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FCC PART 15.249
CLASS II PERMISSIVE CHANGE TEST REPORT
UNLICENSED INTENTIONAL RADIATOR

Applicant	SYN-TECH SYSTEMS, INC.
Address	100 FOUR POINTS WAY PO BOX 5258 TALLAHASSEE FLORIDA 32314 USA
FCC ID	NR3AIM2FMU
Product Description	AUTOMATED FUEL MANAGEMENT SYSTEM
Date Sample Received	8/18/2008
Date Tested	10/16/2008
Tested By	Joe Scoglio
Approved By	Mario de Aranzeta
Report Number	1887AUT8TestReport.doc
Test Results	☒ PASS ☐ FAIL

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



Test Certificate #0955-01

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GENERAL REMARKS

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

The test results relate only to the items tested.

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 requirements.



Testing Certificate # 0955-01

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:

Mario de Aranzeta C.E.T.
Compliance Engineer/ Lab. Supervisor

Date: 10/16/2008

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GENERAL INFORMATION

The purpose of the Class II Permissive change is to add antennas to the filing.

Antennas: 1. PARITY PANEL ANTENNA MODEL #: ARC-P 12 dBi GAIN
 2. 4 ELEMENT YAGI ANTENNA MODEL #: 918-4 7 dBd GAIN
 3. 6 ELEMENT YAGI ANTENNA MODEL #: 918-6 9 dBd GAIN
 4. 10 ELEMENT YAGI ANTENNA MODEL #: 918-10 12 dBd GAIN
 5. FLEXIBLE ROD MAXRAD MODEL #: MUF8963 ANTENNA 3 dBi GAIN

This product is professionally installed.

DUT Specification

Applicable Standard	Part 15.249		
DUT Description	AUTOMATED FUEL MANAGEMENT SYSTEM		
FCC ID	NR3AIM2FMU		
DUT Power Source	☐ 110-120Vac/50- 60Hz		
	☒ DC Power		
	☐ Battery Operated Exclusively		
Test Item	☐ Prototype	☒ Pre-Production	☐ Production
Type of Equipment	☐ Fixed	☐ Mobile	☒ Portable
Antenna Connector	FCC Rules require that the antenna connector be unique unless products require professional installation		
Test Facility	Timco Engineering Inc. located at 849 NW State Road 45 Newberry, FL 32669 USA.		
Test Conditions	Temperature: 26°C Relative humidity: 50%		
Test Exercise	The DUT was placed in continuous transmit mode of operation.		
Modifications	none		

Test Supporting Equipment

See the radiated pages

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EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	Listed 5/11/07	5/10/10
AC Voltmeter	HP	400FL	2213A14499	CAL 12/29/06	12/29/08
Coaxial Cable #64	Semflex Inc.	60637	Timco #64	CHAR 3/30/07	3/30/09
Antenna: Dipole Kit	Electro-Metrics	TDA-30/1-4	152	CAL 3/3/06	3/3/09
Antenna: Dipole Kit	Electro-Metrics	TDA-30/1-4	153	CHAR 4/5/06	4/5/09
Frequency Counter	HP	5385A	2730A03025	CAL 7/6/07	7/6/09
Hygro-Thermometer	Extech	445703	0602	CAL 11/15/07	11/15/09
Antenna: Log-Periodic	Electro-Metrics	LPA-25	1122	CAL 12/1/06	12/1/08
Measuring Tape-7.5M	Kraftixx	7.5M PROFI		CHAR 11/13/07	11/13/09
Modulation Analyzer	HP	8901A	3435A06868	CAL 5/9/07	5/9/09
Digital Multimeter	Fluke	FLUKE-77-3	79510405	CAL 5/14/07	5/14/09
System One	Audio Precision	System One	SYS1-45868	CHAR 2/27/08	2/27/10
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 11/30/07	11/30/09
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 11/30/07	11/30/09
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 11/30/07	11/30/09
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 11/30/07	11/30/09
Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 4/25/08	4/25/10

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TEST PROCEDURES

Radiation Interference: ANSI C63.4-2003 using a spectrum analyzer, a preselector, a quasi-peak adapter, and an appropriate antenna. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz with an appropriate sweep speed and the video bandwidth was 300 kHz up to 1 GHz and 1 MHz with a video BW of 3 MHz above 1 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The spectrum was searched to at least the tenth (10) harmonic of the fundamental.

Formula Of Conversion Factors: The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dB μ V) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the spectrum analyzer meter reading.

Example:

Freq (MHz)	Meter Reading	+ ACF	+ CL	= FS
33	20 dB μ V	+ 10.36 dB	+ 0.5	= 30.86 dB μ V/m @ 3m

Power Line Conducted Interference: The procedure used was ANSI C63.4-2003 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10kHz with an appropriate sweep speed. The spectrum was scanned from 0.15 to 30 MHz.

Occupied Bandwidth: A small sample of the transmitter output was fed into the spectrum analyzer and the attached plot was printed. The vertical scale is set to -10 dBm per division.

ANSI C63.4-2003 10.1 Measurement Procedures: The DUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The DUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes. Emissions attenuated more than 20 dB below the permissible value are not reported.

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RADIATION INTERFERENCE (Antenna 1)

Rules Part No.: 15.249, 15.209

Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) $\mu\text{V/m}$ @ 300 meters
490 to 1705 kHz	24000/F (kHz) $\mu\text{V/m}$ @ 30 meters
1705 kHz to 30 MHz	29.54 dB $\mu\text{V/m}$ @ 30 meters
30 – 88	40.0 dB $\mu\text{V/m}$ @ 3 meters
80 – 216	43.5 dB $\mu\text{V/m}$ @ 3 meters
216 – 960	46.0 dB $\mu\text{V/m}$ @ 3 meters
Above 960	54.0 dB $\mu\text{V/m}$ @ 3 meters
Part 15.249	
Fundamental 902 – 928 MHz	94.0 dB $\mu\text{V/m}$ @ 3 meters
Fundamental 2.4 – 2.4835 MHz	94.0 dB $\mu\text{V/m}$ @ 3 meters
Harmonics	54.0 dB $\mu\text{V/m}$ @ 3 meters

TEST CONFIGURATION:

- TRANSMITTER SOFTWARE SET FOR 20dB OF ATTENUATION AND AN EXTERNAL 10 dB PAD
- PARITY PANEL ANTENNA MODEL #: ARC-P 12 dBi GAIN
- DELL LAPTOP COMPUTER MODEL PP01L

Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dB μV	Ant. Polarity	Coax Loss dB	Correction Factor dB/m	Field Strength dB $\mu\text{V/m}$	Margin dB
902.7	902.00	4.4	V	1.95	22.68	29.03	64.97
902.7	902.70	59.1	V	1.95	22.67	83.72	10.28
919.7	919.70	60.5	V	1.98	22.60	85.08	8.92
927.7	927.70	59.5	V	1.99	22.68	84.17	9.83
927.7	928.00	18.5	V	1.99	22.68	43.17	2.83

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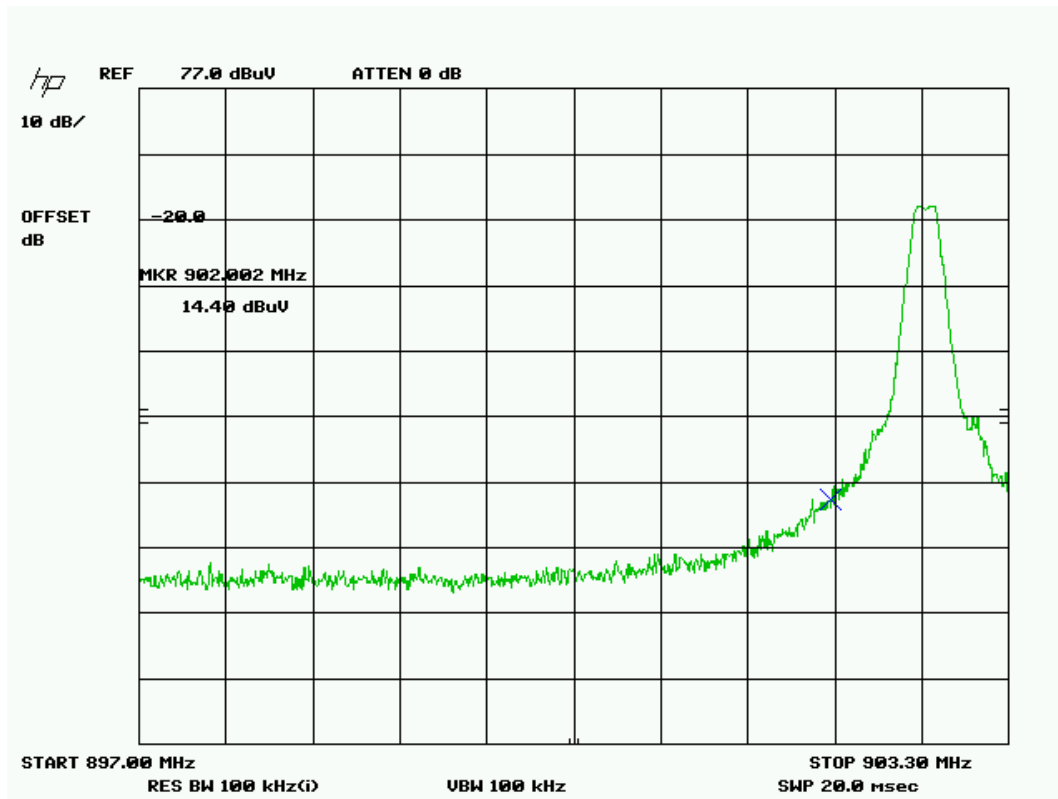
BAND EDGE COMPLIANCE

Rules Part No.: 15.249 (d)

Requirements: 50 dBc or 46 dB μ V/m.

Test Data – with PARITY PANEL ANTENNA MODEL #: ARC-P 12 dBi GAIN:

Lower bandedge
Peak



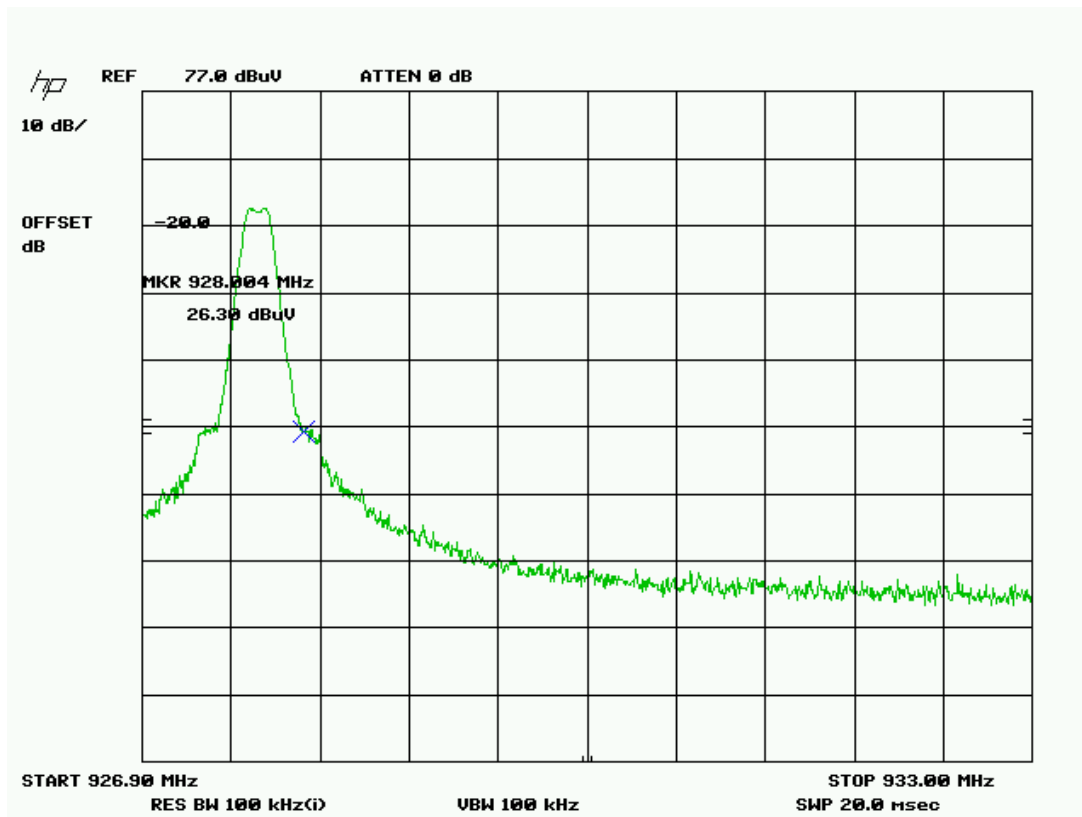
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dB μ V	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dB μ V/m	Peak/Ave
902.7	902	14.4	H	1.95	23.3	39.65	P

APPLICANT: SYN-TECH SYSTEMS, INC.

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Upper bandedge
Peak



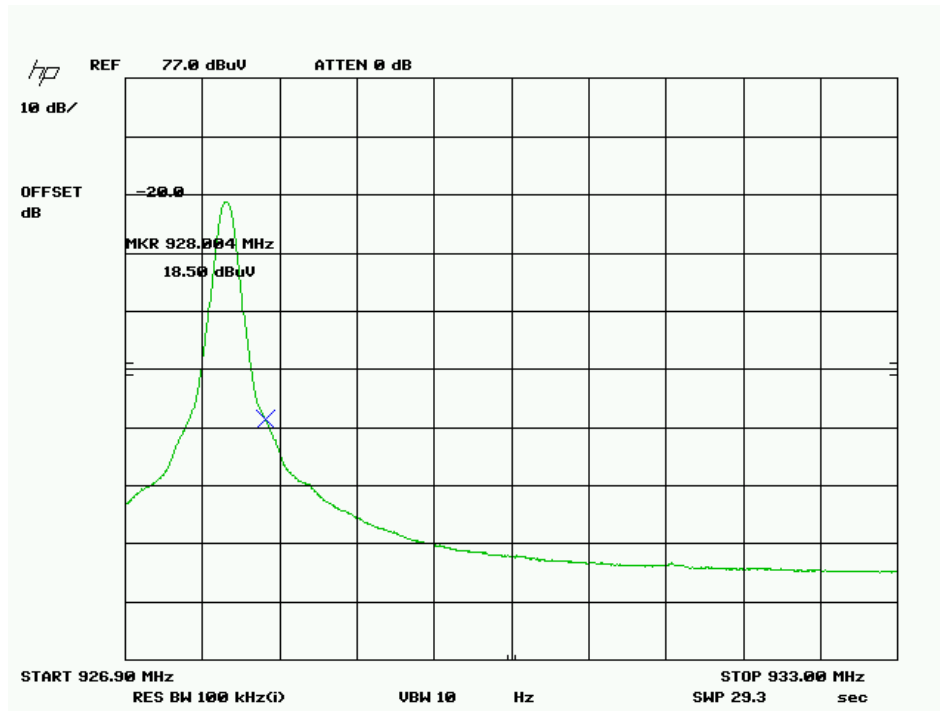
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBμV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBμV/m	Peak/Ave
927.7	928	26.3	H	1.99	23.45	51.74	P
927.7	928	18.5	H	1.99	23.45	43.94	A

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Upper bandedge
Average



APPLICANT: SYN-TECH SYSTEMS, INC.
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RADIATION INTERFERENCE (Antenna 2)

Rules Part No.: 15.249, 15.209

Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) $\mu\text{V}/\text{m}$ @ 300 meters
490 to 1705 kHz	24000/F (kHz) $\mu\text{V}/\text{m}$ @ 30 meters
1705 kHz to 30 MHz	29.54 dB $\mu\text{V}/\text{m}$ @ 30 meters
30 – 88	40.0 dB $\mu\text{V}/\text{m}$ @ 3 meters
80 – 216	43.5 dB $\mu\text{V}/\text{m}$ @ 3 meters
216 – 960	46.0 dB $\mu\text{V}/\text{m}$ @ 3 meters
Above 960	54.0 dB $\mu\text{V}/\text{m}$ @ 3 meters
Part 15.249	
Fundamental 902 – 928 MHz	94.0 dB $\mu\text{V}/\text{m}$ @ 3 meters
Fundamental 2.4 – 2.4835 MHz	94.0 dB $\mu\text{V}/\text{m}$ @ 3 meters
Harmonics	54.0 dB $\mu\text{V}/\text{m}$ @ 3 meters

TEST CONFIGURATION:

- TRANSMITTER SOFTWARE SET FOR 20dB OF ATTENUATION AND AN EXTERNAL 6 dB PAD
- 4 ELEMENT YAGI ANTENNA MODEL #: 918-4 7 dBd GAIN
- DELL LAPTOP COMPUTER MODEL PP01L

Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dB μV	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Field Strength dB $\mu\text{V}/\text{m}$	Margin dB
902.6	902.60	65.0	H	1.95	23.33	90.28	3.72
919.7	919.70	65.6	H	1.98	23.30	90.88	3.12
927.7	927.70	64.3	H	1.99	23.45	89.74	4.26

APPLICANT: SYN-TECH SYSTEMS, INC.

FCC ID: NR3AIM2FMU

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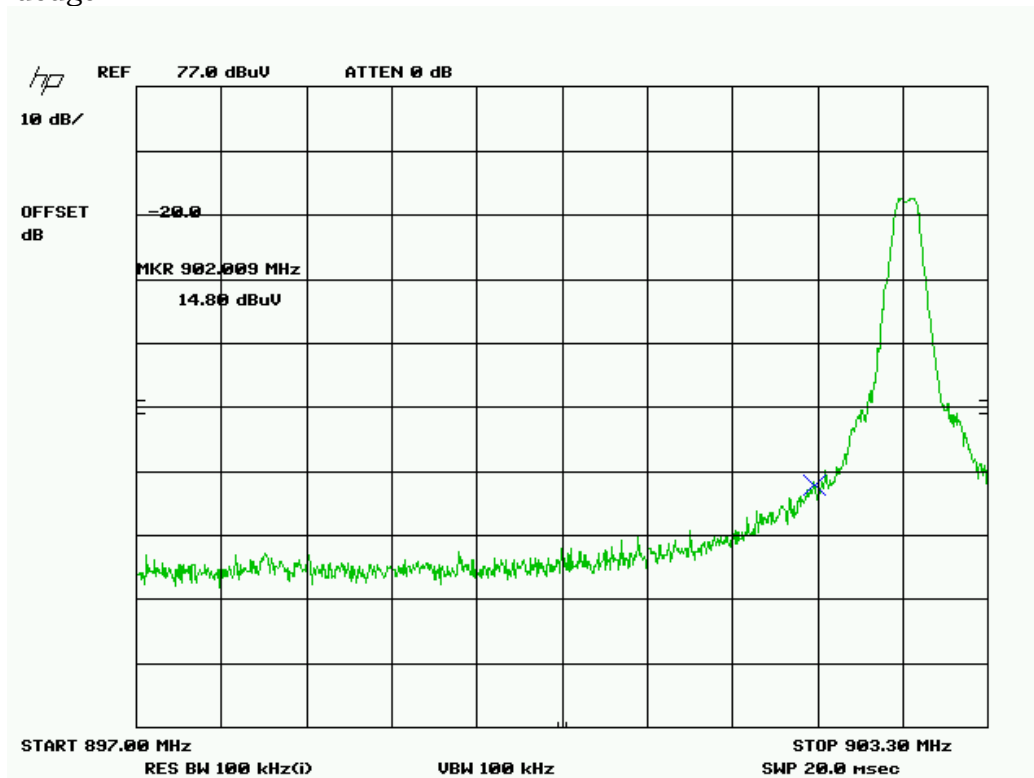
BAND EDGE COMPLIANCE

Rules Part No.: 15.249 (d)

Requirements: 50 dBc or 46 dB μ V/m.

Test Data – with 4 ELEMENT YAGI ANTENNA MODEL #: 918-4 7 dBd GAIN:

Lower bandedge



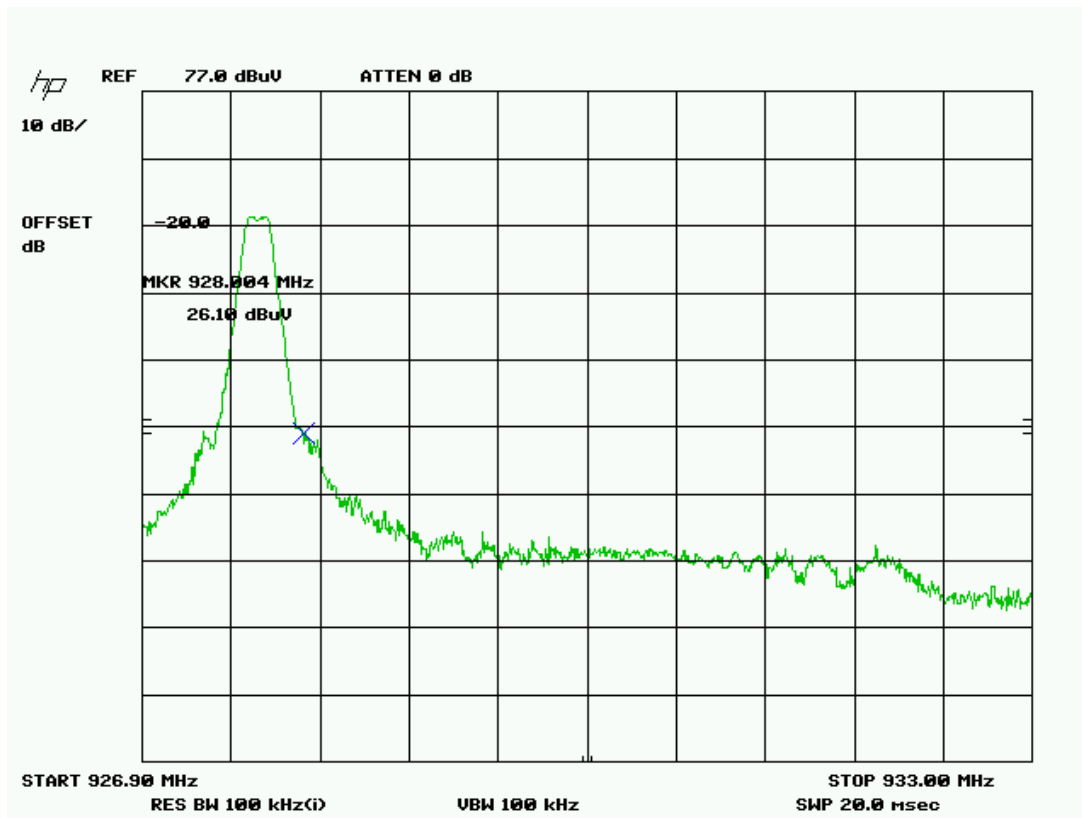
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dB μ V	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dB μ V/m	Peak/Ave
902.7	902	14.8	H	1.95	23.3	40.05	P

APPLICANT: SYN-TECH SYSTEMS, INC.

FCC ID: NR3AIM2FMU

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Upper bandedge
Peak



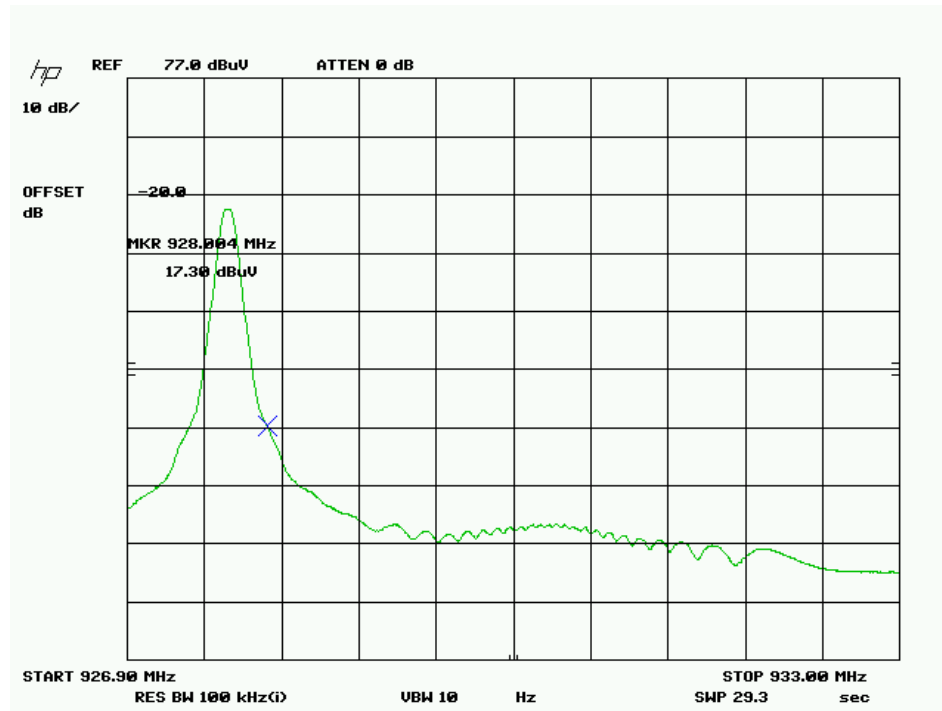
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBμV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBμV/m	Peak/Ave
927.7	928	26.1	H	1.99	23.45	51.54	P
927.7	928	17.3	H	1.99	23.45	42.74	A

APPLICANT: SYN-TECH SYSTEMS, INC.

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Upper bandedge
Average



APPLICANT: SYN-TECH SYSTEMS, INC.
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RADIATION INTERFERENCE (Antenna 3)

Rules Part No.: 15.249, 15.209

Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) $\mu\text{V/m}$ @ 300 meters
490 to 1705 kHz	24000/F (kHz) $\mu\text{V/m}$ @ 30 meters
1705 kHz to 30 MHz	29.54 dB $\mu\text{V/m}$ @ 30 meters
30 – 88	40.0 dB $\mu\text{V/m}$ @ 3 meters
80 – 216	43.5 dB $\mu\text{V/m}$ @ 3 meters
216 – 960	46.0 dB $\mu\text{V/m}$ @ 3 meters
Above 960	54.0 dB $\mu\text{V/m}$ @ 3 meters
Part 15.249	
Fundamental 902 – 928 MHz	94.0 dB $\mu\text{V/m}$ @ 3 meters
Fundamental 2.4 – 2.4835 MHz	94.0 dB $\mu\text{V/m}$ @ 3 meters
Harmonics	54.0 dB $\mu\text{V/m}$ @ 3 meters

TEST CONFIGURATION:

- TRANSMITTER SOFTWARE SET FOR 20dB OF ATTENUATION AND AN EXTERNAL 6 dB PAD
- 6 ELEMENT YAGI ANTENNA MODEL #: 918-6 9 dBd GAIN
- DELL LAPTOP COMPUTER MODEL PP01L

Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dB μV	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Field Strength dB $\mu\text{V/m}$	Margin dB
902.6	902.60	65.7	H	1.95	23.33	90.98	3.02
919.7	919.70	67.1	H	1.98	23.30	92.38	1.62
927.7	927.70	66.1	H	1.99	23.45	91.54	2.46

APPLICANT: SYN-TECH SYSTEMS, INC.

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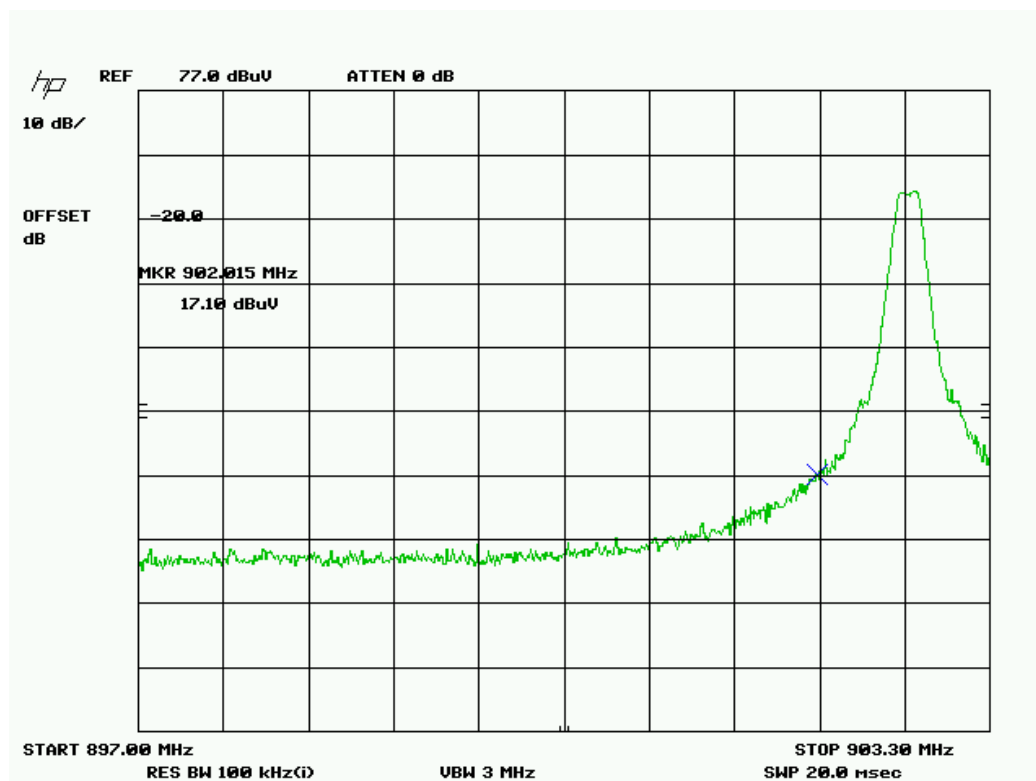
BAND EDGE COMPLIANCE

Rules Part No.: 15.249 (d)

Requirements: 50 dBc or 54 dB μ V/m.

Test Data – with 6 ELEMENT YAGI ANTENNA MODEL #: 918-6 9 dBd GAIN:

Lower bandedge



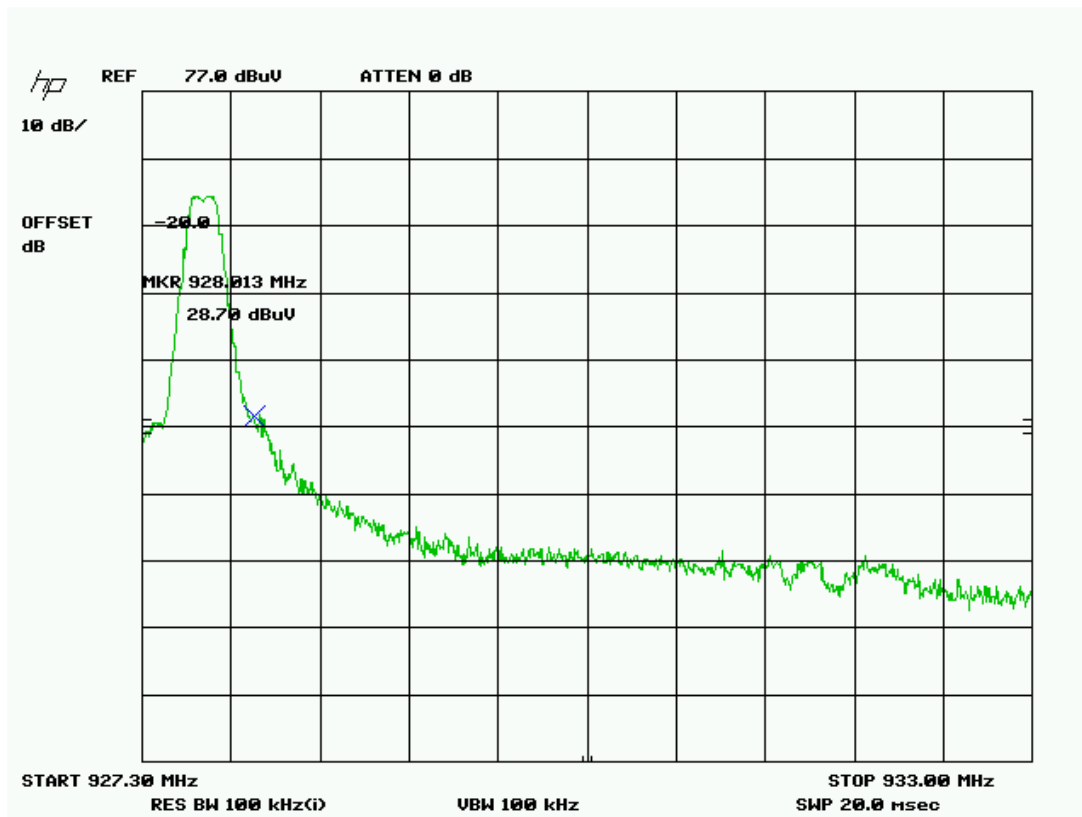
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dB μ V	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dB μ V/m	Peak/Ave
902.7	902	17.1	H	1.95	23.3	42.35	P

APPLICANT: SYN-TECH SYSTEMS, INC.

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Upper bandedge
Peak



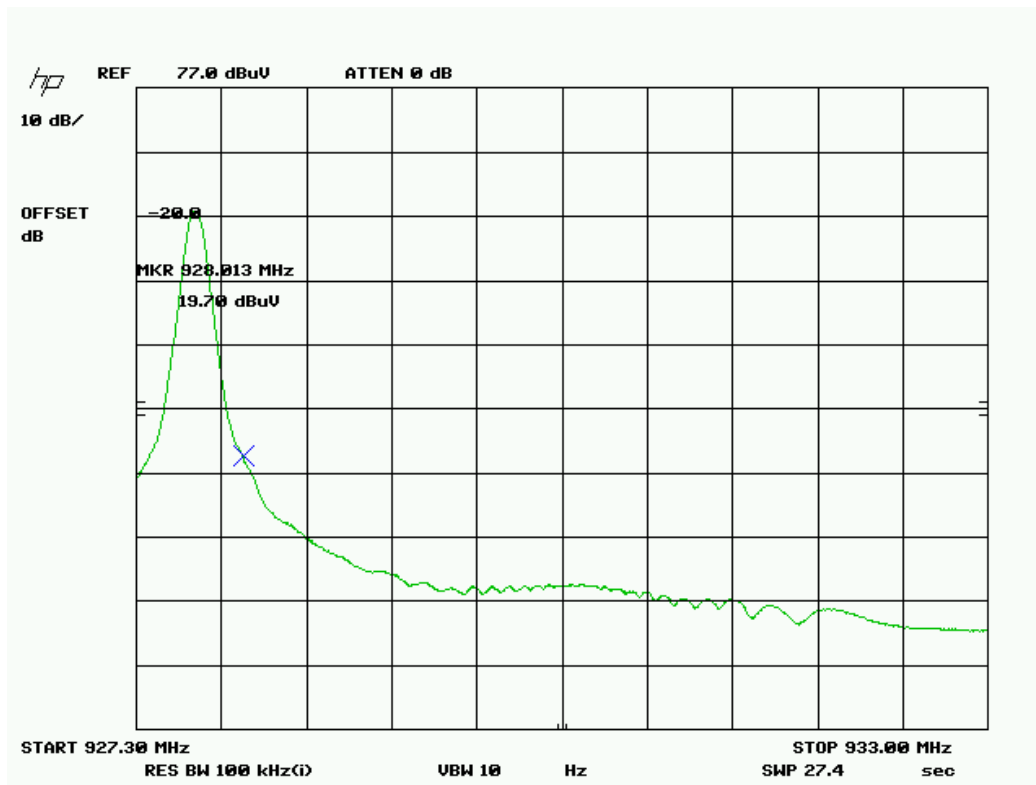
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBμV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBμV/m	Peak/Ave
927.7	928	28.7	H	1.99	23.45	54.14	P
927.7	928	19.7	H	1.99	23.45	45.14	A

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Upper bandedge
Average



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RADIATION INTERFERENCE (Antenna 4)

Rules Part No.: 15.249, 15.209

Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) $\mu\text{V}/\text{m}$ @ 300 meters
490 to 1705 kHz	24000/F (kHz) $\mu\text{V}/\text{m}$ @ 30 meters
1705 kHz to 30 MHz	29.54 dB $\mu\text{V}/\text{m}$ @ 30 meters
30 – 88	40.0 dB $\mu\text{V}/\text{m}$ @ 3 meters
80 – 216	43.5 dB $\mu\text{V}/\text{m}$ @ 3 meters
216 – 960	46.0 dB $\mu\text{V}/\text{m}$ @ 3 meters
Above 960	54.0 dB $\mu\text{V}/\text{m}$ @ 3 meters
Part 15.249	
Fundamental 902 – 928 MHz	94.0 dB $\mu\text{V}/\text{m}$ @ 3 meters
Fundamental 2.4 – 2.4835 MHz	94.0 dB $\mu\text{V}/\text{m}$ @ 3 meters
Harmonics	54.0 dB $\mu\text{V}/\text{m}$ @ 3 meters

TEST CONFIGURATION:

- TRANSMITTER SOFTWARE SET FOR 20dB OF ATTENUATION AND AN EXTERNAL 6 dB PAD
- 10 ELEMENT YAGI ANTENNA MODEL #: 918-10 12 dBd GAIN
- DELL LAPTOP COMPUTER MODEL PP01L

Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dB μV	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Field Strength dB $\mu\text{V}/\text{m}$	Margin dB
902.6	902.60	64.5	H	1.95	23.33	89.78	4.22
919.7	919.70	64.5	H	1.98	23.30	89.78	4.22
927.7	927.70	64.4	H	1.99	23.45	89.84	4.16

APPLICANT: SYN-TECH SYSTEMS, INC.

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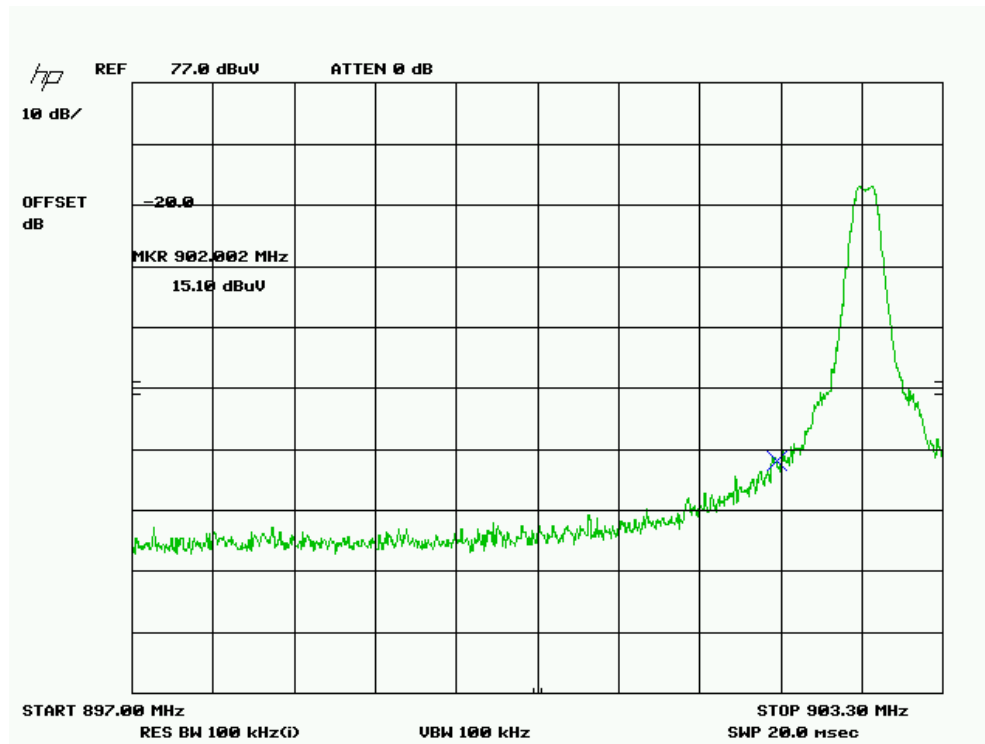
BAND EDGE COMPLIANCE

Rules Part No.: 15.249 (d)

Requirements: 50 dBc or 46 dB μ V/m.

Test Data – with 10 ELEMENT YAGI ANTENNA MODEL #: 918-10 12 dBd GAIN:

Lower bandedge
Peak



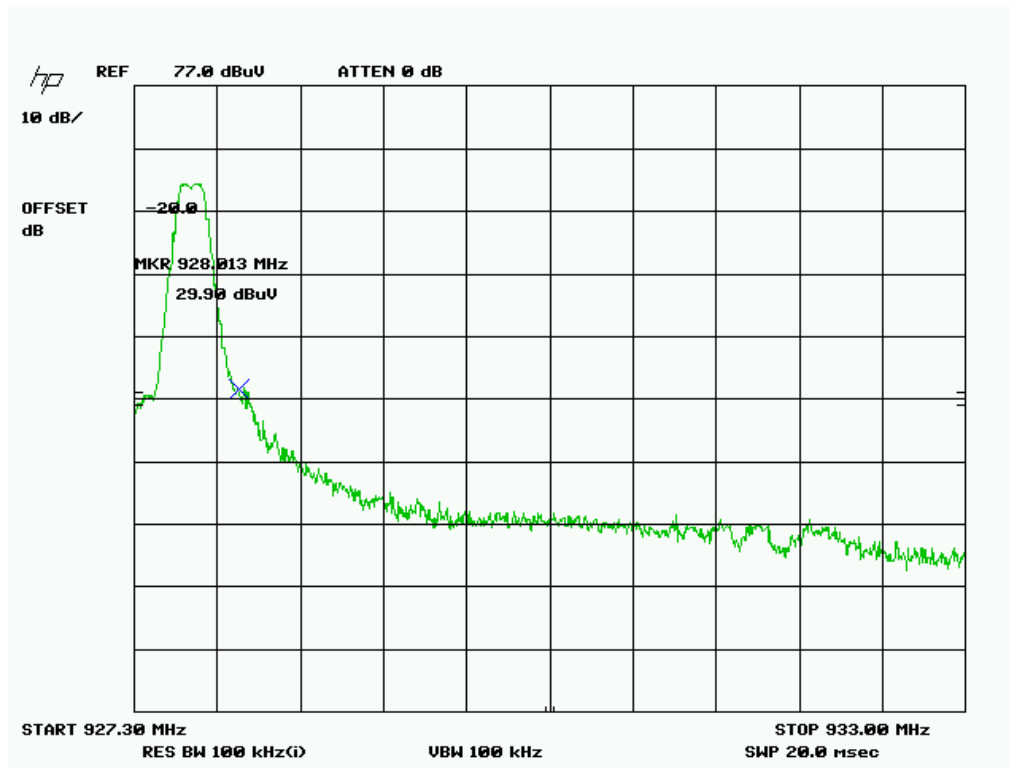
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dB μ V	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dB μ V/m	Peak/Ave
902.7	902	15.1	H	1.95	23.3	40.35	P

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Upper bandedge
Peak



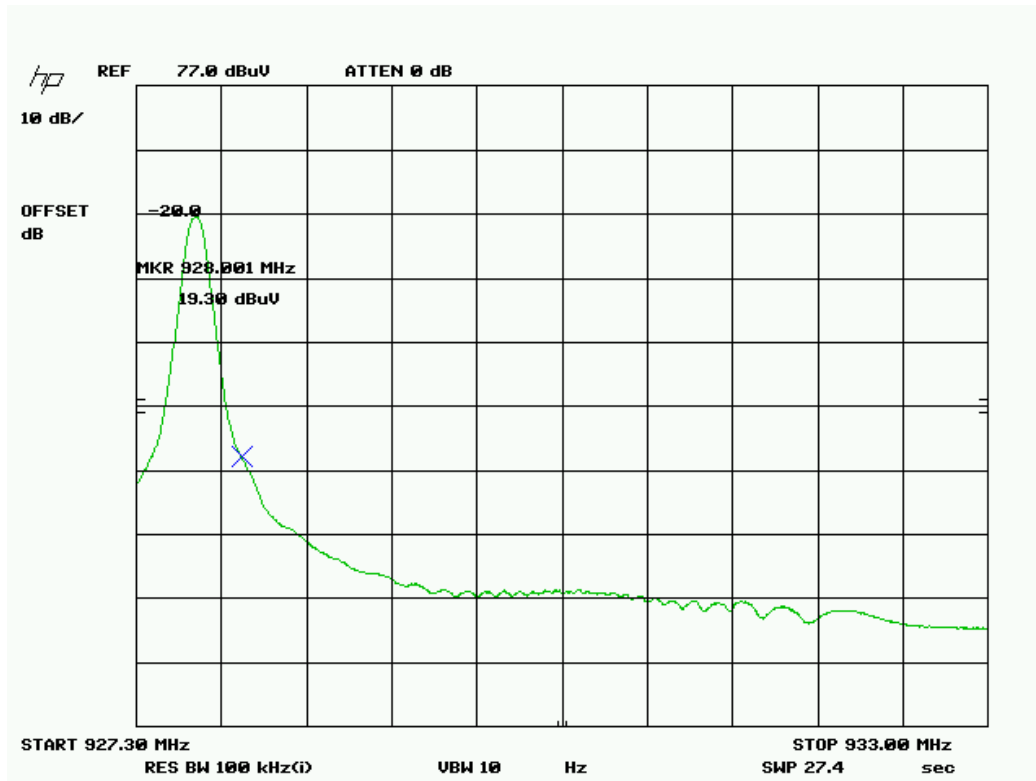
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBμV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBμV/m	Peak/Ave
927.7	928	29.9	H	1.99	23.45	55.34	P
927.7	928	19.3	H	1.99	23.45	44.74	A

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Upper bandedge
Average



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RADIATION INTERFERENCE (Antenna 5)

Rules Part No.: 15.249, 15.209

Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) $\mu\text{V/m}$ @ 300 meters
490 to 1705 kHz	24000/F (kHz) $\mu\text{V/m}$ @ 30 meters
1705 kHz to 30 MHz	29.54 dB $\mu\text{V/m}$ @ 30 meters
30 – 88	40.0 dB $\mu\text{V/m}$ @ 3 meters
80 – 216	43.5 dB $\mu\text{V/m}$ @ 3 meters
216 – 960	46.0 dB $\mu\text{V/m}$ @ 3 meters
Above 960	54.0 dB $\mu\text{V/m}$ @ 3 meters
Part 15.249	
Fundamental 902 – 928 MHz	94.0 dB $\mu\text{V/m}$ @ 3 meters
Fundamental 2.4 – 2.4835 MHz	94.0 dB $\mu\text{V/m}$ @ 3 meters
Harmonics	54.0 dB $\mu\text{V/m}$ @ 3 meters

TEST CONFIGURATION:

- TRANSMITTER SOFTWARE SET FOR 20 dB OF ATTENUATION
- FLEXIBLE ROD MAXRAD MODEL #: MUF8963 ANTENNA 3 dBi GAIN
- DELL LAPTOP COMPUTER MODEL PP01L

Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Field Strength dBuV/m	Margin dB
902.7	902.70	57.0	V	1.95	22.67	81.62	12.38
919.7	919.70	57.0	V	1.98	22.60	81.58	12.42
927.7	927.70	58.1	V	1.99	22.68	82.77	11.23

APPLICANT: SYN-TECH SYSTEMS, INC.

FCC ID: NR3AIM2FMU

REPORT: S\SYN_NR3\1887AUT8\1887AUT8TestReport.doc

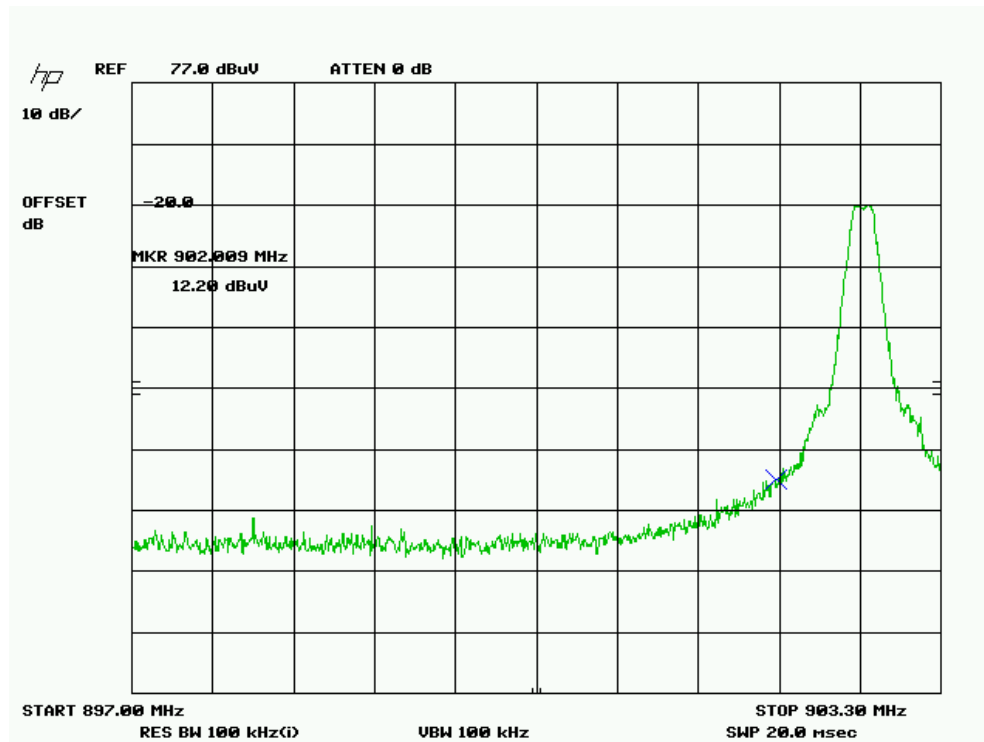
BAND EDGE COMPLIANCE (Antenna 5)

Rules Part No.: 15.249 (d)

Requirements: 50 dBc or 46 dBuV/m.

Test Data –FLEXIBLE ROD MAXRAD MODEL #: MUF8963 ANTENNA 3 dBi GAIN

Lower bandedge
Peak



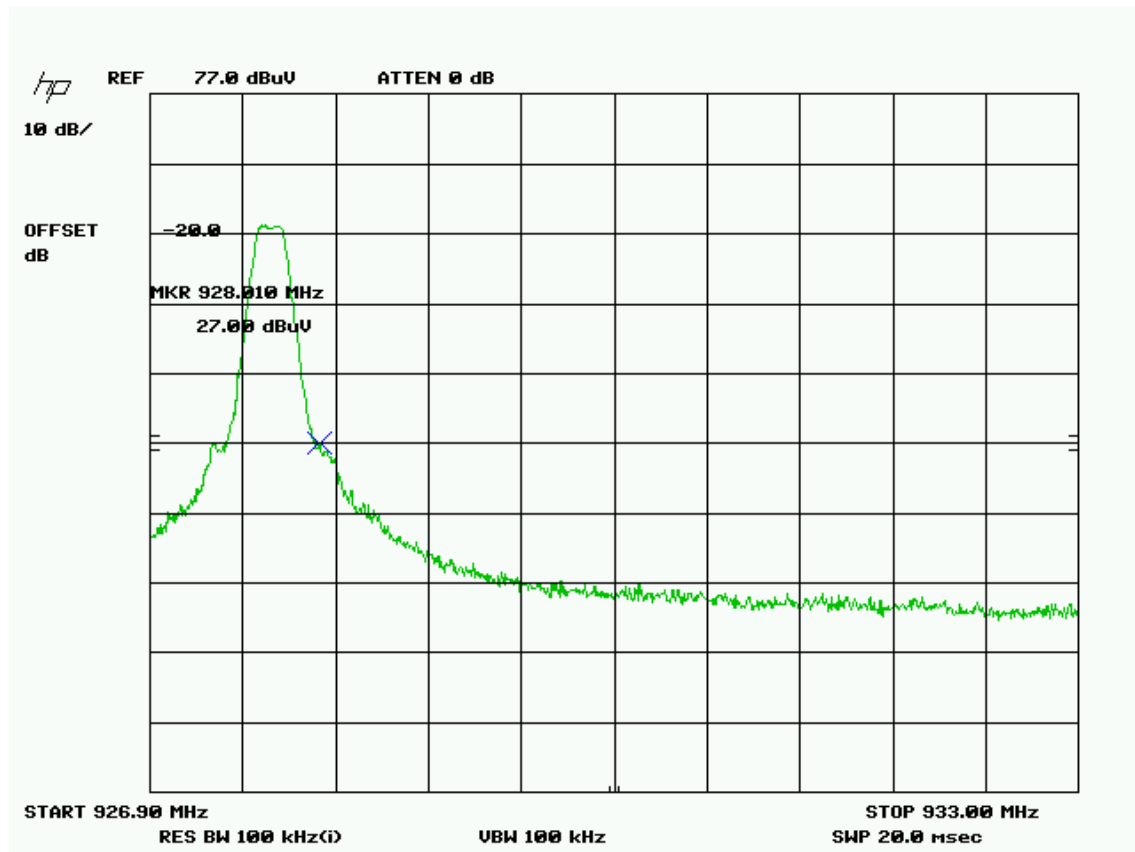
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Pol V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBuV/m	Peak Average
902.7	902.00	12.2	V	1.95	22.68	36.83	P

APPLICANT: SYN-TECH SYSTEMS, INC.

FCC ID: NR3AIM2FMU

REPORT: S\SYN_NR3\1887AUT8\1887AUT8TestReport.doc

Upper bandedge – 20 dB pad Vertical-
Peak



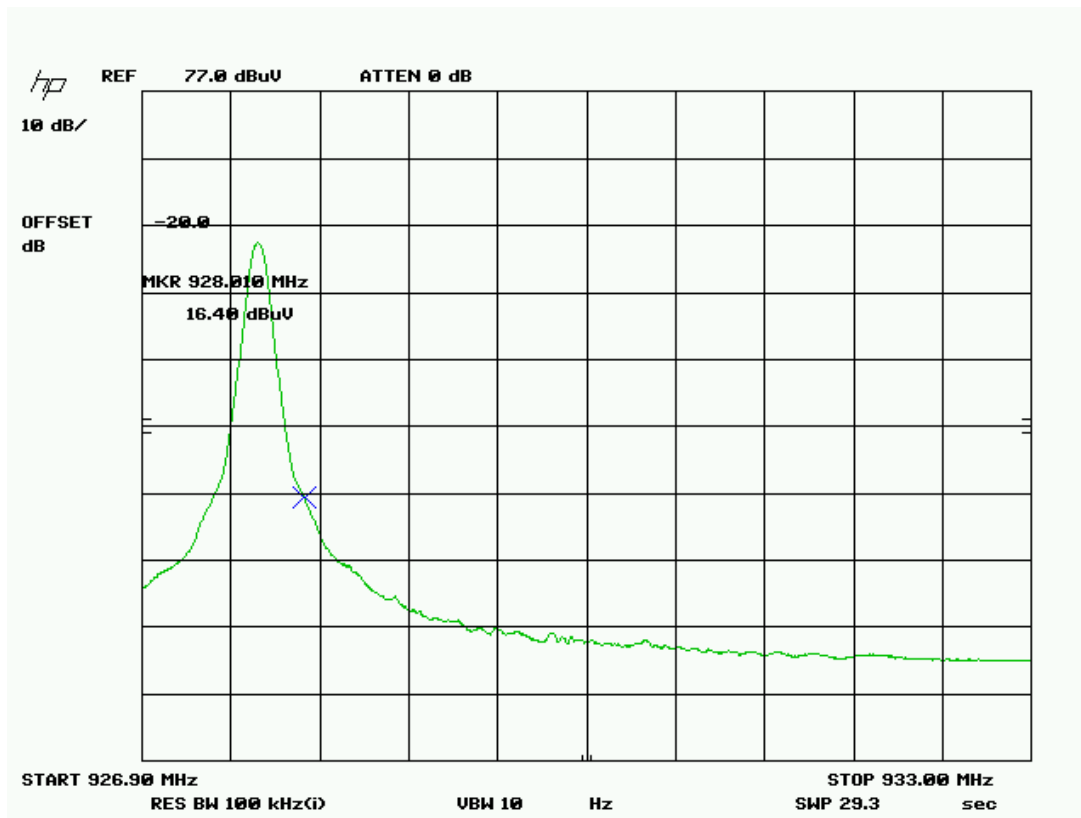
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Pol V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBuV/m	Peak/Average
927.7	928.00	27.0	V	1.99	22.68	51.67	P
927.7	928.00	16.4	V	1.99	22.68	41.07	A

APPLICANT: SYN-TECH SYSTEMS, INC.

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Upper bandedge –
Average



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