

Appendix A

RF Test Data (Conducted Measurement)

Product Name: 2.4 GHz Wireless Paddles

Trade Mark: N/A

Test Model: ARC300

Environmental Conditions

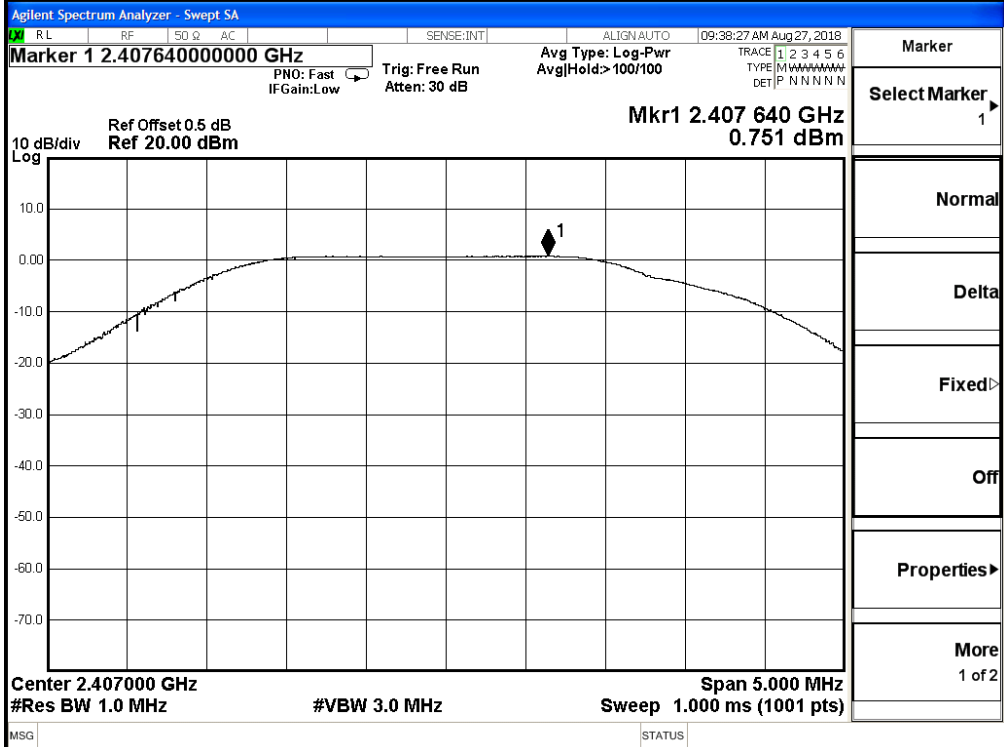
Temperature:	22.6 °C
Relative Humidity:	53.6%
ATM Pressure:	100.0 kPa
Test Engineer:	Wilson Hong
Supervised by:	Jayden.Zhuo

A.1 Maximum Conducted Peak Output Power

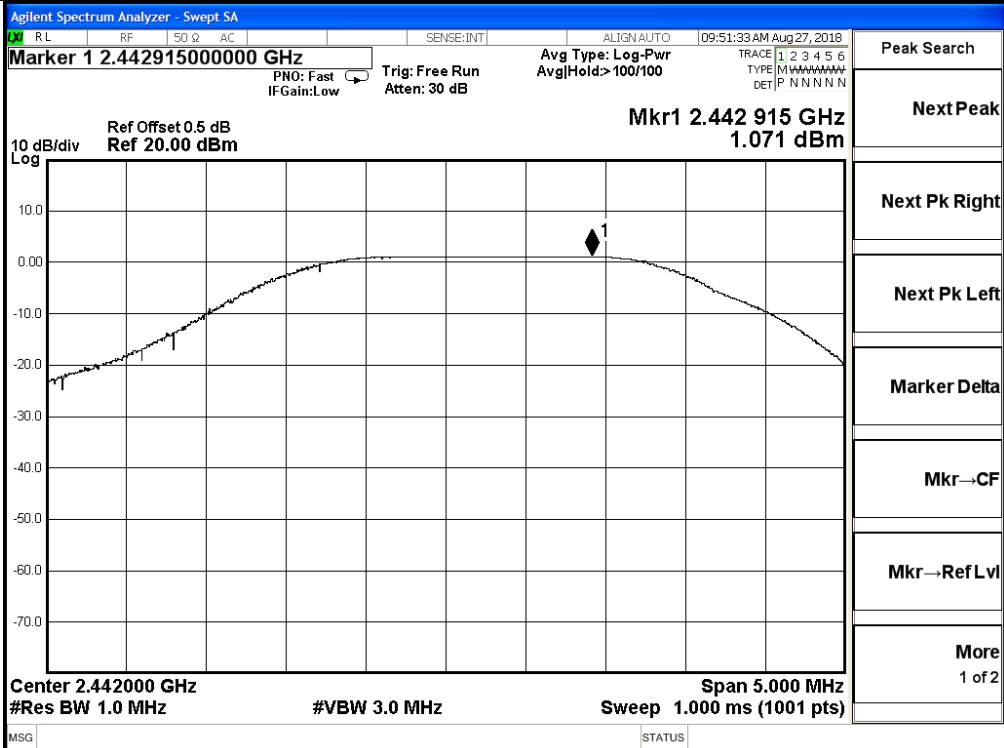
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	0.751	30	PASS
	MCH	1.071	30	PASS
	HCH	1.129	30	PASS

Test Graphs

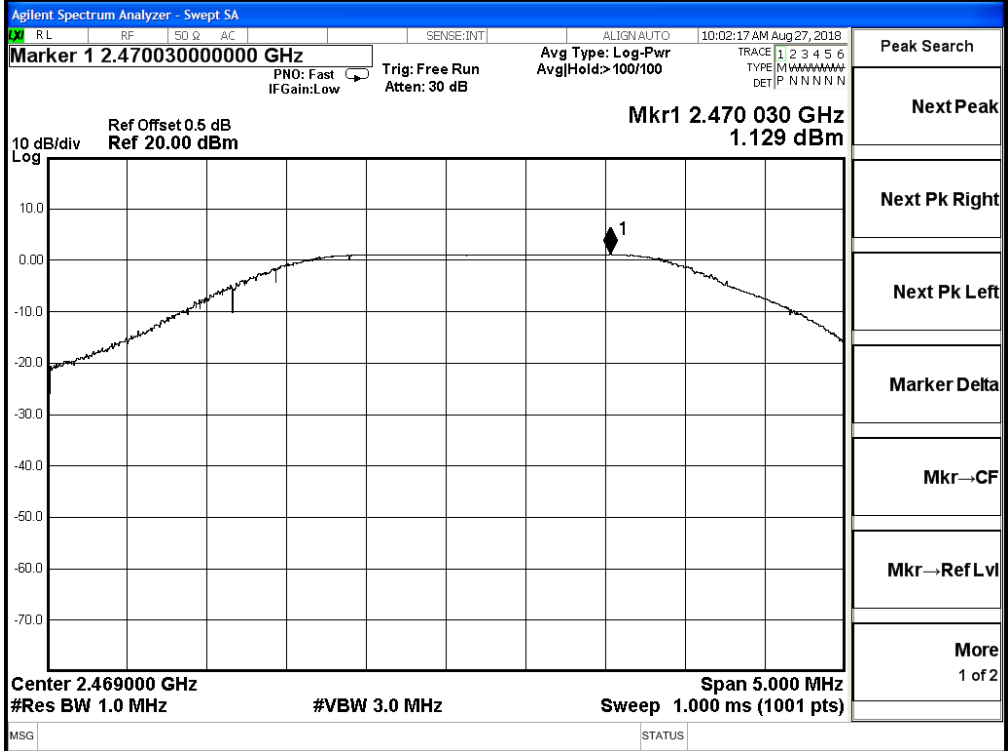
GFSK/LCH



GFSK/MCH

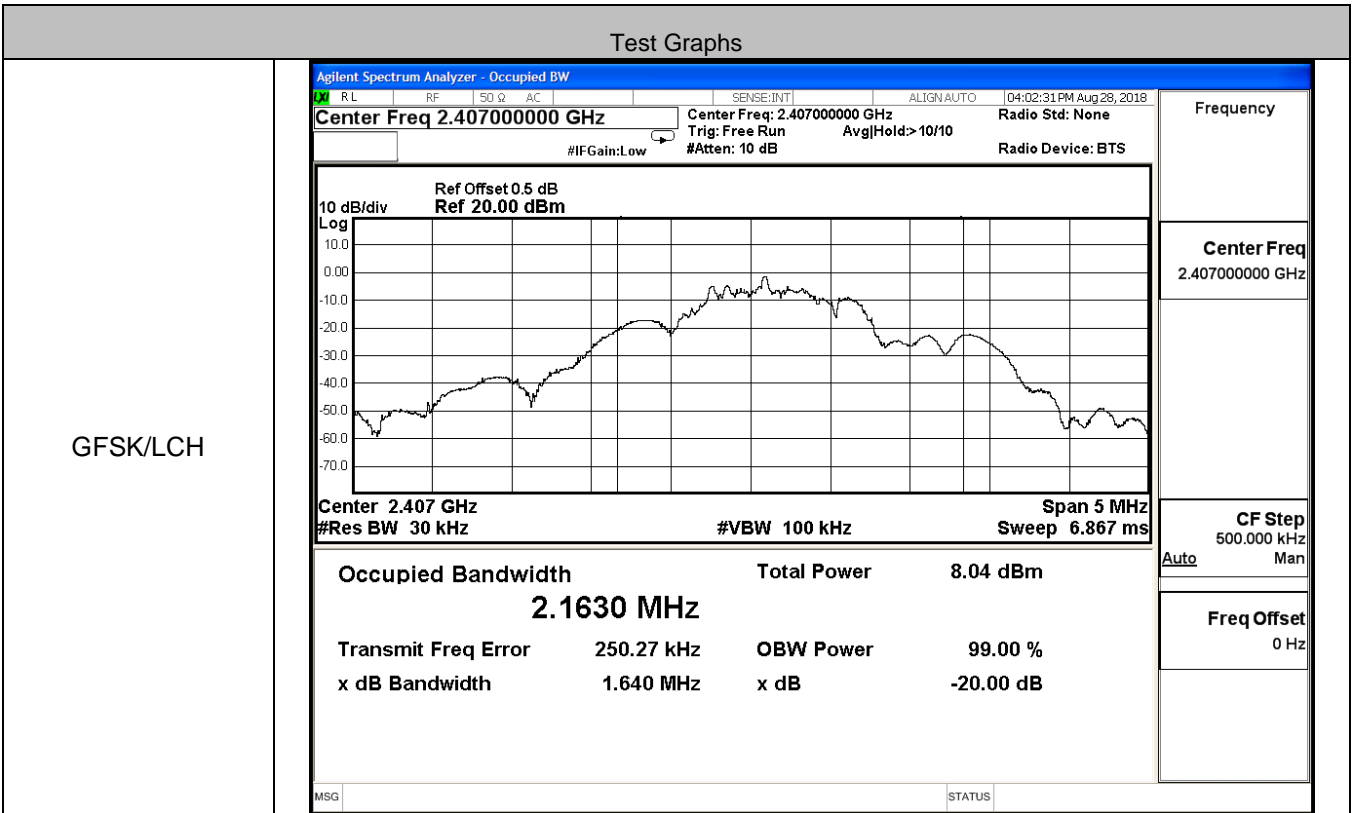


GFSK/HCH



A.2 99% and 20dB Bandwidth

Mode	Channel.	20dB Bandwidth [MHz]	99% Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.640	2.1630	Not Specified	PASS
	MCH	1.766	1.6594	Not Specified	PASS
	HCH	1.896	1.8265	Not Specified	PASS



GFSK/MCH



Frequency	2.44200000 GHz
Center Freq	2.44200000 GHz
CF Step	500.000 kHz
Auto	Man
Freq Offset	0 Hz

GFSK/HCH



Frequency	2.46900000 GHz
Center Freq	2.46900000 GHz
CF Step	500.000 kHz
Auto	Man
Freq Offset	0 Hz

A.3 Carrier Frequency Separation

Mode	Channel Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	7	7.181	1.896	PASS
	6	6.012	1.896	PASS
	5	5.094	1.896	PASS
	3	3.006	1.896	PASS
	2	2.088	1.896	PASS

Test Graphs

Hopping

Frequency

Auto Tune

Center Freq
2.441750000 GHz

Start Freq
2.400000000 GHz

Stop Freq
2.483500000 GHz

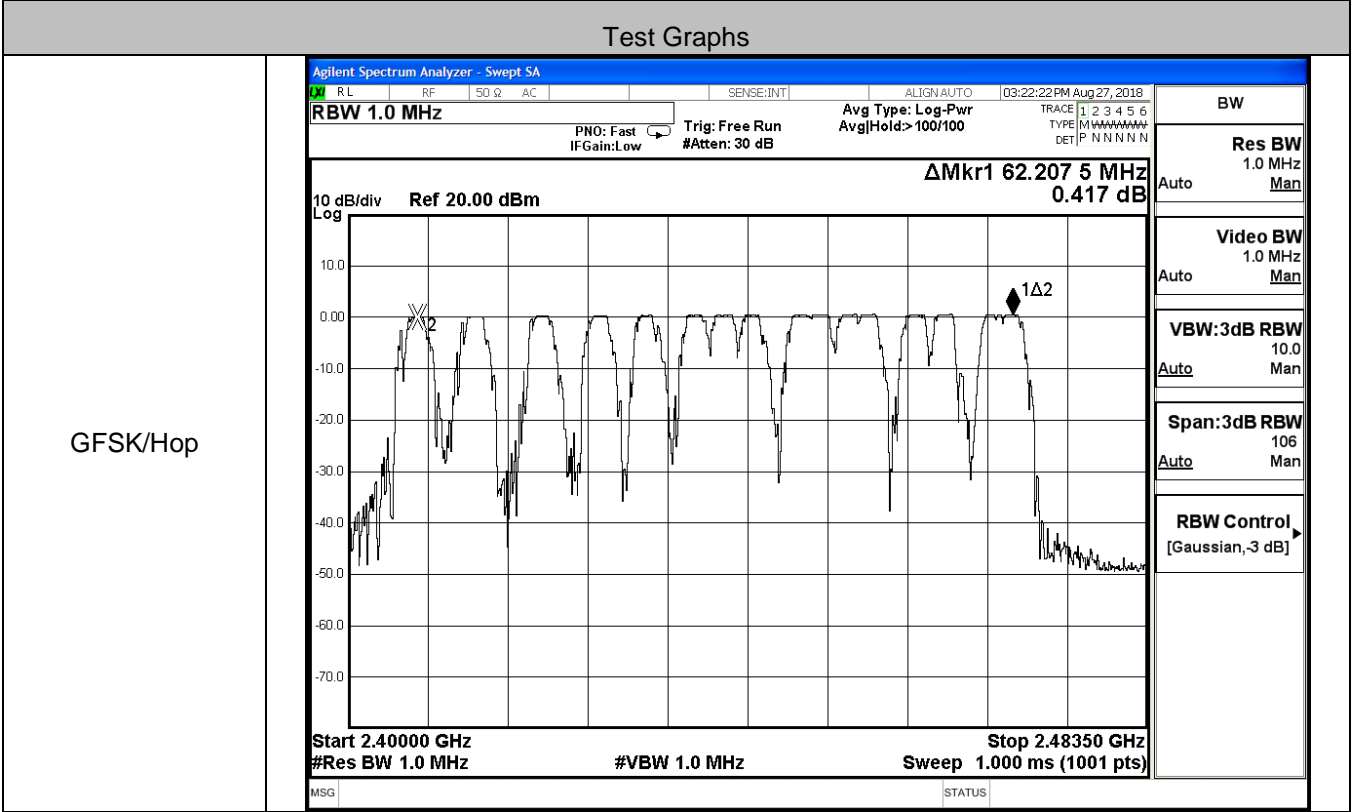
CF Step
8.350000 MHz

Freq Offset
0 Hz

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	f	(Δ)	6.0120 MHz	(Δ) 0.109 dB			
2	F	f		2.407 000 0 GHz	0.538 dBm			
3	Δ4	f	(Δ)	7.181 0 MHz	(Δ) 0.117 dB			
4	F	f		2.413 000 0 GHz	0.643 dBm			
5	Δ6	f	(Δ)	5.093 5 MHz	(Δ) -0.036 dB			
6	F	f		2.426 000 0 GHz	0.806 dBm			
7	Δ8	f	(Δ)	3.006 0 MHz	(Δ) -0.034 dB			
8	F	f		2.436 000 0 GHz	0.896 dBm			
9	Δ10	f	(Δ)	2.087 5 MHz	(Δ) 0.109 dB			
10	F	f		2.467 000 0 GHz	0.971 dBm			

