FCC Measurement/Technical Report on

Industrial WLAN Access Point / Client
SCALANCE W700 / MSAX
MSAX65-W1-M12-E2

FCC ID: LYHMSAX65V1
IC: 267AA-MSAX65V1

Test Report Reference: MDE_SIEM_1911_FCC_06

Test Laboratory:
7layers GmbH
Borsigstrasse 11
40880 Ratingen
Germany

Deutsche Akkreditierungsstelle
D-PL-12140-01-01
D-PL-12140-01-02
D-PL-12140-01-03

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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 (10-1-21 Edition) and 15 (10-1-21 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

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 KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02, 2016-04-08 "COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION".

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: 8.8
Occupied bandwidth	§ 15.403 (i) (26 dB) / § 15.407 (e) (6 dB)	RSS-247 Issue 2: 6.2.1.1, 6.2.2.1, 6.2.3.1 (99%) RSS-247 Issue 2: 6.2.4.1 (6 dB)
Maximum conducted output power	§ 15.407 (a) (1),(2),(3),(4)	RSS-247 Issue 2: 6.2.1.1, 6.2.2.1, 6.2.3.1, 6.2.4.1
Maximum power spectral density	§ 15.407 (a) (1),(2),(3),(5)	RSS-247 Issue 2: 6.2.1.1, 6.2.2.1, 6.2.3.1, 6.2.4.1
Transmitter undesirable emissions; General Field Strength Limits, Restricted Bands	§ 15.407 (b) § 15.209 (a)	RSS-Gen Issue 5: 6.13/8.9/8.10; RSS-247 Issue 2: 3.3/6.2 6.2.1.2, 6.2.2.2, 6.2.3.2, 6.2.4.2
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 2: 6.2.2.1, 6.2.3.1, 6.3
Antenna requirement	§ 15.203 / 15.204	RSS-Gen Issue 5: 8.3
Receiver spurious emissions	–	-

1.3 MEASUREMENT SUMMARY

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

Dynamic Frequency Selection, U-NII Detection Bandwidth
The measurement was performed according to KDB 905462 D02 **Final Result**

OP-Mode	**Setup**	**Date**	**FCC**	**IC**
Radio Technology, Operating Frequency				
WLAN a 20 MHz, 5500 MHz	S01_AJ03	2022-08-31	Passed	Passed
WLAN ac 40 MHz, 5510 MHz	S01_AJ03	2022-08-31	Passed	Passed

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

Dynamic Frequency Selection, Channel Availability Check Time
The measurement was performed according to KDB 905462 D02 **Final Result**

OP-Mode	**Setup**	**Date**	**FCC**	**IC**
Bandwidth, Operating Frequency				
WLAN ax 20 MHz, 5500 MHz	S01_AJ03	2022-08-31	Passed	Passed

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

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 D02 **Final Result**

OP-Mode	**Setup**	**Date**	**FCC**	**IC**
Bandwidth, Operating Frequency				
WLAN ax 40 MHz, 5510 MHz	S01_AJ03	2022-08-31	Passed	Passed

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

Dynamic Frequency Selection, Statistical Performance Check
The measurement was performed according to KDB 905462 D02 **Final Result**

OP-Mode	**Setup**	**Date**	**FCC**	**IC**
Bandwidth, Operating Frequency				
WLAN ax 20 MHz, 5500 MHz	S01_AJ03	2022-09-01	Passed	Passed
WLAN ax 40 MHz, 5510 MHz	S01_AJ03	2022-09-02	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	2023-04-24	--	valid
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COMMENT: This report is a DFS report only. The other applicable tests are not part of this report.

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

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

7 layers GmbH, Borsigstr. 11
40880 Ratingen, Germany
Phone +49 (0)2102 749 0

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-12140-01-01| -02 | -03
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:	2021-01-13

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:	2023-04-24
Testing Period:	2022-08-30 to 2022-09-02

3.3 APPLICANT DATA

Company Name:	SIEMENS AG
Address:	Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany
Contact Person:	Dr. Malgorzata Janson

3.4 MANUFACTURER DATA

Company Name:	SIEMENS AG
Address:	76181 Karlsruhe Germany
Contact Person:	Mr. Kilian Löser

4 TEST OBJECT DATA

4.1 GENERAL EUT DESCRIPTION

Kind of Device product description	Industrial Access Point / Client
Product name	SCALANCE W700 / MSAX
Type	MSAX65-W1-M12-E2
Declared EUT data by the supplier	
Voltage Type	DC
Voltage Level	24.0 V
Tested Modulation Type	OFDM
Specific product description	The MSAX65-W1-M12-E2 device is a wireless LAN access point / client for industrial applications supporting following WLAN modes and frequency bands: • 802.11 ax/ac/a/h/n Mode: 5.15 - 5.35 GHz and 5.47 - 5.85 GHz • 802.11 ax/b/g/n Mode: 2400 - 2483.5 MHz 2 N connectors are available for usage with external antennas. 2x2 MIMO operation is possible in both bands. Simultaneous operation of the device in both frequency bands is supported. Module may be used either as Master or as Client WLAN device. The device supports 10/100/1000 Mbit/s Ethernet. Additionally, the device features one digital input and one digital output signalling line, a configuration/licensing plug and a sleep timer. Supply power is 24Vdc, also PoE on the ethernet interface is available. In the relevant DFS bands 5250 -5350 and 5470 -5725 MHz 20 and 40 MHz Bandwidth are supported.
Ports of the device	• Enclosure • DC port: cable length appr. 1.0m • Digital I/O port: cable length 2.0m (terminated with DIDO box), only for radiated tests • LAN port: cable length (shielded), appr. 3.0m, only for radiated tests • USB C service port: cable length, appr. 2.0m, only for conducted tests 2 Antenna ports, N-connector, appr. 1.0 m & antenna
Data Rates	WLAN a: up to 54 Mbit/s WLAN n: up to 300 Mbit/s WLAN ac: up to 866.7 Mbit/s WLAN ax: up to 1201 Mbit/s
Antennas	External
Antenna Connector Impedance	50 Ohms

Special software used for testing	The test modes were set by command line commands provided by the applicant.
Transmit Power Control	Supported
Power level of the EUT (E.I.R.P.)	30 dBm, 17 dBm/MHz
User Access Restriction	The manufacturer 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	Both antenna ports were connected to the test setup.
Antenna Assembly gain used for DFS Threshold Level	0 dBi
Used threshold level	-64 dBm (EIRP > 200 mW and power spectral density > 10 dBm/MHz)
Channel loading	Video Streaming from laptop connected to EUT to Laptop connected to Client device.
Pulse Type Generation	Pulses were randomly generated using Rohde & Schwarz K6 Pulse sequencer.

4.2 EUT MAIN COMPONENTS

Sample Name	Sample Code	Description
EUT aj03	DE1039028aj03	
Sample Parameter	**Value**	
Serial No.	VPN4200421	
HW Version	02	
SW Version	V02.00.00	
Comment	EUT used as Master	

Sample Name	Sample Code	Description
EUT ah03	DE10039028ah03	
Sample Parameter	**Value**	
Serial No.	VPN4200423	
HW Version	02	
SW Version	V02.00.00	
Comment	EUT used as Client	

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.

Device	Details (Manufacturer, Type Model, HW, SW, S/N)	Description
-	-	-

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**
AUX1	Fujitsu, Lifebook E series E782, 2012-08, Win7 Prof. Engl., DSCM004672	Laptop Computer
AUX2	Fujitsu, Lifebook E series E781, 2012-03, Win10 Pro Engl., DSCK013809	Laptop Computer
AUX3	Siemens, -, -, -, -	DEBUG BOX CLP for sending DFS test mode commands

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**
S01_AJ03	EUT aj03, EUT ah03, AUX1, AUX2, AUX3	Conducted DFS Setup

