TEST REPORT

Report Number: 3174858MIN-001
Project Number: 3174858

Testing performed on the
475 Field Communicator
FCC ID: XAF475
Industry Canada ID: 8299A-475

to
47 CFR Part 15. 249:2008
RSS- 210, Issue 7, 2007

For
Emerson Process Management

Test Performed by:
Intertek Testing Services NA, Inc.
7250 Hudson Blvd., Suite 100
Oakdale, MN 55128

Test Authorized by:
Emerson Process Management.
12001 Technology Drive, Mail Stop AB06
Eden Prairie, MN 55433

Prepared by: _____ Date: April 14, 2009
Uri Spector

Reviewed by: _____ Date: April 14, 2009
Norman Shpilsher

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1.0 GENERAL DESCRIPTION

Model:	475 Field Communicator
Type of EUT:	Wireless Field Communicator
Serial Number:	11063677
FCC ID:	XAF475
Industry Canada ID:	8299A-475
Related Submittal(s) Grants:	None
Company:	Emerson Process Management
Customer:	Mr. Todd Toepke
Address:	12001 Technology Drive, Mail Stop AB06 Eden Prairie, MN 55344
Phone:	(952) 828-3391
Fax:	
Test Standards:	☒ 47 CFR, Part 15:2008, §15.249 ☒ RSS–210, Issue 7, 2007 ☒ RSS-Gen, Issue 2, 2007 ☒ 47 CFR, Part 15:2008, §15.109, Class B ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	March 30, 2009
Test Work Started:	March 30, 2009
Test Work Completed:	April 14, 2009
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	Field Communicator, Bluetooth Transmitter
Operating Frequency	2402-2480 MHz
Channel Number:	79
Emission Designator:	881KG2D
Antenna(s) Info:	Integral antenna
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter Power Configuration:	☒ Internal battery ☒ External power source ☒ 120VAC ☐ 230VAC ☐ 400VAC ☒ 7.2 VDC ☐ Other: Amp. ☐ 50Hz ☐ 60Hz
Special Test Arrangement:	As a hand-held device the EUT was rotated through three orthogonal axes to determine and tested with the maximum emissions
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.4-2003

1.2 EUT Configuration

The equipment under test was operated during the measurement under the following conditions:

☐ - Standby
☒ - Continuous
☐ - Test program (customer specific)
☐ -

Operating modes of the EUT:

No.	Description
1	The device was pre-programmed to transmit continuously in three separate frequency channels, low, middle, and upper frequency channel, one channel being transmitted at a given time.

Cables:

No.	Type	Length	Designation	Note
1	HART Communication Cable	6ft.	Shielded, BNC connector	
2				

Support equipment/Services:

No.	Item	Description
1	None	
2		

1.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

☐ **Normal**

Temperature: 15-35 °C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

1.4 Measurement uncertainty

The expanded uncertainty (k = 2) for radiated emissions from 30 to 1000 MHz has been determined to be: ±4 dB at 10m and ±5.4 dB at 3m

The expanded uncertainty (k = 2) for conducted emissions from 150 kHz to 30 MHz has been determined to be:
±2.6 dB

1.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured emissions reading on the EMI Receiver.
The basic equation with a sample calculation is as follows:
FS = RA + AF + CF - AG

Where: FS = Field Strength in dB(µV/m)
RA = Receiver Amplitude in dB(µV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB(m^{-1})
AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB(µV) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB(µV/m).

RA = 48.1 dB(µV)
AF = 7.4 dB(m^{-1})
CF = 1.6 dB
AG = 16.0 dB
FS = RA + AF + CF - AG
FS = 48.1 + 7.4 + 1.6 – 16.0
FS = 41.1 dB(µV/m)

General notes: None

2.0 TEST SUMMARY

Referring to the performance criteria and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards.

TEST SPECIFICATION	TEST PARAMETERS	RESULT
15.249(a) / RSS-210 A2.9(a)	Field strength of fundamental	Pass
15.249(a) / RSS-210 A2.9(a)	Field strength of harmonics	Pass
15.249(d) / RSS-210 A2.9(b)	Field strength of spurious emissions	Pass
15.215(c) / RSS- Gen 4.6.1	Bandwidth of the emission	Pass
15.207/RSS-Gen 7.2.2	Transmitter Power Line conducted emissions	Pass
15.109/ICES-003	Receiver/digital device radiated emissions	Pass
15.107/ ICES-003	Digital device conducted emissions	Pass

3.0 TEST CONDITIONS AND RESULTS

3.1 Field strength of fundamental

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Max. Emissions margin at fundamental: 4.1 dB below the limits

Notes: Test performed at low, middle and upper channel

Date:	April 3, 2009	**Result: Pass**
Standard:	FCC 15.249(a) / RSS-210 A2.9	
Tested by:	Richard Blonigen	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	All measurements were performed with using Peak detector	

Table 3.1.1

Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Reading	Total @ 3m	Average CF	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dBµV/m	dB	dBµV/m	dB	
					Peak Limits						
2405.00	V	131	28.3	4.1	0.0	54.5	86.9	0.0	114.0	-27.1	
2405.00	H	188	28.3	4.1	0.0	56.1	88.5	0.0	114.0	-25.5	
2442.00	V	126	28.4	4.1	0.0	54.2	86.8	0.0	114.0	-27.2	
2442.00	H	224	28.4	4.1	0.0	57.3	89.9	0.0	114.0	-24.1	
2480.00	V	100	28.5	4.1	0.0	52.3	85.0	0.0	114.0	-29.0	
2480.00	H	219	28.5	4.1	0.0	57.0	89.7	0.0	114.0	-24.3	
					Average Limits						
2405.00	V	131	28.3	4.1	0.0	54.5	86.9	0.0	94.0	-7.1	
2405.00	H	188	28.3	4.1	0.0	56.1	88.5	0.0	94.0	-5.5	
2442.00	V	126	28.4	4.1	0.0	54.2	86.8	0.0	94.0	-7.2	
2442.00	H	224	28.4	4.1	0.0	57.3	89.9	0.0	94.0	-4.1	
2480.00	V	100	28.5	4.1	0.0	52.3	85.0	0.0	94.0	-9.0	
2480.00	H	219	28.5	4.1	0.0	57.0	89.7	0.0	94.0	-4.3	

3.2 Field strength of harmonics and spurious emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Frequency range of measurements: 30MHz-25GHz (10^{th} Harmonic)

Test result: **Pass**

Max. margin of harmonics and spurious emissions: 0.3dB below the limits

Notes: No Spurious Emissions related to transmitter were detected at the frequency range 30MHz-1000MHz. For Harmonics Emissions see Table 3.2.1. Test performed at low, middle and upper channel.

Date:	April 13, 2009	**Result: Pass**
Standard:	FCC 15.249(a) and (d) / RSS-210 A2.9	
Tested by:	Uri Spector	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	No emissions above ambient noise were detected above the 2nd harmonics	

Table 3.2.1

Frequency MHz	Antenna Polarity	Antenna Hts(cm)	Ant. CF dB1/m	Cable loss dB	Pre-amp Gain (dB)	Avg Reading dBµV	Total @ 3m dBµV/m	Average CF dB	Limit dBµV/m	Margin dB	Comments
			Harmonics Emissions								
					Channel 2405MHz						
4810.40	V	130	33.0	6.3	39.8	51.0	50.6	0.0	54.0	-3.4	
					Channel 2440MHz						
4884.42	V	119	33.1	6.4	39.8	53.8	53.6	0.0	54.0	-0.4	
					Channel 2480MHz						
4960.38	V	126	33.2	6.5	39.7	53.7	53.7	0.0	54.0	-0.3	
	Spurious Emissions-Bandedge Compliance, Peak Reading										
2400.00	V	130	28.3	4.1	39.8	22.8	15.4	0.0	54.0	-38.6	
2483.50	V	126	28.6	4.1	39.7	22.6	15.6	0.0	54.0	-38.4	

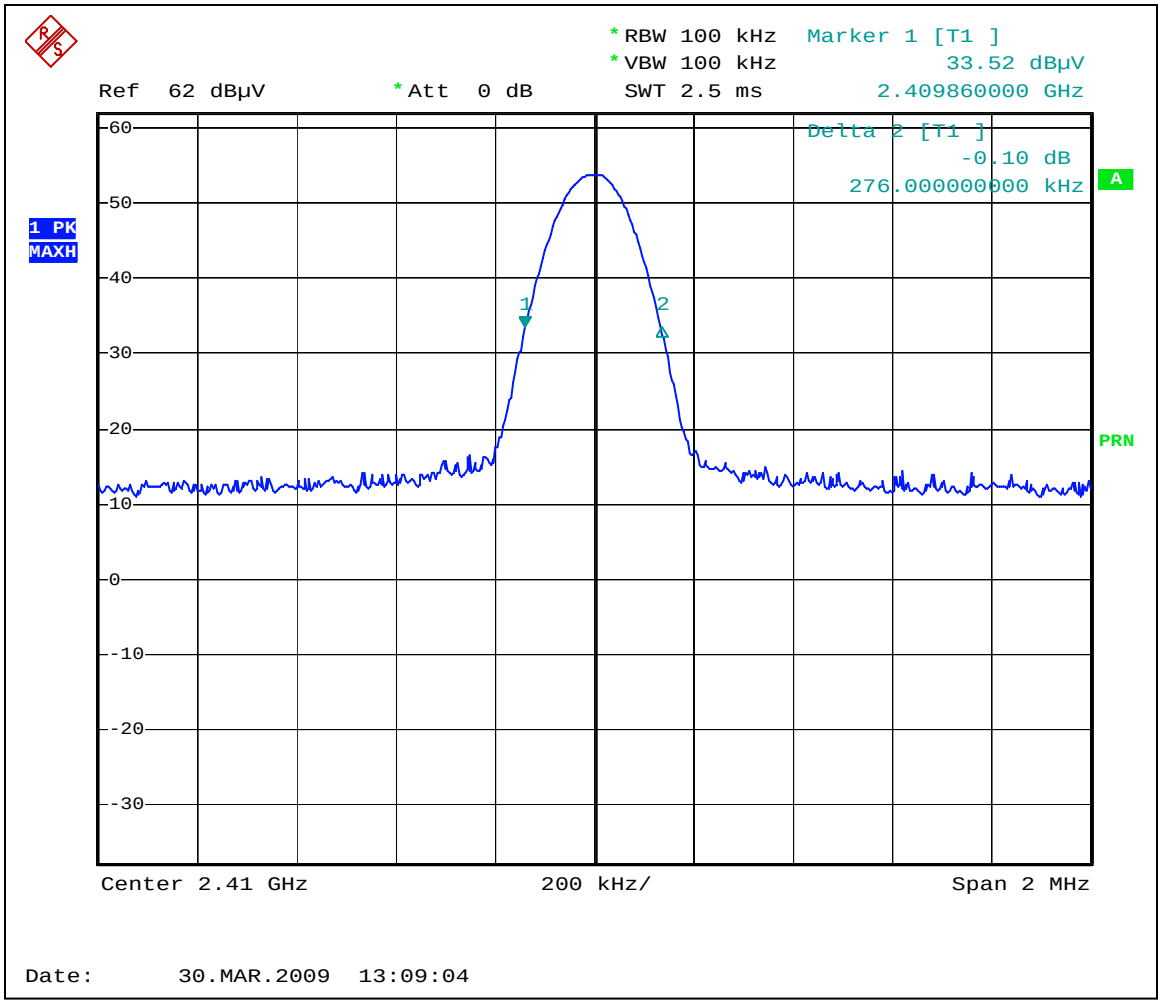
3.3 Bandwidth of Emissions

Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz
276	236

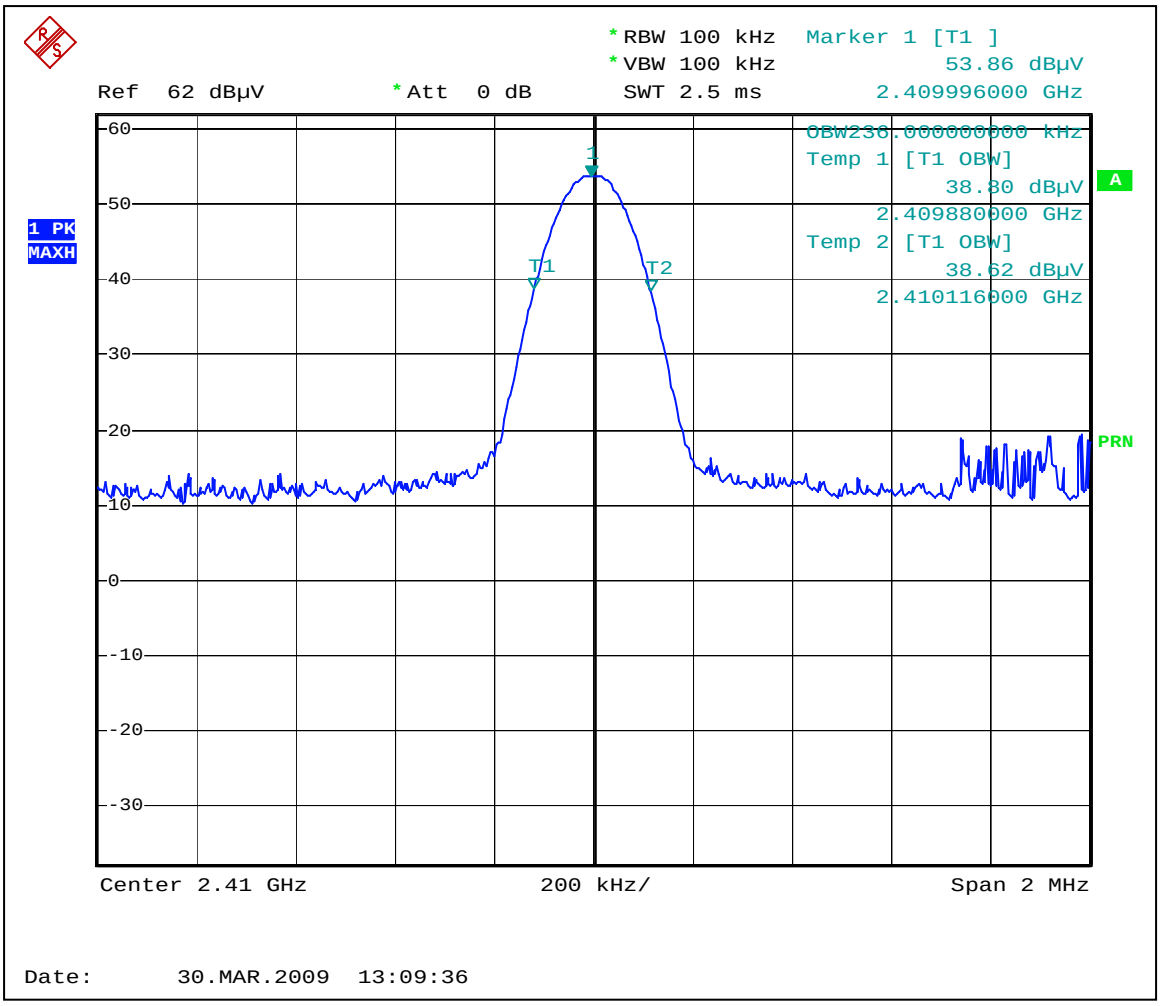
Graphs 3-3-1 and 3-3-2 are show bandwidth of emissions

Notes: The bandwidth of emissions is contained within the frequency band of operation

Graph 3.3.1


*RBW 100 kHz
*VBW 100 kHz
Ref 62 dBµV
*Att 0 dB
SWT 2.5 ms
Marker 1 [T1]
33.52 dBµV
2.409860000 GHz
Delta 2 [T1]
-0.10 dB
276.000000000 kHz
A
1 PK
MAXH
PRN
60
50
40
30
20
10
0
-10
-20
-30
Center 2.41 GHz
200 kHz/
Span 2 MHz
Date: 30.MAR.2009 13:09:04

Graph 3.3.2


*RBW 100 kHz
*VBW 100 kHz
Ref 62 dBµV
*Att 0 dB
SWT 2.5 ms
Marker 1 [T1]
53.86 dBµV
2.409996000 GHz
OBW238.000000000 kHz
Temp 1 [T1 OBW]
38.80 dBµV
2.409880000 GHz
Temp 2 [T1 OBW]
38.62 dBµV
2.410116000 GHz
1 PK
MAXH
A
PRN
T1
T2
60
50
40
30
20
10
0
-10
-20
-30
Center 2.41 GHz
200 kHz/
Span 2 MHz
Date: 30.MAR.2009 13:09:36

3.4 Transmitter power line conducted emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 10.9 dB below the limits

Notes: None

Date:	March 30, 2009	**Result:** **Pass**
Standard:	FCC 15.207	
Tested by:	Richard Blonigen	
Test Point:	Power Line L1 and L 2	
Operation mode:	See Page 5	
Note:		

Table 3.4.1

Line 1

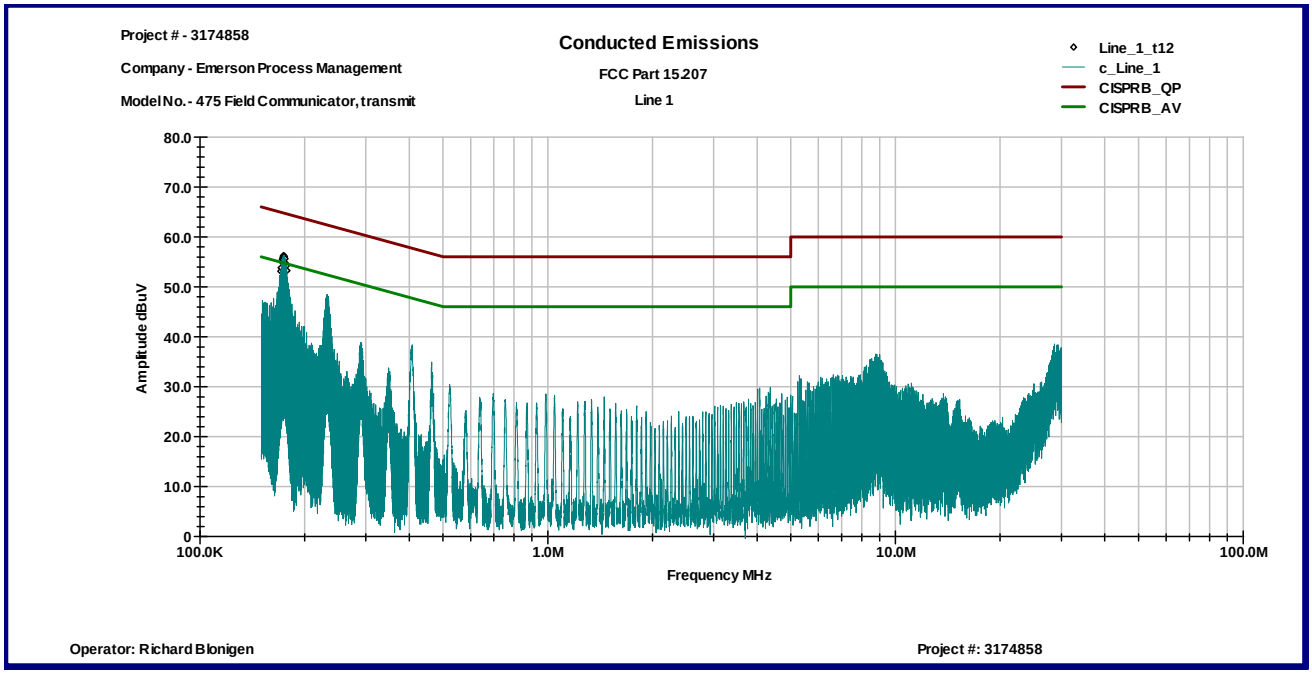
Frequency	QP dBµV	AVG dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
174.44 KHz	53.6	40.2	64.8	54.8	-11.2	-14.5
174.99 KHz	53.9	40.5	64.7	54.7	-10.9	-14.2
176.53 KHz	53.4	40.0	64.7	54.7	-11.3	-14.6
235.51 KHz	45.4	34.3	62.3	52.3	-16.8	-18.0
410.3 KHz	36.6	34.0	57.6	47.6	-21.1	-13.6
8.708 MHz	32.1	23.6	60.0	50.0	-27.9	-26.4

Line 2

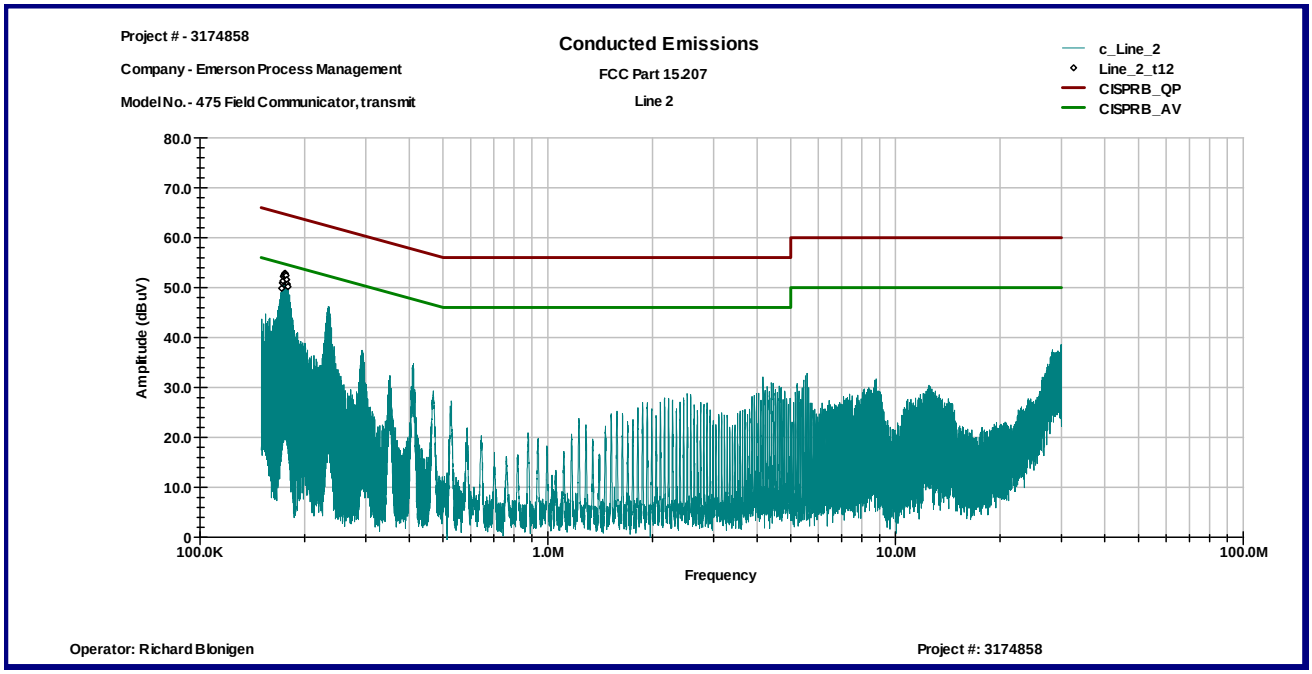
Frequency	QP dBµV	AVG dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
175.66 KHz	51.2	38.0	64.7	54.7	-13.5	-16.7
176.42 KHz	51.4	38.0	64.7	54.7	-13.3	-16.6
176.75 KHz	51.3	38.1	64.6	54.6	-13.4	-16.6
234.06 KHz	44.4	31.1	62.3	52.3	-18.0	-21.2
411.67 KHz	32.9	27.1	57.6	47.6	-24.7	-20.6
8.7133 MHz	12.0	7.4	60.0	50.0	-48.0	-42.6

Graph 3.4.1

Line 1



Line 2



3.5 Receiver/digital device radiated emissions

Test location: ☐ OATS ☒ Anechoic Chamber

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Frequency range: 30MHz-12.5GHz (5th Harmonic)

Max. Emissions margin: 9.9 dB below the limits

Notes: The Radiated Emissions test was performed in the Anechoic chamber at 3m measurement distance (see Table 3.5.1 and Graphs 3.5.1)

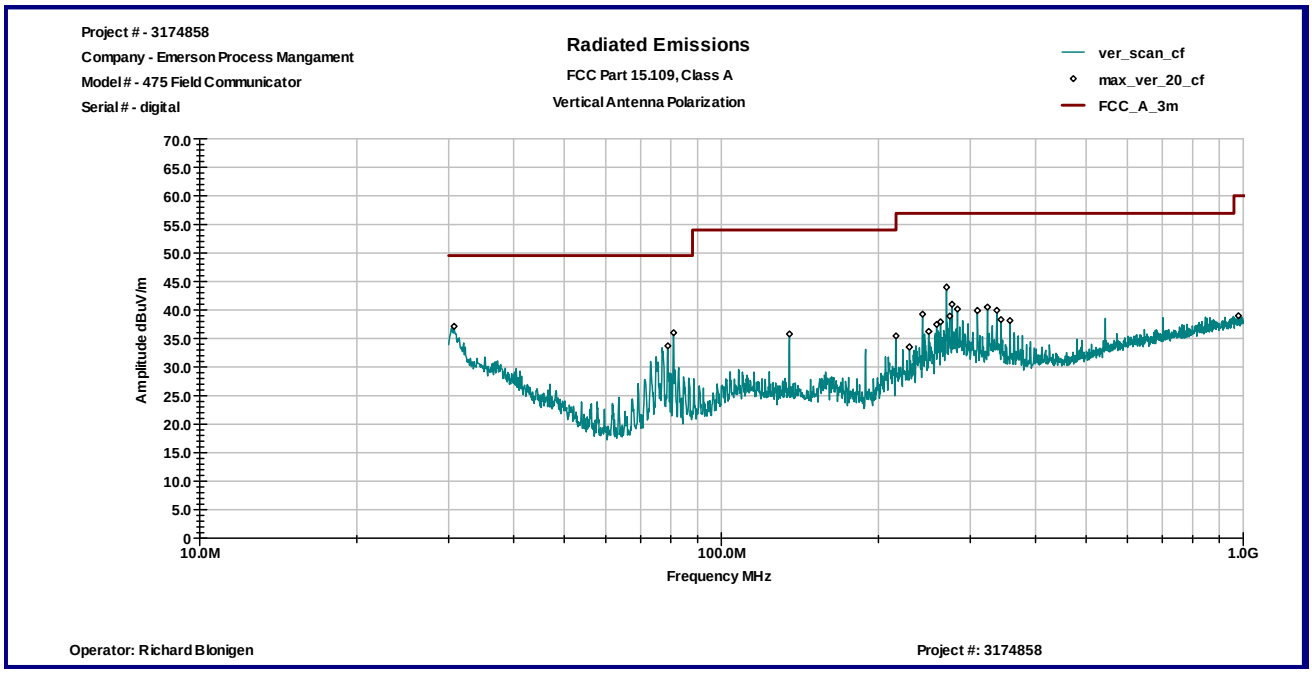
Date:	April 1, 2009	**Result:** **Pass**
Standard:	FCC Part 15.109, Class A	
Tested by:	Richard Blonigen	
Test Point:	Enclosure	
Operation mode:	Digital Device Radiated Emissions	
Note:	None	

Table 3.5.1

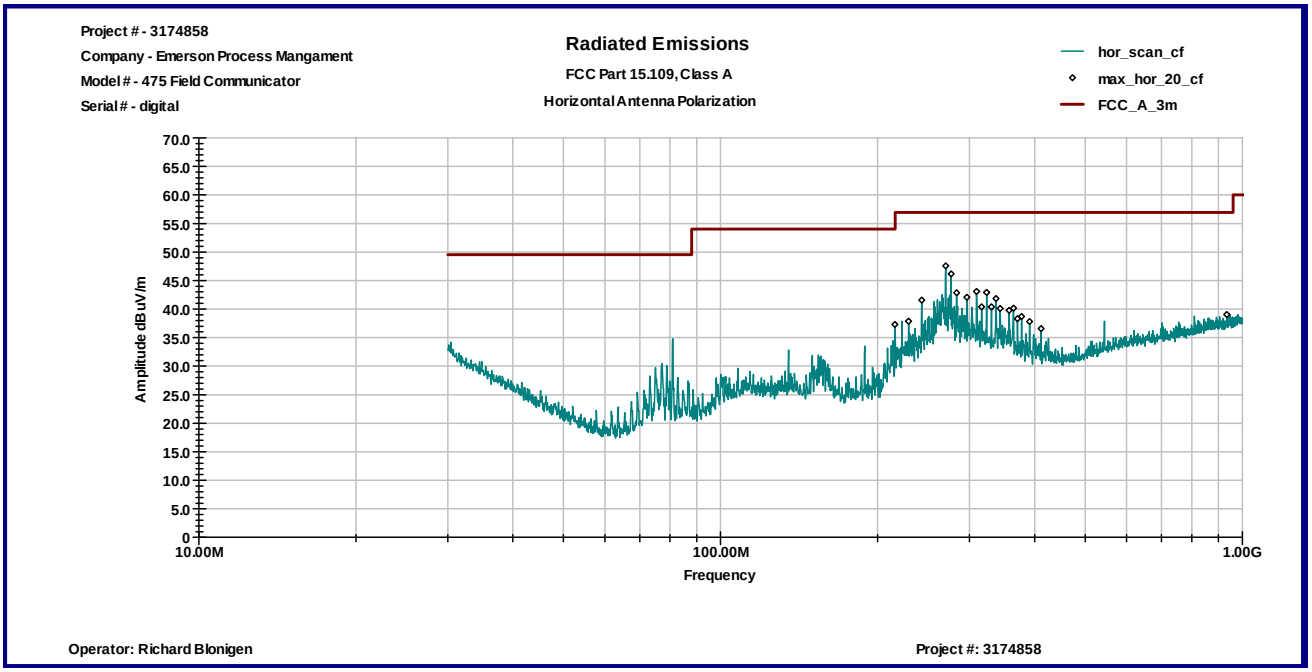
Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Reading	Total @ 3m	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBµV	dBµV/m	dBµV/m	dB	
30.00	V	100	20.5	0.6	0.0	12.0	33.1	49.5	-16.4	
80.95	V	128	8.2	1.0	0.0	26.4	35.5	49.5	-14.0	
134.92	V	100	12.5	1.2	0.0	21.7	35.4	54.0	-18.6	
269.84	V	195	13.9	1.8	0.0	26.8	42.5	56.9	-14.4	
4918.40	V	100	33.2	6.4	39.8	33.8	33.7	60.0	-26.3	
7595.20	V	100	36.6	7.8	39.7	34.1	38.8	60.0	-21.2	
80.95	H	355	8.2	1.0	0.0	24.9	34.0	49.5	-15.5	
156.38	H	205	11.1	1.4	0.0	17.2	29.7	54.0	-24.3	
269.84	H	100	13.9	1.8	0.0	31.3	47.0	56.9	-9.9	
276.55	H	113	13.8	1.9	0.0	26.7	42.4	56.9	-14.5	
5920.80	H	100	34.2	7.0	39.9	34.7	36.0	60.0	-24.0	
9286.40	H	100	37.9	8.4	38.7	33.3	40.9	60.0	-19.1	

Graph 3.5.1

Vertical antenna polarization

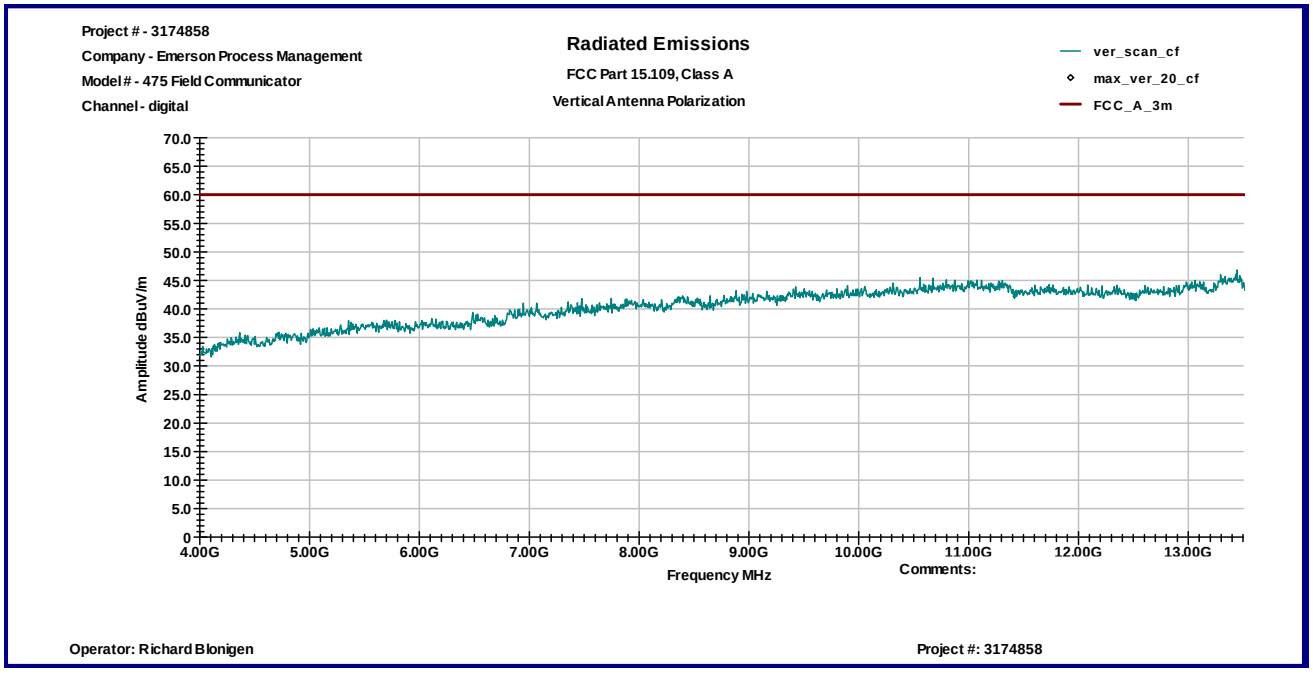


Horizontal antenna polarization

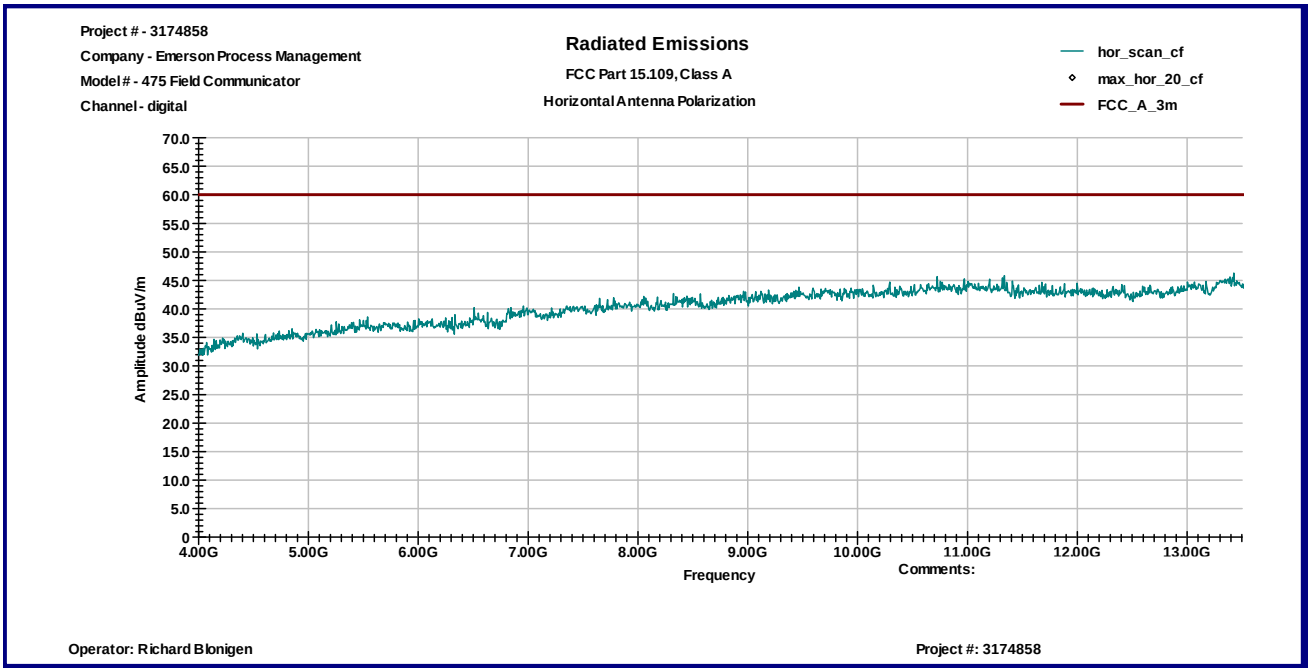


Graph 3.5.2

Vertical antenna polarization



Horizontal antenna polarization



3.6 Digital device conducted emissions

Test location: ☐ OATS ☐ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 25.5 dB below the limits

Notes: None

Date:	March 30, 2009	**Result:** **Pass**
Standard:	FCC Part 15.107, Class A	
Tested by:	Richard Blonigen	
Test Point:	Line 1 and Line 2	
Operation mode:	Digital device conducted	
Note:		

Table 3.6.1

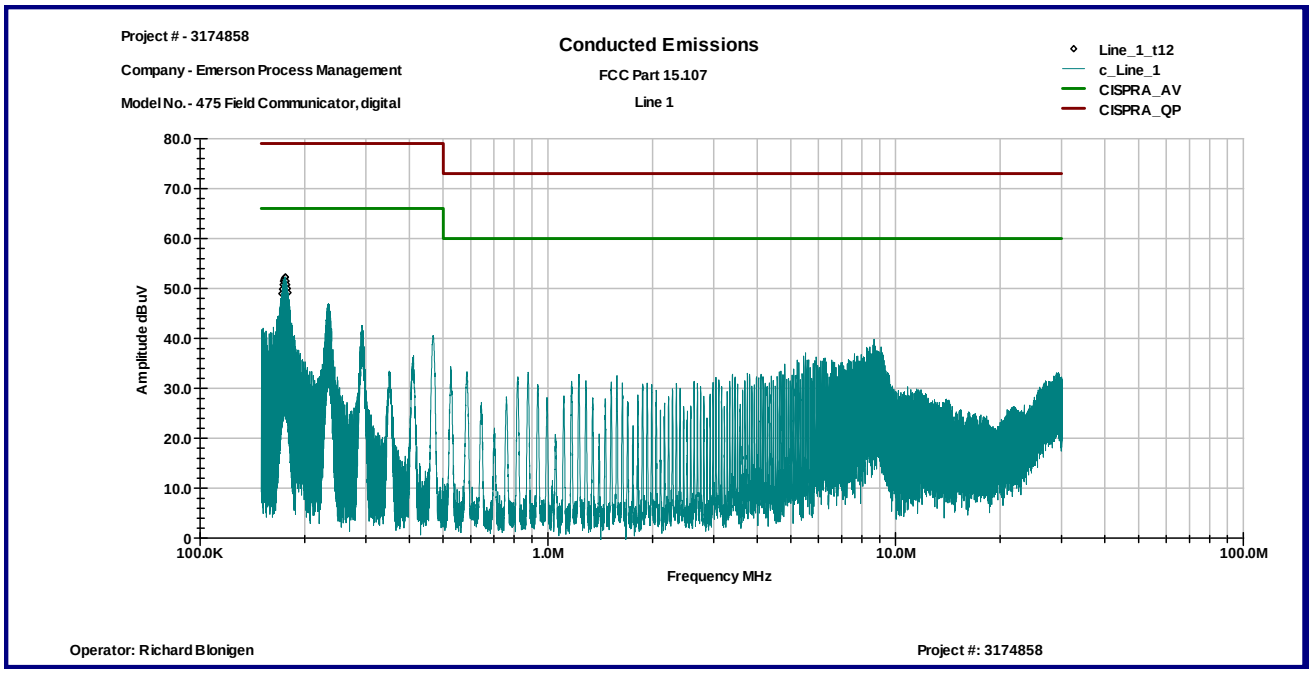
Line 1

Frequency	QP dBµV	AVG dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
174.44 KHz	53.6	40.2	79.0	66.0	-25.4	-25.8
174.99 KHz	53.9	40.5	79.0	66.0	-25.1	-25.5
176.53 KHz	53.4	40.0	79.0	66.0	-25.6	-26.0
235.51 KHz	45.4	34.3	79.0	66.0	-33.6	-31.7
410.3 KHz	36.6	34.0	79.0	66.0	-42.4	-32.0
8.708 MHz	32.1	23.6	73.0	60.0	-40.9	-36.4

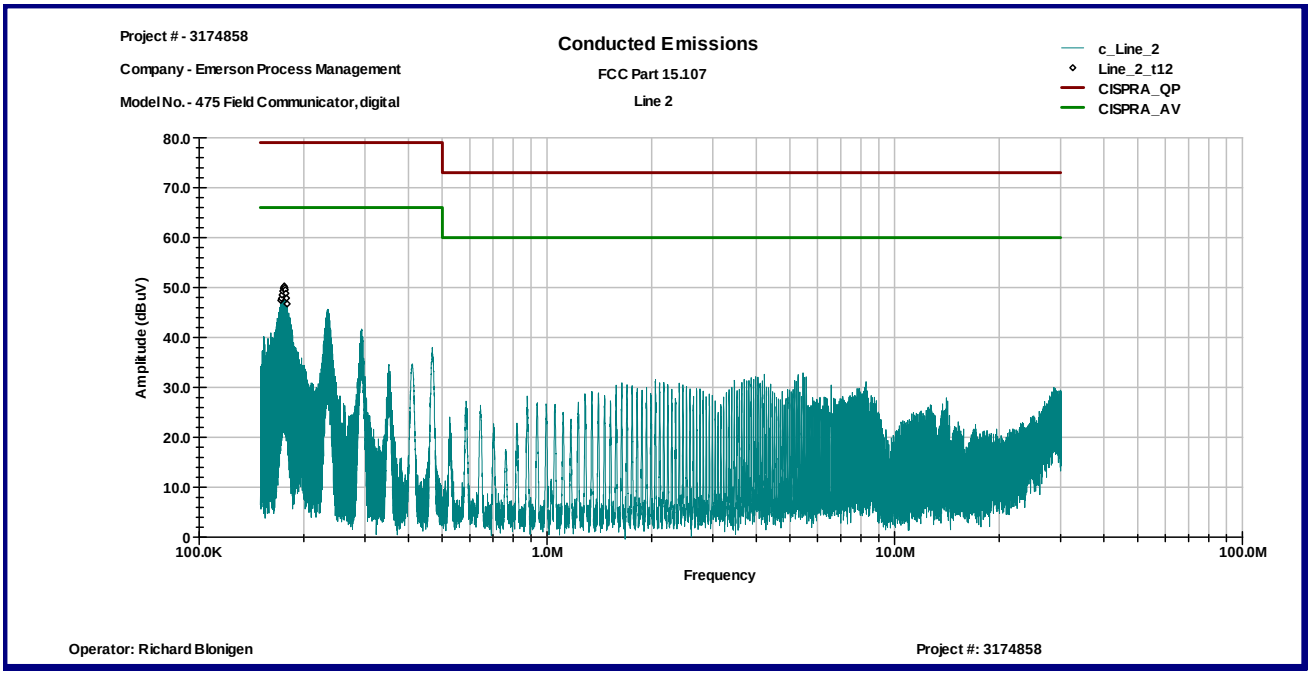
Line 2

Frequency	QP dBµV	AVG dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
175.66 KHz	51.2	38.0	79.0	66.0	-27.8	-28.0
176.42 KHz	51.4	38.0	79.0	66.0	-27.7	-28.0
176.75 KHz	51.3	38.1	79.0	66.0	-27.7	-28.0
234.06 KHz	44.4	31.1	79.0	66.0	-34.7	-34.9
411.67 KHz	32.9	27.1	79.0	66.0	-46.1	-39.0
8.7133 MHz	12.0	7.4	73.0	60.0	-61.0	-52.6

Graph 3.6.1



Graph 3.6.2



4.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	CAL DUE	USED
Spectrum Analyzer	R & S	FSP 40	100024	12559	08/22/2009	☒
Spectrum Analyzer	R & S	ESCI	100358	12909	05/07/2009	☒
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2468	14459	08/27/2009	☒
LISN	Fischer Custom Communications	FCC-LISN-2 MOD.SD	316	9945	10/28/2009	☒
Horn Antenna	EMCO	3115	9507-4513	9936	03/04/2010	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	13475	06/05/2009	☒
System	TILE! Instrument Control		Ver. 3.4.K.29	15259	VBU	☒
High Pass Filter	Reactel	HS-4G-S12	0223	15274	VBU	☒