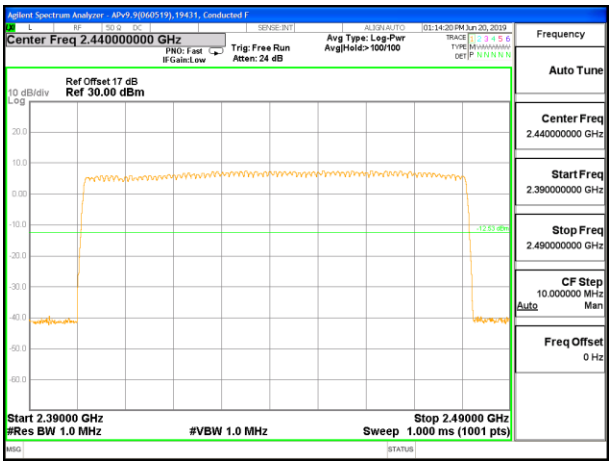
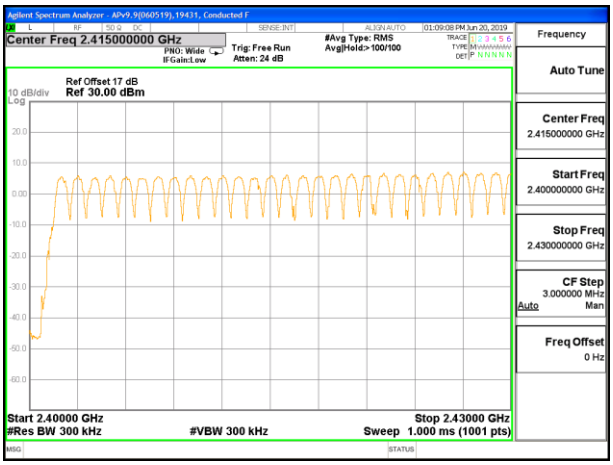
8.12.3 LOW POWER BASIC DATA RATE GFSK MODULATION

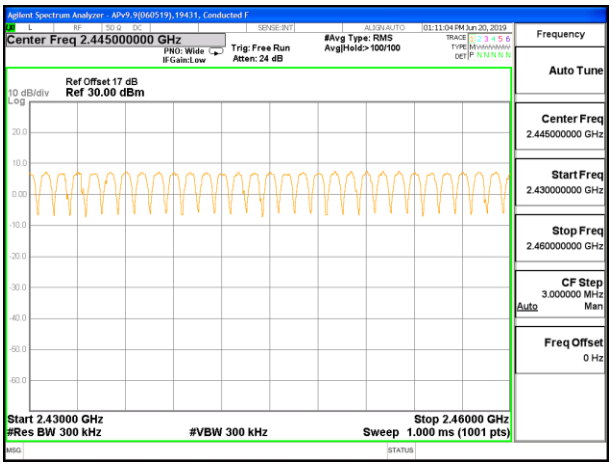
Antenna 4



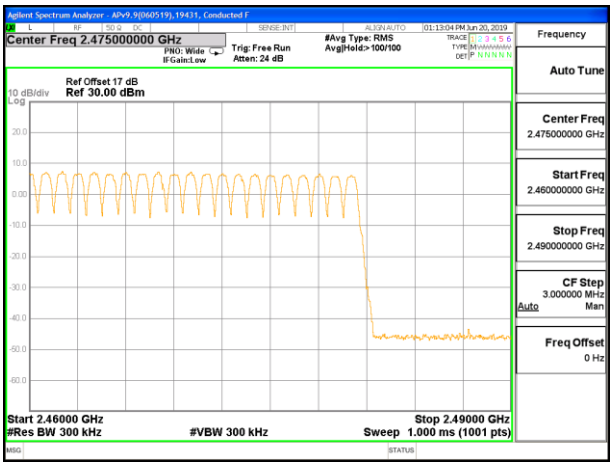
100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3

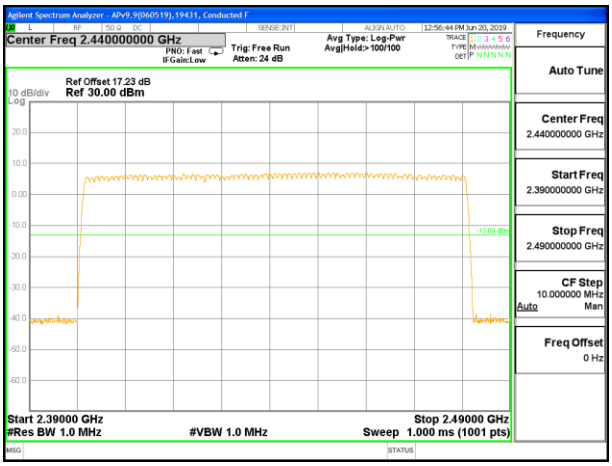


30MHz SPAN, SEGMENT 2 OF 3

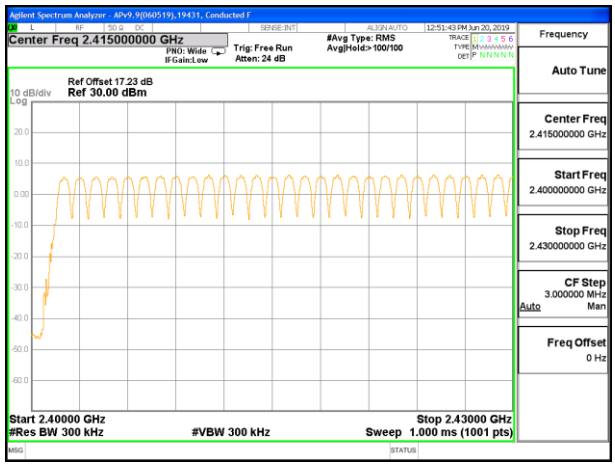


30MHz SPAN, SEGMENT 3 OF 3

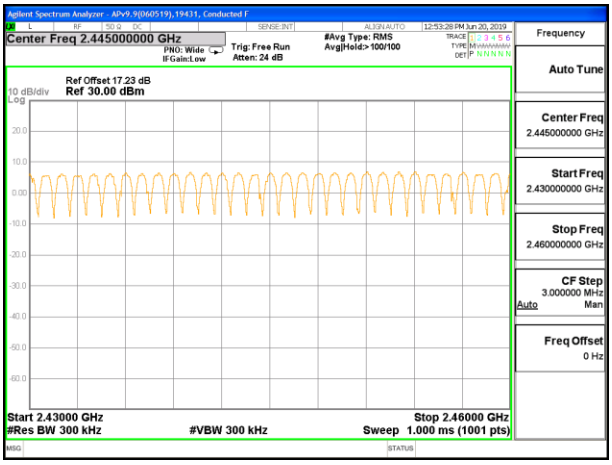
Antenna 3



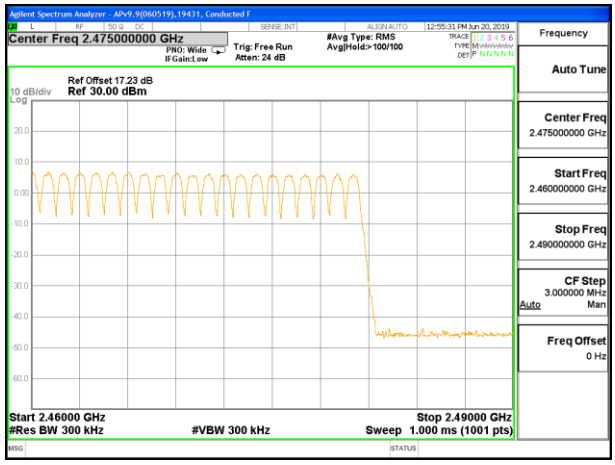
100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3



