TESTING LABORATORY
CERTIFICATE # 4821.01

FCC PART 22H, PART 24E

TEST REPORT

For

Panasonic India Pvt Ltd

12th Floor , Ambience Tower, Ambience Island, NH-8, Gurgaon, Haryana-122002, India.

FCC ID: 2APTIS50P8N

Report Type:	Product Type:
Original Report	mobile phone

Report Number:	RSZ180717003-00D
Report Date:	2018-08-16
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Panasonic India Pvt Ltd's* product, model number: Panasonic P85 NXT (*FCC ID: 2APTIS50P8N)* or the "EUT" in this report was a *mobile phone*, which was measured approximately: 141.7mm (L) × 70.8 mm (W) × 9.3 mm (H), rated with input voltage: DC 3.85V from battery or DC 5.0V from adapter.

Adapter Information:
Model: U222N0A050200
Input: AC 100-240V, 50/60Hz, 350mA
Output: DC 5.0V, 2A

**All measurement and test data in this report was gathered from production sample serial number: 180717003 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2018-07-17.*

Objective

This test report is prepared on behalf of *Panasonic India Pvt Ltd* in accordance with Part 2-Subpart J, Part 22-Subpart H and Part 24-Subpart E of the Federal Communication Commissions rules.

The objective is to determine the compliance of the EUT with FCC rules for output power, modulation characteristic, occupied bandwidth, and spurious emission at antenna terminal, spurious radiated emission, frequency stability and band edge.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS, Part 15.247 DTS and Part 15B JBP submissions with FCC ID: 2APTIS50P8N.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2-Subpart J as well as the following parts:

Part 22 Subpart H - Public Mobile Services
Part 24 Subpart E - Personal Communication Services

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF output power, conducted		±1.5dB
Unwanted Emission, conducted		±1.5dB
Emissions, radiated	Below 1GHz	±4.70dB
	Above 1GHz	±4.80dB
Temperature		±1℃
Supply voltages		±0.4%

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The EUT was configured for testing according to TIA/EIA-603-D.

The final qualification test was performed with the EUT operating at normal mode.

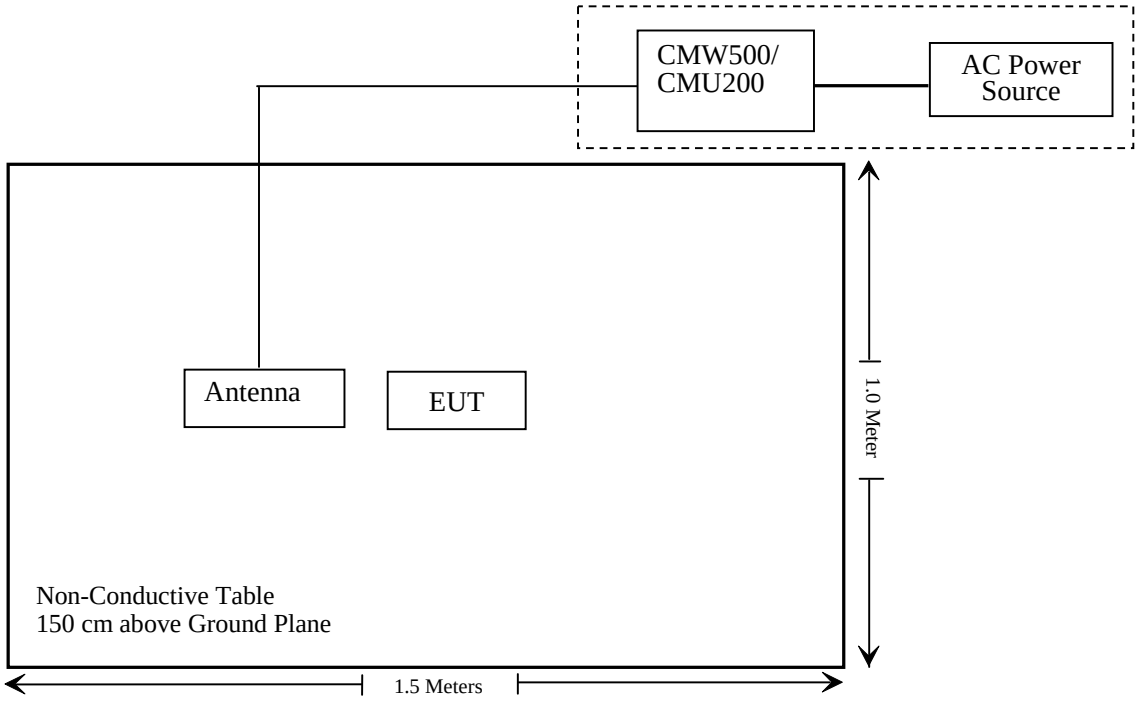
Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-116218-UY
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	110605

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 1.1307 , §2.1093	RF Exposure (SAR)	Compliance*
§2.1046; § 22.913 (a); § 24.232 (c);	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905; § 22.917; § 24.238;	Occupied Bandwidth	Compliance
§ 2.1051; § 22.917 (a); § 24.238 (a);	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053; § 22.917 (a); § 24.238 (a);	Field Strength of Spurious Radiation	Compliance
§ 22.917 (a); § 24.238 (a);	Band Edge	Compliance
§ 2.1055; § 22.355; § 24.235;	Frequency stability	Compliance

Note: * Please refer to SAR report released by BACL, report number: RSZ180717003-20

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017-12-22	2020-12-21
Rohde & Schwarz	Signal ANALYZER	FSIQ26	8386001028	2018-04-24	2019-04-24
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2018-05-21	2019-05-21
HP	Amplifier	HP8447E	1937A01046	2018-05-21	2018-11-19
Anritsu	Signal Generator	68369B	004114	2017-12-24	2018-12-24
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2018-01-11	2019-01-11
COM POWER	Dipole Antenna	AD-100	041000	NCR	NCR
A.H. System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369 223410-001	2018-05-21	2018-11-19
Ducommun technologies	RF Cable	104PEA	218124002	2018-05-21	2018-11-19
Ducommun technologies	RF Cable	RG-214	1	2018-05-21	2018-11-19
Ducommun technologies	RF Cable	RG-214	2	2018-05-22	2018-11-22
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-28
Ducommun technologies	Horn Antenna	ARH-4223-02	1007726-03	2017-12-29	2020-12-28
Ducommun technologies	Pre-amplifier	ALN-22093530-01	991373-01	2017-08-03	2018-08-03
Ducommun technologies	Pre-amplifier	ALN-22093530-01	991373-01	2018-08-03	2019-08-03

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2017-12-24	2018-12-24
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2017-12-21	2018-12-21
Long Wei	DC Power Supply	TPR-6420D	398363	NCR	NCR
Aglient	ESG Vector Signal Generator	E4438C	MY42080875	2018-05-09	2019-05-09
Rohde & Schwarz	Wideband Radio Communication Tester	CMU200	106891	2017-12-14	2018-12-14
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-146520-wh	2018-04-24	2019-04-24
Ducommun technologies	RF Cable	RG-214	3	Each Time	
WEINSCHEL	10dB Attenuator	5324	AU 3842	Each Time	
WEINSCHEL	3dB Attenuator	N/A	N/A	Each Time	
N/A	Power Splitter	N/A	N/A	2018-05-21	2019-05-21

* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliance, please refer to the SAR report: RSZ180717003-20.

FCC §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.

FCC § 2.1046, § 22.913 (a) & § 24.232 (c); - RF OUTPUT POWER

Applicable Standard

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

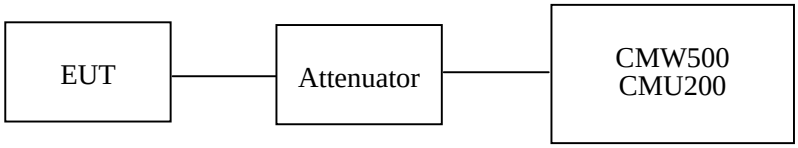
According to FCC §2.1046 and §24.232 (C), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

Test Procedure

Conducted method:

The RF output of the transmitter was connected to the CMW500/CMU200 through sufficient attenuation.



Radiated method:

TIA 603-D section 2.2.17

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Bibo Zhang on 2018-07-23.

Conducted Power

Cellular Band (Part 22H)

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
GSM	128	824.2	31.49	38.45
	190	836.6	31.54	38.45
	251	848.8	31.55	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	128	824.2	31.53	28.73	27.10	25.80	38.45
	190	836.6	31.57	28.64	26.96	25.63	38.45
	251	848.8	31.56	28.56	26.81	25.55	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
EGPRS	128	824.2	25.89	25.50	24.59	23.65	38.45
	190	836.6	25.79	25.37	24.51	23.44	38.45
	251	848.8	25.70	25.29	24.41	23.48	38.45

PCS Band (Part 24E)

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
GSM	512	1850.2	28.74	33
	661	1880.0	28.68	33
	810	1909.8	28.11	33

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	512	1850.2	28.88	27.02	25.10	23.63	33
	661	1880.0	28.79	26.55	24.93	23.57	33
	810	1909.8	28.22	26.45	24.29	23.24	33

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
EGPRS	512	1850.2	24.32	23.40	22.67	21.75	33
	661	1880.0	24.03	23.11	22.27	21.44	33
	810	1909.8	23.66	22.72	21.82	21.03	33

Peak-to-average ratio (PAR)

Cellular Band

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	1.51	13
	Middle	1.47	13
	High	1.43	13

Mode	Channel	PAR (dB)	Limit (dB)
EGPRS	Low	1.38	13
	Middle	1.42	13
	High	1.39	13

PCS Band

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	1.29	13
	Middle	1.34	13
	High	1.38	13

Mode	Channel	PAR (dB)	Limit (dB)
EGPRS	Low	1.44	13
	Middle	1.45	13
	High	1.39	13

Radiated Power
GSM Mode:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 22H/24E	
			Height (m)	Polar (H/V)	Level (dBm)	Cable loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
ERP for Cellular Band (Part 22H), Middle Channel										
836.6	81.37	45	2.3	H	19.3	0.7	0.0	18.60	38.45	19.85
836.6	92.72	96	2.2	V	32.3	0.7	0.0	31.60	38.45	6.85
EIRP for PCS Band (Part 24E), Middle Channel										
1880.00	87.64	236	1.9	H	17.6	1.30	9.40	25.70	33	7.3
1880.00	91.82	55	1.4	V	21.6	1.30	9.40	29.70	33	3.3

EDGE Mode:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	Level (dBm)	Cable loss (dB)	Antenna Gain (dB)			
ERP, Cellular Band (Part 22H), Middle Channel										
836.6	76.38	45	2.3	H	14.4	0.7	0.0	13.70	38.45	24.75
836.6	87.82	96	2.2	V	27.4	0.7	0.0	26.70	38.45	11.75
EIRP, PCS Band (Part 24E), Middle Channel										
1880.00	83.43	236	1.9	H	13.4	1.30	9.40	21.50	33	11.5
1880.00	87.71	55	1.4	V	17.5	1.30	9.40	25.60	33	7.4

LTE Band 5:

Maximum Output Power

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4	QPSK	RB Size=1, RB Offset=0	22.25	22.19	22.07
		RB Size=1, RB Offset=2	21.69	21.65	21.53
		RB Size=1, RB Offset=5	21.77	21.78	21.71
		RB Size=3, RB Offset=0	22.53	22.51	22.40
		RB Size=3, RB Offset=1	22.73	22.71	22.68
		RB Size=3, RB Offset=2	21.80	21.80	21.75
		RB Size=6, RB Offset=0	22.55	22.54	22.50
	16QAM	RB Size=1, RB Offset=0	22.15	22.13	22.03
		RB Size=1, RB Offset=2	22.37	22.37	22.25
		RB Size=1, RB Offset=5	22.69	22.69	22.61
		RB Size=3, RB Offset=0	22.21	22.20	22.08
		RB Size=3, RB Offset=1	22.54	22.57	22.51
		RB Size=3, RB Offset=2	21.41	21.35	21.28
		RB Size=6, RB Offset=0	21.07	21.03	20.93
3.0	QPSK	RB Size=1, RB Offset=0	22.01	21.95	21.90
		RB Size=1, RB Offset=7	21.43	21.32	21.23
		RB Size=1, RB Offset=14	21.58	21.51	21.39
		RB Size=8, RB Offset=0	22.32	22.28	22.25
		RB Size=8, RB Offset=4	22.64	22.61	22.48
		RB Size=8, RB Offset=7	21.71	21.66	21.63
		RB Size=15, RB Offset=0	22.01	21.95	21.90
	16QAM	RB Size=1, RB Offset=0	21.97	21.92	21.84
		RB Size=1, RB Offset=7	22.18	22.08	22.05
		RB Size=1, RB Offset=14	22.50	22.37	22.33
		RB Size=8, RB Offset=0	22.04	21.92	21.85
		RB Size=8, RB Offset=4	22.44	22.31	22.23
		RB Size=8, RB Offset=7	21.24	21.19	21.11
		RB Size=15, RB Offset=0	20.83	20.71	20.65

Bandwidth (MHz)	Modulation	RB size/RB Offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5.0	QPSK	RB Size=1, RB Offset=0	21.94	21.95	21.88
		RB Size=1, RB Offset=12	21.89	21.88	21.83
		RB Size=1, RB Offset=24	21.91	21.85	21.73
		RB Size=12, RB Offset=0	22.40	22.36	22.33
		RB Size=12, RB Offset=6	22.29	22.31	22.24
		RB Size=12, RB Offset=11	21.59	21.55	21.42
		RB Size=25, RB Offset=0	22.12	22.06	21.94
	16QAM	RB Size=1, RB Offset=0	21.82	21.69	21.61
		RB Size=1, RB Offset=12	21.74	21.64	21.60
		RB Size=1, RB Offset=24	21.68	21.62	21.59
		RB Size=12, RB Offset=0	22.23	22.20	22.10
		RB Size=12, RB Offset=6	22.15	22.07	22.00
		RB Size=12, RB Offset=11	21.38	21.32	21.28
		RB Size=25, RB Offset=0	21.90	21.78	21.69
10.0	QPSK	RB Size=1, RB Offset=0	22.08	22.07	21.96
		RB Size=1, RB Offset=24	21.82	21.81	21.71
		RB Size=1, RB Offset=49	22.36	22.38	22.28
		RB Size=25, RB Offset=0	21.78	21.79	21.70
		RB Size=25, RB Offset=12	21.38	21.39	21.36
		RB Size=25, RB Offset=24	22.09	22.08	22.01
		RB Size=50, RB Offset=0	20.63	20.63	20.53
	16QAM	RB Size=1, RB Offset=0	21.83	21.75	21.68
		RB Size=1, RB Offset=24	21.66	21.59	21.52
		RB Size=1, RB Offset=49	22.16	22.05	21.93
		RB Size=25, RB Offset=0	21.60	21.49	21.45
		RB Size=25, RB Offset=12	21.27	21.17	21.12
		RB Size=25, RB Offset=24	21.91	21.82	21.78
		RB Size=50, RB Offset=0	20.40	20.33	20.26

Peak-to-average ratio (PAR)

Modulation	Middle Channel (dB)	PAR Limit (dB)	Result
QPSK (1RB Size)	3.85	13	Pass
QPSK (50RB Size)	3.91	13	Pass
16QAM (1RB Size)	5.21	13	Pass
16QAM (50RB Size)	5.78	13	Pass

QPSK:

Frequency (MHz)	Receiver Reading (dBμV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
836.5	79.68	154	1.3	H	17.6	0.7	0.0	16.90	38.45
836.5	85.77	264	1.4	V	25.3	0.7	0.0	24.60	38.45
3 MHz Bandwidth									
836.5	78.68	233	1.7	H	16.6	0.7	0.0	15.90	38.45
836.5	84.29	124	1.0	V	23.9	0.7	0.0	23.20	38.45
5 MHz Bandwidth									
836.5	77.64	127	1.6	H	15.6	0.7	0.0	14.90	38.45
836.5	85.58	107	1.6	V	25.1	0.7	0.0	24.40	38.45
10 MHz Bandwidth									
836.5	76.64	92	1.9	H	14.6	0.7	0.0	13.90	38.45
836.5	84.28	192	2.3	V	23.8	0.7	0.0	23.10	38.45

16QAM:

Frequency (MHz)	Receiver Reading (dBμV)	Turn table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		
Middle Channel									
1.4 MHz Bandwidth									
836.5	79.67	106	2.1	H	17.6	0.7	0.0	16.90	38.45
836.5	85.94	127	1.8	V	25.5	0.7	0.0	24.80	38.45
3 MHz Bandwidth									
836.5	78.67	276	2.3	H	16.6	0.7	0.0	15.90	38.45
836.5	84.54	275	1.7	V	24.1	0.7	0.0	23.40	38.45
5 MHz Bandwidth									
836.5	77.6	90	2.0	H	15.6	0.7	0.0	14.90	38.45
836.5	83.44	91	1.4	V	23.0	0.7	0.0	22.30	38.45
10 MHz Bandwidth									
836.5	77.38	314	1.8	H	15.3	0.7	0.0	14.60	38.45
836.5	84.67	16	1.4	V	24.2	0.7	0.0	23.50	38.45

Note:
All above data were tested with no amplifier
Absolute Level = Substituted Level - Cable loss + Antenna Gain
Margin = Limit- Absolute Level

FCC §2.1049, §22.917, §22.905 & §24.238 - OCCUPIED BANDWIDTH

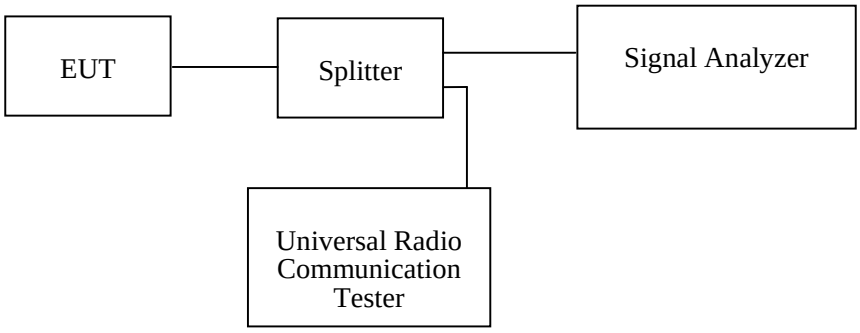
Applicable Standard

FCC 47 §2.1049, §22.917, §22.905 and §24.238 .

Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 1% to 5% of the anticipated emission bandwidth and the 26 dB & 99% bandwidth was recorded.



Test Data

Environmental Conditions

Temperature:	23~25 ℃
Relative Humidity:	50~52 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Bibo Zhang from 2018-07-24 to 2018-08-04.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the following tables and plots.

Cellular Band (Part 22H)

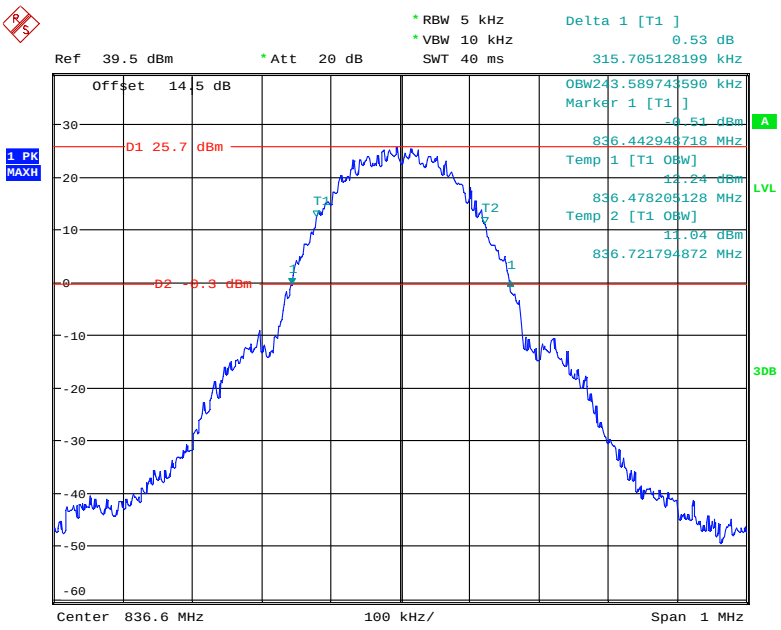
Mode	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM(GMSK)	836.6	243.59	315.71
EGPRS(8PSK)	836.6	247.79	315.71

PCS Band (Part 24E)

Mode	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM(GMSK)	1880.0	248.40	322.12
EGPRS(8PSK)	1880.0	241.99	310.90

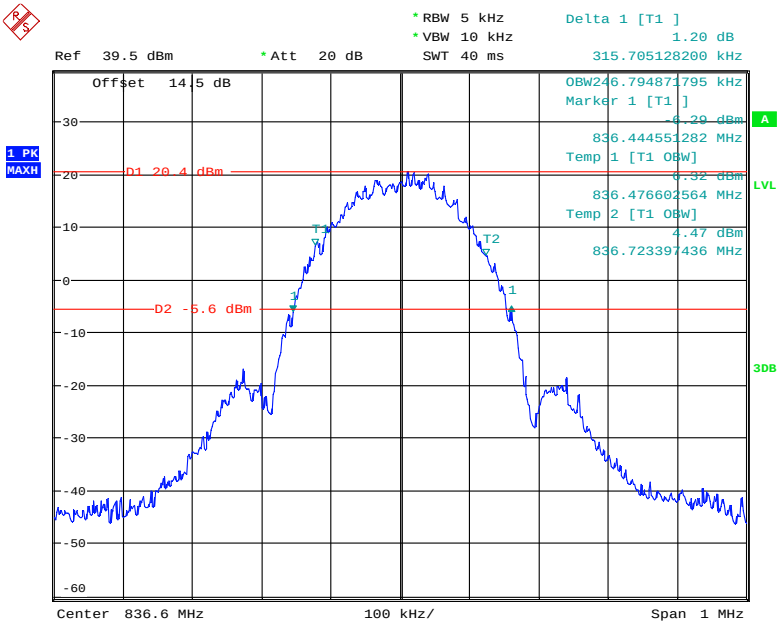
Cellular Band (Part 22H)

26 dB Emissions &99% Occupied Bandwidth for GSM (GMSK) Mode



Date: 24.JUL.2018 00:28:19

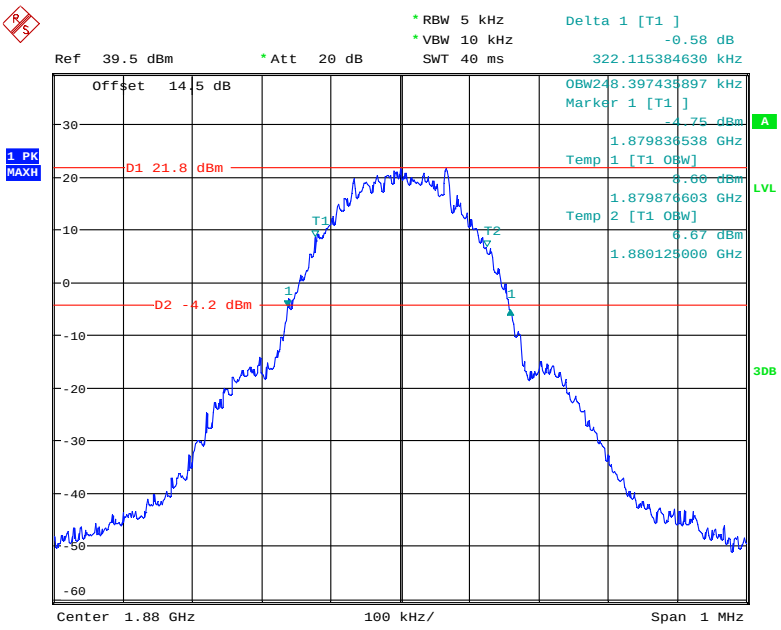
26 dB Emissions &99% Occupied Bandwidth for EDGE Mode



Date: 24.JUL.2018 00:25:52

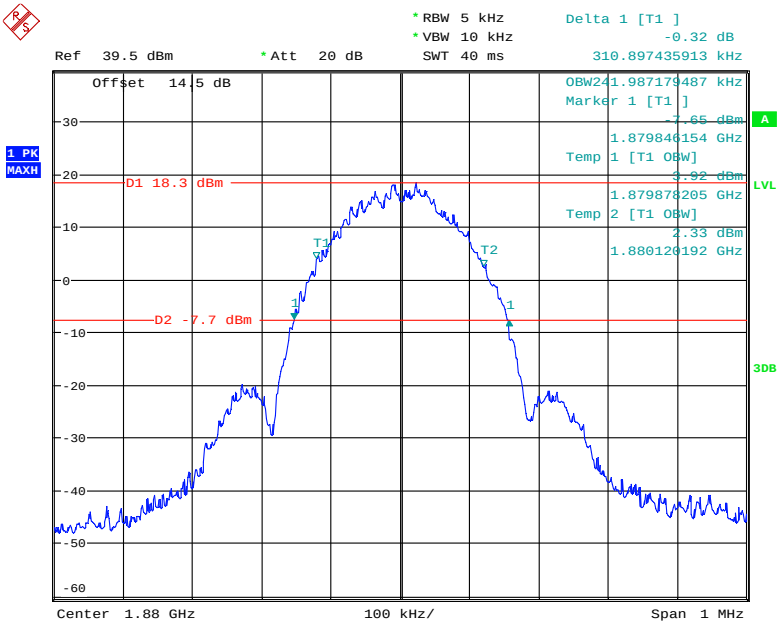
PCS Band (Part 24E)

26 dB Emissions &99% Occupied Bandwidth for GSM (GMSK) Mode



Date: 24.JUL.2018 00:10:31

26 dB Emissions &99% Occupied Bandwidth for EDGE Mode

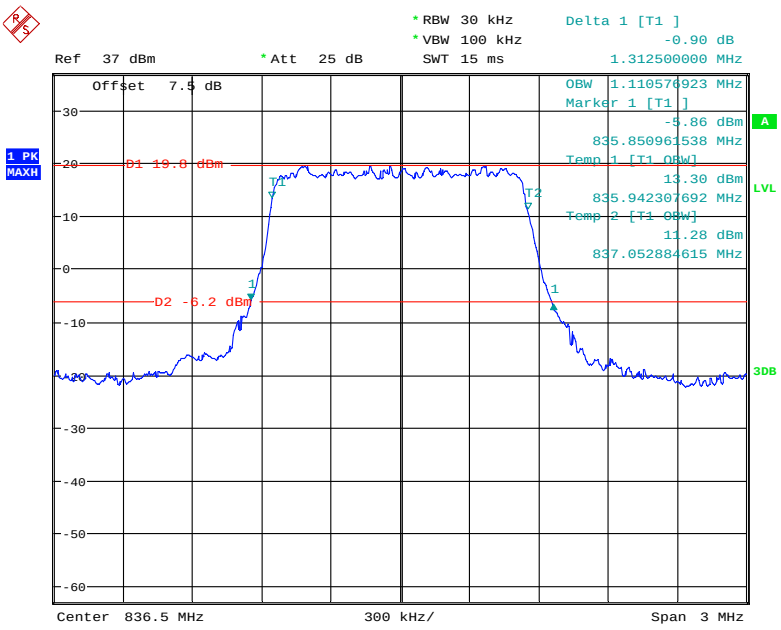


Date: 24.JUL.2018 00:05:58

LTE Band 5: (Middle Channel)

