Measurement of RF Interference from a Model TEK4067, 5W UHF Transmitter

For	:	Innovation Specialites Culver City, CA 90230
P.O. No.	:	
Date Received	:	September 27, 2007
Date Tested	:	October 8 through December 11, 2007
Test Personnel	:	Richard E. King
Specification	:	FCC Part 90 IC RSS-119

Test Report By : Richard E. King

Richard E. King

Approved By : Raymond J. Klouda

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REVISION HISTORY

Revision	Date	Description
—	12-17-07	Initial release

Measurement of RF Emissions from an

Innovation Specialites, Model TEK4067 5W UHF Transmitter

1.0 INTRODUCTION:

1.1 Description of Test Item - This document presents the results of the series of radio interference measurements performed on an Innovation Specialites, Model TEK4067 5W UHF Transmitter (hereinafter referred to as the test item). Serial No. none was assigned. The test item is designed to transmit in the frequency range of 462.7375MHz to 467.5375MHz for FCC part 90 and Industry Canada using an external antenna. The test item was submitted for testing by Innovation Specialites located in Culver City, CA.

1.2 Purpose - The test series was performed to determine if the test item meets the technical requirements of the Federal Communication Commission (FCC) Part 90 and Industry Canada (IC) RSS-119. Testing was performed in accordance with ANSI C63.4-2003 and TIA-603-C-2004.

1.3 Deviations, Additions and Exclusions - There were no deviations, additions to, or exclusions from the test specification during this test series.

1.4 Applicable Documents - The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 90, dated 1 October 2007
- ANSI C63.4-2003, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"
- TIA-603-C-2004, “Land Mobile FM or PM – Communications Equipment – Measurement and Performance Standards”
- RSS-119 - Land Mobile and Fixed Radio Transmitters and Receivers Operating in The Frequency Range 27.41- 960 MHz Issue 8 September 2006

1.5 EMC Laboratory Identification - This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP Lab Code: 100278-0.

1.6 Laboratory Conditions The temperature at the time of the test was 24.6°C and the relative humidity was 43%.

2.0 TEST ITEM SET-UP AND OPERATION:

The test item is an Innovation Specialites, Model TEK4067 5W UHF Transmitter. The test item is designed to transmit from 462.7375MHz to 467.5375MHz. The test item operates at a 5 Watt power level. The test item operates in a 12.5kHz channel spacing. Photographs of the test item are shown as Figure 2.

2.1 Power Input - The test item obtained 9VDC power through 2 leads from the secondary of a Mountpower. step-down transformer, Part No. GFP241DA-1024. The primary of this transformer received 115V 60Hz power through lowpass powerline filters on the wall of the shielded enclosure. The 9VDC power from the secondary of the transformer was provided to the test item through a 2 wire, 6 foot long unshielded cord.

2.2 Grounding - Since only two wires were used to provide the input power, the test item was ungrounded during the tests. The third primary input terminal of the transformer was not used.

2.3 Peripheral Equipment - No peripheral equipment was submitted with the test item.

2.4 Interconnect Cables - No interconnect cables were submitted with the test item.

2.5 Operational Mode - For all transmitter tests, the test item was set to transmit at 467.3125MHz.

2.6 Test Item Modifications - No modifications were required for compliance.

3.0 TEST EQUIPMENT:

3.1 Test Equipment List - A list of the test equipment used can be found on Table I. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

3.2 Calibration Traceability - Test equipment is maintained and calibrated on a regular basis. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

3.3 Measurement Uncertainty - All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system.

The measurement uncertainty budgets were based on guidelines in "ISO Guide to the Expression of Uncertainty in Measurements" and NAMAS NIS81 "The Treatment of

Uncertainty in EMC Measurements".

The measurement uncertainty for these tests is presented below:

Conducted Emission Measurements		
Combined Standard Uncertainty	1.07 dB	-1.07 dB
Expanded Uncertainty (95% confidence)	2.1 dB	-2.1 dB

Radiated Emission Measurements		
Combined Standard Uncertainty	2.26 dB	-2.18 dB
Expanded Uncertainty (95% confidence)	4.5 dB	-4.4 dB

4.0 REQUIREMENTS, PROCEDURES AND RESULTS:

4.2 Transmitter:

4.2.1 RF Power Output:

4.2.1.1 Requirements - In accordance with paragraph 90.205(r), the output power shall not exceed by more than 20 percent the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.

4.2.1.2 Procedures – With the test item transmitting at 467.3MHz, the antenna port of the test item was connected to a spectrum analyzer through 50 dB of attenuation. The resolution bandwidth of the spectrum analyzer was set wider than the bandwidth of the test item. The output power of the item was then measured.

4.2.1.3 Results - The output power measurements are shown in a tabular form on page 18. As can be seen from the data, the power output at each frequency is below the maximum allowable power of 20% above the manufacturer's rated output power.

4.2.2 Emission Mask

4.2.2.1 Requirements - For equipment operating in the frequency band of 462.7375MHz to 467.5375MHz with a 12.5kHz channel bandwidth, any emissions 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 fo to 5.625kHz removed from fo: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625kHz but no more than 12.5kHz: At least 7.25(fd – 2.88kHz) dB.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5kHz; At least 50 + 10log (P) dB or 70dB whichever is the lesser attenuation.

4.2.2.2 Procedures - The test item was set to transmit at 467.3MHz.

(a) The antenna port of the test item was connected to a spectrum analyzer through a 50dB attenuator.

(b) The following spectrum analyzer settings were employed:
- trace 1 = on
- center frequency = transmit frequency of the test item
- resolution bandwidth = 1MHz
- video bandwidth > resolution bandwidth
- frequency span = 100kHz/200kHz
- sweep = Auto
- detector function = peak
- trace = max hold

(c) Several sweeps were made with the settings listed above.

(d) Trace 1 was changed from max hold to view

(e) The following spectrum analyzer settings were employed:
- trace 2 = on
- resolution bandwidth = 100Hz/300Hz
- video bandwidth = 1kHz
- sweep = Auto
- detector function = peak
- trace = max hold

(f) Several sweeps were made with the settings listed above.

4.2.2.3 Results - The spectrum analyzer plots of the emissions of the test item are shown on page 19. The limits, shown on the plots, are referenced to the power measured with a 1MHz resolution bandwidth. As can be seen from the data, the test item did comply with the emission mask requirements. The 99% bandwidth measured 11 kHz for the 12.5 kHz channel.

4.2.3 Spurious Emissions at Antenna Terminal

4.2.3.1 Requirements - For a 12.5kHz channel - on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5kHz the emissions must be attenuated by at least 50 + 10log (P) dB or 70dB whichever is the lesser attenuation. For a 12.5kHz channel - on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than

250% of the emission bandwidth, the emissions must be attenuated by at least 43 + 10log (P) dB.

4.2.3.2 Procedures - The test item was set to transmit at 467.3MHz.

a) The antenna port of the test item was connected to a spectrum analyzer through a 50dB attenuator.
b) The resolution bandwidth of the spectrum analyzer was set to 100kHz.
c) A sweep was made from 30MHz to 1GHz.
d) The resolution bandwidth of the spectrum analyzer was set to 1MHz.
e) A sweep was made from 1GHz to 5GHz.

4.2.3.3 Results - The plots of the antenna conducted output measurements are presented on pages 20 through 21. As can be seen from the data, the test item did not produce spurious emissions in excess of the limit.

4.2.4 Field Strength Of Spurious Emissions:

4.2.4.1 Requirements - For a 12.5kHz channel - on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5kHz the emissions must be attenuated by at least 50 + 10log (P) dB or 70dB whichever is the lesser attenuation. For a 12.5kHz channel - on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 250% of the emission bandwidth, the emissions must be attenuated by at least 43 + 10log (P) dB.

4.2.4.2 Procedures - All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4 2003 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

1. Preliminary radiated emissions measurements were first performed using a peak detector and automatically plotted. The broadband measuring antenna was positioned at a 3 meter distance from the test item. The entire frequency range from 30MHz to

5GHz was investigated using a peak detector function. All preliminary tests were performed separately with the test item operating in the transmit mode at 467.3MHz.

2. All significant broadband and narrowband signals found in the preliminary sweeps were then measured using a peak detector at a test distance of 3 meters. The measurements were made with a tuned dipole or double ridged waveguide antenna over the frequency range of 30MHz to 5GHz.

3. To ensure that maximum emission levels were measured, the following steps were taken:

   a) The test item was rotated so that all of its sides were exposed to the receiving antenna.
   b) Since the measuring antennas are linearly polarized, both horizontal and vertical field components were measured.
   c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

4. The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power a tuned dipole or double ridged waveguide antenna was set in place of the test item and connected to a calibrated signal generator. The output of the signal generator was adjusted to match the received level at the spectrum analyzer. The signal level was recorded. The reading was corrected to compensate for cable loss, as required, and when the double ridged waveguide antenna was used, increased by the difference in gain between the dipole and the waveguide antenna.

4.2.4.3 Results - The preliminary radiated emissions plots are presented on pages 23 through 26. Factors for the antennas and cables were added to the data before it was plotted. This data is only presented for a reference, and is not used as official data.

The final radiated levels are presented on page 27. The radiated emissions were measured through the 10th harmonic. As can be seen from the data, all emissions measured from the test item were within the specification limits. Photographs of the test configuration are shown in Figures 3.

4.2.5 Frequency Stability :

4.2.5.1 Requirements - Fixed and base stations operating in the 462.7375MHz to 467.5375MHz band with a 12.5kHz channel bandwidth must have a frequency stability of 1.5ppm.

4.2.5.2 Procedures - The antenna port of the test item was connected to a frequency counter through a 50dB attenuator. The test item was then placed in a humidity

temperature chamber.

a) The test item was set to transmit at 467.3MHz. The transmit frequency was measured and recorded at ambient temperature.
b) The temperature chamber was then set to -30ºC.
c) Once the temperature chamber had reached -30ºC, the test item was allowed to soak for 30 minutes.
d) After soaking at -30ºC for thirty minutes, the test item was turned on and set to transmit at 467.3MHz and the transmit frequency was measured and recorded.
e) Steps (b) through (d) were repeated at -20ºC.
f) Steps (b) through (d) were repeated at -10ºC.
g) Steps (b) through (d) were repeated at 0ºC.
h) Steps (b) through (d) were repeated at +10ºC.
i) Steps (b) through (d) were repeated at +20ºC.
j) Steps (b) through (d) were repeated at +30ºC.
k) Steps (b) through (d) were repeated at +40ºC.
l) Steps (b) through (d) were repeated at +50ºC.
m) The test item was then removed from the temperature chamber and allowed to adjust to nominal room temperature.
n) The supply voltage was checked and adjusted to the nominal level (120VAC). The test item was turned on and set to transmit at 467.3MHz. The transmit frequency was measured and recorded at ambient temperature.
o) The supply voltage was then varied to 85% of its nominal level (102VAC). The test item was turned on and set to transmit at 467.3MHz. The transmit frequency was measured and recorded at ambient temperature.
p) The supply voltage was then varied to 115% of its nominal level (138VAC). The test item was turned on and set to transmit at 467.3MHz. The transmit frequency was measured and recorded at ambient temperature.

4.2.5.3 Results - The frequency stability measurements are presented on pages 28 and 29. As can be seen from the data, all frequency deviations were within the 1.5 ppm limit. A photograph of the test configuration is shown on Figure 4.

4.2.6 Transient Frequency Behavior

4.2.6.1 Requirements - Transmitters designed to operate in the 462.7375MHz to 467.5375MHz frequency band with 12.5kHz channel spacing must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time intervals	Maximum Frequency Difference	Time (ms)
t_1[4]	+/-12.5kHz/6.25kHz	10.0
t_2	+/-12.5kHz/6.25kHz	25.0

t_3[4]	+/-12.5kHz/6.25kHz	10.0

Where:

t_1[4] is the time period immediately following t_{on}
t_2 is the time period immediately following t_1
t_3[4] is the time period from the instant when the transmitter is turned off until t_{off}

[4] If transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

4.2.6.2 Procedures - Two test signals were connected to the test discriminator via a combining network. The transmitter was connected to a 50 ohm power attenuator. The output of the power attenuator was connected to the test discriminator via one input of the combining network. A test signal was connected to the second input of the combining network.

(a) The test signal was adjusted to the nominal frequency of the transmitter.

(b) The test signal was modulated by a 1 kHz signal with a deviation equal to the value of the relevant channel separation (12.5kHz).

(c) The test signal was adjusted to correspond to 0.5% of the power of the transmitter under test measured at the input of the test discriminator. This level was maintained throughout the measurement.

(d) The amplitude difference (ad) and the frequency difference (fd) output of the test discriminator were connected to a storage oscilloscope.

(e) The storage oscilloscope was set to display the channel corresponding to the (fd) input up to ±1 channel frequency difference, corresponding to the relevant channel separation, from the nominal frequency.

(f) The storage oscilloscope was set to a rate of 5 ms/div and set so that the triggering occurs at 1 div from the left edge of the display.

(g) The 1 kHz test signal was shown continuously. The storage oscilloscope was set to trigger on the channel corresponding to the amplitude difference (ad) input at a low input level, rising.

(h) The transmitter was then switched on, without modulation, to produce the trigger pulse and a picture on the display. The result of the change in the ratio of power between the test signal and the transmitter output produced two separate sides, one showing the 1 kHz test signal, the other the frequency difference of the transmitter versus time.

(i) The transmit signal suppresses the 1 kHz test signal and produces the start of the test or t_{on}. During this test time, the frequency difference was measured and recorded verses time.

(j) The transmitter was then switched off to produce the trigger pulse and a picture of the display. The result of the change in the ratio of power between the test signal and the

transmitter output produced two separate sides, one showing the frequency difference of the transmitter versus time and the other showing the 1 kHz test signal.

(k) The transmitter signal no longer suppresses the 1 kHz test signal and produces t_3.

4.2.6.3 Results - The plots of the transient frequency behavior are shown on pages 30 through 31. As can be seen from the data, all transient frequencies were within the maximum frequency difference limits.

5.0 CONCLUSIONS:

It was determined that the Innovation Specialites, Model TEK4067 5W UHF Transmitter did fully meet the RF power output, emissions mask, spurious emissions at antenna terminal, field strength of spurious emissions, frequency stability, and transient frequency behavior, requirements of the FCC "Code of Federal Regulations" Title 47, Part 90, and RSS-119 - Land Mobile and Fixed Radio Transmitters and Receivers Operating in The Frequency Range 27.41- 960 MHz Issue 8 September 2006.

6.0 CERTIFICATION:

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications.

The data presented in this test report pertains to the test item at the test date. Any electrical or mechanical modification made to the test item subsequent to the specified test date will serve to invalidate the data and void this certification.

7.0 ENDORSEMENT DISCLAIMER:

This report must not be used to claim product endorsement by NVLAP or any agency of the US Government.

TABLE I: TEST EQUIPMENT LIST

ELITE ELECTRONIC ENG. INC. Page: 1

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Inv	Due Date
Equipment Type: ANTENNAS								
NDQ1	TUNED DIPOLE ANTENNA	EMCO	3121C-DB4	313	400-1000MHZ	03/28/07	12	03/28/08
NTA1	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2054	0.03-2GHZ	06/05/07	12	06/05/08
NWF2	RIDGED WAVE GUIDE	ELECTRO-METRICS	RGA 180	2521	1-12.4GHZ	10/13/07	12	10/13/08
NWH0	RIDGED WAVE GUIDE	TENSOR	4105	2081	1-12.4GHZ	10/13/07	12	10/13/08
Equipment Type: ATTENUATORS								
T1E6	10DB, 25W ATTENUATOR	WEINSCHEL	46-10-34	BG3488	DC-18GHZ	03/23/07	12	03/23/08
T2DR	25W 20DB ATTENUATOR	WEINSCHEL	46-20-34	BS2140	DC-18GHZ	09/20/07	12	09/20/08
T2S0	20DB 25W ATTENUATOR	WEINSCHEL CORP	46-20-34	BV3545	DC-18GHZ	03/22/07	12	03/22/08
Equipment Type: CHAMBERS (ENV)								
ETC0	TEMPERATURE CHAMBER	TENNEY	BTR-100350	9145-17	-60C TO 100C		NOTE 1	
Equipment Type: CONTROLLERS								
CDS2	COMPUTER	GATEWAY	MFATXPNT NMZ	0028483108	1.8GHZ		N/A	
CMA0	MULTI-DEVICE CONTROLLER	EMCO	2090	9701-1213	---		N/A	
Equipment Type: METERS								
MFC0	MICROWAVE FREQ. COUNTER	HEWLETT PACKARD	5343A	2133A00591	10HZ-26GHZ	05/30/07	12	05/30/08
MPC2	DUAL POWER METER	HEWLETT PACKARD	EPM-442A	US37480150	0.1MHZ-50GHZ	11/22/06	13	12/22/07
MPCC	POWER SENSOR	HEWLETT PACKARD	8482A	2652A13499	0.1-4200MHZ	04/27/07	12	04/27/08
MSP2	8 CH DIGITAL OSCILLOSCOPE	YOKOGAWA	DL708E	12VB19634	---	01/03/07	12	01/03/08
Equipment Type: RECEIVERS								
RAKG	RF SECTION	HEWLETT PACKARD	85462A	3549A00284	0.009-6500MHZ	11/21/07	12	11/21/08
RAKH	RF FILTER SECTION	HEWLETT PACKARD	85460A	3448A00324	---	11/21/07	12	11/21/08
RBB0	EMI TEST RECEIVER 20HZ TO	ROHDE & SCHWARZ	ESIB40	100250	20 HZ TO 40GHZ	11/05/07	12	11/05/08
RYE0	MODULATION ANALYZER	HEWLETT PACKARD	8901B	3104A03410	0.15-1300MHZ	05/04/07	12	05/04/08
Equipment Type: SIGNAL GENERATORS								
GBN2	SIGNAL GENERATOR	ROHDE & SCHWARZ	SMY 02	DE14046	9KHZ-2.080GHZ	02/26/07	12	02/26/08
GBR2	SIGNAL GENERATOR	HEWLETT PACKARD	8648D	3847U00488	0.009-4000MHZ	02/19/07	12	02/19/08

Cal. Interval: Listed in Months I/O: Initial Only N/A: Not Applicable

Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

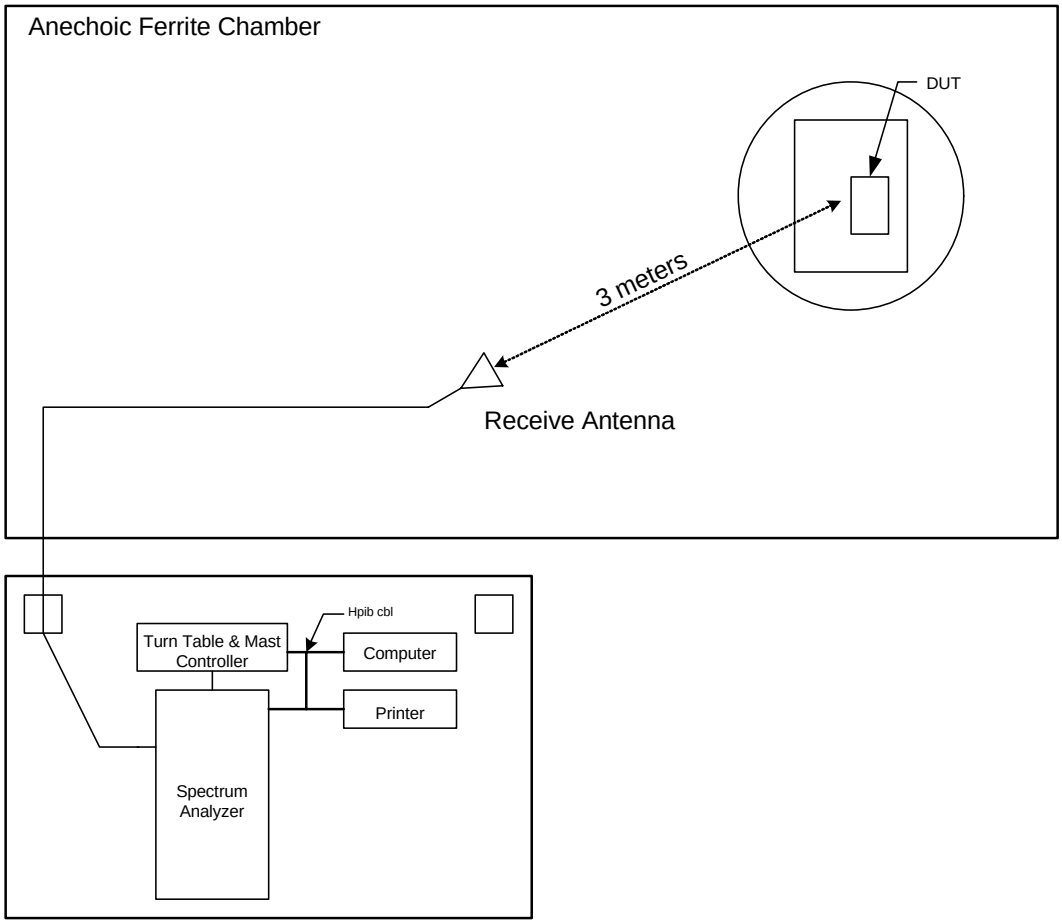
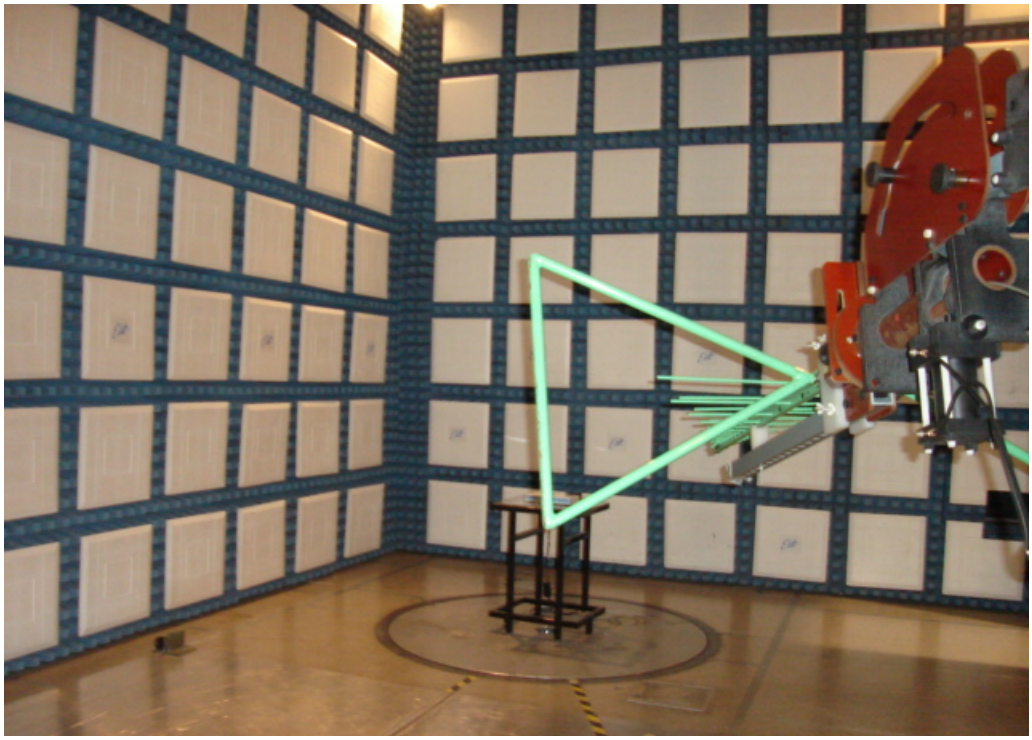
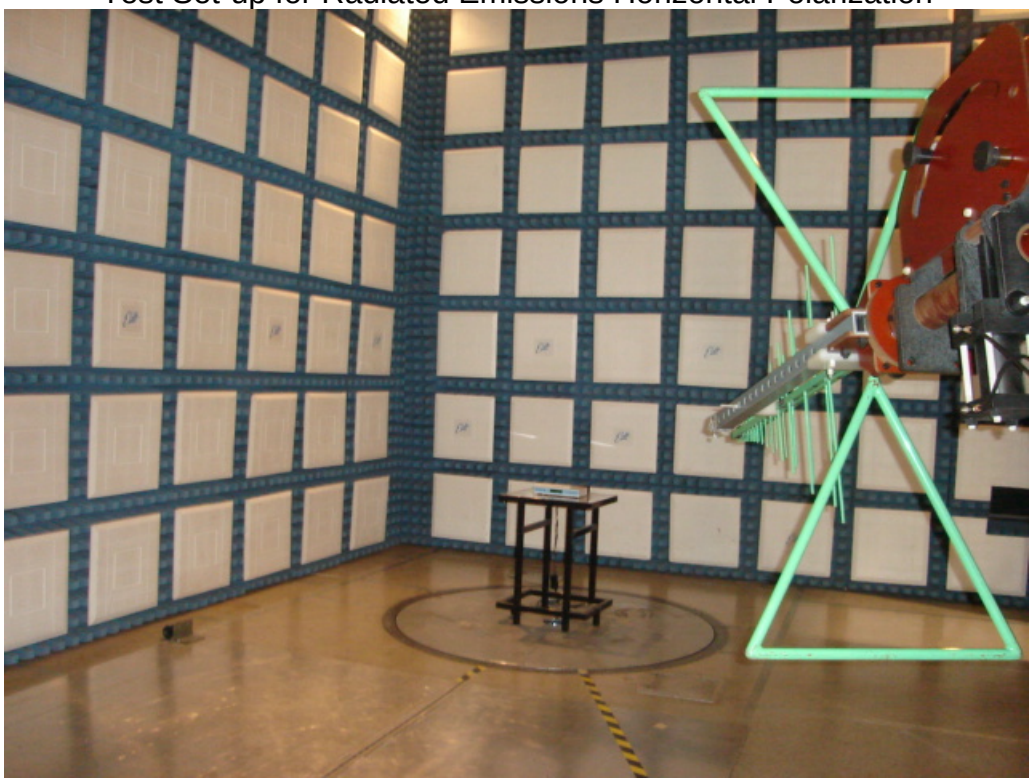


FIGURE 1 BLOCK DIAGRAM OF RADIATED EMISSIONS TEST SETUP

Figure 3



Test Set-up for Radiated Emissions Horizontal Polarization



Test Set-up for Radiated Emissions, Vertical Polarization

Figure 4

Test Set-up for Frequency Stability – Frequency vs. Temperature

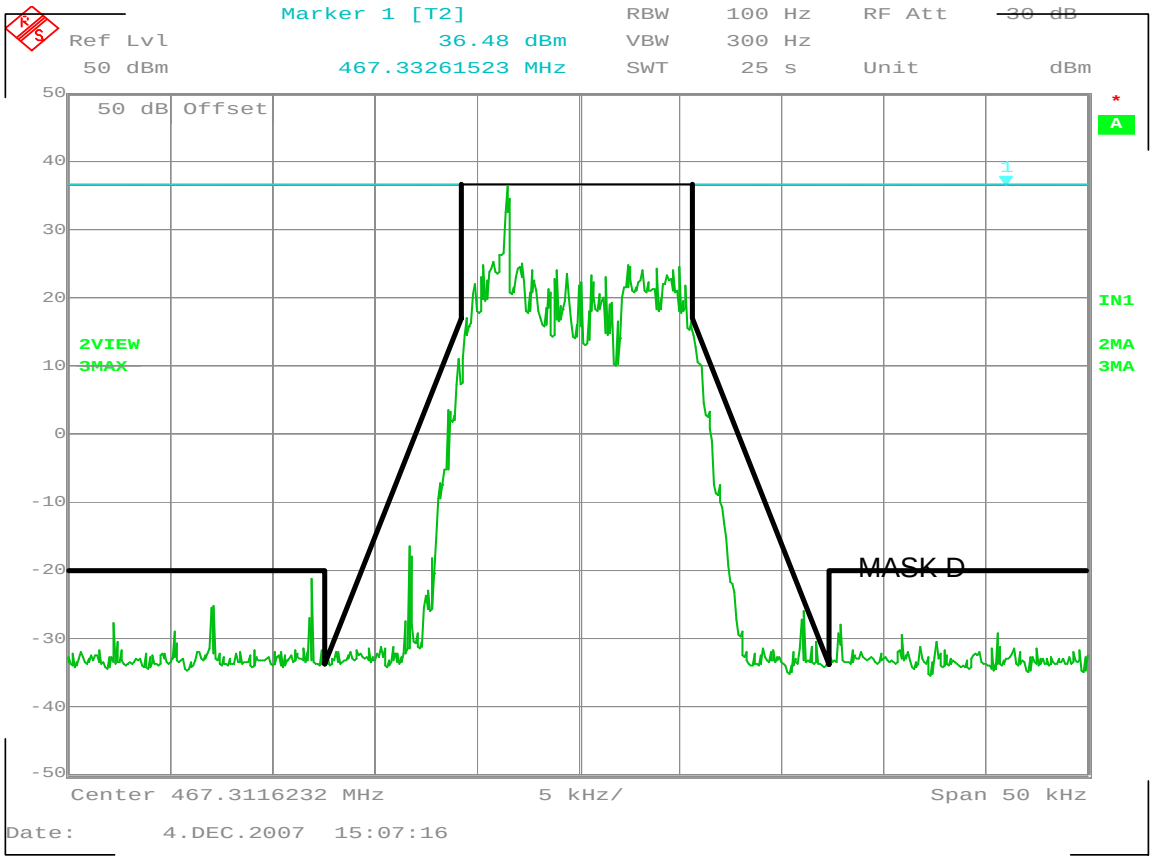
DATA PAGE

MANUFACTURER : Innovation Specialites
MODEL : TEK4067
SERIAL NO. : none
SPECIFICATION : FCC 90.205 Power Output
DATE : October 8, 2007

Frequency MHz	Measured Output Power dBm	Measured Output Power Watts	Manufacturer's Rated Power Watts	Manufacturer's Rated Power + 20% Watts
467.3	36.7	4.7	5.0	6.0

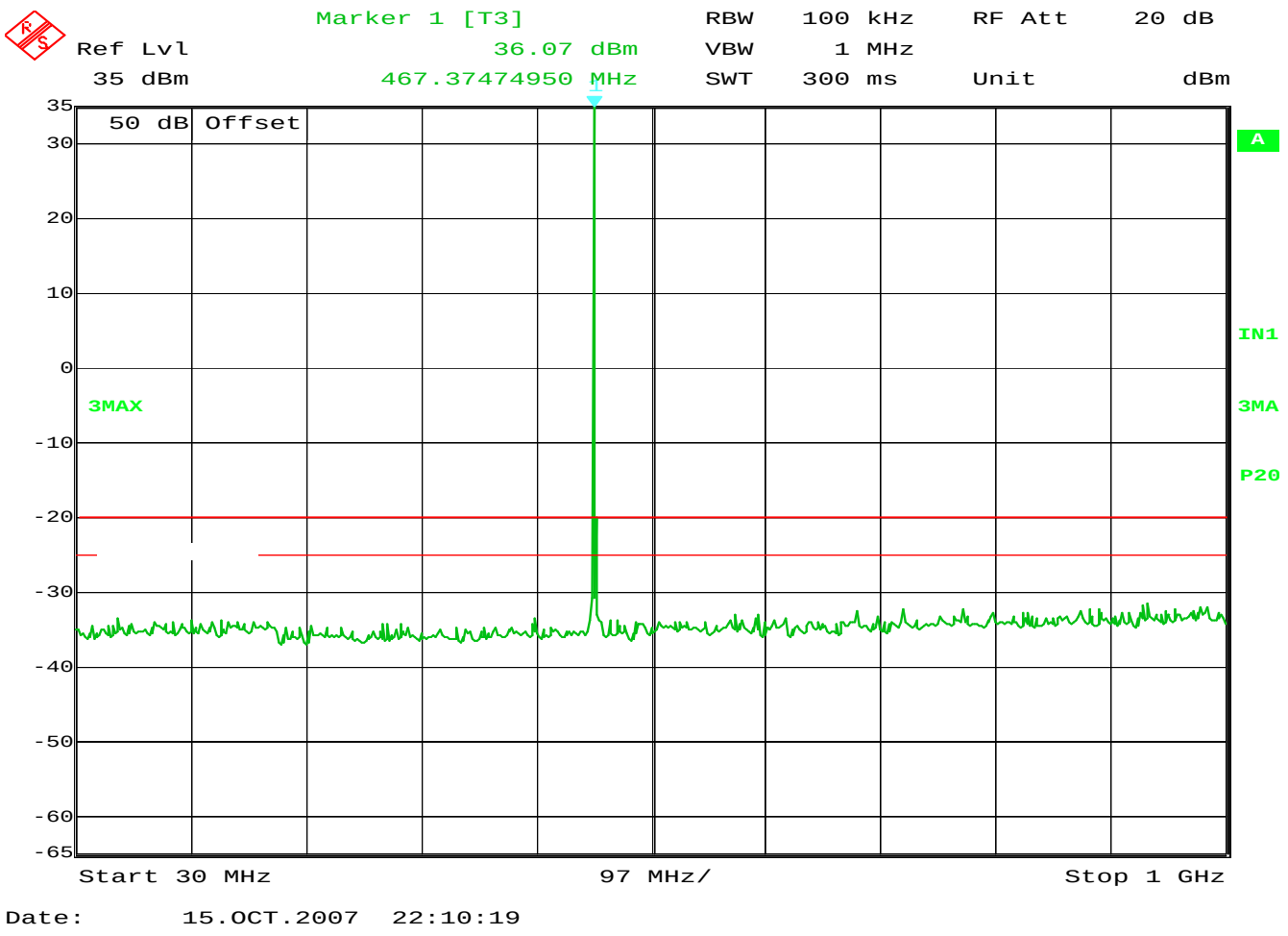
Checked BY Richard E. King :

Richard E. King



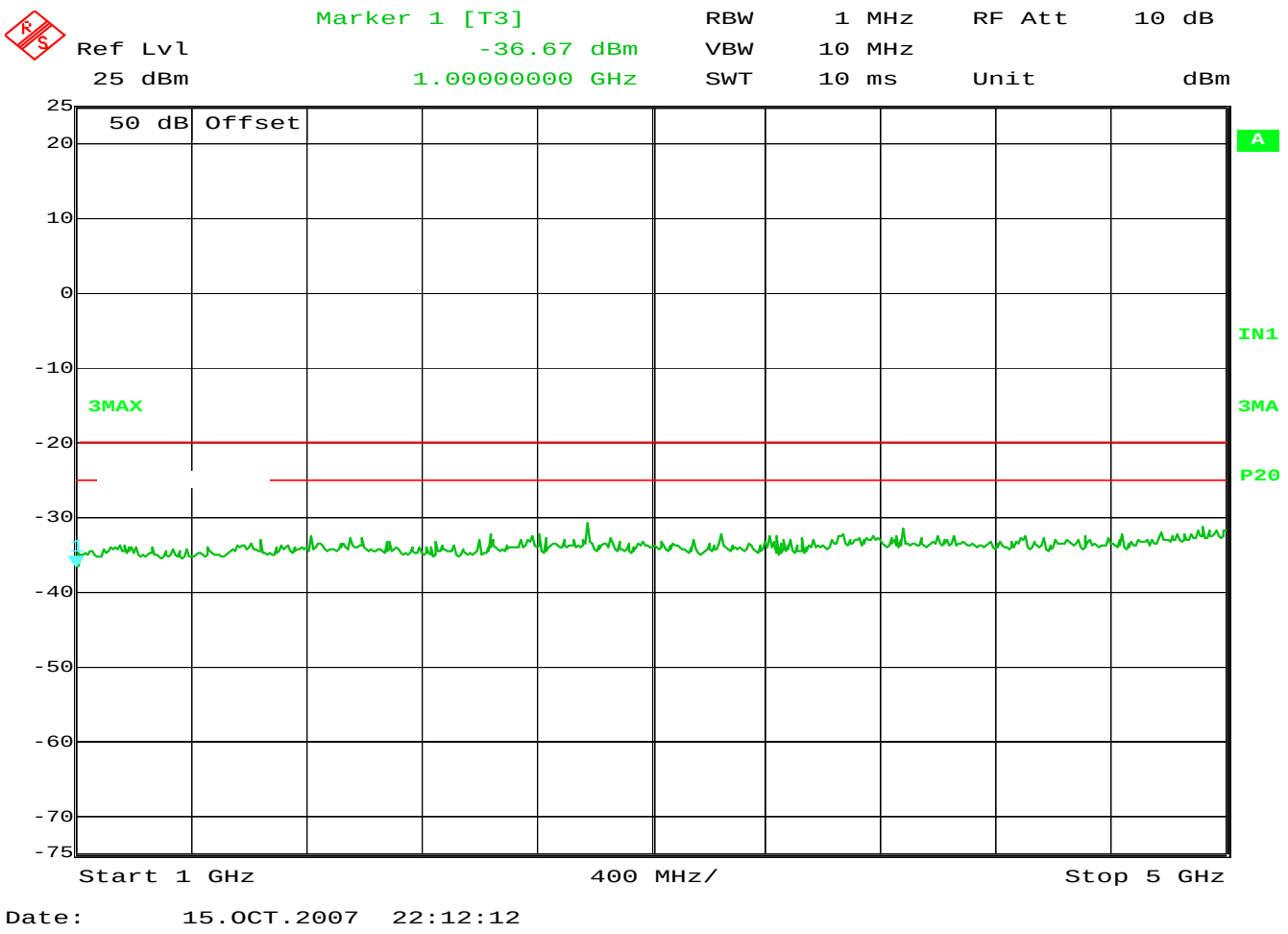
FCC 90 / RSS 119 Occupied Bandwidth

MANUFACTURER	: Innovation Specialites
MODEL	: TEK4067
SERIAL NO.	: none
TEST MODE	: Transmit
FREQUENCY	: 467.3 MHz
POWER LEVEL	: 5W
CHANNEL SPACING	: 12.5kHz
NOTES	:



FCC 90 / RSS 119 Antenna Conducted Emissions

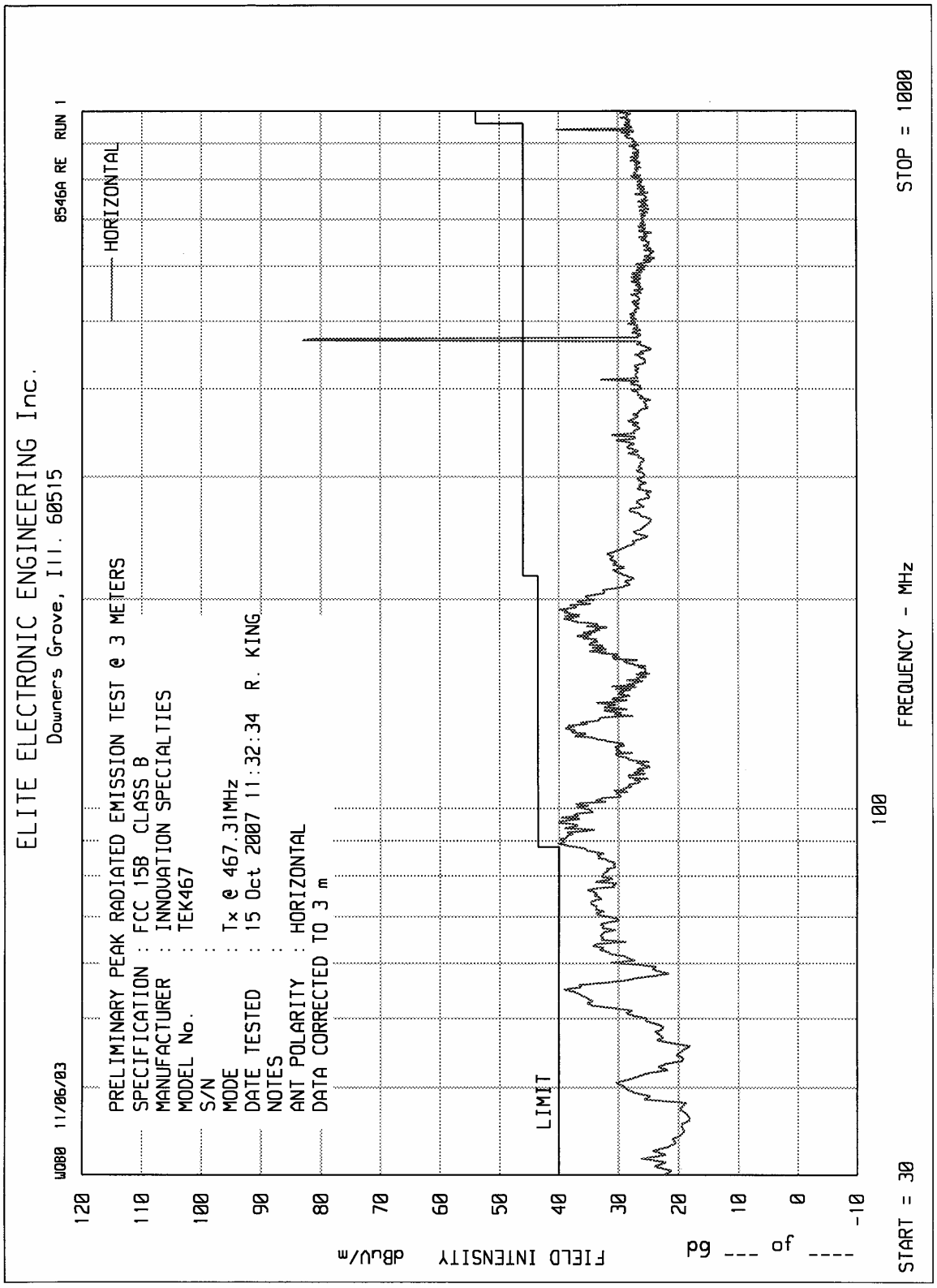
MANUFACTURER : Innovation Specialites
MODEL : TEK4067
SERIAL NO. : none
TEST MODE : Transmit
FREQUENCY : 467.3 MHz
POWER LEVEL : 5W -20 dBm
CHANNEL SPACING : 12.5kHz
NOTES :

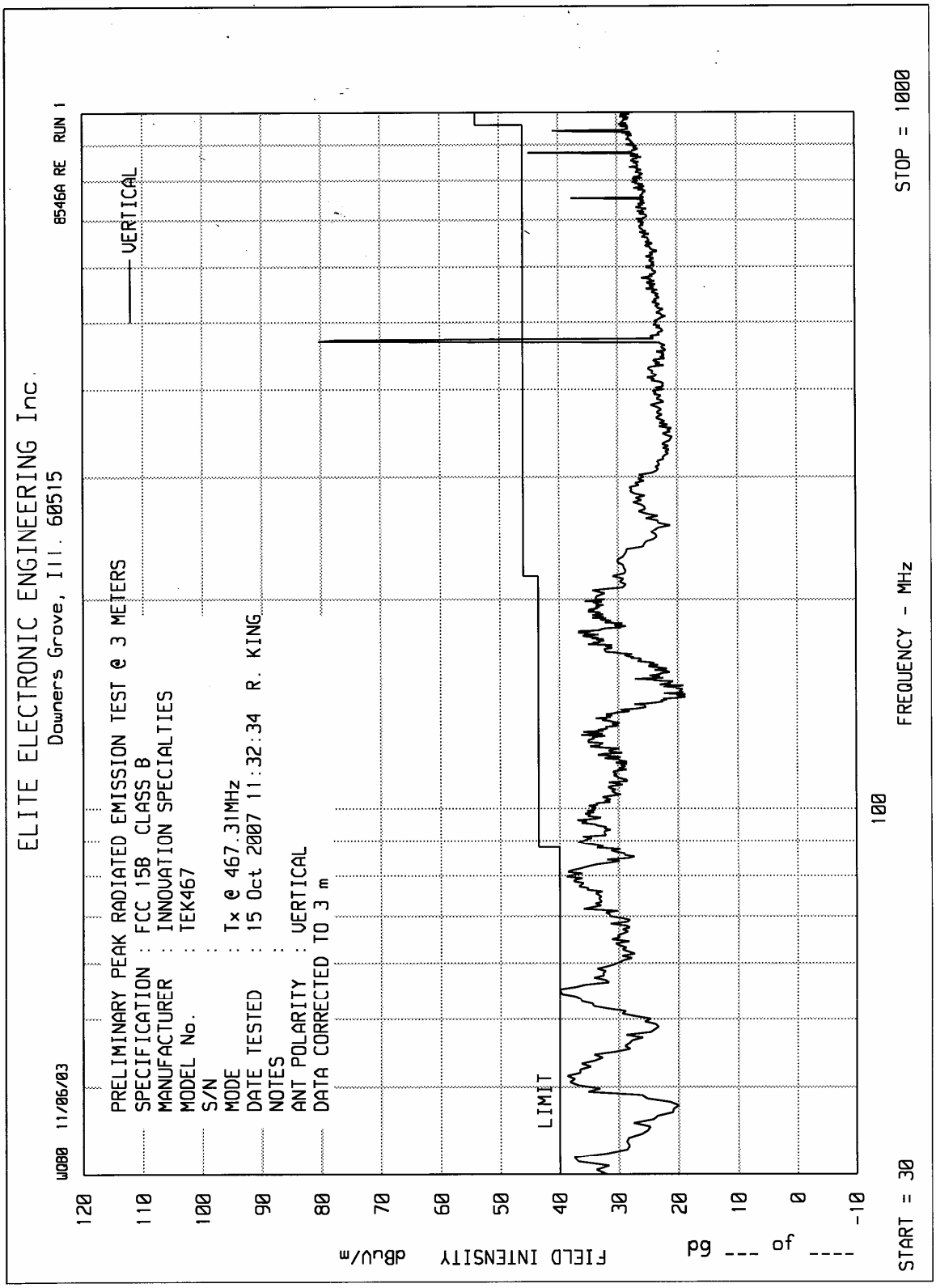


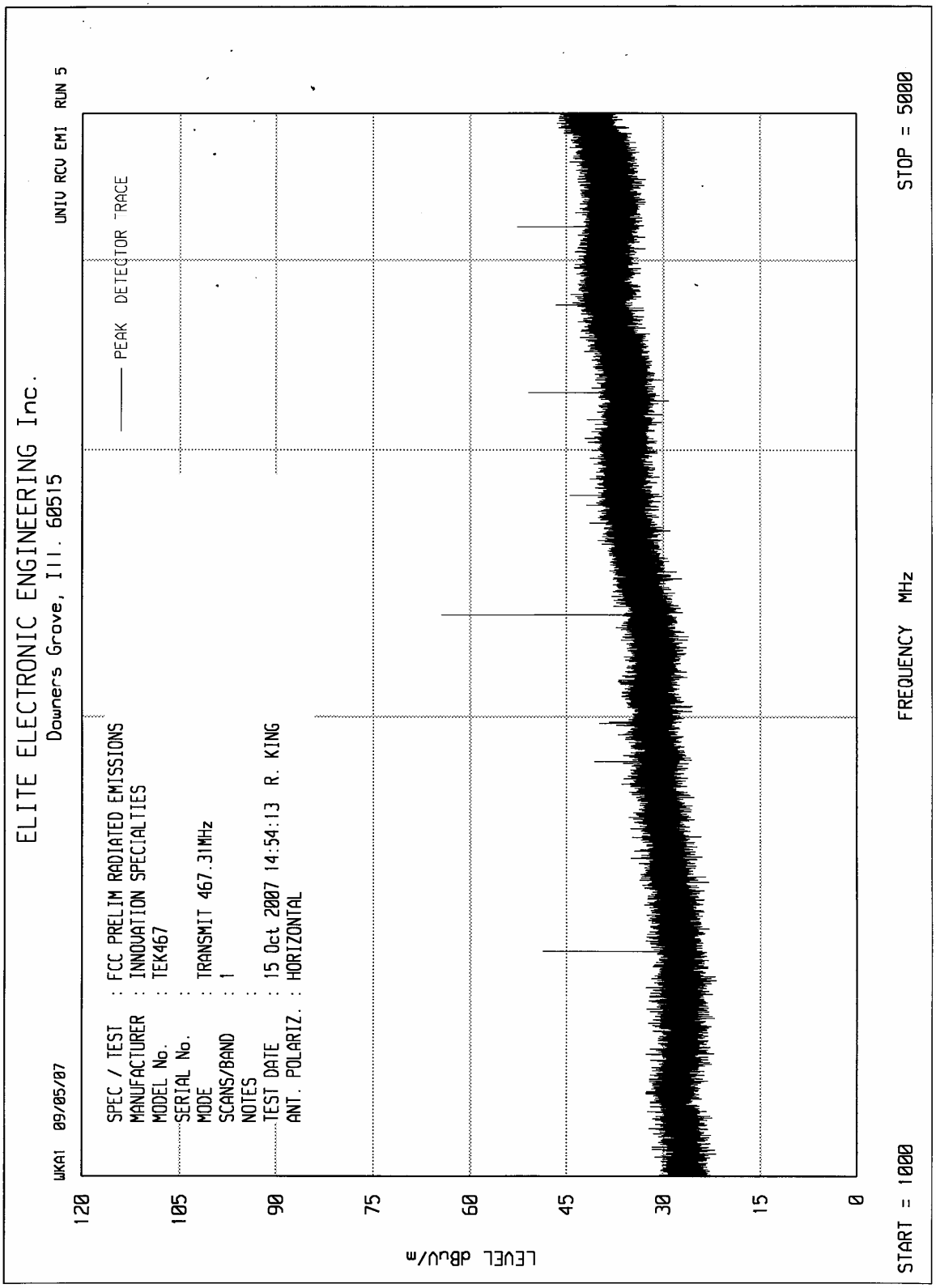
FCC 90 / RSS 119 Antenna Conducted Emissions

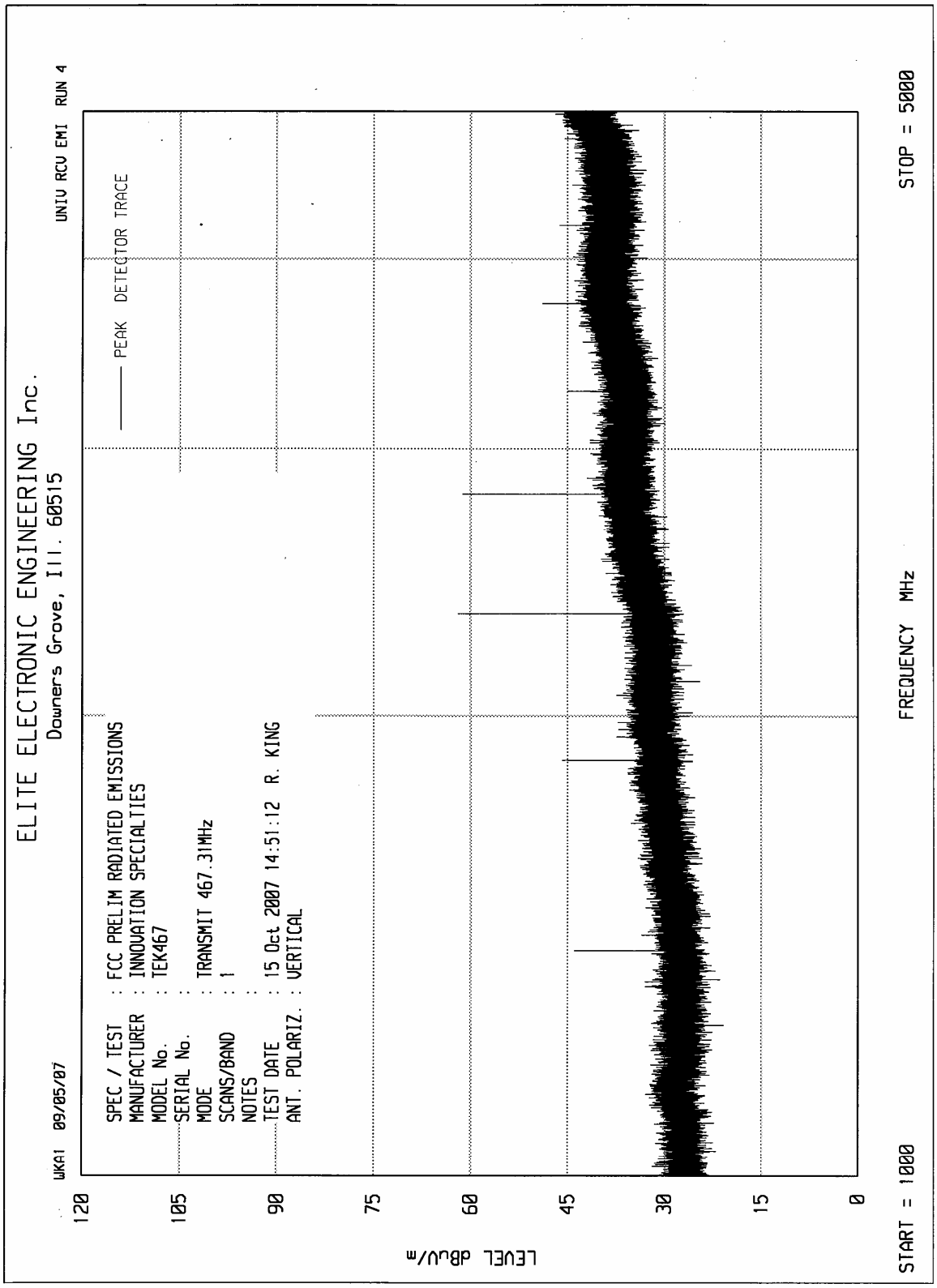
-20 dBm

MANUFACTURER	: Innovation Specialites
MODEL	: TEK4067
SERIAL NO.	: none
TEST MODE	: Transmit
FREQUENCY	: 467.3 MHz
POWER LEVEL	: 5W
CHANNEL SPACING	: 12.5kHz
NOTES	:


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
8546A RE RUN 1
W080 11/06/03
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : INNOVATION SPECIALTIES
MODEL No. : TEK467
S/N :
MODE : Tx @ 467.31MHz
DATE TESTED : 15 Oct 2007 11:32:34 R. KING
NOTES :
ANT POLARITY : HORIZONTAL
DATA CORRECTED TO 3 m
HORIZONTAL
LIMIT
FIELD INTENSITY dBuV/m
FREQUENCY - MHz
START = 30
100
STOP = 1000
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
pg ___ of ____


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
8546A RE RUN 1
W080 11/06/03
PRELIMINARY PEAK RADIATED EMISSION TEST @ 3 METERS
SPECIFICATION : FCC 15B CLASS B
MANUFACTURER : INNOVATION SPECIALTIES
MODEL No. : TEK467
S/N : :
MODE : Tx @ 467.31MHz
DATE TESTED : 15 Oct 2007 11:32:34 R. KING
NOTES : :
ANT POLARITY : VERTICAL
DATA CORRECTED TO 3 m
VERTICAL
LIMIT
FIELD INTENSITY dBuV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
START = 30
100
FREQUENCY - MHz
STOP = 1000
pg --- of ----


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 5
WKA1 09/05/07
SPEC / TEST : FCC PRELIM RADIATED EMISSIONS
MANUFACTURER : INNOVATION SPECIALTIES
MODEL No. : TEK467
SERIAL No. :
MODE : TRANSMIT 467.31MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 15 Oct 2007 14:54:13 R. KING
ANT. POLARIZ. : HORIZONTAL
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 5000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
UNIV RCV EMI RUN 4
WKA1 09/05/07
PEAK DETECTOR TRACE
SPEC / TEST : FCC PRELIM RADIATED EMISSIONS
MANUFACTURER : INNOVATION SPECIALTIES
MODEL No. : TEK467
SERIAL No. :
MODE : TRANSMIT 467.31MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 15 Oct 2007 14:51:12 R. KING
ANT. POLARIZ. : VERTICAL
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 5000

DATA PAGE

MANUFACTURER : Innovation Specialites
MODEL : TEK4067
SERIAL NO. : none
SPECIFICATION : FCC Part 90 and RSS 119- Spurious Radiated Emissions
DATE : October 15, 2007
NOTES : Transmit at 467.3 MHz
: 5 Watts, 12.5kHz channel spacing

Freq. MHz	Ant Pol	Mtr Rdg (dBuV)	Matched Sig Gen (dBm)	equil ant gain	CBL Loss (dB)	Total (dBm)	Attn	min attn
934.6	H	20.7	-48.2	0.0	2.1	-50.3	87.3	57.0
934.6	V	17.4	-51.6	0.0	2.1	-53.7	90.7	57.0
1401.9	H	20.8	-50.6	5.6	2.7	-47.7	84.7	57.0
1401.9	V	21.8	-49.6	5.6	2.7	-46.7	83.7	57.0
1869.2	H	19.3	-49.4	6.0	3.2	-46.7	83.7	57.0
1869.2	V	18.7	-50.0	6.0	3.2	-47.2	84.2	57.0
2336.6	H	33.8	-33.2	6.6	3.8	-30.5	67.5	57.0
2336.6	V	34.2	-32.7	6.6	3.8	-30.0	67.0	57.0
2803.9	H	23.1	-42.0	6.9	4.3	-39.5	76.5	57.0
2803.9	V	20.5	-44.5	6.9	4.3	-42.0	79.0	57.0
3271.2	H	21.9	-41.2	7.0	4.7	-38.9	75.9	57.0
3271.2	V	22.4	-40.7	7.0	4.7	-38.4	75.4	57.0
3738.5	H	17.8	-42.8	6.9	5.1	-41.0	78.0	57.0
3738.5	V	17.9	-42.7	6.9	5.1	-40.9	77.9	57.0
4205.8	H	25.0	-34.4	7.3	5.6	-32.6	69.6	57.0
4205.8	V	23.9	-35.5	7.3	5.6	-33.8	70.8	57.0
4673.1	H	14.9	-44.5	8.0	6.0	-42.5	79.5	57.0
4673.1	V	15.6	-43.8	8.0	6.0	-41.8	78.8	57.0

Checked BY Richard E. King :

Richard E. King

DATA PAGE

MANUFACTURER : Innovation Specialites
MODEL : TEK4067
SERIAL NO. : none
SPECIFICATION : FCC-90 Frequency Stability vs. Temperature
DATE : October 16, 2007
NOTES : Transmit at 467.3 MHz
: 5 Watts, 12.5kHz channel spacing

Temperature °C	Measured Frequency Hz	Frequency Error Hz	Limit Hz
+23	467312452		
-30	467312364	88	701
-20	467312378	74	701
-10	467312499	47	701
0	467312623	171	701
+10	467312600	148	701
+20	467312564	112	701
+30	467312438	14	701
+40	467312375	77	701
+50	467312675	223	701

Limit = 1.5ppm = 467312452Hz * 1.5ppm = 701Hz

Checked BY Richard E. King :

Richard E. King

DATA PAGE

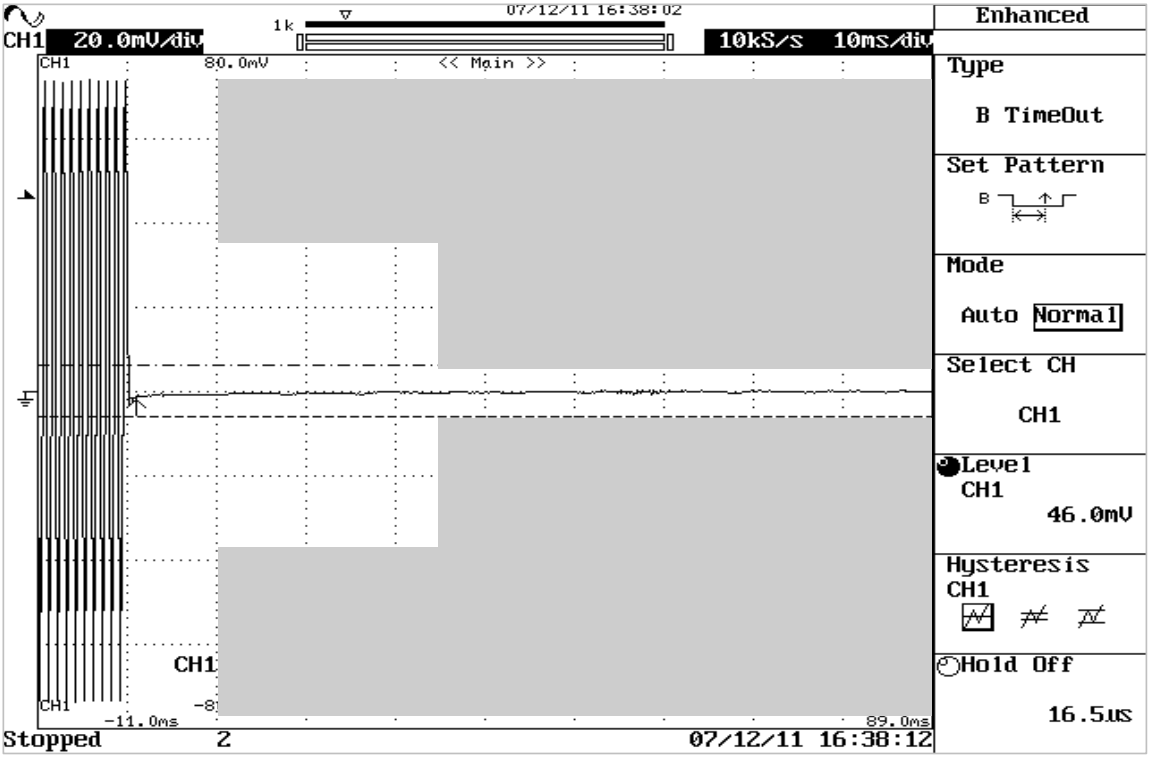
MANUFACTURER : Innovation Specialites
MODEL : TEK4067
SERIAL NO. : none
SPECIFICATION : FCC-90 Frequency Stability Measurements vs. Voltage
DATE : Oct. 16, 2007
NOTES : Transmit at 467.3 MHz
: 5 Watts, 12.5kHz channel spacing

Voltage VAC		Measured Frequency Hz	Frequency Error Hz	Limit Hz
Nominal	120	467312452		
85%	102	467312428	24	701
115%	138	467312347	105	701

Limit = 1.5ppm = 467312452Hz * 1.5ppm = 701Hz

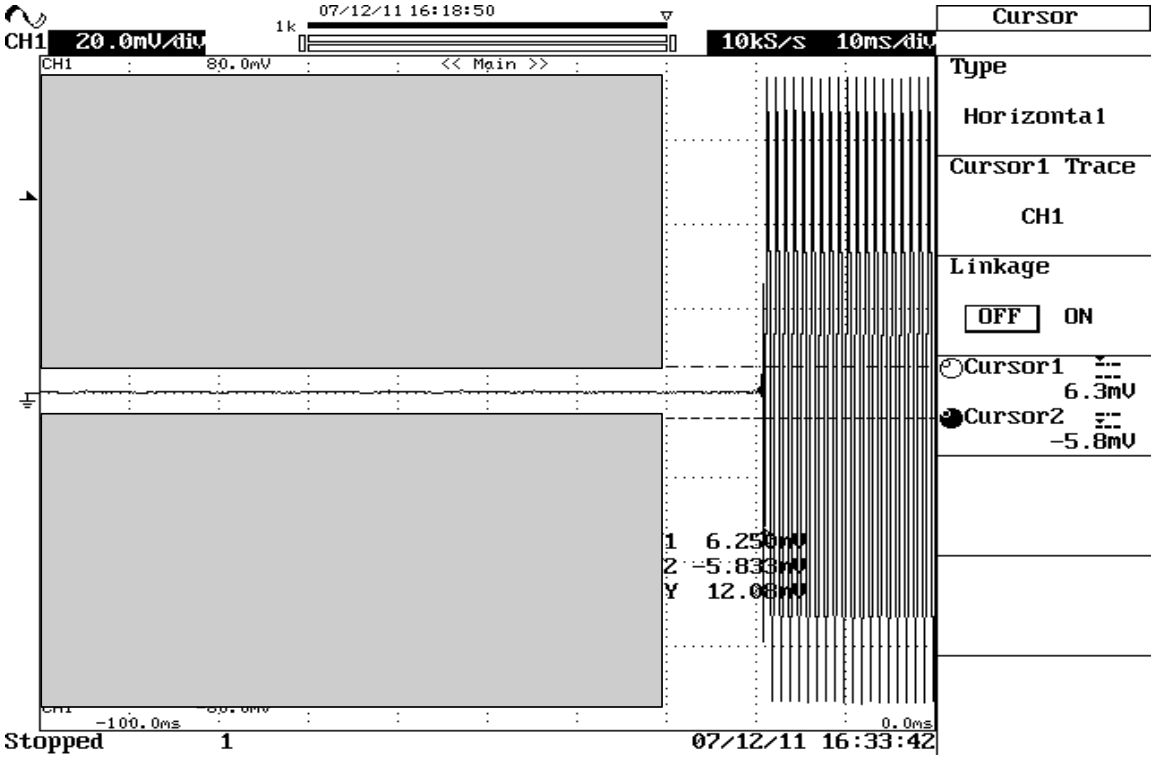
Checked BY Richard E. King :

Richard E. King



FCC 90 Transient Frequency Behavior

MANUFACTURER	: Innovation Specialites
MODEL	: TEK4067
SERIAL NO.	: none
TEST MODE	: Transmit
FREQUENCY	: 467.3MHz
CHANNEL SPACING	: 12.5kHz
NOTE	: ON Condition
	: t1 = 10 mS, t2 = 25 mS



FCC 90 Transient Frequency Behavior

MANUFACTURER	: Innovation Specialites
MODEL	: TEK4067
SERIAL NO.	: none
TEST MODE	: Transmit
FREQUENCY	: 467.3MHz
CHANNEL SPACING	: 12.5kHz
NOTE	: OFF Condition
	: t3 = 10 mS