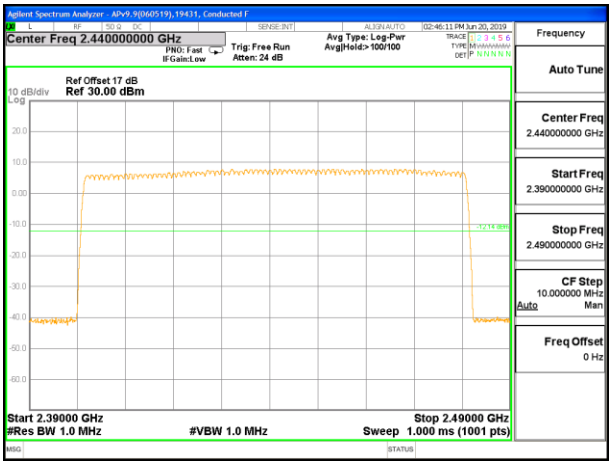
30MHz SPAN, SEGMENT 2 OF 3



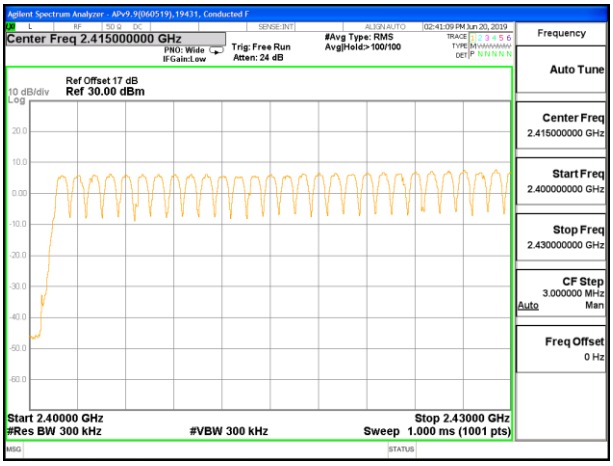
30MHz SPAN, SEGMENT 3 OF 3

8.12.4 LOW POWER ENHANCED DATA RATE 8PSK MODULATION

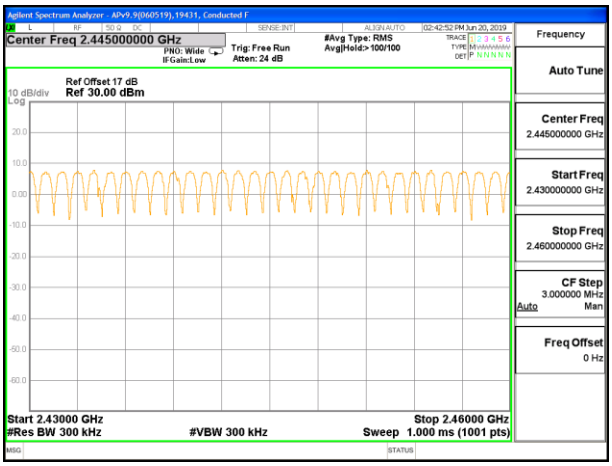
Antenna 4



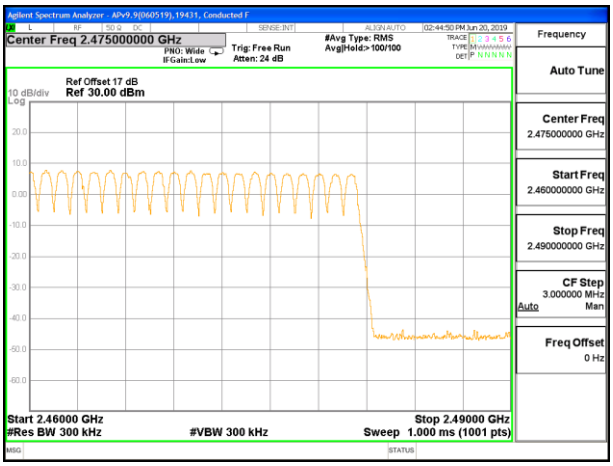
100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3

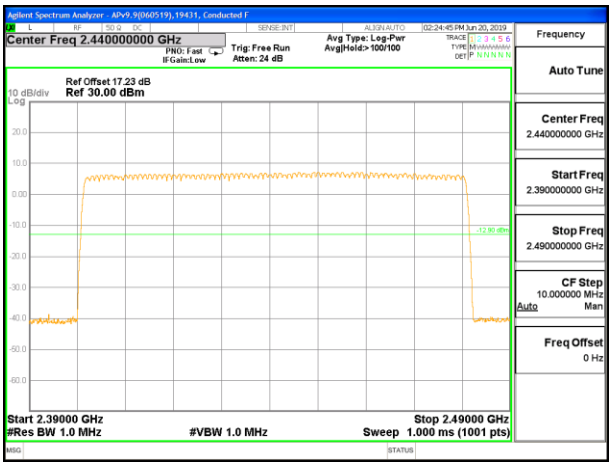


30MHz SPAN, SEGMENT 2 OF 3

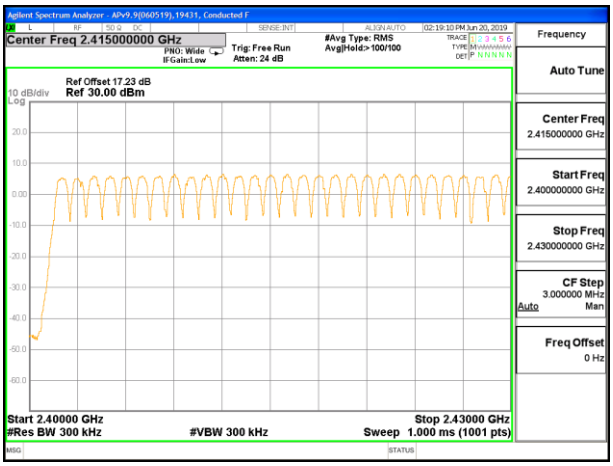


30MHz SPAN, SEGMENT 3 OF 3

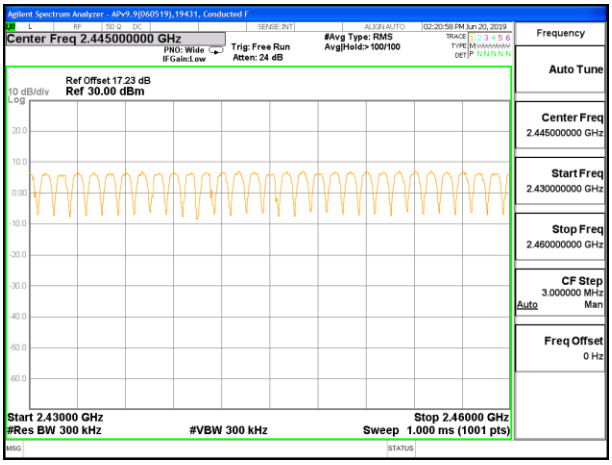
Antenna 3



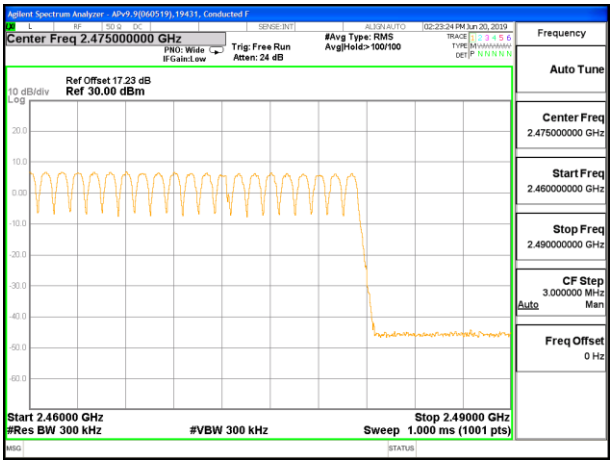
100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3



30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

8.13 BEAMFORMING, AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (d)

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.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 3.16 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * pulse width.

RESULTS

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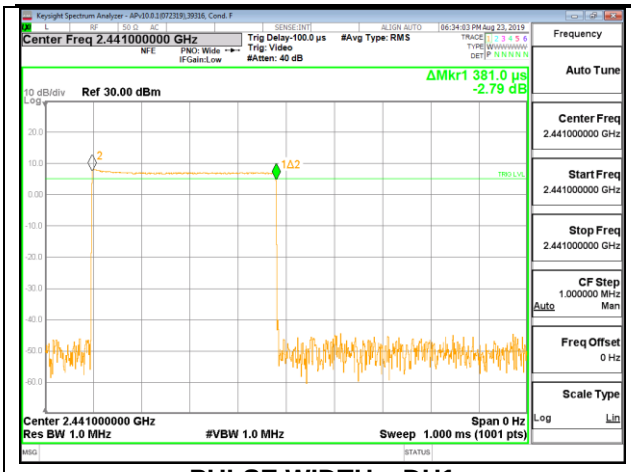
8.13.1 HIGH POWER BASIC DATA RATE GFSK MODULATION

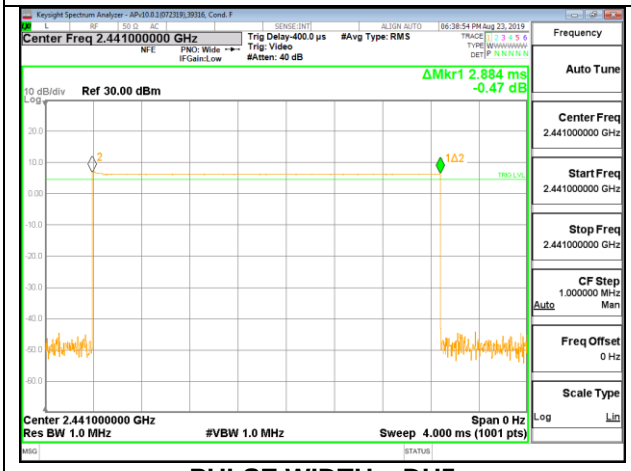
Antenna 4

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.381	32	0.1219	0.4	-0.2781
DH3	1.642	14	0.2299	0.4	-0.1701
DH5	2.884	10	0.2884	0.4	-0.1116
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.381	8	0.03048	0.4	-0.3695
DH3	1.642	3.5	0.05747	0.4	-0.3425
DH5	2.884	2.5	0.07210	0.4	-0.3279



