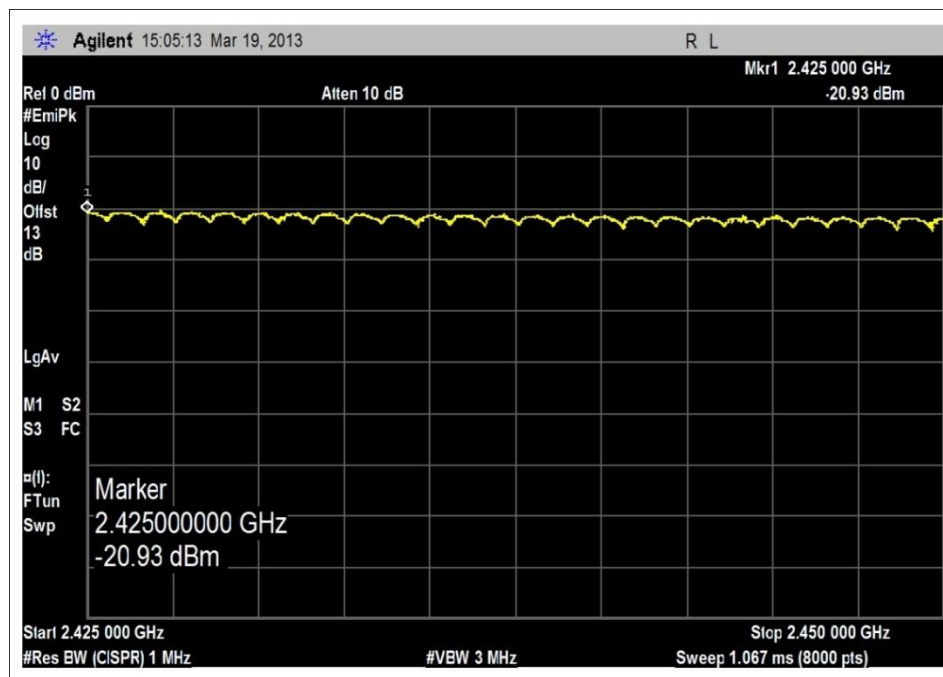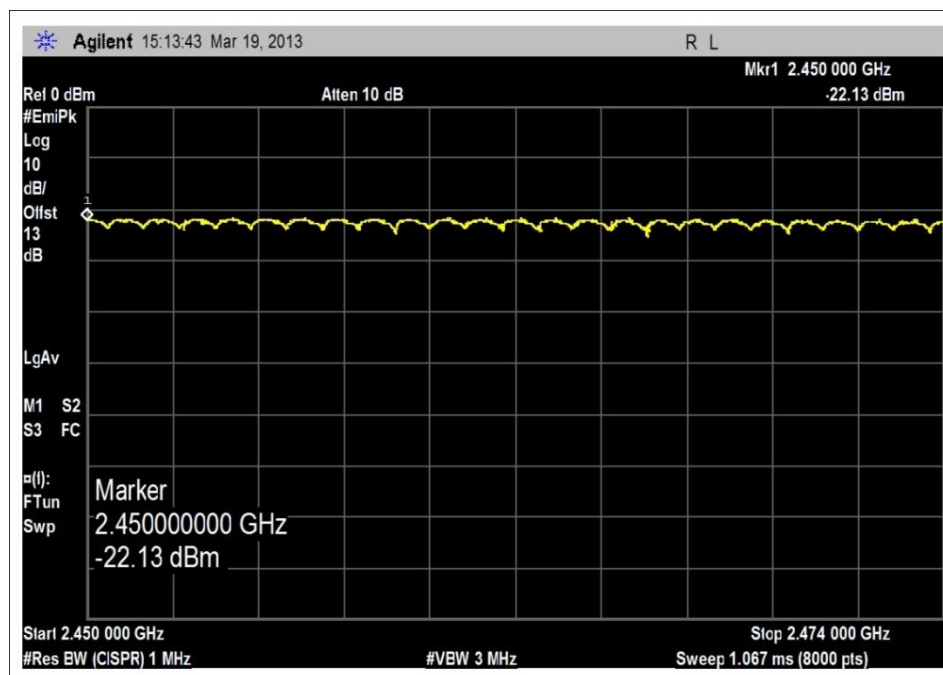Numbers of Hopping Channels of QPSK with 5 slot pack length (channel 24 to channel 49)

Numbers of Hopping Channels of QPSK with 5 slot pack length (channel 49 to channel 73)

Numbers of Hopping Channels of QPSK with 5 slot pack length (channel 73 to channel 79)

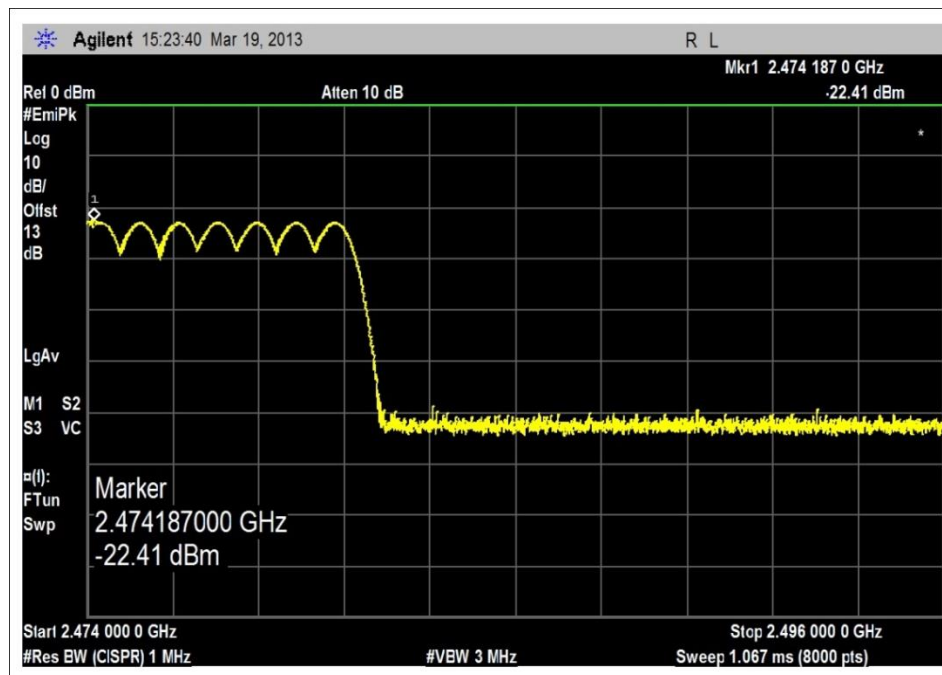Numbers of Hopping Channels of 8PSK with 1 slot pack length (channel 1 to channel 24)

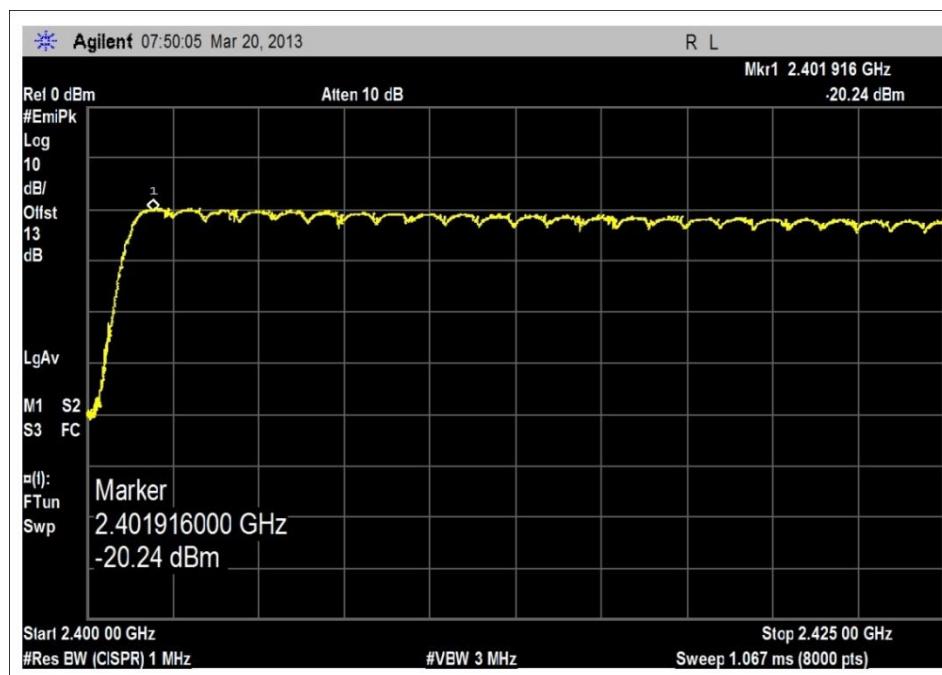Numbers of Hopping Channels of 8PSK with 1 slot pack length (channel 24 to channel 49)

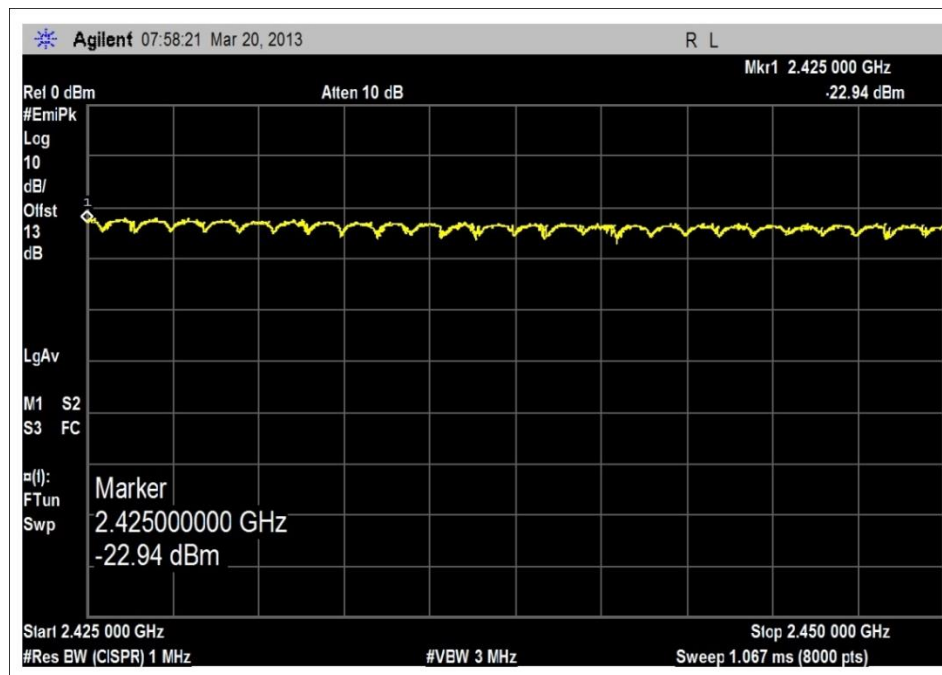Numbers of Hopping Channels of 8PSK with 1 slot pack length (channel 49 to channel 73)

Numbers of Hopping Channels of 8PSK with 1 slot pack length (channel 73 to channel 79)
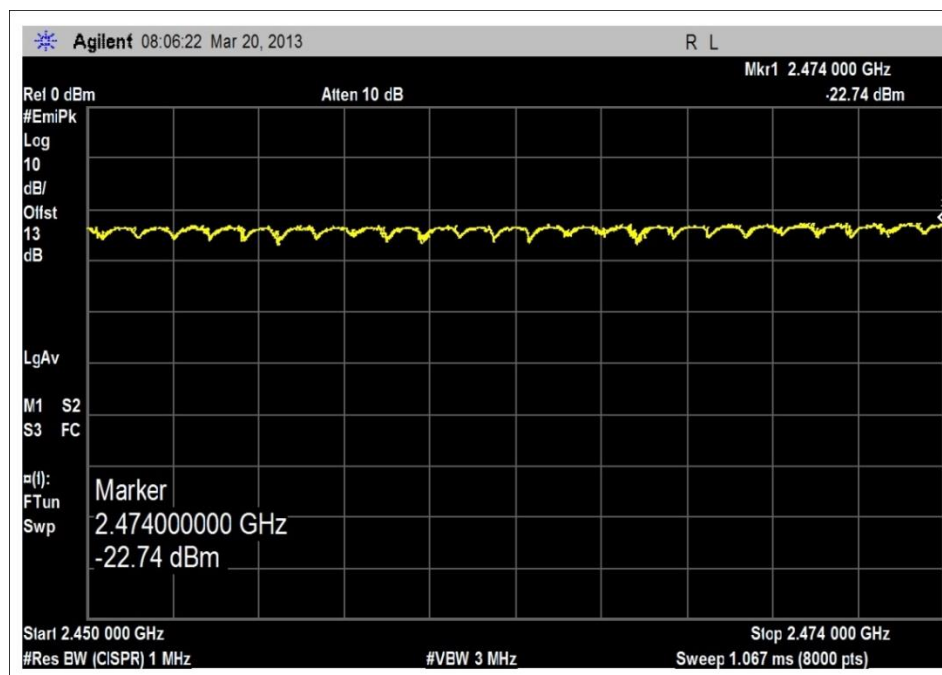

