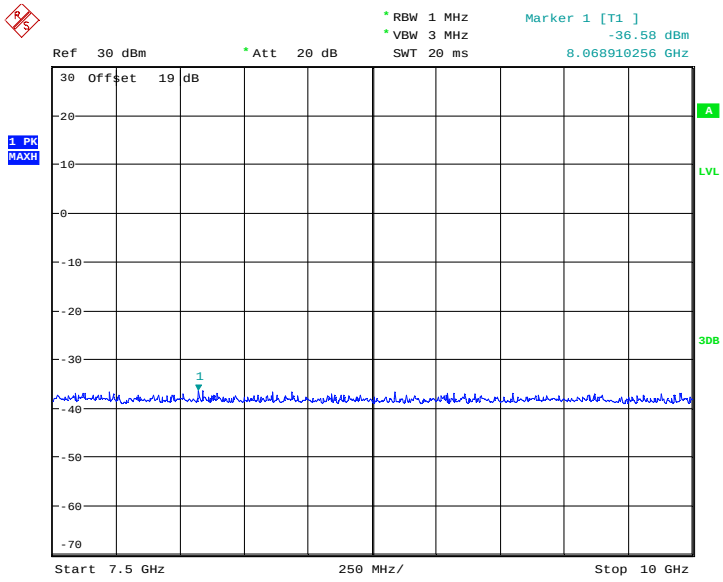
Date: 28.SEP.2015 06:23:02

Conducted Emission Transmitting Mode CH 661 2.5Hz – 7.5GHz



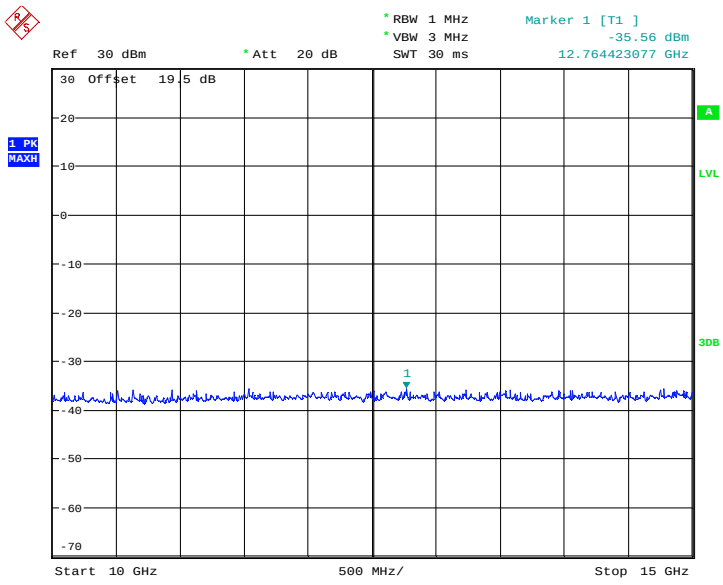
Date: 28.SEP.2015 06:25:12

Conducted Emission Transmitting Mode CH 661 7.5GHz – 10GHz



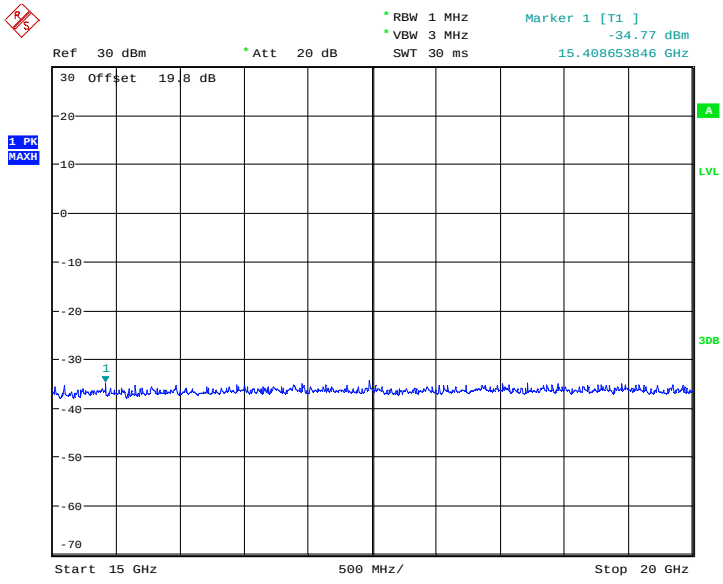
Date: 28.SEP.2015 06:27:18

Conducted Emission Transmitting Mode CH 661 10GHz – 15GHz



