GSM Test Report

Application Purpose	:	Original grant
Applicant Name:	:	TECNO MOBILE LIMITED
FCC ID	:	2ADYY-T463
Equipment Type	:	Mobile Phone
Model Name	:	T463
Report Number	:	FCC 15016713-1
Standard(S)	:	FCC Part 22H & 24E Rules
Date Of Receipt	:	January 15, 2015
Date Of Issue	:	January 23, 2015
Test By	:	*(Neil Wong)*
Reviewed By	:	*(Robie Chen)*
Authorized by	:	*(Michal Ling)*
Prepared by	:	**Shenzhen WST Testing Technology Co., Ltd.** 1F,No.9 Building,TGK Science & Technology ParkYangtian Rd., NO.72 Bao'an Dist.,GuangDong,China (Registration Number: 939433)

Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	January 23, 2015	Valid	Original Report

TABLE OF CONTENTS

1. Certification *5*

2. GENERAL INFORMATION *6*

2.1 EUT DESCRIPTION 6

3. TEST DESCRIPTION *8*

3.1 TEST FACILITY 8

3.3 DESCRIPTION OF TEST CHANNELS AND TEST MODES 9

3.4 EQUIPMENT MODIFICATIONS 9

4. SUMMARY OF TEST REQUIREMENTS AND RESULTS 10

For GSM850/GPRS850: 10

For PCS1900/GPRS1900: 10

5. MEASUREMENT INSTRUMENTS 11

6. OUTPUT POWER *12*

6.1 Conducted Output Power 12

6.3. Peak-to-Average Ratio 17

7. SPURIOUS EMISSION *18*

7.1 CONDUCTED SPURIOUS EMISSION 18

7.2 Radiated Spurious Emission 20

8. FREQUENCY STABILITY *23*

8.1 MEASUREMENT METHOD 23

8.2 PROVISIONS APPLICABLE 23

8.3 MEASUREMENT RESULT (WORST) 24

9. OCCUPIED BANDWIDTH *26*

9.1 MEASUREMENT METHOD 26

9.2 PROVISIONS APPLICABLE 26

9.3 MEASUREMENT RESULT 26

10. EMISSION BANDWIDTH *27*

10.1 MEASUREMENT METHOD 27

10.2 PROVISIONS APPLICABLE 27

10.3 MEASUREMENT RESULT 27

11. BAND EDGE ***28***

11.1 MEASUREMENT METHOD **28**

11.2 PROVISIONS APPLICABLE **28**

11.3 MEASUREMENT RESULT **28**

12. EUT TEST PHOTO ***29***

13. EUT PHOTO ***31***

APPENDIX A: TEST PLOTS FOR CONDUCTED SPURIOUS EMISSIO ***42***

APPENDIX B: TEST PLOTS FOR OCCUPIED BANDWIDTH (99%) ***49***

APPENDIX C: EMISSION BANDWIDTH (-26dBc) ***53***

APPENDIX D: TEST PLOTS FOR BAND EDGES ***57***

1. Certification

Applicant	TECNO MOBILE LIMITED
Address	RMS 05-15, 13A/F., SOUTH TOWER, 17 CANTON ROAD, TSIM SHA TSUI, KOWLOON, HONG KONG
Manufacturer	SHENZHEN SMARTTEL CO., LTD.
Address	6th Floor, Block 15, shatoujiao Free TRADE Zone,Shenyan Road, Yantian District, Shenzhen, Guangdong, P.R.China
Equipment Type	Mobile Phone
Brand Name	TECNO
Test Model	T463
Series Model	N/A
Difference description	N/A
Data of receipt	January 15, 2015
Date of test	January 16, 2015 to January 22, 2015
Deviation	None
Condition of Test Sample	Normal

We hereby certify that:

All measurement facilities used to collect the measurement data are located at
1F,No.9 Building, TGK Science & Technology Park Yangtian Rd., NO.72 Bao'an Dist., GuangDong, China
The data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C 63.4:2009 and TIA/EIA 603. The sample tested as described in this report is in compliance with the FCC Rules Part2, 22H and 24E.
The test results of this report relate only to the tested sample identified in this report.

2. GENERAL INFORMATION

2.1 EUT DESCRIPTION

Equipment Type:	Mobile Phone
Hardware version:	A675_MAIN_PCB_V1.0
Software version:	V1.0
Frequency Bands:	☒GSM 850 ☒PCS 1900 (U.S. Bands) ☒GSM 900 ☒DCS 1800 (Non-U.S. Bands) U.S. Bands: ☐UMTS FDD Band II ☐UMTS FDD Band V Non-U.S. Bands: ☐UMTS FDD Band I ☐UMTS FDD Band VIII
Antenna Type:	Internal Antenna
Antenna gain:	GSM850: -0.6dBm PCS1900: -0.8dBm
Power Supply:	DC3.7V by Battery
Battery information:	Model: BL-8C DC 3.7 V 1650 mAh
Adapter Information:	Model: M45 Input: AC 100–240 V, 50-60 Hz, 0.15A Output: DC 5.0 V 500mA
Dual Card:	Card 1: GSM Card Slot, Card 2: GSM Card Slot
Max power:	See note 3
GPRS Class	12
Extreme Temp. Tolerance	-10℃ to +50℃

Note 1: The High Voltage DC4.2V and Low Voltage DC3.5V were declared by manufacturer, The EUT couldn't be operating normally with higher or lower voltage.

Note 2: Card 1 can't transmit with Card 2 simultaneously.

Note 3:

Card 1:

	Maximum ERP/EIRP (dBm)	Max. Conducted Power (dBm)	Max. Average Burst Power (dBm)
GSM 850	33.26	33.83	33.67
PCS 1900	30.42	30.50	30.15

Card 2:

	Maximum ERP/EIRP (dBm)	Max. Conducted Power (dBm)	Max. Average Burst Power (dBm)
GSM 850	33.49	33.91	33.38
PCS 1900	30.34	30.62	30.23

3. TEST DESCRIPTION

3.1 TEST FACILITY

The test site used to collect the radiated data is located at:
1F,No.9 Building, TGK Science & Technology Park Yangtian Rd., NO.72 Bao'an Dist., GuangDong, China

3.2 EUT SYSTEM 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.

Fig. 2-1 Configuration of EUT System

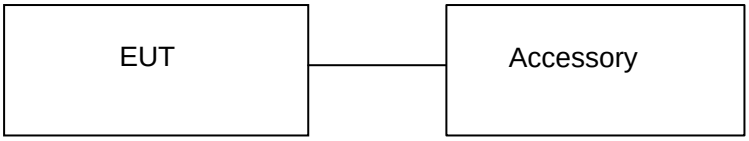


Table 2-1 Equipment Used in EUT System

Item	Equipment	Model No.	ID or Specification	Note
1	Mobile Phone	T463	FCC ID: 2ADYY-T463	EUT
2	Adapter	M45	DC5.0V 500mA	Accessory
3	Battery	BL-8C	DC3.7V 1650mAh	Accessory
4	Earphone	31BT	N/A	Accessory

***Note: All the accessories have been used during the test. The following "EUT" in setup diagram means EUT system.

3.3 DESCRIPTION OF TEST CHANNELS AND 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.

Test channels:

Band	Channel		Frequency (MHz)
GSM850	Low	128	824.2
	Middle	190	836.6
	High	251	848.8

Band	Channel		Frequency (MHz)
PCS1900	Low	512	1850.2
	Middle	661	1880
	High	810	1909.8

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

3.4 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

4. SUMMARY OF TEST REQUIREMENTS AND RESULTS

For GSM850/GPRS850:

Item Number	Item Description		Test Channel	FCC Rules	Result
1	Output Power	Conducted Output Power	128/190/251	2.1046/22.913(a) (2)	Pass
		Radiated Output Power	128/190/251		
2	Spurious Emission	Conducted Spurious Emission	128/190/251	2.1051 / 22.917	Pass
		Radiated Spurious Emission	128/190/251		
4	Frequency Stability		190	2.1055/22.355	Pass
5	Occupied Bandwidth		128/190/251	2.1049	Pass
6	Emission Bandwidth		128/190/251	22.917(a)(b)	Pass
7	Band Edge		128/190/251	22.917(a)	Pass

For PCS1900/GPRS1900:

Item Number	Item Description		Test Channel	FCC Rules	Result
1	Output Power	Conducted Output Power	512/661/810	2.1046/24.232(c)	Pass
		Radiated Output Power	512/661/810		
2	Peak-to-Average Ratio	Peak-to-Average Ratio	512/661/810	24.232(d)	Pass
3	Spurious Emission	Conducted Spurious Emission	512/661/810	2.1051 / 24.238(a)	Pass
		Radiated Spurious Emission	512/661/810		
5	Frequency Stability		661	2.1055/24.235	Pass
6	Occupied Bandwidth		512/661/810	2.1049	Pass
7	Emission Bandwidth		512/661/810	24.238(a)(b)	Pass
8	Band Edge		512/661/810	24.238(a)(b)	Pass

5. MEASUREMENT INSTRUMENTS

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	Calibration Date	Calibration Due.
EMI Test Receiver	R&S	ESCI	100005	08/19/2014	08/18/2015
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI	101139	08/19/2014	08/18/2015
LISN	AFJ	LS16	16010222119	08/19/2014	08/18/2015
LISN(EUT)	Mestec	AN3016	04/10040	08/19/2014	08/18/2015
Universal Radio Communication Tester	R&S	CMU 200	1100.0008.02	08/19/2014	08/18/2015
Coaxial cable	Megalon	LMR400	N/A	08/12/2014	08/11/2015
GPIB cable	Megalon	GPIB	N/A	08/12/2014	08/11/2015
Spectrum Analyzer	R&S	FSU	100114	08/19/2014	08/18/2015
Pre Amplifier	H.P.	HP8447E	2945A02715	10/13/2014	10/12/2015
Pre-Amplifier	CDSI	PAP-1G18-38	--	10/13/2014	10/12/2015
Bi-log Antenna	SUNOL Sciences	JB3	A021907	09/13/2014	09/12/2015
9*6*6 Anechoic	--	--	--	08/21/2014	08/20/2015
Horn Antenna	COMPLIANCE ENGINEERING	CE18000	--	09/13/2014	09/12/2015
Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-631	08/23/2014	08/22/2015
Cable	TIME MICROWAVE	LMR-400	N-TYPE04	04/25/2014	04/24/2015
System-Controller	CCS	N/A	N/A	N.C.R	N.C.R
Turn Table	CCS	N/A	N/A	N.C.R	N.C.R
Antenna Tower	CCS	N/A	N/A	N.C.R	N.C.R
RF cable	Murata	MXHQ87WA3000	-	08/21/2014	08/20/2015
Loop Antenna	EMCO	6502	00042960	08/22/2014	08/21/2015
Horn Antenna	SCHWARZBECK	BBHA 9170	1123	08/19/2014	08/18/2015
Three-way connector	Shaanxi Tianzhu Business Co., Ltd.	1506A	A1213	08/19/2014	08/18/2015
Attenuator	MCL	BW-N20W5+	1306	08/19/2014	08/18/2015
Signal generator	Agilent	8920B	VS36141817	08/19/2014	08/18/2015
Power amplifier	rflight	NTWPA-00810150100E	13103205	08/19/2014	08/18/2015
Power amplifier	rflight	NTWPA-1060040E	13104214	08/19/2014	08/18/2015
Bi-log Antenna	A.H. Systems Inc.	SAS-522-3	1326	08/21/2014	08/20/2015

6. OUTPUT POWER

6.1 Conducted Output Power

6.1.1 MEASUREMENT METHOD

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/GPRS 850, GSM/ GPRS1900) at 3 typical channels described in section 3.3 of this report for each band.