A.4 Hopping Channel Number

Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	16	>=15	PASS

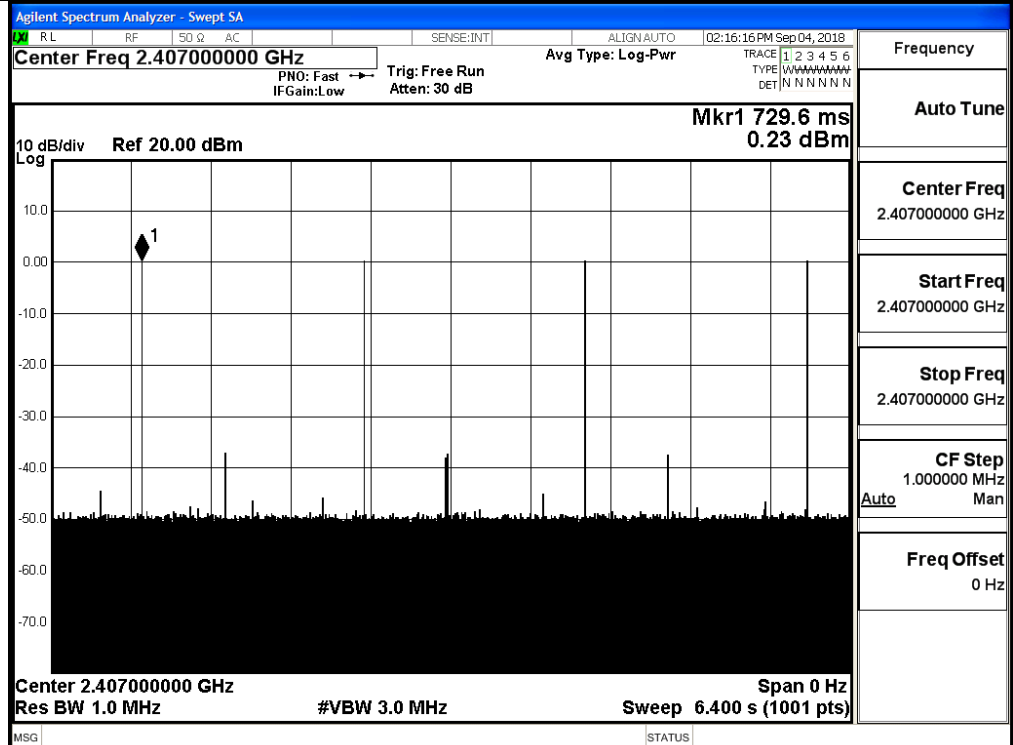


A.5 Dwell Time

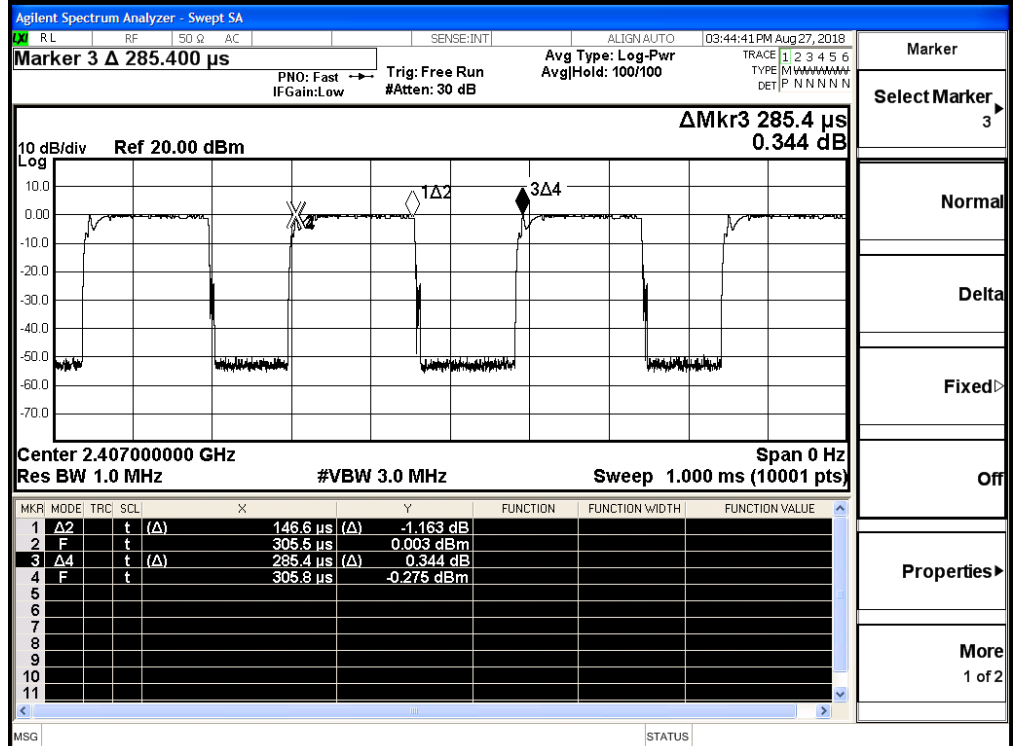
Mode	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	LCH	0.146	4	0.001	0.4	PASS
	MCH	0.148	4	0.001	0.4	PASS
	HCH	0.148	4	0.001	0.4	PASS

Test Graphs

GFSK /LCH



Frequency
Auto Tune
Center Freq 2.407000000 GHz
Start Freq 2.407000000 GHz
Stop Freq 2.407000000 GHz
CF Step 1.000000 MHz Auto Man
Freq Offset 0 Hz



Marker
Select Marker 3
Normal
Delta
Fixed
Off
Properties
More 1 of 2

GFSK /MCH

Agilent Spectrum Analyzer - Swept SA
02:20:05 PM Sep 04, 2018

Center Freq 2.44200000 GHz
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE: W W W W W W W W
DET: N N N N N N N

PN0: Fast
IFGain: Low
Trig: Free Run
Atten: 30 dB

10 dB/div
Log
Ref 20.00 dBm
Mkr1 4.147 s
0.54 dBm

Center 2.44200000 GHz
#VBW 3.0 MHz
Sweep 6.400 s (1001 pts)

MSG
STATUS

Agilent Spectrum Analyzer - Swept SA
03:40:41 PM Aug 27, 2018

Marker 3 Δ 278.500 μs
Avg Type: Log-Pwr
AvgHold: 100/100
TRACE 1 2 3 4 5 6
TYPE: W W W W W W W W
DET: P N N N N N N

PN0: Fast
IFGain: Low
Trig: Free Run
#Atten: 30 dB

10 dB/div
Log
Ref 20.00 dBm
ΔMkr3 278.5 μs
-0.146 dB

Center 2.44200000 GHz
#VBW 3.0 MHz
Sweep 1.000 ms (10001 pts)

MSG
STATUS

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	t	(Δ)	148.1 μs (Δ)	-1.084 dB			
2	F	t		321.7 μs	0.067 dBm			
3	Δ4	t	(Δ)	278.5 μs (Δ)	-0.146 dB			
4	F	t		321.5 μs	-0.332 dBm			
5								
6								
7								
8								
9								
10								
11								

MSG
STATUS

Frequency
Auto Tune
Center Freq 2.442000000 GHz
Start Freq 2.442000000 GHz
Stop Freq 2.442000000 GHz
CF Step 1.000000 MHz
Auto Man
Freq Offset 0 Hz

Marker
Select Marker 3
Normal
Delta
Fixed
Off
Properties
More 1 of 2

GFSK /HCH

Agilent Spectrum Analyzer - Swept SA
02:25:25 PM Sep 04, 2018

Center Freq 2.469000000 GHz
Trig: Free Run
Avg Type: Log-Pwr

PN0: Fast
IFGain:Low
Atten: 30 dB

10 dB/div
Ref 20.00 dBm
Mkr1 89.60 ms

Log

0.57 dBm

Center 2.469000000 GHz
#VBW 3.0 MHz
Sweep 6.400 s (1001 pts)

Res BW 1.0 MHz
Span 0 Hz

MSG
STATUS

Agilent Spectrum Analyzer - Swept SA
03:54:10 PM Aug 27, 2018

Marker 3 Δ 276.700 μs
Trig: Free Run
Avg Type: Log-Pwr

PN0: Fast
IFGain:Low
#Atten: 30 dB

10 dB/div
Ref 20.00 dBm
ΔMkr3 276.7 μs

Log

0.018 dB

Center 2.469000000 GHz
#VBW 3.0 MHz
Sweep 1.000 ms (10001 pts)

Res BW 1.0 MHz
Span 0 Hz

MSG
STATUS

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	t	(Δ)	148.4 μs (Δ)	-1.182 dB			
2	F	t		298.4 μs	0.064 dBm			
3	Δ4	t	(Δ)	276.7 μs (Δ)	0.018 dB			
4	F	t		298.1 μs	-0.302 dBm			
5								
6								
7								
8								
9								
10								
11								

A.6 RF Conducted Spurious Emissions

Mode	Channel	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-33.144	-19.87	PASS
	MCH	-51.662	-19.86	PASS
	HCH	-30.302	-19.66	PASS

GFSK_LCH_Graphs

Pref

Agilent Spectrum Analyzer - Swept SA

RL RF 50 Ω AC SENSE:INT ALIGN:AUTO 04:00:46 PM Aug 27, 2018

Display Line -19.87 dBm PNO: Wide Trig: Free Run Avg Type: Log-Pwr
IFGain:Low Atten: 30 dB AvgHold:>100/100

TRACE 1 2 3 4 5 6
TYPE M M M M M M M M M M
DET P N N N N N N

Ref Offset 0.5 dB
Ref 20.00 dBm

Mkr1 2.407 33 GHz
0.131 dBm

Center 2.407000 GHz
#Res BW 100 kHz

#VBW 300 kHz

Span 10.00 MHz
Sweep 1.000 ms (1001 pts)

MSG STATUS

Display

Annotation

Title

Graticule
On Off

Display Line
On Off

System
Display Settings

Puw

Agilent Spectrum Analyzer - Swept SA

RL RF 50 Ω AC SENSE:INT ALIGN:AUTO 10:36:52 AM Aug 31, 2018

Marker 1 1.749008406000 GHz PNO: Fast Trig: Free Run Avg Type: Log-Pwr
IFGain:Low Atten: 30 dB AvgHold: 75/100

TRACE 1 2 3 4 5 6
TYPE M M M M M M M M M M
DET P N N N N N N

Ref Offset 0.5 dB
Ref 20.00 dBm

Mkr1 1.749 GHz
-33.144 dBm

Start 9 kHz
#Res BW 100 kHz

#VBW 300 kHz

Stop 26.50 GHz
Sweep 2.533 s (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N		f	1.749 GHz	-33.144 dBm			
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSG STATUS AC coupled: Accy unspec'd < 10MHz

Peak Search

Next Peak

Next Pk Right

Next Pk Left

Marker Delta

Mkr→CF

Mkr→Ref Lvl

More
1 of 2

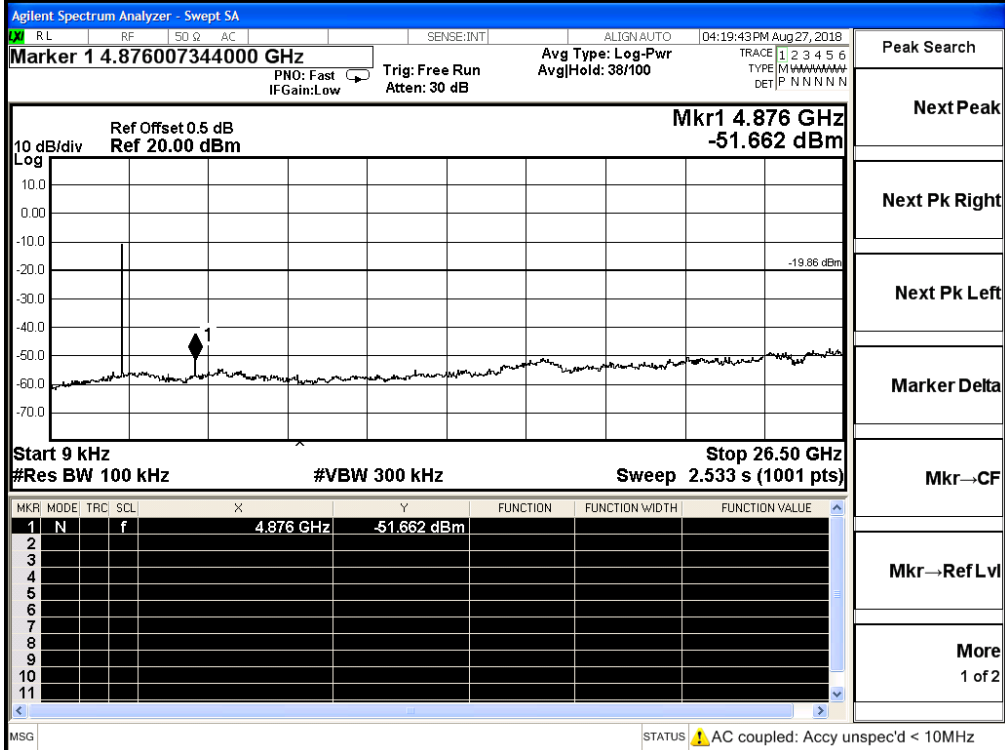
GFSK_MCH_Graphs

Pref



- Display
- Annotation▶
- Title▶
- Graticule On Off
- Display Line On Off
- System Display Settings▶

Puw



- Peak Search
- Next Peak
- Next Pk Right
- Next Pk Left
- Marker Delta
- Mkr→CF
- Mkr→Ref Lvl
- More 1 of 2

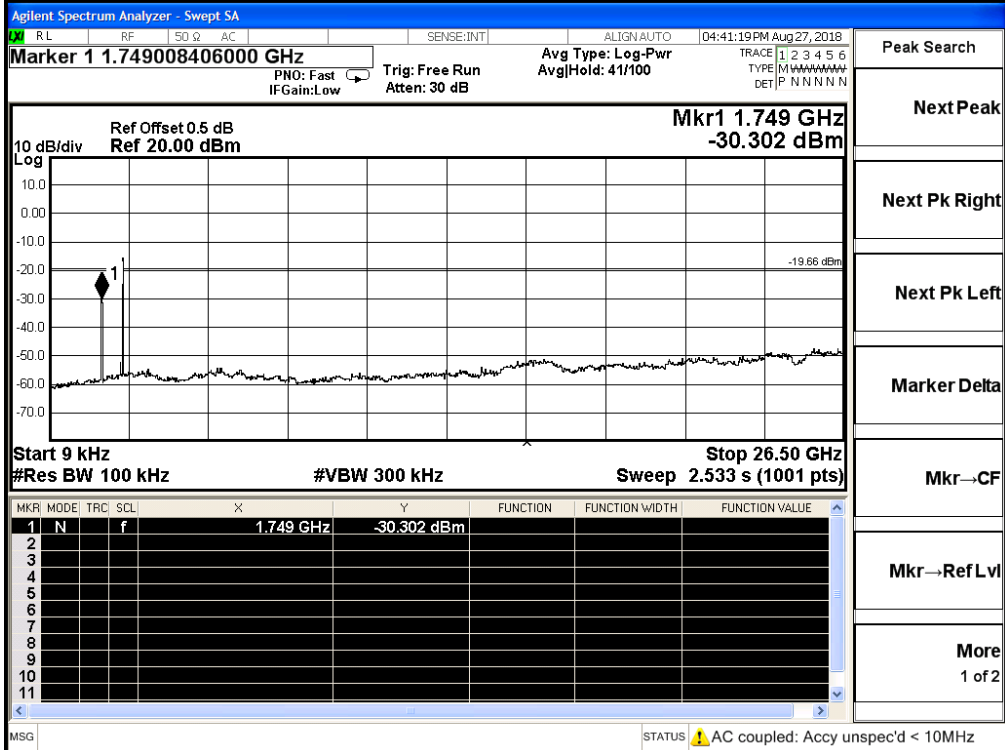
GFSK_HCH_Graphs

Pref



- Display
- Annotation▶
- Title▶
- Graticule
On Off
- Display Line
On Off
- System
Display
Settings▶

Puw



- Peak Search
- Next Peak
- Next Pk Right
- Next Pk Left
- Marker Delta
- Mkr→CF
- Mkr→Ref Lvl
- More
1 of 2

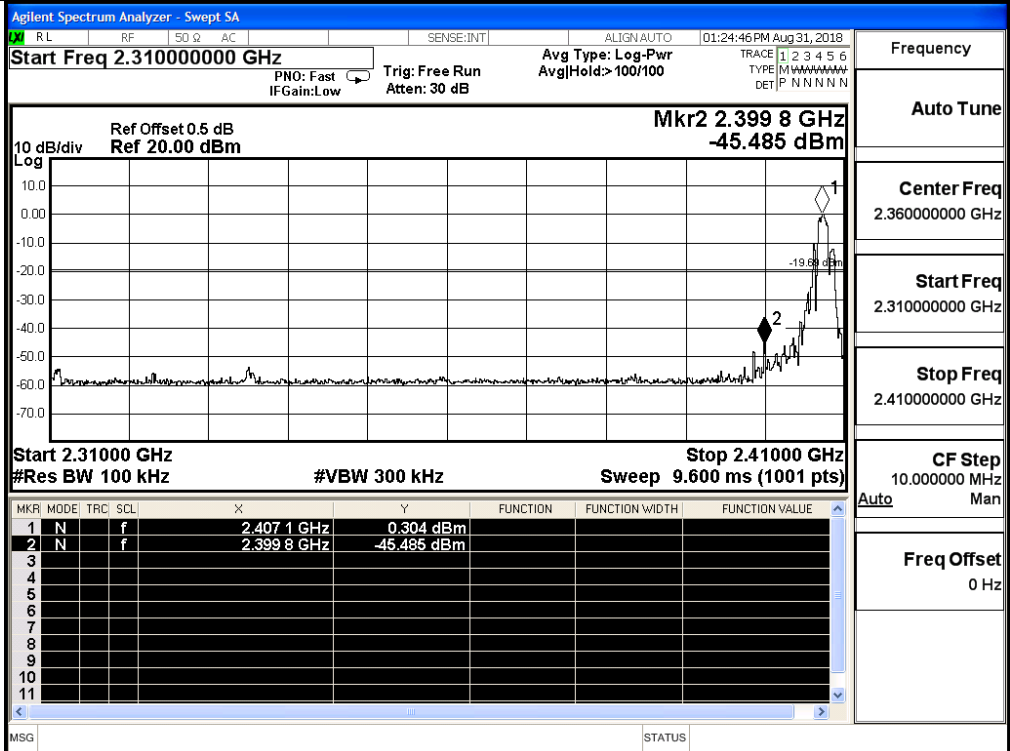
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		1.749 GHz	-30.302 dBm			
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								

A.7 Band-edge for RF Conducted Emissions

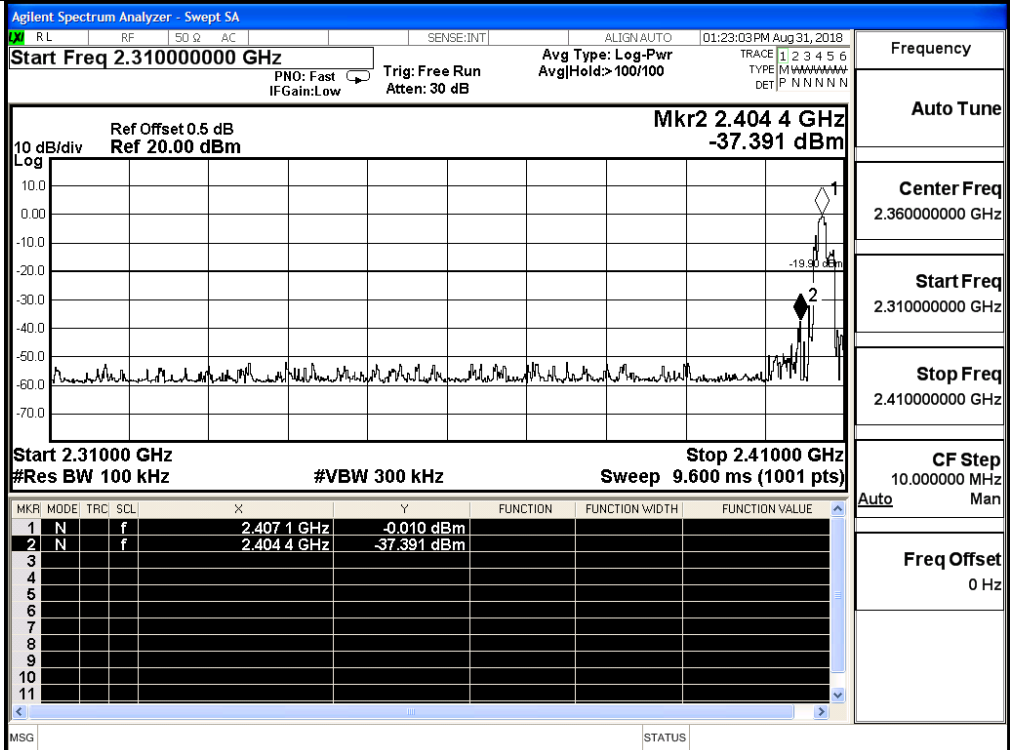
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2407	0.304	Off	-45.485	-19.87	PASS
			-0.010	On	-37.391	-20.24	PASS
	HCH	2469	0.149	Off	-38.768	-19.25	PASS
			-0.373	On	-53.168	-23.17	PASS

Test Graphs

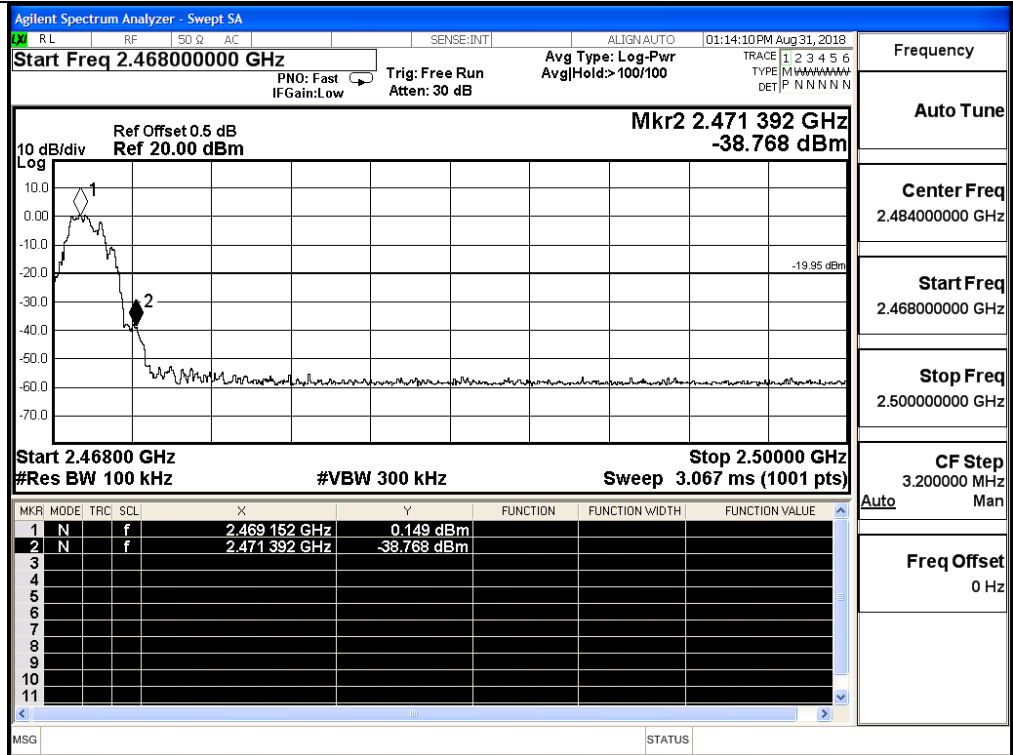
GFSK/LCH/No Hop



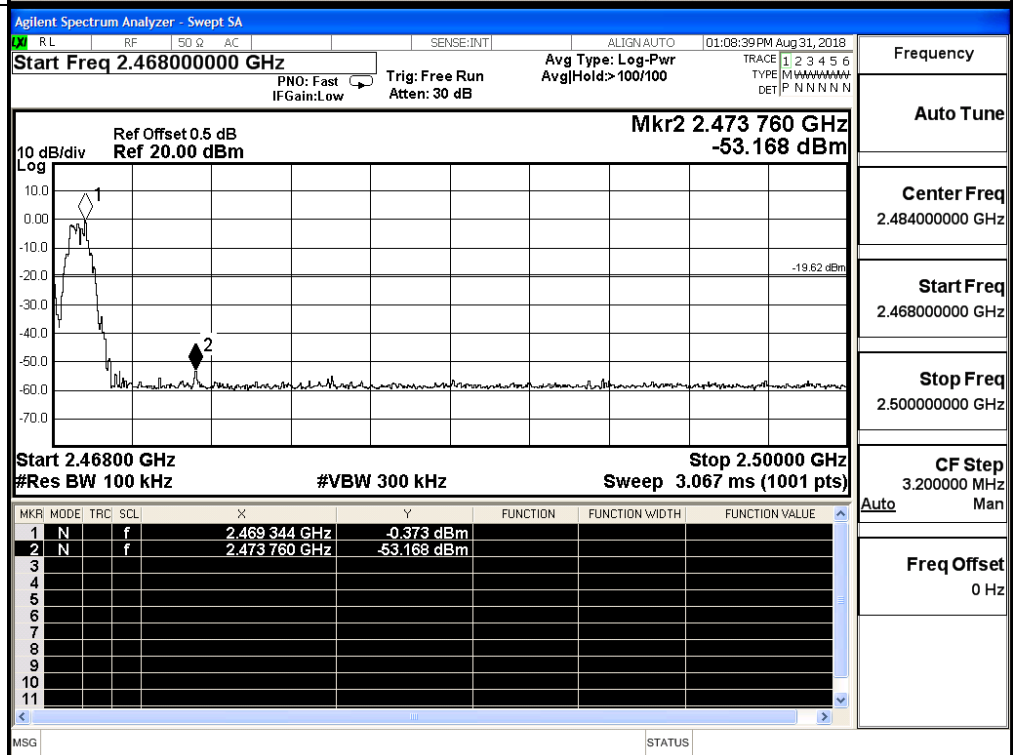
GFSK/LCH/Hop



GFSK/HCH/No Hop



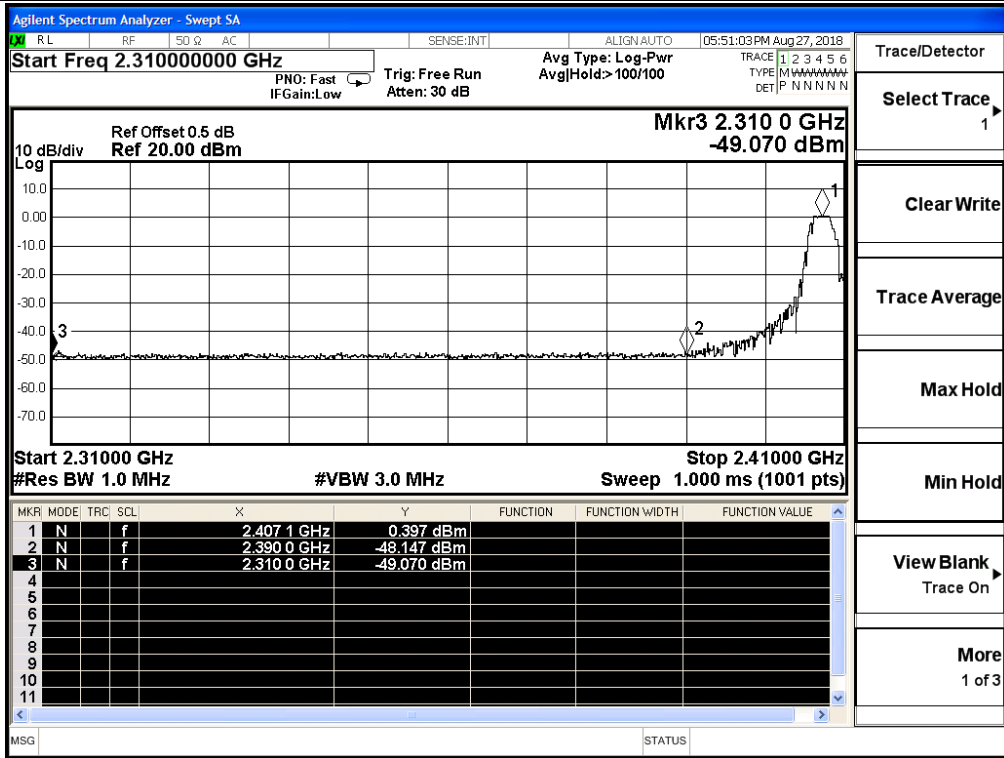
GFSK/HCH/Hop



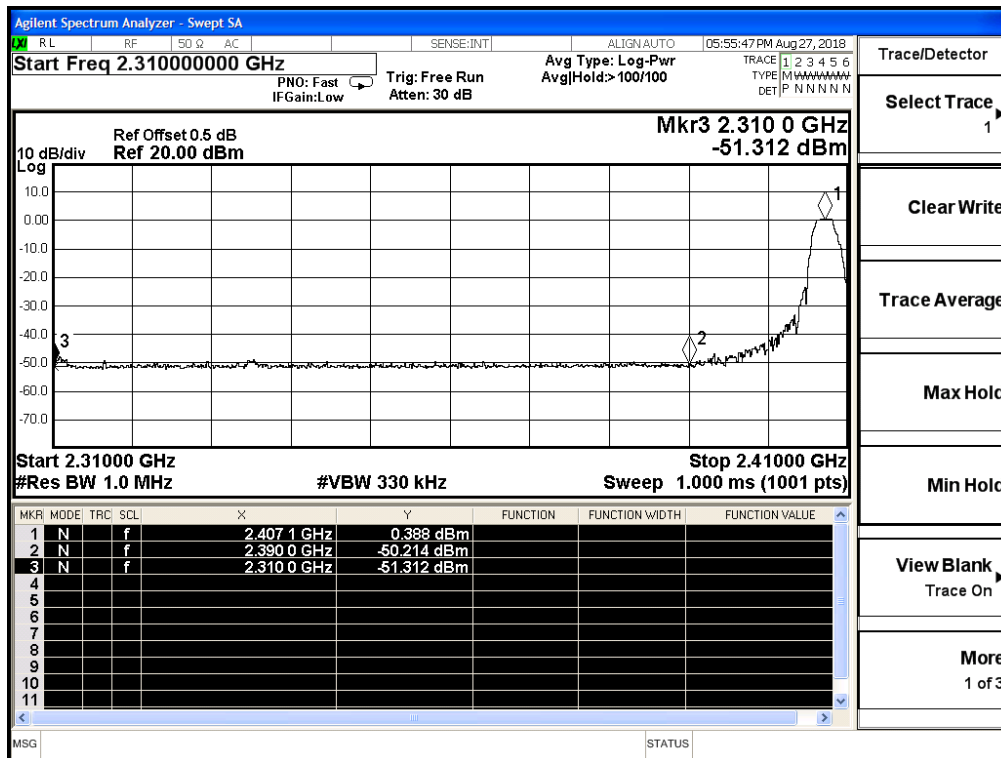
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-49.070	2.0	0	48.19	PEAK	74	PASS
	Off	2310.0	-51.312	2.0	0	45.95	AV	54	PASS
	Off	2390.0	-48.147	2.0	0	49.11	PEAK	74	PASS
	Off	2390.0	-50.214	2.0	0	47.05	AV	54	PASS
	Off	2483.5	-47.851	2.0	0	49.41	PEAK	74	PASS
	Off	2483.5	-51.380	2.0	0	45.88	AV	54	PASS
	Off	2500.0	-48.697	2.0	0	48.56	PEAK	74	PASS
	Off	2500.0	-50.617	2.0	0	46.64	AV	54	PASS

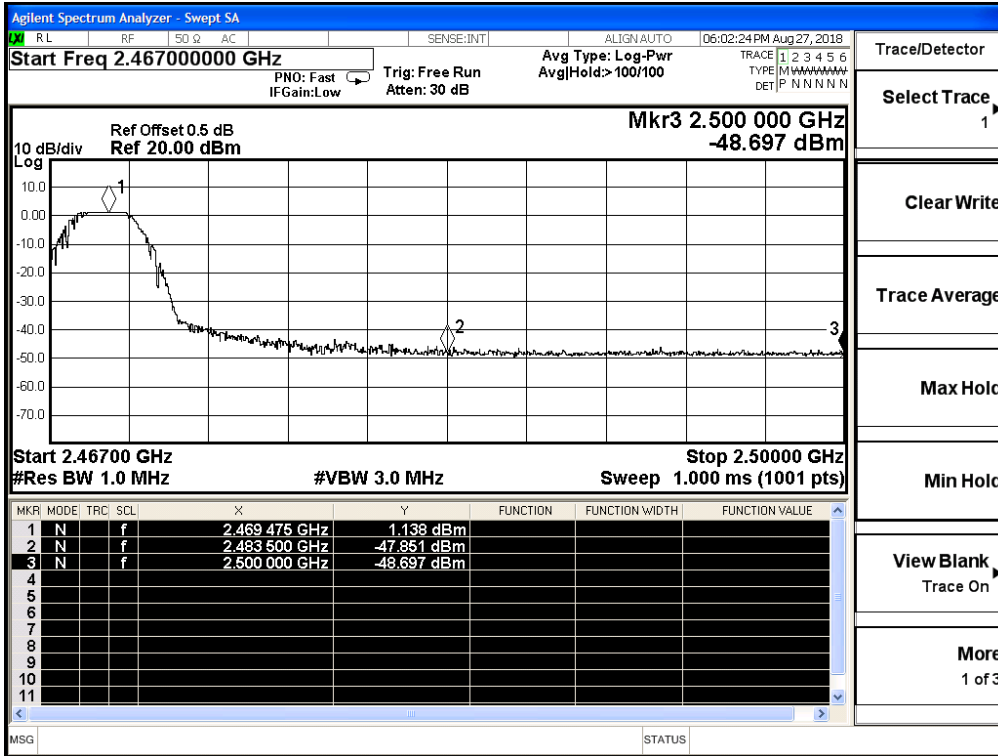
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)



Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (High Channel)



Restrict-band band-edge measurements_Hopping Off_GFSK_Average (High Channel)

