

TEST REPORT

of

FCC Part 15 Subpart C §15.247

FCC ID: A3LSCHI939

Equipment Under Test : Mobile Phone
 Model Name : SCH-I939
 Serial No. : N/A
 Applicant : SAMSUNG ELECTRONICS CO., LTD.
 Manufacturer : SAMSUNG ELECTRONICS CO., LTD.
 Date of Test(s) : 2012.05.04 ~ 2012.05.18
 Date of Issue : 2012.05.18

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Date

2012.05.18

Alvin Kim

Approved By:



Date

2012.05.18

Feel Jeong

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- 413-15, Gomae-Dong Giheung-Gu, Yongin-Si, Gyeonggi-Do, South Korea.
- Wireless Div. 2FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040

www.ee.sgs.com/korea

Telephone : +82 31 428 5700

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1.2. Details of Applicant

Applicant : SAMSUNG ELECTRONICS CO., LTD.

Address : 416, Maetan-3dong, Yeongtong, Suwon, Gyeonggi, Korea

Contact Person : Oh, Chang-Yong

Phone No. : +82 +31 301 7948

1.3. Description of EUT

Kind of Product	Mobile Phone
Model Name	SCH-I939
Serial Number	N/A
Power Supply	DC 3.8 V
Frequency Range	2 402 MHz ~ 2 480 MHz
Modulation Technique	GFSK
Number of Channels	40
Channel separation	2 MHz
Antenna Type	Internal type
Antenna Gain	-1.43 dB i

1.4. Declaration by the manufacturer

- N/A

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1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal Date	Cal Interval	Cal Due.
Signal Generator	R&S	SMR40	100272	Jul. 15, 2011	Annual	Jul. 15, 2012
Signal Generator	Agilent	8648D	3847M00534	Mar. 29, 2012	Annual	Mar. 29, 2013
Spectrum Analyzer	R&S	FSV30	100768	Mar. 29, 2012	Annual	Mar. 29, 2013
Spectrum Analyzer	Agilent	N9030A	US51350132	Oct. 28, 2011	Annual	Oct. 28, 2012
DC Power Supply	Agilent	U8002A	MY50070064	Mar. 29, 2012	Annual	Mar. 29, 2013
Power Sensor	R & S	NRP-Z81	101341	Sep. 29, 2011	Annual	Sep. 29, 2012
Attenuator	Mini-Circuits	BW-N20W5+	0950-1	Mar. 30, 2012	Annual	Mar. 30, 2013

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1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part15		
Section	Test Item	Result
15.205(a) 15.247(d)	Conducted Spurious Emissions	Complied
15.247(a)(2)	6 dB Bandwidth	Complied
15.247(b)(3)	Maximum Peak Conducted Output Power	Complied
15.247(e)	Power Spectral Density	Complied

1.7. Test Procedure(s)

The guidance provided in KDB 558074 were used in the measurement of the DUT.

1.8. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL005522	Initial
1	F690501/RF-RTL005522-1	1. Re-test the PSD & Output power & Conducted spurious emissions. 2. Add the cal interval of test equipment.

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2. Conducted Spurious Emissions



2.1. Limit

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph(b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

2.2. Test Procedures

Per the guidance of KDB 558074, section 5.4.1.1, the reference level for out of band emissions is established from the plots of this section since the band edge emissions are measured with a RBW of 100 kHz. This reference level is then used as the limit in subsequent plots for out of band spurious emissions shown in section 2.3. The limit for out of band spurious emission at the band edge is 30 dB below the fundamental emission level measured in a 100 kHz bandwidth. The plots are measured with a 1 MHz RBW, the display line may not necessarily appear to be 30 dB below the level of the fundamental in a 1 MHz bandwidth.