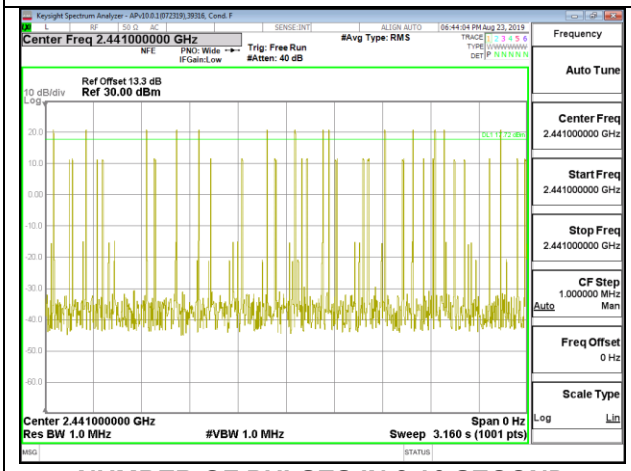
PULSE WIDTH – DH1

PULSE WIDTH – DH3

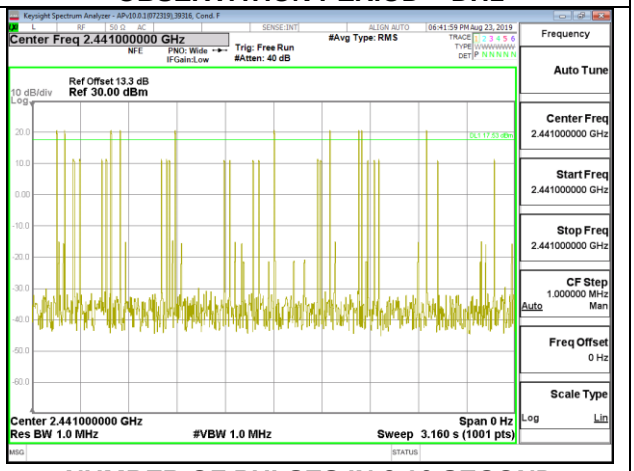


PULSE WIDTH – DH5

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

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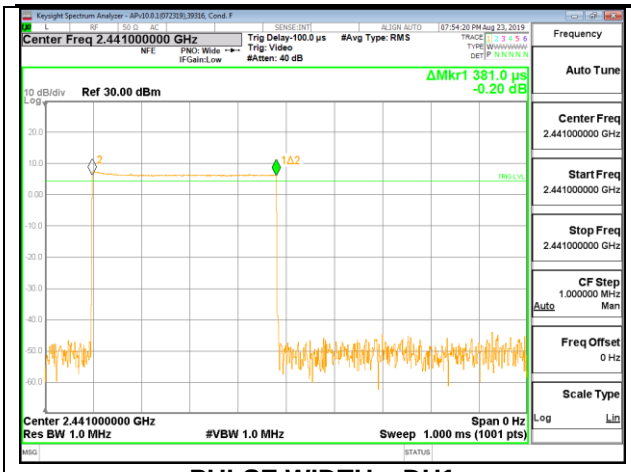
Antenna 3

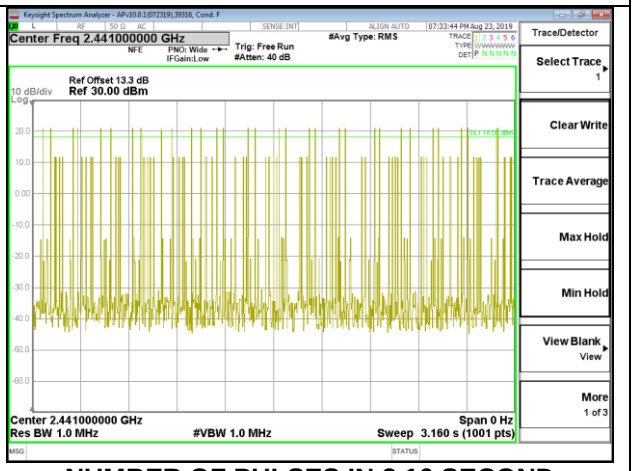
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.381	32	0.1219	0.4	-0.2781
DH3	1.638	17	0.2785	0.4	-0.1215
DH5	2.884	11	0.3172	0.4	-0.0828
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.381	8	0.03048	0.4	-0.3695
DH3	1.638	4.25	0.06962	0.4	-0.3304
DH5	2.884	2.75	0.07931	0.4	-0.3207



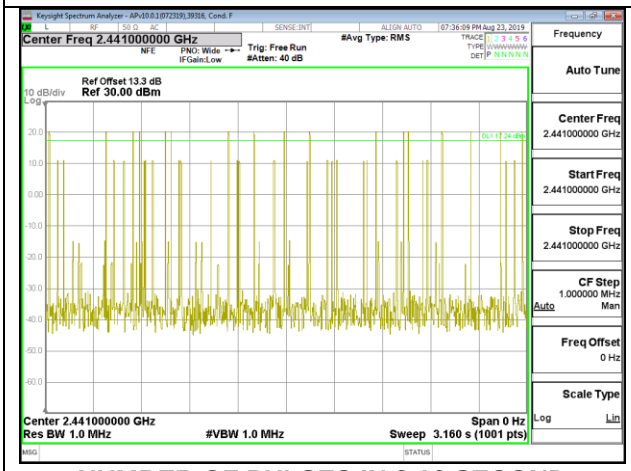
PULSE WIDTH – DH1

PULSE WIDTH– DH3

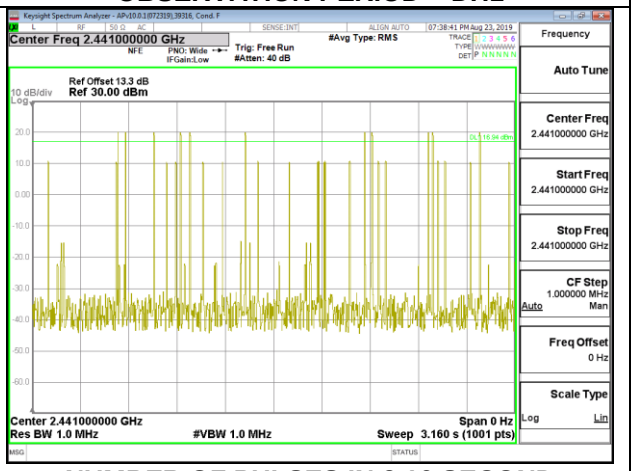
PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



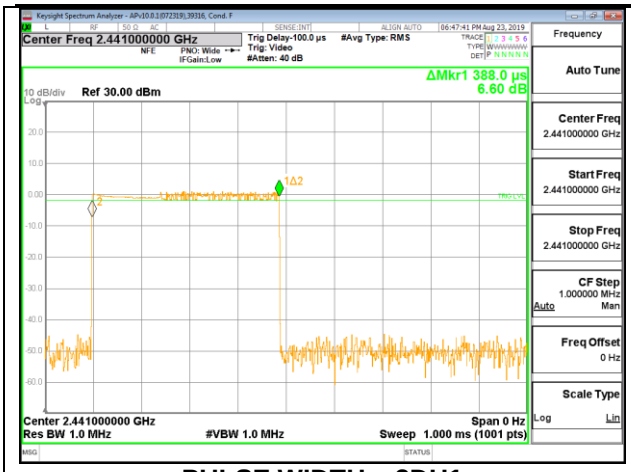
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

8.13.2 HIGH POWER ENHANCED DATA RATE 8PSK MODULATION

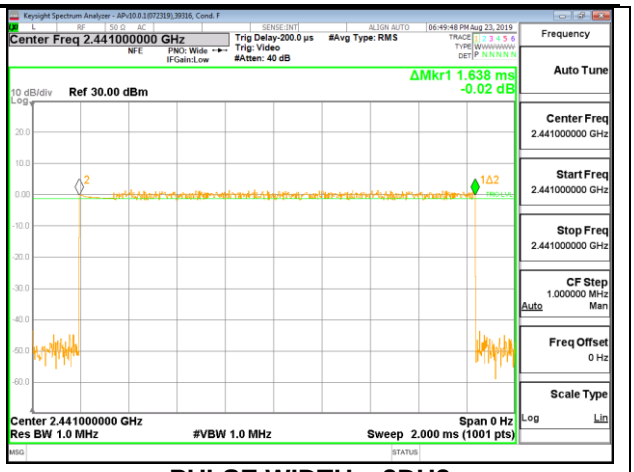
Antenna 4

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
3DH1	0.388	32	0.12416	0.4	-0.2758
3DH3	1.638	15	0.2457	0.4	-0.1543
3DH5	2.888	12	0.34656	0.4	-0.0534

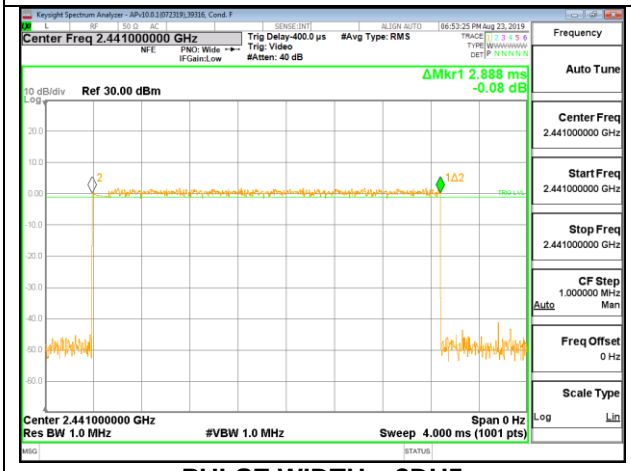
Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.



PULSE WIDTH – 3DH1

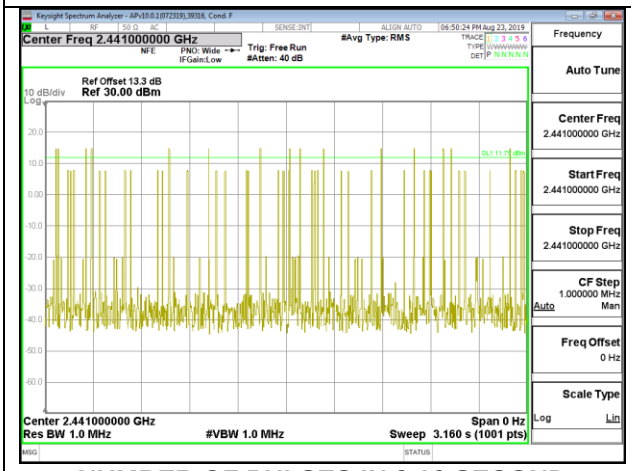


PULSE WIDTH – 3DH3



PULSE WIDTH – 3DH5

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH1



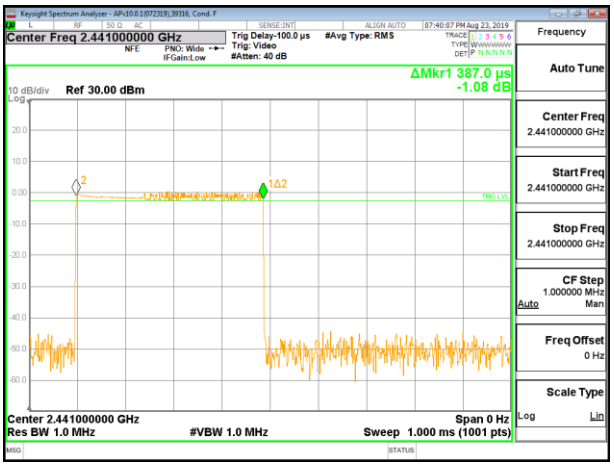
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH3

