Test Report

Prepared for: Decatur Electronics, LLC

Model: SVR3D

FCC ID: HTRSCOUT2

Serial Number: SHD2+-00127

Project: p24c0005

Test Results: Pass

To

FCC_ Part 90 (Subpart F)

Date of Issue: April 11, 2025

On the behalf of the applicant:	**Decatur Electronics, LLC** **920 S. Andreasen Drive. STE 103** **Escondido, CA 92029**
Attention of:	**Kimble Smith, Senior Design Engineer** **Ph: 800-428-4315** **E-Mail: KimbleS@decaturelectronics.com**
Prepared By:	**Compliance Testing, LLC** **Mesa, AZ 85204** **(480) 926-3100 phone / (480) 926-3598 fax** **www.compliancetesting.com** **ANAB Cert#: AT-2901** **FCC Site Reg. #US2901** **ISED Site Reg. #2044A-2**

Greg Corbin

Project Test Engineer

Test Result Summary

FCC Specification	Test Name	Pass, Fail, N/A	Comments
2.1046(a) 90.205(s)	Output Power (Radiated)	Pass	Radiated only
2.1051 90.210	Unwanted Emissions (Transmitter Conducted)	N/A	Radiated only
2.1053 90.210(b)	Field Strength of Spurious Radiation	Pass	
2.1049 90.210(b)	Emission Mask	N/A	CW transmitter
2.1049	Occupied Bandwidth	N/A	CW transmitter
2.1047(a)	Audio Low Pass Filter (Voice Input)	N/A	No Audio port
2.1047(a)	Audio Frequency Response	N/A	No Audio port
2.1047(b)	Modulation Limiting	N/A	No Audio port
2.1055(a)(1) 90.213(a)	Frequency Stability (Temperature Variation)	Pass	
2.1055(d)(1) 90.213(a)	Frequency Stability (Voltage Variation)	Pass	

Statements of conformity are reported as:

- Pass - the measured value is below the acceptance limit, *acceptance limit = test limit*.
- Fail - the measured value is above the acceptance limit, *acceptance limit = test limit*.

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	4/9/2025	Greg Corbin	Original Document

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ANAB

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

FCC Site Reg. #349717

IC Site Reg. #2044A-2

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II, Part 2, Subpart J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, ANSI C63.26-2015, Part 90.

Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing.

In accordance with ANSI/TIA 603C, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Environmental Conditions		
Temp (ºC)	**Humidity (%)**	**Pressure (mbar)**
22.3 – 27.7	25.0 – 30.6	964 – 976.8

Measurement results, unless otherwise noted, are worst-case measurements.

EUT Description

Model:	SVR3D
Serial:	SHD2+-00127
Firmware:	N/A
Software:	2.0
Description:	Handheld Surface Water Velocity Radar
Additional Information	Refer to Table 1
Receipt of Sample(s):	February 25, 2025
EUT Condition:	**Visual Damage** No **State of Development** Production/Production Equivalent
Accessories	None
Modifications	None

Table 1 – Frequency Range, Modulation, emission designators

Frequency Range (GHz)	Test Frequency (GHz)	Modulation	Emission Designator
33.400 – 36.000	35.456	CW	NON

EUT Operation during tests:
The EUT is powered by an internal battery.
Depressing the trigger turns the CW transmitter on.

Carrier Output Power (Radiated)

Engineer: Greg Corbin

Test Date: 3/3/2025

Measurement Procedure

The Radar was positioned on a tripod at a 3 meter distance from the receiving antenna.
The EUT was rotated along its X,Y,Z axis to determine the maximum output power.
The raw data was recorded, and the final results were computed using the formulas C.7, C.8, C.9 in ANSI C63-26-2015 section C.5.2.
C.5.2 When the EUT power is measured using a radiated test configuration, the EIRP may be directly determined using the power (logarithmic) approach as follows in Equation (C.7):
(C.7) **EIRP = *P*R + *L*P**
EIRP equivalent (or effective) isotopically radiated power (in same units as *P*R).
*P*R adjusted received power level, in dBW, dBm, or psd.
*L*P basic free-space propagation path loss, in dB.

