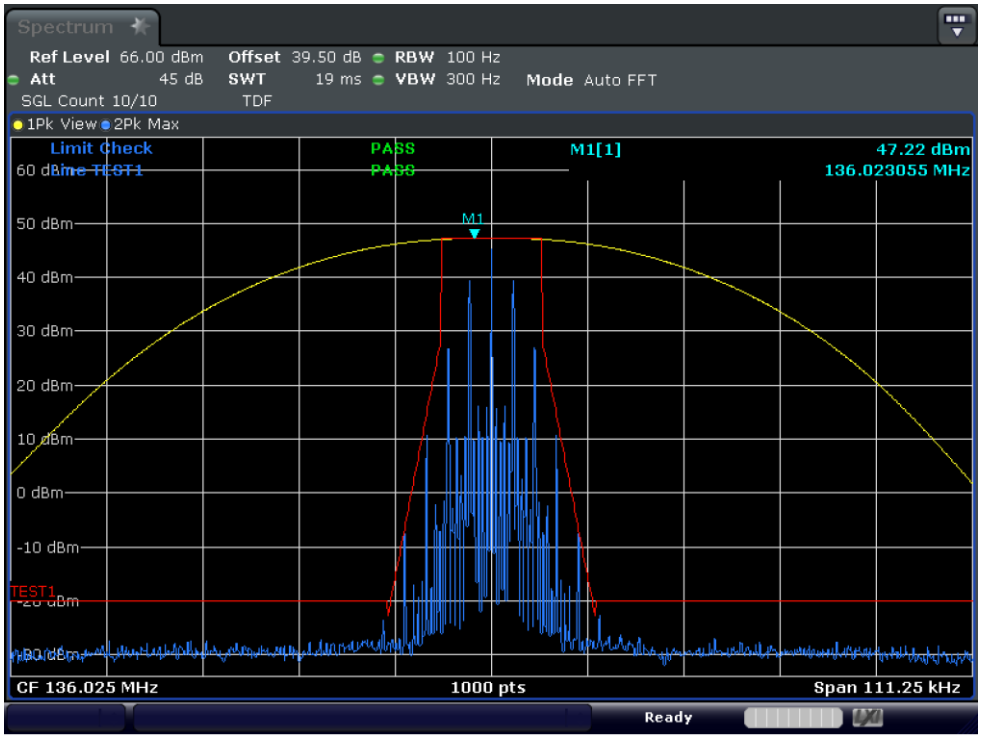
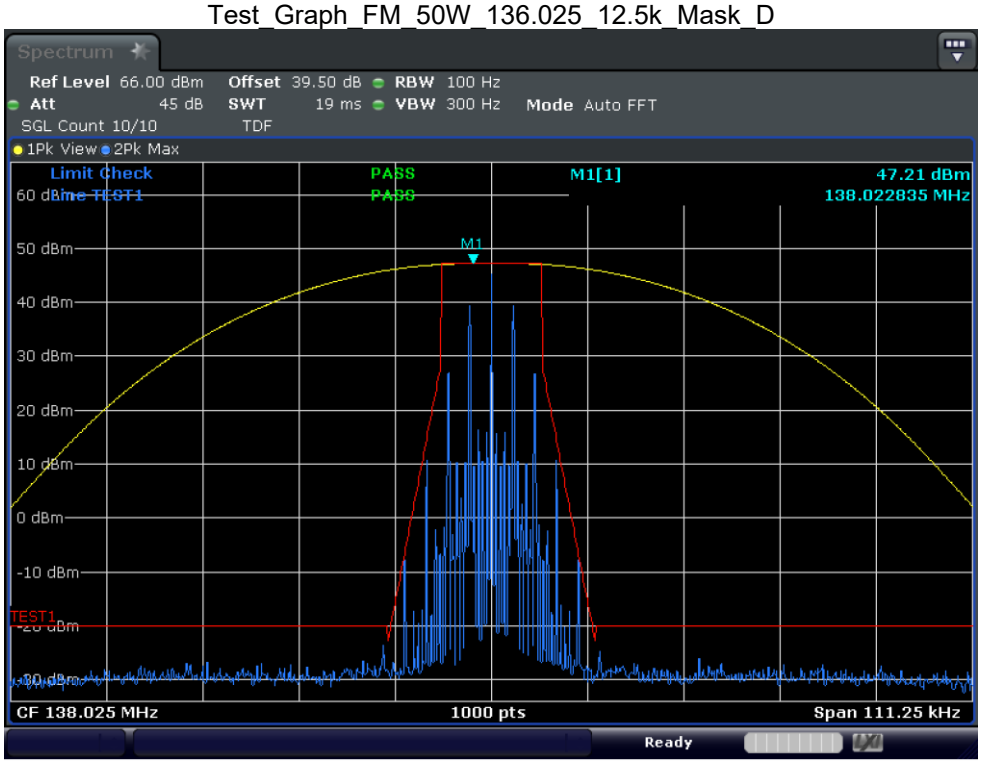
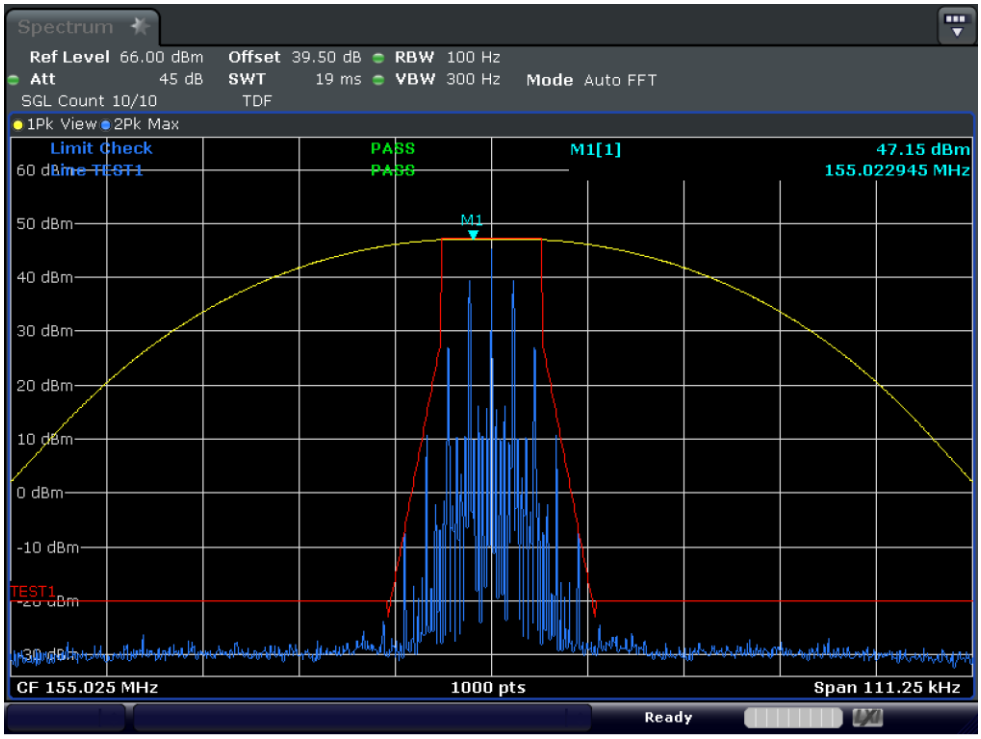


