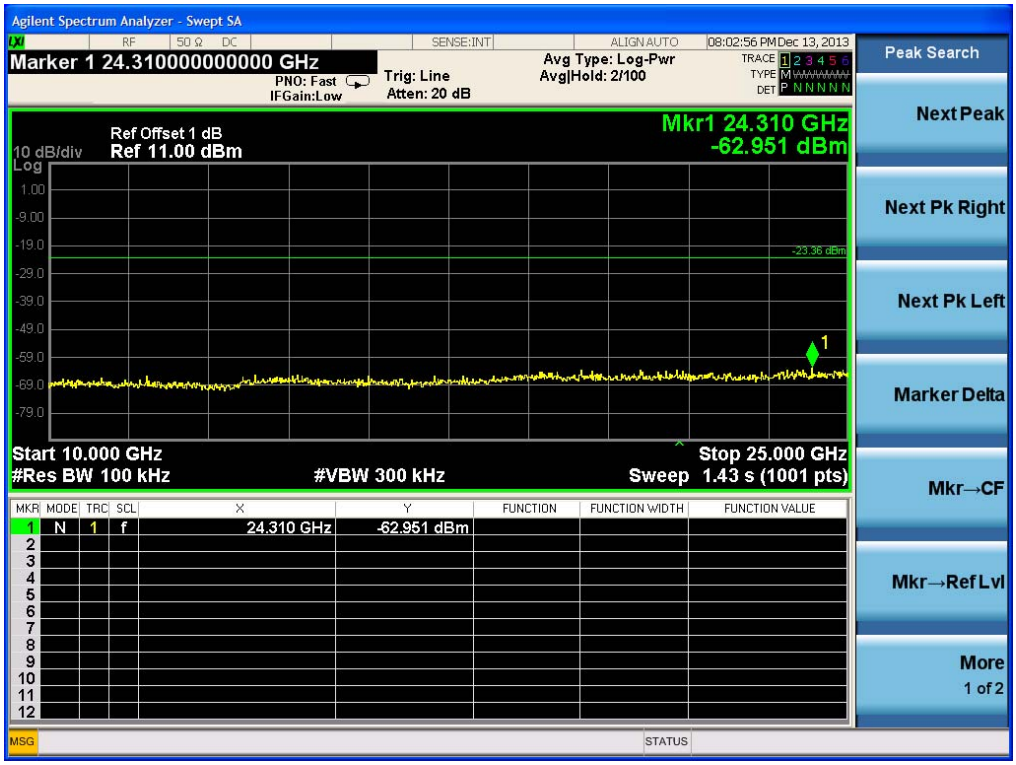
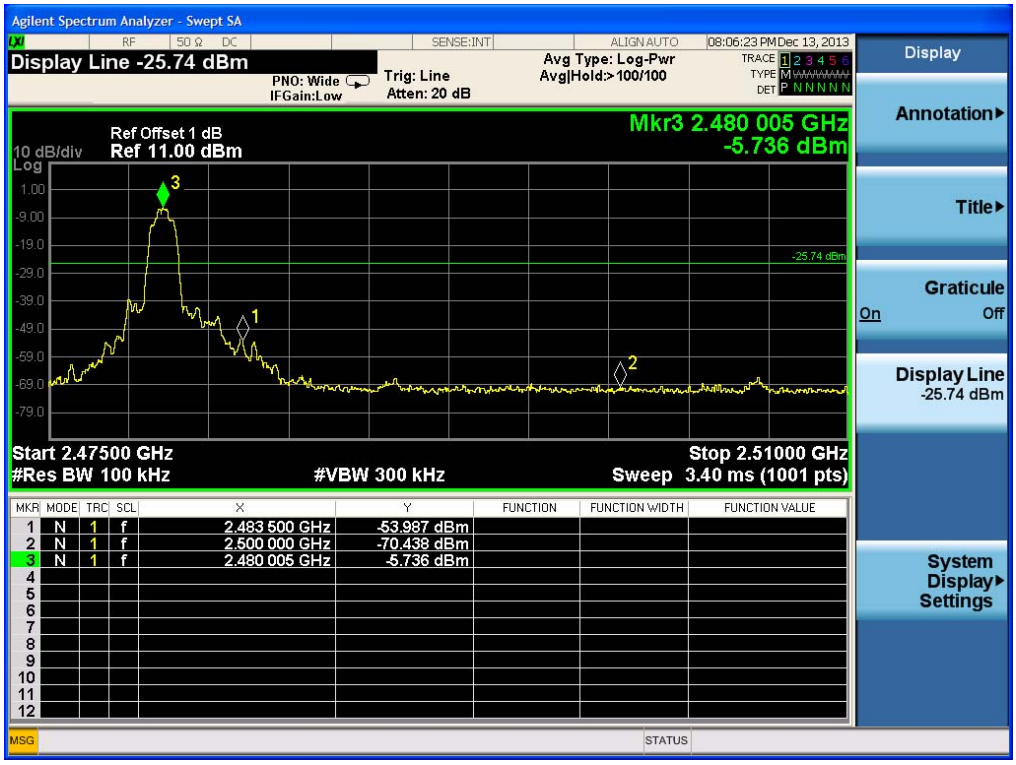
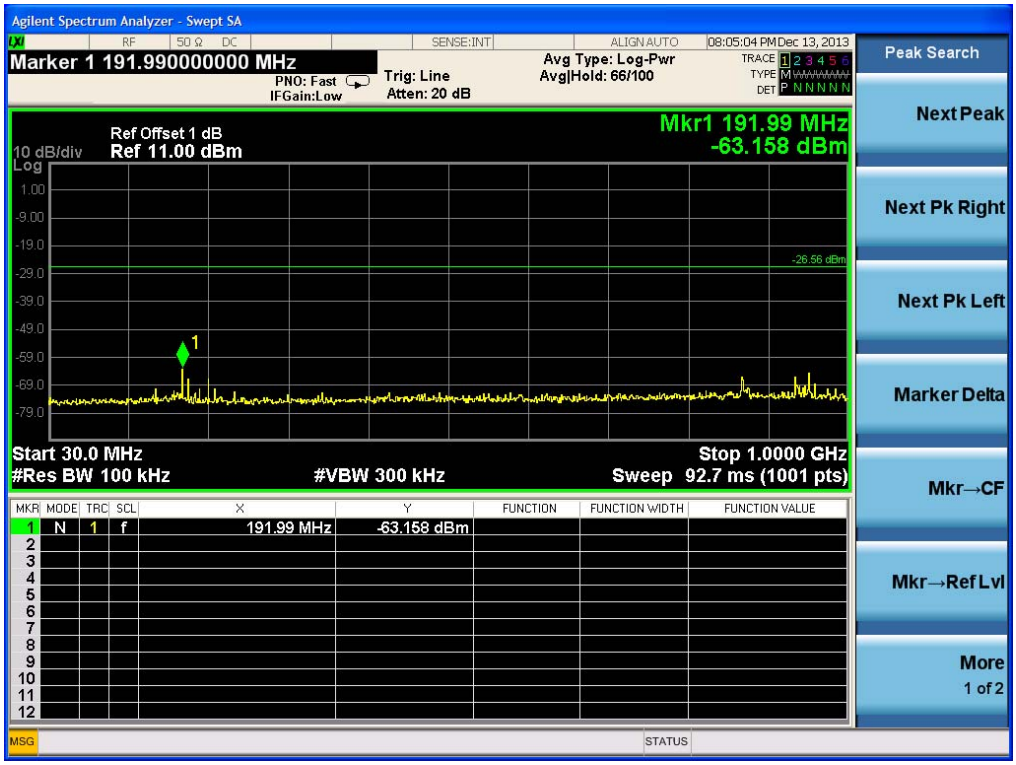
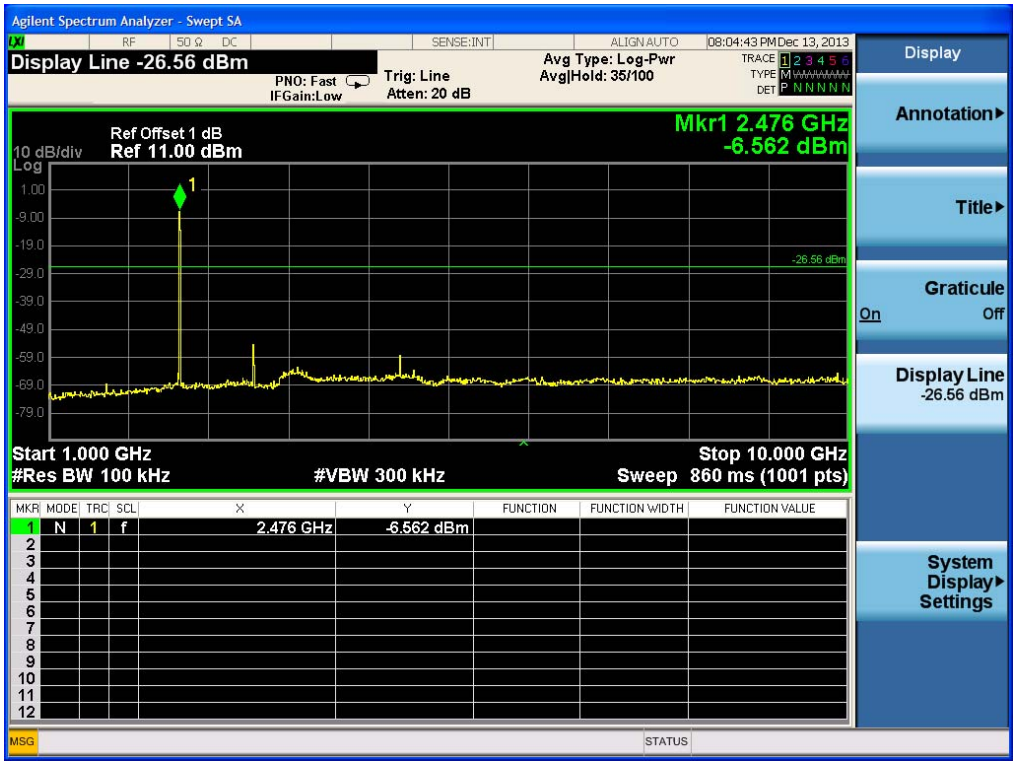
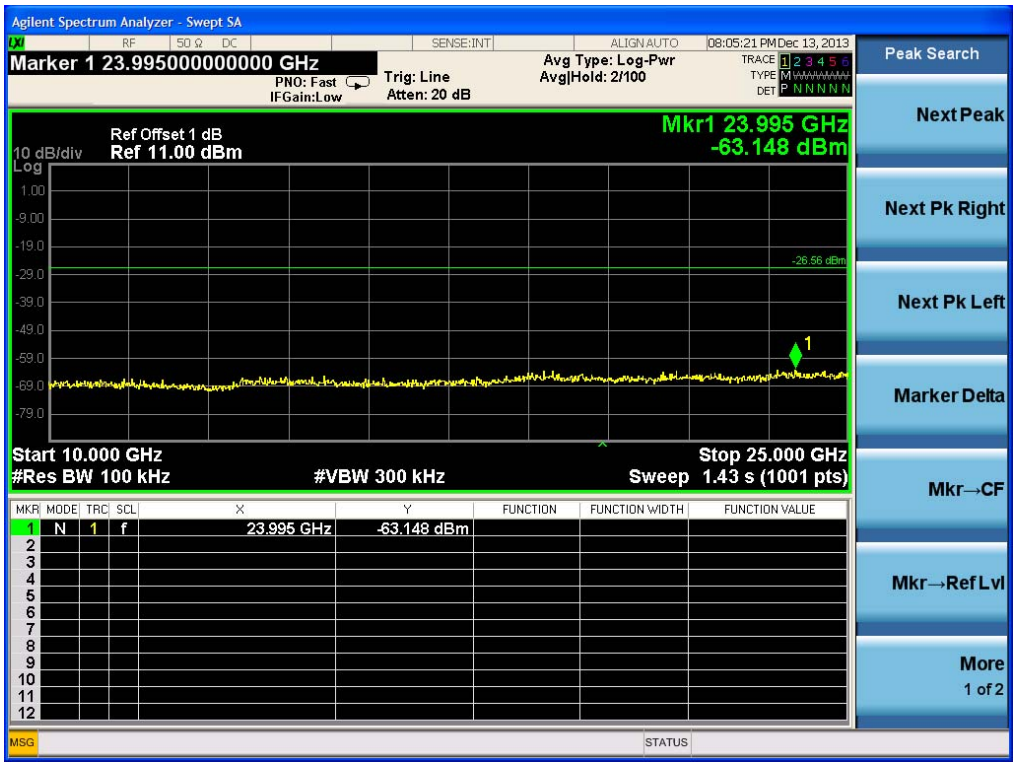