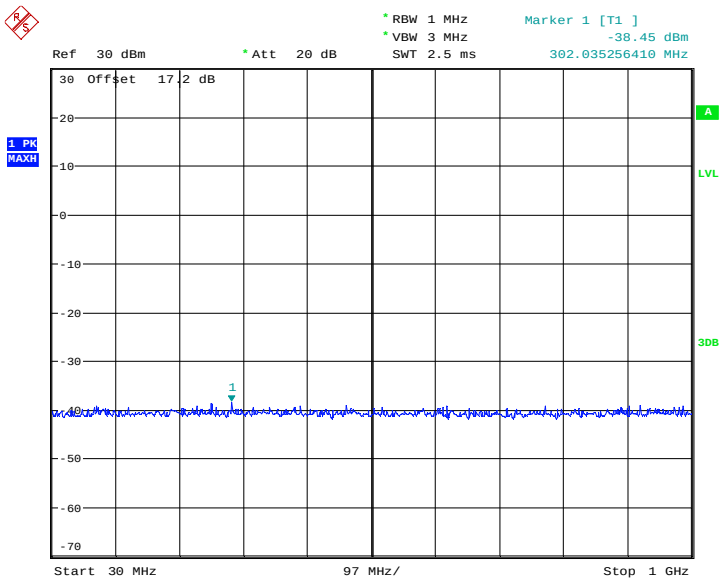
Date: 28.SEP.2015 06:29:16

Conducted Emission Transmitting Mode CH 661 15GHz – 20GHz



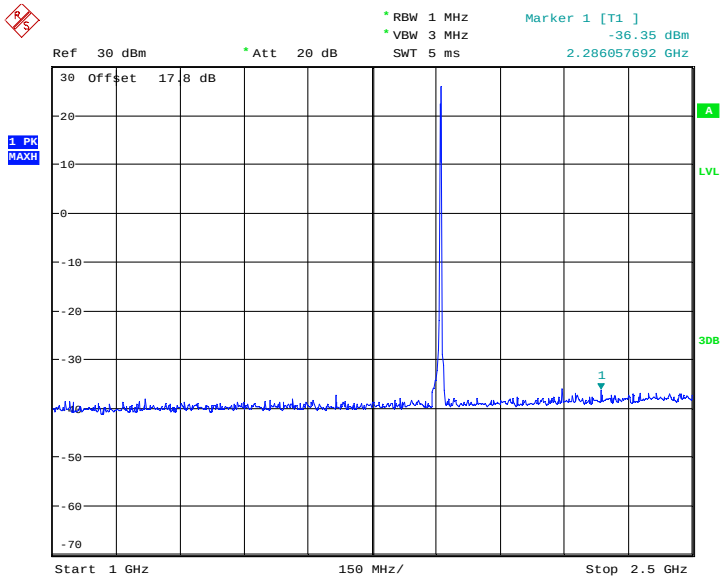
Date: 28.SEP.2015 06:30:48

Conducted Emission Transmitting Mode CH 810 30MHz – 1GHz



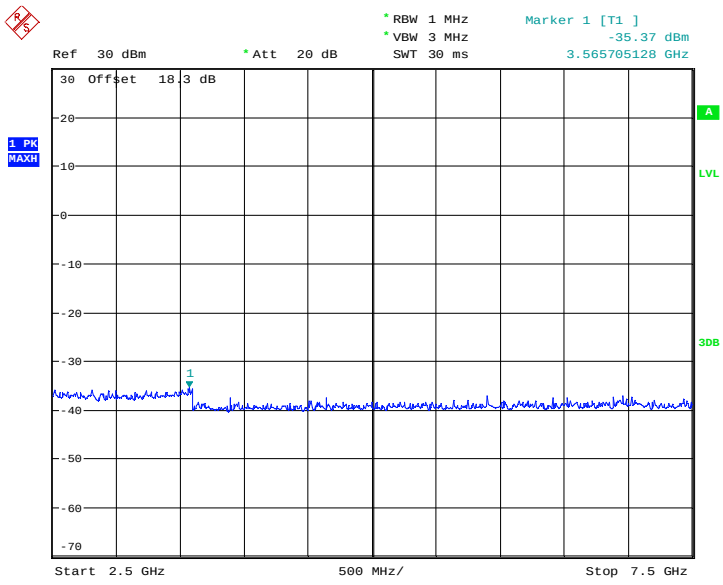
Date: 28.SEP.2015 06:21:28

Conducted Emission Transmitting Mode CH 810 1GHz – 2.5GHz



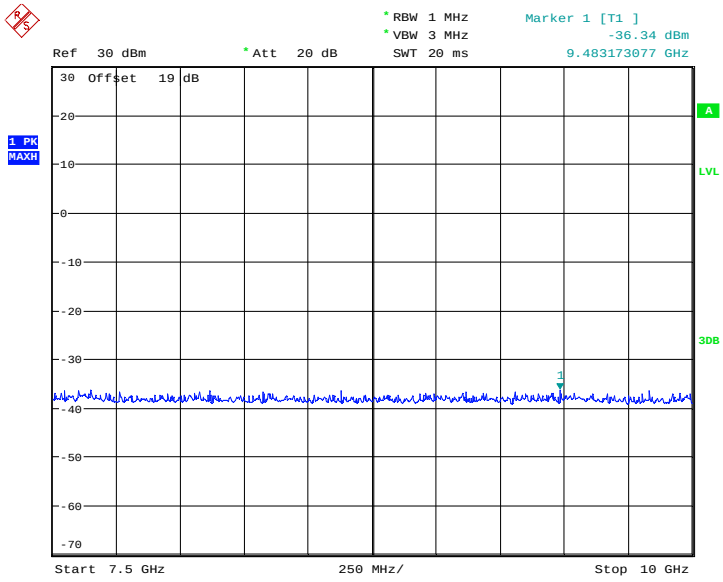
Date: 28.SEP.2015 06:22:23

Conducted Emission Transmitting Mode CH 810 2.5GHz – 7.5GHz



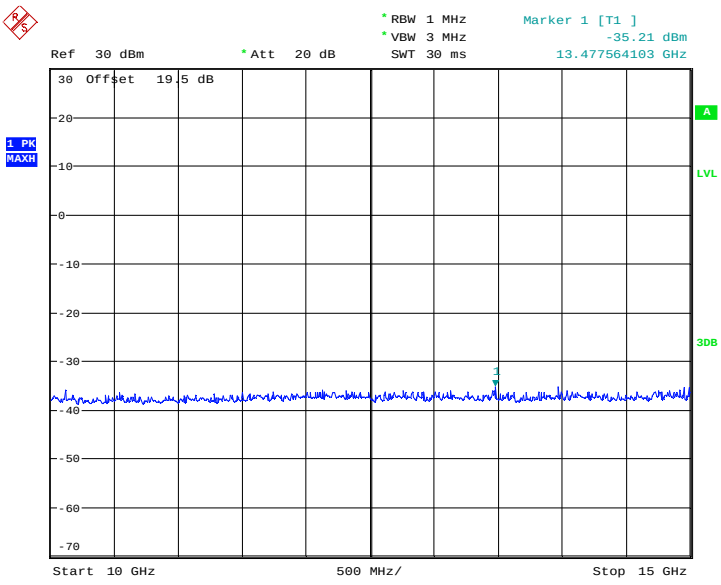
Date: 28.SEP.2015 06:25:48

Conducted Emission Transmitting Mode CH 810 7.5GHz – 10GHz



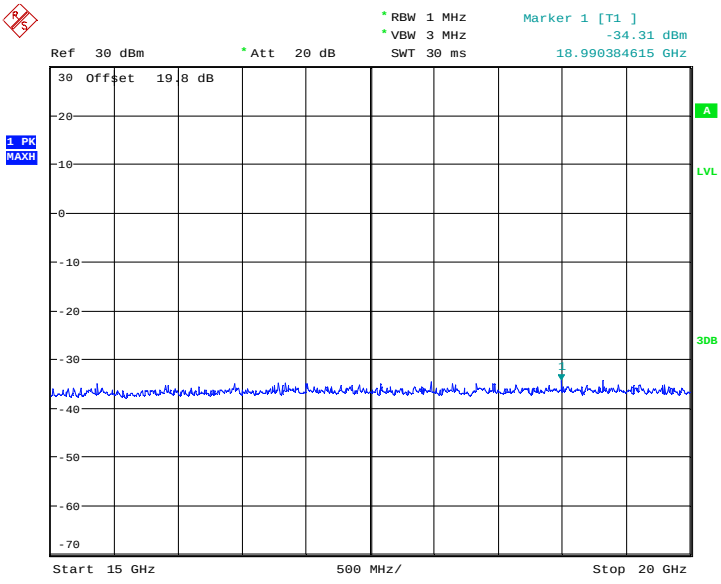
