

# NORTHWEST EMC

## UTC Fire and Security

AVO-BTWIFI (Bluetooth/Wi-Fi module) in the AV-TS7  
FCC 15.247:2015

Report # UTCF0027.2



NVLAP Lab Code: 200881-0

*This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America. This Report may only be duplicated in its entirety*

# CERTIFICATE OF TEST

**Last Date of Test: March 10, 2015**  
**UTC Fire and Security**  
**Model: AVO-BTWIFI (Bluetooth/Wi-Fi module) in the AV-TS7**

## Radio Equipment Testing

### Standards

Specification	Method
FCC 15.247:2015	ANSI C63.10:2009

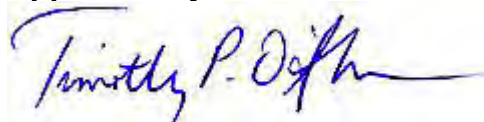
### Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for Class II Permissive change.
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.7	Spurious Conducted Emissions	No	N/A	Not required for Class II Permissive change.
6.9.1	Occupied Bandwidth	No	N/A	Not required for Class II Permissive change.
6.10.1	Output Power	No	N/A	Not required for Class II Permissive change.
7.5	Duty Cycle	No	N/A	Not required for Class II Permissive change.
7.7.2	Channel Separation	No	N/A	Not required for Class II Permissive change.
7.7.3	Number of Hopping Channels	No	N/A	Not required for Class II Permissive change.
7.7.4	Dwell Time	No	N/A	Not required for Class II Permissive change.
7.7.9	Band Edge Compliance	No	N/A	Not required for Class II Permissive change.
7.7.9	Band Edge Compliance - Hopping Mode	No	N/A	Not required for Class II Permissive change.

### Deviations From Test Standards

None

### Approved By:



Tim O'Shea, Operations Manager

*Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.*

# REVISION HISTORY

Revision Number		Description	Date	Page Number
00		None		

# ACCREDITATIONS AND AUTHORIZATIONS

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## United States

**FCC** - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

**A2LA** - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

**NVLAP** - Each laboratory is accredited by NVLAP to ISO 17025

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## Canada

**IC** - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

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## European Union

**European Commission** – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

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## Australia/New Zealand

**ACMA** - Recognized by ACMA as a CAB for the acceptance of test data.

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## Korea

**MSIP / RRA** - Recognized by KCC's RRA as a CAB for the acceptance of test data.

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## Japan

**VCCI** - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

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## Taiwan

**BSMI** – Recognized by BSMI as a CAB for the acceptance of test data.

**NCC** - Recognized by NCC as a CAB for the acceptance of test data.

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## Singapore

**IDA** – Recognized by IDA as a CAB for the acceptance of test data.

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## Israel

**MOC** – Recognized by MOC as a CAB for the acceptance of test data.

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## Hong Kong

**OFCA** – Recognized by OFCA as a CAB for the acceptance of test data.

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## Vietnam

**MIC** – Recognized by MIC as a CAB for the acceptance of test data.

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## SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/accreditations/>  
<http://gsi.nist.gov/global/docs/cabs/designations.html>

# MEASUREMENT UNCERTAINTY

## Measurement Uncertainty

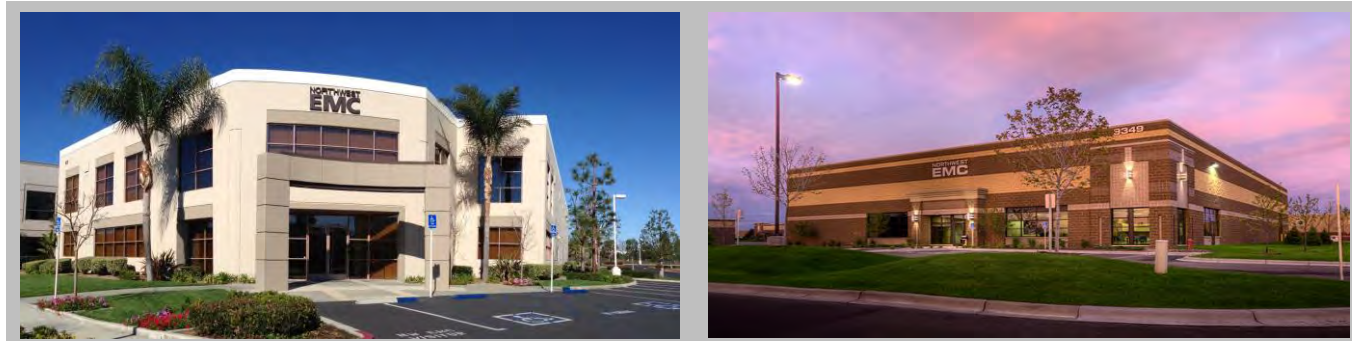
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

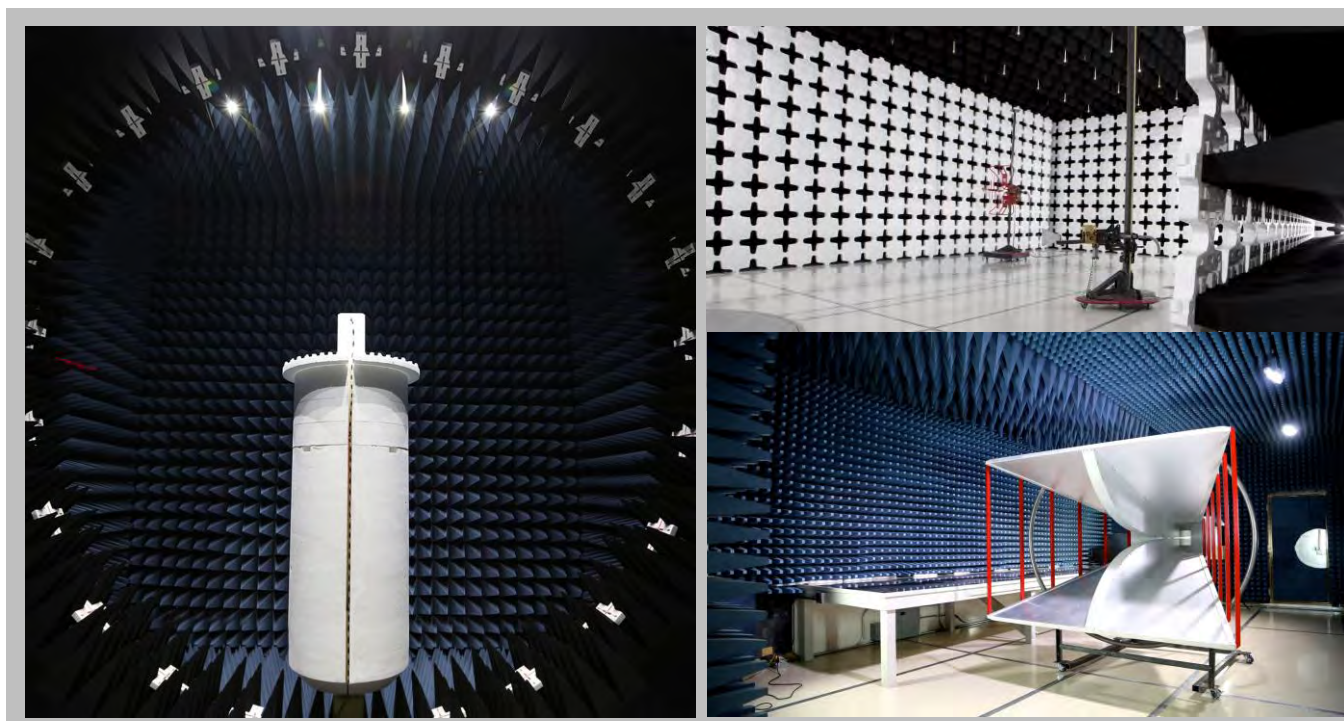
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

<b>Test</b>	<b>+ MU</b>	<b>- MU</b>
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	4.7 dB	-4.7 dB
AC Powerline Conducted Emissions (dB)	2.9 dB	-2.9 dB