Numbers of Hopping Channels of 8PSK with 3 slot pack length (channel 1 to channel 24)
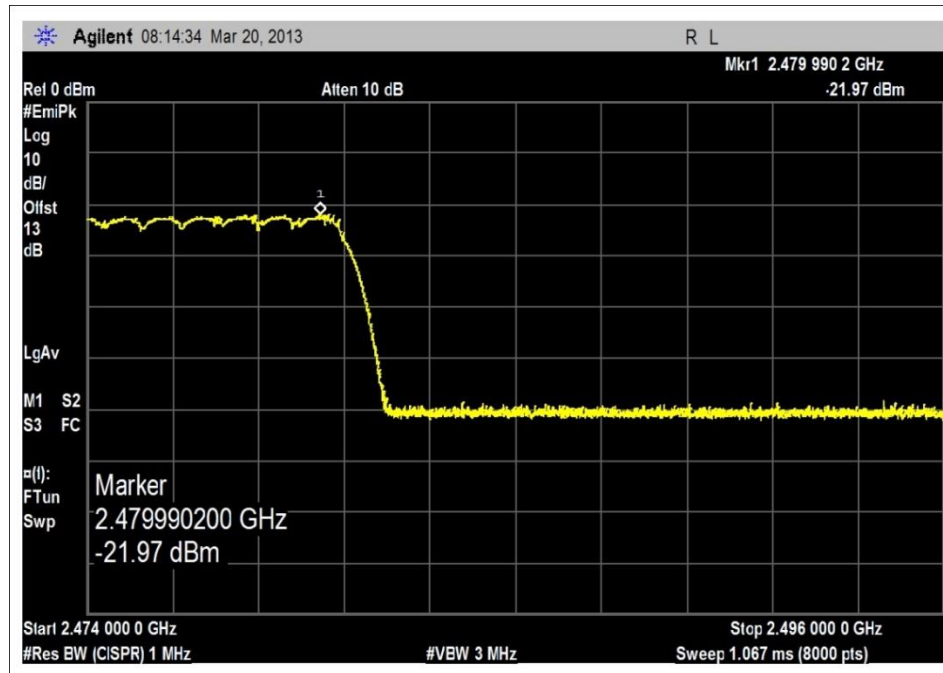
Numbers of Hopping Channels of 8PSK with 3 slot pack length (channel 24 to channel 49)
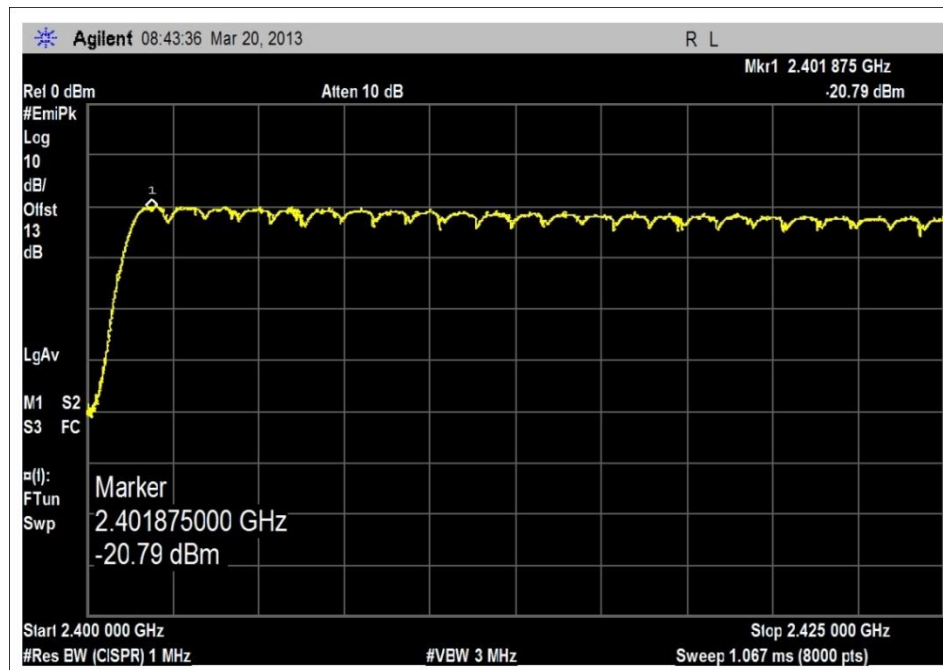

Numbers of Hopping Channels of 8PSK with 3 slot pack length (channel 49 to channel 73)

Numbers of Hopping Channels of 8PSK with 3 slot pack length (channel 73 to channel 79)

Numbers of Hopping Channels of 8PSK with 5 slot pack length (channel 1 to channel 24)

Numbers of Hopping Channels of 8PSK with 5 slot pack length (channel 24 to channel 49)

Numbers of Hopping Channels of 8PSK with 5 slot pack length (channel 49 to channel 73)
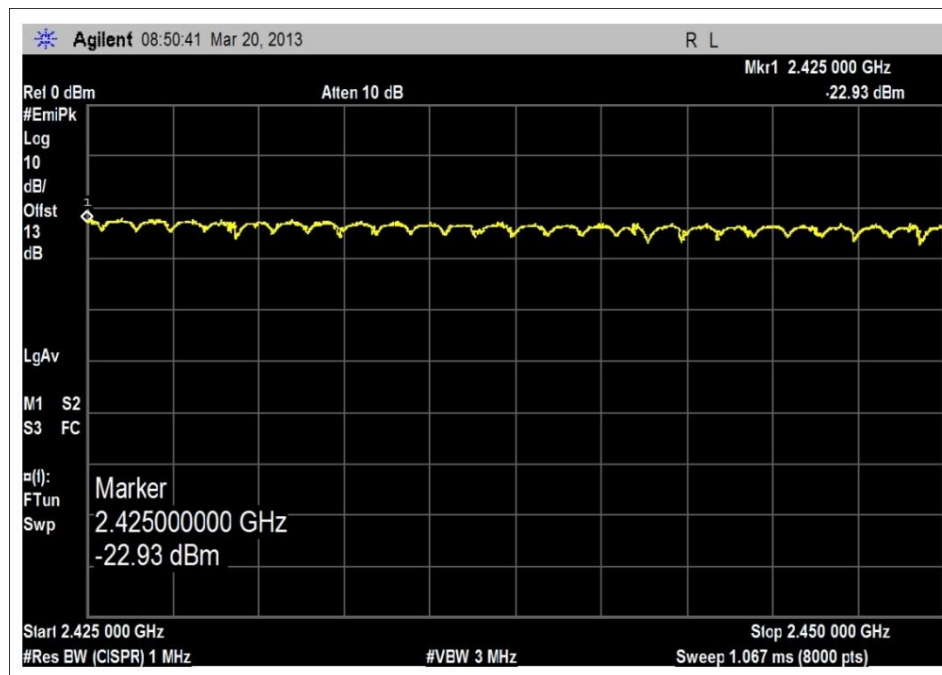
Numbers of Hopping Channels of 8PSK with 5 slot pack length (channel 73 to channel 79)
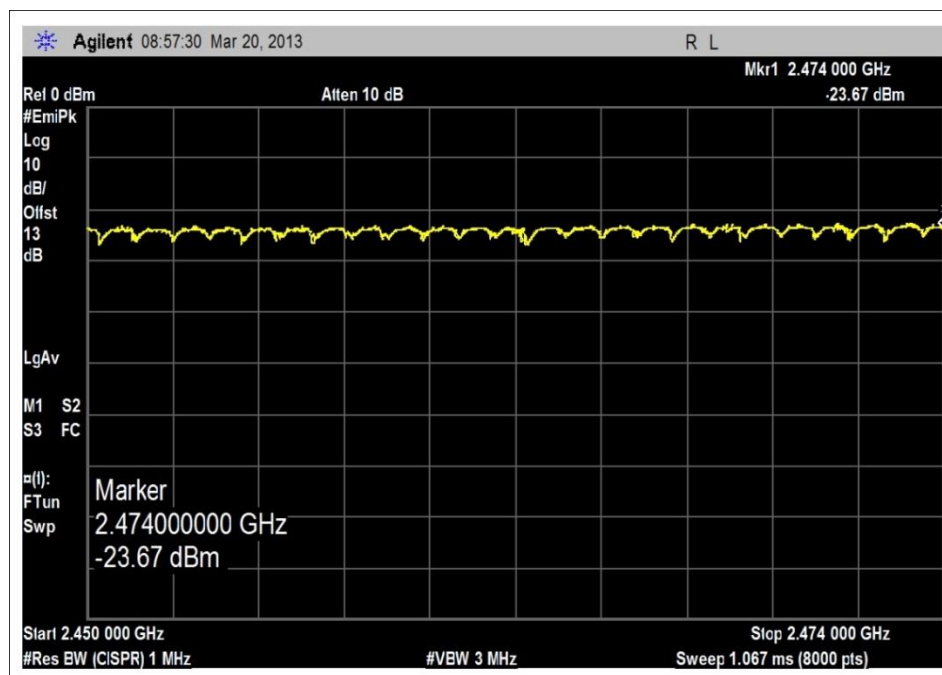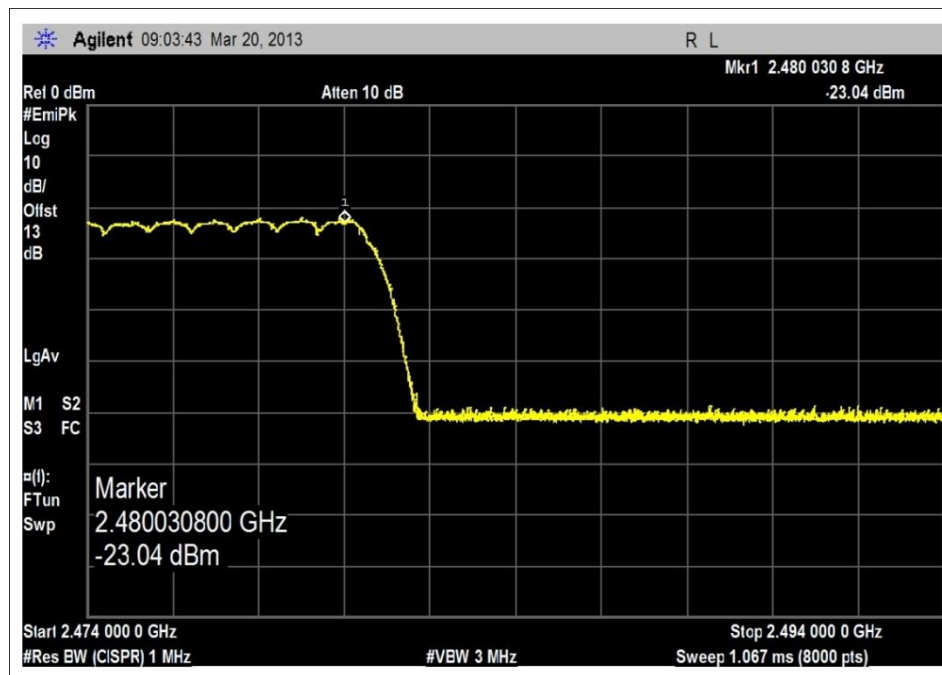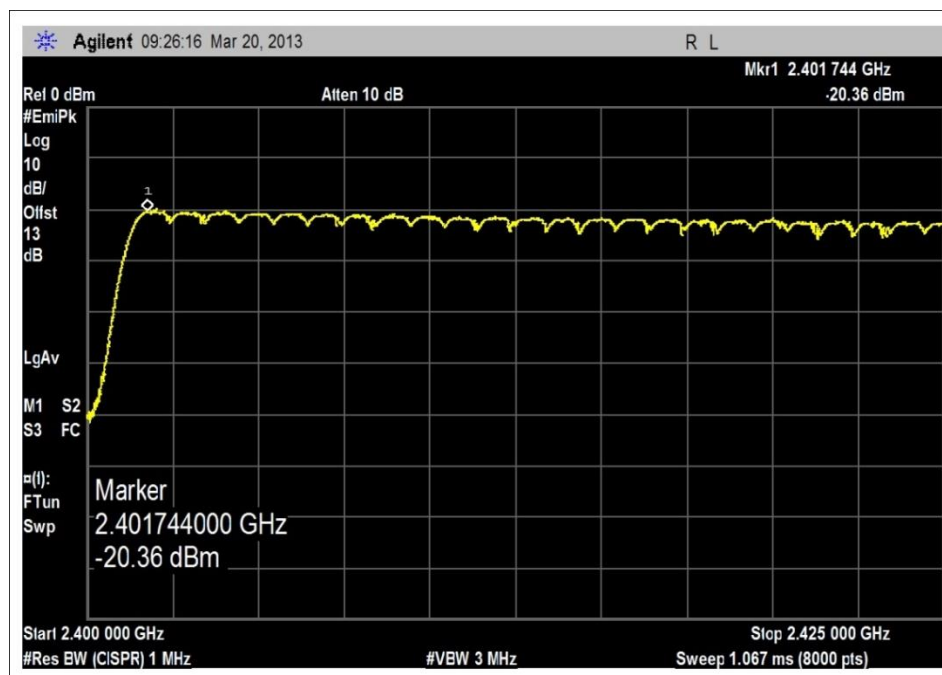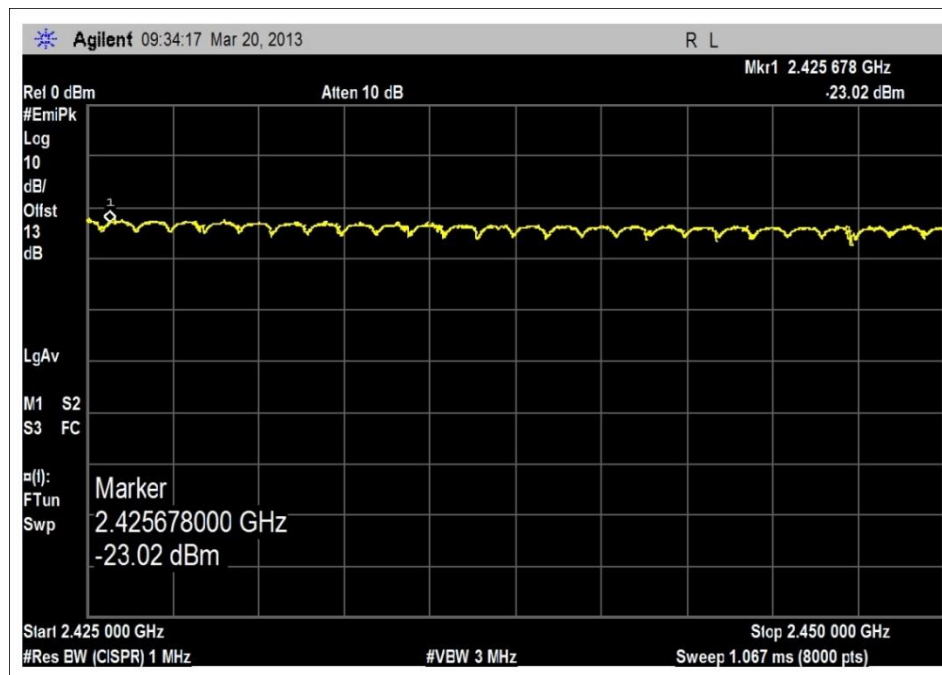
Average Time of Occupancy