Date: 28.SEP.2015 06:26:42

Conducted Emission Transmitting Mode CH 810 10GHz – 15GHz



Date: 28.SEP.2015 06:29:44

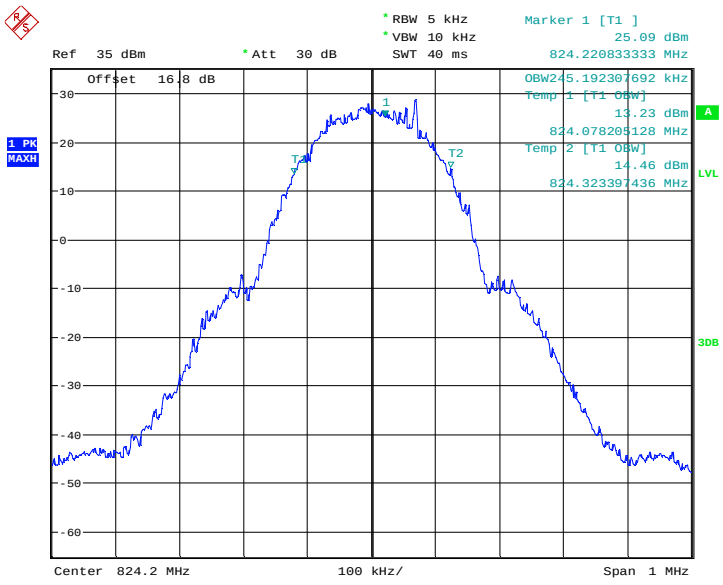
Conducted Emission Transmitting Mode CH 810 15GHz – 20GHz



Date: 28.SEP.2015 06:30:19

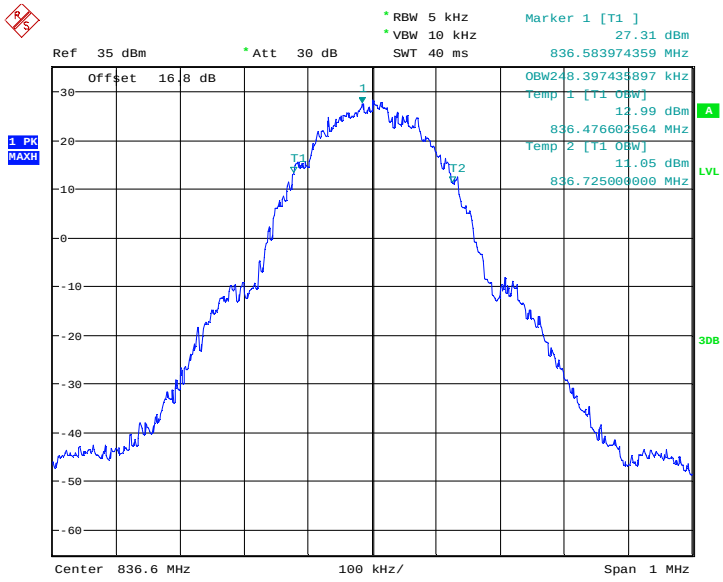
APPENDIX B
TEST PLOTS FOR OCCUPIED BANDWIDTH (99%)
EMISSION BANDWIDTH (-26dBC)

