

EMC TEST REPORT



NVLAP Lab Code 200033-0

Standard(s):

47 CFR FCC Part 15.247
FCC ID: M4Z1000
Class II Permissive Change

Product: 3M Compact RFID Reader
Model: 1000
3M Division: TSSD

Report Number: RE1603020-1
Report Issue Date: June 7, 2016

Report Prepared By:

Signature: 

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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	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:	Limited testing under Class II Permissive Change to include new antenna Model: A1001 (Section 4.9, pages 37-39). See 3M Company Test Report number RE1311030-1, issued on October 16, 2014 for the original FCC/IC certifications.
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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

2.0 Equipment Description

2.1	Equipment Under Test		
Description:	3M Model 1000 is a multi protocol four-Port Compact RFID Reader which can support up to four mono-static or two bi-static antennas. 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). One RF Section and one antenna multiplexing at the time. Antenna path is identical.		
Model(s):	1000		
Serial number:	N/A		
Client Contact:	Name:	Phone:	
	Dave Missimer Randal D. Roebuck Aaron Mills	919-281-1559 512- 984 5688 651- 736-3323	
3M Division:	Traffic Safety and Security		
Modifications:	None		
Frequency Range (MHz) :	902 – 928MHz		
Modulation Type:	FHSS	DSB-ASK, PR-ASK	
Channel No.:	50		
Maximum Output Power:	30.0dBm		
Antenna Type :	MT-262006/TRH/A – 6dBi Dual Polarized Dipole (7dBi max)		
	MT-242048/NRH – 4.5dBi Dual Polarized Dipole		
	A1001 -20dBi Short Range UHF Antenna (new antenna)		
Equipment Category:	☒ General ☐ Portable ☐ Indoor Use		
Rated Input Power:	Voltage: ☒ 120VAC ☐ 230VAC ☐ VDC Frequency: ☐ 50Hz ☒ 60Hz Current: ☒ 3.75A		
Test Dates:	05/19-06/20/2014 - original certification 05/25/2016 – Class II PC		
Received Date:	04/26/2014		
Received Conditions:	☐ Poor ☒ Good ☐ Prototype ☒ Production		

3.0 EUT Configuration

3.1 Support Equipment

No.	Product Type	Manufacturer	Model	Comments
1	24 VDC Power Supply	Mean Well	p/n GS90A24-P1M	100-240VAC, 50/60Hz
2				

3.2 Cables/Ports

No.	Name	Type	Length	Shielding	Comments
1	Ethernet	RG45	2m	Yes	Digital I/O Connection
2	USB	USB	2m	No	
3	Serial	RS232	2m	No	

3.3 Operating Condition of EUT

	Operation Modes
☐	Stand by
☒	Continuous Monitored Operation
☐	Continuous Unmonitored Operation
☒	RFID reader was programmed for FHSS operation using RTS RFID software via Command Line Interface.
☒	FCC Dense mode – 902.75-927.250MHz with 500KHz channels
☒	FCC Band A - 902.75-912.100MHz with 200KHz channels
☒	FCC Band B - 910.100-919.900MHz with 200KHz channels
☒	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 were 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: ☒		Laboratory Ambient Temperature		21°C
		Relative Humidity		35%
Reference Standard:		☐ ANSI C63.4:2003 ☒ ANSI C63.4:2009 ☐ ANSI C63.10:2013 ☒ FCC Part 15.207/RSS Gen ☐ FCC Part 15.247/RSS 210 ☐		
Frequency Range:		☒ 150KHz to 30KHz ☐		
Nominal Voltage:		☒ 120VAC ☐ 230VAC ☐		
Tested By:		Mike Schultz <i>MS</i>		Date: 05/22/2014
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:	

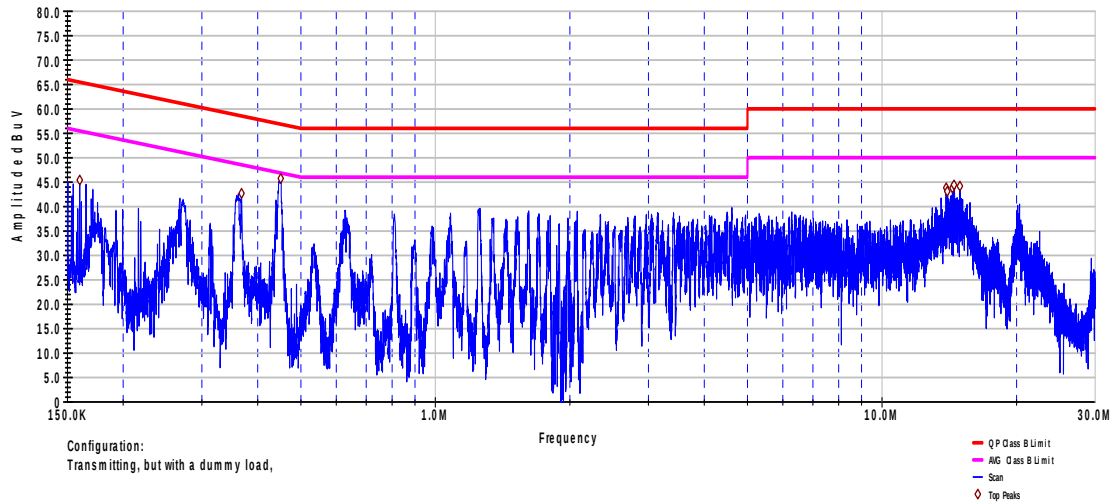


Frequency (MHz)	QP Line 1 dB (µV)	AVG Line 1 dB (µV)	QP Limit dB (µV)	AVG Limit dB (µV)	QP Margin dB	AVG Margin dB
0.17	42.23	36.78	64.92	54.92	-22.70	-18.14
0.27	42.50	38.23	61.07	51.07	-18.57	-12.84
0.36	43.97	42.54	58.70	48.70	-14.73	-6.16
0.45	47.02	45.74	56.89	46.89	-9.87	-1.15
0.63	40.94	35.81	56.00	46.00	-15.06	-10.19
14.39	39.15	32.09	60.00	50.00	-20.85	-17.91
14.59	41.08	32.14	60.00	50.00	-18.92	-17.86
15.06	38.83	30.78	60.00	50.00	-21.17	-19.22
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
0.16	37.98	24.25	65.47	55.47	-27.49	-31.22
0.37	37.35	30.81	58.54	48.54	-21.19	-17.73
0.44	42.10	35.26	57.03	47.03	-14.93	-11.77
14.14	40.08	32.12	60.00	50.00	-19.92	-17.88
14.14	38.68	30.98	60.00	50.00	-21.32	-19.02
14.37	39.24	31.03	60.00	50.00	-20.76	-18.97
14.48	41.46	32.75	60.00	50.00	-18.54	-17.25
14.74	40.09	31.78	60.00	50.00	-19.91	-18.22
Voltage		☒ 120VAC ☐ 230VAC ☐				
Notes						



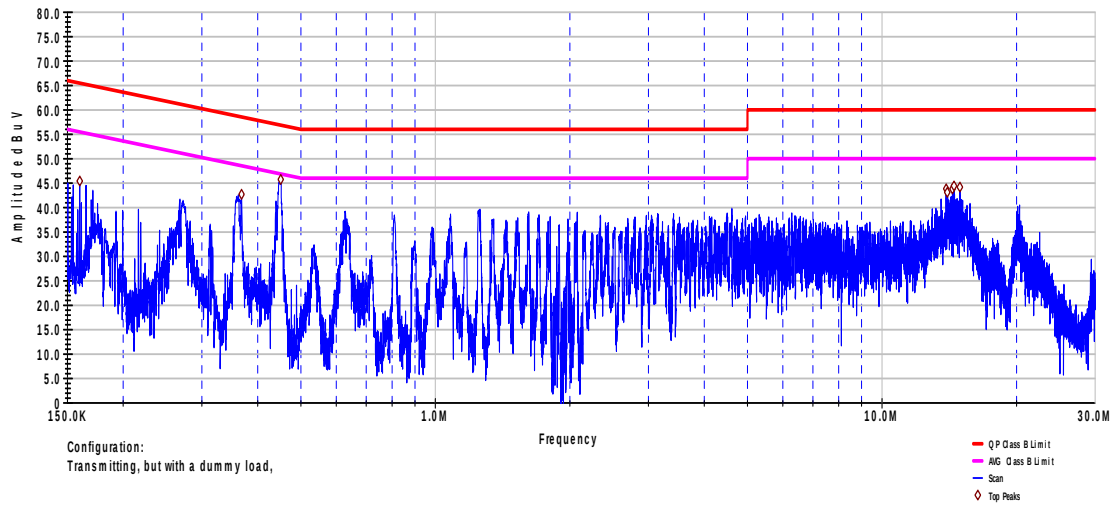
3M Company
Conducted Emissions
CISPR22_FCC Part 15, Class B, Line 2

RE Project # - RE1311030
Model # - IN610
EUT Description - Traffic Systems RFID Reader
Serial # - IN6104S01208
EUT Power - 120 VAC / 60 Hz



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

RE Project # - RE1311030
Model # - IN610
EUT Description - Traffic Systems RFID Reader
Serial # - IN6104S01208
EUT Power - 120 VAC / 60 Hz



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: ☒	Laboratory Ambient Temperature		23°C	
	Relative Humidity		35%	
Reference Standard:	☐ ANSI C63.4:2003 ☒ ANSI C63.4:2009 ☐ ANSI C63.10:2013 ☒ FCC Part 15.109/ICES 003 ☐ FCC Part 15.247/RSS 210 ☒ FCC Part 15.209		Measurement Distance	
			☒ 3 Meters ☐	
Frequency Range:	☒ 30 MHz TO 10GHz ☐			
Nominal Voltage:	☒ 120VAC ☐ 230VAC ☐			
Tested By:	Mike Schultz <i>MS</i>		Date: 05/28/2014	
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.			

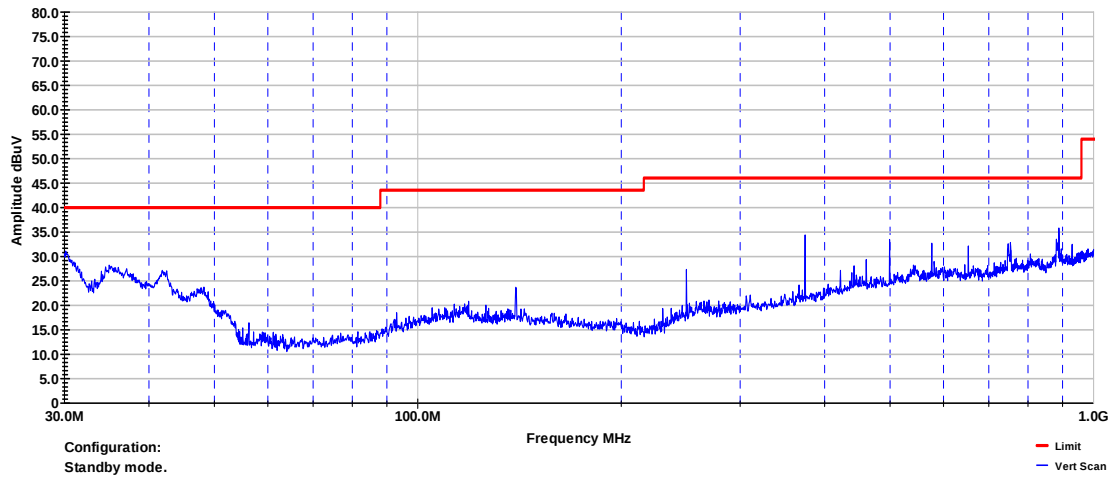


Frequency (MHz)	Pol.	QP Reading dBμV/m	Total CF dB	Net at 3 m dBμV/m	Limit (dBμV/m)	Margin dB
249.60	H	13.90	15.39	29.29	47.00	-17.71
374.00	H	7.69	19.12	26.81	47.00	-20.19
500.00	H	8.59	21.71	30.30	47.00	-16.70
576.00	H	11.94	23.27	35.21	47.00	-11.79
652.00	H	8.92	23.74	32.66	47.00	-14.34
249.60	H	13.90	15.39	29.29	47.00	-17.71
Notes		Total CF = Antenna Factor + Cable Factor - AMP Gain				



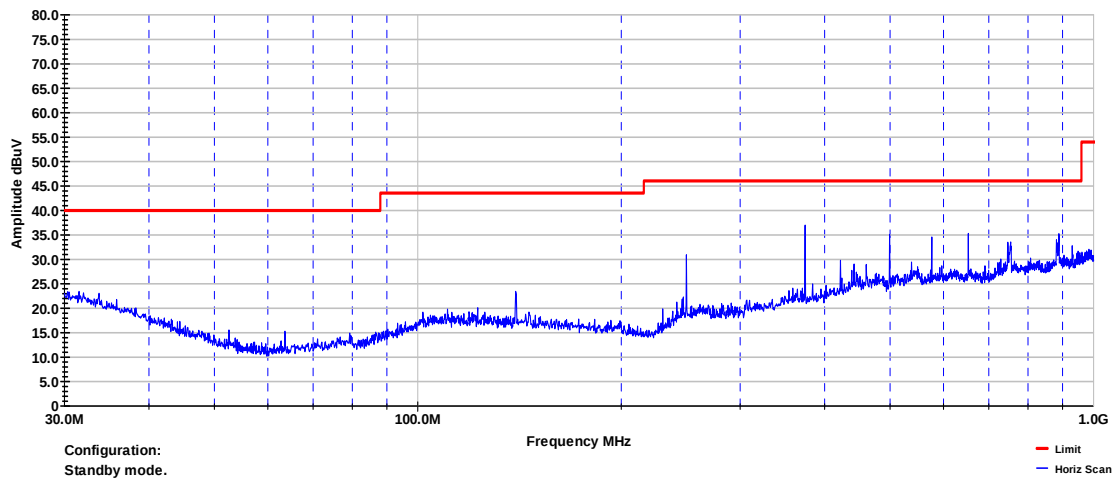
3M Company
Radiated Emissions Prescan
FCC Part 15, Class B, Vertical

RE Project # - RE1311030
Model # - IN1000
EUT Description - Traffic Systems RFID Reader
Serial # - IN6104S01208
EUT Power - 120 VAC / 60 Hz



3M Company
Radiated Emissions Prescan
FCC Part 15, Class B, Horizontal

RE Project # - RE1311030
Model # - IN1000
EUT Description - Traffic Systems RFID Reader
Serial # - IN6104S01208
EUT Power - 120 VAC / 60 Hz