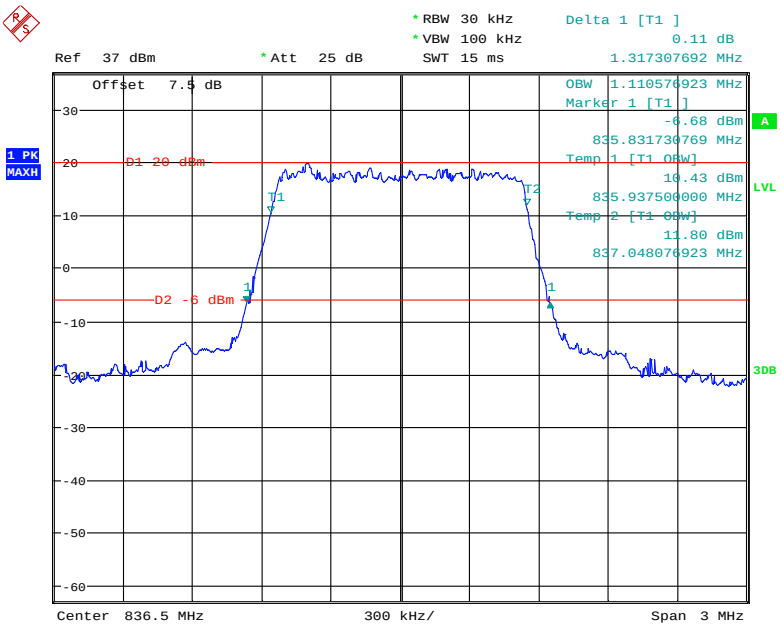
Bandwidth (MHz)	Modulation	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
1.4	QPSK	1.111	1.313
	16QAM	1.111	1.317
3.0	QPSK	2.702	2.942
	16QAM	2.702	2.971
5.0	QPSK	4.535	5.032
	16QAM	4.519	5.032
10.0	QPSK	8.942	9.712
	16QAM	8.942	9.712

QPSK (1.4 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



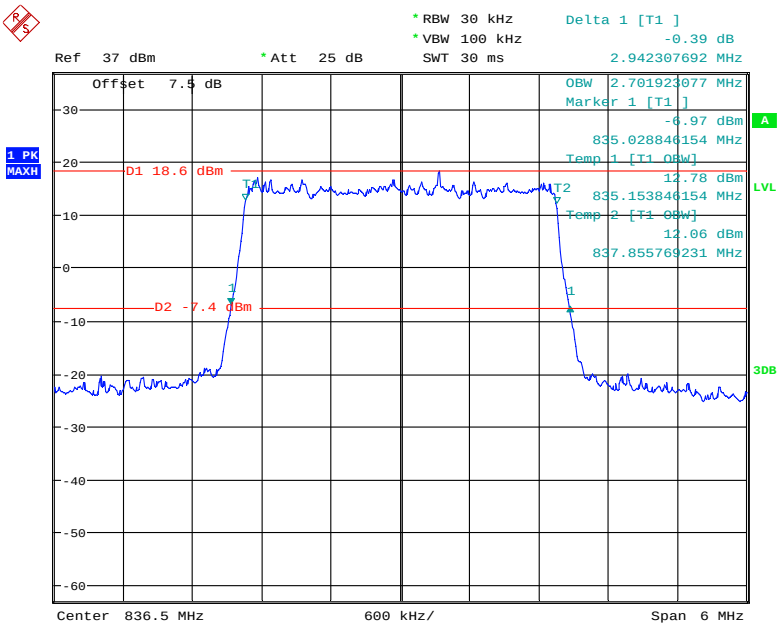
Date: 4.AUG.2018 00:13:12

16-QAM (1.4 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



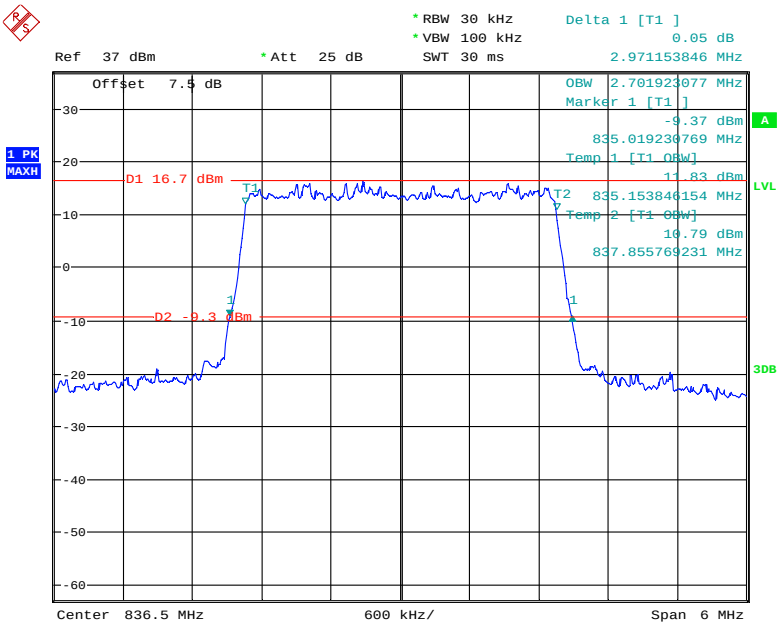
Date: 4.AUG.2018 00:10:36

QPSK (3.0 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



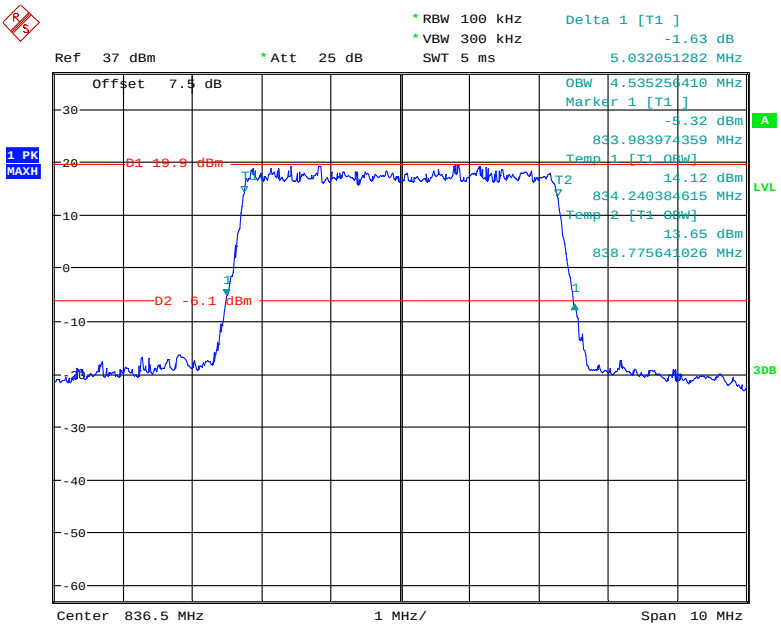
Date: 4.AUG.2018 00:09:16

16-QAM (3.0 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



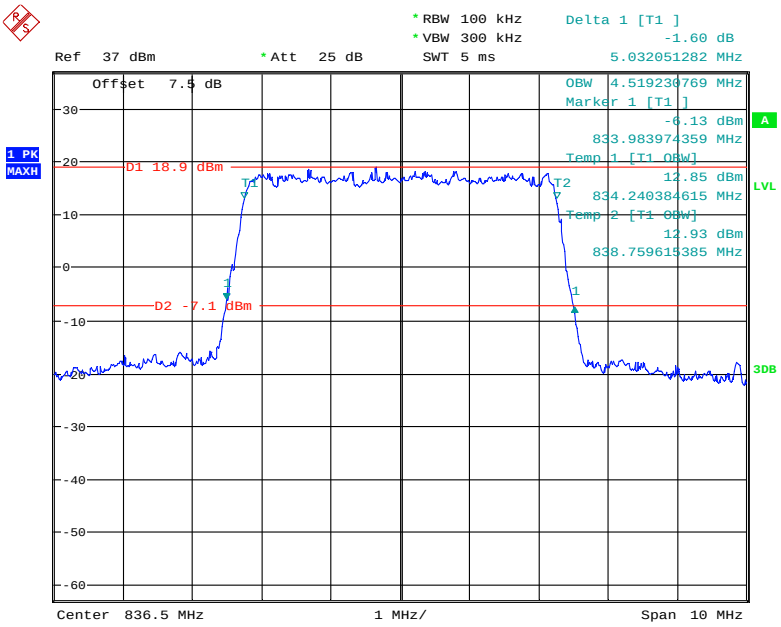
Date: 4.AUG.2018 00:07:49

QPSK (5.0 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



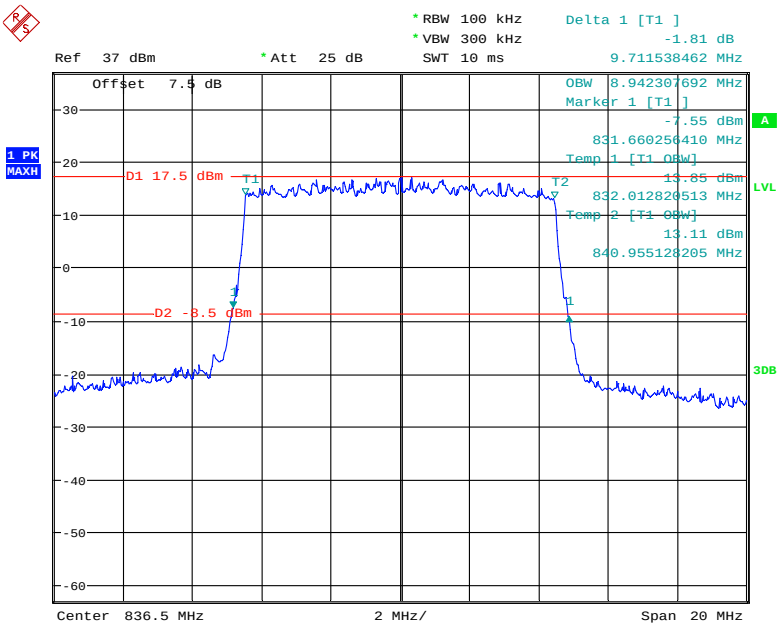
Date: 4.AUG.2018 00:16:52

16-QAM (5.0 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



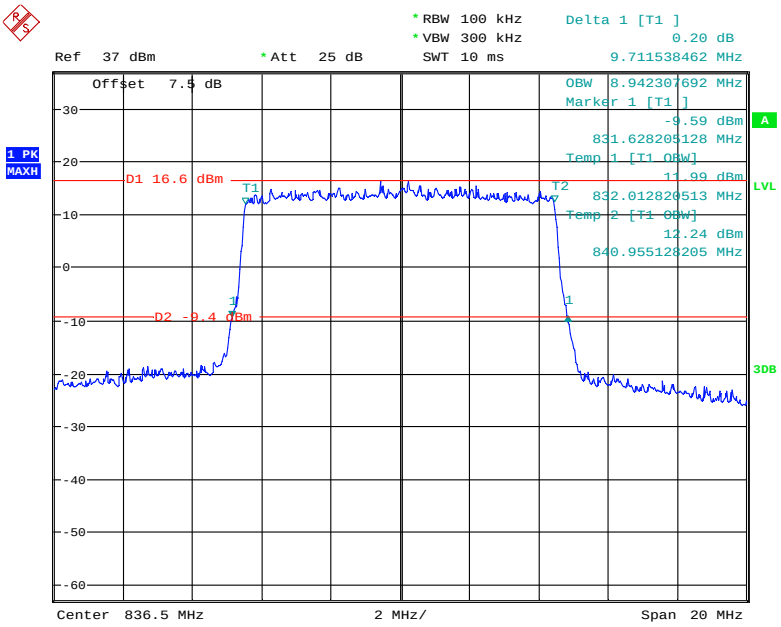
Date: 4.AUG.2018 00:15:19

QPSK (10.0 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



Date: 4.AUG.2018 00:20:21

16-QAM (10.0 MHz) - 26 dB Bandwidth & 99% Occupied Bandwidth, Middle channel



Date: 4.AUG.2018 00:18:46

FCC §2.1051, §22.917(a) & §24.238(a) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

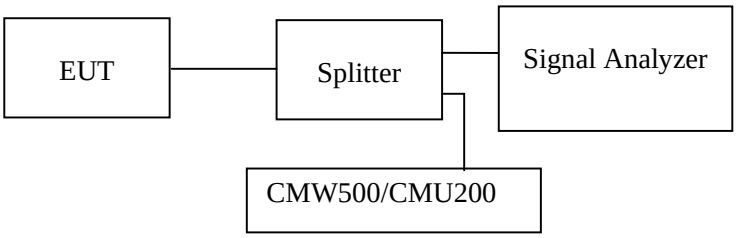
Applicable Standard

FCC §2.1051, §22.917(a) and §24.238(a).

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for below 1GHz and 1MHz for above 1GHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



Test Data

Environmental Conditions

Temperature:	23~25 ℃
Relative Humidity:	50~52 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Bibo Zhang from 2018-07-24 to 2018-08-04.

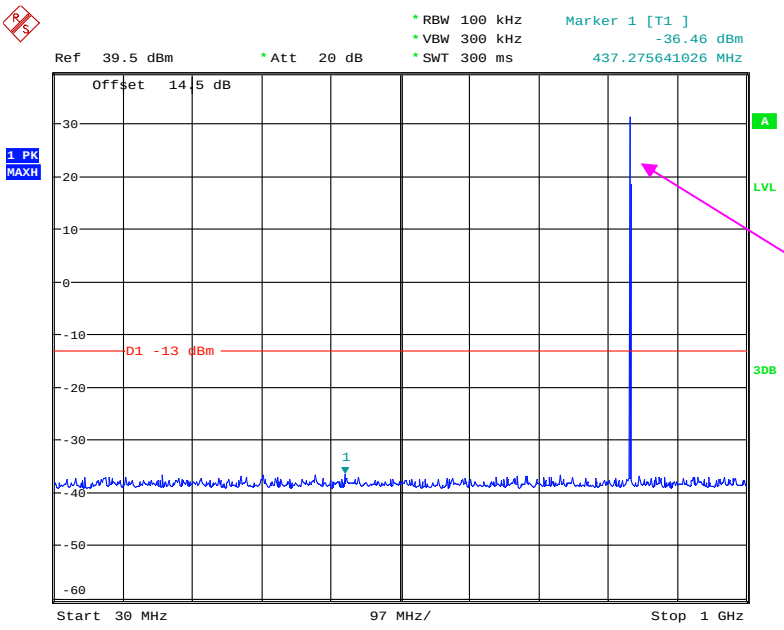
Test result: Compliance.