6.1.2 MEASUREMENT RESULT

Conducted Output Power Limits for GSM850 band		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
GSM	33 dBm (2W)	+/- 1
Conducted Output Power Limits for PCS1900 band		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
GSM	30 dBm (1W)	+/- 1

GSM 850:
Card 1:

Mode	Frequency (MHz)	Reference Power	Peak Power	Tolerance	Avg. Burst Power	PAPR (dB)	Duty cycle Factor(dB)	Frame Power(dBm)
GSM850	824.2	33.00	33.70	0.70	33.26	0.44	-9	24.26
	836.6	33.00	33.80	0.80	33.32	0.48	-9	24.32
	848.8	33.00	**33.83**	0.83	**33.67**	0.39	-9	24.67
GPRS850 (1 Slot)	824.2	33.00	33.33	0.33	32.98	0.35	-9	23.98
	836.6	33.00	33.51	0.51	33.18	0.33	-9	24.18
	848.8	33.00	33.79	0.79	33.28	0.51	-9	24.28
GPRS850 (2 Slot)	824.2	30.00	30.41	0.41	29.92	0.49	-6	23.92
	836.6	30.00	30.31	0.31	29.83	0.48	-6	23.83
	848.8	30.00	30.47	0.47	30.14	0.33	-6	24.14
GPRS850 (3 Slot)	824.2	28.23	28.79	0.56	28.27	0.52	-4.26	24.01
	836.6	28.23	28.78	0.55	28.44	0.34	-4.26	24.18
	848.8	28.23	28.87	0.64	28.51	0.36	-4.26	24.25
GPRS850 (4 Slot)	824.2	27.00	27.61	0.61	27.33	0.28	-3	24.33
	836.6	27.00	27.84	0.84	27.46	0.38	-3	24.46
	848.8	27.00	27.82	0.82	27.45	0.37	-3	24.45

Card 2:

Mode	Frequency (MHz)	Reference Power	Peak Power	Tolerance	Avg. Burst Power	PAPR (dB)	Duty cycle Factor(dB)	Frame Power(dBm)
GSM850	824.2	33.00	33.71	0.71	33.18	0.53	-9	24.18
	836.6	33.00	33.82	0.82	33.27	0.55	-9	24.27
	848.8	33.00	**33.91**	0.91	**33.38**	0.53	-9	24.38
GPRS850 (1 Slot)	824.2	33.00	33.28	0.28	32.79	0.49	-9	23.79
	836.6	33.00	32.94	-0.06	32.67	0.27	-9	23.67
	848.8	33.00	33.50	0.50	32.95	0.55	-9	23.95
GPRS850 (2 Slot)	824.2	30.00	30.29	0.29	29.97	0.32	-6	23.97
	836.6	30.00	30.05	0.05	29.81	0.24	-6	23.81
	848.8	30.00	30.34	0.34	30.00	0.34	-6	24.00
GPRS850 (3 Slot)	824.2	28.23	28.81	0.58	28.26	0.55	-4.26	24.00
	836.6	28.23	28.94	0.71	28.67	0.27	-4.26	24.41
	848.8	28.23	28.97	0.74	28.43	0.54	-4.26	24.17
GPRS850 (4 Slot)	824.2	27.00	27.38	0.38	27.08	0.3	-3	24.08
	836.6	27.00	27.67	0.67	27.46	0.21	-3	24.46
	848.8	27.00	27.61	0.61	27.41	0.2	-3	24.41

PCS 1900:

Card 1:

Mode	Frequency (MHz)	Reference Power	Peak Power	Tolerance	Avg. Burst Power	PAPR (dB)	Duty cycle Factor(dB)	Frame Power(dBm)
GSM1900	1850.2	30.00	**30.50**	0.30	**30.15**	0.35	-9	21.15
	1880	30.00	30.43	0.23	30.14	0.29	-9	21.14
	1909.8	30.00	30.12	-0.08	29.87	0.25	-9	20.87
GPRS1900 (1 Slot)	1850.2	30.00	30.38	0.58	29.92	0.46	-9	20.92
	1880	30.00	30.33	0.33	29.84	0.49	-9	20.84
	1909.8	30.00	30.21	0.21	29.82	0.39	-9	20.82
GPRS1900 (2 Slot)	1850.2	27.00	27.46	0.46	27.13	0.33	-6	21.13
	1880	27.00	27.52	0.52	27.10	0.42	-6	21.10
	1909.8	27.00	27.41	0.41	27.08	0.33	-6	21.08
GPRS1900 (3 Slot)	1850.2	25.23	25.75	0.52	25.32	0.43	-4.26	21.06
	1880	25.23	25.70	0.47	25.21	0.49	-4.26	20.95
	1909.8	25.23	25.55	0.32	25.12	0.43	-4.26	20.86
GPRS1900 (4 Slot)	1850.2	24.00	24.70	0.70	24.38	0.32	-3	21.38
	1880	24.00	24.72	0.72	24.32	0.4	-3	21.32
	1909.8	24.00	24.70	0.70	24.30	0.35	-3	21.30

Card 2:

Mode	Frequency (MHz)	Reference Power	Peak Power	Tolerance	Avg. Burst Power	PAPR (dB)	Duty cycle Factor(dB)	Frame Power(dBm)
GSM1900	1850.2	30.00	**30.62**	0.42	**30.23**	0.39	-9	21.23
	1880	30.00	30.52	0.32	30.2	0.32	-9	21.20
	1909.8	30.00	30.42	0.22	30.04	0.38	-9	21.04
GPRS1900 (1 Slot)	1850.2	30.00	30.26	0.36	29.93	0.33	-9	20.93
	1880	30.00	30.26	0.36	29.79	0.47	-9	20.79
	1909.8	30.00	30.19	0.29	29.8	0.39	-9	20.80
GPRS1900 (2 Slot)	1850.2	27.00	27.68	0.68	27.19	0.49	-6	21.19
	1880	27.00	27.53	0.53	27.21	0.32	-6	21.21
	1909.8	27.00	27.45	0.45	27.06	0.39	-6	21.06
GPRS1900 (3 Slot)	1850.2	25.23	25.58	0.35	25.24	0.34	-4.26	20.98
	1880	25.23	25.57	0.34	25.21	0.36	-4.26	20.95
	1909.8	25.23	25.53	0.30	25.16	0.37	-4.26	20.90
GPRS1900 (4 Slot)	1850.2	24.00	24.77	0.77	24.31	0.46	-3	21.31
	1880	24.00	24.83	0.83	24.33	0.5	-3	21.33
	1909.8	24.00	24.63	0.63	24.32	0.31	-3	21.32

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 MHZ				
Mode	Frequency	Result		Conclusion
		Max. Peak ERP (dBm)	Polarization Of Max. ERP	
GSM850	824.2	33.67	Horizontal	Pass
	836.6	33.54	Horizontal	Pass
	848.8	**33.76**	Horizontal	Pass

Radiated Power (E.I.R.P) for PCS 1900 MHZ				
Mode	Frequency	Result		Conclusion
		Max. Peak E.I.R.P.(dBm)	Polarization Of Max. E.I.R.P.	
GSM 1900	1850.2	**30.59**	Horizontal	Pass
	1880.0	30.47	Horizontal	Pass
	1909.8	30.35	Horizontal	Pass

Note: Above is worst mode data.

6.3. Peak-to-Average Ratio

6.3.1 MEASUREMENT METHOD

The following steps outline the procedure used to measure the Peak-to-Average Ratio from the EUT.

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. For GSM operating modes:

a. Set the RBW = 1MHz, VBW = 1MHz, Peak detector in spectrum analyzer.

b. Set EUT in maximum power output, and triggered the burst signal.

c. Measured respectively the Peak level and Mean level, and the deviation was recorded as Peak to Average Ratio.

3. For UMTS operating modes:

a. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.

b. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.

6.3.2 PROVISIONS APPLICABLE

Use one of the procedures presented in 5.1 to measure the total peak power and record as PPk. Use one of the applicable procedures presented 5.2 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:

$$PAPR\ (dB) = P_{Pk}\ (dBm) - P_{Avg}\ (dBm).$$

6.3.3 MEASUREMENT RESULT

ACCORDING to **KDB 971168** D01 5.7

" If peak power or power density is used to demonstrate compliance, a PAPR measurement is not required."

According to section 6.1.2, the PAPR is the difference value of peak power and average power, and it meets the value of the limit.

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 GSM850, data taken from 30 MHz to 9 GHz.
2, Determine EUT transmit frequencies: the following typical channels were chosen to conducted emissions testing.

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.

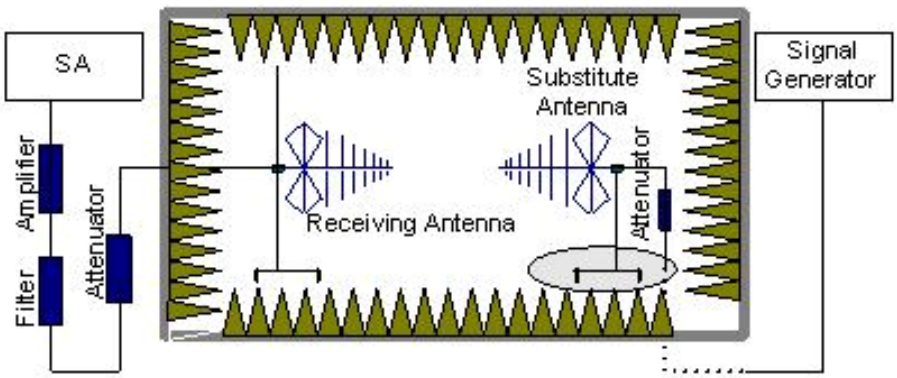
7.2 Radiated Spurious Emission

7.2.1 MEASUREMENT METHOD

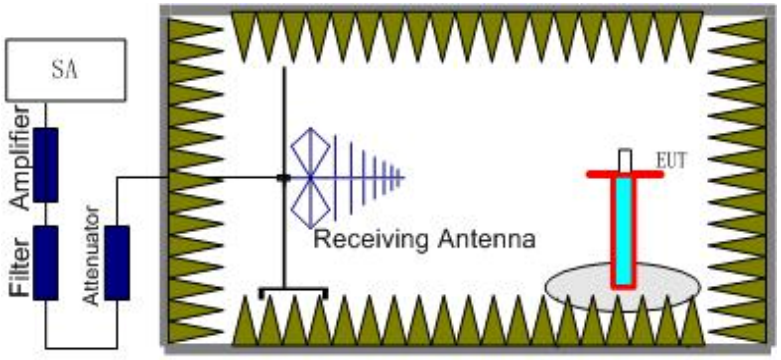
The measurements procedures specified in TIA-603C-2004 were used for testing. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set 1MHz as outlined in Part 24.238. The measurements were performed on all modes(GPRS850, GPRS1900) 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 251/848.8 MHz					
Frequency(MHz)	Power(dBm)	ARpl (dBm)	PMea(dBm)	Limit（dBm）	Polarity
1697.6	-38.12	-4.99	-33.13	-13.00	Horizontal
2546.4	-36.33	-2.45	-33.88	-13.00	Vertical
3395.2	-36.24	3.61	-39.85	-13.00	Vertical
4244.0	-38.45	2.82	-41.27	-13.00	Horizontal

PCS 1900:

The Worst Test Results for Channel 810/1909.8MHz					
Frequency(MHz)	Power(dBm)	ARpl (dBm)	PMea(dBm)	Limit（dBm）	Polarity
3819.6	-44.16	-3.21	-40.95	-13.00	Horizontal
5729.4	-40.28	0.34	-40.62	-13.00	Vertical
7639.2	-38.51	3.95	-42.46	-13.00	Horizontal
9549	-38.94	-2.26	-36.68	-13.00	Vertical

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

8. FREQUENCY STABILITY

8.1 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, 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.

