

EMC TEST REPORT



NVLAP Lab Code 200033-0

Standard(s):

47 CFR FCC Part 15.247
47 CFR FCC Parts 15.107 and 15.109
RSS 210, Issue 8, 2010
FCC ID: M4Z6204
IC ID: 458C-6204

Product: Toll RFID READER

Model: 6204

3M Division: TSSD

Report Number: RE1407019-1

Report Issue Date: November 13, 2014

Report Prepared By:

Signature: 

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Tested By:

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1.0 Test Summary

Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

	Section FCC 15C/RSS 210	Scope of Test	Result	Comments
4.1	15/107/15.207/RSS-Gen	Conducted Emissions	pass	
4.2	15.109/15.209/RSS-Gen	Radiated Emissions	pass	
4.3	15.247(a)(1)/A8.1(b)	Carrier Frequency Separation	pass	
4.4	15.247(a)(1)/A8.1(d)	Number of Hopping Frequencies	pass	
4.5	15.247(a)(1)/A8.1(d)	Time of Occupancy (Dwell Time)	pass	
4.6	15.247(a)(1)/A8.1(a)	20dB Bandwidth	pass	
4.7	15.247(b)(3)/A8.4	Band-edge Compliance	pass	
4.8	15.247(c)/A8.5)	Conducted Output Power	pass	
4.9	15.247(c)/A8.5	Spurious Conducted and Radiated Emissions	pass	
4.10	15.247(2)(h)(i)/RSS102	RF Exposure Compliance	pass	

Note:	
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1.1 Measurement Uncertainty

The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements. The measurement uncertainty figures were calculated and correspond to a coverage factor of k=2, providing a confidence level of respectively 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian).

Radiated emissions	5.20 dB
Conducted emissions	3.60 dB
Harmonics and Flicker	3.32 dB

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2.0 Equipment Description

2.1	Equipment Under Test		
Description:	The four-port Toll RFID Reader 6204 is a multi-protocol, multi-regional Radio Frequency Identification (RFID) System that operates in the 902-928 MHz UHF band. All antenna ports operate sequentially with only one port transmitting at the time from a single transmit source Antenna path is identical. Optional 3M's Reader Redundancy Switch (RRS) can be used where the peripheral component interfaces with two RFID Readers and associated antenna systems to provide antenna change without operational disturbance and hardware replacement in event of reader failure. This peripheral was tested in FCC Part 90 test report RE1407019-2.		
Model(s):	6204		
Serial number:	ID6204000021		
Firmware:	Version # 1.4.25483		
Client Contact:	Name:	Phone:	
	Dave Missimer Randal D. Roebuck Jason Bram	919-281-1559 512-984-5688 512-984-5431	
3M Division:	Traffic Safety and Security		
Modifications:	None		
Frequency Range (MHz) :	902 – 928MHz		
Modulation Type:	FHSS	DB-ASK, PR-ASK	
Channel No.:	50		
Maximum Output Power:	30.0dBm		
Antenna Type :	3M SKU#78-0060-1048-8	NA	Linear 36°, 13.5dBi
	3M SKU#7800601053-8	MT- 262044	Linear 30°, 15dBi
	3M SKU#78-0060-1044-7	MT-263006	Linear 42°, 12.5dBi
	3M SKU# 78-0060-1045-4	MT-262006	6dBi, RHCP (max 7dBi)
	N/A	MT-242048	4.5dBi, RHCP
Rated Input Power:	Voltage: <input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/> VDC Frequency: <input type="checkbox"/> 50Hz <input checked="" type="checkbox"/> 60Hz Current: <input checked="" type="checkbox"/> 2.0A		
Test Dates:	08/04-11/12/2014		
Received Date:	06/26/2014		
Received Conditions:	<input type="checkbox"/> Poor <input checked="" type="checkbox"/> Good <input type="checkbox"/> Prototype <input checked="" type="checkbox"/> Production		

3.0 EUT Configuration

3.1 Support Equipment

No.	Product Type	Manufacturer	Model	Comments
1	Power Supply	TDK-Lambda	DSP100-24	24VDC/4.4A
2				

3.2 Cables/Ports

No.	Name	Type	Length	Shielding	Comments
1	RS232/Ethernet Interface	Wire Harness	13m	Unshielded	Digital I/O Connection
2					

3.3 Operating Condition of EUT

	Operation Modes
<input type="checkbox"/>	Stand by
<input checked="" type="checkbox"/>	Continuous Monitored Operation
<input type="checkbox"/>	Continuous Unmonitored Operation
<input checked="" type="checkbox"/>	RFID reader was programmed for FHSS operation using RTS RFID software via Command Line Interface.
<input checked="" type="checkbox"/>	FCC Dense mode – 902.75-927.250MHz with 500KHz channels
<input checked="" type="checkbox"/>	FCC Band A - 902.75-912.100MHz with 200KHz channels
<input checked="" type="checkbox"/>	FCC Band B - 910.100-919.900MHz with 200KHz channels
<input checked="" type="checkbox"/>	FCC Band C - 917.900-927.700MHz with 200KHz channels

3.4 Exercising of EUT

No.	Description of EUT Exercising
1	Transmitting at lowest, middle and highest channels of operation with un-modulated carrier
2	Transmitting with hopping channels enabled
3	Transmitting un-modulated carrier at maximum rated RF output power

4.0 Test Conditions and Results

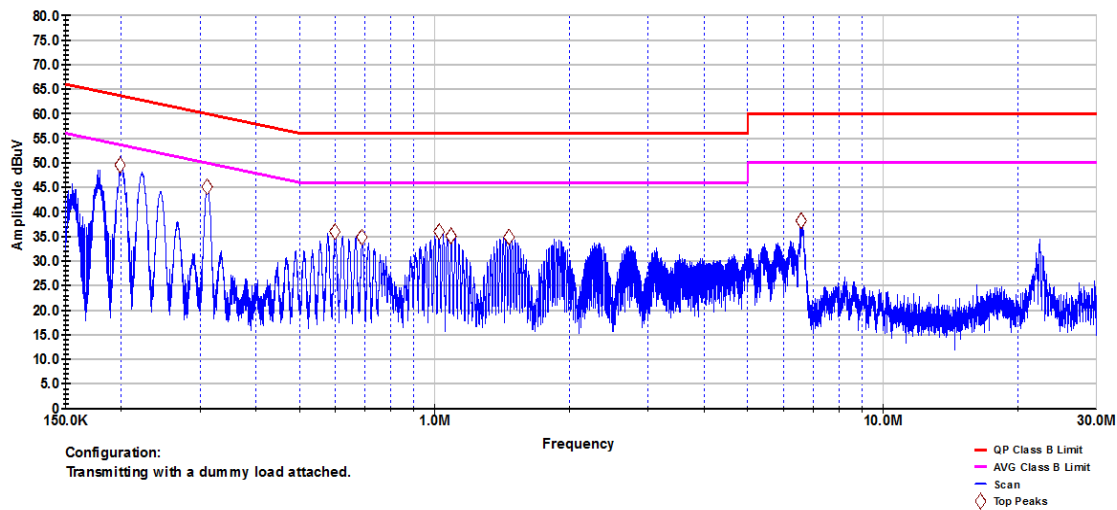
4.1	Conducted Emissions Data			
Method:	The AMN was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane. This distance was between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the AMN. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.			
Test Verification: <input checked="" type="checkbox"/>	Laboratory Ambient Temperature	21°C		
	Relative Humidity	45%		
Reference Standard:	<input type="checkbox"/> ANSI C63.4:2003 <input checked="" type="checkbox"/> ANSI C63.4:2009 <input type="checkbox"/> ANSI C63.10:2009 <input checked="" type="checkbox"/> FCC Part 15.207/RSS Gen <input type="checkbox"/> FCC Part 15.247/RSS 210 <input type="checkbox"/>		Measurement Point <input checked="" type="checkbox"/> Mains <input type="checkbox"/> Telecommunication ports <input type="checkbox"/>	
Frequency Range:	<input checked="" type="checkbox"/> 150KHz to 30KHz <input type="checkbox"/>			
Nominal Voltage:	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/>			
Tested By:	Mike Schultz <i>MS</i>		Date: 08/12/2014	
Limits				
Frequency (MHz)	Limit dB (µV)			
	Quasi-Peak	Average	Result	Comments
0.15 to 0.50	66 to 56	56 to 46	pass	
0.50 to 5	56	46	pass	
5 to 30	60	50	pass	
Modifications:				
Note:				

Frequency (MHz)	QP Line 1 dB (μV)	AVG Line 1 dB (μV)	QP Limit dB (μV)	AVG Limit dB (μV)	QP Margin dB	AVG Margin dB
0.201	49.45	48.29	63.56	53.56	-14.12	-5.27
0.312	45.45	44.41	59.93	49.93	-14.48	-5.52
0.579	34.94	33.73	56	46	-21.06	-12.27
0.668	34.73	33.44	56	46	-21.27	-12.56
1.046	34.87	33.49	56	46	-21.13	-12.51
1.472	35.4	34.36	56	46	-20.6	-11.64
1.896	35.06	33.91	56	46	-20.94	-12.09
6.598	36.75	31.21	60	50	-23.25	-18.79
Frequency (MHz)	QP Line 2 dB (μV)	AVG Line 2 dB (μV)	QP Limit dB (μV)	AVG Limit dB (μV)	QP Margin dB	AVG Margin dB
0.201	49.34	48.12	63.58	53.58	-14.24	-5.46
0.313	45.16	44.65	59.9	49.9	-14.74	-5.25
0.603	35.39	34.26	56	46	-20.61	-11.74
0.7	22.87	16.55	56	46	-33.13	-29.45
1.028	35.17	34.05	56	46	-20.83	-11.95
1.095	34.92	33.82	56	46	-21.08	-12.18
1.452	34.95	33.76	56	46	-21.05	-12.24
6.615	36.09	45.51	60	50	-23.91	-4.49
Voltage		<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/>				
Notes						



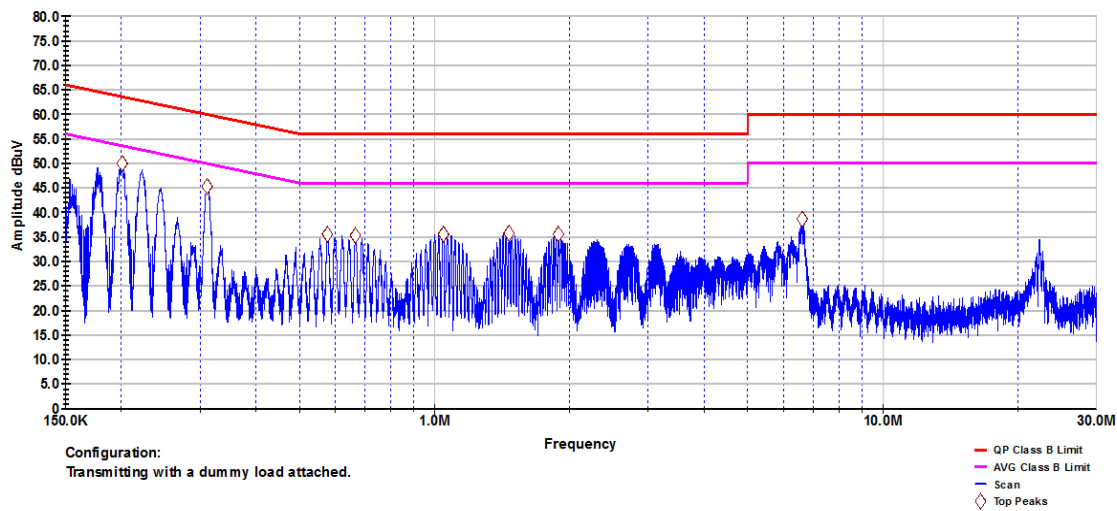
3M Company
Conducted Emissions
CISPR22_FCC Part 15, Class B, Line 2

RE Project # - RE1407019
Model # - 6204
EUT Description - RFID Reader
Serial # - 6204000021
EUT Power - 230 / 50 Hz



3M Company
Conducted Emissions
CISPR22_FCC Part 15, Class B, Line 1

RE Project # - RE1407019
Model # - 6204
EUT Description - RFID Reader
Serial # - 6204000021
EUT Power - 230 / 50 Hz





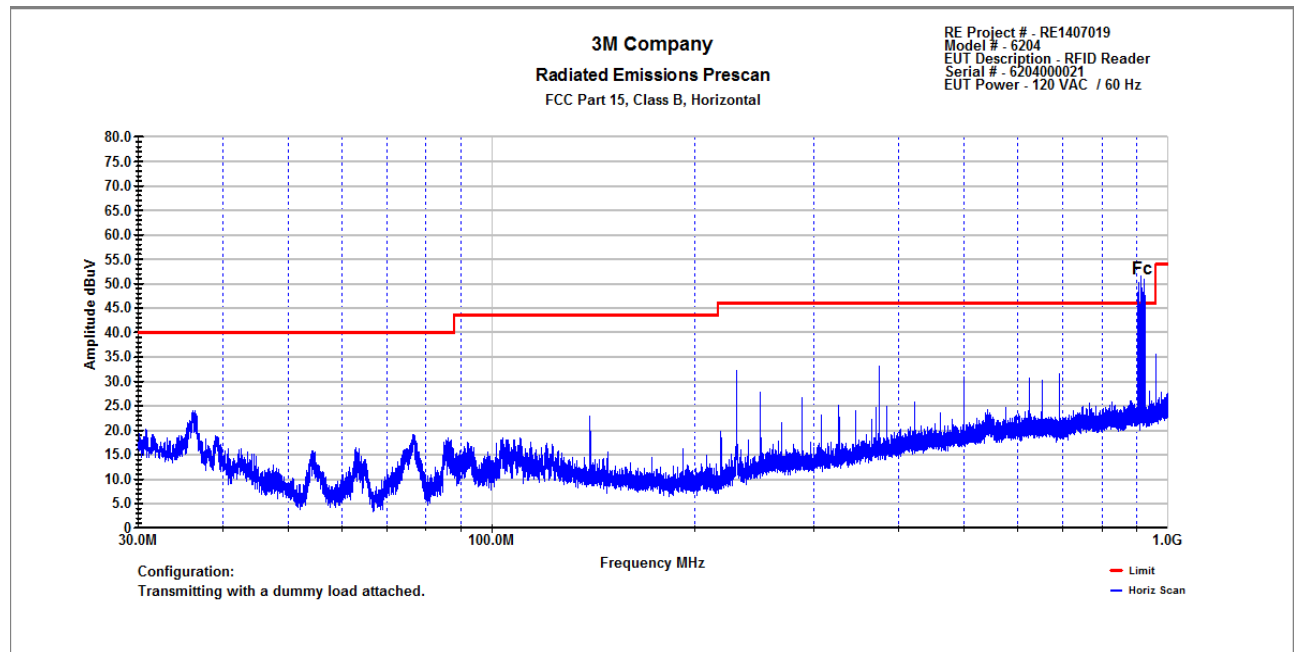
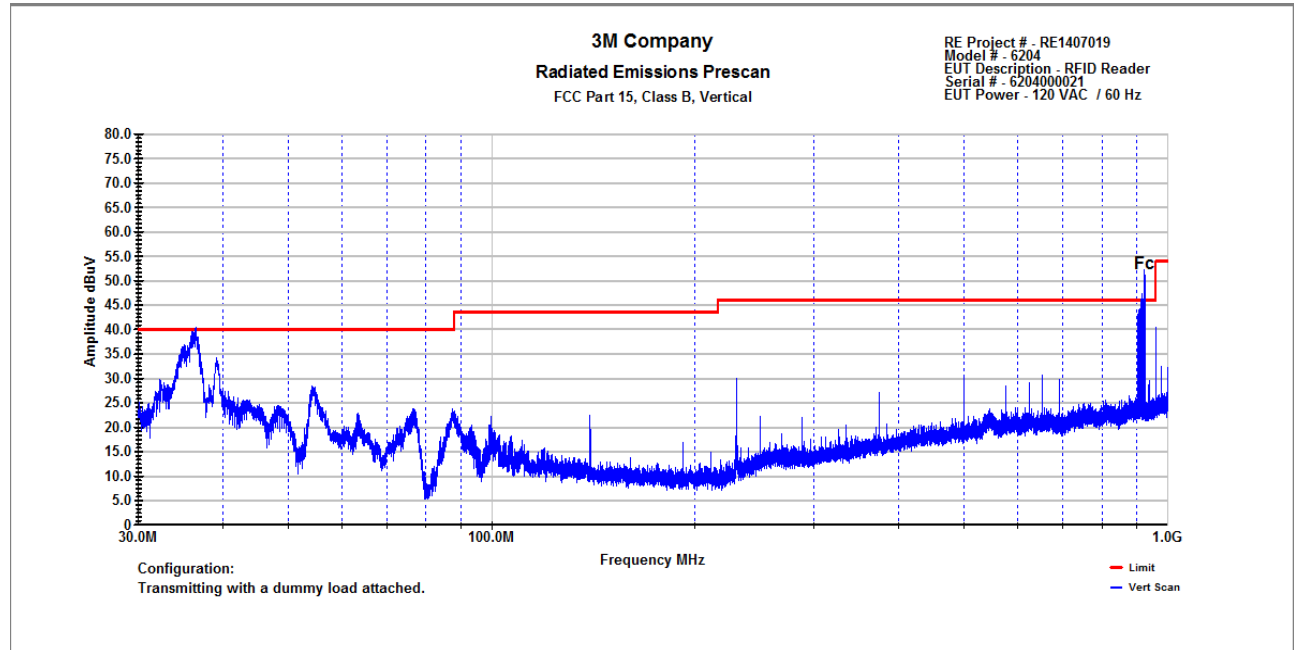
Test Set Up Photo

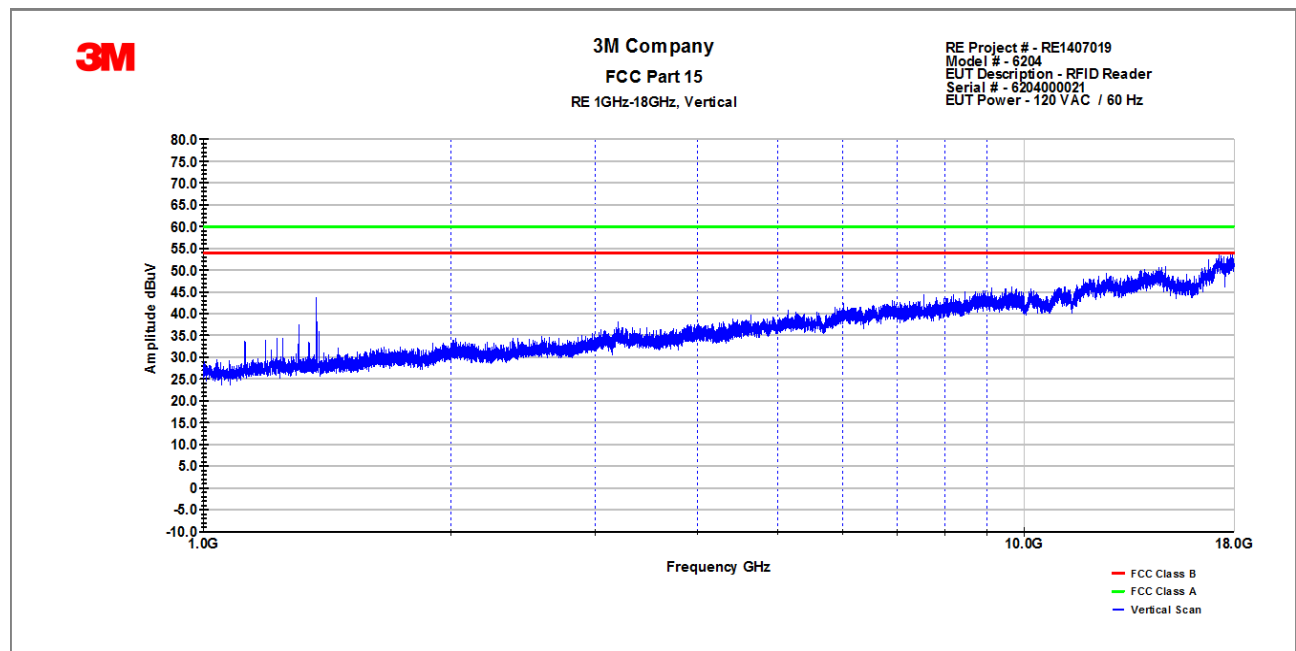
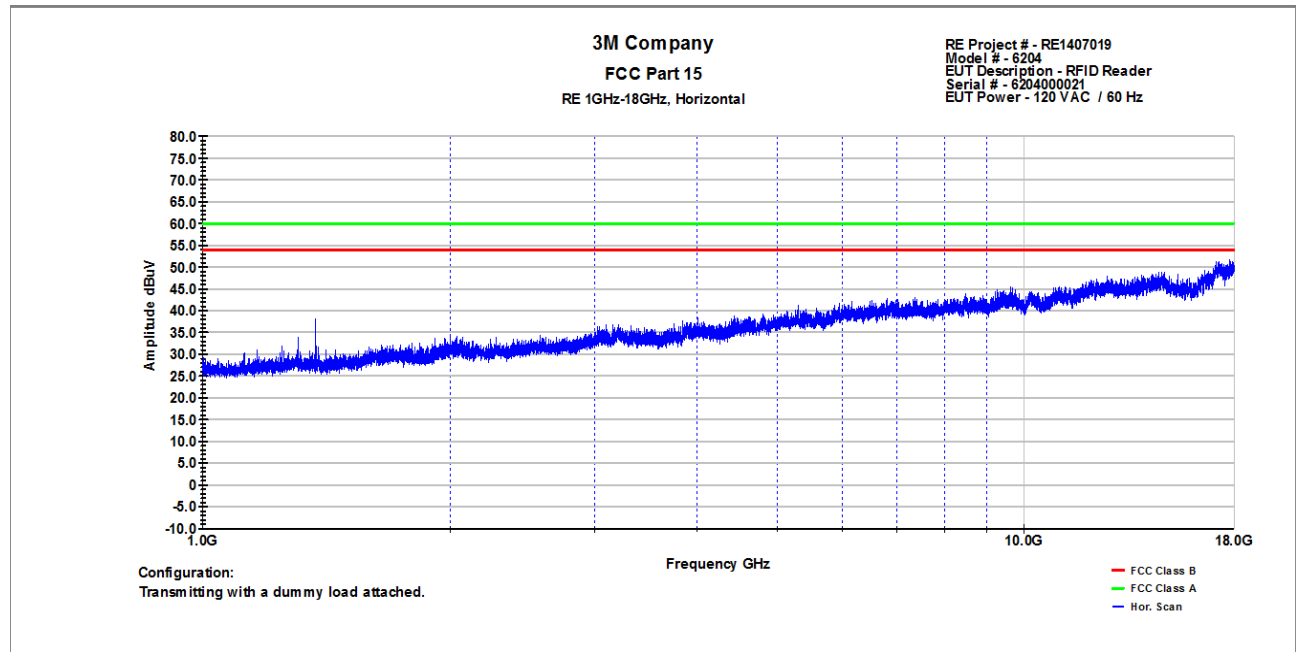
4.2	Radiated Emissions Data			
Method:	Measurements were made in a 3-meter semi-anechoic chamber that complies to CISPR 16. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements (quasi-peak) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.			
Test Verification: <input checked="" type="checkbox"/>	Laboratory Ambient Temperature	23°C		
	Relative Humidity	35%		
Reference Standard:	<input type="checkbox"/> ANSI C63.4:2003 <input checked="" type="checkbox"/> ANSI C63.4:2009 <input type="checkbox"/> ANSI C63.10:2009 <input checked="" type="checkbox"/> FCC Part 15.109/ICES 003 <input type="checkbox"/> FCC Part 15.247/RSS 210 <input checked="" type="checkbox"/> FCC Part 15.209		Measurement Distance	
			<input checked="" type="checkbox"/> 3 Meters <input type="checkbox"/> 	
Frequency Range:	<input checked="" type="checkbox"/> 30 MHz TO 10GHz <input type="checkbox"/>			
Nominal Voltage:	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/>			
Tested By:	 Mike Schultz <i>MS</i>		Date: 08/11/2014	
Limits				
Frequency (MHz)	Limit dB (µV/m)			
	Quasi-Peak	Average	Distance	Results
0.009-0.490		2400/F(KHz)	300	N/A
0.490-1.705	24000/F(KHz)		30	N/A
1.705-30	29.5		30	N/A
30 to 88	40		3	pass
88-216	43.5		3	pass
216-960	46		3	pass
Above 960		54	3	pass

Modifications:	
Note:	For emission in the restricted bands, the limit of 15.209 was used.


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Frequency (MHz)	Pol.	QP Reading dBμV/m	Total CF dB	Net at 3 m dBμV/m	Limit (dBμV/m)	Margin dB
36.15	V	16.36	18.42	34.78	40	-5.22
39.068	V	11.1	16.92	28.02	40	-11.98
54.5	V	13.83	10.38	24.21	40	-15.79
76.27	V	9.33	10.52	19.85	40	-20.15
913.734	H	-5.01	25.57	20.56	46.02	-25.46
921.647	V	3.62	25.29	28.91	46.02	-17.11
Notes		Total CF = Antenna Factor + Cable Factor - AMP Gain				

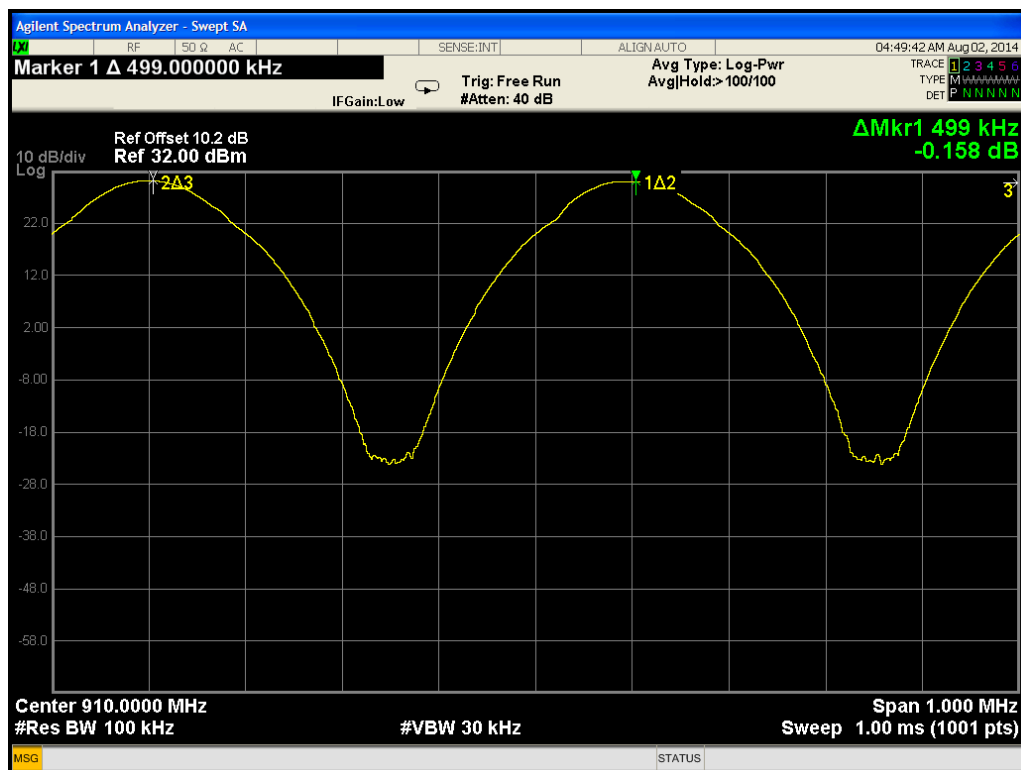




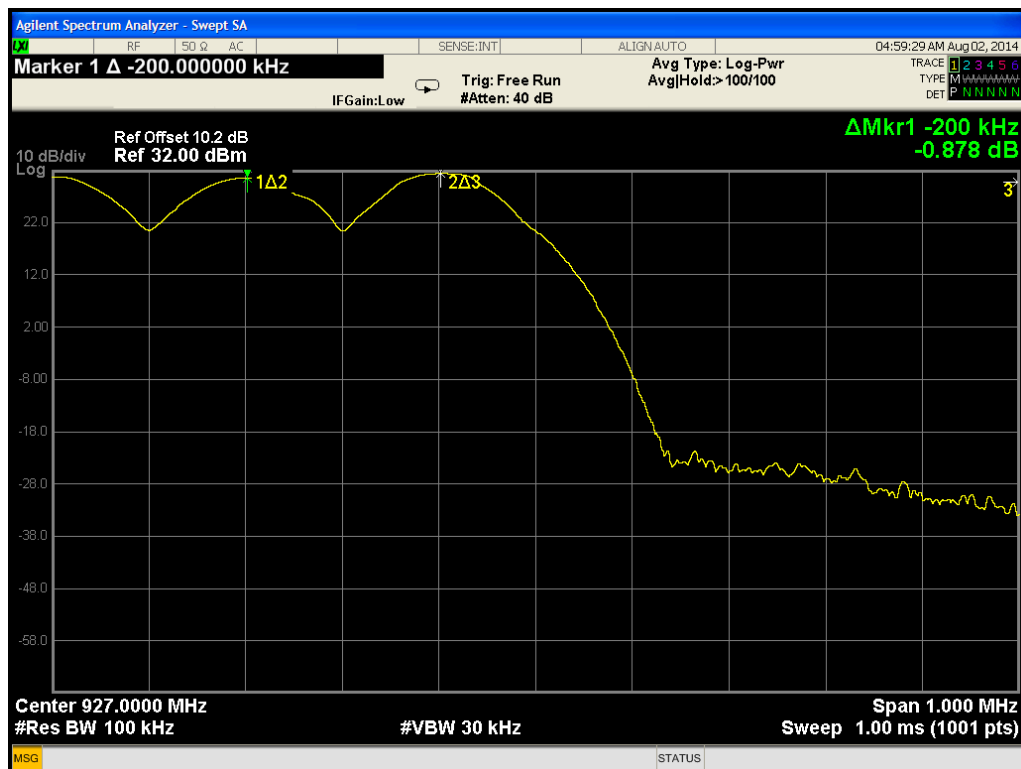
**Test Set Up Photo****Test Set Up Photo**

4.3	Carrier Frequency Separation				
Method:	The measurements were made with transmitter set to transmit a continuously with hopping function enabled. The EUT antenna was removed and the cable was connected directly into the spectrum analyzer via 10dB attenuator.				
	Laboratory Ambient Temperature	23°C			
	Relative Humidity	45%			
Reference Standard:	<input type="checkbox"/> ANSI C63.4:2003 <input type="checkbox"/> ANSI C63.4:2009 <input checked="" type="checkbox"/> ANSI C63.10:2009 <input type="checkbox"/> FCC Part 15.109/ICES 003 <input checked="" type="checkbox"/> FCC Part 15.247/RSS 210 <input type="checkbox"/> FCC Part 15.209	Measurement Point <input checked="" type="checkbox"/> Conducted <input type="checkbox"/> Radiated <input type="checkbox"/> 			
Frequency Range:	<input checked="" type="checkbox"/> 902.3-927.75MHz				
		Result			
Limit	<input type="checkbox"/> >25KHz	Pass			
	<input checked="" type="checkbox"/> >20dB Bandwidth (110 KHz)	Dense 499KHz	Band A 200KHz	Band B 200KHz	Band C 200KHz
Nominal Voltage:	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> VDC				
Tested By:	Yuriy Litvinov			Date: 08/02/2014	

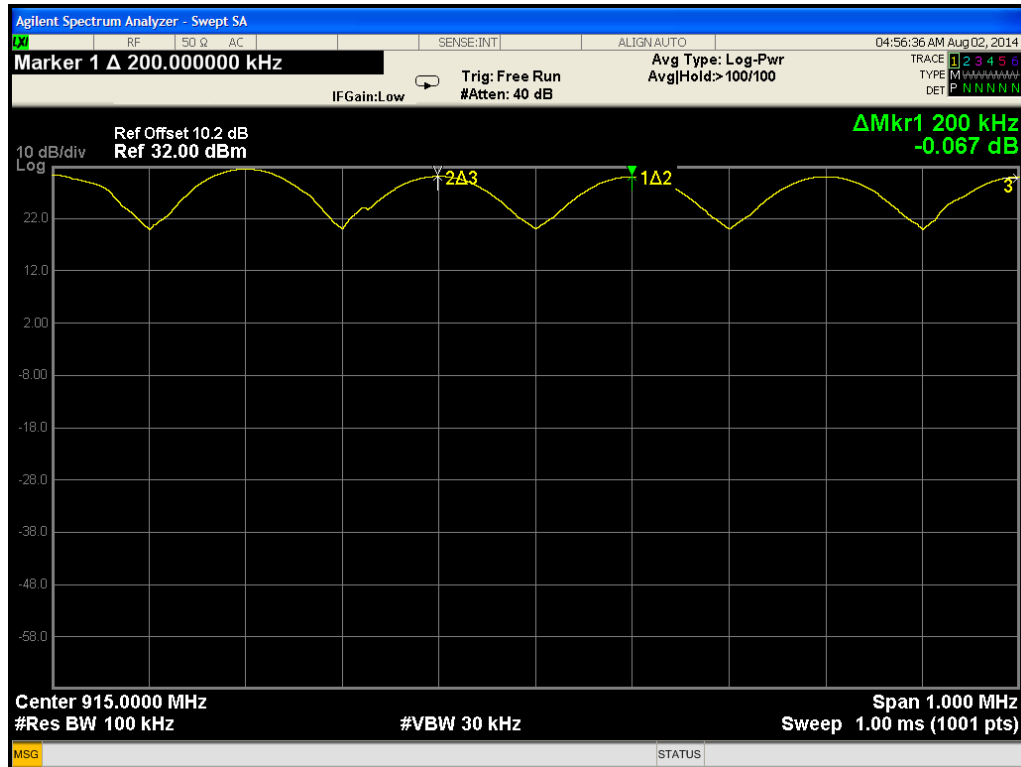
Note:	The channel spacing was verified to be nominally 200KHz in Bands A, B and C. The dense mode utilizes 50 channels and the channel spacing in this mode was measured to be 500KHz.
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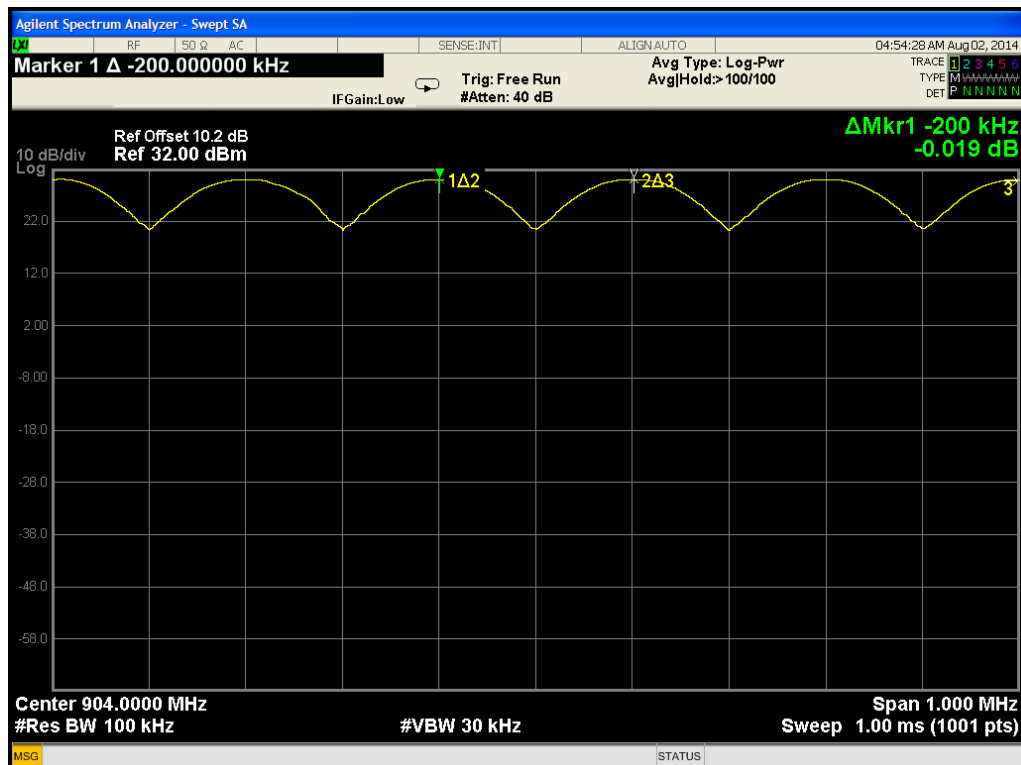
Carrier Frequency Separation – Dense Mode






Carrier Frequency Separation – Band C




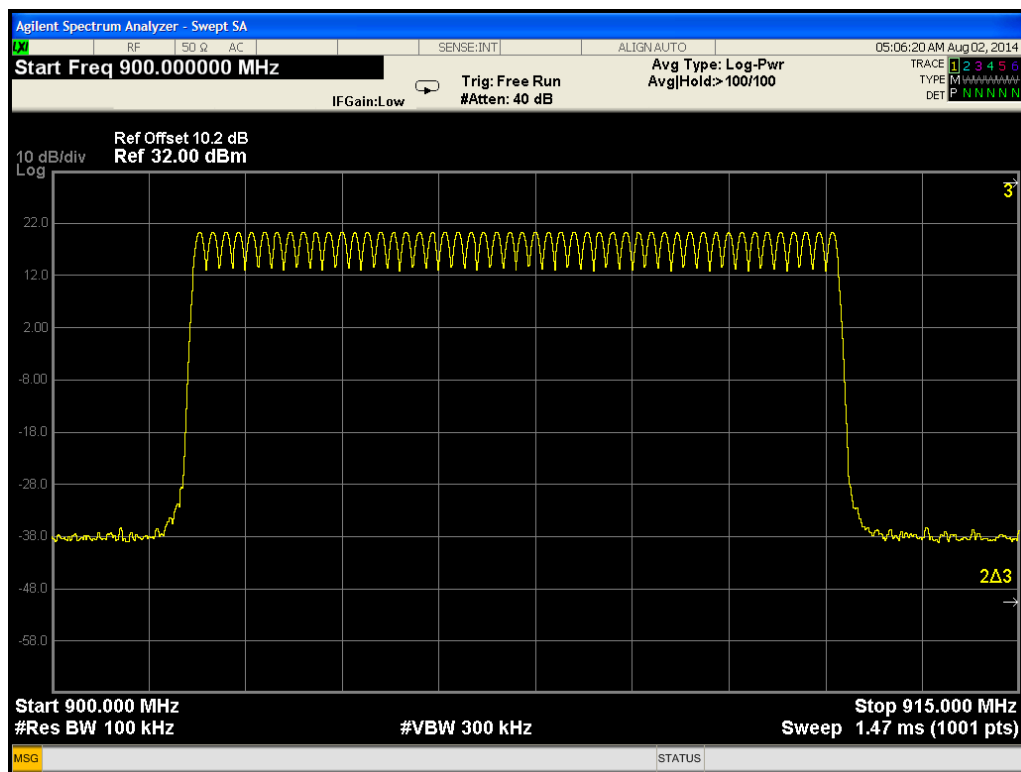
Carrier Frequency Separation – Band B



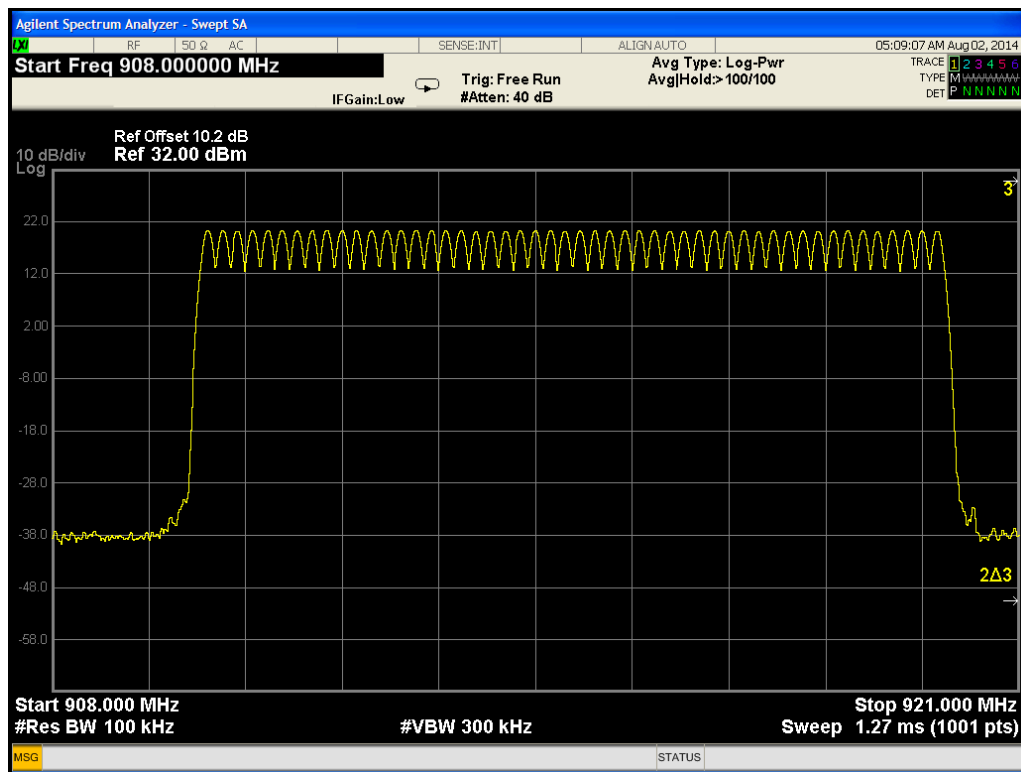
Carrier Frequency Separation – Band A

4.4	Number of Hopping Frequencies		
Method:	The measurements were made with transmitter set to transmit a continuously with hopping function enabled. The EUT antenna was removed and the cable was connected directly into the spectrum analyzer via 10dB attenuator.		
	Laboratory Ambient Temperature	23°C	
	Relative Humidity	45%	
Reference Standard:	<input type="checkbox"/> ANSI C63.4:2003 <input type="checkbox"/> ANSI C63.4:2009 <input checked="" type="checkbox"/> ANSI C63.10:2009 <input type="checkbox"/> FCC Part 15.109/ICES 003 <input checked="" type="checkbox"/> FCC Part 15.247/RSS 210 <input type="checkbox"/> FCC Part 15.209	Measurement Point <input checked="" type="checkbox"/> Conducted <input type="checkbox"/> Radiated <input type="checkbox"/> 	
Frequency Range:	<input checked="" type="checkbox"/> 902.3-927.75MHz		
Antenna Gain:	<input type="checkbox"/>	Number of Channels	Result
Limit	<input checked="" type="checkbox"/> > 50 Hopping Channels, BW <250KHz	50	Pass
	<input type="checkbox"/> >25 Hopping Channels, BW >250KHz		
Nominal Voltage:	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> VDC		
Tested By:	Yuriy Litvinov		Date: 08/02/2014

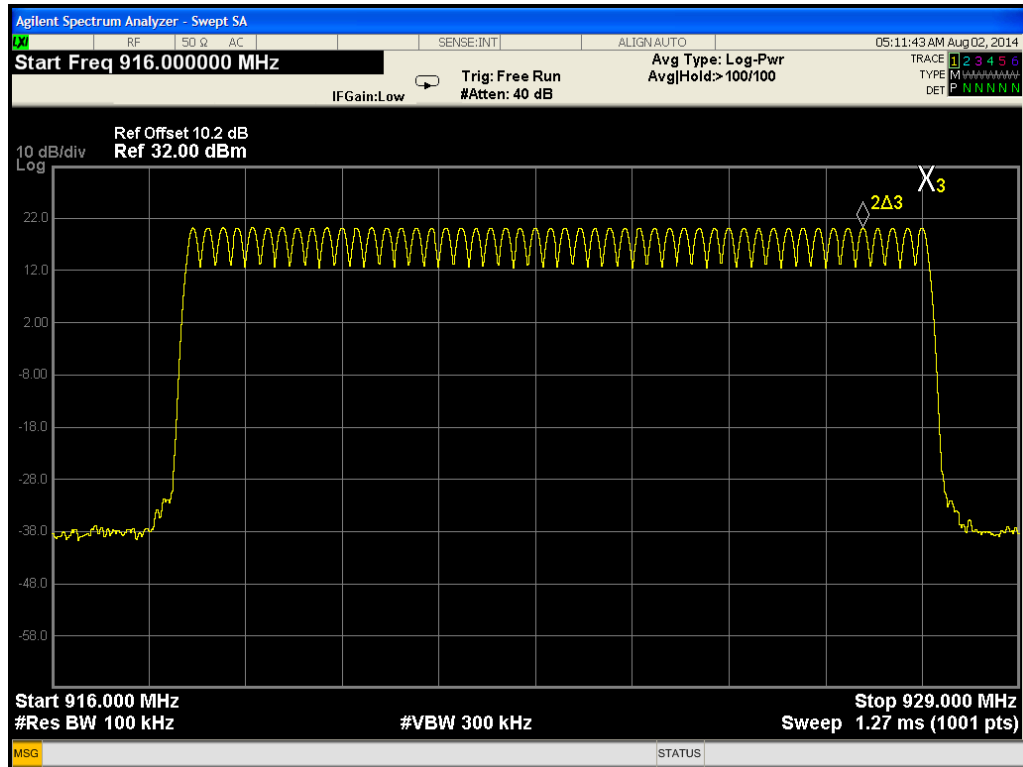
Note:	
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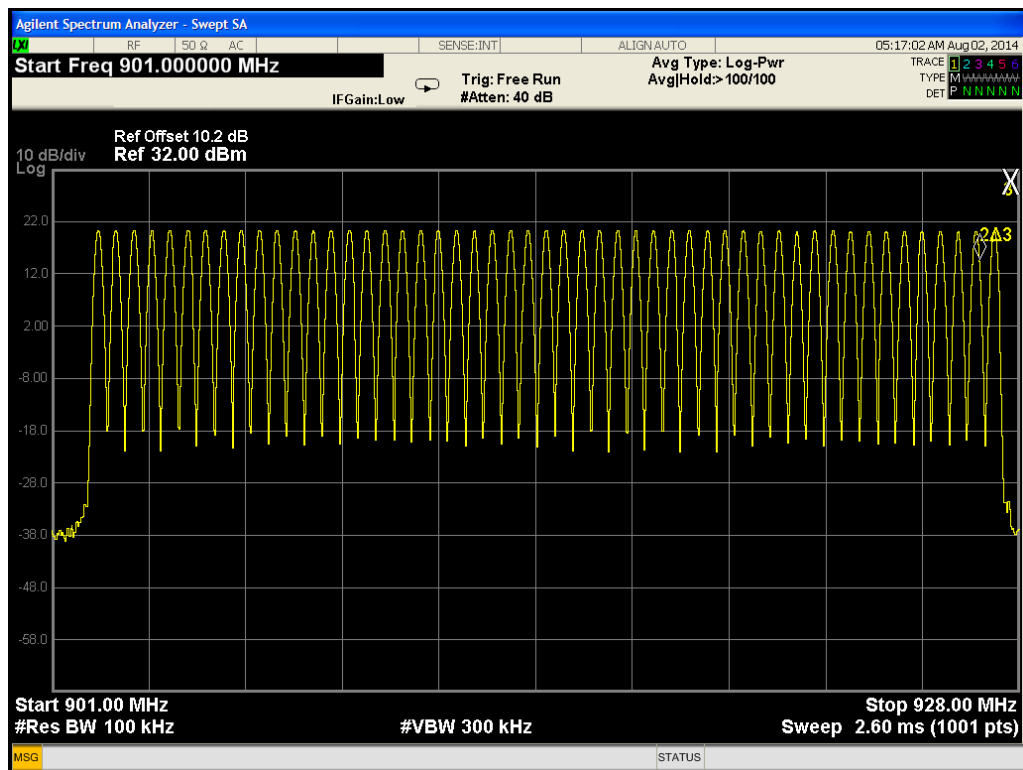
Number of Channels – Band A




Number of Channels – Band B

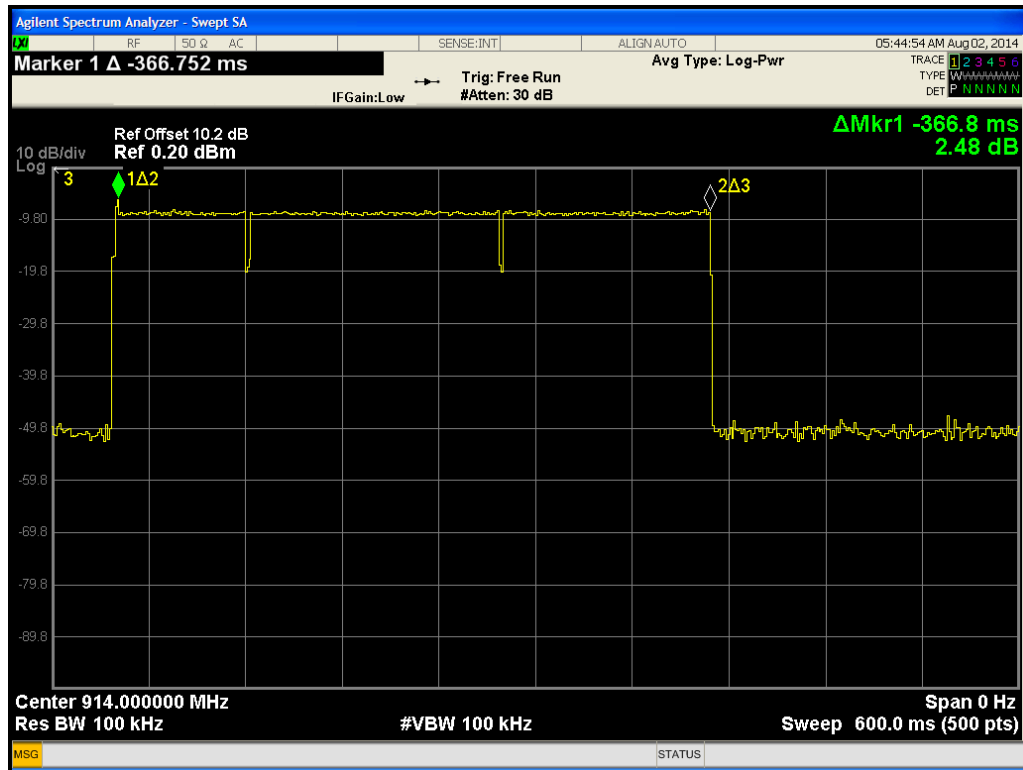


Number of Channels – Band C

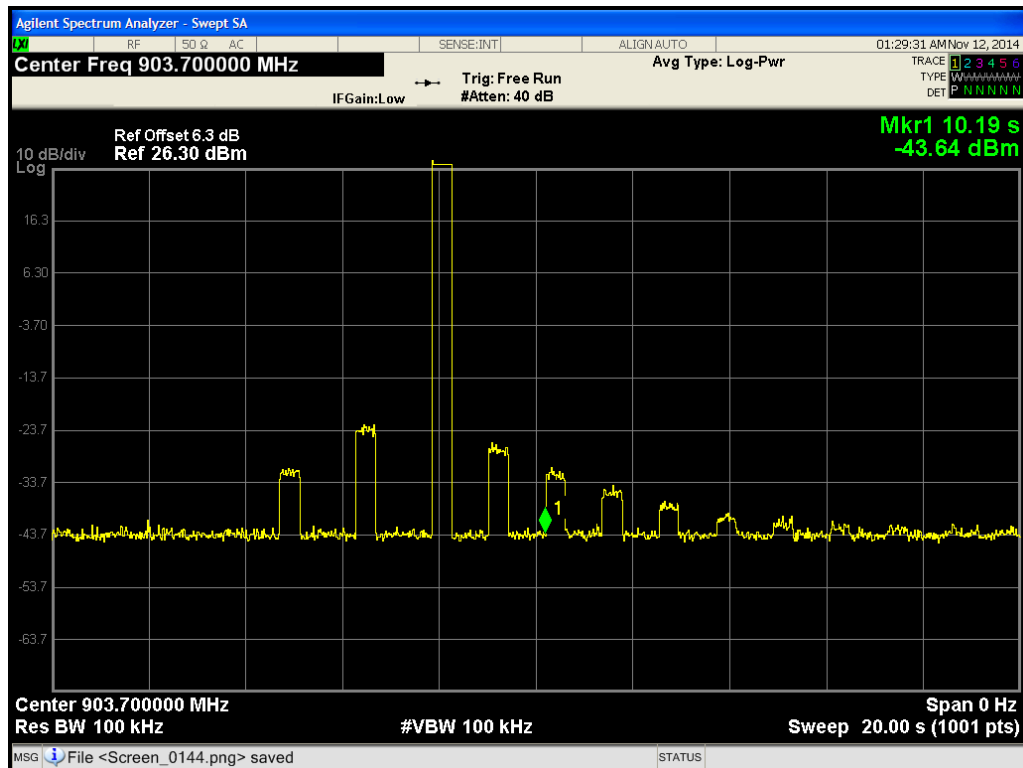


Number of Channels – Dense Mode


4.5	Time of Occupancy		
Method:	The measurements were made with transmitter set to transmit continuously with hopping function enabled. The EUT antenna was removed and the cable was connected directly into the spectrum analyzer via 10dB attenuator.		
	Laboratory Ambient Temperature		23°C
	Relative Humidity		35%
Reference Standard:	<input type="checkbox"/> ANSI C63.4:2003 <input type="checkbox"/> ANSI C63.4:2009 <input checked="" type="checkbox"/> DA 00-705 <input type="checkbox"/> FCC Part 15.109/ICES 003 <input checked="" type="checkbox"/> FCC Part 15.247/RSS 210 <input type="checkbox"/> FCC Part 15.209		Measurement Point <input checked="" type="checkbox"/> Conducted <input type="checkbox"/> Radiated <input type="checkbox"/> 
Frequency Range:	<input checked="" type="checkbox"/> 902.3-927.25MHz		
Antenna Gain:	<input type="checkbox"/>		Results
Limit (dwell time):	<input checked="" type="checkbox"/> 20dB<250KHz	<input checked="" type="checkbox"/> <0.4 sec within a period of 20s	366.8ms
	<input type="checkbox"/> 20dB>250KHz	<input type="checkbox"/> <0.4 sec within a period of 10s	
Nominal Voltage:	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> VDC		
Tested By:	Yuriy Litvinov		Date: 05/09/2104
Note:	Single pulse duration is 366.8ms in a 20s sweep period 1 pulse occurs, and therefore the total on time is 366.8.6ms		



Duty Cycle



Total on Time

4.6	20dB Bandwidth		
Method:	The measurements were made with transmitter set to transmit continuously modulated signal at low, mid and high channels. The marker delta method was used to determine the 20dB bandwidth.		
	Laboratory Ambient Temperature	23°C	
	Relative Humidity	45%	
Reference Standard:	<input type="checkbox"/> ANSI C63.4:2003 <input type="checkbox"/> ANSI C63.4:2009 <input checked="" type="checkbox"/> DA 00-705 <input type="checkbox"/> FCC Part 15.109/ICES 003 <input checked="" type="checkbox"/> FCC Part 15.247/RSS 210 <input type="checkbox"/> FCC Part 15.209	Measurement Point <input checked="" type="checkbox"/> Conducted <input type="checkbox"/> Radiated <input type="checkbox"/> 	
Frequency Range:	<input checked="" type="checkbox"/> 902.3-927.75MHz		
Antenna Gain:	<input type="checkbox"/> dBi	RBW ≥ 1% of the 20 dB bandwidth VBW ≥ RBW	
Nominal Voltage:	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> VDC		
Tested By:	Yuriy Litvinov	Date: 08/02/2014	

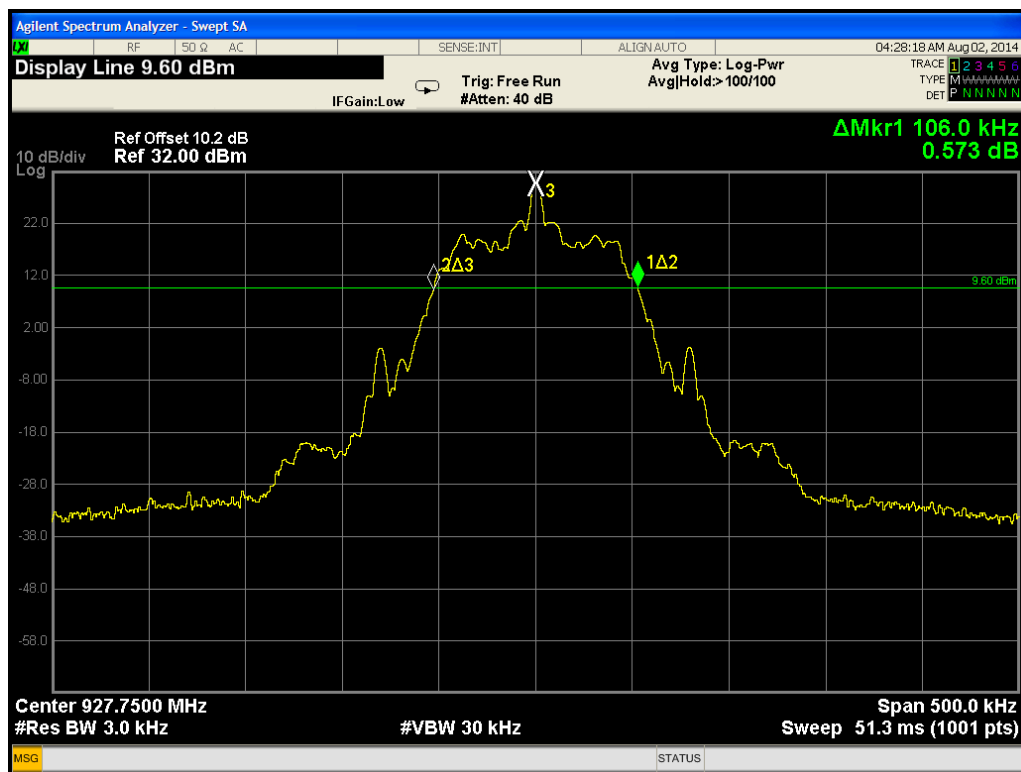
Note:	Occupied Bandwidth for the various modes available. The worst case modulations used by the device have been reported.
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Channels Frequency (MHz)	20 dB Bandwidth (KHz)	Limit (KHz)	Results
Low Band A: 902.3	106.0	500	pass
Mid Band B: 910.1	106.0	500	pass
High Band C: 927.75	106.0	500	pass

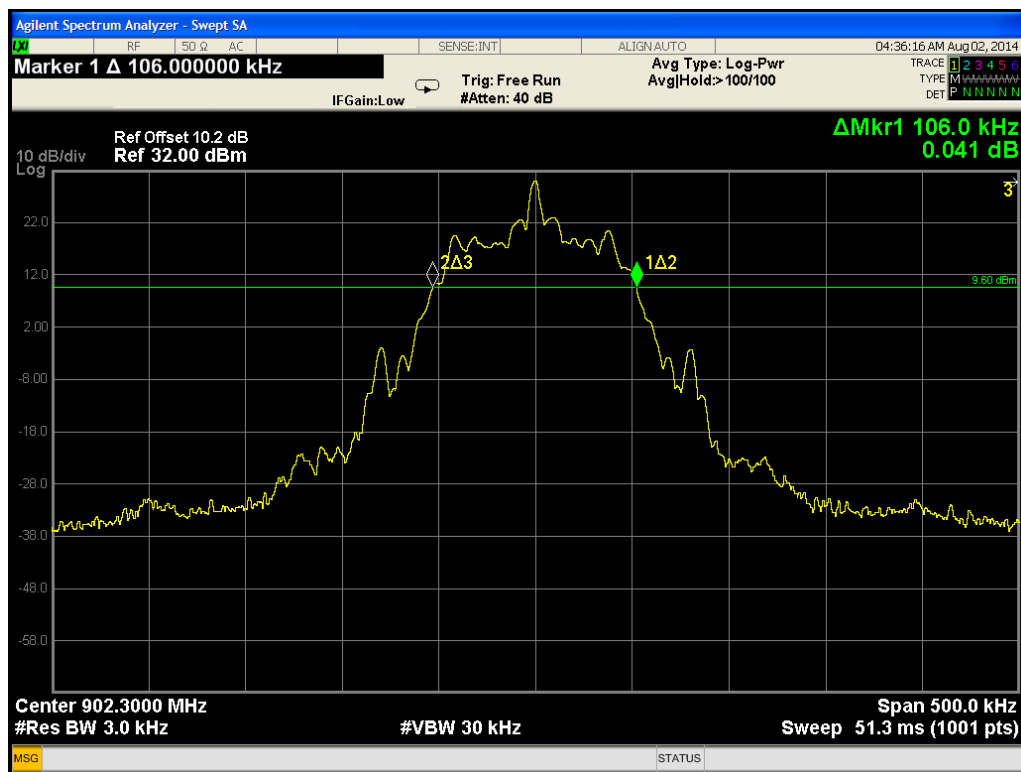
Frequency (MHz) (lower data rate dense mode)	20 dB Bandwidth (KHz)	Limit (KHz)	Results
Dense Mode Low: 902.3	106.0	500	pass
Dense Mode Mid: 914.5	106.5	500	pass
Dense Mode High: 927.75	106.0	500	pass

Frequency (MHz) (higher data rate dense mode)	20 dB Bandwidth (KHz)	Limit (KHz)	Results
Dense Mode Low: 902.3	190.8	500	pass
Dense Mode Mid: 914.5	185.3	500	pass
Dense Mode High: 927.75	185.2	500	pass





Occupied Bandwidth – Band C

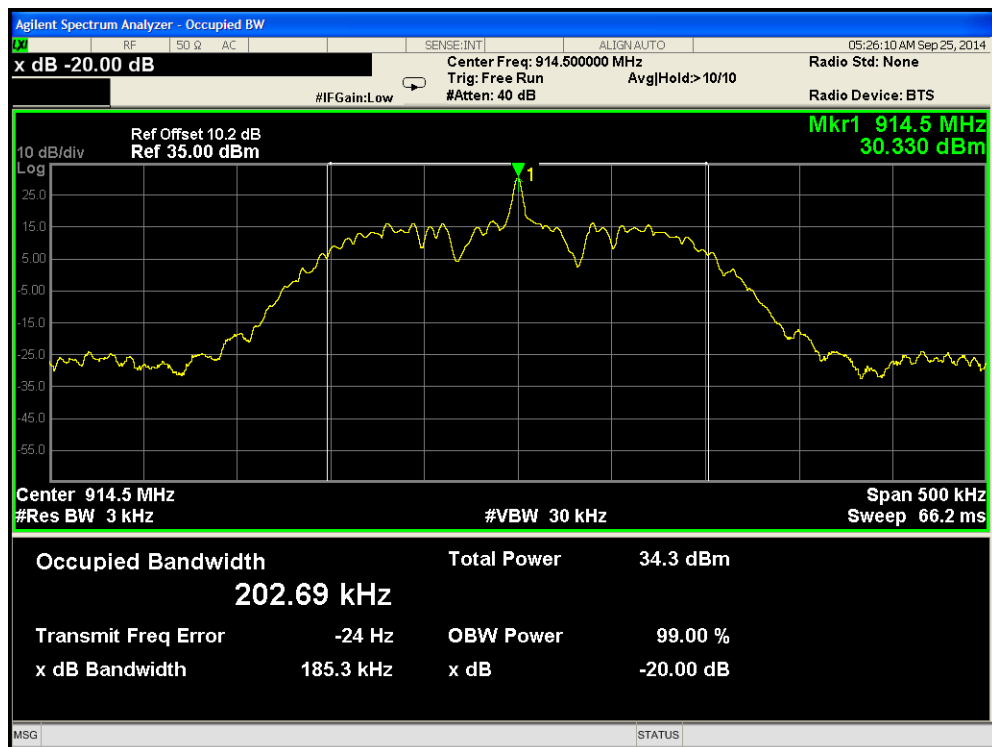


Occupied Bandwidth – Dense Mode Low






Occupied Bandwidth – Dense Mode High (higher data rate)




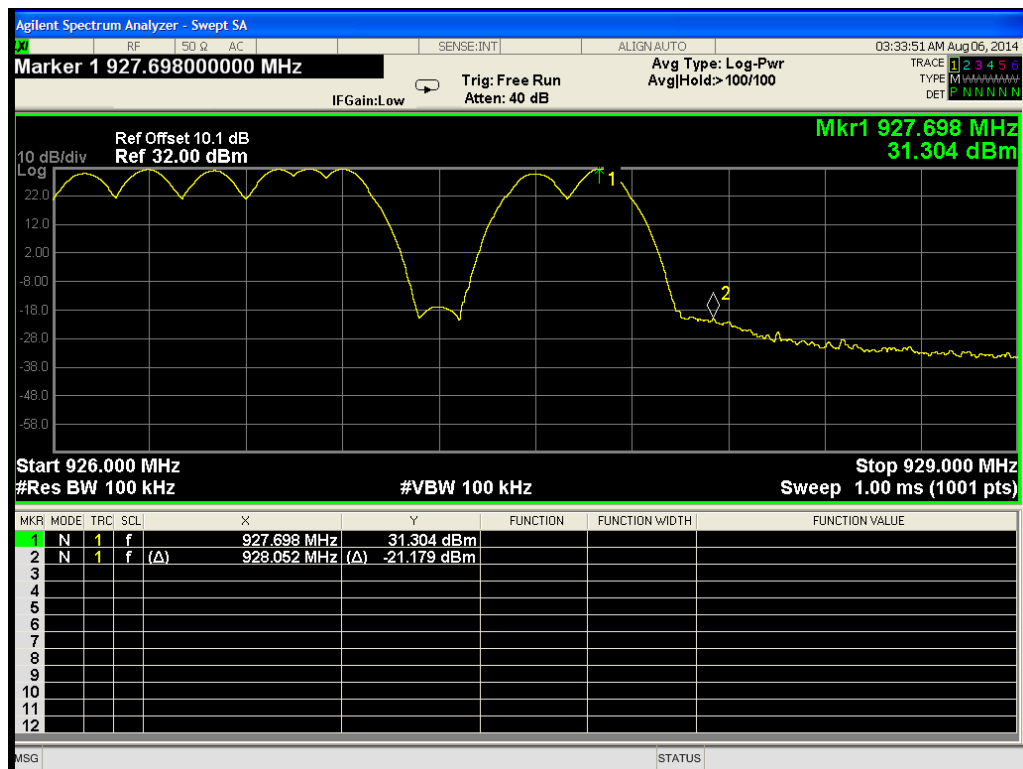
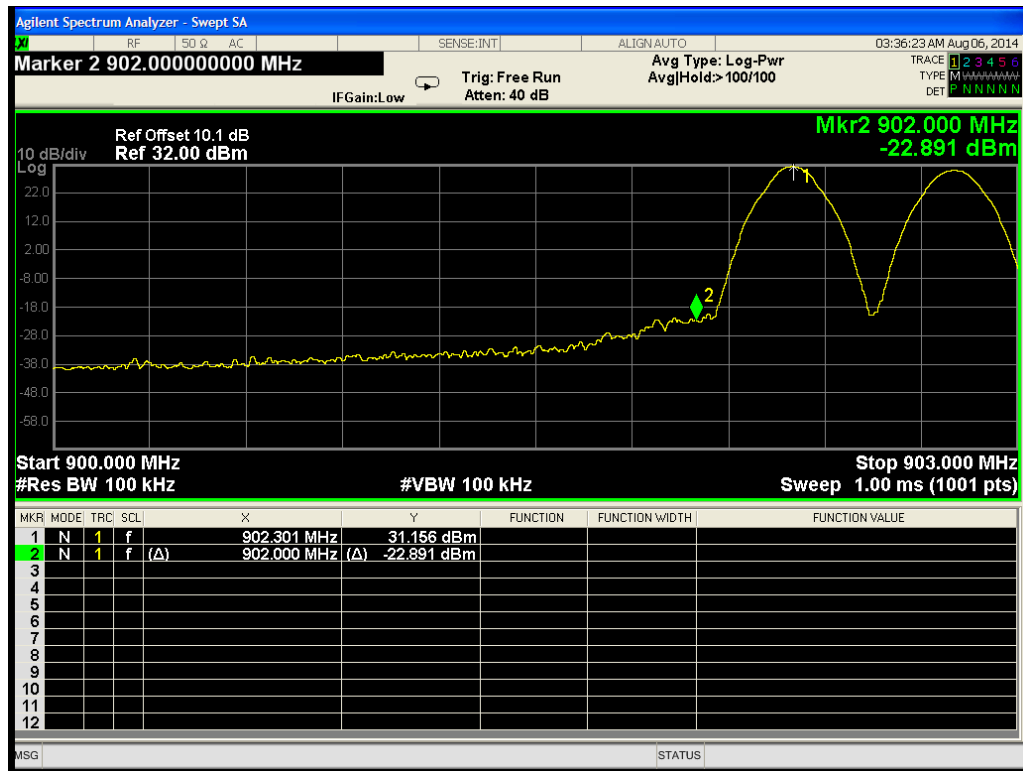
Occupied Bandwidth – Dense Mode Mid (higher data rate)






Occupied Bandwidth – Dense Mode Low (higher data rate)

4.7	Band-Edge Compliance		
Method:	The measurements were made with transmitter set to transmit continuously with un-modulated signal and hopping enabled at low and high channels. The marker delta method was used to determine band-edge compliance.		
	Laboratory Ambient Temperature	23°C	
	Relative Humidity	35%	
Reference Standard:	<input type="checkbox"/> ANSI C63.4:2003 <input type="checkbox"/> ANSI C63.4:2009 <input checked="" type="checkbox"/> DA 00-705 <input type="checkbox"/> FCC Part 15.109/ICES 003 <input checked="" type="checkbox"/> FCC Part 15.247/RSS 210 <input type="checkbox"/> FCC Part 15.209	Measurement Point <input checked="" type="checkbox"/> Conducted <input type="checkbox"/> Radiated <input type="checkbox"/> 	
Frequency Range:	<input checked="" type="checkbox"/> 902.3-927.75MHz		
Antenna Gain:	<input type="checkbox"/>	Results	
Limit	<input checked="" type="checkbox"/> >20dBc <input type="checkbox"/> FCC Part 15.209	➤ 53dBc	
Nominal Voltage:	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> VDC		
Tested By:	Yuriy Litvinov		Date: 08/09/2014

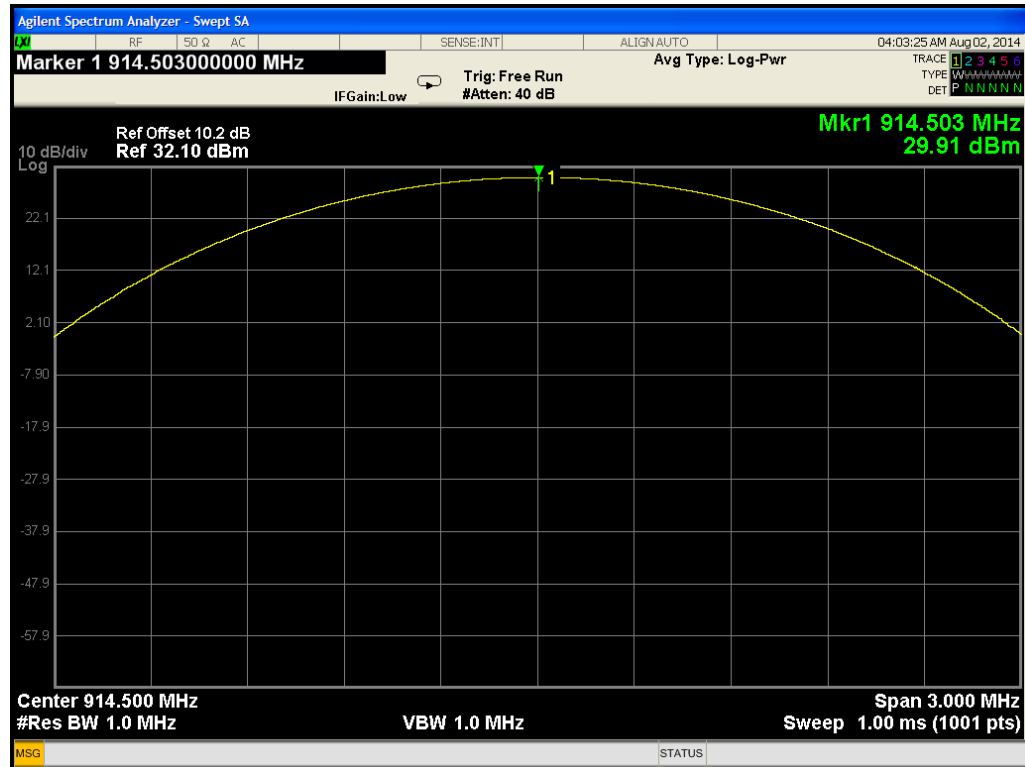
Note:	
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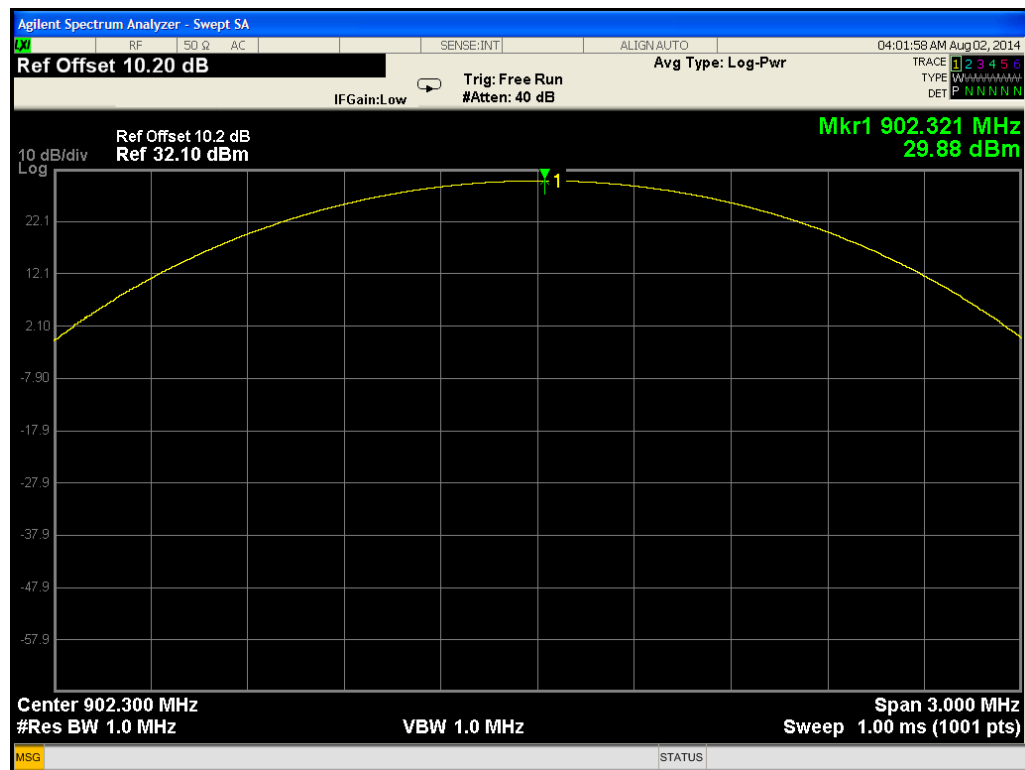
4.8	Conducted Output Power		
Method:	Measurements was performed with an un-modulated carrier at the highest power level at which the transmitter is intended to operate. The transmitter was configured to operate lowest, middle and highest power channels and connected to an antenna port. The carrier or mean power delivered to antenna was measured under normal test conditions. The analyzer offset was adjusted to compensate for the attenuator and other losses. The RF Power output listed in the table is the power delivered to the antenna.		
	Laboratory Ambient Temperature	23°C	
	Relative Humidity	45%	
Reference Standard:	<input type="checkbox"/> ANSI C63.4:2003 <input type="checkbox"/> ANSI C63.4:2009 <input checked="" type="checkbox"/> ANSI C63.10:2009 <input type="checkbox"/> FCC Part 15.109/ICES 003 <input checked="" type="checkbox"/> FCC Part 15.247/RSS 210 <input type="checkbox"/> FCC Part 15.209	Measurement Point <input checked="" type="checkbox"/> Conducted <input type="checkbox"/> Radiated <input type="checkbox"/> 	
Frequency Range:	<input checked="" type="checkbox"/> 902.3-927.75MHz		
Limit	≥50 Hopping Channels		>25 Hopping Channels <50
	<input checked="" type="checkbox"/> 30dBm <input type="checkbox"/> 		<input type="checkbox"/> 24dBm <input type="checkbox"/> 
Nominal Voltage:	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> VDC		
Tested By:	Yuriy Litvinov		Date: 08/02/2014

Antenna Port	Channels Frequency (MHz)	RF Power Output (dBm)	Limit (dBm)	Results
1	902.3	29.88	30	pass
	914.5	29.81	30	pass
	927.7	29.71	30	pass
2	902.3	29.75	30	pass
	914.5	29.85	30	pass
	927.7	29.89	30	pass
3	902.3	29.85	30	pass
	914.5	29.88	30	pass
	927.7	29.88	30	pass
4	902.3	29.88	30	pass
	914.5	29.85	30	pass
	927.7	29.75	30	pass

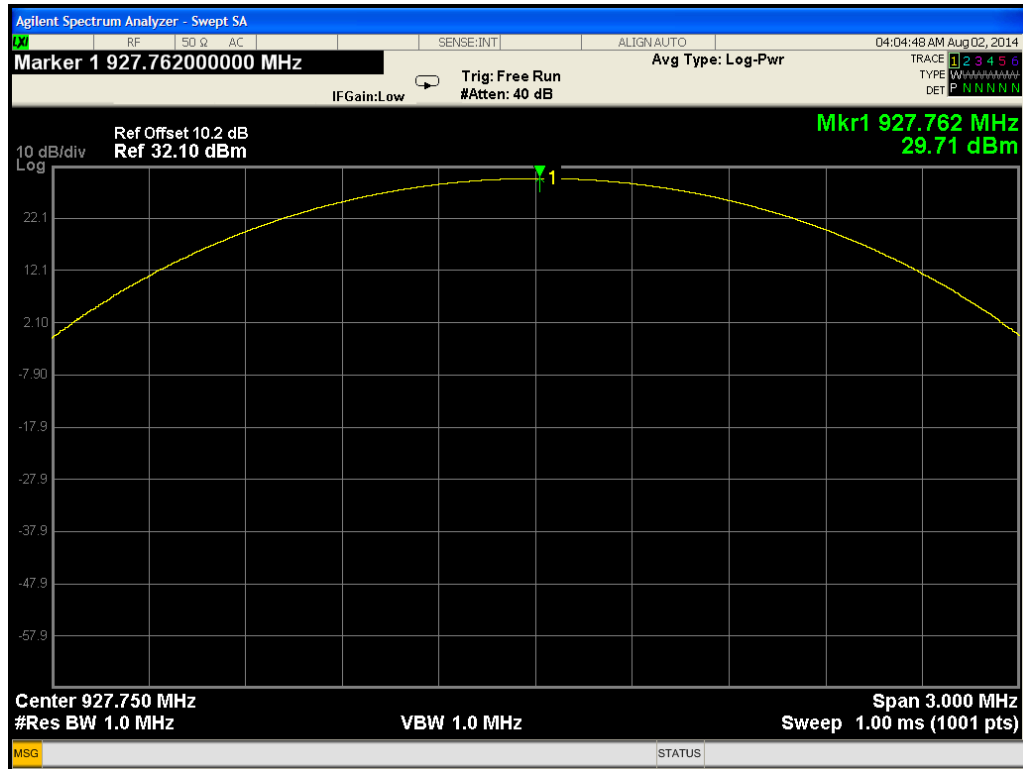
Note:	Worst case modulation used by the device. KDB 594280. Professional installation or authorized service personnel is required to configure radio parameters of the transmitter using the software for adjusting total EIRP (36dBm) power at local installation to ensure compliance with FCC Rules.
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Peak Power-Low Channel



Peak Power-Mid Channel



Peak Power-High Channel

4.9	Transmitter spurious emissions								
Method:	<p>The measurements were made with transmitter set to transmit continuously with un-modulated signal and hopping enabled at low, mid and high channels. The level of spurious emissions was measured as conducted spurious emission and radiated power that falls in a restricted band.</p> <p>EUT was rotated through three orthogonal axes to determine which attitude (orientation) and arrangement produces the highest emission relative to the limit; the attitude and headset arrangement that produces the highest emission relative to the limit was used in making final radiated emission measurements.</p> <p>EUT was rotated 360 deg and radiated emissions was measured while the headset situated in three orthogonal planes with the measurement antenna set up in vertical and horizontal polarization. Spurious Radiated emissions measurements were performed with external preamp and a high pass filter.</p>								
	Laboratory Ambient Temperature		23°C						
	Relative Humidity		35%						
Reference Standard:	<input type="checkbox"/> ANSI C63.4:2003 <input checked="" type="checkbox"/> ANSI C63.4:2009 <input checked="" type="checkbox"/> DA 00-705 <input checked="" type="checkbox"/> FCC Part 15.247/RSS 210 <input checked="" type="checkbox"/> FCC Part 15.209		Measurement Point <input checked="" type="checkbox"/> Conducted <input checked="" type="checkbox"/> Radiated						
Frequency Range:	<input checked="" type="checkbox"/> 902.3-927.75Mhz								
Limit	<input checked="" type="checkbox"/> >20dBc		Restricted Band						
	<input checked="" type="checkbox"/> FCC Part 15.209		<input checked="" type="checkbox"/> 15.205						
Antenna	MT-262006/N – 7dBi (RHCP) MT- 262044/NH,15dBi MT-263006,12.5dBi								
Nominal Voltage:	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> VDC								
Tested By:	Mike Schultz <i>MS</i>	Date: 08/12/2014							
Limits									
Frequency (MHz)	Limit dB (µV/m)								
	Quasi-Peak	Average	Distance	Results					
0.009-0.490		2400/F(KHz)	300	N/A					
0.490-1.705	24000/F(KHz)		30	N/A					
1.705-30	29.5		30	N/A					
30 to 88	40		3	pass					
88-216	43.5		3	pass					
216-960	46		3	pass					
Above 960		54	3	pass					

Note:	No spurious emissions (conducted & radiated) were detected in the frequency range above 5GHz. Test was performed with the highest gain of each type of antenna proposed for use with the EUT.
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[illegible]

Pol.	Frequency (MHz)	Reading dBμV/m	Total CF dB	Net at 3 m dBμV/m.	Limit dBμV/m	Margin dB	Comments	
V	2783.0	46.0	-12.0	34.0	74	-40.0	PK	
V	2783.0	33.7	-12.0	21.7	54	-32.3	AV	
H	2783.0	60.8	-12.0	48.8	74	-25.2	PK	
H	2783.0	50.6	-12.0	38.6	54	-15.5	AV	
V	3710.8	45.9	-10.0	35.9	74	-38.1	PK	
V	3710.8	33.5	-10.0	23.5	54	-30.5	AV	
H	3710.8	46.7	-10.0	36.7	74	-37.3	PK	
H	3710.8	34.8	-10.0	24.8	54	-29.2	AV	
V	4638.515	44.3	-5.8	38.5	74	-35.5	PK	
V	4638.515	31.5	-5.8	25.7	54	-28.3	AV	
H	4638.515	44.2	-5.8	38.4	74	-35.6	PK	
H	4638.515	31.9	-5.8	26.1	54	-27.9	AV	
Notes		Total CF = Antenna Factor + Cable Factor - AMP Gain						
		MT- 262044/NH,15dBi High Channel. Average readings obtained with the 10Hz VBW						



Test Set Up Photo

[illegible][illegible]

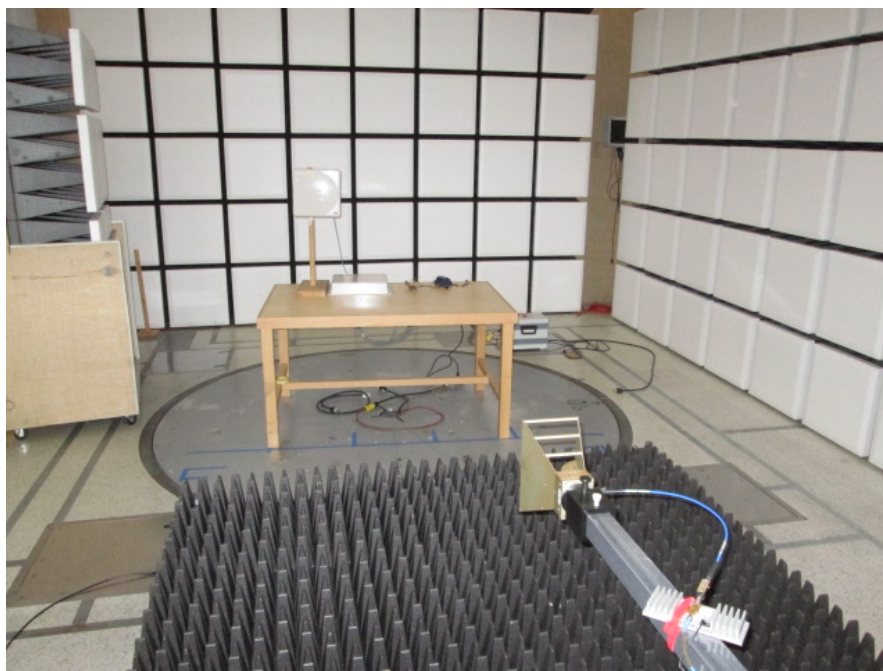
Pol.	Frequency (MHz)	Reading dBμV/m	Total CF dB	Net at 3 m dBμV/m.	Limit dBμV/m	Margin dB	Comments	
V	2783.0	47.3	-12.0	35.3	74	-38.7	PK	
V	2783.0	36.8	-12.0	24.8	54	-29.2	AV	
H	2783.0	51.8	-12.0	39.8	74	-34.2	PK	
H	2783.0	46.9	-12.0	34.9	54	-19.1	AV	
V	3710.8	46.2	-10.0	36.2	74	-37.8	PK	
V	3710.8	33.7	-10.0	23.7	54	-30.3	AV	
H	3710.8	45.7	-10.0	35.7	74	-38.3	PK	
H	3710.8	33.7	-10.0	23.7	54	-30.3	AV	
Notes		Total CF = Antenna Factor + Cable Factor - AMP Gain Antenna MT-263006, 12.5dBi High Channel. Average readings obtained with the 10Hz VBW						



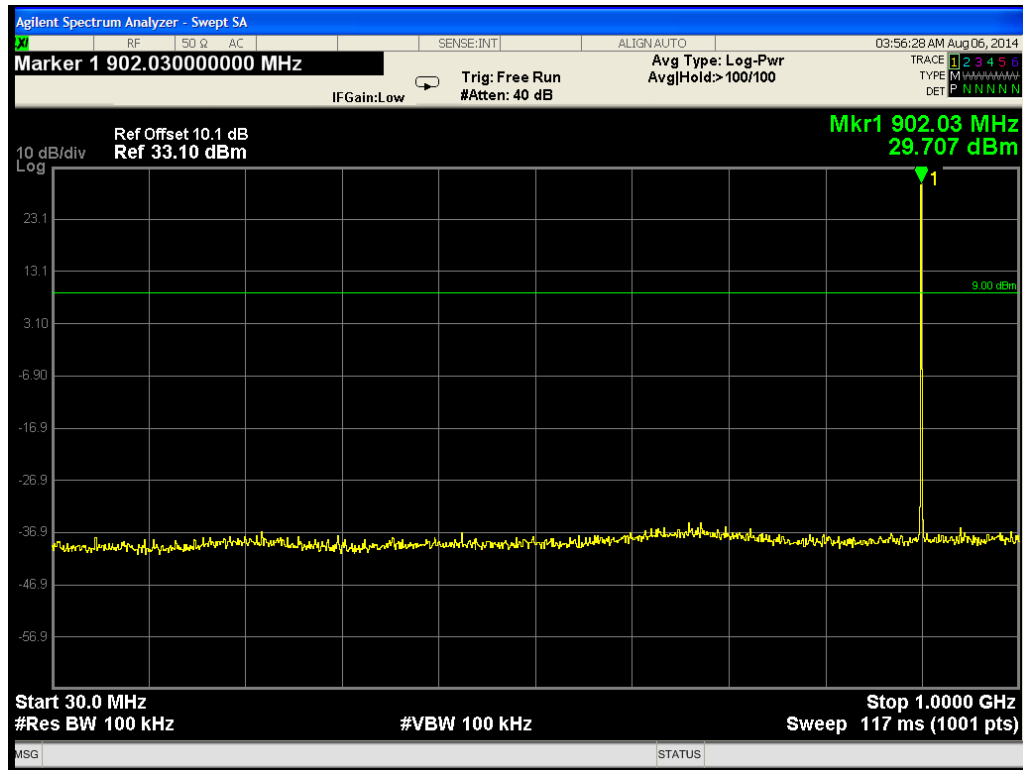
Test Set Up Photo

[illegible][illegible]

Pol.	Frequency (MHz)	Reading dBμV/m	Total CF dB	Net at 3 m dBμV/m.	Limit dBμV/m	Margin dB	Comments	
V	2783.0	56.2	-12.0	44.2	74	-29.8	PK	
V	2783.0	46.1	-12.0	34.1	54	-19.9	AV	
H	2783.0	52.3	-12.0	40.3	74	-33.7	PK	
H	2783.0	42.2	-12.0	30.2	54	-23.8	AV	
V	3712.0	46.4	-10.0	36.4	74	-37.6	PK	
V	3712.0	34.1	-10.0	24.1	54	-29.9	AV	
H	3712.0	46.7	-10.0	36.7	74	-37.3	PK	
H	3712.0	34.2	-10.0	24.2	54	-29.8	AV	
Notes		Total CF = Antenna Factor + Cable Factor - AMP Gain MT-262006/N, 7dBi High Channel. Average readings obtained with the 10Hz VBW						



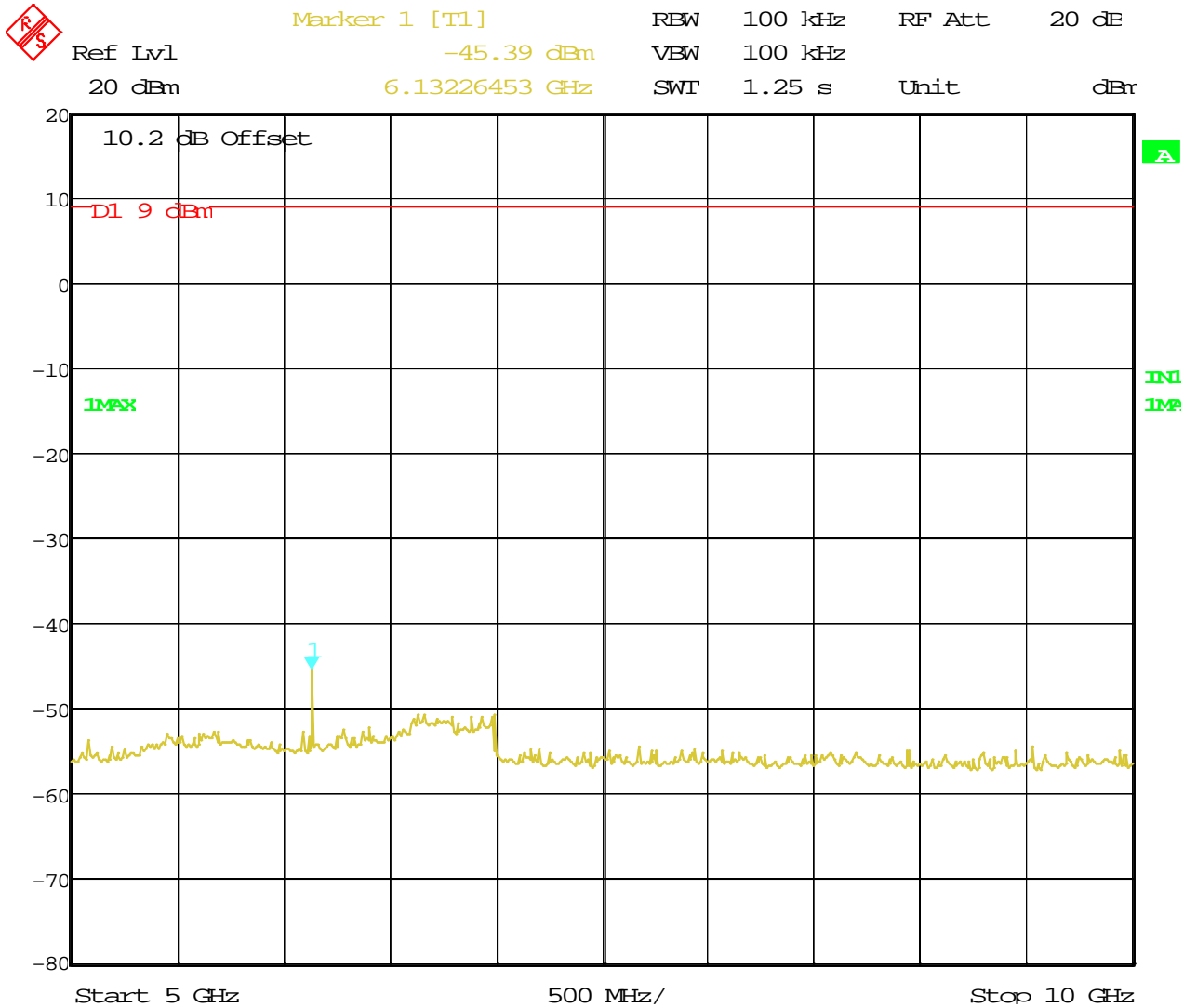
Test Set Up Photo



Conducted Spurious Emissions Low channel

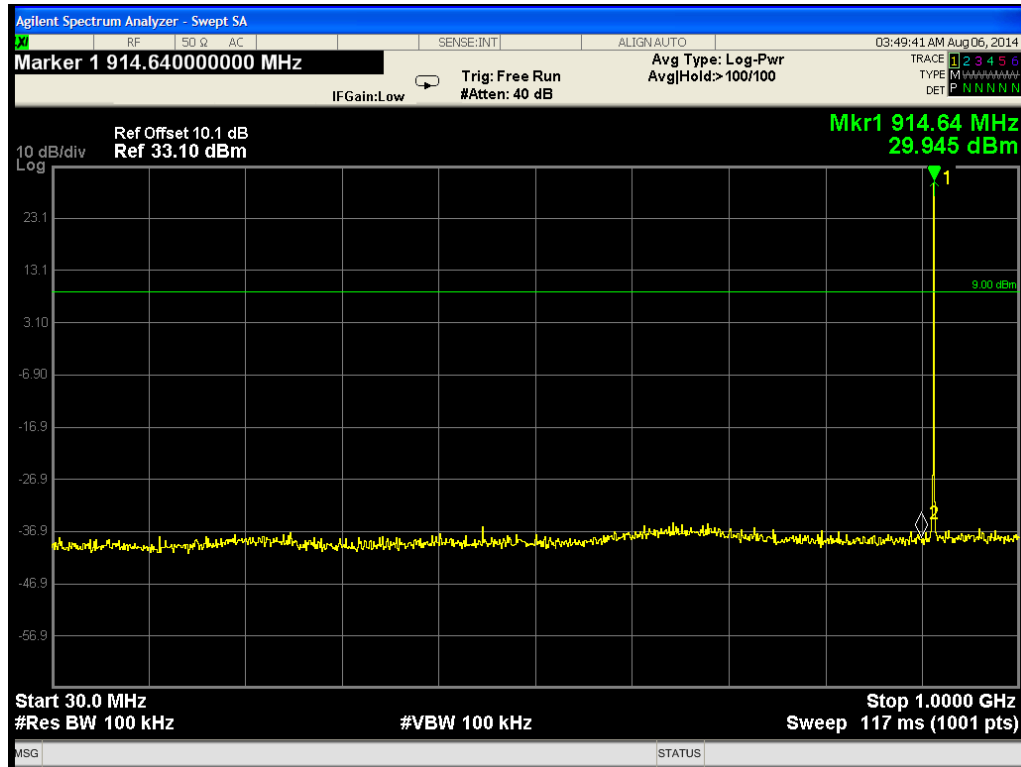


Conducted Spurious Emissions Low channel

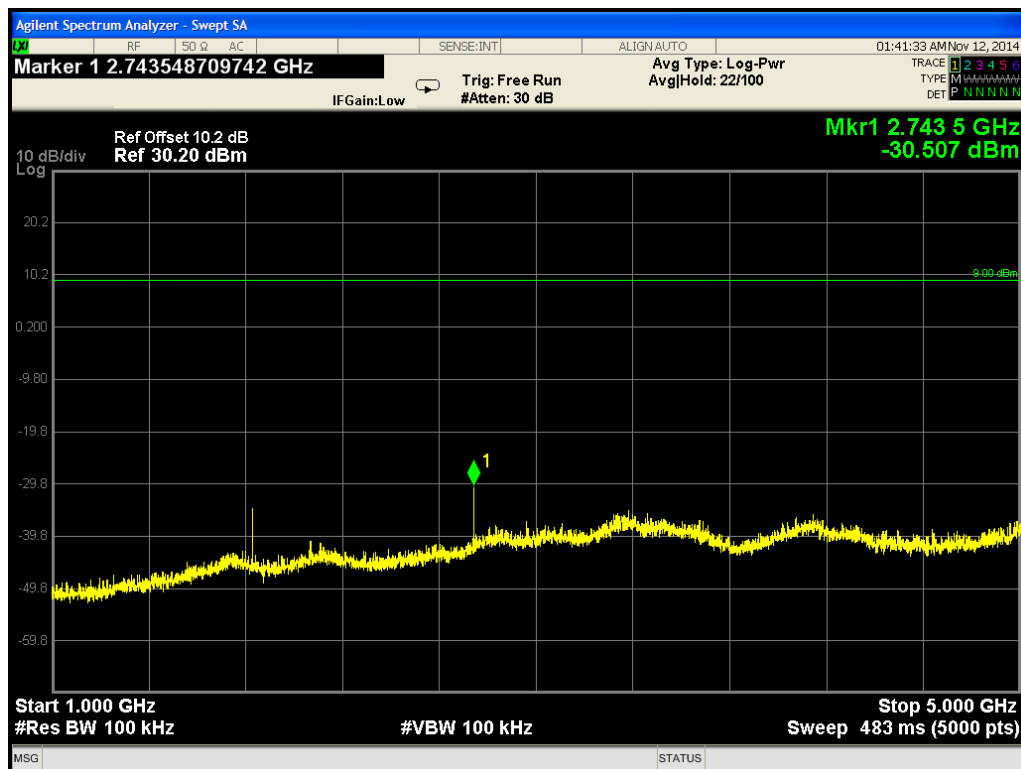


Date: 11.NOV.2014 11:32:07

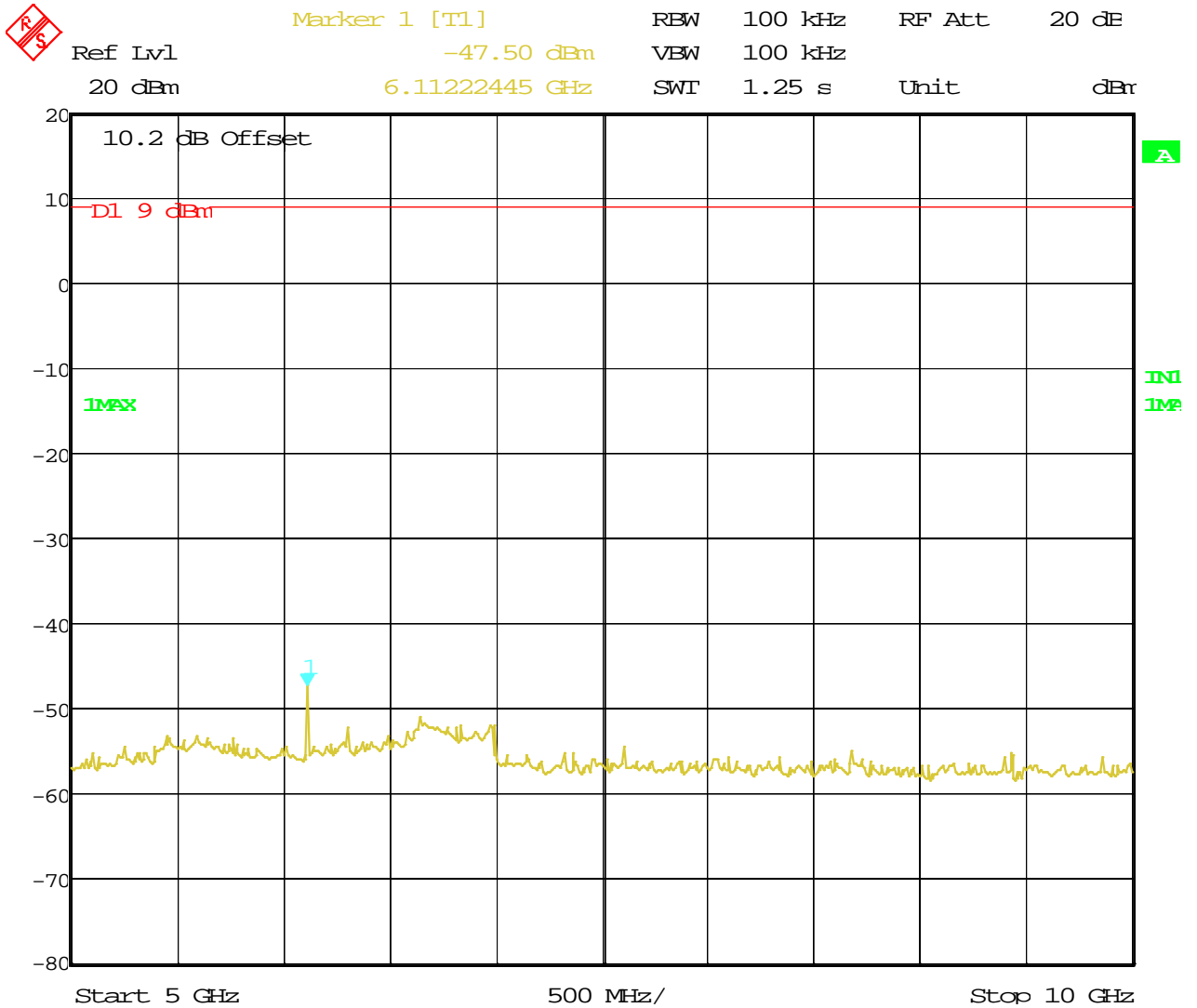
Conducted Spurious Emissions Low channel



Conducted Spurious Emissions Mid channel

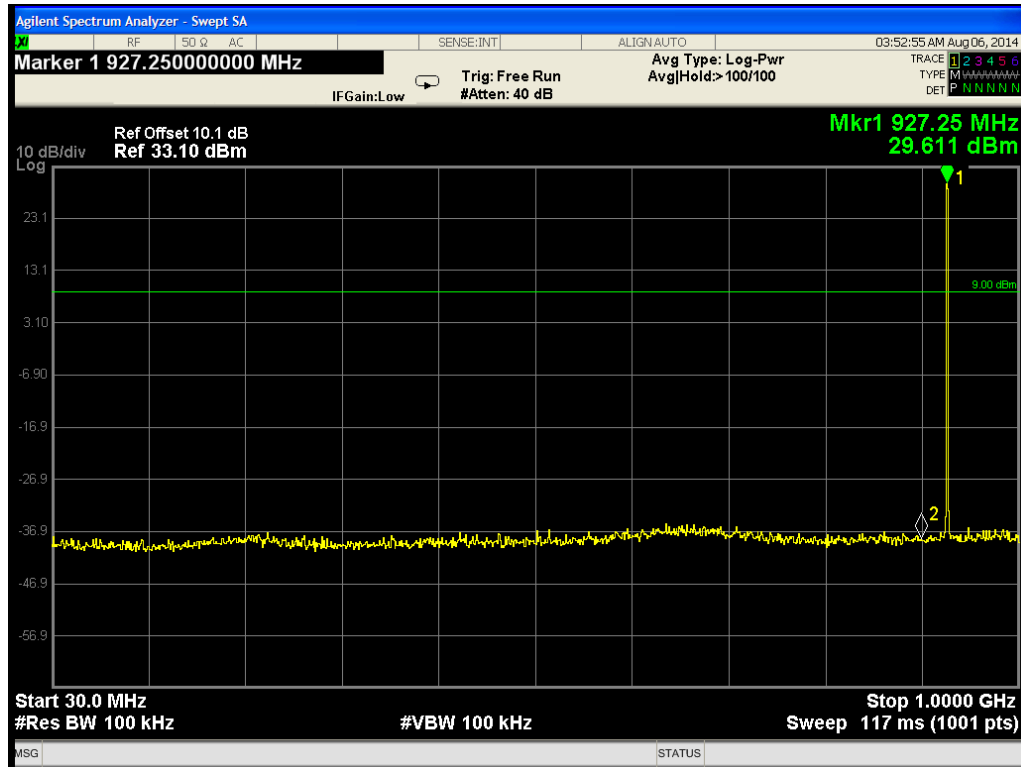


Conducted Spurious Emissions Mid channel



Date: 11.NOV.2014 11:33:46

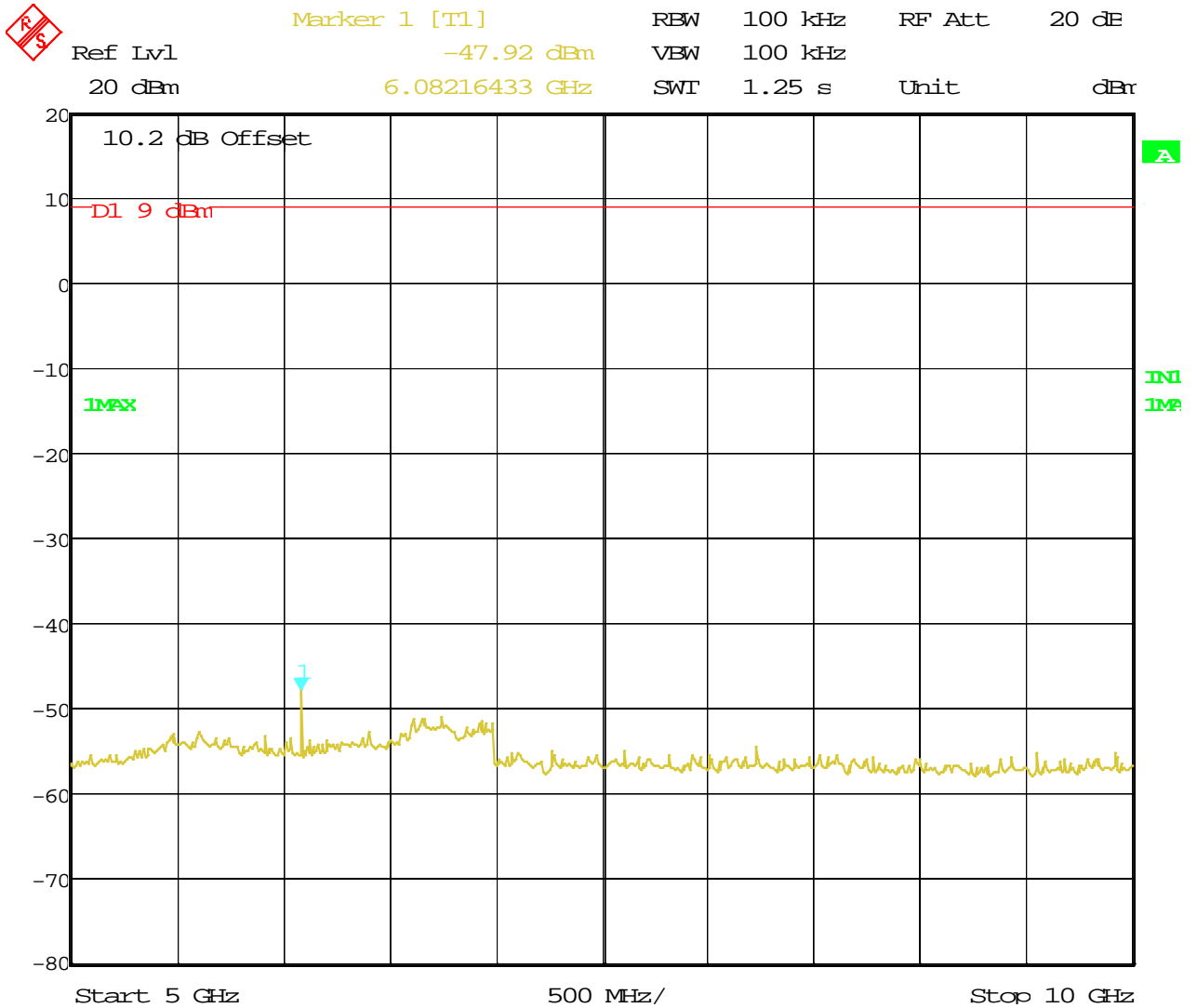
Conducted Spurious Emissions Mid channel



Conducted Spurious Emissions High channel



Conducted Spurious Emissions High channel



Date: 11.NOV.2014 11:34:59

Conducted Spurious Emissions High channel

4.10 RF Exposure Compliance	
Reference Standard:	<input checked="" type="checkbox"/> IEEE Std 1528a <input checked="" type="checkbox"/> RSS 102, Issue 4 <input checked="" type="checkbox"/> KDB 447498 <input type="checkbox"/> KDB <input checked="" type="checkbox"/> FCC Parts 2.1091 and 2.1093 <input type="checkbox"/> OET 65
Frequency Range:	<input checked="" type="checkbox"/> 902-928MHz
Antenna Separation Distance	>100cm
Antenna Gain (maximum)	15dBi (31.6 numeric gain)
Maximum Output Power at antenna terminal	21dBm (126mW)
Power Density	0.032 mW/cm ²
GENERAL POPULATION/UNCONTROLLED LIMIT	
FCC/RSS102	0.610 mW/cm ²

Note:	The highest RF output power of the unit was measured and recorded. According to §1.1310 of the FCC rules, the power density limit for General population/Uncontrolled Exposure is 0.610 mW/cm ² . The MPE shall be calculated at 20cm to show compliance with the power density limit. The following formula was used to calculate the Power Density: $S=PG/4\pi R^2$
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5.0	Test Equipment				
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Due	Check
Biconilog Antenna	Schaffner	CBL6112B	27491	10/2014	<input checked="" type="checkbox"/>
Horn Antenna	AH Systems	SAS 571	1010	10/2014	<input checked="" type="checkbox"/>
Loop Antenna	EMCO	ALR25M	1011	10/2014	<input type="checkbox"/>
EMI Receiver	Rohde & Schwarz	ESIB 40	100235	10/2014	<input type="checkbox"/>
EMI Receiver	Agilent	E4448A	1530975	09/2014	<input checked="" type="checkbox"/>
Signal Analyzer	Agilent	N9000A	MY53031040	05/2014	<input checked="" type="checkbox"/>
LISN	TESEQ	NNB51	1130	10/2014	<input checked="" type="checkbox"/>
Harmonic/Flicker Source	Cal. Instruments	C4-5001iX	57162	10/2014	<input type="checkbox"/>
Amplifier	AR	250W1000AM	14354	10/2014	<input type="checkbox"/>
Amplifier	AR	25S1G4A	4003	10/2014	<input type="checkbox"/>
Signal Generator	HP	8656A	2326A05125	10/2014	<input type="checkbox"/>
Signal Generator	Agilent	E8257D	160895	10/2014	<input type="checkbox"/>
Field Probe	AR	FL7006	25019	10/2014	<input type="checkbox"/>
Field Monitor	AR	FM2000	14292	10/2014	<input type="checkbox"/>
AC CDN	Schaffner	M316,	21937	10/2014	<input type="checkbox"/>
AC CDN	Teseq	M016,	26131	10/2014	<input type="checkbox"/>
ISN	Teseq	T4	25652	10/2014	<input type="checkbox"/>
Current Injection Coil	A.H. Systems	ICP-200/521	149	10/2014	<input type="checkbox"/>
RF Conducted System	TESEQ	NSG 4070-75	1141	10/2014	<input type="checkbox"/>
ESD Generator	KeyTek	MZ-15/EC	609325	10/2014	<input type="checkbox"/>
EFT/Surge Generator	ThermoFisher	EMC Pro Plus	1146	10/2014	<input type="checkbox"/>
EMF Meter	NARDA	ELT400	1139	10/2014	<input type="checkbox"/>
Absorbing Clamp	Rhode & Schwarz	MDS-21	1001	10/2014	<input type="checkbox"/>
EMF Test Generator	FCC	F-1000-4-8-G	9940	NCR	<input type="checkbox"/>
AC Power System	Titan	MAC-03	6619921	NCR	<input type="checkbox"/>
EMC Software	ETS-Lindgren	TILE 6		05/2014	<input checked="" type="checkbox"/>
Oscilloscope	Tektronix	DPO4104	1550	03/2015	<input type="checkbox"/>

6.0		Report revision history	
Revision Level	Date	Report Number	Notes
0	11/11/2014	RE1407019-1	Original Issue



Certificate of Conformity

3M EMC Laboratory

SEMS Global Regulatory Engineering
Building 76-01-01
St. Paul, MN 55144-1000, USA

MANUFACTURER'S NAME	3M COMPANY
NAME OF EQUIPMENT	Toll RFID READER
MODEL NUMBER(S)	6204
TEST REPORT NUMBER	RE1407019-1
DATE OF ISSUE	November 13, 2014

Referring to the performance criteria and operating mode during the tests specified in this report the equipment complies with the essential requirements herein specified:

47 CFR Part 15 – Subpart C – Intentional
Radiator

FCC Part 15.247

License-exempt Radio Apparatus (All
Frequency Bands): Category I Equipment

RSS 210, Issue 8, 2010

Emissions

47 CFR:2013, FCC Parts 15.107 and 15.109
ICES-003, Issue 5, 2012

Comments:

Yuriy Litvinov

Yuriy Litvinov
Lead EMC Engineer



NVLAP Lab Code 200033-0