# FCC Test Report

Report No: FCS202011056W03

Issued for

| | |
|---|---|
| Applicant: | Guangzhou Cal-Boz Electrical Science &Technology Co., Ltd |
| Address: | Building A-1, No.4 Weiwu Road, Zengjiang Street, Zengcheng District, Guangzhou City,Guangdong Province, China |
| Product Name: | Mini computer |
| Brand Name: | NA |
| Model Name: | Z83II |
| Series Model: | NA |
| FCC ID: | 2AX54-Z83II |

Issued By: Flux Compliance Service Laboratory
Add: Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan
Tel: 769-27280901 Fax:769-27280901 http://www.FCS-lab.com

# TEST RESULT CERTIFICATION

| | |
|---|---|
| Applicant's Name .....: | Guangzhou Cal-Boz Electrical Science &Technology Co., Ltd |
| Address.....: | Building A-1, No.4 Weiwu Road, Zengjiang Street, Zengcheng District, Guangzhou City,Guangdong Province, China |
| Manufacture's Name .....: | Guangzhou Cal-Boz Electrical Science &Technology Co., Ltd |
| Address.....: | Building A-1, No.4 Weiwu Road, Zengjiang Street, Zengcheng District, Guangzhou City,Guangdong Province, China |

**Product Description**

| | |
|---|---|
| Product Name.....: | Mini computer |
| Model Name.....: | Z83II |
| Series Model.....: | N/A |
| Test Standards.....: | FCC Part 15.407 |
| Test Procedure.....: | 905462 D02 UNII DFS Compliance Procedures New Rules v02<br>905462 D03 UNII Clients Without Radar Detection New Rules |

This device described above has been tested by Flux Compliance Service Laboratory, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
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**Date of Test** ..... :

| | |
|---|---|
| Date (s) of performance of tests : | 05 Nov, 2020 ~ 19 Nov, 2020 |
| Date of Issue ..... : | 20 Nov, 2020 |
| Test Result..... : | Pass |

Tested by : Chris chen

(Chris Chen)

Reviewed by : Jack chen

(Jack Chen)

Approved by : Andy yue

( Andy yue)

**Table of Contents** **Page**

**1. SUMMARY OF TEST RESULTS** **5**
1.1 TEST FACTORY 6
1.2 MEASUREMENT UNCERTAINTY 6
**2. GENERAL INFORMATION** **7**
2.1 GENERAL DESCRIPTION OF THE EUT 7
2.2 TEST CONDITIONS AND CHANNEL 9
2.3 EQUIPMENTS LIST 10
**3. DFS PARAMETERS** **11**
3.1 DFS PARAMETERS 11
3.2 DFS –TEST RESULTS 15

## Revision History

| Rev. | Issue Date | Effect Page | Contents |
|---|---|---|---|
| 00 | 20 Nov, 2020 | All | Initial Issue |
| | | | |

# 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards: KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02 and 905462 D03 UNII Clients Without Radar Detection New Rules v01r02

| Part 15.407 | | | |
|---|---|---|---|
| Requirement | Operational Mode | | RESULTS |
| | Master | Client | |
| Non-Occupancy Period | N/A | Yes | Pass |
| DFS Detection Threshold | N/A | Not required | Not required |
| Channel Availability Check Time | N/A | Not required | Not required |
| Channel Closing Transmission Time | N/A | Yes | Pass |
| Channel Move Time | N/A | Yes | Pass |
| U-NII Detection Bandwidth | N/A | Not required | Not required |

## 1.1 TEST FACTORY

| | |
|---|---|
| Company Name: | Flux Compliance Service Laboratory |
| Address: | Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan |
| Telephone: | +86-769-27280901 |
| Fax: | +86-769-27280901 |
| FCC Test Firm Registration Number: 514908<br>Designation number: CN0127<br>A2LA accreditation number：5545.01 | |

## 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ±**U**, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95** %.

| No. | Item | Uncertainty |
|---|---|---|
| 1 | RF output power, conducted | ±0.71dB |
| 2 | Unwanted Emissions, conducted | ±2.988 dB |
| 3 | Conducted Emission (9KHz-150KHz) | ±4.13 dB |
| 4 | Conducted Emission (150KHz-30MHz) | ±4.74 dB |
| 5 | All emissions,radiated(<1G) 30MHz-1000MHz | ±5.2 dB |
| 6 | All emissions,radiated 1GHz -18GHz | ±4.66 dB |
| 7 | All emissions,radiated 18GHz -40GHz | ±4.31 dB |

# 2. GENERAL INFORMATION

## 2.1 GENERAL DESCRIPTION OF THE EUT

| | |
|---|---|
| Product Name | Mini computer |
| Trade Name | NA |
| Model Name | Z83II |
| Series Model | N/A |
| Model Difference | N/A |
| Channel List | Please refer to the Note 2. |
| Operation frequency | 802.11a/ 802.11ac20/ 802.11n(HT20): 5260-5230MHz<br>802.11ac40/ 802.11n(HT40): 5270-5310MHz, |
| Modulation: | IIEEE 802.11a/n :OFDM(64QAM, 16QAM, QPSK, BPSK)<br>IEEE 802.11ac :OFDM(64QAM, 16QAM, QPSK, BPSK) |
| Power supply | DC 5V by adapter |
| Battery | NA |
| Hardware version number | NA |
| Software version number | NA |
| Connecting I/O Port(s) | Please refer to the User's Manual |

Note:

1. For a more detailed features description, please refer to the manufacturer’s specifications or the User's Manual.

2.

| Channel List for 802.11a/n/ac (20MHz) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 52 | 5260 | 56 | 5280 | 60 | 5300 | 64 | 5320 |

| Channel List for 802.11n/ac (40 MHz) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 54 | 5270 | 62 | 5310 | | | | |

| Channel List for 802.11a/n/ac (20 MHz) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 100 | 5500 | 104 | 5520 | 108 | 5540 | 112 | 5560 |
| 116 | 5580 | 120 | 5600 | 124 | 5620 | 128 | 5640 |
| 132 | 5660 | 136 | 5680 | 140 | 5700 | | |

| Channel List for 802.11 n/ac (40 MHz) | | | |
|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 102 | 5510 | 110 | 5550 |
| 134 | 5670 | | |

Remark: The EUT not support TPC function. EUT is used indoors and is a without radar detection client device.

3.EQUIPMENT UNDER TEST (EUT) DETAILS

The manufacturer declared values for the EUT operational characteristics that affect DFS are as follows

**Operating Modes (5250 – 5350 MHz, 5470 – 5725 MHz)**

☐ Master Device
☒ Client Device (no In Service Monitoring, no Ad-Hoc mode)
☐ Client Device with In-Service Monitoring

**Antenna Gains / EIRP (5250 – 5350 MHz, 5470 – 5725 MHz)**

| | 5250 – 5350 MHz | | 5470 – 5725 MHz | |
|---|---|---|---|---|
| | 5300MHz | 5290MHz | 5580MHz | 5530MHz |
| Antenna Gain (dBi) | 1.44 | 1.44 | 1.44 | 1.44 |
| DFS Detection Threshold (dBm) | -62 | | | |

**Channel Protocol**

☒ IP Based
☐ Frame Based
☐ OTHER_____

The EUT did not require modifications during testing in order to comply with the requirements of the standard(s) referenced in this test report.

2.2 TEST CONDITIONS AND CHANNEL

| | Normal Test Conditions |
|---|---|
| Temperature | 15°C – 35°C |
| Relative Humidity | 20% - 75% |
| Supply Voltage | DC 5V by adapter |

| Channel List | | |
|---|---|---|
| Band Frequency | EUT Channel | Test Frequency (MHz) |
| Band II | CH60 | 5300 |
| Channel List | | |
| Band Frequency | EUT Channel | Test Frequency (MHz) |
| Band III | CH116 | 5580 |

## 2.3 EQUIPMENTS LIST

Radiation Test equipment

| Kind of Equipment | Manufacturer | Type No. | Company No. | Last calibration | Calibrated until |
|---|---|---|---|---|---|
| Signal Generator | Agilent | N5182A | MY46240556 | 2020.10.08 | 2021.10.07 |
| Signal Analyzer | Agilent | N9020A | MY49100060 | 2020.10.08 | 2021.10.07 |
| Coupler | Rio tinto in overseas | ZFSC-2-11 | 15542 | 2020.04.30 | 2021.04.29 |
| Coupler | Rio tinto in overseas | ZN2PD-9G | SF078500430 | 2020.04.30 | 2021.04.29 |
| Attenuator | HP | 8494B | DC-18G | 2020.04.30 | 2021.04.29 |
| Router | LINKSY（ID:Q87-WRT3200ACM） | WRT3200ACM | 1.98116E+13 | N.C.R | N.C.R |

# 3. DFS PARAMETERS

## 3.1 DFS PARAMETERS

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

| **Requirement** | **Operational Mode** | | |
|---|---|---|---|
| | **Master** | **Client Without Radar Detection** | **Client With Radar Detection** |
| *Non-Occupancy Period* | Yes | Not required | Yes |
| *DFS Detection Threshold* | Yes | Not required | Yes |
| *Channel Availability Check Time* | Yes | Not required | Not required |
| *U-NII Detection Bandwidth* | Yes | Not required | Yes |

Table 2: Applicability of DFS requirements during normal operation

| **Requirement** | **Operational Mode** | |
|---|---|---|
| | **Master Device or Client with Radar Detection** | **Client Without Radar Detection** |
| *DFS Detection Threshold* | Yes | Not required |
| *Channel Closing Transmission Time* | Yes | Yes |
| *Channel Move Time* | Yes | Yes |
| *U-NII Detection Bandwidth* | Yes | Not required |

| **Additional requirements for devices with multiple bandwidth modes** | **Master Device or Client with Radar Detection** | **Client Without Radar Detection** |
|---|---|---|
| *U-NII Detection Bandwidth and Statistical Performance Check* | All BW modes must be tested | Not required |
| *Channel Move Time and Channel Closing Transmission Time* | Test using widest BW mode available | Test using the widest BW mode available for the link |
| *All other tests* | Any single BW mode | Not required |
| **Note:** Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency. | | |

Table 3: DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection

| **Maximum Transmit Power** | **Value (See Notes 1, 2, and 3)** |
|---|---|
| EIRP ≥ 200 milliwatt | -64 dBm |
| EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz | -62 dBm |
| EIRP < 200 milliwatt that do not meet the power spectral density requirement | -64 dBm |
| **Note 1:** This is the level at the input of the receiver assuming a 0 dBi receive antenna.<br>**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.<br>**Note3:** EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01. | |

Table 4: DFS Response Requirement Values

| **Parameter** | **Value** |
|---|---|
| *Non-occupancy period* | Minimum 30 minutes |
| *Channel Availability Check Time* | 60 seconds |
| *Channel Move Time* | 10 seconds<br>See Note 1. |
| *Channel Closing Transmission Time* | 200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period.<br>See Notes 1 and 2. |
| *U-NII Detection Bandwidth* | Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3. |
| **Note 1:** *Channel Move Time* and the *Channel Closing Transmission Time* should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.<br>**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 to facilitate a *Channel* move (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.<br>**Note 3:** During the *U-NII Detection Bandwidth* detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic. | |

Table 5 – Short Pulse Radar Test Waveforms

| Radar Type | Pulse Width (µsec) | PRI (µsec) | Number of Pulses | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|---|---|---|---|---|---|
| 0 | 1 | 1428 | 18 | See Note 1 | See Note 1 |
| 1 | 1 | Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a | $\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$ | 60% | 30 |
| | | Test B: 15 unique PRI values randomly selected within the range of 518-3066 µsec, with a minimum increment of 1 µsec, excluding PRI values selected in Test A | | | |
| 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 |

**Note 1:** Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.

Table 5a - Pulse Repetition Intervals Values for Test A

| Pulse Repetition Frequency Number | Pulse Repetition Frequency (Pulses Per Second) | Pulse Repetition Interval (Microseconds) |
|---|---|---|
| 1 | 1930.5 | 518 |
| 2 | 1858.7 | 538 |
| 3 | 1792.1 | 558 |
| 4 | 1730.1 | 578 |
| 5 | 1672.2 | 598 |
| 6 | 1618.1 | 618 |
| 7 | 1567.4 | 638 |
| 8 | 1519.8 | 658 |
| 9 | 1474.9 | 678 |
| 10 | 1432.7 | 698 |
| 11 | 1392.8 | 718 |
| 12 | 1355 | 738 |
| 13 | 1319.3 | 758 |
| 14 | 1285.3 | 778 |
| 15 | 1253.1 | 798 |
| 16 | 1222.5 | 818 |
| 17 | 1193.3 | 838 |
| 18 | 1165.6 | 858 |
| 19 | 1139 | 878 |
| 20 | 1113.6 | 898 |
| 21 | 1089.3 | 918 |
| 22 | 1066.1 | 938 |
| 23 | 326.2 | 3066 |

The aggregate is the average of the percentage of successful detections of Short Pulse Radar Types 1-4. For example, the following table indicates how to compute the aggregate of percentage of successful detections.

| Radar Type | Number of Trials | Number of Successful Detections | Minimum Percentage of Successful Detection |
|---|---|---|---|
| 1 | 35 | 29 | 82.9% |
| 2 | 30 | 18 | 60% |
| 3 | 30 | 27 | 90% |
| 4 | 50 | 44 | 88% |
| Aggregate (82.9% + 60% + 90% + 88%)/4 = 80.2% | | | |

Long Pulse Radar Test Waveform

Table 6 – Long Pulse Radar Test Waveform

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

Figure 1 provides a graphical representation of the Long Pulse Radar Test Waveform.

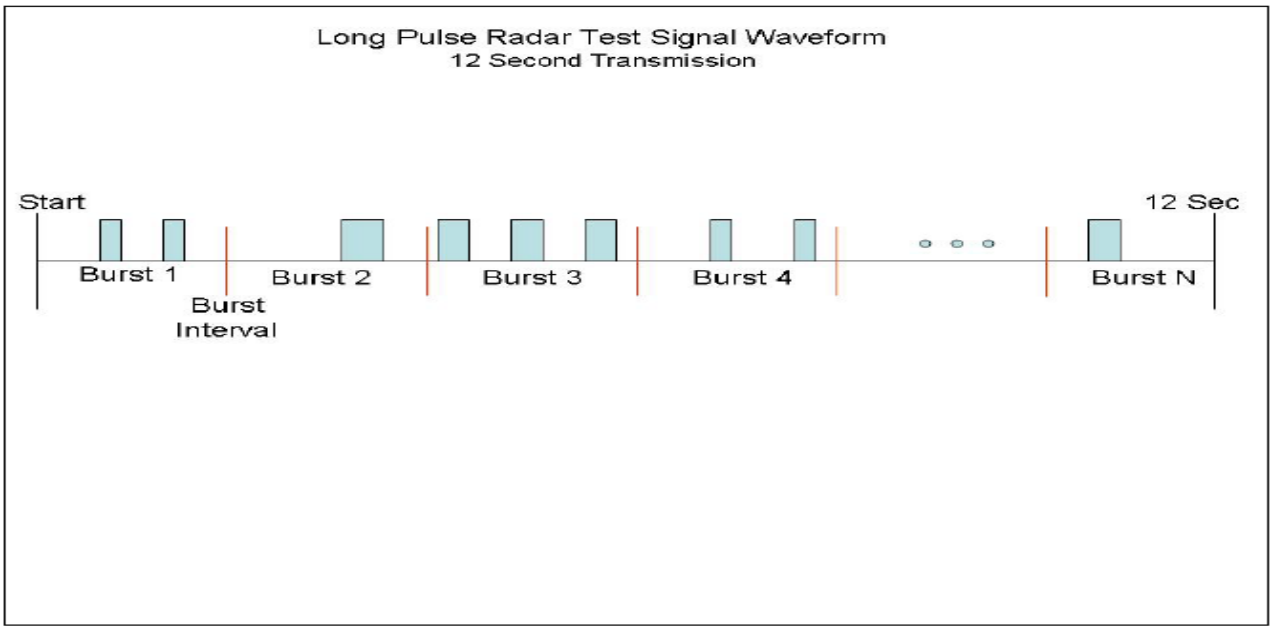



Table 7 – Frequency Hopping Radar Test Waveform

| Radar Type | Pulse Width (µsec) | PRI (µsec) | Pulses per Hop | Hopping Rate (kHz) | Hopping Sequence Length (msec) | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|---|---|---|---|---|---|---|---|
| 6 | 1 | 333 | 9 | 0.333 | 300 | 70% | 30 |

## 3.2 DFS –TEST RESULTS

### 3.2.1 TEST RESULTS– FCC Part 15.407 CLIENT DEVICE

Shutdown Time

| Mode | Frequency (MHz) | Channel Move Time (s) | Limit Channel Move Time (s) | Close Transmission Time (s) | Limit Close Transmission Time (ms) | Verdict |
|---|---|---|---|---|---|---|
| a | 5300 | 1.2487 | 10 | 0.0384 | 260 | Pass |
| a | 5580 | 1.2542 | 10 | 0.0399 | 260 | Pass |

Notes:
1) Tests were performed using the conduction test method.
2) Channel availability check, detection threshold and non-occupancy period are not applicable to client devices.

### 3.2.2 DFS MEASUREMENT METHODS

a. DFS – CHANNEL CLOSING TRANSMISSION TIME AND CHANNEL MOVE TIME

Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.
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 to facilitate a Channel move (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.

b. DFS – CHANNEL NON-OCCUPANCY AND VERIFICATION OF PASSIVE SCANNING

Non-occupancy Period. A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.

c. CHANNEL AVAILABILITY CHECK TIME

Channel Availability Check Time. A U-NII device shall check if there is a radar system already operating on the channel before it can initiate a transmission on a channel and when it has to move to a new channel. The U-NII device may start using the channel if no radar signal with a power level greater than the interference threshold values listed in paragraph (h)(2) of this section, is detected within 60 seconds.

d. CONTROL (TPC)

Compliance with the transmit power control requirements for devices is demonstrated through measurements showing multiple power levels and manufacturer statements explaining how the power control is implemented.

e. DETECTION PROBABILITY / SUCCESS RATE

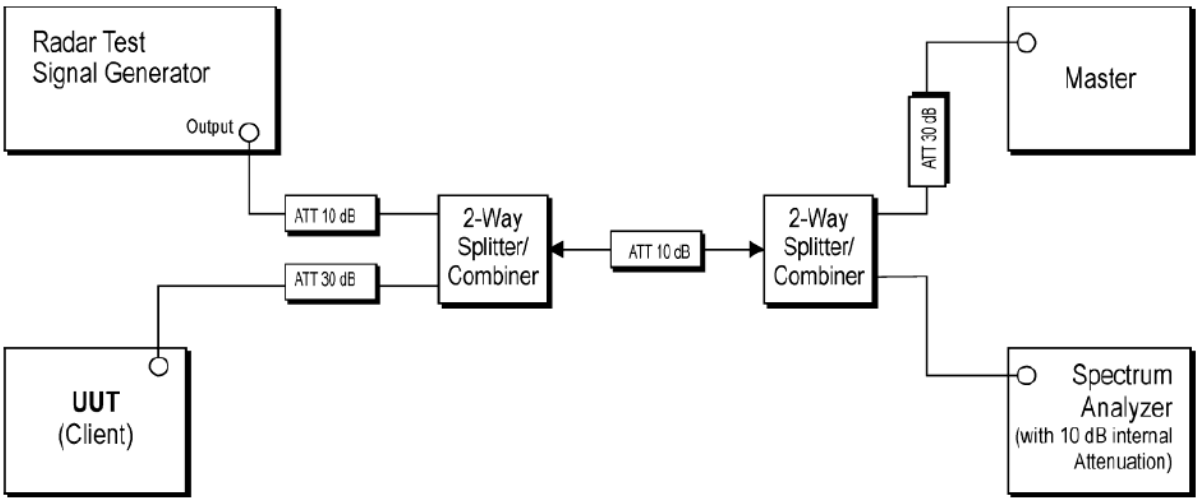
During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic. Minimum 100% of the U-NII 99% transmission power bandwidth.

f. NON- OCCUPANCY PERIOD

During the 30 minutes observation time, UUT did not make any transmissions on a channel after a radar signal was detected on that channel by either the Channel Availability Check or the In-Service Monitoring

3.2.3 DFS CONDUCTION TEST METHOD

a. The signal level of the simulated waveform is set to a reference level equal to the threshold level (plus 1dB if testing against FCC requirements). Lower levels may also be applied on request of the manufacturer.
The signal level is verified by measuring the CW signal level at the coupling point to the RDD antenna port. The radar signal level is calculated from the measured level, R (dBm) and the lowest gain antenna assembly intended for use with the RDD
If both master and client devices have radar detection capability then the radar level at the non RDD is verified to be at least 20dB below the threshold level to ensure that any responses are due to the RDD detecting radar.
The antenna connected to the channel monitoring subsystem is positioned to allow both master and client transmissions to be observed, with the level of the EUT's transmissions between 6 and 10dB higher than those from the other device.



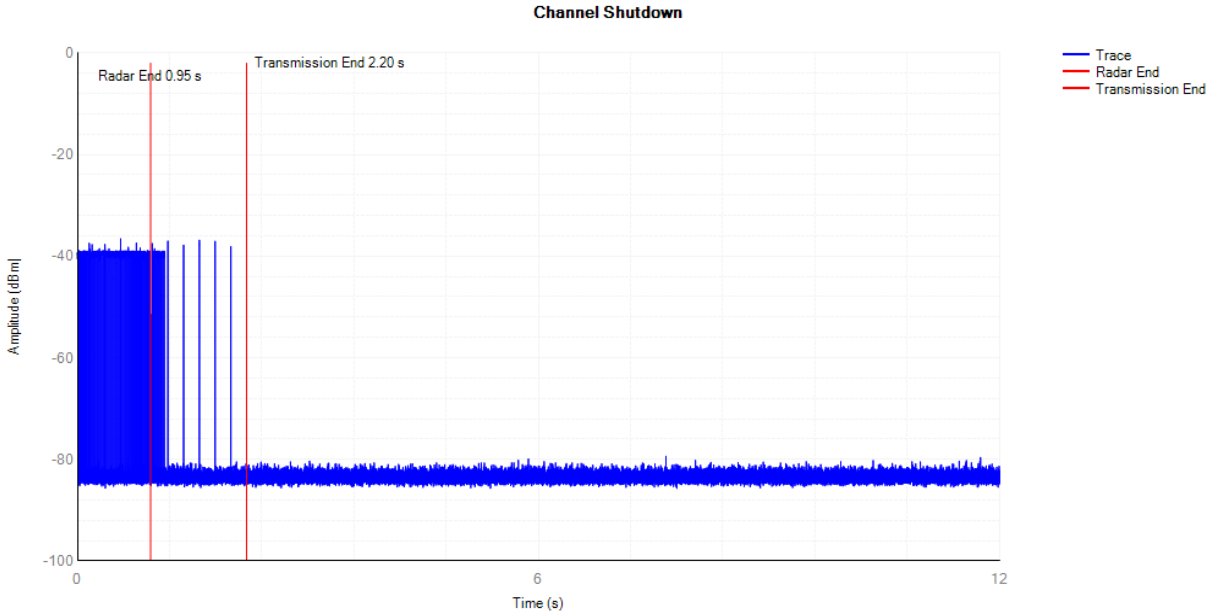

b. *Set-up B* is a set-up whereby the UUT is an RLAN device operating in slave mode, with or without Radar Interference Detection function. This set-up also contains an RLAN device operating in master mode. The radar test signals are injected into the master device. The UUT (slave device) is associated with the master device. Figure 5 shows an example for *Set-up B*. The set-up used shall be documented in the test report.

Channel loading mode:
EUT connects to the router through DFS setup, then controls and switches the EUT channel on the router background page.

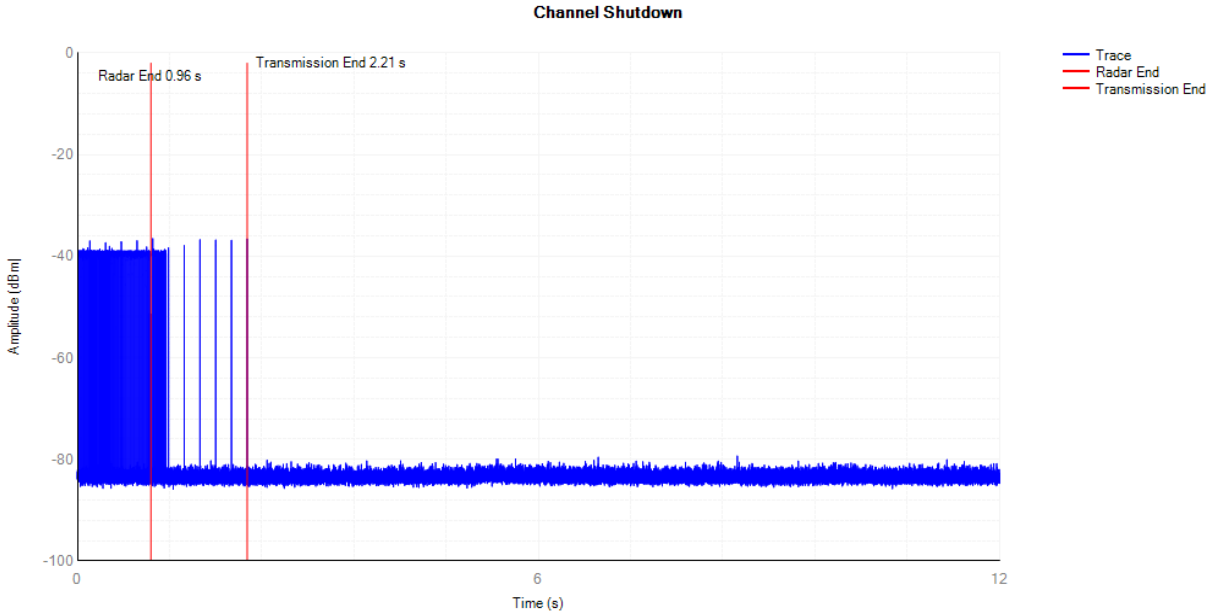
### 3.2.4 DFS Test Data

Shutdown Time

5300MHz a Shutdown

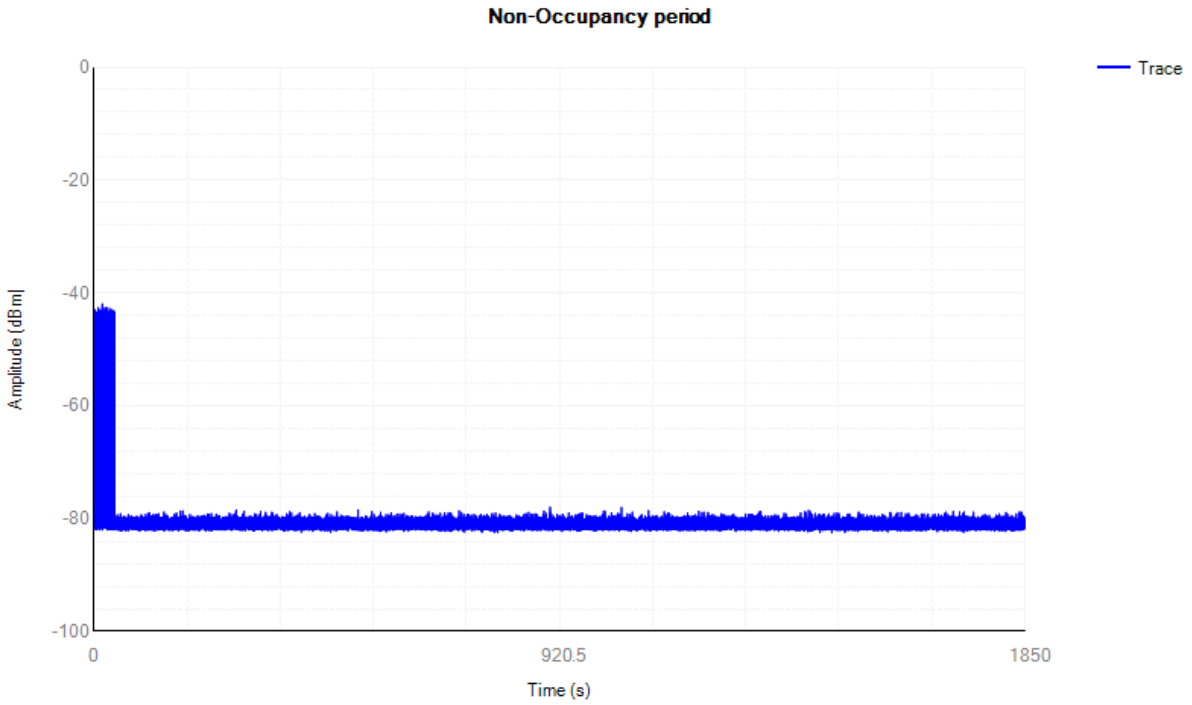



5580MHz a Shutdown

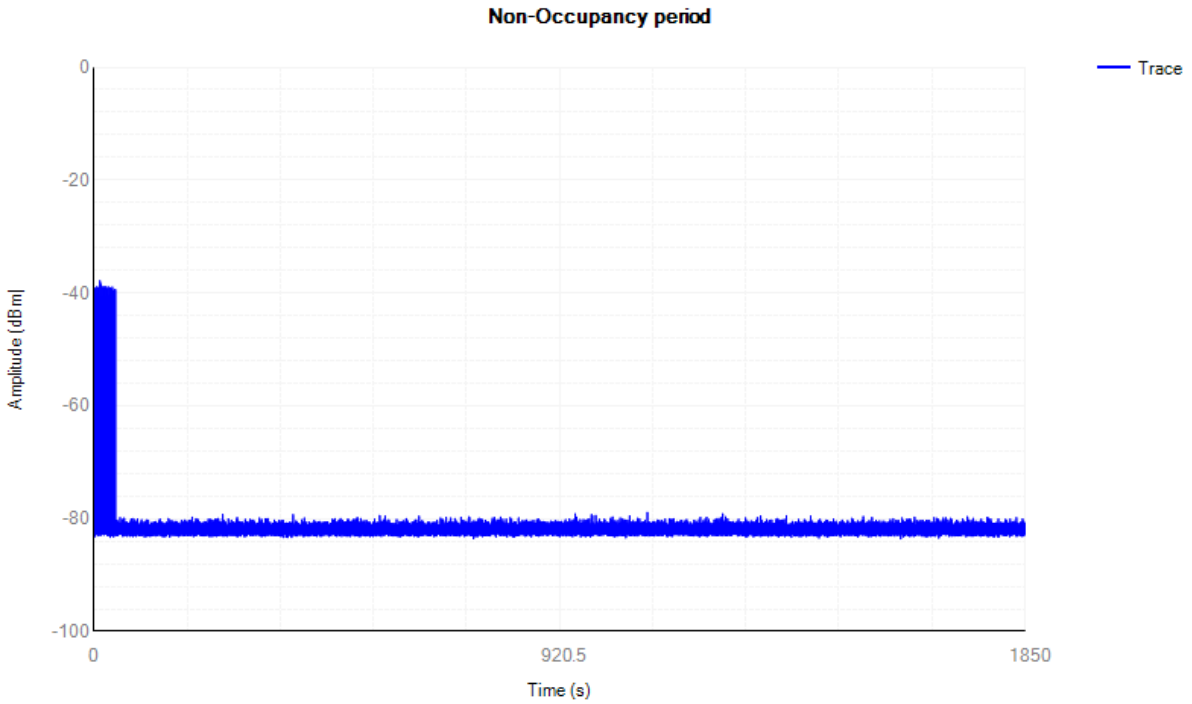


Non-Occupancy

5300MHz a Non-Occupancy

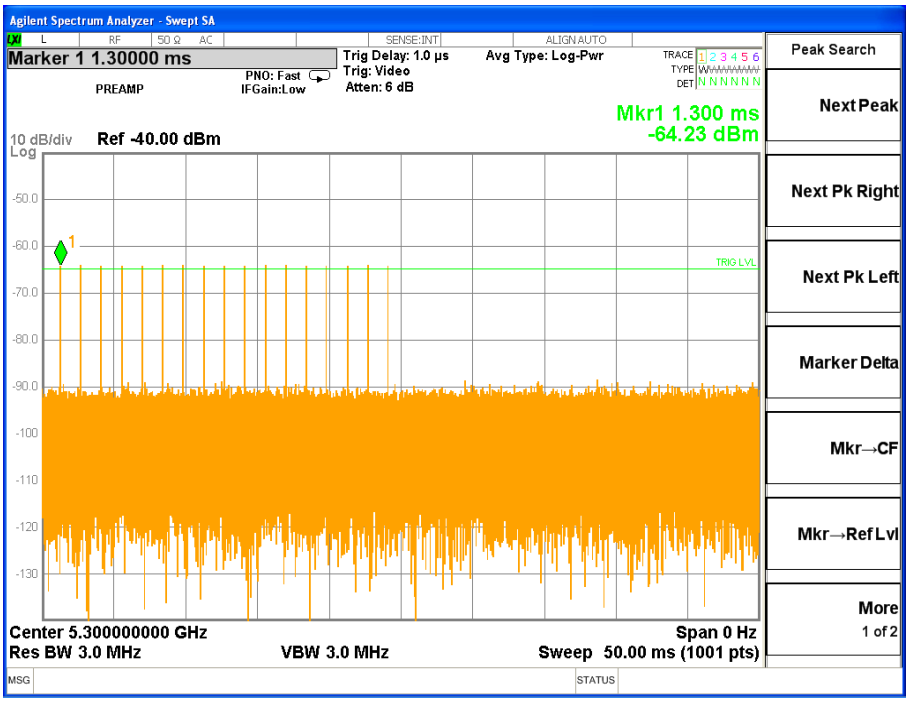



5580MHz a Non-Occupancy

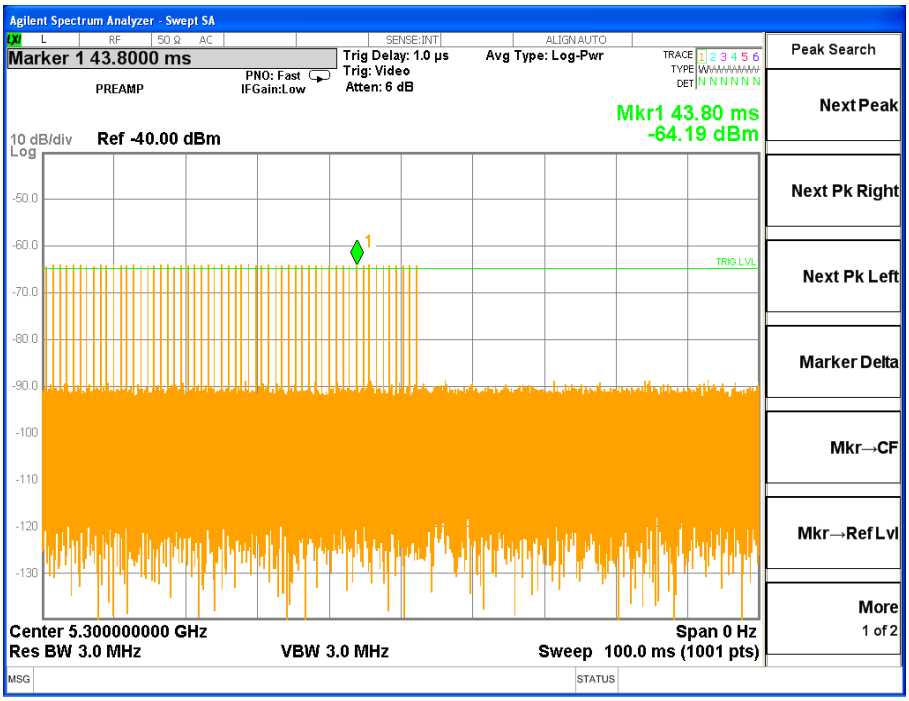


Radar Waveform Calibration

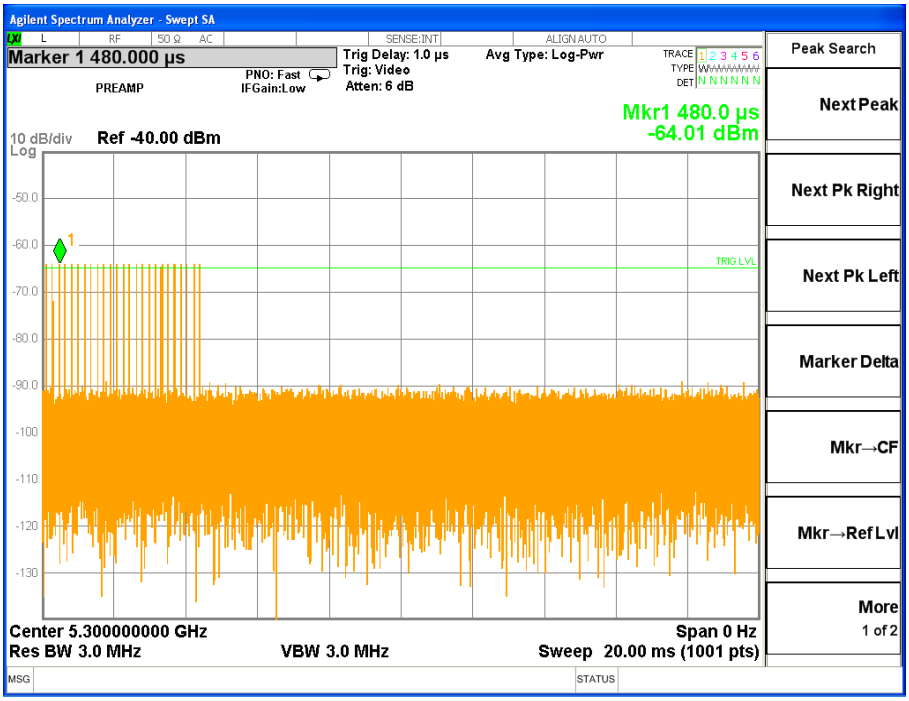
Type 0



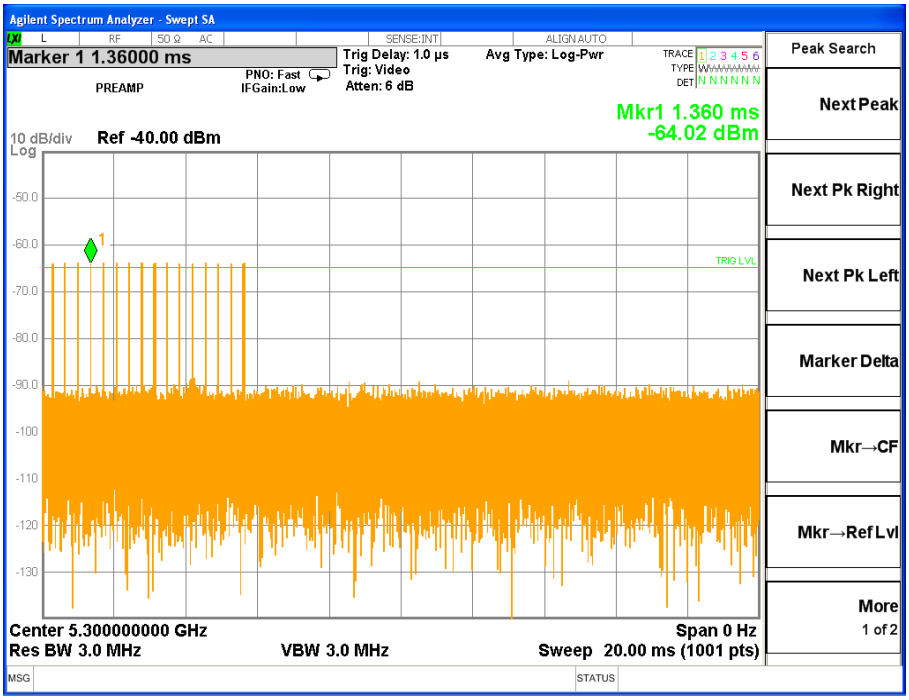

Type 1



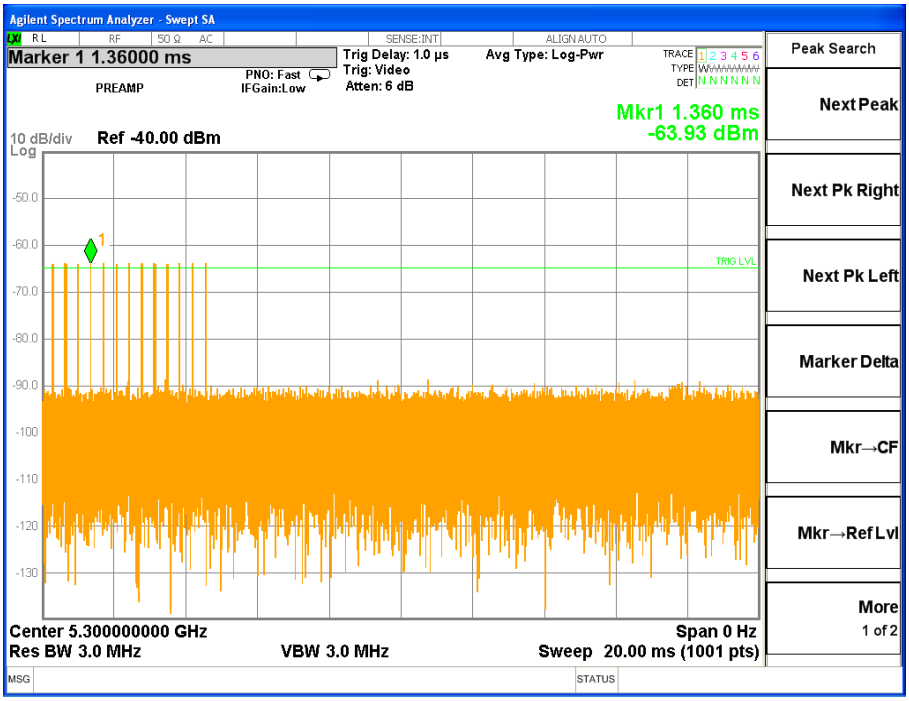
Type 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 480.000 µs
PREAMP
PNO: Fast
IFGain:Low
Trig Delay: 1.0 µs
Trig: Video
Atten: 6 dB
Avg Type: Log-Pwr
Mkr1 480.0 µs
-64.01 dBm
10 dB/div
Log
Ref -40.00 dBm
Center 5.300000000 GHz
Res BW 3.0 MHz
VBW 3.0 MHz
Span 0 Hz
Sweep 20.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

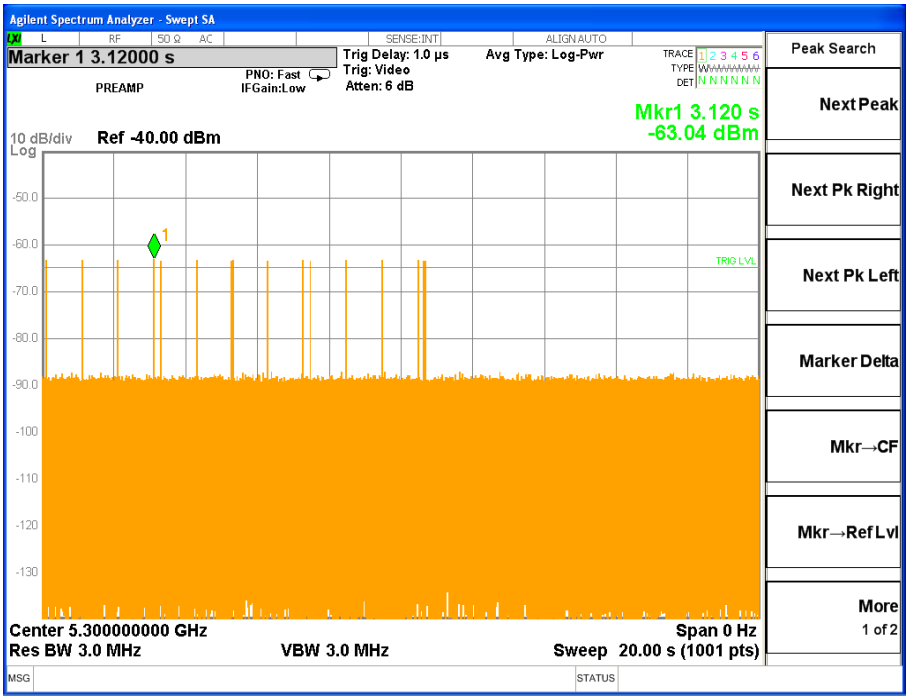
Type 3


Agilent Spectrum Analyzer - Swept SA
Marker 1 1.36000 ms
PREAMP
PNO: Fast
IFGain:Low
Trig Delay: 1.0 µs
Trig: Video
Atten: 6 dB
Avg Type: Log-Pwr
Mkr1 1.360 ms
-64.02 dBm
10 dB/div
Log
Ref -40.00 dBm
Center 5.300000000 GHz
Res BW 3.0 MHz
VBW 3.0 MHz
Span 0 Hz
Sweep 20.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

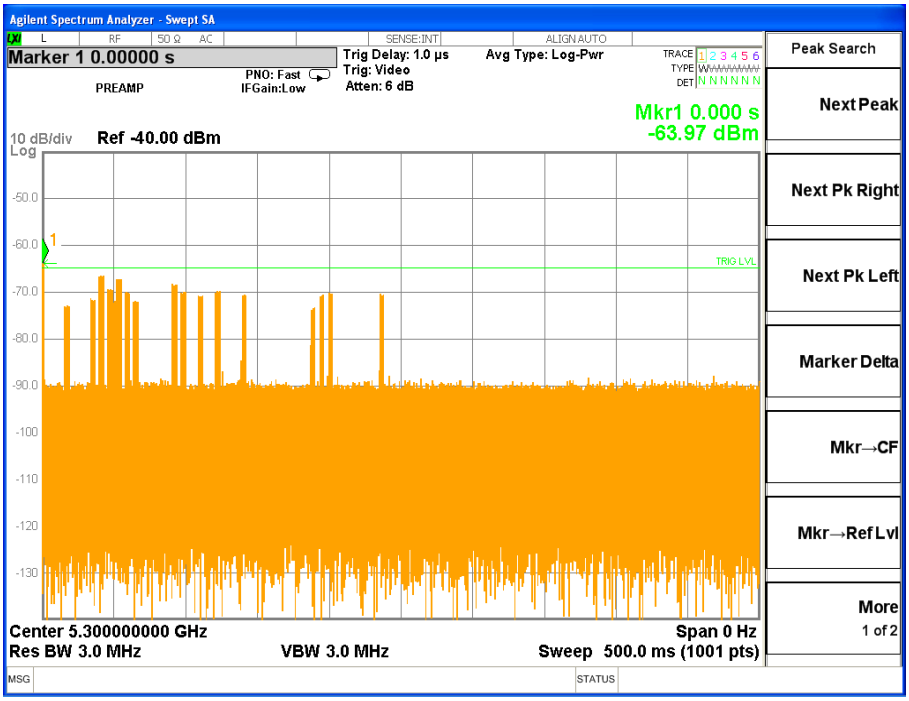
Type 4


Agilent Spectrum Analyzer - Swept SA
Marker 1 1.36000 ms
PREAMP
PNO: Fast
IFGain:Low
Trig Delay: 1.0 µs
Trig: Video
Atten: 6 dB
Avg Type: Log-Pwr
Mkr1 1.360 ms
-63.93 dBm
10 dB/div
Log
Ref -40.00 dBm
Center 5.300000000 GHz
Res BW 3.0 MHz
VBW 3.0 MHz
Span 0 Hz
Sweep 20.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Type 5


Agilent Spectrum Analyzer - Swept SA
Marker 1 3.12000 s
PREAMP
PNO: Fast
IFGain:Low
Trig Delay: 1.0 µs
Trig: Video
Atten: 6 dB
Avg Type: Log-Pwr
Mkr1 3.120 s
-63.04 dBm
10 dB/div
Log
Ref -40.00 dBm
Center 5.300000000 GHz
Res BW 3.0 MHz
VBW 3.0 MHz
Span 0 Hz
Sweep 20.00 s (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Type 6

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