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH5

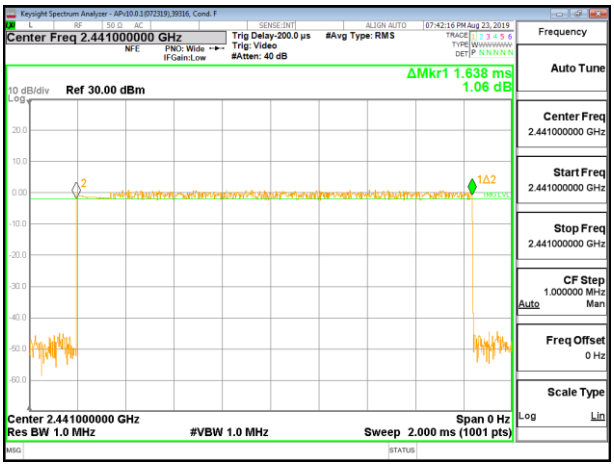
Antenna 3

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
3DH1	0.387	31	0.11997	0.4	-0.28
3DH3	1.638	17	0.27846	0.4	-0.1215
3DH5	2.888	12	0.34656	0.4	-0.0534

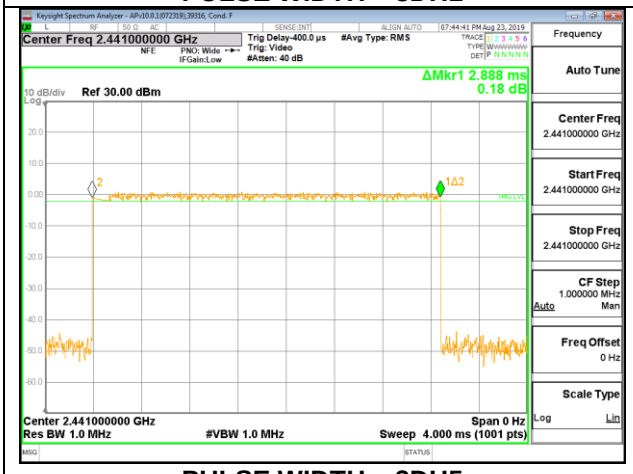
Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.



PULSE WIDTH – 3DH1

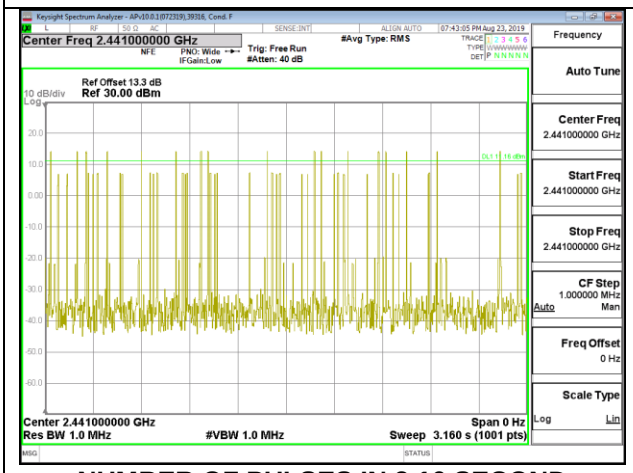


PULSE WIDTH – 3DH3

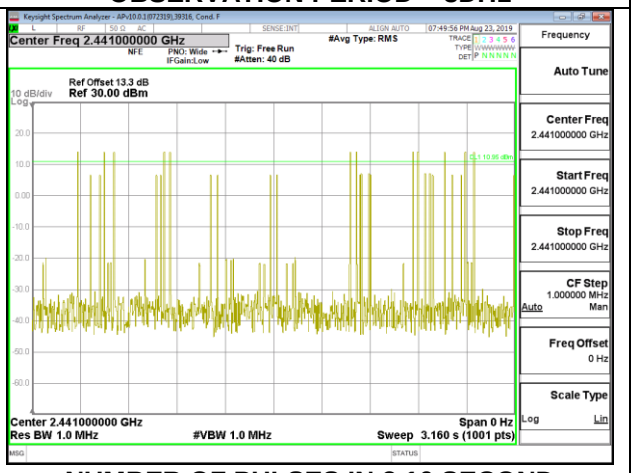


PULSE WIDTH – 3DH5

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH5

8.13.3 LOW POWER BASIC DATA RATE GFSK MODULATION

Antenna 4

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.382	32	0.1222	0.4	-0.2778
DH3	1.636	16	0.2618	0.4	-0.1382
DH5	2.884	11	0.3172	0.4	-0.0828
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.382	8	0.03056	0.4	-0.3694
DH3	1.636	4	0.06544	0.4	-0.3346
DH5	2.884	2.75	0.07931	0.4	-0.3207

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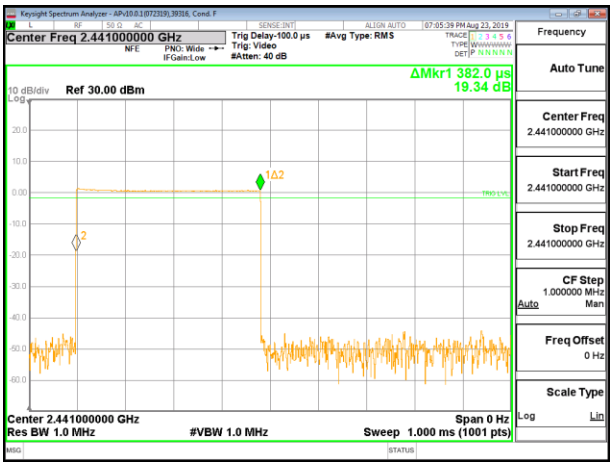
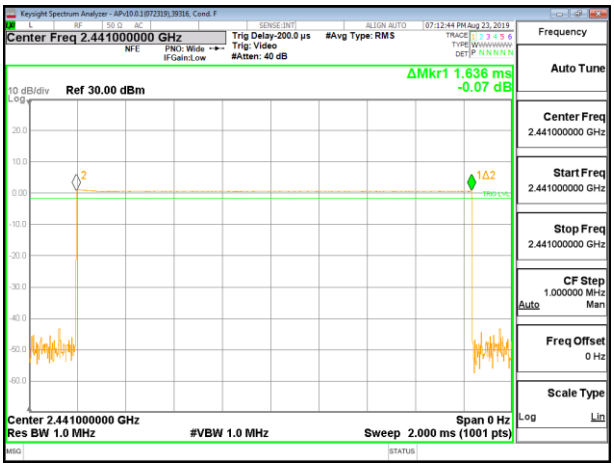
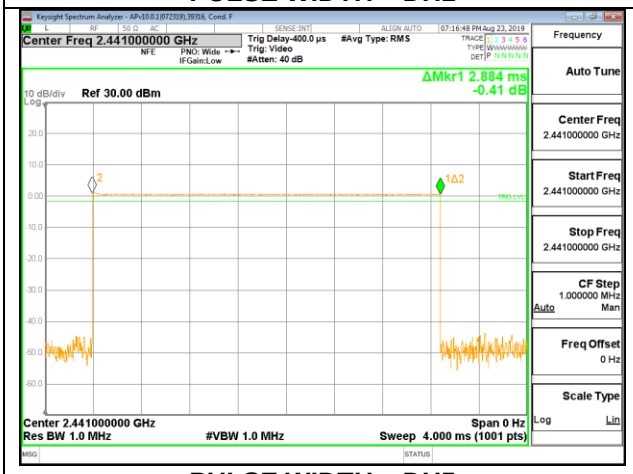


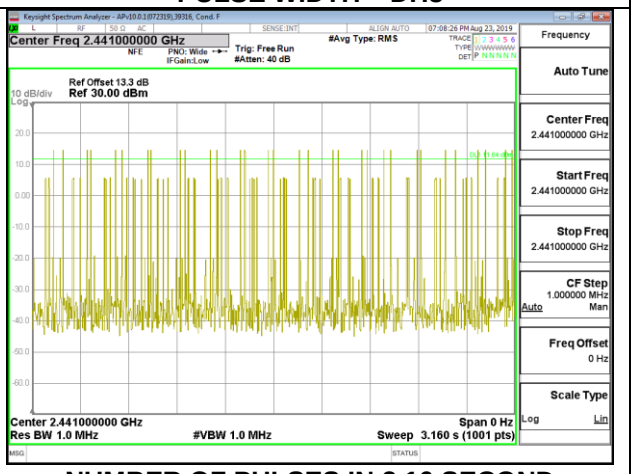
PULSE WIDTH – DH1



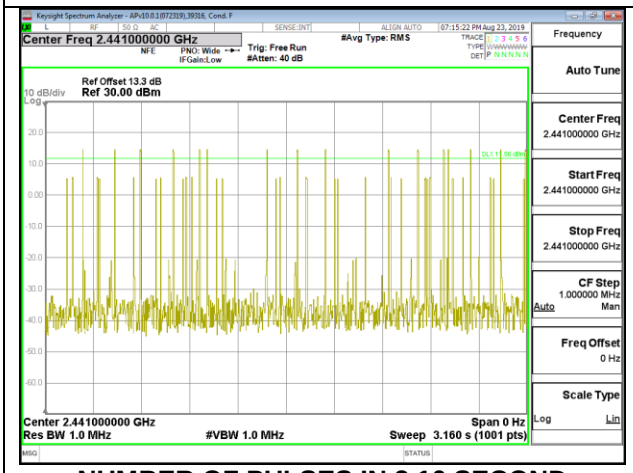
PULSE WIDTH – DH3



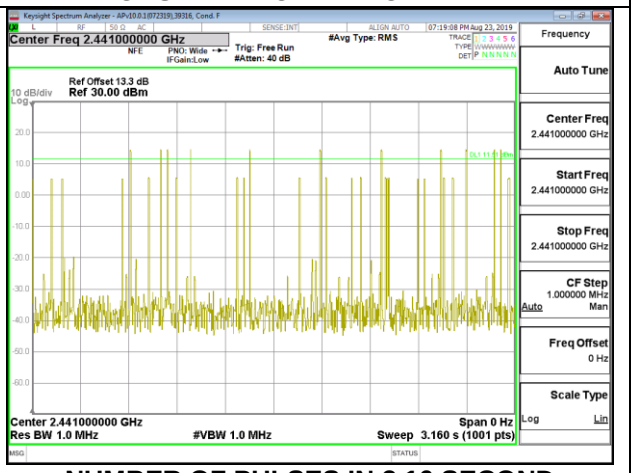
PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



