TEST RESULT SUMMARY

Radiated out-of-band emissions per;
FCC Part 15 Subpart C §15.247(d)
Industry Canada RSS-210 Issue 8 Section A8.5

MANUFACTURER	Trane U.S. Inc 4833 White Bear Parkway St Paul MN 55110
DESCRIPTION OF EQUIPMENT	Wireless Communications Interface
NAME OF EQUIPMENT	Wireless COMM Interface
MODEL NUMBER(S) TESTED	For FCC/IC (100mW) markets: X13790901-01 Universal WCI individually packaged with wire harness
SERIAL NUMBER(S) TESTED	A109D
TEST REPORT NUMBER	WC1208398.2B
TEST DATE(S)	20-27 August 2012

TÜV SÜD America Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the out-of-band radiated emissions requirements of FCC Part 15, Subpart C, §15.247(d) and Industry Canada RSS-210 Issue 8

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

		Tested by:	Approved by:
Date:	26 October 2012		
Location:	Taylors Falls MN USA	Greg S Jakubowski EMC Test Engineer	Joel T Schneider Senior EMC Engineer

Not Transferable

EMC TEST REPORT

Test Report No.	**WC1208398.2B**	Date of issue:	26 October 2012
Description of Equipment	Wireless Communications Interface		
Name of Equipment	Wireless COMM Interface		
Model No(s) Tested	For FCC/IC (100mW) markets: X13790901-01 Universal WCI individually packaged with wire harness		
Serial No(s) Tested	A109D		
Manufacturer	Trane U.S. Inc 4833 White Bear Parkway St Paul MN 55110		

Test Result ■ **Positive** ☐ **Negative**

TÜV SÜD America Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV SÜD America Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America Inc issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval. This report shall not be used by the client to claim product endorsement by NVLAP, NIST, or any agency of the US government.

TÜV SÜD America Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NARTE, and VCCI.

REVISION RECORD

REVISION	TOTAL NUMBER OF PAGES	DATE	DESCRIPTION
	46	26 October 2012	Initial Release

TEST REPORT CONTENTS **Page(s)**

EMC TEST REGULATIONS:
The tests were performed according to the following regulations:
- FCC Part 15 Subpart C Section 15.247 Paragraph (d)
- Industry Canada RSS-210 Issue 8, Section A8.5

ENVIRONMENTAL CONDITIONS IN THE LAB

	Actual
Temperature:	: 20-23°C
Atmospheric pressure	: 99 kPa
Relative Humidity	: 51-61%

POWER SUPPLY UTILIZED

Power supply system	: 24Vdc

TEST EQUIPMENT
All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.

SIGN EXPLANATIONS
☐ - not applicable
■ - applicable.

Out-of-band Radiated Emissions
FCC 15.247(d), IC RSS-210 A8.5

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Testing was performed in accordance with FCC KDB Publication 558074
Per the manufacturer, a peak-average duty cycle correction of -19.6 dB applies.
Maximum out-of-band emission relative to the limit is 33.1 dBμV/m qp at 3 meters at 54.424 MHz.
Minimum margin of compliance is 6.9 dB
Maximum out-of-band emission in the restricted bands relative to the limit is 33.19 dBμV/m qp at 3 meters at 171.684 MHz.
Minimum margin of compliance is 10.31 dB

Test location
Wild River Lab Large Test Site (Open Area Test Site)

Test distance
3 meters

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03995	EM-6917B	Electro-Metrics	Biconicalog Periodic	151	07-Jun-13
WRLE02670	8447D	Hewlett-Packard	Preamplifier	2443A03954	Code B 06-Feb-13
WRLE02690	8568B	Hewlett-Packard	Spectrum Analyzer	2430A00930	07-Dec-12
WRLE02674	85662A	Hewlett-Packard	Analyzer Display	2050A02007	07-Dec-12
NBLE02683	85650A	Hewlett-Packard	Quasi-peak Adapter	2430A00495	17-Apr-13
WRLE03229	3115	EMCO	Ridge Guide Antenna	2483	04-Sep-12
WRLE10527	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B 05-Jan-13
WRLE03997	EWT-14-0066	EWT	2.4 GHz Notch filter	E2	Code B 12-Sep-12

Cal Code B = Calibration verification performed internally.

Test limits;
Radiated emissions into restricted bands

Frequncy (MHz)	Field strength (μV/meter)	Field strength (dBμV/meter)
30 - 88	100, QP	40.0
88 - 216	150, QP	43.5
216 - 960	200, QP	46.0
Above 960	500, QP	54.0
> 1000	500, AV 5000, PK	54.0 74.0

Test data
see following pages

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 1	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	1 of 10

List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 <1GHz 3m	DELTA2
Freestar Radio Module-Low channel						
47.044 MHz	36.3 Qp	0.64 / 13.95 / 27.55 / 0.0	23.34	V / 1.00 / 0	-16.66	n/a
51.844 MHz	43.65 Qp	0.67 / 12.78 / 27.51 / 0.0	29.59	V / 1.00 / 0	-10.41	n/a
53.344 MHz	46.1 Qp	0.68 / 12.36 / 27.52 / 0.0	31.62	V / 1.00 / 0	-8.38	n/a
54.424 MHz	45.05 Qp	0.69 / 12.06 / 27.52 / 0.0	30.27	V / 1.00 / 0	-9.73	n/a
56.224 MHz	41.2 Qp	0.7 / 11.61 / 27.53 / 0.0	25.97	V / 1.00 / 0	-14.03	n/a
58.744 MHz	37.25 Qp	0.73 / 11.0 / 27.54 / 0.0	21.44	V / 1.00 / 0	-18.56	n/a
70.805 MHz	38.15 Qp	0.82 / 8.6 / 27.59 / 0.0	19.98	V / 1.00 / 0	-20.02	n/a
84.941 MHz	34.5 Qp	0.87 / 6.81 / 27.56 / 0.0	14.62	V / 1.00 / 0	-25.38	n/a
114.029 MHz	34.35 Qp	1.01 / 8.18 / 27.46 / 0.0	16.07	V / 1.00 / 0	-27.43	n/a
150.679 MHz	34.3 Qp	1.17 / 8.45 / 27.49 / 0.0	16.42	V / 1.00 / 0	-27.08	n/a
159.906 MHz	41.25 Qp	1.2 / 8.35 / 27.47 / 0.0	23.33	V / 1.00 / 0	-20.17	n/a
171.684 MHz	44.55 Qp	1.23 / 8.93 / 27.43 / 0.0	27.29	V / 1.00 / 0	-16.21	n/a
178.344 MHz	36.7 Qp	1.25 / 9.27 / 27.41 / 0.0	19.81	V / 1.00 / 0	-23.69	n/a
225.013 MHz	34.55 Qp	1.43 / 10.53 / 27.33 / 0.0	19.18	V / 1.00 / 0	-26.82	n/a
240.031 MHz	31.45 Qp	1.46 / 11.01 / 27.38 / 0.0	16.54	V / 1.00 / 0	-29.46	n/a
244.153 MHz	31.0 Qp	1.47 / 11.14 / 27.39 / 0.0	16.22	V / 1.00 / 0	-29.78	n/a
249.205 MHz	30.85 Qp	1.48 / 11.3 / 27.4 / 0.0	16.23	V / 1.00 / 0	-29.77	n/a
250.015 MHz	32.15 Qp	1.48 / 11.33 / 27.4 / 0.0	17.56	V / 1.00 / 0	-28.44	n/a
257.167 MHz	30.15 Qp	1.49 / 11.55 / 27.38 / 0.0	15.81	V / 1.00 / 0	-30.19	n/a
258.667 MHz	30.05 Qp	1.5 / 11.6 / 27.38 / 0.0	15.77	V / 1.00 / 0	-30.23	n/a
265.459 MHz	32.9 Qp	1.51 / 11.82 / 27.36 / 0.0	18.87	V / 1.00 / 0	-27.13	n/a
275.011 MHz	32.8 Qp	1.54 / 12.3 / 27.34 / 0.0	19.3	V / 1.00 / 0	-26.7	n/a
287.575 MHz	32.2 Qp	1.57 / 12.05 / 27.32 / 0.0	18.5	V / 1.00 / 0	-27.5	n/a
300.008 MHz	34.05 Qp	1.61 / 12.23 / 27.29 / 0.0	20.59	V / 1.00 / 0	-25.41	n/a
331.814 MHz	31.0 Qp	1.73 / 13.14 / 27.22 / 0.0	18.65	V / 1.00 / 0	-27.35	n/a
350.012 MHz	31.05 Qp	1.78 / 13.76 / 27.23 / 0.0	19.36	V / 1.00 / 0	-26.64	n/a
420.297 MHz	29.45 Qp	1.96 / 16.39 / 27.2 / 0.0	20.6	V / 1.00 / 0	-25.4	n/a
450.01 MHz	32.75 Qp	2.02 / 16.0 / 27.28 / 0.0	23.5	V / 1.00 / 0	-22.5	n/a
856.3 MHz	27.1 Qp	2.87 / 21.35 / 26.52 / 0.0	24.8	V / 1.00 / 0	-21.2	n/a

Tested by: Moshe D Peri (Printed) — Peri Moshe (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 1	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	2 of 10

List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 <1GHz 3m	DELTA2
931.348 MHz	27.85 Qp	2.95 / 21.52 / 26.56 / 0.0	25.75	V / 1.00 / 0	-20.25	n/a
244.153 MHz	31.0 Qp	1.47 / 11.14 / 27.39 / 0.0	16.22	H / 1.00 / 0	-29.78	n/a
249.205 MHz	31.2 Qp	1.48 / 11.3 / 27.4 / 0.0	16.58	H / 1.00 / 0	-29.42	n/a
257.167 MHz	30.35 Qp	1.49 / 11.55 / 27.38 / 0.0	16.01	H / 1.00 / 0	-29.99	n/a
856.3 MHz	26.55 Qp	2.87 / 21.35 / 26.52 / 0.0	24.25	H / 1.00 / 0	-21.75	n/a
931.348 MHz	29.0 Qp	2.95 / 21.52 / 26.56 / 0.0	26.9	H / 1.00 / 0	-19.1	n/a
150.679 MHz	37.75 Qp	1.17 / 8.45 / 27.49 / 0.0	19.87	H / 1.00 / 90	-23.63	n/a
159.906 MHz	43.5 Qp	1.2 / 8.35 / 27.47 / 0.0	25.58	H / 1.00 / 90	-17.92	n/a
171.684 MHz	47.1 Qp	1.23 / 8.93 / 27.43 / 0.0	29.84	H / 1.00 / 90	-13.66	n/a
178.344 MHz	39.4 Qp	1.25 / 9.27 / 27.41 / 0.0	22.51	H / 1.00 / 90	-20.99	n/a
240.031 MHz	30.0 Qp	1.46 / 11.01 / 27.38 / 0.0	15.09	H / 1.00 / 90	-30.91	n/a
244.153 MHz	31.6 Qp	1.47 / 11.14 / 27.39 / 0.0	16.82	H / 1.00 / 90	-29.18	n/a
249.205 MHz	31.7 Qp	1.48 / 11.3 / 27.4 / 0.0	17.08	H / 1.00 / 90	-28.92	n/a
257.167 MHz	30.85 Qp	1.49 / 11.55 / 27.38 / 0.0	16.51	H / 1.00 / 90	-29.49	n/a
258.667 MHz	30.6 Qp	1.5 / 11.6 / 27.38 / 0.0	16.32	H / 1.00 / 90	-29.68	n/a
856.3 MHz	27.3 Qp	2.87 / 21.35 / 26.52 / 0.0	25.0	H / 1.00 / 90	-21.0	n/a
47.044 MHz	36.45 Qp	0.64 / 13.95 / 27.55 / 0.0	23.49	V / 1.00 / 90	-16.51	n/a
51.844 MHz	43.5 Qp	0.67 / 12.78 / 27.51 / 0.0	29.44	V / 1.00 / 90	-10.56	n/a
53.344 MHz	46.05 Qp	0.68 / 12.36 / 27.52 / 0.0	31.57	V / 1.00 / 90	-8.43	n/a
54.424 MHz	44.95 Qp	0.69 / 12.06 / 27.52 / 0.0	30.17	V / 1.00 / 90	-9.83	n/a
70.805 MHz	38.25 Qp	0.82 / 8.6 / 27.59 / 0.0	20.08	V / 1.00 / 90	-19.92	n/a
84.941 MHz	35.05 Qp	0.87 / 6.81 / 27.56 / 0.0	15.17	V / 1.00 / 90	-24.83	n/a
114.029 MHz	34.25 Qp	1.01 / 8.18 / 27.46 / 0.0	15.97	V / 1.00 / 90	-27.53	n/a
225.013 MHz	34.9 Qp	1.43 / 10.53 / 27.33 / 0.0	19.53	V / 1.00 / 90	-26.47	n/a
240.031 MHz	31.8 Qp	1.46 / 11.01 / 27.38 / 0.0	16.89	V / 1.00 / 90	-29.11	n/a
244.153 MHz	31.8 Qp	1.47 / 11.14 / 27.39 / 0.0	17.02	V / 1.00 / 90	-28.98	n/a
249.205 MHz	31.95 Qp	1.48 / 11.3 / 27.4 / 0.0	17.33	V / 1.00 / 90	-28.67	n/a

Tested by: Moshe D Peri (Printed) — Peri Moshe (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 1	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	3 of 10

List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 <1GHz 3m	DELTA2
250.015 MHz	34.25 Qp	1.48 / 11.33 / 27.4 / 0.0	19.66	V / 1.00 / 90	-26.34	n/a
258.667 MHz	31.0 Qp	1.5 / 11.6 / 27.38 / 0.0	16.72	V / 1.00 / 90	-29.28	n/a
287.575 MHz	33.0 Qp	1.57 / 12.05 / 27.32 / 0.0	19.3	V / 1.00 / 90	-26.7	n/a
331.814 MHz	31.55 Qp	1.73 / 13.14 / 27.22 / 0.0	19.2	V / 1.00 / 90	-26.8	n/a
350.012 MHz	31.65 Qp	1.78 / 13.76 / 27.23 / 0.0	19.96	V / 1.00 / 90	-26.04	n/a
420.297 MHz	30.3 Qp	1.96 / 16.39 / 27.2 / 0.0	21.45	V / 1.00 / 90	-24.55	n/a
450.01 MHz	34.4 Qp	2.02 / 16.0 / 27.28 / 0.0	25.15	V / 1.00 / 90	-20.85	n/a
856.3 MHz	27.3 Qp	2.87 / 21.35 / 26.52 / 0.0	25.0	V / 1.00 / 90	-21.0	n/a
931.348 MHz	33.65 Qp	2.95 / 21.52 / 26.56 / 0.0	31.55	V / 1.00 / 90	-14.45	n/a
47.044 MHz	36.65 Qp	0.64 / 13.95 / 27.55 / 0.0	23.69	V / 1.00 / 180	-16.31	n/a
70.805 MHz	38.1 Qp	0.82 / 8.6 / 27.59 / 0.0	19.93	V / 1.00 / 180	-20.07	n/a
84.941 MHz	35.25 Qp	0.87 / 6.81 / 27.56 / 0.0	15.37	V / 1.00 / 180	-24.63	n/a
114.029 MHz	34.95 Qp	1.01 / 8.18 / 27.46 / 0.0	16.67	V / 1.00 / 180	-26.83	n/a
225.013 MHz	34.75 Qp	1.43 / 10.53 / 27.33 / 0.0	19.38	V / 1.00 / 180	-26.62	n/a
331.814 MHz	31.95 Qp	1.73 / 13.14 / 27.22 / 0.0	19.6	V / 1.00 / 180	-26.4	n/a
244.153 MHz	30.85 Qp	1.47 / 11.14 / 27.39 / 0.0	16.07	H / 1.00 / 180	-29.93	n/a
249.205 MHz	31.1 Qp	1.48 / 11.3 / 27.4 / 0.0	16.48	H / 1.00 / 180	-29.52	n/a
856.3 MHz	26.7 Qp	2.87 / 21.35 / 26.52 / 0.0	24.4	H / 1.00 / 180	-21.6	n/a
150.679 MHz	38.75 Qp	1.17 / 8.45 / 27.49 / 0.0	20.87	H / 1.00 / 270	-22.63	n/a
159.906 MHz	43.9 Qp	1.2 / 8.35 / 27.47 / 0.0	25.98	H / 1.00 / 270	-17.52	n/a
856.3 MHz	26.75 Qp	2.87 / 21.35 / 26.52 / 0.0	24.45	H / 1.00 / 270	-21.55	n/a
47.044 MHz	36.75 Qp	0.64 / 13.95 / 27.55 / 0.0	23.79	V / 1.00 / 270	-16.21	n/a
54.424 MHz	45.4 Qp	0.69 / 12.06 / 27.52 / 0.0	30.62	V / 1.00 / 270	-9.38	n/a
56.224 MHz	41.3 Qp	0.7 / 11.61 / 27.53 / 0.0	26.07	V / 1.00 / 270	-13.93	n/a
70.805 MHz	38.4 Qp	0.82 / 8.6 / 27.59 / 0.0	20.23	V / 1.00 / 270	-19.77	n/a
250.015 MHz	34.25 Qp	1.48 / 11.33 / 27.4 / 0.0	19.66	V / 1.00 / 270	-26.34	n/a

Tested by: Moshe D Peri (Printed) — Peri Moshe (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 1	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	4 of 10

List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 <1GHz 3m	DELTA2
265.459 MHz	32.95 Qp	1.51 / 11.82 / 27.36 / 0.0	18.92	V / 1.00 / 270	-27.08	n/a
275.011 MHz	32.5 Qp	1.54 / 12.3 / 27.34 / 0.0	19.0	V / 1.00 / 270	-27.0	n/a
331.814 MHz	31.7 Qp	1.73 / 13.14 / 27.22 / 0.0	19.35	V / 1.00 / 270	-26.65	n/a
350.012 MHz	31.9 Qp	1.78 / 13.76 / 27.23 / 0.0	20.21	V / 1.00 / 270	-25.79	n/a
420.297 MHz	30.2 Qp	1.96 / 16.39 / 27.2 / 0.0	21.35	V / 1.00 / 270	-24.65	n/a
450.01 MHz	34.5 Qp	2.02 / 16.0 / 27.28 / 0.0	25.25	V / 1.00 / 270	-20.75	n/a
225.013 MHz	34.75 Qp	1.43 / 10.53 / 27.33 / 0.0	19.38	V / 3.00 / 270	-26.62	n/a
249.205 MHz	32.0 Qp	1.48 / 11.3 / 27.4 / 0.0	17.38	V / 3.00 / 270	-28.62	n/a
265.459 MHz	34.2 Qp	1.51 / 11.82 / 27.36 / 0.0	20.17	V / 3.00 / 270	-25.83	n/a
275.011 MHz	35.3 Qp	1.54 / 12.3 / 27.34 / 0.0	21.8	V / 3.00 / 270	-24.2	n/a
287.575 MHz	33.55 Qp	1.57 / 12.05 / 27.32 / 0.0	19.85	V / 3.00 / 270	-26.15	n/a
331.814 MHz	32.5 Qp	1.73 / 13.14 / 27.22 / 0.0	20.15	V / 3.00 / 270	-25.85	n/a
420.297 MHz	31.45 Qp	1.96 / 16.39 / 27.2 / 0.0	22.6	V / 3.00 / 270	-23.4	n/a
450.01 MHz	35.3 Qp	2.02 / 16.0 / 27.28 / 0.0	26.05	V / 3.00 / 270	-19.95	n/a
150.679 MHz	41.35 Qp	1.17 / 8.45 / 27.49 / 0.0	23.47	H / 3.00 / 270	-20.03	n/a
159.906 MHz	48.0 Qp	1.2 / 8.35 / 27.47 / 0.0	30.08	H / 3.00 / 270	-13.42	n/a
171.684 MHz	48.9 Qp	1.23 / 8.93 / 27.43 / 0.0	31.64	H / 3.00 / 270	-11.86	n/a
178.344 MHz	40.5 Qp	1.25 / 9.27 / 27.41 / 0.0	23.61	H / 3.00 / 270	-19.89	n/a
244.153 MHz	30.95 Qp	1.47 / 11.14 / 27.39 / 0.0	16.17	H / 3.00 / 270	-29.83	n/a
257.167 MHz	30.75 Qp	1.49 / 11.55 / 27.38 / 0.0	16.41	H / 3.00 / 270	-29.59	n/a
856.3 MHz	26.6 Qp	2.87 / 21.35 / 26.52 / 0.0	24.3	H / 3.00 / 270	-21.7	n/a
856.3 MHz	26.75 Qp	2.87 / 21.35 / 26.52 / 0.0	24.45	H / 3.00 / 180	-21.55	n/a
84.941 MHz	34.75 Qp	0.87 / 6.81 / 27.56 / 0.0	14.87	V / 3.00 / 180	-25.13	n/a
225.013 MHz	34.6 Qp	1.43 / 10.53 / 27.33 / 0.0	19.23	V / 3.00 / 180	-26.77	n/a
244.153 MHz	31.65 Qp	1.47 / 11.14 / 27.39 / 0.0	16.87	V / 3.00 / 180	-29.13	n/a
265.459 MHz	34.2 Qp	1.51 / 11.82 / 27.36 / 0.0	20.17	V / 3.00 / 180	-25.83	n/a

Tested by: Moshe D Peri (Printed) — Peri Moshe (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 1	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	5 of 10

List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 <1GHz 3m	DELTA2
275.011 MHz	35.3 Qp	1.54 / 12.3 / 27.34 / 0.0	21.8	V / 3.00 / 180	-24.2	n/a
331.814 MHz	32.35 Qp	1.73 / 13.14 / 27.22 / 0.0	20.0	V / 3.00 / 180	-26.0	n/a
350.012 MHz	31.8 Qp	1.78 / 13.76 / 27.23 / 0.0	20.11	V / 3.00 / 180	-25.89	n/a
420.297 MHz	31.4 Qp	1.96 / 16.39 / 27.2 / 0.0	22.55	V / 3.00 / 180	-23.45	n/a
450.01 MHz	35.2 Qp	2.02 / 16.0 / 27.28 / 0.0	25.95	V / 3.00 / 180	-20.05	n/a
240.031 MHz	31.65 Qp	1.46 / 11.01 / 27.38 / 0.0	16.74	V / 3.00 / 90	-29.26	n/a
244.153 MHz	32.05 Qp	1.47 / 11.14 / 27.39 / 0.0	17.27	V / 3.00 / 90	-28.73	n/a
225.013 MHz	34.75 Qp	1.43 / 10.53 / 27.33 / 0.0	19.38	V / 3.00 / 90	-26.62	n/a
240.031 MHz	31.7 Qp	1.46 / 11.01 / 27.38 / 0.0	16.79	V / 3.00 / 90	-29.21	n/a
244.153 MHz	32.1 Qp	1.47 / 11.14 / 27.39 / 0.0	17.32	V / 3.00 / 90	-28.68	n/a
249.205 MHz	32.75 Qp	1.48 / 11.3 / 27.4 / 0.0	18.13	V / 3.00 / 90	-27.87	n/a
250.015 MHz	34.25 Qp	1.48 / 11.33 / 27.4 / 0.0	19.66	V / 3.00 / 90	-26.34	n/a
257.167 MHz	30.65 Qp	1.49 / 11.55 / 27.38 / 0.0	16.31	V / 3.00 / 90	-29.69	n/a
258.667 MHz	31.0 Qp	1.5 / 11.6 / 27.38 / 0.0	16.72	V / 3.00 / 90	-29.28	n/a
265.459 MHz	35.25 Qp	1.51 / 11.82 / 27.36 / 0.0	21.22	V / 3.00 / 90	-24.78	n/a
275.011 MHz	35.95 Qp	1.54 / 12.3 / 27.34 / 0.0	22.45	V / 3.00 / 90	-23.55	n/a
287.575 MHz	34.15 Qp	1.57 / 12.05 / 27.32 / 0.0	20.45	V / 3.00 / 90	-25.55	n/a
331.814 MHz	32.85 Qp	1.73 / 13.14 / 27.22 / 0.0	20.5	V / 3.00 / 90	-25.5	n/a
350.012 MHz	31.85 Qp	1.78 / 13.76 / 27.23 / 0.0	20.16	V / 3.00 / 90	-25.84	n/a
420.297 MHz	31.45 Qp	1.96 / 16.39 / 27.2 / 0.0	22.6	V / 3.00 / 90	-23.4	n/a
450.01 MHz	35.3 Qp	2.02 / 16.0 / 27.28 / 0.0	26.05	V / 3.00 / 90	-19.95	n/a
856.3 MHz	27.15 Qp	2.87 / 21.35 / 26.52 / 0.0	24.85	V / 3.00 / 90	-21.15	n/a
931.348 MHz	33.35 Qp	2.95 / 21.52 / 26.56 / 0.0	31.25	V / 3.00 / 90	-14.75	n/a
150.679 MHz	40.25 Qp	1.17 / 8.45 / 27.49 / 0.0	22.37	H / 3.00 / 90	-21.13	n/a
159.906 MHz	47.45 Qp	1.2 / 8.35 / 27.47 / 0.0	29.53	H / 3.00 / 90	-13.97	n/a
171.684 MHz	49.55 Qp	1.23 / 8.93 / 27.43 / 0.0	32.29	H / 3.00 / 90	-11.21	n/a
178.344 MHz	41.0 Qp	1.25 / 9.27 / 27.41 / 0.0	24.11	H / 3.00 / 90	-19.39	n/a
856.3 MHz	26.9 Qp	2.87 / 21.35 / 26.52 / 0.0	24.6	H / 3.00 / 90	-21.4	n/a

Tested by: Moshe D Peri (Printed) — Peri Moshe (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 1	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	6 of 10

List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 <1GHz 3m	DELTA2
244.153 MHz	31.0 Qp	1.47 / 11.14 / 27.39 / 0.0	16.22	H / 3.00 / 0	-29.78	n/a
257.167 MHz	30.7 Qp	1.49 / 11.55 / 27.38 / 0.0	16.36	H / 3.00 / 0	-29.64	n/a
856.3 MHz	26.7 Qp	2.87 / 21.35 / 26.52 / 0.0	24.4	H / 3.00 / 0	-21.6	n/a
70.805 MHz	37.35 Qp	0.82 / 8.6 / 27.59 / 0.0	19.18	V / 3.00 / 0	-20.82	n/a
84.941 MHz	34.95 Qp	0.87 / 6.81 / 27.56 / 0.0	15.07	V / 3.00 / 0	-24.93	n/a
225.013 MHz	34.8 Qp	1.43 / 10.53 / 27.33 / 0.0	19.43	V / 3.00 / 0	-26.57	n/a
331.814 MHz	32.7 Qp	1.73 / 13.14 / 27.22 / 0.0	20.35	V / 3.00 / 0	-25.65	n/a
350.012 MHz	32.15 Qp	1.78 / 13.76 / 27.23 / 0.0	20.46	V / 3.00 / 0	-25.54	n/a
420.297 MHz	31.3 Qp	1.96 / 16.39 / 27.2 / 0.0	22.45	V / 3.00 / 0	-23.55	n/a
931.348 MHz	34.05 Qp	2.95 / 21.52 / 26.56 / 0.0	31.95	V / 3.00 / 0	-14.05	n/a
Maximize						
53.344 MHz	46.51 Qp	0.68 / 12.36 / 27.52 / 0.0	32.03	V / 1.00 / 0	-7.97	n/a
54.424 MHz	47.88 Qp	0.69 / 12.06 / 27.52 / 0.0	33.1	V / 1.00 / 16	-6.9	n/a
171.684 MHz	50.45 Qp	1.23 / 8.93 / 27.43 / 0.0	33.19	H / 2.50 / 90	-10.31	n/a
Freestar Radio Module-Mid. channel						
53.344 MHz	43.35 Qp	0.68 / 12.36 / 27.52 / 0.0	28.87	V / 1.00 / 0	-11.13	n/a
54.424 MHz	44.47 Qp	0.69 / 12.06 / 27.52 / 0.0	29.69	V / 1.00 / 18	-10.31	n/a
No changes detected						
Freestar Radio Module-High channel						
No changes detected						
Ember Radio Module-Low channel						
No changes detected						
Ember Radio Module-Mid. channel						

Tested by: Moshe D Peri (Printed) — Peri Moshe (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 1	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	7 of 10

List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 <1GHz 3m	DELTA2
No changes detected						
Ember Radio Module-High channel						
No changes detected						
End scan 30-1000 MHz						

Tested by: Moshe D Peri (Printed) — Peri Moshe (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 1	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	8 of 10

Measurement summary for limit1: FCC 15.247 <1GHz 3m (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 <1GHz 3m
54.424 MHz	47.88 Qp	0.69 / 12.06 / 27.52 / 0.0	33.1	V / 1.00 / 16	-6.9
53.344 MHz	46.51 Qp	0.68 / 12.36 / 27.52 / 0.0	32.03	V / 1.00 / 0	-7.97
171.684 MHz	50.45 Qp	1.23 / 8.93 / 27.43 / 0.0	33.19	H / 2.50 / 90	-10.31
51.844 MHz	43.65 Qp	0.67 / 12.78 / 27.51 / 0.0	29.59	V / 1.00 / 0	-10.41
159.906 MHz	48.0 Qp	1.2 / 8.35 / 27.47 / 0.0	30.08	H / 3.00 / 270	-13.42
56.224 MHz	41.3 Qp	0.7 / 11.61 / 27.53 / 0.0	26.07	V / 1.00 / 270	-13.93
931.348 MHz	34.05 Qp	2.95 / 21.52 / 26.56 / 0.0	31.95	V / 3.00 / 0	-14.05
47.044 MHz	36.75 Qp	0.64 / 13.95 / 27.55 / 0.0	23.79	V / 1.00 / 270	-16.21
58.744 MHz	37.25 Qp	0.73 / 11.0 / 27.54 / 0.0	21.44	V / 1.00 / 0	-18.56
178.344 MHz	41.0 Qp	1.25 / 9.27 / 27.41 / 0.0	24.11	H / 3.00 / 90	-19.39
70.805 MHz	38.4 Qp	0.82 / 8.6 / 27.59 / 0.0	20.23	V / 1.00 / 270	-19.77
450.01 MHz	35.3 Qp	2.02 / 16.0 / 27.28 / 0.0	26.05	V / 3.00 / 270	-19.95
150.679 MHz	41.35 Qp	1.17 / 8.45 / 27.49 / 0.0	23.47	H / 3.00 / 270	-20.03
856.3 MHz	27.3 Qp	2.87 / 21.35 / 26.52 / 0.0	25.0	H / 1.00 / 90	-21.0
420.297 MHz	31.45 Qp	1.96 / 16.39 / 27.2 / 0.0	22.6	V / 3.00 / 270	-23.4
275.011 MHz	35.95 Qp	1.54 / 12.3 / 27.34 / 0.0	22.45	V / 3.00 / 90	-23.55
84.941 MHz	35.25 Qp	0.87 / 6.81 / 27.56 / 0.0	15.37	V / 1.00 / 180	-24.63
265.459 MHz	35.25 Qp	1.51 / 11.82 / 27.36 / 0.0	21.22	V / 3.00 / 90	-24.78
300.008 MHz	34.05 Qp	1.61 / 12.23 / 27.29 / 0.0	20.59	V / 1.00 / 0	-25.41
331.814 MHz	32.85 Qp	1.73 / 13.14 / 27.22 / 0.0	20.5	V / 3.00 / 90	-25.5
350.012 MHz	32.15 Qp	1.78 / 13.76 / 27.23 / 0.0	20.46	V / 3.00 / 0	-25.54
287.575 MHz	34.15 Qp	1.57 / 12.05 / 27.32 / 0.0	20.45	V / 3.00 / 90	-25.55
250.015 MHz	34.25 Qp	1.48 / 11.33 / 27.4 / 0.0	19.66	V / 1.00 / 90	-26.34
225.013 MHz	34.9 Qp	1.43 / 10.53 / 27.33 / 0.0	19.53	V / 1.00 / 90	-26.47
114.029 MHz	34.95 Qp	1.01 / 8.18 / 27.46 / 0.0	16.67	V / 1.00 / 180	-26.83
249.205 MHz	32.75 Qp	1.48 / 11.3 / 27.4 / 0.0	18.13	V / 3.00 / 90	-27.87
244.153 MHz	32.1 Qp	1.47 / 11.14 / 27.39 / 0.0	17.32	V / 3.00 / 90	-28.68
240.031 MHz	31.8 Qp	1.46 / 11.01 / 27.38 / 0.0	16.89	V / 1.00 / 90	-29.11
258.667 MHz	31.0 Qp	1.5 / 11.6 / 27.38 / 0.0	16.72	V / 1.00 / 90	-29.28

Tested by: Moshe D Peri (Printed) — Peri Moshe (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 1	Test Area:	LTS			
EUT Model #:	6400251701	Date:	8/20/2012			
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0	°C
Test Method:	FCC 15.247			Air Pressure:	99.0	kPa
Customer:	TRANE			Rel. Humidity:	51.0	%
EUT Description:	Wireless Communication Interface					
Notes:						
Data File Name:	8398.dat			Page:	9 of 10	

Measurement summary for limit1: FCC 15.247 <1GHz 3m (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 <1GHz 3m
257.167 MHz	30.85 Qp	1.49 / 11.55 / 27.38 / 0.0	16.51	H / 1.00 / 90	-29.49

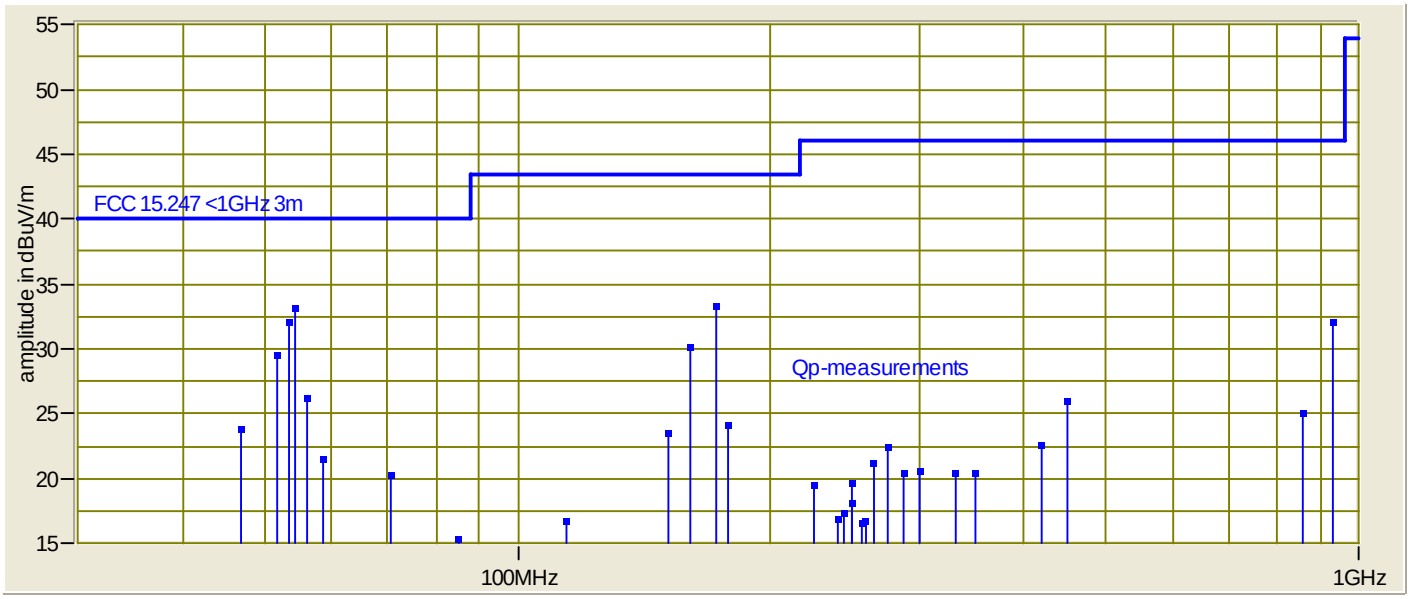
Tested by: Moshe D Peri (Printed) — Peri Moshe (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 1	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	10 of 10

Graph:



Tested by: Moshe D Peri (Printed) — Peri Moshe (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 2	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	1 of 5

List of measurements for run #: 2

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 >1GHz 3m av	DELTA2 FCC 15.247>1G 3m pk
Begin scan 1 - 18 GHz						
Ember Radio Module, High channel						
Determine worst case orthogonal position						
Device lying flat						
2.474 GHz	102.95 Pk	5.1 / 28.59 / 42.32 / 0.0	94.32	V / 1.00 / 186	n/a	-36.88
Device upright						
2.474 GHz	101.3 Pk	5.1 / 28.59 / 42.32 / 0.0	92.67	V / 1.23 / 266	n/a	-38.53
Device on its side						
2.475 GHz	100.4 Pk	5.11 / 28.59 / 42.32 / 0.0	91.78	V / 1.23 / 115	n/a	-39.42
Device lying flat						
Maximized fundamental for bandedge measurements						
No significant spurious emissions detected						
Absorbers on floor, bore sighted						
No significant spurious emissions detected						
Low channel						
2.404 GHz	124.95 Pk	5.03 / 28.42 / 42.25 / 0.0	116.15	V / 1.34 / 190	n/a	-15.05
No significant spurious emissions detected						
Mid channel						
No significant spurious emissions detected						
Freestar radio module						
Mid channel						
Determine worst case orthogonal axis						
maximized						
Device lying flat						
2.44 GHz	78.4 Pk	5.07 / 28.51 / 0.0 / 0.0	111.98	V / 1.03 / 72	n/a	-19.22

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 2	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	2 of 5

List of measurements for run #: 2

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 >1GHz 3m av	DELTA2 FCC 15.247>1G 3m pk
Device upright						
2.439 GHz	76.9 Pk	5.07 / 28.51 / 0.0 / 0.0	110.47	V / 1.00 / 73	n/a	-20.73
Device on its side						
2.44 GHz	78.95 Pk	5.07 / 28.51 / 0.0 / 0.0	112.53	V / 1.00 / 44	n/a	-18.67
Device remains on its side						
Begin spurious emissions scan 1 - 18 GHz						
maximized						
4.879 GHz	51.9 Pk	8.81 / 33.24 / 40.76 / 1.04	54.23	V / 1.00 / 146	n/a	-19.77
4.879 GHz	43.54 Av	8.81 / 33.24 / 40.76 / 1.04	45.87	V / 1.00 / 146	-8.13	n/a
No other significant emissions detected						
Absorbers on floor, bore sighted						
4.879 GHz	51.25 Pk	8.81 / 33.24 / 40.76 / 1.04	53.58	V / 1.60 / 145	n/a	-20.42
4.879 GHz	41.13 Av	8.81 / 33.24 / 40.76 / 1.04	43.46	V / 1.60 / 145	-10.54	n/a
No other significant emissions detected						
Low channel						
Maximized fundamental for bandedge measurements						
2.404 GHz	122.5 Pk	5.03 / 28.42 / 42.25 / 0.0	113.7	V / 1.21 / 30	n/a	-17.5
2.39 GHz	72.85 Pk	5.01 / 28.39 / 42.23 / 0.0	64.02	V / 1.15 / 30	n/a	-9.98
2.39 GHz	65.61 Av	5.01 / 28.39 / 42.23 / 0.0	56.78	V / 1.15 / 30	2.78	n/a
Begin spurious emissions scan 1 - 18 GHz						
maximized						
4.809 GHz	59.8 Pk	8.69 / 33.14 / 40.71 / 1.05	61.97	V / 1.15 / 152	n/a	-12.03
4.809 GHz	53.47 Av	8.7 / 33.14 / 40.71 / 1.05	55.64	V / 1.15 / 152	1.64	n/a
reduced power						
2.39 GHz	65.92 Av	5.01 / 28.39 / 42.23 / 0.0	57.09	V / 1.25 / 30	3.09	n/a

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 2	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	3 of 5

List of measurements for run #: 2

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 >1GHz 3m av	DELTA2 FCC 15.247>1G 3m pk
full power						
Per manufacturer, a duty cycle relaxation of at least 10 dB can be applied						
Average levels with -10dB correction applied						
2.39 GHz	55.92 Av	5.01 / 28.39 / 42.23 / 0.0	47.09	V / 1.25 / 30	-6.91	n/a
4.809 GHz	43.47 Av	8.7 / 33.14 / 40.71 / 1.05	45.64	V / 1.20 / 152	-8.36	n/a
High channel						
Maximized fundamental for bandedge measurements						
2.479 GHz	104.6 Pk	5.11 / 28.6 / 42.33 / 0.0	95.99	V / 1.23 / 26	n/a	-35.21
Begin spurious emissions scan 1 - 18 GHz						
No significant emissions detected						

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 2	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	4 of 5

Average levels with the fundamental on continuous. 1 MHz RBW, 10 Hz VBW

Measurement summary for limit1: FCC 15.247 >1GHz 3m av (Av)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 >1GHz 3m av
2.39 GHz	65.92 Av	5.01 / 28.39 / 42.23 / 0.0	57.09	V / 1.25 / 30	3.09
4.809 GHz	53.47 Av	8.7 / 33.14 / 40.71 / 1.05	55.64	V / 1.15 / 152	1.64
4.879 GHz	43.54 Av	8.81 / 33.24 / 40.76 / 1.04	45.87	V / 1.00 / 146	-8.13

Measurement summary, peak limit: FCC 15.247>1G 3m pk (Pk)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA FCC 15.247>1G 3m pk
2.39 GHz	72.85 Pk	5.01 / 28.39 / 42.23 / 0.0	64.02	V / 1.15 / 30	-9.98
4.809 GHz	59.8 Pk	8.69 / 33.14 / 40.71 / 1.05	61.97	V / 1.15 / 152	-12.03
4.879 GHz	51.9 Pk	8.81 / 33.24 / 40.76 / 1.04	54.23	V / 1.00 / 146	-19.77

Corrected out-of-band average levels using -19.6 dB pk-avg correction

Measurement summary, avg limit: FCC 15.247>1G 3m avg

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN / Pk-Avg correction (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA FCC 15.247>1G 3m avg
2.39 GHz	72.85 Pk	5.01 / 28.39 / 42.23 / 0.0 / 19.6	44.42	V / 1.15 / 30	-9.58
4.809 GHz	59.8 Pk	8.69 / 33.14 / 40.71 / 1.05 / 19.6	42.37	V / 1.15 / 152	-11.63
4.879 GHz	51.9 Pk	8.81 / 33.24 / 40.76 / 1.04 / 19.6	34.63	V / 1.00 / 146	-19.37

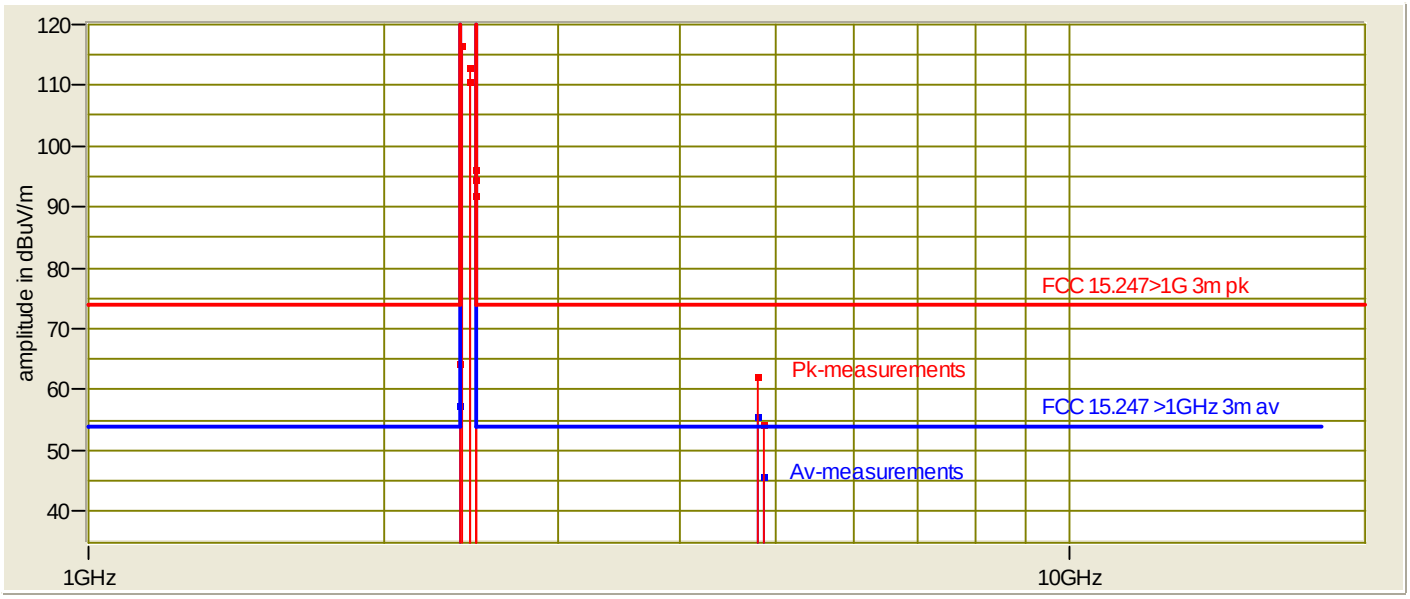
Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 2	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/20/2012		
EUT Serial #:	A109D	EUT Power:	24V	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	51.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:	8398.dat			Page:	5 of 5

Graph:



Tested by: Greg Jakubowski — Printed — Signature

Reviewed by: Joel T Schneider — Printed — Signature

RADIATED EMISSIONS

Test Report #:	WC1208398 Run 6	Test Area:	LTS		
EUT Model #:	6400251701	Date:	8/27/2012		
EUT Serial #:	A109D	EUT Power:	24Vdc	Temperature:	23.0 °C
Test Method:	FCC 15.247			Air Pressure:	99.0 kPa
Customer:	TRANE			Rel. Humidity:	61.0 %
EUT Description:	Wireless Communication Interface				
Notes:					
Data File Name:				Page:	1 of 1

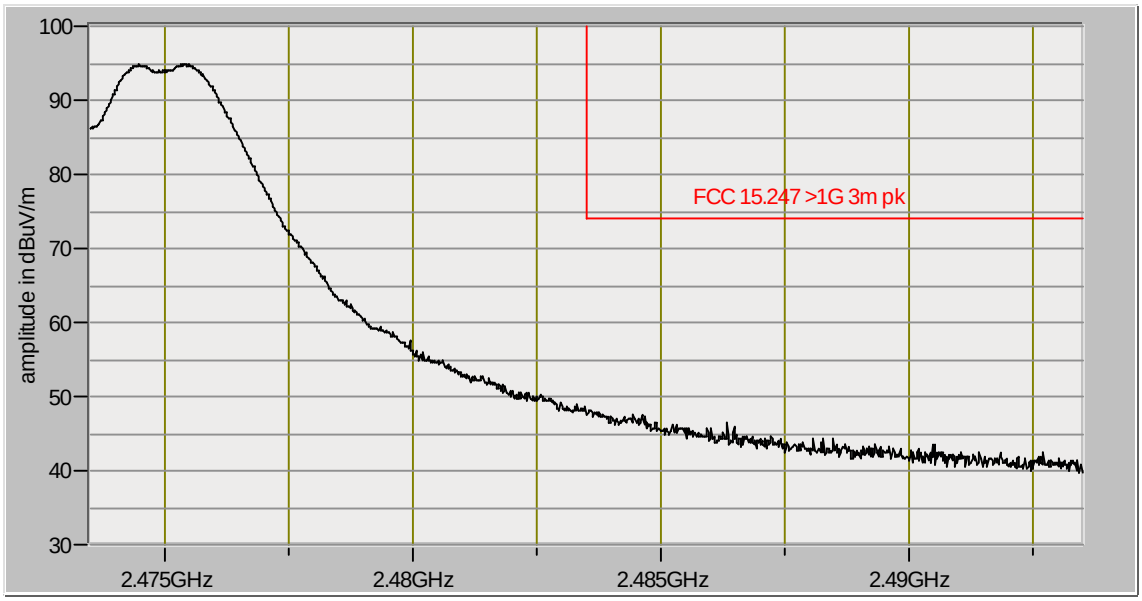
List of measurements for run #: 5

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247>1ghz 3m pk	DELTA2 FCC 15.247>1ghz 3m av
Begin scan 18 - 25 GHz						
Ember radio on lowest channel, Freestar radio on highest, FCC power settings						
Scanned all sides of DUT, 0.3 meter distance, vertical & horizontal						
No significant emissions detected						
Changed to other low, mid, high channel combination						
No significant emissions detected						
End scan 18 - 25 GHz						

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

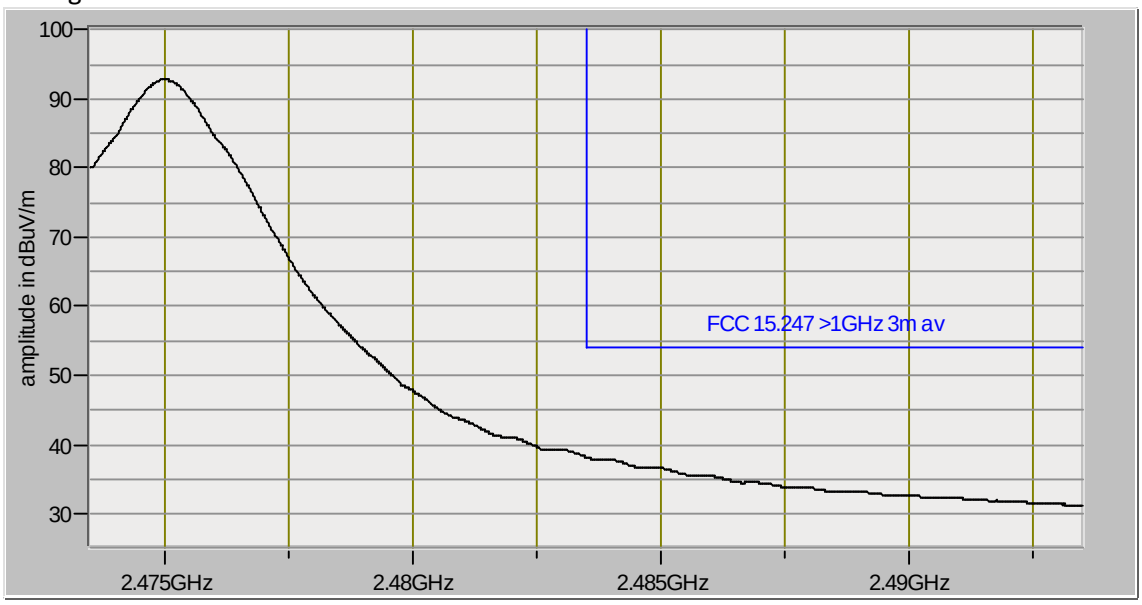
Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

Ember radio
high channel
Peak



RBW 1 MHz VBW 1 MHz

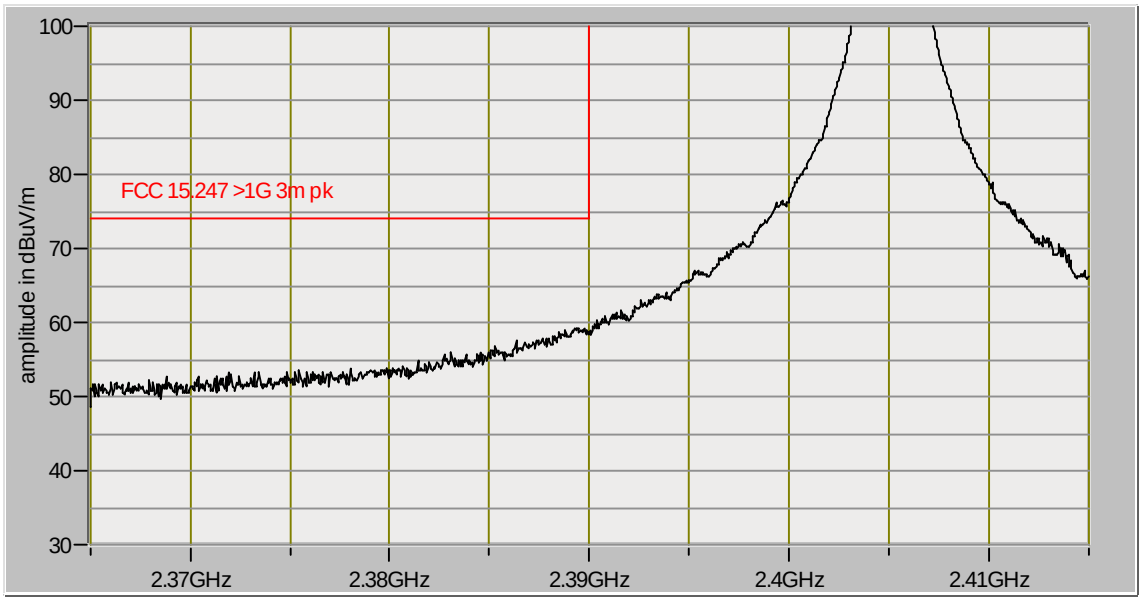
Average



RBW 1 MHz VBW 10 Hz

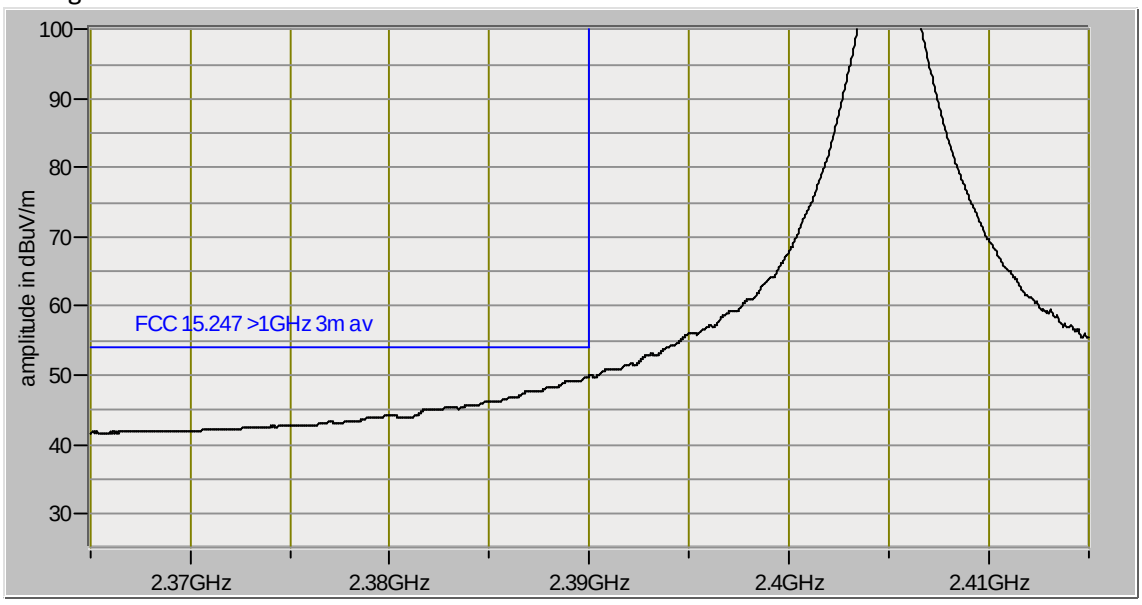
Low channel

Peak



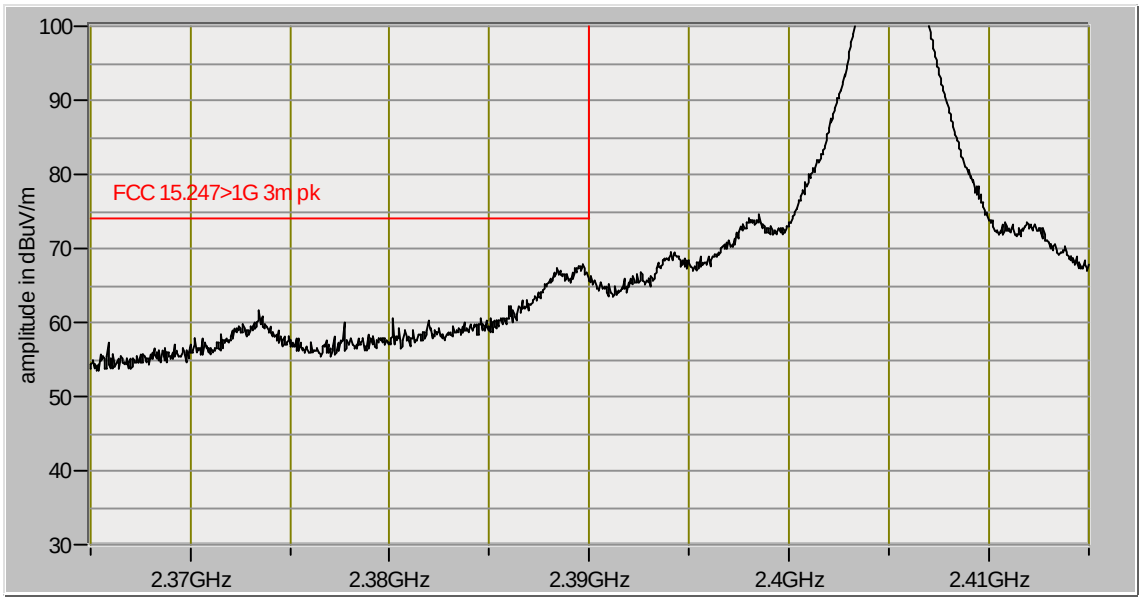
RBW 1 MHz VBW 1 MHz

Average



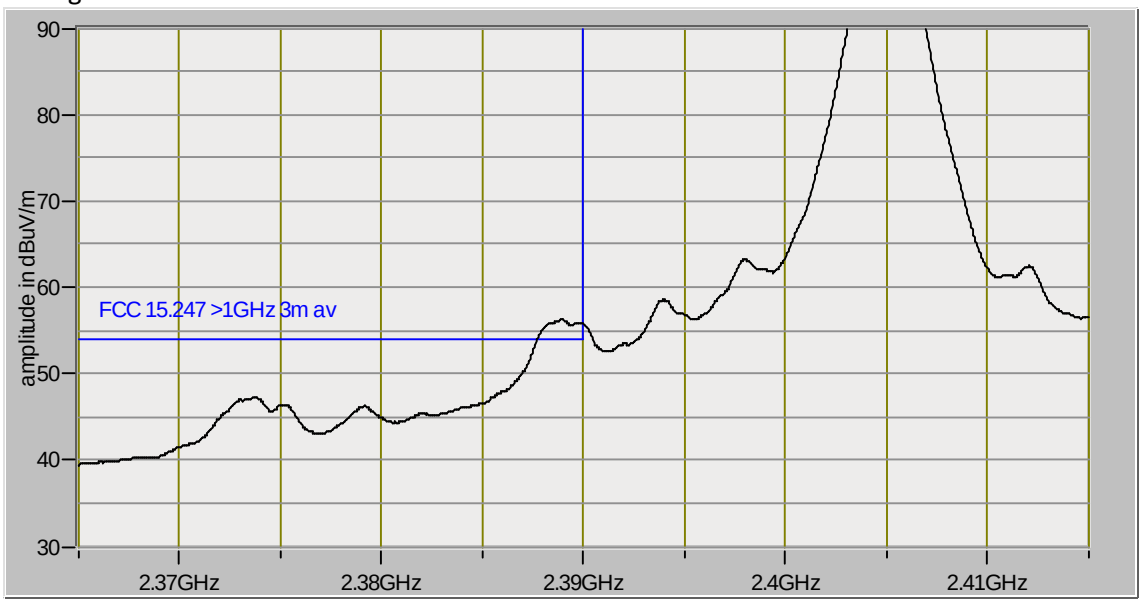
RBW 1 MHz VBW 10 Hz

Freestar radio
low channel
Peak



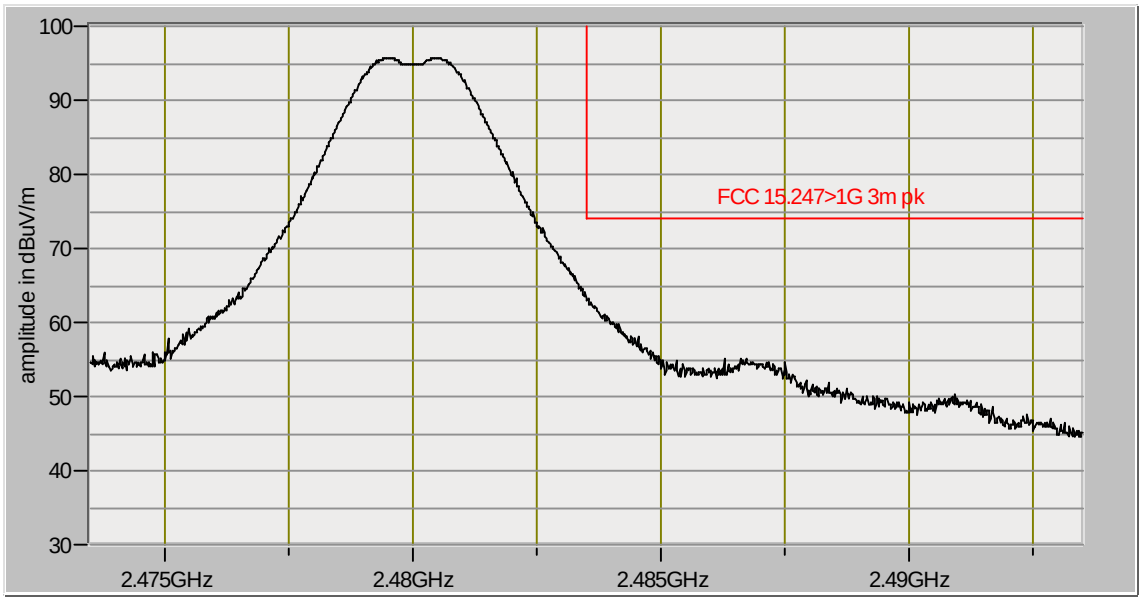
RBW 1 MHz VBW 1 MHz

Average



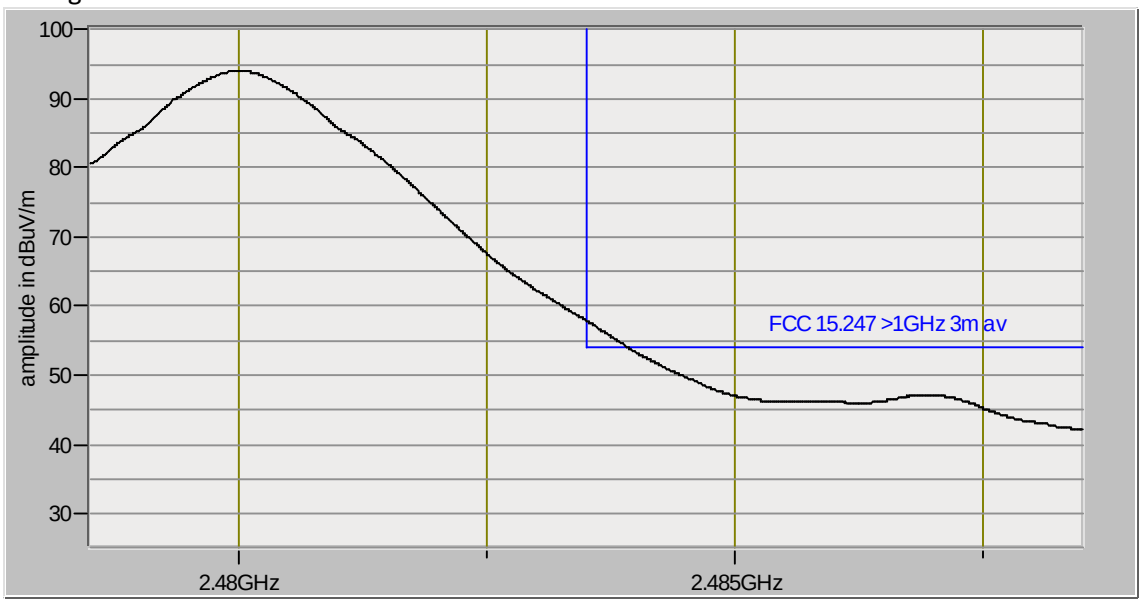
RBW 1 MHz VBW 10 Hz
Per manufacturer, a duty cycle relaxation of -19.6 dB can be applied

high channel
Peak



RBW 1 MHz VBW 1 MHz

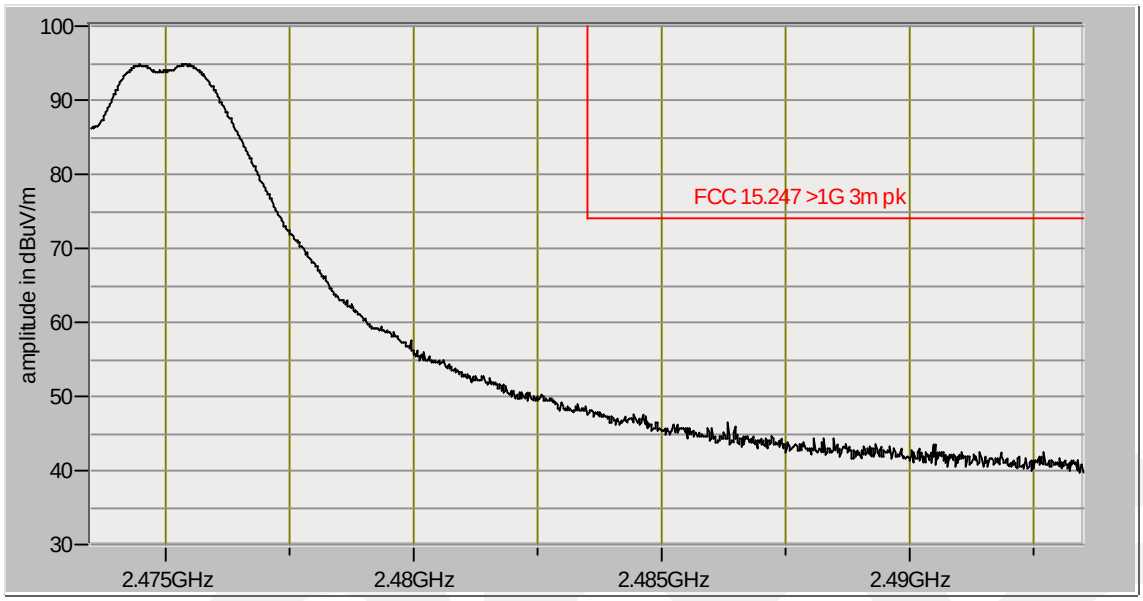
Average



RBW 1 MHz VBW 10 Hz
Per manufacturer, a duty cycle relaxation of -19.6 dB can be applied

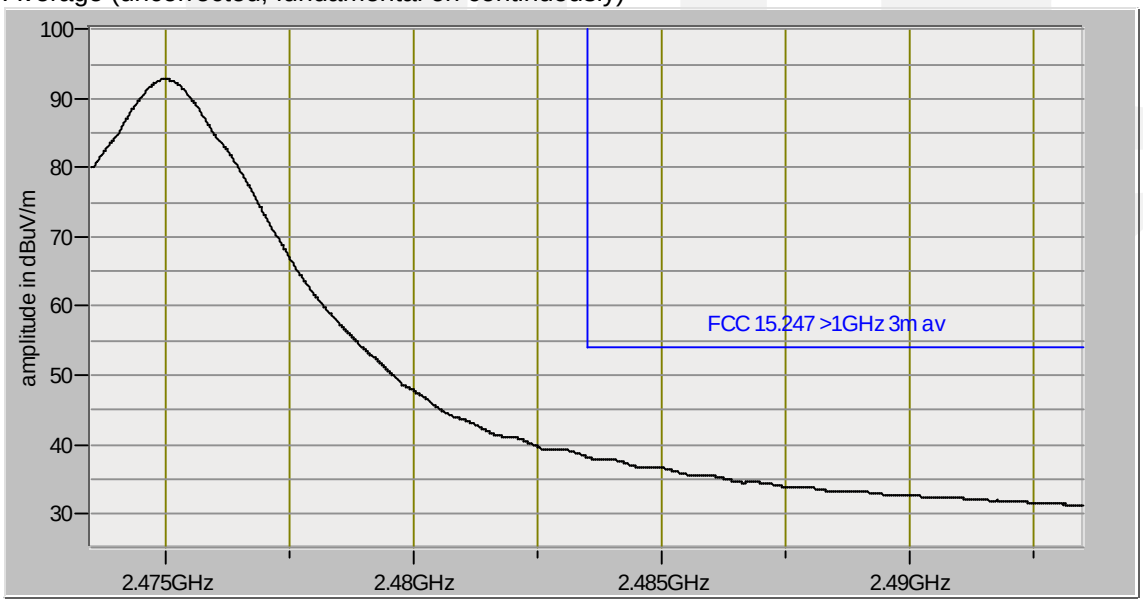
Band edge, Ember radio

High channel
Peak



RBW 1 MHz VBW 1 MHz

Average (uncorrected, fundamental on continuously)

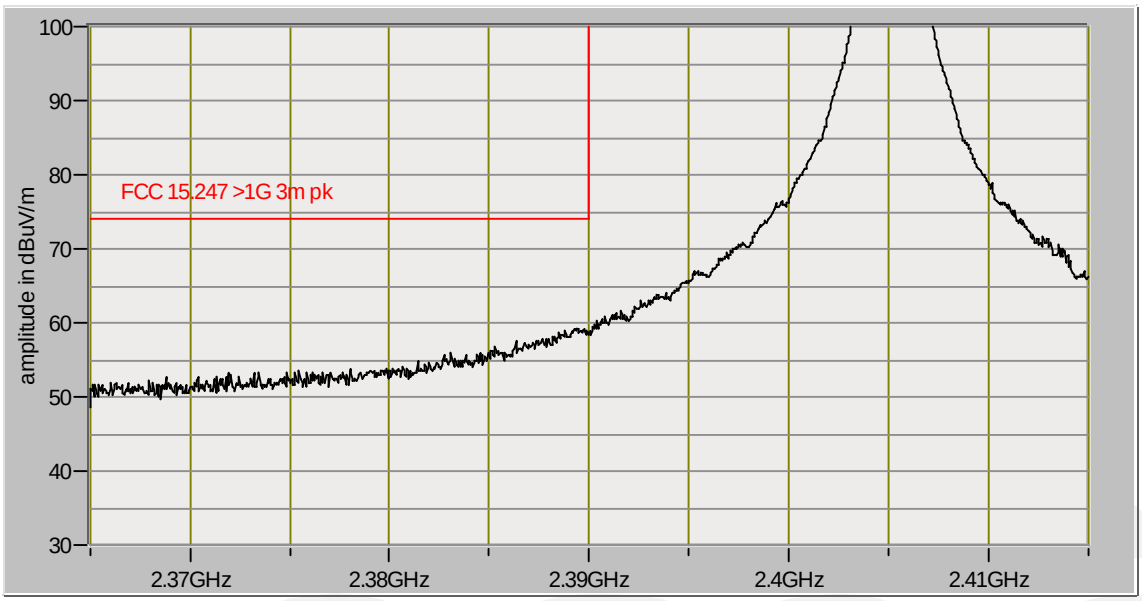


RBW 1 MHz VBW 10 Hz

Per manufacturer, a -19.6 dB duty cycle correction is applicable

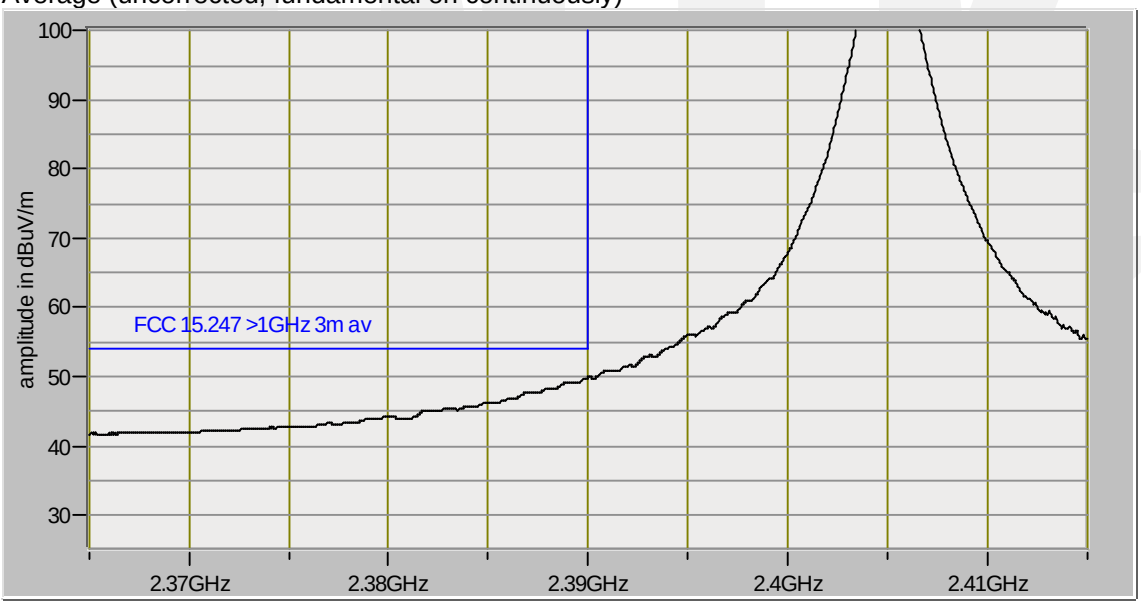
Low channel

Peak



RBW 1 MHz VBW 1 MHz

Average (uncorrected, fundamental on continuously)

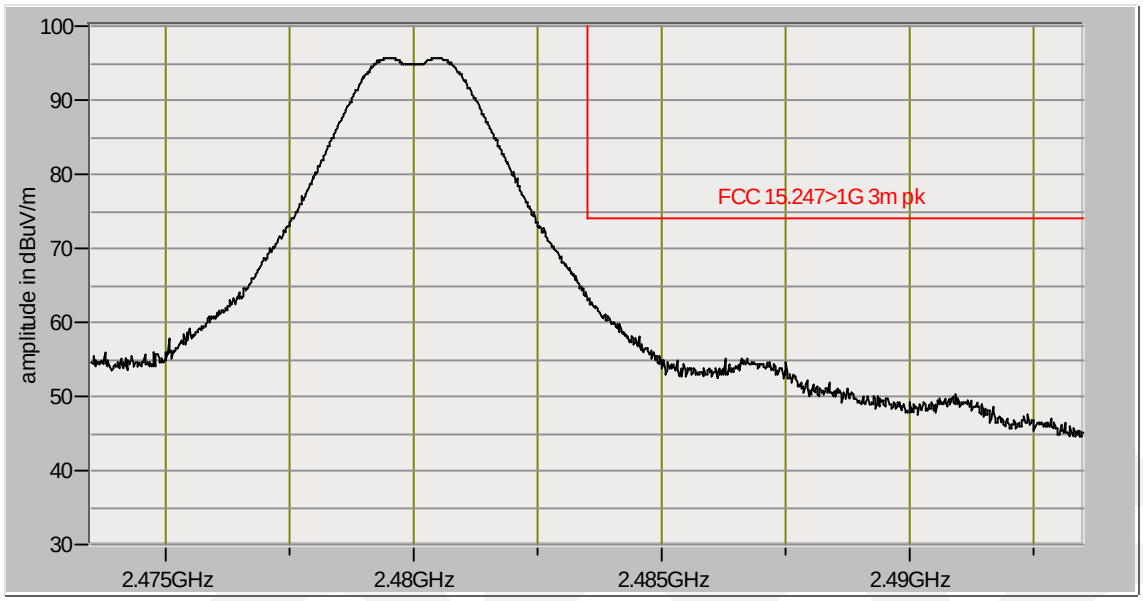


RBW 1 MHz VBW 10 Hz

Per manufacturer, a -19.6 dB duty cycle correction is applicable

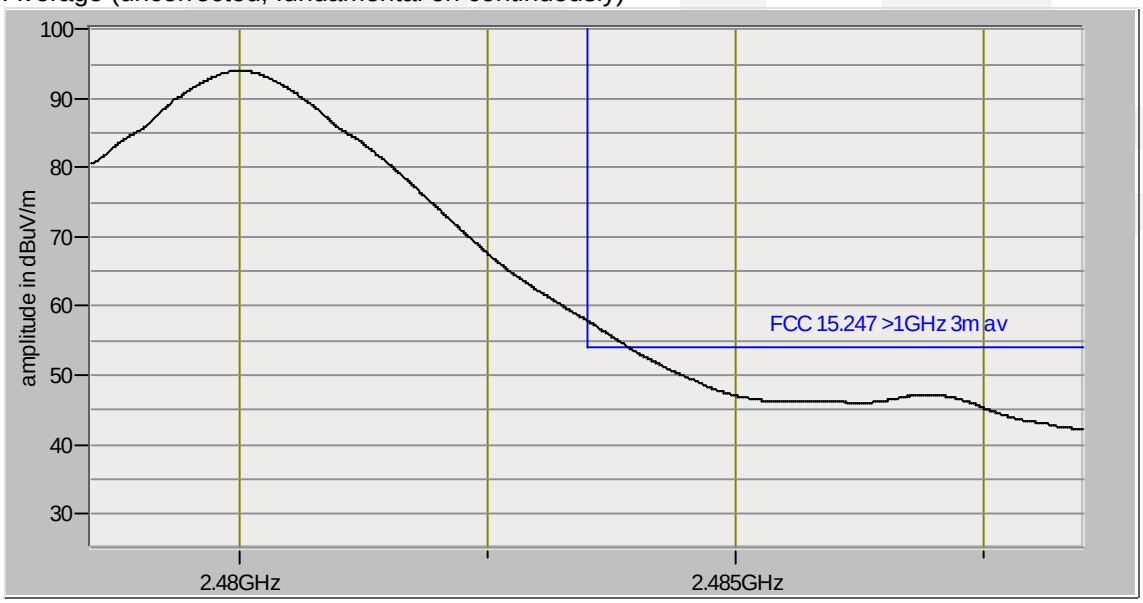
Band edge, Freestar radio

High channel
Peak



RBW 1 MHz VBW 1 MHz

Average (uncorrected, fundamental on continuously)

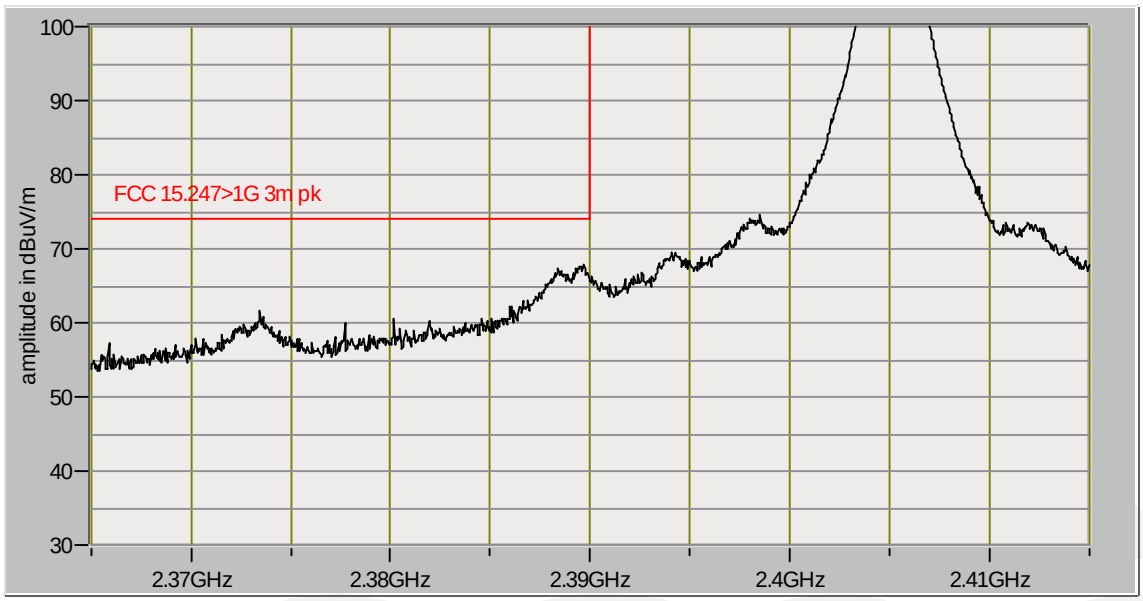


RBW 1 MHz VBW 10 Hz

Per manufacturer, a -19.6 dB duty cycle correction is applicable

Low channel

Peak



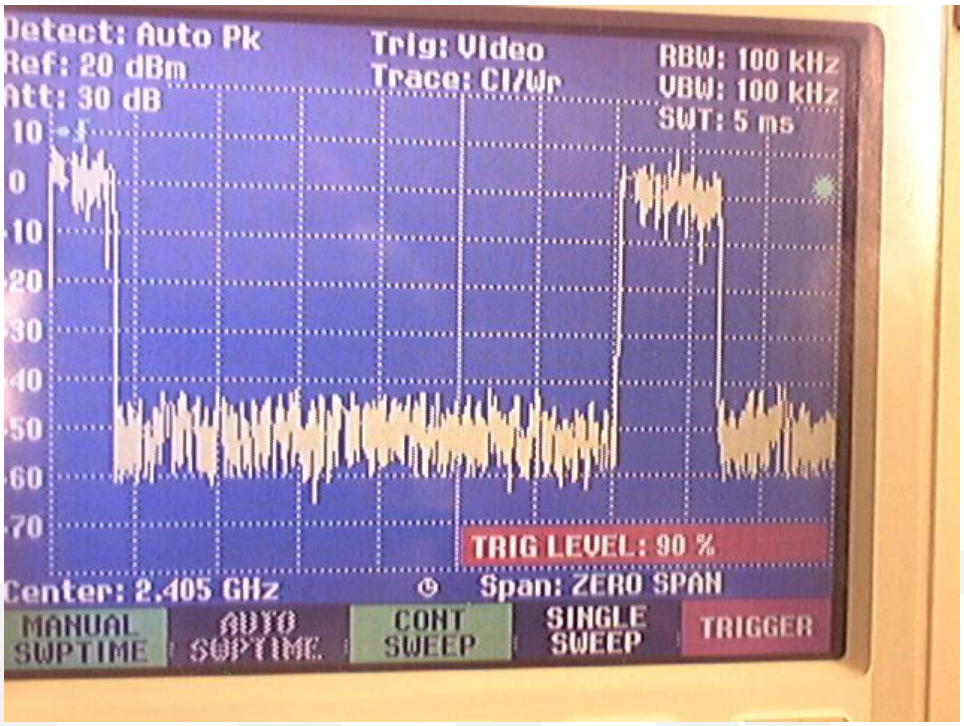
RBW 1 MHz VBW 1 MHz

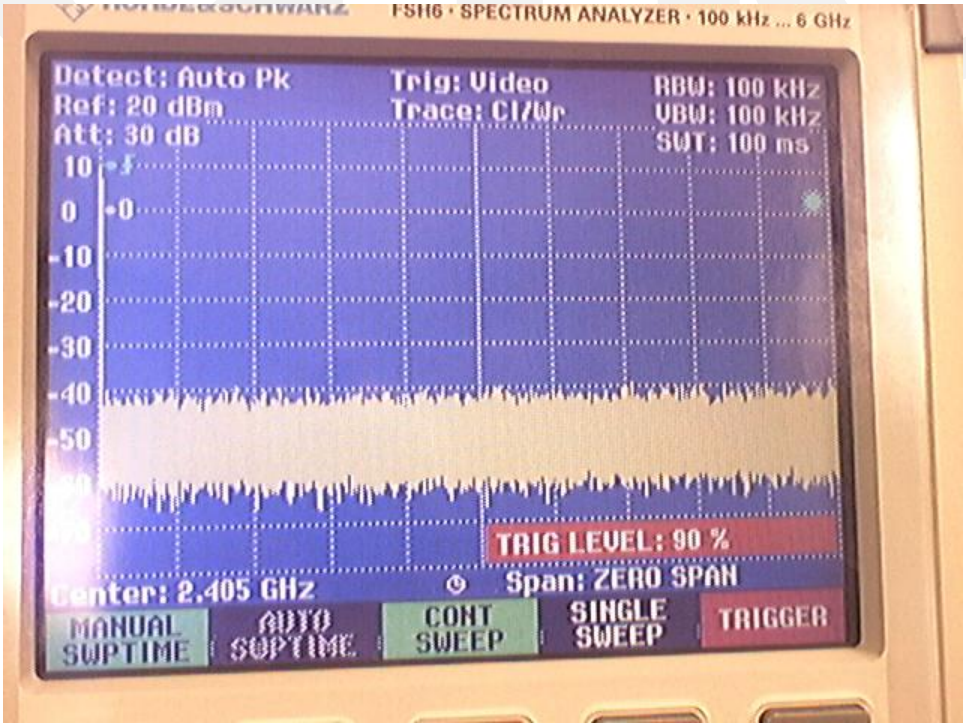
Average (uncorrected, fundamental on continuously)

RBW 1 MHz VBW 10 Hz

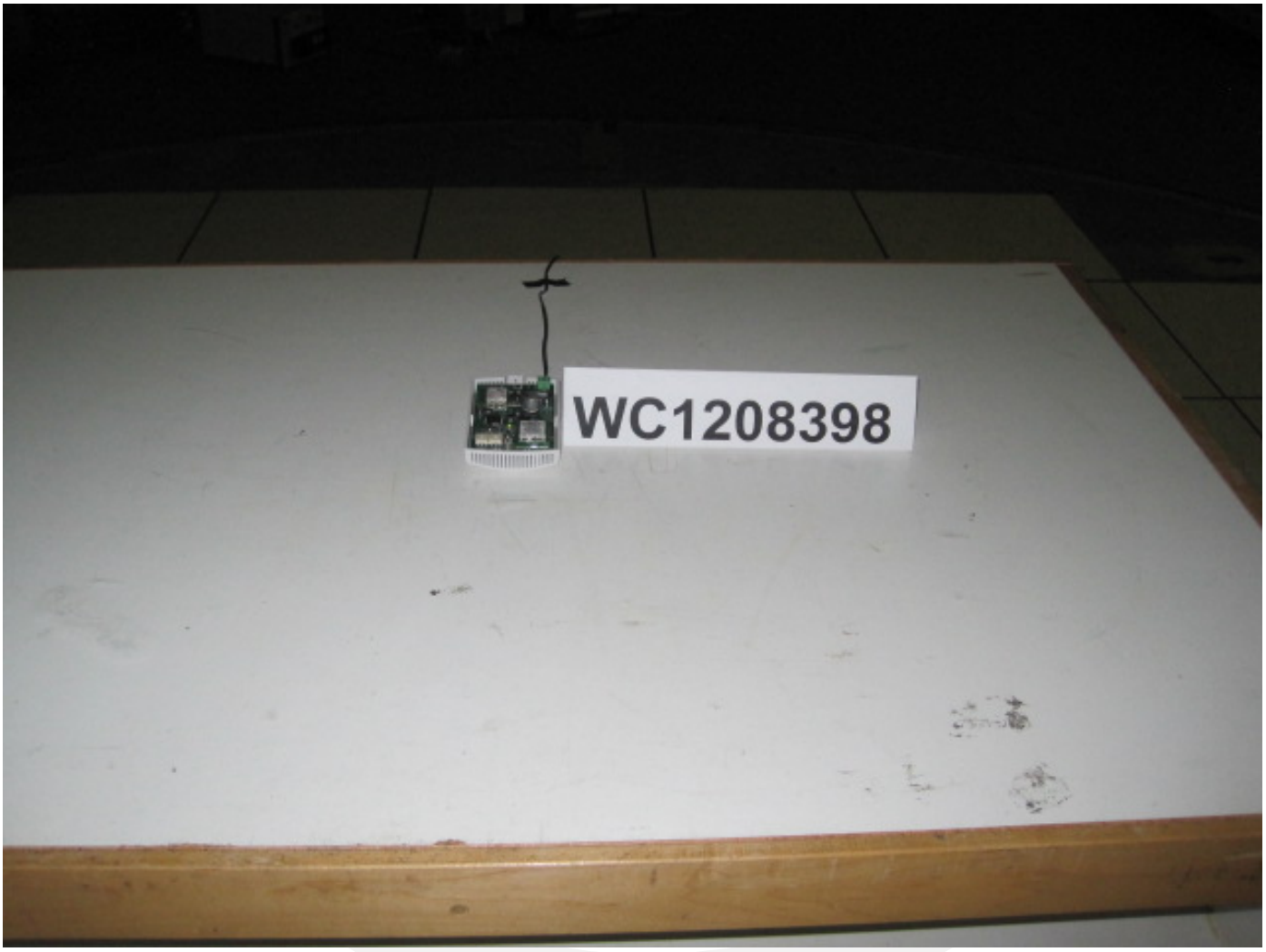
Per manufacturer, a -19.6 dB duty cycle correction is applicable

Duty cycle, per manufacturer
Total maximum on time per 100 mS = 1.1 mS
Duty cycle correction = 10*log(1.1 / 100) = -19.6 dB



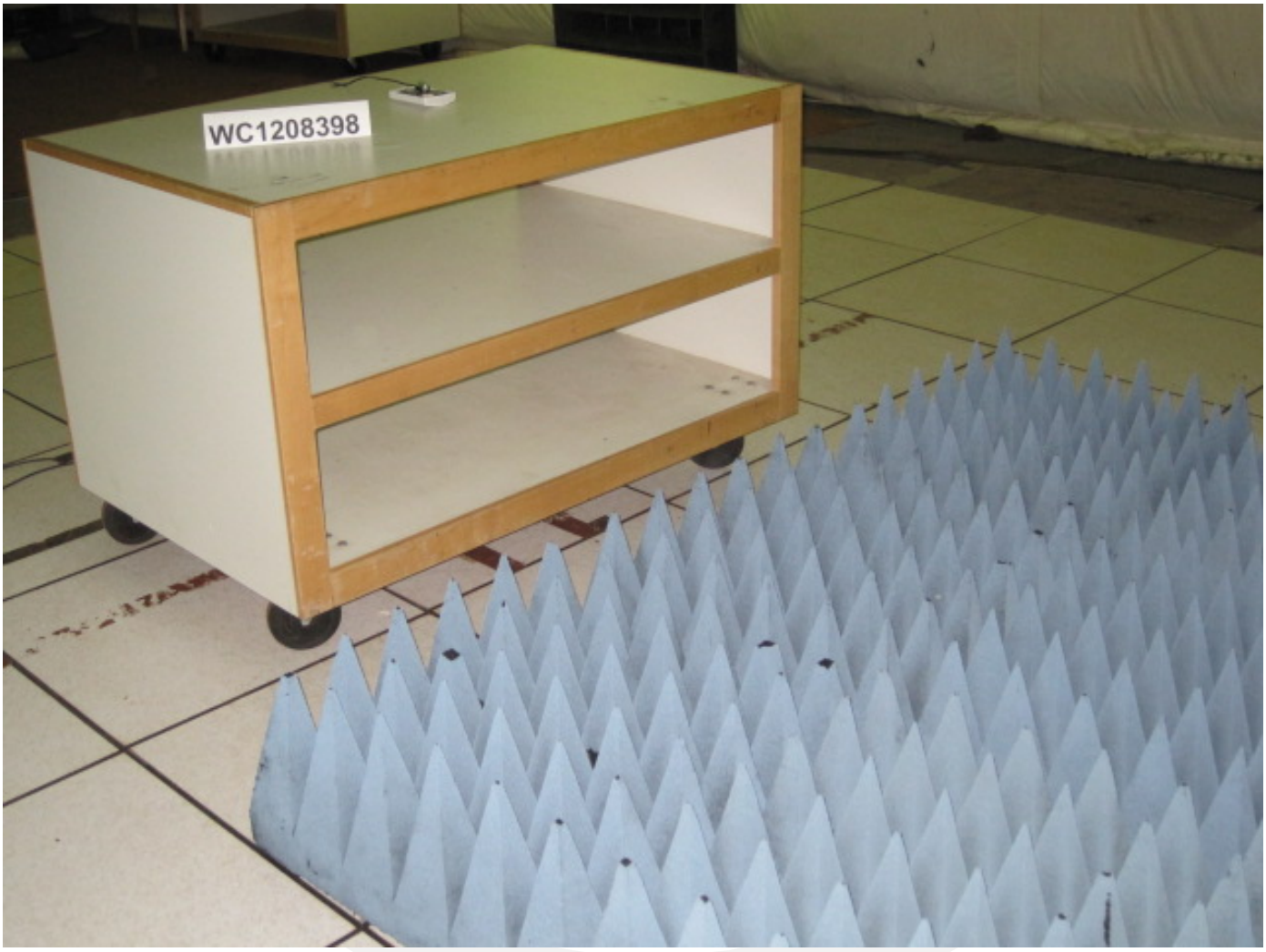


Test-setup photo(s):
Radiated measurements

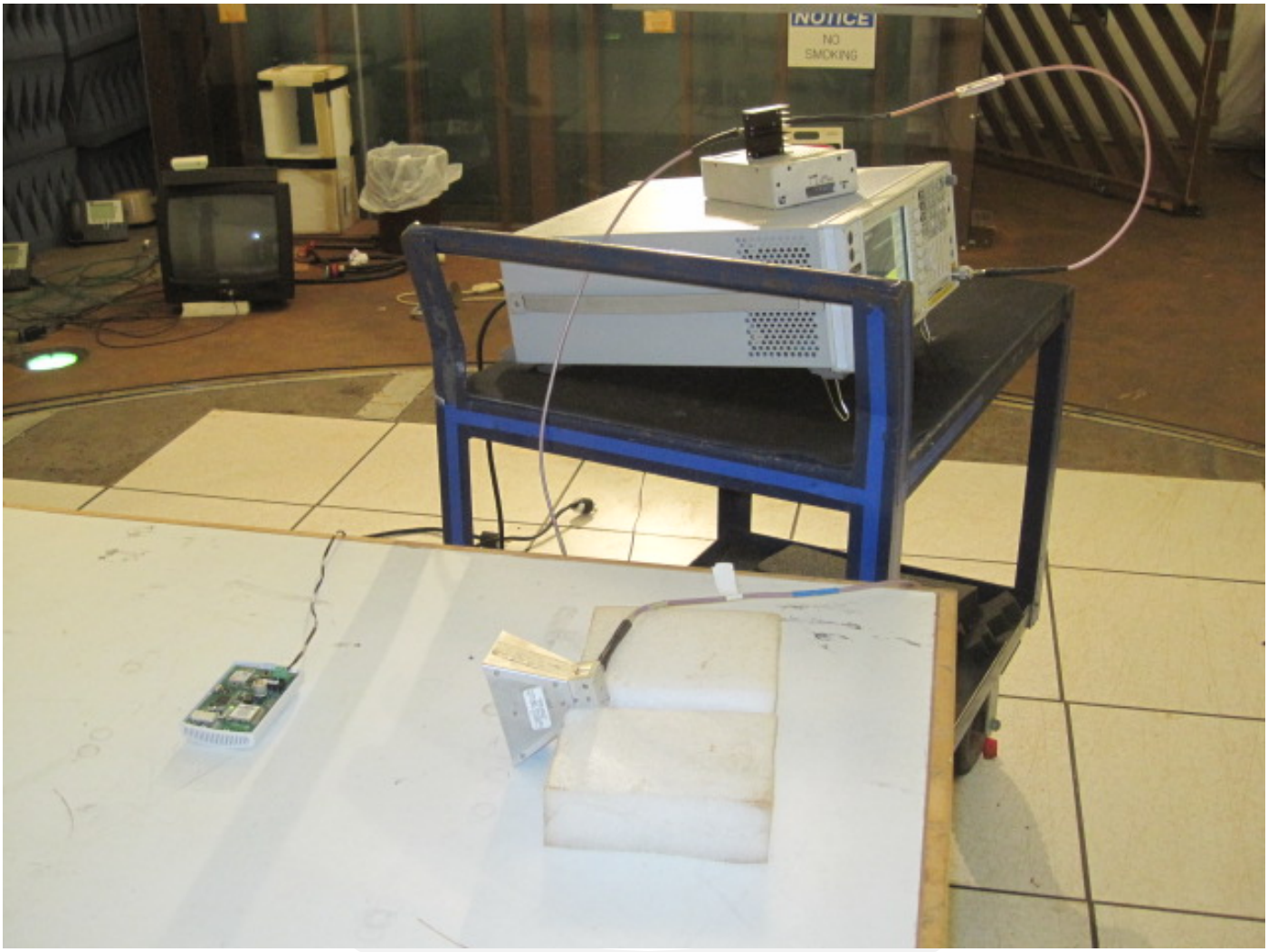


Test-setup photo(s):
Radiated measurements

Test-setup photo(s):
Radiated measurements



Test-setup photo(s):
Radiated measurements



Equipment Under Test (EUT) Test Operation Mode:

The device under test was operated under the following conditions during emissions testing:

☐ - Standby

☐ - Test program (H - Pattern)

☐ - Test program (color bar)

☐ - Test program (customer specific)

☐ - Practice operation

☐ - Normal Operating Mode

■ - See Software and/or Operating Modes in Appendix A.

Configuration of the device under test:

■ - See Constructional Data Form and Block Diagram in Appendix A

☐ - See Product Information Form in Appendix B

GENERAL REMARKS:

None

Modifications required to pass:

■ None
☐ As indicated on the data sheet(s)

Test Specification Deviations: Additions to or Exclusions from:

■ None
☐ As indicated in the Test Plan

SUMMARY:

The requirements according to the technical regulations are

■ - met and the equipment under test does fulfill the general approval requirements.
☐ - **not** met and the equipment under test does **not** fulfill the general approval requirements.

EUT Received Date:	20 August 2012
Condition of EUT:	Normal
Testing Start Date:	20 August 2012
Testing End Date:	27 August 2012

TÜV SÜD AMERICA INC

Tested by:

Greg S Jakubowski
EMC Test Engineer

Approved by:

Joel T Schneider
Senior EMC Engineer

Appendix A

Constructional Data Form

Form

EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE. IF TESTING RESULTS IN MODIFICATIONS TO THE EQUIPMENT, PLEASE SUBMIT A REVISED TP/CDF INDICATING THOSE MODIFICATIONS.
NOTE: This information will be input into your test report as shown below. Press the F1 key at any time to get HELP for the current field selected.

Company:	Trane U.S. Inc		
Address:	4833 White Bear Parkway		
	Saint Paul, MN 55104		
Contact:	Chris VanderKoy	Position:	HW Engineer
Phone:	651.407.4359	Fax:	651.407.4191
E-mail Address:	cvanderkoy@trane.com		

General Equipment Description -- ***NOTE: This information will be input into your test report as shown below.***

EUT Description	Wireless Communications Interface		
EUT Name	Wireless COMM Interface		
Model No.:	FCC/IC:X13790901-01 EU: X13790937-01 (see pg 4 for add'l model number details)	Serial No.:	0A109D
Product Options:			
Configurations to be tested:			

Equipment Modification (*If applicable, indicate modifications since EUT was last tested. If modifications are made during this testing, submit revised TP/CDF after testing is complete.)*

Modifications since last test:

Modifications made during test:

Test Objective(s): ***Please indicate the tests to be performed, entering the applicable standard(s) where noted.***

- ☐ EMC Directive 2004/108/EC (EMC) Std:
- ☐ Machinery Directive 89/392/EEC (EMC) Std:
- ☐ Medical Device Directive 93/42/EEC (EMC) Std:
- ☐ Vehicle Directive - 2004/104/EC (EMC)
  - ☐ Other Vehicle Std:
- ☐ FDA Reviewers Guidance for Premarket Notification Submissions (EMC)
- ☒ FCC: Class ☐ A ☒ B Part
- ☐ VCCI: Class ☐ A ☐ B
- ☐ BSMI: Class ☐ A ☐ B (Separate Report)
- ☒ Canada: Class ☐ A ☒ B
- ☐ Australia: Class ☐ A ☐ B
- ☐ Other:
- ☐ Ag Directive *2009/64/EC (EMC)

Form

EMC Test Plan and Constructional Data Form

Third Party Certification (contact TÜV for quote), if applicable (*Signature on last page required).	
☐ Attestation of Compliance (AoC)*	☐ EMC Certification (used with Octagon Mark)*
☐ Statement of Compliance (SoC, previously CoC)* - All aspects of the essential requirements were assessed	
Protection Class (Req'd for AoC, SoC, EMC Cert. N/A for vehicles) ☐ Class I ☐ Class II ☐ Class III (Press **F1** when field is selected to show additional information on Protection Class.)	
☒ FCC / TCB Certification	☐ Taiwan Certification
☒ Industry Canada / FCB Certification	☐ Korean Certification
☐ e-Mark Certification	

Attendance

Test will be: ☒ Attended by the customer ☐ Unattended by the customer

Failure - *Complete this section if testing will not be attended by the customer.*

If a failure occurs, TÜV SÜD America should:

☐ Call contact listed above, if not available then stop testing. (After hrs phone): _____
☐ Continue testing to complete test series.
☐ Continue testing to define corrective action.
☐ Stop testing.

EUT Specifications and Requirements

Length: 4.5" Width: 3" Height: 1.5" Weight: _____

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: 24V ac or dc (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: 1

Current (Amps/phase(max)): 0.1A/1phase Current (Amps/phase(nominal)): 0.05A/1phase

Other Power supply will be providd

Other Special Requirements

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)
Commercial Buildings

EUT Power Cable

☐ Permanent OR ☒ Removable Length (in meters): 1
☐ Shielded OR ☒ Unshielded
☐ Not Applicable

Form

EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables

			During Test			Shielding								
Type	Analog	Digital	Active	Passive	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length tested (in meters)	Removable	Permanent
EXAMPLE: *RS232*	☐	☒	☒	☐	*2*	☒	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	☒	☐
RS485	☐	☒	☒	☐	1	☐	☒			Phoenix style	n/a	1	☒	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
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	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐

Form

EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: Emisisons: n/a. Immunity: 1.00.28

Description: Development Software used for Emisisons Testing

Equipment Under Test (EUT) Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. Freestar Radio: Transmit, Zigbee Radio Recieve

2. Freestar Radio Receive, Zigbee Radio Transmit

3. Frestar Radio Receive, Zigbee Radio Receive

Equipment Under Test (EUT) System Components -- List and describe all components which are part of the EUT. For FCC & Taiwan testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc)

Description	Model #	Serial #	FCC ID #
WCI	X13790901-01	0A109D	TPF-251701

The WCI has 10 different product #'s. They are all identical in terms of hardware, just different in terms of power levels, plastic enclosures, packaging, and whether or not a cable harness is supplied.

For FCC/IC (100mW) markets:

X13790901-01 Universal WCI individually packaged with wire harness
X13790902-01 Flush mount WCI individually packaged
X13790903-01 Universal WCI bulk pack (box of 30)
X13790904-01 Flush mount WCI bulk pack (box of 30)
X13790941-01 Outdoor WCI individually packaged with wire harness

Note that the 1st and 3rd part have back covers, where the 2nd and 4th do not, i.e. if you turn the product over, the PCB is exposed.

For CE (10mW) markets:

X13790937-01 Universal WCI individually packaged with wire harness
X13790938-01 Flush mount WCI individually packaged
X13790939-01 Universal WCI bulk pack (box of 30)
X13790940-01 Flush mount WCI bulk pack (box of 30)
X13790942-01 Outdoor WCI individually packaged with wire harness

Form

EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc) This information is required for FCC & Taiwan testing.

Description	*Model #*	*Serial #*	*FCC ID #*

Oscillator Frequencies

Manufacturer	*Frequency*	*Derived Frequency*	*Component # / Location*	*Description of Use*
PDI	12MHz	96MHz	Y1/ Near U4	Crystal for STR911 Host processor
PDI	24MHz	2.4GHz	PCB2/ Radio module	Crystal for Freestar Radio
PDI	24MHz	2.4GHz	PCB1/Radio module	Crystal for Zigbee Radio

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*

Form

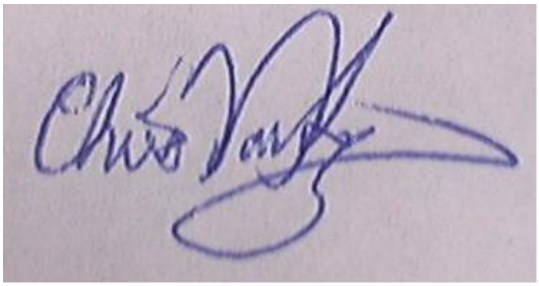
EMC Test Plan and Constructional Data Form

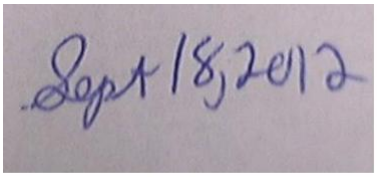
Critical EMI Components (Capacitors, ferrites, etc.)				
Description	***Manufacturer***	***Part # or Value***	***Qty***	***Component # / Location***

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

PLEASE ENTER NAMES BELOW (INSERT ELECTRONIC SIGNATURE IF POSSIBLE)

Authorization (Signature Required if a Third Party Certification is checked on pg 1)



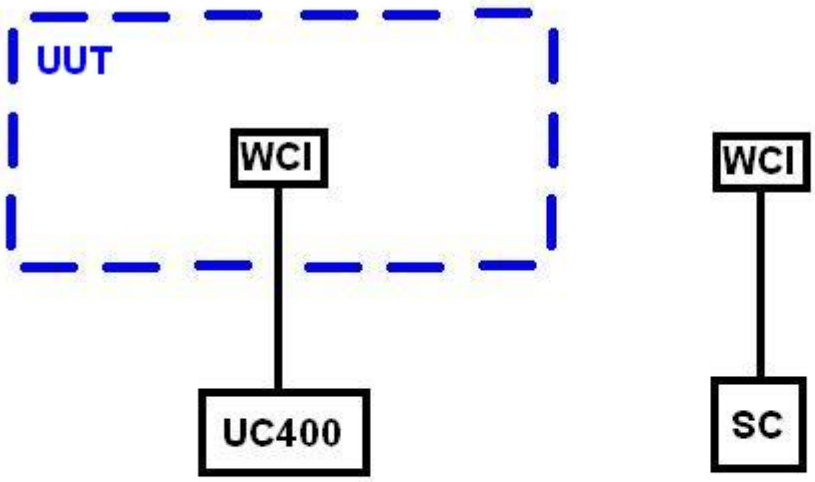


Customer authorization to perform tests according to this test plan.	Date
Chris VanderKoy	Sept 18, 2012
Test Plan/CDF Prepared By (please print)	Date

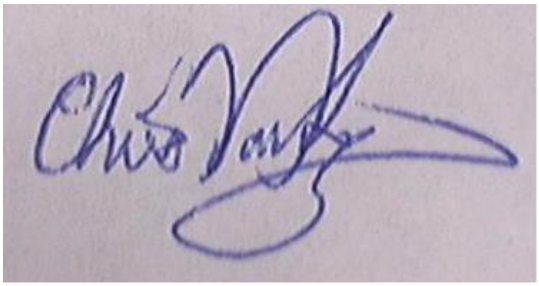
Form

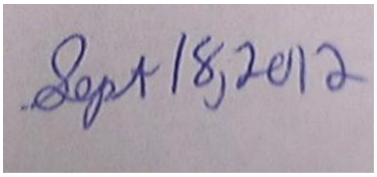
EMC Block Diagram Form

System Configuration Block Diagram -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.



Authorization Signatures





Customer authorization to perform tests according to this test plan.	Date
Chris VanderKoy	Sept 18,2012
Test Plan/CDF Prepared By (please print)	Date

Appendix B

Measurement Protocol

MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Emissions testing is performed according to the procedures in ANSI C63.4-2003, FCC KDB Publication 558074, the article "The Measurement of Occupied Bandwidth" by Industry Canada's certification bureau, & FCC Public Notice DA 02-2138.

Measurement Uncertainty

The test system for conducted emissions – AC lines is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system has a measurement uncertainty of ±1.8 dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. The test system has a measurement uncertainty of ±4.8 dB. The equipment comprising the test systems is calibrated on an annual basis.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

Conducted Emissions

Final measurement levels are determined by connecting the antenna port of the DUT to a spectrum analyzer input via coaxial adapters, high frequency coax, and attenuators as necessary. The loss created by the interconnect apparatus is offset by settings within the analyzer. Specific analyzer settings are determined by the procedures throughout this report.

Radiated Emissions

The spectrum analyzer uses a quasi-peak detector for frequencies up to and including 1 GHz. For measurements above 1 GHz, peak and average detectors are used. The bandwidths used are equal to or greater than 100 Hz from 9 kHz to 150 kHz, 9 kHz from 150 kHz to 30 MHz, 100 kHz from 30 MHz to 1000 MHz, and 1 MHz from 1 GHz to 40 GHz. Video bandwidths are at least three times greater than the IF bandwidth. Average measurements above 1 GHz are also achieved using a peak detector with 1 MHz RBW and 10 Hz VBW.

The final level, in dBμV/m, equals the reading from the spectrum analyzer (Level dBμV), adding the antenna correction factor and cable loss factor (Factor dB) to it, and subtracting the preamp gain (and duty cycle correction factor, if applicable). This result then has the limit subtracted from it to provide the Delta, which gives the tabular data as shown in the data. Intentional radiators are rotated through 3 orthogonal axes to determine the test position yielding the maximum emission levels.

Example:

FREQ (MHz)	LEVEL (dBuV)		CABLE/ANT/PREAMP (dB)	(dB/m)	(dB)	FINAL (dBuV/m)	POL/HGT/AZ	(m)	(deg)	DELTA1
60.80	42.5Qp	+	1.2	+ 10.9	- 25.5 =	29.1	V	1.0	0.0	-10.9

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Test Equipment

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.