Occupied Bandwidth (99%) GSM 850 BAND CH 128



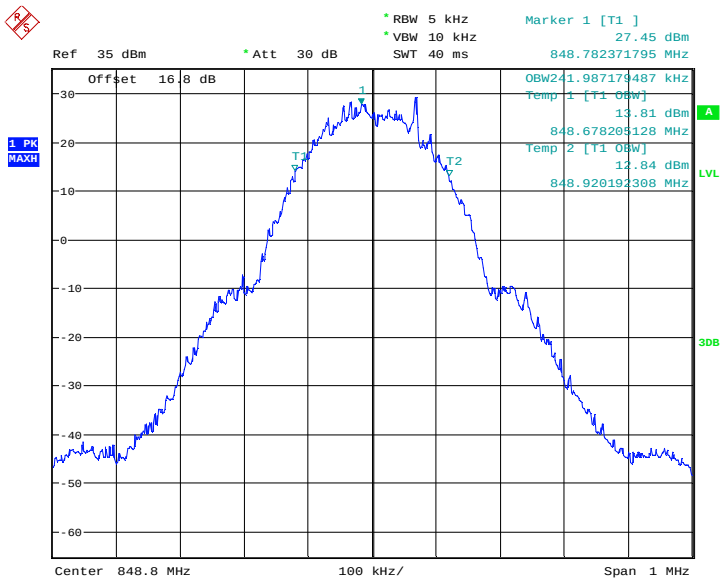
Date: 28.SEP.2015 05:19:32

Occupied Bandwidth (99%) GSM 850 BAND CH 190



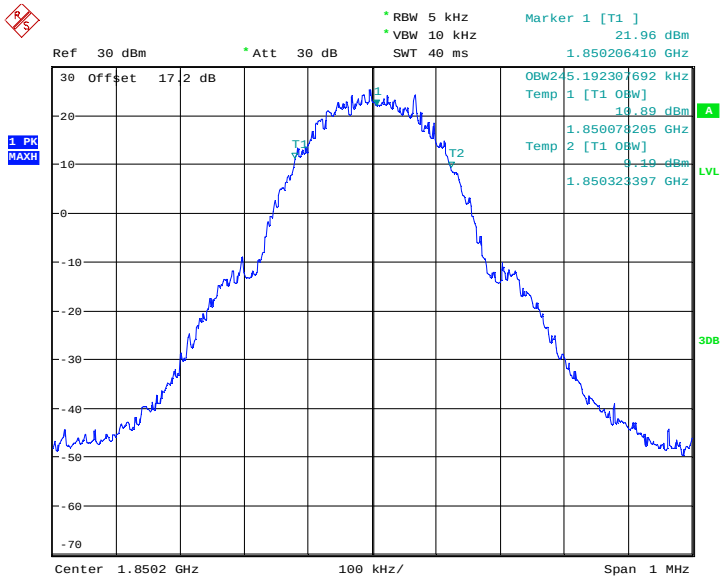
Date: 28.SEP.2015 05:20:54

Occupied Bandwidth (99%) GSM 850 BAND CH 251



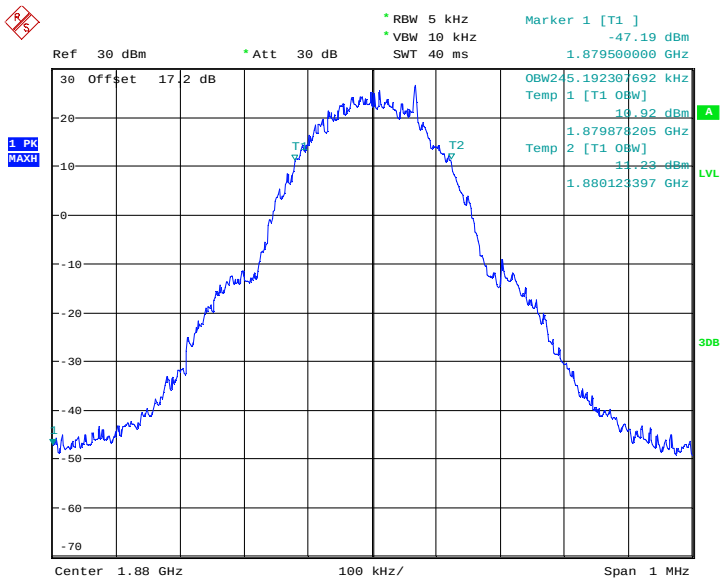
Date: 28.SEP.2015 05:21:52

