Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) RF Exposure

RF Exposure Requirements: **§1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit Calculation: EUT's operating frequencies @ 5240-5320, 5500-5700 MHz; highest conducted power = 19.78*dBm* (avg) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

Gain of Omni Antenna @ 5GHz = 10 dBi

Equation from page 18 of OET 65, Edition 97-01

$S = PG / 4\pi R^2$ or $R = \sqrt{PG / 4\pi S}$

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (95.11 mW)
G = Numeric Antenna Gain (10)
R = Radius (20 cm)

$S = (95.11 * 10)/(4*3.14*20^2) = 0.189$ mW/cm^2
Gain of Sector Antenna @ 5GHz = 15.5 dBi
Number of summing antenna elements =2
Array Gain of Sector Antenna = 15.5+10log(2) = 18.51 dBi
Highest Conducted Power with Sector Antenna = 12.16 dBm

S = Power Density (mW/cm^2)
P = Power Input to antenna (16.44 mW)
G = Antenna Gain(70.96)
R = Radius (20 cm)

$S = (16.44 * 70.96)/(4 * 3.14 * 20^2) = 0.232$ mW/cm^2

Co-location Analysis
Worst Case Power Density for M25 radio = 0.241 mW/cm^2
Worst Case Power Density for M5 radio = 0.232 mW/cm^2
Co-located Power Density = 0.473 mW/cm^2
Since S<1mW/cm^2 for the worst case, the EUT is compliant with RF exposure limits at a distance of 20cm.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(g) Frequency Stability

Test Requirements: **§ 15.407(g):** Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

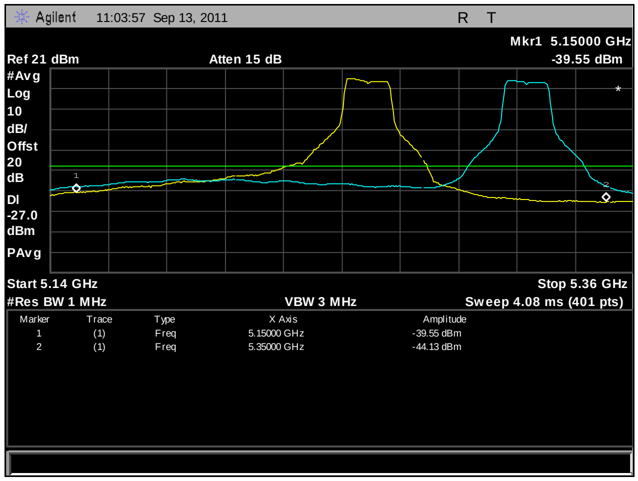
Test Procedure: The EUT was placed in a temperature chamber and connected directly to a spectrum analyzer through an attenuator. The resolution bandwidth was set to 1 MHz with an average detector and the span was set to encompass the complete frequency band. The transmitter was set to transmit on the low and high channels. Markers were used to measure the channels to ensure that the entire emission was contained within the frequency band. The temperature was varied between the minimum and maximum temperature (-20°C and +55°C) at increments of 10°C and the measurements were repeated. At ambient temperature (+20°C), the input voltage was varied between +/- 10% of the nominal input voltage and the measurements were repeated. Measurements were repeated for each frequency band.

Test Results: The EUT was found compliant with the requirements of §15.407(g).

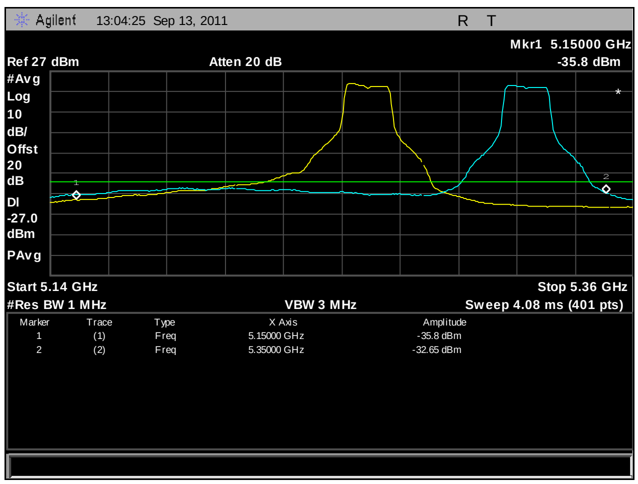
Test Engineer(s): Jeff Pratt

Test Date(s): 09/16/11

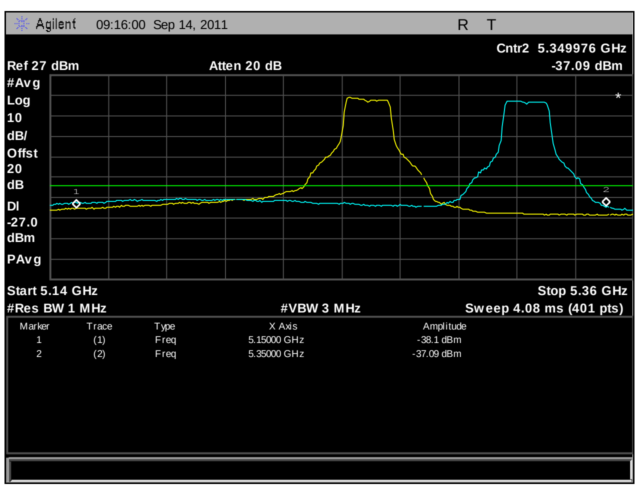
Frequency Stability, 802.11a



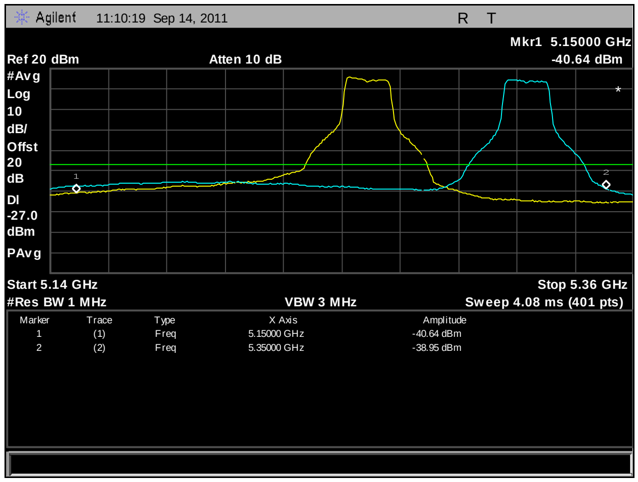
Plot 349. Frequency Stability, 802.11a, 5250 MHz – 5350 MHz @ -20°C, 120 V



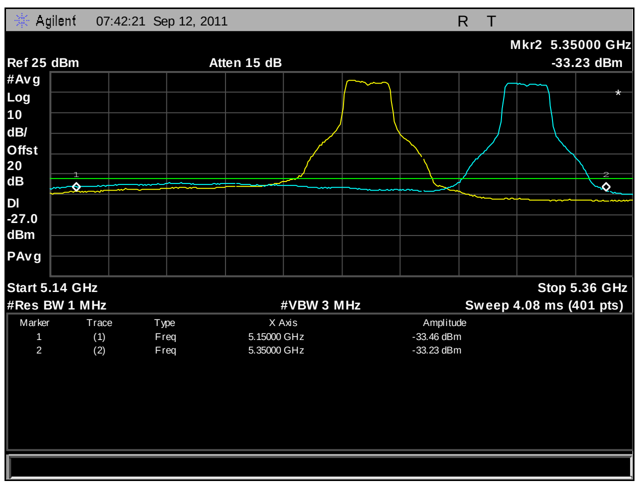
Plot 350. Frequency Stability, 802.11a, 5250 MHz – 5350 MHz @ -10°C, 120 V



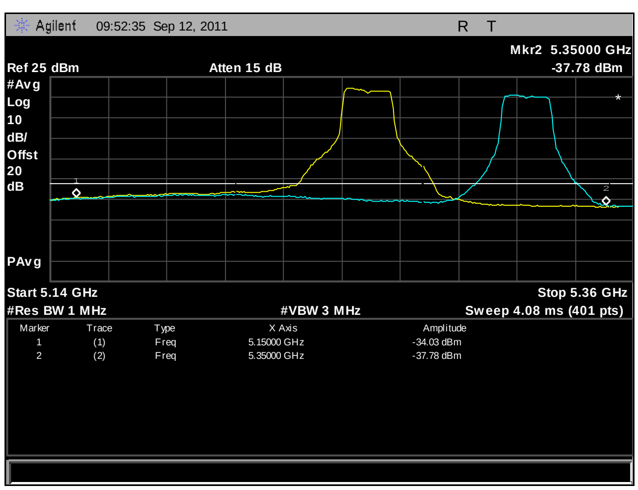
Plot 351. Frequency Stability, 802.11a, 5250 MHz – 5350 MHz @ 0°C, 120 V



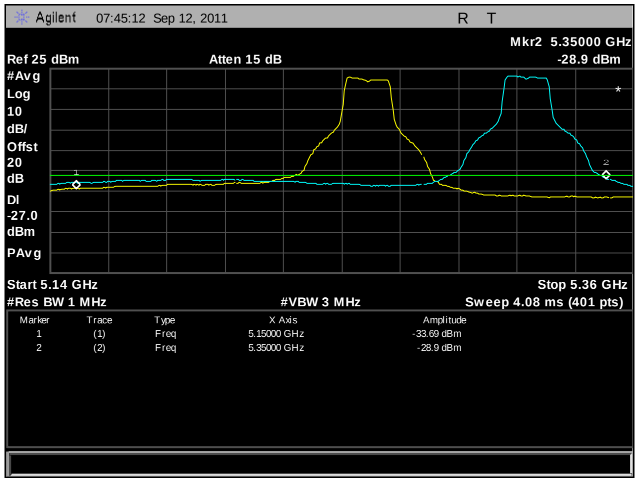
Plot 352. Frequency Stability, 802.11a, 5250 MHz – 5350 MHz @ 10°C, 120 V



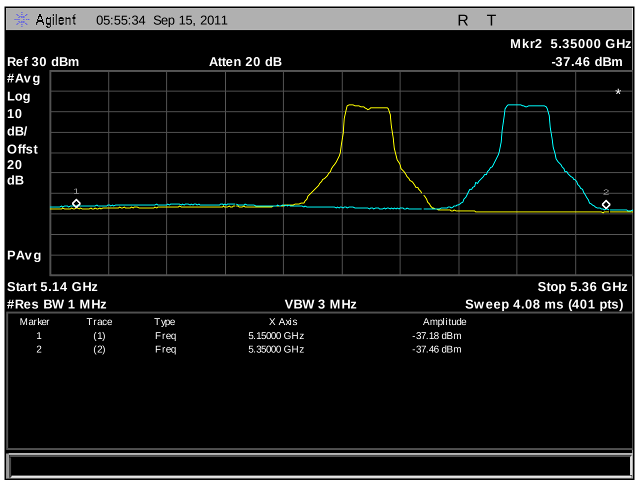
Plot 353. Frequency Stability, 802.11a, 5250 MHz – 5350 MHz @ 20°C, 108 V



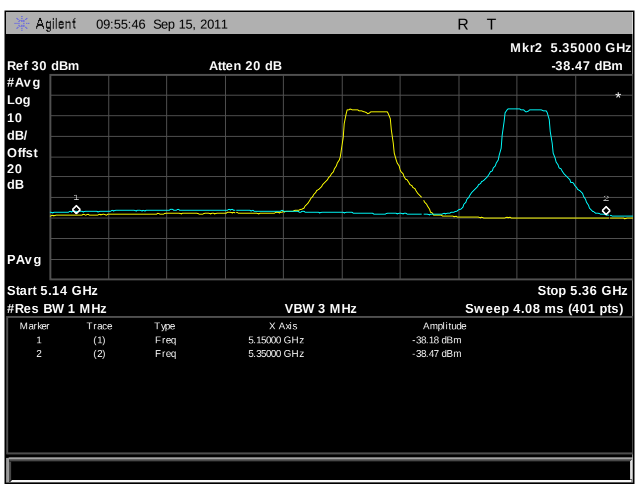
Plot 354. Frequency Stability, 802.11a, 5250 MHz – 5350 MHz @ 20°C, 120 V



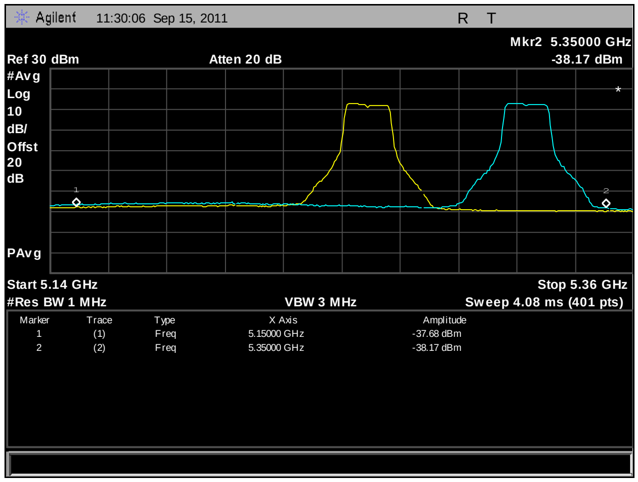
Plot 355. Frequency Stability, 802.11a, 5250 MHz – 5350 MHz @ 20°C, 132 V



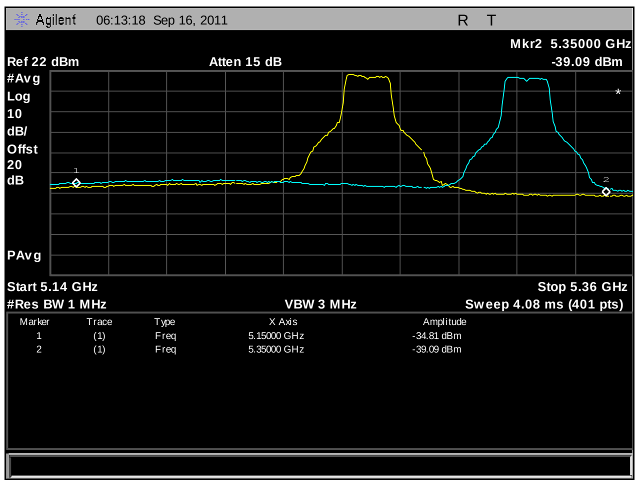
Plot 356. Frequency Stability, 802.11a, 5250 MHz – 5350 MHz @ 30°C, 120 V



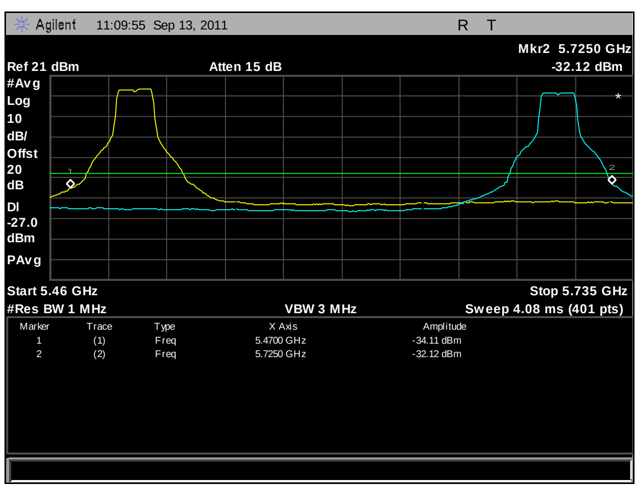
Plot 357. Frequency Stability, 802.11a, 5250 MHz – 5350 MHz @ 40°C, 120 V



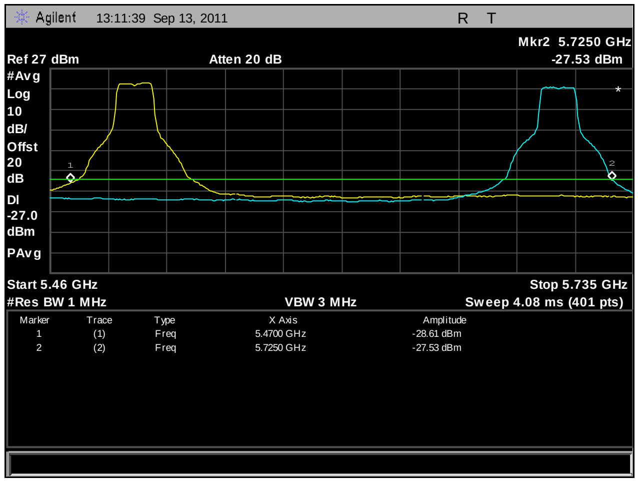
Plot 358. Frequency Stability, 802.11a, 5250 MHz – 5350 MHz @ 50°C, 120 V



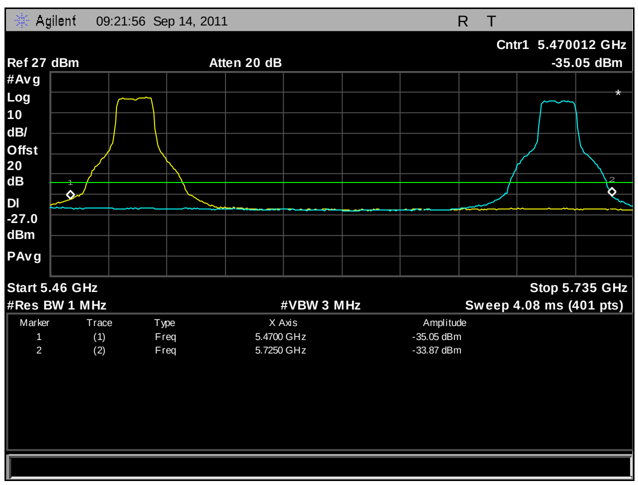
Plot 359. Frequency Stability, 802.11a, 5250 MHz – 5350 MHz @ 55°C, 120 V



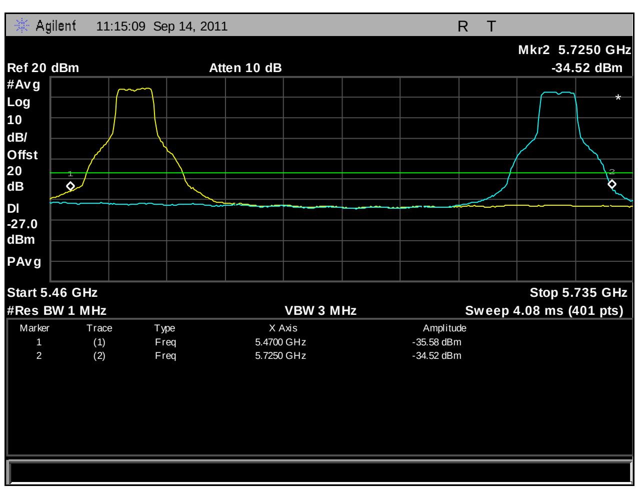
Plot 360. Frequency Stability, 802.11a, 5470 MHz – 5725 MHz @ -20°C, 120 V



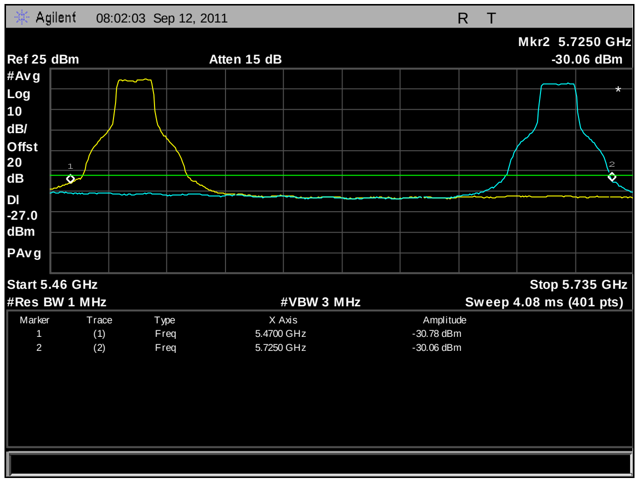
Plot 361. Frequency Stability, 802.11a, 5470 MHz – 5725 MHz @ -10°C, 120 V



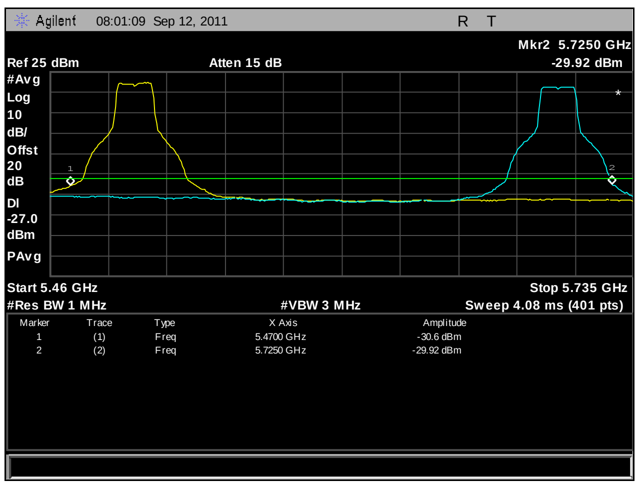
Plot 362. Frequency Stability, 802.11a, 5470 MHz – 5725 MHz @ 0°C, 120 V



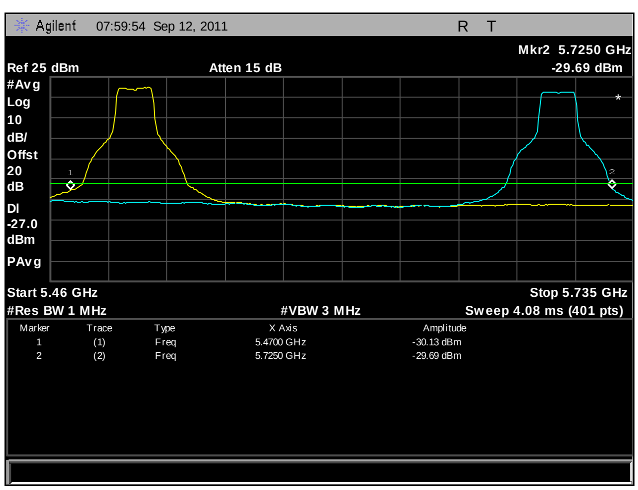
Plot 363. Frequency Stability, 802.11a, 5470 MHz – 5725 MHz @ 10°C, 120 V



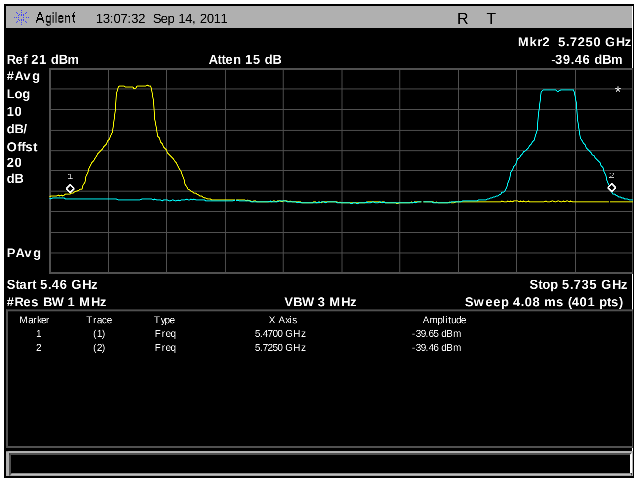
Plot 364. Frequency Stability, 802.11a, 5470 MHz – 5725 MHz @ 20°C, 108 V



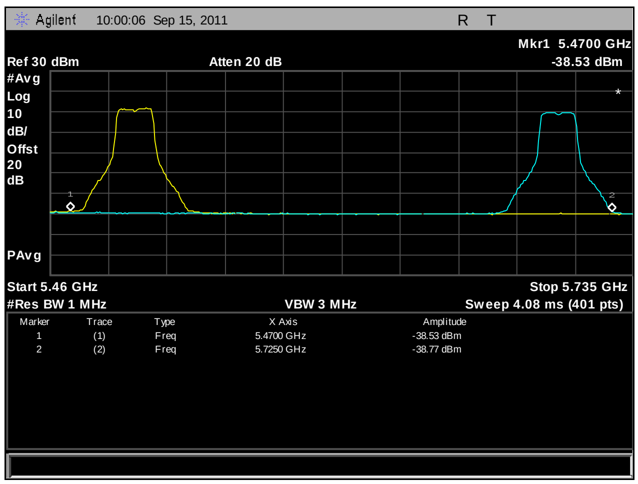
Plot 365. Frequency Stability, 802.11a, 5470 MHz – 5725 MHz @ 20°C, 120 V



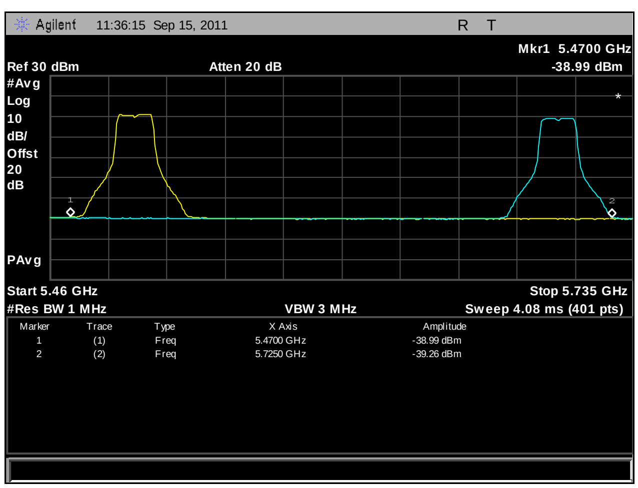
Plot 366. Frequency Stability, 802.11a, 5470 MHz – 5725 MHz @ 20°C, 132 V