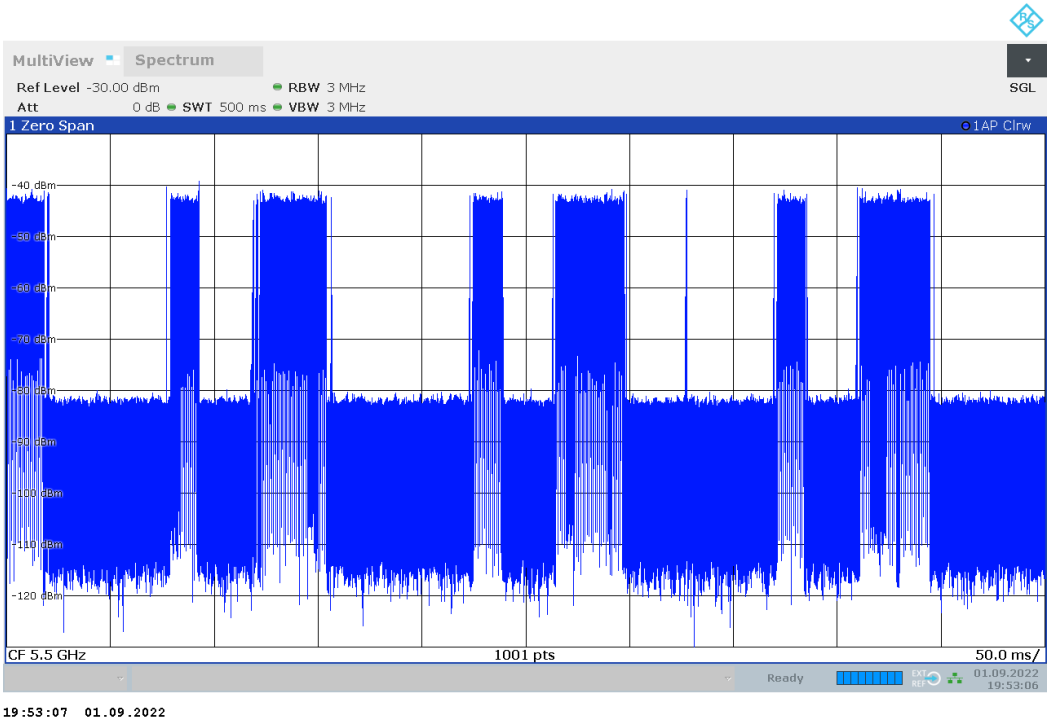
4.6 OPERATING MODES / TEST CHANNELS

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

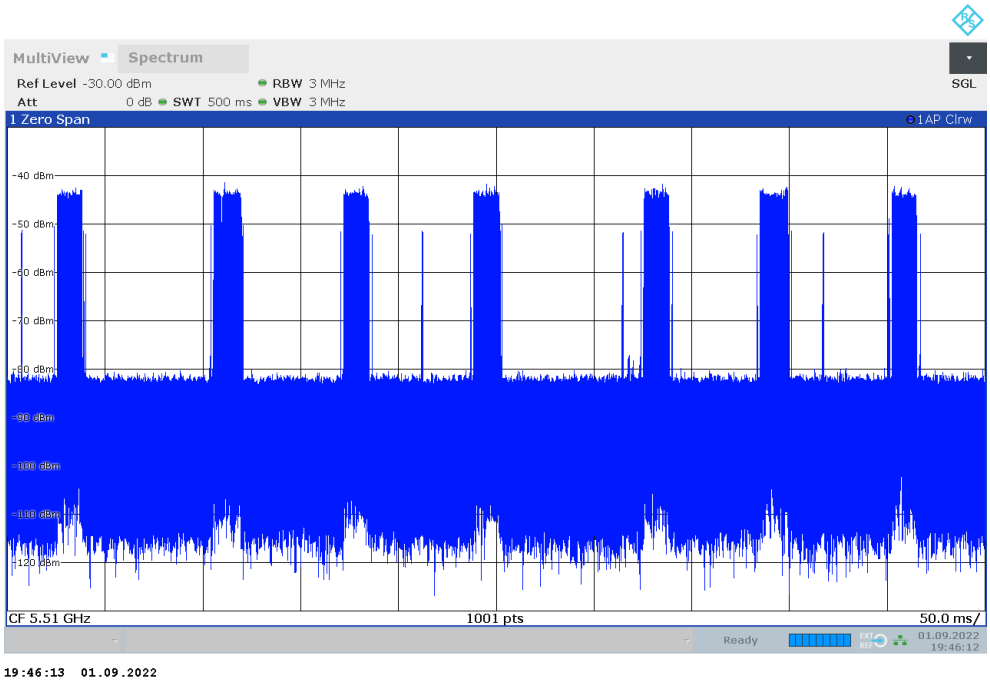
Channel Loading Duty Cycle

WLAN ax 20 MHz MCS1



Comment: 342 points above -60 dBm corresponds to 34 % DC

WLAN ac 40 MHz MCS1



Comment: 218 points above -60 dBm corresponds to 22 % DC

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

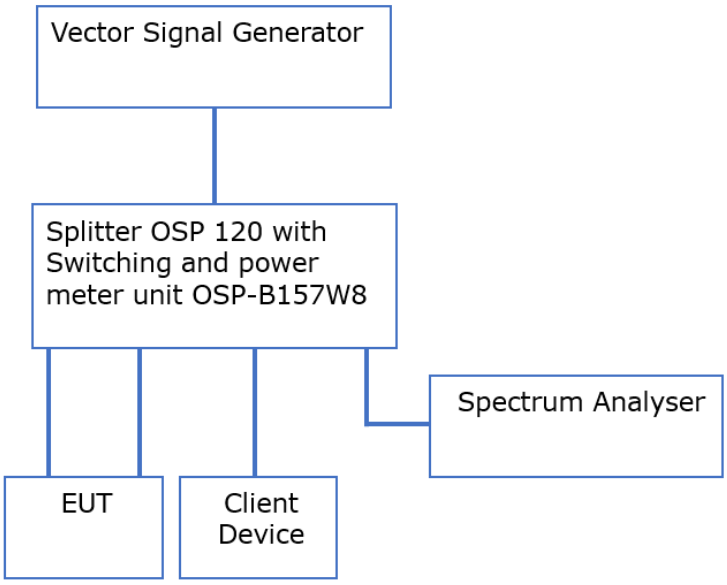
5.1 DYNAMIC FREQUENCY SELECTION, U-NII DETECTION BANDWIDTH

Standard **FCC Part 15 Subpart E**

The test was performed according to:
KDB 905462 D02

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 °C
Air Pressure: 990 hPa
Humidity: 30 %

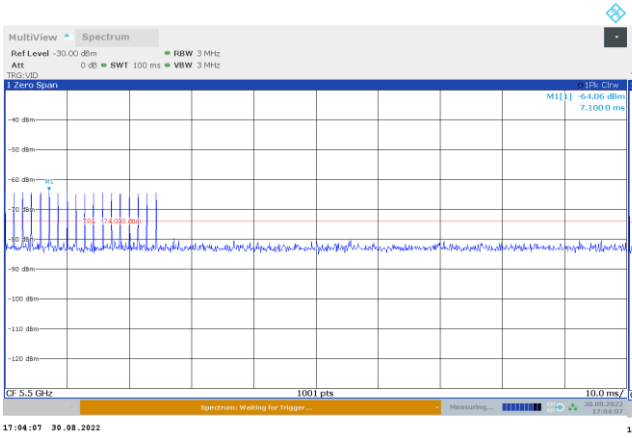
Mode	TX Frequency [MHz]	Channel BW [MHz]	Radar Test Signal #	F_L [MHz]	F_H [MHz]	Detection BW [MHz]	99 % BW [MHz]
WLAN a 20 MHz	5500	20	Radar Type 0	5490	5510	20	19.2
WLAN ac 40 MHz	5510	40	Radar Type 0	5490	5530	40	38.4

Remark: Detection of radar pulses is monitored by console interface.
No plots are recorded.

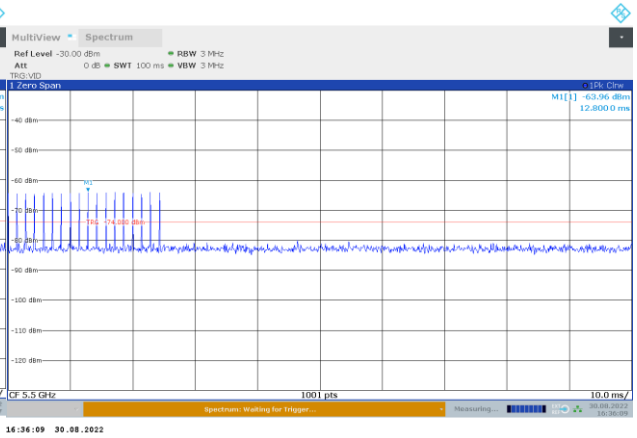
5.1.4 MEASUREMENT RESULT

MHz from Centre	TX Frequency [MHz]	Channel BW [MHz]	Detected	TX Freq. [MHz]	Channel BW [MHz]	Detected
-20				5510	40	10
-19				5510	40	
-18				5510	40	
-17				5510	40	
-16				5510	40	
-15				5510	40	10
-10	5500	20	10	5510	40	10
-9	5500	20		5510	40	
-8	5500	20		5510	40	
-7	5500	20		5510	40	
-6	5500	20		5510	40	
-5	5500	20	10	5510	40	10
0	5500	20	10	5510	40	10
5	5500	20	10	5510	40	10
6	5500	20		5510	40	
7	5500	20		5510	40	
8	5500	20		5510	40	
9	5500	20		5510	40	
10	5500	20	10	5510	40	10
15				5510	40	10
16				5510	40	
17				5510	40	
18				5510	40	
19				5510	40	
20				5510	40	10

Radar Pulse Level Calibration

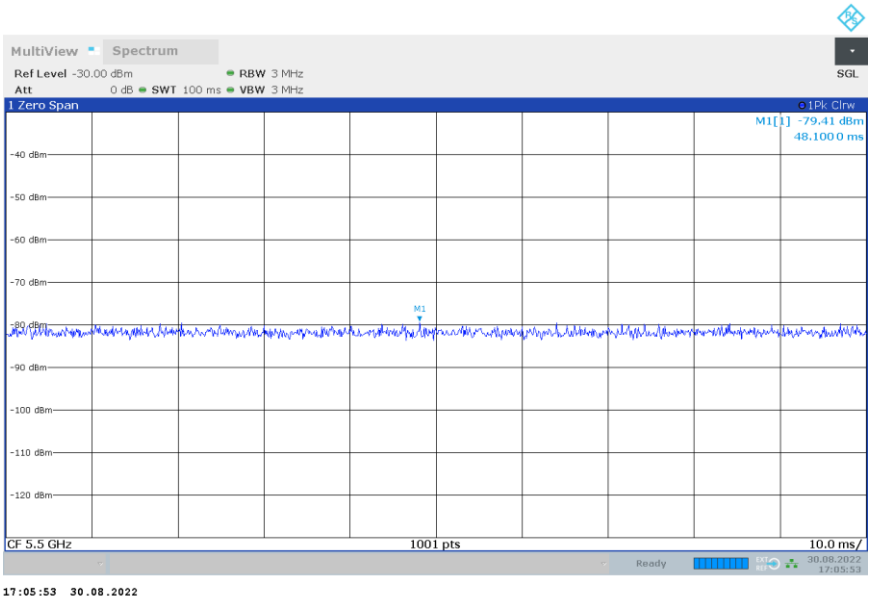


Antenna Port 1



Antenna Port 2

Radar Pulse level



Noise Level

5.1.5 TEST EQUIPMENT USED

- R&S TS8997

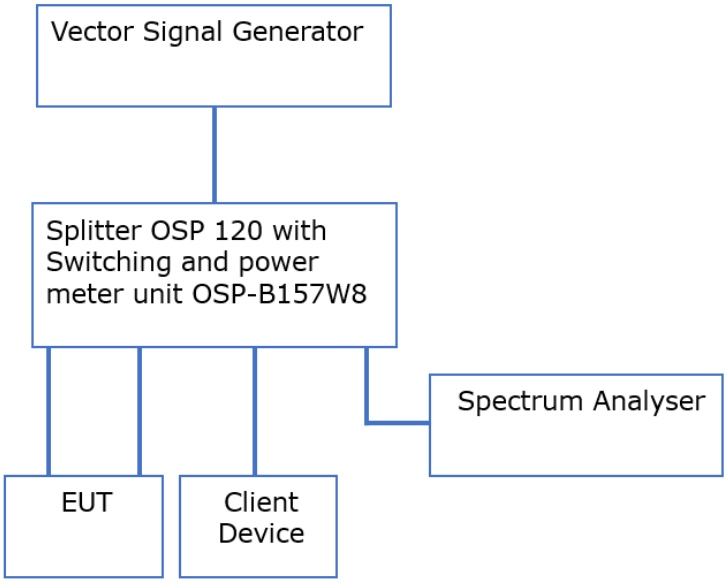
5.2 DYNAMIC FREQUENCY SELECTION, CHANNEL AVAILABILITY CHECK TIME

Standard **FCC Part 15 Subpart E**

The test was performed according to:
KDB 905462 D02

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 and the EUT restarted by software commands.

When the console interface indicates the restart, the measurement sweep on the spectrum analyser is started.

Analyzer settings:
•Resolution Bandwidth (RBW): 3 MHz
•Video Bandwidth (VBW): 3 MHz
•Trace: Clear/Write
•Sweeps: Single Sweep
•Sweeptime: 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.

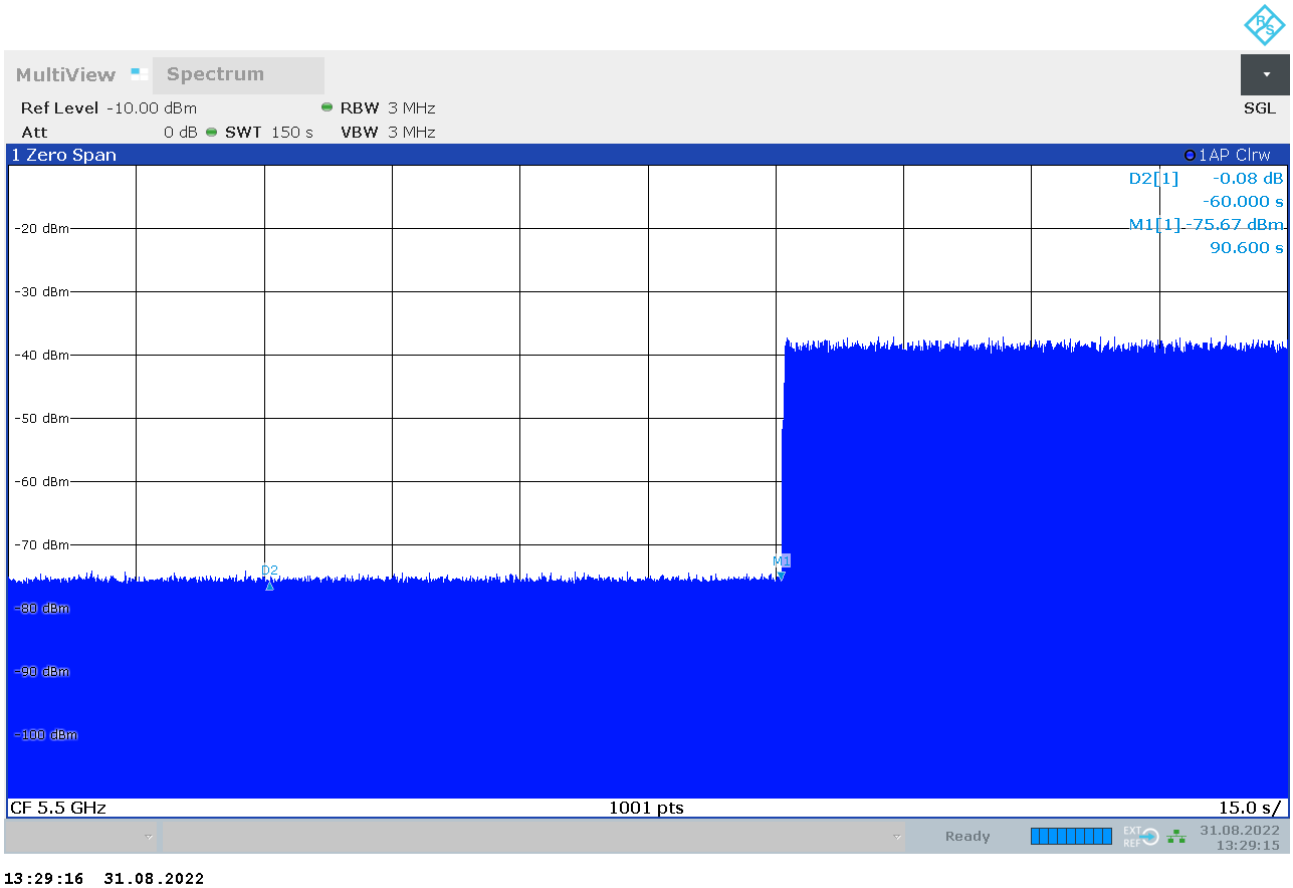
5.2.3 TEST PROTOCOL

Ambient temperature: 24 °C
Air Pressure: 990 hPa
Humidity: 30 %

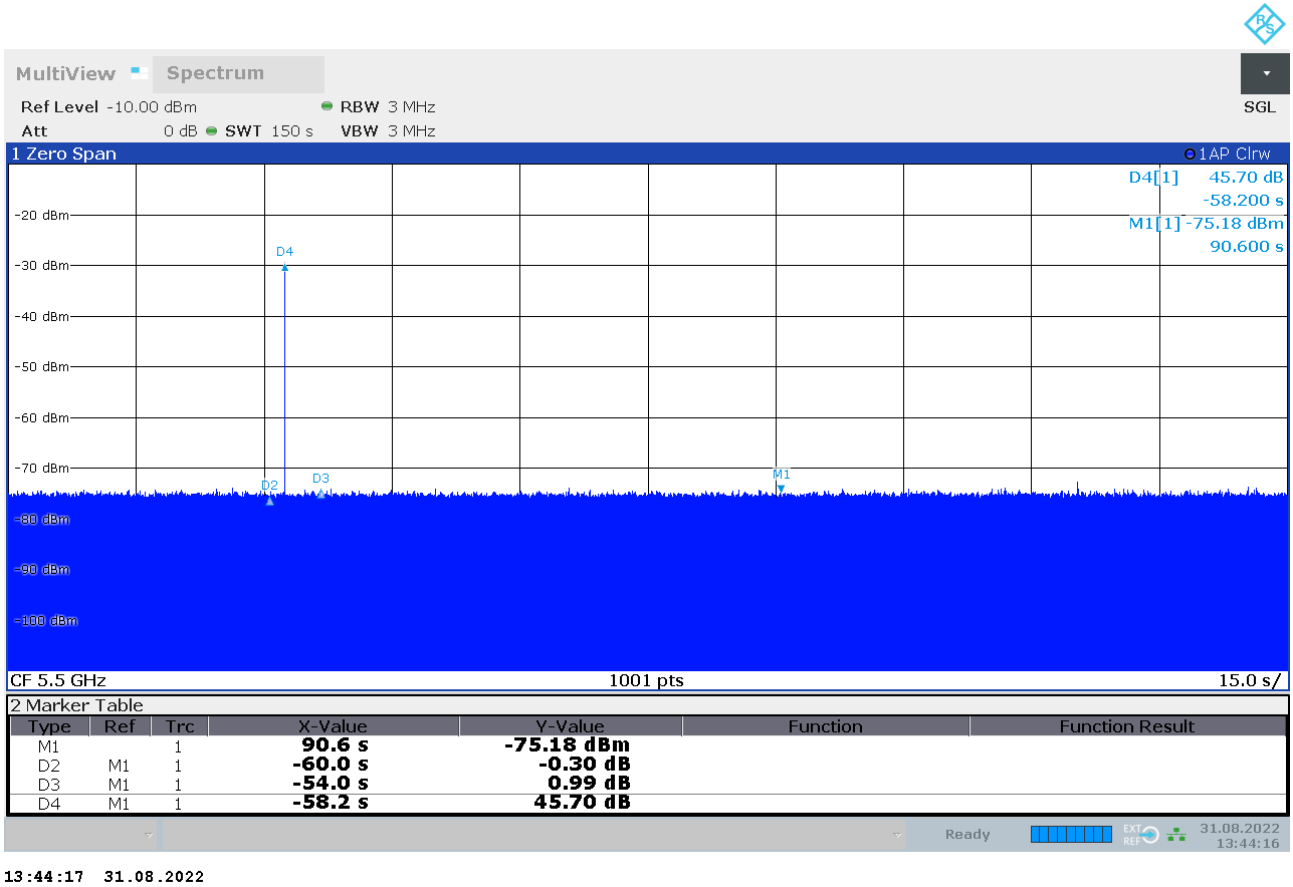
Mode	TX Frequency [MHz]	Radar Test Signal #	Detected?	Transmissions within 150 s?
WLAN ax 20 MHz	5530	Type 0 @ 0 to 6 s	Yes	No
WLAN ax 20 MHz	5530	Type 0 @ 54 to 60 s	Yes	No

Remark: Please see next sub-clause for the measurement plot.
For radar pulse calibration see test case U-NII detection BW.

5.2.4 MEASUREMENT PLOT



Determination of startup time (no radar pulse send)
Resulting start up time: 90.6 s (Marker 1) – 60 s = 30.6 s (Marker D2)



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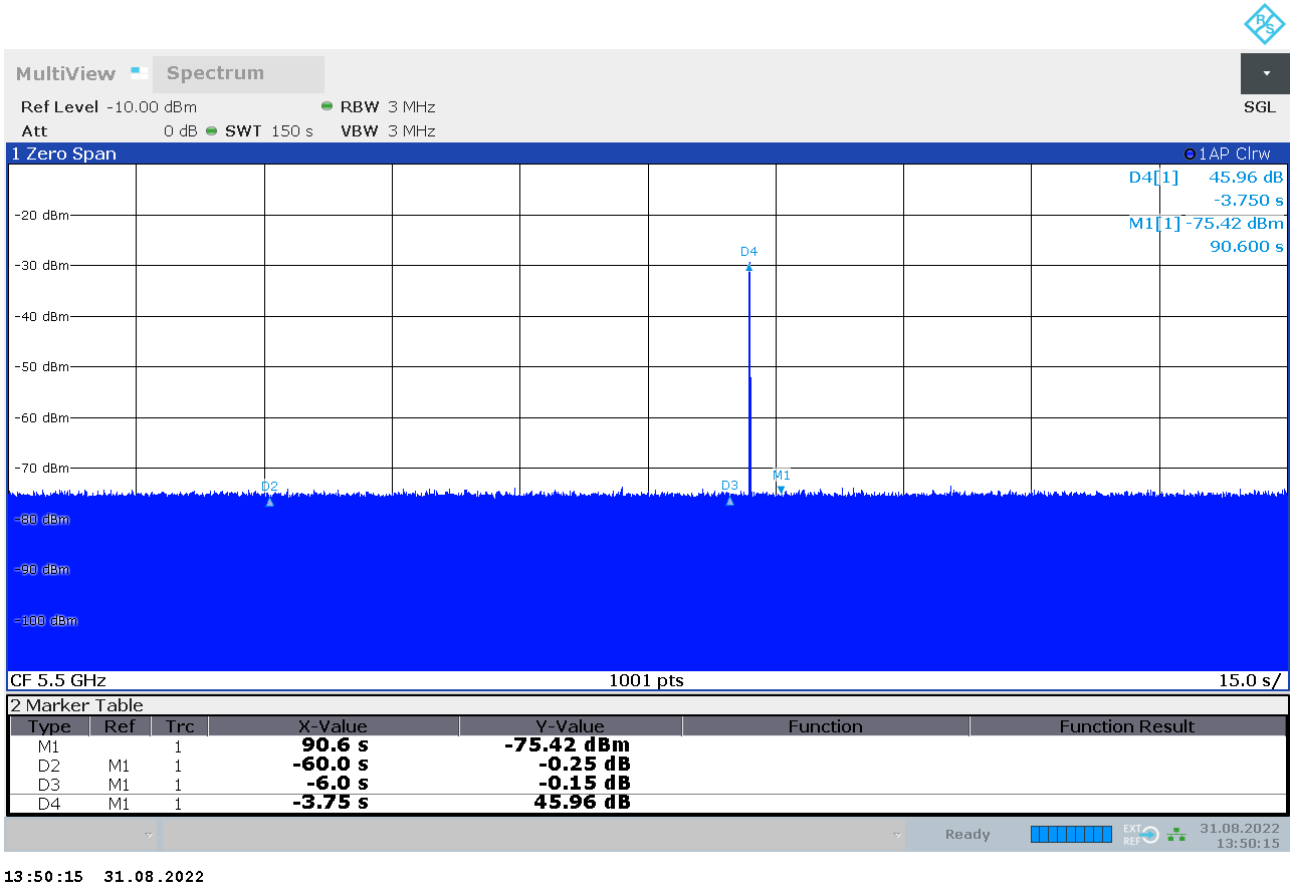
Radar Pulse at beginning of CAC period.
Emission of radar pulse at 1.8s after calculated startup (Marker D4)



Radar Pulse at end of CAC period.
Emission of radar pulse at 56.25s after calculated startup (Marker D4)

5.2.5 TEST EQUIPMENT USED

- R&S TS8997

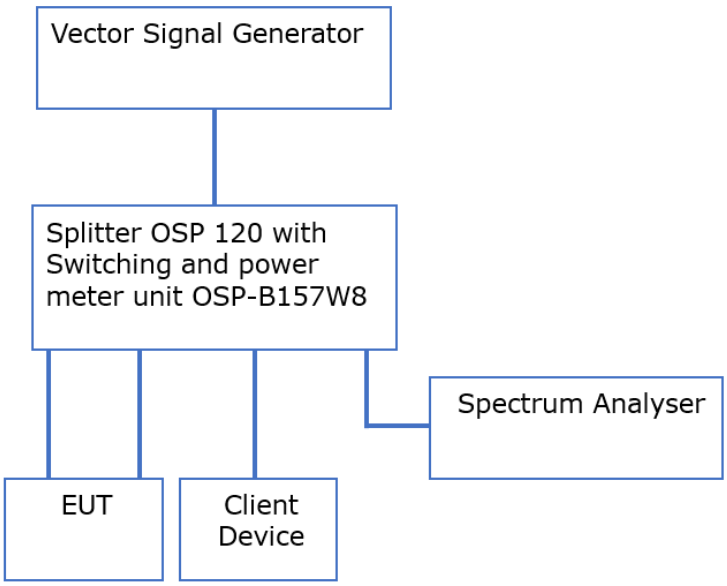
5.3 DYNAMIC FREQUENCY SELECTION, IN-SERVICE MONITORING FOR CHANNEL MOVE TIME, CHANNEL CLOSING TRANSMISSION TIME AND NON-OCCUPANCY PERIOD

Standard **FCC Part 15 Subpart E**

The test was performed according to:
KDB 905462 D02

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 together with the laptops for traffic generation. Afterwards the master and client were configured for connection on a DFS channel using the maximum supported bandwidth.
Once the Channel Availability Check was completed and connection was established, the video streaming 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
•Sweeptime: 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
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
Note 1: *Channel Move Time* and the *Channel Closing Transmission Time* should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required to facilitate a *Channel* 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.	

5.3.3 TEST PROTOCOL

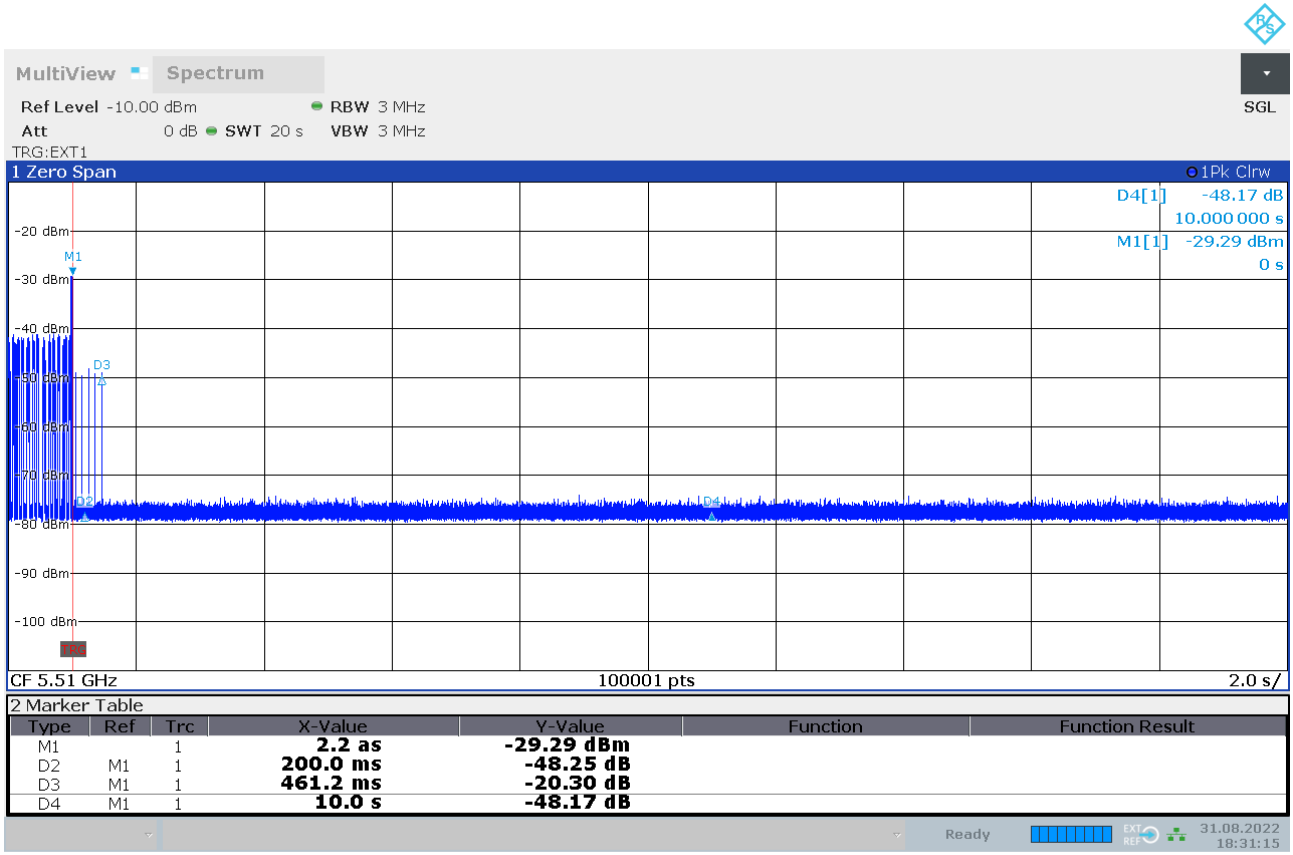
Master

Ambient temperature: 25 °C
Air Pressure: 990 hPa
Humidity: 30 %

WLAN ax 40 MHz						
TX Frequency [MHz]	**Radar Test Signal #**	**Channel Closing Transmission Time [ms]**	**Limit [ms]**	**Channel Move Time [s]**	**Limit [s]**	**Transmissions in Non-Occupancy Period?**
5510	Type 0	200 + 3	200 + 60	0.46	10	None

Remark: Please see next sub-clause for the measurement plot.
For radar pulse calibration see test case U-NII detection BW.

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



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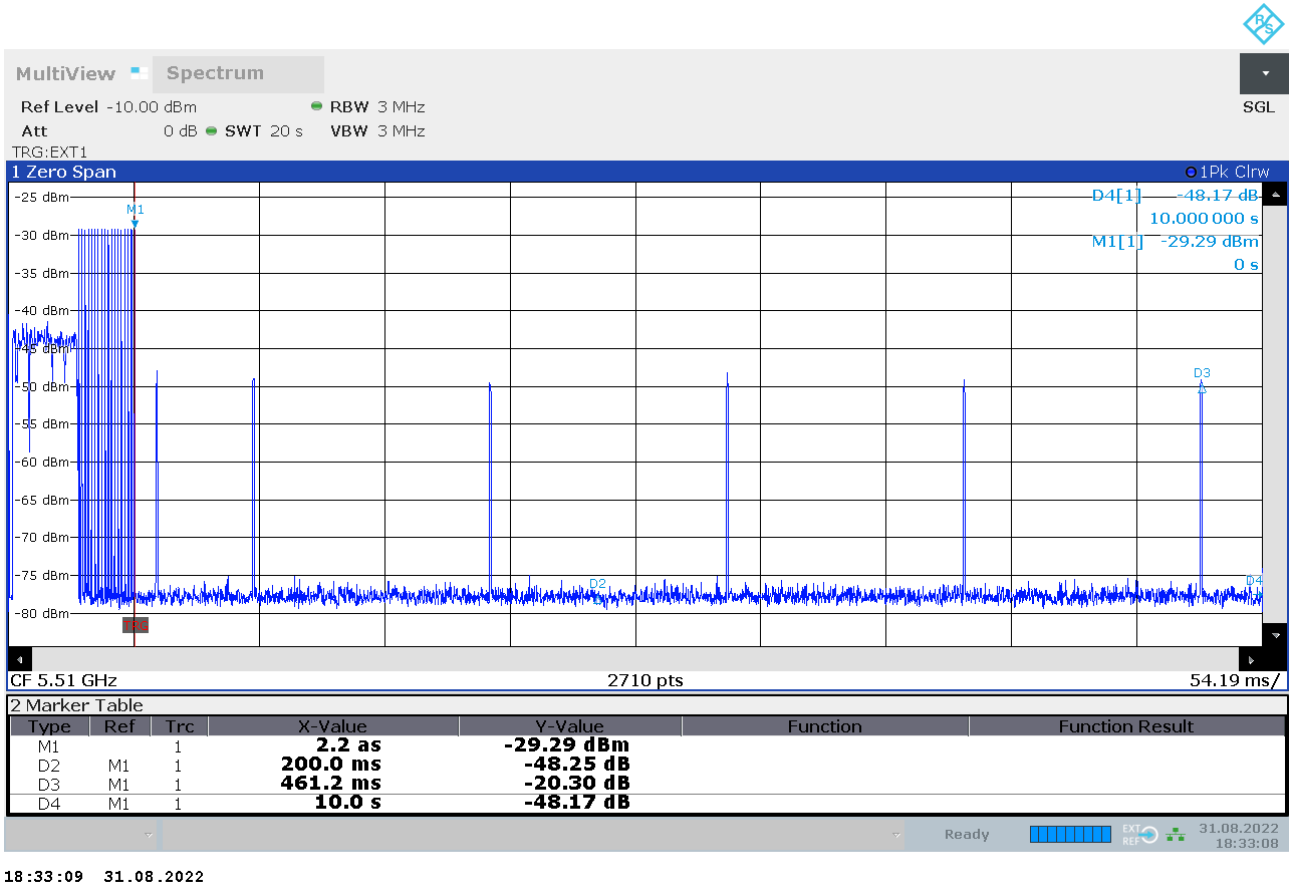
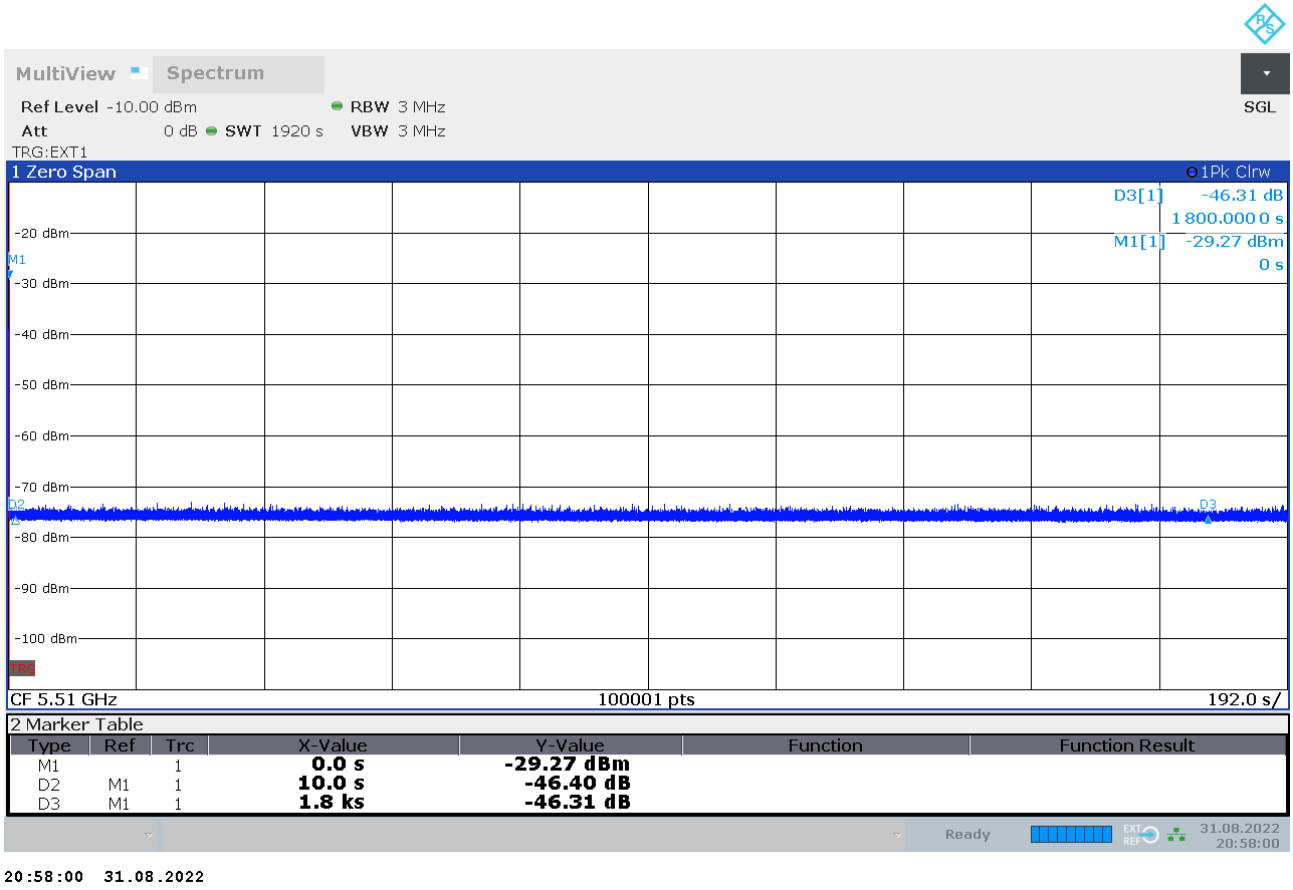
M1 = Radar Pulse, D2 = 200 ms after Radar Pulse end, D3 = Last Transmission end



18:33:09 31.08.2022

Zoomed into trace data of channel move and channel closing time plot.



Non Occupancy Period

5.3.5 TEST EQUIPMENT USED

- R&S TS8997

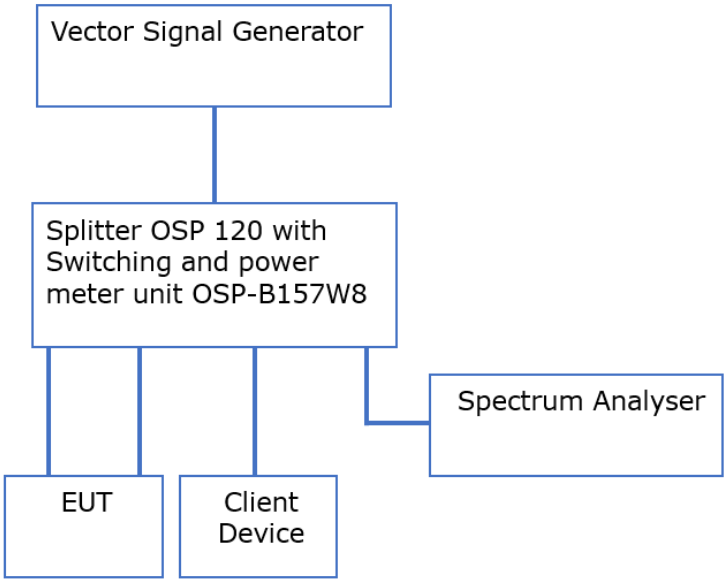
5.4 DYNAMIC FREQUENCY SELECTION, STATISTICAL PERFORMANCE CHECK

Standard **FCC Part 15 Subpart E**

The test was performed according to:
KDB 905462 D02

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 together with the laptops for traffic generation.
Afterwards the master and client were configured for connection on a DFS channel.
Once the Channel Availability Check was completed and connection was established, the video streaming was started.

Using command line commands provided by the customer, the device's channel change 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	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$	60%	30
		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			
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: 990 hPa
Humidity: 30 %

Radio Technology	TX Frequency [MHz]	Radar Test Signal #	Number of send pulses	Number of detected pulses	Successful Detection Percentage [%]	Limit [%]	Margin to Limit [%]
WLAN ax 20 MHz MIMO	5500	Type 1	30	25	83	60	23
WLAN ax 20 MHz MIMO	5500	Type 2	30	26	87	60	27
WLAN ax 20 MHz MIMO	5500	Type 3	30	23	77	60	17
WLAN ax 20 MHz MIMO	5500	Type 4	30	26	87	60	27
WLAN ax 20 MHz MIMO	5500	Aggregate 1-4	120	100	83	80	3
WLAN ax 20 MHz MIMO	5500	Type 5	30	28	93	80	13
WLAN ax 20 MHz MIMO	5500	Type 6	30	30	100	70	30
WLAN ax 40 MHz MIMO	5510	Type 1	30	29	97	60	37
WLAN ax 40 MHz MIMO	5510	Type 2	30	28	93	60	33
WLAN ax 40 MHz MIMO	5510	Type 3	30	27	90	60	30
WLAN ax 40 MHz MIMO	5510	Type 4	30	26	87	60	27
WLAN ax 40 MHz MIMO	5510	Aggregate 1-4	120	110	92	80	12
WLAN ax 40 MHz MIMO	5510	Type 5	30	26	87	80	7
WLAN ax 40 MHz MIMO	5510	Type 6	30	30	100	70	30

Remark: Detection of radar pulses is monitored by console interface.
No plots are recorded.

5.4.4 MEASUREMENT RESULT

20 MHz Bandwidth Pulse Types 1 to 4 and 6

RADAR TYPE 1 Table 5a					RADAR TYPE 1 Random				
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	102	1	518	yes	1	20	1	2692	yes
2	99	1	538	yes	2	19	1	2900	yes
3	95	1	558	yes	3	53	1	1004	yes
4	92	1	578	no	4	24	1	2227	yes
5	89	1	598	yes	5	30	1	1806	no
6	86	1	618	yes	6	86	1	619	yes
7	83	1	638	yes	7	22	1	2498	no
8	81	1	658	yes	8	56	1	943	yes
9	78	1	678	yes	9	21	1	2609	yes
10	76	1	698	yes	10	63	1	845	yes
11	74	1	718	no	11	59	1	1097	yes
12	72	1	738	yes	12	24	1	2271	yes
13	70	1	758	yes	13	18	1	3041	yes
14	68	1	778	yes	14	56	1	956	yes
15	67	1	798	yes	15	36	1	1503	no

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	28	1.2	181	yes	1	18	7.4	422	yes
2	29	4.1	199	yes	2	17	9.6	457	yes
3	23	5	206	yes	3	17	6.1	426	yes
4	24	2.5	196	yes	4	16	9.1	353	yes
5	24	2.3	216	yes	5	16	8.3	342	yes
6	24	3.1	159	yes	6	17	7.3	475	no
7	27	2.8	228	no	7	16	6.6	412	no
8	26	2.4	163	yes	8	17	9.8	322	yes
9	29	2.4	203	yes	9	17	8.4	352	yes
10	26	4.4	183	yes	10	17	7.6	432	yes
11	28	3.9	196	yes	11	16	8.1	371	yes
12	25	3.9	175	yes	12	17	7.4	285	yes
13	24	1.7	184	yes	13	18	8.3	414	yes
14	28	4.7	163	yes	14	17	6.3	215	no
15	24	2.5	170	no	15	16	8	443	yes
16	25	4.9	188	yes	16	17	9.7	205	yes
17	25	3.4	217	yes	17	17	8	445	yes
18	29	3.6	218	no	18	17	7.3	321	yes
19	27	2.3	159	yes	19	17	6.3	446	no
20	28	2.7	161	yes	20	16	9	386	yes
21	29	3.2	224	yes	21	18	7.2	200	yes
22	28	2.7	185	yes	22	17	9.6	257	yes
23	23	5	207	no	23	16	6	245	no
24	23	1.9	217	yes	24	17	9.9	415	yes
25	26	1.3	197	yes	25	17	9.8	384	yes
26	24	1.8	203	yes	26	17	9.9	434	yes
27	26	3.6	170	yes	27	17	6.8	438	yes
28	25	3.9	170	yes	28	16	7	341	no
29	25	3.2	194	yes	29	16	7.9	350	yes
30	27	3.5	178	yes	30	18	8.7	489	no

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	14	14.4	446	yes	1	9	1	333	yes
2	13	14.9	299	yes	2	9	1	333	yes
3	16	19	500	yes	3	9	1	333	yes
4	15	18.1	449	yes	4	9	1	333	yes
5	15	11.4	285	yes	5	9	1	333	yes
6	13	19.5	435	yes	6	9	1	333	yes
7	15	16.5	220	yes	7	9	1	333	yes
8	13	17.5	277	yes	8	9	1	333	yes
9	12	11.8	253	yes	9	9	1	333	yes
10	13	14.3	413	yes	10	9	1	333	yes
11	14	18.2	307	yes	11	9	1	333	yes
12	16	15.8	485	yes	12	9	1	333	yes
13	13	12.8	471	yes	13	9	1	333	yes
14	13	15.5	212	yes	14	9	1	333	yes
15	14	18.3	393	no	15	9	1	333	yes
16	14	11.6	261	yes	16	9	1	333	yes
17	15	16.6	277	yes	17	9	1	333	yes
18	13	18.4	292	yes	18	9	1	333	yes
19	13	15.8	359	yes	19	9	1	333	yes
20	13	14.3	333	yes	20	9	1	333	yes
21	15	11.1	391	no	21	9	1	333	yes
22	12	14.6	435	yes	22	9	1	333	yes
23	14	19.2	473	yes	23	9	1	333	yes
24	14	18.2	400	yes	24	9	1	333	yes
25	15	13	282	yes	25	9	1	333	yes
26	16	14.2	455	no	26	9	1	333	yes
27	14	18.2	334	yes	27	9	1	333	yes
28	12	12.4	369	yes	28	9	1	333	yes
29	15	19.6	460	yes	29	9	1	333	yes
30	12	19.5	407	no	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	102	1	518	yes	1	22	1	2502	yes
2	99	1	538	yes	2	23	1	2317	yes
3	95	1	558	yes	3	69	1	767	yes
4	92	1	578	yes	4	34	1	1592	no
5	89	1	598	yes	5	29	1	1842	yes
6	86	1	618	yes	6	40	1	1324	yes
7	83	1	638	yes	7	20	1	2751	yes
8	81	1	658	yes	8	27	1	2000	yes
9	78	1	678	yes	9	26	1	2065	yes
10	76	1	698	yes	10	19	1	2888	yes
11	74	1	718	yes	11	44	1	1208	yes
12	72	1	738	yes	12	20	1	2698	yes
13	70	1	758	yes	13	24	1	2227	yes
14	68	1	778	yes	14	18	1	3007	yes
15	67	1	798	yes	15	83	1	642	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	28	1.2	181	yes	1	18	7.4	422	yes
2	29	4.1	199	yes	2	17	9.6	457	no
3	23	5	206	yes	3	17	6.1	426	yes
4	24	2.5	196	yes	4	16	9.1	353	yes
5	24	2.3	216	yes	5	16	8.3	342	yes
6	24	3.1	159	yes	6	17	7.3	475	yes
7	27	2.8	228	yes	7	16	6.6	412	yes
8	26	2.4	163	yes	8	17	9.8	322	yes
9	29	2.4	203	yes	9	17	8.4	352	yes
10	26	4.4	183	yes	10	17	7.6	432	yes
11	28	3.9	196	no	11	16	8.1	371	yes
12	25	3.9	175	yes	12	17	7.4	285	no
13	24	1.7	184	yes	13	18	8.3	414	yes
14	28	4.7	163	yes	14	17	6.3	215	yes
15	24	2.5	170	yes	15	16	8	443	yes
16	25	4.9	188	yes	16	17	9.7	205	yes
17	25	3.4	217	yes	17	17	8	445	yes
18	29	3.6	218	yes	18	17	7.3	321	yes
19	27	2.3	159	yes	19	17	6.3	446	yes
20	28	2.7	161	yes	20	16	9	386	yes
21	29	3.2	224	yes	21	18	7.2	200	yes
22	28	2.7	185	yes	22	17	9.6	257	yes
23	23	5	207	yes	23	16	6	245	yes
24	23	1.9	217	yes	24	17	9.9	415	yes
25	26	1.3	197	yes	25	17	9.8	384	no
26	24	1.8	203	yes	26	17	9.9	434	yes
27	26	3.6	170	yes	27	17	6.8	438	yes
28	25	3.9	170	yes	28	16	7	341	yes
29	25	3.2	194	yes	29	16	7.9	350	yes
30	27	3.5	178	yes	30	18	8.7	489	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	14	14.4	446	yes	1	9	1	333	yes
2	13	14.9	299	yes	2	9	1	333	yes
3	16	19	500	yes	3	9	1	333	yes
4	15	18.1	449	yes	4	9	1	333	yes
5	15	11.4	285	yes	5	9	1	333	yes
6	13	19.5	435	yes	6	9	1	333	yes
7	15	16.5	220	yes	7	9	1	333	yes
8	13	17.5	277	no	8	9	1	333	yes
9	12	11.8	253	yes	9	9	1	333	yes
10	13	14.3	413	yes	10	9	1	333	yes
11	14	18.2	307	yes	11	9	1	333	yes
12	16	15.8	485	no	12	9	1	333	yes
13	13	12.8	471	yes	13	9	1	333	yes
14	13	15.5	212	yes	14	9	1	333	yes
15	14	18.3	393	yes	15	9	1	333	yes
16	14	11.6	261	yes	16	9	1	333	yes
17	15	16.6	277	no	17	9	1	333	yes
18	13	18.4	292	yes	18	9	1	333	yes
19	13	15.8	359	yes	19	9	1	333	yes
20	13	14.3	333	yes	20	9	1	333	yes
21	15	11.1	391	yes	21	9	1	333	yes
22	12	14.6	435	yes	22	9	1	333	yes
23	14	19.2	473	yes	23	9	1	333	yes
24	14	18.2	400	yes	24	9	1	333	yes
25	15	13	282	yes	25	9	1	333	yes
26	16	14.2	455	yes	26	9	1	333	yes
27	14	18.2	334	yes	27	9	1	333	yes
28	12	12.4	369	yes	28	9	1	333	yes
29	15	19.6	460	yes	29	9	1	333	yes
30	12	19.5	407	no	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	5500
2	yes	5500	2	no	5500
3	yes	5500	3	yes	5500
4	yes	5500	4	yes	5500
5	yes	5500	5	yes	5500
6	yes	5500	6	yes	5500
7	yes	5500	7	yes	5500
8	yes	5500	8	yes	5500
9	yes	5500	9	yes	5500
10	yes	5500	10	yes	5500
11	no	5497.2	11	yes	5497.6
12	yes	5493.6	12	yes	5494.0
13	yes	5494.4	13	yes	5494.8
14	yes	5496.8	14	no	5497.2
15	yes	5494.8	15	yes	5495.2
16	yes	5492.8	16	yes	5493.2
17	yes	5493.6	17	yes	5494.0
18	yes	5493.2	18	yes	5493.6
19	yes	5492.8	19	yes	5493.2
20	yes	5494.4	20	yes	5494.8
21	yes	5503.2	21	yes	5522.8
22	yes	5502.0	22	no	5521.6
23	yes	5504.0	23	yes	5523.6
24	yes	5504.4	24	yes	5524.0
25	yes	5502.4	25	yes	5522.0
26	yes	5507.2	26	yes	5526.8
27	yes	5505.2	27	yes	5524.8
28	yes	5505.6	28	yes	5525.2
29	yes	5502.8	29	yes	5522.4
30	no	5501.6	30	no	5521.2

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	67.2	7	1094		23
2	1	98.1	7			1022
3	1	80.8	7			1262
4	2	95.2	7	915		852
5	2	74.4	7	1603		865
6	3	70.5	7	1766	953	1098
7	2	92.4	7	1887		737
8	2	51.1	7	1751		1068

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	2	50.4	19	1301		345
2	3	76.8	19	1435	1830	161
3	1	61.6	19			1074
4	2	79.8	19	1467		182
5	2	73.5	19	1713		1259
6	3	51.1	19	1738	1061	785
7	3	96.8	19	1184	1082	230
8	2	89.6	19	1083		268
9	3	56.1	19	1801	1511	1195

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	2	88.4	15	1291		390
2	3	66	15	1240	1597	391
3	2	97.6	15	916		226
4	2	50.2	15	1619		319
5	3	84.7	15	1731	1854	1037
6	2	92.9	15	1298		480
7	3	50	15	1526	1374	408
8	1	76.9	15			80
9	2	71.2	15	1338		336
10	3	81.8	15	932	1172	589

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	3	74.8	6	1216	1187	158
2	2	84.4	6	1118		868
3	2	53.8	6	1135		585
4	2	94.9	6	1140		574
5	3	64.7	6	1769	1051	825
6	3	61.4	6	1503	1114	272
7	1	50.3	6			532
8	3	97.3	6	1206	1077	28
9	1	80.8	6			1045
10	2	65.4	6	1552		214
11	1	65.7	6			45

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	85.9	15	1091		904
2	1	91.1	15			66
3	1	95.1	15			548
4	3	83.6	15	1791	1747	764
5	2	70.1	15	1764		764
6	2	67.5	15	1611		490
7	1	50.1	15			195
8	1	60.9	15			903
9	2	81.9	15	1020		108
10	2	56.2	15	1596		952
11	3	83.3	15	1565	1375	942
12	1	69.7	15			54

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	1	52.8	14			636
2	1	90.7	14			231
3	2	58.2	14	1856		548
4	2	94	14	1358		701
5	3	72.6	14	1156	1644	165
6	2	56.1	14	1030		828
7	2	99	14	1097		6
8	3	53.7	14	1696	1782	378
9	3	90.3	14	1040	1373	753
10	2	74.6	14	1440		811
11	3	66.1	14	1573	1231	820
12	2	89.1	14	1550		227
13	2	62.3	14	1912		637

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	3	86.9	8	1046	1862	287
2	2	94.2	8	1590		104
3	2	72.2	8	972		219
4	1	84	8			609
5	2	62	8	1213		451
6	2	71.1	8	1816		455
7	1	58.8	8			519
8	2	57.7	8	1883		158
9	1	71.5	8			649
10	1	53.8	8			711
11	1	74.4	8			140
12	2	64.4	8	1219		586
13	2	66.8	8	1603		86
14	2	82	8	1763		115

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	96.7	5	1410		171
2	2	67.4	5	1570		377
3	2	79.7	5	1725		240
4	1	86.7	5			23
5	2	87.5	5	1780		134
6	2	54.9	5	1294		682
7	3	91	5	1212	1312	158
8	3	100	5	1045	1155	283
9	2	93.3	5	1636		713
10	2	97.5	5	1155		636
11	2	70.6	5	1901		358
12	3	55	5	1379	1739	471
13	2	63.8	5	1742		606
14	1	50.9	5			51
15	2	94	5	1695		493

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	98.8	14	1337		67
2	2	96.3	14	1833		698
3	2	56.2	14	1700		151
4	3	72.1	14	981	1311	28
5	1	63.7	14			528
6	2	73.9	14	1033		343
7	2	90.7	14	1655		520
8	2	98.9	14	1565		735
9	3	71.9	14	1076	1168	325
10	2	75.2	14	1413		92
11	1	89.6	14			519
12	1	78.9	14			630
13	3	77.3	14	1090	1901	695
14	3	50.7	14	1471	970	343
15	2	93.8	14	1622		676
16	1	97.8	14			535

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	2	89.6	12	1093		89
2	2	88.5	12	1836		681
3	1	52.6	12			423
4	3	59.9	12	1895	1592	81
5	1	56.4	12			599
6	1	51	12			596
7	3	67	12	1490	1777	389
8	2	76.2	12	1075		250
9	3	94.7	12	1784	1259	432
10	3	84.3	12	1867	1860	671
11	2	61.6	12	989		466
12	3	55.7	12	1490	1673	638
13	3	72.5	12	1474	977	663
14	3	87.2	12	1346	1566	692
15	3	91.8	12	1074	1474	144
16	2	76.1	12	1733		406
17	3	86.8	12	1576	1801	12

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	56.4	17	1044	1131	575
2	3	94.3	17	1459	1482	43
3	3	91	17	1527	1775	268
4	2	51.9	17	1031		343
5	2	64.5	17	1783		170
6	3	97.6	17	1223	1132	551
7	2	56.5	17	1465		217
8	2	65.3	17	1025		27
9	3	83.2	17	1764	1321	617
10	2	99.1	17	1094		206
11	2	90.4	17	1582		392
12	2	58.6	17	1862		227
13	2	82.8	17	1494		551
14	1	86.5	17			361
15	2	86.1	17	1443		579
16	3	81.2	17	1048	1344	592
17	1	79.1	17			289
18	2	92	17	1288		516

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	1	68.8	8			12
2	2	94.4	8	1195		364
3	2	99	8	1651		512
4	1	94	8			601
5	2	69.9	8	1716		270
6	1	88.3	8			297
7	1	72.8	8			215
8	2	84.7	8	1350		615
9	3	94.1	8	1424	1105	192
10	2	99.6	8	1544		601
11	2	88	8	1034		559
12	1	71.4	8			203
13	2	79	8	1220		608
14	3	81.2	8	1548	1656	76
15	3	54.8	8	1024	1909	182
16	3	88	8	998	1435	16
17	3	85.5	8	1620	989	137
18	2	61.8	8	1501		372
19	2	72.2	8	1719		371

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	64	10			453
2	2	56.4	10	1310		404
3	1	95.4	10			560
4	2	94.9	10	997		165
5	2	57.6	10	1510		452
6	2	94.2	10	1778		225
7	2	72.7	10	1252		439
8	2	78.7	10	1510		516
9	2	90.8	10	1382		81
10	2	83.2	10	1757		282
11	2	91.4	10	978		62
12	2	85.7	10	1680		368
13	2	94.8	10	1404		208
14	1	87.6	10			443
15	1	85.5	10			491
16	2	68.1	10	1287		314
17	2	90.4	10	986		590
18	3	81.1	10	1784	1594	54
19	2	93.5	10	1335		429
20	2	97.2	10	1112		146

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	3	91	16	1869	1720	731
2	2	88.8	16	1430		90
3	2	58.2	16	1705		75
4	2	68.7	16	1071		442
5	1	97.9	16			726
6	2	68	16	1198		926
7	2	81.1	16	925		1053
8	3	70.1	16	1249	1400	961

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	1	74.1	11			586
2	2	98.1	11	1554		862
3	3	88.9	11	1807	1566	489
4	2	52.2	11	1458		1142
5	2	69.3	11	1895		12
6	1	76.2	11			623
7	1	63.9	11			1144
8	3	65.6	11	1212	1421	1016
9	1	61.4	11			1274

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	1	89.3	6			392
2	2	97	6	1894		667
3	1	55.1	6			1058
4	2	74.7	6	1151		790
5	2	56.9	6	1369		1155
6	1	52.8	6			570
7	2	78	6	1228		394
8	2	54.9	6	1687		947
9	2	90	6	1780		1115
10	3	86	6	1357	1463	77

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	3	83.5	8	1558	1650	293
2	3	60.1	8	1498	1495	239
3	2	75.7	8	1469		561
4	2	60.6	8	1562		645
5	3	59.6	8	1091	1329	442
6	2	98.9	8	1830		264
7	2	64.6	8	970		399
8	1	81	8			35
9	3	70.8	8	1583	1654	836
10	2	69.3	8	1451		1066
11	2	93.3	8	1384		569

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	71.9	7	1424		209
2	1	63.4	7			167
3	2	53.6	7	1186		711
4	2	81.9	7	1570		850
5	2	60.5	7	947		852
6	2	99.5	7	1374		980
7	1	62.5	7			647
8	1	59	7			36
9	1	90	7			819
10	1	64.5	7			958
11	1	82.3	7			307
12	3	65.6	7	1212	1472	6

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	3	60.6	6	1925	1036	426
2	2	68	6	1924		758
3	2	55.7	6	962		790
4	2	80.9	6	952		367
5	2	54.5	6	1065		217
6	2	69.4	6	1190		506
7	1	50.9	6			886
8	2	69.6	6	961		604
9	3	74.5	6	1685	1557	743
10	2	69	6	1898		361
11	2	77.1	6	1236		538
12	2	54.8	6	1743		288
13	2	67.6	6	1796		288

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	64.2	10	1583		24
2	1	64.8	10			326
3	2	57.9	10	1500		701
4	2	63.3	10	1136		242
5	2	82.9	10	1530		512
6	1	68.2	10			224
7	3	88.5	10	1185	1585	115
8	2	99.5	10	1285		642
9	3	84.3	10	1698	1346	323
10	3	60.3	10	1678	1189	216
11	3	50.2	10	1210	1364	265
12	2	59.6	10	1029		715
13	3	73.9	10	1913	1679	243
14	3	85.5	10	1243	1603	179

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	3	80.5	16	1598	1324	110
2	2	68.7	16	1150		179
3	1	76.5	16			292
4	3	84.7	16	1727	1449	470
5	2	94.6	16	1257		648
6	3	91	16	1523	911	588
7	3	77.2	16	1910	1501	511
8	3	57.9	16	1421	1721	225
9	1	68.7	16			538
10	3	75.1	16	1714	1885	706
11	1	88.5	16			214
12	1	58.8	16			96
13	3	74.7	16	1369	1877	682
14	1	70.6	16			223
15	2	82.9	16	1811		76

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	2	57.8	19	1250		433
2	1	91.2	19			516
3	2	69.9	19	1120		102
4	3	74.6	19	1127	1850	65
5	1	54	19			561
6	2	63	19	1466		708
7	2	79	19	1218		719
8	2	65.6	19	1774		182
9	1	98.1	19			352
10	2	55.7	19	1596		346
11	1	71.8	19			234
12	1	64.5	19			108
13	2	68.2	19	1787		502
14	1	63.7	19			276
15	2	75	19	997		721
16	3	52	19	1825	1832	420

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	2	93.6	14	1343		325
2	3	60.2	14	1473	1490	185
3	1	95.1	14			203
4	3	51.2	14	1430	1786	448
5	1	92.3	14			604
6	2	70.3	14	1825		185
7	2	64.2	14	1324		115
8	2	54	14	1568		488
9	1	61.9	14			76
10	2	97.6	14	1737		209
11	3	88.9	14	1425	1493	75
12	1	86.6	14			184
13	2	52.2	14	1785		134
14	2	66.4	14	1506		169
15	1	66.7	14			327
16	2	63.1	14	978		32
17	2	60.6	14	1781		125

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	2	71.9	13	1022		356
2	3	83.8	13	990	1243	572
3	2	87.8	13	1534		601
4	3	54.1	13	1155	1765	154
5	2	71	13	1873		617
6	3	52.6	13	1155	966	319
7	2	90.4	13	1190		139
8	3	73.8	13	964	1605	397
9	2	51.4	13	976		27
10	2	66.9	13	1692		12
11	2	69.6	13	1119		333
12	3	84.3	13	1651	1390	269
13	1	76.6	13			278
14	3	57.6	13	1553	1599	25
15	1	70.7	13			185
16	3	60.4	13	1073	1644	494
17	3	74.8	13	1225	1514	218
18	2	66.2	13	1747		429

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	3	58.2	18	1128	1814	549
2	3	89.3	18	1753	999	59
3	2	92.3	18	1848		425
4	3	76.5	18	1041	1329	396
5	2	78.3	18	1214		436
6	3	56.4	18	1658	1290	489
7	1	98	18			313
8	1	54.5	18			360
9	1	61.4	18			546
10	2	85.8	18	1591		145
11	2	98	18	1201		14
12	2	66	18	1906		445
13	2	77.9	18	1336		383
14	2	99.1	18	968		510
15	2	68.8	18	1751		115
16	2	60.6	18	1166		147
17	2	51	18	1167		367
18	2	98.7	18	1251		217
19	3	66.6	18	1014	1231	163

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	3	94.9	6	1429	1682	119
2	1	50	6			249
3	2	99.7	6	1728		409
4	2	63.4	6	1072		403
5	2	59.5	6	1108		92
6	1	88.6	6			164
7	1	96.2	6			12
8	2	55.9	6	1379		586
9	3	55.1	6	952	1688	365
10	1	88.1	6			338
11	2	83.3	6	924		496
12	2	96.5	6	1223		511
13	2	82.6	6	1122		488
14	3	65.9	6	1192	1816	203
15	2	66.2	6	1718		71
16	2	76.3	6	1179		127
17	2	50.1	6	1804		464
18	1	61.2	6			169
19	3	59.6	6	1777	1764	487
20	3	55.1	6	1636	1415	541

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	2	65.5	11	1628		54
2	2	68.7	11	1074		574
3	2	50.1	11	1810		804
4	2	71.8	11	1150		735
5	2	82.3	11	1704		134
6	3	79.6	11	1767	1211	772
7	3	70.7	11	1635	1711	216
8	3	67.8	11	1163	1598	387
9	2	64.1	11	961		621
10	2	84.8	11	1688		832
11	3	85.3	11	1089	1309	176
12	2	85.9	11	1586		724

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	1	58.9	10			790
2	3	74.3	10	1775	1518	66
3	2	57.9	10	1130		221
4	3	94.4	10	1367	1704	847
5	2	71.5	10	1816		802
6	2	64.5	10	1578		565
7	3	57.3	10	1135	1836	419
8	3	78.4	10	1419	1293	774
9	2	67.3	10	1226		599
10	2	80	10	1530		260
11	2	58.7	10	1645		884
12	1	73.5	10			368
13	1	61.6	10			861

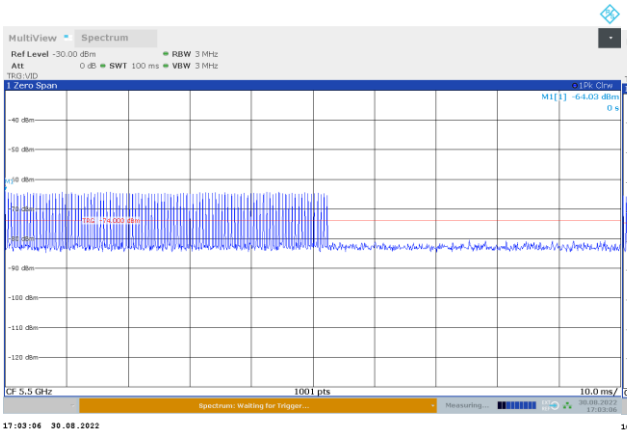
Trial Number : 29						
Bursts in Trial: 14						
Burst	**Number of Pulses**	**Pulse Width (µsec)**	**Chirp Width (MHz)**	**Pulse 1-to-2 Spacing (µsec)**	**Pulse 2-to-3 Spacing (µsec)**	**Start Location Within Interval (msec)**
1	2	96.8	17	1615		523
2	1	68.7	17			379
3	3	88.3	17	1385	1533	46
4	2	99.3	17	1426		563
5	2	72.4	17	1182		439
6	2	79.9	17	1901		479
7	2	80.3	17	1428		302
8	1	71.5	17			139
9	3	87.7	17	1287	1673	25
10	3	60.1	17	1612	1783	275
11	3	60.7	17	1594	1386	169
12	1	71.7	17			182
13	2	98.8	17	1185		570
14	2	52.2	17	1064		246

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	99.8	20	1844	939	509
2	3	95.3	20	990	998	514
3	3	62.4	20	1742	1866	661
4	2	66.8	20	1391		73
5	1	55.7	20			591
6	1	80.2	20			108
7	2	72.6	20	1287		150
8	3	92.5	20	1391	1837	123
9	2	93.5	20	1425		245
10	2	82	20	1294		477
11	2	52.8	20	999		25
12	1	74.7	20			340
13	3	92.5	20	1441	1670	288
14	1	86.8	20			66
15	2	61.8	20	1046		422

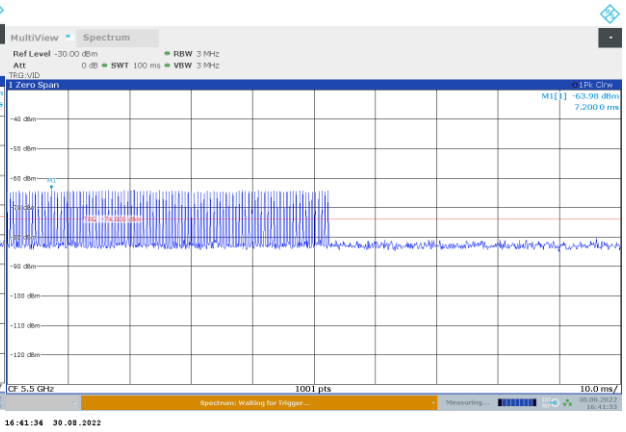
Pulse Type 6

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

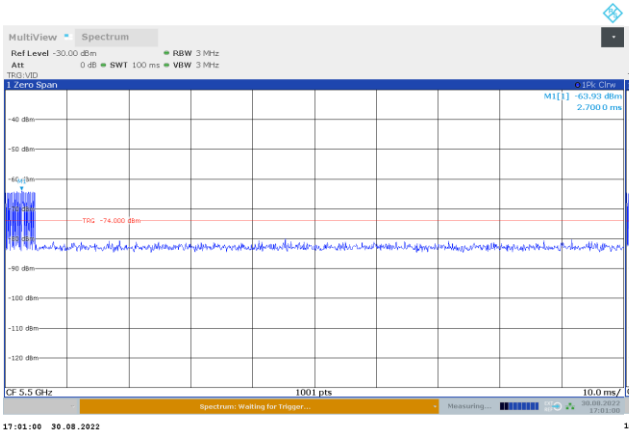
Radar Pulse Calibrations



Pulse Type 1 Antenna 1



Pulse Type 1 Antenna 2



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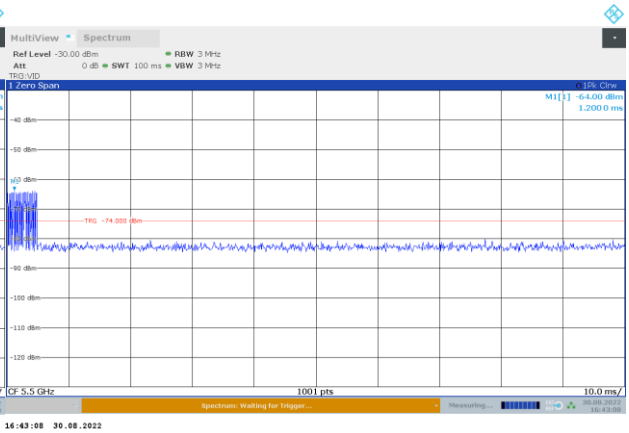

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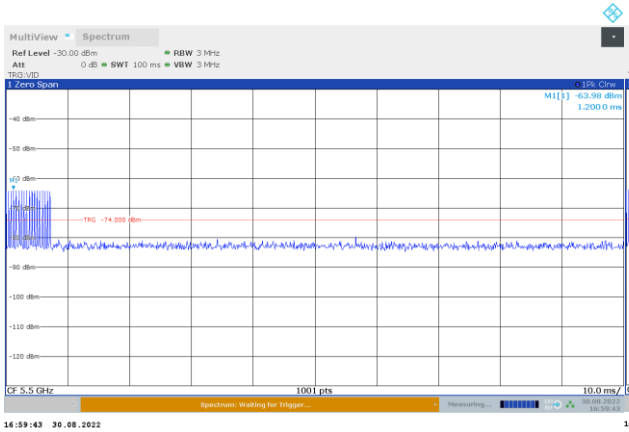
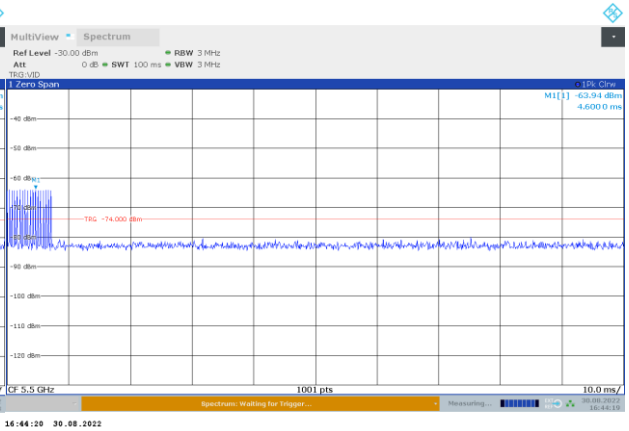
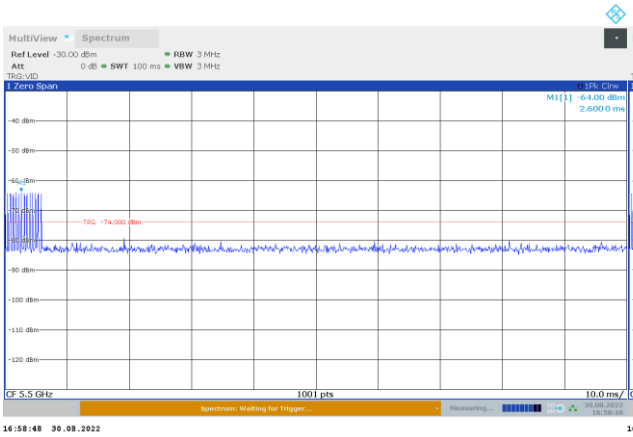


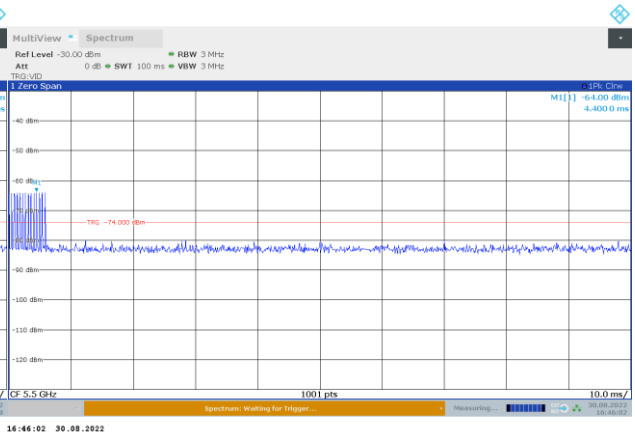
Pulse Type 3 Antenna 1



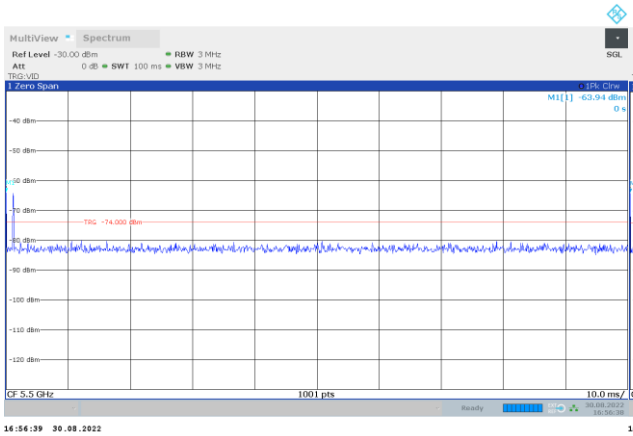
Pulse Type 3 Antenna 2



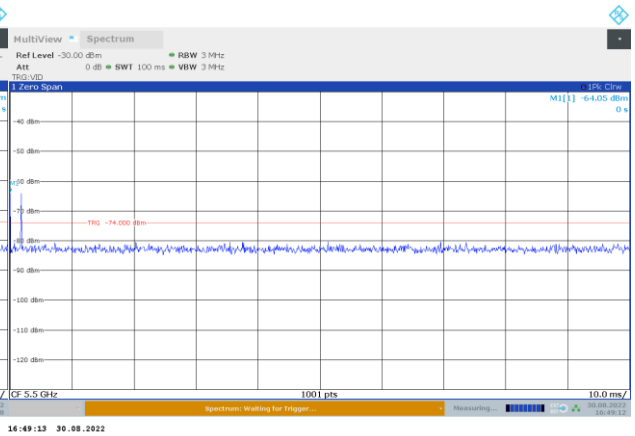
Pulse Type 4 Antenna 1



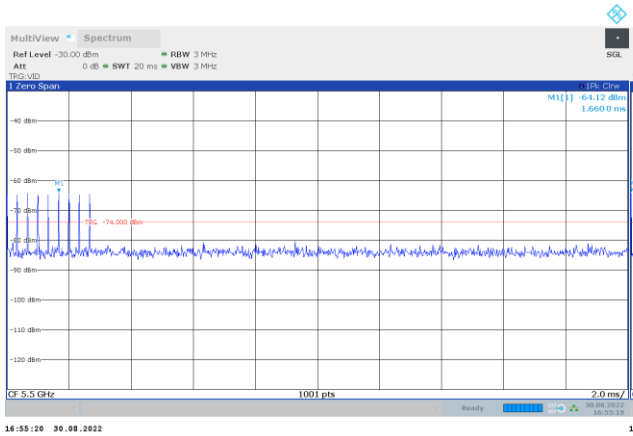
Pulse Type 4 Antenna 2



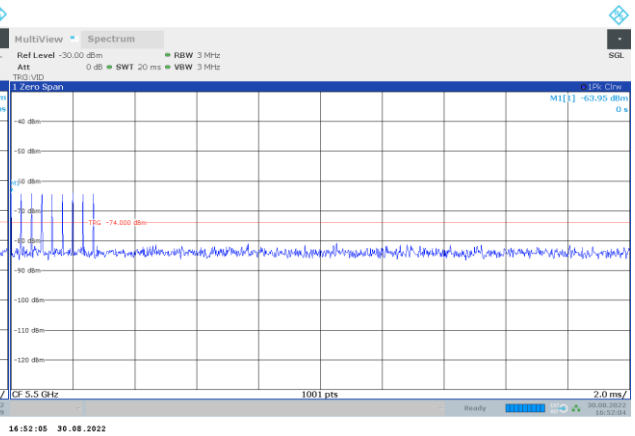
Pulse Type 5 Antenna 1



Pulse Type 5 Antenna 2



Pulse Type 6 Antenna 1



Pulse Type 6 Antenna 2

5.4.5 TEST EQUIPMENT USED

- R&S TS8997

6 TEST EQUIPMENT

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	FSW43	Signal analyser	Rohde & Schwarz GmbH & Co. KG	102013	2021-06	2023-06
1.2	Opus10 THI (8152.00)	T/H Logger 13	Lufft Mess- und Regeltechnik GmbH	13936	2021-10	2023-10
1.3	Opus10 THI (8152.00)	T/H Logger 14	Lufft Mess- und Regeltechnik GmbH	13993	2021-08	2023-08
1.4	SMBV100A	Vector Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	259291	2019-11	2022-11
1.5	OSP120	Contains Power Meter and Switching Unit OSP-B157W8	Rohde & Schwarz	101158	2021-08	2024-08

The calibration interval is the time interval between “Last Calibration” and “Calibration Due”

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_{LISN} (dB µV) = U (dB µV) + 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 (dB µV/m) = U (dB µV) + AF (dB 1/m) + 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 = -40 * LOG (d_{Limit}/ d_{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_{Limit} = 3 m)

Frequency	AF R&S HL562	Corr.	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)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	m	m
30	18.6	0.6	0.29	0.04	0.23	0.02	0.0	3	3
50	6.0	0.9	0.39	0.09	0.32	0.08	0.0	3	3
100	9.7	1.2	0.56	0.14	0.47	0.08	0.0	3	3
150	7.9	1.6	0.73	0.20	0.59	0.12	0.0	3	3
200	7.6	1.9	0.84	0.21	0.70	0.11	0.0	3	3
250	9.5	2.1	0.98	0.24	0.80	0.13	0.0	3	3
300	11.0	2.3	1.04	0.26	0.89	0.15	0.0	3	3
350	12.4	2.6	1.18	0.31	0.96	0.13	0.0	3	3
400	13.6	2.9	1.28	0.35	1.03	0.19	0.0	3	3
450	14.7	3.1	1.39	0.38	1.11	0.22	0.0	3	3
500	15.6	3.2	1.44	0.39	1.20	0.19	0.0	3	3
550	16.3	3.5	1.55	0.46	1.24	0.23	0.0	3	3
600	17.2	3.5	1.59	0.43	1.29	0.23	0.0	3	3
650	18.1	3.6	1.67	0.34	1.35	0.22	0.0	3	3
700	18.5	3.6	1.67	0.42	1.41	0.15	0.0	3	3
750	19.1	4.1	1.87	0.54	1.46	0.25	0.0	3	3
800	19.6	4.1	1.90	0.46	1.51	0.25	0.0	3	3
850	20.1	4.4	1.99	0.60	1.56	0.27	0.0	3	3
900	20.8	4.7	2.14	0.60	1.63	0.29	0.0	3	3
950	21.1	4.8	2.22	0.60	1.66	0.33	0.0	3	3
1000	21.6	4.9	2.23	0.61	1.71	0.30	0.0	3	3

(d_{Limit} = 10 m)

30	18.6	-9.9	0.29	0.04	0.23	0.02	-10.5	10	3
50	6.0	-9.6	0.39	0.09	0.32	0.08	-10.5	10	3
100	9.7	-9.2	0.56	0.14	0.47	0.08	-10.5	10	3
150	7.9	-8.8	0.73	0.20	0.59	0.12	-10.5	10	3
200	7.6	-8.6	0.84	0.21	0.70	0.11	-10.5	10	3
250	9.5	-8.3	0.98	0.24	0.80	0.13	-10.5	10	3
300	11.0	-8.1	1.04	0.26	0.89	0.15	-10.5	10	3
350	12.4	-7.9	1.18	0.31	0.96	0.13	-10.5	10	3
400	13.6	-7.6	1.28	0.35	1.03	0.19	-10.5	10	3
450	14.7	-7.4	1.39	0.38	1.11	0.22	-10.5	10	3
500	15.6	-7.2	1.44	0.39	1.20	0.19	-10.5	10	3
550	16.3	-7.0	1.55	0.46	1.24	0.23	-10.5	10	3
600	17.2	-6.9	1.59	0.43	1.29	0.23	-10.5	10	3
650	18.1	-6.9	1.67	0.34	1.35	0.22	-10.5	10	3
700	18.5	-6.8	1.67	0.42	1.41	0.15	-10.5	10	3
750	19.1	-6.3	1.87	0.54	1.46	0.25	-10.5	10	3
800	19.6	-6.3	1.90	0.46	1.51	0.25	-10.5	10	3
850	20.1	-6.0	1.99	0.60	1.56	0.27	-10.5	10	3
900	20.8	-5.8	2.14	0.60	1.63	0.29	-10.5	10	3
950	21.1	-5.6	2.22	0.60	1.66	0.33	-10.5	10	3
1000	21.6	-5.6	2.23	0.61	1.71	0.30	-10.5	10	3

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + 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 * LOG (d_{Limit}/ d_{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.	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)		
MHz	dB (1/m)	dB	dB	dB	dB	dB		
1000	24.4	-19.4	0.99	0.31	-21.51	0.79		
2000	28.5	-17.4	1.44	0.44	-20.63	1.38		
3000	31.0	-16.1	1.87	0.53	-19.85	1.33		
4000	33.1	-14.7	2.41	0.67	-19.13	1.31		
5000	34.4	-13.7	2.78	0.86	-18.71	1.40		
6000	34.7	-12.7	2.74	0.90	-17.83	1.47		
7000	35.6	-11.0	2.82	0.86	-16.19	1.46		

Frequency	AF R&S HF907	Corr.	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
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	
3000	31.0	-23.4	0.47	1.87	0.53	-27.58	1.33	
4000	33.1	-23.3	0.56	2.41	0.67	-28.23	1.31	
5000	34.4	-21.7	0.61	2.78	0.86	-27.35	1.40	
6000	34.7	-21.2	0.58	2.74	0.90	-26.89	1.47	
7000	35.6	-19.8	0.66	2.82	0.86	-25.58	1.46	

Frequency	AF R&S HF907	Corr.	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)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	dB
7000	35.6	-57.3	0.56	1.28	-62.72	2.66	0.94	1.46
8000	36.3	-56.3	0.69	0.71	-61.49	2.84	1.00	1.53
9000	37.1	-55.3	0.68	0.65	-60.80	3.06	1.09	1.60
10000	37.5	-56.2	0.70	0.54	-61.91	3.28	1.20	1.67
11000	37.5	-55.3	0.80	0.61	-61.40	3.43	1.27	1.70
12000	37.6	-53.7	0.84	0.42	-59.70	3.53	1.26	1.73
13000	38.2	-53.5	0.83	0.44	-59.81	3.75	1.32	1.83
14000	39.9	-56.3	0.91	0.53	-63.03	3.91	1.40	1.77
15000	40.9	-54.1	0.98	0.54	-61.05	4.02	1.44	1.83
16000	41.3	-54.1	1.23	0.49	-61.51	4.17	1.51	1.85
17000	42.8	-54.4	1.36	0.76	-62.36	4.34	1.53	2.00
18000	44.2	-54.7	1.70	0.53	-62.88	4.41	1.55	1.91

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (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 (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (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	AF EMCO 3160-10	Corr.	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)
GHz	dB (1/m)	dB	dB	dB	dB	dB	dB	m	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

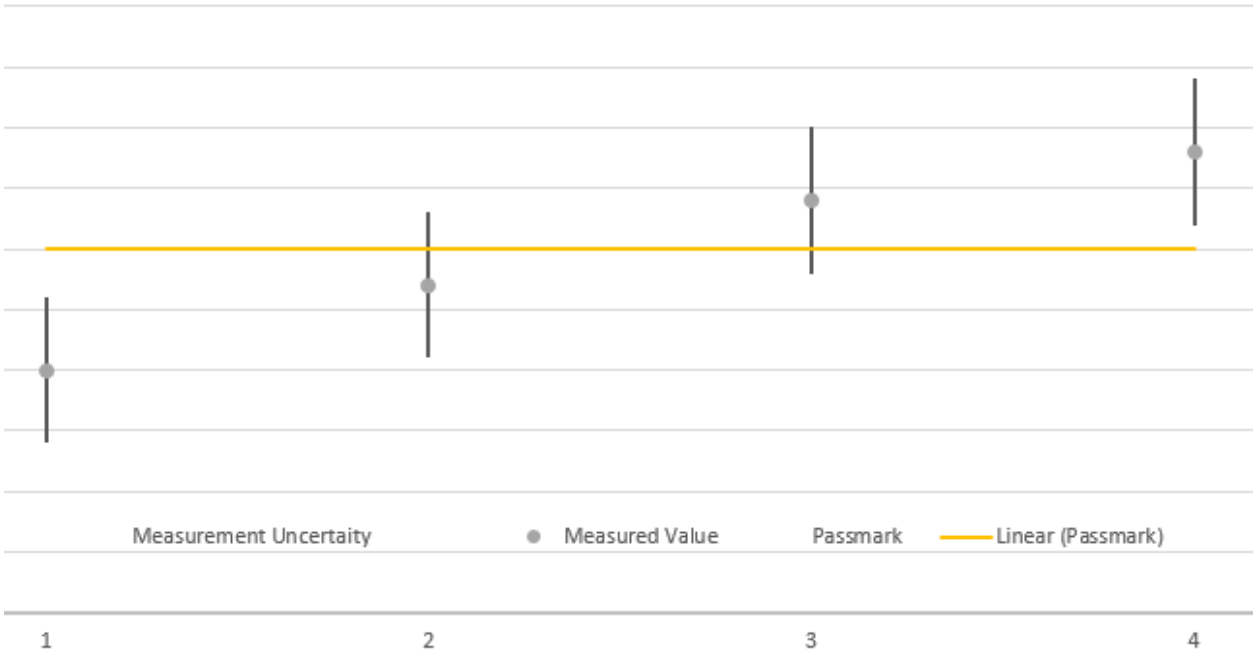
Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (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 * LOG (d_{Limit}/ d_{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	above pass mark	within pass mark	Failed
4	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.