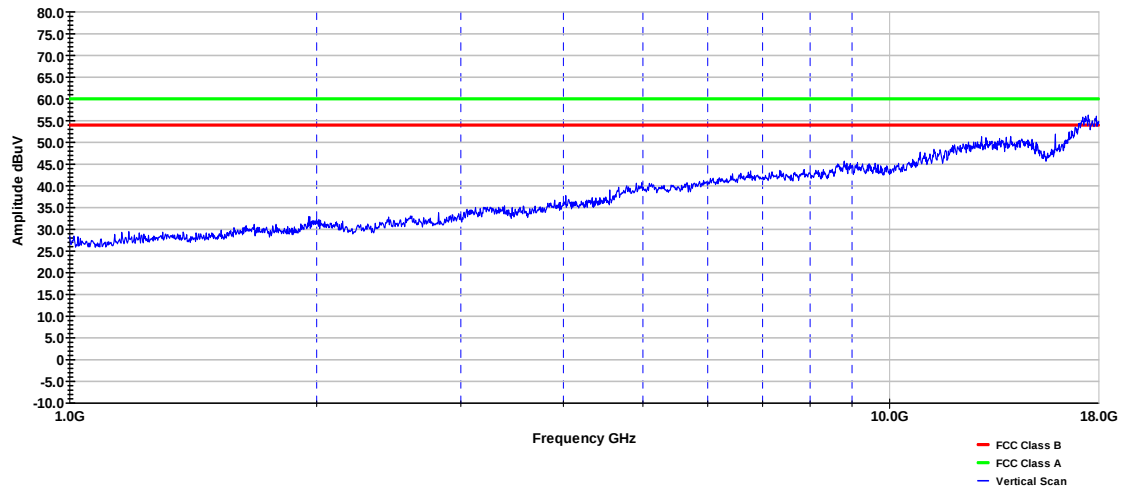




3M Company

FCC Part 15

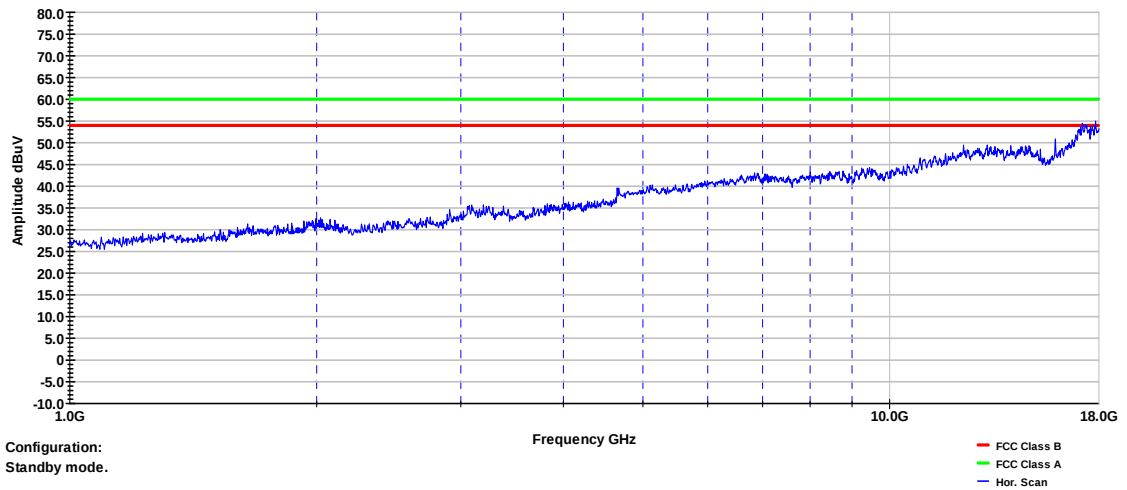
RE 1GHz-18GHz, Vertical

RE Project # - RE1311030
Model # - IN1000
EUT Description - Traffic Systems RFID Reader
Serial # - IN6104S01208
EUT Power - 120 VAC / 60 Hz

3M Company

FCC Part 15

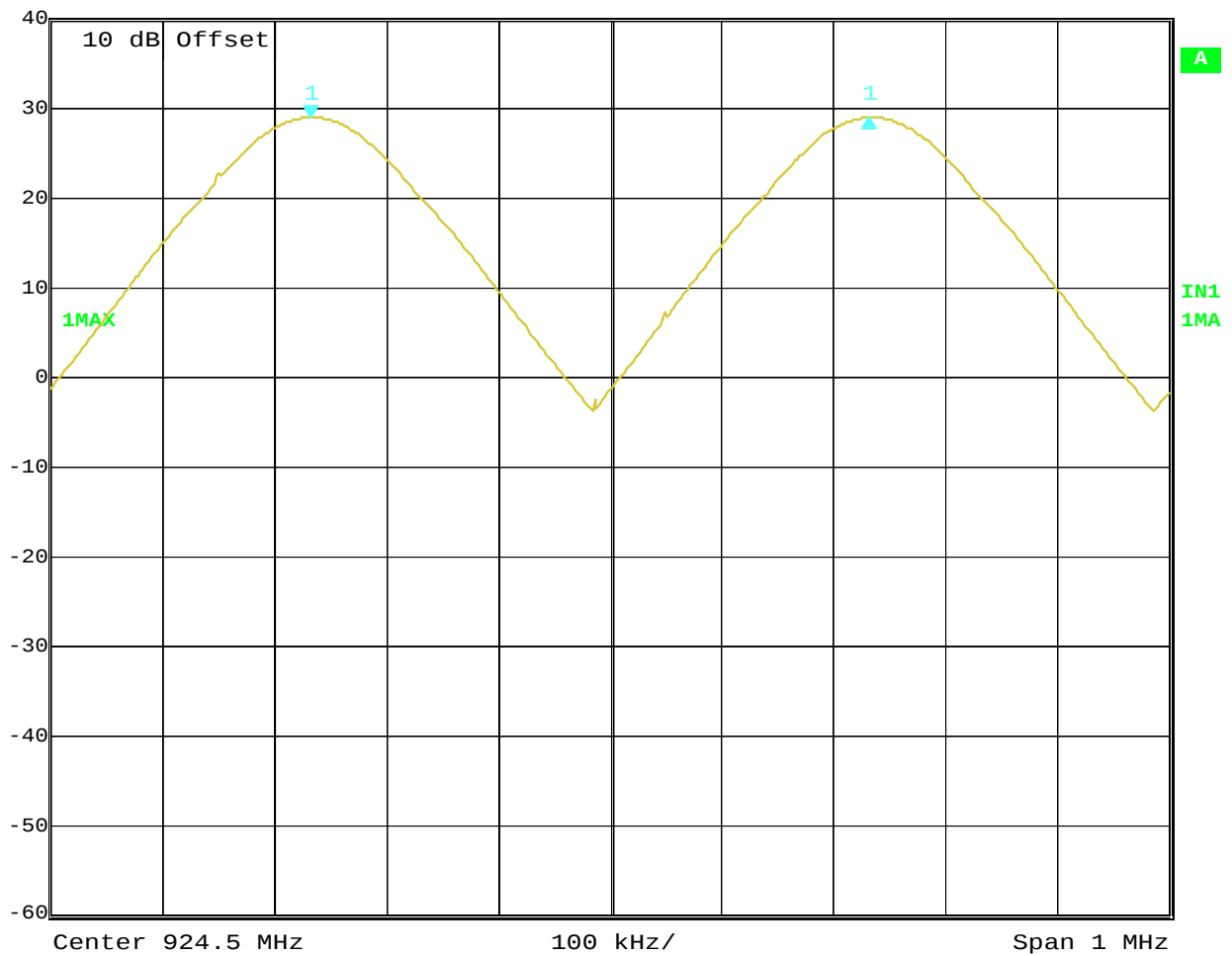
RE 1GHz-18GHz, Horizontal

RE Project # - RE1311030
Model # - IN1000
EUT Description - Traffic Systems RFID Reader
Serial # - IN6104S01208
EUT Power - 120 VAC / 60 Hz

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		35%		
Reference Standard:	☐ ANSI C63.4:2003 ☐ ANSI C63.4:2009 ☒ ANSI C63.10:2009 ☐ FCC Part 15.109/ICES 003 ☒ FCC Part 15.247/RSS 210 ☐ FCC Part 15.209		Measurement Point ☒ Conducted ☐ Radiated ☐		
Frequency Range:	☒ 902.3-927.75MHz				
Antenna Gain:	☒ 6dBi		Result		
Limit	☐ >25KHz				
	☒ >20dB Bandwidth (110 KHz)		Dense 499KHz	Band A 200KHz	Band B 200KHz
Nominal Voltage:	☒ 120VAC ☐ VDC				
Tested By:	Yuriy Litvinov			Date: 05/09/2014	

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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	Delta 1 [T1]	RBW	100 kHz	RF Att	40 dB
	Ref Lvl	-0.03 dB	VBW	30 kHz	
	40 dBm	498.99799599 kHz	SWT	500 ms	Unit dBm

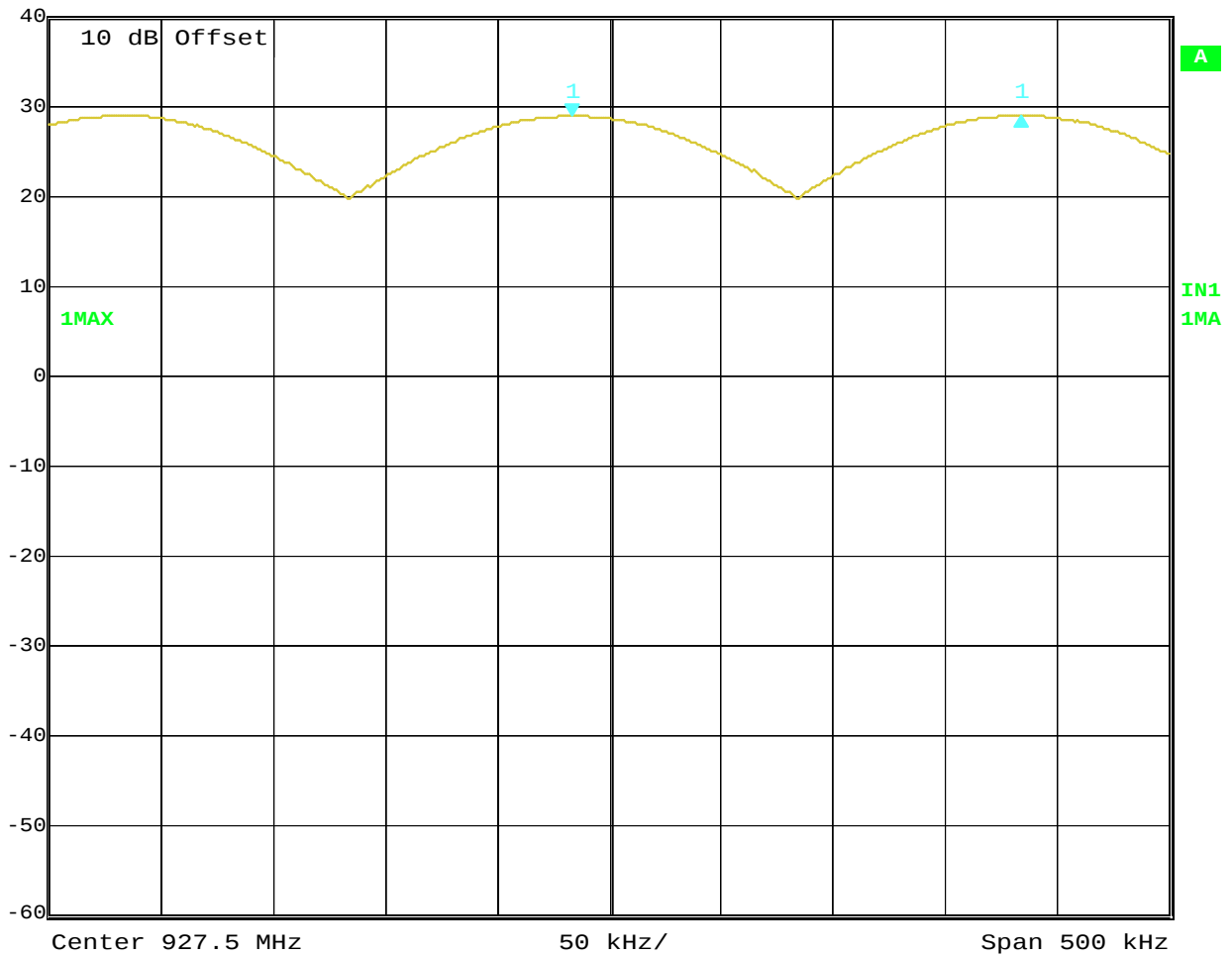


Date: 9.MAY.2014 13:55:26

Carrier Frequency Separation – Dense Mode



	Delta 1 [T1]	RBW	100 kHz	RF Att	40 dB
Ref Lvl	0.05 dB	VBW	30 kHz		
40 dBm	200.40080160 kHz	SWT	500 ms	Unit	dBm

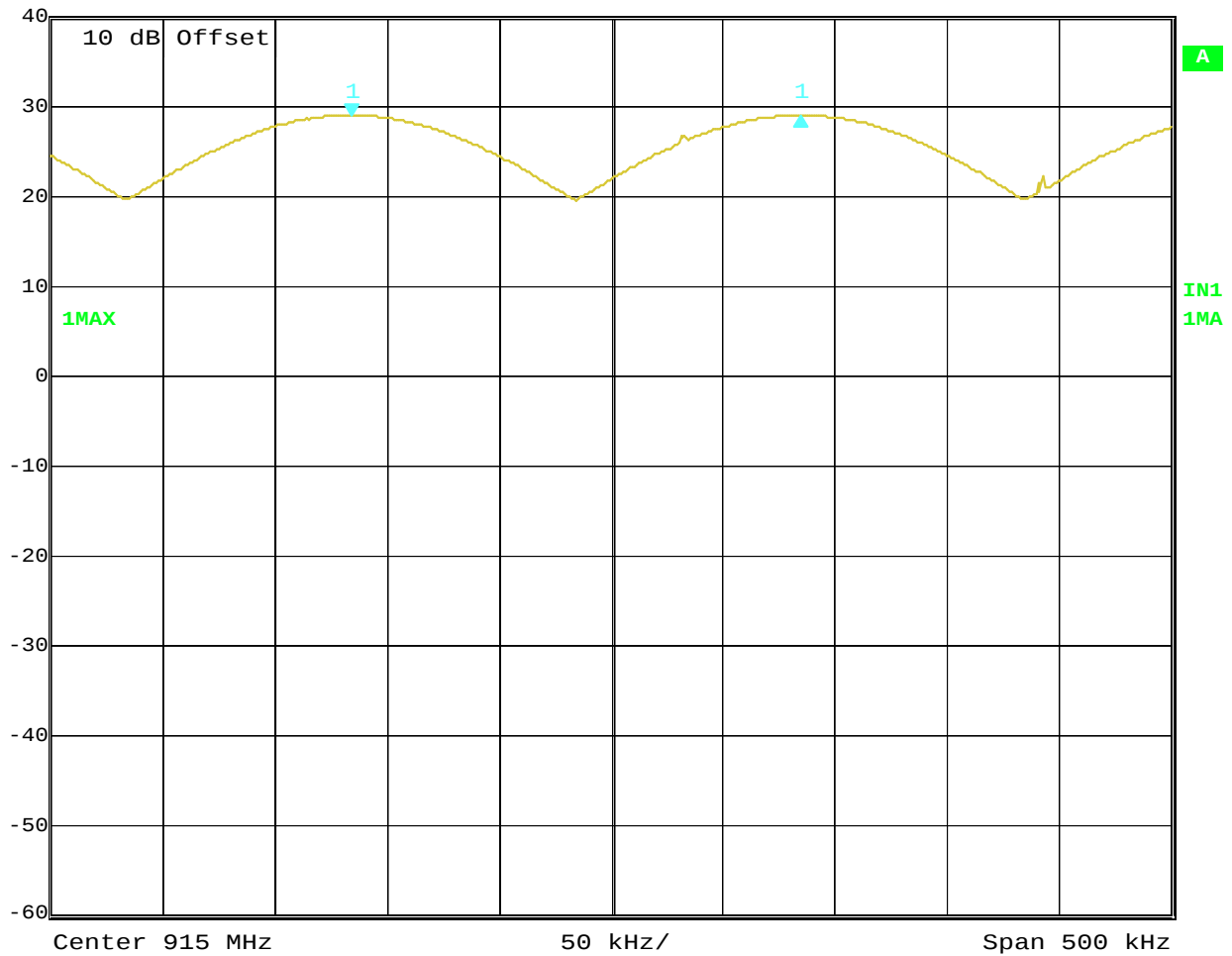


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Carrier Frequency Separation – Band C

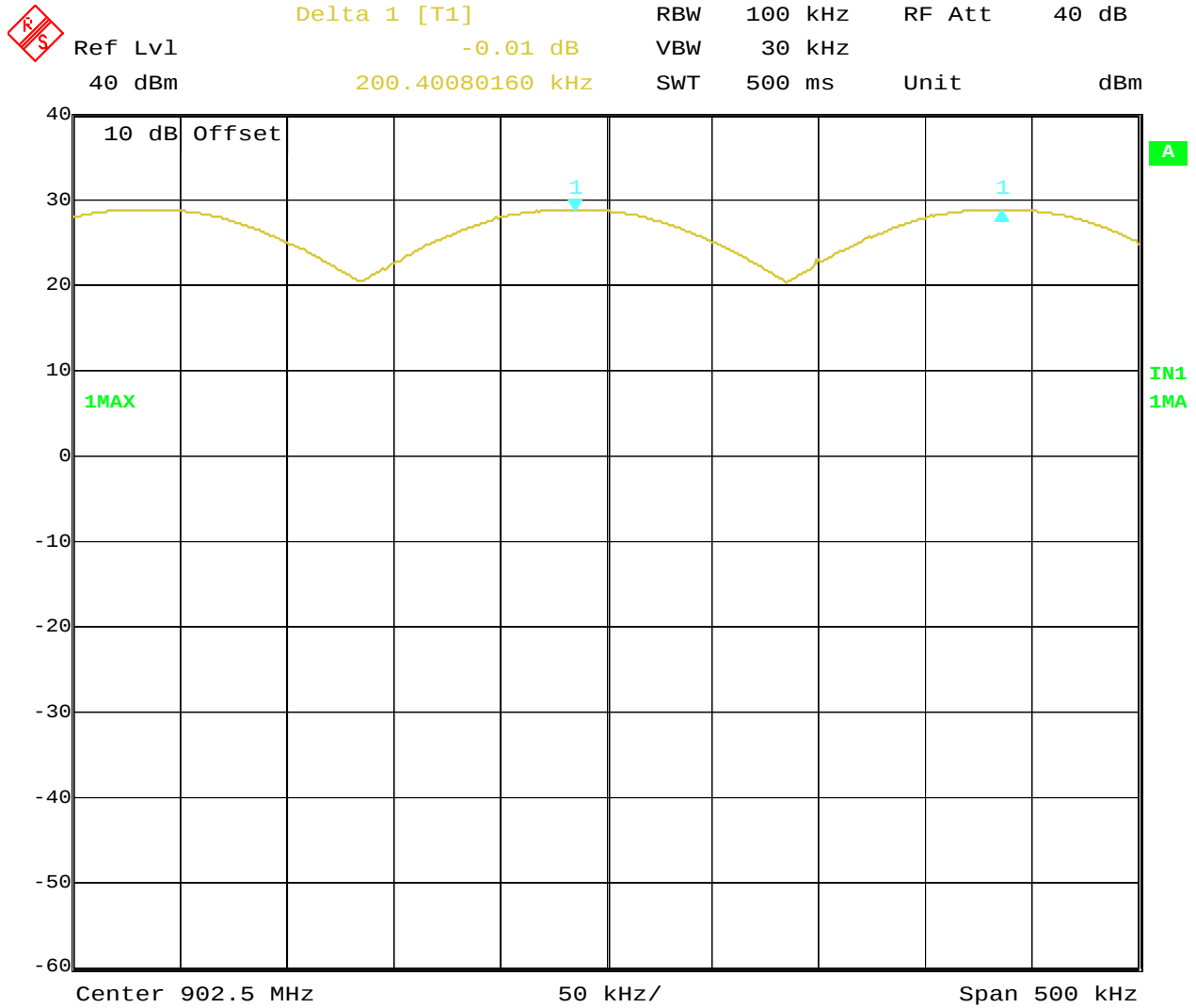


Delta 1 [T1] RBW 100 kHz RF Att 40 dB
 Ref Lvl -0.01 dB VBW 30 kHz
 40 dBm 200.40080160 kHz SWT 500 ms Unit dBm



Date: 9.MAY.2014 14:02:59

Carrier Frequency Separation – Band B

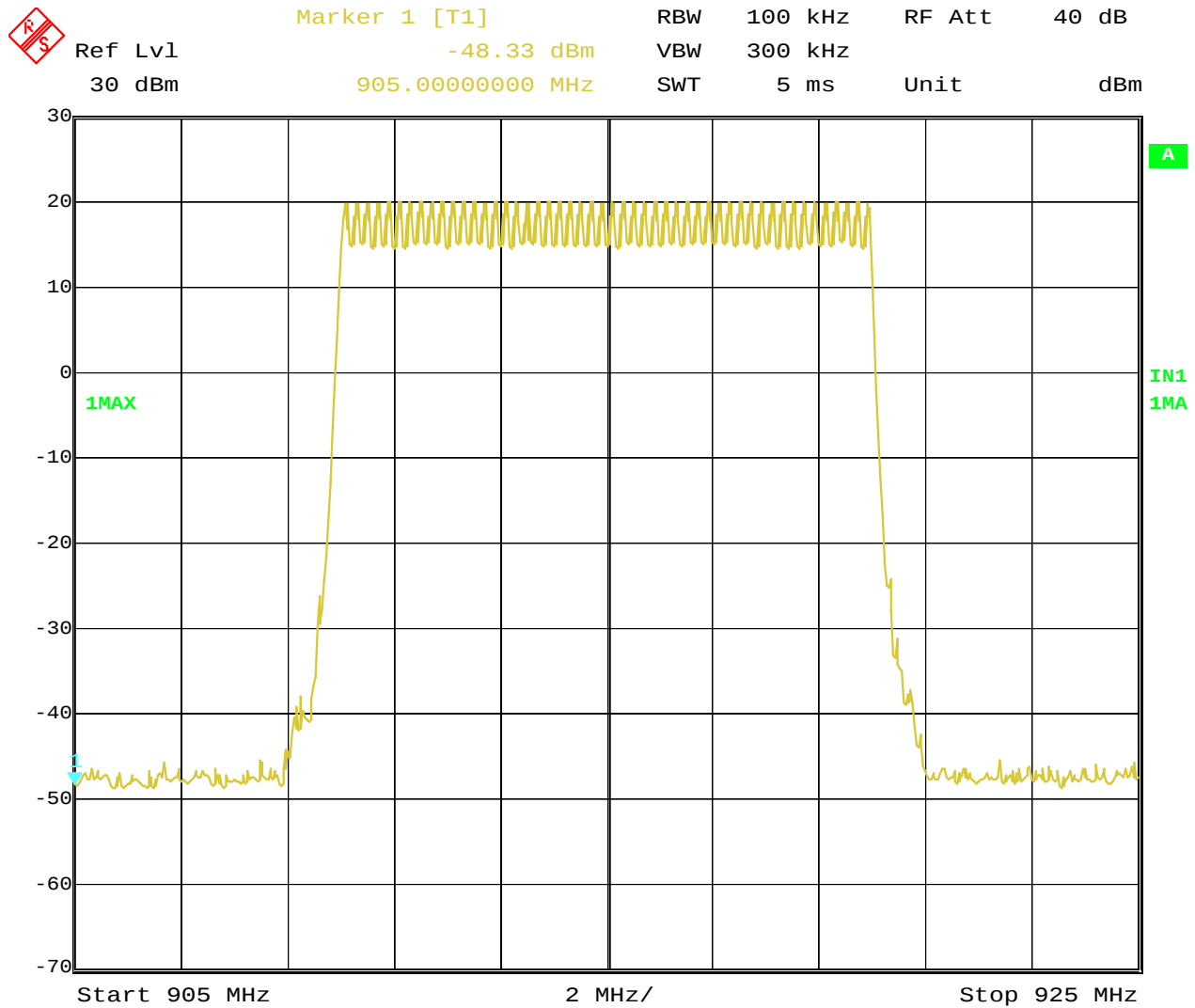


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Carrier Frequency Separation – Band A

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	35%	
Reference Standard:	☐ ANSI C63.4:2009 ☒ ANSI C63.10:2013 ☐ FCC Part 15.109/ICES 003 ☒ FCC Part 15.247/RSS 210 ☐ FCC Part 15.209	Measurement Point ☒ Conducted ☐ Radiated ☐	
Frequency Range:	☒ 902.3-927.75MHz		
Antenna Gain:	☒ 6dBi	Number of Channels	Result
Limit	☒ > 50 Hopping Channels, BW <250KHz	50	Pass
	☒ >25 Hopping Channels, BW >250KHz		
Nominal Voltage:	☒ 120VAC ☐ VDC		
Tested By:	Yuriy Litvinov	Date: 05/08/2014	

Note:	
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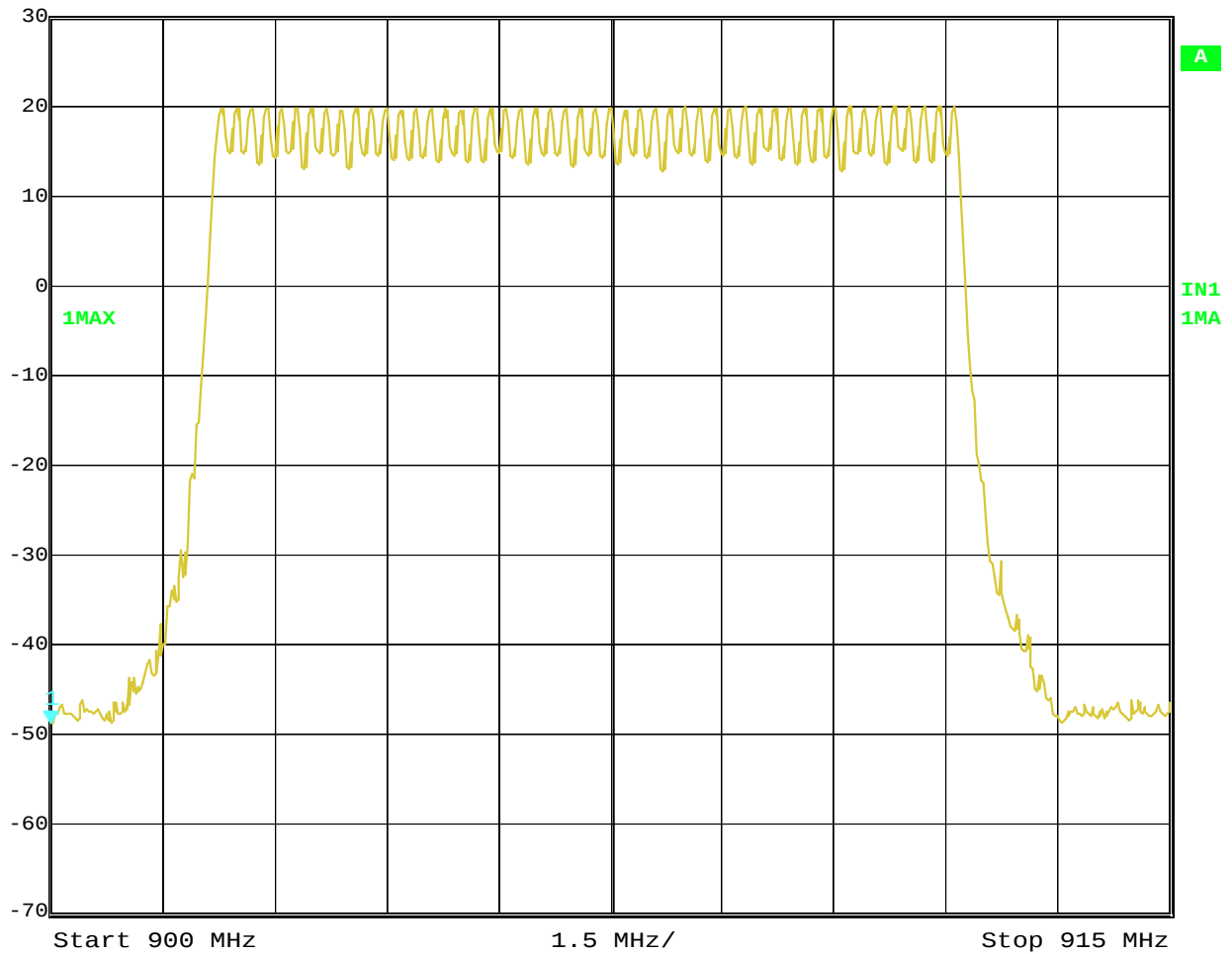


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Number of Channels – Band B

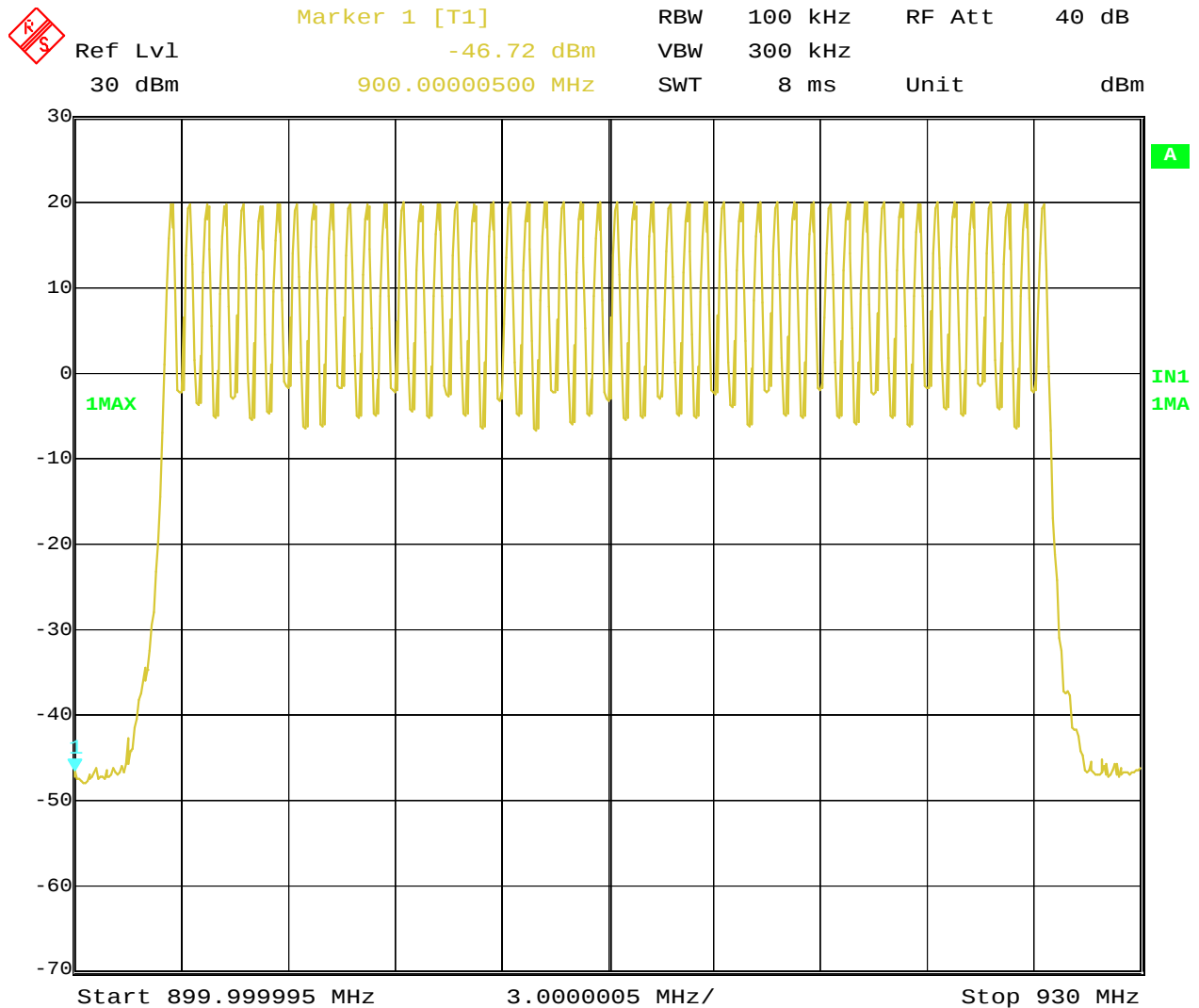


Ref Lvl 30 dBm
 Marker 1 [T1] -48.97 dBm
 900.00000500 MHz
 RBW 100 kHz RF Att 40 dB
 VBW 300 kHz
 SWT 5 ms Unit dBm



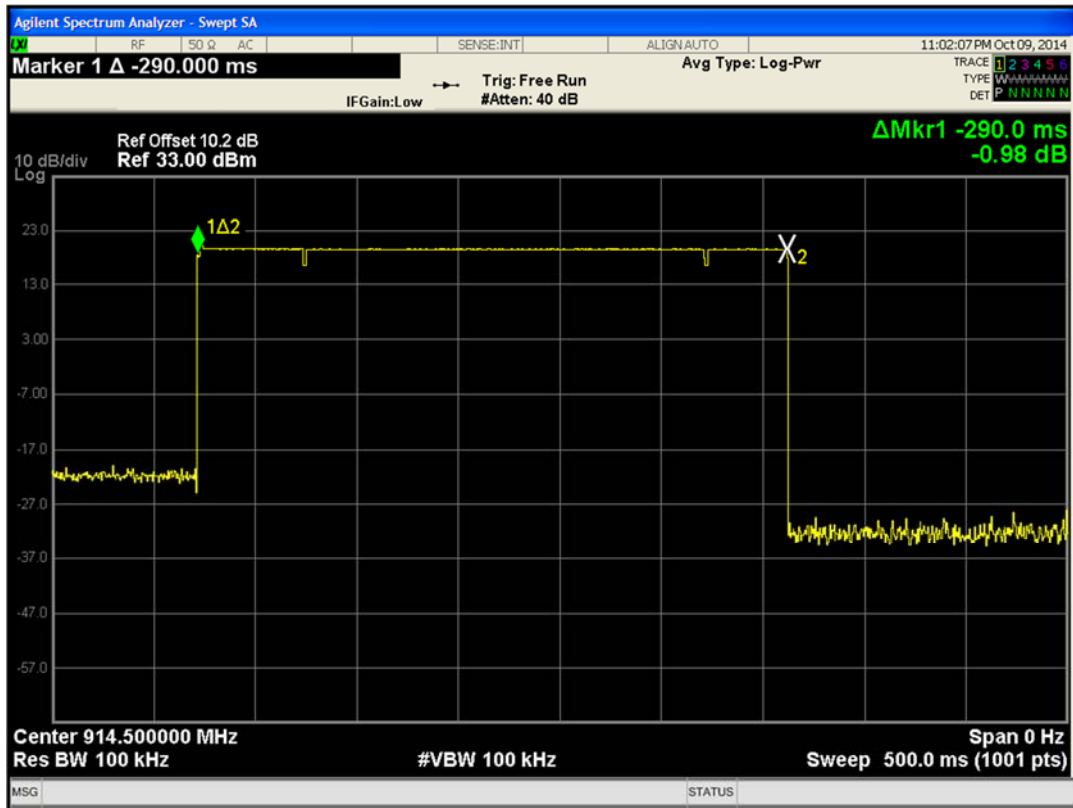
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Number of Channels – Band A

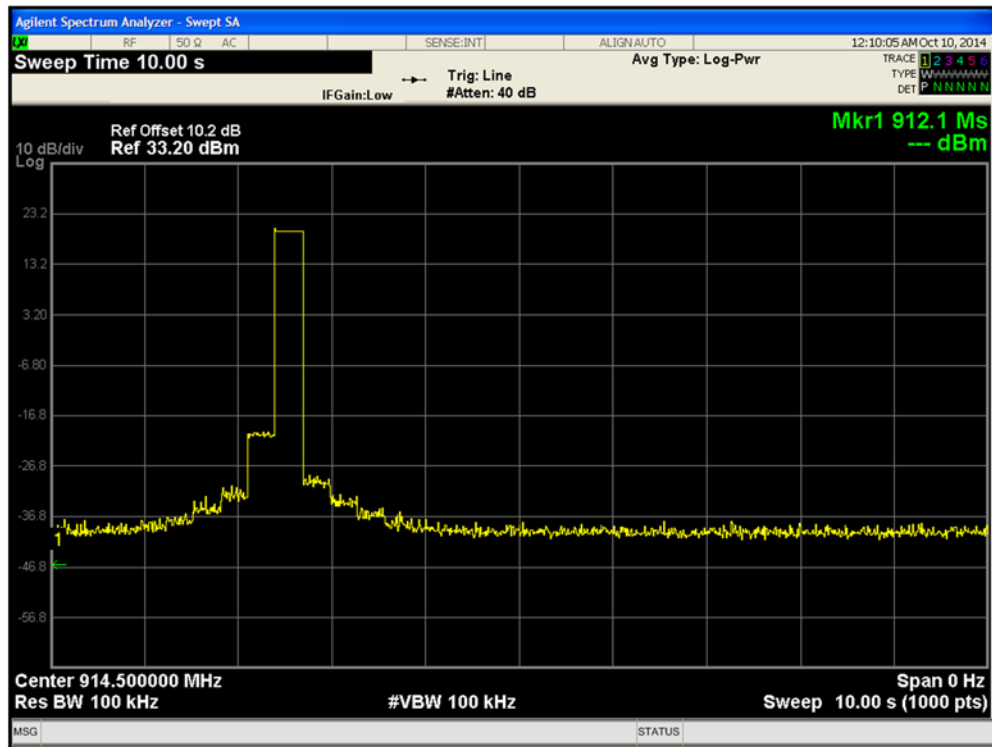


4.5	Time of Occupancy		
Method:	The measurements were made with transmitter set to transmit continuously with hopping function enabled. The EUT antenna was removed and the cable was connected directly into the spectrum analyzer via 10dB attenuator.		
	Laboratory Ambient Temperature	23°C	
	Relative Humidity	35%	
Reference Standard:	☐ ANSI C63.4:2009 ☒ ANSI C63.10:2013 ☐ FCC Part 15.109/ICES 003 ☒ FCC Part 15.247/RSS 210 ☐ FCC Part 15.209	Measurement Point ☒ Conducted ☐ Radiated ☐	
Frequency Range:	☒ 902.3-927.25MHz		
Antenna Gain:	☐		Results
Limit (dwell time):	☒ 20dB<250KHz	☒ <0.4 sec within a period of 20s	290.00ms
	☒ 20dB>250KHz	☒ <0.4 sec within a period of 10s	
Nominal Voltage:	☒ 120VAC ☐ VDC		
Tested By:	Yuriy Litvinov		Date: 10/09/2014

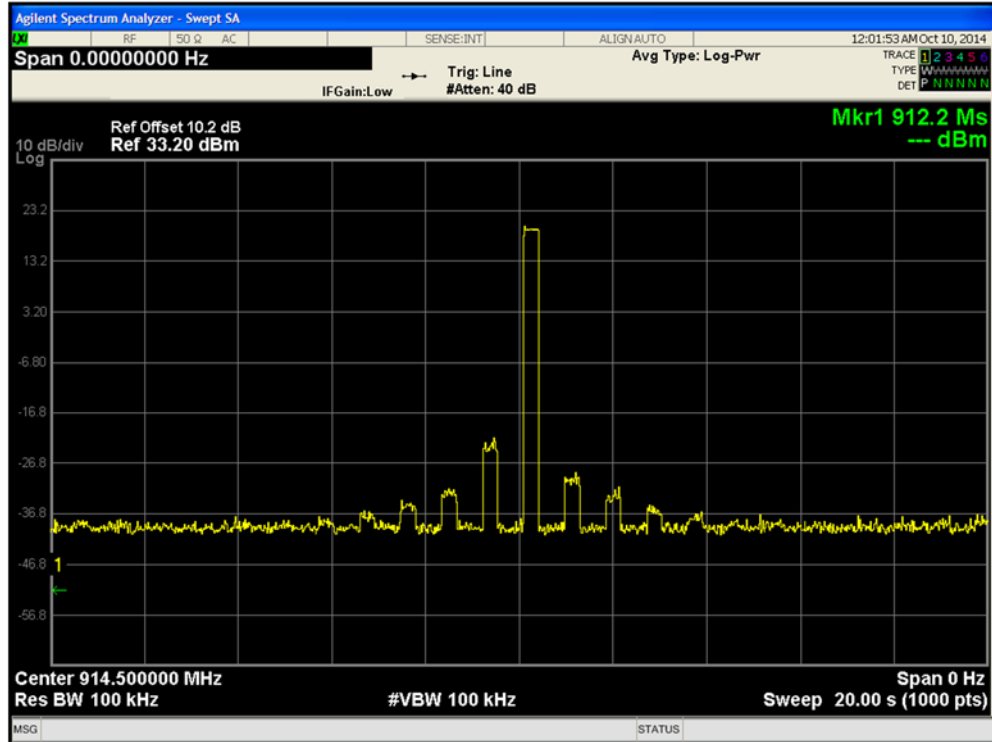
Note:	Tested worst case using PR-ASK/DSB-ASK protocols. Single pulse duration is 290.0ms in a 10s/20s sweep period 1 pulse occurs, and therefore the total on time is 290.0 ms
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Duty Cycle



Total on Time – 20dB >250KHz



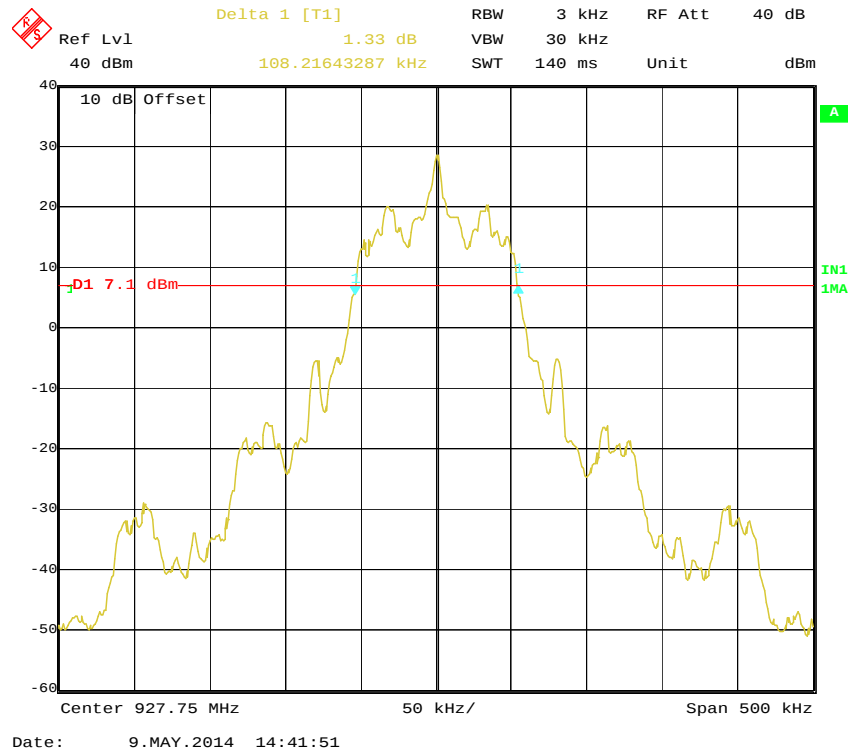
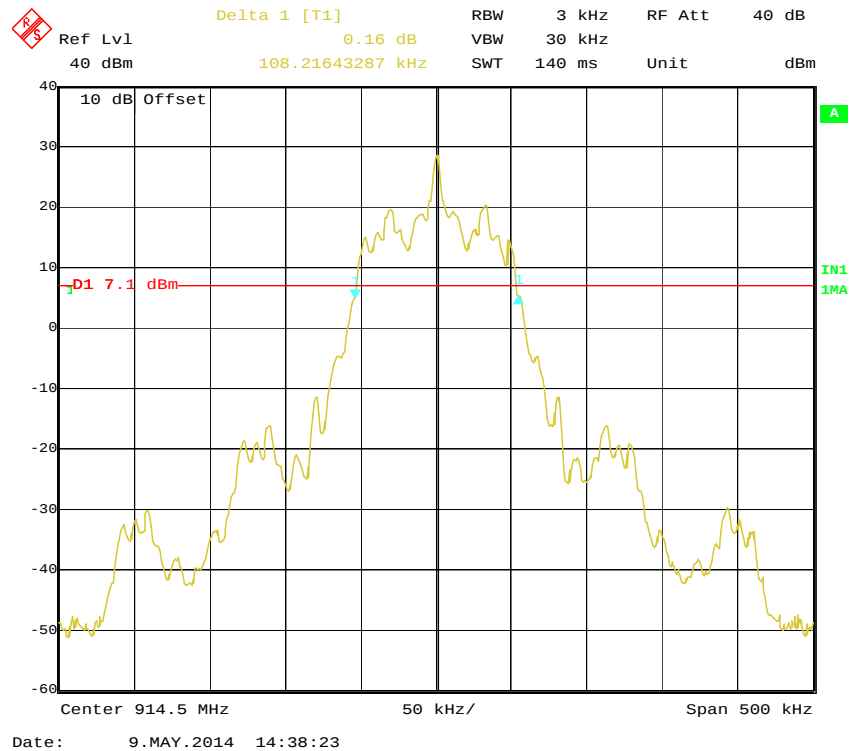
Total on Time – 20dB <250KHz

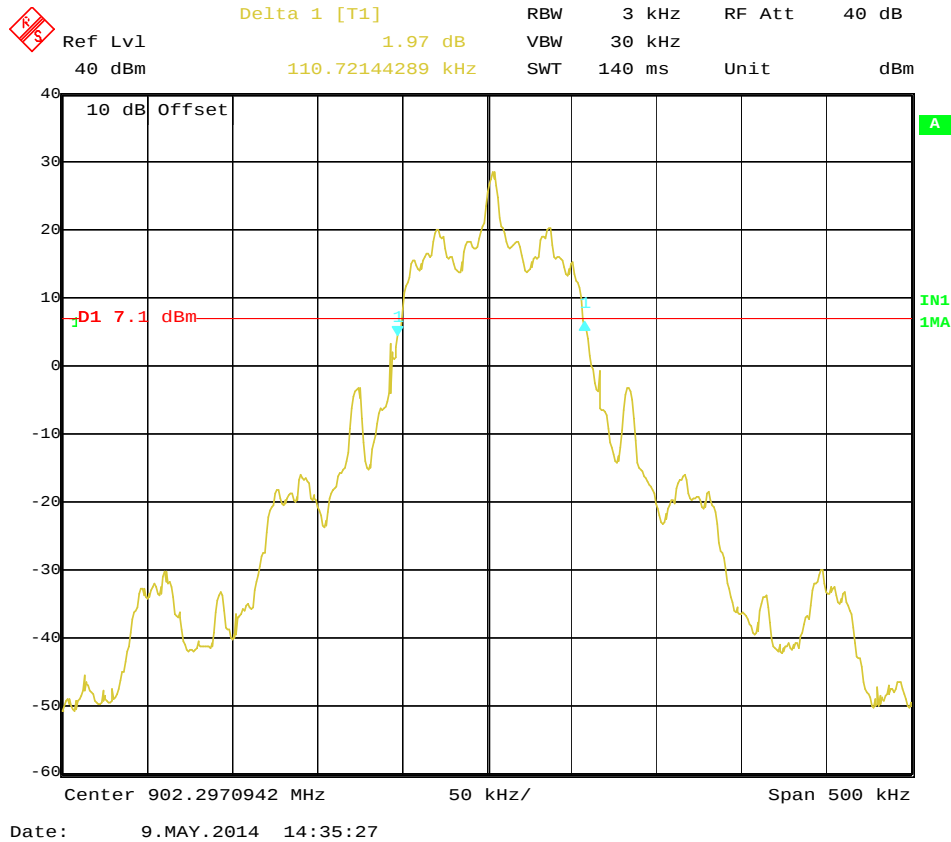
4.6	20dB Bandwidth		
Method:	The measurements were made with transmitter set to transmit continuously modulated signal at low, mid and high channels. The marker delta method was used to determine the 20dB bandwidth.		
	Laboratory Ambient Temperature	23°C	
	Relative Humidity	35%	
Reference Standard:	☐ ANSI C63.4:2009 ☒ ANSI C63.10:2013 ☒ DA 00-705 ☐ FCC Part 15.109/ICES 003 ☒ FCC Part 15.247/RSS 210 ☐ FCC Part 15.209	Measurement Point ☒ Conducted ☐ Radiated ☐	
Frequency Range:	☒ 902.3-927.75MHz		
Antenna Gain:	☐	RBW ≥ 1% of the 20 dB bandwidth VBW ≥ RBW	
Nominal Voltage:	☒ 120VAC ☐ VDC		
Tested By:	Yuriy Litvinov	Date: 10/09/2014	

Note:	The worst case modulations used by the device have been reported.
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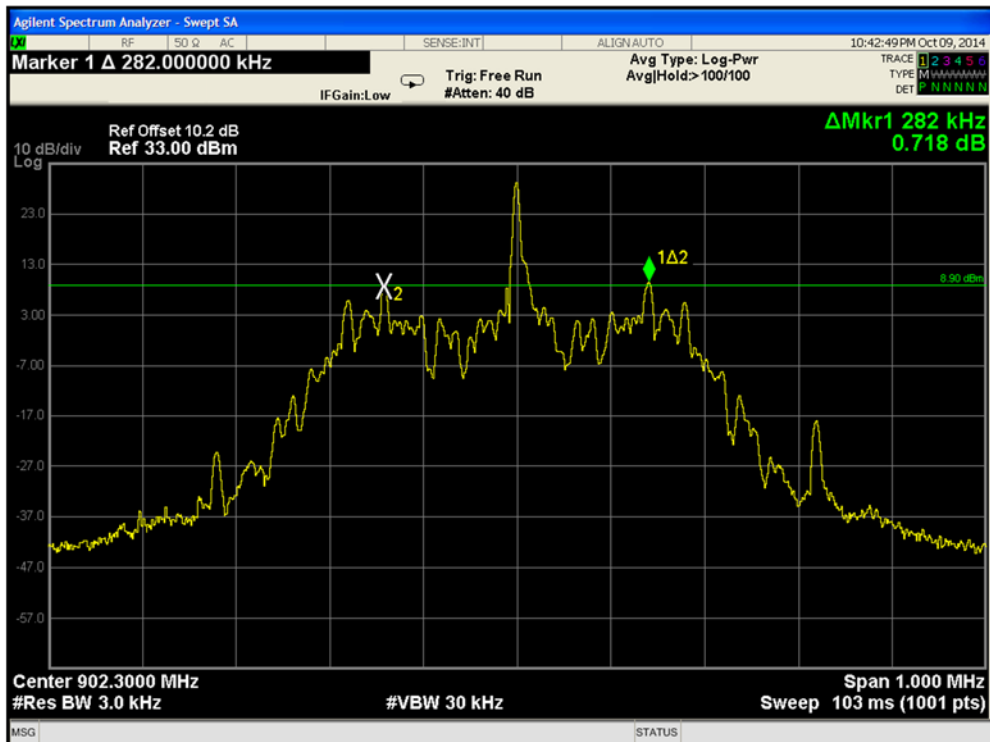
Frequency (MHz) (PR-ASK)	20 dB Bandwidth (KHz)	Limit (KHz)	Results
902.3	110.7	500	pass
914.5	108.2	500	pass
927.75	108.2	500	pass

Frequency (MHz) (DSB-ASK)	20 dB Bandwidth (KHz)	Limit (KHz)	Results
902.3	282	500	pass
914.5	282	500	pass
927.75	282	500	pass

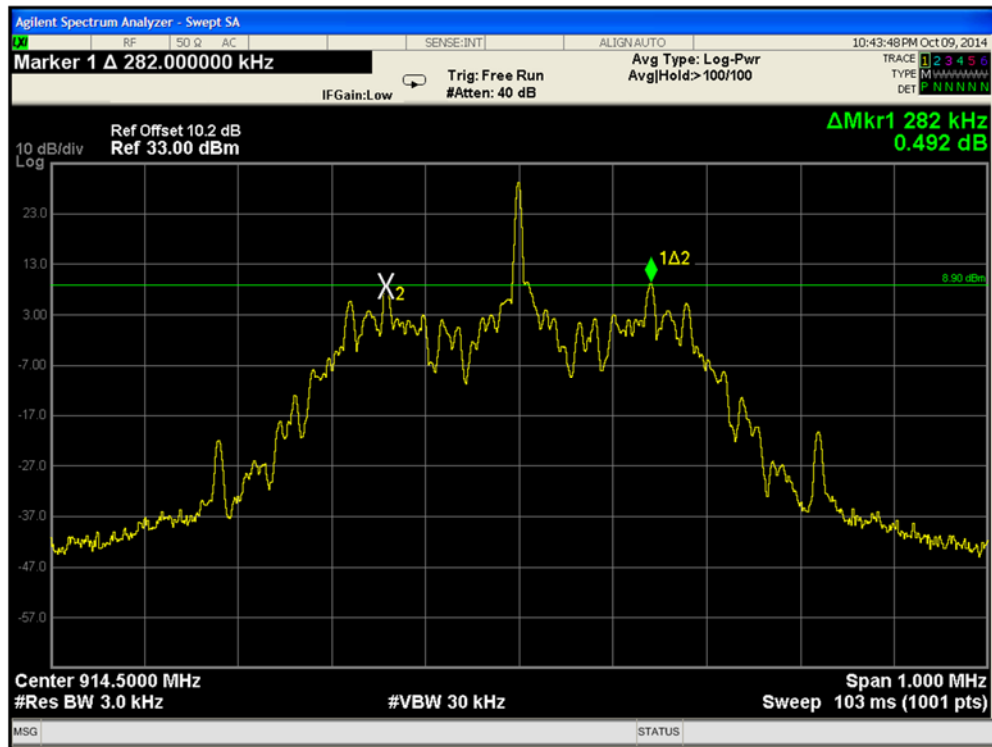
**20dB BW Low Channel****20dB BW Mid Channel**



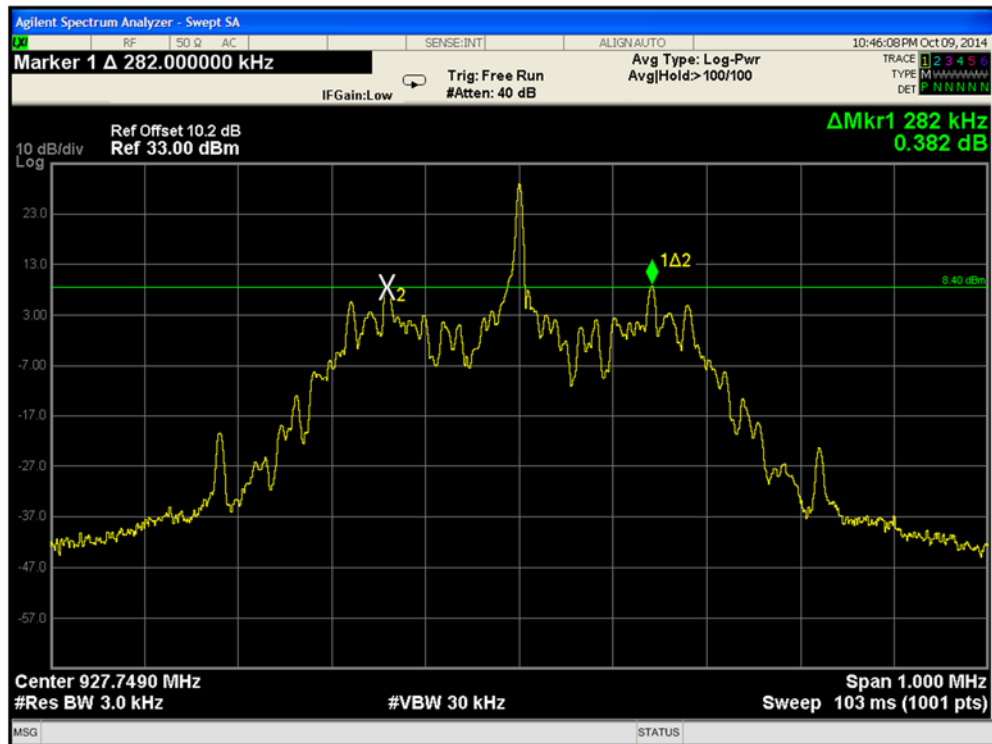
20dB BW High Channel



20dB BW Low Channel



20dB BW Mid Channel



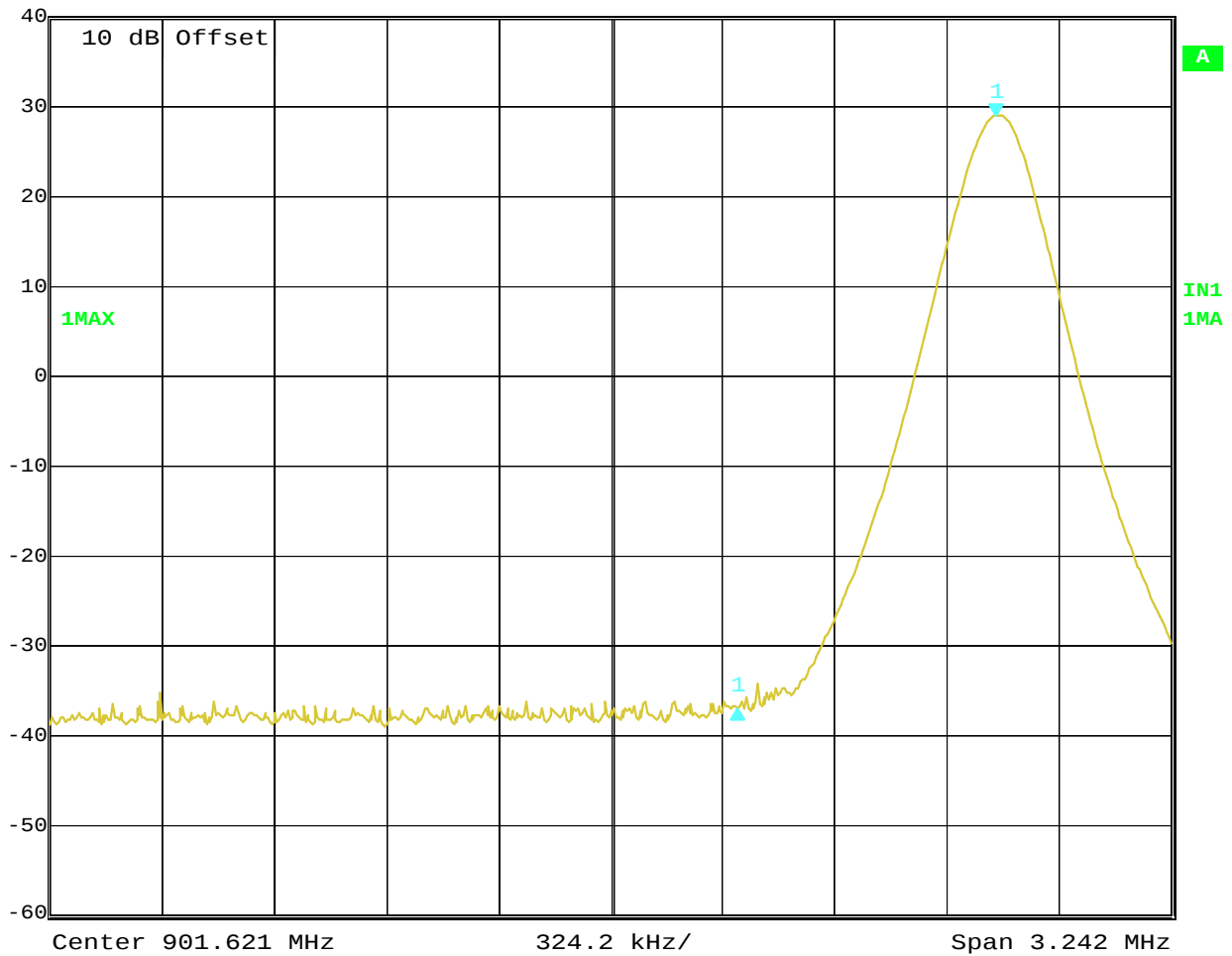
20dB BW High Channel

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:	☐ ANSI C63.4:2009 ☒ ANSI C63.10:2013 ☐ FCC Part 15.109/ICES 003 ☒ FCC Part 15.247/RSS 210 ☐ FCC Part 15.209	Measurement Point ☒ Conducted ☐ Radiated ☐ 	
Frequency Range:	☒ 902.3-927.75MHz		
Antenna Gain:	☒ 6dBi		
Limit	☒ >20dBc ☐ FCC Part 15.209	Results ➤ 34dBc	
Nominal Voltage:	☒ 120VAC ☐ VDC		
Tested By:	Yuriy Litvinov	Date: 05/09/2014	

Note:	
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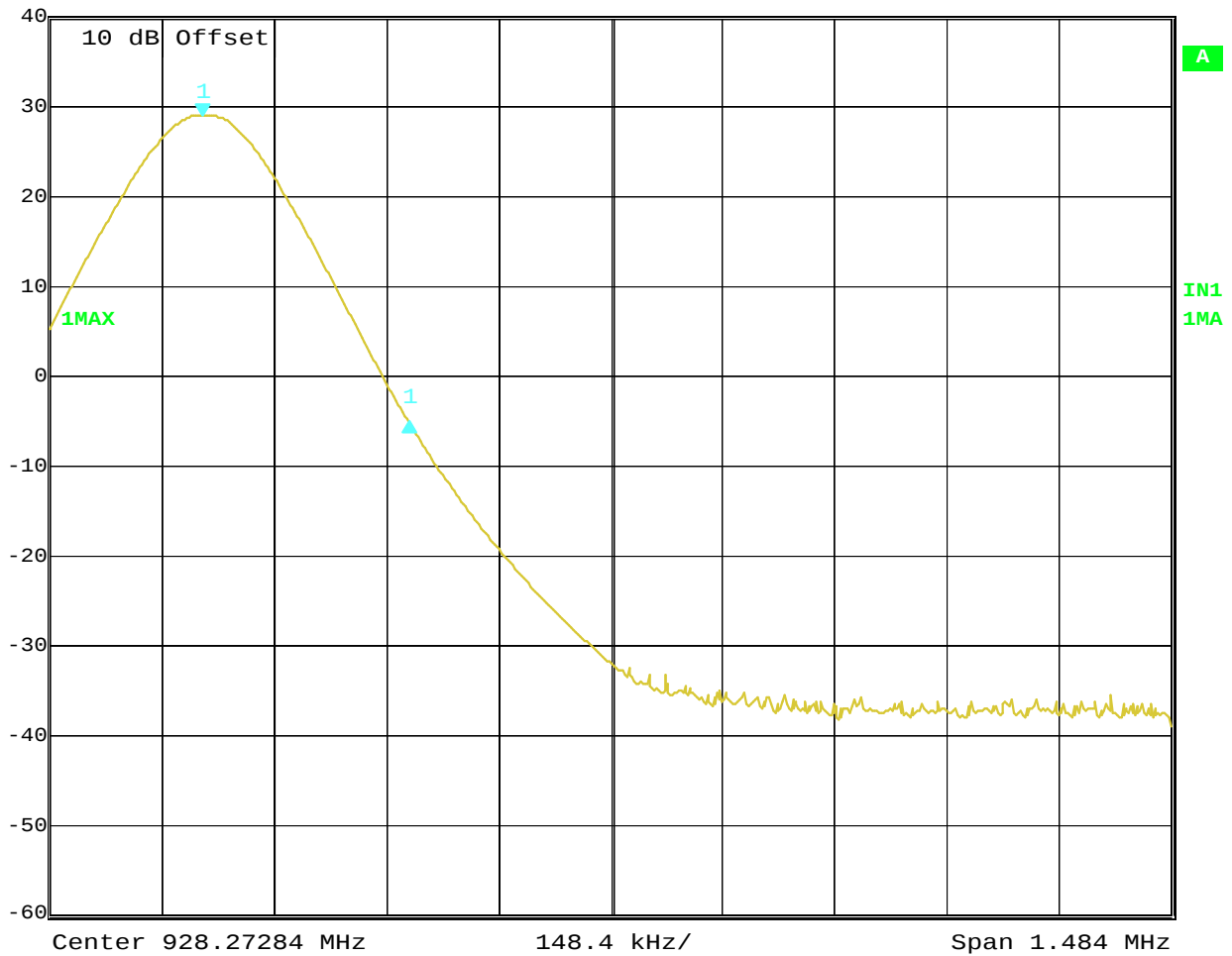
	Delta 1 [T1]	RBW	100 kHz	RF Att	40 dB
Ref Lvl	-65.89 dB	VBW	100 kHz		
40 dBm	-747.15430862 kHz	SWT	5 ms	Unit	dBm



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Ref Lvl	Delta 1 [T1]	RBW	100 kHz	RF Att	40 dB
40 dBm	-34.14 dB	VBW	100 kHz		
	273.64561122 kHz	SWT	5 ms	Unit	dBm



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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	55%	
Reference Standard:	☐ ANSI C63.4:2009 ☒ ANSI C63.10:2013 ☒ FCC Part 15.247/RSS 210 ☐ FCC Part 15.209	Measurement Point ☒ Conducted ☐ Radiated ☐	
Frequency Range:	☒ 902.3-927.75MHz		
Antenna Gain:	☐		
Limit	≥ 50 Hopping Channels ☒ 30dBm ☐	>25 Hopping Channels <50 ☐ 24dBm ☐	
Nominal Voltage:	☒ 120VAC ☐ VDC		
Tested By:	Yuriy Litvinov	Date: 05/08/2014	

Antenna Port	Channels Frequency (MHz)	Power Output Conducted (dBm)	Limit (dBm)	Results
1	902.3	29.35	30	pass
	914.5	29.55	30	pass
	927.7	29.45	30	pass
2	902.3	29.40	30	pass
	914.5	29.54	30	pass
	927.7	29.51	30	pass
3	902.3	29.40	30	pass
	914.5	29.42	30	pass
	927.7	29.55	30	pass
4	902.3	29.51	30	pass
	914.5	29.47	30	pass
	927.7	29.43	30	pass

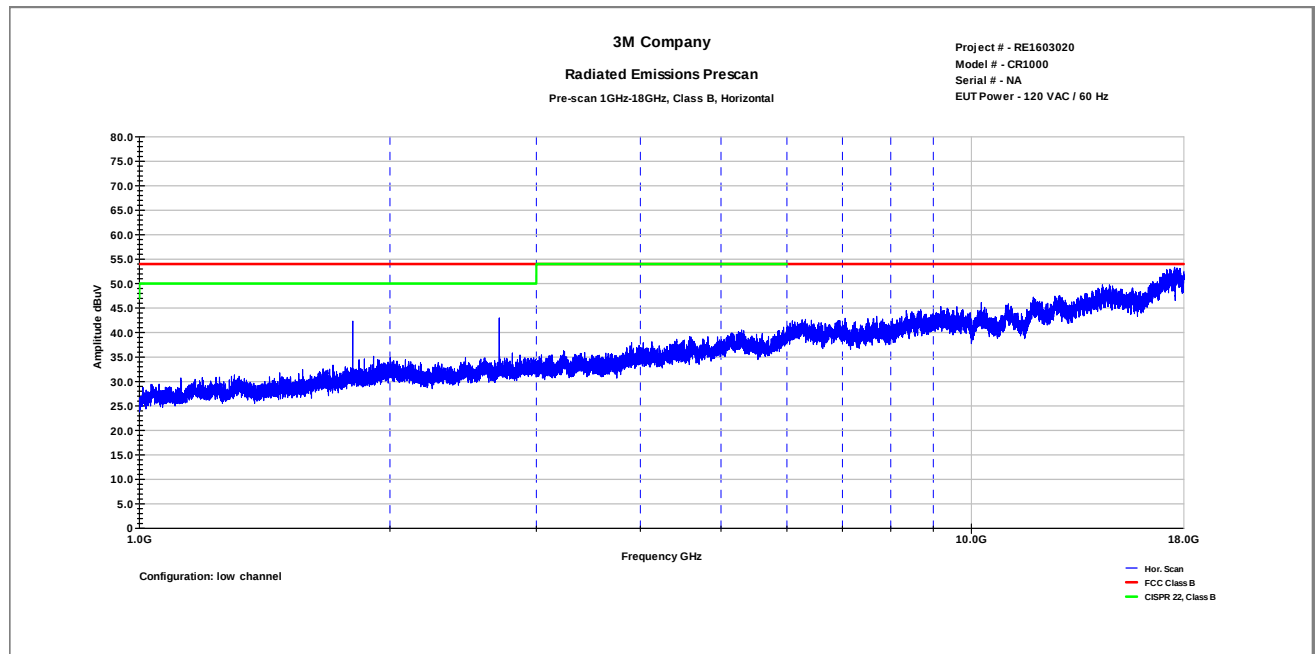
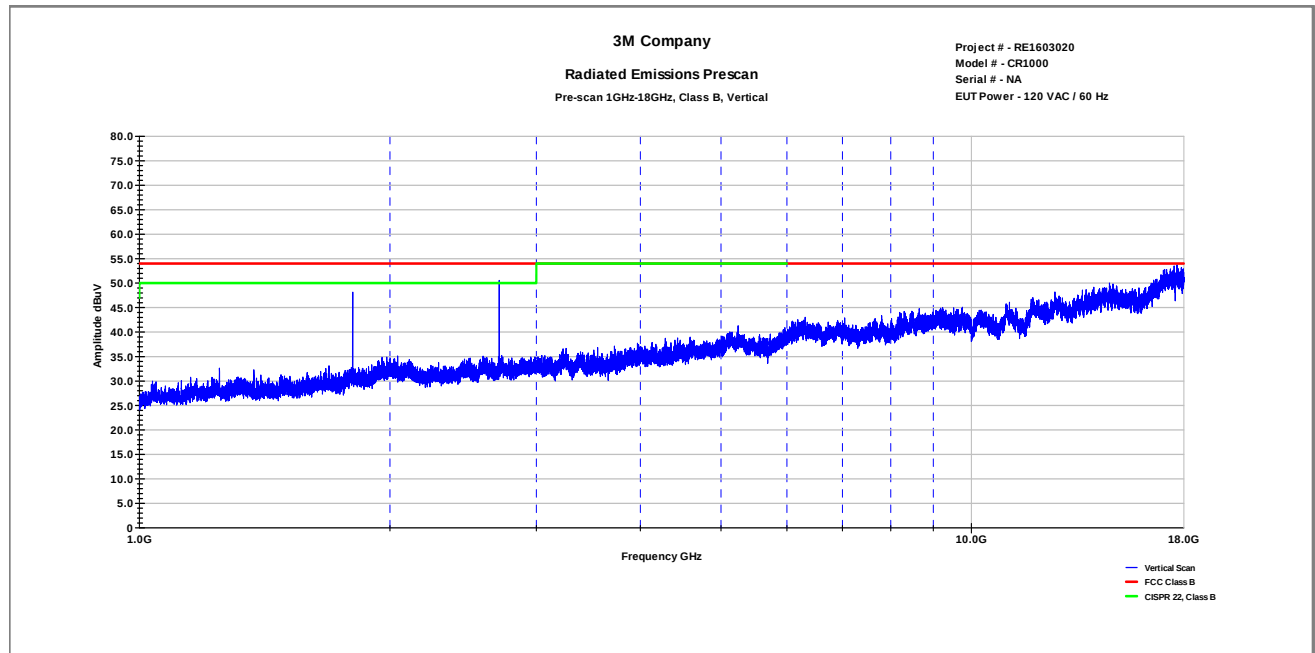
Note:	Worst case modulation used by the device. $EIRP_{max} = P_{max}(dBm) + Antenna\ Gain(dBi) = 29.55dBm + 6dBi = 35.55dBm$ KDB 594280 - Professional installation. Authorized service personnel is required to configure radio parameters of RFID Reader using the software for adjusting total EIRP power at local installation to ensure compliance with FCC Rules.
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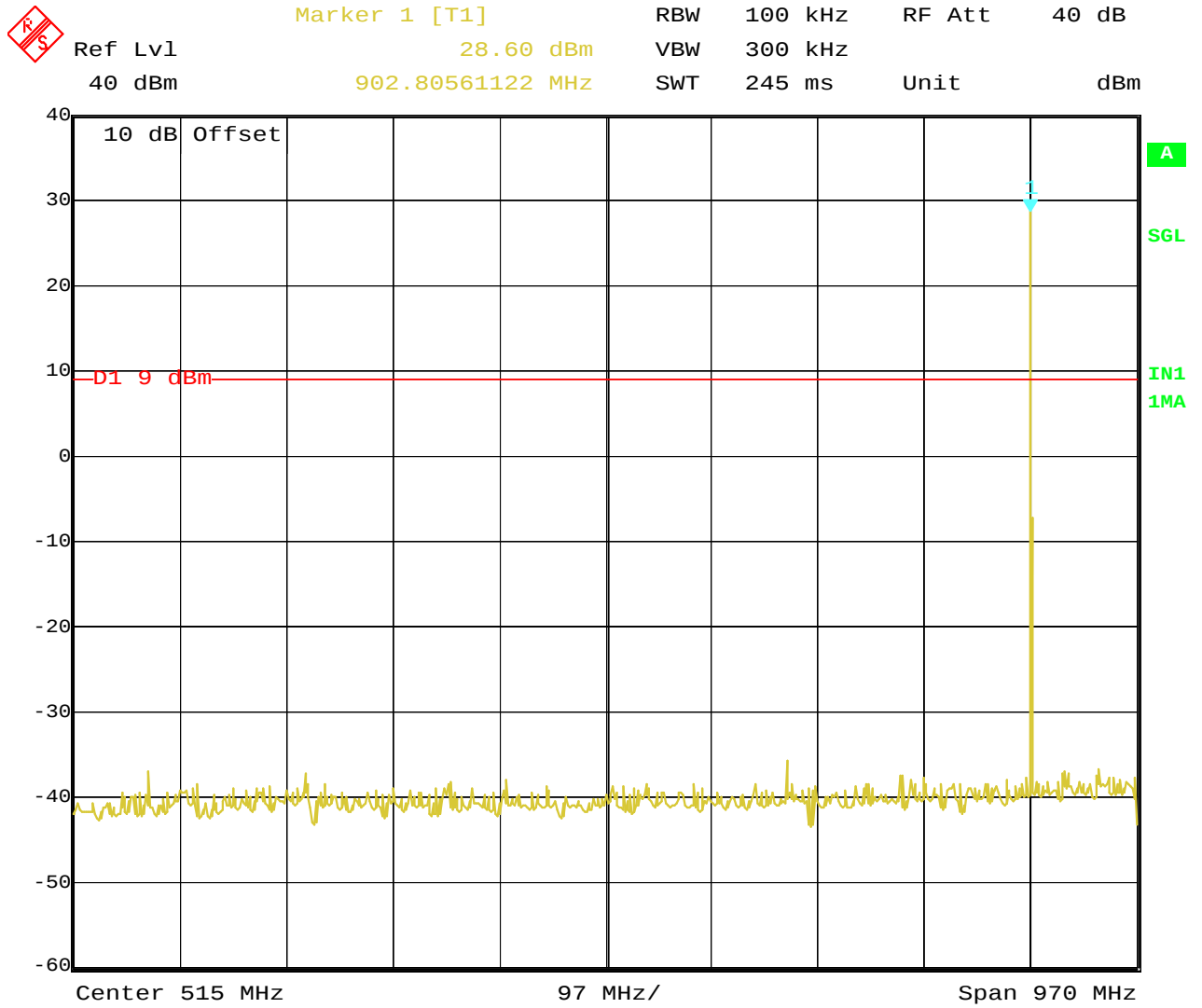
4.9	Transmitter spurious emissions			
Method:	The measurements were made with transmitter set to transmit continuously with un-modulated signal and hopping enabled at low, mid and high channels. The level of spurious emissions was measured as conducted spurious emission and radiated power that falls in a restricted band. 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. 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.			
	Laboratory Ambient Temperature		23°C	
	Relative Humidity		35%	
Reference Standard:	☐ ANSI C63.4:2009 ☒ ANSI C63.10:2013 ☐ FCC Part 15.109/ICES 003 ☒ FCC Part 15.247/RSS 210 ☒ FCC Part 15.209		Measurement Point ☒ Conducted ☒ Radiated	
Frequency Range:	☒ 902.3-927.75Mhz			
Limit	☒ >20dBc		Restricted Band	
	☒ FCC Part 15.209		☒ 15.205	
Nominal Voltage:	☒ 120VAC ☐ VDC			
Tested By:	Mike Schultz <i>MS</i>		Date: 05/28/2014	
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 were detected in the frequency range above 5GHz. 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). One RF Section and one antenna multiplexing at the time. Antenna path is identical.
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Pol.	Frequency (MHz)	Reading dBμV/m	Total CF dB	Net at 3 m dBμV/m.	Limit dBμV/m	Margin dB	Comments	
V	2708.00	49.7	-13.0	36.7	74	-37.3	PK	
V	2708.00	36.5	-13.0	23.5	54	-30.5	AV	
H	2708.00	48.5	-13.0	35.5	74	-38.5	PK	
H	2708.00	36.5	-13.0	23.5	54	-30.5	AV	
V	3610.00	48.5	-11.0	37.5	74	-36.5	PK	
V	3610.00	33.8	-11.0	22.8	54	-31.2	AV	
H	3610.00	48.2	-11.0	37.2	74	-36.8	PK	
H	3610.00	33.9	-11.0	22.9	54	-31.1	AV	
Notes		Total CF = Antenna Factor + Cable Factor - AMP Gain						
		Low Channel. Average readings obtained with the 10Hz VBW MT-262006/TRH/A – 6dBi Dual Polarized Dipole						
V	2744.00	49.9	-12.0	37.9	74	-36.1	PK	
V	2744.00	37.1	-12.0	25.1	54	-28.9	AV	
H	2744.00	49.5	-12.0	37.5	74	-36.5	PK	
H	2744.00	36.2	-12.0	24.2	54	-29.8	AV	
V	3658.0	48.6	-10.7	37.9	74	-36.1	PK	
V	3658.0	34.1	-10.7	23.4	54	-30.6	AV	
H	3658.0	45.6	-10.7	34.9	74	-39.1	PK	
H	3658.0	34.0	-10.7	23.3	54	-30.7	AV	
Notes		Total CF = Antenna Factor + Cable Factor - AMP Gain						
		Mid Channel. Average readings obtained with the 10Hz VBW MT-262006/TRH/A – 6dBi Dual Polarized Dipole						
V	2783.0	48.5	-12.0	36.5	74	-37.5	PK	
V	2783.0	33.5	-12.0	21.5	54	-32.5	AV	
H	2783.0	48.4	-12.0	36.4	74	-37.6	PK	
H	2783.0	33.4	-12.0	21.4	54	-32.6	AV	
V	3712.0	46.9	-10.0	36.9	74	-37.1	PK	
V	3712.0	33.7	-10.0	23.7	54	-30.3	AV	
H	3712.0	47.6	-10.0	37.6	74	-36.4	PK	
H	3712.0	33.7	-10.0	23.7	54	-30.3	AV	
Notes		Total CF = Antenna Factor + Cable Factor - AMP Gain						
		High Channel. Average readings obtained with the 10Hz VBW MT-262006/TRH/A – 6dBi Dual Polarized Dipole						

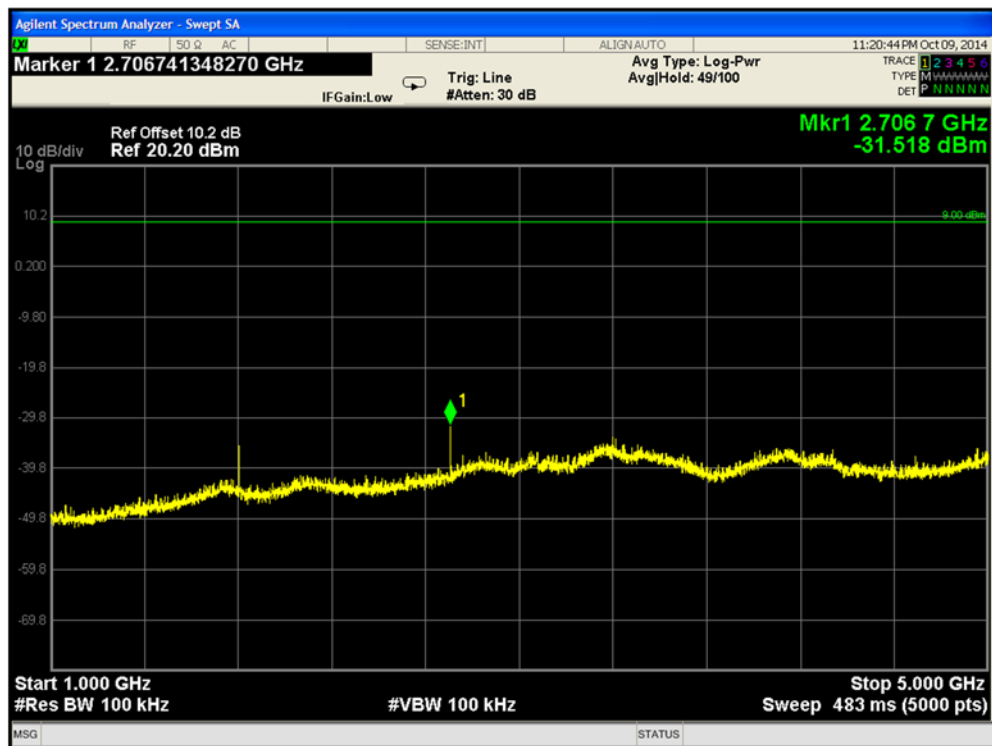
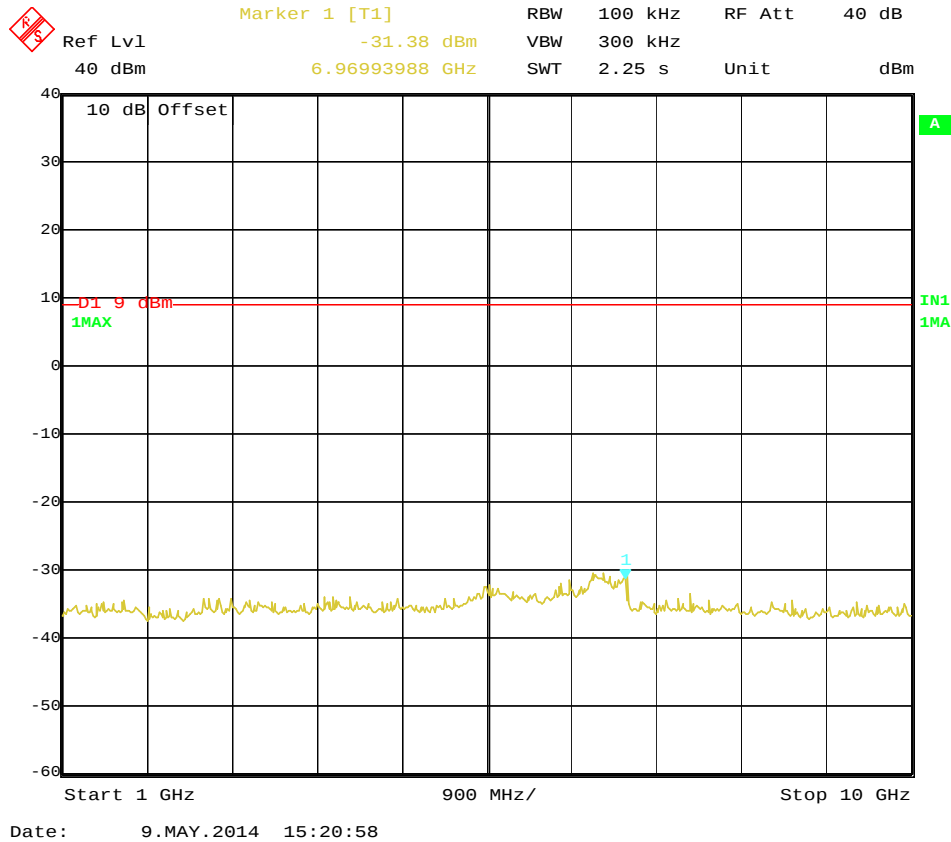
Pol.	Frequency (MHz)	Reading dBμV/m	Total CF dB	Net at 3 m dBμV/m.	Limit dBμV/m	Margin dB	Comments	
V	2706.90	47.7	-13.0	34.7	74	-39.3	PK	
V	2706.90	35.5	-13.0	22.5	54	-31.5	AV	
H	2706.90	47.8	-13.0	34.8	74	-39.2	PK	
H	2706.90	35.0	-13.0	22.0	54	-32.0	AV	
V	3609.2	46.3	-11.0	35.3	74	-38.7	Pk	
V	3609.2	34.0	-11.0	23.0	54	-31.0	AV	
H	3609.2	46.2	-11.0	35.2	74	-38.8	Pk	
H	3609.2	33.9	-11.0	22.9	54	-31.1	AV	
Notes		Total CF = Antenna Factor + Cable Factor - AMP Gain						
		Low Channel. Average readings obtained with the 10Hz VBW A1001 -20dBi Short Range UHF Antenna						
V	2743.50	46.6	-12.0	34.6	74	-39.4	PK	
V	2743.50	34.7	-12.0	22.7	54	-31.3	AV	
H	2743.50	47.6	-12.0	35.6	74	-38.4	PK	
H	2743.50	34.7	-12.0	22.7	54	-31.3	AV	
V	3658.0	47.2	-10.7	36.5	74	-37.5	Pk	
V	3658.0	34.4	-10.7	23.7	54	-30.3	AV	
H	3658.0	34.5	-10.7	23.8	74	-50.2	Pk	
H	3658.0	34.3	-10.7	23.6	54	-30.4	AV	
Notes		Total CF = Antenna Factor + Cable Factor - AMP Gain						
		Mid Channel. Average readings obtained with the 10Hz VBW A1001 -20dBi Short Range UHF Antenna						
V	2783.00	47.4	-12.7	34.7	74	-39.3	PK	
V	2783.00	35.1	-12.7	22.4	54	-31.6	AV	
H	2783.00	47.2	-12.6	34.6	74	-39.4	PK	
H	2783.00	33.6	-12.6	21.0	54	-33.0	AV	
V	3710.8	47.7	-10.0	37.7	74	-36.3	Pk	
V	3710.8	35.0	-10.0	25.0	54	-29.0	AV	
H	3710.8	46.5	-10.0	36.5	74	-37.5	Pk	
H	3710.8	33.9	-10.0	23.9	54	-30.1	AV	
Notes		Total CF = Antenna Factor + Cable Factor - AMP Gain						
		High Channel. Average readings obtained with the 10Hz VBW A1001 -20dBi Short Range UHF Antenna						



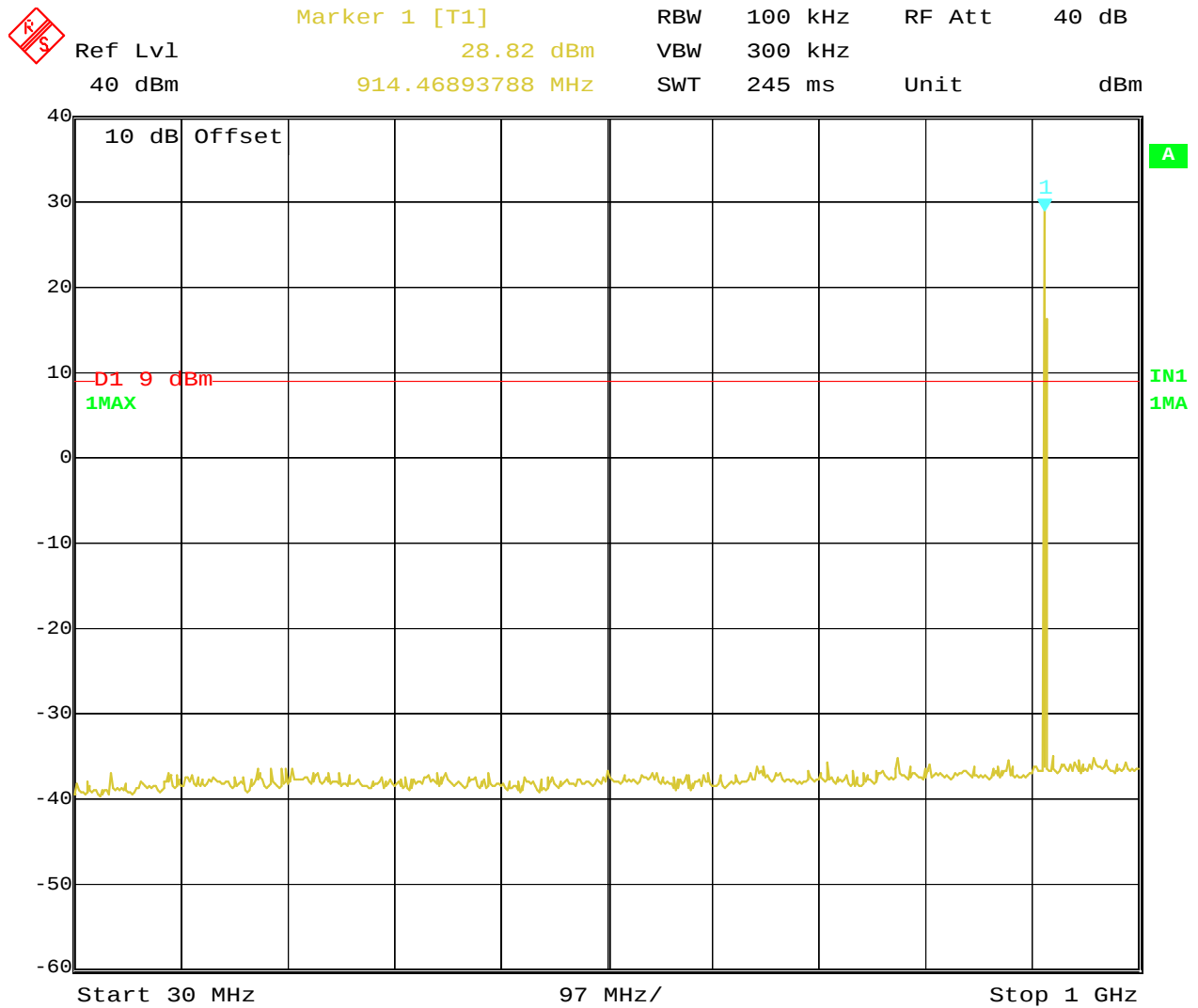


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Conducted Spurious Emissions Low channel

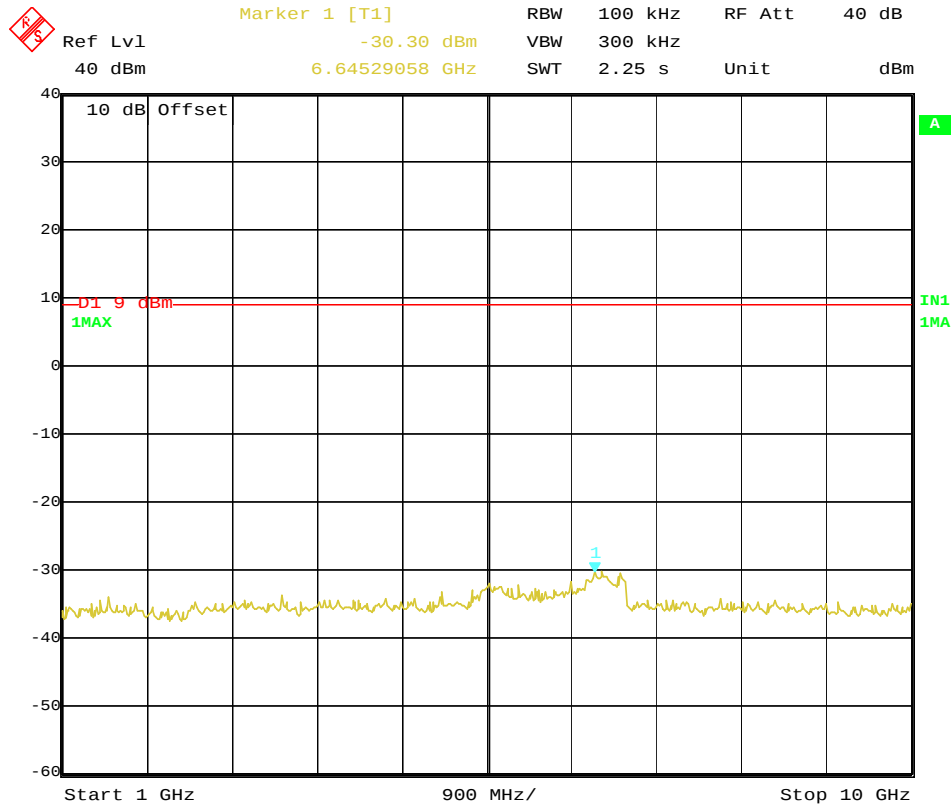


Conducted Spurious Emissions Low channel

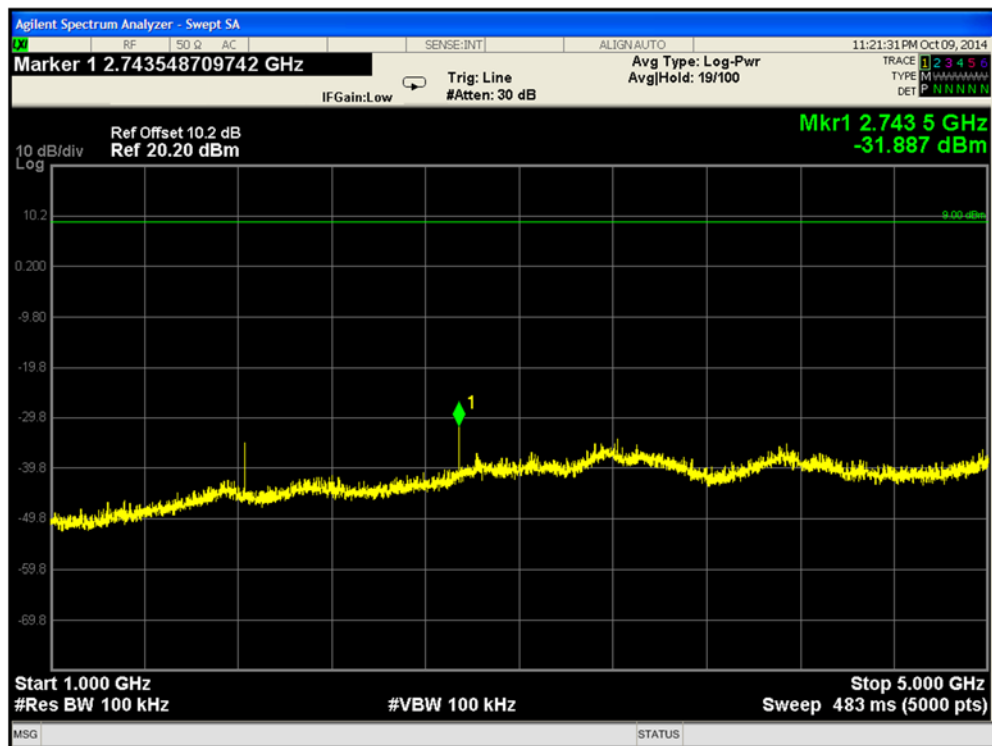


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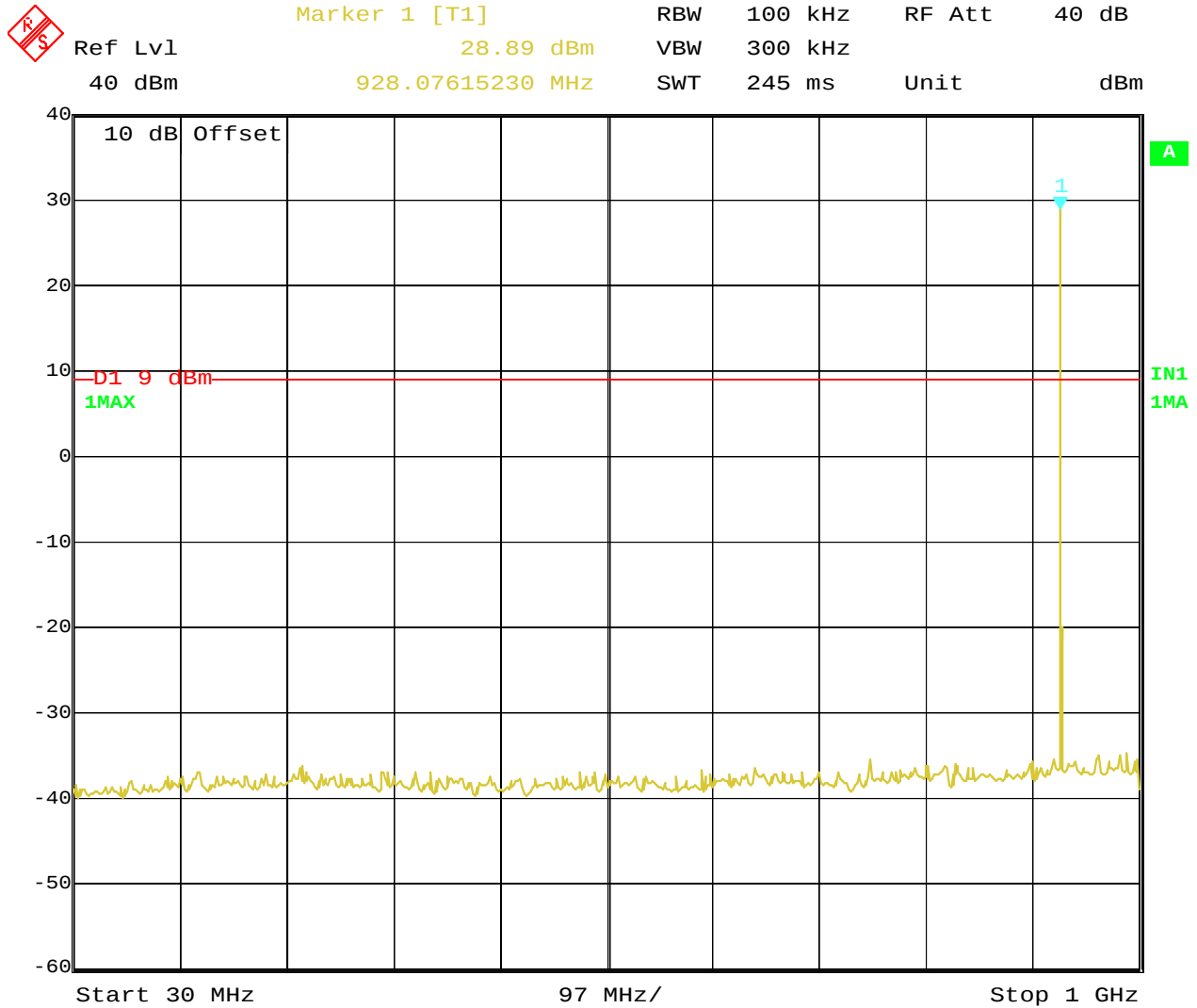
Conducted Spurious Emissions Mid channel



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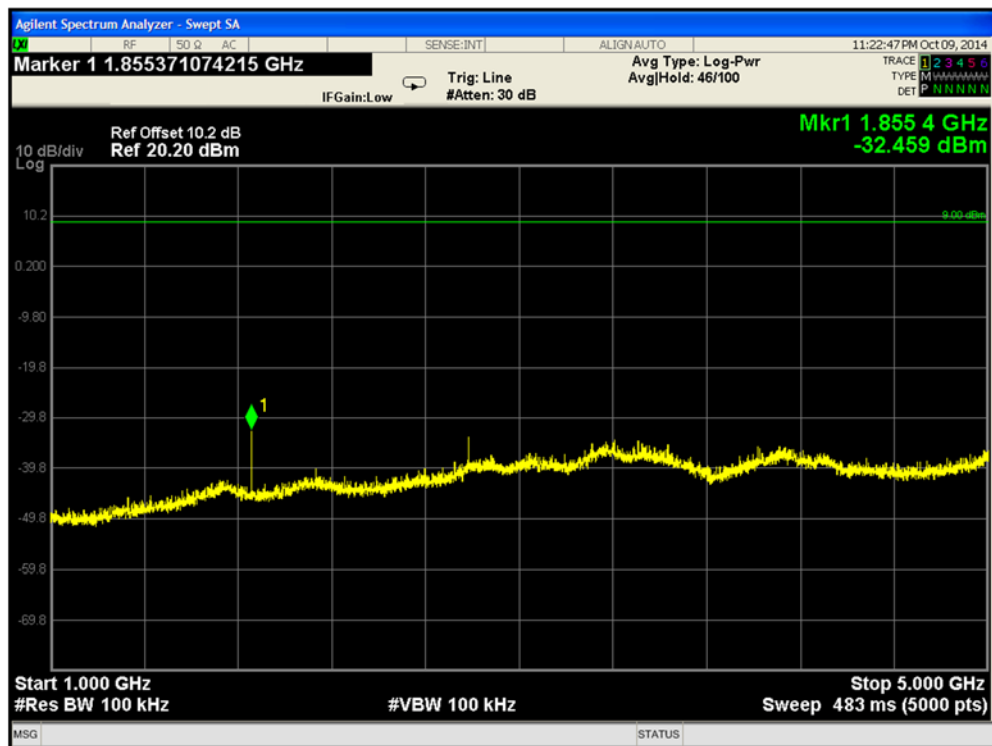
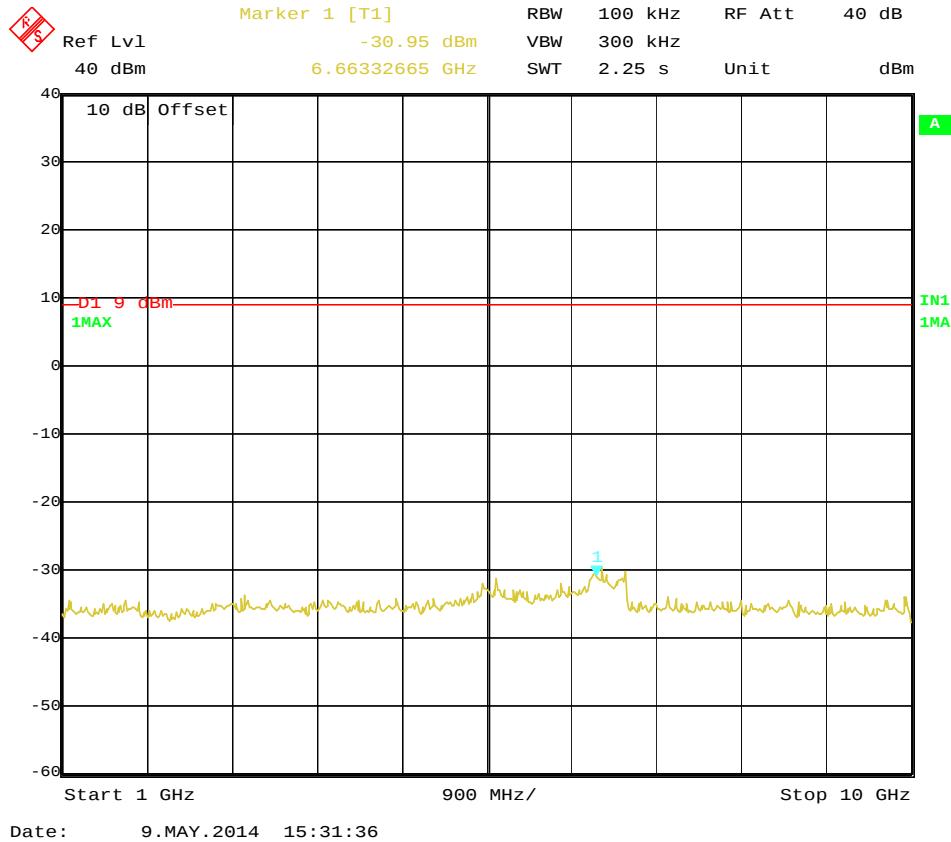


Conducted Spurious Emissions Mid channel



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Conducted Spurious Emissions High channel



Conducted Spurious Emissions High channel

4.10	RF Exposure Compliance		
Reference Standard:	☒ IEEE Std 1528a ☒ RSS 102, Issue 4 ☒ KDB 447498 ☐ KDB ☒ FCC Parts 2.1091 and 2.1093 ☐ OET 65		☒ MPE ☐ SAR Evaluation
Frequency Range:	☒ 902-928MHz		
Antenna Separation Distance	>100cm	>20cm	
Antenna Model:	MT-262006/TRH/A	A1001	
Antenna Gain (maximum)	7dBi (5.01 numeric gain)	-20dBi (0.01 numeric gain)	
Maximum Output Power at antenna terminal	29dBm (794mW)	30dBm (1000mW)	
Power Density	0.032 mW/cm ²	0.002 mW/cm ²	
GENERAL POPULATION/UNCONTROLLED LIMIT			
FCC/RSS102	0.610 mW/cm ² at 915MHz		

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	10/2016	☒
Horn Antenna	AH Systems	SAS 571	1010	10/2016	☒
Loop Antenna	EMCO	ALR25M	1011	10/2016	☐
EMI Receiver	Rohde & Schwarz	ESIB 40	100235	10/2016	☐
EMI Receiver	Agilent	E4448A	1530975	10/2016	☒
Signal Analyzer	Agilent	N9000A	MY53031040	10/2016	☒
LISN	TESEQ	NNB51	1130	10/2016	☒
Harmonic/Flicker Source	Cal. Instruments	C4-5001iX	57162	10/2016	☐
Amplifier	AR	250W1000AM	14354	10/2016	☐
Amplifier	AR	25S1G4A	4003	10/2016	☐
Signal Generator	HP	8656A	2326A05125	10/2016	☐
Signal Generator	Agilent	E8257D	160895	10/2016	☐
Field Probe	AR	FL7006	25019	10/2016	☐
Field Monitor	AR	FM2000	14292	10/2016	☐
AC CDN	Schaffner	M316,	21937	10/2016	☐
AC CDN	Teseq	M016,	26131	10/2016	☐
ISN	Teseq	T4	25652	10/2016	☐
Current Injection Coil	A.H. Systems	ICP-200/521	149	10/2016	☐
RF Conducted System	TESEQ	NSG 4070-75	1141	10/2016	☐
ESD Generator	KeyTek	MZ-15/EC	609325	10/2016	☐
EFT/Surge Generator	ThermoFisher	EMC Pro Plus	1146	10/2016	☐
EMF Meter	NARDA	ELT400	1139	10/2016	☐
Absorbing Clamp	Rhode & Schwarz	MDS-21	1001	10/2016	☐
EMF Test Generator	FCC	F-1000-4-8-G	9940	10/2016	☐
AC Power System	Titan	MAC-03	6619921	10/2016	☐
EMC Software	ETS-Lindgren	TILE 7		10/2016	☒
Oscilloscope	Tektronix	DPO4104	1550	10/2016	☐

6.0	Report revision history		
Revision Level	Date	Report Number	Notes
0	10/15/2014	RE1311030-1	Original Issue
1	06/07/2016	RE1603020-1	Class II PC – Added new antenna



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	COMPACT RFID READER
MODEL NUMBER(S)	1000
TEST REPORT NUMBER	RE1603020-1
DATE OF ISSUE	June 7, 2016

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

FCC Part 15.247

Emissions

47 CFR, FCC Parts 15.107 and 15.109

Comments: Class II PC

Yuriy Litvinov
Lead EMC Engineer



NVLAP Lab Code 200033-0