

# **C2PC TEST REPORT**

# **Report Number:** 14663671-E1V1

- Applicant : SPOTTER RF LLC 709 E. TECHNOLOGY AVE. BLDG E 3100 OREM, UTAH 84097, U.S.A.
  - Model : C550, AX250-3D, 3D-250, AX350-2D, AX400-2D
  - Brand : SPOTTER RF LLC
  - FCC ID : CO6-C550-LIC
- EUT Description : COMPACT SURVEILLANCE RADAR
- Test Standard(s) : FCC CFR47 PART 90

Date of Issue: March 20, 2023

Prepared by: UL VERIFICATION SERVICES 47173 Benicia Street Fremont, CA 94538 U.S.A. TEL: (510) 319-4000 FAX: (510) 661-0888



#### **Revision History**

Rev.	lssue Date	Revisions	Revised By
V1	2023-03-20	Initial Issue	

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Complies

### **1. ATTESTATION OF TEST RESULTS**

s	TANDARD	TEST RESULTS
	APPLICABLE STANDARDS	
DATE TESTED:	2023-2-7 to 2023-2-15	
SAMPLE RECEIPT DATE:	2023-2-3	
SERIAL NUMBER:	Radiated: SP45345 Conducted: SP45167	
MODEL TESTED:	AX250-3D	
MODEL:	C550, AX250-3D, 3D-250, AX350-2D,	, AX400-2D
EUT DESCRIPTION:	COMPACT SURVEILLANCE RADAR	
COMPANY NAME:	SPOTTERRF LLC 709 E. TECHNOLOGY AVE. BLDG E 31 OREM, UTAH 84097, U.S.A.	00

UL Verification Services Inc. 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 Verification Services Inc. 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.

CFR 47 Part 90

**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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 A2LA, NIST, any agency of the Federal Government, or any agency of any government.

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# 2. TEST RESULTS SUMMARY

This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. is only responsible for the validity of results after the integration of the data provided by the customer.

Below is a list of the data provided by the customer:

- 1) Antenna gain and type (see section 6.3)
- 2) Cable Loss (see section 9.2 & 9.3)

FCC Clause	Requirement	Result	Comment
§2.1049	Occupied Bandwidth	Complies	
§2.1046, §90.205(s), §90.103(c)(13)	Output Power	Complies	
§2.1055, §90.213(b)	Frequency Stability	Not tested	Refer to Original report
§2.1051, §90.210	Conducted Spurious Emissions	Complies	
§2.1053, §90.210	Radiated Spurious Emissions	Complies	
§1.1310 & 2.1091	RF Exposure	Complies	Refer to UL Report # 14663671-E3

# 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 90, 971168 D01 Power Meas License Digital Systems v03r01.

# 4. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by A2LA, Certificate Number 0751.05, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
$\boxtimes$	Building 1: 47173 Benicia Street Fremont, CA 94538, U.S.A	US0104	2324A	550739
	Building 2: 47266 Benicia Street Fremont, CA 94538, U.S.A	US0104	2324A	550739
$\boxtimes$	Building 4: 47658 Kato Rd Fremont, CA 94538, U.S.A	US0104	2324A	550739

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# 5. DECISION RULES AND MEASUREMENT UNCERTAINTY

# 5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

# 5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

# 5.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	U <sub>Lab</sub>
Radio Frequency (Spectrum Analyzer)	141.16 Hz
Occupied Bandwidth	1.22%
RF Power Measurement Direct Method Using Power Meter	1.3 dB (PK) 0.45 dB (AV)
Unwanted Emissions, conducted	1.94 dB
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.78 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.40 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.87 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	6.01 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.73 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.51 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.29 dB
Time Domain Measurements	3.39 %
Temperature	0.57°C
Humidity	3.39%
DC Supply voltages	0.57%

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

# 5.4. SAMPLE CALCULATION

#### RADIATED EMISSIONS

Where relevant, the following sample calculation is provided: Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB) 36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

#### MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided: Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss. 36.5 dBuV + 0 dB + 10.1 dB + 0 dB = 46.6 dBuV

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# 6. EQUIPMENT UNDER TEST

# 6.1. DESCRIPTION OF EUT

The EUT is 10 GHz medium range Compact Surveillance Radar (CSR). The unit operates only between channel 2 through 9 (10.055 GHz to 10.455 GHz)

The radio module is manufactured by SpotterRF LLC.

# 6.2. PERMISIVE CHANGE SCOPE

Purpose for C2PC permissive change is to add a new antenna rotating motor and reduction of BW by 10MHz and implementing a wider antenna plate and longer coax cable to antenna.

# 6.3. MODEL DIFFERENCES

Model AX250-3D and 3D-250 uses model C550 Hardware but implements the rotating motor and reduction of BW by 10Mhz and implements a wider antenna plate with a longer coax cable to antenna.

Model AX350-2D and AX400-2D are electrically identical to AX250-3D and 3D-250 without the rotating base.

### 6.4. MAXIMUM OUTPUT POWER

Frequency (GHz)	Channel	Output Power (dBm)	Output Power (mW)
10.075	2	20.94	124.17
10.225	5	20.98	125.31
10.425	9	20.61	115.08

The transmitter has a maximum peak conducted output power as follows:

### 6.5. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:

The radio utilizes a patch antenna, with a maximum gain of 14 dBi.

### 6.6. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was v3.0.0-alpha.00502

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# 6.7. WORST-CASE CONFIGURATION AND MODE

Radiated emission was performed with the EUT set to transmit at the channel with highest output power as worst-case scenario for Below 1GHz, Above 1GHz. For Above 18GHz, Radiated emission was performed with the EUT set to transmit at the low mid and high channel.

The EUT has eight usable channels and each channel has 50MHz bandwidth with frequency modulation on continuous wave format.

Sweeping mode at which the continuous wave frequency sweeps inside the 50 MHz band while the output power measured as shown below under 9.3 and 9.4.

All final radiated testing was performed with the EUT in upright orientation as indicated by the installation instructions.

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## 6.8. DESCRIPTION OF TEST SETUP

#### SUPPORT EQUIPMENT

			SUPPORT TEST	EQUIPMENT		
Des	cription	Manufacturer	Model	Serial N	umber	FCC ID/ DoC
POE S	E Power upply	Phoenix Contact	Various	Various		DoC
			O CABLES (CON	DUCTED TEST)		
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Unshielded	1m	None
2	Ethernet	1	RJ45	Unshielded	1m	None

#### **TEST SETUP**

The EUT is powered via the POE adapter. Test software exercised using the Laptop controlled through the Ethernet cables. Laptop was removed for final testing.

#### SETUP DIAGRAM FOR TESTS



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# 7. MEASUREMENT METHOD

On Time and Duty Cycle: ANSI C63.25-2015 Section 5.2.4.3.4

Occupied BW (99%): ANSI C63.25-2015 Section 5.4.3

Output Power: ANSI C63.25-2015 Section 5.2.3.2

Radiated Spurious emissions: ANSI C63.25-2015 Section 5.5

Conducted Spurious emissions: ANSI C63.25-2015 Section 5.7

# 8. TEST AND MEASUREMENT EQUIPMENT

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

	TEST EQU	JIPMENT LIST			
Description	Manufacturer	Model	ID Num	Cal Due	Last Cal
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	101724	2023/02/28	2022/02/16
Antenna, BroadBand Hybrid,	Sunol Sciences	JB1	80813	2023/06/08	2022/06/08
30MHz to 2GHz	Corp.				
Thermometer	Control Company	14-650-118	175731	2024/02/29	2023/02/08
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	382692	2023/02/28	2022/02/28
RF Filter Box, 1-18GHz	UL	N/A	197920	2023/04/19	2022/04/19
Horn Antenna 1-18GHz	ETS Lindgren	3117	223083	2023/10/25	2022/10/25
Attenuator, 20dB	Mini-Circuits	VAT-20+	231193	Verify be	fore use
Attenuator, 6dB	Mini-Circuits	VAT-6+	231191	Verify be	efore use
Horn Antenna 18-26.5 GHz	A.R.A	MWH-1826/B	172364	2023/03/08	2022/03/08
RF Amplifier 18-26.5GHz	AMPLICAL	AMP18G26.5-60	215705	2023/02/26	2022/02/26
Antenna, Horn 26.5 to 40GHz	A.R.A	MWH-2640/B	81104	2023/12/15	2022/12/15
Rf Amplifier, 26-40GHz Kit	AMPLICAL	AMP26G40-65	172365	2023/03/08	2022/03/08
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies Inc	N9030A	125178	2023/02/28	2022/02/03
Attenuator, 10dB	Mini-Circuits	VAT-10+	231192	Verify be	efore use
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	81319	2024/01/31	2023/01/25
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	90719	2024/01/31	2023/01/25
Spectrum Analyzer, PXA, 3Hz to 50GHz w/Ext. Mixer	Keysight Technologies Inc	N9030A	80125	2023/02/28	2023/02/01
Antenna Horn, Rectangle, WR22	Custom Microwave Inc.	HO22R	201518	2023/07/06	2022/07/06
Low Noise Amplifier 40-50GHz	ERAVANT	SBL-3335033040- 2222-E1	215450	2023/04/14	2022/04/14
Antenna Horn, Rectangle, 50 – 75GHz	Custom Microwave Inc.	No Model #	H15-1	Verify be	efore use
LNA, 50-75 GHz	VIVA TECH	VTLNA-15-6018-FB	202496	2023-07-08	2022-07-08
	UL TEST SO	OFTWARE LIST			
Radiated Software	UL	UL EMC	F	Rev 9.5 18 Jan 2	2023
Antenna Port Software	UL	UL RF		AP2022.8.16	6

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# 9. ANTENNA PORT TEST RESULTS

## 9.1. OCCUPIED BANDWIDTH

#### <u>LIMITS</u>

FCC §2.1049

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The sweep time is coupled. The spectrum analyzer internal 26dB bandwidth function is utilized.

KDB 971168 Occupied bandwidth measurement method is used.

#### **RESULTS**

#### 26dB BANDWIDTH SWEEPING MODE

Channel	Frequency	26dB Bandwidth
	(GHz)	(MHz)
2	10.075	48.972
5	10.225	49.338
9	10.425	49.787

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#### REPORT NO: 14663671-E1V1 EUT: COMPACT SURVEILLANCE RADAR

* Agilent 15:11:54 Feb 14, 2023 L Fre	rq/Channel Agilent 15:09:28 Feb 14, 2023 L Freq/Channel
FreqRefUnlock     Ct       Ch Freq     10.075 GHz     Trig     Free     10.075 GHz	enter Freq Ch Freq 10.225 GHz Trig Free 10.225 GHz Center Freq
Occupied Bandwidth	0.0000 012 0ccupied Bandwidth
10.0	Start Freq 0250000 GHz Start Freq 10.1750000 GHz
Ref 26.7 dBm +Atten 26 dB	HP2022.3.16.44352,1emp H       Stop Frag     Ref 26.7 dBm     *Atten 26 dB
Log 10.1	1250000 GHz
	CF Step     10     →     ←     CF Step       adagaga MHz     adagaga MHz     adagaga MHz     10 adagaga MHz     10 adagaga MHz
	Man 10.7 August Aug
Res BW 1.5 MHz #VBW 5 MHz Sweep 1 ms (1001 pts)	Center 10.225 0 GHz     Span 100 MHz     Span 100 MHz       •Res BM 1.5 MHz     •VBW 5 MHz     Sweep 1 ms (1001 pts)
Occupied Bandwidth Occ BW % Pwr 99.00 % On	Ignal Frack Off Occupied Bandwidth Occ BW % Pwr 99.00 % On Off
ransmit Freq Error -2.023 MHz   x dB Bandwidth 48.972 MHz	x dB Bandwidth 49.338 MHz
Copyright 2000-2010 Agilent Technologies	Copyright 2000-2010 Agilent Technologies
LOW CHANNEL 1	MID CHANNEL 6
* Agilent 15:15:04 Feb 14, 2023   L   Free     PregRefUnlock   Ch Freq 10.425 GHz   Trig Free     Occupied Bandwidth   0.3   0.3     AP2022.8.16.44352.Temp A   ••Atten 26 dB   ••Peak     AP2022.8.16.44352.Temp A   ••Atten 26 dB   0.0     Ref 26.7 dBm   ••Atten 26 dB   0.0     Offst   ••Atten 26 dB   0.0     10.7   ••Atten 26 dB   0.0     0   ••Atten 26 dB   0.0     0.6   ••Atten 26 dB   0.0     0.7   ••Atten 26 dB   0.0     0.8   ••Atten 26 dB   0.0     0.9   ••Atten 26 dB   0.0     0.10.425 0 GHz   ••Span 100 MHz   0.0     •*Res BB 1.5 MHz   •VBH 5 MHz   Sweep 1 ms (1001 pts)   0.0     0.0   0cc BH Z PHr   9.00 Z   0.0   0.0     17ansmit Freq Error   -24.68 MHz   × dB   -26.00 dB   0.0     17ansmit Freq Error   -24.68 MHz   × dB   -26.00 dB   0.0     17ansmit Freq Error   -24.68 MHz   × dB   -26.00 dB   0.0     18	erder Freq 4250000 GHz       Start Freq 3750000 GHz       Stop Freq 4750000 GHz       CF Step 0000000 MHz man       Treq Offset 0000000 Hz       ignal Track 0ff

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# 9.2. OUTPUT POWER

#### <u>LIMITS</u>

FCC §2.1046

FCC §90.205(s) the output power shall not exceed by more than 20 percent either the output power shown in the Radio Equipment List

FCC §90.103(c) (13) operations in this band are limited to survey operations using transmitters with a peak power not to exceed 5 watts into the antenna.

#### TEST PROCEDURE

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband peak power sensor. Peak output power was read directly from power meter.

The SMA cable has a declared worst-case loss of 1dB by manufacturer.

KDB 971168 Wideband power measurement method is used.

#### **RESULTS**

Tested By:	44352			
Date:	2023-02-07			
	Frequency	Peak Power Reading (dBm)	Limit	Margin
Channel	(GHz)	Sweep mode	(dBm)	Sweep mode (dBm)
2	10.075	20.94	37	-16.06
5	10.225	20.98	37	-16.02
9	10.425	20.61	37	-16.39

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### 9.3. AVERAGE POWER

#### <u>LIMITS</u>

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

#### RESULTS

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband average power sensor. Gated average output power was read directly from power meter.

The SMA cable has a declared worst-case loss of 1dB by manufacturer.

KDB 971168 Wideband power measurement method is used.

Tested By:	44352	
Date:	2023-02-07	
Channel	Frequency	AV Power (dBm)
	(GHz)	Sweep
2	10.075	20.87
5	10.225	20.89
9	10.425	20.57

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# 9.4. CONDUCTED SPURIOUS EMISSIONS

#### <u>LIMITS</u>

FCC §2.1051 FCC §2.1057, & FCC §90.210

For frequencies outside the authorized band, the attenuation must be at least  $43 + 10 \log(Pm)$  dB. Pm is defined as the mean power of the radar in Watts. This equation will result in a -13 dBm limit line, regardless of the value of Pm: Pm (dBW) - attenuation = Pm (dBW) - (43 + 10 log(Pm)) = -43 dBW = -13 dBm.

#### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 1MHz. The video bandwidth is set to 3MHz.

The spectrum from 20MHz to 40GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

#### **RESULTS**

For 40GHz to 53GHz, see section 10.5 & 10.6.

#### SPURIOUS EMISSIONS SWEEPING MODE

#### LOW CHANNEL



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#### SPURIOUS EMISSIONS, MID CHANNEL



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#### HIGH CHANNEL



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# **10. RADIATED TEST RESULTS**

# 10.1. LIMITS AND PROCEDURE

#### <u>LIMITS</u>

FCC §2.1053 & FCC §90.210

For frequencies outside the authorized band, the attenuation must be at least  $43 + 10 \log(Pm)$  dB. Pm is defined as the mean power of the radar in Watts. This equation will result in a -13 dBm limit line, regardless of the value of Pm: Pm (dBW) - attenuation = Pm (dBW) - (43 + 10  $\log(Pm)$ ) = -43 dBW = -13 dBm or 82 dBuV/m at 3m.

*Emission Mask C.* For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5 kHz, but not more than 10 kHz: At least 83 log ( $f_d$ /5) dB;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least 29 log ( $f_d^2/11$ ) dB or 50 dB, whichever is the lesser attenuation;

(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

Equation (3) results in a -13 dBm limit line, regardless of the value of Pm: Pm (dBW) - attenuation = Pm (dBW) -  $(43 + 10 \log(Pm)) = -43 dBW = -13 dBm or 82 dBuV/m at 3m$ .

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.26. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9 to 150kHz range. Peak detection is used unless otherwise noted as quasi-peak or average (9-90kHz and 110-490kHz).

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

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For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

The spectrum from 9 kHz to 18 GHz and 40 GHz to 53 GHz, the channel with the highest output power was tested.

The spectrum from 18 MHz to 40 GHz is investigated with the transmitter set at the low mid and high channel.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

#### **RESULTS**

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# 10.2. WORST-CASE BELOW 1 GHz

#### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION,)



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#### **BELOW 1 GHz HORIZONTAL AND VERTICAL DATA**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	80813 ACF (dB)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Fcc Part 90 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 108.348	48.03	Pk	18.4	-30.9	35.53	82	-46.47	0-360	299	Н
4	* 108.348	51.41	Pk	18.4	-30.9	38.91	82	-43.09	0-360	101	V
2	399.526	48.8	Pk	21.8	-29.4	41.2	82	-40.8	0-360	299	Н
3	724.968	43.67	Pk	26.7	-28.5	41.87	82	-40.13	0-360	299	Н
5	* 400.239	48.73	Pk	21.8	-29.4	41.13	82	-40.87	183	150	V
6	* 975.001	42.04	Pk	29.3	-26	45.34	82	-36.66	0-360	101	V

Pk - Peak detector

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# 10.3. WORST-CASE TRANSMITTER ABOVE 1 GHz



Note, the signal over the limit line is the fundamental frequency of the EUT

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#### ABOVE 1 GHz HORIZONTAL AND VERTICAL DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	223083 ACF (dB) 3mH	Amp/Cbl (dB)	Pad	Corrected Reading dBuV/m	FCC Part 90 Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	5046.015	51.47	Pk	33.9	-41	26	70.37	82	-11.63	201	146	Н
1	3396.319	51.4	Pk	32.7	-42.7	26	67.4	82	-14.6	179	117	Н
3	15009.635	45.85	Pk	40.1	-34.8	26	77.15	82	-4.85	269	234	Н
5	5034.99	49.88	Pk	33.8	-41.1	26	68.58	82	-13.42	45	147	V
4	2728.725	52.18	Pk	32.3	-43.9	26	66.58	82	-15.42	28	352	V
6	17500.309	44.92	Pk	40.8	-31.4	26	80.32	82	-1.68	325	269	V

Pk - Peak detector

Marker 1, 3, 4 & 6 are noise floor.

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# 10.4. TRANSMITTER ABOVE 18 GHz

#### Low Channel



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#### 18000 TO 26000 MHz HORIZONTAL & VERTICAL DATA

Marker	Frequency	Meter	Det	172364 AF	215705	Cables (dB)	Corrected	FCC Part 90	PK	Azimuth	Height	Polarity
	(IVIFIZ)	(dBuV)		(dB)	(dB)		(dBuVolts)	(dBuV/m)	(dB)	(Degs)	(cm)	
1	* 20106.179	73.9	Pk	32.9	-60.3	18.5	65	82	-17	97	295	Н
2	24137.469	46.58	Pk	34.1	-61.1	20.3	39.88	82	-42.12	0-360	101	Н
3	25137.636	51.89	Pk	34.3	-61.2	20.7	45.69	82	-36.31	0-360	199	Н
4	* 20109.416	71.91	Pk	32.9	-60.3	18.5	63.01	82	-18.99	0-360	200	V
5	* 22065.359	46.75	Pk	33.5	-60.8	19.3	38.75	82	-43.25	0-360	200	V
6	25234.913	47.25	Pk	34.4	-61.2	20.8	41.25	82	-40.75	0-360	101	V

Pk - Peak detector

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#### 26000 TO 40000 MHz HORIZONTAL & VERTICAL DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	81104 AF (dB/m)	172345 amp/cbl (dB)	Cables (dB)	Corrected Reading (dBuV/m)	FCC Part 90 Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30164.714	60.64	Pk	36.4	-70.2	22.9	49.74	82	-32.26	19	238	Н
2	35207.5	42.49	Pk	37.3	-73.5	24.9	31.19	82	-50.81	0-360	101	Н
3	38148.5	41.52	Pk	37.7	-68.6	26.4	37.02	82	-44.98	0-360	101	Н
4	30164.5	50.73	Pk	36.4	-70.2	22.9	39.83	82	-42.17	0-360	200	V
5	35192	40.72	Pk	37.6	-73.6	24.9	29.62	82	-52.38	0-360	200	V
6	38117.5	40.9	Pk	38	-68.4	26.5	37	82	-45	0-360	200	V

Pk - Peak detector

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#### Mid Channel



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#### REPORT NO: 14663671-E1V1 EUT: COMPACT SURVEILLANCE RADAR

#### 18000 TO 26000 MHz HORIZONTAL & VERTICAL DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	172364 AF (dB)	215705 amp/cbl (dB)	Cables (dB)	Corrected Reading (dBuVolts)	FCC Part 90 Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 19826.555	48.06	Pk	32.9	-60.8	18.3	38.46	82	-43.54	0-360	101	Н
2	* 20432.946	67.67	Pk	33.1	-59.8	18.7	59.67	82	-22.33	102	232	Н
3	25512.108	47.91	Pk	34.4	-61.2	20.9	42.01	82	-39.99	0-360	101	Н
4	* 18538.805	49.33	Pk	32.6	-60.6	17.8	39.13	82	-42.87	0-360	101	V
5	* 20427.221	64.9	Pk	33.1	-59.8	18.7	56.9	82	-25.1	0-360	200	V
6	25546.58	46.12	Pk	34.4	-61.2	20.9	40.22	82	-41.78	0-360	101	V

Pk - Peak detector

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#### 26000 TO 40000 MHz HORIZONTAL & VERTICAL DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	81104 AF (dB/m)	172345 amp/cbl (dB)	Cables (dB)	Corrected Reading (dBuV/m)	FCC Part 90 Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30764.776	56.61	Pk	36.2	-70.1	23.2	45.91	82	-36.09	32	288	Н
2	32890	39.41	Pk	36.9	-70.9	24.1	29.51	82	-52.49	0-360	200	Н
3	38127	40.05	Pk	38	-68.5	26.5	36.05	82	-45.95	0-360	200	Н
4	30764.5	50.21	Pk	36.2	-70.1	23.2	39.51	82	-42.49	0-360	200	V
5	32881	40.63	Pk	37.1	-70.9	24.1	30.93	82	-51.07	0-360	200	V
6	38109.5	39.98	Pk	37.9	-68.4	26.5	35.98	82	-46.02	0-360	200	V

Pk - Peak detector

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#### **High Channel**

![](_page_33_Figure_3.jpeg)

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#### REPORT NO: 14663671-E1V1 EUT: COMPACT SURVEILLANCE RADAR

#### 18000 TO 26000 MHz HORIZONTAL & VERTICAL DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	172364 AF (dB)	215705 amp/cbl (dB)	Cables (dB)	Corrected Reading (dBuVolts)	FCC Part 90 Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 18287.111	48.75	Pk	32.5	-60.8	17.7	38.15	82	-43.85	0-360	101	Н
2	* 20808.059	59.81	Pk	33.1	-59.5	18.9	52.31	82	-29.69	101	202	Н
3	26048.552	46.72	Pk	34.7	-60.7	21.2	41.92	82	-40.08	0-360	101	Н
4	* 19626.805	47.69	Pk	32.8	-60.9	18.3	37.89	82	-44.11	0-360	101	V
5	* 20809.721	59.16	Pk	33.1	-59.5	18.9	51.66	82	-30.34	0-360	200	V
6	26005.58	45.63	Pk	34.6	-60.8	21.1	40.53	82	-41.47	0-360	101	V

Pk - Peak detector

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![](_page_35_Figure_2.jpeg)

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#### 26000 TO 40000 MHz HORIZONTAL & VERTICAL DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	81104 AF (dB/m)	172345 amp/cbl (dB)	Cables (dB)	Corrected Reading (dBuV/m)	FCC Part 90 Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	29030	43.63	Pk	36.1	-71.8	22.4	30.33	82	-51.67	0-360	101	Н
2	* 31214.5	54.83	Pk	36.5	-69.8	23.4	44.93	82	-37.07	0-360	200	Н
2	* 31214.641	56.69	Pk	36.6	-69.8	23.4	46.89	82	-35.11	22	317	Н
3	37679.5	40.07	Pk	38.1	-68.8	26.4	35.77	82	-46.23	0-360	200	Н
4	28783	43.42	Pk	36.2	-72	22.3	29.92	82	-52.08	0-360	101	V
5	* 31214.5	46.24	Pk	36.5	-69.8	23.4	36.34	82	-45.66	0-360	101	V
6	37706	40.79	Pk	38.1	-68.7	26.4	36.59	82	-45.41	0-360	101	V

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# 10.5. WORST CASE TRANSMITTER ABOVE 40 GHz

#### Worst Case

Tester: 19437 HL

Number of the construction of the construct	40000 TO 50000		ONTAL PLOT			
MultiView     Spectrum     Count 100/100       Ref Level 20.00 dbm     Offset 40.00 db * RBW 1 MHz     Count 100/100       D'ffer     Out 100/100     Offset 40.00 db * RBW 1 MHz     Out 100/100       Frequency Sweep     Offset 40.00 db * RBW 1 MHz     Out 100/100     Offset 40.00 db * RBW 1 MHz       Imit Check     PASS     Out 100/100     Offset 40.00 db * RBW 1 MHz     Out 100/100       Imit Check     PASS     Out 100/100     Offset 40.00 db * RBW 1 MHz     Out 100/100       Imit Check     PASS     Out 100/100     Offset 40.00 db * RBW 1 MHz     Out 100/100       Imit Check     PASS     Out 100/100     Offset 40.00 db * RBW 1 MHz     Out 100/100       Imit Check     PASS     Out 100/100     Out 100/100     Out 100/100       Imit Check     PASS     Out 100/100     Out 100/100     Out 100/100       Imit Check     PASS     Out 100/100     Out 100/100     Out 100/100       Imit Check     Imit Out 100/100     Imit Out 100/100     Out 100/100     Out 100/100       Imit Check     Imit Out 100/100     Imit Out 100/100     Imit Out 100/100     Imit Out 100						8
Ref Level 20.00 dm 0ffset 40.00 dB * RW 1 MHz   Avg a	MultiView Spect	rum				
Att 2d SWT 40m s + WW 3MHz Med Auto Sweep Control Office   Impercent 2d SWT 40m s + WW 3MHz PASS 40m s + WW 3MHz <th>Ref Level 20.00 dBm C</th> <th>)ffset 40.00 dB = RBW</th> <th>1 MHz</th> <th></th> <th></th> <th></th>	Ref Level 20.00 dBm C	)ffset 40.00 dB = RBW	1 MHz			
Frequency Sweep     01Pk Max       Limit Chek     PASS     M3[1]     -28.61 dBm       Limit Chek     PASS     M3[1]     -28.61 dBm       0 dBm     M1[1]     -26.40 dBm     -28.60 dBm       10 dBm     M1[1]     -26.40 dBm     -0.280 500 GHz       10 dBm     M1[1]     -26.40 dBm     -0.280 500 GHz       10 dBm     M1[1]     -26.40 dBm     -0.280 500 GHz       10 dBm     M3     -0.280 500 GHz     -0.280 500 GHz       0 dBm     M3     -0.280 500 GHz     -0.280 500 GHz       0 dBm     M3     -0.280 500 GHz     -0.280 500 GHz       0 dBm     M3     -0.280 500 GHz     -0.280 500 GHz       0 dBm     M3     -0.280 500 GHz     -0.280 500 GHz       0 dBm     M3     -0.280 500 GHz     -0.280 50 GHz       0 dBm     M3     -0.280 500 GHz     -0.280 50 GHz       0 dBm     M3     -0.280 50 GHz     -0.280 50 GHz       0 dBm     -0.280 50 GHz     -0.280 50 GHz     -0.280 50 GHz       0 dBm     -0.280 50 GHz     -28.61 dBm </th <th>● Att 2 dB S TDF "RF"</th> <th>WT 40 ms • VBW</th> <th>3 MHz Mode Auto Sweep</th> <th></th> <th></th> <th>Count 100/100</th>	● Att 2 dB S TDF "RF"	WT 40 ms • VBW	3 MHz Mode Auto Sweep			Count 100/100
Line FCC ART 90 LIMIT     PASS     M3[1]     -28.61 dBm       0 dBm     48.875 100 GHz     48.875 100 GHz     48.875 100 GHz       10 dBm     40.280 500 GHz     40.280 500 GHz     40.280 500 GHz       20 dBm     40.000 Hz     40.280 500 GHz     40.280 500 GHz       10 dBm     40.280 500 GHz     40.280 500 GHz     40.280 500 GHz       20 dBm     40.480 Hz     40.480 Hz     40.480 Hz       40 dBm     40.480 Hz     40.480 Hz     40.480 Hz       50 dBm     40.480 Hz     40.480 Hz     40.480 Hz       50 dBm     40.480 Hz     40.480 Hz     40.480 Hz       50 dBm     10.001 pts     1.0 GHz/     50.0 GHz       10.001 pts     1.0 GHz/     50.0 GHz     50.0 GHz       11 442.875 1 GHz     -28.61 dBm     40.480 Hz       11 442.875 1 GHz     -28.61 dBm     40.420 Hz       11 442.875 1 GHz     -28.61 dBm     40.420 Hz       12 1 442.875 1 GHz     -28.61 dBm     40.420 Hz       12 1 442.875 1 GHz     -28.61 dBm     41.402.2023	1 Frequency Sweep					o1Pk Max
0 dBm dBm dBm dBm dBm dBm dBm dBm	Limit Check Line FCC PART 90 LI		PASS PASS		м	3[1] -28.61 dBm 48.875 100 GHz
dBm Image: Construction of the second of t	10 dBm				м	1[1] -26.40 dBm
10 dbm	0 dBm					40.280 500 012
CC PART 90 LIMIT LINE Image: Constraint of the second of	-10 dBm					
Continue	CC PART 90 LIMIT LINE					
Ball High   M2   M2   M2   M3   M4	M1					M3
40 dBm   1 <td>-BoldBro</td> <td>44 L 14</td> <td>M2</td> <td>antono da Manifestro de la constantidada en la constantidada en la constantidada en la constantidada en la cons</td> <td>a sea the second se</td> <td></td>	-BoldBro	44 L 14	M2	antono da Manifestro de la constantidada en la constantidada en la constantidada en la constantidada en la cons	a sea the second se	
50 dBm   Image: constraint of the second o	-40 dBm	and the second				
60 dBm	-50 dBm					
70 dBm   10001 pts   1.0 GHz/   50.0 GHz     Marker Table     Type Ref Trc X-Value Y-Value Function Function Result     M1   1   40.280 5 GHz   -26.40 dBm     M3   1   48.8751 GHz   -28.61 dBm     Measuring     Measuring     14.02.2023	-60 dBm					
70 dBm 10001 pts 1.0 GHz/ 50.0 GHz   Marker Table   Type Ref Trc X-Value Y-Value Function Result   M1 1 40.280 5 GHz -26.40 dBm   M2 1 44.457 2 GHz -34.69 dBm   M3 1 48.8751 GHz -28.61 dBm   .:56:38 14.02.2023						
40.0 GHz 10001 pts 1.0 GHz/ 50.0 GHz   Marker Table Type Ref Trc X-Value Y-Value Function Function Result   M1 1 40.280 5 GHz -26.40 dBm -34.69 dBm -34.69 dBm -34.69 dBm   M2 1 48.8751 GHz -28.61 dBm -34.69 dBm -34.69 dBm   M3 1 48.8751 GHz -28.61 dBm -28.61 dBm   .:56:38 14.02.2023	-70 dBm-					
Marker Table   Type Ref Trc X-Value Y-Value Function Function Result   M1 1 40.280 5 GHz -26.40 dBm -26.40 dBm -26.40 dBm   M2 1 44.457 2 GHz -34.69 dBm -34.69 dBm   M3 1 48.875 1 GHz -28.61 dBm   Measuring   Measuring   * 14.02.2023   ::56:38   14.02.2023	40.0 GHz		10001 pts	1.0 GHz/		50.0 GHz
Type     Ref     Irc     x-value     Y-Value     Function     Function Result       M1     1     40.280 5 GHz     -26.40 dBm     -26.40 dBm     -34.69 dBm       M3     1     48.875 1 GHz     -28.61 dBm     -28.61 dBm     -28.61 dBm       Measuring     -     Measuring     -     14.02.2023	2 Marker Table					
M3 1 48.8751 GHz -28.61 dBm Measuring Measuring 14.02.2023 ::56:38 14.02.2023	Type     Ref     Irc       M1     1       M2     1	x-Value 40.280 5 GHz 44.457 2 GHz	-26.40 dBm -34,69 dBm	Function	Funct	ion Result
.:56:38 14.02.2023	M3 1	48.8751 GHz	-28.61 dBm		Moscuring	<b>14.02.2023</b>
.:56:38 14.02.2023	V			~	measuring	21:56:38
	1:56:38 14.02.2023					

DATE: March 20, 2023
FCC ID: CO6-C550-LIC

40000 TO 50000	MHz VERTI	CAL PLOT					
MultiView Spectrue Ref Level 20.00 dBm Offs	m et 40.00 dB ● RBW	1 MHz					•
Att 2 dB SW1	「 40 ms ● <b>VBW</b>	3 MHz Mode Auto Sweep				С	ount 100/100
I Frequency Sweep							o1Pk Max
Limit Check		PASS				M3[1]	-32,17 dBr
Line FCC PART 90 LIMI	TLINE	PASS				4	7.679 400 GH
IU dBm						M1[1]	-24.72 dBr
						4	0.306 500 GH
) dBm							
10 dgm							
20.dom							
-20 Mgm							
					МЗ		As his reality of the
-36VdBm		M2	ande konstant kale og			a selection of the selection of the	
and a local sector of the sect	AN LOCAL DISCOURSE AND A SUCCESSION	and a line of a labor					
-40 dBm							
-50 dBm							
-60 dBm							
-70 dBm							
40.0.011-		10001					
40.0 GHZ		10001 pts	1.0	GHZ/			50.0 GH
Marker Lable	V Value	V Volue		Euroption		Eurotion D	soult:
M1 1	40.306 5 GHz	-24.72 dBm		unction		Function Re	suit
M2 1	43.4286 GHz	-37.48 dBm					
M3 1	47.679 4 GHz	-32.17 dBm					
					Measuring		14.02.202
							21,33:0.
1:53:02 14.02.2023							

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# 10.6. WORST CASE TRANSMITTER ABOVE 50 GHz

#### Worst Case

Tester: 19437 HL

50000 TO	53000 MH	Iz HORIZ(	ONTAL PL	ОТ					
									<b></b>
MultiView	Spectrum	× Spect	um 2 ×						•
TDF "RF" Inp: Extl	dBm Offset 40 SWT Mix USER	1.00 dB ● RBW 1 9 ms ● VBW 3	MHz MHz Mode Auto	o Sweep				(	Count 100/100
1 Frequency Sw	eep							<b>O</b> 1P	k Max Auto ID
Limit Check			PASS					M3[1]	-34.42 dBm
Line FCC PA	RT 90 LIMIT LIN	JE	PASS					mo[1]	2 052 000 CU-
10 dBm									07.00 GHZ
								M1[1]	-27,26 dBm
									50.066 500 GHz
0 dBm									
10 40									
-10 dBm									
FCC PART 90 LIMIT LI	INE								
-20 dBm									
M1									
1944 anno 1				MZ				a linear s	
-30 UBMOMENTA	the all interioritation and much a constraint	مالى الإراد الم الم الم الم الم الم الم الم	A STATE AND A STAT	enter and a state of the state	an sing and shipped and side and side	man and an	regelation worth hereballer	and the second s	
-40 dBm									
-50 dBm									
-30 ubm									
-60 dBm									
-70 dBm									
10 ubiii									
50.0 GHz			3001 pts		30	0.0 MHz/	1	1	53.0 GHz
2 Marker Table						,			
Type Ref	Trc	X-Value	V-V	alue		Eunction		Eunction R	esult
M1	1 50.	.066.5 GHz	-27.2	6 dBm		Tuncuon		Tancaonin	caure
M2	1 51	471 6 GHz	-29.92	2 dBm					
M3	1 52.	852 9 GHz	-34.42	2 dBm					
									15.02.2023
							Measuring		17:06:38
17:06:38 15.02	.2023								

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	2 VERTICAL PLOT		
MultiView - Spectrum	× Spectrum 2 ×		•
Ref Level 20.00 dBm Offset 40.0	00 dB ● <b>RBW</b> 1 MHz 9 ms ● <b>VBW</b> 3 MHz <b>Mode</b> Auto Sween		Count 100/100
TDF "RF" Inp: ExtMix USER	- ···· - ······		
1 Frequency Sweep			⊙1Pk Max Auto ID
Limit Check	PASS		M3[1] -33.31 dBm
LINE FUC PART 90 LIMIT LINE	PA55		52.873 900 GHz
10 dbm			M1[1] -27.43 dBm
			50.065 500 GHz
0 dBm			
-10 dBm			
FCC PART 90 LIMIT LINE			
-20 dBm			
M1			
	M		
-30"dBm++++++++++++++++++++++++++++++++++++	العاليد الاعصار مسيه والدمية والمستر المالية المرجو المالية والمرجوع والمعالية المحارية والمحارية المستر المستر	and when the solar between a law and a start and a solar and a start and a start and a solar and a solar and a	A STATE AND A STAT
-40 dBm			
-50 dBm			
-60 dBm			
-00 4811			
-70 dBm			
50.0 CHz	3001 pts	300.0 MHz /	53.0.CHz
2 Markor Table	5001 pt3	50010 101127	3010 0112
Z Marker Table	V-Value V-Value	Euroction	Function Pecult
M1 1 <b>50.0</b>	0655 GHz -27.43 dBm	rancuori	Tanctorritesait
M2 1 <b>51.4</b>	1806 GHz -30.48 dBm		
M3 1 <b>52.8</b>	373 9 GHz -33.31 dBm		
~		Measur	ing 15.02.2023
		Medadi	17:24:14
17:24:14 15.02.2023			

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