

# Test Report

Report Number:

**F191589E1**

Equipment under Test (EUT):

**LILY-W131**  
**inside dedicated host device**

Applicant:

**u-blox AG**

Manufacturer:

**u-blox AG**



Deutsche  
Akkreditierungsstelle  
D-PL-17186-01-01  
D-PL-17186-01-02  
D-PL-17186-01-03

## References

- [1] **ANSI C63.10-2013**, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- [2] **FCC CFR 47 Part 15**, Radio Frequency Devices
- [3] **RSS-247 Issue 2 (March 2017)**, Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
- [4] **RSS-Gen Issue 5 (March 2019)**, General Requirements for Compliance of Radio Apparatus

## Test Result

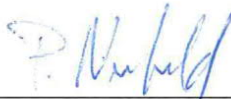
The requirements of the tests performed as shown in the overview (clause 0) were fulfilled by the equipment under test.

The complete test results are presented in the following.

Test  
engineer:

Paul NEUFELD

Name



Signature

11.03.2020

Date

Authorized  
reviewer:

Bernward ROHDE

Name



Signature

11.03.2020

Date

**This test report is only valid in its original form.**

Any reproduction of its contents in extracts without written permission of the accredited test laboratory PHOENIX TESTLAB GmbH is prohibited.

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalizations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

This test report is valid in hardcopy form as well as in electronic form.

## Contents

## Page

1	Identification .....	4
1.1	Applicant.....	4
1.2	Manufacturer .....	4
1.3	Test Laboratory .....	4
1.4	EUT (Equipment Under Test) – WLAN module .....	5
1.5	EUT (Equipment Under Test) – Dedicated host device* .....	5
1.6	Technical Data of Equipment .....	6
1.7	Dates .....	6
2	Operational States .....	7
3	Additional Information .....	7
4	Overview.....	8
5	Results.....	9
5.1	Duty cycle .....	9
5.2	Maximum conducted output power .....	9
5.2.1	Method of measurement.....	9
5.2.2	Test results .....	10
5.3	DTS Bandwidth / 99% Bandwidth .....	11
5.3.1	Method of measurement.....	11
5.3.2	Test result.....	12
5.4	Band-edge compliance.....	13
5.4.1	Method of measurement (band edges next to restricted bands (radiated)) .....	13
5.4.2	Test result (band edges next to restricted bands (radiated)) .....	13
5.5	Maximum unwanted emissions .....	14
5.5.1	Method of measurement (radiated emissions) .....	14
5.5.2	Test results (radiated emissions) – Emissions 30 MHz – 26.5 GHz .....	19
6	Test equipment and ancillaries used for tests .....	23
7	Test site Validation .....	24
8	Report History.....	24
9	List of Annexes .....	24

# 1 Identification

## 1.1 Applicant

Name:	u-blox AG
Address:	Zürcherstr. 68, 8800 Thalwil
Country:	Switzerland
Name for contact purposes:	Mr. Filip KRUZELA
Phone:	+46 40 630 71 70
Fax:	N/A
eMail address:	Filip.Kruzela@u-blox.com
Applicant represented during the test by the following person:	-

## 1.2 Manufacturer

Name:	u-blox AG
Address:	Zürcherstr. 68, 8800 Thalwil
Country:	Switzerland
Name for contact purposes:	Mr. Filip KRUZELA
Phone:	+46 40 630 71 70
Fax:	N/A
eMail address:	Filip.Kruzela@u-blox.com
Applicant represented during the test by the following person:	-

## 1.3 Test Laboratory

The tests were carried out by: **PHOENIX TESTLAB GmbH**  
**Königswinkel 10**  
**32825 Blomberg**  
**Germany**

Accredited by Deutsche Akkreditierungsstelle GmbH (DAkKS) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-05 and D-PL-17186-01-06, FCC Test Firm Accreditation designation number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

#### 1.4 EUT (Equipment Under Test) – WLAN module

Test object: *	WLAN module
Type / PMN: *	LILY-W131
FCC ID: *	XPYLILYW1
IC certification number: *	8595A-LILYW1
PCB identifier: *	549
HMN (Host Marketing Name): *	N/A
HVIN (Hardware Version Identification Number): *	LILY-W131
FVIN (Firmware Version Identification Number): *	N/A
Hardware version: *	3.0
Software version: *	1.0

#### 1.5 EUT (Equipment Under Test) – Dedicated host device\*

Test object: *	WIFI to J1939 CAN bus vehicle interface
HMN (Host Marketing Name): *	HE-XL19009, HE-WIFISCAN, 7398367
PCB identifier: *	PCBLC034-R2F
HVIN (Hardware Version Identification Number): *	PWAPLC034-G50
FVIN (Firmware Version Identification Number): *	2.0.0.31
Hardware version: *	2.0
Software version: *	Labtool 2.0.0.92

#### Contact data of the host manufacturer

Name:	Horner APG
Address:	59 South State Avenue, 46201 Indianapolis
Country:	United States of America
Name for contact purposes:	Mr. Matt YOUNG
Phone:	+1 317 492-9115
eMail Address:	matt.young@heapg.com
Applicant represented during the test by the following person:	None

Note: Phoenix Testlab GmbH does not take samples. The samples used for tests are provided exclusively by the applicant.