Agilent Spectrum Analyzer - Swept SA
RF
50 Ω DC
SENSE:INT
ALIGN AUTO
08:02:56 PM Dec 13, 2013
Marker 1 24.310000000000 GHz
PNO: Fast
IFGain:Low
Trig: Line
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 2/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Peak Search
Ref Offset 1 dB
10 dB/div
Log
Ref 11.00 dBm
Mkr1 24.310 GHz
-62.951 dBm
1.00
-9.00
-19.0
-29.0
-39.0
-49.0
-59.0
-69.0
-79.0
-23.36 dBm
Start 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 GHz
Sweep 1.43 s (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 24.310 GHz -62.951 dBm
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

8DPSK Hopping off CHH :

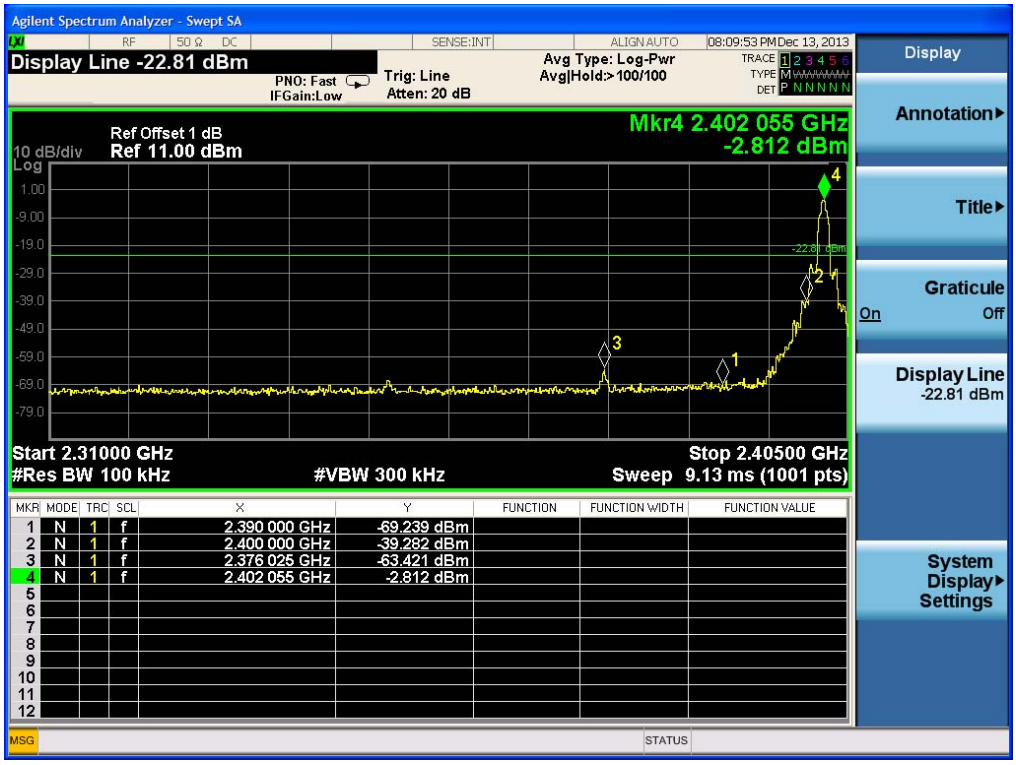


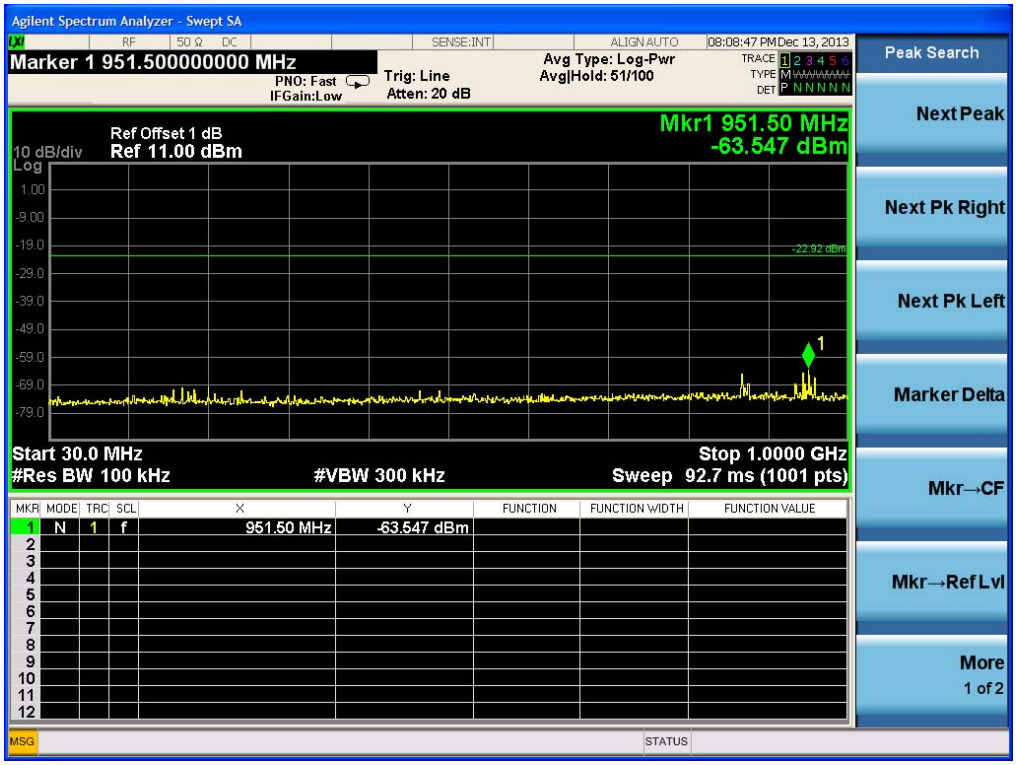


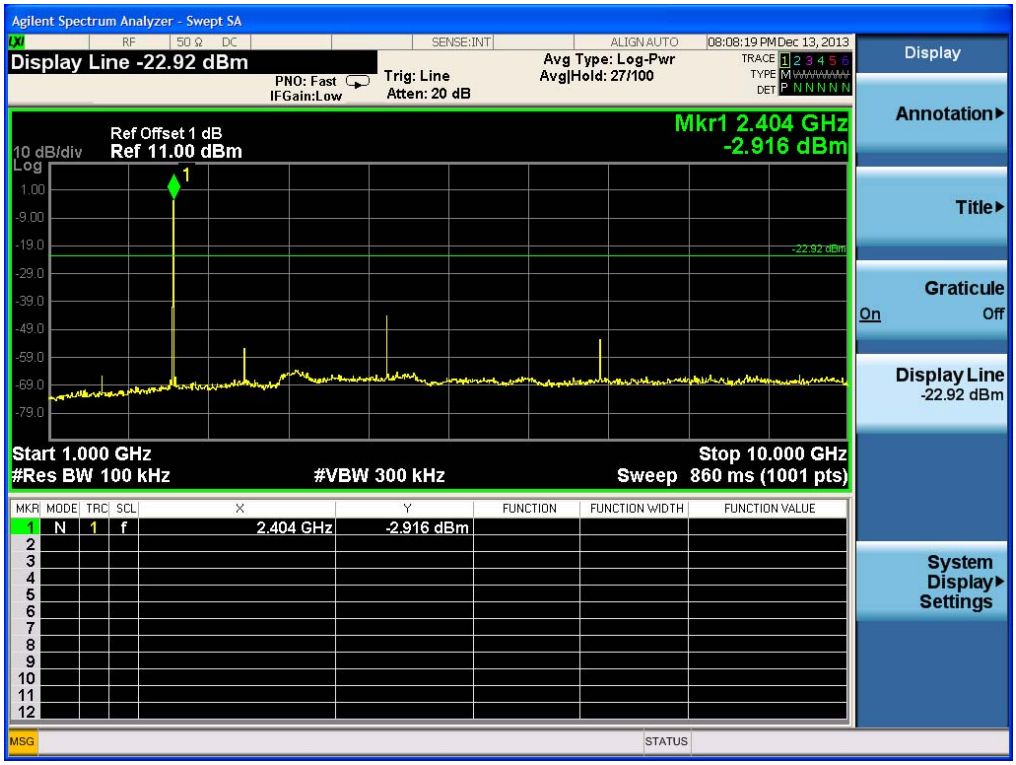

Agilent Spectrum Analyzer - Swept SA
Display Line -26.56 dBm
PNO: Fast
IFGain:Low
Trig: Line
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 35/100
08:04:43 PM Dec 13, 2013
Ref Offset 1 dB
10 dB/div
Ref 11.00 dBm
Log
Mkr1 2.476 GHz
-6.562 dBm
-26.56 dBm
Start 1.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 10.000 GHz
Sweep 860 ms (1001 pts)
1 N 1 f 2.476 GHz -6.562 dBm
Display
Annotation
Title
Graticule
On Off
Display Line
-26.56 dBm
System
Display
Settings
MSG
STATUS