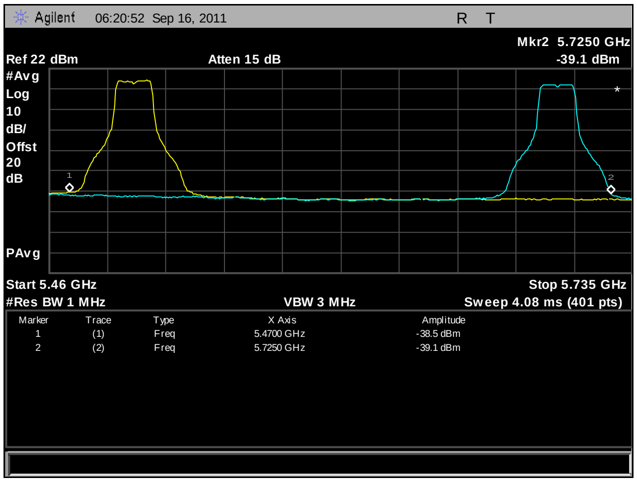
Plot 367. Frequency Stability, 802.11a, 5470 MHz – 5725 MHz @ 30°C, 120 V



Plot 368. Frequency Stability, 802.11a, 5470 MHz – 5725 MHz @ 40°C, 120 V

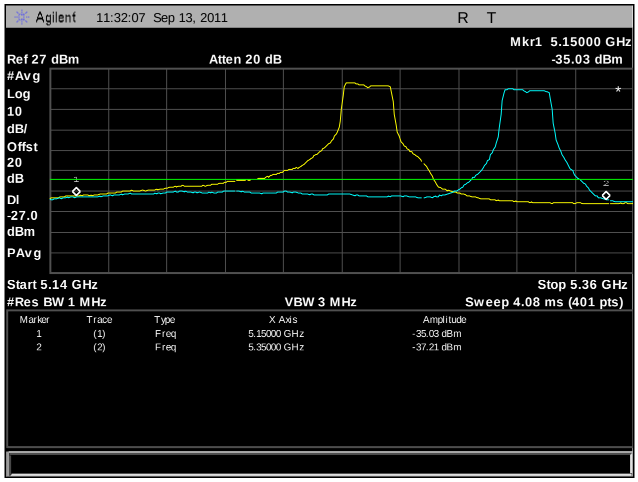


Plot 369. Frequency Stability, 802.11a, 5470 MHz – 5725 MHz @ 50°C, 120 V

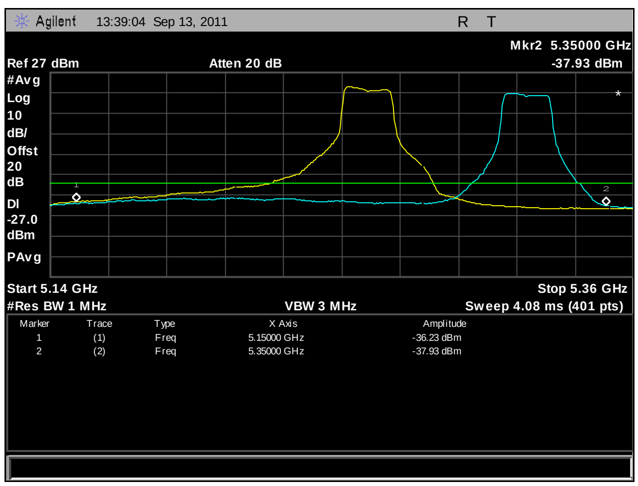


Plot 370. Frequency Stability, 802.11a, 5470 MHz – 5725 MHz @ 55°C, 120 V

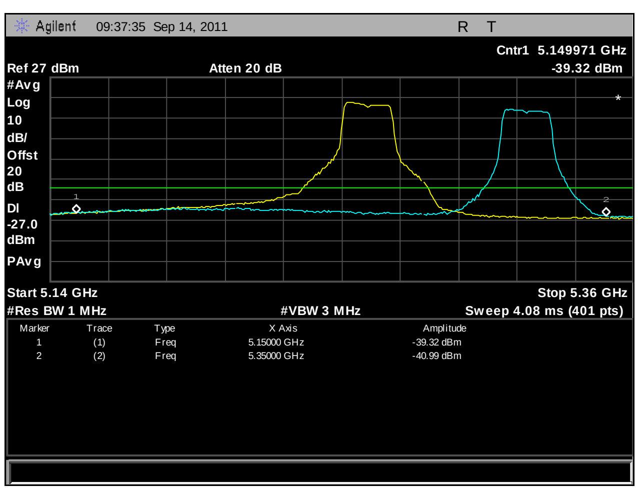
Frequency Stability, 802.11n 20 MHz



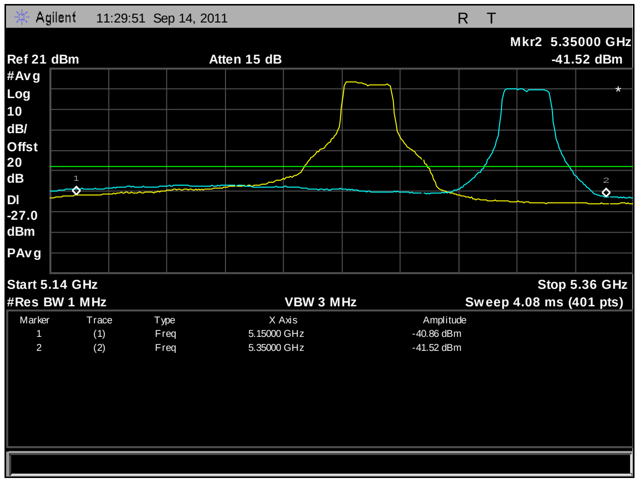
Plot 371. Frequency Stability, 802.11n 20 MHz, 5250 MHz – 5350 MHz @ -20°C, 120 V



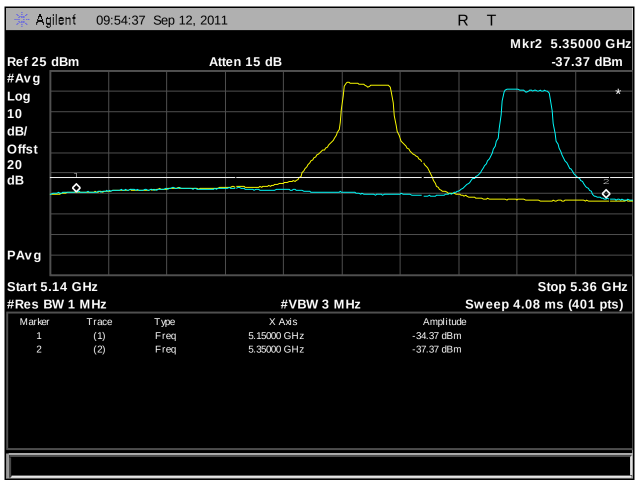
Plot 372. Frequency Stability, 802.11n 20 MHz, 5250 MHz – 5350 MHz @ -10°C, 120 V



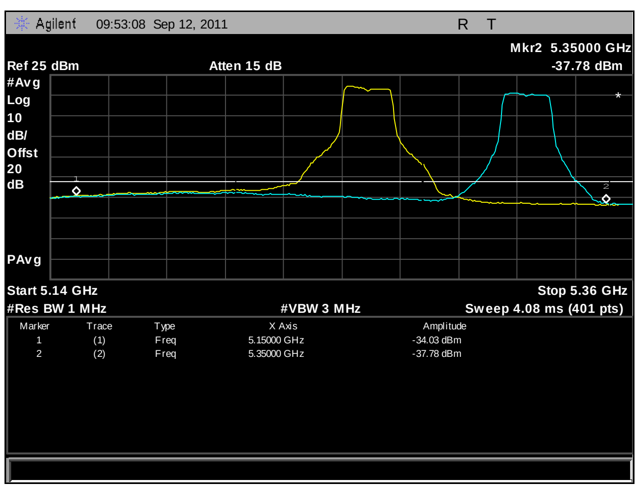
Plot 373. Frequency Stability, 802.11n 20 MHz, 5250 MHz – 5350 MHz @ 0°C, 120 V



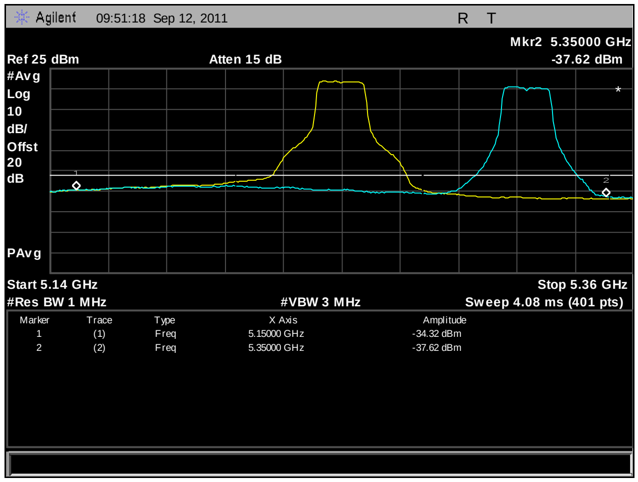
Plot 374. Frequency Stability, 802.11n 20 MHz, 5250 MHz – 5350 MHz @ 10°C, 120 V



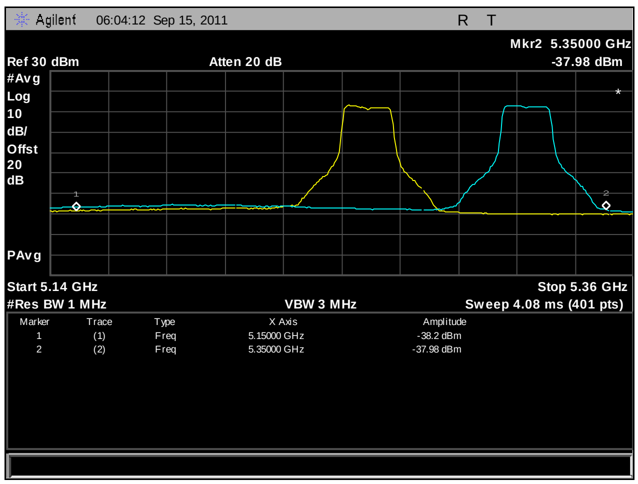
Plot 375. Frequency Stability, 802.11n 20 MHz, 5250 MHz – 5350 MHz @ 20°C, 108 V



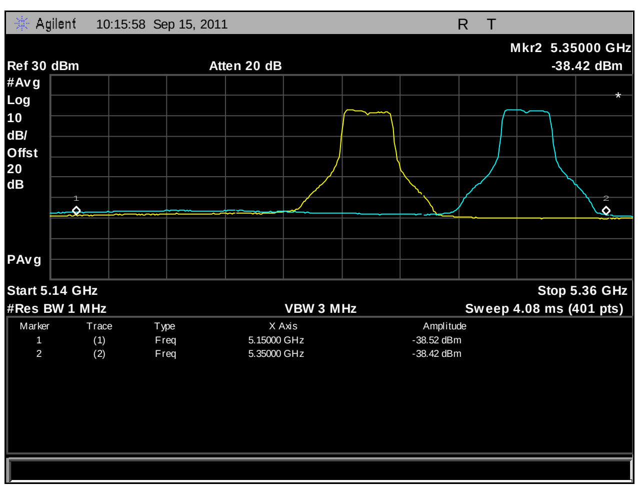
Plot 376. Frequency Stability, 802.11n 20 MHz, 5250 MHz – 5350 MHz @ 20°C, 120 V



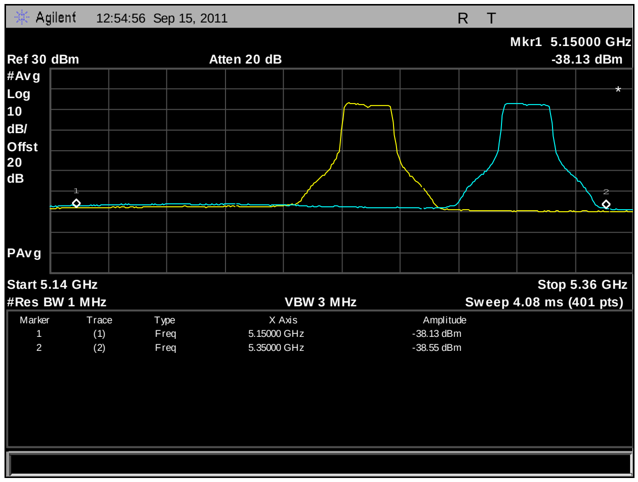
Plot 377. Frequency Stability, 802.11n 20 MHz, 5250 MHz – 5350 MHz @ 20°C, 132 V



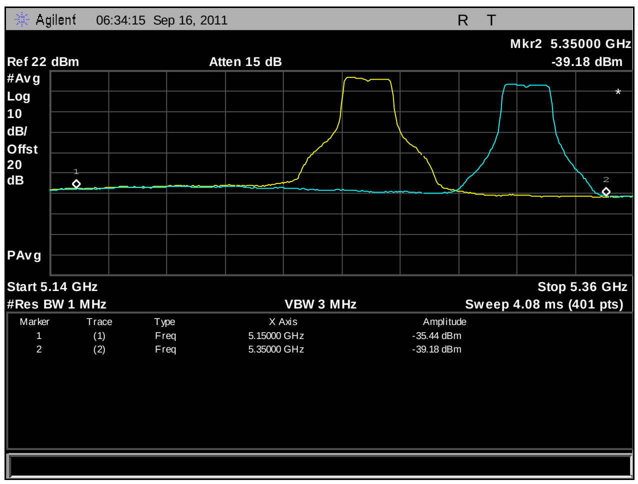
Plot 378. Frequency Stability, 802.11n 20 MHz, 5250 MHz – 5350 MHz @ 30°C, 120 V



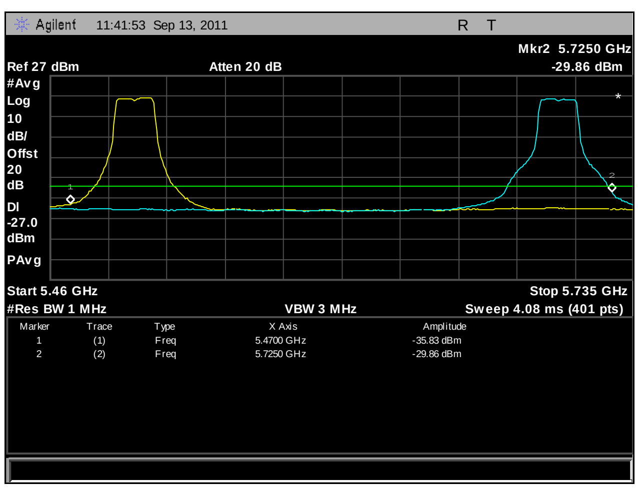
Plot 379. Frequency Stability, 802.11n 20 MHz, 5250 MHz – 5350 MHz @ 40°C, 120 V



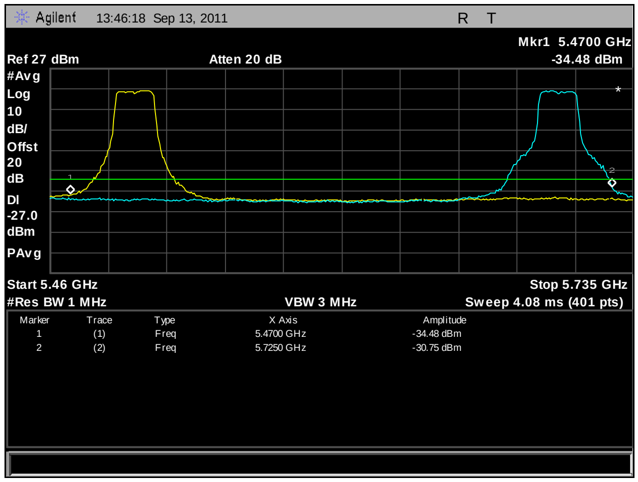
Plot 380. Frequency Stability, 802.11n 20 MHz, 5250 MHz – 5350 MHz @ 50°C, 120 V



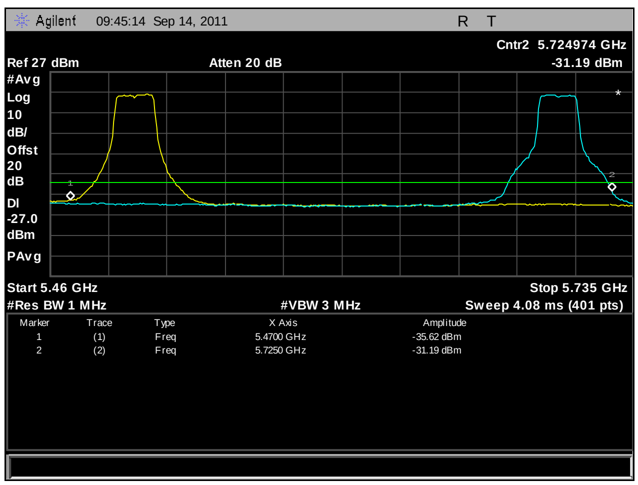
Plot 381. Frequency Stability, 802.11n 20 MHz, 5250 MHz – 5350 MHz @ 55°C, 120 V



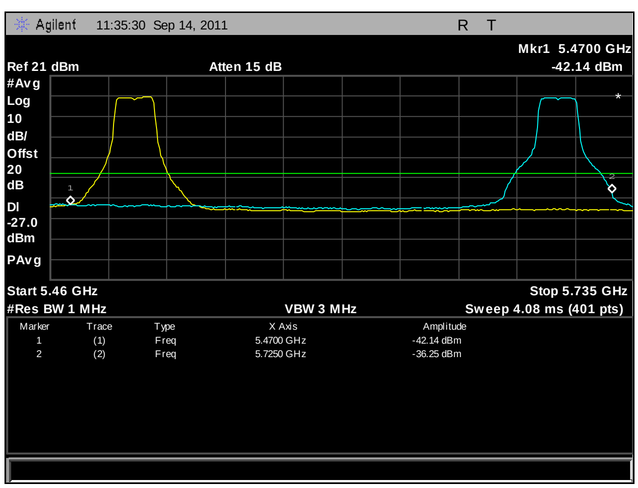
Plot 382. Frequency Stability, 802.11n 20 MHz, 5470 MHz – 5725 MHz @ -20°C, 120 V



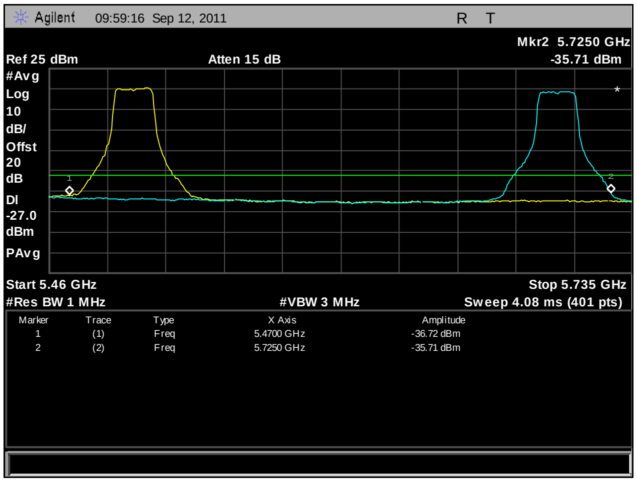
Plot 383. Frequency Stability, 802.11n 20 MHz, 5470 MHz – 5725 MHz @ -10°C, 120 V



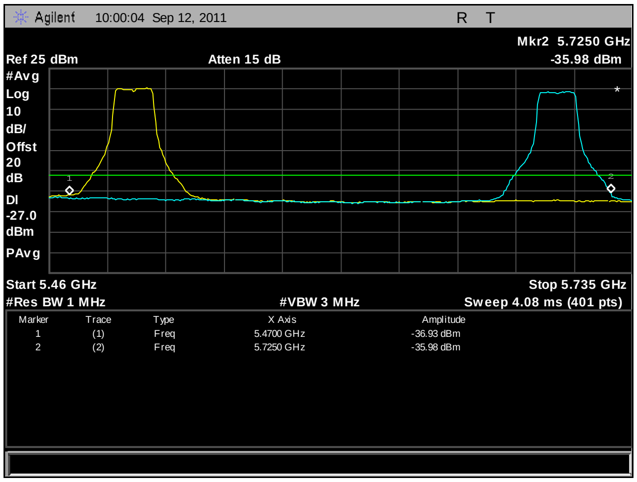
Plot 384. Frequency Stability, 802.11n 20 MHz, 5470 MHz – 5725 MHz @ 0°C, 120 V



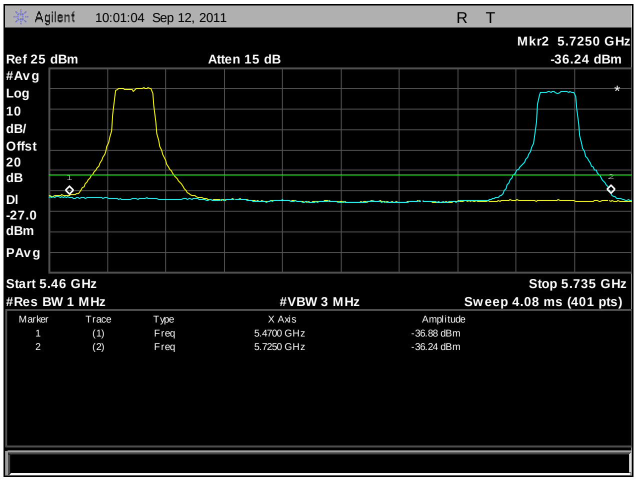
Plot 385. Frequency Stability, 802.11n 20 MHz, 5470 MHz – 5725 MHz @ 10°C, 120 V



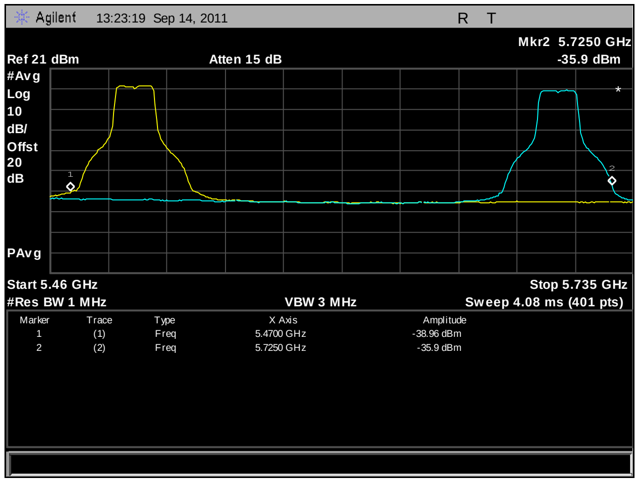
Plot 386. Frequency Stability, 802.11n 20 MHz, 5470 MHz – 5725 MHz @ 20°C, 108 V



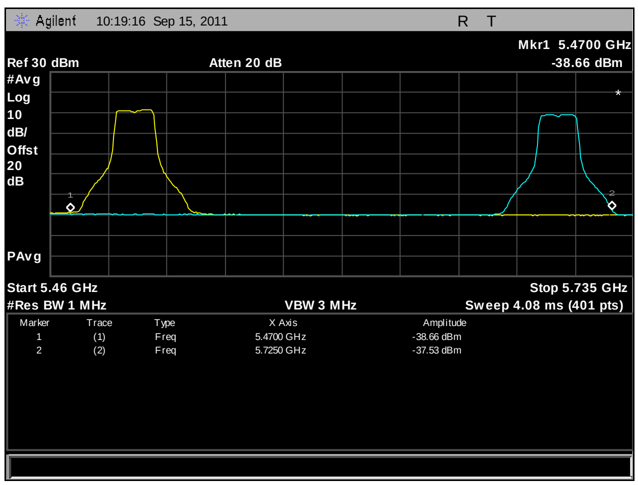
Plot 387. Frequency Stability, 802.11n 20 MHz, 5470 MHz – 5725 MHz @ 20°C, 120 V



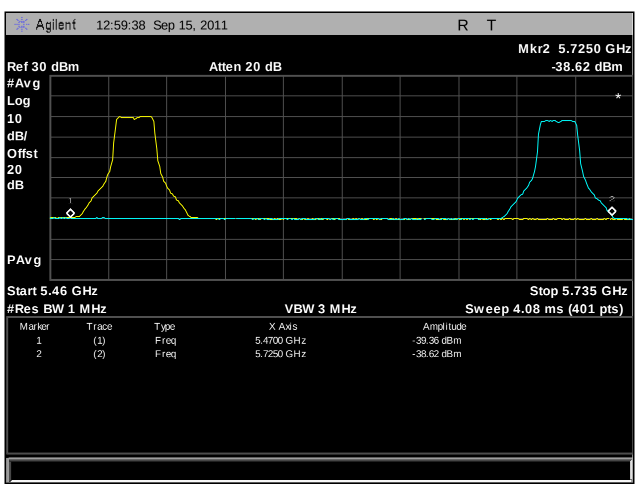
Plot 388. Frequency Stability, 802.11n 20 MHz, 5470 MHz – 5725 MHz @ 20°C, 132 V



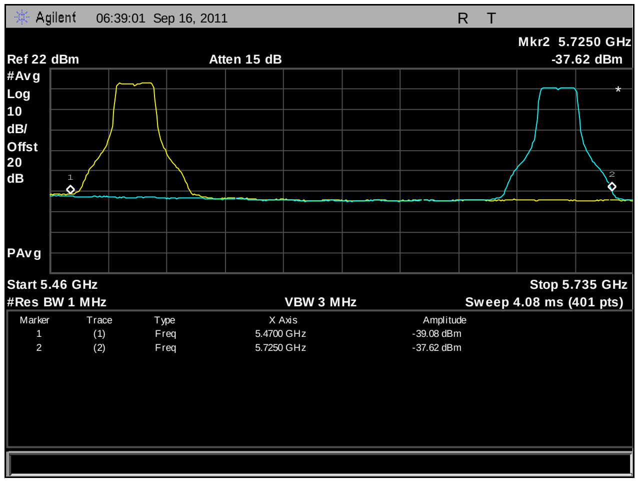
Plot 389. Frequency Stability, 802.11n 20 MHz, 5470 MHz – 5725 MHz @ 30°C, 120 V



Plot 390. Frequency Stability, 802.11n 20 MHz, 5470 MHz – 5725 MHz @ 40°C, 120 V

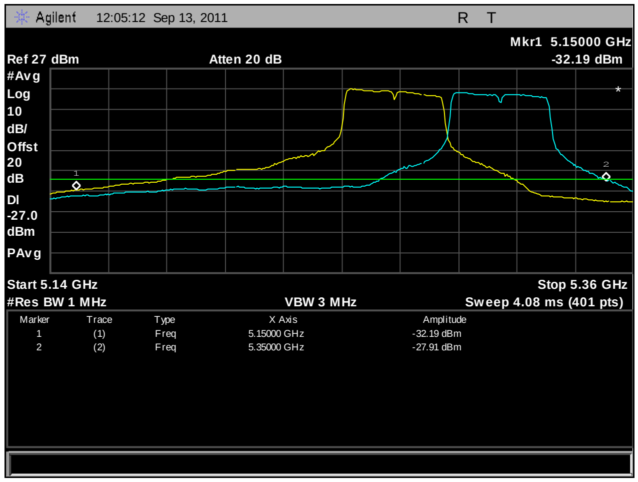


Plot 391. Frequency Stability, 802.11n 20 MHz, 5470 MHz – 5725 MHz @ 50°C, 120 V

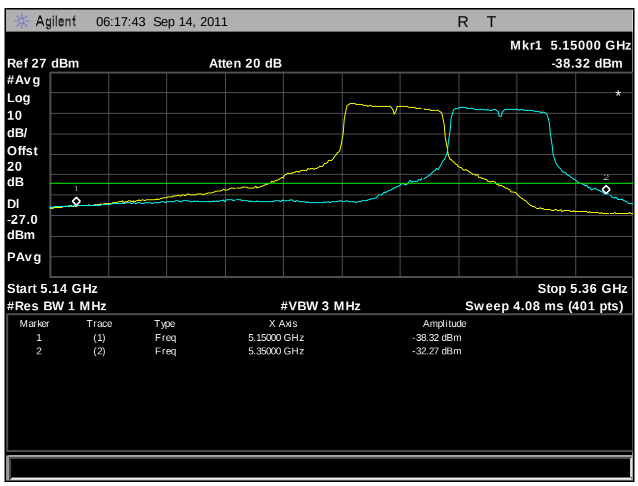


Plot 392. Frequency Stability, 802.11n 20 MHz, 5470 MHz – 5725 MHz @ 55°C, 120 V

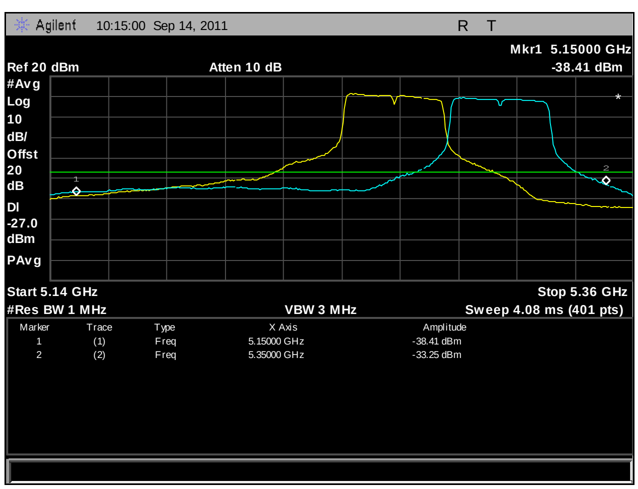
Frequency Stability, 802.11n 40 MHz



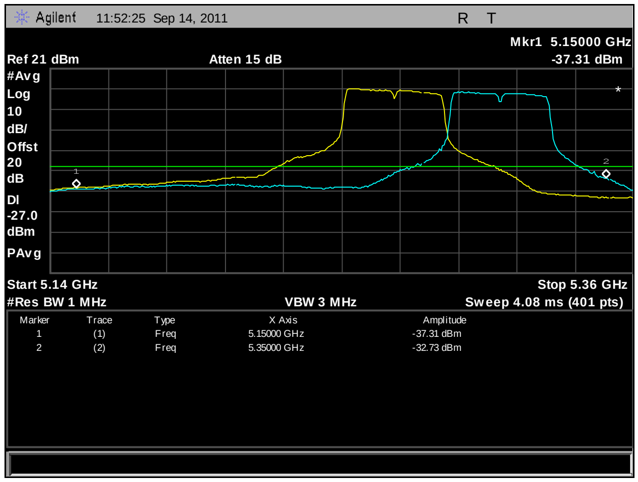
Plot 393. Frequency Stability, 802.11n 40 MHz, 5250 MHz – 5350 MHz @ -20°C, 120 V



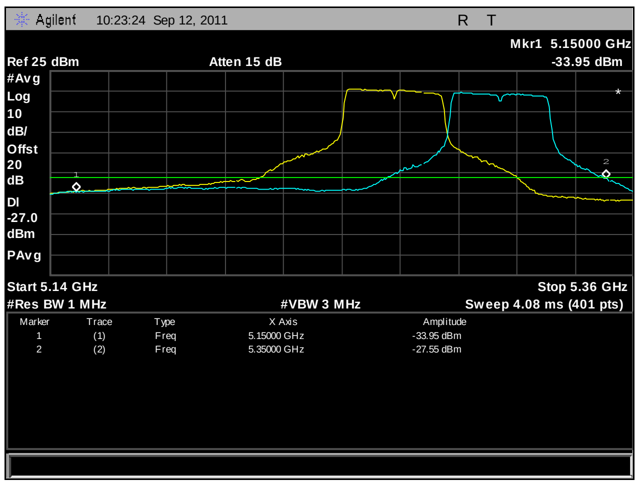
Plot 394. Frequency Stability, 802.11n 40 MHz, 5250 MHz – 5350 MHz @ -10°C, 120 V



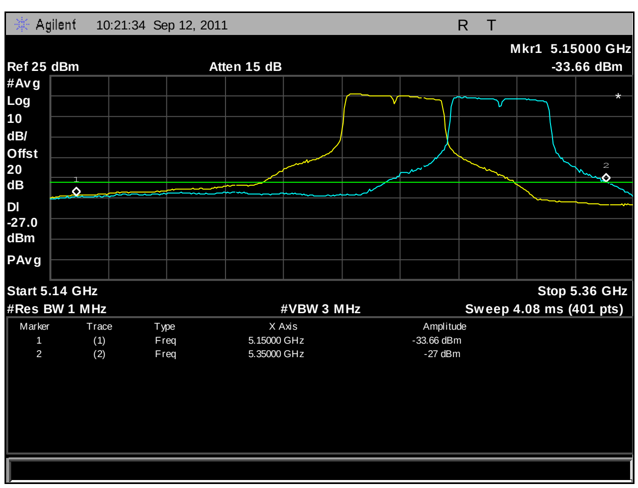
Plot 395. Frequency Stability, 802.11n 40 MHz, 5250 MHz – 5350 MHz @ 0°C, 120 V



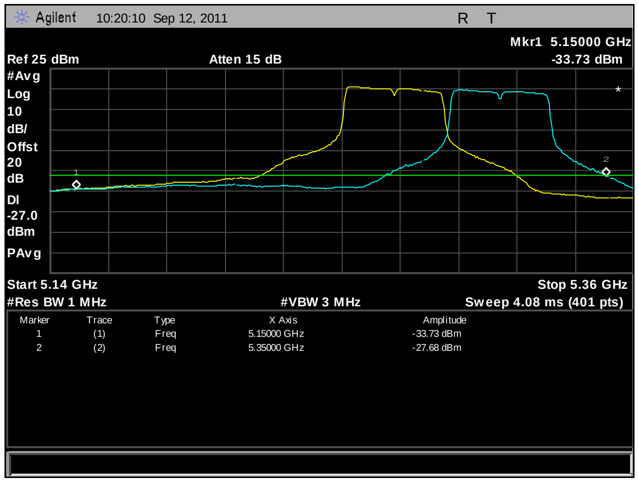
Plot 396. Frequency Stability, 802.11n 40 MHz, 5250 MHz – 5350 MHz @ 10°C, 120 V



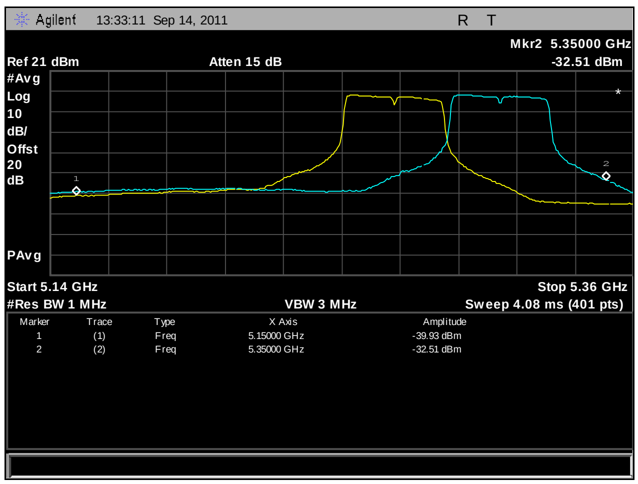
Plot 397. Frequency Stability, 802.11n 40 MHz, 5250 MHz – 5350 MHz @ 20°C, 108 V



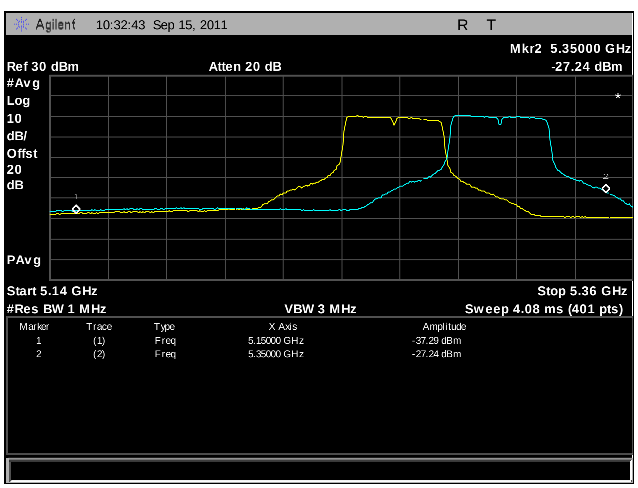
Plot 398. Frequency Stability, 802.11n 40 MHz, 5250 MHz – 5350 MHz @ 20°C, 120 V



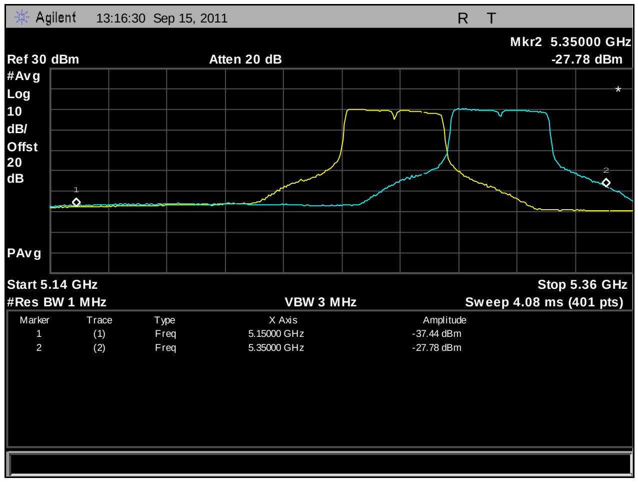
Plot 399. Frequency Stability, 802.11n 40 MHz, 5250 MHz – 5350 MHz @ 20°C, 132 V



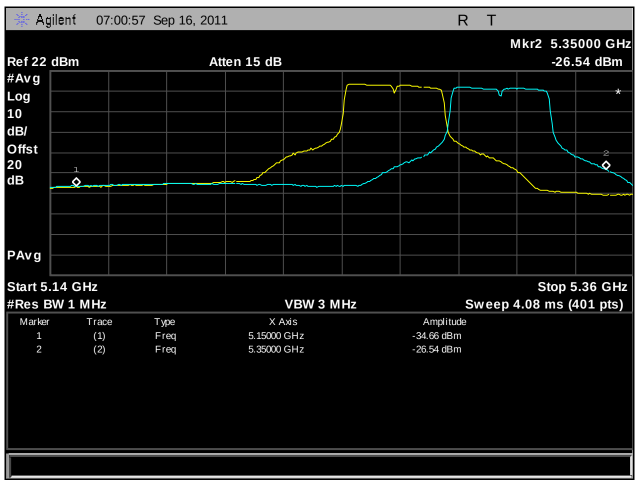
Plot 400. Frequency Stability, 802.11n 40 MHz, 5250 MHz – 5350 MHz @ 30°C, 120 V



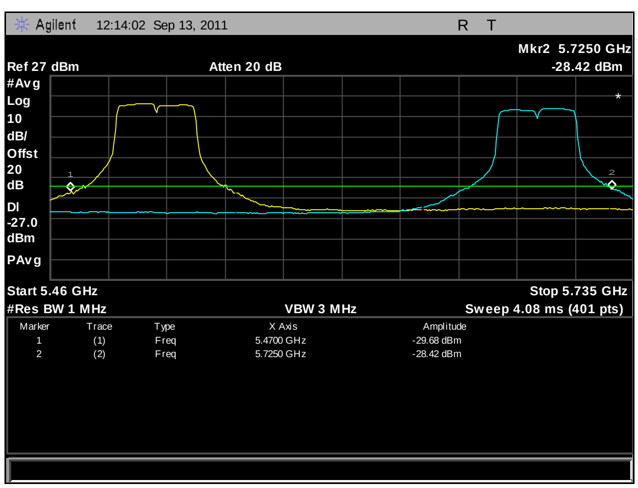
Plot 401. Frequency Stability, 802.11n 40 MHz, 5250 MHz – 5350 MHz @ 40°C, 120 V



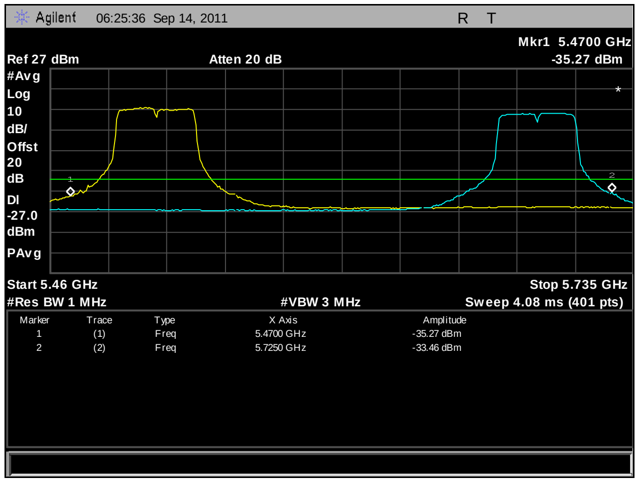
Plot 402. Frequency Stability, 802.11n 40 MHz, 5250 MHz – 5350 MHz @ 50°C, 120 V



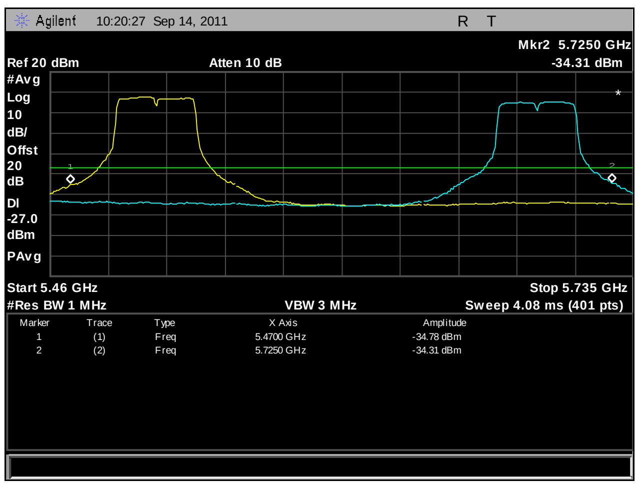
Plot 403. Frequency Stability, 802.11n 40 MHz, 5250 MHz – 5350 MHz @ 55°C, 120 V



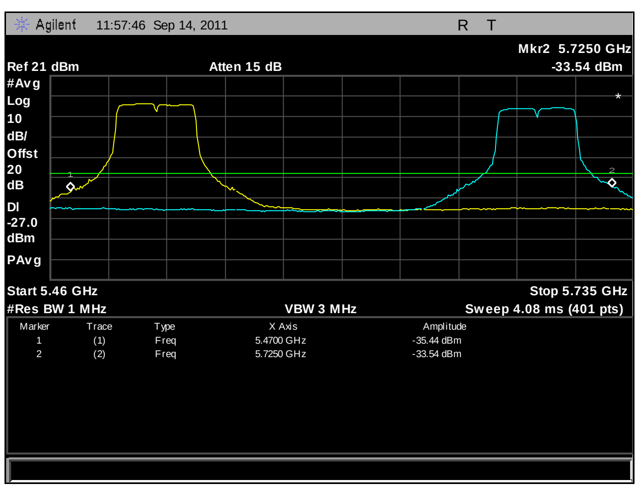
Plot 404. Frequency Stability, 802.11n 40 MHz, 5470 MHz – 5725 MHz @ -20°C, 120 V



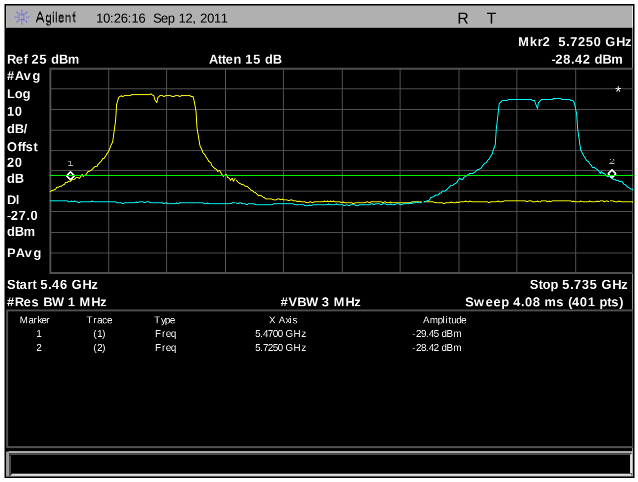
Plot 405. Frequency Stability, 802.11n 40 MHz, 5470 MHz – 5725 MHz @ -10°C, 120 V



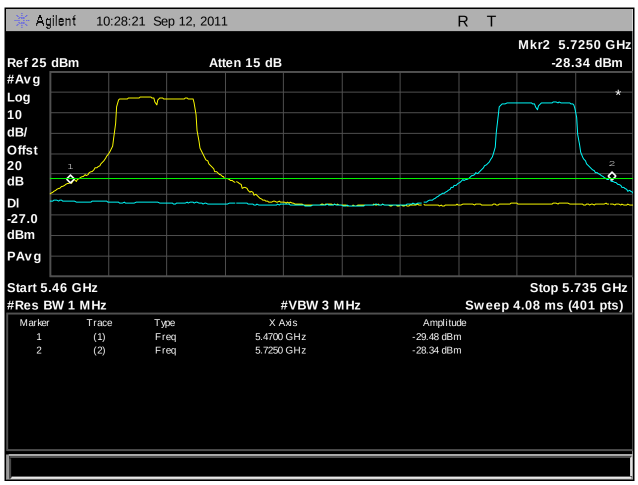
Plot 406. Frequency Stability, 802.11n 40 MHz, 5470 MHz – 5725 MHz @ 0°C, 120 V



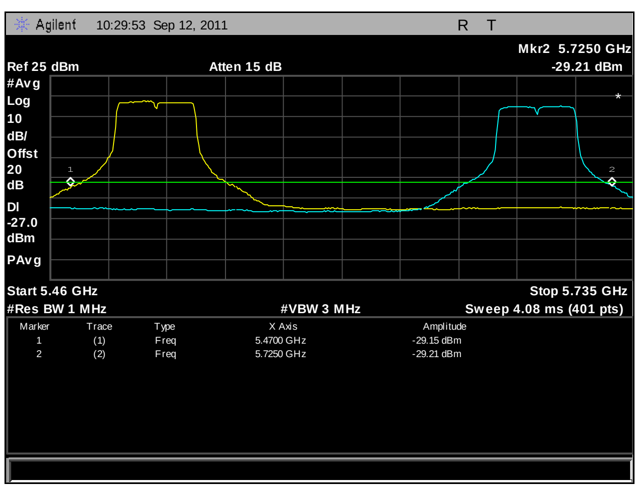
Plot 407. Frequency Stability, 802.11n 40 MHz, 5470 MHz – 5725 MHz @ 10°C, 120 V



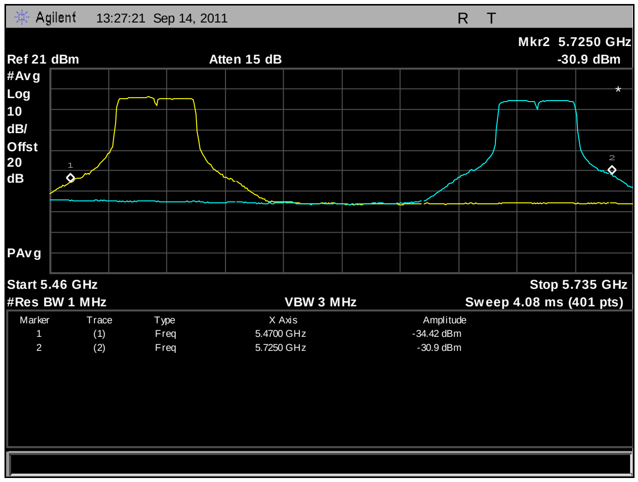
Plot 408. Frequency Stability, 802.11n 40 MHz, 5470 MHz – 5725 MHz @ 20°C, 108 V



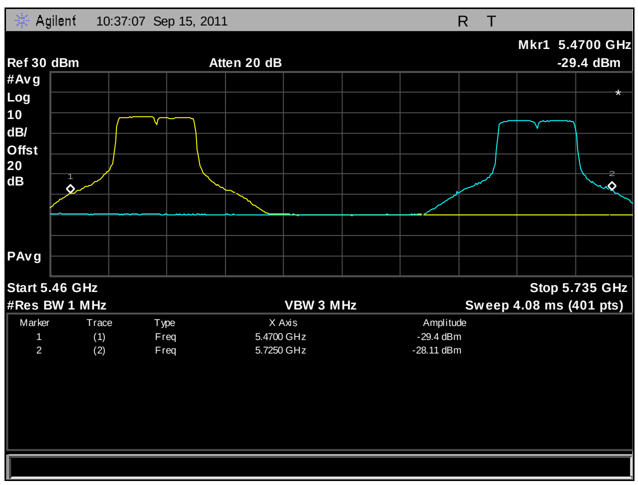
Plot 409. Frequency Stability, 802.11n 40 MHz, 5470 MHz – 5725 MHz @ 20°C, 120 V



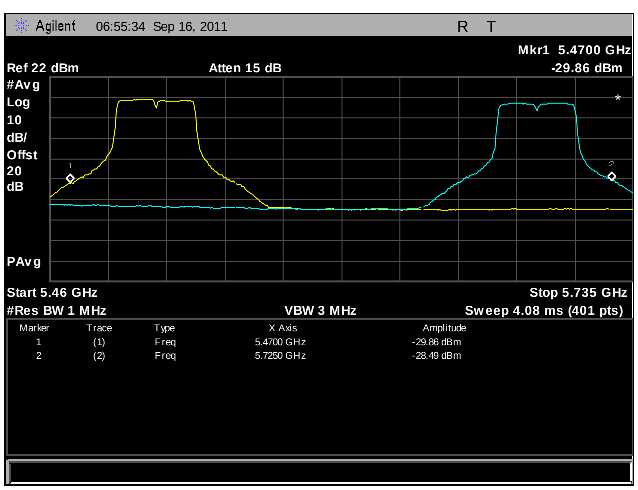
Plot 410. Frequency Stability, 802.11n 40 MHz, 5470 MHz – 5725 MHz @ 20°C, 132 V



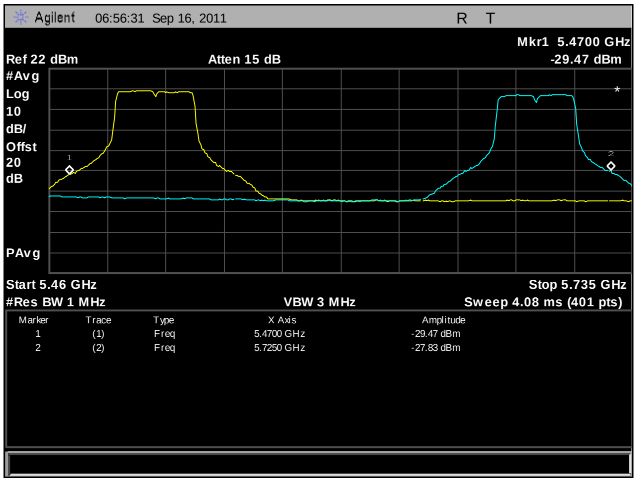
Plot 411. Frequency Stability, 802.11n 40 MHz, 5470 MHz – 5725 MHz @ 30°C, 120 V



Plot 412. Frequency Stability, 802.11n 40 MHz, 5470 MHz – 5725 MHz @ 40°C, 120 V



Plot 413. Frequency Stability, 802.11n 40 MHz, 5470 MHz – 5725 MHz @ 50°C, 120 V



Plot 414. Frequency Stability, 802.11n 40 MHz, 5470 MHz – 5725 MHz @ 55°C, 120 V

Electromagnetic Compatibility Criteria for Intentional Radiators

RSS-GEN Receiver Spurious Emissions

Test Requirement: The following receiver spurious emission limits shall be complied with:

a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 28.

Spurious Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

Table 28. Spurious Emission Limits for Receivers

b) If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

Test Procedures: The EUT was programmed for receive mode only. Conducted measurements were taken at the antenna port of the EUT. 100 kHz resolution bandwidth was used from 30 MHz - 1 GHz and 300 kHz resolution was used for measurements done above 1 GHz. All plots are corrected for cable loss.

Test Results: Equipment is compliant with the Receiver Spurious Emissions Requirements of RSS-GEN.

Test Engineer(s): Jeff Pratt

Test Date(s): 10/04/11

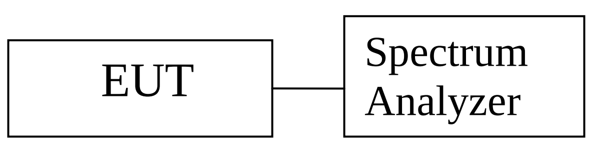
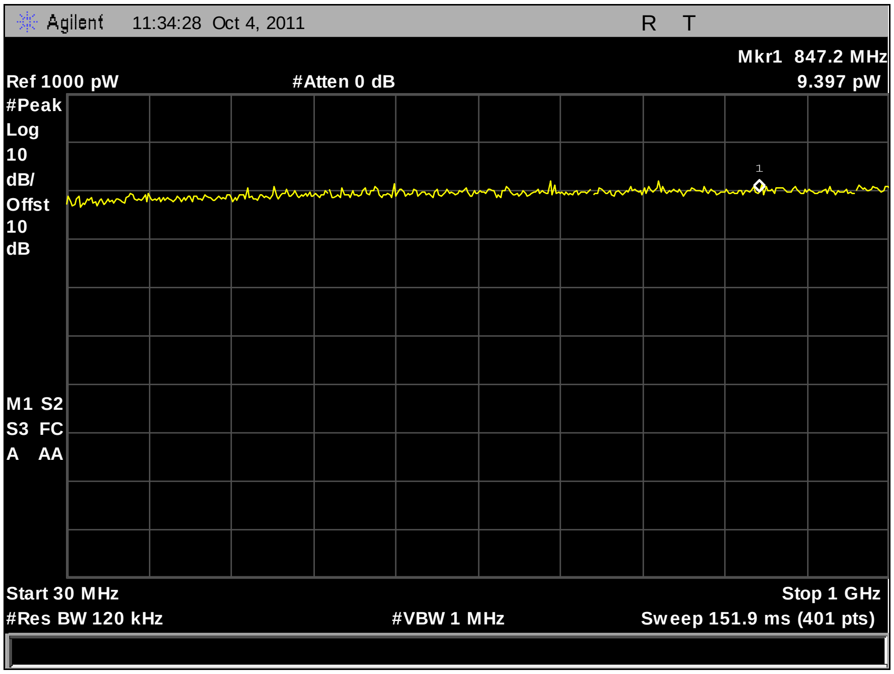
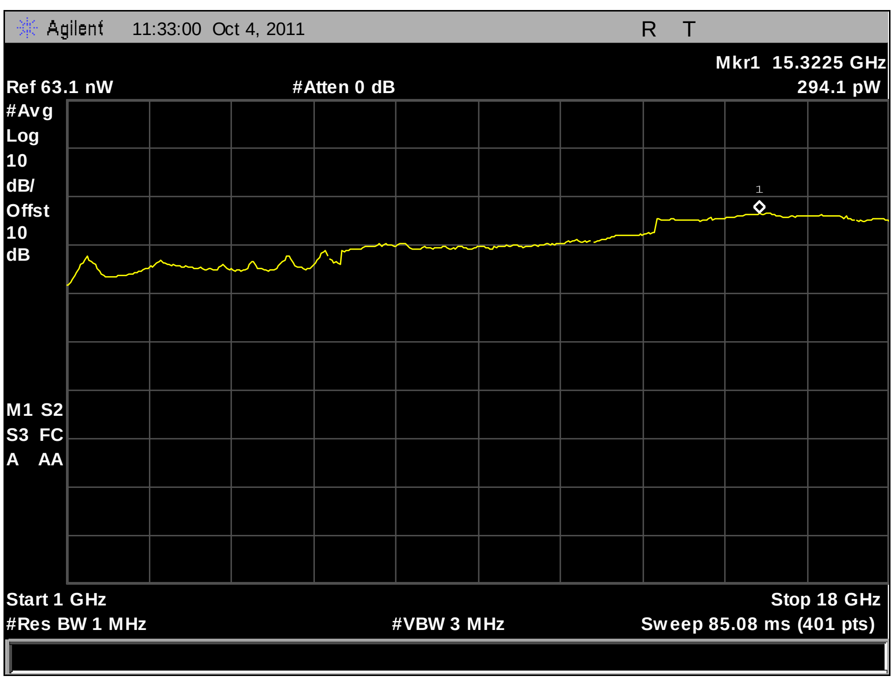


Figure 4. Block Diagram, Conducted Receiver Spurious Emissions Test Setup

Conducted Receiver Spurious Emissions, Port A

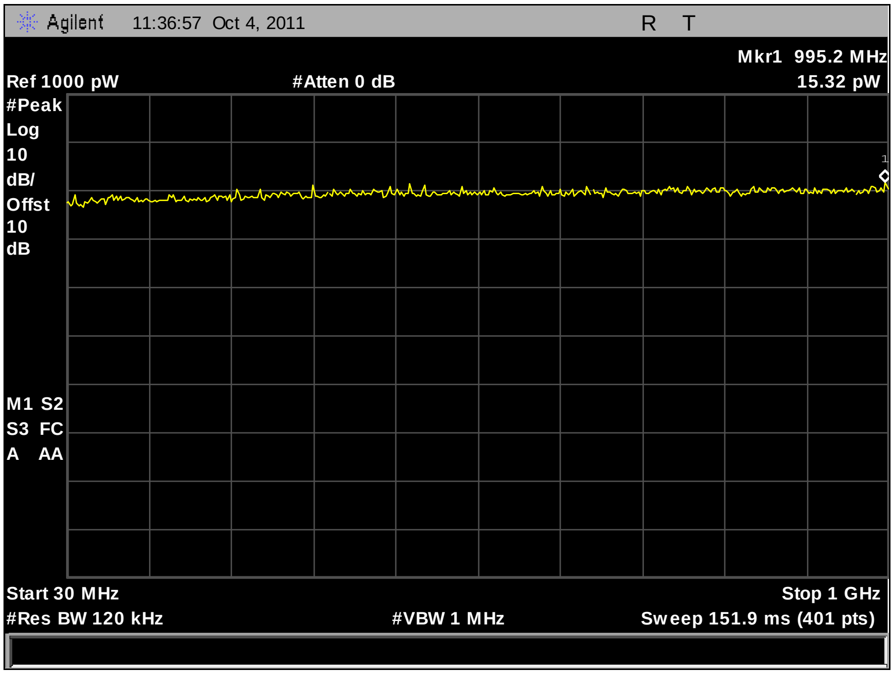


Plot 415. Receiver Spurious Emission, 30 MHz – 1 GHz, Port A

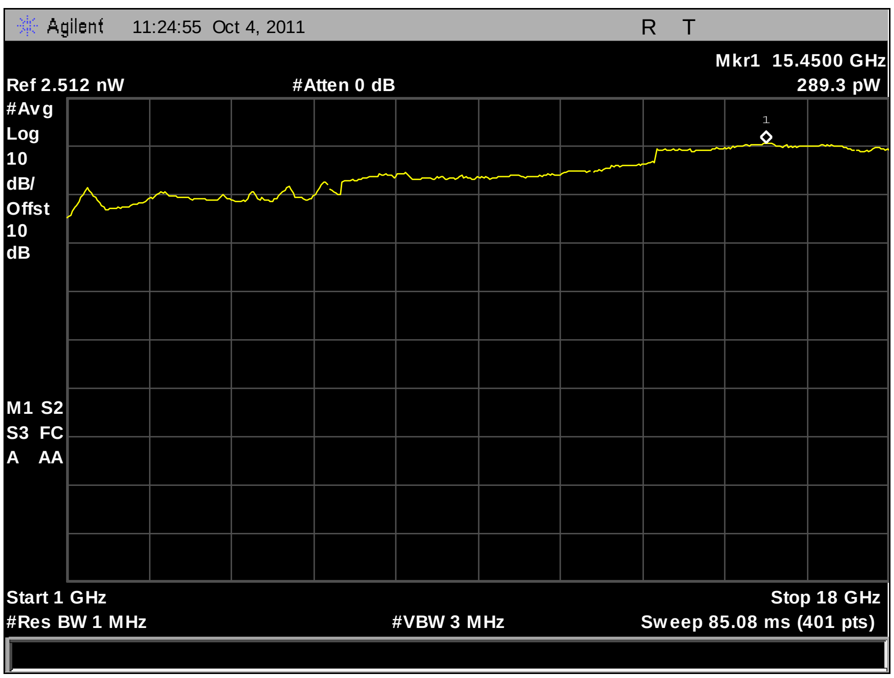


Plot 416. Receiver Spurious Emission, 1 GHz – 18 GHz, Port A

Conducted Receiver Spurious Emissions, Port B



Plot 417. Receiver Spurious Emission, 30 MHz – 1 GHz, Port B



Plot 418. Receiver Spurious Emission, 1 GHz – 18 GHz, Port B

V. DFS Requirements and Radar Waveform Description & Calibration

A. DFS Requirements

DFS Detection Thresholds for Master or Client Devices Incorporating DFS

Maximum Transmit Power	Value
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna **Note 2:** Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.	

DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2
U-NII Detection Bandwidth	Minimum 80% of the 99% power bandwidth. See Note 3.
Note 1: The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows: • For the Short pulse radar Test Signals this instant is the end of the *Burst*. • For the Frequency Hopping radar Test Signal, this instant is the end of the last radar *Burst* generated. • For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission. **Note 2:** The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required facilitating *Channel* changes (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. **Note 3:** During the *U-NII Detection Bandwidth* detection test, radar type 1 is used and for each frequency step the minimum percentage of detection is 90%. Measurements are performed with no data traffic.	

B. Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Trials
1	1	1428	18	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

A minimum of 30 unique waveforms are required for each of the short pulse radar types 2 through 4. For short pulse radar type 1, the same waveform is used a minimum of 30 times. If more than 30 waveforms are used for short pulse radar types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. The aggregate is the average of the percentage of successful detections of short pulse radar types 1-4.

Long Pulse Radar Test Waveform

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses per Bursts	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse radar test signal. If more than 30 waveforms are used for the Long Pulse radar test signal, then each additional waveform must also be unique and not repeated from the previous waveforms.

Each waveform is defined as follows:

1) The transmission period for the Long Pulse Radar test signal is 12 seconds.
2) There are a total of 8 to 20 Bursts in the 12 second period, with the number of Bursts being randomly chosen. This number is Burst_Count.
3) Each Burst consists of 1 to 3 pulses, with the number of pulses being randomly chosen. Each Burst within the 12 second sequence may have a different number of pulses.
4) The pulse width is between 50 and 100 microseconds, with the pulse width being randomly chosen. Each pulse within a Burst will have the same pulse width. Pulses in different Bursts may have different pulse widths.
5) Each pulse has a linear FM chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a Burst will have the same chirp width. Pulses in different Bursts may have different chirp widths. The chirp is centered on the pulse. For example, with radar frequency of 5300 MHz and a 20 MHz chirped signal, the chirp starts at 5290 MHz and ends at 5310 MHz.
6) If more than one pulse is present in a Burst, the time between the pulses will be between 1000 and 2000 microseconds, with the time being randomly chosen. If three pulses are present in a Burst, the time between the first and second pulses is chosen independently of the time between the second and third pulses.
7) The 12 second transmission period is divided into even intervals. The number of intervals is equal to Burst_Count. Each interval is of length (12,000,000 / Burst_Count) microseconds. Each interval contains one Burst. The start time for the Burst, relative to the beginning of the interval, is between 1 and [(12,000,000 / Burst_Count) – (Total Burst Length) + (One Random PRI Interval)] microseconds, with the start time being randomly chosen. The step interval for the start time is 1 microsecond. The start time for each Burst is chosen independently.

A representative example of a Long Pulse radar test waveform:

1) The total test signal length is 12 seconds.
2) 8 Bursts are randomly generated for the Burst_Count.
3) Burst 1 has 2 randomly generated pulses.
4) The pulse width (for both pulses) is randomly selected to be 75 microseconds.
5) The PRI is randomly selected to be at 1213 microseconds.
6) Bursts 2 through 8 are generated using steps 3 – 5.
7) Each Burst is contained in even intervals of 1,500,000 microseconds. The starting location for Pulse 1, Burst 1 is randomly generated (1 to 1,500,000 minus the total Burst 1 length + 1 random PRI interval) at the 325,001 microsecond step. Bursts 2 through 8 randomly fall in successive 1,500,000 microsecond intervals (i.e. Burst 2 falls in the 1,500,001 – 3,000,000 microsecond range).

Graphical Representation of a Long Pulse radar Test Waveform

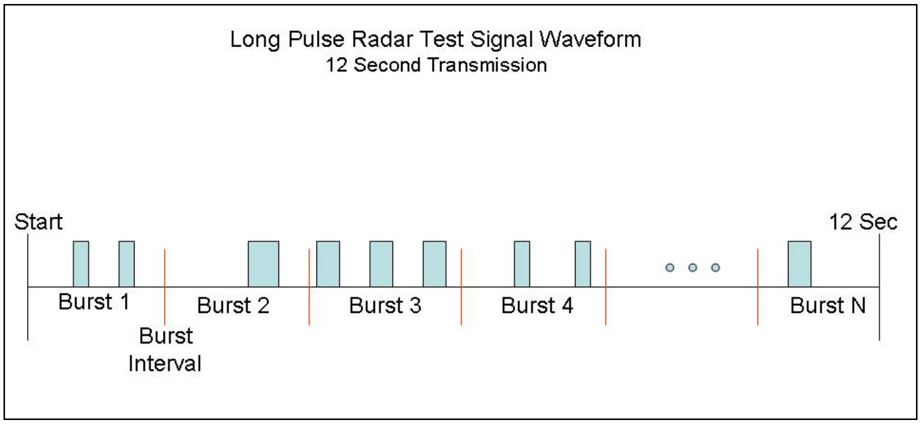


Figure 5. Long Pulse Radar Test Signal Waveform

Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	9	.333	300	70%	30

For the Frequency Hopping Radar Type, the same *Burst* parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected1 from the hopping sequence defined by the following algorithm:

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

C. Radar Waveform Calibration

The following equipment setup was used to calibrate the conducted Radar Waveform. A spectrum analyzer was used to establish the test signal level for each radar type. During this process there were no transmissions by either the Master or Client Device. The spectrum analyzer was switched to the zero span (Time Domain) mode at the frequency of the Radar Waveform generator. Peak detection was utilized. The spectrum analyzer's resolution bandwidth (RBW) was set to 3 MHz and the video bandwidth (VBW) was set to 3 MHz. The calibration setup is diagrammed in Figure 6, and the radar test signal generator is shown in Figure 6.

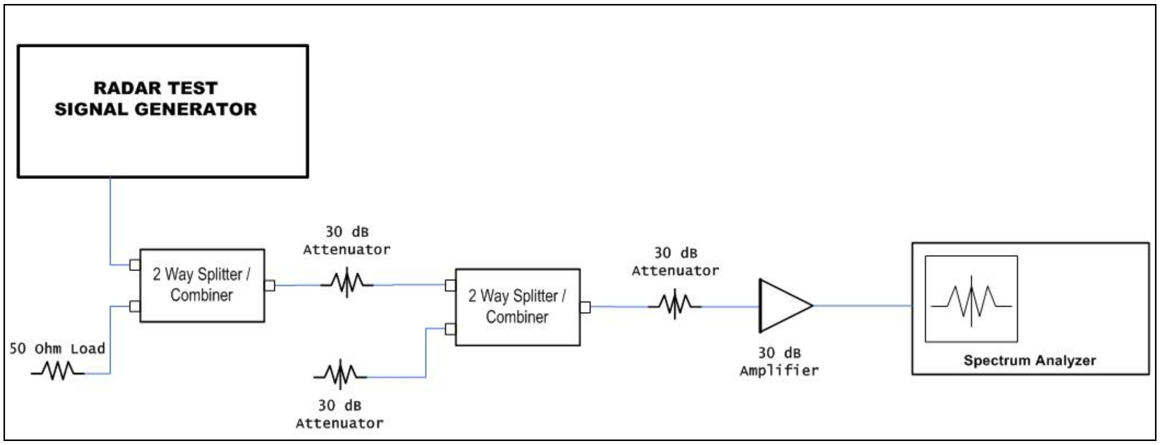
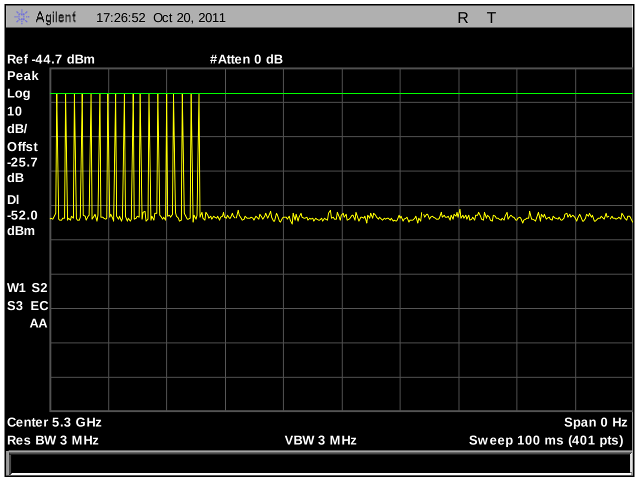
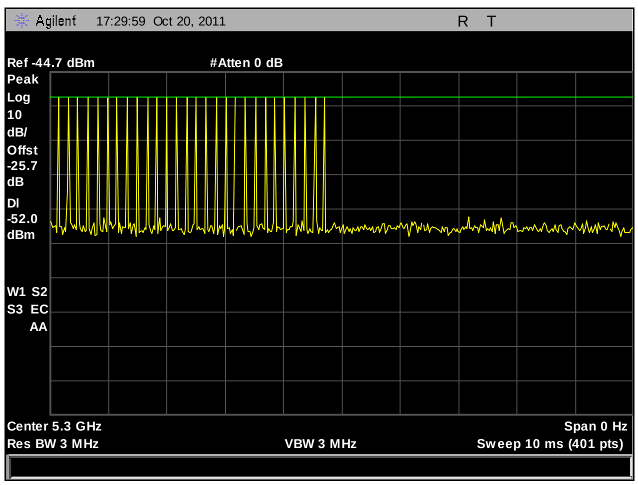


Figure 6. DFS Radar Waveform Calibration Setup

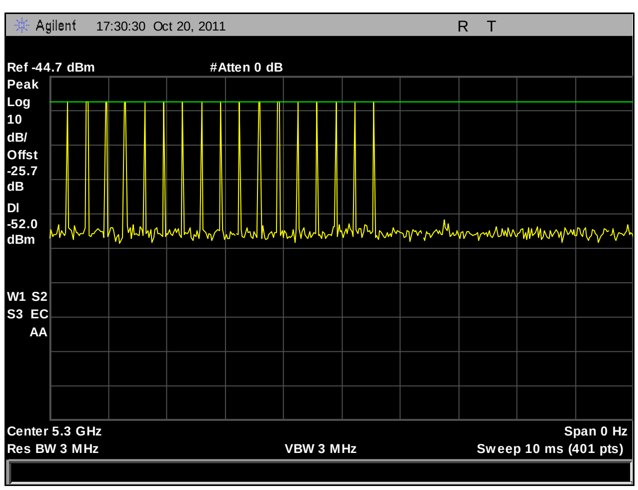
Radar Waveform Calibration



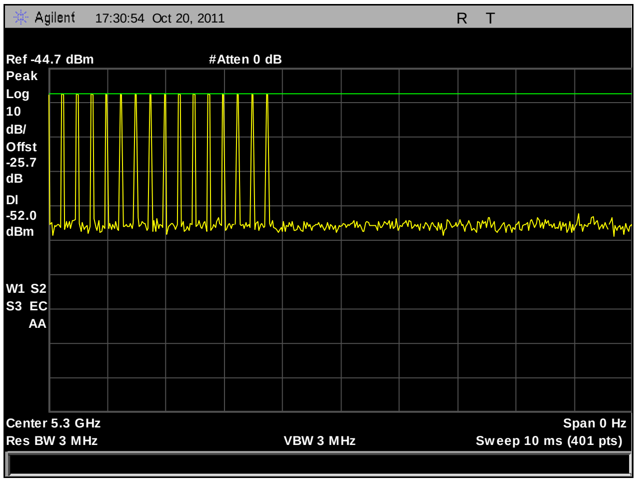
Plot 419. Radar Calibration, Bin 1



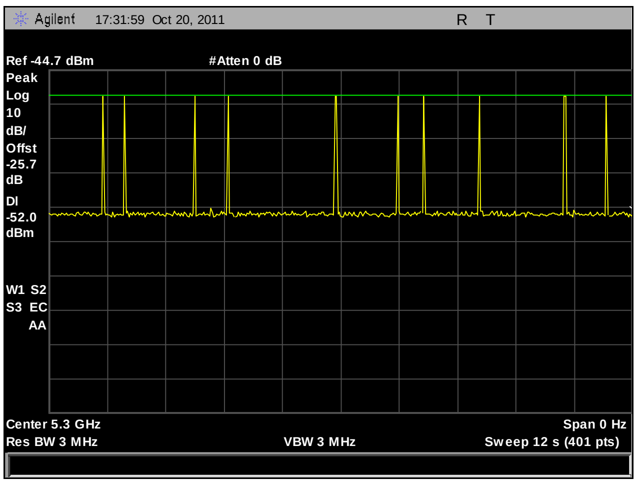
Plot 420. Radar Calibration, Bin 2



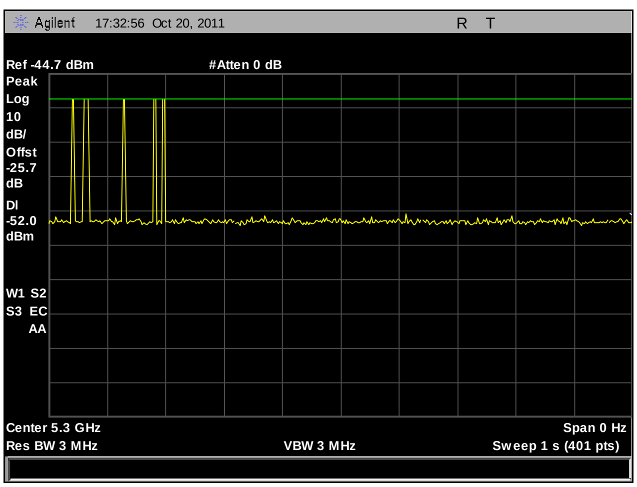
Plot 421. Radar Calibration, Bin 3



Plot 422. Radar Calibration, Bin 4

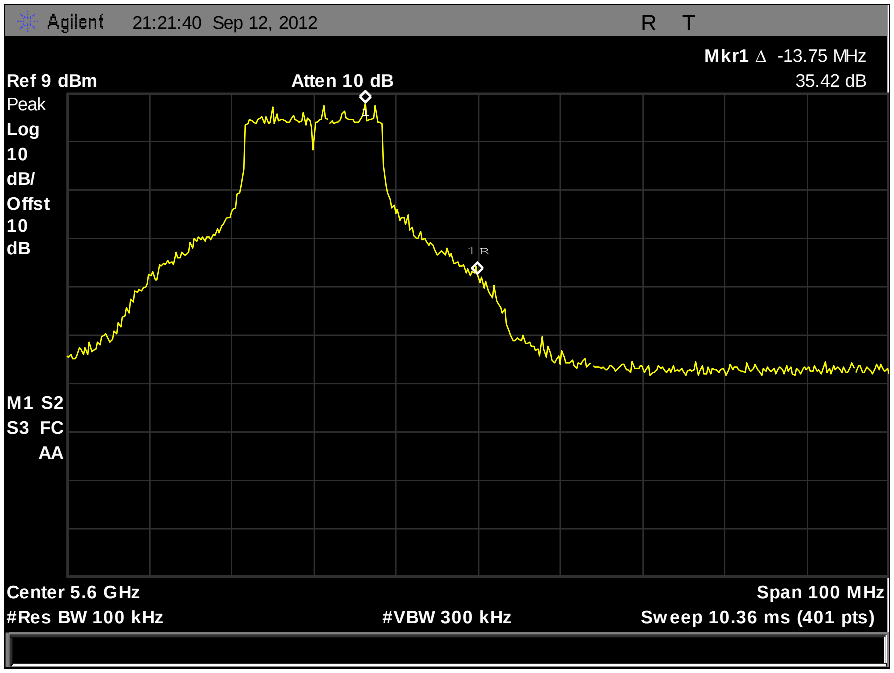


Plot 423. Radar Calibration, Bin 5

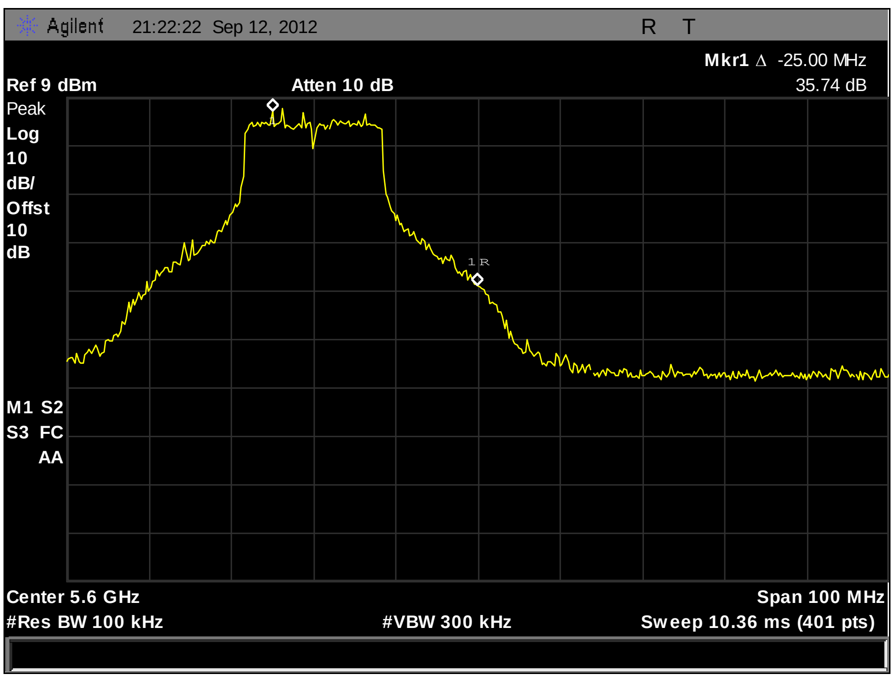


Plot 424. Radar Calibration, Bin 6

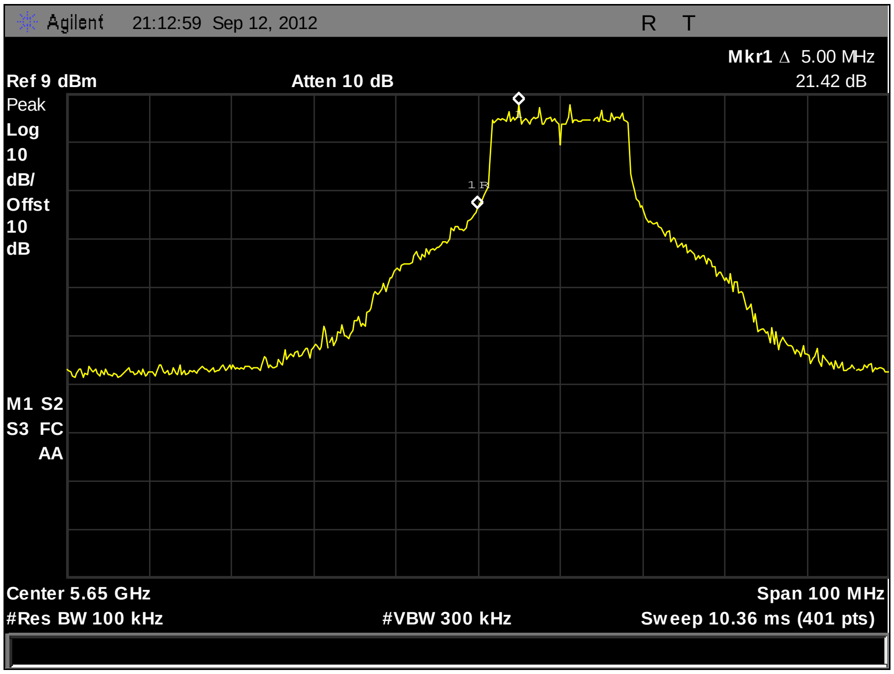
D. 20 dBc Notched Band



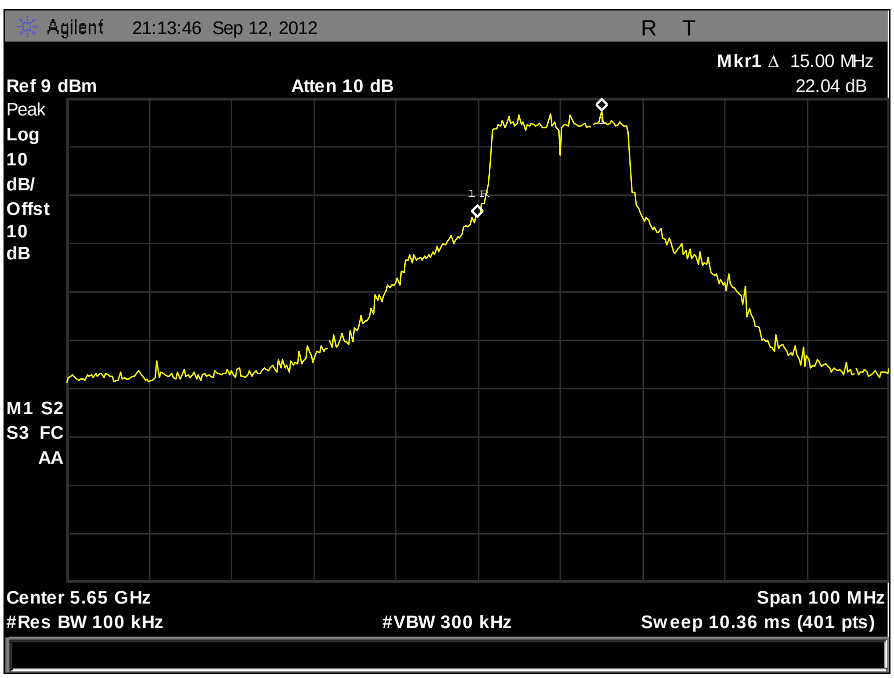
Plot 425. 20 dBc Notched Band, 802.11a, 5580 MHz, Port A



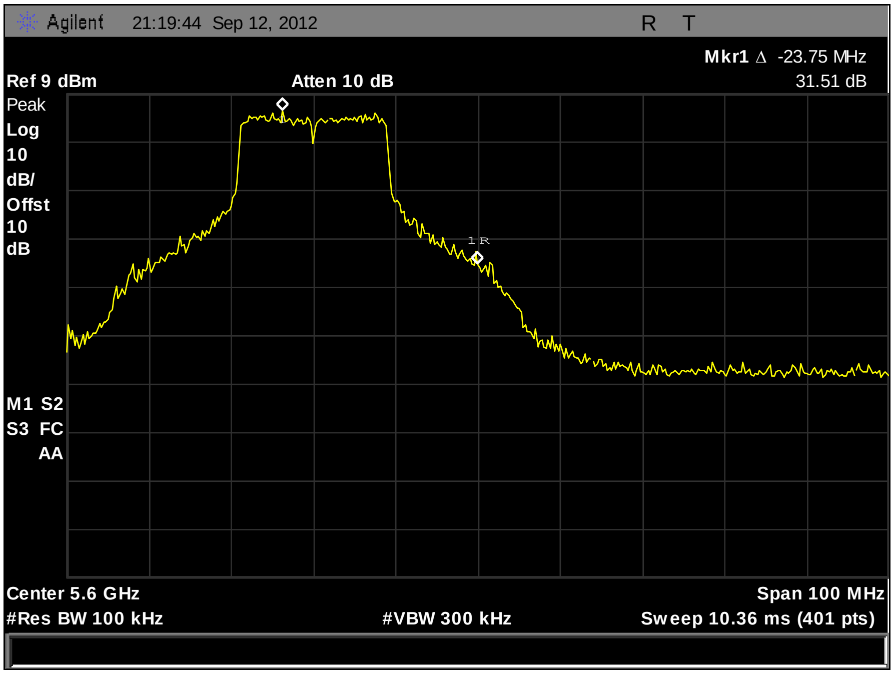
Plot 426. 20 dBc Notched Band, 802.11a, 5580 MHz, Port B



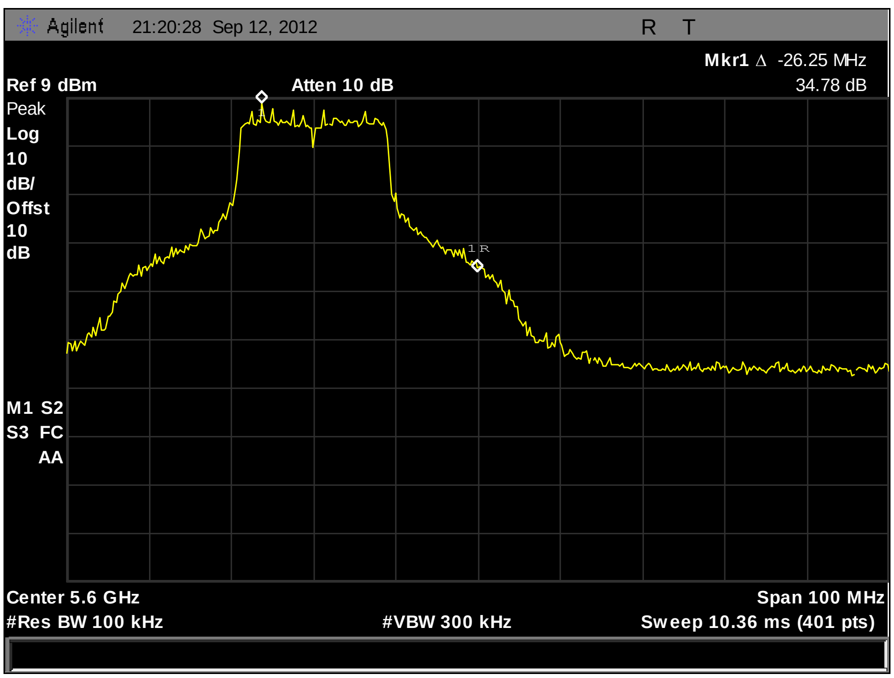
Plot 427. 20 dBc Notched Band, 802.11a, 5660 MHz, Port A



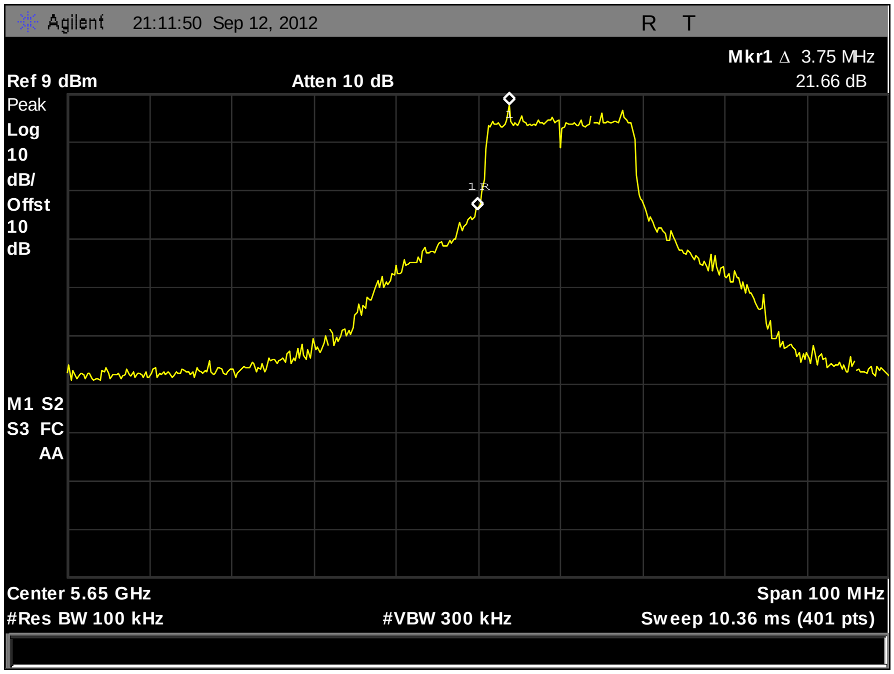
Plot 428. 20 dBc Notched Band, 802.11a, 5660 MHz, Port B



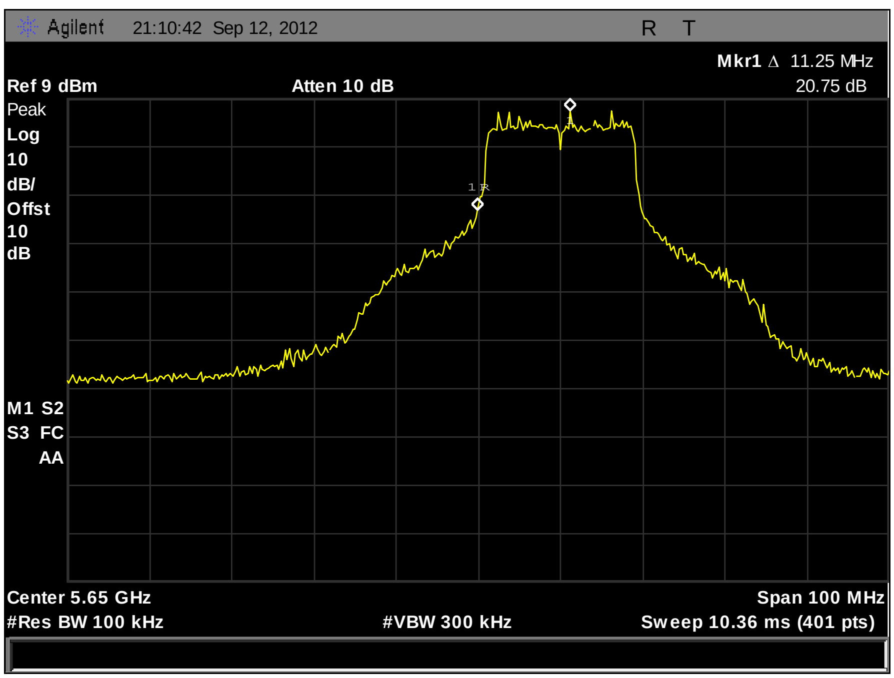
Plot 429. 20 dBc Notched Band, 802.11N 20 MHz, 5580 MHz, Port A



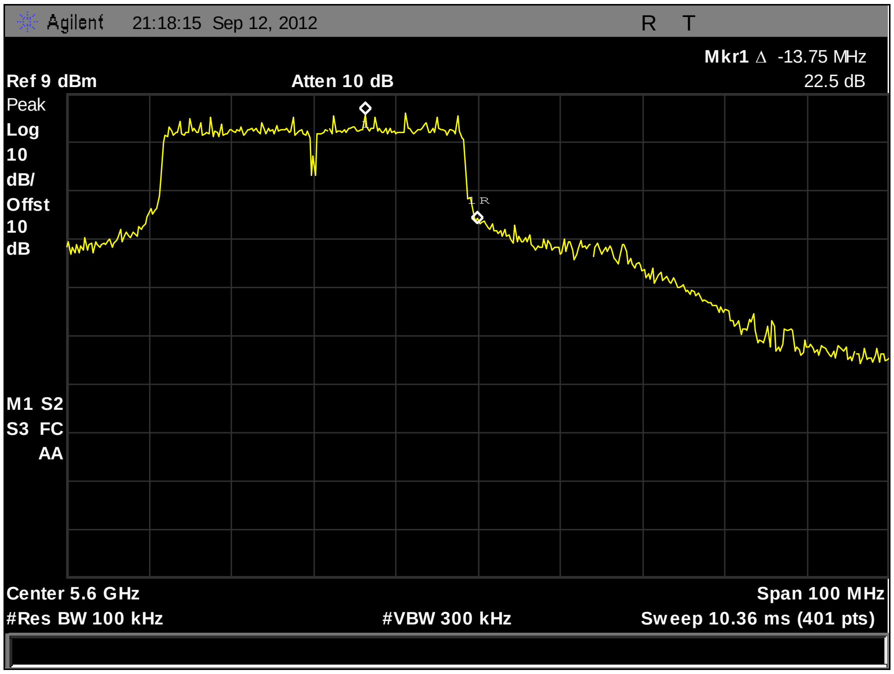
Plot 430. 20 dBc Notched Band, 802.11N 20 MHz, 5580 MHz, Port B



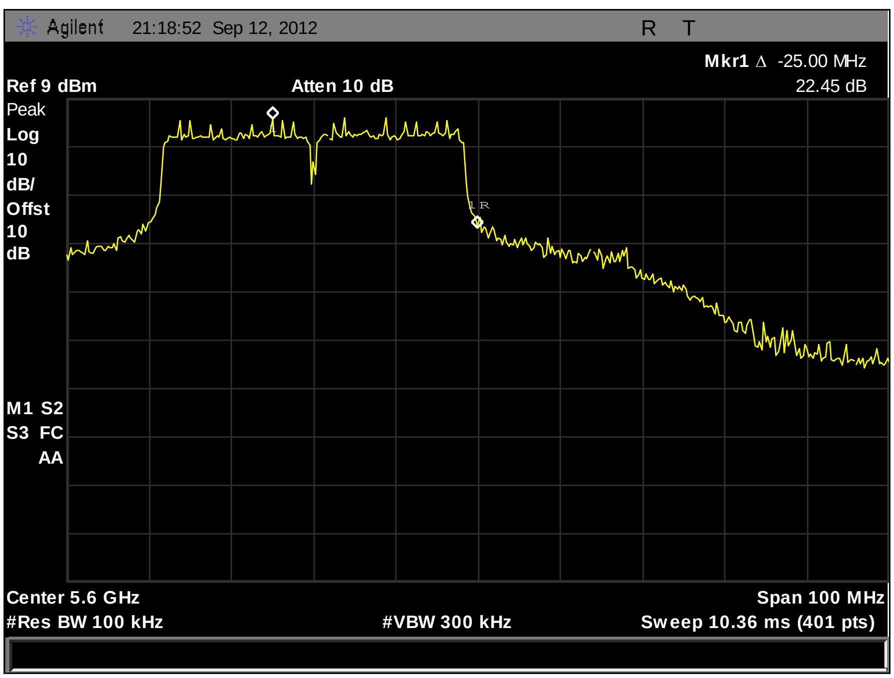
Plot 431. 20 dBc Notched Band, 802.11N 20 MHz, 5660 MHz, Port A



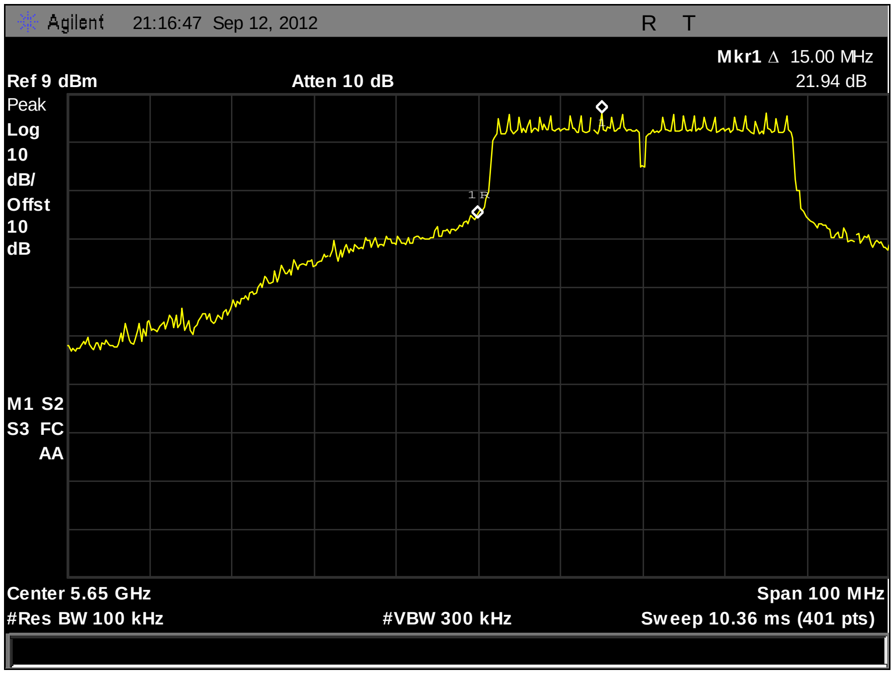
Plot 432. 20 dBc Notched Band, 802.11N 20 MHz, 5660 MHz, Port B



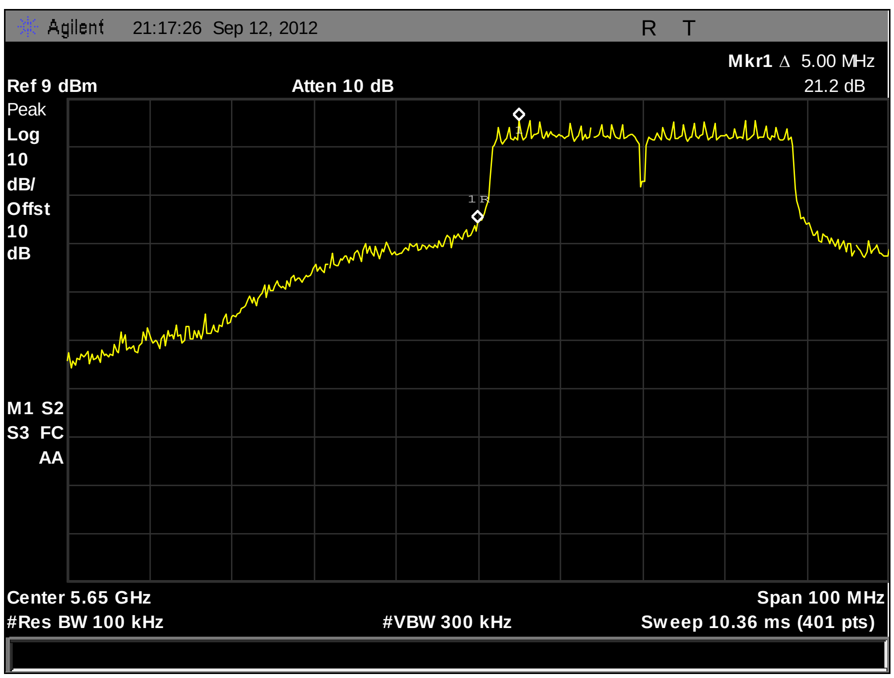
Plot 433. 20 dBc Notched Band, 802.11N 40 MHz, 5580 MHz, Port A



Plot 434. 20 dBc Notched Band, 802.11N 40 MHz, 5580 MHz, Port B



Plot 435. 20 dBc Notched Band, 802.11N 40 MHz, 5670 MHz, Port A



Plot 436. 20 dBc Notched Band, 802.11N 40 MHz, 5670 MHz, Port B

VI. DFS Test Procedure and Test Results

A. DFS Test Setup

1. A spectrum analyzer is used as a monitor to verify that the Unit Under Test (UUT) has vacated the Channel within the Channel Closing Transmission Time and Channel Move Time, and does not transmit on a Channel during the Non-Occupancy Period after the detection and subsequent Channel move. It is also used to monitor UUT transmissions during the Channel Availability Check Time.
2. The test setup, which consists of test equipment and equipment under test (EUT), is diagrammed in Figure 7 and pictured in Figure 7. Test Setup Diagram.

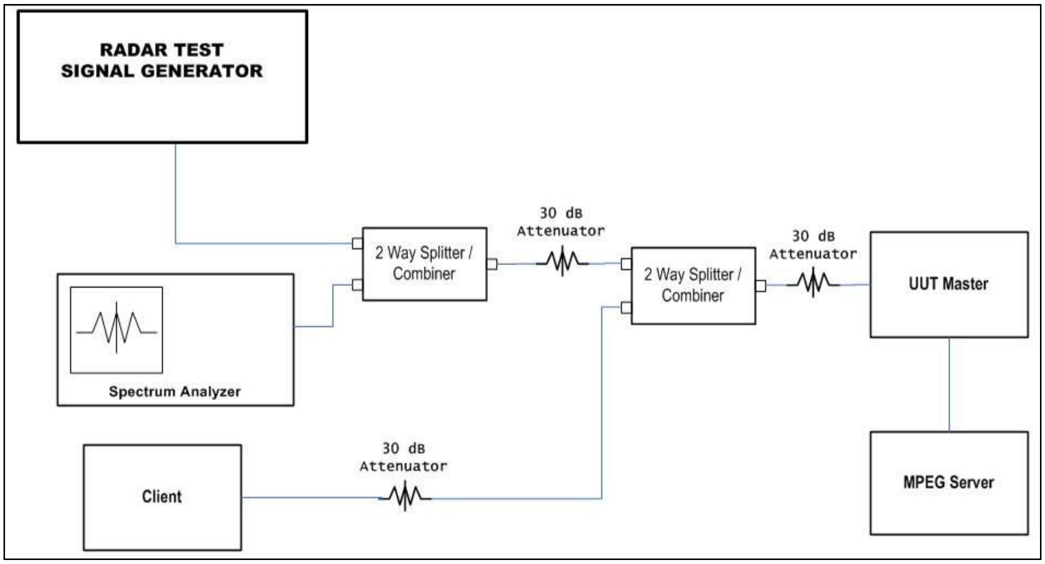


Figure 7. Test Setup Diagram

B. Description of Master Device

1. Operating Frequency Range – 5250-5350 MHz, 5470-5725 MHz
2. Modes of Operation – 802.11a/802.11n
3. Highest and Lowest EIRP – Highest: 30 dBm; Lowest: 23.3 dBm
4. List all antennas and associated gains –

   AirMax AMO-5G10 5GHz Omni MIMO Antennna
   Gain is 10

   PCTel SP4959 16XP90 4.9-5.9GHz MIMO Sector Antenna
   Gain is 16
5. List output power ranges – 13.3dBm – 19.782 dBm
6. List antenna impedance – 50 ohms
7. Antenna gain verification - Use antenna data sheet
8. State test file that is transmitted – 6 and ½ Magic Hours
9. Time for master to complete its power-on-cycle – 94 seconds

C. UNII Detection Bandwidth

Test Requirement(s): **§ 15.407** A minimum 80% detection rate is required across an EUT's 99% bandwidth.

Test Procedure: All UNII channels for this device have two channel bandwidths. Therefore, DFS testing was done at 20 MHz bandwidth at 5580 MHz and 40 MHz bandwidth at 5310 MHz.

A single burst of the short pulse radar type 1 is produced at 5580 and 5310 MHz, at the -63dBm test level. The UUT is set up as a standalone device (no associated client, and no data traffic).

A single radar burst is generated for a minimum of 10 trials, and the response of the UUT is recorded. The UUT must detect the radar waveform 90% or more of the time.

The radar frequency is increased in 1 MHz steps, repeating the above test sequence, until the detection rate falls below 90%. The highest frequency at which detection is greater than or equal to 90% is denoted F_H.

The radar frequency is decreased in 1 MHz steps, repeating the above test sequence, until the detection rate falls below 90%. The lowest frequency at which detection is greater than or equal to 90% is denoted F_L.

The U-NII Detection Bandwidth is calculated as follows:

$$\text{U-NII Detection Bandwidth} = F_H – F_L$$

UNII Detection Bandwidth was found to be greater than the 99% Power Bandwidth, so the test was truncated.

Test Engineer: Jeff Pratt

Test Date: 10/17/11

UNII Detection Bandwidth – Test Results

EUT Frequency- 5300MHz											
	DFS Detection Trials (1=Detection, 0= No Detection)										
Radar Frequency (MHz)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Detection Rate (%)**
5287	0	1	1	1	1	0	1	0	1	0	60
5288	1	1	1	1	1	1	1	1	1	1	100
5289	1	1	1	1	1	1	1	1	1	1	100
5290	1	1	1	1	1	1	1	1	1	1	100
5291	1	1	1	1	1	1	1	1	1	1	100
5292	1	1	1	1	1	1	1	1	1	1	100
5293	1	1	1	1	1	1	1	1	1	1	100
5294	1	1	1	1	1	1	1	1	1	1	100
5295	1	1	1	1	1	1	1	1	1	1	100
5296	1	1	1	1	1	1	1	1	1	1	100
5297	1	1	1	1	1	1	1	1	1	1	100
5298	1	1	1	1	1	1	1	1	1	1	100
5299	1	1	1	1	1	1	1	1	1	1	100
5300	1	1	1	1	1	1	1	1	1	1	100
5301	1	1	1	1	1	1	1	1	1	1	100
5302	1	1	1	1	1	1	1	1	1	1	100
5303	1	1	1	1	1	1	1	1	1	1	100
5304	1	1	1	1	1	1	1	1	1	1	100
5305	1	1	1	1	1	1	1	1	1	1	100
5306	1	1	1	1	1	1	1	1	1	1	100
5307	1	1	1	1	1	1	1	1	1	1	100
5308	1	1	1	1	1	1	1	1	1	1	100
5309	1	1	1	1	1	1	1	1	1	1	100
5310	1	1	1	1	1	1	1	1	1	1	100
5311	1	1	1	1	1	1	1	1	1	1	100
5312	1	1	1	1	1	1	1	1	1	1	100
5313	1	1	1	1	1	1	1	1	1	1	100
5314	1	1	1	1	1	1	1	1	1	1	100
5315	1	1	1	1	1	1	1	1	1	1	100
5316	1	1	1	1	1	1	1	1	1	1	100
5317	1	1	1	1	1	1	1	1	1	1	100
5318	1	1	1	1	1	1	1	1	1	1	100
5319	1	1	1	1	1	1	1	1	1	1	100
5320	1	1	1	1	1	1	1	1	1	1	100
5321	1	1	1	1	1	1	1	1	1	1	100
5322	1	1	1	1	1	1	1	1	1	1	100
5323	1	1	1	1	1	1	1	1	1	1	100
5324	1	1	1	1	1	1	1	1	1	1	100
Overall Detection Percentage											98.9%
Detection Bandwidth = f_h - f_l = 5324MHz-5287MHz = 37MHz											
EUT 99% Bandwidth = 36.12MHz											
OBW* 80% = 28.89MHz											

Table 29. UNII Detection Bandwidth, Test Results

D. Initial Channel Availability Check Time

Test Requirements: **§ 15.407** The Initial Channel Availability Check Time tests that the UUT does not emit beacon, control, or data signals on the test channel until the power-up sequence has been completed and the U-NII device has checked for radar waveforms, for one minute, on the test channel. This test does not use any of the radar waveforms and only needs to be performed once.

The UUT should not make any transmissions over the test channel, for at least 1 minute after completion of its power-on cycle.

Test Procedure: The U-NII device is powered on and instructed to operate at 5580 MHz At the same time the UUT is powered on, the spectrum analyzer is set to 5580MHz with a zero span and a 2.5 minute sweep time. The analyzer is triggered at the same time power is applied to the U-NII device.

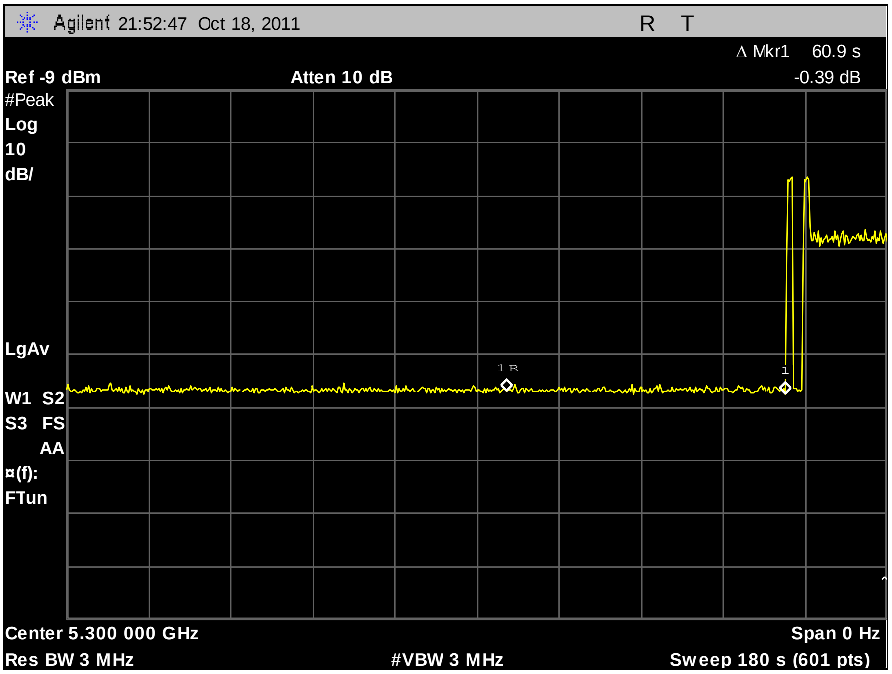
Test Results: The initial power up time of the EUT is indicated by marker 1R on Plot 437. Initial beacon/data transmission is indicated by marker 1.

The Equipment complies with § 15.407 Initial Channel Availability Check Time. Initial CAC time is 60.9s.

Test Engineer: Jeff Pratt

Test Date: 10/18/11

Initial Channel Availability Check Time – Plot



Plot 437. Initial Channel Availability Check Time

E. Radar Burst at the Beginning of Channel Availability Check Time

Test Requirements: **§ 15.407** A Radar Burst at the Beginning of the Channel Availability Check Time tests that the UUT does not emit beacon, control, or data signals on the test Channel if it has detected a radar burst during that time period until the power-up sequence has been completed and the U-NII device checks for Radar Waveforms for one minute on the test Channel. The steps below define the procedure to verify successful radar detection on the selected Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar Burst with a level equal to the DFS Detection Threshold + 1 dB (-63dBm) occurs at the beginning of the Channel Availability Check Time.

Test Procedure: The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence. The Channel Availability Check Time commences at instant T1 and will end no sooner than T1 + 60 seconds.

A single Burst of short pulse radar type 1, at -63 dBm, will commence within a 6 second window starting at T1.

Visual indication of the UUT of successful detection of the radar Burst will be recorded and reported. Observation of transmission at 5580MHz will continue for 2.5 minutes after the radar Burst has been generated.

Verify that during the 2.5 minute measurement window, no UUT transmissions occur at 5580MHz.

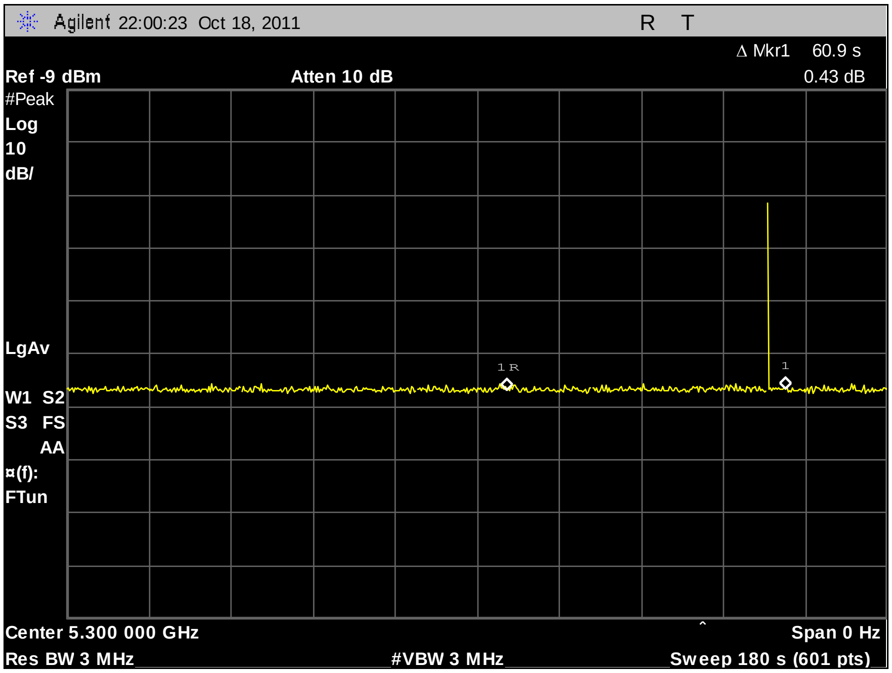
Test Results Plot 438 below indicates that there were no UUT transmissions during the 2.5 minute measurement window. Marker 1R indicates completion of the power-on cycle. Marker 1 indicates the end of the 60-second channel availability check time.

The equipment complies with § 15.407 Radar Burst at the Beginning of the Channel Availability Check Time.

Test Engineer: Jeff Pratt

Test Date: 10/18/11

Radar Burst at the Beginning of Channel Availability Check Time – Plot



Plot 438. Radar Burst at the Beginning of CACT

F. Radar Burst at the End of Channel Availability Check Time

Test Requirements: **§ 15.407** A Radar Burst at the End of the Channel Availability Check Time tests that the UUT does not emit beacon, control, or data signals on the test Channel if it has detected a radar burst during that time period until the power-up sequence has been completed and the U-NII device checks for Radar Waveforms for one minute on the test Channel. The steps below define the procedure to verify successful radar detection on the selected Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar Burst with a level equal to the DFS Detection Threshold + 1 dB (-63dBm) occurs at the end of the Channel Availability Check Time.

Test Procedure: The steps below define the procedure to verify successful radar detection on the selected Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar Burst with a level equal to the DFS Detection Threshold + 1 dB (-63dBm) occurs at the end of the Channel Availability Check Time.

The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence. The Channel Availability Check Time commences at instant T1 and will end no sooner than T1 + 60 seconds.

A single Burst of short pulse of radar type 1 at -63 dBm will commence within a 6 second window starting at T1+ 54 seconds.

Visual indication on the UUT of successful detection of the radar Burst will be recorded and reported. Observation of emissions at 5580 MHz will continue for 2.5 minutes after the radar Burst has been generated.

Verify that during the 2.5 minute measurement window no UUT transmissions occurred at 5580MHz.

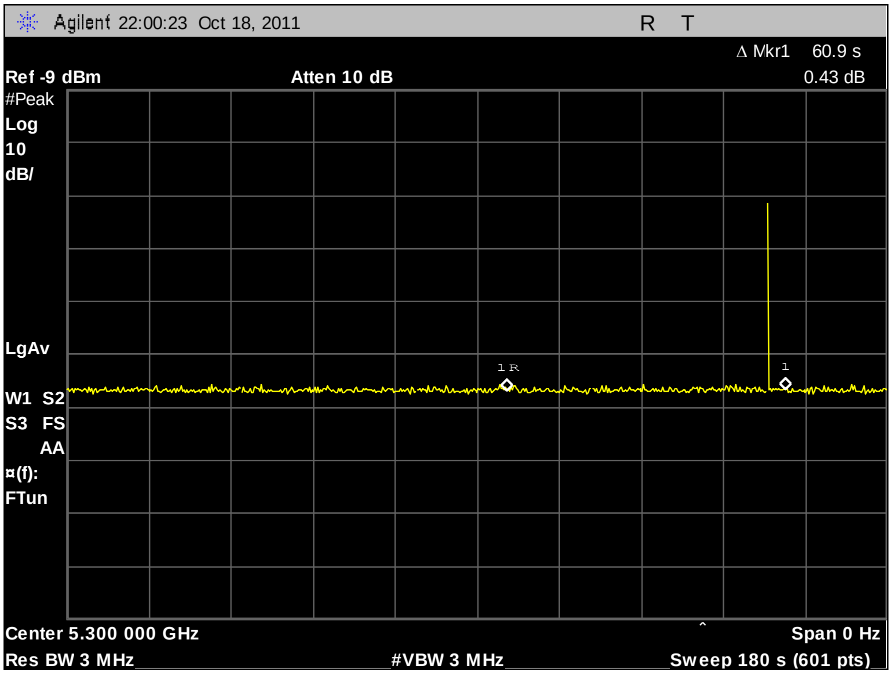
Test Results: Plot 439 indicates that no UUT transmissions occurred during the 2.5 minute measurement window. Marker 1R indicates completion of the power-on cycle. Marker 1 indicates the end of the 60-second channel availability check time.

The equipment complies with § 15.407 Radar Burst at the End of the Channel Availability Check Time.

Test Engineer: Jeff Pratt

Test Date: 10/18/11

Radar Burst at the End of Channel Availability Check Time – Plot



Plot 439. Radar Burst at the End of CACT

G. In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time, and Non-Occupancy Period

Test Requirements: **§ 15.407** (Refer to DFS Response Requirement Values table in section III-A of this report.) The UUT shall continuously monitor for radar transmissions in the operating test channel. When a radar burst occurs in the test channel, it has 10 seconds to move to another channel. This 10 second window is termed Channel Move Time (CMT).

When a radar burst occurs, the UUT has 200 milliseconds, plus an aggregate of 60 milliseconds, to cease transmission in the operating test channel. This 200 ms + 60 ms requirement is termed Channel Closing Transmission Time (CCT).

After radar burst and subsequent move to another channel, the UUT shall not resume transmission, on the channel it moved from, for a period of 30 minutes. This requirement is termed Non-Occupancy Period (NOP).

Test Procedure: These tests define how the following DFS parameters are verified during In-Service Monitoring: Channel Closing Transmission Time, Channel Move Time, and Non-Occupancy Period.

The steps below define the procedure to determine the above mentioned parameters when a radar Burst with a level equal to the DFS Detection Threshold + 1dB (-63dBm) is generated on the Operating Channel of the U-NII device.

A U-NII device operating as a Client Device will associate with the UUT (Master) at 5580MHz. Stream the MPEG test file from the Master Device to the Client Device on the selected Channel for the entire period of the test.

At time T0 the Radar Waveform generator sends a Burst of pulses for each of the radar types at -63dBm.

Observe the transmissions of the UUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). Compare the Channel Move Time and Channel Closing Transmission Time results to the limits defined in the *DFS Response Requirement Values table*.

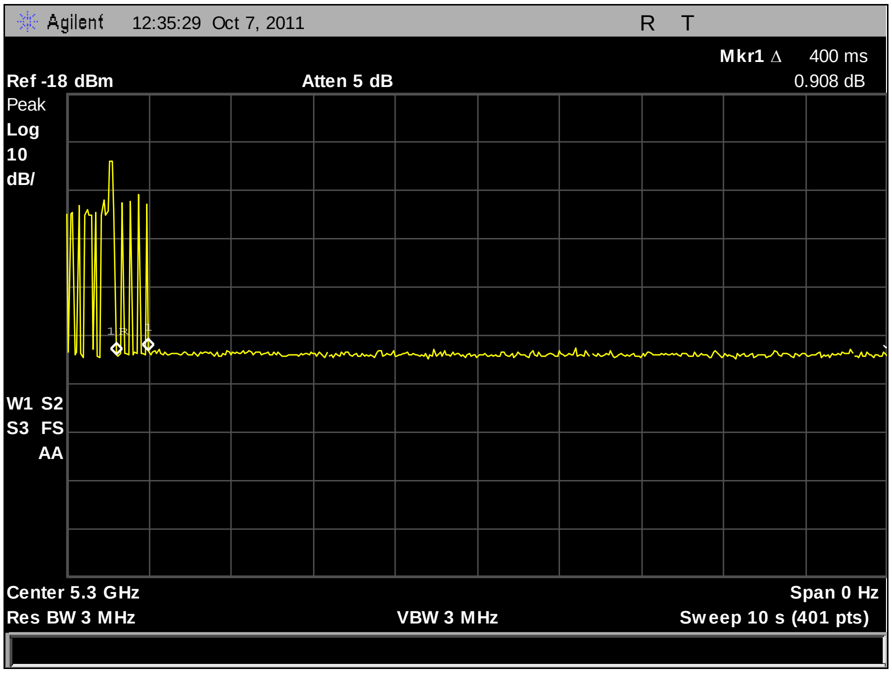
Test Results: Plot 440 indicates cessation of transmission for more than 10 seconds after a radar burst (marker 1). Plot 442 depicts the 200 ms closing time window (marker 1), and Plot 443 depicts post 200 ms aggregate transmissions. Finally, Plot 444 shows that transmissions have not resumed within 30 minutes of channel move.

The UUT complies with § 15.407 In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time, and Non-Occupancy Period. Channel move time is 400ms. Channel closing transmission time is 30ms. Non-occupancy period is greater than 30 minutes.

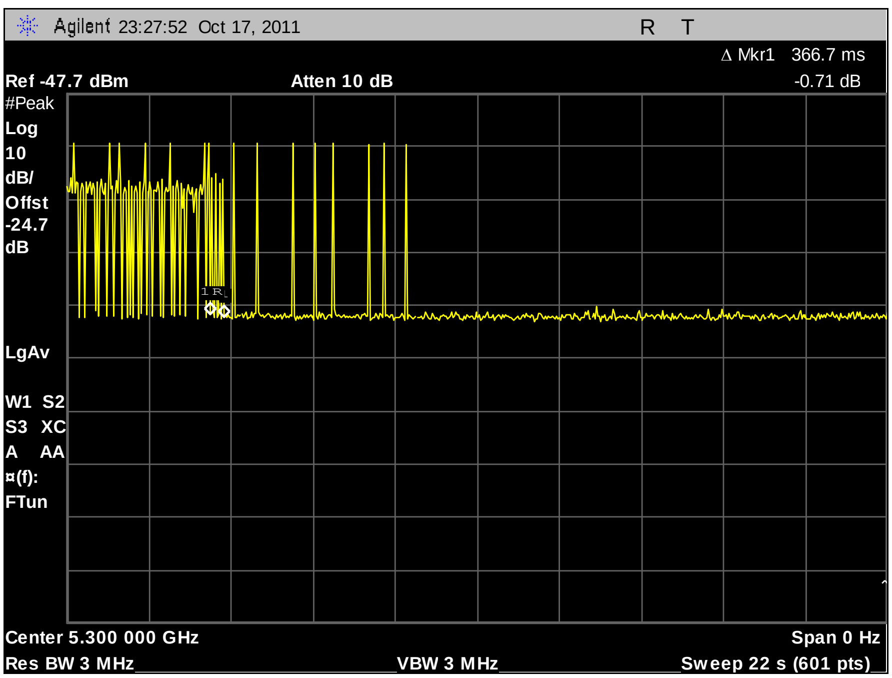
Test Engineer: Jeff Pratt

Test Date: 10/17/11

In-Service Monitoring for Channel Move Time – Plots

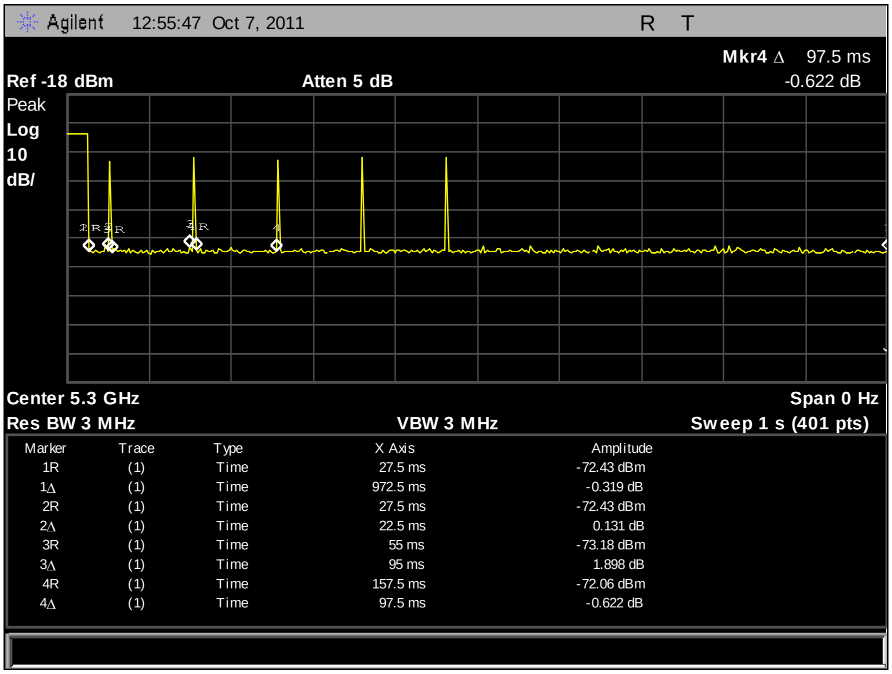


Plot 440. Channel Move Time

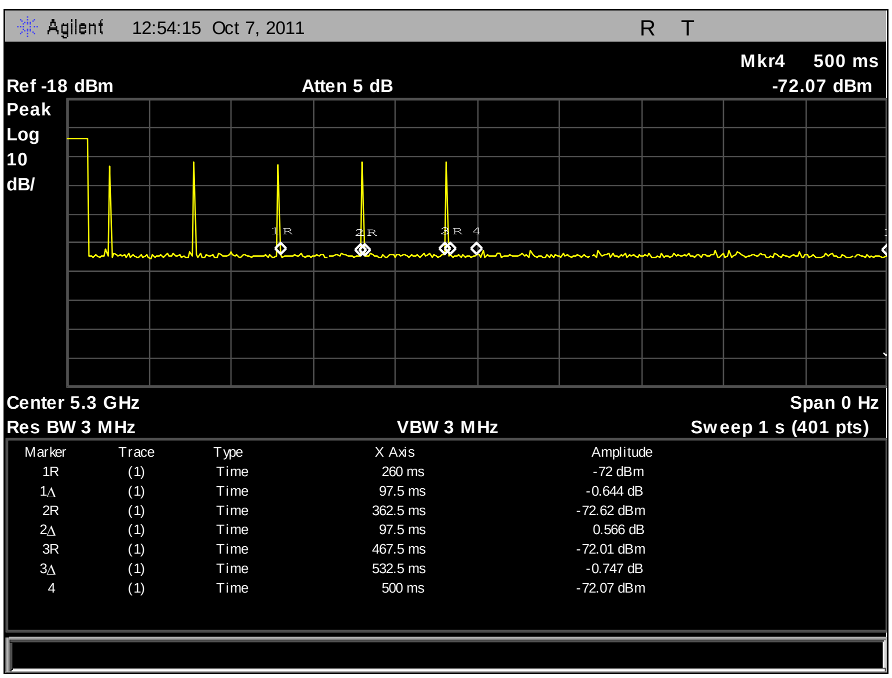


Plot 441. Channel Move Time, Bin 5

In-Service Monitoring for Channel Closing Transmission Time – Plots

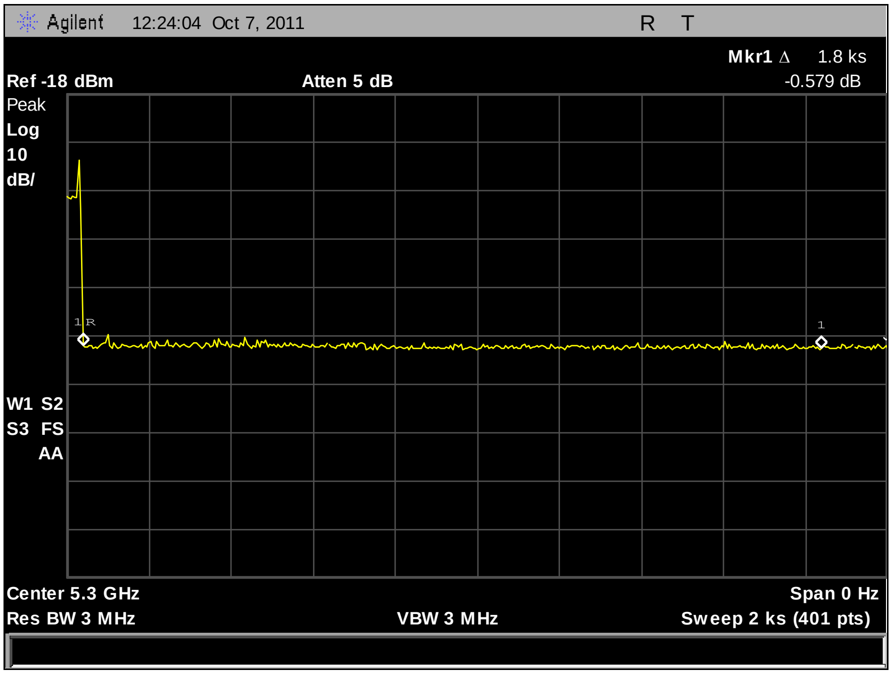


Plot 442. Channel Closing Transmission Time, 1



Plot 443. Channel Closing Transmission Time, 2

In-Service Monitoring for Non-Occupancy Period – Plot



Plot 444. Non-Occupancy Period

H. Statistical Performance Check

Test Requirements: **§ 15.407** During In-Service Monitoring, the EUT requires a minimum percentage of successful radar detections from all required radar waveforms at a level equal to the DFS Detection Threshold + 1dB.

Test Procedure: Stream the MPEG test file from the Master Device to the Client Device on the selected Channel for the entire period of the test. The Radar Waveform generator sends the individual waveform for each of the radar types 1-6 at -63dbm. Statistical data is gathered to determine the ability of the device to detect the radar test waveforms. The device can utilize a test mode to demonstrate when detection occurs to prevent the need to reset the device between trial runs. The percentage of successful detection is calculated by:

$$\frac{TotalWaveformDetections}{TotalWaveformTrials} \times 100$$

The Minimum number of trails, minimum percentage of successful detection and the average minimum percentage of successful detection are found in the Radar Test Waveforms section.

Test Results: Statistical performance for radar types 1-4 are tabulated in Tables 28-31. Detection probability is 86.65%.

The equipment complies with § 15.407 Statistical Performance Check.

Test Engineer: Jeff Pratt

Test Date: 10/17/11

Radar Type	Trial #	Pulses per Burst	Pulse Width (μsec)	PRI (μsec)	Detection 1 = Yes, 0 = No
1	1	18	1	1428	1
	2	18	1	1428	1
	3	18	1	1428	1
	4	18	1	1428	1
	5	18	1	1428	0
	6	18	1	1428	1
	7	18	1	1428	0
	8	18	1	1428	1
	9	18	1	1428	1
	10	18	1	1428	1
	11	18	1	1428	1
	12	18	1	1428	1
	13	18	1	1428	1
	14	18	1	1428	1
	15	18	1	1428	1
	16	18	1	1428	1
	17	18	1	1428	1
	18	18	1	1428	1
	19	18	1	1428	1
	20	18	1	1428	1
	21	18	1	1428	1
	22	18	1	1428	1
	23	18	1	1428	1
	24	18	1	1428	1
	25	18	1	1428	1
	26	18	1	1428	1
	27	18	1	1428	1
	28	18	1	1428	0
	29	18	1	1428	0
	30	18	1	1428	1
	Detection Percentage				**86.7% (> 60%)**

Table 30. Statistical Performance Check – Radar Type 1

Radar Type	Trial #	Pulse Width 1 to 5 µsec	PRI 150 to 230 µsec	Pulses per Burst 23 to 29	Detection 1 = Yes, 0 = No
2	1	2.1	169	29	1
	2	4.4	197	27	1
	3	3.2	167	23	0
	4	3.3	154	26	1
	5	3.5	225	23	1
	6	1.8	218	26	1
	7	4.9	203	28	0
	8	3.6	214	27	1
	9	1.9	160	26	1
	10	3.7	192	29	0
	11	3.5	153	25	1
	12	4.2	225	29	1
	13	2.4	157	25	1
	14	3.9	223	25	1
	15	4.3	157	28	1
	16	3.2	165	27	0
	17	4.4	169	28	1
	18	3	194	29	1
	19	3.2	189	25	0
	20	1.1	155	28	1
	21	4	177	28	1
	22	2.1	213	24	1
	23	1	228	29	1
	24	2.5	192	28	1
	25	4	187	24	1
	26	3.1	177	29	1
	27	2.3	199	23	1
	28	2.4	218	24	1
	29	4.4	167	26	1
	30	1	226	29	1
	Detection Percentage				**83.3% (> 60%)**

Table 31. Statistical Performance Check – Radar Type 2

Radar Type	Trial #	Pulse Width 6 to 10 µsec	PRI 200 to 500 µsec	Pulses per Burst 16 to 18	Detection 1 = Yes, 0 = No
3	1	9	328	18	1
	2	6.4	420	17	1
	3	6.3	283	18	1
	4	6.7	408	18	1
	5	5.8	253	18	1
	6	5.5	458	17	1
	7	5.4	415	17	0
	8	8	372	16	1
	9	5.8	277	18	1
	10	5.7	463	17	0
	11	8.8	468	18	0
	12	5.6	297	16	1
	13	9.3	364	16	1
	14	9.5	438	16	1
	15	9.2	420	16	1
	16	5.2	463	16	0
	17	7.3	267	18	1
	18	8.4	446	17	0
	19	9.3	302	17	1
	20	6.4	398	16	1
	21	5.8	402	17	1
	22	8.6	261	17	1
	23	9.3	409	17	1
	24	7.9	281	17	1
	25	6	321	17	1
	26	9	435	18	1
	27	9.3	258	17	1
	28	5.9	378	16	1
	29	9.2	482	16	1
	30	7.4	271	17	1
	Detection Percentage				83.3% (> 60%)

Table 32. Statistical Performance Check – Radar Type 3

Radar Type	Trial #	Pulse Width 11 to 20 µsec	PRI 200 to 500 µsec	Pulses per Burst 12 to 16	Detection 1 = Yes, 0 = No
4	1	18.6	250	16	1
	2	19.4	375	16	1
	3	12.9	436	13	1
	4	11	495	16	1
	5	11.6	257	15	1
	6	17	336	15	1
	7	11.1	472	14	0
	8	12.5	275	16	1
	9	15	461	15	1
	10	11.2	322	13	1
	11	13	293	16	1
	12	17.1	496	14	1
	13	19.1	340	14	1
	14	19.7	329	13	1
	15	15.5	379	14	1
	16	19.2	405	14	1
	17	19.9	290	16	1
	18	10.2	325	14	1
	19	13.4	343	13	1
	20	14.3	439	14	1
	21	15.2	410	16	1
	22	13.7	260	13	1
	23	16.8	269	16	0
	24	15.2	496	15	1
	25	16	408	14	1
	26	18.4	489	14	1
	27	14.6	455	12	1
	28	14.4	450	14	1
	29	14.3	477	13	1
	30	10.9	281	16	1
	Detection Percentage				**93.3% (> 60%)**

Table 33. Statistical Performance Check – Radar Type 4

Radar Type	**Trial #**	**Filename***	**Detection 1 = Yes, 0 = No**
5	1	bin5set101trial 1	1
	2	bin5set101trial 2	1
	3	bin5set101trial 3	1
	4	bin5set101trial 4	1
	5	bin5set101trial 5	1
	6	bin5set101trial 6	1
	7	bin5set101trial 7	1
	8	bin5set101trial 8	1
	9	bin5set101trial 9	1
	10	bin5set101trial 10	1
	11	bin5set101trial 11	1
	12	bin5set101trial 12	1
	13	bin5set101trial 13	1
	14	bin5set101trial 14	1
	15	bin5set101trial 15	1
	16	bin5set101trial 16	1
	17	bin5set101trial 17	1
	18	bin5set101trial 18	0
	19	bin5set101trial 19	0
	20	bin5set101trial 20	1
	21	bin5set101trial 21	1
	22	bin5set101trial 22	1
	23	bin5set101trial 23	0
	24	bin5set101trial 24	1
	25	bin5set101trial 25	1
	26	bin5set101trial 26	1
	27	bin5set101trial 27	1
	28	bin5set101trial 28	1
	29	bin5set101trial 29	1
	30	bin5set101trial 30	1
	Detection Percentage		**90.0% (> 80%)**

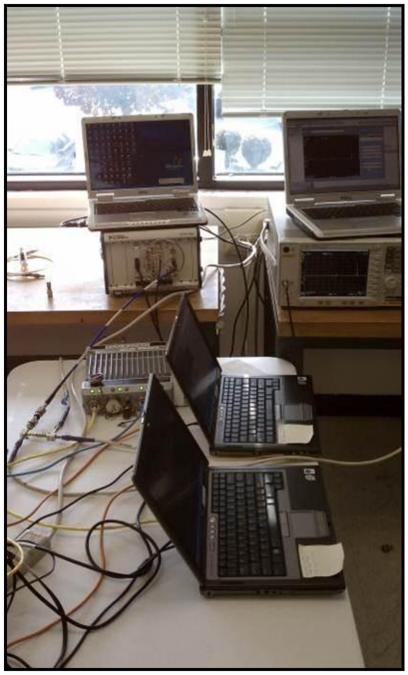
Table 34. Statistical Performance Check – Radar Type 5

Note: See Appendix

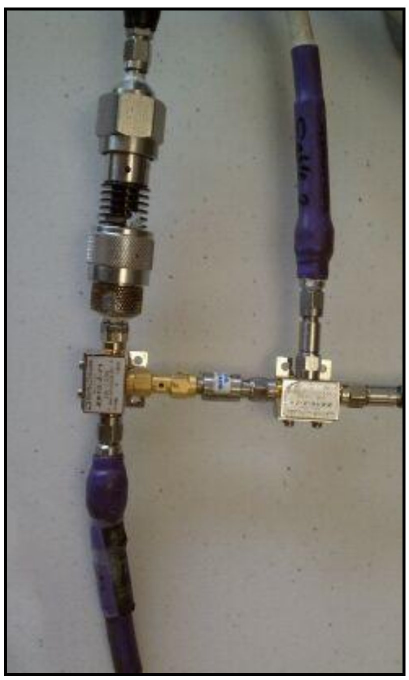
Radar Type	Trial #	Frequency (MHz)	Pulses/Hop	Pulse Width (μsec)	PRI (μsec)	Detection 1 = Yes, 0 = No
6	1	5300	9	1	333	1
	2	5300	9	1	333	1
	3	5300	9	1	333	1
	4	5300	9	1	333	1
	5	5300	9	1	333	1
	6	5300	9	1	333	1
	7	5300	9	1	333	1
	8	5300	9	1	333	1
	9	5300	9	1	333	1
	10	5300	9	1	333	1
	11	5300	9	1	333	1
	12	5300	9	1	333	1
	13	5300	9	1	333	1
	14	5300	9	1	333	1
	15	5300	9	1	333	1
	16	5300	9	1	333	1
	17	5300	9	1	333	0
	18	5300	9	1	333	1
	19	5300	9	1	333	1
	20	5300	9	1	333	1
	21	5300	9	1	333	1
	22	5300	9	1	333	1
	23	5300	9	1	333	1
	24	5300	9	1	333	1
	25	5300	9	1	333	1
	26	5300	9	1	333	1
	27	5300	9	1	333	1
	28	5300	9	1	333	1
	29	5300	9	1	333	1
	30	5300	9	1	333	1
	Detection Percentage					**96.7% (> 60%)**

Table 35. Statistical Performance Check – Radar Type 6

I. DFS Setup



Photograph 4. DFS Test Setup



Photograph 5. DFS Cable Setup

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4771	SPECTRUM ANALYZER	AGILENT	E4446A	6/25/2011	6/25/2012
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4612	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	10/27/2010	10/27/2011
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	7/19/2011	7/19/2012
1T4745	ANTENNA, HORN	ETS-LINDGREN	3116	10/4/2011	10/4/2012
1T4751	ANTENNA – BILOG	SUNOL SCIENCES	JB6	11/3/2010	11/3/2011
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	6/14/2011	6/14/2012
1T4565	LISN (24 AMP)	SOLAR ELECTRONICS	9252-50-R-24-BNC	10/28/2010	10/28/2011
1T4752	PRE-AMPLIFIER	MITEQ	JS44-18004000-35-8P	SEE NOTE	
1T4394	ISOLATION TRANSFORMER	TOPAZ	91005-31	SEE NOTE	
1T4563	LISN (24 AMP)	SOLAR ELECTRONICS	9252-50-R-24-BNC	10/6/2010	10/6/2011
1T2109	RECEIVER, EMI, RECEIVER SECTION	HEWLETT PACKARD	85462A	1/7/2011	1/7/2012
1T2108	RECEIVER, EMI, FILTER SECTION	HEWLETT PACKARD	85460A	1/7/2011	1/7/2012
1T4728	PROGRAMMABLE AC POWER SOURCE	QUADTECH	31010	SEE NOTE	
1T4502	COMB GENERATOR	COM-POWER	CGC-255	10/6/2010	10/6/2011
1T4634	THERMO/HYGRO/BAROMETER	CONTROL COMPANY	02-401	3/11/2010	3/11/2012
1T4758	THERMO-HYGROMETER	CONTROL COMPANY	4040	5/21/2010	5/21/2012
1T4568	RADIATING NOISE SOURCE	MET LABORATORIES	N/A	SEE NOTE	

Table 36. Test Equipment List

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

V. Certification & User's Manual Information

Certification & User's Manual Information

A. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[1] *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer*, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

Certification & User's Manual Information

Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Verification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

> Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

> Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
>
> – Reorient or relocate the receiving antenna.
>
> – Increase the separation between the equipment and receiver.
>
> – Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
>
> – Consult the dealer or an experienced radio/TV technician for help.

ICES-003 Procedural & Labeling Requirements

From the Industry Canada Electromagnetic Compatibility Advisory Bulletin entitled, "Implementation and Interpretation of the Interference-Causing Equipment Standard for Digital Apparatus, ICES-003" (EMCAB-3, Issue 2, July 1995):

> "At present, CISPR 22: 2002 and ICES technical requirements are essentially equivalent. Therefore, if you have CISPR 22: 2002 approval by meeting CISPR Publication 22, the only additional requirements are: to attach a note to the report of the test results for compliance, indicating that these results are deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations; to maintain these records on file for the requisite five year period; and to provide the device with a notice of compliance in accordance with ICES-003."

Procedural Requirements:

According to Industry Canada's Interference Causing Equipment Standard for Digital Apparatus ICES-003 Issue 4, February 2004:

Section 6.1: A record of the measurements and results, showing the date that the measurements were completed, shall be retained by the manufacturer or importer for a period of at least five years from the date shown in the record and made available for examination on the request of the Minister.

Section 6.2: A written notice indicating compliance must accompany each unit of digital apparatus to the end user. The notice shall be in the form of a label that is affixed to the apparatus. Where because of insufficient space or other constraints it is not feasible to affix a label to the apparatus, the notice may be in the form of a statement in the user's manual.

Labeling Requirements:

The suggested text for the notice, in English and in French, is provided below, from the Annex of ICES-003:

This Class [[2]] digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe [[1]] est conforme à la norme NMB-003 du Canada.

[2] Insert either A or B but not both as appropriate for the equipment requirements.

Appendix

Random DFS waveform parameters (NewBin5) 01-Oct-2011 08:53:11

Waveform Num = 1
Num of Bursts = 18
Burst Interval (us) = 666667.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	598742	1	12.0	51	1266	0	0	598742	0	666666
2	725761	3	15.0	63	1393	1759	1617	1325769	666667	1333333
3	266922	3	5.0	51	1321	1794	1269	1597460	1333334	2000000
4	577038	1	9.0	93	1132	0	0	2178882	2000001	2666667
5	519984	3	7.0	54	1336	1258	1404	2699998	2666668	3333334
6	705478	1	20.0	77	1840	0	0	3409474	3333335	4000001
7	736866	1	10.0	63	1469	0	0	4148180	4000002	4666668
8	1065566	2	16.0	79	1294	1303	0	5215215	4666669	5333335
9	265178	3	20.0	60	1076	1318	1962	5482990	5333336	6000002
10	942598	2	16.0	50	1305	1250	0	6429944	6000003	6666669
11	258229	3	11.0	50	1777	1808	1580	6690728	6666670	7333336
12	1052341	1	18.0	88	1970	0	0	7748234	7333337	8000003
13	465257	1	18.0	68	1145	0	0	8215461	8000004	8666670
14	479238	2	17.0	75	1354	1443	0	8695844	8666671	9333337
15	1191420	3	7.0	60	1913	1400	1790	9890061	9333338	10000004
16	342917	3	14.0	83	1437	1759	1843	10238081	10000005	10666671
17	751169	3	6.0	81	1348	1142	1740	10994289	10666672	11333338
18	382319	1	18.0	66	1301	0	0	11380838	11333339	12000005

Total number of pulses in waveform = 37

Waveform Num = 2
Num of Bursts = 19

Burst Interval (us) = 631579.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	271686	2	18.0	68	1792	1132	0	271686	0	631578
2	938855	2	17.0	88	1605	1780	0	1213465	631579	1263157
3	260796	3	11.0	77	1932	1235	1692	1477646	1263158	1894736
4	671791	1	8.0	75	1324	0	0	2154296	1894737	2526315
5	696471	2	8.0	52	1804	1412	0	2852091	2526316	3157894
6	909064	2	18.0	92	1071	1661	0	3764371	3157895	3789473
7	124846	3	9.0	60	1241	1247	1117	3891949	3789474	4421052
8	653956	3	14.0	91	1914	1515	1421	4549510	4421053	5052631
9	618129	2	13.0	80	1119	1203	0	5172489	5052632	5684210
10	936481	3	6.0	88	1789	1154	1972	6111292	5684211	6315789
11	632001	3	15.0	100	1110	1036	1595	6748208	6315790	6947368
12	481521	3	7.0	64	1054	1393	1857	7233470	6947369	7578947
13	928317	1	11.0	60	1830	0	0	8166091	7578948	8210526
14	396724	3	8.0	70	1479	1479	1358	8564645	8210527	8842105
15	591021	1	9.0	93	1665	0	0	9159982	8842106	9473684
16	874676	2	7.0	66	1448	1334	0	10036323	9473685	10105263
17	459132	3	15.0	82	1149	1930	1414	10498237	10105264	10736842
18	479510	2	15.0	79	1244	1561	0	10982240	10736843	11368421
19	757872	1	17.0	73	1700	0	0	11742917	11368422	12000000

Total number of pulses in waveform = 42

Waveform Num = 3
Num of Bursts = 16
Burst Interval (us) = 750000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	51833	1	5.0	93	1660	0	0	51833	0	749999
2	1393298	3	7.0	95	1575	1781	1513	1446791	750000	1499999
3	507424	3	19.0	69	1716	1300	1322	1959084	1500000	2249999
4	474211	1	11.0	60	1292	0	0	2437633	2250000	2999999
5	843636	1	17.0	63	1029	0	0	3282561	3000000	3749999
6	847104	2	5.0	52	1276	1001	0	4130694	3750000	4499999
7	393868	3	15.0	97	1745	1450	1912	4526839	4500000	5249999
8	1013778	3	14.0	53	1044	1804	1827	5545724	5250000	5999999
9	1151842	1	7.0	54	1636	0	0	6702241	6000000	6749999
10	739055	1	10.0	99	1030	0	0	7442932	6750000	7499999
11	404701	1	12.0	90	1479	0	0	7848663	7500000	8249999
12	939713	2	8.0	59	1804	1675	0	8789855	8250000	8999999
13	519222	3	5.0	72	1071	1949	1726	9312556	9000000	9749999
14	479244	1	6.0	78	1595	0	0	9796546	9750000	10499999
15	1433924	2	12.0	68	1540	1533	0	11232065	10500000	11249999
16	594518	3	19.0	81	1210	1817	1723	11829656	11250000	11999999

Total number of pulses in waveform = 31

Waveform Num = 4
Num of Bursts = 18
Burst Interval (us) = 666667.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	518400	3	15.0	84	1107	1462	1823	518400	0	666666
2	485873	3	17.0	79	1056	1554	1895	1008665	666667	1333333
3	525685	2	17.0	87	1702	1165	0	1538855	1333334	2000000

4	984561	1	6.0	97	1567	0	0	2526283	2000001	2666667
5	570640	3	18.0	87	1332	1234	1029	3098490	2666668	3333334
6	755319	2	12.0	97	1558	1269	0	3857404	3333335	4000001
7	159863	2	20.0	68	1561	1398	0	4020094	4000002	4666668
8	711917	2	12.0	78	1811	1222	0	4734970	4666669	5333335
9	859154	3	13.0	73	1911	1785	1547	5597157	5333336	6000002
10	442641	1	17.0	64	1616	0	0	6045041	6000003	6666669
11	969110	3	18.0	69	1495	1532	1323	7015767	6666670	7333336
12	788801	3	19.0	84	1428	1623	1550	7808918	7333337	8000003
13	404504	2	15.0	92	1123	1014	0	8218023	8000004	8666670
14	939769	2	12.0	70	1976	1834	0	9159929	8666671	9333337
15	522648	1	7.0	79	1804	0	0	9686387	9333338	10000004
16	629264	3	11.0	79	1334	1090	1827	10317455	10000005	10666671
17	589912	3	9.0	56	1353	1748	1301	10911618	10666672	11333338
18	1047146	2	15.0	61	1946	1044	0	11963166	11333339	12000005

Total number of pulses in waveform = 41

Waveform Num =   5
Num of Bursts = 18
Burst Interval (us) =   666667.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	571034	2	6.0	78	1799	1685	0	571034	0	666666
2	667971	1	16.0	53	1640	0	0	1242489	666667	1333333
3	96498	3	7.0	69	1411	1458	1359	1340627	1333334	2000000
4	734818	3	12.0	80	1827	1554	1315	2079673	2000001	2666667
5	759739	1	12.0	80	1471	0	0	2844108	2666668	3333334

6	817251	2	14.0	95	1924	1666	0	3662830	3333335	4000001
7	395395	2	15.0	71	1657	1589	0	4061815	4000002	4666668
8	1095869	3	7.0	83	1978	1814	1570	5160930	4666669	5333335
9	662120	1	5.0	85	1315	0	0	5828412	5333336	6000002
10	244698	1	18.0	66	1817	0	0	6074425	6000003	6666669
11	1089593	2	5.0	51	1607	1082	0	7165835	6666670	7333336
12	547032	1	9.0	55	1260	0	0	7715556	7333337	8000003
13	705845	3	10.0	61	1312	1872	1290	8422661	8000004	8666670
14	458317	1	18.0	94	1526	0	0	8885452	8666671	9333337
15	988167	3	17.0	65	1300	1699	1373	9875145	9333338	10000004
16	495929	1	13.0	95	1379	0	0	10375446	10000005	10666671
17	479399	3	16.0	78	1385	1770	1422	10856224	10666672	11333338
18	521409	2	11.0	59	1425	1047	0	11382210	11333339	12000005

Total number of pulses in waveform = 35

Waveform Num = 6
Num of Bursts = 16
Burst Interval (us) = 750000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	214868	2	19.0	94	1841	1680	0	214868	0	749999
2	874077	3	14.0	78	1175	1207	1394	1092466	750000	1499999
3	606762	3	7.0	99	1286	1561	1638	1703004	1500000	2249999
4	1279766	2	15.0	100	1074	1359	0	2987255	2250000	2999999
5	361899	2	13.0	94	1746	1579	0	3351587	3000000	3749999
6	1073652	3	20.0	62	1215	1088	1463	4428564	3750000	4499999
7	489839	1	8.0	85	1028	0	0	4922169	4500000	5249999

8	437537	1	7.0	51	1641	0	0	5360734	5250000	5999999
9	655029	3	13.0	96	1712	1408	1327	6017404	6000000	6749999
10	826049	2	7.0	83	1794	1343	0	6847900	6750000	7499999
11	1312143	2	20.0	56	1606	1244	0	8163180	7500000	8249999
12	484874	3	8.0	80	1668	1230	1250	8650904	8250000	8999999
13	1011127	3	17.0	92	1433	1304	1068	9666179	9000000	9749999
14	354967	3	8.0	85	1636	1504	1331	10024951	9750000	10499999
15	1079023	1	12.0	61	1311	0	0	11108445	10500000	11249999
16	179325	2	17.0	80	1520	1427	0	11289081	11250000	11999999

Total number of pulses in waveform = 36

Waveform Num =   7
Num of Bursts = 10
Burst Interval (us) = 1200000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	1052287	3	17.0	84	1274	1192	1404	1052287	0	1199999
2	1068465	1	8.0	61	1089	0	0	2124622	1200000	2399999
3	562205	3	13.0	68	1004	1668	1473	2687916	2400000	3599999
4	1531279	1	11.0	68	1488	0	0	4223340	3600000	4799999
5	1574862	2	16.0	52	1399	1792	0	5799690	4800000	5999999
6	386002	3	8.0	97	1551	1410	1840	6188883	6000000	7199999
7	1919924	2	11.0	65	1326	1264	0	8113608	7200000	8399999
8	1171730	2	18.0	88	1502	1175	0	9287928	8400000	9599999
9	757853	1	16.0	60	1634	0	0	10048458	9600000	10799999
10	1150902	2	16.0	52	1962	1733	0	11200994	10800000	11999999

Total number of pulses in waveform = 20

Waveform Num = 8
Num of Bursts = 14
Burst Interval (us) = 857143.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	464313	2	20.0	97	1288	1904	0	464313	0	857142
2	1177217	1	13.0	53	1038	0	0	1644722	857143	1714285
3	320273	2	8.0	82	1179	1203	0	1966033	1714286	2571428
4	868274	3	10.0	65	1677	1743	1869	2836689	2571429	3428571
5	1265937	3	12.0	63	1268	1339	1987	4107915	3428572	4285714
6	834754	3	19.0	69	1517	1470	1839	4947263	4285715	5142857
7	880573	1	7.0	77	1994	0	0	5832662	5142858	6000000
8	167922	2	18.0	50	1289	1674	0	6002578	6000001	6857143
9	1100569	1	14.0	93	1243	0	0	7106110	6857144	7714286
10	1060010	2	16.0	90	1039	1503	0	8167363	7714287	8571429
11	816079	2	11.0	63	1036	1450	0	8985984	8571430	9428572
12	565716	2	12.0	59	1255	1424	0	9554186	9428573	10285715
13	1257952	2	13.0	81	1027	1347	0	10814817	10285716	11142858
14	589667	2	6.0	93	1663	1553	0	11406858	11142859	12000001

Total number of pulses in waveform = 28

Waveform Num = 9
Num of Bursts = 18
Burst Interval (us) = 666667.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	194966	1	17.0	65	1053	0	0	194966	0	666666
2	640036	3	17.0	72	1330	1155	1081	836055	666667	1333333
3	746785	3	14.0	94	1148	1988	1788	1586406	1333334	2000000

4	568481	2	20.0	53	1434	1555	0	2159811	2000001	2666667
5	640607	2	8.0	93	1073	1326	0	2803407	2666668	3333334
6	991388	2	5.0	96	1088	1044	0	3797194	3333335	4000001
7	820792	1	13.0	67	1937	0	0	4620118	4000002	4666668
8	398469	1	8.0	70	1395	0	0	5020524	4666669	5333335
9	499935	2	13.0	79	1376	1193	0	5521854	5333336	6000002
10	962490	2	6.0	52	1010	1051	0	6486913	6000003	6666669
11	215865	2	11.0	97	1497	1150	0	6704839	6666670	7333336
12	874137	2	18.0	69	1306	1607	0	7581623	7333337	8000003
13	654072	1	6.0	56	1654	0	0	8238608	8000004	8666670
14	493067	1	7.0	78	1137	0	0	8733329	8666671	9333337
15	605946	3	10.0	50	1021	1443	1793	9340412	9333338	10000004
16	1164858	1	20.0	69	1150	0	0	10509527	10000005	10666671
17	814033	1	16.0	97	1047	0	0	11324710	10666672	11333338
18	312601	3	13.0	70	1979	1017	1710	11638358	11333339	12000005

Total number of pulses in waveform = 33

Waveform Num =   10
Num of Bursts = 19
Burst Interval (us) =   631579.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	447309	3	10.0	55	1541	1903	1672	447309	0	631578
2	494817	2	5.0	75	1674	1180	0	947242	631579	1263157
3	919155	3	19.0	92	1062	1848	1786	1869251	1263158	1894736
4	476359	1	6.0	83	1132	0	0	2350306	1894737	2526315
5	384214	2	10.0	79	1603	1776	0	2735652	2526316	3157894

6	542874	1	7.0	59	1414	0	0	3281905	3157895	3789473
7	1043809	1	17.0	60	1290	0	0	4327128	3789474	4421052
8	646801	2	17.0	53	1348	1143	0	4975219	4421053	5052631
9	501810	1	5.0	62	1952	0	0	5479520	5052632	5684210
10	653875	1	11.0	95	1366	0	0	6135347	5684211	6315789
11	695240	2	9.0	85	1860	1519	0	6831953	6315790	6947368
12	185257	3	13.0	67	1451	1560	1949	7020589	6947369	7578947
13	1066394	2	16.0	86	1348	1527	0	8091943	7578948	8210526
14	244022	1	11.0	63	1166	0	0	8338840	8210527	8842105
15	884105	2	13.0	54	1577	1509	0	9224111	8842106	9473684
16	800312	3	13.0	77	1934	1452	1719	10027509	9473685	10105263
17	298543	2	9.0	100	1826	1155	0	10331157	10105264	10736842
18	570167	1	15.0	82	1947	0	0	10904305	10736843	11368421
19	477835	2	7.0	58	1395	1634	0	11384087	11368422	12000000

Total number of pulses in waveform = 35

Waveform Num =   11
Num of Bursts = 19
Burst Interval (us) =   631579.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	389007	2	8.0	97	1351	1685	0	389007	0	631578
2	625933	3	12.0	68	1604	1501	1819	1017976	631579	1263157
3	730007	1	14.0	59	1700	0	0	1752907	1263158	1894736
4	630368	3	20.0	50	1311	1391	1497	2384975	1894737	2526315
5	365855	2	8.0	82	1663	1677	0	2755029	2526316	3157894
6	769933	1	10.0	81	1017	0	0	3528302	3157895	3789473

7	547505	2	11.0	71	1377	1815	0	4076824	3789474	4421052
8	384452	1	7.0	69	1039	0	0	4464468	4421053	5052631
9	1052997	2	16.0	50	1694	1757	0	5518504	5052632	5684210
10	745893	1	8.0	71	1304	0	0	6267848	5684211	6315789
11	362634	1	15.0	58	1570	0	0	6631786	6315790	6947368
12	929595	1	11.0	98	1753	0	0	7562951	6947369	7578947
13	70151	1	16.0	82	1377	0	0	7634855	7578948	8210526
14	818305	2	13.0	68	1437	1703	0	8454537	8210527	8842105
15	715169	3	16.0	78	1815	1539	1301	9172846	8842106	9473684
16	367233	1	8.0	69	1044	0	0	9544734	9473685	10105263
17	1103480	1	6.0	100	1841	0	0	10649258	10105264	10736842
18	414048	3	17.0	83	1060	1337	1037	11065147	10736843	11368421
19	774814	1	8.0	72	1731	0	0	11843395	11368422	12000000

Total number of pulses in waveform = 32

Waveform Num =   12
Num of Bursts = 10
Burst Interval (us) = 1200000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	1114617	2	6.0	95	1693	1682	0	1114617	0	1199999
2	453348	2	6.0	61	1434	1818	0	1571340	1200000	2399999
3	1448852	2	10.0	55	1698	1784	0	3023444	2400000	3599999
4	681478	2	5.0	74	1324	1682	0	3708404	3600000	4799999
5	2193187	3	9.0	89	1322	1576	1909	5904597	4800000	5999999
6	1274206	1	17.0	77	1897	0	0	7183610	6000000	7199999
7	542483	1	17.0	64	1656	0	0	7727990	7200000	8399999

8	1129498	2	18.0	89	1224	1279	0	8859144	8400000	9599999
9	1750342	2	13.0	52	1258	1213	0	10611989	9600000	10799999
10	851102	3	16.0	98	1334	1775	1174	11465562	10800000	11999999

Total number of pulses in waveform = 20

Waveform Num = 13
Num of Bursts = 9
Burst Interval (us) = 1333333.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	349351	3	13.0	56	1300	1295	1669	349351	0	1333332
2	1291178	3	14.0	93	1416	1559	1095	1644793	1333333	2666665
3	1928928	2	12.0	98	1832	1292	0	3577791	2666666	3999998
4	1432764	1	17.0	80	1059	0	0	5013679	3999999	5333331
5	980180	3	11.0	78	1282	1858	1207	5994918	5333332	6666664
6	1208273	2	8.0	66	1165	1254	0	7207538	6666665	7999997
7	1558414	1	14.0	58	1192	0	0	8768371	7999998	9333330
8	1884807	1	19.0	76	1715	0	0	10654370	9333331	10666663
9	257888	3	9.0	68	1744	1609	1804	10913973	10666664	11999996

Total number of pulses in waveform = 19

Waveform Num = 14
Num of Bursts = 10
Burst Interval (us) = 1200000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	472551	1	15.0	60	1400	0	0	472551	0	1199999
2	1077933	2	7.0	74	1232	1338	0	1551884	1200000	2399999
3	1219545	3	5.0	92	1920	1861	1680	2773999	2400000	3599999
4	1193508	2	14.0	86	1052	1577	0	3972968	3600000	4799999

5	1040545	1	19.0	95	1260	0	0	5016142	4800000	5999999
6	2159965	1	15.0	58	1558	0	0	7177367	6000000	7199999
7	1083105	1	7.0	96	1065	0	0	8262030	7200000	8399999
8	1293342	2	9.0	63	1370	1477	0	9556437	8400000	9599999
9	639870	1	13.0	71	1566	0	0	10199154	9600000	10799999
10	1594917	1	12.0	95	1989	0	0	11795637	10800000	11999999

Total number of pulses in waveform = 15

Waveform Num = 15
Num of Bursts = 11
Burst Interval (us) = 1090909.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	792228	3	19.0	64	1489	1992	1751	792228	0	1090908
2	528604	3	16.0	51	1932	1574	1280	1326064	1090909	2181817
3	1207468	3	19.0	61	1212	1664	1196	2538318	2181818	3272726
4	1631635	2	9.0	51	1701	1454	0	4174025	3272727	4363635
5	638728	1	18.0	100	1265	0	0	4815908	4363636	5454544
6	1379944	1	13.0	93	1484	0	0	6197117	5454545	6545453
7	598590	3	18.0	91	1758	1912	1929	6797191	6545454	7636362
8	1886237	1	9.0	72	1823	0	0	8689027	7636363	8727271
9	564805	2	20.0	74	1233	1073	0	9255655	8727272	9818180
10	1238752	2	9.0	85	1600	1325	0	10496713	9818181	10909089
11	1147860	3	11.0	98	1444	1285	1841	11647498	10909090	11999998

Total number of pulses in waveform = 24

Waveform Num = 16
Num of Bursts = 14
Burst Interval (us) = 857143.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	449590	2	20.0	60	1939	1941	0	449590	0	857142
2	978197	3	18.0	96	1488	1794	1743	1431667	857143	1714285
3	525557	1	18.0	96	1517	0	0	1962249	1714286	2571428
4	1005232	1	5.0	57	1804	0	0	2968998	2571429	3428571
5	641512	1	10.0	62	1012	0	0	3612314	3428572	4285714
6	1249089	2	6.0	97	1957	1260	0	4862415	4285715	5142857
7	524678	2	13.0	85	1675	1320	0	5390310	5142858	6000000
8	1243150	2	11.0	79	1668	1142	0	6636455	6000001	6857143
9	393836	1	12.0	62	1481	0	0	7033101	6857144	7714286
10	724071	1	11.0	64	1558	0	0	7758653	7714287	8571429
11	1227402	1	6.0	84	1826	0	0	8987613	8571430	9428572
12	717459	2	17.0	62	1849	1948	0	9706898	9428573	10285715
13	1036303	2	17.0	62	1870	1639	0	10746998	10285716	11142858
14	509383	3	8.0	51	1302	1552	1221	11259890	11142859	12000001

Total number of pulses in waveform = 24

Waveform Num = 17
Num of Bursts = 13
Burst Interval (us) = 923077.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	230124	2	19.0	92	1909	1002	0	230124	0	923076
2	1086788	2	9.0	52	1741	1264	0	1319823	923077	1846153
3	653401	1	10.0	92	1373	0	0	1976229	1846154	2769230
4	1353456	3	15.0	87	1633	1988	1029	3331058	2769231	3692307
5	594359	1	6.0	91	1753	0	0	3930067	3692308	4615384

6	1313866	2	7.0	77	1510	1406	0	5245686	4615385	5538461
7	427470	2	5.0	76	1416	1817	0	5676072	5538462	6461538
8	1450827	3	16.0	76	1535	1276	1586	7130132	6461539	7384615
9	324634	1	14.0	95	1718	0	0	7459163	7384616	8307692
10	1145638	1	14.0	58	1051	0	0	8606519	8307693	9230769
11	951216	3	7.0	91	1031	1384	1517	9558786	9230770	10153846
12	771915	3	6.0	52	1123	1577	1307	10334633	10153847	11076923
13	1245042	1	12.0	87	1733	0	0	11583682	11076924	12000000

Total number of pulses in waveform = 25

Waveform Num = 18
Num of Bursts = 9
Burst Interval (us) = 1333333.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	199264	2	14.0	96	1619	1174	0	199264	0	1333332
2	2424008	1	10.0	74	1972	0	0	2626065	1333333	2666665
3	103657	3	13.0	69	1945	1806	1241	2731694	2666666	3999998
4	1681265	2	13.0	56	1846	1534	0	4417951	3999999	5333331
5	1189786	1	15.0	98	1267	0	0	5611117	5333332	6666664
6	1792657	1	13.0	81	1005	0	0	7405041	6666665	7999997
7	1782933	1	19.0	56	1519	0	0	9188979	7999998	9333330
8	275537	3	13.0	67	1934	1250	1680	9466035	9333331	10666663
9	2314488	2	16.0	96	1109	1821	0	11785387	10666664	11999996

Total number of pulses in waveform = 16

Waveform Num = 19
Num of Bursts = 10
Burst Interval (us) = 1200000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	1047638	3	10.0	64	1867	1807	1617	1047638	0	1199999
2	487759	1	19.0	90	1495	0	0	1540688	1200000	2399999
3	1547094	3	13.0	97	1398	1894	1162	3089277	2400000	3599999
4	1099511	1	10.0	86	1516	0	0	4193242	3600000	4799999
5	774358	1	8.0	63	1941	0	0	4969116	4800000	5999999
6	1340528	2	7.0	96	1981	1542	0	6311585	6000000	7199999
7	1418251	2	10.0	91	1805	1151	0	7733359	7200000	8399999
8	894235	1	20.0	96	1679	0	0	8630550	8400000	9599999
9	1678594	1	6.0	97	1433	0	0	10310823	9600000	10799999
10	1243115	1	8.0	85	1834	0	0	11555371	10800000	11999999

Total number of pulses in waveform = 16

Waveform Num = 20
Num of Bursts = 20
Burst Interval (us) = 600000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	565617	3	17.0	73	1895	1509	1012	565617	0	599999
2	127664	1	6.0	98	1170	0	0	697697	600000	1199999
3	737198	1	5.0	92	1355	0	0	1436065	1200000	1799999
4	418088	2	6.0	96	1800	1607	0	1855508	1800000	2399999
5	758119	1	11.0	64	1477	0	0	2617034	2400000	2999999
6	881986	3	16.0	67	1092	1758	1916	3500497	3000000	3599999
7	252990	1	12.0	60	1038	0	0	3758253	3600000	4199999
8	878019	3	20.0	50	1923	1738	1765	4637310	4200000	4799999
9	355581	3	13.0	54	1528	1015	1081	4998317	4800000	5399999

10	863401	3	6.0	52	1325	1897	1100	5865342	5400000	5999999
11	410378	1	15.0	89	1954	0	0	6280042	6000000	6599999
12	378439	1	16.0	64	1439	0	0	6660435	6600000	7199999
13	940452	3	5.0	69	1154	1970	1699	7602326	7200000	7799999
14	769484	1	9.0	84	1856	0	0	8376633	7800000	8399999
15	518019	2	16.0	75	1048	1614	0	8896508	8400000	8999999
16	233390	3	14.0	81	1257	1866	1467	9132560	9000000	9599999
17	586542	1	16.0	100	1889	0	0	9723692	9600000	10199999
18	623938	3	14.0	99	1993	1381	1594	10349519	10200000	10799999
19	1027453	3	19.0	51	1067	1714	1983	11381940	10800000	11399999
20	377701	1	7.0	100	1404	0	0	11764405	11400000	11999999

Total number of pulses in waveform = 40

Waveform Num = 21
Num of Bursts = 8
Burst Interval (us) = 1500000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	186792	1	19.0	94	1019	0	0	186792	0	1499999
2	2218436	1	13.0	87	1571	0	0	2406247	1500000	2999999
3	666240	3	17.0	57	1514	1030	1276	3074058	3000000	4499999
4	2742795	1	9.0	99	1712	0	0	5820673	4500000	5999999
5	548886	3	19.0	80	1593	1961	1428	6371271	6000000	7499999
6	2402949	1	10.0	91	1520	0	0	8779202	7500000	8999999
7	740278	1	6.0	62	1043	0	0	9521000	9000000	10499999
8	2337052	1	9.0	69	1512	0	0	11859095	10500000	11999999

Total number of pulses in waveform = 12

Waveform Num = 22
Num of Bursts = 16
Burst Interval (us) = 750000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	235408	1	10.0	56	1945	0	0	235408	0	749999
2	1042651	1	12.0	83	1443	0	0	1280004	750000	1499999
3	630913	2	7.0	92	1560	1665	0	1912360	1500000	2249999
4	451973	1	8.0	54	1613	0	0	2367558	2250000	2999999
5	1318725	2	6.0	92	1033	1634	0	3687896	3000000	3749999
6	191797	3	13.0	94	1650	1126	1891	3882360	3750000	4499999
7	834107	3	7.0	72	1135	1935	1537	4721134	4500000	5249999
8	614594	1	20.0	93	1728	0	0	5340335	5250000	5999999
9	1142023	3	5.0	51	1040	1221	1666	6484086	6000000	6749999
10	902326	2	13.0	53	1734	1986	0	7390339	6750000	7499999
11	418819	1	14.0	77	1624	0	0	7812878	7500000	8249999
12	698500	1	14.0	55	1716	0	0	8513002	8250000	8999999
13	1131665	2	16.0	66	1988	1640	0	9646383	9000000	9749999
14	121755	1	12.0	67	1498	0	0	9771766	9750000	10499999
15	1275806	3	6.0	98	1509	1169	1839	11049070	10500000	11249999
16	770125	1	13.0	81	1093	0	0	11823712	11250000	11999999

Total number of pulses in waveform = 28

Waveform Num = 23
Num of Bursts = 12
Burst Interval (us) = 1000000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	379723	2	20.0	71	1218	1122	0	379723	0	999999

2	1241395	2	11.0	98	1857	1081	0	1623458	1000000	1999999
3	1251292	3	18.0	73	1072	1476	1649	2877688	2000000	2999999
4	491017	3	13.0	74	1129	1417	1318	3372902	3000000	3999999
5	957281	1	7.0	71	1251	0	0	4334047	4000000	4999999
6	1404240	1	11.0	76	1901	0	0	5739538	5000000	5999999
7	743364	3	12.0	72	1578	1432	1045	6484803	6000000	6999999
8	1288409	1	15.0	61	1461	0	0	7777267	7000000	7999999
9	273191	1	6.0	53	1105	0	0	8051919	8000000	8999999
10	1203185	3	8.0	89	1062	1525	1964	9256209	9000000	9999999
11	1365993	1	7.0	72	1937	0	0	10626753	10000000	10999999
12	1286340	3	16.0	61	1810	1400	1616	11915030	11000000	11999999

Total number of pulses in waveform = 24

Waveform Num = 24
Num of Bursts = 10
Burst Interval (us) = 1200000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	229635	3	18.0	67	1831	1465	1491	229635	0	1199999
2	1365641	1	10.0	58	1740	0	0	1600063	1200000	2399999
3	1111534	3	8.0	50	1310	1952	1548	2713337	2400000	3599999
4	1021998	2	20.0	52	1660	1909	0	3740145	3600000	4799999
5	1967306	1	15.0	85	1239	0	0	5711020	4800000	5999999
6	1262379	3	7.0	62	1989	1801	1630	6974638	6000000	7199999
7	649102	2	10.0	97	1521	1519	0	7629160	7200000	8399999
8	1400328	2	8.0	85	1184	1007	0	9032528	8400000	9599999
9	681800	3	9.0	92	1530	1902	1622	9716519	9600000	10799999

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
10	1989945	3	20.0	82	1917	1538	1742	11711518	10800000	11999999

Total number of pulses in waveform = 23

Waveform Num = 25
Num of Bursts = 20
Burst Interval (us) = 600000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	53706	1	10.0	58	1208	0	0	53706	0	599999
2	929374	2	14.0	94	1331	1543	0	984288	600000	1199999
3	692371	3	18.0	55	1642	1294	1348	1679533	1200000	1799999
4	556446	2	16.0	76	1799	1723	0	2240263	1800000	2399999
5	382814	3	10.0	52	1248	1661	1439	2626599	2400000	2999999
6	673373	3	12.0	59	1229	1914	1081	3304320	3000000	3599999
7	882893	1	19.0	88	1993	0	0	4191437	3600000	4199999
8	524323	3	13.0	84	1495	1646	1378	4717753	4200000	4799999
9	431814	1	14.0	63	1713	0	0	5154086	4800000	5399999
10	372214	2	12.0	66	1266	1629	0	5528013	5400000	5999999
11	844701	3	18.0	91	1886	1290	1051	6375609	6000000	6599999
12	432627	2	11.0	88	1054	1311	0	6812463	6600000	7199999
13	445784	3	10.0	76	1144	1135	1487	7260612	7200000	7799999
14	613831	3	10.0	84	1081	1677	1696	7878209	7800000	8399999
15	952288	1	16.0	96	1518	0	0	8834951	8400000	8999999
16	526064	2	10.0	50	1766	1986	0	9362533	9000000	9599999
17	636416	2	18.0	100	1128	1579	0	10002701	9600000	10199999
18	575769	3	14.0	88	1717	1516	1128	10581177	10200000	10799999
19	324074	3	6.0	50	1670	1977	1923	10909612	10800000	11399999

20	494309	1	19.0	67	1232	0	0	11409491	11400000	11999999

Total number of pulses in waveform = 44

Waveform Num =   26
Num of Bursts = 15
Burst Interval (us) =   800000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	628717	1	9.0	53	1929	0	0	628717	0	799999
2	524807	1	18.0	72	1417	0	0	1155453	800000	1599999
3	527586	1	8.0	51	1727	0	0	1684456	1600000	2399999
4	780206	2	17.0	73	1634	1354	0	2466389	2400000	3199999
5	1406898	1	7.0	94	1612	0	0	3876275	3200000	3999999
6	781003	1	20.0	66	1432	0	0	4658890	4000000	4799999
7	560932	2	13.0	70	1911	1833	0	5221254	4800000	5599999
8	562203	1	16.0	85	1895	0	0	5787201	5600000	6399999
9	925440	2	14.0	70	1633	1481	0	6714536	6400000	7199999
10	878299	3	7.0	55	1810	1179	1057	7595949	7200000	7999999
11	412170	2	8.0	53	1842	1722	0	8012165	8000000	8799999
12	1552722	2	15.0	55	1967	1036	0	9568451	8800000	9599999
13	47101	3	13.0	54	1692	1057	1136	9618555	9600000	10399999
14	1211934	1	14.0	100	1785	0	0	10834374	10400000	11199999
15	876629	1	20.0	91	1398	0	0	11712788	11200000	11999999

Total number of pulses in waveform = 24

Waveform Num =   27
Num of Bursts = 10
Burst Interval (us) = 1200000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)

1	845530	2	16.0	90	1252	1267	0	845530	0	1199999
2	456017	2	18.0	59	1770	1030	0	1304066	1200000	2399999
3	2218467	3	17.0	68	1464	1177	1413	3525333	2400000	3599999
4	847097	3	8.0	59	1158	1237	1450	4376484	3600000	4799999
5	1239886	1	13.0	81	1807	0	0	5620215	4800000	5999999
6	1225003	2	9.0	86	1360	1013	0	6847025	6000000	7199999
7	781943	3	6.0	57	1121	1309	1310	7631341	7200000	8399999
8	1796429	1	19.0	96	1743	0	0	9431510	8400000	9599999
9	1090657	2	18.0	89	1327	1150	0	10523910	9600000	10799999
10	303728	2	12.0	75	1034	1472	0	10830115	10800000	11999999

Total number of pulses in waveform = 21

Waveform Num =   28
Num of Bursts =   8
Burst Interval (us) = 1500000.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	38087	3	6.0	76	1114	1368	1729	38087	0	1499999
2	1601341	2	15.0	67	1464	1526	0	1643639	1500000	2999999
3	2182785	3	10.0	57	1435	1099	1505	3829414	3000000	4499999
4	1671926	1	14.0	97	1339	0	0	5505379	4500000	5999999
5	1306121	3	12.0	66	1478	1248	1640	6812839	6000000	7499999
6	822283	2	19.0	53	1981	1340	0	7639488	7500000	8999999
7	2295651	3	7.0	79	1955	1906	1209	9938460	9000000	10499999
8	1334281	1	8.0	88	1500	0	0	11277811	10500000	11999999

Total number of pulses in waveform = 18

Waveform Num =   29
Num of Bursts = 14

Burst Interval (us) = 857143.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	236032	2	8.0	70	1192	1612	0	236032	0	857142
2	1063001	2	9.0	78	1867	1483	0	1301837	857143	1714285
3	574252	1	8.0	83	1061	0	0	1879439	1714286	2571428
4	939282	2	19.0	68	1409	1295	0	2819782	2571429	3428571
5	1063268	1	16.0	99	1076	0	0	3885754	3428572	4285714
6	425044	2	6.0	91	1432	1028	0	4311874	4285715	5142857
7	1158870	2	12.0	59	1233	1497	0	5473204	5142858	6000000
8	1343246	3	18.0	95	1232	1513	1247	6819180	6000001	6857143
9	882166	3	15.0	96	1174	1595	1156	7705338	6857144	7714286
10	831738	3	8.0	72	1765	1247	1588	8541001	7714287	8571429
11	239364	1	15.0	92	1050	0	0	8784965	8571430	9428572
12	700285	1	9.0	100	1081	0	0	9486300	9428573	10285715
13	972880	2	19.0	98	1921	1812	0	10460261	10285716	11142858
14	729660	3	18.0	54	1384	1081	1792	11193654	11142859	12000001

Total number of pulses in waveform = 28

Waveform Num = 30
Num of Bursts = 19
Burst Interval (us) = 631579.0

Burst #	Off Time (us)	# Pulses	Chirp (MHz)	PW (us)	Pulse 1 Pri(us)	Pulse 2 Pri(us)	Pulse 3 Pri(us)	Start Loc (us)	Start Burst Interval(us)	End Burst Interval(us)
1	3901	2	13.0	57	1067	1117	0	3901	0	631578
2	897232	1	8.0	87	1612	0	0	903317	631579	1263157
3	432858	3	9.0	88	1757	1663	1197	1337787	1263158	1894736
4	814357	3	8.0	97	1753	1000	1555	2156761	1894737	2526315

	853749									
5		2	14.0	58	1444	1729	0	3014818	2526316	3157894
	222716									
6		1	18.0	70	1896	0	0	3240707	3157895	3789473
	843134									
7		2	8.0	90	1721	1514	0	4085737	3789474	4421052
	649531									
8		1	18.0	93	1909	0	0	4738503	4421053	5052631
	702120									
9		1	8.0	60	1897	0	0	5442532	5052632	5684210
	779287									
10		2	16.0	52	1386	1655	0	6223716	5684211	6315789
	236604									
11		3	12.0	83	1317	1778	1600	6463361	6315790	6947368
	794742									
12		1	7.0	76	1470	0	0	7262798	6947369	7578947
	849356									
13		3	11.0	55	1659	1512	1932	8113624	7578948	8210526
	696618									
14		1	13.0	69	1639	0	0	8815345	8210527	8842105
	250466									
15		1	15.0	57	1626	0	0	9067450	8842106	9473684
	621302									
16		3	17.0	75	1752	1222	1694	9690378	9473685	10105263
	997997									
17		2	8.0	91	1061	1703	0	10693043	10105264	10736842
	651027									
18		1	18.0	53	1171	0	0	11346834	10736843	11368421
	647219									
19		3	9.0	75	1022	1930	1138	11995224	11368422	12000000

Total number of pulses in waveform = 36