1. The transmitter output was connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW=100 kHz, VBW=300 kHz.

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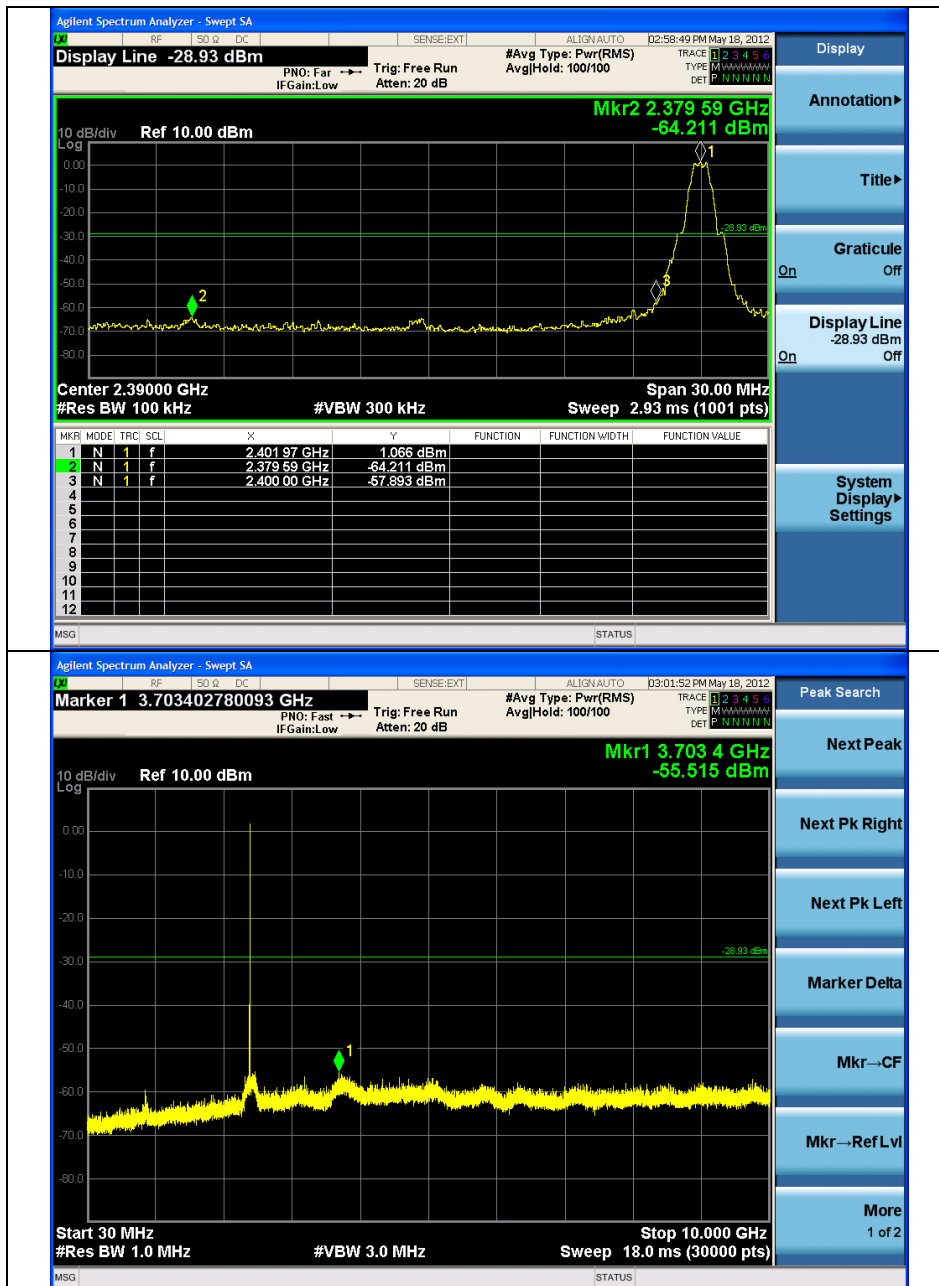
2.3. Test Results

Ambient temperature : (24 ± 2) °C
Relative humidity : 47 % R.H.

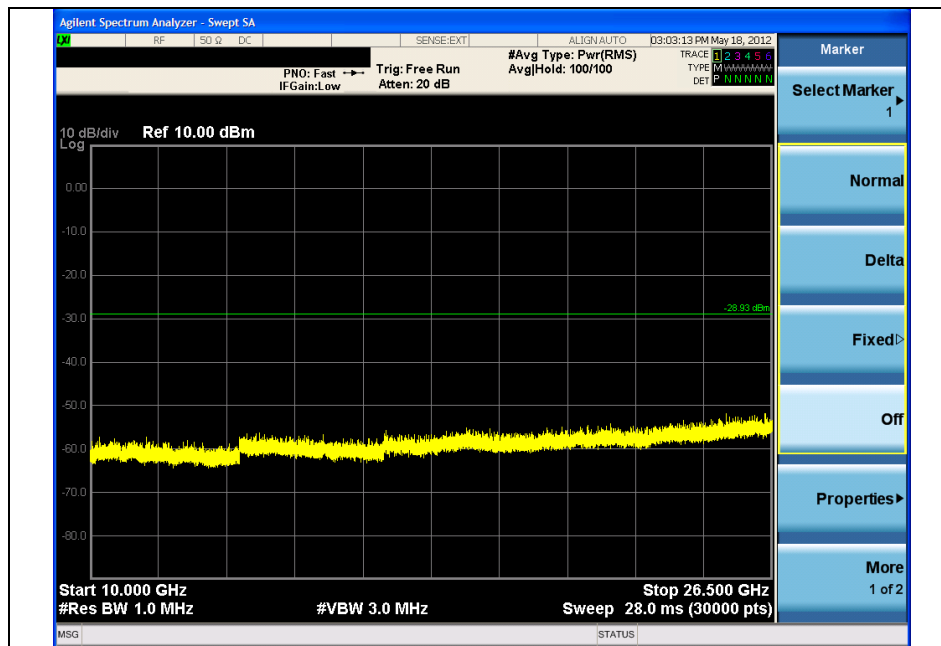
Plots of Conducted Spurious Emissions

Operating Mode: GFSK

Low Channel



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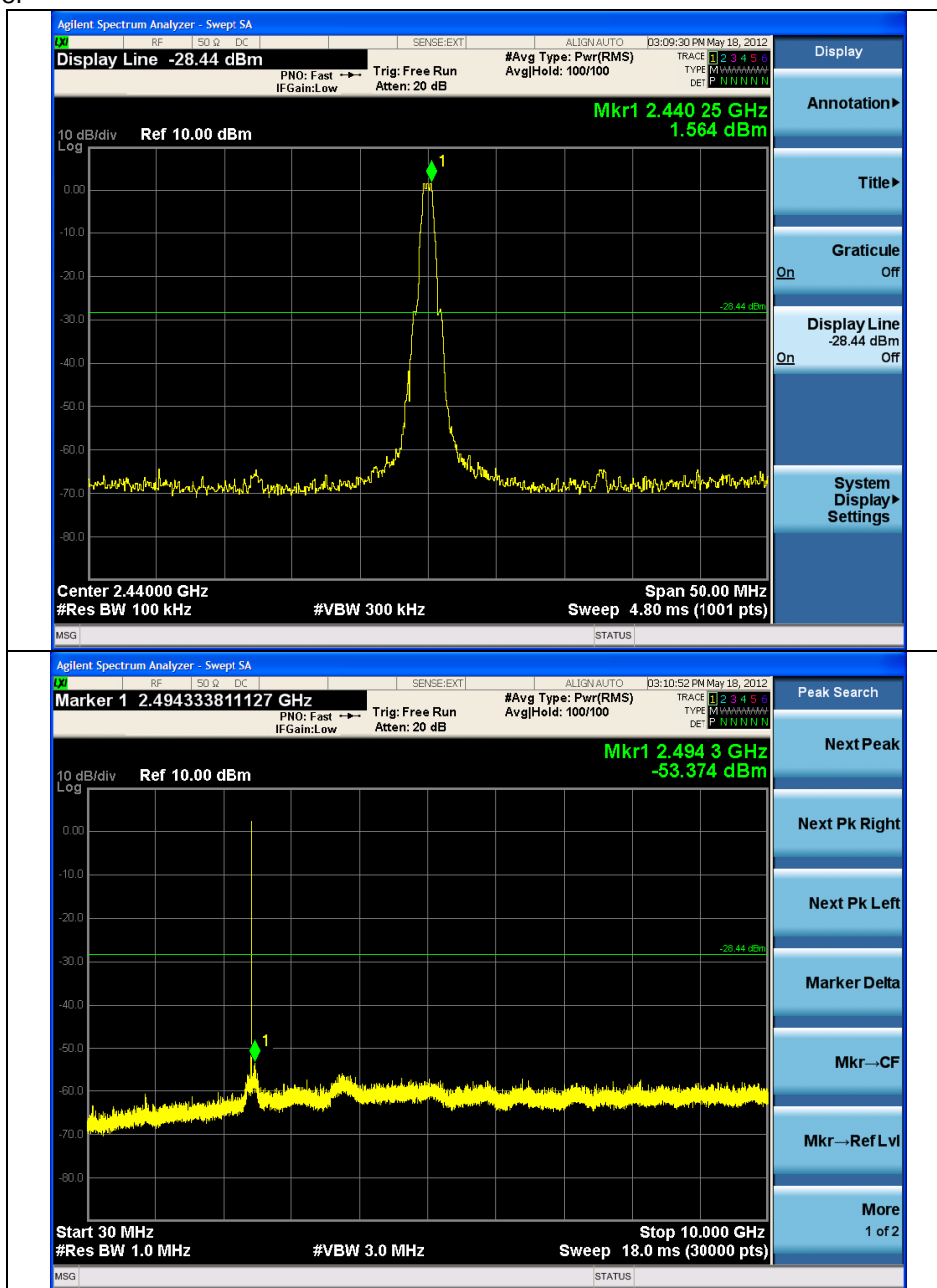
Note:

Offset value (dB) = Coax. Cable loss (dB)

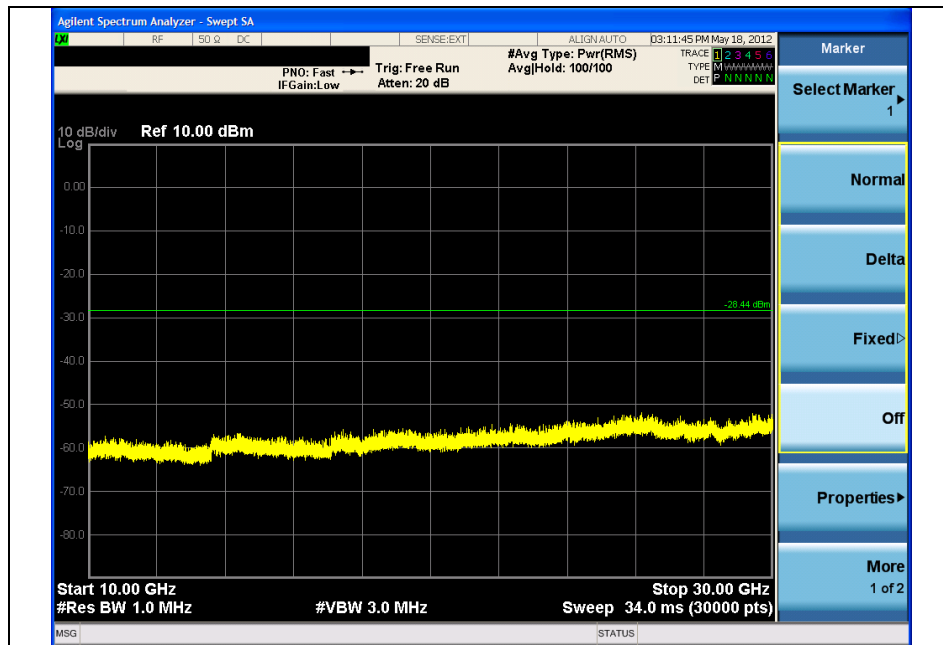
Frequency (MHz)	Reading (dB m)	Coax. Cable loss (dB)	Result (dB m)
2 402	1.066	1.53	2.596
2 379	-64.211	1.50	-62.711
2 400	-57.893	1.53	-56.363
3 703	-55.515	1.71	-53.805

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Middle Channel



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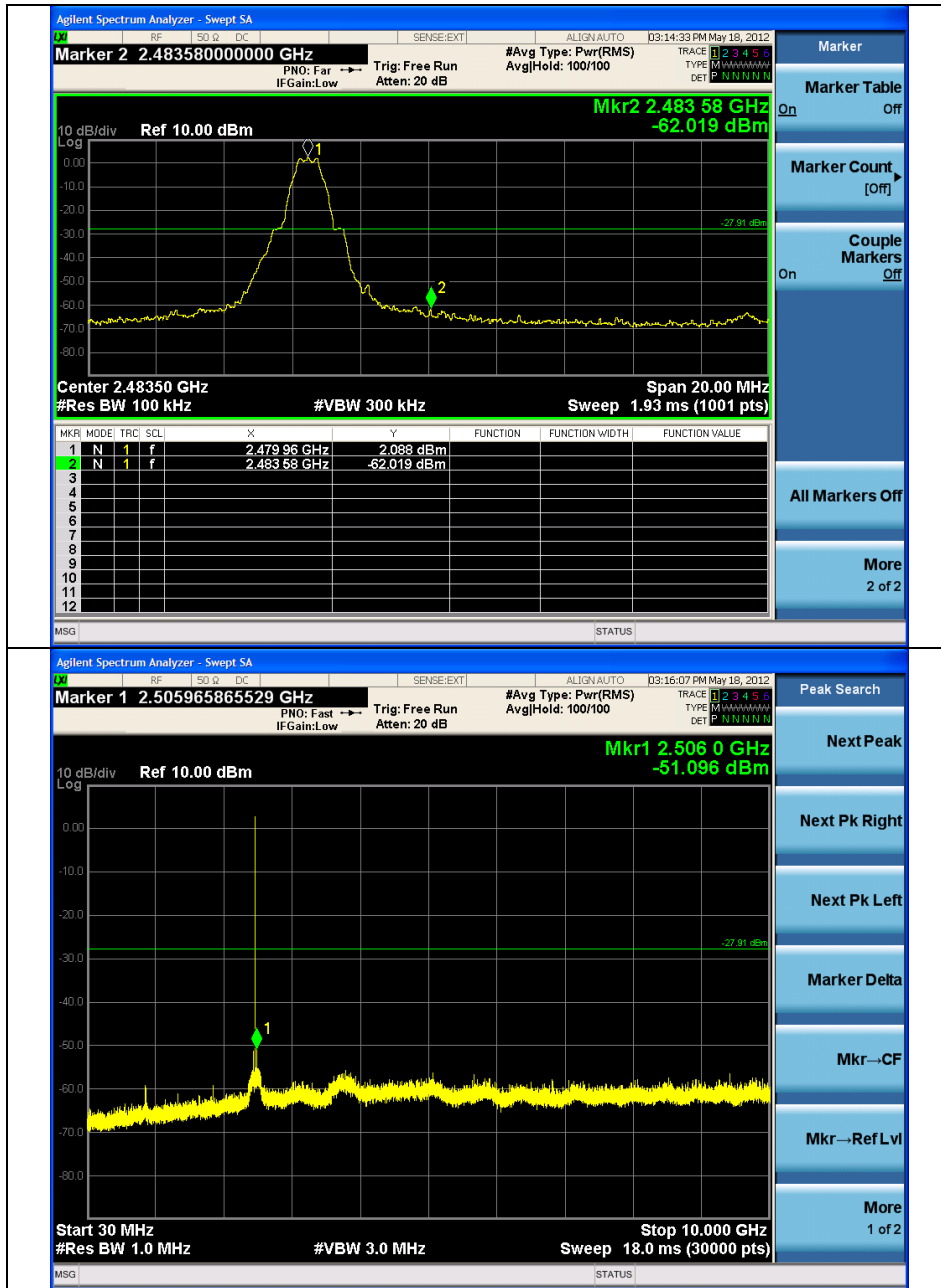
Note:

Offset value (dB) = Coax. Cable loss (dB)

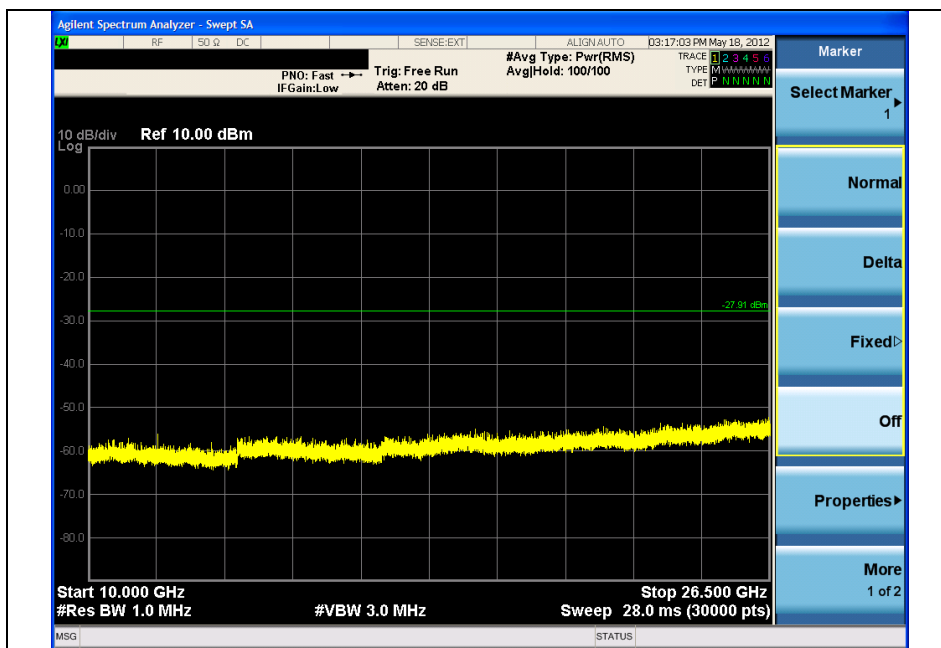
Frequency (MHz)	Reading (dB m)	Coax. Cable loss (dB)	Result (dB m)
2 440	1.564	1.60	3.164
2 494	-53.374	1.57	-51.804

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High Channel



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Note:

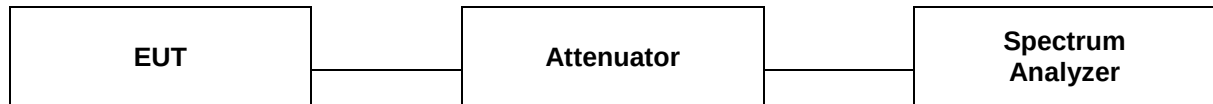
Offset value (dB) = Coax. Cable loss (dB)

Frequency (MHz)	Reading (dB m)	Coax. Cable loss (dB)	Result (dB m)
2 480	2.088	1.56	3.648
2 483.5	-62.019	1.56	-60.459
2 506	-51.096	1.54	-49.556

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3. 6 dB Bandwidth of the channel

3.1. Test Setup



3.2. Limit

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 ~ 928 MHz , 2 400 ~ 2 483.5 MHz, and 5 725 ~ 5 825 MHz bands. The minimum of 6 dB Bandwidth shall be at least 500 kHz

3.3. Test procedure

The test follows section 5.1 of FCC KDB Publication 558074

1. Set resolution bandwidth (RBW) = 1 – 5 % of the emission bandwidth (EBW).
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude point (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is 1 – 5 %.

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3.4. Test Results

Ambient temperature : (24 ± 2) °C
Relative humidity : 47 % R.H.

Operation Mode	Channel	Channel Frequency (MHz)	6 dB Bandwidth (MHz)
GFSK	Low	2 402	0.606
	Middle	2 440	0.608
	High	2 480	0.608

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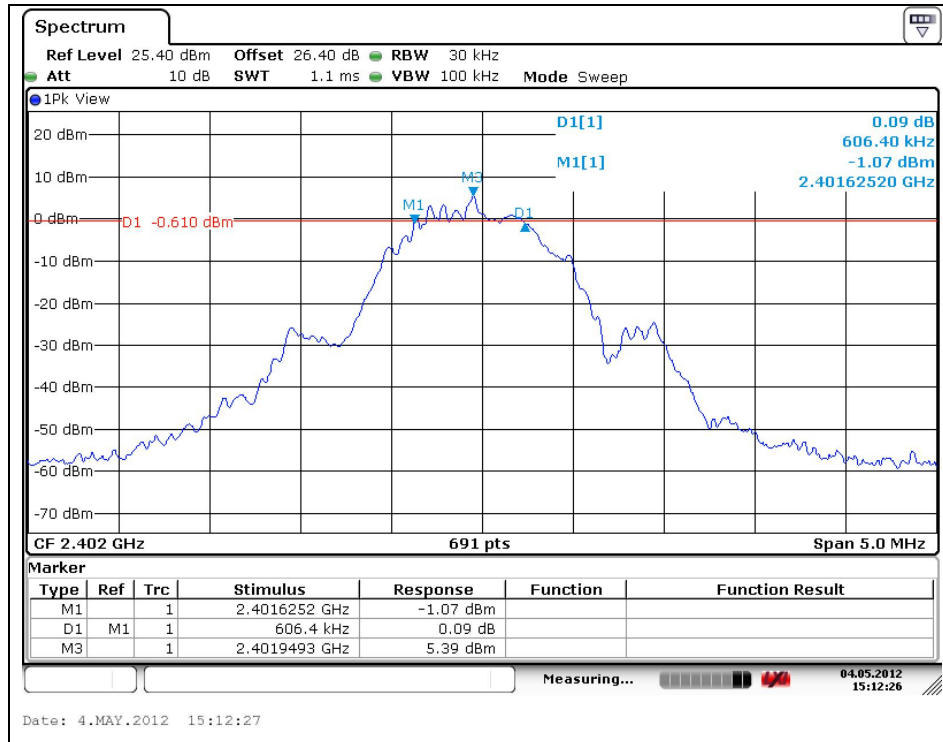
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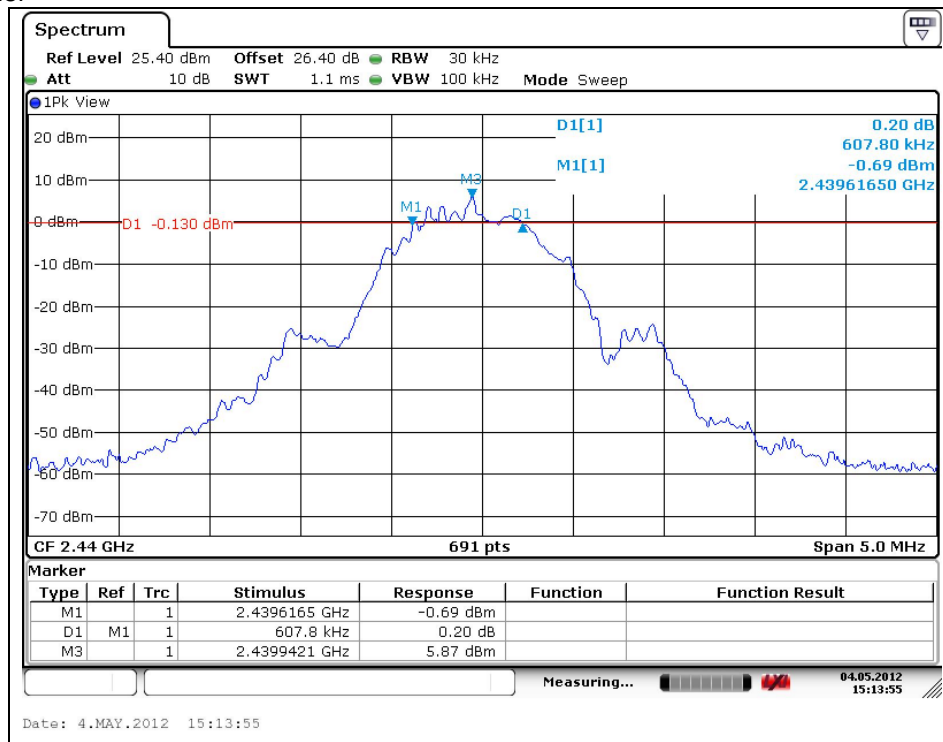
Plots of 6 dB Bandwidth

Operating Mode: GFSK

Low Channel

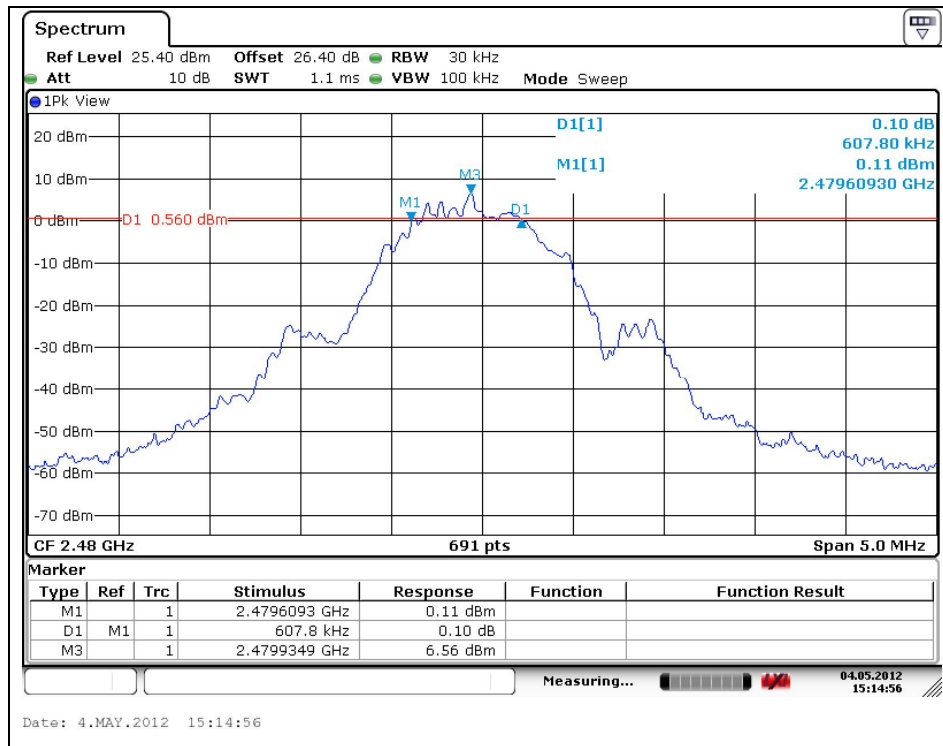


Middle Channel



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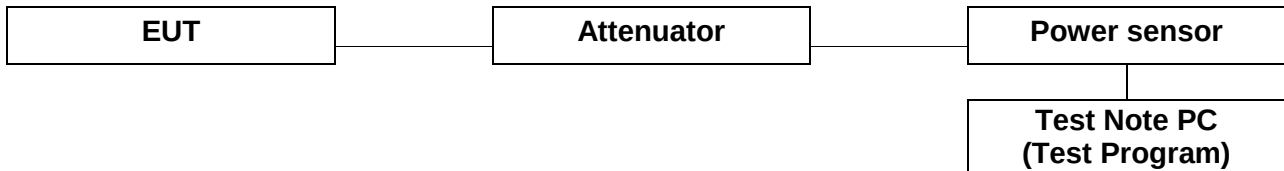
High Channel



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4. Maximum Peak Conducted Output Power

4.1. Test Setup



4.2. Limit

The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247(b)(3), For systems using digital modulation in the 2400-2483.5 MHz bands the limit is 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

4.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the wideband power sensor.
3. Test program : (S/W name : R&S Power Viewer, Version : 3.2.0)
4. Measure peak & average power each channel.