8.2 PROVISIONS APPLICABLE

8.2.1 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.

8.2.2 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^{o}C.

8.3 MEASUREMENT RESULT (WORST)

Frequency Error Against Voltage for GSM850 band		
Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.5	36	0.043
3.7	30	0.036
4.2	41	0.049

Frequency Error Against Temperature for GSM850 band		
temperature(℃)	Frequency error(Hz)	Frequency error(ppm)
-10	39	0.047
0	31	0.037
10	35	0.042
20	43	0.051
30	42	0.050
40	34	0.041
50	40	0.048

Note: The EUT doesn't work below -10℃

Frequency Error Against Voltage for PCS1900 band		
Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.5	30	0.016
3.7	36	0.019
4.2	32	0.017

Frequency Error Against Temperature for PCS1900 band		
temperature(℃)	Frequency error(Hz)	Frequency error(ppm)
-10	56	0.030
0	45	0.024
10	39	0.021
20	42	0.022
30	48	0.026
40	59	0.031
50	51	0.027

Note: The EUT doesn't work below -10℃

9. OCCUPIED BANDWIDTH

9.1 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.

9.2 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.

9.3 MEASUREMENT RESULT

Occupied Bandwidth (99%) for GSM850 band		
Mode	Frequency(MHz)	Occupied Bandwidth (99%)(kHz)
Low Channel	824.2	243.59
Middle Channel	836.6	241.99
High Channel	848.8	240.38

Occupied Bandwidth (99%) for PCS1900 band		
Mode	Frequency(MHz)	Occupied Bandwidth (99%)(kHz)
Low Channel	1850.2	241.99
Middle Channel	1880.0	243.59
High Channel	1909.8	243.59

10. EMISSION 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

Emission Bandwidth (-26dBc) for GSM850 band		
Mode	Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)
Low Channel	824.2	317.31
Middle Channel	836.6	312.50
High Channel	848.8	310.90

Emission Bandwidth (-26dBc) for PCS1900 band		
Mode	Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)
Low Channel	1850.2	312.50
Middle Channel	1880.0	310.90
High Channel	1909.8	310.90

11. BAND EDGE

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

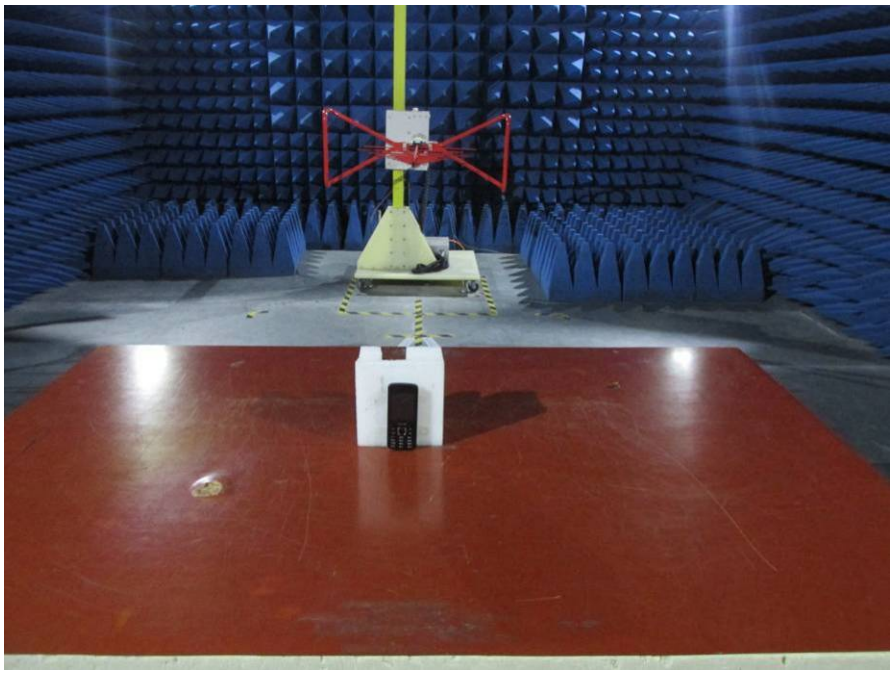
As Specified in FCC rules of 22.917(a) and 24.238(a)

11.3 MEASUREMENT RESULT

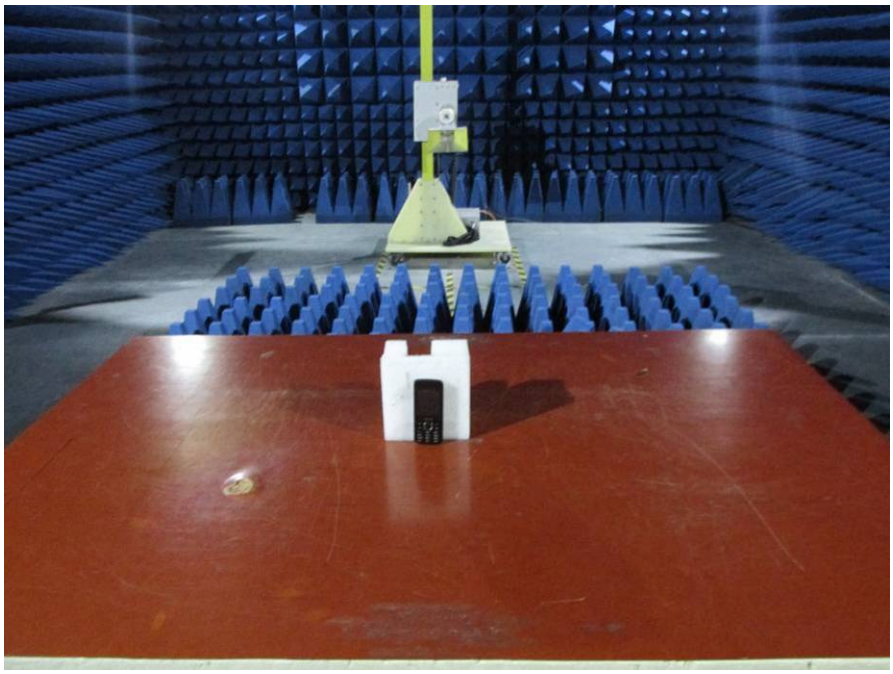
Please refers to Appendix III for compliance test plots for band edges

