

FCC Measurement/Technical Report on

WLAN and Bluetooth Module

JODY-W5

FCC ID: XPYJODYW562
IC: 8595A-JODYW562

Test Report Reference: MDE_UBLOX_2317_FCC_04_rev01

Test Laboratory:

7layers GmbH
Borsigstrasse 11
40880 Ratingen
Germany



Deutsche
Akkreditierungsstelle
D-PL-12140-01-00

Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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Table of Contents

1	Applied Standards and Test Summary	3
1.1	Applied Standards	3
1.2	FCC-IC Correlation Table	4
1.3	Measurement Summary	5
2	Revision History / Signatures	6
3	Administrative Data	7
3.1	Testing Laboratory	7
3.2	Project Data	7
3.3	Applicant Data	7
3.4	Manufacturer Data	8
4	Test object Data	9
4.1	General EUT Description	9
4.2	EUT Main components	10
4.3	Ancillary Equipment	10
4.4	Auxiliary Equipment	11
4.5	EUT Setups	11
4.6	Operating Modes / Test Channels	12
4.7	Product labelling	17
5	Test Results	18
5.1	Dynamic Frequency Selection - U-NII Detection Bandwidth	18
5.2	Dynamic Frequency Selection - Channel Availability Check Time	22
5.3	Dynamic Frequency Selection - In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period	26
5.4	Dynamic Frequency Selection - Statistical Performance Check	30
6	Test Equipment	53
6.1	Test Equipment Hardware	53
6.2	Test Equipment Software	54
7	Antenna Factors, Cable Loss and Sample Calculations	55
7.1	LISN R&S ESH3-Z5 (150 kHz – 30 MHz)	55
7.2	Antenna R&S HFH2-Z2 (9 kHz – 30 MHz)	56
7.3	Antenna R&S HL562 (30 MHz – 1 GHz)	57
7.4	Antenna R&S HF907 (1 GHz – 18 GHz)	58
7.5	Antenna EMCO 3160-09 (18 GHz – 26.5 GHz)	59
7.6	Antenna EMCO 3160-10 (26.5 GHz – 40 GHz)	60
8	Measurement Uncertainties	61
9	Photo Report	62

1 APPLIED STANDARDS AND TEST SUMMARY

1.1 APPLIED STANDARDS

Type of Authorization

Certification for an Intentional Radiator (Digital Device / Spread Spectrum).

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 and 15 (10-1-23 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.201 Equipment authorization requirement

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

Part 15, Subpart E – Unlicensed National Information Infrastructure Devices

§ 15.403 Definitions

§ 15.407 General technical requirements

Note:

The tests were selected and performed with reference to the FCC KDB "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, 789033 D02 General U-NII Test Procedures New Rules v02r01, 2017-12-14". and

"GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE 6 GHz (U-NII) DEVICES PART 15, SUBPART E, 987594 D02 U-NII 6GHz EMC Measurement v01r01, 2021-02-04".

ANSI C63.10-2013 is applied.

1.2 FCC-IC CORRELATION TABLE

Correlation of measurement requirements for UNII / LE-LAN (e.g. WLAN 5 GHz) equipment from FCC and IC

UNII equipment

Measurement	FCC reference	IC reference
Conducted emissions on AC Mains	§ 15.207	RSS-Gen Issue 5 & AMD 1 & AMD 2: 8.8
Occupied bandwidth	§ 15.403 (26 dB) / § 15.407 (e) (6 dB)	RSS-247 Issue 3: 6.2.1.1, 6.2.2.1, 6.2.3.1 (99%) RSS-247 Issue 3: 6.2.4.2 (6 dB) RSS-248 Issue 2: 4.4
Maximum conducted output power	§ 15.407 (a) (1) to (8), (11)	RSS-247 Issue 3: 6.2.1.1, 6.2.2.1, 6.2.3.1, 6.2.4.2 RSS-248 Issue 2: 4.5
Maximum power spectral density	§ 15.407 (a) (1) to (8), (12)	RSS-247 Issue 3: 6.2.1.1, 6.2.2.1, 6.2.3.1, 6.2.4.1 RSS-248 Issue 2: 4.5
Transmitter undesirable emissions; General Field Strength Limits, Restricted Bands, In-Band Emissions	§ 15.407 (b) § 15.209 (a)	RSS-Gen Issue 5: 6.13/8.9/8.10; RSS-247 Issue 3: 3.3/6.2 6.2.1.2, 6.2.2.2, 6.2.3.2, 6.2.4.2 RSS-248 Issue 2: 4.6
Frequency stability	§ 15.407 (g)	RSS-Gen Issue 5: 6.11/8.11
Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS)	§ 15.407 (h)	RSS-247 Issue 3: 6.2.2.1, 6.2.3.1, 6.3
Antenna requirement	§ 15.203 / 15.204 § 15.407 (a) (9)	RSS-Gen Issue 5 & AMD 1 & AMD 2: 8.3
Contention Based Protocol	§ 15.407 (d) (6)	RSS-248 Issue 2: 4.7
Receiver spurious emissions	-	-

1.3 MEASUREMENT SUMMARY

47 CFR CHAPTER I FCC PART 15 FCC §15.31, §15.407 (h) **Subpart E §15.407**

Dynamic Frequency Selection - U-NII Detection Bandwidth
The measurement was performed according to KDB 905462

Final Result

OP-Mode	Setup	Date	FCC	IC
Radio Technology				
WLAN a	S01_AD02	2024-08-26	Passed	Passed
WLAN ac 80 MHz	S01_AD02	2024-08-26	Passed	Passed
WLAN ax 40 MHz	S01_AD02	2024-08-26	Passed	Passed

47 CFR CHAPTER I FCC PART 15 FCC §15.31, §15.407 (h) **Subpart E §15.407**

Dynamic Frequency Selection - Channel Availability Check Time
The measurement was performed according to KDB 905462

Final Result

OP-Mode	Setup	Date	FCC	IC
Radio Technology				
WLAN a	S01_AD02	2024-08-26	Passed	Passed

47 CFR CHAPTER I FCC PART 15 FCC §15.31, §15.407 (h) **Subpart E §15.407**

Dynamic Frequency Selection - In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period
The measurement was performed according to KDB 905462

Final Result

OP-Mode	Setup	Date	FCC	IC
Radio Technology				
WLAN ax 80 MHz	S07_AD02	2024-11-27	Passed	Passed

47 CFR CHAPTER I FCC PART 15 FCC §15.31, §15.407 (h) **Subpart E §15.407**

Dynamic Frequency Selection - Statistical Performance Check
The measurement was performed according to KDB 905462

Final Result

OP-Mode	Setup	Date	FCC	IC
Radio Technology				
WLAN a	S08_AD02	2024-08-30	Passed	Passed
WLAN ax 40 MHz	S08_AD02	2024-08-30	Passed	Passed
WLAN ax 80 MHz	S08_AD02	2024-08-30	Passed	Passed

N/A: Not applicable
N/P: Not performed

2 REVISION HISTORY / SIGNATURES

Report version control			
Version	Release date	Change Description	Version validity
initial	2025-02-06	--	valid
rev01	2025-08-22	Added HVIN to Type in chapter 4.1 General EUT Description	valid

COMMENT: This report is a DFS Master Report only. For results of the other test cases see report MDE_UBLOX_2317_FCC_02



(responsible for accreditation scope)
Dipl.-Ing. Marco Kullik



(responsible for testing and report)
Dipl.-Ing. Daniel Gall



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3 ADMINISTRATIVE DATA

3.1 TESTING LABORATORY

Company Name: 7layers GmbH
Address: Borsigstr. 11
40880 Ratingen
Germany

The test facility is accredited by the following accreditation organisation:

Laboratory accreditation no: DAKKS D-PL-12140-01-00
FCC Designation Number: DE0015
FCC Test Firm Registration: 929146
ISED CAB Identifier DE0007; ISED#: 3699A

Responsible for accreditation scope: Dipl.-Ing. Marco Kullik
Report Template Version: 2024-11-06

3.2 PROJECT DATA

Responsible for testing and report: Dipl.-Ing. Daniel Gall
Employees who performed the tests: documented internally at 7Layers
Date of Report: 2025-08-22
Testing Period: 2024-08-26 to 2024-11-27

3.3 APPLICANT DATA

Company Name: u-blox AG
Address: Zürcherstrasse 68
8800 Thalwil
Switzerland
Contact Person: Filip Kruzela

3.4 MANUFACTURER DATA

Company Name: please see Applicant Data

Address:

Contact Person:

4 TEST OBJECT DATA

4.1 GENERAL EUT DESCRIPTION

Kind of Device product description	WLAN and Bluetooth Module
Product name	JODY-W5
Type	JODY-W562-00A (HVIN: M2-JODY-W562)
Declared EUT data by the supplier	
Voltage Type	DC
Voltage Level	1.8 V + 3.3 V
Tested Modulation Type	OFDM
Specific product description	The EUT is a Bluetooth and WLAN module. It supports SISO Mode only. Supported WLAN modes are a, n, ac and ax with 20 MHz (mode a, n, ac, ax), 40 MHz (mode n, ac, ax) and 80 MHz (mode ac, ax) BW. The U-NII bands 1, 2A, 2C, 3 and 4 are supported.
Ports of the device	Enclosure Data DC Power Antenna The EUT is a module with solder pads for surface mounting, so no cables were connected to the EUT itself.
Antenna 1	External / 5.1 dBi
Datarates	WLAN a: up to 56 Mbit WLAN n: up to 150 Mbit WLAN ac: up to 433 Mbit WLAN ax: up to 601 Mbit
Special software used for testing	Console scripts provided by the applicant
Transmit Power Control	Not Supported
Power level of the EUT	23.6 dBm (E.I.R.P.), 12.2 dBm/MHz
User Access Restriction	The applicant confirms that information regarding the parameters of the detected waveforms is not accessible to the end user.
Channel Loading System Type	IP based system

Declared data by the laboratory	
Used antenna ports during testing	The WLAN antenna port was connected to the setup, the BT port was terminated by 50 Ohm.
Antenna Assembly gain used for DFS Threshold Level	0 dBi (The applicant intends to use various antennas that may also be lower than 5.1 dBi)
Used threshold level	-64 dBm (power spectral density > 10 dBm/MHz results in -64 dBm threshold which is also the used threshold since assumed antenna gain is 0 dBi)
Channel loading	The applicant provided a script that generates traffic at irregular intervals. The amount of traffic was set by the laboratory to comply with the > 17 % DC criterion.
Pulse Type Generation	Pulses were randomly generated using Rohde & Schwarz K6 Pulse sequencer.

4.2 EUT MAIN COMPONENTS

Sample Name	Sample Code	Description
EUT ac02	DE1015185ac02	Type JODY-W562-00A on M.2 KEY-E board
Sample Parameter	Value	
Serial No.	BU520BA36D796200200	
HW Version	3	
SW Version	v2.0.0.31-18.99.2.p66.20	
Comment		

Sample Name	Sample Code	Description
EUT ad02	DE1015185ad02	Type JODY-W562-00A on M.2 KEY-E board
Sample Parameter	Value	
Serial No.	BU520BA36D798100200	
HW Version	3	
SW Version	v2.0.0.31-18.99.2.p66.20	
Comment		

NOTE: The short description is used to simplify the identification of the EUT in this test report.

4.3 ANCILLARY EQUIPMENT

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

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4.4 AUXILIARY EQUIPMENT

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Auxiliary Equipment can influence the test results.

Device	Details (Manufacturer, Type Model, HW, SW, S/N)	Description
AUX 01	UBLOX, JODY Carrier Board M.2 Adapter, REV. A, -, -	M.2 Adapter board
AUX 04	EDACPOWER ELEC., EA1045CR, -, -, -	AC Adapter
AUX 05	UBLOX, JODY-Carrier Board, Rev. D, -, 10000003369561020001	Jody Carrier Board
AUX 06	UBLOX, JODY-Carrier Board, Rev. D, -, 10000003369561002002	Jody Carrier Board
AUX 07	NXP, i.MX 8M MINI on 8MMINI-BB, REV A2, -, NT19151052	Computer Board
AUX 08	NXP, i.MX 8M MINI on 8MMINI-BB, REV A2, -, NT19150864	Computer Board
AUX 09	UBLOX, JODY-W377-00B, , , M186009C384ECF40500	Companion Device for Normal Mode tests

4.5 EUT SETUPS

This chapter describes the combination of EUTs and equipment used for testing. The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards.

Setup	Combination of EUTs	Description and Rationale
S08_AD02	EUT ad02, EUT ac02, AUX 06, AUX 07, AUX 05, AUX 08, AUX 01, AUX 04,	DFS AP Setup ISM Test Mode
S01_AD02	EUT ad02, AUX 06, AUX 08, AUX 01, AUX 04,	Conducted Setup
S07_AD02	EUT ad02, AUX 06, AUX 08, AUX 01, AUX 04, AUX09	DFS AP Setup Normal Mode

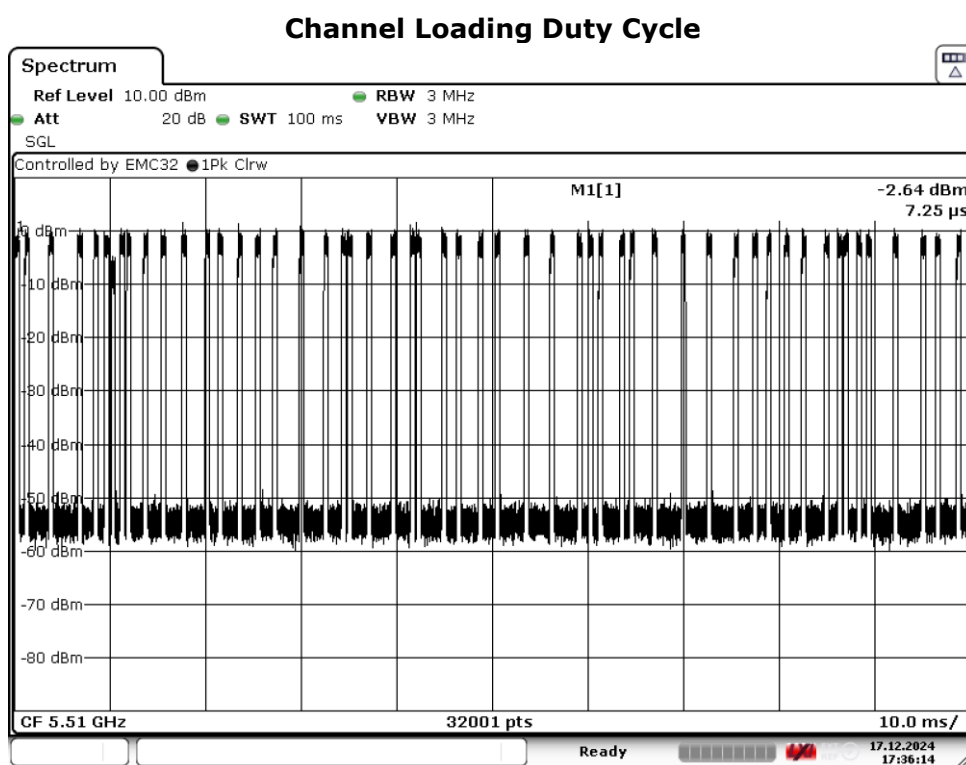
4.6 OPERATING MODES / TEST CHANNELS

This chapter describes the operating modes of the EUTs used for testing.

U-NII-Subband 2A 5250 - 5350 MHz			U-NII-Subband 2C 5470 - 5725 MHz			Nom. BW
low	mid	high	low	mid	high	20 MHz
-	-	-	100	-	-	Ch.-No.
-	-	-	5500	-	-	MHz

low	mid	high	low	mid	high	40 MHz
-	-	-	102	-	-	Ch.-No.
-	-	-	5510	-	-	MHz

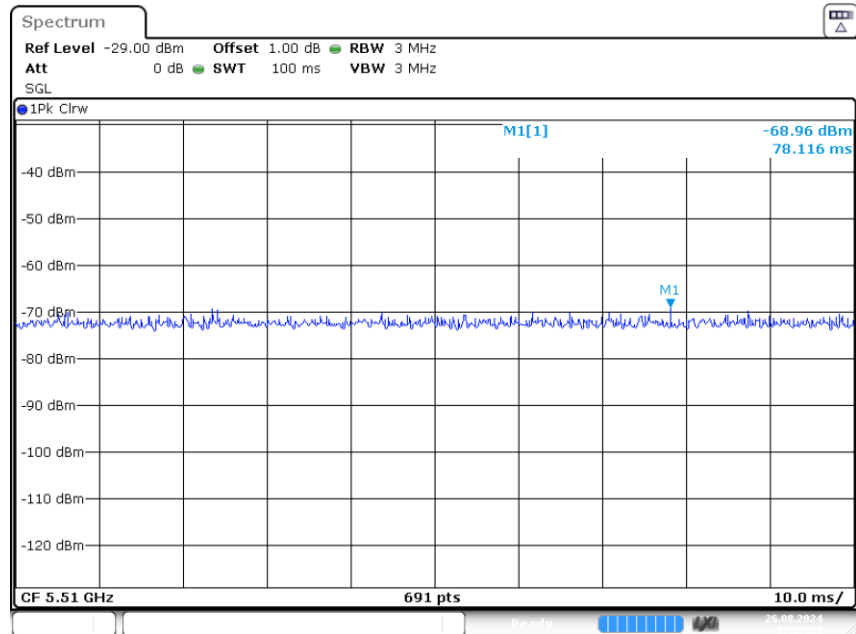
low	mid	high	low	mid	high	80 MHz
-	-	-	106	-	-	Ch.-No.
-	-	-	5530	-	-	MHz



Date: 17.DEC.2024 17:36:14

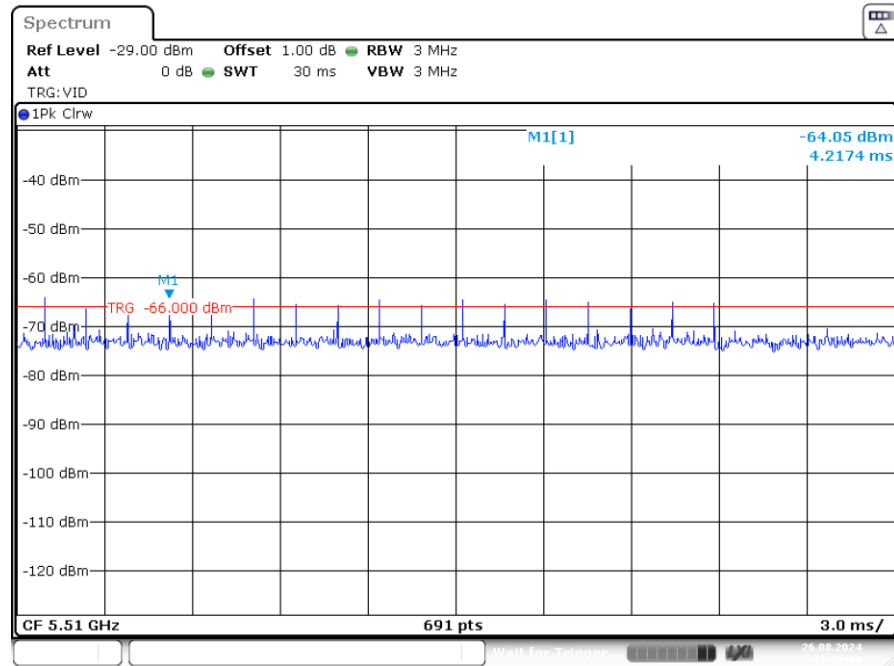
8473 pts above -30 dBm ~26 % DC

Radar Pulse Calibration



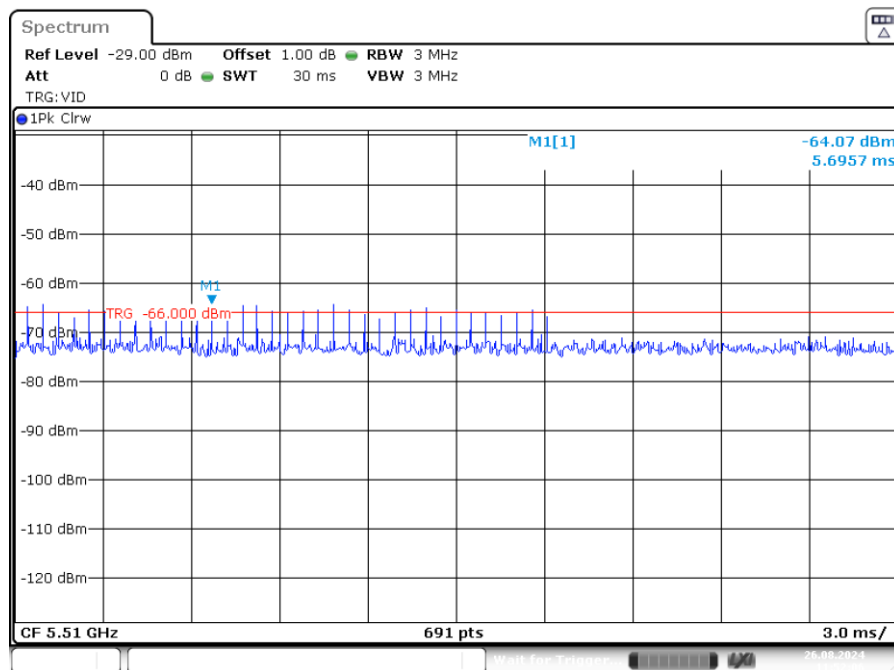
Date: 26 AUG 2024 13:27:23

Noise Floor



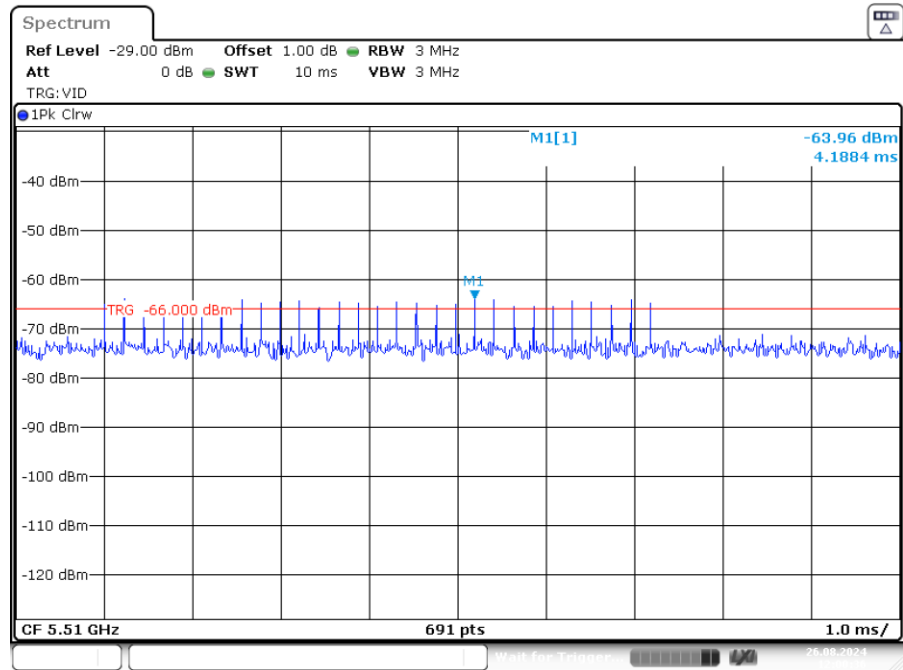
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Pulse Type 0



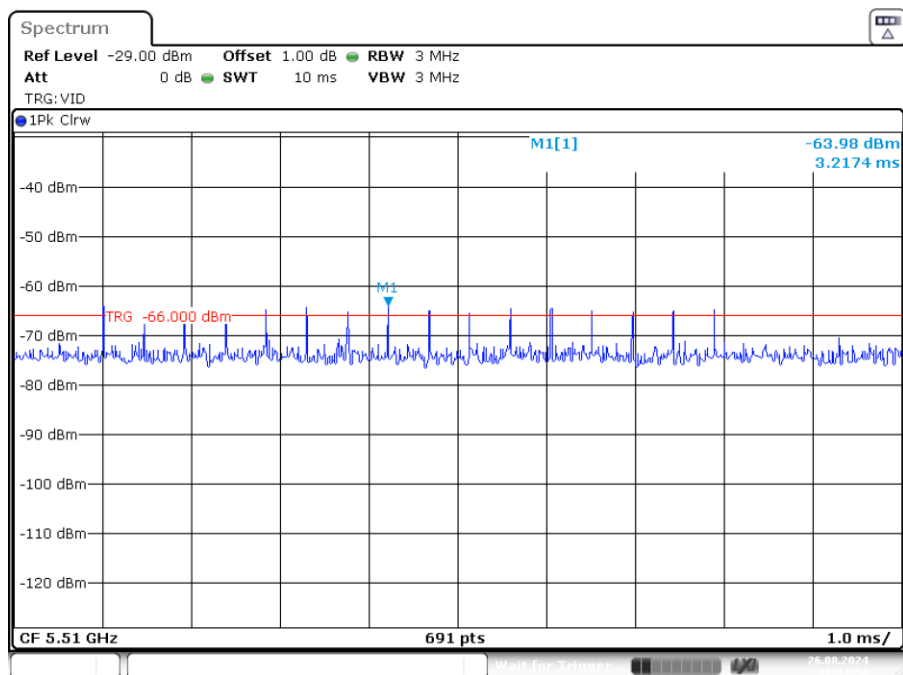
Date: 26.AUG.2024 11:52:06

Pulse Type 1



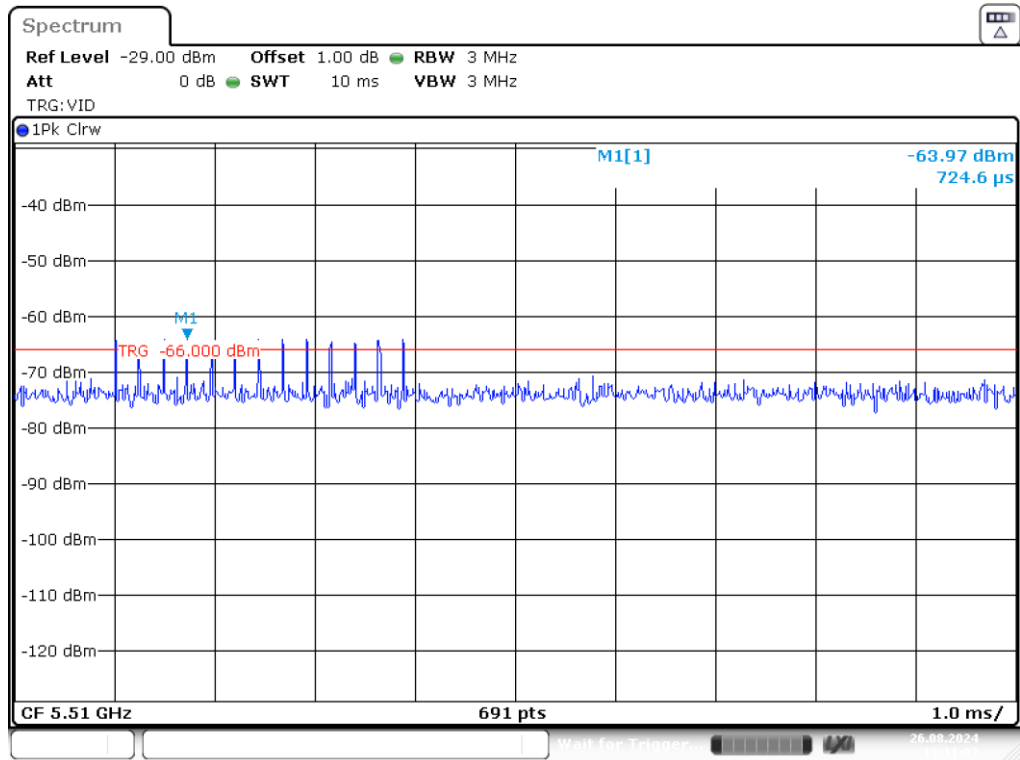
Date: 26.AUG.2024 12:00:37

Pulse Type 2



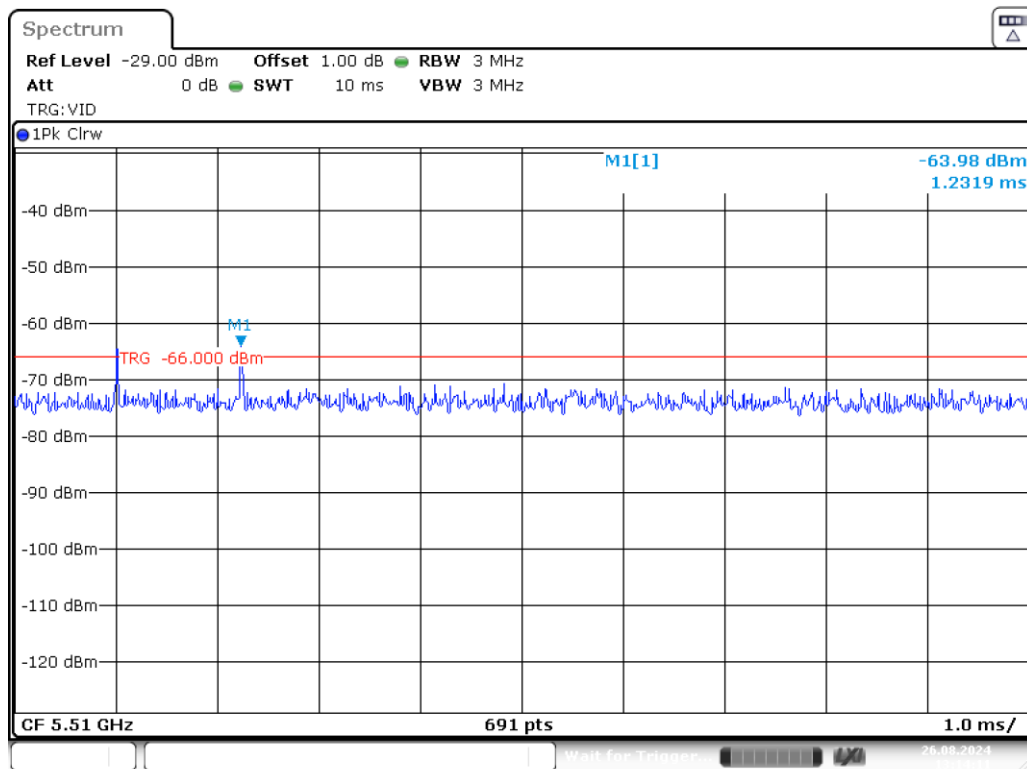
Date: 26.AUG.2024 12:11:51

Pulse Type 3



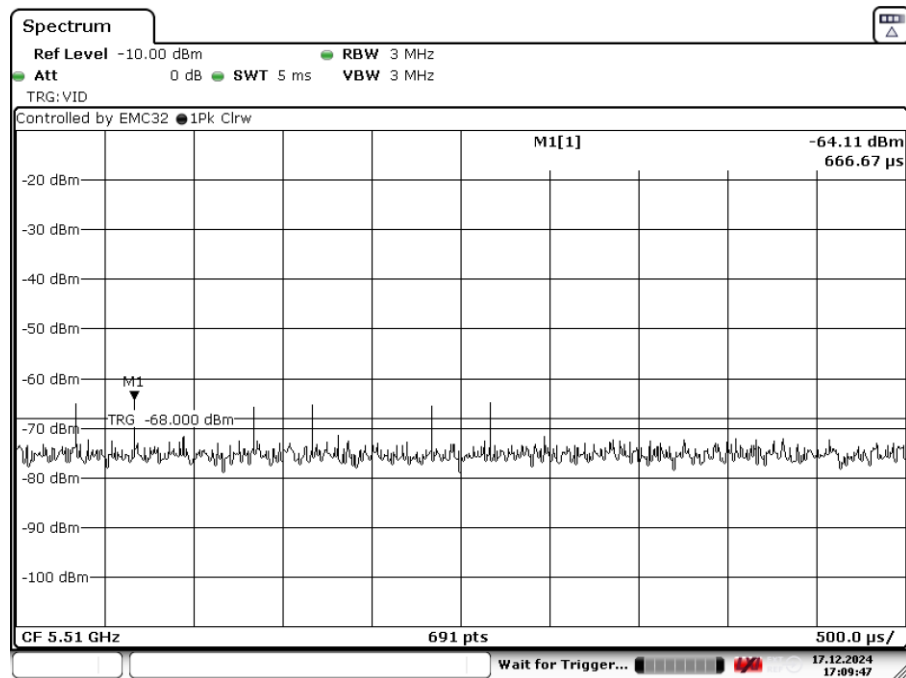
Date: 26.AUG.2024 13:11:04

Pulse Type 4



Date: 26.AUG.2024 13:14:12

Pulse Type 5



Date: 17.DEC.2024 17:09:47

Pulse Type 6

4.7 PRODUCT LABELLING

4.7.1 FCC ID LABEL

Please refer to the documentation of the applicant.

4.7.2 LOCATION OF THE LABEL ON THE EUT

Please refer to the documentation of the applicant.

5 TEST RESULTS

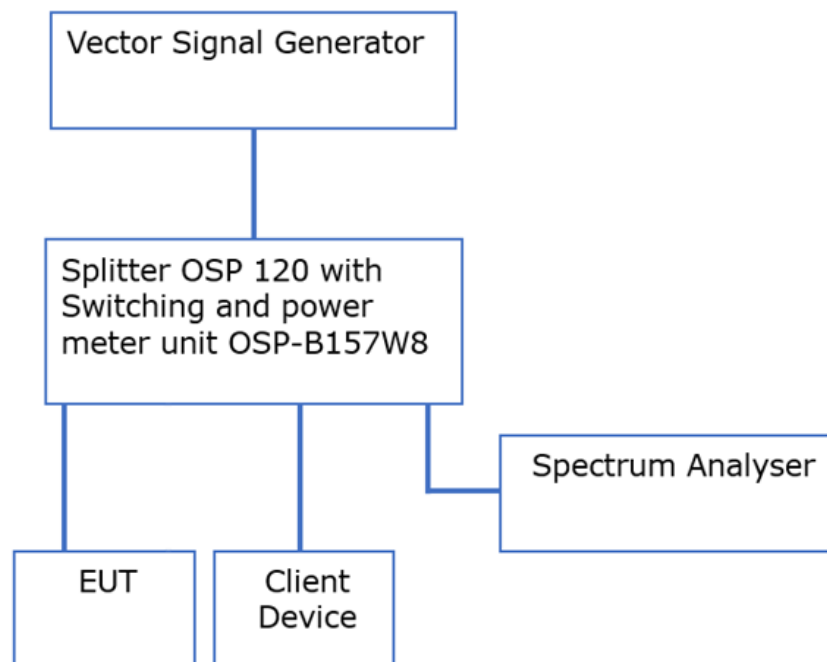
5.1 DYNAMIC FREQUENCY SELECTION - U-NII DETECTION BANDWIDTH

Standard **FCC Part 15 Subpart E**

The test was performed according to:
KDB 905462

5.1.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up in a shielded room for the DFS measurements.



Since the DFS Master shall be tested stand alone, the DFS Client was connected but not activated.

After activating the EUT, a radar pulse of type 0 was send on mid channel frequency from the radar signal generator and the response was noted. This was repeated 9 further times.

If at least 9 of the 10 pulses were recognized by the device, the radar pulse frequency was increased or decreased by 5 MHz and the test was repeated. If the detection rate falls below 9 pulses, the step size is reduced to 1 MHz from the previous 5 MHz step until detection rate falls below 9 again. The result is compared to the 99 % Bandwidth.

5.1.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart E, §15.407 (h) (2)

The device must sense for radar signals at 100 percent of its emission bandwidth.

The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is –64 dBm. For devices that operate with less than 200 mW e.i.r.p. and a power spectral density of less than 10 dBm in a 1 MHz band, the minimum detection threshold is –62 dBm. The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna.

5.1.3 TEST PROTOCOL

Ambient temperature: 24-25 °C

Air Pressure: 1010 hPa

Humidity: 36 %

Radio Technology	TX Frequency [MHz]	Channel BW [MHz]	Radar Test Signal #	FL (MHz)	FH (MHz)	Detection BW [MHz]	Max. 99 % BW [MHz]
WLAN a	5500	20	Radar Type 0	5490	5510	20	18.8
WLAN ax 40 MHz	5510	40	Radar Type 0	5490	5530	40	37.5
WLAN ac 80 MHz	5530	80	Radar Type 0	5490	5570	80	77.5

Remark: Channel Move feature was deactivated for this test.

Detection of radar pulses was monitored by console interface.

Please see next sub-clause for the measurement results.

5.1.4 MEASUREMENT RESULT

Radar Pulse Frequency Deviation from Channel Centre Frequency [MHz]	Channel Centre Frequency [MHz]	Ch. BW [MHz]	Detected	TX Frequency [MHz]	Ch. BW [MHz]	Detected	TX Frequency [MHz]	Ch. BW [MHz]	Detected
-40	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	10
-39	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	N/P
-38	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	N/P
-37	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	N/P
-36	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	N/P
-35	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	10
-30	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	10
-25	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	10
-20	N/P	N/P	N/P	5510	40	10	5530	80	10
-19	N/P	N/P	N/P	5510	40	N/P	5530	80	N/P
-18	N/P	N/P	N/P	5510	40	N/P	5530	80	N/P
-17	N/P	N/P	N/P	5510	40	N/P	5530	80	N/P
-16	N/P	N/P	N/P	5510	40	N/P	5530	80	N/P
-15	N/P	N/P	N/P	5510	40	10	5530	80	10
-10	5500	20	10	5510	40	10	5530	80	10
-9	5500	20	N/P	5510	40	N/P	5530	80	N/P
-8	5500	20	N/P	5510	40	N/P	5530	80	N/P
-7	5500	20	N/P	5510	40	N/P	5530	80	N/P
-6	5500	20	N/P	5510	40	N/P	5530	80	N/P
-5	5500	20	10	5510	40	10	5530	80	10
0 (Centre Freq.)	5500	20	10	5510	40	10	5530	80	10
5	5500	20	10	5510	40	10	5530	80	10
6	5500	20	N/P	5510	40	N/P	5530	80	N/P
7	5500	20	N/P	5510	40	N/P	5530	80	N/P
8	5500	20	N/P	5510	40	N/P	5530	80	N/P
9	5500	20	N/P	5510	40	N/P	5530	80	N/P
10	5500	20	10	5510	40	10	5530	80	10
15	N/P	N/P	N/P	5510	40	10	5530	80	10
16	N/P	N/P	N/P	5510	40	N/P	5530	80	N/P
17	N/P	N/P	N/P	5510	40	N/P	5530	80	N/P
18	N/P	N/P	N/P	5510	40	N/P	5530	80	N/P
19	N/P	N/P	N/P	5510	40	N/P	5530	80	N/P
20	N/P	N/P	N/P	5510	40	10	5530	80	10
25	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	10
30	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	10
35	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	10
36	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	N/P
37	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	N/P
38	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	N/P
39	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	N/P
40	N/P	N/P	N/P	N/P	N/P	N/P	5530	80	10

N/P = Not Performed

5.1.5 TEST EQUIPMENT USED

- R&S TS8997

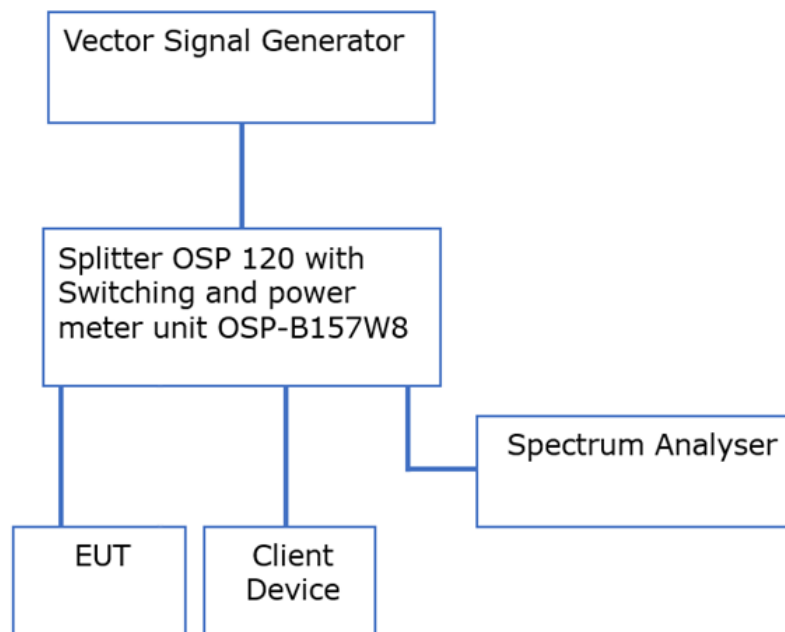
5.2 DYNAMIC FREQUENCY SELECTION - CHANNEL AVAILABILITY CHECK TIME

Standard **FCC Part 15 Subpart E**

The test was performed according to:
KDB 905462

5.2.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up in a shielded room for the DFS measurements.



The blocked channel list is reset by restart of EUT and AP Mode is afterwards activated by software script.

When the AP script is started, the measurement sweep on the spectrum analyser is started in parallel.

Analyzer settings:

- Resolution Bandwidth (RBW): 3 MHz
- Video Bandwidth (VBW): 3 MHz
- Trace: Clear/Write
- Sweeps: Single Sweep
- Sweep time: 150 s
- Detector: Peak

5.2.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart E, §15.407 (h) (2) (ii)

Channel Availability Check Time. A U-NII device shall check if there is a radar system already operating on the channel before it can initiate a transmission on a channel and when it has to move to a new channel. The U-NII device may start using the channel if no radar signal with a power level greater than the interference threshold values listed in paragraph (h)(2) of this section, is detected within 60 seconds.

FCC Part 15, Subpart E, §15.407 (h) (2)

The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is –64 dBm. For devices that operate with less than 200 mW e.i.r.p. and a power spectral density of less than 10 dBm in a 1 MHz band, the minimum detection threshold is –62 dBm. The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna.

5.2.3 TEST PROTOCOL

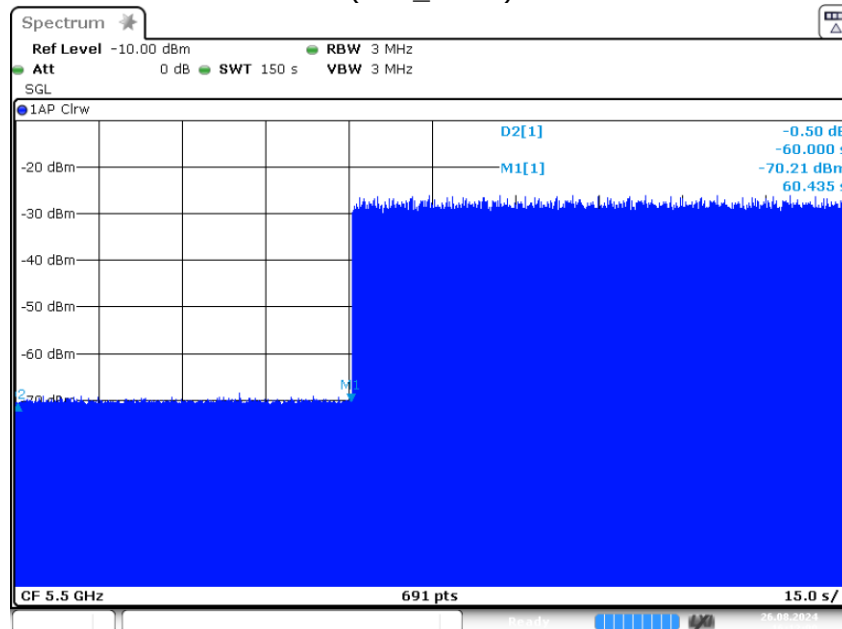
Ambient temperature: 24-25 °C
 Air Pressure: 1010 hPa
 Humidity: 36 %

Radio Technology	TX Frequency [MHz]	Radar Test Signal #	Detected?	Transmissions within 150 s?
WLAN a	5500	Type 0 @ 0 to 6 s	YES	NO
WLAN a	5500	Type 0 @ 54 to 60 s	YES	NO

Remark: Please see next sub-clause for the measurement plot.

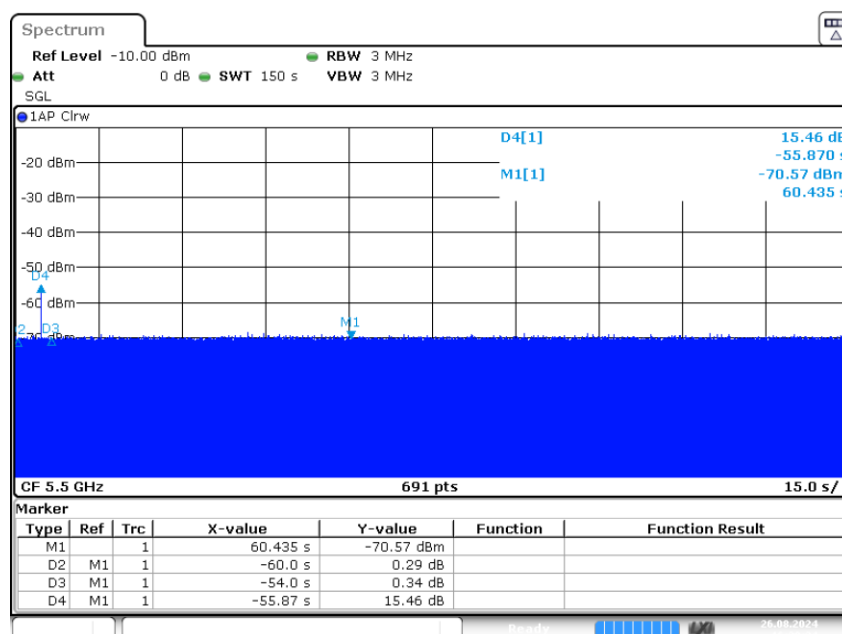
5.2.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

Radio Technology = WLAN a
(S01_AD02)



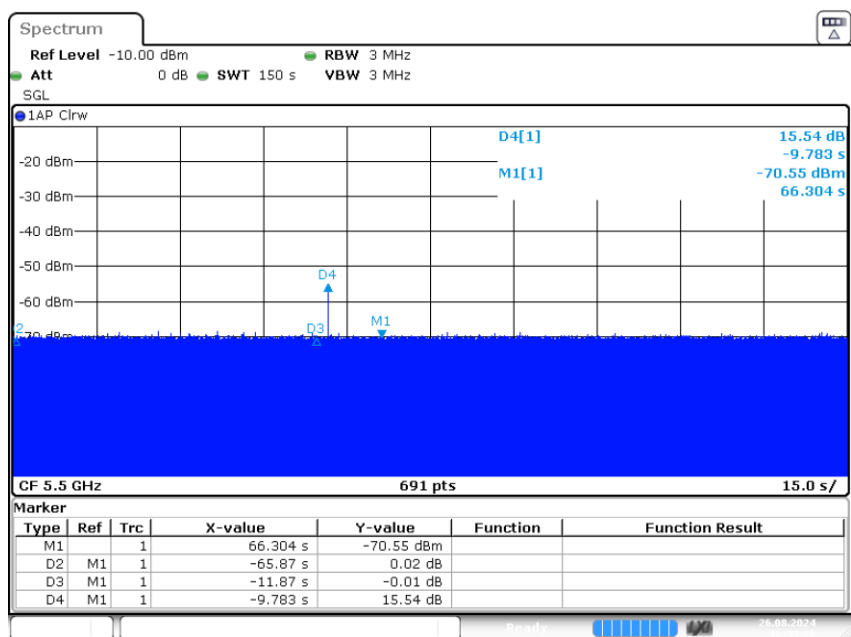
Date: 26.AUG.2024 16:12:01

Startup Time (M1 = startup time, D2 = beginning of CAC phase (startup - 60 s = 0,435s after activation))



Date: 26.AUG.2024 16:20:34

Pulse at beginning of CAC time (D4 = radar pulse at 4.13 s after CAC startup)



Date: 26.AUG.2024 16:33:08

Pulse at end of CAC time (D4 = radar pulse at 56.086 s after CAC startup)

5.2.5 TEST EQUIPMENT USED

- R&S TS8997

5.3 DYNAMIC FREQUENCY SELECTION - IN-SERVICE MONITORING FOR CHANNEL MOVE TIME, CHANNEL CLOSING TRANSMISSION TIME AND NON-OCCUPANCY PERIOD

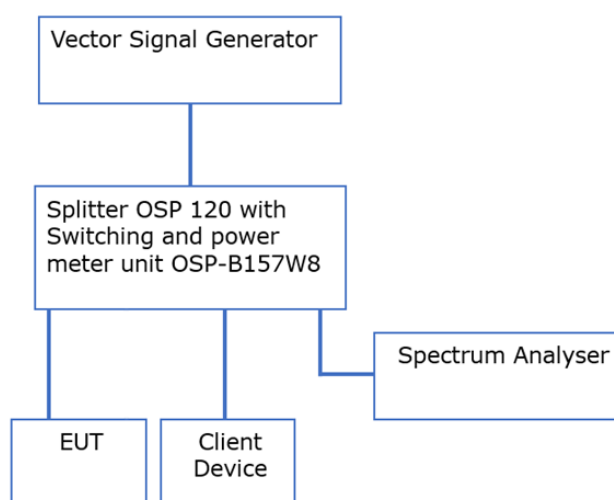
Standard **FCC Part 15 Subpart E**

The test was performed according to:

KDB 905462

5.3.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up in a shielded room for the DFS measurements.



The Master and Client EUT were powered and connected to each other at maximum supported bandwidth. Afterwards the script for traffic generation was started.

With established connection, a radar pulse of type 0 was send from the radar pulse generator. At the same time the spectrum analyser is triggered by the radar signal generator and a trace is recorded:

Analyzer settings:

- Resolution Bandwidth (RBW): 3 MHz
- Video Bandwidth (VBW): 3 MHz
- Trace: Clear/Write
- Sweeps: Single Sweep
- Sweep time: 20 s
- Detector: Peak
- Trigger: External

In addition to the plot, also the trace data is recorded to calculate the Channel Closing Time.

Afterwards the test is repeated with a sweep time of 32 minutes to monitor the Non-occupancy period.

5.3.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart E, §15.407 (h) (2) (iii)

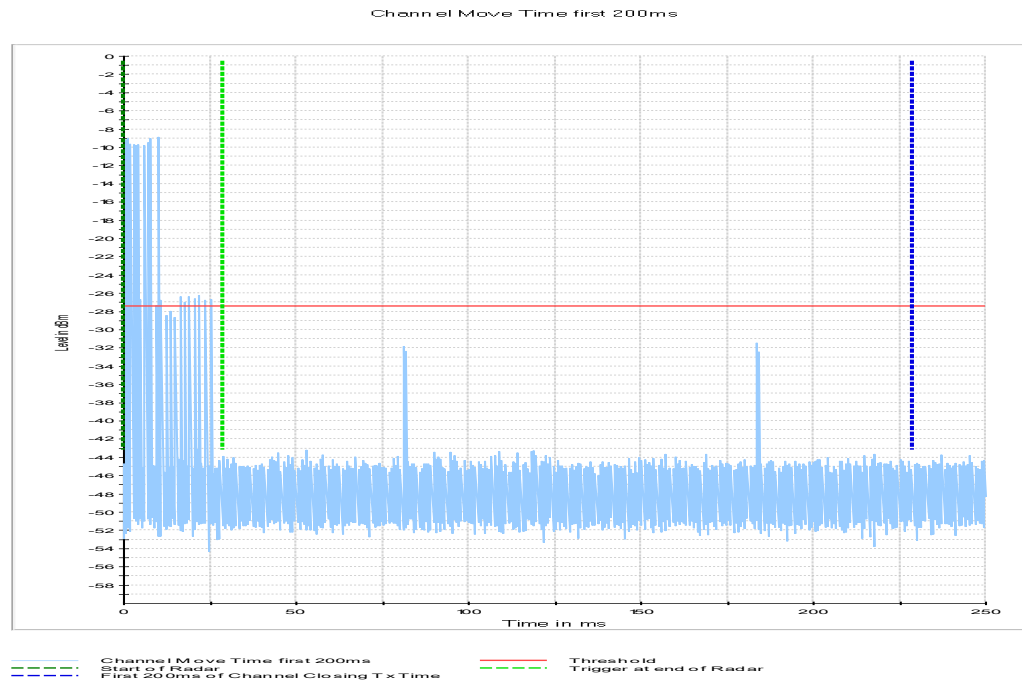
Channel Move Time. After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

FCC Part 15, Subpart E, §15.407 (h) (2) (iii)

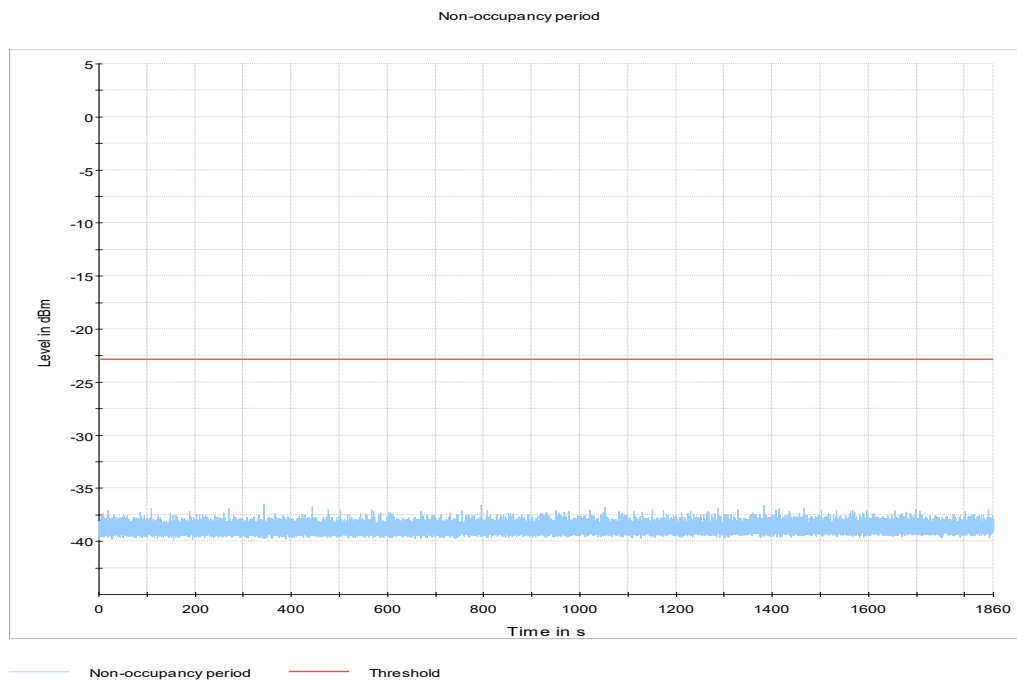
Non-occupancy Period. A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.

Limits according KDB 905462 D02 UNII DFS Compliance Procedures New Rules

Parameter	Value
<i>Non-occupancy period</i>	Minimum 30 minutes
<i>Channel Availability Check Time</i>	60 seconds
<i>Channel Move Time</i>	10 seconds See Note 1.
<i>Channel Closing Transmission Time</i>	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
Note 1: <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel</i> move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.	



Channel Move first 200 ms



Non Occupancy Period

5.3.5 TEST EQUIPMENT USED

- R&S TS8997

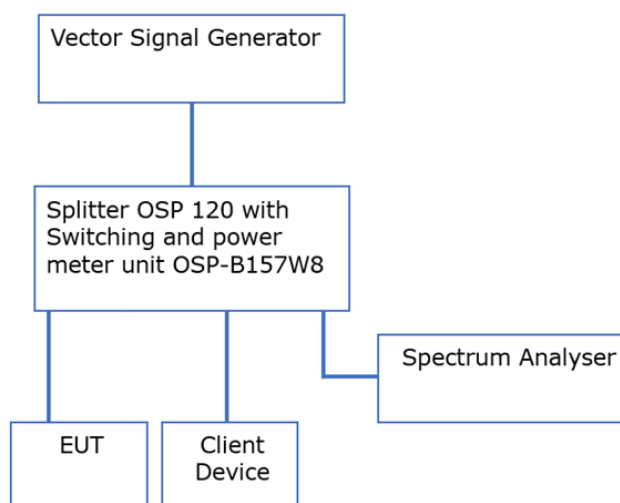
5.4 DYNAMIC FREQUENCY SELECTION - STATISTICAL PERFORMANCE CHECK

Standard **FCC Part 15 Subpart E**

The test was performed according to:
 KDB 905462

5.4.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up in a shielded room for the DFS measurements.



The Master and Client EUT were powered and connected to each other at maximum supported bandwidth. Afterwards the script for traffic generation was started.

Using command line commands provided by the customer, the device's channel move functionality was deactivated and non-occupancy period reduced to 1 s to reduce testing time.

Detection of radar pulse is monitored by console interface.

30 unique pulses of radar type 1 to 6 are send while for each type 10 pulses are send at the lower end of the 99 % detection BW, 10 pulses at the higher end of the detection BW and 10 are send mid channel.

For each send pulse detection is recorded.

Testing is repeated for all supported channel bandwidths.

5.4.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart E, §15.407 (h) (2)

U-NII devices operating with any part of its 26 dB emission bandwidth in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems. Operators shall only use equipment with a DFS mechanism that is turned on when operating in these bands. The device must sense for radar signals at 100 percent of its emission bandwidth. The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is –64 dBm. For devices that operate with less than 200 mW e.i.r.p. and a power spectral density of less than 10 dBm in a 1 MHz band, the minimum detection threshold is –62 dBm. The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna.

Limits according KDB 905462 D02 UNII DFS Compliance Procedures New Rules

Table 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A	Roundup $\left\{ \begin{array}{l} \left(\frac{1}{360} \right) \cdot \\ \left(\frac{19 \cdot 10^6}{PRI_{\mu sec}} \right) \end{array} \right\}$	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

Table 6 – Long Pulse Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Table 7 – Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

5.4.3 TEST PROTOCOL

Ambient temperature: 25 °C
 Air Pressure: 1014 hPa
 Humidity: 40 %

Radio Technology	TX Frequency [MHz]	Radar Test Signal #	Number of send pulses	Number of detected pulses	Successful Detection Percentage [%]	Limit [%]	Margin to Limit [%]
WLAN a	5500	Type 1	30	30	100	60	40
WLAN a	5500	Type 2	30	30	100	60	40
WLAN a	5500	Type 3	30	30	100	60	40
WLAN a	5500	Type 4	30	28	93.3	60	33.3
WLAN a	5500	Aggregate 1-4	120	118	98.3	80	18.3
WLAN a	5500	Type 5	30	30	100	80	20
WLAN a	5500	Type 6	30	30	100	70	30
WLAN ax 40 MHz	5510	Type 1	30	30	100	60	40
WLAN ax 40 MHz	5510	Type 2	30	30	100	60	40
WLAN ax 40 MHz	5510	Type 3	30	30	100	60	40
WLAN ax 40 MHz	5510	Type 4	30	29	96.7	60	36.7
WLAN ax 40 MHz	5510	Aggregate 1-4	120	119	99.2	80	19.2
WLAN ax 40 MHz	5510	Type 5	30	30	100	80	20
WLAN ax 40 MHz	5510	Type 6	30	30	100	70	30
WLAN ax 80 MHz	5530	Type 1	30	30	100	60	40
WLAN ax 80 MHz	5530	Type 2	30	30	100	60	40
WLAN ax 80 MHz	5530	Type 3	30	30	100	60	40
WLAN ax 80 MHz	5530	Type 4	30	30	100	60	40
WLAN ax 80 MHz	5530	Aggregate 1-4	120	120	100	80	20
WLAN ax 80 MHz	5530	Type 5	30	30	100	80	20
WLAN ax 80 MHz	5530	Type 6	30	30	100	70	30

Remark: Please see next sub-clause for the measurement results and radar pulse definition.

5.4.4 MEASUREMENT RESULTS

20 MHz Bandwidth Pulse Types 1 to 4 and 6

RADAR TYPE 1 Table Random					RADAR TYPE 1 5a				
Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)	Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)
1	76	1	2072	yes	1	102	1	518	yes
2	76	1	2062	yes	2	99	1	538	yes
3	71	1	1728	yes	3	95	1	558	yes
4	72	1	1793	yes	4	92	1	578	yes
5	66	1	1504	yes	5	89	1	598	yes
6	74	1	1926	yes	6	86	1	618	yes
7	60	1	1261	yes	7	83	1	638	yes
8	78	1	2223	yes	8	81	1	658	yes
9	70	1	1687	yes	9	78	1	678	yes
10	73	1	1867	yes	10	76	1	698	yes
11	70	1	1668	yes	11	74	1	718	yes
12	67	1	1536	yes	12	72	1	738	yes
13	83	1	2867	yes	13	70	1	758	yes
14	45	1	932	yes	14	68	1	778	yes
15	82	1	2678	yes	15	67	1	798	yes
RADAR TYPE 2					RADAR TYPE 3				
Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)	Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)
1	29	2.1	220	yes	1	16	9.9	458	yes
2	26	2.9	198	yes	2	16	7.5	409	yes
3	24	1.1	180	yes	3	17	6.6	453	yes
4	27	4.6	179	yes	4	17	9.7	255	yes
5	28	1.9	216	yes	5	17	6.6	251	yes
6	28	4.7	152	yes	6	18	8.8	499	yes
7	28	3.5	157	yes	7	17	9.2	497	yes
8	25	2.8	211	yes	8	18	8.2	284	yes
9	24	1.5	179	yes	9	18	6.4	312	yes
10	29	4.2	211	yes	10	17	9.4	306	yes
11	27	3.6	170	yes	11	17	7.6	305	yes
12	24	1.8	178	yes	12	16	7.1	448	yes
13	26	2.7	195	yes	13	17	7.7	299	yes
14	27	1.7	169	yes	14	17	6.8	225	yes
15	26	4.4	197	yes	15	17	9.7	370	yes
16	29	3.6	195	yes	16	17	8.2	264	yes
17	24	1.6	177	yes	17	17	8.8	302	yes
18	23	4.4	159	yes	18	17	9.9	307	yes
19	28	3.1	174	yes	19	17	7.1	274	yes
20	24	1.2	227	yes	20	18	9.1	240	yes
21	23	3.5	208	yes	21	17	7.4	303	yes
22	27	4.6	198	yes	22	17	7.7	226	yes
23	24	4.7	170	yes	23	18	10	270	yes
24	25	3.1	223	yes	24	17	6.7	287	yes
25	26	3.1	195	yes	25	17	8.4	283	yes
26	24	4.5	171	yes	26	17	7	356	yes
27	25	1.5	172	yes	27	17	9.7	449	yes
28	23	2.4	172	yes	28	17	6	472	yes
29	24	4.5	217	yes	29	17	10	239	yes
30	25	1.5	218	yes	30	17	8.5	260	yes

RADAR TYPE 4					RADAR TYPE 6				
Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)	Trial #	Number of Pulses per Hop	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)
1	13	15.9	239	yes	1	9	1	333	yes
2	16	18.6	336	yes	2	9	1	333	yes
3	14	15	206	yes	3	9	1	333	yes
4	13	14.4	338	yes	4	9	1	333	yes
5	13	12.3	396	yes	5	9	1	333	yes
6	16	18.8	225	yes	6	9	1	333	yes
7	14	19.5	219	yes	7	9	1	333	yes
8	14	19.5	338	yes	8	9	1	333	yes
9	13	18.6	399	yes	9	9	1	333	yes
10	15	14.9	440	yes	10	9	1	333	yes
11	15	16.9	411	yes	11	9	1	333	yes
12	14	16.2	467	yes	12	9	1	333	yes
13	12	16.4	471	yes	13	9	1	333	yes
14	15	19.9	397	yes	14	9	1	333	yes
15	14	19	253	yes	15	9	1	333	yes
16	15	14.3	212	yes	16	9	1	333	yes
17	14	16.3	287	yes	17	9	1	333	yes
18	14	12.2	210	yes	18	9	1	333	yes
19	13	17.9	424	yes	19	9	1	333	yes
20	13	11.4	359	yes	20	9	1	333	yes
21	15	13.4	377	yes	21	9	1	333	yes
22	14	19.2	478	yes	22	9	1	333	yes
23	15	17.4	287	yes	23	9	1	333	yes
24	13	14.4	345	no	24	9	1	333	yes
25	13	19.7	315	yes	25	9	1	333	yes
26	13	12.2	430	no	26	9	1	333	yes
27	12	11.3	307	yes	27	9	1	333	yes
28	14	12.3	254	yes	28	9	1	333	yes
29	13	16.4	381	yes	29	9	1	333	yes
30	13	19.7	325	yes	30	9	1	333	yes

40 MHz Bandwidth Pulse Types 1 to 4 and 6

RADAR TYPE 1 Table 5a					RADAR TYPE 1				
Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)	Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)
1	76	1	2072	yes	1	102	1	518	yes
2	76	1	2062	yes	2	99	1	538	yes
3	71	1	1728	yes	3	95	1	558	yes
4	72	1	1793	yes	4	92	1	578	yes
5	66	1	1504	yes	5	89	1	598	yes
6	74	1	1926	yes	6	86	1	618	yes
7	60	1	1261	yes	7	83	1	638	yes
8	78	1	2223	yes	8	81	1	658	yes
9	70	1	1687	yes	9	78	1	678	yes
10	73	1	1867	yes	10	76	1	698	yes
11	70	1	1668	yes	11	74	1	718	yes
12	67	1	1536	yes	12	72	1	738	yes
13	83	1	2867	yes	13	70	1	758	yes
14	45	1	932	yes	14	68	1	778	yes
15	82	1	2678	yes	15	67	1	798	yes
RADAR TYPE 2					RADAR TYPE 3				
Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)	Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)
1	29	2.1	220	yes	1	16	9.9	458	yes
2	26	2.9	198	yes	2	16	7.5	409	yes
3	24	1.1	180	yes	3	17	6.6	453	yes
4	27	4.6	179	yes	4	17	9.7	255	yes
5	28	1.9	216	yes	5	17	6.6	251	yes
6	28	4.7	152	yes	6	18	8.8	499	yes
7	28	3.5	157	yes	7	17	9.2	497	yes
8	25	2.8	211	yes	8	18	8.2	284	yes
9	24	1.5	179	yes	9	18	6.4	312	yes
10	29	4.2	211	yes	10	17	9.4	306	yes
11	27	3.6	170	yes	11	17	7.6	305	yes
12	24	1.8	178	yes	12	16	7.1	448	yes
13	26	2.7	195	yes	13	17	7.7	299	yes
14	27	1.7	169	yes	14	17	6.8	225	yes
15	26	4.4	197	yes	15	17	9.7	370	yes
16	29	3.6	195	yes	16	17	8.2	264	yes
17	24	1.6	177	yes	17	17	8.8	302	yes
18	23	4.4	159	yes	18	17	9.9	307	yes
19	28	3.1	174	yes	19	17	7.1	274	yes
20	24	1.2	227	yes	20	18	9.1	240	yes
21	23	3.5	208	yes	21	17	7.4	303	yes
22	27	4.6	198	yes	22	17	7.7	226	yes
23	24	4.7	170	yes	23	18	10	270	yes
24	25	3.1	223	yes	24	17	6.7	287	yes
25	26	3.1	195	yes	25	17	8.4	283	yes
26	24	4.5	171	yes	26	17	7	356	yes
27	25	1.5	172	yes	27	17	9.7	449	yes
28	23	2.4	172	yes	28	17	6	472	yes
29	24	4.5	217	yes	29	17	10	239	yes
30	25	1.5	218	yes	30	17	8.5	260	yes

RADAR TYPE 4					RARAR TYPE 6				
Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)	Trial #	Number of Pulses per Hop	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)
1	13	15.9	239	no	1	9	1	333	yes
2	16	18.6	336	yes	2	9	1	333	yes
3	14	15	206	yes	3	9	1	333	yes
4	13	14.4	338	yes	4	9	1	333	yes
5	13	12.3	396	yes	5	9	1	333	yes
6	16	18.8	225	yes	6	9	1	333	yes
7	14	19.5	219	yes	7	9	1	333	yes
8	14	19.5	338	yes	8	9	1	333	yes
9	13	18.6	399	yes	9	9	1	333	yes
10	15	14.9	440	yes	10	9	1	333	yes
11	15	16.9	411	yes	11	9	1	333	yes
12	14	16.2	467	yes	12	9	1	333	yes
13	12	16.4	471	yes	13	9	1	333	yes
14	15	19.9	397	yes	14	9	1	333	yes
15	14	19	253	yes	15	9	1	333	yes
16	15	14.3	212	yes	16	9	1	333	yes
17	14	16.3	287	yes	17	9	1	333	yes
18	14	12.2	210	yes	18	9	1	333	yes
19	13	17.9	424	yes	19	9	1	333	yes
20	13	11.4	359	yes	20	9	1	333	yes
21	15	13.4	377	yes	21	9	1	333	yes
22	14	19.2	478	yes	22	9	1	333	yes
23	15	17.4	287	yes	23	9	1	333	yes
24	13	14.4	345	yes	24	9	1	333	yes
25	13	19.7	315	yes	25	9	1	333	yes
26	13	12.2	430	yes	26	9	1	333	yes
27	12	11.3	307	yes	27	9	1	333	yes
28	14	12.3	254	yes	28	9	1	333	yes
29	13	16.4	381	yes	29	9	1	333	yes
30	13	19.7	325	yes	30	9	1	333	yes

80 MHz Bandwidth Pulse Types 1 to 4 and 6

RADAR TYPE 1 Table 5a					RADAR TYPE 1				
Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)	Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)
1	76	1	2072	yes	1	102	1	518	yes
2	76	1	2062	yes	2	99	1	538	yes
3	71	1	1728	yes	3	95	1	558	yes
4	72	1	1793	yes	4	92	1	578	yes
5	66	1	1504	yes	5	89	1	598	yes
6	74	1	1926	yes	6	86	1	618	yes
7	60	1	1261	yes	7	83	1	638	yes
8	78	1	2223	yes	8	81	1	658	yes
9	70	1	1687	yes	9	78	1	678	yes
10	73	1	1867	yes	10	76	1	698	yes
11	70	1	1668	yes	11	74	1	718	yes
12	67	1	1536	yes	12	72	1	738	yes
13	83	1	2867	yes	13	70	1	758	yes
14	45	1	932	yes	14	68	1	778	yes
15	82	1	2678	yes	15	67	1	798	yes
RADAR TYPE 2					RADAR TYPE 3				
Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)	Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)
1	29	2.1	220	yes	1	16	9.9	458	yes
2	26	2.9	198	yes	2	16	7.5	409	yes
3	24	1.1	180	yes	3	17	6.6	453	yes
4	27	4.6	179	yes	4	17	9.7	255	yes
5	28	1.9	216	yes	5	17	6.6	251	yes
6	28	4.7	152	yes	6	18	8.8	499	yes
7	28	3.5	157	yes	7	17	9.2	497	yes
8	25	2.8	211	yes	8	18	8.2	284	yes
9	24	1.5	179	yes	9	18	6.4	312	yes
10	29	4.2	211	yes	10	17	9.4	306	yes
11	27	3.6	170	yes	11	17	7.6	305	yes
12	24	1.8	178	yes	12	16	7.1	448	yes
13	26	2.7	195	yes	13	17	7.7	299	yes
14	27	1.7	169	yes	14	17	6.8	225	yes
15	26	4.4	197	yes	15	17	9.7	370	yes
16	29	3.6	195	yes	16	17	8.2	264	yes
17	24	1.6	177	yes	17	17	8.8	302	yes
18	23	4.4	159	yes	18	17	9.9	307	yes
19	28	3.1	174	yes	19	17	7.1	274	yes
20	24	1.2	227	yes	20	18	9.1	240	yes
21	23	3.5	208	yes	21	17	7.4	303	yes
22	27	4.6	198	yes	22	17	7.7	226	yes
23	24	4.7	170	yes	23	18	10	270	yes
24	25	3.1	223	yes	24	17	6.7	287	yes
25	26	3.1	195	yes	25	17	8.4	283	yes
26	24	4.5	171	yes	26	17	7	356	yes
27	25	1.5	172	yes	27	17	9.7	449	yes
28	23	2.4	172	yes	28	17	6	472	yes
29	24	4.5	217	yes	29	17	10	239	yes
30	25	1.5	218	yes	30	17	8.5	260	yes

RADAR TYPE 4					RARAR TYPE 6				
Trial #	Number of Pulses per Burst	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)	Trial #	Number of Pulses per Hop	Pulse Width (μsec)	PRI (μs)	Detection (yes/no)
1	13	15.9	239	yes	1	9	1	333	yes
2	16	18.6	336	yes	2	9	1	333	yes
3	14	15	206	yes	3	9	1	333	yes
4	13	14.4	338	yes	4	9	1	333	yes
5	13	12.3	396	yes	5	9	1	333	yes
6	16	18.8	225	yes	6	9	1	333	yes
7	14	19.5	219	yes	7	9	1	333	yes
8	14	19.5	338	yes	8	9	1	333	yes
9	13	18.6	399	yes	9	9	1	333	yes
10	15	14.9	440	yes	10	9	1	333	yes
11	15	16.9	411	yes	11	9	1	333	yes
12	14	16.2	467	yes	12	9	1	333	yes
13	12	16.4	471	yes	13	9	1	333	yes
14	15	19.9	397	yes	14	9	1	333	yes
15	14	19	253	yes	15	9	1	333	yes
16	15	14.3	212	yes	16	9	1	333	yes
17	14	16.3	287	yes	17	9	1	333	yes
18	14	12.2	210	yes	18	9	1	333	yes
19	13	17.9	424	yes	19	9	1	333	yes
20	13	11.4	359	yes	20	9	1	333	yes
21	15	13.4	377	yes	21	9	1	333	yes
22	14	19.2	478	yes	22	9	1	333	yes
23	15	17.4	287	yes	23	9	1	333	yes
24	13	14.4	345	yes	24	9	1	333	yes
25	13	19.7	315	yes	25	9	1	333	yes
26	13	12.2	430	yes	26	9	1	333	yes
27	12	11.3	307	yes	27	9	1	333	yes
28	14	12.3	254	yes	28	9	1	333	yes
29	13	16.4	381	yes	29	9	1	333	yes
30	13	19.7	325	yes	30	9	1	333	yes

Pulse Type 5

TYPE 5 20 MHz			TYPE 5 40 MHz		
Trial #	Detection (yes/no)	Radar Pulse Freq. [MHz]	Trial #	Detection (yes/no)	Radar Pulse Freq. [MHz]
1	yes	5500	1	yes	5510
2	yes	5500	2	yes	5510
3	yes	5500	3	yes	5510
4	yes	5500	4	yes	5510
5	yes	5500	5	yes	5510
6	yes	5500	6	yes	5510
7	yes	5500	7	yes	5510
8	yes	5500	8	yes	5510
9	yes	5500	9	yes	5510
10	yes	5500	10	yes	5510
11	yes	5497	11	yes	5497.65
12	yes	5494.2	12	yes	5494.85
13	yes	5497	13	yes	5497.65
14	yes	5497	14	yes	5497.65
15	yes	5493.4	15	yes	5494.05
16	yes	5493	16	yes	5493.65
17	yes	5495.8	17	yes	5496.45
18	yes	5497.8	18	yes	5498.45
19	yes	5493	19	yes	5493.65
20	yes	5497.8	20	yes	5498.45
21	yes	5506.2	21	yes	5525.55
22	yes	5507	22	yes	5526.35
23	yes	5505.8	23	yes	5525.15
24	yes	5501.8	24	yes	5521.15
25	yes	5501.8	25	yes	5521.15
26	yes	5506.2	26	yes	5525.55
27	yes	5505.8	27	yes	5525.15
28	yes	5507	28	yes	5526.35
29	yes	5502.6	29	yes	5521.95
30	yes	5505.4	30	yes	5524.75

TYPE 5 80 MHz		
Trial #	Detection (yes/no)	Radar Pulse Freq. [MHz]
1	yes	5530
2	yes	5530
3	yes	5530
4	yes	5530
5	yes	5530
6	yes	5530
7	yes	5530
8	yes	5530
9	yes	5530
10	yes	5530
11	yes	5497.65
12	yes	5494.85
13	yes	5497.65
14	yes	5497.65
15	yes	5494.05
16	yes	5493.65
17	yes	5496.45
18	yes	5498.45
19	yes	5493.65
20	yes	5498.45
21	yes	5565.55
22	yes	5566.35
23	yes	5565.15
24	yes	5561.15
25	yes	5561.15
26	yes	5565.55
27	yes	5565.15
28	yes	5566.35
29	yes	5561.95
30	yes	5564.75

Trial Number : 1						
Bursts in Trial: 8						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	56.1	16	1930		499
2	2	84.7	16	1121		366
3	2	91.7	16	1365		303
4	2	96.2	16	1342		168
5	2	68.4	16	1272		851
6	1	54.1	16			458
7	3	93.8	16	1658	1510	641
8	2	96.4	16	1127		79
Trial Number : 2						
Bursts in Trial: 9						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	1	63.5	7			230
2	3	58.3	7	1668	1040	808
3	1	67.4	7			394
4	3	51.1	7	967	1692	136
5	2	51.9	7	1829		601
6	1	79.5	7			1097
7	2	57.4	7	1600		1109
8	2	87.6	7	1577		1009
9	3	83.8	7	1281	1417	292
Trial Number : 3						
Bursts in Trial: 10						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	3	69.5	7	1846	1796	7
2	1	72.7	7			500
3	1	62.2	7			164
4	3	54.8	7	1238	1534	302
5	2	79	7	1350		133
6	2	87.4	7	1743		195
7	2	79.8	7	1857		1010
8	2	85.2	7	1091		819
9	2	52.6	7	1369		1122
10	2	71.8	7	1722		343

Trial Number : 4						
Bursts in Trial: 11						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	61.2	9	1320		810
2	1	58.7	9			738
3	3	85.6	9	1894	1867	160
4	1	99.2	9			1033
5	2	88.7	9	1884		586
6	1	90.9	9			599
7	2	72.3	9	1728		243
8	2	57.3	9	1908		562
9	2	83.7	9	1435		567
10	1	59.1	9			461
11	3	78.5	9	1508	1501	986
Trial Number : 5						
Bursts in Trial: 12						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	78	14	1702		23
2	3	93.4	14	1837	1582	308
3	2	69.5	14	995		831
4	3	96.8	14	1256	1903	597
5	2	89.6	14	1846		514
6	2	73.3	14	1452		873
7	2	50.7	14	1380		588
8	2	96.9	14	1183		258
9	2	77	14	1528		900
10	1	91.1	14			926
11	3	74.5	14	1841	1008	678
12	1	64.7	14			310
Trial Number : 6						
Bursts in Trial: 13						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	54	14	1324		635
2	2	57.2	14	1001		512
3	1	61.9	14			40
4	3	93.2	14	915	935	56
5	3	93.6	14	1306	1393	59
6	2	68.1	14	1202		628
7	3	89.7	14	913	1765	99
8	2	97.9	14	1197		889
9	2	87	14	1620		749
10	2	89.5	14	1287		666
11	2	74.6	14	1164		162
12	1	62.4	14			352
13	2	63.8	14	1932		246

Trial Number : 7						
Bursts in Trial: 14						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	92.2	18	1249		63
2	2	95.8	18	1397		292
3	2	75.9	18	1451		755
4	3	89.1	18	1882	1680	388
5	2	73.8	18	1616		377
6	3	65.8	18	1440	1330	179
7	2	94.4	18	1618		395
8	1	97.7	18			581
9	1	89.8	18			4
10	1	65.9	18			436
11	2	85.7	18	1371		570
12	1	59.1	18			451
13	2	74.7	18	1216		319
14	1	85.7	18			846
Trial Number : 8						
Bursts in Trial: 15						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	79.8	12	1181		683
2	2	89	12	1704		740
3	2	56.8	12	1609		499
4	1	58	12			349
5	2	94.5	12	1527		641
6	1	86.3	12			65
7	1	79.5	12			729
8	3	76	12	1917	949	466
9	3	89.9	12	1019	1706	176
10	3	99.6	12	1734	1646	370
11	1	83.1	12			708
12	3	57.2	12	1557	1786	406
13	2	56.4	12	1777		269
14	3	89.4	12	979	1123	528
15	1	63.1	12			478
Trial Number : 9						
Bursts in Trial: 16						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	56.1	17	1250		537
2	2	99.7	17	1874		705
3	1	96.8	17			419
4	3	90.4	17	941	1651	363
5	1	96.8	17			703
6	3	53	17	1882	1648	181
7	2	57.3	17	1694		254
8	2	50.5	17	1758		30
9	2	59	17	963		115
10	2	96.3	17	1741		91
11	2	93.3	17	1905		373
12	2	65.4	17	1778		742
13	2	98.2	17	1585		218
14	1	87.3	17			622
15	2	87.3	17	1510		558
16	3	99.1	17	1869	1445	179

Trial Number : 10						
Bursts in Trial: 17						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	1	84.2	19			49
2	2	68.5	19	1121		68
3	3	65	19	1536	1755	46
4	1	64.2	19			97
5	3	88.6	19	1213	1524	686
6	1	81.3	19			347
7	3	60.2	19	1562	1782	28
8	1	76.6	19			152
9	1	72	19			161
10	2	63.1	19	1050		506
11	3	85.9	19	956	1873	38
12	2	92	19	1388		190
13	1	68.6	19			621
14	2	98.8	19	1403		596
15	2	68.2	19	1422		154
16	2	52.5	19	966		124
17	1	63.4	19			202
Trial Number : 11						
Bursts in Trial: 18						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	3	72.6	16	1424	988	426
2	1	74.7	16			517
3	1	67.3	16			427
4	1	98.8	16			56
5	2	59.9	16	985		12
6	2	67.5	16	1018		532
7	2	83.9	16	1788		91
8	1	91.3	16			113
9	3	97.5	16	1470	1543	214
10	1	86.8	16			126
11	2	77.9	16	1602		541
12	2	62.2	16	1580		78
13	2	80.2	16	943		185
14	3	61.6	16	1162	1745	422
15	1	72.7	16			227
16	3	59.5	16	1399	1021	268
17	2	92.5	16	1677		239
18	2	68.3	16	1476		580

Trial Number : 12						
Bursts in Trial: 19						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	3	61.5	9	1785	947	493
2	2	60.5	9	1320		2
3	1	84.2	9			34
4	1	84.8	9			601
5	1	79.9	9			282
6	1	90.4	9			242
7	2	96.8	9	965		561
8	2	95.8	9	1301		472
9	1	71.9	9			54
10	2	74.5	9	1242		484
11	2	61.7	9	1405		506
12	1	50.1	9			575
13	2	71.1	9	1787		457
14	2	61.6	9	1815		580
15	1	86.4	9			455
16	1	57.7	9			108
17	1	95.1	9			300
18	1	94.9	9			99
19	1	88.2	9			508
Trial Number : 13						
Bursts in Trial: 20						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	1	60.7	16			364
2	2	96.6	16	926		130
3	2	80.2	16	1700		288
4	2	53	16	1057		538
5	3	82.2	16	1603	1416	274
6	3	52.1	16	1568	1666	158
7	1	93.1	16			238
8	3	89.3	16	1054	1310	274
9	3	77.4	16	1396	1714	142
10	3	55.8	16	1330	1489	161
11	2	98.8	16	1515		501
12	3	93.5	16	1793	1603	556
13	1	74.7	16			117
14	2	75.6	16	1293		389
15	1	87.9	16			333
16	2	88.2	16	1163		477
17	2	55.2	16	1698		141
18	2	64.4	16	1679		311
19	3	86.1	16	1624	1631	538
20	2	96.1	16	1550		503

Trial Number : 14						
Bursts in Trial: 8						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	1	63.9	16			1128
2	1	97.5	16			1077
3	3	54.7	16	1301	1569	217
4	3	87.6	16	1889	1326	17
5	2	78.6	16	1446		1256
6	3	55.6	16	1479	1191	163
7	1	50.3	16			1338
8	1	68.2	16			659
Trial Number : 15						
Bursts in Trial: 9						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	67.6	7	1527		759
2	2	94.5	7	1587		238
3	2	79.5	7	1024		1294
4	2	95.8	7	1325		294
5	2	67.1	7	1358		509
6	3	65.5	7	1343	1365	993
7	3	67.8	7	1418	1827	1039
8	1	98.5	7			279
9	2	85.4	7	1604		242
Trial Number : 16						
Bursts in Trial: 10						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	72.9	6	1116		241
2	3	65.4	6	1539	1104	582
3	2	94.8	6	1221		434
4	2	67.2	6	1869		816
5	3	52.3	6	1679	1492	211
6	1	73.7	6			232
7	3	63.6	6	1225	1434	278
8	1	72	6			391
9	1	80.7	6			275
10	2	93.8	6	1257		510

Trial Number : 17						
Bursts in Trial: 11						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	83.6	13	1682		640
2	3	94.5	13	973	1888	978
3	2	98.3	13	1231		391
4	3	58.1	13	1901	1107	766
5	1	77.5	13			1073
6	1	97.6	13			110
7	3	92	13	1807	1671	8
8	3	58.8	13	1285	1705	1060
9	3	65	13	1707	1186	183
10	3	84.6	13	1233	933	708
11	2	56.4	13	1132		417
Trial Number : 18						
Bursts in Trial: 12						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	64	18	1755		969
2	1	65.5	18			185
3	2	78.3	18	969		254
4	2	94.6	18	1816		918
5	2	76.1	18	1636		367
6	2	96.4	18	1480		694
7	2	52.5	18	1025		211
8	2	50.3	18	1063		692
9	2	71.1	18	959		22
10	1	90.6	18			874
11	1	54.7	18			54
12	2	52.3	18	1019		449
Trial Number : 19						
Bursts in Trial: 13						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	1	91.7	6			675
2	2	64.4	6	1146		538
3	1	77.1	6			567
4	2	92.8	6	1473		146
5	1	68.6	6			875
6	1	70.7	6			815
7	1	79.5	6			487
8	1	67.8	6			578
9	2	89.1	6	1066		134
10	3	62.6	6	1132	1536	868
11	3	79.6	6	1223	1354	423
12	2	67.6	6	1565		486
13	2	68.5	6	1635		569

Trial Number : 20						
Bursts in Trial: 14						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	88.7	18	1312		309
2	2	71.6	18	1106		288
3	1	50.8	18			805
4	2	56.3	18	1073		177
5	2	63.3	18	1144		766
6	2	98.3	18	1508		496
7	2	92.4	18	1481		11
8	2	70.3	18	1431		73
9	2	93.9	18	1434		359
10	2	57.4	18	1543		163
11	1	57.3	18			397
12	3	86.3	18	1856	997	845
13	2	73.8	18	1145		560
14	2	53.8	18	1583		192
Trial Number : 21						
Bursts in Trial: 15						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	1	78.2	8			628
2	2	98.7	8	1169		609
3	2	77.5	8	1803		344
4	2	97.2	8	918		754
5	2	98.8	8	1125		177
6	3	55.5	8	1139	1082	434
7	2	94.2	8	1237		8
8	2	56.5	8	992		735
9	2	83.5	8	1867		378
10	1	89.2	8			565
11	3	98.7	8	1490	1275	749
12	2	87.3	8	982		740
13	1	91.5	8			396
14	1	58.5	8			71
15	2	62.1	8	1261		234
Trial Number : 22						
Bursts in Trial: 16						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	1	73.4	6			369
2	3	89.1	6	967	1802	379
3	2	55.1	6	1666		110
4	1	71.2	6			225
5	2	88.8	6	1013		442
6	2	78.6	6	1805		658
7	3	54.6	6	1690	1478	442
8	2	68.9	6	1652		133
9	2	57.7	6	1471		25
10	1	93.1	6			391
11	3	61.8	6	1242	1763	512
12	2	81.6	6	1664		502
13	1	92.4	6			573
14	2	94	6	1380		169
15	1	77.1	6			705
16	2	52.7	6	1732		307

Trial Number : 23						
Bursts in Trial: 17						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	3	72.5	9	948	1153	546
2	2	69.3	9	1105		110
3	3	86.2	9	1140	1692	316
4	2	75.9	9	1060		39
5	2	68.8	9	1578		492
6	3	64.4	9	1494	973	325
7	2	94.7	9	1799		336
8	2	95.1	9	977		258
9	3	62	9	1492	1487	447
10	2	59	9	1020		333
11	1	68.3	9			22
12	1	58.5	9			234
13	1	84.3	9			586
14	2	58.2	9	1912		662
15	3	73.8	9	1566	1550	605
16	2	50	9	1796		175
17	3	50.2	9	1463	1578	407
Trial Number : 24						
Bursts in Trial: 18						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	1	52.8	19			615
2	2	71.2	19	1039		627
3	3	85.5	19	1830	1188	459
4	2	50.2	19	1262		141
5	2	97.3	19	1653		189
6	2	64.9	19	1701		79
7	2	75.3	19	1406		112
8	2	55.6	19	1628		381
9	2	84	19	985		504
10	1	92	19			334
11	1	71.3	19			142
12	1	99.5	19			644
13	2	76.1	19	1032		28
14	2	68.1	19	1735		358
15	2	69.8	19	1118		637
16	1	68.4	19			246
17	2	83	19	1635		211
18	3	65.6	19	1044	1108	298

Trial Number : 25						
Bursts in Trial: 19						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	96.4	19	1245		111
2	2	55	19	1309		541
3	2	68.9	19	1365		406
4	3	56.7	19	1036	1674	402
5	2	88.7	19	1642		573
6	3	71.4	19	937	1909	415
7	1	77.4	19			340
8	2	75	19	1182		86
9	1	60	19			107
10	1	74.6	19			115
11	2	75	19	1623		267
12	2	91.1	19	1876		192
13	2	88.3	19	1181		230
14	2	56.4	19	1666		579
15	2	63	19	1041		272
16	2	91.7	19	1748		240
17	1	66.3	19			390
18	1	66.3	19			115
19	1	74.2	19			60
Trial Number : 26						
Bursts in Trial: 20						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	1	99.2	8			269
2	3	58.6	8	1480	1167	49
3	3	91.5	8	1269	1307	221
4	2	52.2	8	1201		219
5	1	93.2	8			536
6	2	95.7	8	1028		430
7	2	59.8	8	1287		136
8	1	59.5	8			200
9	2	68.4	8	1619		312
10	2	55.7	8	1336		182
11	1	84.5	8			134
12	1	82.8	8			293
13	2	92.3	8	1852		200
14	2	95	8	1783		329
15	2	71.3	8	1713		42
16	2	70.6	8	1451		102
17	2	63.2	8	1603		191
18	2	51.6	8	1381		192
19	2	69.7	8	1852		243
20	1	63.6	8			101

Trial Number : 27						
Bursts in Trial: 12						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	3	99.8	9	1107	1582	648
2	2	89.8	9	1717		661
3	2	60.8	9	1911		549
4	2	92.4	9	981		319
5	1	84.4	9			458
6	2	94.7	9	1592		788
7	1	67.4	9			426
8	1	79.6	9			11
9	2	83.9	9	1579		269
10	2	90.6	9	1827		632
11	1	55.2	9			649
12	1	96.9	9			154
Trial Number : 28						
Bursts in Trial: 13						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	2	94	6	1712		474
2	1	70.8	6			286
3	2	75.6	6	1369		293
4	3	85.9	6	1142	1004	41
5	2	71.9	6	1896		732
6	3	73.5	6	1104	1699	216
7	2	64.9	6	1769		855
8	2	90.2	6	1456		62
9	1	69.3	6			633
10	1	52.6	6			362
11	2	50.7	6	978		115
12	2	59.5	6	1272		82
13	1	81.4	6			305
Trial Number : 29						
Bursts in Trial: 14						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	3	56.4	17	1280	1419	677
2	3	80	17	1571	1530	80
3	3	54.2	17	1427	1660	278
4	1	73.9	17			375
5	2	69	17	982		388
6	2	55.3	17	1167		283
7	2	77	17	994		517
8	3	92.9	17	1726	1488	807
9	3	66.5	17	977	1452	729
10	2	63.7	17	1195		508
11	1	91.6	17			489
12	2	78.5	17	1171		234
13	3	88.4	17	1127	978	484
14	3	81.3	17	1454	1580	54

Trial Number : 30						
Bursts in Trial: 15						
Burst	Number of Pulses	Pulse Width (μsec)	Chirp Width (MHz)	Pulse 1-to-2 Spacing (μsec)	Pulse 2-to-3 Spacing (μsec)	Start Location Within Interval (msec)
1	3	58.9	10	1642	1788	718
2	1	92.2	10			165
3	2	84.7	10	1778		439
4	2	94.9	10	914		487
5	2	64.1	10	1242		310
6	2	65.1	10	1437		743
7	2	73.6	10	1079		772
8	3	99.3	10	1481	1519	166
9	2	86.6	10	1342		737
10	2	96.7	10	1184		176
11	3	67.3	10	1582	1143	510
12	1	95.7	10			18
13	2	76.5	10	1436		458
14	1	70.5	10			758
15	2	96.3	10	1552		471

Pulse Type 6

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

5.4.5 TEST EQUIPMENT USED

- R&S TS8997

6 TEST EQUIPMENT

6.1 TEST EQUIPMENT HARDWARE

- 1 R&S TS8997
2.4 and 5 GHz Bands Conducted Test Lab

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.1	Opus10 TPR (8253.00)	T/P Logger 13	Lufft Mess- und Regeltechnik GmbH	13936	2023-12	2025-12
1.2	FSV30	Signal Analyzer 10 Hz - 30 GHz	Rohde & Schwarz	103005	2023-08	2025-08
1.3	Opus10 THI (8152.00N)	T/H Logger 01	Lufft Mess- und Regeltechnik GmbH	5809	2023-12	2025-12
1.4	FSW43	Signal Analyser	Rohde & Schwarz GmbH & Co. KG	102013	2023-07	2025-07
1.5	Opus10 THI (8152.00)	T/H Logger 14	Lufft Mess- und Regeltechnik GmbH	13993	2023-12	2025-12
1.6	SMBV100A	Vector Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	259291	2023-01	2026-01
1.7	OSP120	Contains Power Meter and Switching Unit OSP-B157W8 PLUS	Rohde & Schwarz	101158	2024-08	2027-08
1.8	CS-RUB6	Rubidium Frequency Standard	Rohde & Schwarz GmbH & Co. KG	100321	2023-10	2025-10

The calibration interval is the time interval between "Last Calibration" and "Calibration Due"

6.2 TEST EQUIPMENT SOFTWARE

Semi-Anechoic Chamber:	
Software	Version
EMC32 Measurement Software	10.60.10
INNCO Mast Controller	1.02.62
INNCO Mast Height	34.10
INNCO Mast Elevation	36.11
MATURO Controller	1.24
MATURO Mast	12.19
MATURO Turn-Table	30.10
Fully-Anechoic Chamber:	
Software	Version
EMC32 Measurement Software	10.60.10
MATURO Controller	1.30
MATURO Turn-Unit	11.10
MATURO Mast	12.10
MATURO Turntable	12.11
INNCO Controller	1.03.02
INNCO Mast Height	34.10
INNCO Mast Elevation	36.11
TS 8997	
WMS32 Measurement Software	11.60.00 (till 2024-03-19), 11.70.00 + Hotfix 01
Conducted AC Emissions:	
Software	Version
EMC32 Measurement Software	10.60.20

7 ANTENNA FACTORS, CABLE LOSS AND SAMPLE CALCULATIONS

This chapter contains the antenna factors with their corresponding path loss of the used measurement path for all antennas as well as the insertion loss of the LISN.

7.1 LISN R&S ESH3-Z5 (150 KHZ – 30 MHZ)

Frequency		Corr.	LISN insertion loss ESH3-Z5	cable loss (incl. 10 dB atten- uator)
MHz		dB	dB	dB
0.15		10.1	0.1	10.0
5		10.3	0.1	10.2
7		10.5	0.2	10.3
10		10.5	0.2	10.3
12		10.7	0.3	10.4
14		10.7	0.3	10.4
16		10.8	0.4	10.4
18		10.9	0.4	10.5
20		10.9	0.4	10.5
22		11.1	0.5	10.6
24		11.1	0.5	10.6
26		11.2	0.5	10.7
28		11.2	0.5	10.7
30		11.3	0.5	10.8

Sample calculation

$$U_{\text{LISN}} (\text{dB } \mu\text{V}) = U (\text{dB } \mu\text{V}) + \text{Corr. (dB)}$$

U = Receiver reading

LISN Insertion loss = Voltage Division Factor of LISN

Corr. = sum of single correction factors of used LISN, cables, switch units (if used)

Linear interpolation will be used for frequencies in between the values in the table.

7.2 ANTENNA R&S HFH2-Z2 (9 KHZ – 30 MHZ)

Frequency	AF HFH- Z2)	Corr.	cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	cable loss 4 (to receiver)	distance corr. (-40 dB/ decade)	d _{Limit} (meas. distance (limit)	d _{used} (meas. distance (used)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	m	m
0.009	20.50	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.01	20.45	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.015	20.37	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.02	20.36	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.025	20.38	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.03	20.32	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.05	20.35	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.08	20.30	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.1	20.20	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.2	20.17	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.3	20.14	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.49	20.12	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.490001	20.12	-39.6	0.1	0.1	0.1	0.1	-40	30	3
0.5	20.11	-39.6	0.1	0.1	0.1	0.1	-40	30	3
0.8	20.10	-39.6	0.1	0.1	0.1	0.1	-40	30	3
1	20.09	-39.6	0.1	0.1	0.1	0.1	-40	30	3
2	20.08	-39.6	0.1	0.1	0.1	0.1	-40	30	3
3	20.06	-39.6	0.1	0.1	0.1	0.1	-40	30	3
4	20.05	-39.5	0.2	0.1	0.1	0.1	-40	30	3
5	20.05	-39.5	0.2	0.1	0.1	0.1	-40	30	3
6	20.02	-39.5	0.2	0.1	0.1	0.1	-40	30	3
8	19.95	-39.5	0.2	0.1	0.1	0.1	-40	30	3
10	19.83	-39.4	0.2	0.1	0.2	0.1	-40	30	3
12	19.71	-39.4	0.2	0.1	0.2	0.1	-40	30	3
14	19.54	-39.4	0.2	0.1	0.2	0.1	-40	30	3
16	19.53	-39.3	0.3	0.1	0.2	0.1	-40	30	3
18	19.50	-39.3	0.3	0.1	0.2	0.1	-40	30	3
20	19.57	-39.3	0.3	0.1	0.2	0.1	-40	30	3
22	19.61	-39.3	0.3	0.1	0.2	0.1	-40	30	3
24	19.61	-39.3	0.3	0.1	0.2	0.1	-40	30	3
26	19.54	-39.3	0.3	0.1	0.2	0.1	-40	30	3
28	19.46	-39.2	0.3	0.1	0.3	0.1	-40	30	3
30	19.73	-39.1	0.4	0.1	0.3	0.1	-40	30	3

Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

distance correction = $-40 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values

7.3 ANTENNA R&S HL562 (30 MHz – 1 GHz)

($d_{\text{Limit}} = 3 \text{ m}$)

Frequency	AF R&S HL562	Corr.
MHz	dB (1/m)	dB
30	18.6	0.6
50	6.0	0.9
100	9.7	1.2
150	7.9	1.6
200	7.6	1.9
250	9.5	2.1
300	11.0	2.3
350	12.4	2.6
400	13.6	2.9
450	14.7	3.1
500	15.6	3.2
550	16.3	3.5
600	17.2	3.5
650	18.1	3.6
700	18.5	3.6
750	19.1	4.1
800	19.6	4.1
850	20.1	4.4
900	20.8	4.7
950	21.1	4.8
1000	21.6	4.9

cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	cable loss 4 (to receiver)	distance corr. (-20 dB/ decade)	d_{Limit} (meas. distance (limit))	d_{used} (meas. distance (used))
dB	dB	dB	dB	dB	m	m
0.29	0.04	0.23	0.02	0.0	3	3
0.39	0.09	0.32	0.08	0.0	3	3
0.56	0.14	0.47	0.08	0.0	3	3
0.73	0.20	0.59	0.12	0.0	3	3
0.84	0.21	0.70	0.11	0.0	3	3
0.98	0.24	0.80	0.13	0.0	3	3
1.04	0.26	0.89	0.15	0.0	3	3
1.18	0.31	0.96	0.13	0.0	3	3
1.28	0.35	1.03	0.19	0.0	3	3
1.39	0.38	1.11	0.22	0.0	3	3
1.44	0.39	1.20	0.19	0.0	3	3
1.55	0.46	1.24	0.23	0.0	3	3
1.59	0.43	1.29	0.23	0.0	3	3
1.67	0.34	1.35	0.22	0.0	3	3
1.67	0.42	1.41	0.15	0.0	3	3
1.87	0.54	1.46	0.25	0.0	3	3
1.90	0.46	1.51	0.25	0.0	3	3
1.99	0.60	1.56	0.27	0.0	3	3
2.14	0.60	1.63	0.29	0.0	3	3
2.22	0.60	1.66	0.33	0.0	3	3
2.23	0.61	1.71	0.30	0.0	3	3

($d_{\text{Limit}} = 10 \text{ m}$)

30	18.6	-9.9
50	6.0	-9.6
100	9.7	-9.2
150	7.9	-8.8
200	7.6	-8.6
250	9.5	-8.3
300	11.0	-8.1
350	12.4	-7.9
400	13.6	-7.6
450	14.7	-7.4
500	15.6	-7.2
550	16.3	-7.0
600	17.2	-6.9
650	18.1	-6.9
700	18.5	-6.8
750	19.1	-6.3
800	19.6	-6.3
850	20.1	-6.0
900	20.8	-5.8
950	21.1	-5.6
1000	21.6	-5.6

0.29	0.04	0.23	0.02	-10.5	10	3
0.39	0.09	0.32	0.08	-10.5	10	3
0.56	0.14	0.47	0.08	-10.5	10	3
0.73	0.20	0.59	0.12	-10.5	10	3
0.84	0.21	0.70	0.11	-10.5	10	3
0.98	0.24	0.80	0.13	-10.5	10	3
1.04	0.26	0.89	0.15	-10.5	10	3
1.18	0.31	0.96	0.13	-10.5	10	3
1.28	0.35	1.03	0.19	-10.5	10	3
1.39	0.38	1.11	0.22	-10.5	10	3
1.44	0.39	1.20	0.19	-10.5	10	3
1.55	0.46	1.24	0.23	-10.5	10	3
1.59	0.43	1.29	0.23	-10.5	10	3
1.67	0.34	1.35	0.22	-10.5	10	3
1.67	0.42	1.41	0.15	-10.5	10	3
1.87	0.54	1.46	0.25	-10.5	10	3
1.90	0.46	1.51	0.25	-10.5	10	3
1.99	0.60	1.56	0.27	-10.5	10	3
2.14	0.60	1.63	0.29	-10.5	10	3
2.22	0.60	1.66	0.33	-10.5	10	3
2.23	0.61	1.71	0.30	-10.5	10	3

Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + \text{AF (dB 1/m)} + \text{Corr. (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

distance correction = $-20 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

Linear interpolation will be used for frequencies in between the values in the table.

Tables show an extract of values.

7.4 ANTENNA R&S HF907 (1 GHZ – 18 GHZ)

Frequency	AF R&S HF907	Corr.
MHz	dB (1/m)	dB
1000	24.4	-19.4
2000	28.5	-17.4
3000	31.0	-16.1
4000	33.1	-14.7
5000	34.4	-13.7
6000	34.7	-12.7
7000	35.6	-11.0

cable loss 1 (relay + cable inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit, atten- uator & pre-amp)	cable loss 4 (to receiver)		
dB	dB	dB	dB		
0.99	0.31	-21.51	0.79		
1.44	0.44	-20.63	1.38		
1.87	0.53	-19.85	1.33		
2.41	0.67	-19.13	1.31		
2.78	0.86	-18.71	1.40		
2.74	0.90	-17.83	1.47		
2.82	0.86	-16.19	1.46		

Frequency	AF R&S HF907	Corr.
MHz	dB (1/m)	dB
3000	31.0	-23.4
4000	33.1	-23.3
5000	34.4	-21.7
6000	34.7	-21.2
7000	35.6	-19.8

cable loss 1 (relay inside chamber)	cable loss 2 (inside chamber)	cable loss 3 (outside chamber)	cable loss 4 (switch unit, atten- uator & pre-amp)	cable loss 5 (to receiver)	used for FCC 15.247
dB	dB	dB	dB	dB	
0.47	1.87	0.53	-27.58	1.33	
0.56	2.41	0.67	-28.23	1.31	
0.61	2.78	0.86	-27.35	1.40	
0.58	2.74	0.90	-26.89	1.47	
0.66	2.82	0.86	-25.58	1.46	

Frequency	AF R&S HF907	Corr.
MHz	dB (1/m)	dB
7000	35.6	-57.3
8000	36.3	-56.3
9000	37.1	-55.3
10000	37.5	-56.2
11000	37.5	-55.3
12000	37.6	-53.7
13000	38.2	-53.5
14000	39.9	-56.3
15000	40.9	-54.1
16000	41.3	-54.1
17000	42.8	-54.4
18000	44.2	-54.7

cable loss 1 (relay inside chamber)	cable loss 2 (High Pass)	cable loss 3 (pre- amp)	cable loss 4 (inside chamber)	cable loss 5 (outside chamber)	cable loss 6 (to receiver)
dB	dB	dB	dB	dB	dB
0.56	1.28	-62.72	2.66	0.94	1.46
0.69	0.71	-61.49	2.84	1.00	1.53
0.68	0.65	-60.80	3.06	1.09	1.60
0.70	0.54	-61.91	3.28	1.20	1.67
0.80	0.61	-61.40	3.43	1.27	1.70
0.84	0.42	-59.70	3.53	1.26	1.73
0.83	0.44	-59.81	3.75	1.32	1.83
0.91	0.53	-63.03	3.91	1.40	1.77
0.98	0.54	-61.05	4.02	1.44	1.83
1.23	0.49	-61.51	4.17	1.51	1.85
1.36	0.76	-62.36	4.34	1.53	2.00
1.70	0.53	-62.88	4.41	1.55	1.91

Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

Tables show an extract of values.

7.5 ANTENNA EMCO 3160-09 (18 GHZ – 26.5 GHZ)

Frequency	AF EMCO 3160-09	Corr.	cable loss 1 (inside chamber)	cable loss 2 (pre- amp)	cable loss 3 (inside chamber)	cable loss 4 (switch unit)	cable loss 5 (to receiver)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB
18000	40.2	-23.5	0.72	-35.85	6.20	2.81	2.65
18500	40.2	-23.2	0.69	-35.71	6.46	2.76	2.59
19000	40.2	-22.0	0.76	-35.44	6.69	3.15	2.79
19500	40.3	-21.3	0.74	-35.07	7.04	3.11	2.91
20000	40.3	-20.3	0.72	-34.49	7.30	3.07	3.05
20500	40.3	-19.9	0.78	-34.46	7.48	3.12	3.15
21000	40.3	-19.1	0.87	-34.07	7.61	3.20	3.33
21500	40.3	-19.1	0.90	-33.96	7.47	3.28	3.19
22000	40.3	-18.7	0.89	-33.57	7.34	3.35	3.28
22500	40.4	-19.0	0.87	-33.66	7.06	3.75	2.94
23000	40.4	-19.5	0.88	-33.75	6.92	3.77	2.70
23500	40.4	-19.3	0.90	-33.35	6.99	3.52	2.66
24000	40.4	-19.8	0.88	-33.99	6.88	3.88	2.58
24500	40.4	-19.5	0.91	-33.89	7.01	3.93	2.51
25000	40.4	-19.3	0.88	-33.00	6.72	3.96	2.14
25500	40.5	-20.4	0.89	-34.07	6.90	3.66	2.22
26000	40.5	-21.3	0.86	-35.11	7.02	3.69	2.28
26500	40.5	-21.1	0.90	-35.20	7.15	3.91	2.36

Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values.

7.6 ANTENNA EMCO 3160-10 (26.5 GHZ – 40 GHZ)

Frequency GHz	AF EMCO 3160-10 dB (1/m)	Corr. dB	cable loss 1 (inside chamber) dB	cable loss 2 (outside chamber) dB	cable loss 3 (switch unit) dB	cable loss 4 (to receiver) dB	distance corr. (-20 dB/ decade) dB	d _{Limit} (meas. distance (limit) m	d _{used} (meas. distance (used) m
26.5	43.4	-11.2	4.4				-9.5	3	1.0
27.0	43.4	-11.2	4.4				-9.5	3	1.0
28.0	43.4	-11.1	4.5				-9.5	3	1.0
29.0	43.5	-11.0	4.6				-9.5	3	1.0
30.0	43.5	-10.9	4.7				-9.5	3	1.0
31.0	43.5	-10.8	4.7				-9.5	3	1.0
32.0	43.5	-10.7	4.8				-9.5	3	1.0
33.0	43.6	-10.7	4.9				-9.5	3	1.0
34.0	43.6	-10.6	5.0				-9.5	3	1.0
35.0	43.6	-10.5	5.1				-9.5	3	1.0
36.0	43.6	-10.4	5.1				-9.5	3	1.0
37.0	43.7	-10.3	5.2				-9.5	3	1.0
38.0	43.7	-10.2	5.3				-9.5	3	1.0
39.0	43.7	-10.2	5.4				-9.5	3	1.0
40.0	43.8	-10.1	5.5				-9.5	3	1.0

Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

distance correction = $-20 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

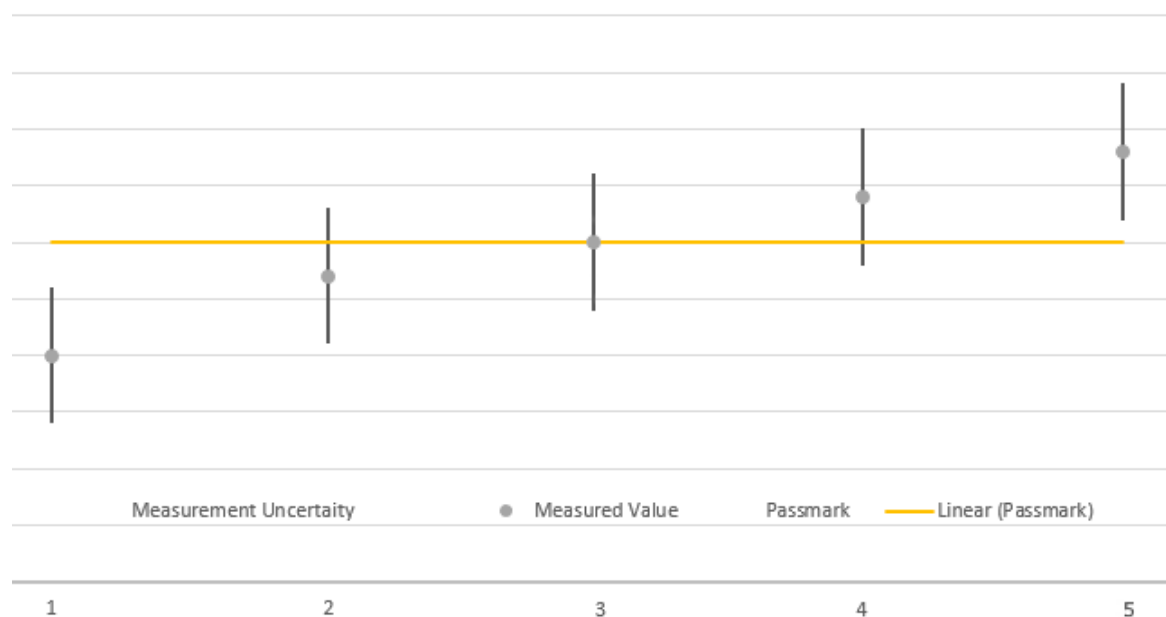
Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values.

8 MEASUREMENT UNCERTAINTIES

Test Case	Parameter	Uncertainty
AC Power Line	Power	± 3.4 dB
Field Strength of spurious radiation	Power	± 5.5 dB
6 dB / 26 dB / 99% Bandwidth	Power Frequency	± 2.9 dB ± 11.2 kHz
Conducted Output Power	Power	± 2.2 dB
Band Edge Compliance	Power Frequency	± 2.2 dB ± 11.2 kHz
Frequency Stability	Frequency	± 25 Hz
Power Spectral Density	Power	± 2.2 dB

The measurement uncertainties for all parameters are calculated with an expansion factor (coverage factor) $k = 1.96$. This means, that the true value is in the corresponding interval with a probability of 95 %.



The verdicts in this test report are given according the above diagram:

Case	Measured Value	Uncertainty Range	Verdict
1	below pass mark	below pass mark	Passed
2	below pass mark	within pass mark	Passed
3	on pass mark	within pass mark	Passed
4	above pass mark	within pass mark	Failed
5	above pass mark	above pass mark	Failed

That means, the laboratory applies, as decision rule (see ISO/IEC 17025:2017), the so-called shared risk principle.

9 PHOTO REPORT

Please see separate photo report.

*****END OF TEST REPORT*****