

## EMC TEST REPORT



NVLAP Lab Code 200033-0

**Standard(s):**

47 CFR FCC Part 90, Subpart M  
RSS 137, Issue 2, 2009  
47 CFR FCC Parts 15.107 and 15.109  
FCC ID: M4Z6204  
IC ID: 458C-6204

**Product:** Toll RFID READER and Reader Redundancy Switch

**Model:** 6204 and RRS

**3M Division:** TSSD

**Report Number:** RE1407019-2

**Report Issue Date:** November 13, 2014

**Report Prepared By:**

**Signature:** 

**Yuriy Litvinov**  
**Lead EMC Engineer**

**Tested By:**  
**3M EMC Laboratory**  
**410 E. Fillmore Avenue, Building 76-01-1**  
**St. Paul, Minnesota 55107-1000**

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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.


No	Standard	Test Requirements	Result	Comments
4.1	Part15.107/RSS Gen	Conducted Emissions	pass	
4.2	Part 15.109/RSS-Gen	Radiated Emissions	pass	
4.3	Part 90.205/RSS137, 6.4	Conducted Output Power	pass	
4.4	Part 90.210/RSS137, 6.1	Occupied Bandwidth	pass	
4.5	Part 90.210/RSS137, 6.5	Spurious Emissions at Antenna terminals	pass	
4.6	Part 90.210/RSS137, 6.5	Field Strength of Spurious Emissions	pass	
4.7	Part 90.213/RSS137, 6.3	Frequency Stability	N/A	See note below
4.8	Part 2.1091/RSS102	RF Exposure Compliance	pass	

<b>Note:</b>	Fixed Non-Multilateral LMS transmitters with an emission bandwidth located more than 40 kHz from the band edge are exempt from meeting the frequency stability limits.
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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

<b>2.1</b>	<b>Equipment Under Test</b>	
<b>Description:</b>	The four-port Toll RFID Reader 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 (RF path is switched between selected ports) 3M Reader Redundancy Switch (RRS) interfaces with two RFID Readers and associated antenna systems to provide an antenna change over facility in the event of a reader failure. The RRS is controlled by TTL level input signals.	
<b>Model(s):</b>	6204 and RRS (SKU#75-0302-0128)	
<b>Serial number(s):</b>	ID6204000021 RRS00181	
<b>Firmware:</b>	Version # 1.4.25483	
<b>Client Contact:</b>	<b>Name:</b>	<b>Phone:</b>
	Dave Missimer Randal D. Roebuck Jason Bram	919-281-1559 512-984-5688 512-984-5431
<b>3M Division:</b>	Traffic Safety and Security	
<b>Modifications:</b>	None	
<b>Frequency Range (MHz) :</b>	902.75 – 903.25MHz	911.25-920.45MHz
<b>Modulation Type:</b>	K1D	
<b>RFID Protocols:</b>	ISO 18000-6B ISO 18000-6C ISO 10374 (ATA)	PS111 TDM (IAG) Title 21 (T21)
<b>Maximum Output Power:</b>	35.0dBm	
<b>Equipment Category:</b>	Non-Multilateral LMS	
<b>Rated Input Power:</b>	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	
<b>Test Dates:</b>	08/04-09/18/2014	
<b>Received Date:</b>	06/26/2014	
<b>Received Conditions:</b>	<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/Power Interface	Reader Wire Harness	13m	Unshielded	Digital I/O Connection
2	Ethernet/TTL Interface	Switch Wire Harness	2m	Unshielded	I/O Control

#### 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 90 Dense mode – 911.25-920.75MHz with 500KHz channels
<input checked="" type="checkbox"/>	FCC 90 Band – 910.95-920.45MHz with 200KHz channels
<input checked="" type="checkbox"/>	FCC 90 Low Band – 902.75-903.25MHz with 200KHz channels

#### 3.4 Exercising of EUT

No.	Description of EUT Exercising
1	Transmitting modulated carrier at the maximum rated RF output power
2	
3	

## 4.0 Test Conditions and Results

4.1	<b>Conducted Emissions Data</b>			
<b>Method:</b>	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.			
<b>Test Verification:</b> <input checked="" type="checkbox"/>	Laboratory Ambient Temperature	21°C		
	Relative Humidity	45%		
<b>Reference Standard:</b>	<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 15.107/RSS Gen <input type="checkbox"/>		<b>Measurement Point</b> <input checked="" type="checkbox"/> Mains <input type="checkbox"/> Telecommunication ports <input type="checkbox"/>	
<b>Frequency Range:</b>	<input checked="" type="checkbox"/> 150KHz to 30KHz <input type="checkbox"/>			
<b>Nominal Voltage:</b>	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/>			
<b>Tested By:</b>	Mike Schultz <i>MS</i>		<b>Date:</b> 09/15/2014	
<b>Limits</b>				
Frequency (MHz)	Limit dB (µV)			
	Quasi-Peak	Average	Result	Comments
0.15 to 0.50	66 to 56	56 to 46	<b>pass</b>	
0.50 to 5	56	46	<b>pass</b>	
5 to 30	60	50	<b>pass</b>	
<b>Modifications:</b>				
<b>Note:</b>				

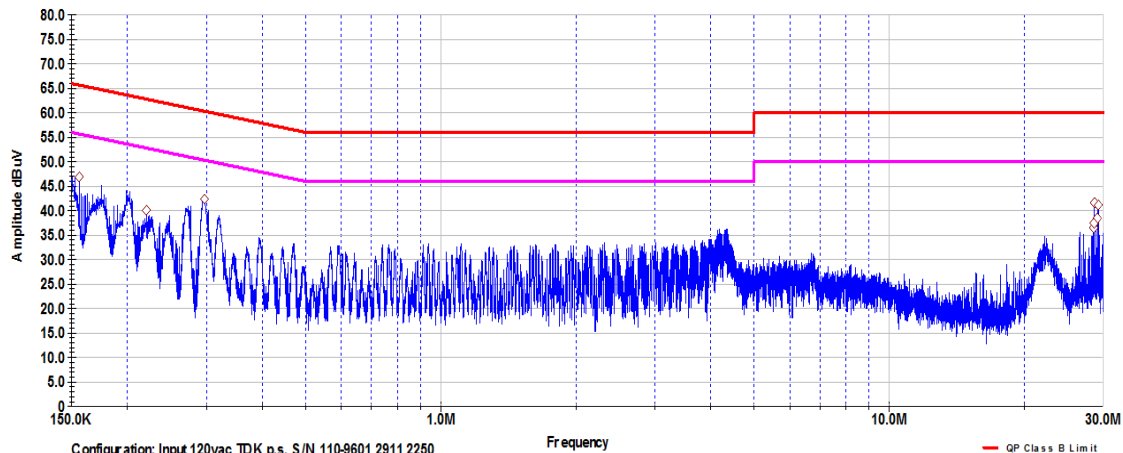


Frequency (MHz)	QP Line 1 dB (μV)	AVG Line 1 dB (μV)	QP Limit dB (μV)	AVG Limit dB (μV)	QP Margin dB	AVG Margin dB
0.154	43.31	38.33	65.78	55.78	-22.47	-17.45
0.221	38.44	34.31	62.78	52.78	-24.34	-18.47
0.294	41.4	39.16	60.42	50.42	-19.02	-11.26
28.686	41.63	38.56	60	50	-18.37	-11.44
28.687	41.22	38.21	60	50	-18.78	-11.79
29.234	40.43	36.73	60	50	-19.57	-13.27
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
0.153	44.04	39.46	65.86	55.86	-21.82	-16.39
0.221	37.67	33.45	62.78	52.78	-25.11	-19.33
0.295	41.96	40.34	60.39	50.39	-18.43	-10.05
4.275	35.29	29.09	56	46	-20.71	-16.91
27.158	35.84	31.67	60	50	-24.16	-18.33
28.686	41.67	38.61	60	50	-18.33	-11.39
<b>Voltage</b>		<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/>				
<b>Notes</b>		RFID Reader 6204				



3M Company  
Conducted Emissions  
CISPR22\_FCC Part 15, Class B, Line 1

RE Project# - RE1407019  
Model # - 6204  
EUT Description - RFID Reader with Reader Redundancy  
Serial # - 6204000021 - RRS00181  
EUT Power - 24 Vdc



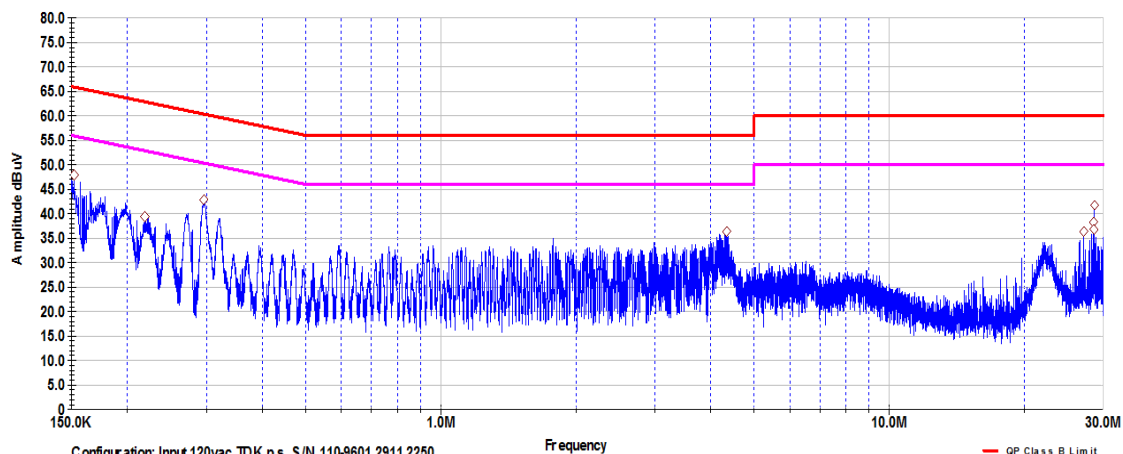
Configuration: Input 120vac TDK p.s. S/N 110-9601 2911 2250  
Power Supply connected the 6204 RFID Reader.  
Tested the 6204 RFID Reader with a Reader Redundancy Switch.  
RFID has a dummy load attached.

— QP Class B Limit  
— AVG Class B Limit  
— Scan  
◇ Top Peaks



3M Company  
Conducted Emissions  
CISPR22\_FCC Part 15, Class B, Line 2

RE Project# - RE1407019  
Model # - 6204  
EUT Description - RFID Reader with Reader Redundancy  
Serial # - 6204000021 - RRS00181  
EUT Power - 24 Vdc



Configuration: Input 120vac TDK p.s. S/N 110-9601 2911 2250  
Power Supply connected the 6204 RFID Reader.  
Tested the 6204 RFID Reader with a Reader Redundancy Switch.  
RFID has a dummy load attached.

— QP Class B Limit  
— AVG Class B Limit  
— Scan  
◇ Top Peaks



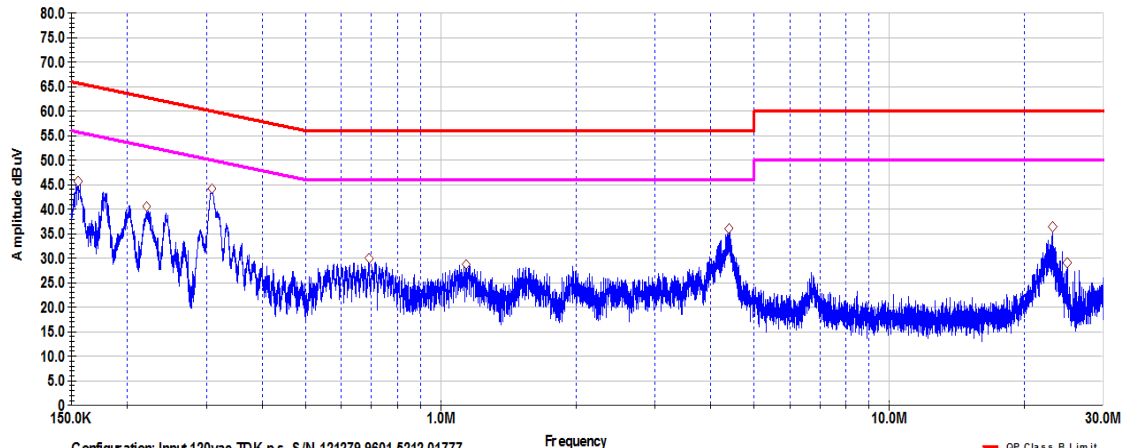


Frequency (MHz)	QP Line 1 dB (μV)	AVG Line 1 dB (μV)	QP Limit dB (μV)	AVG Limit dB (μV)	QP Margin dB	AVG Margin dB
0.155	44.33	40.33	65.75	55.75	-21.42	-15.41
0.222	38.22	34.5	62.75	52.75	-24.53	-18.25
0.308	42.6	40.09	60.02	50.02	-17.42	-9.93
0.574	27.31	23.43	56	46	-28.69	-22.57
4.362	34.6	29.45	56	46	-21.4	-16.55
23.128	37.72	34.63	60	50	-22.28	-15.37
24.348	31.62	42.73	60	50	-28.38	-7.27
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
0.154	43.87	39.43	65.77	55.77	-21.9	-16.34
0.223	38.32	35.3	62.72	52.72	-24.4	-17.41
0.309	42.48	39.06	60.01	50.01	-17.53	-10.95
0.69	27.93	23.78	56	46	-28.07	-22.22
1.147	27.81	23.35	56	46	-28.19	-22.65
4.389	33.55	27.46	56	46	-22.45	-18.54
23.127	36.82	33.52	60	50	-23.18	-16.48
24.899	29.03	24.7	60	50	-30.97	-25.3
<b>Voltage</b>		<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/>				
<b>Notes</b>		<b>RF Switch</b>				



3M Company  
Conducted Emissions  
CISPR22\_FCC Part 15, Class B, Line 2

RE Project# - RE1407019  
Model# - 6204  
EUT Description - RFID Reader with Reader Redundancy  
Serial# - 6204000021 - RRS00181  
EUT Power - 24 Vdc

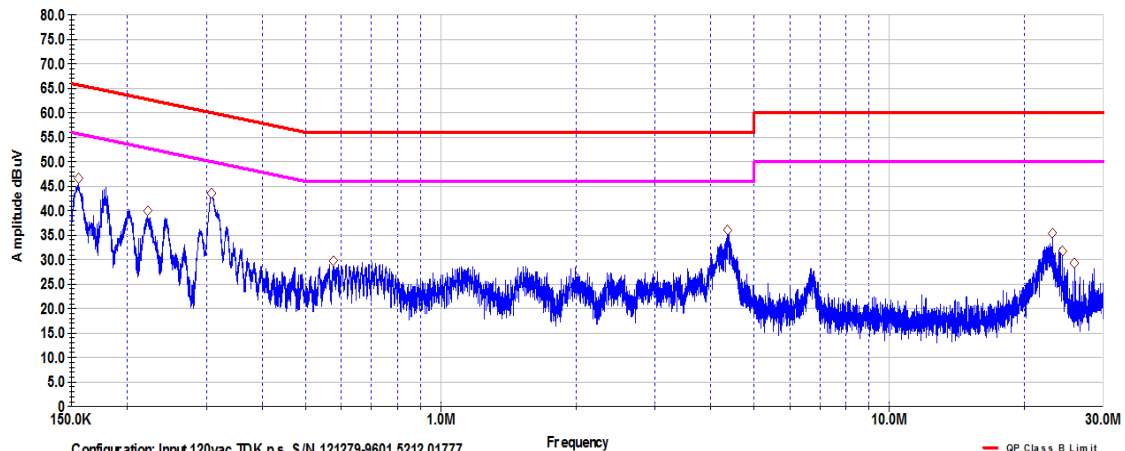


Configuration: Input 120vac TDK p.s. S/N 121279-9601 5212 01777  
Power Supply connected to Reader Redundancy Switch.  
Tested the 6204 RFID Reader with a Reader Redundancy Switch.  
RFID has a dummy load attached.

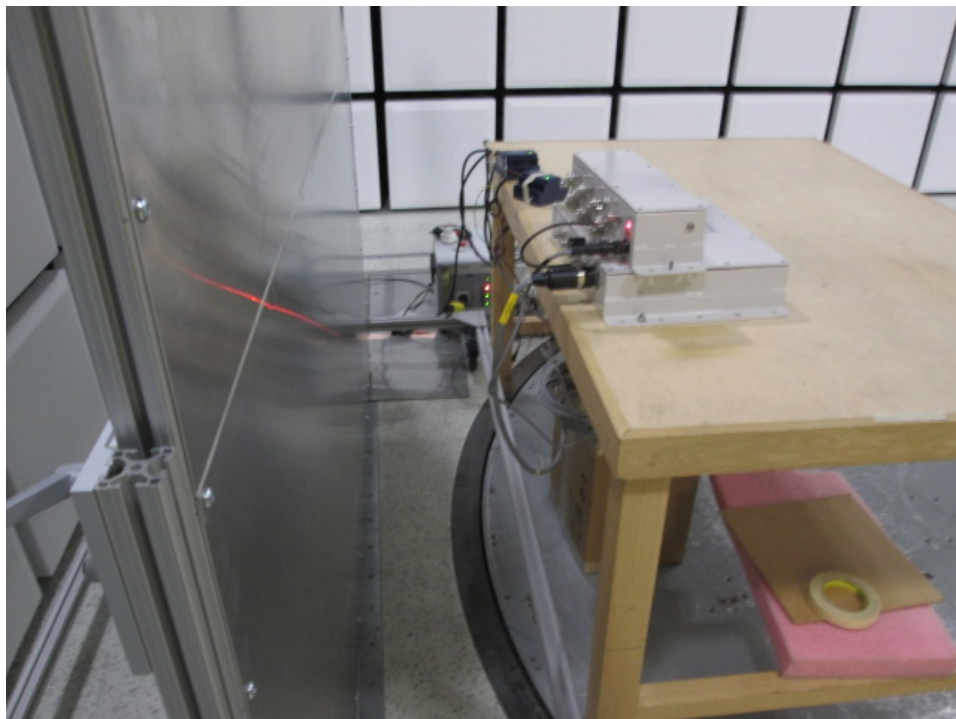


3M Company  
Conducted Emissions  
CISPR22\_FCC Part 15, Class B, Line 1

RE Project# - RE1407019  
Model# - 6204  
EUT Description - RFID Reader with Reader Redundancy  
Serial# - 6204000021 - RRS00181  
EUT Power - 24 Vdc



Configuration: Input 120vac TDK p.s. S/N 121279-9601 5212 01777  
Power Supply connected to Reader Redundancy Switch.  
Tested the 6204 RFID Reader with a Reader Redundancy Switch.  
RFID has a dummy load attached.

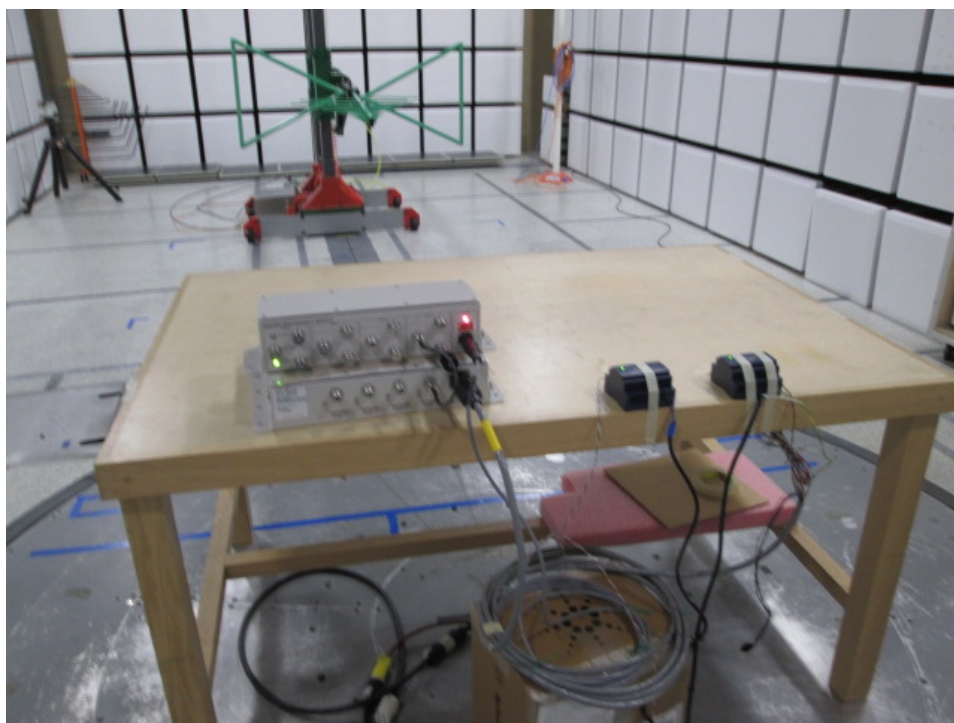


**Test Set Up Photo**

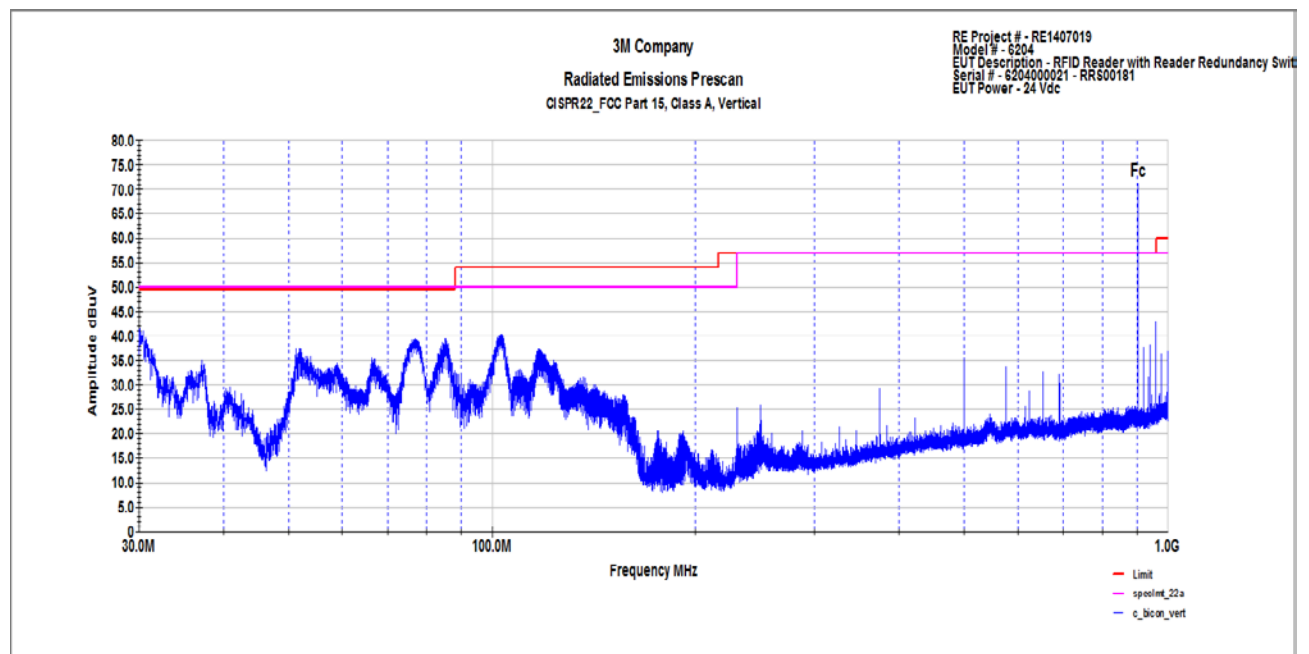
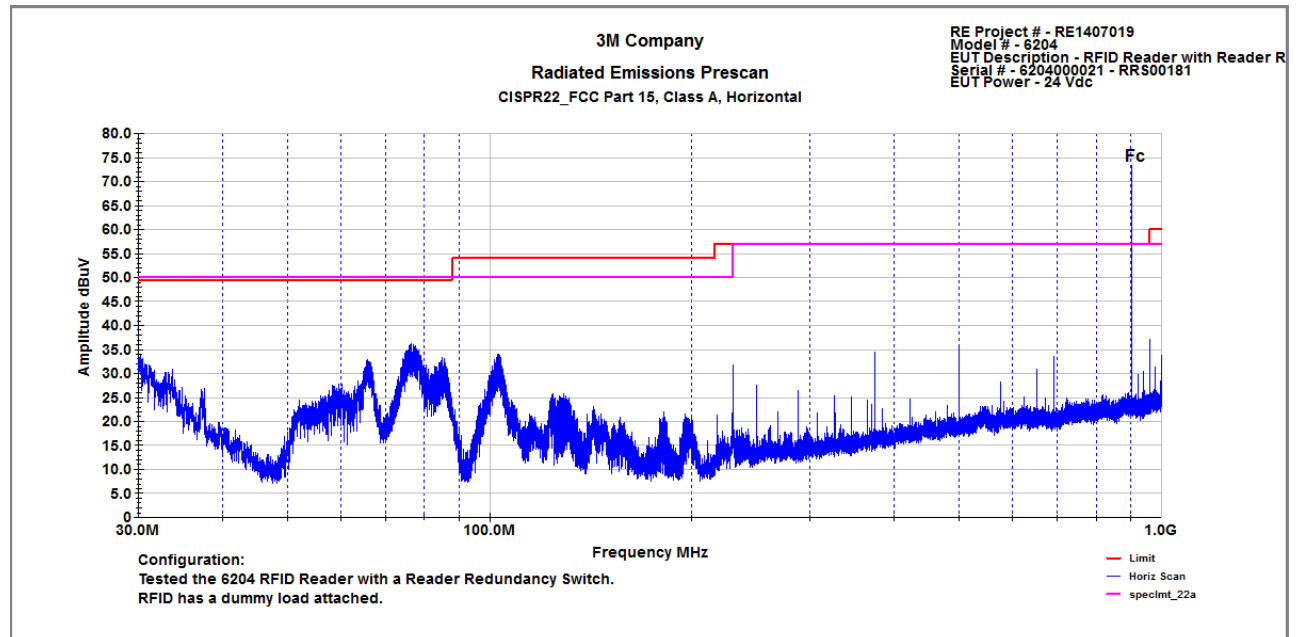
<b>4.2</b>	<b>Radiated Emissions Data</b>				
<b>Method:</b>	Measurements were made in a 3-meter semi-anechoic chamber that complies to CISPR 16. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements (quasi-peak) 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.				
<b>Test Verification:</b> <input checked="" type="checkbox"/>	Laboratory Ambient Temperature	23°C			
	Relative Humidity	45%			
<b>Reference Standard:</b>	<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/RSS Gen <input type="checkbox"/> FCC Part 15.209			<b>Measurement Distance</b>	
				<input checked="" type="checkbox"/> 3 Meters <input type="checkbox"/> <span style="background-color: #cccccc; padding: 2px 10px;"></span>	
<b>Frequency Range:</b>	<input checked="" type="checkbox"/> 30 MHz TO 10GHz <input type="checkbox"/>				
<b>Nominal Voltage:</b>	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/>				
<b>Tested By:</b>	Mike Schultz <i>MS</i>			<b>Date:</b> 09/18/2014	
<b>Limits - Class A</b>					
Frequency (MHz)	Limit dB (µV/m)				
	Quasi-Peak	Average	Peak	Distance	Results
30 to 230	40			10	<b>pass</b>
230 to 1000	47			10	<b>pass</b>
1000 to 3000		56	76	3	<b>N/A</b>
3000 to 6000		60	80	3	<b>N/A</b>
<b>Limits - Class B</b>					
30 to 230	30			10	<b>N/A</b>
230 to 1000	37			10	<b>N/A</b>
1000 to 3000		50	70	3	<b>N/A</b>
3000 to 6000		54	74	3	<b>N/A</b>

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

Frequency (MHz)	Pol.	QP Reading dBμV/m	Total CF dB	Net at 3 m dBμV/m	Limit (dBμV/m)	Margin dB
30.12	V	18.4	21.62	40.02	49.5	-9.48
37.02	V	12.87	17.98	30.84	49.5	-18.66
51.34	V	22.86	11.31	34.17	49.5	-15.33
66.35	H	23.01	9.86	32.87	49.5	-16.63
77.1	V	25.63	10.62	36.26	49.5	-13.24
84.97	V	22.14	11.81	33.96	49.5	-15.54
102.43	V	22.92	14.96	37.87	54	-16.13
960	V	16.4	26.06	42.46	57	-14.54
<b>Notes</b>		Total CF = Antenna Factor + Cable Factor - AMP Gain				



**Test Set Up Photo**



<b>4.3</b>	<b>Conducted Output Power</b>		
<b>Method:</b>	Measurements was performed with modulated carrier at the highest power level at which the transmitter is intended to operate. 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%	
<b>Reference Standard:</b>	<input type="checkbox"/> ANSI C63.10:2009 <input checked="" type="checkbox"/> FCC Part 90.205/RSS 137 <input checked="" type="checkbox"/> FCC Part 2.1046	<b>Measurement Point</b> <input checked="" type="checkbox"/> Conducted <input type="checkbox"/> Radiated <input type="checkbox"/>	
<b>Frequency Range:</b>	<input checked="" type="checkbox"/> 902.75-920.45MHz		
<b>Limit ERP</b>	902-927.25MHz	927.25-928MHz	
	<input checked="" type="checkbox"/> 30 Watts	<input type="checkbox"/> 300 Watts	
<b>Nominal Voltage:</b>	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> VDC		
<b>Tested By:</b>	Yuriy Litvinov	<b>Date:</b> 09/12/2014	

Frequency (MHz)	Operating Mode	RF Power Output (dBm)	RF Power Output (Watts)	OBW (KHz)
902.75	ISO10374(CW)	34.6	2.9	399.2
903.25	ISO10374(CW)	34.6	2.9	397.5
<b>902.75</b>	<b>ISO18000-6C(ISOC)</b>	<b>34.8</b>	<b>3.0</b>	<b>431.8</b>
<b>903.25</b>	<b>ISO18000-6C(ISOC)</b>	<b>34.8</b>	<b>3.0</b>	<b>431.9</b>
<b>911.75</b>	<b>Title 21</b>	<b>35</b>	<b>3.16</b>	<b>1006.4</b>
<b>919.25</b>	<b>Title 21</b>	<b>35</b>	<b>3.16</b>	<b>1004.2</b>
911.25	ISO18000-6C(ISOC)	34.5	2.8	423.5
920.25	ISO18000-6C(ISOC)	34.6	2.9	427.0
911.25	EASALARM	34.5	2.8	423.5
920.25	EASALARM	34.5	2.8	428.9
<b>914.25</b>	<b>PS111</b>	<b>34</b>	<b>2.5</b>	<b>758.0</b>
<b>915.75</b>	<b>PS111</b>	<b>33.7</b>	<b>2.5</b>	<b>757.7</b>
<b>910.95</b>	<b>ISO18000-6C(ISOC)</b>	<b>34.6</b>	<b>2.9</b>	<b>421.6</b>
<b>920.45</b>	<b>ISO18000-6C(ISOC)</b>	<b>34.6</b>	<b>2.9</b>	<b>424.7</b>

<b>Note:</b>	The devices may employ any type of modulation technique. The worst case modulations used by the device have been reported.
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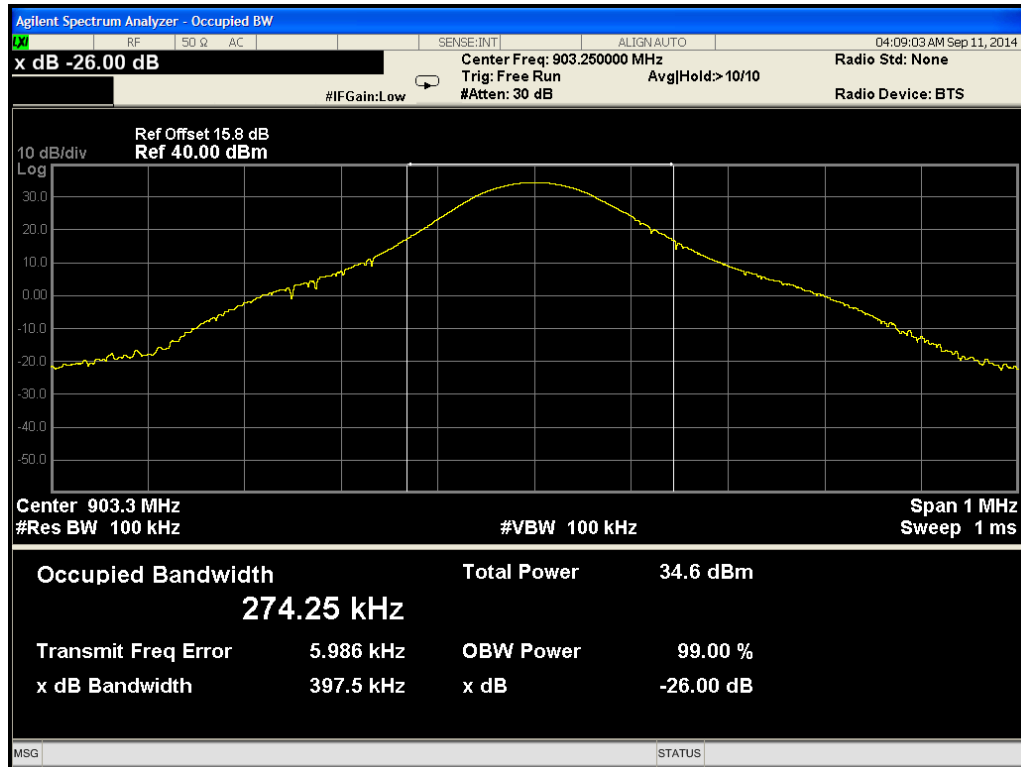


<b>4.4</b>	<b>Occupied Bandwidth</b>		
<b>Method:</b>	The measurements were made with transmitter set to transmit continuously modulated signal. The marker delta method was used to determine the 26dB bandwidth.		
	Laboratory Ambient Temperature	23°C	
	Relative Humidity	45%	
<b>Reference Standard:</b>	<input type="checkbox"/> FCC Part 15.109/ICES 003 <input checked="" type="checkbox"/> FCC Part 90.209/RSS 137 <input checked="" type="checkbox"/> FCC Part 2.1046	<b>Measurement Point</b> <input checked="" type="checkbox"/> Conducted <input type="checkbox"/> Radiated <input type="checkbox"/> <span style="background-color: #cccccc; display: inline-block; width: 40px; height: 15px;"></span>	
<b>Frequency Range:</b>	<input checked="" type="checkbox"/> 902.75-920.45MHz		
<b>Maximum OBW</b>	902-904MHz	909.75-921.75MHz	
	<input checked="" type="checkbox"/> 2MHz	<input checked="" type="checkbox"/> 12MHz	
<b>Nominal Voltage:</b>	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> VDC		
<b>Tested By:</b>	Yuriy Litvinov		<b>Date:</b> 09/11/2014

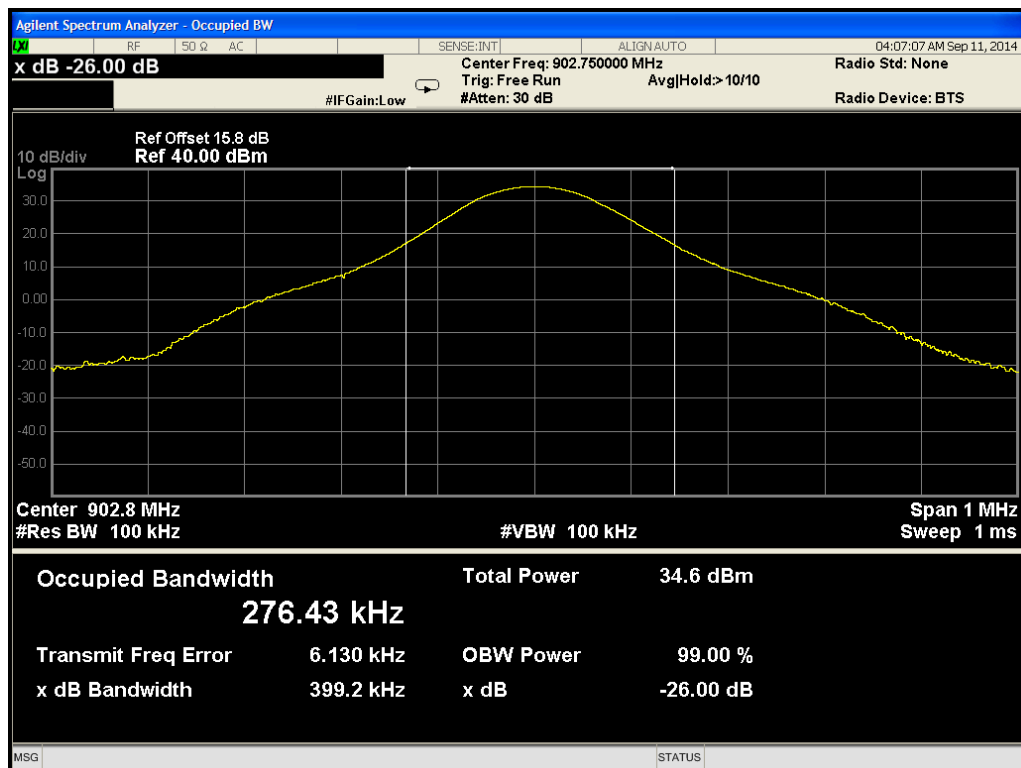
<b>Note:</b>	The devices may employ any type of modulation technique. The worst case modulations used by the device have been reported.
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Operation Mode	Frequency Bands (MHz)	Occupied Bandwidth (KHz)
CW	902.75-903.25	399.2
ISO 18000-6C	902.75-903.25	432.6
ISO 18000-6C	911.25-920.25	427.1
PS111	914.25-915.75	755.8
Title 21	911.75-919.25	1006.4
ISO 18000-6C	910.95-920.45	421.1

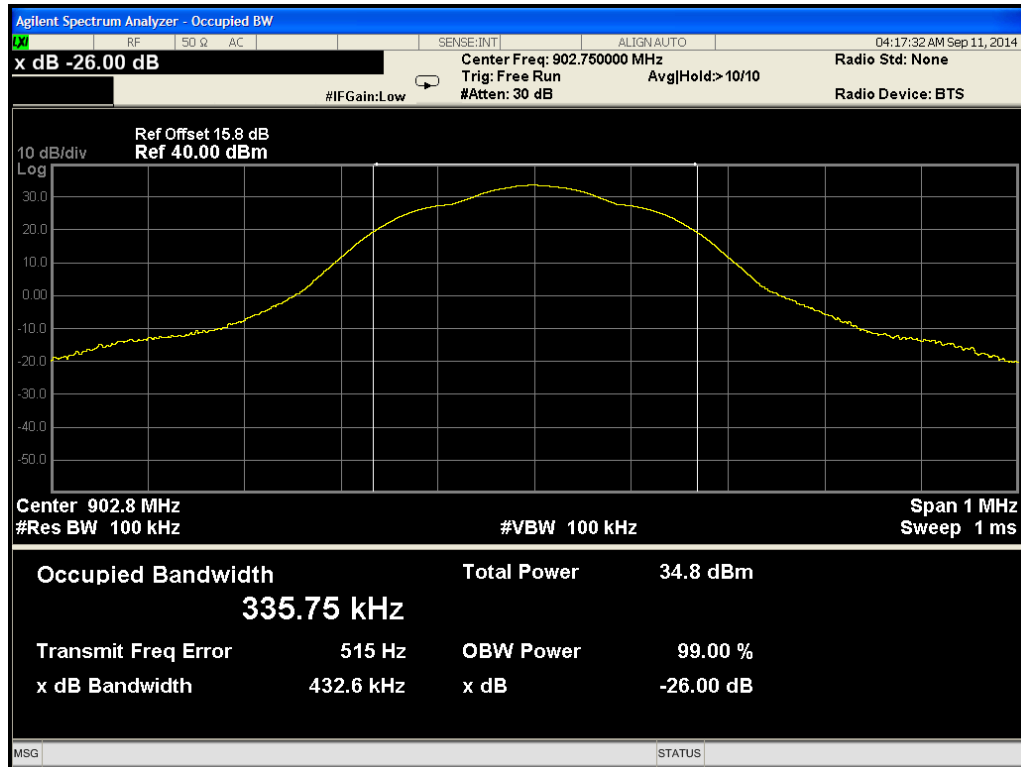




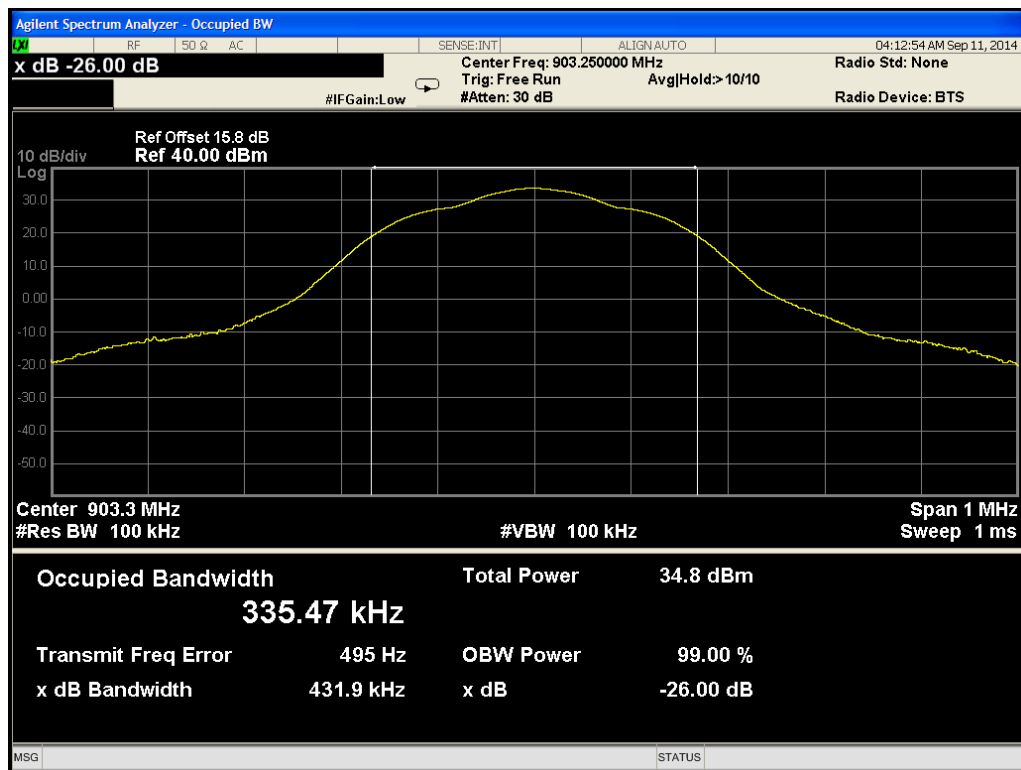
### Occupied Bandwidth – Low Band CW



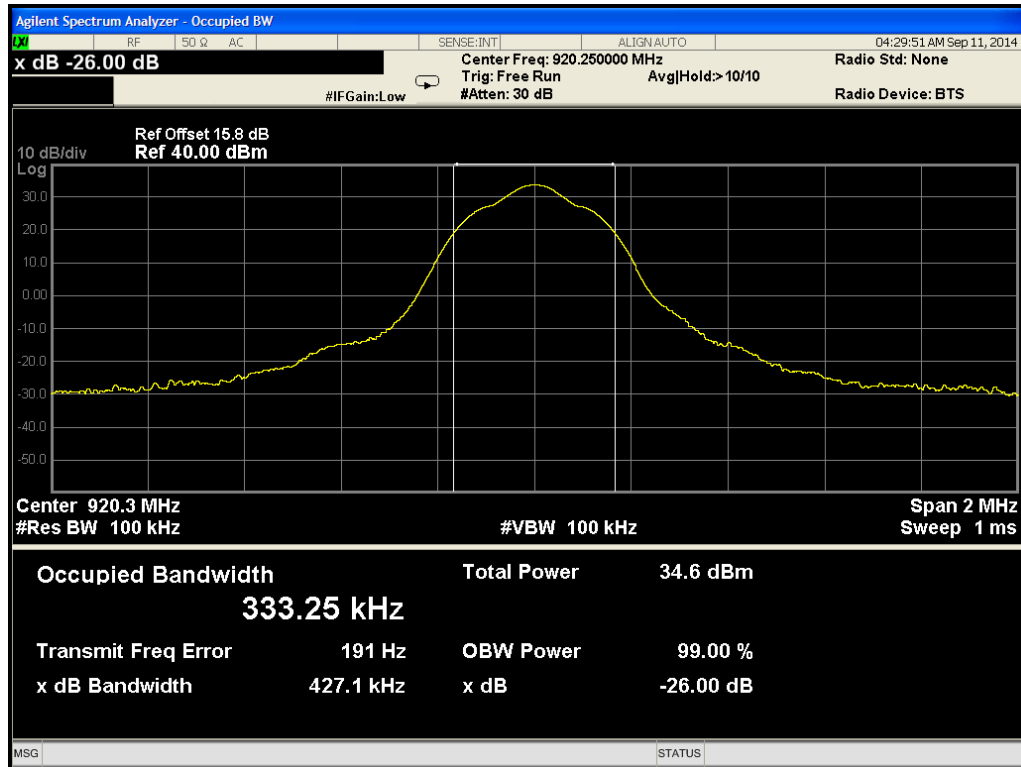
### Occupied Bandwidth – Low Band CW



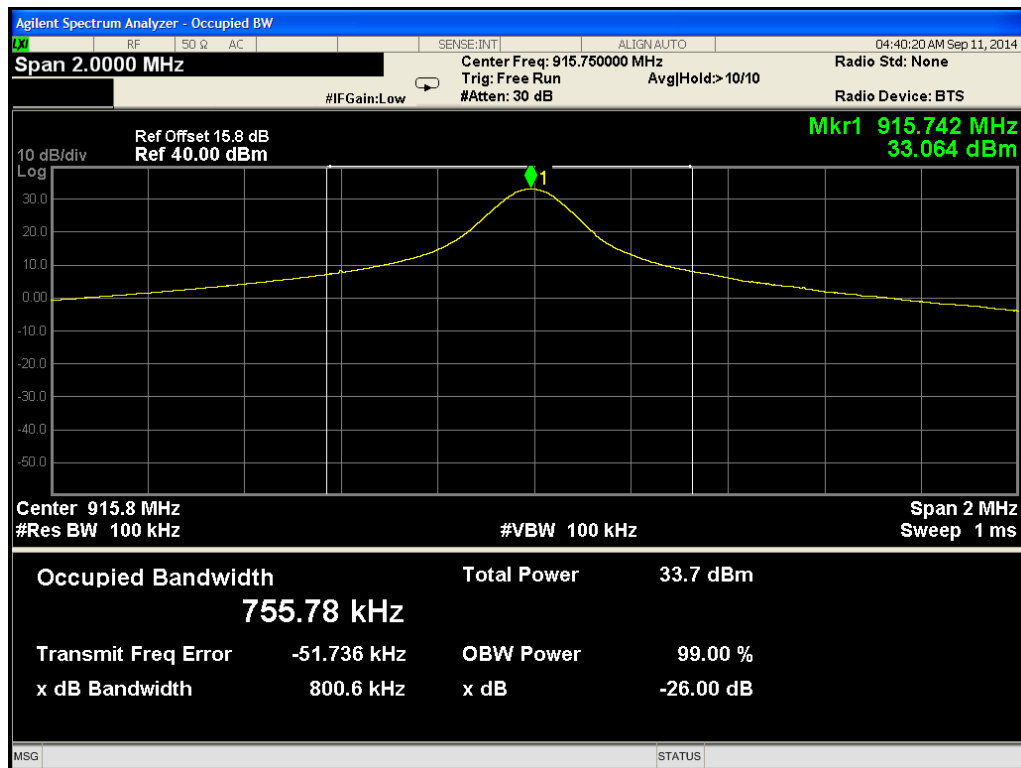
### Occupied Bandwidth – Low Band ISOC



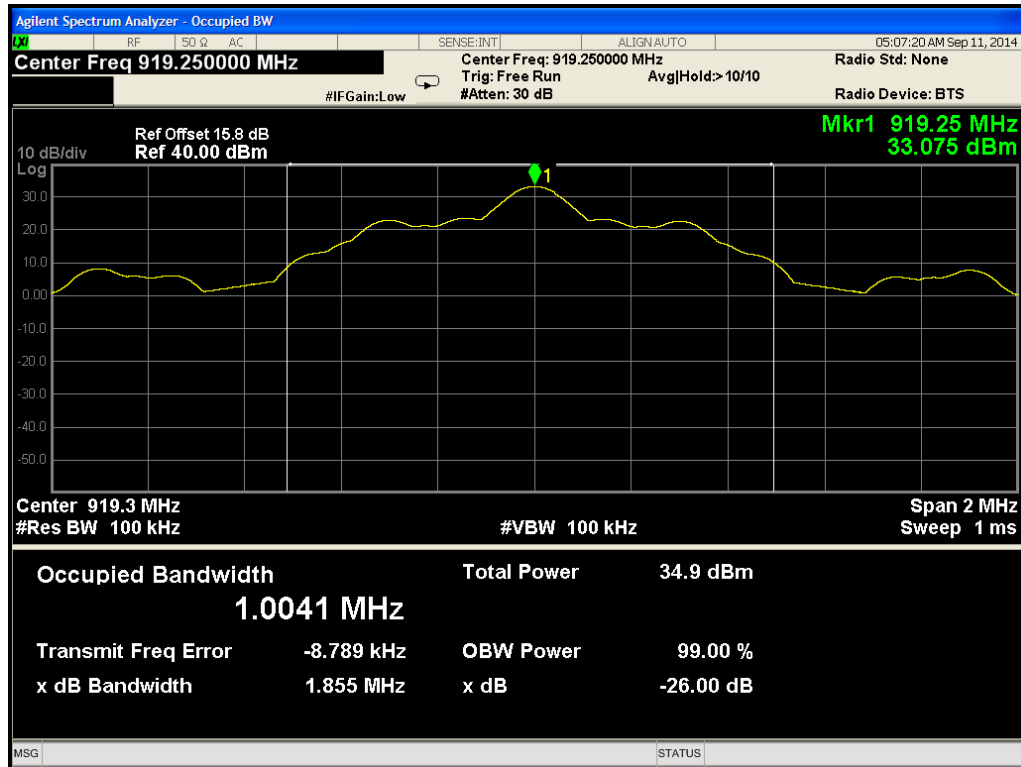
### Occupied Bandwidth – Low Band ISOC



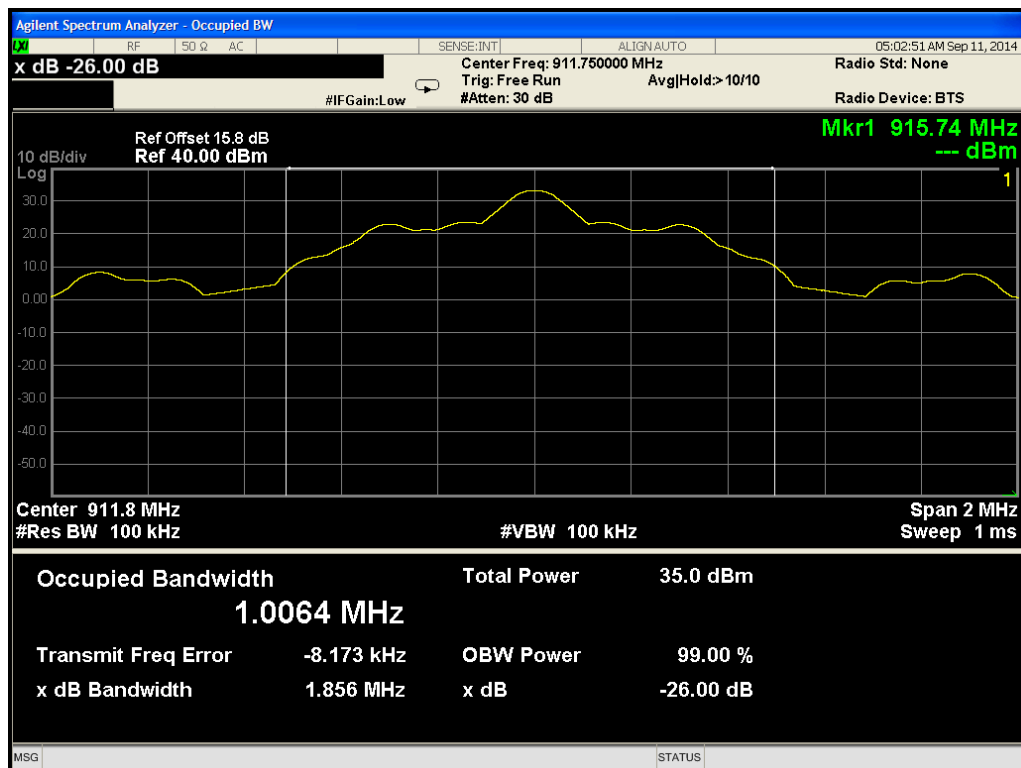
Occupied Bandwidth – FCC 90\_dense ISOC



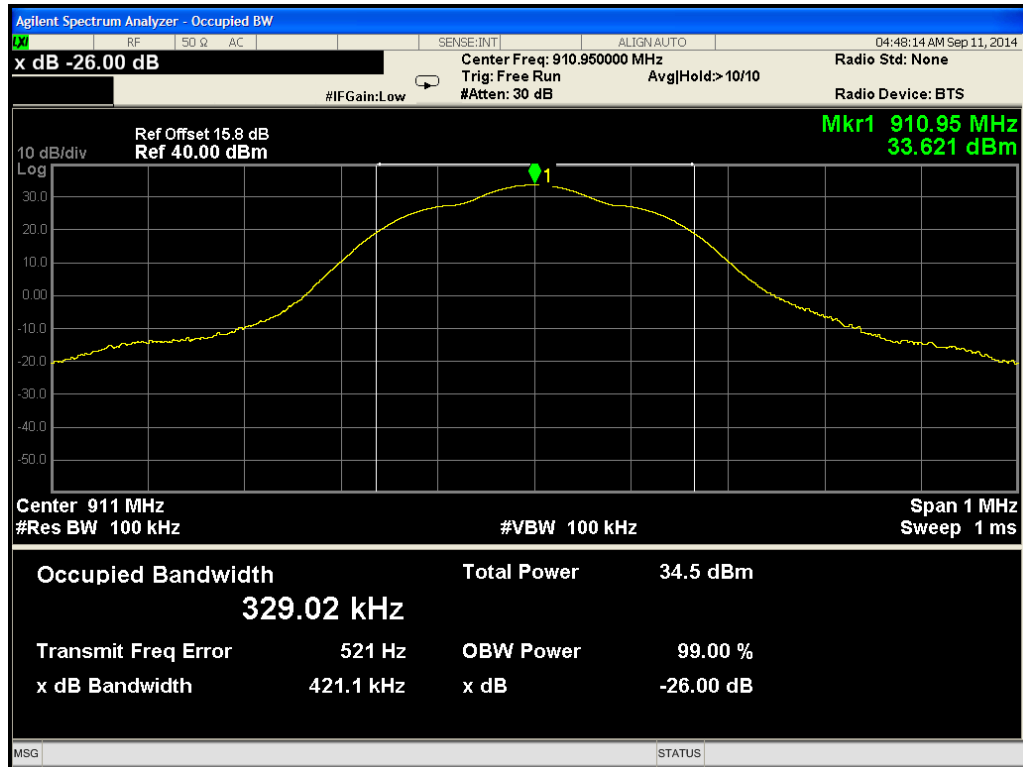
Occupied Bandwidth – FCC 90\_dense PS111



Occupied Bandwidth – FCC 90\_dense T21




Occupied Bandwidth – FCC 90\_dense T21

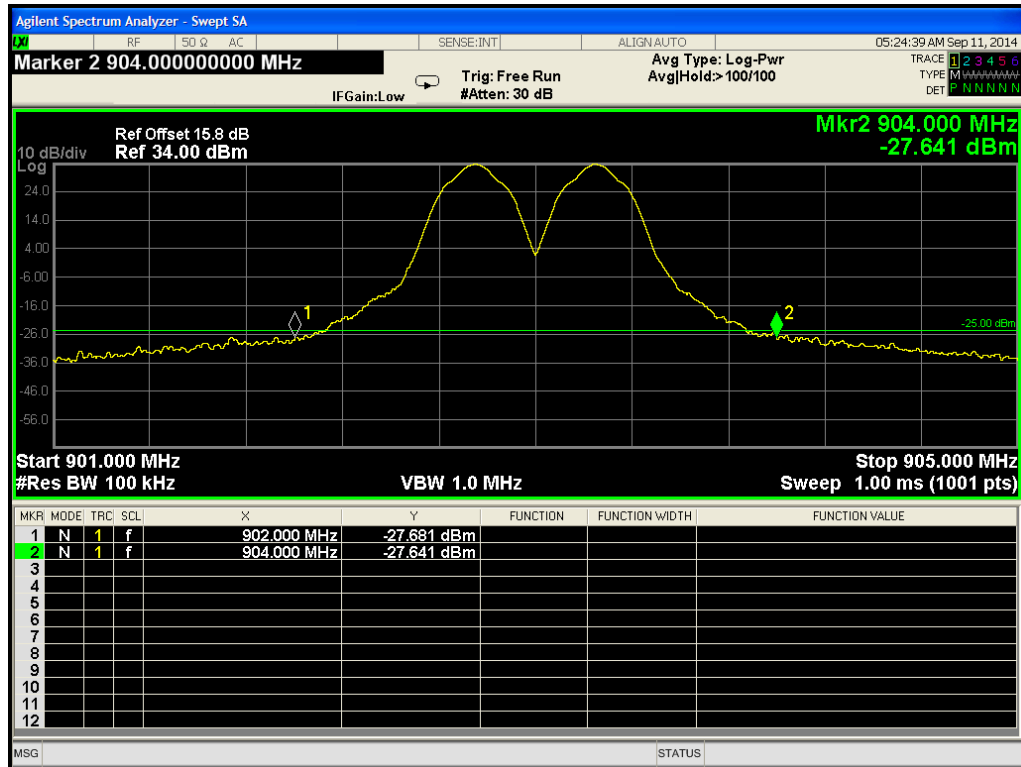


Occupied Bandwidth – FCC 90 ISOC

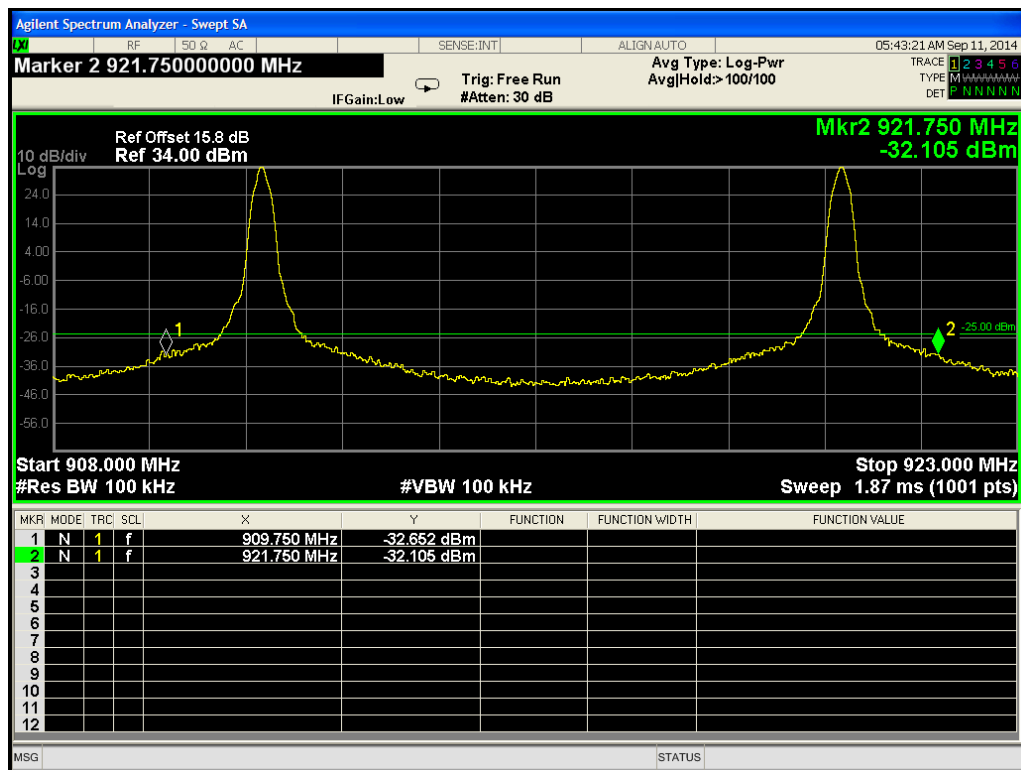
<b>3M</b>	<b>SEMS Regulatory Engineering</b>	<b>Report Number:</b> RE1407019-2 <b>Date:</b> November 13, 2014	Page 22 of 34
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<b>4.5</b>	<b>Spurious Emissions at Antenna Terminals</b>		
<b>Method:</b>	The measurements were made with transmitter set to transmit continuously with modulated. The marker delta method was used to determine band-edge compliance.		
	Laboratory Ambient Temperature	23°C	
	Relative Humidity	45%	
<b>Reference Standard:</b>	<input type="checkbox"/> FCC Part 90.210/RSS 137 <input checked="" type="checkbox"/> FCC Part 2.1051	<b>Measurement Point</b> <input checked="" type="checkbox"/> Conducted <input type="checkbox"/> Radiated <input type="checkbox"/> 	
<b>Frequency Range:</b>	<input checked="" type="checkbox"/> 902.75-920.45MHz		
<b>Limit</b>	Emission Mask "K"(RSS137 EM "C")	<b>Results</b>	
	<input checked="" type="checkbox"/> 55+10log(Pmax)dB <input checked="" type="checkbox"/> >60dBc	<b>pass</b>	
<b>Nominal Voltage:</b>	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> VDC		
<b>Tested By:</b>	Yuriy Litvinov	<b>Date:</b>	

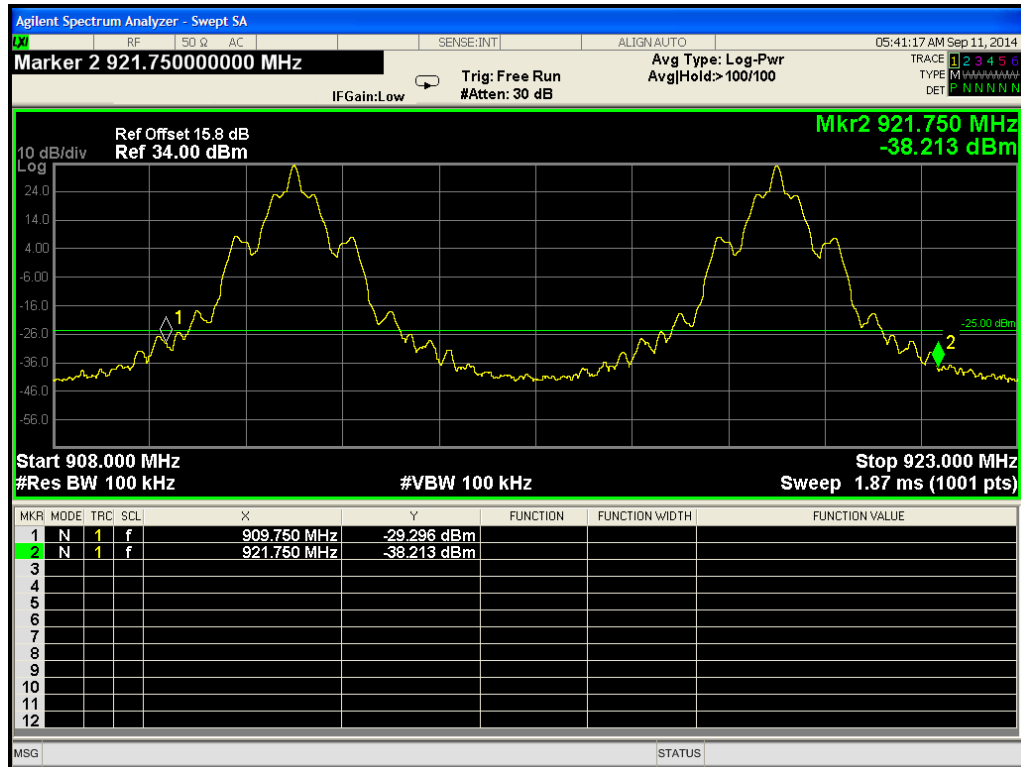
<b>Note:</b>	
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Lower and Upper Band Edge - Low Band -ISO18000-6C



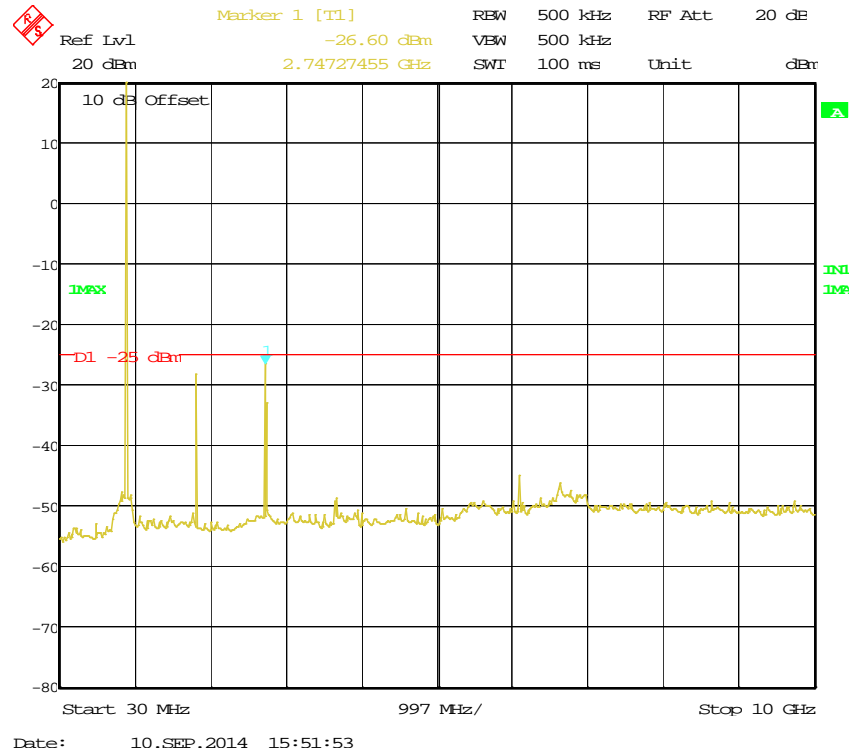
Lower and Upper Band Edge FCC\_90-910.95-920.45MHz - ISO18000-6C



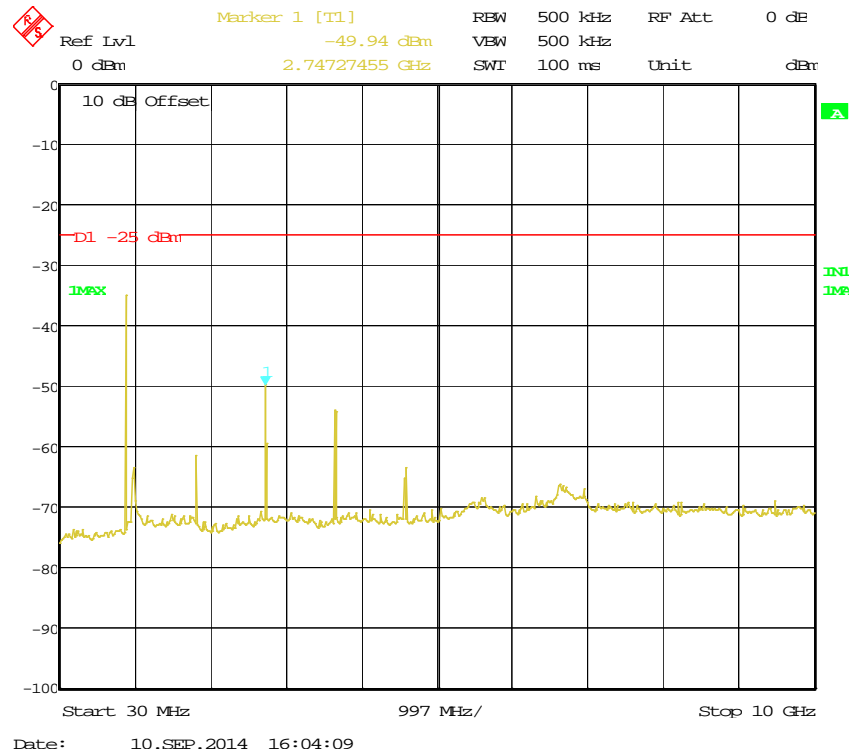
Lower and Upper Band Edge - FCC 90\_dense 911.75-919.25MHz – T21



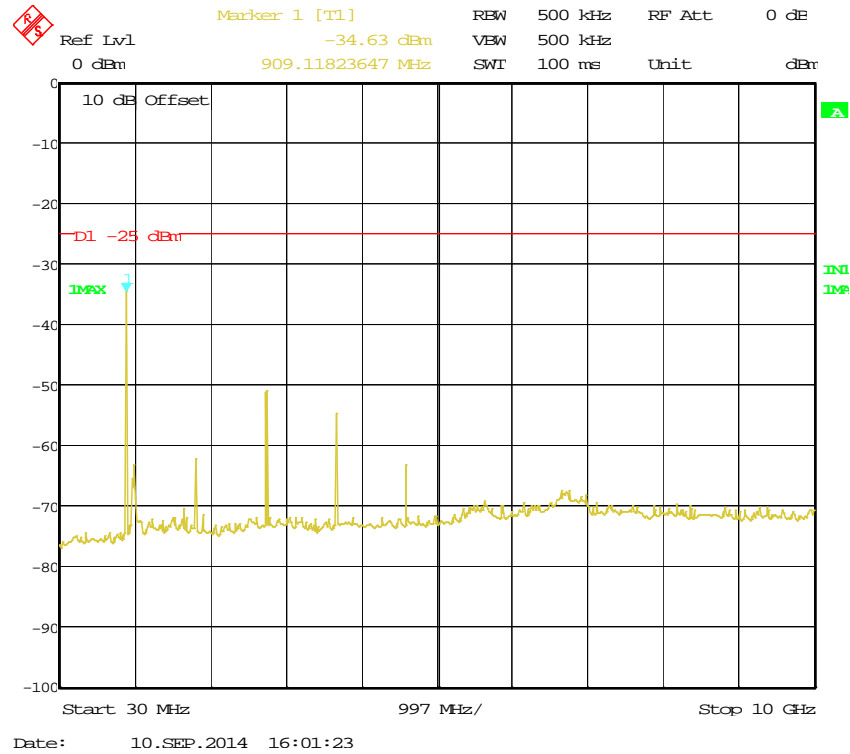




FCC 90\_dense 911.75-919.25MHz – T21




FCC 90\_dense 911.75-919.25MHz – T21 (notched)



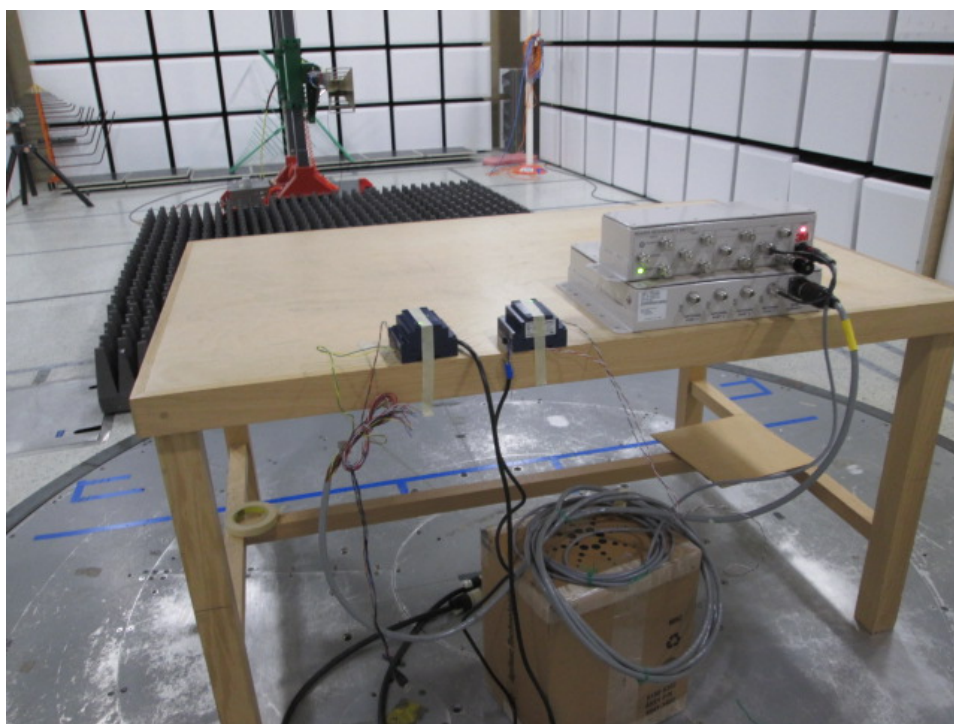
FCC\_90-910.95-920.45MHz – ISO18000-6C (notched)

<b>3M</b>	<b>SEMS Regulatory Engineering</b>	<b>Report Number:</b> RE1407019-2 <b>Date:</b> November 13, 2014	Page 28 of 34
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<b>4.6</b>	<b>Field Strength of Spurious Emissions</b>		
<b>Method:</b>	The measurements were made with transmitter set to transmit continuously with modulated signal. The level of spurious emissions was measured by their effective radiated power when radiated by the cabinet and structure of the device.		
	Laboratory Ambient Temperature	23°C	
	Relative Humidity	45%	
<b>Reference Standard:</b>	<input type="checkbox"/> FCC Part 90.210/RSS 137 <input checked="" type="checkbox"/> FCC Part 2.1051	<b>Measurement Point</b> <input checked="" type="checkbox"/> Conducted <input type="checkbox"/> Radiated <input type="checkbox"/> 	
<b>Frequency Range:</b>	<input checked="" type="checkbox"/> 902.75-920.45MHz		
<b>Limit</b>	Emission Mask "K"(RSS137 EM "C")	<b>Results</b>	
	<input checked="" type="checkbox"/> 55+10log(Pmax)dB <input checked="" type="checkbox"/> >60dBc	<b>pass</b>	
<b>Nominal Voltage:</b>	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> VDC		
<b>Tested By:</b>	Mike Schultz	<b>Date:</b> 09/18/2014	

<b>Note:</b>	Worst case modulation T21
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Pol.	Frequency (MHz)	SA Reading (dBm)	SG Reading (dBm)	Total CF (dB)	ERP Level (dBm)	EIRP Limit (dBm)	Margin (dB)
V	1248.0	57.2	-63.4	6.8	-56.6	-25	-31.6
V	1305.6	58.2	-63.4	7.1	-56.3	-25	-31.3
V	1372.9	64.0	-65.6	7.5	-58.1	-25	-33.1
H	1838.6	55.0	-68.0	10.5	-57.5	-25	-32.5
V	3513.5	46.2	-70.6	11.0	-59.6	-25	-34.6
V	5235.0	43.2	-70.6	11.3	-59.3	-25	-34.3
<b>Notes</b>		ERP = SG Reading (dBm) - Cable Loss(dBm) + Antenna Gain (dBi)					

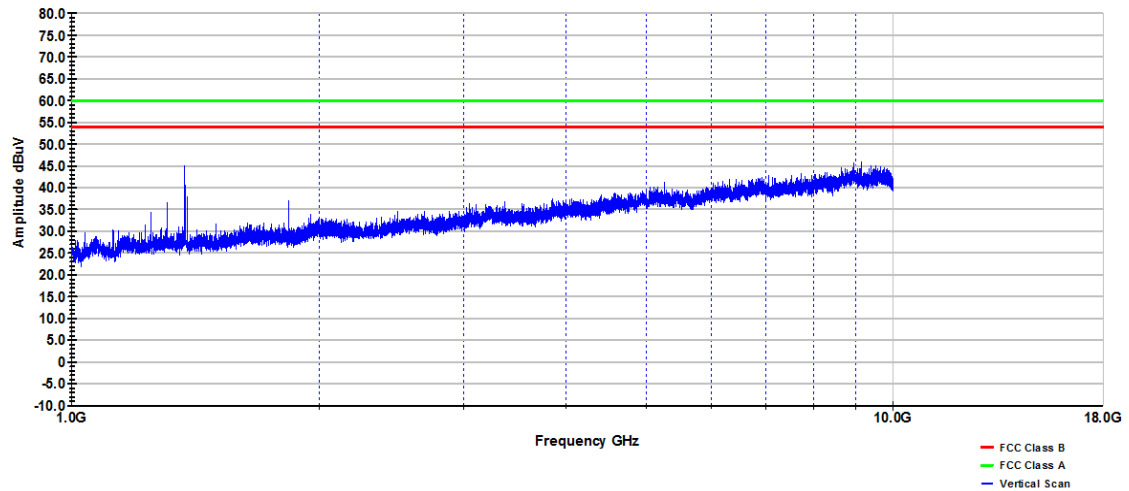


**Test Set Up Photo**



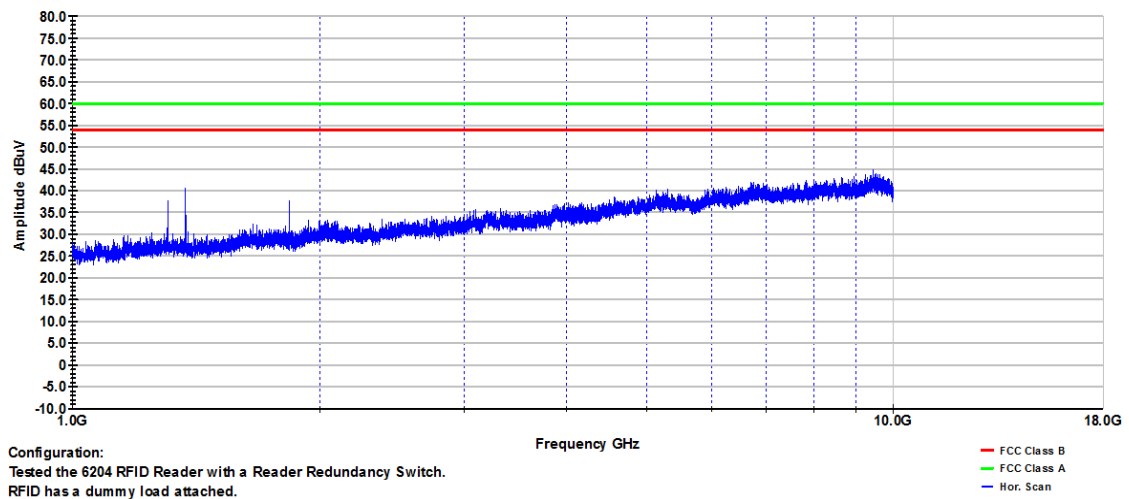
3M Company  
FCC Part 15  
RE 1GHz-18GHz, Vertical

RE Project # - RE1407019  
Model # - 6204  
EUT Description - RFID Reader with Reader Redundancy  
Serial # - 6204000021 - RRS00181  
EUT Power - 24 Vdc



3M Company  
FCC Part 15  
RE 1GHz-18GHz, Horizontal

RE Project # - RE1407019  
Model # - 6204  
EUT Description - RFID Reader with Reader Redundancy  
Serial # - 6204000021 - RRS00181  
EUT Power - 24 Vdc



<b>3M</b>	<b>SEMS Regulatory Engineering</b>	<b>Report Number:</b> RE1407019-2 <b>Date:</b> November 13, 2014	Page 31 of 34
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<b>4.7</b>	<b>Frequency Stability</b>		
<b>Method:</b>	The measurements was made with the device set to transmit a continuous un-modulated carrier and performed at each of the applicable frequencies.		
	Laboratory Ambient Temperature	21°C	
	Relative Humidity	45%	
<b>Reference Standard:</b>	<input checked="" type="checkbox"/> FCC Part 90.213/RSS 137 <input type="checkbox"/>	<b>Measurement Point</b> <input checked="" type="checkbox"/> Conducted <input type="checkbox"/> Radiated <input type="checkbox"/>	
<b>Frequency Range:</b>	<input checked="" type="checkbox"/> 902-928MHz		
<b>Limit</b>	<b>Frequency Drift</b>	<b>Output Power</b>	
	<input checked="" type="checkbox"/> ±2.5ppm <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Nominal Voltage:</b>	<input type="checkbox"/> 230VAC <input checked="" type="checkbox"/> 120VAC		
<b>Tested By:</b>		<b>Date:</b>	

<b>Note:</b>	Part 90.213(a) Note 13. Fixed non-multilateration transmitters with an authorized bandwidth that is more than 40 kHz from the band edge, intermittently operated hand-held readers, and mobile transponders are not subject to frequency tolerance restrictions.
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4.8	<b>RF Exposure Compliance</b>	
<b>Reference Standard:</b>	<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 <span style="background-color: #cccccc; display: inline-block; width: 40px; height: 1em;"></span> <input checked="" type="checkbox"/> FCC Parts 2.1091 and 2.1093 <input type="checkbox"/> OET 65	<input checked="" type="checkbox"/> MPE <input type="checkbox"/> SAR Evaluation
<b>Frequency Range:</b>	<input checked="" type="checkbox"/> 902-928MHz	
<b>Antenna Separation Distance</b>	>120cm	
<b>Antenna Type</b>	LINEAR 30°, 15DBI	
<b>Antenna Gain (maximum)</b>	31.6 (numeric)	
<b>Maximum Output Power at antenna terminal</b>	35dBm (3162mW)	
<b>Power Density</b>	0.552 mW/cm <sup>2</sup>	
GENERAL POPULATION/UNCONTROLLED LIMIT		
<b>FCC/RSS102</b>	0.610 mW/cm <sup>2</sup>	

<b>Note:</b>	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 <sup>2</sup> . 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"/>
High Pass Filter	WHK	WHK1.1/1.5G	9	10/2014	<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	10/31/2014	RE1407019-2	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  
NAME OF EQUIPMENT

3M COMPANY  
Toll RFID READER and READER  
REDUNDANCY SWITCH

MODEL NUMBER(S)  
TEST REPORT NUMBER  
DATE OF ISSUE

6204 and RRS  
RE1407019-2  
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 90 - Subpart M - LMS  
Operations in the 902-928 MHz band

FCC Part 90.353

Location and Monitoring Service in the  
Band 902-928 MHz.

RSS 137, Issue 2, 2009

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