EUT operation mode: transmitting

Please refer to the following plots.

Cellular Band (Part 22H)

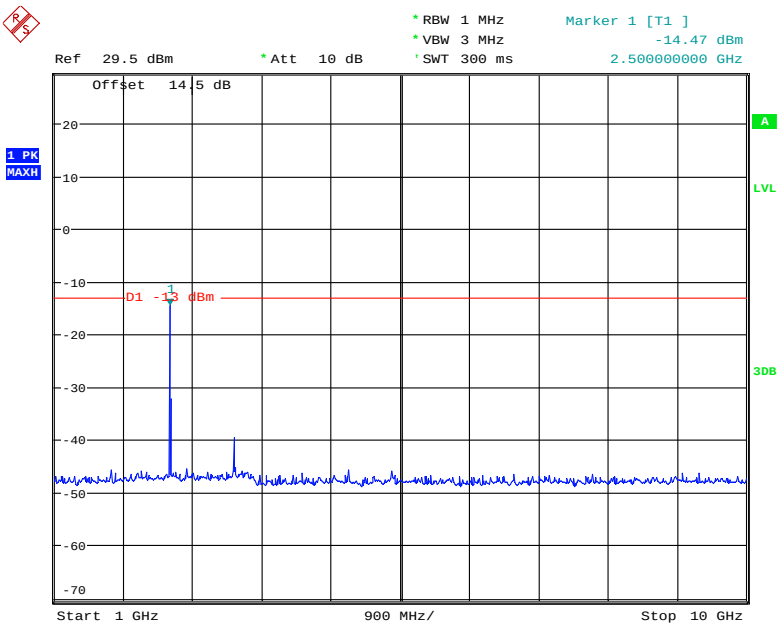
30 MHz – 1 GHz (GSM Mode)



Fundamental test

Date: 24.JUL.2018 00:32:08

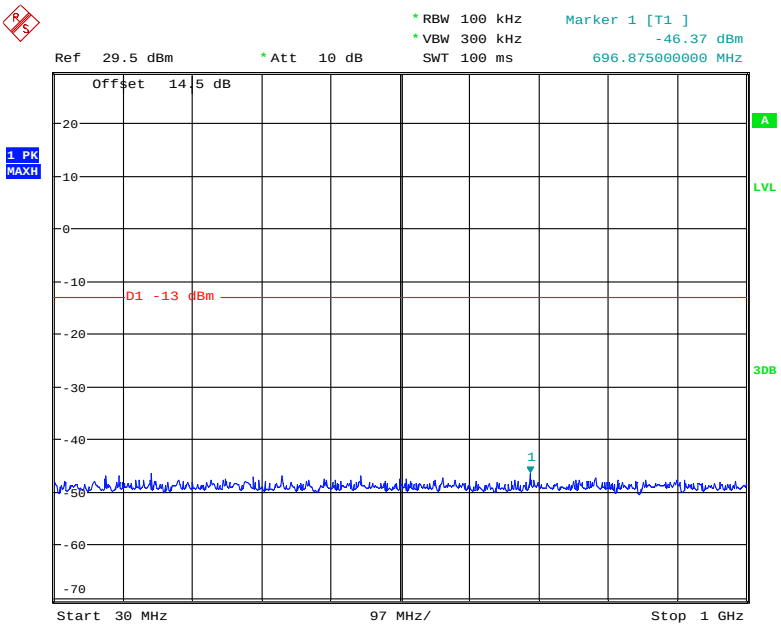
1 GHz – 10 GHz (GSM Mode)



Date: 24.JUL.2018 00:32:56

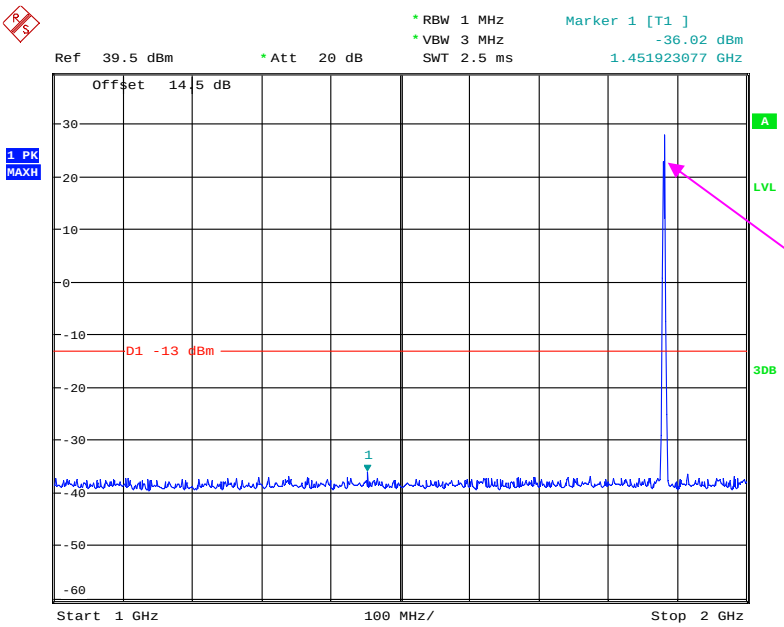
PCS Band (Part 24E)

30 MHz – 1 GHz (GSM Mode)



Date: 24.JUL.2018 00:11:47

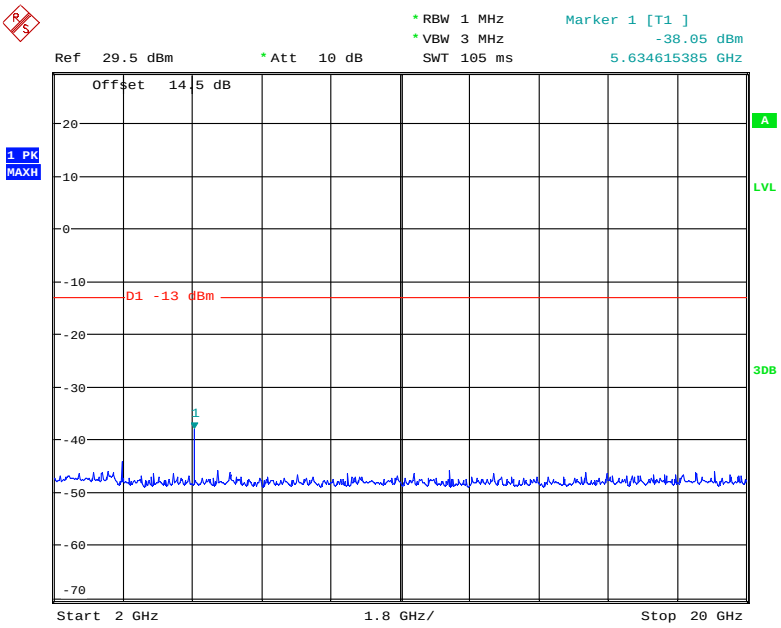
1 GHz – 2 GHz (GSM Mode)



Fundamental test

Date: 24.JUL.2018 00:12:52

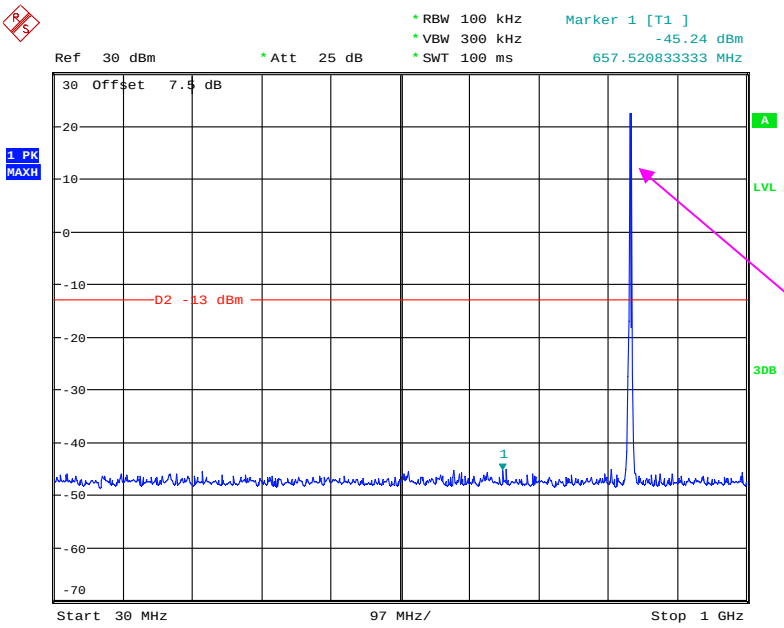
2 GHz – 20 GHz (GSM Mode)



Date: 24.JUL.2018 00:13:30

LTE Band 5:

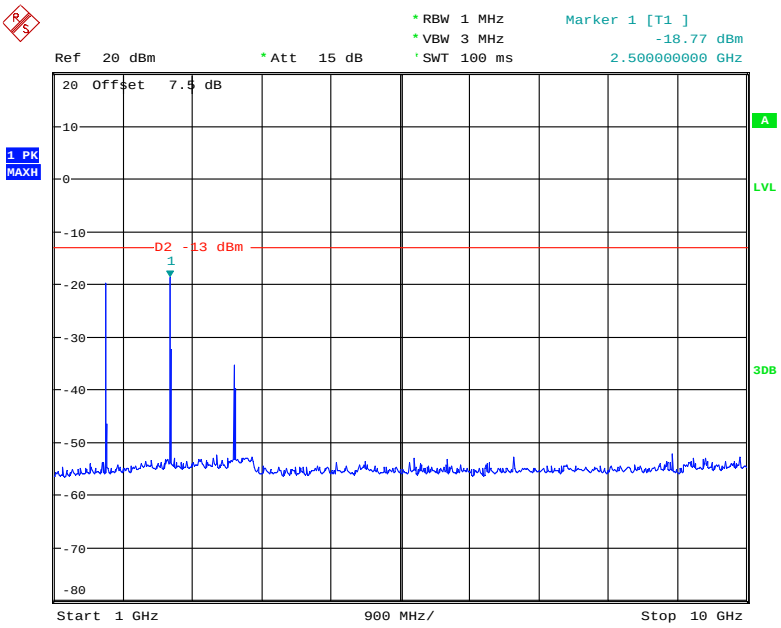
30 MHz - 1 GHz (1.4 MHz, Middle Channel)



Fundamental test

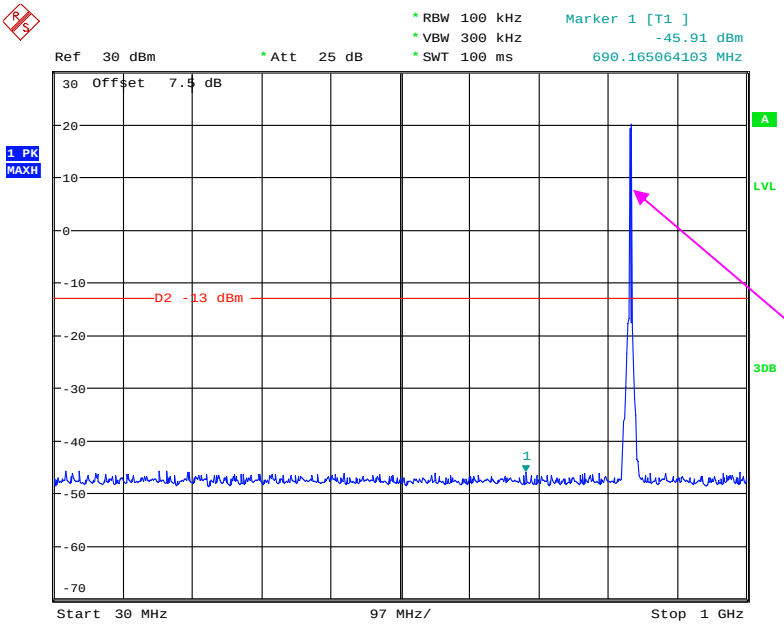
Date: 4.AUG.2018 00:42:24

1 GHz – 10 GHz (1.4 MHz, Middle Channel)



Date: 4.AUG.2018 00:47:17

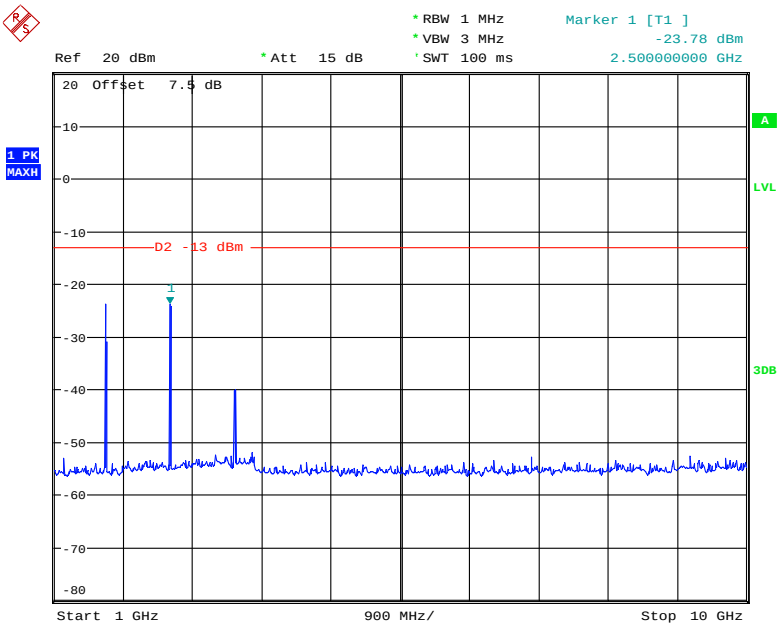
30 MHz - 1 GHz (3.0 MHz, Middle Channel)



