

FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS-210 ISSUE 9

CERTIFICATION TEST REPORT

FOR

BTLE Transmitter

MODEL NUMBER: GCC30-4

FCC ID: TXTGCC30-4 IC: - 909H-GCC304

REPORT NUMBER: 11765425

ISSUE DATE: December 17, 2017

Prepared for

Robert Bosch Tool Corp 1800 W Central Rd Mt Prospect, IL, 60056-2230 USA

Prepared by
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Revision History

Rev.	Issue Date	Revisions	Revised By
	December 17, 2017	Initial Issue	V Sabalvaro

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REPORT NO: 11765425 DATE:December 17, 2017 IC: 909H-GCC304 FCC ID: TXTGCC30-4

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Robert Bosch Tool Corp

1800 W Central Rd

Mt Prospect, IL, 60056-2230

EUT DESCRIPTION: Bluetooth Tracktag

MODEL: GCC30-4

SERIAL NUMBER: Non-Serialized

DATE TESTED: August 23 – October 23, 2017

APPLICABLE STANDARDS

STANDARD TEST RESULTS

CFR 47 Part 15 Subpart C Pass

INDUSTRY CANADA RSS-210 Issue 9 Annex B.10 Pass

INDUSTRY CANADA RSS-GEN Issue 4 Pass

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL LLC based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

Approved & Released For

UL LLC By:

Tested By:

Bart Mucha Staff Engineer

UL LLC

Vincent Sabalvaro **EMC ENGINEER**

UL LLC

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-210 Issue 9.

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3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 333 Pfingsten Road, Northbrook, IL 60062 USA.

UL NBK is accredited by NVLAP, Laboratory Code 100414-0. The full scope of accreditation can be viewed at http://ts.nist.gov/

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Sample Calculations

Radiated Field Strength and Conducted Emissions data contained within this report is calculated on the following basis:

Field Strength (dBuV/m) = Meter Reading (dBuV) + AF (dB/m) - Gain (dB) + Cable Loss (dB) Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable Loss (dB) + LISN IL (dB) Conducted Current (dBuA) = Meter Reading (dBuV) + Cable Loss (dB) - Transducer Factor (dBohms)

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test	Range	Equipment	Uncertainty k=2
Radiated Emissions	9k-30MHz	H-Field Loop	3.15dB
Radiated Emissions	200-1000MHz	LogP 3m Horz	4.00dB
Radiated Emissions	200-1000MHz	LogP 3m Vert	5.36dB
Radiated Emissions	30-200MHz	Bicon 10m Horz	4.48dB
Radiated Emissions	30-200MHz	Bicon 10m Vert	4.49dB
Radiated Emissions	200-1000MHz	LogP 10m Horz	3.79dB
Radiated Emissions	200-1000MHz	LogP 10m Vert	3.84dB
Radiated Emissions	1-18GHz	Horn	4.32dB

Uncertainty figures are valid to a confidence level of 95%.

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5. EQUIPMENT UNDER TEST

5.1. **DESCRIPTION OF EUT**

The EUT, GCC30-4 Bluetooth Tracktag, is a BTLE Transmitter which operates over the advertising channels 2402MHz, 2426MHz and 2480MHz. The transmitter emits a periodic pulse every 8 seconds for the tracking of the proximity to the paired mobile device. The device is manufactured by Robert Bosch Tool Corp

5.2. **MAXIMUM OUTPUT POWER**

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Average E-Field Strength (dBuV/m)
2402-2480	TX	45.45

5.3. **DESCRIPTION OF AVAILABLE ANTENNAS**

The radio is equipped with an embedded, impedance matched quarter-wave antenna. Antenna was designed as a trace on PCB.

5.4. **WORST-CASE CONFIGURATION AND MODE**

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Z-Axis orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

5.1. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List										
Description Manufacturer Model Serial Number FCC IE										
None	-	-	-	-						

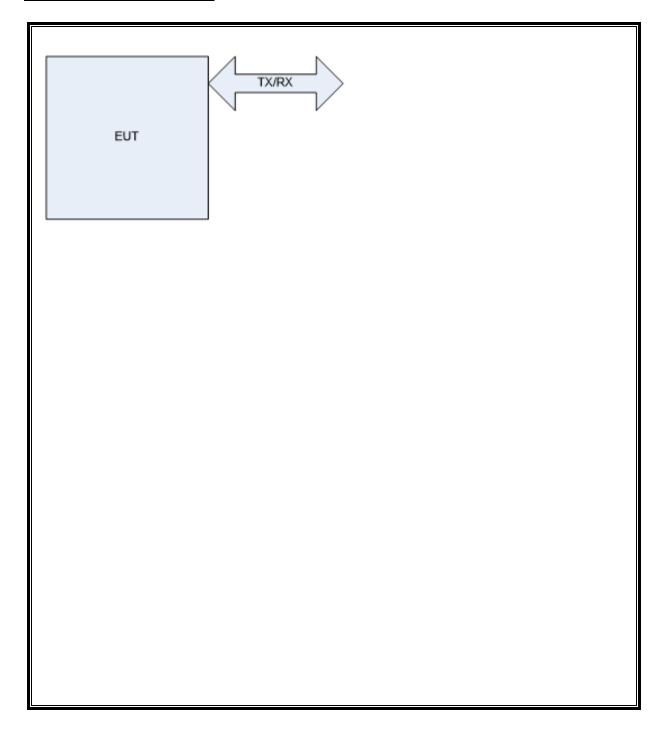
I/O CABLES

I/O Cable List										
Cable Port # of identical Connector Cable Cable Remarks										
No		ports	Type	Type	Length (m)					
		•	, · ·	,,,	. ,					

TEST SETUP

The EUT is programmed for continuous TX mode or normal cycle mode during transmitter tests.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Conducted Software	UL	UL EMC	V	er 9.5, May 17	2012
Signal Analyzer	Agilent	N9030A	EMC4360	1/27/2017	1/31/2018
Test Receiver	Rhode & Schwarz	ESCI	EMC4328	12/2/2016	12/31/2017
Log-P Antenna	Chase	VBA6106A	EMC4078	2/15/2017	2/15/2018
Bicon Antenna	Chase	UPA6109	EMC4313	2/15/2017	2/15/2018
Antenna Array	UL	BOMS	EMC4276	1/27/2017	1/31/2018
Test Receiver	Rhode & Schwarz	ESU	EMC4323	12/24/2016	12/31/2017
Loop Antenna	EMCO	6502/1	EMC4026	9/12/2017	9/30/2018

7. MEASUREMENT METHODS

ANSI C63.10:2013 for the following tests:

Duty Cycle
20dB and 99% Bandwidth
Radiated Spurious Emissions

8. NEAR FIELD MEASUREMENTS

8.1. DUTY CYCLE

LIMITS

Measured for the purpose of:

When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 s (100 ms).

The average field strength may be found by measuring the peak pulse amplitude (in log equivalent units) and determining the duty cycle correction factor (in dB) associated with the pulse modulation

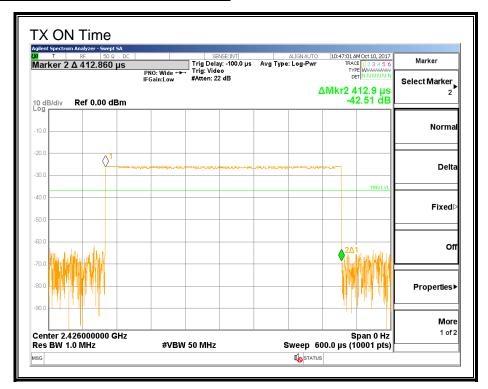
PROCEDURE

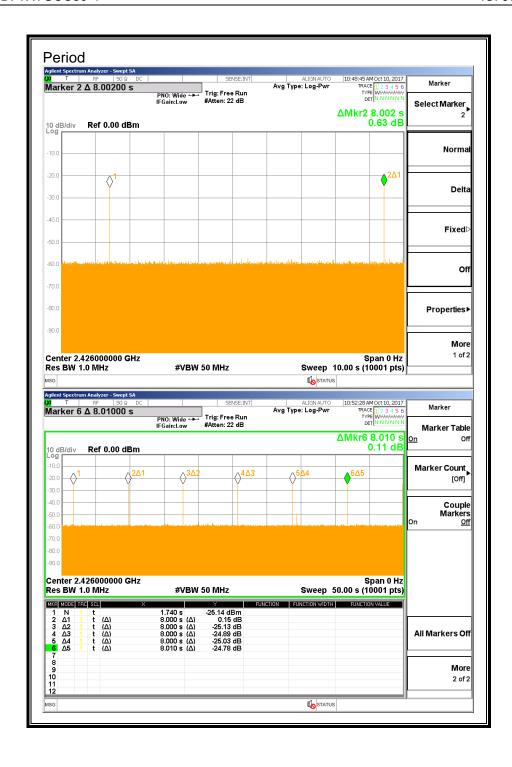
ANSI C63.10, section 7.5

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time Period D		Duty Cycle	Duty	Duty Cycle		
	В		x	Cycle	Correction Factor		
	(msec)	(msec)	(linear)	(%)	(dB)		
BTLE	0.413	100 000	0.0041290	0.41290%	-47.68		

DUTY CYCLE PLOTS for Individual Channel





8.1. 20dB Bandwidth and 99% Bandwidth

LIMITS

For reporting purpose only

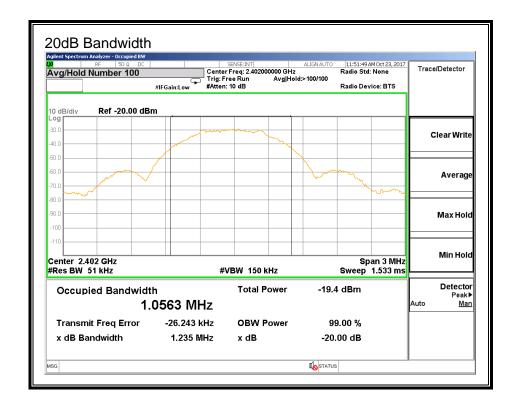
MEASUREMENT METHOD

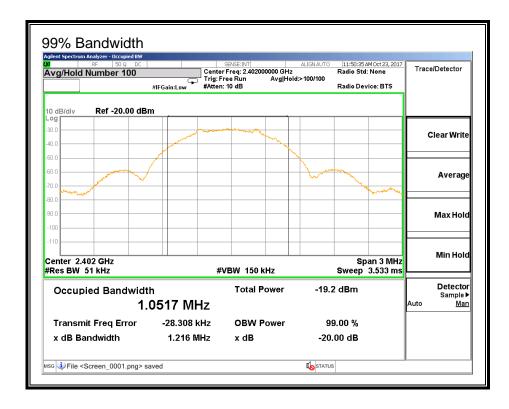
ANSI C63.10:2013, section 7.8.7

RESULTS

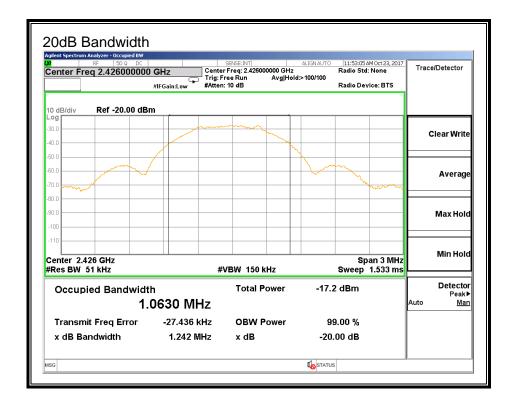
Channel	Frequency	20dB Bandwidth	99% Bandwidth
	(MHz)	(MHz)	(MHz)
Low	2402	1.05	1.235
Mid	2426	1.06	1.242
High	2480	1.05	1.21

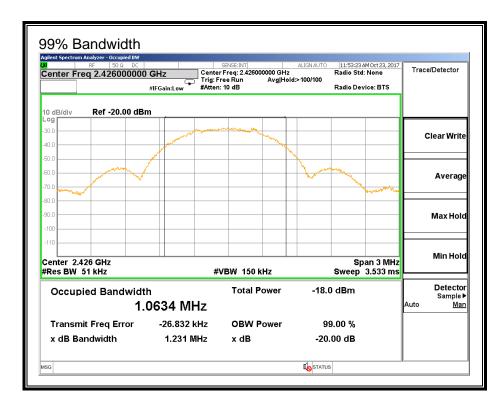
Low Channel



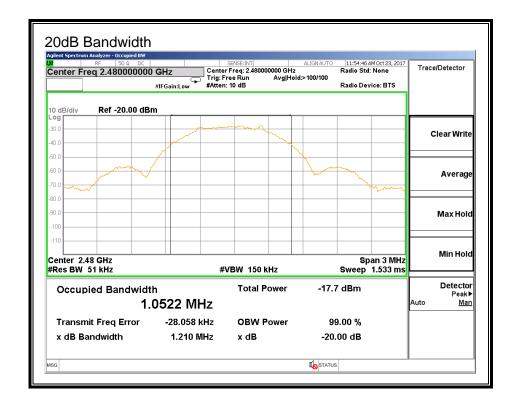


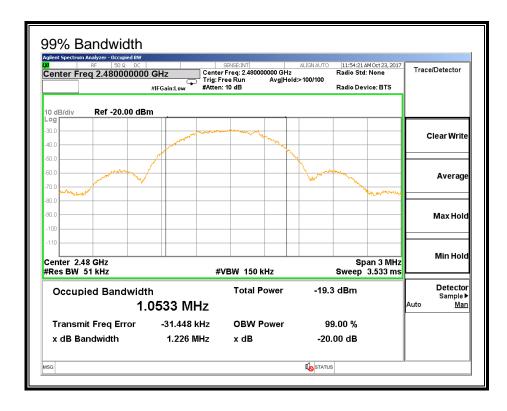
Middle Channel





High Channel





9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.249

IC RSS-210 Clause B.10

	_	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

PROCEDURES

ANSI C63.10:2013, Section 11.12

9.2. RADIATED SPUROUS EMSSIONS

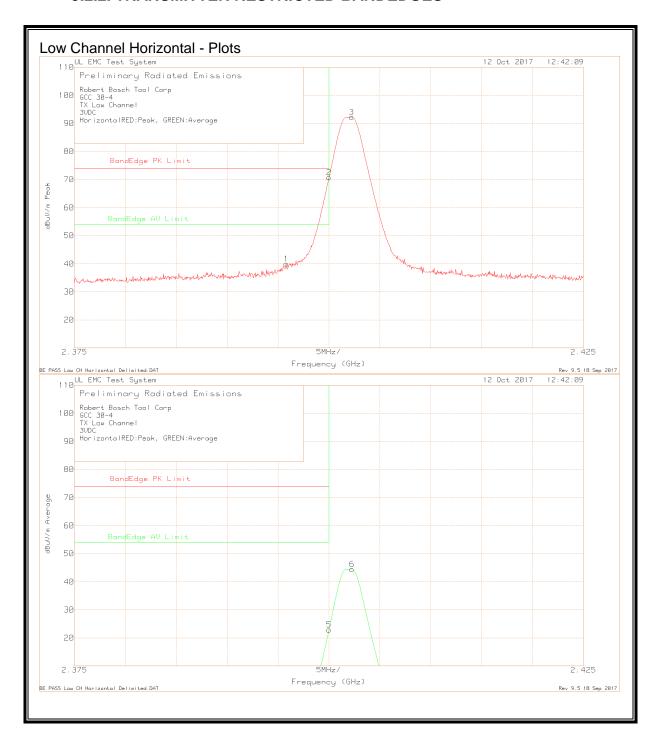
9.2.1. Fundamental Frequency Radiated Emissions

Data

Robert Bosc	h Tool Co	rp												
GCC30-4														
3VDC Batter	У													
					Corrected				Corrected					
Test	Meter		Antenna		Peak		PK	Duty Cycle	Average		AV			
Frequency	Reading		Factor	Path	Reading	PK Limit	Margin	Correction	Reading	AV Limit	Margin	Azimuth	Height	
(GHz)	(dBuV)	Detector	(dBm)	(dB)	dBuV/m	dBuV/m	(dB)	Factor (dB)	dBuV/m	dBuV/m	(dB)	[Degs]	[cm]	Polarity
Low CH														
2.4022	121.56	Pk	21.8	-51.15	92.21	114	-21.79	-47.68	44.53	94	-49.47	50	118	Н
2.4022	114.07	Pk	21.8	-51.15	84.72	114	-29.28	-47.68	37.04	94	-56.96	338	101	V
Mid Channe	1													
2.4262	122.55	Pk	21.9	-51.32	93.13	114	-20.87	-47.68	45.45	94	-48.55	208	128	Н
2.4262	115.54	Pk	21.9	-51.32	86.12	114	-27.88	-47.68	38.44	94	-55.56	144	102	V
High Channe	el													
2.4797	121.42	Pk	22	-51.37	92.05	114	-21.95	-47.68	44.37	94	-49.63	99	133	V
2.4797	124.75	Pk	22	-51.37	95.38	114	-18.62	-47.68	47.7	94	-46.3	58	156	Н
Pk - Peak de	tector													
Av - Average	e detectio	on												

Averge measuremnts were not conducted, however per C63.10 Section 7.5 duty cycle factor was measured and it was added to peak level. Because of duty cycle factor is larger then the average to peak limit delta and since all peaks are under the peak limit the devices is deemed to

9.2.2. TRANSMITTER RESTRICTED BANDEDGES



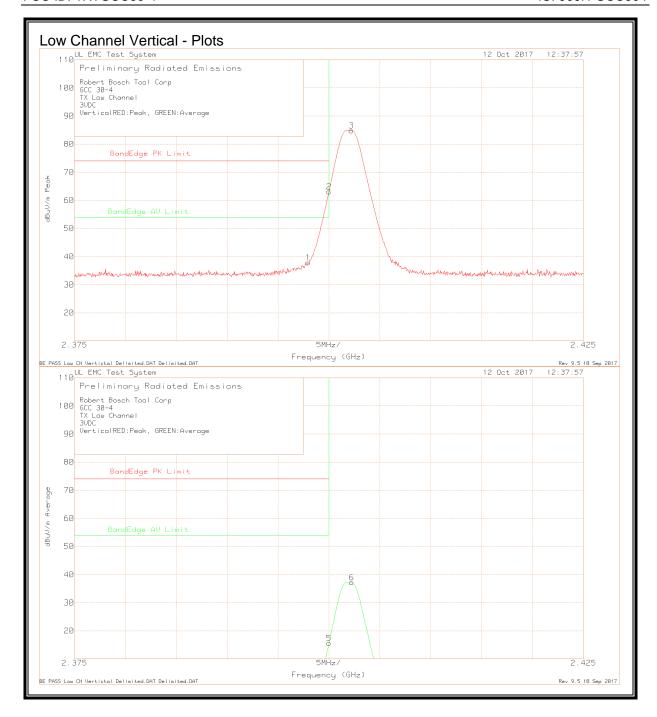
FORM NO: CCSUP4701J

333 Pfingsten Rd., Northbrook, IL 60062, USA

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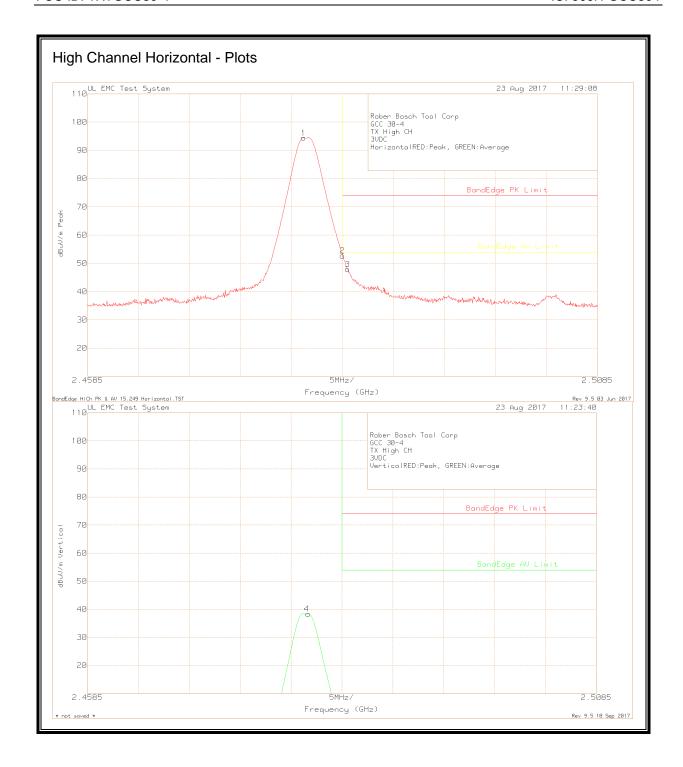
Low Channel Horizontal - Data

Robert E	Bosch Tool C	orp												
GCC 30-4	4													
TX Low (Channel													
3VDC														
Trace M	Arkers													
	Test	Meter		Antenna		Duty Cycle	Corrected	BandEdge	Pk	BandEdge	AV			
Marker	Frequency	Reading		Factor	Path	Correction	Reading	PK Limit	Margin	AV Limit	Margin	Azimuth	Height	
No.	(GHz)	(dBuV)	Detector	(dBm)	(dB)	Factor (dB)	dBuV/m	dBuV/m	(dB)	dBuV/m	(dB)	[Degs]	[cm]	Polarity
1	2.3958	69.14	Pk	21.8	-50.9	-	40.04	74	-33.96	-	-	50	118	Н
2	2.4	100	Pk	21.8	-51.02	-	70.78	74	-3.22	-	-	50	118	Н
3	2.4022	121.59	Pk	21.8	-51.15	-	92.24	-	-	-	-	50	118	Н
4	2.3966	69.84	Pk	21.8	-50.92	-47.7	-6.98	-	-	54	-60.98	50	118	Н
5	2.4	99.85	Pk	21.8	-51.02	-47.7	22.93	-	-	54	-31.07	50	118	Н
6	2.4023	121.55	Pk	21.8	-51.15	-47.7	44.5	-	-	-	-	50	118	Н
Pk - Pea	k detector													



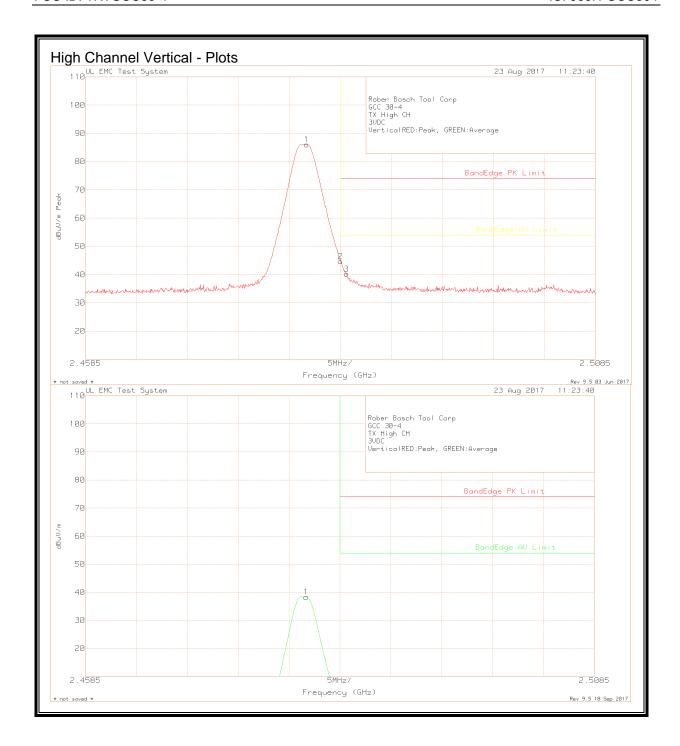
Low Channel Vertical - Data

Robert I	Bosch Tool C	orp												
GCC 30-	4													
TX Low	Channel													
3VDC														
Trace M	Arkers													
	Test	Meter		Antenna		Duty Cycle	Corrected	BandEdge	Pk	BandEdge	AV			
Marker	Frequency	Reading		Factor	Path	Correction	Reading	PK Limit	Margin	AV Limit	Margin	Azimuth	Height	
No.	(GHz)	(dBuV)	Detector	(dBm)	(dB)	Factor (dB)	dBuV/m	dBuV/m	(dB)	dBuV/m	(dB)	[Degs]	[cm]	Polarity
1	2.398	67.2	Pk	21.8	-51.1	-	37.9	74	-36.1	-	-	338	101	V
2	2.4	92.36	Pk	21.8	-51.02	-	63.14	74	-10.86	-	-	338	101	V
3	2.4022	114.21	Pk	21.8	-51.16	-	84.85	-	-	-	-	338	101	V
4	2.3989	75.55	Pk	21.8	-51.16	-47.7	-1.51	-	-	54	-55.51	338	101	V
5	2.4	92.53	Pk	21.8	-51.02	-47.7	15.61	-	-	54	-38.39	338	101	V
6	2.4022	114.25	Pk	21.8	-51.15	-47.7	37.2	-	-	-	-	338	101	V
Pk - Pea	k detector													



High Channel Horizontal - Data

Rober Bo	osch Tool Co	rp												
GCC 30-4	1													
TX High	СН													
3VDC														
Trace M	A riko ra													
Trace ivi						D . C .		D IE I	D.I	D. JEJ.	417			
	Test	Meter		Antenna		Duty Cycle	Corrected	BandEdge	PK	BandEdge	AV			
Marker	Frequency	Reading		Factor	Path	Correction	Reading	PK Limit	Margin	AV Limit	Margin	Azimuth	Height	
No.	(GHz)	(dBuV)	Detector	(dBm)	(dB)	Factor (dB)	dBuV/m	dBuV/m	(dB)	dBuV/m	(dB)	[Degs]	[cm]	Polarity
1	2.4797	123.81	Pk	22	-51.37	-	94.44	-	-	-	-	46	196	Н
2	2.4835	82.03	Pk	22.1	-51.42	-	52.71	74	-21.29	-	-	46	196	Н
3	2.484	77.29	Pk	22.1	-51.49	-	47.9	74	-26.1	-	-	46	196	Н
4	2.4797	123.81	Pk	22	-51.37	-47.7	46.74	-	-	-	-	46	196	Н
5	2.4835	82.03	Pk	22.1	-51.42	-47.7	5.01	-	-	54	-48.99	46	196	Н
6	2.484	77.29	Pk	22.1	-51.49	-47.7	0.2	-	-	54	-53.8	46	196	Н
Pk - Pea	k detector													

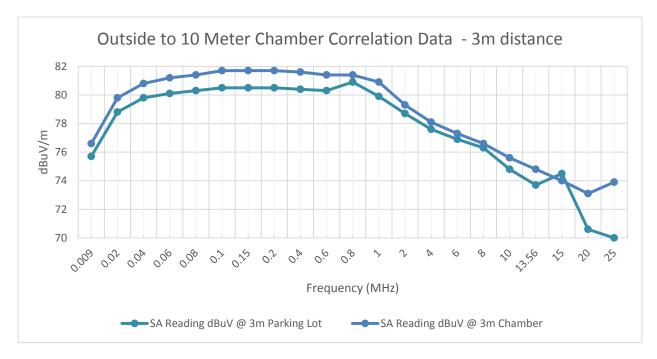


High Channel Vertical - Data Rober Bosch Tool Corp GCC 30-4 TX High CH 3VDC Trace MArkers Test Meter Antenna Duty Cycle | Corrected | BandEdge | Pk BandEdge AV Marker Frequency Reading Factor Path Correction Reading PK Limit Margin AV Limit Margin Azimuth Height No. (GHz) (dBuV) Detector (dBm) (dB) Factor (dB) dBuV/m dBuV/m (dB) dBuV/m (dB) [Degs] [cm] Polarity 1 2.4802 115.44 Pk 2 2.4835 74.02 Pk 22 -51.39 -86.05 -117 74 -29.3 -22.1 -51.42 -44.7 99 V 117 2.4841 69.62 Pk 22.1 -51.48 -40.24 74 -33.76 -117 99 V 3 -47.7 4 2.4802 115.44 Pk 22 -51.39 38.35 -117 99 V 74.02 Pk 2.4835 -47.7 5 22.1 -51.42 -3 -54 -48.99 117 99 V 2.4841 69.62 Pk 22.1 -51.48 -47.7 -7.46 -54 -53.8 117 99 V

Pk - Peak detector

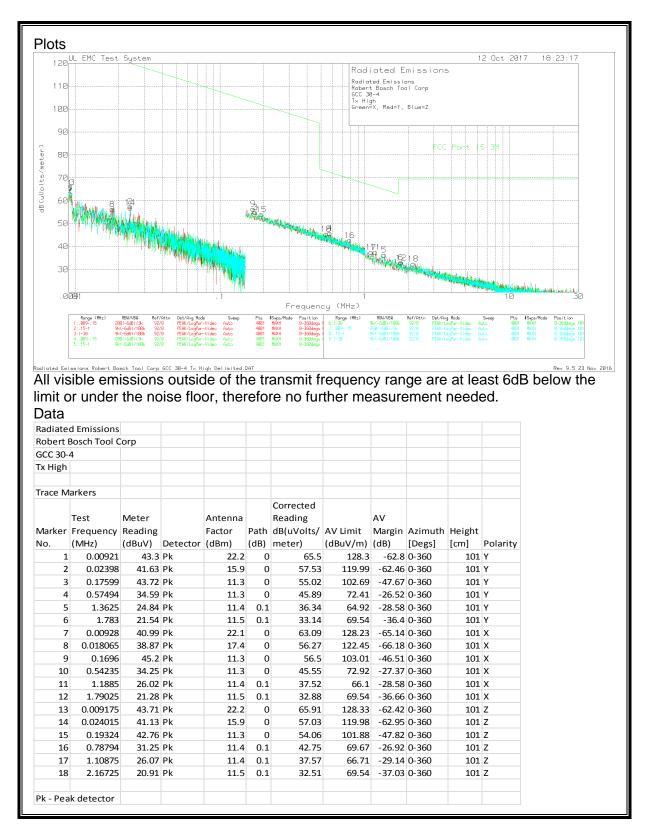
9.2.3. SPURIOUS EMISSIONS 9kHz-30MHz Open Field to 10 Meter Chamber Correlation Data

Correlation Data for measurements 9kHz-30MHz between Outdoor and 10m semi-anechoic chamber in at Underwriter Laboratories in Northbrook, IL.

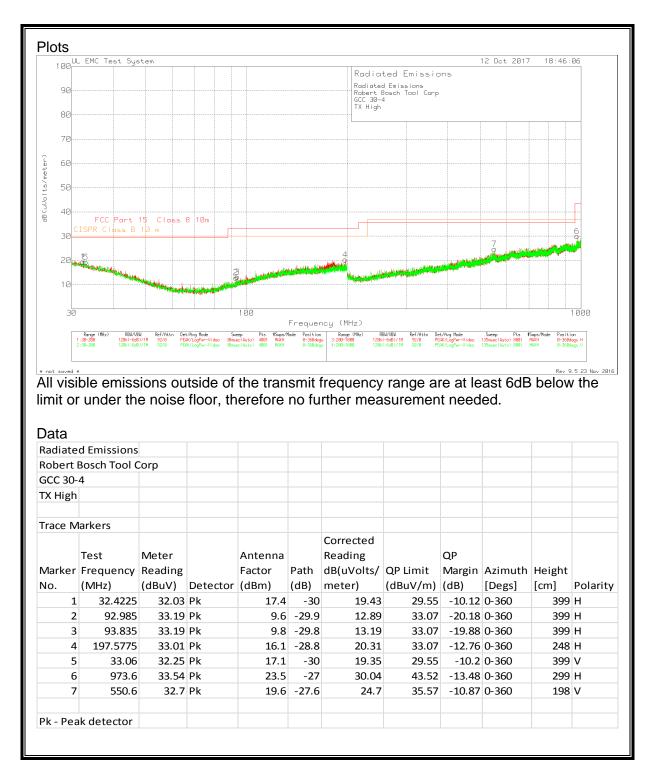


Correlation measurements were conducted using a signal source with an antenna outside in open area (parking lot). Immediately following the measurements the same setup was moved inside the 10 meter semi-anechoic chamber and the measurements were repeated. The above plot shows the difference in levels measured between outside and the 10 meter semi anechoic chamber.

9.2.4. Spurious Emissions 9kHz - 30MHz



9.2.5. SPURIOUS EMISSIONS 30 TO 1000 MHz



9.2.6. SPURIOUS EMISSIONS 1GHz TO 25GHz