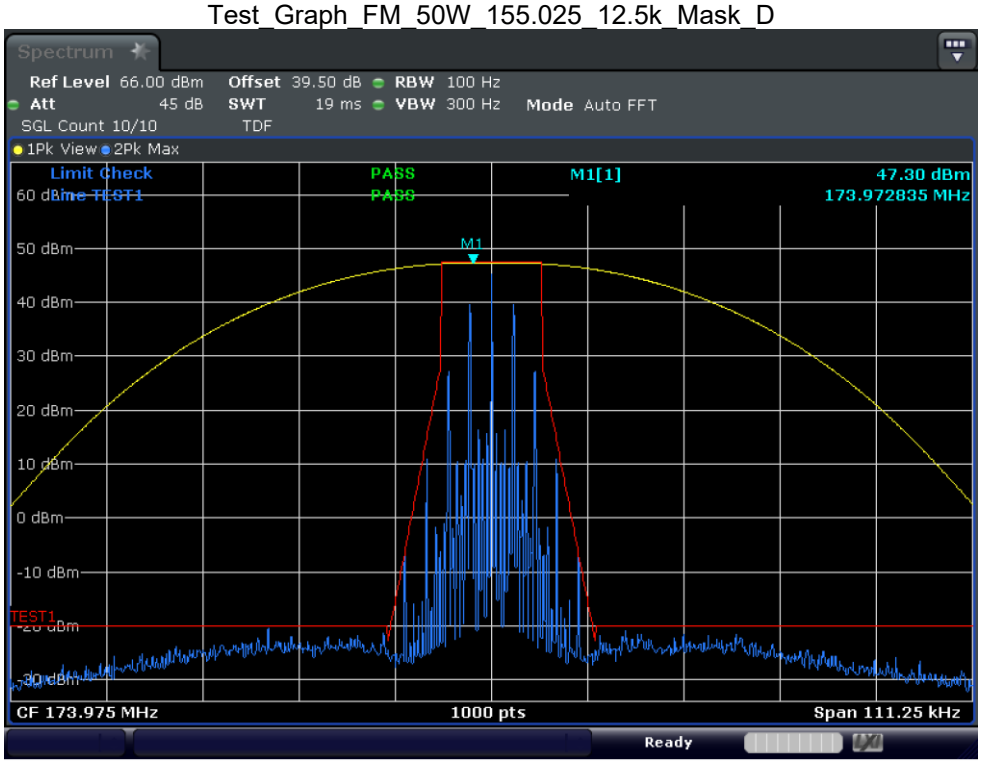
Test_Graph_FM_50W_136.025_12.5k_Mask_D



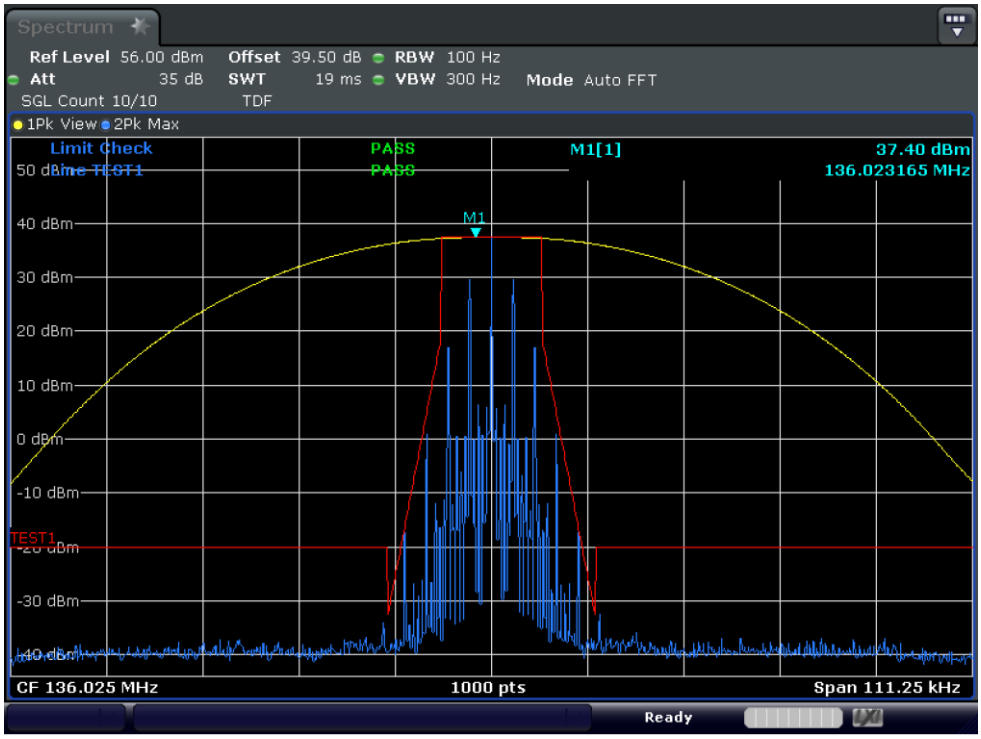
Test_Graph_FM_50W_138.025_12.5k_Mask_D



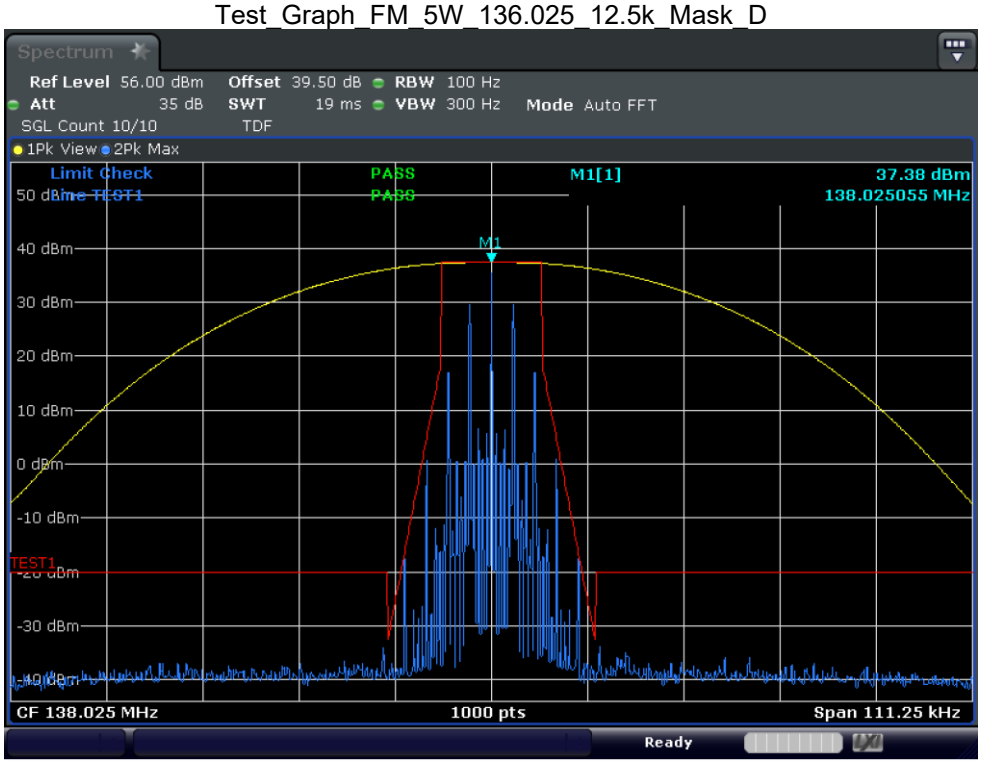
Test_Graph_FM_50W_155.025_12.5k_Mask_D



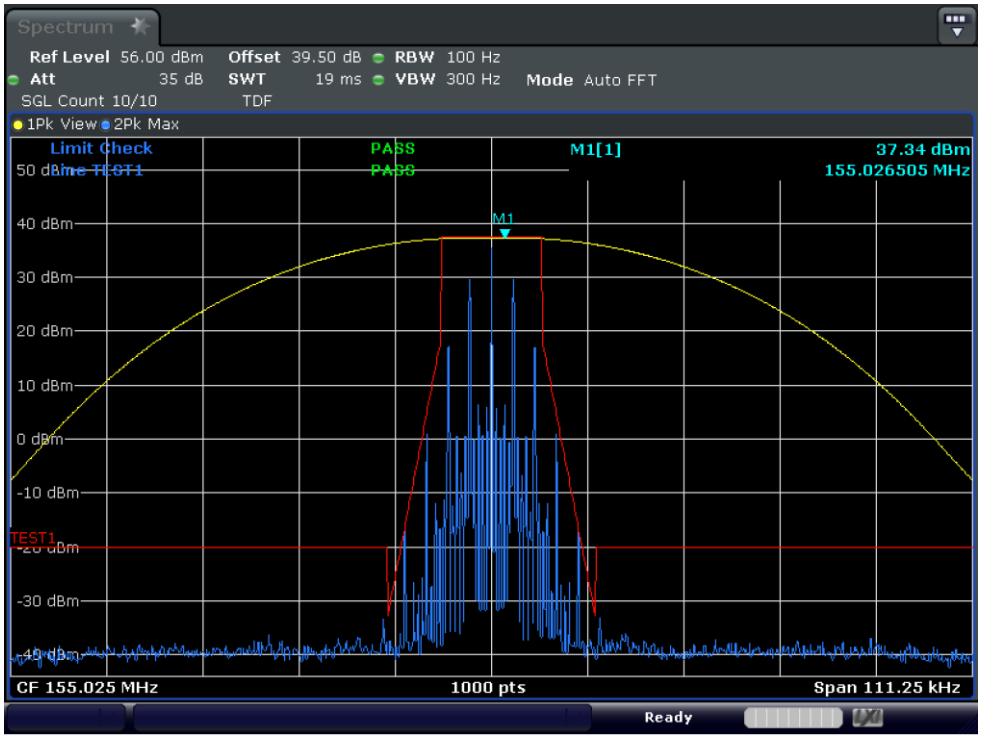
Test_Graph_FM_50W_173.975_12.5k_Mask_D



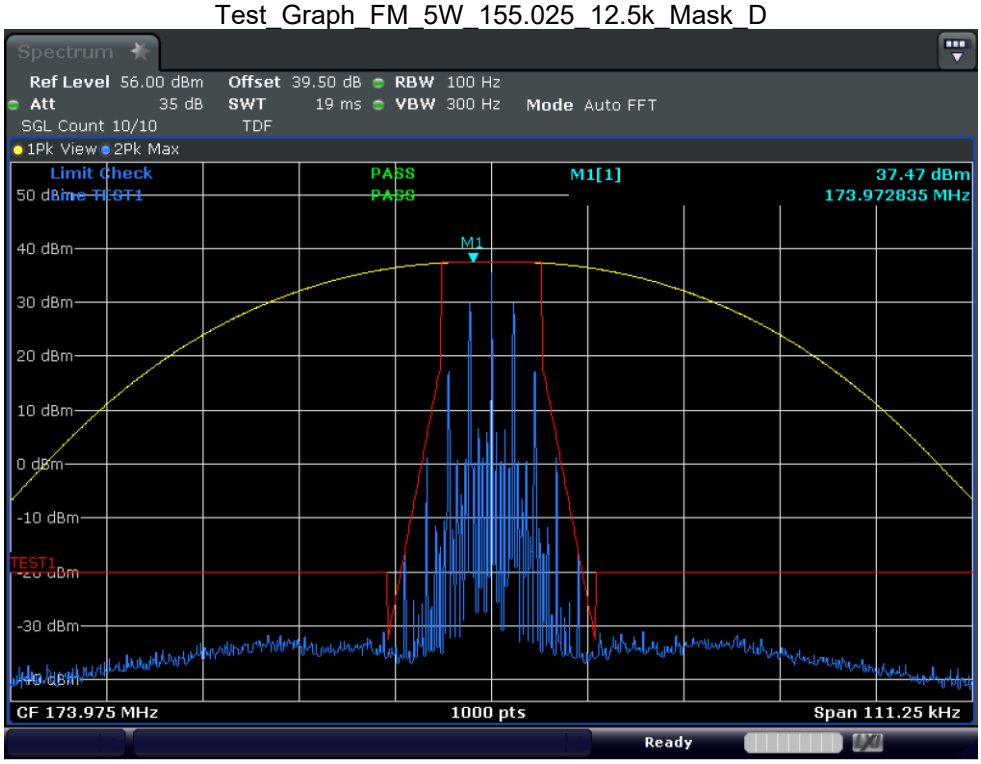
Test_Graph_FM_5W_136.025_12.5k_Mask_D



Test_Graph_FM_5W_138.025_12.5k_Mask_D



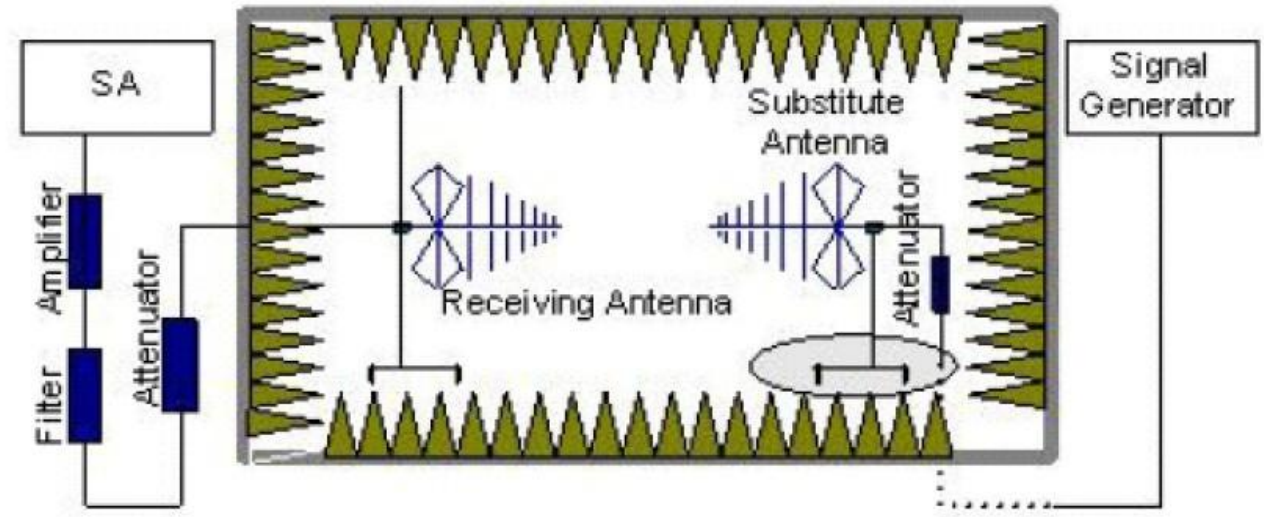
Test_Graph_FM_5W_155.025_12.5k_Mask_D

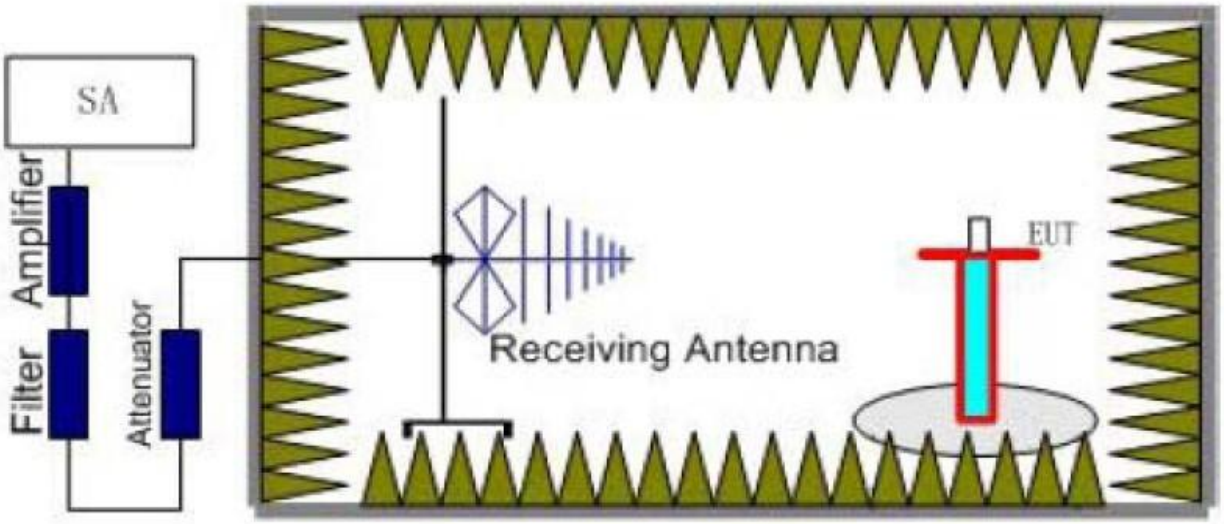


Test_Graph_FM_5W_173.975_12.5k_Mask_D

4.4. Field Strength Spurious Emissions

TEST CONFIGURATION





TEST PROCEDURE

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in six channels were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyser or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyser or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz for above 1GHz and RBW=100KHz,VBW=300KHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna.In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest isconnected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}) ,the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
   The measurement results are obtained as described below:
   Power(EIRP)=P_{Mea}- P_{Ag} - P_{cl}+ G_a

It can omit power amplifier if signal generator level meets requirement;

This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.

6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

Subrange (GHz)	RBW	VBW	Sweep time (s)
0.00009~0.15	1KHz	3KHz	30
0.00015~0.03	10KHz	30KHz	10
0.03~1	100KHz	300KHz	10
1~5	1 MHz	3 MHz	5

TEST LIMIT

According to §90.210 d) (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

According to §90.210 b) (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

TEST RESULTS

1. In general, the worst case attenuation requirement shown above was applied.
2. The measurement frequency range from 9KHz to 5 GHz.

3. EIRP for measure frequency above 1 GHz and ERP for below 1 GHz.
4. *** means that the emission level is too low to be measured or at least 20 dB down than the limit.

Test Frequency: 136.025MHz				Channel Separation:12.5KHz			
Frequency (MHz)	P_{Mea} (dBm)	Path Loss	Antenna Gain	Correction (dB)	Values (dBm)	Limit (dBm)	Polarization
272.05	-46.11	0.33	3.16	2.15	-45.43	-20	H
408.08	-45.77	0.42	3.42	2.15	-44.92	-20	H
544.10	-51.23	0.46	4.15	2.15	-49.69	-20	H
…	…	…	…	…	…	…	H
272.05	-43.35	0.33	3.16	2.15	-42.67	-20	V
408.08	-45.16	0.42	3.42	2.15	-44.31	-20	V
544.10	-50.28	0.46	4.15	2.15	-48.74	-20	V
…	…	…	…	…	…	…	V

Test Frequency: 138.025MHz				Channel Separation:12.5KHz			
Frequency (MHz)	P_{Mea} (dBm)	Path Loss	Antenna Gain	Correction (dB)	Values (dBm)	Limit (dBm)	Polarization
276.05	-46.73	0.33	3.16	2.15	-46.05	-20	H
414.08	-46.29	0.42	3.42	2.15	-45.44	-20	H
552.10	-52.33	0.46	4.15	2.15	-50.79	-20	H
…	…	…	…	…	…	…	H
276.05	-44.18	0.33	3.16	2.15	-43.5	-20	V
414.08	-44.89	0.42	3.42	2.15	-44.04	-20	V
552.10	-52.26	0.46	4.15	2.15	-50.72	-20	V
…	…	…	…	…	…	…	V

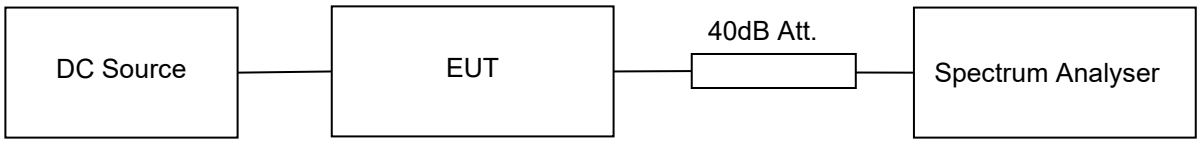
Test Frequency: 155.025MHz				Channel Separation:12.5KHz			
Frequency (MHz)	P_{Mea} (dBm)	Path Loss	Antenna Gain	Correction (dB)	Values (dBm)	Limit (dBm)	Polarization
310.05	-47.35	0.33	3.16	2.15	-46.67	-20	H
465.08	-43.89	0.47	3.77	2.15	-42.74	-20	H
620.10	-52.47	0.53	4.89	2.15	-50.26	-20	H
…	…	…	…	…	…	…	H
310.05	-45.14	0.33	3.16	2.15	-44.46	-20	V
465.08	-43.58	0.47	3.77	2.15	-42.43	-20	V
620.10	-51.54	0.53	4.89	2.15	-49.33	-20	V
…	…	…	…	…	…	…	V

Test Frequency: 173.975MHz				Channel Separation:12.5KHz			
Frequency (MHz)	P_{Mea} (dBm)	Path Loss	Antenna Gain	Correction (dB)	Values (dBm)	Limit (dBm)	Polarization
347.95	-44.65	0.33	3.16	2.15	-43.97	-20	H
521.93	-44.75	0.47	3.77	2.15	-43.6	-20	H
695.90	-47.95	0.53	4.89	2.15	-45.74	-20	H
…	…	…	…	…	…	…	H
347.95	-44.13	0.33	3.16	2.15	-43.45	-20	V
521.93	-47.26	0.47	3.77	2.15	-46.11	-20	V
695.90	-49.87	0.53	4.89	2.15	-47.66	-20	V
…	…	…	…	…	…	…	V

Note: All the test modes was tested, but only the worst mode(FM in 50W with 12.5k channel separation) be recorded in this part.

4.5. Conducted spurious emission result(at antenna terminal):

TEST CONFIGURATION



TEST PROCEDURE

1) Connect the equipmet as illuastrated.
2) Set EUT working in continuous mode in low,middle,high frequency,read and record the peak power value.

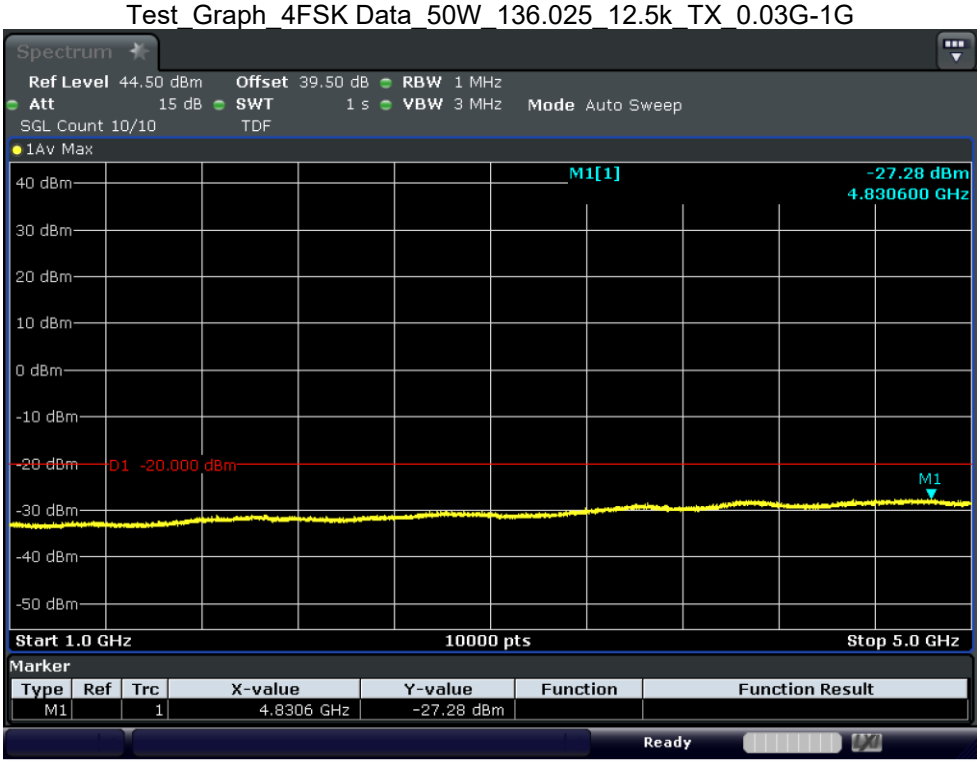
TEST LIMIT

According to §90.210 d) (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

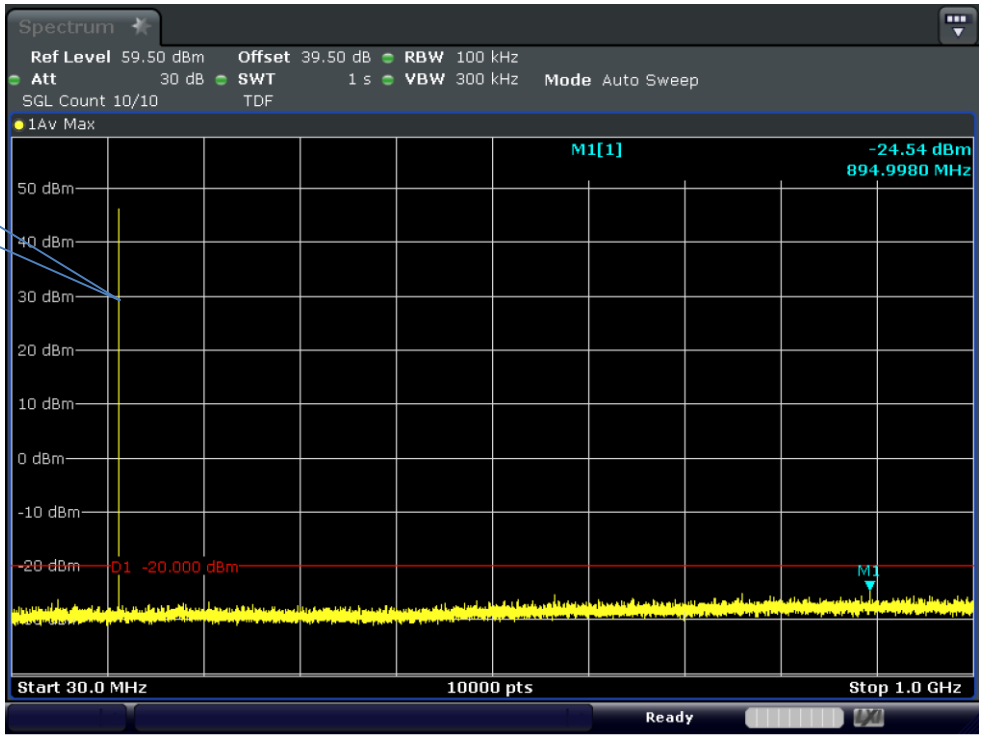
According to §90.210 b) (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

TEST RESULTS

Test_Graph_4FSK Data_50W_136.025_12.5k_TX_0.03G-1G



Test_Graph_4FSK Data_50W_136.025_12.5k_TX_1G-5G



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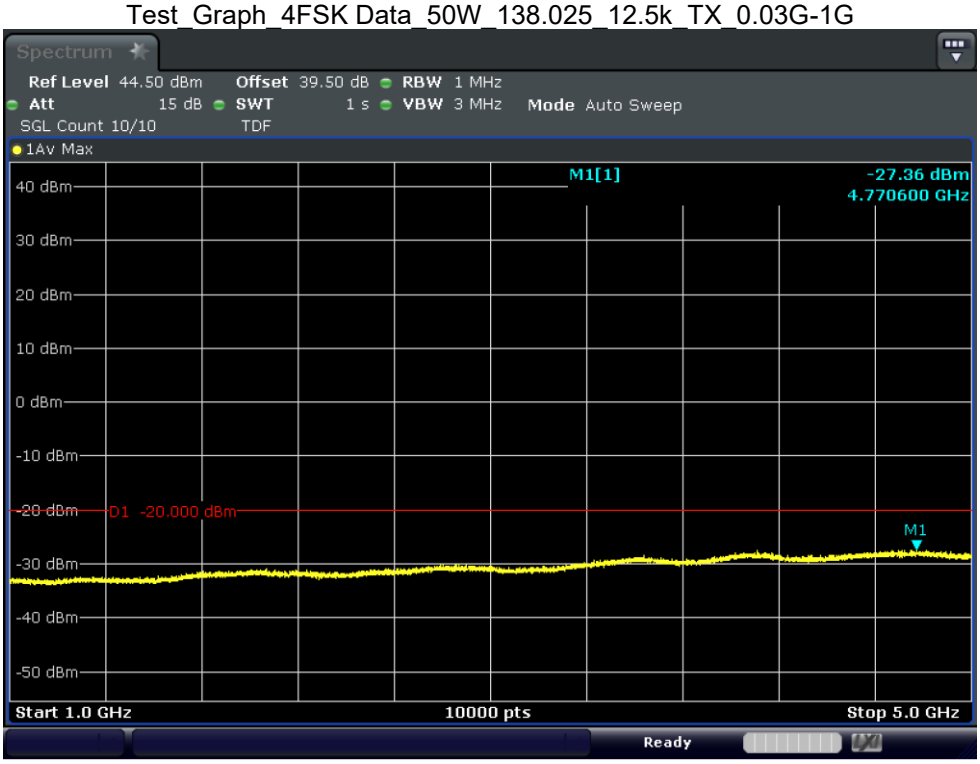
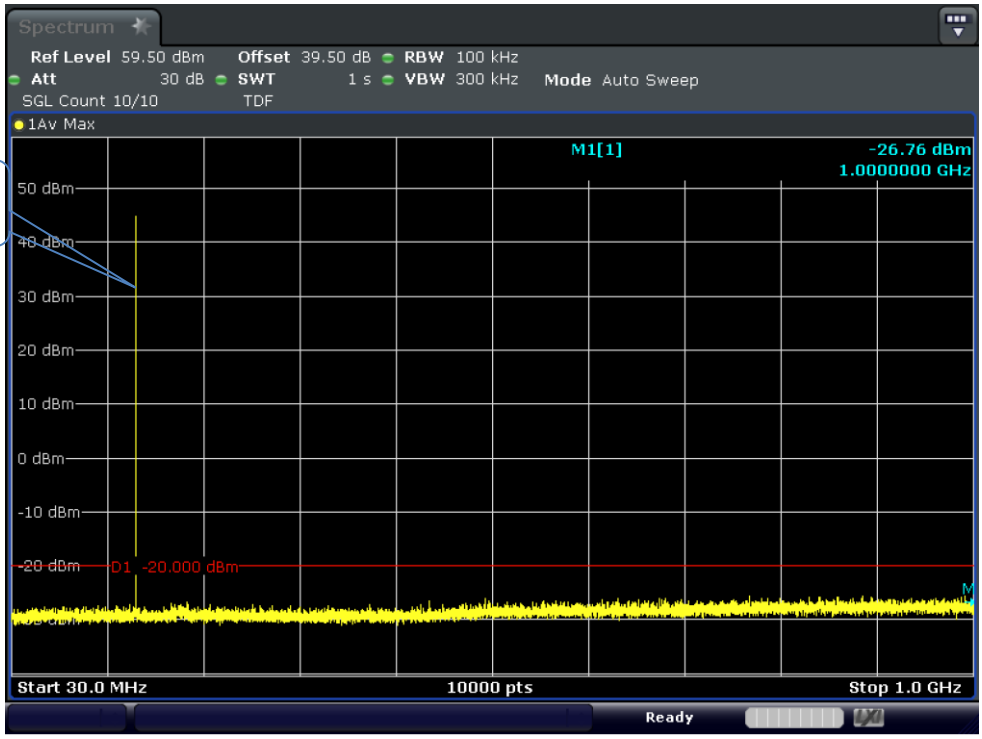
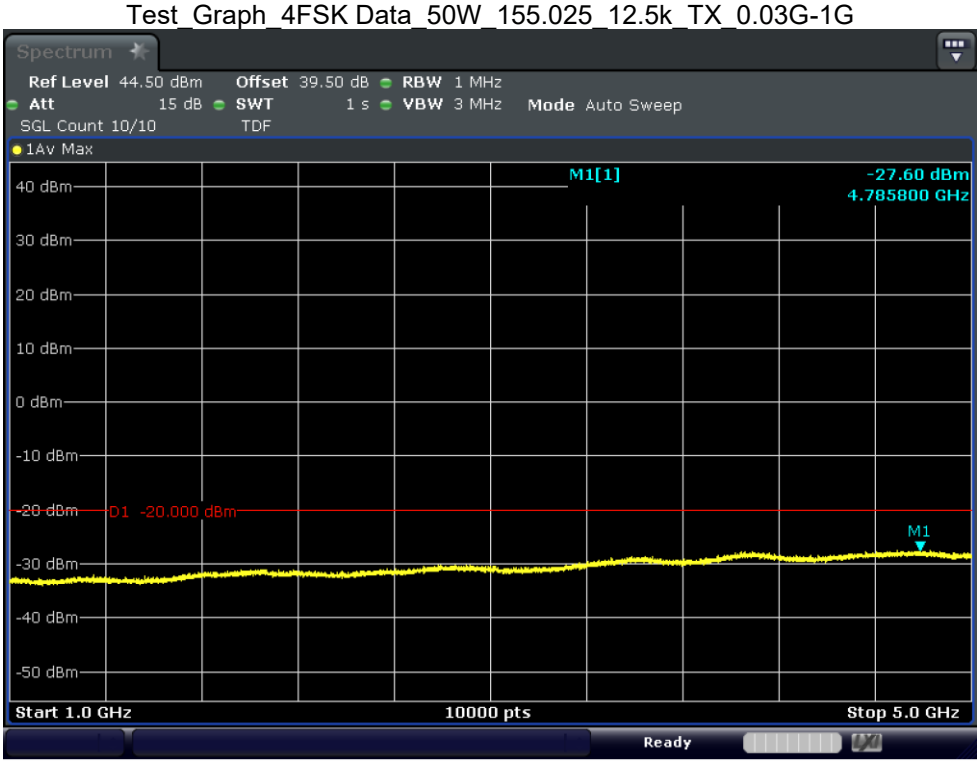


Test_Graph_4FSK Data_50W_138.025_12.5k_TX_1G-5G

Fundamental



Test_Graph_4FSK Data_50W_155.025_12.5k_TX_0.03G-1G



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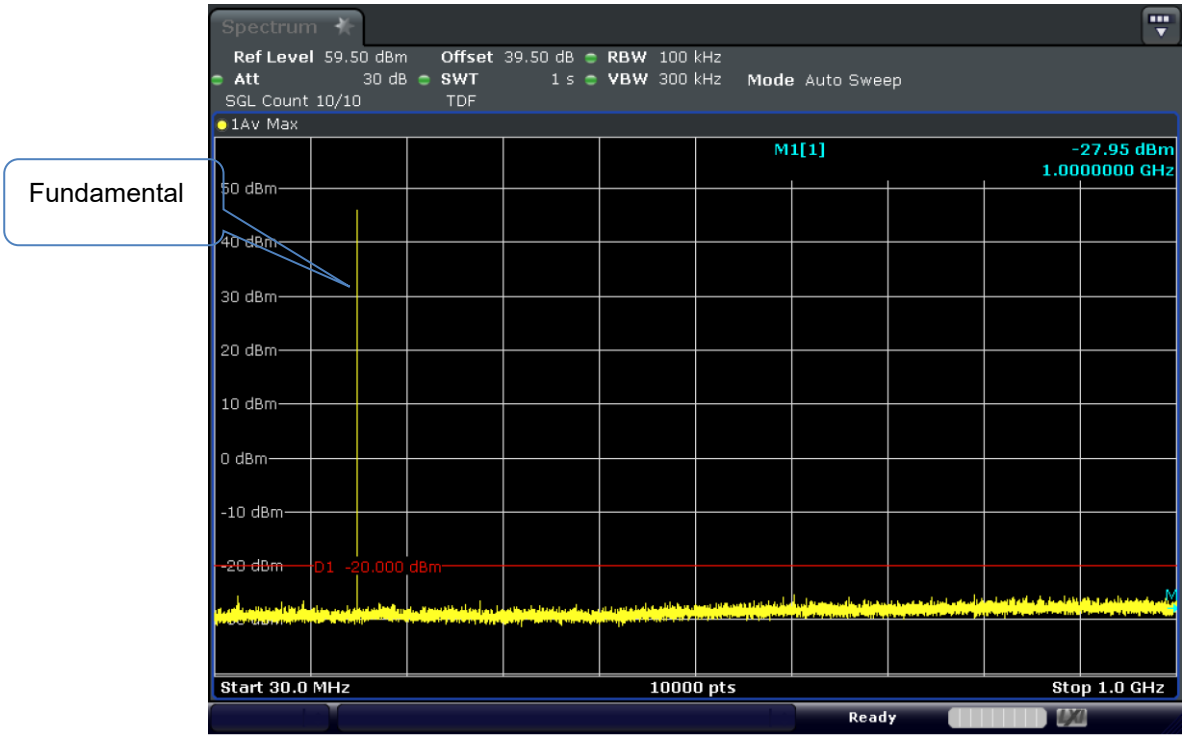

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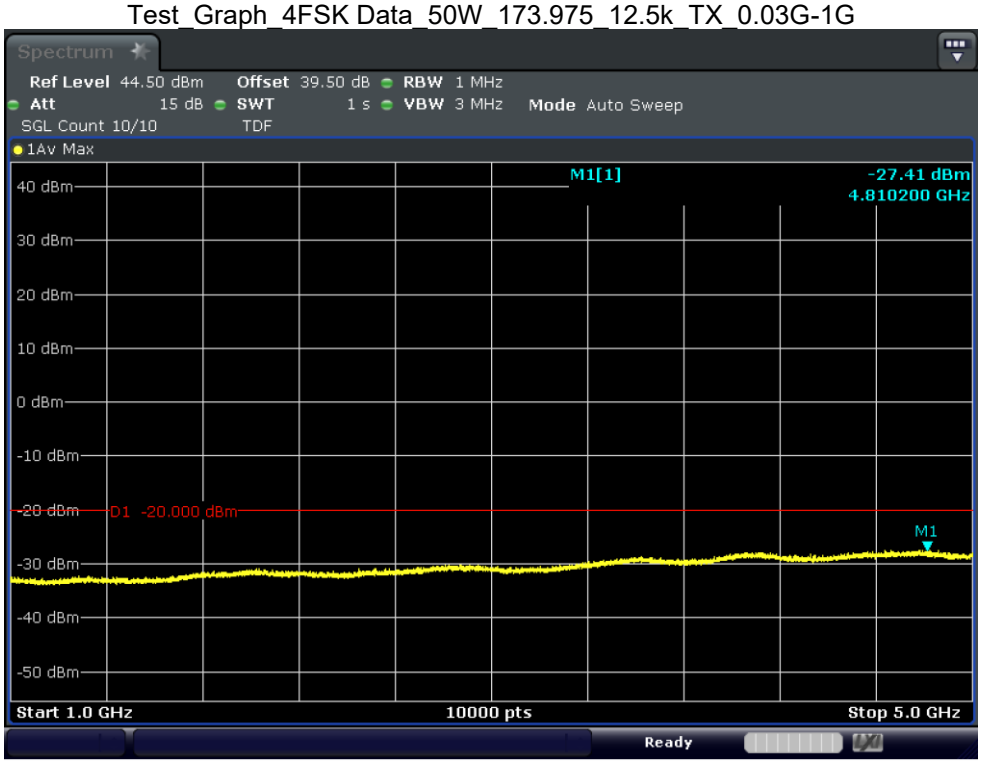

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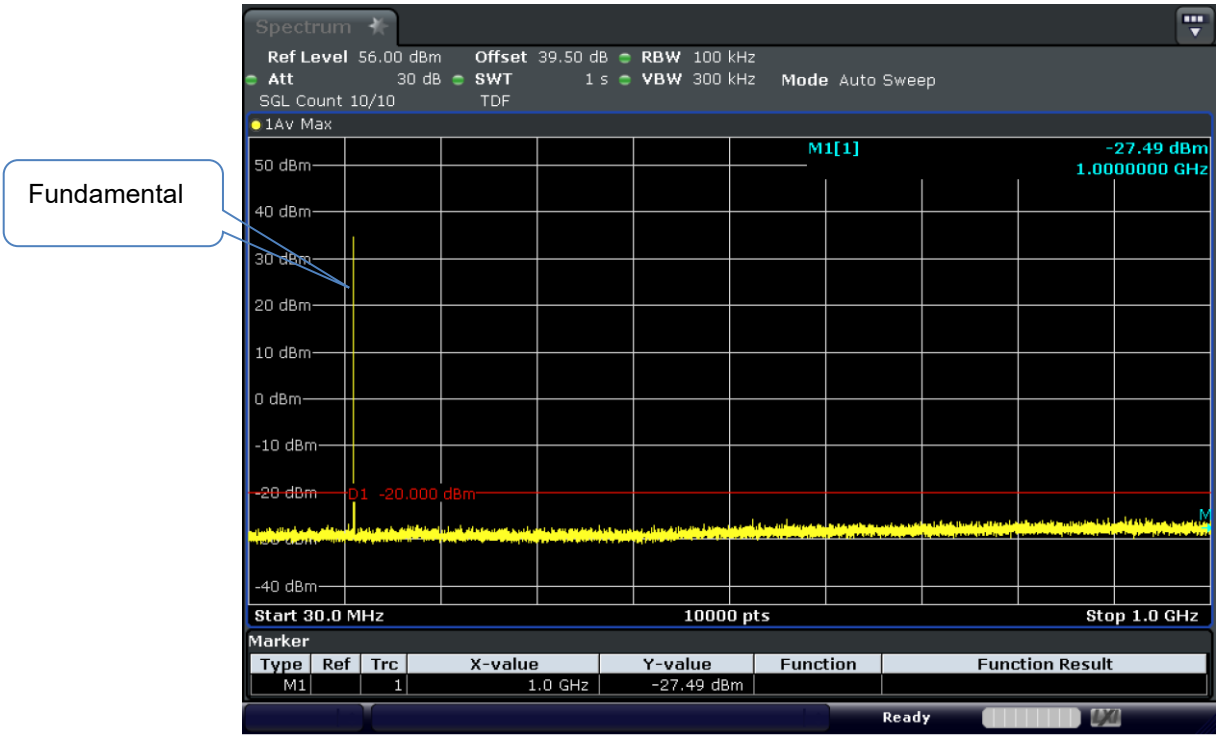

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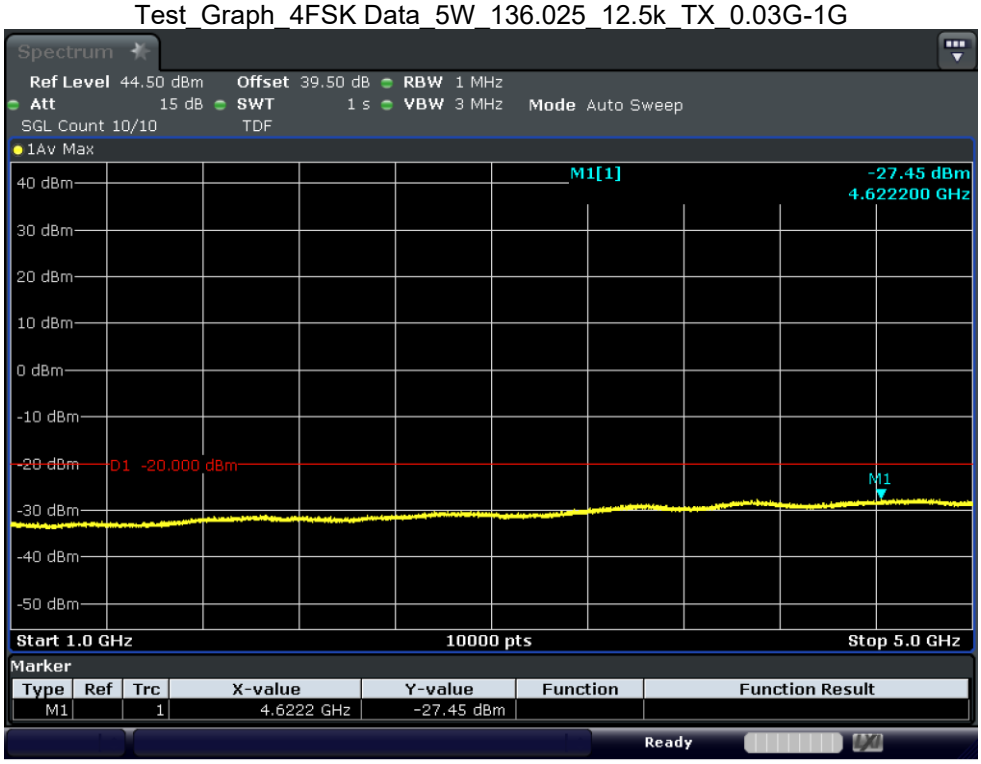

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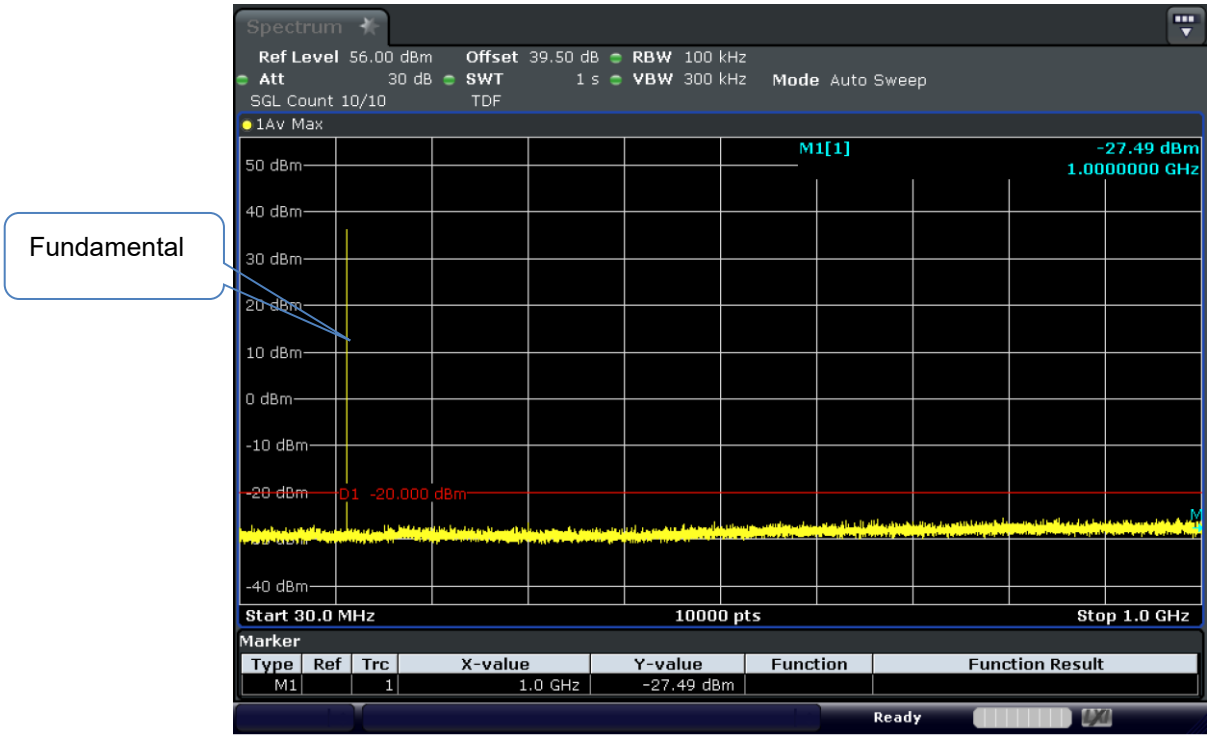

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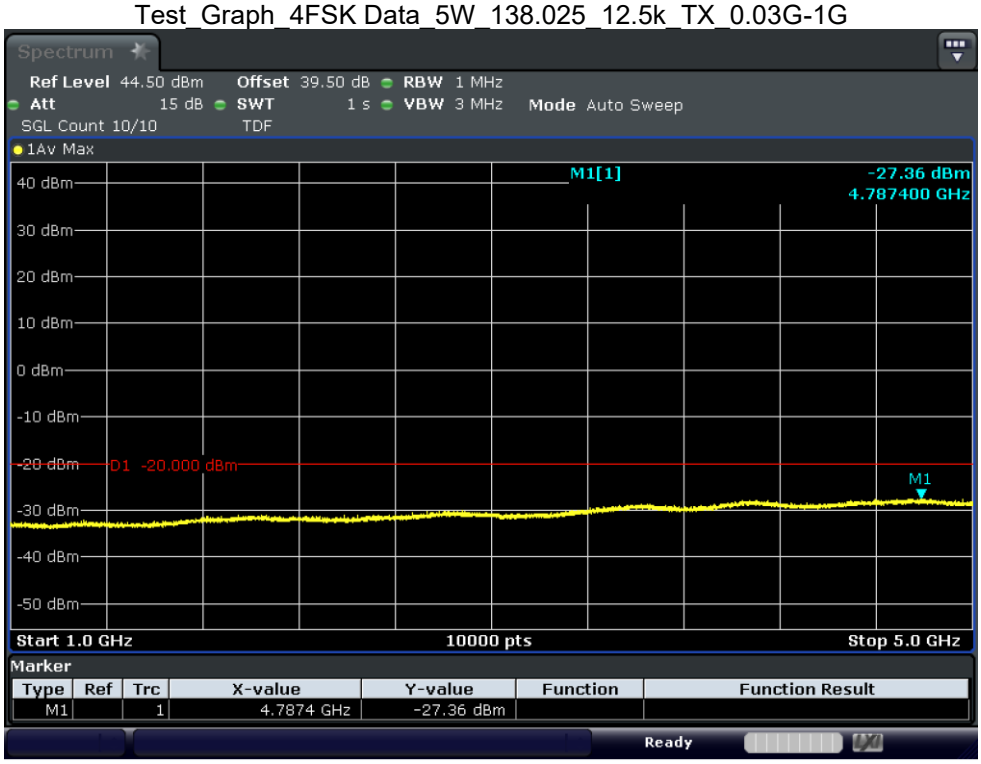
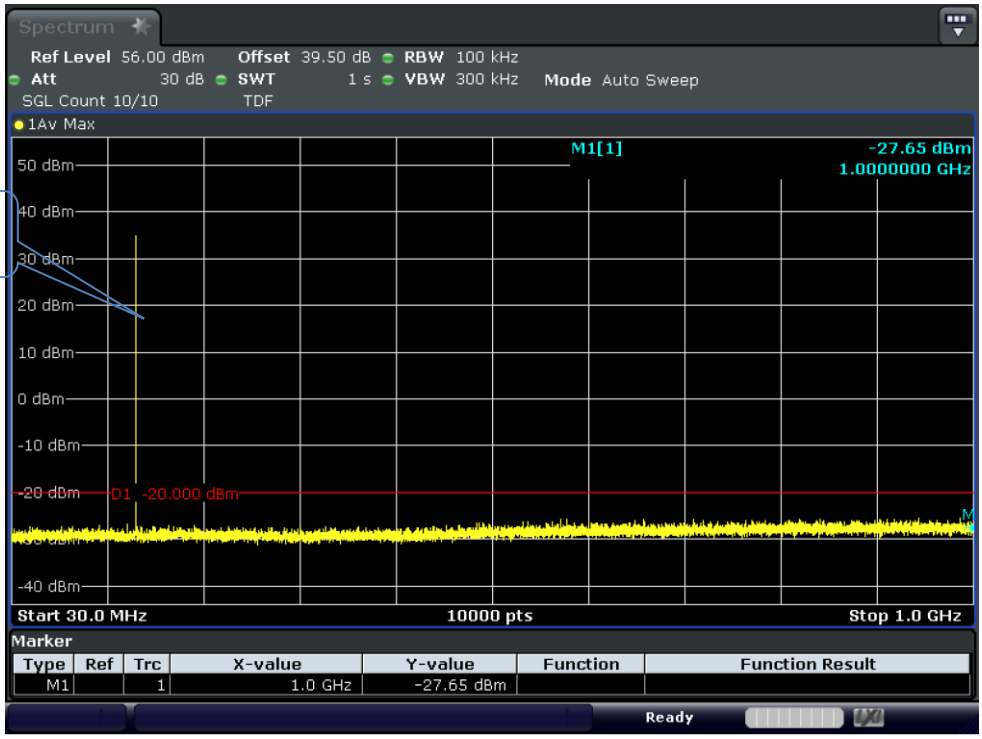


Test_Graph_4FSK Data_5W_138.025_12.5k_TX_1G-5G

Fundamental



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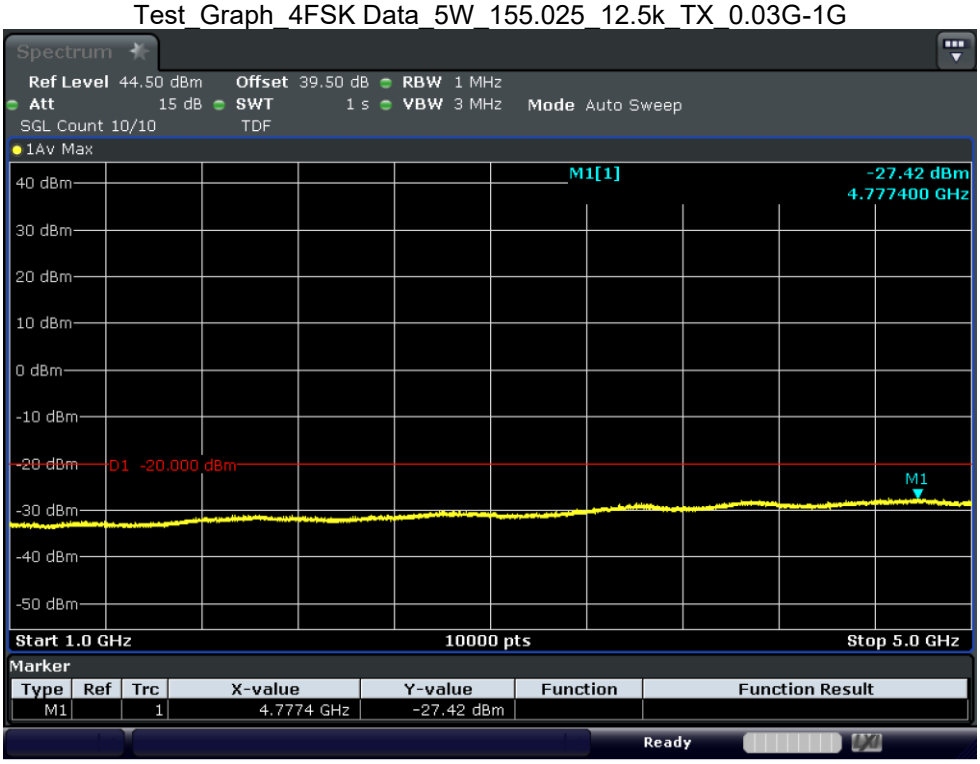
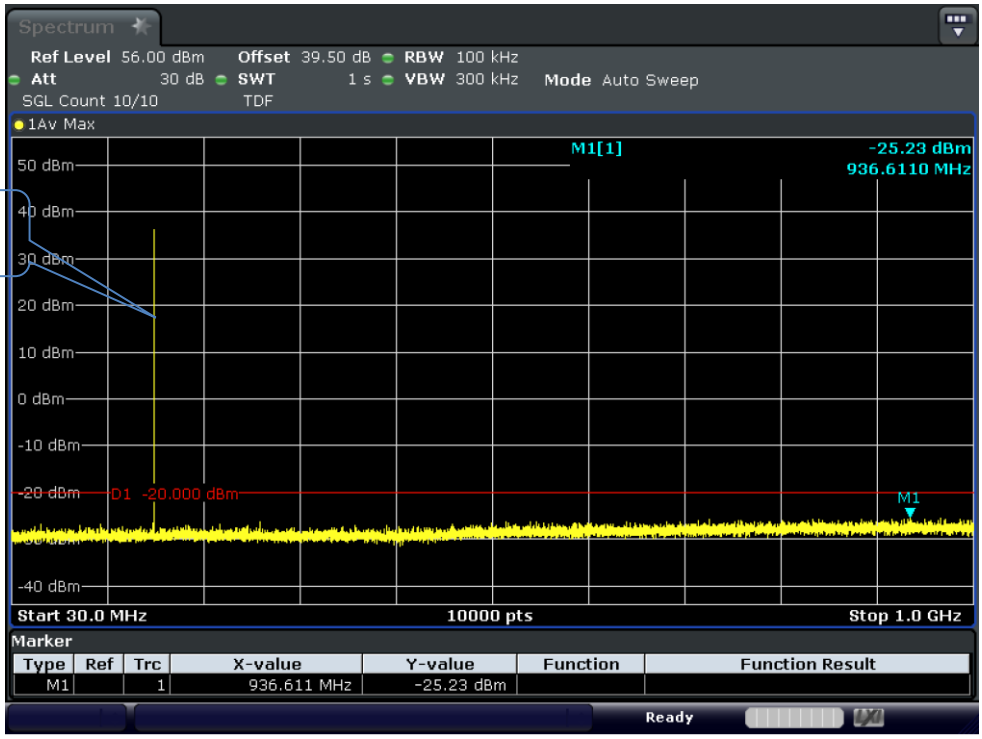


Test_Graph_4FSK Data_5W_155.025_12.5k_TX_1G-5G



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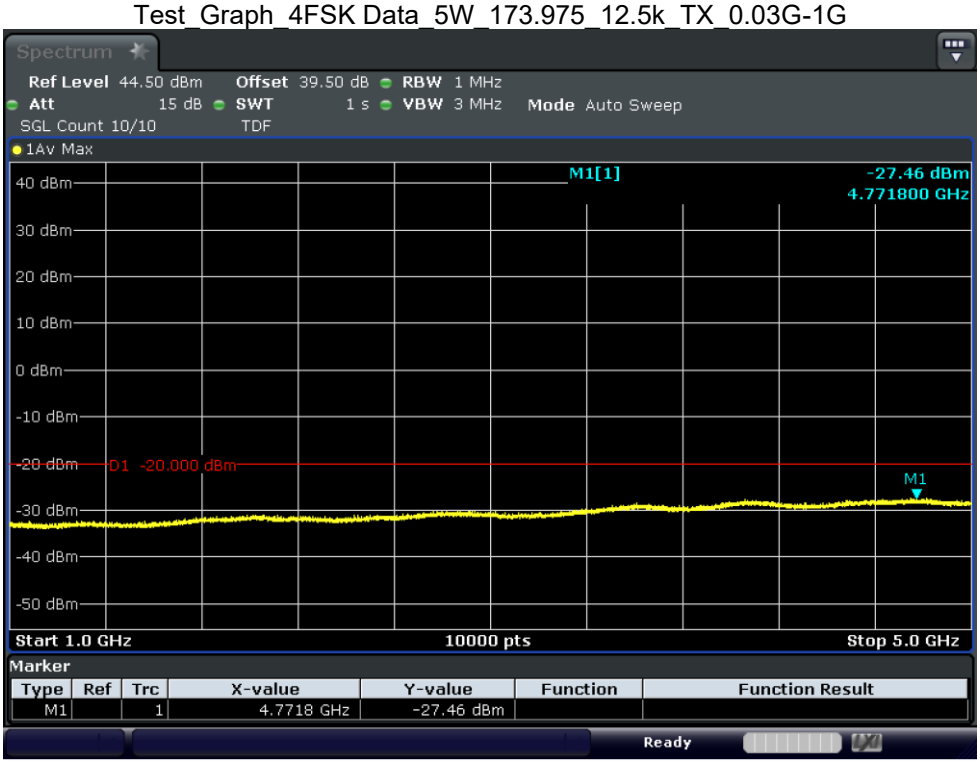

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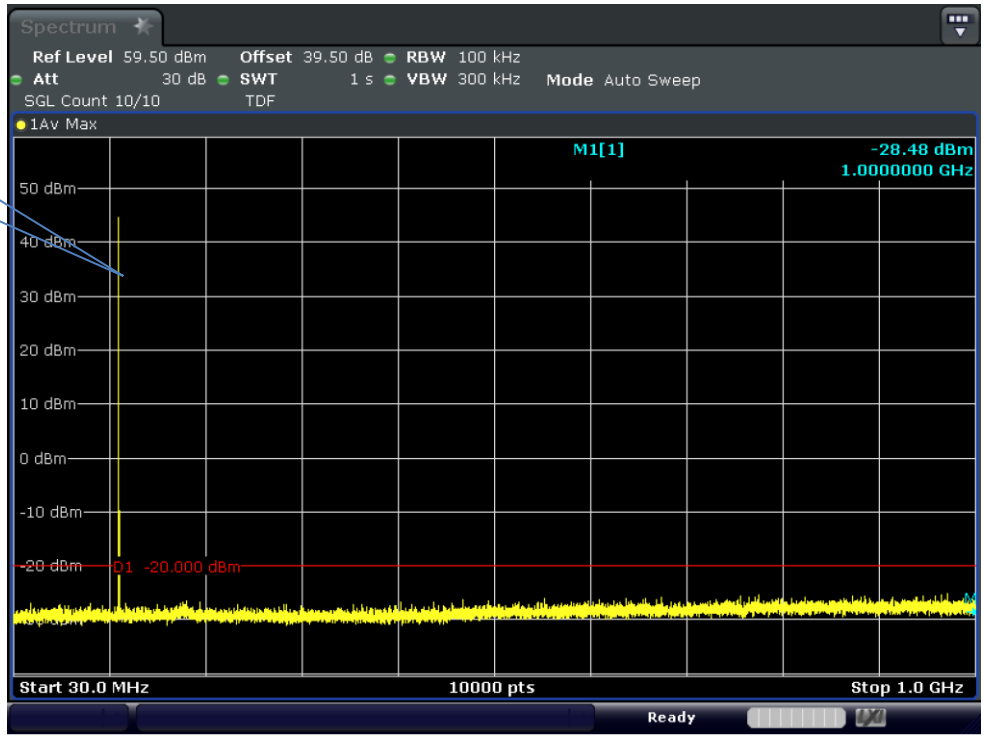
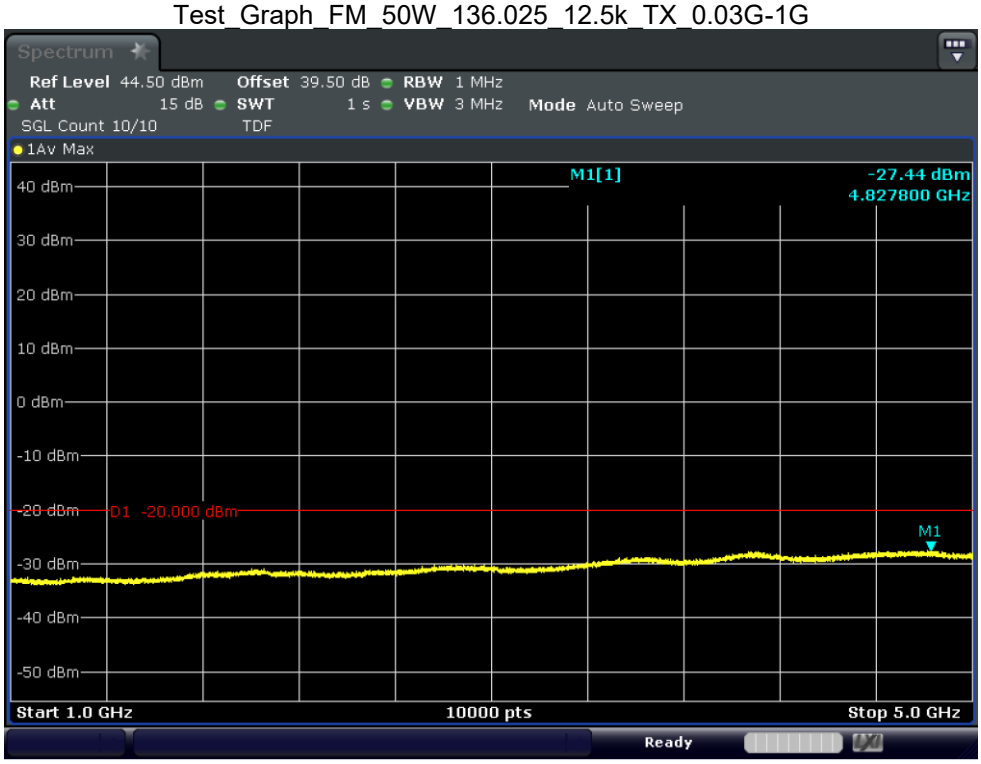
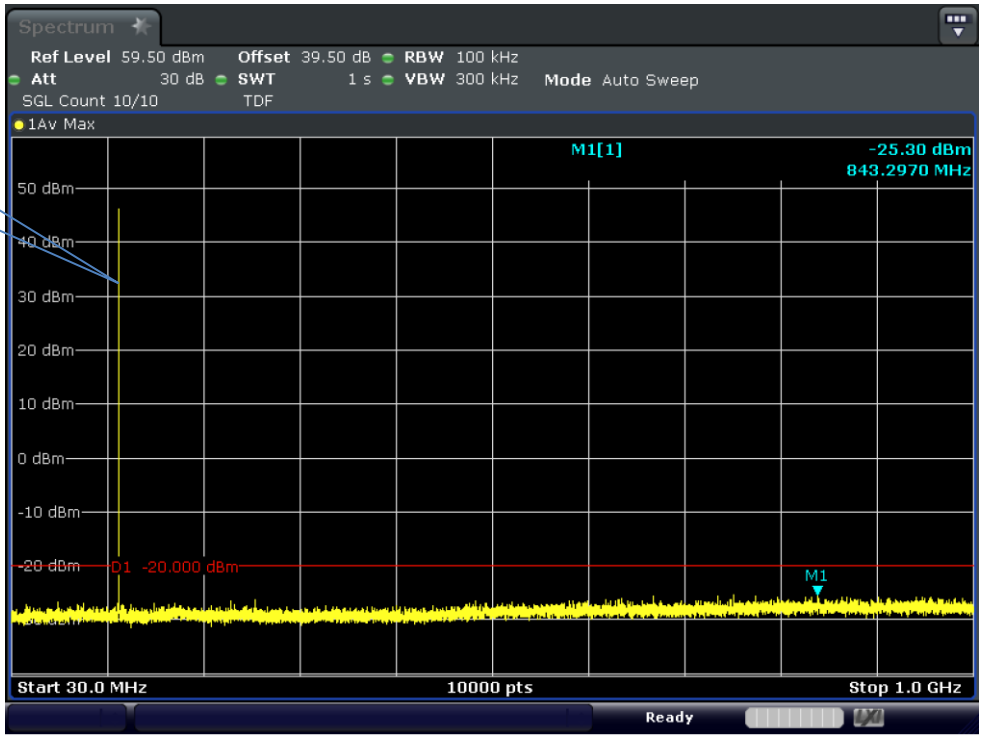


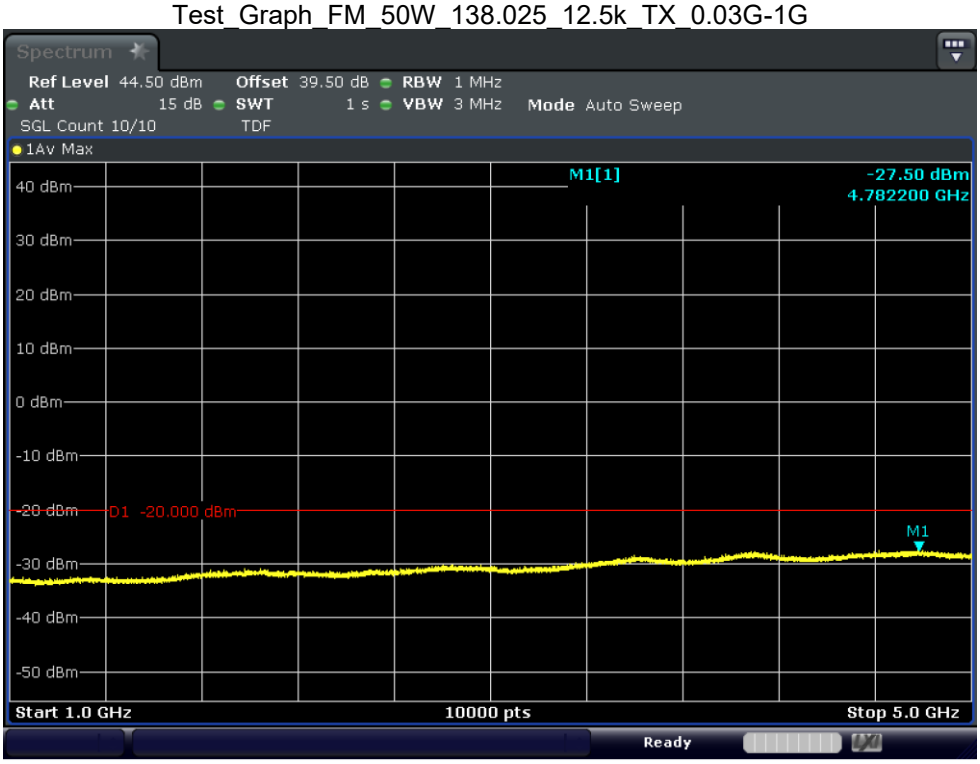
Test_Graph_FM_50W_136.025_12.5k_TX_0.03G-1G



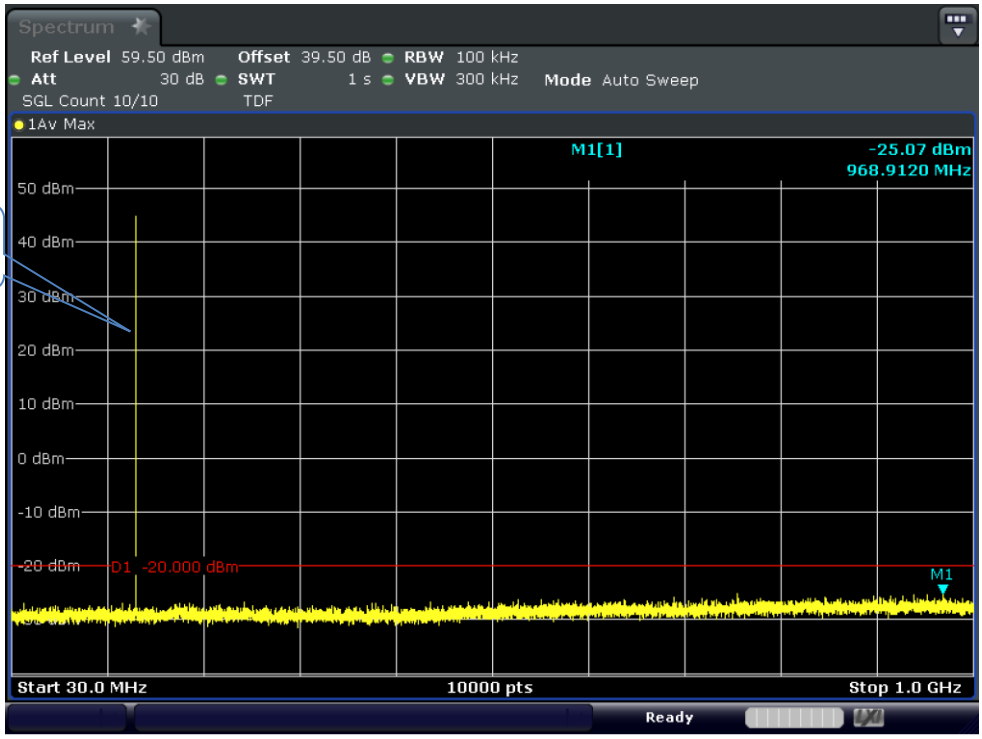
Test_Graph_FM_50W_136.025_12.5k_TX_1G-5G



Test_Graph_FM_50W_138.025_12.5k_TX_0.03G-1G

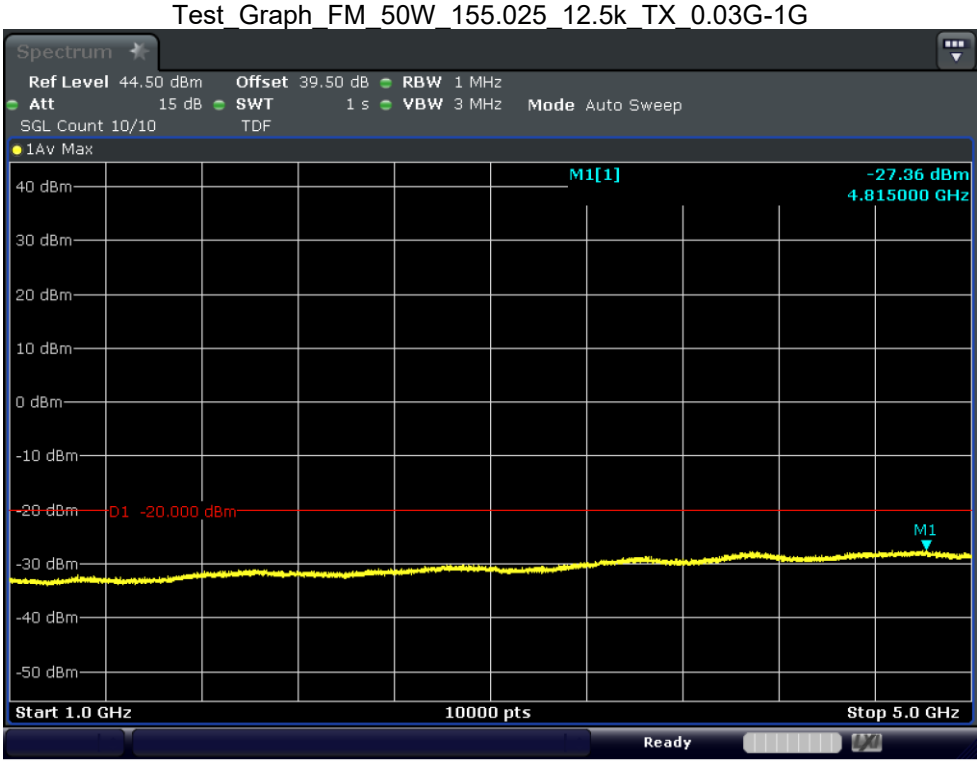


Test_Graph_FM_50W_138.025_12.5k_TX_1G-5G

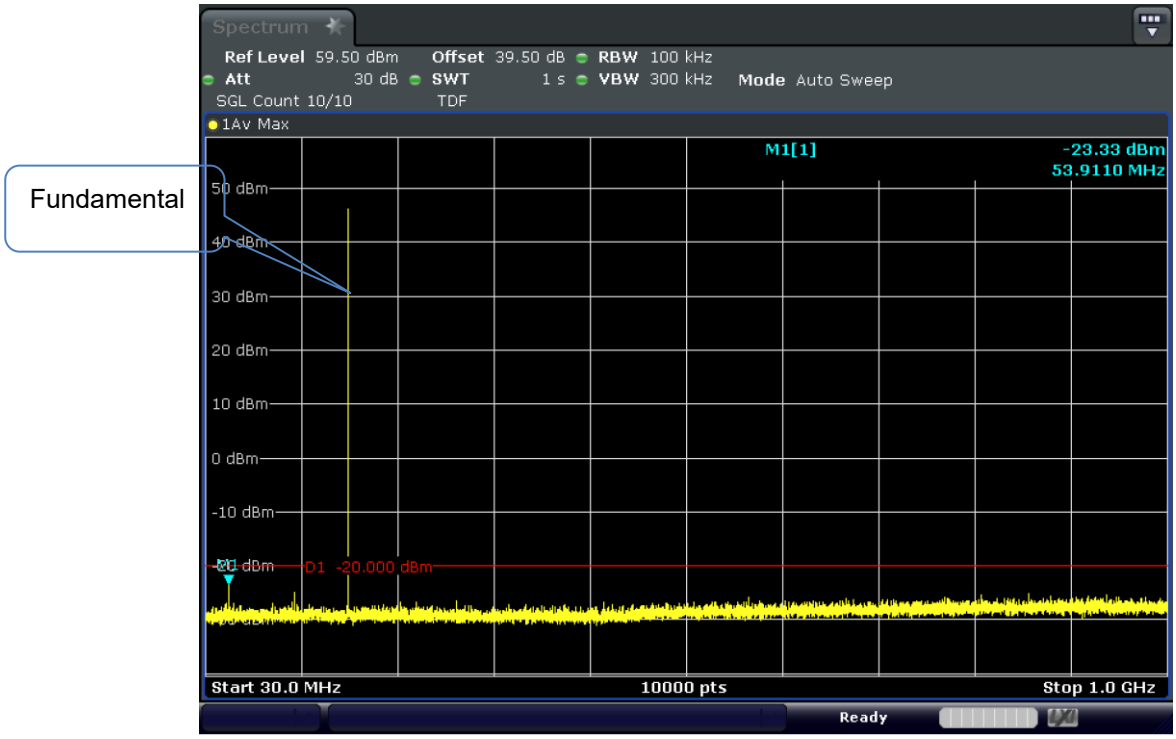


Fundamental

Test_Graph_FM_50W_155.025_12.5k_TX_0.03G-1G



Test_Graph_FM_50W_155.025_12.5k_TX_1G-5G



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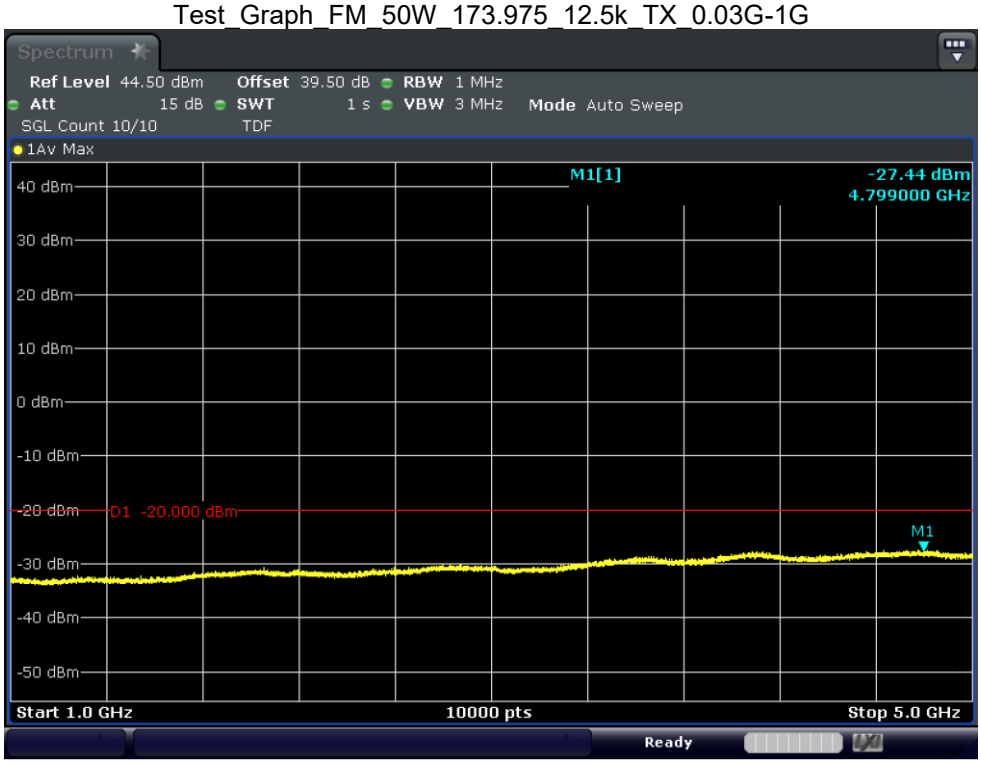

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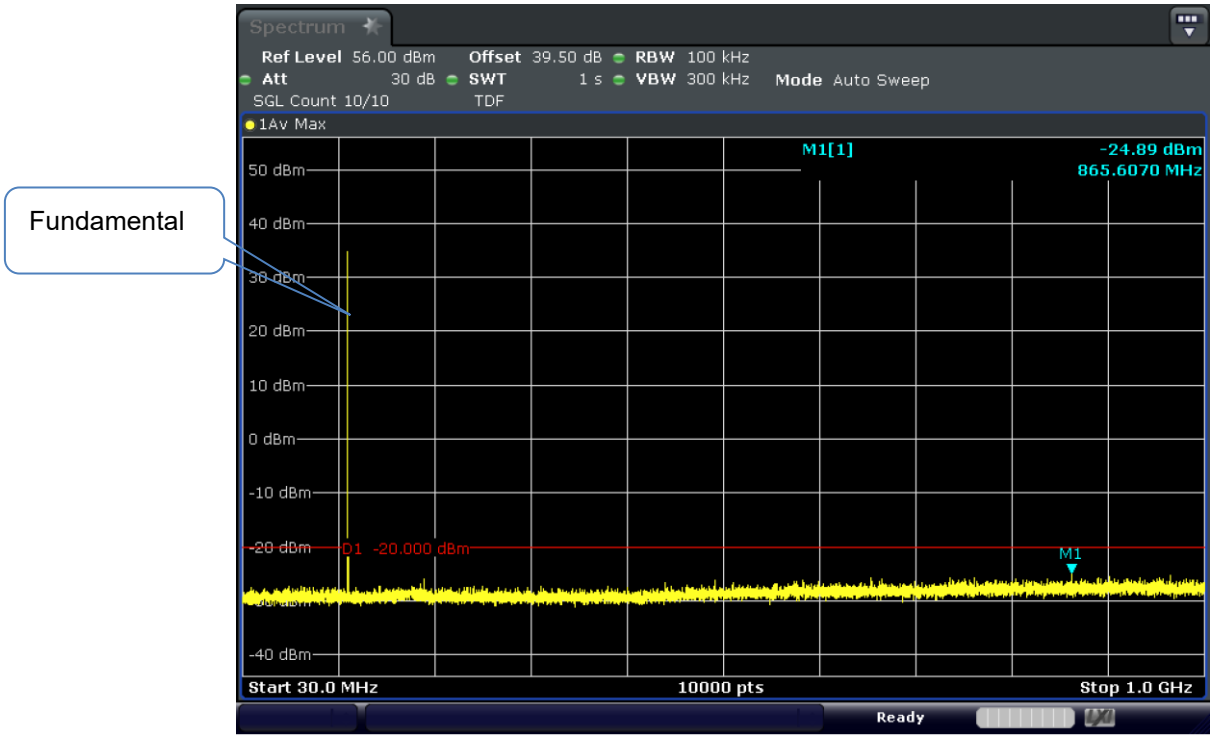

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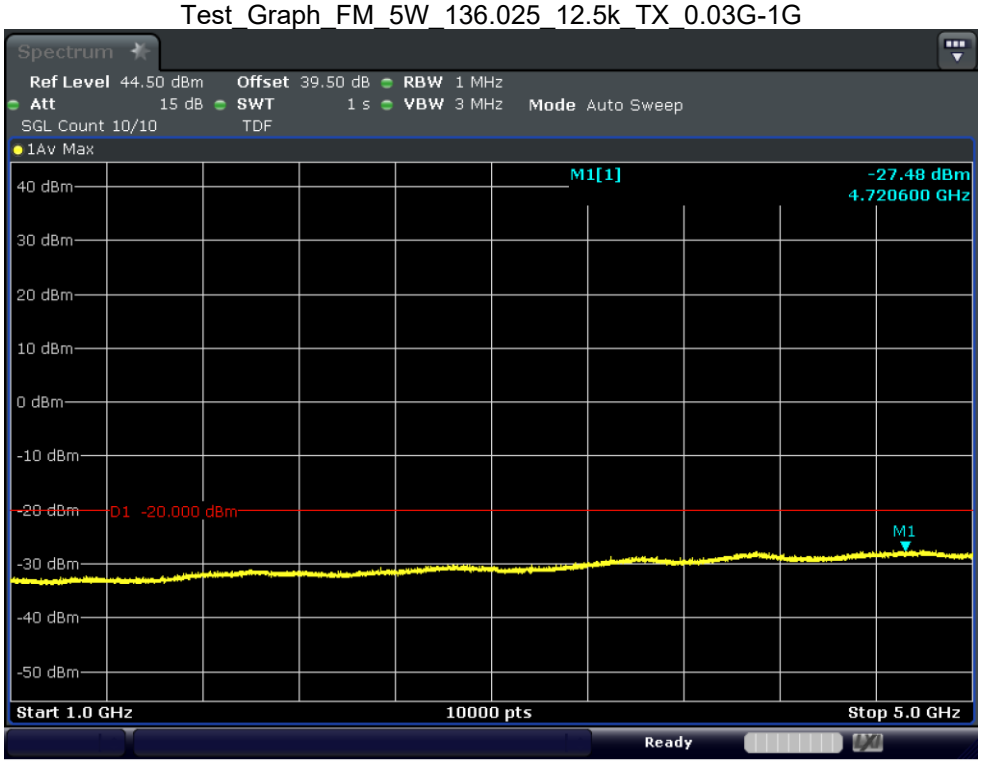
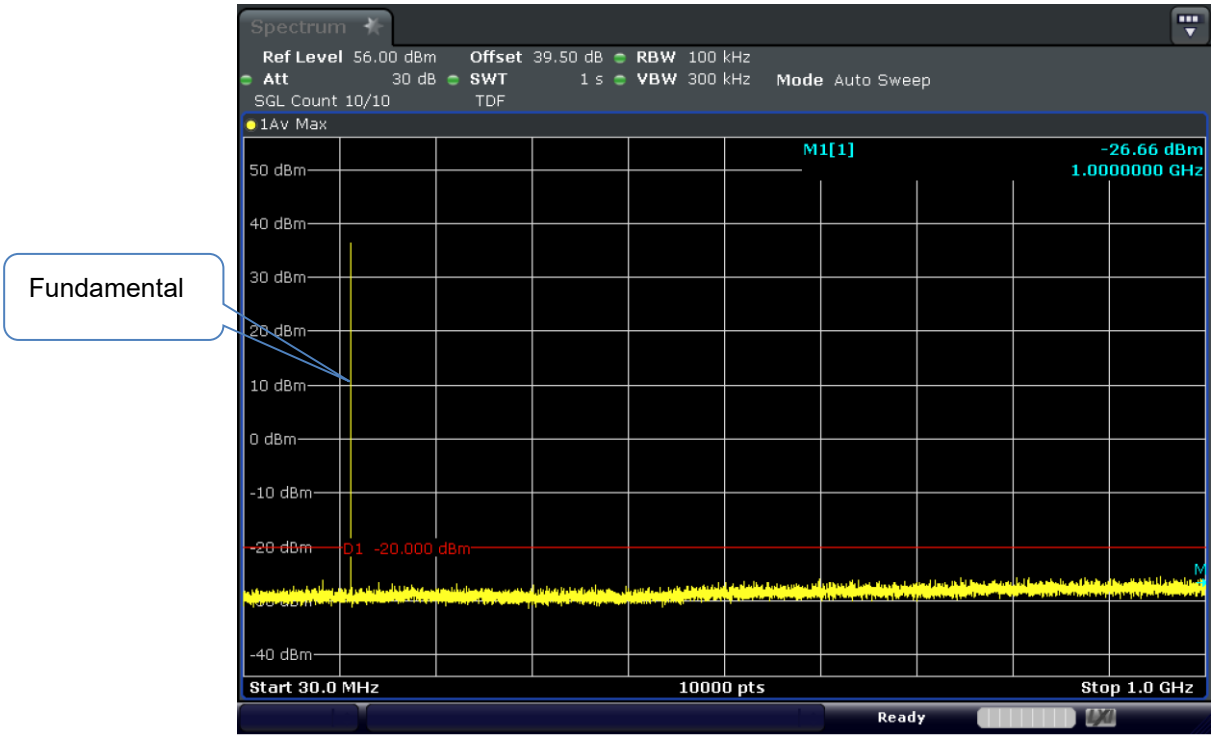
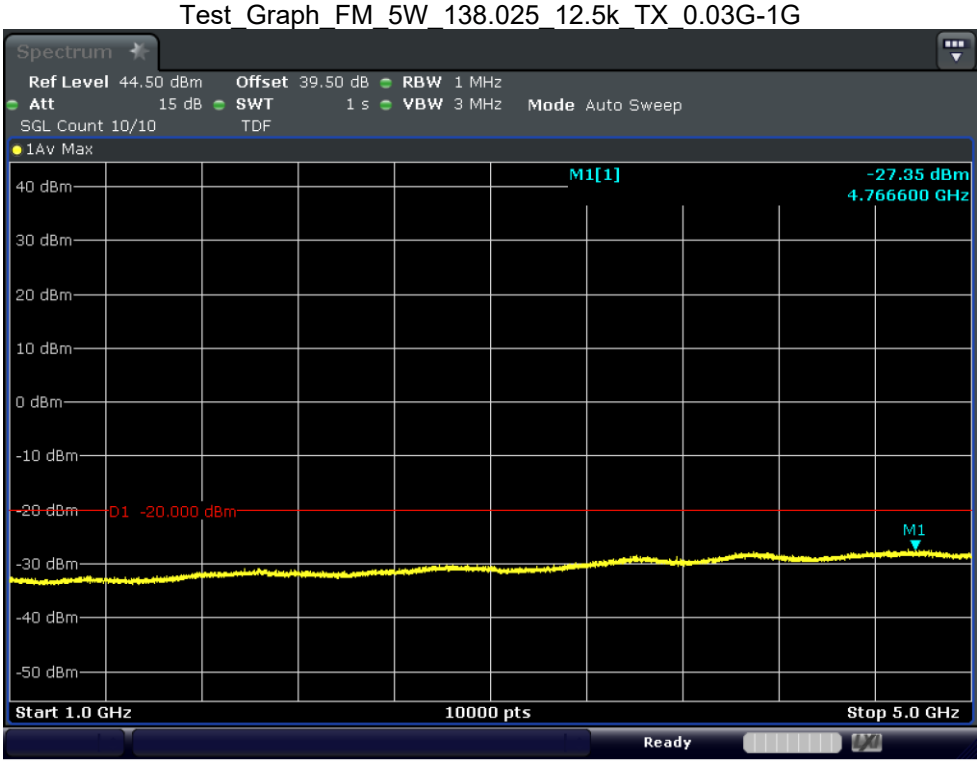


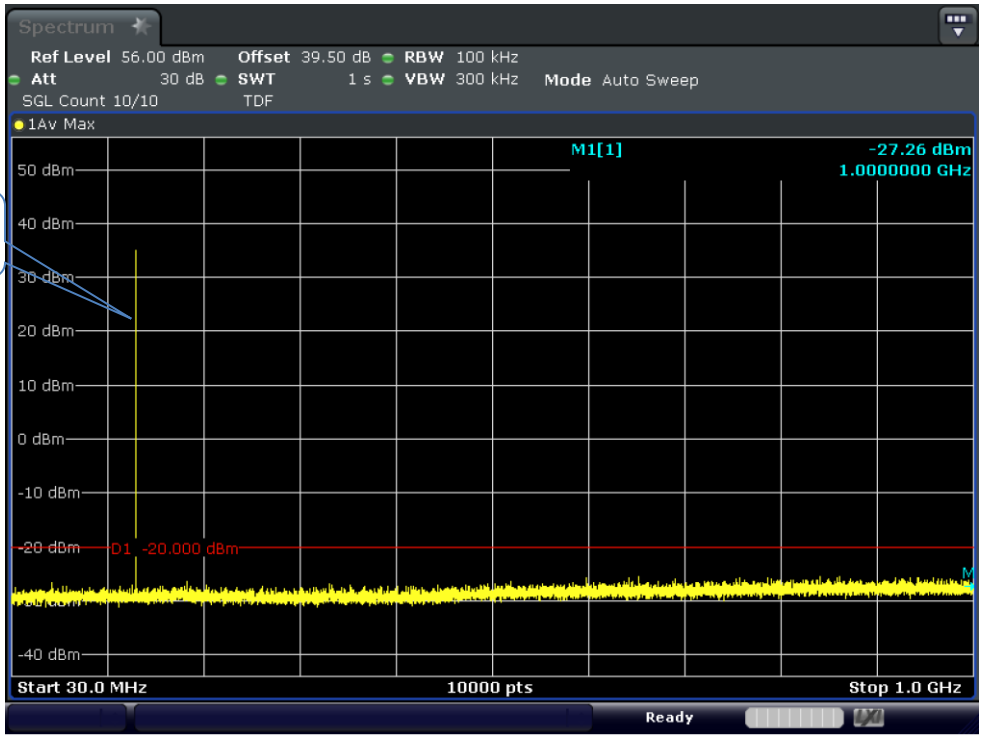
Test_Graph_FM_5W_136.025_12.5k_TX_1G-5G



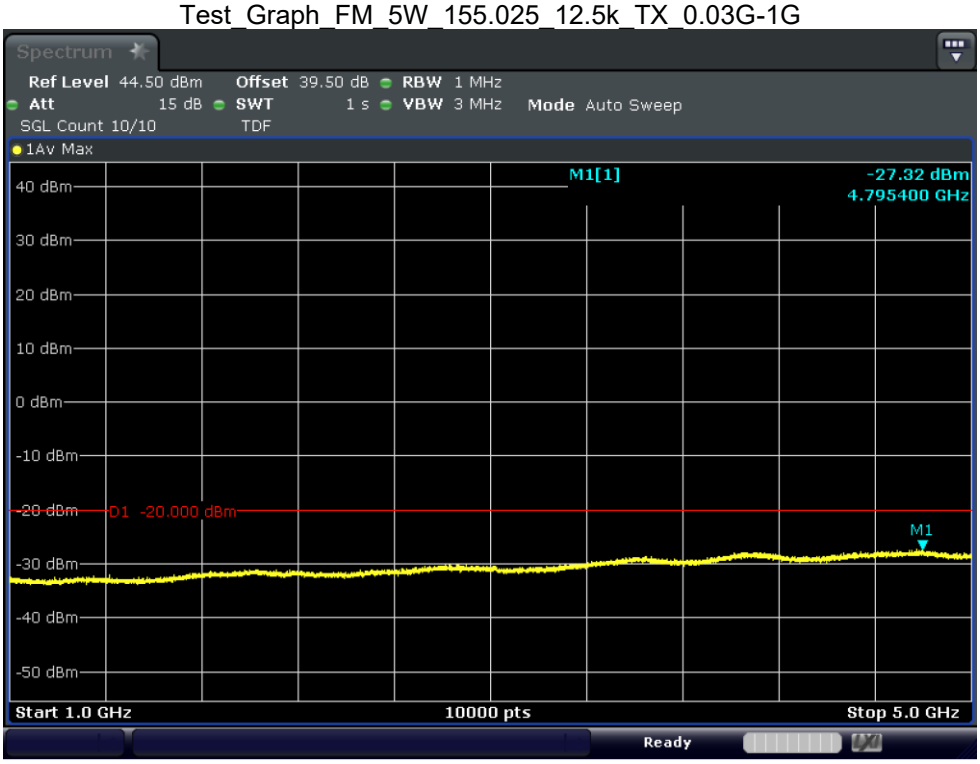
Test_Graph_FM_5W_138.025_12.5k_TX_0.03G-1G



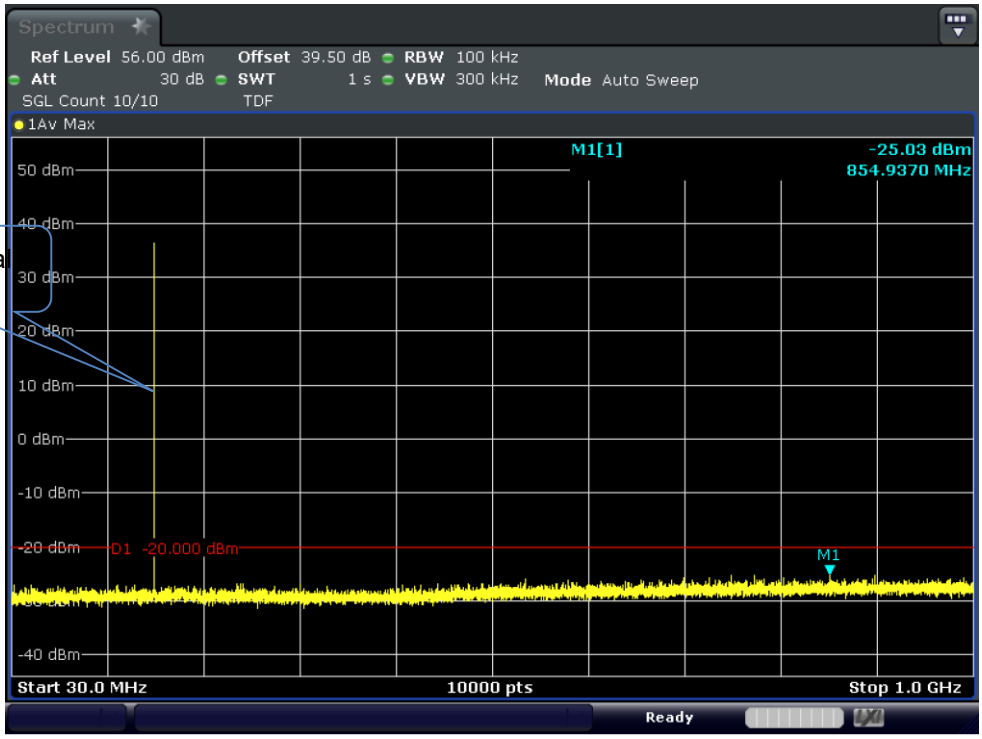
Test_Graph_FM_5W_138.025_12.5k_TX_1G-5G



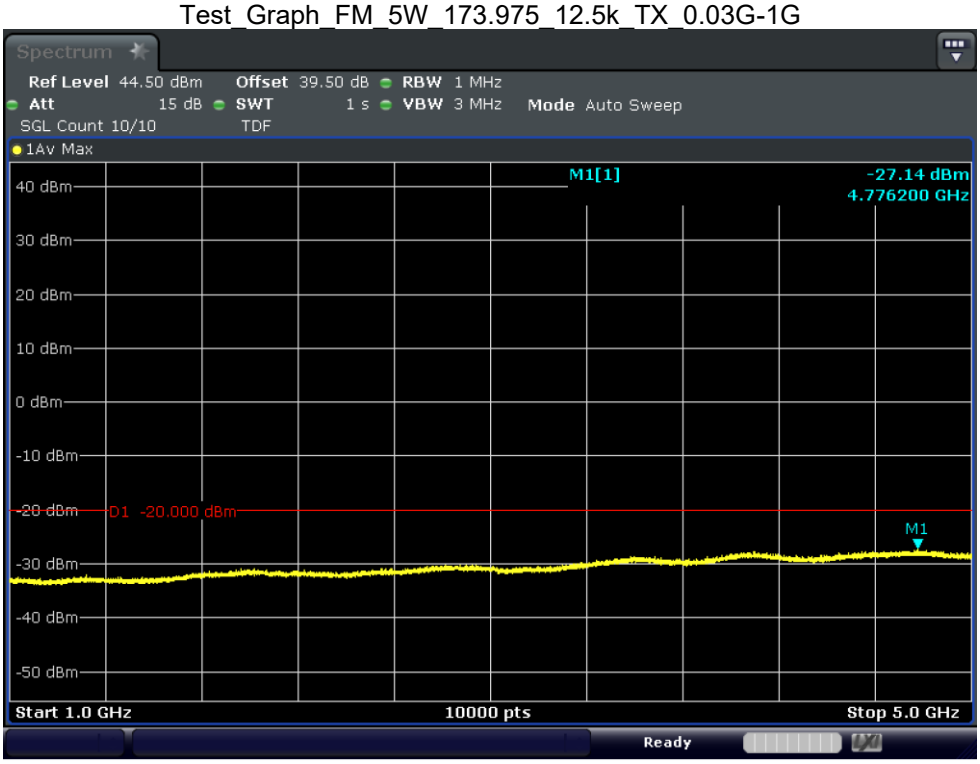
Test_Graph_FM_5W_155.025_12.5k_TX_0.03G-1G



Test_Graph_FM_5W_155.025_12.5k_TX_1G-5G



Test_Graph_FM_5W_173.975_12.5k_TX_0.03G-1G

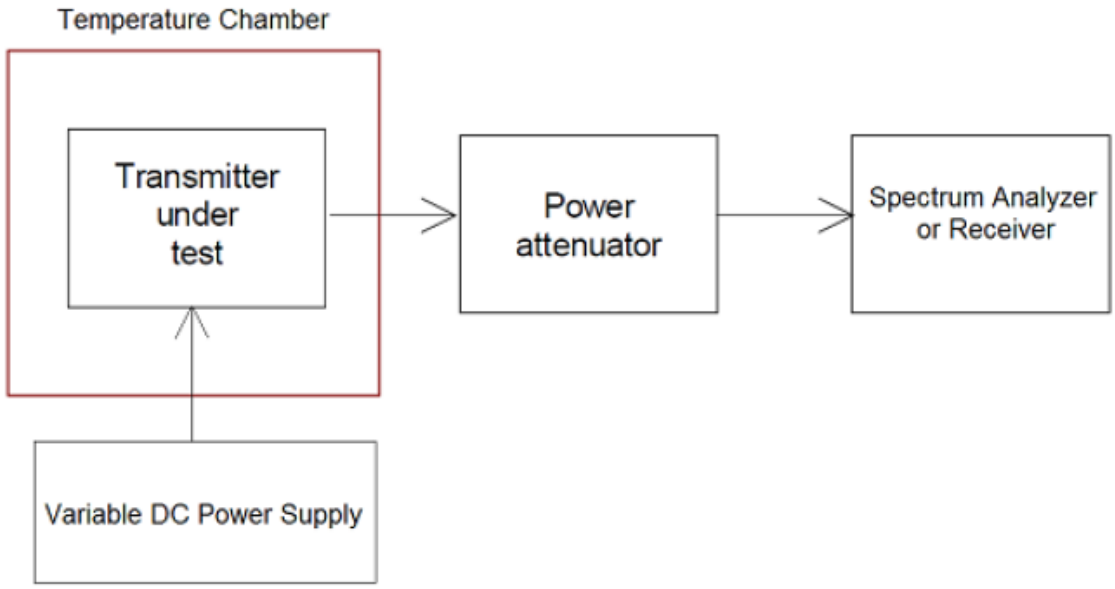


Test_Graph_FM_5W_173.975_12.5k_TX_1G-5G

Note: All the test modes was tested, but only the worst mode(4FSK Data and FM at 12.5kHz channel spacing) be recorded in this part.

4.6. Frequency Stability

TEST CONFIGURATION



TEST PROCEDURE

The EUT was set in the climate chamber and connected to an external DC power supply. The RF output was directly connected to frequency meter. The coupling loss of the additional cables was recorded and taken in account for all the measurements. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage the EUT was connected to a DC power supply and the voltage was adjusted in the required ranges. The result was recorded.

TEST APPLICABLE

1 According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30℃ to +60℃centigrade.
2 According to FCC Part 2 Section 2.1055 (a) (2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
3 Vary primary supply voltage from 85 to 115 percent of the nominal value; if manufacturer declares extreme voltage within 85 to 115 percent of the nominal value, measured at extreme voltage declared by manufacturer.

LIMIT

2.5 ppm.

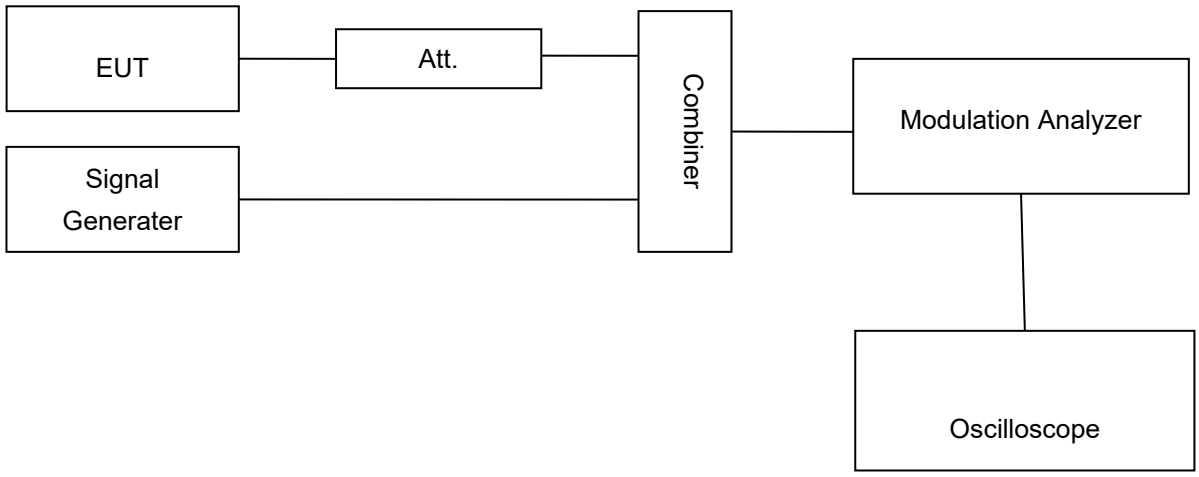
TEST RESULTS

Test conditions		Frequency error (ppm)		
Voltage Condition	Temp(℃)	136.025 MHz	155.025MHz	173.975MHz
NV	-30	0.038	0.038	0.038
	-20	0.040	0.040	0.040
	-10	0.040	0.040	0.040
	0	0.038	0.038	0.038
	10	0.040	0.040	0.040
	20	0.040	0.040	0.040
	30	0.044	0.044	0.044
	40	0.044	0.044	0.044
	50	0.045	0.045	0.045
LV	20	0.040	0.040	0.040
HV	20	0.040	0.040	0.040
Limit(ppm)		2.50	2.50	2.50
Result		PASS	PASS	PASS

NV: Normal Voltage 13.60V
LV: Low Voltage 11.56V
HV: High Voltage 15.64V

4.7. Transient Frequency Behavior

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the EUT and test equipment as shown on the following block diagram.
2. Set the Spectrum Analyzer to measure FM deviation, and tune the RF frequency to the transmitter assigned frequency.
3. Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at ±12.5 kHz deviation and set its output level to -100dBm.
4. Turn on the transmitter.
5. Supply sufficient attenuation via the RF attenuator to provide an input level to the Spectrum Analyzer that is 40 dB below the maximum allowed input power when the transmitter is operating at its rated power level. Note this power level on the Spectrum Analyzer as P0.
6. Turn off the transmitter.
7. Adjust the RF level of the signal generator to provide RF power equal to P0. This signal generator RF level shall be maintained throughout the rest of the measurement.
8. Remove the attenuation 1, so the input power to the Spectrum Analyzer is increased by 30 dB when the transmitter is turned on.
9. Adjust the vertical amplitude control of the spectrum analyzer to display the 1000 Hz at ±4 divisions
10. vertically centered on the display. Set trigger mode of the Spectrum Analyzer to “Video”, and tune the “trigger level” on suitable level. Then set the “tiger offset” to -10ms for turn on and -15ms for turn off.
11. Turn on the transmitter and the transient wave will be captured on the screen of Spectrum Analyzer. Observe the stored display. The instant when the 1 kHz test signal is completely suppressed is considered to be ton. The trace should be maintained within the allowed divisions during the period t_1 and t_2.
12. Then turn off the transmitter, and another transient wave will be captured on the screen of Spectrum Analyzer. The trace should be maintained within the allowed divisions during the period t_3.

LIMIT

Channel Separation:12.5KHz

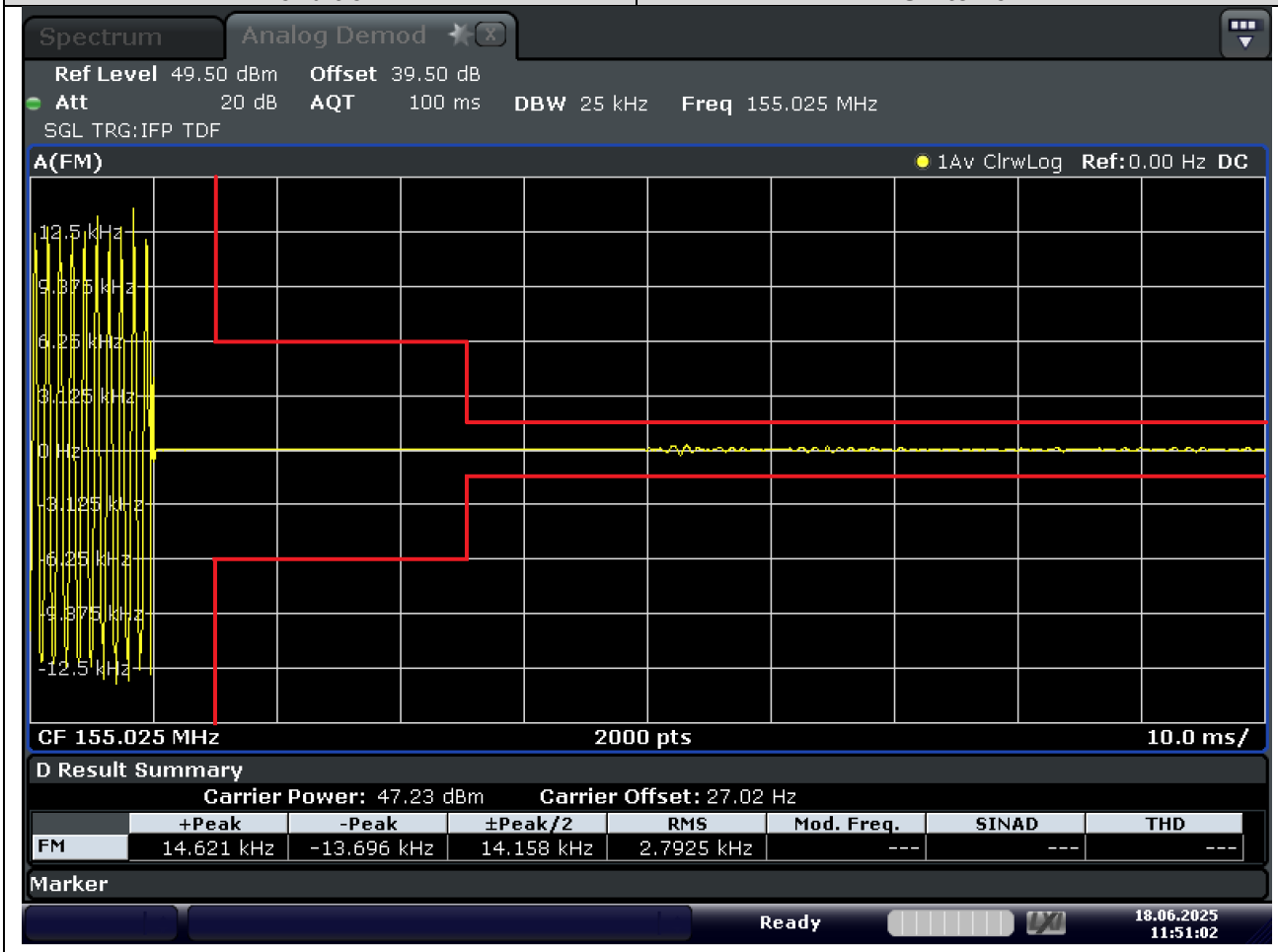
Time intervals	Maximum frequency difference	Requirement
t_1	±12.5KHz	5.0 ms
t_2	±6.25KHz	20.0 ms
t_3	±12.5KHz	5.0 ms

t_{on}: the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

t_1: the time period immediately following t_{on}.
t_2: the time period immediately following t_1.
t_3: the time period from the instant when the transmitter is turned off until t_{off}.
t_{off}: the instant when the 1 kHz test signal starts to rise.

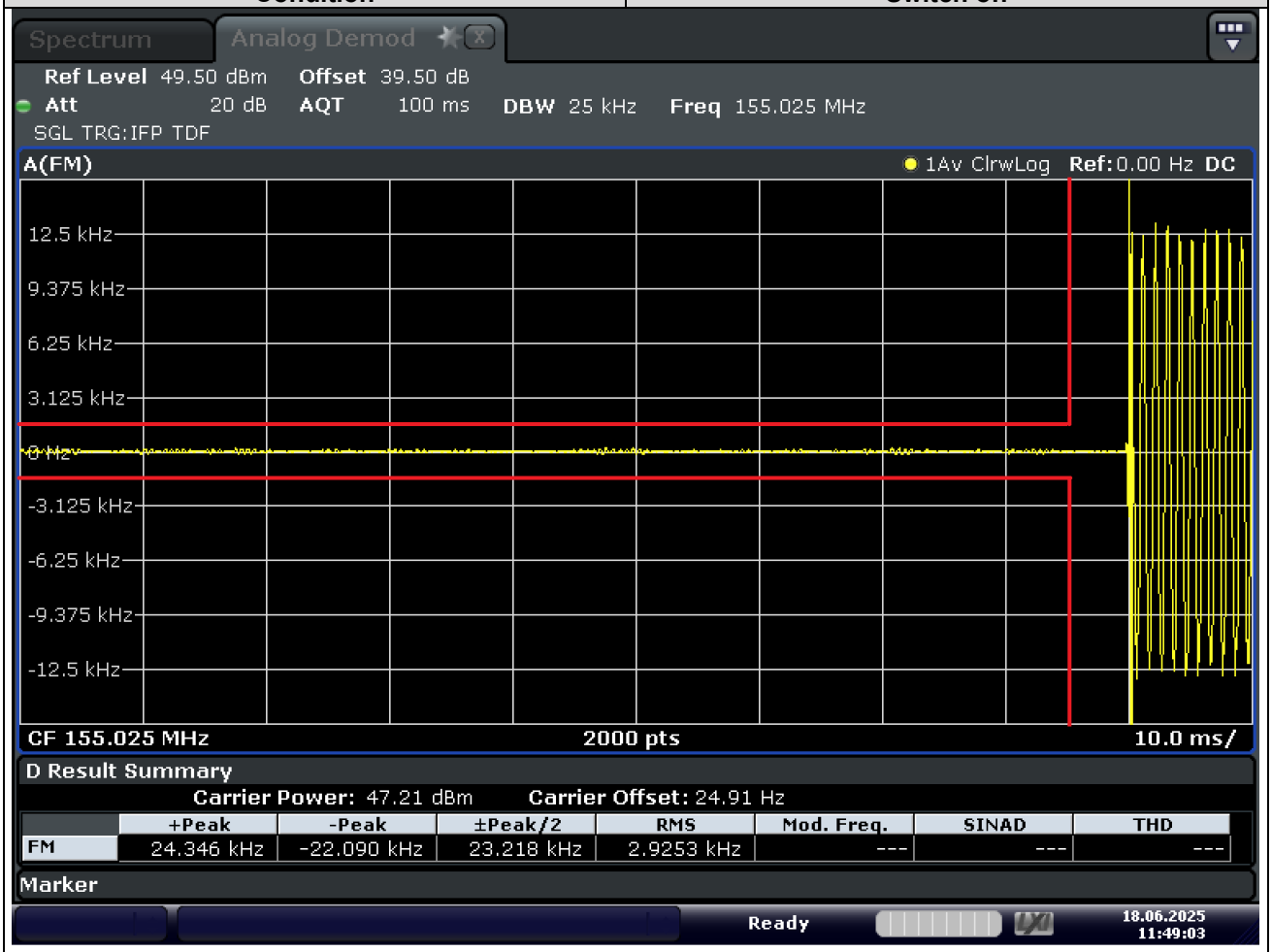
TEST RESULTS

Test Frequency: 155.025MHz	Channel Separation:12.5KHz
Condition	Switch on



Note: All the test frequencies was tested, but only the worst data be recorded in this part.

Test Frequency: 155.025MHz	Channel Separation:12.5KHz
Condition	Switch off



Note: All the test frequencies was tested, but only the worst data be recorded in this part.

5. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

6. EXTERIOR PHOTOGRAPHS OF EUT

Please refer to separated files for External Photos of the EUT.

7. INTERIOR PHOTOGRAPHS OF EUT

Please refer to separated files for Internal Photos of the EUT.

.....End of Report.....