

TEST REPORT

Report No.: SRTC2015-9004(F)-0010

Product Name: GSM/GPRS/EDGE/UMTS Digital Mobile Phone
with Bluetooth and Wi-Fi

Product Model: Philips S309

Applicant: Shenzhen Sang Fei Consumer Communications Co.,Ltd.

Manufacturer: Shenzhen Sang Fei Consumer Communications Co.,Ltd

Specification: FCC Part 15, Subpart C (April 22, 2015 edition)

FCC ID: VQRCTS309

The State Radio_monitoring_center Testing Center (SRTC)

No.80 Beilishi Road Xicheng District Beijing, China

Tel: 86-10-68009202 Fax: 86-10-6800920

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1. GENERAL INFORMATION

1.1 Notes of the test report

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written permission of The State Radio_monitoring_center Testing Center (SRTC).

The test results relate only to individual items of the samples which have been tested.

1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
Address:	No.80 Beilishi Road, Xicheng District
City:	Beijing
Country or Region:	P.R.China
Contacted person:	Wang Junfeng
Tel:	+86 10 68009181 +86 10 68009202
Fax:	+86 10 68009195 +86 10 68009205
Email:	wangjf@srrc.org.cn / wangjunfeng@srtc.org.cn

1.3 Applicant's details

Company:	Shenzhen Sang Fei Consumer Communications Co.,Ltd.
Address:	11 Science & Technology Rd., Shenzhen Hi-tech Industrial Park, Nanshan District
City:	Shenzhen
Country or Region:	P.R.China
Grantee Code:	VQRCT
Contacted person:	Helen.Lin
Tel:	0755-33308888
Fax:	0755-26614979
Email:	Helen.Lin@sangfei.com

1.4 Manufacturer's details

Company:	Shenzhen Sang Fei Consumer Communications Co.,Ltd.
Address:	11 Science & Technology Rd., Shenzhen Hi-tech Industrial Park, Nanshan District
City:	Shenzhen
Country or Region:	P.R.China
Contacted person:	Helen.Lin
Tel:	0755-33308888
Fax:	0755-26614979
Email:	Helen.Lin@sangfei.com

1.5 Application details

Date of Receipt of test sample at SRTC:	2015.05.04
Testing Start Date:	2015.05.05
Testing End Date:	2015.05.20

1.6 Reference specification

FCC Part 15, Subpart C (April 22, 2015 edition)

1.7 Information of EUT

1.7.1 General information

Frequency Range	2.4GHz~2.4835GHz
Number of Channel	40
Modulation Type	GFSK
Duplex Mode	TDD
Channel Spacing	1MHz
Data Rate	1Mbps
Antenna Type	Fixed Internal
Power Supply	Battery or Charger
Rated Power Supply Voltage	3.8V
HW Version	WMCSa
SW Version	Philips_S309_1516_V01T03_AG
IMEI	866636020005512

1.7.2 Auxiliary equipment details

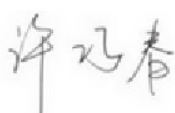
The following support equipment was used to exercise the EUT during testing:

Equipment	Battery
Manufacturer	SHENZHEN CYCLELONG POWER-TECH CO.,Ltd.
Model Number	AB1600DWML
Serial Number	----

2. TEST INFORMATION

2.1 Summary of the test results

No.	Test case	FCC reference	Verdict
1	Occupied Bandwidth	15.247(a)(2)	Pass
2	Peak Power Output	15.247(b)(3)	Pass
3	Transmitter Power Spectral Density	15.247(e)	Pass
4	Conducted Out of band emission measurement	15.247(d)	Pass
5	Spurious Radiated Emissions	15.247(d)/15.35(b)/15.209	Pass

This Test Report Is Issued by: Ms. Xu Qiaochun 	Checked by: Mr. Li Bin 
Tested by: Mr. Jiang Shuo 	Issued date: 2015.05.21

2.2 Test result

2.2.1 Occupied Bandwidth

2.2.1.1 Ambient condition

Temperature	Relative humidity	Pressure
22°C	40%	101.5kPa

2.2.1.2 Test Description

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer and Bluetooth test set via a power splitter with a known loss. Which connected to the transmitter antenna terminal of the EUT while the EUT is operating at maximum power and at the appropriate frequencies. All modes of operation were investigated and the worst case configuration results are reported in this section.

2.2.1.3 Test limit

Part15.247(a)(2)

The minimum permissible 6dB bandwidth is 500 kHz

2.2.1.4 Test Procedure Used

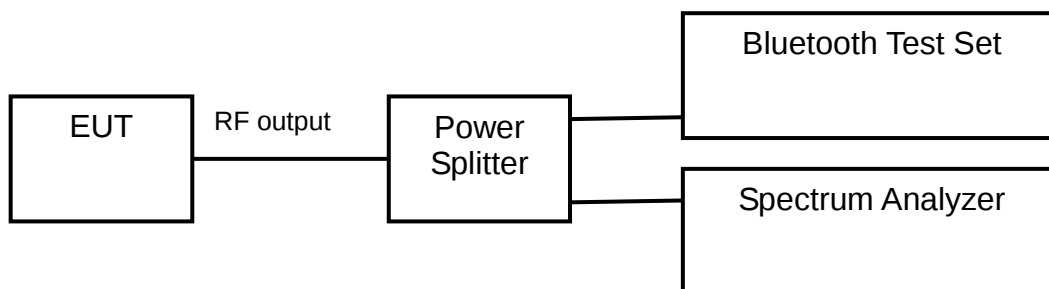
KDB 558074 D01 v03r02 - Section 8.1 Option 1