The received power level is the measured power adjusted for measurement antenna gain, connecting cable loss, and any external signal amplification or attenuation used in the test configuration. Mathematically, as in Equation (C.8):
(C.8) ***P*R = *P*meas −*G*R + *L*C + *L*atten −*G*amp**
*P*meas measured power level, in dBW, dBm or psd.
*G*R gain of the receive (measurement) antenna, in dBi.
*L*C signal loss in the measurement cable, in dB.
*L*atten value of external attenuation (if used), in dB.
*G*amp value of external amplification (if used), in dB.

The free space propagation path loss is determined from the Equation (C.9):
(C.9) ***L*P = 20log*F* + 20log*d* − 27.5**
*L*P basic free space propagation path loss, in dB.
F center frequency of radiated EUT signal, in MHz.
d measurement distance, in m.

dBm = dBuV - 107

There is no power limit listed in Part 90 for the 33.4 – 36 GHz band.
When there is no output power limit listed, the maximum output power limit is the manufacturer rated output power + 20% per 90.205(s) which states:

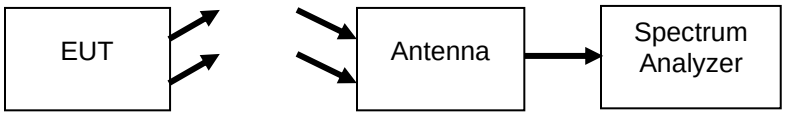
Per FCC Part 90.205(s) *The output power shall not exceed by more than 20 percent either the output power shown in the Radio Equipment List [available in accordance with § 90.203(a)(1)] for transmitters included in this list or when not so listed, the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.*

The manufacturer's rated output power =32 dBm (10 mw+ 22 dB antenna gain)

FCC Output Power Limit = 1.9 watts (32.79 dBm) which is the manufacturer rated power + 20%

RBW = 120 kHz (30 – 1000 MHz) and 1 MHz from 1 – 200 GHz
VBW = 3 x RBW

Test Setup



Output power Test Results

	F	Pmeas	d	LP	LC	Gamp	Latten	GR	PR	PR+LP				
Freq Band	Raw Data		distance	Free-space Path Loss	Cable Insertion Loss	Ext. Amplifier Gain	Receive Mixer Conversion Loss	Receive Antenna Gain	Received Power Level	EIRP	EIRP	FCC Limit	Margin	Pass / Fail
	Freq	Amplitude												
GHz	MHz	dBuV	meter	dB	dB	dB	dB	dB	dBuV	dBuV	dBm	dBm	dB	
33.4 - 36	35456	77.7	3	73.04	-4.20	0	0	12.9	60.6	133.64	26.64	32.79	-6.15	Pass

Fundamental Output Power_35.456 GHz_ Trace 1 Avg_ Trace 2 Peak

Field Strength of Spurious Radiation

Engineer: Greg Corbin

Test Date: 3/3/2025, 4/10/25

Test Procedure

Measurement Procedure

The Radar was positioned on a tripod at a 3 meter distance from the receiving antenna.
The EUT was rotated along its X,Y,Z axis to determine the maximum spurious emission.
Spriuos emissions were measured from 30 MHz to 200 GHz.
The raw data was recorded, and the final results were computed using the formulas C.7, C.8, C.9 in ANSI C63-26-2015 section C.5.2.
C.5.2 When the EUT power is measured using a radiated test configuration, the EIRP may be directly determined using the power (logarithmic) approach as follows in Equation (C.7):
(C.7) **EIRP = *P*R + *L*P**
EIRP equivalent (or effective) isotopically radiated power (in same units as *P*R).
*P*R adjusted received power level, in dBW, dBm, or psd.
*L*P basic free-space propagation path loss, in dB.