12. EUT TEST PHOTO

RADIATED EMISSION TEST



RADIATED EMISSION TEST



RF TEST

13. EUT PHOTO

Appearance photograph of EUT

Appearance photograph of EUT

Appearance photograph of EUT

Appearance photograph of EUT

Appearance photograph of EUT

Appearance photograph of EUT

Appearance photograph of EUT

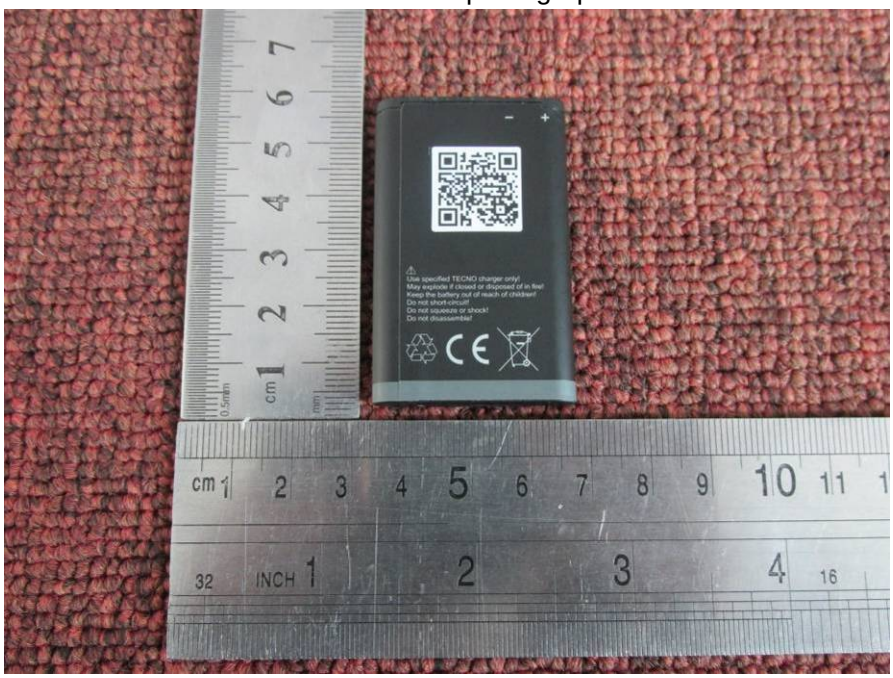
Appearance photograph of EUT

Internal photograph of EUT

Internal photograph of EUT

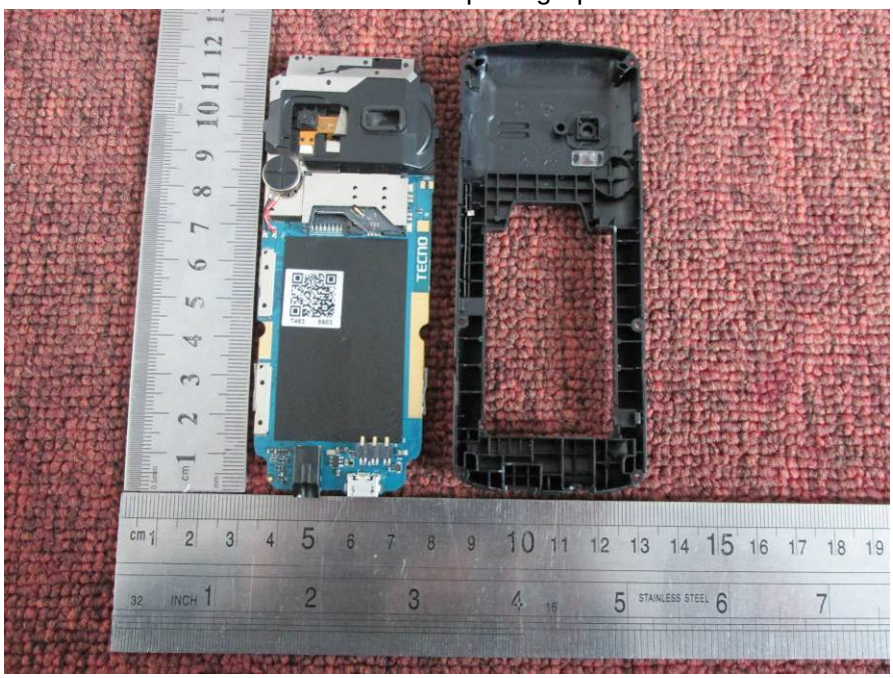
Internal photograph of EUT

Internal photograph of EUT

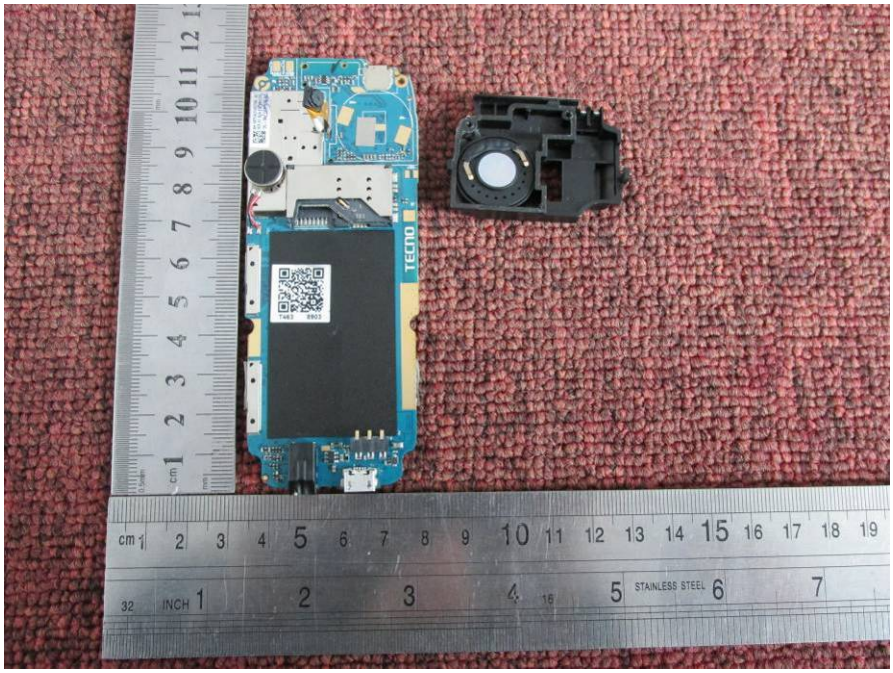


Internal photograph of EUT

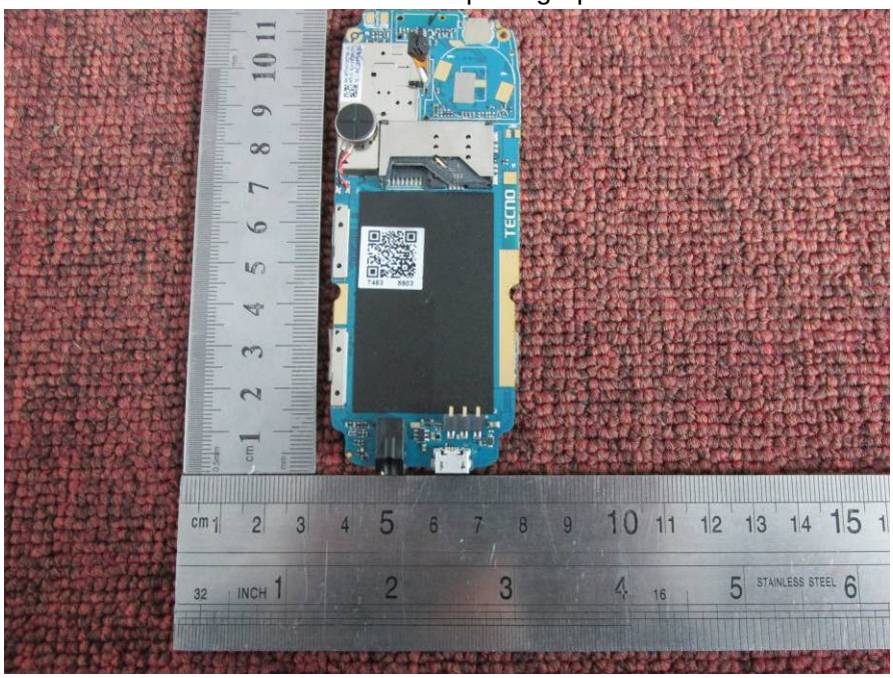
Internal photograph of EUT



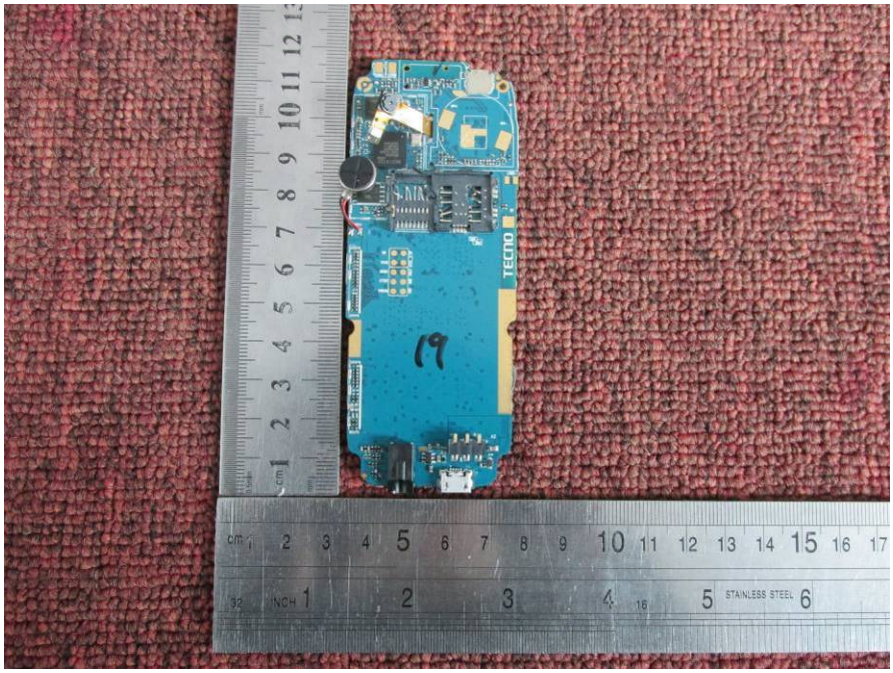
Internal photograph of EUT



Internal photograph of EUT



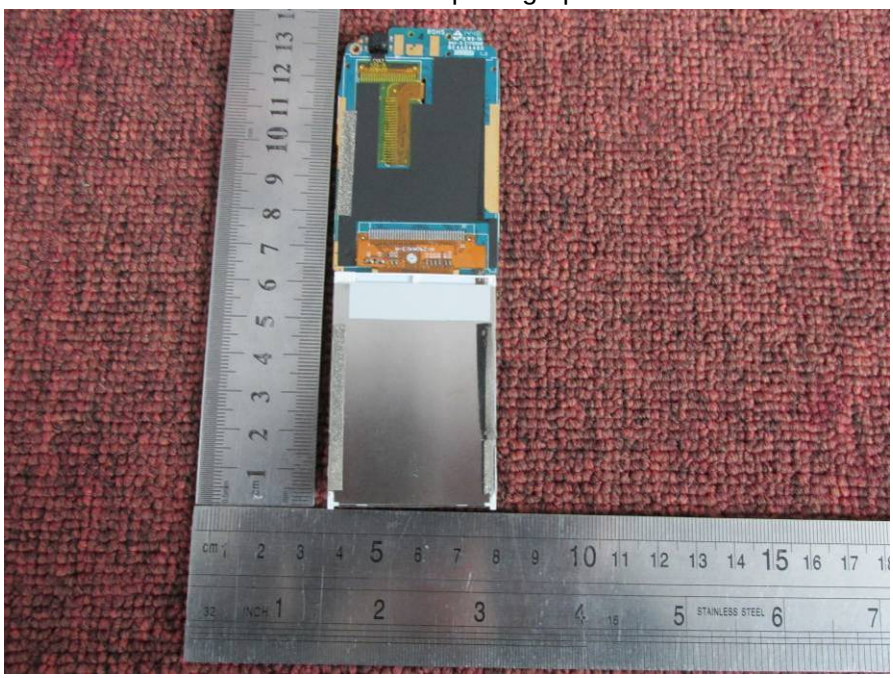
Internal photograph of EUT



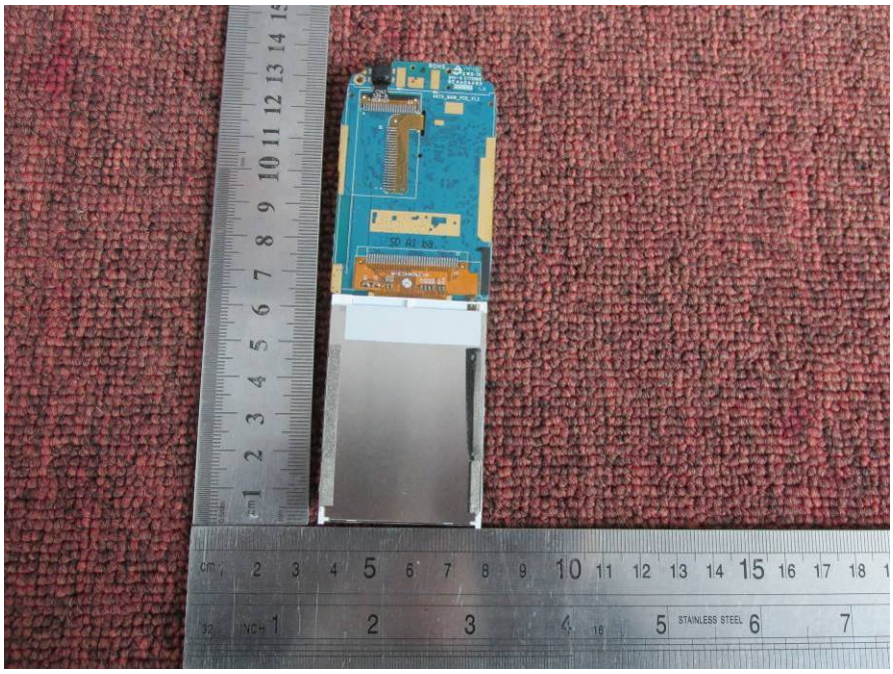
Internal photograph of EUT

Internal photograph of EUT

Internal photograph of EUT



Internal photograph of EUT

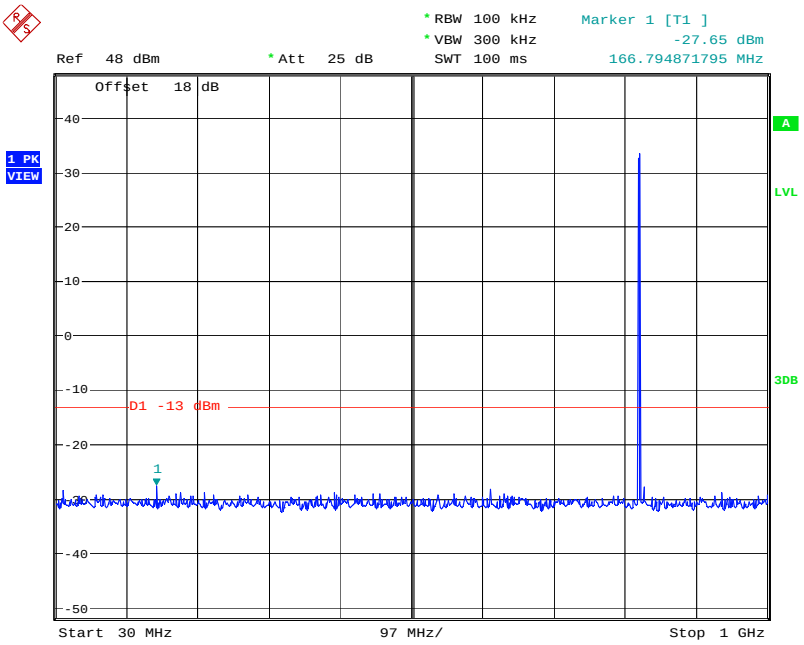


Note: The EUT and CMU200, frequency analyser are connected by three-way connector. There procude loss, like three-way connector loss, attenuator loss, RF cable loss. The offset is compensation.

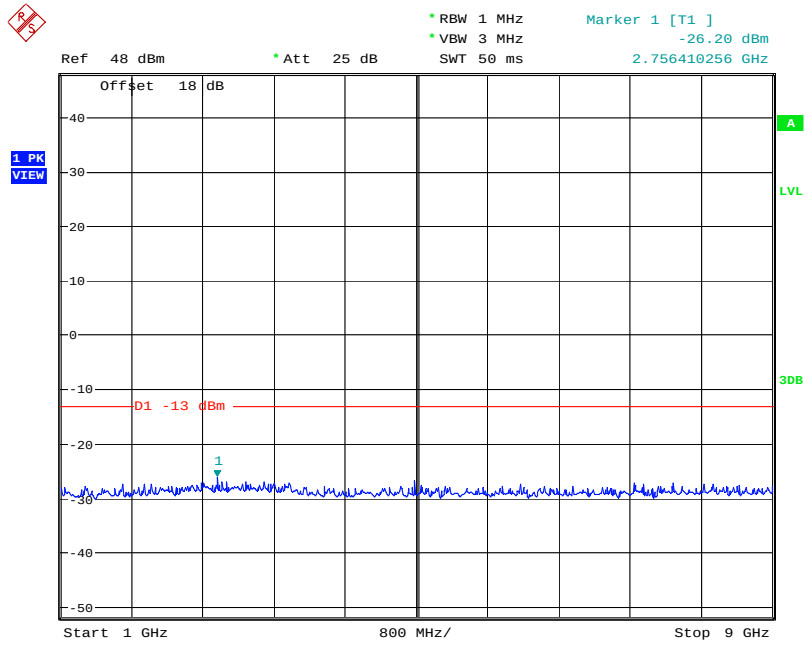
APPENDIX A: TEST PLOTS FOR CONDUCTED SPURIOUS EMISSIO

CONDUCTED EMISSION IN GSM850 BAND

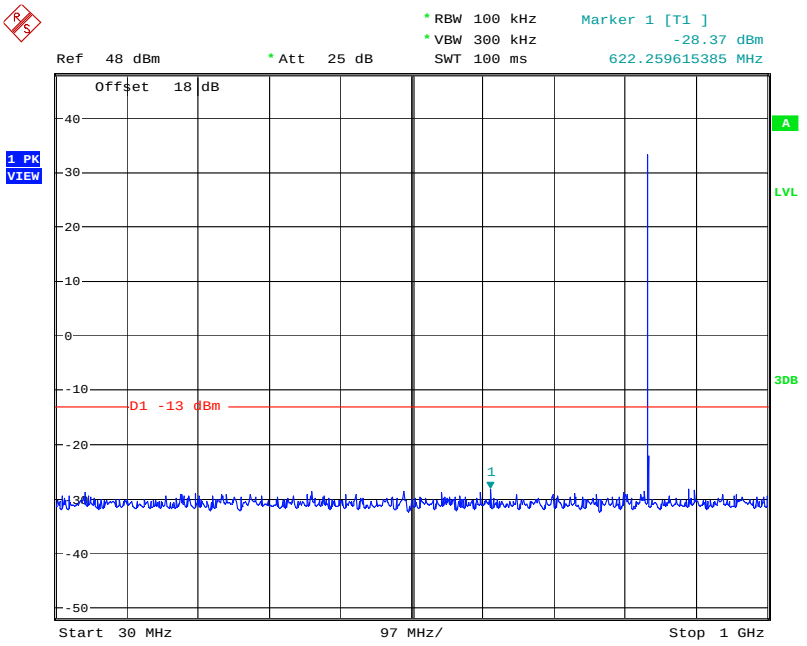
Conducted Emission Transmitting Mode CH 128 30MHz – 1GHz



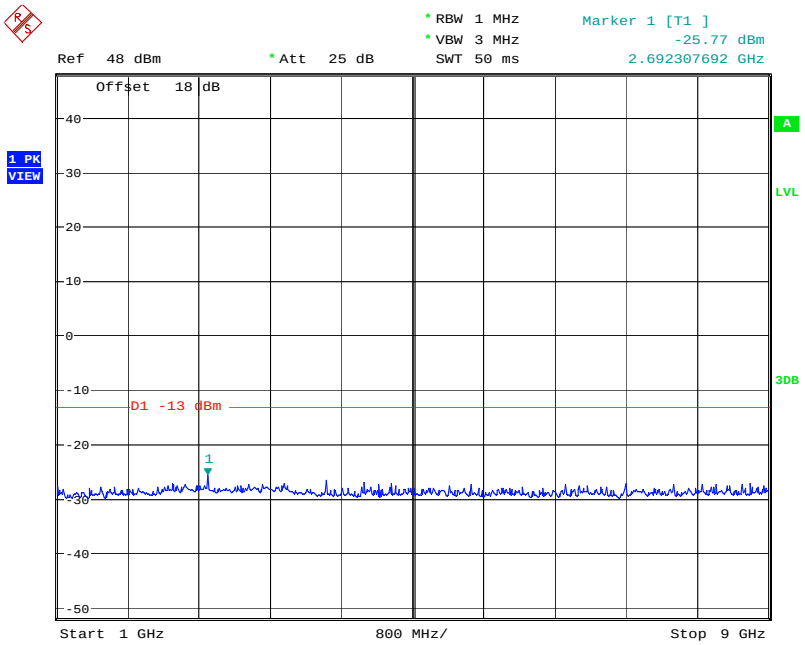
Conducted Emission Transmitting Mode CH 128 1GHz – 9GHz



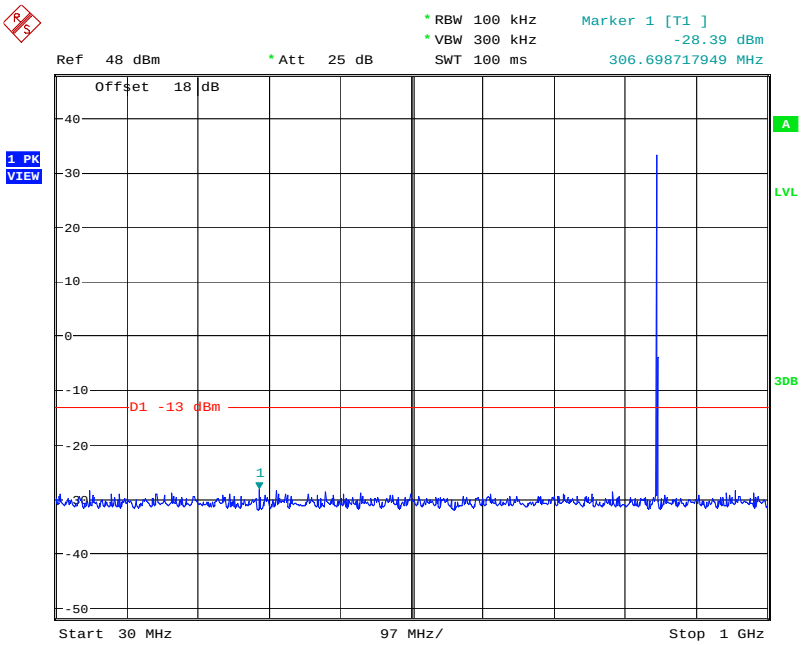
Conducted Emission Transmitting Mode CH 190 30MHz – 1GHz



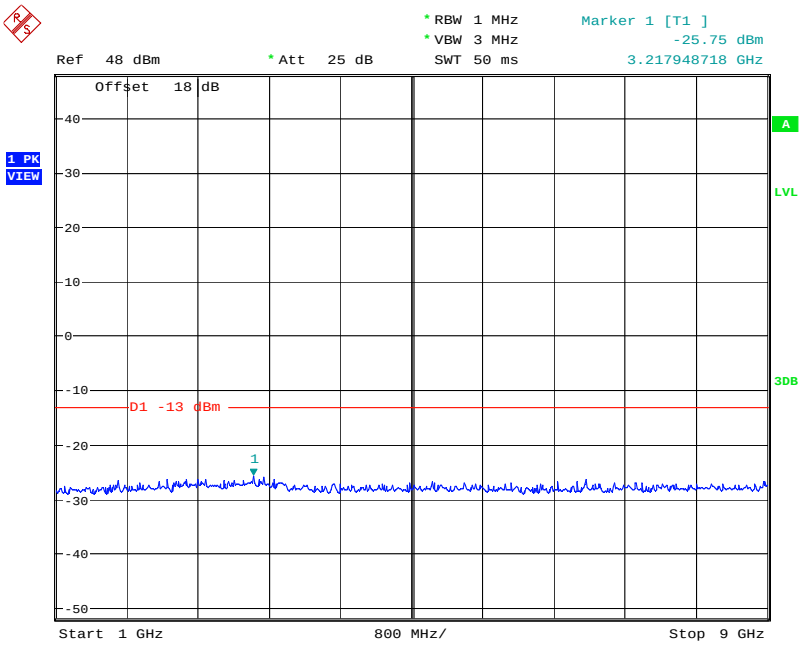
Conducted Emission Transmitting Mode CH 190 1GHz – 9GHz



Conducted Emission Transmitting Mode CH 251 30MHz – 1GHz

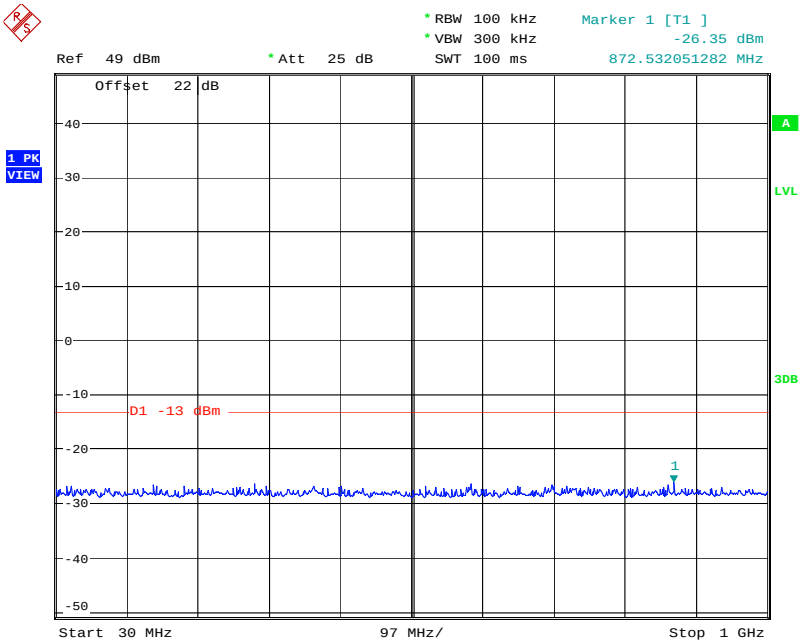


Conducted Emission Transmitting Mode CH 251 1GHz – 9GHz

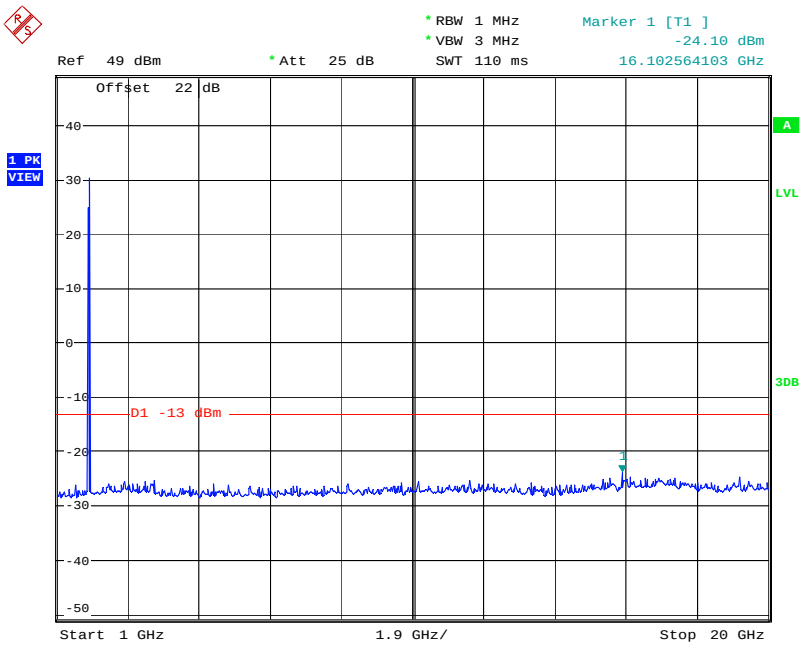


CONDUCTED EMISSION IN PCS1900 BAND

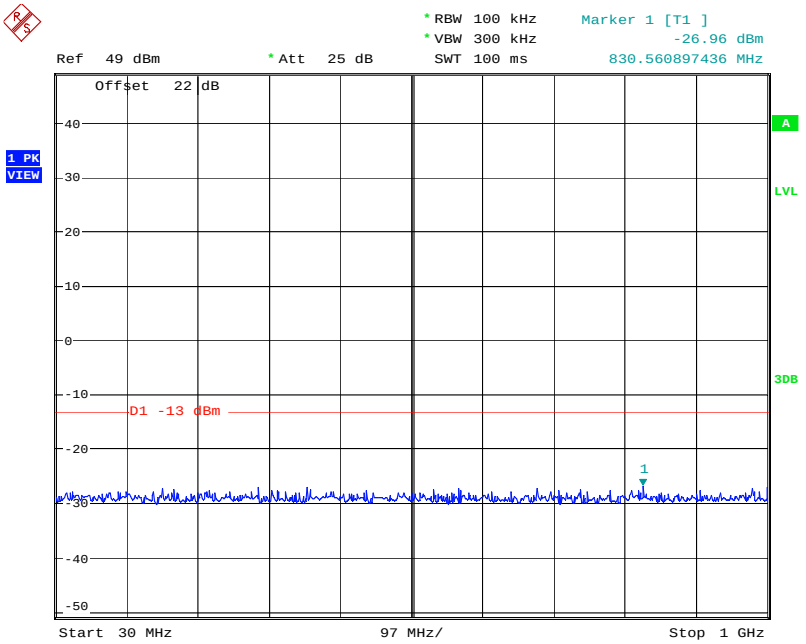
Conducted Emission Transmitting Mode CH 512 30MHz – 1GHz



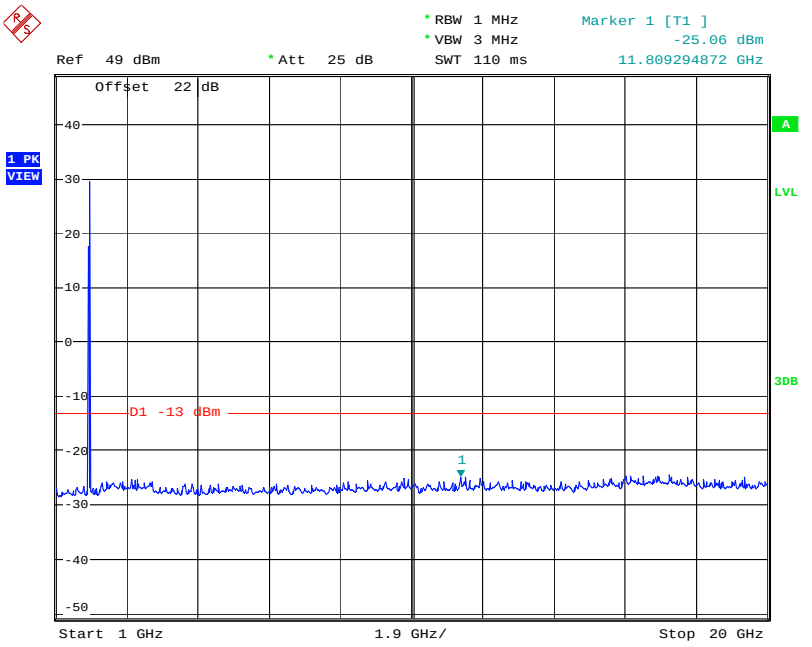
Conducted Emission Transmitting Mode CH 512 1GHz – 20GHz



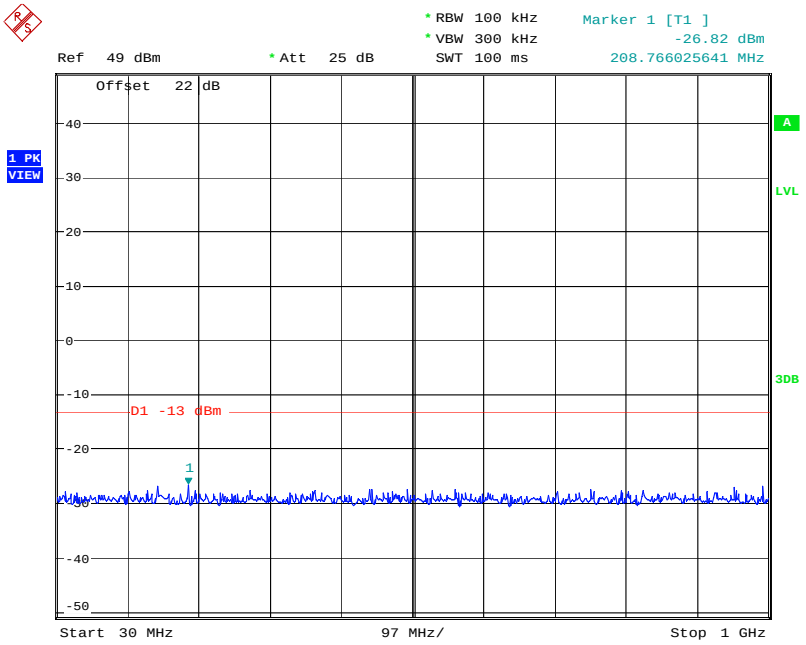
Conducted Emission Transmitting Mode CH 661 30MHz – 1GHz



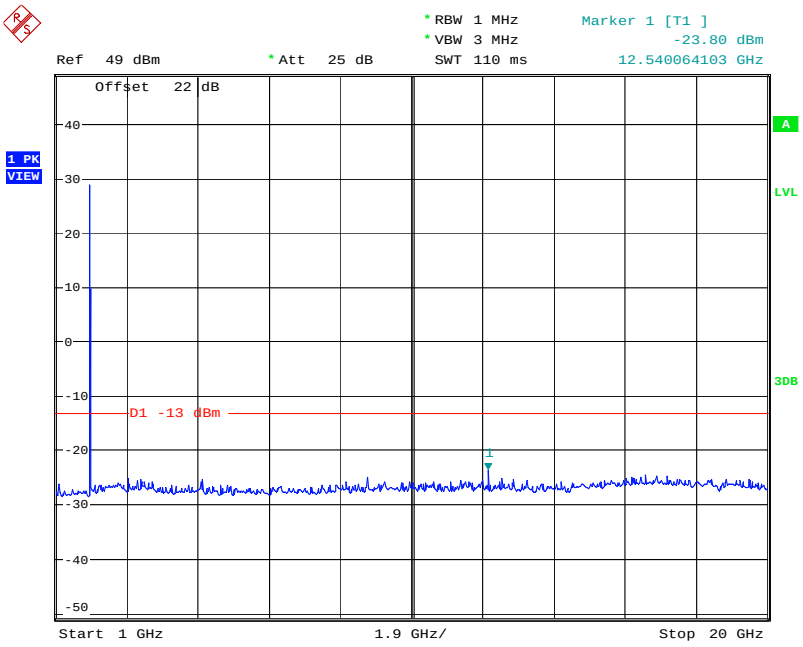
Conducted Emission Transmitting Mode CH 661 1GHz – 20GHz



Conducted Emission Transmitting Mode CH 810 30MHz – 1GHz

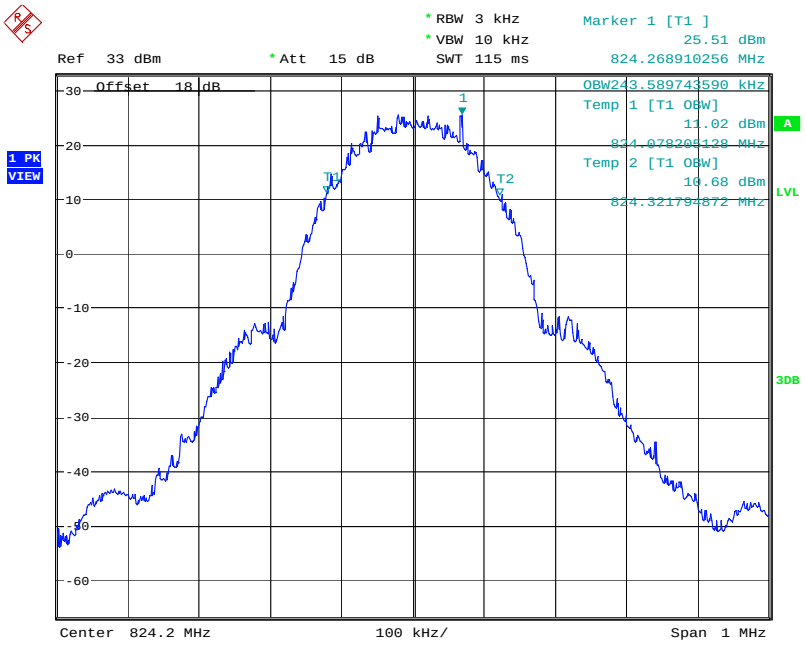


Conducted Emission Transmitting Mode CH 810 1GHz – 20GHz

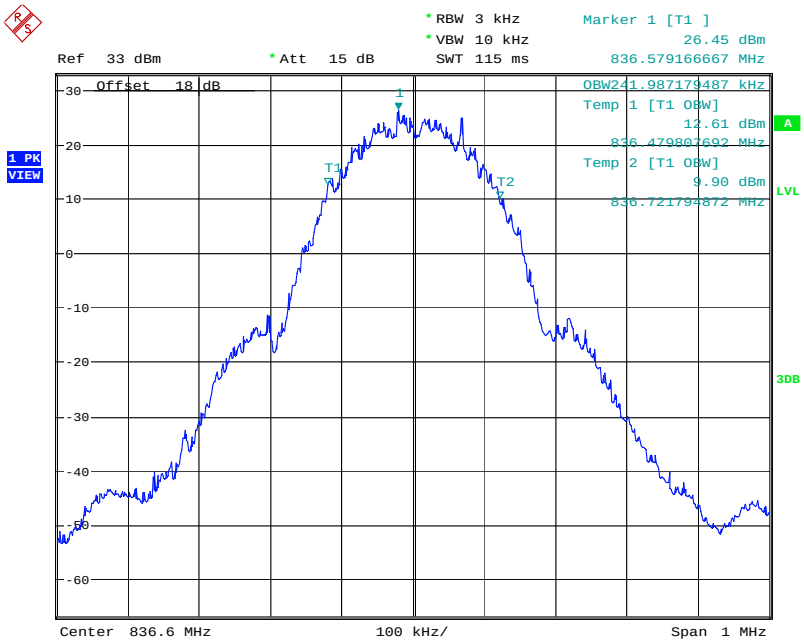


APPENDIX B: TEST PLOTS FOR OCCUPIED BANDWIDTH (99%)

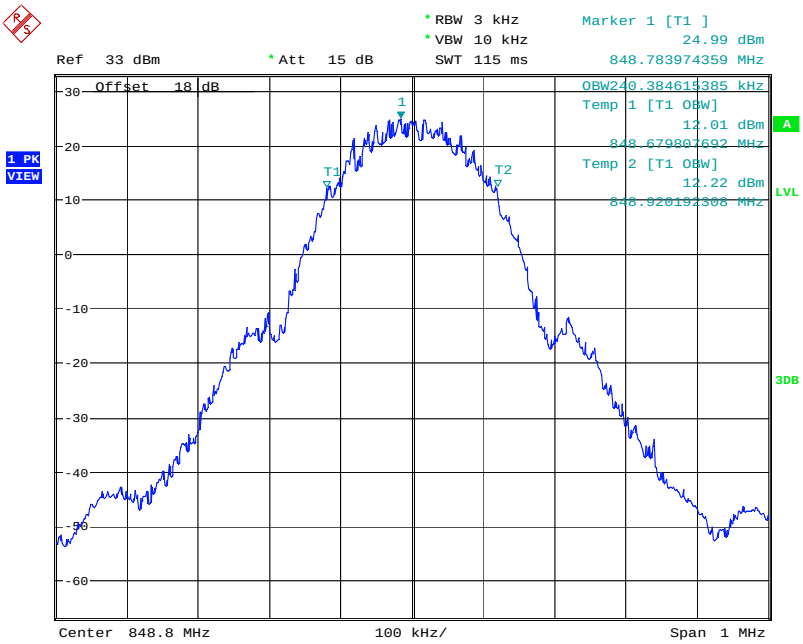
Occupied Bandwidth (99%) GSM 850 BAND CH 128



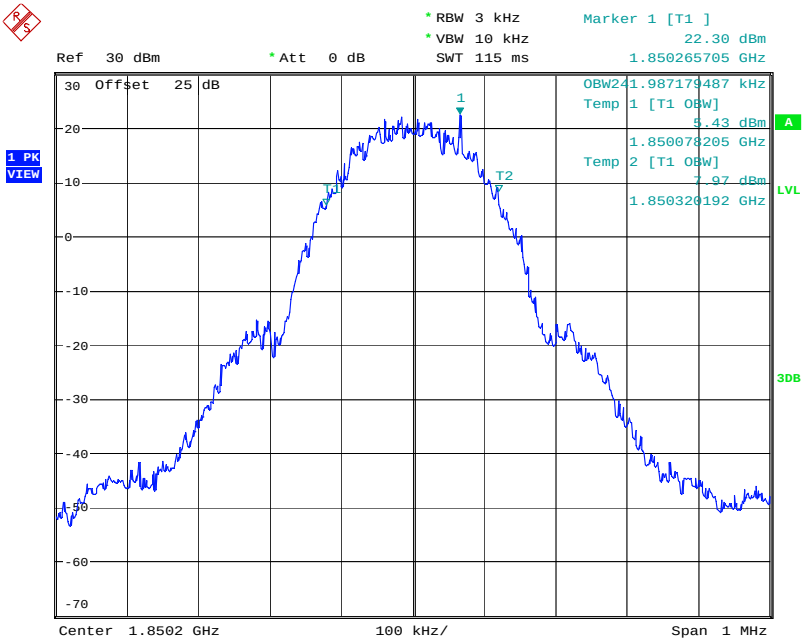
Occupied Bandwidth (99%) GSM 850 BAND CH 190



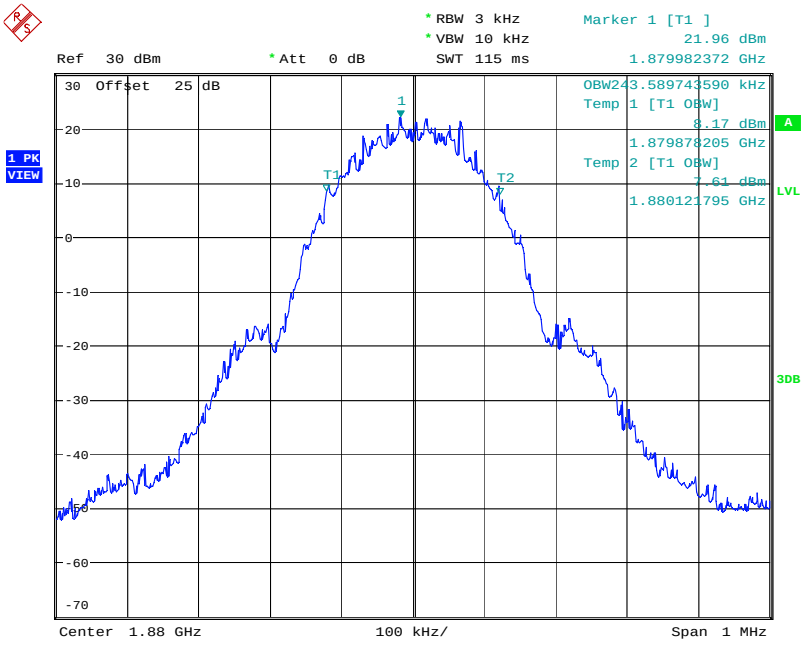
Occupied Bandwidth (99%) GSM 850 BAND CH 251



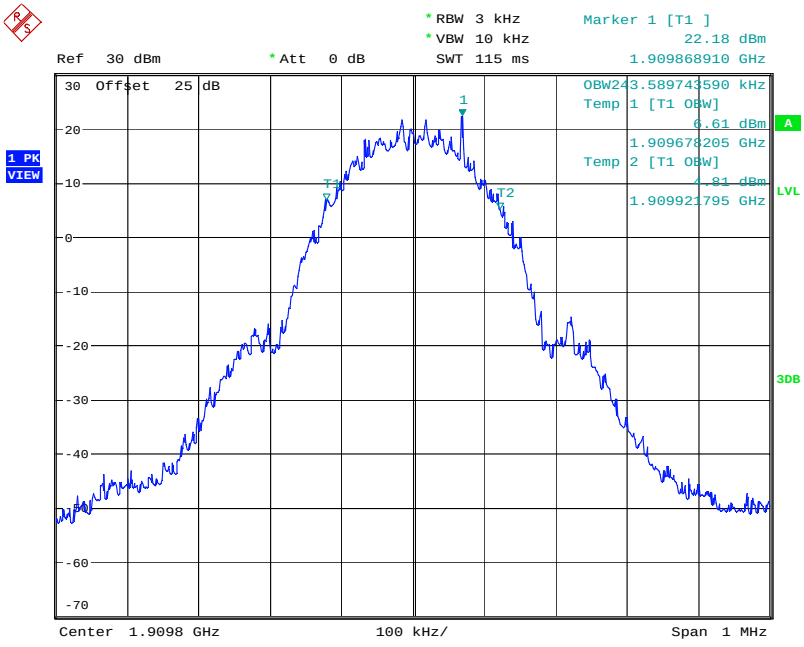
Occupied Bandwidth (99%) PCS 1900 BAND CH 512



Occupied Bandwidth (99%) PCS 1900 BAND CH 661

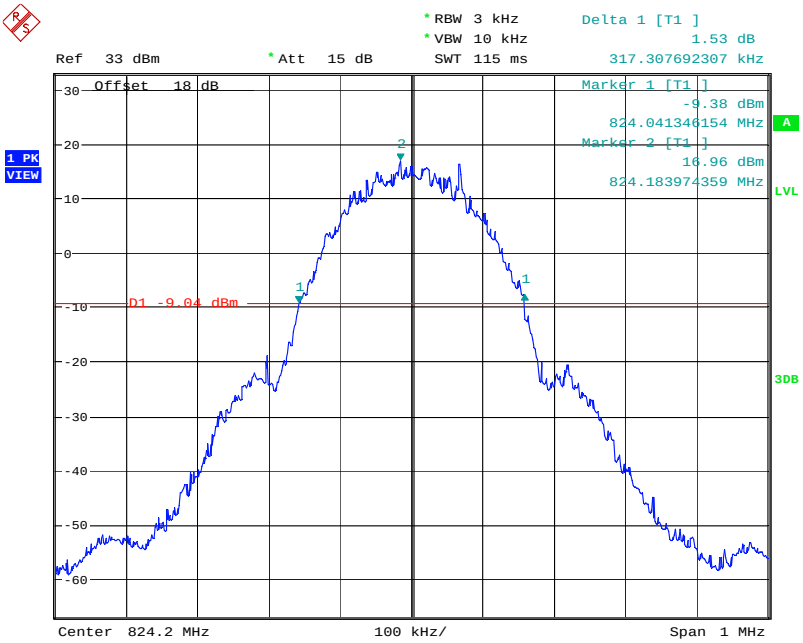


Occupied Bandwidth (99%) PCS 1900 BAND CH 810

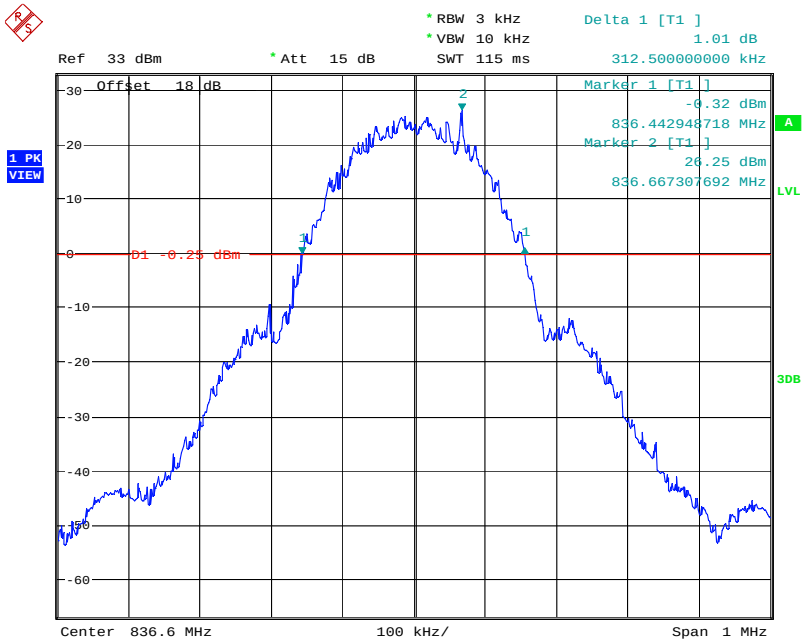


APPENDIX C: EMISSION BANDWIDTH (-26dBc)

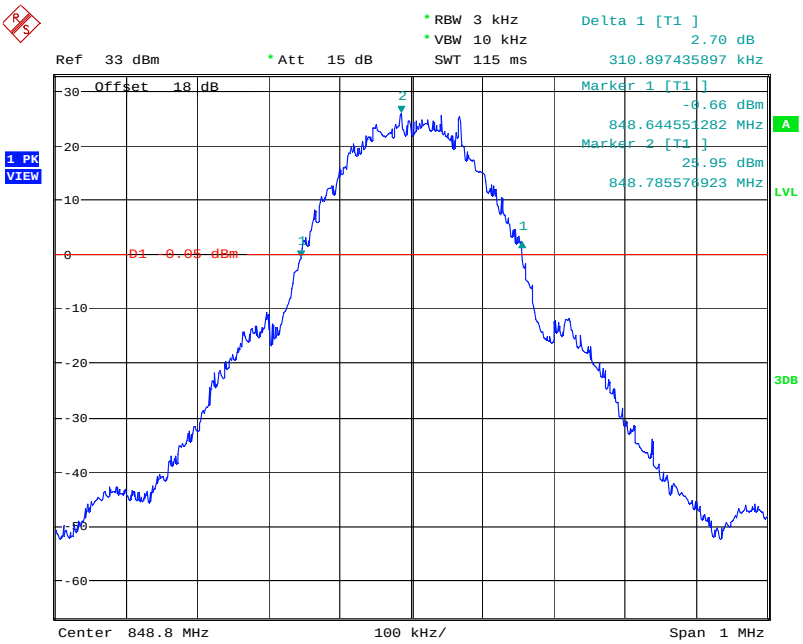
Occupied Bandwidth (-26dBc) GSM 850 BAND CH 128