# FACILITIES



<b>California</b> Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	<b>Minnesota</b> Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	<b>New York</b> Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	<b>Oregon</b> Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	<b>Texas</b> Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	<b>Washington</b> Labs NC01-05 19201 120 <sup>th</sup> Ave NE Bothell, WA 9801 (425)984-6600
<b>NVLAP</b>					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
<b>Industry Canada</b>					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
<b>BSMI</b>					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
<b>VCCI</b>					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
<b>Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFCA</b>					
US0158	US0175	N/A	US0017	US0191	US0157





# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

<b>Company Name:</b>	UTC Fire and Security
<b>Address:</b>	1275 Red Fox Road
<b>City, State, Zip:</b>	Arden Hills, MN 55112
<b>Test Requested By:</b>	Paul Price
<b>Model:</b>	AVO-BTWIFI (Bluetooth/Wi-Fi module) in the AV-TS7
<b>First Date of Test:</b>	March 10, 2015
<b>Last Date of Test:</b>	March 10, 2015
<b>Receipt Date of Samples:</b>	March 04, 2015
<b>Equipment Design Stage:</b>	Production
<b>Equipment Condition:</b>	No Damage

## Information Provided by the Party Requesting the Test

<b>Functional Description of the EUT:</b>
AV-TS7 Touchscreen Security Device with a Bluetooth wireless interface.
<b>Testing Objective:</b>
To demonstrate compliance of the Bluetooth radio to FCC 15.247 requirements for a Class II Permissive change. Changing the device from a system approval to LMA to include an alternate host. Testing SRE and unintentional emissions in the alternate host AV-TS7.

# CONFIGURATIONS

## Configuration UTCF0027- 3

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
AVO-BTWIFI (Bluetooth/Wi-Fi module) in the AV-TS7	UTC Fire and Security	AV-TS7	01021041040200000092

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AC Adapter	UTC Fire and Security	UTC 22-169	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power Cable	No	2.5m	No	AC Adapter	AV-TS7 Touchscreen



# MODIFICATIONS

## Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	3/10/2015	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

## MODES OF OPERATION

Transmitting Low, Mid, High Channels: 2402, 2440, 2480 MHz

## POWER SETTINGS INVESTIGATED

110VAC/60Hz

## CONFIGURATIONS INVESTIGATED

UTCF0027 - 3

## FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26000 MHz
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## SAMPLE CALCULATIONS

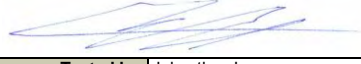
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

## TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Low Pass Filter, 0 - 1000 MHz	Micro-Tronics	LPM50004	HGK	3/2/2015	12 mo
High Pass Filter, 2.8 - 18 GHz	Micro-Tronics	HPM50111	HGQ	3/2/2015	12 mo
Attenuator, 20 dB, 'SMA'	SM Electronics	SA6-20	REO	3/2/2015	12 mo
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	10/3/2014	12 mo
MN05 Cable	N/A	18-26GHz Standard Gain Horn Cable	MNP	10/3/2014	12 mo
Antenna, Horn	ETS	3160-09	AHG	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	3/2/2015	12 mo
Antenna, Horn	ETS Lindgren	3160-08	AIQ	NCR	0 mo
MN05 Cables	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	3/2/2015	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	3/2/2015	12 mo
Antenna, Horn	ETS	3160-07	AXP	NCR	0 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	3/14/2014	12 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	3/2/2015	12 mo
Antenna, Horn	ETS	3115	AJA	6/3/2014	24 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAD	3/2/2015	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	3/2/2015	12 mo
Antenna, Biconilog	Teseq	CBL 6141B	AYD	12/17/2013	24 mo
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2015	12 mo

