FCC/IC TEST REPORT

Test report No.:	EMC- FCC- R0100
FCC ID:	TQ8-AC110B4GG
IC:	5074A-AC110B4GG
Type of equipment:	DIGITAL CAR AUDIO SYSTEM
Basic Model Name:	AC110B4GG
Variant Model name:	AC111B4GG, AC110B4GN, AC110B4GE, AC110B4GL
Applicant:	Hyundai Mobis Co., Ltd.
Max.RF Output Power:	4.36 dBm
FCC Rule Part(s):	FCC Part 15 Subpart C 15.247
IC Rule:	RSS-210, RSS-GEN
Frequency Range:	2 402 MHz ~ 2 480 MHz
Test result:	Complied

The above equipment was tested by EMC compliance Testing Laboratory for compliance with the requirements of FCC Rules and Regulations.
The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of test: March 17, 2013 ~ March 26, 2013

Issued date: March 27,2013

Tested by: ______________________
SON, MIN GI

Approved by: ______________________ .
KIM, CHANG MIN

EMC compliance Ltd.
480-5 Shin-dong, Yeongtong-gu, Suwon-city, Gyunggi-do, 443-390, Korea
82 31 336 9919 (Main) 82 31 336 4767 (Fax)

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1. Client information

Applicant:	Hyundai Mobis Co., Ltd.
Address:	80-9, Mabook-dong, Giheung-gu, Yongin-shi, Gyunggi-do, Korea (446-912)
Telephone number:	+82-31-260-0092
Facsimile number	+82-31-899-1788
Contact person:	Jong Tae Kim / dounu@mobis.co.kr

Manufacturer:	Mobis India Ltd.
Address :	Kannur Post, S/No. 679(1A/B/C/D), Kottaiyur, Tiruvallur District, Tamil Nadu, 602-108, India

2. Laboratory information

Address
EMC Compliance Ltd.
480-5 Shin-dong, Yeongtong-gu, Suwon-city, Gyunggi-do, 443-390, Korea
Telephone Number: 82 31 336 9919   Facsimile Number: 82 31 336 4767

Certificate
CBTL Testing Laboratory, KOLAS NO.: 231
FCC Filing No.: 508785
VCCI Registration No.: C-1713, R-1606, T-258
IC Recognition No.:8035A-2

SITE MAP

3. Description of E.U.T.

3.1 Basic description

Applicant :	Hyundai Mobis Co., Ltd.
Address of Applicant:	80-9, Mabook-dong, Giheung-gu, Yongin-shi, Gyunggi-do, Korea (446-912)
Manufacturer:	Mobis India Ltd.
Address of Manufacturer:	Kannur Post, S/No. 679(1A/B/C/D), Kottaiyur, Tiruvallur District, Tamil Nadu, 602-108, India
Type of equipment:	DIGITAL CAR AUDIO SYSTEM
Basic Model:	AC110B4GG
Variant Model:	AC111B4GG, AC110B4GN, AC110B4GE, AC110B4GL
Serial number:	Proto Type

* Variant model names are different only for the marketing area, and all model names are electrically identical in construction, radio characteristics, and features.

3.2 General description

Frequency Range	2 402 MHz ~ 2 480 MHz
Type of Modulation	Modulation technologies: FHSS Modulation : GFSK, π/4DQPSK, 8DPSK
Number of Channels	79 channels
Type of Antenna	Integral
Antenna Gain	3.5 dBi
Transmit Power	4.36 dBm
Power supply	14.4 V DC

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3.3 Test frequency

	Frequency
Low frequency	**2 402 MHz**
Middle frequency	**2 441 MHz**
High frequency	**2 480 MHz**

3.4 Test Voltage

mode	Voltage
Norminal voltage	**DC 14.4 V**

※ 15.247 Requirements for Bluetooth transmitter

- This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following:
  1) This system is hopping pseudo-randomly.
  2) Each frequency is used equally on the average by each transmitter.
  3) The receiver input bandwidths that match the hopping channel bandwidths of their corresponding transmitters
  4) The receiver shifts frequencies in synchronization with the transmitted signals.

- 15.247(g): The system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this Section 15.247 should the transmitter be presented with a continuous data (or information) stream.
- 15.247(h): The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

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4. Summary of test results

4.1 Standards & results

FCC Rule	IC Rule	Parameter	Report Section	Test Result
15.203, 15.247(b)(4)	RSS-GEN, 7.1.2	Antenna Requirement	5.1	C
15.247(b)(1), (4)	RSS-210, A8.4(2)	Maximum Peak Output Power	5.2	C
15.247(a)(1)	RSS-210, A8.1(b)	Carrier Frequency Separation	5.3	C
15.247(a)(1)	RSS-210, A8.1(a)	20dB Channel Bandwidth	5.4	C
-	RSS-210, A1.1	Occupied Bandwidth	5.4	C
15.247(a)(iii) 15.247(b)(1)	RSS-210, A8.1(d)	Nunber of Hopping Channel	5.5	C
15.247(a) (iii)	RSS-210, A8.1(d)	Time of Occupancy(Dwell Time)	5.6	C
15.247(d), 15.205(a), 15.209(a)	RSS-210, A8.5 RSS-210, A2.9 RSS-GEN, 7.2.3	Spurious Emission, BandEdge, Restricted Band	5.7	C
-	RSS-GEN, 4.10	Receiver Spurious Emissions	5.8	C
15.247(i), 1.1307(b)(1)	-	RF Exposure	5.10	C
Note: C=complies NC= Not complies NT=Not tested NA=Not Applicable				

* The method of measurement used to test this DSS device is FCC Public Notice DA 00-705
* The general test methods used to test this device is ANSI C63.4 2003 (or 2009, or ANSI C63.10 2009)

4.2 Uncertainty

Measurement Item	Combined Standard Uncertainty Uc	Expanded Uncertainty U = KUc (K = 2)
Conducted RF power	± 0.29 dB	± 0.58 dB
Radiated disturbance	30 ㎒ ~ 300 ㎒ : + 2.43 ㏈, - 2.44 ㏈ 300 ㎒~1 000 ㎒ : + 2.49㏈, - 2.50 ㏈ 1 ㎓ ~ 6 ㎓ : + 3.10 ㏈, - 3.10 ㏈ 6 ㎓ ~ 18 ㎓ : + 3.21 ㏈, - 3.27 ㏈	30 ㎒ ~ 300 ㎒ : + 4.86 ㏈, - 4.88 ㏈ 300 ㎒ ~ 1 000 ㎒ + 4.98㏈, - 4.99 ㏈ 1 ㎓ ~ 6 ㎓ : + 6.19 ㏈, - 6.20 ㏈ 6 ㎓ ~ 18 ㎓ : + 6.41 ㏈, - 6.53 ㏈

5. Test results

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

-Complied

The transmitter has an integral dipole antenna. type of antenna.
The directional gain of the antenna is 3.5 dBi.

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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 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via UART interface and make sure the spectrum analyzer is operated in its linear range.
4. 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
5. Measure the highest amplitude appearing on spectral display and record the level to calculate results.
6. Repeat above procedures until all frequencies measured were complete.

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5.2.3 Test Result

-Complied

- GFSK

Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 402	1.94	30.00	28.06
Middle	2 441	3.29	30.00	26.71
High	2 480	2.50	30.00	27.50

- π/4DQPSK

Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 402	2.94	20.97	18.03
Middle	2 441	4.24	20.97	16.73
High	2 480	3.14	20.97	17.83

- 8DPSK

Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 402	3.08	20.97	17.89
Middle	2 441	**4.36**	20.97	16.61
High	2 480	3.31	20.97	17.66

NOTE:

1. Since the directional gain of the integral antenna declared by the manufacturer (G_{ANT} = 3.5 dBi) does not exceed 6.0 dBi, there was no need to reduce the output power.
2. We took the insertion loss of the cable loss into consideration within the measuring instrument.

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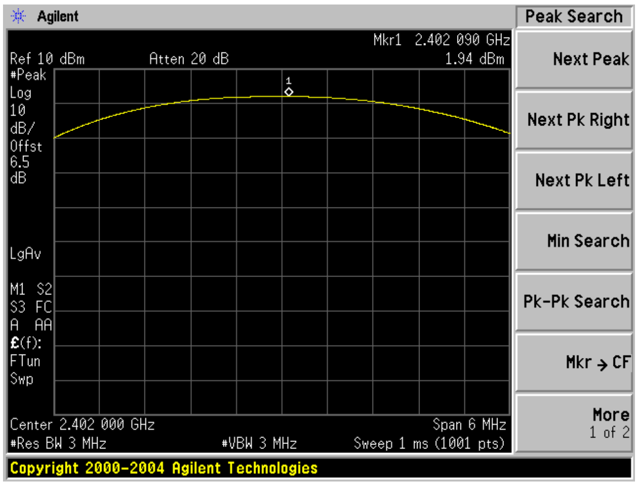
5.2.4 Test Plot

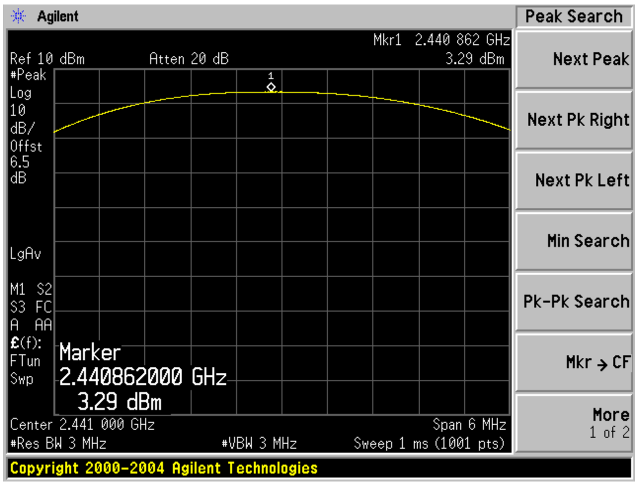
Figure 1. Plot of the Maximum Peak Output Power (Conducted)

- GFSK

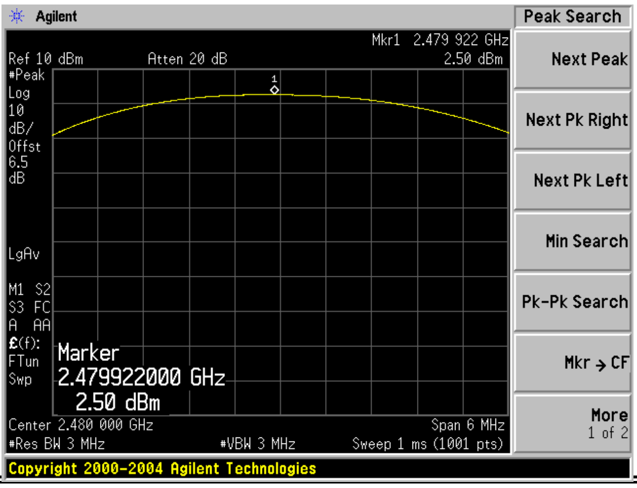
Lowest Channel
(2 402 MHz)



Middle Channel
(2 441 MHz)



Highest Channel
(2 480 MHz)



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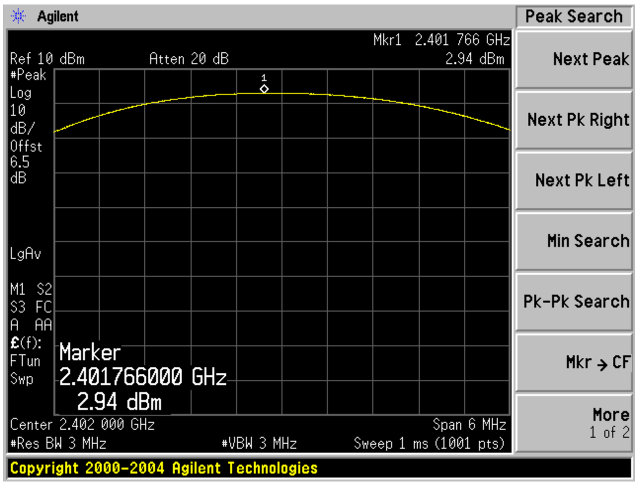
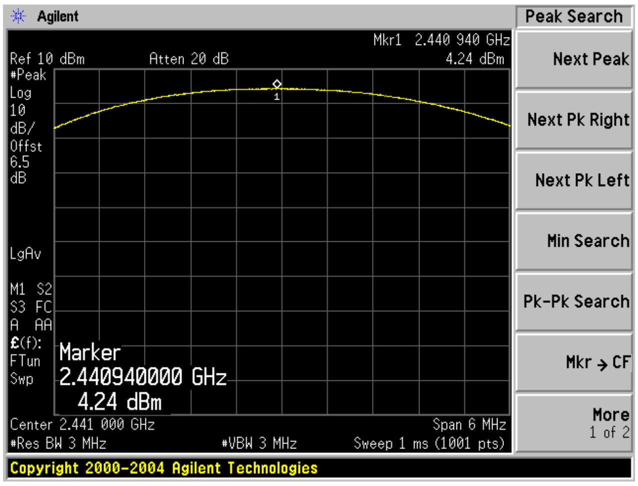
- π/4DQPSK

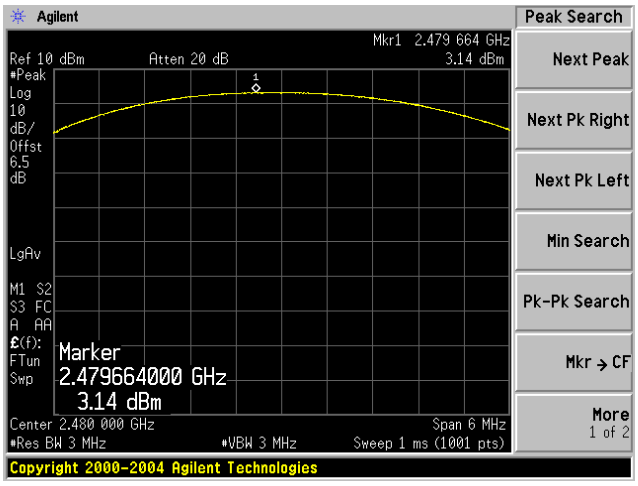
Lowest Channel
(2 402 MHz)



Middle Channel
(2 441 MHz)



Highest Channel
(2 480 MHz)



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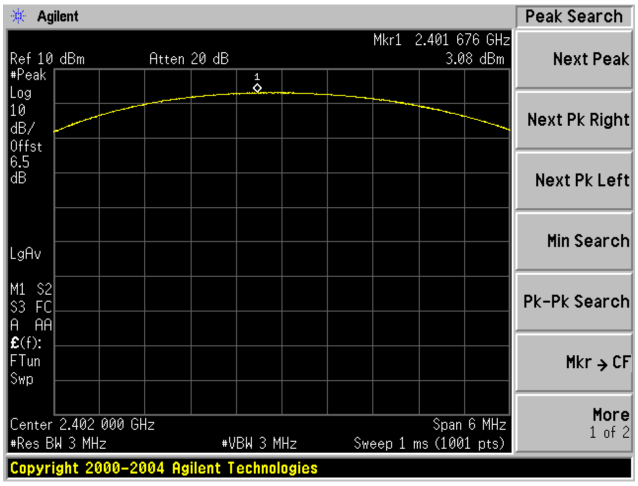
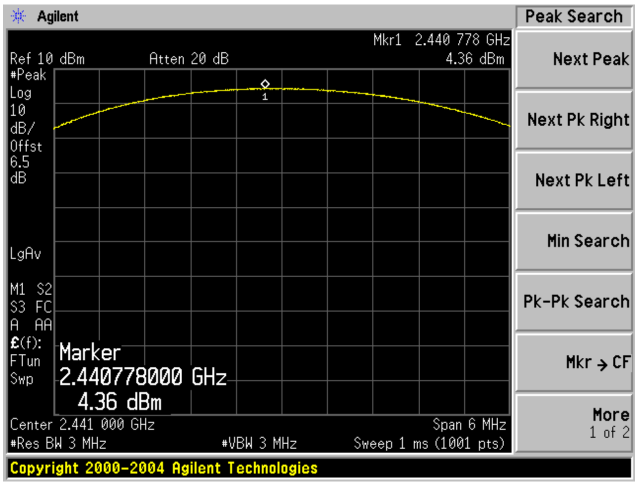
- 8DPSK

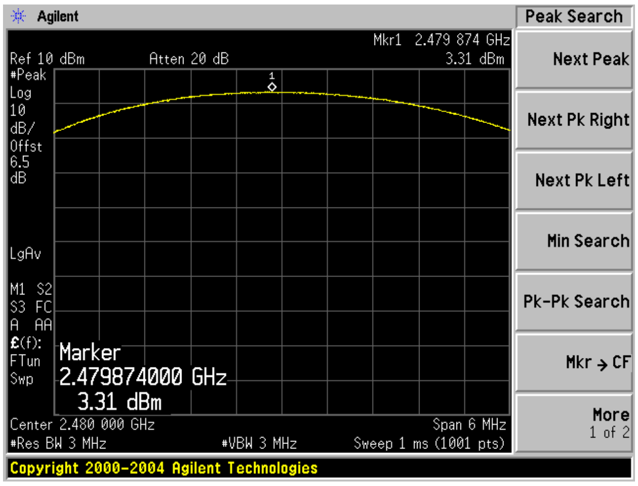
Lowest Channel
(2 402 MHz)



Middle Channel
(2 441 MHz)



Highest Channel
(2 480 MHz)



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5.3 Carrier Frequency Separation

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 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable and attenuator.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via UART interface.
4. Set the spectrum analyzer as follows: 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
5. Measure the separation between the peaks of the adjacent channels using the marker-delta function.
6. Repeat above procedures until all frequencies measured were complete.