2.2.1.5 Test Settings

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

2.2.1.6 Test Setup

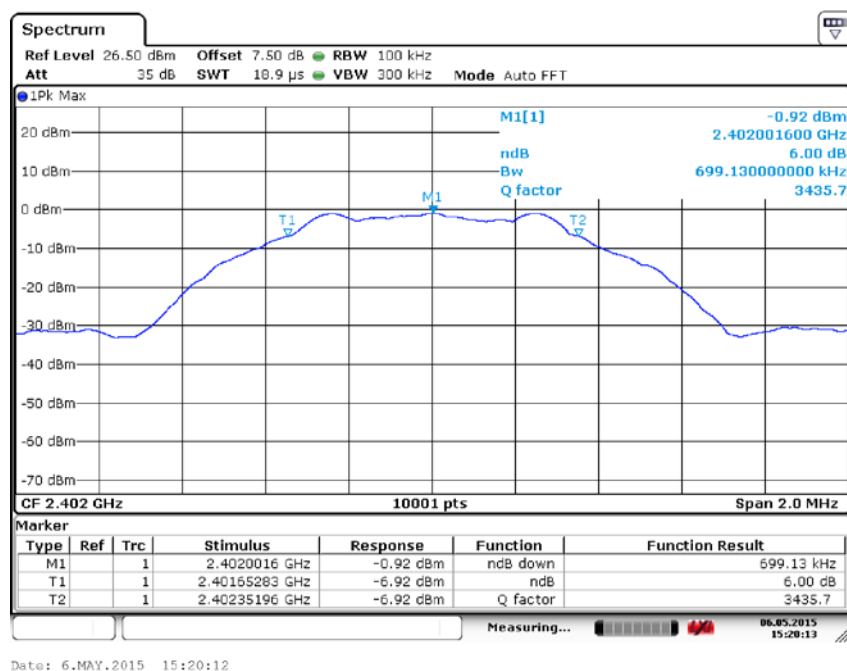
The EUT and measurement equipment were set up as shown in the diagram below.



2.2.1.7 Test result

Modulation type: GFSK (LE)

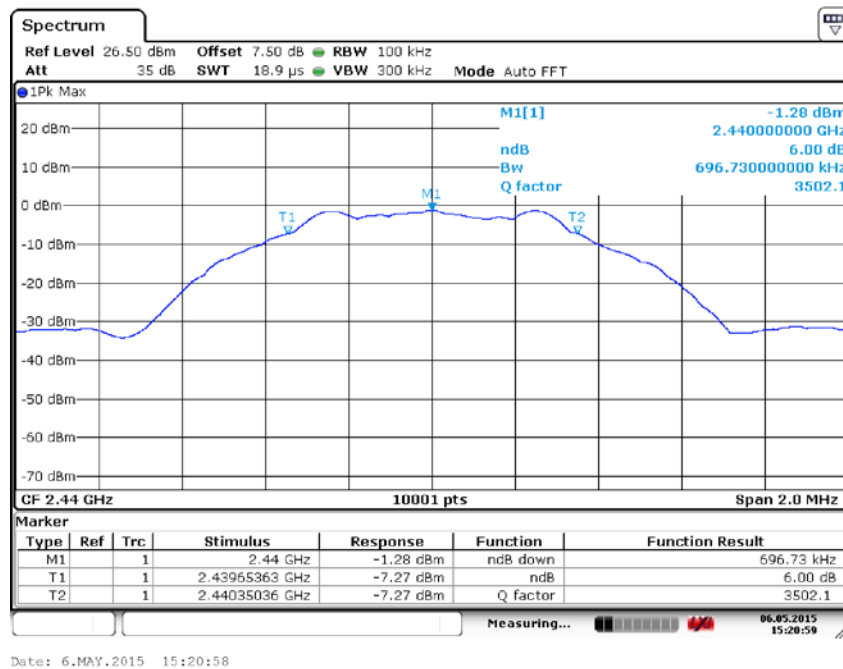
Carrier frequency (MHz)	Channel No.	6 dB bandwidth(kHz)
2402	0	699.13
2440	19	696.73
2480	39	698.33



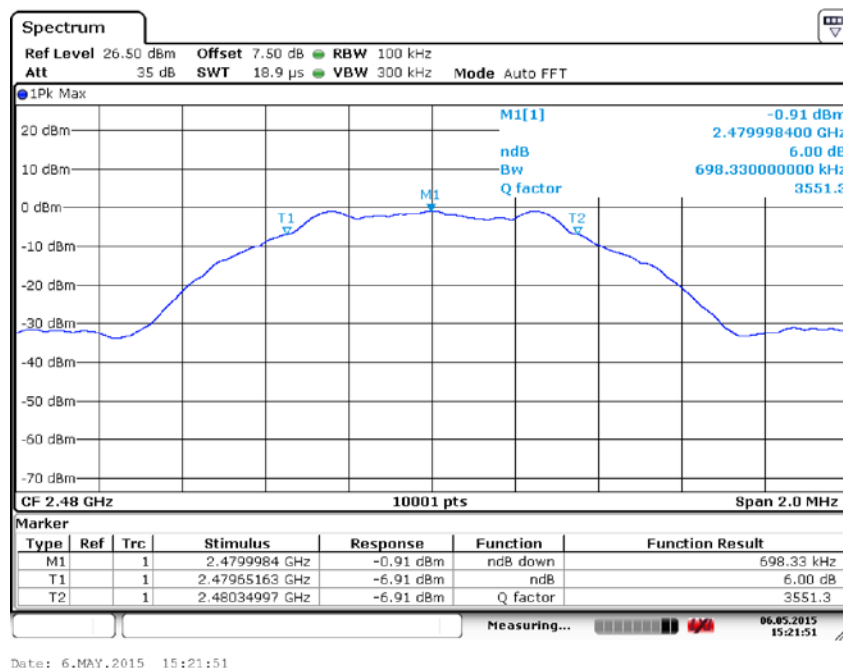
Carrier frequency (MHz): 2402

Channel No.:0

Modulation type: GFSK (LE)



Carrier frequency (MHz): 2440
Channel No.:19
Modulation type: GFSK (LE)



Carrier frequency (MHz): 2480
Channel No.:39
Modulation type: GFSK (LE)

2.2.2 Peak Power Output

2.2.2.1 Ambient condition

Temperature	Relative humidity	Pressure
22°C	40%	101.5kPa

2.2.2.2 Test Description

The transmitter antenna terminal of the EUT is connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. Measurements are made while the EUT is operating at maximum power and at the appropriate frequencies.

2.2.2.3 Test limit

Part15.247(b)(3)

The maximum permissible conducted output power is 1 Watt.

