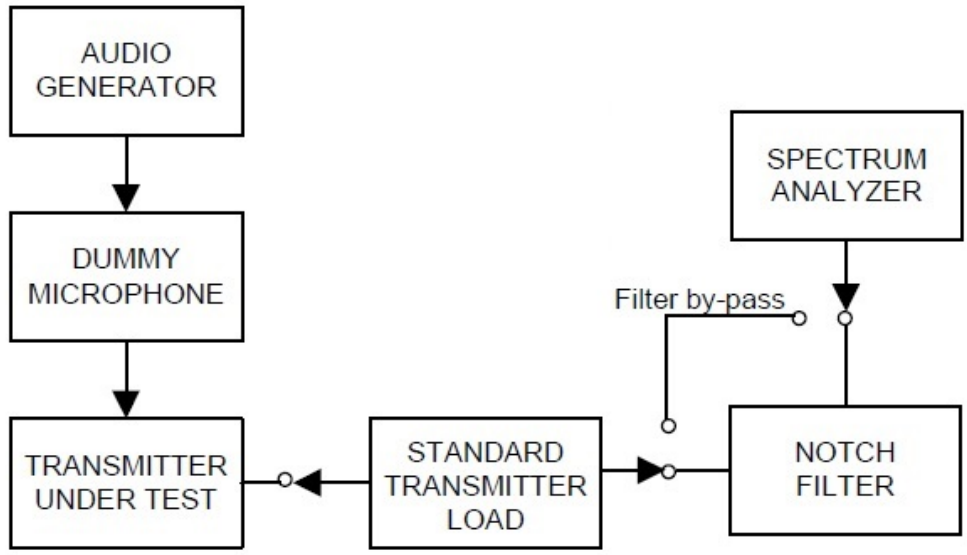
7.8 Unwanted Emissions : Conducted Spurious Emission

▣Definition

Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies that are outside a band sufficient to ensure transmission of information of required quality for the class of communication desired.

▣ TEST CONFIGURATION



▣TEST PROCEDURE

According to 2.2.13 in TIA-603-D Standard.

e) Connect the equipment as illustrated, with the notch filter by-passed.

f) Set the center frequency of the spectrum analyzer to the assigned transmitter frequency, key the transmitter, and set the level of the carrier to the full scale reference line.

g) Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation. The input level shall be established at the frequency of maximum response of the audio modulation circuit.

h) Adjust the spectrum analyzer for the following settings:

1) Resolution Bandwidth = 10 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1 GHz.

2) Video Bandwidth ≥3 times the resolution bandwidth.

3) Sweep Speed ≤2000 Hz per second.

4) Detector Mode = mean or average power.

e) Adjust the center frequency of the spectrum analyzer for incremental coverage of the range from:

1) The lowest radio frequency generated in the equipment to the carrier frequency minus the test bandwidth (see 1.3.4.4).

2) The carrier frequency plus the test bandwidth to a frequency less than 2 times the carrier frequency.

f) Record the frequencies and levels of spurious emissions from step e).

g) Unkey the transmitter. Replace the transmitter under test with the signal generator and adjust the signal level to reproduce the frequencies and levels of every spurious emission recorded in step f). Record the signal generator levels in dBm.

h) Insert the notch filter.

i) Adjust the spectrum analyzer for the following settings:

1) Resolution Bandwidth = 10 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1 GHz.

2) Video Bandwidth ≥3 times the resolution bandwidth.

3) Sweep Speed ≤2000 Hz per second.

4) Detector Mode = mean or average power.

j) Key the transmitter. Adjust the center frequency of the spectrum analyzer for incremental coverage of the range from a frequency equal to 2 times the carrier frequency and to the tenth harmonic of the carrier frequency.

▣LIMIT

Frequency Band (MHz)	Channel bandwidth (kHz)	Limit (dB)
138- 174	12.5	50+10Log(P) or 70 dB
	6.25	55+10Log(P) or 65 dB
	25	43+10Log(p)

Note

1. Correct Level (dBm) : Substitute SG Level (dBm)
2. Emission Level (dBc) : Correct Level – 10Log(P*1000)
3. P = Carrier Output Power(W)

(P value, please refer to Section 7.1)

▣TEST RESULTS For ONLY FCC

7K60FXD/7K60FXE

Frequency (MHz)	Channel	Power Mode	Spurious Frequency (MHz)	Correct Level (dBm)	Emission Level (dBc)	Limit (dBc)	Margin (dB)
150.05	Low	High Power	0.010	-45.875	-82.925	-57.050	25.875
			0.150	-47.903	-84.953	-57.050	27.903
			299.660	-42.526	-79.576	-57.050	22.526
			5331.981	-35.423	-72.473	-57.050	15.423
150.05	Low	Low Power	0.010	-46.410	-77.040	-50.630	26.410
			0.160	-48.761	-79.391	-50.630	28.761
			299.660	-39.491	-70.121	-50.630	19.491
			5389.488	-36.167	-66.797	-50.630	16.167

11K0F3E

Frequency (MHz)	Channel	Power Mode	Spurious Frequency (MHz)	Correct Level (dBm)	Emission Level (dBc)	Limit (dBc)	Margin (dB)
150.05	Low	High Power	0.020	-47.716	-84.700	-56.984	27.716
			0.150	-47.531	-84.515	-56.984	27.531
			299.660	-39.257	-76.241	-56.984	19.257
			5360.985	-35.791	-72.775	-56.984	15.791
150.05	Low	Low Power	0.010	-46.788	-76.605	-49.817	26.788
			0.150	-47.589	-77.406	-49.817	27.589
			299.660	-40.600	-70.417	-49.817	20.600
			5424.992	-36.004	-65.821	-49.817	16.004

▣TEST RESULTS For FCC AND IC

7K60FXD/7K60FXE

Frequency (MHz)	Channel	Power Mode	Spurious Frequency (MHz)	Correct Level (dBm)	Emission Level (dBc)	Limit (dBc)	Margin (dB)
162.05	Middle	High Power	0.009	-45.469	-82.062	-56.593	25.469
			0.150	-46.014	-82.607	-56.593	26.014
			323.910	-41.538	-78.131	-56.593	21.538
			5473.997	-35.301	-71.894	-56.593	15.301
173.95	High		0.009	-45.677	-81.871	-56.194	25.677
			0.150	-48.274	-84.468	-56.194	28.274
			348.160	-41.149	-77.343	-56.194	21.149
			5492.999	-35.643	-71.837	-56.194	15.643
162.05	Middle	Low Power	0.010	-48.330	-78.003	-49.673	28.330
			0.150	-47.295	-76.968	-49.673	27.295
			323.910	-48.460	-78.133	-49.673	28.460
			5436.493	-34.591	-64.264	-49.673	14.591
173.95	High		0.010	-47.065	-76.650	-49.585	27.065
			0.160	-47.701	-77.286	-49.585	27.701
			37.760	-42.973	-72.558	-49.585	22.973
			5493.999	-34.537	-64.122	-49.585	14.537

11K0F3E

Frequency (MHz)	Channel	Power Mode	Spurious Frequency (MHz)	Correct Level (dBm)	Emission Level (dBc)	Limit (dBc)	Margin (dB)
162.05	Middle	High Power	0.010	-44.468	-81.202	-56.734	24.468
			0.150	-48.917	-85.651	-56.734	28.917
			323.910	-39.196	-75.930	-56.734	19.196
			5410.990	-35.465	-72.199	-56.734	15.465
173.95	High		0.009	-47.201	-83.827	-56.626	27.201
			0.150	-48.285	-84.911	-56.626	28.285
			348.160	-40.386	-77.012	-56.626	20.386
			5394.988	-35.604	-72.230	-56.626	15.604
162.05	Middle	Low Power	0.009	-47.051	-76.495	-49.444	27.051
			0.170	-48.685	-78.129	-49.444	28.685
			323.910	-41.948	-71.392	-49.444	21.948
			5359.484	-34.625	-64.069	-49.444	14.625
173.95	High		0.010	-46.251	-76.051	-49.800	26.251
			0.150	-47.851	-77.651	-49.800	27.851
			37.760	-41.792	-71.592	-49.800	21.792
			5359.984	-35.687	-65.487	-49.800	15.687

▣TEST RESULTS For ONLY IC

7K60FXD/7K60FXE

Frequency (MHz)	Channel	Power Mode	Spurious Frequency (MHz)	Correct Level (dBm)	Emission Level (dBc)	Limit (dBc)	Margin (dB)
138.05	Low	High Power	0.010	-45.537	-82.352	-56.815	25.537
			0.165	-50.041	-86.856	-56.815	30.041
			276.380	-35.880	-72.695	-56.815	15.880
			5456.995	-35.023	-71.838	-56.815	15.023
138.05	Low	Low Power	0.010	-44.533	-74.782	-50.249	24.533
			0.155	-49.445	-79.694	-50.249	29.445
			276.380	-36.428	-66.677	-50.249	16.428
			5447.494	-35.830	-66.079	-50.249	15.830

11K0F3E

Frequency (MHz)	Channel	Power Mode	Spurious Frequency (MHz)	Correct Level (dBm)	Emission Level (dBc)	Limit (dBc)	Margin (dB)
138.05	Low	High Power	0.009	-45.160	-82.246	-57.086	25.160
			0.150	-49.648	-86.734	-57.086	29.648
			276.380	-35.651	-72.737	-57.086	15.651
			5461.496	-35.147	-72.233	-57.086	15.147
138.05	Low	Low Power	0.012	-46.839	-77.066	-50.227	26.839
			0.155	-47.730	-77.957	-50.227	27.730
			276.380	-38.383	-68.610	-50.227	18.383
			5439.493	-35.761	-65.988	-50.227	15.761

▣TEST RESULTS For ONLY IC

16K0F3E

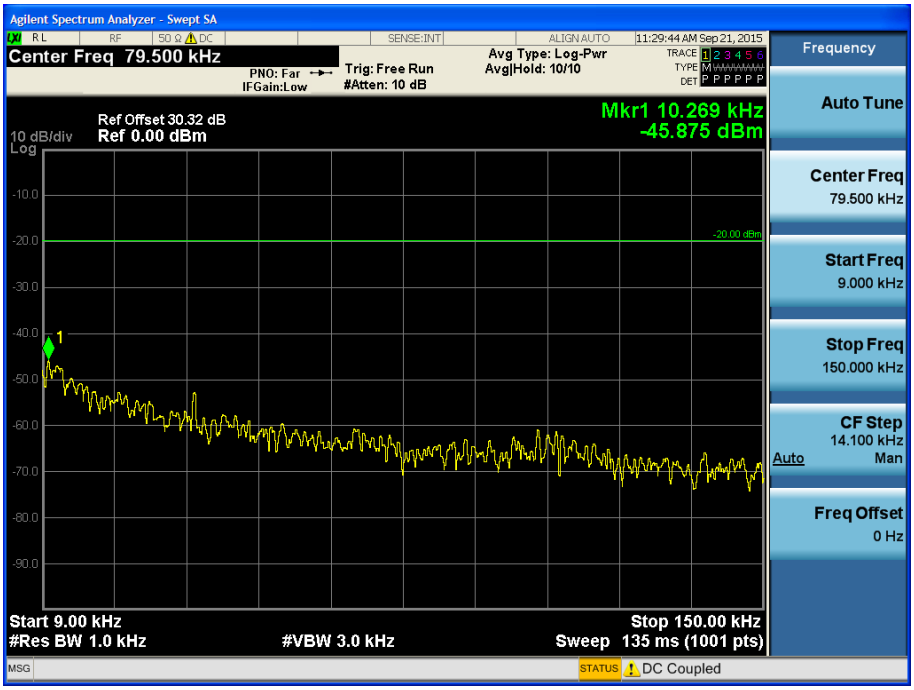
Frequency (MHz)	Channel	Power Mode	Spurious Frequency (MHz)	Correct Level (dBm)	Emission Level (dBc)	Limit (dBc)	Margin (dB)
138.05	Low	High Power	0.009	-46.387	-83.477	-57.090	26.387
			0.150	-50.797	-87.887	-57.090	30.797
			276.380	-35.684	-72.774	-57.090	15.684
			5377.986	-35.007	-72.097	-57.090	15.007
162.05	Middle		0.011	-46.238	-82.998	-56.760	26.238
			0.155	-48.660	-85.420	-56.760	28.660
			323.910	-39.992	-76.752	-56.760	19.992
			5462.996	-35.885	-72.645	-56.760	15.885
173.95	High		0.011	-47.165	-83.790	-56.625	27.165
			0.150	-44.976	-81.601	-56.625	24.976
			348.160	-40.372	-76.997	-56.625	20.372
			5450.494	-36.339	-72.964	-56.625	16.339
138.05	Low	Low Power	0.009	-47.282	-77.469	-50.187	27.282
			0.150	-47.919	-78.106	-50.187	27.919
			276.380	-38.453	-68.640	-50.187	18.453
			5423.992	-35.037	-65.224	-50.187	15.037
162.05	Middle		0.010	-47.103	-76.422	-49.319	27.103
			0.150	-48.830	-78.149	-49.319	28.830
			323.910	-41.615	-70.934	-49.319	21.615
			2619.180	-36.117	-65.436	-49.319	16.117
173.95	High		0.009	-47.733	-77.452	-49.719	27.733
			0.155	-47.057	-76.776	-49.719	27.057
			37.760	-41.144	-70.863	-49.719	21.144
			5424.992	-35.932	-65.651	-49.719	15.932

▣TEST PLOT

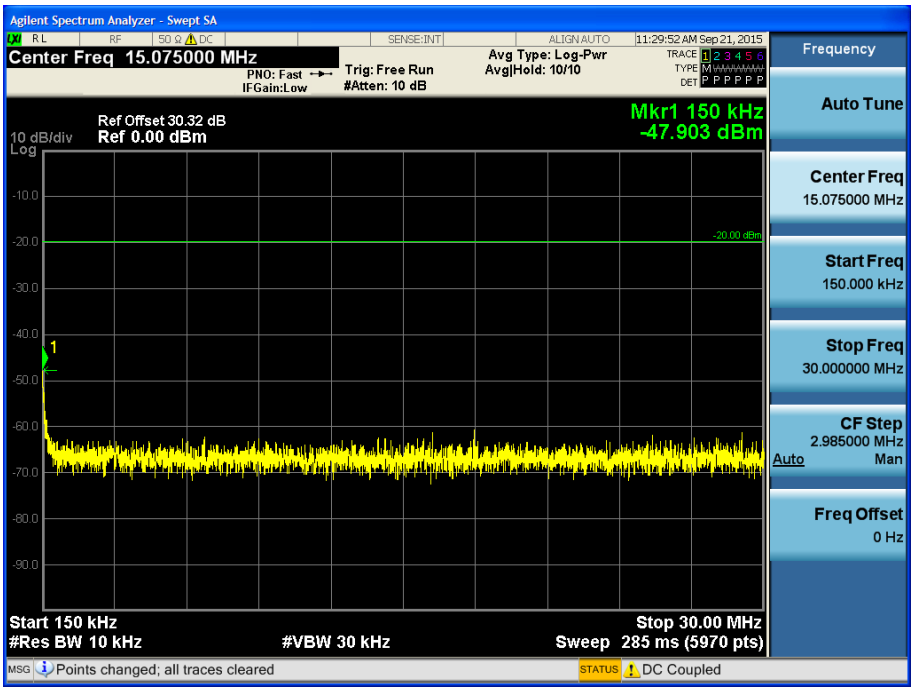
7K60FXD/7K60FXE For ONLY FCC

HIGH POWER_ 7K60FXD/7K60FXE _150.05 MHz

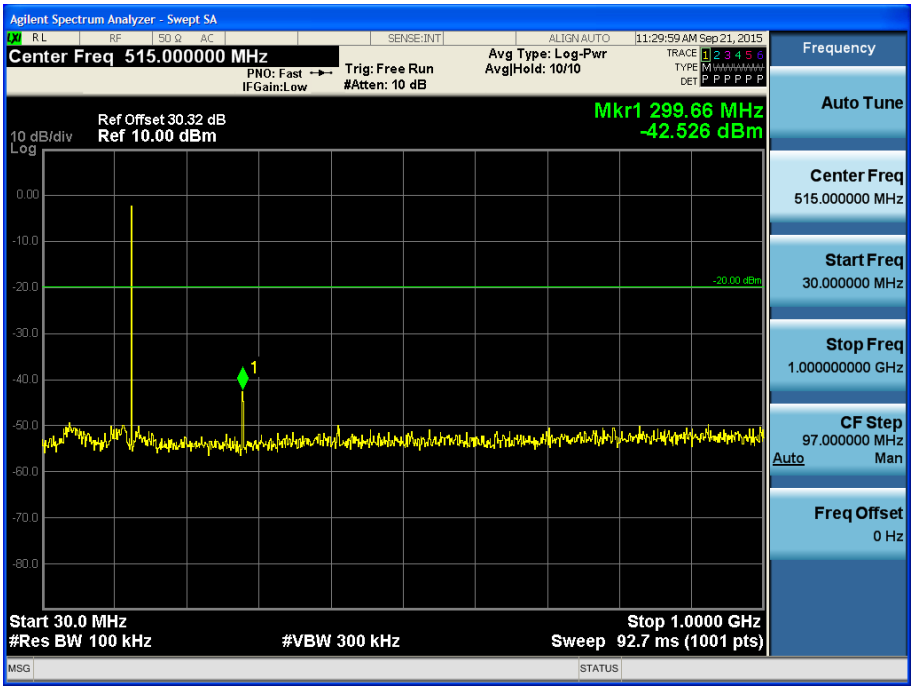
(9 kHz ~ 150 kHz)



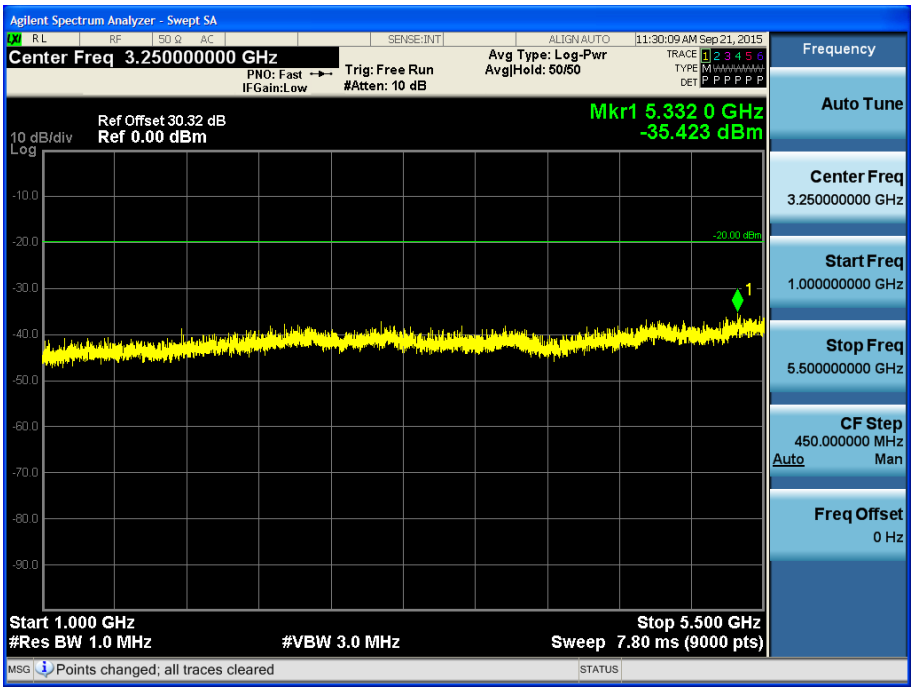
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

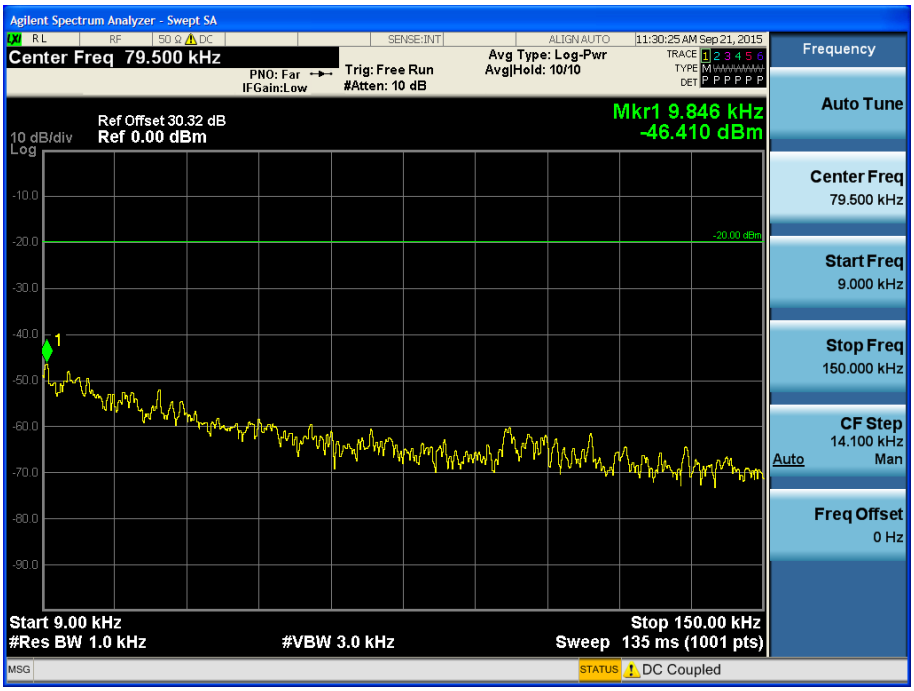


(1 GHz ~ 5.5 GHz)

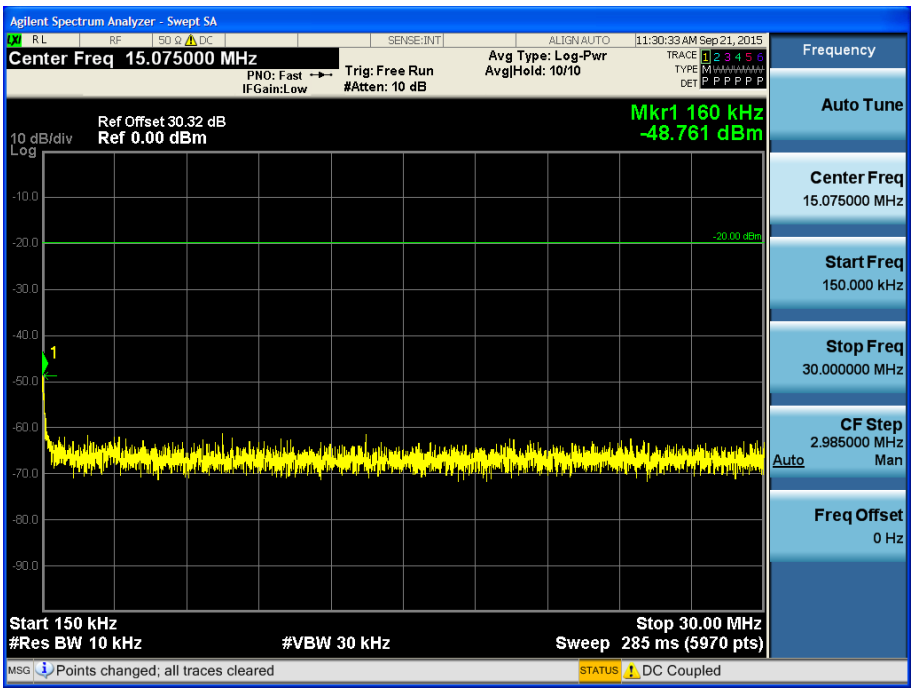


LOW POWER_ 7K60FXD/7K60FXE _150.05 MHz

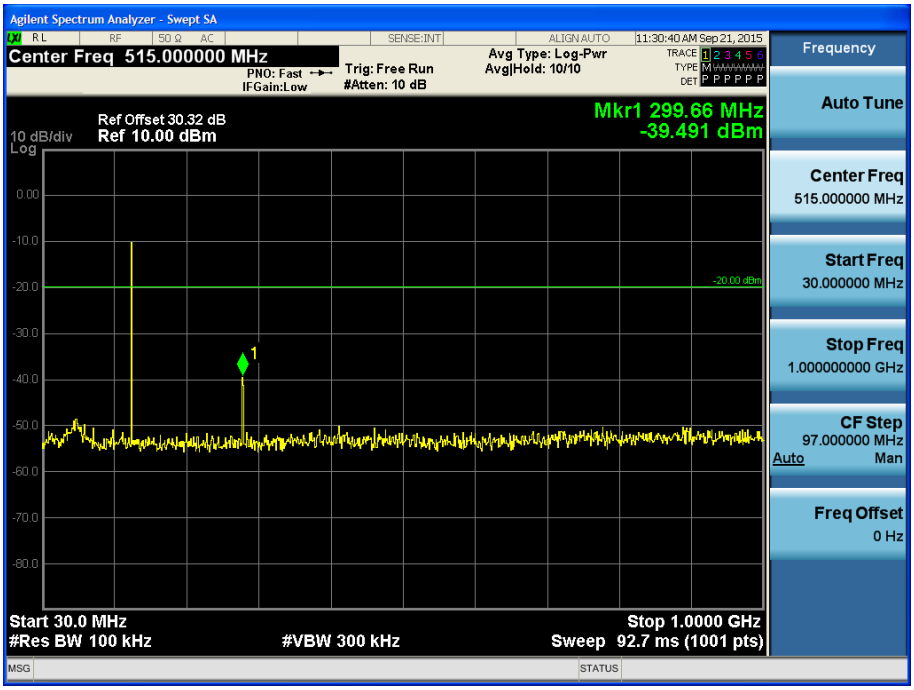
(9 kHz ~ 150 kHz)