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5.3.3 Test Result
-Complied

- GFSK

Channel	Carrier frequency separation(MHz)	Limit
Low	1.020	≥25 kHz or two-thirds of the 20 dB bandwidth
Middle	1.029	≥25 kHz or two-thirds of the 20 dB bandwidth
High	1.002	≥25 kHz or two-thirds of the 20 dB bandwidth

- π/4DQPSK

Channel	Carrier frequency separation(MHz)	Limit
Low	1.008	≥25 kHz or two-thirds of the 20 dB bandwidth
Middle	1.002	≥25 kHz or two-thirds of the 20 dB bandwidth
High	1.005	≥25 kHz or two-thirds of the 20 dB bandwidth

- 8DPSK

Channel	Carrier frequency separation(MHz)	Limit
Low	1.008	≥25 kHz or two-thirds of the 20 dB bandwidth
Middle	1.002	≥25 kHz or two-thirds of the 20 dB bandwidth
High	1.008	≥25 kHz or two-thirds of the 20 dB bandwidth

NOTE: We took the insertion loss of the cable loss into consideration within the measuring instrument.

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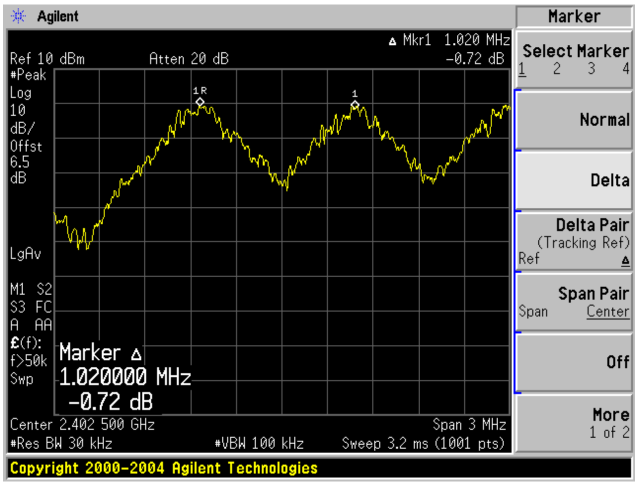
5.3.4 Test Plot

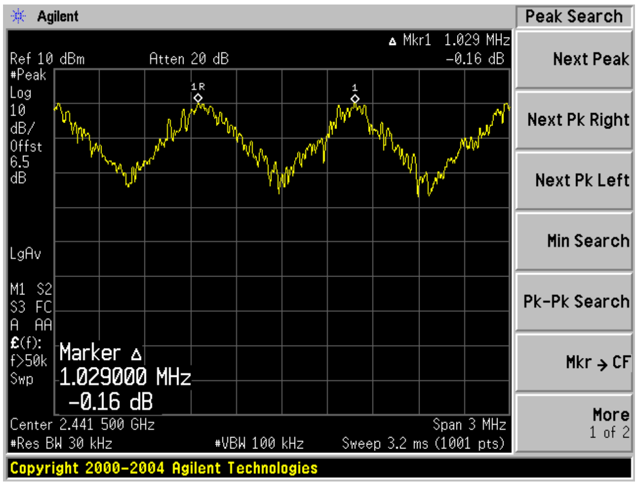
Figure 2.Plot of the Carrier Frequency Separation (Conducted)

- GFSK

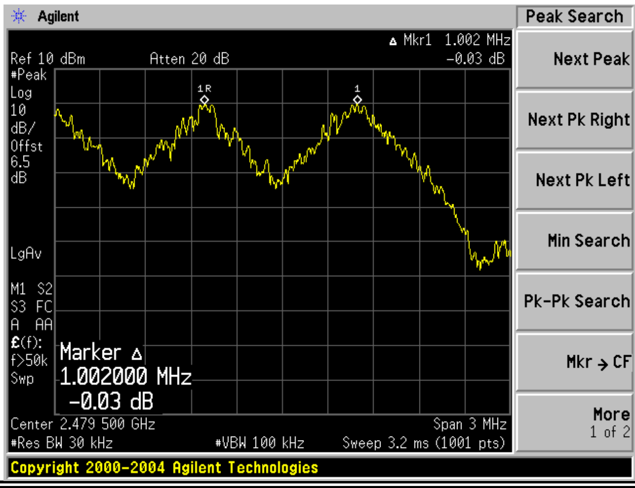
Lowest Channel
(2 402 MHz)



Middle Channel
(2 441 MHz)



Highest Channel
(2 480 MHz)



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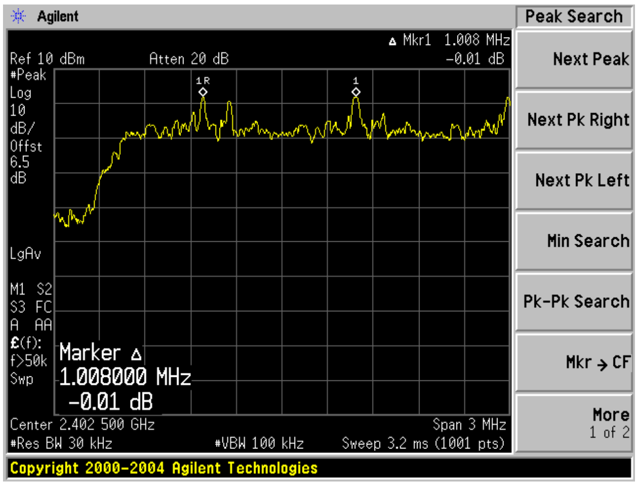
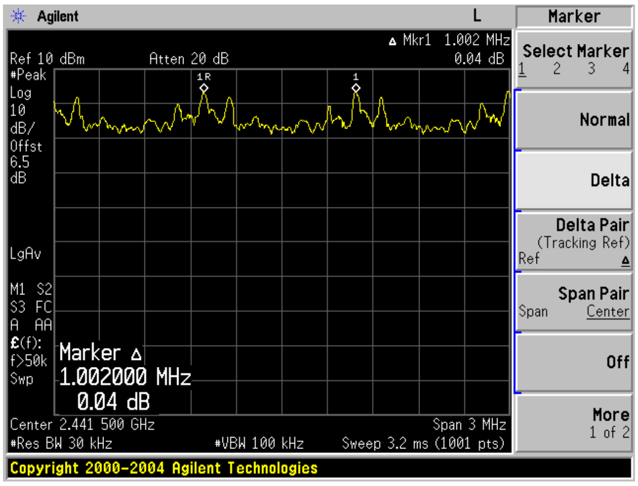
- π/4DQPSK

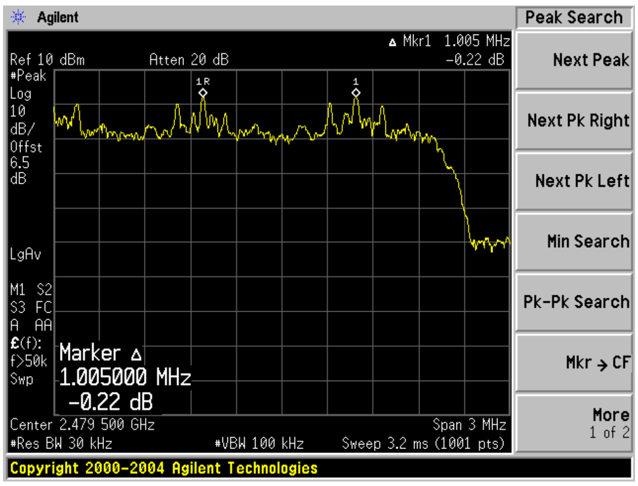
Lowest Channel
(2 402 MHz)



Middle Channel
(2 441 MHz)



Highest Channel
(2 480 MHz)



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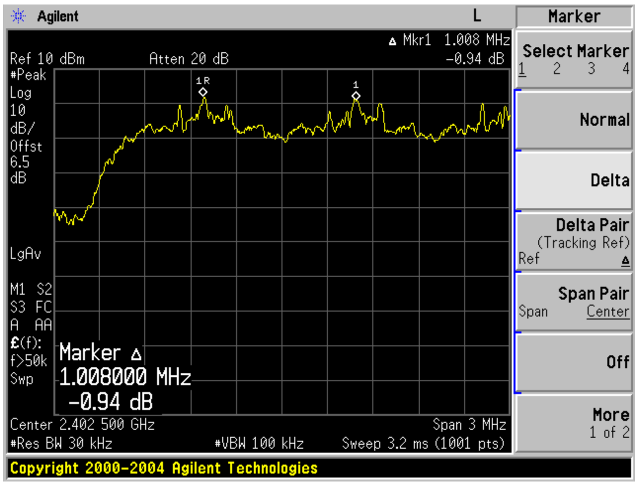
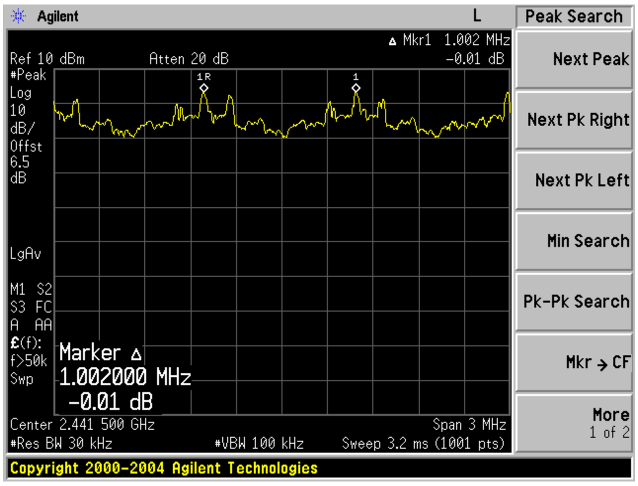
- 8DPSK

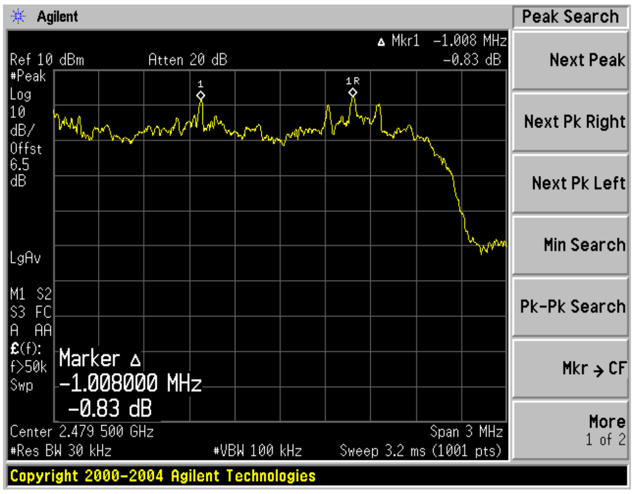
Lowest Channel
(2 402 MHz)



Middle Channel
(2 441 MHz)



Highest Channel
(2 480 MHz)



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5.4 20 dB Channel Bandwidth

5.4.1 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

5.4.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable and attenuator.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via UART interface and make sure the spectrum analyzer is operated in its linear range.
4. Set the spectrum analyzer as follows: 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
5. Set a reference level on it equal to the highest peak value.
6. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
7. Repeat above procedures until all frequencies measured were complete..

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5.4.3 Test Result
-Complied

- GFSK

Channel	20dB Channel Bandwidth(MHz)	Carrier frequency Separation(MHz)	Occupied Bandwidth (99% BW)(MHz)
Low	0.945	1.020	0.860
Middle	0.965	1.029	0.889
High	0.931	1.002	0.877

- π/4DQPSK

Channel	20dB Channel Bandwidth(MHz)	Carrier frequency Separation(MHz)	Occupied Bandwidth (99% BW)(MHz)
Low	1.326	1.008	1.221
Middle	1.367	1.002	1.227
High	1.265	1.005	1.194

- 8DPSK

Channel	20dB Channel Bandwidth(MHz)	Carrier frequency Separation(MHz)	Occupied Bandwidth (99% BW)(MHz)
Low	1.311	1.008	1.220
Middle	1.317	1.002	1.218
High	1.304	1.008	1.204

NOTE: We took the insertion loss of the cable loss into consideration within the measuring instrument.

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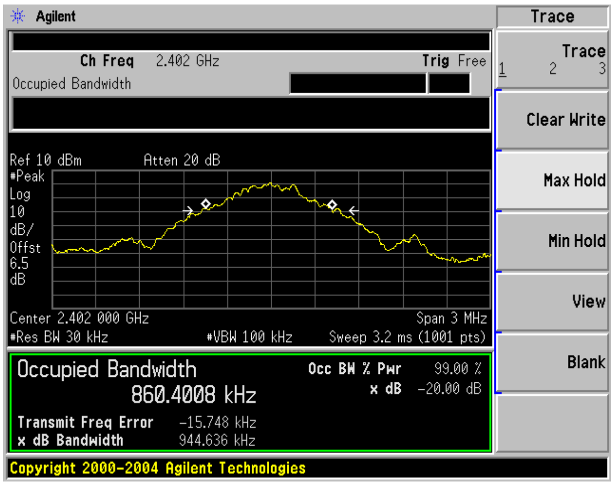
5.4.4 Test Plot

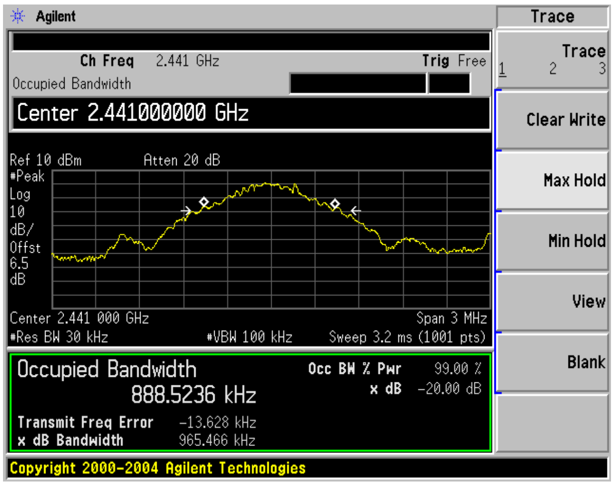
Figure 3.Plot of the 20dB Channel Bandwidth/ Occupied Bandwidth (Conducted)

- GFSK

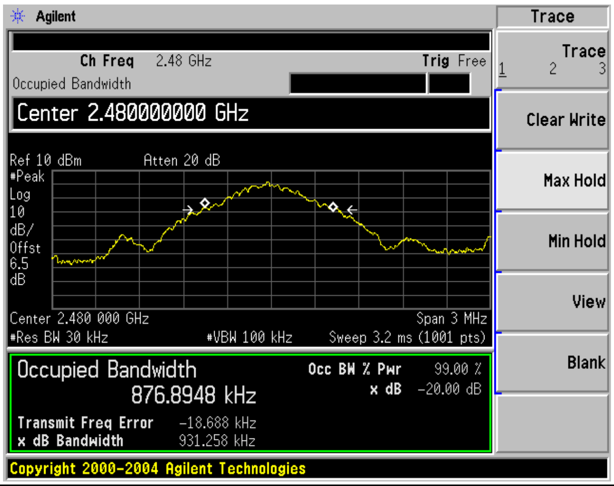
Lowest Channel
(2 402 MHz)



Middle Channel
(2 441MHz)



Highest Channel
(2 480 MHz)



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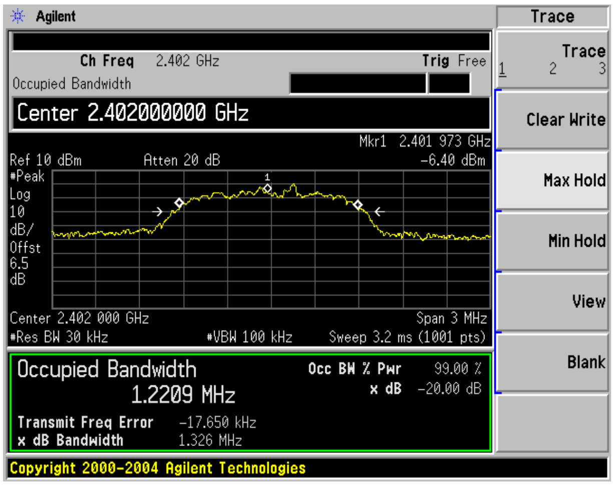
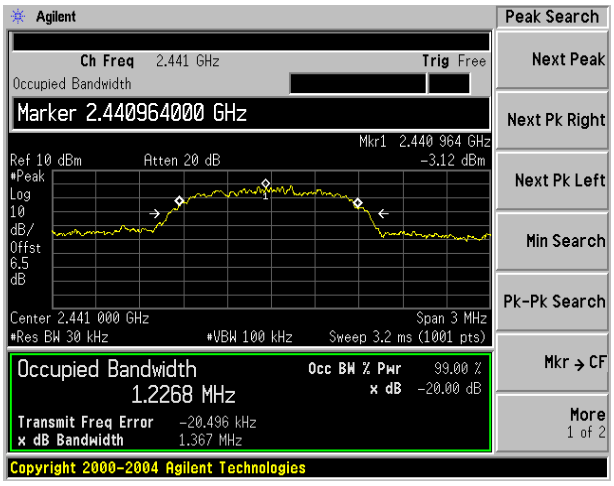
- π/4DQPSK

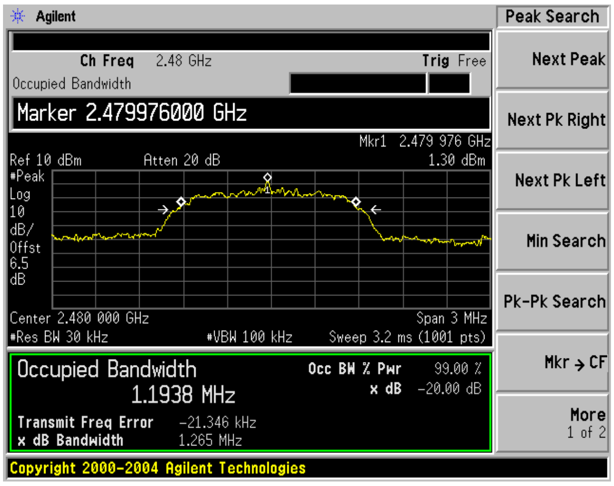
Lowest Channel
(2 402 MHz)



Middle Channel
(2 441 MHz)

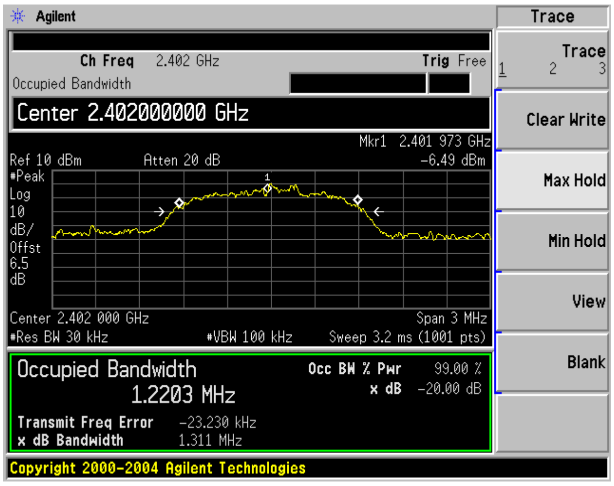


Highest Channel
(2 480 MHz)

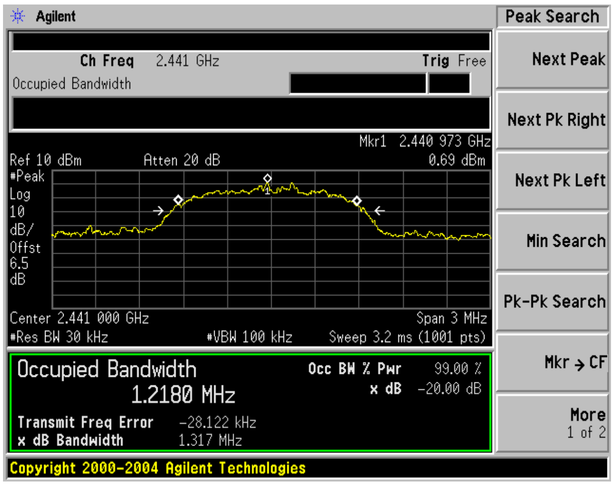


- 8DPSK

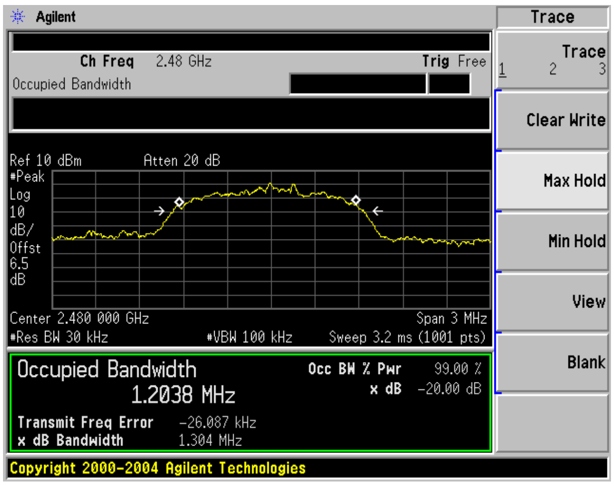
Lowest Channel
(2 402 MHz)



Middle Channel
(2 441 MHz)



Highest Channel
(2 480 MHz)



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5.5 Number of Hopping Channels

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. 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.

5.5.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable and attenuator.
3. Turn on the EUT and set the hopping function enabled by controlling it via UART interface.
4. 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
5. Record the number of hopping channels.

5.5.3 Test Result

-Complied

- GFSK

Frequency	Number of hopping channel	Limit
2 402 – 2 480 MHz	79	≥15

- 8DPSK/ π/4DQPSK

Frequency	Number of hopping channel	Limit
2 402 – 2 480 MHz	79	≥15

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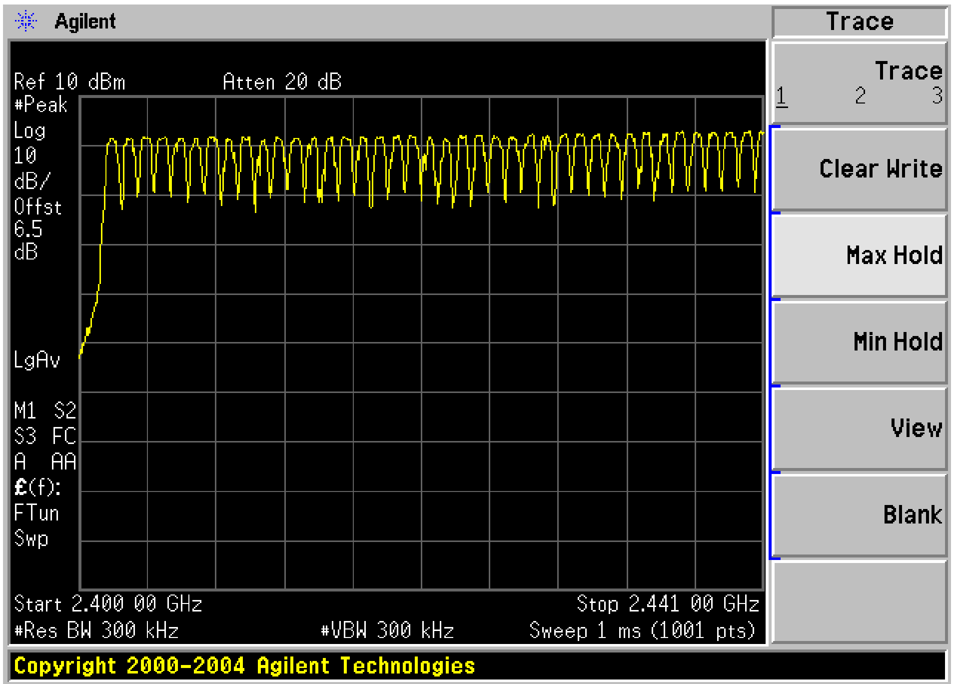
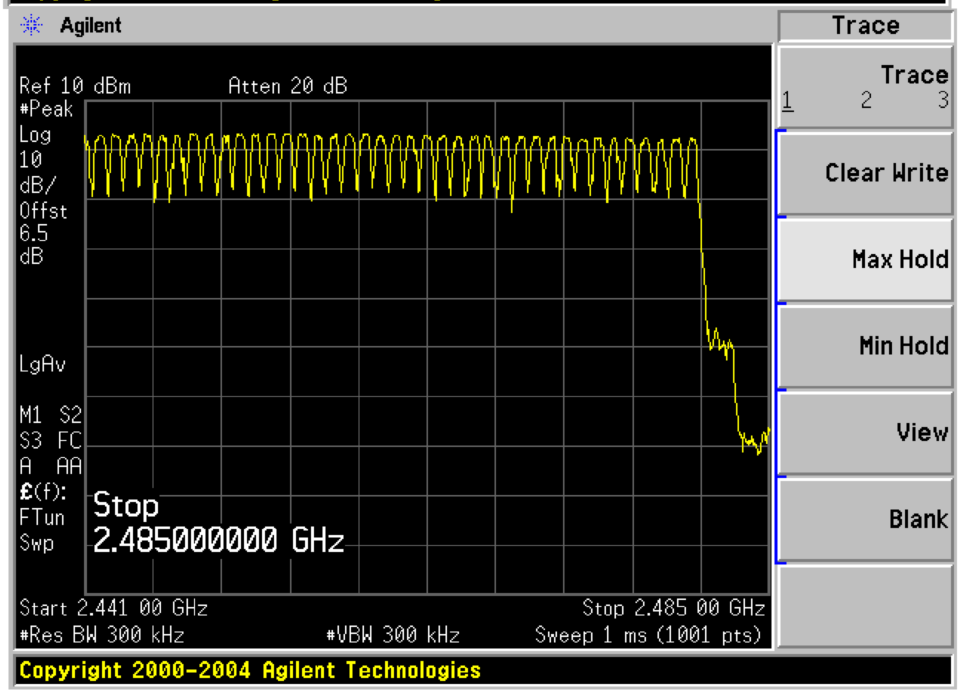
5.5.4 Test Plot

Figure 4. Plot of the Number of Hopping Channels (Conducted)

- GFSK





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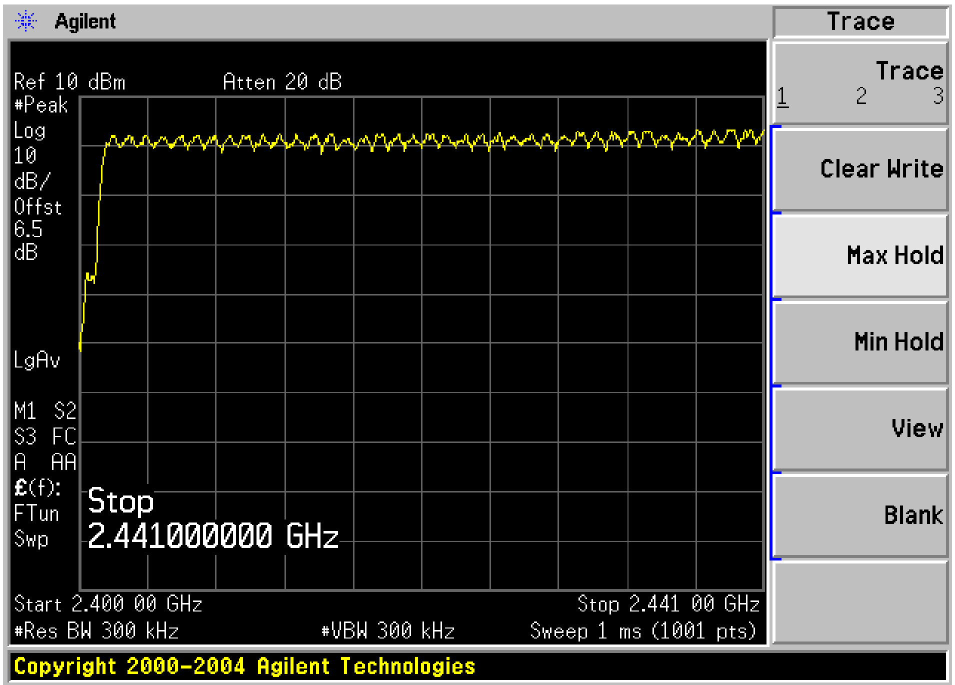
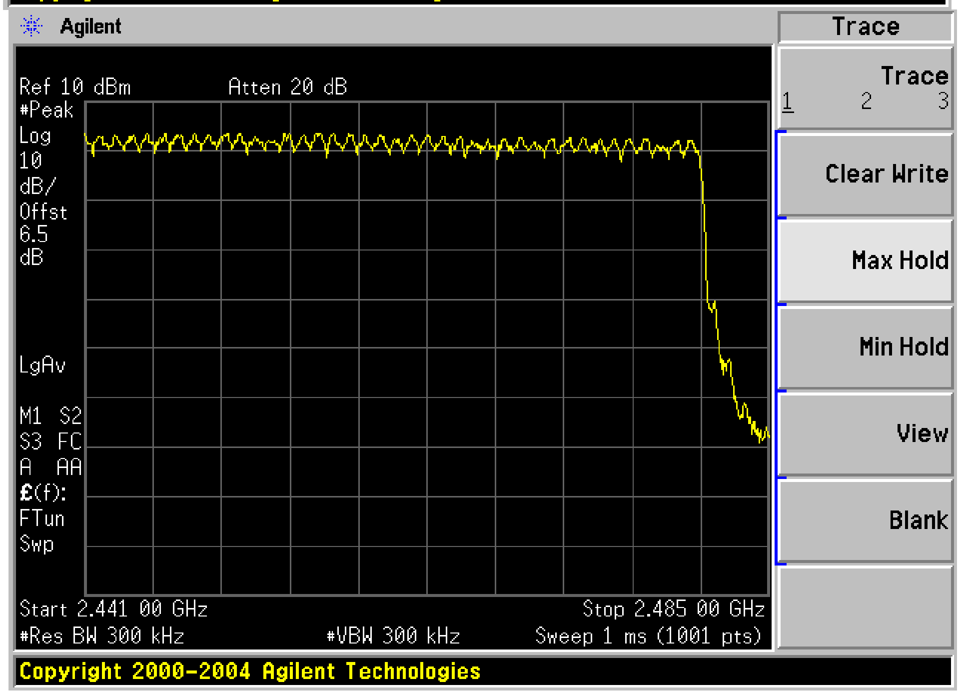
- π/4DQPSK





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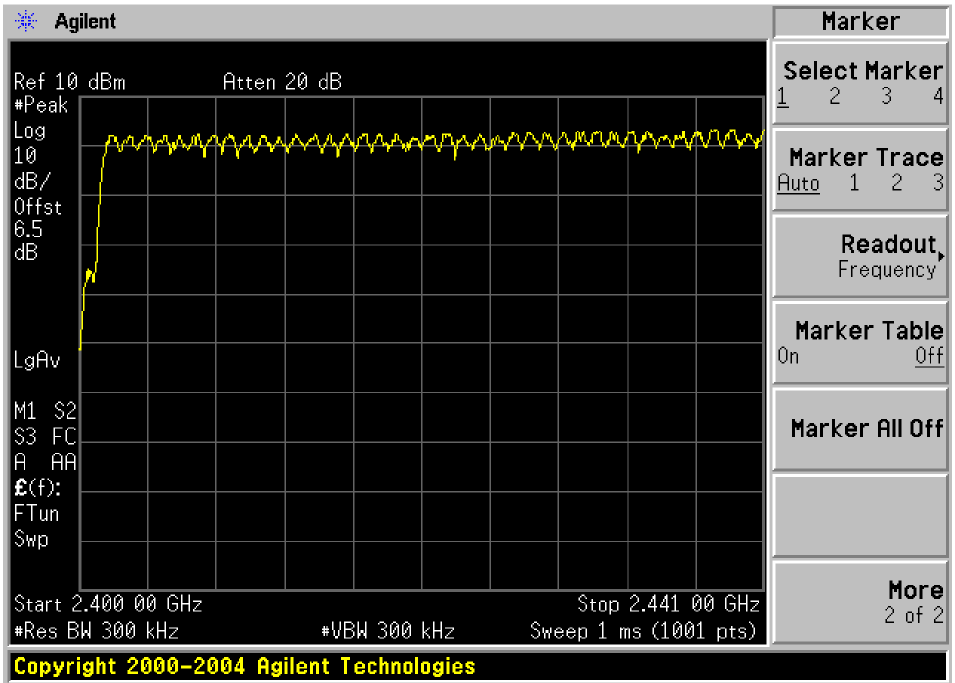
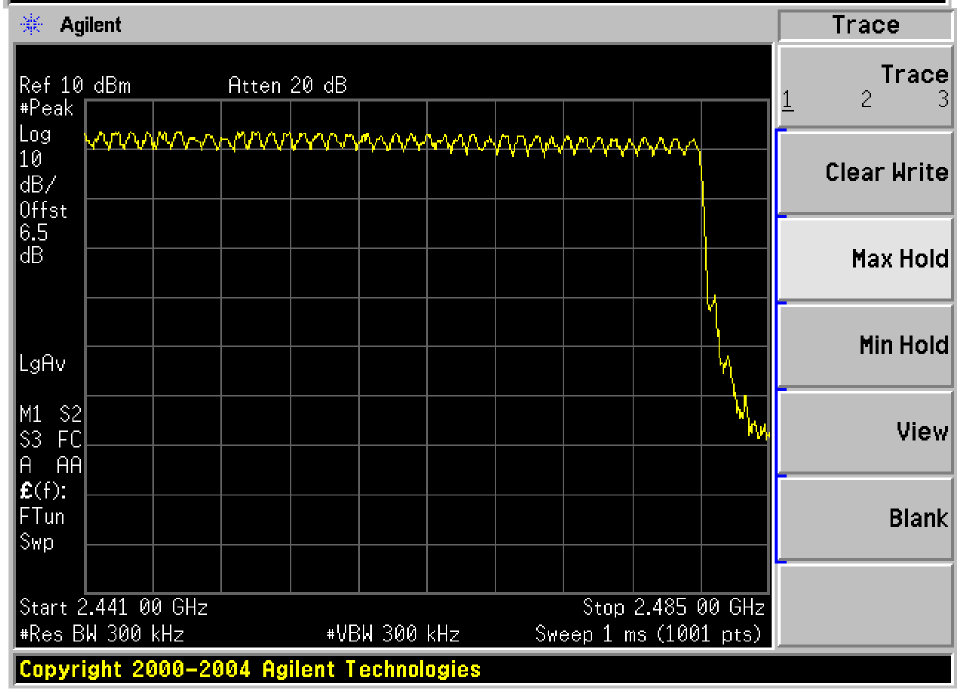
- 8DPSK





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5.6 Time of Occupancy(Dwell Time)

5.6.1 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.

5.6.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via UART interface.
4. Set the spectrum analyzer as follows: Span = zero span, centered on a hopping channel RBW = 1 MHz VBW ≥ RBW Sweep = as necessary to capture the entire dwell time per hopping channel Detector function = peak Trace = max hold
5. Measure the dwell time using the marker-delta function.
6. Repeat above procedures until all frequencies measured were complete.
7. Repeat this test for different modes of operation (e.g., data rate, modulation format, etc.), if applicable.

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5.6.3 Test Result

-Complied

- GFSK

Channel	Reading[ms]	Hopping rate[hop/s]	Number of Channels	Actual[s]	Limit[s]
Low	2.895	266.667	79	0.309	0.40
Middle	2.895	266.667	79	0.309	0.40
High	2.895	266.667	79	0.309	0.40

- π/4DQPSK

Channel	Reading[ms]	Hopping rate[hop/s]	Number of Channels	Actual[s]	Limit[s]
Low	2.905	266.667	79	0.310	0.40
Middle	2.905	266.667	79	0.310	0.40
High	2.905	266.667	79	0.310	0.40

- 8DPSK

Channel	Reading[ms]	Hopping rate[hop/s]	Number of Channels	Actual[s]	Limit[s]
Low	2.905	266.667	79	0.310	0.40
Middle	2.905	266.667	79	0.310	0.40
High	2.905	266.667	79	0.310	0.40

Actual = Reading × (Hopping rate / Number of channels) × Test period
Test period = 0.4 [seconds / channel] × 79 [channel] = 31.6 [seconds]

NOTE:

1. We took the insertion loss of the cable loss into consideration within the measuring instrument.

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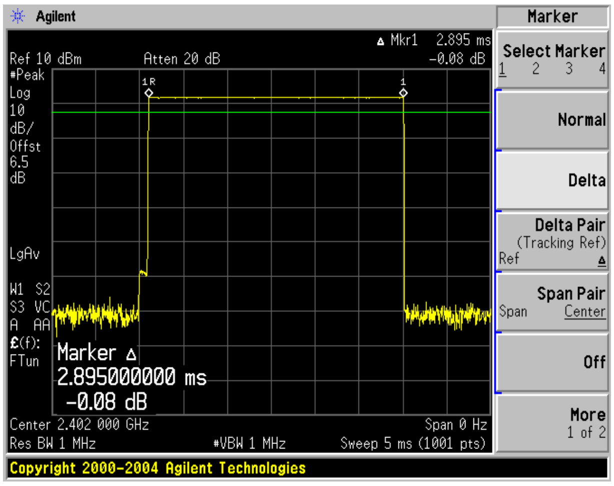
5.6.4 Test Plot

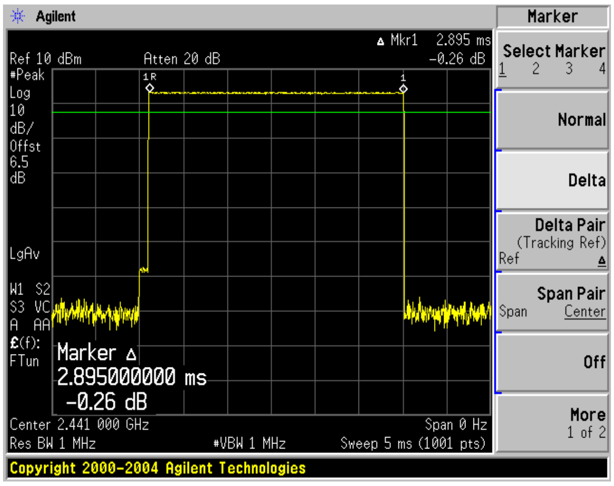
Figure 5. Plot of the Time of Occupancy (Conducted)

- GFSK

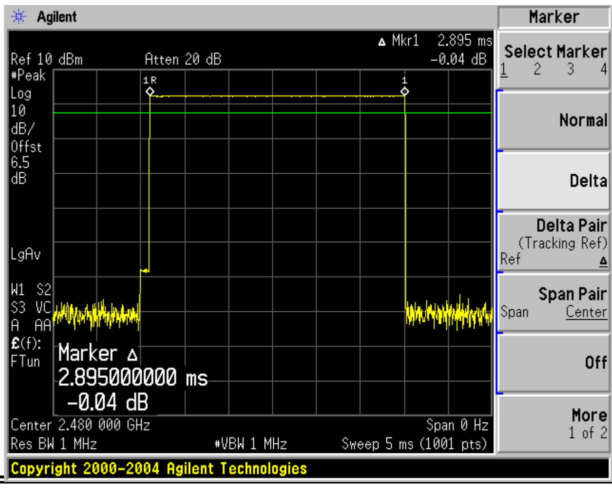
Lowest Channel
(2 402 MHz)



Middle Channel
(2 441 MHz)



Highest Channel
(2 480 MHz)



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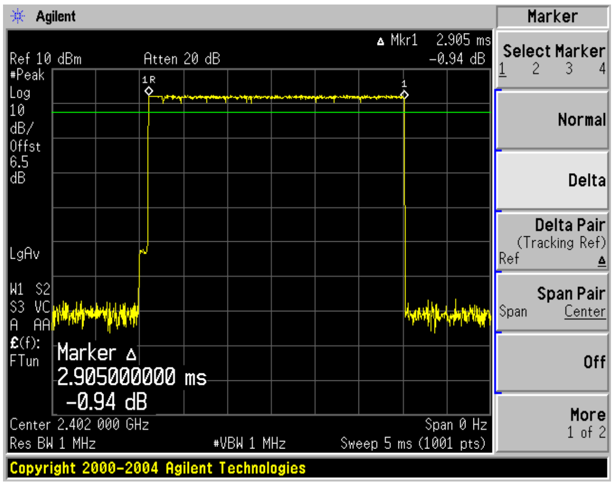
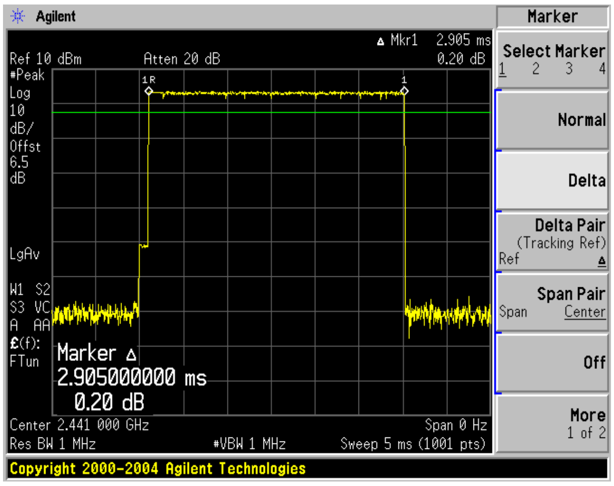
- π/4DQPSK

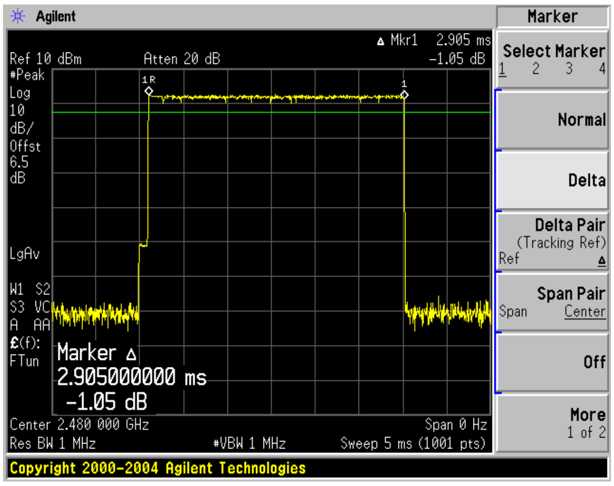
Lowest Channel
(2 402 MHz)



Middle Channel
(2 441 MHz)



Highest Channel
(2 480 MHz)



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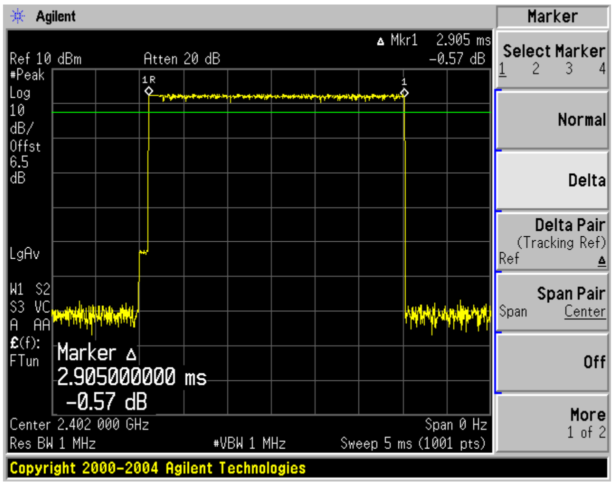
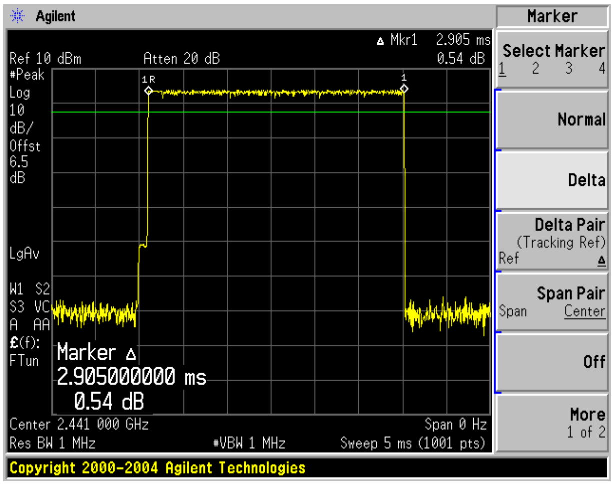
- 8DPSK

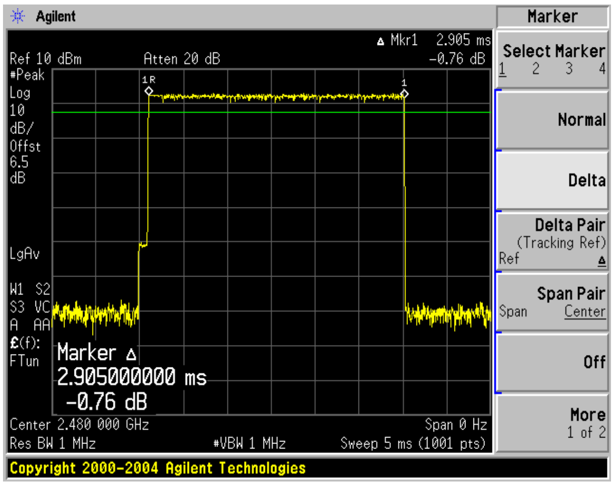
Lowest Channel
(2 402 MHz)



Middle Channel
(2 441 MHz)



Highest Channel
(2 480 MHz)



5.7 Spurious Emission, Band edge, and Restricted bands

5.7.1 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.

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5.7.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1) Band-edge Compliance of RF Conducted Emissions
2)

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 bandedge, as well as any modulation products which fall outside of the authorized band of operation
   RBW ≥ 1% of the 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.

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.

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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.
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, and from 30 to 1000 MHz using the TRILOG broadband antenna, and from 1000 MHz to 26500 MHz 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.

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5.7.3 Test Result

-complied

1. Band edge compliance of RF Conducted Emissions was shown in figure 6.
2. Band edge compliance of RF Radiated Emissions was shown in figure 7.
3. Spurious RF conducted Emissions were shown in the Figure 8.

   Note: We took the insertion loss of the cable into consideration within the measuring instrument.

4. Measured value of the Field strength of spurious Emissions (Radiated)

- **GFSK**
  Low channel (2 402 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 30 MHz							
Below 30.000	Not Detected	-	-	-	-	-	-
Quasi-Peak DATA. Emissions below 1GHz							
94.6	120	V	41.3	-19.1	22.2	43.5	21.3
135.2	120	H	42.7	-14.5	28.2	43.5	15.3
360.0	120	V	44.3	-10.4	33.9	46.0	12.1
480.0	120	H	39.2	-7.2	32.0	46.0	14.0
Above 500.0	Not Detected	-	-	-	-	-	-
Peak DATA. Emissions above 1GHz							
2 385.0	1 000	V	47.3	-1.2	46.1	74.0	27.9
3 145.8	1 000	V	49.6	0.3	49.9	74.0	24.1
Above 4 000.0	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
2 369.0	1 000	V	33.5	-1.2	32.3	54.0	21.7
3 145.8	1 000	V	46.6	0.3	46.9	54.0	7.1
Above 4 000.0	Not Detected	-	-	-	-	-	-

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Middle channel (2 441 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 30 MHz							
Below 30.00	Not Detected	-	-	-	-	-	-
Quasi-Peak DATA. Emissions below 1GHz							
135.2	120	H	42.5	-14.5	28.0	43.5	15.5
360.0	120	H	50.4	-10.4	40.0	46.0	6.0
480.0	120	H	38.8	-7.2	31.6	46.0	14.4
564.6	120	H	34.4	-5.1	29.3	46.0	16.7
Above 600.0	Not Detected	-	-	-	-	-	-
Peak DATA. Emissions above 1GHz							
3 145.8	1 000	V	51.4	0.3	51.7	74.0	22.3
Above 4 000.0	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
3 145.8	1 000	V	43.6	0.3	43.9	54.0	10.1
Above 4 000.0	Not Detected	-	-	-	-	-	-

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High channel (2 480 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 30 MHz							
Below 30.000	Not Detected	-	-	-	-	-	-
Quasi-Peak DATA. Emissions below 1GHz							
135.2	120	H	42.7	-14.5	28.2	43.5	15.3
360.0	120	H	51.3	-10.4	40.9	46.0	5.1
480.0	120	H	38.9	-7.2	31.7	46.0	14.3
Above 500.0	Not Detected	-	-	-	-	-	-
Peak DATA. Emissions above 1GHz							
2 483.5	1 000	V	52.4	-1.0	51.4	74.0	22.6
3145.8	1 000	V	49.6	0.3	49.9	74.0	24.1
Above 4 000.0	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
2 483.5	1 000	V	37.0	-1.0	36.0	54.0	18.0
3 145.8	1 000	V	41.5	0.3	41.8	54.0	12.2
Above 4 000.0	Not Detected	-	-	-	-	-	-

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- **8DPSK**

Low channel (2 402 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 30 MHz							
Below 30.000	Not Detected	-	-	-	-	-	-
Quasi-Peak DATA. Emissions below 1GHz							
135.2	120	H	42.6	-14.5	28.1	43.5	15.4
167.5	120	H	35.0	-13.6	21.4	43.5	22.1
360.0	120	H	51.3	-10.4	40.9	46.0	5.1
Above 400.0	Not Detected	-	-	-	-	-	-
Peak DATA. Emissions above 1GHz							
2 334.8	1 000	V	47.5	-1.2	46.3	74.0	27.7
3 145.8	1 000	V	50.7	0.3	51.0	74.0	23.0
Above 4 000.0	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
2 368.4	1 000	V	33.6	-1.2	32.4	54.0	21.6
3 145.8	1 000	V	42.5	0.3	42.8	54.0	11.2
Above 4 000.0	Not Detected	-	-	-	-	-	-

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Middle channel (2 441 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 30 MHz							
Below 30.000	Not Detected	-	-	-	-	-	-
Quasi-Peak DATA. Emissions below 1GHz							
135.2	120	H	42.0	-14.5	27.5	43.5	16.0
192.0	120	V	39.5	-15.9	23.6	43.5	19.9
360.0	120	H	49.9	-10.4	39.5	46.0	6.5
480.1	120	H	38.9	-7.2	31.7	46.0	14.3
Above 500.0	Not Detected	-	-	-	-	-	-
Peak DATA. Emissions above 1GHz							
3145.8	1 000	V	50.0	0.3	50.3	74.0	23.7
Above 4 000.0	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
3145.8	1 000	V	45.8	0.3	46.1	54.0	7.9
Above 4 000.0	Not Detected	-	-	-	-	-	-

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High channel (2 480 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 30 MHz							
Below 30.0	Not Detected	-	-	-	-	-	-
Quasi-Peak DATA. Emissions below 1GHz							
89.4	120	V	44.4	-19.4	25.0	43.5	18.5
135.2	120	H	43.3	-14.5	28.8	43.5	14.7
167.6	120	V	42.1	-13.6	28.5	43.5	15.0
177.8	120	H	38.8	-14.5	24.3	43.5	19.2
240.0	120	V	50.0	-14.7	35.3	46.0	10.7
360.0	120	H	48.1	-10.4	37.7	46.0	8.3
Above 400.0	Not Detected	-	-	-	-	-	-
Peak DATA. Emissions above 1GHz							
2 483.5	1 000	V	53.7	-1.0	52.7	74.0	21.3
3 145.8	1 000	V	50.2	0.3	50.5	74.0	23.5
Above 4 000.0	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
2 483.6	1 000	V	37.6	-1.0	36.6	54.0	17.5
3 145.8	1 000	V	46.8	0.3	47.1	54.0	6.9
Above 4 000.0	Not Detected	-	-	-	-	-	-

Factor(dB) = ANT Factor+ Amp Gain + Cable Loss
Margin (dB) = Limit - Result
[Result = Reading – Factor]
1. H = Horizontal, V = Vertical Polarization
2. ATT = Attenuation (10dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss

* The spurious emission at the frequency does not fall in the restricted bands.
** The measured result is within the test standard limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance.

NOTE: All emissions not reported were more than 20 dB below the specified limit or in the noise floor.

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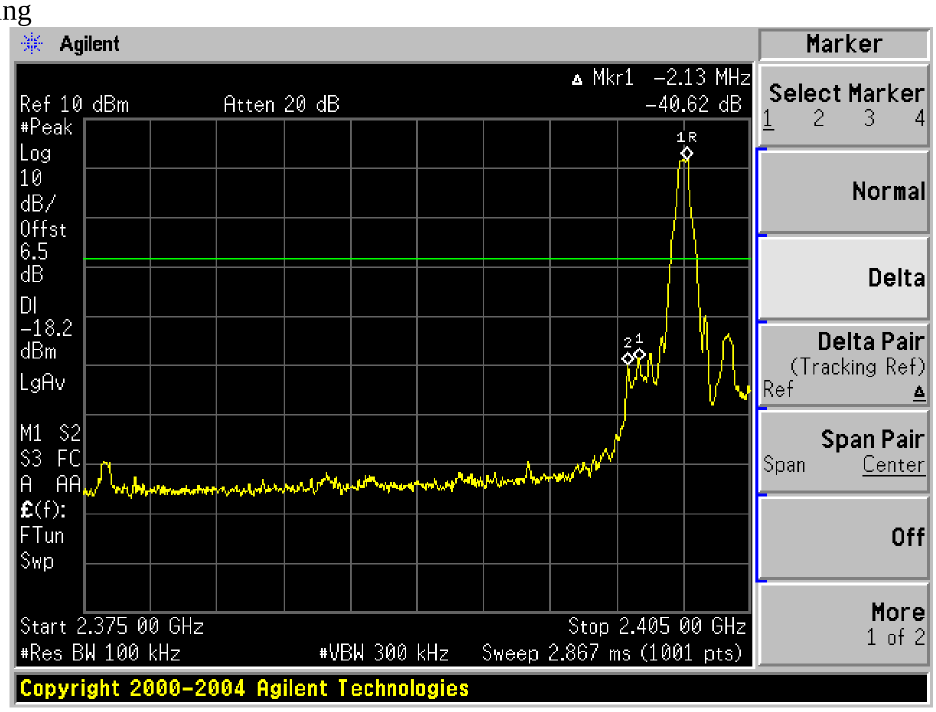
5.7.4 Test Plot

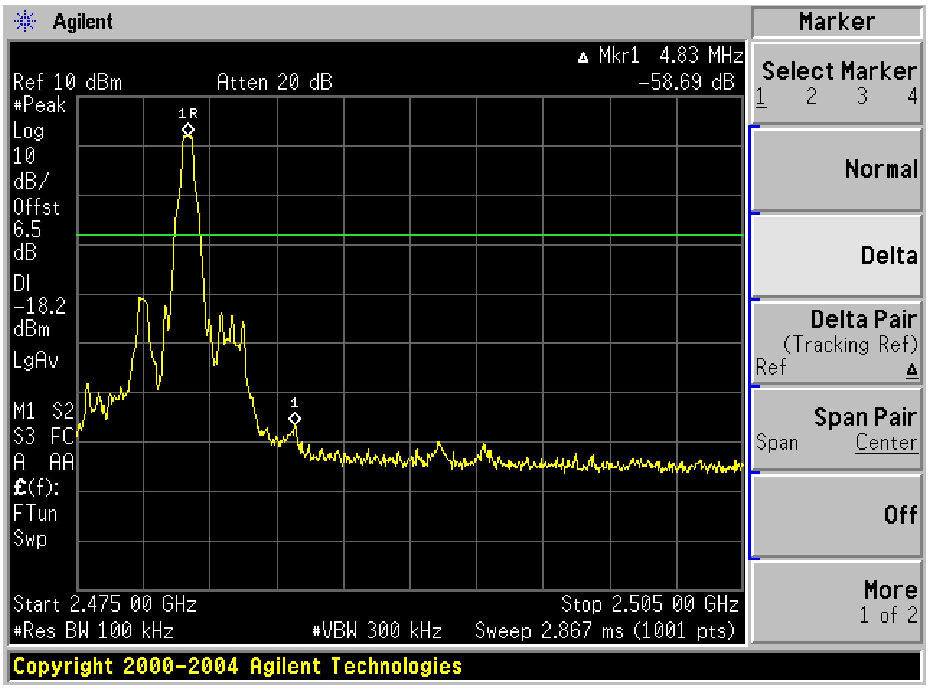
Figure 6. Plot of the Band Edge (Conducted)

- GFSK without Hopping

Lowest Channel
(2 402 MHz)



Highest Channel
(2 480 MHz)



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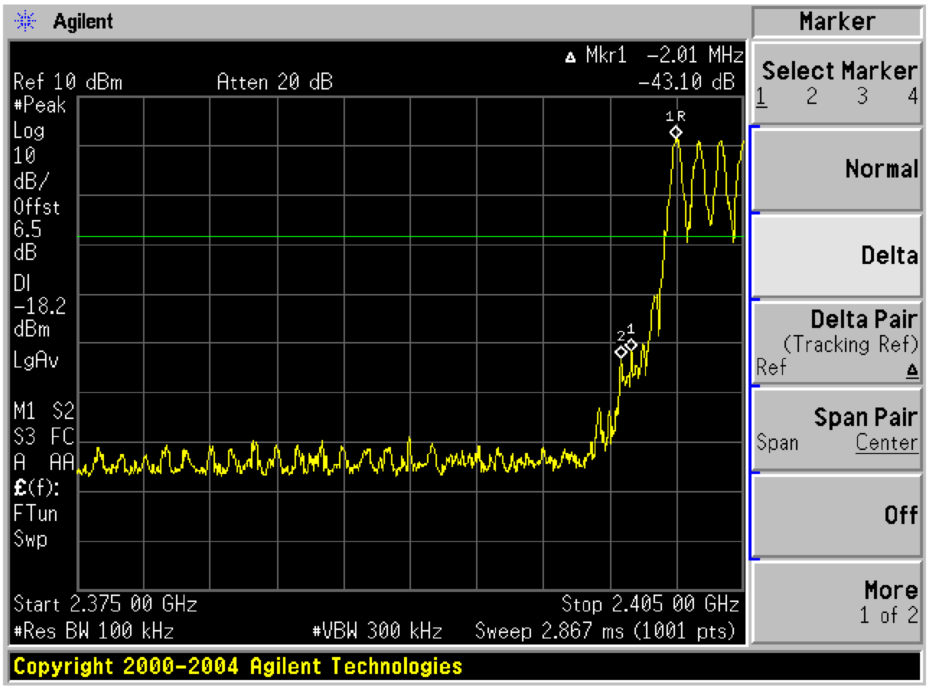
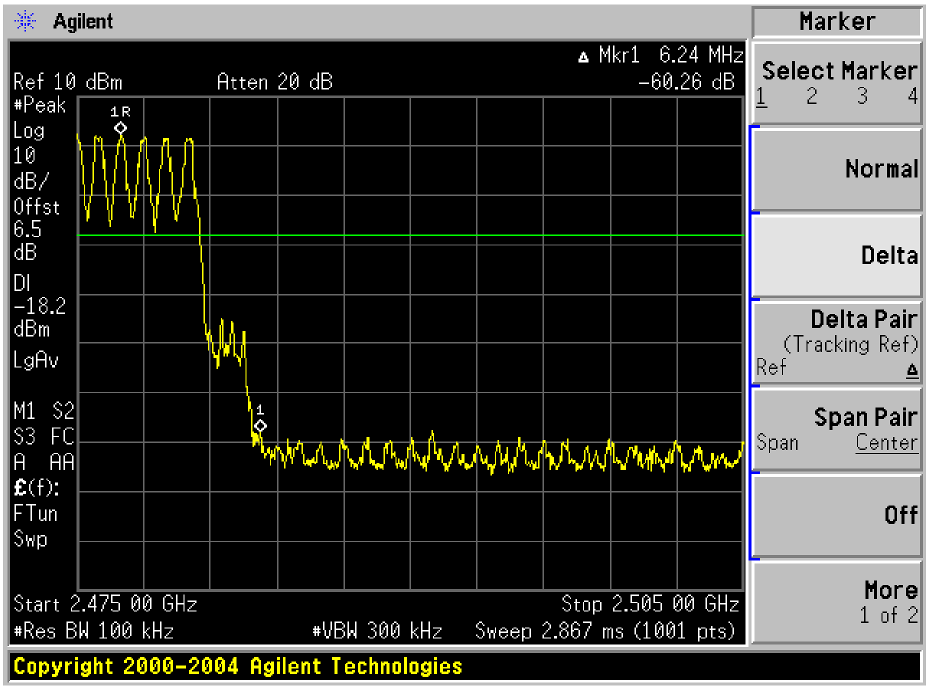
- GFSK with Hopping

Lowest Channel
(2 402 MHz)

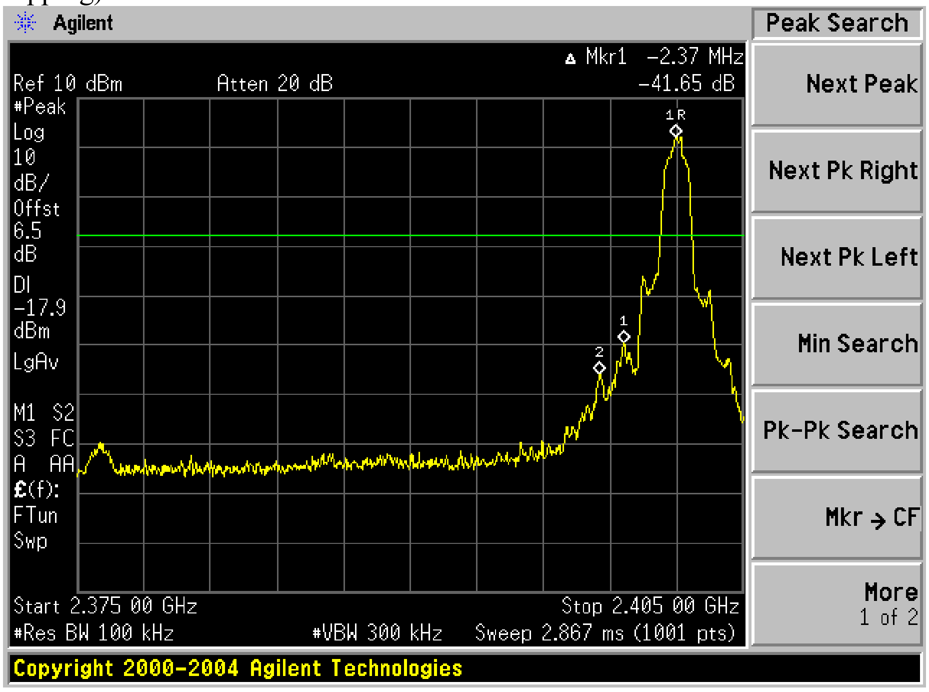


Highest Channel
(2 480 MHz)

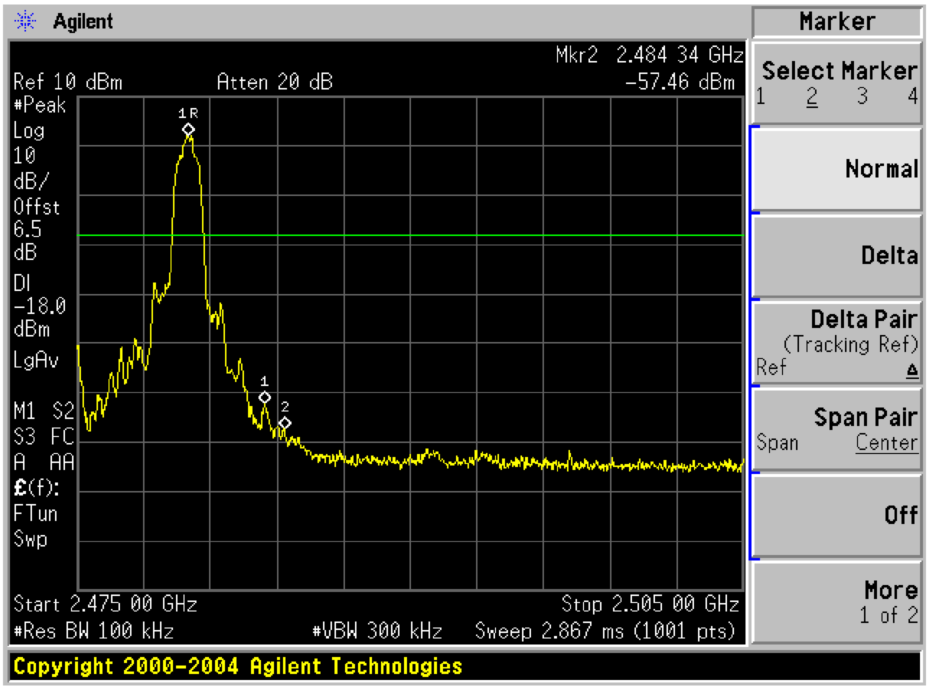


- π/4DQPSK (without Hopping)

Lowest Channel
(2 402 MHz)



Highest Channel
(2 480 MHz)



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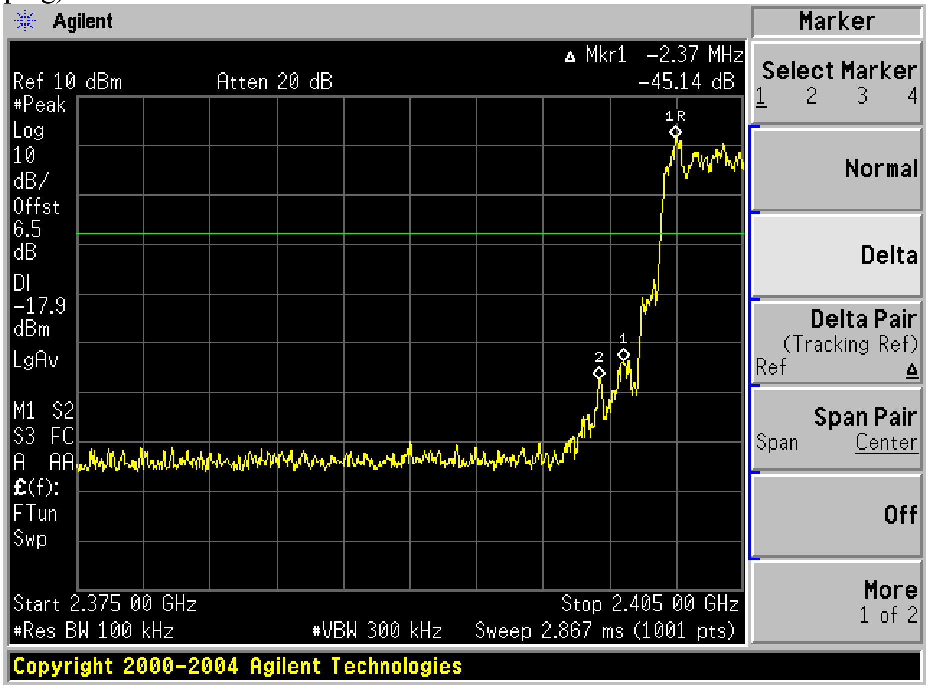
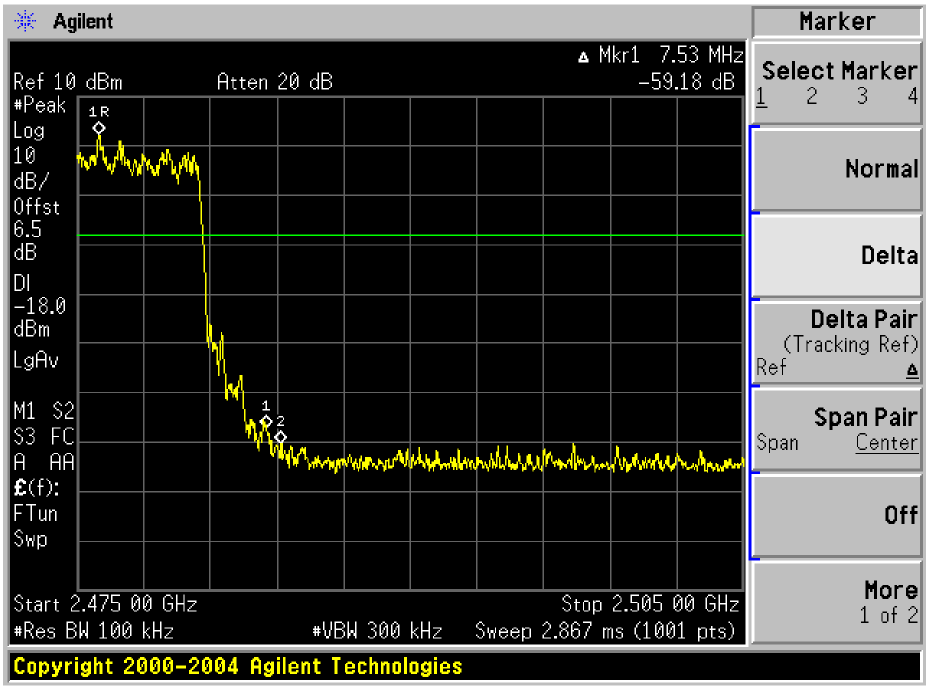
- π/4DQPSK (with Hopping)

Lowest Channel
(2 402 MHz)



Highest Channel
(2 480 MHz)



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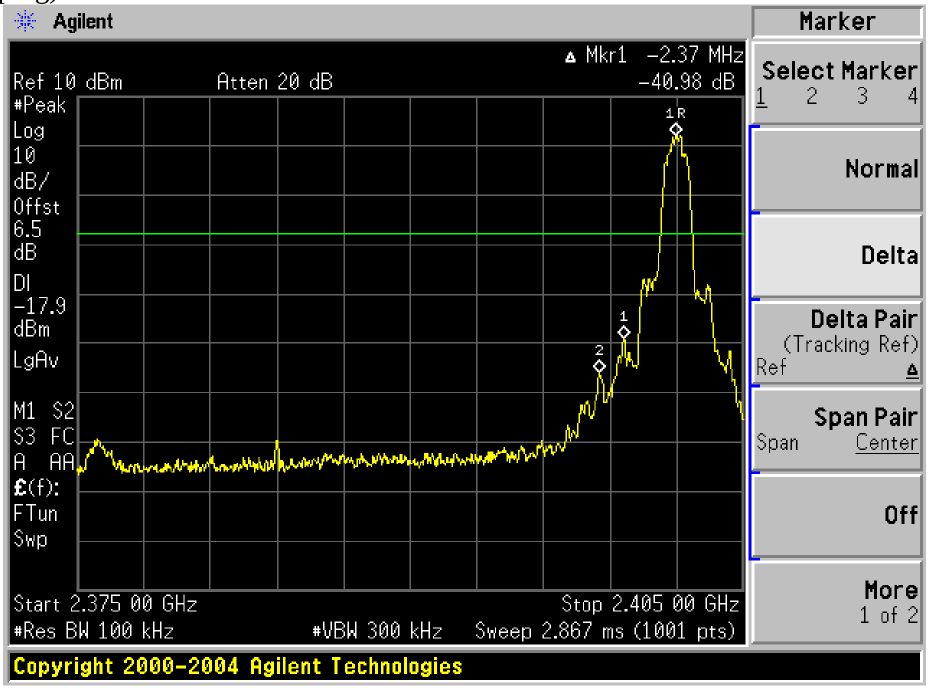
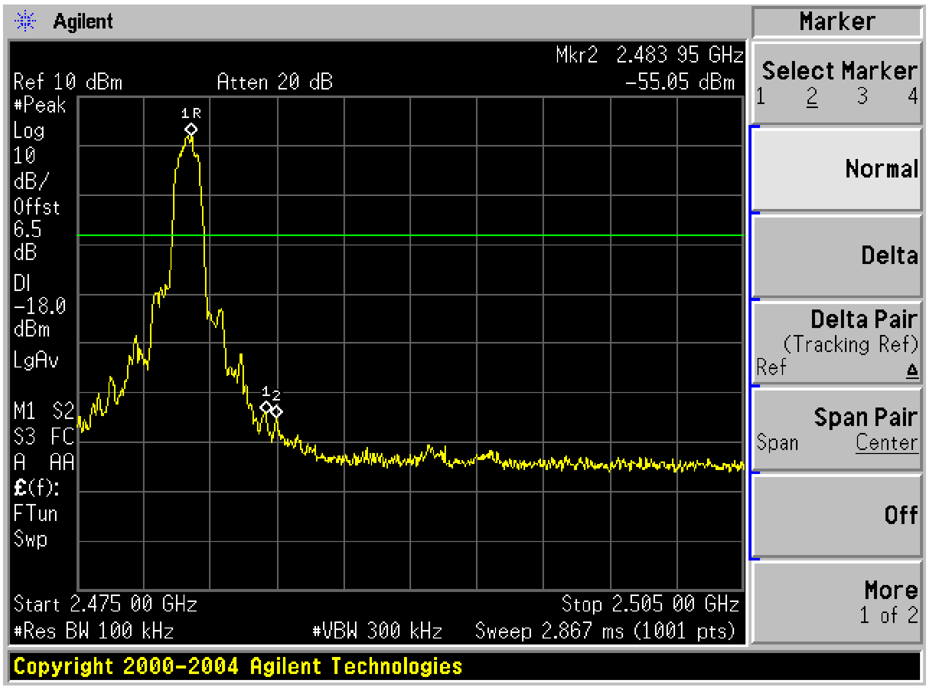
- 8DPSK (without Hopping)

Lowest Channel
(2 402 MHz)



Highest Channel
(2 480 MHz)



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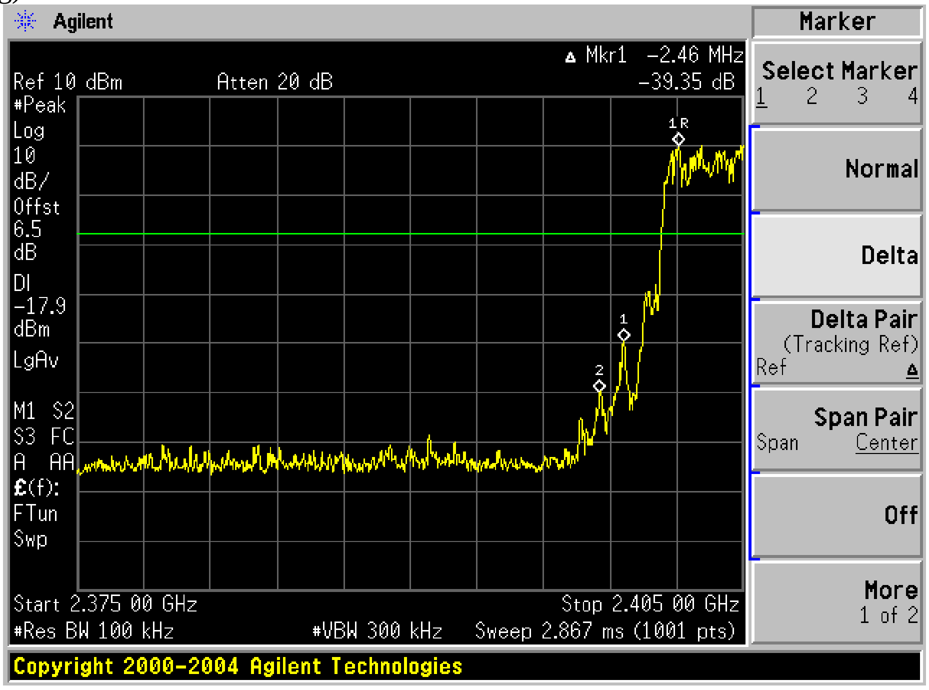
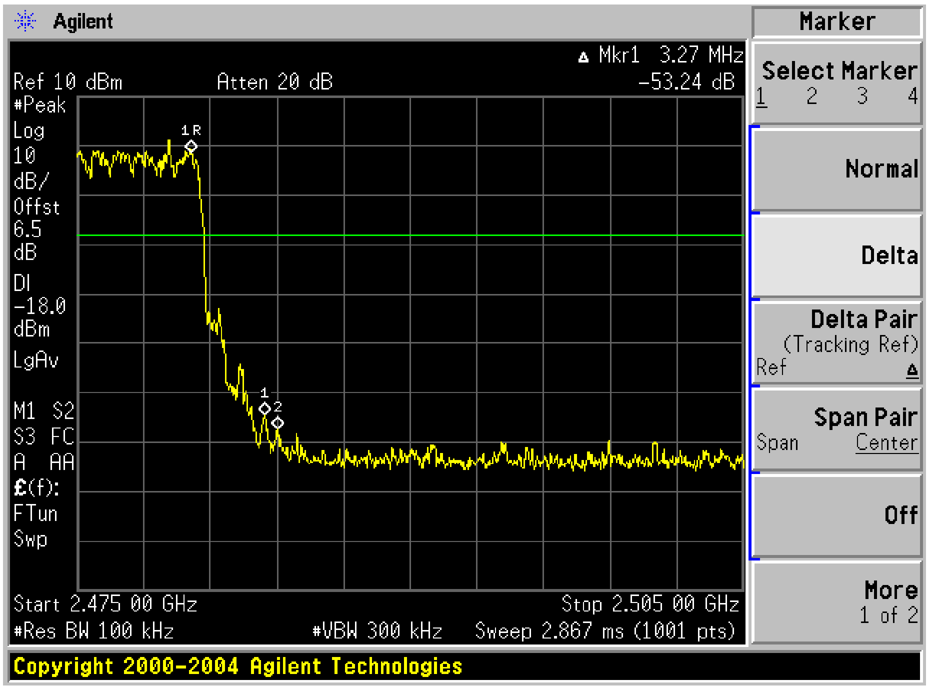
- 8DPSK (with Hopping)

Lowest Channel
(2 402 MHz)



Highest Channel
(2 480 MHz)



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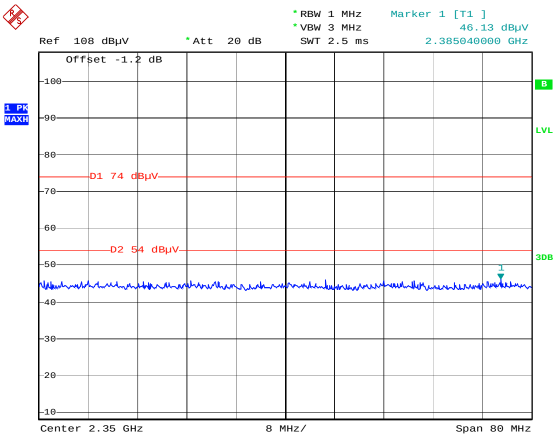
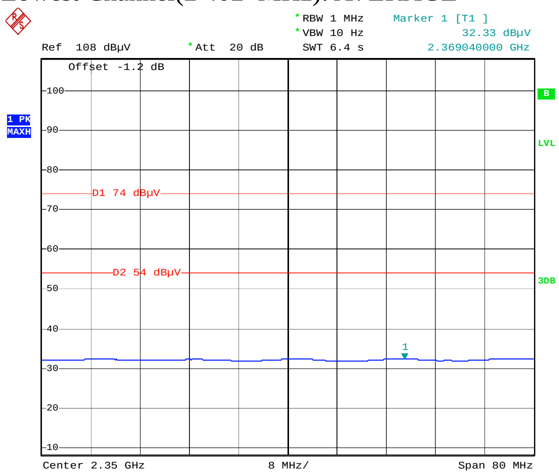
5.7.4 Test Plot (Continue)

Figure 7. Plot of the Band Edge (Radiated)
- GFSK

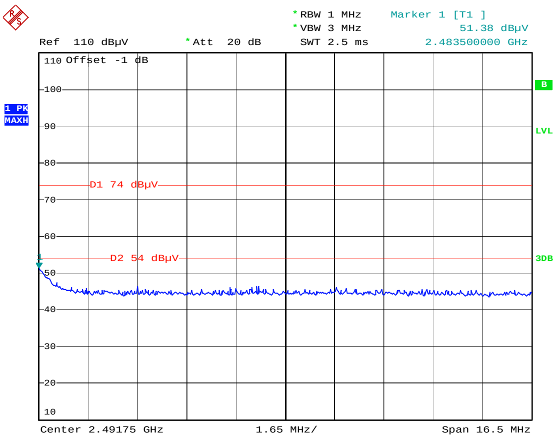
Lowest Channel(2 402 MHz): PEAK



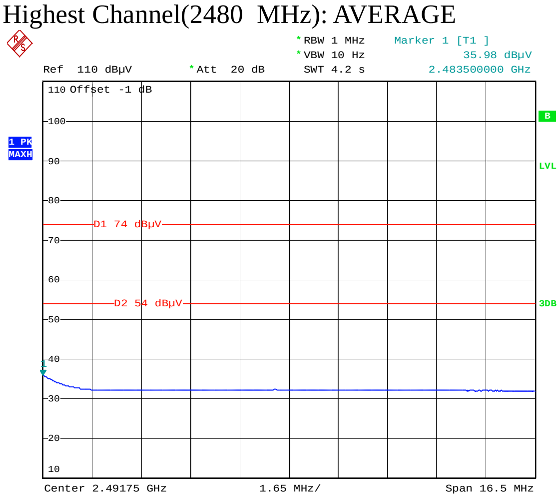
Lowest Channel(2 402 MHz): AVERAGE



Highest Channel(2480 MHz): PEAK



Highest Channel(2480 MHz): AVERAGE



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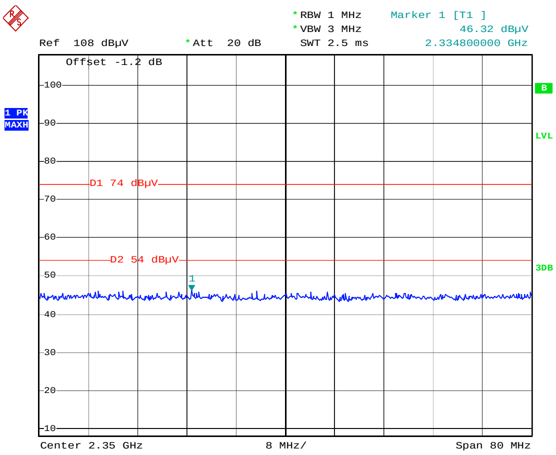
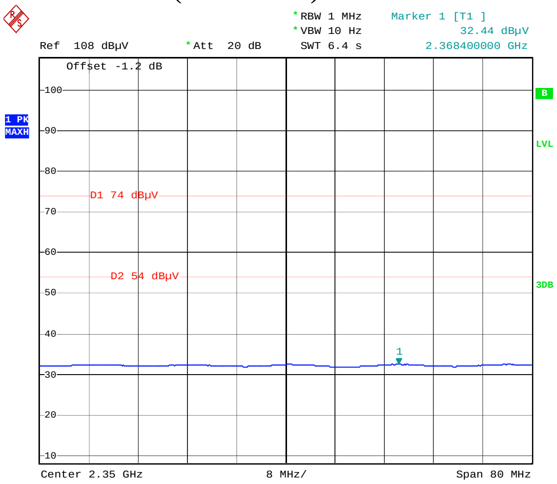
- 8DPSK
-worst case

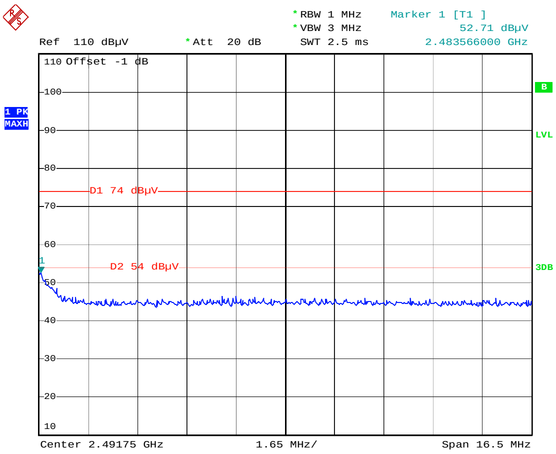
Lowest Channel(2 402 MHz): PEAK



Lowest Channel(2 402 MHz): AVERAGE



Highest Channel(2480 MHz): PEAK



Highest Channel(2480 MHz): AVERAGE

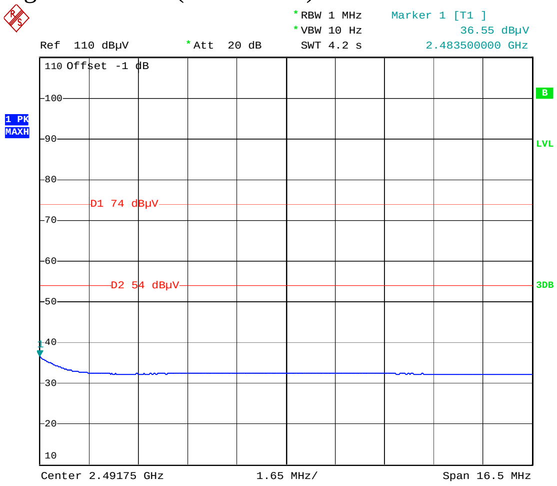


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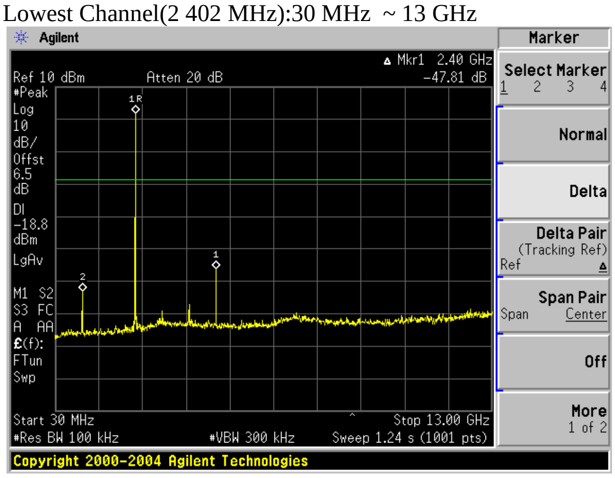
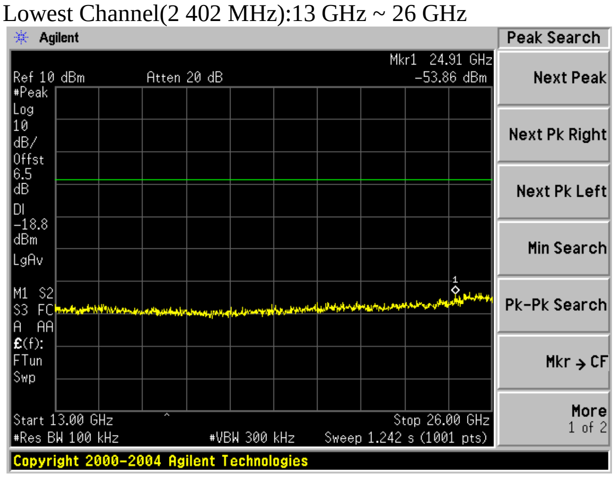
Figure 8. Plot of the Spurious RF conducted emissions
- GFSK

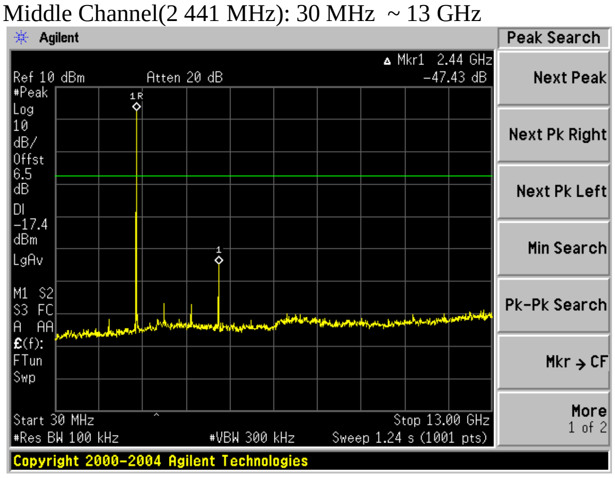
Lowest Channel(2 402 MHz):30 MHz ~ 13 GHz



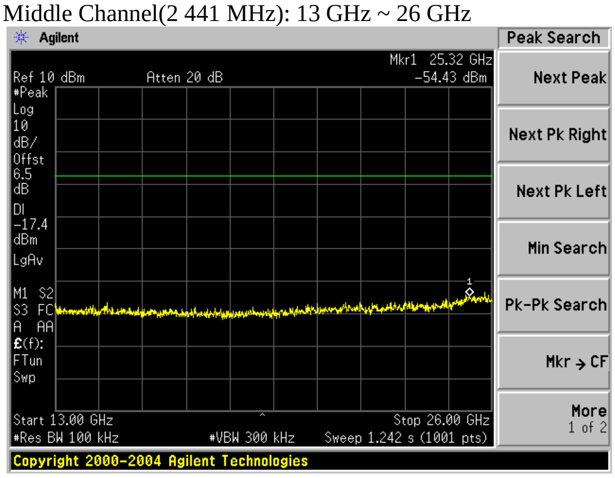
Lowest Channel(2 402 MHz):13 GHz ~ 26 GHz



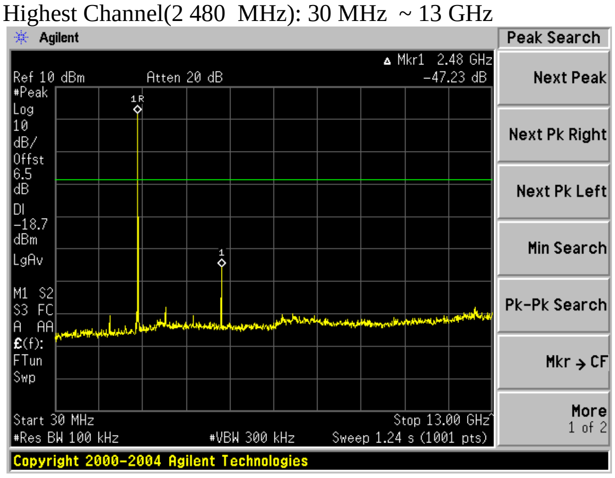
Middle Channel(2 441 MHz): 30 MHz ~ 13 GHz



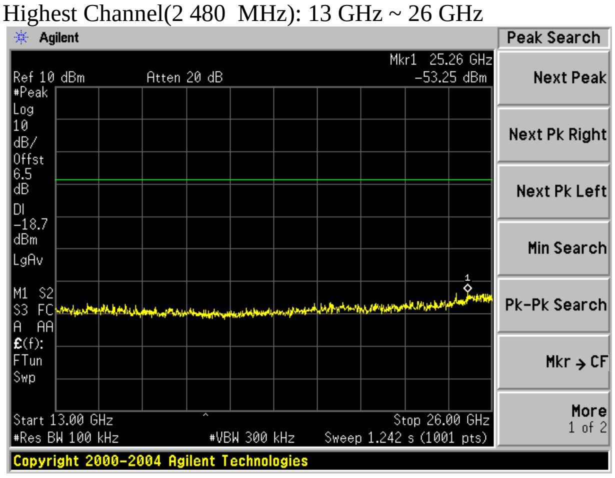
Middle Channel(2 441 MHz): 13 GHz ~ 26 GHz



Highest Channel(2 480 MHz): 30 MHz ~ 13 GHz



Highest Channel(2 480 MHz): 13 GHz ~ 26 GHz



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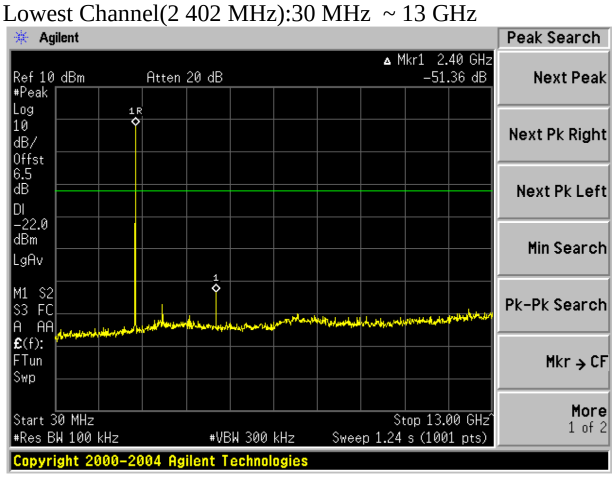
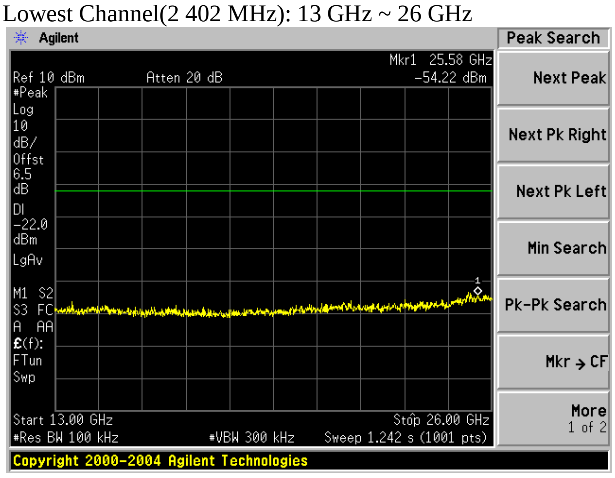
- π/4DQPSK

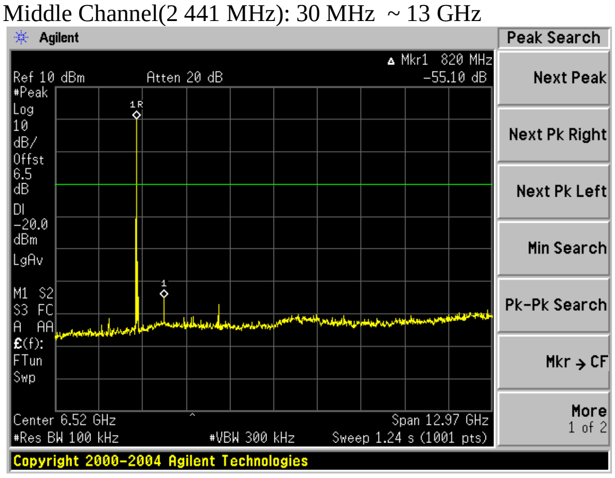
Lowest Channel(2 402 MHz):30 MHz ~ 13 GHz



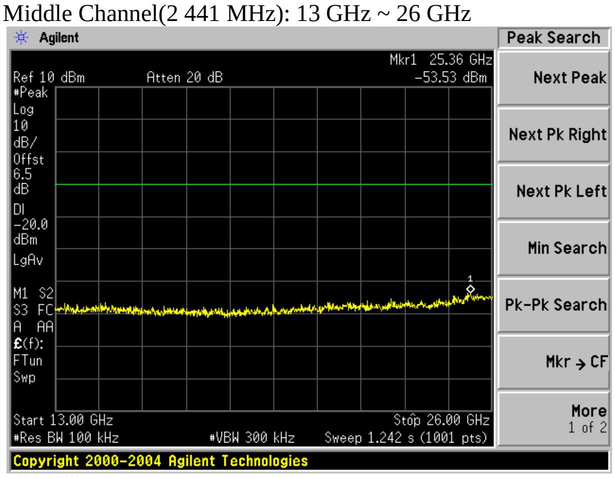
Lowest Channel(2 402 MHz): 13 GHz ~ 26 GHz



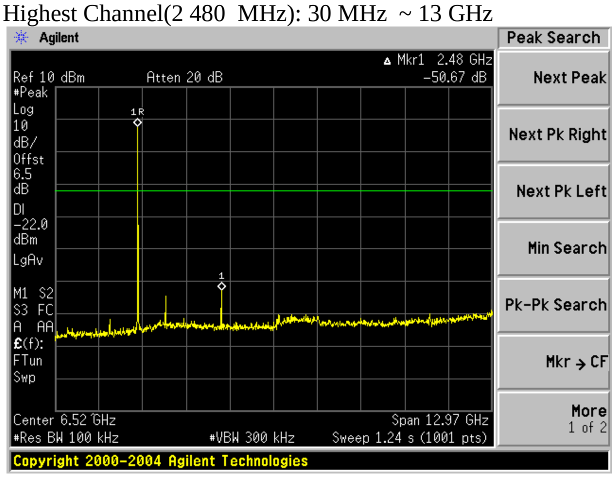
Middle Channel(2 441 MHz): 30 MHz ~ 13 GHz



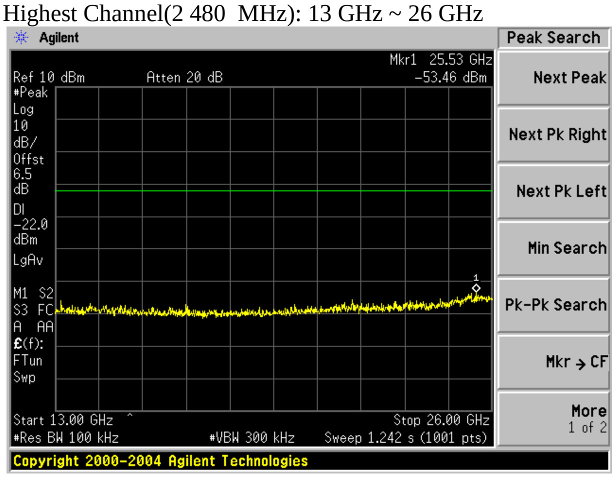
Middle Channel(2 441 MHz): 13 GHz ~ 26 GHz



Highest Channel(2 480 MHz): 30 MHz ~ 13 GHz



Highest Channel(2 480 MHz): 13 GHz ~ 26 GHz



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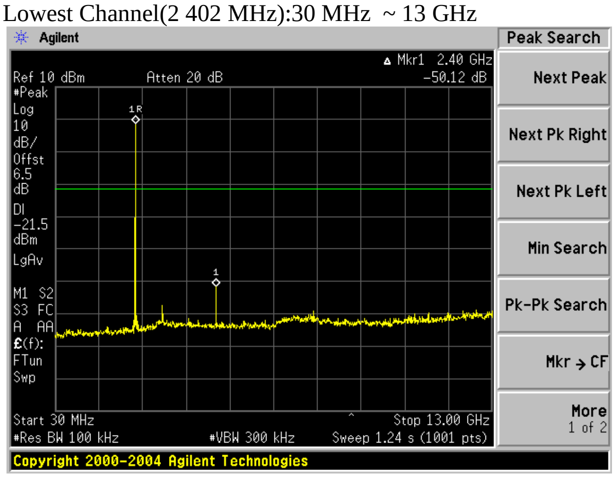
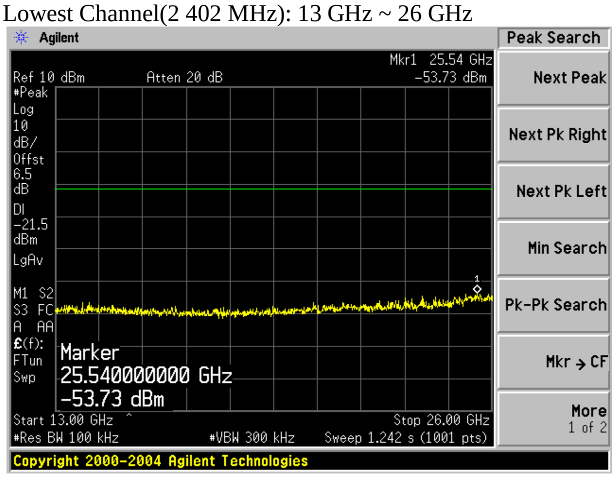
- 8DPSK

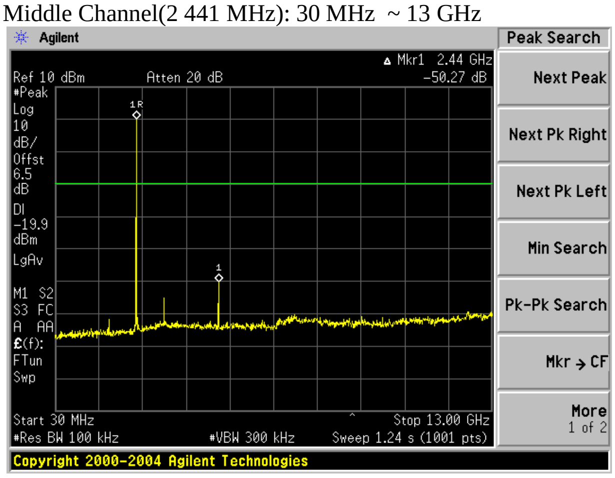
Lowest Channel(2 402 MHz):30 MHz ~ 13 GHz



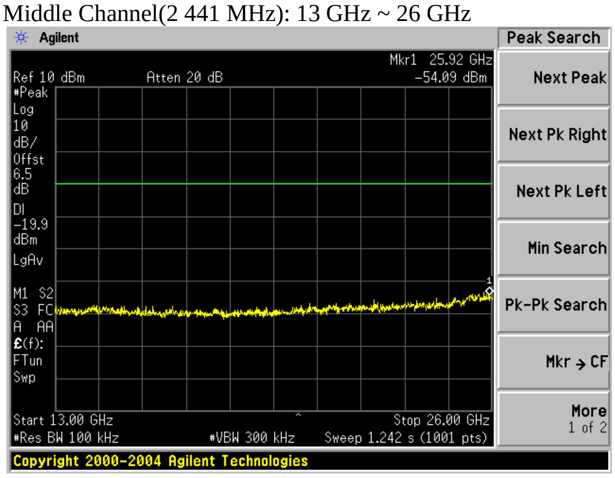
Lowest Channel(2 402 MHz): 13 GHz ~ 26 GHz



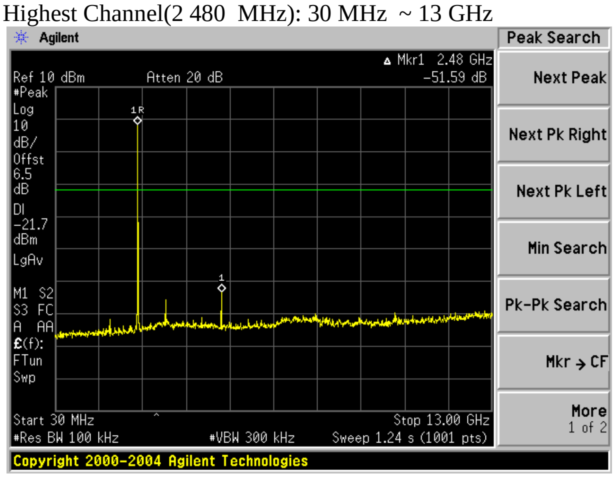
Middle Channel(2 441 MHz): 30 MHz ~ 13 GHz



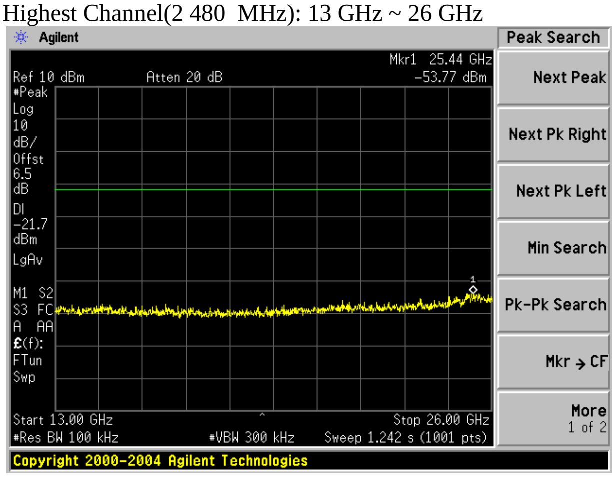
Middle Channel(2 441 MHz): 13 GHz ~ 26 GHz



Highest Channel(2 480 MHz): 30 MHz ~ 13 GHz



Highest Channel(2 480 MHz): 13 GHz ~ 26 GHz



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5.8 Receiver Spurious Emissions

5.8.1 Regulation

The receiver shall be operated in the normal receive mode near the mid-point of the band in which the receiver is designed to operate.
Radiated emission measurements are to be performed on a test site registered with Industry Canada. As an alternative, the conducted measurement method may be used when the antenna is detachable. In such a case, the receiver spurious signal may be measured at the antenna port.
If the receiver is super-regenerative, stabilize it by coupling to it an unmodulated carrier on the receiver frequency (antenna conducted measurement) or by transmitting an unmodulated carrier on the receiver frequency from an antenna in the proximity of the receiver (radiated measurement). Taking care not to overload the receiver, vary the amplitude and frequency of the stabilizing signal to obtain the highest level of the spurious emissions from the receiver.
For either method, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is higher, without exceeding 40 GHz.
For emissions below 1000 MHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector function properly adjusted for factors such as pulse desensitization as required, with an equal or greater measurement bandwidth relative to the applicable CISPR quasi-peak bandwidth.
Above 1000 MHz, measurements shall be performed using an average detector with a minimum resolution bandwidth of 1 MHz.

5.8.2 Measurement Procedure

Radiated spurious emission measurements shall be performed with the receiver antenna connected to the receiver antenna terminals.
Spurious emissions from receivers shall not exceed the radiated limits shown in the table below:

Frequency (MHz)	**Field Strength (microvolts/m at 3 metres)***
30-88	100
88-216	150
216-960	200
Above 960	500

***Measurements for compliance with limits in the above table may be performed at distances other than 3 metres, in accordance with Section 7.2.7.

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5.8.3 Test Result
-Complied

- GFSK

Low channel (2 402 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 1GHz							
135.2	120	H	42.3	-14.5	27.8	43.5	15.7
167.3	120	V	41.4	-13.6	27.8	43.5	15.7
360.0	120	H	49.5	-10.4	39.1	46.0	6.9
480.1	120	H	39.6	-7.2	32.4	46.0	13.6
Above 500.0	Not Detected	-	-	-	-	-	-
Peak DATA. Emissions above 1GHz							
3145.8	1 000	V	47.8	0.3	48.1	74.0	25.9
Above 4 000.0	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
3145.8	1 000	V	40.6	0.3	40.9	54.0	13.1
Above 4 000.0	Not Detected	-	-	-	-	-	-

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Middle channel (2 441 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 1GHz							
135.2	120	H	42.3	-14.5	27.8	43.5	15.7
167.3	120	V	41.4	-13.6	27.8	43.5	15.7
360.0	120	H	49.5	-10.4	39.1	46.0	6.9
480.1	120	H	39.7	-7.2	32.5	46.0	13.5
Above 500.0	Not Detected	-	-	-	-	-	-
Peak DATA. Emissions above 1GHz							
3145.8	1 000	V	47.7	0.3	48.0	74.0	26.0
Above 4 000.0	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
3145.8	1 000	V	42.5	0.3	42.8	54.0	11.2
Above 4 000.0	Not Detected	-	-	-	-	-	-

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High channel (2 480 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 1GHz							
135.2	120	H	42.3	-14.5	27.8	43.5	15.7
167.3	120	V	42.7	-13.6	29.1	43.5	14.4
360.0	120	H	49.5	-10.4	39.1	46.0	6.9
480.1	120	H	38.8	-7.2	31.6	46.0	14.4
Above 500.0	Not Detected	-	-	-	-	-	-
Peak DATA. Emissions above 1GHz							
3145.8	1 000	V	49.6	0.3	49.9	74.0	24.1
Above 4 000.0	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
3145.8	1 000	V	41.5	0.3	41.8	54.0	12.2
Above 4 000.0	Not Detected	-	-	-	-	-	-

Factor(dB) = ANT Factor+ Amp Gain + Cable Loss
Margin (dB) = Limit - Result
[Result = Reading – Factor]
1. H = Horizontal, V = Vertical Polarization
2. ATT = Attenuation (10dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss

* The spurious emission at the frequency does not fall in the restricted bands.
** The measured result is within the test standard limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance.

NOTE: All emissions not reported were more than 20 dB below the specified limit or in the noise floor.

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- 8DPSK

Low channel (2 402 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 1GHz							
135.2	120	H	42.3	-14.5	27.8	43.5	15.7
167.3	120	V	41.4	-13.6	27.8	43.5	15.7
360.0	120	H	49.5	-10.4	39.1	46.0	6.9
480.1	120	H	39.6	-7.2	32.4	46.0	13.6
Above 500.0	Not Detected	-	-	-	-	-	-
Peak DATA. Emissions above 1GHz							
3145.8	1 000	V	47.5	0.3	47.8	74.0	26.2
Above 4 000.0	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
3145.8	1 000	V	42.6	0.3	42.9	54.0	11.1
Above 4 000.0	Not Detected	-	-	-	-	-	-

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Middle channel (2 441 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(µV)]	Factor [dB]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 1GHz							
135.2	120	H	42.3	-14.5	27.8	43.5	15.7
167.3	120	V	41.2	-13.6	27.6	43.5	15.9
360.0	120	H	49.5	-10.4	39.1	46.0	6.9
480.1	120	H	39.3	-7.2	32.1	46.0	13.9
Above 500.0	Not Detected	-	-	-	-	-	-
Peak DATA. Emissions above 1GHz							
3 145.8	1 000	V	49.5	0.3	49.8	74.0	24.2
Above 4 000.0	Not Detected	-	-	-	-	-	-
Average DATA. Emissions above 1GHz							
3 145.8	1 000	V	39.9	0.3	40.2	54.0	13.8
Above 4 000.0	Not Detected	-	-	-	-	-	-

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High channel (2 480 MHz)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 1GHz							
135.2	120	H	42.3	-14.5	27.8	43.5	15.7
167.3	120	V	41.1	-13.6	27.5	43.5	16.0
360.0	120	H	49.5	-10.4	39.1	46.0	6.9
480.1	120	H	39.6	-7.2	32.4	46.0	13.6
Above 500.0	Not Detected						
Peak DATA. Emissions above 1GHz							
3 145.8	1 000	V	47.6	0.3	47.9	74.0	26.1
Above 4 000.0	Not Detected						
Average DATA. Emissions above 1GHz							
3 145.8	1 000	V	40.3	0.3	40.6	54.0	13.4
Above 4 000.0	Not Detected						

Factor(dB) = ANT Factor+ Amp Gain + Cable Loss
Margin (dB) = Limit - Result
[Result = Reading – Factor]
1. H = Horizontal, V = Vertical Polarization
2. ATT = Attenuation (10dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss

* The spurious emission at the frequency does not fall in the restricted bands.
** The measured result is within the test standard limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance.

NOTE: All emissions not reported were more than 20 dB below the specified limit or in the noise floor.

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5.9 RF Exposure

5.9.1 Regulation

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this Chapter.

Limits for Maximum Permissive Exposure: RF exposure is calculated.

Frequency Range	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [mW/cm^2]	Averaging Time [minute]
Limits for General Population / Uncontrolled Exposure				
0.3 ~ 1.34	614	1.63	*(100)	30
1.34 ~ 30	824 /f	2.19/f	*(180/f^2)	30
30 ~ 300	27.5	0.073	0.2	30
300 ~ 1500	/	/	f/1500	30
1500 ~ 15000	/	/	1.0	30

*f=frequency in MHz, *= plane-wave equivalent power density*

MPE (Maximum Permissive Exposure) Prediction

Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2 \quad \left(\Rightarrow R = \sqrt{PG/4\pi S}\right)$$

S=power density [mW/cm^2]
P=Power input to antenna [mW]
G=Power gain of the antenna in the direction of interest relative to an isotropic radiator
R= distance to the center of radiation of the antenna [cm]

EUT: Maximum peak output power = 2.73 [mW](= 4.36 dBm) Antenna gain=2.24 (= 3.5 [dBi])	
100 mW, at 20 cm from an antenna 6[dBi]	S = PG/4πR² = 100 × 3.98 / (4 × π × 400) = 0.079 2 [mW/cm^2] < 1.0 [mW/cm^2]
2.73 mW, at 20 cm from an antenna 3.5 [dBi]	S = PG/4πR²= 0.001 22 [mW/cm^2] < 1.0 [mW/cm^2]
2.73 mW, at 2.5 cm from an antenna 3.5 [dBi]	S = PG/4πR²= 0.077 79 [mW/cm^2] < 1.0 [mW/cm^2]

5.9.2 RF Exposure Compliance Issue

The information should be included in the user’s manual:
This appliance and its antenna must not be co-located or operation in conjunction with any other antenna or transmitter. A minimum separation distance of 20 cm must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

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6. Test equipment used for test

	Description	Manufacture	Model No.	Serial No.	Next Cal Date.
□	Temp & humidity chamber	taekwang	TK-04	TK001	13.12.07
□	Temp & humidity chamber	taekwang	TK-500	TK002	13.09.03
□	Frequency Counter	HP	53150A	US39250565	13.09.04
■	Spectrum Analyzer	Agilent	E4440A	MY44303500	13.06.27
■	Spectrum Analyzer	R & S	FSP40	100209	13.06.27
□	Modulation Analyzer	HP	8901B	3538A05527	13.10.25
□	Audio Analyzer	HP	8903B	3729A19213	13.10.23
□	AC Power Supply	KIKUSUI	PCR2000W	GB001619	13.10.23
□	DC Power Supply	Tektronix	PS2520G	TW50517	13.02.06
■	DC Power Supply	Tektronix	PS2521G	TW53135	13.10.23
□	Dummy Load	BIRD	8141	7560	13.09.09
□	Dummy Load	BIRD	8401-025	799	13.09.09
■	EMI Test Receiver	R&S	ESCI	100001	13.11.06
□	Attenuator	HP	8494A	2631A09825	12.10.24
□	Attenuator	HP	8496A	3308A16640	12.10.24
□	Attenuator	R&S	RBS1000	D67079	12.10.24
□	WIDEBAND POWER SENSOR	R & S	NRP-Z81	100677	13.05.04
■	LOOP Antenna	EMCO	EMCO6502	9205-2745	13.05.22
■	BILOG Antenna	Schwarzbeck	VULB 9168	375	13.09.21
■	HORN Antenna	ETS	3115	00086706	13.11.21
■	HORN Antenna	ETS	3115	00062589	13.09.06
■	HORN Antenna	ETS	3116	00086632	13.11.15
■	HORN Antenna	ETS	3116	00086632	13.11.15
■	Amplifier	SONOMA INSTRUMENT	310N	293004	13.11.06
■	PREAMPLIFIER	AGILENT	8449B	3008A01802	13.05.08
■	Signal Generator	R & S	SMR40	100007	13.06.27
■	Power Divider	Weinschel	1580-1	NX380	13.09.09
□	Power Divider	Weinschel	1594	671	13.09.10
■	Bluetooth tester	Tescom	TC3000A	3000A310047	13.04.06

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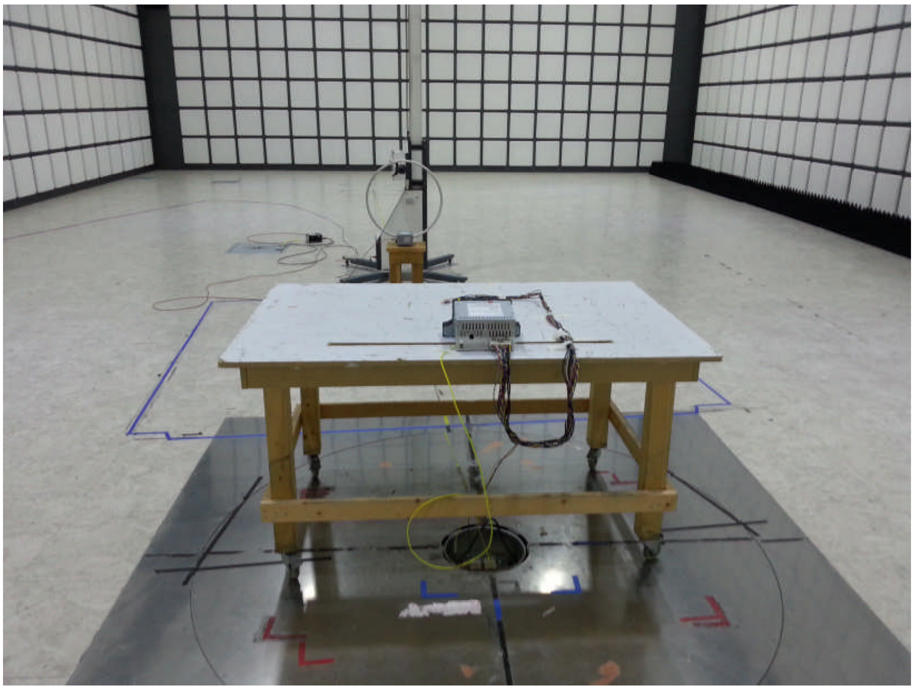
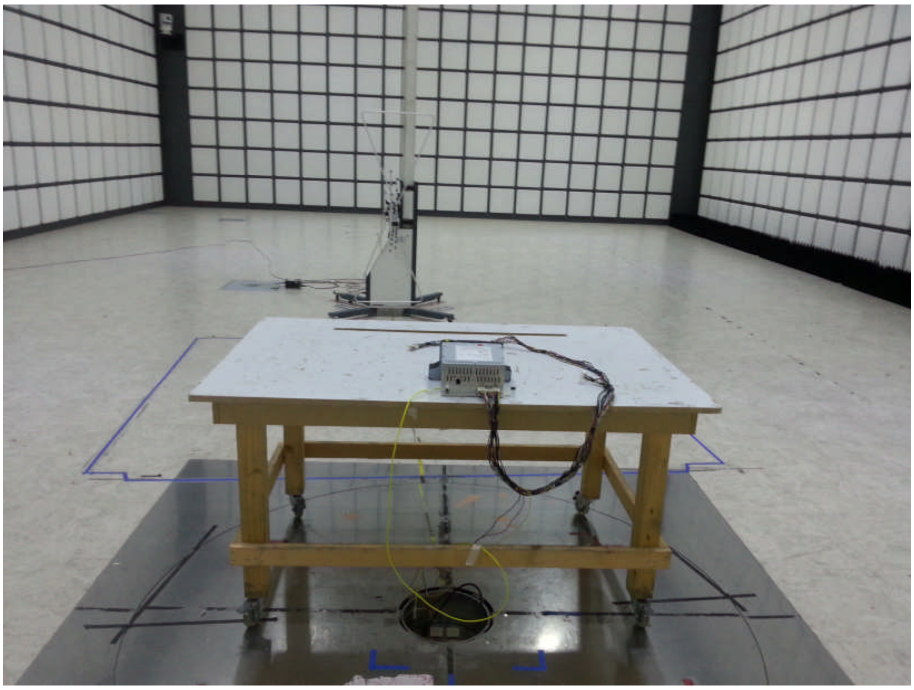
Appendix 1. Test Setup Photos

Below 30MHz



Above 30MHz



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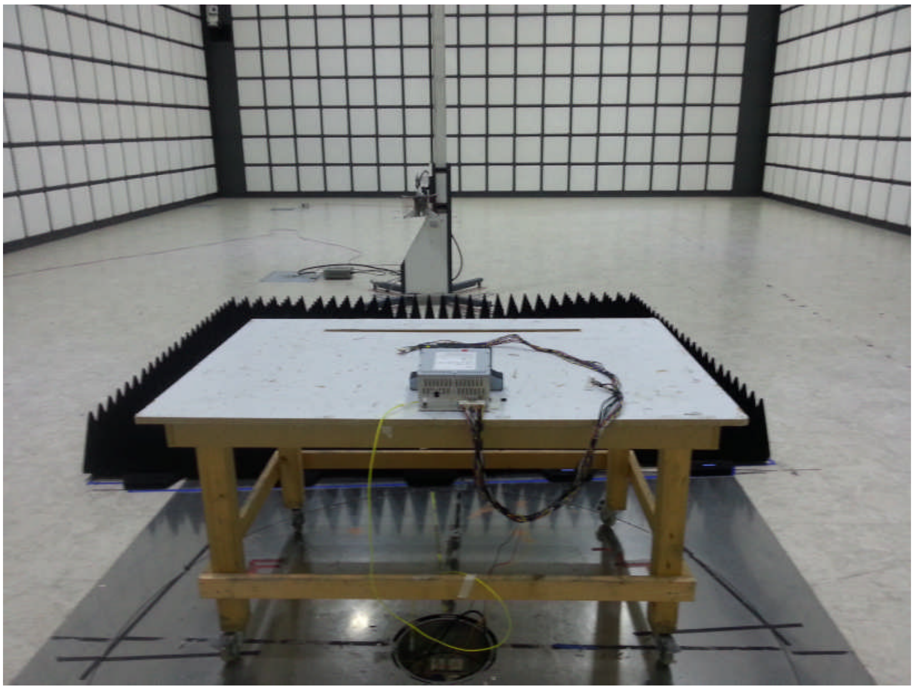
Above 1GHz



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