Report No. 359526-01

Test Report
Radio Characteristics

Product	Development Kit
Name and address of the applicant	Nordic Semiconductor ASA Otto Nielsens vei 12, 7004 Trondheim, Norway
Name and address of the manufacturer	Nordic Semiconductor ASA Otto Nielsens vei 12, 7004 Trondheim, Norway
Model	nRF52-DK
Rating	3V Lithim battery or 5Vdc, 50mA (USB)
Trademark	Nordic Semiconductor
Serial number	682787661
Additional information	Bluetooth Low Energy
Tested according to	ETSI EN 300 328 v2.1.1 (2016-11) Draft ETSI EN 300 328 v2.2.0 (2017-11)
Order number	359526
Tested in period	2018.08.20 – 2018.08.23
Issue date	2018.08.28
Name and address of the testing laboratory	**Nemko Group** Nemko AS Gaustadalléen 30, P.O.Box 73 Blindern, 0314 Oslo, Norway Tel: +47 22 96 03 30 Fax: +47 22 96 05 50 **An accredited technical test executed under the Norwegian accreditation scheme**

Prepared by [G.Suhanthakumar]	Approved by [Frode Sveinsen]

Template version: B

CONTENTS

1 GENERAL INFORMATION

1.1 Test Information

Name :	Nordic Semiconductor
Model/version :	nRf52-DK
Serial number :	682787661
Hardware identity and/or version :	V1.2.1
Software identity and/or version :	35212
Adaptivity:	N/A
Frequency Range :	2402 - 2480 MHz
Number of Channels :	40
Channel Spacing :	2 MHz
Operating Mode :	Mode 4 : BLE2M , and Mode 5: NRF1M
Type of Modulation :	GFSK
Rated Output Power :	4 dBm @ 50 ohm
Power supply :	USB (5Vdc) or 3V lithium battery
Antenna Connector :	N/A (PCB antenna)
Number of Antennas :	1
Receiver:	Yes
Geo-Location capability:	Not implemented

Description of Tested Device(s)

The nRF52 DK is a single board development kit for *Bluetooth* low energy and 2.4GHz proprietary applications This kit supports development for the nRF52832 and nRF52810 SoC.

An NFC antenna can be connected the kit to enable NFC tag functionality. This test report does not cover NFC tesing. The kit gives access to all I/O and interfaces via connectors and has 4 LEDs and 4 buttons which are user-programmable.

1.2 Test Environment

1.2.1 Normal test condition

Temperature:	20.0 – 23.3 °C
Relative humidity:	20.0 – 44.0 %
Normal test voltage:	5Vdc (USB)

The values are the limit registered during the test period.

1.2.2 Extreme test conditions

Voltage

5Vdc (USB)

Temperature

Minimum Temp.:	+5 °C
Maximum Temp.:	+35 °C

Defined by the manufacturer.

1.3 Test Engineer

G.Suhanthakumar

1.4 Test Equipment

See list of test equipment in clause 8.

1.5 Other Comments

The EUT has been tested to ETSI EN 300 328 and all relevant tests are passed. The difference between V2.1.1 and draft version V2.2.0 is blocking test. This blocking test is performed according to both versions.

2 TEST REPORT SUMMARY

2.1 General

The tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with

EN 300 328 V2.1.1 (2016-11):
Wideband Transmission systems; Data transmission equipment operating in the 2.4 GHz ISM band and using spread spectrum modulation techniques: Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

EN 300 328 V2.2.0 (2017-11):
Wideband Transmission systems; Data transmission equipment operating in the 2.4 GHz ISM band and using wide band modulation techniques: Harmonised Standard for access to radio spectrum.

The test methods have been in accordance with TM-NO-WLS-500, TM-NO-WLS-204A and EN 300 328 where applicable.

Radiated tests were performed is accordance with TM-NO-WLS-500, TM-NO-WLS-204A and EN 300 328. Radiated emissions are made in a 3m anechoic chamber.

☒ Production Unit

☐ Pre-production Unit

3 Test Report Summary

3.1 Abbreviations

The following abbreviations are used in the test summary:

Pass The test results are inside the limits given in EN 300 328.
Fail The test results are outside the limits given in EN 300 328.
N/A Not applicable. The testcase is not applicable for the tested equipment.
N/T Not tested. The testcase is not covered by this test report.
U Unconditional.
C Conditional.

3.2 Test Summary

Harmonized Standard EN 300 328					
Technical Reqirement reference		**Technical Requirement Conditionality**		**Test Specification**	
Description	**Reference Clause No**	**U/C**	**Condition**	**Reference Clause No**	**Verdict (P/F/NA)**
RF Output Power	4.3.1.2 or 4.3.2.2	U		5.4.2	P
Power Spectral Density	4.3.2.3	C	Only for modulations other than FHSS	5.4.3	N/A[1]
Duty cycle, Tx-Sequence, Tx-gap	4.3.1.3 or 4.3.2.4	C	Only for non-adaptive equipment	5.4.2	N/A[1]
Accumlated Transmit time, Frequency Occupation & Hopping Sequence	4.3.1.4	C	Only for FHSS	5.4.4	N/A
Hopping Frequency Separation	4.3.1.5	C	Only for FHSS	5.4.5	N/A
Medium Utilisation	4.3.1.6 or 4.3.2.5	C	Only for non-adaptive equipment	5.4.2	N/A
Adaptivity	4.3.1.7 or 4.3.2.6	C	Only for adaptive equipment	5.4.6	N/A[1]
Occupied Channel Bandwidth	4.3.1.8 or 4.3.2.7	U		5.4.7	P
Transmitter unwanted emissions in the Out-of-Band domain	4.3.1.9 or 4.3.2.8	U		5.4.8	P
Transmitter unwanted emissions in the spurious domain	4.3.1.10 or 4.3.2.9	U		5.4.9	P
Receiver spurious emissions	4.3.1.11 or 4.3.2.9	U		5.4.10	P
Receiver Blocking	4.3.1.12 or 4.3.2.11	U		5.4.11	P
Geo-Location capability	4.3.1.13 or 4.3.2.12	C	If Implemented	X	N/A[2]

[1]: The eirp is less than 10 dBm

[2]: Not implemented.

4 Test Results

4.1 RF Output Power, Radiated (Mode 4 and 5)

ETSI EN 300 328 subclause 4.3.2.2

EIRP

nRF52832(Mode 4)

DUT Frequency (MHz)	Polarization	Max EIRP (dBm)	Limit (dBm)	Temperature (°C)	Result	Comment
2402.000000	HP	4.75	<= 20.0	23	PASS	XY plane
2440.000000	HP	3.81	<= 20.0	23	PASS	XY plane
2480.000000	HP	5.58	<= 20.0	23	PASS	XY plane

50% duty cycle (Peak Power)

NRF1M(Mode 5)

DUT Frequency (MHz)	Polarization	Max EIRP (dBm)	Limit (dBm)	Temperature (°C)	Result	Comment
2402.000000	HP	4.14	<= 20.0	23	PASS	XY plane
2440.000000	HP	4.48	<= 20.0	23	PASS	XY plane
2480.000000	HP	4.91	<= 20.0	23	PASS	XY plane

57.6 % duty cycle (Peak Power)

The maximum eirp is observed in Horizontal polarization & XY plane.

Limits: Clause 4.3.2.2.3

Maximum Effective Radiated Power shall be less than or equal to 100 mW (20 dBm) e.i.r.p.

Test Equipment Used: 2,8,9

4.2 RF Output Power, Conducted - nRF52832(Mode 4)

ETSI EN 300 328 subclause 4.3.2.2

Manufacturer stated antenna gain 0 dBi is used to determine EIRP.

Nominal

DUT Frequency (MHz)	Max Burst RMS Power (dBm)	Max EIRP (dBm	Limit (dBm)	Temperature (°C)	Result	Comment
2402	3.6	3.6	<= 20.0	21.0	PASS	
2440	3.6	3.6	<= 20.0	21.0	PASS	
2480	3.5	3.5	<= 20.0	21.0	PASS	

5° C, 1.7Vdc

DUT Frequency (MHz)	Max Burst RMS Power (dBm)	Max EIRP (dBm	Limit (dBm)	Temperature (°C)	Result	Comment
2402	3.9	3.9	<= 20.0	5.0	PASS	
2440	4.0	4.0	<= 20.0	5.0	PASS	
2480	3.9	3.9	<= 20.0	5.0	PASS	

5° C, 5Vdc

DUT Frequency (MHz)	Max Burst RMS Power (dBm)	Max EIRP (dBm	Limit (dBm)	Temperature (°C)	Result	Comment
2402	3.9	3.9	<= 20.0	5.0	PASS	
2440	3.9	3.9	<= 20.0	5.0	PASS	
2480	3.9	3.9	<= 20.0	5.0	PASS	

35° C, 1.7Vdc

DUT Frequency (MHz)	Max Burst RMS Power (dBm)	Max EIRP (dBm	Limit (dBm)	Temperature (°C)	Result	Comment
2402	3.5	3.5	<= 20.0	35.0	PASS	
2440	3.5	3.5	<= 20.0	35.0	PASS	
2480	3.4	3.4	<= 20.0	35.0	PASS	

35° C, 5Vdc

DUT Frequency (MHz)	Max Burst RMS Power (dBm)	Max EIRP (dBm	Limit (dBm)	Temperature (°C)	Result	Comment
2402	3.5	3.5	<= 20.0	35.0	PASS	
2440	3.5	3.5	<= 20.0	35.0	PASS	
2480	3.4	3.4	<= 20.0	35.0	PASS	

Limits: Clause 4.3.2.2

Maximum Equivalent Isotropic Radiated Power shall be less than or equal to 100 mW (20 dBm)

Test Equipment Used: 2, 12

4.3 Power Spectral Density

ETSI EN 300 328 subclause 4.3.2.3

N/A (eirp is less than 10 dBm)

Limits: Clause 4.3.2.3.3

The maximum power spectral density is limited to 10 dBm per MHz

Test Equipment Used: -

4.4 Duty Cycle,TX-Sequence, TX-gap

ETSI EN 300 328 subclause 4.3.2.4

Test Results : N/A

This requirement is not applicable for using FHSS and using DSSS with RF output power less than 10 dBm e.i.r.p. But applicable to non-adaptive equipment or to adaptive equipment when operating in a non- adaptive mode.

Limits: Clause 4.3.2.4.3

The Duty cycle shall be equal to or less than the maximum value declared by the supplier. The TX- sequence time shall be equal to or less than 10ms. The minimum Tx-gap time following a Tx-sequence shall be equal to the duration of that proceeding Tx-sequence with minimum of 3.5ms.

4.5 Medium Utilisation (MU) factor

ETSI EN 300 328 subclause 4.3.2.5

Test Results: N/A

This requirement is not applicable for Adaptive Equipments, using FHSS and RF out-put power less than 10 dBm e.i.r.p.

Limits: Clause 4.3.2.5.3

For non-adaptive equipment using wide band modulations other than FHSS, the maximum Medium Utilisation factor shall be 10 %.

Test Equipment Used: /

4.6 Adaptivity

ETSI EN 300 328 subclause 4.3.2.6

Cl.4.3.2.6.2 – Non-LBT based Detect and Avoid : N/A

Test results: N/A

Limits: clause 4.3.2.6.2.2.2

Cl.4.3.2.6.3 – LBT based Detect and Avoid: N/A

Frame Based equipment: -

Test results : N/A

Load based equipment : N/A

Test results : N/A

Limits: clause 4.3.2.6.3.2.2, for Frame based equipment

Limits: clause 4.3.2.6.3.2.3, for Load based equipment

Cl.4.3.2.6.4 – Short Control Signalling Transmissions: N/A

Test results : N/A

Limits: Clause 4.3.2.6.4.2

Test Equipment Used: N/A

4.7 Occupied Channel Bandwidth

ETSI EN 300 328 subclause 4.3.2.7

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Limit Min BE L (MHz)	Band Edge Right (MHz)
2402.000	1.88	---	---	2401.054726	2400.000000	2402.935323
2440.000	1.89	---	---	2439.054726	2400.000000	2440.945274
2480.000	1.89	---	---	2479.054726	2400.000000	2480.945274

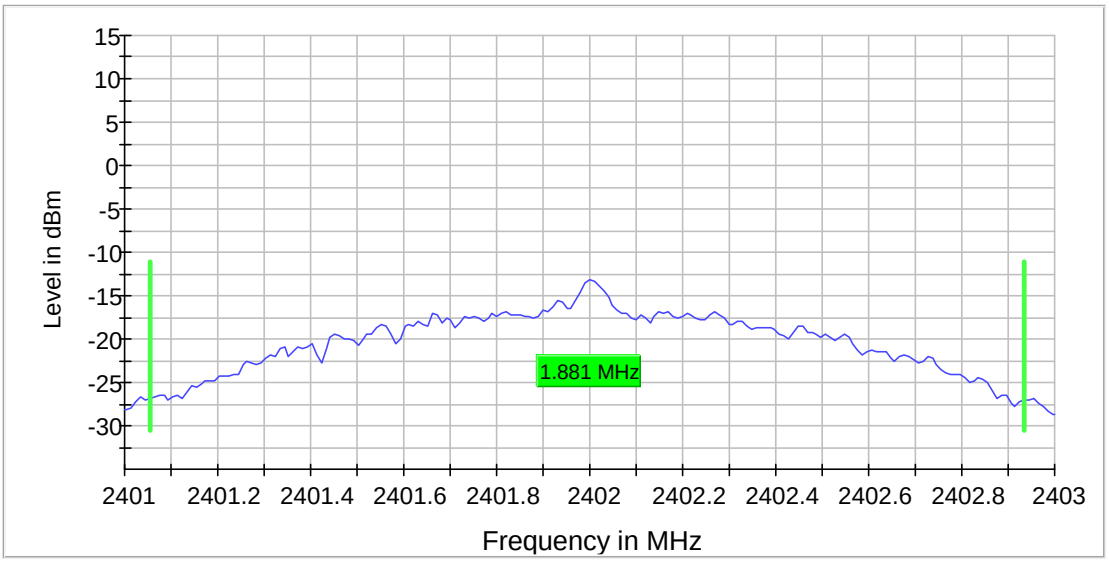
Limits: Clause 4.3.2.7.3

The Occupied Channel Bandwidth shall fall completely within the 2400 – 2483.5 MHz band.

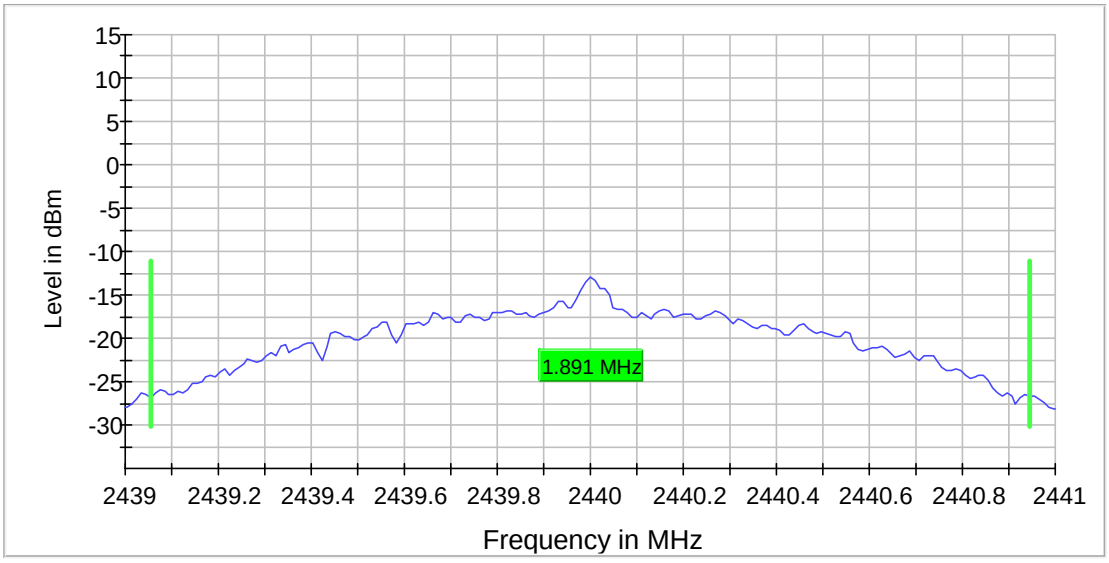
In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz

Test Equipment Used: 1,2,5

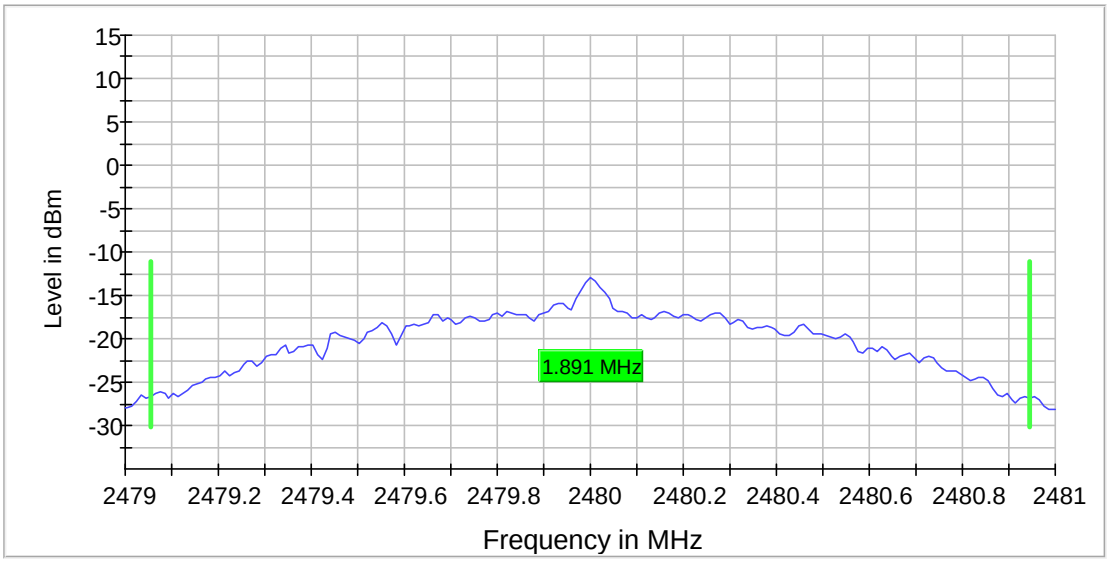
Low Frequency



Middle Frequency



High Frequency



4.8 Transmitter unwanted emissions in the Out-of-band domain

ETSI EN 300 328 subclause 4.3.2.8

Ch2402MHz

Frequency (MHz)	level (dBm)	Limit (dBm)	Result
2396.738806	-48.2	-20.0	PASS
2397.619403	-45.3	-20.0	PASS
2398.619403	-44.0	-10.0	PASS
2399.500000	-33.5	-10.0	PASS
2484.000000	-53.4	-10.0	PASS
2484.880597	-53.9	-10.0	PASS
2485.880597	-54.5	-20.0	PASS
2486.761194	-54.1	-20.0	PASS

Ch2480MHz

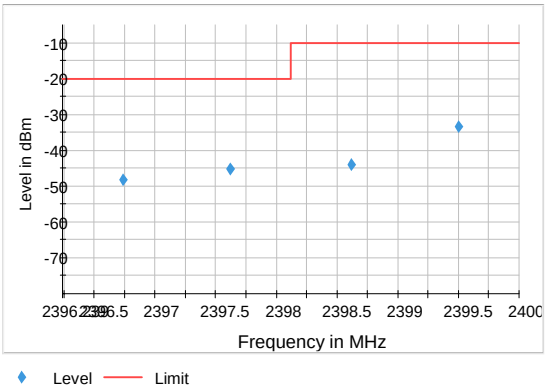
Frequency (MHz)	level (dBm)	Limit (dBm)	Result
2396.718904	-52.8	-20.0	PASS
2397.609452	-53.5	-20.0	PASS
2398.609452	-53.8	-10.0	PASS
2399.500000	-54.9	-10.0	PASS
2484.000000	-45.6	-10.0	PASS
2484.890548	-45.8	-10.0	PASS
2485.890548	-46.7	-20.0	PASS
2486.781096	-47.3	-20.0	PASS

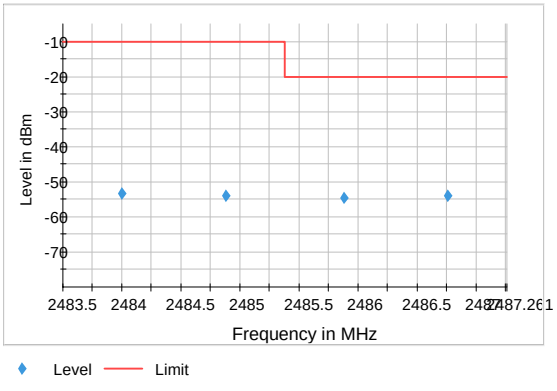
Limits: Clause 4.3.2.8.3

Out of Band Domain	Limit (dBm/MHz)
A	-10 dBm/MHz e.i.r.p.
B	-20 dBm/MHz e.i.r.p.