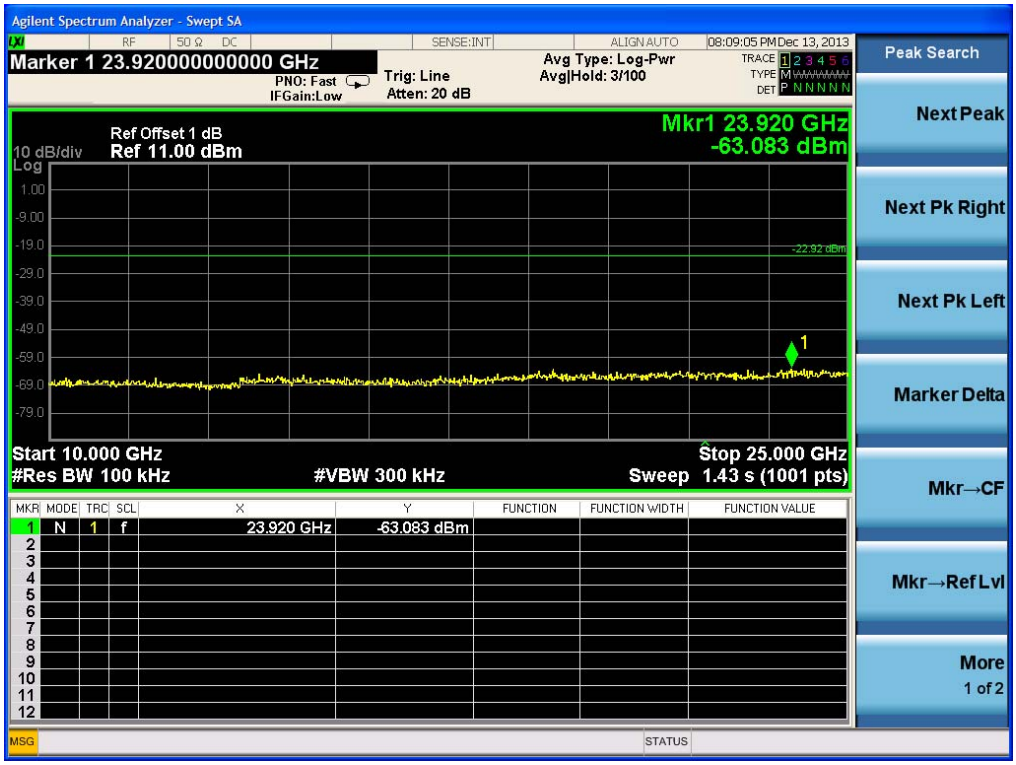

Agilent Spectrum Analyzer - Swept SA
Marker 1 23.995000000000 GHz
PNO: Fast
IFGain:Low
Trig: Line
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 2/100
08:05:21 PM Dec 13, 2013
Ref Offset 1 dB
10 dB/div
Ref 11.00 dBm
Log
Mkr1 23.995 GHz
-63.148 dBm
-26.56 dBm
Start 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 GHz
Sweep 1.43 s (1001 pts)
1 N 1 f 23.995 GHz -63.148 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

π /4 DQPSK Hopping off CHL :

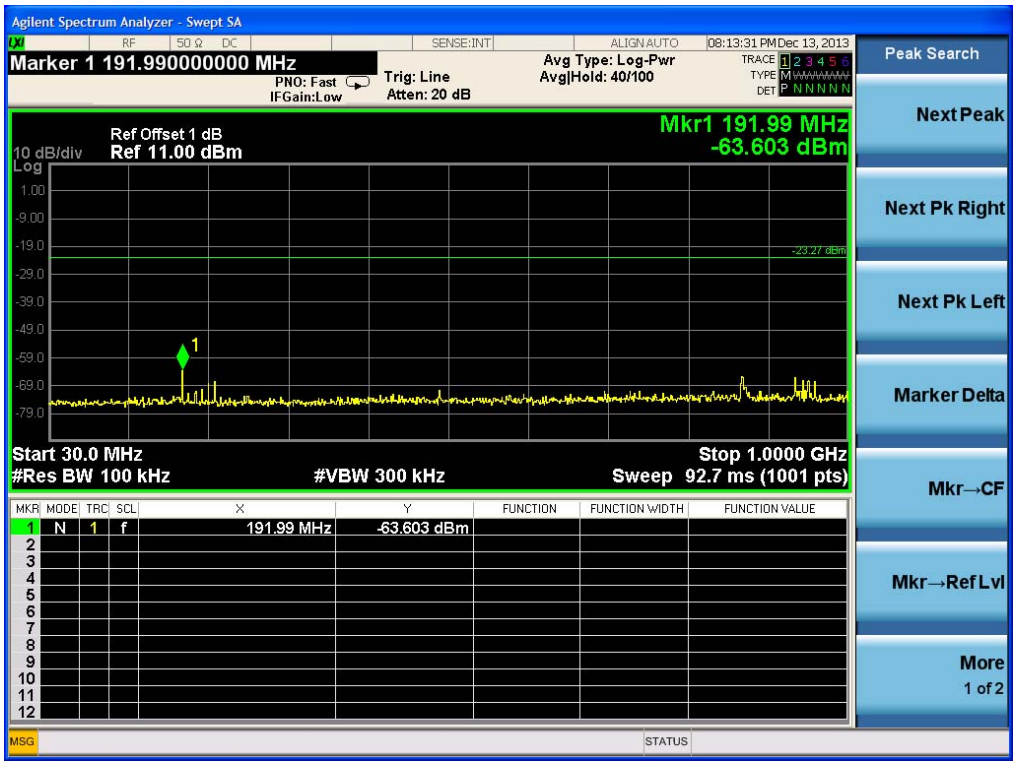


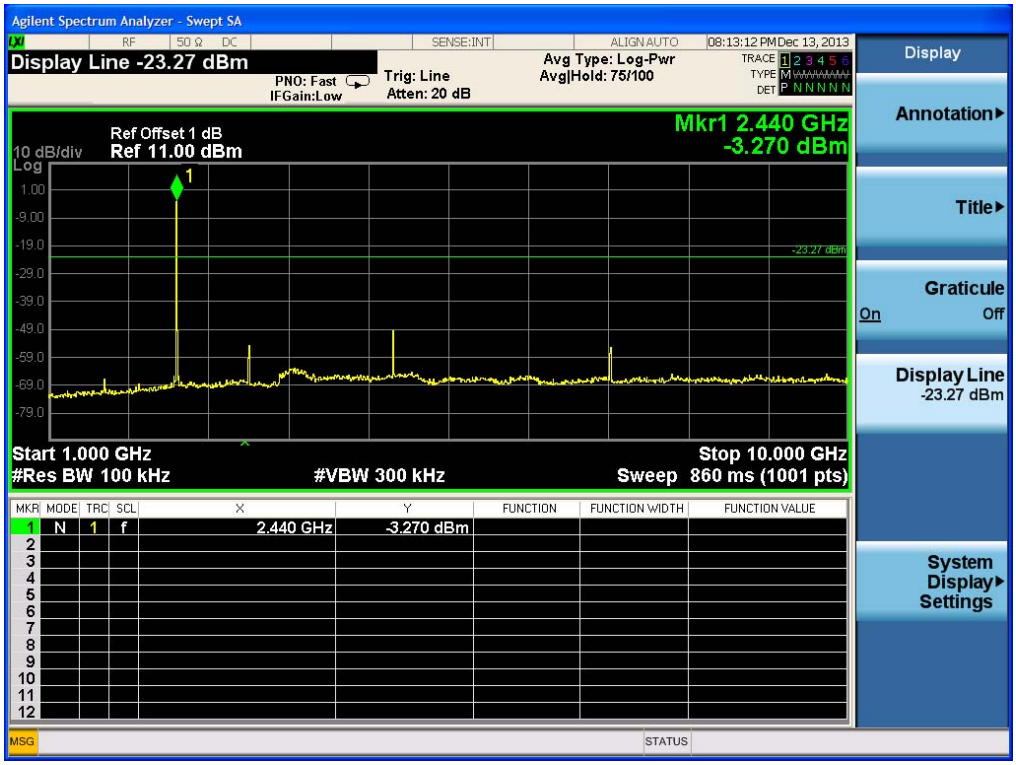


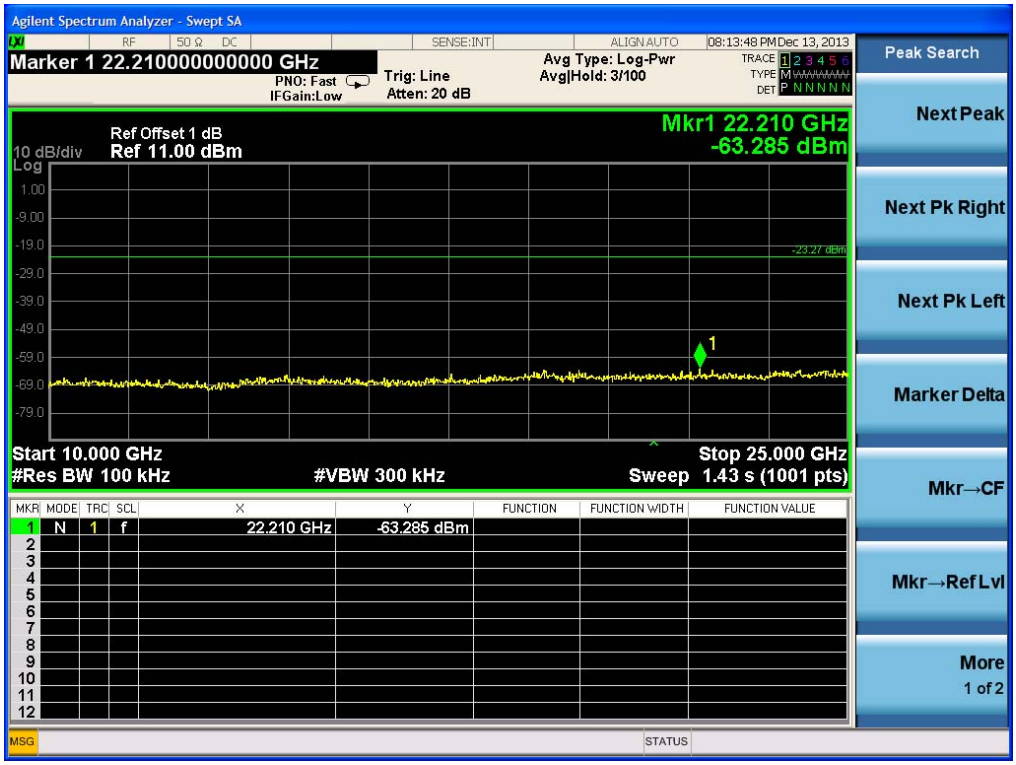

Agilent Spectrum Analyzer - Swept SA
Display Line -22.92 dBm
PNO: Fast
IFGain:Low
Trig: Line
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 27/100
08:08:19 PM Dec 13, 2013
Ref Offset 1 dB
10 dB/div
Ref 11.00 dBm
Log
Mkr1 2.404 GHz
-2.916 dBm
-22.92 dBm
Start 1.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 10.000 GHz
Sweep 860 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.404 GHz -2.916 dBm
Display
Annotation
Title
Graticule
On Off
Display Line
-22.92 dBm
System
Display
Settings
MSG
STATUS


Agilent Spectrum Analyzer - Swept SA
Marker 1 23.920000000000 GHz
PNO: Fast
IFGain:Low
Trig: Line
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 3/100
08:09:05 PM Dec 13, 2013
Ref Offset 1 dB
10 dB/div
Ref 11.00 dBm
Log
Mkr1 23.920 GHz
-63.083 dBm
-22.92 dBm
Start 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 GHz
Sweep 1.43 s (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 23.920 GHz -63.083 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

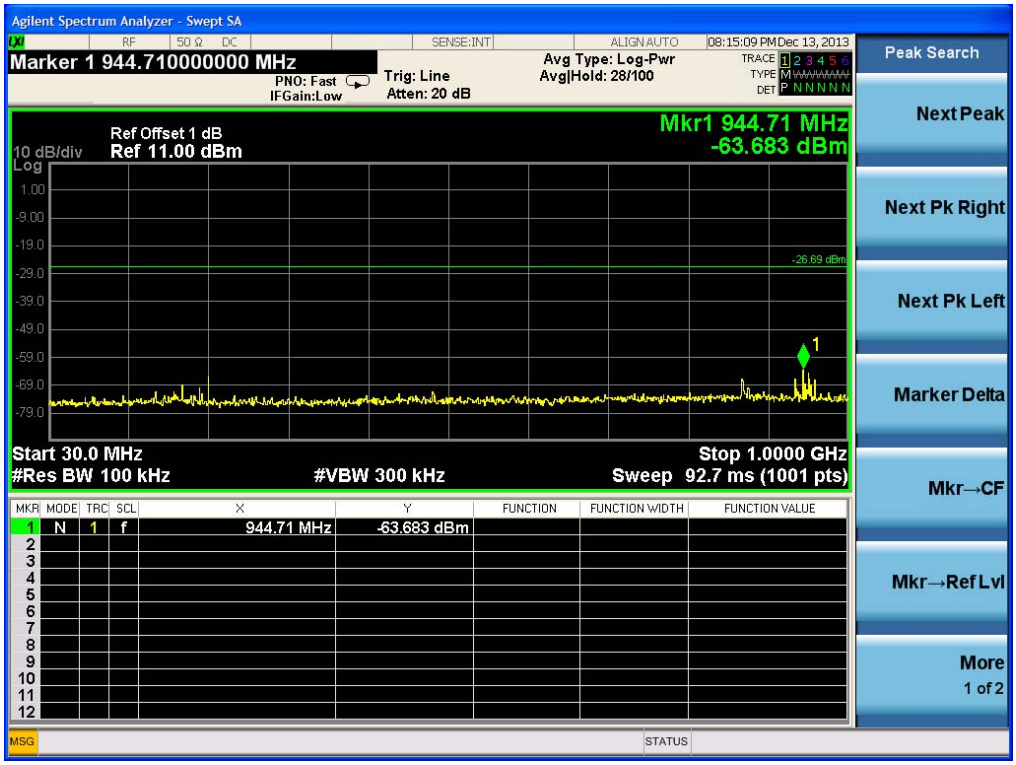
π /4 DQPSK Hopping off CHM :

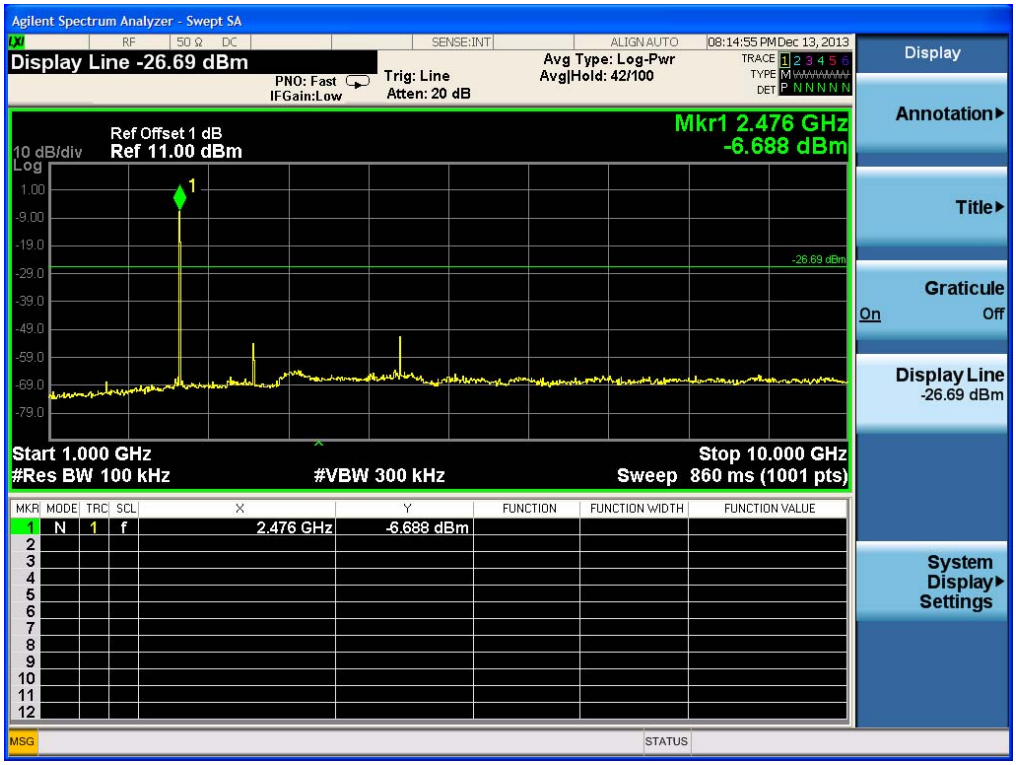


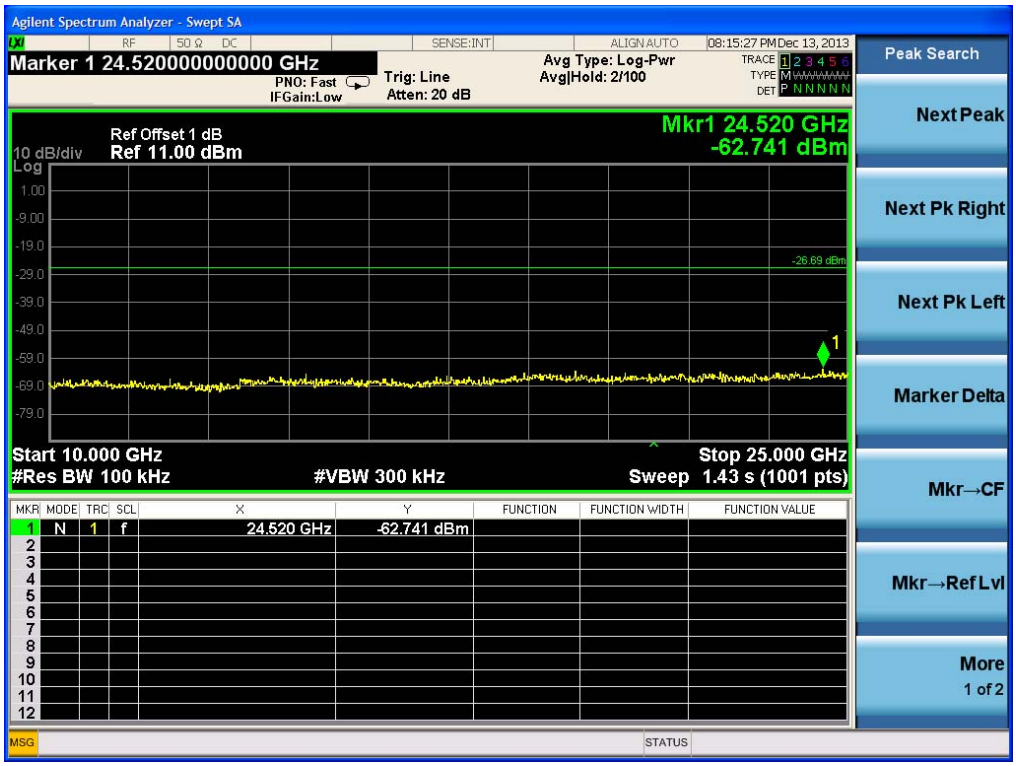



Agilent Spectrum Analyzer - Swept SA
RF
50 Ω
DC
SENSE:INT
ALIGN AUTO
08:13:48 PM Dec 13, 2013
Marker 1 22.210000000000 GHz
PNO: Fast
IFGain:Low
Trig: Line
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 3/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 11.00 dBm
Mkr1 22.210 GHz
-63.285 dBm
1.00
-9.00
-19.0
-29.0
-39.0
-49.0
-59.0
-69.0
-79.0
-23.27 dBm
Start 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 GHz
Sweep 1.43 s (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 22.210 GHz -63.285 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

π /4 DQPSK Hopping off CHH :




Agilent Spectrum Analyzer - Swept SA
Display Line -26.69 dBm
PNO: Fast
IFGain:Low
Trig: Line
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 42/100
08:14:55 PM Dec 13, 2013
Ref Offset 1 dB
10 dB/div
Ref 11.00 dBm
Log
Mkr1 2.476 GHz
-6.688 dBm
-26.69 dBm
Start 1.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 10.000 GHz
Sweep 860 ms (1001 pts)
1 N 1 f 2.476 GHz -6.688 dBm
Display
Annotation
Title
Graticule
On Off
Display Line
-26.69 dBm
System
Display
Settings
MSG
STATUS


Agilent Spectrum Analyzer - Swept SA
Marker 1 24.520000000000 GHz
PNO: Fast
IFGain:Low
Trig: Line
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 2/100
08:15:27 PM Dec 13, 2013
Ref Offset 1 dB
10 dB/div
Ref 11.00 dBm
Log
Mkr1 24.520 GHz
-62.741 dBm
-26.69 dBm
Start 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 GHz
Sweep 1.43 s (1001 pts)
1 N 1 f 24.520 GHz -62.741 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

9. Carrier Frequency Separation Test

9.1 Test Procedure

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, freq 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. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

The peak detector was used with 100 kHz/300 kHz RBW/VBW

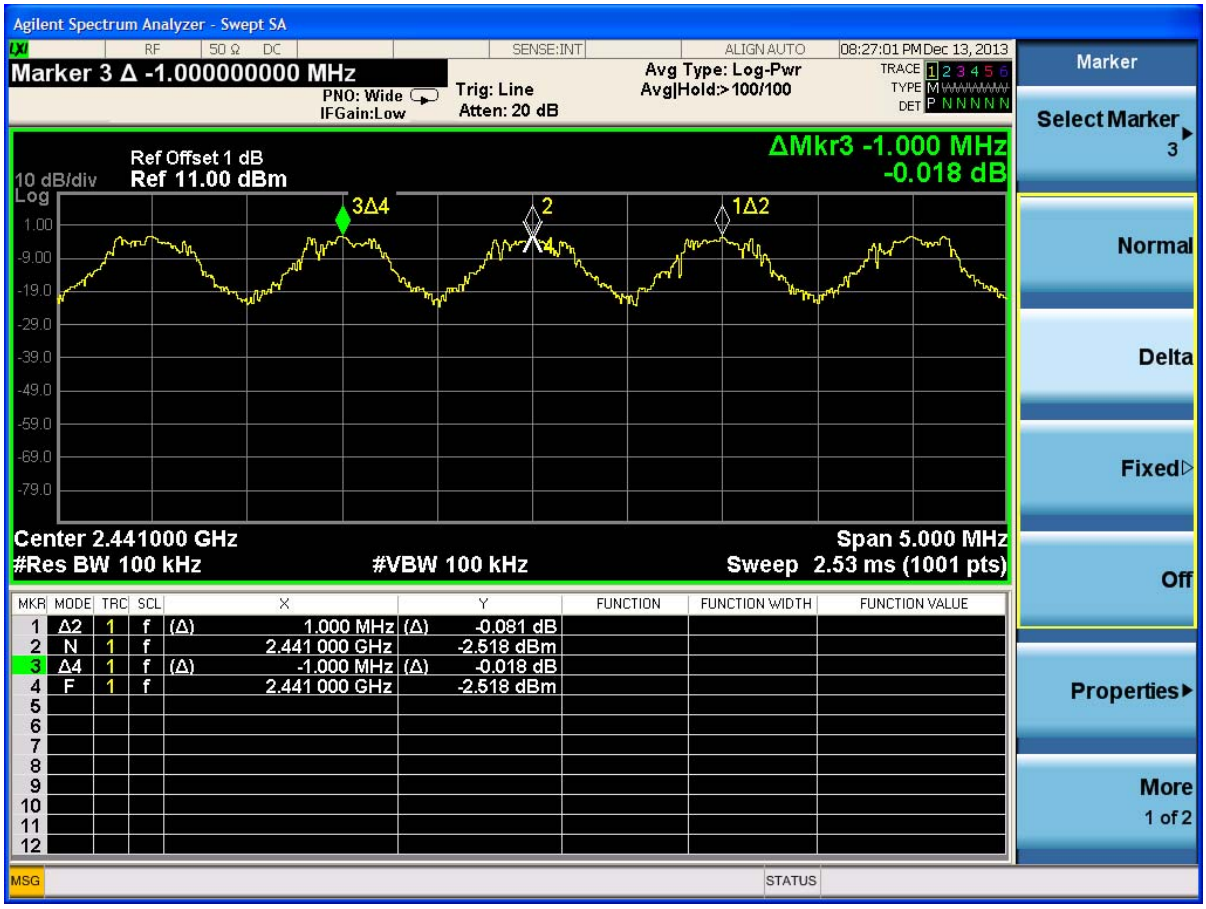
9.2 Measurement Equipment

Item	Equipment	Last Calibration	Type	Serial No.	Manufacturer
1	Spectrum	May.08, 13	E4446A	US44300459	Agilent

9.3 Test Result

Widest channel bandwidth was **1215**kHz. So Two-thirds is **810**kHz and greater than 25kHz .

Result : Pass. Carrier Frequency Separation=1MHz > **810**kHz



10. Output Power Test

10.1 Test Procedure

The maximum peak conducted output power of the intentional radiator shall not exceed the following:
(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 W. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 W.
(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 by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

10.2 Measurement Equipment

Item	Equipment	Last Calibration	Type	Serial No.	Manufacturer
1	Spectrum	May.08, 13	E4446A	US44300459	Agilent

10.3 Test Result

Remark : 1:RBW=2MHz VBW=3MHz PK detector for GFSK
Cable loss is 1dB and it have been set in Spectrum

GFSK:

Frequency, MHz	Result Output power, dBm	<Power Limit, dBm
2402	-2.393	30.00
2441	-2.425	30.00
2480	-4.083	30.00

Diagram of GFSK is as below:


Agilent Spectrum Analyzer - Swept SA
RF
50 Ω DC
SENSE:INT
ALIGN AUTO
07:29:18 PM Dec 13, 2013
Marker 1 2.479890000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Peak Search
Ref Offset 1 dB
10 dB/div
Log
Ref 11.00 dBm
Mkr1 2.479 89 GHz
-4.083 dBm
1.00
-9.00
-19.0
-29.0
-39.0
-49.0
-59.0
-69.0
-79.0
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
Center 2.480000 GHz
#Res BW 2.0 MHz
#VBW 3.0 MHz
Span 10.00 MHz
Sweep 1.00 ms (1001 pts)
MSG
STATUS

Remark : 1:RBW=2MHz VBW=3MHz PK detector for 8DPSK
Cable loss is 1dB and it have been set in Spectrum

8DPSK:

Frequency, MHz	Result Output power, dBm	<Power Limit, dBm
2402	-2.604	30.00
2441	-2.768	30.00
2480	-4.819	30.00

Diagram of 8DPSK is as below:


Agilent Spectrum Analyzer - Swept SA
Marker 1 2.441000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
07:30:40 PM Dec 13, 2013
Ref Offset 1 dB
10 dB/div
Log
Ref 11.00 dBm
Mkr1 2.441 00 GHz
-2.768 dBm
Center 2.441000 GHz
#Res BW 2.0 MHz
#VBW 3.0 MHz
Span 10.00 MHz
Sweep 1.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 2.479990000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
07:31:01 PM Dec 13, 2013
Ref Offset 1 dB
10 dB/div
Log
Ref 11.00 dBm
Mkr1 2.479 99 GHz
-4.819 dBm
Center 2.480000 GHz
#Res BW 2.0 MHz
#VBW 3.0 MHz
Span 10.00 MHz
Sweep 1.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Remark : 1:RBW=2MHz VBW=3MHz PK detector for π/4 DQPSK
Cable loss is 1dB and it have been set in Spectrum
π/4 DQPSK:

Frequency, MHz	Result Output power, dBm	<Power Limit, dBm
2402	-2.680	30.00
2441	-2.897	30.00
2480	-5.134	30.00

Diagram of π/4 DQPSK is as below:


Agilent Spectrum Analyzer - Swept SA
Marker 1 2.441130000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
07:32:30 PM Dec 13, 2013
Ref Offset 1 dB
10 dB/div
Log
Ref 11.00 dBm
Mkr1 2.441 13 GHz
-2.897 dBm
Center 2.441000 GHz
#Res BW 2.0 MHz
#VBW 3.0 MHz
Span 10.00 MHz
Sweep 1.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS


Agilent Spectrum Analyzer - Swept SA
Marker 1 2.480170000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
07:33:06 PM Dec 13, 2013
Ref Offset 1 dB
10 dB/div
Log
Ref 11.00 dBm
Mkr1 2.480 17 GHz
-5.134 dBm
Center 2.480000 GHz
#Res BW 2.0 MHz
#VBW 3.0 MHz
Span 10.00 MHz
Sweep 1.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

11. NUMBER OF HOPPING FREQUENCY TEST

11.1 Test Procedure

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 1 5 channels are used.

11.2 Measurement Equipment

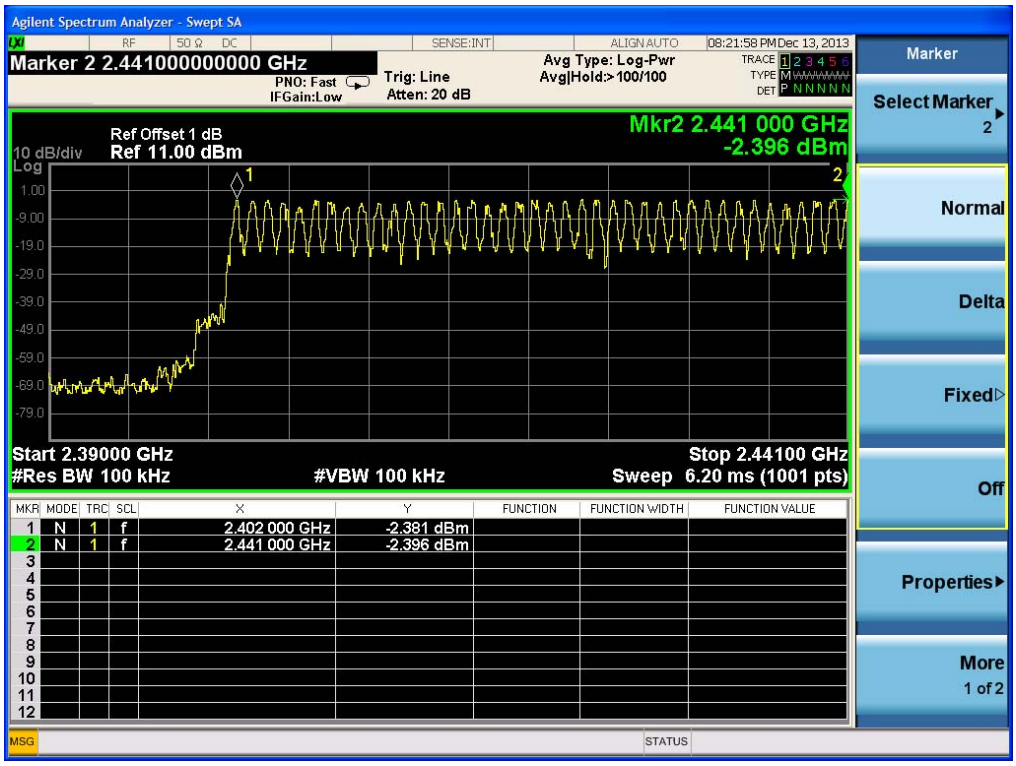
Item	Equipment	Last Calibration	Type	Serial No.	Manufacturer
1	Spectrum	May.08, 13	E4446A	US44300459	Agilent

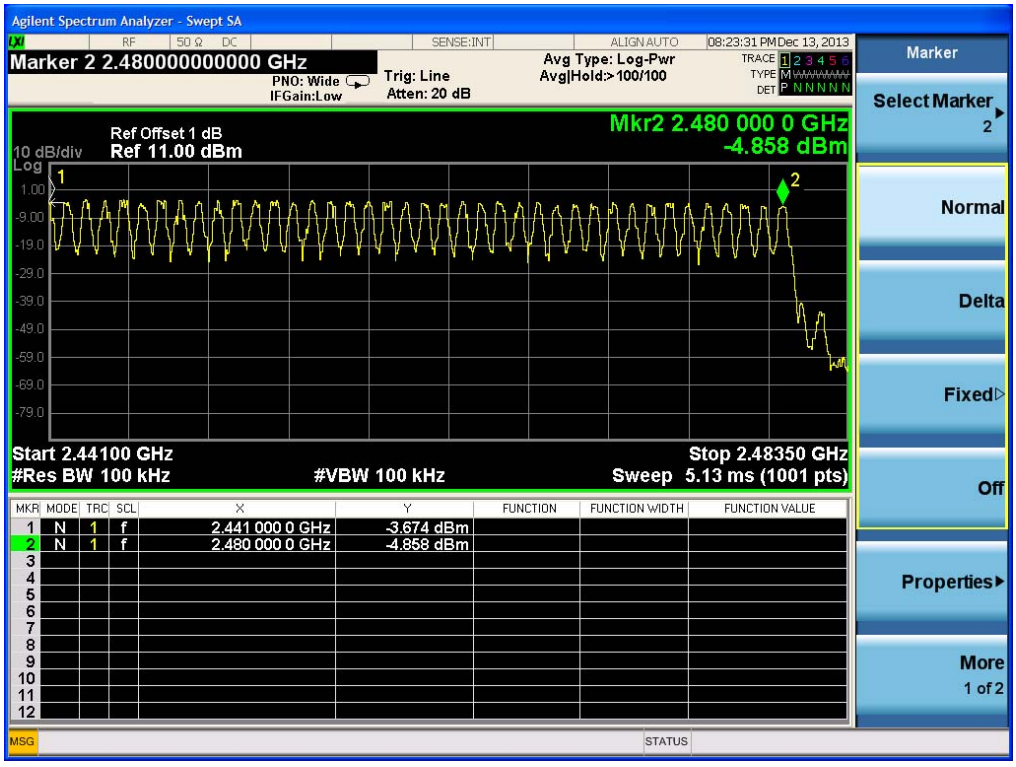
11.3 Test Result

Test mode: Transmitter Hopping on

Number of channels used	Minimum number of channels limit	Margin
79	15	64

11.3.1 Diagram





12. DWELL TIME TEST

12.1 Test Procedure

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.

12.2 Measurement Equipment

Item	Equipment	Last Calibration	Type	Serial No.	Manufacturer
1	Spectrum	May.08, 13	E4446A	US44300459	Agilent

12.3 Test Result

Limit:

Total time of occupancy is 0.4 s within a period of time equals number of hopping channels employed multiplied by 0.4 s, which is 0.4 s within the period of time 0.4 × 79 = 31.6 s

Remark :

DH1 Packet permit maximum 1600 / 79 /2 = 10.12 hops per second in each channel (1 time slot RX, 1 time slot TX). So, total hops is 10.12 x 31.6 = 320

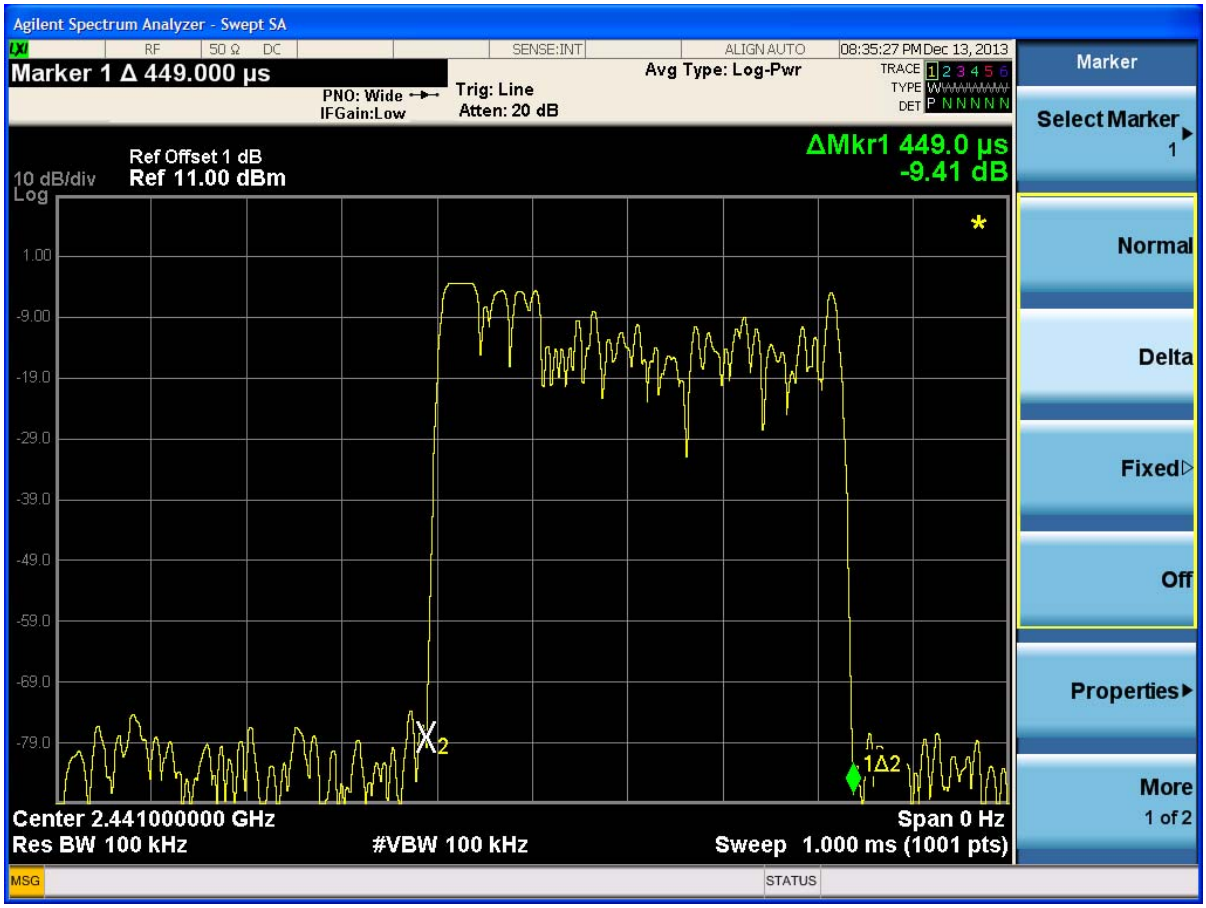
DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots RX, 1 time slot TX). So, total hops is 5.06 x 31.6 = 160

DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). So, total hops is 3.37 x 31.6 = 106.6

8DPSK

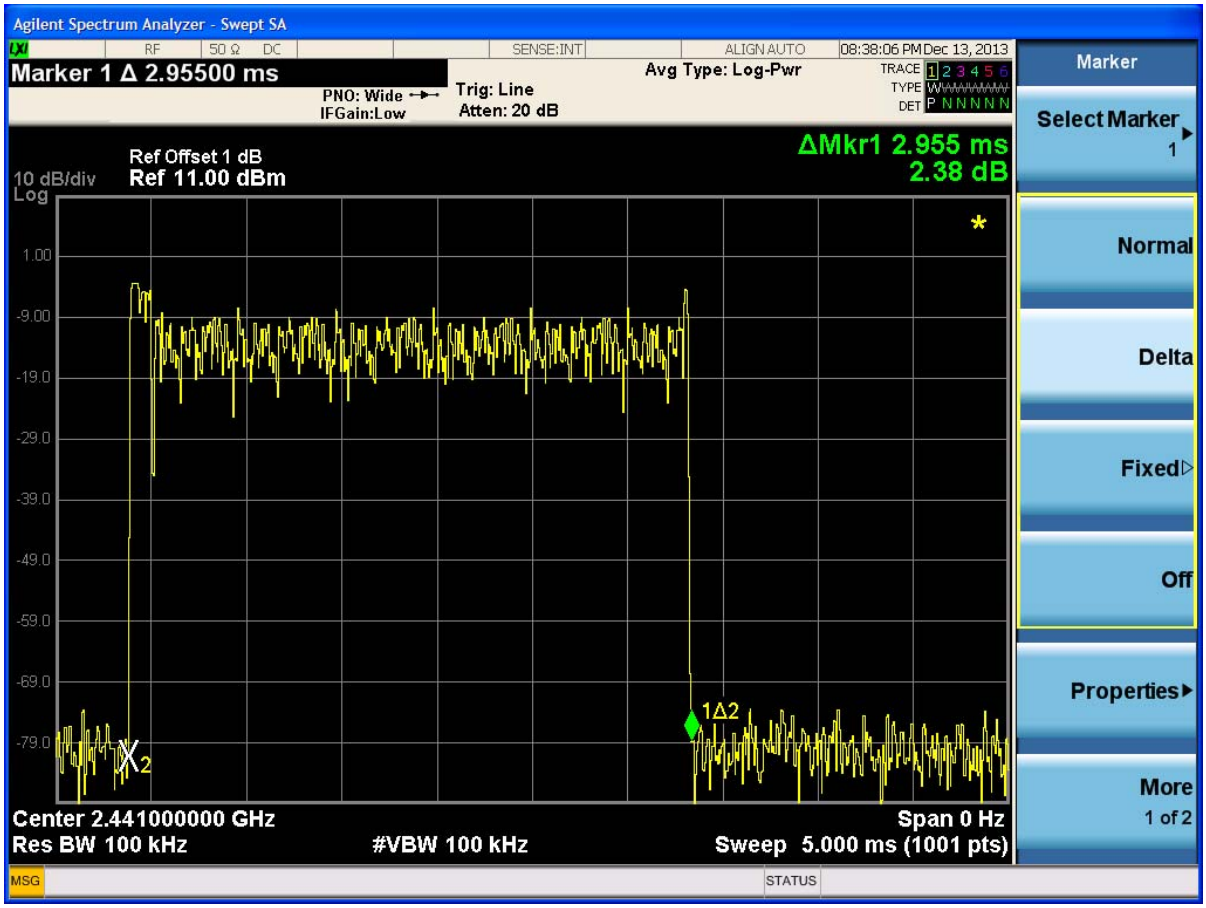
Grouping	Diagram	Time of occupancy ms	Limit ms	Remark
DH1	11-1	143.68	400	320x 0.449
DH3	11-2	273.60	400	160x 1.710
DH5	11-3	315.00	400	106.6x 2.955

12.3.1 Diagram 11-1



12.3.2 Diagram 11-2

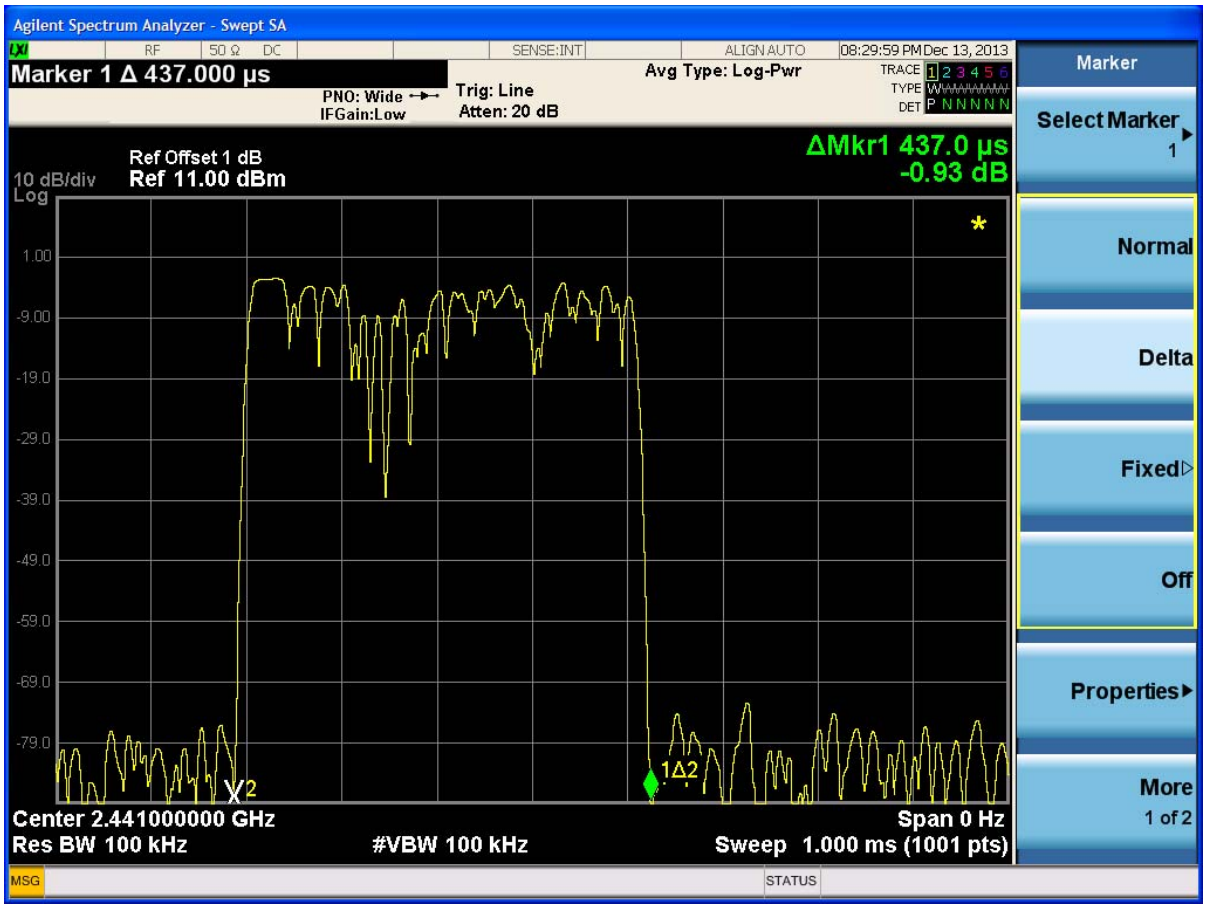
12.3.3 Diagram 11-3



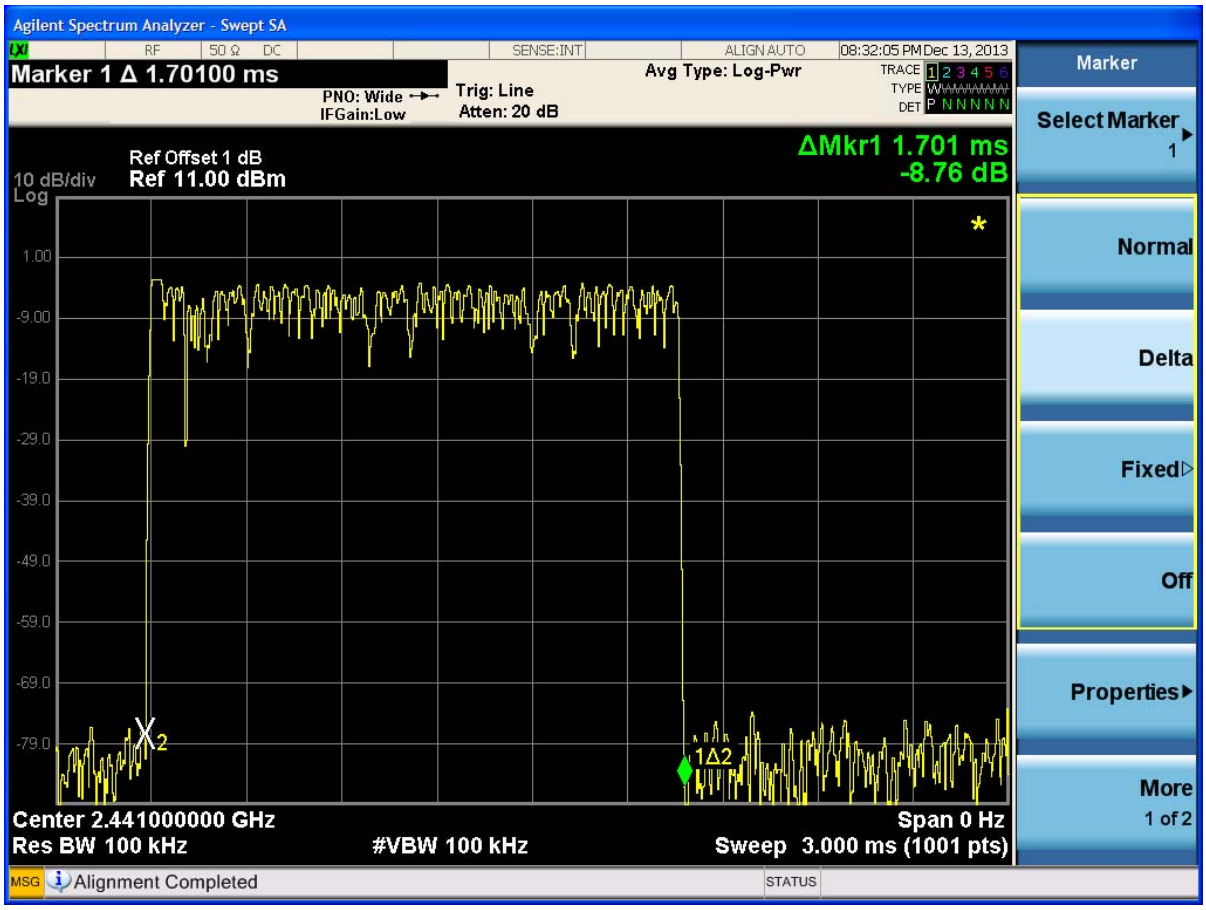
GFSK

Grouping	Diagram	Time of occupancy ms	Limit ms	Remark
DH1	11-4	139.84	400	320x 0.437
DH3	11-5	272.16	400	160x 1.701
DH5	11-6	316.07	400	106.6x 2.965

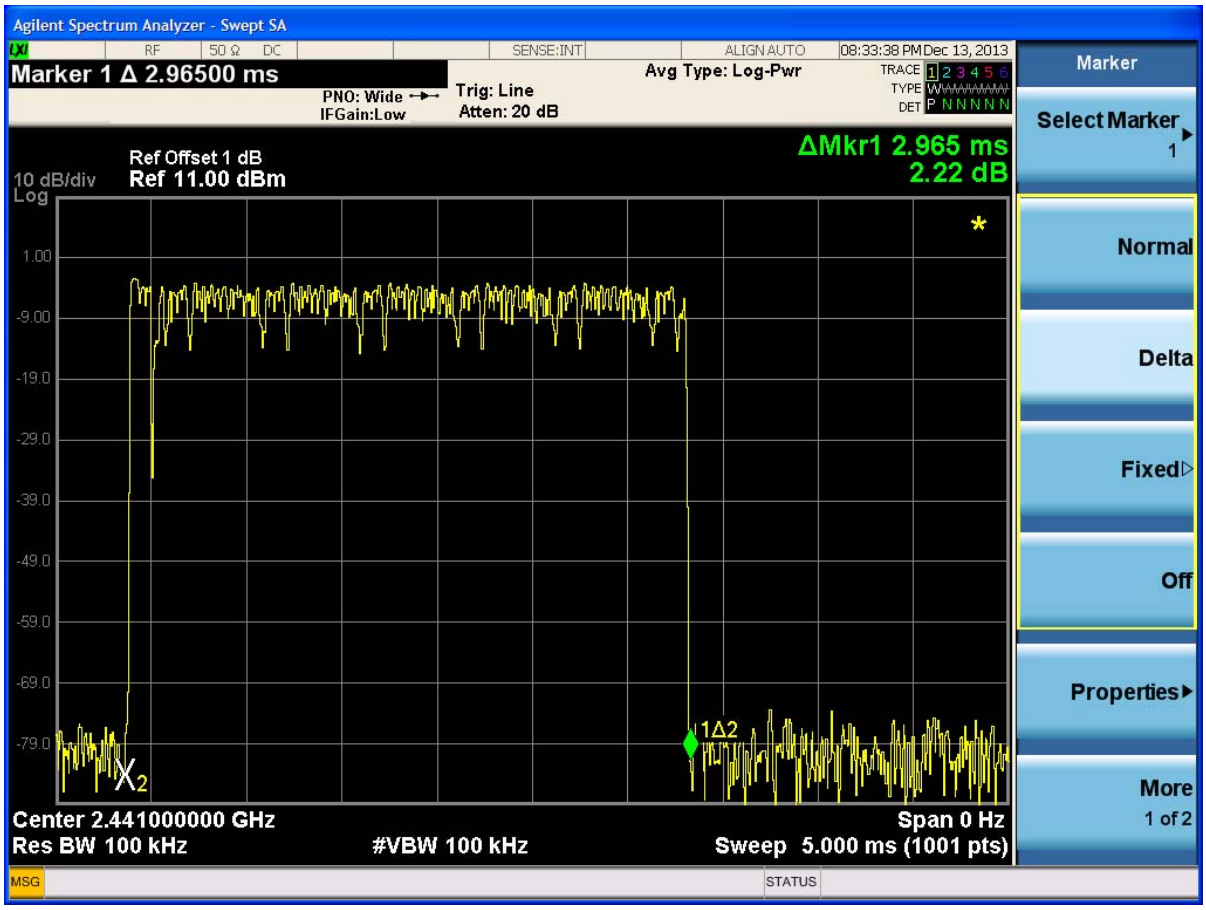
12.3.4 Diagram 11-4



12.3.5 Diagram 11-5



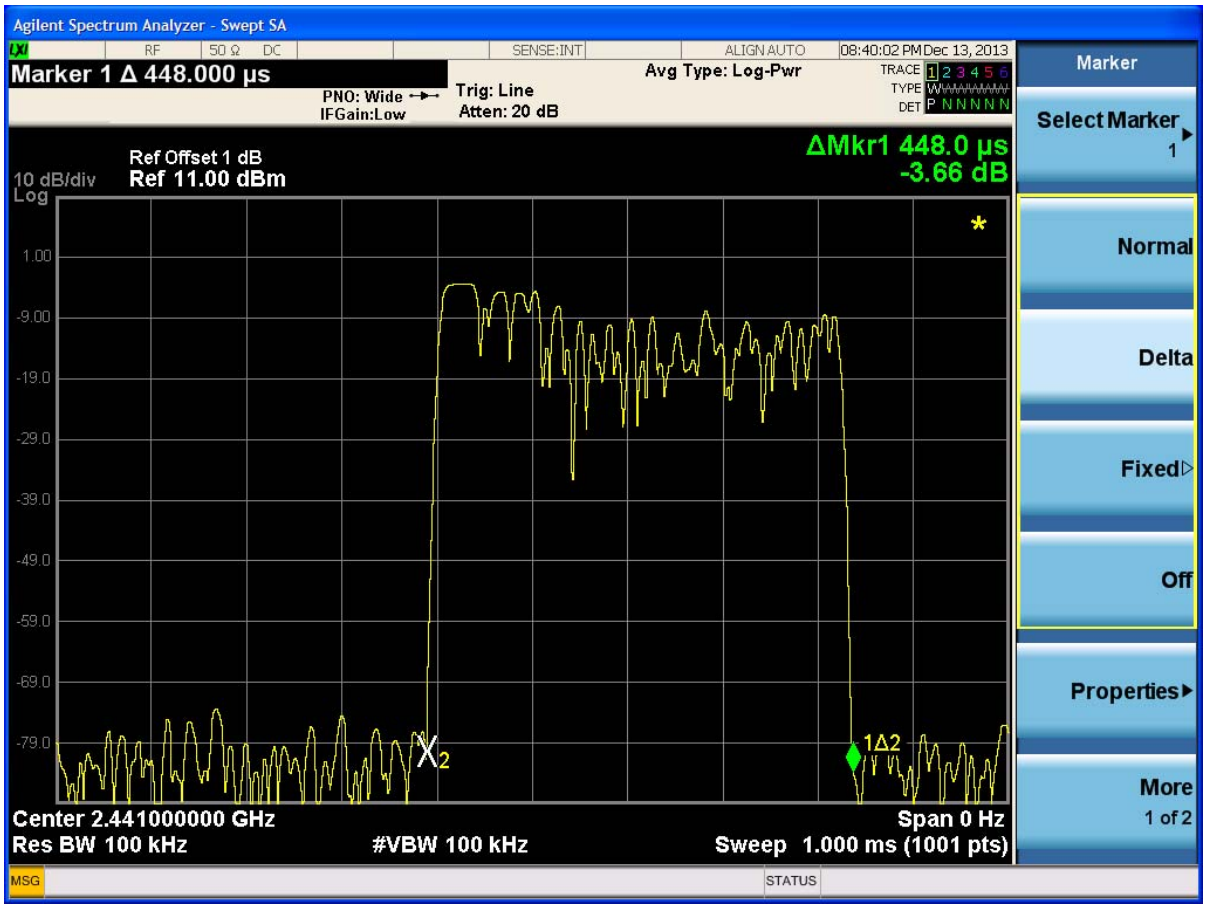
12.3.6 Diagram 11-6



π /4 DQPSK

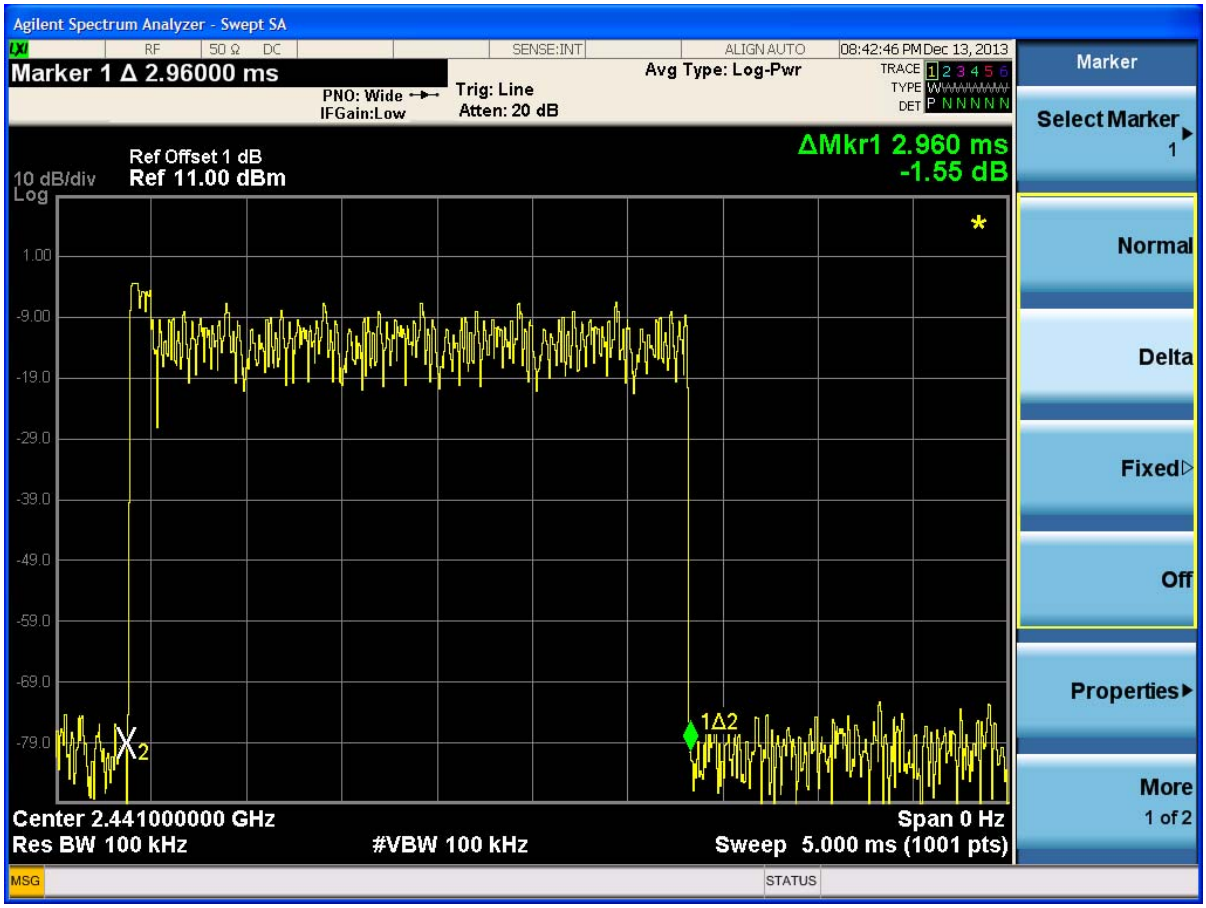
Grouping	Diagram	Time of occupancy ms	Limit ms	Remark
DH1	11-7	143.36	400	320x 0.448
DH3	11-8	272.64	400	160x 1.704
DH5	11-9	315.54	400	106.6x 2.960

12.3.7 Diagram 11-7



12.3.8 Diagram 11-8

12.3.9 Diagram 11-9



13 Antenna requirement

13.1 Requirement

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

13.2 Result

The antenna used for this product is Internal Patch antenna that no antenna other than that furnished by the responsible party shall be used with the device, The Antenna gain of this antenna is 2 dBi.

END OF REPORT