The received power level is the measured power adjusted for measurement antenna gain, connecting cable loss, and any external signal amplification or attenuation used in the test configuration. Mathematically, as in Equation (C.8):
(C.8) ***P*R = *P*meas −*G*R + *L*C + *L*atten −*G*amp**
*P*meas measured power level, in dBW, dBm or psd.
*G*R gain of the receive (measurement) antenna, in dBi.
*L*C signal loss in the measurement cable, in dB.
*L*atten value of external attenuation (if used), in dB.
*G*amp value of external amplification (if used), in dB

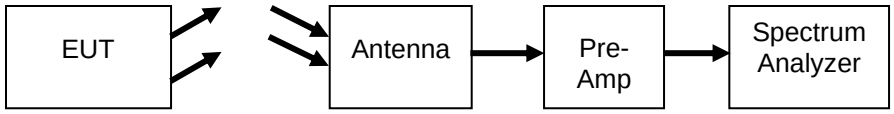
The free space propagation path loss is determined from the Equation (C.9):
(C.9) ***L*P = 20log*F* + 20log*d* − 27.5**
*L*P basic free space propagation path loss, in dB.
F center frequency of radiated EUT signal, in MHz.
d measurement distance, in m.

dBm = dBuV - 107

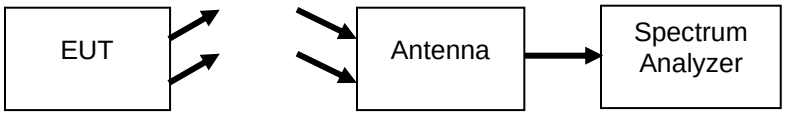
The FCC spurious emission limit = – 13 dBm.

Test Setup

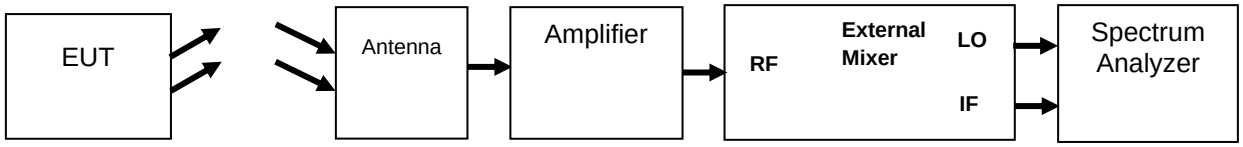
30 – 1000 MHz



1 – 50 GHz Test Set-up



50 – 200 GHz Test Setup



Radiated Spurious Test Results

	F	Pmeas	d	LP	LC	Gamp	Latten	GR	PR	PR+LP				
Freq Band	Raw Data		distance	Free-space Path Loss	Cable Insertion Loss	Ext. Amplifier Gain	Receive Mixer Conversion Loss	Receive Antenna Gain	Received Power Level	EIRP	EIRP	FCC Limit	Margin	Pass / Fail
	Freq	Amplitude												
GHz	MHz	dBuV	meter	dB	dB	dB	dB	dB	dBuV	dBuV	dBm	dBm	dB	
0.30 - 1	320.03	43.85	3.00	32.15	-2.06	35.96	0.00	2.00	3.83	35.98	-71.0	-13.0	-58.02	Pass
1 - 18	3663.3	37.27	3.00	53.32	-7.40	0.00	0.00	10.73	19.14	72.46	-34.54	-13.00	-21.54	Pass
18 - 40	38639	34.10	3.00	73.78	-4.21	0.00	0.00	16.40	13.49	87.27	-19.73	-13.00	-6.73	Pass
40 - 50	46953	32.50	3.00	75.48	-5.09	0.00	0.00	23.40	4.01	79.49	-27.51	-13.00	-14.51	Pass
50 – 75	70862	33.25	3.00	79.05	-0.50	34.62	-47.95	23.40	-73.22	5.83	-101.17	-13.00	-88.17	Pass
75 – 110	106385	15.62	3.00	82.58	-1.00	28.57	-44.78	24.00	-82.73	-0.15	-107.15	-13.00	-94.15	Pass
110 – 170	141823	52.80	3.00	85.08	-0.50	42.90	-11.53	23.22	-25.35	59.73	-47.27	-13.00	-34.27	Pass
170 - 200	199157	24.62	3.00	88.03	-0.50	27.14	-12.67	22.98	-38.67	49.36	-57.64	-13.00	-44.64	Pass

Annex A Radiated Spurious Emission

Refer to Annex A for Radiated Spurious Emission plots.

Note: Marker 1 on the 18 – 40 GHz graph in Annex A is the fundamental transmit signal and is exempt from the spurious emission limits.

Frequency Stability (Temperature Variation)

Engineer: Greg Corbin

Test Date:3/28/2025, 4/3/2025

Measurement Procedure

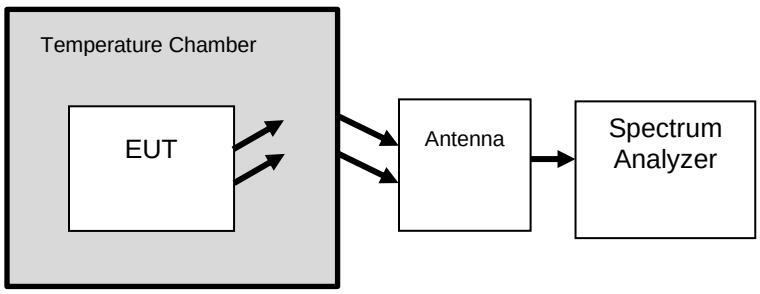
The EUT was placed in an environmental test chamber and the RF output was connected directly to a spectrum analyzer.
The temperature was varied from -30°C to 50°C in 10°C increments.
After a sufficient time for temperature stabilization the RF output was turned on, the spectrum analyzer was set to peak max hold. After 60 seconds the trace was recorded.
There is no frequency stability limit for 33.4 – 36 GHz in Part 90.
When there is no PPM or % limit, the frequency is verified to stay within the band of operation.
For each temperature, the minimum and maximum freq was recorded and verified to remain within the band of operation.

The EUT has an internal battery.
ANSI C63.26-2015 section 5.6.3 states:
For handheld equipment that is only capable of operating from internal batteries and the supply voltage cannot be varied, the frequency stability tests shall be performed at the nominal battery voltage and the battery end point voltage specified by the manufacturer.

The EUT has a battery monitor reading the % of remaining battery voltage.
For all tests except the voltage variation test, the EUT battery voltage was > 90%.
At 20 deg C, the test was performed at 90%, 20%, 10% battery voltage.

A spectrum analyzer plot was provided for each temperature setting.

Frequency Stability Test Setup



Frequency Stability vs Temperature

Temperature	Measured Frequency		Lower Limit	Upper Limit	Pass / Fail
	Lower	Upper			
(deg C)	(MHz)	(MHz)	(MHz)	(MHz)	
-30	35486.183	35490.124	33400	36000	Pass
-20	35482.368	35486.616	33400	36000	Pass
-10	35471.327	35477.122	33400	36000	Pass
0	35466.401	35470.649	33400	36000	Pass
10	35453.466	35457.361	33400	36000	Pass
20	35442.115	35446.75	33400	36000	Pass
30	35433.741	35438.289	33400	36000	Pass
40	35425.664	35430.672	33400	36000	Pass
50	35419.522	35424.584	33400	36000	Pass

Battery Level	Measured Frequency		Lower Limit	Upper Limit	Pass / Fail
	Lower	Upper			
%	(MHz)	(MHz)	(MHz)	(MHz)	
10	35431.243	35435.358	33400	36000	Pass
20	35431.703	35435.651	33400	36000	Pass
90	35442.115	35446.75	33400	36000	Pass

Annex B Frequency Stability plots.

Refer to Annex B for Frequency Stability plots.

Measurement Uncertainty

Measurement Uncertainty (U_{lab}) for Compliance Testing is listed in the table below.

Measurement	U_{lab}
Radio Frequency	± 3.3 x 10^{-8}
RF Power, conducted	± 1.5 dB
RF Power Density, conducted	± 1.0 dB
Conducted Emissions	± 1.8 dB
Radiated Emissions 9kHz-30MHz	± 3.6 dB
Radiated Emissions 30MHz-1000MHz	± 4.25 dB
Radiated Emissions – 1GHz-18GHz	± 4.5 dB
Temperature	± 1.5 deg C
Humidity	± 4.3 %
DC voltage	± 0.20 VDC
AC Voltage	± 1.2 VAC

The reported expanded uncertainty +/- U_{lab}(dB) has been estimated at a 95% confidence level (k=2)

U_{lab} is less than or equal to U_{ETSI} therefore

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit
- Non-Compliance is deemed to occur if any measured disturbance exceeds the disturbance limit

Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Temperature Chamber	Tenney	Tenney Jr	i00027	NR	
Data Logger	Fluke	Hydra Data Bucket	i00343	6/19/24	6/19/25
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	7/13/23	7/13/26
Temp./humidity/ pressure monitor (Main Lab)	Omega Engineering	iBTHX-W-5	i00686	1/25/25	1/25/26
Voltmeter	Fluke	79III	i00499	10/15/24	10/15/25
PSA Spectrum Analyzer	Agilent	E4445A	i00471	1/25/25	1/25/26
MXE EMI receiver	Keysight	N9038A	i00552	3/17/25	3/17/26
Bi-Log antenna	Chase	CBL6111C	i00267	3/5/24	3/5/26
Horn Antenna	ARA	DRG-118/A	i00271	8/9/24	8/9/26
Horn Antenna (18-40GHz)	EMCO	3116	i00085	3/14/23	3/14/25
Horn Antenna, standard gain	CMI	HO22R	i00484	NR	NR
Horn Antenna, standard gain	CMI	HO15R	i00477	NR	NR
Horn Antenna, standard gain	CMI	HO10R	i00476	NR	NR
Horn Antenna, standard gain	CMI	HO6R	i00475	NR	NR
Horn Antenna, standard gain	CMI	HO4R	i00473	NR	NR
Harmonic Mixer	Agilent	11970W	i00464	Verified on: 7/11/24	
Mixer with Preselector	Hewlett Packard	11974	i00726	Verified on: 9/23/24	
Spectrum Analyzer Extension Module	VDI	WR4.3SAX-M	i00740	Verified on: 9/24/24	
Spectrum Analyzer Extension Module	VDI	WR6.5SAX-M	i00741	Verified on: 7/12/24	
LNA	Preamplifier	SBL-1141743065-0606-E1	i00658	Verified on: 9/30/24	
Preamplifier	Eravant	SBB-0115034019-2F2F-E3	i00588	Verified on: 9/3/24	
LNA	Eravant	SBL-7531143550-1010-E1	i00589	Verified on: 9/3/24	
Preamplifier	VDI	VDIWR4.3PAMP	i00682	Verified on: 9/24/24	
Preamplifier	Eravant	SBB-0115034019-2F2F-E3	i00722	Verified on: 12/4/24	
Preamplifier	Com Power	PAM-103	i00734	Verified on: 6/4//24	
Power Meter w/859V power sensor (75 – 110 GHz)	VDI	PM5B with 859V sensor	i00736	6-25-24	6-5-25
Waveguide taper WR10 to WR6.5	VDI	WR6.5TA	i00737	N/A	

Waveguide taper WR10 to WR4.3	VDI	WR4.3TA	i00738	N/A
Waveguide Extension, WR-15	Eravant	SWG-15020-FB	i00664	N/A
Waveguide Extension, WR-15	VDI	WR15SWG2R4	i00749	N/A
Waveguide Extension, WR-10	Eravant	SWG-10020-FB	i00665	N/A
Waveguide Extension, WR-06	OML	N/A	i00748	N/A
Waveguide Extension, WR-04	Eravant	STQ-WG-04020-F1-A-R	i00750	N/A

In addition to the equipment listed above standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPO