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## FCC PART 90 & IC RSS 119

### TEST REPORT

|                      |                                                                        |
|----------------------|------------------------------------------------------------------------|
| APPLICANT            | SPECTRA ENGINEERING PTY LTD                                            |
|                      | 731 MARSHALL RD<br>MALAGA WESTERN AUSTRALIA 6090 AUSTRALIA             |
| FCC ID               | OKRMXDR7V                                                              |
| IC                   | 5605A-MXDR7V                                                           |
| MODEL NUMBER         | MXDR7V                                                                 |
| PRODUCT DESCRIPTION  | ATLAS 4500 MULTIMODE STATION                                           |
| DATE SAMPLE RECEIVED | 6/23/2016                                                              |
| DATE TESTED          | 7/19/2016                                                              |
| TESTED BY            | Sid Sanders                                                            |
| APPROVED BY          | Cory Leverett                                                          |
| TEST RESULTS         | <input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL |

| Report Number        | Version Number | Description                                                                    | Issue Date |
|----------------------|----------------|--------------------------------------------------------------------------------|------------|
| 1198AUT16TestReport_ | Rev2           | Initial Issue                                                                  | 7/19/2016  |
|                      | Rev2.5         | Added reference to IC requirements on Summary Table, and updated FCC rule part | 7/29/2016  |
|                      | Rev3           | Updated Product Description                                                    | 8/25/2016  |

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL  
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**

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## GENERAL REMARKS

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## Summary

The device under test does:

- ☒ Fulfill the general approval requirements as identified in this test report and was selected by the customer.
- ☐ Not fulfill the general approval requirements as identified in this test report

## Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made at:

**Timco Engineering Inc.**  
**849 NW State Road 45**  
**Newberry, FL 32669**

**Tested by:** 

Name and Title: Project Manager/Testing Technician

**Date: 7/ 19/ 2016**

**Reviewed and approved by:** 

Name and Title: Cory Leverett, Engineering Tech.

**Date: 7/ 29/ 2016**

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Applicant: SPECTRA ENGINEERING PTY LTD  
FCC ID: OKRMXDR7V  
IC: 5605A-MXDR7V  
Report: 1198AUT16\1198AUT16TestReport.docx

## GENERAL INFORMATION

### EUT Specification

|                                |                                                                                                    |
|--------------------------------|----------------------------------------------------------------------------------------------------|
| <b>EUT Description</b>         | ATLAS 4500 MULTIMODE STATION                                                                       |
| <b>FCC ID</b>                  | OKRMXDR7V                                                                                          |
| <b>IC</b>                      | 5605A-MXDR7V                                                                                       |
| <b>Model Number</b>            | MXDR7V                                                                                             |
| <b>Operating Frequency</b>     | 763-775, and 851-869 MHz                                                                           |
| <b>Test Frequencies</b>        | 764.500, 769.500, 851.500, 868.500 MHz                                                             |
| <b>Type of Emission</b>        | 8K10F1E, 8K10F1D, 8K10F7E,                                                                         |
| <b>Modulation</b>              | FM                                                                                                 |
| <b>EUT Power Source</b>        | <input checked="" type="checkbox"/> 110-120Vac/50- 60Hz                                            |
|                                | <input type="checkbox"/> DC Power 12V                                                              |
|                                | <input type="checkbox"/> Battery Operated Exclusively                                              |
| <b>Test Item</b>               | <input type="checkbox"/> Prototype                                                                 |
|                                | <input checked="" type="checkbox"/> Pre-Production                                                 |
|                                | <input type="checkbox"/> Production                                                                |
| <b>Type of Equipment</b>       | <input checked="" type="checkbox"/> Fixed                                                          |
|                                | <input type="checkbox"/> Mobile                                                                    |
|                                | <input type="checkbox"/> Portable                                                                  |
| <b>Test Conditions</b>         | The temperature was 24-26°C with a relative humidity of 50 - 65%.<br>Atmospheric Pressure 1014.9mb |
| <b>Modification to the EUT</b> | None                                                                                               |
| <b>Test Exercise</b>           | The EUT was operated in a normal mode.                                                             |
| <b>Applicable Standards</b>    | ANSI/TIA 603-D:2010, FCC CFR 47 Part 90, & IC RSS 119 i12 2015                                     |
| <b>Test Facility</b>           | <b>Timco Engineering Inc. at 849 NW State Road 45<br/>Newberry, FL 32669 USA.</b>                  |

### RF EXPOSURE INFORMATION: 47CFR 2.1093

The requirements for this equipment are covered in the included a RF Exposure exhibit.

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## Test Results Summary

| Test Description                          | FCC RULE PART NO.                                   | IC RSS      | RESULT |
|-------------------------------------------|-----------------------------------------------------|-------------|--------|
| RF Power Output                           | 2.1046(a), 90.541(a),<br>90.542(a)(1), 90.635(a)(b) | 119§5.4     | Pass   |
| Occupied Bandwidth                        | 2.1049(c)(h),<br>90.210(b)(g)(h), 90.691            | 119§5.5     | Pass   |
| Adjacent Channel Power                    | 90.543(a)                                           | 119§5.8.9.1 | Pass   |
| Spurious Emissions at<br>Antenna Terminal | 2.1051(a), 90.210(b)(g)(h),<br>90.691, 90.543(c),   | 119§5.8.2   | Pass   |
| Field Strength of<br>Spurious Radiation   | 2.1053, 90.210(b)(g)(h),<br>90.691, 90.543(c),      | 119§5.8.2   | Pass   |
| Frequency Stability                       | 2.1055, 90.213, 90.539(c),                          | 119§5.3     | Pass   |

## RF POWER OUTPUT

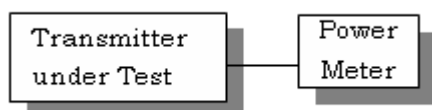
**Rule Part No.:** Part 2.1046(a), Part 90, RSS-119.

**Requirements:** For IC the power output must be within  $\pm 1.0\text{dB}$  of the manufacturer's rating.

**Method of Measurement:** RF power is measured by using a 50-ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage (if battery operated), or a properly adjusted power supply (if not battery operated), and the transmitter properly adjusted the RF output measures:

For the device with a fixed or integral antenna, the RF power is measured as ERP. The substitution method was used. The RF output measures:

**Test Setup Diagram :**



**Test Data: Power Output Measurement Table**

| Tuned Freq.<br>MHz | Power Output |        |       |       |
|--------------------|--------------|--------|-------|-------|
|                    | High         |        | Low   |       |
|                    | dBm          | Watts  | dBm   | Watts |
| 764.500            | 50.77        | 119.94 | 47.71 | 58.88 |
| 851.500            | 50.65        | 119.97 | 47.60 | 57.54 |
| 868.500            | 50.79        | 120.22 | 47.50 | 60.30 |

### Part 2.1033 (C)(8) DC Input into the final amplifier

FOR LOW POWER SETTING INPUT POWER:  $(48\text{V})(3.8\text{A}) = 182.49.75 \text{ Watts}$

FOR HIGH POWER SETTING INPUT POWER:  $(48\text{V})(8.1\text{A}) = 388.8\text{Watts}$

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## **MODULATION CHARACTERISTICS**

**Rule Part: Part 2.1033(c), Part 2.1033(c) (4), Part 90.209, Part 90.207**

APCO 25 modulation phase 1 and phase 2 as defined in ANSI/ TIA-102.BABA.

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## OCCUPIED BANDWIDTH

### **Part 2.1049(c) EMISSION BANDWIDTH:**

#### **Part 90.210(b) 25 kHz Channel Spacing**

Data in the plots show that on any frequency removed from the assigned frequency by more than 50%, but not more than 100%: At least 25dB. On any frequency removed from the assigned frequency by more than 100%, but not more than 250%: At least 35 dB. On any frequency removed from the assigned frequency by more than 250%, of the authorized bandwidth: At least  $43 + 10\log(P)$  dB.

#### **Part 90.210(c) 25 kHz Channel Spacing Not Equipped with a Low Pass Filter**

For transmitters that are not equipped with an audio low pass filter pursuant to S90.211 (b), the power of any emission must be attenuated below the un-modulated carrier output power as follows; (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5 kHz but not more than 10 kHz: At least  $83 \log(f_d/5)$  dB; (2) ON any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 10 kHz, but not more than 250% of the authorized bandwidth: At least  $29 \log(f_d^2/11)$  dB or 50 dB, whichever is the lesser attenuation; (3) On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: At least  $43 + 10 \log(P)$  dB.

#### **Part 90.210(d) Emission Mask D - 12.5 kHz channel BW equipment.**

For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power ( $P$ ) of the highest emission contained within the authorized bandwidth as follows:

- (1) On any frequency from the center of the authorized bandwidth  $f_0$  to 5.625 kHz removed from  $f_0$ : Zero dB.
- (2) On any frequency from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least  $7.27(f_d - 2.88 \text{ kHz})$  dB.
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz: At least  $50 + 10\log(P)$  dB or 70 dB, whichever is the lesser attenuation.

#### **Part 90.210(e) Emission Mask E – 6.25 kHz channel BW equipment.**

For transmitters designed to operate with a 6.25 kHz bandwidth, any emission must be attenuated below the power ( $P$ ) of the highest emission contained within the authorized bandwidth as follows:

- (1) On any frequency from the center of the authorized bandwidth  $f_0$  to 3.0 kHz removed from  $f_0$ : Zero dB.
- (2) On any frequency from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least  $30 + 16.67(f_d - 3.0 \text{ kHz})$  or  $55 + 10 \log(P)$  or 65, whichever is the lesser attenuation.

## OCCUPIED BANDWIDTH

- (3) On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least  $55 + 10\log(P)$  dB or 65 dB, whichever is the lesser attenuation.

### **Part 90.210(h) Emission Mask H) NPSPAC Mutual aid**

### **Part 90.210(h) & 90.615 Emission Mask H) NPSPAC Mutual aid**

**FCC Rule 90.615 (a)** explains what frequencies should be used to determine compliance with the NPSPAC, THIS IS ONLY REQUIRED IN the 806-824/851/869MHz band.

For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1).On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of 4kHz or less: Zero dB.

(2).On any frequency removed from the center of the authorized bandwidth by a displacement frequency of ( $f_d$  in kHz) of more than 4kHz, but no more than 8.5kHz: At least  $107 \log(f_d/4)$  dB;

(3). On any frequency removed from the center of the authorized bandwidth by a displacement frequency of ( $f_d$  in kHz) of more than 8.5 kHz, but no more than 15 kHz; At least  $40.5 \log(f_d/1.16)$  dB.

(4).On any frequency removed from the center of the authorized bandwidth by a displacement frequency of ( $f_d$  in kHz) of more than 15 kHz, but no more than 25 kHz; At least  $116 \log(f_d/6.1)$  dB.

(5).On any frequency removed from the center of the authorized bandwidth by more than 25 kHz: At least  $43 + \log(P)$  dB.

## EA EMISSION MASK

### **Part 90.691: Emission mask requirements for EA-based systems**

(Under the Policies Governing the Licensing and Use of EA-Based SMR Systems in the 809–824/854–869 MHz Band rule part)

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10\log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

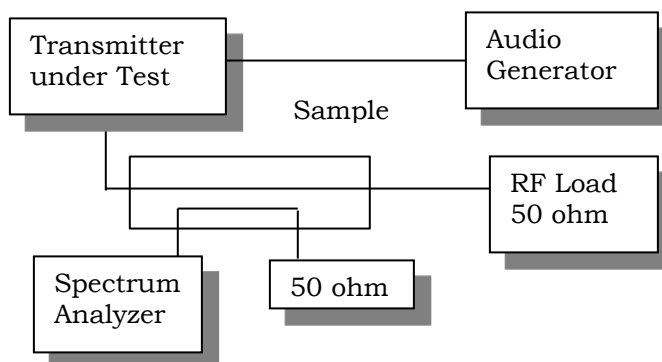
(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

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## OCCUPIED BANDWIDTH

**Method of Measurement:** Was in accordance with test procedures detailed in the standard list above.

**Test Setup Diagram:**



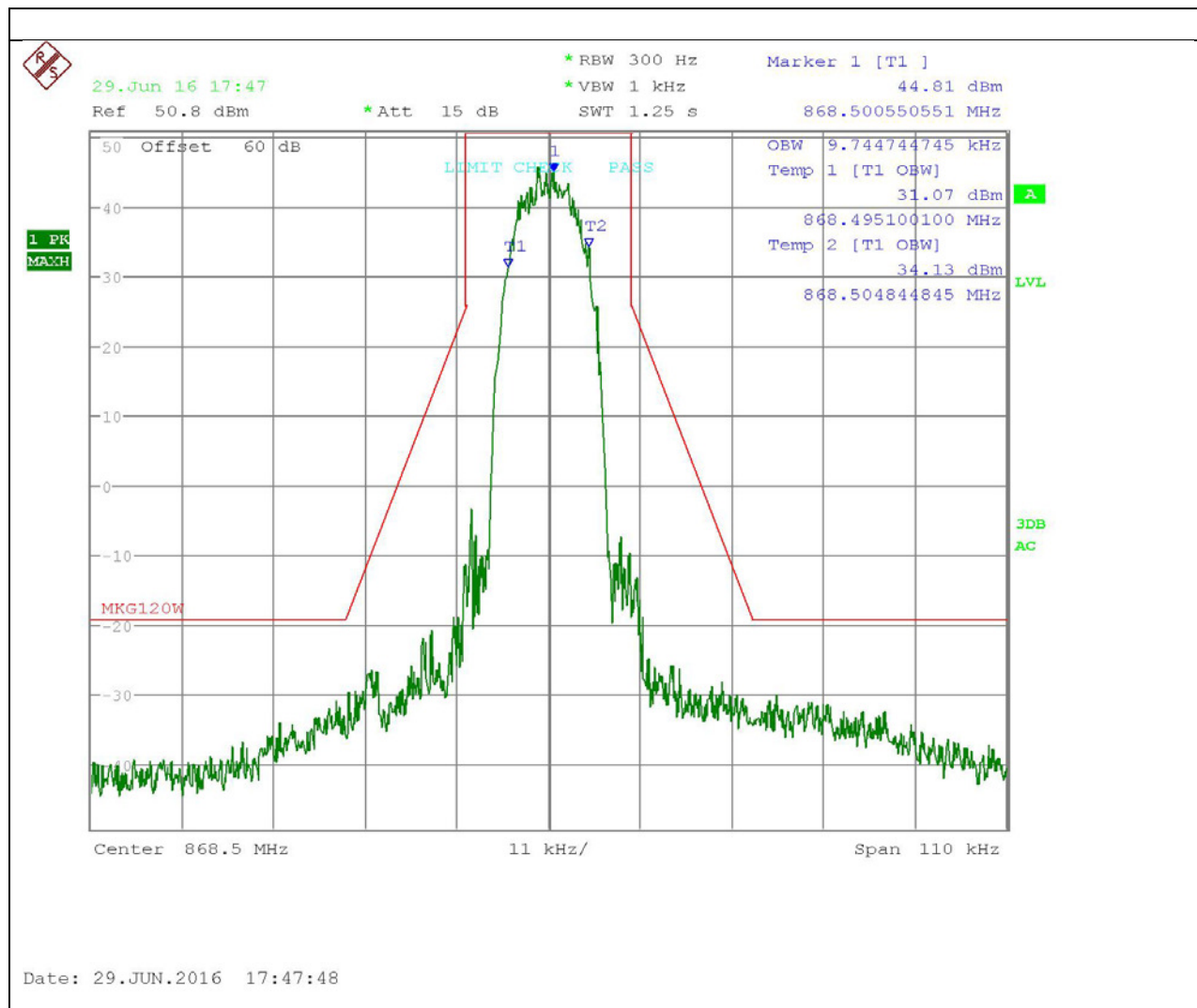
**Test Data:** See the plots below

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## OCCUPIED BANDWIDTH 12.5 KHz Digital

### Part 90.210(d) Emission Mask G - 12.5 kHz channel Digital

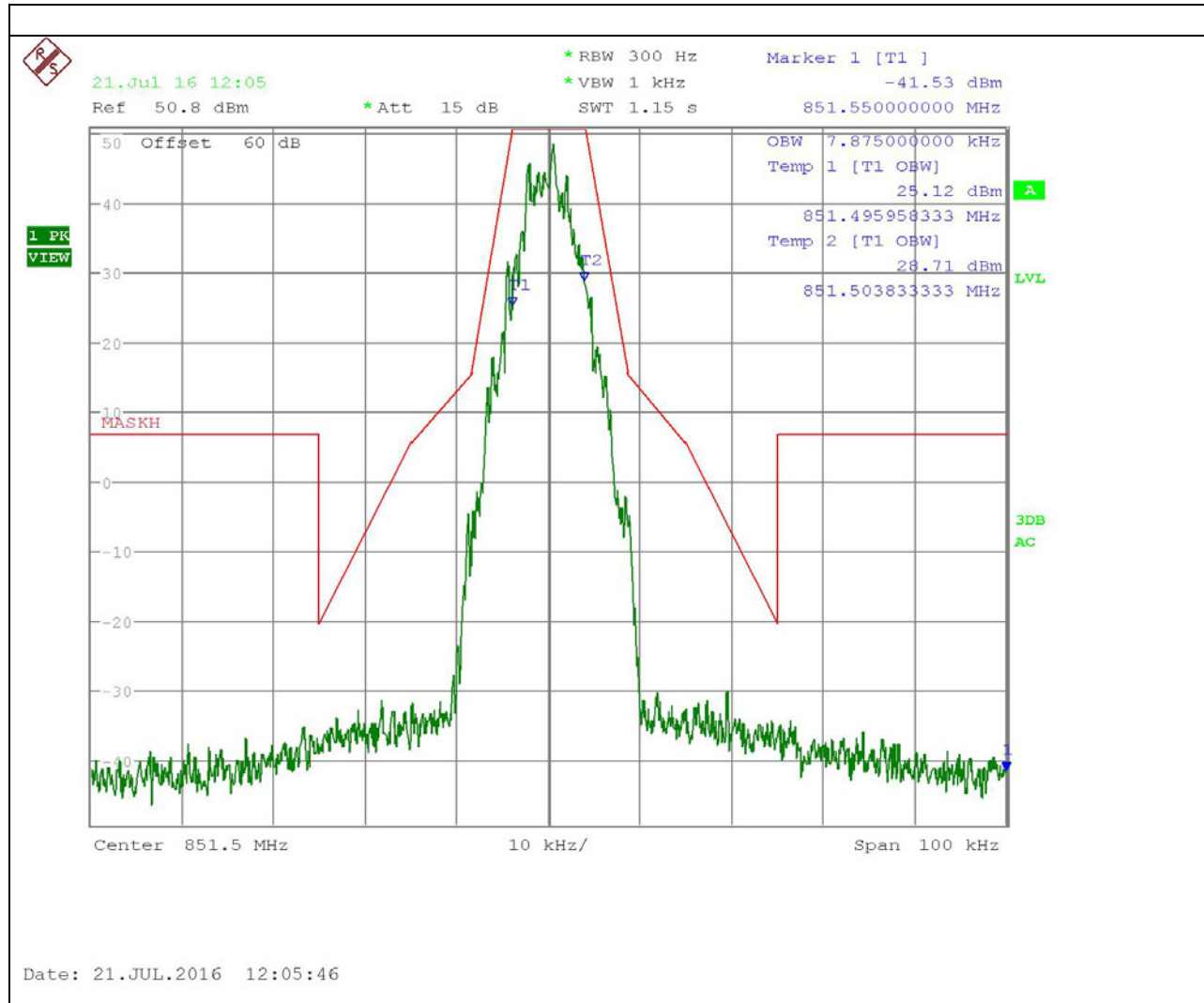
Test Data: 868.50 MHz Mask G 8k10F1E/ 8k10F1D



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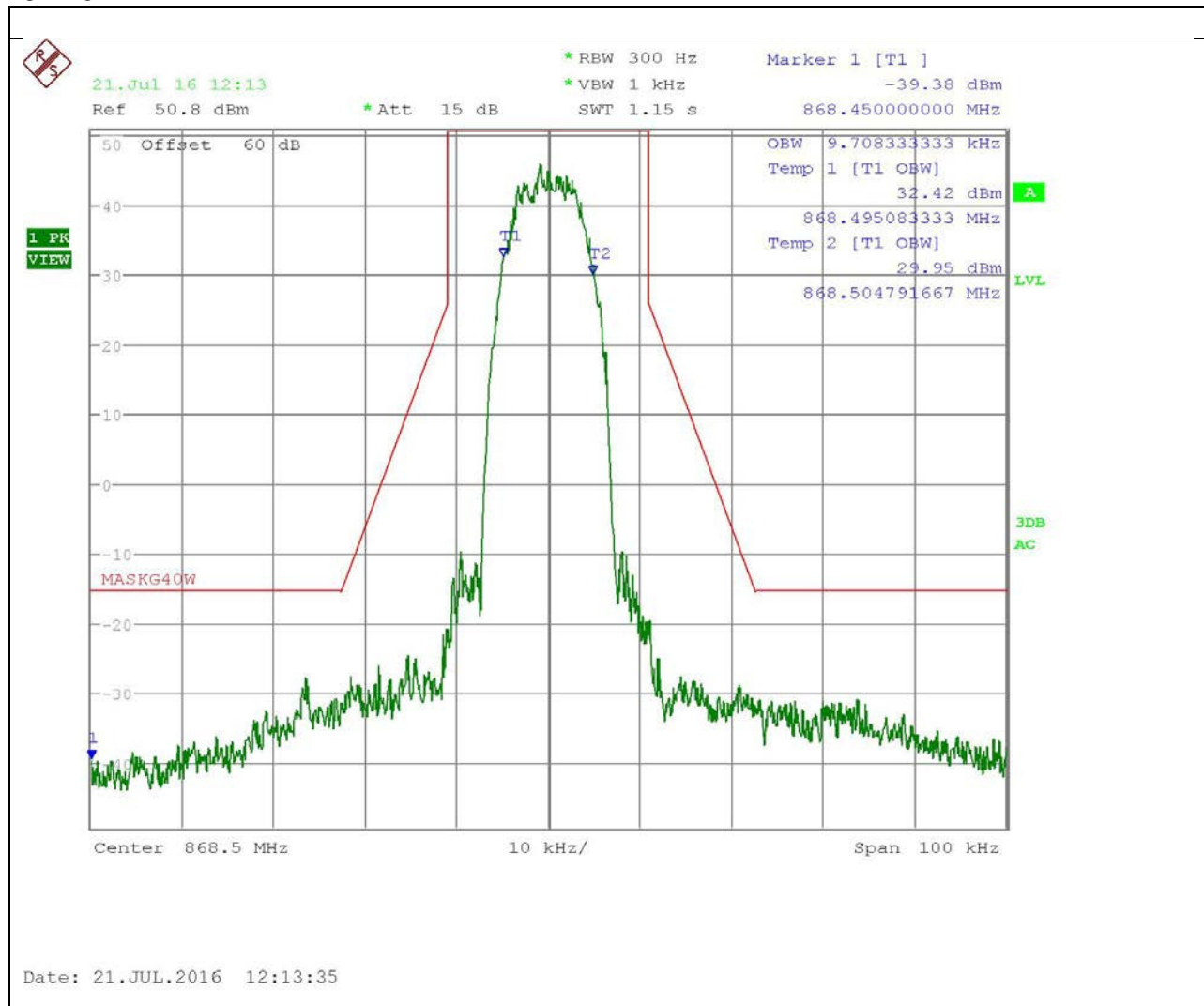
Applicant: SPECTRA ENGINEERING PTY LTD  
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IC: 5605A-MXDR7V  
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# Part 90.210(d) Emission Mask H - 12.5 kHz channel Digital 8k10F1E/ 8k10F1D

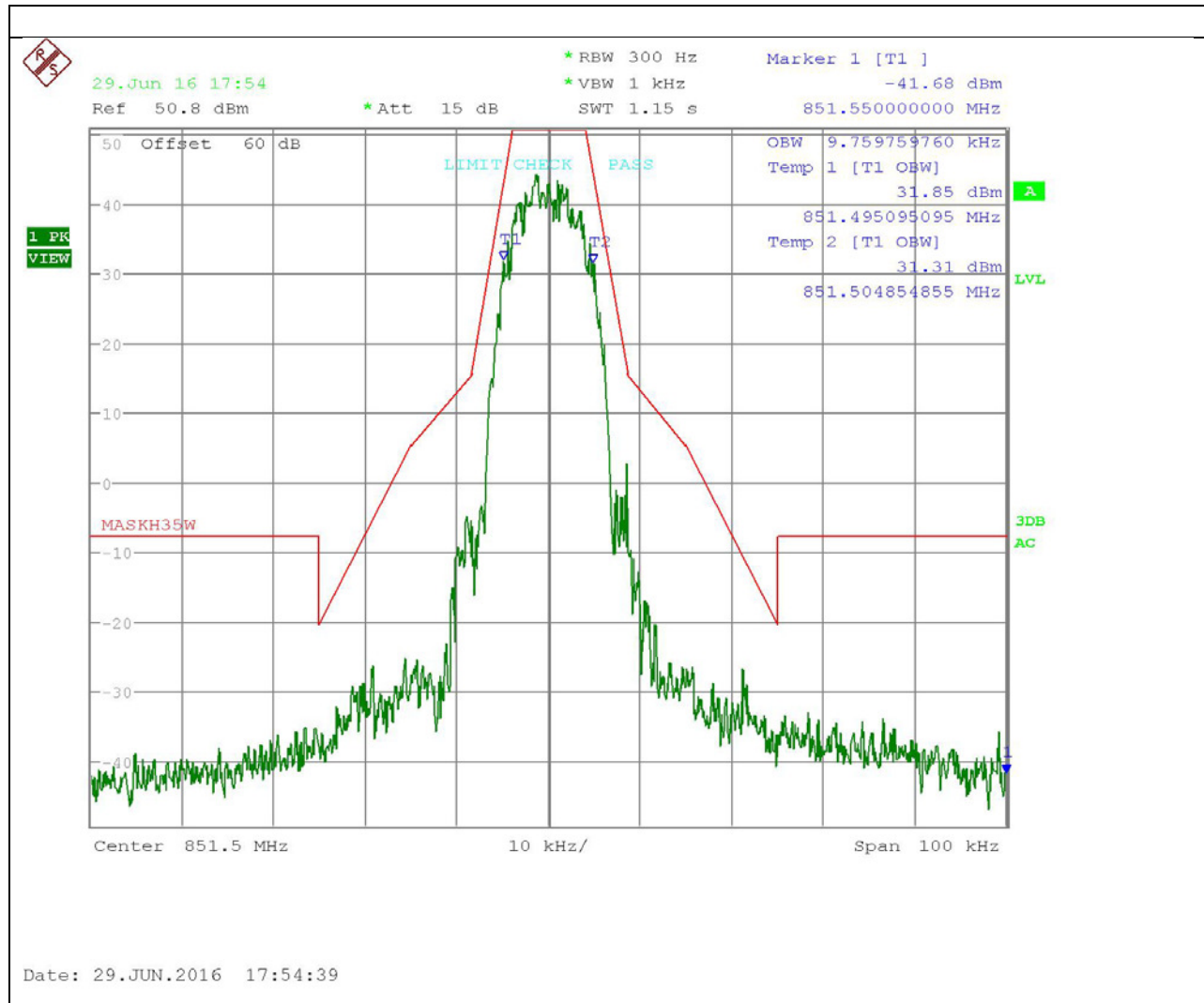


# Part 90.210(d) Emission Mask G - 12.5 kHz channel Digital

8k10F7E



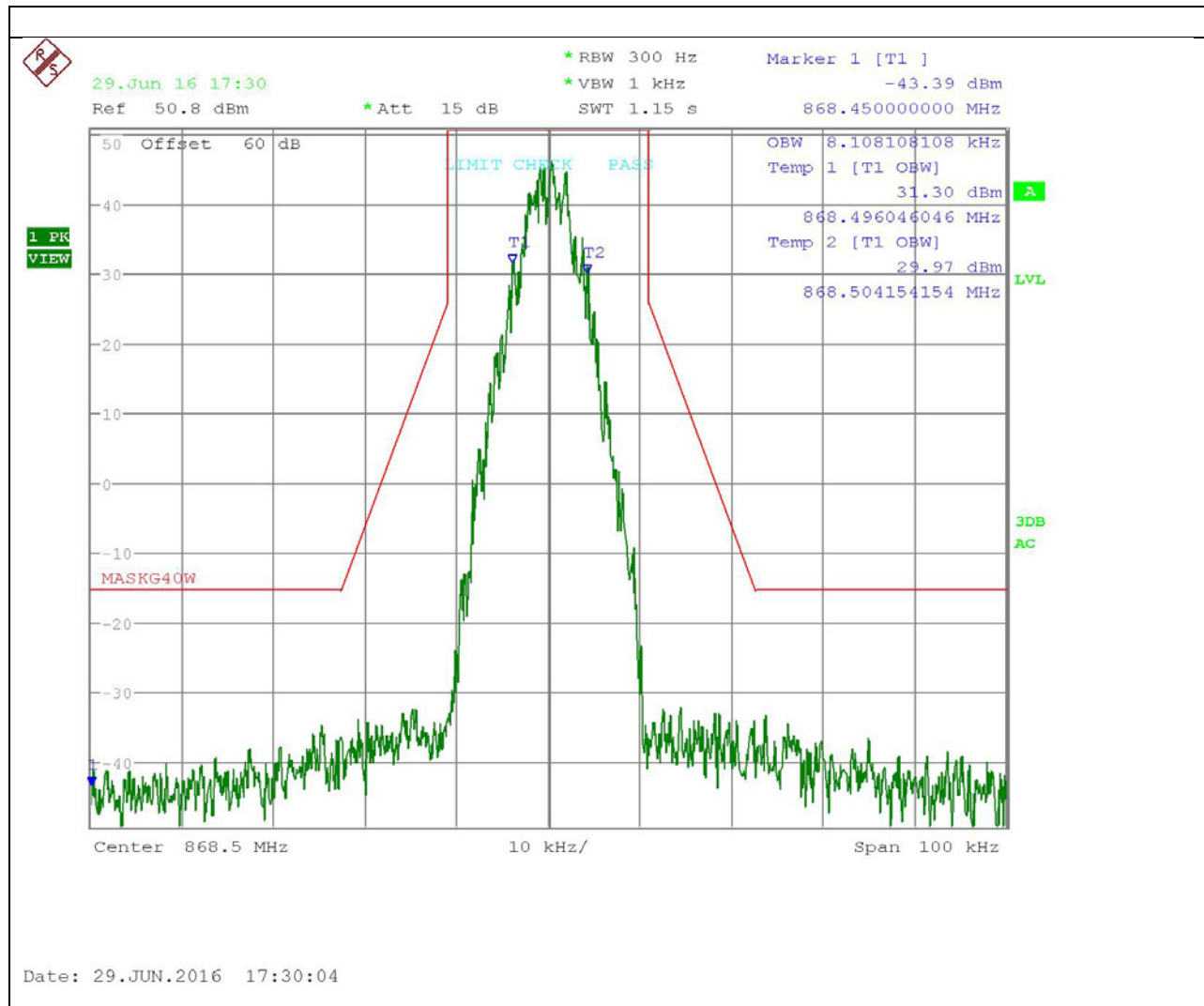
# Part 90.210(h) Emission Mask H - 12.5 kHz channel Digital 8K10F7



Applicant: SPECTRA ENGINEERING PTY LTD  
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IC: 5605A-MXDR7V  
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# Part 90.210(d) Emission Mask D - 12.5 kHz channel Digital

Test Data: 868.50 Mask G 8K10F7E



Note: Although the limit line says "MASK G 40Watts the reference was set to the 50.8dBm and complies with the requirement.

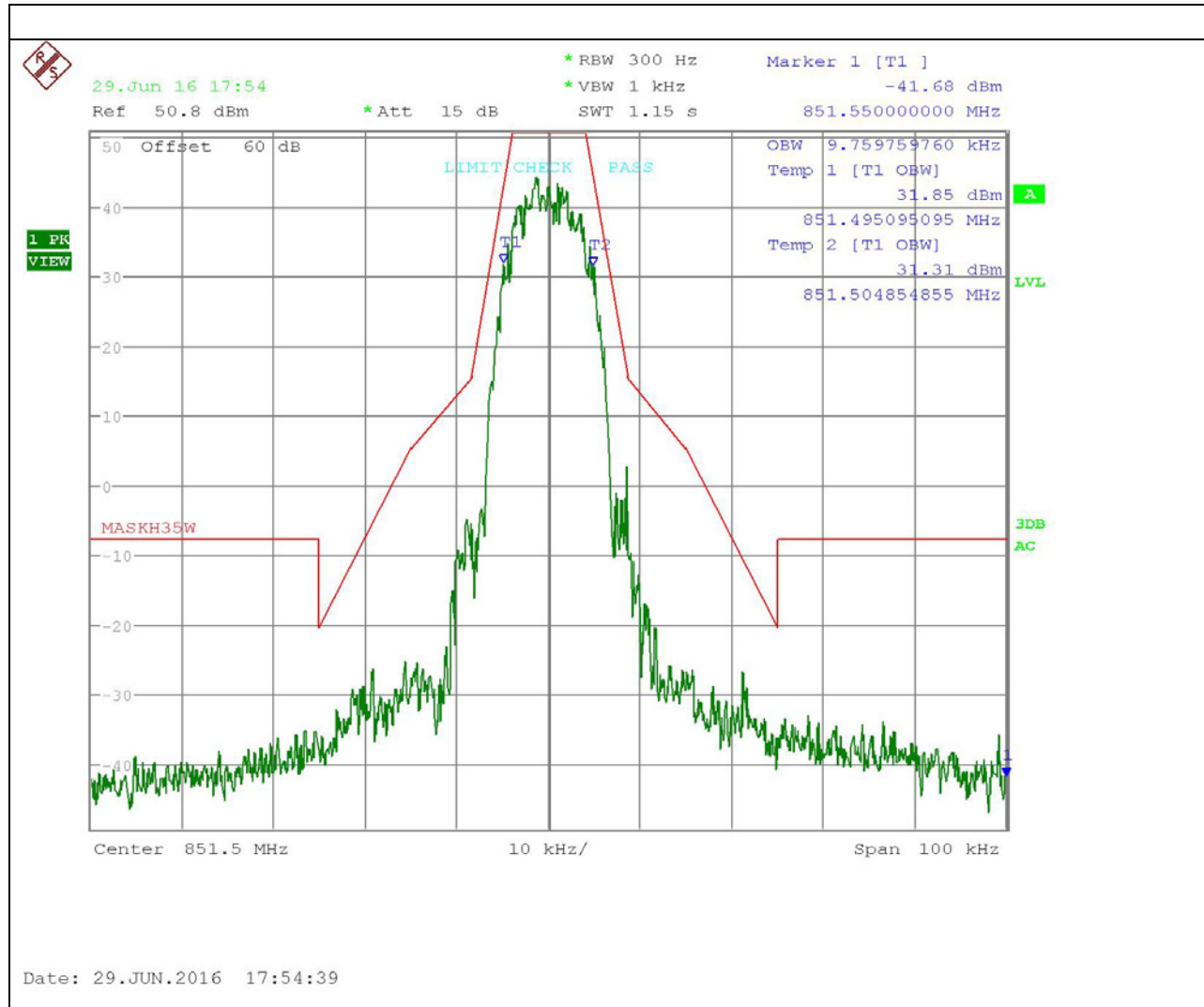
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## OCCUPIED BANDWIDTH PLOTS (NPSPAC mutual aid channels)

### Part 90.210(h) Emission Mask H

Test Data: 851.50 Mask H 8k10F1E/ 8K10F1D



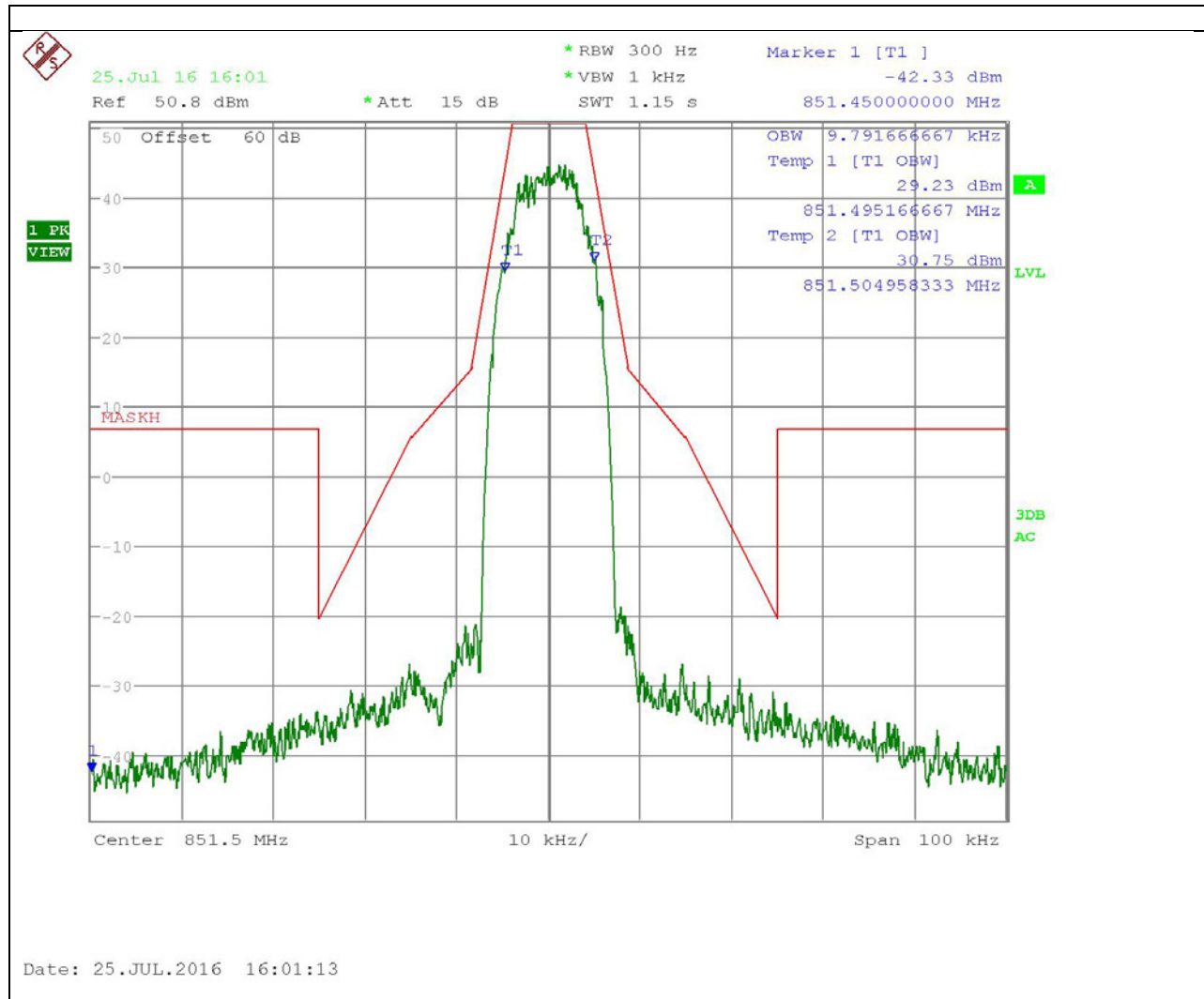
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# OCCUPIED BANDWIDTH PLOTS (NPSPAC mutual aid channels)

## Part 90.210(h) Emission Mask H

Test Data: 851.50 Mask H 8k10F7E



## OCCUPIED BANDWIDTH 806-824/ 854-869MHz EA Mask

### ADJACENT CHANNEL POWER (ACP)

#### 25 kHz Transmitter ACP: 16k0F3E

Requirements: 90.543 Emission limitations.

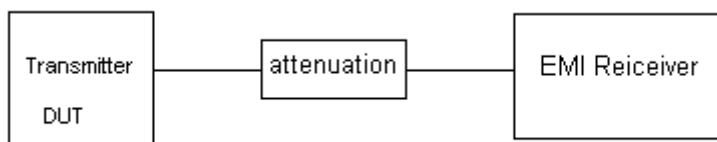
| Offset from center frequency<br>(kHz) | Measurement<br>bandwidth<br>(kHz) | Maximum<br>ACP relative<br>(dBc) |
|---------------------------------------|-----------------------------------|----------------------------------|
| 15.625                                | 6.25                              | -40                              |
| 21.875                                | 6.25                              | -60                              |
| 37.5                                  | 25                                | -60                              |
| 62.5                                  | 25                                | -65                              |
| 87.5                                  | 25                                | -65                              |
| 150                                   | 100                               | -65                              |
| 250                                   | 100                               | -65                              |
| 350                                   | 100                               | -65                              |
| > 400 kHz to 12 MHz                   | 30 (s)                            | -75                              |
| 12 MHz to paired receive band         | 30 (s)                            | -75                              |
| In the paired receive band            | 30 (s)                            | -100                             |

Swept 30 KHz Bandwidth Measurement

| Offset from center<br>frequency | ACP<br>Limit<br>(dBc) |
|---------------------------------|-----------------------|
| > 400 KHz to 12 MHz             | -75                   |
| 12 MHz to paired rx band        | -75                   |
| In the paired rx band           | -100                  |

#### TEST PROCEDURE:

1. All the measurement are made at the transmitter's output port.
2. The ACP was made with the EMI receiver which has a direct ACP function.
3. Reference level was set at 34 dBm.

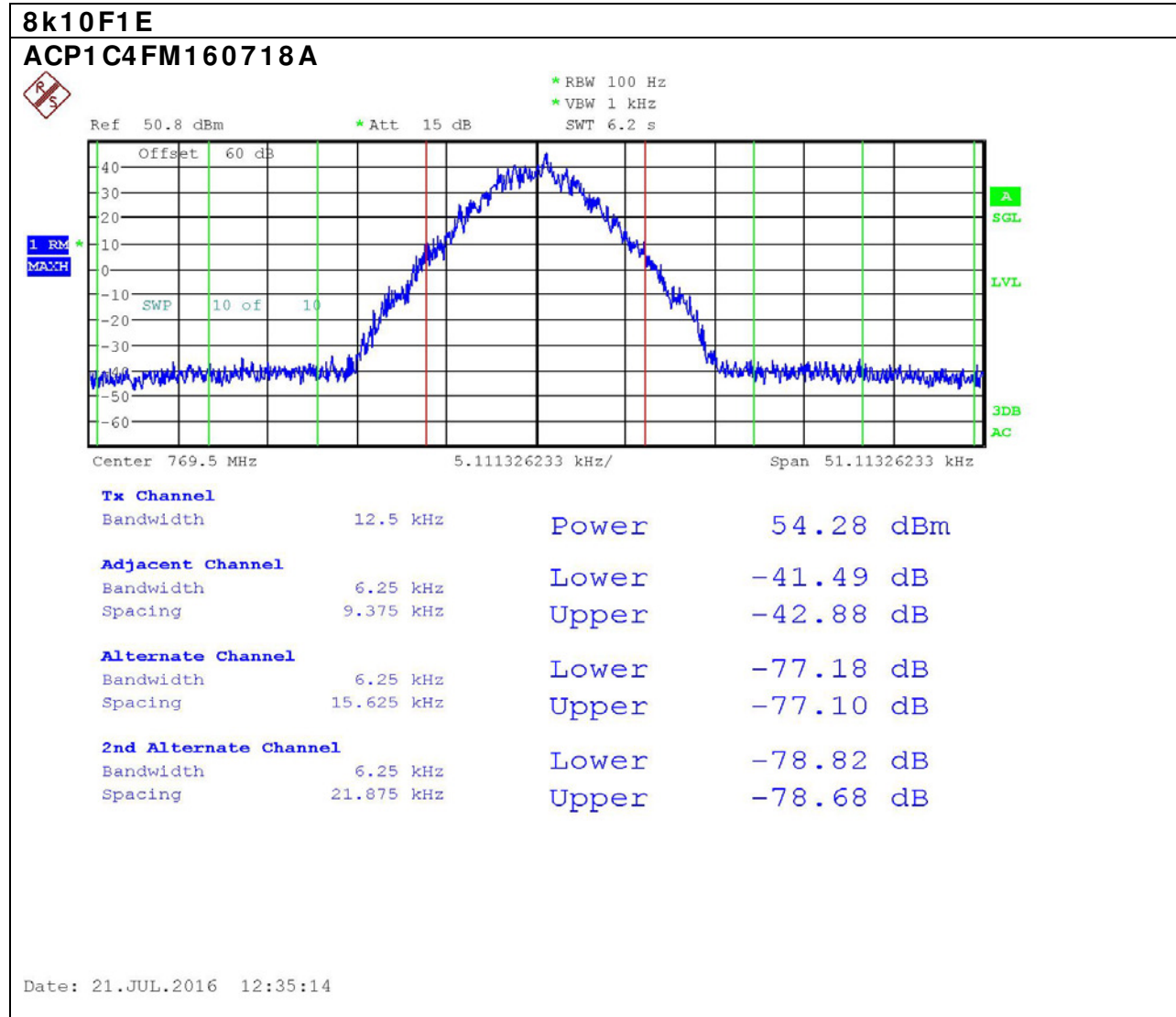


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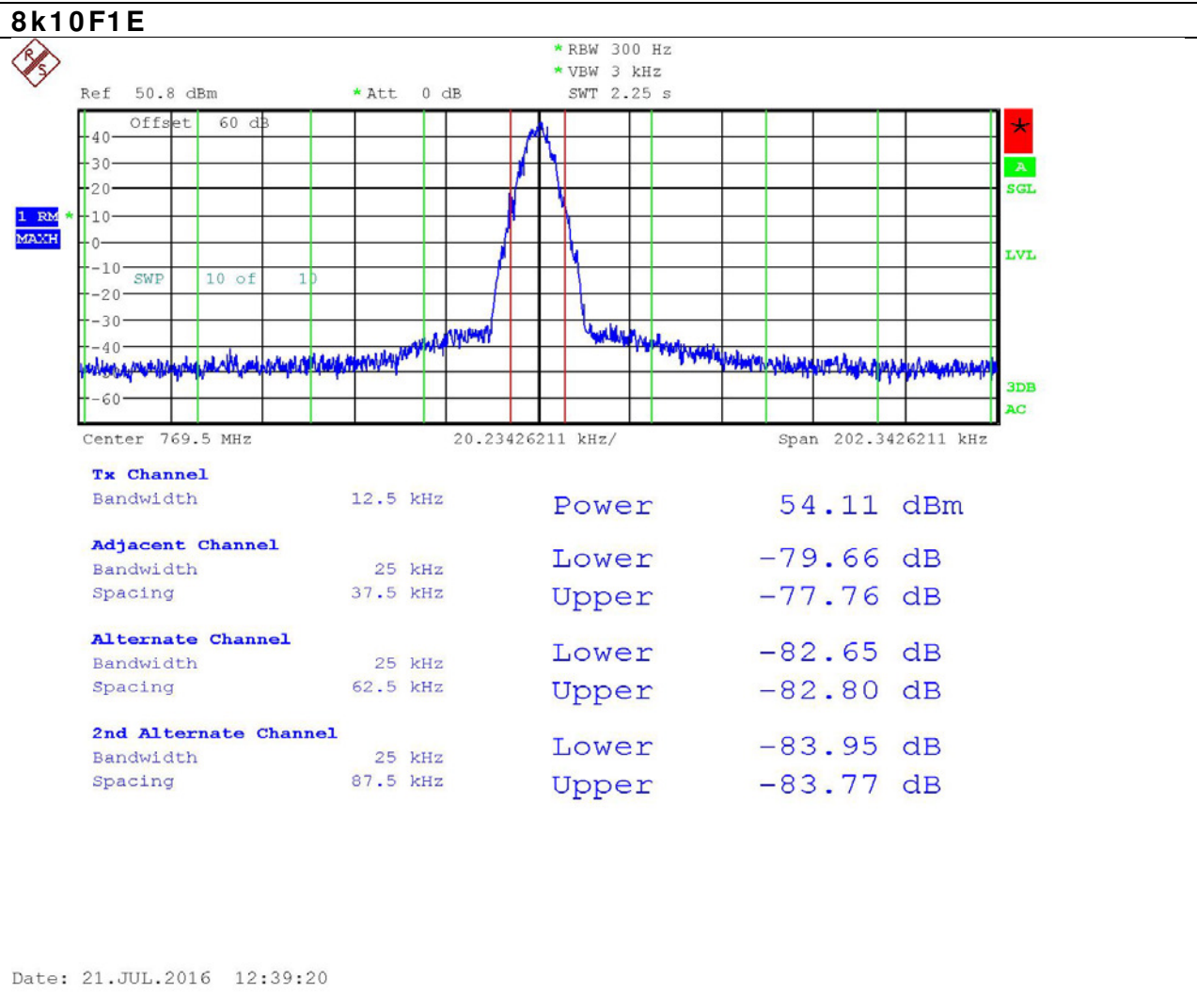
ADJACENT CHANNEL POWER (ACP)  
12.5 kHz Transmitter ACP: 8k10F1E

Test Data: 12.5 KHz 8K10F1E/ 8K10F1D



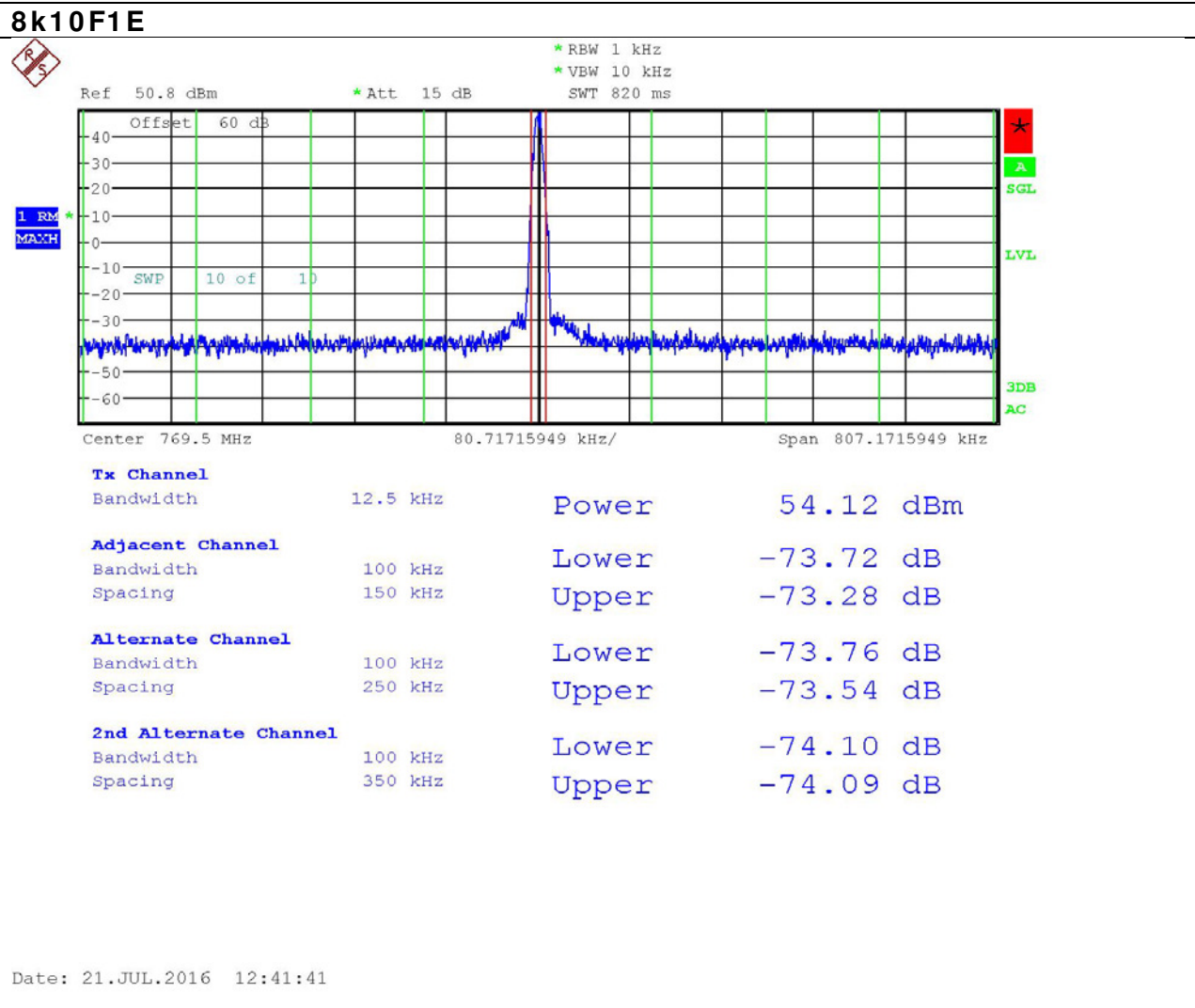
# ADJACENT CHANNEL POWER (ACP) 12.5 kHz Transmitter ACP: 8k10F1E

# 2



# ADJACENT CHANNEL POWER (ACP) 12.5 kHz Transmitter ACP: 8k10F1E

# 3



Swept 30 KHz Bandwidth Measurement

| Offset from center frequency | ACP Limit (dBc) | ACP Level (dBc) |         | Margin (dB) |
|------------------------------|-----------------|-----------------|---------|-------------|
| > 400 KHz to 12 MHz          | -75             | Upper           | -97.9   | 23.5        |
|                              |                 | Lower           | -103    | 27.8        |
| 12 MHz to paired rx band     | -75             |                 | -100.22 | 25.2        |
| In the paired rx band        | -100            |                 | -103.73 | 4.2         |

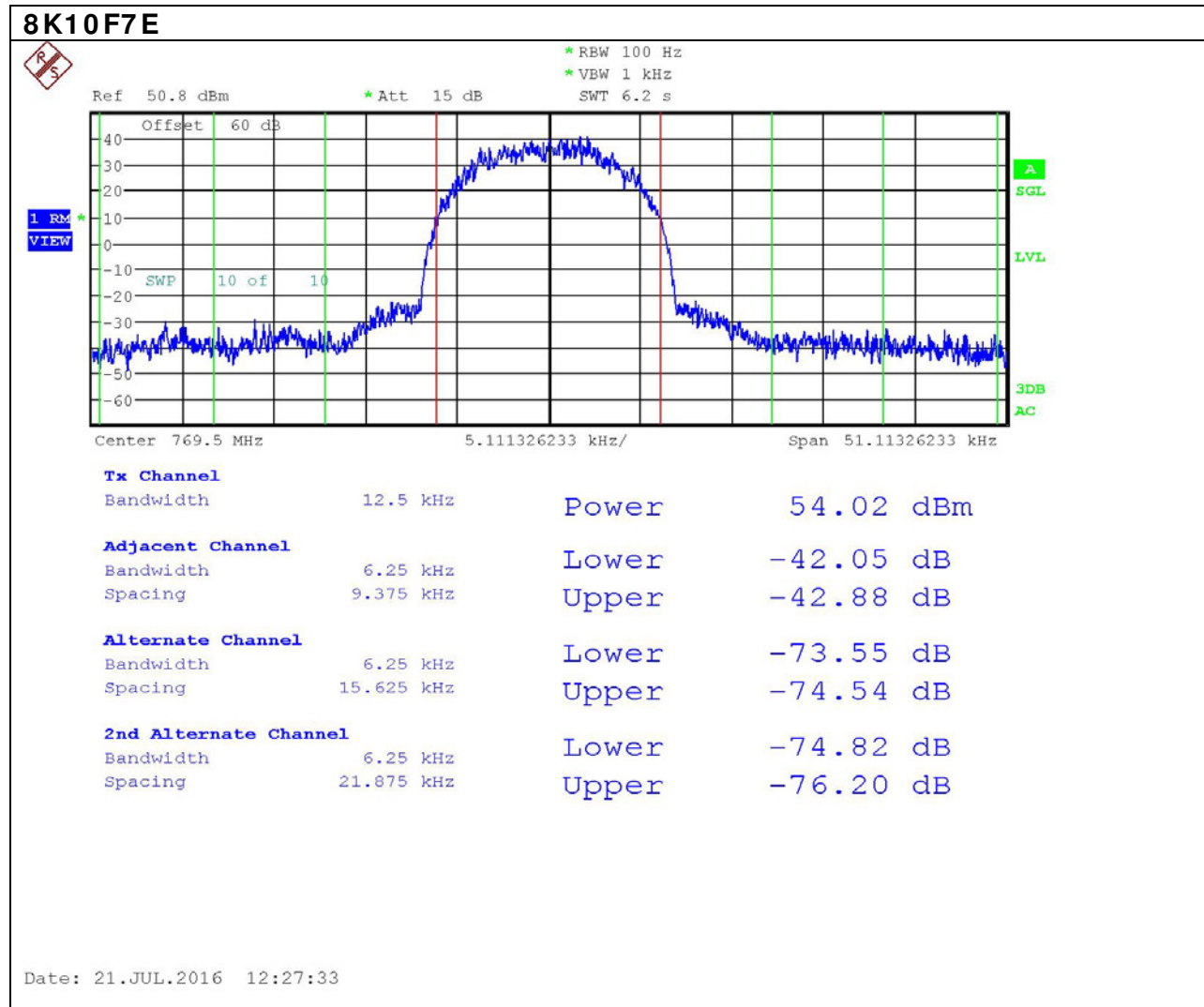
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## ADJACENT CHANNEL POWER (ACP)

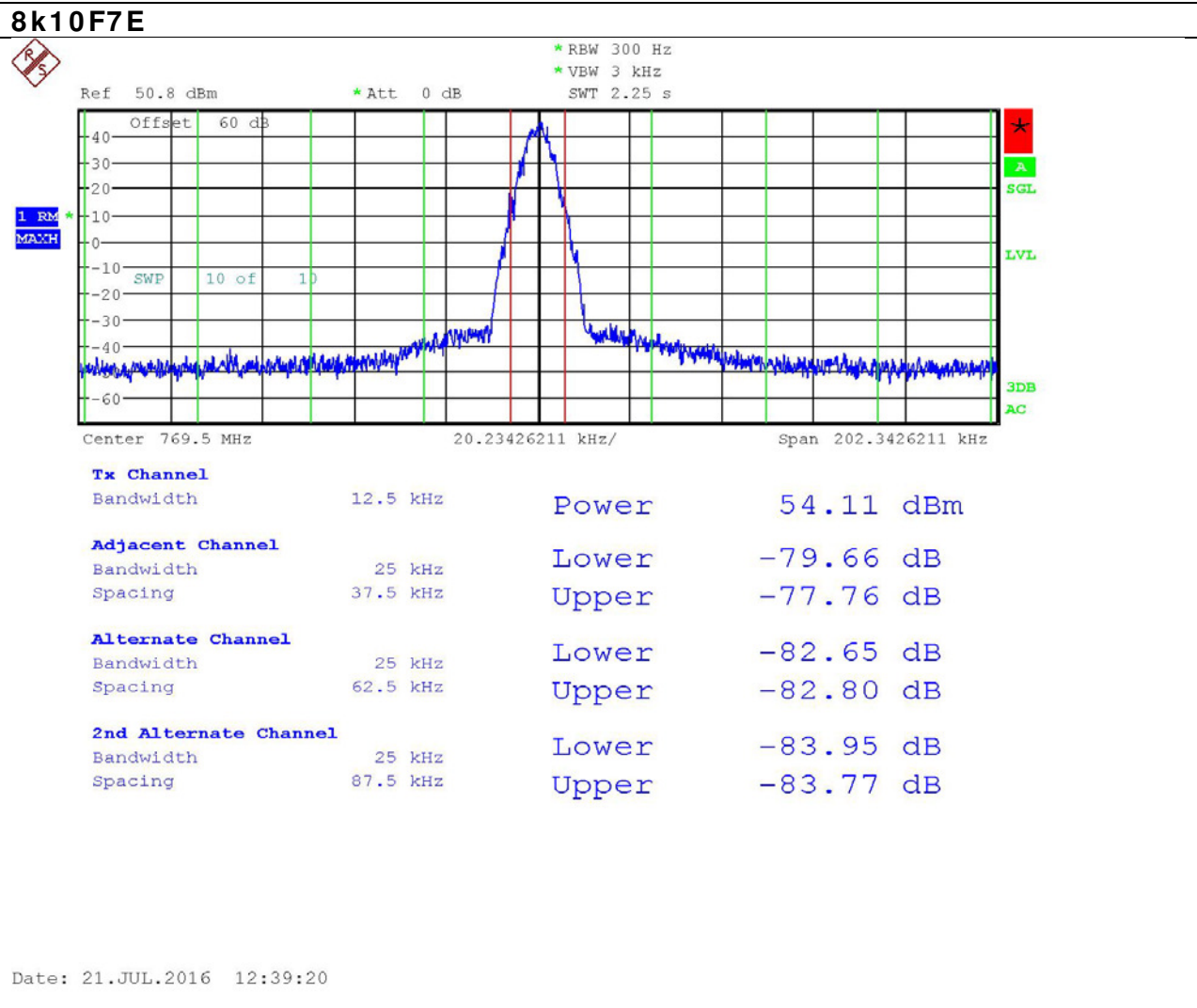
### 12.5 kHz Transmitter ACP: 8K10F7E

Test Data: 12.KHz 8K10F7E



# ADJACENT CHANNEL POWER (ACP) 12.5 kHz Transmitter ACP: 8k10F7E

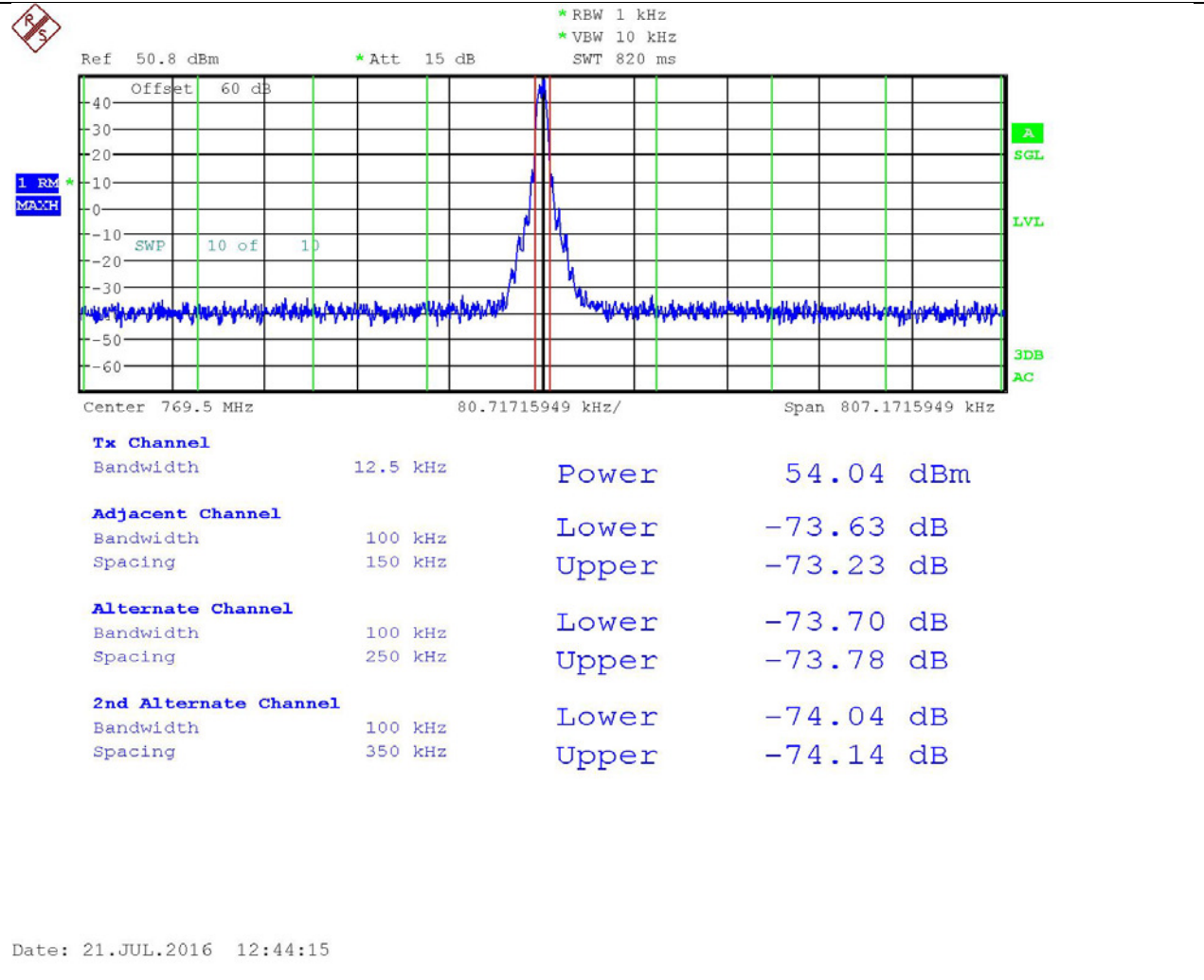
# 2



# ADJACENT CHANNEL POWER (ACP) 12.5 kHz Transmitter ACP: 8k10F7E

# 3

8k10F7E



## 25 kHz Transmitter ACP Swept 30 KHz Bandwidth Measurement

| Offset from center frequency | ACP Limit (dBc) | ACP Level (dBc) |       | Margin (dB) |
|------------------------------|-----------------|-----------------|-------|-------------|
| > 400 KHz to 12 MHz          | -75             | Upper           | -97.9 | 23.5        |
|                              |                 | Lower           | -103  | 27.8        |
| 12 MHz to paired rx band     | -75             | -100.22         |       | 25.2        |
| In the paired rx band        | -100            | -103.73         |       | 4.2         |

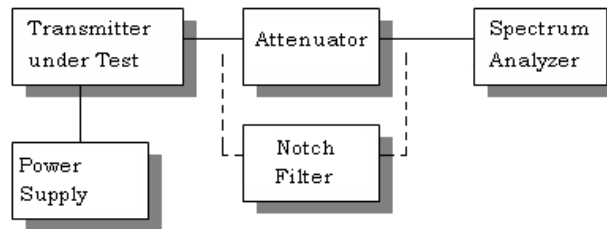
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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

### Method of Measuring Conducted Spurious Emissions



#### Requirements:

$$12.5 \text{ kHz Channel Spacing} = 50 + 10 \log (120.9) = 70.8 \text{ dBc}$$

$$12.5 \text{ kHz Channel Spacing} = 50 + 10 \log (60.3) = 67.80 \text{ dBc}$$

**Method of Measurement:** The carrier was modulated 16 dB above the 50% modulation using a 2500 Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard test procedures detailed in the standard list above.

#### Test Data: 764.500MHz Low Power

|              | dBm       | Watts | Limit   | Notes |
|--------------|-----------|-------|---------|-------|
| Power Output | 47.8      | 60.3  | 67.8dBc |       |
|              |           |       | Margin  |       |
|              | Frequency | dBc   | dB      |       |
|              | 764.5     | 0     |         |       |
|              | 1529      | 84.2  | 16.4    | *     |
|              | 2293.5    | 85.5  | 17.7    | *     |
|              | 3058      | 84.98 | 17.18   |       |
|              | 3822.5    | 84.95 | 17.15   | *     |
|              | 4587      | 86.9  | 19.1    | *     |
|              | 5351.5    | 82.16 | 14.36   | *     |
|              | 6116      | 79.4  | 11.6    | *     |
|              | 6880.5    | 80.88 | 13.08   | *     |
|              | 7645      | 86.04 | 18.24   | *     |

Note: "\*" Indicates noise floor.

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Applicant: SPECTRA ENGINEERING PTY LTD  
 FCC ID: OKRMXDR7V  
 IC: 5605A-MXDR7V  
 Report: 1198AUT16\1198AUT16TestReport.docx

## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

### Test Data: 764.500MHz High Power

#### High Power

|              | dBm       | Watts | Limit | Notes |
|--------------|-----------|-------|-------|-------|
| Power Output | 50.79     | 25    | dBc   |       |
|              |           |       | 70.82 |       |
|              | Frequency | dBc   |       |       |
|              | 764.5     | 0     |       |       |
|              | 1529      | 88.29 | 17.47 | *     |
|              | 2293.5    | 88.73 | 17.91 |       |
|              | 3058      | 88.71 | 17.89 | *     |
|              | 3822.5    | 90.35 | 19.53 | *     |
|              | 4587      | 89.35 | 18.53 | *     |
|              | 5351.5    | 85.33 | 14.51 | *     |
|              | 6116      | 84.27 | 13.45 | *     |
|              | 6880.5    | 83.57 | 12.75 | *     |
|              | 7645      | 89.07 | 18.25 | *     |

Note: "\*" Indicates noise floor.

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

### Test Data: 851.500MHz Low Power

Low Power

|              | dBm       | Watts | Limit  | Notes |
|--------------|-----------|-------|--------|-------|
| Power Output | 47.7      |       | 67.88  |       |
|              |           |       | Margin |       |
|              | Frequency | dBc   |        |       |
|              | 851.5     | 0     | 0      |       |
|              | 1703      | 88.6  | 20.72  | *     |
|              | 2554.5    | 87.76 | 19.88  |       |
|              | 3406      | 90.17 | 22.29  | *     |
|              | 4257.5    | 90.57 | 22.69  | *     |
|              | 5109      | 85.81 | 17.93  | *     |
|              | 5960.5    | 83.84 | 15.96  | *     |
|              | 6812      | 82.95 | 15.07  | *     |
|              | 7663.5    | 87.67 | 19.79  | *     |

Note: "\*" Indicates noise floor.

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

### Test Data: 851.500MHz High Power

High Power

|              | dBm       | Watts | Limit   | Notes |
|--------------|-----------|-------|---------|-------|
| Power Output | 50.79     | 25    | 70.8dBc |       |
|              |           |       |         |       |
|              | Frequency | dBc   | Margin  |       |
|              | 851.5     | 0     |         |       |
|              | 1703      | 97.5  | 26.7    | *     |
|              | 2554.5    | 95.16 | 24.36   |       |
|              | 3406      | 96.47 | 25.67   | *     |
|              | 4257.5    | 99.75 | 28.95   | *     |
|              | 5109      | 95.71 | 24.91   | *     |
|              | 5960.5    | 95.58 | 24.78   | *     |
|              | 6812      | 94.3  | 23.5    | *     |
|              | 7663.5    | 98.32 | 27.52   | *     |
|              | 8515      | 89.89 | 19.09   | *     |

Note: “\*” Indicates noise floor.

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

### Test Data: 868.500MHz Low Power

Low Power

|              | dBm       | Watts | Limit   | Notes |
|--------------|-----------|-------|---------|-------|
| Power Output | 47.7      |       | 67.88   |       |
|              |           |       | Martgin |       |
|              | Frequency | dBc   |         |       |
|              | 868.5     | 0     | 0       |       |
|              | 1737      | 88.42 | 20.54   | *     |
|              | 2605.5    | 88.06 | 20.18   |       |
|              | 3474      | 89.34 | 21.46   | *     |
|              | 4342.5    | 89.39 | 21.51   | *     |
|              | 5211      | 85.01 | 17.13   | *     |
|              | 6079.5    | 83.37 | 15.49   | *     |
|              | 6948      | 80.26 | 12.38   | *     |
|              | 7816.5    | 88.16 | 20.28   | *     |
|              | 8685      | 87.6  | 19.72   | *     |

Note: "\*" Indicates noise floor.

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

### Test Data: 868.500MHz High Power

High Power

|              | dBm       | Watts | Limit   | Notes |
|--------------|-----------|-------|---------|-------|
| Power Output | 50.79     |       | 67.88   |       |
|              |           |       | Martgin |       |
|              | Frequency | dBc   |         |       |
|              | 868.5     | 0     | 0       |       |
|              | 1737      | 91.06 | 23.18   | *     |
|              | 2605.5    | 93.49 | 25.61   | *     |
|              | 3474      | 93.29 | 25.41   | *     |
|              | 4342.5    | 94.05 | 26.17   | *     |
|              | 5211      | 90.57 | 22.69   | *     |
|              | 6079.5    | 85.12 | 17.24   | *     |
|              | 6948      | 86.18 | 18.3    | *     |
|              | 7816.5    | 87.46 | 19.58   | *     |
|              | 8685      | 88.54 | 20.66   | *     |

Note: “\*” Indicates noise floor.

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## FIELD STRENGTH OF SPURIOUS RADIATION EMISSIONS

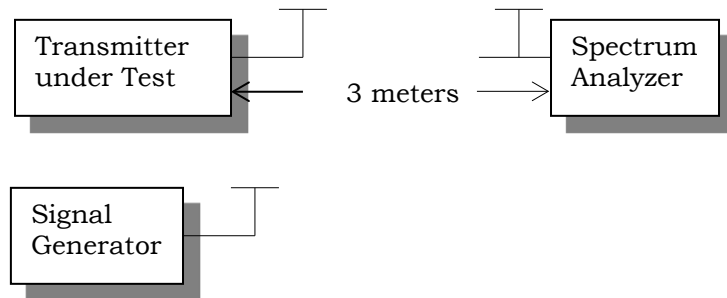
**Rule Parts. No.:** Part 2.1053

**Requirements:**

12.5 kHz Channel Spacing =  $50 + 10\log(P_o)$  12.5  
 kHz Channel Spacing =  $50 + 10\log(60.3) = 67.80\text{dBc}$

**METHOD OF MEASUREMENT:** The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted in accordance with test procedures detailed in the standard list above using the substitution method. Measurements were made at the test site of **TIMCO ENGINEERING, INC. located at 849 NW State Road 45, Newberry, FL 32669.**

**Test Setup Diagram:**



**TEST DATA:** The test data shown below represents the worst case for all of the test frequencies.

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## FIELD STRENGTH OF SPURIOUS RADIATION EMISSIONS

Rule Parts. No.: Part 2.1053

Test Data: 851.50 MHz 11K0F3E

This test data represents the worse case of emission of any of the test frequencies.

| Emission Frequency (MHz) | Power Mode    | Power Output (dBm)  | Power Output (Watts) | FCC Requirement dB | Bandwidth - BW - kHz |
|--------------------------|---------------|---------------------|----------------------|--------------------|----------------------|
| 851.50                   | Hi            | 50.80               | 120.23               | 70.00              | 12.50                |
| Emission Frequency (MHz) | Ant. Polarity | Below Carrier (dBc) |                      | Margin             |                      |
| 1,703.00                 | V             | 75.42               |                      | 5.42               |                      |
| 2,554.50                 | V             | 100.87              |                      | 30.87              |                      |
| 3,406.00                 | H             | 82.03               |                      | 12.03              |                      |
| 4,257.50                 | H             | 93.09               |                      | 23.09              |                      |
| 5,109.00                 | H             | 82.58               |                      | 12.58              |                      |
| 5,960.50                 | H             | 87.91               |                      | 17.91              |                      |
| 6,812.00                 | H             | 97.38               |                      | 27.38              |                      |
| 7,663.50                 | H             | 104.70              |                      | 34.70              |                      |
| 8,515.00                 | H             | 101.98              |                      | 31.98              |                      |

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## FIELD STRENGTH OF SPURIOUS RADIATION EMISSIONS

**Rule Parts. No.:** Part 2.1053, 90.210, 90.543(c)(f)

**REQUIREMENTS:** Out of Band Emission Limits

| Transmit Band (MHz) | Equipment Type      | Rule Part | Requirement                                                                                                                                                |
|---------------------|---------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 769-775             | All Equipment Types | 90.543(c) | 43 + 10log (P) dB<br>Except for emissions in the band 1559-1610 MHz                                                                                        |
|                     |                     | 90.543(f) | -70 dBW/MHz EIRP for wideband signals, & -80 dBW/MHz EIRP for discrete emissions of less than 700 Hz bandwidth for all emissions in the band 1559-1610 MHz |

**METHOD OF MEASUREMENT:** The following test methods were used

ANSI/TIA-603 § 2.2.12.2 Unwanted Emissions: Radiated Spurious  
(Out of Band Emissions from 9 KHz – Tenth Harmonic of Fundamental)

ANSI/TIA-603 § 2.2.12.3 Unwanted Emissions: EIRP in GNSS Band: 1.559 to 1.610 GHz  
(EIRP of Emissions In the 1559 – 1610 MHz Band)

**RULE PARTS. NO.:** Part 2.1053, 90.210, 90.543(c)(f)

Test Data: Emissions in Band 1559 – 1610 MHz

Note: For the purpose of equipment authorization, during this test the transmitter was tested with an antenna that is representative of the type that will be used with the equipment in normal operation. All modes of modulation were tested; the following is the worst case results

**Test Data: 769.5 MHz 8K10F1E/ 8K10F1D**

| Tuned Freq MHz | Emission Freq MHz | Meter Reading dBuV | Ant Polarity | Coax Loss dB | Filter Insertion Loss dB | Correction Factor dB/M | Field Strength dBu V/M | EIRP dBW/MHz | Margin dB |
|----------------|-------------------|--------------------|--------------|--------------|--------------------------|------------------------|------------------------|--------------|-----------|
| 769.5          | 1598.1            | 18.76              | H            | 3.14         | 1.30                     | 28.67                  | 51.87                  | -73.43       | 3.43      |
| 769.5          | 1598.1            | 17.76              | V            | 3.14         | 1.30                     | 28.67                  | 50.87                  | -74.43       | 4.43      |
| 769.5          | 1604.1            | 19.83              | H            | 3.13         | 1.30                     | 28.71                  | 52.97                  | -72.33       | 2.33      |
| 769.5          | 1604.1            | 18.22              | V            | 3.13         | 1.30                     | 28.71                  | 51.36                  | -73.94       | 3.94      |
| 769.5          | 1609.9            | 17.03              | H            | 3.12         | 1.30                     | 28.75                  | 50.20                  | -75.10       | 5.10      |
| 769.5          | 1609.9            | 15.59              | V            | 3.12         | 1.30                     | 28.75                  | 48.76                  | -76.54       | 6.54      |

**NOTE:** The field strength measurement listed above represent the worse case for all emission designators.

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## FREQUENCY STABILITY

**Rule Parts. No.:** Part 2.1055, Part 90.213

**Requirements:** Temperature range requirements: -30 to +50° C.  
Voltage Variation +, -15%  
±2.5 PPM

**Method of Measurements:** Was in accordance with test procedures detailed in the standard list above.

### Test Data: 868.50 MHz

| Temperature      | Frequency<br>MHz | Cycles | PPM    |
|------------------|------------------|--------|--------|
| 25°C (reference) | 868.500000       |        |        |
| -30°C            | 868.499798       | -202   | -0.233 |
| -20°C            | 868.499791       | -209   | -0.241 |
| -10°C            | 868.499768       | -232   | -0.267 |
| 0°C              | 868.499778       | -222   | -0.256 |
| 10°C             | 868.499785       | -215   | -0.248 |
| 20°C             | 868.499786       | -214   | -0.246 |
| 30°C             | 868.499785       | -215   | -0.248 |
| 40°C             | 868.499782       | -218   | -0.251 |
| 50°C             | 868.499704       | -296   | -0.341 |
|                  |                  |        |        |
| Input Voltage    | Frequency        | Cycles | PPM    |
| -15%             | 868.499885       | -115   | -0.132 |
| 15%              | 868.499883       | -117   | -0.135 |

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## EQUIPMENT LIST

| Device                                        | Manufacturer         | Model                         | Serial Number                            | Cal/ Char Date | Due Date |
|-----------------------------------------------|----------------------|-------------------------------|------------------------------------------|----------------|----------|
| Antenna: Biconical 1057                       | Eaton                | 94455-1                       | 1057                                     | 11/18/15       | 11/18/17 |
| CHAMBER                                       | Panashield           | 3M                            | N/A                                      | 12/31/16       | 12/31/17 |
| Antenna: Log-Periodic 1122                    | Electro-Metrics      | LPA-25                        | 1122                                     | 07/14/15       | 07/14/17 |
| Temperature Chamber LARGE                     | Tenney Engineering   | TTRC                          | 11717-7                                  | 08/19/14       | 08/19/16 |
| AC Voltmeter                                  | HP                   | 400FL                         | 2213A14728                               | 10/24/15       | 10/24/17 |
| Digital Multimeter                            | Fluke                | 77                            | 35053830                                 | 10/21/15       | 10/21/17 |
| Frequency Counter Large Chamber               | HP                   | 5352B                         | 2632A00165                               | 07/01/15       | 07/01/17 |
| Antenna: Double-Ridged Horn/ETS Horn 2        | ETS-Lindgren Chamber | 3117                          | 00041534                                 | 02/25/15       | 02/25/17 |
| Software: Field Strength Program              | Timco                | N/A                           | Version 4.0 NO                           | N/A            | N/A      |
| RF Power Meter                                | Boonton              | 4531                          | 11793                                    | 04/08/16       | 04/08/18 |
| Hygro-Thermometer                             | Extech               | 445703                        | 0602                                     | 06/30/15       | 06/30/17 |
| Type K J Thermometer                          | Martel               | 303                           | 080504494                                | 10/26/15       | 10/26/17 |
| Modulation Analyzer                           | HP                   | 8901A                         | 3050A05856                               | 04/16/15       | 04/16/17 |
| Attenuator N 30dB 150W DC-6G                  | Narda                | 769-30                        | 10267                                    | 06/26/15       | 06/26/17 |
| EMI Test Receiver R & S ESU 40 Chamber        | Rohde & Schwarz      | ESU 40                        | 100320                                   | 04/01/16       | 04/01/18 |
| Waverunner Digital Scope                      | LeCroy               | LT364L                        | 00543                                    | 10/23/15       | 10/23/17 |
| Attenuator 6dB 50OHM DC-2G                    | Mini-Circuits        | HAT-6+                        | # 52 NO                                  | 06/25/15       | 06/25/17 |
| Coaxial Cable - Chamber 3 cable set (Primary) | Micro-Coax           | Chamber 3 cable set (Primary) | KMKM-0244-00; KMKM-0670-00; KFKF-0198-00 | 12/05/15       | 12/05/17 |

### \* EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

## End of REPORT

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Applicant: SPECTRA ENGINEERING PTY LTD  
 FCC ID: OKRMXDR7V  
 IC: 5605A-MXDR7V  
 Report: 1198AUT16\1198AUT16TestReport.docx

**APPLICANT: SPECTRA ENGINEERING PTY LTD**

**FCC ID: OKRMXDR7V**

**IC: 5605A-MXDR7V**

**TEST SET UP PHOTOS**

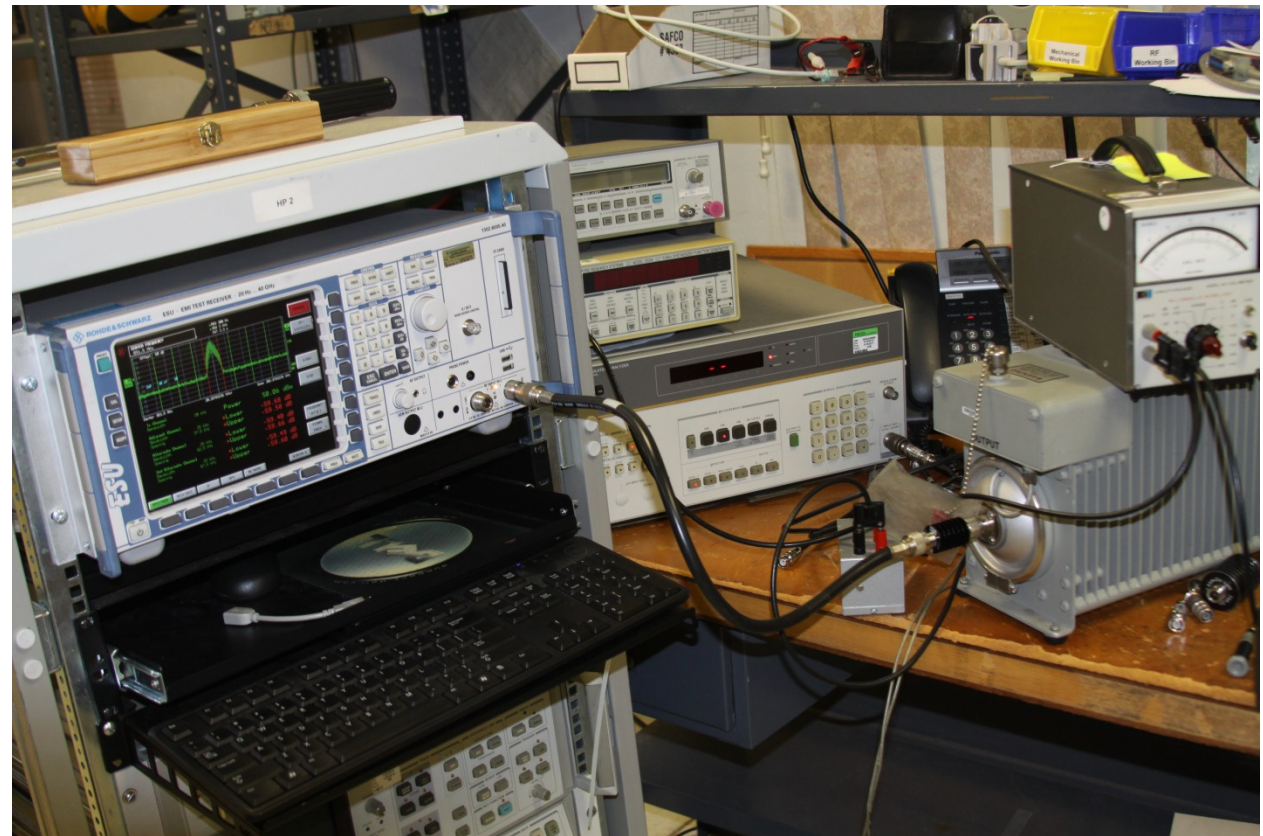
**OUTPUT POWER**



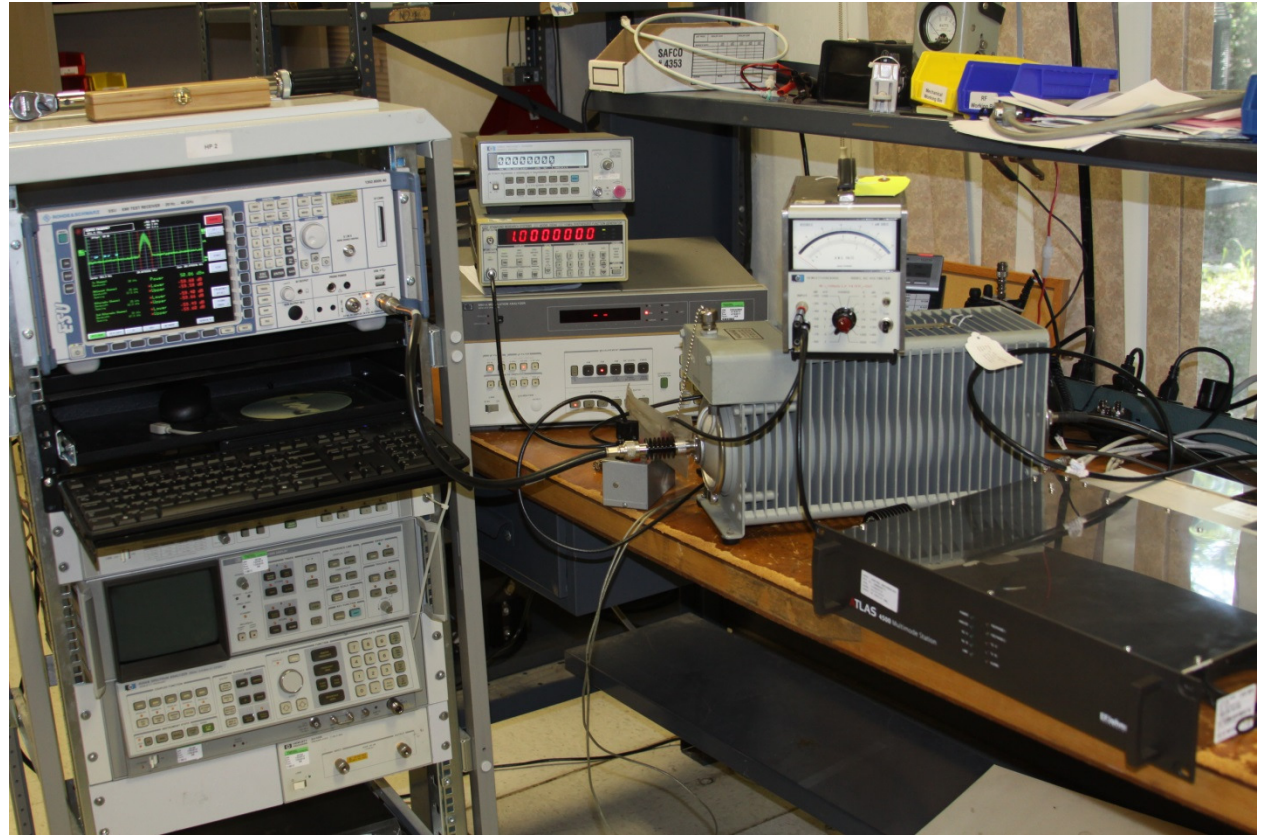
## MODULATION CHARACTERISTICS



## OCCUPIED BANDWIDTH



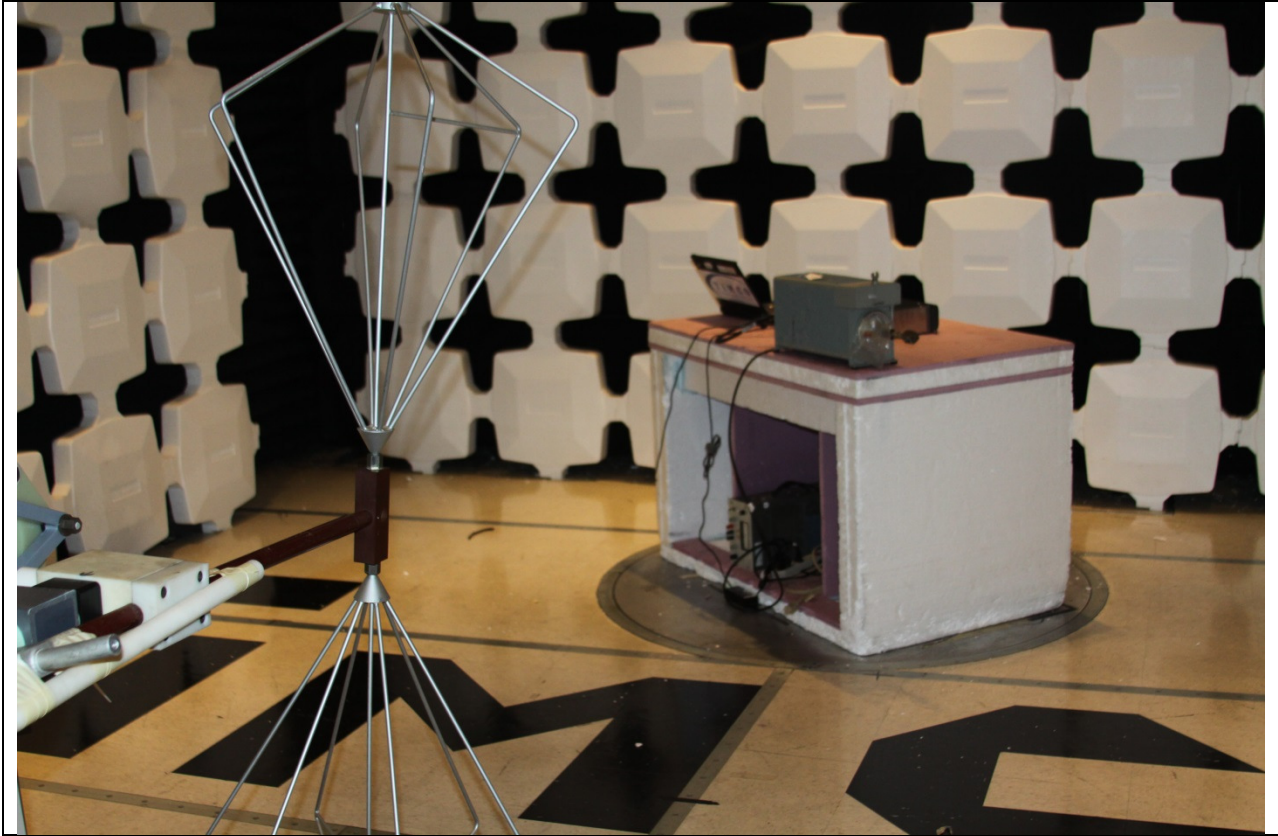
## SPURIOUS EMISSIONS AT ANTENNA



## FIELD STRENGTH SPURIOUS EMISSIONS



# FIELD STRENGTH SPURIOUS EMISSIONS



## FREQUENCY STABILITY



## TRANSIENT FREQUENCY BEHAVIOR