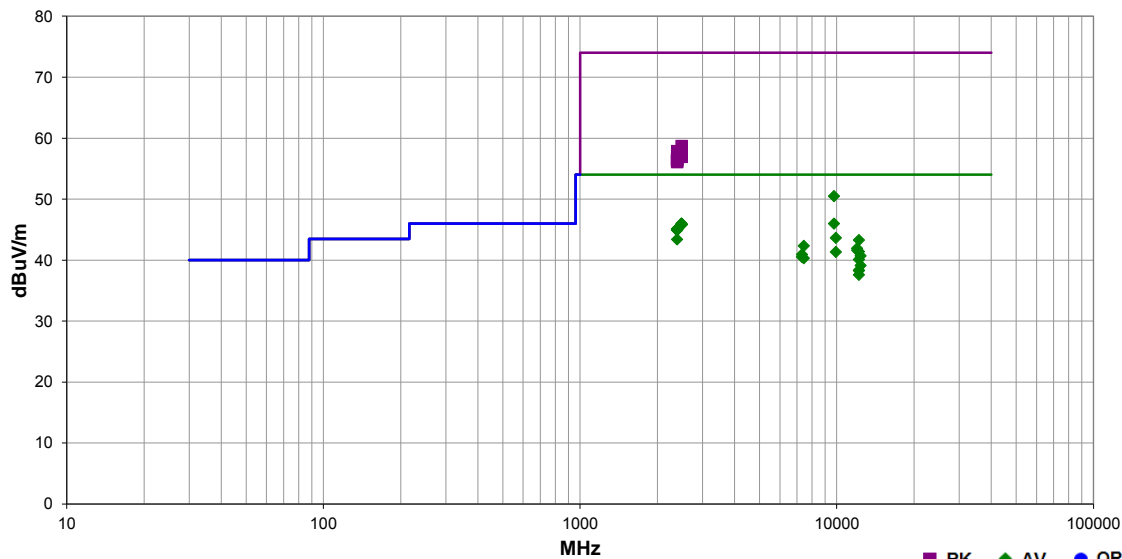
## TEST DESCRIPTION

The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization. A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

Work Order:	UTCF0027	Date:	03/10/15	
Project:	None	Temperature:	22.4 °C	
Job Site:	MN05	Humidity:	23.3% RH	
Serial Number:	01021041040200000092	Barometric Pres.:	1010.3 mbar	
Tested by: Johnathan Lee				
EUT: AVO-BTWIFI (Bluetooth/Wi-Fi module) in the AV-TS7				
Configuration: 3				
Customer: UTC Fire and Security				
Attendees: Paul Price				
EUT Power: 110VAC/60Hz				
Operating Mode: Transmitting Low, Mid, High Channels: 2402, 2440, 2480 MHz				
Deviations: Customer cannot verify packetization structure (DH5, 2DH5, 3DH5), using Texas Instruments script: BT_PLT.sh to set modes.				
Comments: None				

Test Specifications	Test Method
FCC 15.247:2015	ANSI C63.10:2009

Run #	43	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
9760.442	57.5	-7.0	1.0	210.1	3.0	0.0	Horz	AV	0.0	50.5	54.0	-3.5	EUT Horizontal, Mid Ch, GFSK, DH5
2483.708	29.5	-3.5	1.0	289.9	3.0	20.0	Vert	AV	0.0	46.0	54.0	-8.0	EUT Horizontal, High Ch, EDR, 2DH5
9760.467	53.0	-7.0	1.0	16.1	3.0	0.0	Vert	AV	0.0	46.0	54.0	-8.0	EUT Horizontal, Mid Ch, GFSK, DH5
2483.517	29.4	-3.5	3.2	268.9	3.0	20.0	Horz	AV	0.0	45.9	54.0	-8.1	EUT Horizontal, High Ch, EDR, 3DH5
2483.525	29.4	-3.5	1.0	315.0	3.0	20.0	Vert	AV	0.0	45.9	54.0	-8.1	EUT Horizontal, High Ch, EDR, 3DH5
2486.867	29.3	-3.5	3.0	101.1	3.0	20.0	Horz	AV	0.0	45.8	54.0	-8.2	EUT Horizontal, High Ch, GFSK, 2DH5
2484.433	29.3	-3.5	3.5	37.1	3.0	20.0	Vert	AV	0.0	45.8	54.0	-8.2	EUT Horizontal, High Ch, GFSK, 2DH5
2484.008	29.3	-3.5	1.0	103.0	3.0	20.0	Horz	AV	0.0	45.8	54.0	-8.2	EUT Horizontal, High Ch, EDR, 2DH5
2386.975	28.9	-3.8	2.9	282.0	3.0	20.0	Horz	AV	0.0	45.1	54.0	-8.9	EUT Horizontal, High Ch, EDR, 2DH5
2388.525	28.9	-3.8	3.6	34.1	3.0	20.0	Horz	AV	0.0	45.1	54.0	-8.9	EUT Horizontal, High Ch, EDR, 3DH5
2389.008	28.9	-3.8	1.0	282.9	3.0	20.0	Vert	AV	0.0	45.1	54.0	-8.9	EUT Horizontal, High Ch, EDR, 3DH5
2389.333	28.9	-3.8	1.0	194.0	3.0	20.0	Horz	AV	0.0	45.1	54.0	-8.9	EUT Horizontal, Low Ch, GFSK, DH5
2389.908	28.9	-3.8	1.0	49.0	3.0	20.0	Vert	AV	0.0	45.1	54.0	-8.9	EUT Horizontal, High Ch, EDR, 2DH5
2388.900	28.8	-3.8	1.0	66.1	3.0	20.0	Vert	AV	0.0	45.0	54.0	-9.0	EUT Horizontal, Low Ch, GFSK, DH5
2389.450	28.8	-3.8	1.0	311.9	3.0	20.0	Vert	AV	0.0	45.0	54.0	-9.0	EUT On Side, Low Ch, GFSK, DH5
2389.633	28.8	-3.8	2.4	164.0	3.0	20.0	Horz	AV	0.0	45.0	54.0	-9.0	EUT On Side, Low Ch, GFSK, DH5
2388.467	28.7	-3.8	1.0	271.9	3.0	20.0	Vert	AV	0.0	44.9	54.0	-9.1	EUT Vertical, Low Ch, GFSK, DH5
9919.467	50.6	-7.0	1.0	213.1	3.0	0.0	Horz	AV	0.0	43.6	54.0	-10.4	EUT Horizontal, High Ch, GFSK, DH5
2389.933	27.2	-3.8	1.8	192.1	3.0	20.0	Horz	AV	0.0	43.4	54.0	-10.6	EUT Vertical, Low Ch, GFSK, DH5
12200.630	47.5	-4.2	1.0	117.0	3.0	0.0	Vert	AV	0.0	43.3	54.0	-10.7	EUT Horizontal, Mid Ch, GFSK, DH5
7440.192	28.7	13.6	1.5	156.1	3.0	0.0	Vert	AV	0.0	42.3	54.0	-11.7	EUT Horizontal, High Ch, GFSK, DH5
12009.380	46.7	-4.8	1.0	114.0	3.0	0.0	Vert	AV	0.0	41.9	54.0	-12.1	EUT Horizontal, Low Ch, GFSK, DH5
12010.570	46.4	-4.8	1.0	206.1	3.0	0.0	Horz	AV	0.0	41.6	54.0	-12.4	EUT Horizontal, Low Ch, GFSK, DH5
12199.980	45.6	-4.2	1.0	131.1	3.0	0.0	Vert	AV	0.0	41.4	54.0	-12.6	EUT Horizontal, Mid Ch, EDR, 3DH5
9919.458	48.3	-7.0	1.1	160.1	3.0	0.0	Vert	AV	0.0	41.3	54.0	-12.7	EUT Horizontal, Low Ch, GFSK, DH5
7319.792	27.9	13.0	1.2	136.0	3.0	0.0	Horz	AV	0.0	40.9	54.0	-13.1	EUT Horizontal, Mid Ch, GFSK, DH5
12399.310	44.5	-3.8	1.0	68.0	3.0	0.0	Vert	AV	0.0	40.7	54.0	-13.3	EUT Horizontal, High Ch, GFSK, DH5
7320.033	27.5	13.0	1.0	127.1	3.0	0.0	Vert	AV	0.0	40.5	54.0	-13.5	EUT Horizontal, Mid Ch, GFSK, DH5
7437.683	26.7	13.6	1.0	311.0	3.0	0.0	Horz	AV	0.0	40.3	54.0	-13.7	EUT Horizontal, High Ch, GFSK, DH5
12200.590	44.3	-4.2	1.0	144.0	3.0	0.0	Horz	AV	0.0	40.1	54.0	-13.9	EUT Horizontal, Mid Ch, GFSK, DH5
12399.330	42.9	-3.8	1.0	206.1	3.0	0.0	Horz	AV	0.0	39.1	54.0	-14.9	EUT Horizontal, High Ch, GFSK, DH5
2486.058	42.2	-3.5	3.5	37.1	3.0	20.0	Vert	PK	0.0	58.7	74.0	-15.3	EUT Horizontal, High Ch, GFSK, 2DH5
12200.710	42.5	-4.2	1.1	207.0	3.0	0.0	Horz	AV	0.0	38.3	54.0	-15.7	EUT Horizontal, Mid Ch, EDR, 2DH5
12200.030	42.5	-4.2	1.0	208.0	3.0	0.0	Horz	AV	0.0	38.3	54.0	-15.7	EUT Horizontal, Mid Ch, EDR, 3DH5

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2388.725	41.7	-3.8	1.8	192.1	3.0	20.0	Horz	PK	0.0	57.9	74.0	-16.1	EUT Vertical, Low Ch, GFSK, DH5
12200.750	41.8	-4.2	1.0	105.1	3.0	0.0	Vert	AV	0.0	37.6	54.0	-16.4	EUT Horizontal, Mid Ch, EDR, 2DH5
2486.725	40.8	-3.5	1.0	103.0	3.0	20.0	Horz	PK	0.0	57.3	74.0	-16.7	EUT Horizontal, High Ch, EDR, 2DH5
2483.500	40.7	-3.5	3.0	101.1	3.0	20.0	Horz	PK	0.0	57.2	74.0	-16.8	EUT Horizontal, High Ch, GFSK, 2DH5
2487.142	40.6	-3.5	1.0	315.0	3.0	20.0	Vert	PK	0.0	57.1	74.0	-16.9	EUT Horizontal, High Ch, EDR, 3DH5
2487.467	40.5	-3.5	3.2	268.9	3.0	20.0	Horz	PK	0.0	57.0	74.0	-17.0	EUT Horizontal, High Ch, EDR, 3DH5
2488.367	40.4	-3.5	1.0	289.9	3.0	20.0	Vert	PK	0.0	56.9	74.0	-17.1	EUT Horizontal, High Ch, EDR, 2DH5
2389.942	40.6	-3.8	1.0	49.0	3.0	20.0	Vert	PK	0.0	56.8	74.0	-17.2	EUT Horizontal, High Ch, EDR, 2DH5
2386.917	40.4	-3.8	1.0	194.0	3.0	20.0	Horz	PK	0.0	56.6	74.0	-17.4	EUT Horizontal, Low Ch, GFSK, DH5
2388.667	40.4	-3.8	3.6	34.1	3.0	20.0	Horz	PK	0.0	56.6	74.0	-17.4	EUT Horizontal, High Ch, EDR, 3DH5
2389.150	40.3	-3.8	2.9	282.0	3.0	20.0	Horz	PK	0.0	56.5	74.0	-17.5	EUT Horizontal, High Ch, EDR, 2DH5
2385.942	40.1	-3.8	1.0	282.9	3.0	20.0	Vert	PK	0.0	56.3	74.0	-17.7	EUT Horizontal, High Ch, EDR, 3DH5
2386.783	40.0	-3.8	1.0	311.9	3.0	20.0	Vert	PK	0.0	56.2	74.0	-17.8	EUT On Side, Low Ch, GFSK, DH5
2388.558	39.9	-3.8	2.4	164.0	3.0	20.0	Horz	PK	0.0	56.1	74.0	-17.9	EUT On Side, Low Ch, GFSK, DH5