FCC RF
TEST REPORT

Test Laboratory:

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Test Report Number: SKT-RFC-140001

Date of issue: January 21, 2014

Applicant:	**G.I.T Co., Ltd.** GIT BLDG., 38-5 Garakbon-Dong, Songpa-Gu, Seoul, 138-801 Korea
Manufacturer:	**G.I.T Co., Ltd.** GIT BLDG., 38-5 Garakbon-Dong, Songpa-Gu, Seoul, 138-801 Korea
Product:	TPMS Module
Model:	**TPMS B/T Adapter** (please see P5 for all the model numbers)
FCC ID:	TMGG1TDDMN006
File number:	SKTEU13-1515
EUT received:	November 11, 2013

Applied standards:	ANSI C63.10-2009 and ANSI C63.4-2009
Rule parts:	FCC Part 15 Subpart C - Intentional radiators
Equipment Class:	**DSS - Part 15 Spread Spectrum Transmitter**

Remarks to the standards: None

The above equipment has been tested by SK Tech Co., Ltd., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product or system, which was tested.

Inyong Song **/ Testing Engineer**   Jongsoo Yoon **/ Technical Manager**

Revision History of Report

Rev.	Revisions	Effect page	Reviewed by	Date
-	Initial issue	All	Jongsoo Yoon	January 21, 2014

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1 Summary of test results

Requirement	CFR 47 Section	Result
Antenna Requirement	15.203, 15.247(b)(4)	Meets the requirements
Maximum Peak Output Power	15.247(b)(1), (4)	Meets the requirements
Carrier Frequency Separation	15.247(a)(1)	Meets the requirements
20dB Channel Bandwidth	15.247(a)(1)	Meets the requirements
Number of Hopping Channels	15.247(a)(iii), 15.247(b)(1)	Meets the requirements
Time of Occupancy (Dwell Time)	15.247(a)(iii)	Meets the requirements
Spurious Emission, Band Edge, and Restricted bands	15.247(d), 15.205(a), 15.209(a)	Meets the requirements
AC power line Conducted emissions	15.207(a)	Meets the requirements

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2 Description of equipment under test (EUT)

Product:	TPMS Module
Model:	TPMS B/T Adapter
Serial number:	None (prototype)

Model differences:

Model name	Difference	Tested (checked)
TPMS B/T Adapter	Original (basic model that was fully tested)	☒
GDS TPMS BTA		
GDS TPMS B/T Adapter		
GDSM TPMS BTA		
GDSM TPMS B/T Adapter		
GDS Mobile BTA	Listed by the applicant's request without the tests; the applicant declared that the variant models were identical to the tested sample and added for the marketing purpose	
GDS Mobile B/T Adapter		
TPMS BTA		
TPMS BT Adapter		
TPMS B/T Adaptor		
GDS TPMS B/T Adaptor		

Note: *All the differences were compared with the tested sample.*

Technical data:

Power source	DC 3.7 V battery
Local Oscillator or X-Tal	25 MHz, 26 MHz
Transmit Frequency	2402 MHz to 2480 MHz (79 channels)
Antenna Type	Omni-directional chip antenna, peak gain: 1.99 dBi
Type of Modulation	GFSK, 4QDPSK, 8DPSK
RF Output power	-1.12 dBm (measured conducted RF power)

NOTE *The test report for the compliance with FCC Part 15B as a digital device was issued with other test report number*

I/O port	Type	Q'ty	Remark
Power input (DC)	Jack for charging the internal battery of EUT	1	DC 7 V to 35 V
Power output (DC)	Plug for charging the battery of GDS TPMS	1	
RS-232	D-sub (9-pin female) connected to PC	1	
RS-232	D-sub (9-pin male) connected to GDS TPMS	1	

Equipment Modifications

The temporary power switch was attached to the EUT.
No modifications were made during the testing.

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3   Test and measurement conditions

3.1. Test configuration (arrangement of EUT)

The measurements were taken in continuous transmitting mode using the TEST MODE. For controlling the EUT as TEST MODE, the test program and the cable assembly were provided by the applicant.
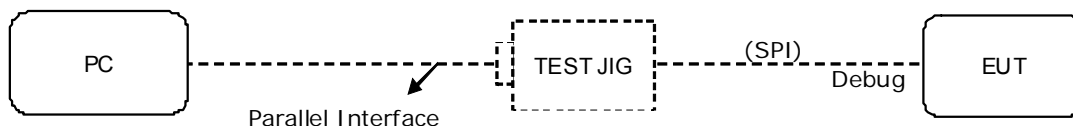
3.2. Description of support units (accessory equipment)

The following support units or accessories were used to form a representative test configuration during the tests.

#	Equipment	Manufacturer	Model No.	Serial No.
1	PC	DELL INC.	7XH86BX	17261795085
2	TEST JIG	-	-	-

Note: *1) For control of the RF module via SPI interface at the Debug port in the EUT.*
2) For radiated spurious emission measurements, the measurements were performed without PC after setting the radio module to TEST MODE.
3) If not otherwise stated, for modulating the transmitter, a pseudo random bit sequence with each pattern type DH5 for GFSK, 2-DH5 for π/4DQPSK and 3-DH5 for 8DPSK were used. The power setting value of Basic 48 and EDR 97 were used as the applicant provided. BC4 (Hardware ID 0x26) firmware version 6705

3.3. Interconnection and I/O cables

The following support units or accessories were used to form a representative test configuration during the tests.

#	Start		End		Cable	
	Name	I/O port	Name	I/O port	length (m)	shielded (Y/N)
1	EUT	Debug(SPI)	TEST JIG	SPI	0.5	N
2	TEST JIG	Parallel Interface	PC	LPT	1.0	N

Note: *1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

3.4. Measurement Uncertainty (U)

Measurement Item	Combined Standard Uncertainty Uc	Expanded Uncertainty $U = k \times Uc$ (k = 2)
Conducted RF power	±1.49 dB	±2.98 dB
Radiated disturbance	±2.30 dB	±4.60 dB
Conducted disturbance	±1.96 dB	±3.92 dB

3.5. Test date

Date Tested	November 28, 2013 – December 4, 2013

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4 Facilities and accreditations

4.1. Facilities

All of the measurements described in this report were performed at SK Tech Co., Ltd

Site I: 88, Geulgaeul-ro 81beon-gil, Wabu-up, Namyangju-si, Kyunggi-do, Korea
Site II: 124-8, Geulgaeul-ro, Wabu-up, Namyangju-si, Kyunggi-do, Korea

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-4. The sites comply with the Normalized Site Attenuation requirements given in ANSI C63.4, and site VSWR requirements specified in CISPR 16-1-4. The measuring apparatus and ancillary equipment conform to CISPR 16-1 series.

4.2. Accreditations

The laboratory has been also notified to FCC by RRA as a Conformity Assessment Body, and designated to perform compliance testing on equipment subject to Declaration of Conformity (DOC) and Certification under Parts 15 and 18 of the FCC Rules.

Designation No.　KR0007

4.3. List of test and measurement instruments

No	Description	Manufacturer	Model	Serial No.	Cal. due	Use
1	Spectrum Analyzer	Agilent	E4405B	US40520856	2014.03.07	
2	Spectrum Analyzer	Agilent	E4440A	MY46186322	2014.03.18	☒
3	EMC Spectrum Analyzer	Agilent	E7405A	US40240203	2014.07.08	
4	EMI Test Receiver	Rohde&Schwarz	ESPI7	101206	2014.07.08	☒
5	EMI Test Receiver	Rohde&Schwarz	ESHS10	835871/002	2014.07.08	☒
6	Artificial Mains Network	Rohde&Schwarz	ESH2-Z5	834549/011	2014.07.08	☒
7	Pre-amplifier	HP	8447F	3113A05153	2014.07.08	☒
8	Pre-amplifier	MITEQ	AFS44	1116321	2014.12.06	
9	Pre-amplifier	MITEQ	AFS44	1116322	2014.03.08	☒
10	Power Meter	Agilent	E4417A	MY45100426	2014.07.09	
11	Power Meter	Agilent	E4418B	US39402176	2014.07.09	
12	Power Sensor	Agilent	E9327A	MY44420696	2014.07.09	
13	Power Sensor	Agilent	8485A	3318A13916	2014.07.09	
14	Attenuator (10dB)	HP	8491B	38072	2014.07.08	☒
15	High Pass Filter	Wainwright	WHKX3.0/18G	8	2014.07.08	☒
16	VHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	VHAP	1014 / 1015	2014.10.25	
17	UHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	UHAP	989 / 990	2014.10.25	
18	Loop Antenna	Schwarzbeck	HFH2-Z2	863048/019	2015.12.04	☒
19	TRILOG Broadband Antenna	Schwarzbeck	VULB9168	189	2014.05.21	☒
20	Horn Antenna	AH Systems	SAS-200/571	304	N/A	
21	Horn Antenna	EMCO	3115	00040723	2014.03.26	☒
22	Horn Antenna	EMCO	3115	00056768	2014.09.05	
23	Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170318	2015.09.06	☒
24	Vector Signal Generator	Agilent	E4438C	MY42080359	2014.07.09	
25	PSG analog signal generator	Agilent	E8257D-520	MY45141255	2014.07.09	
26	DC Power Supply	HP	6622A	3348A03223	2014.07.09	☒
27	DC Power Supply	KYUNGEUN ELECTRONICS	KE-5A	-	N/A	☒
28	Hygro/Thermo Graph	SATO	PC-5000TRH-II	-	2014.07.12	☒
29	Temperature/Humidity Chamber	All Three	ATM-50M	20030425	2014.03.08	

5   Test and measurements

5.1. Antenna requirement

5.1.1 Regulation

According to §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.1.2 Result: PASS

The transmitter has the internal chip antenna. The directional gain of the antenna is 1.99 dBi.

5.2. Maximum peak output power

5.2.1 Regulation

According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2.2 Test Procedure

1. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable and attenuator.
2. The measurements were taken in TEST MODE provided by the applicant for controlling the EUT.
3. Set the spectrum analyzer as follows:

   Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

   RBW > the 20 dB bandwidth of the emission being measured

   VBW ≥ RBW

   Sweep = auto

   Detector function = peak

   Trace = max hold
4. Measure the highest amplitude appearing on spectral display and record the level to calculate results.
5. Repeat above procedures until all frequencies measured were complete.

5.2.3 Test Results: PASS

Table 1: Measured values of the Maximum Peak Conducted Output Power					
Modulation	Operating Frequency	Resolution Bandwidth	Measured value		Limit
			dBm	W	
Basic (GFSK)	2402 MHz	3 MHz	-3.71	0.000 43	1 W (the number of the non-overlapping hopping channels is equal to or greater than 75)
	2442 MHz	3 MHz	-4.13	0.000 39	
	2480 MHz	3 MHz	-5.98	0.000 25	
EDR (π/4DQPSK)	2402 MHz	3 MHz	-1.22	0.000 76	0.125 W (all other frequency hopping systems)
	2442 MHz	3 MHz	-2.56	0.000 55	
	2480 MHz	3 MHz	-4.17	0.000 38	
EDR (8DPSK)	2402 MHz	3 MHz	-1.12	0.000 77	
	2442 MHz	3 MHz	-2.42	0.000 57	
	2480 MHz	3 MHz	-4.11	0.000 39	

Figure 1. Plot of the Maximum Peak Conducted Output Power (Conducted)

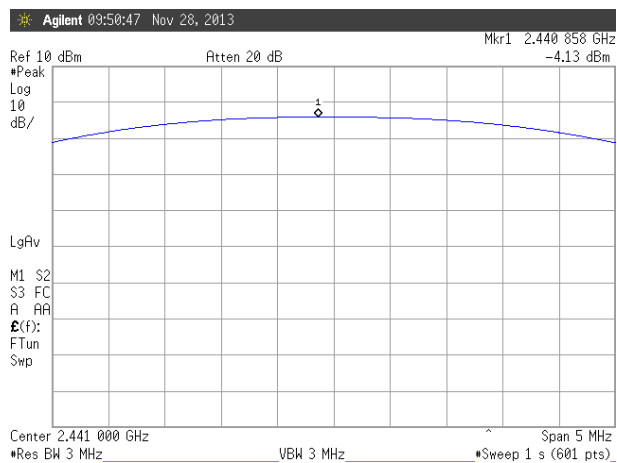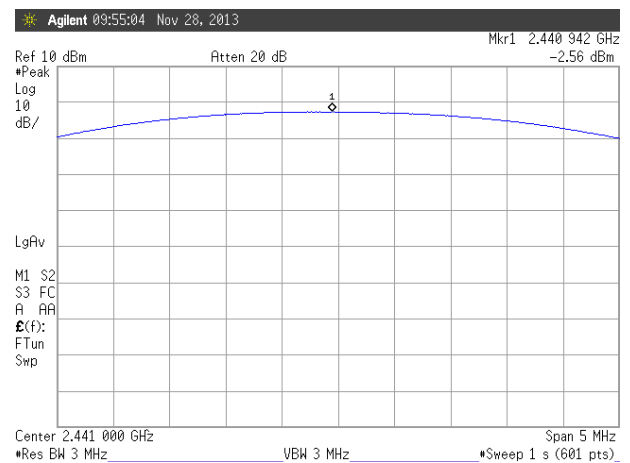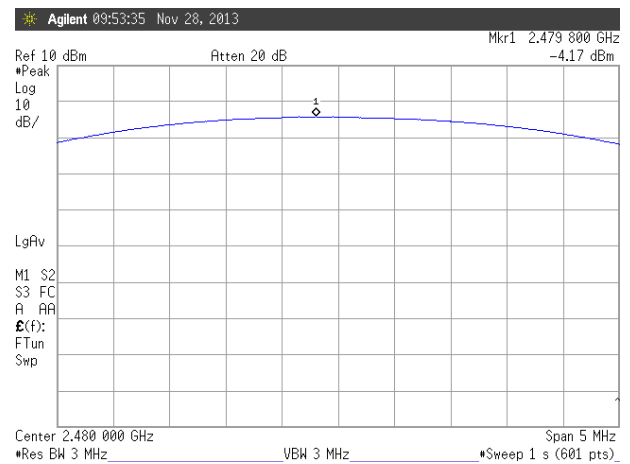| **Basic(GFSK)**	**EDR(π/4DQPSK)**
Lowest Channel (2402 MHz)	Lowest Channel (2402 MHz)
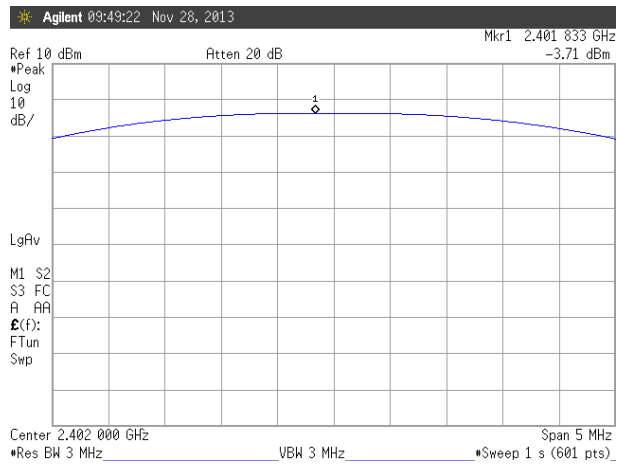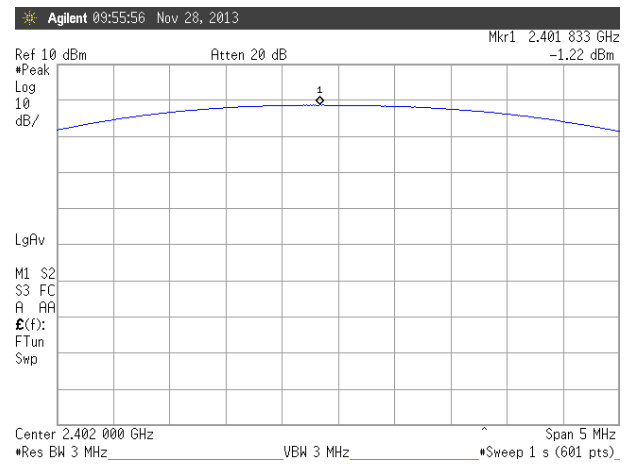
Middle Channel (2441 MHz) | Middle Channel (2441 MHz)

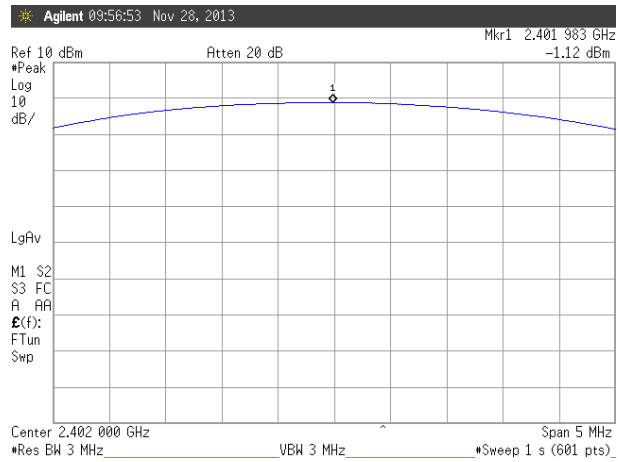

Highest Channel (2480 MHz) | Highest Channel (2480 MHz)

![SK Tech Co., Ltd. logo] **SK Tech Co., Ltd.**
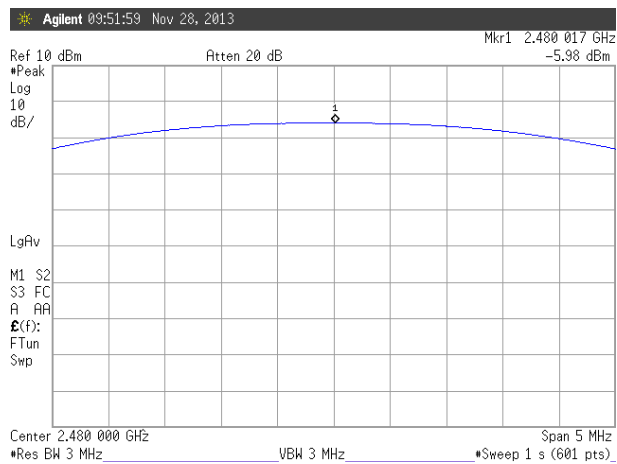
Plot of the Maximum Peak Conducted Output Power (Conducted) *(continued)*

EDR(8DPSK)

Lowest Channel (2402 MHz)

Middle Channel (2441 MHz)

Highest Channel (2480 MHz)

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5.3. Carrier frequency separations and 20 dB bandwidth

5.3.1 Regulation

According to §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

5.3.2 Test Procedure

1. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable and attenuator.
2. The measurements were taken in TEST MODE provided by the applicant for controlling the EUT.
3. Set the spectrum analyzer as follows:

   For measurements of Carrier Frequency Separation

   Span = wide enough to capture the peaks of two adjacent channels

   Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span

   Video (or Average) Bandwidth (VBW) ≥ RBW

   Sweep = auto

   Detector function = peak

   Trace = max hold

   For measurements of 20 dB Bandwidth

   Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

   RBW ≥ 1% of the 20 dB bandwidth

   VBW ≥ RBW

   Sweep = auto

   Detector function = peak

   Trace = max hold

4. Measure the separation between the peaks of the adjacent channels using the marker-delta function.
5. Repeat above procedures until all frequencies measured were complete.

5.3.3 Test Results: PASS

| Table 2: Measured values of the Carrier Frequency Separation and 20 dB Bandwidth				
Modulation	Operating Frequency	Frequency Separation	20 dB Bandwidth	LIMIT (Frequency Separation)
Basic (GFSK)	2402 MHz	1000 kHz	935 kHz	≥ 25 kHz or 20 dB bandwidth, whichever is greater
	2441 MHz	1015 kHz	940 kHz	
	2480 MHz	1015 kHz	935 kHz	
EDR (π/4DQPSK)	2402 MHz	1015 kHz	1320 kHz	Alternatively ≥ 25 kHz or two-thirds of the 20 dB bandwidth, whichever is greater (output power ≤ 125 mW)
	2441 MHz	1000 kHz	1320 kHz	
	2480 MHz	1005 kHz	1315 kHz	
EDR (8DPSK)	2402 MHz	1000 kHz	1300 kHz	
	2441 MHz	1010 kHz	1275 kHz	
	2480 MHz	1005 kHz	1270 kHz	

Figure 2. Plot of the Carrier Frequency Separation
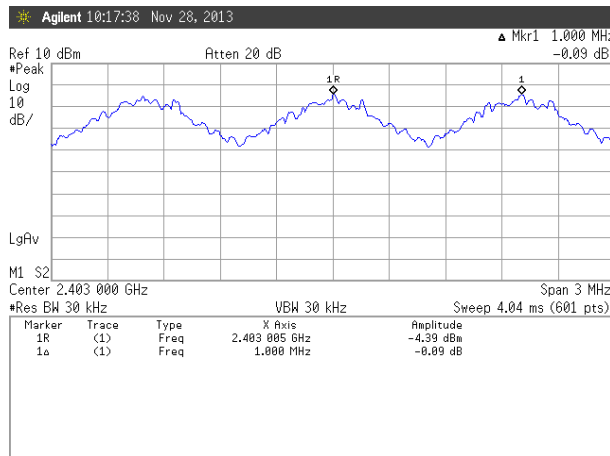
Basic(GFSK)	EDR(π/4DQPSK)
Lowest Channel (2402 MHz)	Lowest Channel (2402 MHz)

Middle Channel (2441 MHz)

Middle Channel (2441 MHz)

Highest Channel (2480 MHz)

Highest Channel (2480 MHz)

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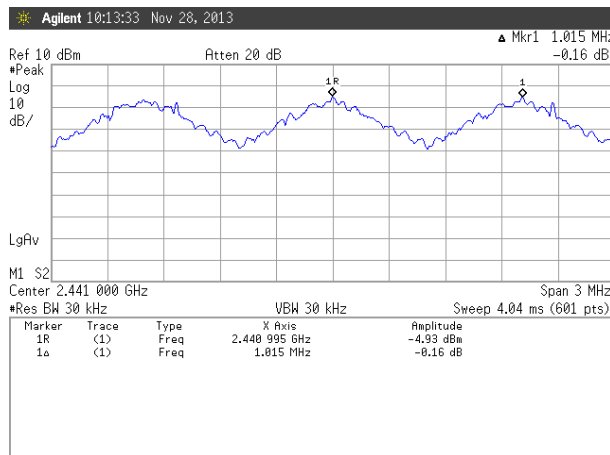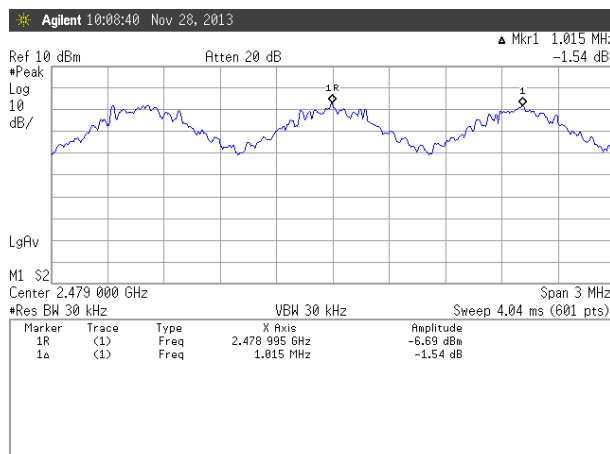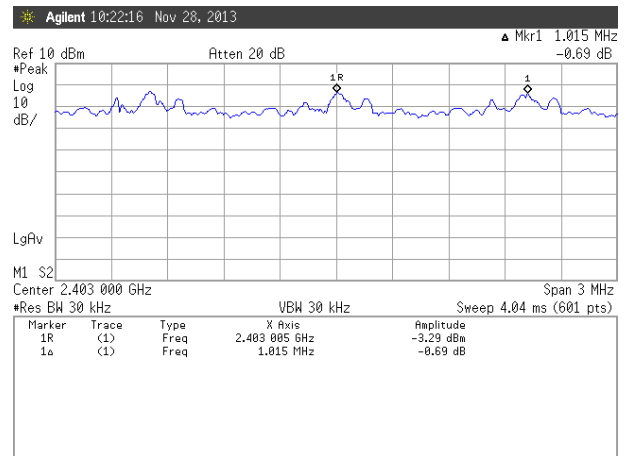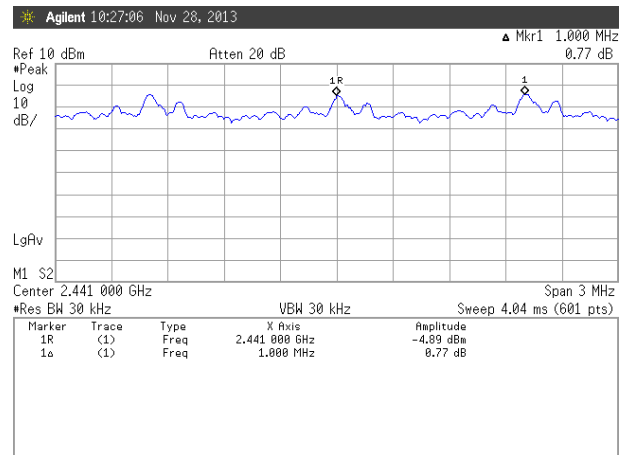
Plot of the Carrier Frequency Separation *(continued)*

EDR(8DPSK)

Lowest Channel (2402 MHz)

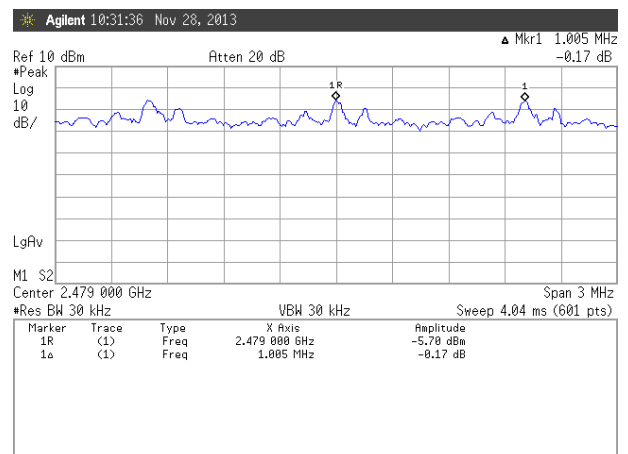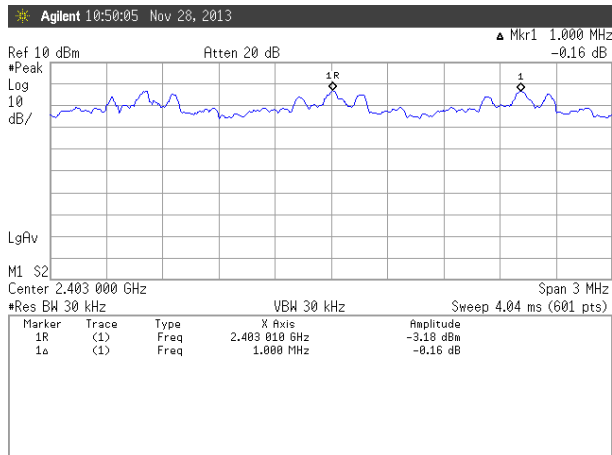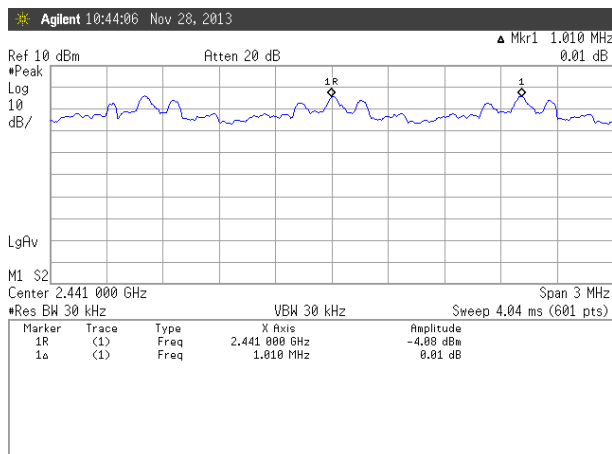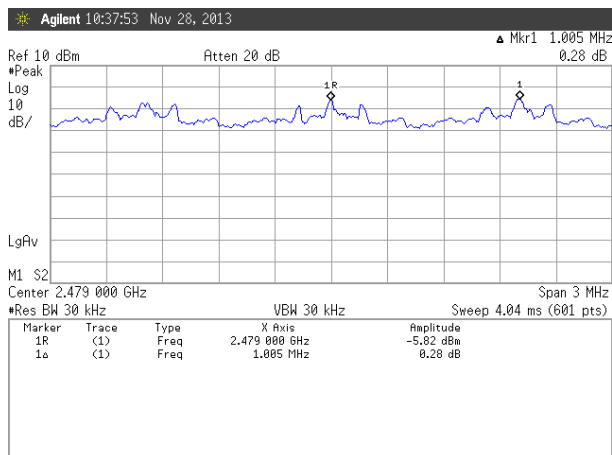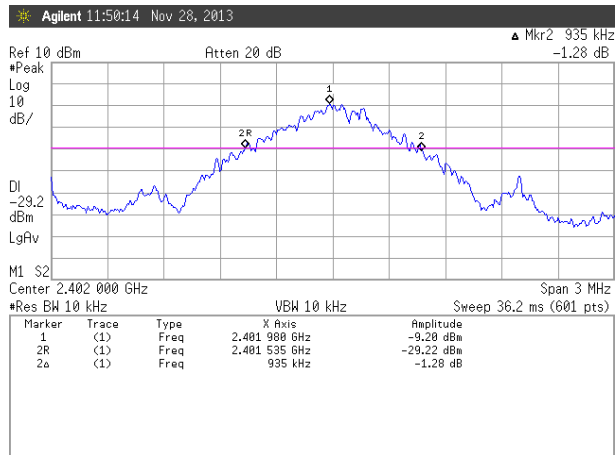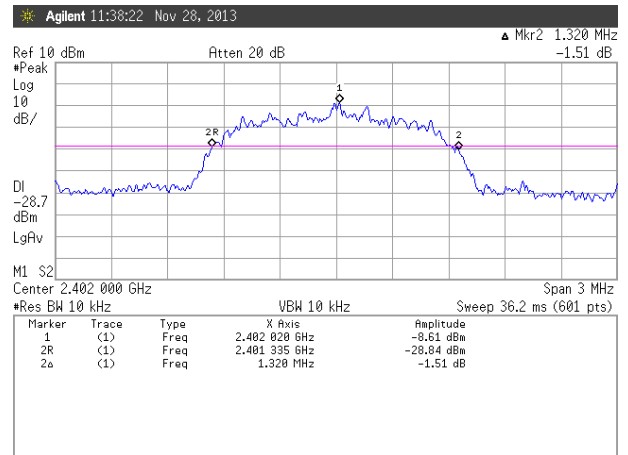Middle Channel (2441 MHz)

Highest Channel (2480 MHz)

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Figure 3. Plot of the 20 dB Channel Bandwidth
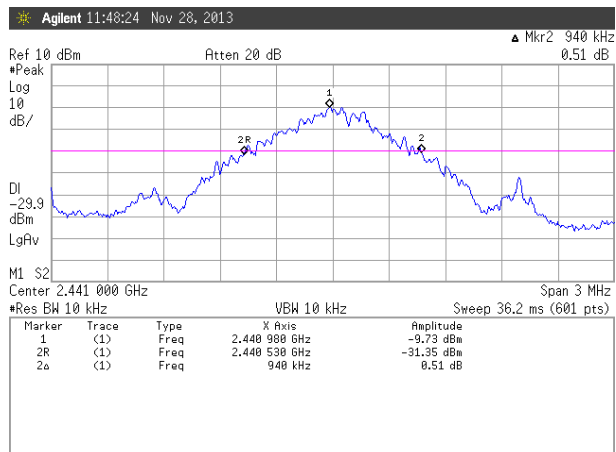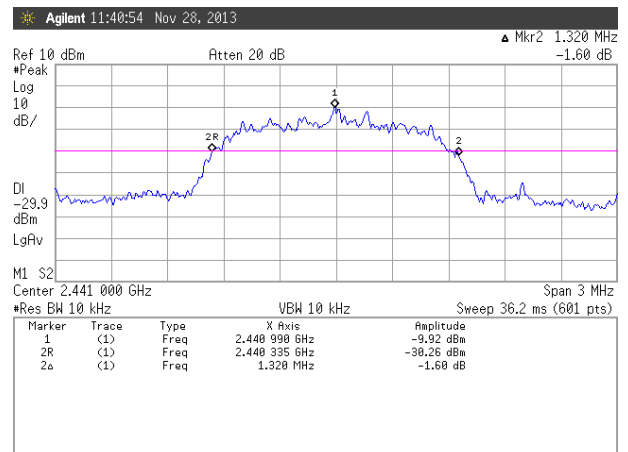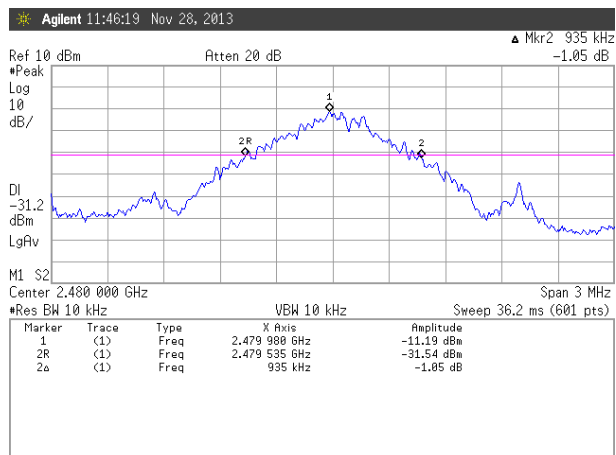
Basic(GFSK)

Lowest Channel (2402 MHz)

Middle Channel (2441 MHz)

Highest Channel (2480 MHz)

EDR(π/4DQPSK)
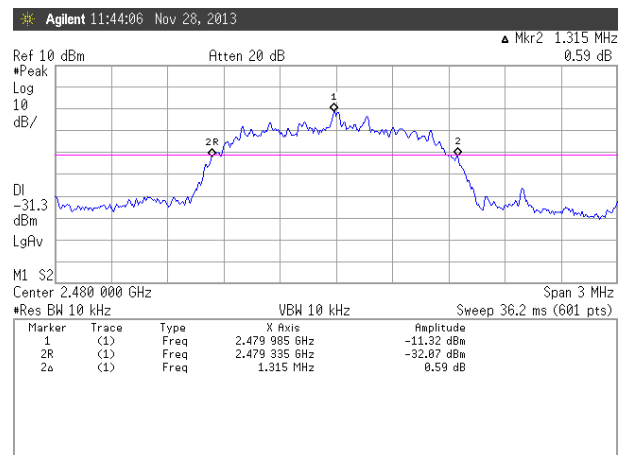
Lowest Channel (2402 MHz)

Middle Channel (2441 MHz)

Highest Channel (2480 MHz)

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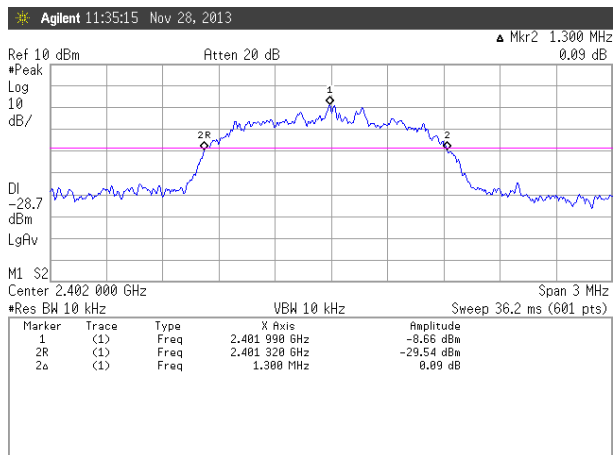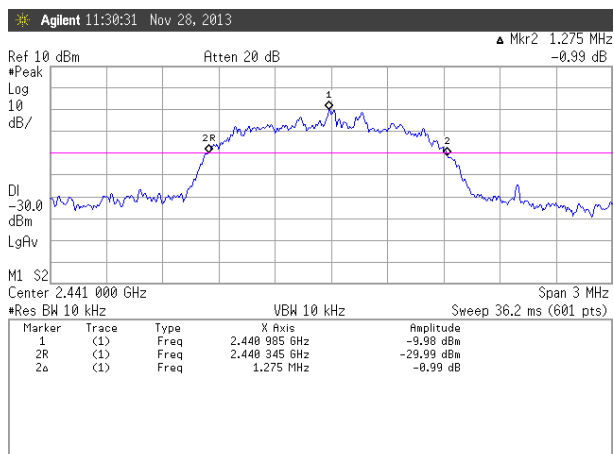## Plot of the 20 dB Channel Bandwidth *(continued)*

EDR(8DPSK)

Lowest Channel (2402 MHz)

Middle Channel (2441 MHz)

Highest Channel (2480 MHz)

SK Tech Co., Ltd.
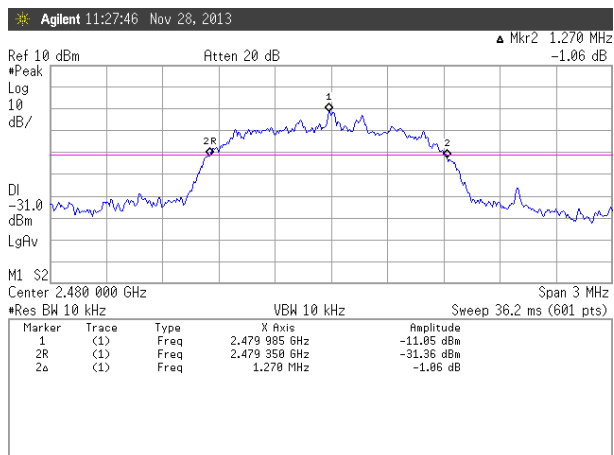
5.4. Number of Hopping channels

5.4.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

5.4.2 Test Procedure

1. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable and attenuator.
2. The measurements were taken in TEST MODE provided by the applicant for controlling the EUT.
3. Set the spectrum analyzer as follows:

    Span = the frequency band of operation

    RBW ≥ 1% of the span

    VBW ≥ RBW

    Sweep = auto

    Detector function = peak

    Trace = max hold

4. Record the number of hopping channels.
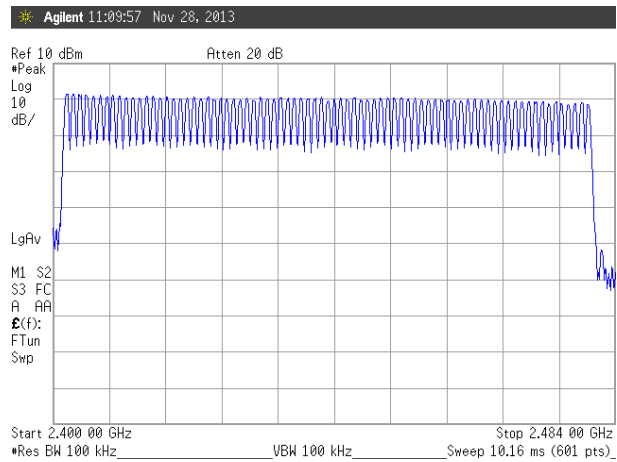
5.4.3 Test Results: PASS

Table 3: Measured values of the Number of Hopping Channels			
Modulation	Operating Frequency	Number of hopping channels	LIMIT
Basic (GFSK)	2402 - 2480 MHz	79	≥ 15
EDR (π/4DQPSK)	2402 - 2480 MHz	79	≥ 15
EDR (8DPSK)	2402 - 2480 MHz	79	≥ 15

Figure 4. Plot of the Number of Hopping Channels

Basic(GFSK)

EDR(π/4DQPSK)

EDR(8DPSK)

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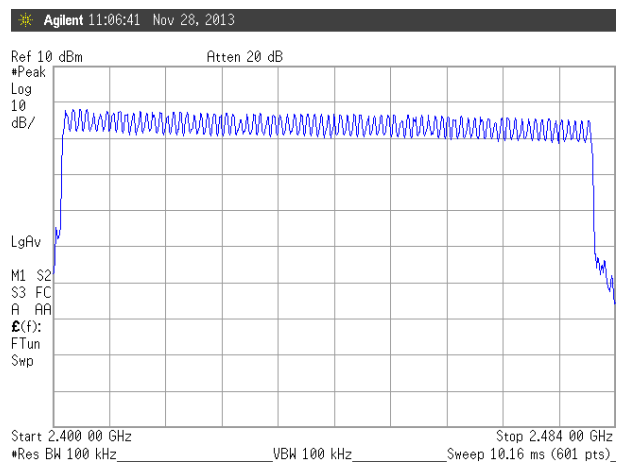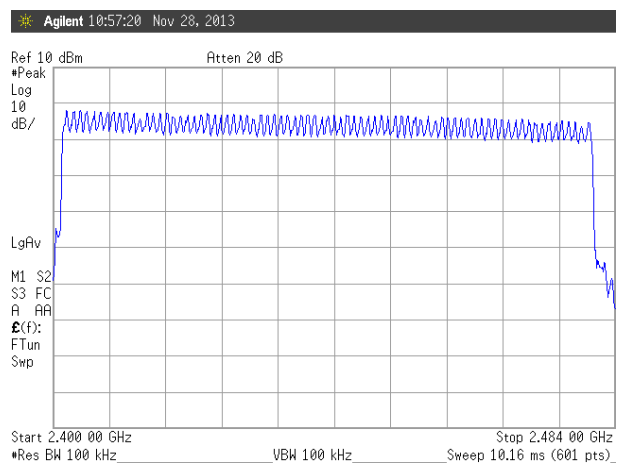
5.5. Time of occupancy (Dwell time)

5.5.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.5.2 Test Procedure

1. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
2. The measurements were taken in TEST MODE provided by the applicant for controlling the EUT.
3. Set the spectrum analyzer as follows:

    Span = zero span, centered on a hopping channel

    RBW = 1 MHz

    VBW $\geq$ RBW

    Sweep = as necessary to capture the entire dwell time per hopping channel

    Detector function = peak

    Trace = max hold
4. Measure the dwell time using the marker-delta function.
5. Repeat above procedures until all frequencies measured were complete.
6. Repeat this test for different modes of operation (e.g., data rate, modulation format, etc.), if applicable.

5.5.3 Test Results: PASS

Table 4: Measured values of the Time of Occupancy						
Modulation	Operating Frequency	Reading (ms)	Hopping rate (hops/s)	Number of Channels	Actual (seconds)	LIMIT (seconds)
Basic (GFSK)	2402 MHz	2.907	266.667	79	0.31	0.4
	2441 MHz	2.907	266.667	79	0.31	0.4
	2480 MHz	2.907	266.667	79	0.31	0.4
EDR (π/4DQPSK)	2402 MHz	2.907	266.667	79	0.31	0.4
	2442 MHz	2.907	266.667	79	0.31	0.4
	2480 MHz	2.907	266.667	79	0.31	0.4
EDR (8DPSK)	2402 MHz	2.907	266.667	79	0.31	0.4
	2441 MHz	2.907	266.667	79	0.31	0.4
	2480 MHz	2.907	266.667	79	0.31	0.4

**Actual = Reading × (Hopping rate / Number of channels) × Test period**

Test period = 0.4 [seconds / channel] × 79 [channel] = 31.6 [seconds]

NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. The DH5 Packet (GFSK) , 2-DH5 Packet (π/4DQPSK), 3-DH5 Packet needs 5 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 266.667 hops per second with 79 channels.
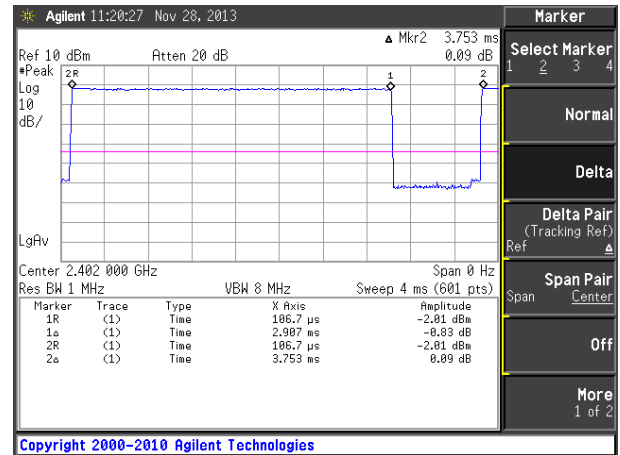
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Figure 5. Plot of the Time of Occupancy

Basic(GFSK)

Lowest Channel (2402 MHz)
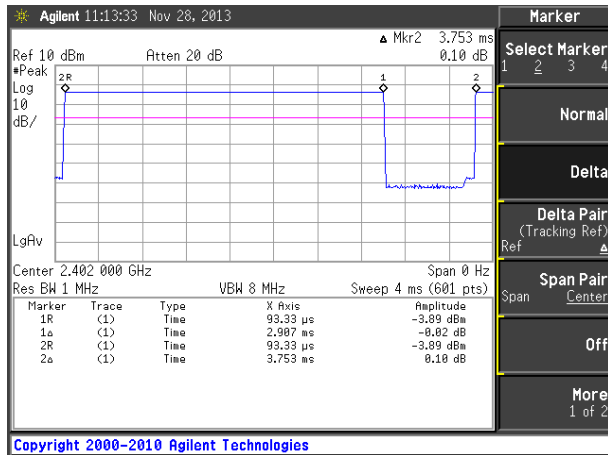
Middle Channel (2441 MHz)

Highest Channel (2480 MHz)

EDR(π/4DQPSK)

Lowest Channel (2402 MHz)

Middle Channel (2441 MHz)

Highest Channel (2480 MHz)

SK Tech Co., Ltd.
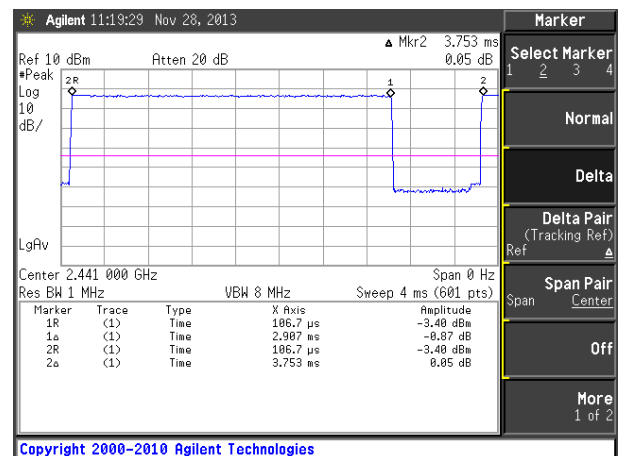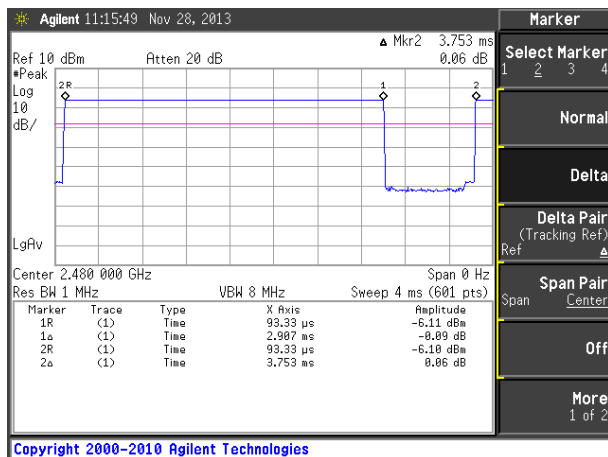
Plot of the Time of Occupancy *(continued)*

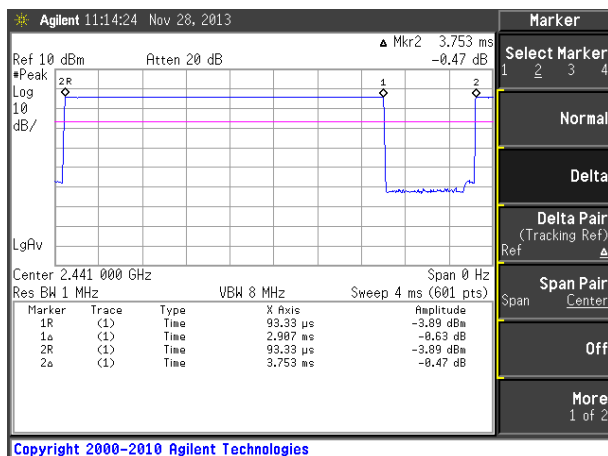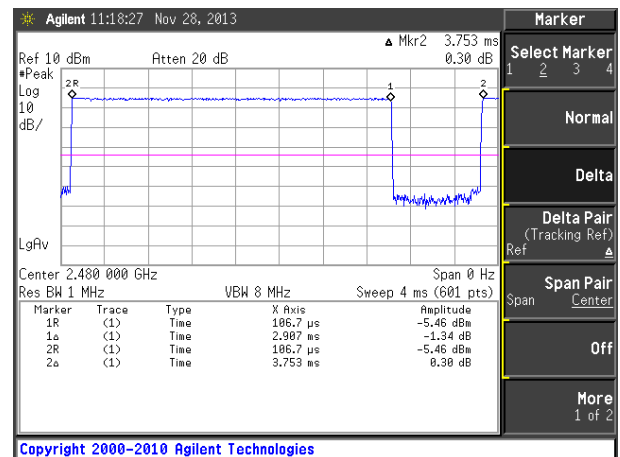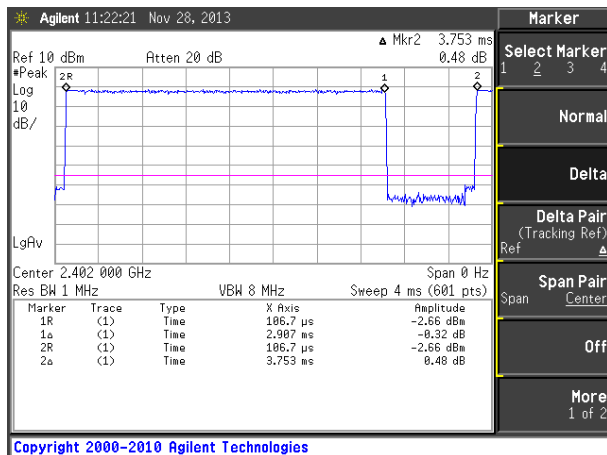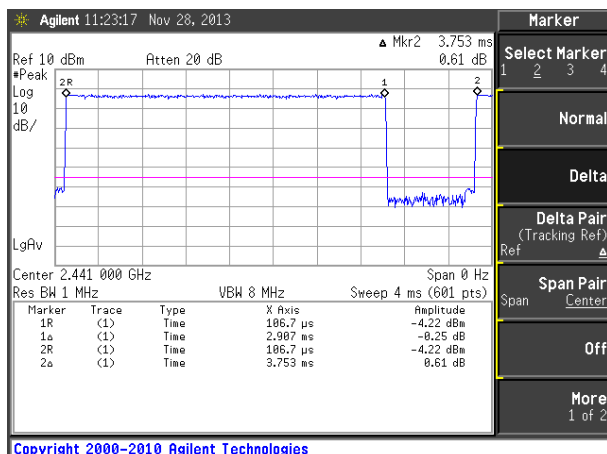## EDR(8DPSK)

Lowest Channel (2402 MHz)

Middle Channel (2441 MHz)

Highest Channel (2480 MHz)

SK Tech Co., Ltd.
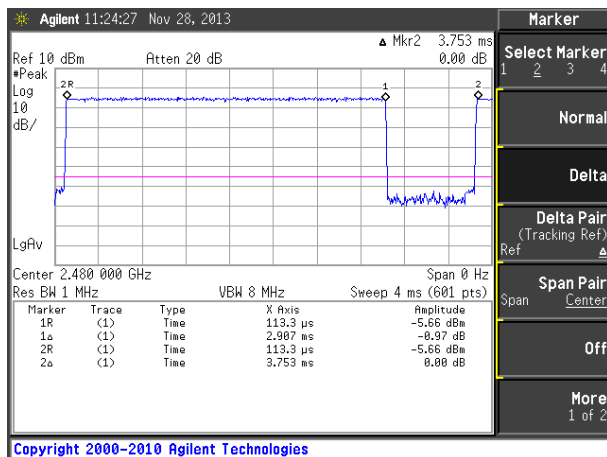
5.6. Spurious emissions, Band edge, and Restricted bands

5.6.1 Regulation

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 emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

According to §15.209(a), for an intentional device, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Field strength (µV/m @ 3m)	Field strength (dBµV/m @ 3m)
30–88	100	40.0
88–216	150	43.5
216–960	200	46.0
Above 960	500	54.0

According to §15.109(a), for an unintentional device, except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the above table.

** The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector and above 1000 MHz are based on the average value of measured emissions.

5.6.2 Test Procedure

1) Band-edge measurements for RF conducted emissions

1. Set the spectrum analyzer as follows:
    Span = wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation
    RBW ≥ 1 % of spectrum analyzer display span
    VBW ≥ RBW
    Sweep = auto
    Detector function = peak
    Trace = max hold
2. Allow the trace to stabilize. Set the marker on the emission at the band-edge, or on the highest modulation product outside of the band, if this level is greater than that at the band-edge. Enable the marker-delta function, and then use the marker-to-peak function to move the marker to the peak of the in-band emission.
3. Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

2) Spurious RF Conducted Emissions:

1. Set the spectrum analyzer as follows:

   Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

   RBW = 100 kHz

   VBW ≥ RBW

   Sweep = auto

   Detector function = peak

   Trace = max hold

2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.

3) Spurious Radiated Emissions:

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters for above 30 MHz, and at 1 meter / 3 meter distance for below 30 MHz.

2. The EUT was placed on the top of the 0.8-meter height, 1 × 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360˚.

3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 9 kHz to 30 MHz using the loop antenna, from 30 to 1000 MHz using the Trilog broadband antenna, and from 1 GHz to tenth harmonic of the highest fundamental frequency using the horn antenna.

4. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 4 × 4 meter at the Open Area Test Site. The EUT was tested at a distance 3 meters.

5. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

6. The EUT is situated in three orthogonal planes (if appropriate)

7. The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT.

8. If the emission on which a radiated measurement must be made is located at the edge of the authorized band of operation, then the alternative "marker-delta" method may be employed.

4) Marker-Delta Method at the edge of the authorized band of operation:

1. Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function specified in 6.3 and 6.4, 6.5, or 6.6, as applicable, and the appropriate regulatory requirements for the frequency being measured.43

2. Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to approximately 1 % to 5 % of the total span, unless otherwise specified, with a video bandwidth equal to or greater than the RBW.

   Record the peak levels of the fundamental emission and the relevant band-edge emission (i.e., run several sweeps in peak hold mode). Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not an absolute field strength measurement; it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.

3. Subtract the delta measured in b) from the field strengths measured in a). The resultant field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band-edge compliance of the restricted bands, described in 5.9.

4. The above "delta" measurement technique may be used for measuring emissions that are up to two "standard" bandwidths away from the band edge, where a "standard" bandwidth is the bandwidth specified by 4.2.3.2 for the frequency being measured. For example, band-edge measurements in the restricted band that begins at 2483.5 MHz require a measurement bandwidth of at least 1 MHz.

   Therefore the "delta" technique for measuring emissions up to 2 MHz removed from the band edge may be used. Radiated emissions that are removed by more than two "standard" bandwidths shall be measured in the conventional manner.

5.6.3 Test Results: PASS

Band-edge compliance of RF conducted/radiated emissions was shown in the Figure 6 and 7.
Spurious RF conducted emissions were shown in the Figure 8.
Emission plot for the preliminary radiated measurements were shown in the Figure 9.

NOTE 1: for conducted measurement, we took the insertion loss of the cable loss into consideration within the measuring instrument. And for radiated measurement, the results were calibrated to the field strength within the measuring instrument; Table 5 contains the correction factors at the operating frequencies such as antenna factor, cable loss, etc.

NOTE 2: The preliminary radiated measurements were performed in the anechoic chamber in order to find the frequency, which falls in the restricted bands as defined in Section 15.205, and the results for the final measurements were indicated in the Table 5.

Table 5: Measured values of the Field strength of spurious emission (Radiated)												
BELOW 1 GHz												
Frequency	Receiver Bandwidth	Pol.	Antenna Height	Turn Table	Reading	Amp Gain	ATT	AF	CL	Actual	Limit	Margin
[MHz]	[kHz]	[V/H]	[m]	[degree]	[dB(µV)]	[dB]	[dB]	dB(1/m)	[dB]	[dB(µV/m)]	[dB(µV/m)]	[dB]
Average/Peak/Quasi-peak data, emissions below 30 MHz												
			No Radiated Spurious Emissions Found									
Quasi-peak data, emissions below 1000 MHz												
			No Radiated Spurious Emissions Found									

Margin (dB) = Limit – Actual
[Actual = Reading – Amp Gain + Attenuator + AF + CL]
1. H = Horizontal, V = Vertical Polarization
2. ATT = Attenuation (10dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss
NOTE: All emissions not reported were more than 20 dB below the specified limit or in the noise floor.

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Measured values of the Field strength of spurious emission (Radiated) *(continued)*												
ABOVE 1 GHz												
Frequency	Receiver Bandwidth	Pol.	Antenna Height	Turn Table	Reading	Amp Gain	ATT	AF	CL	Actual	Limit	Margin
[MHz]	[kHz]	[V/H]	[m]	[degree]	[dB(µV)]	[dB]	[dB]	dB(1/m)	[dB]	[dB(µV/m)]	[dB(µV/m)]	[dB]
PEAK data, emissions above 1000 MHz **(Basic(GFSK))**												
2402.0	1000	H	1.27	94	103.72	48.46	10.23	28.15	6.50	100.14	Not Applicable	
2402.0	1000	V	1.80	48	99.30	48.46	10.23	28.15	6.50	95.72		
2315.6	1000	H	1.27	94	61.12	48.44	10.24	27.88	6.36	57.16	74.00	16.84
2331.2	1000	V	1.80	48	61.56	48.44	10.24	27.93	6.39	57.68	74.00	16.32
4803.9	1000	H	1.36	203	60.33	49.00	0.43	33.12	9.68	54.56	74.00	19.44
4803.9	1000	V	1.85	267	58.48	49.00	0.43	33.12	9.68	52.71	74.00	21.29
2441.0	1000	H	1.27	97	101.97	48.48	10.23	28.28	6.56	98.56	Not Applicable	
2441.0	1000	V	1.79	50	98.49	48.48	10.23	28.28	6.56	95.08		
4881.9	1000	H	1.32	217	58.94	49.02	0.38	33.17	9.76	53.23	74.00	20.77
4881.9	1000	V	1.85	245	56.75	49.02	0.38	33.17	9.76	51.04	74.00	22.96
2480.0	1000	H	1.27	99	100.22	48.49	10.23	28.40	6.61	96.97	Not Applicable	
2480.0	1000	V	1.78	52	97.66	48.49	10.23	28.40	6.61	94.41		
2483.6	1000	H	1.27	99	61.51	48.50	10.23	28.41	6.62	58.27	74.00	15.73
2483.6	1000	V	1.78	52	60.34	48.50	10.23	28.41	6.62	57.10	74.00	16.90
4859.7	1000	H	1.29	280	58.49	49.02	0.40	33.16	9.74	52.77	74.00	21.23
4859.7	1000	V	1.86	221	56.26	49.02	0.40	33.16	9.74	50.54	74.00	23.46
PEAK data, emissions above 1000 MHz **(EDR(π/4DQPSK))**												
2402.0	1000	H	1.29	97	104.85	48.46	10.23	28.15	6.50	101.27	Not Applicable	
2402.0	1000	V	1.79	49	100.70	48.46	10.23	28.15	6.50	97.12		
2339.2	1000	H	1.29	97	61.95	48.44	10.24	27.95	6.40	58.10	74.00	15.90
2342.4	1000	V	1.79	49	62.24	48.44	10.24	27.96	6.41	58.41	74.00	15.59
4804.0	1000	H	1.36	205	53.31	49.00	0.43	33.12	9.68	47.54	74.00	
4804.0	1000	V	1.85	268	51.40	49.00	0.43	33.12	9.68	45.63	74.00	
2441.0	1000	H	1.28	98	101.96	48.48	10.23	28.28	6.56	98.55	Not Applicable	
2441.0	1000	V	1.78	51	99.31	48.48	10.23	28.28	6.56	95.90		
4882.0	1000	H	1.33	219	51.73	49.02	0.38	33.17	9.76	46.02	74.00	27.98
4882.0	1000	V	1.85	245	49.58	49.02	0.38	33.17	9.76	43.87	74.00	30.13
2480.0	1000	H	1.28	98	98.88	48.49	10.23	28.40	6.61	95.63	Not Applicable	
2480.0	1000	V	1.77	52	97.93	48.49	10.23	28.40	6.61	94.68		
2483.6	1000	H	1.28	98	63.56	48.50	10.23	28.41	6.62	60.32	74.00	13.68
2483.6	1000	V	1.77	52	63.28	48.50	10.23	28.41	6.62	60.04	74.00	13.96
4959.9	1000	H	1.30	283	50.01	49.04	0.34	33.22	9.83	44.36	74.00	29.64
4959.9	1000	V	1.86	219	47.75	49.04	0.34	33.22	9.83	42.10	74.00	31.90

Margin (dB) = Limit – Actual

[Actual = Reading – Amp Gain + Attenuator + AF + CL]

1. H = Horizontal, V = Vertical Polarization

2. ATT = Attenuation (10dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss

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Measured values of the Field strength of spurious emission (Radiated) *(continued)*													
ABOVE 1 GHz													
Frequency	Receiver Bandwidth	Pol.	Antenna Height	Turn Table	Reading	Amp Gain	ATT	AF	CL	Actual	Limit	Margin
[MHz]	[kHz]	[V/H]	[m]	[degree]	[dB(μV)]	[dB]	[dB]	dB(1/m)	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
PEAK data, emissions above 1000 MHz (**EDR(8DPSK))**													
2402.0	1000	H	1.27	95	105.04	48.46	10.23	28.15	6.50	101.46	Not Applicable	
2402.0	1000	V	1.79	50	100.49	48.46	10.23	28.15	6.50	96.91		
2338.0	1000	H	1.27	95	60.89	48.44	10.24	27.95	6.40	57.04	74.00	16.96
2333.2	1000	V	1.79	50	61.74	48.44	10.24	27.93	6.39	57.86	74.00	16.14
4803.9	1000	H	1.36	205	53.68	49.00	0.43	33.12	9.68	47.91	74.00	26.09
4803.9	1000	V	1.83	263	51.88	49.00	0.43	33.12	9.68	46.11	74.00	27.89
2441.0	1000	H	1.26	96	103.62	48.48	10.23	28.28	6.56	100.21	Not Applicable	
2441.0	1000	V	1.79	50	99.05	48.48	10.23	28.28	6.56	95.64		
4881.9	1000	H	1.33	216	45.98	49.02	0.38	33.17	9.76	40.27	74.00	33.73
4881.9	1000	V	1.84	250	43.80	49.02	0.38	33.17	9.76	38.09	74.00	35.91
2480.0	1000	H	1.21	93	102.32	48.49	10.23	28.40	6.61	99.07	Not Applicable	
2480.0	1000	V	1.81	50	97.38	48.49	10.23	28.40	6.61	94.13		
2483.6	1000	H	1.21	93	67.07	48.50	10.23	28.41	6.62	63.83	74.00	10.17
2483.6	1000	V	1.81	50	62.61	48.50	10.23	28.41	6.62	59.37	74.00	14.63
4960.0	1000	H	1.30	278	45.52	49.04	0.34	33.22	9.83	39.87	74.00	34.13
4960.0	1000	V	1.85	222	43.25	49.04	0.34	33.22	9.83	37.60	74.00	36.40

Margin (dB) = Limit – Actual

[Actual = Reading – Amp Gain + Attenuator + AF + CL]

1. H = Horizontal, V = Vertical Polarization

2. ATT = Attenuation (10dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss

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Measured values of the Field strength of spurious emission (Radiated) *(continued)*														
ABOVE 1 GHz														
Frequency	Receiver Bandwidth	Pol.	Antenna Height	Turn Table	Reading	Amp Gain	ATT	AF	CL	Actual	Limit	Margin
[MHz]	[kHz]	[V/H]	[m]	[degree]	[dB(µV)]	[dB]	[dB]	dB(1/m)	[dB]	[dB(µV/m)]	[dB(µV/m)]	[dB]
AVERAGE data, emissions above 1000 MHz **(Basic(GFSK))**												
2402.0	1000	H	1.27	94	100.70	48.46	10.23	28.15	6.50	97.12	Not Applicable	
2402.0	1000	V	1.80	48	96.34	48.46	10.23	28.15	6.50	92.76		
2315.6	1000	H	1.27	94	45.80	48.44	10.24	27.88	6.36	41.84	54.00	12.16
2331.2	1000	V	1.80	48	45.28	48.44	10.24	27.93	6.39	41.40	54.00	12.60
4803.9	1000	H	1.36	203	54.31	49.00	0.43	33.12	9.68	48.54	54.00	5.46
4803.9	1000	V	1.85	267	52.26	49.00	0.43	33.12	9.68	46.49	54.00	7.51
2441.0	1000	H	1.27	97	98.93	48.48	10.23	28.28	6.56	95.52	Not Applicable	
2441.0	1000	V	1.79	50	95.60	48.48	10.23	28.28	6.56	92.19		
4881.9	1000	H	1.32	217	52.88	49.02	0.38	33.17	9.76	47.17		
4881.9	1000	V	1.85	245	50.53	49.02	0.38	33.17	9.76	44.82		
2480.0	1000	H	1.27	99	97.21	48.49	10.23	28.40	6.61	93.96	Not Applicable	
2480.0	1000	V	1.78	52	94.76	48.49	10.23	28.40	6.61	91.51		
2483.6	1000	H	1.27	99	48.55	48.50	10.23	28.41	6.62	45.31	54.00	8.69
2483.6	1000	V	1.78	52	47.05	48.50	10.23	28.41	6.62	43.81	54.00	10.19
4859.7	1000	H	1.29	280	52.18	49.02	0.40	33.16	9.74	46.46	54.00	7.54
4859.7	1000	V	1.86	221	50.09	49.02	0.40	33.16	9.74	44.37	54.00	9.63
AVERAGE data, emissions above 1000 MHz (**EDR(π/4DQPSK)**)												
2402.0	1000	H	1.29	97	98.91	48.46	10.23	28.15	6.50	95.33	Not Applicable	
2402.0	1000	V	1.79	49	94.96	48.46	10.23	28.15	6.50	91.38		
2339.2	1000	H	1.29	97	46.39	48.44	10.24	27.95	6.40	42.54	54.00	11.46
2342.4	1000	V	1.79	49	45.63	48.44	10.24	27.96	6.41	41.80	54.00	12.20
4804.0	1000	H	1.36	205	47.21	49.00	0.43	33.12	9.68	41.44	54.00	12.56
4804.0	1000	V	1.85	268	45.20	49.00	0.43	33.12	9.68	39.43	54.00	14.57
2441.0	1000	H	1.28	98	96.00	48.48	10.23	28.28	6.56	92.59	Not Applicable	
2441.0	1000	V	1.78	51	93.53	48.48	10.23	28.28	6.56	90.12		
4882.0	1000	H	1.33	219	45.71	49.02	0.38	33.17	9.76	40.00	54.00	14.00
4882.0	1000	V	1.85	245	43.39	49.02	0.38	33.17	9.76	37.68	54.00	16.32
2480.0	1000	H	1.28	98	92.89	48.49	10.23	28.40	6.61	89.64	Not Applicable	
2480.0	1000	V	1.77	52	92.14	48.49	10.23	28.40	6.61	88.89		
2483.6	1000	H	1.28	98	50.38	48.50	10.23	28.41	6.62	47.14	54.00	6.86
2483.6	1000	V	1.77	52	49.94	48.50	10.23	28.41	6.62	46.70	54.00	7.30
4959.9	1000	H	1.30	283	43.68	49.04	0.34	33.22	9.83	38.03	54.00	15.97
4959.9	1000	V	1.86	219	41.60	49.04	0.34	33.22	9.83	35.95	54.00	18.05

Margin (dB) = Limit – Actual

[Actual = Reading – Amp Gain + Attenuator + AF + CL]

1. H = Horizontal, V = Vertical Polarization

2. ATT = Attenuation (10dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss

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Measured values of the Field strength of spurious emission (Radiated) *(continued)*												
ABOVE 1 GHz												
Frequency	Receiver Bandwidth	Pol.	Antenna Height	Turn Table	Reading	Amp Gain	ATT	AF	CL	Actual	Limit	Margin
[MHz]	[kHz]	[V/H]	[m]	[degree]	[dB(μV)]	[dB]	[dB]	dB(1/m)	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
AVERAGE data, emissions above 1000 MHz (**EDR(8DPSK))**												
2402.0	1000	H	1.27	95	99.14	48.46	10.23	28.15	6.50	95.56	Not Applicable	
2402.0	1000	V	1.79	50	94.64	48.46	10.23	28.15	6.50	91.06		
2338.4	1000	H	1.27	95	46.00	48.44	10.24	27.95	6.40	42.15	54.00	11.85
2338.8	1000	V	1.79	50	45.53	48.44	10.24	27.93	6.39	41.65	54.00	12.35
4803.9	1000	H	1.36	205	47.74	49.00	0.43	33.12	9.68	41.97	54.00	12.03
4803.9	1000	V	1.83	263	45.63	49.00	0.43	33.12	9.68	39.86	54.00	14.14
2441.0	1000	H	1.26	96	97.75	48.48	10.23	28.28	6.56	94.34	Not Applicable	
2441.0	1000	V	1.79	50	93.21	48.48	10.23	28.28	6.56	89.80		
4881.9	1000	H	1.33	216	39.92	49.02	0.38	33.17	9.76	34.21	54.00	19.79
4881.9	1000	V	1.84	250	37.55	49.02	0.38	33.17	9.76	31.84	54.00	22.16
2480.0	1000	H	1.21	93	96.49	48.49	10.23	28.40	6.61	93.24	Not Applicable	
2480.0	1000	V	1.81	50	91.62	48.49	10.23	28.40	6.61	88.37		
2483.6	1000	H	1.21	93	53.19	48.50	10.23	28.41	6.62	49.95	54.00	4.05
2483.6	1000	V	1.81	50	49.43	48.50	10.23	28.41	6.62	46.19	54.00	7.81
4960.0	1000	H	1.30	278	39.17	49.04	0.34	33.22	9.83	33.52	54.00	20.48
4960.0	1000	V	1.85	222	39.14	49.04	0.34	33.22	9.83	33.49	54.00	20.51

Margin (dB) = Limit – Actual

[Actual = Reading – Amp Gain + Attenuator + AF + CL]

1. H = Horizontal, V = Vertical Polarization

2. ATT = Attenuation (10dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss

Figure 6. Plot of the Band Edge (Conducted)

Lowest Channel (2402 MHz)   Highest Channel (2480 MHz)
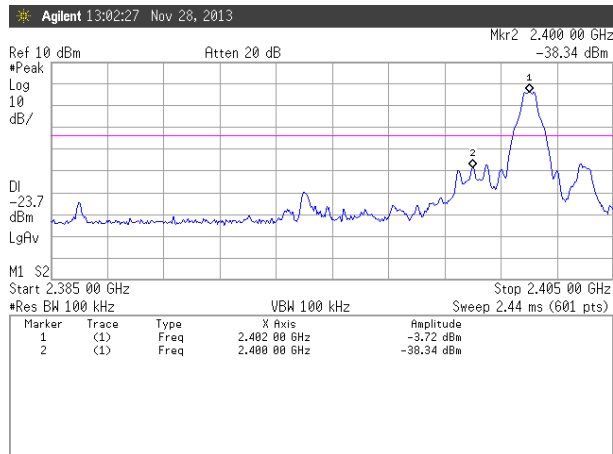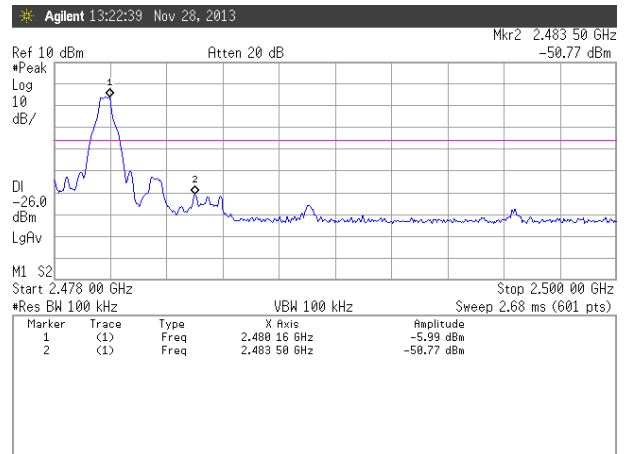
Basic(GFSK)

EDR(π/4DQPSK)
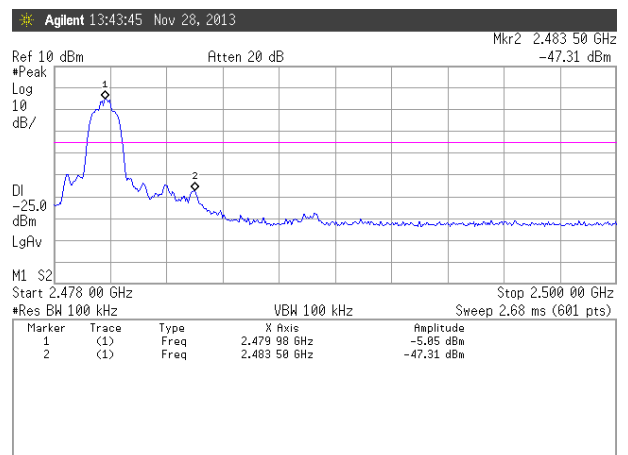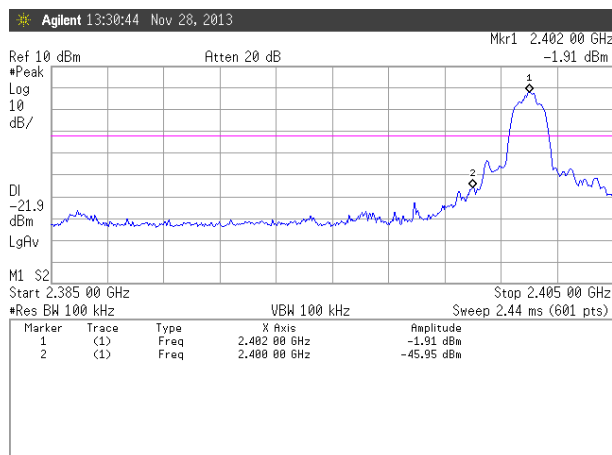
EDR(8DPSK)
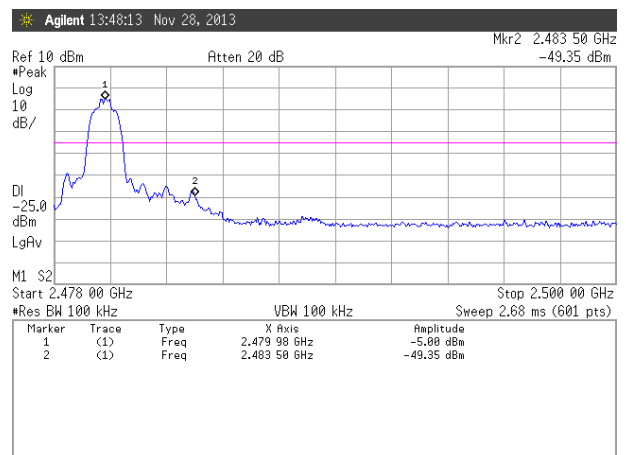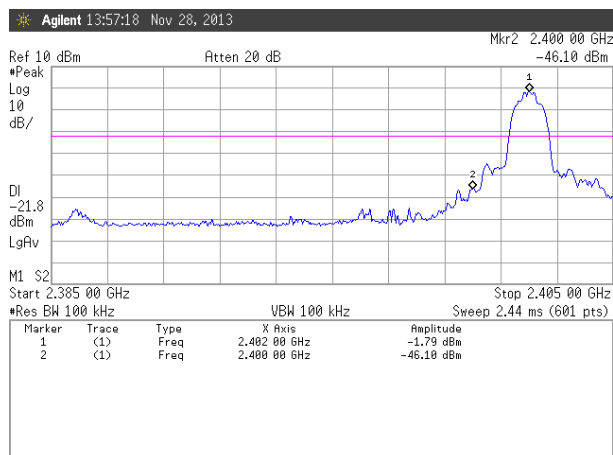
Figure 7. Plot of the Band Edge (Radiated)

Lowest Channel (2402 MHz)

Basic(GFSK) - Horizontal
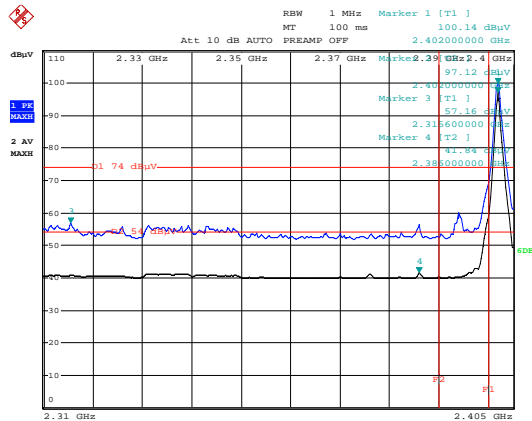
Date: 4.DEC.2013 15:15:30

Lowest Channel (2402 MHz)

Basic(GFSK) - Vertical
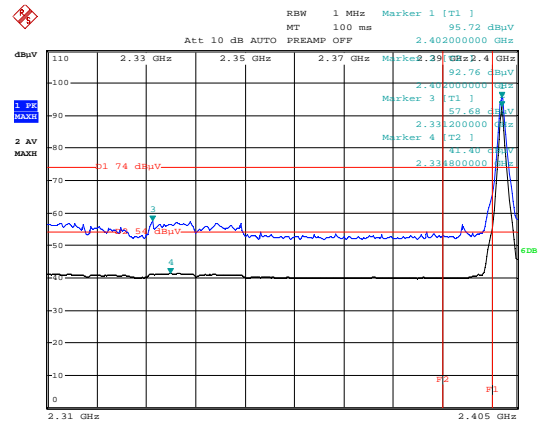
Date: 4.DEC.2013 16:06:42

EDR(π/4DQPSK) - Horizontal
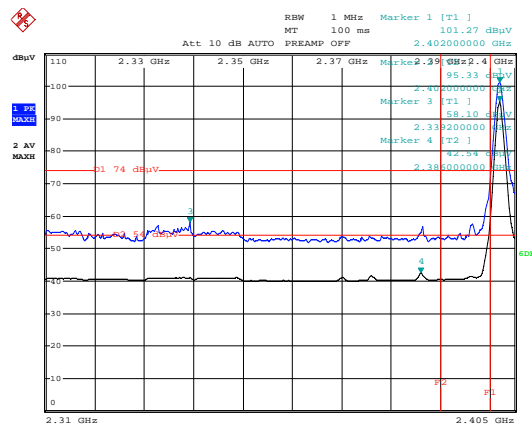
Date: 4.DEC.2013 15:26:08

EDR(π/4DQPSK) - Vertical
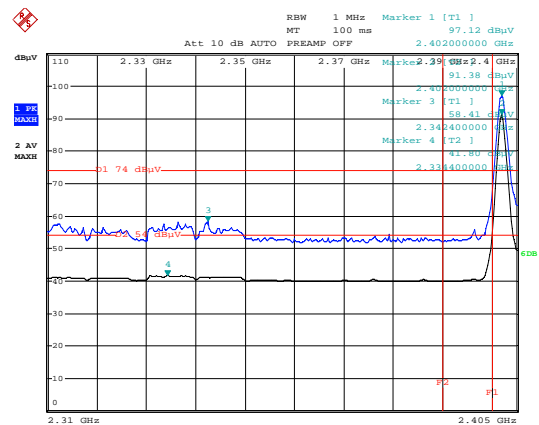
Date: 4.DEC.2013 15:57:57

EDR(8DPSK) - Horizontal
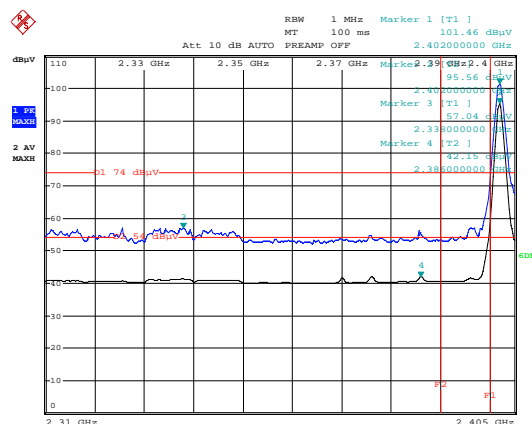
Date: 4.DEC.2013 15:40:02

EDR(8DPSK) - Vertical
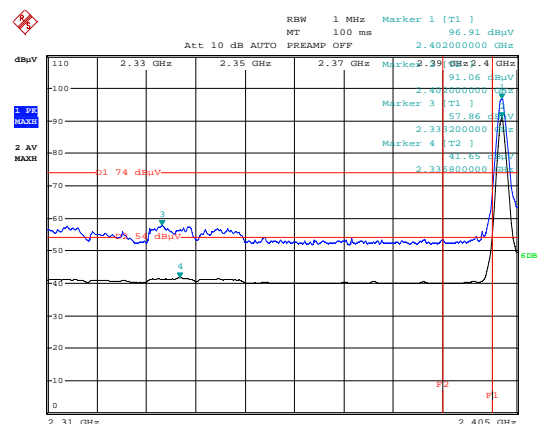
Date: 4.DEC.2013 15:47:41

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Plot of the Band Edge (Radiated) *(continued)*

Highest Channel (2480 MHz)

Basic(GFSK) - Horizontal
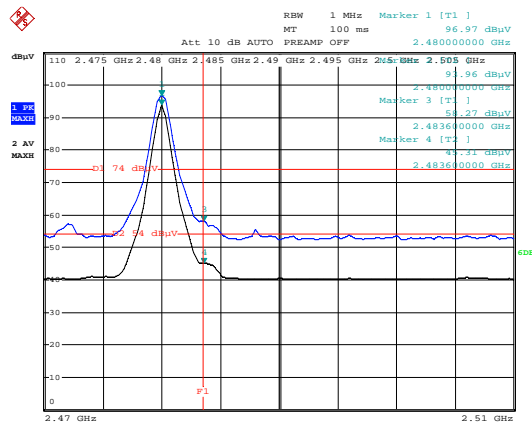
Date: 4.DEC.2013 16:48:34

Highest Channel (2480 MHz)

Basic(GFSK) - Vertical
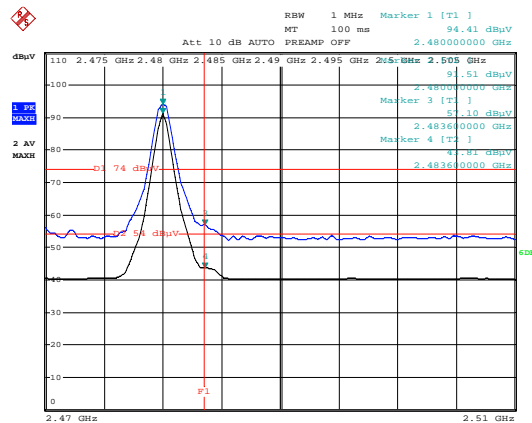
Date: 4.DEC.2013 16:16:35

EDR(π/4DQPSK) - Horizontal
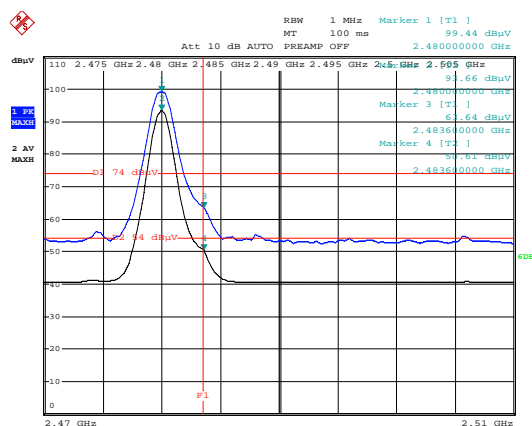
Date: 4.DEC.2013 16:42:39

EDR(π/4DQPSK) - Vertical
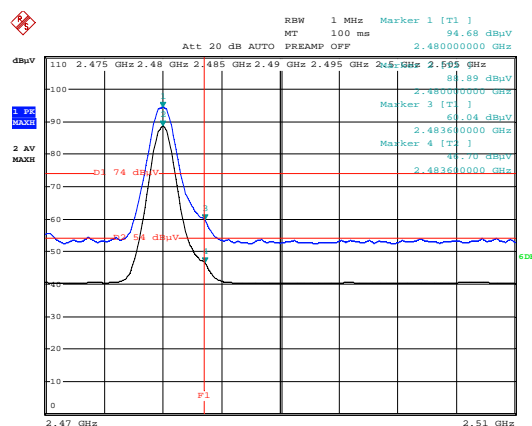
Date: 4.DEC.2013 16:22:51

EDR(8DPSK) - Horizontal
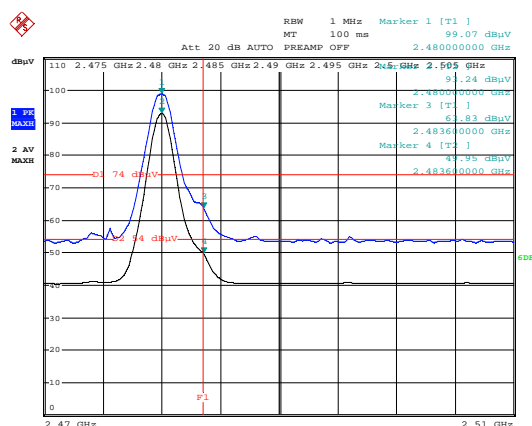
Date: 4.DEC.2013 16:36:33

EDR(8DPSK) - Vertical
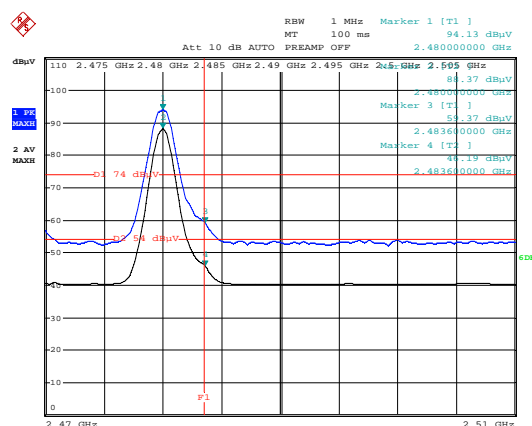
Date: 4.DEC.2013 16:28:52

Figure 8. Spurious RF conducted emissions

Basic(GFSK)

Lowest Channel(2402 MHz): 30 MHz ~ 7 GHz
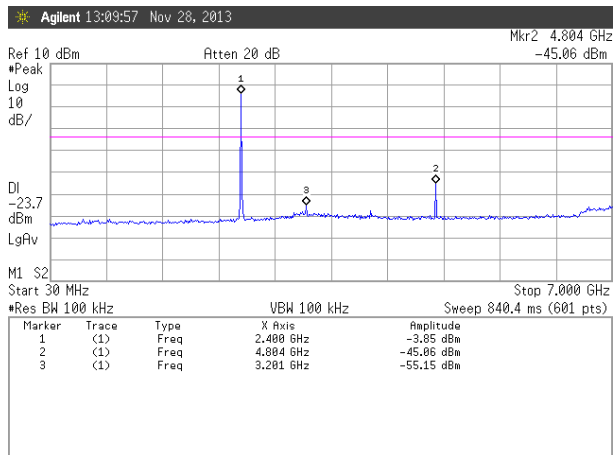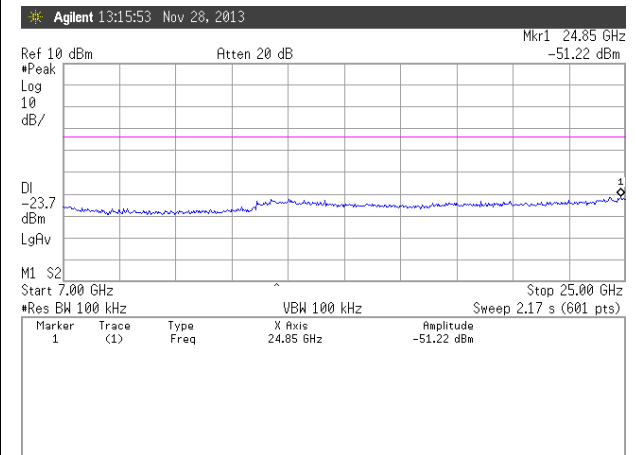
Lowest Channel (2402 MHz): 7 GHz ~ 25 GHz

Middle Channel (2441 MHz): 30 MHz ~ 7 GHz

Middle Channel (2441 MHz): 7 GHz ~ 25 GHz

Highest Channel(2480 MHz): 30 MHz ~ 7 GHz


Highest Channel(2480 MHz): 7 GHz ~ 25 GHz

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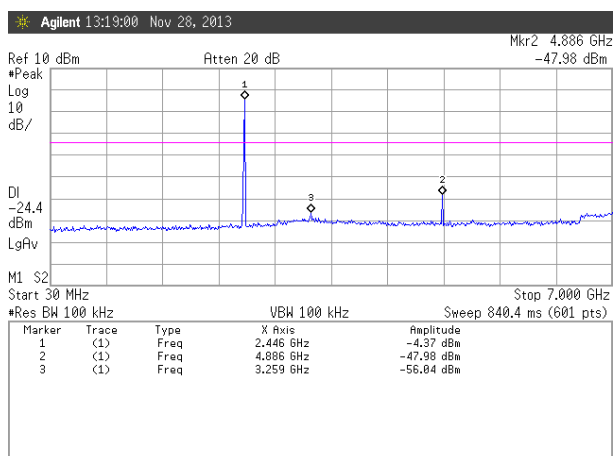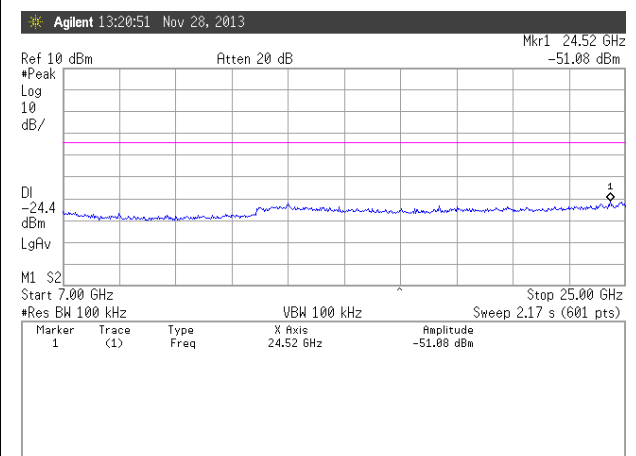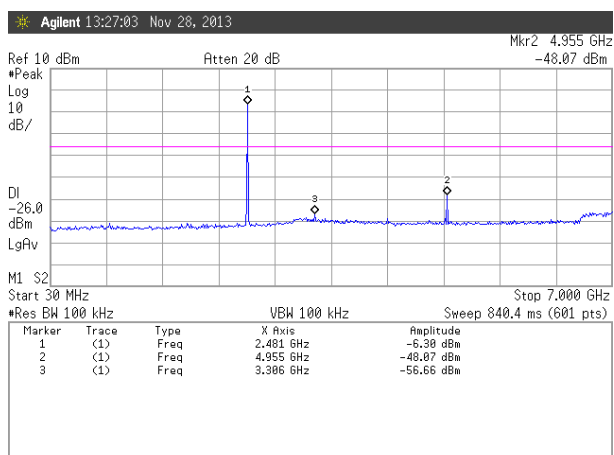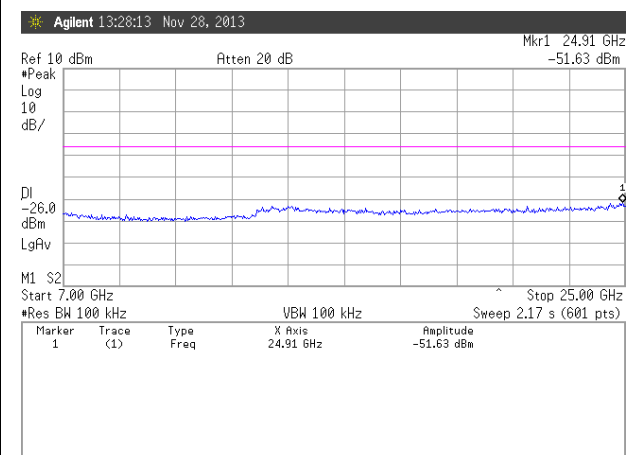
Spurious RF conducted emissions

EDR(π/4DQPSK)
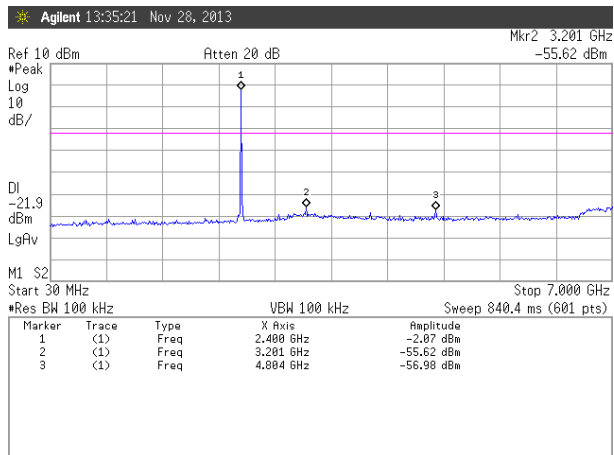
Lowest Channel(2402 MHz): 30 MHz ~ 7 GHz

Lowest Channel (2402 MHz): 7 GHz ~ 25 GHz

Middle Channel (2441 MHz): 30 MHz ~ 7 GHz

Middle Channel (2441 MHz): 7 GHz ~ 25 GHz

Highest Channel(2480 MHz): 30 MHz ~ 7 GHz

Highest Channel(2480 MHz): 7 GHz ~ 25 GHz

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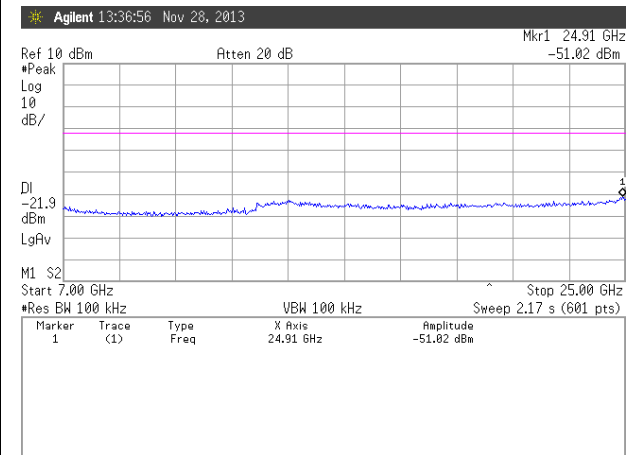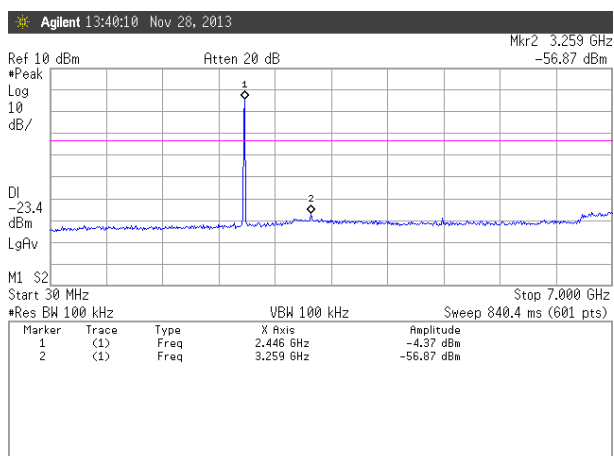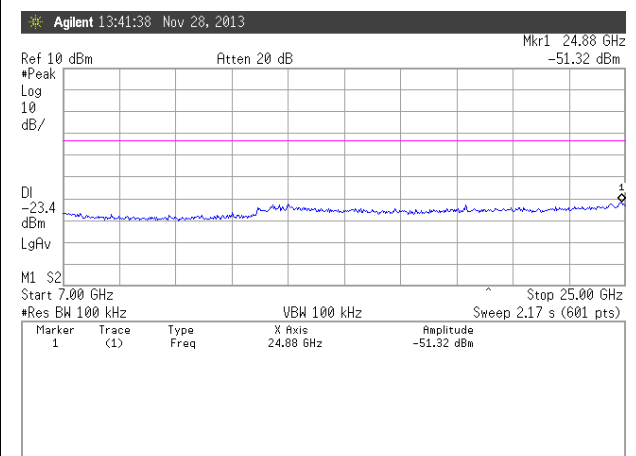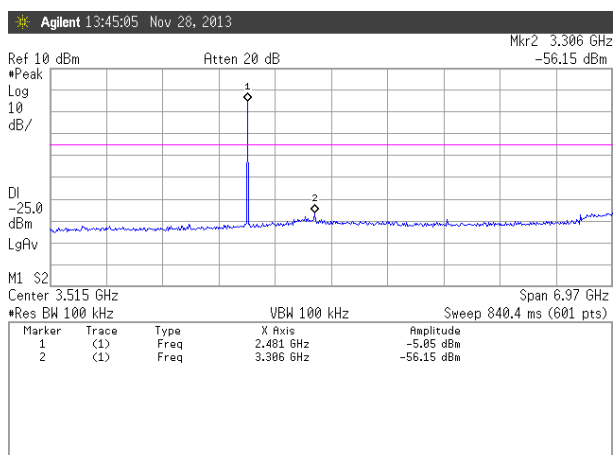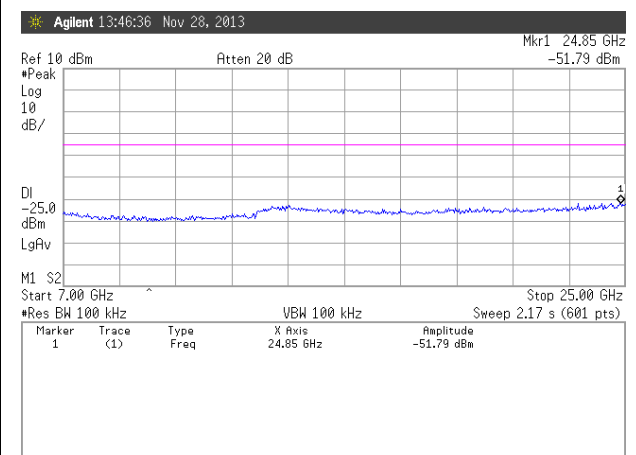
Spurious RF conducted emissions *(continued)*

EDR(8DPSK)
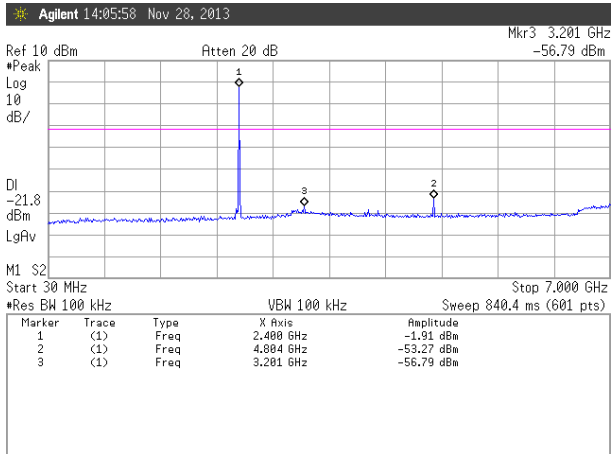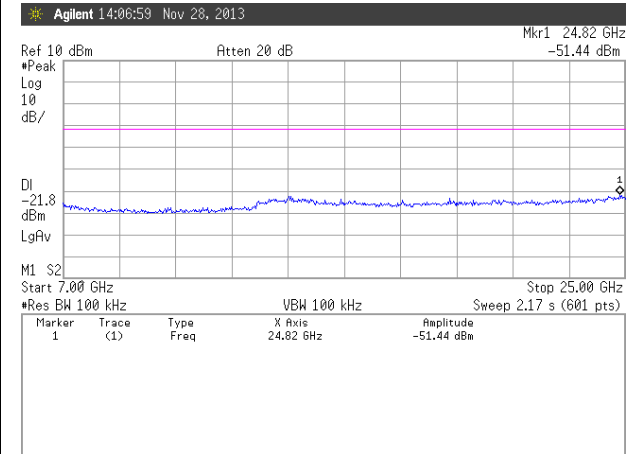
Lowest Channel(2402 MHz): 30 MHz ~ 7 GHz

Lowest Channel (2402 MHz): 7 GHz ~ 25 GHz

Middle Channel (2441 MHz): 30 MHz ~ 7 GHz

Middle Channel (2441 MHz): 7 GHz ~ 25 GHz

Highest Channel(2480 MHz): 30 MHz ~ 7 GHz

Highest Channel(2480 MHz): 7 GHz ~ 25 GHz

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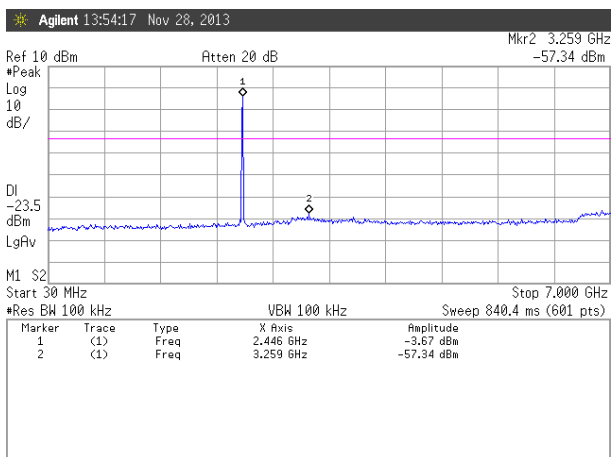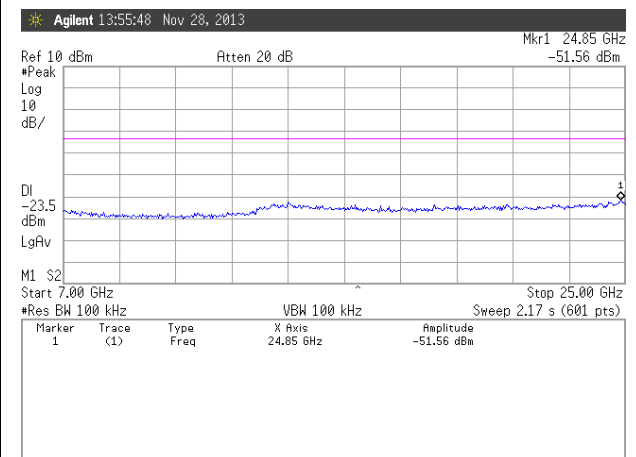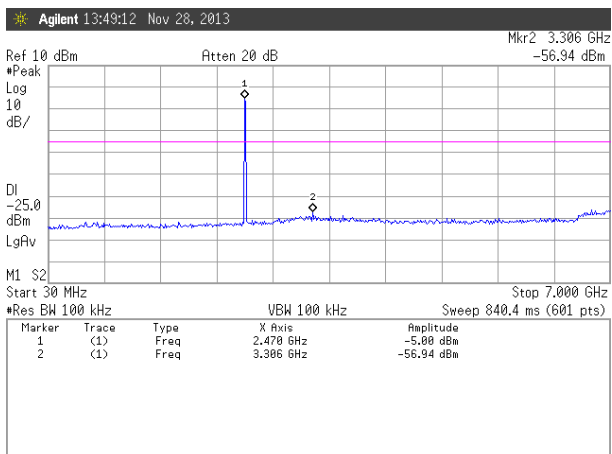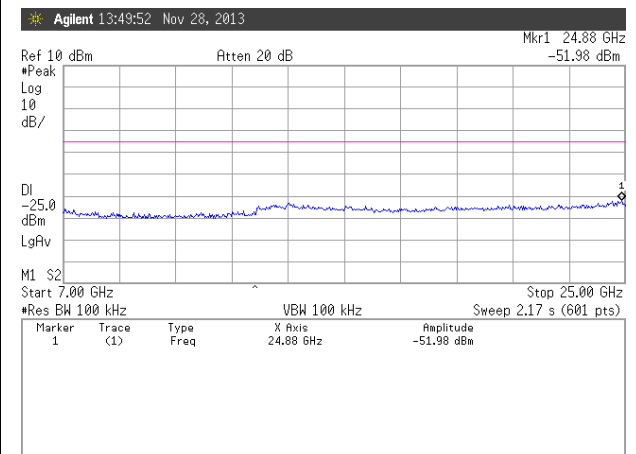
Figure 9. Emission plot for the preliminary radiated measurements

Operating at 2402 MHz: 9 kHz ~ 150 kHz (@ 3-m distance)
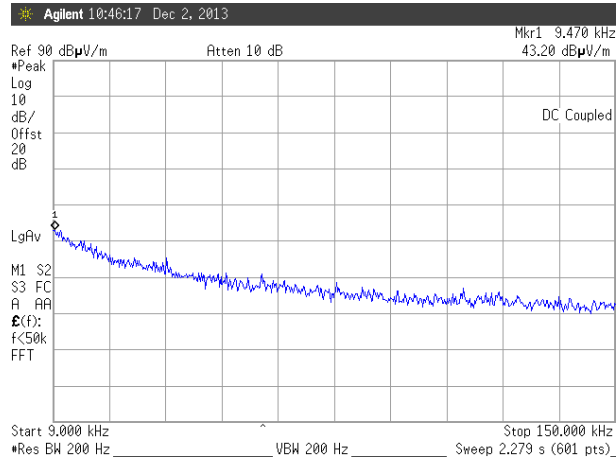
Operating at 2480 MHz: 9 kHz ~ 150 kHz (@ 3-m distance)
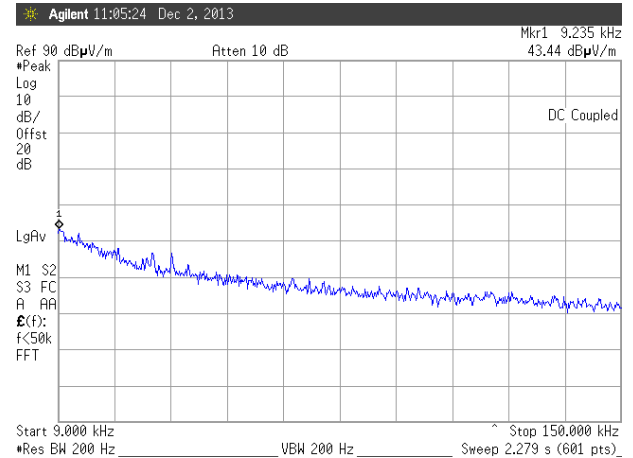
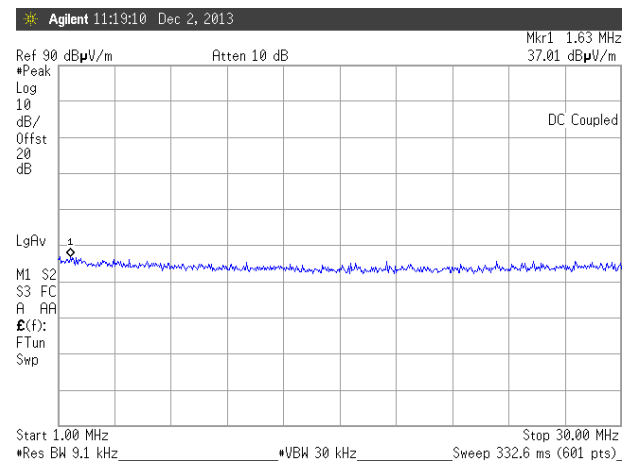Operating at 2402 MHz: 150 kHz ~ 1 MHz (@ 3-m distance)
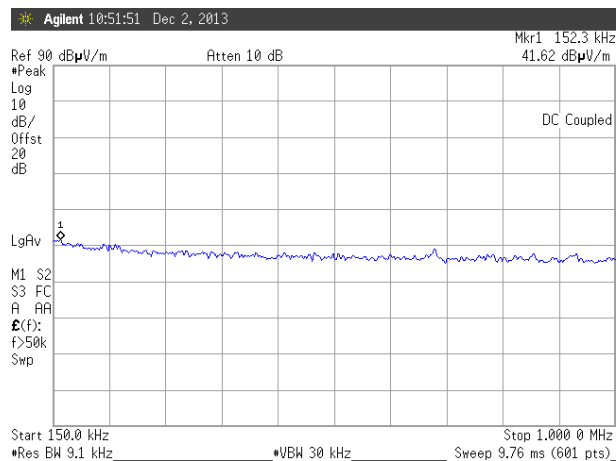
Operating at 2480 MHz: 150 kHz ~ 1 MHz (@ 3-m distance)
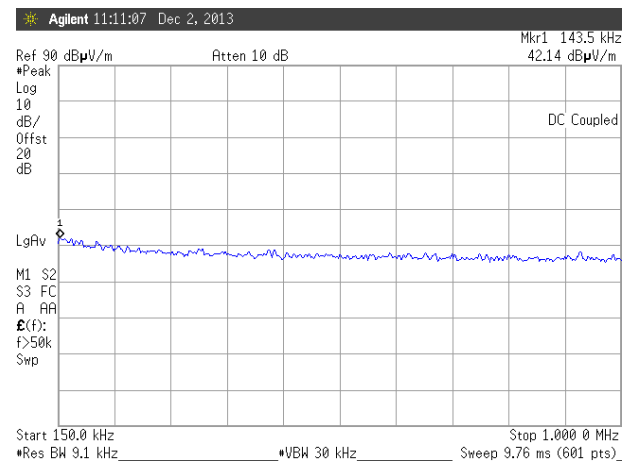
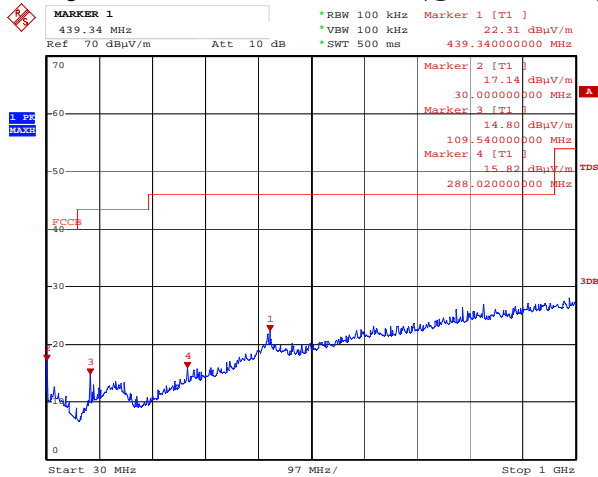
Operating at 2402 MHz: 1 MHz ~ 30 MHz (@ 3-m distance)
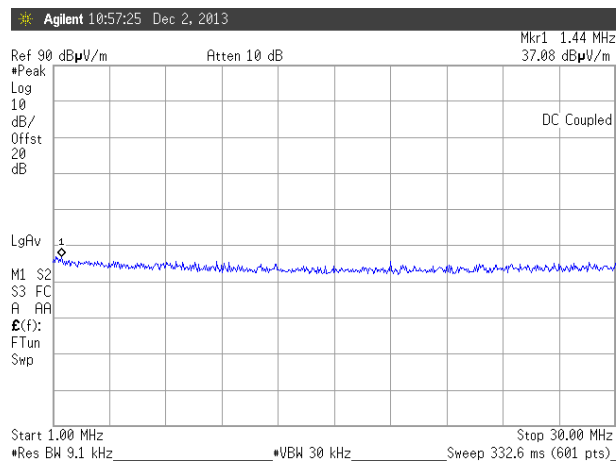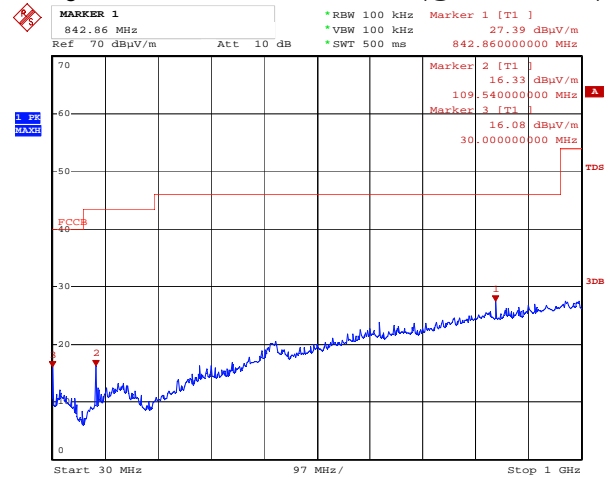

Operating at 2480 MHz: 1 MHz ~ 30 MHz (@ 3-m distance)

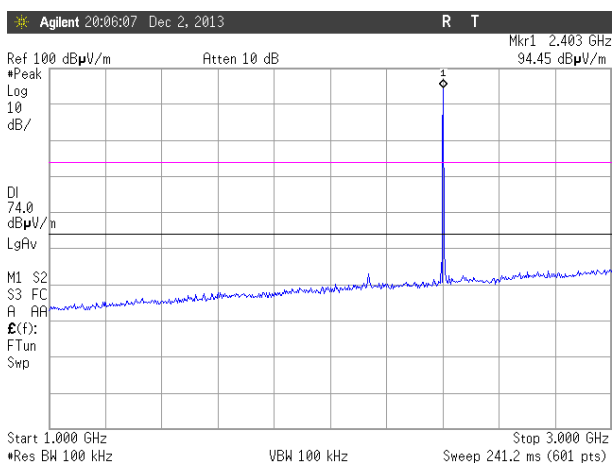## Emission plot for the preliminary radiated measurements *(continued)*

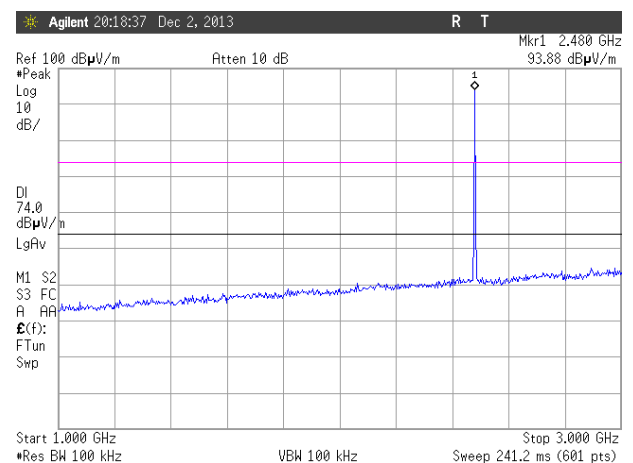Operating at 2402 MHz: 30 MHz ~ 1 GHz (@ 3-m distance)

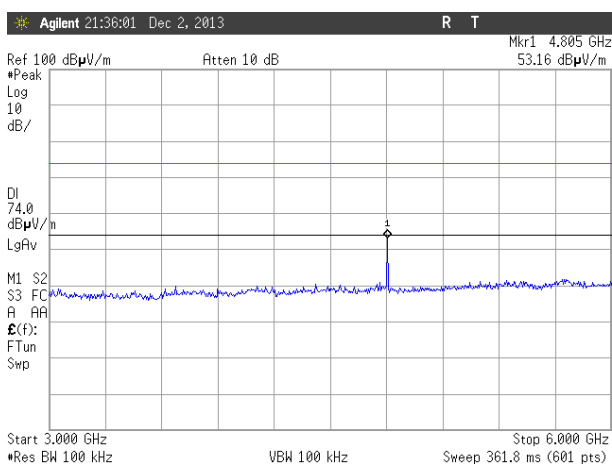Operating at 2480 MHz: 30 MHz ~ 1 GHz (@ 3-m distance)

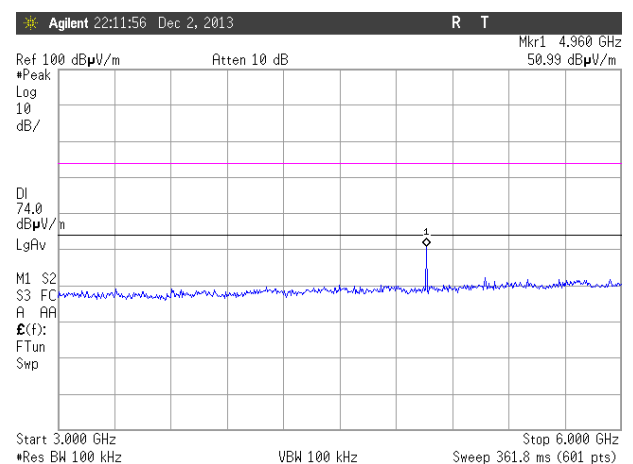Operating at 2402 MHz: 1 GHz ~ 3 GHz (@ 3-m distance)

Operating at 2480 MHz: 1 GHz ~ 3 GHz (@ 3-m distance)

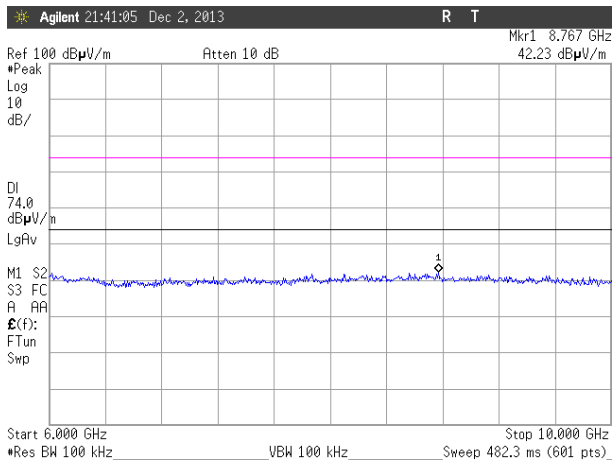Operating at 2402 MHz: 3 GHz ~ 6 GHz (@ 3-m distance)

Operating at 2480 MHz: 3 GHz ~ 6 GHz (@ 3-m distance)

Emission plot for the preliminary radiated measurements *(continued)*

Operating at 2402 MHz: 6 GHz ~ 10 GHz (@ 3-m distance)

Operating at 2480 MHz: 6 GHz ~ 10 GHz (@ 3-m distance)

Operating at 2402 MHz: 10 GHz ~ 18 GHz (@ 1-m distance)

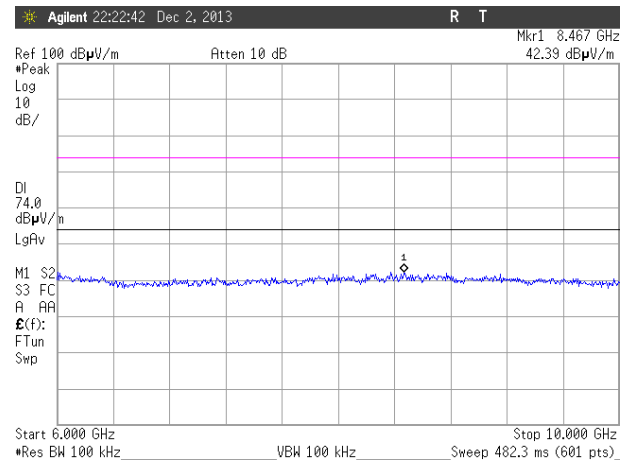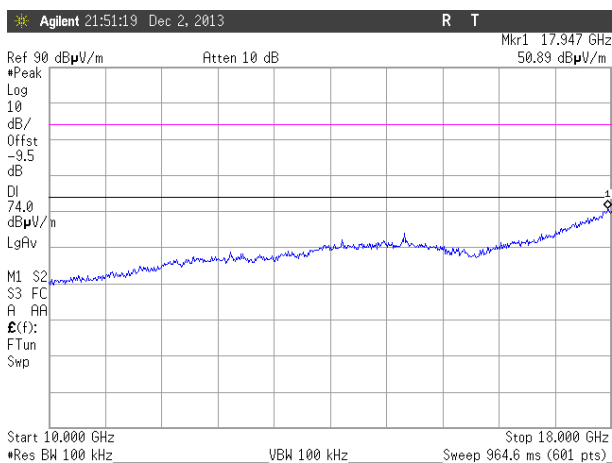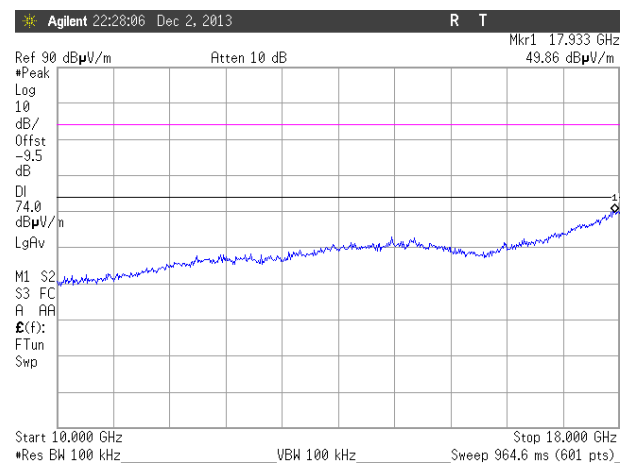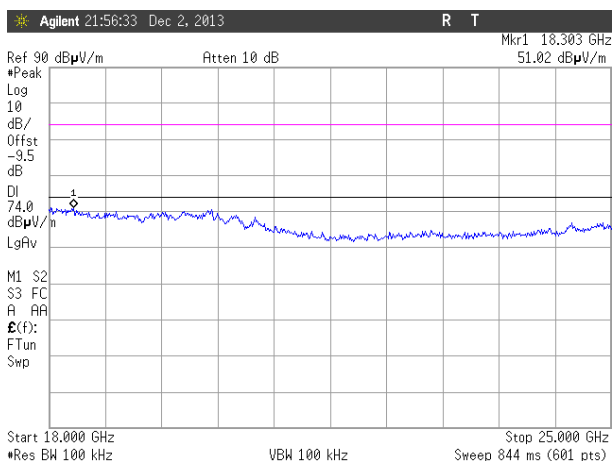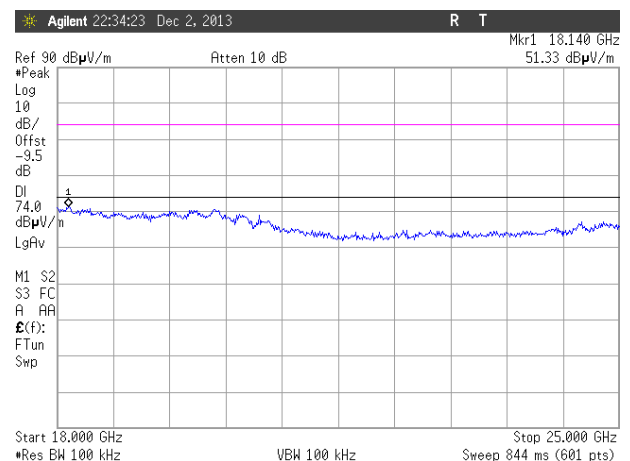Operating at 2480 MHz: 10 GHz ~ 18 GHz (@ 1-m distance)

Operating at 2402 MHz: 18 GHz ~ 25 GHz (@ 1-m distance)

Operating at 2480 MHz: 18 GHz ~ 25 GHz (@ 1-m distance)

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5.7. AC power line conducted emissions

5.7.1 Regulation

According to §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Qausi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency.

According to §15.107(a), for unintentional device, except for Class A digital devices, line conducted emission limits are the same as the above table.

5.7.2 Test Procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50μH LISN, which is an input transducer to a Spectrum Analyzer or an EMI/Field Intensity Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
5. The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 kHz or to QUASI-PEAK and AVERAGE within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

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5.7.3 Test Results: **PASS**

Table 6: Measured values of the AC Power Line Conducted Emissions

Frequency [MHz]	Reading [dBµV]	L / N	CF [dB]	CL [dB]	Actual [dBµV]	Limit [dBµV]	Margin [dB]
QUASI-PEAK DATA							
0.150	35.66	N	0.14	0.01	35.81	66.00	30.19
0.165	33.60	N	0.13	0.01	33.74	65.21	31.47
0.180	32.46	L	0.12	0.01	32.59	64.49	31.90
0.195	30.01	L	0.12	0.01	30.14	63.82	33.68
0.210	29.40	N	0.12	0.01	29.53	63.21	33.68
0.220	29.46	N	0.12	0.01	29.59	62.82	33.23
0.245	27.40	L	0.13	0.01	27.54	61.92	34.38
0.255	26.17	N	0.12	0.01	26.30	61.59	35.29
0.270	25.26	N	0.12	0.01	25.39	61.12	35.73
0.285	24.79	L	0.13	0.01	24.93	60.67	35.74
0.380	32.66	L	0.15	0.01	32.82	58.28	25.46
0.390	33.18	N	0.10	0.01	33.29	58.06	24.77
0.410	37.33	L	0.15	0.01	37.49	57.65	20.16
28.670	28.01	L	1.69	0.30	30.00	60.00	30.00
AVERAGE DATA							
0.150	11.21	N	0.14	0.01	11.36	56.00	44.64
0.165	9.87	N	0.13	0.01	10.01	55.21	45.20
0.180	9.15	L	0.12	0.01	9.28	54.49	45.21
0.195	8.53	L	0.12	0.01	8.66	53.82	45.16
0.210	7.40	N	0.12	0.01	7.53	53.21	45.68
0.220	8.67	N	0.12	0.01	8.80	52.82	44.02
0.245	10.68	L	0.13	0.01	10.82	51.92	41.10
0.255	7.63	N	0.12	0.01	7.76	51.59	43.83
0.270	8.60	N	0.12	0.01	8.73	51.12	42.39
0.285	11.05	L	0.13	0.01	11.19	50.67	39.48
0.380	17.64	L	0.15	0.01	17.80	48.28	30.48
0.390	16.96	N	0.10	0.01	17.07	48.06	30.99
0.410	21.96	L	0.15	0.01	22.12	47.65	25.53
28.670	25.89	L	1.69	0.30	27.88	50.00	22.12

Margin (dB) = Limit – Actual
[Actual = Reading + CF + CL]
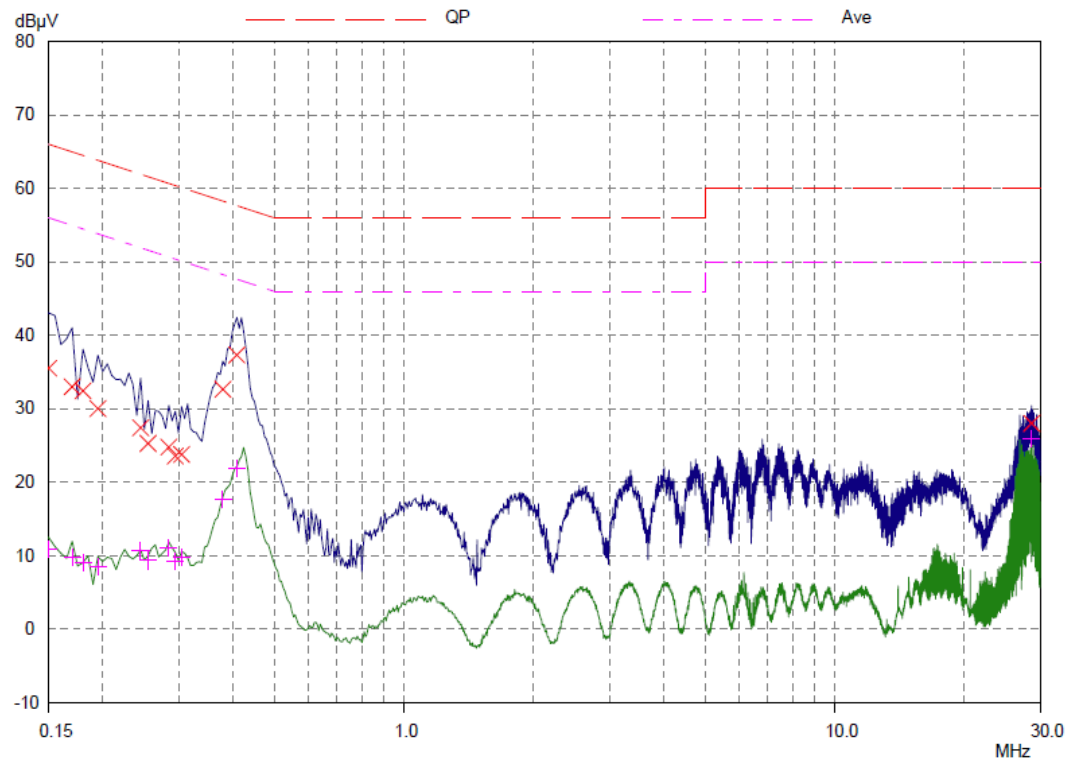L/N = LINE / NEUTRAL
CF/CL = Correction Factor and Cable Loss

NOTE: The frequency range was scanned from 150 kHz to 30 MHz. All emissions not reported were more than 20 dB below the specified limit.

Figure 10. Plot of the AC Power Line Conducted Emissions

Line – PE (Peak and Average detector used)

Neutral – PE (Peak and Average detector used)