

Amber Helm Development L.C.

92723 Michigan Hwy-152

Sister Lakes, Michigan 49047 USA

Tel: 888-847-8027

EMC Test Report

FOBIK-1802249TX

Issued: June 4, 2018

regarding

USA: CFR Title 47, Part 15.231 (Emissions)
Canada: ISCED RSS-210v9/GENv5 (Emissions)

for



MY19 HD FOBIK

Category: Keyless Entry Transmitter

Judgements:

15.231/RSS-210v9 Compliant Transmitter

Tested: June 1, 2018



TESTING No. 200129-0

Prepared for:

TRW Automotive

24175 Research Drive, Farmington Hills Michigan 48335-2642 USA

Phone: +1 (248) 699-4487, Fax: +1 (248) 699-4102

Contact: Mark Baker, mark.baker@zf.com

Data Recorded by:

Gordon L. Helm
Gordon Helm, EMC-00201-NE

Reviewed by:

Dave Miller
Dave Miller, EMC-003027-NE

Prepared by:

Joseph Brunett
Dr. Joseph Brunett, EMC-002790-NE

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Revision History

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1 Test Report Scope and Limitations

1.1 Laboratory Authorization

Test Facility description and attenuation characteristics are on file with the FCC Laboratory, Columbia, Maryland (FCC Reg. No: 90413) and with ISED Canada, Ottawa, ON (File Ref. No: IC3161). Amber Helm Development L.C. holds accreditation under NVLAP Lab Code 200129-0 and includes within its scope CFR Title 47 Part 15 Subparts B and C.

1.2 Report Retention

For equipment verified to comply with the regulations herein, the manufacturer is obliged to retain this report with the product records for the life of the product, and no less than ten years. A copy of this Report will remain on file with this laboratory until June 2028.

1.3 Subcontracted Testing

This report does not contain data produced under subcontract.

1.4 Test Data

This test report contains data included within the laboratories scope of accreditation.

1.5 Limitation of Results

The test results contained in this report relate only to the item(s) tested. Any electrical or mechanical modification made to the test item subsequent to the test date shall invalidate the data presented in this report. Any electrical or mechanical modification made to the test item subsequent to this test date shall require reevaluation.

1.6 Copyright

This report shall not be reproduced, except in full, without the written approval of Amber Helm Development L.C..

1.7 Endorsements

This report shall not be used to claim product endorsement by any accrediting, regulatory, or governmental agency.

1.8 Test Location

The EUT was fully tested by **Amber Helm Development L.C.**, 92723 Michigan Hwy-152, Sister Lakes, Michigan 49047 USA. Table 1 lists all sites employed herein. Specific test sites utilized are also listed in the test results sections of this report.

Table 1: Test Site List.

Description	Location	Quality Num.
OATS (3m & 10m)	92723 Michigan Hwy-152, Sister Lakes, Michigan 49047 USA	OATSA

1.9 Traceability and Equipment Used

Pertinent test equipment used for measurements at this facility is listed in Table 2. The quality system employed at Amber Helm Development L.C. has been established to ensure all equipment has a clearly identifiable classification, calibration expiry date, and that all calibrations are traceable to the SI through NIST, other recognized national laboratories, accepted fundamental or natural physical constants, ratio type of calibration, or by comparison to consensus standards.

Table 2: Equipment List.

Description	Manufacturer/Model	SN	Quality Num.	Last Cal By / Date Due
Biconical	EMCO / 93110B	9802-3039	BICEMCO01	Lib. Labs / Aug-2018
Log Periodic Antenna	EMCO / 3146	9305-3614	LOGEMCO01	Lib. Labs / Aug-2018
(3m) RG8 Coax	CS-3227 / CS-3227	C060914	CS3227	AHD / Sept-2018
EMI Receiver	HP / 85460A/85462A	3704A00422, 3807A00465	HP8546A	Std and Cal / May-2019
Spectrum Analyzer	Rohde & Schwarz / FSV30	101660	RSFSV30001	RS / Apr-2019
(3m) LMR-400 Coax	AHD / LMR400	C090804	LMR400	AHD / Sept-2018
(LCI) DS Coax	AHD / RG58/U	920809	RG58U	AHD / Jul-2018
(10-m) Amelco Coax	AHD / RG213U	9903-10ab	RG213U	AHD / Sept-2018
Double Ridged Horn	EMCO / 3115	2788	RH3115	Lib.Labs. / July-2018

2 Test Specifications and Procedures

2.1 Test Specification and General Procedures

The ultimate goal of TRW Automotive is to demonstrate that the Equipment Under Test (EUT) complies with the Rules and/or Directives below. Detailed in this report are the results of testing the TRW Automotive MY19 HD FOBIK for compliance to:

Country/Region	Rules or Directive	Referenced Section(s)
United States	Code of Federal Regulations	CFR Title 47, Part 15.231
Canada	ISED Canada	ISED RSS-210v9/GENv5

It has been determined that the equipment under test is subject to the rules and directives above at the date of this testing. In conjunction with these rules and directives, the following specifications and procedures are followed herein to demonstrate compliance (in whole or in part) with these regulations.

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"
ANSI C63.10:2013 (USA)	"American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"
TP0102RA	"AHD Internal Document TP0102 - Radiated Emissions Test Procedure"
ISED Canada	"The Measurement of Occupied Bandwidth"
ICES-003; Issue 6 (2016)	"Information Technology Equipment (ITE) Limits and methods of measurement"

3 Configuration and Identification of the Equipment Under Test

3.1 Description and Declarations

The equipment under test is a UHF transmitter for automotive remote access and remote start. The EUT is approximately 4.5 x 8 x 2 cm (approx.) in dimension, and is depicted in Figure 1. It is powered by 3 VDC Lithium cell battery. In use, this device is hand held. Table 3 outlines provider declared EUT specifications.



Figure 1: Photos of EUT.

Table 3: EUT Declarations.

General Declarations			
Equipment Type:	Keyless Entry Transmitter	Country of Origin:	Mexico
Nominal Supply:	3 VDC	Oper. Temp Range:	−40°C to +80°C
Frequency Range:	433.92 MHz	Antenna Dimension:	Not Declared
Antenna Type:	PCB Trace	Antenna Gain:	−20 dBi (approx)
Number of Channels:	1	Channel Spacing:	Not Applicable
Alignment Range:	Not Declared	Type of Modulation:	ASK, FSK
United States			
FCC ID Number:	GQ4-76T	Classification:	DSC
Canada			
IC Number:	1470A-76T	Classification:	Remote Control Device, Vehicular Device

3.1.1 EUT Configuration

The EUT is configured for testing as depicted in Figure 2.

