ETSI Test Report for

EN 300 328 v2.2.2

The RvA is signatory to ILAC - MRA

Product name : Apollo Max with 4G modem

Applicant : Payter B.V.

Test report No. : P000405718 002 Ver 1.00

Laboratory information

Accreditation

Kiwa Nederland B.V. complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2017. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L248 and is granted by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

Kiwa Nederland B.V. is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Designation number is: NL0001.

Kiwa Nederland B.V. is a Wireless Device Testing laboratory recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements.
The Industry Canada company number for Kiwa Nederland B.V. is: 4173A. The CABID is NL0001.

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Documentation

The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at Kiwa Nederland B.V.

Testing Location

Test Site	Kiwa Nederland B.V.
Test Site location	Wilmersdorf 50 7327 AC Apeldoorn The Netherlands Tel. +31 88998 3393
Test Site FCC	NL0001
CABID	NL0001

Revision History

Version	Date	Remarks	By
v0.50	11-09-2024	First draft	MHK
v1.00	21-10-2024	Final release	MHK

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4.3.2.12	Geo-location capability	3.9	Pass

1 General Description

1.1 Applicant

Client name:	Payter B.V.
Address:	Rozenlaan 115
Zip code:	3051LP
Country:	Netherlands
Telephone:	+31854012380
E-mail:	l.degelder@payter.nl
Contact name:	Eric van Diggele

1.2 Manufacturer

Manufacturer name:	Payter B.V.
Address:	Rozenlaan 115
Zip code:	3051LP
Country:	Netherlands
Telephone:	+31854012380
E-mail:	m.noordermeer@payter.nl
Contact name:	Marcus Noordermeer

1.3 Tested Equipment Under Test (EUT)

Product name:	Apollo Max with 4G modem
Brand name:	Payter
Product description:	Payment terminal with PIN entry
Model number:	APM.BL.ENG V1-0
Software version:	--
Hardware version:	--
Date of receipt:	01-07-2024
Tests started:	21-08-2024
Testing ended:	04-09-2024

1.4 Product specifications of Equipment under test

TX Frequency range (MHz):	WiFi (2412-2472); LTE/WCDMA/GSM (815-960, 1447-1511, 1710-2170, 2500-2690)
RX frequency range (MHz):	WiFi (2412-2472); LTE/WCDMA/GSM (815-960, 1447-1511, 1710-2170, 2500-2690)
Antenna type:	PCB antenna (Wifi) External monopole (LTE/GSM)
Antenna gain (dBi):	2.0
Type of modulation:	WLAN: CCK, OFDM, BPSK, QPSK, 16-QAM, 64-QAM BLE: GFSK
Receiver category:	1

Disclaimer: The antenna gain and operating frequency bands are declared by the applicant

1.5 Observations and remarks

The manufacturer provided a sample with RF connectors instead of antennas for conducted testing. The EUT only operates on 802.11b.

1.6 Environmental conditions

Test date	Ambient temperature (°C)	Humidity (%)
21-08-2024	23.3	51.4

1.7 Measurement standards

- EN 300 328 v2.2.2

1.8 Applicable standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- EN 300 328 V2.2.2

1.9 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specifications stated in paragraph 1.8 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Kiwa Netherland B.V. accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.8 *"Applicable standards".*

All tests are performed by:

Name : ing. Maaz H. Khan

Review of test methods and report by:

Name : ing R. van Barneveld

The above conclusions have been verified by the following signatory:

Date : 22-10-2024

Name : P. van Wanrooij

Function : Test Engineer

Signature :

2 Test configuration of the Equipment Under Test

2.1 Test mode

The applicant provided test mode firmware for the EUT, in which it was possible to configure the EUT into different test channels.

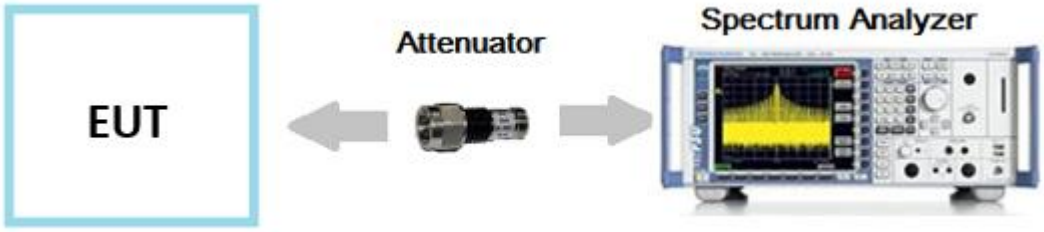
2.2 Tested channels and Data rates

Technology	Channels	Data rate	Frequency (MHz)
802.11b	1	1 Mbps	2412
	7	1 Mbps	2442
	13	1 Mbps	2472

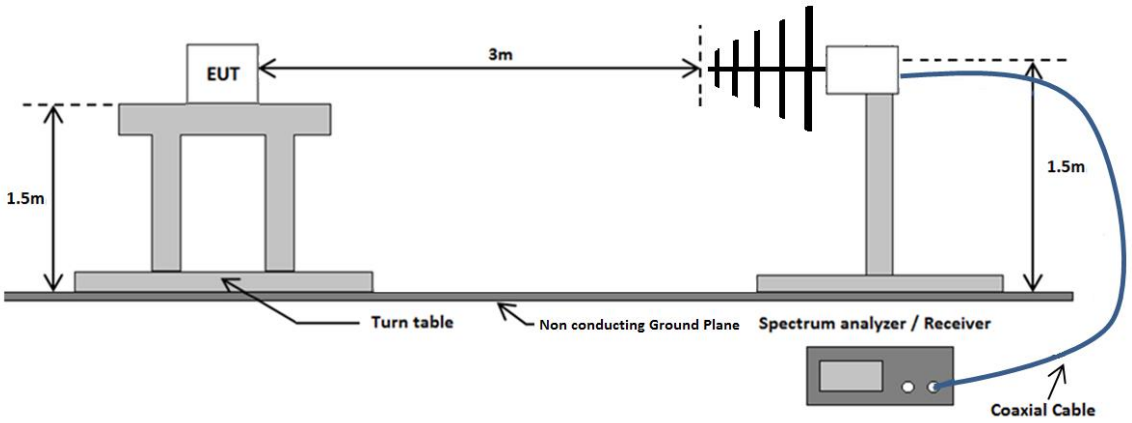
2.3 Test setups

Test setup for RF power measurement

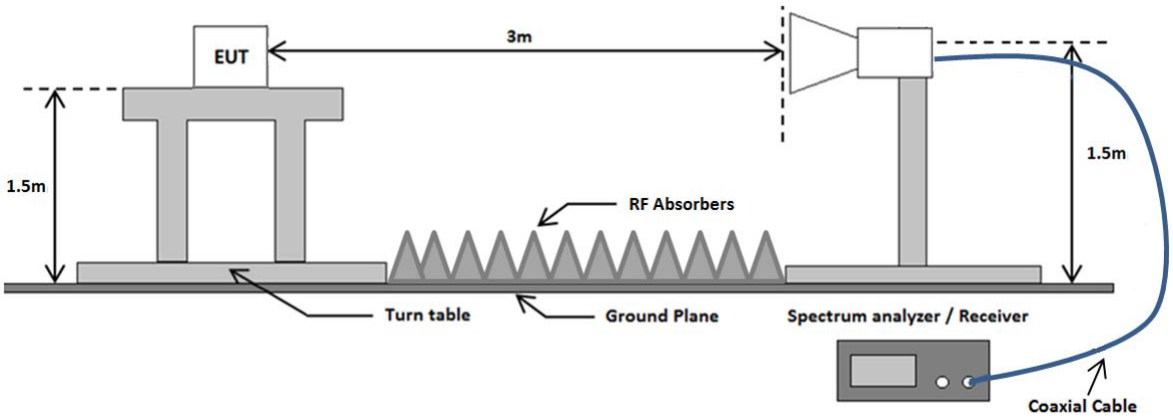
Test setup for other conducted measurements



Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



2.4 Equipment used in the test configuration

Nyquist

Description	Manufacturer	Model	ID	Used at Par.
Anechoic room	ETS Lindgren	FRIIS	114872	3.1/3.2
Spectrum analyzer	Rohde & Schwarz	FSV3044	114871	3.1/3.2
Preamplifier 25 - 1000 MHz	Schwarzbeck	BBV 9745	114138	3.1/3.2
Preamplifier 1 - 18 GHz	Schwarzbeck	BBV 9718D	114874	3.1/3.2
Antenna 25 - 1000 MHz	Chase	CBL 6111	114763	3.1/3.2
Antenna 1 - 18 GHz	EMCO	3117	114873	3.1/3.2
Armoured blue cable inside room	Huber+Suhner	Sucoflex 118	--	3.1/3.2
Blue cable outside room	Huber+Suhner	Sucoflex 101	--	3.1/3.2

STACK

Description	Manufacturer	Model	ID	Used at Par.
Spectrum Analyzer	Rohde & Schwarz	FSV3044	115043	3.1/3.2
Open Switch And Control Platform	Rohde & Schwarz	OSP220	115042	3.1/3.2
Open Switch And Control Platform	Rohde & Schwarz	OSP150	115041	3.1/3.2
Signal Generator	Rohde & Schwarz	SMB100A	115040	3.1/3.2
Climate chamber	CTS	C-40/350	114509	3.1/3.2
Cables	SEMFLEX INC	HP160S	--	3.1/3.2
Vector Signal Generator	Rohde & Schwarz	SMM100A	115039	3.1/3.2

3 Test results

3.1 TX Radiated Spurious Emissions Measurement

3.1.1 Limit

Frequency range	Power
30 – 47 MHz	-36 dBm
47 – 74 MHz	-54 dBm
74 – 87.5 MHz	-36 dBm
87.5 – 118 MHz	-54 dBm
118 – 174 MHz	-36 dBm
174 – 230 MHz	-54 dBm
230 – 470 MHz	-36 dBm
470 – 694 MHz	-54 dBm
694 – 1000 MHz	-36 dBm
1 – 12.75 GHz	-30 dBm

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.1.4 Test procedure

According to chapter 5.4.9 of EN 300 328 v2.2.2
IRN 415 – Method 1

3.1.5 Measurement Uncertainty

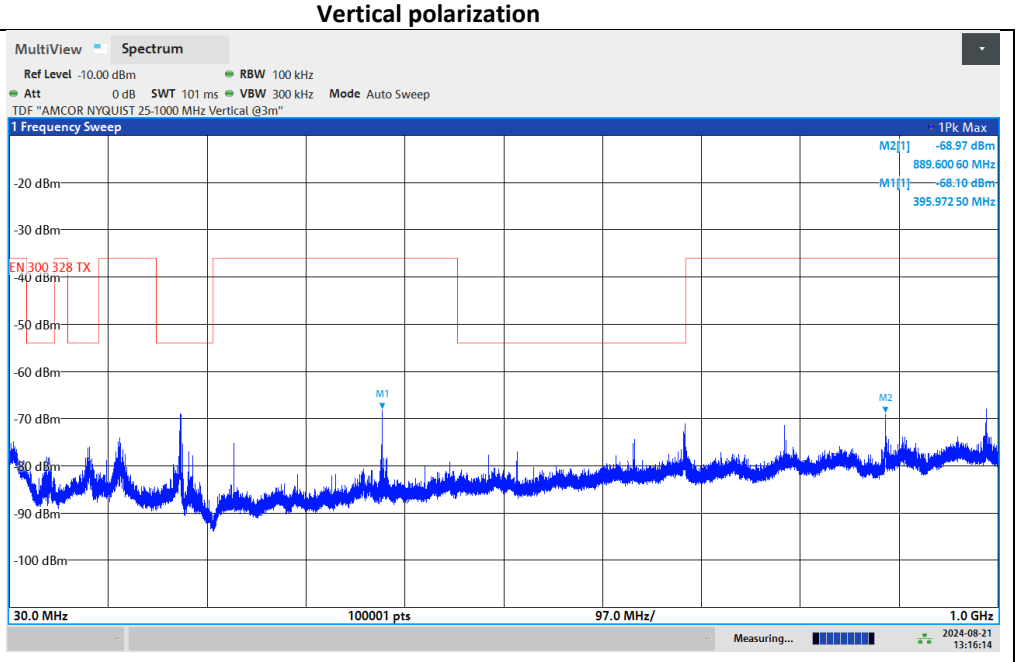
Frequency range	Measurement uncertainty
30 – 1000 MHz	±3.6 dB
1 – 10 GHz	±3.5 dB
10 – 18 GHz	±3.8 dB

3.1.6 Plots of the TX Radiated Spurious Emissions Measurement of 802.11b

30 MHz to 1 GHz

Vertical polarization

Low ch



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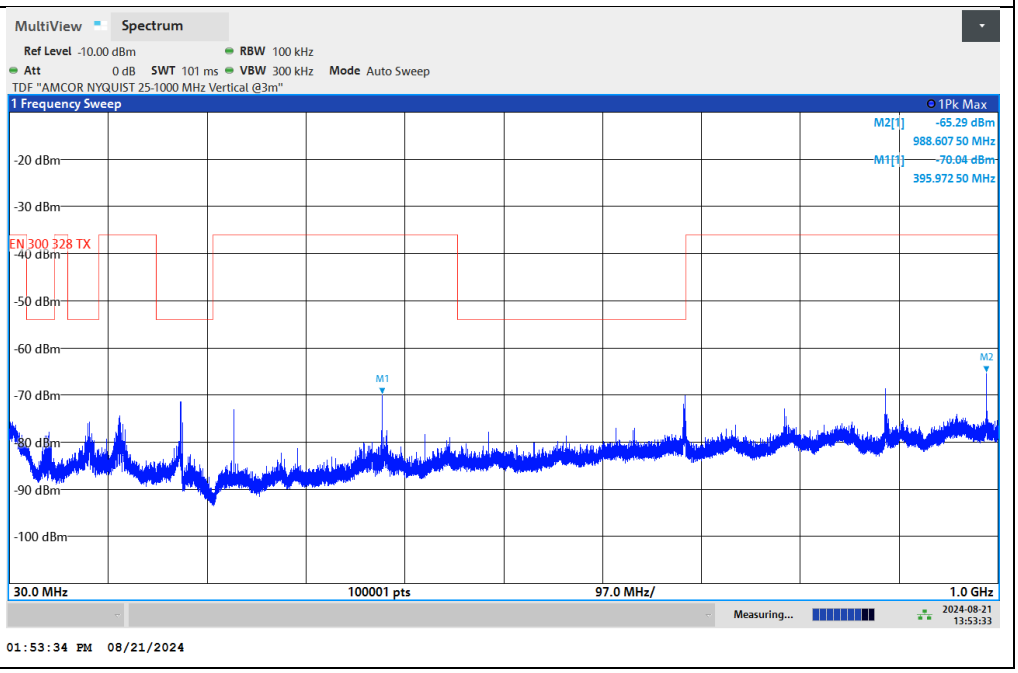
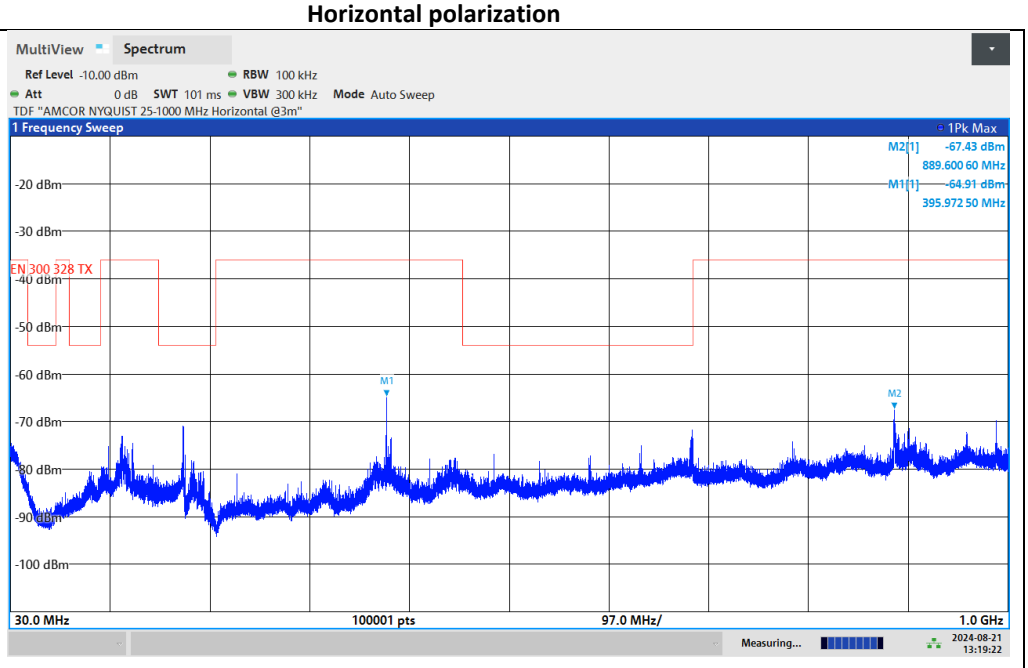
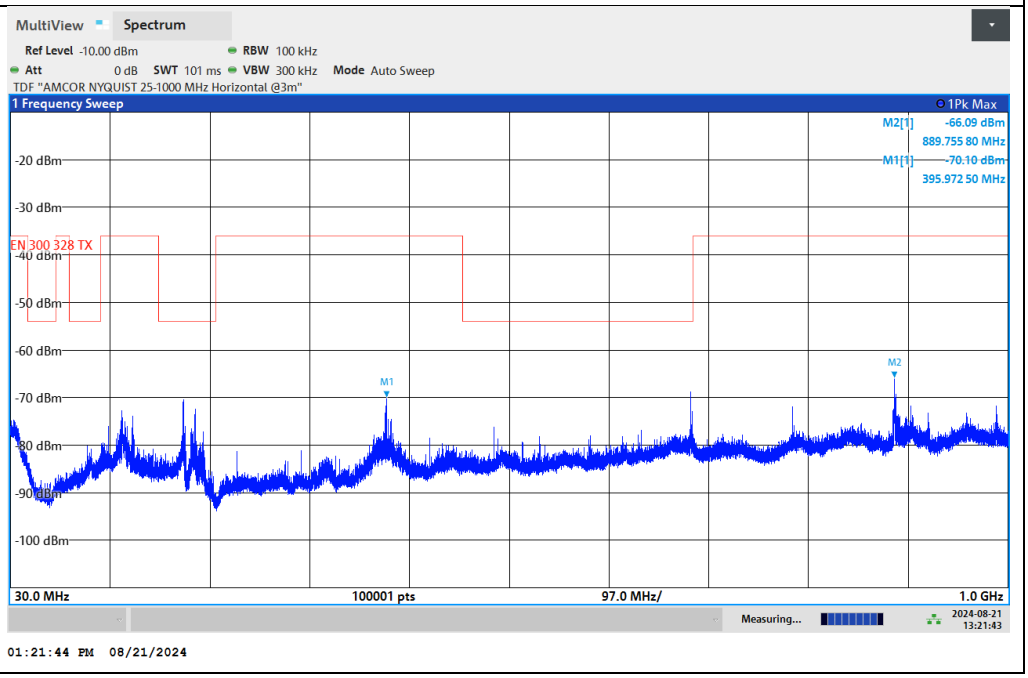


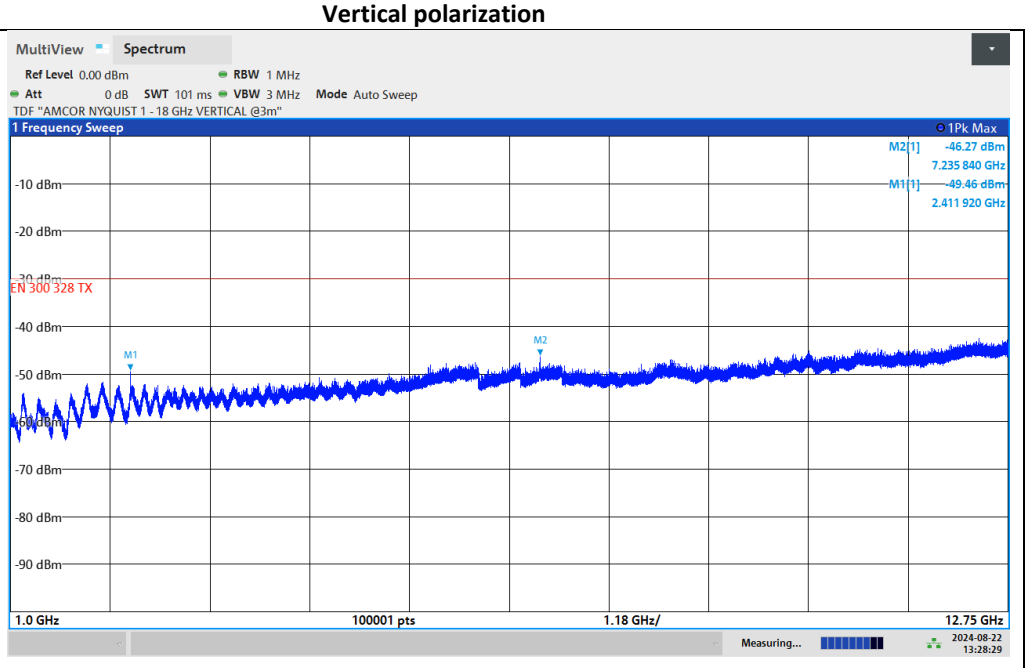
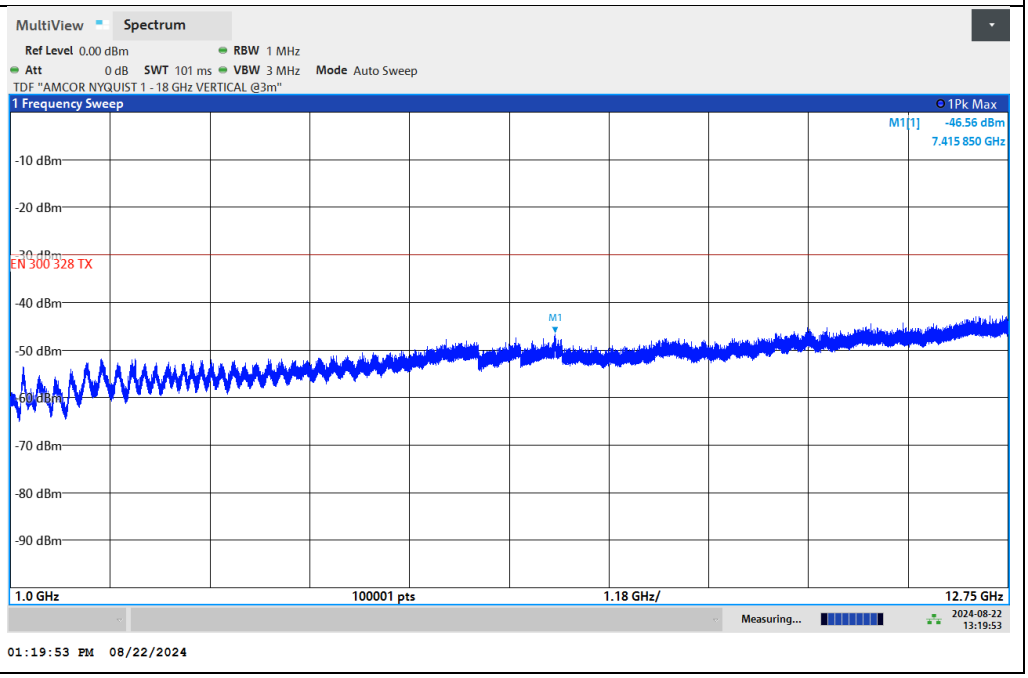
30 MHz to 1 GHz

Horizontal polarization

Low ch	
High ch	

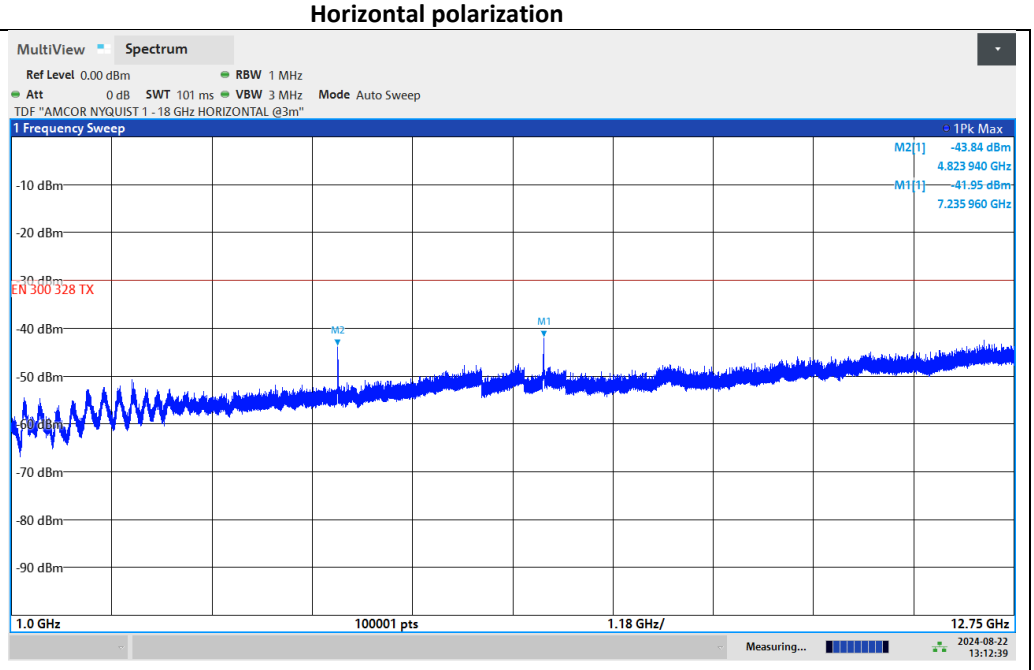
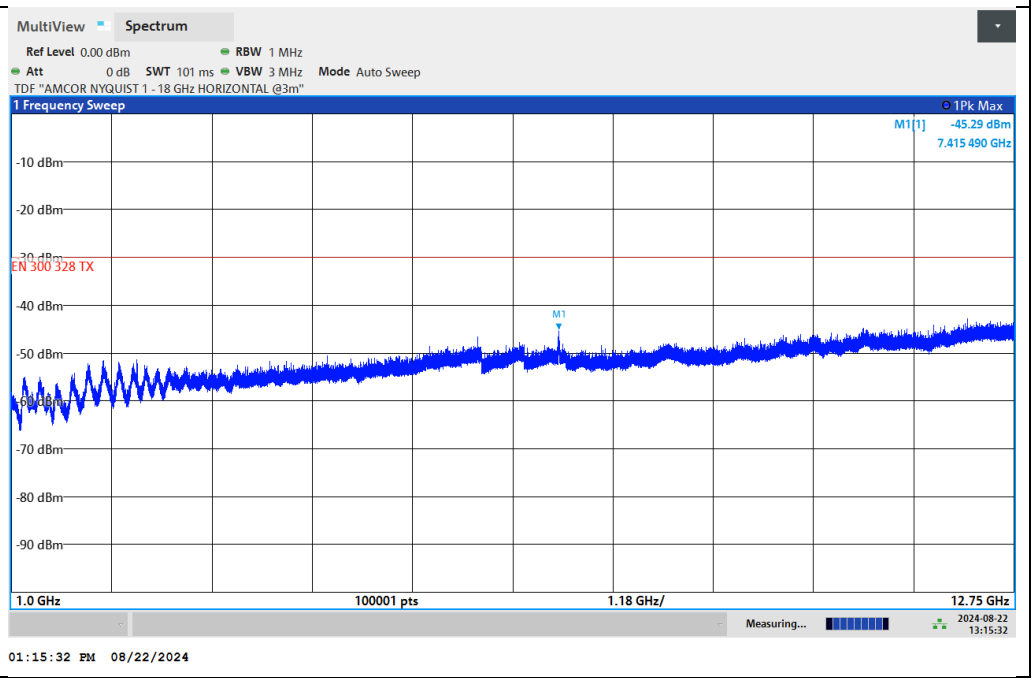
1 GHz to 12.75 GHz

Vertical polarization

Low ch	
High ch	

1 GHz to 12.75 GHz

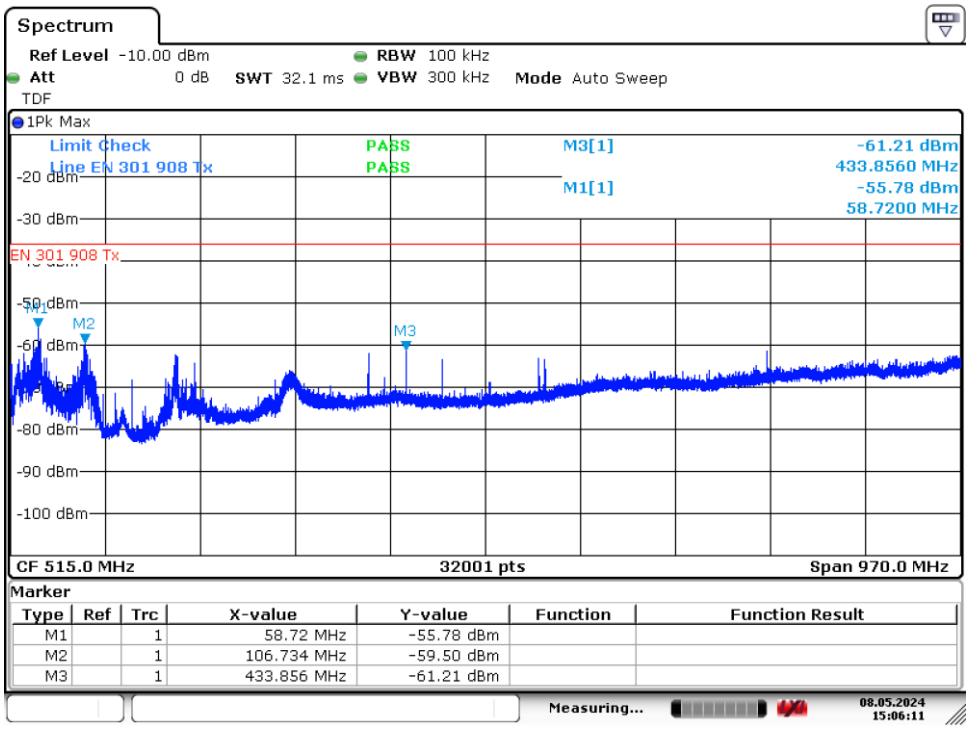
Horizontal polarization

Low ch	
High ch	

3.1.7 Multi radio assessment LTE B1 and 802.11 Ch 1

30-1000MHz

Vertical



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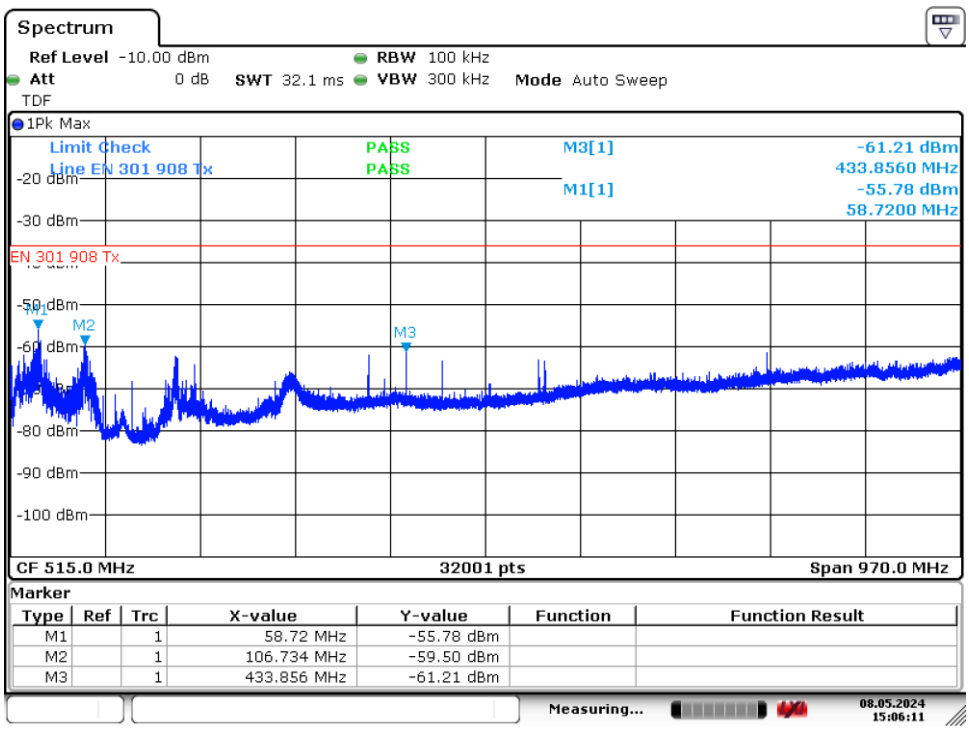
Horizontal



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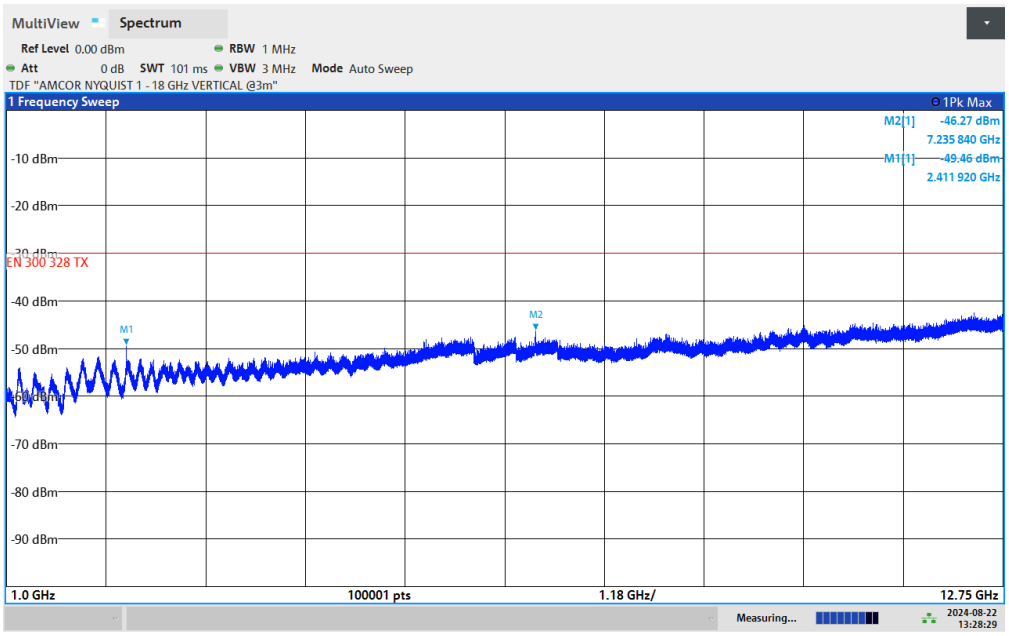
1-12.75GHz

Vertical



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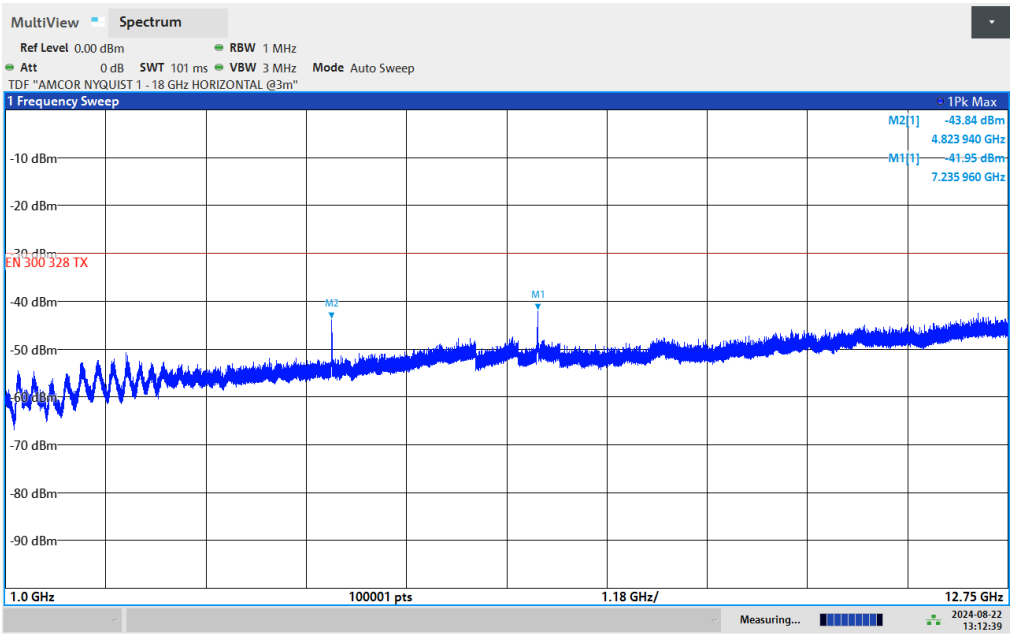

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3.2 Radiated RX Spurious Emissions Measurement

3.2.1 Limit

Frequency range	Power
30 – 1000 MHz	-57 dBm
1 – 12.75 GHz	-47 dBm

3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.2.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.2.4 Test procedure

According to chapter 5.4.10 of EN 300 328 v2.2.2
IRN 415 – Method 1

3.2.5 Measurement Uncertainty

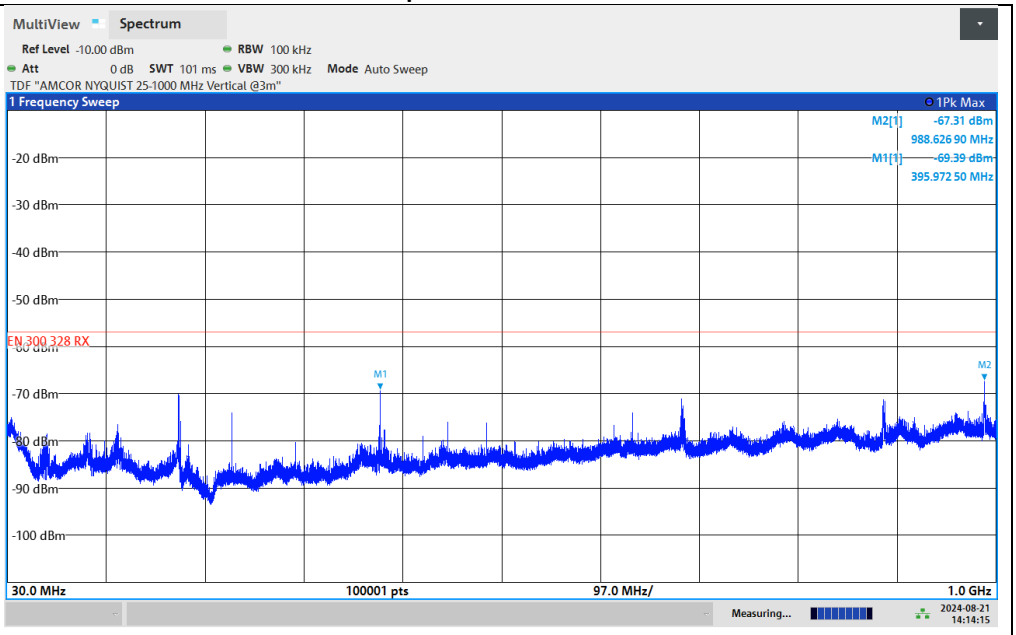
Frequency range	Measurement uncertainty
30 – 1000 MHz	±3.6 dB
1 – 10 GHz	±3.5 dB
10 – 18 GHz	±3.8 dB

3.2.6 Plots of the RX Radiated Spurious Emissions Measurement of 802.11b

30 MHz to 1 GHz

Vertical polarization

Low ch



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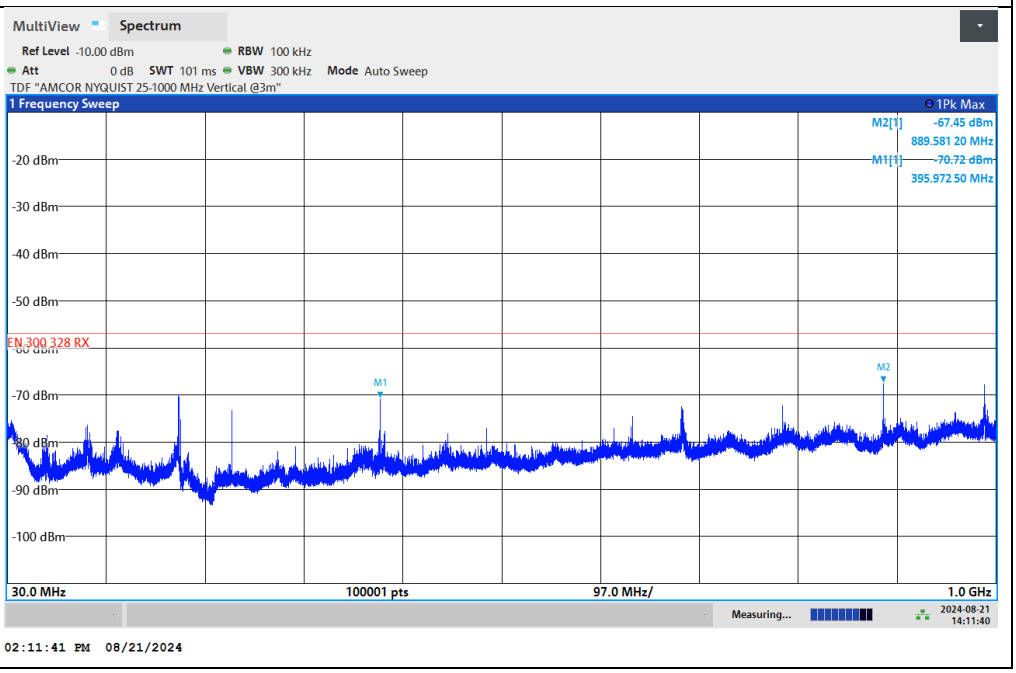
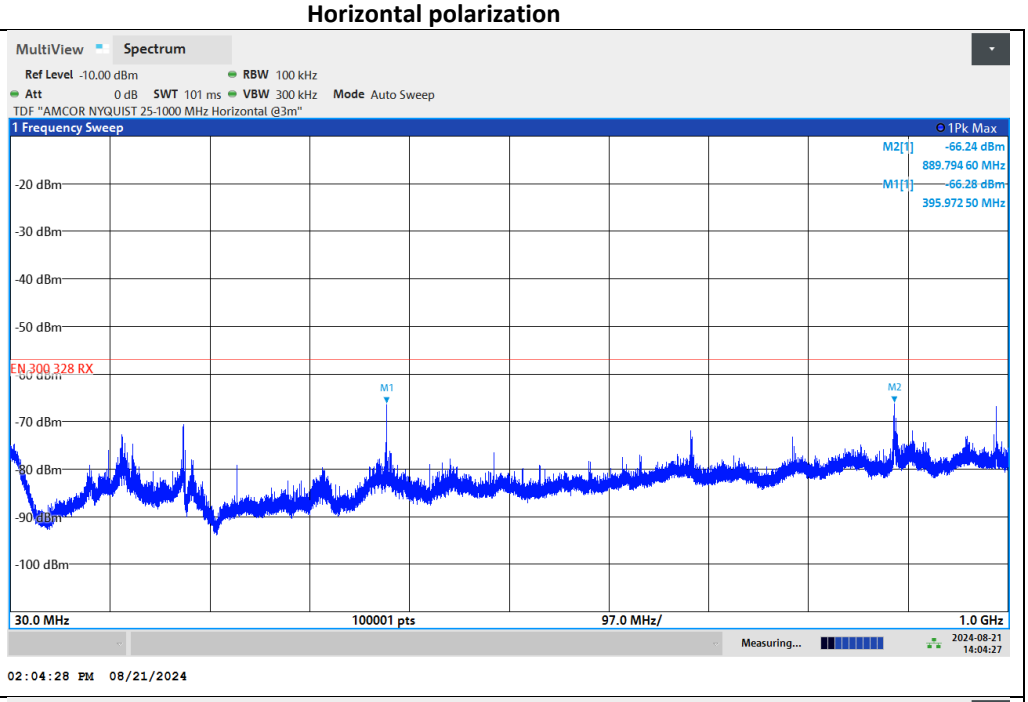
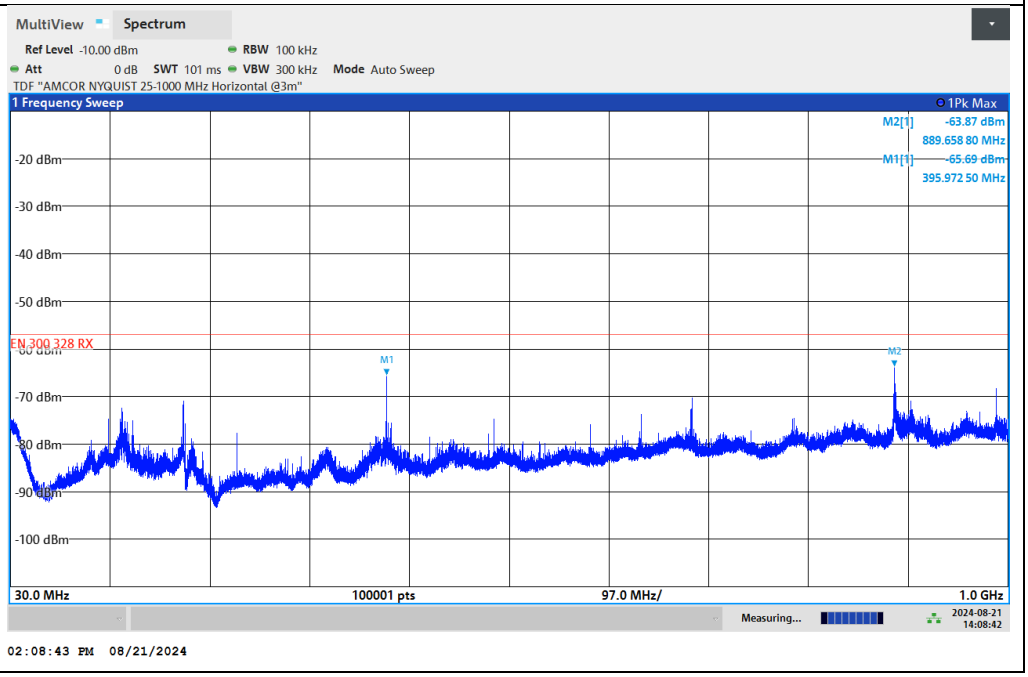


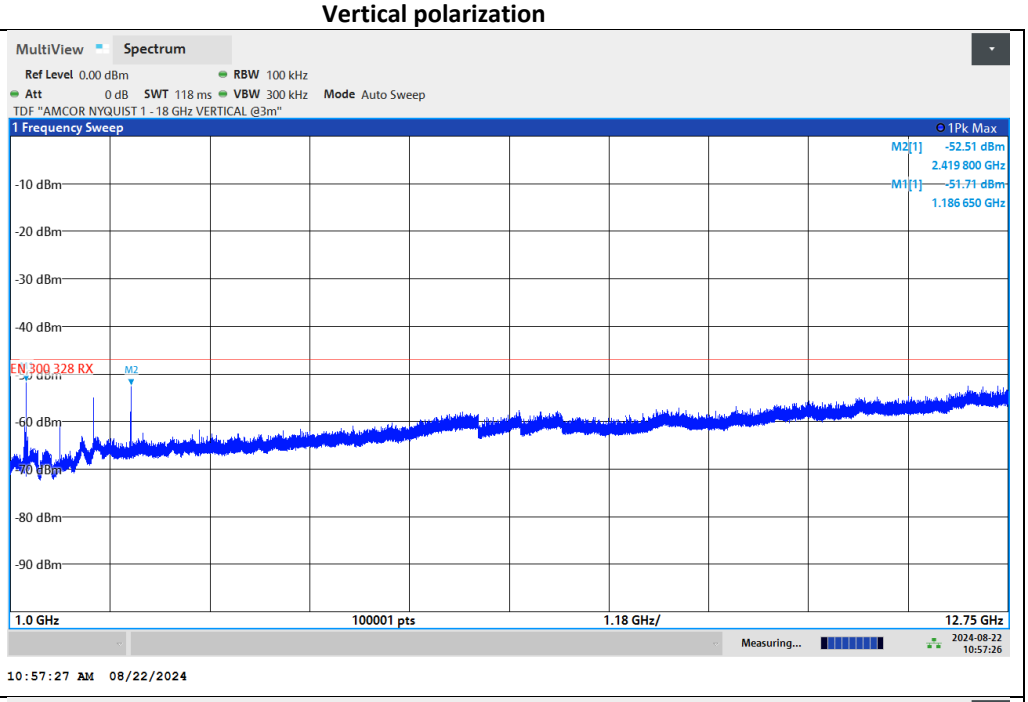
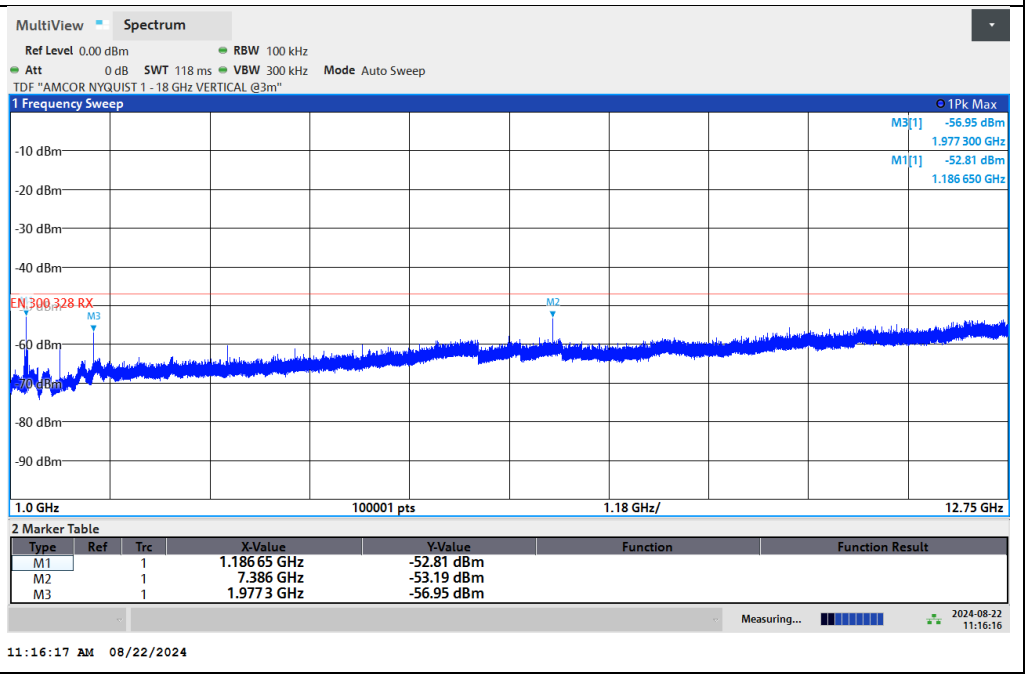
30 MHz to 1 GHz

Horizontal polarization

Low ch	
High ch	

1 GHz to 12.75 GHz

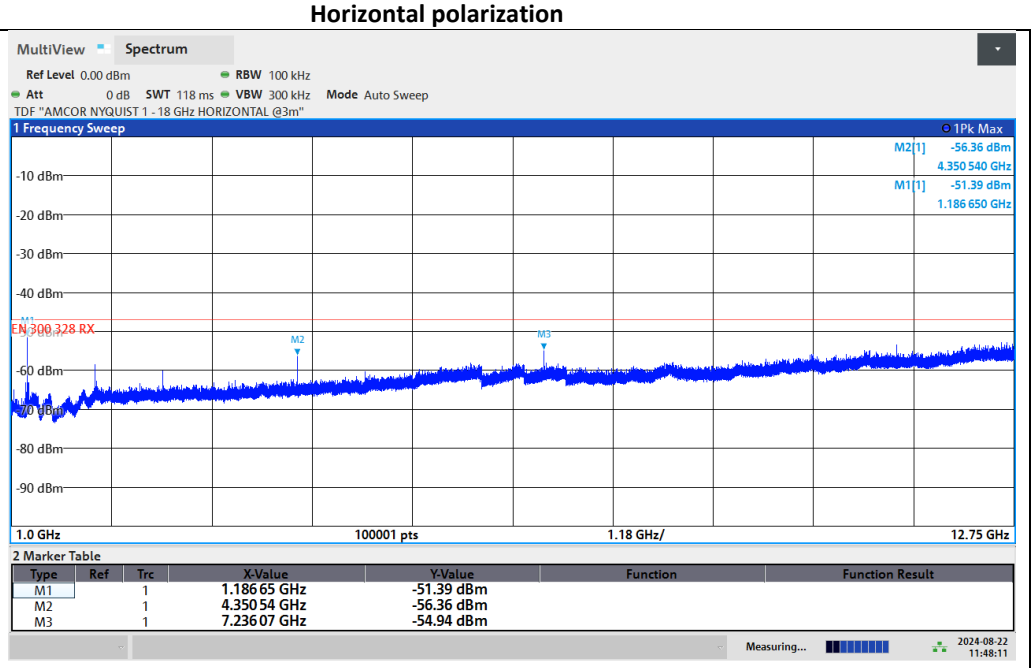
Vertical polarization

Low ch	
High ch	

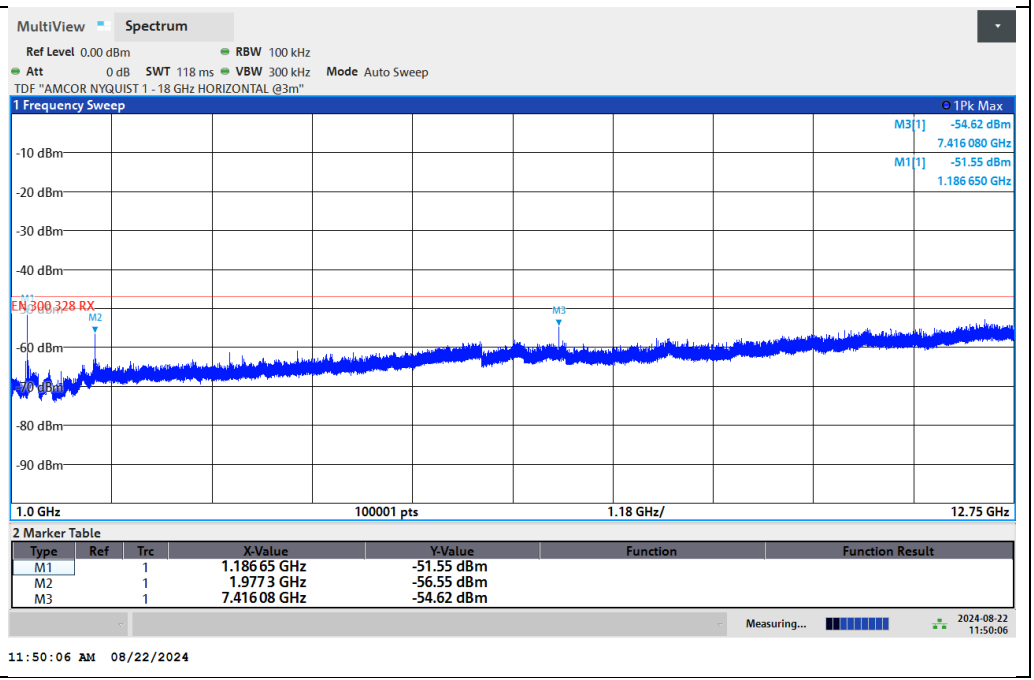
1 GHz to 12.75 GHz

Horizontal polarization

Low ch



High ch



Measured Peaks

Channel	Polarization	Frequency (MHz)	Pre-scan Level (dBm)	Final Level (dBm)	Limit (dBm)
Low channel	Horizontal	1.18665	-51.39	-56.7	-47
	Vertical	1.18665	-51.71	-55.8	-47
High channel	Horizontal	1.18665	-51.55	-56.2	-47
	Vertical	1.18665	-52.81	-57.3	-47

Note: If no peaks are found from EUT the final measurement is not performed. Only ambient noise is visible in the plots.

3.3 RF output power Measurement

3.3.1 Limit

The maximum RF output power = 20 dBm.

3.3.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.3.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.3.4 Test procedure

According to chapter 5.4.2 of EN 300 328 v2.2.2
IRN 402 – Method 3

3.3.5 Test Results of the RF output power Measurement

802.11b

Frequency (MHz)	Test conditions	Data rate	Output power (dBm) e.i.r.p.
2412	T_{nom} 20°C	1 Mbps	16.9
2442			16.83
2472			16.75
Uncertainty:	±1.0 dB		

802.11b

Frequency (MHz)	Test conditions	Data rate	Output power (dBm) e.i.r.p.
2412	T_{low} -20°C	1 Mbps	15.9
2442			9.9
2472			11.9
Uncertainty:	±1.0 dB		

802.11b

Frequency (MHz)	Test conditions	Data rate	Output power (dBm) e.i.r.p.
2412	T_{high} 55°C	1 Mbps	16.5
2442			13.7
2472			13.7
Uncertainty:	±1.0 dB		

3.4 99% Occupied Bandwidth

3.4.1 Limit

The occupied bandwidth shall fit completely inside the band 2400 – 2483.5 MHz.

3.4.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.4.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.4.4 Test procedure

According to chapter 5.4.7 of EN 300 328 v2.2.2
IRN 404 – Method 1

3.4.5 Test results of the 99% Occupied Bandwidth Measurement

Technology Std.	Channel	Frequency (MHz)	Data rate	99% OBW (kHz)	Uncertainty (kHz)
802.11b	1	2412	11 Mbps	13913.04	1376.73
	7	2442	11 Mbps	13913.04	1376.79
	13	2472	11 Mbps	13913.04	1376.85

3.5 Power Spectral Density

3.5.1 Limit

10 dBm per MHz.

3.5.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.5.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.5.4 Test procedure

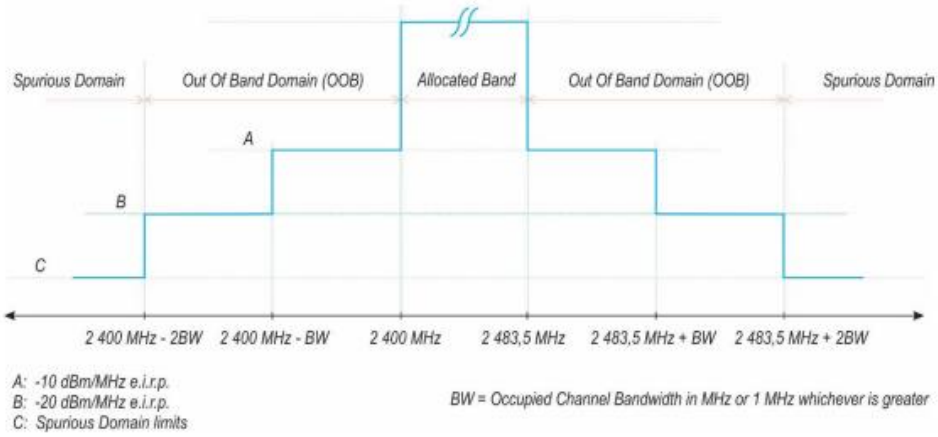
According to chapter 5.4.3 of EN 300 328 V2.2.2
IRN 412 – Method 4

3.5.5 Test results of Power Spectral Density Measurement

Technology Std.	Channel	Frequency (MHz)	Data rate	PSD (dBm /MHz) e.i.r.p.
802.11b	1	2412	11 Mbps	4.773
	7	2442		4.556
	13	2472		5.049
Uncertainty	±2.0 dB			

3.6 Out-of-Band Emissions

3.6.1 Limit



3.6.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.6.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.6.4 Test procedure

According to chapter 5.4.8 of EN 300 328 v2.2.2
IRN 409 – Method 3

3.6.5 Measurement Uncertainty

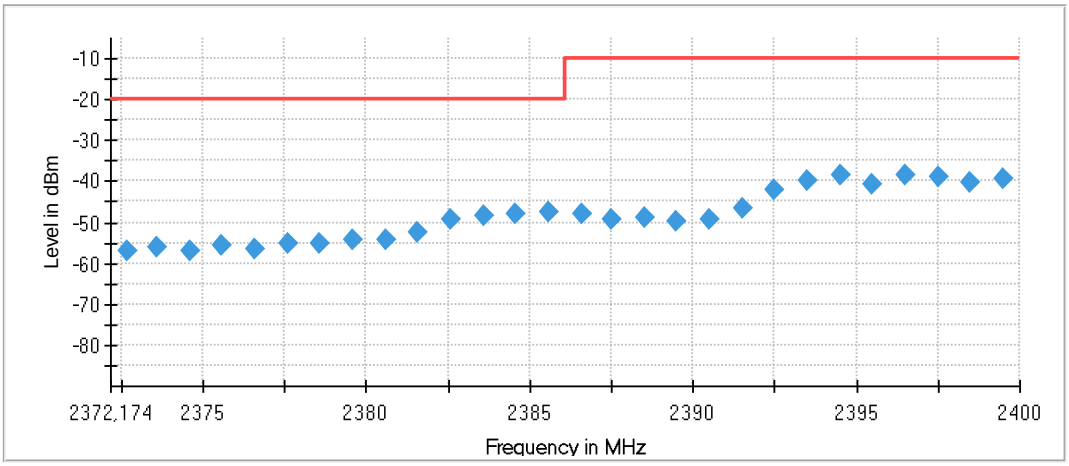
Measurement uncertainty: ±1.4 dB.

3.6.6 Test results of the OOB Measurements

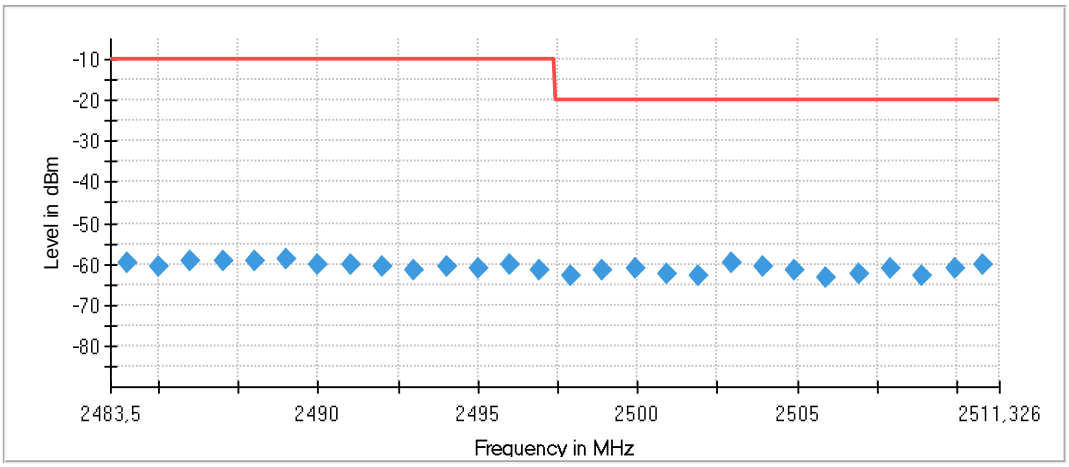
See next page.

802.11b 2412 MHz

Out of band low

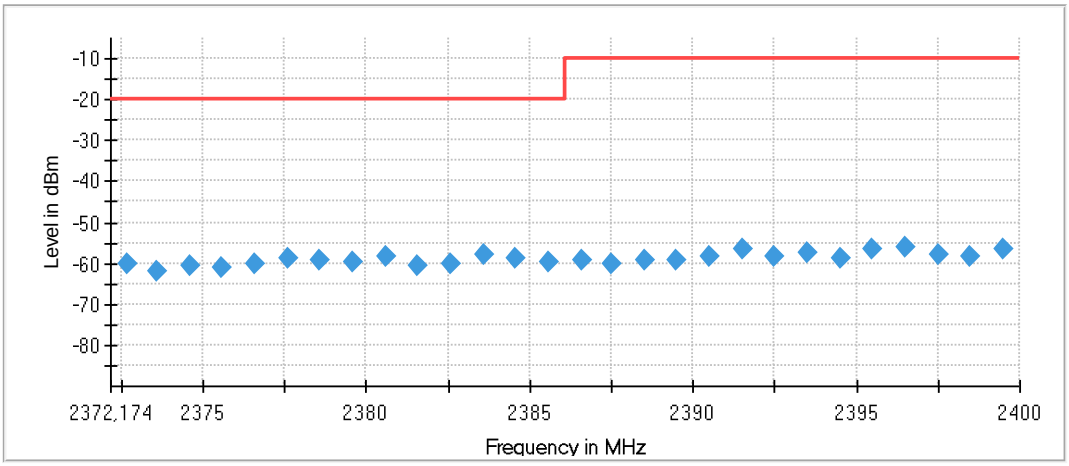


Out of band high

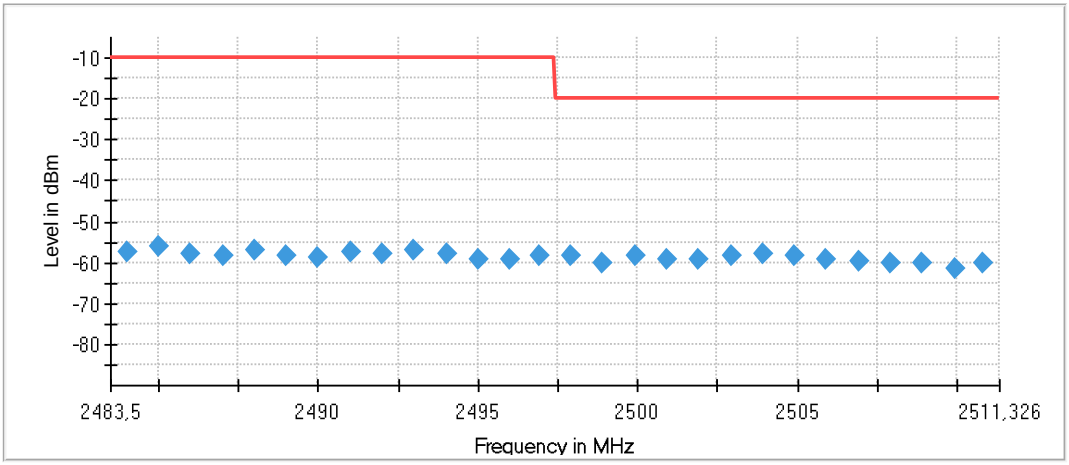


802.11b 2442 MHz

Out of band low

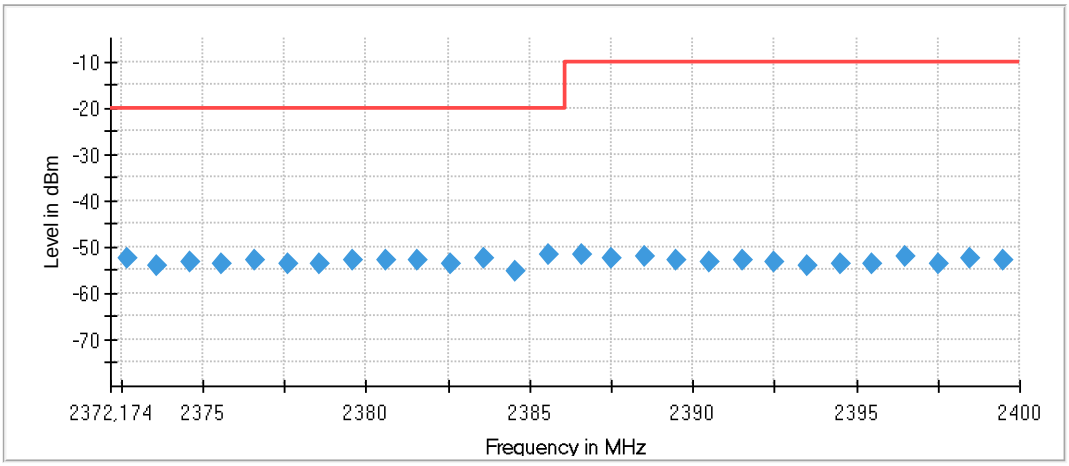


Out of band high

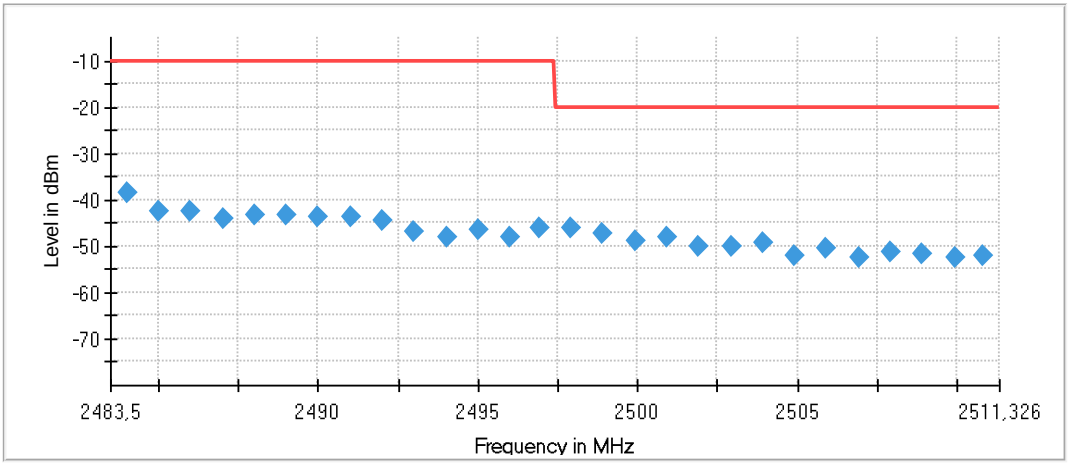


802.11b 2472 MHz

Out of band low



Out of band high



3.7 Receiver blocking measurement

3.7.1 Limit

10% Packet Error Rate at the blocking levels stated in EN 300 328 v2.2.2, chapter 4.3.2.11.

3.7.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.7.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.7.4 Test procedure

See EN 300 328 v2.2.2, clause 5.4.11.
IRN 407 – Method 1

3.7.5 Test results of the Receiver Blocking measurement

802.11b

Receiver category	Frequency of unwanted signal (MHz)	Minimum blocking level (dBm)	Applied blocking level (dBm)	Result
1	2300	-34.0	-34.0	Pass
	2330	-34.0	-34.0	Pass
	2360	-34.0	-34.0	Pass
	2380	-34.0	-34.0	Pass
	2504	-34.0	-34.0	Pass
	2524	-34.0	-34.0	Pass
	2584	-34.0	-34.0	Pass
	2674	-34.0	-34.0	Pass
Uncertainty:	+ 2.5/ -2.5 dB			

3.8 Adaptivity measurement

3.8.1 Limit

Limits applicable for load based equipment

Minimum CCA check duration	≥ 18 µs
Extended CCA check duration	Between 18 and 160 µs
Maximum channel occupancy time	13 ms
Energy detect threshold TL	$TL(\frac{dBm}{MHz}) = -70\frac{dBm}{MHz} + 10\log(\frac{100\ mW}{Pout})$
Short Control Signalling Transmissions maximum on-time	5 ms in any 50 ms observation period

Note: P_{out} is the transmit power of the transmitter in mW

3.8.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.8.3 Test setup

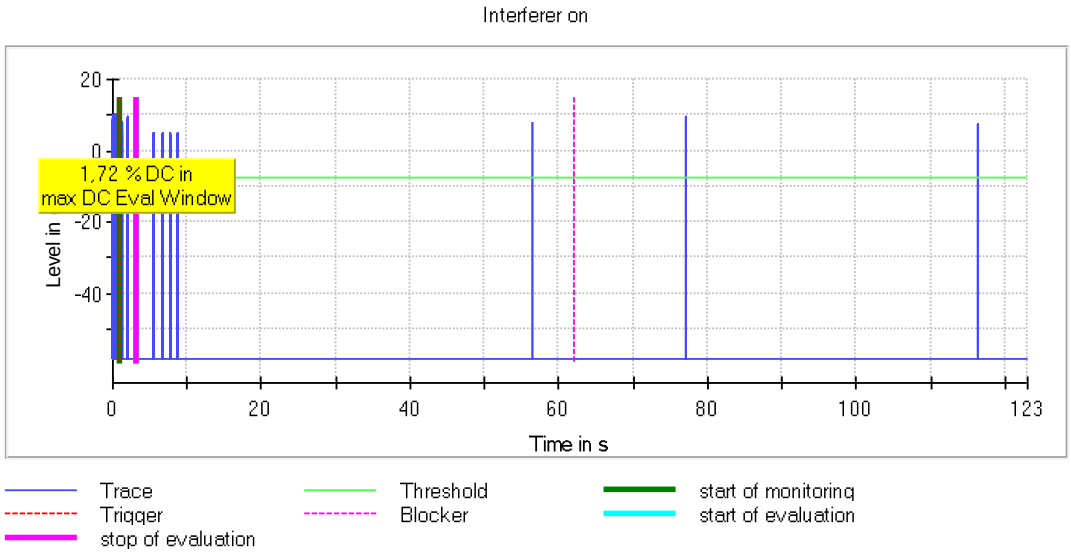
The test setup is as shown in chapter 2.3 of this report.

3.8.4 Test procedure

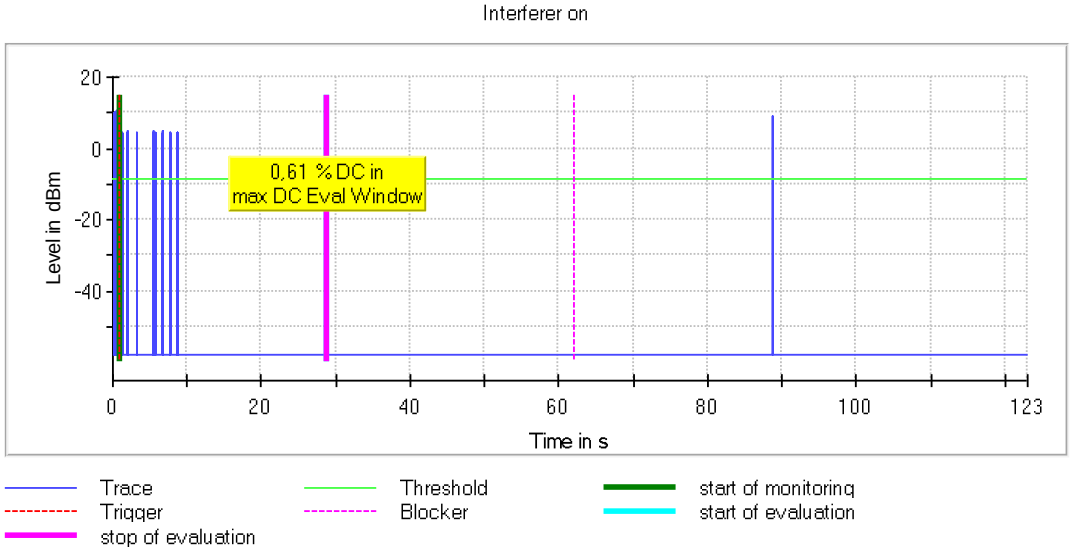
See EN 300 328 v2.2.2, clause 5.4.11.
IRN 413 – Method 3

3.8.5 Test results of the Adaptivity measurement

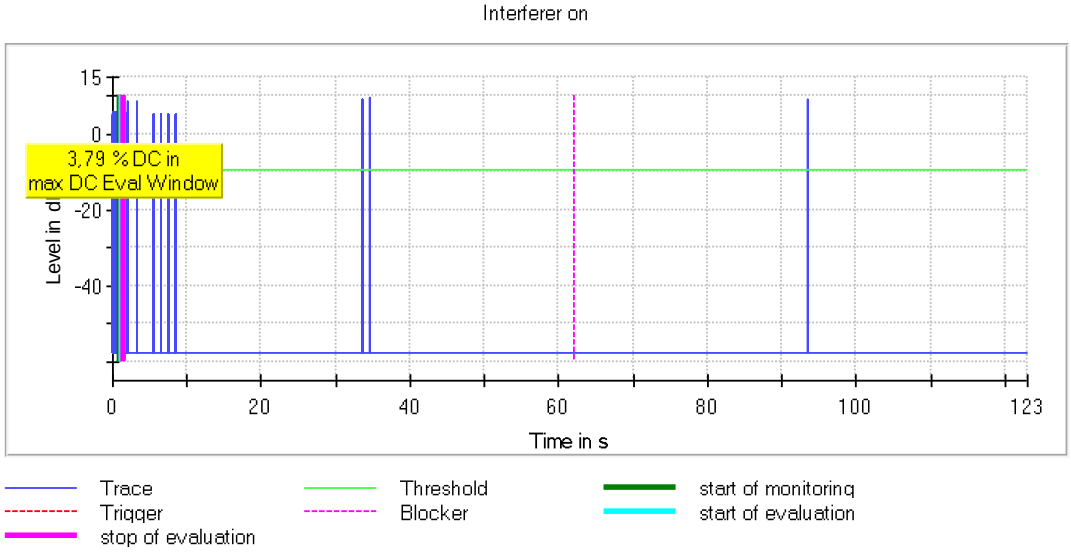
802.11b 2412MHz (Pass)



802.11b 2442MHz (Pass)



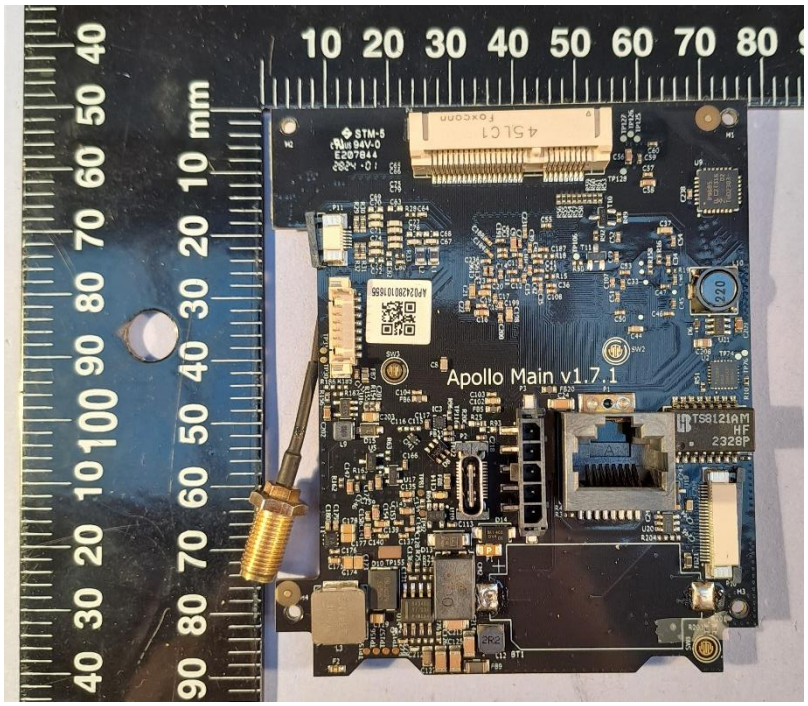
802.11b 2472MHz (Pass)



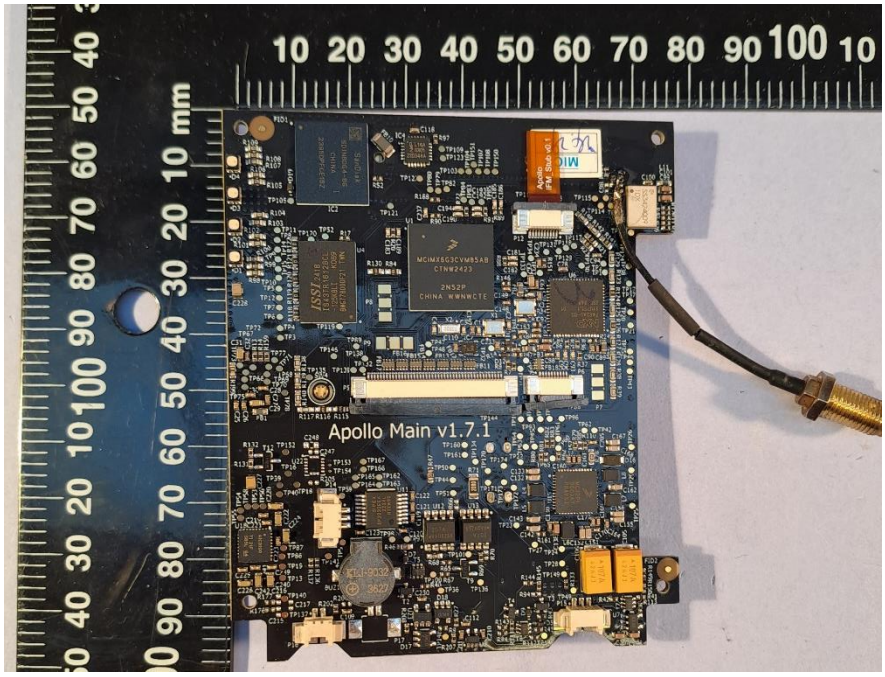
4 Photo Module

4.1 EUT photos

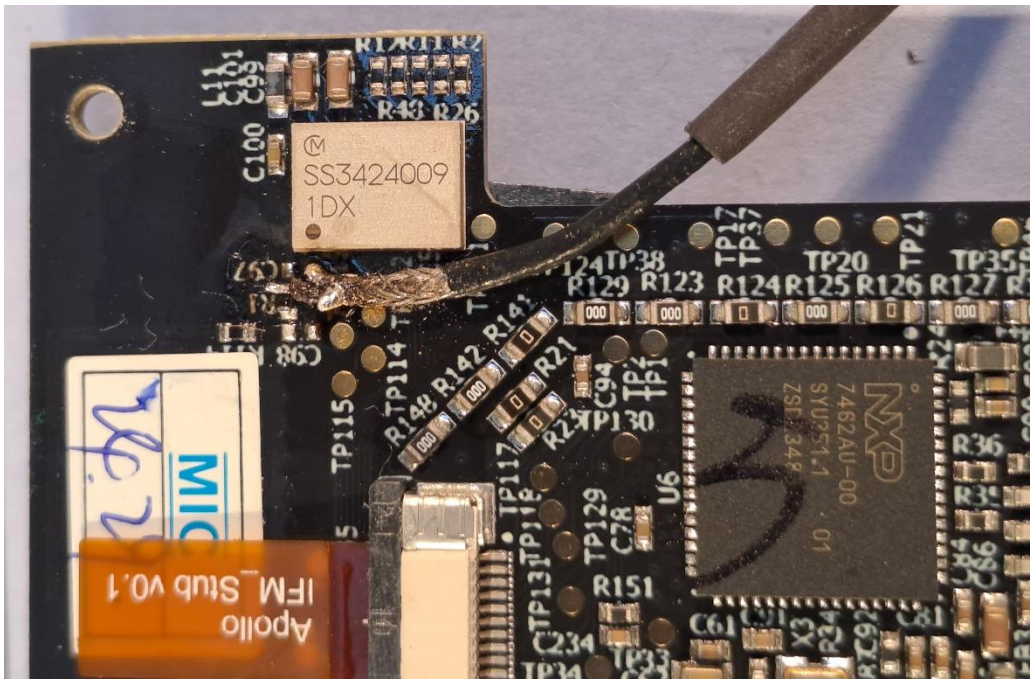
Board top



Board bottom

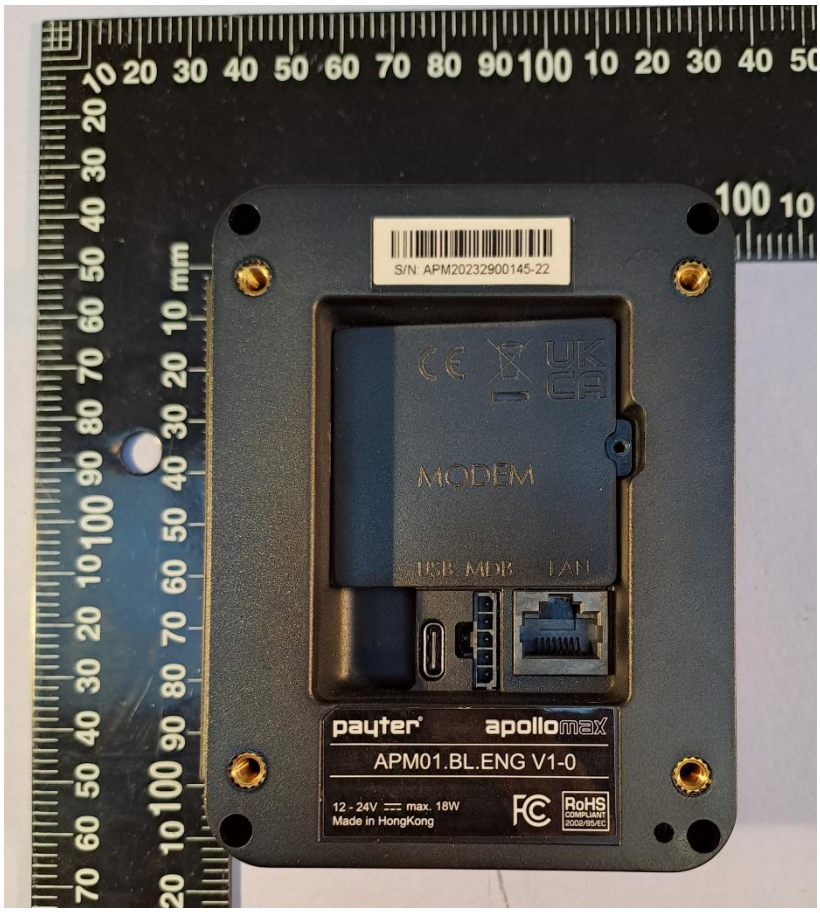


802.11b Rransceiver



EUT Top

EUT Back


S/N: APM20232900145-22
MODEM
USB MDB LAN
payter
apollomax
APM01.BL.ENG V1-0
12 - 24V max. 18W
Made in HongKong
RoHS

4.2 Test setup Photos

Radiated emissions 30-1000 MHz

Radiated emissions > 1 GHz

<END OF REPORT>>