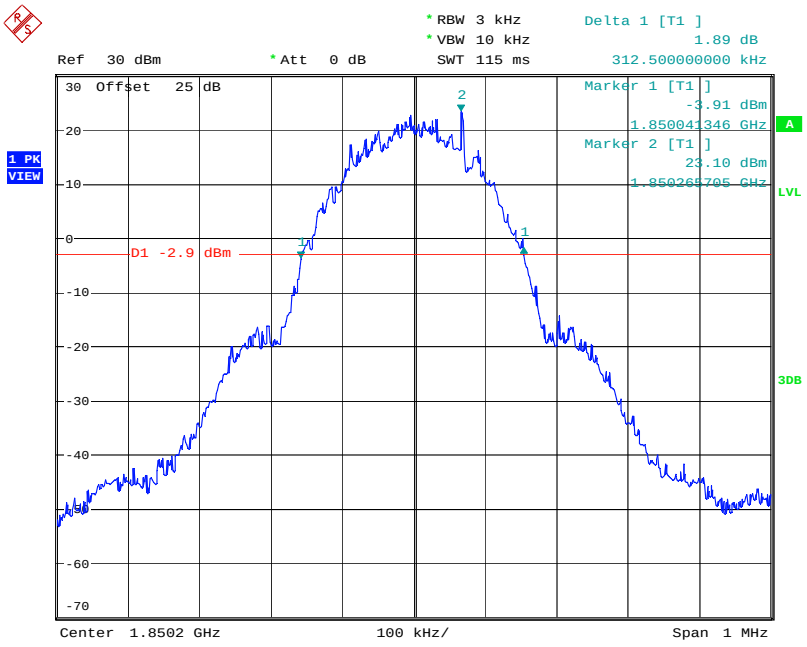
Occupied Bandwidth (-26dBc) GSM 850 BAND CH 190



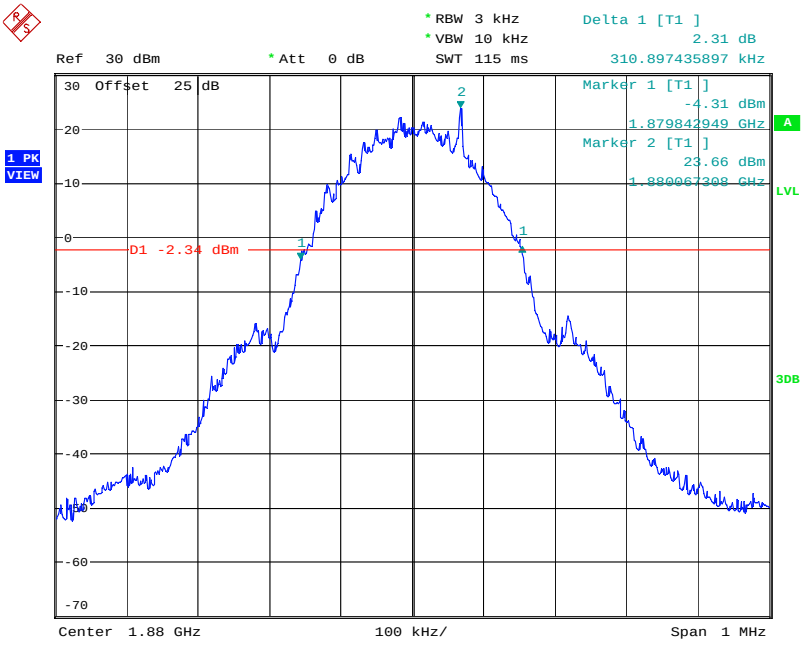
Occupied Bandwidth (-26dBc) GSM 850 BAND CH 251



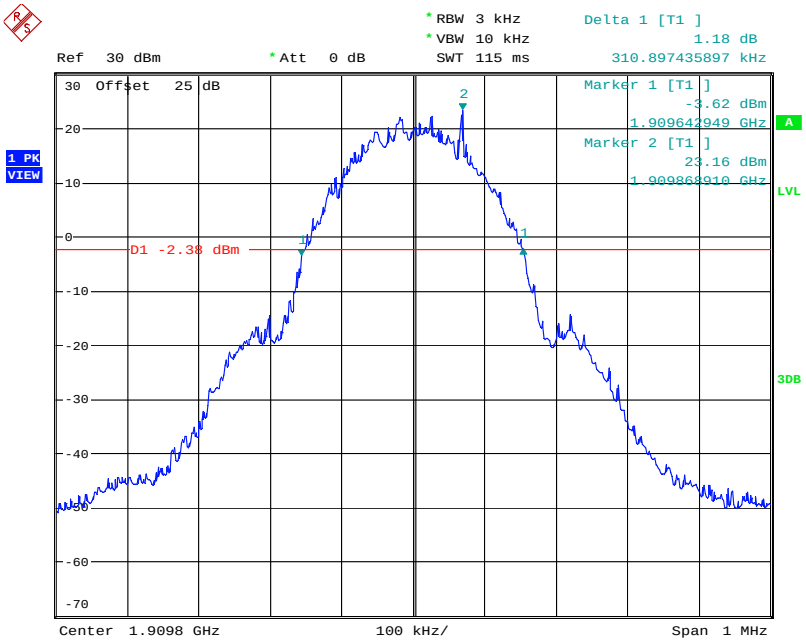
Occupied Bandwidth (-26dBc) PCS 1900 BAND CH 512



Occupied Bandwidth (-26dBc) PCS 1900 BAND CH 661

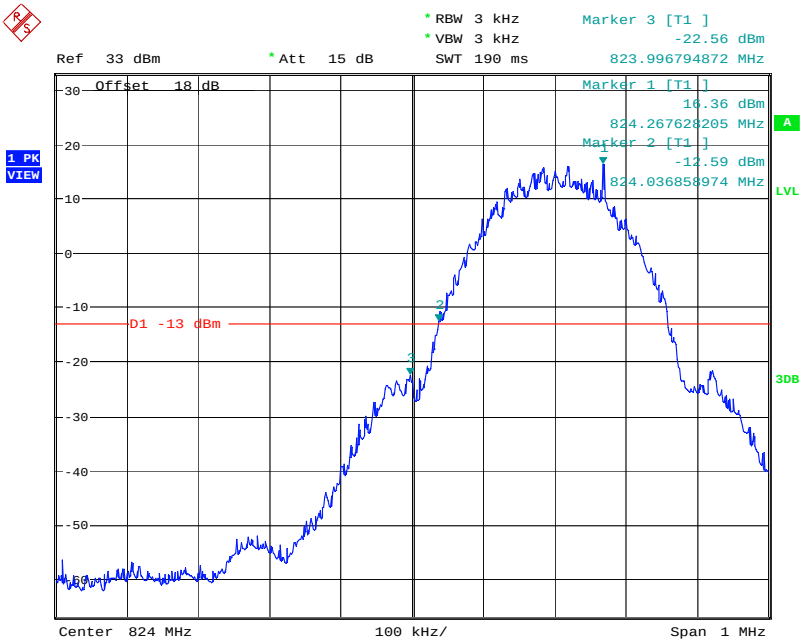


Occupied Bandwidth (-26dBc) PCS 1900 BAND CH 810

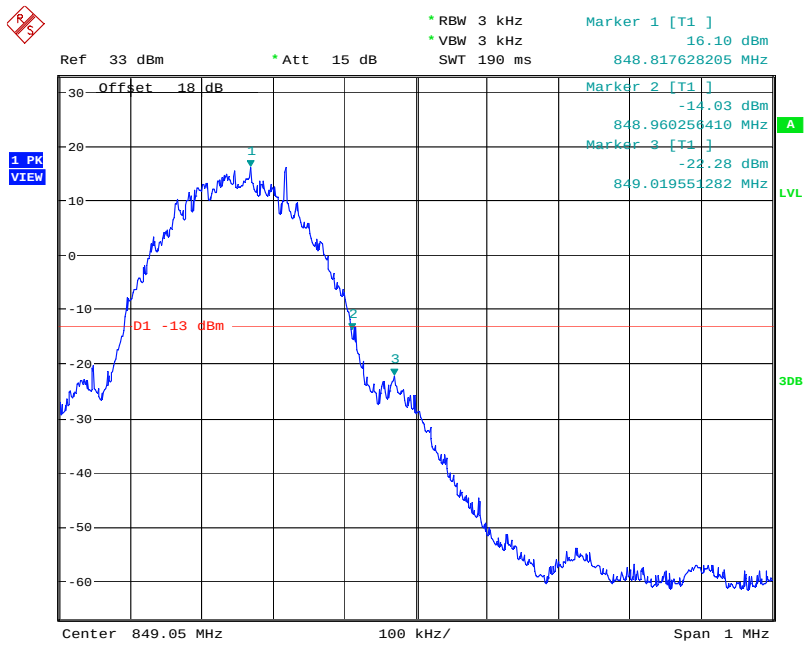


APPENDIX D: TEST PLOTS FOR BAND EDGES

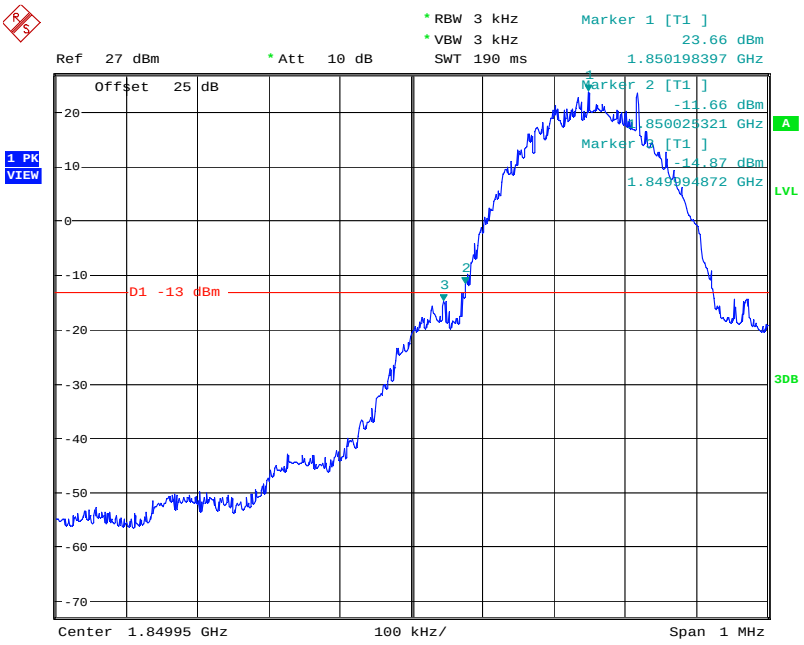
Low Band Edge GSM 850 BAND CH 128



High Band Edge GSM 850 BAND CH 251



Low Band Edge PCS 1900 BAND CH 512



High Band Edge PCS 1900 BAND CH 810