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4.4. Test Results

Ambient temperature : (24 ± 2) °C
Relative humidity : 47 % R.H.

Operation Mode	Channel	Frequency (MHz)	Attenuator + Cable offset (dB)	Peak Power Result (dB m)	Average Power Result (dB m)	Peak Power Limit (dB m)
GFSK	Low	2 402	20.72	2.91	2.46	30
	Middle	2 440	20.87	3.52	3.01	30
	High	2 480	21.01	3.64	2.96	30

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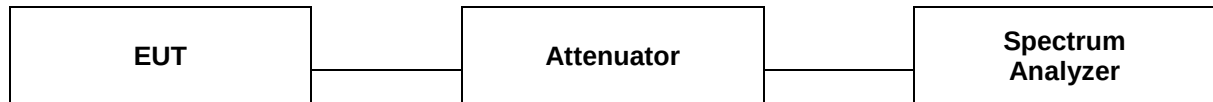
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5. Power Spectral Density

5.1. Test Setup



5.2. Limit

According to §15.247(e), For digitally modulated system, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph(b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density

5.3. Test procedure

The measurements are recorded using the AVGPDS measurement procedure in section 5.3 of KDB 558074.

1. Use this procedure when the maximum conducted output power in the fundamental emission is used to demonstrate compliance. The EUT must be configured to transmit continuously at full power over the measurement duration.
2. Set the analyzer span to 5 – 30 % greater than the EBW.
3. Set the RBW = 100 kHz
4. Set the VBW $\geq$ 300 kHz
5. Detector = power average (RMS).
6. Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span/RBW}$ (use of a greater number of measurement points than this minimum requirement is recommended).
7. Manually set the sweep time to : $\geq 10 \times (\text{number of measurement points in sweep}) \times (\text{transmission symbol period})$.
8. Perform the measurement over a single sweep.
9. Use the peak marker function to determine the maximum level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent level in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where : $\text{BWCF} = 10\log(3 \text{ kHz}/100 \text{ kHz}) = -15.2 \text{ dB}$.
11. The resulting PSD level must be $\leq 8 \text{ dBm}$.

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5.4. Test Results

Ambient temperature : (24 ± 2) °C
Relative humidity : 47 % R.H.

Operation Mode	Channel	Frequency (MHz)	Measured PSD (dB m)	Bandwidth Correction Factor (dB)	Corrected PSD (dB m)	Maximum Limit (dB m)
GFSK	Low	2 402	-4.73	-15.2	-19.93	8
	Middle	2 440	-4.32	-15.2	-19.52	8
	High	2 480	-4.01	-15.2	-19.21	8

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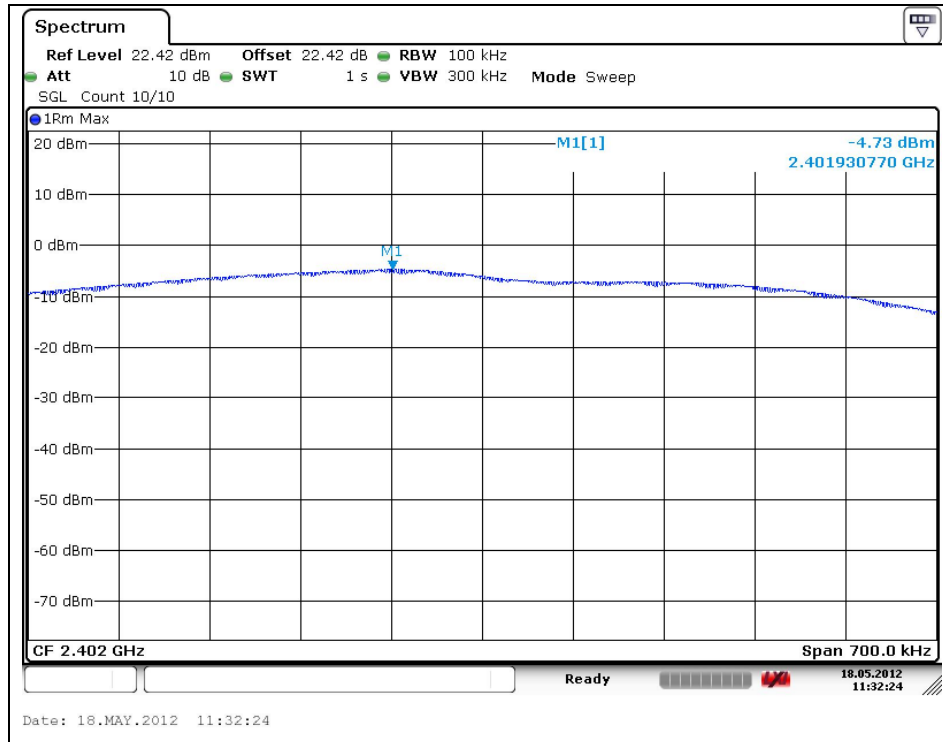
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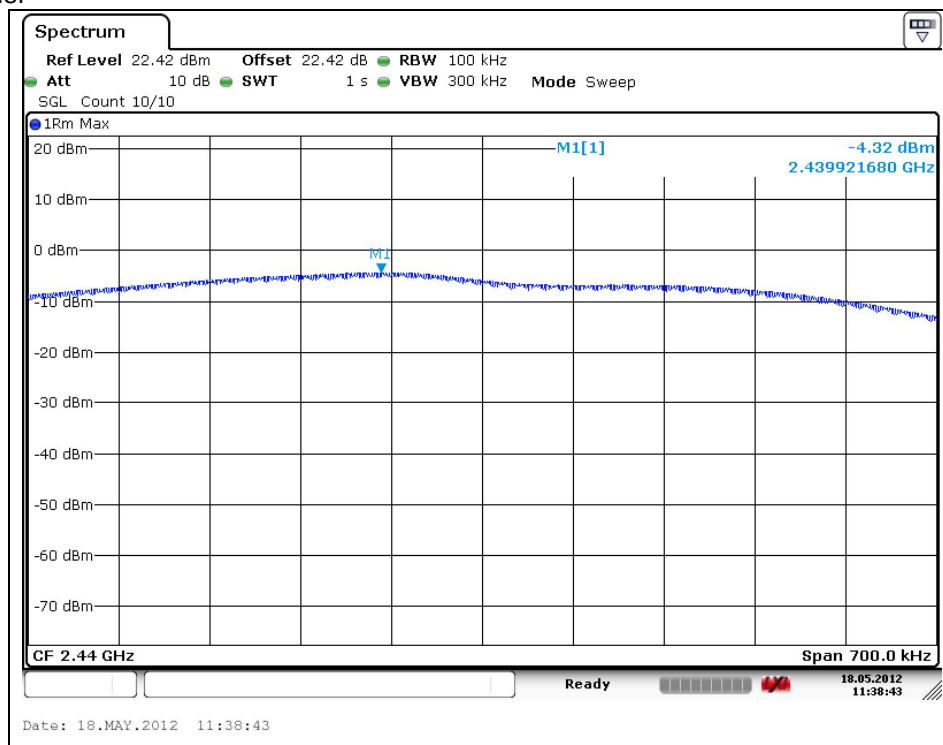
Plots of Power spectral density

Operating Mode: GFSK

Low Channel

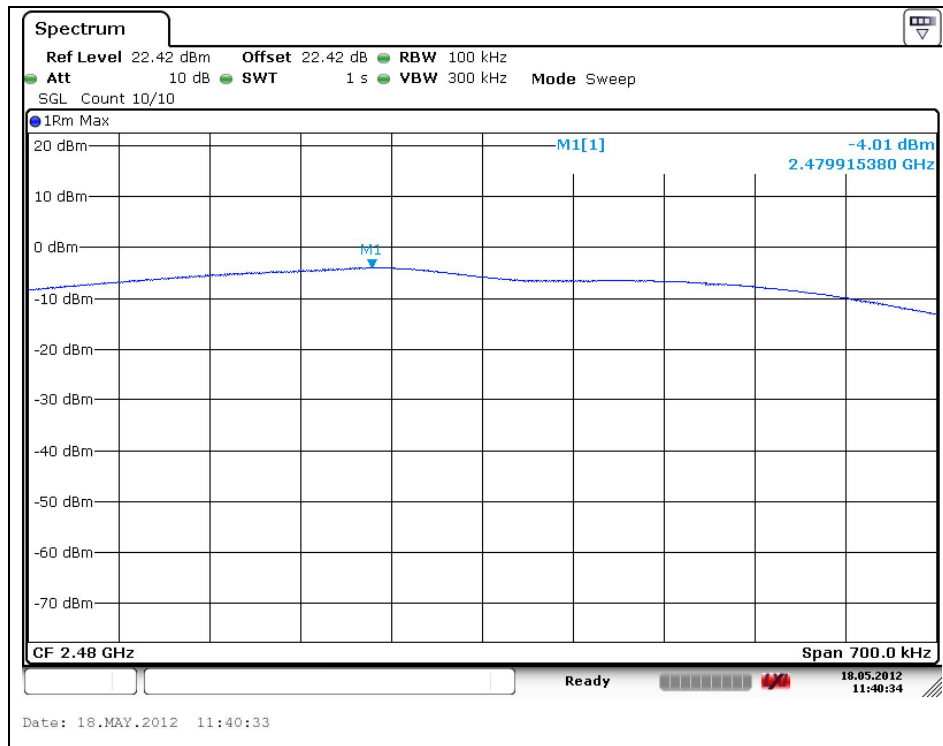


Middle Channel



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High Channel



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6. Antenna Requirement

6.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section §15.247 (b) if transmitting antennas of directional gain greater than 6 dB i are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dB i.

6.2. Antenna Connected Construction

Antenna used in this product is Internal type gain of -1.43 dB i.

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