3.1.2 Modes of Operation

This device is capable of two modes of activation, and two power levels. First, when manually activated by button press the EUT transmits a ASK set of frames at either a high power (REMOTE START) or low power (LOCK/UNLOCK) level. Second, when manually activated by LF interrogation (i.e. when user lifts a door handle or presses a button on the vehicle which in turn causes a module in the vehicle to transmit encoded LF to the EUT) the EUT transmits a low power short FSK Transmission. Both ASK power levels and the FSK transmission are fully evaluated herein.

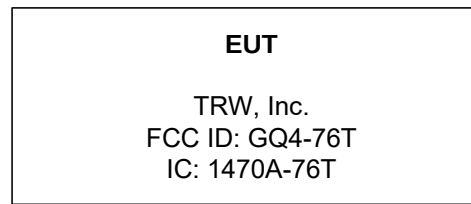


Figure 2: EUT Test Configuration Diagram.

3.1.3 Variants

There are a total of nine (9) variants of the EUT. All 9 variants are electrically identical except for variations in the number of SMT switches populated and minor variations in housing appearance, as described in the labeling exhibit

3.1.4 Test Samples

Seven samples in total were provided; two samples capable of CW transmission (one with 1 button and one with 5 buttons), 2 normal operating samples actuated by button press, one modified sample that transmits only the LF actuated transmission for passive entry, and two additional samples that were dismantled for photos. Both 1 button (lowest populated) and 5 button (highest populated) variants are fully tested to ensure compliance.

3.1.5 Functional Exerciser

Normal operating EUT functionality was verified by observation of transmitted signal.

3.1.6 Modifications Made

There were no modifications made to the EUT by this laboratory.

3.1.7 Production Intent

The EUT appears to be a production ready sample.

3.1.8 Declared Exemptions and Additional Product Notes

None.

4 Emissions

4.1 General Test Procedures

4.1.1 Radiated Test Setup and Procedures

Radiated electromagnetic emissions from the EUT are first pre-scanned in our screen room. Spectrum and modulation characteristics of all emissions are recorded. Instrumentation, including spectrum analyzers and other test equipment as detailed in Section 1.8 are employed. After pre-scan, emission measurements are made on the test site of record. If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in relevant test standards are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed if the resulting emissions appear to be worst-case in such a configuration. See Figure 3. All intentionally radiating elements that are not fixed-mounted in use are placed on the test table lying flat, on their side, and on their end (3-axes) and the resulting worst case emissions are recorded. If the EUT is fixed-mounted in use, measurements are made with the device oriented in the manner consistent with installation and then emissions are recorded. If the EUT exhibits spurious emissions due to internal receiver circuitry, such emissions are measured with an appropriate carrier signal applied.

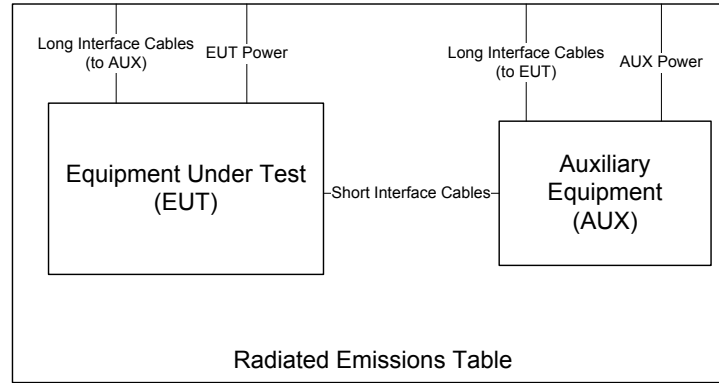


Figure 3: Radiated Emissions Diagram of the EUT.

For devices with intentional emissions below 30 MHz, a shielded loop antenna and/or E-field and H-Field broadband probes are used depending on the regulations. Shielded loops are placed at a 1 meter receive height at the desired measurement distance. For exposure in this band, the broadband probes employed are 10cm diameter single-axis shielded transducers and measurements are repeated and summed over three axes.

Emissions between 30 MHz and 1 GHz are measured using calibrated broadband antennas. For both horizontal and vertical polarizations, the test antenna is raised and lowered from 1 to 4 m in height until a maximum emission level is detected. The EUT is then rotated through 360° in azimuth until the highest emission is detected. The test antenna is then raised and lowered one last time from 1 to 4 m and the worst case value is recorded. Emissions above 1 GHz are characterized using standard gain or broadband ridge-horn antennas on our OATS with a 4×5 m rectangle of ECCOSORB absorber covering the OATS ground screen and a 1.5m table height. Care is taken to ensure that test receiver resolution and video bandwidths meet the regulatory requirements, and that the emission bandwidth of the EUT is not reduced. Photographs of the test setup employed are depicted in Figure 4.

Where regulations allow for direct measurement of field strength, power values (dBm) measured on the test receiver / analyzer are converted to $\text{dB}\mu\text{V}/\text{m}$ at the regulatory distance, using

$$E_{dist} = 107 + P_R + K_A - K_G + K_E - C_F$$

where P_R is the power recorded on spectrum analyzer, in dBm, K_A is the test antenna factor in dB/m, K_G is the combined pre-amplifier gain and cable loss in dB, K_E is duty correction factor (when applicable) in dB, and C_F is a distance conversion (employed only if limits are specified at alternate distance) in dB. This field strength value is then compared with the regulatory limit. If effective isotropic radiated power (EIRP) is computed, it is computed as

$$\text{EIRP}(\text{dBm}) = E_{3m}(\text{dB}\mu\text{V}/\text{m}) - 95.2.$$

When presenting data at each frequency, the highest measured emission under all possible EUT orientations (3-axes) is reported.



Figure 4: Radiated Emissions Test Setup Photograph(s).

4.1.2 Conducted Emissions Test Setup and Procedures

Battery Power Conducted Spurious The EUT is not subject to measurement of power line conducted emissions as it is powered solely by its internal battery.

4.1.3 Power Supply Variation

Tests at extreme supply voltages are made if required by the the procedures specified in the test standard, and results of this testing are detailed in this report.

In the case the EUT is designed for operation from a battery power source, the extreme test voltages are evaluated over the range specified in the test standard; no less than $\pm 10\%$ of the nominal battery voltage declared by the manufacturer. For all battery operated equipment, worst case intentional and spurious emissions are re-checked employing a new (fully charged) battery.

4.2 Intentional Emissions

4.2.1 Fundamental Emission Pulsed Operation

Test Setup & Procedure The test equipment and facilities were setup in accordance with the standards and procedures listed in Section 2.1. Environmental conditions were set at the appropriate temperature and thermal balance was checked with a thermocouple based probe. Duty cycle is reported for all relevant modes of operation. The test equipment employed includes RSFSV30001, LOGEMCO01.

Measurement Results The details and results of testing the EUT are summarized in Table 4. Plots showing the measurements made to obtain these values are provided in Figure 5.

Table 4: Fundamental Emission Pulsed Operation.

Detector	Span	IF Bandwidth	Video Bandwidth	Test Date:	1-Jun-18
Pk	0	1 MHz	3 MHz	Test Engineer:	Joseph Brunett
				EUT:	TRW HD FOBIK
				EUT Mode:	All
				Meas. Distance:	10 cm

FCC/IC										
#	Frequency	EUT Test Mode*	Overall Transmission			Internal Frame Characteristics			Computed Duty Cycle*	
			Min. Repetition Rate (sec)	Max. No. of Frames	Total Transmission Length (sec)	Max. Frame Length (ms)	Min. Frame Period (ms)	Frame Encoding	(%)	(dB)
1	433.92 MHz	Manual Activated ASK Frame Set (Low & High Power)	-	5	0.56	46.7	>100	Worst Case transmission consists of five ASK frames, each with >100 ms period after a single button press. Longest ASK frame is 46.7 ms with 209 us / 419 us duty.	23.3	-12.7
2	433.92 MHz	Manual Activated FSK Frame Set	-	2	0.09	10.6	-	Worst Case transmission consists of a single pair of FSK frames within 90 ms of activation. The first frame is 1.71 ms, the second is 10.6 ms.	12.3	-18.2

* Worst Case ASK duty cycle applied throughout to demonstrate compliance for all variants.

Example Calculation: Worst Case ASK Duty (%) = $46.7 \text{ ms} \times (0.209 \text{ ms} / 0.419 \text{ ms}) / 100 \text{ ms} = 23.3\%$

Example Calculation: Worst Case FSK Duty (%) = $(1.71 \text{ ms} + 10.6 \text{ ms}) / 100 \text{ ms} = 12.3 \%$

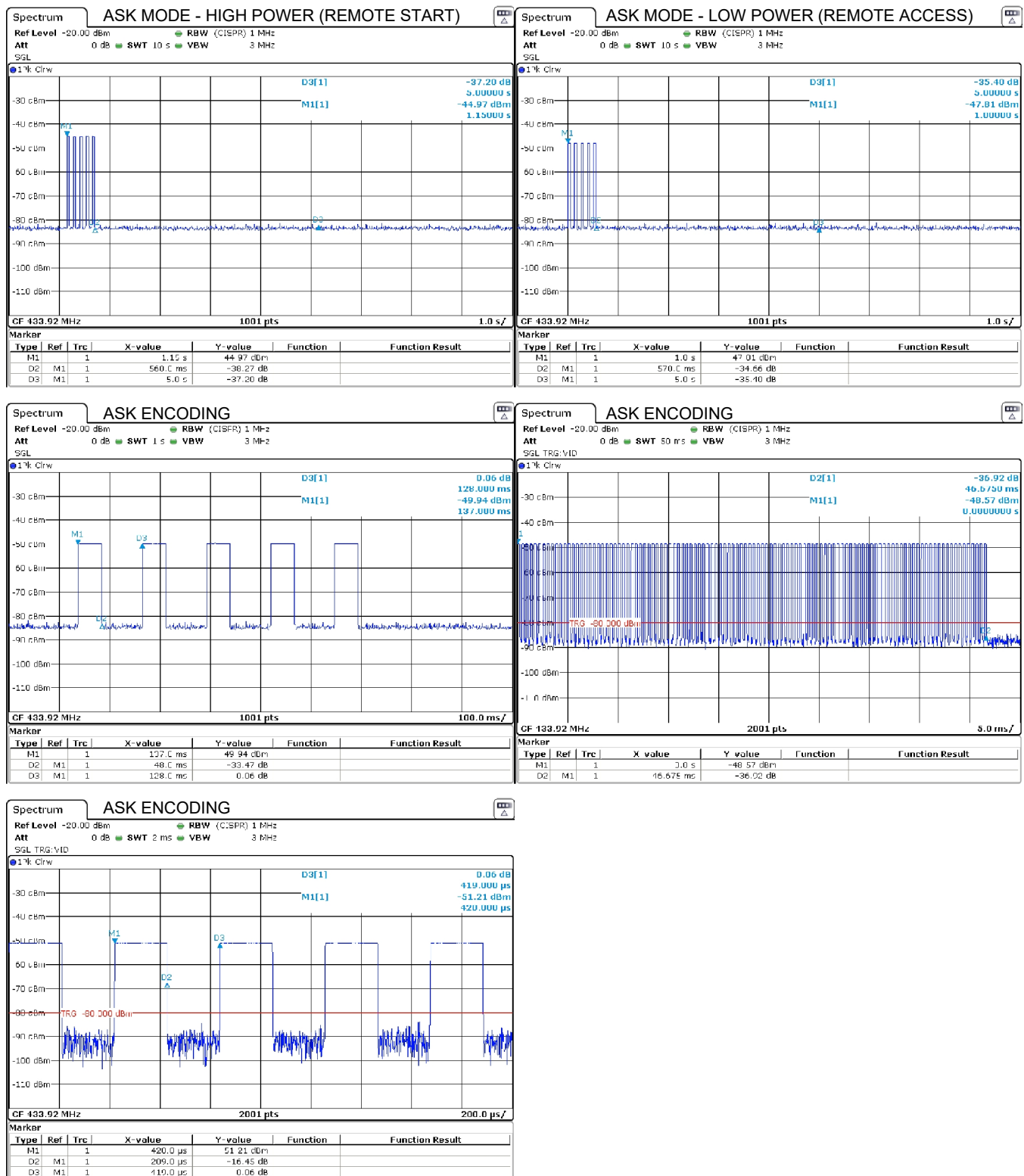


Figure 5(a): Fundamental Emission Pulsed Operation.

