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| | |
|---|---|
| **Nemko Test Report:** | 2015 279131 FCC 15247 |
| **Applicant:** | Alcatel Lucent<br>3400 West Plano Parkway<br>Plano, TX 75075<br>USA |
| **Equipment Under Test:**<br>**(E.U.T.)** | MPT-HLC<br>Model #: 3DB19060AA<br>FCC ID.: JF6-9558L<br>IC ID: 6933B-9558L |
| **In Accordance With:** | **FCC Part 15, Subpart C, 15.247 and**<br>**Industry Canada RSS-210, Issue 8**<br>Digital Transmission Systems |
| **Tested By:** | Nemko USA, Inc.<br>2210 Faraday Avenue. Suite 150<br>Carlsbad, California 92008 |

**TESTED BY:** _____ **DATE:** **12 March 2015**
Tran Phan, Senior Wireless Engineer

**APPROVED BY:** _____ **DATE:** **12 March 2015**
Jim Morris, EMC/Wireless Manager

**Number of Pages: 81**

## Table of Contents

## Section 1. Summary of Test Results

Manufacturer: Alcatel USA

Model No.: MPT-HLC

Serial No.: BS1447UW08Y

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.247 and Industry Canada RSS-210, Issue 8 for Digital Transmission Systems. Radiated tests were conducted is accordance with ANSI C63.10-2013. Conducted tests were made in accordance with FCC OET Bulletin 558074 D01 v03r02. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC and Industry Canada.

☒ New Submission ☒ Production Unit

☐ Class II Permissive Change ☐ Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.
See “Summary of Test Data”.

NVLAP Lab Code 100426-0

**Summary Of Test Data**

| NAME OF TEST | PARA. NO. | RESULT |
|---|---|---|
| Powerline Conducted Emissions | 15.207(a) / RSS-Gen 7.2.4 | Complies |
| Minimum 6 dB Bandwidth | 15.247(a)(2) / RSS-210 A8.2(a) | Complies |
| Maximum Conducted Average Power Output | 15.247(b)(3) / RSS-210 A8.4(4) | Complies |
| Spurious Emissions (Antenna Conducted) | 15.247(d) / RSS-210 A8.5 | Complies |
| Spurious Emissions (Restricted Bands) | 15.247(d)/15.209(a) / RSS-Gen 7.2.2 | Complies |
| Max Average Power Spectral Density | 15.247(e) / RSS-210 A8.2(b) | Complies |

**Footnotes:**

**Document History**

| REVISION | DATE | BY | COMMENTS |
|---|---|---|---|
| - | 03/12/2015 | Tran Phan | Initial Release |
| - | 5/18/2015 | James Morris | Split Report |
| | | | |
| | | | |

## Section 2. Equipment Under Test (E.U.T.)

### General Equipment Information

| **Frequency Band (MHz):** | 902-928 | 2400-2483.5 | 5725-5850 |
|---|---|---|---|
| | ☐ | ☐ | ☒ |

**Operating Frequency of Test Sample:** 5725 to 5850 MHz

**Channel Spacing:** 5, 10 or 30 MHz

**User Frequency Adjustment:** Software controlled

### Description of EUT

5 GHz rack-mounted point to point transceiver. This model includes two distinct radios as listed below, which were tested together as a system.

Not included in this report is:
Part # 3DB19060BA, FCC ID.: JF6-9558L-D, IC ID: 6933B-9558L-D

This report includes:
Part # 3DB19060AA, FCC ID.: JF6-9558L, IC ID: 6933B-9558L.

Software revision: 9500MPR 5.2 WebEML Version V05.02.24.

**Table 6-J. 5.8 GHz unlicensed antenna options**

| PARABOLIC | FLAT |
|---|---|
| **MPT-HL/9558HC** | **MPT-HL/9558HC** |
| 2 ft parabolic – 29 dB/6° | 1 ft flat panel – 23 dB/9° |
| 4 ft parabolic – 35 dB/3° | 2 ft flat panel – 28 dB/3.5° |
| 6 ft parabolic – 38 dB/2° | — |
| 8 ft parabolic – 41 dB/1.5° | — |
| 10 ft parabolic – 42.5 dB/1.2° | — |

## Section 3. Occupied Bandwidth

| | |
|---|---|
| NAME OF TEST: Occupied Bandwidth | PARA. NO.: 15.247(a)(2) RSS-210 A8.2(a) |
| TESTED BY: Tran Phan | DATE: 24 Feb 2015 |

**Test Results:** Complies.

**Measurement Data:** See attached plots

**Test Conditions:** 45 %RH
22 °C

**Measurement Uncertainty:** +/-1x10$^{-7}$ ppm

**Test Equipment Used:** 1767

The Low/Mid/High Channels were selected as following:

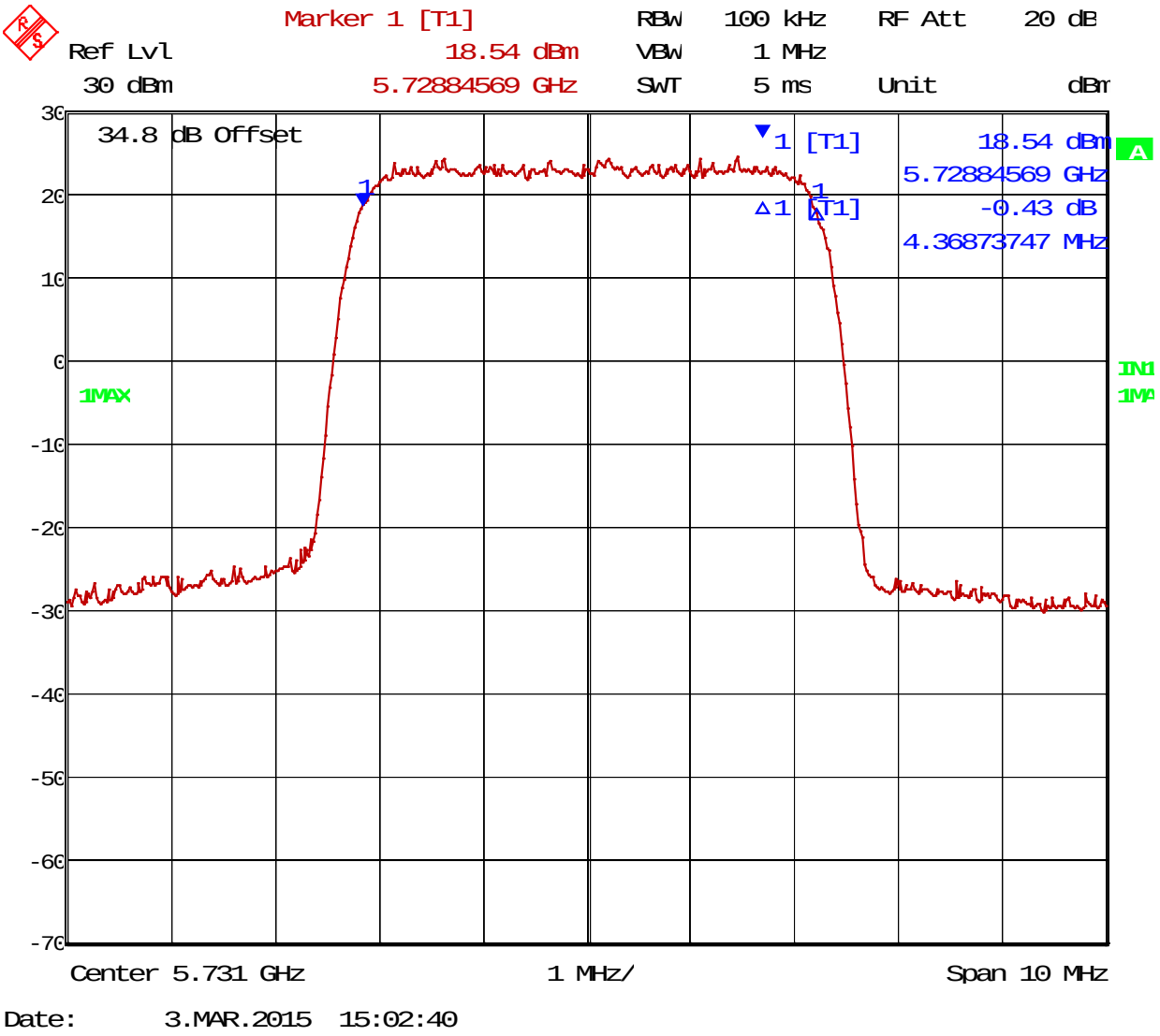
| | Frequency | | |
|---|---|---|---|
| **Channel** | **At 5MHz BW** | **At 10MHz BW** | **At 30MHz BW** |
| Low | 5.731GHz | 5.731GHz | 5.741GHz |
| Mid | 5.781GHz | 5.781GHz | 5.771GHz |
| High | 5.844GHz | 5.844GHz | 5.834GHz |

**The device was tested on three channels at the highest and lowest data rates.**

**Only result from the lowest data rate was shown due to the worst case scenario.**

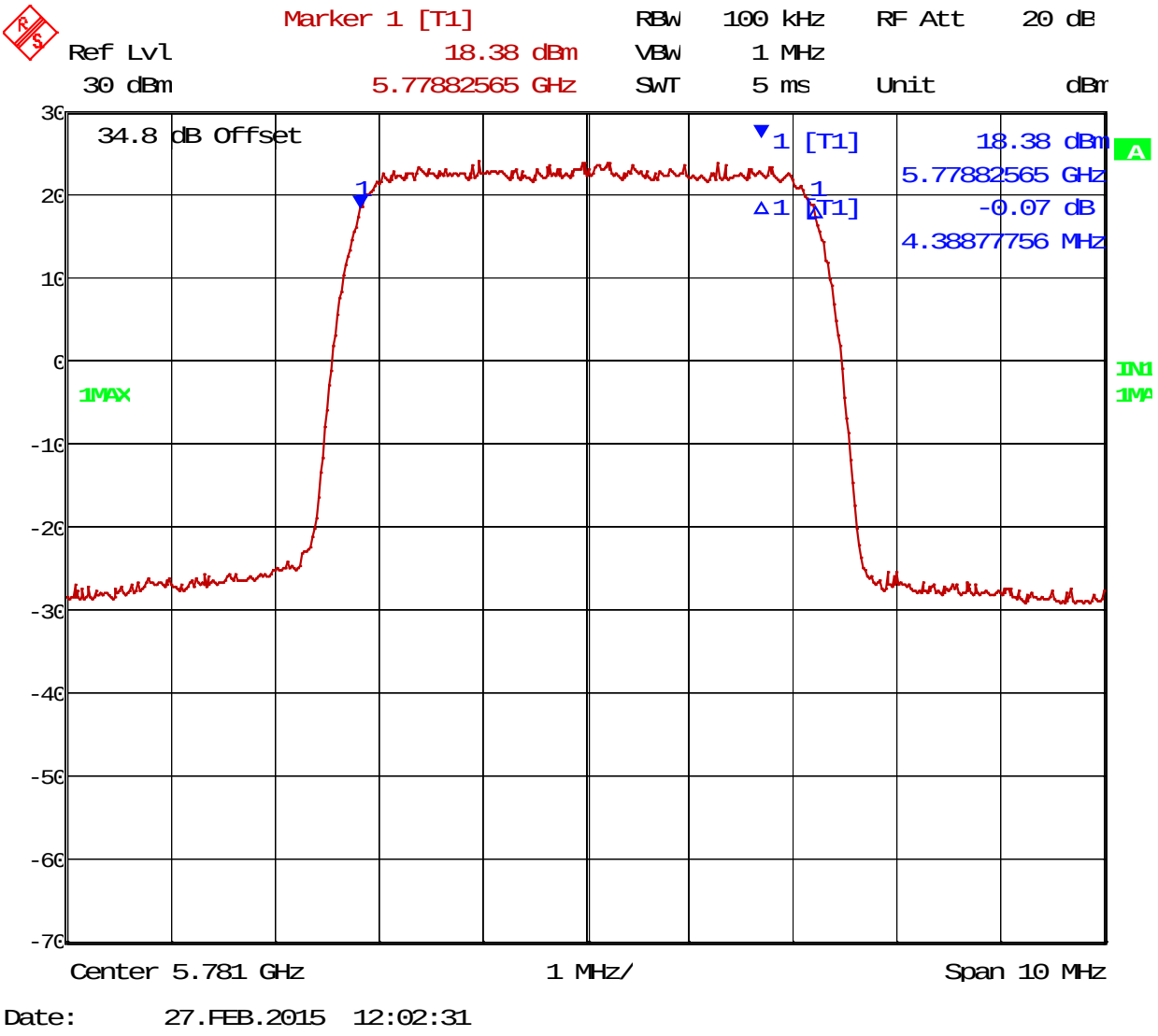
**Test Data – Occupied Bandwidth**

Low Channel (5.731GHz)
4QAM
5 MHz Channel
6 dB Bandwidth



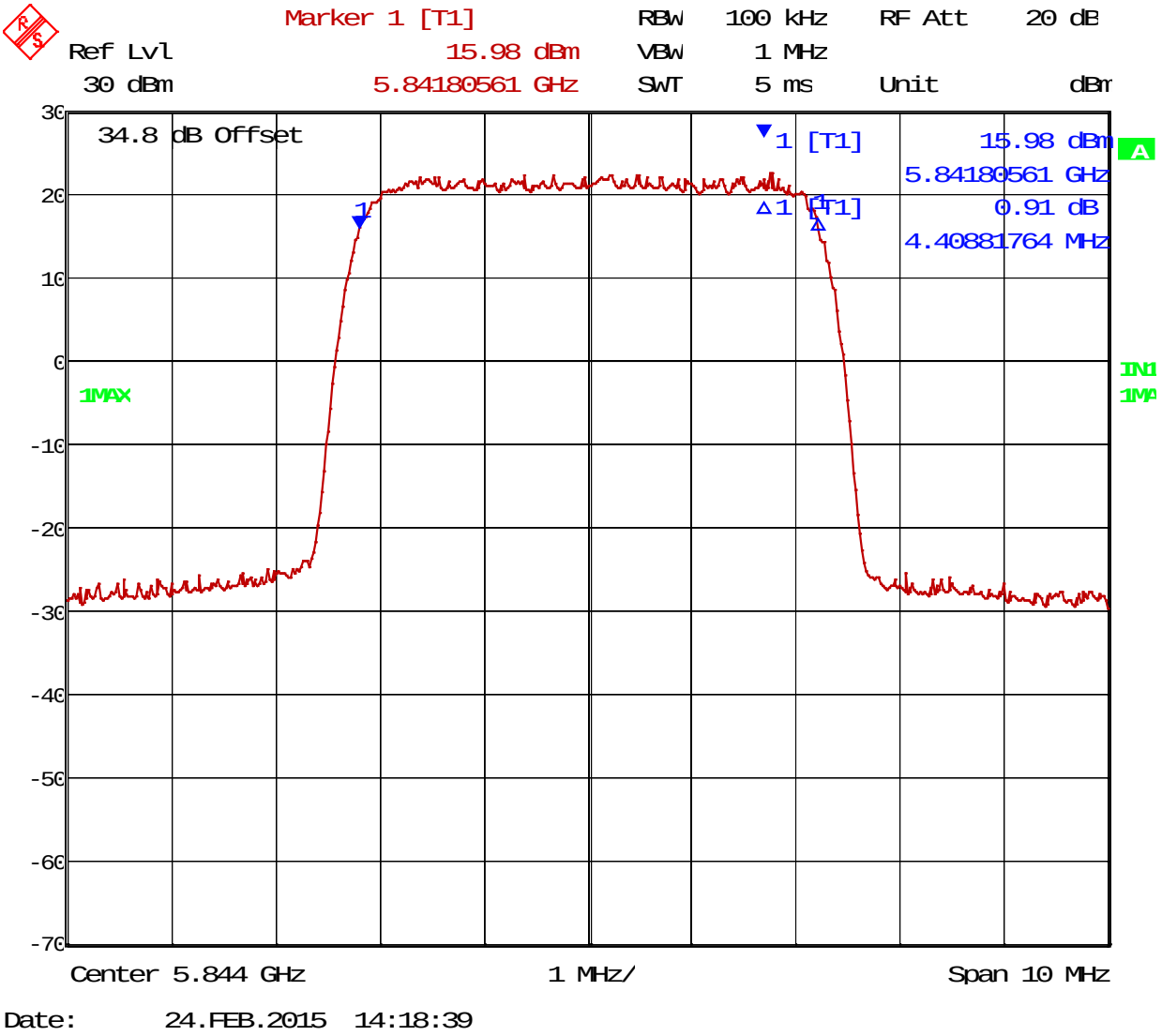
**Test Data – Occupied Bandwidth**

Mid Channel (5.781GHz)
4QAM
5 MHz Channel
6 dB Bandwidth



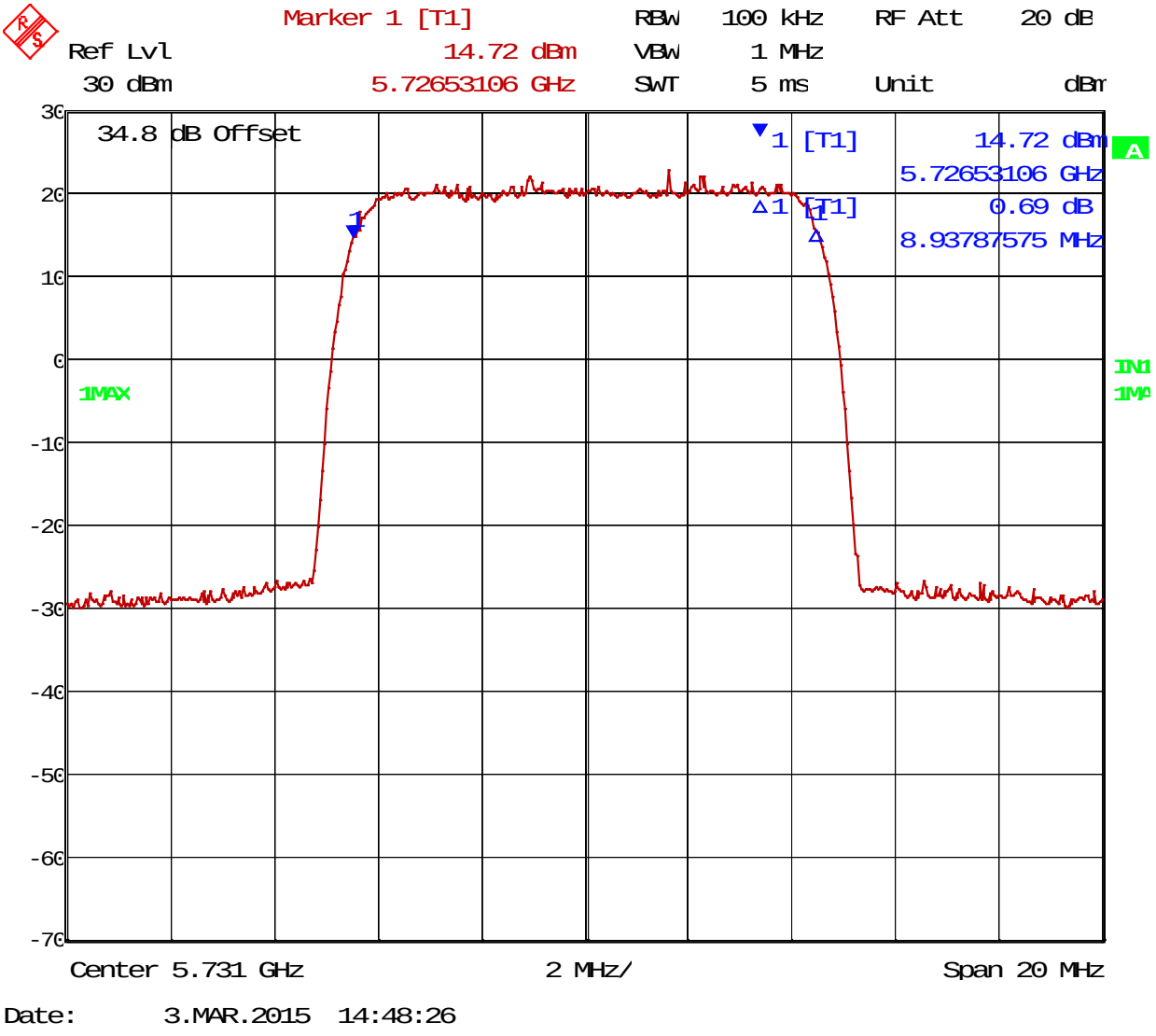
**Test Data – Occupied Bandwidth**

High Channel (5.834GHz)
4QAM
5 MHz Channel
6 dB Bandwidth



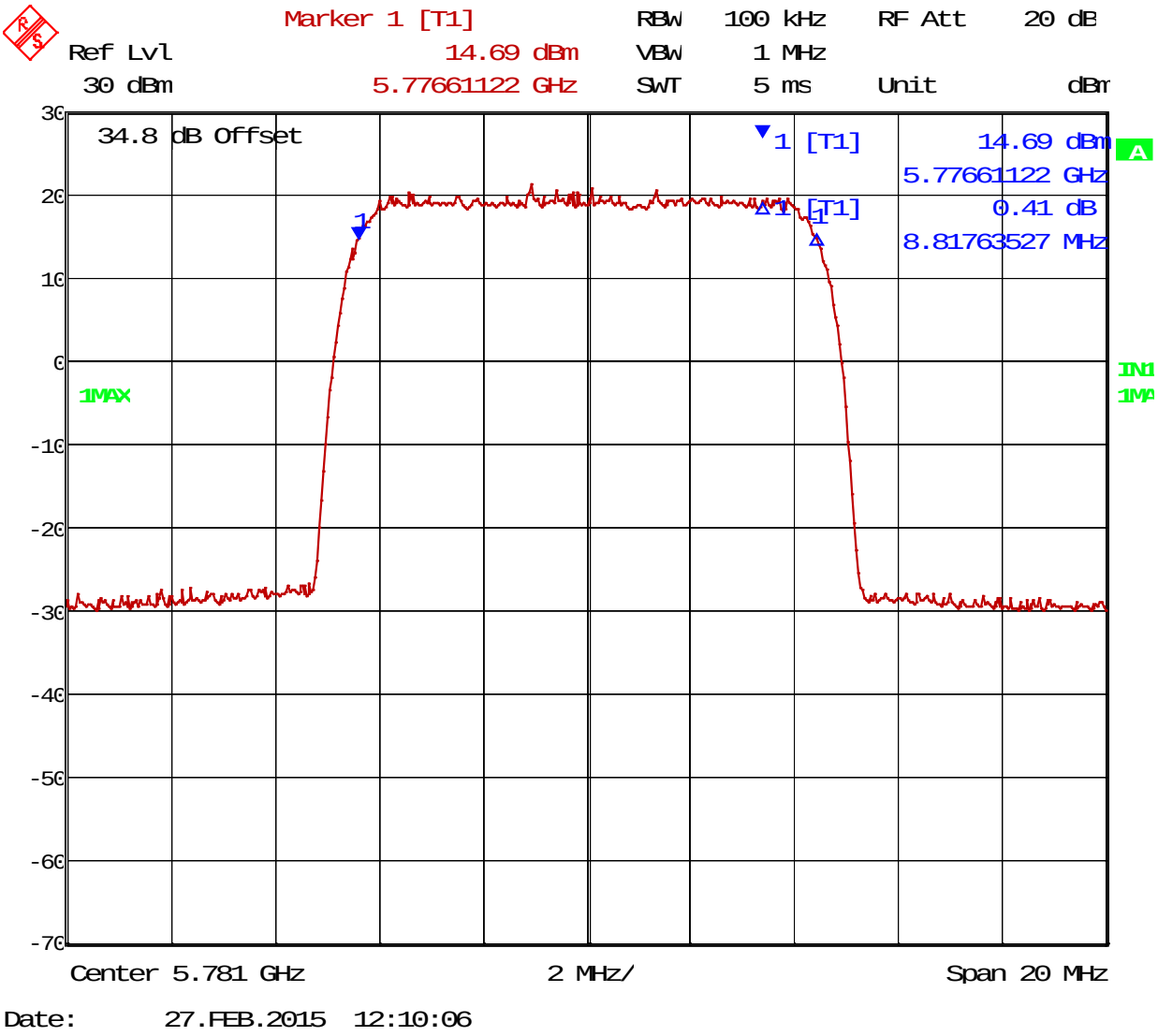
**Test Data – Occupied Bandwidth**

Low Channel (5.731GHz)
6 dB Bandwidth
10 MHz Channel
4QAM
6 dB Bandwidth



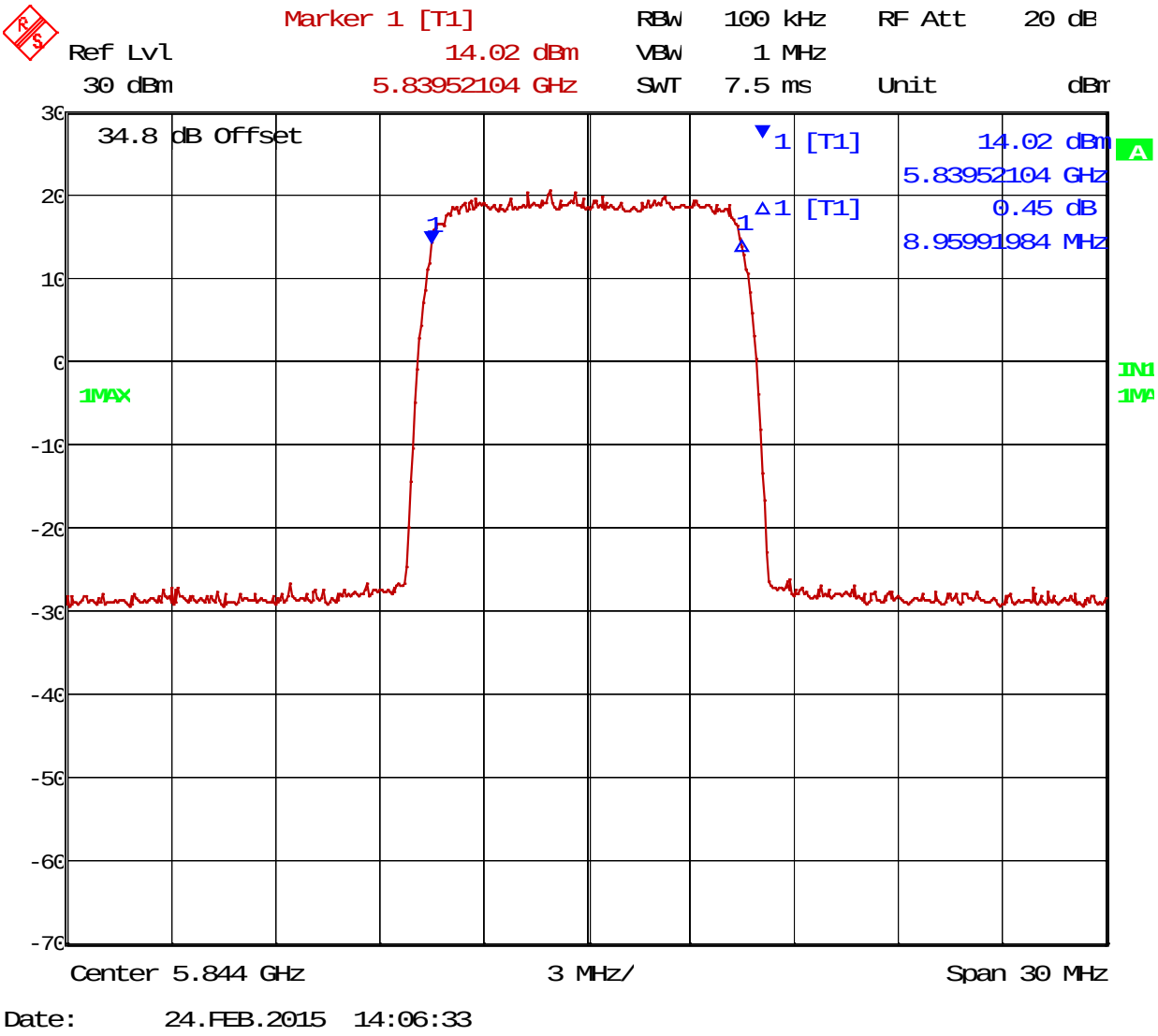
**Test Data – Occupied Bandwidth**

Mid Channel (5.781GHz)
10 MHz Channel
4QAM
6 dB Bandwidth



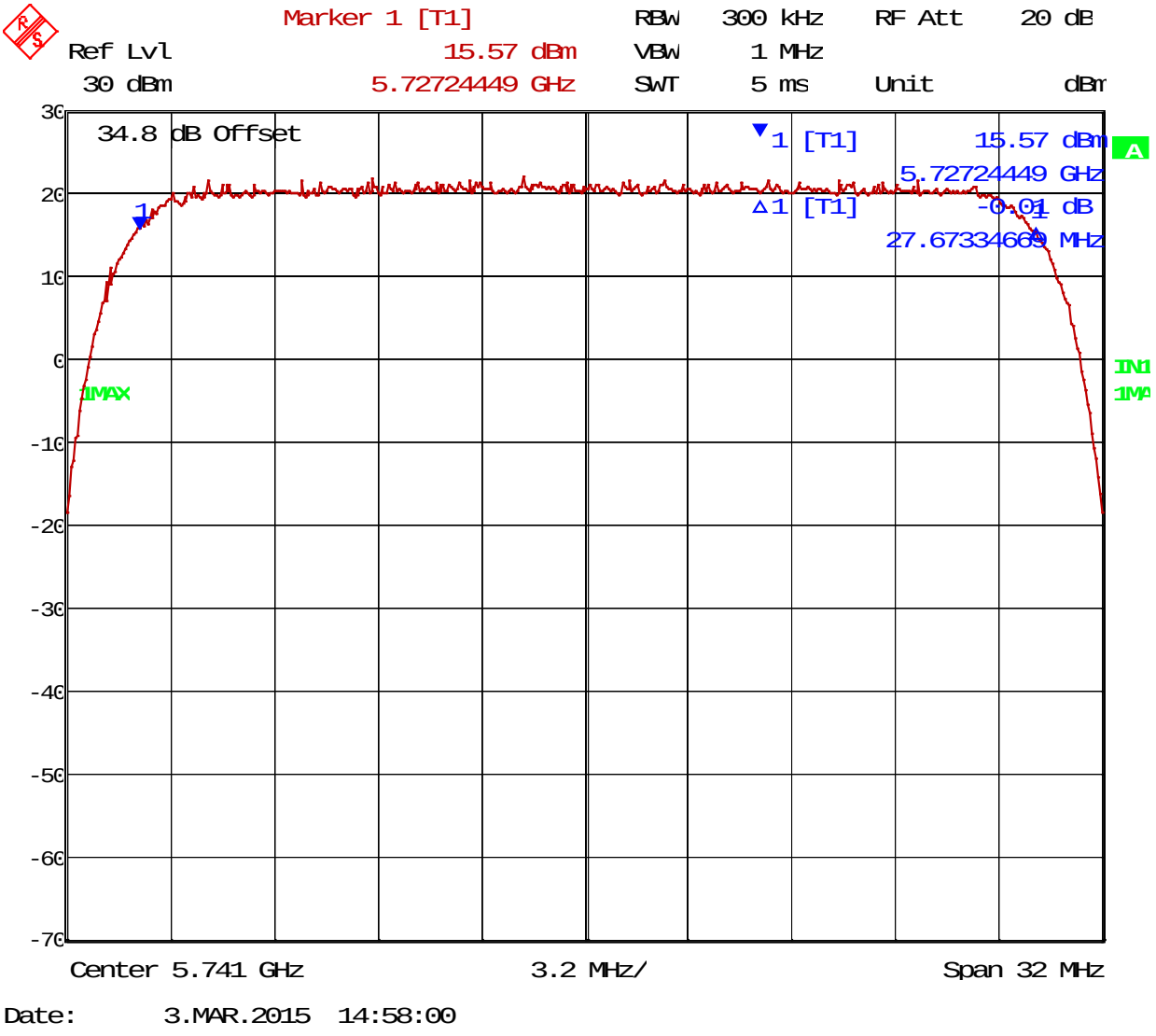
**Test Data – Occupied Bandwidth**

High Channel (5.844GHz)
4QAM
10 MHz Channel
6 dB Bandwidth



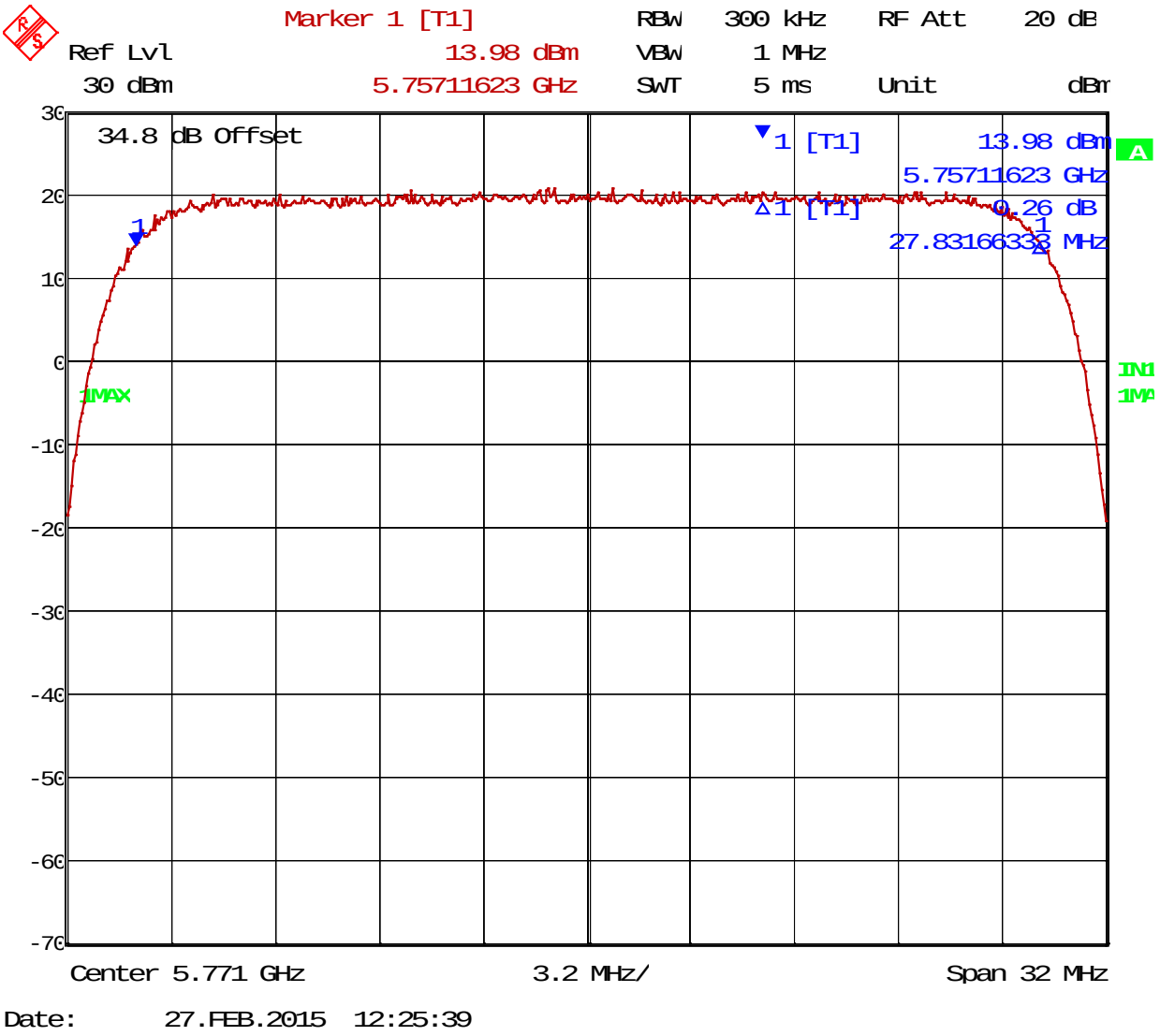
**Test Data – Occupied Bandwidth**

Low Channel (5.741GHz)
4QAM
30 MHz Channel
6 dB Bandwidth



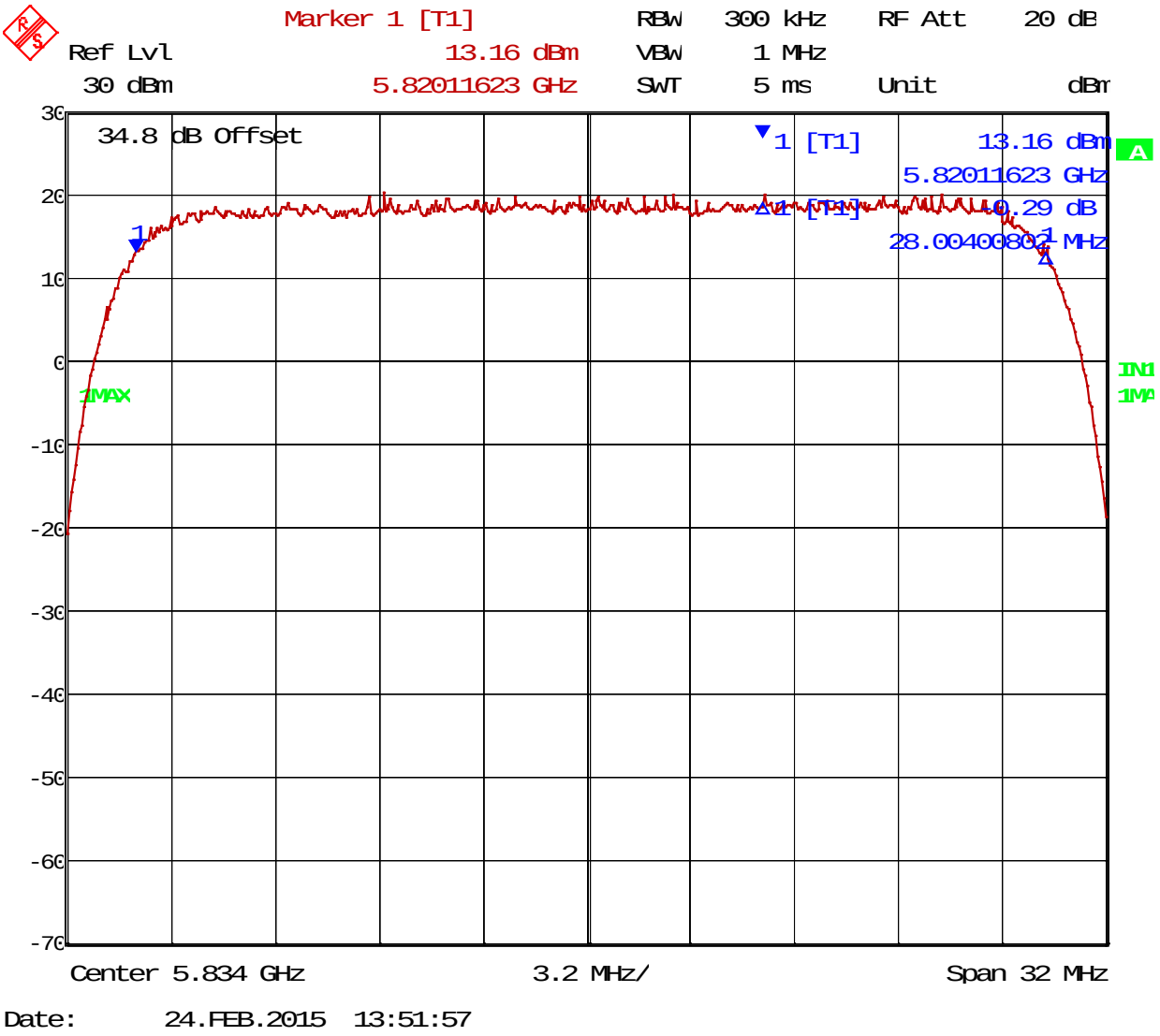
**Test Data – Occupied Bandwidth**

Mid Channel (5.771GHz)
4QAM
30 MHz Channel
6 dB Bandwidth



**Test Data – Occupied Bandwidth**

High Channel (5.834MHz)
4QAM
30 MHz Channel
6 dB Bandwidth



## Section 4. Maximum Conducted Average Output Power

| | |
|---|---|
| NAME OF TEST: Maximum Conducted Output power | PARA. NO.: 15.247(b)(3) RSS-210 A8.4(4) |
| TESTED BY: Tran Phan | DATE: 03 March 2015 |

**Test Results:** Complies.

**Measurement Data:** Refer to attached data

**Test Conditions:** 54 %RH
22 °C

**Measurement Uncertainty:** +/-1.7 dB

**Test Equipment Used:** 1767

☒ This device was tested at +/- 15% input power per 15.31(e), with no variation in output power.

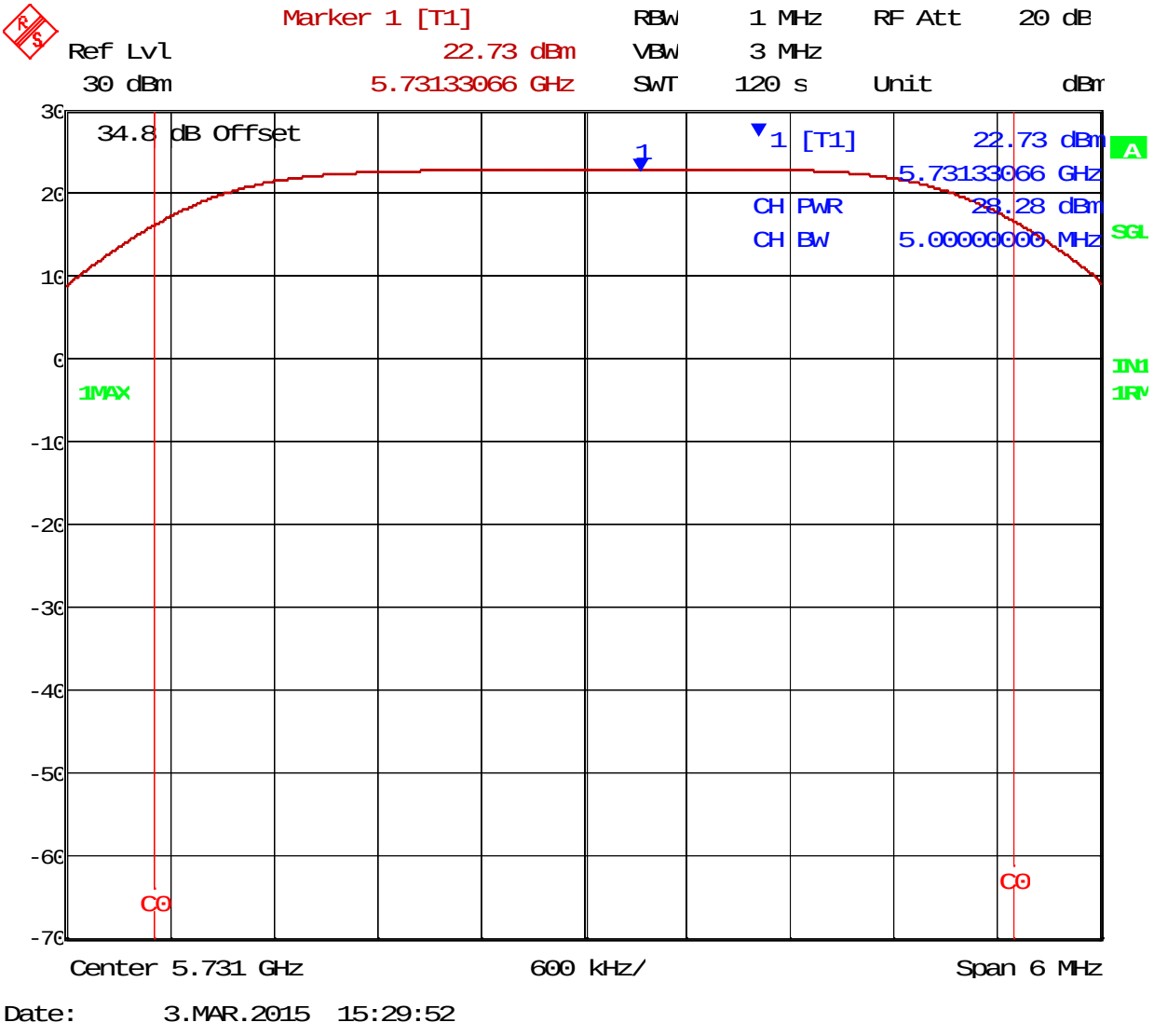
☐ For battery powered equipment, the device was tested with a fresh battery per 15.31(e).

☒ The device was tested on three channels per 15.31(l).

☐ This test was performed radiated.

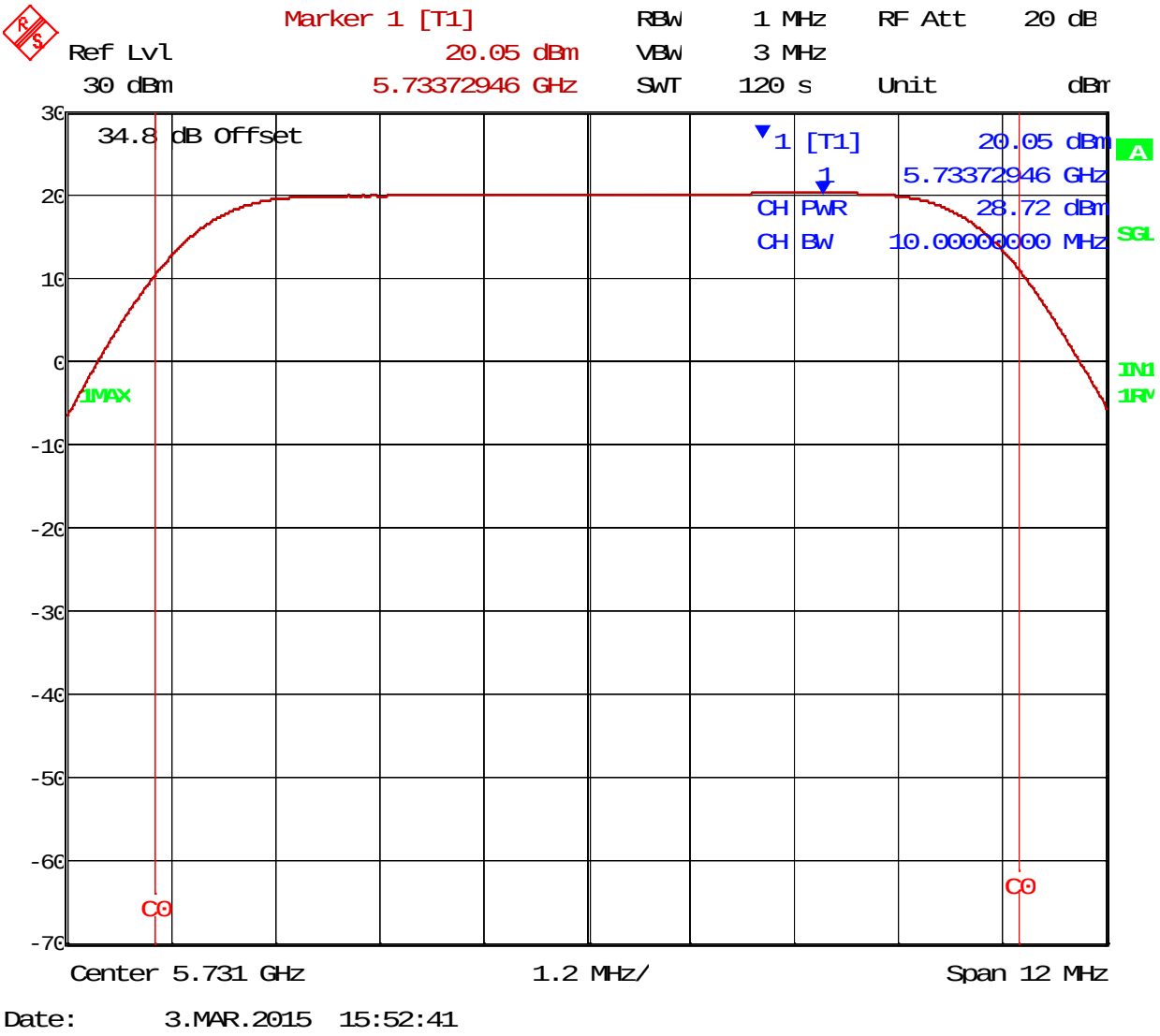
**Test Data – Maximum Conducted Average Power**

Low Channel (5.731GHz)
Output Power
5 MHz Channel
4QAM



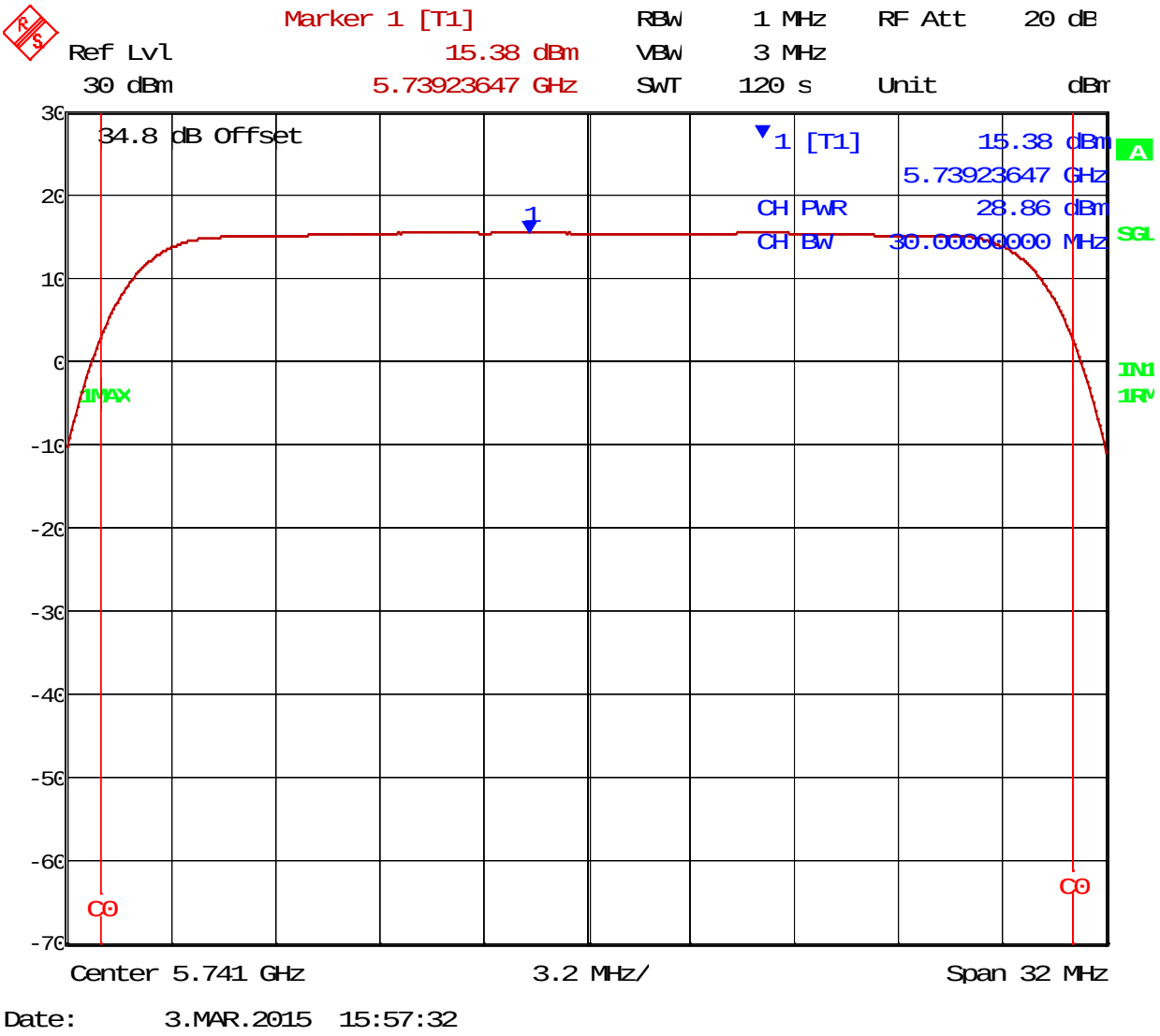
**Test Data – Maximum Conducted Average Power**

Low Channel (5.731GHz)
Output Power
10 MHz Channel
4QAM



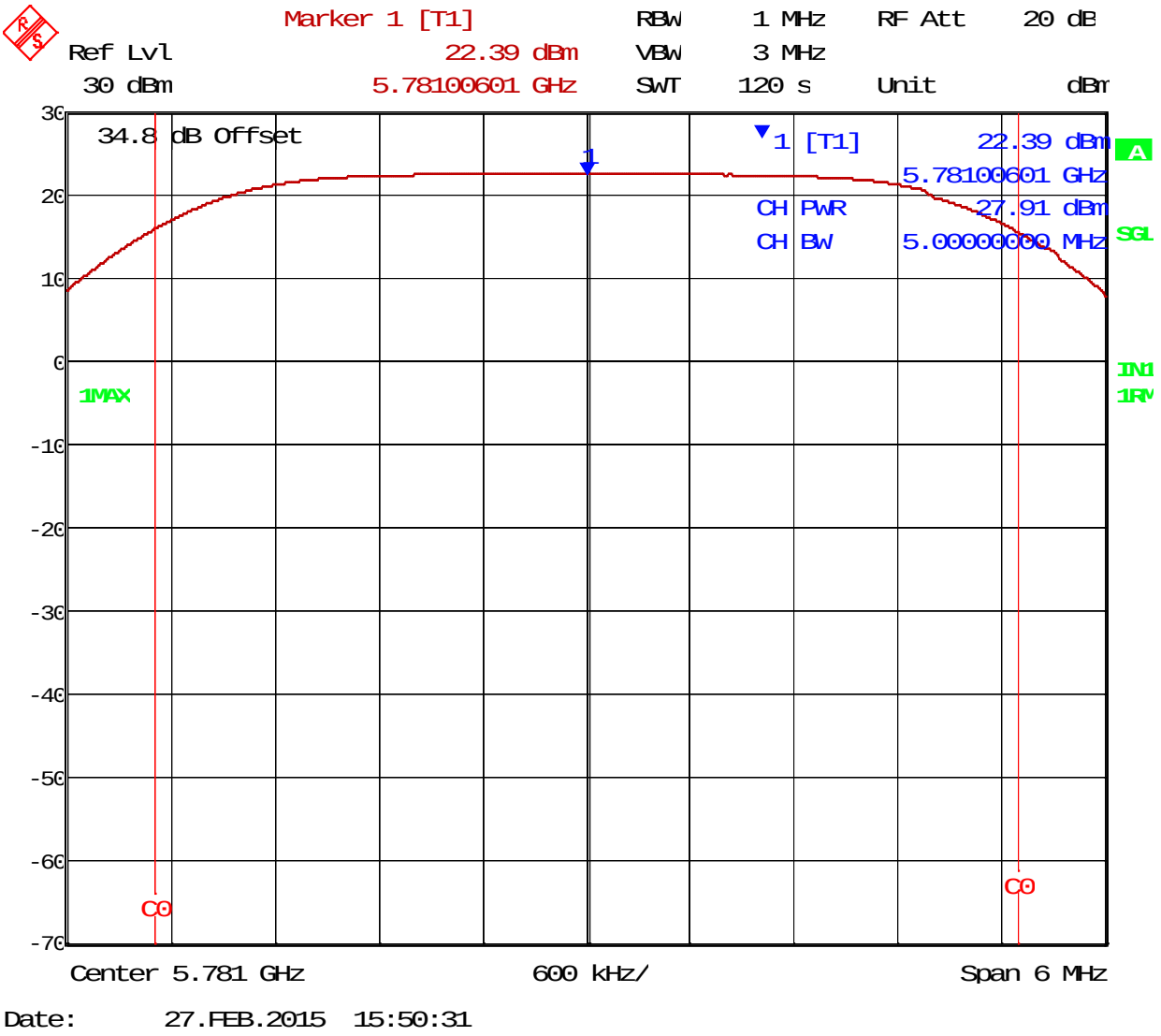
**Test Data – Maximum Conducted Average Power**

Low Channel (5.731GHz)
Output Power
30 MHz Channel
4QAM



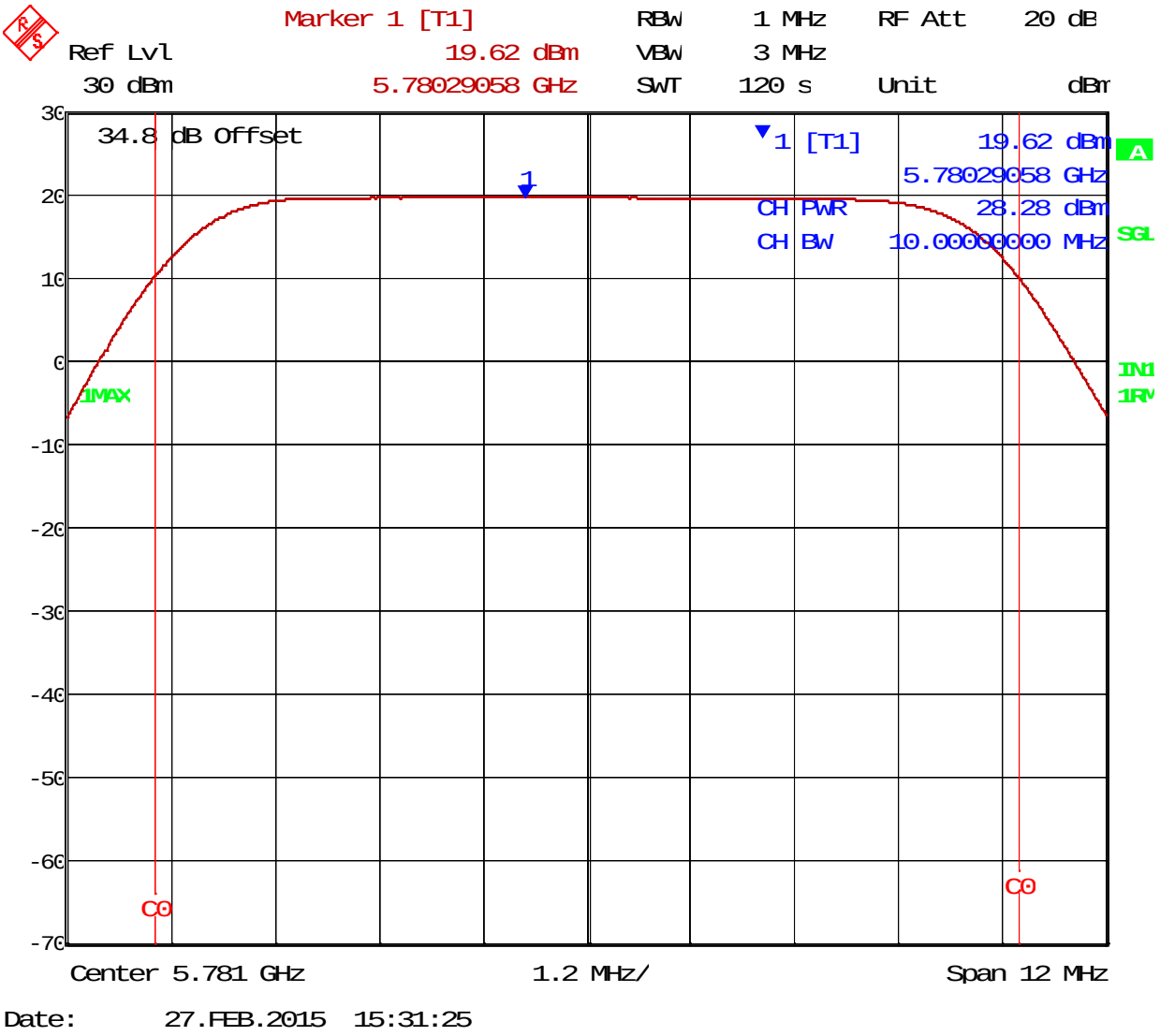
**Test Data – Maximum Conducted Average Power**

Mid Channel
4QAM
5 MHz Channel
Output Power



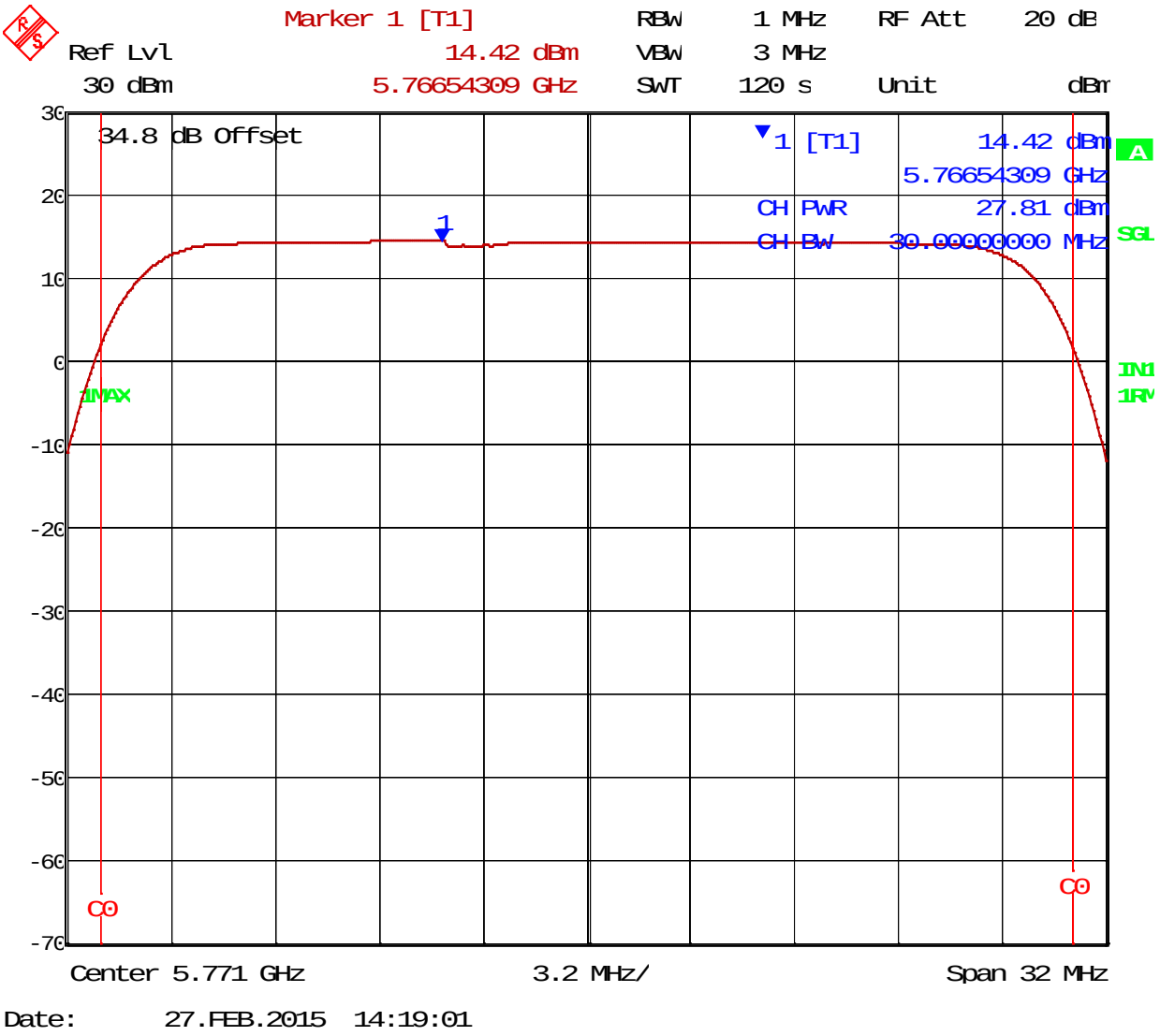
**Test Data – Maximum Conducted Average Power**

Mid Channel
10 MHz Channel
4QAM
Output Power



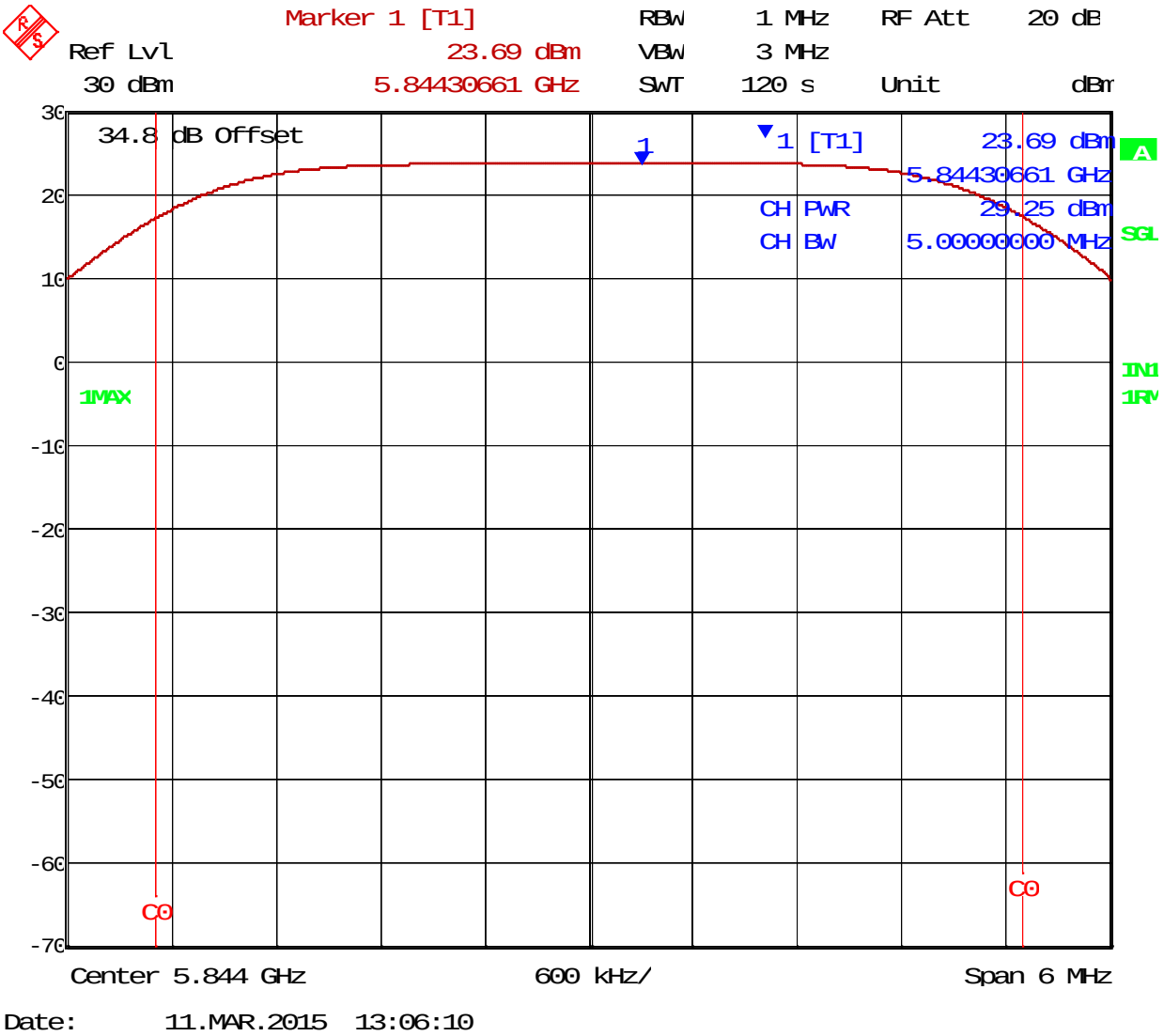
**Test Data – Maximum Conducted Average Power**

Mid Channel
4QAM
30 MHz Channel
Output Power



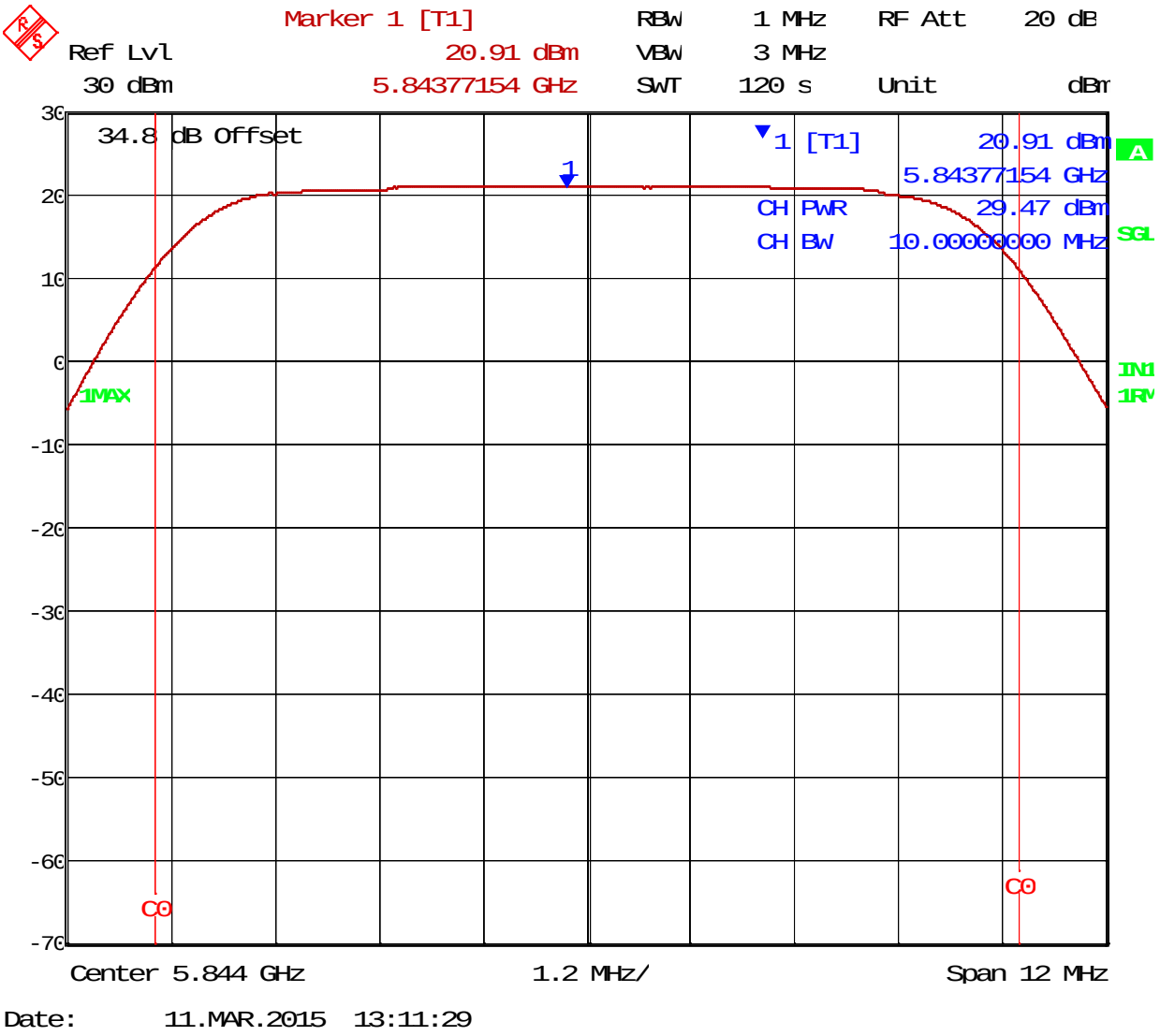
**Test Data – Maximum Conducted Average Power**

High Channel
4QAM
5 MHz Channel
Output Power



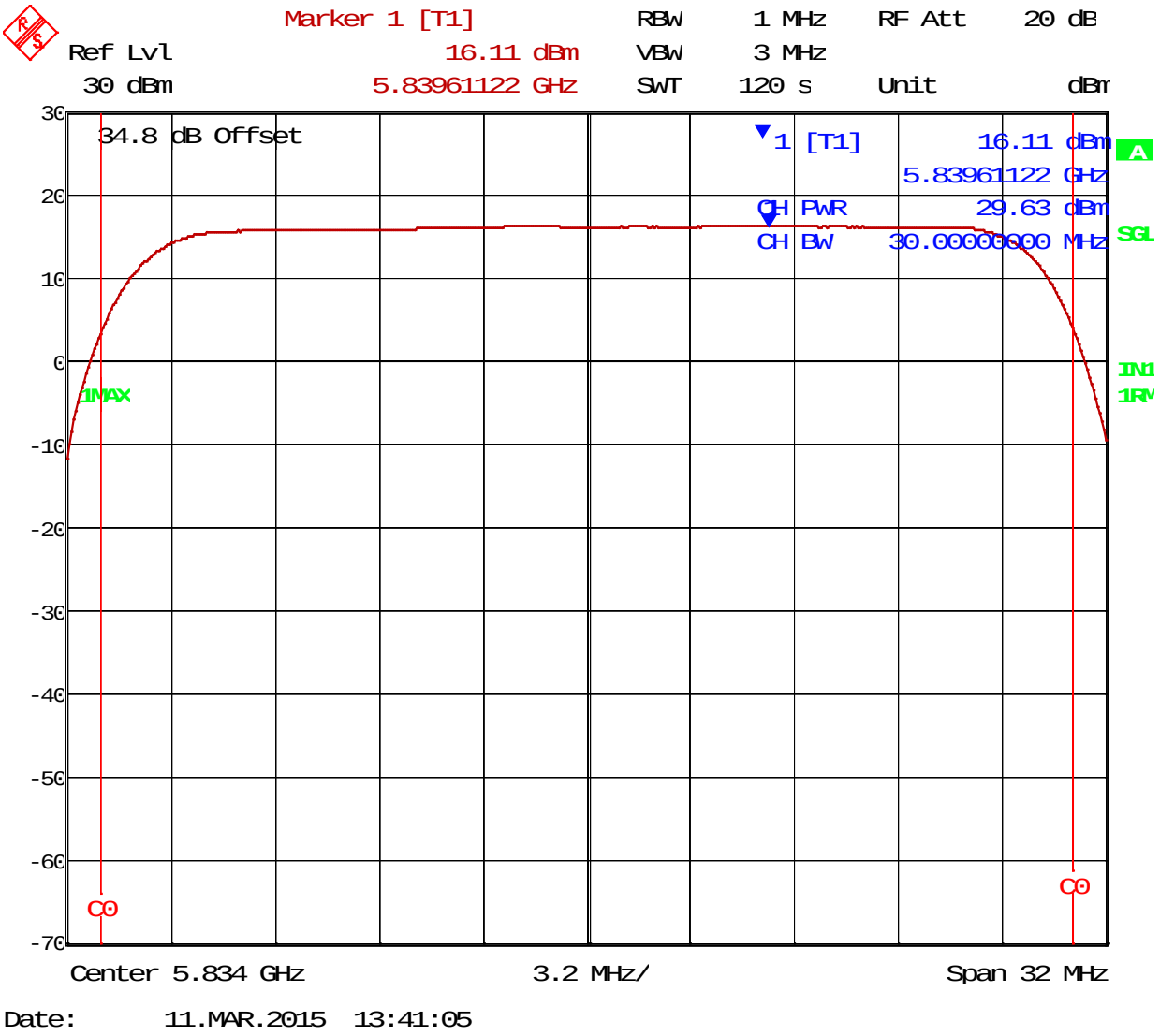
**Test Data – Maximum Conducted Average Power**

High Channel
4QAM
10 MHz Channel
Output Power



**Test Data – Maximum Conducted Average Power**

High Channel
4QAM
30 MHz Channel
Output Power



## Section 5 Spurious Emissions at Antenna Terminals

| | |
|---|---|
| NAME OF TEST: Spurious Emissions at Antenna Terminals | PARA. NO.: 15.247 (d)<br>RSS-210 AA8.5 |
| TESTED BY: Tran Phan | DATE: 04 March 2015 |

**Test Results:** Complies.

**Measurement Data:** See attached plots.

**Test Conditions:** 54 %RH
22 °C

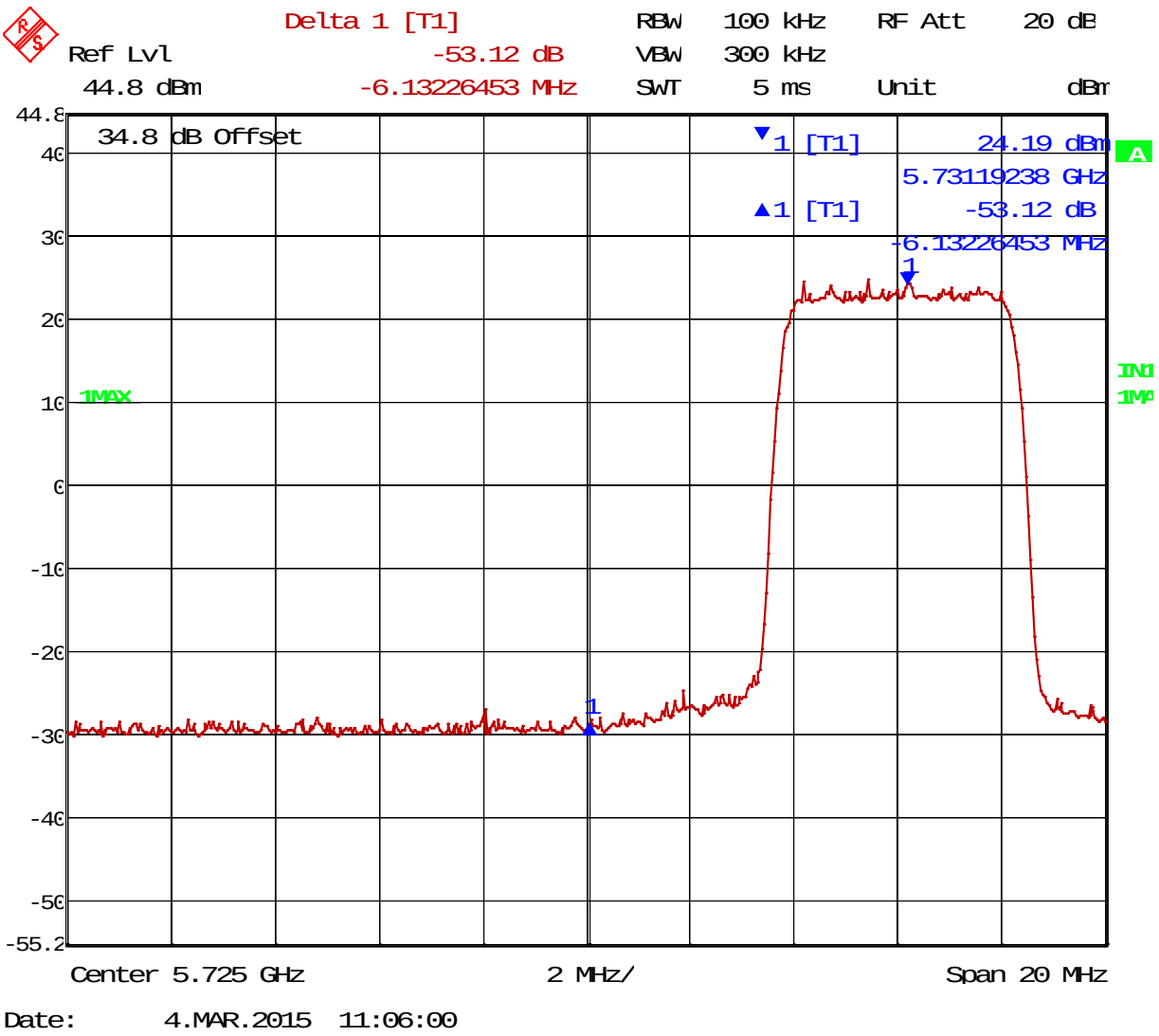
**Measurement Uncertainty:** +/-1.7 dB

**Test Equipment Used:** 1767-835

**Note: Average power is reported. All spurious emissions were determined to be 30 dB below the carrier power.**

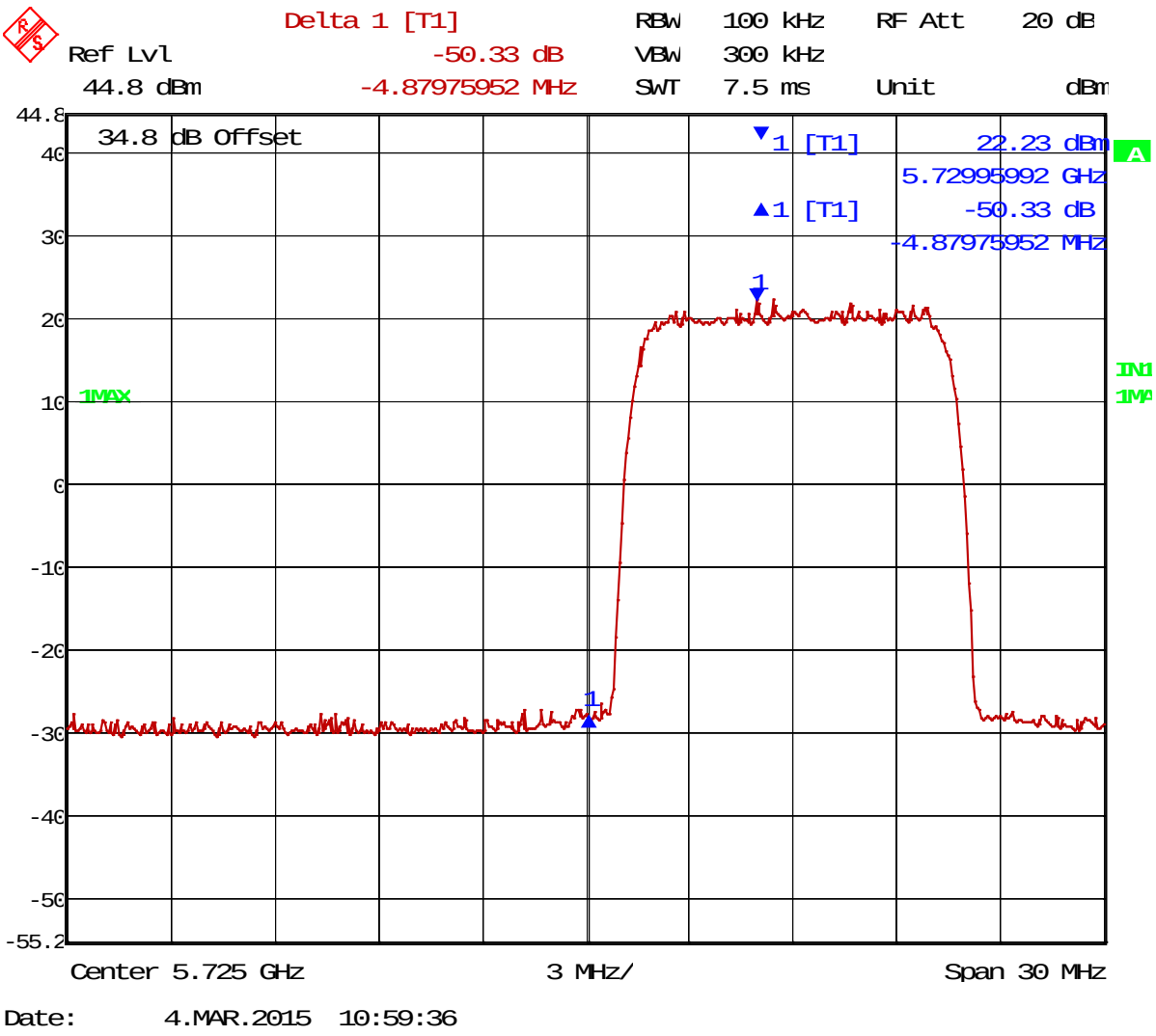
**Test Data – Spurious Emissions at Antenna Terminals**

Low Channel (5.731GHz)
Low Band Edge
5 MHz Channel
4 QAM



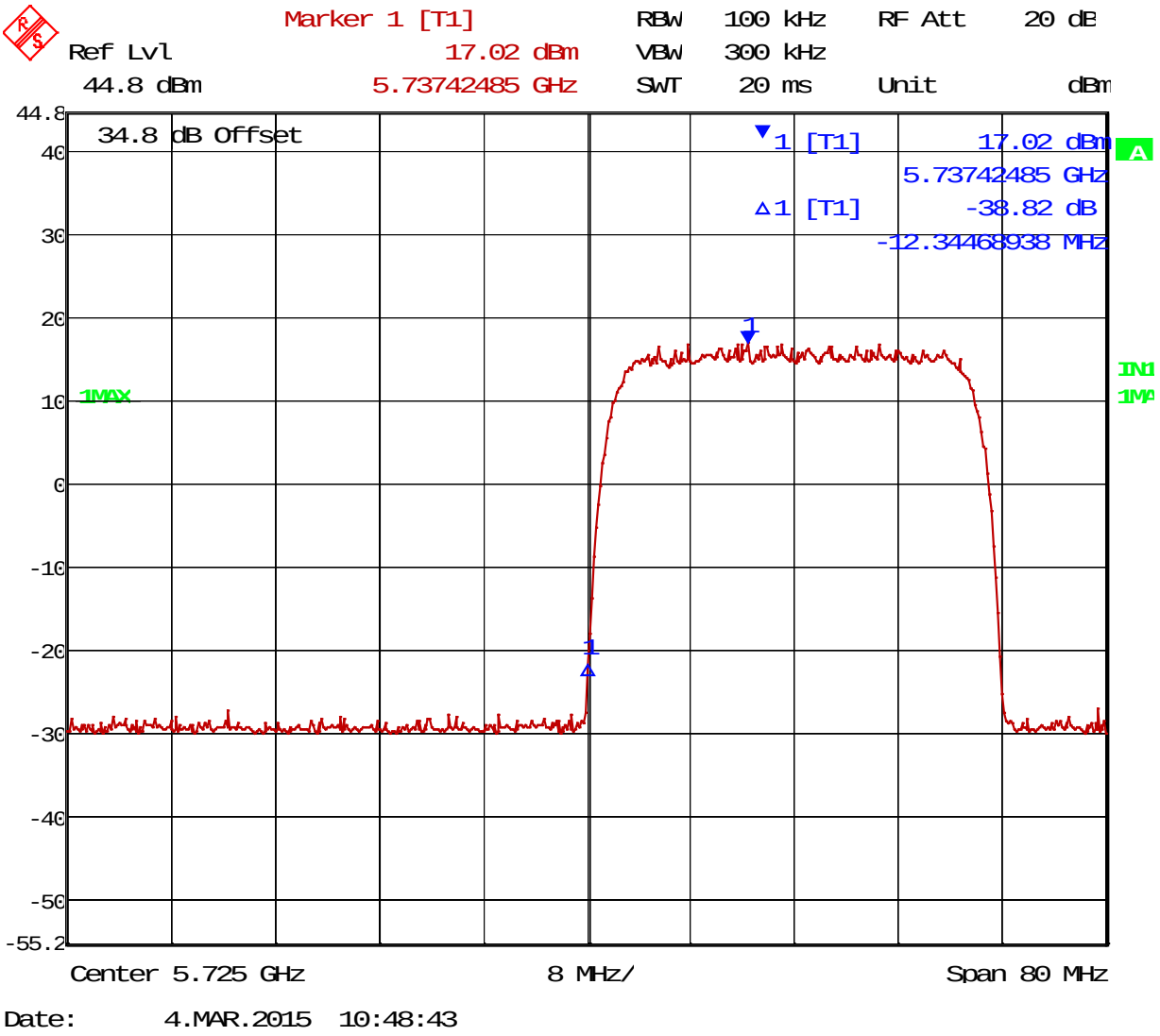
**Test Data – Spurious Emissions at Antenna Terminals**

Low Channel (5.731GHz)
Low Band Edge
10 MHz Channel
4QAM



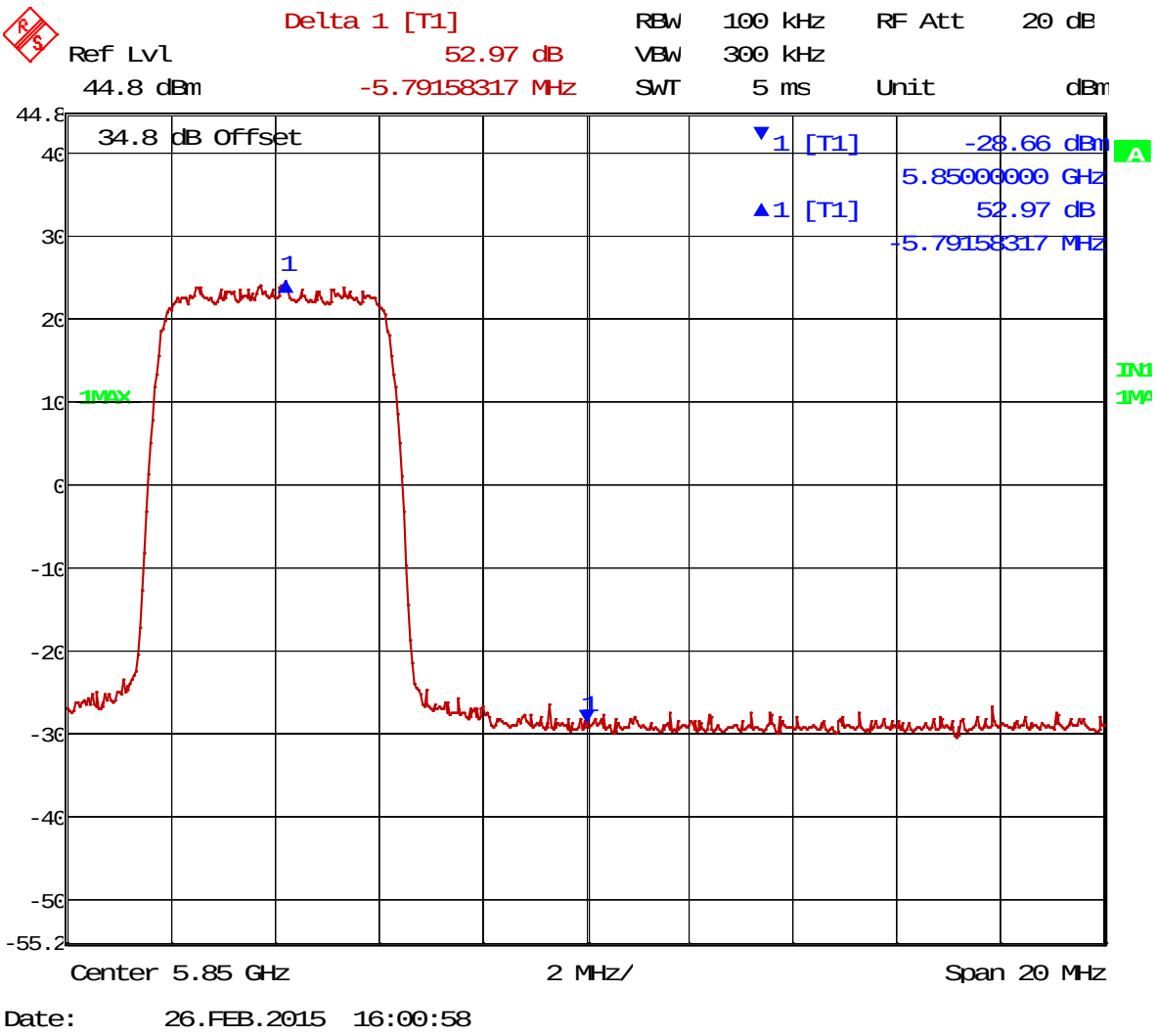
**Test Data – Spurious Emissions at Antenna Terminals**

Low Channel(5.741GHz)
Low Band Edge
30 MHz Channel
4QAM



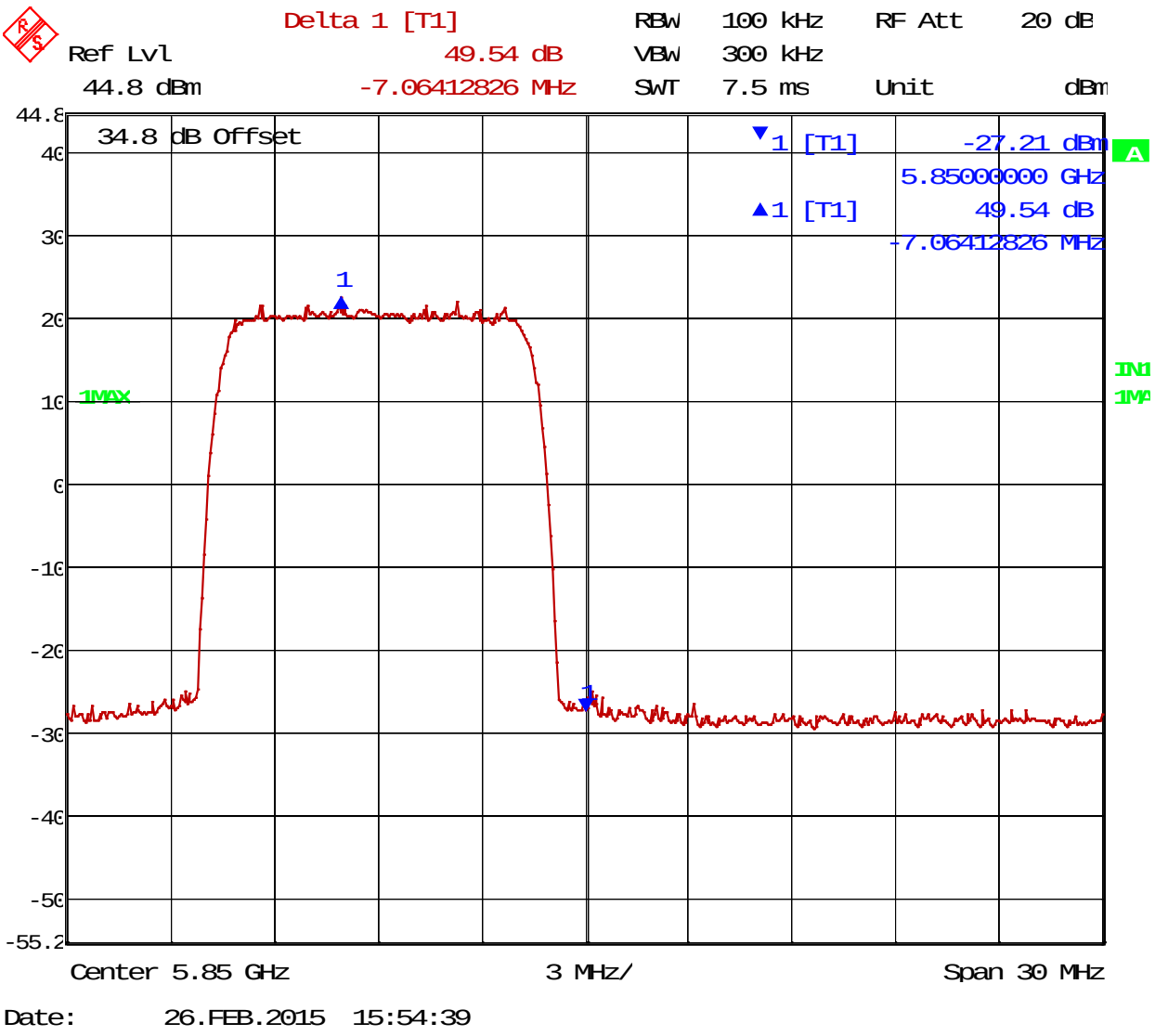
**Test Data – Spurious Emissions at Antenna Terminals**

High Channel (5.844GHz)
4QAM
5 MHz Channel
Upper Band Edge



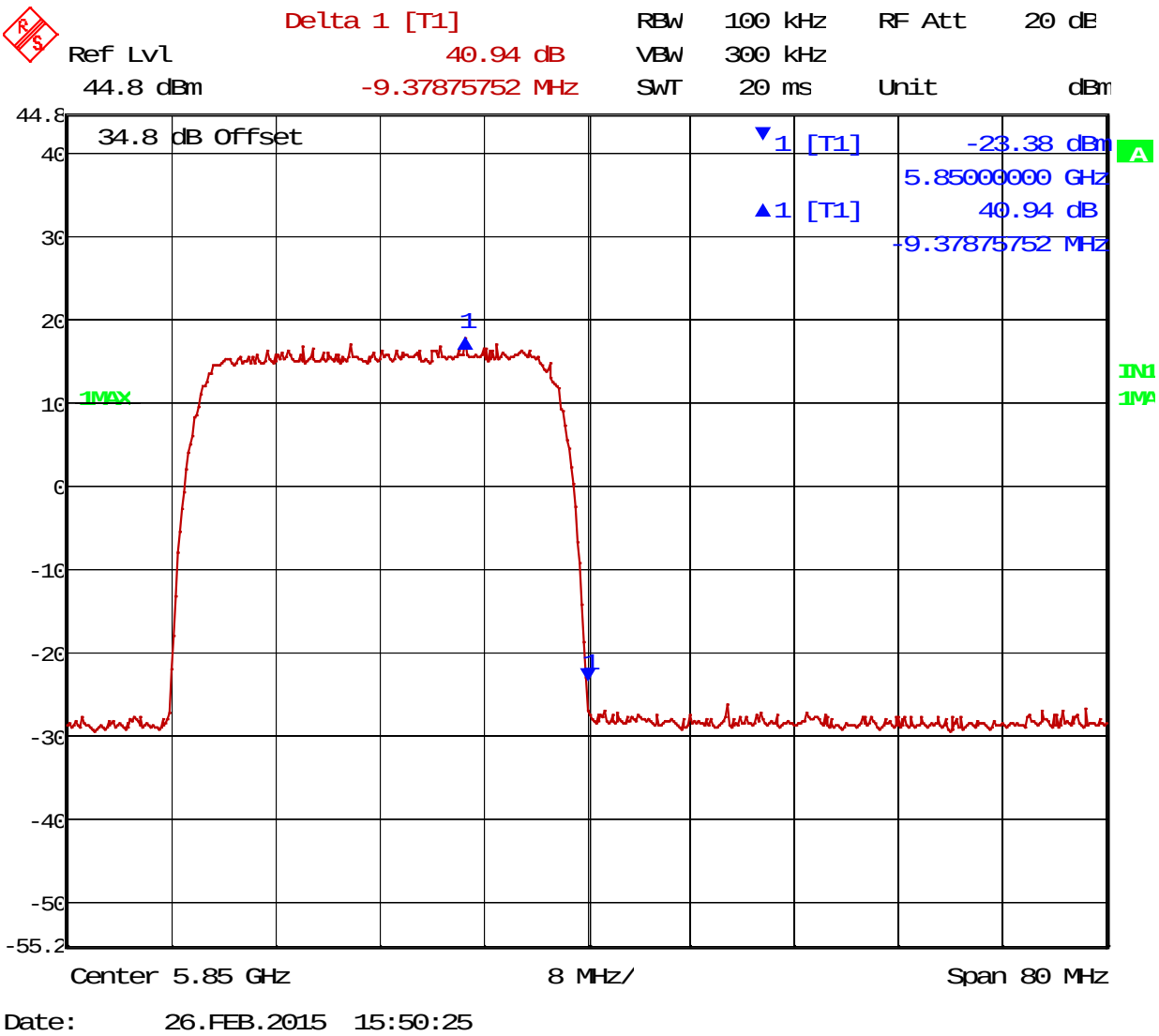
**Test Data – Spurious Emissions at Antenna Terminals**

High Channel (5.844GHz)
4QAM
10 MHz Channel
Upper Band Edge



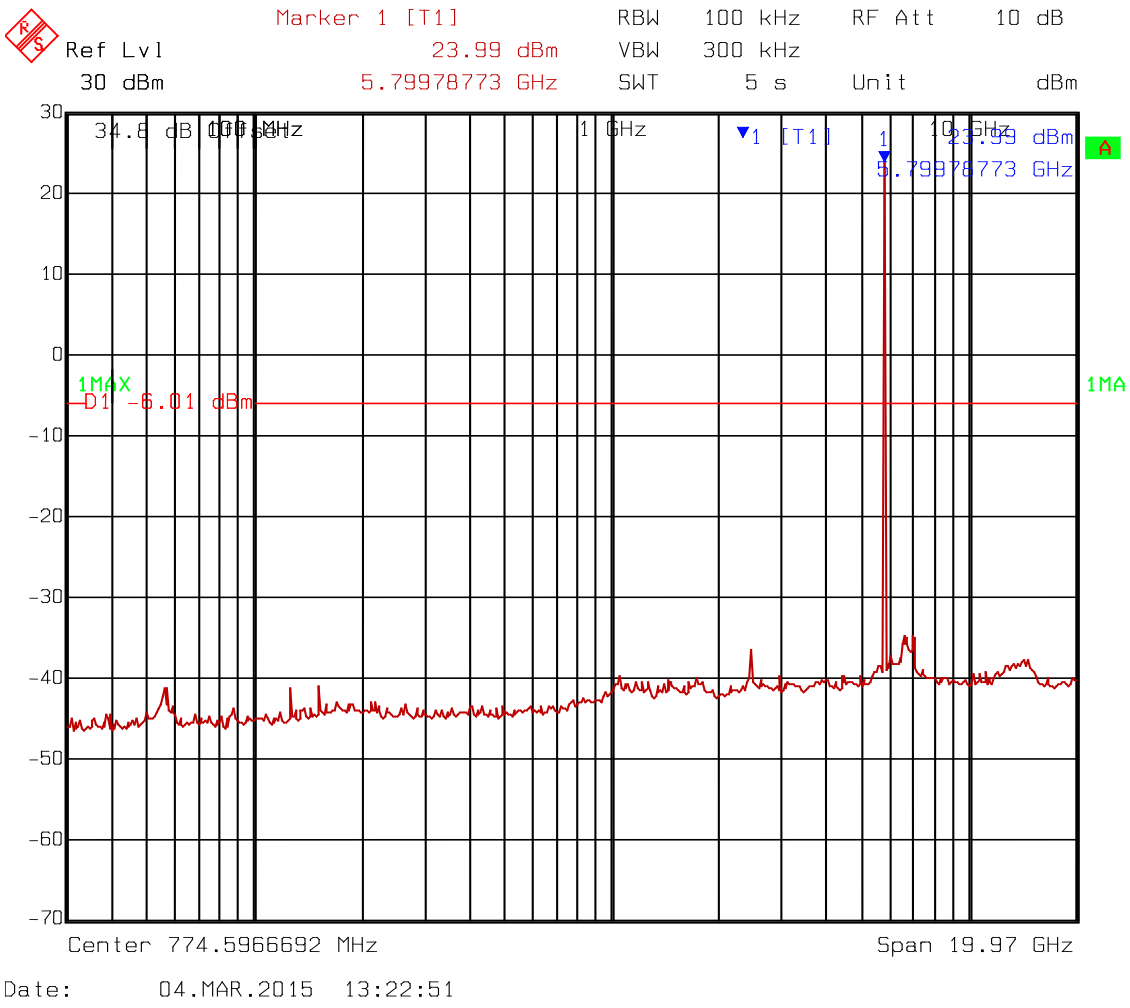
**Test Data – Spurious Emissions at Antenna Terminals**

High Channel (5.834GHz)
4QAM
30 MHz Channel
Upper Band Edge

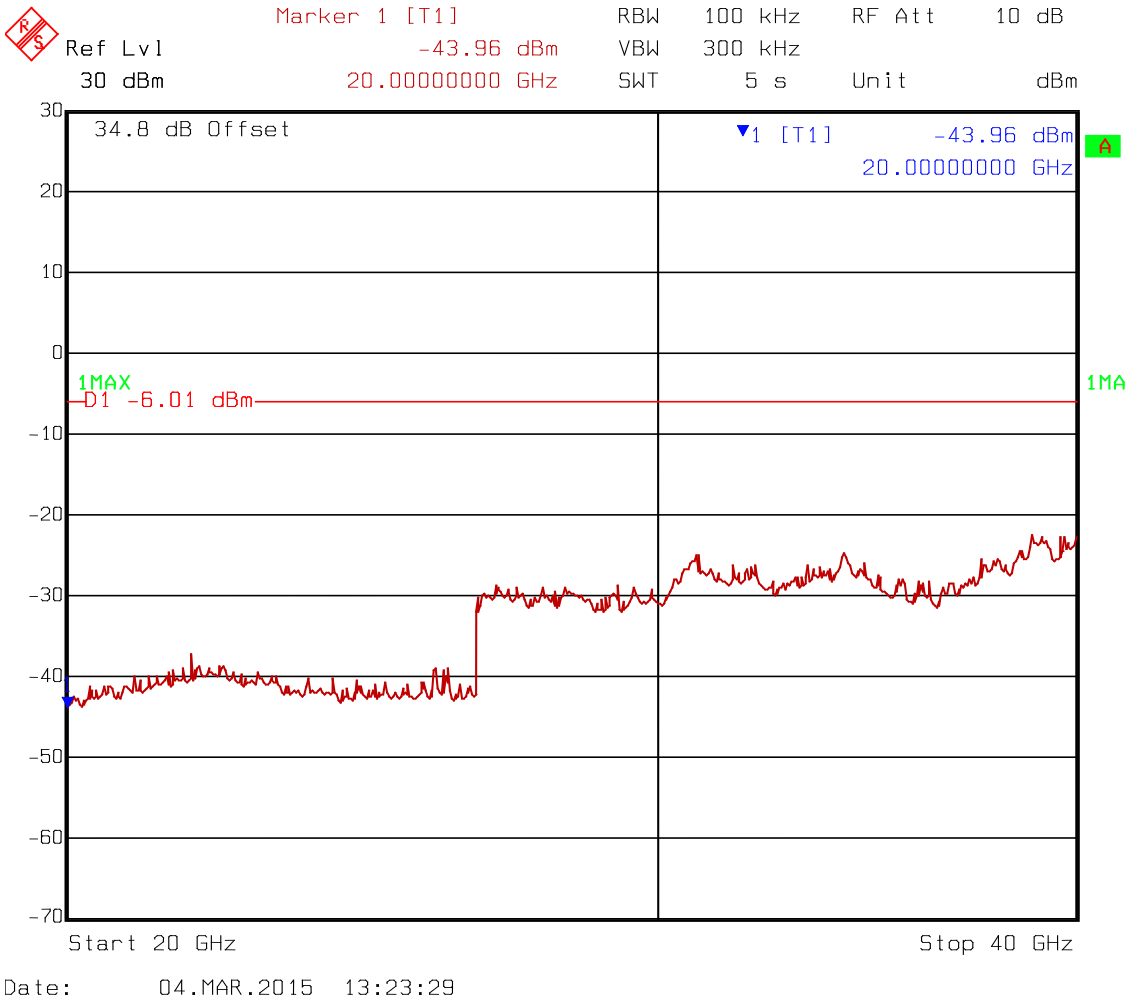


## Test Data – Spurious Emissions at Antenna Terminals

Low Channel
Spurious Emissions (30MHz to 20GHz)
5 MHz Channel
4QAM

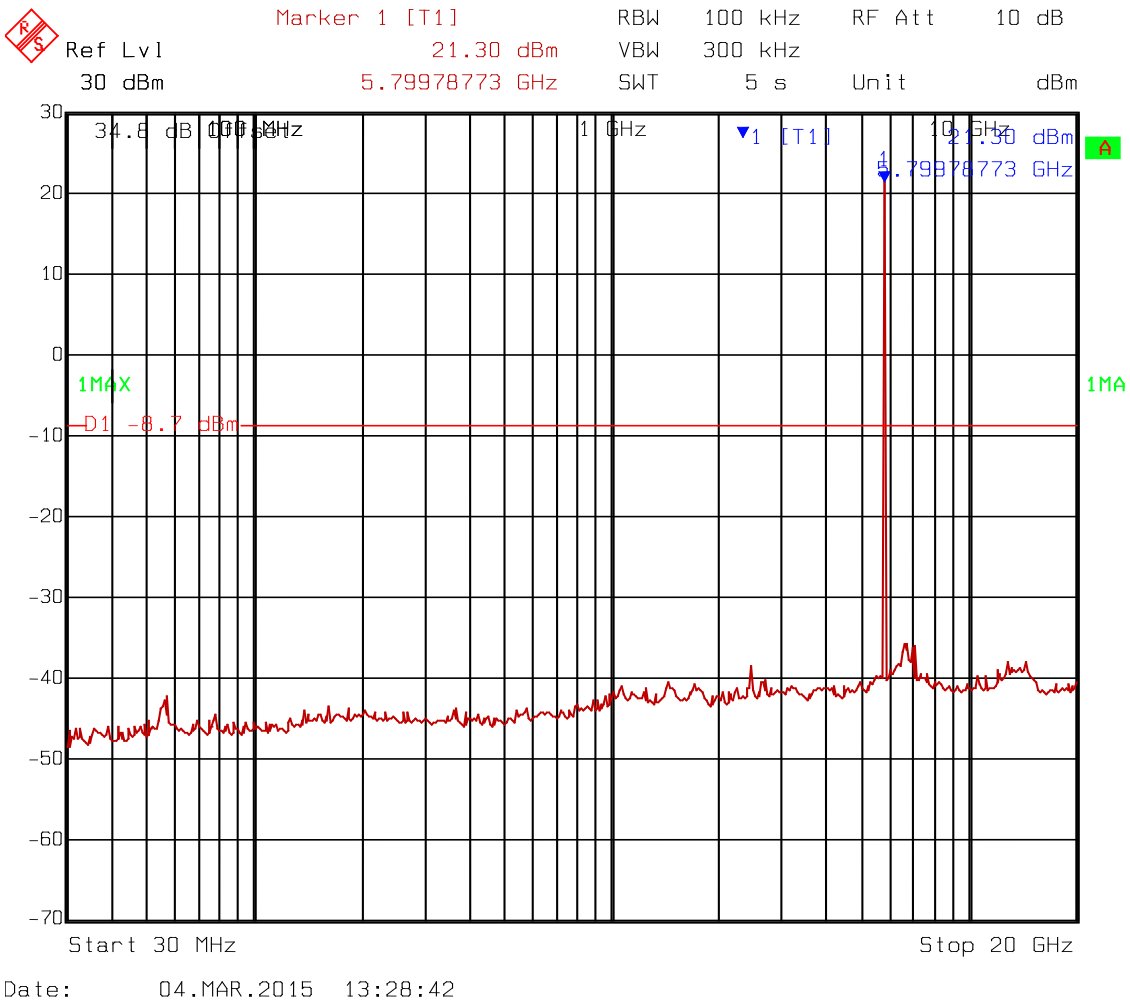


Low Channel
Spurious Emissions (20GHz to 40GHz)
5 MHz Channel
4QAM

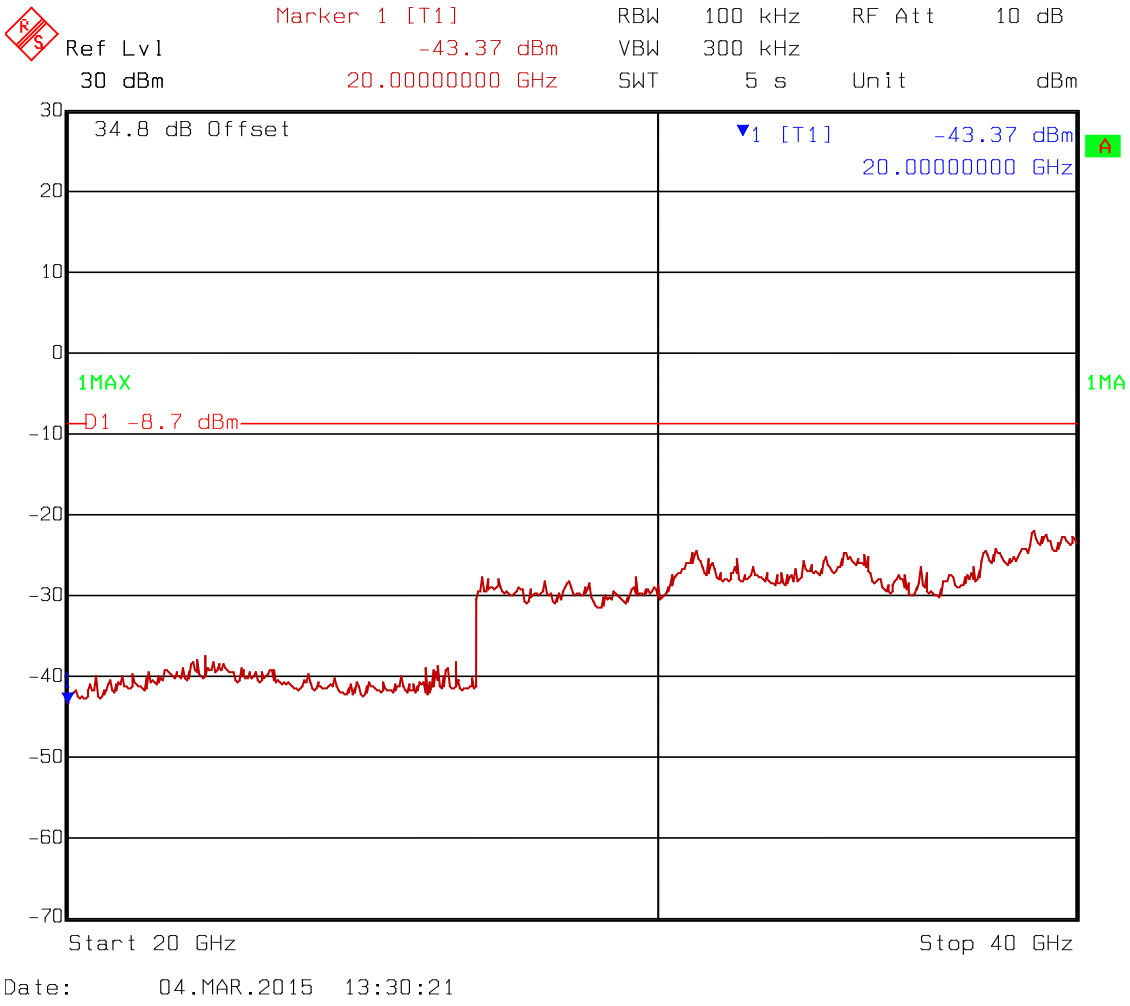


## Test Data – Spurious Emissions at Antenna Terminals

Low Channel
Spurious Emissions (30MHz to 20GHz)
10 MHz Channel
4 QAM

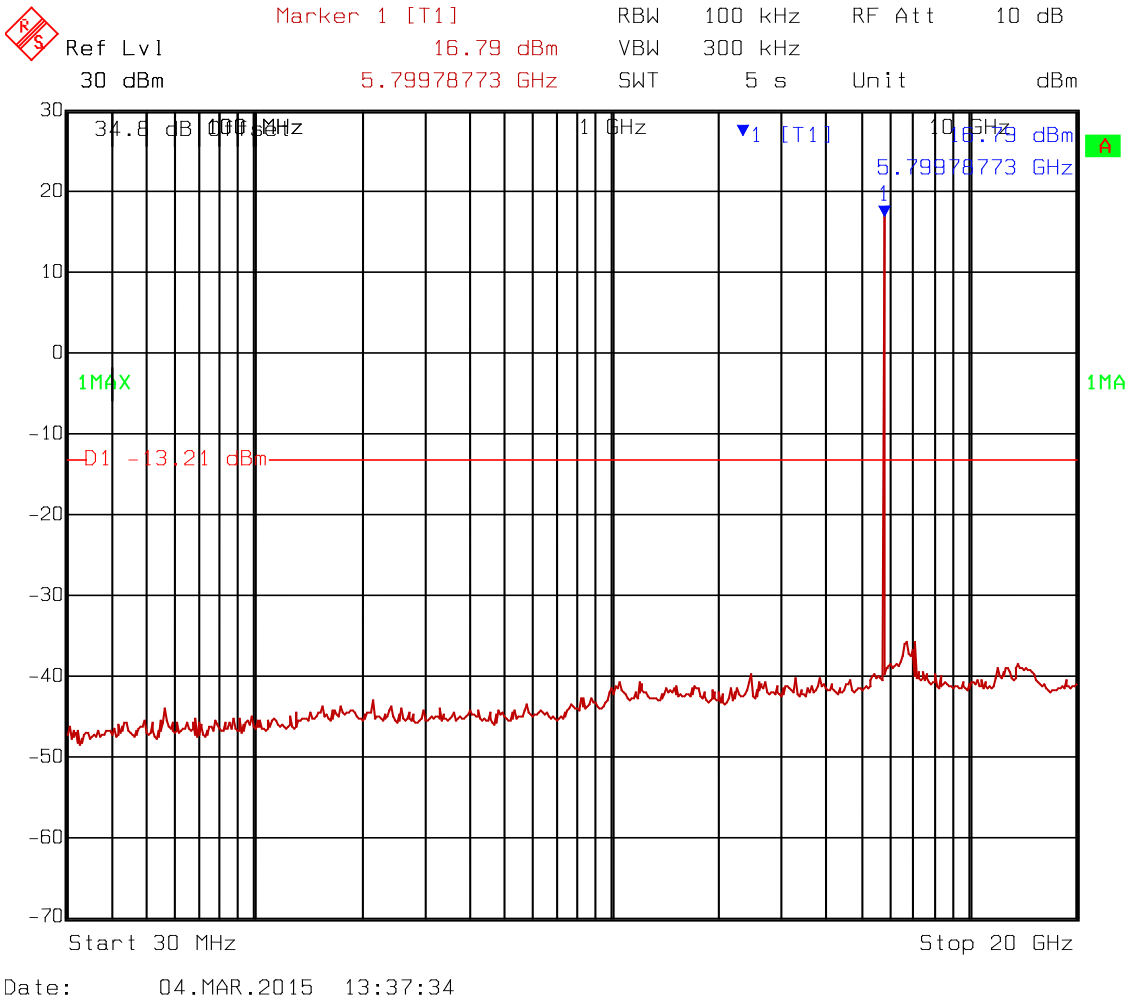


Low Channel
Spurious Emissions (20GHz to 40GHz)
10 MHz Channel
4 QAM

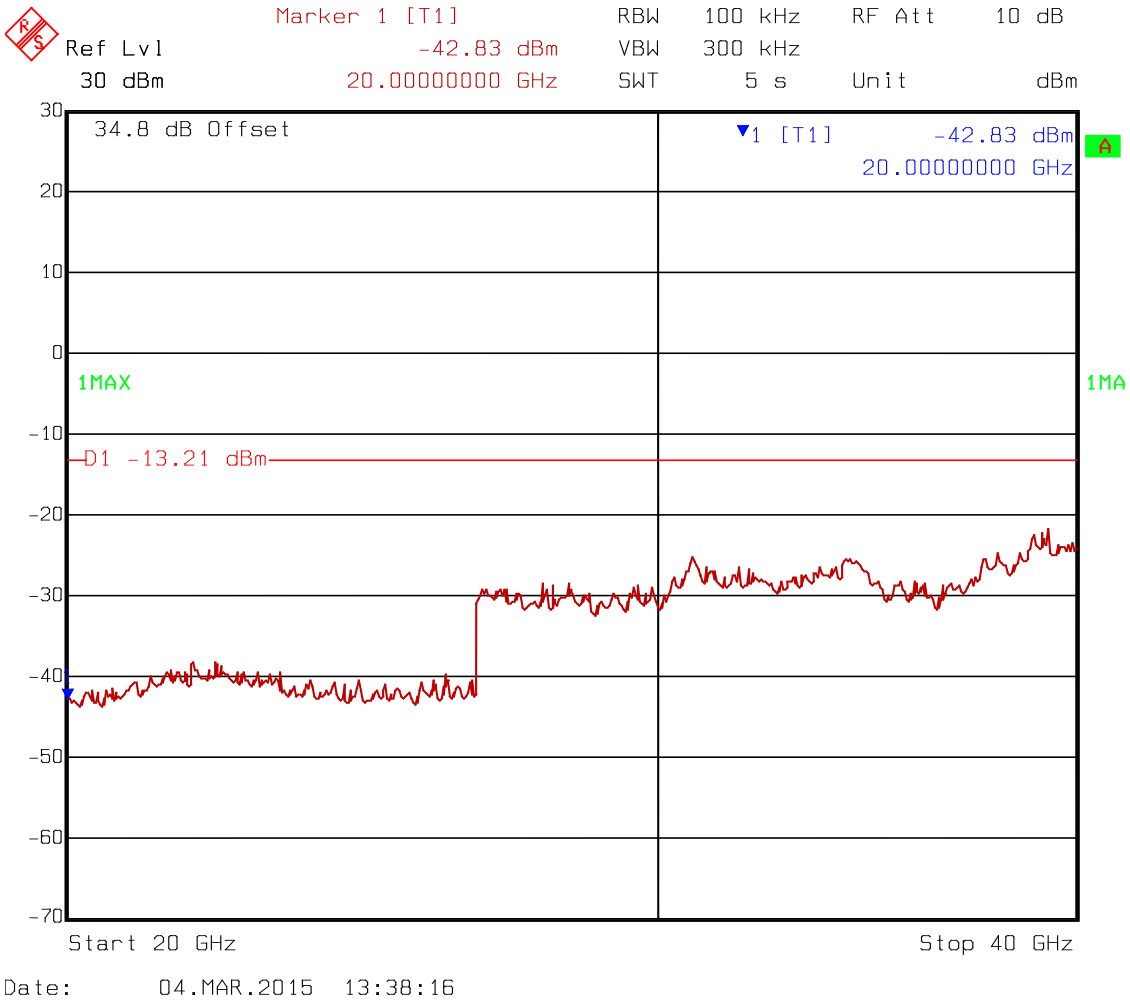


## Test Data – Spurious Emissions at Antenna Terminals

Low Channel
Spurious Emissions (30MHz to 20GHz)
30 MHz Channel
4QAM

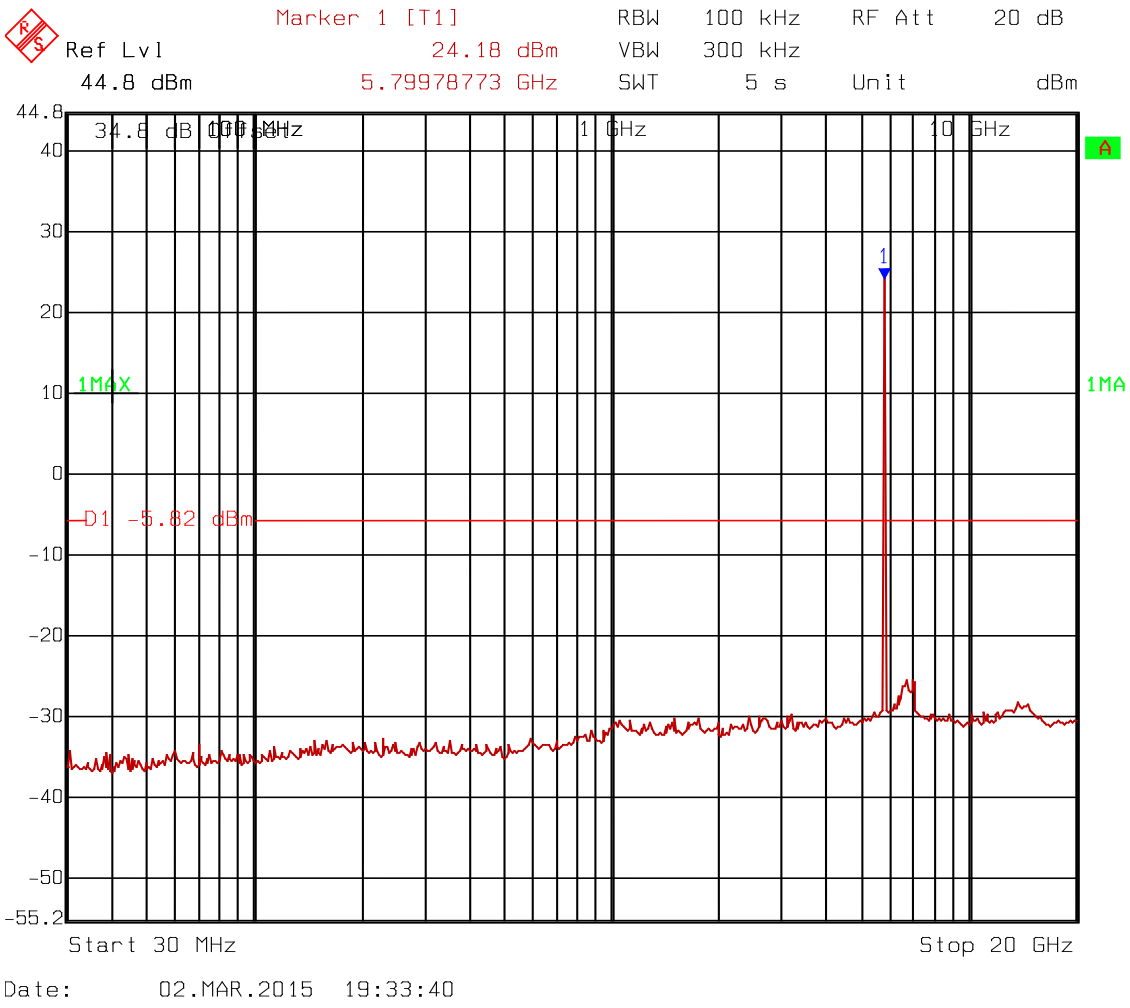


Low Channel
Spurious Emissions (20GHz to 40GHz)
30 MHz Channel
4QAM

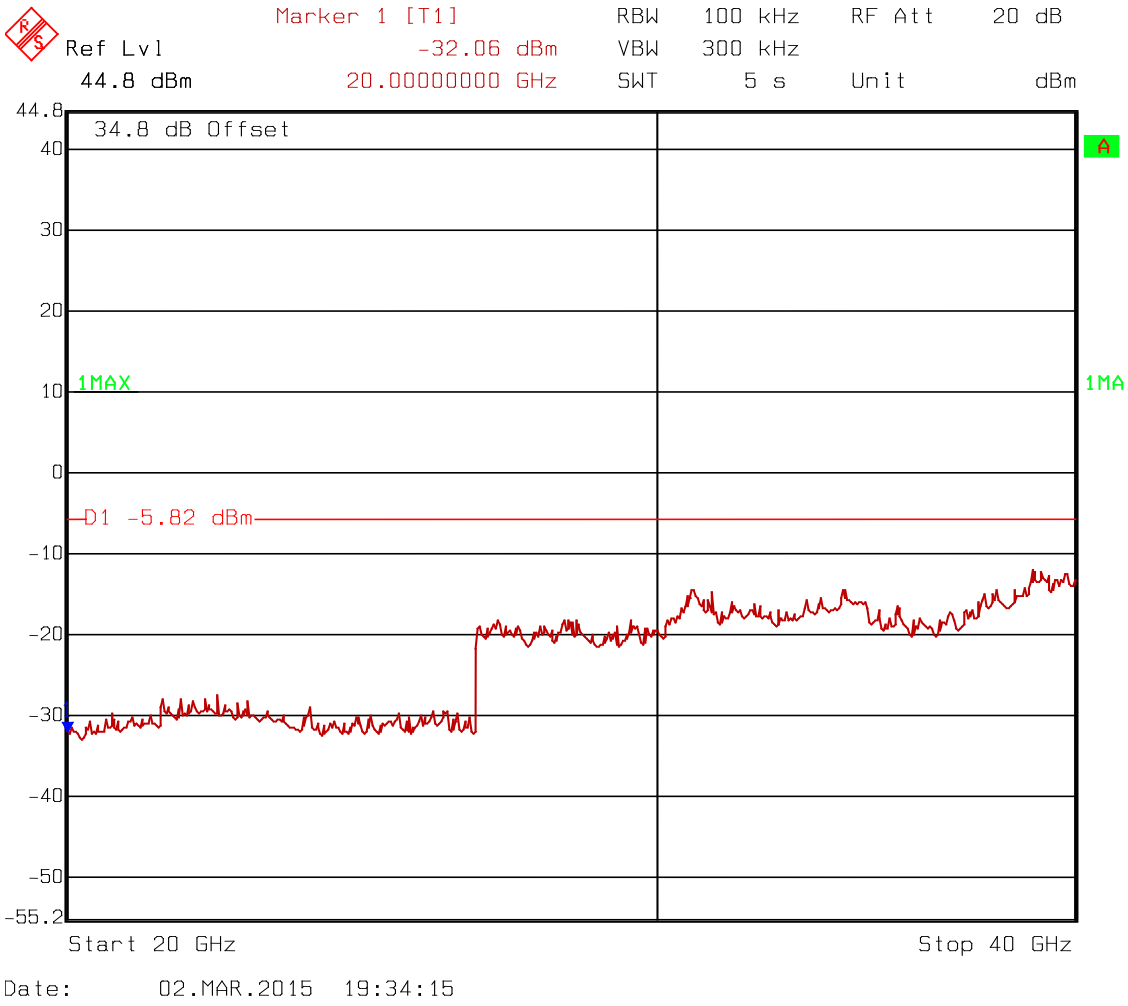


## Test Data – Spurious Emissions at Antenna Terminals

Mid Channel
Spurious Emissions (30MHz to 20GHz)
5 MHz Channel
4QAM

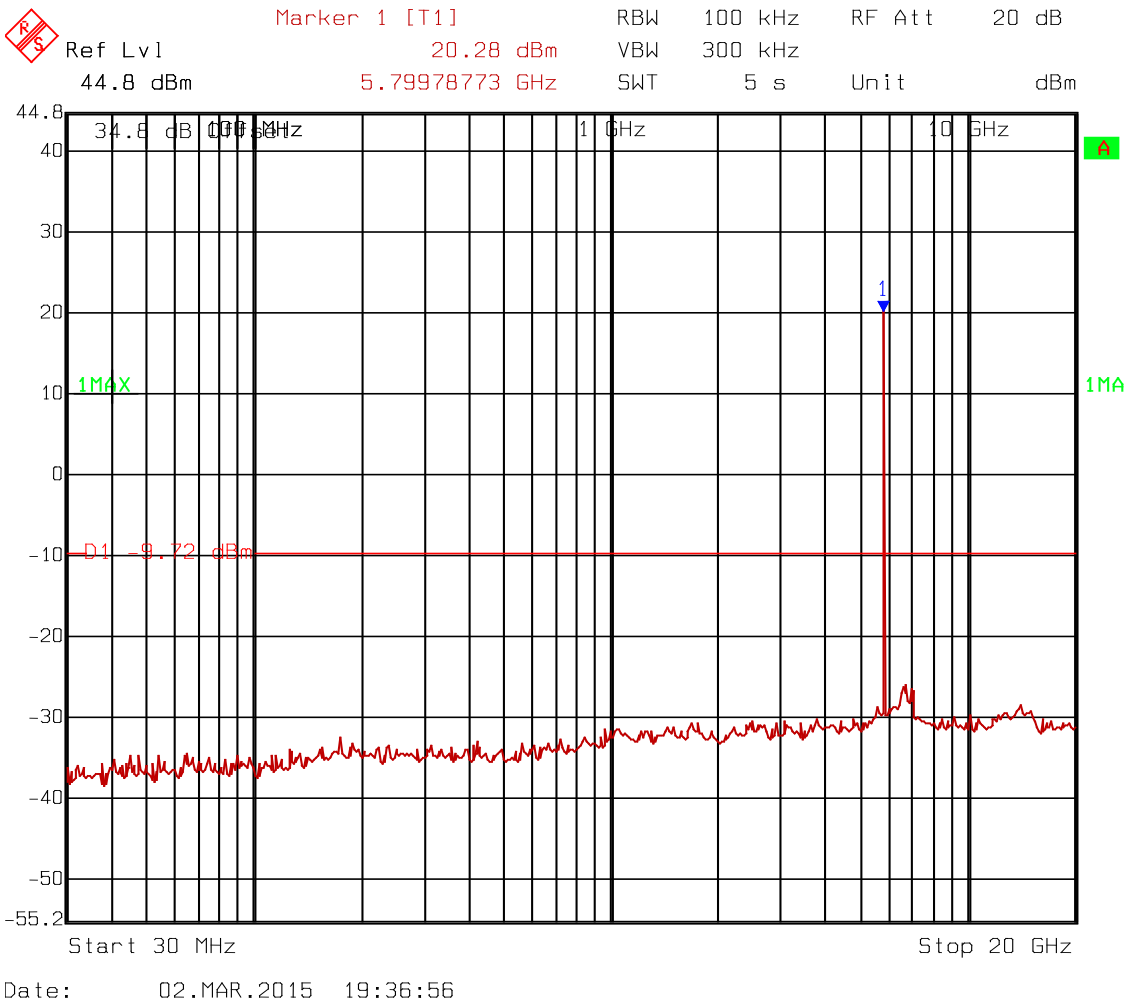


Mid Channel
Spurious Emissions (20GHz to 40GHz)
5 MHz Channel
4QAM

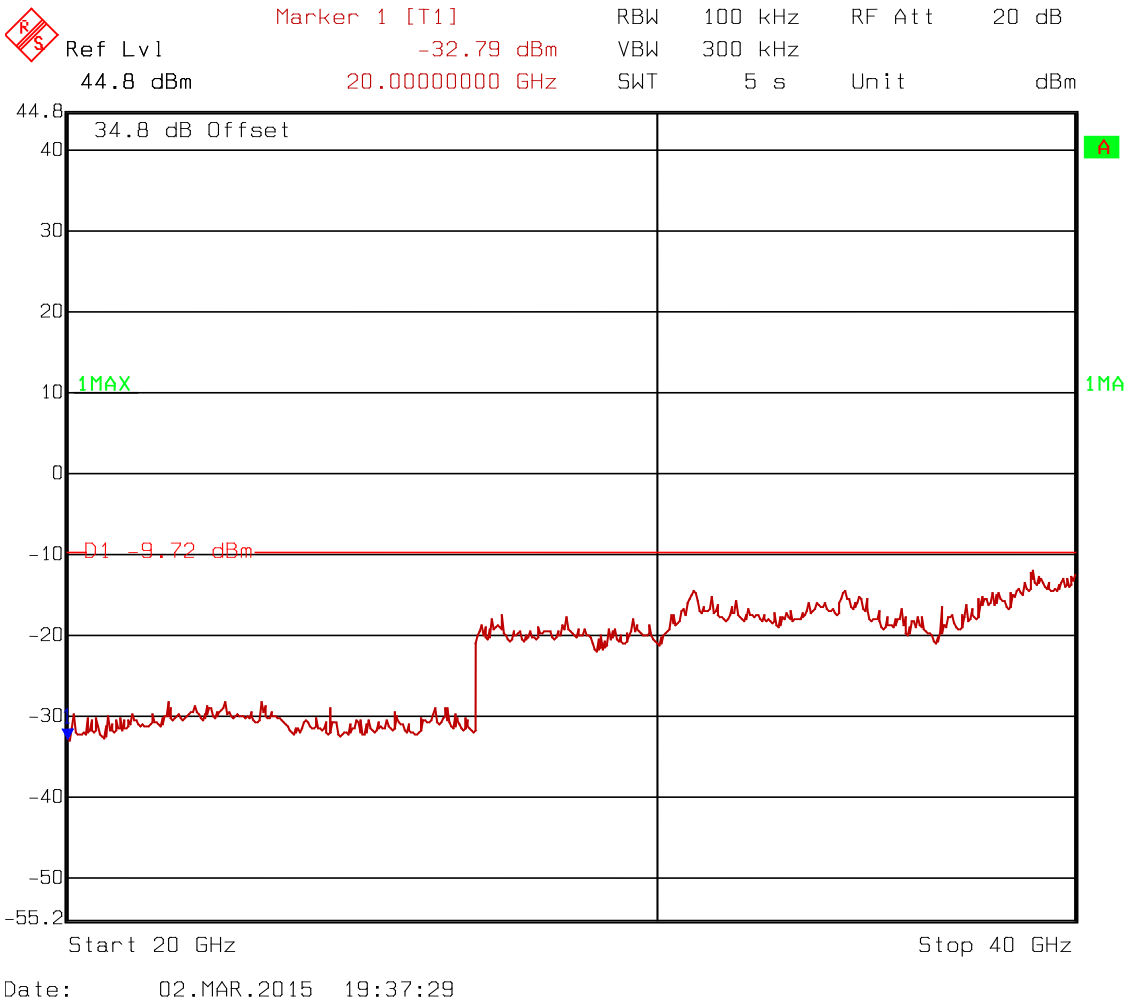


## Test Data – Spurious Emissions at Antenna Terminals

Mid Channel
Spurious Emissions (30MHz to 20GHz)
10 MHz Channel
4QAM

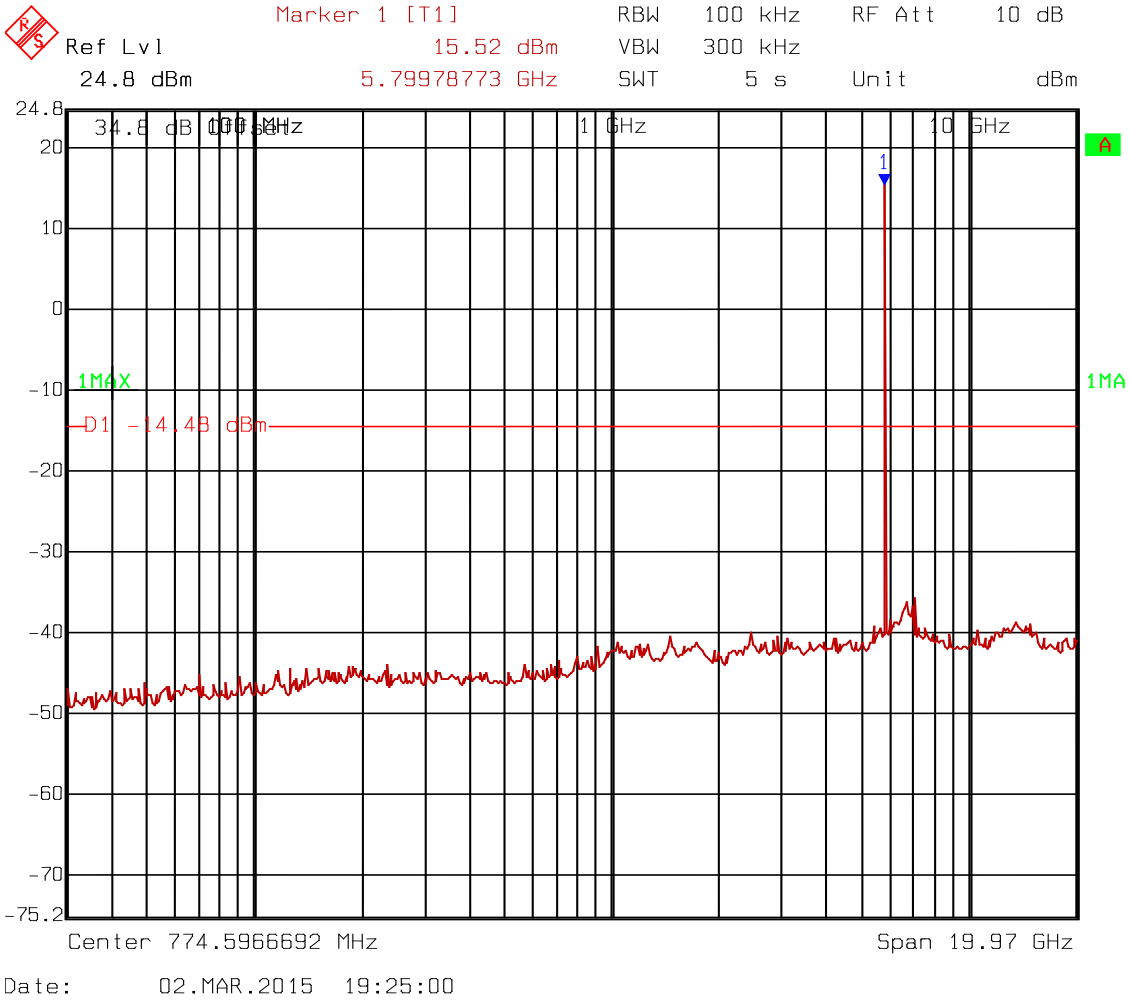


Mid Channel
Spurious Emissions (20GHz to 40GHz)
10 MHz Channel
4QAM

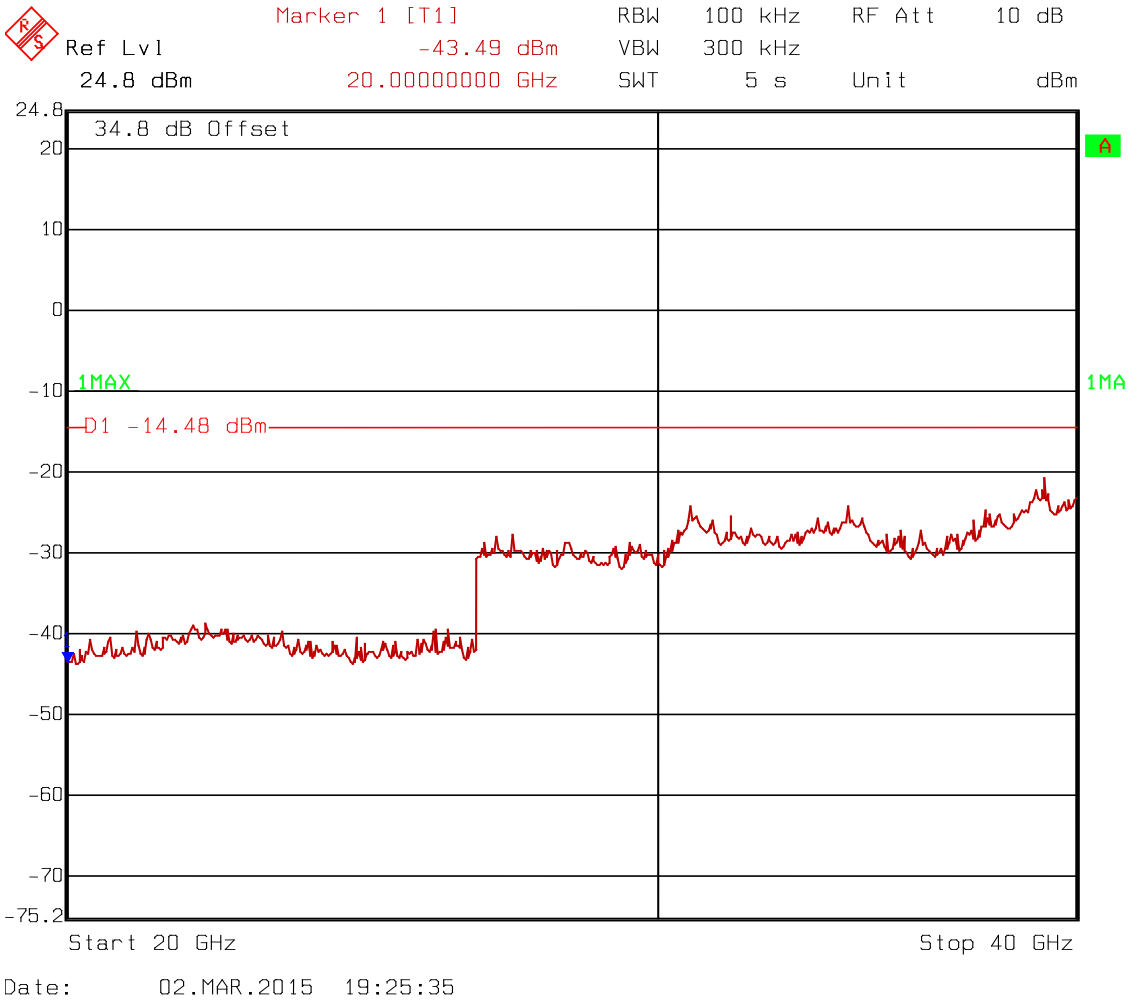


**Test Data – Spurious Emissions at Antenna Terminals**

Mid Channel
Spurious Emissions (30MHz to 20GHz)
4QAM
30 MHz Channel

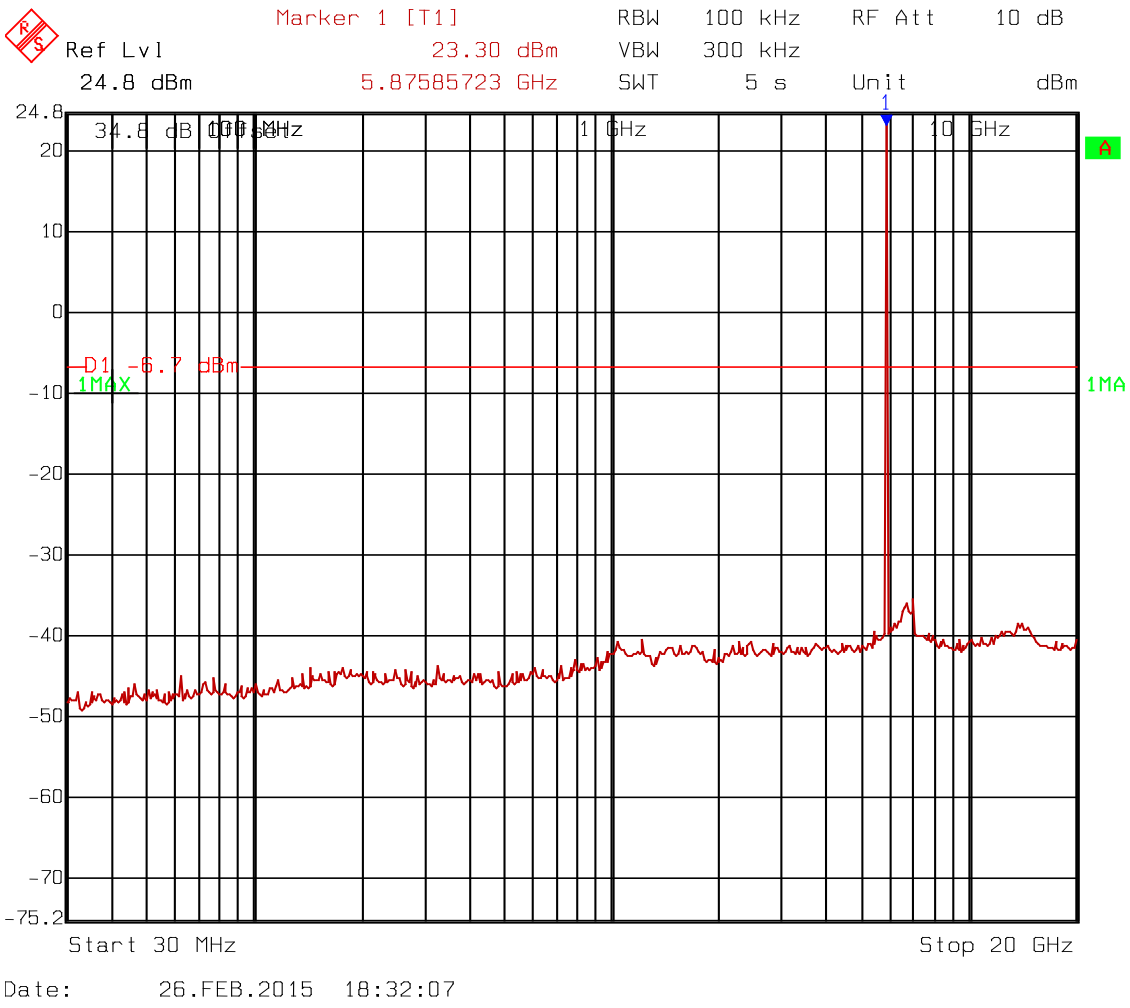


Mid Channel
Spurious Emissions (20GHz to 40GHz)
4QAM
30 MHz Channel

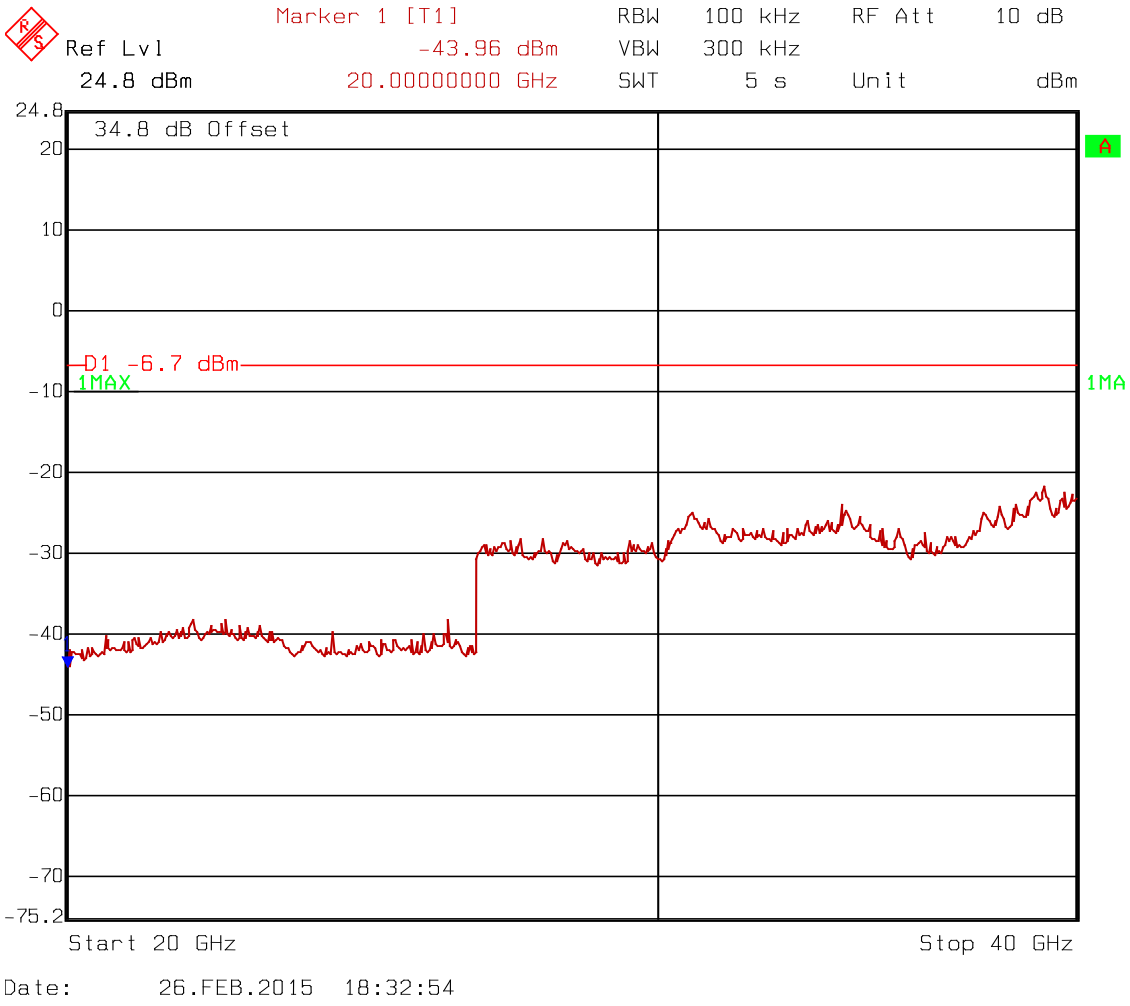


## Test Data – Spurious Emissions at Antenna Terminals

High Channel
Spurious Emissions (30MHz to 20GHz)
4QAM
5 MHz Channel

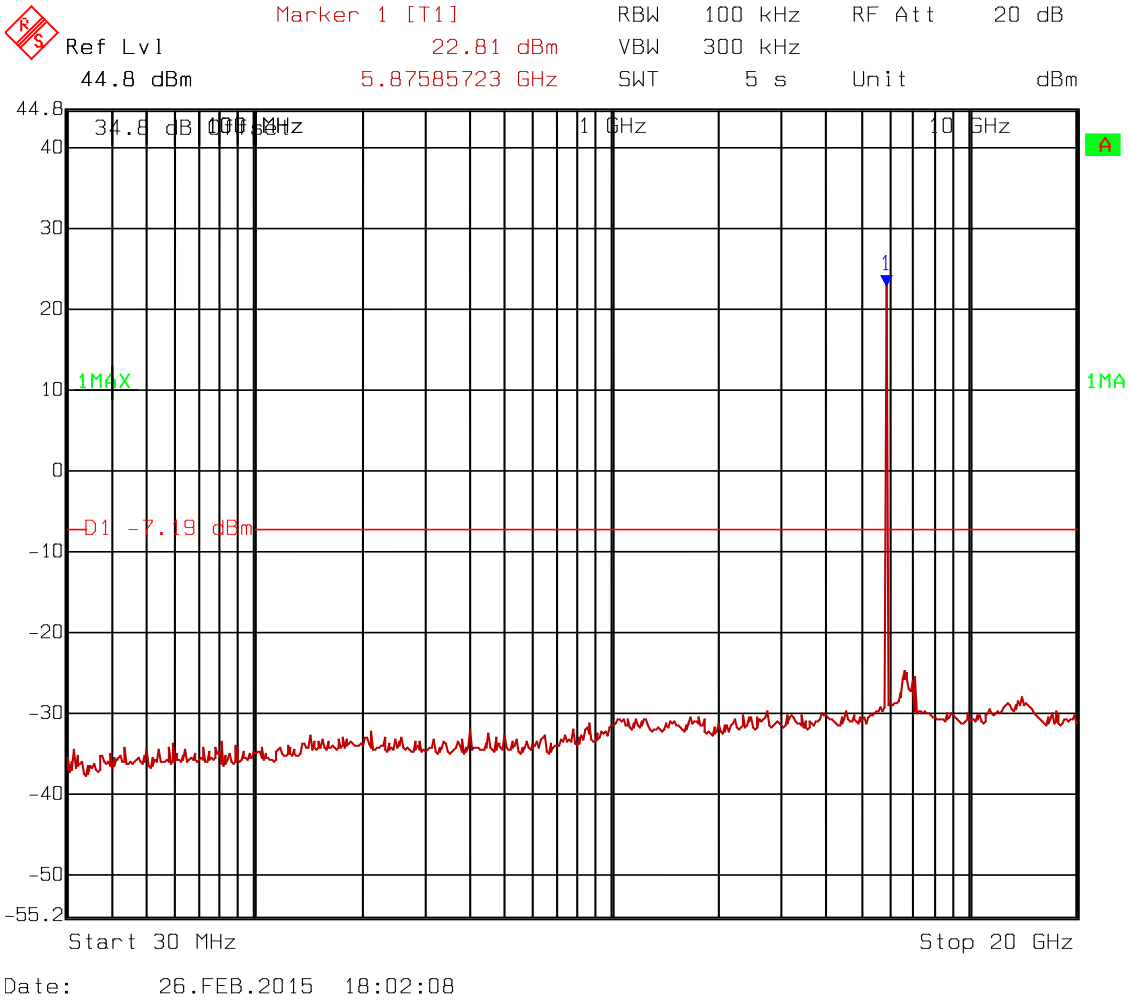


High Channel
Spurious Emissions (20GHz to 40GHz)
4QAM
5 MHz Channel

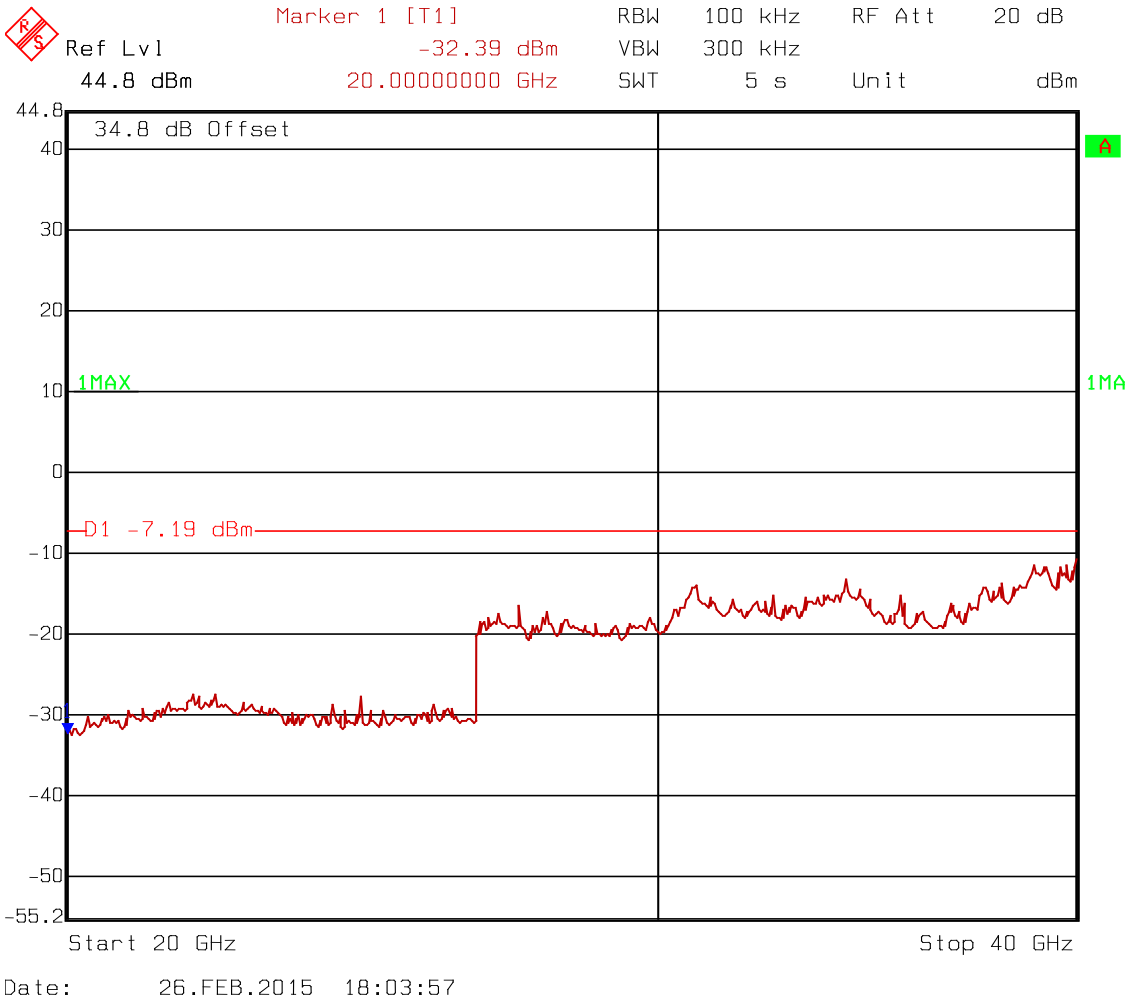


## Test Data – Spurious Emissions at Antenna Terminals

High Channel
Spurious Emissions (30MHz to 20GHz)
4QAM
10 MHz Channel

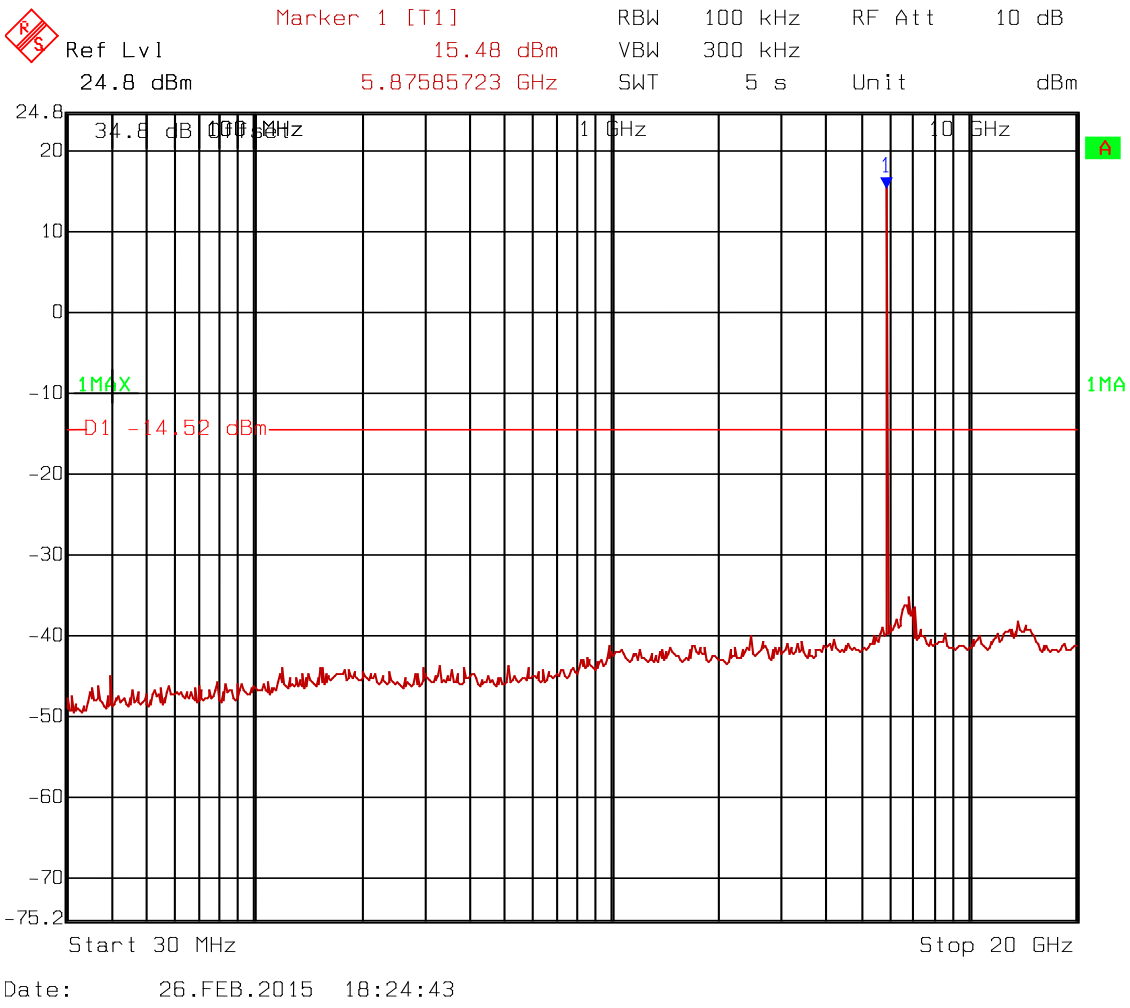


High Channel
Spurious Emissions (20GHz to 40GHz)
4QAM
10 MHz Channel

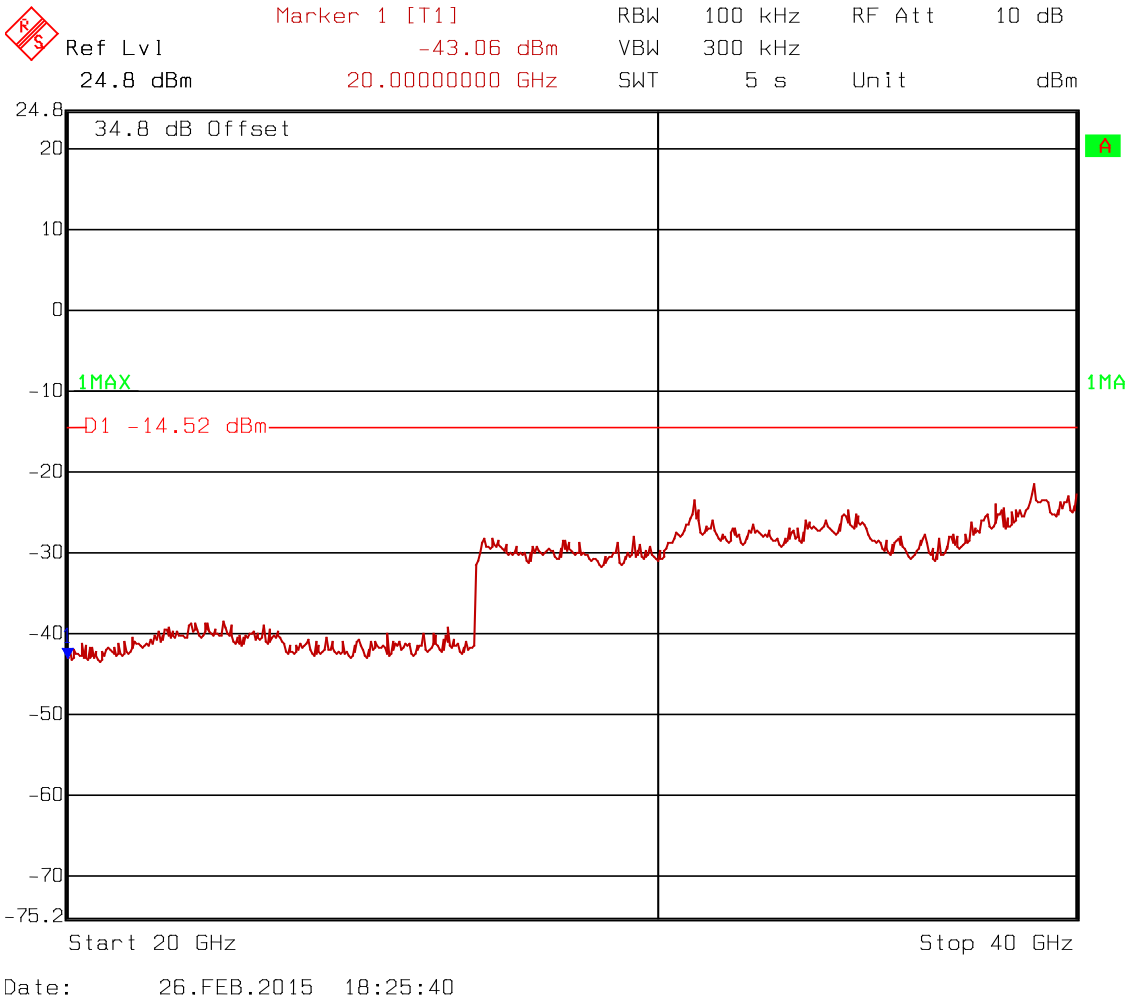


## Test Data – Spurious Emissions at Antenna Terminals

High Channel
Spurious Emissions (30MHz to 20GHz)
4QAM
30 MHz Channel



High Channel
Spurious Emissions (20GHz to 40GHz)
4QAM
30 MHz Channel



## Section 6. Radiated Emissions

| | |
|---|---|
| NAME OF TEST: Radiated Emissions | PARA. NO.: 15.247 (d)<br>RSS-Gen 7.2.2 |
| TESTED BY: Tran Phan | DATE: 10 March 2015 |

**Test Results:** Complies.

**Measurement Data:** See attached table.

**Test Conditions:** 46 %RH
21 °C

**Measurement Uncertainty:** +/-1.7 dB

**Test Equipment Used:** E1064-E1029-529-835

Notes:

☐ For handheld devices, the EUT was tested on three orthogonal axis

☒ The device was tested from 30 MHz to the tenth harmonic of the highest fundamental frequency per 15.33

☒ The device was tested on three channels per 15.31(l).

☐ No emissions were detected within 20 dB of the specification limit therefore none are reported per 15.31(o).

RBW=VBW=100 kHz below 1000 MHz
RBW=VBW=1 MHz above 1000 MHz (Peak)
RBW= 1 MHz VBW=10MHz (Average)

**Test Data – Conducted Emissions in Restricted Bands**

**The device was tested on three channels at the highest and lowest data rates using both Peak detector and Average detector with bandwidths as listed. Results for peak detector are worst case of these.**

**Only one data rate result was shown due to the data consistency.**

**The -83.73 dBm Limit is derived from the following:**
**54dBuv/m-42.5dBi -95.23dB=-83.73dBm**
**(Limit @ 3m(dBuV/m) – Ant Gain - Conversion = Spec Limit (dBm))**

| Measured Frequency (MHz) | Meter Reading for 5MHz CH BW (dBm) | Meter Reading for 10MHz CH BW (dBm) | Meter Reading for 30MHz CH BW (dBm) | Spec Limit (dBm) | Difference from Limt (dB) | Pas Fail | Comment |
|---|---|---|---|---|---|---|---|
| | **TX 5731 MHz** | **TX 5731 MHz** | **TX 5741 MHz** | | | | **Tx 5731/5741 MHz** |
| 11462 | -88.72 | | | -83.73 | -4.99 | Pass | Low Channel |
| 11462 | | -98.68 | | -83.73 | -14.95 | Pass | Low Channel |
| 11462 | | | -96.83 | -83.73 | -13.10 | Pass | Low Channel |
| | | | | | | | |
| | **TX 5781 MHz** | **TX 5781 MHz** | **TX 5771 MHz** | | | | **Tx 5771/5781 MHz** |
| 23124 | -96.59 | | | -83.73 | -12.86 | Pass | Mid Channel |
| 23124 | | --97.35 | | -83.73 | -13.62 | Pass | Mid Channel |
| 23084 | | | --97.24 | -83.73 | -13.51 | Pass | Mid Channel |
| | | | | | | | |
| | **TX 5844 MHz** | **TX 5844 MHz** | **TX 5834 MHz** | | | | **Tx 5834/5844 MHz** |
| 11688 | -98.22 | | | -83.73 | -14.49 | Pass | High Channel |
| 11688 | | -97.45 | | -83.73 | -13.72 | Pass | High Channel |
| 23336 | | | -97.32 | -83.73 | -13.59 | Pass | High Channel |
| | | | | | | | |

**Test Data - Radiated Emissions in Restricted Bands**

**The device was tested on three channels at the highest and lowest data rates using both Peak detector and Average detector using bandwidths as listed. Results for peak detector are worst case of these.**

**Only one channel and one data rate was shown due to the data consistency.**

**The device was tested conducted (above) and then radiated with the antenna port loaded.**

| Measured Frequency (MHz) | Antenna Polarity (H/V) | Atten (dB) | Meter Reading (dBuV) | Antenna Factor (dB) | Path Loss (dB) | RF Gain (dB) | Corrected Reading (dBuv/m) | Avg Limit (dBuVm) | Difference from Limt (dB) | Pas Fail | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Tx 5731 MHz |
| 11462 | H | 0 | 36.1 | 40 | 17 | 45.2 | 47.9 | 54 | -6.1 | Pass | |
| 11462 | V | 0 | 36.1 | 40 | 17 | 45.2 | 47.9 | 54 | -6.1 | Pass | |
| | | | | | | | | | | | |
| 22924 | H | 0 | Noise Floor | | | | | 54 | | Pass | Not measurable |
| 22924 | V | 0 | Noise Floot | | | | | 54 | | Pass | Not measurable |

## Section 7. Maximum Average Power Spectral Density

| | |
|---|---|
| NAME OF TEST: Average Power Spectral Density | PARA. NO.: 15.247(e)<br>RSS-210 A8.2(b) |
| TESTED BY: Tran Phan | DATE: 04 March 2015 |

**Test Results:** Complies.

**Measurement Data:** See attached plots.

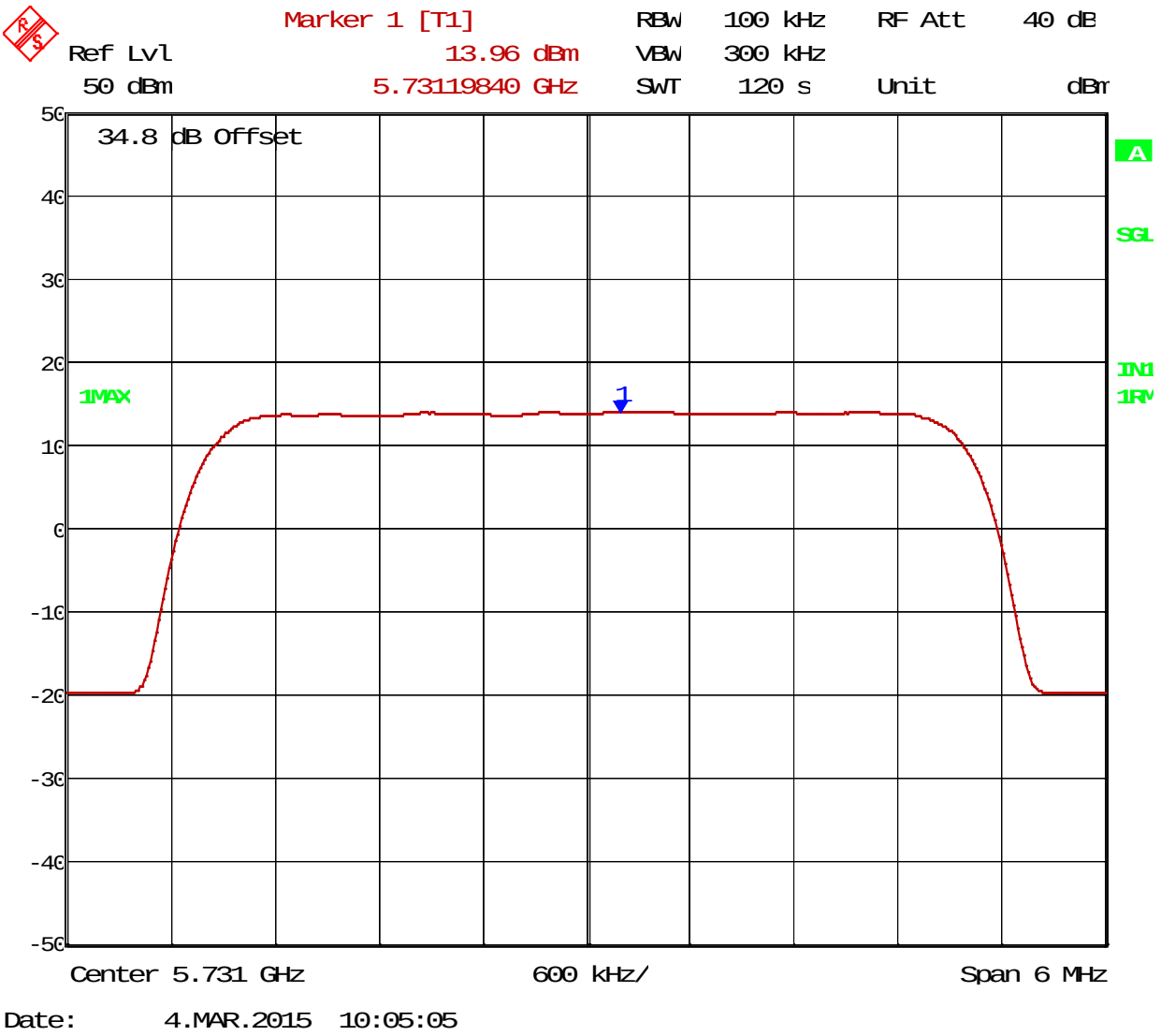
**Test Conditions:** 45 %RH
21 °C

**Measurement Uncertainty:** +/-1.7 dB

**Test Equipment Used:** 1767

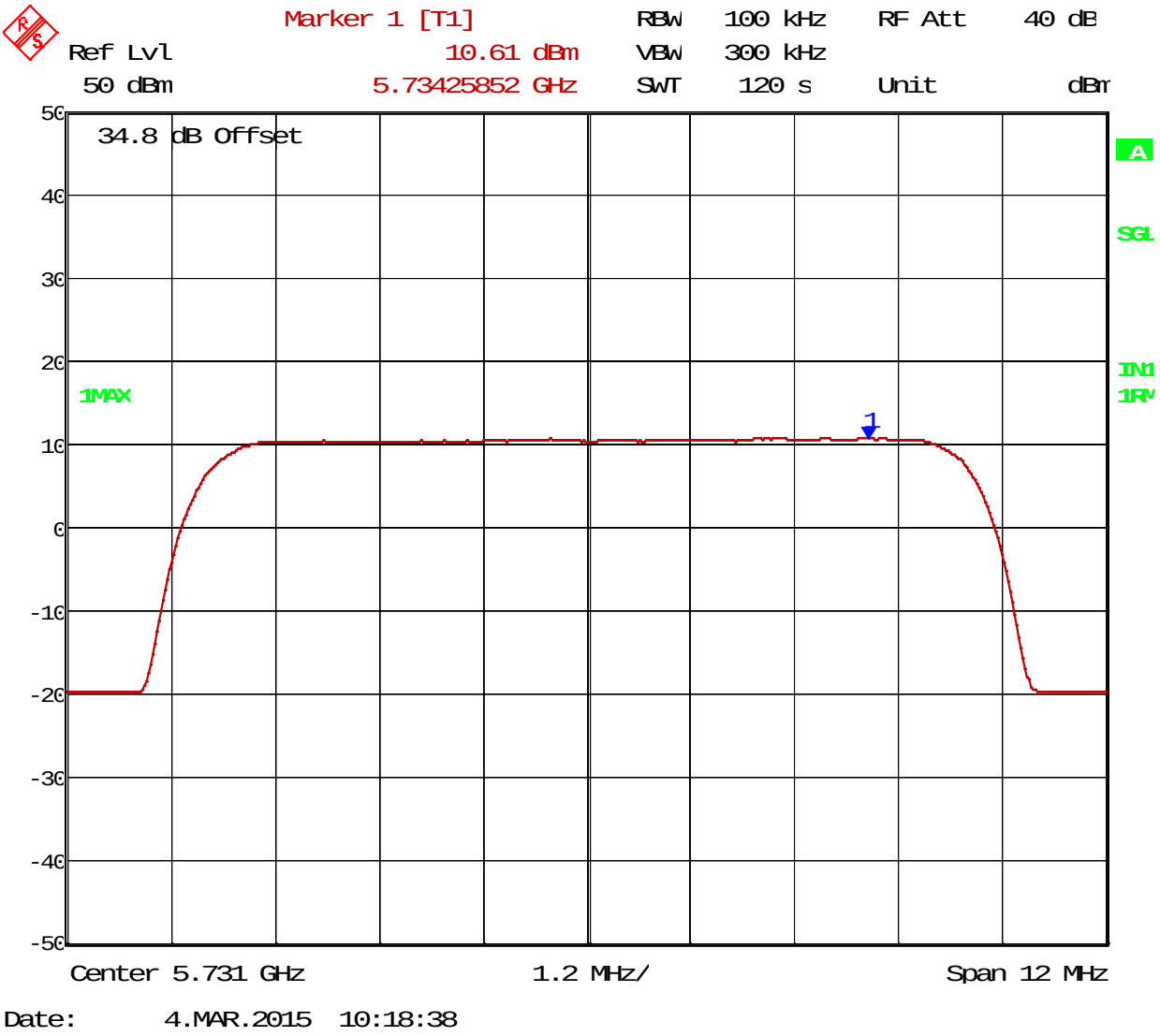
**Maximum Average Power Spectral Density**

Low Channel
5 MHz Channel
4QAM
13.96 – 15.2 = -1.24dBm < 8dBm



**Maximum Average Power Spectral Density**

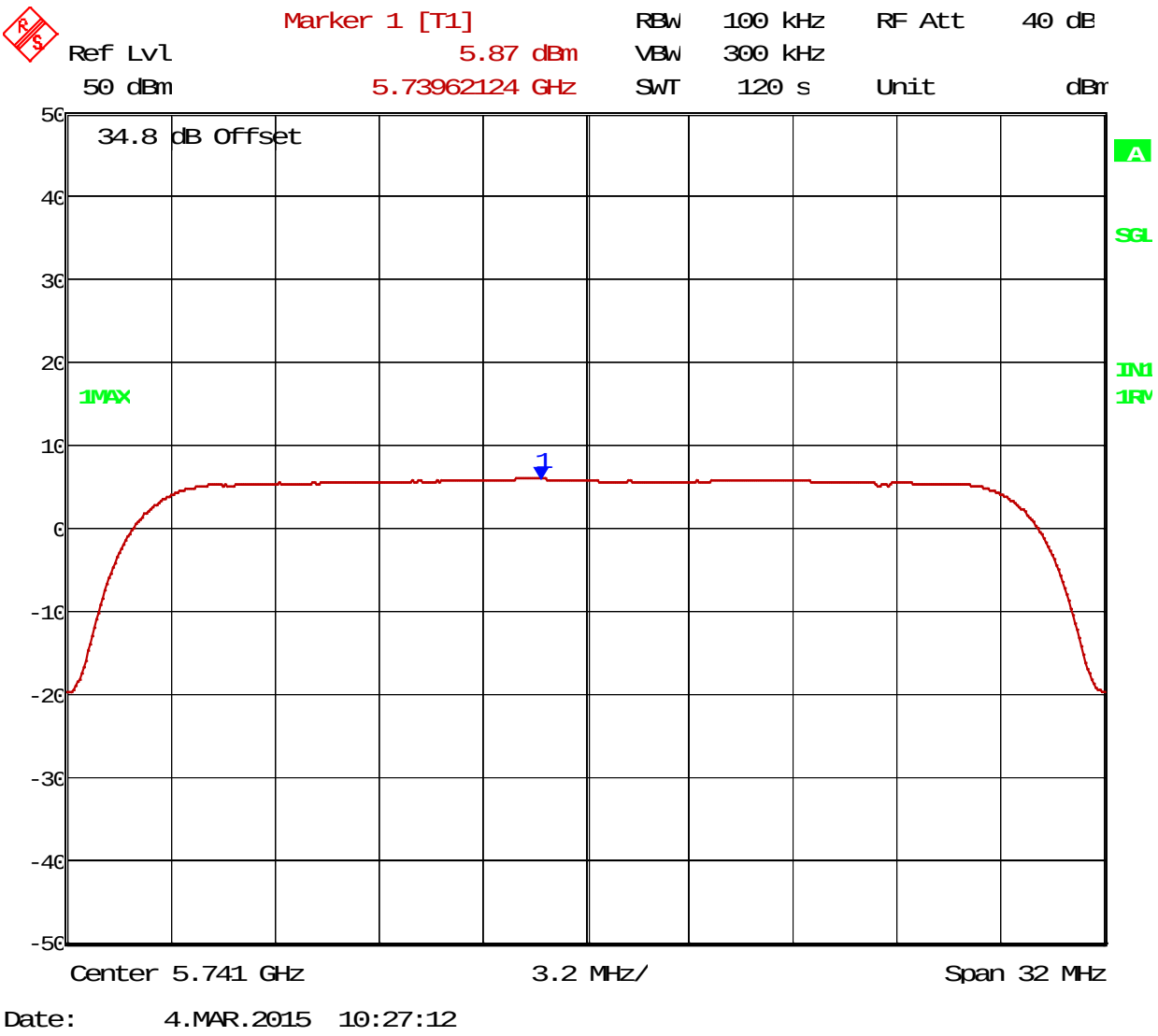
Low Channel
10 MHz Channel
4QAM
10.61 – 15.2 = -4.59 dBm < 8dBm



**Maximum Average Power Spectral Density**

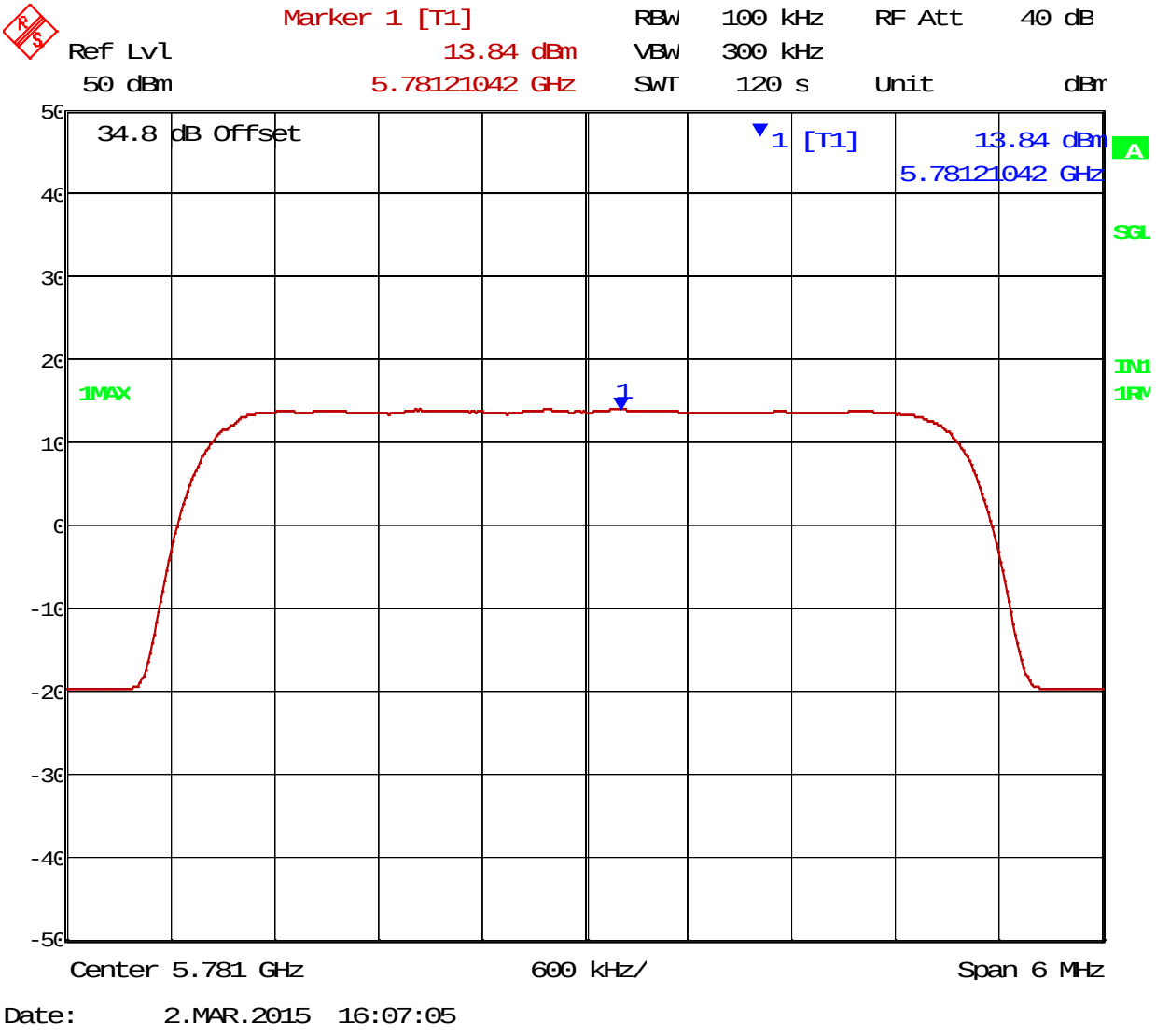
Low Channel
30 MHz Channel
4QAM

5.87 – 15.2 = -9.33 dBm < 8dBm



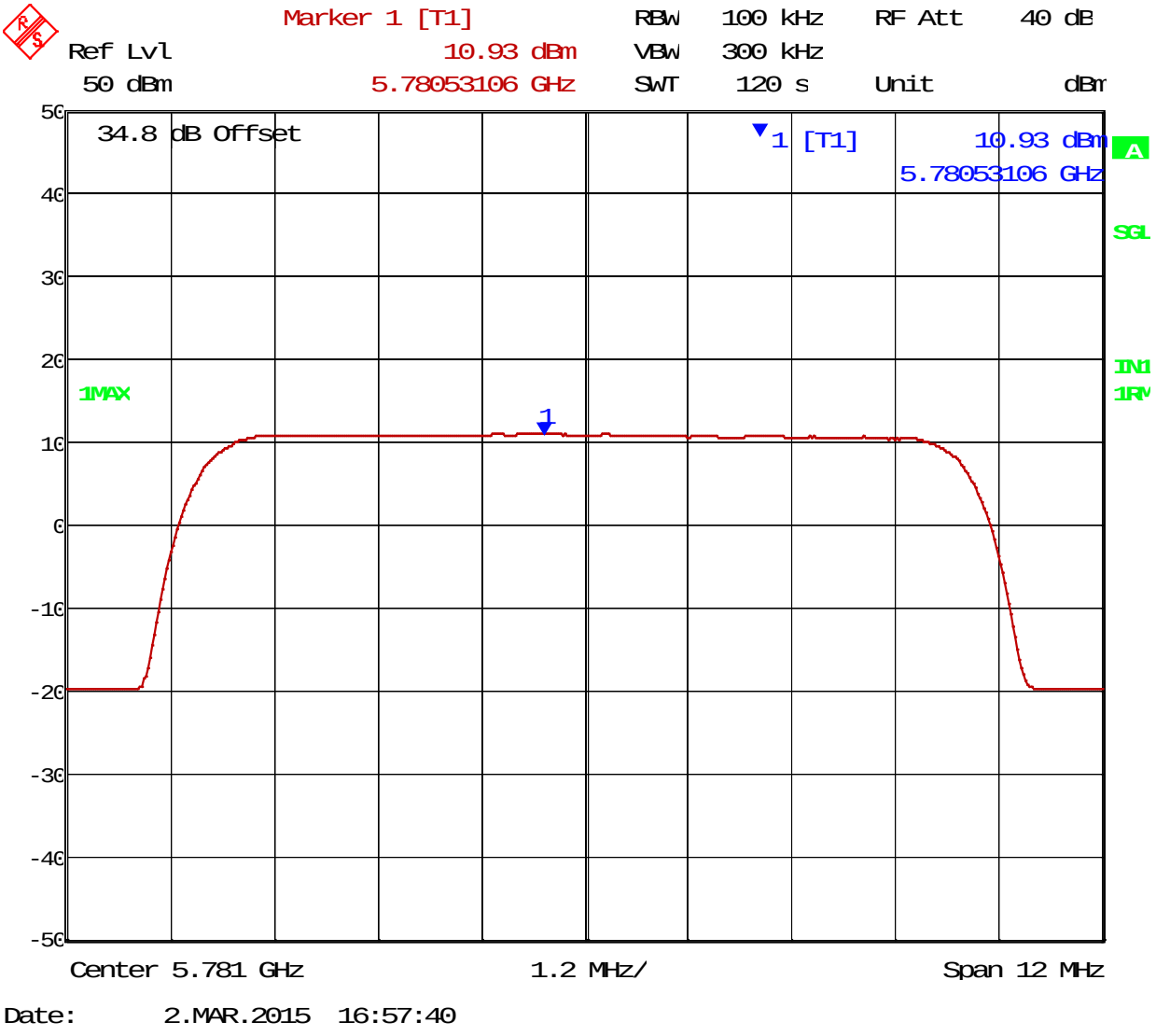
**Maximum Average Power Spectral Density**

Mid Channel
5 MHz Channel
4QAM
Density
13.64 -15.2= -1.56 dBm < 8 dBm



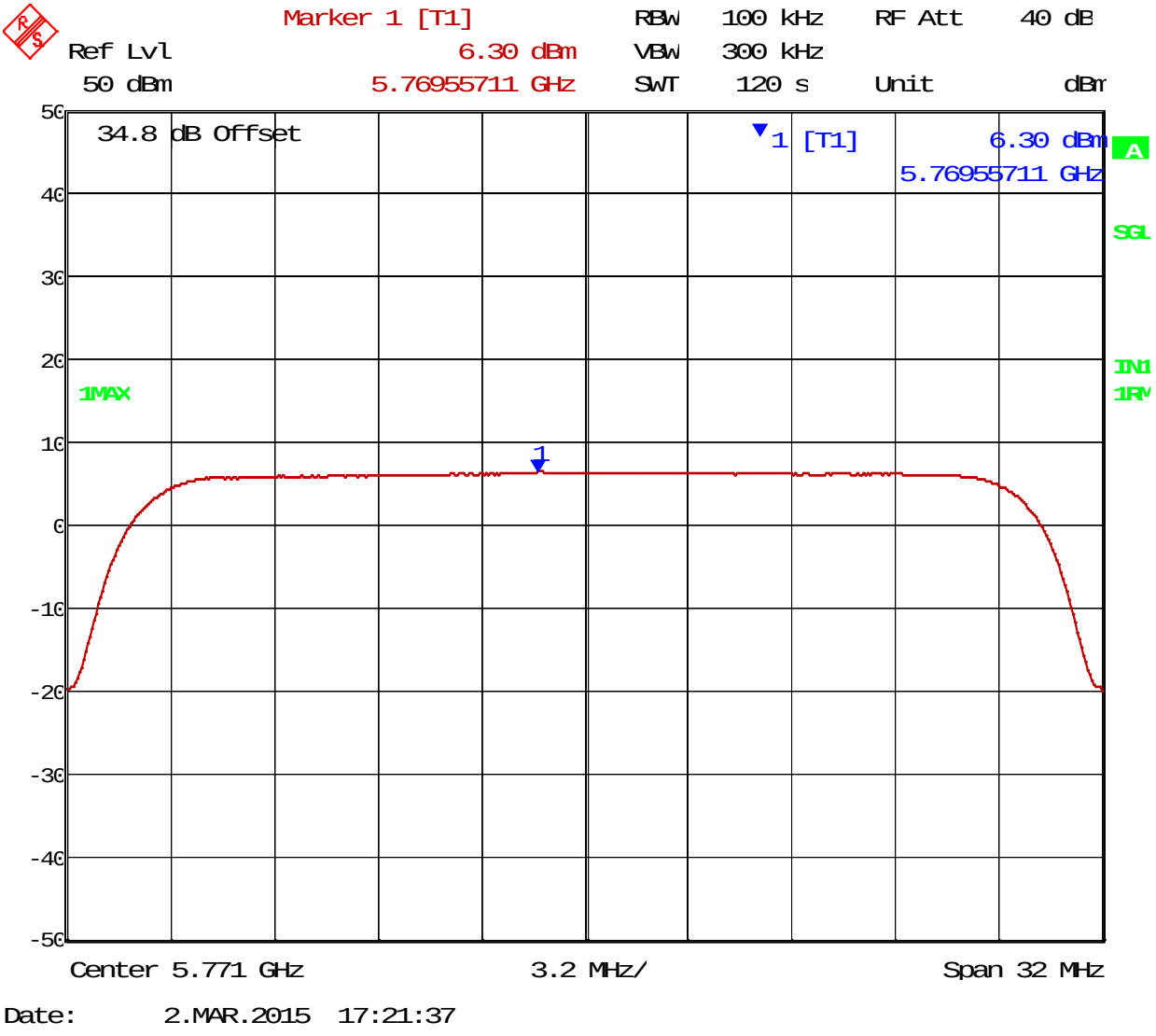
**Maximum Average Power Spectral Density**

Mid Channel
10 MHz Channel
4QAM
Density
10.93-15.2= -4.27 dBm < 8 dBm



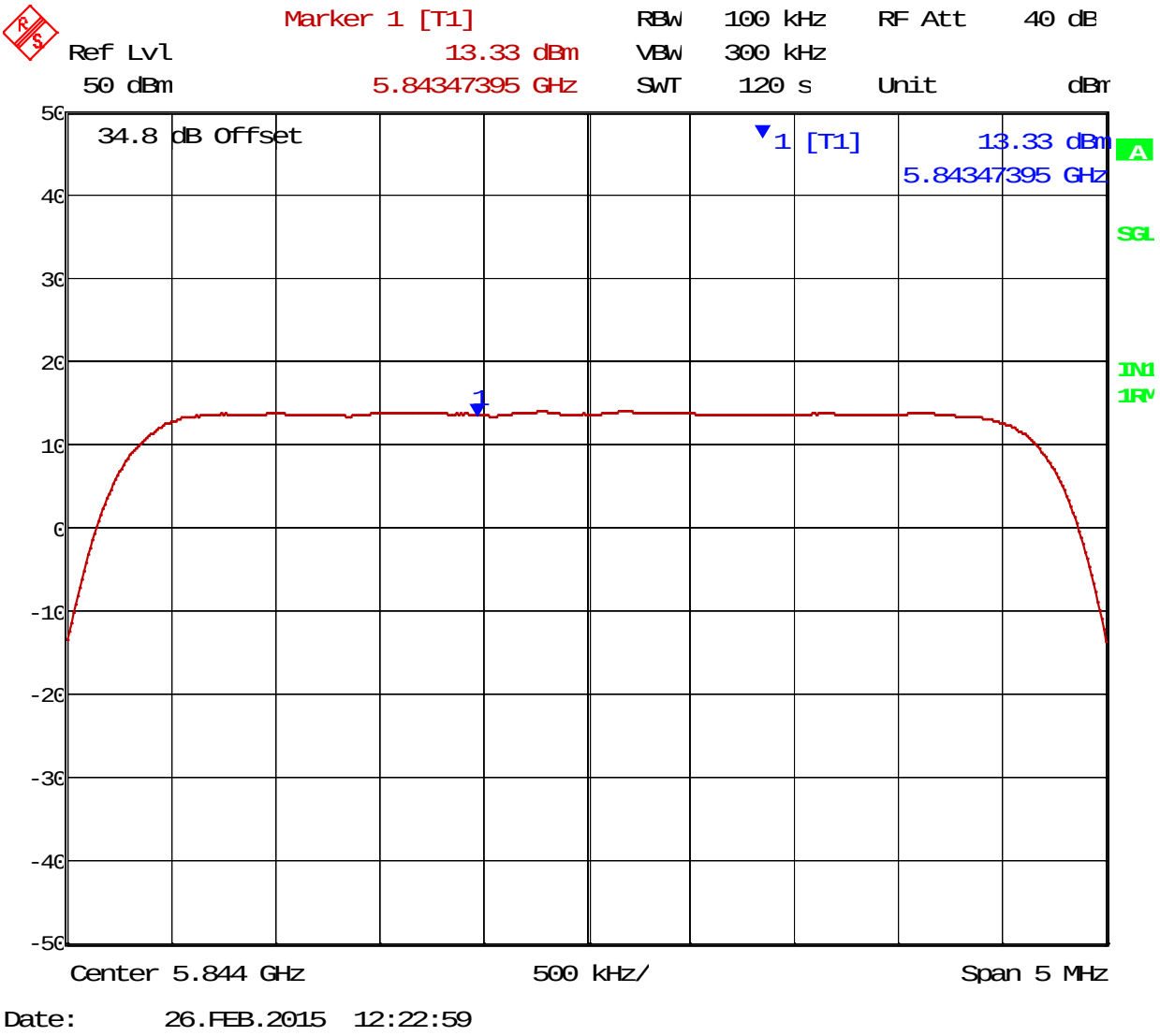
**Maximum Average Power Spectral Density**

Mid Channel
4QAM
30 MHz Channel
Density
6.36-15.2= -8.84 dBm < 8dBm

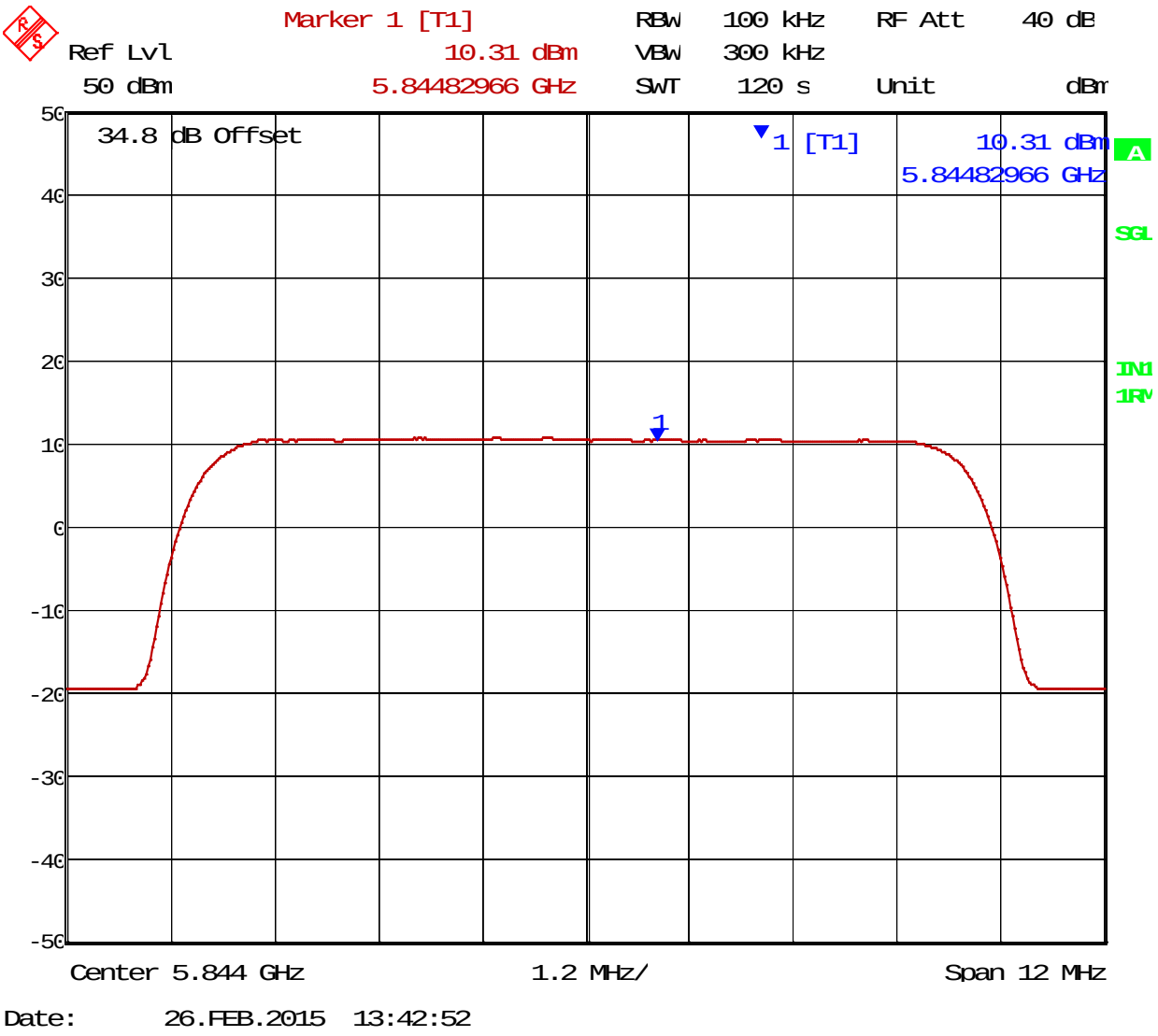


**Maximum Average Power Spectral Density**

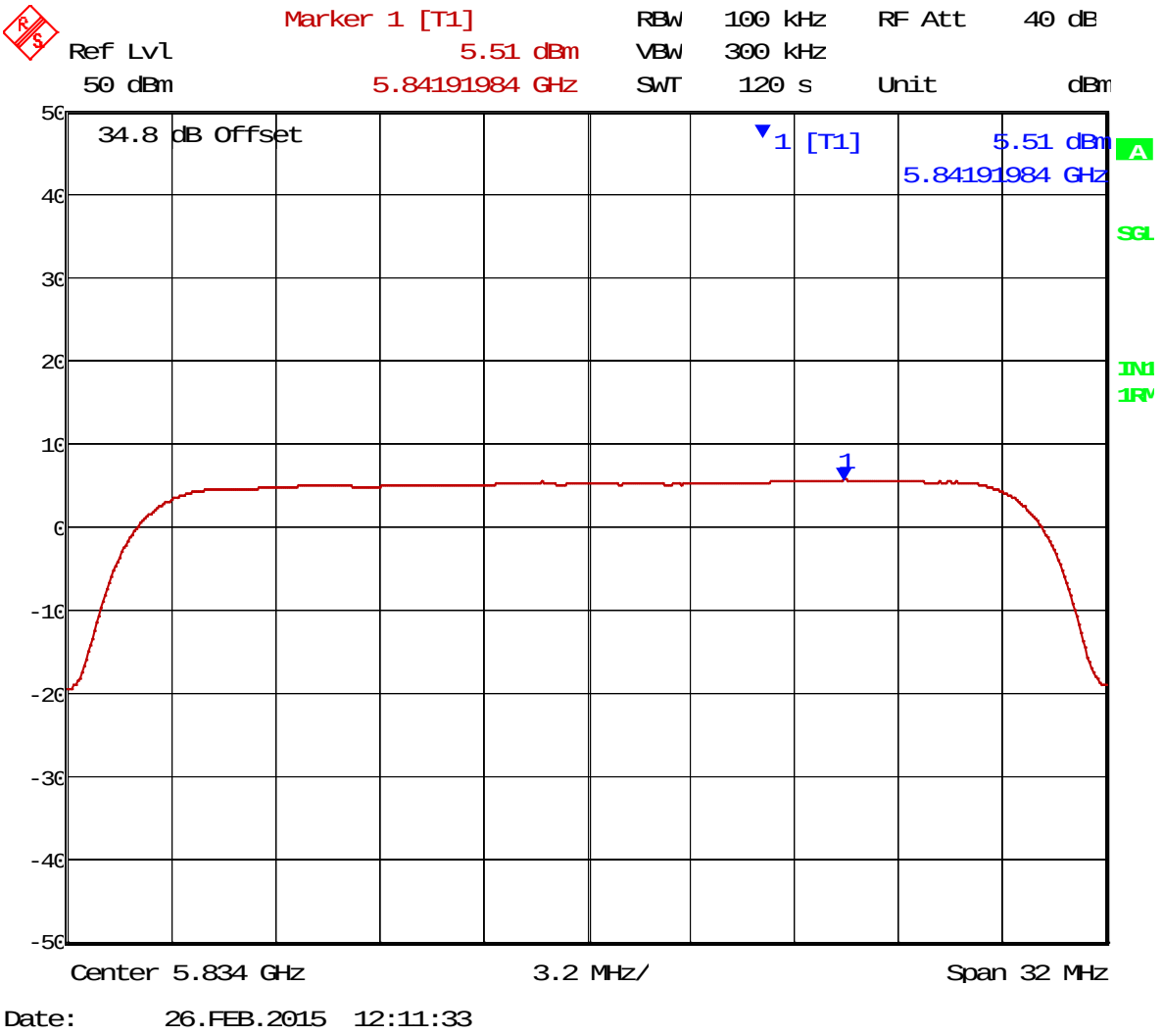
High Channel
4QAM
5 MHz Channel
13.33 – 15.2 =-1.9dBm < 8dBm



**Maximum Average Power Spectral Density**
High Channel
4QAM
10 MHz Channel
Density
10.31 – 15.2 = -4.89dBm < 8dBm



**Maximum Average Power Spectral Density**
High Channel
4QAM
30 MHz Channel
Density
5.51-15.2= -9.69 dBm < 8dBm



## Section 8. Powerline Conducted Emissions

| | |
|---|---|
| NAME OF TEST: Powerline Conducted Emissions | PARA. NO.: 15.207(a)<br>RSS-Gen 7.2.4 |
| TESTED BY: Tran Phan | DATE: 06 March 2015 |

**Test Results:** Complies.

**Measurement Data:** See attached plots.

**Measurement Uncertainty:** +/- 1.7 dB

**Temperature:** 21° C

**Relative Humidity;** 46%

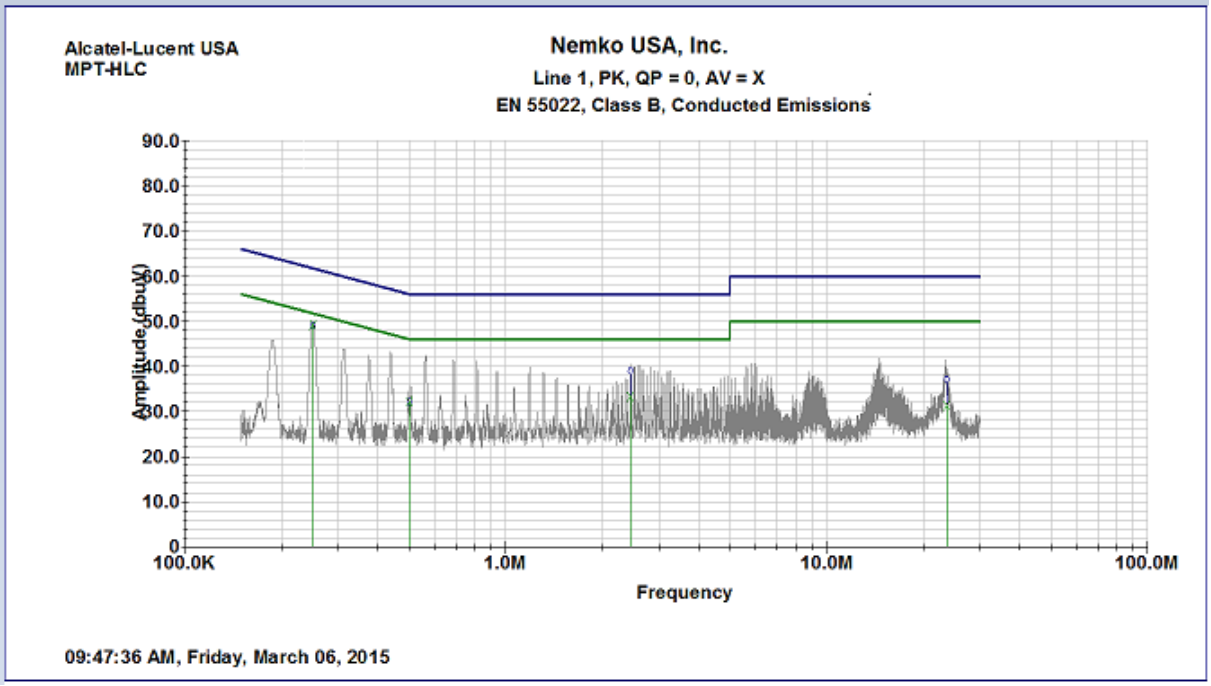
**Test Equipment Used:** E1026-E1019

Notes:

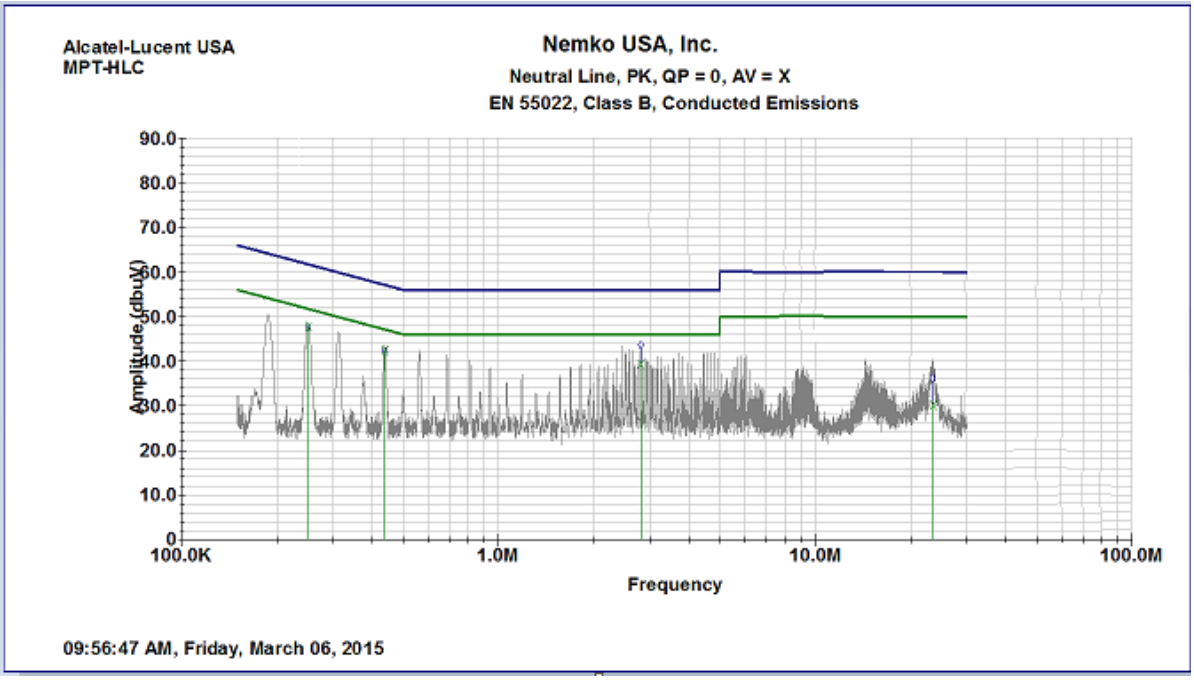
1) There was no DC power supply provided from the client. The DUT system was powered by the lab DC power supply (Manufacturer=Xantrex, Model=XFR300-4, and Serial number=1917)
2) A 5W load was connected to the DUT Antenna Port (the diplexer's output port)

**Test Data – Powerline Conducted Emissions**

Line 1




Line 2



## Section 9. Test Equipment List

| Asset Tag | Description | Manufacturer | Model | Serial # | Last Cal | Next Cal |
|---|---|---|---|---|---|---|
| 529 | Antenna, Horn | EMCO | 3115 | 2505 | 08-Dec-2014 | 08-Dec-2016 |
| E1029 | Preamplifier | A.H. Systems, Inc. | PAM-0118 | 343 | 14-Aug-2014 | 14-Aug-2015 |
| E1064 | Spectrum Analyzer | Agilent | E4440A | US42221762 | 22-Dec-2014 | 22-Dec-2015 |
| 835 | Spectrum Analyzer | Rohde & Schwartz | RHDFSEK | 8290584/005 | 09-Jun-2014 | 09-Jun-2015 |
| E1026 | Spectrum Analyzer | Rohde & Schwartz | ESCI 7 | 100800 | 14-Aug-2014 | 14-Aug-2015 |
| 1767 | Receiver | Rohde & Schwartz | ESIB26 | 837491/0002 | 04-Nov-2014 | 04-Nov-2015 |
| E1019 | Two Line V-Network | Rohde & Schwartz | ENV216 | 101045 | 07-May-2014 | 07-May-2015 |

# ANNEX A - TEST DETAILS

NAME OF TEST: Powerline Conducted Emissions PARA. NO.: 15.207(a)/7.2.4

**Minimum Standard:** Conducted limits.

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 mH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency of Conducted Emission (MHz) | Limit (dBmV) Quasi-peak | Average |
|---|---|---|
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

* Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 mV within the frequency band 535-1705 kHz, as measured using a 50 mH/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as provided in §15.205 and §§15.209, 15.221, 15.223, 15.225 or 15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

NAME OF TEST: Maximum Peak Output Power PARA. NO.: 15.247(b)(3)/A8.4(4)

**Minimum Standard:** The maximum peak output power shall not exceed 1 watt.

If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point to point operation may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceed 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operation may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

**5.2.1.1 Measurement Procedure PK1**:

1. This procedure requires availability of a spectrum analyzer resolution bandwidth that is ≥ EBW.
2. Set the RBW ≥ EBW.
3. Set VBW ≥ 3 x RBW.
4. Set span = zero.
5. Sweep time = auto couple.
6. Detector = peak.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use peak marker function to determine the peak amplitude level within the fundamental emission.

**5.2.1.2 Measurement Procedure PK2**:

1. This procedure provides an integrated measurement alternative when the maximum available RBW < EBW.
2. Set the RBW = 1 MHz.
3. Set the VBW = 3 MHz.
4. Set the span to a value that is 5-30 % greater than the EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the spectrum analyzer's integrated band power measurement function with band limits set equal to the EBW band edges (for some analyzers, this may require a manual override to ensure use of peak detector). If the spectrum analyzer does not have a band power function, sum the spectrum levels (in linear power units) at 1 MHz intervals extending across the EBW of the spectrum.

| NAME OF TEST: Occupied Bandwidth | PARA. NO.: 15.247(a)(2)/A8.2(a) |
|---|---|

**Minimum Standard:** Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

**Method Of Measurement:**

**5.1.1 EBW Measurement Procedure**:
1. Set resolution bandwidth (RBW) = 1-5 % of the emission bandwidth (EBW).
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is 1-5 %.

**5.1.2 Alternate EBW Measurement Procedure**:
The automatic bandwidth measurement capability of a spectrum analyzer may be employed if it implements the functionality described above (*e.g.*, RBW = 1-5% of EBW, VBW ≥ 3 x RBW, peak detector with maximum hold). When using this capability, care should be taken to ensure that the bandwidth measurement is not influenced by any nulls in the fundamental emission.

| NAME OF TEST: Spurious Emissions(conducted) | PARA. NO.: 15.247(d)/A8.5 |
|---|---|

**Minimum Standard:** In any 100 kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

**5.4.1.1 Measurement Procedure – Reference Level**

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Set the span to 5-30 % greater than the EBW.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW. Next, determine the power in 100 kHz band segments outside of the authorized frequency band using the following measurement:

**5.4.1.2 Measurement Procedure - Unwanted Emissions**

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Set span to encompass the spectrum to be examined.
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize (this may take some time, depending on the extent of the span).

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified above.

NAME OF TEST: Radiated Spurious Emissions PARA. NO.: 15.247(c)/7.2.2

**Minimum Standard:** In any 100 kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits:

**Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:**

| Frequency (MHz) | Field Strength (μV/m @ 3m) | Field Strength (dB @ 3m) |
|---|---|---|
| 30 - 88 | 100 | 40.0 |
| 88 - 216 | 150 | 43.5 |
| 216 - 960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

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**15.205 Restricted Bands**

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.09-0.11 | 16.42-16.423 | 399.9-410 | 4.5-5.25 |
| 0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.125-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2655-2900 | 22.01-23.120 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | Above 38.6 |
| 13.36-13.41 | 1718 | | |

Number of channels tested:

| Tuning range | Number of channels tested | Channel location in band |
|---|---|---|
| 1 MHz or less | 1 | middle |
| 1 to 10 MHz | 2 | top and bottom |
| more than 10 MHz | 3 | top, middle, bottom |

NAME OF TEST: Transmitter Power Density PARA. NO.: 15.247(d)/A8.2(b)

**Minimum Standard:** The transmitted power density averaged over any 1 second interval shall not be greater than +8 dBm in any 3 kHz bandwidth.

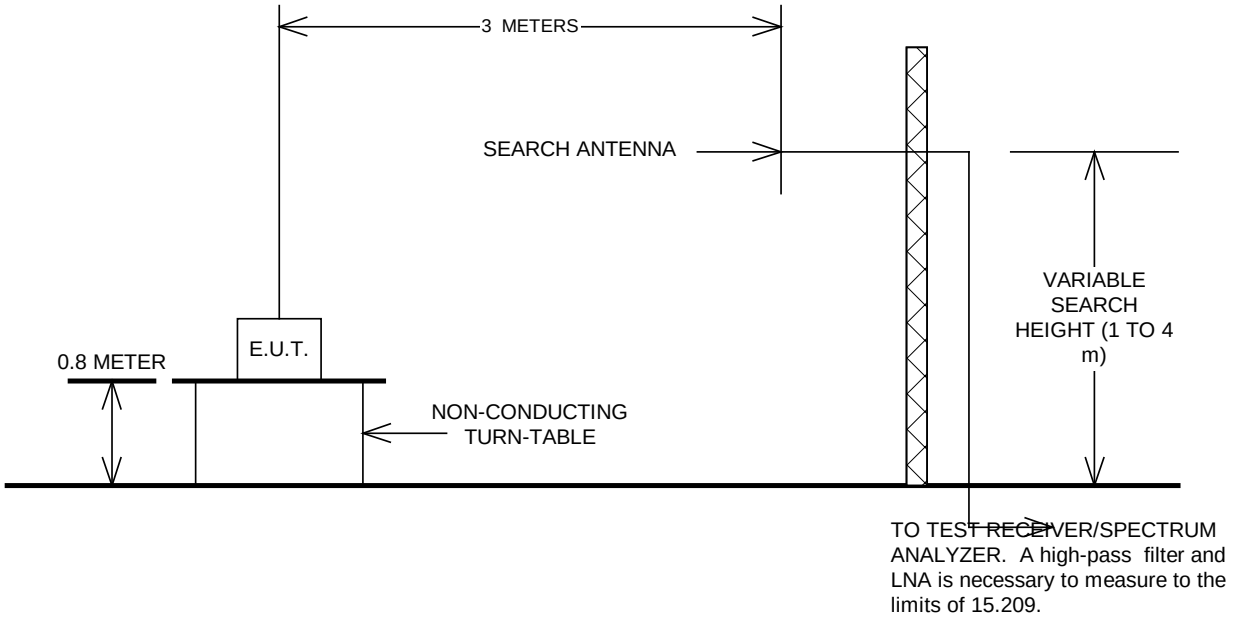
**Method Of Measurement:**

**5.3.1 Measurement Procedure PKPSD**:
1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 100 kHz.
3. Set the VBW ≥ 300 kHz.
4. Set the span to 5-30 % greater than the EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where
BWCF = 10log (3 kHz/100 kHz = -15.2 dB).
11. The resulting peak PSD level must be ≤ 8 dBm.

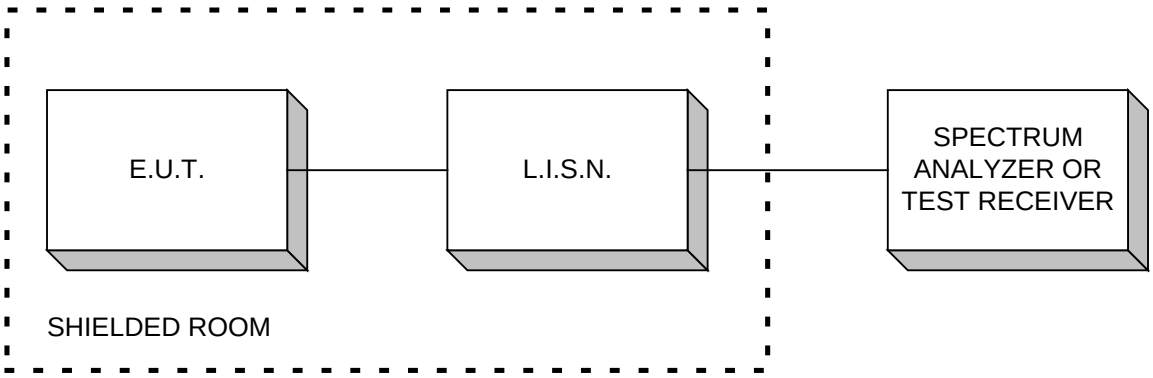
**5.3.2 Measurement Procedure AVGPSD**:
1. Use this procedure when the maximum conducted output power in the fundamental emission is used to demonstrate compliance. The EUT must be configured to transmit continuously at full power over the measurement duration.
2. Set the analyzer span to 5-30% greater than the EBW.
3. Set the RBW = 100 kHz.
4. Set the VBW ≥ 300 kHz.
5. Detector = power average (RMS).
6. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW (use of a greater number of measurement points than this minimum requirement is recommended).
7. Manually set the sweep time to: ≥ 10 x (number of measurement points in sweep) x (transmission symbol period).
8. Perform the measurement over a single sweep.
9. Use the peak marker function to determine the maximum level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent level in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where:
BWCF = 10log (3 kHz/100 kHz = -15.2 dB).
11. The resulting PSD level must be ≤ 8 dBm.

# ANNEX B - TEST DIAGRAMS

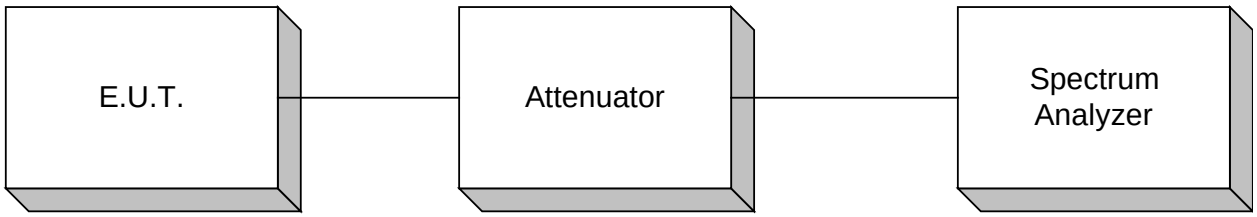
## Test Site For Radiated Emissions




## Conducted Emissions

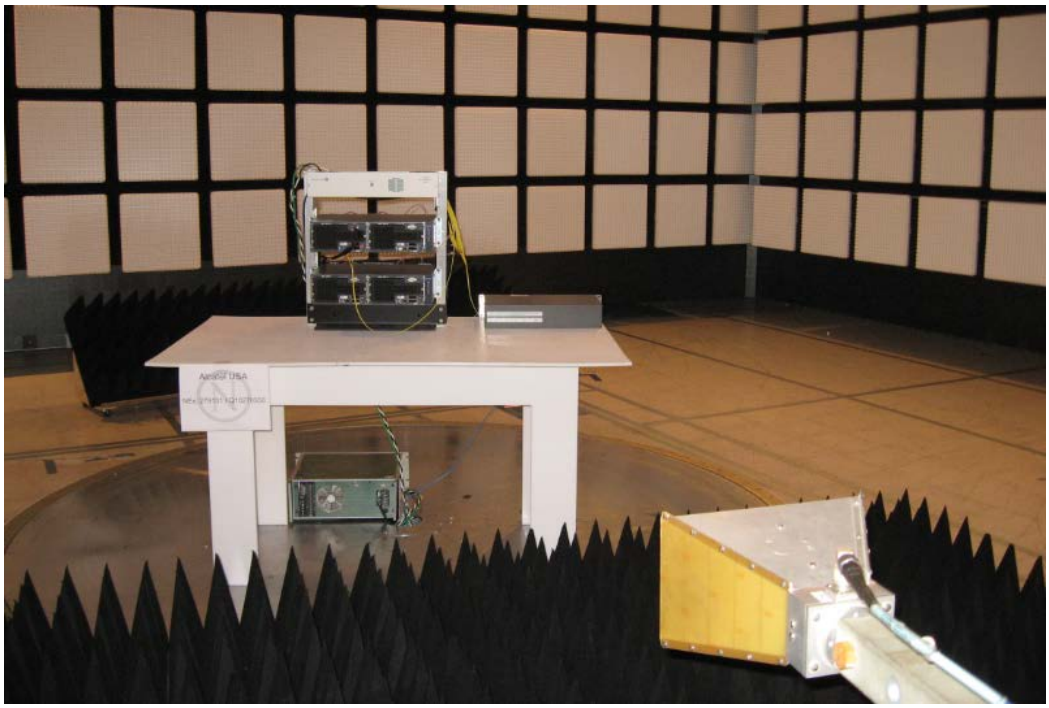


**Peak Power At Antenna Terminals**
**Minimum 6 dB Bandwidth**
**Peak Power Spectral Density**
**Spurious Emissions (conducted)**

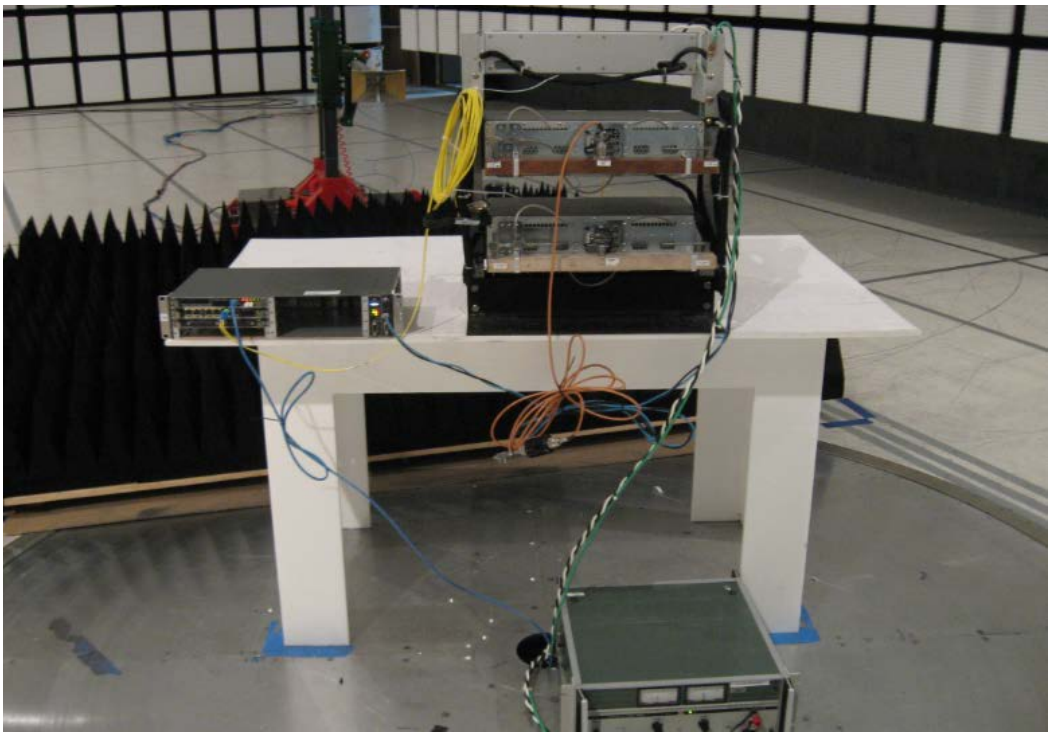


# ANNEX C - PHOTO

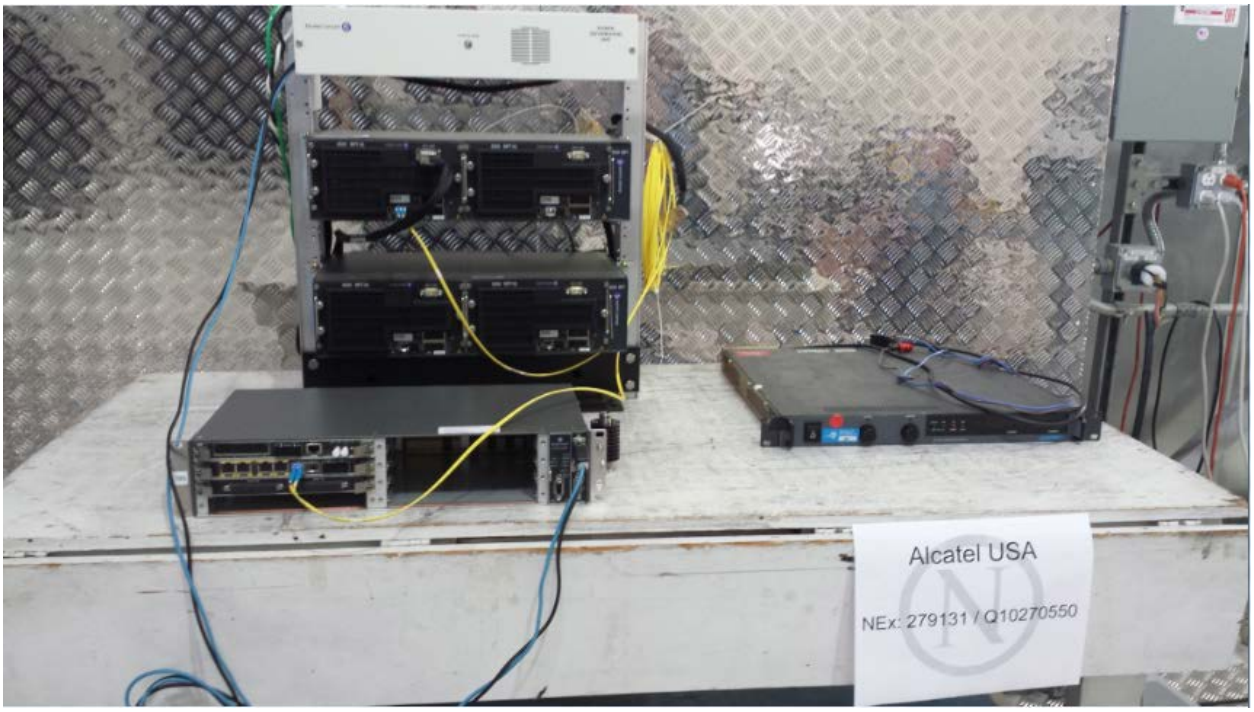
**Front of Radiated Emissions Setup**



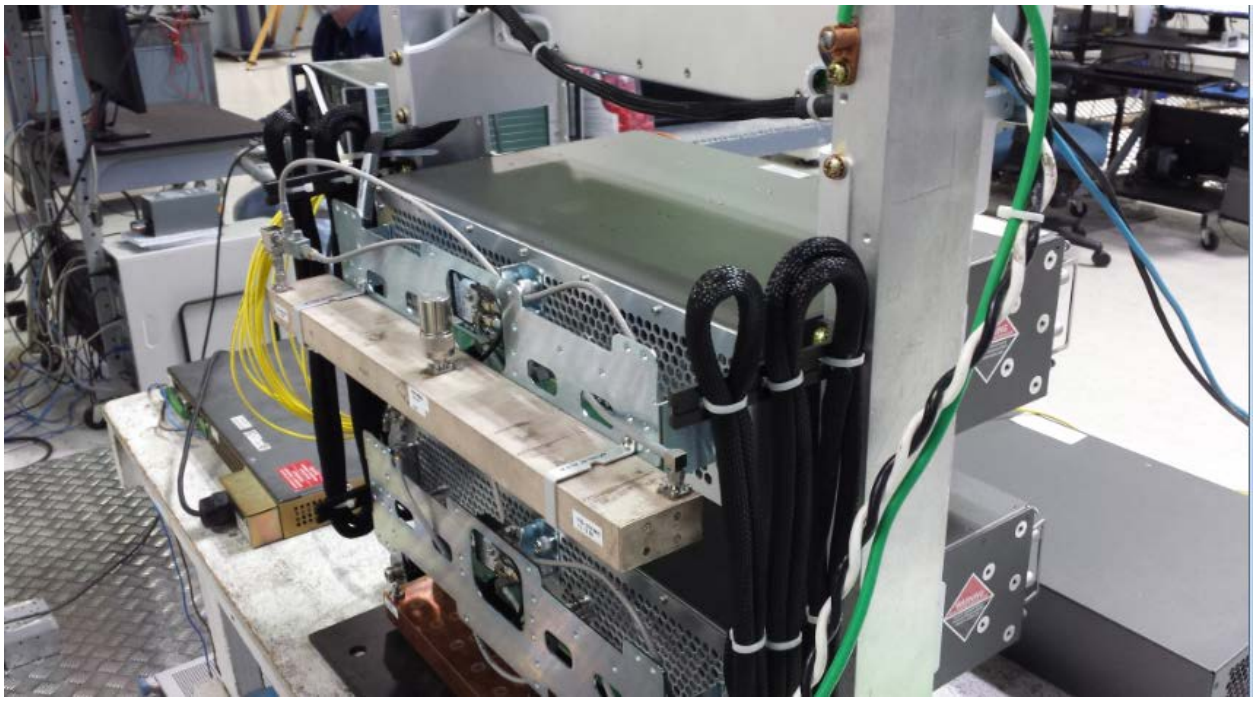
**Rear of Radiated Emissions Setup**



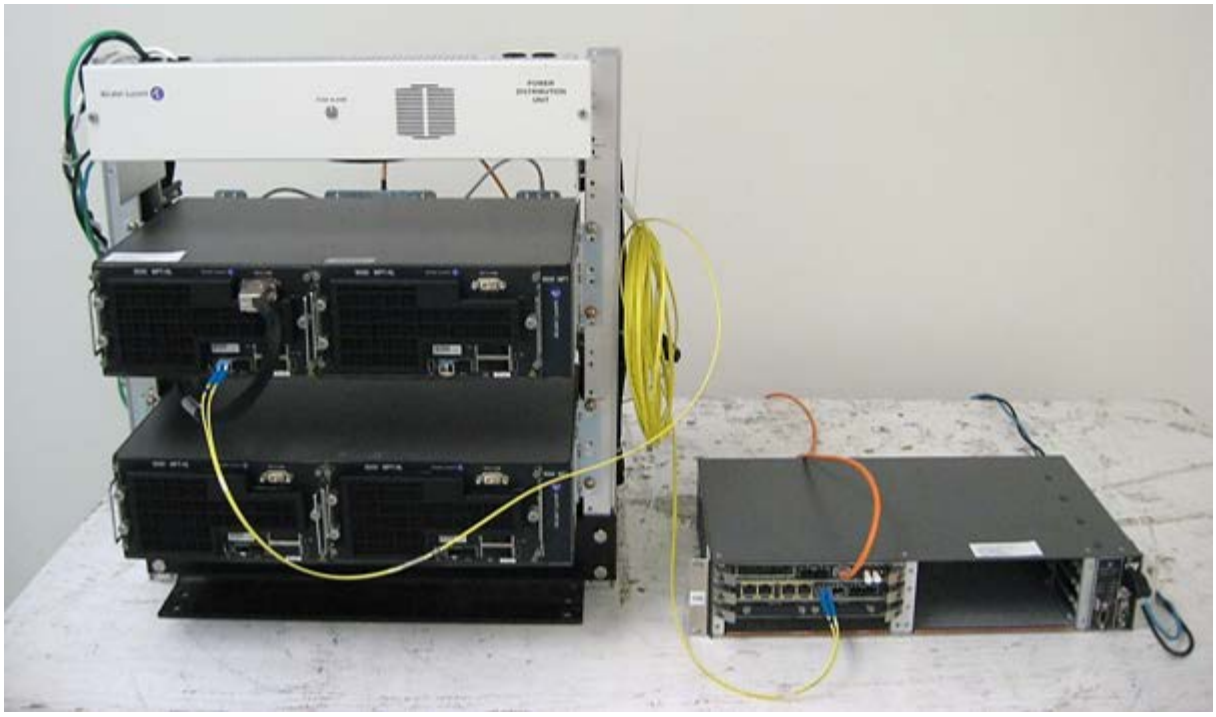
**Front of Powerline Conducted Emissions Setup**




**Rear of Powerline Conducted Emissions Setup**



**Front of EUT**



**Rear of EUT**