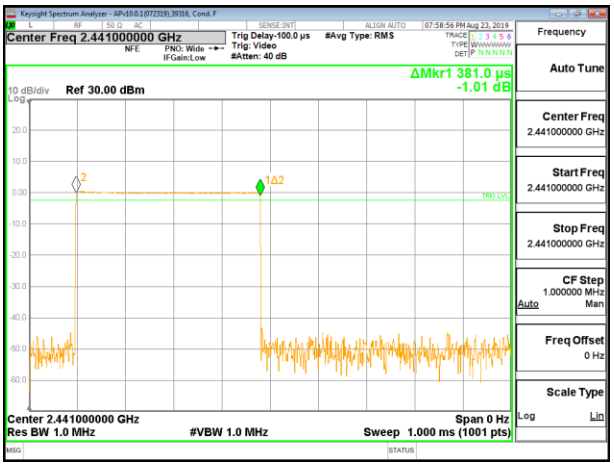
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

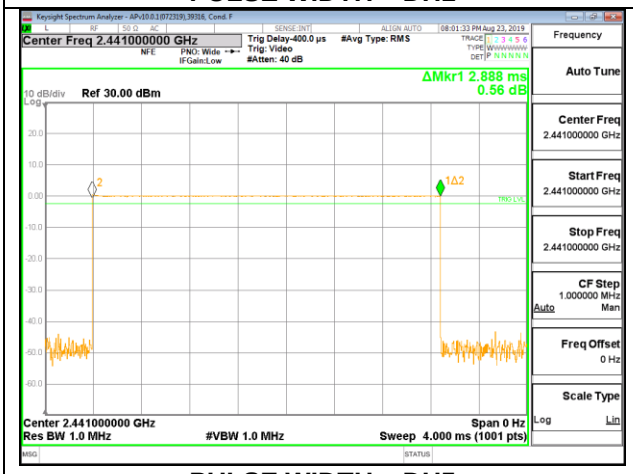
Antenna 3

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.381	32	0.1219	0.4	-0.2781
DH3	1.638	16	0.2621	0.4	-0.1379
DH5	2.888	11	0.3177	0.4	-0.0823
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.381	8	0.03048	0.4	-0.3695
DH3	1.638	4	0.06552	0.4	-0.3345
DH5	2.888	2.75	0.07942	0.4	-0.3206

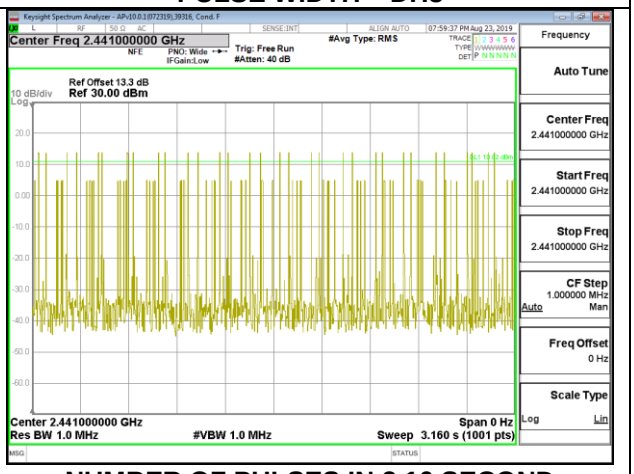


PULSE WIDTH – DH1

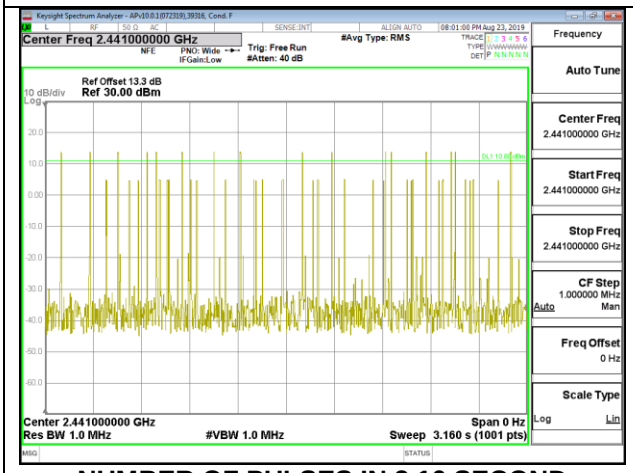
PULSE WIDTH – DH3



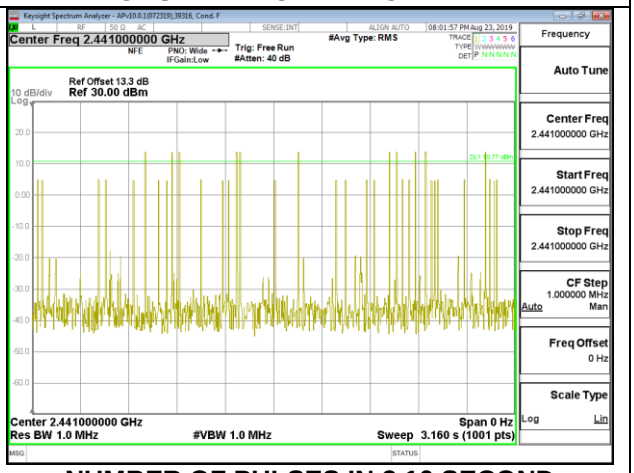
PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



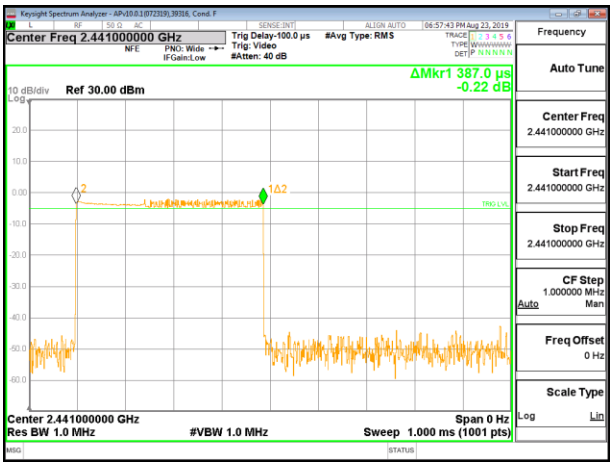
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

8.13.4 LOW POWER ENHANCED DATA RATE 8PSK MODULATION

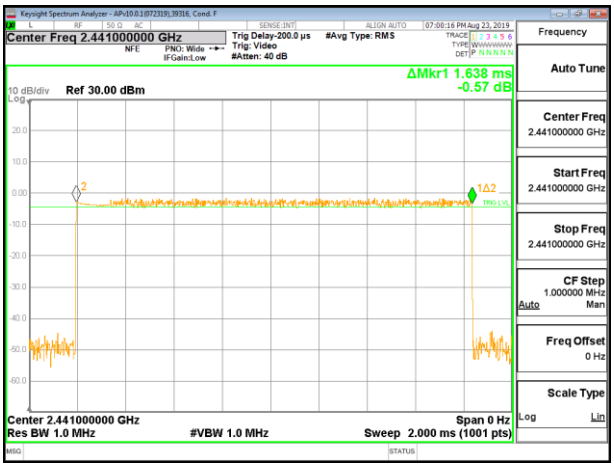
Antenna 4

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
3DH1	0.387	32	0.12384	0.4	-0.2762
3DH3	1.638	16	0.26208	0.4	-0.1379
3DH5	2.888	11	0.31768	0.4	-0.0823

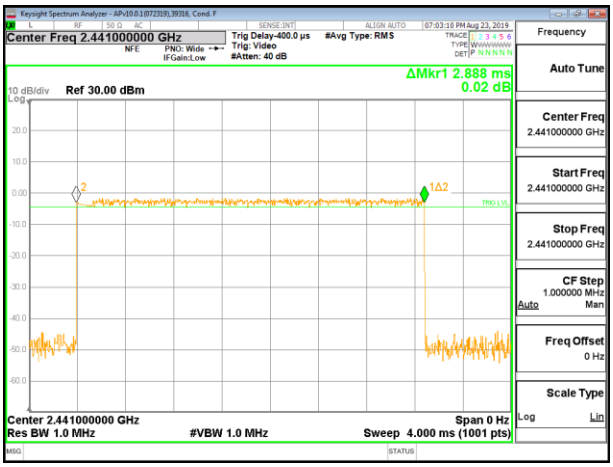
Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.