Fundamental test

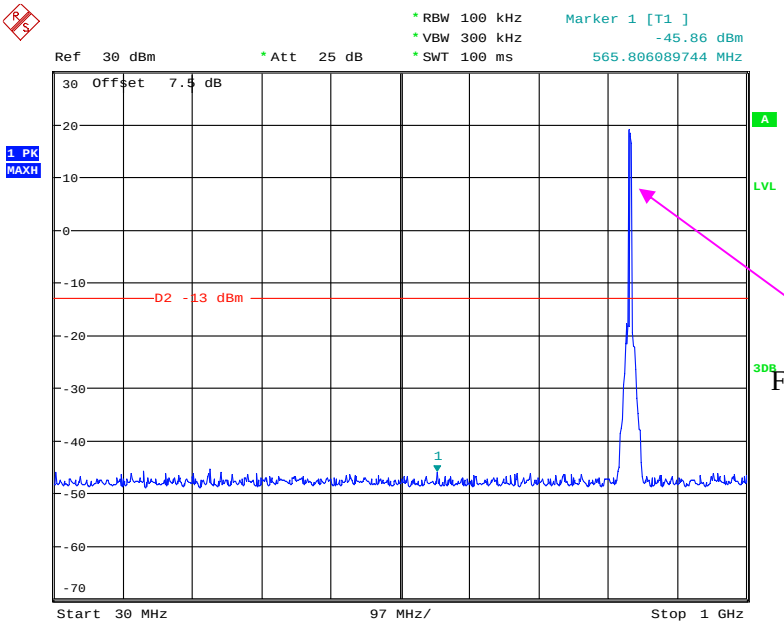
Date: 4.AUG.2018 00:43:21

1 GHz –10 GHz (3.0 MHz, Middle Channel)



Date: 4.AUG.2018 00:46:58

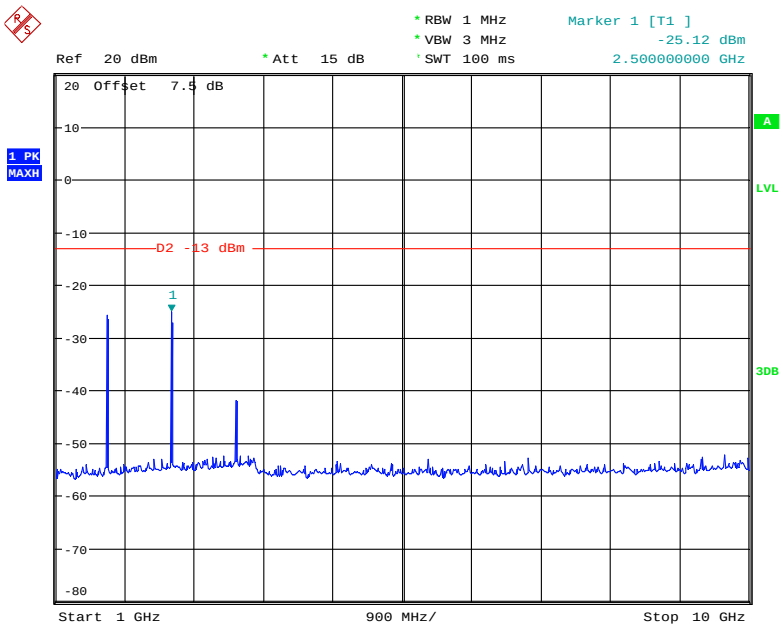
30 MHz - 1 GHz (5.0 MHz, Middle Channel)



Fundamental test

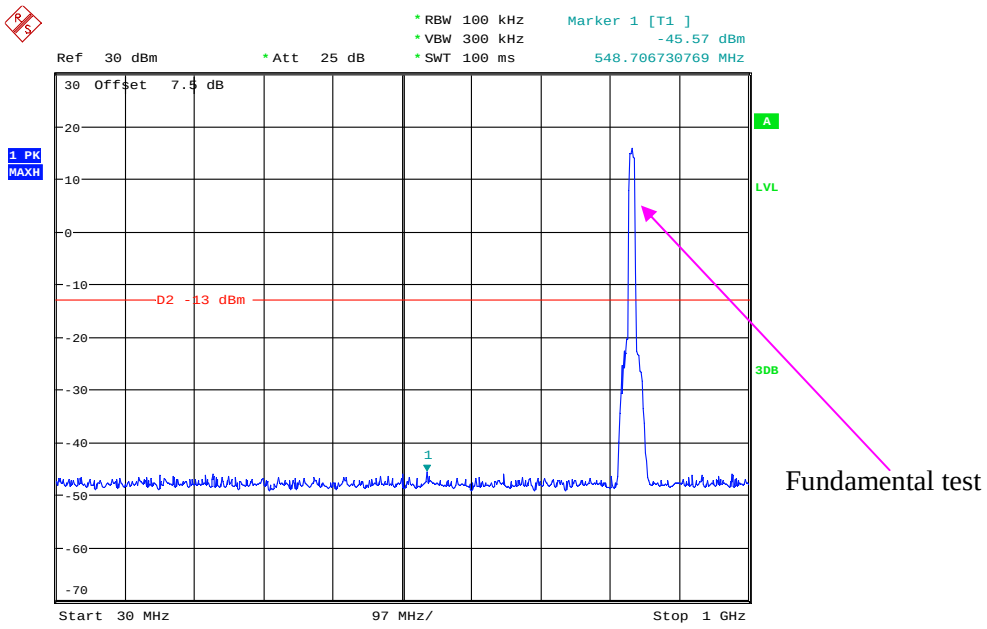
Date: 4.AUG.2018 00:43:51

1 GHz – 10 GHz (5 MHz, Middle Channel)



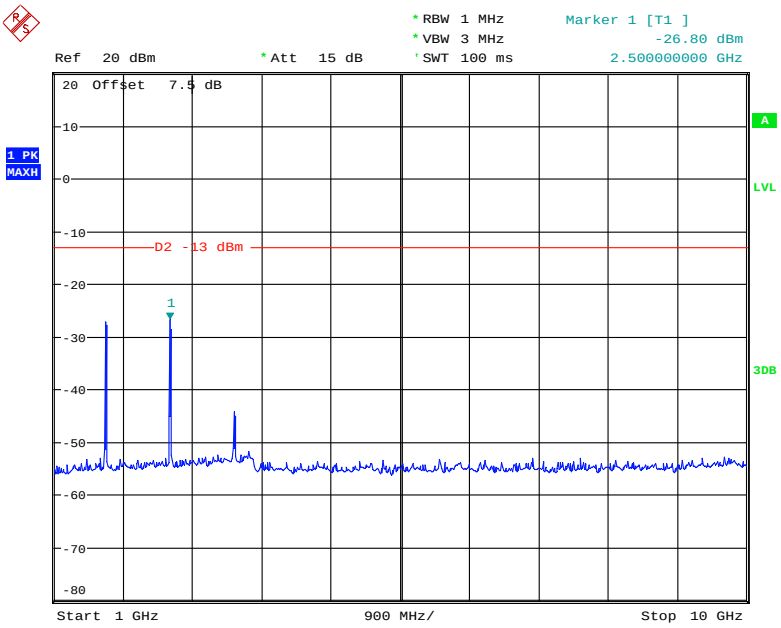
Date: 4.AUG.2018 00:46:37

30 MHz - 1 GHz (10.0 MHz, Middle Channel)



Date: 4.AUG.2018 00:44:29

1 GHz – 10 GHz (10.0 MHz, Middle Channel)



Date: 4.AUG.2018 00:46:05

FCC § 2.1053; § 22.917 (a);§ 24.238 (a); SPURIOUS RADIATED EMISSIONS

Applicable Standard

FCC § 2.1053, §22.917(a) and § 24.238(a)

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the receiving 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.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Bibo Zhang on 2018-07-23.

EUT operation mode: Transmitting

Pre-scan with Low, Middle and High channel, the worst case as below:

30 MHz ~ 10 GHz:

Cellular Band (Part 22H)

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 22H	
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
GSM Mode, middle channel										
915.83	32.84	145	1.1	H	-64.2	0.70	0	-64.90	-13	51.90
915.83	33.81	66	1.2	V	-63.2	0.70	0	-63.90	-13	50.90
1673.20	52.28	313	1.4	H	-54.8	1.30	8.90	-47.20	-13	34.20
1673.20	56.55	265	2.3	V	-49.9	1.30	8.90	-42.30	-13	29.30
2509.80	70.56	132	2.1	H	-33.0	2.60	10.20	-25.40	-13	12.40
2509.80	72.93	267	2.5	V	-30.0	2.60	10.20	-22.40	-13	9.40

30 MHz ~ 20 GHz:

PCS Band (Part 24E)

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 24E	
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
GSM Mode, middle channel										
915.83	32.95	52	2.5	H	-64.0	0.70	0	-64.70	-13	51.70
915.83	33.01	135	2.0	V	-64.0	0.70	0	-64.70	-13	51.70
3760.00	44.56	268	1.6	H	-56.7	1.50	11.80	-46.40	-13	33.40
3760.00	44.79	83	1.1	V	-56.0	1.50	11.80	-45.70	-13	32.70

LTE Band: *(Pre-scan with all the bandwidth, and worse case as below)*

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
Band 5 QPSK middle channel 10MHz										
Test frequency range: 30 MHz ~ 10GHz										
915.83	33.00	278	2.5	H	-64.0	0.70	0	-64.70	-13	51.70
915.83	32.03	310	1.6	V	-65.0	0.70	0	-65.70	-13	52.70
1673.00	49.35	227	2.0	H	-57.7	1.30	8.90	-50.10	-13	37.10
1673.00	52.14	295	1.8	V	-54.3	1.30	8.90	-46.70	-13	33.70
2509.50	50.81	118	1.5	H	-52.8	2.60	10.20	-45.20	-13	32.20
2509.50	53.17	154	1.5	V	-49.8	2.60	10.20	-42.20	-13	29.20

Note:
1) Absolute Level = Substituted Level - Cable loss + Antenna Gain
2) Margin = Limit- Absolute Level

FCC § 22.917 (a);§ 24.238 (a) - BAND EDGES

Applicable Standard

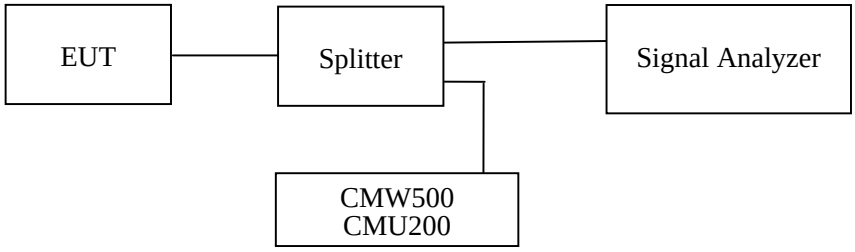
According to § 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency



Test Data

Environmental Conditions

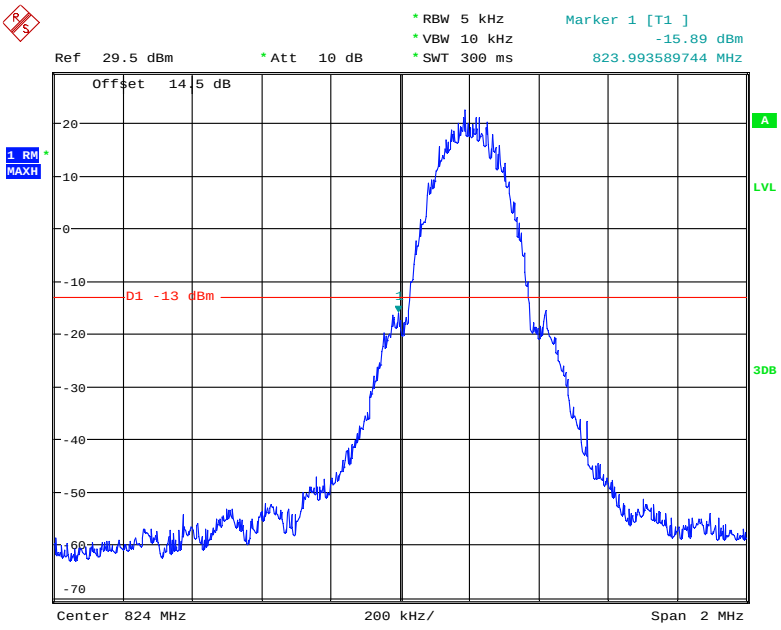
Temperature:	23~25 ℃
Relative Humidity:	50~52 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Bibo Zhang from 2018-07-23 to 2018-08-15.

EUT operation mode: Transmitting

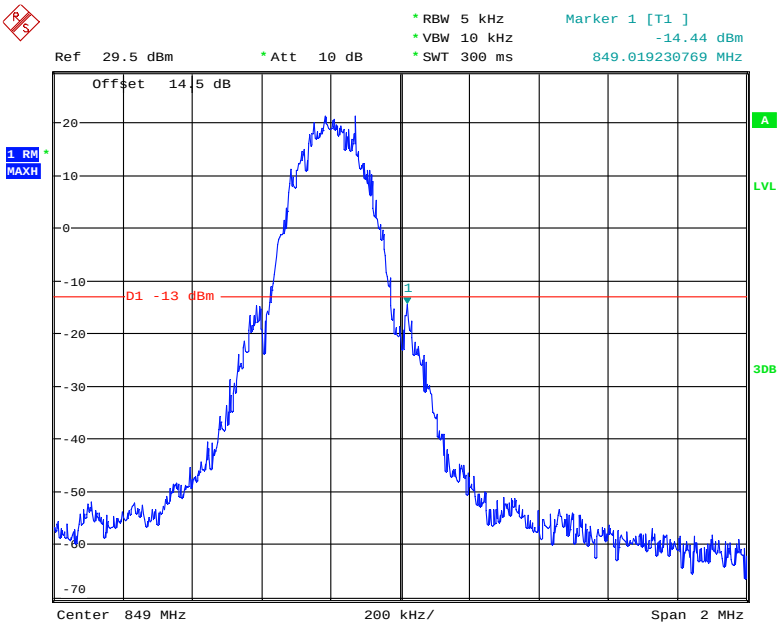
Test Result: Compliance. Please refer to the following plots.

Cellular Band, Left Band Edge for GSM (GMSK) Mode



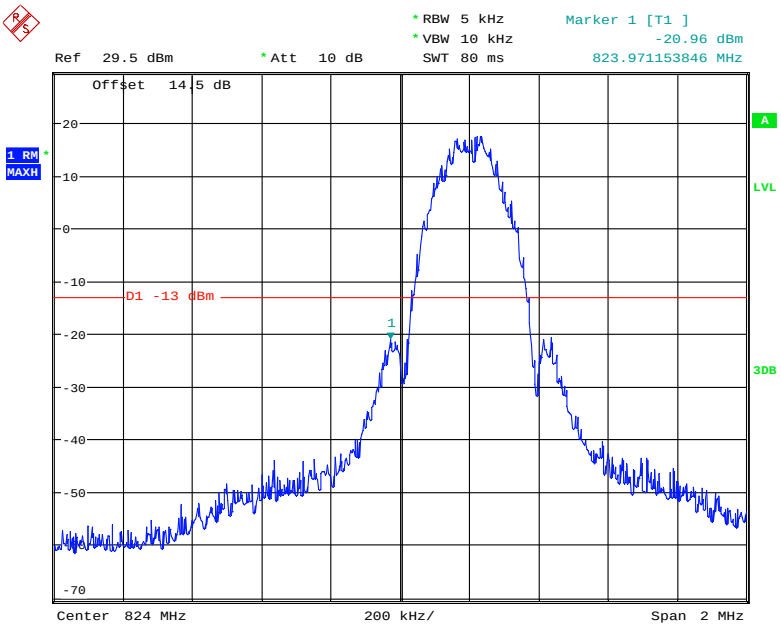
Date: 24.JUL.2018 00:30:13

Cellular Band, Right Band Edge for GSM (GMSK) Mode



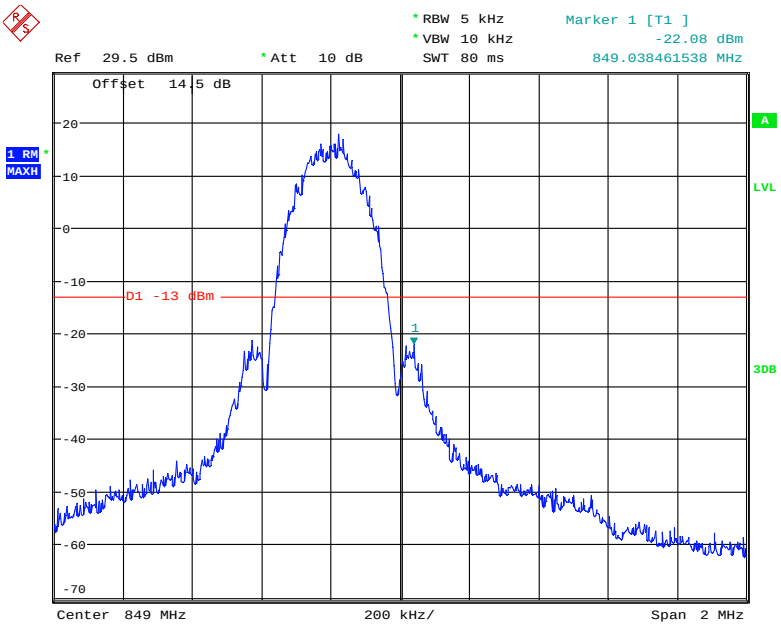
Date: 24.JUL.2018 00:30:54

Cellular Band, Left Band Edge for EDGE Mode



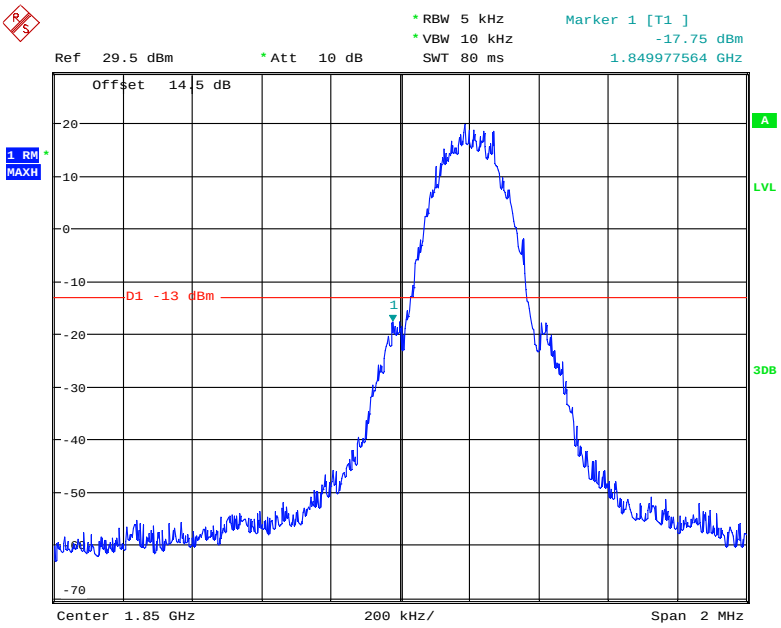
Date: 24.JUL.2018 00:15:56

Cellular Band, Right Band Edge for EDGE Mode



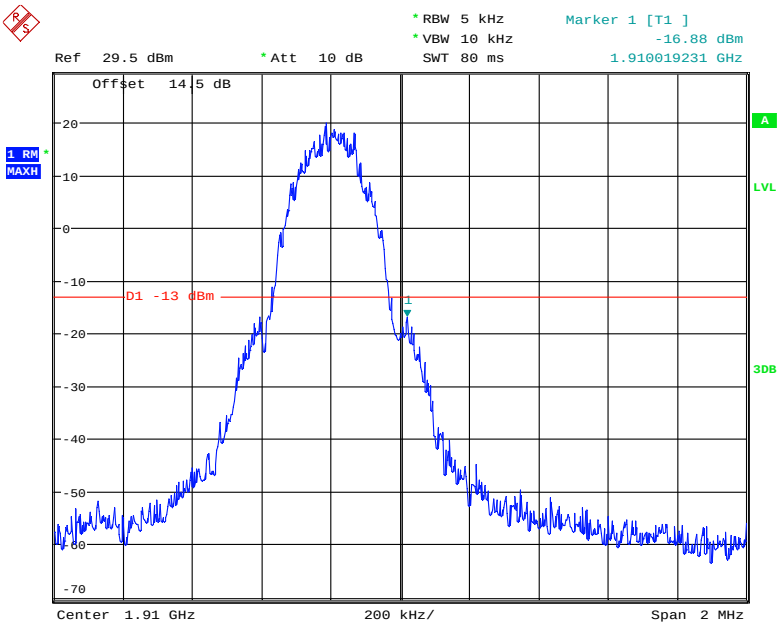
Date: 15.AUG.2018 23:03:54

PCS Band, Left Band Edge for GSM (GMSK) Mode



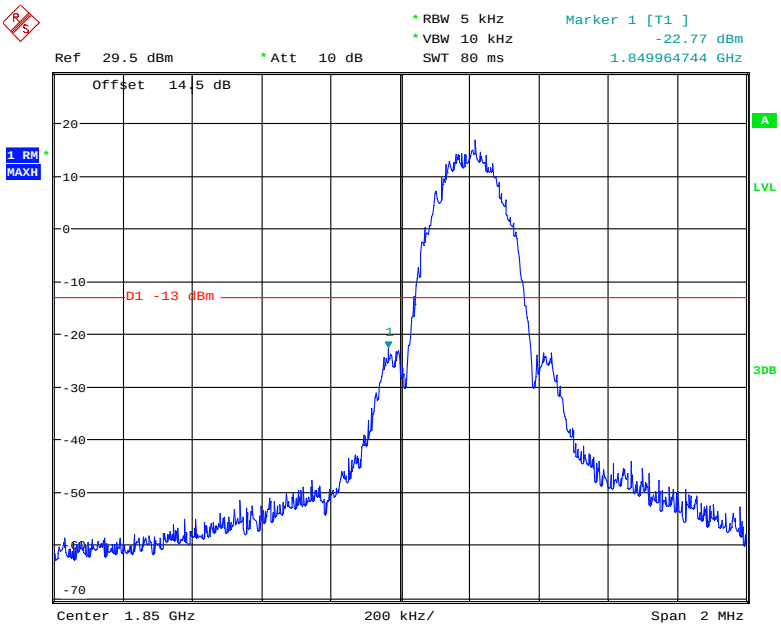
Date: 24.JUL.2018 00:08:04

PCS Band, Right Band Edge for GSM (GMSK) Mode



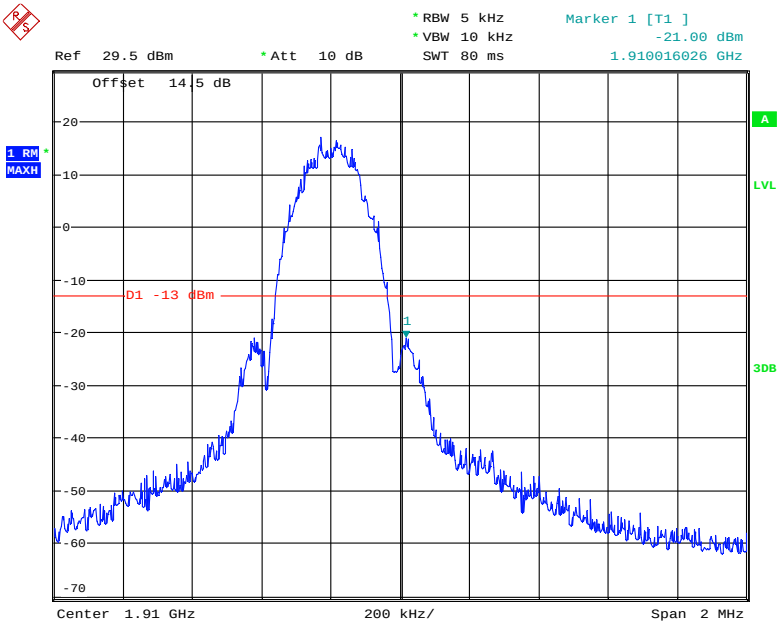
Date: 24.JUL.2018 00:08:58

PCS Band, Left Band Edge for EDGE Mode



Date: 24.JUL.2018 00:01:00

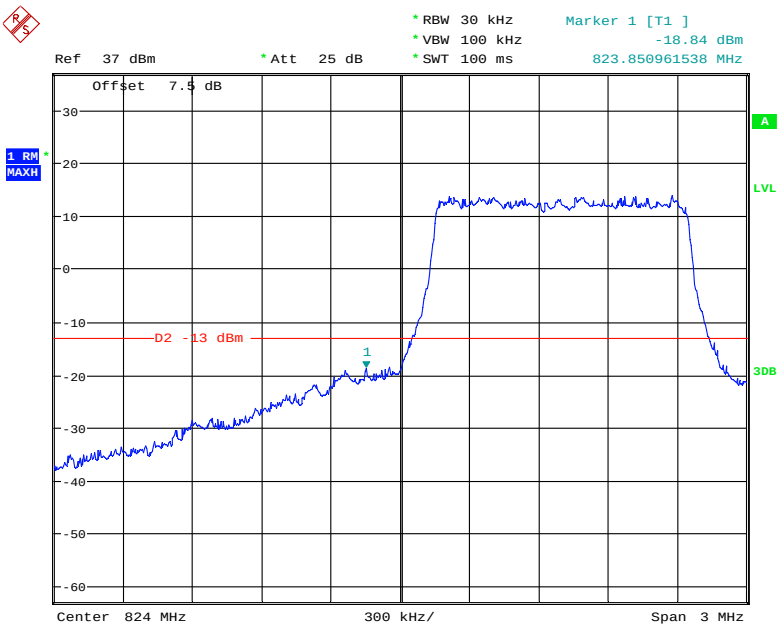
PCS Band, Right Band Edge for EDGE Mode



Date: 24.JUL.2018 00:02:41

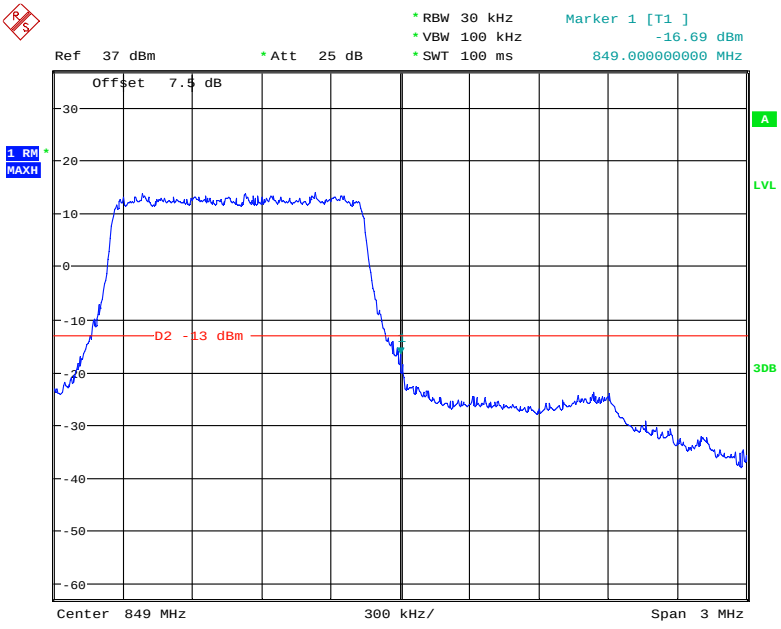
Band 5:

QPSK (1.4 MHz, FULL RB) - Left Band Edge



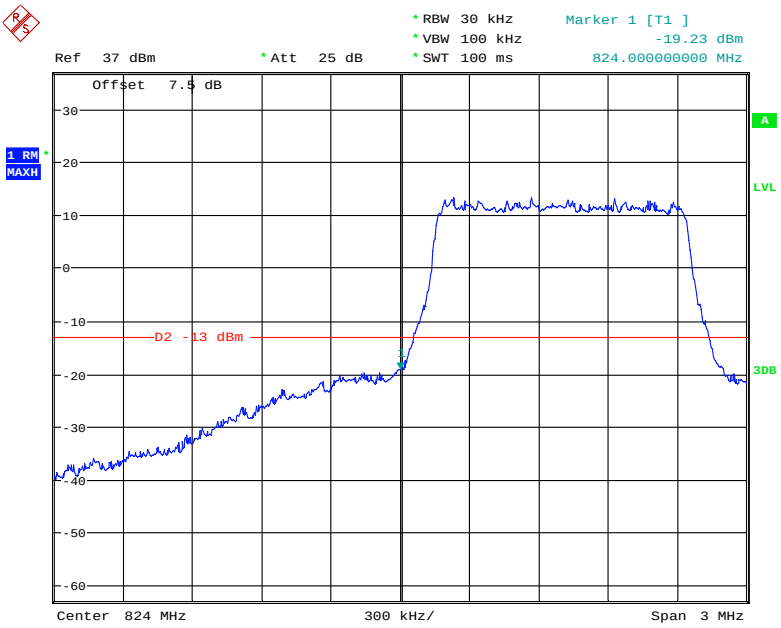
Date: 4.AUG.2018 00:39:27

QPSK (1.4 MHz, FULL RB) - Right Band Edge



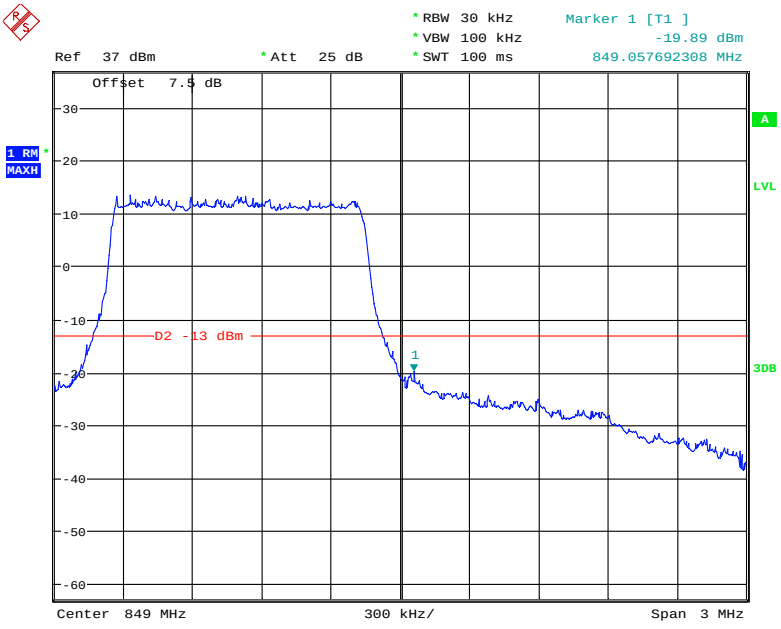
Date: 4.AUG.2018 00:37:20

16-QAM (1.4 MHz, FULL RB) - Left Band Edge



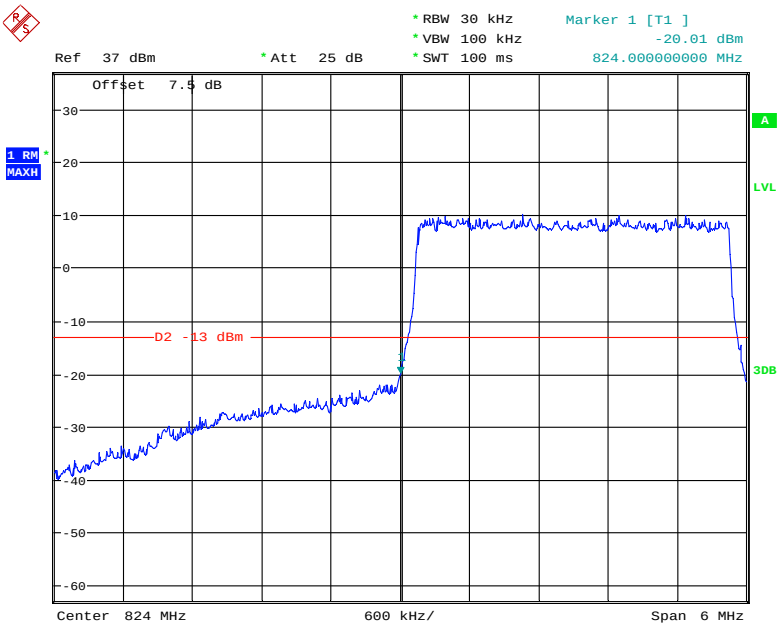
Date: 4.AUG.2018 00:38:55

16-QAM (1.4 MHz, FULL RB) - Right Band Edge



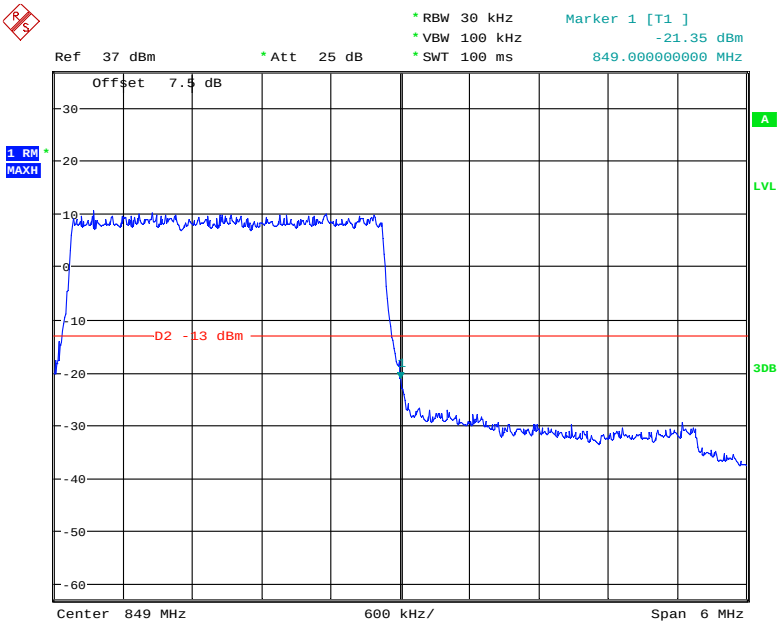
Date: 4.AUG.2018 00:38:08

QPSK (3.0 MHz, FULL RB) - Left Band Edge



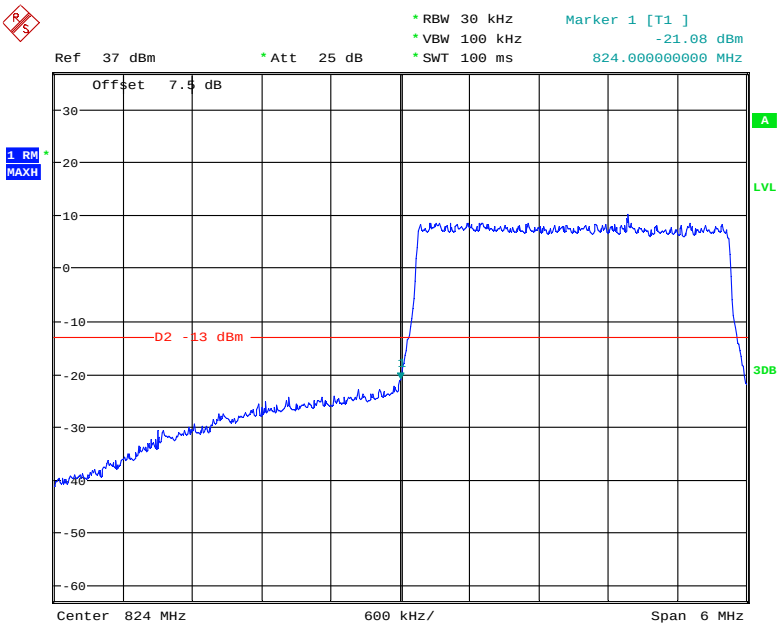
Date: 4.AUG.2018 00:34:12

QPSK (3.0 MHz, FULL RB) - Right Band Edge



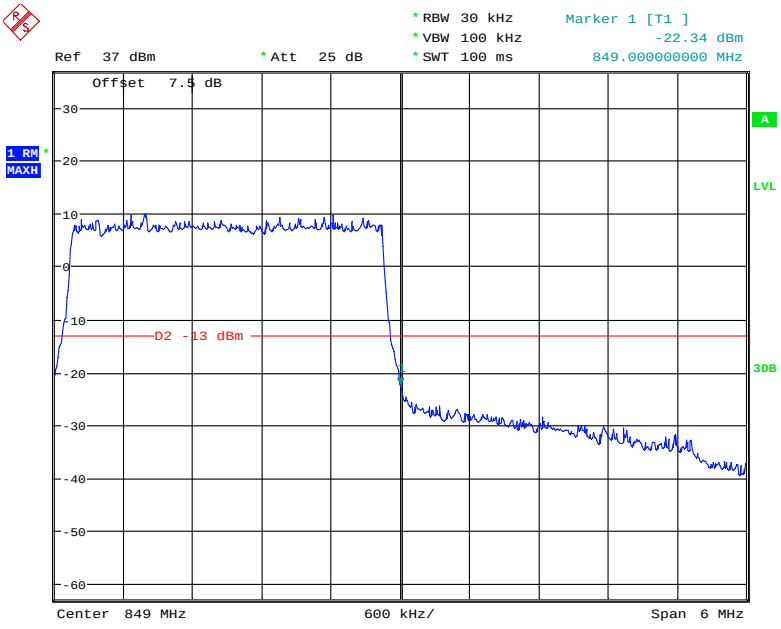
Date: 4.AUG.2018 00:36:26

16-QAM (3.0 MHz, FULL RB) - Left Band Edge



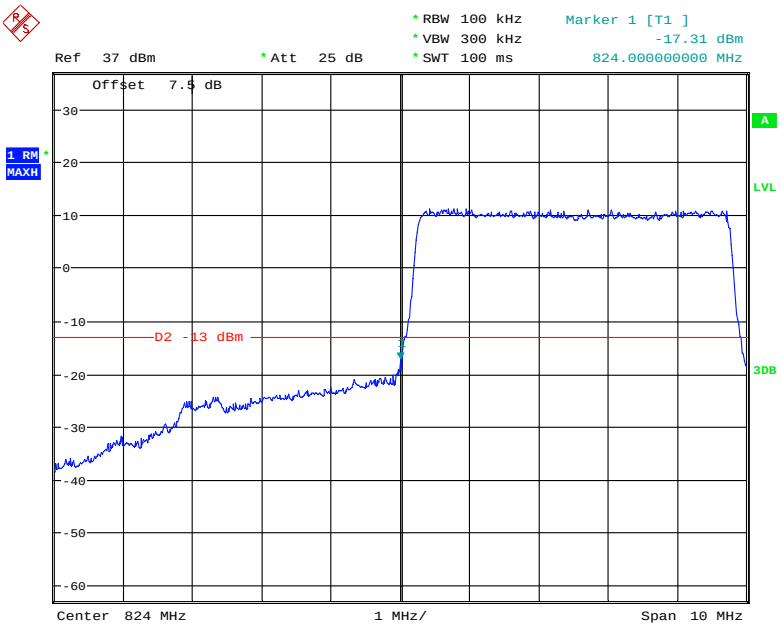
Date: 4.AUG.2018 00:34:53

16-QAM (3.0 MHz, FULL RB) - Right Band Edge



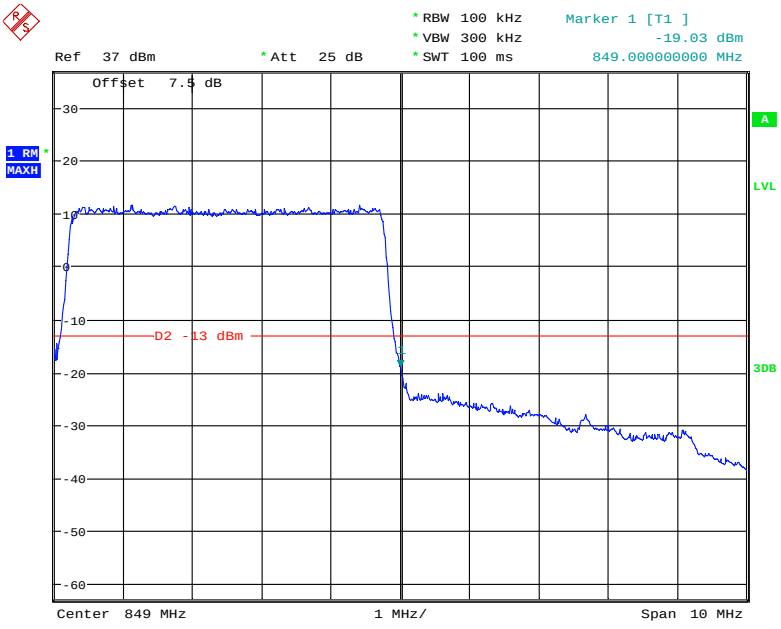
Date: 4.AUG.2018 00:36:01

QPSK (5.0 MHz, FULL RB) - Left Band Edge



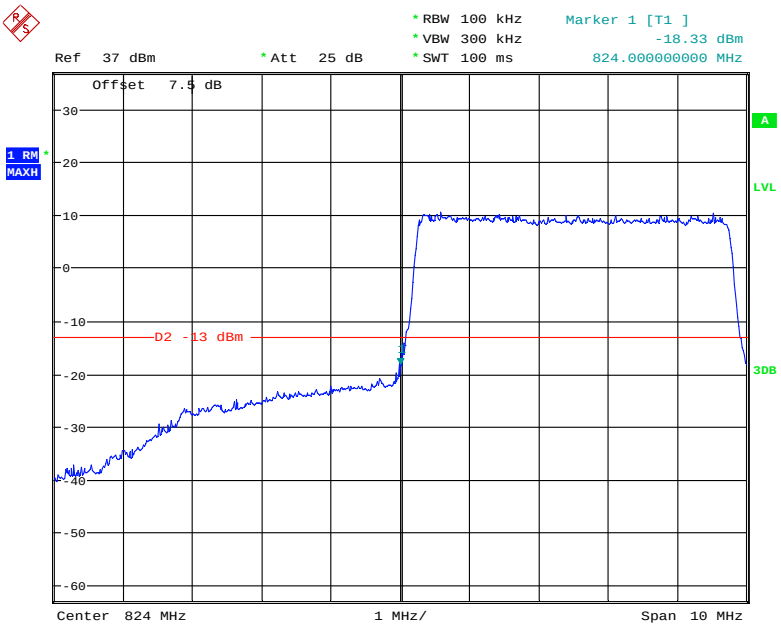
Date: 4.AUG.2018 00:33:02

QPSK (5.0 MHz, FULL RB) - Right Band Edge



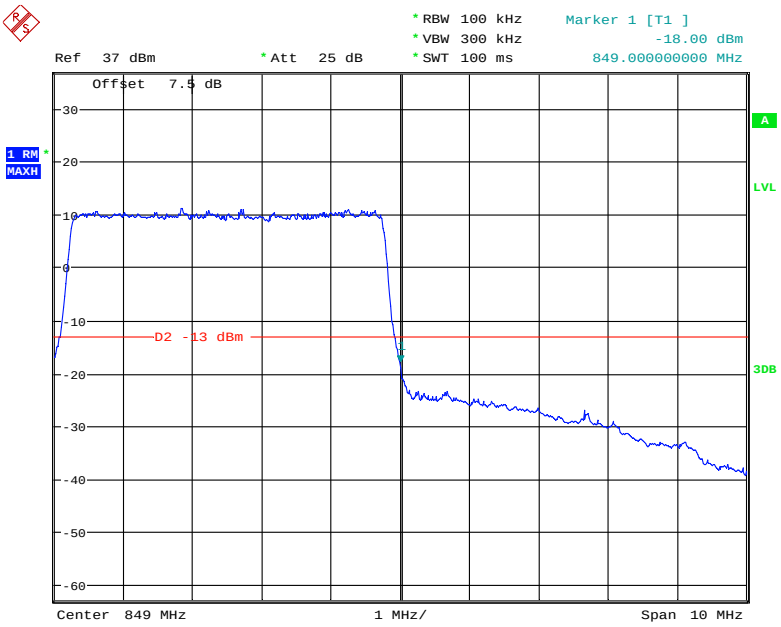
Date: 4.AUG.2018 00:30:27

16-QAM (5.0 MHz, FULL RB) - Left Band Edge



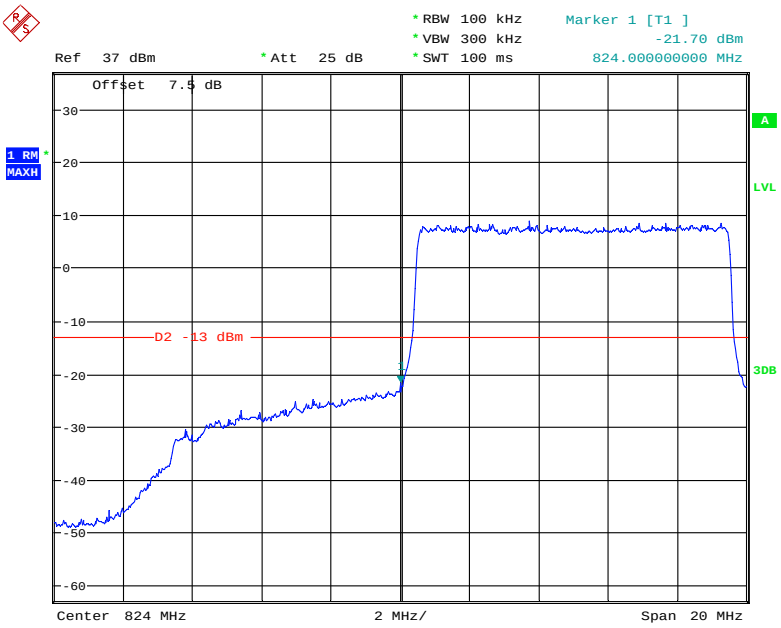
Date: 4.AUG.2018 00:32:36

16-QAM (5.0 MHz, FULL RB) - Right Band Edge



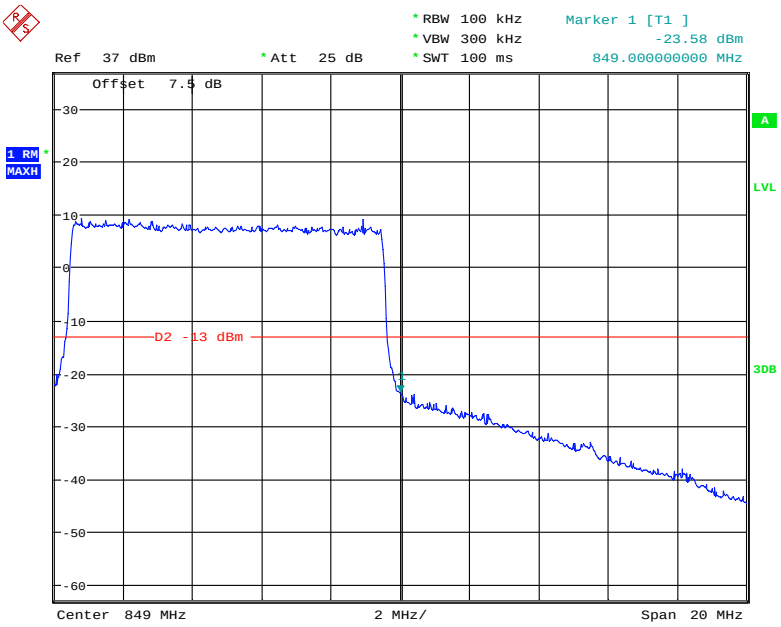
Date: 4.AUG.2018 00:31:59

QPSK (10.0 MHz, FULL RB) - Left Band Edge



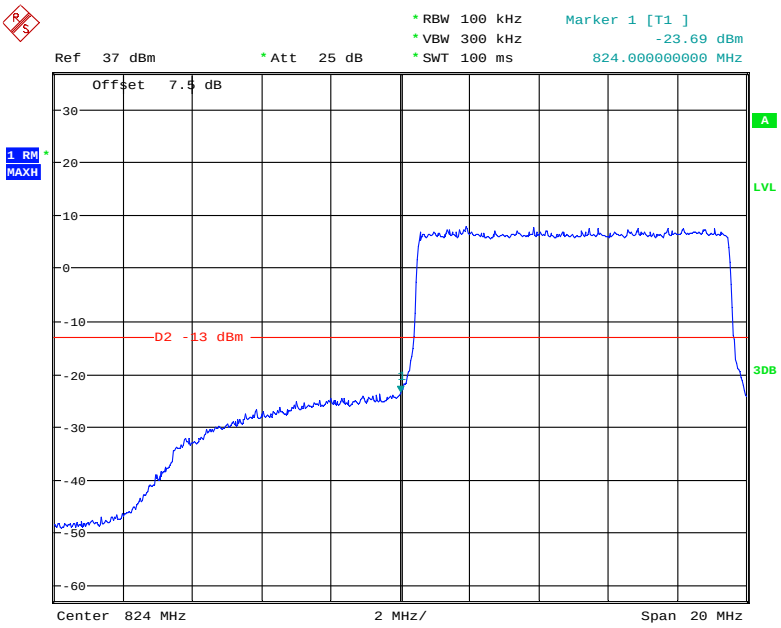
Date: 4.AUG.2018 00:26:02

QPSK (10.0 MHz, FULL RB) - Right Band Edge



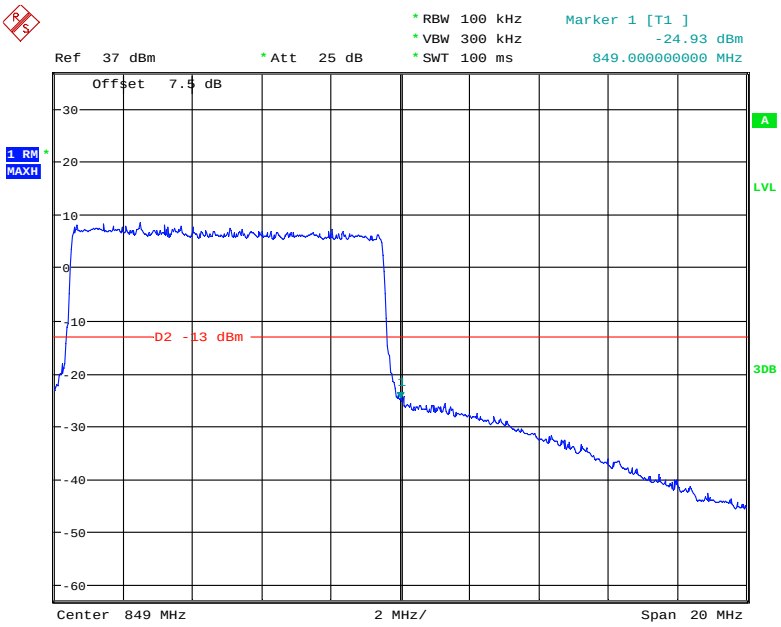
Date: 4.AUG.2018 00:28:53

16-QAM (10.0 MHz, FULL RB) - Left Band Edge



Date: 4.AUG.2018 00:27:07

16-QAM (10.0 MHz, FULL RB) - Right Band Edge



Date: 4.AUG.2018 00:28:13

FCC § 2.1055; § 22.355; § 24.235 - FREQUENCY STABILITY

Applicable Standard

FCC § 2.1055, §22.355, §24.235.

According to FCC §2.1055, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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

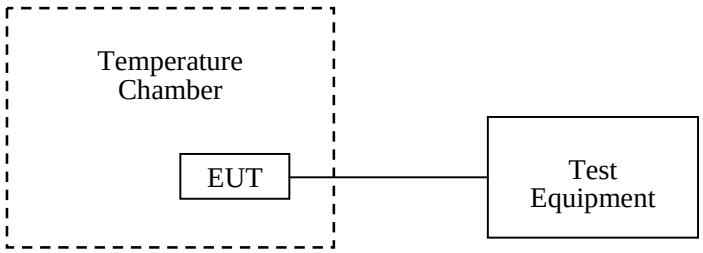
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: For hand carried, battery powered equipment; reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Bibo Zhang on 2018-08-06.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the following tables.

Cellular Band (Part 22H)

GSM Mode

Middle Channel, f_o =836.6MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	3.85	-1	-0.0012	2.5
-20		1	0.0012	2.5
-10		2	0.0024	2.5
0		4	0.0048	2.5
10		3	0.0036	2.5
20		5	0.0060	2.5
30		7	0.0084	2.5
40		9	0.0108	2.5
50		12	0.0143	2.5
25	V min.= 3.6	8	0.0096	2.5
	V max.= 4.3	11	0.0131	2.5

EDGE Mode

Middle Channel, f_o =836.6MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	3.85	7	0.0084	2.5
-20		9	0.0108	2.5
-10		10	0.0120	2.5
0		13	0.0155	2.5
10		15	0.0179	2.5
20		16	0.0191	2.5
30		12	0.0143	2.5
40		14	0.0167	2.5
50		17	0.0203	2.5
25	V min.= 3.6	18	0.0215	2.5
	V max.= 4.3	19	0.0227	2.5

PCS Band (Part 24E)

GSM Mode

Middle Channel, f_o =1880.0 MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.85	-13	-0.0069	pass
-20		-18	-0.0096	pass
-10		-15	-0.0080	pass
0		-17	-0.0090	pass
10		-11	-0.0059	pass
20		-16	-0.0085	pass
30		-12	-0.0064	pass
40		-9	-0.0048	pass
50		-5	-0.0027	pass
25	V min.= 3.6	-1	-0.0005	pass
	V max.= 4.3	2	0.0011	pass

EDGE Mode

Middle Channel, f_o =1880.0 MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	3.85	-19	-0.0101	pass
-20		-17	-0.0090	pass
-10		-15	-0.0080	pass
0		-13	-0.0069	pass
10		-10	-0.0053	pass
20		-9	-0.0048	pass
30		-7	-0.0037	pass
40		-5	-0.0027	pass
50		-3	-0.0016	pass
25	V min.= 3.6	1	0.0005	pass
	V max.= 4.3	-1	-0.0005	pass

LTE:
Band 5

QPSK:

GSM Mode

Middle Channel, f_o =836.5MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	3.85	-6	-0.00717	2.5
-20		-7	-0.00837	2.5
-10		-5	-0.00598	2.5
0		-5	-0.00598	2.5
10		-5	-0.00598	2.5
20		-1	-0.00120	2.5
30		-5	-0.00598	2.5
40		-4	-0.00478	2.5
50		-7	-0.00837	2.5
25	V min.= 3.6	-6	-0.00717	2.5
	V max.= 4.3	-7	-0.00837	2.5

16QAM:

Middle Channel, f_o =836.5MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	3.85	-5	-0.00598	2.5
-20		-7	-0.00837	2.5
-10		-5	-0.00598	2.5
0		-4	-0.00478	2.5
10		-6	-0.00717	2.5
20		-1	-0.0012	2.5
30		-6	-0.00717	2.5
40		-3	-0.00359	2.5
50		-7	-0.00837	2.5
25	V min.= 3.6	-6	-0.00717	2.5
	V max.= 4.3	-6	-0.00717	2.5

******* END OF REPORT *******