Used conversion factor: Limit (dBm) = 10 log (Limit (W)/1mW)

==> Maximum Output Power: 30 dBm

2.2.2.4 Test Procedure Used

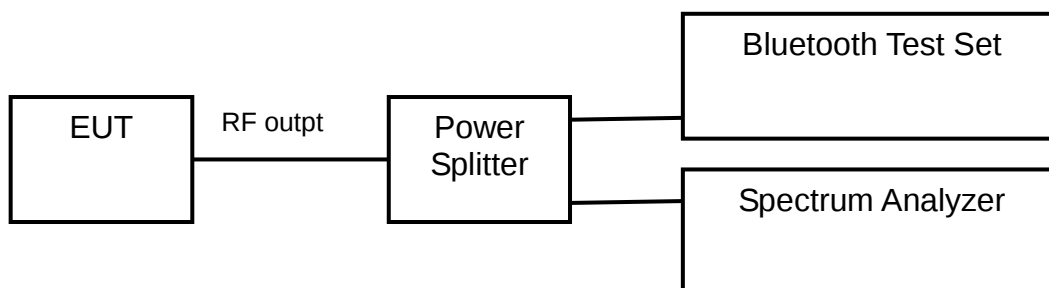
KDB 558074 D01 v03r02 - Section 9.1.1

2.2.2.5 Test Settings

- a) RBW =2 MHz
- b) VBW =10 MHz
- c) span $\geq 3 \times$ RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

2.2.2.6 Test Setup

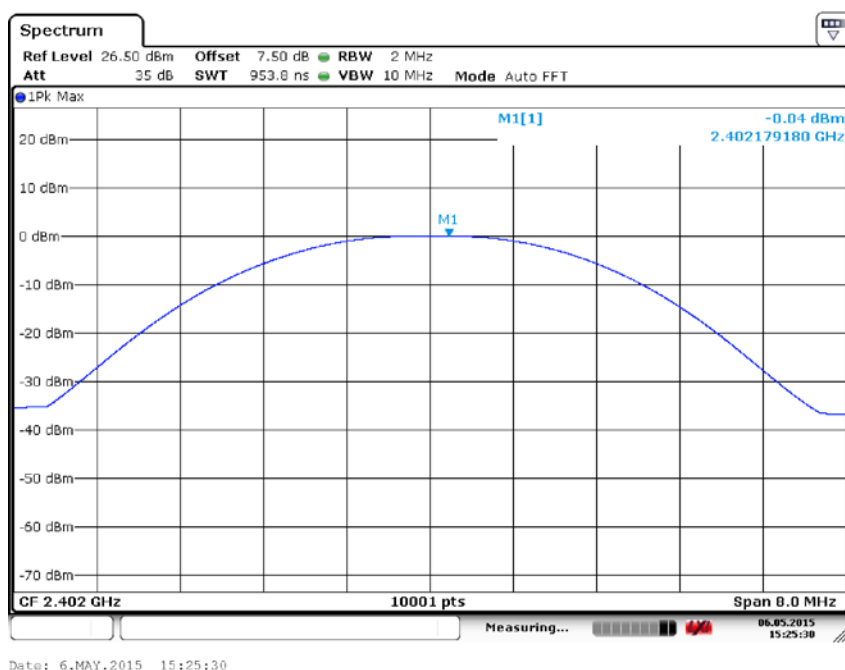
The EUT and measurement equipment were set up as shown in the diagram below.



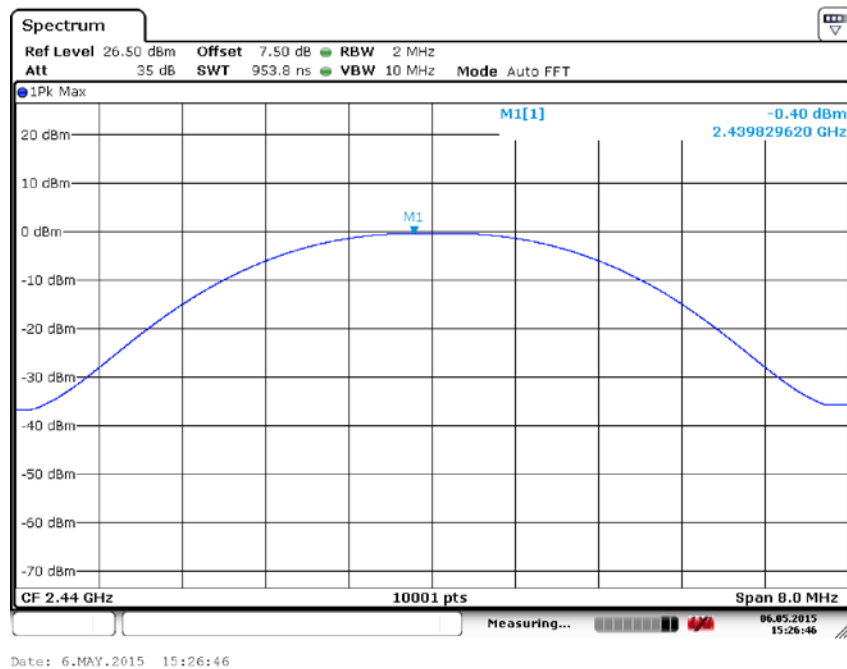
2.2.2.7 Test result

Modulation type	Average Power Output (dBm)		
	2402MHz (Ch0)	2440MHz (Ch19)	2480MHz (Ch39)
GFSK (LE)	-0.08	-0.45	-0.06

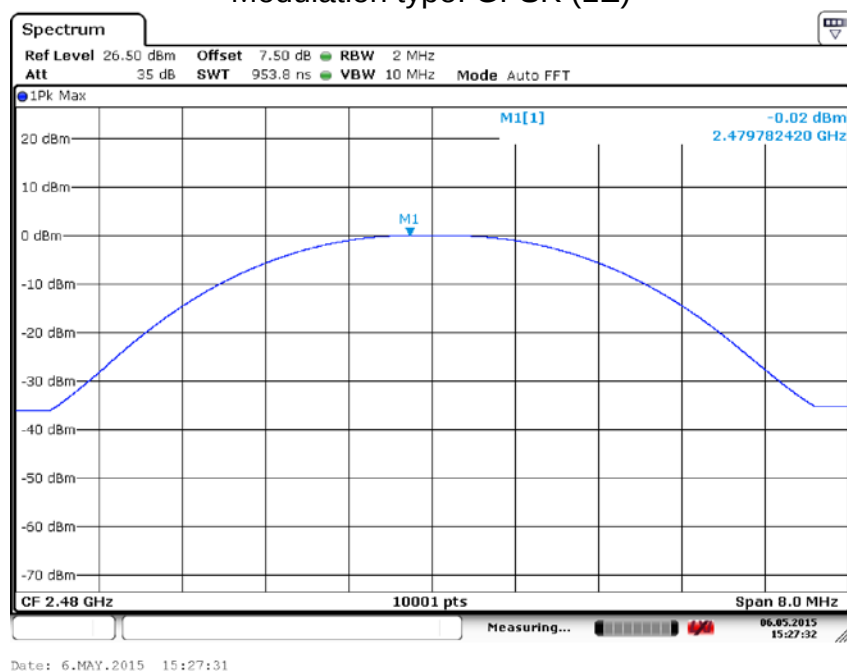
Modulation type	Peak Power Output (dBm)		
	2402MHz (Ch0)	2440MHz (Ch19)	2480MHz (Ch39)
GFSK (LE)	-0.04	-0.40	-0.02