Dwell Time GSFK with 1 Slot Packet Length

Event on time =384.8 uS

Channel occupancy in 5s of GFSK with 1 Slot packet length

There are 45 events which occur in 5s

45 events/ 5 second= 9 events per second.

Limit: On time **shall not exceed 0.4 second**, in 0.4 sec x 79 channels (31.6 Sec)

Each events on time = 384.8 uS,

Therefore, in 31.6 second, total on time = 31.6 sec x 9 events /sec x 384.8 uS/event = 0.109s

Dwell Time GSFK with 3 Slot Packet Length

Event on time = 1.6132 ms

Channel occupancy in 5s of GFSK with 3 Slot packet length

There are 22 events which occur in 5s

22 events/ 5 second= 4.4 events per second.

Limit: On time **shall not exceed 0.4 second**, in 0.4 sec x 79 channels (31.6 Sec)

Each events on time = 1.6132 mS,

Therefore, in 31.6 second, total on time = 31.6 sec x 4.4 events /sec x 1.6132 ms/event = 0.2243s

Dwell Time GSFK with 5 Slot Packet length

Event on time = 2.866933 ms

Channel occupancy in 5s of GFSK with 5 Slot packet length
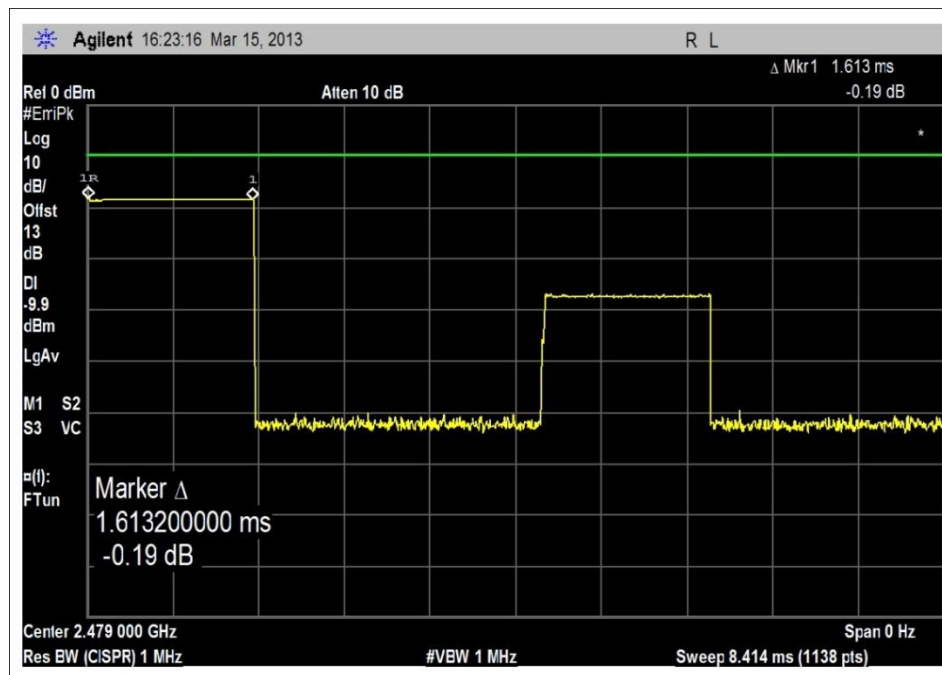

There are 10 events which occur in 5s

10 events/ 5 second= 2 events per second.

Limit: On time **shall not exceed 0.4 second**, in 0.4 sec x 79 channels (31.6 Sec)

Each events on time = 2.866933 mS,

Therefore, in 31.6 second, total on time = 31.6 sec x 2 events /sec x 2.86693 ms/event = 0.182 s

Dwell Time QPSK with 1 Slot Packet length

Event on time = 460.2 us

Channel occupancy in 5s of QPSK with 1 Slot packet length

There are 27 events which occur in 5s

27 events/ 5 second= 5.4 events per second.

Limit: On time **shall not exceed 0.4 second**, in 0.4 sec x 79 channels (31.6 Sec)
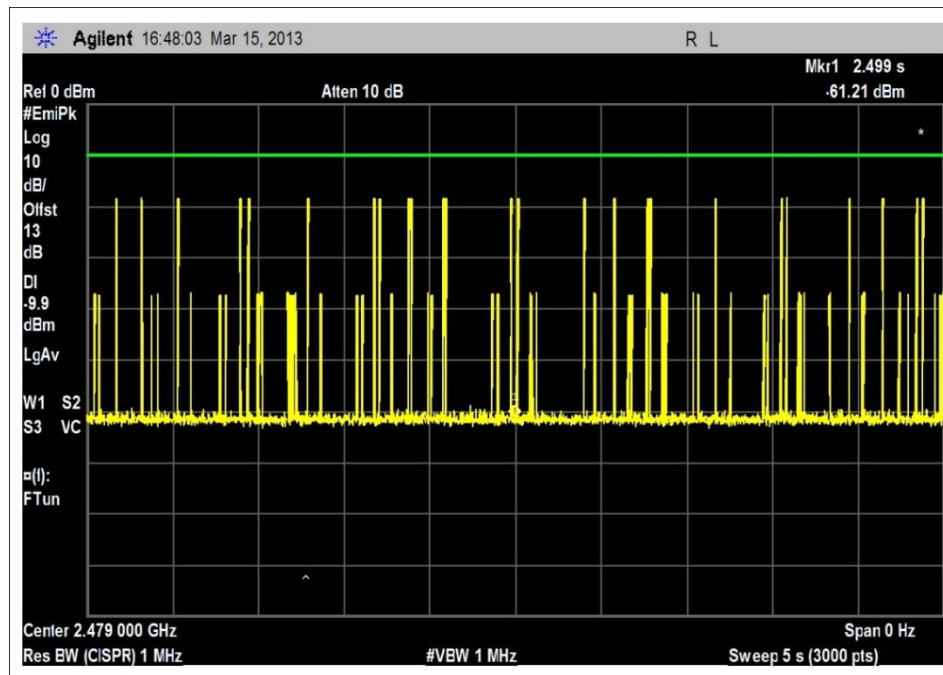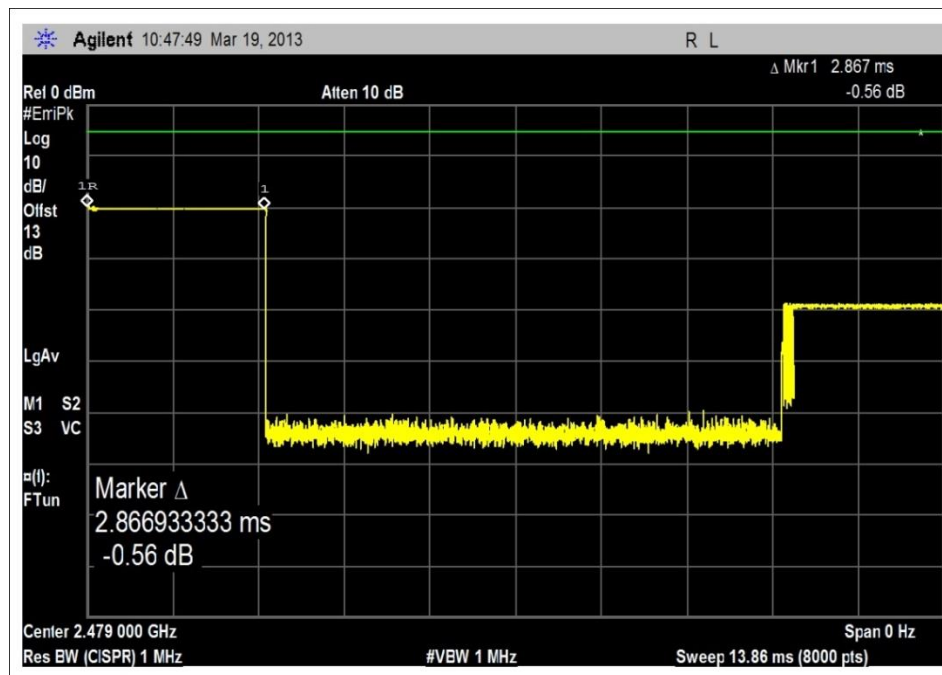
Each events on time = 460.2 uS,

Therefore, in 31.6 second, total on time = 31.6 sec x 5.4 events /sec x 0.4602 ms/event= 0.0786 s

Dwell Time QPSK with 3 Slot Packet length

Event on time = 1.6388 ms

Channel occupancy in 5s of QPSK with 3 Slot packet length

There are 25 events which occur in 5s

25 events/ 5 second= 5 events per second.

Limit: On time **shall not exceed 0.4 second**, in 0.4 sec x 79 channels (31.6 Sec)
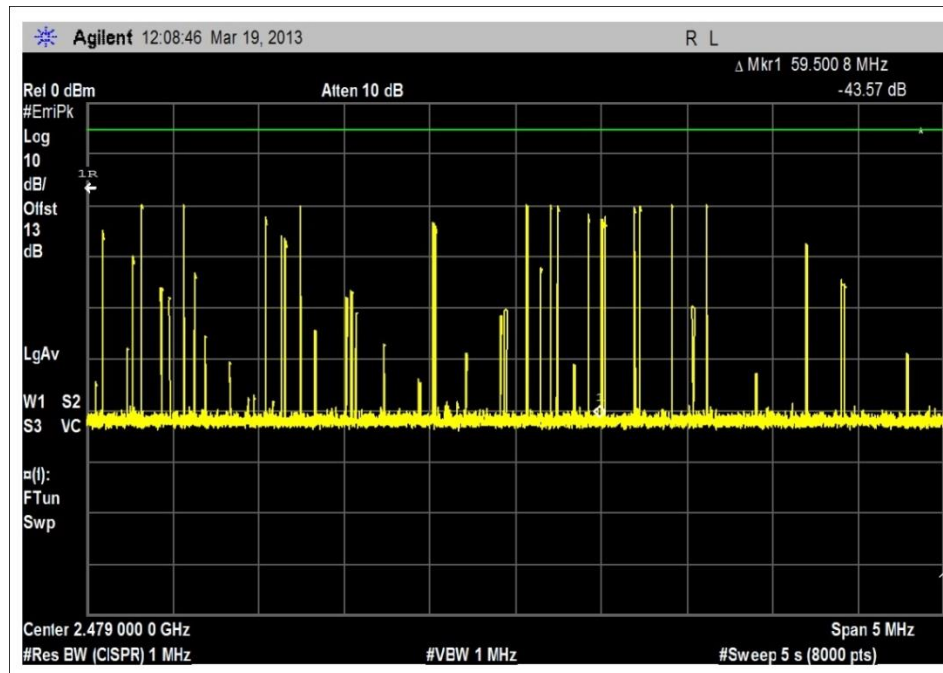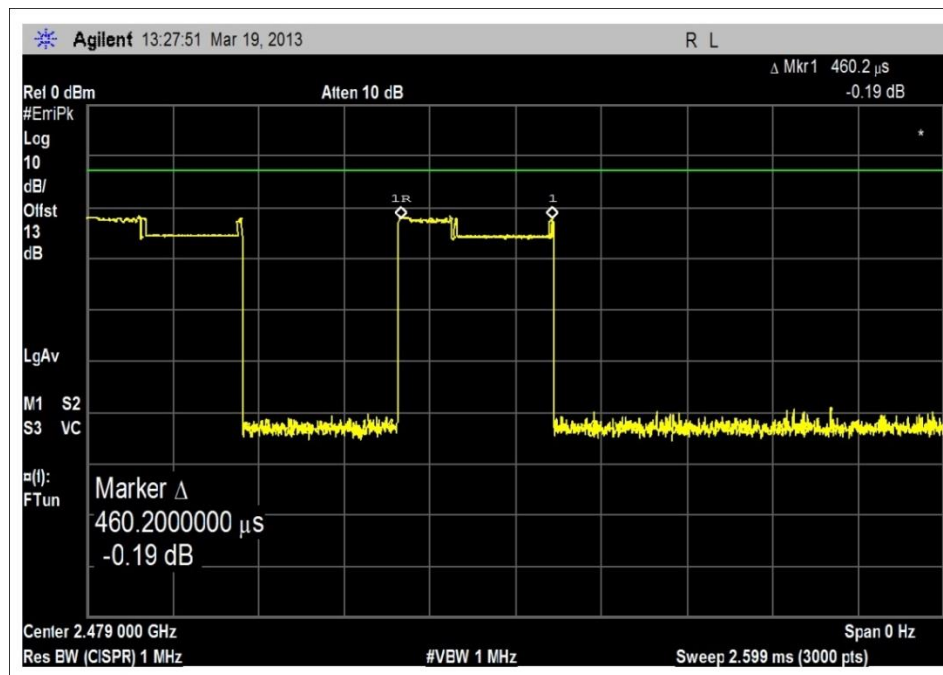
Each events on time = 1.6388 mS,

Therefore, in 31.6 second, total on time = 31.6 sec x 5 events /sec x 1.6388 ms/event= 0.259 s

Dwell Time QPSK with 5 Slot Packet length

Event on time = 2.8974 ms

Channel occupancy in 5s of QPSK with 5 Slot packet length

There are 16 events which occur in 5s

16 events/ 5 second= 3.2 events per second.

Limit: On time **shall not exceed 0.4 second**, in 0.4 sec x 79 channels (31.6 Sec)
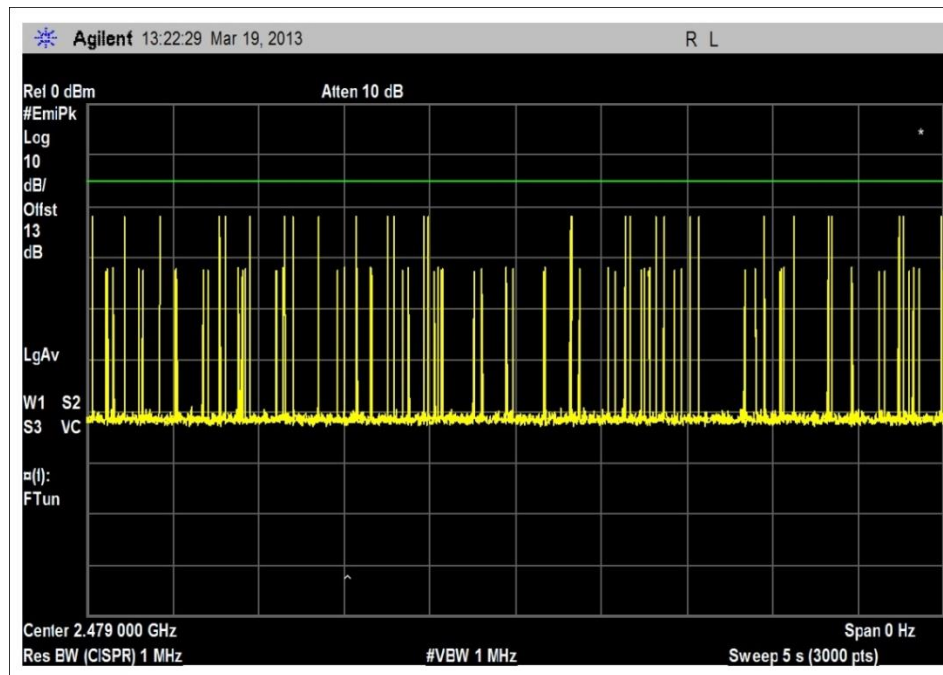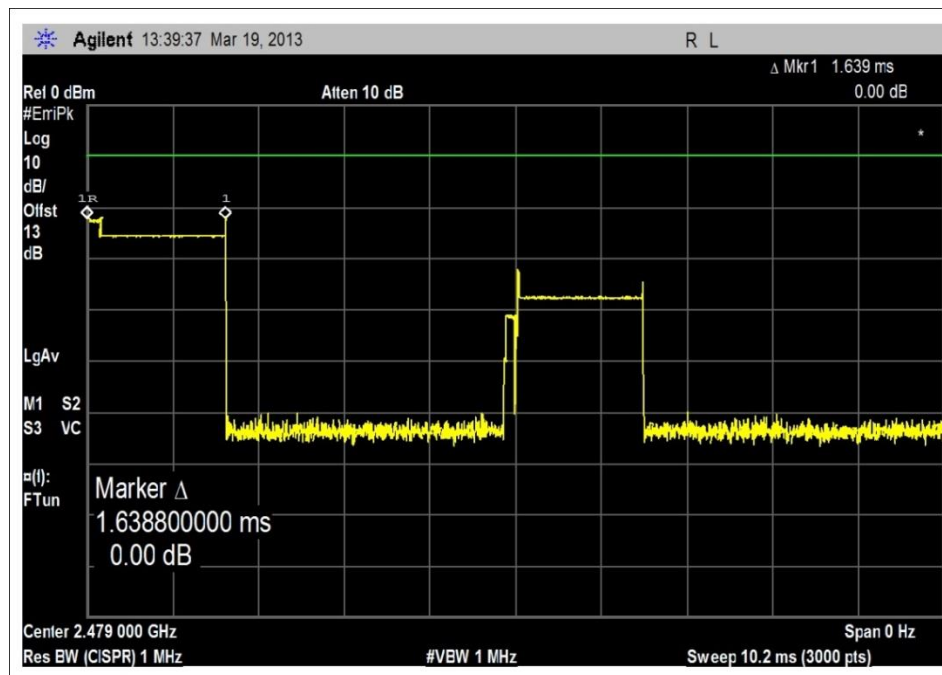
Each events on time = 2.8974 mS,

Therefore, in 31.6 second, total on time = 31.6 sec x 3.2 events /sec x 2.8974 ms/event= 0.293 s

Dwell Time 8PSK with 1 Slot Packet length

Event on time = 390.0 uS

Channel occupancy in 5s of 8PSK with 1 Slot packet length
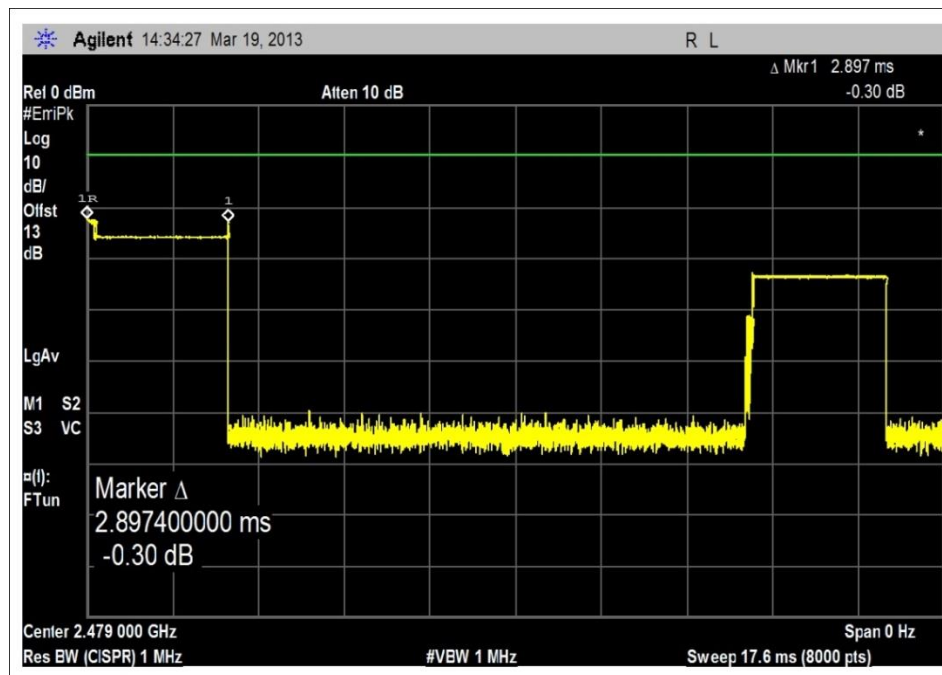

There are 26 events which occur in 5s

26 events/ 5 second= 5.2 events per second.

Limit: On time **shall not exceed 0.4 second**, in 0.4 sec x 79 channels (31.6 Sec)

Each events on time = 390 uS,

Therefore, in 31.6 second, total on time = 31.6 sec x 5.2 events /sec x 0.39 ms/event= 0.0641 s

Dwell Time 8PSK with 3 Slot Packet length

Event on time = 1.6543 mS

Channel occupancy in 5s of 8PSK with 3 Slot packet length

There are 22 events which occur in 5s

22 events/ 5 second= 4.4 events per second.

Limit: On time **shall not exceed 0.4 second**, in 0.4 sec x 79 channels (31.6 Sec)
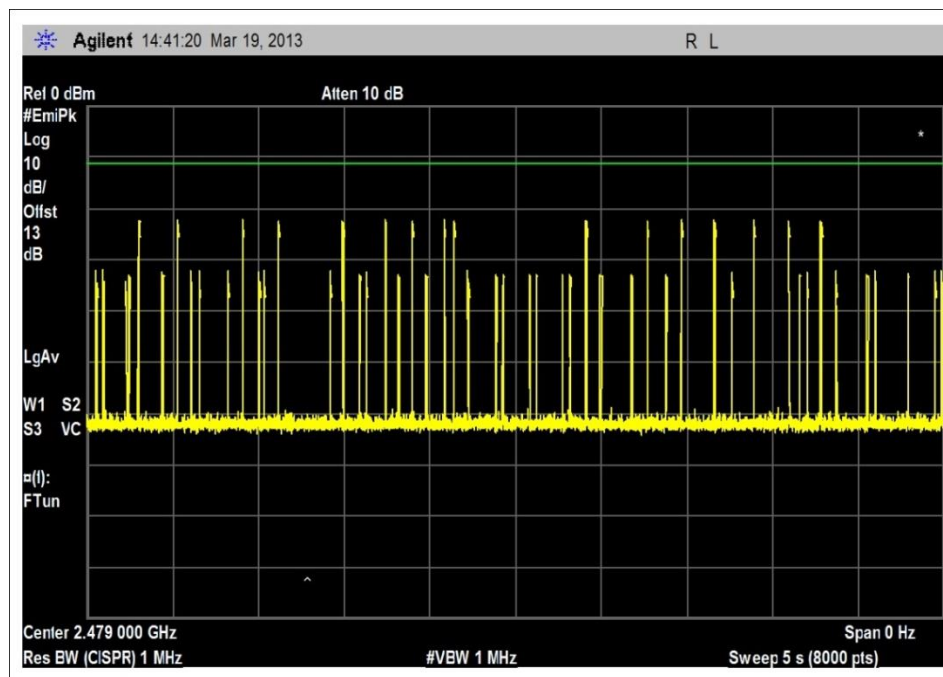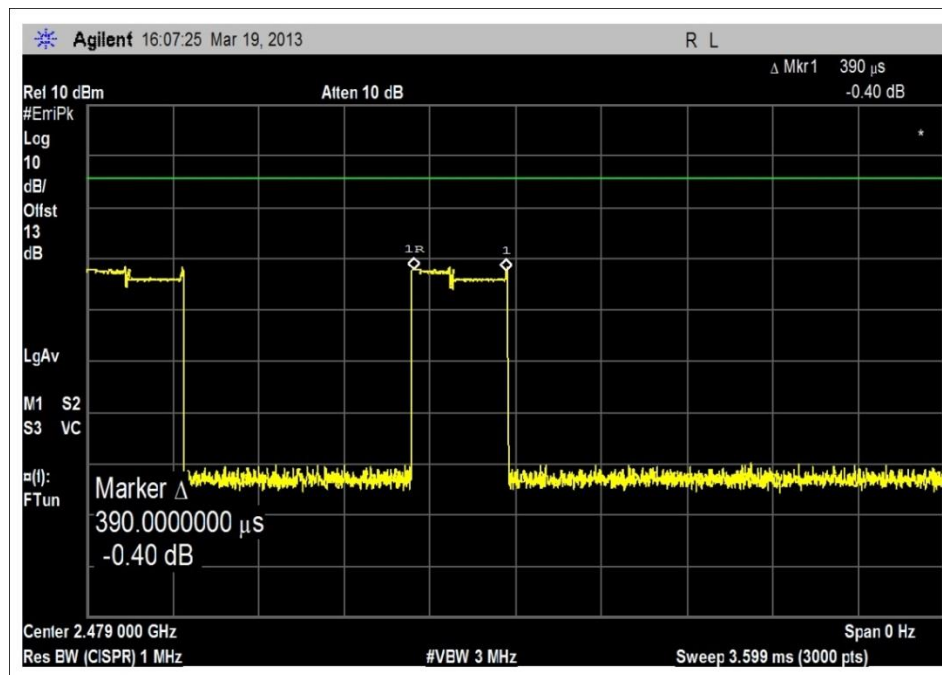
Each events on time = 1.6543 mS,

Therefore, in 31.6 second, total on time = 31.6 sec x 4.4 events /sec x 1.6543 ms/event= 0.231 s

Dwell Time 8PSK with 5 Slot Packet length

Event on time = 2.8981 mS

Channel occupancy in 5s of 8PSK with 5 Slot packet length

There are 17 events which occur in 5s

17 events/ 5 second= 3.4 events per second.

Limit: On time **shall not exceed 0.4 second**, in 0.4 sec x 79 channels (31.6 Sec)
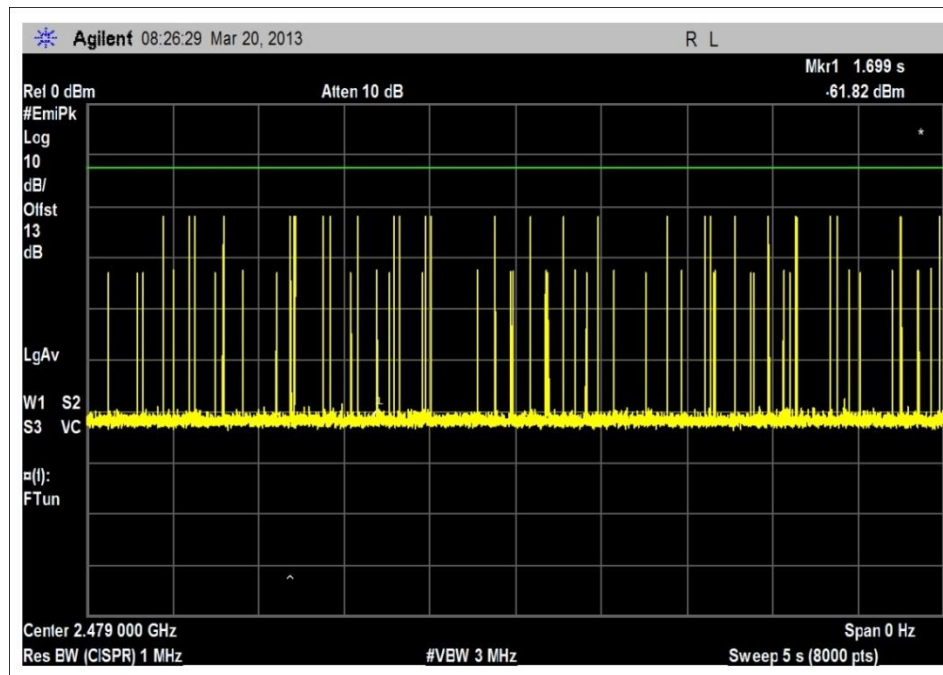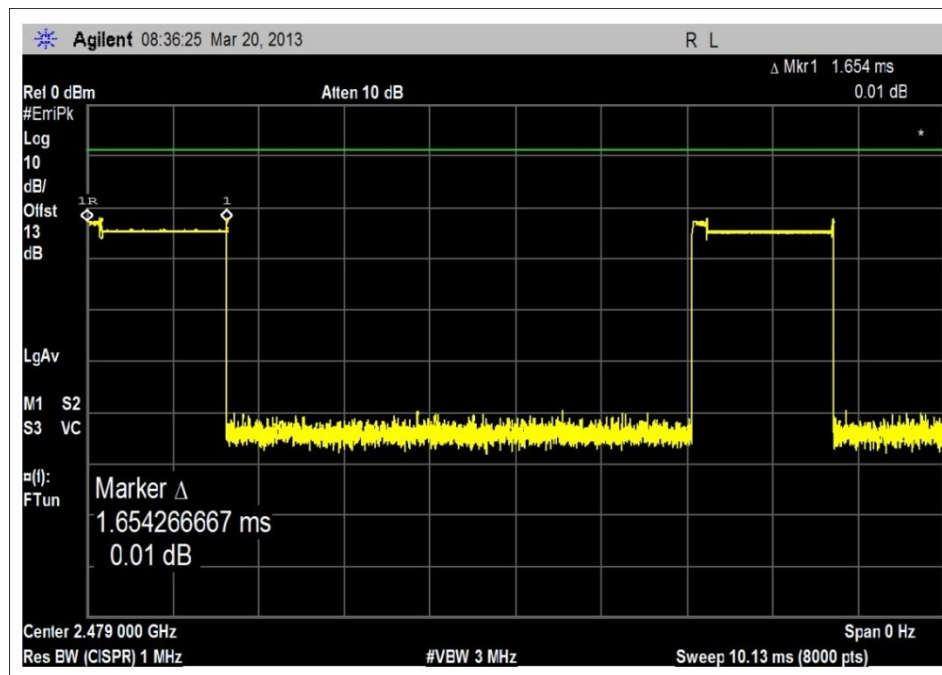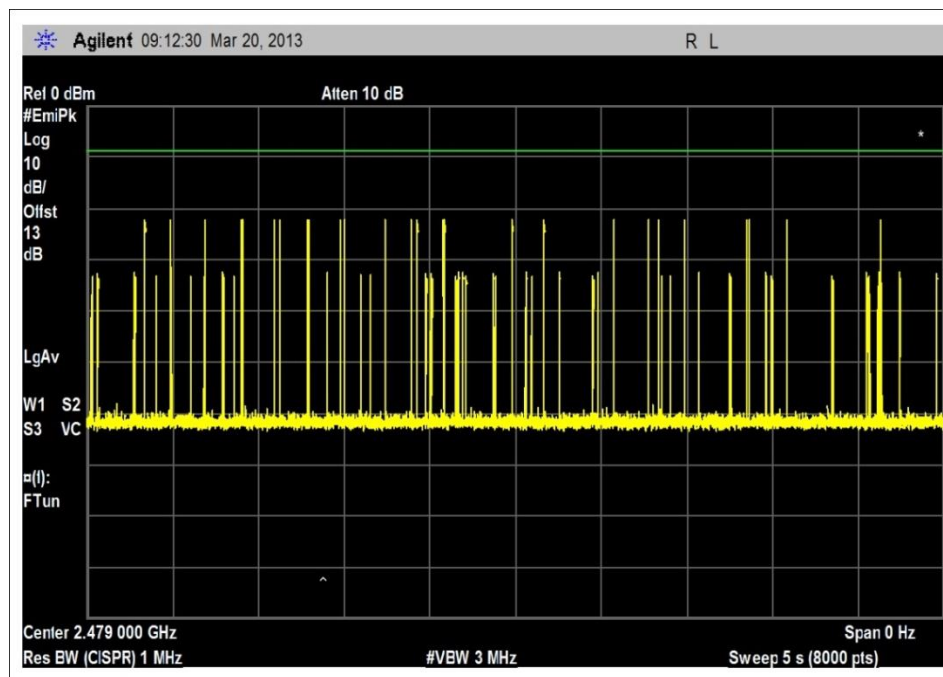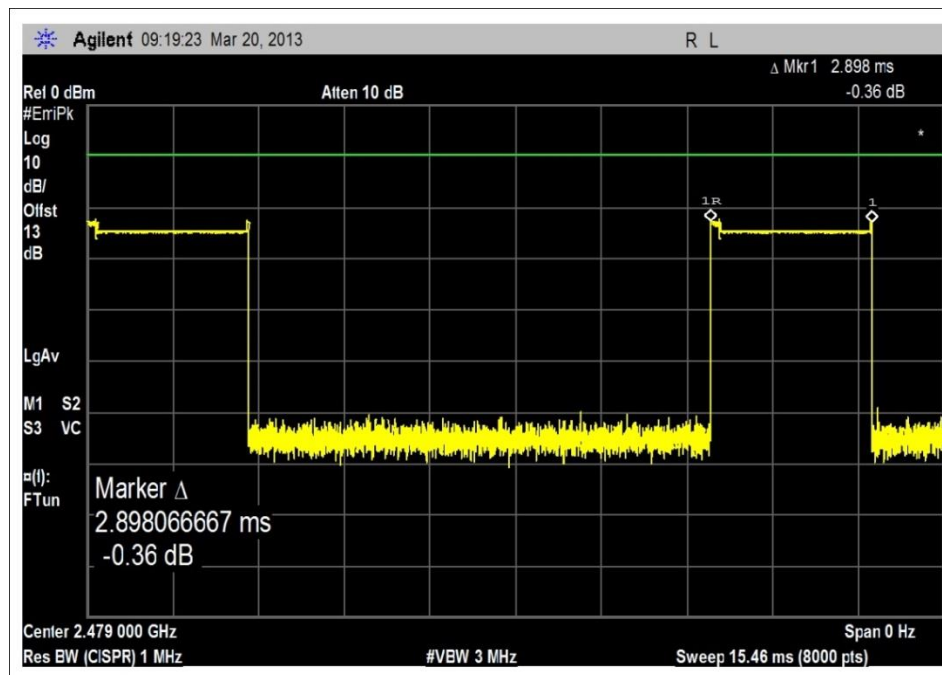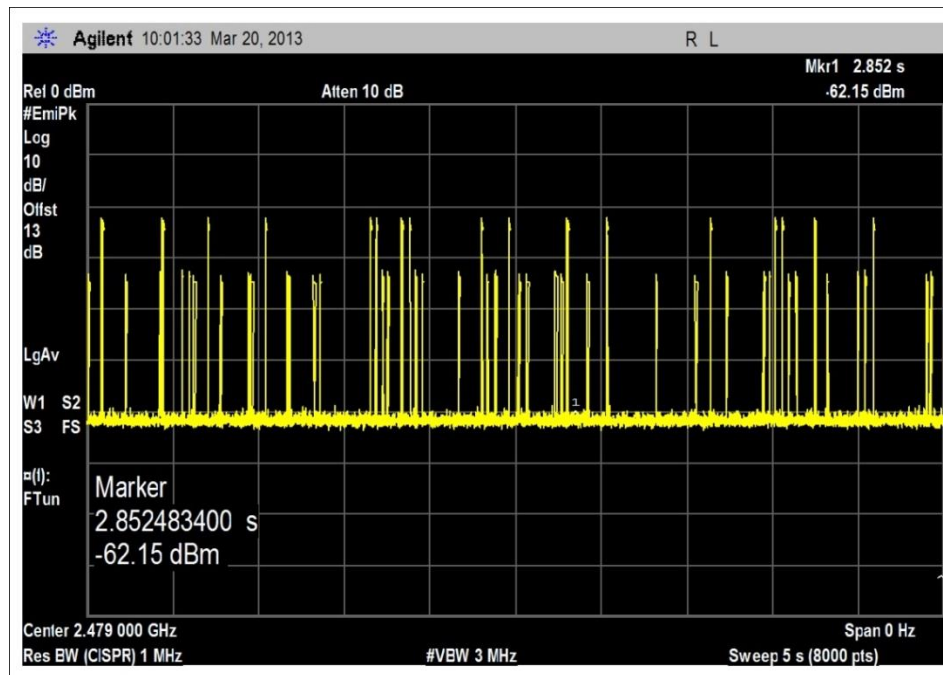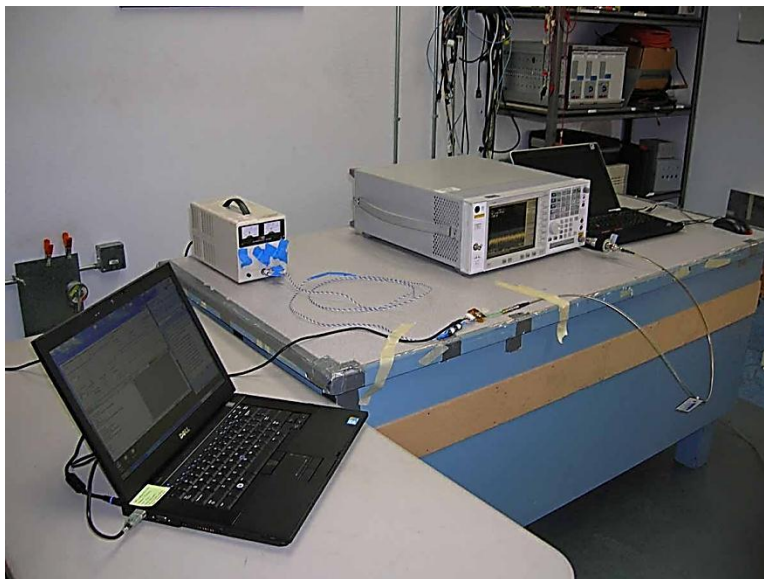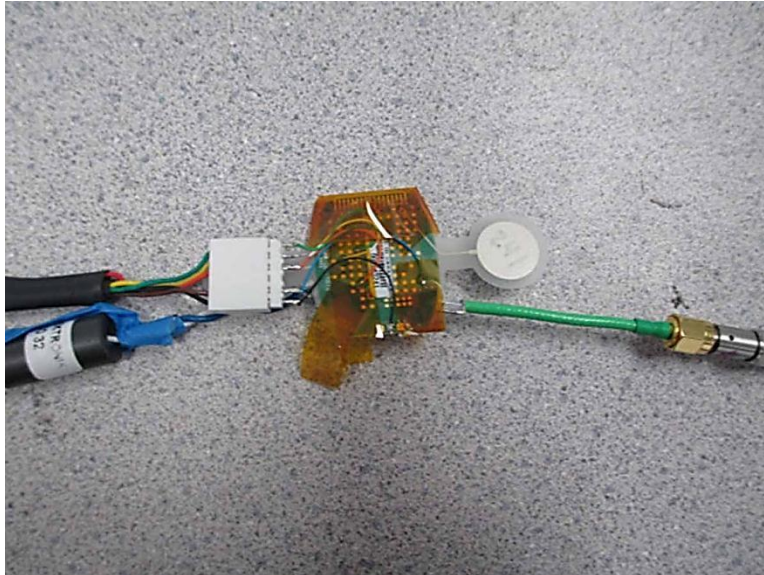
Each events on time = 2.8981 mS,

Therefore, in 31.6 second, total on time = 31.6 sec x 3.4 events /sec x 2.8981 ms/event= 0.311 s

Test Setup Photos

-20dBc & 99% Occupied Bandwidth

Test Location: CKC Laboratories, Inc. • 1120 Fulton Places • Fremont, CA 94539 • (510) 249-1170

Customer: **Proteus Digital Health, Inc.**
Specification: **Occupied Band Width**
Work Order #:   **94175**   Date: 3/12/2013
                                                        Time: 14:47:55
Equipment: **PPM (RP4) Electronics Module**   Sequence#: 3
Manufacturer: Proteus Digital Health, Inc.   Tested By: Hieu Song Nguyenpham
Model: SPC-0175
S/N: None

*Test Equipment***:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	ANP05843	Cable	32022-2-29094K-48TC	8/7/2012	8/7/2014
	AN02668	Spectrum Analyzer	E4446A	2/22/2013	2/22/2015

Equipment Under Test (*** = EUT**)**:**

Function	Manufacturer	Model #	S/N
PPM (RP4) Electronic Module*	Proteus Digital Health, Inc.	SPC-0175	None

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop AC/DC Power Adapter	Dell	D130PE1-00	CN-0JU012-48661-09U-K8GG-A04
Laptop	Dell	Latitude E6500	B76FVL1
DC power Supply	EZ	GP-4303A	01070038
USB to TTL Serial Cable-1.8m Wire End Version	FTDI	TTL-232RG-VREG1V8-WE	None

Test Conditions / Notes:

The EUT is a battery device, and it is adaptive equipment. The EUT is placed on the test bench. The measurement is performed at the antenna port. The service port is connected to a laptop for testing configuration purposes. Instead of using a fresh battery, the EUT is connected to a DC power supply at 2.4V

Temperature: 19.9°C

Humidity: 40 %

Atmospheric Pressure:101.9kPa

High Clock: 26MHz

Software Used: HCI Lite

Rate power = +4dBm (nominal)
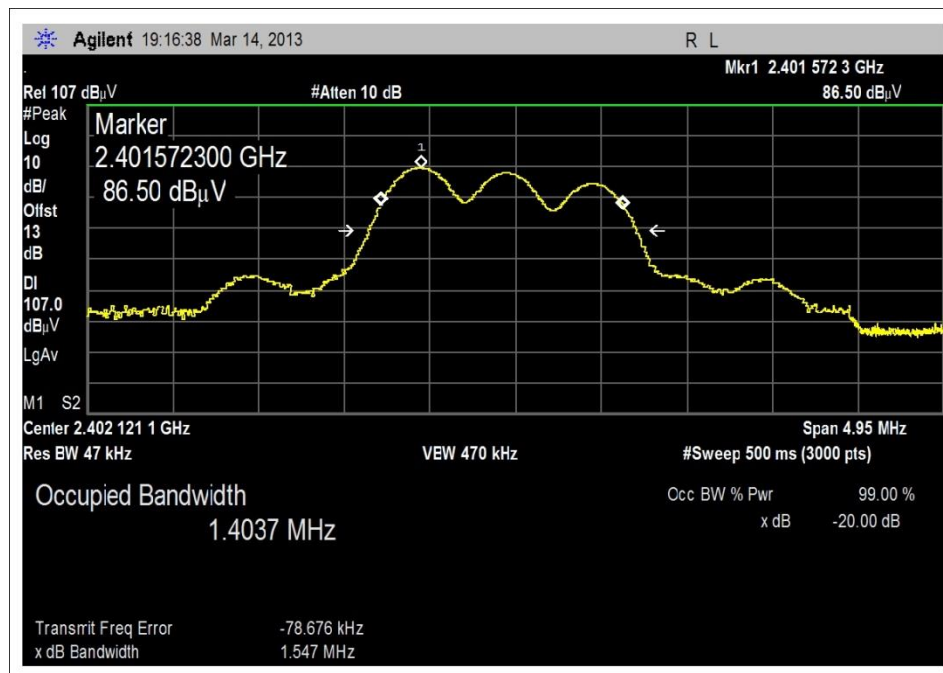Transmitter Operation Frequency Range: 2400 - 2483.5 MHz
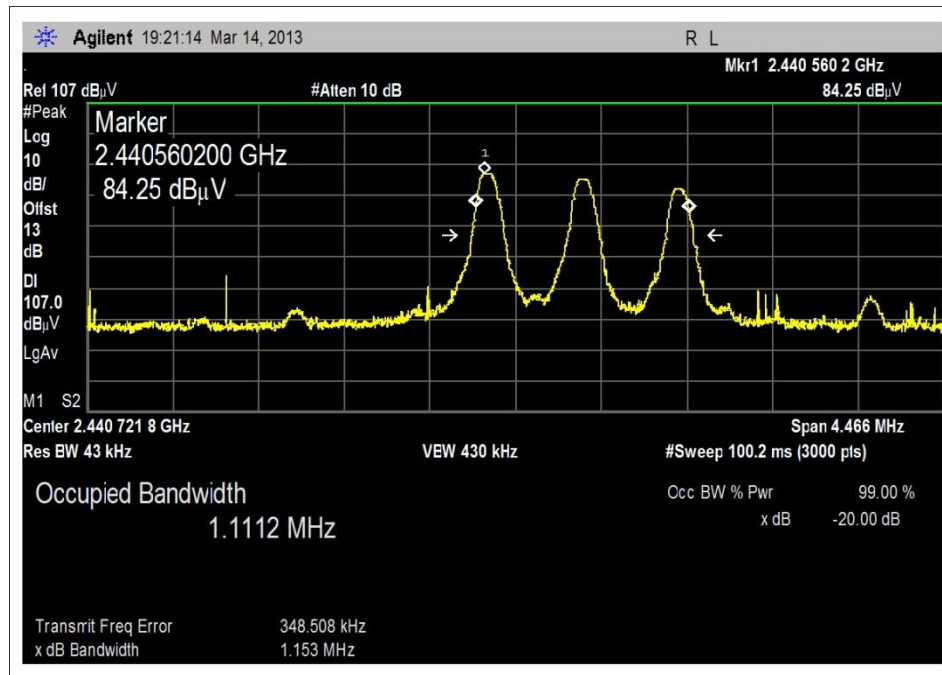

Low Channel: 2402MHz

Middle Channel: 2441MHz

High Channel: 2480MHz

10dB External attenuation, 1.72 dB gain of the antenna and 0.9dB cable loss compensated as amplitude offset entered into the spectrum analyzer.
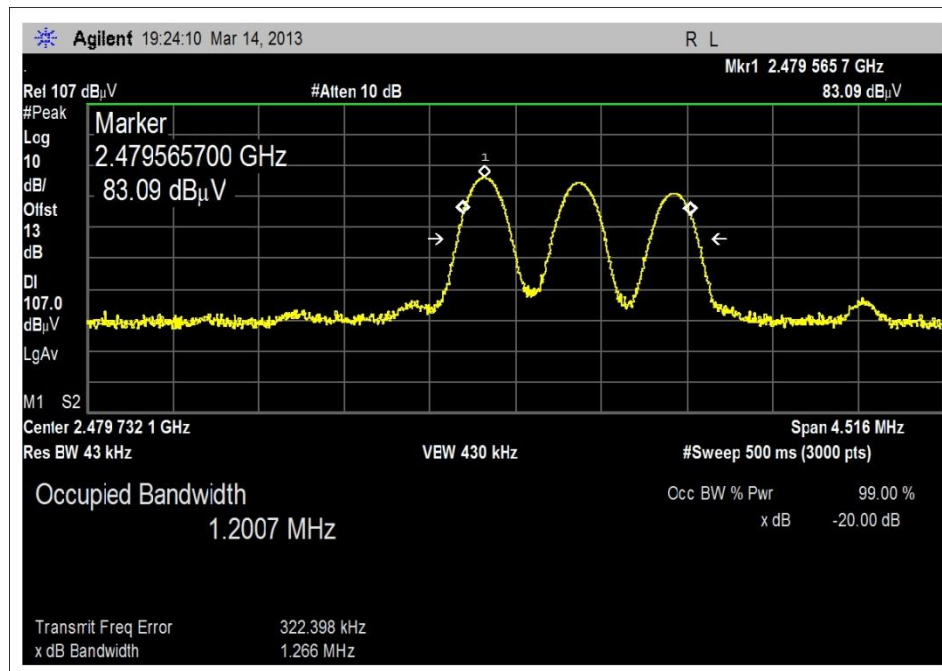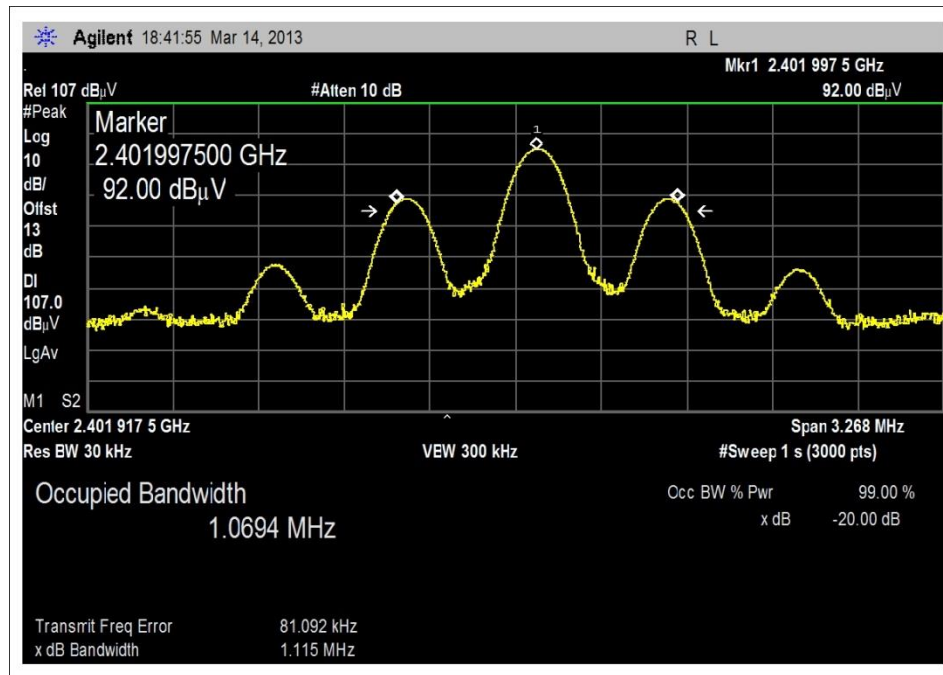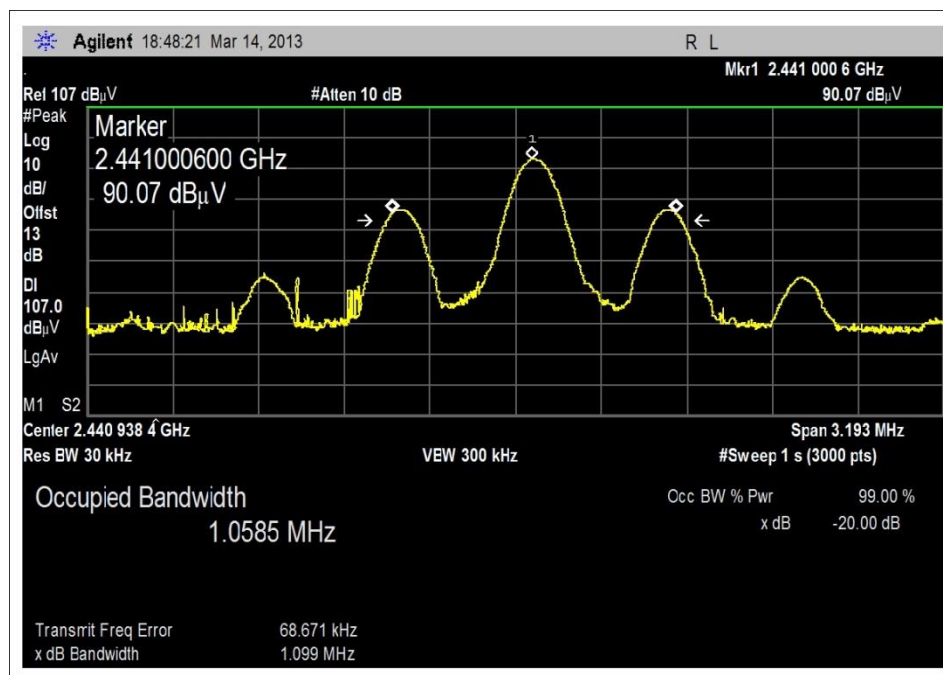
Test Plots

8PSK Module, Low Channel
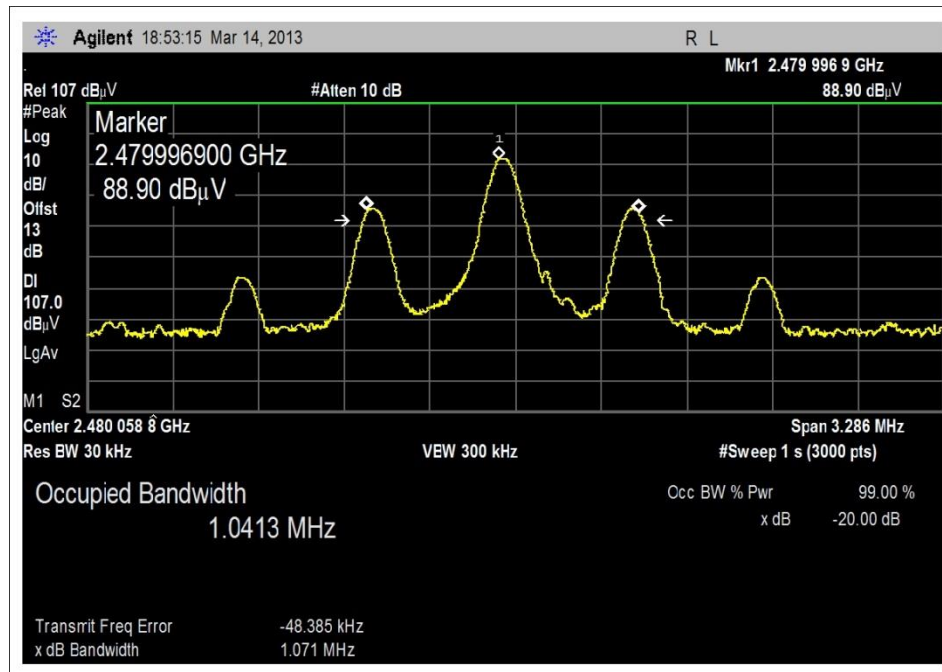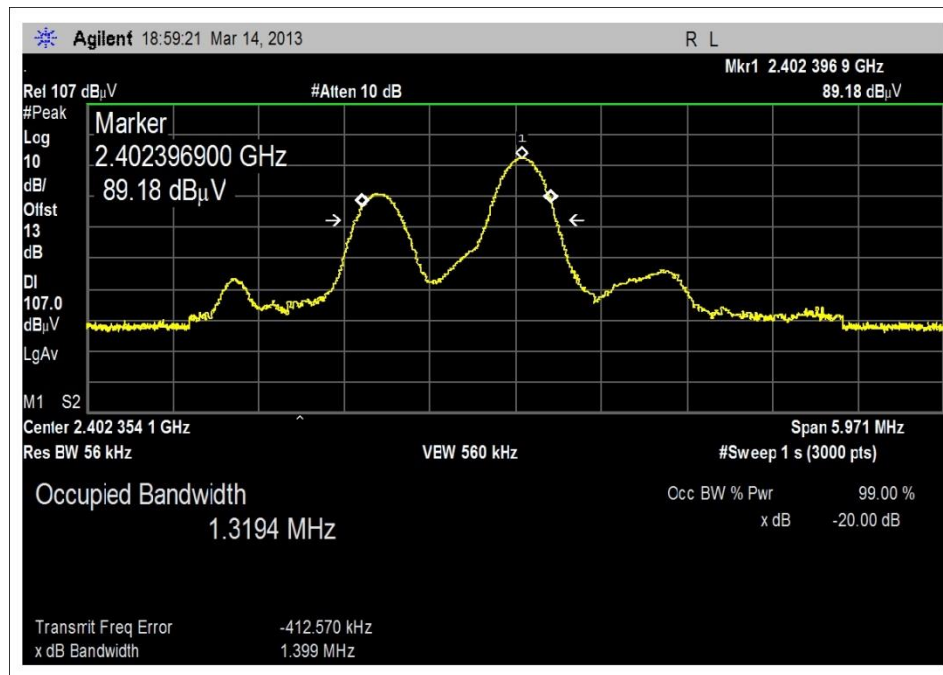
8PSK Module, Middle Channel

8PSK Module, High Channel
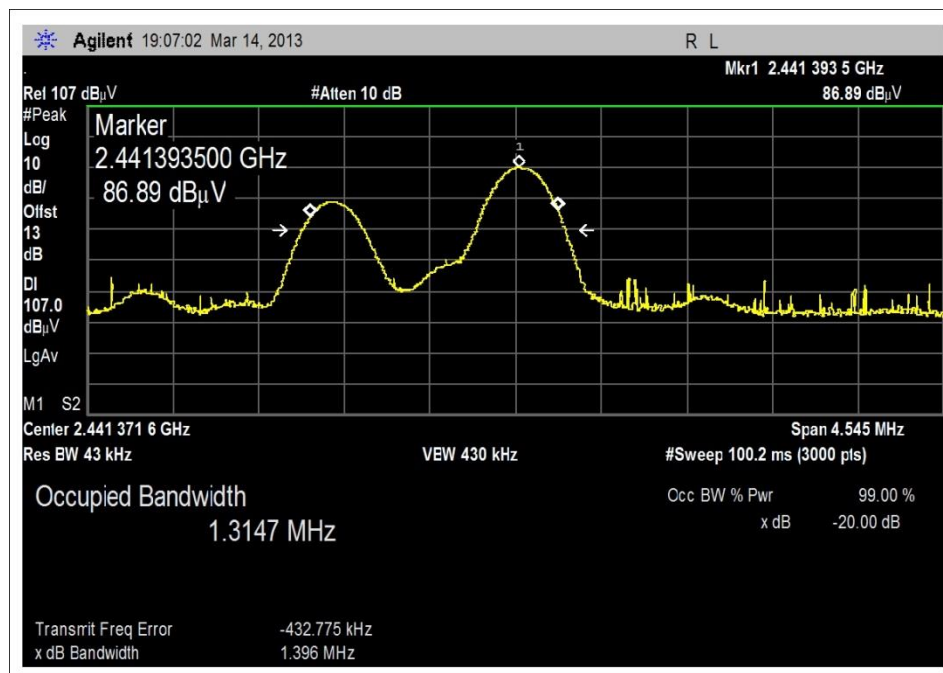
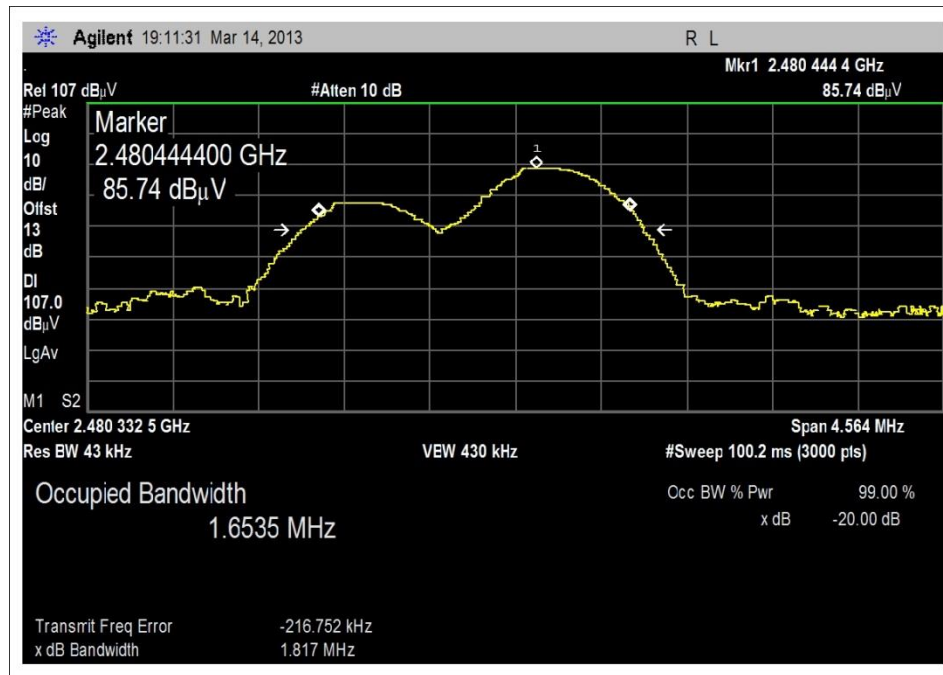GFSK Module, Low Channel

GFSK Module, Middle Channel

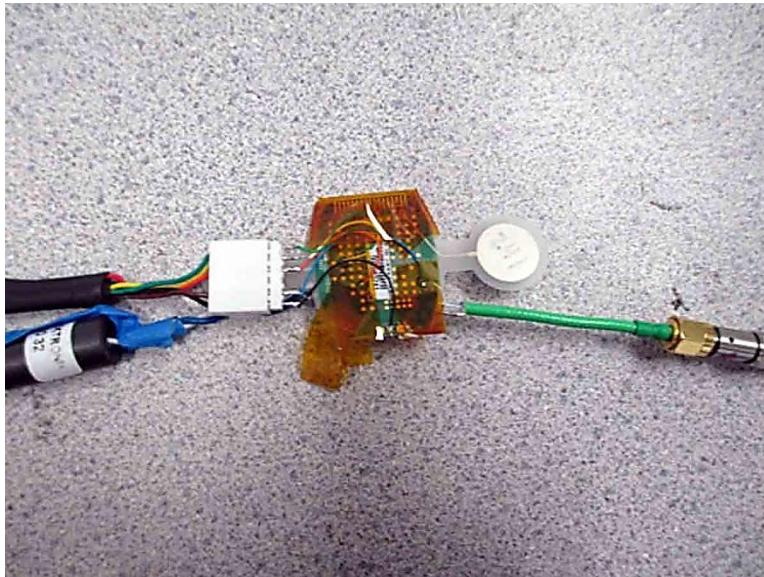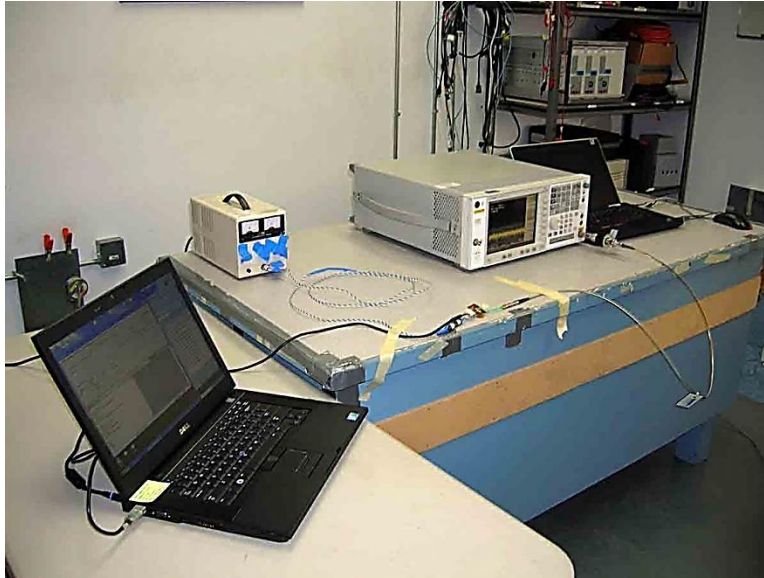GFSK Module, High Channel

QPSK Module, Low Channel

QPSK Module, Middle Channel

QPSK Module, High Channel

Test Setup Photos

Bandedge

Test Location: CKC Laboratories, Inc. • 1120 Fulton Places • Fremont, CA 94539 • (510) 249-1170

Customer: **Proteus Digital Health, Inc.**
Specification: **Band Edge**

Work Order #: **94175**

Date: 3/12/2013
Time: 14:47:55

Equipment: **PPM (RP4) Electronics Module**
Manufacturer: Proteus Digital Health, Inc.
Model: SPC-0175
S/N: None

Sequence#: 3
Tested By: Hieu Song Nguyenpham

*Test Equipment***:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02668	Spectrum Analyzer	E4446A	2/22/2013	2/22/2015
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/23/2013	1/23/2015
T2	ANP01210	Cable	FSJ1P-50A-4A	2/19/2013	2/19/2015
T3	AN03302	Cable	32026-29094K-29094K-72TC	3/21/2012	3/21/2014

Equipment Under Test (* = **EUT**):

Function	Manufacturer	Model #	S/N
PPM (RP4) Electronic Module*	Proteus Digital Health, Inc.	SPC-0175	None

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop AC/DC Power Adapter	Dell	D130PE1-00	CN-0JU012-48661-09U-K8GG-A04
Laptop	Dell	Latitude E6500	B76FVL1
DC power Supply	EZ	GP-4303A	01070038
USB to TTL Serial Cable-1.8m Wire End Version	FTDI	TTL-232RG-VREG1V8-WE	None

The EUT is a battery device, and it is adaptive equipment. The EUT is placed on 80cm table right at the center of the turning table. The EUT is orientated at Z –axis position. . Instead of using a fresh battery, the EUT is connected to a DC power supply at 2.4V

Temperature: 19.9°C
Humidity: 40 %
Atmospheric Pressure:101.9kPa

High Clock: 26MHz
Software Used: HCI Lite
Rate power = +4dBm (nominal)

Transmitter Operation Frequency Range: 2400 - 2483.5 MHz

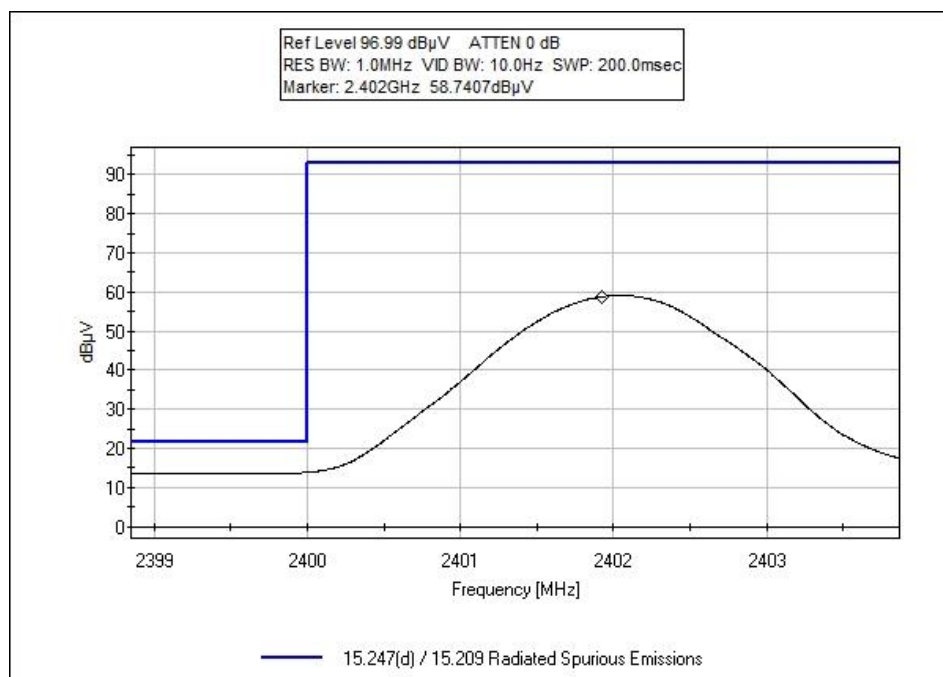Low Channel: 2402MHz
Middle Channel: 2441MHz
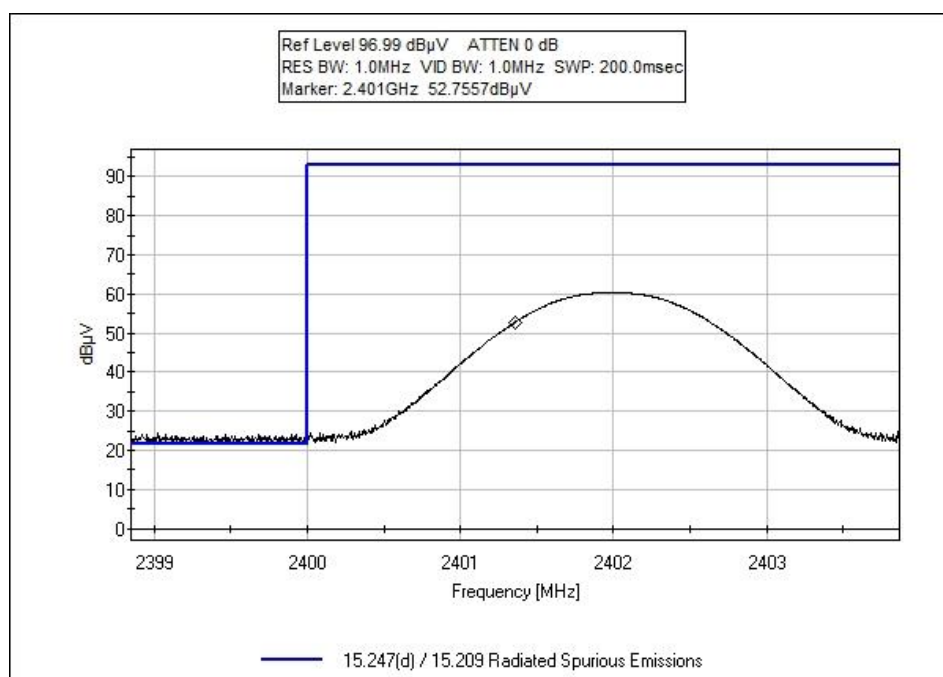High Channel: 2480MHz

Note:
GFSK is the worst module.
Bit Pattern =10101010
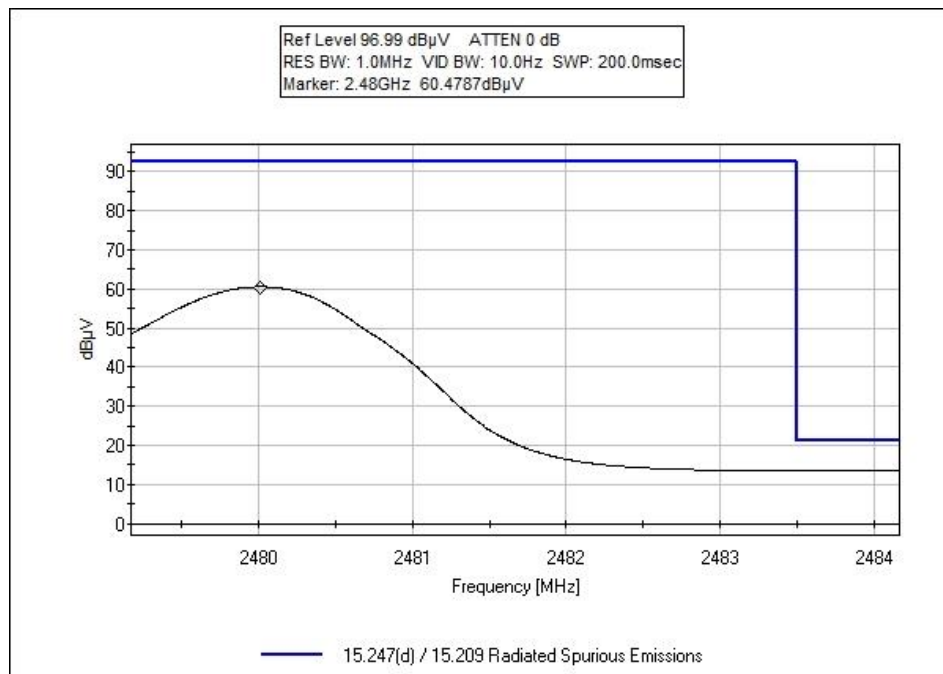Two ferrites (742 700 32) on a cable which connects from the EUT to a DC power supply with one pass through.
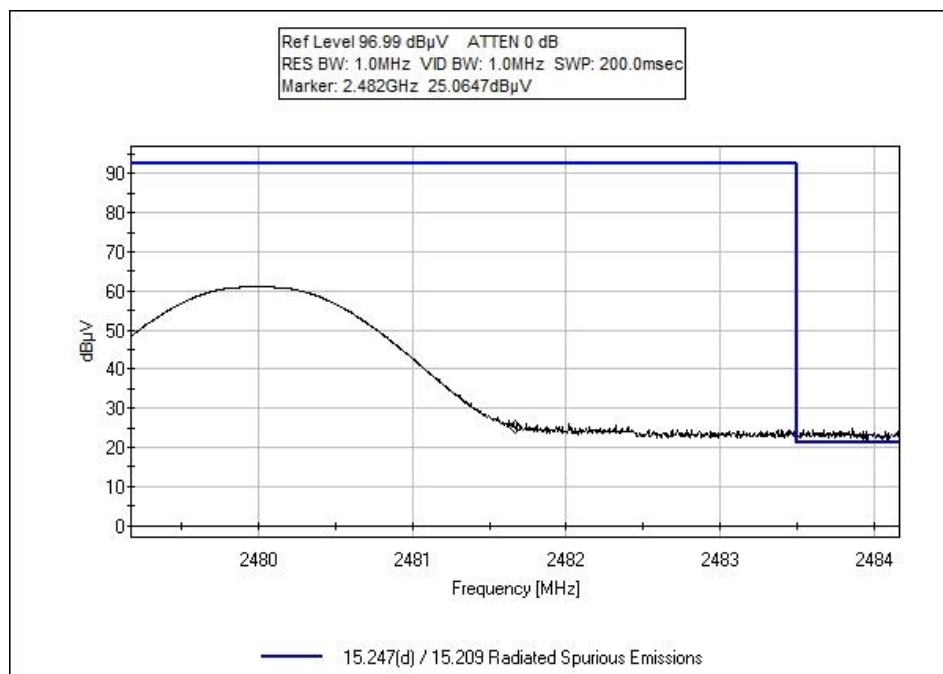
Test Plots

GFSK Module, Low Channel - Ave

GFSK Module, Low Channel -Peak

GFSK Module, High Channel - Ave

GFSK Module, High Channel - Peak

Test Setup Photos