WLAN channels:

Channel 1	RX:	2412 MHz	TX:	2412 MHz
Channel 6	RX:	2437 MHz	TX:	2437 MHz
Channel 11	RX:	2462 MHz	TX:	2462 MHz

## 1.6 Technical Data of Equipment

Fulfils specifications: *	IEEE 802.11 b/g/n20					
Antenna type: *	Rod antenna					
Antenna name: *	W5010					
Antenna gain: *	1.5 dBi					
Antenna connector: *	RP-SMA					
Supply voltage EUT: *	U <sub>nom</sub> =	12.0 V DC	U <sub>min</sub> =	6.0 V DC	U <sub>max</sub> =	18.0 V DC
Type of modulation: *	802.11b: CCK, DQPSK, DBPSDK 802.11 g/n20: OFDM					
Operating frequency range: *	2412 – 2462 MHz					
Number of channels: *	11					
Temperature range: *	-40 °C to 60 °C					
Lowest / highest Internal clock frequency: *	24 MHz / 2462 MHz					

\* Declared by the applicant

Equipment used for testing	
Cables (connected to the EUT): *1	[USB A to USB Micro B]
Battery: *1	DURA12-2.3F
Laptop PC: *2	Fujitsu Lifebook S751 (PM No. 201036)

\*1 Supplied by the applicant

\*2 Supplied by the manufacturer

## 1.7 Dates

Date of receipt of test sample:	10.10.2019
Start of test:	08.11.2019
End of test:	08.11.2019

## 2 Operational States

The EUT is a certified modular approved transmitter (LILY-W131) from u-blox AG inside a dedicated host device (WIFI to J1939 CAN bus vehicle interface) manufactured by Horner APG.

The documented test cases cover the unique antenna trace design which is integrated into this dedicated host device including the usage of the external antenna.

For the following tests, only the worst cases from the original report of the module were re-tested. The original report has the report number F160785 and is written by Phoenix Testlab GmbH.

The test modes were established by connecting a micro USB cable to the EUT and installing a special firmware on the EUT, which was provided by the applicant.

The test modes could be started also using a micro USB connection to the EUT and using a test tool named labtool version 2.0.0.92. The test tool also was provided by the applicant.

During the test there was no connection between the laptop computer for the test configuration and the EUT.

During the tests the EUT was supplied with 12.0 V DC via a battery type DURA12-2.3F, which was supplied by the applicant.

Maximum power Settings for all measurements:

channel	1	2	3	4	5	6	7	8	9	10	11
Power [dBm] b-mode	16	16	16	16	16	16	16	16	16	16	16
Power [dBm] g-mode	14	16	16	16	16	16	16	16	16	16	13
Power [dBm] n20-mode	13	16	16	16	16	16	16	16	16	16	11

Operation mode	Description of the operation mode	mode	channel	Modulation	Data rate / Mbps
1	Continuous transmitting on 2437 MHz	n20	6	OFDM	6.5 Mbps
2	Continuous transmitting on 2462 MHz	n20	11	OFDM	6.5 Mbps
3	Continuous transmitting on 2412 MHz	b	1	CCK	1 Mbps

## 3 Additional Information

All tests were performed with an unmodified sample.

## 4 Overview

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section [2]	RSS-247 [3] or RSS-Gen [4]	Status	Refer page
Maximum peak conducted output power	2400.0 - 2483.5	15.247 (b) (3), (4)	5.4 (d) [3]	Passed*	9 et seq
DTS Bandwidth / 99% Bandwidth	2400.0 - 2483.5	15.247 (a) (2)	5.2 (a) [3]	Passed*	11 et seq
Peak Power Spectral Density	2400.0 - 2483.5	15.247 (e)	5.2 (b) [3]	Not tested* <sup>2</sup>	-
Band edge compliance	2400.0 - 2483.5	15.247 (d) 15.205 (a) 15.209 (a)	5.5 [3]	Passed*	13 et seq.
Maximum unwanted emissions	0.009 – 26,500	15.247 (d) 15.205 (a) 15.209 (a)	5.5 [3] 8.9 [4], 8.10 [4]	Passed*	14 et seq.
Conducted emissions on supply line	0.15 - 30	15.207 (a)	8.8 [4]	Not tested* <sup>2</sup>	-

\* Only the worst-case measurements from the original report F160785 by Phoenix Testlab GmbH were repeated for this test report.

\*<sup>2</sup> Not tested, because not ordered by the applicant.



## 5 Results

### 5.1 Duty cycle

During the test the EUT transmitted with 100 %, therefore no duty cycle measurement was necessary. For this reason, no duty cycle correction is performed for average measurements in the following report.

### 5.2 Maximum conducted output power

#### 5.2.1 Method of measurement

The EUT was measured conducted at the antenna connector.

#### Acceptable measurement configurations

Procedure 11.9.1.1 in [1] was used for the following test.

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

- a) Set the RBW  $\geq$  DTS bandwidth.
- b) Set VBW  $\geq$  [3  $\times$  RBW].
- c) Set span  $\geq$  [3  $\times$  RBW].
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

The measurement was performed at the middle of the assigned frequency band.

The measured Electric field strength was corrected with the following correction factor:

Antenna Factor [dB] + Cable Attenuation [dB] - Amplifier Gain[dB] = correction factor [dB]

The formula in 11.12.2.2 e) in [1] was used to calculate the EIRP power:

$$E = EIRP - 20\log(d) + 104.8$$

$$EIRP = E - 95.3$$

$$MOP = EIRP - G$$

*E* is the electric field strength in dB $\mu$ V/m

*EIRP* is the equivalent isotropically radiated power in dBm

*d* is the specified measurement distance in m

*G* is the antenna gain in dBi

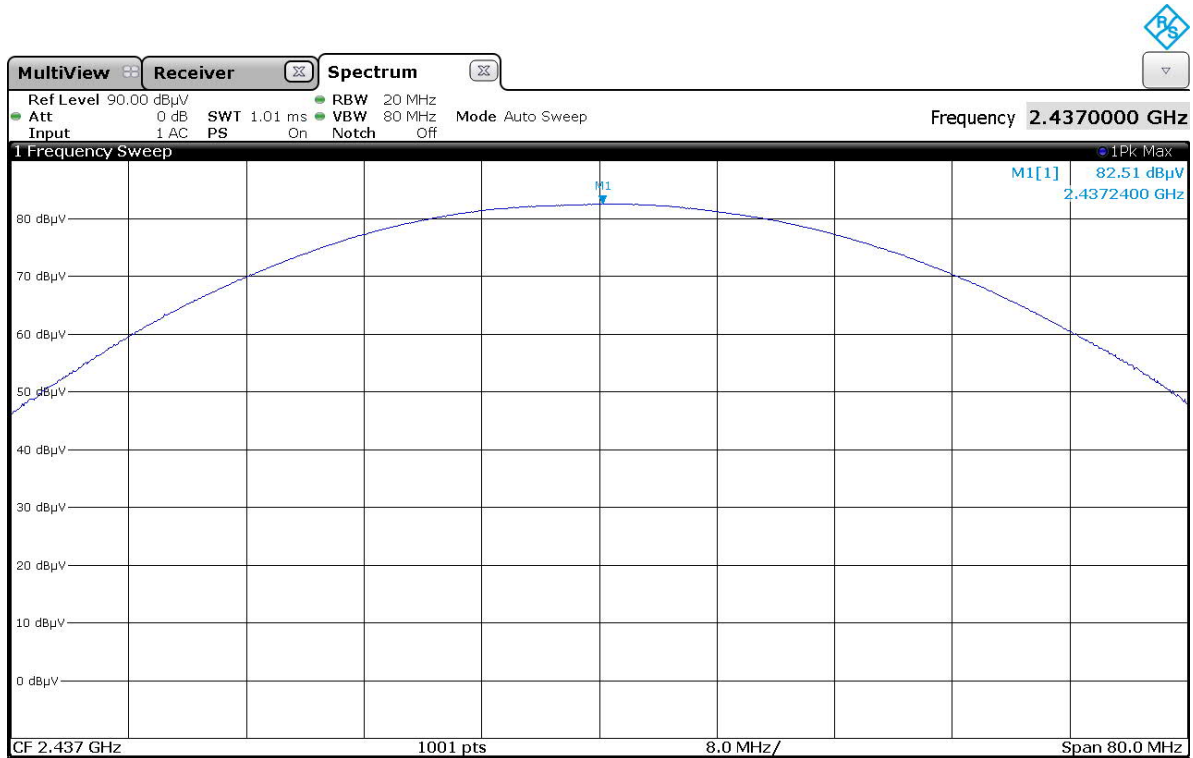
*MOP* is the maximum output power – measured antenna port conducted – in dBm

## 5.2.2 Test results

Ambient temperature	22 °C	Relative humidity	62 %
---------------------	-------	-------------------	------

The plot below shows the worst-case result. All other results are submitted in the table below

MPOP.PNG: Maximum output power measured on channel 6 (operation mode 1):



The antenna gain is below 6 dBi, therefore no conducted output limit reduction is necessary.

Operation mode	Frequency [MHz]	Reading [dBμV]	Corr. Fact. [dB/m]	Corr. Reading [dBμV/m]	EIRP [dBm]	MOP [dBm]	Limit [dBm]
1 6.5 Mbps	2437	82.51	33.60	116.11	20.81	19.31	30

The conducted output power for this test case in the original report (F160785 by Phoenix Testlab GmbH), is 20.9 dBm. Therefore, the measured power lies within in the measurement uncertainty of the original value (since it has been obtained radiated).

Test: Passed

### TEST EQUIPMENT USED FOR THE TEST:

1 – 6, 9, 10

## 5.3 DTS Bandwidth / 99% Bandwidth

### 5.3.1 Method of measurement

The EUT was measured conducted at the antenna connector.

#### Acceptable measurement configurations

The measurement for the DTS bandwidth procedure refers to part 11.8.1 of document [1].

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

The following procedure was used for measuring the 99 % bandwidth:

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

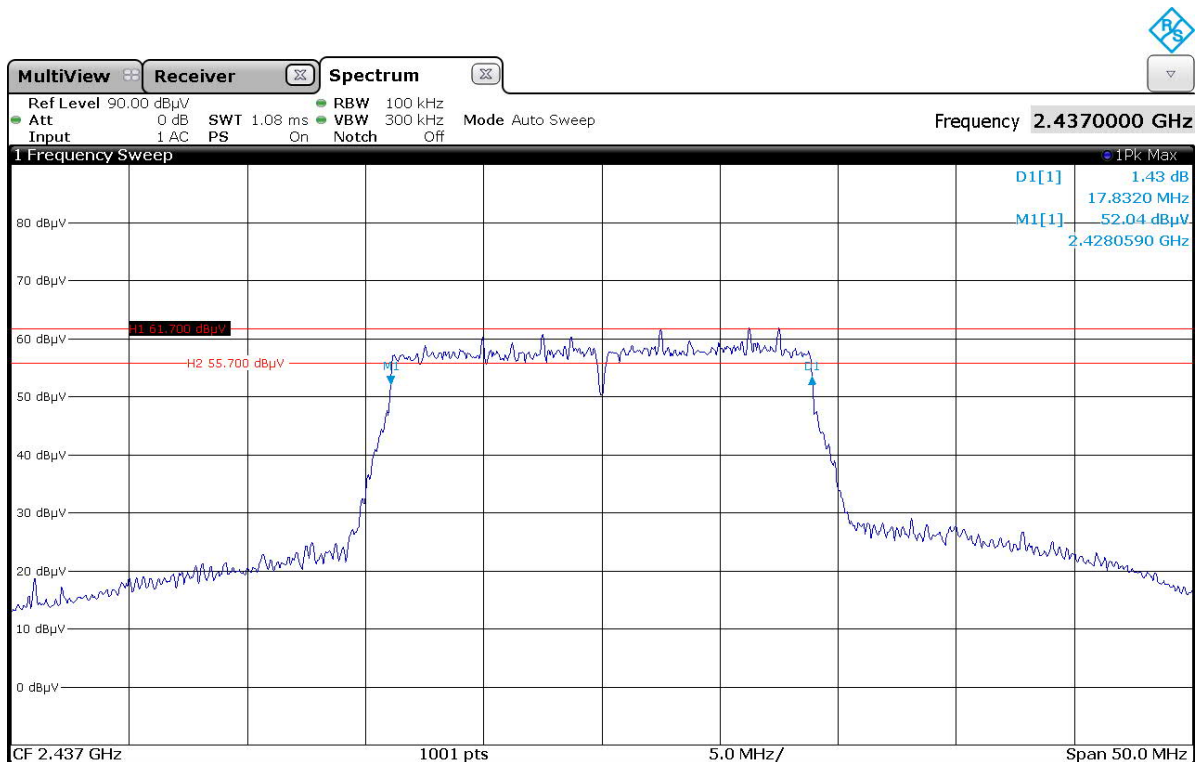
- The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
- The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
- Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than  $[10 \log (OBW/RBW)]$  below the reference level. Specific guidance is given in 4.1.5.2.
- Step a) through step c) might require iteration to adjust within the specified range.
- e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.
- g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.
- The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labelled. Tabular data maybe reported in addition to the plot(s).

### 5.3.2 Test result

Ambient temperature	22 °C	Relative humidity	59 %
---------------------	-------	-------------------	------

The plots show an exemplary measurement result for the worst documented case. The other results are listed in the following tables.

6dB\_BW.PNG: 6-dB Bandwidth (operation mode 1):



Operation Mode	Center Frequency [MHz]	Minimum 6-dB Bandwidth Limit [MHz]	6 dB Bandwidth [MHz]	Result
1   6.5 Mbps	2437	0.5	17.832	Passed

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

1 – 6, 9, 10

## 5.4 Band-edge compliance

### 5.4.1 Method of measurement (band edges next to restricted bands (radiated))

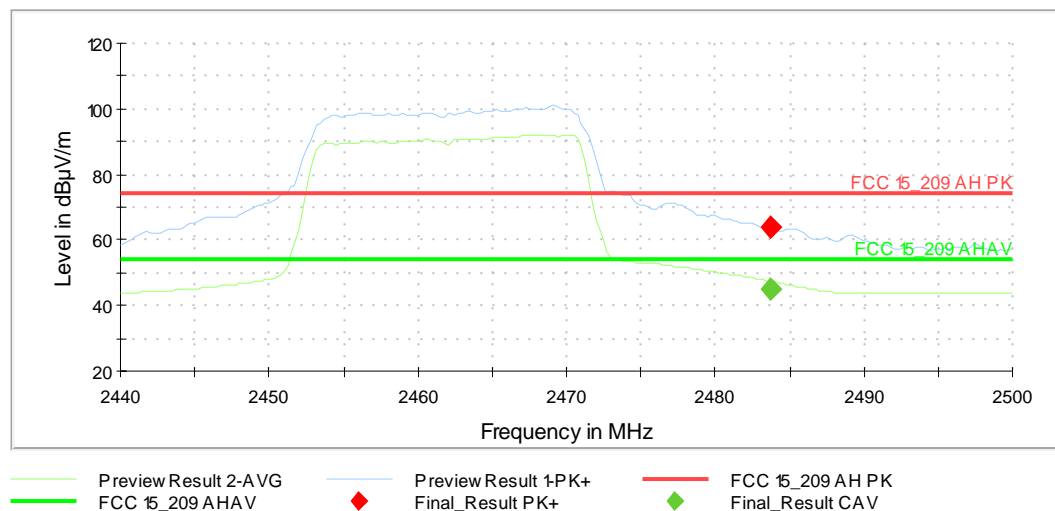
The EUT was measured radiated in the anechoic chamber using the procedures described in 5.5.1.

#### Acceptable measurement configurations

The same measurement configurations as described in 5.5.1. were used for the preview and final measurement.

### 5.4.2 Test result (band edges next to restricted bands (radiated))

191589\_UpBE\_ch11\_6.5Mbps\_Pwr11: radiated band-edge compliance at a restricted band-edge (operation mode 2):



#### Transmitter operates at the upper end of the assigned frequency band (operation mode 2)

Frequency [MHz]	MaxPeak [dBμV/m]	Average [dBμV/m]	Limit [dBμV/m]	Margin (dB)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
2483.750	---	45.15	54.00	8.85	V	253.0	150.0	33.5
2483.750	63.73	---	74.00	10.27	V	253.0	150.0	33.5
Measurement uncertainty				+2.2 dB / -3.6 dB				

Test: Passed

#### TEST EQUIPMENT USED FOR THE TEST:

1 – 6, 9, 10

## 5.5 Maximum unwanted emissions

### 5.5.1 Method of measurement (radiated emissions)

The radiated emission measurement is subdivided into five stages.

- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 30 MHz to 1 GHz.
- A final measurement carried out on an open area test site with reflecting ground plane and various antenna height in the frequency range 30 MHz to 1 GHz.
- A preliminary measurement carried out in a fully anechoic chamber with a variable antenna distance and height in the frequency range above 1 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range above 1 GHz.

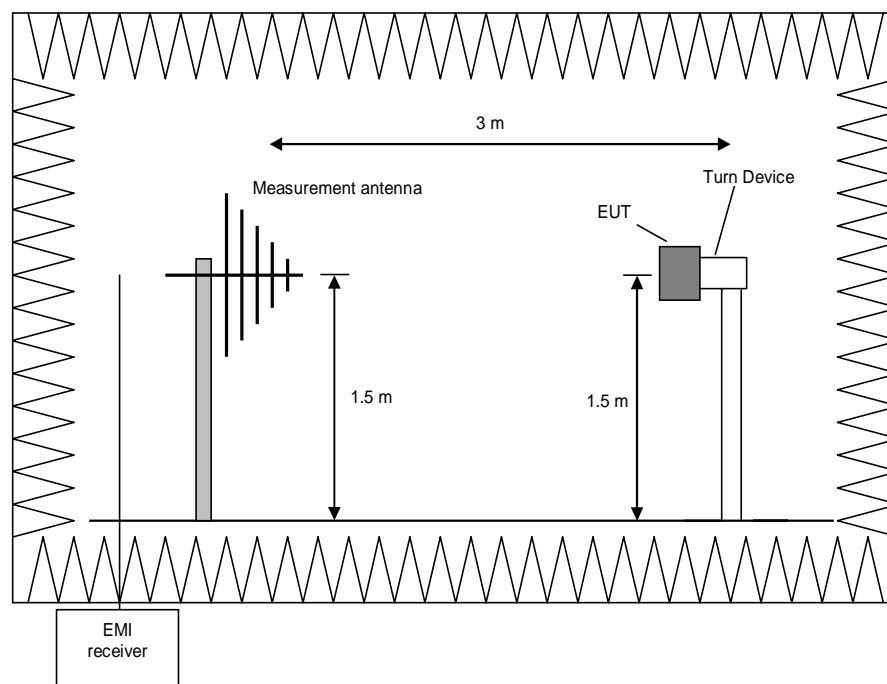
#### Preliminary measurement (30 MHz to 1 GHz)

In the first stage a preliminary measurement will be performed in a fully anechoic chamber with a measuring distance of 3 meter. Tabletop devices will set up on a non-conducting turn device on the height of 1.5m. Floor-standing devices will be placed directly on the turntable/ground plane. The set-up of the Equipment under test will be in accordance to [1].

The frequency range 30 MHz to 1 GHz will be measured with an EMI Receiver set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °. This measurement is repeated after raising the EUT in 30° steps according 6.6.5.4 in [1].

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	100 kHz



#### Procedure preliminary measurement:

Pre-scans were performed in the frequency range 30 MHz to 230 MHz and 230 MHz to 1 GHz.

The following procedure will be used:

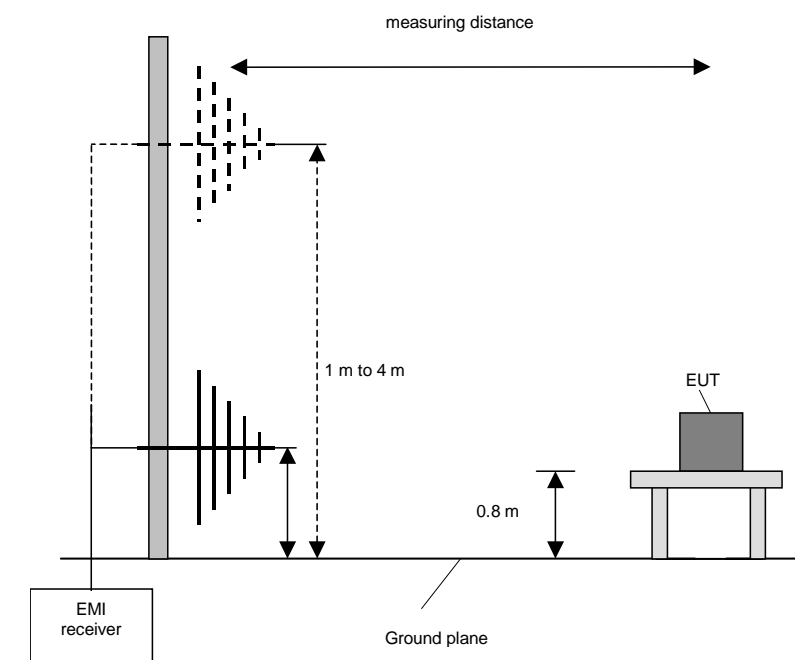
1. Monitor the frequency range at horizontal polarization and a EUT azimuth of 0°.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360° to maximize the detected signals.
4. Repeat 1) to 3) with the vertical polarization of the measuring antenna.
5. Make a hardcopy of the spectrum.
6. Repeat 1) to 5) with the EUT raised by an angle of 0° (45°, 90°) according to 6.6.5.4 in [1].
7. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.

#### Final measurement (30 MHz to 1 GHz)

A final measurement on an open area test site will be performed on selected frequencies found in the preliminary measurement. During this test the EUT will be rotated in the range of 0° to 360°, the measuring antenna will be set to horizontal and vertical polarization and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	120 kHz



Procedure final measurement:

The following procedure will be used:

- 1) Measure on the selected frequencies at an antenna height of 1 m and a EUT azimuth of 23 °.
- 2) Move the antenna from 1 m to 4 m and note the maximum value at each frequency.
- 3) Rotate the EUT by 45 ° and repeat 2) until an azimuth of 337 ° is reached.
- 4) Repeat 1) to 3) for the other orthogonal antenna polarization.
- 5) Move the antenna and the turntable to the position where the maximum value is detected.
- 6) Measure while moving the antenna slowly +/- 1 m.
- 7) Set the antenna to the position where the maximum value is found.
- 8) Measure while moving the turntable +/- 45 °.
- 9) Set the turntable to the azimuth where the maximum value is found.
- 10) Measure with Final detector (QP and AV) and note the value.
- 11) Repeat 5) to 10) for each frequency.
- 12) Repeat 1) to 11) for each orthogonal axis of the EUT (because of EUT is a module and might be used in a handheld equipment application).

**Preliminary and final measurement (1 GHz to 40 GHz)**

This measurement will be performed in a fully anechoic chamber. Tabletop devices will set up on a non-conducting turn device on the height of 1.5m. The set-up of the Equipment under test will be in accordance to [1].

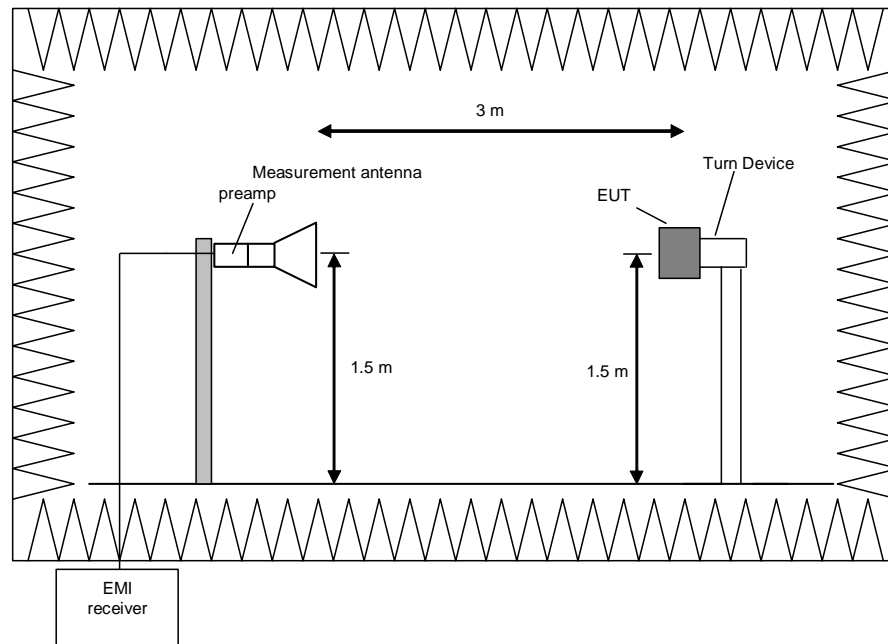
**Preliminary measurement (1 GHz to 40 GHz)**

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The spectrum analyzer set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °. This measurement is repeated after raising the EUT in 30° steps according 6.6.5.4 in [1].

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
1 GHz to 4 GHz	100 kHz
4 GHz to 12 GHz	100 kHz
12 GHz to 18 GHz	100 kHz
18 GHz to 25 / 26.5 GHz	100 kHz
26.5 GHz to 40 GHz	100 kHz





#### Procedure preliminary measurement:

Pre-scans were performed in the frequency range 1 to 40 GHz.

The following procedure will be used:

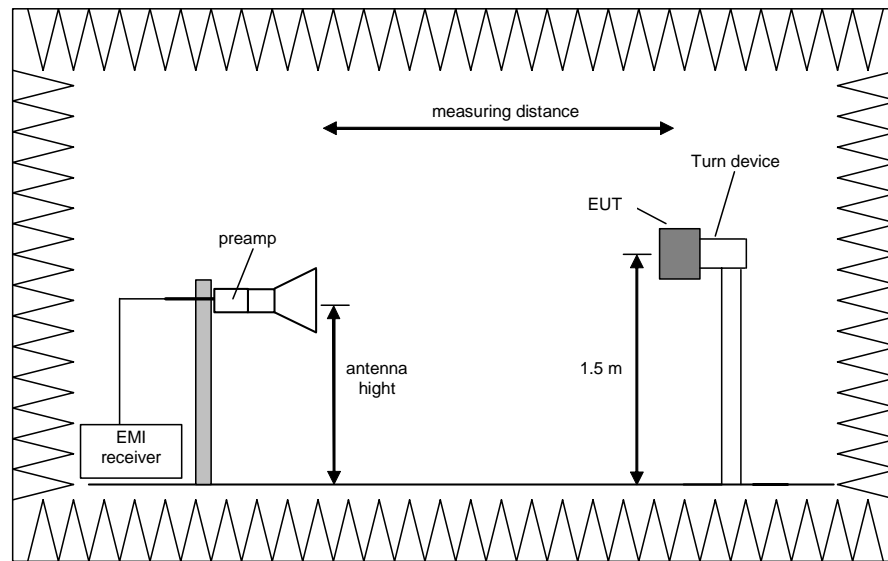
1. Monitor the frequency range at horizontal polarization and a EUT azimuth of 0 °.
2. Rotate the EUT by 360° to maximize the detected signals.
3. Repeat 1) to 2) with the vertical polarization of the measuring antenna.
4. Make a hardcopy of the spectrum.
5. Repeat 1) to 4) with the EUT raised by an angle of 30° (60°, 90°, 120° and 150°) according to 6.6.5.4 in [1].
6. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
7. The measurement antenna polarization, with the according EUT position (Turntable and Turn device) which produces the highest emission for each frequency will be used for the final measurement. The six closest values to the applicable limit will be used for the final measurement.

#### Final measurement (1 GHz to 40 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1 MHz. The measurement will be performed by rotating the turntable through 0 to 360° in the worst-case EUT orientation which was obtained during the preliminary measurements.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
1 GHz to 4 GHz	1 MHz
4 GHz to 12 GHz	1 MHz
12 GHz to 18 GHz	1 MHz
18 GHz to 25 / 26.5 GHz	1 MHz
26.5 GHz to 40 GHz	1 MHz



#### Procedure of measurement:

The measurements were performed in the frequency ranges 1 GHz to 4 GHz, 4 GHz to 12 GHz, 12 GHz to 18 GHz, 18 GHz to 25 /26.5 GHz and 26.5 GHz to 40 GHz.

The following procedure will be used:

- 1) Set the turntable and the turn device to obtain the worst-case emission for the first frequency identified in the preliminary measurements.
- 2) Set the measurement antenna polarization to the orientation with the highest emission for the first frequency identified in the preliminary measurements.
- 3) Set the spectrum analyzer to EMI mode with peak and average detector activated.
- 4) Rotate the turntable from 0° to 360° to find the TT Pos. that produces the highest emissions.
- 5) Note the highest displayed peak and average values
- 6) Repeat the steps 1) to 5) for each frequency detected during the preliminary measurements.

## 5.5.2 Test results (radiated emissions) – Emissions 30 MHz – 26.5 GHz

### 5.5.2.1 Preliminary radiated emission measurement 1 GHz – 26.5 GHz

Ambient temperature	22 °C	Relative humidity	59 %
---------------------	-------	-------------------	------

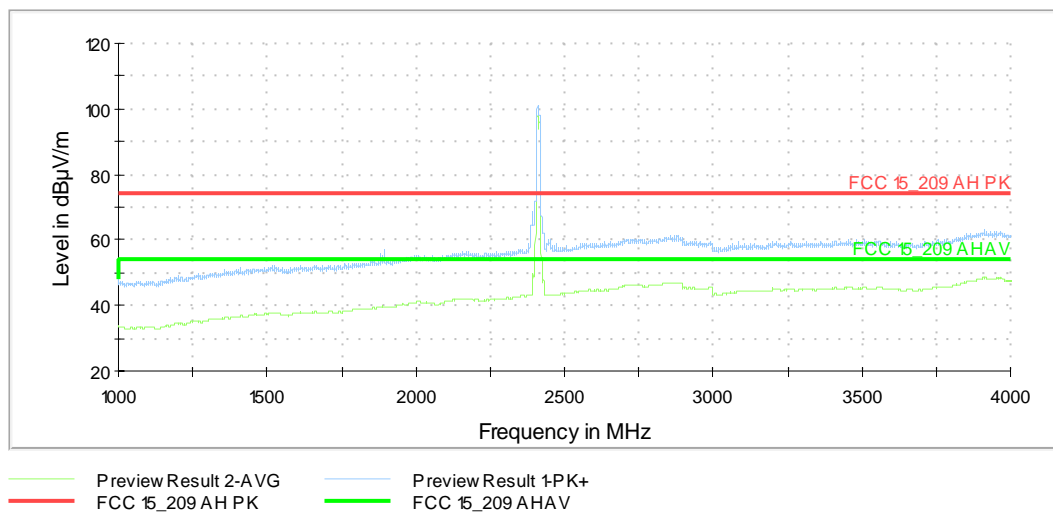
Position of EUT: The EUT was set-up on an EUT turn device of a height of 1.5 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

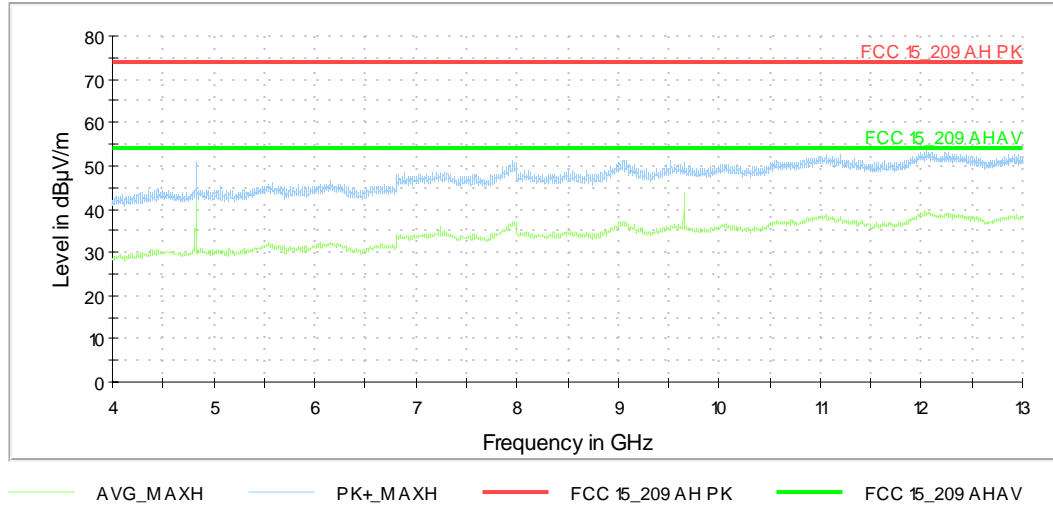
Test record: Only the plot of the worst-case emission is submitted below.

Remark: Only emissions higher than 1 GHz were tested in this test report, because no significant emissions below 1 GHz were measured in the original report F160785 by Phoenix Testlab GmbH.

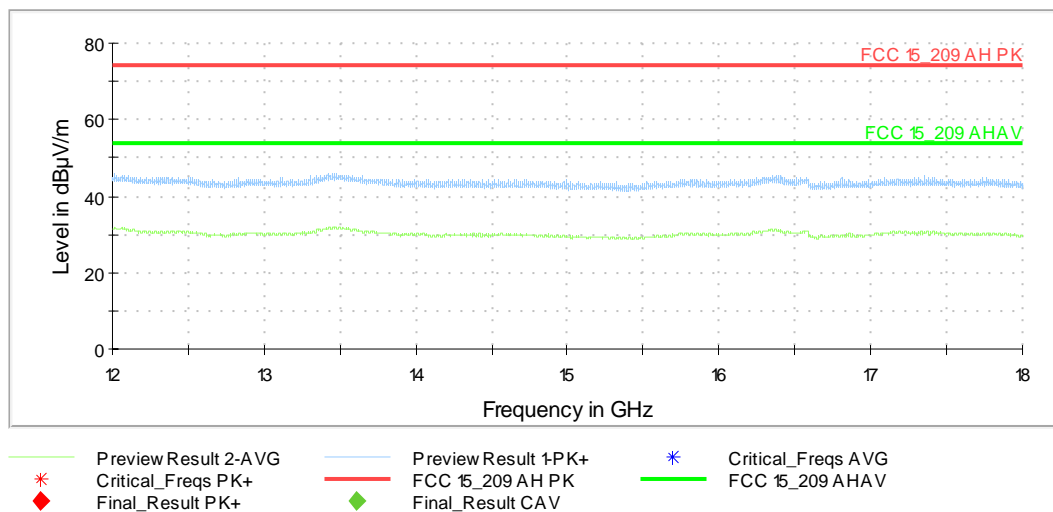
191589 1-4G\_ch1\_1Mbps\_Pwr16: Spurious emissions from 1 GHz to 4 GHz (operation mode 3)



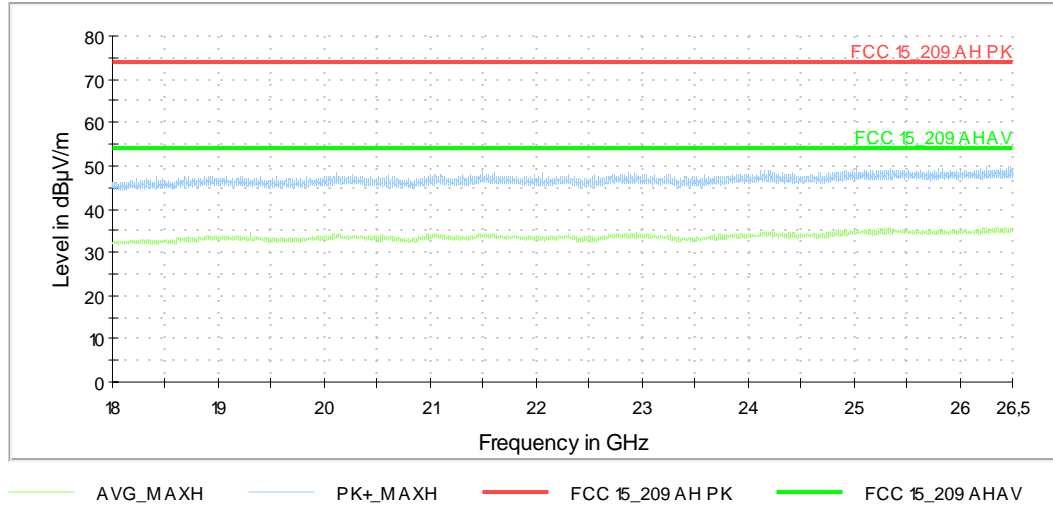
191589 4-12G\_ch1\_1Mbps\_Pwr16: Spurious emissions from 4 GHz to 13 GHz (operation mode 3):



191589 12-18G\_ch1\_1Mbps\_Pwr16: Spurious emissions from 12 GHz to 18 GHz (operation mode 3):



191589 18-26,5G ch1 1Mbps Pwr16: Spurious emissions from 18 GHz to 26.5 GHz (operation mode 3):



### 5.5.2.2 Final radiated measurements

**Transmitter operates at the lower end of the assigned frequency band (operation mode 3, 1 Mbps)**

Frequency [MHz]	MaxPeak [dBμV/m]	Average [dBμV/m]	Limit [dBμV/m]	Margin (dB)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
1892.250	---	27.38	54.00	26.62	H	98.0	60.0	30.6
1892.250	39.27	---	74.00	34.73	H	98.0	60.0	30.6
2411.250	---	98.56	-	In Band	V	203.0	150.0	33.5
2411.250	101.65	---	-	In Band	V	203.0	150.0	33.5
4824.000	---	47.28	54.00	6.72	V	26.0	0.0	-1.9
4824.000	50.36	---	74.00	23.64	V	26.0	0.0	-1.9
9648.000	---	44.81	54.00	9.19	H	278.0	90.0	7.3
9648.000	51.45	---	74.00	22.55	H	278.0	90.0	7.3
19296.000	---	33.43	54.00	20.57	H	273.0	120.0	6.7
19296.000	45.27	---	74.00	28.73	H	273.0	120.0	6.7
Measurement uncertainty				+2.2 dB / -3.6 dB				

TEST EQUIPMENT USED FOR THE TEST:

1 – 10, 13, 15 - 19

## 6 Test equipment and ancillaries used for tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal. Due
1	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303	Calibration not necessary	
2	Signal & Spectrum Analyzer	ESW44	Rohde & Schwarz	101635	482467	29.03.2018	03.2020
3	Controller	MCU	Maturo	MCU/043/971107	480832	Calibration not necessary	
4	Turntable	DS420HE	Deisel	420/620/80	480315	Calibration not necessary	
5	Antenna support	AS615P	Deisel	615/310	480187	Calibration not necessary	
6	Antenna (Log.Per.)*	HL050	Rohde & Schwarz	100438	481170	09.10.2017	10.2020
7	Standard Gain Horn 11.9 GHz – 18 GHz	18240-20	Flann Microwave	483	480294	Calibration not necessary	
8	Standard Gain Horn 17.9 GHz – 26.7 GHz	20240-20	Flann Microwave	411	480297	Calibration not necessary	
9	RF-cable No. 3	Sucoflex 106B	Huber&Suhner	500234/6B	482644	Calibration not necessary	
10	RF-cable No. 40	Sucoflex 106B	Huber&Suhner	SF106B/11N/11N/150 0MM	482125	Calibration not necessary	
11	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059	21.02.2018	02.2020
12	Antenna (Bilog)	CBL6112B	Schaffner EMV GmbH (-Chase)	2688	480328	19.06.2017	06.2020
13	RF-cable 2 m	KPS-1533-800-KPS	Insulated Wire	-	480302	Calibration not necessary	
14	Kabel 36	Sucoflex 106B	Suhner	500003/6B / Kabel 36	481680	Calibration not necessary	
15	Preamplifier 100 MHz - 16 GHz	AFS6-00101600-23-10P-6-R	Narda MITEQ	2011215	482333	10.07.2018	07.2020
16	Preamplifier	JS3-12001800-16-5A	Miteq	571667	480343	10.07.2018	07.2020
17	Preamplifier	JS3-18002600-20-5A	Miteq	658697	480342	10.07.2018	07.2020
18	4 GHz High Pass Filter	WHKX4.0/18G-8SS	Wainwright Instruments	1	480587	Calibration not necessary	
19	EMC32	1300.7010.02	Rohde & Schwarz	100061	481022	Calibration not necessary	

## 7 Test site Validation

Test equipment	PM. No.	Frequency range	Type of validation	According to	Val. Date	Val Due
Fully anechoic chamber M20	480303	1 -18 GHz	SVSWR	CISPR 16-1-4 Amd. 1	13.07.2018	12.07.2020

## 8 Report History

Report Number	Date	Comment
F191589E1	11.03.2020	Initial Test Report

## 9 List of Annexes

ANNEX A	TEST SETUP PHOTOS	5 pages
ANNEX B	EXTERNAL PHOTOS	6 pages
ANNEX C	INTERNAL PHOTOS	2 pages