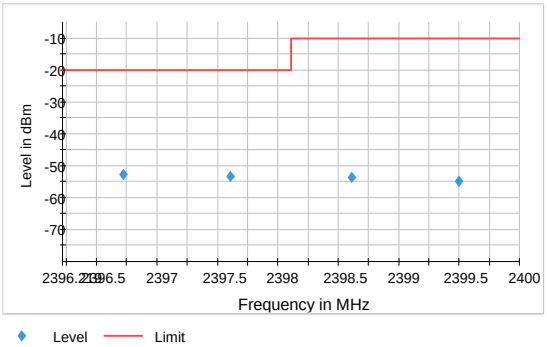
Test Equipment Used: 1,2,5

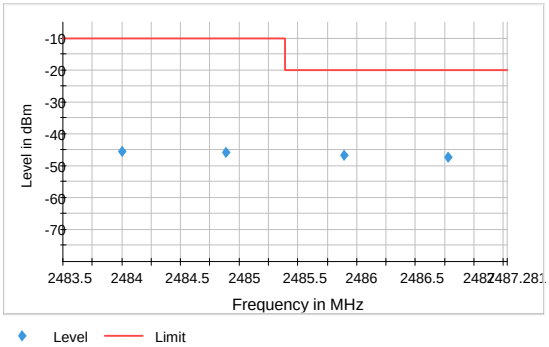
Ch2402MHz





Ch2480MHz





4.9 Transmitter spurious emissions - Radiated (Operating) – Mode4

ETSI EN 300 328 subclause 4.3.2.9

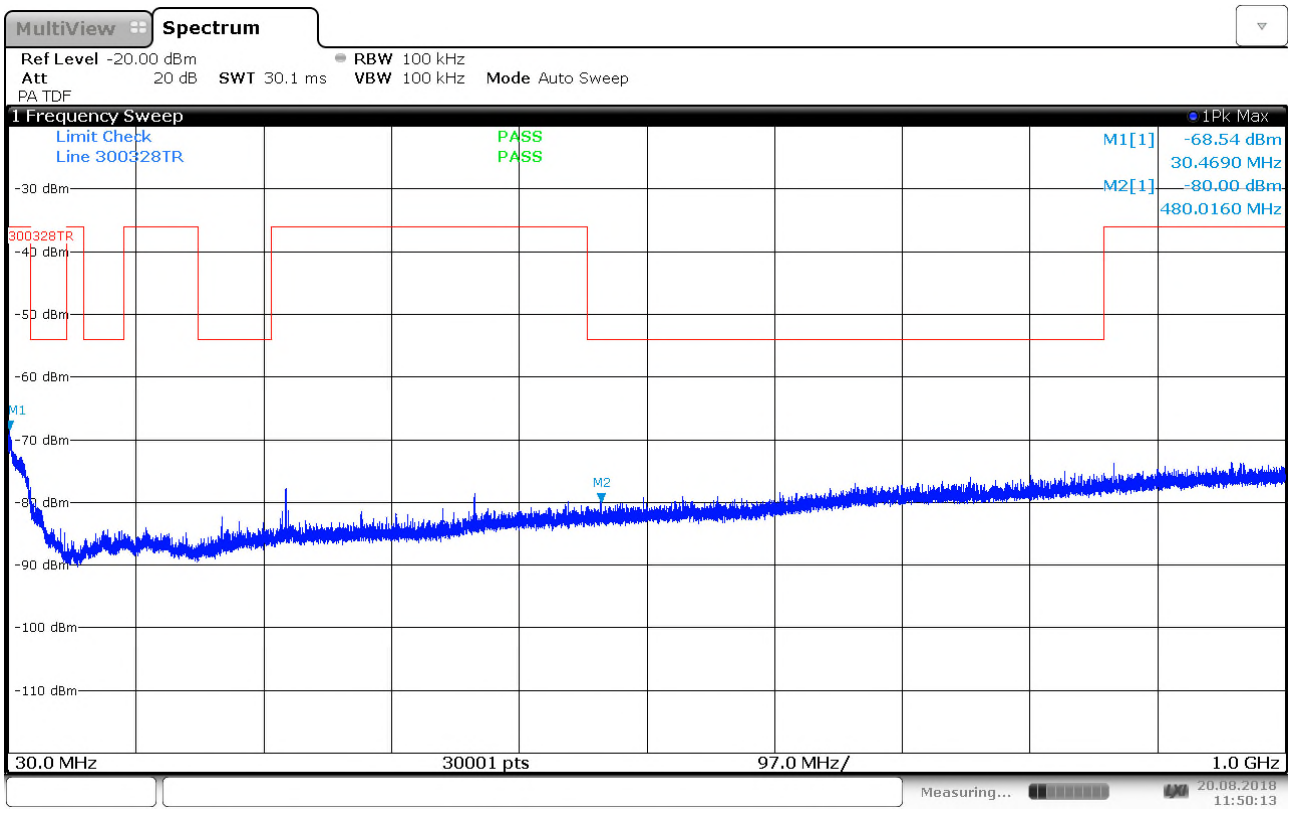
Frequency (MHz)	Detector	Polarization	Spurious Emission Level (dBm)
30 – 1000 (all others)	PK	VP/HP	< -60
1000 – 12750 (all others)	PK	VP/HP	< -36
Measurement uncertainty			**≤ 2GHz - ± 1.1 dB** **2GHz - 18 GHz - ± 2.0 dB**

Mode 4: BLE2Mps. Regulator DC

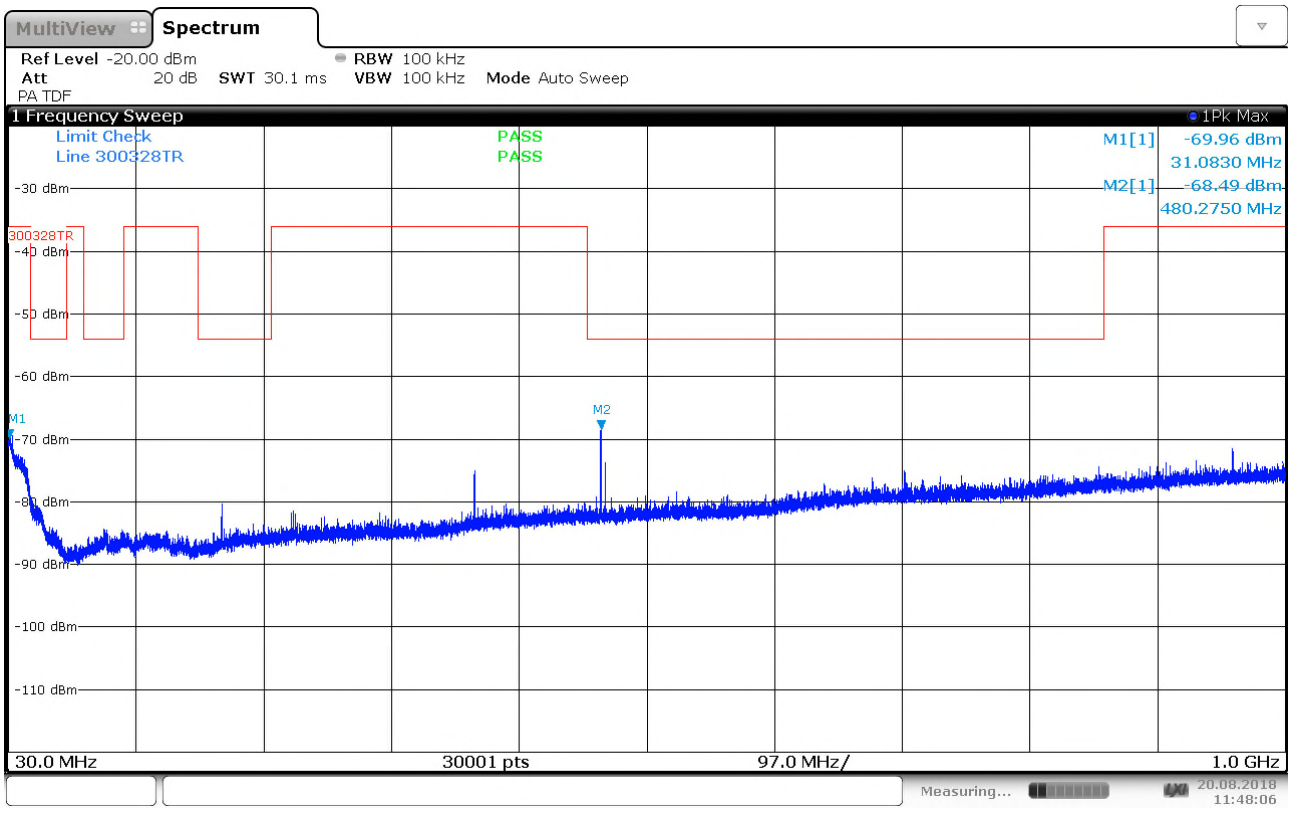
Limits: Clause 4.3.2.9.3

Frequency Range	Maximum power e.r.p. (≤ 1 GHz) e.i.r.p (> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87.5 MHz	-36 dBm	100 kHz
87.5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12.75 GHz	-30 dBm	1 MHz

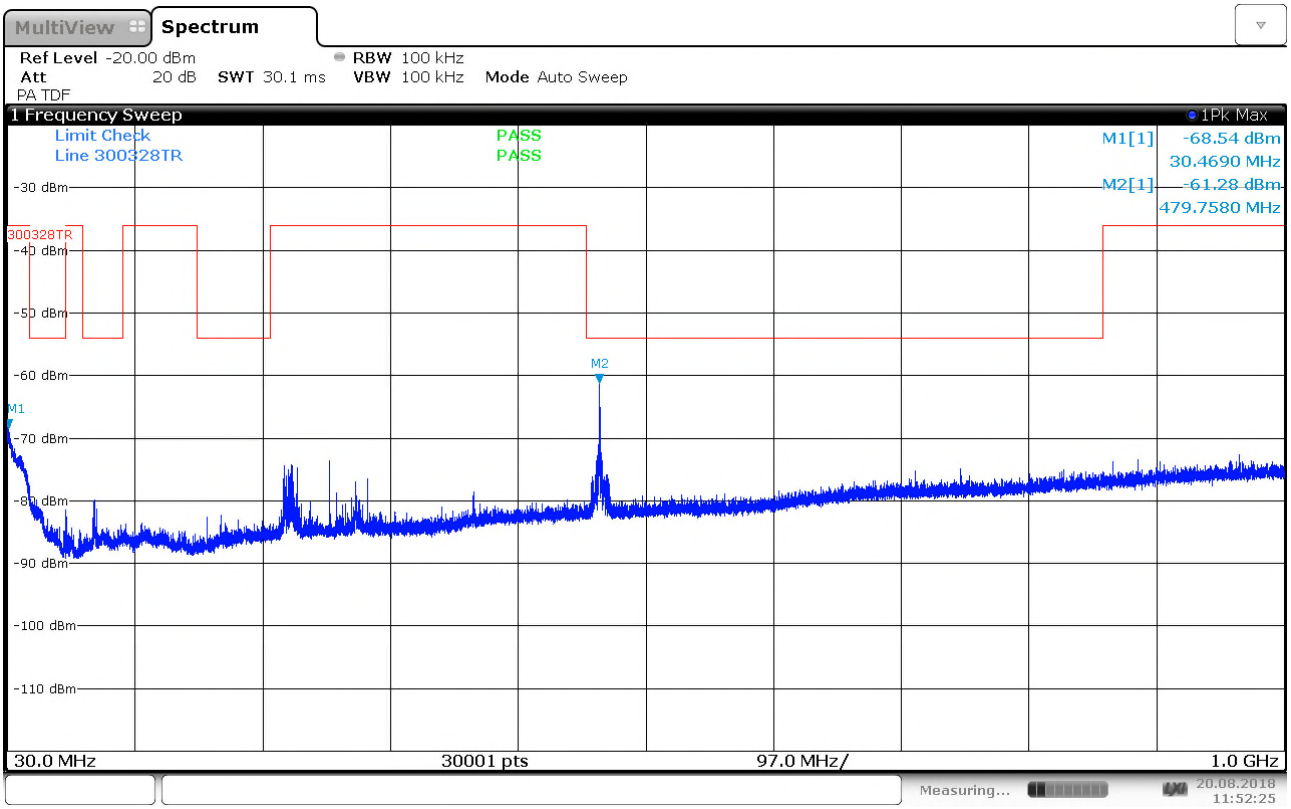
Test Equipment Used:6,9,10,11



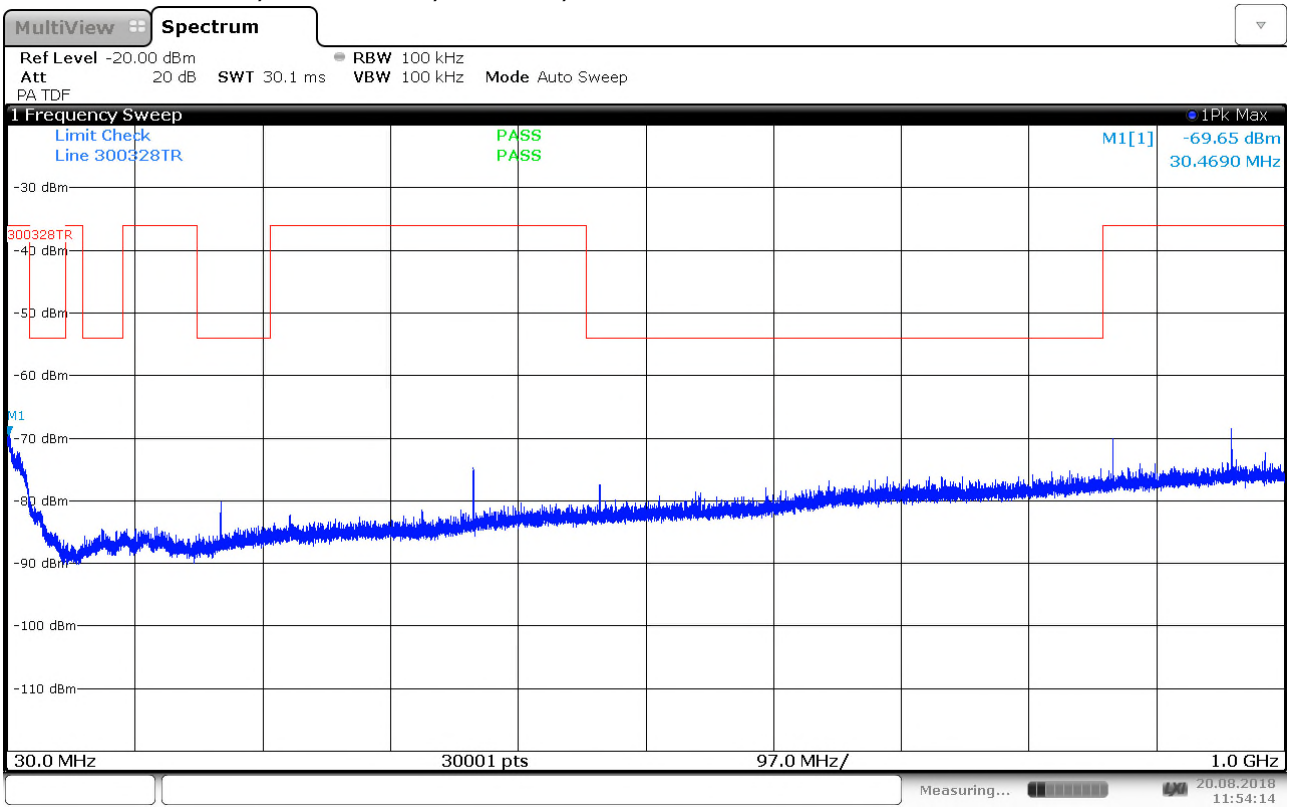
Radiated Emissions, 30 -1000MHz, 2402MHz, VP



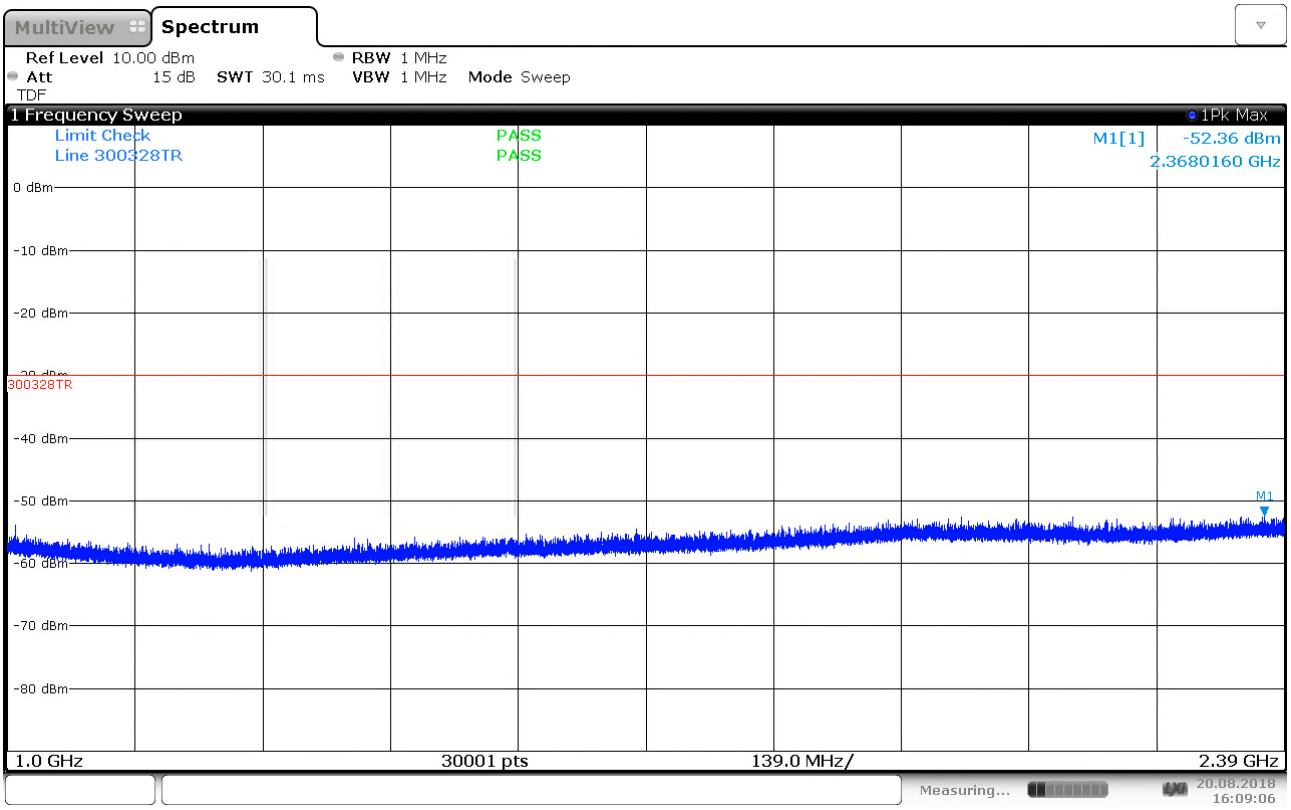
Radiated Emissions, 30 -1000MHz, 2402MHz, HP



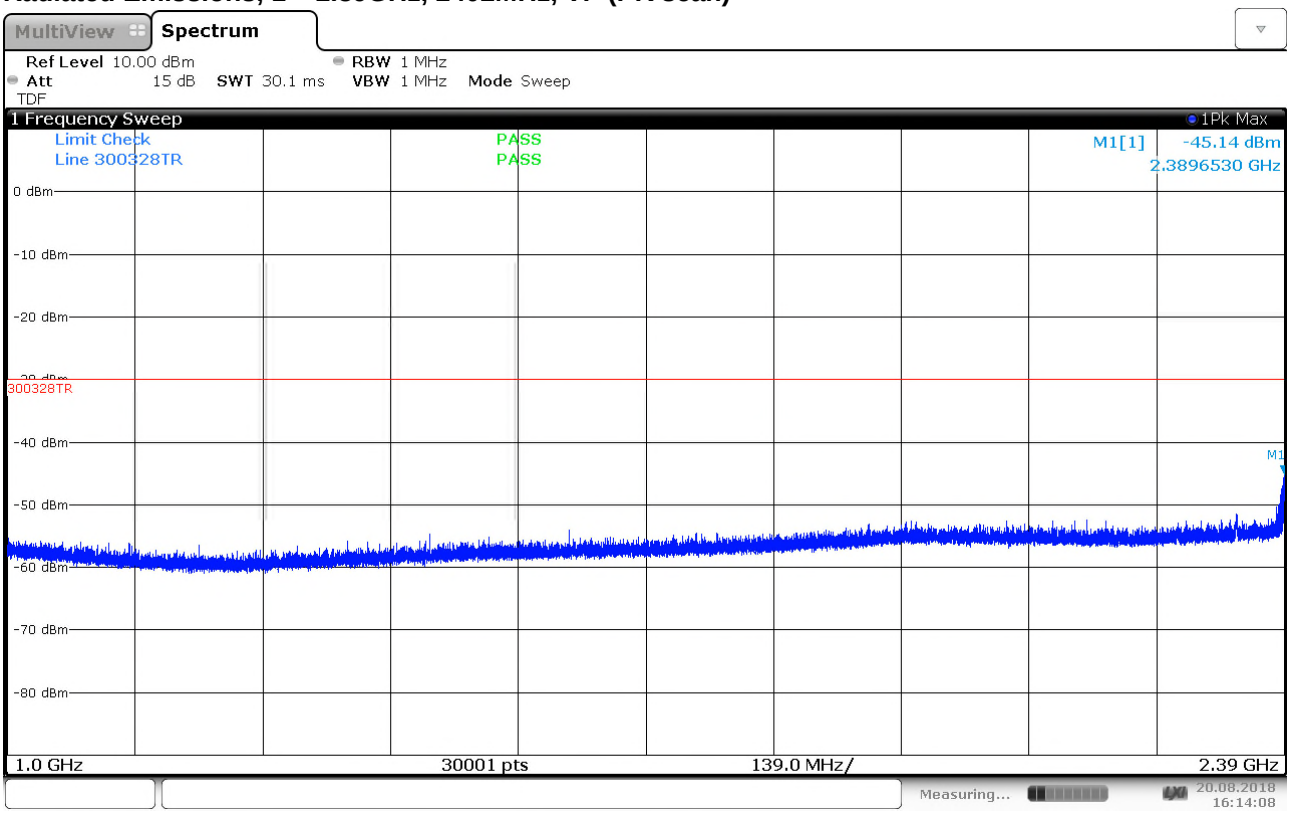
Radiated Emissions, 30 -1000MHz, 2480MHz, VP



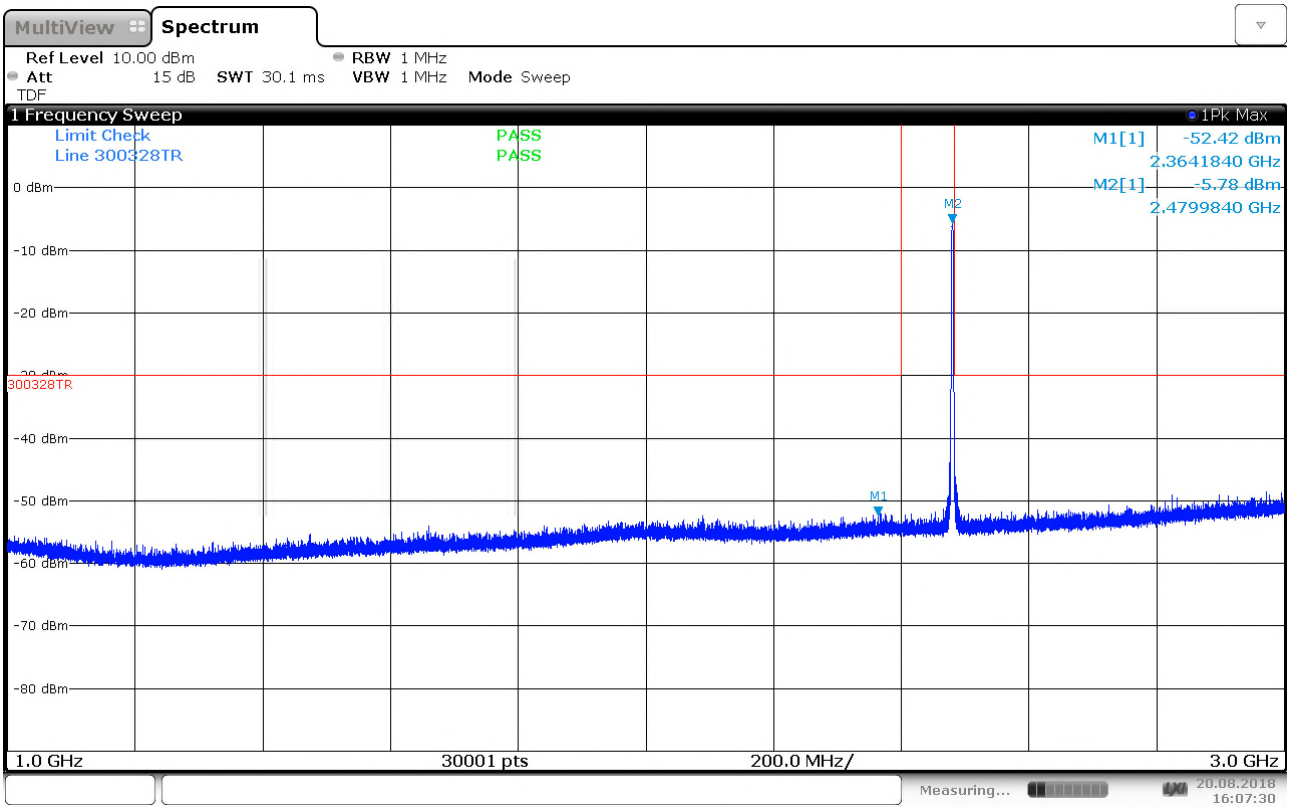
Radiated Emissions, 30 -1000MHz, 2480MHz, HP



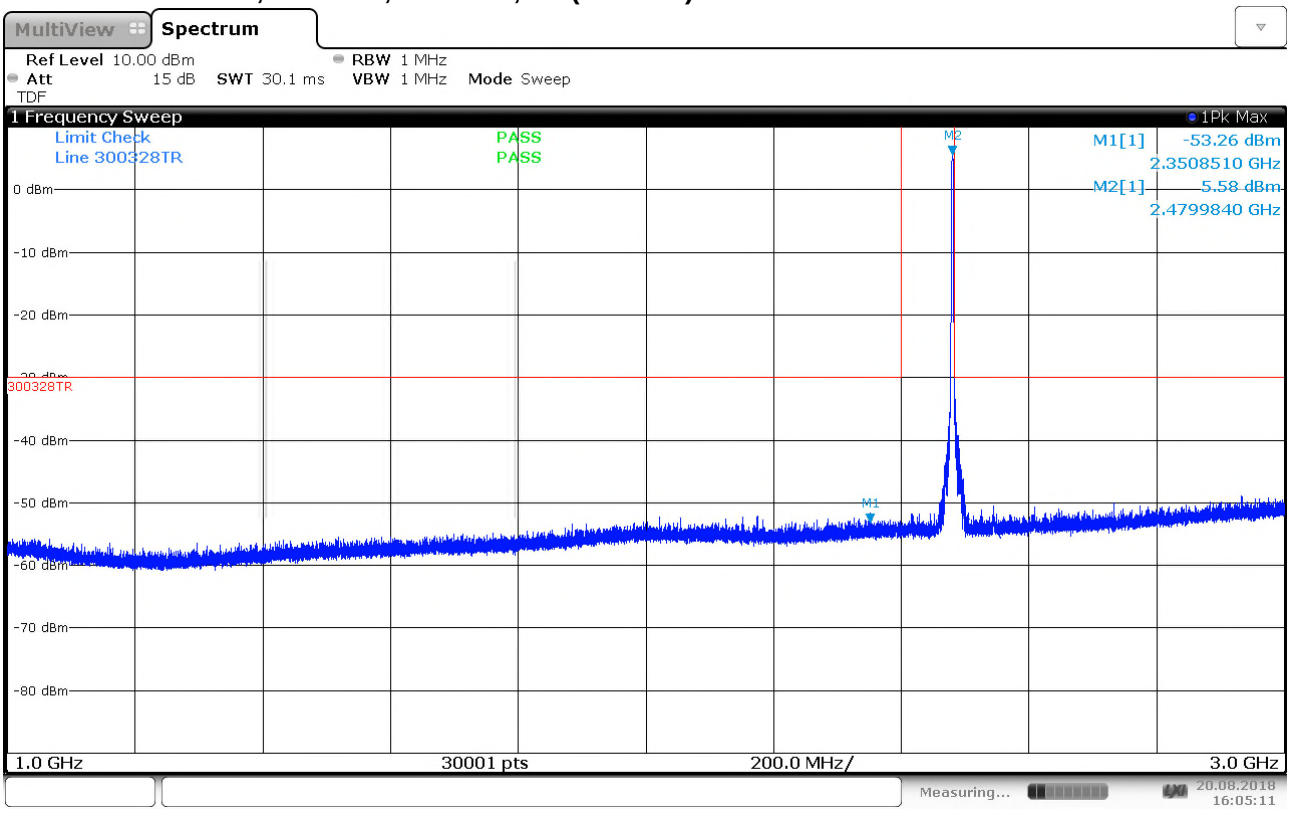
Radiated Emissions, 1 – 2.39GHz, 2402MHz, VP (PK scan)



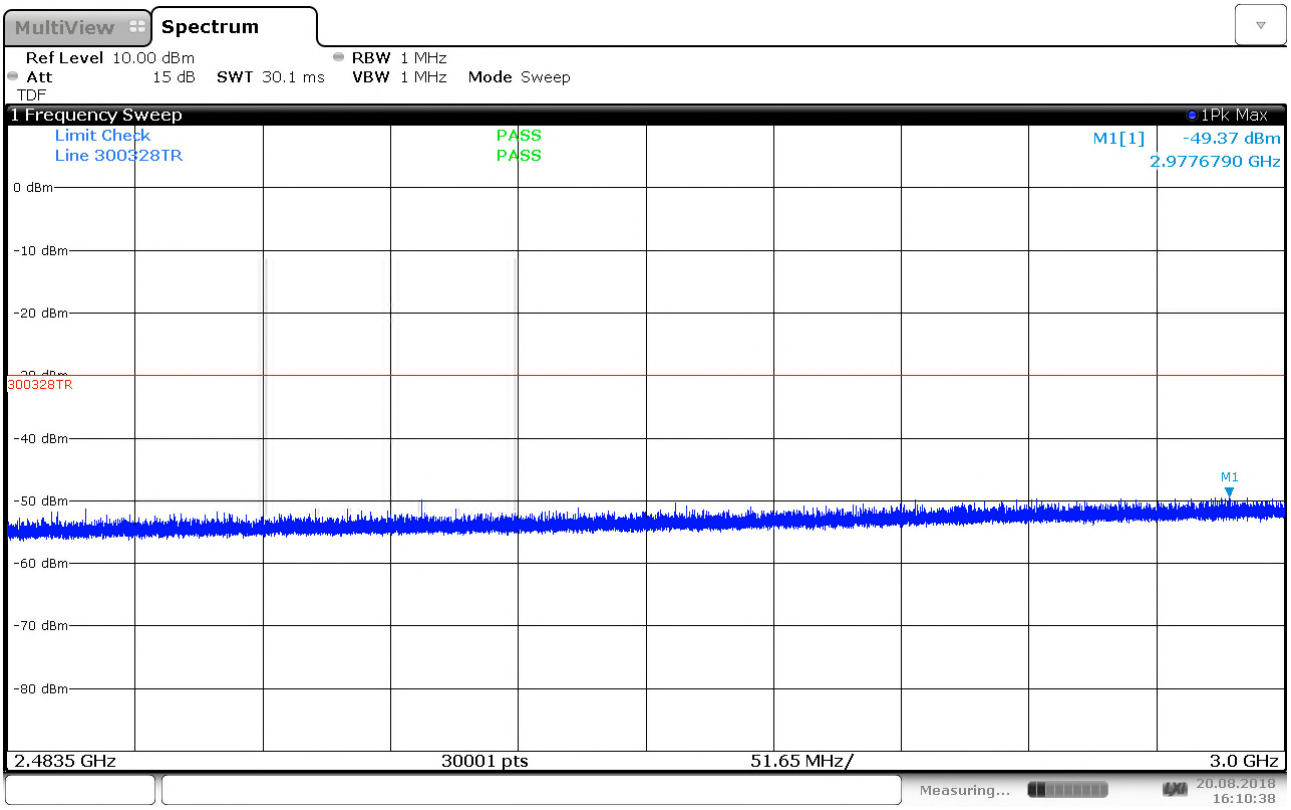
Radiated Emissions, 1 – 2.39GHz, 2402MHz, HP (PK scan)



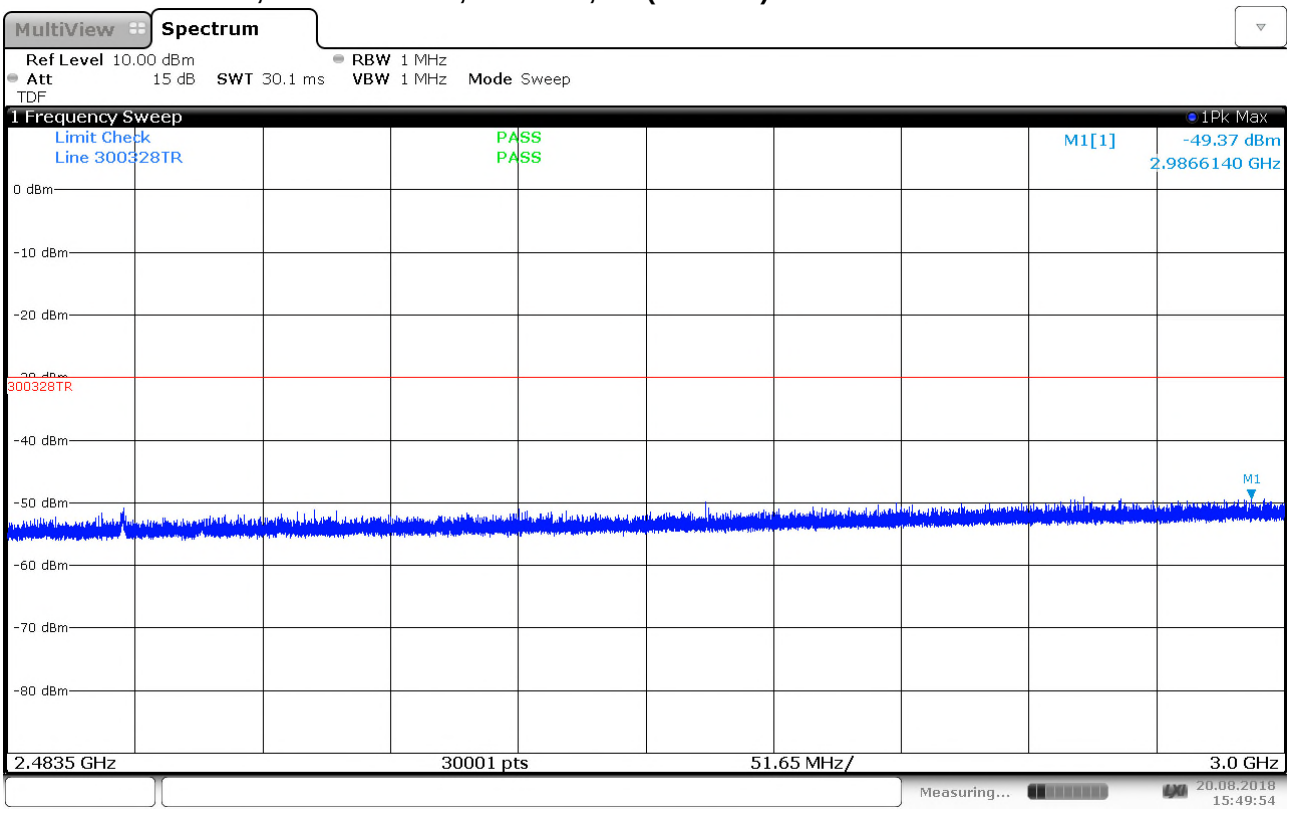
Radiated Emissions, 1 – 3GHz, 2480MHz, VP (PK scan)



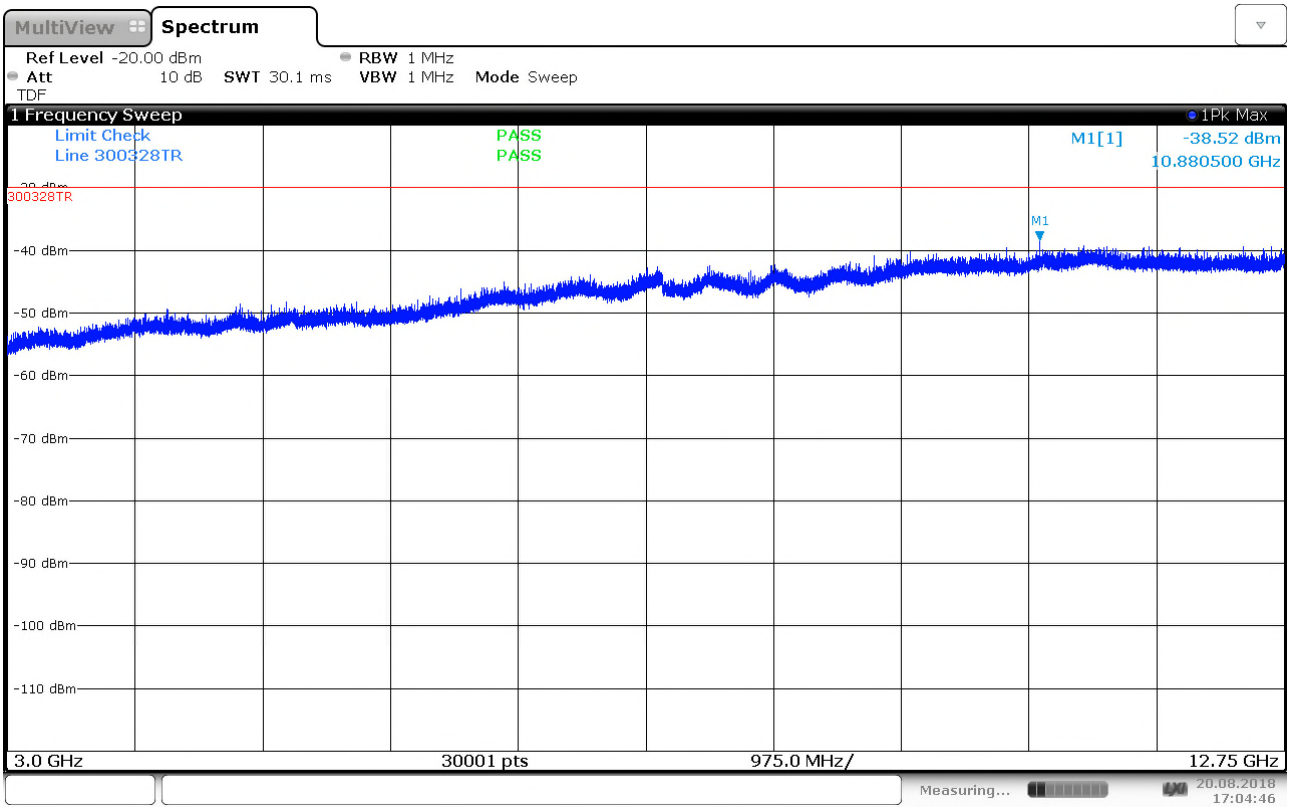
Radiated Emissions, 1 - 3GHz, 2480MHz, HP (PK scan)



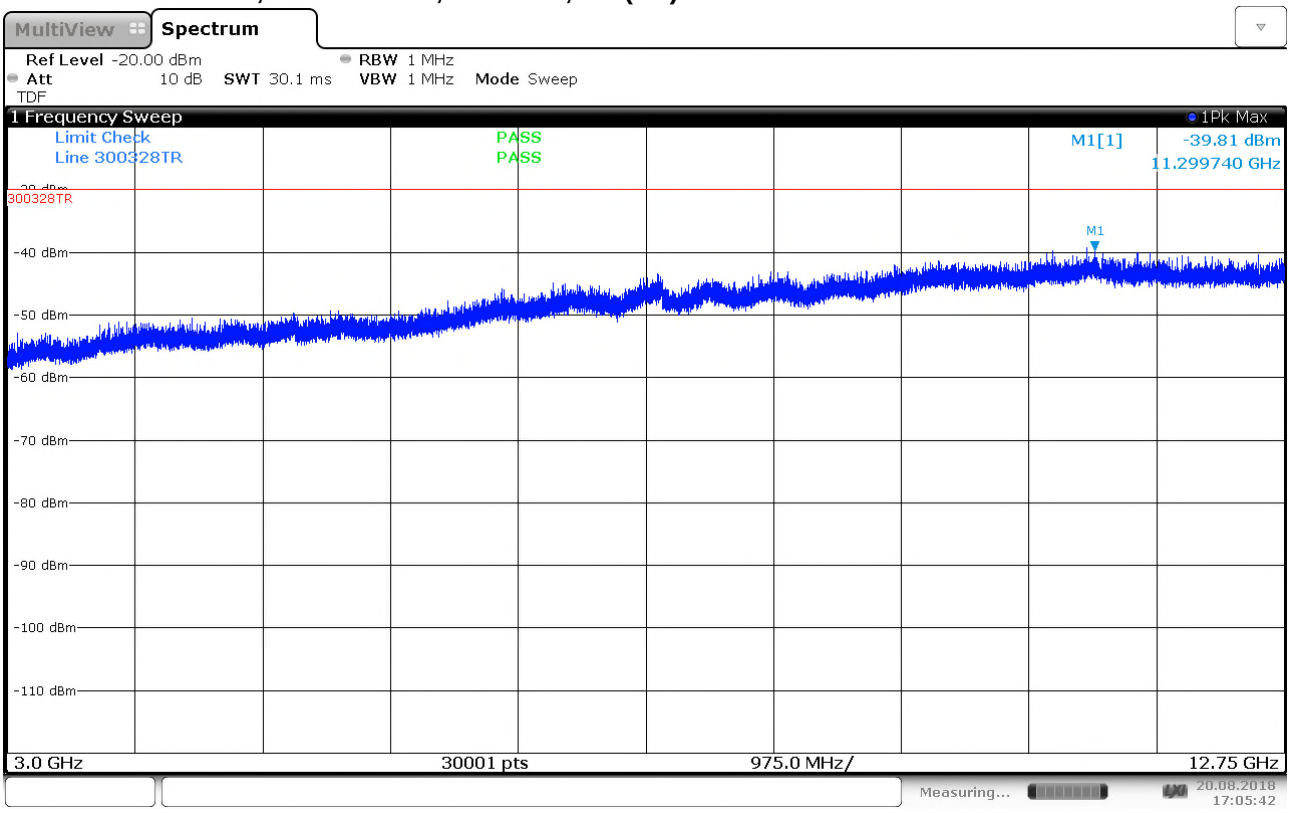
Radiated Emissions, 2.4835 - 3GHz, 2402MHz, VP (PK scan)



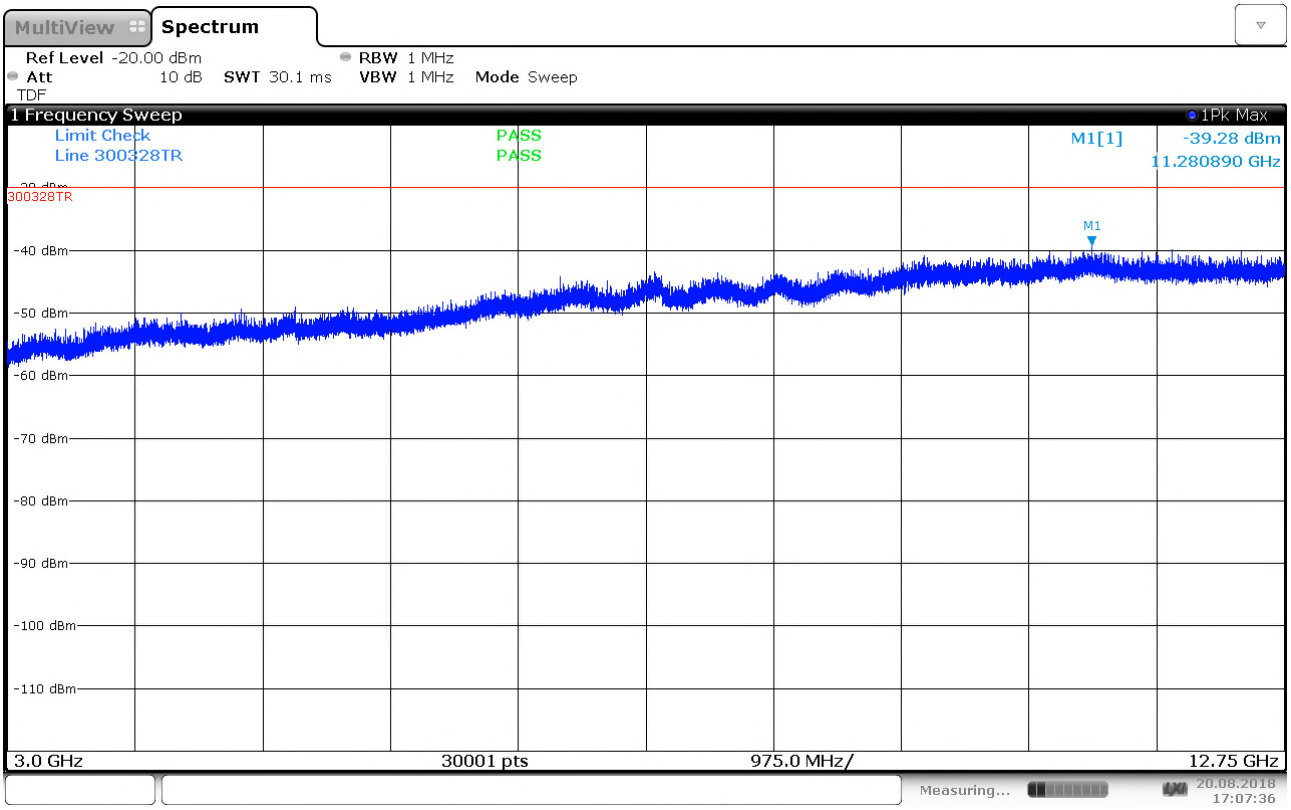
Radiated Emissions, 2.4835 - 3GHz, 2402MHz, HP (PK scan)



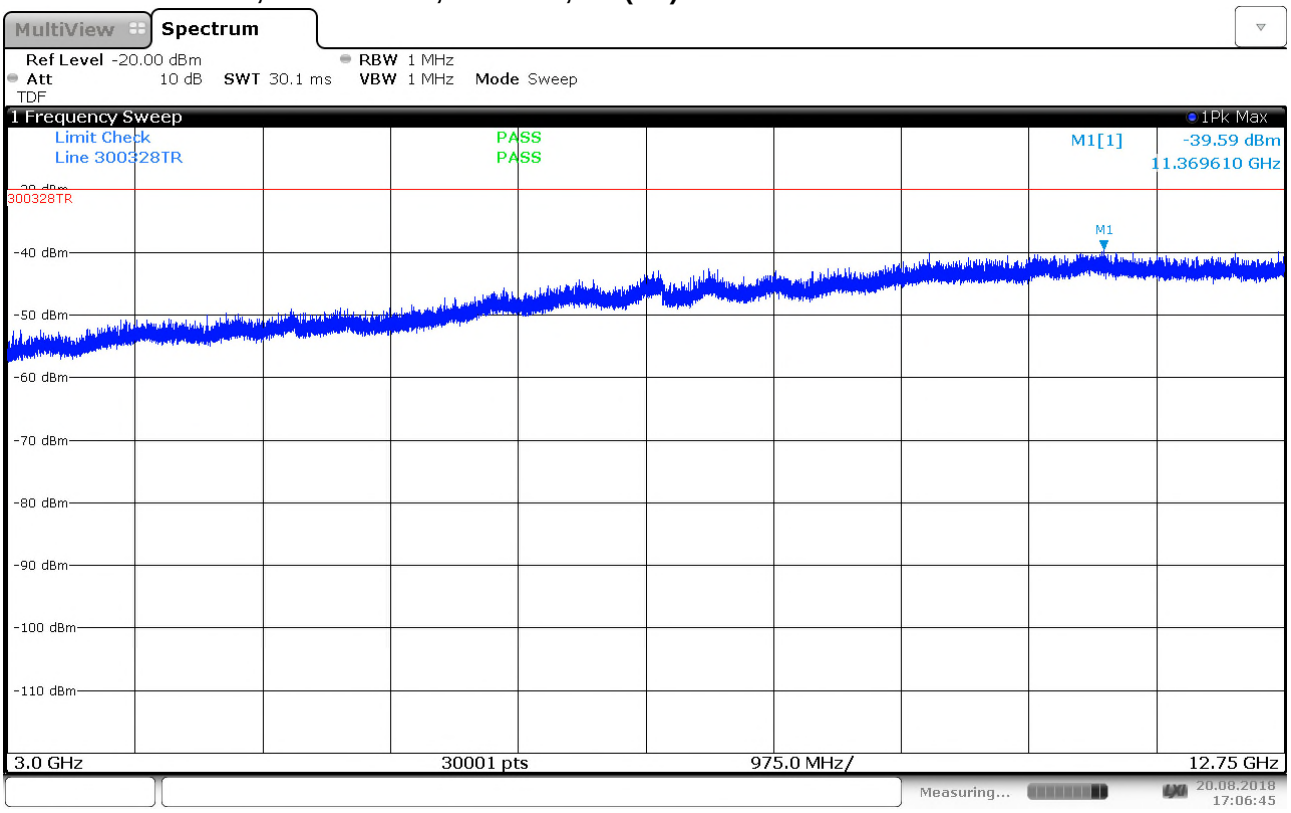
Radiated Emissions, 3 – 12.75GHz, 2402MHz, HP (PK)



Radiated Emissions, 3 – 12.75GHz, 2402MHz, VP (PK)



Radiated Emissions, 3 – 12.75GHz, 2480MHz, HP (PK)



Radiated Emissions, 3 – 12.75GHz, 2480MHz, VP (PK)

4.10 Transmitter spurious emissions - Radiated (Operating) – Mode5

ETSI EN 300 328 subclause 4.3.2.9

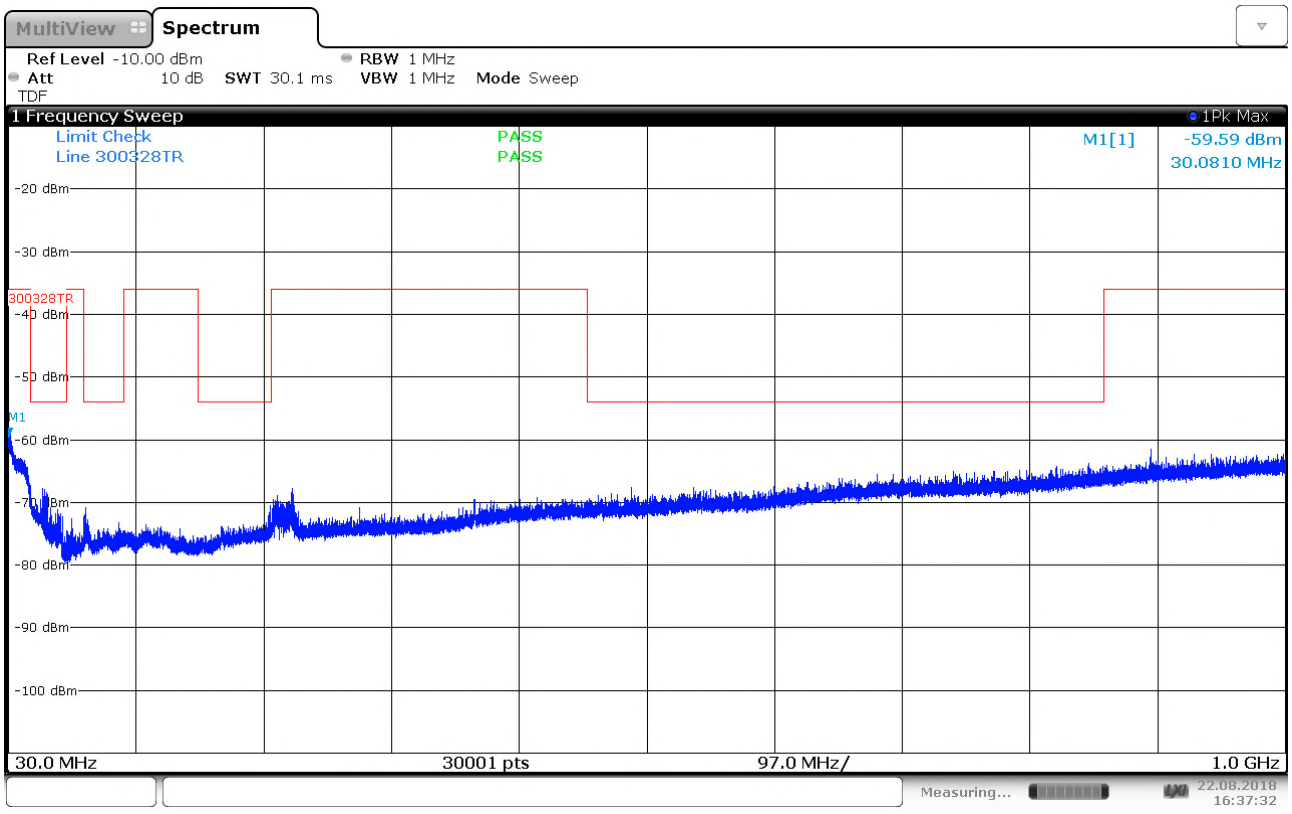
Frequency (MHz)	Detector	Polarization	Spurious Emission Level (dBm)
30 – 1000 (all others)	PK	VP/HP	< -60
1000 – 12750 (all others)	PK	VP/HP	< -36
Measurement uncertainty			**≤ 2GHz - ± 1.1 dB** **2GHz - 18 GHz - ± 2.0 dB**

Mode 5: NRF1Mps. Regulator DC

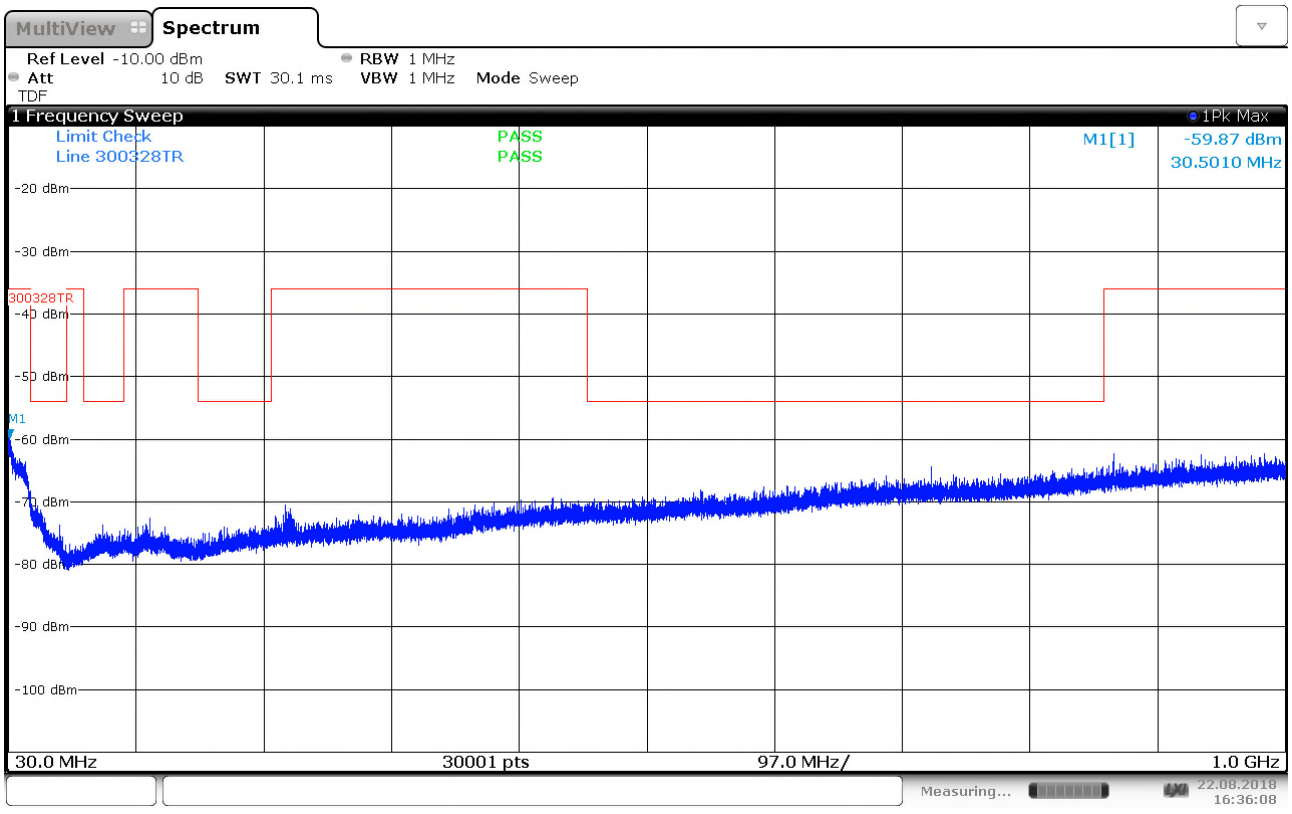
Limits: Clause 4.3.2.9.3

Frequency Range	Maximum power e.r.p. (≤ 1 GHz) e.i.r.p (> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87.5 MHz	-36 dBm	100 kHz
87.5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12.75 GHz	-30 dBm	1 MHz

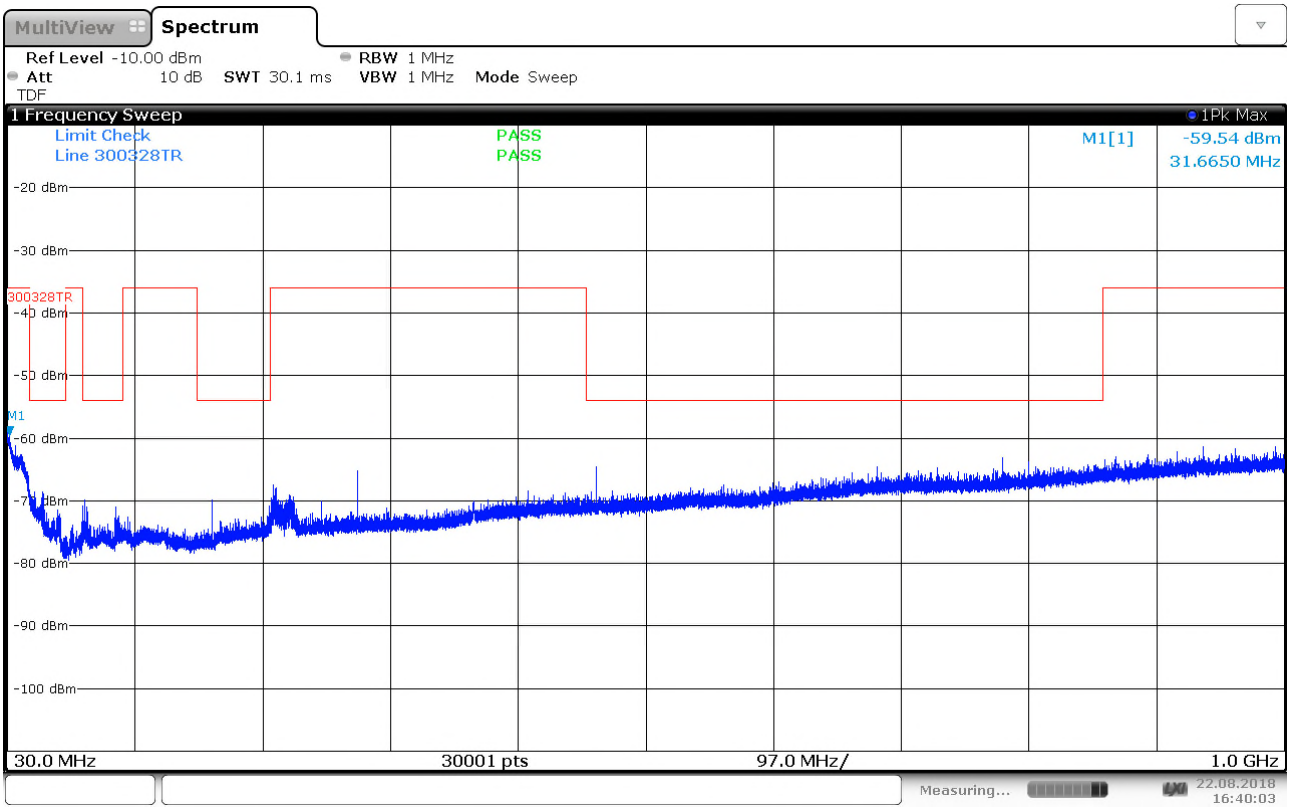
Test Equipment Used:6,9,10,11



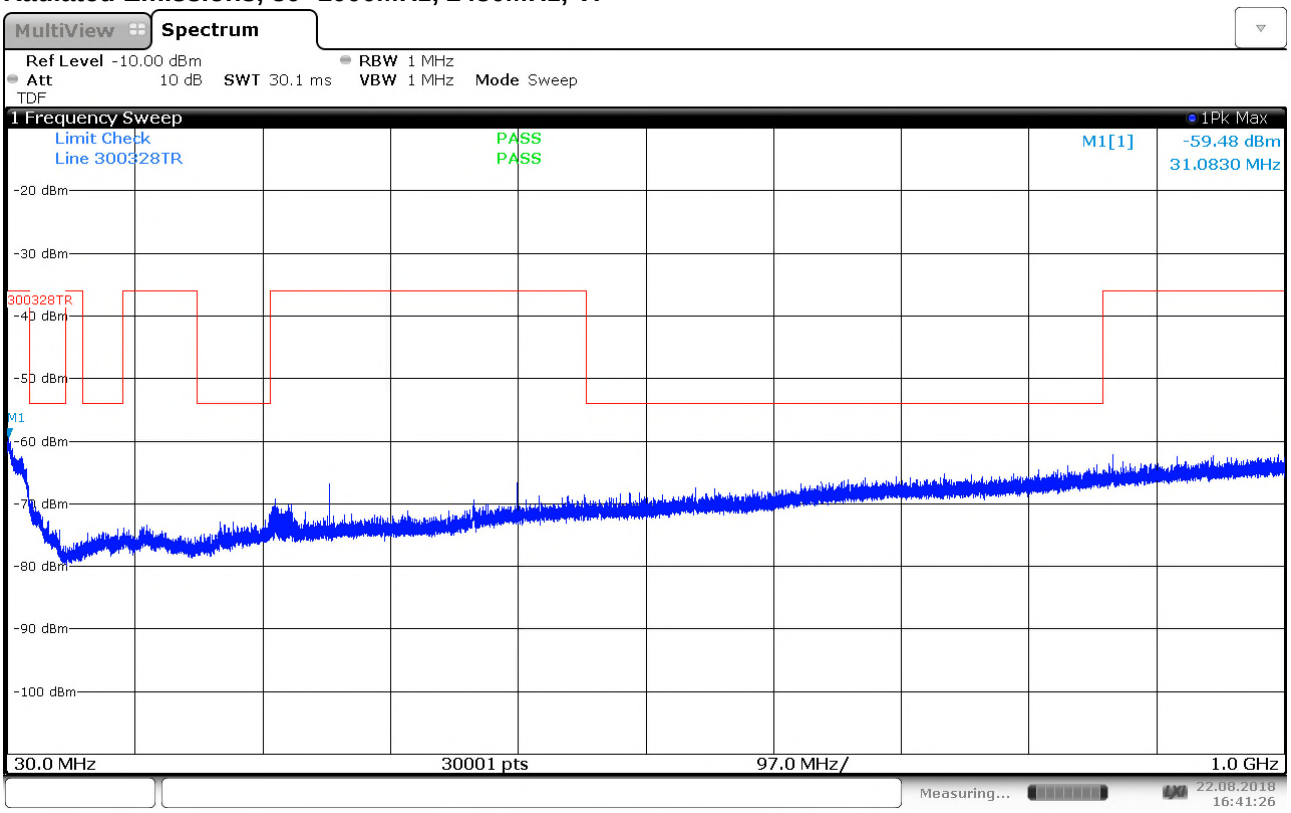
Radiated Emissions, 30 -1000MHz, 2402MHz, VP



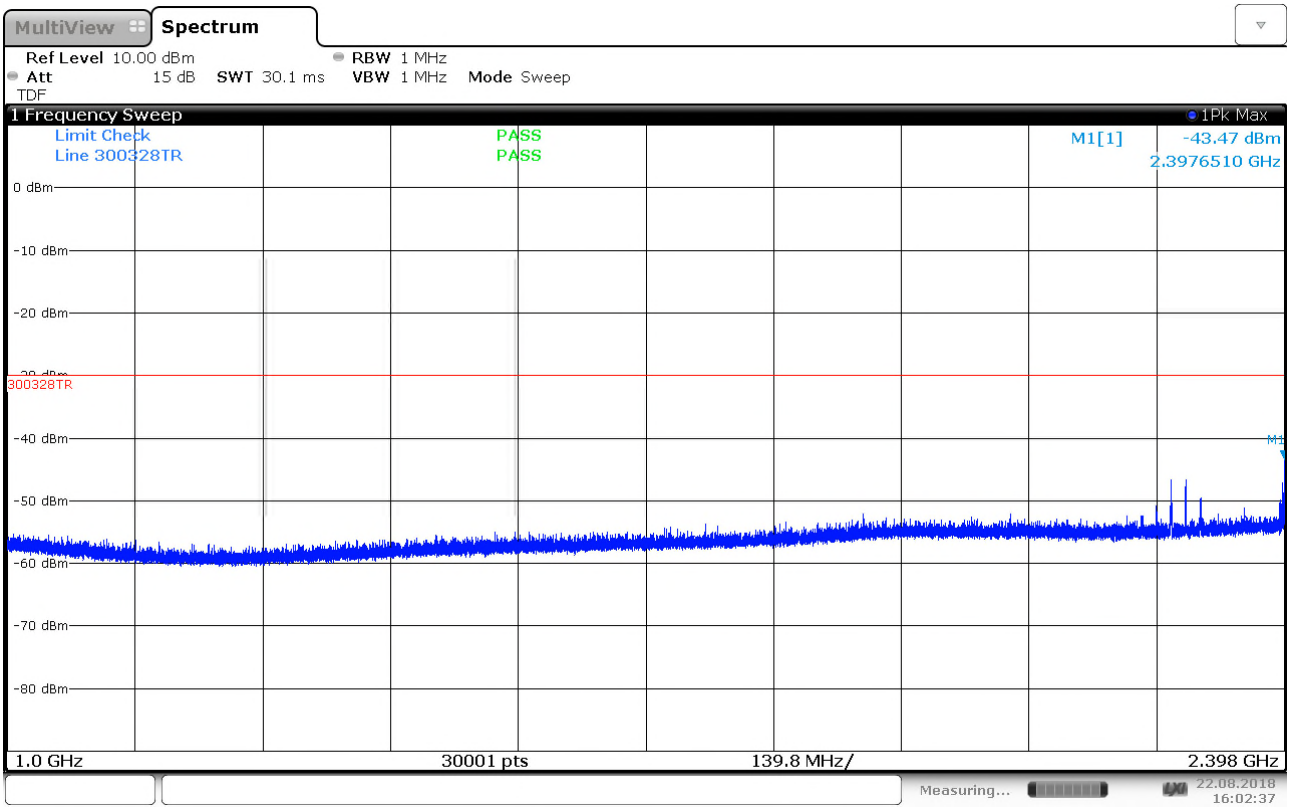
Radiated Emissions, 30 -1000MHz, 2402MHz, HP



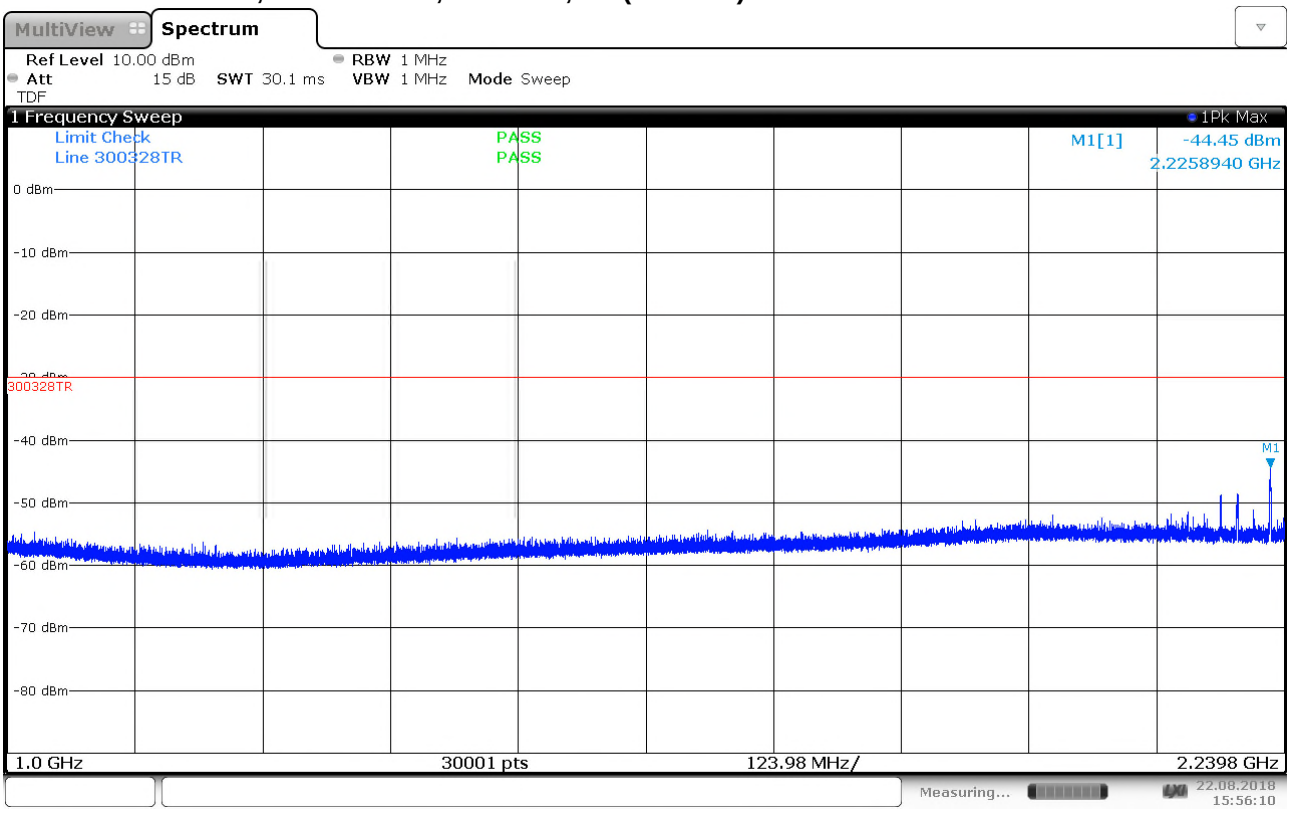
Radiated Emissions, 30 -1000MHz, 2480MHz, VP



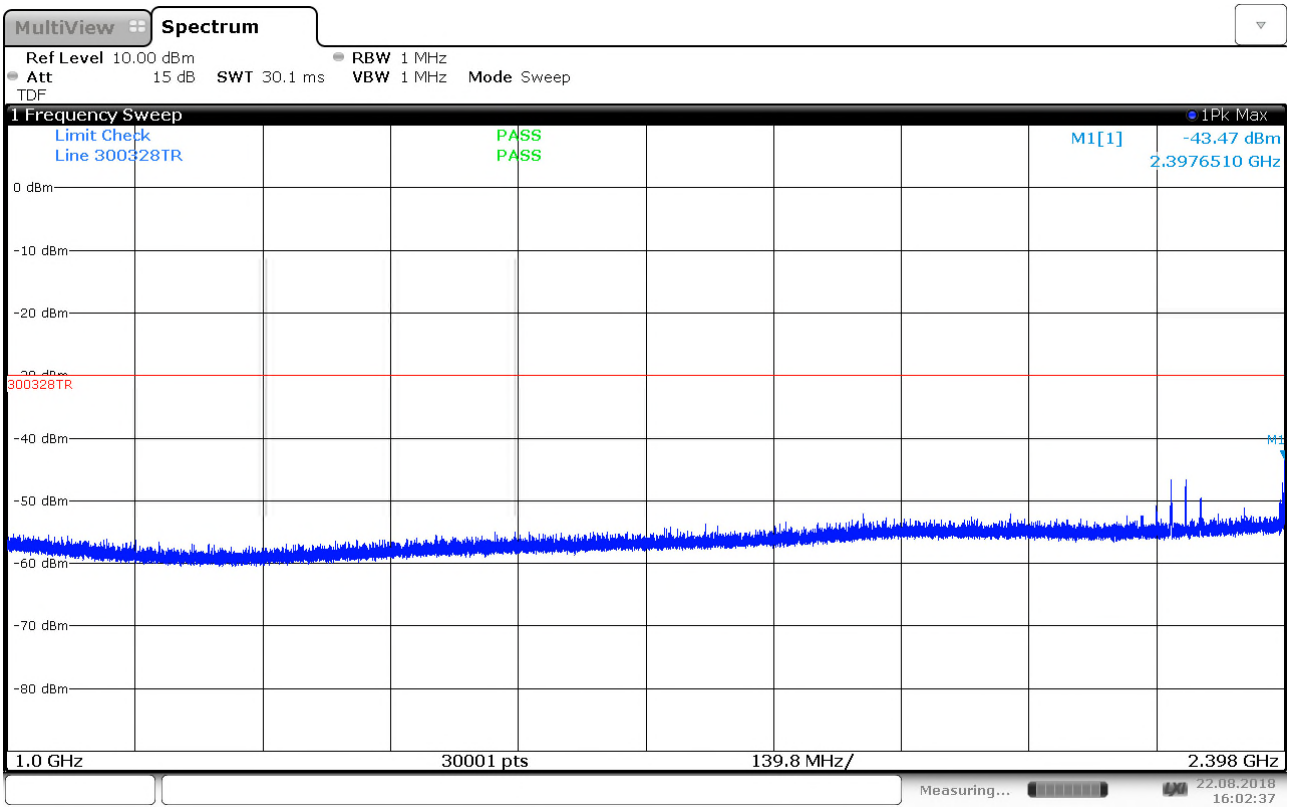
Radiated Emissions, 30 -1000MHz, 2480MHz, HP



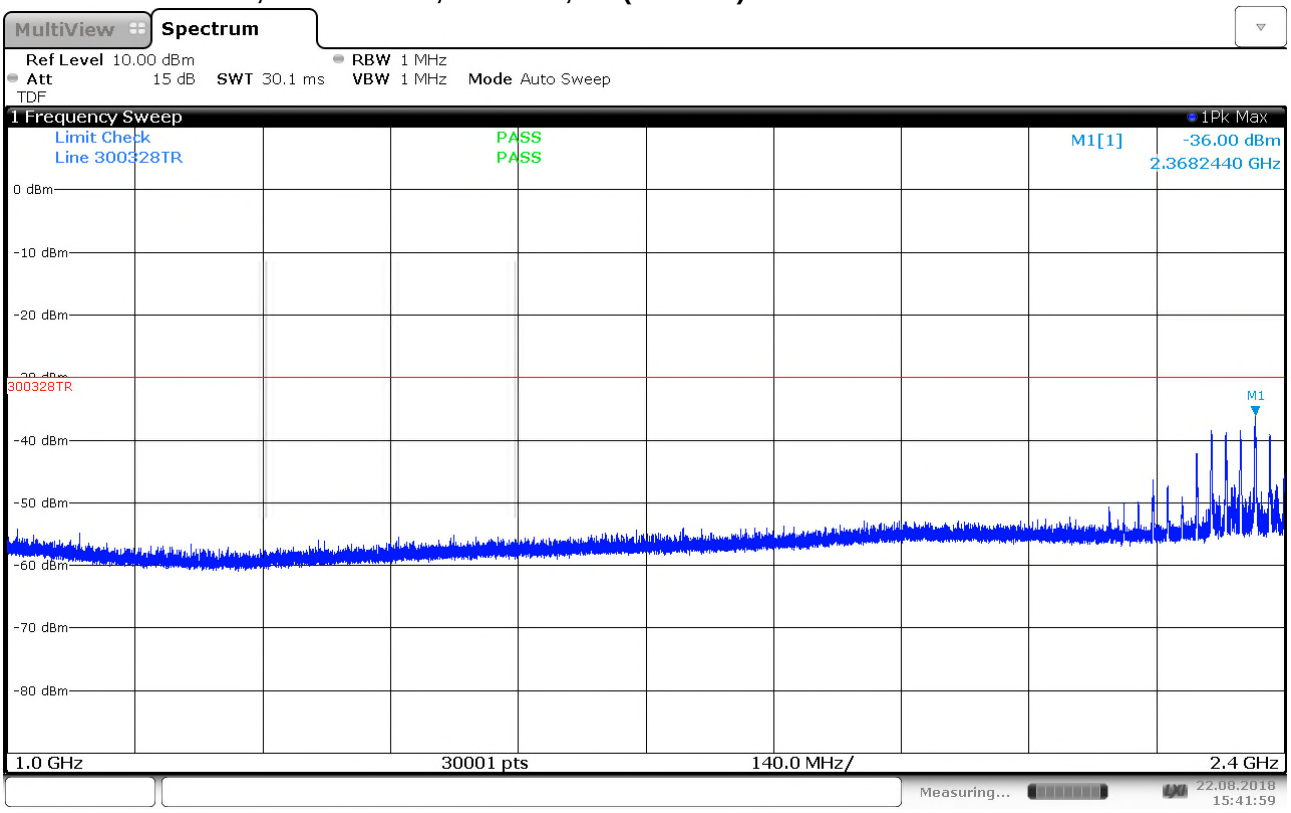
Radiated Emissions, 1 – 2.398GHz, 2402MHz, VP (PK scan)



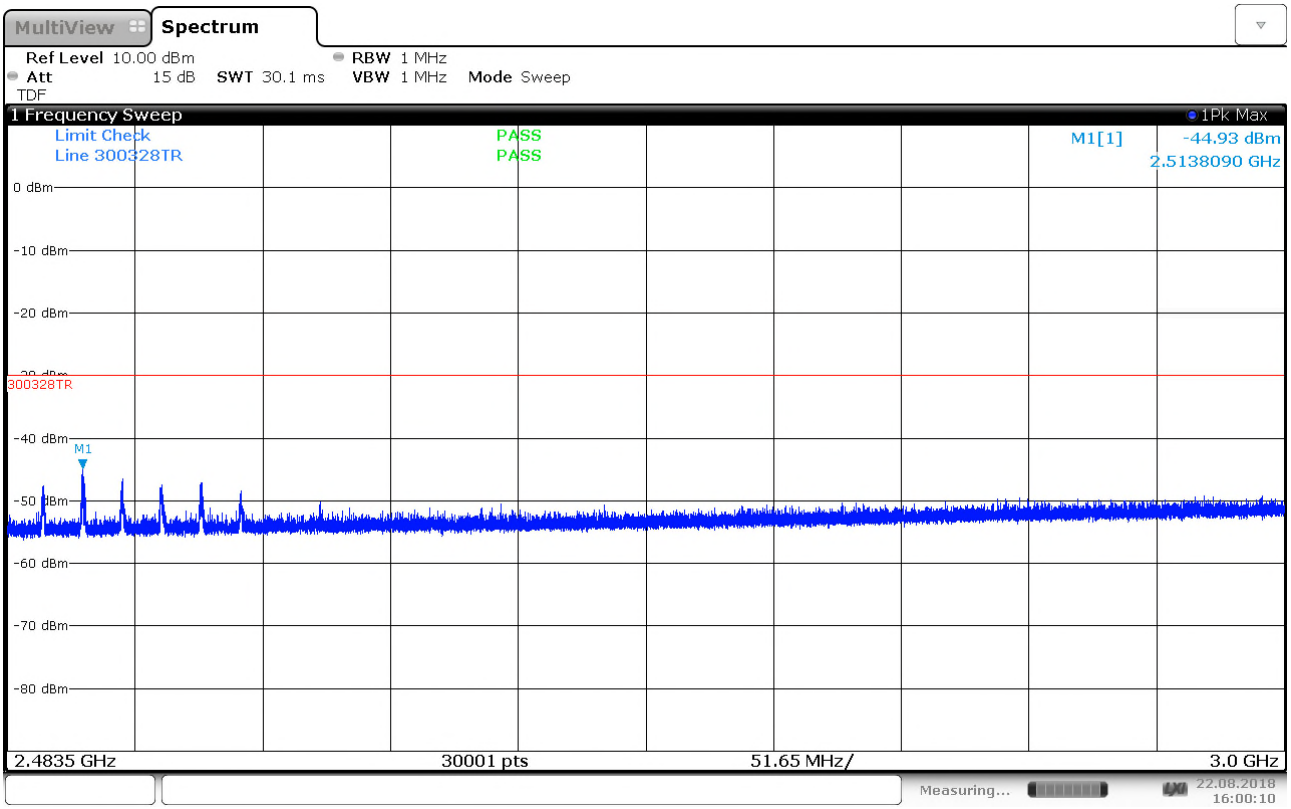
Radiated Emissions, 1 – 2.39GHz, 2402MHz, HP (PK scan)



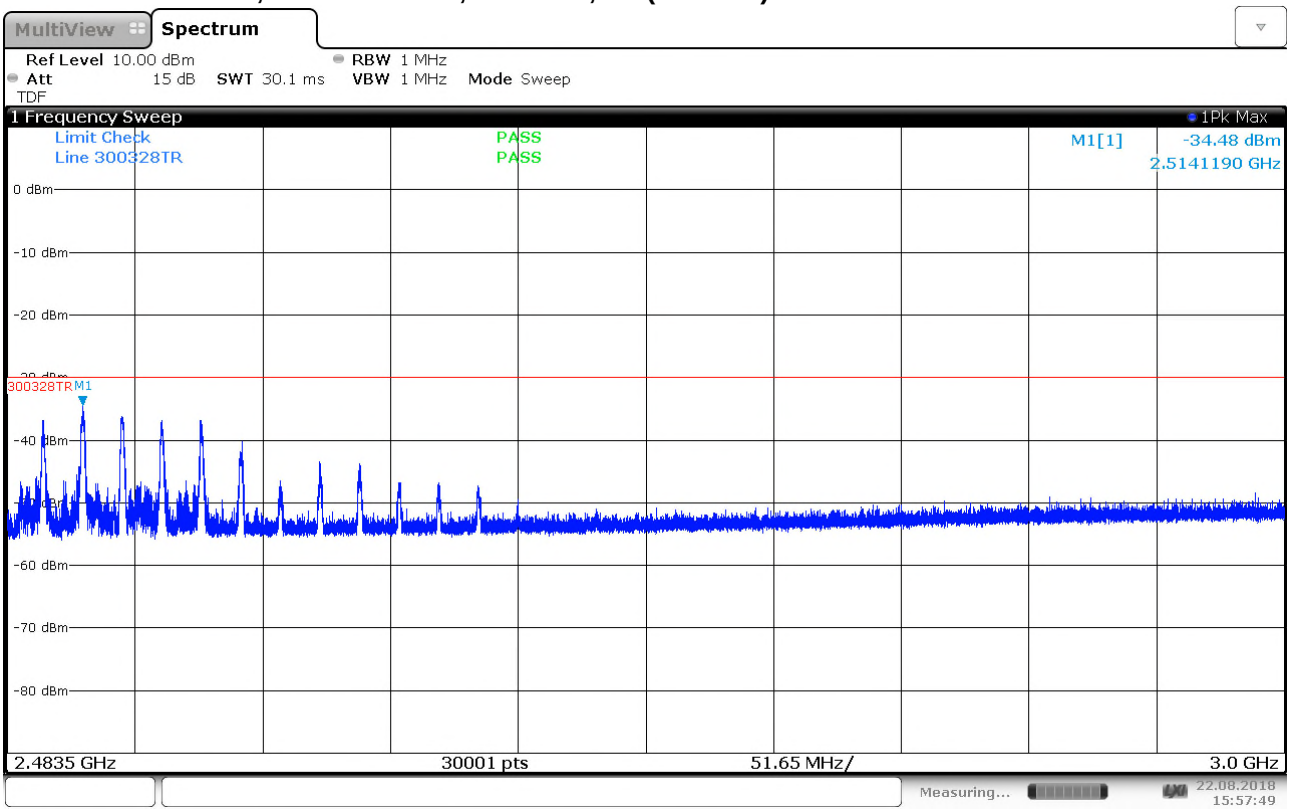
Radiated Emissions, 1 – 2.398GHz, 2480MHz, VP (PK scan)



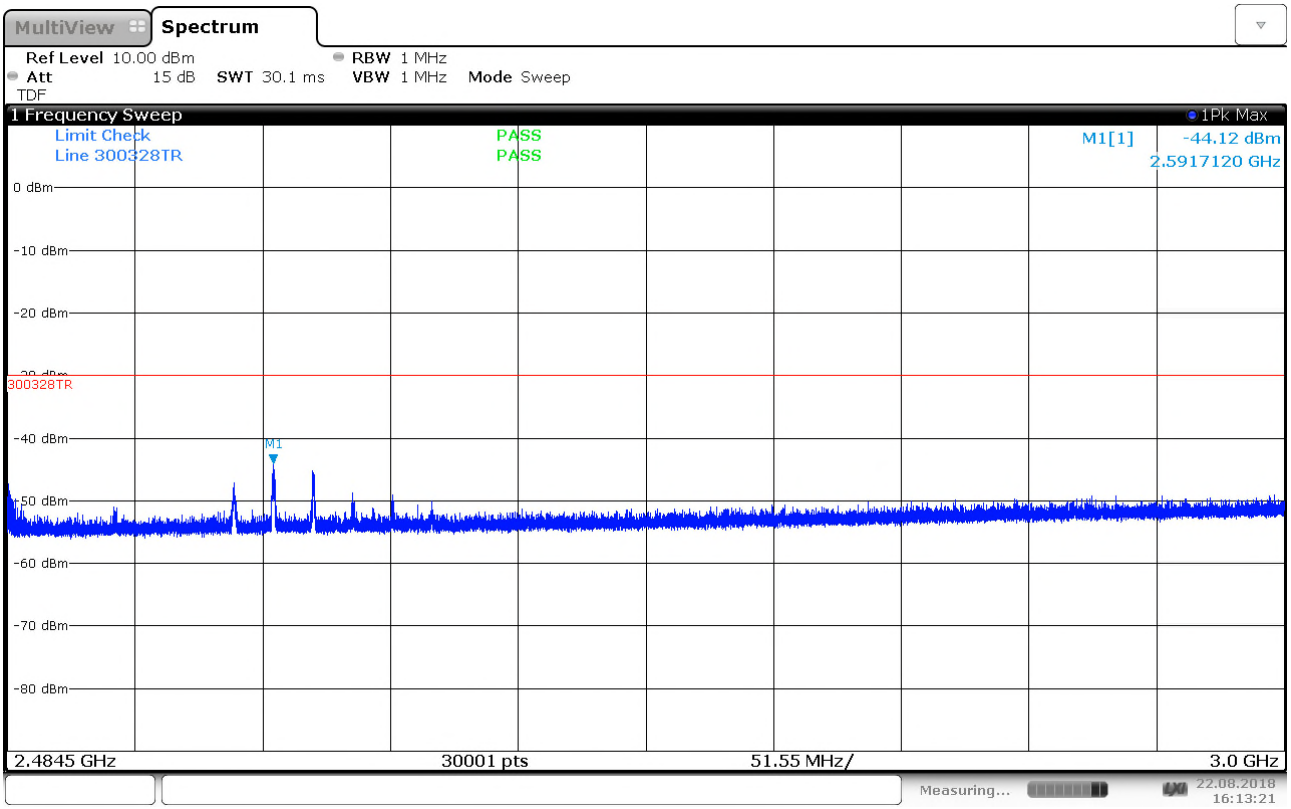
Radiated Emissions, 1 - 2.4GHz, 2480MHz, HP (PK scan)



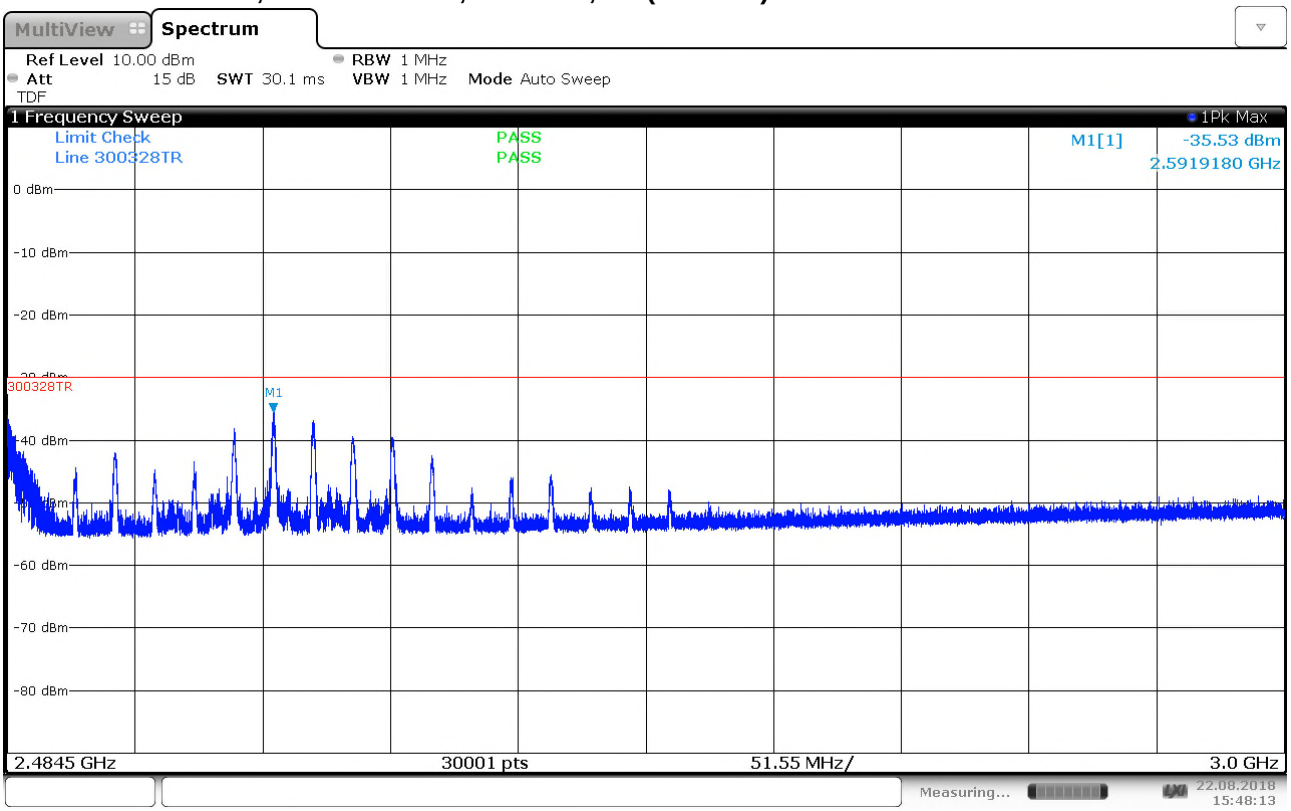
Radiated Emissions, 2.4835 - 3GHz, 2402MHz, VP (PK scan)



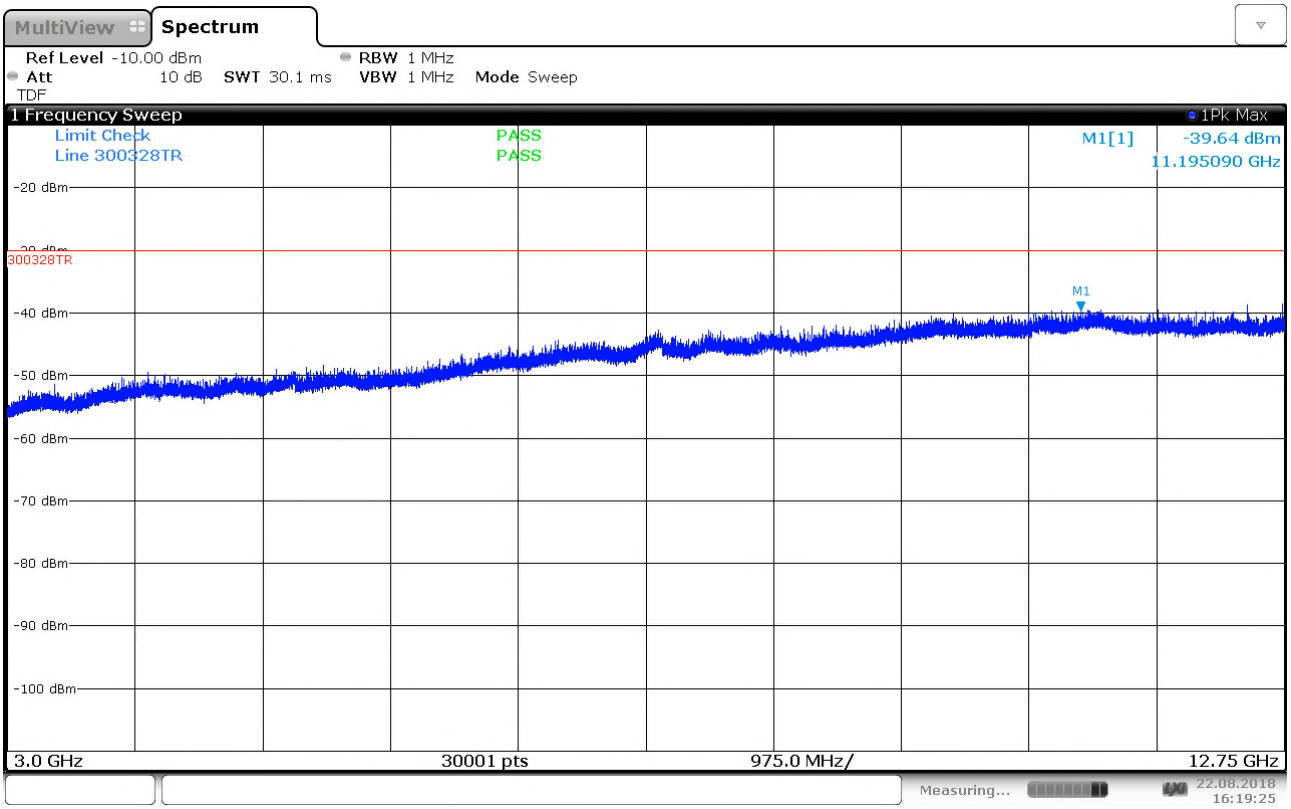
Radiated Emissions, 2.4835 - 3GHz, 2402MHz, HP (PK scan)



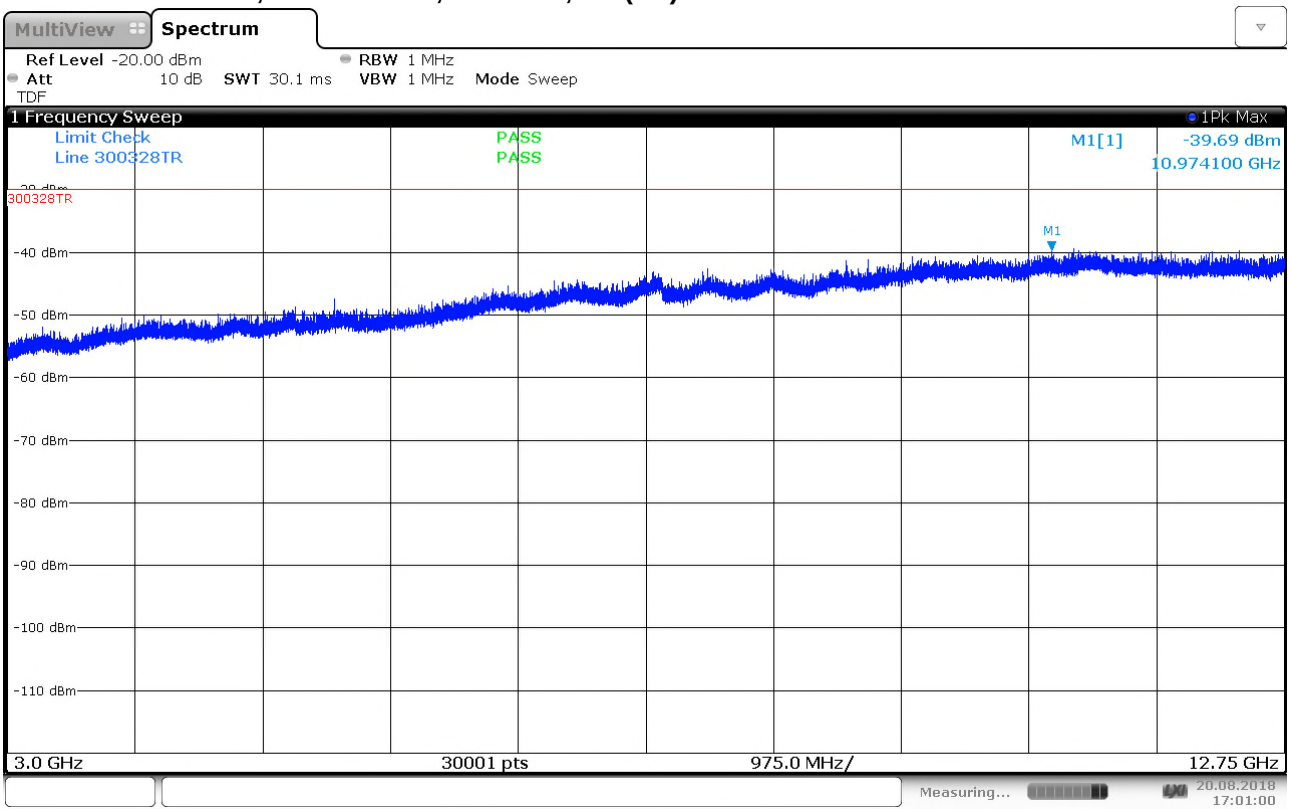
Radiated Emissions, 2.4835 - 3GHz, 2480MHz, VP (PK scan)



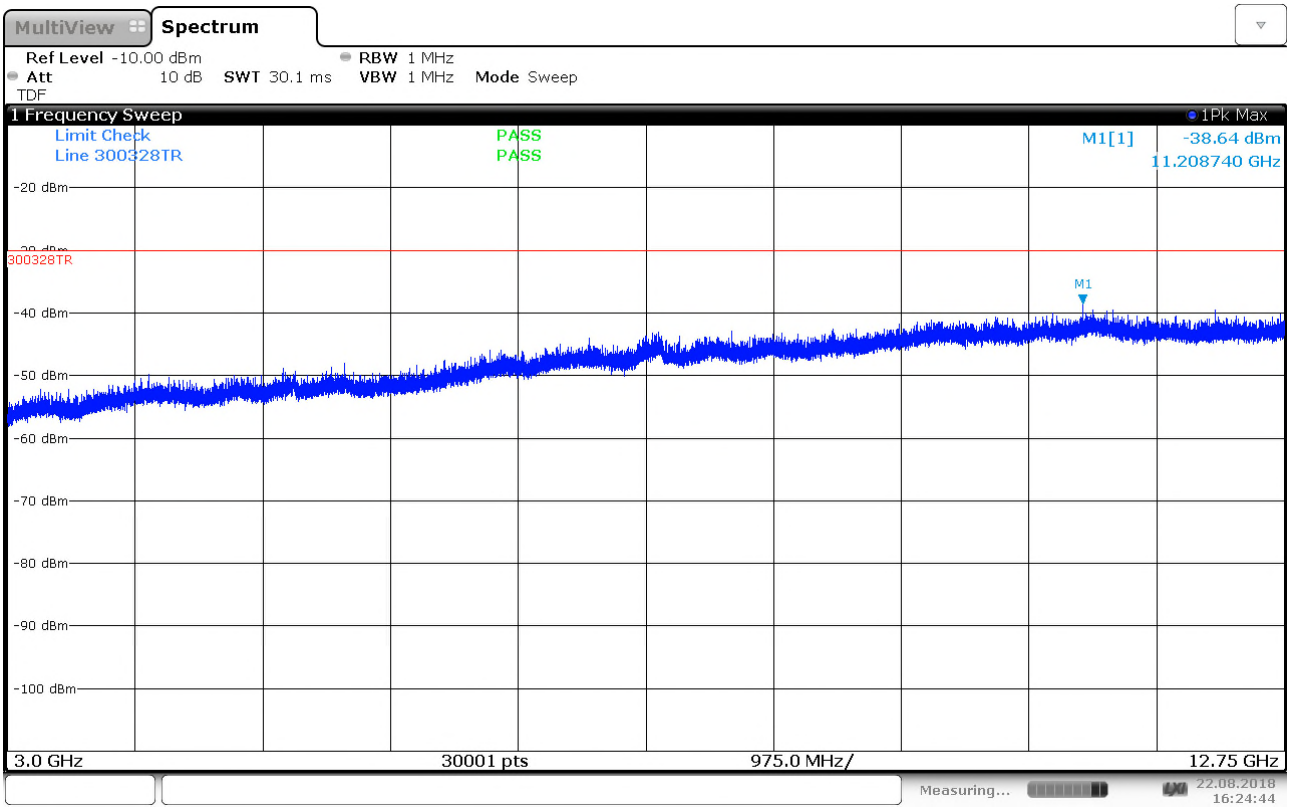
Radiated Emissions, 2.4835 - 3GHz, 2480MHz, HP (PK scan)



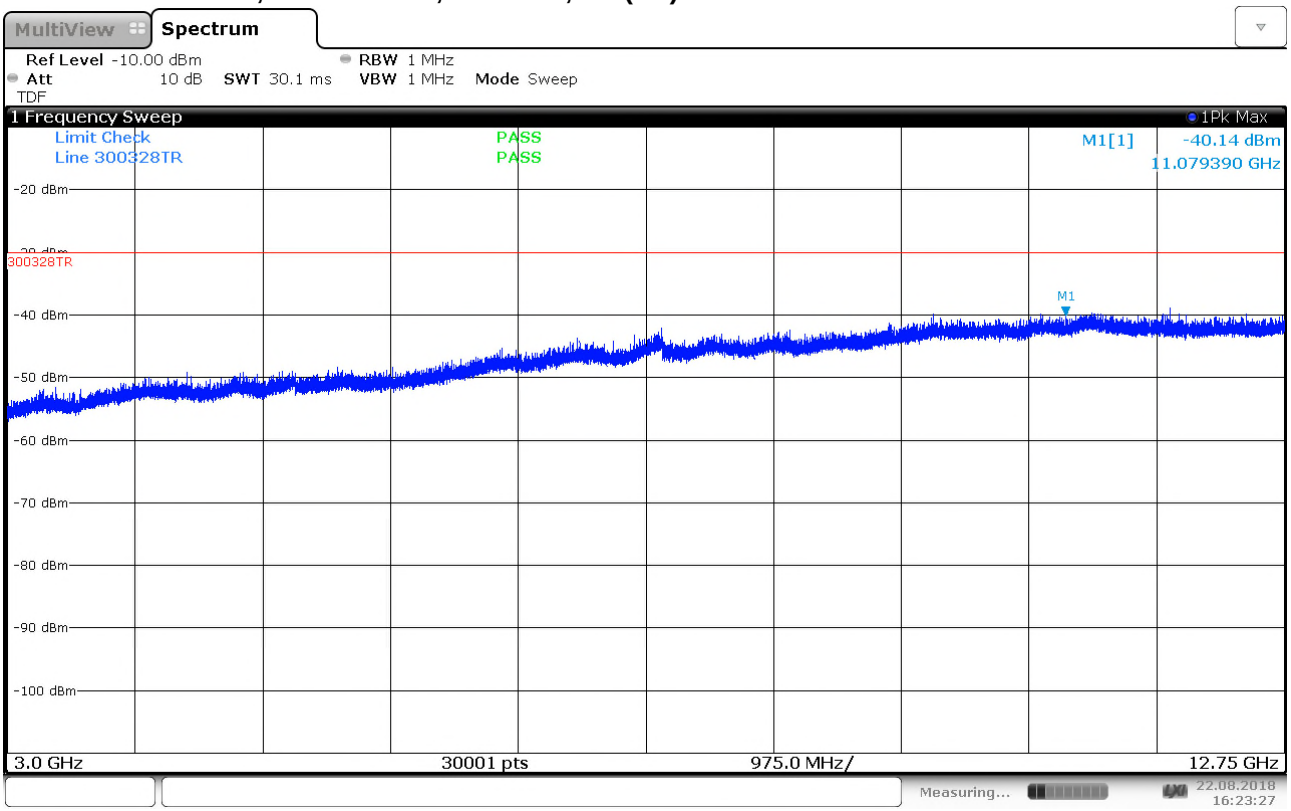
Radiated Emissions, 3 – 12.75GHz, 2402MHz, HP (PK)



Radiated Emissions, 3 – 12.75GHz, 2402MHz, VP (PK)



Radiated Emissions, 3 – 12.75GHz, 2480MHz, HP (PK)



Radiated Emissions, 3 – 12.75GHz, 2480MHz, VP (PK)

4.11 Receiver spurious emissions - Radiated

ETSI EN 300 328 subclause 4.3.2.10

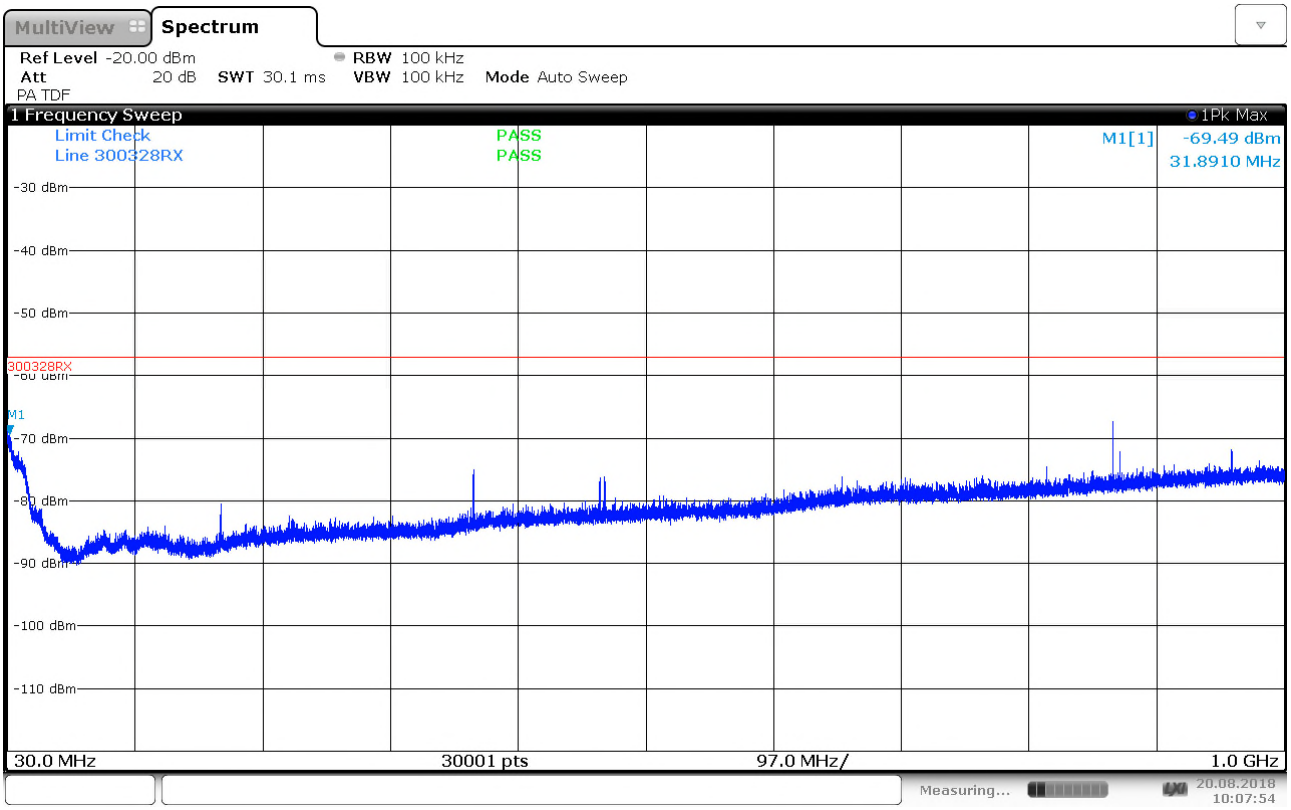
Frequency (MHz)	Detector	Polarization	Spurious Emission Level (dBm)
4800	rms	HP	-59.6
4960	rms	HP	-60.7
30 – 1000 (all others)	PK	VP/HP	< -63
1000 – 12750 (all others)	PK	VP/HP	< -53

Because of large backround noise, the RBW of 100 kHz is used for pre-scan for above 1GHz. And detected emissions are measured with RBW of 1MHz

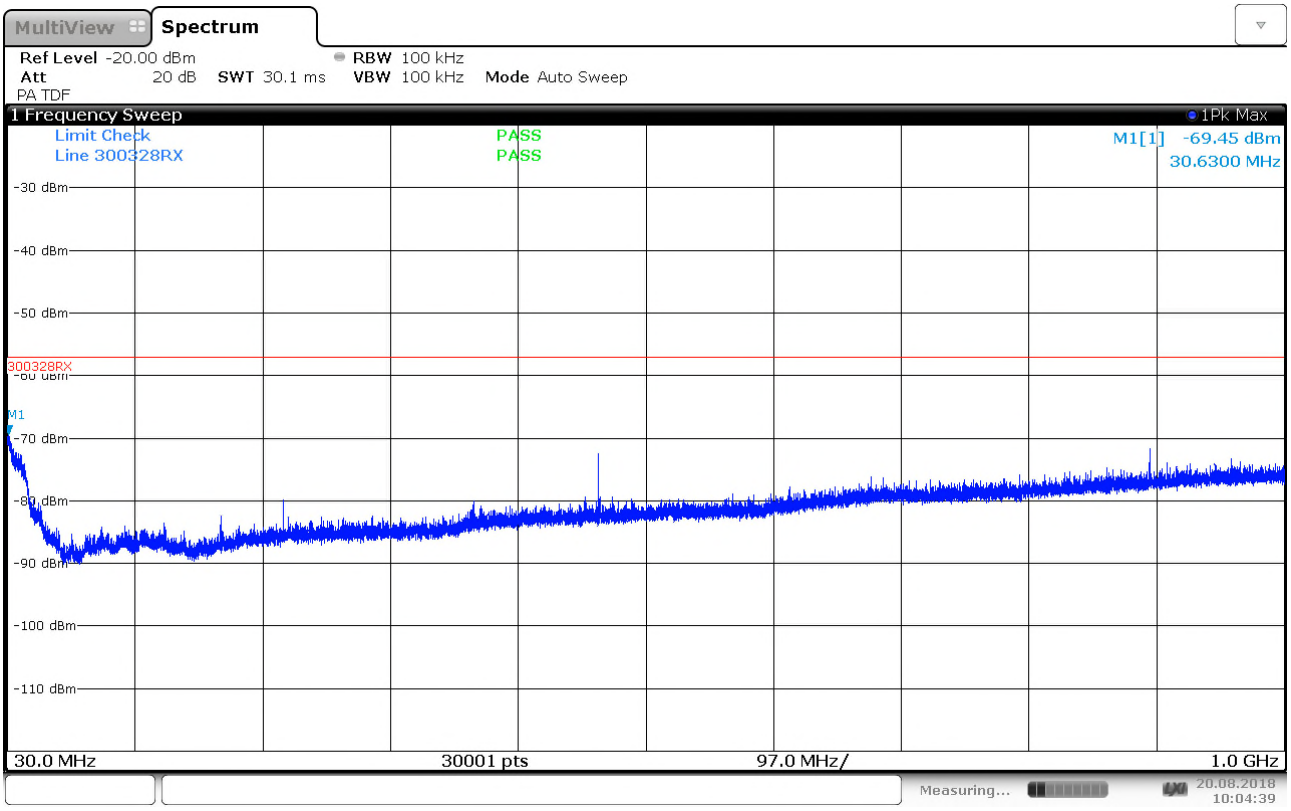
Limits: Clause 4.3.2.10.3

Frequency Range	Limit
30 MHz to 1 GHz	-57 dBm
above 1 GHz to 12,75 GHz	-47 dBm

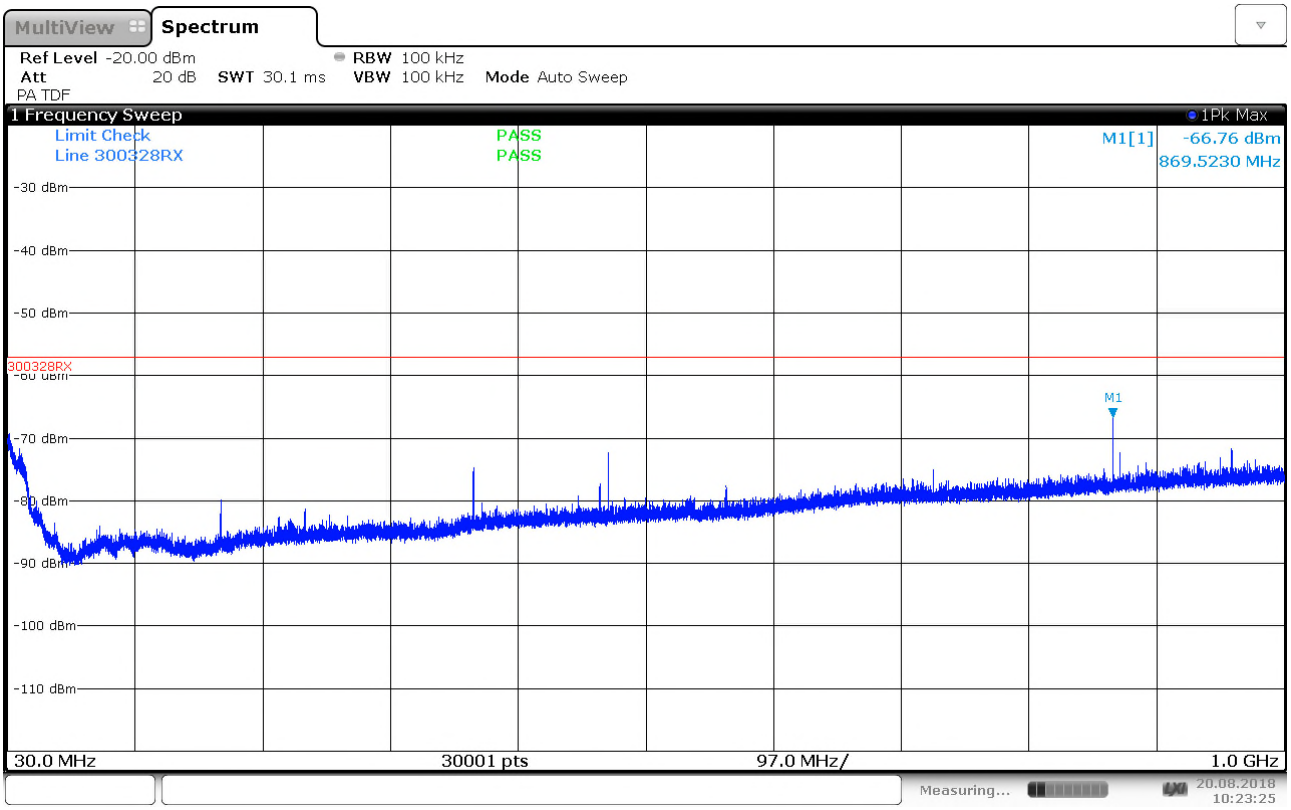
Test Equipment Used: 6,8,9,11



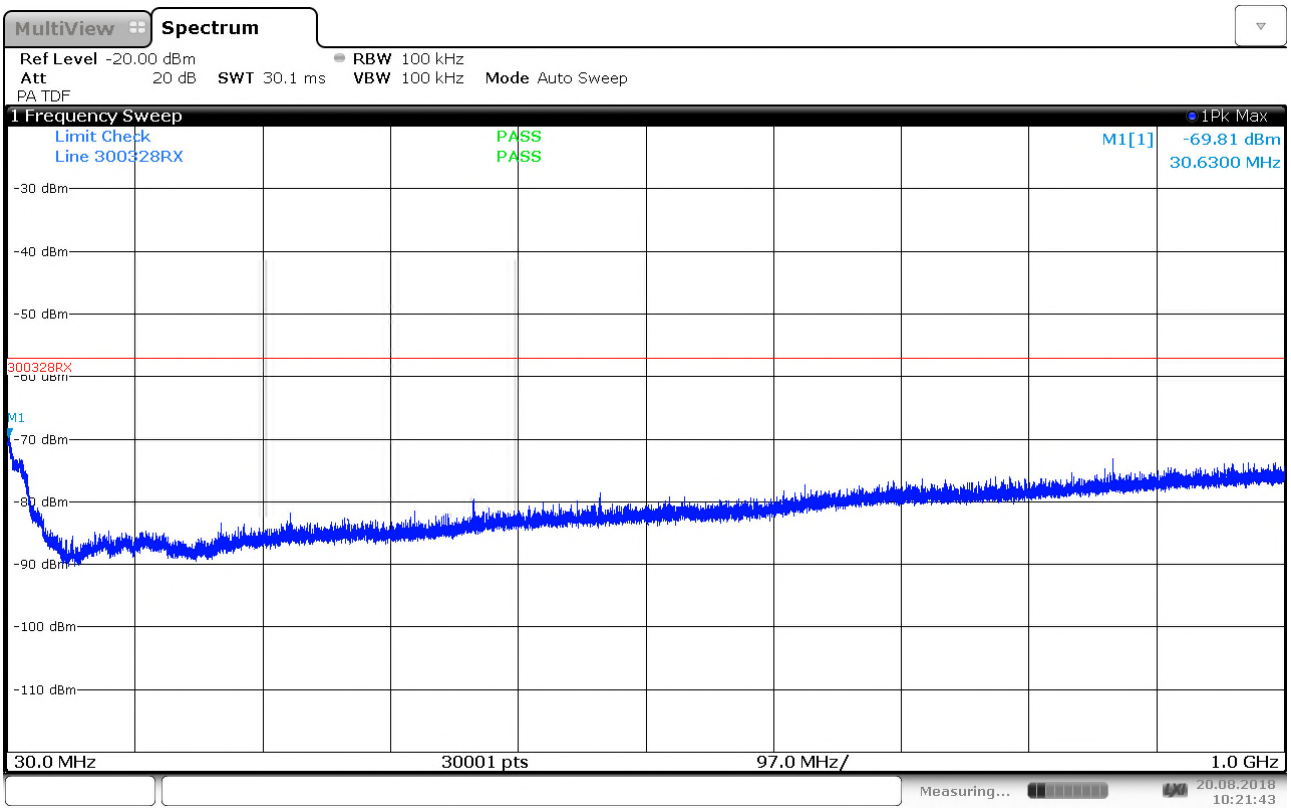
Receiver Emissions, radiated, 30 -1000 MHz, ch2402MHz,HP



Receiver Emissions, radiated, 30 -1000 MHz, ch2402MHz,VP

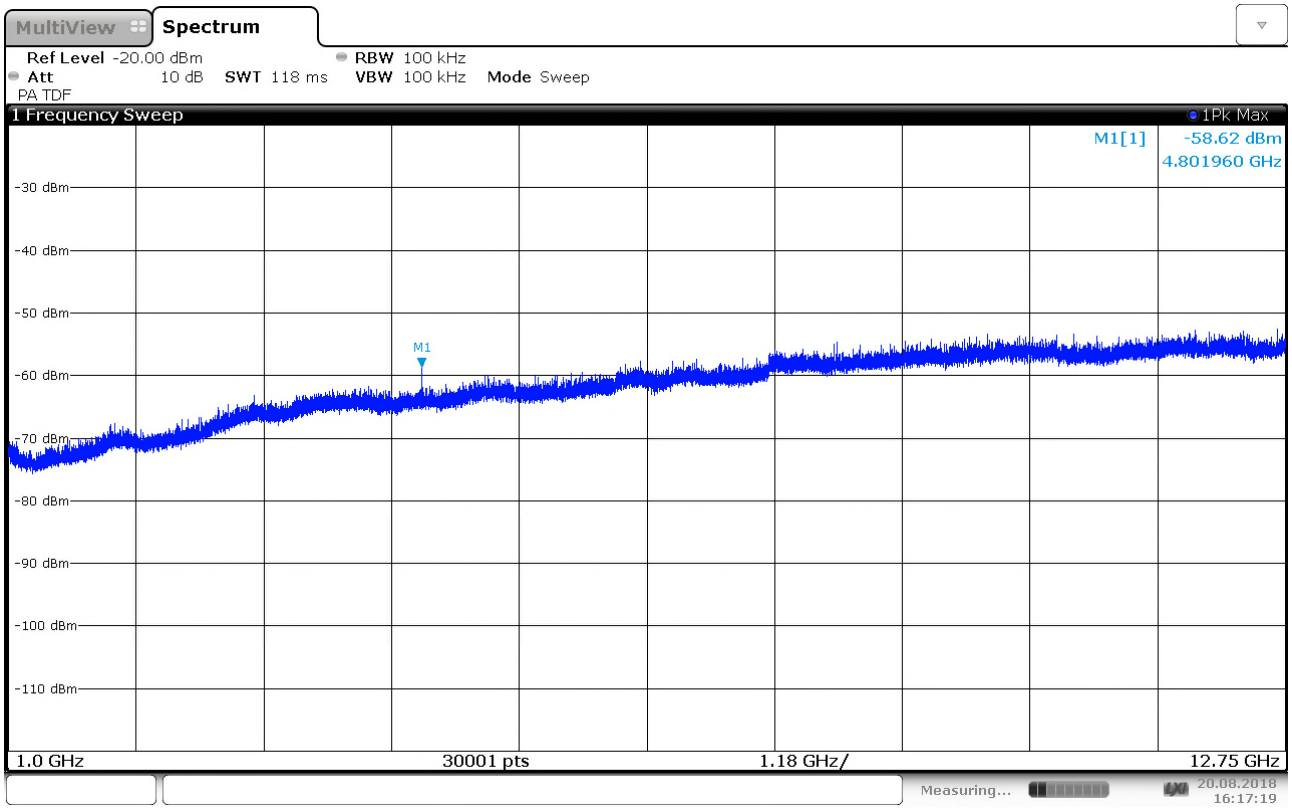


Receiver Emissions, radiated, 30 - 1000MHz, ch2480MHz,HP

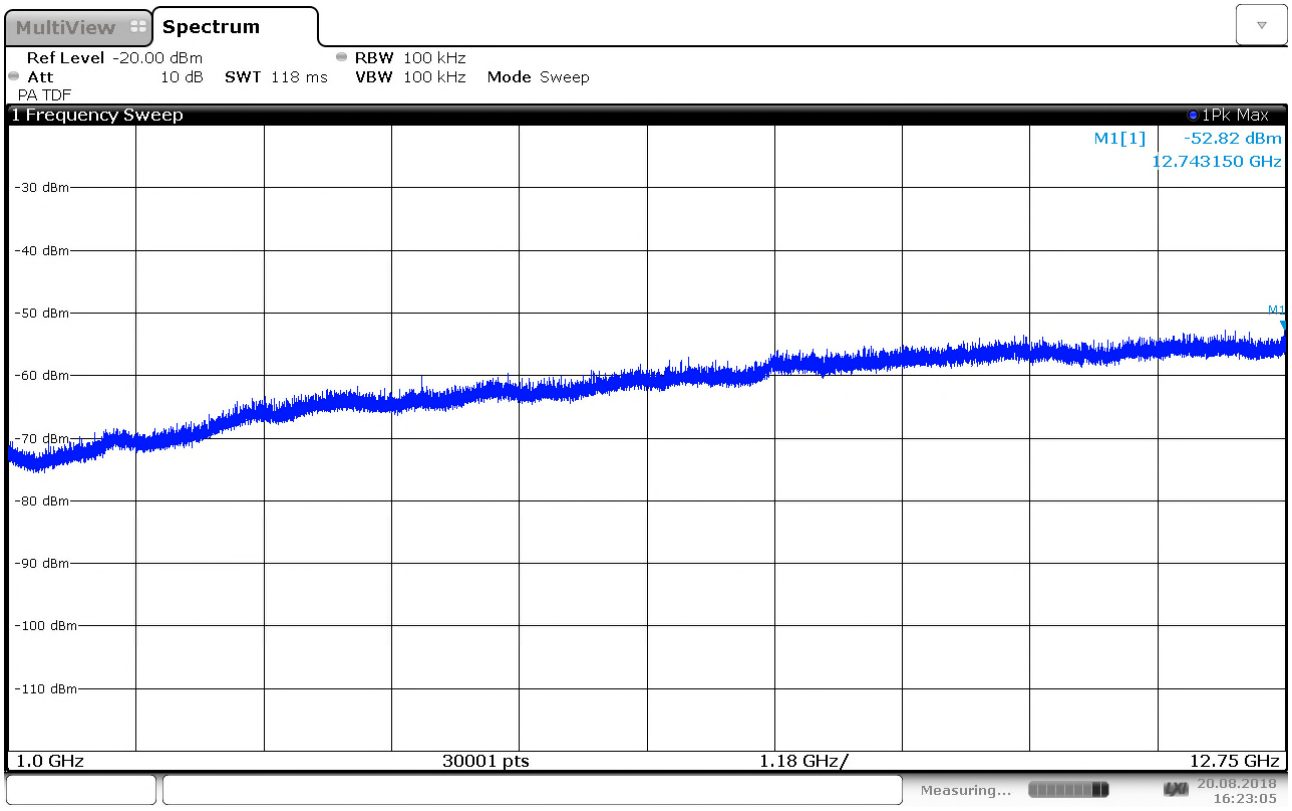


Receiver Emissions, radiated, 30 - 1000MHz, ch2480MHz,VP

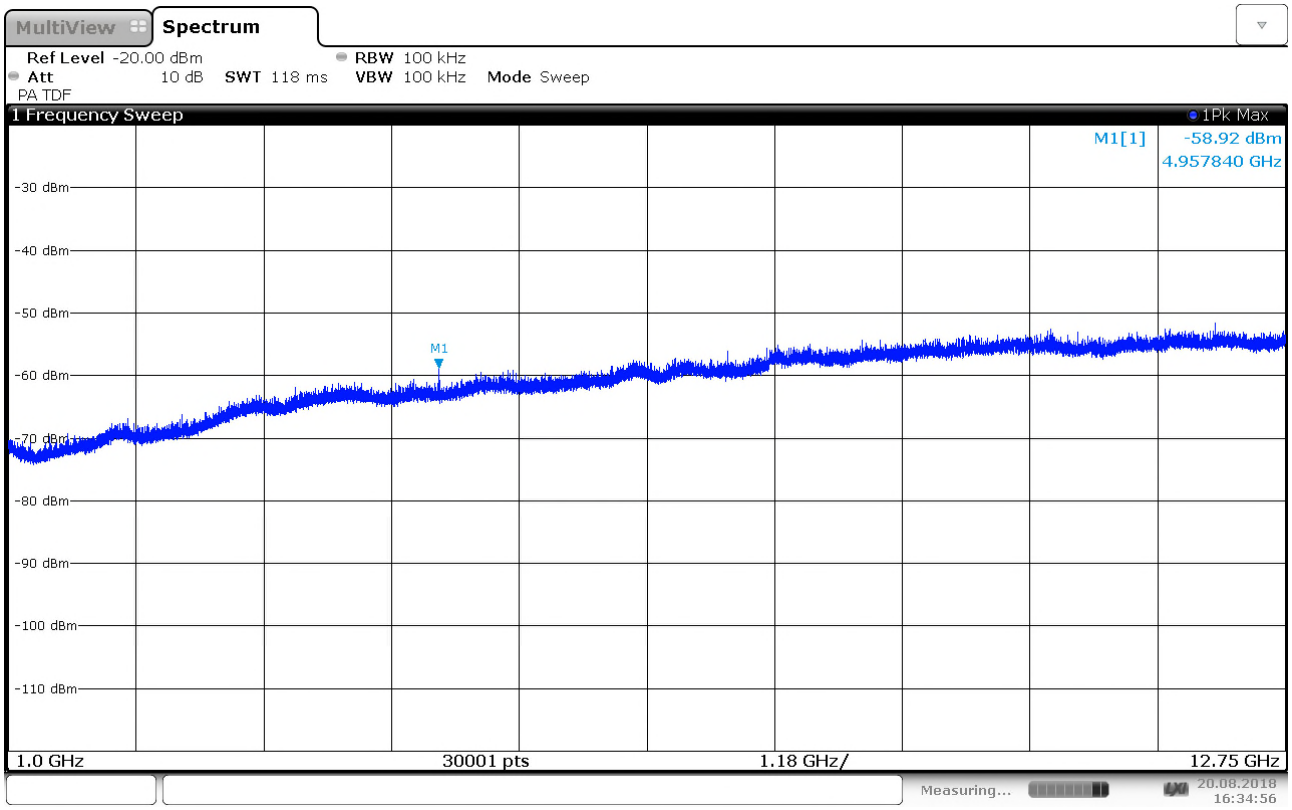
Receiver Emissions, radiated, 1.44GHz,rms,HP



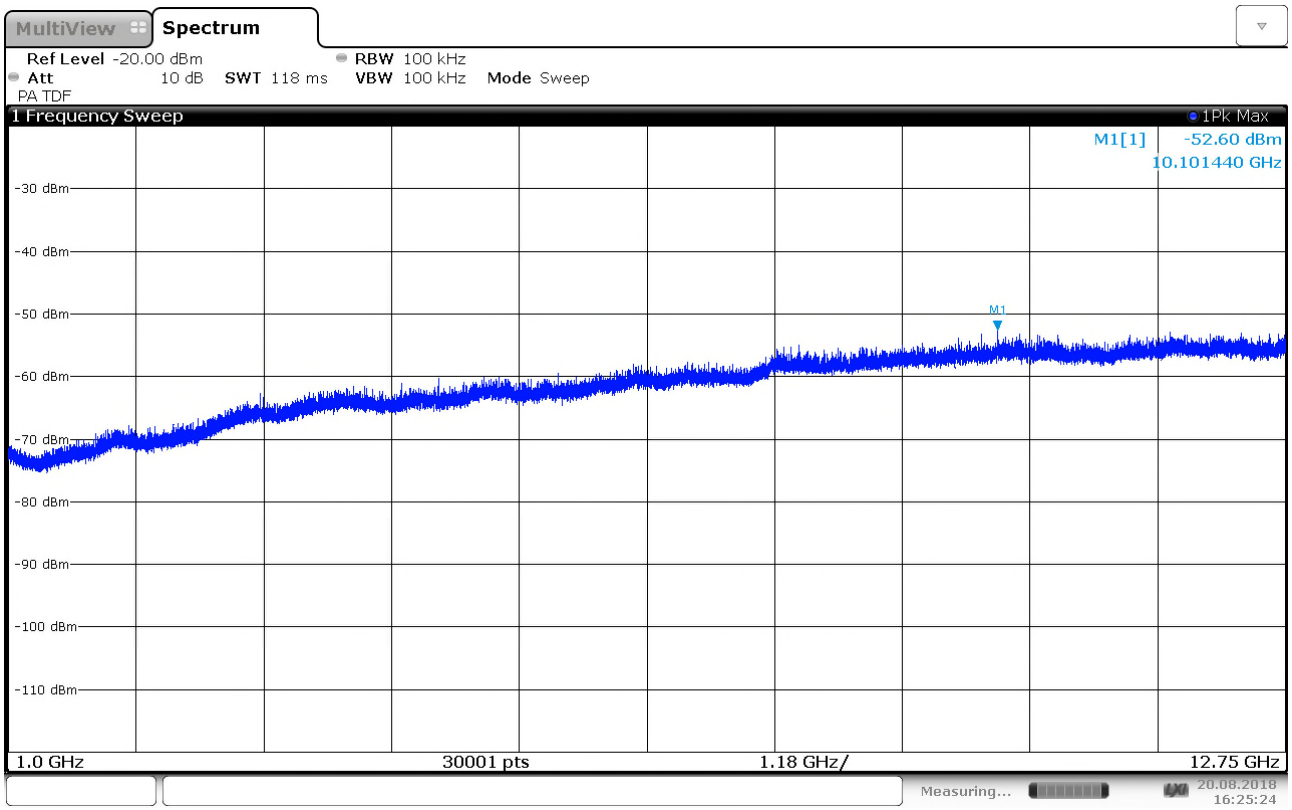
Receiver Emissions, radiated, 1 - 12.75GHz, ch2402MHz,HP, PK , pre-scan



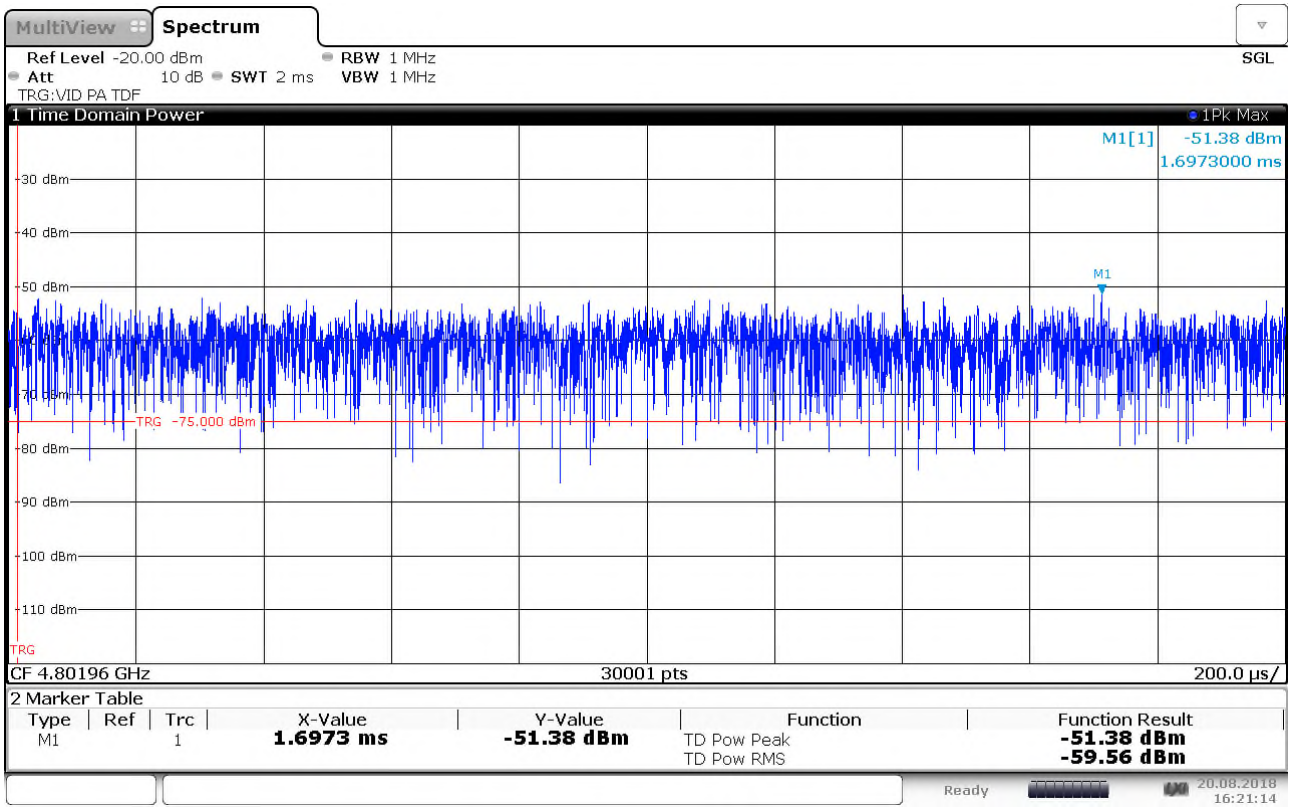
Receiver Emissions, radiated, 1 - 12.75GHz, ch2402MHz,VP, PK , pre-scan



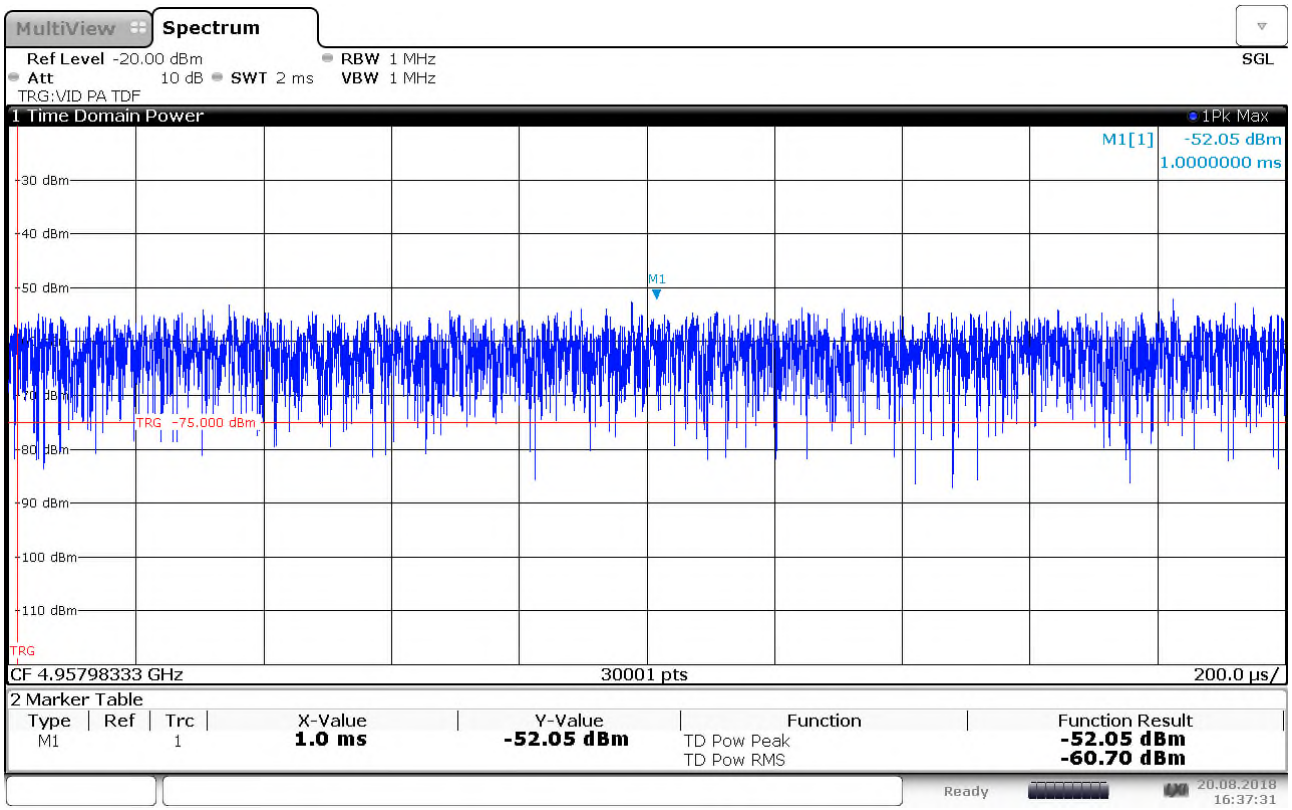
Receiver Emissions, radiated, 1 - 12.75GHz, ch2480MHz,HP, PK , pre-scan



Receiver Emissions, radiated, 1 - 12.75GHz, ch2480MHz,VP, PK , pre-scan



Receiver Emissions, radiated, 4.8GHz, ch2402,rms,HP



Receiver Emissions, radiated, 4.8GHz, ch2402,rms,HP

4.12 Receiver Blocking

ETSI EN 300 328 subclause 4.3.2.11

Conducted measurements

EN 300 328 V2.1.1:

Wanted signal mean power from companion device (dBm)	Blocking signal frequency [MHz]	Blocking signal power [dBm] (see note 2)	Observed criteria LED 1 & 3 ON
§	2 380	-45.9	YES
§	2 503,5	-45.9	YES
§	2 300	-45.9	YES
§	2 583,5	-45.9	YES

EN 300 328 V2.2.0:

Wanted signal mean power from companion device (dBm)	Blocking signal frequency [MHz]	Blocking signal power [dBm] (see note 4)	Observed criteria LED 1 & 3 ON
§	2 380	-32.9	YES
§	2 503,5	-32.9	YES
§	2 300	-32.9	YES
§	2 583,5	-32.9	YES

The EUT was in hopping mode.

OCBW : 1890000Hz
Blocking signal power with antenna gain of 0dBi
P_{min} = -56.79 dBm
§ Wanted signal level: P_{min} + 6 dB: -50.79 dBm (according to V2.1.1)
And -139+10 log10(OCBW)+10: -56.24 dBm (according to v2.2.0)

Category 2 receiver

Limits: Clause 4.3.2.11.4.3

EN 300 328v2.1.1

Wanted signal mean power from companion device (dBm)	Blocking signal frequency [MHz]	Blocking signal power [dBm] (see note 2)	Type of interfering signal	Performance criteria (%)
P_{min} + 6 dB	2 380 2 503,5	-57	CW	<10*
P_{min} + 6 dB	2 300 2 583,5	-47	CW	<10*
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna.In case of conducted measurements,the levels have to be corrected by the actual antenna assembly gain.				

EN 300 328v2.2.0

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 10) or (-74 dBm + 10) whichever is less (see note 2)	2 380 2 503,5 2 300 2 583,5	[-34]	CW
NOTE 1: OCBW is in Hz. NOTE 2: As an alternative the test may be performed using a wanted signal equal to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: In case of radiated measurements, this wanted signal level is the level in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2. In the case of conducted measurements this wanted signal level is the level applied at the antenna connector. NOTE 4: In case of radiated measurements, the blocking levels specified are levels in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2. In the case of conducted measurements this blocking level is the level applied at the antenna connector. Alternatively, in case the actual antenna performance at the blocking frequencies has been declared (see clause 5.4.1 m) ii)), the difference between the in-band antenna gain and the actual antenna gain at each of the blocking frequencies shall be taken into account.			

***) or manufacturer declared performace criteria**

Test Equipment Used: 1,3,4, 19 - 23

4.13 Geo-Location capability

ETSI EN 300 328 subclause 4.3.2.12

Description	Yes/NO
Geo-location capability implemented	NO

Requirements: Clause 4.3.2.12.3

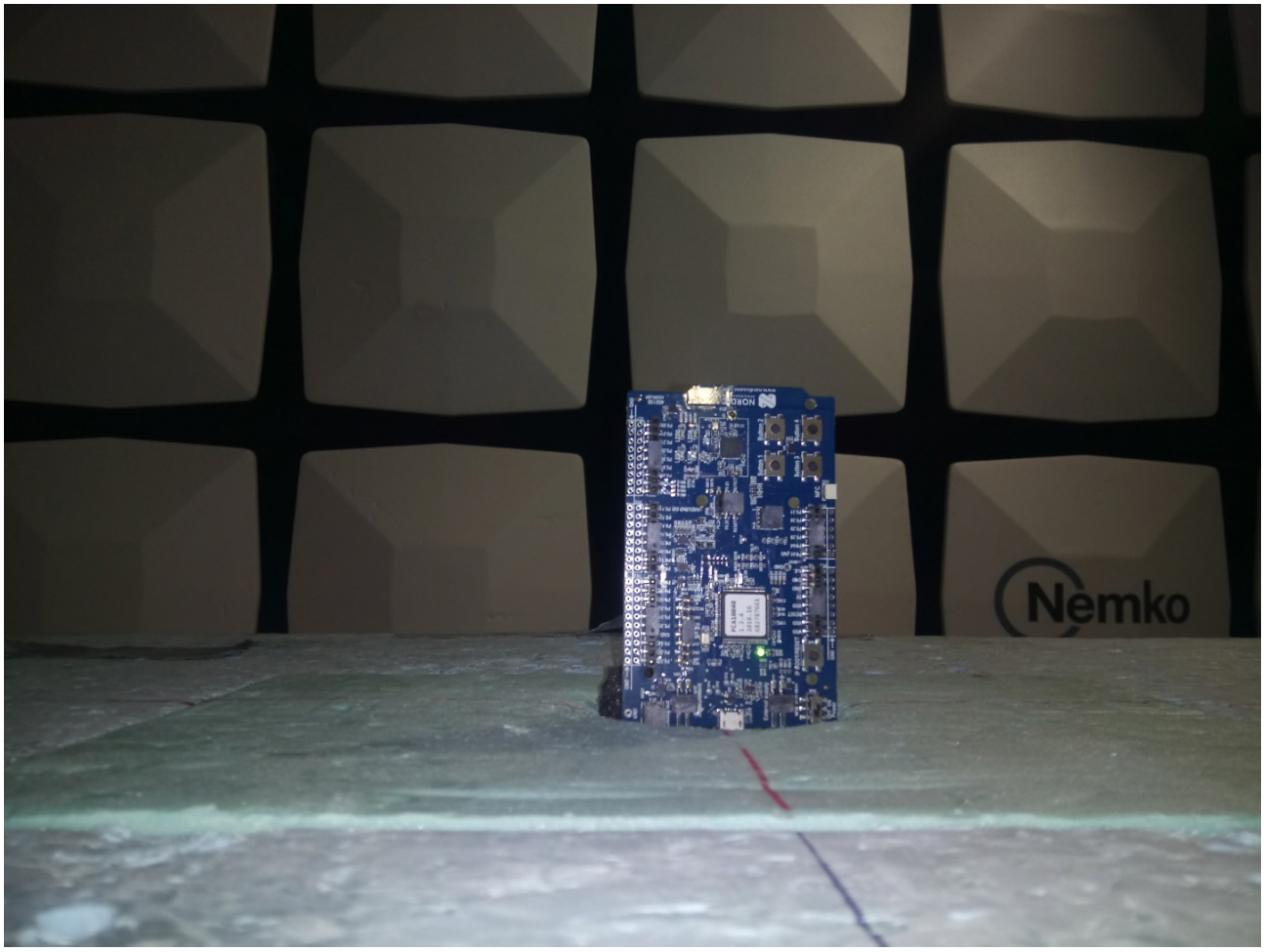
The geographical location determined by the equipment as defined in cl. 4.3.2.12.2 shall not be accessible to the user.

5 Measurement Uncertainty

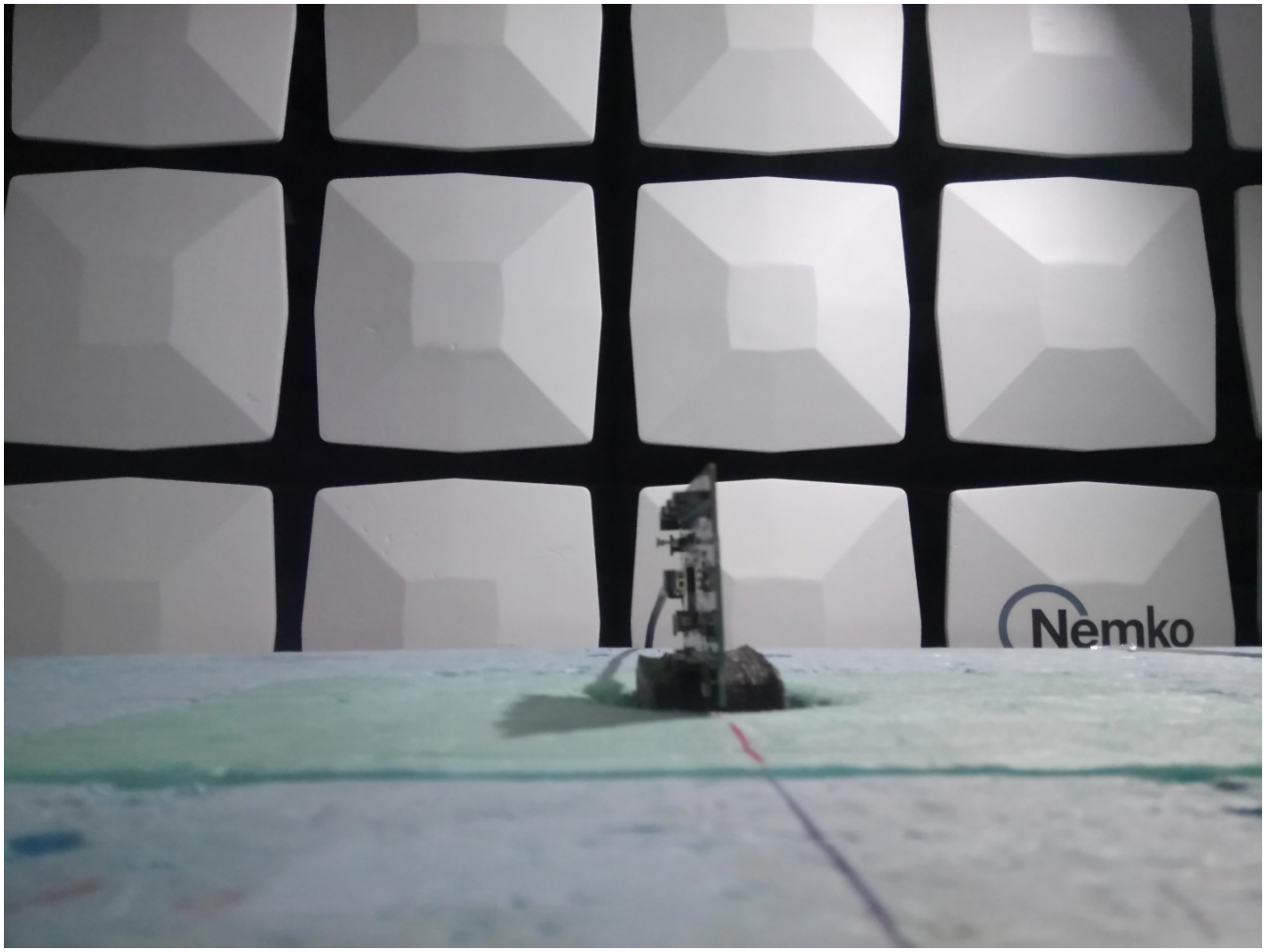
Measurement Uncertainty Values		
Test Item		**Uncertainty**
Conducted Output Power		±0.35 dB
Power Spectral Density		±3.7 dB
Out of Band Emissions, Conducted	**< 1 GHz**	±1.39 dB
	> 1 GHz	±1.39 dB
Spurious Emissions, Radiated	**< 2 GHz**	±1.1 dB
	> 2 GHz	±2.0 dB
Occupied Bandwidth		±0.1kHz
Timing/Duty cycle		< 0.5ns

Conducted measurements are given by the manufacturer (R&S TS8997)

6 Test Setups

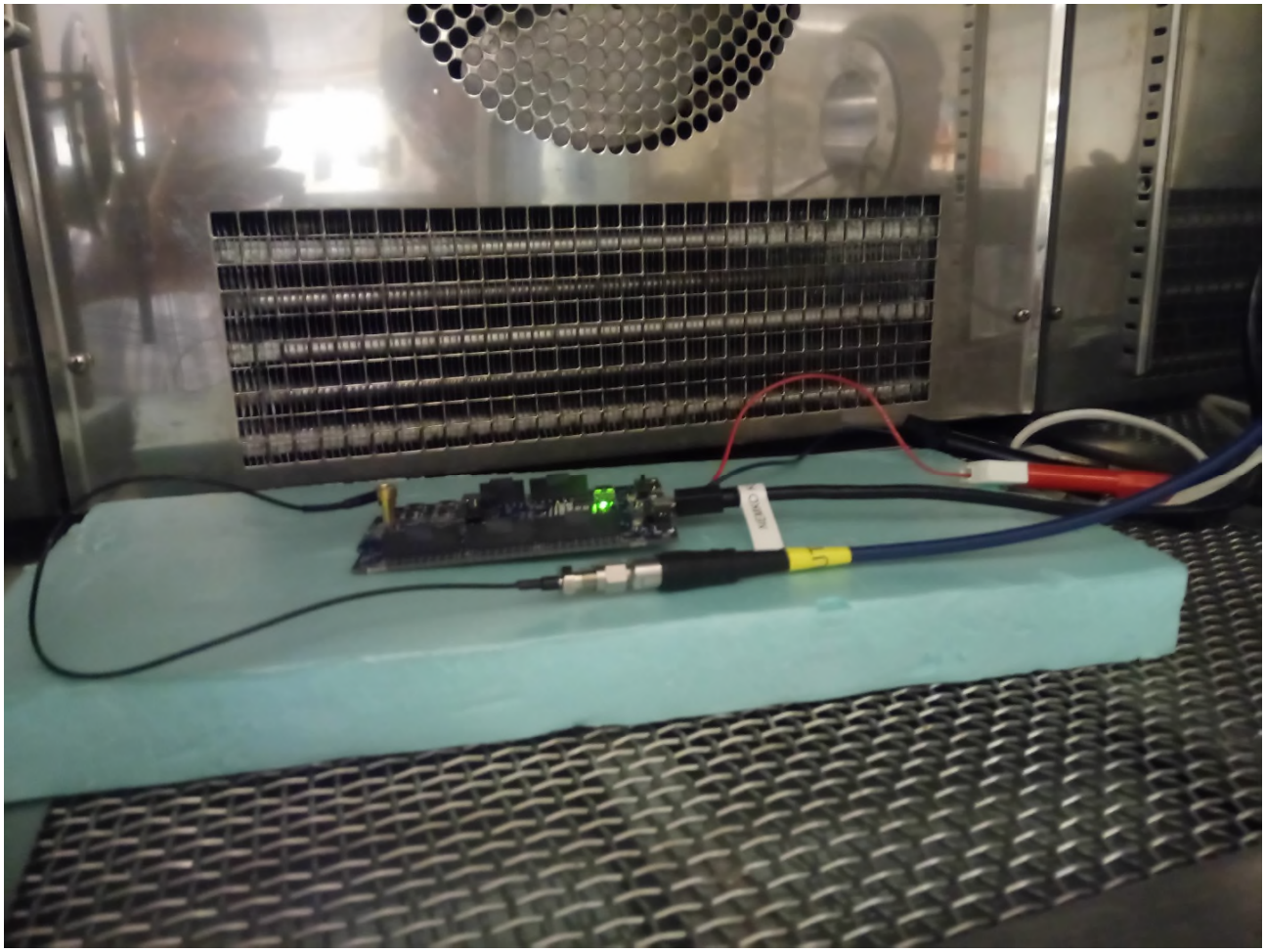


YZ – plane, Radiated measurements



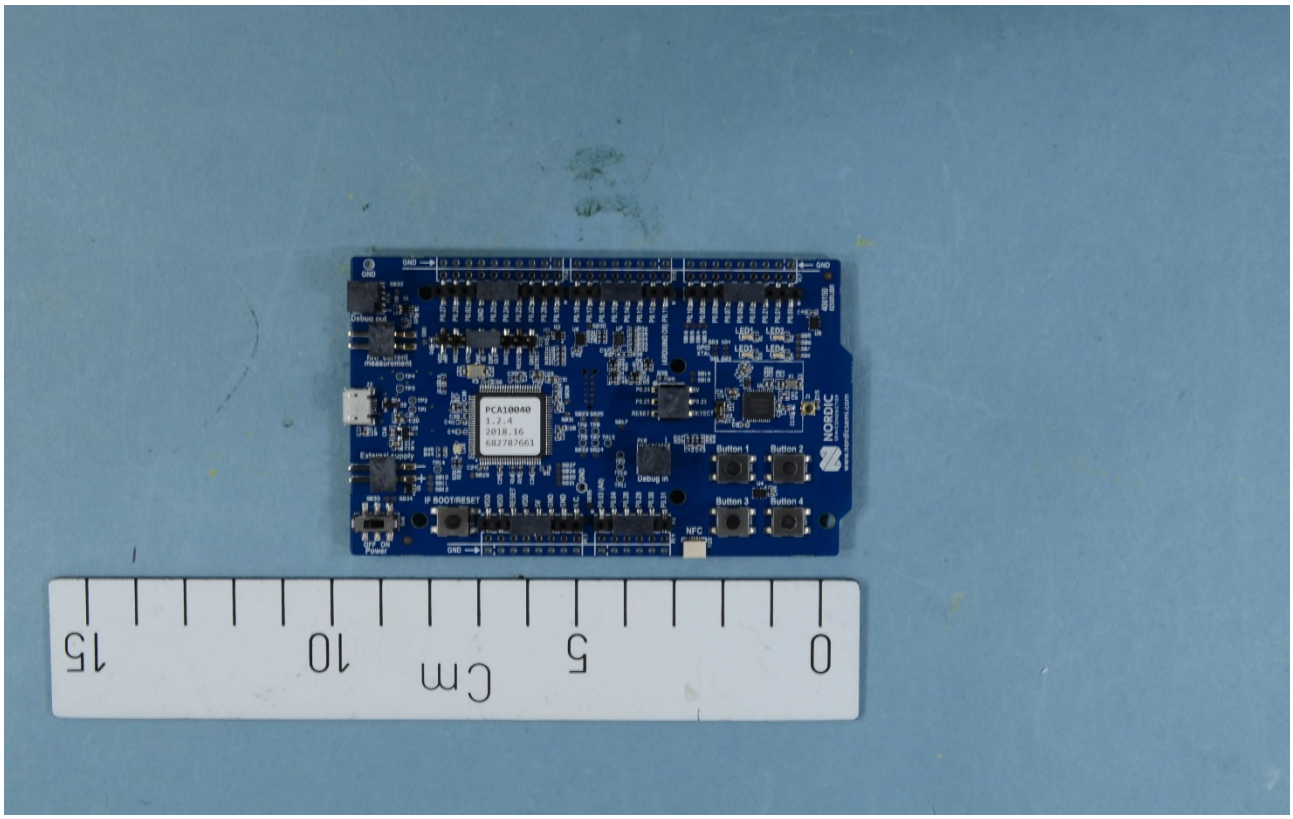
XZ- plane, Radiated measurements

XY-Plane, Radiated measurements

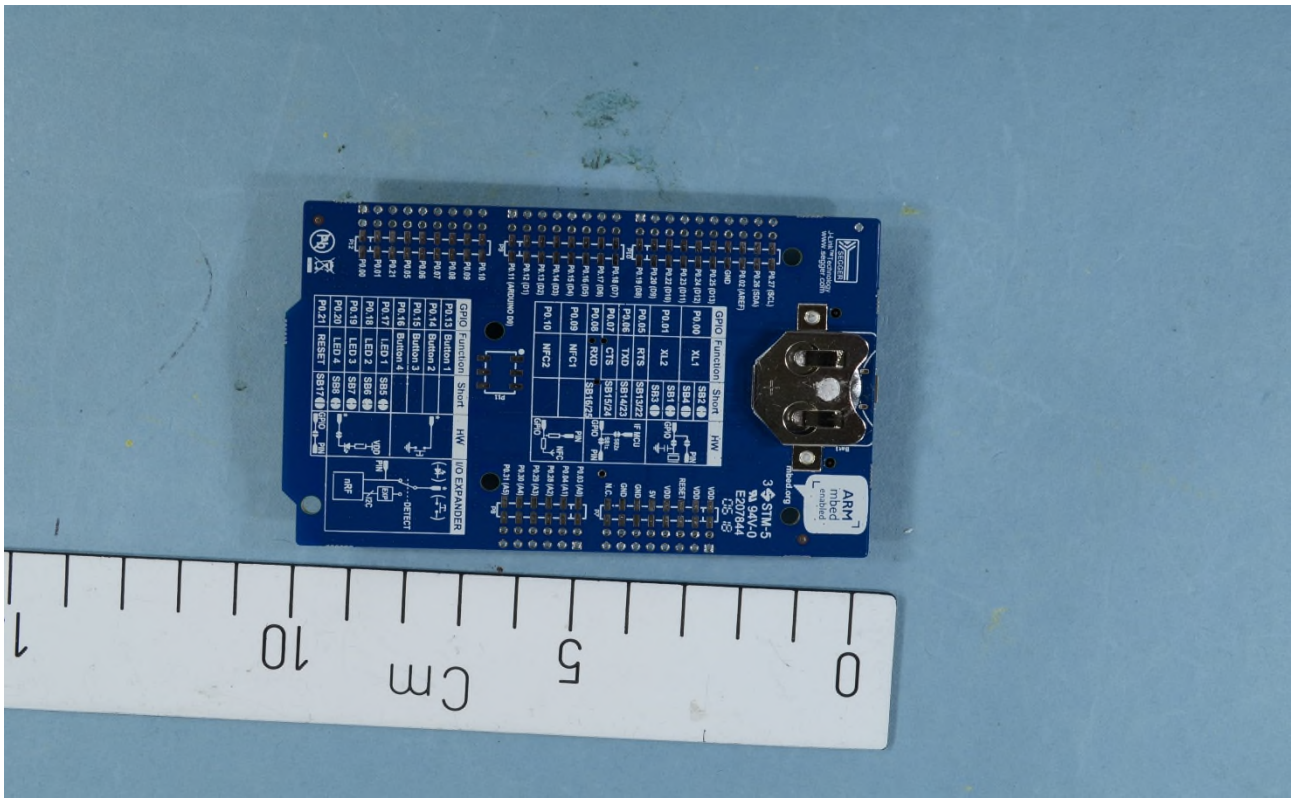


Climatic measurements

7 PHOTOGRAPHS OF THE EUT



nRF52-DK – Front side



nRF52-DK – Rear side

8 Test Equipment Used

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the testhouse.

No	Ref. No	Description	Manufacturer	Type	Cal. date	Cal. due
1.	LR 1654	Spectrum Analyzer	Rohde & Schwarz	FSV 30	01.2017	01.2019
2.	LR 1657	Power meter	Rohde & Schwarz	OSP –B157	01.2017	01.2019
3.	LR 1655	Vector Signal generator	Rohde & Schwarz	SMBV 100A	01.2017	01.2019
4.	LR 1656	Signal generator	Rohde & Schwarz	SMB100A	01.2017	01.2019
5.	-	EMC 32, TS899 (Soft ware)	Rohde & Schwarz	V9.26.00/1.26.01	N/A	
6.	LR 1640	Spectrum Analyzer	Rohde & Schwarz	FSW26	11/2017	11/2019
7.	LR 1673	Attenuator	NARDA	4768-10	Cal b4 use	
8.	LR 1552	Pre-Amplifier	Miteq	JS4	10.2017	10.2018
9.	LR 1226	Double Ridged Horn Antenna	EMCO	3115	11/2008	11/2018
10.	LR 1614	Highpass Filter	Trilithic	6HC3000/18000	Cal b4 use	
11.	LR 1734	Biconical-log hybrid antenna	Sunol Sciences	JB3	05.2018	05.2020
12.	LR 1083	Climatic Chamber	ACS	TY 80	03.2018	03.2019
13.	LR1619	HP filter	Wainwright Instr.	WHKX6.5/18G-8	N/A	
14.	LR 102	Antenna, Horn	Sivers	PM7320X	12.2008	12.2020
15.	LR 101	Antenna, Horn	Systron	DBF-5230	12.2008	12.2020
16.	LR 1480	Antenna, Horn	Narda	638	12.2008	12.2020
17.	LT 666	Power Supply	Oltronix	B300	Cal b4 use	
18.	LR 1598	Multimeter, Digital	Fluke	87V	10.2017	10.2018
19.	LR 1673	Attenuator	NARDA	4768-10	Cal b4 use	
20.	LR 1528	Hybrid	NARDA	4356B	Cal b4 use	
21.	LR1526	Directional coupler	Agilent	87300C	Cal b4 use	
22.	LR1627	Cable			Cal b4 use	
23.	LR1634	Cable			Cal b4 use	
24.	LR1188	RF signal generator	Gigatronics	7200	01.2017	01.2019

Revisions

Revision #	Date	Order #	Description
00	2018-08-29	359526	First issued