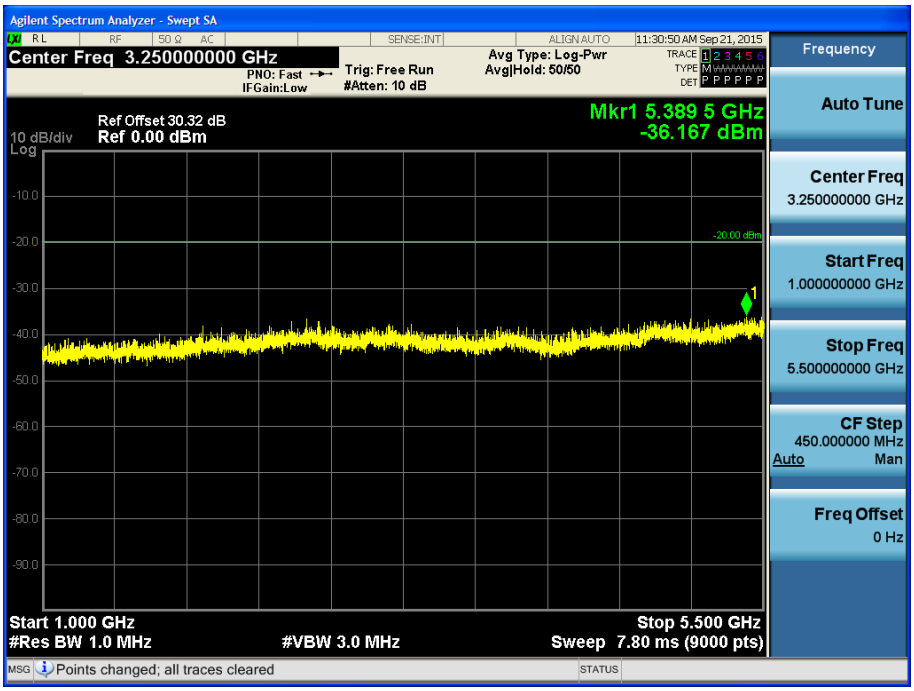
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)



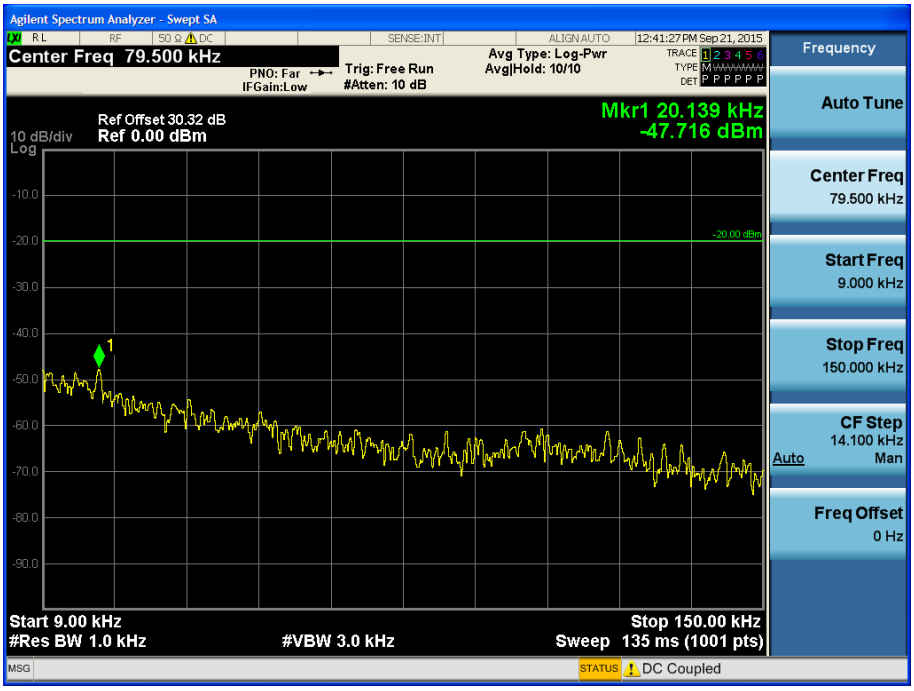
(1 GHz ~ 5.5 GHz)



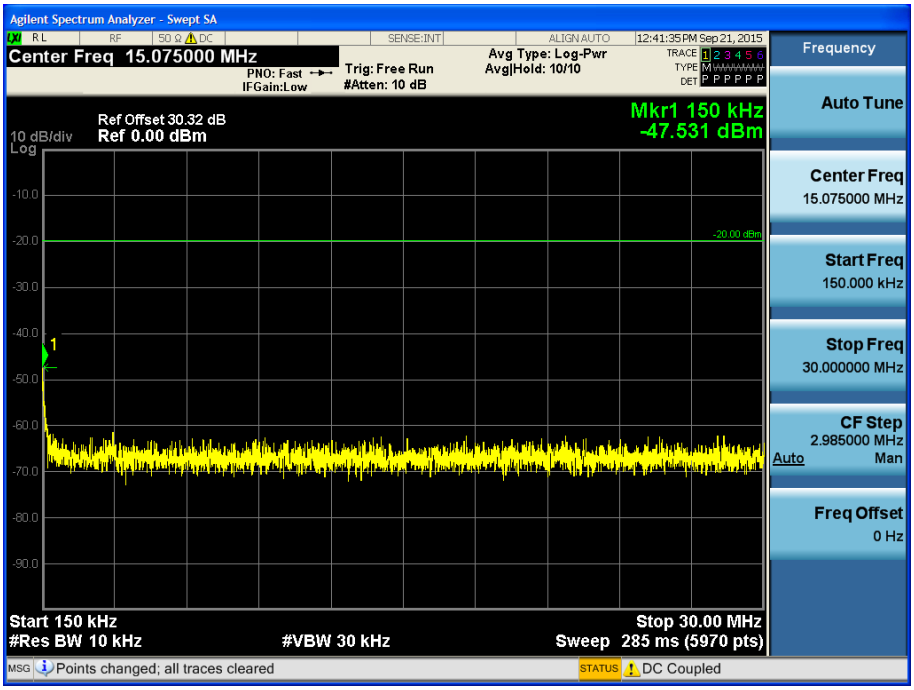
11K0F3E For ONLY FCC

HIGH POWER_11K0F3E_150.05 MHz

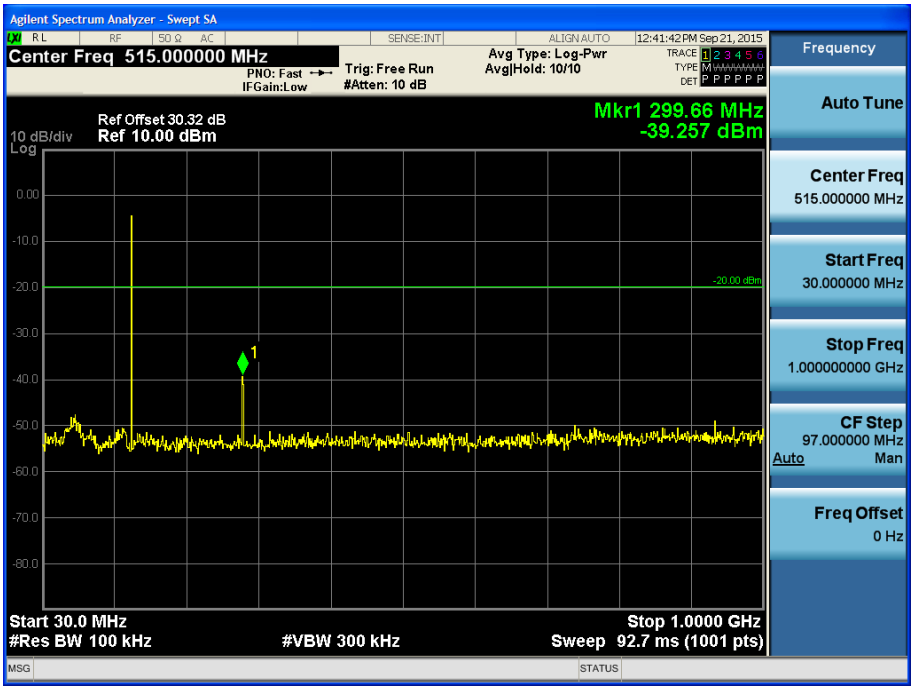
(9 kHz ~ 150 kHz)



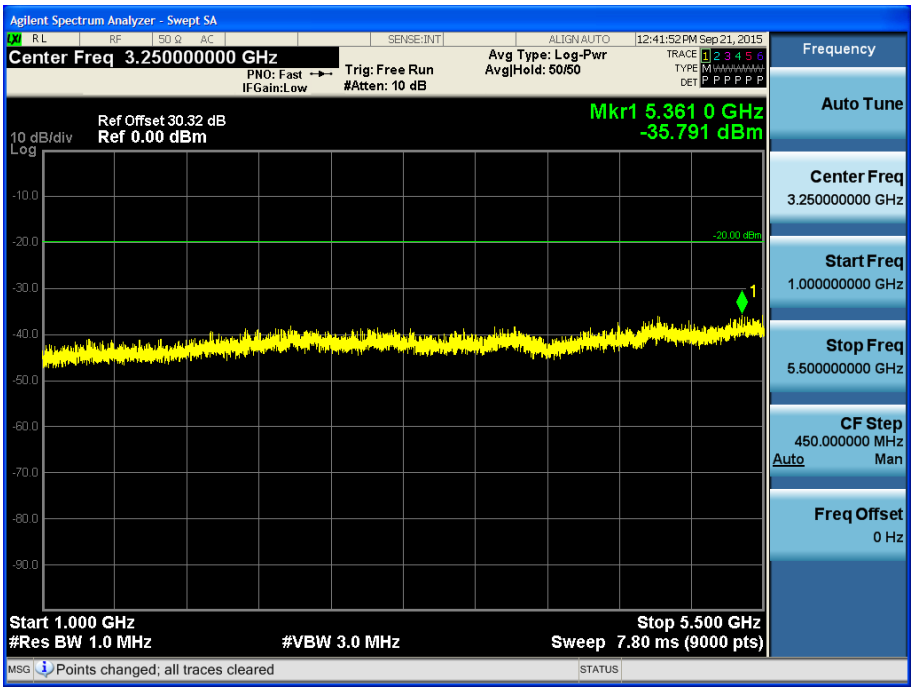
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

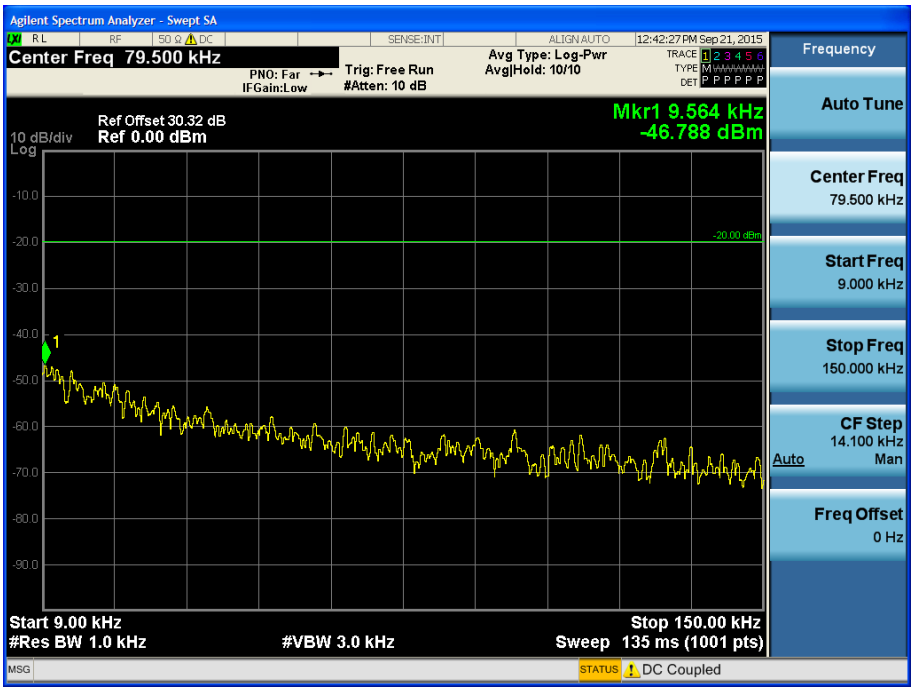


(1 GHz ~ 5.5 GHz)

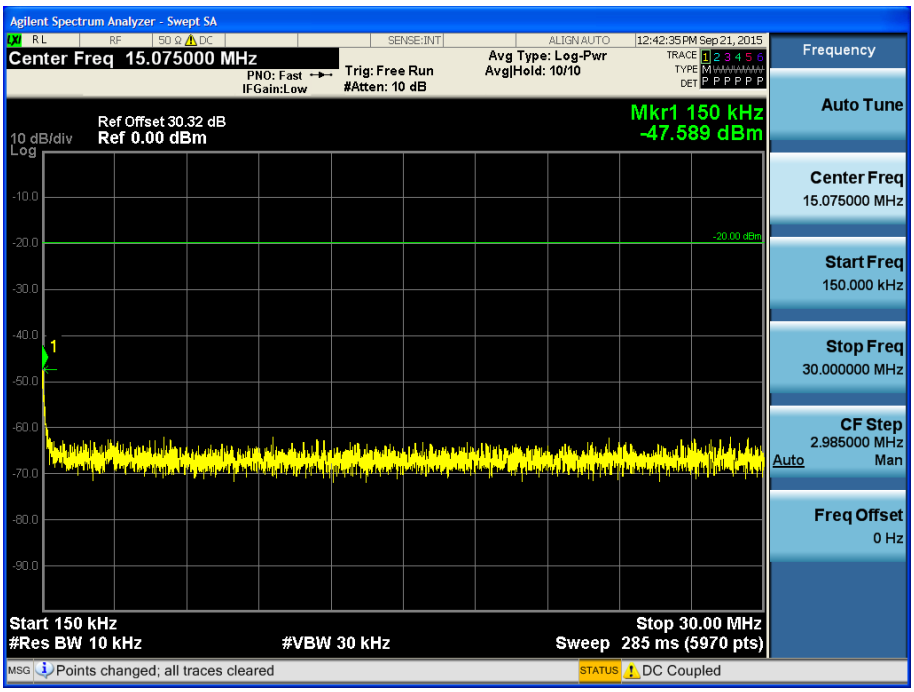


LOW POWER_11K0F3E _150.05 MHz

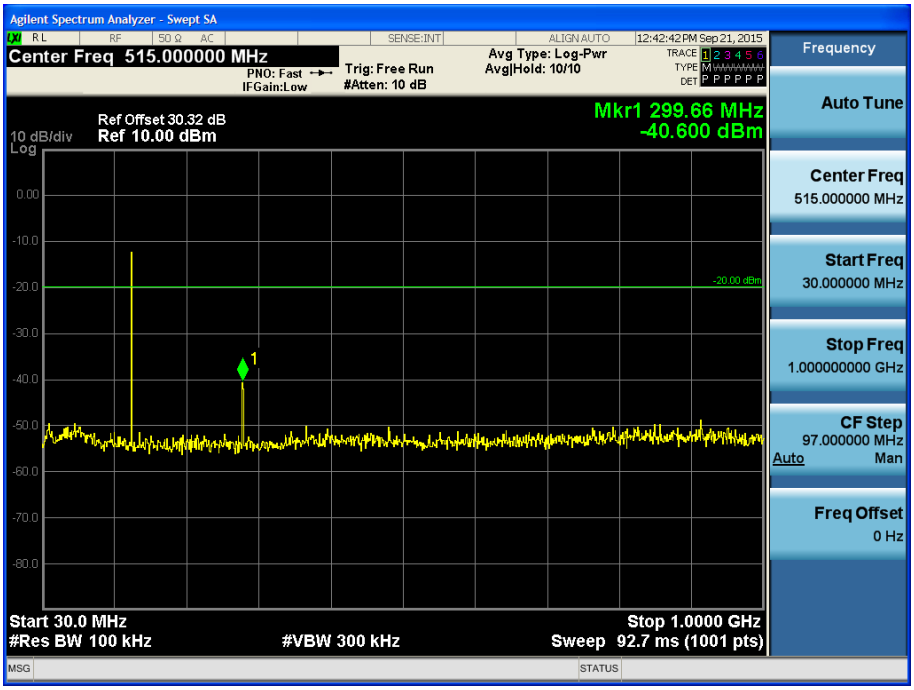
(9 kHz ~ 150 kHz)



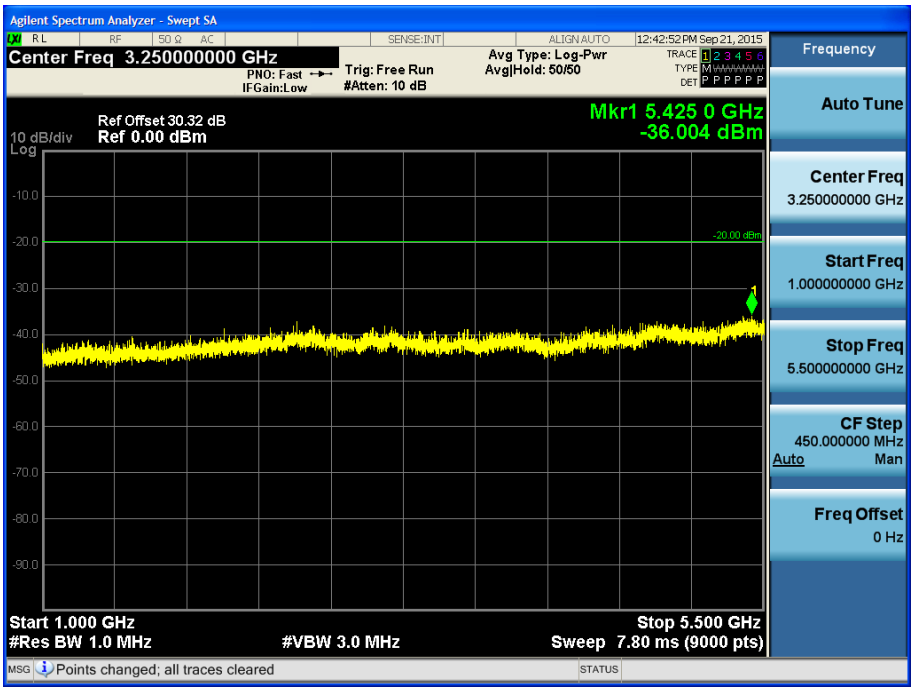
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)



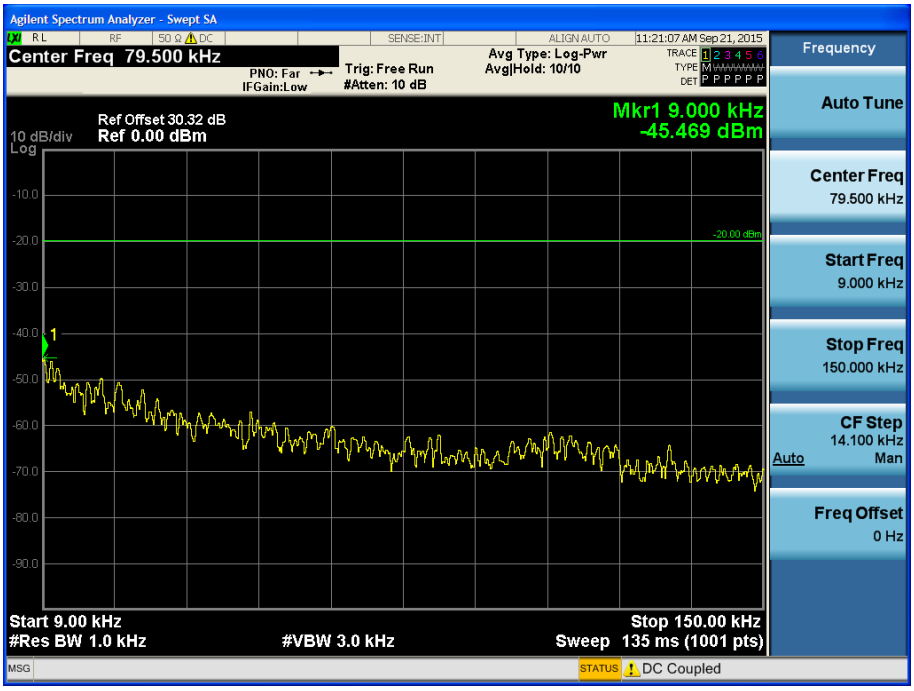
(1 GHz ~ 5.5 GHz)



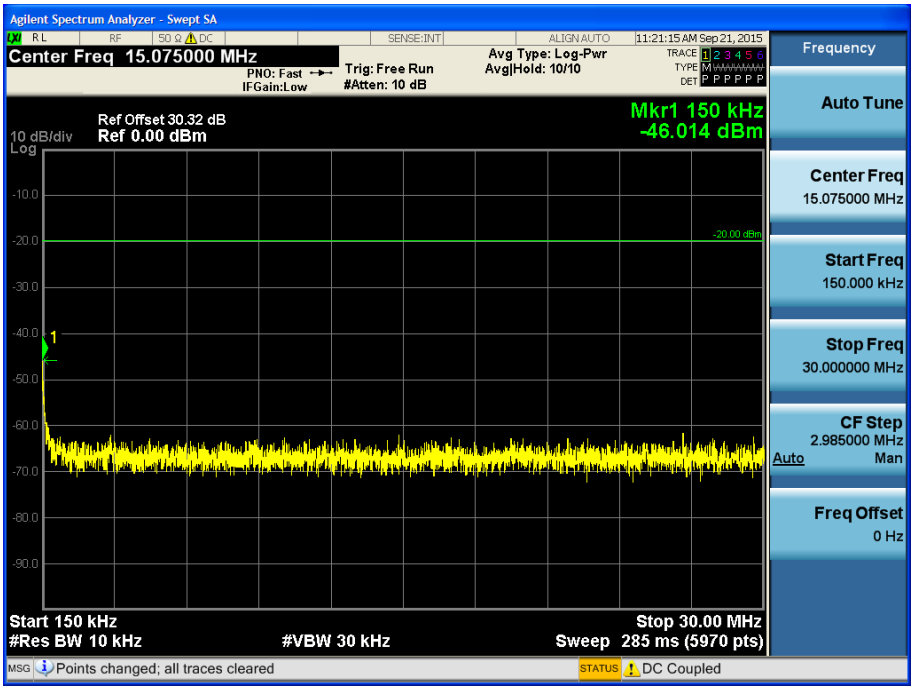
7K60FXD/7K60FXE For FCC AND IC

HIGH POWER_ 7K60FXD/7K60FXE _162.05 MHz

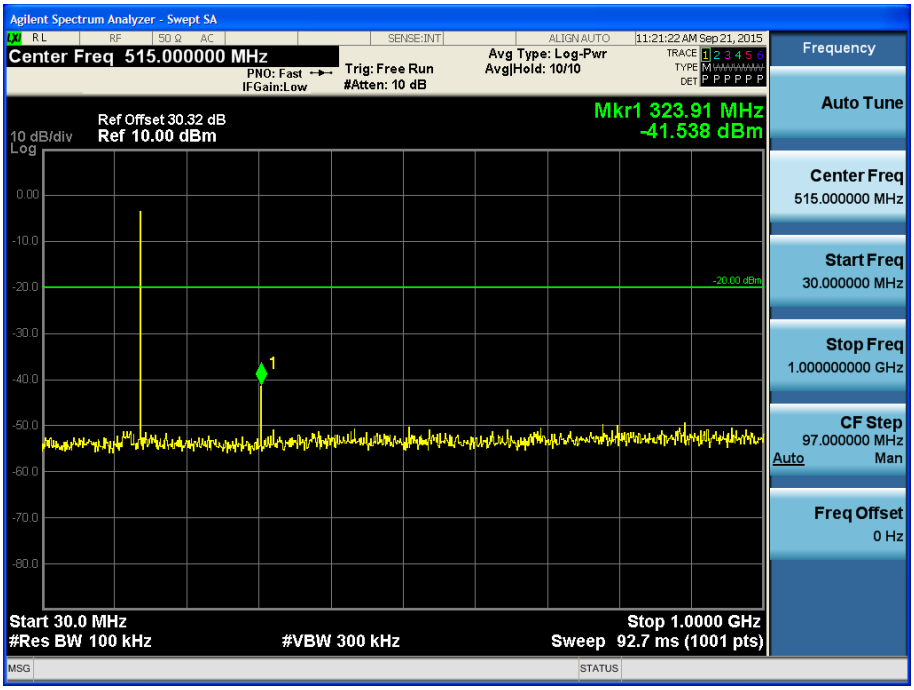
(9 kHz ~ 150 kHz)



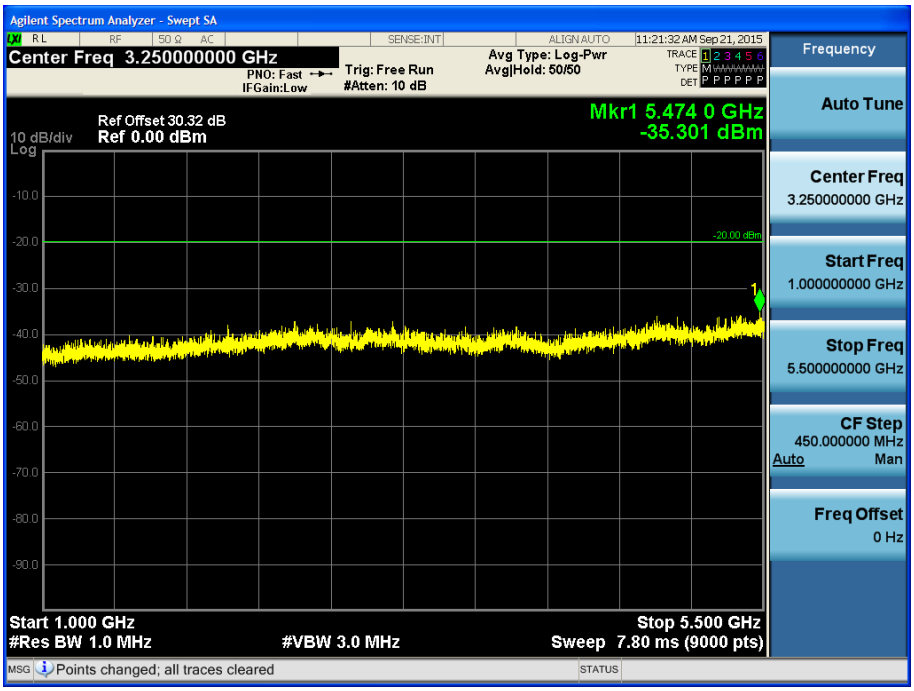
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

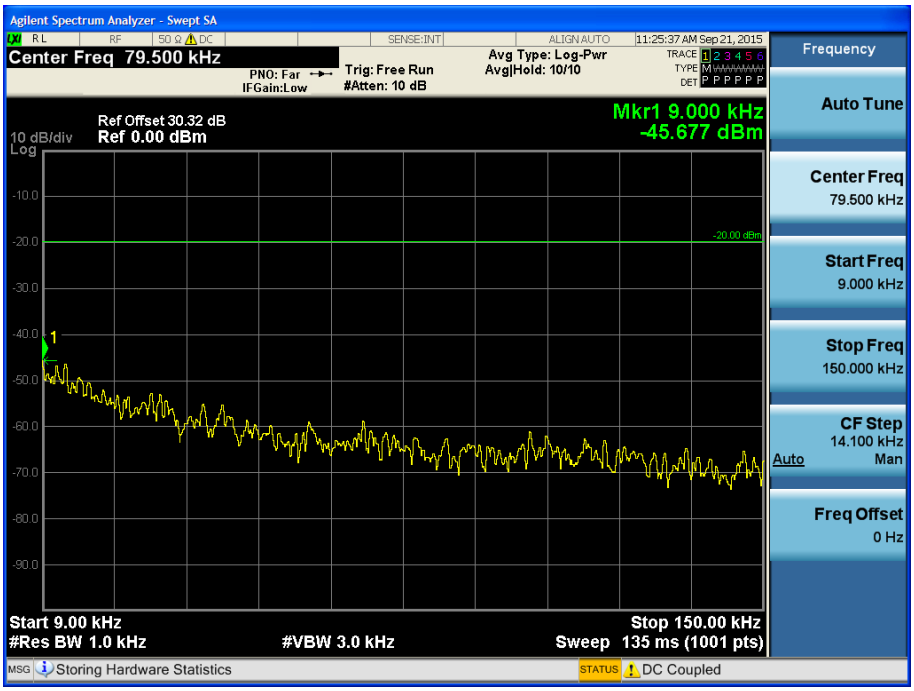


(1 GHz ~ 5.5 GHz)

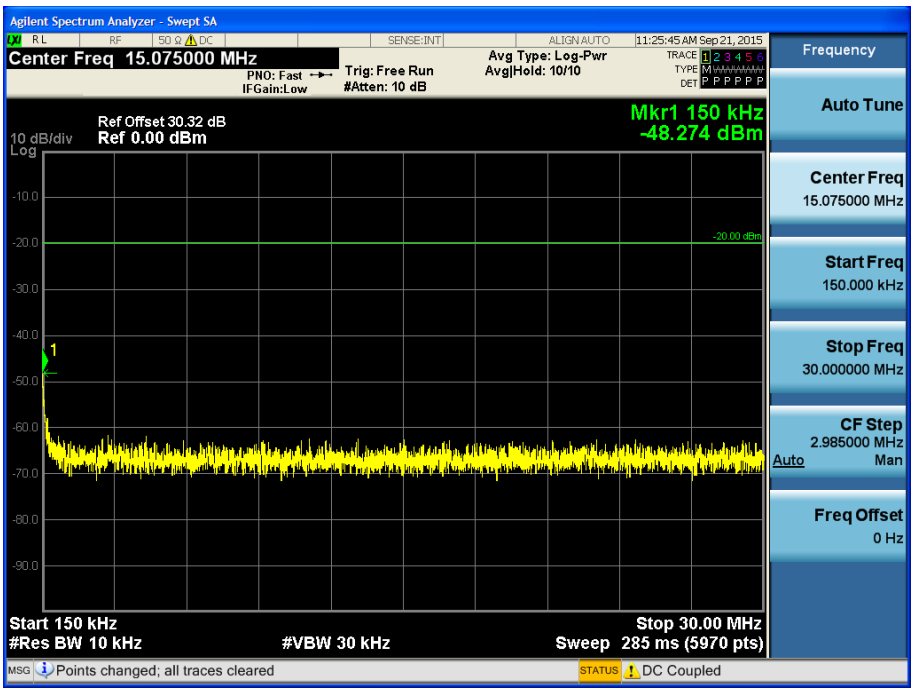


HIGH POWER_ 7K60FXD/7K60FXE _173.95 MHz

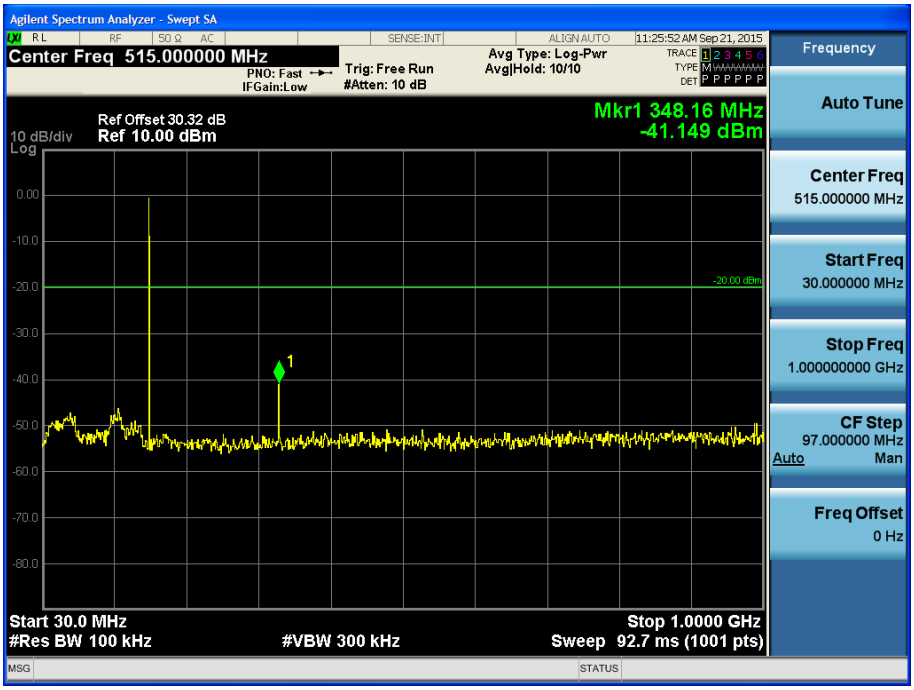
(9 kHz ~ 150 kHz)



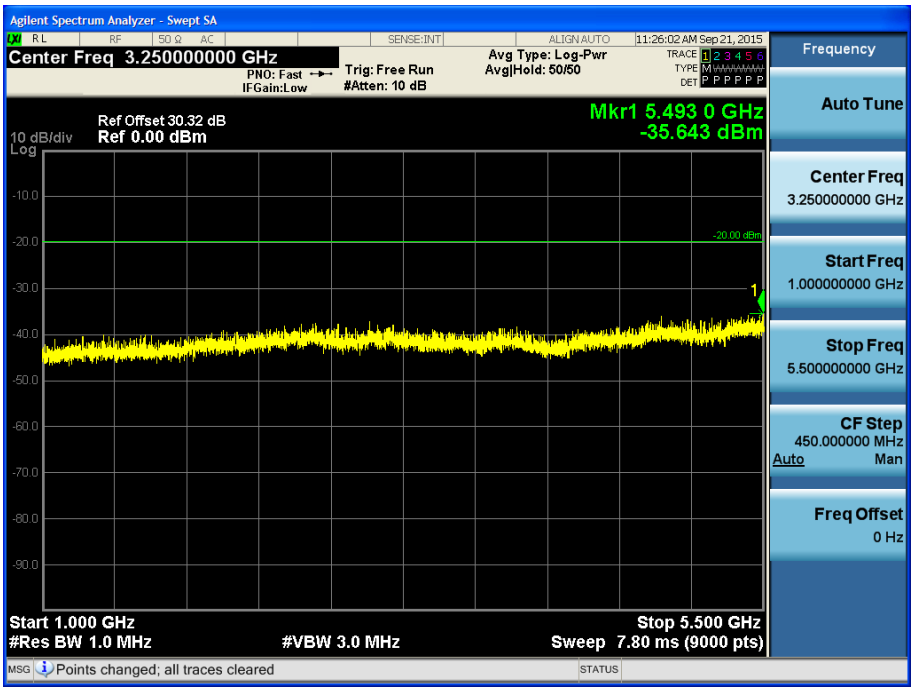
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

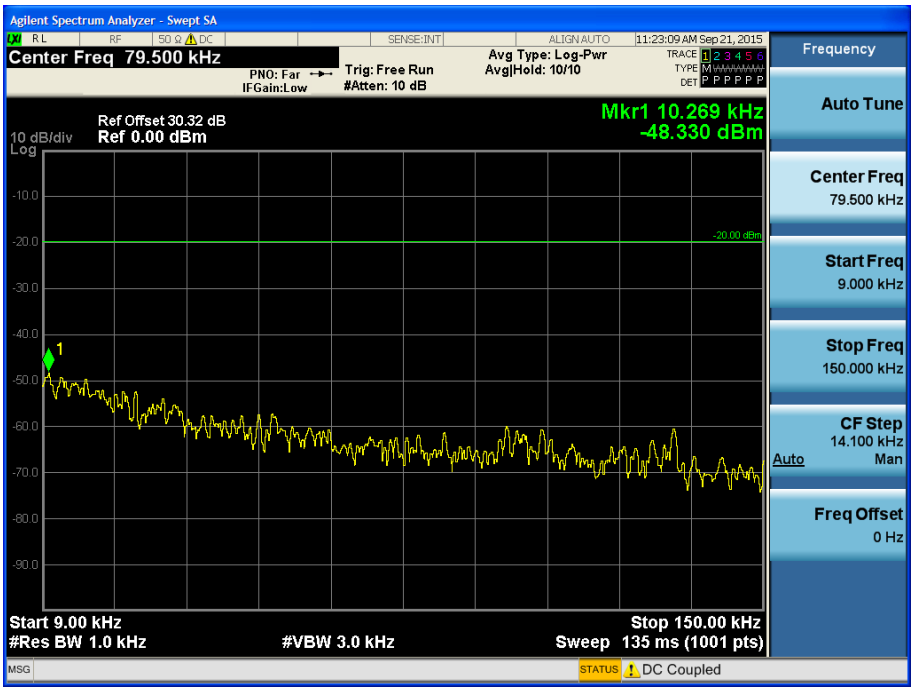


(1 GHz ~ 5.5 GHz)

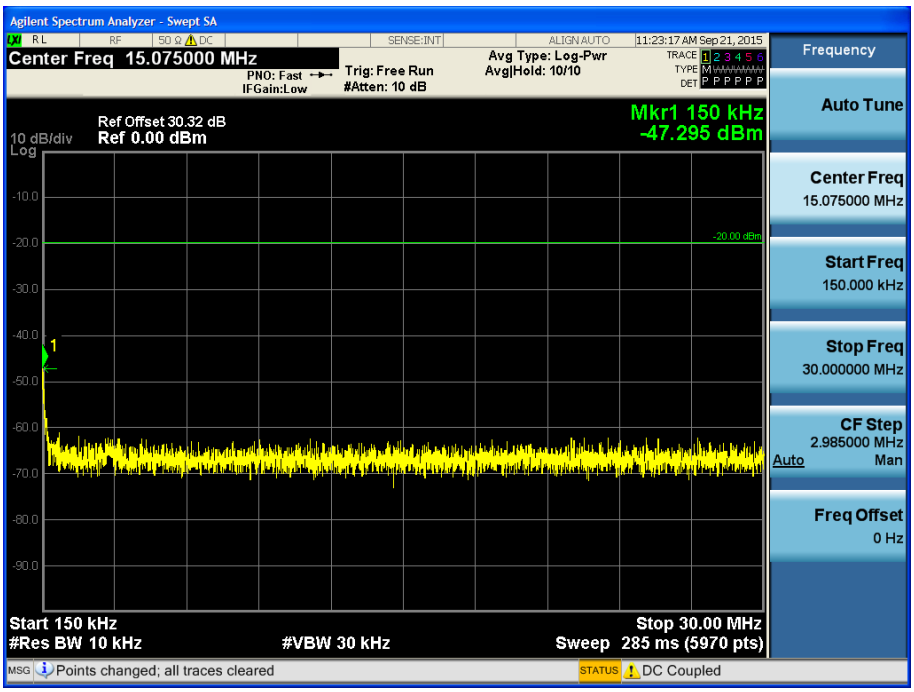


LOW POWER_ 7K60FXD/7K60FXE _162.05 MHz

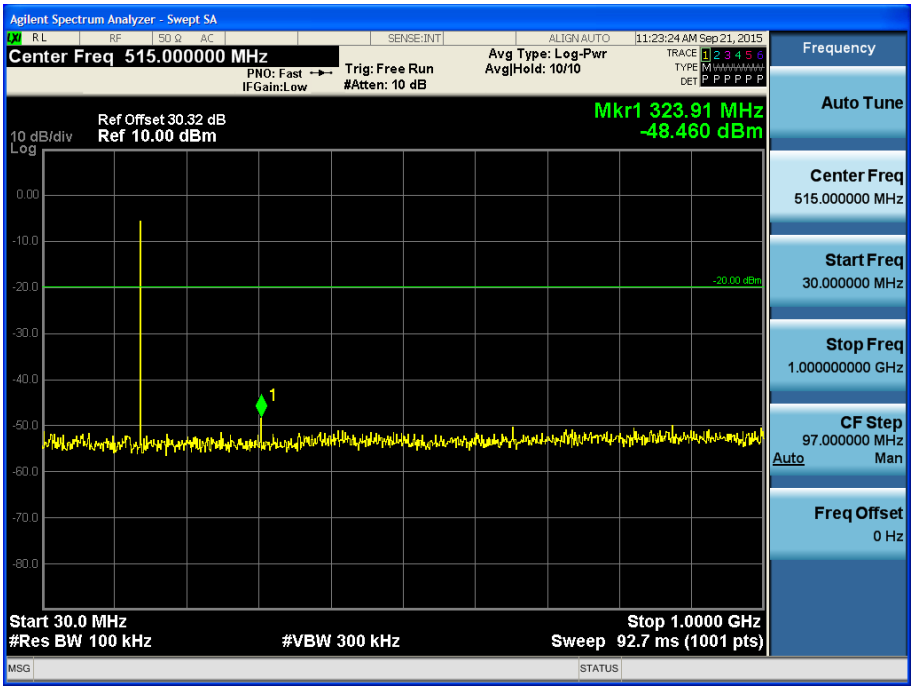
(9 kHz ~ 150 kHz)



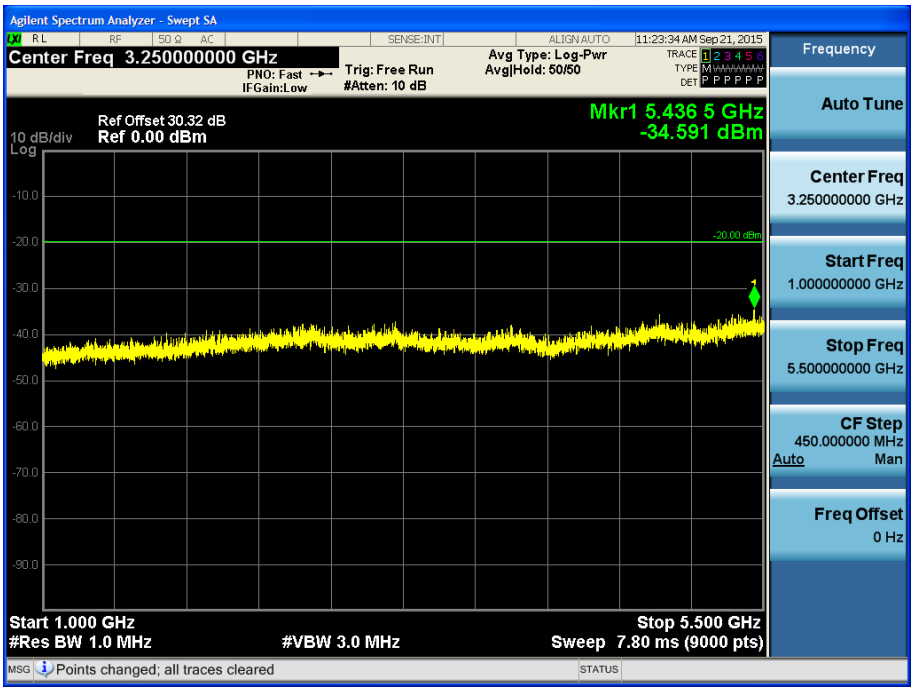
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

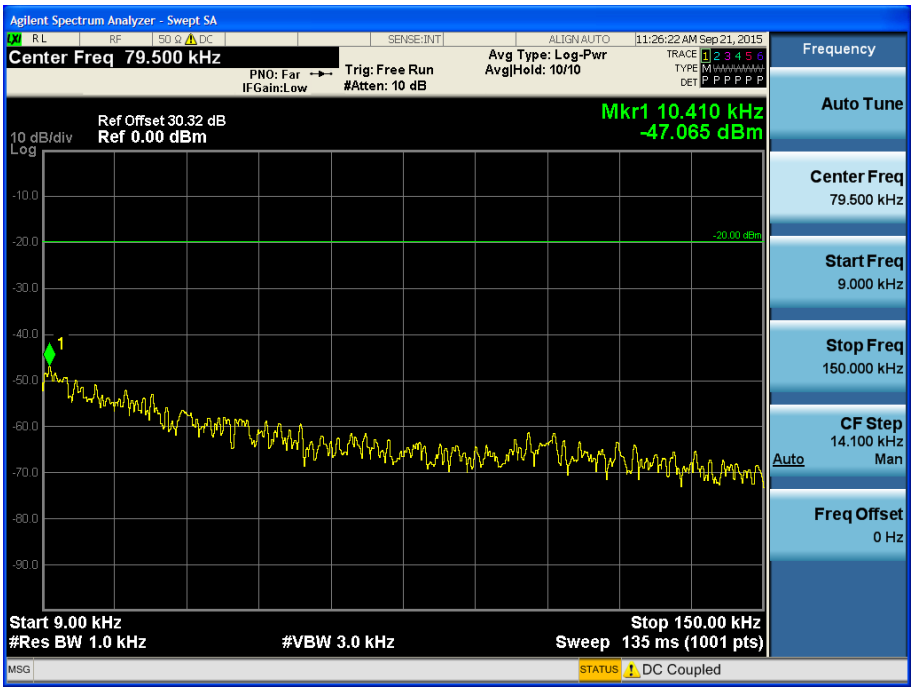


(1 GHz ~ 5.5 GHz)

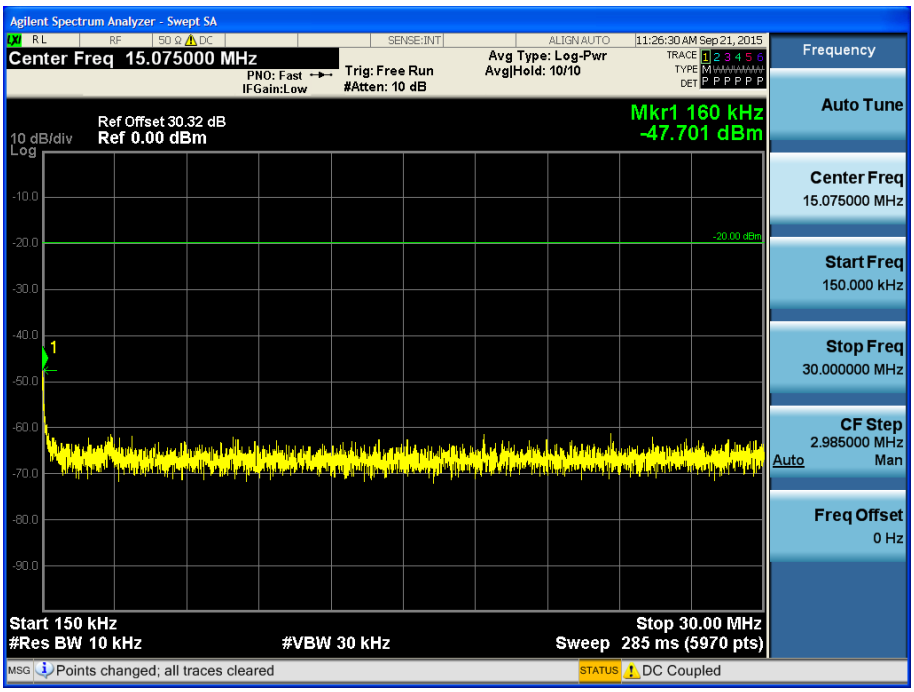


LOW POWER_ 7K60FXD/7K60FXE _173.95 MHz

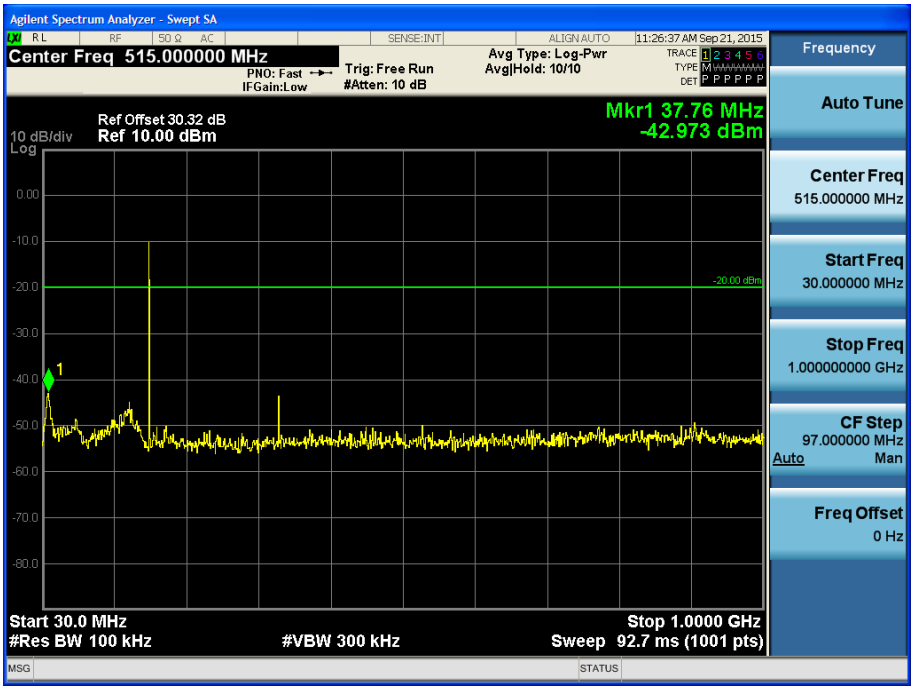
(9 kHz ~ 150 kHz)



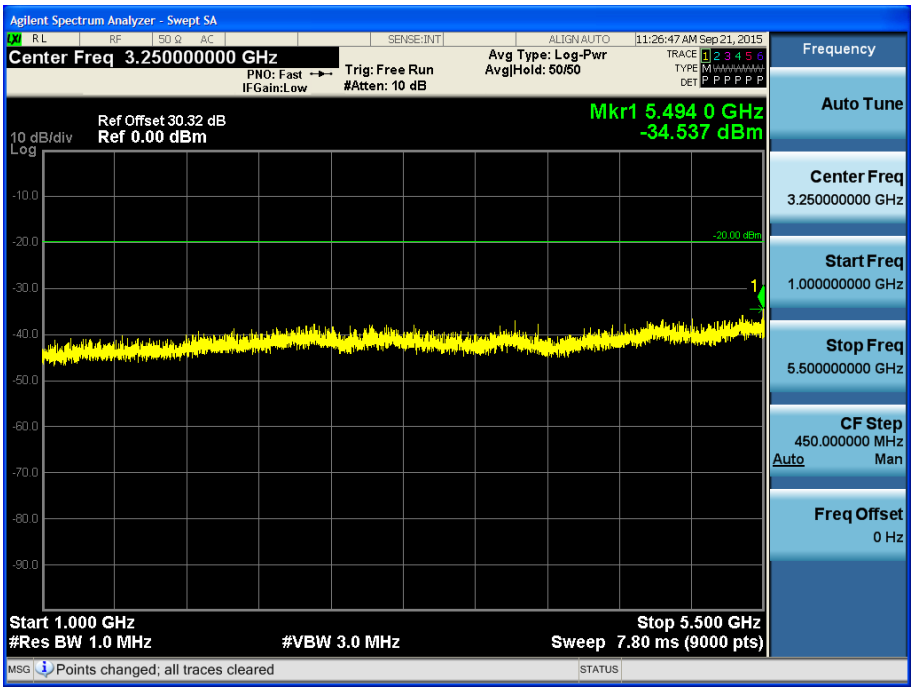
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)



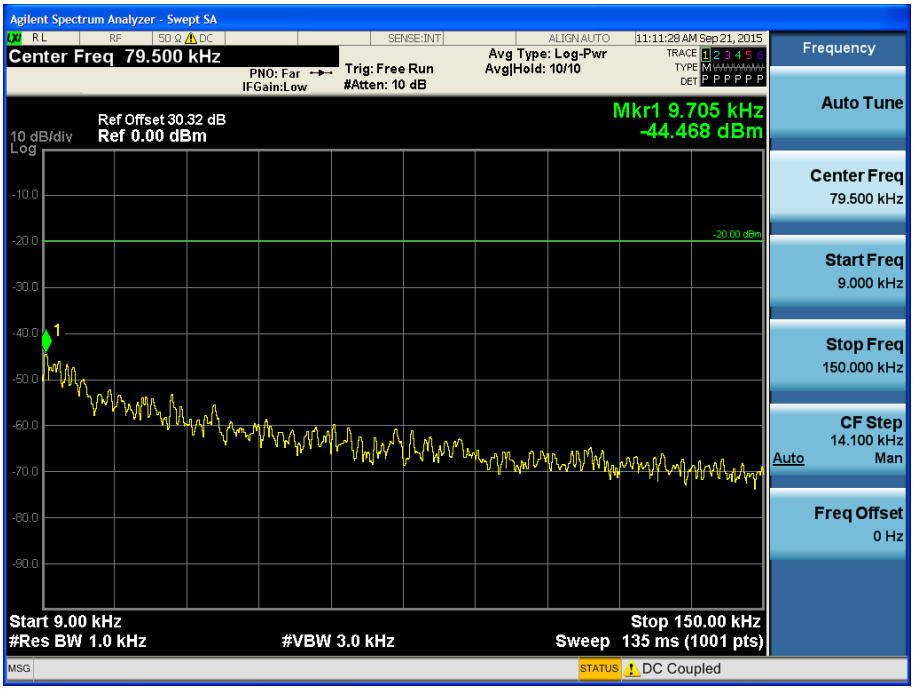
(1 GHz ~ 5.5 GHz)



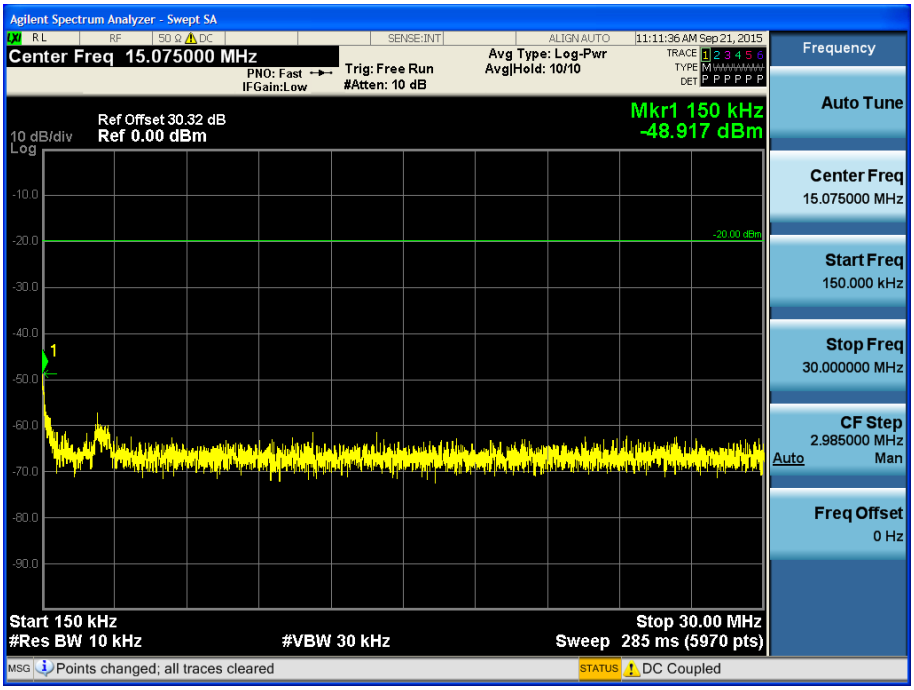
11K0F3E For FCC AND IC

HIGH POWER_11K0F3E_162.05 MHz

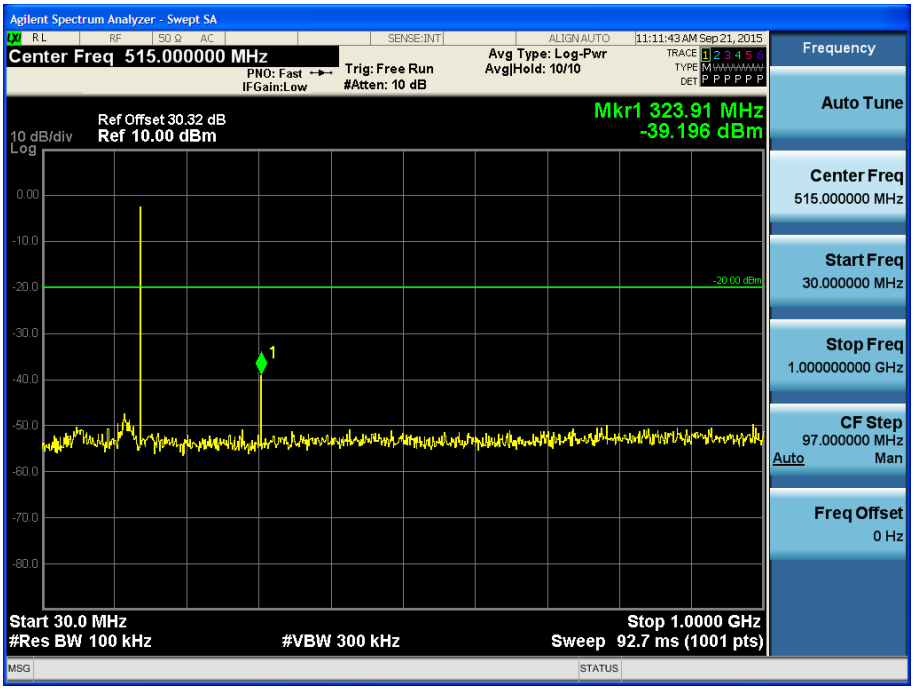
(9 kHz ~ 150 kHz)



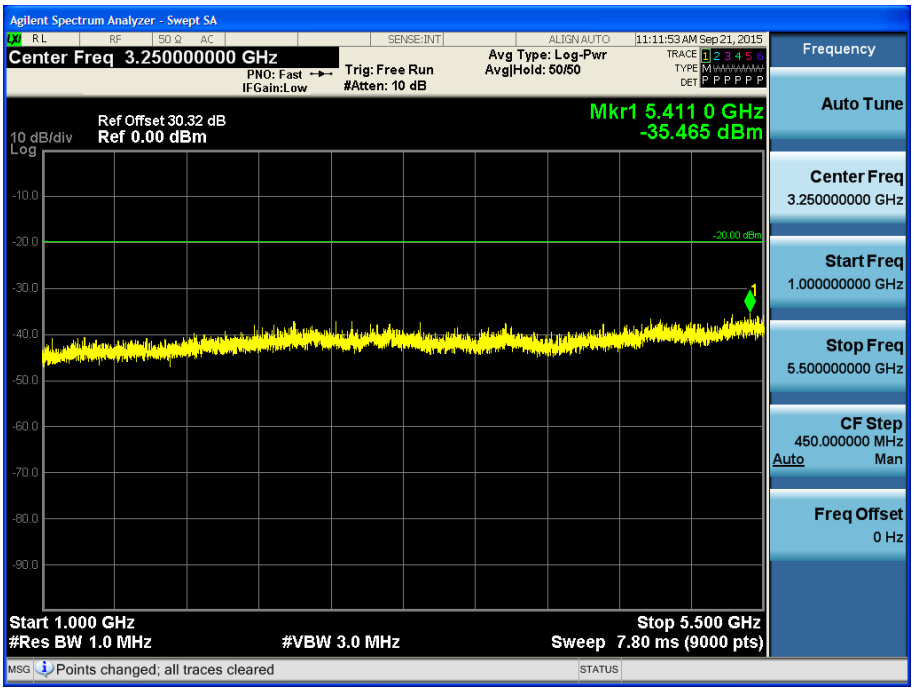
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

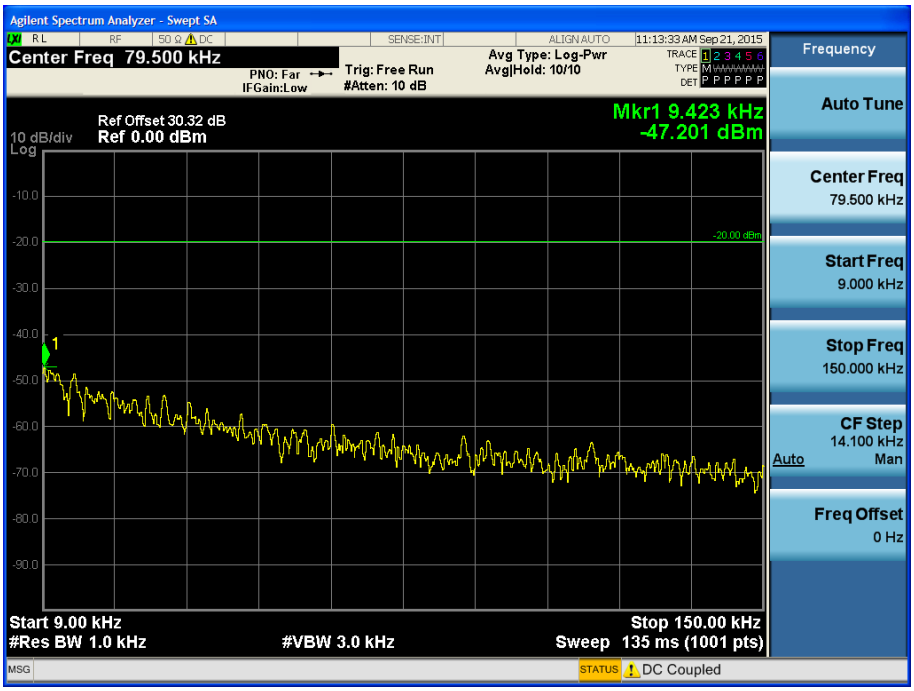


(1 GHz ~ 5.5 GHz)

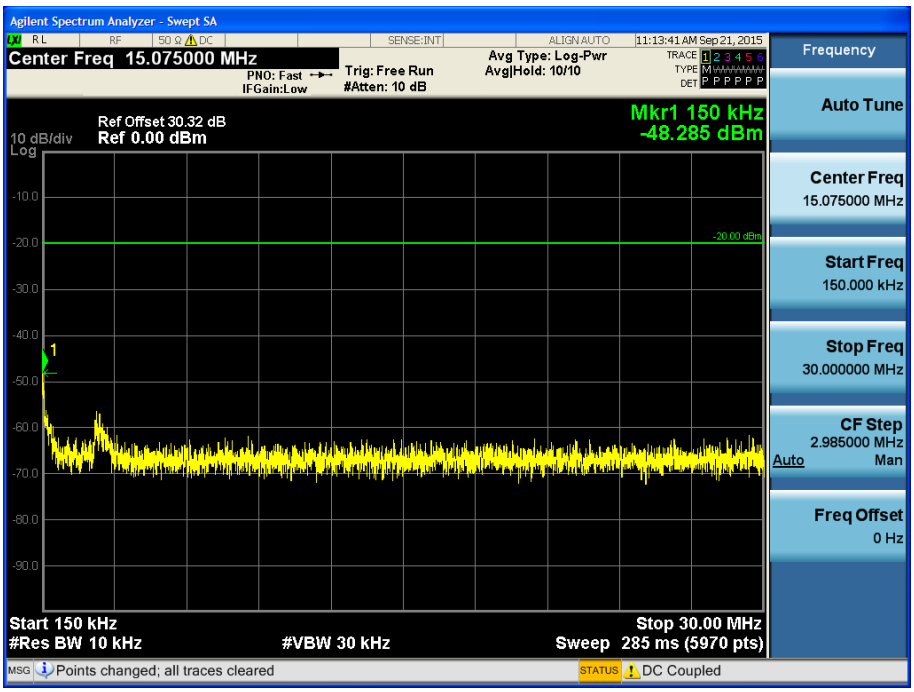


HIGH POWER_11K0F3E_173.95 MHz

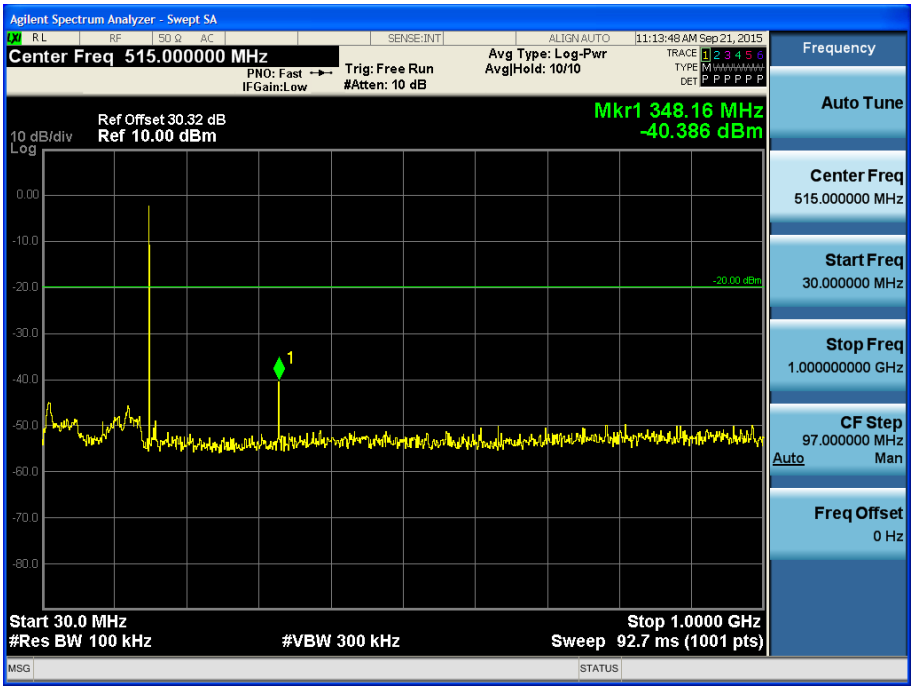
(9 kHz ~ 150 kHz)



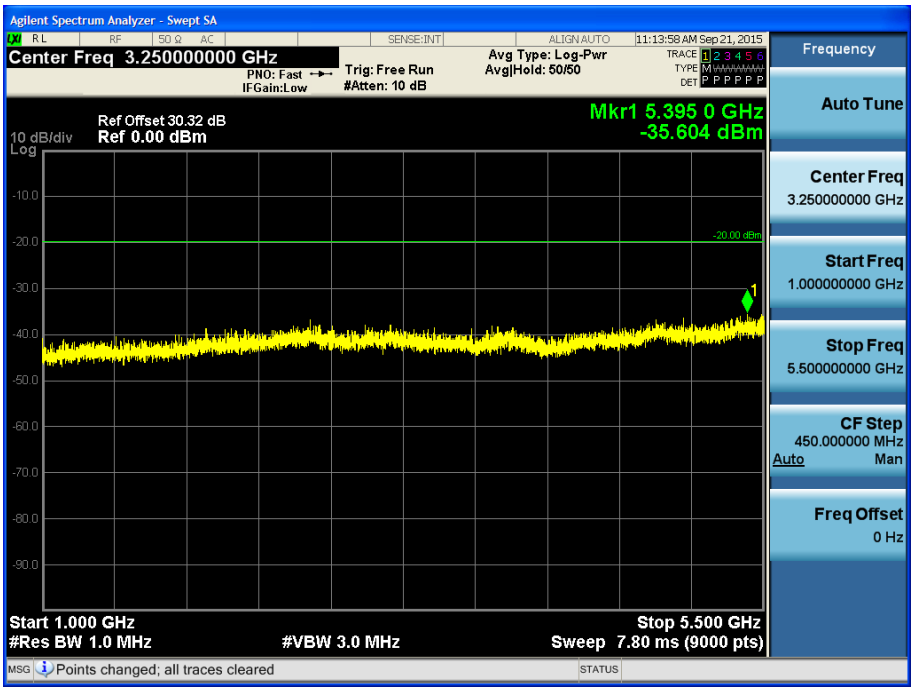
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

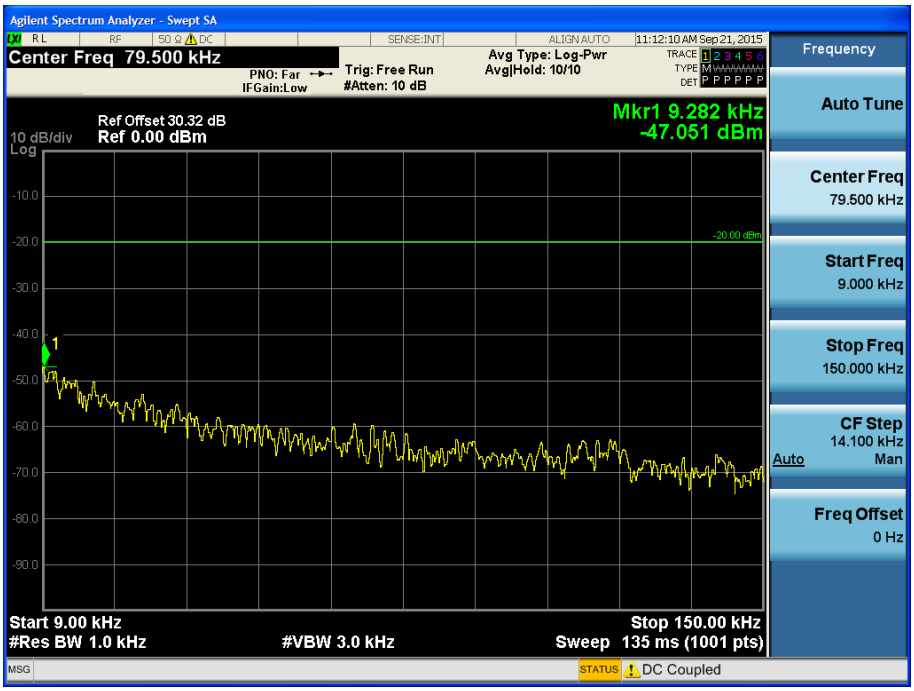


(1 GHz ~ 5.5 GHz)

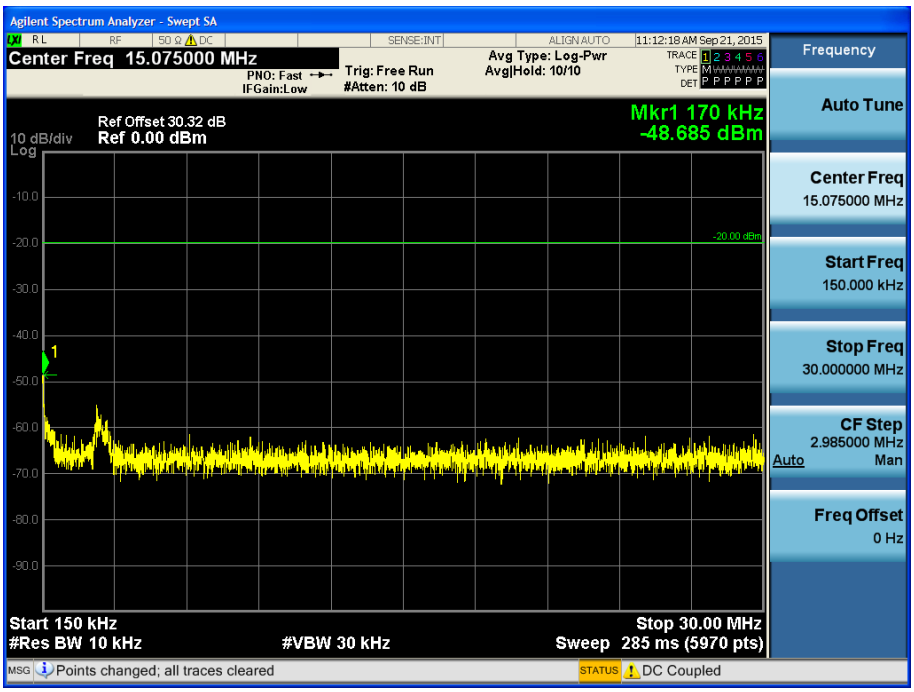


LOW POWER_11K0F3E _162.05 MHz

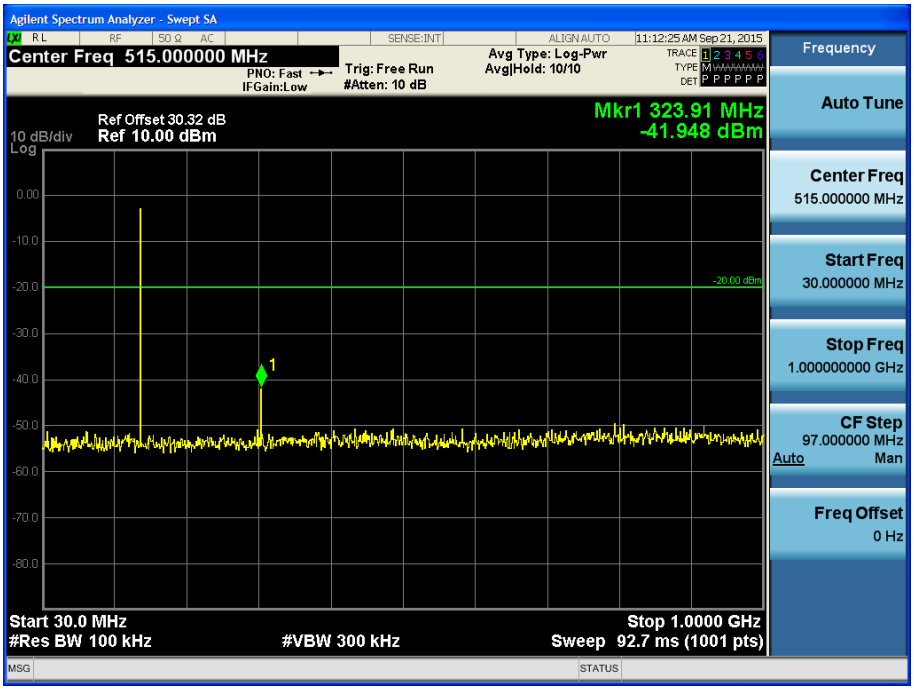
(9 kHz ~ 150 kHz)



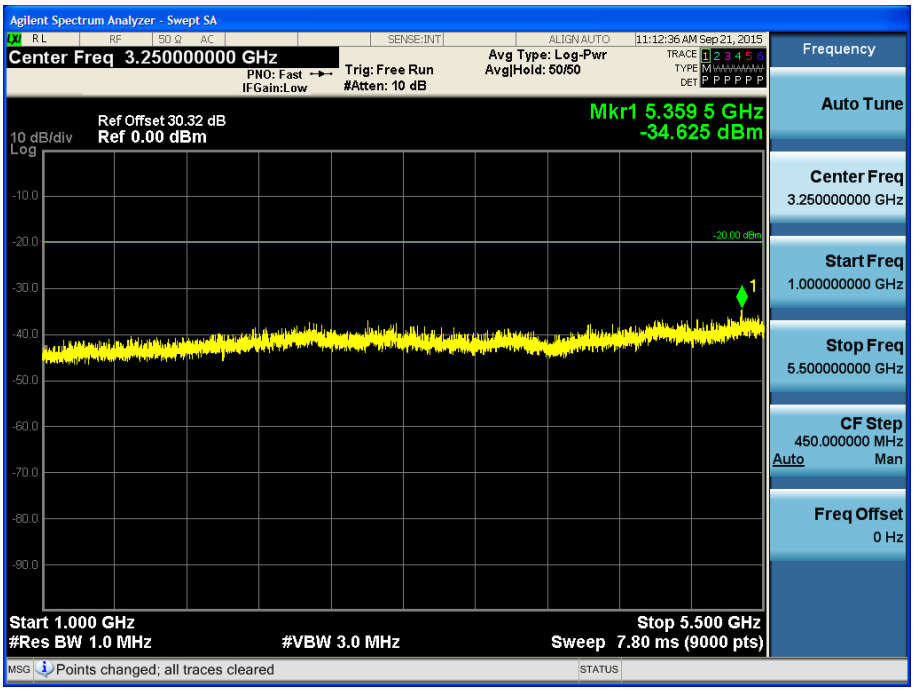
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

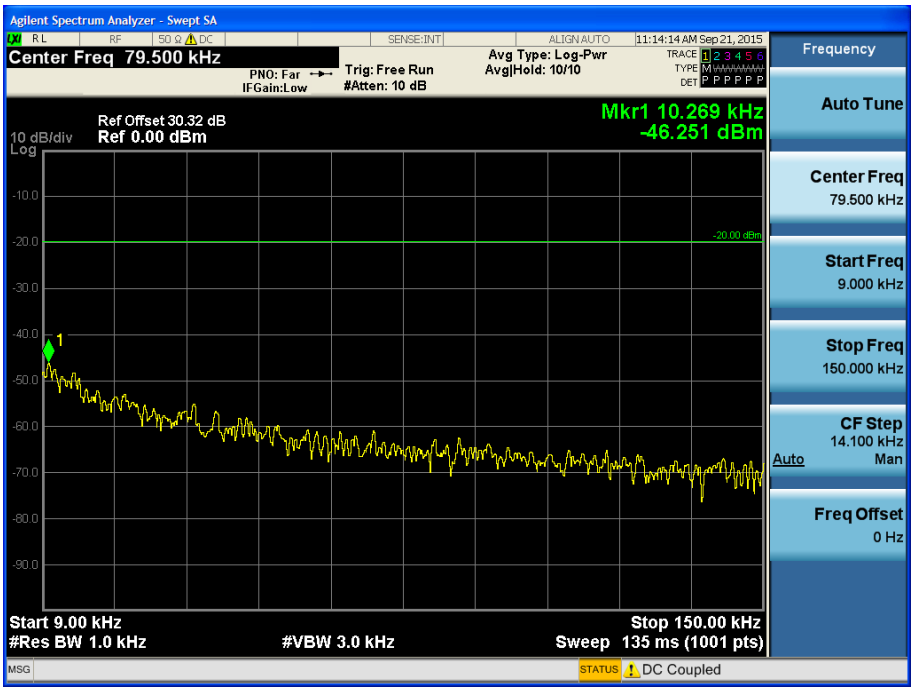


(1 GHz ~ 5.5 GHz)

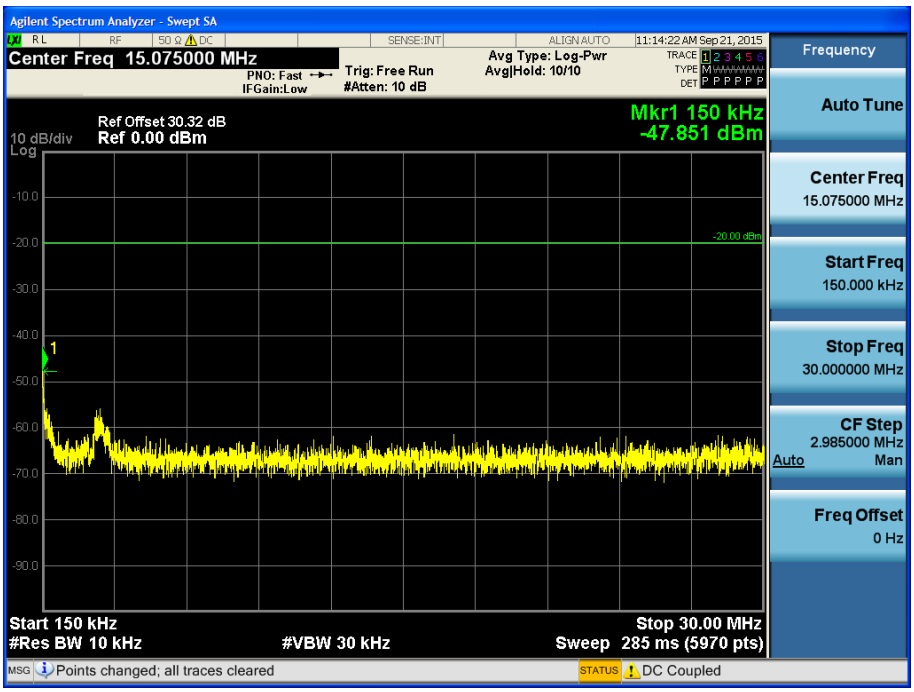


LOW POWER_11K0F3E _173.95 MHz

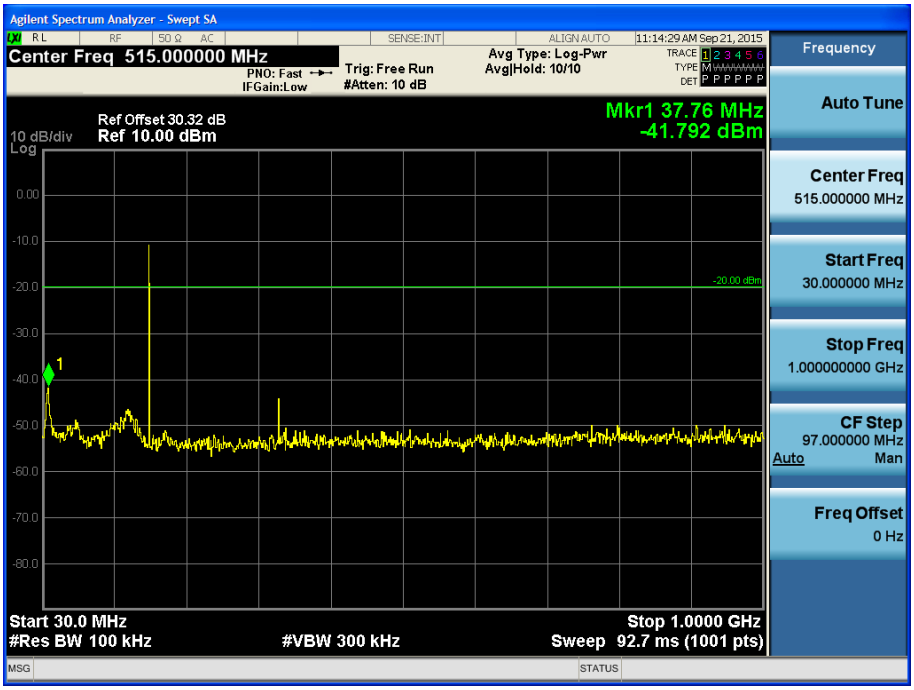
(9 kHz ~ 150 kHz)



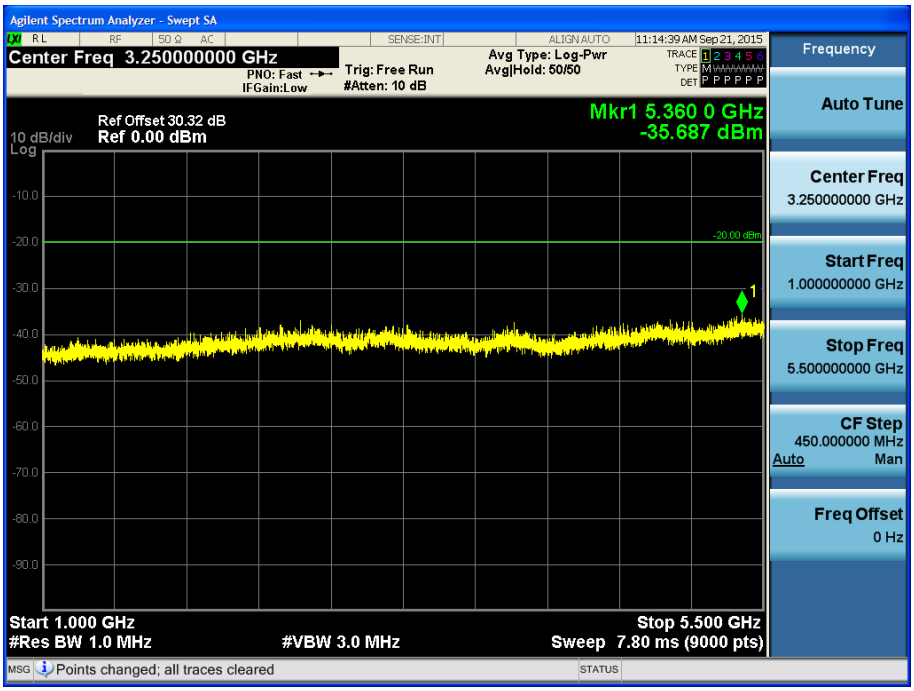
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)



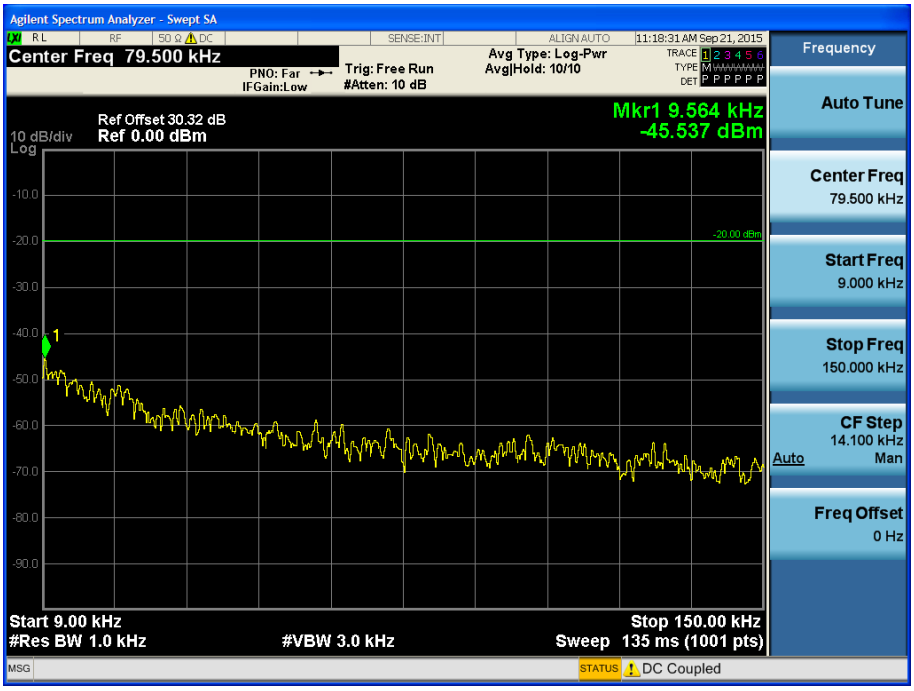
(1 GHz ~ 5.5 GHz)



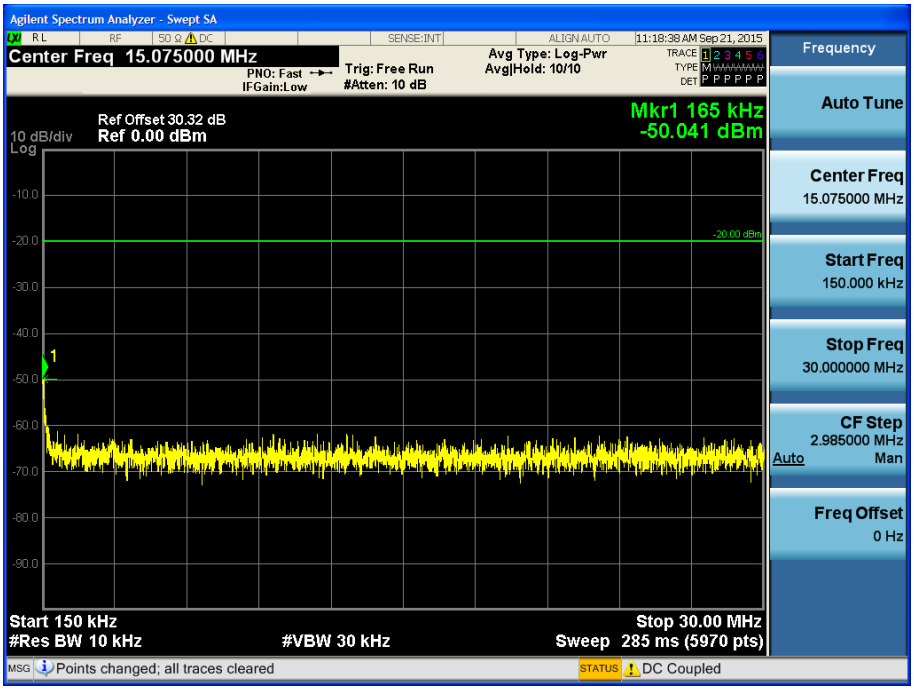
7K60FXD/7K60FXE For ONLY IC

HIGH POWER_ 7K60FXD/7K60FXE _138.05 MHz

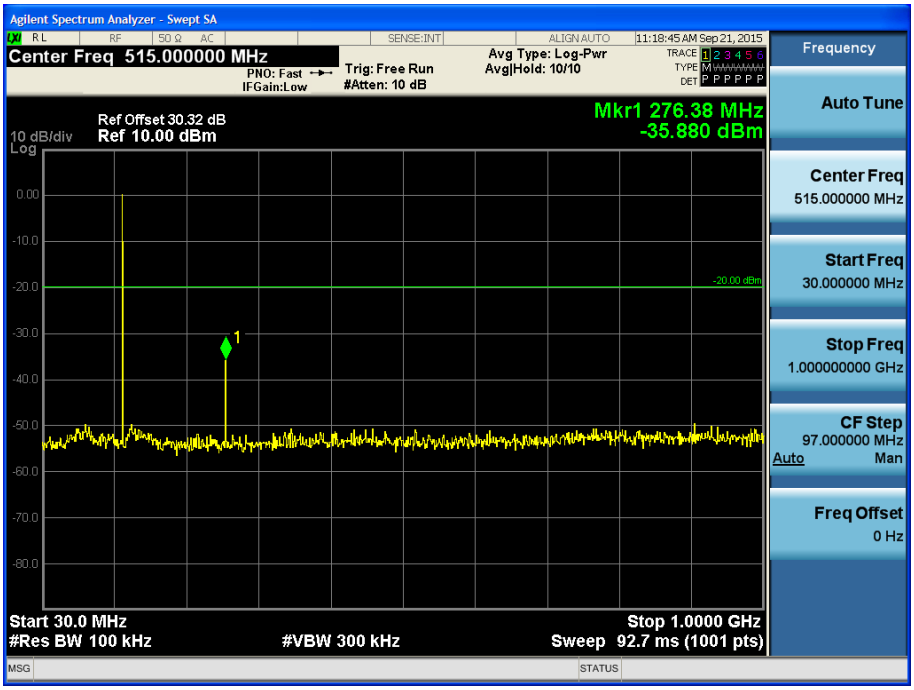
(9 kHz ~ 150 kHz)



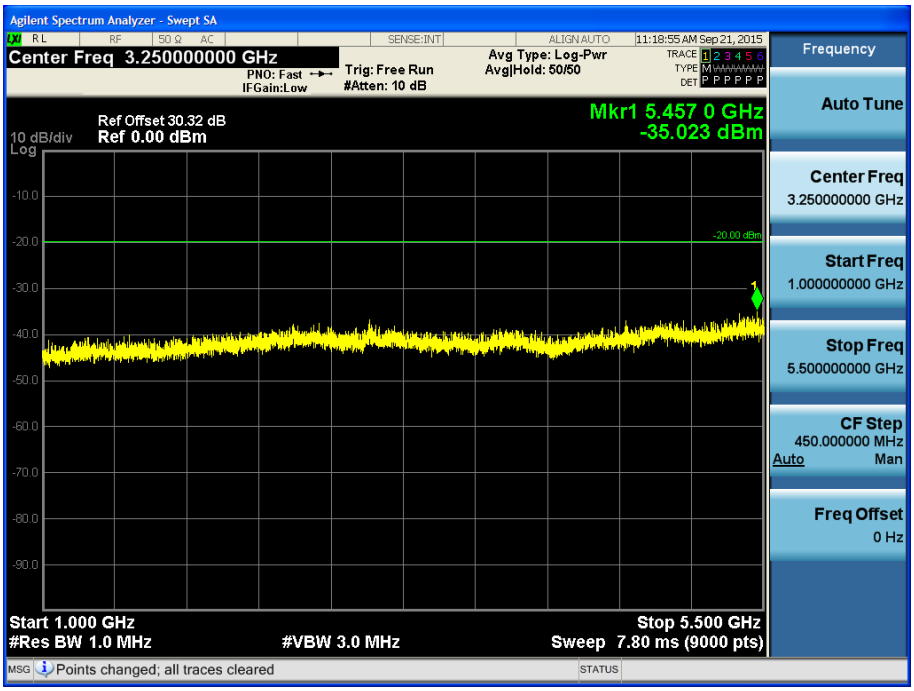
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

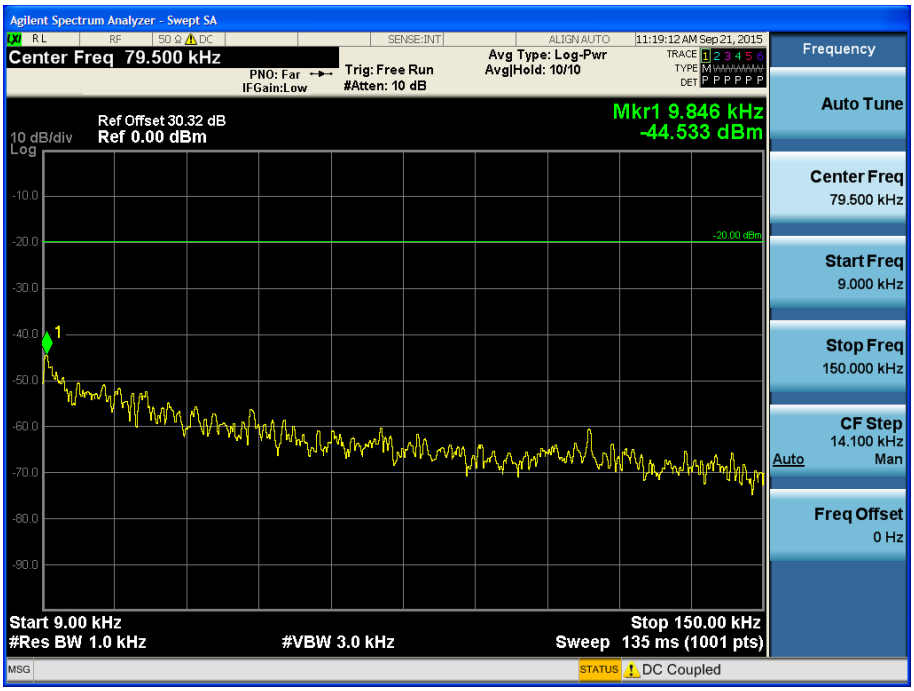


(1 GHz ~ 5.5 GHz)

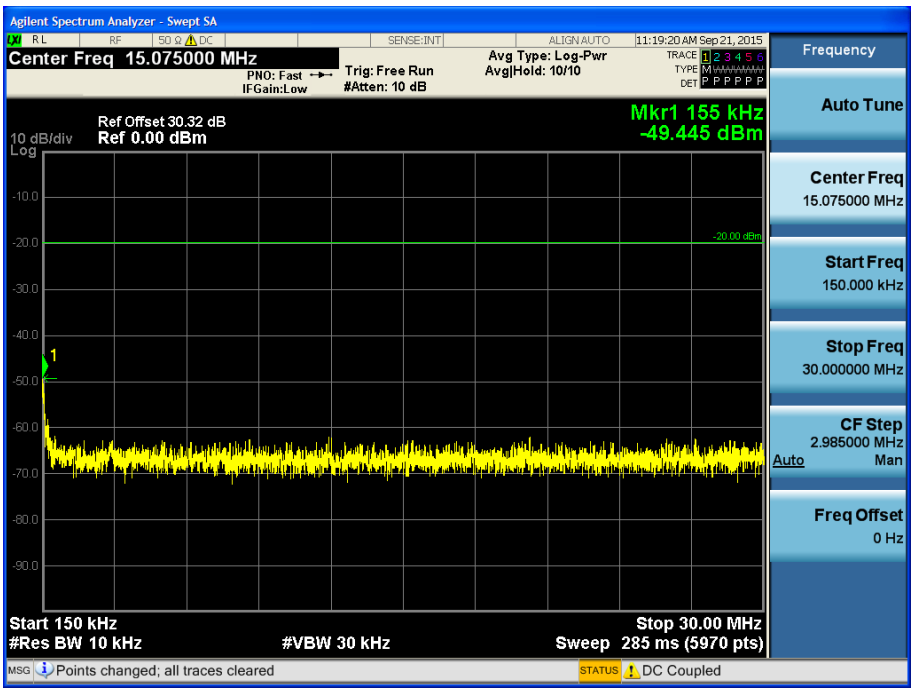


LOW POWER_ 7K60FXD/7K60FXE _138.05 MHz

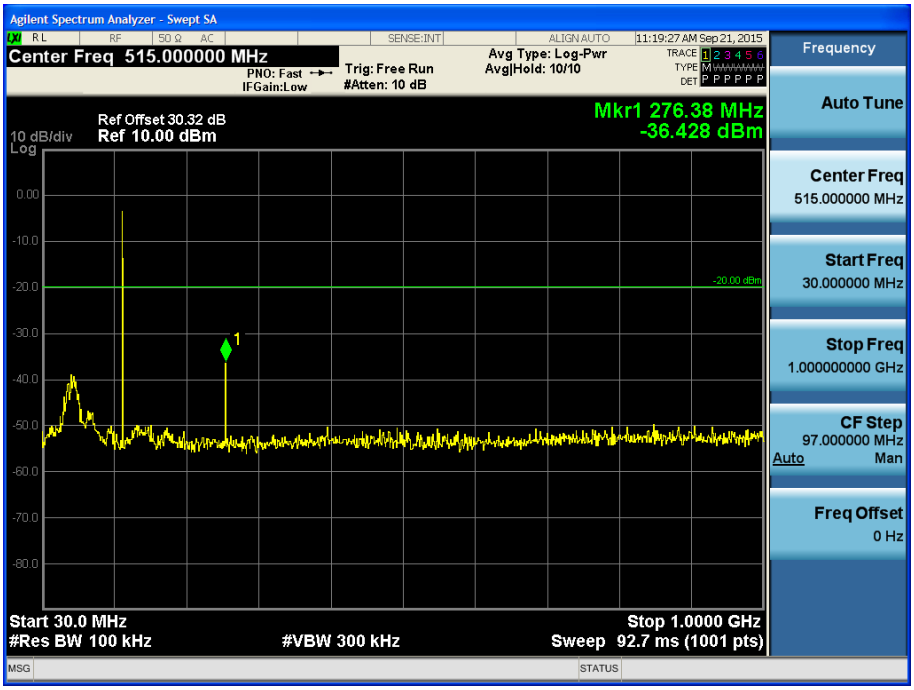
(9 kHz ~ 150 kHz)



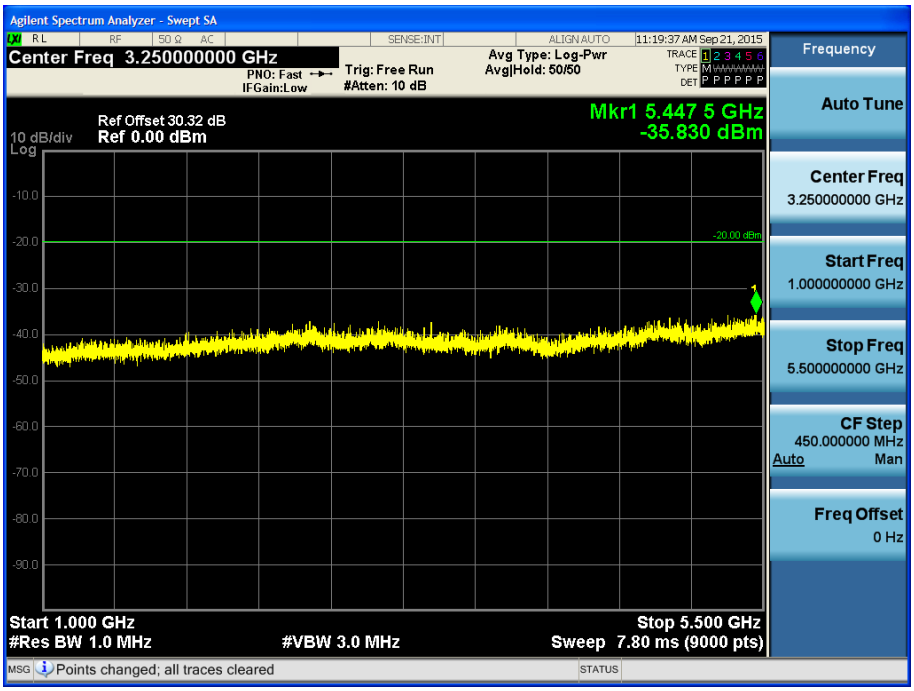
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)



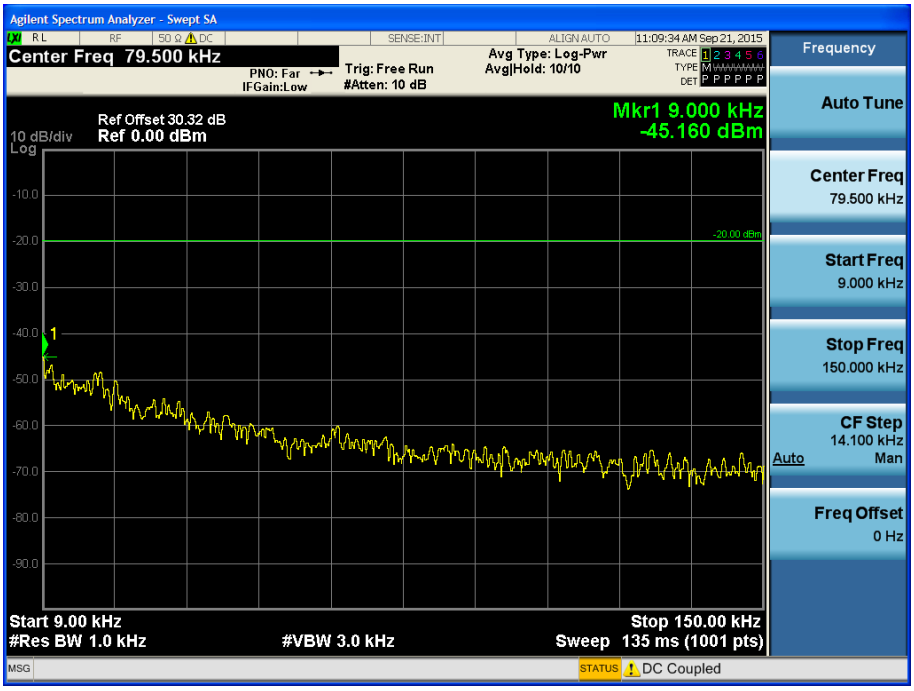
(1 GHz ~ 5.5 GHz)



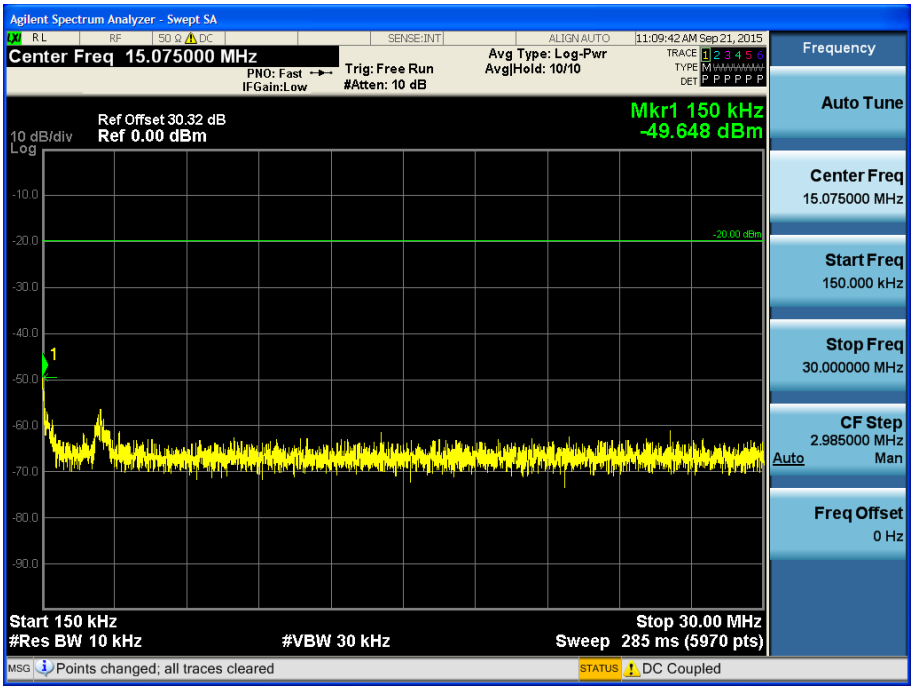
11K0F3E For ONLY IC

HIGH POWER_11K0F3E_138.05 MHz

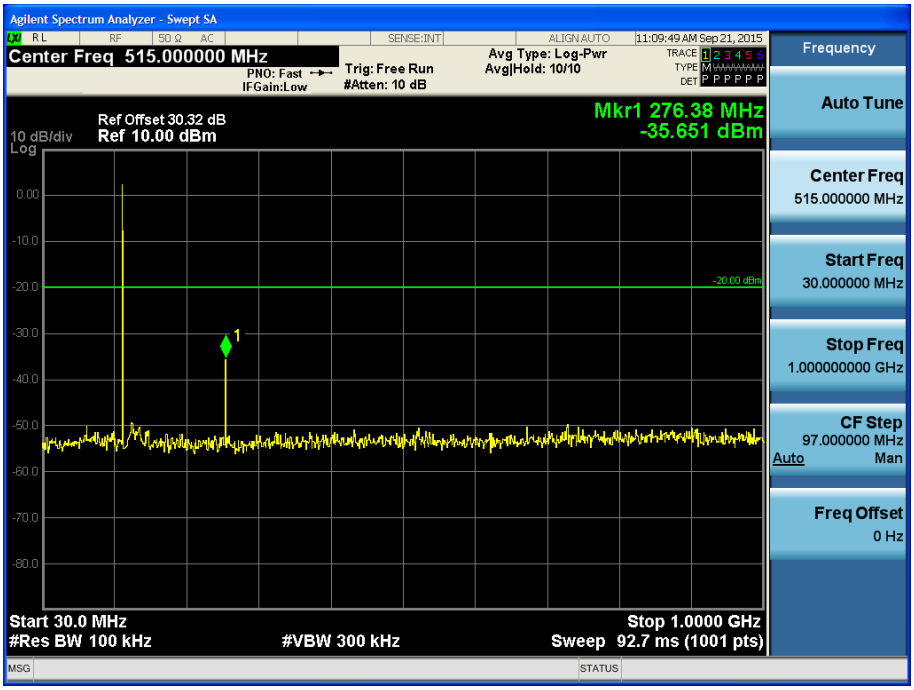
(9 kHz ~ 150 kHz)



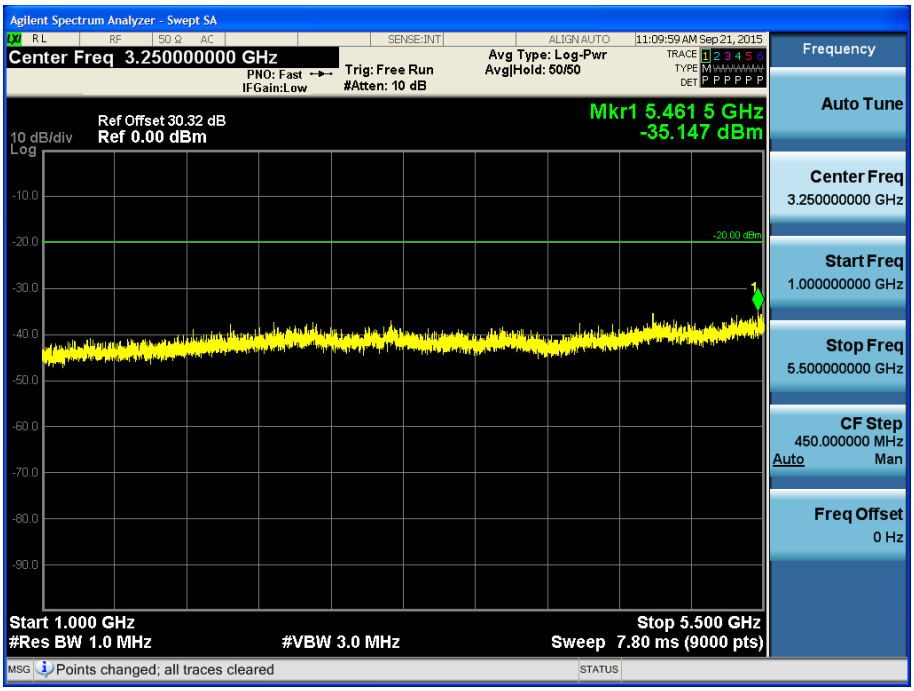
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

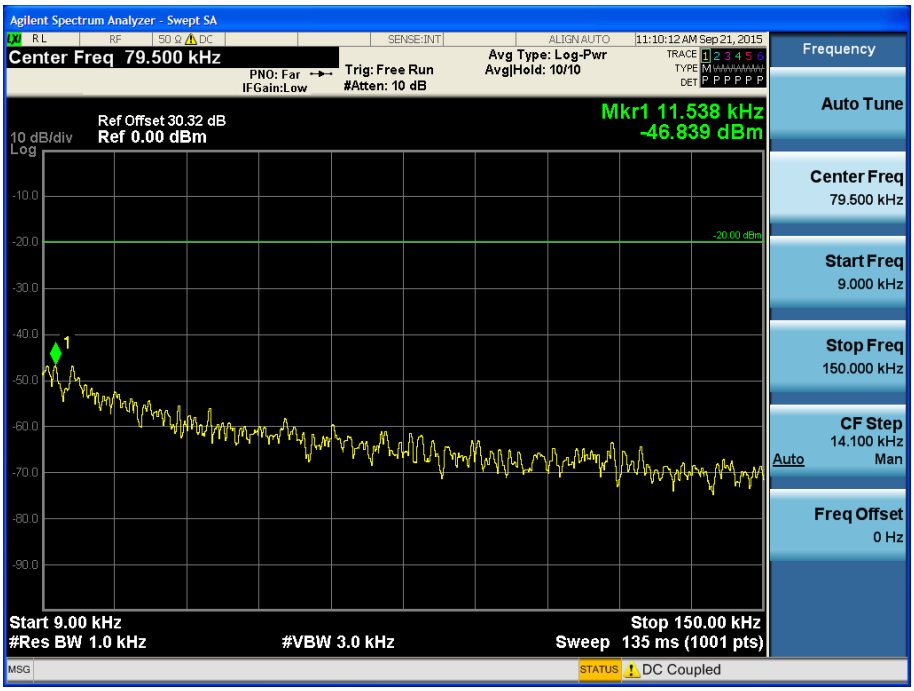


(1 GHz ~ 5.5 GHz)

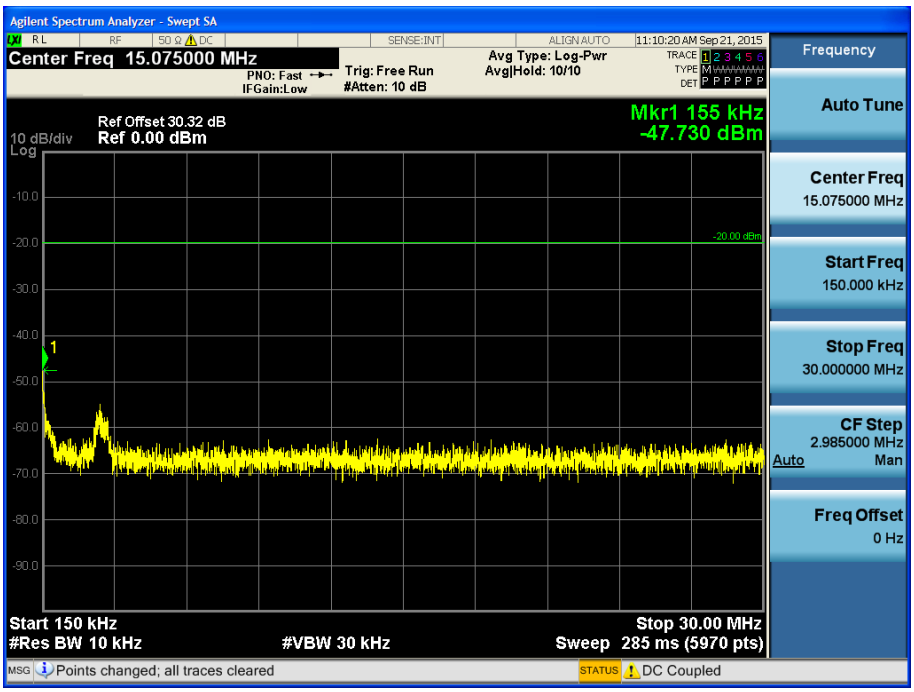


LOW POWER_11K0F3E _138.05 MHz

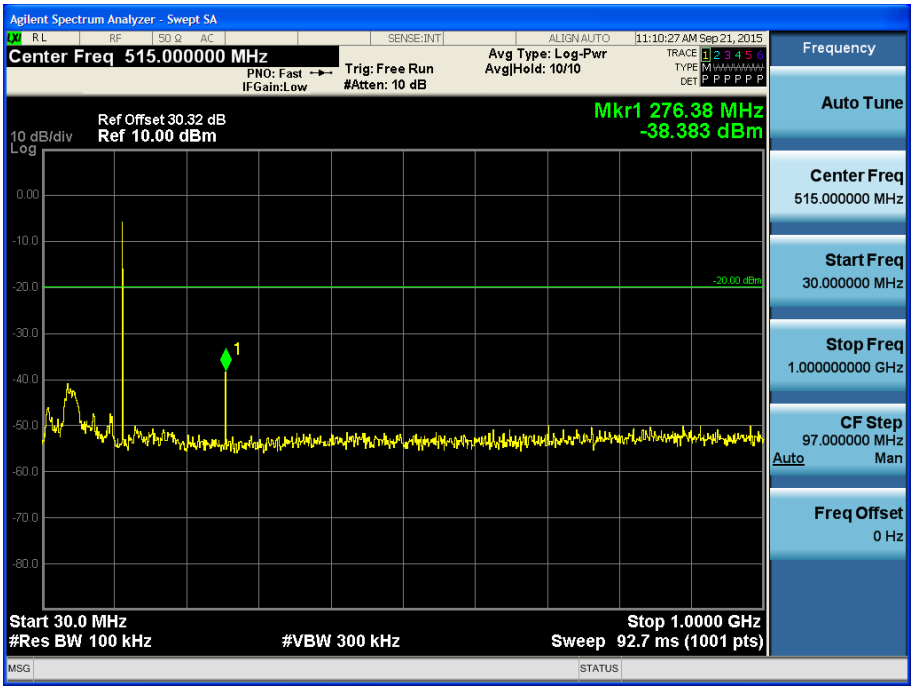
(9 kHz ~ 150 kHz)



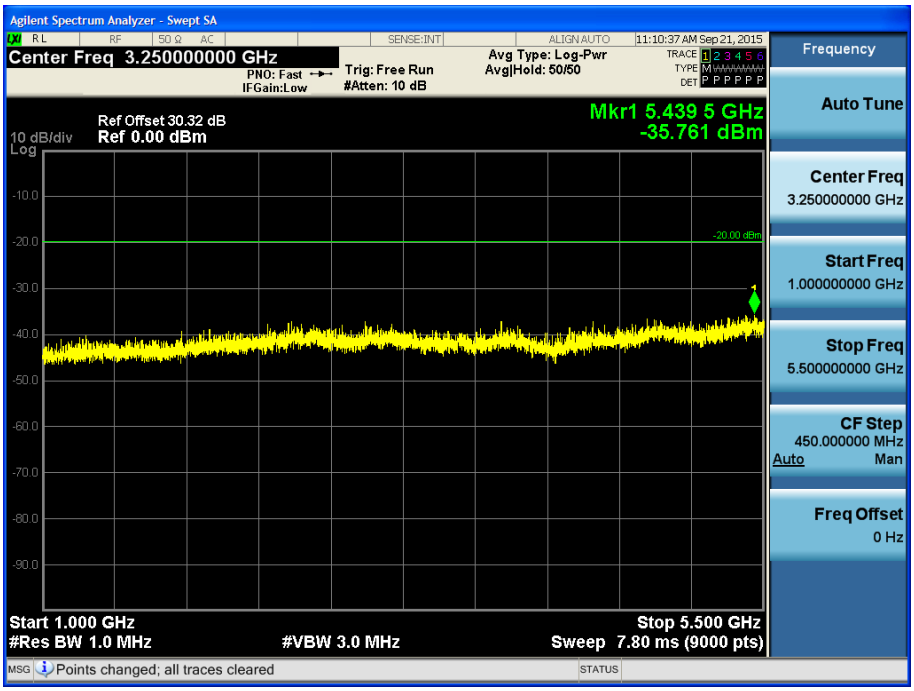
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)



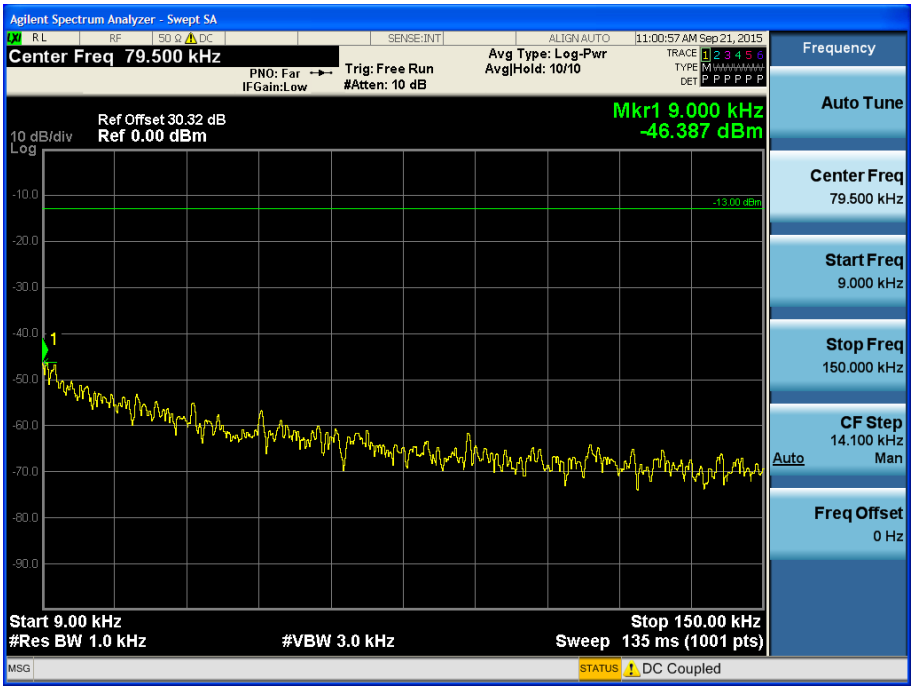
(1 GHz ~ 5.5 GHz)



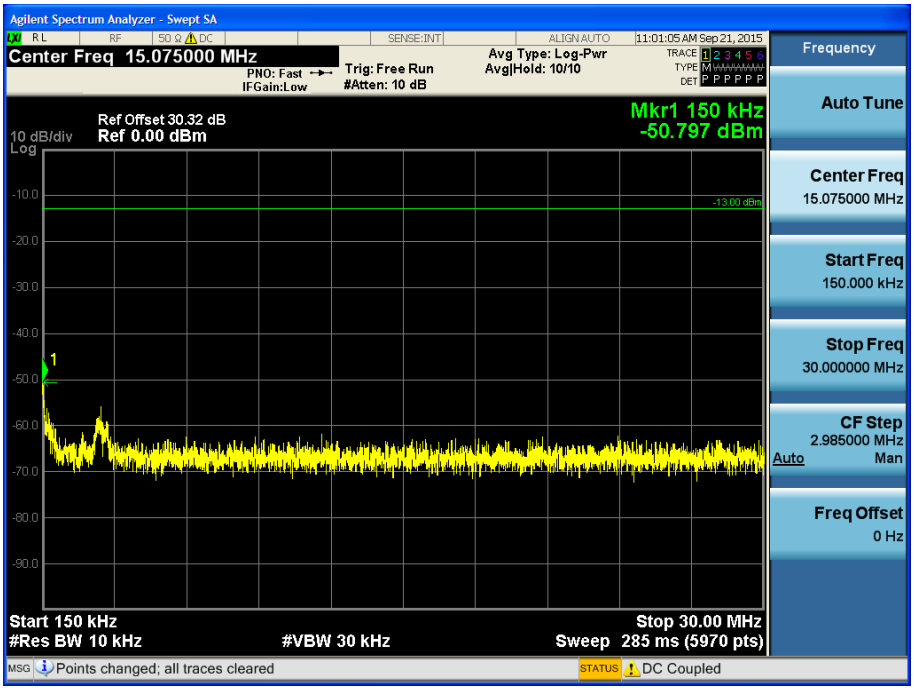
16K0F3E For ONLY IC

HIGH POWER_16K0F3E_138.05 MHz

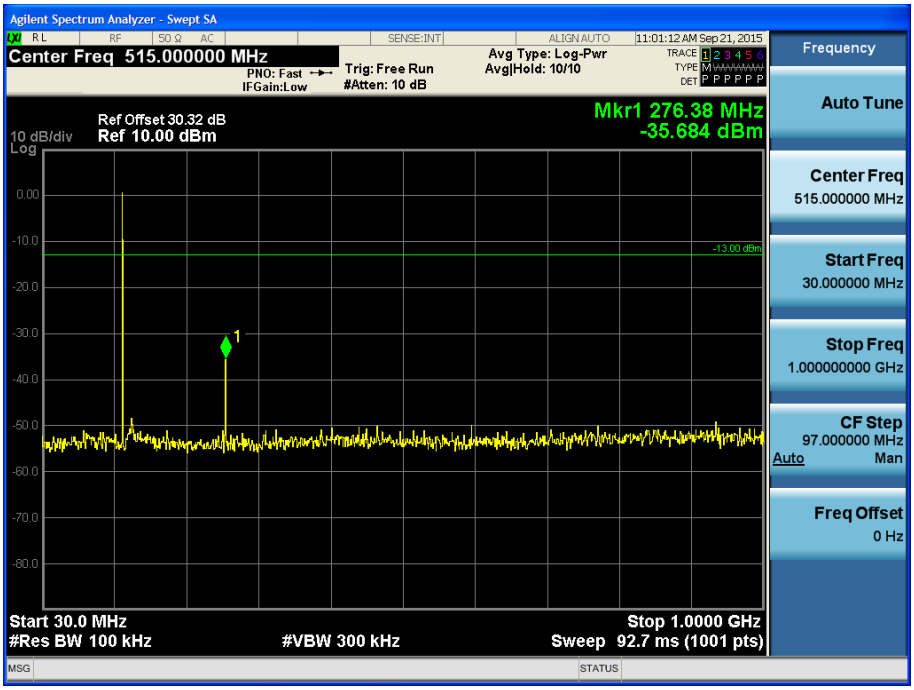
(9 kHz ~ 150 kHz)



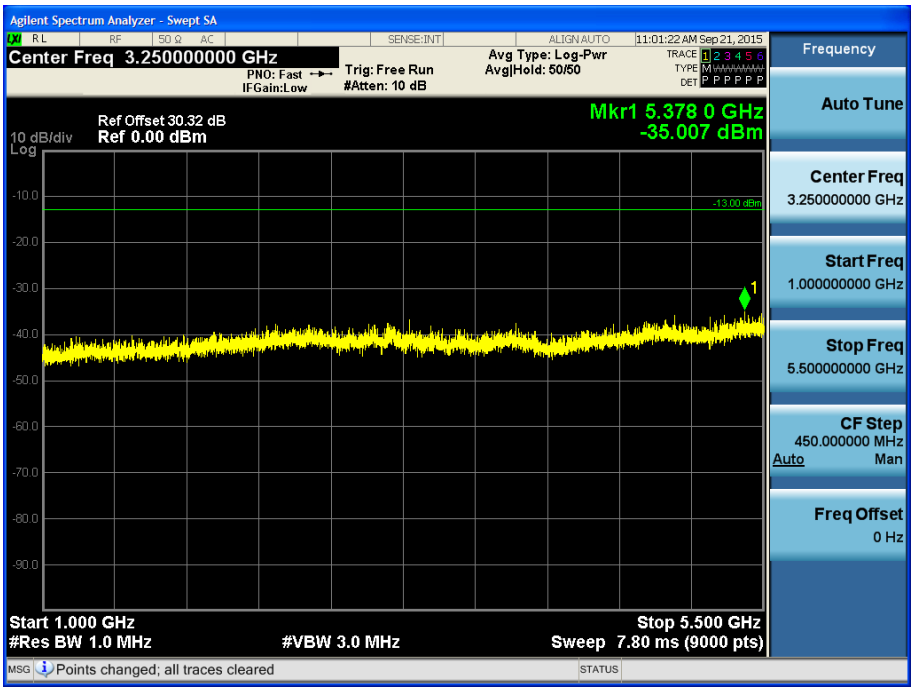
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

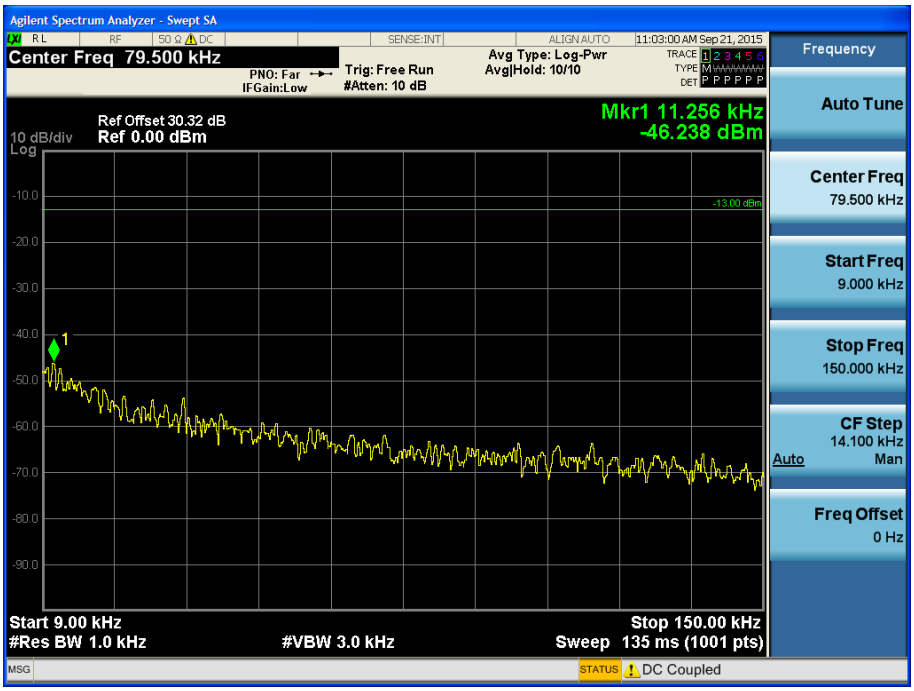


(1 GHz ~ 5.5 GHz)

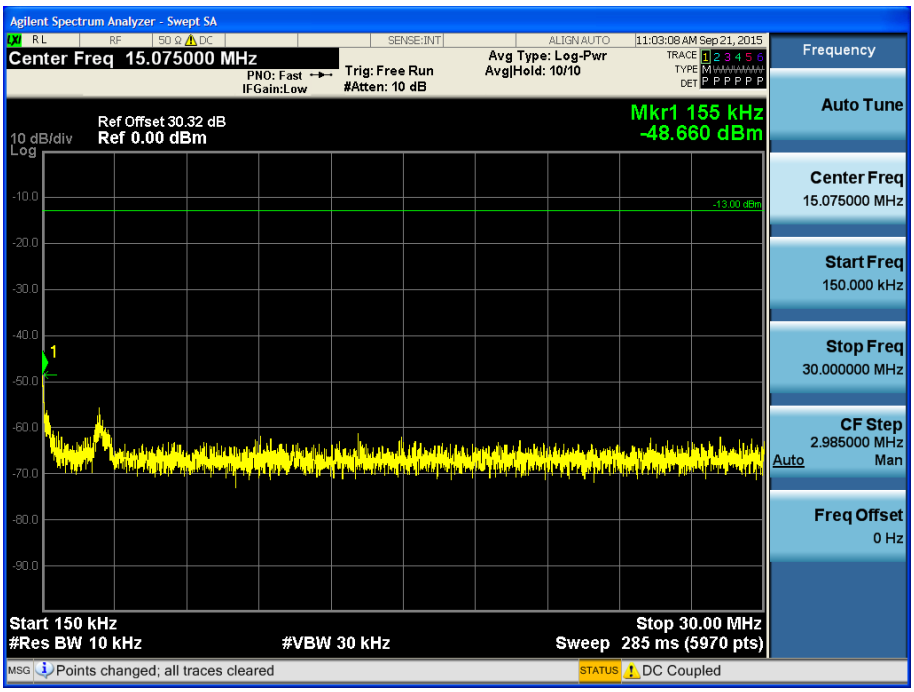


HIGH POWER_16K0F3E_162.05 MHz

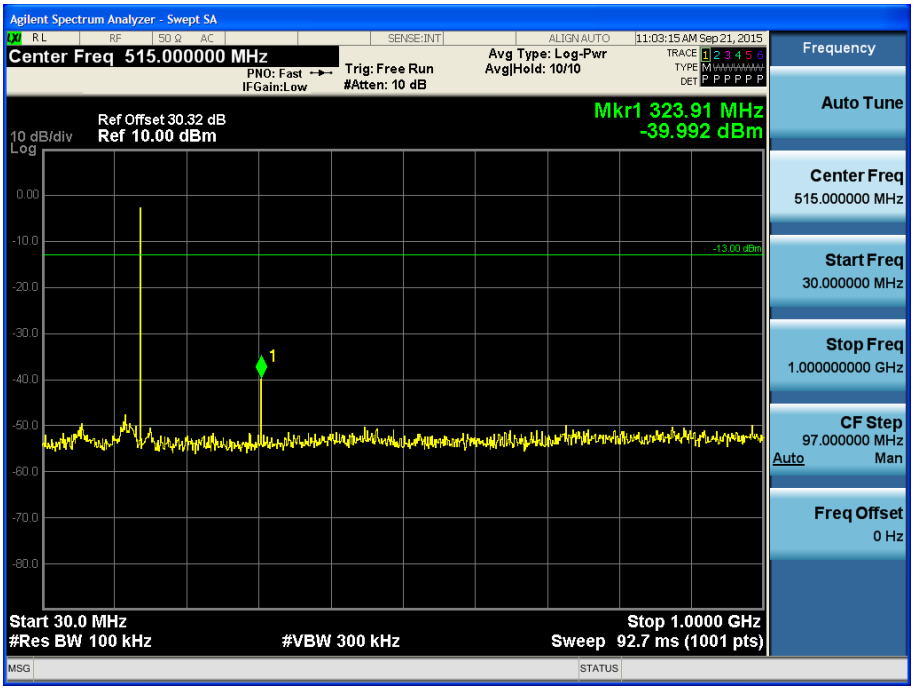
(9 kHz ~ 150 kHz)



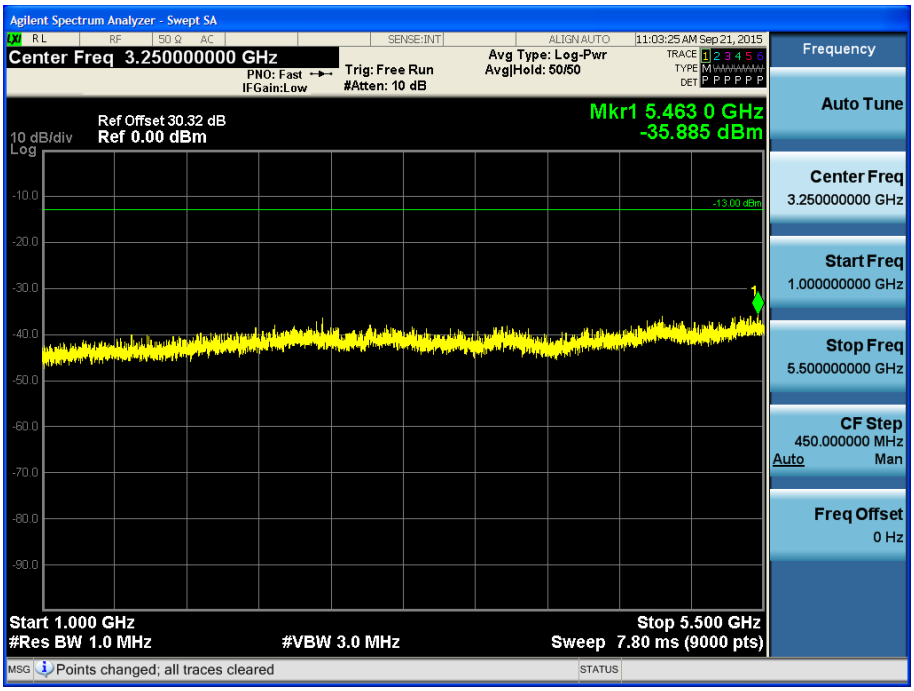
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

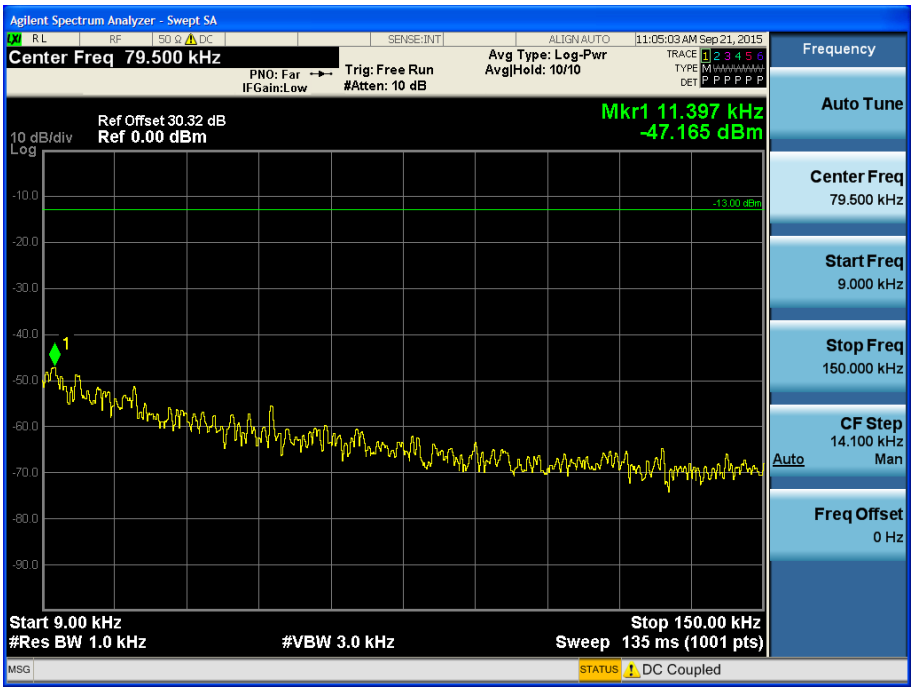


(1 GHz ~ 5.5 GHz)

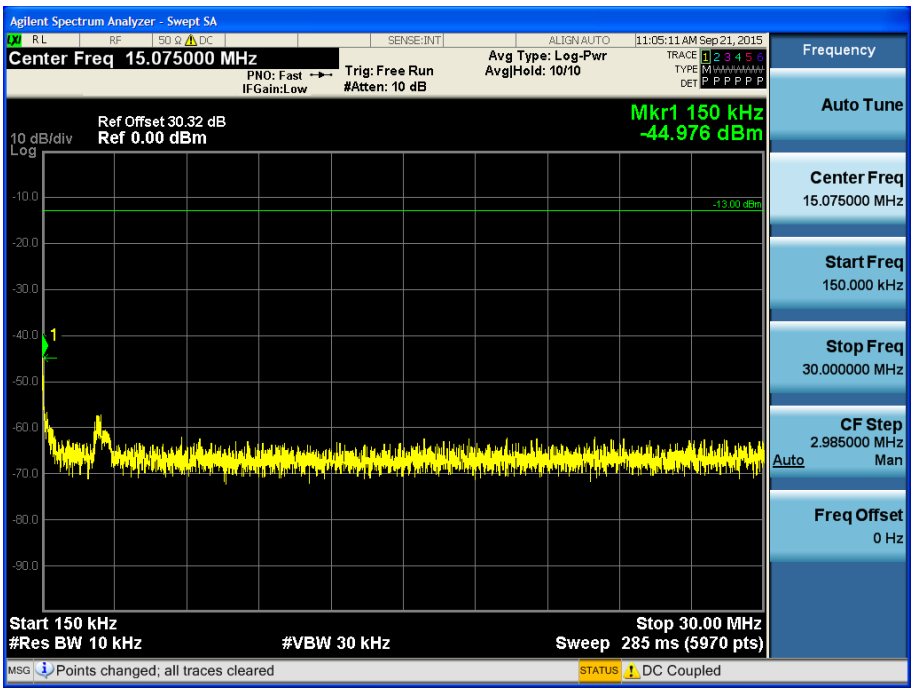


HIGH POWER_16K0F3E_173.95 MHz

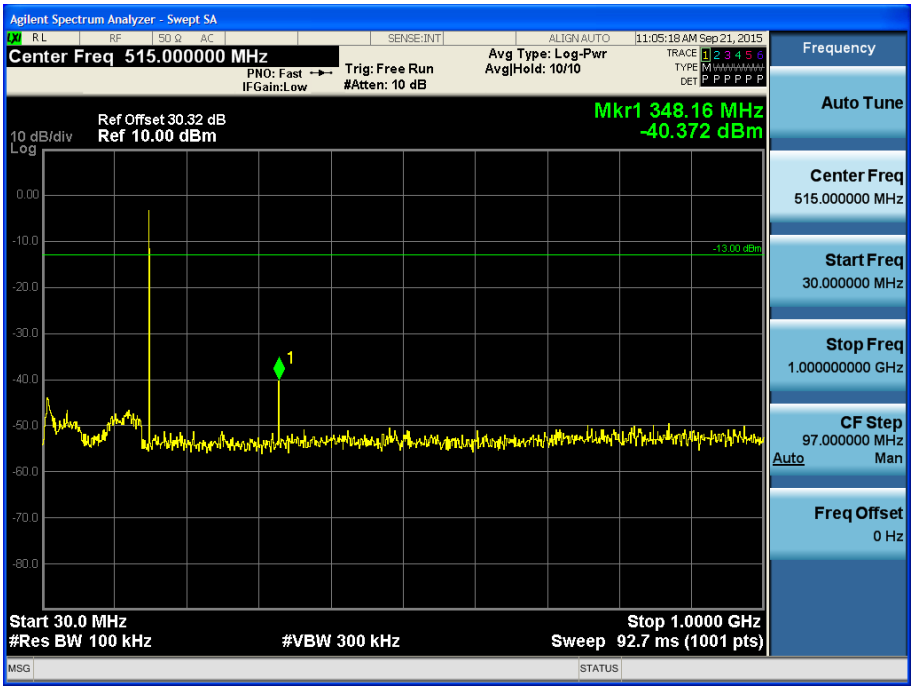
(9 kHz ~ 150 kHz)



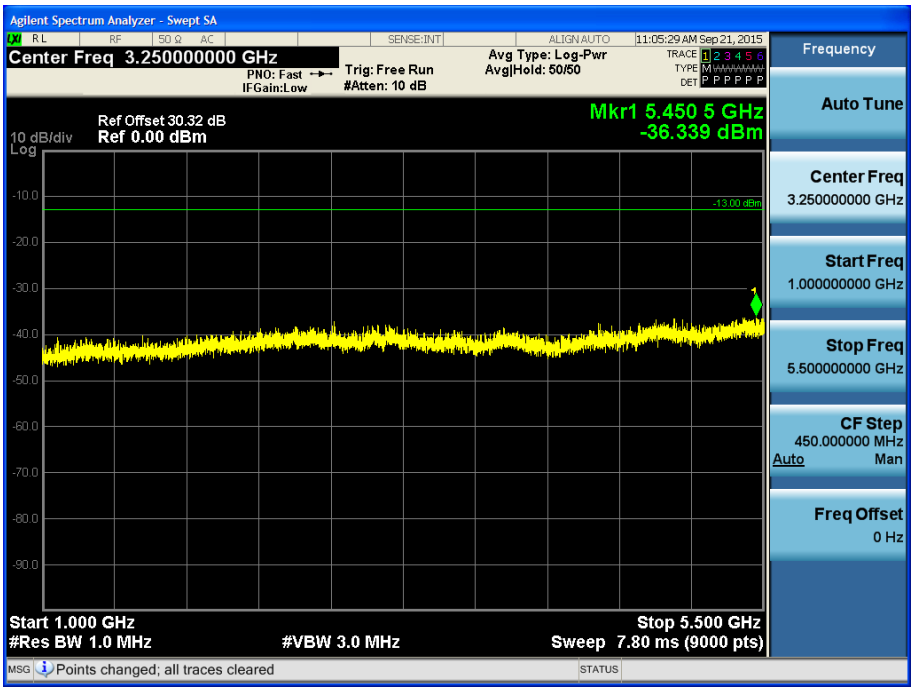
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

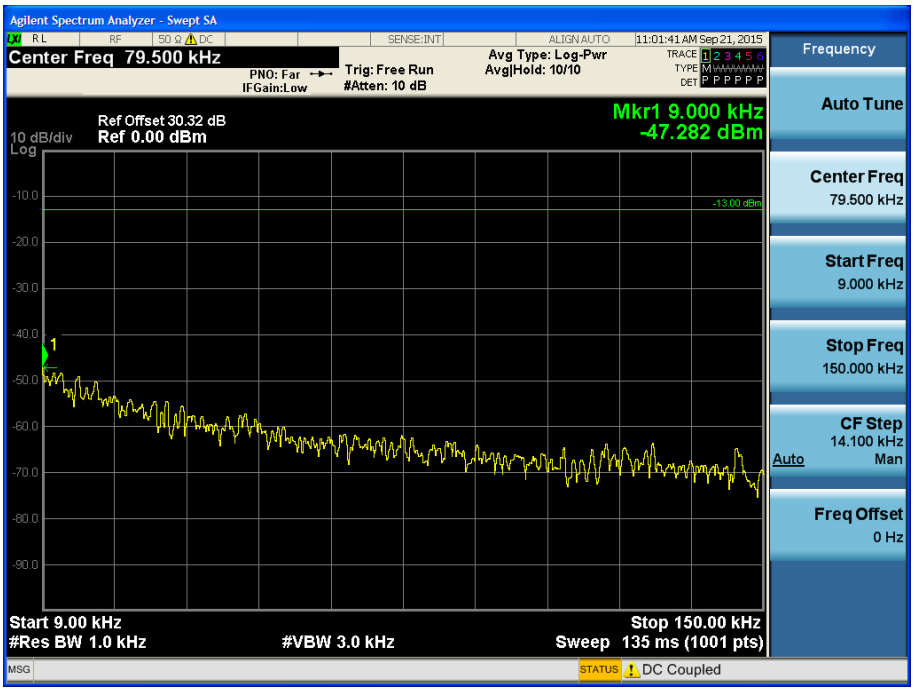


(1 GHz ~ 5.5 GHz)

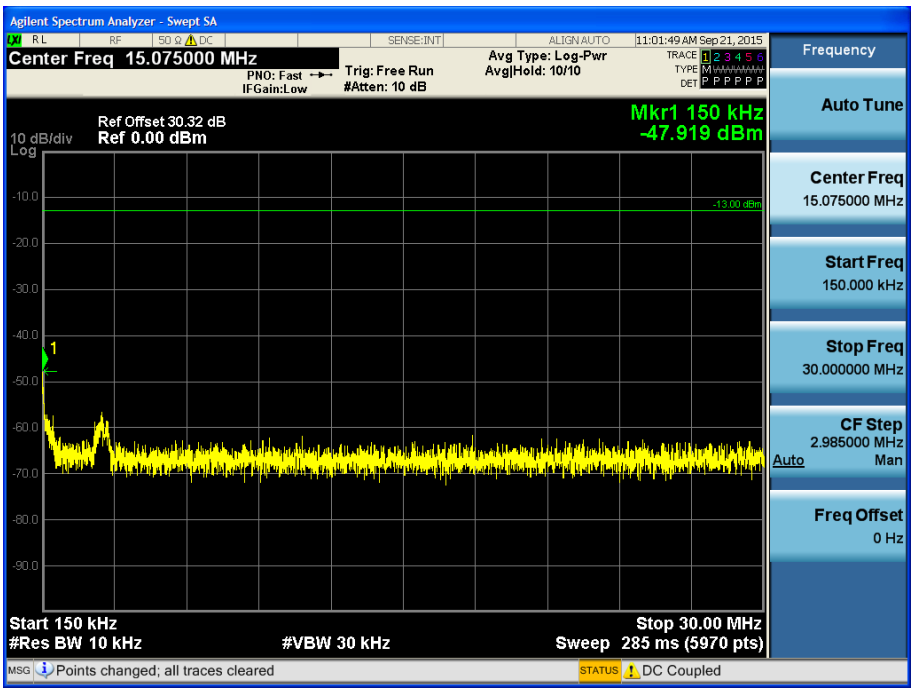


LOW POWER_16K0F3E _138.05 MHz

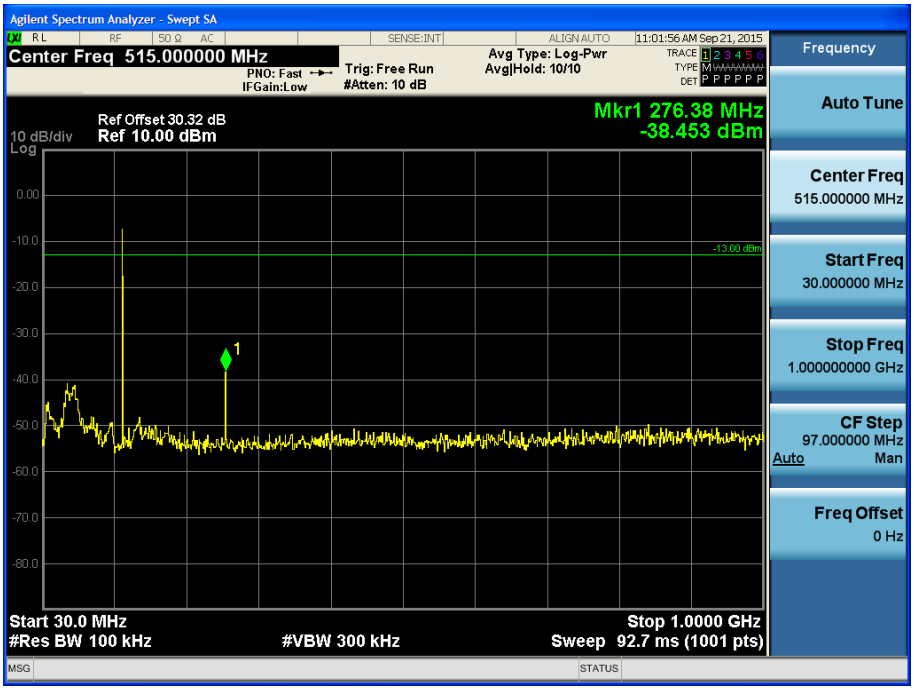
(9 kHz ~ 150 kHz)



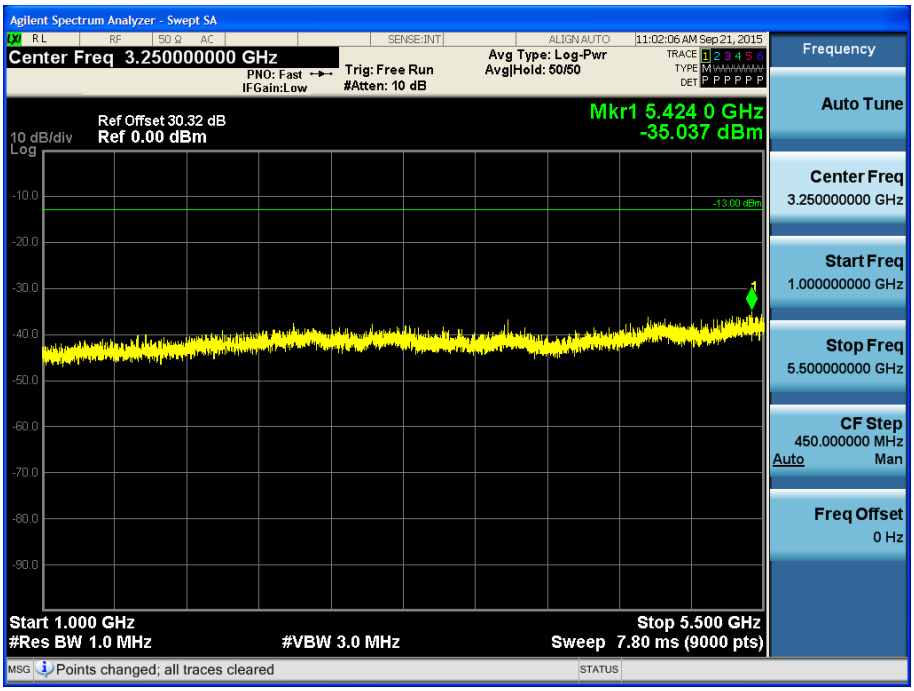
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

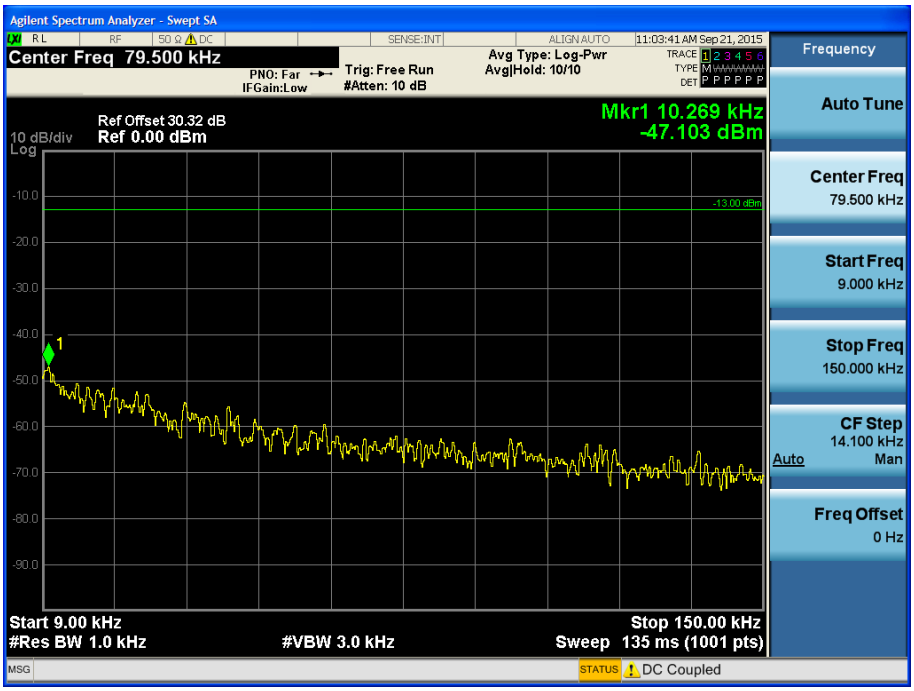


(1 GHz ~ 5.5 GHz)

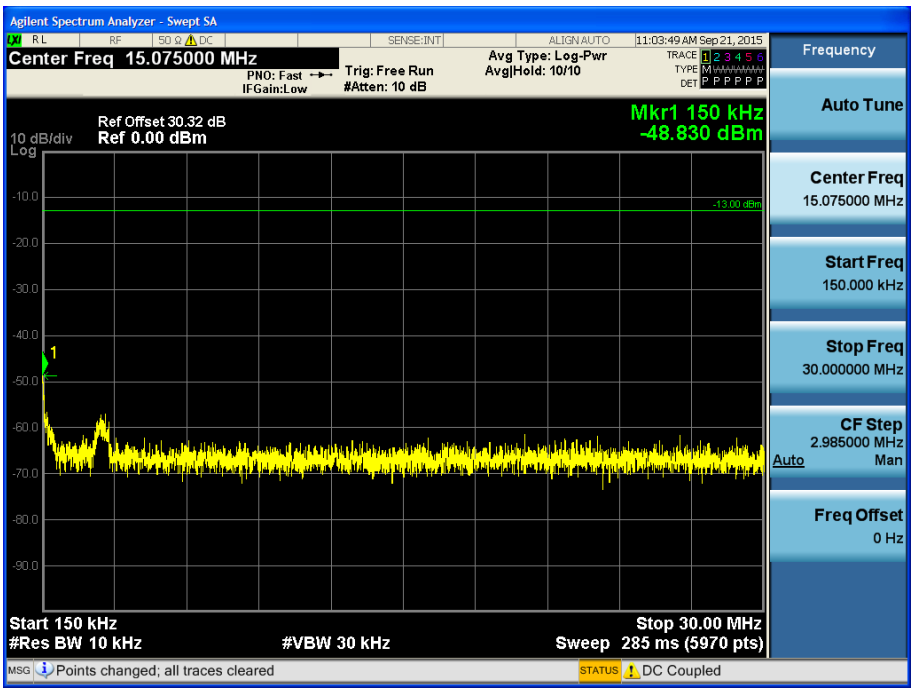


LOW POWER_16K0F3E _162.05 MHz

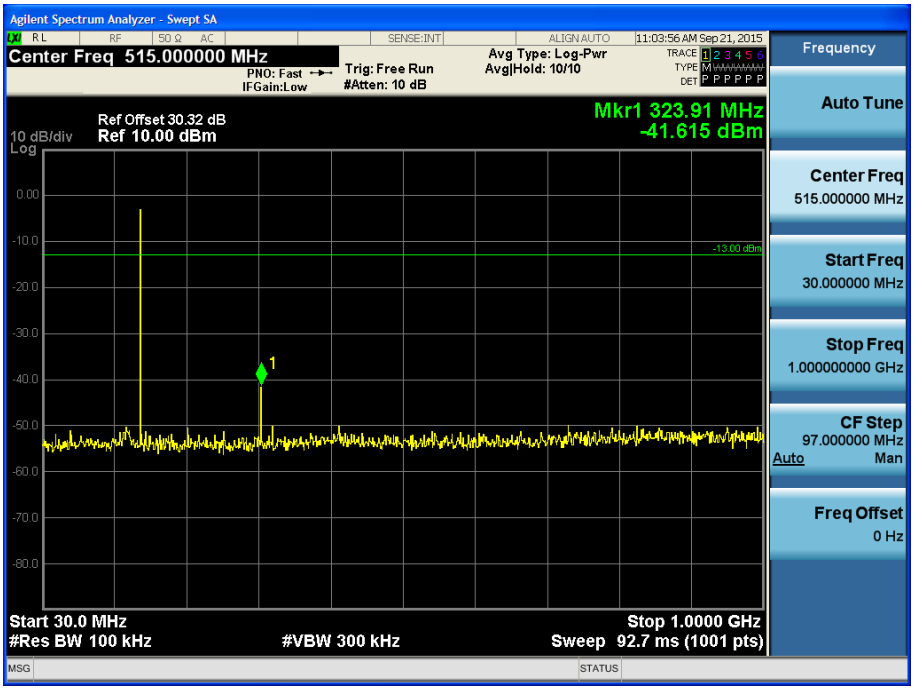
(9 kHz ~ 150 kHz)



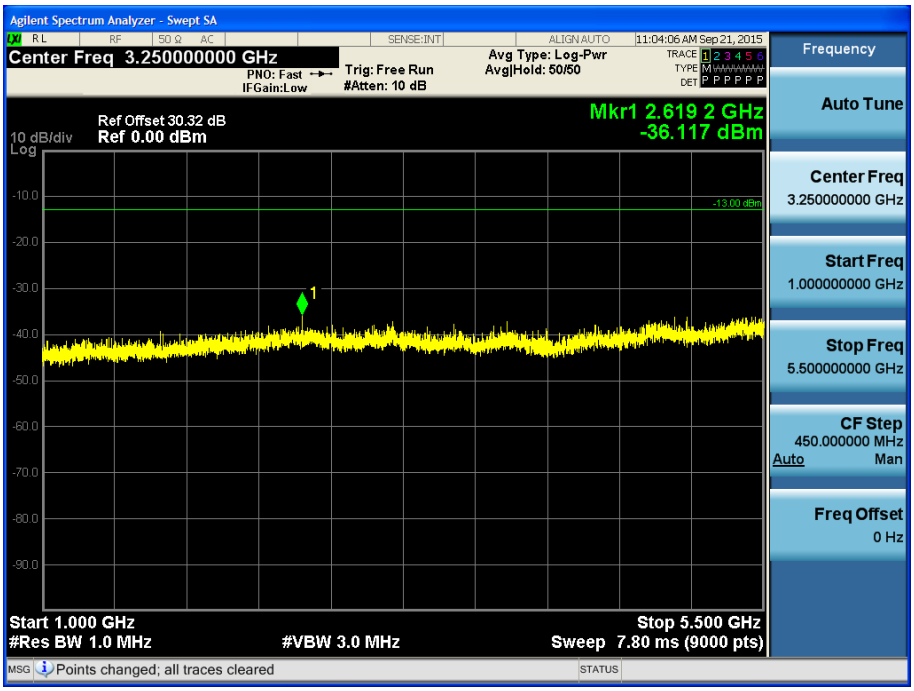
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)

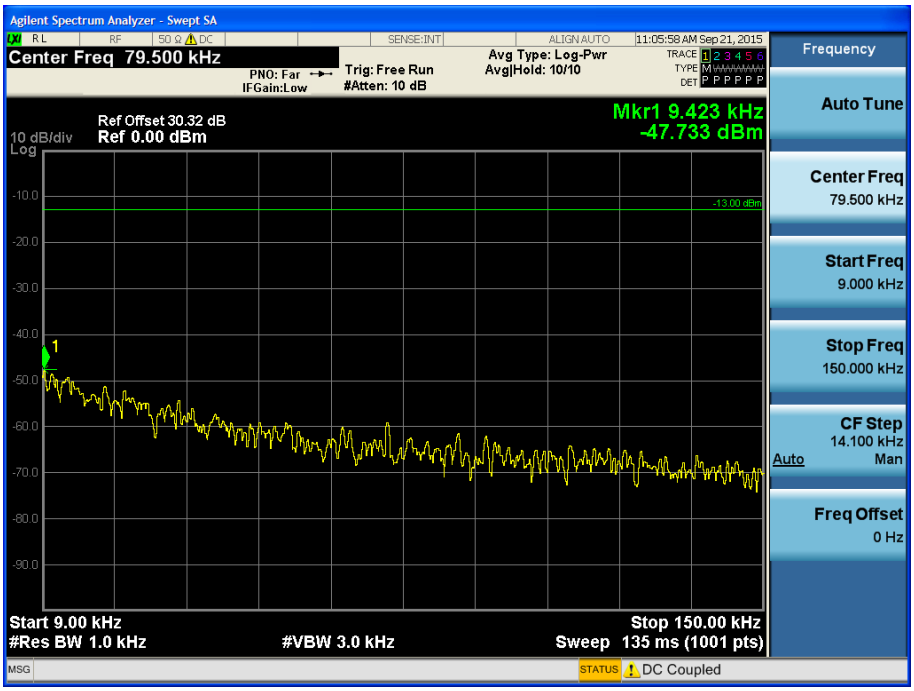


(1 GHz ~ 5.5 GHz)

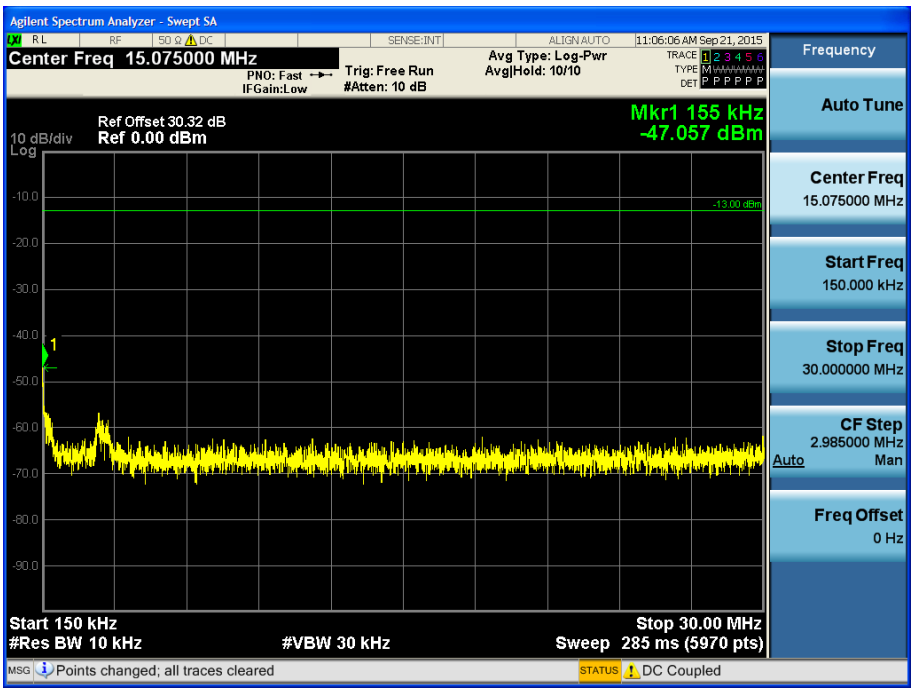


LOW POWER_16K0F3E _173.95 MHz

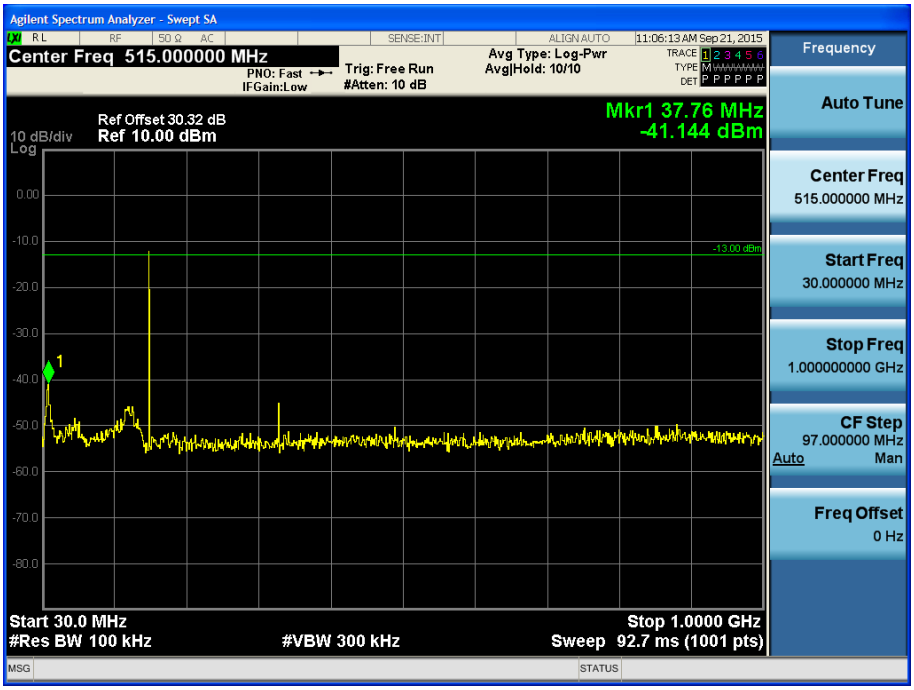
(9 kHz ~ 150 kHz)



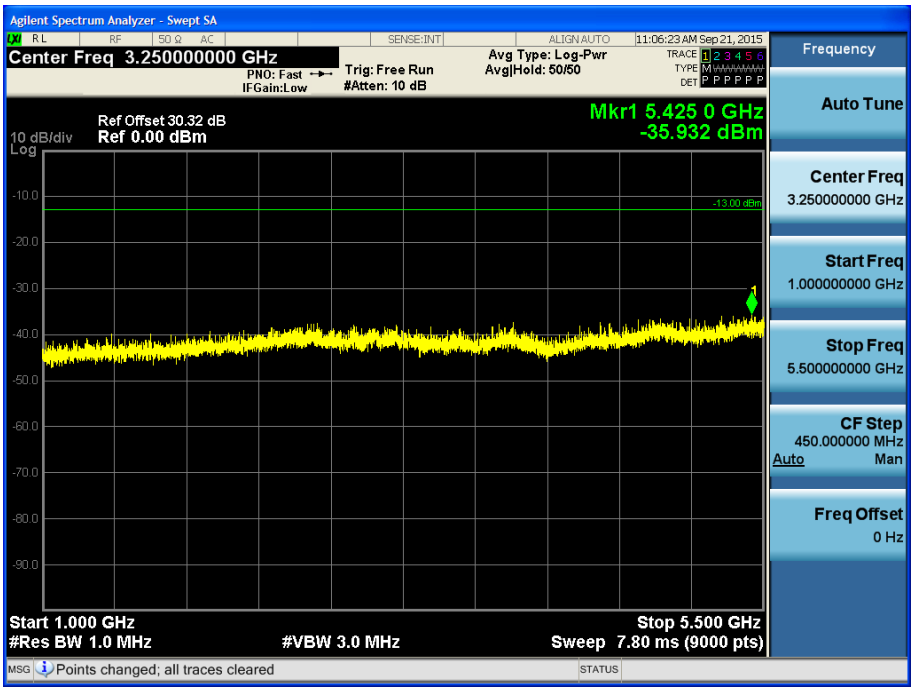
(150 kHz ~ 30 MHz)



(30 MHz ~ 1 GHz)



(1 GHz ~ 5.5 GHz)



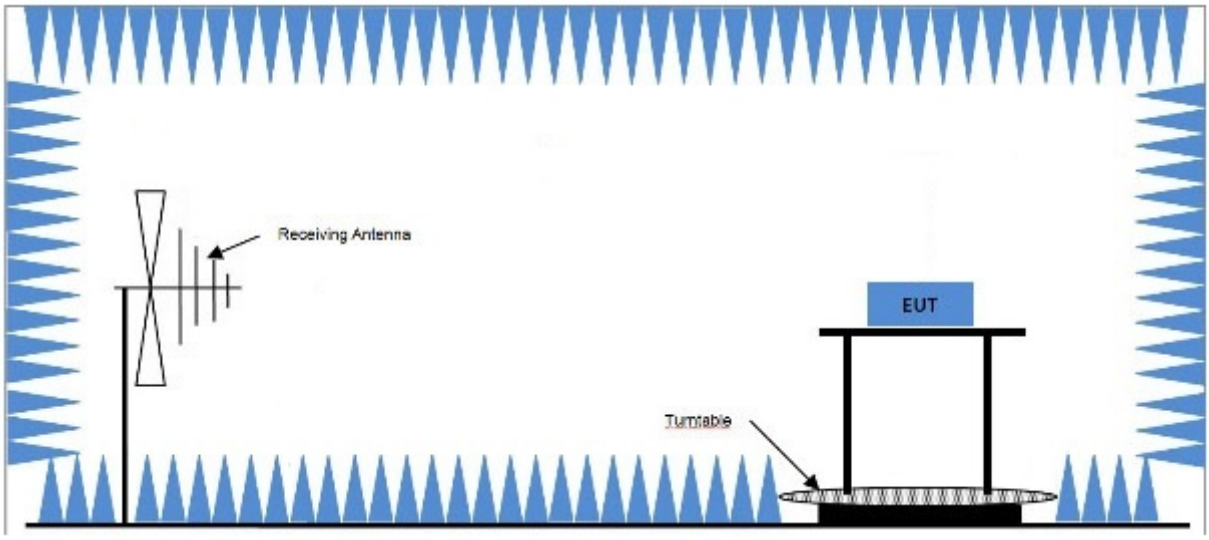
7.9 Unwanted Emissions : Radiated Spurious Emission

▣Definition

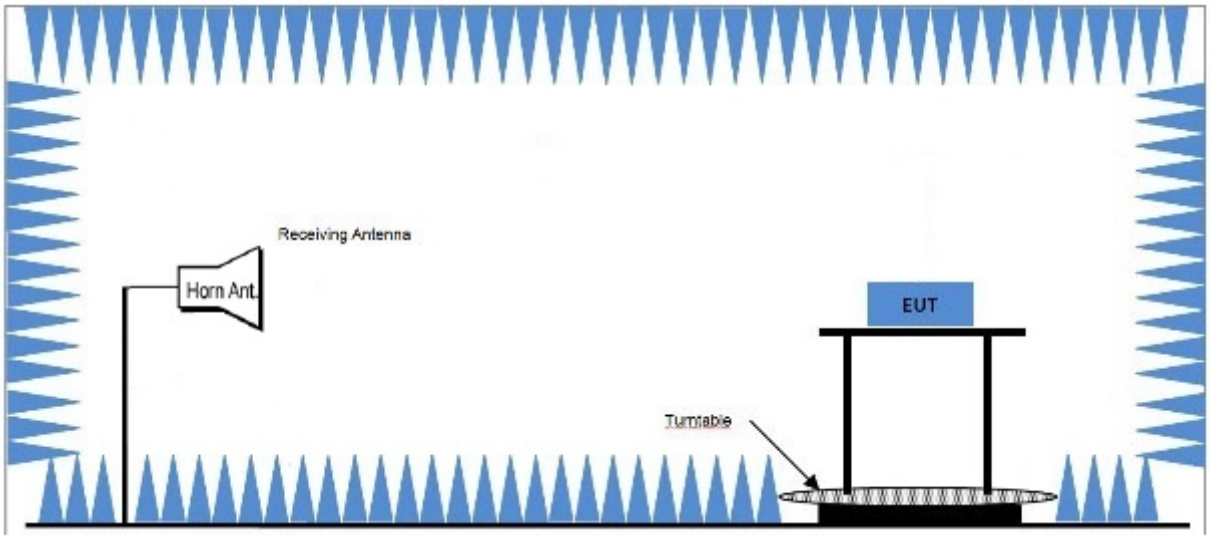
Radiated spurious emissions are emissions from the equipment when transmitting into a non-radiating load on a frequency or frequencies that are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

▣ TEST CONFIGURATION

Below 1 GHz



Above 1 GHz



TEST PROCEDURE USED

According to 2.2.12 in TIA-603-D Standard.

a) Connect the equipment as illustrated.

b) Adjust the spectrum analyzer for the following settings:

1) Resolution Bandwidth = 10 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1GHz.

2) Video Bandwidth = 300 kHz for spurious emissions below 1 GHz, and 3 MHz for spurious emissions above 1 GHz.

3) Sweep Speed slow enough to maintain measurement calibration.

4) Detector Mode = Positive Peak.

c) Place the transmitter to be tested on the turntable in the standard test site, or an FCC listed site compliant with ANSI C63.4-2001 clause 5.4. The transmitter is transmitting into a nonradiating load that is placed on the turntable. The RF cable to this load should be of minimum length. For transmitters with integral antennas, the tests are to be run with the unit operating into the integral antenna.

d) For each spurious measurement the test antenna should be adjusted to the correct length for the frequency involved. This length may be determined from a calibration ruler supplied with the equipment. Measurements shall be made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, except for the region close to the carrier equal to± the test bandwidth (see 1.3.4.4).

e) Key the transmitter.

f) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Then the turntable should be rotated 360°to determine the maximum reading.

Repeat this procedure to obtain the highest possible reading. Record this maximum reading.

g) Repeat step f) for each spurious frequency with the test antenna polarized vertically.

h) Reconnect the equipment as illustrated.

i) Keep the spectrum analyzer adjusted as in step b).

j) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.

k) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

l) Repeat step k) with both antennas vertically polarized for each spurious frequency.

m) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps k) and l) by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an

ideal half-wave dipole antenna by the following formula:

Pd(dBm) = *Pg*(dBm) – *cable loss* (dB) + *antenna gain* (dB)

where:

*Pd*is the dipole equivalent power and

*Pg*is the generator output power into the substitution antenna.

n) The *Pd*levels record in step m) are the absolute levels of radiated spurious emissions in dBm. The radiated spurious emissions in dB can be calculated by the following:

Radiated spurious emissions (dB) =

$10*\log_{10}$(TX power in watts/0.001)- *the levels in step m)*

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▣LIMIT

Frequency Band (MHz)	Channel bandwidth (kHz)	Limit (dBm)
150 – 174(FCC)	25(only IC)	-13
138 – 144 and 148 – 174(IC)	12.5(FCC and IC)	-20

▣Operating Mode

EUT Type	Modulation	Battery	Test frequency (MHz)	Antenna
Stand alone	16K0F3E(Only IC) 11K0F3E(FCC and IC) 7K60FXD, 7K60FXE (FCC and IC)	KNB-45L KNB-69L KNB-29N KNB-53N	138.05(IC)	KRA-41M3
				KRA-22M3
				KRA-26M3
			150.05(FCC)	KRA-41M
				KRA-22M
				KRA-26M
			162.05(FCC and IC)	KRA-41M2
				KRA-22M2
				KRA-26M2
			173.95(FCC and IC)	KRA-41M2
				KRA-22M2
				KRA-26M2

Note

1. It is permissible to use other antennas provided they can be referenced to a dipole.
2. Worst case is red mark.

▣TEST RESULTS

11K0F3E

Frequency [MHz] F1 : 138.05
Battery : KNB-45LAntenna : KRA-26M3

Frequency (MHz)	Reading [dBm]	Factor (dB)	Pol.	Result (dBm)	Limit (dBm)	Margin (dB)
138.05	-0.15	26.082	Y-V	25.93	-	-
276.1	-78.98	22.894	Y-V	-56.09	-20	36.09
414.15	-78.19	25.923	Y-V	-52.27	-20	32.27
552.2	-71.92	28.075	Y-V	-43.85	-20	23.85
690.25	-	30.474	-	-	-20	-
828.3	-	32.511	-	-	-20	-
966.35	-	33.493	-	-	-20	-
1104.4	-52.72	-6.29	Y-V	-59.01	-20	39.01
1242.45	-53.77	-3.736	Y-V	-57.51	-20	37.51
1380.5	-54.20	-4.005	Y-V	-58.20	-20	38.20

*Note :

1. Limit = P_{dBm} – (50+10 log (P_{watt})) = -20 dBm

Frequency [MHz] F2 : 150.05
Battery : KNB-45LAntenna : KRA-26M

Frequency (MHz)	Reading [dBm]	Factor (dB)	Pol.	Result (dBm)	Limit (dBm)	Margin (dB)
150.05	-1.95	26.977	Y-V	25.03	-	-
300.1	-81.60	23.769	Y-V	-57.83	-20	37.83
450.15	-78.36	27.176	X-H	-51.18	-20	31.18
600.2	-71.19	29.291	Y-V	-41.90	-20	21.90
750.25	-85.33	31.644	Y-V	-53.69	-20	33.69
900.3	-	33.017	-	-	-20	-
1050.35	-	-6.082	-	-	-20	-
1200.4	-52.24	-5.277	Y-V	-57.52	-20	37.52
1350.45	-51.58	-4.195	Y-V	-55.77	-20	35.77
1500.5	-	-3.888	-	-	-20	-

*Note :

1. Limit = P_{dBm} – (50+10 log (P_{watt})) = -20 dBm

Frequency [MHz] F3 : 162.05
Battery : KNB-45LAntenna : KRA-26M2

Frequency (MHz)	Reading [dBm]	Factor (dB)	Pol.	Result (dBm)	Limit (dBm)	Margin (dB)
162.05	-1.58	27.124	Y-V	25.54	-	-
324.1	-87.30	24.267	Y-V	-63.03	-20	43.03
486.15	-83.83	27.254	Y-V	-56.58	-20	36.58
648.2	-79.53	30.039	Y-V	-49.49	-20	29.49
810.25	-	32.202	-	-	-20	-
972.3	-	33.629	-	-	-20	-
1134.35	-50.69	-6.219	Y-V	-56.91	-20	36.91
1296.4	-54.27	-3.82	Y-V	-58.09	-20	38.09
1458.45	-55.27	-3.216	X-H	-58.49	-20	38.49
1620.5	-	-4.39	-	-	-20	-

*Note :

1. Limit = P_{dBm} – (50+10 log (P_{watt})) = -20 dBm

Frequency [MHz] F3 : 173.95
Battery : KNB-45LAntenna : KRA-26M2

Frequency (MHz)	Reading [dBm]	Factor (dB)	Pol.	Result (dBm)	Limit (dBm)	Margin (dB)
173.95	8.36	25.376	Y-V	33.74	-	-
347.9	-65.94	24.312	X-H	-41.63	-20	21.63
521.85	-65.52	27.446	X-H	-38.07	-20	18.07
695.8	-85.09	30.52	Y-H	-54.57	-20	34.57
869.75	-84.74	32.072	Y-V	-52.67	-20	32.67
1043.7	-54.48	-6.284	Y-V	-60.76	-20	40.76
1217.65	-49.15	-5.412	Y-V	-54.56	-20	34.56
1391.6	-54.85	-3.264	X-H	-58.11	-20	38.11
1565.55	-52.03	-4.323	X-H	-56.35	-20	36.35
1739.5	-	-4.538	-	-	-20	-

*Note :

1. Limit = P_{dBm} – (50+10 log (P_{watt})) = -20 dBm

7.10 Unwanted Emissions :Receiver Radiated Spurious Emission

IC Rule(s)	**RSS-GEN**
Test Requirements:	**Blow the table**
Operating conditions:	**Under normal test conditions**
Method of testing:	**Radiated**
S/A. Settings:	**F < 1 GHz: RBW: 120 kHz, VBW: 300 kHz (Quasi Peak)** **F > 1 GHz: RBW: 1 MHz, VBW: 1 MHz (Peak)**
Mode of operation:	**Receive**

Frequency (MHz)	Field Strength (microvolts/m at 3 meters)
30 – 88	100
88 - 216	150
216 – 960	200
Above 960	500

Operation Mode: Receive:

30 MHz ~ 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶	dB /m	dB	(H/V)	dB㎶/m	dB㎶/m	dB
No Critical peaks found							

Above 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶	dB /m	dB	(H/V)	dB㎶/m	dB㎶/m	dB
No Critical peaks found							

7.11 Necessary Bandwidth Calculations

Modulation = 16K0F3E	
Maximum Modulation (M), kHz	3
Maximum Deviation (D), kHz	5
Constant Factor (K)	1
Necessary Bandwidth (BN), kHz	(2xM)+(2xDxK)
Necessary Bandwidth (BN), kHz	16.0

Modulation = 11K0F3E	
Maximum Modulation (M), kHz	3
Maximum Deviation (D), kHz	2.5
Constant Factor (K)	1
Necessary Bandwidth (BN), kHz	(2xM)+(2xDxK)
Necessary Bandwidth (BN), kHz	11.0

Modulation = 7K60FXD/7K60FXE	
Digital information rate (R), bps	9600
Maximum Deviation (D), kHz	3.391
Signaling States (S)	4
Constant Factor (K)	0.516
Necessary Bandwidth (BN), kHz	$(R/\log_2 S)+2DK$
Necessary Bandwidth (BN), kHz	7.60

8. LIST OF TEST EQUIPMENT

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Calibration Due	Serial No.
Agilent	N9020A/ SIGNAL ANALYZER	06/30/2015	Annual	06/30/2016	MY51110085
Agilent	N1911A/Power Meter	07/09/2015	Annual	07/09/2016	MY45100523
Agilent	N1921A /POWER SENSOR	07/09/2015	Annual	07/09/2016	MY45241059
Hewlett Packard	8903B/Audio Analyzer	12/16/2014	Annual	12/16/2015	3413A13913
Hewlett Packard	8901B/Modulation Analyzer	04/21/2015	Annual	04/21/2016	2406A00169
Tektronix	RSA3303B/Real Time Spectrum Analyzer	09/21/2015	Annual	09/21/2016	B010208
Agilent	8498A/30 dB Attenuator	11/04/2014	Annual	11/04/2015	51162
EAGLE	220NFNM/Tuneable Notch Filter	10/31/2014	Annual	10/31/2015	H00564-7
EAGLE	220NFNM/Tuneable Notch Filter	10/29/2014	Annual	10/29/2015	H00564-8
EAGLE	230NFNM/Tuneable Notch Filter	10/29/2014	Annual	10/29/2015	H00564-9
Korea Engineering	KR-1005L / Temperature Chamber	11/12/2014	Annual	11/12/2015	KRAC05063-3CH
CERNEX	AMPLIFIER_CBLU1183540B	05/21/2015	Annual	05/21/2016	25540
Wainwright	WHKX1.0/15G-12SS	08/12/2015	Annual	08/12/2016	42
Schwarzbeck	UHAP/ Dipole Antenna	03/23/2015	Biennial	03/23/2017	557
Schwarzbeck	UHAP/ Dipole Antenna	03/23/2015	Biennial	03/23/2017	558
Schwarzbeck	BBHA 9120D/ Horn Antenna	09/01/2014	Biennial	09/01/2016	147
Schwarzbeck	BBHA 9120D/ Horn Antenna	05/15/2015	Biennial	05/15/2017	1299
ROHDE&SCHWARZ	FSV40-N/Spectrum Analyzer	09/23/2015	Annual	09/23/2016	101068-SZ
Inn-co GmbH	CT 0800/Turn table	N/A	N/A	N/A	AS2000P/034/9740 305
Inn-co GmbH	DE 3260/Ant. Mast	N/A	N/A	N/A	DE3260/005/7860504/L
Schwarzbeck	VULB 9160/ TRILOG Antenna	10/10/2014	Biennial	10/10/2016	3368