FCC TEST DATA

4.0 Temperature VS Frequency Stability Tests

This test was performed to generate the data to demonstrate the frequency stability of the coaxial magnetron over the range of -40 to +50 degrees Celsius.

DESCRIPTION OF TEST PROCEDURE

For this test, the transmitter is set up in the temperature chamber and ready to be turned on. At that time, the power is totally removed and the chamber temperature is lowered to -40C. A temperature probe is attached to the body of the magnetron to determine the temperature. After the magnetron temperature stabilizes at ambient, primary power is applied and the filaments are warmed for 5 minutes. The system is then placed into radiate remotely from outside the chamber and frequency is recorded immediately. The frequency is then recorded in increments shown in the following charts. A block diagram (Fig. 5) shows the test setup used.

COAXIAL MAGNETRON FREQUENCY VS TEMPERATURE TEST MEASUREMENTS (-40C)

TIME IN MINUTES	TEMPERATURE OF MAGNETRON	TEMPERATURE OF TEST CHAMBER	FREQUENCY
0	-40	-40	2880.250
1		-40	2880.380
2		-40	2880.410
3		-40	2880.330
4		-40	2880.360
5		-40	2880.290
6		-40	2880.310
7		-40	2880.300
8		-40	2880.280
9		-40	2880.260
10		-40	2880.180
15		-40	2880.200
20		-40	2880.240
25		-40	2880.220
30	-27	-40	2880.230

COAXIAL MAGNETRON FREQUENCY VS TEMPERATURE TEST MEASUREMENTS (-30C)			
TIME IN MINUTES	TEMPERATURE OF MAGNETRON	TEMPERATURE OF TEST CHAMBER	FREQUENCY
0	-25 C	-30	2880.140
1		-30	2879.960
2		-30	2879.930
3		-30	2879.950
4		-30	2879.850
5		-30	2879.940
6		-30	2879.780
7		-30	2879.950
8		-30	2879.790
9		-30	2879.840
10		-30	2879.790
15		-30	2879.710
20		-30	2879.740
25		-30	2879.740
30	-17	-30	2879.730

COAXIAL MAGNETRON FREQUENCY VS TEMPERATURE TEST MEASUREMENTS (-20C)			
TIME IN MINUTES	TEMPERATURE OF MAGNETRON	TEMPERATURE OF TEST CHAMBER	FREQUENCY
0	-16C	-20	2880.340
1		-20	2880.170
2		-20	2880.090
3		-20	2879.980
4		-20	2879.900
5		-20	2879.880
6		-20	2879.760
7		-20	2879.780
8		-20	2879.750
9		-20	2879.660
10		-20	2879.680
15		-20	2879.520
20		-20	2879.400
25		-20	2879.410
30		-20	2879.370
35	-9	-20	2879.330

COAXIAL MAGNETRON FREQUENCY VS TEMPERATURE TEST MEASUREMENTS (-10C)

TIME IN MINUTES	TEMPERATURE OF MAGNETRON	TEMPERATURE OF TEST CHAMBER	FREQUENCY
0	-7 C	-10	2879.690
1		-10	2879.630
2		-10	2879.610
3		-10	2879.570
4		-10	2879.550
5		-10	2879.500
6		-10	2879.500
7		-10	2879.490
8		-10	2879.480
9		-10	2879.460
10		-10	2879.460
15		-10	2879.400
20		-10	2879.390
25		-10	2879.340
30	0 C	-10	2879.340

COAXIAL MAGNETRON FREQUENCY VS TEMPERATURE TEST MEASUREMENTS (0C)

TIME IN MINUTES	TEMPERATURE OF MAGNETRON	TEMPERATURE OF TEST CHAMBER	FREQUENCY
0	1 C	0	2878.900
1		0	2879.030
2		0	2878.980
3		0	2878.980
4		0	2878.960
5		0	2878.930
6		0	2878.920
7		0	2878.920
8		0	2878.870
9		0	2878.870
10		0	2878.860
15		0	2878.850
20		0	2878.820
25		0	2878.810
30	9 C	0	2878.770

COAXIAL MAGNETRON FREQUENCY VS TEMPERATURE TEST MEASUREMENTS (10C)

TIME IN MINUTES	TEMPERATURE OF MAGNETRON	TEMPERATURE OF TEST CHAMBER	FREQUENCY
0	11 C	10	2878.250
1		10	2878.180
2		10	2878.140
3		10	2878.110
4		10	2878.100
5		10	2878.100
6		10	2878.070
7		10	2878.060
8		10	2878.030
9		10	2878.040
10		10	2878.020
15		10	2877.990
20		10	2877.980
25		10	2877.960
30	17 C	10	2877.950

COAXIAL MAGNETRON FREQUENCY VS TEMPERATURE TEST MEASUREMENTS (20C)

TIME IN MINUTES	TEMPERATURE OF MAGNETRON	TEMPERATURE OF TEST CHAMBER	FREQUENCY
0	20 C	20	2877.850
1		20	2877.770
2		20	2877.740
3		20	2877.700
4		20	2877.680
5		20	2877.650
6		20	2877.630
7		20	2877.620
8		20	2877.600
9		20	2877.560
10		20	2877.570
15		20	2877.510
20		20	2877.480
25		20	2877.480
30	27 C	20	2877.450

COAXIAL MAGNETRON FREQUENCY VS TEMPERATURE TEST MEASUREMENTS (30C)

TIME IN MINUTES	TEMPERATURE OF MAGNETRON	TEMPERATURE OF TEST CHAMBER	FREQUENCY
0	30C	30	2877.450
1		30	2877.240
2		30	2877.230
3		30	2877.180
4		30	2877.170
5		30	2877.150
6		30	2877.120
7		30	2877.110
8		30	2877.100
9		30	2877.080
10		30	2877.060
15		30	2877.000
20		30	2876.980
25		30	2876.970
30	37 C	30	2876.950

COAXIAL MAGNETRON FREQUENCY VS TEMPERATURE TEST MEASUREMENTS (40C)

TIME IN MINUTES	TEMPERATURE OF MAGNETRON	TEMPERATURE OF TEST CHAMBER	FREQUENCY
0	40 C	40	2877.060
1		40	2877.010
2		40	2876.960
3		40	2876.930
4		40	2876.920
5		40	2876.890
6		40	2876.870
7		40	2876.850
8		40	2876.840
9		40	2876.820
10		40	2876.820
15		40	2876.760
20		40	2876.720
25		40	2876.690
30	46 C	40	2876.700

COAXIAL MAGNETRON FREQUENCY VS TEMPERATURE TEST MEASUREMENTS (50C)			
TIME IN MINUTES	**TEMPERATURE OF MAGNETRON**	**TEMPERATURE OF TEST CHAMBER**	**FREQUENCY**
0	50 C	50	2876.280
1		50	2876.250
2		50	2876.210
3		50	2876.180
4		50	2876.170
5		50	2876.140
6		50	2876.110
7		50	2876.110
8		50	2876.080
9		50	2876.070
10		50	2876.080
15		50	2876.000
20		50	2875.970
25		50	2875.960
30	56 C	50	2875.960

Fig. 4

The "Frequency Stability vs. Temperature Test" was run at the operating frequency for this particular VHDD-550S transmitter. The frequency remained stable over the complete temperature range.

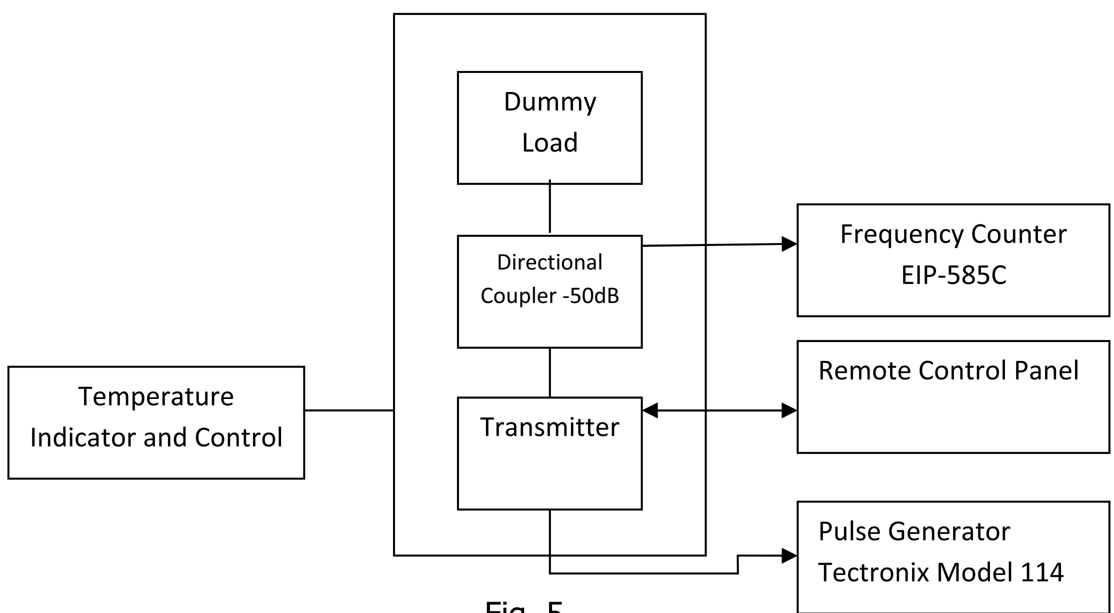


Fig. 5

5.0 Transmitter Stability with Line Voltage Fluctuations

The transmitter Line Voltage Fluctuation test was not performed due to the Uninterruptable Power Supply and Voltage Regulator installed with the transmitter. This UPS/VR is designed to regulate the voltage to within +-5 volts of the transmitter operating voltage. If the system drifts out of tolerance due to a failure of UPS components or increasing / decreasing line voltage, the UPS power output will shut off, effectively removing power from the VHDD-550S transmitter.

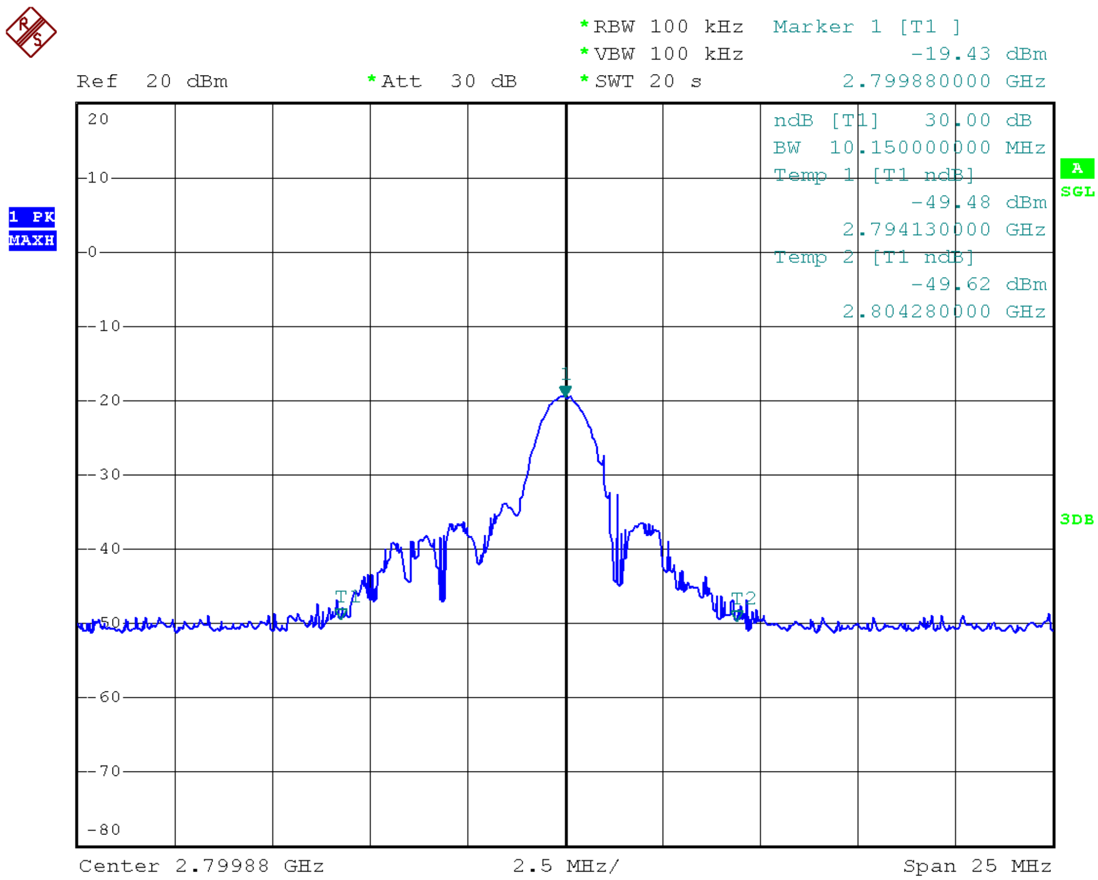
6.0 Spectrum Analysis

The following tests were performed to record the signature of the transmitted spectrum of the VHDD-550S radar system. The plots of the spectrum analyzer are shown on the following pages and sequentially numbered in the bottom left hand corner of each plot. The plots and results of the measurements are listed as follows:

VHDD-550S EMISSION MEASUREMENTS		
Plot Number	Test	Comments
1	Emitted Spectrum, Narrow Pulse (.8us) 2800MHz **NOTE: Used for maximum spectrum occupancy**	.8μs Pulse, Spectrum width 10.15MHz, -30dBm down points at 2.7941GHz and 2.8042GHz
2	Emitted Spectrum, Narrow Pulse (.8us) 2800MHz	.8μs pulse, 12MHz span
3	Emitted Spectrum, Wide Pulse (2.0us), 2800MHz	2.0μs pulse, Spectrum width 3.340MHz
4	Emitted Spectrum, Wide Pulse (2.0us), 2800MHz	2.0μs pulse, spectrum width 3.850MHz, -30dBm down points at 2.7975GHz and 2.8014GHz
5	Emitted Spectrum, Wide Pulse (2.0us), 2800MHz	2.0μs pulse, Emission bandwidth at -30dB = 3.36MHz
6	Emitted Spectrum, Wide Pulse (2.0us), 2800MHz	2.0μs pulse, Emission bandwidth at -40dB = 10.6MHz
7	Spurious Emissions Test	Plot 20MHz to 5GHz, -15.24dBm (Main Transmit Pulse at 2800MHz)
8	Spurious Emissions Test	Plot 5GHz to 10GHz, -72.46dBm
9	Spurious Emissions Test	Plot 10GHz to 15Ghz, -68.37
10	Spurious Emissions Test	Plot 15GHz to 20Ghz, -69.18dBm
11	Spurious Emissions Test	Plot 20GHz to 25GHz, -67.20dBm
12	Spurious Emissions Test	Plot 25Ghz to 30Ghz, -65.17dBm
13	RF Leakage, 1m from chassis using double ridge horn, Reference plot, Transmitter Radiation OFF	Reference Plot of 2.5GHz to 5GHz, TX OFF
14	RF Leakage, 1m from chassis using double ridge horn, Transmitter Radiation ON	Plot 0Hz to 5GHz, -61.11dBm signal
15	RF Leakage, 1m from chassis using double ridge horn, Transmitter Radiation	Plot 5GHz to 10GHz, -72.21dBm signal

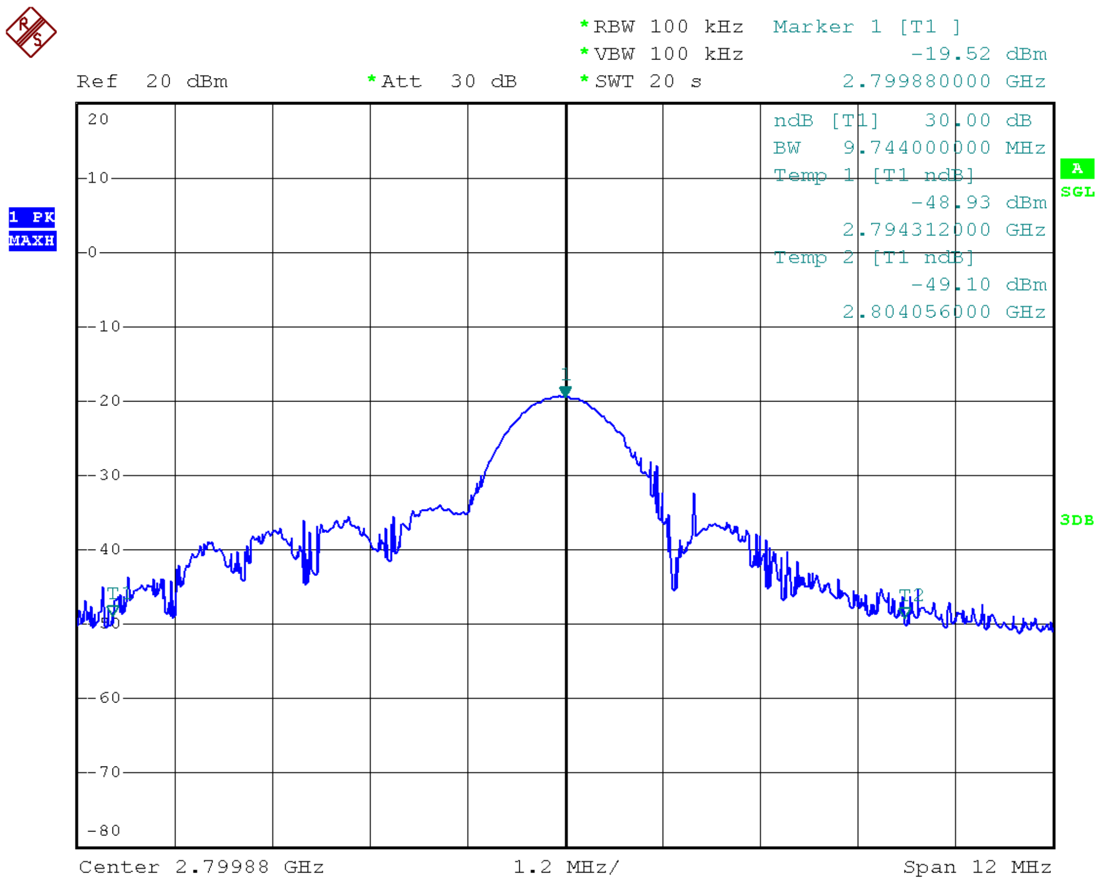
	ON	
16	RF Leakage, 1m from chassis using double ridge horn, Transmitter Radiation ON	Plot 10GHz to 15GHz, -69.25dBm signal
17	RF Leakage, 1m from chassis using double ridge horn, Transmitter Radiation ON	Plot 15GHz to 20GHz, -68.92dBm signal
18	Detected RF Pulse	2.0μs Detected RF Pulse
19	Detected RF Pulse	1.0μs Detected RF Pulse
20	Detected RF Pulse	.8μs Detected RF Pulse,
21	RF Peak Power Measurement	2.0us RF Pulse, 80.4dBm attenuation correction
22	RF Peak Power Measurement	1.0μsRF Pulse, 80.4dBm attenuation correction
23	RF Peak Power Measurement	.8μs RF Pulse, 80.4dBm attenuation correction
24	RF Peak Power Measurement	.4μs RF Pulse, 80.4dBm attenuation correction
25	Antenna Specification Table	Table containing Antenna specifications

Fig. 6

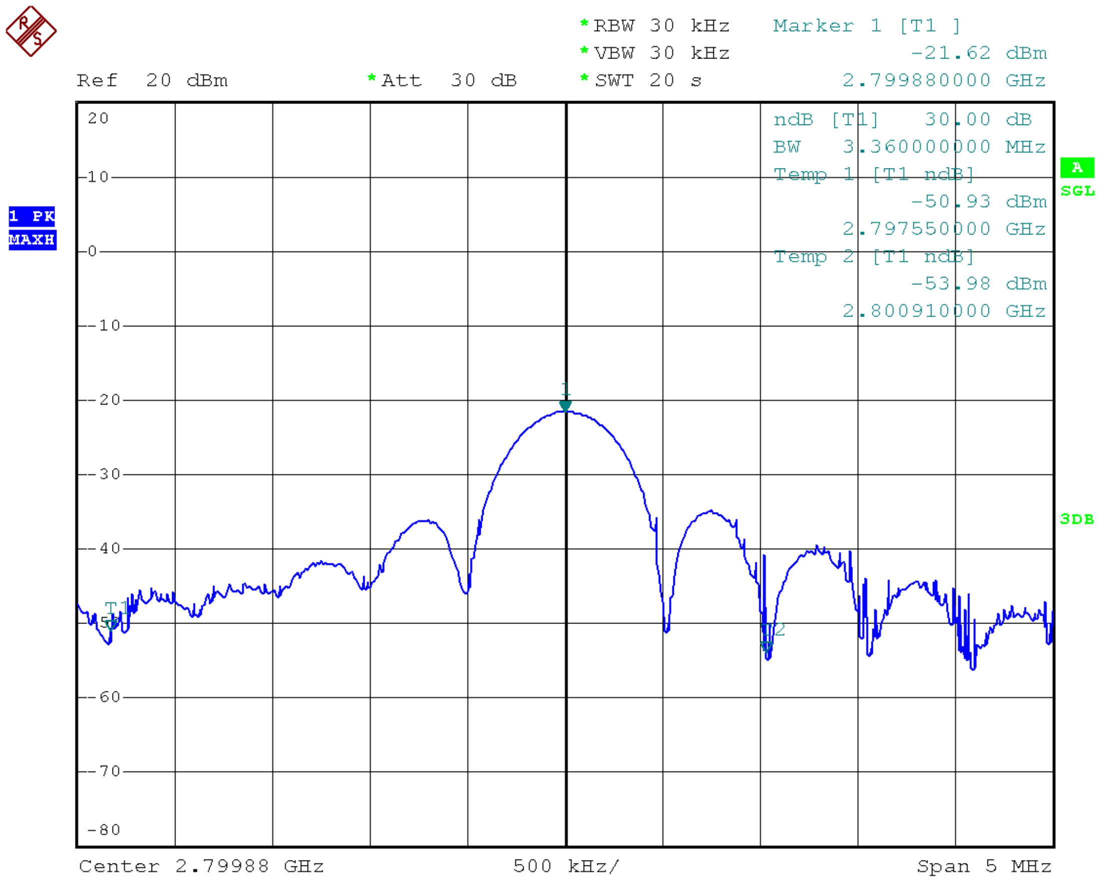


Plot #1: .8us pulse, spectrum width of 10.15MHz at 30dBm down

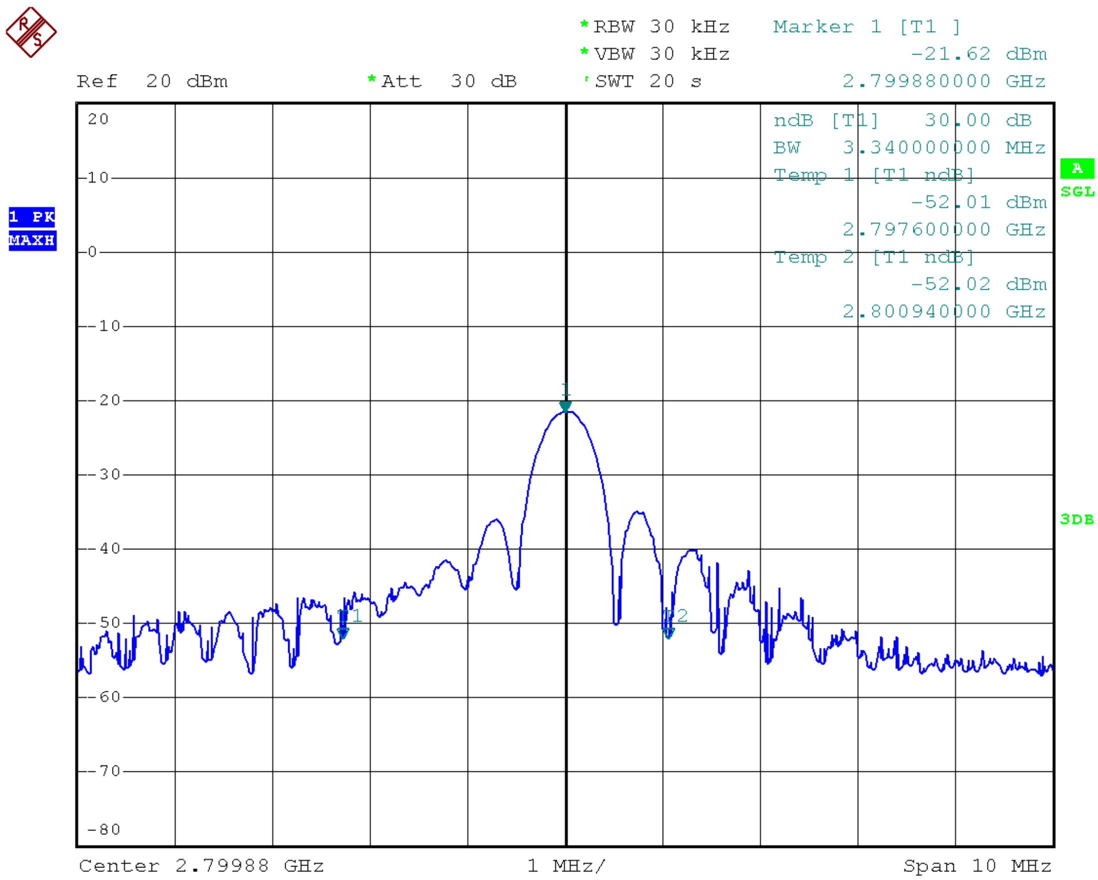
Used for calculating Maximum Spectrum Occupancy



Plot #2: .8μs pulse, 12MHz span



Plot #3: 2.0µs pulse, Spectrum width 3.360MHz



Plot #4: 2.0μs pulse, spectrum width 3.850MHz