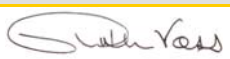
Compliance Test Report	RF MEASUREMENT REPORT	FCC & IC

Test Lab Information	**Name**	**CELLTECH LABS INCORPORATED**
	Address	21-364 Lougheed Road, Kelowna, British Columbia V1X 7R8 Canada
Test Lab Registration No.(s)	**FCC**	Accredited (ISO 17025 - A2LA Test Lab Certificate No. 2470.01)
	IC	3874A-1
Applicant Information	**Name**	**Kramble Industries Inc.**
	Address	102-2750 Faithfull Ave., Saskatoon, SK, S7K 6M6
Standard(s) & Procedure(s)	**FCC**	47 CFR Part 2; 15.231, 15B
	IC	RSS-210 Issue 8; RSS-Gen Issue 4
	ANSI	C63.4-2014
Device Classification(s)	**FCC**	Part 15 Periodic Operational Devices (DSC)
	IC	Low-power License-exempt Momentarily Operated Devices (Category 1)
Application Type	**FCC/IC**	New Certification
Device Identifier(s)	**FCC ID:**	2AHDO- FBSXLDR
	IC ID:	21117- FBSXLDR
Device Under Test (DUT)	Momentarily Operated Transmitter.	
Device Model(s) Tested	FBAr4	

This wireless device has demonstrated compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in FCC 47 CFR Rule Part 2 and Rule Part 15.231; Industry Canada RSS-210, RSS-Gen; and ANSI C63.4-2014.

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

The results and statements contained in this report pertain only to the device(s) evaluated. This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc.

Test Report Approved By		**Art Voss**	**Celltech Labs Inc.**

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GENERAL REMARKS

This report shall not be reproduced partially or in full without the prior written approval of Celltech Labs Inc. The results and statements contained in this report pertain only to the device(s) evaluated.

SUMMARY

The device under test (DUT) fulfills the general approval requirements as identified in this test report.

REVISION LOG

Revision	Description	Implemented By	Implementation Date
1.0	1st Release	Art Voss	2/4/2016

Test Report Prepared By	Date	QA Review By	Date
Art Voss	2/4/2016	Art Voss	2/4/2016

1.0 REFERENCES

1.1 Normative References

ANSI/ISO 17025:2005	General Requirements for competence of testing and calibration laboratories
IEEE/ANSI C63.4-2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CFR Title 47 Part 15B/15C	Code of Federal Regulations Title 47: Telecommunication Part 15C: Intentional Radiators
IC Spectrum Management & Telecommunications Policy	Radio Standards Specification RSS-210 Issue 8 - Low-Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment RSS-Gen Issue 4 - General Requirements and Information for the Certification of Radiocommunication Equipment

2.0 PASS/FAIL CRITERIA

Unless otherwise noted in the Appendices, the pass/fail criteria is the limit set forth in the reference standards. The DUT is considered to have passed the requirements if the data collected during the described measurement procedure is no greater than the specified limits as defined. The pass/fail statements made in this report only apply to the unit tested.

3.0 FACILITIES AND ACCREDITATIONS

The facilities used in collecting the test results outlined in this report are located at 21-364 Lougheed Road, Kelowna, British Columbia, Canada V1X 7R8. The radiated emissions site conforms to the requirements set forth in ANSI C63.4 and is filed and listed with Industry Canada under File Number IC 3874A-1. Celltech test site is listed with the FCC as an accredited test facility.

4.0 GENERAL INFORMATION

4.1 DUT Description & Specifications

Device Type	Remote control 916 MHz low power transmitter.	
Device Model(s)	FBAr4	
Test Sample Serial No.	T/A Sample - Identical Prototype	
Device Identifier(s)	**FCC ID:**	**2AHDO-FBSXLDR**
	IC ID:	**21117- FBSXLDR**
Transmit Frequency Range	915.8 MHz	
No. of Channels	1	
Measured Field Strength	78.3 dBuV/m@3m	
Modulation	FM	
Antenna	External, Omni directional Whip	
TX Duty Cycle	100%, 50% and 10%, no duty cycle correct used	
Emission Designator	138KF1D	
DUT Power Source	9 VDC Battery, DC Cell	
Type of Equipment	DSC, Periodic operation device / Momentarily operated device.	
Deviation(s) from standard/procedure	None	
Modification of DUT	None	
Applicable Standards	FCC Part 15.231, IC RSS-210	

Notes:

(1) This radio transmitter is intended for use with a dedicated receiver that is not part of this equipment authorization.

(2) The receiver was tested and approved separately following the Declaration of Conformity procedure. As such the manufacture will follow all DoC requirements for marketing this product.

5.0 GENERAL DESCRIPTION OF OPERATION, FCC PART 15.231(A)

Item	Description	Yes	No
1	Does this device transmit a signal that is only used to control another device?	X	
2	Does this device send data with this control signal?		X
3	Does this device send data? Data is, things like: temperature, wind direction, fluid amount, rate of flow, etc.		X
4	Does this device transmit continuously?		X
5	*If manually operated does this device stop transmitting within 5 seconds of releasing the button or deactivation?	X	
6	If automatically operated does it deactivate 5 seconds after activation?	N/A	
7	Does it transmit at regular predetermined intervals?		X
8	Does it poll or send supervisory information? If 'Yes', does it do a system integrity check? How often?		X
9	Is this a fire, security, or safety of life device? If 'Yes' does the device stop transmitting after the alarm condition is satisfied?		X
10	Modulation technique: Please specify the modulation of the test sample, FM or AFSK, or FSK, or On-Off Keying, or others?	FSK	

The device is suspended to the end of a manually operated grain chute used to fill a grain bin. During the fill process, the device hangs in a vertical orientation. When the grain reaches the level of the device, its orientation is no longer vertical and the transmitter is activated, notifying the operator that the bin is full. The operator discontinues the filling process pulling the fill chute from the bin. This deactivates the device which immediately deactivates the transmitter. The transmitter deactivates in less than 5 seconds.

6.0 FIELD STRENGTH OF THE FUNDAMENTAL AND SPURIOUS EMISSIONS

6.1 References

Normative Reference Standard	FCC CFR 47 §15.231; §15.209; IC RSS-210 Issue 8
Procedure Reference	ANSI C63.4:2014

6.2 Limits

TX Emission Limits (FCC §15.231)

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emission (microvolts/meter)
40.66–40.70	2,250	225
70–130	1,250	125
130–174	1,250 to 3,750	125 to 375
174–260	3,750	375
260–470	3,750 to 12,500	375 to 1,250
Above 470	12,500	1,250
[1]Linear interpolations		

TX Emission Limits (IC RSS-210 A1.1.1)

Fundamental Frequency (MHz), excluding restricted band frequencies of RSS-Gen	Field Strength of the Fundamental (microvolts/meter)	Field Strength of Unwanted Emissions (microvolts/meter)
40.66–40.70	See Section A2.7	
70–130	1,250	125
130–174	1,250 to 3,750	125 to 375
174–260	3,750	375
260–470	3,750 to 12,500	375 to 1,250
Above 470	12,500	1,250
[1]Linear interpolations		

6.3 Environmental conditions

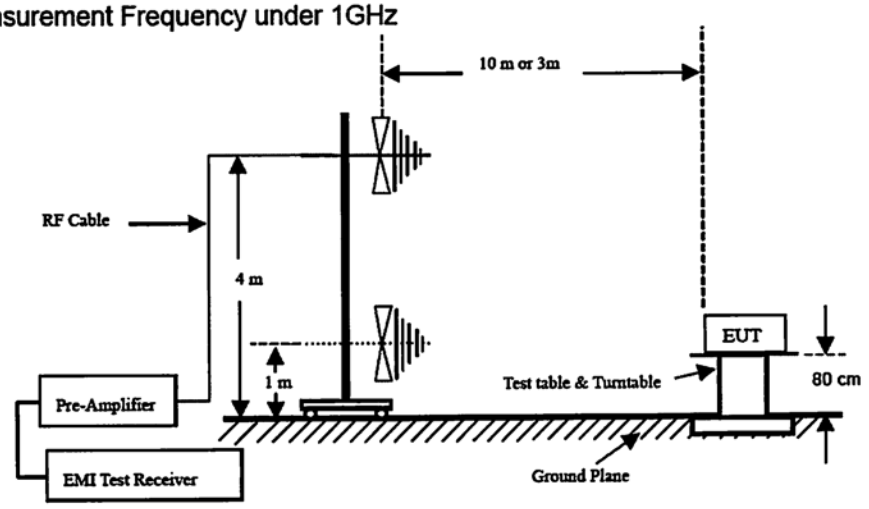
Temperature	25 +/- 5 ºC
Humidity	40 +/- 10 %
Barometric Pressure	101 +/- 3 kPa

6.4 Equipment List

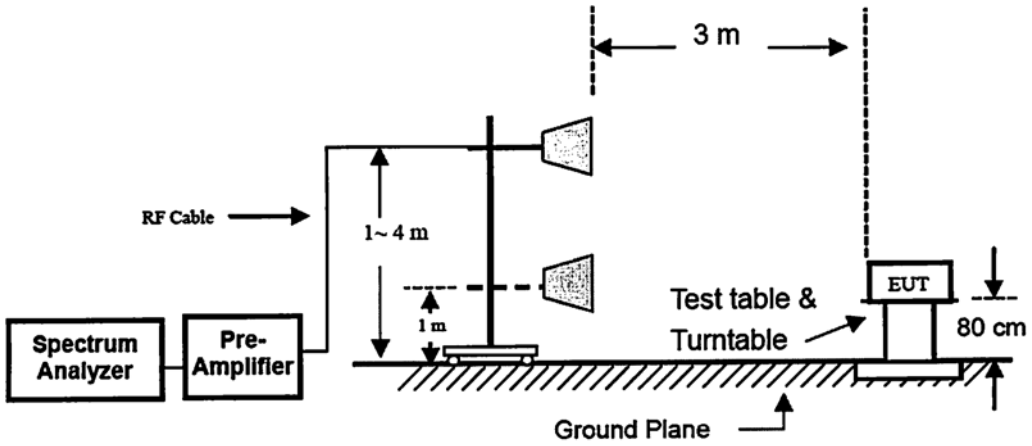
Asset Number	Manufacturer	Model Number	Description	Last Calibrated	Calibration Interval	Calibration Due
00051	HP	8566B	Spectrum Analyzer RF Section	30 Apr 2014	Biennial	30 Apr 2016
00049	HP	85650A	Quasi-peak Adapter	30 Apr 2014	Biennial	30 Apr 2016
00047	HP	85685A	RF Preselector	30 Apr 2014	Biennial	30 Apr 2016
00072	EMCO	2075	Mini-mast	n/a	n/a	n/a
00073	EMCO	2080	Turn Table	n/a	n/a	n/a
00071	EMCO	2090	Multi-Device Controller	n/a	n/a	n/a
00265	Miteq	JS32-00104000-58-5P	Microwave L/N Amplifier	COU	n/a	COU
00241	R&S	FSU40	Spectrum Analyzer	23 Apr 2015	Biennial	23 Apr 2017
00050	Chase	CBL-6111A	Bilog Antenna	25 Apr 2014	Biennial	25 Apr 2016
00275	Coaxis	LMR400	25m Cable	COU	n/a	COU
00276	Coaxis	LMR400	4m Cable	COU	n/a	COU
00278	TILE	34G3	TILE Test Software	NCR	n/a	NCR
00034	ETS	3115	Double Ridged Guide Horn	06 Dec 2012	Triennial	06 Dec 2015

6.5 Test Measurement Configuration.

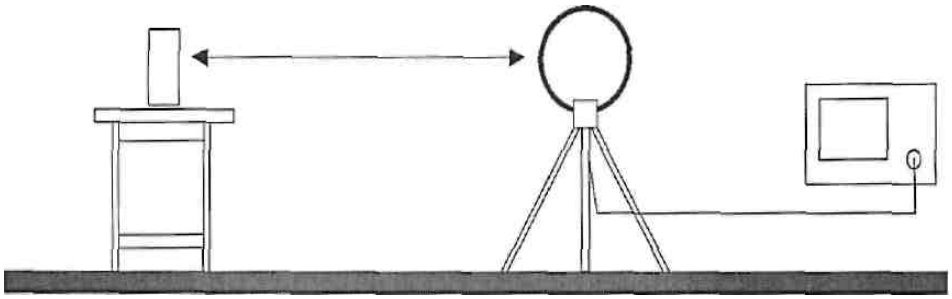
Measurement Frequency under 1GHz



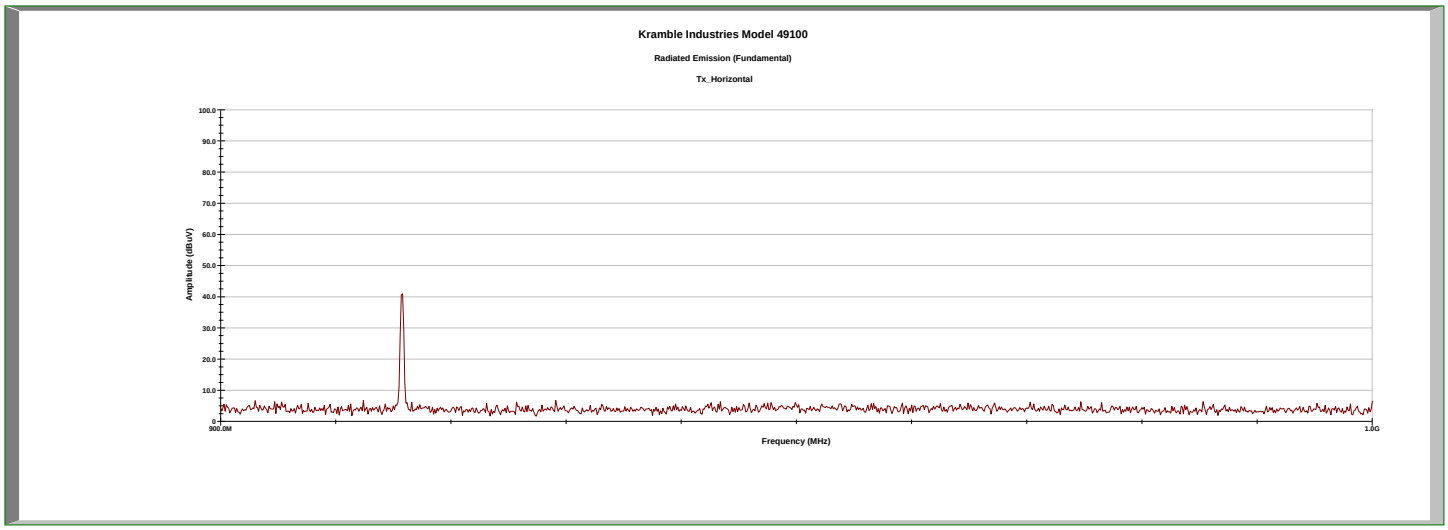
Measurement Frequency above 1GHz



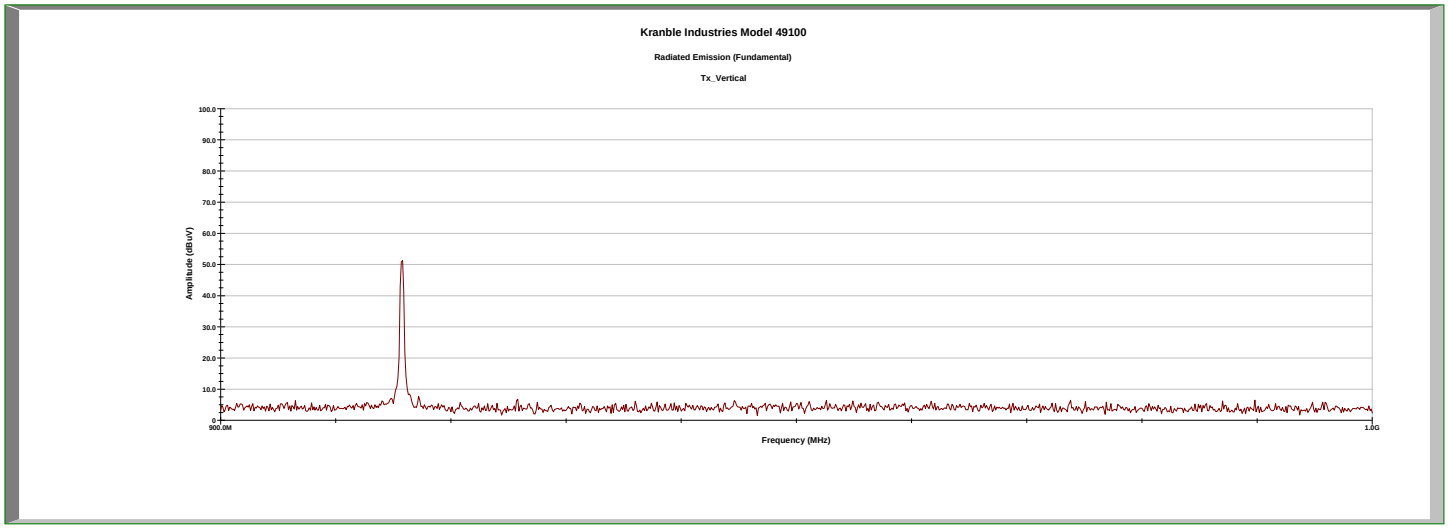
Measurement Frequency under 30 MHz



TX Radiated Emissions Scan, 900 MHz-1GHz, Horizontal



TX Radiated Emissions Scan, 900 MHz-1GHz, Vertical



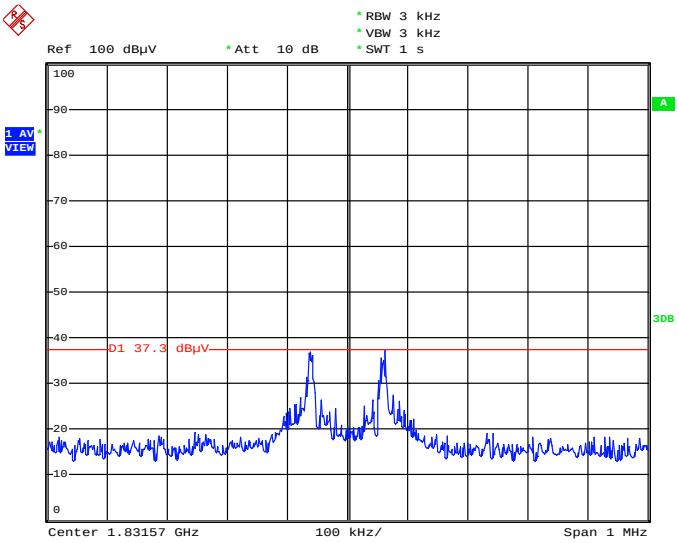
- Emissions for the transmitter and receiver were searched from the lowest frequency generated to the 10^{th} harmonic of the fundamental frequency.
- All detected emissions are reported.
- Data reported was captured using a quasi-peak detector.
- The transmitter was tested with fully charged DC cells.
- N.D. = Not Detected.

Fundamental Emission

E (dBuV/m)@3m = V(dBuV)@3m + AF_{Bilog} + CL_{Total} + CL_{4m}
Where:
AF_{Bilog} = Antenna Factor of Bilog Antenna
CL_{Total} = Cable Loss of 25m Cable + Cable Loss of 4m Cable

Emission Frequency	Ant. Pol.	Maximized Level	Cable Loss	Ant. Factor	Duty Cycle Factor	Field Strength	Limit	Margin	Result
[MHz]		[dBuV]	[dB]	[dB]	[-dB]	[dBuV]	[dBuV]	[dB]	
915.8	H	40.9	3.6	23.6	0	68.1	82.0	-13.9	Pass
915.8	V	51.2	3.6	23.5	0	78.3	82.0	-3.7	Pass

Spurious Emissions 1GHz to 10GHz



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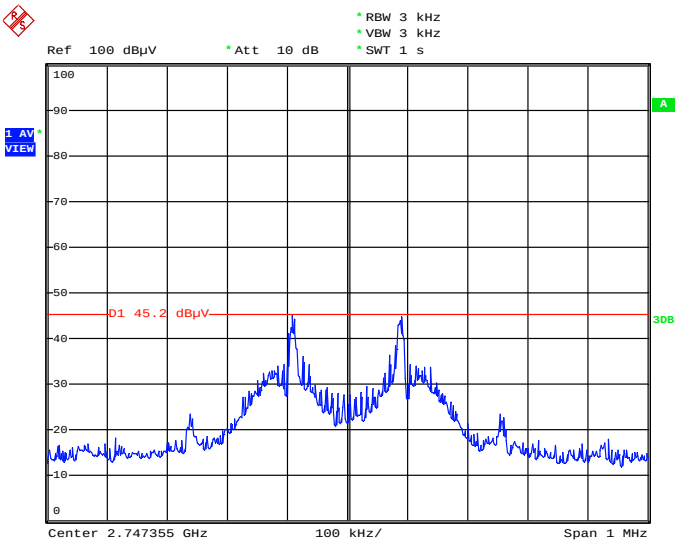
2nd Harmonic – 1.83GHz, Horizontal
V @ 3m = 37.3dBuV



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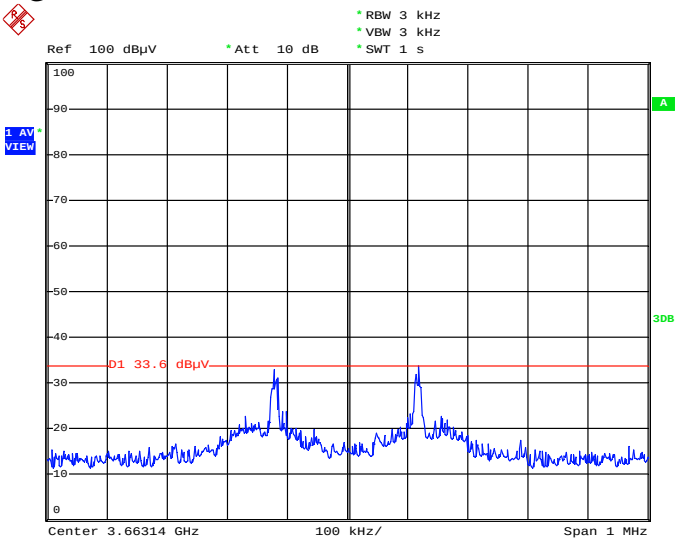
3rd Harmonic – 2.75GHz, Horizontal
V @ 3m = 45.2dBuV



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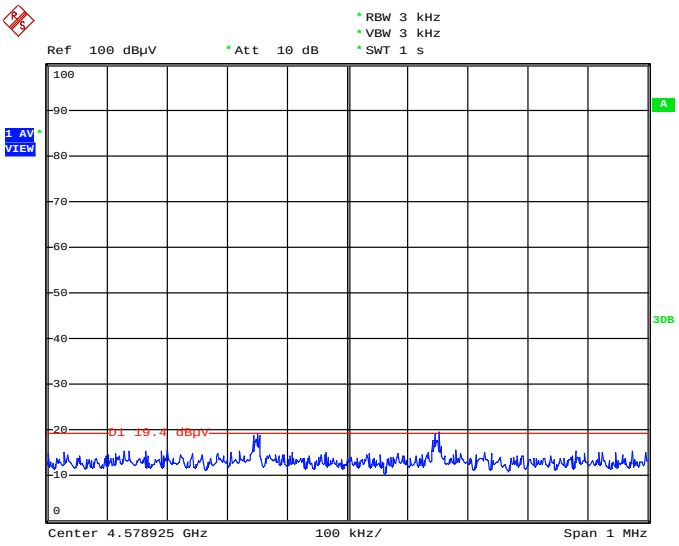
4th Harmonic – 3.66GHz, Horizontal
V @ 3m = 33.6dBuV



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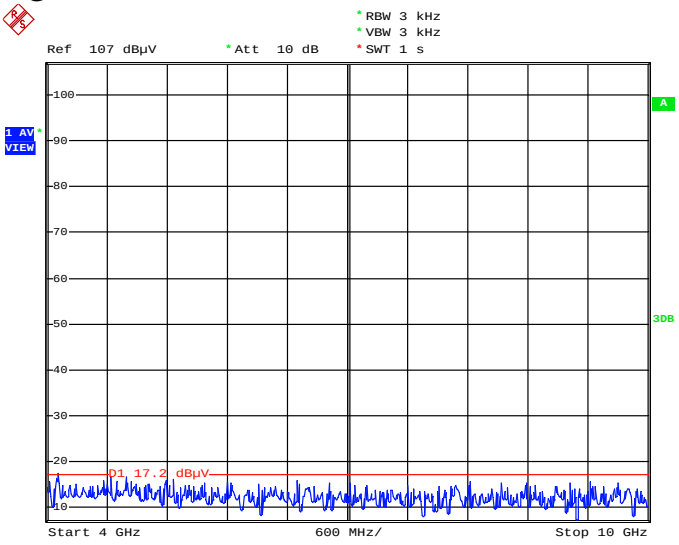
5th Harmonic – 4.58GHz, Horizontal
V @ 3m = 19.4dBuV



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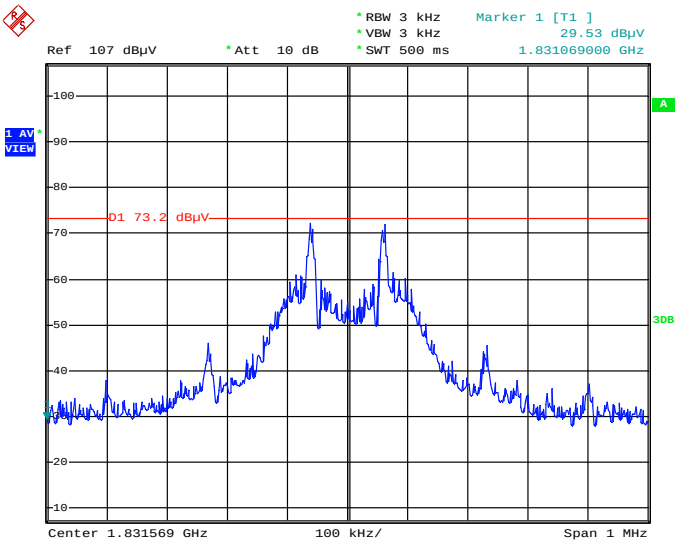
Measurement Scan – 4GHz to 10GHz, Horizontal
Max V @ 3m = 17.2dBuV



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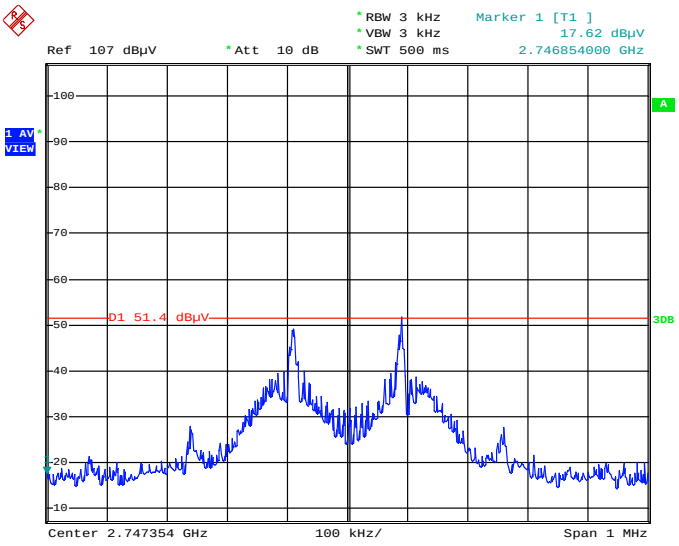
2nd Harmonic – 1.83GHz, Vertical
V @ 3m = 73.2dBuV



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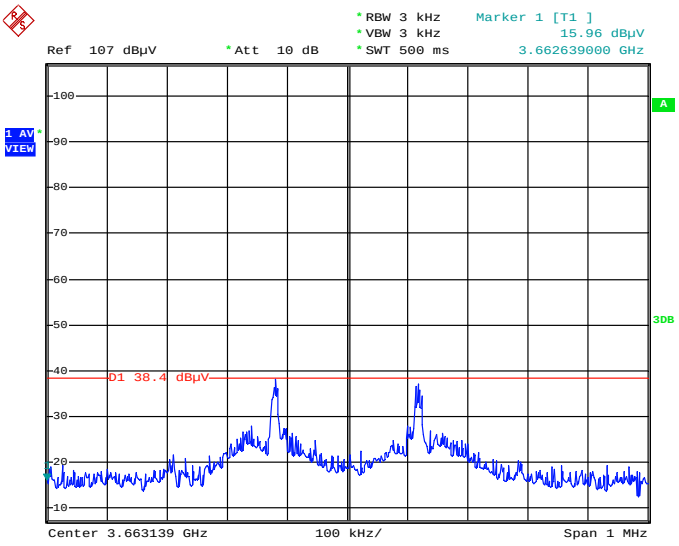
3rd Harmonic – 2.75GHz, Vertical
V @ 3m = 51.4dBuV



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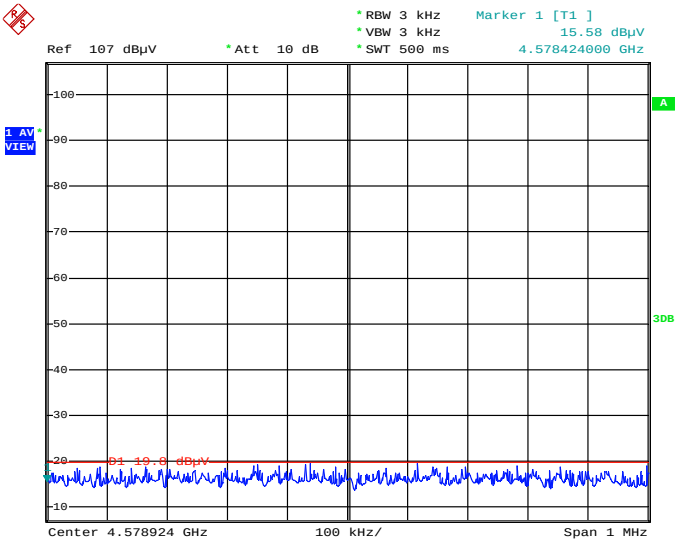
4th Harmonic – 3.66GHz, Vertical
V @ 3m = 38.4dBuV



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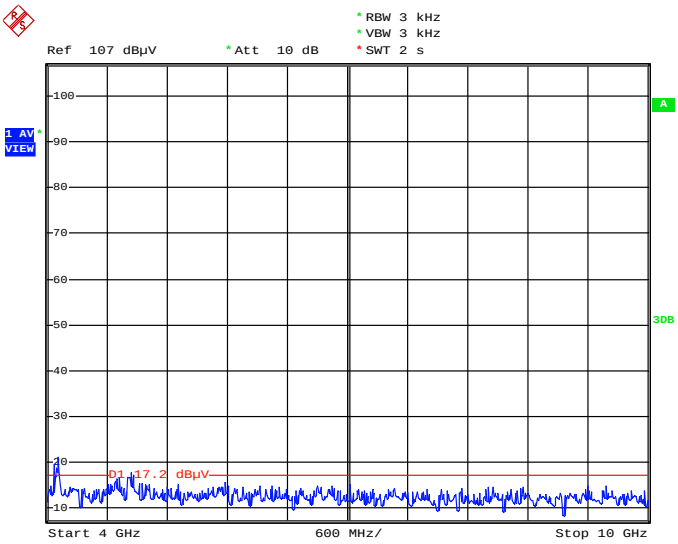
5th Harmonic –4.58GHz, Vertical
V @ 3m = 19.8dBuV



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Measurement Scan 4GHz to 10GHz, Vertical
Max V @ 3m = 17.2dBuV

E (dBuV/m)@3m = V(dBuV)@3m + AF_{Horn} + CL_{Total} + CL_{4m} + G_{PreAmp}
Where:
AF_{Horn} = Antenna Factor of Horn Antenna (+dB)
CL_{Total} = Cable Loss of 25m Cable (+dB) + Cable Loss of 4m Cable (+dB)
G_{PreAmp} = Gain of PreAmp (-dB)

Emission Frequency	Antenna Pol.	Emission Level (dBuV/m) @3m	Antenna Factor	Cable Loss	PreAmp Gain	Emission Level (dBuV/m@3m)	Limit (avg)	Margin	Result
[MHz]		[dBuV]	[dB]	[dB]	[-dB]	[dBuV]	[dBuV]	[dB]	
1832.0	V	73.2	26.7	3.7	54.5	49.1	62.0	-12.9	Pass
1832.0	H	37.3	26.8	3.7	54.5	13.3	62.0	-48.7	Pass
* 2748.0	V	51.4	28.8	5.6	54.0	31.8	54.0	-22.2	Pass
* 2748.0	H	45.2	28.9	5.6	54.0	25.7	54.0	-28.3	Pass
* 3664.0	V	38.4	31.3	7.2	53.6	23.3	54.0	-30.7	Pass
* 3664.0	H	33.6	31.3	7.2	53.6	18.5	54.0	-35.5	Pass
* 4580.0	V	19.8	32.3	8.3	52.5	7.9	54.0	-46.1	Pass
* 4580.0	H	19.4	32.4	8.3	52.5	7.6	54.0	-46.4	Pass
5496.0	V	N.D 17.2	34.1	9.2	52.0	8.5	62.0	-53.5	Pass
5496.0	H	N.D. 17.2	34.2	9.2	52.0	8.6	62.0	-53.4	Pass
6412.0	V	N.D. 17.2				---	62.0	---	Pass
6412.0	H	N.D. 17.2				---	62.0	---	Pass
* 7328.0	V	N.D. 17.2				---	54.0	---	Pass
* 7328.0	H	N.D. 17.2				---	54.0	---	Pass
* 8244.0	V	N.D. 17.2				---	54.0	---	Pass
* 8244.0	H	N.D. 17.2				---	54.0	---	Pass
9140.0	V	N.D. 17.2				---	62.0	---	Pass
9140.0	H	N.D. 17.2				---	62.0	---	Pass

* denotes restricted band.

- Emissions for the transmitter and receiver were searched from the lowest frequency generated to the 10th harmonic of the fundamental frequency.
- All detected emissions are reported.
- Data reported was captured using a average detector.
- The transmitter was tested with fully charged DC cells.
- N.D. = Not Detected.

Sign-Off

I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.

Art Voss
Sr. Engineer

7.0 OCCUPIED BANDWIDTH

7.1 References	
Normative Reference Standard	FCC CFR 47 §15.231(c); IC RSS-210 Issue 8
Procedure Reference	ANSI C63.4

7.2 Limits	
FCC §15.231(c)	The bandwidth of the emission shall be no wider that 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier.
IC RSS-210 A1.1.3	For the purpose of Section A1.1, the 99% bandwidth shall be no wider than 0.25% of the centre frequency for devices operating between 70-900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency.

7.3 Environmental conditions	
Temperature	25 +/- 5 ºC
Humidity	40 +/- 10 %
Barometric Pressure	101 +/- 3 kPa

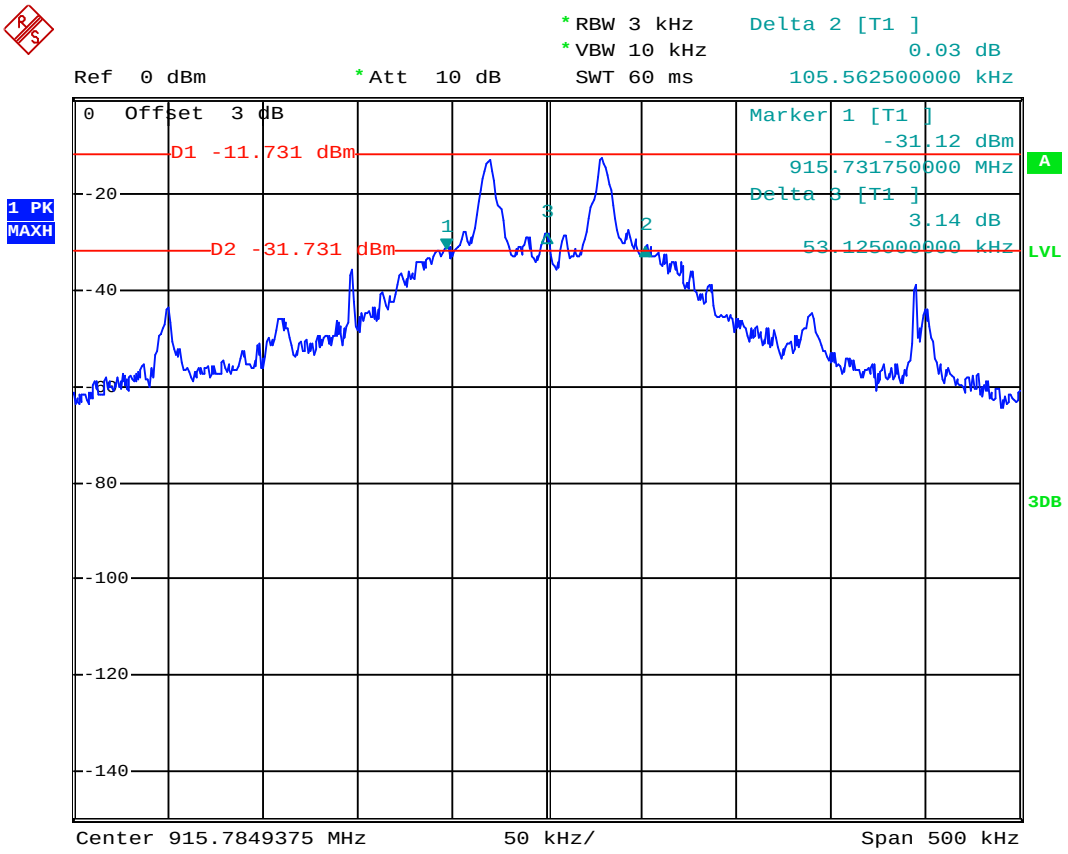
7.4 Equipment List

Asset Number	Manufacturer	Model Number	Description	Last Calibrated	Calibration Interval	Calibration Due
00265	Miteq	JS32-00104000-58-5P	Microwave L/N Amplifier	COU	n/a	COU
00241	R&S	FSU40	Spectrum Analyzer	23 Apr 2015	Biennial	23 Apr 2017
00050	Chase	CBL-6111A	Bilog Antenna	25 Apr 2014	Biennial	25 Apr 2016
00275	Coaxis	LMR400	25m Cable	COU	n/a	COU
00276	Coaxis	LMR400	4m Cable	COU	n/a	COU
00278	TILE	34G3	TILE Test Software	NCR	n/a	NCR
00034	ETS	3115	Double Ridged Guide Horn	06 Dec 2012	Triennial	06 Dec 2015

7.5 Setup drawing

7.6 Test Data:

20dB Occupied Bandwidth		
TX Frequency	Measured 20dB bandwidth	Limit 20dB bandwidth
915.8 MHz	105.6 kHz	4.6 MHz



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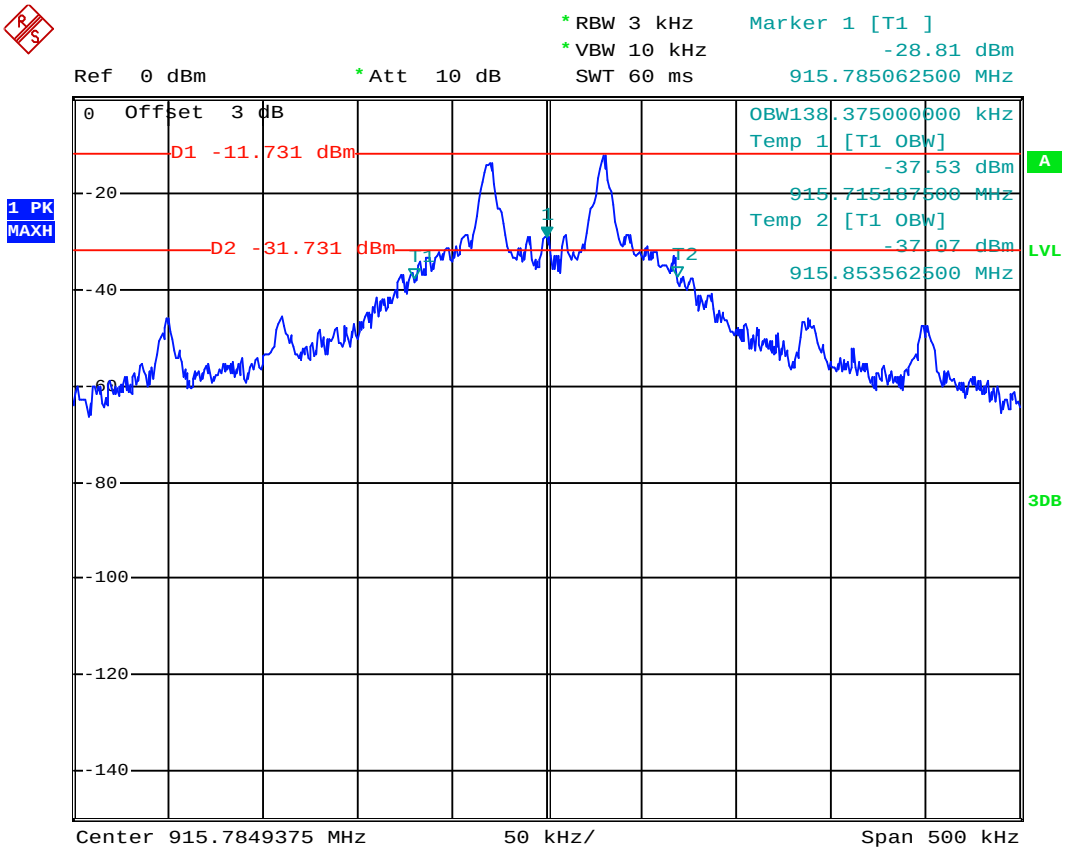
99% Occupied Bandwidth		
TX Frequency	Measured 99% bandwidth	Limit 20dB bandwidth
916 MHz	138.4 kHz	4.6 MHz



Date: 10.NOV.2015 09:46:23

Sign-Off

I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.

Art Voss
Sr. Engineer

END OF DOCUMENT