

Agident Corporation

ADDENDUM TEST REPORT 97591-4

LF RFID Transceiver Module Model: ABR200

Tested To The Following Standard:

FCC Part 15 Subpart C Section(s)

15.209

Report No.: 97591-4A

Date of issue: July 22, 2016



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:

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REPRESENTATIVE: Diane Smith

REPORT PREPARED BY:

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5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 97591

DATE OF EQUIPMENT RECEIPT:

June 1, 2016

DATE(S) OF TESTING:

June 1-2, 2016, July 6, 2016
and July 19, 2016

Revision History

Original: Testing of LF RFID Transceiver Module, Model: ABR200, To FCC Part 15 Subpart C Section(s), 15.209.

Addendum A: To replace the Fundamental data with new testing for voltages required by the standard.

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

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.02

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Mariposa A	US0103	SL2-IN-E-1147R	3082A-2	90477	A-0136

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C - 15.209

Test Procedure	Description	Modifications	Results
15.215(c)	Occupied Bandwidth	NA	Pass
15.209	Field Strength of Fundamental	NA	Pass
15.209	Field Strength of Spurious Emissions	Mod. #1	Pass

NA = Not Applicable

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions

Modification #1: Installed Ferrite: Wurth Elektronik 742 758 12 on the power cable one turn closest to the EUT.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions

AC Conducted Emissions: NA = Not applicable because the manufacturer declares that the EUT is intended to be implemented into battery powered devices with no chargers which connect to AC mains.

EQUIPMENT UNDER TEST (EUT)

During testing numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
LF RFID Transceiver Module	Agrident	ABR 200	1202001467

Support Equipment:

Device	Manufacturer	Model #	S/N
DC Supply	HP	6205C	2228A01775
Modular board	Agrident	EVK200	4057001217
Tag	Agrident	FDX-B	NA

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Radio Module
Modulation Type(s):	ASK
Maximum Duty Cycle:	50/50
Antenna Type(s) and Gain:	Ferrite Coil (100 mm) and Unknown
Antenna Connection Type:	External Connector
Nominal Input Voltage:	2.2 – 4.5VDC
Firmware / Software used for Test:	ABR200 Firmware: v1.12

FCC Part 15 Subpart C

15.215(c) Occupied Bandwidth (20dB BW)

Test Setup/Conditions			
Test Location:	Mariposa Lab A	Test Engineer:	Michael Rauch Jr.
Test Method:	ANSI C63.10 (2013)	Test Date(s):	6/1/2016
Configuration:	1		
Test Conditions:	Modulation: Antenna type: Ferrite Coil (100 mm) Antenna Gain: Unknown Transmit Frequency: 134.2kHz The EUT was tested in the X, Y and Z orientations. The X-Axis orientation was determined to be the worst-case orientation and all data has been collected and submitted with this orientation. EUT Firmware: ABR200 Firmware: v1.12 Protocol / Modulation: ASK Firmware power setting: Non- adjustable The EUT is setup on an 80cm foam block, a sample tag is in proximity to the antenna. The EUT is continuously transmitting.		

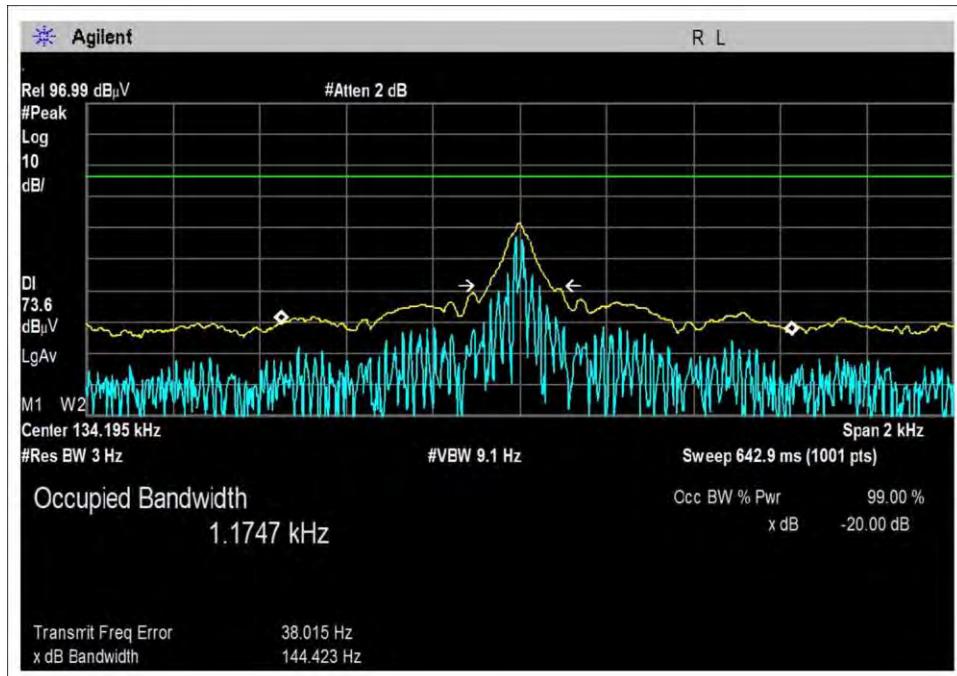
Environmental Conditions			
Temperature (°C)	31.2	Relative Humidity (%):	34

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
P06230	Cable	Andrew	CXTA04A-50	3/3/2016	3/3/2018
00226	Loop Antenna	EMCO	6502	4/4/2016	4/4/2018
02668	Spectrum Analyzer	Agilent	E4446A	8/14/2015	8/14/2016
P04249	Cable - Site A Underground	Andrew	NA	3/3/2016	3/3/2018
P06847	Cable	Times Microwave Systems	LMR195-FR-6	7/9/2015	7/9/2017

Test Data Summary

Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
0.134	1	ASK	1.1576	None	NA

Plot



Test Setup Photos



15.209 Field Strength of Fundamental

Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	V _{Minimum} (dBuV/m)	V _{Nominal} (dBuV/m)	V _{Maximum} (dBuV/m)	Max Deviation from V _{Nominal} (dB)
0.134kHz Parallel	ASK/External	2.9	3.0	8.9	6
0.134kHz Perpendicular	ASK/External	-13.8	-13.4	-11.7	2.1

Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

Parameter	Value
V _{Nominal} :	3.3VDC
V _{Minimum} :	2.2VDC
V _{Maximum} :	4.5VDC

Note: The manufacturer declares that the 2.2VDC and 4.5VDC voltages are the absolute extremes that the module can be powered from without damage. Since they give a range, testing was performed at those extremes. The 3.3VDC was chosen as a mid-voltage between the manufacturer's tolerance.

Test Data Summary – Radiated Field Strength Measurement					
Frequency (MHz)	Modulation	Ant. Type	Measured (dBuV/m @ 300m)	Limit (dBuV/m @ 300m)	Results
0.134176 (Parallel)	ASK	External	3.0	≤25.7	Pass
0.134194 (Perpendicular)	ASK	External	-13.4	≤25.7	Pass

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240
 Customer: **Agrident Corporation**
 Specification: **15.209 Radiated Emissions**
 Work Order #: **97591** Date: **7/19/2016**
 Test Type: **Radiated Scan** Time: **16:43:13**
 Tested By: Michael Rauch Jr. Sequence#: **1**
 Software: EMITest 5.03.02

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Firmware power setting: Non- adjustable
 EUT Firmware: ABR200 Firmware: v1.12
 Protocol / Modulation: ASK

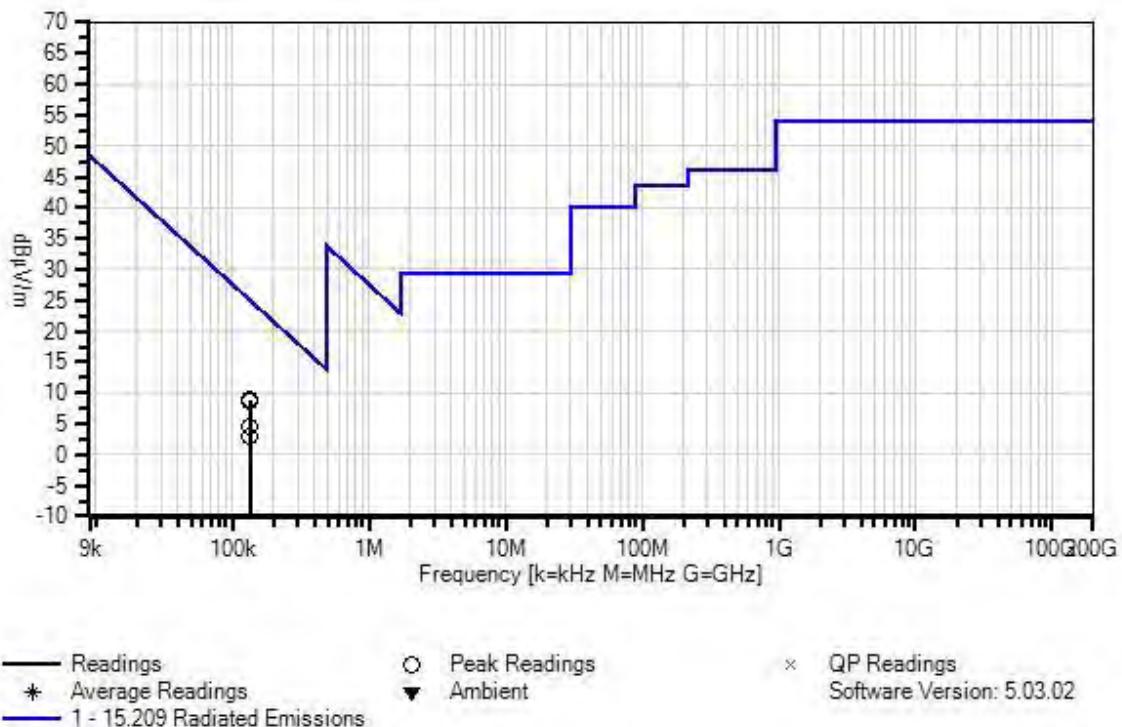
Modulation:
 Antenna type: Ferrite Coil (100 mm)
 Antenna Gain: Unknown
 Transmit Frequency: 134.2kHz

Test Method: ANSI C63.10 (2013)
 The EUT is setup on an 80cm foam block, a sample tag is in proximity to the antenna.
 The EUT is continuously transmitting.

Temperature: 31.2°C
 Humidity: 34%
 Atmospheric Pressure: 97.8 kPa

The EUT was tested in the X, Y and Z orientations. The X-Axis orientation was determined to be the worst-case orientation and all data has been collected and submitted with this orientation.

Agrident Corporation WO#: 97591 Sequence#: 1 Date: 7/19/2016
15.209 Radiated Emissions Test Distance: 10 Meters Perpendicular



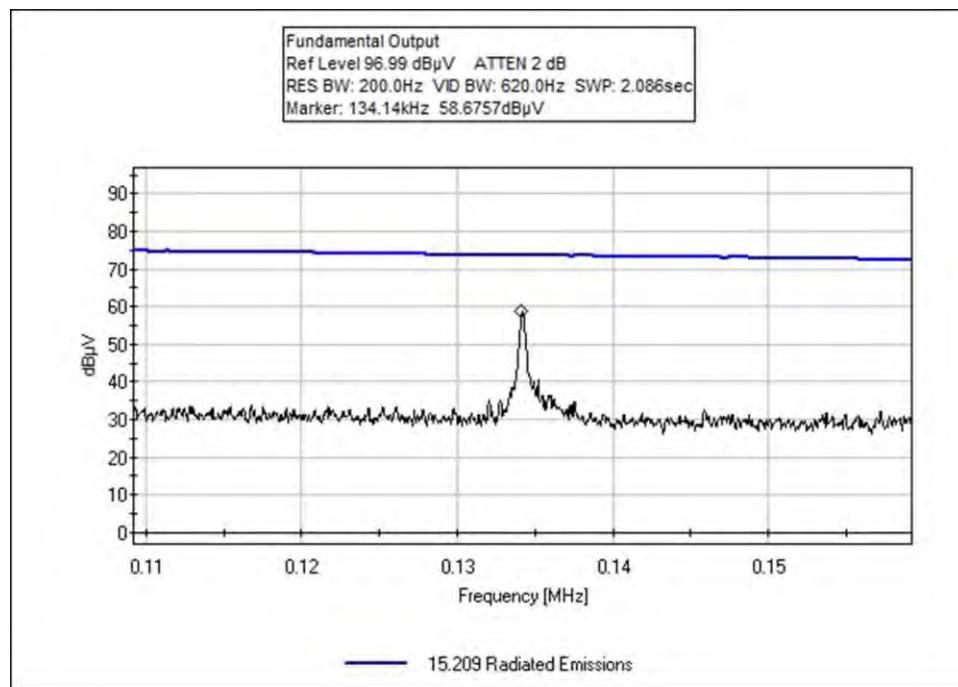
Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00226	Loop Antenna	6502	4/4/2016	4/4/2018
T2	ANP04249	Cable	CXTA04A-50	3/3/2016	3/3/2018
T3	ANP06230	Cable	CXTA04A-50	3/3/2016	3/3/2018
T4	ANP06847	Cable	LMR195-FR-6	7/9/2015	7/9/2017
T5	AN02668	Spectrum Analyzer	E4446A	8/14/2015	8/14/2016

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

#	Freq MHz	Rdng dB μ V	T1 T5				Dist Table	Corr dB μ V/m	Spec dB	Margin	Polar
			T1 dB	T2 dB	T3 dB	T4 dB					
1	134.193k	57.5	+10.4 +0.0	+0.0	+0.1	+0.0	-59.1	8.9	25.0	-16.1	Paral 4.5VDC X Axis
2	134.196k	57.4	+10.4 +0.0	+0.0	+0.1	+0.0	-59.1	8.8	25.0	-16.2	Paral 4.5VDC Y Axis
3	134.193k	53.0	+10.4 +0.0	+0.0	+0.1	+0.0	-59.1	4.4	25.0	-20.6	Paral 4.5VDC Z Axis
4	134.193k	51.6	+10.4 +0.0	+0.0	+0.1	+0.0	-59.1	3.0	25.0	-22.0	Paral 3.3VDC X Axis
5	134.193k	51.5	+10.4 +0.0	+0.0	+0.1	+0.0	-59.1	2.9	25.0	-22.1	Paral 2.2VDC X Axis
6	134.189k	36.9	+10.4 +0.0	+0.0	+0.1	+0.0	-59.1	-11.7	25.0	-36.7	Perpe 4.5VDC X Axis
7	134.189k	35.2	+10.4 +0.0	+0.0	+0.1	+0.0	-59.1	-13.4	25.0	-38.4	Perpe 3.3VDC X Axis
8	134.184k	34.8	+10.4 +0.0	+0.0	+0.1	+0.0	-59.1	-13.8	25.0	-38.8	Perpe 2.2VDC X Axis

Plot



Test Setup Photos



15.209 Radiated Emissions

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240
 Customer: **Agilent Corporation**
 Specification: **15.209 Radiated Emissions**
 Work Order #: **97591** Date: 6/2/2016
 Test Type: **Radiated Scan** Time: 14:00:51
 Tested By: Michael Rauch Jr. Sequence#: 1
 Software: EMITest 5.03.02

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency tested: 9kHz to 30MHz
 Firmware power setting: Non- adjustable
 EUT Firmware: ABR200 Firmware: v1.12
 Protocol / Modulation: ASK

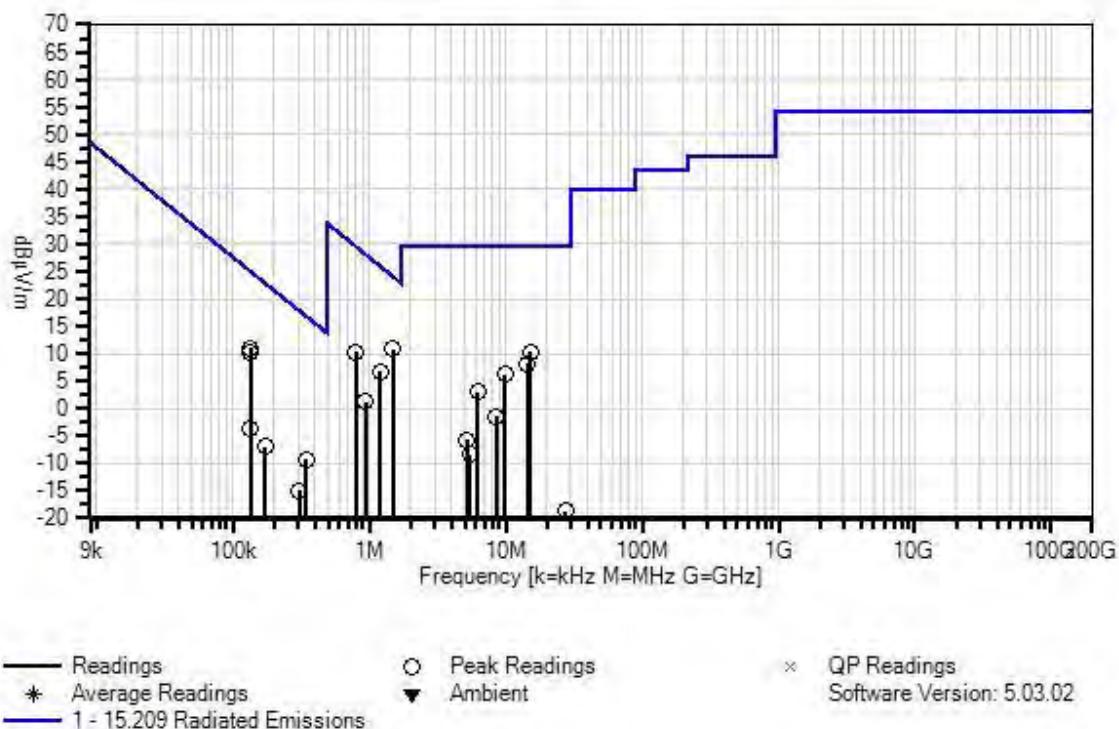
Modulation:
 Antenna type: Ferrite Coil (100 mm)
 Antenna Gain: Unknown
 Transmit Frequency: 134.2kHz
 The EUT was tested in the X, Y and Z orientations. The X-Axis orientation was determined to be the worst-case orientation and all data has been collected and submitted with this orientation.

Test Method: ANSI C63.10 (2013)
 The EUT is setup on an 80cm foam block, a sample tag is in proximity to the antenna.
 The EUT is continuously transmitting.

Temperature: 31.2°C
 Humidity: 34%
 Atmospheric Pressure: 97.8 kPa

Modification #1 was in place during testing.

Agilent Corporation WO#: 97591 Sequence#: 1 Date: 6/2/2016
15.209 Radiated Emissions Test Distance: 10 Meters Parallel



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02668	Spectrum Analyzer	E4446A	8/14/2015	8/14/2016
T1	AN00226	Loop Antenna	6502	4/4/2016	4/4/2018
T2	ANP04249	Cable	CXTA04A-50	3/3/2016	3/3/2018
T3	ANP06847	Cable	LMR195-FR-6	7/9/2015	7/9/2017
T4	ANP06230	Cable	CXTA04A-50	3/3/2016	3/3/2018

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

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	1.480M	19.7	+10.1	+0.1	+0.0	+0.1	-19.1	10.9	24.1	-13.2	Paral
2	134.197k	59.7	+10.4	+0.0	+0.0	+0.1	-59.1	11.1	25.0	-13.9	Perpe
3	134.240k	59.0	+10.4	+0.0	+0.0	+0.1	-59.1	10.4	25.0	-14.6	Perpe
4	803.649k	18.9	+10.4	+0.1	+0.0	+0.1	-19.1	10.4	29.5	-19.1	Paral
5	15.140M	18.9	+9.6	+0.3	+0.1	+0.5	-19.1	10.3	29.5	-19.2	Perpe
6	1.205M	15.3	+10.2	+0.1	+0.0	+0.2	-19.1	6.7	25.9	-19.2	Paral
7	14.434M	16.8	+9.6	+0.3	+0.1	+0.5	-19.1	8.2	29.5	-21.3	Perpe
8	9.930M	14.9	+9.8	+0.2	+0.1	+0.4	-19.1	6.3	29.5	-23.2	Perpe
9	343.900k	39.9	+9.8	+0.1	+0.0	+0.1	-59.1	-9.2	16.9	-26.1	Perpe
10	6.223M	11.7	+9.9	+0.2	+0.1	+0.3	-19.1	3.1	29.5	-26.4	Perpe
11	939.143k	9.9	+10.3	+0.1	+0.0	+0.1	-19.1	1.3	28.1	-26.8	Paral
12	134.199k	44.8	+10.4	+0.0	+0.0	+0.1	-59.1	-3.8	25.0	-28.8	Paral
13	173.890k	41.9	+10.0	+0.1	+0.0	+0.1	-59.1	-7.0	22.8	-29.8	Perpe
14	8.575M	7.1	+9.8	+0.2	+0.1	+0.4	-19.1	-1.5	29.5	-31.0	Perpe
15	304.790k	34.2	+9.8	+0.1	+0.0	+0.1	-59.1	-14.9	17.9	-32.8	Perpe
16	5.236M	2.9	+9.9	+0.2	+0.1	+0.3	-19.1	-5.7	29.5	-35.2	Paral
17	5.503M	0.3	+9.9	+0.2	+0.1	+0.3	-19.1	-8.3	29.5	-37.8	Paral
18	27.469M	-6.8	+6.2	+0.4	+0.1	+0.6	-19.1	-18.6	29.5	-48.1	Perpe



Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240
Customer: **Agilent Corporation**
Specification: **15.209 Radiated Emissions**
Work Order #: **97591** Date: 7/6/2016
Test Type: **Maximized Emissions** Time: 11:30:48
Tested By: Skip Doyle Sequence#: 1
Software: EMITest 5.03.02

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency tested: 30MHz to 1GHz
Firmware power setting: Non- adjustable
EUT Firmware: ABR200 Firmware: v1.12
Protocol / Modulation: ASK

Modulation:
Antenna type: Ferrite Coil (100 mm)
Antenna Gain: Unknown
Transmit Frequency: 134.2kHz

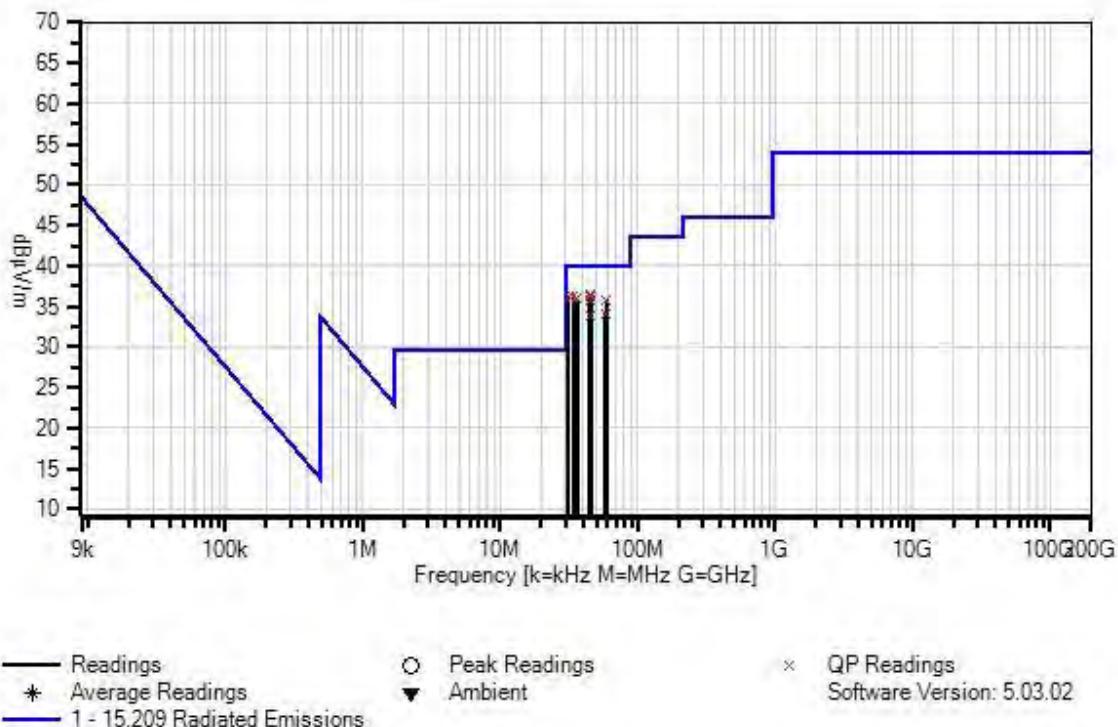
Test Method: ANSI C63.10 (2013)
Test Setup: EUT is setup on an 80cm foam block, a sample tag is in proximity to the antenna.
The EUT is continuously transmitting.

The EUT was tested in the X, Y and Z orientations. The X-Axis orientation was determined to be the worst-case orientation and all data has been collected and submitted with this orientation.

Temperature: 22.2°C
Humidity: 24%
Atmospheric Pressure: 97.8 kPa

Modification #1 was in place during testing.

Agilent Corporation WO#: 97591 Sequence#: 1 Date: 7/6/2016
15.209 Radiated Emissions Test Distance: 10 Meters Horiz



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00449	Preamp-Top Amp (dB)	8447F	2/18/2016	2/18/2018
T2	AN02668	Spectrum Analyzer	E4446A	8/14/2015	8/14/2016
T3	ANP06883	Cable	LMR195-FR-3	10/27/2015	10/27/2017
T4	ANP06847	Cable	LMR195-FR-6	7/9/2015	7/9/2017
T5	AN01993	Biconilog Antenna	CBL6111C	3/11/2016	3/11/2018
T6	ANP04249	Cable	CXTA04A-50	3/3/2016	3/3/2018
T7	ANP06230	Cable	CXTA04A-50	3/3/2016	3/3/2018
T8	ANP05656	Attenuator	PE7004-6	12/22/2015	12/22/2017

Measurement Data:

Reading listed by margin.

Test Distance: 10 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz		T5	T6	T7	T8	Table				
			dB μ V	dB	dB	dB		dB μ V/m	dB μ V/m		
1	45.200M	34.8	-27.2	+0.0	+0.1	+0.2	+10.5	36.6	40.0	-3.4	Vert
	QP		+10.9	+0.5	+0.8	+6.0					
2	45.482M	34.6	-27.2	+0.0	+0.1	+0.2	+10.5	36.3	40.0	-3.7	Vert
	QP		+10.7	+0.6	+0.8	+6.0					
3	34.209M	28.9	-27.2	+0.0	+0.1	+0.1	+10.5	36.3	40.0	-3.7	Horiz
	QP		+16.8	+0.4	+0.7	+6.0					
4	31.539M	27.7	-27.2	+0.0	+0.1	+0.1	+10.5	36.3	40.0	-3.7	Horiz
	QP		+18.1	+0.4	+0.6	+6.0					
5	36.351M	29.8	-27.1	+0.0	+0.1	+0.2	+10.5	36.0	40.0	-4.0	Horiz
	QP		+15.3	+0.5	+0.7	+6.0					
6	44.941M	33.9	-27.2	+0.0	+0.1	+0.2	+10.5	35.8	40.0	-4.2	Vert
	QP		+11.0	+0.5	+0.8	+6.0					
7	58.910M	38.4	-27.1	+0.0	+0.1	+0.2	+10.5	35.8	40.0	-4.2	Vert
	QP		+6.2	+0.6	+0.9	+6.0					
8	58.643M	36.6	-27.1	+0.0	+0.1	+0.2	+10.5	34.1	40.0	-5.9	Vert
	QP		+6.3	+0.6	+0.9	+6.0					
9	45.494M	32.2	-27.2	+0.0	+0.1	+0.2	+10.5	33.9	40.0	-6.1	Vert
	QP		+10.7	+0.6	+0.8	+6.0					

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

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 dB μ V/m, the spectrum analyzer reading in dB μ V was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS	
Meter reading	(dB μ V)
+ Antenna Factor	(dB/m)
+ Cable Loss	(dB)
- Distance Correction	(dB)
- Preamplifier Gain	(dB)
= Corrected Reading	(dB μ 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.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED 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 caret ("^") 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.