Carrier frequency (MHz): 2402
Channel No.:0
Modulation type: GFSK (LE)



Carrier frequency (MHz): 2440
Channel No.:19
Modulation type: GFSK (LE)



Carrier frequency (MHz): 2480
Channel No.:39
Modulation type: GFSK (LE)

2.2.3 Transmitter Power Spectral Density

2.2.3.1 Ambient condition

Temperature	Relative humidity	Pressure
22°C	40%	101.5kPa

2.2.3.2 Test Description

The peak power density is measured with a spectrum analyzer and Bluetooth test set via a power splitter with a known loss connected to the antenna terminal of the EUT while the EUT is operating at maximum power and at the appropriate frequencies.

2.2.3.3 Test limit

Part15.247(e)

The maximum permissible power spectral density is 8 dBm in any 3 kHz band.

2.2.3.4 Test Procedure Used

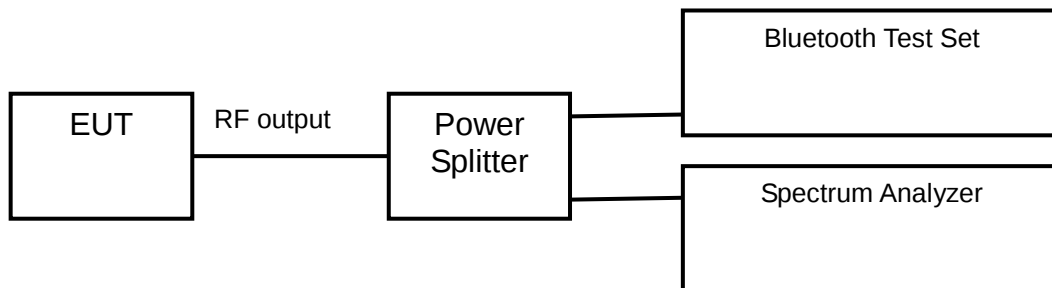
KDB 558074 D01 v03r02 Section 10.2.

2.2.3.5 Test Settings

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq 3 \times \text{RBW}$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.
- If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

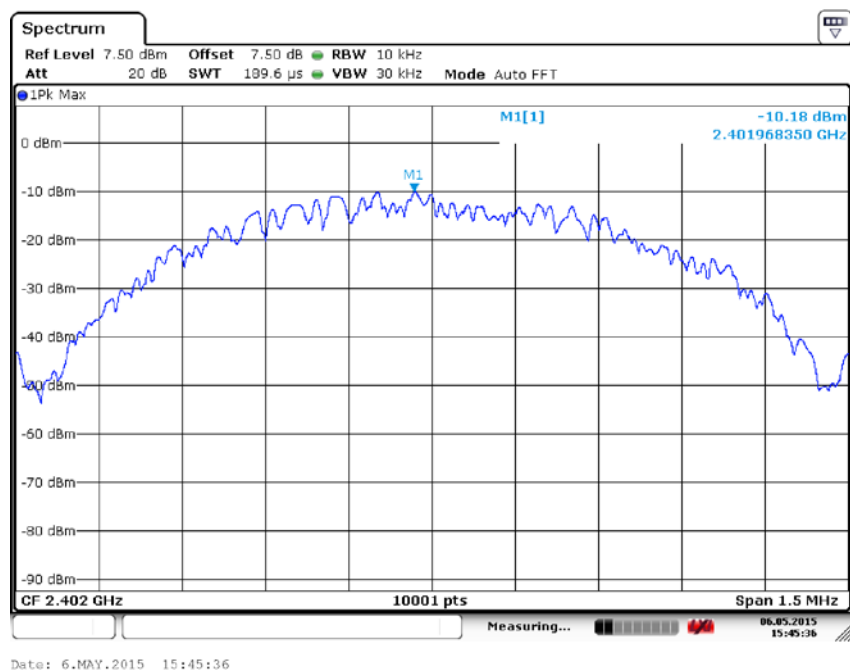
2.2.3.6 Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