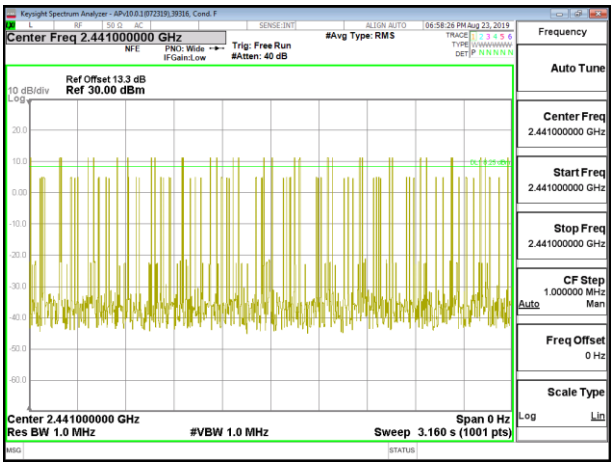
PULSE WIDTH – 3DH1



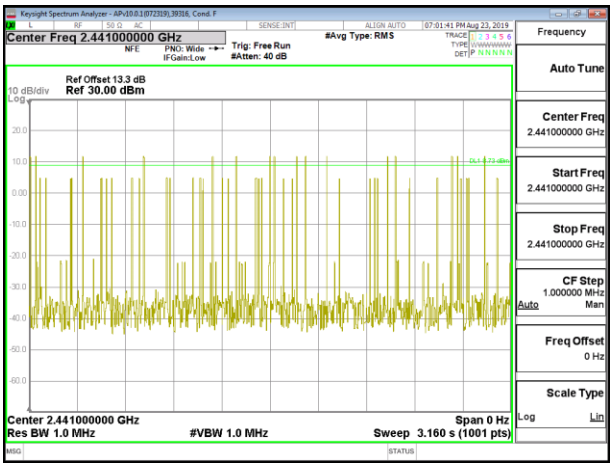
PULSE WIDTH – 3DH3



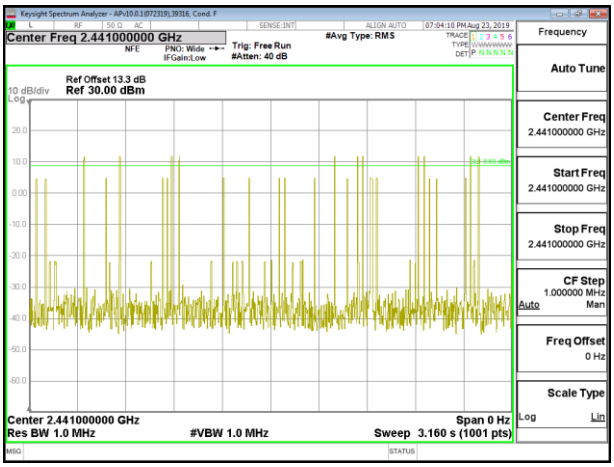
PULSE WIDTH – 3DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH3



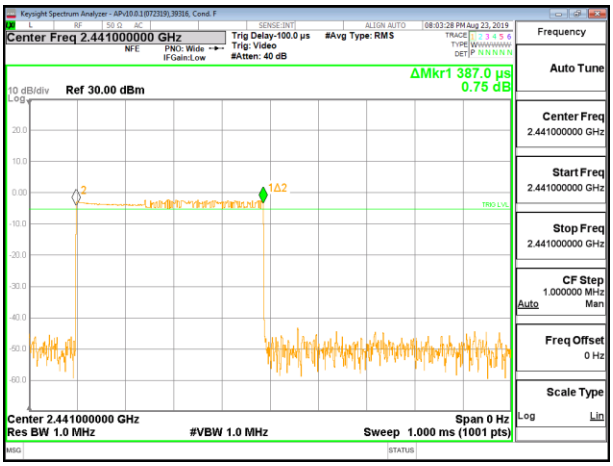
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH5

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

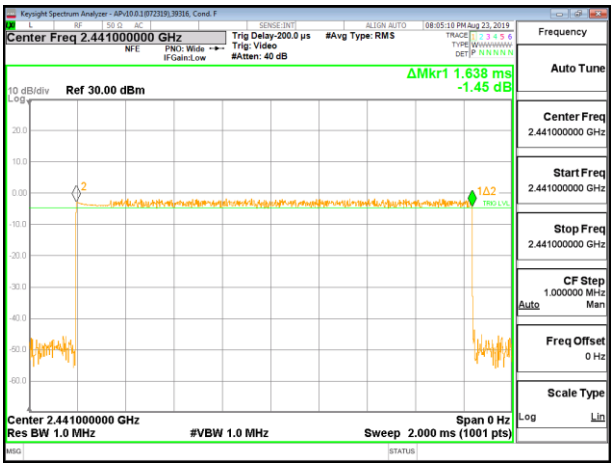
Antenna 3

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
3DH1	0.387	31	0.11997	0.4	-0.28
3DH3	1.638	16	0.26208	0.4	-0.1379
3DH5	2.892	12	0.34704	0.4	-0.053

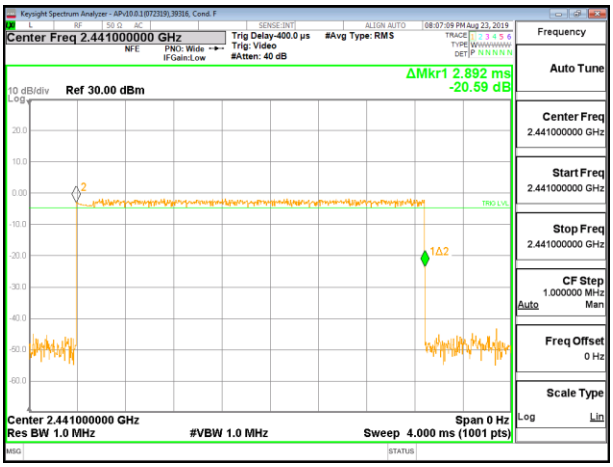
Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.



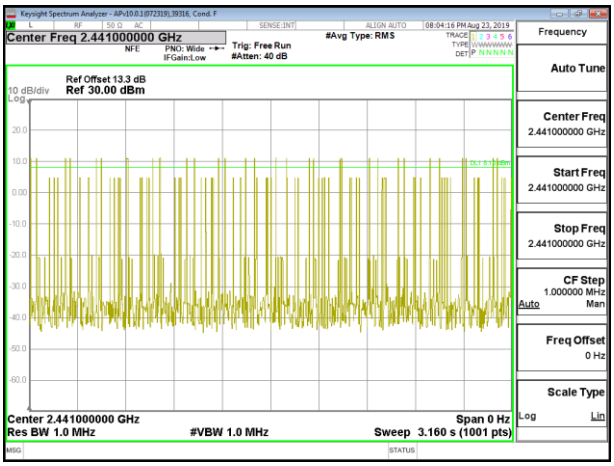
PULSE WIDTH – 3DH1



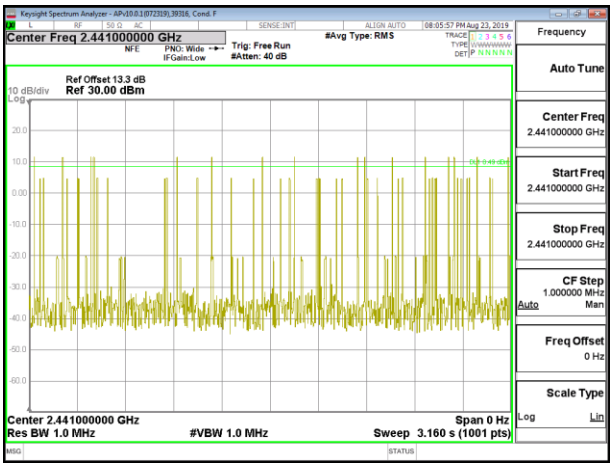
PULSE WIDTH – 3DH3



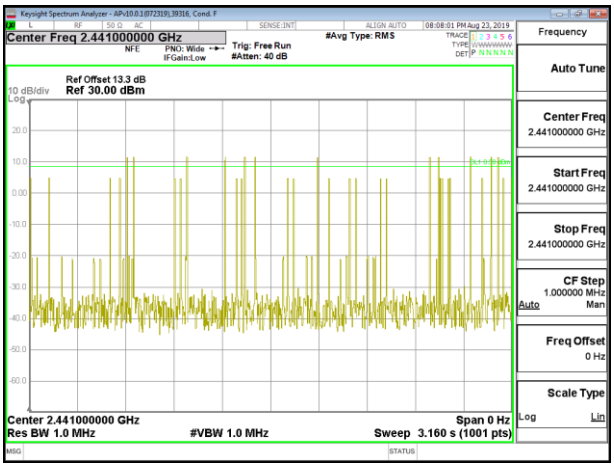
PULSE WIDTH – 3DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH5

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8.14 BEAMFORMING, OUTPUT POWER

8.14.1 HIGH POWER BASIC DATA RATE GFSK MODULATION

2TX Antenna 4 + Antenna 3 TxBF Mode

Tested By:	50820
Date:	7/24/2019

Channel	Frequency (MHz)	Output Power Antenna 4 (dBm)	Output Power Antenna 3 (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	17.12	17.15	20.15	21	-0.85
Middle	2441	17.23	17.28	20.27	21	-0.73
High	2480	17.2	17.21	20.22	21	-0.78

8.14.2 HIGH POWER ENHANCED DATA RATE QPSK MODULATION

2TX Antenna 4 + Antenna 3 TxBF Mode

Tested By:	50820
Date:	7/24/2019

Channel	Frequency (MHz)	Output Power Antenna 2 (dBm)	Output Power Antenna 5 (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	16.91	16.9	19.92	21	-1.08
Middle	2441	16.97	16.99	19.99	21	-1.01
High	2480	16.89	16.88	19.90	21	-1.10

8.14.3 HIGH POWER ENHANCED DATA RATE 8PSK MODULATION

2TX Antenna 4 + Antenna 3 TxBF Mode

Tested By:	50820
Date:	7/24/2019

Channel	Frequency (MHz)	Output Power Antenna 4 (dBm)	Output Power Antenna 3 (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	17.15	17.13	20.15	21	-0.85
Middle	2441	17.22	17.28	20.26	21	-0.74
High	2480	17.18	17.17	20.19	21	-0.81

8.14.4 LOW POWER BASIC DATA RATE GFSK MODULATION

2TX Antenna 4 + Antenna 3 TxBF Mode

Tested By:	50820
Date:	7/24/2019

Channel	Frequency (MHz)	Output Power Antenna 2 (dBm)	Output Power Antenna 5 (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	12.62	12.68	15.66	21	-5.34
Middle	2441	12.72	12.75	15.75	21	-5.25
High	2480	12.69	12.72	15.72	21	-5.28

8.14.5 LOW POWER ENHANCED DATA RATE QPSK MODULATION

2TX Antenna 4 + Antenna 3 TxBF Mode

Tested By:	50820
Date:	7/24/2019

Channel	Frequency (MHz)	Output Power Antenna 2 (dBm)	Output Power Antenna 5 (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.93	10.97	13.96	21	-7.04
Middle	2441	11.01	11.05	14.04	21	-6.96
High	2480	10.99	11.03	14.02	21	-6.98

8.14.6 LOW POWER ENHANCED DATA RATE 8PSK MODULATION

2TX Antenna 4 + Antenna 3 TxBF Mode

Tested By:	50820
Date:	7/24/2019

Channel	Frequency (MHz)	Output Power Antenna 2 (dBm)	Output Power Antenna 5 (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	11.19	11.22	14.22	21	-6.78
Middle	2441	11.31	11.29	14.31	21	-6.69
High	2480	11.24	11.27	14.27	21	-6.73

8.15 BEAMFORMING, AVERAGE POWER

8.15.1 HIGH POWER BASIC DATA RATE GFSK MODULATION

2TX Antenna 4 + Antenna 3 TxBF Mode

Tested By:	50820
Date	7/24/2019

Channel	Frequency (MHz)	Average Power Antenna 4 (dBm)	Average Power Antenna 3 (dBm)	Total Average Power (dBm)
Low	2402	16.84	16.87	19.87
Middle	2441	16.91	16.9	19.92
High	2480	16.87	16.88	19.89

8.15.2 HIGH POWER ENHANCED ENHANCED RATE QPSK MODULATION

2TX Antenna 4 + Antenna 3 TxBF Mode

Tested By:	50820
Date	7/24/2019

Channel	Frequency (MHz)	Average Power Antenna 4 (dBm)	Average Power Antenna 3 (dBm)	Total Average Power (dBm)
Low	2402	14.64	14.61	17.64
Middle	2441	14.69	14.6	17.66
High	2480	14.58	14.62	17.61

8.15.3 HIGH POWER ENHANCED DATA RATE 8PSK MODULATION

2TX Antenna 4 + Antenna 3 TxBF Mode

Tested By:	50820
Date	7/24/2019

Channel	Frequency (MHz)	Average Power Antenna 4 (dBm)	Average Power Antenna 3 (dBm)	Total Average Power (dBm)
Low	2402	14.82	14.87	17.86
Middle	2441	14.92	14.91	17.93
High	2480	14.83	14.85	17.85

8.15.4 LOW POWER BASIC DATA RATE GFSK MODULATION

2TX Antenna 4 + Antenna 3 TxBF Mode

Tested By:	50820
Date	7/24/2019

Channel	Frequency (MHz)	Average Power Antenna 4 (dBm)	Average Power Antenna 3 (dBm)	Total Average Power (dBm)
Low	2402	12.33	12.35	15.35
Middle	2441	12.42	12.4	15.42
High	2480	12.37	12.38	15.39

8.15.5 LOW POWER ENHANCED DATA RATE QPSK MODULATION

2TX Antenna 4 + Antenna 3 TxBF Mode

Tested By:	50820
Date	7/24/2019

Channel	Frequency (MHz)	Average Power Antenna 4 (dBm)	Average Power Antenna 3 (dBm)	Total Average Power (dBm)
Low	2402	8.62	8.64	11.64
Middle	2441	8.69	8.68	11.70
High	2480	8.59	8.55	11.58

8.15.6 LOW POWER ENHANCED DATA RATE 8PSK MODULATION

2TX Antenna 4 + Antenna 3 TxBF Mode

Tested By:	50820
Date	7/24/2019

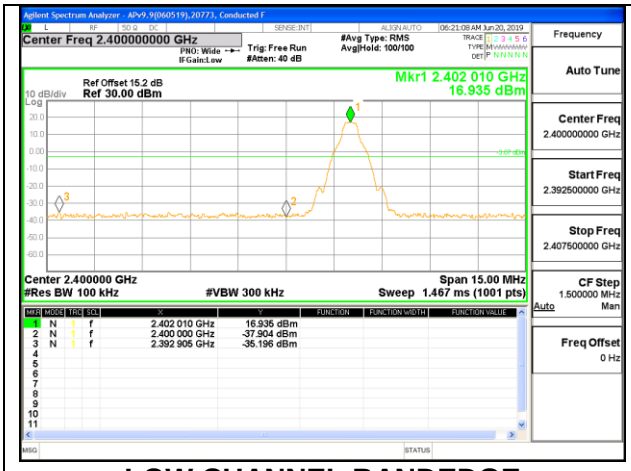
Channel	Frequency (MHz)	Average Power Antenna 4 (dBm)	Average Power Antenna 3 (dBm)	Total Average Power (dBm)
Low	2402	8.88	8.89	11.90
Middle	2441	8.98	8.95	11.98
High	2480	8.83	8.91	11.88

8.16 BEAMFORMING, CONDUCTED SPURIOUS EMISSIONS

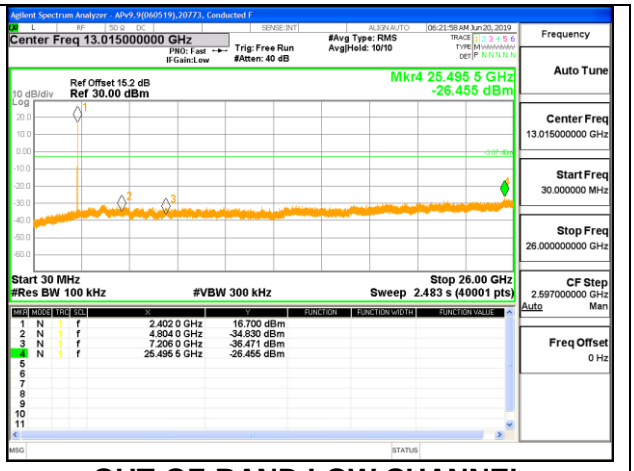
8.16.1 HIGH POWER BASIC DATA RATE GFSK MODULATION

Note: Test procedure on beamforming mode is same as BT basic and EDR mode

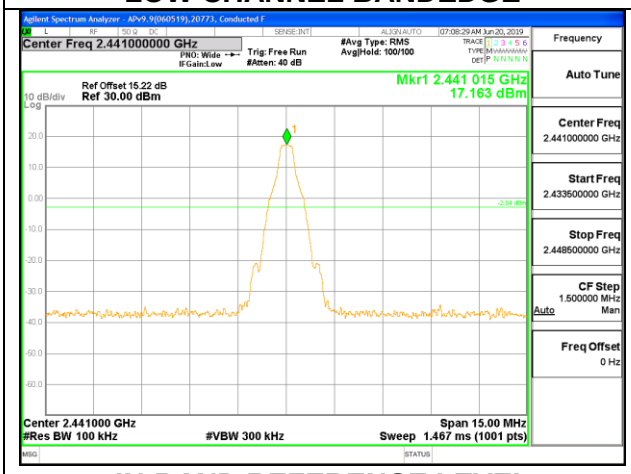
Antenna 4 SPURIOUS EMISSIONS, NON-HOPPING



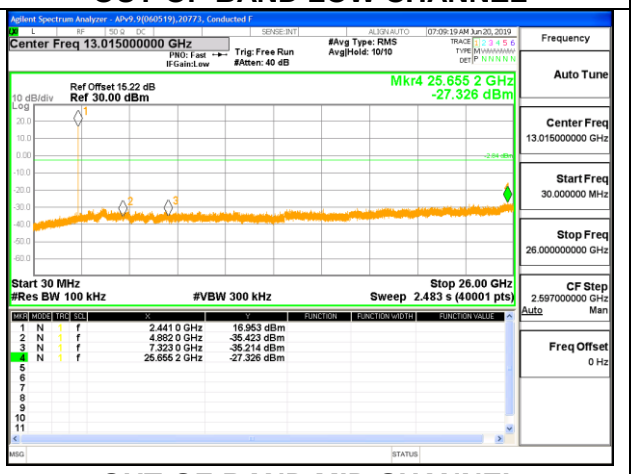
LOW CHANNEL BANDEDGE



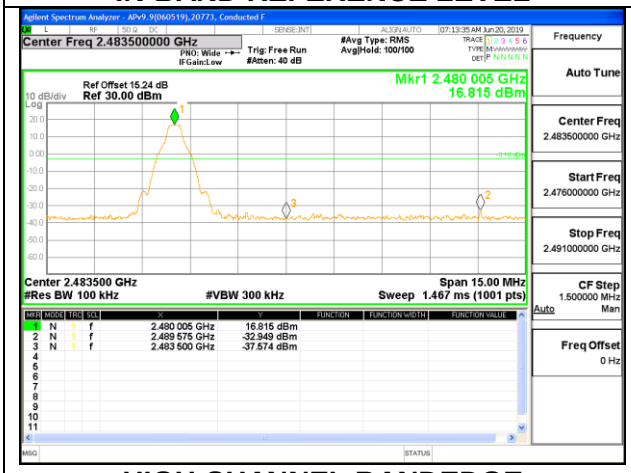
OUT-OF-BAND LOW CHANNEL



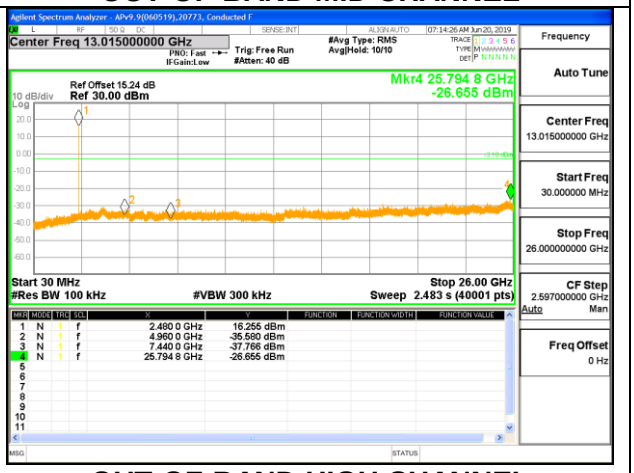
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

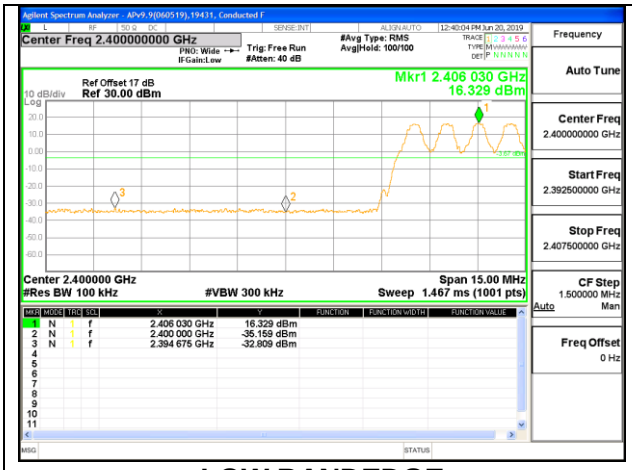


HIGH CHANNEL BANDEDGE

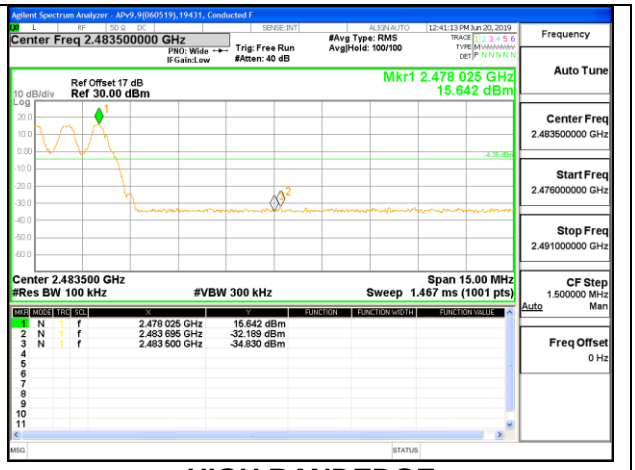


OUT-OF-BAND HIGH CHANNEL

Antenna 4 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

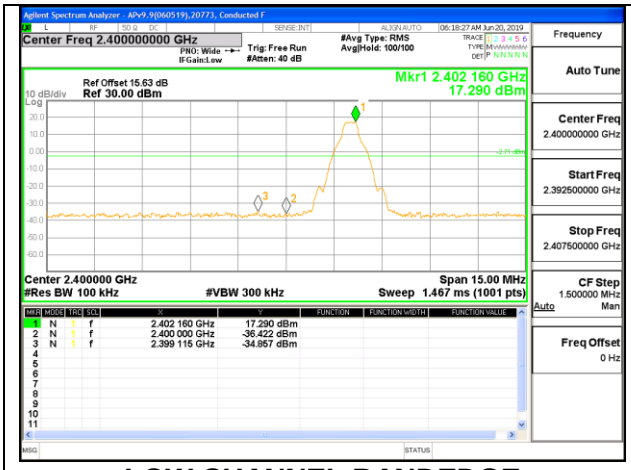


LOW BANDEDGE

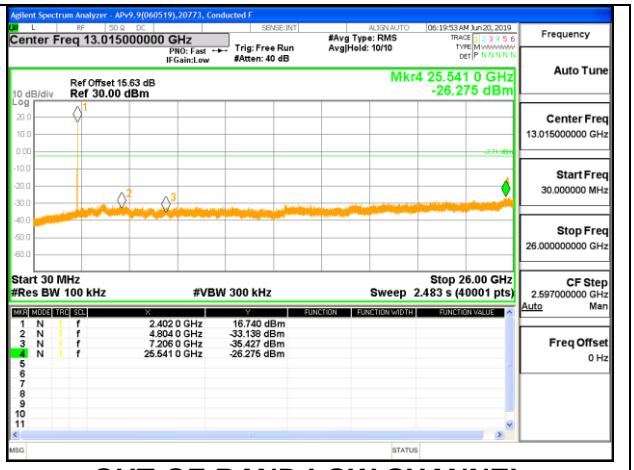


HIGH BANDEDGE

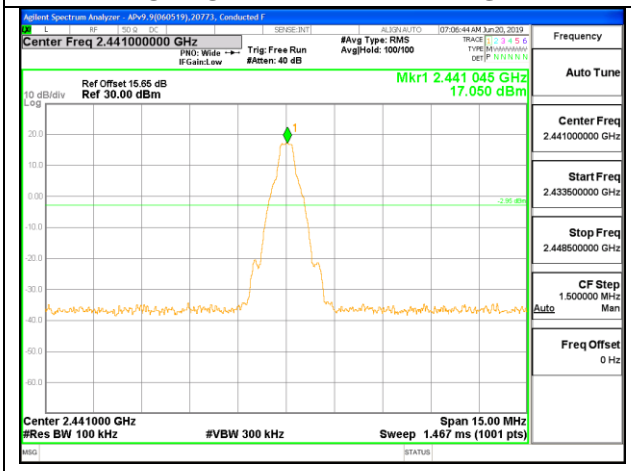
Antenna 3 SPURIOUS EMISSIONS, NON-HOPPING



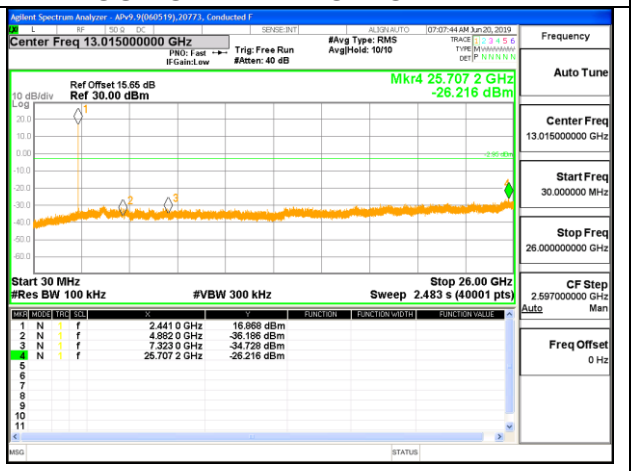
LOW CHANNEL BANDEDGE



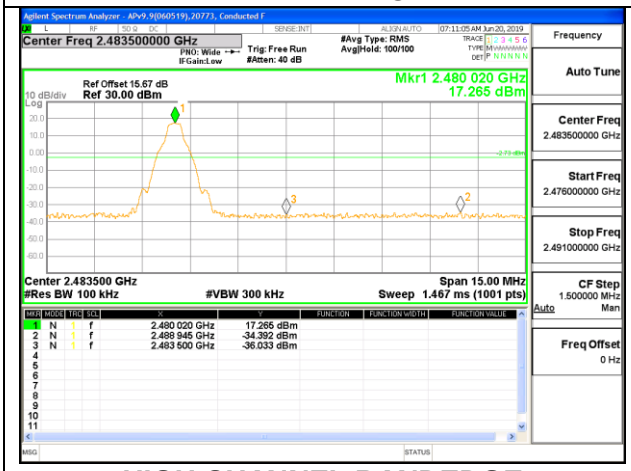
OUT-OF-BAND LOW CHANNEL



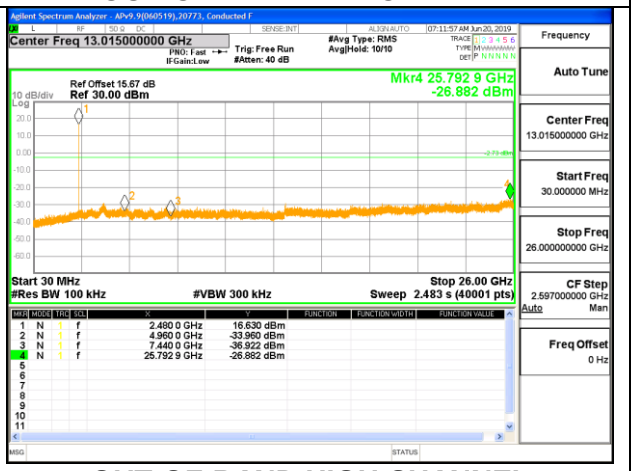
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL