

# Ingersoll Rand

## ADDENDUM TEST REPORT TO 92314-10

Smart Reader, SM10

### Tested To The Following Standards:

FCC Part 15 Subpart C Sections 15.207, 15.225  
and  
RSS 210 Issue 8

Report No.: 92314-10A

Date of issue: June 6, 2012



This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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## ADMINISTRATIVE INFORMATION

### Test Report Information

**REPORT PREPARED FOR:**

Ingersoll Rand  
500 Golden Ridge Road  
Bldg. 1, Suite 160  
Golden, CO 80401

Representative: Bryan Hoff  
Customer Reference Number: 4011258

**REPORT PREPARED BY:**

Joyce Walker  
CKC Laboratories, Inc.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

Project Number: 92314

**DATE OF EQUIPMENT RECEIPT:**

March 12, 2012

**DATE(S) OF TESTING:**

March 12-April 3, 2012

### Revision History

**Original:** Testing of the Smart Reader, SM10 to FCC Part 15 Subpart C Sections 15.207, 15.225 and RSS 210 Issue 8.

**Addendum A:** Replaced the 15.225 Carrier data sheet with corrected data, which also added a statement regarding 15.31(e) testing and revised the frequency stability table. Updated test conditions for 15.207 testing.

### Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



*Steve Behm*  
*Director of Quality Assurance & Engineering Services*  
*CKC Laboratories, Inc.*

## Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):  
CKC Laboratories, Inc.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

## Site Registration & Accreditation Information

Location	CB #	Taiwan	Canada	FCC	Japan
Mariposa A	US0103	SL2-IN-E-1147R	3082A-2	90477	R-563 C-578 T-1492 G-87

## SUMMARY OF RESULTS

**Standard / Specification: FCC Part 15 Subpart C Sections 15.207, 15.225 and RSS 210 Issue 8**

Description	Test Procedure/Method	Results
Conducted Emissions	FCC Part 15 Subpart C Section 15.207 / ANSI C63.4 (2009)	Pass
Carrier Radiated Emissions	FCC Part 15 Subpart C Section 15.225 (a)(b)(c) / ANSI C63.4 (2009)	Pass
Spurious Radiated Emissions	FCC Part 15 Subpart C Section 15.225 (d) / ANSI C63.4 (2009)	Pass
Frequency Stability	FCC Part 15 Subpart C Section 15.225 (e) / ANSI C63.4 (2009) / ANSI C63.10 (2009)	Pass
99% Bandwidth	RSS 210 Issue 8	Pass

## Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
None

## EQUIPMENT UNDER TEST (EUT)

### EQUIPMENT UNDER TEST

#### Smart Reader (2)

Manuf: Ingersoll Rand  
Model: SM10  
Serial: E0001 / E0004

### PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

#### Dual Tracking DC Power Supply

Manuf: Topwards Electronic instruments CO. LTD.  
Model: 4303  
Serial: 918520

## FCC PART 15 SUBPART C

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) 47 CFR 15C requirements for Unlicensed Radio Frequency Devices, Subpart C - Intentional Radiators.

### 15.207 Conducted Emissions

#### Test Data Sheets

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 425-402-1717

Customer:	<b>Ingersoll Rand</b>	
Specification:	<b>15.207 AC Mains - Average</b>	
Work Order #:	<b>92314</b>	Date: 3/15/2012
Test Type:	<b>Conducted Emissions</b>	Time: 13:45:38
Equipment:	<b>Smart Reader</b>	Sequence#: 3
Manufacturer:	Ingersoll Rand	Tested By: Michael Rauch Jr.
Model:	SM10	120V 60Hz
S/N:	E0001	

#### **Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01184	Spectrum Analyzer	8568B	5/4/2011	5/4/2013
T2	AN01183	Spectrum Analyzer Display	85662A	5/4/2011	5/4/2013
T3	ANP00082	Attenuator	PE7002-10	6/7/2011	6/7/2013
T4	ANMACOND	Cable		5/10/2011	5/10/2013
T5	AN02609	High Pass Filter	HE9615-150K-50-720B	3/15/2012	3/15/2014
T6	AN00374	50uH LISN-Black Lead Amplitude (dB)	8028-TS-50-BNC	10/31/2011	10/31/2013
	AN00374	50uH LISN-White Lead Amplitude (dB)	8028-TS-50-BNC	10/31/2011	10/31/2013

#### **Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Smart Reader*	Ingersoll Rand	SM10	E0001
Smart Reader	Ingersoll Rand	SM10	E0004

#### **Support Devices:**

Function	Manufacturer	Model #	S/N
Dual Tracking DC Power Supply	Topwards Electronic instruments CO. LTD.	4303	918520

**Test Conditions / Notes:**

EUT set up a wooden table in the center of flush mounted turntable. EUT support equipment is located on top of the turntable. Test was performed in accordance with FCC KDB 174176 with the EUT integral antenna attached. The test was repeated at 13.56MHz with a dummy load attached to the EUT antenna terminals to determine compliance with spec limit. The measurement at the fundamental with integral antenna attached is included only for reference.

Frequencies investigated: 150k to 30MHz

Clock Frequencies of interest are: 8MHz, 27.12MHz

TX Freq: 13.56MHz

RBW used in accordance with CISPR 16, VBW is greater than RBW

Temperature = 16°C

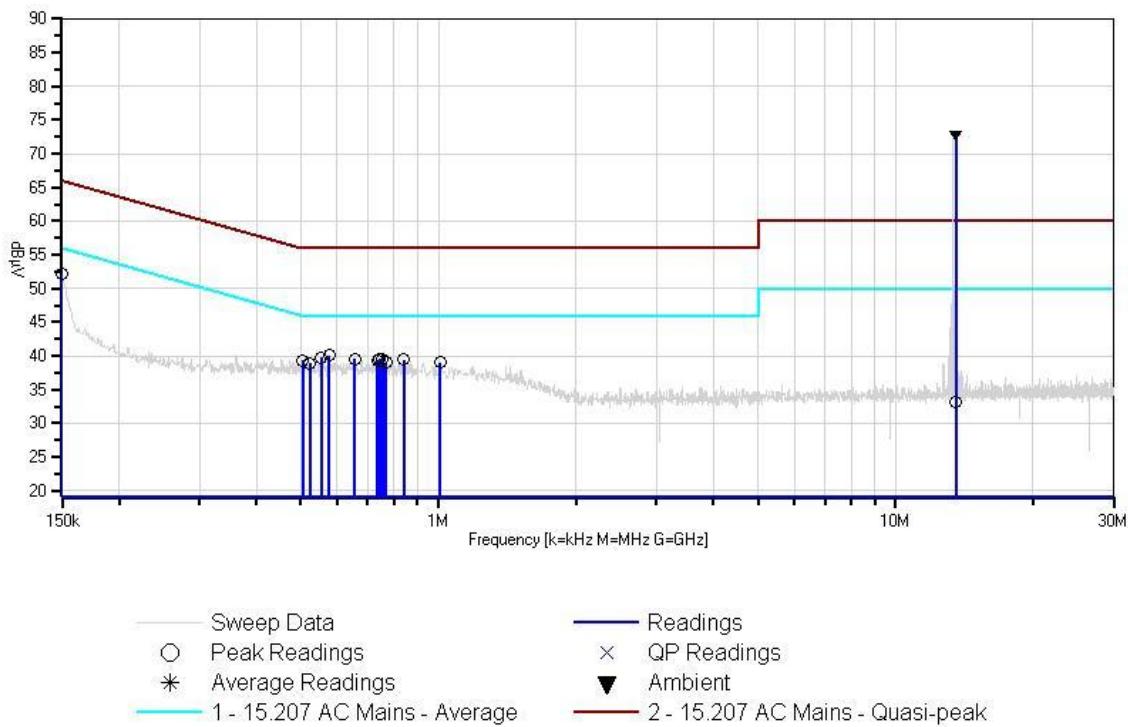
Relative Humidity = 51%

Pressure = 97.7 kPa

Ext Attn: 0 dB

#	Freq	Rdng	Reading listed by margin.				Dist	Corr	Spec	Margin	Polar
			T1	T2	T3	T4					
			T5	T6	Table	dBpV					
MHz	MHz	dBpV	dB	dB	dB	dB	Table	dBpV	dBpV	dB	Ant
1	13.560M	61.6	+0.0	+0.0	+10.1	+1.0	+0.0	72.9	50.0	+22.9	Black
	Ambient		+0.1	+0.1							EUT with integral antenna attached
2	150.000k	29.8	+0.0	+0.0	+10.0	+0.1	+0.0	52.2	56.0	-3.8	Black
			+7.4	+4.9							
3	576.866k	25.4	+0.0	+0.0	+10.0	+0.2	+0.0	40.1	46.0	-5.9	Black
			+0.2	+4.3							
4	553.596k	25.1	+0.0	+0.0	+10.0	+0.2	+0.0	39.8	46.0	-6.2	Black
			+0.2	+4.3							
5	656.858k	24.9	+0.0	+0.0	+10.0	+0.2	+0.0	39.6	46.0	-6.4	Black
			+0.3	+4.2							
6	742.668k	24.8	+0.0	+0.0	+10.0	+0.3	+0.0	39.5	46.0	-6.5	Black
			+0.2	+4.2							
7	752.849k	24.8	+0.0	+0.0	+10.0	+0.3	+0.0	39.5	46.0	-6.5	Black
			+0.2	+4.2							
8	840.113k	24.8	+0.0	+0.0	+10.0	+0.3	+0.0	39.4	46.0	-6.6	Black
			+0.2	+4.1							
9	505.601k	24.6	+0.0	+0.0	+10.0	+0.2	+0.0	39.3	46.0	-6.7	Black
			+0.2	+4.3							
10	734.669k	24.6	+0.0	+0.0	+10.0	+0.3	+0.0	39.3	46.0	-6.7	Black
			+0.2	+4.2							
11	768.847k	24.4	+0.0	+0.0	+10.0	+0.3	+0.0	39.0	46.0	-7.0	Black
			+0.2	+4.1							
12	1.009M	24.5	+0.0	+0.0	+10.0	+0.3	+0.0	39.0	46.0	-7.0	Black
			+0.2	+4.0							
13	522.326k	24.2	+0.0	+0.0	+10.0	+0.2	+0.0	38.9	46.0	-7.1	Black
			+0.2	+4.3							
14	13.560M	21.8	+0.0	+0.0	+10.1	+1.0	+0.0	33.1	50.0	-16.9	Black
			+0.1	+0.1							EUT with dummy load attached

CKC Laboratories, Inc. Date: 3/15/2012 Time: 13:45:38 Ingersoll Rand WO#: 92314  
 15.207 AC Mains - Average Test Lead: Black Black Sequence#: 3 Ext ATTN: 0 dB



Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 425-402-1717

Customer: **Ingersoll Rand**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **92314** Date: **3/15/2012**  
 Test Type: **Conducted Emissions** Time: **13:41:48**  
 Equipment: **Smart Reader** Sequence#: **2**  
 Manufacturer: **Ingersoll Rand** Tested By: **Michael Rauch Jr.**  
 Model: **SM10** **120V 60Hz**  
 S/N: **E0001**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01184	Spectrum Analyzer	8568B	5/4/2011	5/4/2013
T2	AN01183	Spectrum Analyzer Display	85662A	5/4/2011	5/4/2013
T3	ANP00082	Attenuator	PE7002-10	6/7/2011	6/7/2013
T4	ANMACOND	Cable		5/10/2011	5/10/2013
	AN00374	50uH LISN-Black Lead Amplitude (dB)	8028-TS-50-BNC	10/31/2011	10/31/2013
T5	AN00374	50uH LISN-White Lead Amplitude (dB)	8028-TS-50-BNC	10/31/2011	10/31/2013
T6	AN02609	High Pass Filter	HE9615-150K- 50-720B	3/15/2012	3/15/2014

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Smart Reader	Ingersoll Rand	SM10	E0004
Smart Reader*	Ingersoll Rand	SM10	E0001

**Support Devices:**

Function	Manufacturer	Model #	S/N
Dual Tracking DC Power Supply	Topwards Electronic instruments CO. LTD.	4303	918520

**Test Conditions / Notes:**

EUT set up a wooden table in the center of flush mounted turntable. EUT support equipment is located on top of the turntable. Test was performed in accordance with FCC KDB 174176 with the EUT integral antenna attached. The test was repeated at 13.56MHz with a dummy load attached to the EUT antenna terminals to determine compliance with spec limit. The measurement at the fundamental with integral antenna attached is included only for reference.

Frequencies investigated: 150k to 30MHz

Clock Frequencies of interest are: 8MHz, 27.12MHz

TX Freq: 13.56MHz

RBW used in accordance with CISPR 16, VBW is greater than RBW

Temperature = 16°C

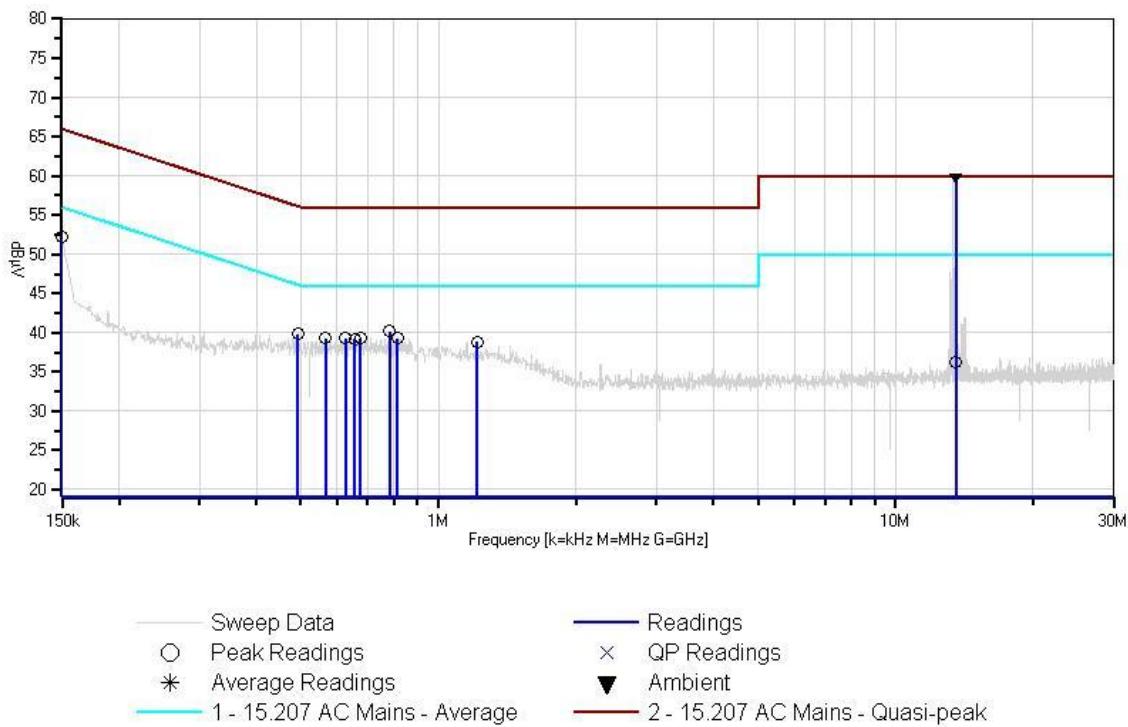
Relative Humidity = 51%

Pressure = 97.7 kPa

Ext Attn: 0 dB

Measurement Data:			Reading listed by margin.				Test Lead: White				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6			Table	dB $\mu$ V	dB $\mu$ V		
			MHz	dB $\mu$ V	dB	dB	dB	Table	dB $\mu$ V	dB	Ant
1	13.560M	48.5	+0.0	+0.0	+10.1	+1.0	+0.0	59.8	50.0	+9.8	White
	Ambient		+0.1	+0.1							EUT with integral antenna attached
2	150.000k	30.0	+0.0	+0.0	+10.0	+0.1	+0.0	52.3	56.0	-3.7	White
			+4.8	+7.4							
3	782.664k	25.5	+0.0	+0.0	+10.0	+0.3	+0.0	40.2	46.0	-5.8	White
			+4.2	+0.2							
4	492.511k	25.0	+0.0	+0.0	+10.0	+0.2	+0.0	39.8	46.1	-6.3	White
			+4.4	+0.2							
5	675.766k	24.7	+0.0	+0.0	+10.0	+0.2	+0.0	39.3	46.0	-6.7	White
			+4.2	+0.2							
6	565.958k	24.6	+0.0	+0.0	+10.0	+0.2	+0.0	39.3	46.0	-6.7	White
			+4.3	+0.2							
7	813.206k	24.6	+0.0	+0.0	+10.0	+0.3	+0.0	39.3	46.0	-6.7	White
			+4.2	+0.2							
8	624.862k	24.5	+0.0	+0.0	+10.0	+0.2	+0.0	39.3	46.0	-6.7	White
			+4.3	+0.3							
9	655.404k	24.4	+0.0	+0.0	+10.0	+0.2	+0.0	39.2	46.0	-6.8	White
			+4.3	+0.3							
10	1.213M	24.3	+0.0	+0.0	+10.0	+0.3	+0.0	38.8	46.0	-7.2	White
			+4.0	+0.2							
11	13.560M	25.0	+0.0	+0.0	+10.1	+1.0	+0.0	36.3	50.0	-13.7	White
			+0.1	+0.1							EUT with dummy load attached

CKC Laboratories, Inc. Date: 3/15/2012 Time: 13:41:48 Ingersoll Rand WO#: 92314  
 15.207 AC Mains - Average Test Lead: White White Sequence#: 2 Ext ATTN: 0 dB



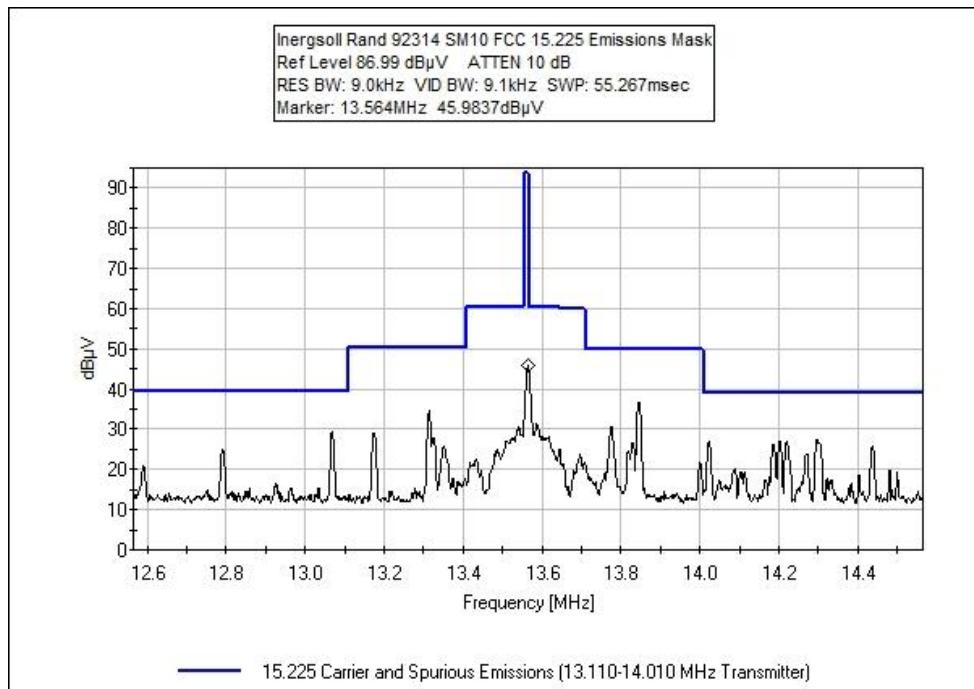
**Test Setup Photos**



## 15.225(a)(b)(c)(d) Carrier and Spurious Emissions

### Carrier Radiated Emissions

#### Test Data



Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 95338 • (209) 966-5240

Customer: **Ingersoll Rand**  
 Specification: **15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**  
 Work Order #: **92314** Date: **3/26/2012**  
 Test Type: **Maximized Emissions** Time: **14:02:50**  
 Equipment: **Smart Reader** Sequence#: **3**  
 Manufacturer: Ingersoll Rand Tested By: Michael Rauch Jr.  
 Model: SM10  
 S/N: E0001

***Test Equipment:***

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01184	Spectrum Analyzer	8568B	5/4/2011	5/4/2013
T2	AN01183	Spectrum Analyzer Display	85662A	5/4/2011	5/4/2013
T3	AN00226	Loop Antenna	6502	7/8/2011	7/8/2013
	ANdBuA	Unit Conversion		1/30/2012	1/30/2014
T4	ANP01017	Cable		3/16/2012	3/16/2014

***Equipment Under Test (\* = EUT):***

Function	Manufacturer	Model #	S/N
Smart Reader*	Ingersoll Rand	SM10	E0001

***Support Devices:***

Function	Manufacturer	Model #	S/N
Dual Tracking DC Power Supply	Topwards Electronic instruments CO. LTD.	4303	918520

***Test Conditions / Notes:***

EUT set up a wooden table in the center of flush mounted turntable.

EUT support equipment is located on top of the turntable.

Frequencies investigated: 150k to 30MHz

Clock Frequencies of interest are: 8MHz, 27.12MHz

TX Freq: 13.56MHz

15.31(e)

Voltage variations preformed in accordance with 15.31(e) no changes were observed to transmitter output.

RBW used in accordance with CISPR 16, VBW is greater than RBW

Temperature = 16°C

Relative Humidity = 51%

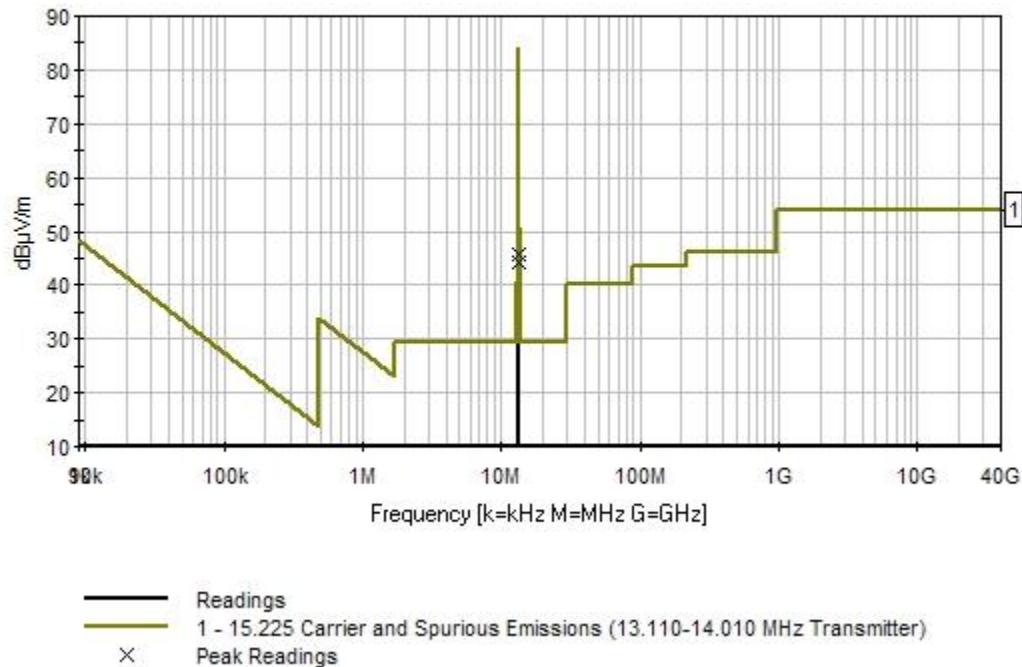
Pressure = 97.7 kPa

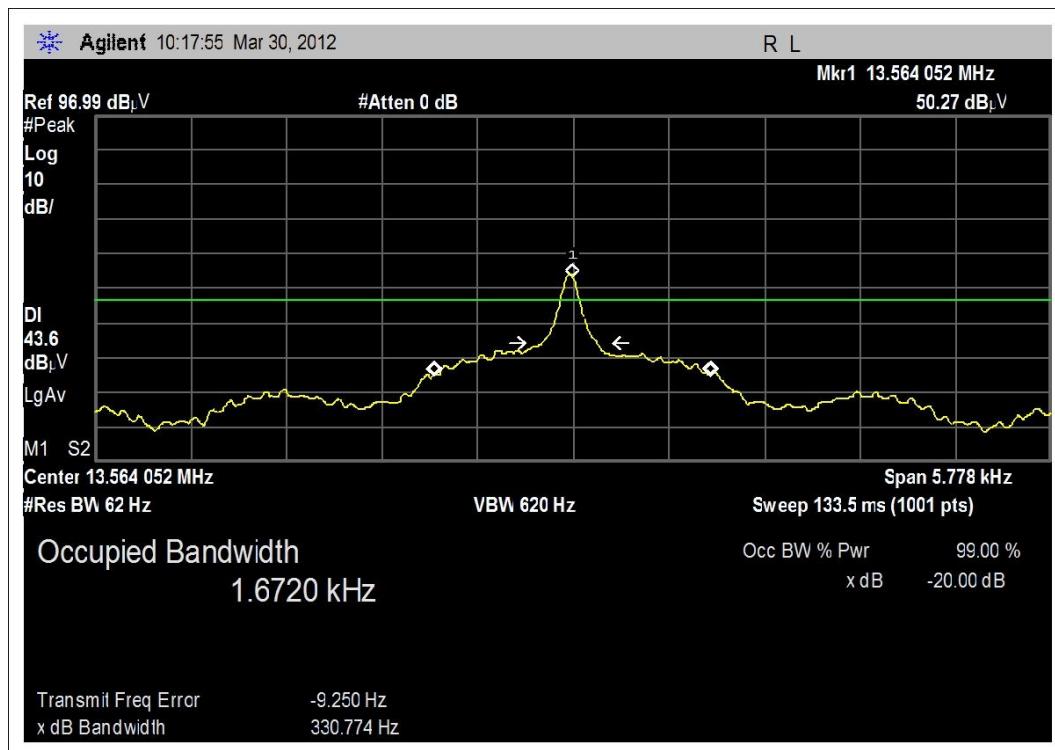
Ext Attn: 0 dB

***Measurement Data:*** Reading listed by margin. **Test Distance: 10 Meters**

#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	13.564M	46.0	+0.0	+0.0	+10.2	-0.8	-9.5	45.9	84.0	-38.1	Horiz
2	13.566M	44.4	+0.0	+0.0	+10.2	-0.8	-9.5	44.3	84.0	-39.7	Vert

CKC Laboratories, Inc. Date: 3/26/2012 Time: 14:02:50 Ingersoll Rand WO#: 92314  
15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)  
Test Distance: 10 Meters Vert Sequence#: 3 Ext ATTN: 0 dB





## Spurious Radiated Emissions

### Test Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 95338 • (209) 966-5240

Customer: **Ingersoll Rand**  
 Specification: **15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**  
 Work Order #: **92314** Date: **3/28/2012**  
 Test Type: **Maximized Emissions** Time: **15:46:28**  
 Equipment: **Smart Reader** Sequence#: **3**  
 Manufacturer: Ingersoll Rand Tested By: Michael Rauch Jr.  
 Model: SM10  
 S/N: E0001

#### **Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN01184	Spectrum Analyzer	8568B	5/4/2011	5/4/2013
	AN01183	Spectrum Analyzer Display	85662A	5/4/2011	5/4/2013
T1	ANdBuA	Unit Conversion		1/30/2012	1/30/2014
T2	ANP01017	Cable		3/16/2012	3/16/2014
T3	AN00226	Loop Antenna	6502	3/28/2012	3/28/2014

#### **Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Smart Reader*	Ingersoll Rand	SM10	E0001

#### **Support Devices:**

Function	Manufacturer	Model #	S/N
Dual Tracking DC Power Supply	Topwards Electronic instruments CO. LTD.	4303	918520

#### **Test Conditions / Notes:**

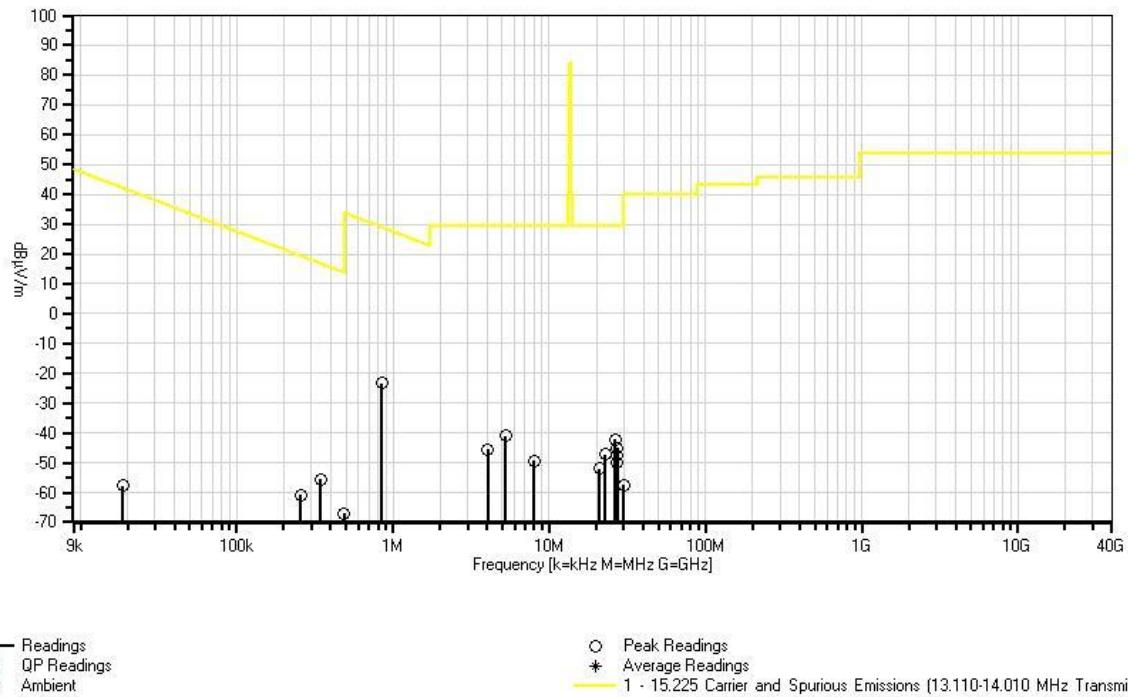
EUT set up a wooden table in the center of flush mounted turntable.  
 EUT support equipment is located on top of the turntable.  
 Frequencies investigated: 9KHz to 30MHz  
 Clock Frequencies of interest are: 8MHz, 27.12MHz  
 TX Freq: 13.56MHz  
 RBW used in accordance with CISPR 16, VBW is greater than RBW  
 Temperature = 16°C  
 Relative Humidity = 51%  
 Pressure = 97.7 kPa

Ext Attn: 0 dB

Measurement Data:					Test Distance: 10 Meters						
#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant	
1	845.630k	37.1	-51.5	-0.1	+10.4	-19.1	-23.2	29.0	-52.2	Vert	
2	5.240M	20.3	-51.5	-0.5	+9.8	-19.1	-41.0	29.5	-70.5	Vert	

3	26.405M	22.6	-51.5	-1.2	+7.0	-19.1	-42.2	29.5	-71.7	Vert
4	345.630k	45.3	-51.5	-0.1	+9.8	-59.1	-55.6	16.8	-72.4	Vert
5	27.126M	19.9	-51.5	-1.2	+6.8	-19.1	-45.1	29.5	-74.6	Vert
6	4.048M	15.6	-51.5	-0.4	+9.8	-19.1	-45.6	29.5	-75.1	Horiz
7	22.822M	16.7	-51.5	-1.1	+7.7	-19.1	-47.3	29.5	-76.8	Vert
8	26.874M	17.4	-51.5	-1.2	+6.9	-19.1	-47.5	29.5	-77.0	Vert
9	8.000M	11.9	-51.5	-0.6	+9.9	-19.1	-49.4	29.5	-78.9	Horiz
10	27.127M	15.0	-51.5	-1.2	+6.8	-19.1	-50.0	29.5	-79.5	Horiz
11	256.960k	40.1	-51.5	-0.1	+9.8	-59.1	-60.8	19.4	-80.2	Horiz
12	485.310k	33.9	-51.5	-0.1	+9.7	-59.1	-67.1	13.9	-81.0	Horiz
13	20.884M	11.6	-51.5	-1.0	+8.0	-19.1	-52.0	29.5	-81.5	Horiz
14	29.982M	8.4	-51.5	-1.3	+5.9	-19.1	-57.6	29.5	-87.1	Horiz
15	18.610k	39.5	-51.5	+0.0	+13.5	-59.1	-57.6	42.2	-99.8	Horiz

CKC Laboratories, Inc. Date: 3/28/2012 Time: 15:46:28 Ingersoll Rand WO#: 92314  
 15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter) Test Distance: 10 Meters Horiz  
 Sequence#: 3 Ext ATTN: 0 dB



Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 425-402-1717

Customer: **Ingersoll Rand**  
 Specification: **15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**  
 Work Order #: **92314** Date: **3/26/2012**  
 Test Type: **Maximized Emissions** Time: **09:30:43**  
 Equipment: **Smart Reader** Sequence#: **1**  
 Manufacturer: **Ingersoll Rand** Tested By: **Michael Rauch Jr.**  
 Model: **SM10**  
 S/N: **E0001**

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN01183	Spectrum Analyzer Display	85662A	5/4/2011	5/4/2013
	AN01184	Spectrum Analyzer	8568B	5/4/2011	5/4/2013
T1	AN00062	Preamp	8447D	6/23/2010	6/23/2012
T2	ANMA10M	Cable		5/10/2011	5/10/2013
T3	AN00851	Biconilog Antenna	CBL6111C	3/14/2012	3/14/2014

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Smart Reader*	Ingersoll Rand	SM10	E0001

**Support Devices:**

Function	Manufacturer	Model #	S/N
Dual Tracking DC Power Supply	Topwards Electronic instruments CO. LTD.	4303	918520

**Test Conditions / Notes:**

EUT set up a wooden table in the center of flush mounted turntable.

EUT support equipment is located on top of the turntable.

Frequencies investigated: 30MHz to 1GHz

Clock Frequencies of interest are: 8MHz, 27.12MHz

TX Freq: 13.56MHz

RBW used in accordance with CISPR 16, VBW is greater than RBW

Temperature = 16°C

Relative Humidity = 51%

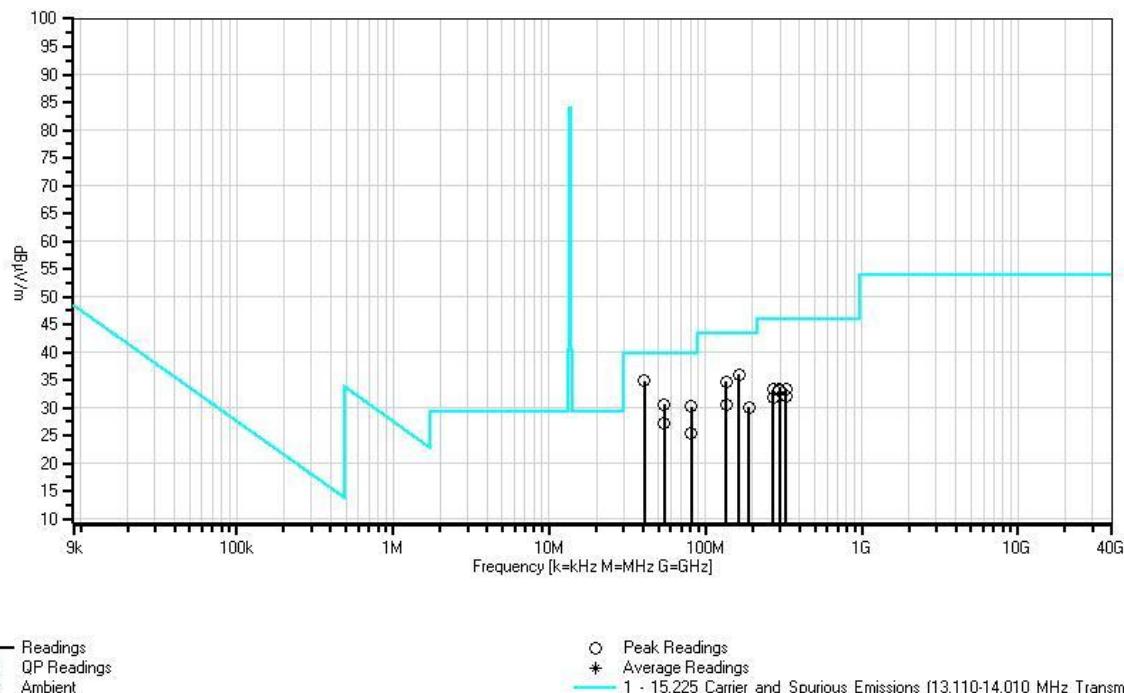
Pressure = 97.7 kPa

Ext Attn: 0 dB

#	Freq MHz	Reading listed by margin.			Test Distance: 10 Meters					
		Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	40.677M	41.3	-31.0	+1.4	+12.6	+10.5	34.8	40.0	-5.2	Vert
2	162.784M	41.6	-30.4	+2.8	+11.5	+10.5	36.0	43.5	-7.5	Vert
3	135.645M	40.0	-30.6	+2.6	+12.2	+10.5	34.7	43.5	-8.8	Vert
4	54.247M	40.6	-30.9	+1.6	+8.8	+10.5	30.6	40.0	-9.4	Vert
5	81.387M	41.4	-30.8	+2.0	+7.1	+10.5	30.2	40.0	-9.8	Vert

6	325.504M	35.0	-30.0	+4.2	+13.7		+10.5	33.4	46.0	-12.6	Horiz
7	298.349M	35.7	-29.9	+4.0	+13.1		+10.5	33.4	46.0	-12.6	Horiz
8	54.295M	37.2	-30.9	+1.6	+8.9		+10.5	27.3	40.0	-12.7	Horiz
9	271.266M	37.4	-29.8	+3.8	+11.4		+10.5	33.3	46.0	-12.7	Horiz
10	135.604M	35.9	-30.6	+2.6	+12.2		+10.5	30.6	43.5	-12.9	Horiz
11	298.390M	35.4	-29.9	+4.0	+13.1		+10.5	33.1	46.0	-12.9	Vert
12	189.925M	37.1	-30.2	+3.1	+9.6		+10.5	30.1	43.5	-13.4	Vert
13	325.541M	33.7	-30.0	+4.2	+13.7		+10.5	32.1	46.0	-13.9	Vert
14	271.269M	35.9	-29.8	+3.8	+11.4		+10.5	31.8	46.0	-14.2	Vert
15	81.456M	36.6	-30.8	+2.0	+7.1		+10.5	25.4	40.0	-14.6	Horiz

CKC Laboratories, Inc. Date: 3/26/2012 Time: 09:30:43 Ingersoll Rand WO#: 92314  
 15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter) Test Distance: 10 Meters Horiz  
 Sequence#: 1 Ext ATTN: 0 dB



**Test Setup Photos**



## Frequency Stability

### Test Set Up / Conditions

The Equipment is located in a temperature chamber. A loop antenna is set inside the chamber and connected to a spectrum analyzer. Voltage variations are performed using support power supply and monitored using a digital volt meter. Enclosure temperature is monitored using a digital thermometer with a sensor attached direction to the case of the EUT.

Engineer Name: M. Rauch Jr.

Test Equipment					
Asset/Serial #	Description	Model	Manufacturer	Cal Date	Cal Due
01879	Temperature Chamber	S-1.2 Min.	Thermotron	12/1/2010	12/1/2012
00170	Loop Antenna	7334-1	Solar	NCR	NCR
02660	Spectrum Analyzer	E4446A	Agilent	11/3/2011	11/3/2013
00483	Multimeter	75	Fluke	7/28/2010	7/28/2012
03197	Multimeter	MM570A	Extech	9/28/2010	9/28/2012

NCR= No Calibration Required.

**Data**

<b>Date:</b>	30-Mar-12		
<b>Test Engineer:</b>	Michael Rauch Jr.		
<b>Test Specification</b>	FCC 15.225		
<b>Device Model #:</b>	SM10		
<b>Operating Voltage:</b>	12		VDC/VAC
<b>Frequency Limit:</b>	0.01		%
<b>Temperature Variations</b>			
		<b>Freq (MHz)</b>	<b>Dev. (%)</b>
<b>Channel Frequency:</b>		13.564	
<b>Temp (C)</b>	<b>Voltage</b>		
-30	12	NA	NA
-20	12	13.56405	0.00037
-10	12	13.56430	0.00222
0	12	13.56403	0.00022
10	12	13.56397	0.00021
20	12	13.56400	0.00001
30	12	13.56393	0.00055
40	12	13.56393	0.00055
50	12	13.56394	0.00046
<b>Voltage Variations (<math>\pm 15\%</math>)</b>			
20	10.2	13.56400	0.00001
20	12	13.56400	0.00001
20	13.8	13.56400	0.00001
<b>Max Deviation (%)</b>			0.00222
			PASS

**Test Setup Photos**



## RSS-210

### 99 % Bandwidth

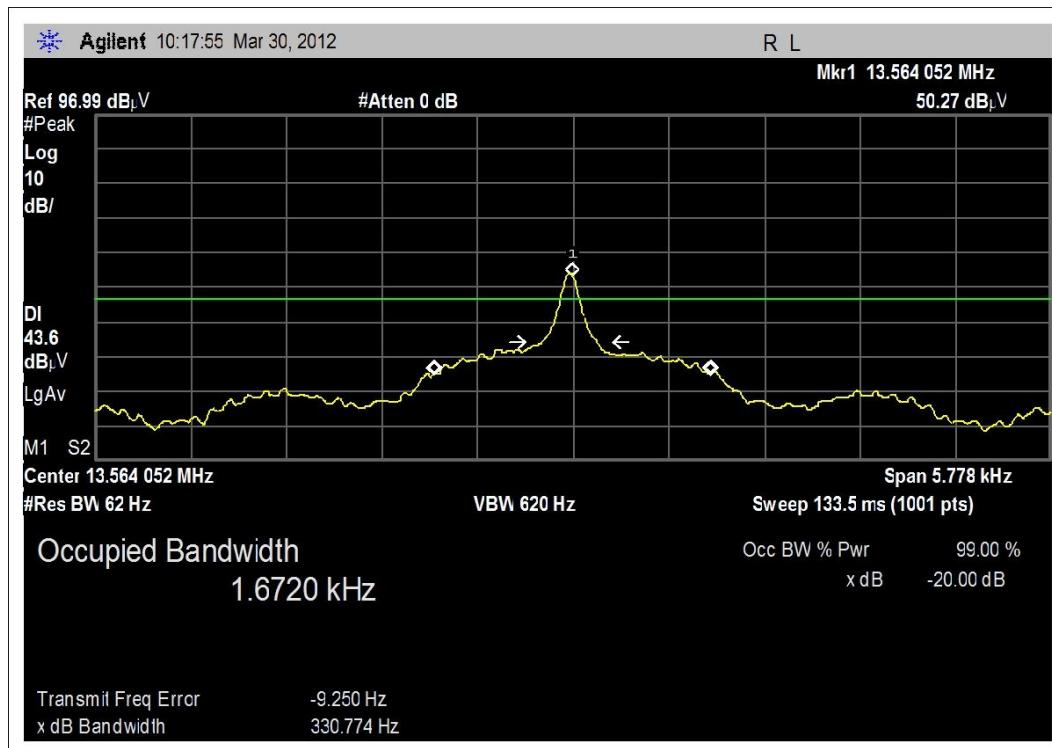
#### Test Set Up / Conditions

EUT set up a wooden table in the center of flush mounted turntable.  
 EUT support equipment is located on top of the turntable.  
 Frequencies investigated: 9KHz to 30MHz  
 Clock Frequencies of interest are: 8MHz, 27.12MHz  
 TX Freq: 13.56MHz  
 RBW used in accordance with CISPR 16, VBW is greater than RBW  
 Temperature = 16°C  
 Relative Humidity = 51%  
 Pressure = 97.7 kPa

Engineer Name: M. Rauch Jr.

#### Test Equipment

Asset/Serial #	Description	Model	Manufacturer	Cal Date	Cal Due
AN01184	Spectrum Analyzer	8568B	HP	5/4/2011	5/4/2013
AN01183	Spectrum Analyzer Display	85662A	HP	5/4/2011	5/4/2013
ANdBuA	Unit Conversion		EMCO	1/30/2012	1/30/2014
ANP01017	Cable		Andrews	3/16/2012	3/16/2014
AN00226	Loop Antenna	6502	Agilent	3/28/2012	3/28/2014



**Test Setup Photos**



## SUPPLEMENTAL INFORMATION

### Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ . Compliance is deemed to occur provided measurements are below the specified limits.

### Emissions Test Details

#### TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

#### CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in  $\text{dB}\mu\text{V}/\text{m}$ , the spectrum analyzer reading in  $\text{dB}\mu\text{V}$  was corrected by using the following formula. This reading was then compared to the applicable specification limit.

<b>SAMPLE CALCULATIONS</b>	
Meter reading	(dB $\mu$ V)
+ Antenna Factor	(dB)
+ Cable Loss	(dB)
- Distance Correction	(dB)
- Preamplifier Gain	(dB)
= Corrected Reading	(dB $\mu$ V/m)

#### TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

<b>MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE</b>			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

#### SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

##### Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

##### Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

##### Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.