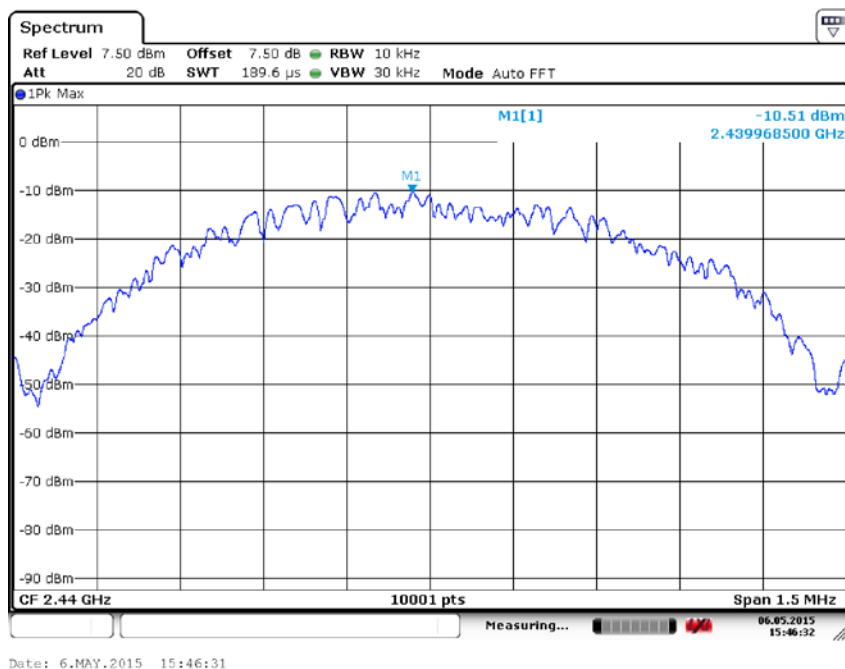


2.2.3.7 Test result:

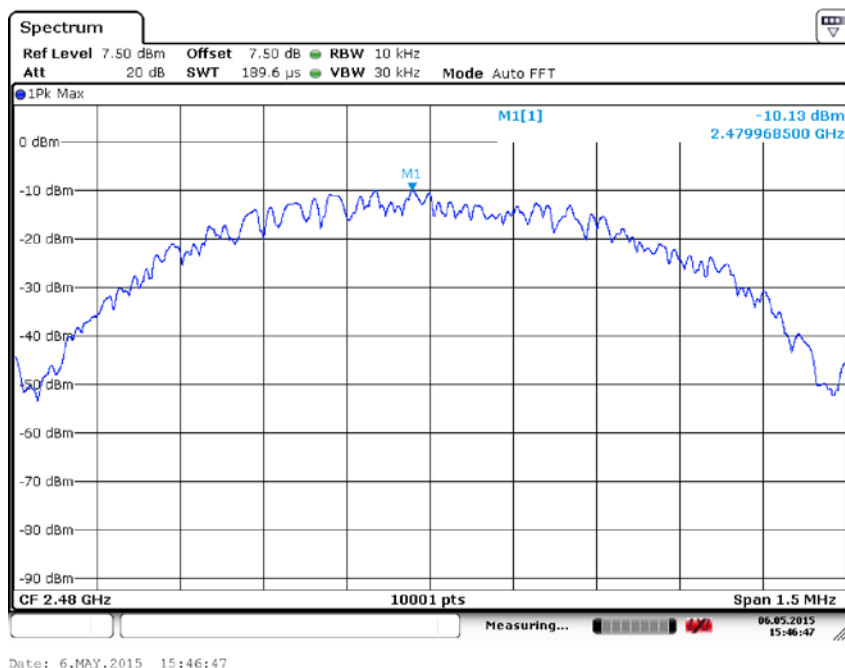
Carrier frequency (MHz)	Channel No	Power Density
2402	0	-10.18
2440	19	-10.51
2480	39	-10.13



Carrier frequency (MHz): 2402
Channel No.:0
Modulation type: GFSK (LE)



Carrier frequency (MHz): 2440
Channel No.:19
Modulation type: GFSK (LE)



Carrier frequency (MHz): 2480
Channel No.:39
Modulation type: GFSK (LE)

2.2.4 Conducted Out of band emission measurement

2.2.4.1 Ambient condition

Temperature	Relative humidity	Pressure
22°C	40%	101.5kPa

2.2.4.2 Test Description

For the following out of band conducted spurious emissions plots, the EUT was set to transmit at maximum power with the largest packet size available. The worst case spurious emissions were found in this configuration.

2.2.4.3 Test limit

Part 15.247(d)

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth.

2.2.4.4 Test Procedure Used

KDB 558074 D01 v03r02 Section 11.3

2.2.4.5 Test Settings

- Set the center frequency and span to encompass frequency range to be measured.
- Set the RBW = 100kHz.
- Set the VBW $\geq$ 300kHz.
- Detector = peak.
- Set span to encompass the spectrum to be examined
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

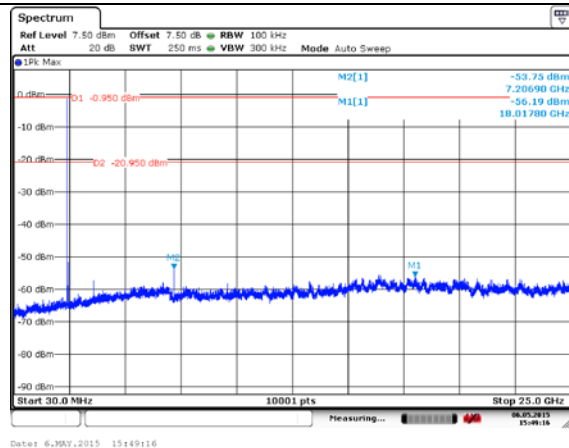
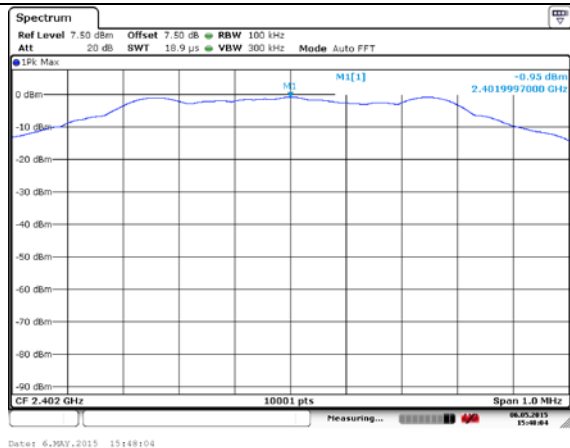
2.2.4.6 Test Setup

The EUT and measurement equipment were set up as shown in 2.2.3.6

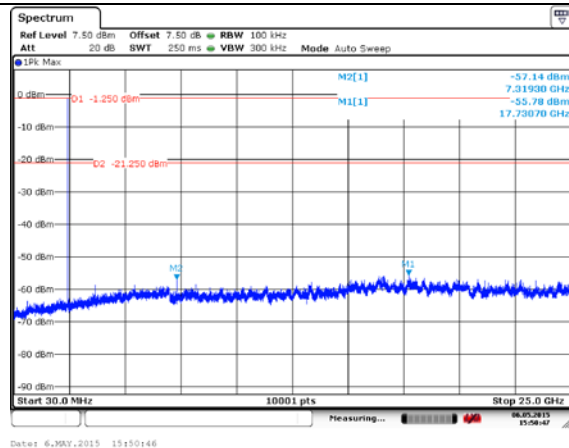
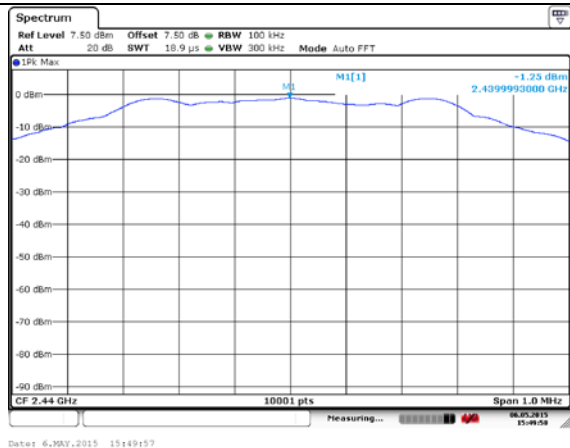
2.2.4.7 Test result

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

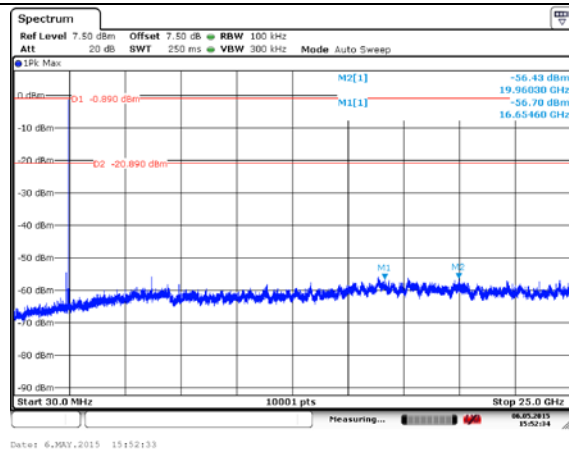
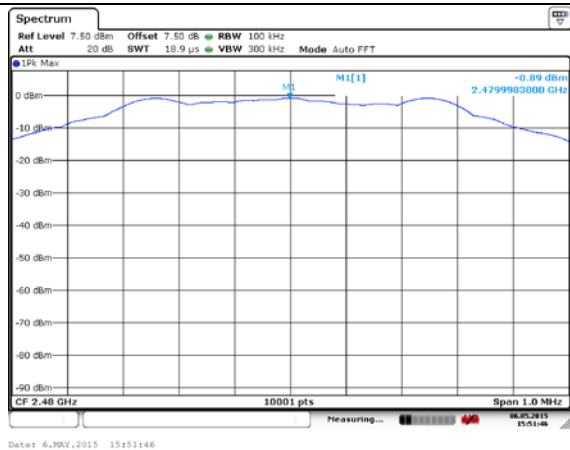
CH0



CH19



CH39



2.2.5 Spurious Radiated Emissions

2.2.5.1 Ambient condition

Temperature	Relative humidity	Pressure
20.8°C	36.5%	100.9kPa

2.2.5.2 Test Description

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

2.2.5.3 Test limit

Part15.205, 15.209, 15.247(d);

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in below Table per Section 15.209.

Frequency [MHz]	Field strength [$\mu\text{V/m}$]	Measured Distance [meters]
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Radiated Limits

Part15.35(b):

there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit

Used conversion factor: $\text{Limit (dB}\mu\text{V/m)} = 20 \log (\text{Limit } (\mu\text{V/m})/1\mu\text{V/m)}$

Frequency [MHz]	Detector	Unit (dB $\mu\text{V/m}$)
30~88	Quasi-peak	40.0
88~216	Quasi-peak	43.5
216~960	Quasi-peak	46.0
960~1000	Quasi-peak	54.0
1000~5th harmonic of the highest frequency or 40GHz, whichever is lower	Average	54.0
	Peak	74.0

Conversion Radiated limits

2.2.5.4 Test Procedure Used

- KDB 558074 D01 v03r02 - Section 12.2.5 (average power measurements)
KDB 558074 D01 v03r02 - Section 12.2.4 (peak power measurements)

2.2.5.5 Test Settings

Average Field Strength Measurements per Section 12.2.5.3 of KDB 558074 v03r02

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3kHz > 1/T
4. Averaging type was set to RMS to ensure that video filtering was applied in the power domain
5. Detector = peak
6. Sweep time = auto
7. Trace mode = max hold
8. Trace was allowed to run for at least 50 times (1/duty cycle) traces

Peak Field Strength Measurements per Section 12.2.4 of KDB 558074 v03r02

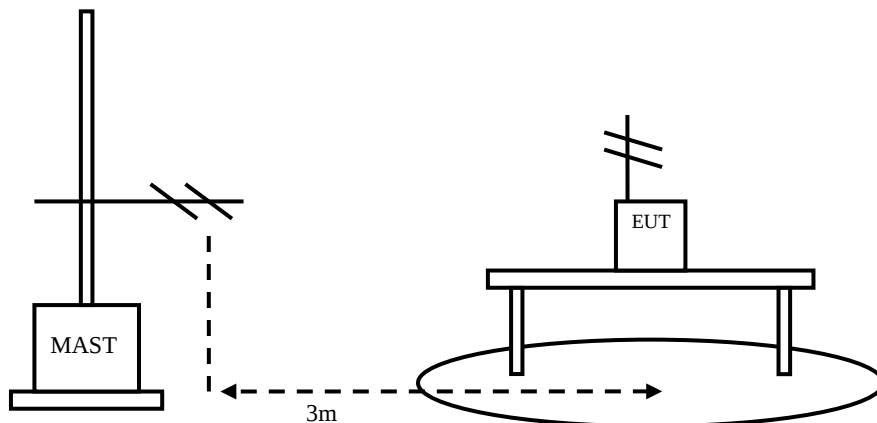
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW is set depending on measurement frequency, as specified in following table

Frequency	RBW
9-150kHz	200-300Hz
0.15-30MHz	9-10kHz
30-1000MHz	100-120kHz
>1000MHz	1MHz

3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

2.2.5.6 Test Setup

The EUT and measurement equipment were set up as shown in the diagram below



The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration. Then start the test software ES-K1. Sweep the whole frequency band through the range from 30MHz to 1GHz or above, using receive log period antenna HL562 or Ridge horn antenna HF906.

During the test, the antenna height and EUT azimuth were varied in order to identify the maximum level of emission from the EUT. The height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees. The measurements shall be repeated with orthogonal polarization of the test antenna. The results shall be showed the worst case of the three orthogonal axes.

The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.

2.2.5.7 Test result

The worst case attitude: The mobile lay down.

Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: GFSK (LE)

Polarity: Vertical

Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	85.77	51.77	N/A	N/A	8.90	25.10
2	2390	48.18	14.18	-25.82	74.00	8.90	25.10

Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: GFSK (LE)

Polarity: Horizontal

Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	83.20	49.20	N/A	N/A	8.90	25.10
2	2390	45.03	11.03	-28.97	74.00	8.90	25.10

Carrier frequency (MHz): 2402

Channel No.:0

Test Mode: GFSK (LE)

Polarity: Vertical

Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	80.69	46.69	N/A	N/A	8.90	25.10
2	2390	38.56	4.56	-15.44	54.00	8.90	25.10

Carrier frequency (MHz): 2402
Channel No.:0
Test Mode: GFSK (LE)
Polarity: Horizontal
Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2402	78.81	44.81	N/A	N/A	8.90	25.10
2	2390	37.50	3.50	-16.50	54.00	8.90	25.10

Carrier frequency (MHz): 2480
Channel No.:39
Test Mode: GFSK (LE)
Polarity: Vertical
Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	86.99	52.99	N/A	N/A	8.90	25.10
2	2483.5	47.34	13.34	-26.66	74.00	8.90	25.10

Carrier frequency (MHz): 2480
Channel No.:39
Test Mode: GFSK (LE)
Polarity: Horizontal
Detector: Peak

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	82.91	48.91	N/A	N/A	8.90	25.10
2	2483.5	46.04	12.04	-27.96	74.00	8.90	25.10

Carrier frequency (MHz): 2480
Channel No.:39
Test Mode: GFSK (LE)
Polarity: Vertical
Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	80.71	46.71	N/A	N/A	8.90	25.10
2	2483.5	37.60	3.60	-16.40	54.00	8.90	25.10

Carrier frequency (MHz): 2480

Channel No.:39

Test Mode: GFSK (LE)

Polarity: Horizontal

Detector: Average

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	cable loss (dB)	antenna factor (dB)
1	2480	78.58	44.58	N/A	N/A	8.90	25.10
2	2483.5	37.87	3.87	-16.13	54.00	8.90	25.10

Sample Calculations

Determining Spurious Emissions Levels

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.

The measurement results are obtained as described below:

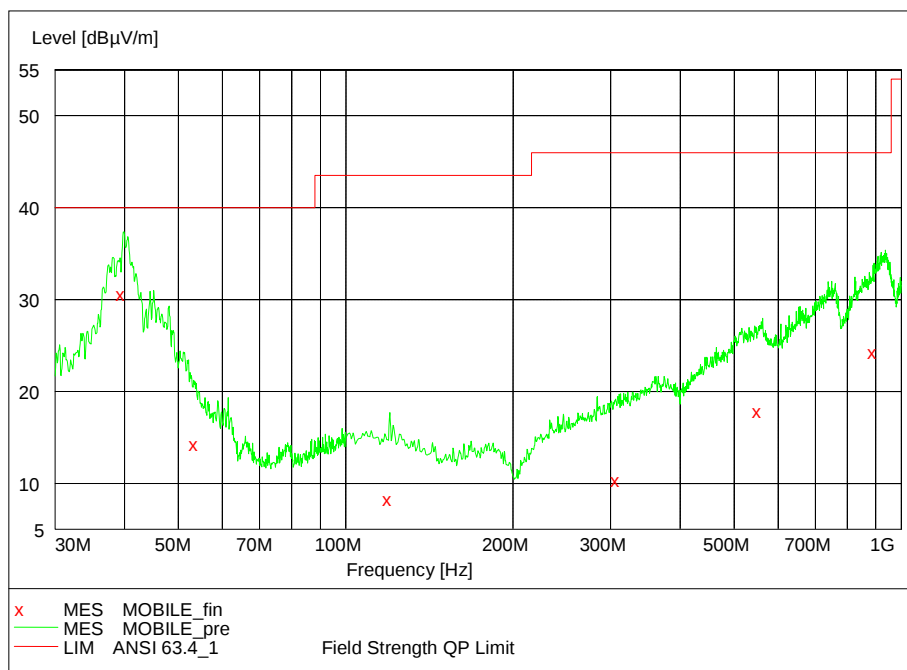
Result= $P_{mea} + A_{Rpl}$

The worst case attitude: The mobile lay down.

For GFSK (LE)

Channel No.:19

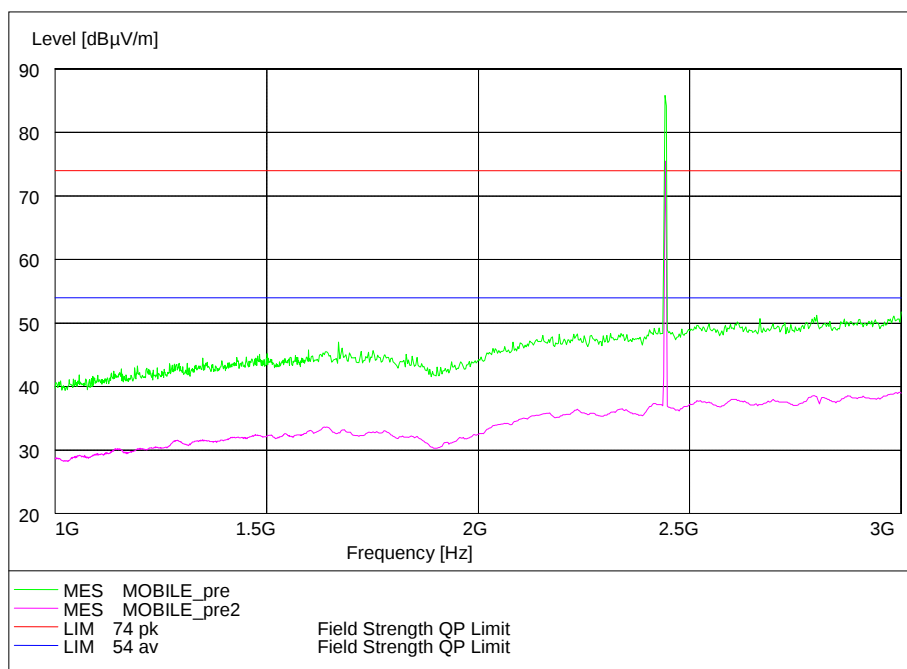
Frequency (MHz)	Result (dBuV/m)	A_{Rpl} (dB)	P_{mea} (dBuV/m)	Polarity	Limit (dBuV/m)
39.819639	30.70	16.0	14.7	Vertical	40.0
53.847695	14.40	7.6	6.8	Vertical	40.0
120.040080	8.40	10.0	-1.6	Vertical	43.5
309.218437	10.40	12.3	-1.9	Horizontal	46.0
556.112224	18.00	19.3	-1.3	Horizontal	46.0
895.791583	24.40	24.8	-0.4	Vertical	46.0



Frequency Range: 30MHz-1000 MHz

Detector: QP mode

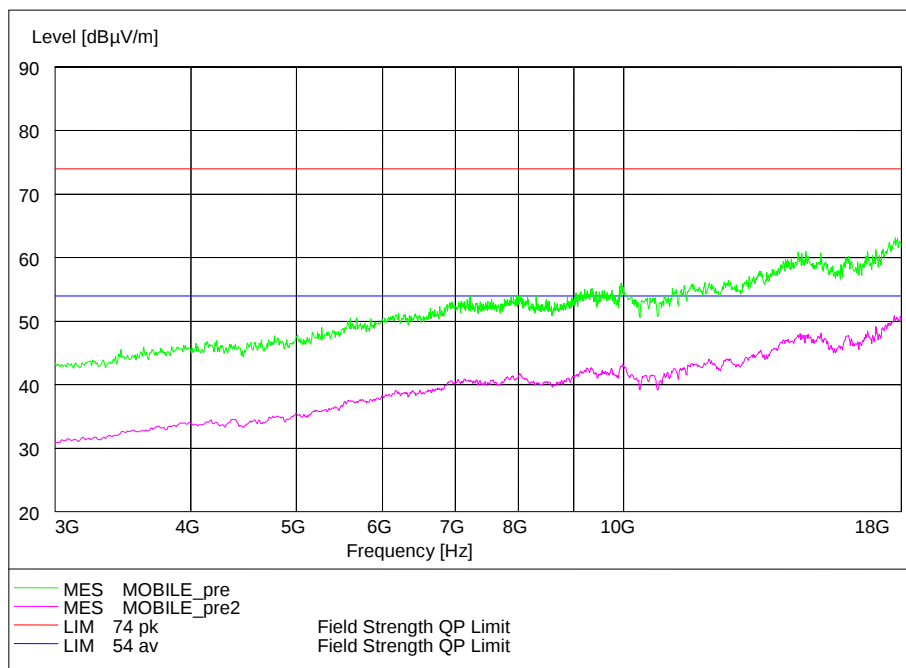
Modulation type: GFSK (LE)



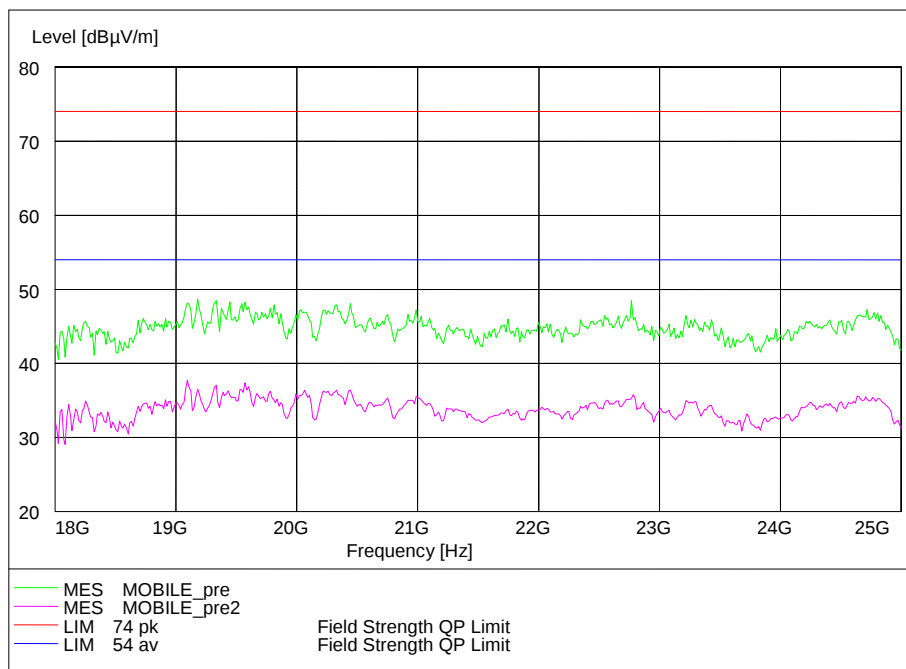
Frequency Range: 1GHz-3GHz

Detector: Av mode and PK mode

Modulation type: GFSK (LE)



Frequency Range: 3GHz-18GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE)



Frequency Range: 18GHz-25GHz
Detector: Av mode and PK mode
Modulation type: GFSK (LE)

2.3. Measurement Uncertainty

Items	Uncertainty	
Occupied Bandwidth	3kHz	
Peak power output	0.67dB	
Band edge compliance	1.20dB	
Spurious emissions	30MHz~1GHz	2.83dB
	1GHz~12.75GHz	2.50dB
	12.75GHz~25GHz	2.75dB

2.4. List of test equipment

No.	Name/ Model	Manufacturer	S/N	Cal Due date
1.	Spectrum Analyzer FSV	ROHDE&SCHWARZ	101065	2015.8
2.	Signal Generator MG3700A	Anritsu	6200677084	2015.8
3.	Bluetooth Test Set MT8852B	Anritsu	1142010	2015.2
4.	Cable 104EA	SUCOFLEX	9272/4EA	2015.8
5.	Cable 104EA	SUCOFLEX	9266/4EA	2015.8
6.	Power Splitter 11850C	Agilent	026057	2015.8
7.	12.65m×8.03m×7.50m Fully-Anechoic Chamber	FRANKONIA	----	----
8.	23.18m×16.88m×9.60m Semi-Anechoic Chamber	FRANKONIA	---	----
9.	Turn table Diameter:1m	HD	----	----
10.	Turn table Diameter:5m	HD	----	----
11.	Antenna master FAC(MA4.0)	MATURO	----	----
12.	Antenna master SAC(MA4.0)	MATURO	----	----
13.	9.080m×5.255m×3.525m Shielding room	FRANKONIA	----	----
14.	HF 906 Double-Ridged Waveguide Horn Antenna	R&S	100030	2015.8
15.	HF 906 Double-Ridged Waveguide Horn Antenna	R&S	100029	2015.8
16.	HL562 Ultra log antenna	R&S	100016	2015.8
17.	3160-09 Receive antenna	SCHWARZ-BECK	002058-002	2015.8
18.	ESI 40 EMI test receiver	R&S	100015	2015.8
19.	Radio tester	CMU 200	114667	2015.8
20.	ESCS30 EMI test receiver	R&S	100029	2015.8
21.	HL562 Receive antenna	R&S	100167	2015.8
22.	ESH3-Z5 LISN	R&S	100020	2015.8

Appendix

Appendix Test Setup