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FCC
VHF MOBILE PART 90
TEST REPORT

| | |
|-----------------------------|--|
| APPLICANT | KP ELECTRONIC SYSTEMS LTD. |
| | P.O. BOX 42 TEFEN INDUSTRIAL PARK 24959 ISRAEL |
| FCC ID | H78KPRFM200 |
| MODEL NUMBER | RFM200 |
| PRODUCT DESCRIPTION | MOBILE TRANSCEIVER |
| STANDARD APPLIED | CFR 47 Part 90 |
| DATE SAMPLE RECEIVED | 8/3/2015 |
| DATE TESTED | 9/1/2015 |
| TESTED BY | Tim Royer |
| APPROVED BY | Cory Leverett |
| TEST RESULTS | <input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL |

| Report Number | Version Number | Description | Issue Date |
|----------------------|----------------|---------------|------------|
| 1250ZAUT15TestReport | Rev1 | Initial Issue | 9/16/2015 |

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

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GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

Summary

The device under test does:

- Fulfill the general approval requirements as identified in this test report
 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: 2005 requirements.

I attest that the necessary measurements were made, under my supervision, at:

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

Authorized Signatory Name:



Cory Leverett
Engineering Project Manager

Date: 9/16/2015

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Applicant: KP ELECTRONIC SYSTEMS LTD.
FCC ID: H78KPRFM200
Report: K\KP H78\1250ZAUT15\1250ZAUT15TestReport.docx

GENERAL INFORMATION

EUT Specification

| | |
|------------------------------------|--|
| EUT Description | MOBILE TRANSCEIVER |
| FCC ID | H78KPRFM200 |
| Model Number | RFM200 |
| Operating Frequency | 150.8 - 174 |
| Test Frequencies | 151, 163, 173.3 MHz |
| Type of Emission | 2K89F1D |
| Modulation | FM |
| EUT Power Source | <input type="checkbox"/> 110–120Vac/50– 60Hz |
| | <input checked="" type="checkbox"/> DC Power 12V |
| | <input type="checkbox"/> Battery Operated Exclusively |
| Test Item | <input type="checkbox"/> Prototype |
| | <input checked="" type="checkbox"/> Pre-Production |
| | <input type="checkbox"/> Production |
| Type of Equipment | <input checked="" type="checkbox"/> Fixed |
| | <input type="checkbox"/> Mobile |
| | <input type="checkbox"/> Portable |
| Test Conditions | The temperature was 26°C with a relative humidity of 50%. |
| Revision History to the EUT | None |
| Test Exercise | The EUT was placed in continuous transmit mode. |
| Applicable Standards | ANSI/TIA 603-D:2010, FCC CFR 47 Part 90 |
| Test Facility | Timco Engineering Inc. 849 NW State Road 45 Newberry, FL 32669 USA. |

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TEST REPORT SUMMARY

| Rule Part No. | Scope of Work | Status Pass/Fail/NA |
|---|--|------------------------|
| Part 2.1033(c)(8) , Part 2.1046(a) , Part 90 | RF Power Output | Pass |
| Part 2.1033(c)(4) Part 2.1047(a)(6) | Modulation Characteristics | NA |
| 2.1049(c) , 90.210(b) , 90.210(c) 90.210(d) , 90.210(e) | Emission Mask and Occupied Bandwidths | Pass |
| 2.1051(a) | Antenna Conducted Emissions | Pass |
| 2.1053 , Part 90 | Field Strength Spurious Emissions | Pass |
| Part 2.1055 , Part 90.213 | Frequency Stability | Pass |
| Part 90.214 | Transient Frequency Behavior | Pass |

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TEST PROCEDURE

Power Line Conducted Interference: The procedure used was ANSI/TIA 603-D: 2010, using a 50uH LISN. Both lines were observed with the EUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

Bandwidth 20 dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on plot.

Power Output: The RF power output was measured at the antenna feed point using a peak power meter.

Antenna Conducted Emissions: The RBW = 100 kHz, VBW = 300 kHz and the span set to 10.0 MHz and the spectrum was scanned from 30 MHz to the 10th harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

Radiation Interference: The test procedure used was ANSI/TIA 603-D: 2010, using a Rohde & Schwarz – EMI test receiver. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

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RF POWER OUTPUT

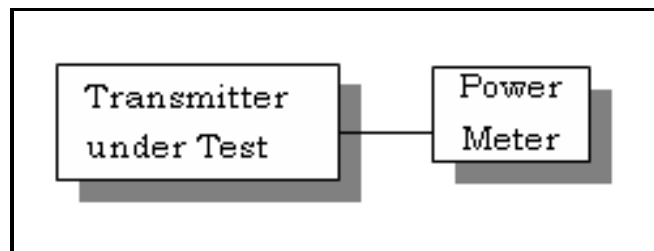
Rule Part No.: Part 2.1046(a), Part 90

Test Requirements: Manufacturer's Specification

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: RF power of the EUT can be set at 5W to 25W.

OUTPUT POWER:

| Tuned Frequency (MHz) | RF POWER (W) | |
|-----------------------|--------------|-------|
| | dBm | Watts |
| 151 | 32.99 | 1.99 |
| 163 | 32.45 | 1.75 |
| 173.3 | 31.1 | 1.28 |

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

FOR HIGH POWER SETTING INPUT POWER: $(12.5V) (.45A) = 5.625\text{Watts}$

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OCCUPIED BANDWIDTH

Part 2.1049(c) EMISSION BANDWIDTH:

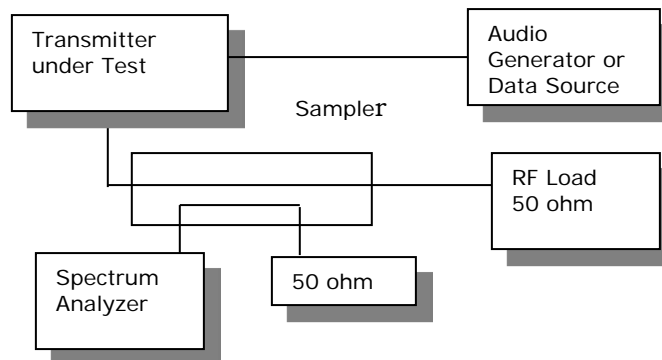
Part 90.210(e) **Emission Mask E – 6.25 kHz channel BW equipment.**

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

Method of Measurement: ANSI/TIA 603-D: 2010

Test Setup Diagram:

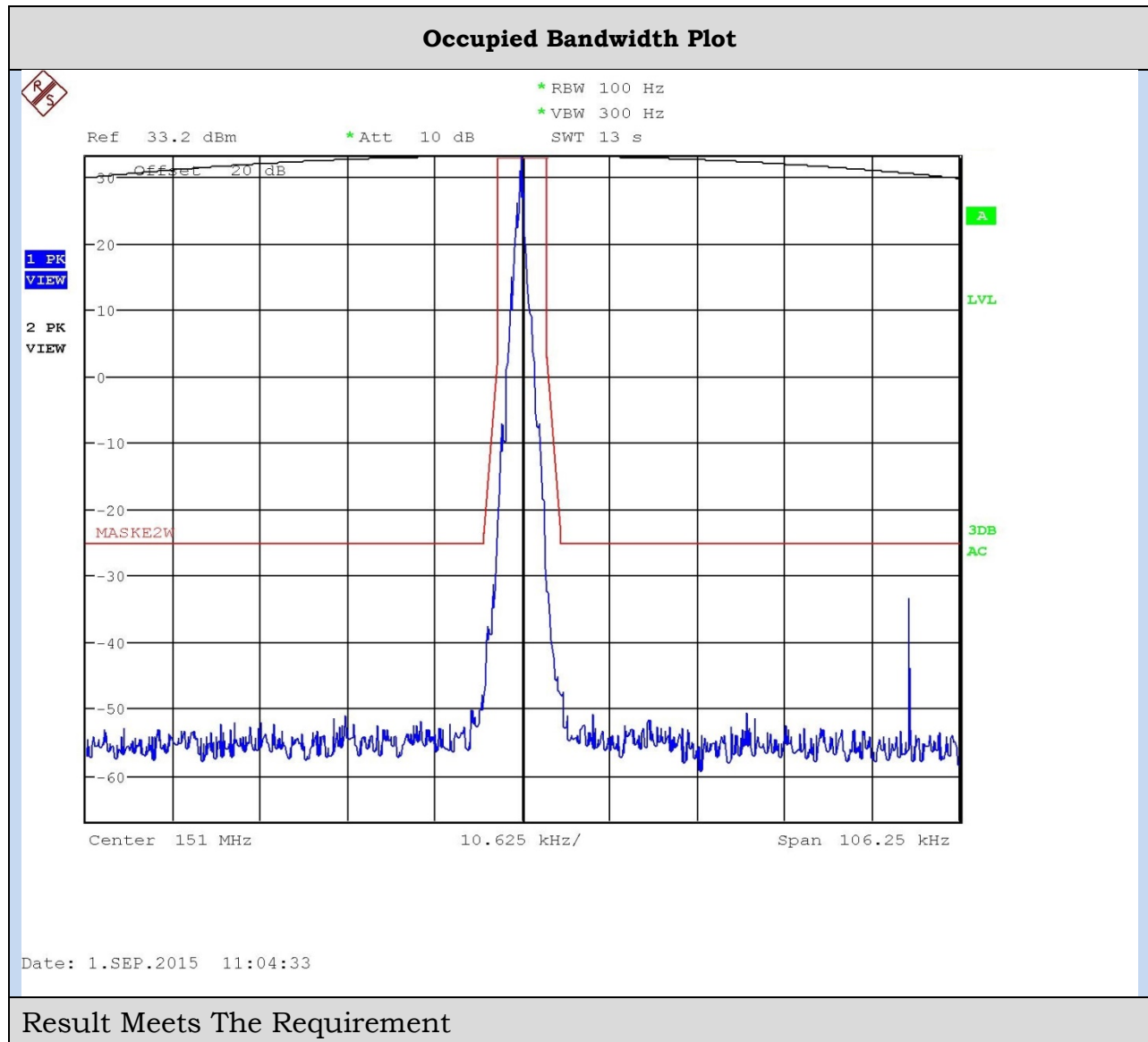


Test Data: See the plots below

OCCUPIED BANDWIDTH PLOTS: DIGIAL

Low End Band

Part 90.210(e) Emission Mask E – 6.25 KHz Channel Bandwidth -



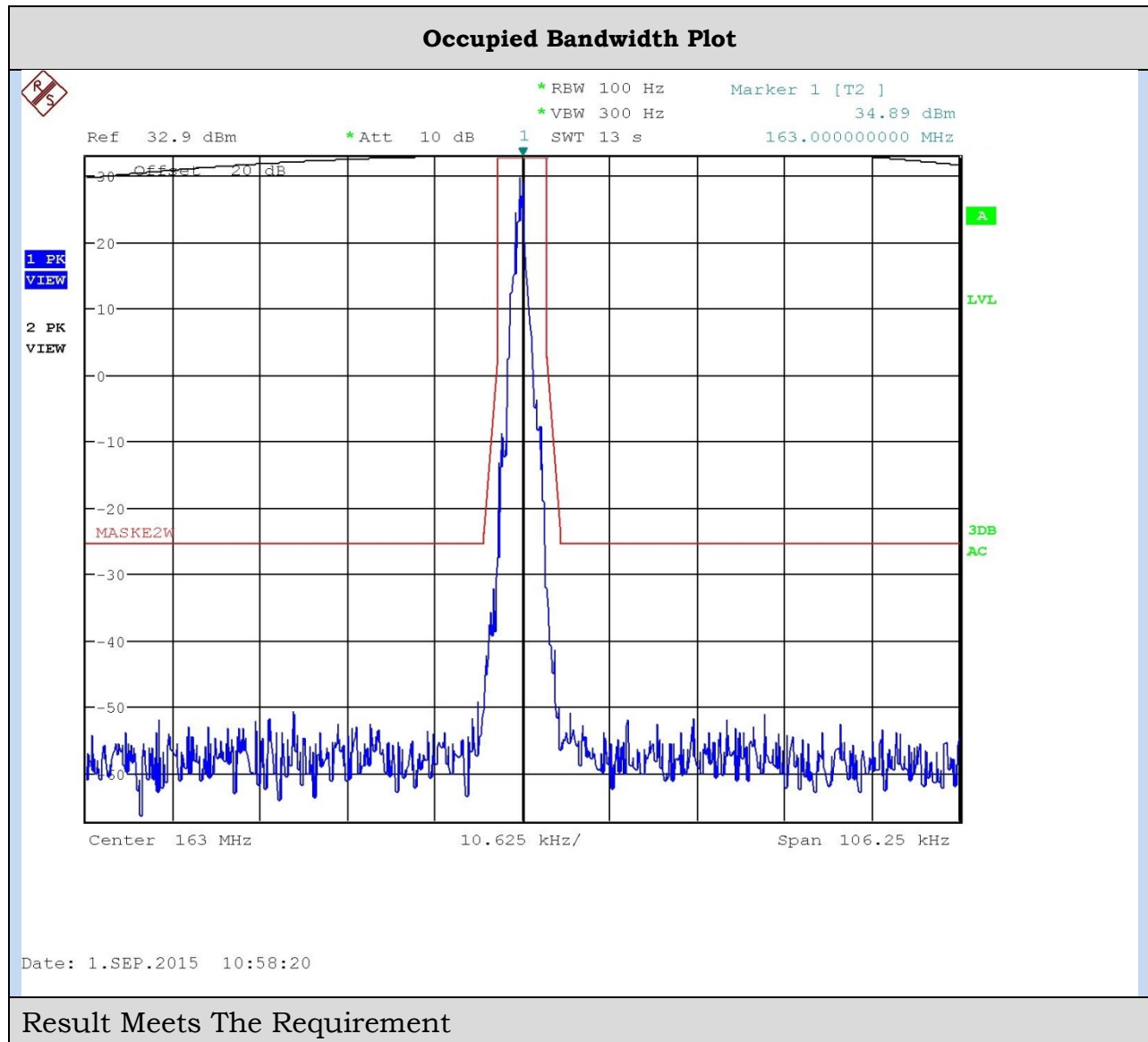
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FCC ID: H78KPRFM200
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OCCUPIED BANDWIDTH PLOTS: DIGIAL

Middle of Band

Part 90.210(e) Emission Mask E – 6.25 KHz Channel Bandwidth -



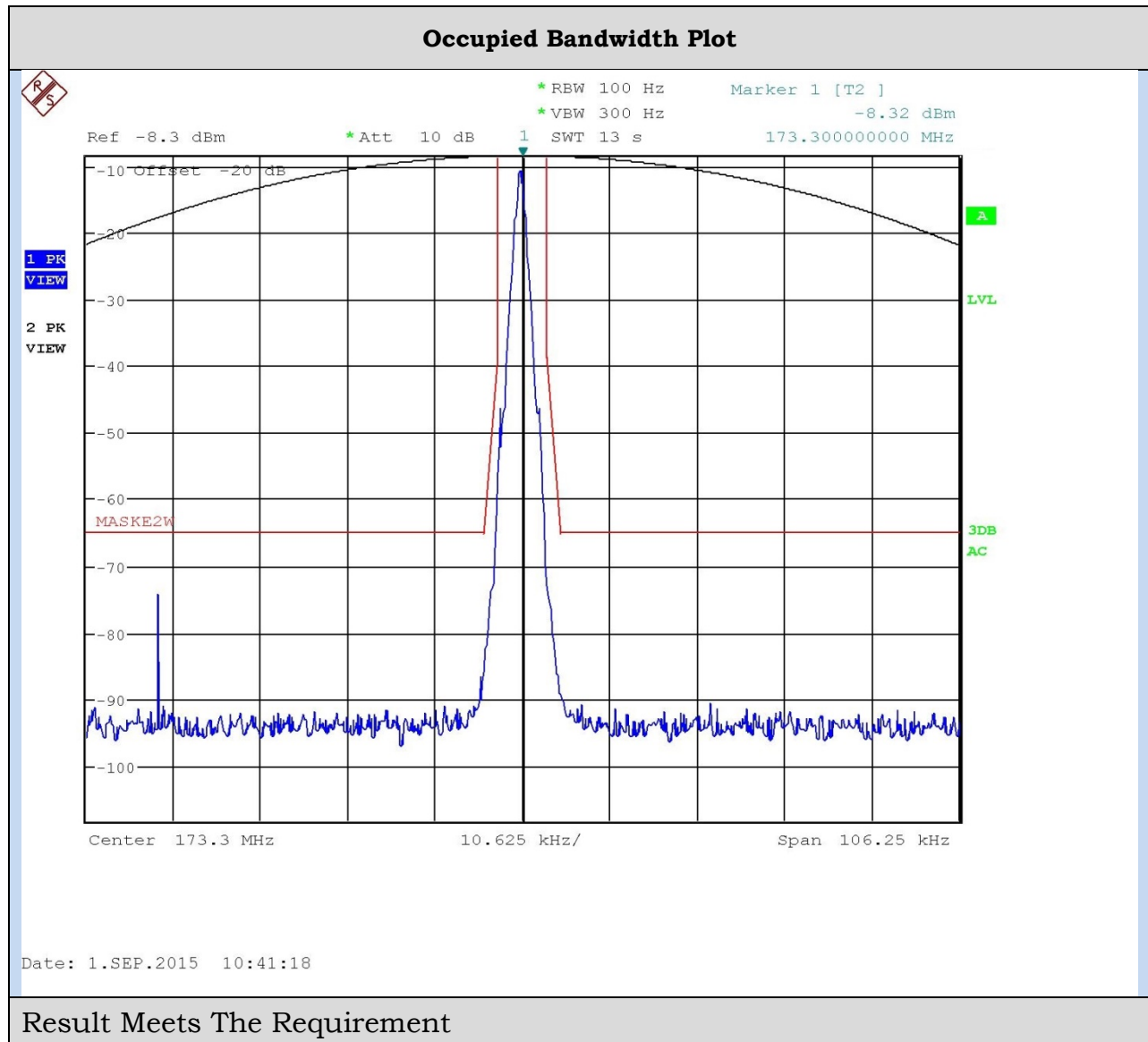
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OCCUPIED BANDWIDTH PLOTS: DIGIAL

High End Band

Part 90.210(e) Emission Mask E – 6.25 KHz Channel Bandwidth -



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Applicant: KP ELECTRONIC SYSTEMS LTD.
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SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

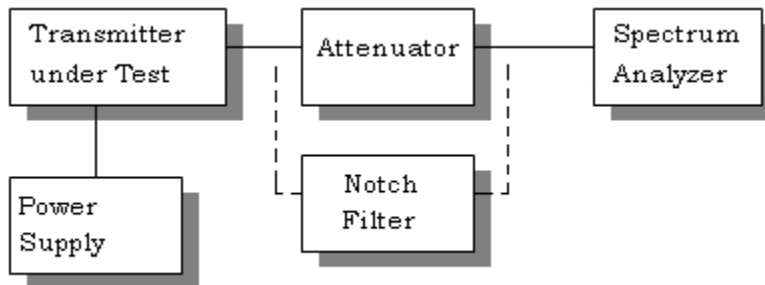
Rule Part No.: Part 2.1051(a)

Requirements:

6.25 kHz Channel Spacing = $55 + 10 \log (P)$

Method of Measurement: The carrier was modulated 100% using a 2500 Hz tone. The spectrum was scanned from the lowest frequency generated to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard ANSI/TIA 603-D: 2010.

Method of Measuring Conducted Spurious Emissions



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Test Data: High Power Low end of Band 151 MHz

| | dBm | Watts | Limit |
|--------------|-----------|-------|--------|
| Power Output | 32.99 | 1.99 | 57.99 |
| | | | |
| | Frequency | dBc | Margin |
| | 42.79 | 71 | 13.01 |
| | 53.85 | 71.9 | 13.91 |
| | 78.28 | 76.7 | 18.71 |
| | 120.5 | 77.7 | 19.71 |
| | 302.00 | 67.0 | 9.01 |
| | 453.00 | 87.6 | 29.61 |
| | 604.00 | 92.1 | 34.11 |
| | 755.00 | 104.6 | 46.61 |
| | 906.00 | 103.6 | 45.61 |
| | 1057.00 | 103.5 | 45.51 |
| | 1208.00 | 102.9 | 44.9 |
| | 1359.00 | 103.7 | 45.71 |
| | 1510.00 | 104.1 | 46.11 |

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Test Data: High Power Middle of Band 163 MHz

| | dBm | Watts | Limit |
|--------------|-----------|-------|--------|
| Power Output | 32.45 | 1.76 | 52.45 |
| | | | |
| | Frequency | dBc | Margin |
| | 42.57 | 65.2 | 12.75 |
| | 121.22 | 72.1 | 19.65 |
| | 489.00 | 97.4 | 44.9 |
| | 652.00 | 93.9 | 41.45 |
| | 815.00 | 101.9 | 49.49 |
| | 978.00 | 101.9 | 49.49 |
| | 1141.00 | 102.0 | 49.5 |
| | 1304.00 | 102.0 | 49.5 |
| | 1467.00 | 70.8 | 18.35 |
| | 1630.00 | 100.2 | 47.75 |

Test Data: High Power High End of Band 173.3 MHz

| | dBm | Watts | Limit |
|--------------|-----------|-------|--------|
| Power Output | 31.1 | 1.29 | 56.1 |
| | | | |
| | Frequency | dBc | Margin |
| | 43.97 | 92.9 | 36.8 |
| | 87.29 | 83.6 | 83.6 |
| | 123.73 | 78.4 | 22.3 |
| | 154.66 | 83.8 | 27.7 |
| | 165.89 | 86.6 | 30.5 |
| | 346.60 | 70.0 | 13.9 |
| | 519.90 | 70.0 | 13.9 |
| | 693.20 | 71.3 | 15.2 |
| | 866.50 | 34.7 | -21.4 |
| | 1039.80 | 96.5 | 40.4 |
| | 1213.10 | 34.7 | -21.4 |
| | 1386.40 | 34.7 | -21.4 |
| | 1559.70 | 97.4 | 41.3 |

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FIELD STRENGTH OF SPURIOUS EMISSIONS

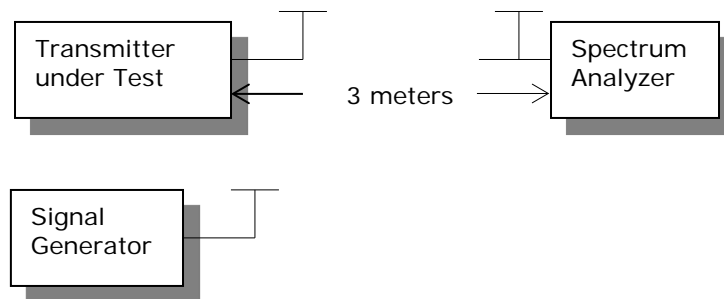
Rule Parts. No.: Part 2.1053

Requirements:

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

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 per ANSI/TIA 603-D: 2010 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:

HIGH POWER: Low End of the Band

| Emission Frequency (MHz) | Power Mode | ERP Power Output (dBm) | ERP Power Output (Watts) | FCC Requirement dB | Bandwidth - BW - kHz |
|--------------------------|---------------|------------------------|--------------------------|--------------------|----------------------|
| 151.00 | Hi | 33.75 | 2.37 | 58.75 | 6.25 |
| Emission Frequency (MHz) | Ant. Polarity | Below Carrier (dBc) | Margin | | |
| 302.00 | H | 97.83 | 39.08 | | |
| 453.00 | H | 89.18 | 30.43 | | |
| 604.00 | H | 90.84 | 32.09 | | |
| 755.00 | H | 90.12 | 31.37 | | |
| 906.00 | H | 82.82 | 24.07 | | |
| 1,057.00 | H | 76.83 | 18.08 | | |
| 1,208.00 | V | 80.74 | 21.99 | | |
| 1,359.00 | V | 81.29 | 22.54 | | |
| 1,510.00 | H | 80.32 | 21.57 | | |

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Applicant: KP ELECTRONIC SYSTEMS LTD.

FCC ID: H78KPRFM200

Report: K\KP H78\1250ZAUT15\1250ZAUT15TestReport.docx

FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data:

HIGH POWER: Middle of the Band

| Emission Frequency (MHz) | Power Mode | ERP Power Output (dBm) | ERP Power Output (Watts) | FCC Requirement dB | Bandwidth - BW - kHz |
|--------------------------|---------------|------------------------|--------------------------|--------------------|----------------------|
| 163.00 | Hi | 33.84 | 2.42 | 58.84 | 6.25 |
| Emission Frequency (MHz) | Ant. Polarity | Below Carrier (dBc) | Margin | | |
| 326.00 | V | 87.48 | 40.64 | | |
| 489.00 | V | 80.72 | 33.88 | | |
| 652.00 | V | 83.66 | 36.82 | | |
| 815.00 | H | 88.16 | 41.32 | | |
| 978.00 | H | 83.73 | 36.89 | | |
| 1,141.00 | V | 81.90 | 23.06 | | |
| 1,304.00 | V | 80.69 | 21.85 | | |
| 1,467.00 | H | 81.44 | 22.60 | | |
| 1,630.00 | V | 76.32 | 17.48 | | |

HIGH POWER: High end of the Band

| Emission Frequency (MHz) | Power Mode | ERP Power Output (dBm) | ERP Power Output (Watts) | FCC Requirement dB | Bandwidth - BW - kHz |
|--------------------------|---------------|------------------------|--------------------------|--------------------|----------------------|
| 173.30 | Hi | 33.75 | 2.37 | 58.75 | 6.25 |
| Emission Frequency (MHz) | Ant. Polarity | Below Carrier (dBc) | Margin | | |
| 346.60 | V | 94.75 | 36.00 | | |
| 519.90 | V | 85.26 | 26.51 | | |
| 693.20 | V | 88.96 | 30.21 | | |
| 866.50 | H | 86.56 | 27.81 | | |
| 1,039.80 | V | 70.82 | 12.07 | | |
| 1,213.10 | V | 69.74 | 10.99 | | |
| 1,386.40 | V | 69.54 | 10.79 | | |
| 1,559.70 | H | 69.86 | 11.11 | | |
| 1,733.00 | V | 65.69 | 6.94 | | |

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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: ANSI/TIA 603-D: 2010.

Test Data:

| Temperature | Frequency MHz | PPM |
|------------------|------------------|--------|
| 25°C (reference) | 162.999799 | |
| -30°C | 162.999612 | -1.147 |
| -20°C | 162.999684 | -0.706 |
| -10°C | 162.999749 | -0.307 |
| 0°C | 162.999752 | -0.288 |
| 10°C | 162.999759 | -0.245 |
| 20°C | 162.999798 | -0.006 |
| 30°C | 162.999802 | 0.018 |
| 40°C | 162.999819 | 0.123 |
| 50°C | 162.999861 | 0.380 |
| | | |
| Battery Voltage | Frequency | PPM |
| -15% | 162.999803 | 0.025 |
| 15% | 162.999801 | 0.012 |

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TRANSIENT FREQUENCY BEHAVIOR

Part 90.214 Transient Frequency Behavior

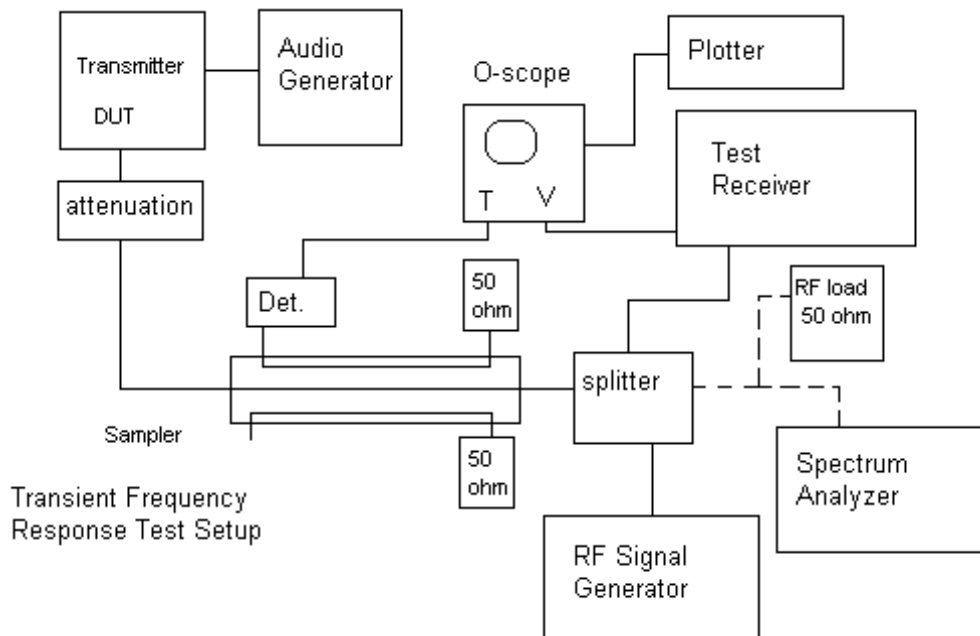
REQUIREMENTS: Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels

| Time Intervals | Maximum frequency difference | All Equipment | |
|----------------|------------------------------|---------------|-------------|
| | | 150-174 MHz | 421-512 MHz |
| t_1^4 | ± 6.25 kHz | 5.0 ms | 10.0 ms |
| t_2 | ± 3.125 kHz | 20.0 ms | 25.0 ms |
| t_3^4 | ± 6.25 kHz | 5.0 ms | 10.0 ms |

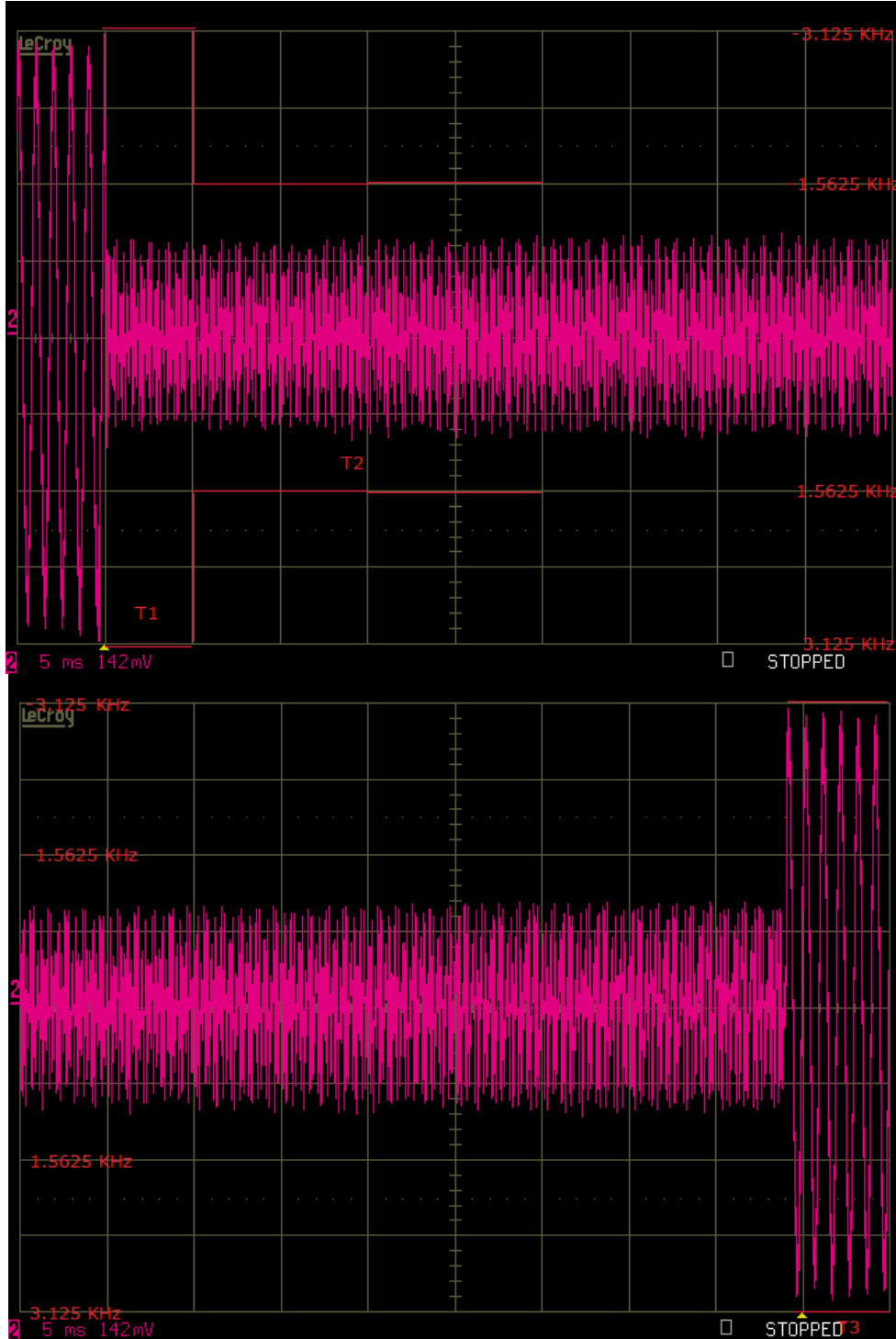
TEST PROCEEDURE: ANSI/TIA 603-D: 2010, the levels were set as follows:

1. Using the variable attenuator the transmitter level was set to 40 dB below the test receivers maximum input level, and then the transmitter was turned off.
2. With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.
3. Reduce the attenuation between the transmitter and the RF detector by 30 dB.
4. With the levels set as above, the transient frequency behavior was observed and recorded.



TRANSIENT FREQUENCY BEHAVIOR

Test Data:



Applicant: KP ELECTRONIC SYSTEMS LTD.
FCC ID: H78KPRFM200
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EQUIPMENT LIST

| Device | Manufacturer | Model | Serial Number | Cal/Char Date | Due Date |
|---------------------------------------|----------------------|---------------|---------------|---------------|----------|
| Antenna: Biconnical Chamber | Eaton Chamber | 94455-1 | 1057 | 06/14/13 | 12/14/15 |
| Antenna: Log-Periodic Chamber | Eaton | 96005 | 1243 | 05/31/13 | 11/30/15 |
| DC Power Supply | HP | 6264B | 2032A04119 | 05/06/13 | 11/06/15 |
| Digital Multimeter | Fluke | 77 | 35053830 | 08/22/13 | 12/22/15 |
| DC Power Supply | HP | 6286A | 2411A09414 | NA | NA |
| Frequency Counter Small Chamber | HP | 5385A | 3242A07460 | 06/16/13 | 12/16/15 |
| 3-Meter Semi-Anechoic Chamber | Panashield | N/A | N/A | 12/31/13 | 12/31/15 |
| Ant: Double-Ridged Horn/ETS Horn 1 Ch | ETS-Lindgren Chamber | 3117 | 00035923 | 06/13/14 | 06/13/16 |
| Temperature Chamber Small | Thermotron Corp. | S1.2 Mini Max | 25-1420-09 | 08/20/14 | 08/20/16 |
| EMI Test Receiver R & S ESIB 40 | Rohde & Schwarz | ESIB 40 | 100274 | 08/12/14 | 08/12/16 |
| Software: Field Strength Program | Timco | N/A | Version 4.0 | N/A | N/A |
| Hygro-Thermometer | Extech | 445703 | 0602 | 06/20/13 | 12/20/15 |
| Attenuator N 30dB 150W DC-6G | Narda | 769-30 | 10267 | 6/29/15 | 6/29/17 |
| EMI Test Receiver R & S ESU 40 | Rohde & Schwarz | ESU 40 | 100320 | 03/11/14 | 03/11/16 |
| Signal Generator HP 8648C | HP | 8648C | 3623A02898 | 08/29/13 | 12/29/15 |

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

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