Occupied Bandwidth (99%) PCS 1900 BAND CH 512



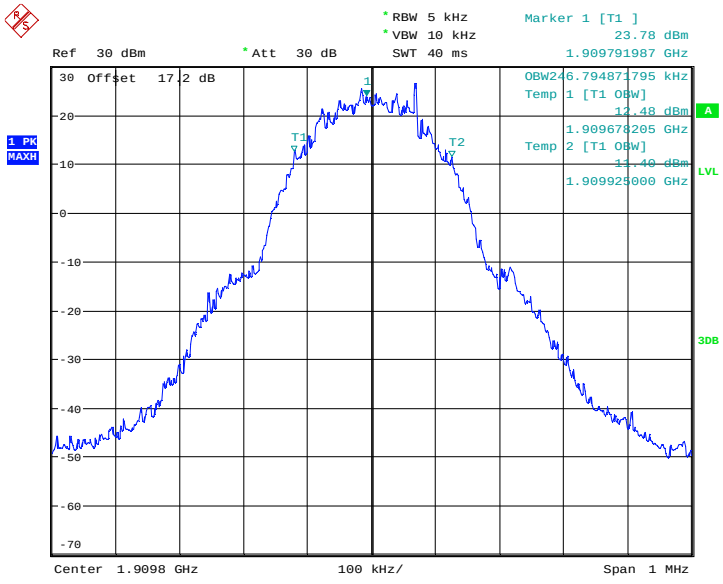
Date: 28.SEP.2015 06:11:09

Occupied Bandwidth (99%) PCS 1900 BAND CH 661



Date: 28.SEP.2015 06:11:52

Occupied Bandwidth (99%) PCS 1900 BAND CH 810

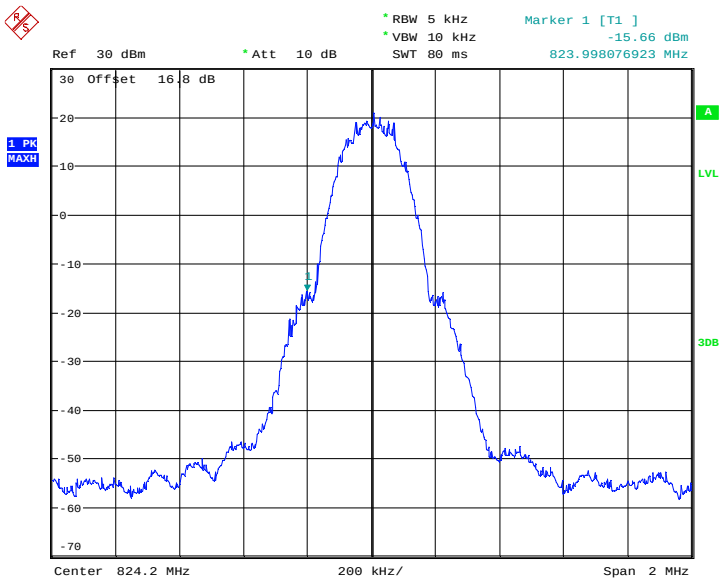


Date: 28.SEP.2015 06:13:17

APPENDIX C

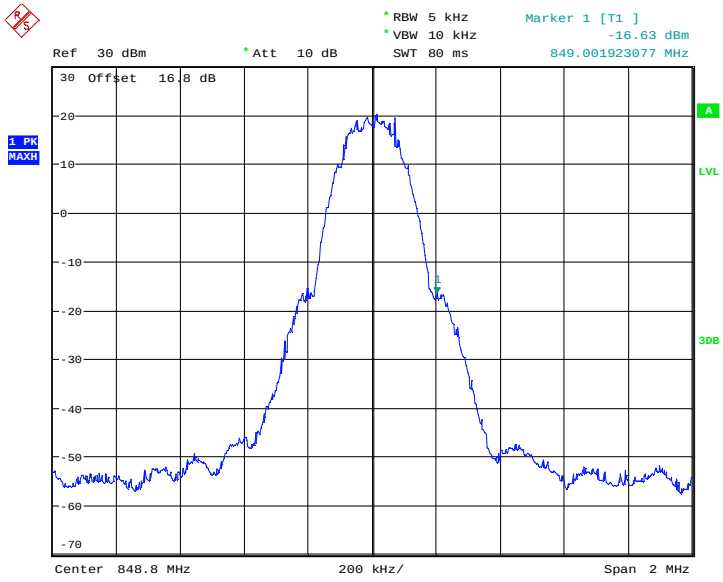
TEST PLOTS FOR BAND EDGES

Low Band Edge GSM 850 BAND CH 128



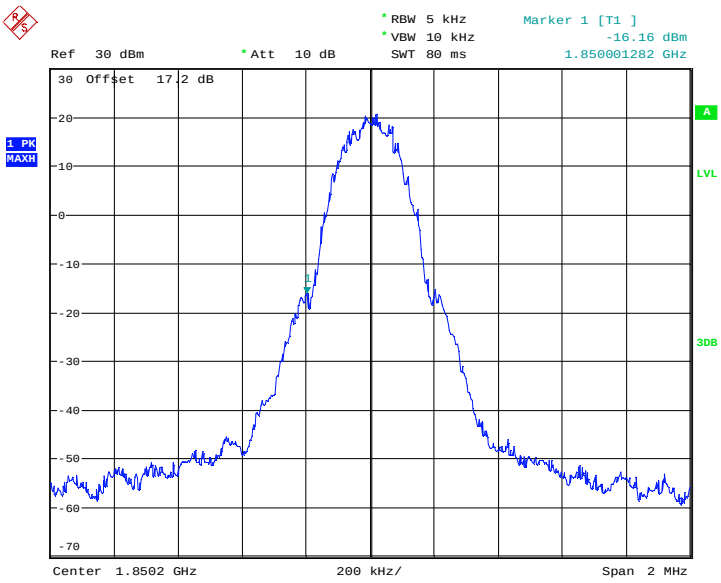
Date: 28.SEP.2015 05:27:54

High Band Edge GSM 850 BAND CH 251



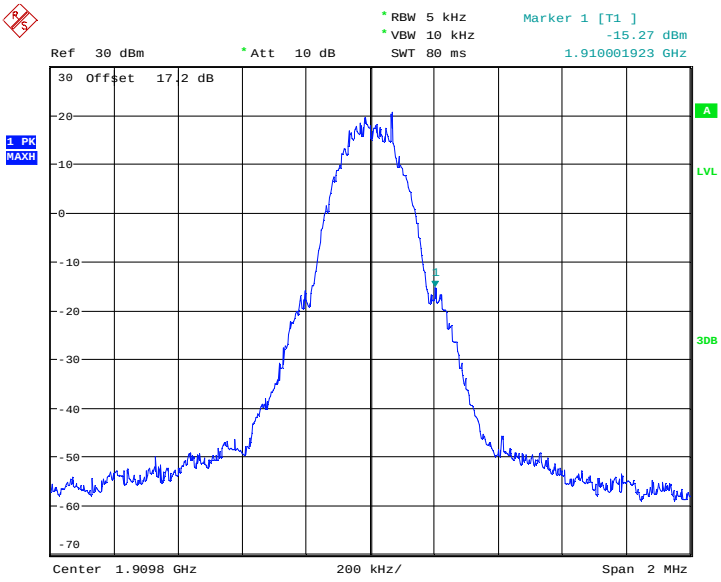
Date: 28.SEP.2015 05:29:08

Low Band Edge PCS 1900 BAND CH 512



Date: 28.SEP.2015 06:17:08

High Band Edge PCS 1900 BAND CH 810



Date: 28.SEP.2015 06:17:58