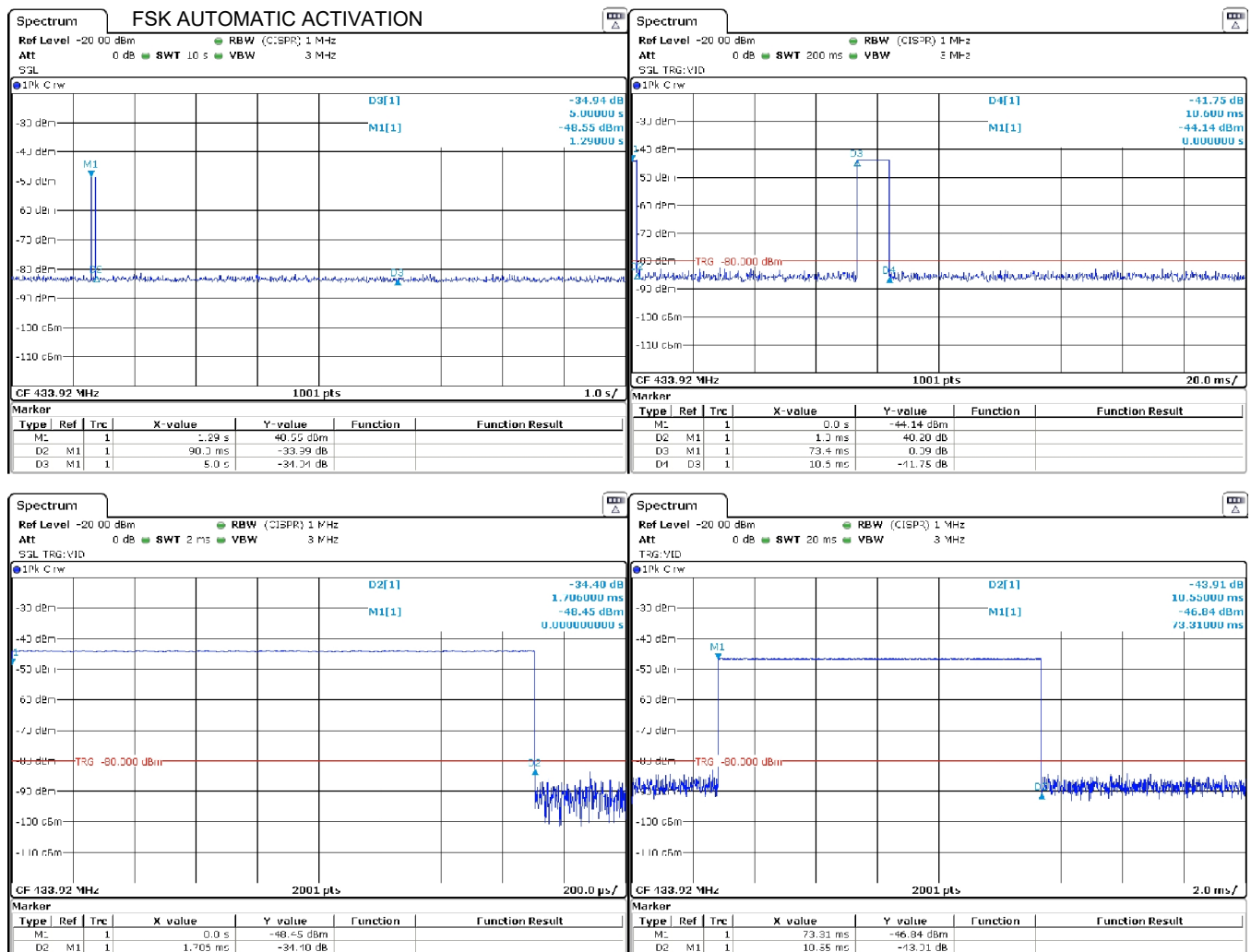


Figure 5(b): Fundamental Emission Pulsed Operation.

4.2.2 Fundamental Emission Bandwidth

Test Setup & Procedure The test equipment and facilities were setup in accordance with the standards and procedures listed in Section 2.1. Environmental conditions were set at the appropriate temperature and thermal balance was checked with a thermocouple based probe. Emission bandwidth (EBW) of the EUT is measured with the device placed in the test mode(s) with the shortest available frame length and minimum frame spacing. The 20 dB EBW is measured as the max-held peak-detected signal when the IF bandwidth is greater than or equal to 1% of the receiver span. For complex modulations other than ASK and FSK, the 99% emission bandwidth per IC test procedures has a different result, and is also reported. The test equipment employed includes RSFSV30001, LOGEMCO01.

Measurement Results The details and results of testing the EUT are summarized in Table 5. Plots showing the measurements made to obtain these values are provided in Figure 6.

Table 5: Fundamental Emission Bandwidth.

Detector	IF Bandwidth	Video Bandwidth	Test Date:	1-Jun-18
Pk	10 kHz	30 kHz	Test Engineer:	Joseph Brunett
			EUT:	TRW HD FOBIK
			EUT Mode:	All
			Meas. Distance:	10 cm

FCC/IC						
#	Modulation	Center Frequency (MHz)	20 dB EBW (MHz)	EBW Limit (MHz)	99% OBW (MHz)	
1	ASK Low Power	433.92	0.059	1.0848	0.256	
2	ASK High Power	433.92	0.063	1.0848	0.287	
3	FSK Low Power	433.92	0.125	1.0848	0.151	

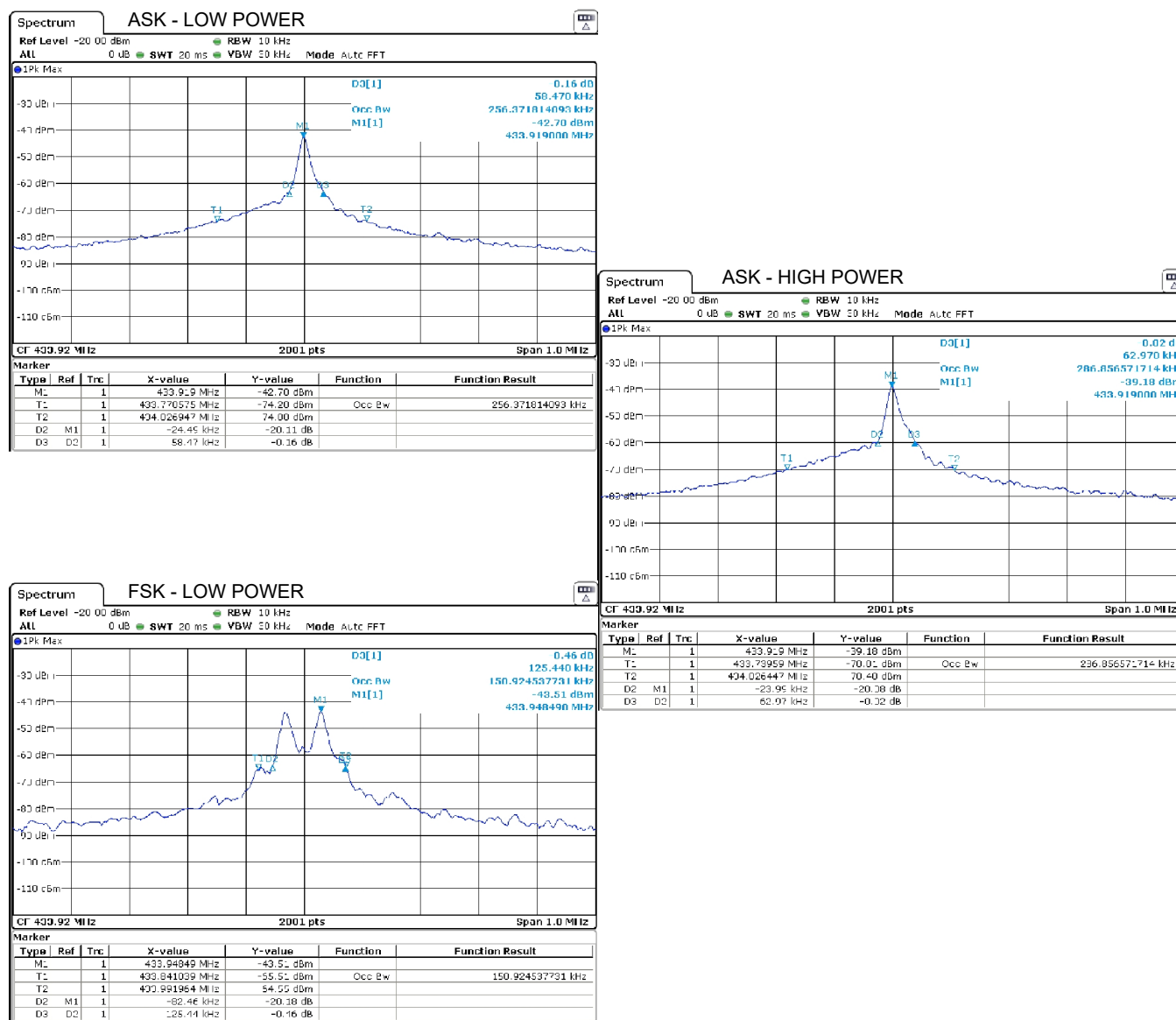


Figure 6: Fundamental Emission Bandwidth.

4.2.3 Fundamental Emission Field Strength

Test Setup & Procedure The test equipment and facilities were setup in accordance with the standards and procedures listed in Section 2.1. Environmental conditions were set at the appropriate temperature and thermal balance was checked with a thermocouple based probe. Fundamental emissions are measured at the regulatory distance on our OATS. The test equipment employed includes HP8546A, LOGEMCO01.

Measurement Results The details and results of testing the EUT are summarized in Table 6.

Table 6: Fundamental Emission Field Strength.

EUT Modes: a1 CM – One Button + Plastic Bezel – Key Inserted – LOW POWER
a2 CM – One Button + Plastic Bezel – No Key – LOW POWER
a3 CM – 5 Button + Metal Bezel – Key Inserted – HIGH POWER
a4 CM – 5 Button + Metal Bezel – No Key – HIGH POWER

Test Date: 05/30/18
Test Engineer: J. Brunett, G. Helm

R0	Frequency		Temp.	Table Angle	Site			CF	EUT			Test Antenna				Cable	Kg	Receiver				Field Strength @ DR						EIRP		Details
	Start	Stop			MR	DR	N/F		Mode	Volt.	Dim	Pol.	Dim.	Height	Ka			Rx Power	Bandwidth	Pk	Avg	RBW	VBW	Meas.	Pk		Calc.	Avg		
	MHz	MHz	(C)	deg	m	see table	(V)	cm	H/V	cm	m	dB/m	dB	dBuV/m	MHz	USA	CAN	dBuV/m	USA	CAN	dBm	Pass								
	Fail	dB																												
R1	SETUP				OATSA				TRW HD FOBIK			EMCOLOG					HP8546A				NOTES: max all orientations of EUT									
R2	433.9	433.9	24	260	3.0	3.0		0.0	a1	3.0	6.0	H	100.0	1.0	16.3	-1.5		0.12	0.30	80.0	100.8	100.8	67.3	80.8	80.8	-17.6			13.5	
R3	433.9	433.9	24	350	3.0	3.0		0.0	a1	3.0	6.0	V	100.0	1.3	16.3	-1.5		0.12	0.30	80.5	100.8	100.8	67.8	80.8	80.8	-17.1			13.0	
R5	SETUP				OATSA				TRW HD FOBIK			EMCOLOG					HP8546A				NOTES: max all orientations of EUT									
R6	433.9	433.9	24	260	3.0	3.0		0.0	a2	3.0	6.0	H	100.0	1.0	16.3	-1.5		0.12	0.30	81.2	100.8	100.8	68.5	80.8	80.8	-16.4			12.3	
R7	433.9	433.9	24	350	3.0	3.0		0.0	a2	3.0	6.0	V	100.0	1.3	16.3	-1.5		0.12	0.30	80.8	100.8	100.8	68.1	80.8	80.8	-16.8			12.7	
R8	SETUP				OATSA				TRW HD FOBIK			EMCOLOG					HP8546A				NOTES: max all orientations of EUT									
R9	433.9	433.9	24	30	3.0	3.0		0.0	a3	3.0	6.0	H	100.0	1.0	16.3	-1.5		0.12	0.30	83.0	100.8	100.8	70.3	80.8	80.8	-14.6			10.5	
R10	433.9	433.9	24	0	3.0	3.0		0.0	a3	3.0	6.0	V	100.0	1.4	16.3	-1.5		0.12	0.30	83.5	100.8	100.8	70.8	80.8	80.8	-14.1			10.0	
R11	SETUP				OATSA				TRW HD FOBIK			EMCOLOG					HP8546A				NOTES: max all orientations of EUT									
R12	433.9	433.9	24	350	3.0	3.0		0.0	a4	3.0	6.0	H	100.0	1.0	16.3	-1.5		0.12	0.30	84.6	100.8	100.8	71.9	80.8	80.8	-13.0			8.9	
R13	433.9	433.9	24	350	3.0	3.0		0.0	a4	3.0	6.0	V	100.0	1.6	16.3	-1.5		0.12	0.30	82.8	100.8	100.8	70.1	80.8	80.8	-14.8			10.7	
R14																														
R15																														
#	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13		C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	

(ROW) (COLUMN)

NOTE:

R0 C5 MR is Measurement Range, which may be reduced from DR to achieve necessary SNR.

R0 C6 DR is the regulatory Desired Range measurement distance.

R0 C7 N/F is Near-Field / Far-Field distance computed for max of EUT Antenna Dimension (C10) and Test Antenna dimension (C12), where applicable.

R0 C8 CF is computed using a 20 dB/decade Decay Rate.

R0 C16 When E-field or EIRP is reported directly from Spectrum Analyzer, Antenna Factors and Cable losses are included directly in SA settings and Pr is not reported.

R0 C23 Average Field Strength computed from Peak via Duty Cycle.

4.3 Unintentional Emissions

4.3.1 Transmit Chain Spurious Emissions

Test Setup & Procedure The test equipment and facilities were setup in accordance with the standards and procedures listed in Section 2.1. Environmental conditions were set at the appropriate temperature and thermal balance was checked with a thermocouple based probe. Spurious radiated emissions measurements are performed to 10 times the highest fundamental operating frequency. The test equipment employed includes HP8546A, LOGEMCO01, RH3115.

Measurement Results The details and results of testing the EUT are summarized in Table 7.

Table 7(a): Transmit Chain Spurious Emissions.

EUT Modes: a1 CM – One Button + Plastic Bezel – Key Inserted – LOW POWER a2 CM – One Button + Plastic Bezel – No Key – LOW POWER a3 a4 Test Date: 05/31/18 Test Engineer: J. Brunett, G. Helm																														
R0	Frequency		Temp.	Table Angle	Site				EUT				Test Antenna				Cable Kg	Receiver				Field Strength @ DR						EIRP		Details
	Start	Stop			MR	DR	N/F	CF	Mode	Volt.	Dim	Pol.	Dim.	Height	Ka	Rx Power Pk		Avg	Bandwidth RBW	VBW	Meas.	Limit	Meas.	Limit	Calc.	Limit				
	MHz	MHz			m			dB	see table	(V)	cm	H/V	cm	m	dB/m	dB		dBuV/m		MHz		USA	CAN	dBuV/m	USA	CAN	dBm	Pass Fail		
R1	SETUP				OATSA				TRW HD FOBIK				EMCOLOG					HP8546A				NOTES: max all orientations of EUT								
R2	867.8	867.8	24	45	3.0	3.0		0.0	a1	3.0	6.0	H	22.0	1.0	22.2	-2.8		0.12	0.30	58.0	80.8	80.8	45.3	60.8	60.8	-37.2		15.5		
R3	867.8	867.8	24	45	3.0	3.0		0.0	a1	3.0	6.0	V	22.0	1.0	22.2	-2.8		0.12	0.30	58.0	80.8	80.8	45.3	60.8	60.8	-37.2		15.5		
R4	SETUP				OATSA				TRW HD FOBIK				HP3115					HP8546A				NOTES: max all orientations of EUT								
R5	1301.8	1301.8	24	all	3.0	3.0	0.2	0.0	a1	3.0	6.0	H/V	15.0	all	26.7	-1.5		1.00	3.00	42.6	74.0	74.0	29.9	54.0	54.0	-52.6		24.1		
R6	1735.7	1735.7	24	all	3.0	3.0	0.3	0.0	a1	3.0	6.0	H/V	15.0	all	27.5	-1.8		1.00	3.00	48.5	80.8	80.8	35.8	60.8	60.8	-46.7		25.0		
R7	2169.6	2169.6	24	all	3.0	3.0	0.3	0.0	a1	3.0	6.0	H/V	15.0	all	28.3	-2.2		1.00	3.00	51.4	80.8	80.8	38.7	60.8	60.8	-43.8		22.1		
R8	2603.5	2603.5	24	all	3.0	3.0	0.4	0.0	a1	3.0	6.0	H/V	15.0	all	28.9	-2.5		1.00	3.00	46.2	80.8	80.8	33.5	60.8	60.8	-49.0		27.3		
R9	3037.4	3037.4	24	all	3.0	3.0	0.5	0.0	a1	3.0	6.0	H/V	15.0	all	29.3	-2.8		1.00	3.00	53.8	80.8	80.8	41.1	60.8	60.8	-41.4		19.7		
R10	3471.4	3471.4	24	all	3.0	3.0	0.5	0.0	a1	3.0	6.0	H/V	15.0	all	29.8	-3.0		1.00	3.00	63.7	80.8	80.8	51.0	60.8	60.8	-31.5		9.8		
R11	3905.3	3905.3	24	all	3.0	3.0	0.6	0.0	a1	3.0	6.0	H/V	15.0	all	30.1	-3.3		1.00	3.00	46.6	74.0	74.0	33.9	54.0	54.0	-48.6		20.1		
R12	4339.2	4339.2	24	all	3.0	3.0	0.7	0.0	a1	4.0	6.0	H/V	15.0	all	30.6	-3.5		1.00	3.00	58.6	74.0	74.0	45.9	54.0	54.0	-36.6		8.1		
R13																														
R14	SETUP				OATSA				TRW HD FOBIK				EMCOLOG					HP8546A				NOTES: max all orientations of EUT								
R15	867.8	867.8	24	45	3.0	3.0		0.0	a2	3.0	6.0	H	22.0	1.0	22.2	-2.8		0.12	0.30	61.5	80.8	80.8	48.8	60.8	60.8	-33.7		12.0		
R16	867.8	867.8	24	45	3.0	3.0		0.0	a2	3.0	6.0	V	22.0	1.0	22.2	-2.8		0.12	0.30	61.5	80.8	80.8	48.8	60.8	60.8	-33.7		12.0		
R17	SETUP				OATSA				TRW HD FOBIK				HP3115					HP8546A				NOTES: max all orientations of EUT								
R18	1301.8	1301.8	24	all	3.0	3.0	0.2	0.0	a2	3.0	6.0	H/V	15.0	all	26.7	-1.5		1.00	3.00	45.0	74.0	74.0	32.3	54.0	54.0	-50.2		21.7		
R19	1735.7	1735.7	24	all	3.0	3.0	0.3	0.0	a2	3.0	6.0	H/V	15.0	all	27.5	-1.8		1.00	3.00	44.9	80.8	80.8	32.2	60.8	60.8	-50.3		28.6		
R20	2169.6	2169.6	24	all	3.0	3.0	0.3	0.0	a2	3.0	6.0	H/V	15.0	all	28.3	-2.2		1.00	3.00	55.0	80.8	80.8	42.3	60.8	60.8	-40.3		18.6		
R21	2603.5	2603.5	24	all	3.0	3.0	0.4	0.0	a2	3.0	6.0	H/V	15.0	all	28.9	-2.5		1.00	3.00	48.9	80.8	80.8	36.2	60.8	60.8	-46.3		24.6		
R22	3037.4	3037.4	24	all	3.0	3.0	0.5	0.0	a2	3.0	6.0	H/V	15.0	all	29.3	-2.8		1.00	3.00	50.8	80.8	80.8	38.1	60.8	60.8	-44.4		22.7		
R23	3471.4	3471.4	24	all	3.0	3.0	0.5	0.0	a2	3.0	6.0	H/V	15.0	all	29.8	-3.0		1.00	3.00	63.1	80.8	80.8	50.4	60.8	60.8	-32.1		10.4		
R24	3905.3	3905.3	24	all	3.0	3.0	0.6	0.0	a2	3.0	6.0	H/V	15.0	all	30.1	-3.3		1.00	3.00	45.1	74.0	74.0	32.4	54.0	54.0	-50.1		21.6		
R25	4339.2	4339.2	24	all	3.0	3.0	0.7	0.0	a2	4.0	6.0	H/V	15.0	all	30.6	-3.5		1.00	3.00	58.3	74.0	74.0	45.6	54.0	54.0	-36.9		8.4		
R26																														
#	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13		C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	
(ROW)	(COLUMN)		NOTE:																											
R0	C5		MR is Measurement Range, which may be reduced from DR to achieve necessary SNR.																											
R0	C6		DR is the regulatory Desired Range measurement distance.																											
R0	C7		N/F is Near-Field / Far-Field distance computed for max of EUT Antenna Dimension (C10) and Test Antenna dimension (C12), where applicable.																											
R0	C8		CF is computed using a 20 dB/decade Decay Rate.																											
R0	C16		When E-field or EIRP is reported directly from Spectrum Analyzer, Antenna Factors and Cable losses are included directly in SA settings and Pr is not reported.																											
R0	C23		Average Field Strength computed from Peak via Duty Cycle.																											

Table 7(b): Transmit Chain Spurious Emissions.

EUT Modes: a1

a2

Test Date: 05/31/18

a3 CM – 5 Button + Metal Bezel – Key Inserted – HIGH POWER

Test Engineer: J. Brunett, G. Helm

a4 CM – 5 Button + Metal Bezel – No Key – HIGH POWER

R0	Frequency		Temp.	Site				EUT			Test Antenna				Cable Kg	Receiver				Field Strength @ DR						EIRP		Details	
	Start	Stop		Table Angle	MR	DR	N/F	CF	Mode	Volt.	Dim	Pol.	Dim.	Height		Ka	Rx Power Pk	Avg	Bandwidth RBW	VBW	Pk		Avg		Calc.	Limit			
																					Meas.	Limit	Meas.	Limit					
																											USA		CAN
MHz	MHz	(C)	deg	m				see table	(V)	cm	H/V	cm	m	dB/m	dB	dBuV/m	MHz	dBuV/m				dBm							
R1	SETUP			OATSA				TRW HD FOBIK			EMCOLOG					HP8546A				NOTES: max all orientations of EUT									
R2	867.8	867.8	26	45	3.0	3.0		0.0	a3	3.0	6.0	H/V	22.0	1.0	22.2	-2.8		0.12	0.30	54.3	80.8	80.8	41.6	60.8	60.8	-40.9		19.2	
R3	867.8	867.8	26	45	3.0	3.0		0.0	a3	3.0	6.0	H/V	22.0	1.0	22.2	-2.8		0.12	0.30	54.3	80.8	80.8	41.6	60.8	60.8	-40.9		19.2	
R4	SETUP			OATSA				TRW HD FOBIK			HP3115					HP8546A				NOTES: max all orientations of EUT									
R5	1301.8	1301.8	26	all	3.0	3.0	0.2	0.0	a3	3.0	6.0	H/V	15.0		26.7	-1.5		1.00	3.00	46.5	74.0	74.0	33.8	54.0	54.0	-48.7		20.2	
R6	1735.7	1735.7	26	all	3.0	3.0	0.3	0.0	a3	3.0	6.0	H/V	15.0		27.5	-1.8		1.00	3.00	48.0	80.8	80.8	35.3	60.8	60.8	-47.2		25.5	
R7	2169.6	2169.6	26	all	3.0	3.0	0.3	0.0	a3	3.0	6.0	H/V	15.0		28.3	-2.2		1.00	3.00	50.5	80.8	80.8	37.8	60.8	60.8	-44.8		23.1	
R8	2603.5	2603.5	26	all	3.0	3.0	0.4	0.0	a3	3.0	6.0	H/V	15.0		28.9	-2.5		1.00	3.00	54.4	80.8	80.8	41.7	60.8	60.8	-40.8		19.1	
R9	3037.4	3037.4	26	all	3.0	3.0	0.5	0.0	a3	3.0	6.0	H/V	15.0		29.3	-2.8		1.00	3.00	45.2	80.8	80.8	32.5	60.8	60.8	-50.0		28.3	
R10	3471.4	3471.4	26	all	3.0	3.0	0.5	0.0	a3	3.0	6.0	H/V	15.0		29.8	-3.0		1.00	3.00	57.4	80.8	80.8	44.7	60.8	60.8	-37.8		16.1	
R11	3905.3	3905.3	26	all	3.0	3.0	0.6	0.0	a3	3.0	6.0	H/V	15.0		30.1	-3.3		1.00	3.00	54.7	74.0	74.0	42.0	54.0	54.0	-40.5		12.0	
R12	4339.2	4339.2	26	all	3.0	3.0	0.7	0.0	a3	4.0	6.0	H/V	15.0		30.6	-3.5		1.00	3.00	56.5	74.0	74.0	43.8	54.0	54.0	-38.7		10.2	
R13	SETUP																												
R14	SETUP			OATSA				TRW HD FOBIK			EMCOLOG					HP8546A				NOTES: max all orientations of EUT									
R15	867.8	867.8	26	250	3.0	3.0		0.0	a4	3.0	6.0	H/V	22.0	1.0	22.2	-2.8		0.12	0.30	55.1	80.8	80.8	42.4	60.8	60.8	-40.1		18.4	
R16	867.8	867.8	26	250	3.0	3.0		0.0	a4	3.0	6.0	H/V	22.0	1.0	22.2	-2.8		0.12	0.30	55.1	80.8	80.8	42.4	60.8	60.8	-40.1		18.4	
R17	SETUP			OATSA				TRW HD FOBIK			HP3115					HP8546A				NOTES: max all orientations of EUT									
R18	1301.8	1301.8	26	all	3.0	3.0	0.2	0.0	a4	3.0	6.0	H/V	15.0		26.7	-1.5		1.00	3.00	47.6	74.0	74.0	34.9	54.0	54.0	-47.6		19.1	
R19	1735.7	1735.7	26	all	3.0	3.0	0.3	0.0	a4	3.0	6.0	H/V	15.0		27.5	-1.8		1.00	3.00	49.4	80.8	80.8	36.7	60.8	60.8	-45.9		24.2	
R20	2169.6	2169.6	26	all	3.0	3.0	0.3	0.0	a4	3.0	6.0	H/V	15.0		28.3	-2.2		1.00	3.00	48.4	80.8	80.8	35.7	60.8	60.8	-46.8		25.1	
R21	2603.5	2603.5	26	all	3.0	3.0	0.4	0.0	a4	3.0	6.0	H/V	15.0		28.9	-2.5		1.00	3.00	52.4	80.8	80.8	39.7	60.8	60.8	-42.8		21.1	
R22	3037.4	3037.4	26	all	3.0	3.0	0.5	0.0	a4	3.0	6.0	H/V	15.0		29.3	-2.8		1.00	3.00	42.9	80.8	80.8	30.2	60.8	60.8	-52.3		30.6	
R23	3471.4	3471.4	26	all	3.0	3.0	0.5	0.0	a4	3.0	6.0	H/V	15.0		29.8	-3.0		1.00	3.00	54.8	80.8	80.8	42.1	60.8	60.8	-40.4		18.7	
R24	3905.3	3905.3	26	all	3.0	3.0	0.6	0.0	a4	3.0	6.0	H/V	15.0		30.1	-3.3		1.00	3.00	56.1	74.0	74.0	43.4	54.0	54.0	-39.1		10.6	
R25	4339.2	4339.2	26	all	3.0	3.0	0.7	0.0	a4	4.0	6.0	H/V	15.0		30.6	-3.5		1.00	3.00	53.4	74.0	74.0	40.7	54.0	54.0	-41.8		13.3	
R26	SETUP																												
#	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13		C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28

4.3.2 Radiated Digital Spurious

The results for the measurement of digital spurious emissions are not reported herein as all digital emissions were greater than 20 dB below the regulatory limit. Radiation from digital components was measured to 4 GHz, or to five times the maximum digital component operating frequency, whichever is greater.

5 Measurement Uncertainty and Accreditation Documents

The maximum values of measurement uncertainty for the laboratory test equipment and facilities associated with each test are given in the table below. This uncertainty is computed for a 95.45% confidence level based on a coverage factor of $k = 2$.

Table 8: Measurement Uncertainty.

Measured Parameter	Measurement Uncertainty [†]
Radio Frequency	$\pm(f_{Mkr}/10^7 + RBW/10 + (SPN/(PTS - 1))/2 + 1 \text{ Hz})$
Conducted Emm. Amplitude	$\pm 1.9 \text{ dB}$
Radiated Emm. Amplitude (30 – 200 MHz)	$\pm 4.0 \text{ dB}$
Radiated Emm. Amplitude (200 – 1000 MHz)	$\pm 5.2 \text{ dB}$
Radiated Emm. Amplitude ($f > 1000 \text{ MHz}$)	$\pm 3.7 \text{ dB}$

[†]Ref: CISPR 16-4-2:2011+A1:2014

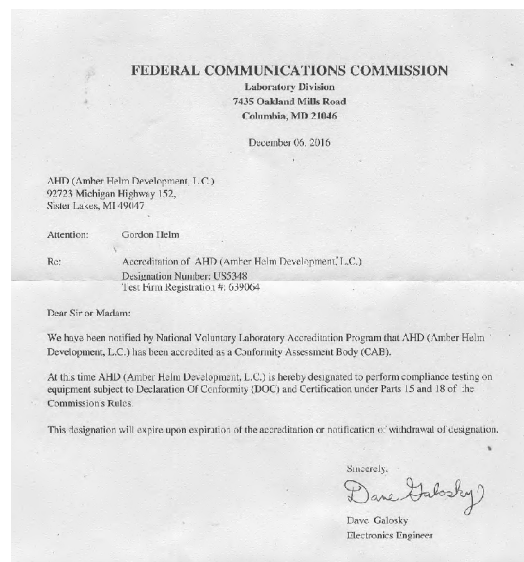


Figure 7: Accreditation Documents