

## Test Report

### Radio Characteristics

<b>Product</b>	Development Kit
<b>Name and address of the applicant</b>	Nordic Semiconductor ASA Otto Nielsens vei 12, 7004 Trondheim, Norway
<b>Name and address of the manufacturer</b>	Nordic Semiconductor ASA Otto Nielsens vei 12, 7004 Trondheim, Norway
<b>Model</b>	nRF52840-DK
<b>Rating</b>	3V Lithium battery or 5Vdc, 50mA (USB)
<b>Trademark</b>	Nordic Semiconductor
<b>Serial number</b>	683086794
<b>Additional information</b>	2.4GHz IEEE 802.15.4 based radio
<b>Tested according to</b>	ETSI EN 300 328 v2.1.1 (2016-11) Final Draft ETSI EN 300 328 v2.2.1 (2019-04)
<b>Order number</b>	372254
<b>Tested in period</b>	2019.05.02 – 2019.05.20
<b>Issue date</b>	2019.10.02
<b>Name and address of the testing laboratory</b>	 Instituttveien 6 Kjeller, Norway Tel: +47 22 96 03 30 Fax: +47 22 96 05 50   An accredited technical test executed under the Norwegian accreditation scheme
<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">   Prepared by [G.Suhanthakumar] </div> <div style="text-align: center;">   Approved by [Frode Sveinsen] </div> </div>	
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# 1 GENERAL INFORMATION

## 1.1 Test Information

Name :	Nordic Semiconductor
Model/version :	nRF52840-DK
Serial number :	683086794
Hardware identity and/or version :	V1.1.0
Software identity and/or version :	TBD
Adaptivity:	N/A
Frequency Range :	2405 - 2480 MHz
Number of Channels :	16
Channel Spacing :	5 MHz
Operating Mode :	Transceiver
Type of Modulation :	QPSK, DSSS PHY
Rated Output Power :	8 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 nRF52840-DK is a versatile single board development kit for Bluetooth 5, Bluetooth mesh, Thread, Zigbee, 802.15.4, ANT and 2.4 GHz proprietary applications on the nRF52840 SoC.

It also supports development for the nRF52811 SoC.

It facilitates development exploiting all features of the nRF52840 SoC. It includes an NFC antenna that quickly enables utilization of the NFC-A tag peripheral. All GPIOs are available via edge connectors and headers, and 4 buttons and 4 LEDs simplifies input and output to and from the SoC.

## 1.2 Test Environment

### 1.2.1 Normal test condition

Temperature:	20.0 – 23 °C
Relative humidity:	20.0 – 44.0 %
Normal test voltage:	3Vdc

The values are the limit registered during the test period.

### 1.2.2 Extreme test conditions

#### Voltage

Minimum Voltage.:	1.7Vdc
Maximum Voltage.:	3.6Vdc

#### Temperature

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

Defined by the manufacturer.

## 1.3 Test Engineer

Kristian Osvoll and G.Suwanthakumar

## 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 V2.2.1 is blocking test. This blocking test is performed according to both versions of the standard.

Test command for Zigbee I TX mode:

- TX\_IE154\_LDO\_8dBm\_PCKT9\_PL20\_2405
- TX\_IE154\_LDO\_8dBm\_PCKT9\_PL20\_2445
- TX\_IE154\_LDO\_8dBm\_PCKT9\_PL20\_2480

Test command for Zigbee I RX mode:

- RX\_IE154\_LDO\_2405
- RX\_IE154\_LDO\_2445
- RX\_IE154\_LDO\_2480
-

## 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 V2.2.1 (2019-04):**

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 in 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



**THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.**

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

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### 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 Requirement 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 <sup>1</sup>
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 <sup>1</sup>
Accumulated 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 <sup>1</sup>
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 <sup>2</sup>

<sup>1</sup>: The eirp is less than 10 dBm

<sup>2</sup>: Not implemented.

## 4 Test Results

### 4.1 RF Output Power, Radiated

ETSI EN 300 328 subclause 4.3.2.2

#### EIRP

DUT Frequency (MHz)	Polarization	Max EIRP (dBm)	Limit (dBm)	Temperature (°C)	Result	Comment
2405.000000	HP	7.10	<= 20.0	23	PASS	XY plane
2445.000000	HP	8.13	<= 20.0	23	PASS	XY plane
2480.000000	HP	8.32	<= 20.0	23	PASS	XY plane

50.1% 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

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
2405	6.7	6.7	<= 20.0	21.0	PASS	
2445	6.6	6.6	<= 20.0	21.0	PASS	
2480	5.7	5.7	<= 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
2405	6.7	6.7	<= 20.0	5.0	PASS	
2445	6.6	6.6	<= 20.0	5.0	PASS	
2480	5.7	5.7	<= 20.0	5.0	PASS	

### 5° C, 3.6Vdc

DUT Frequency (MHz)	Max Burst RMS Power (dBm)	Max EIRP (dBm)	Limit (dBm)	Temperature (°C)	Result	Comment
2405	6.9	6.9	<= 20.0	5.0	PASS	
2445	6.7	6.7	<= 20.0	5.0	PASS	
2480	5.9	5.9	<= 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
2405	6.4	6.4	<= 20.0	35.0	PASS	
2445	6.4	6.4	<= 20.0	35.0	PASS	
2480	5.5	5.5	<= 20.0	35.0	PASS	



### 35° C, 3.6Vdc

DUT Frequency (MHz)	Max Burst RMS Power (dBm)	Max EIRP (dBm)	Limit (dBm)	Temperature (°C)	Result	Comment
2405	6.7	6.7	<= 20.0	35.0	PASS	
2445	6.5	6.5	<= 20.0	35.0	PASS	
2480	5.7	5.7	<= 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**

<p>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.</p>
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#### 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

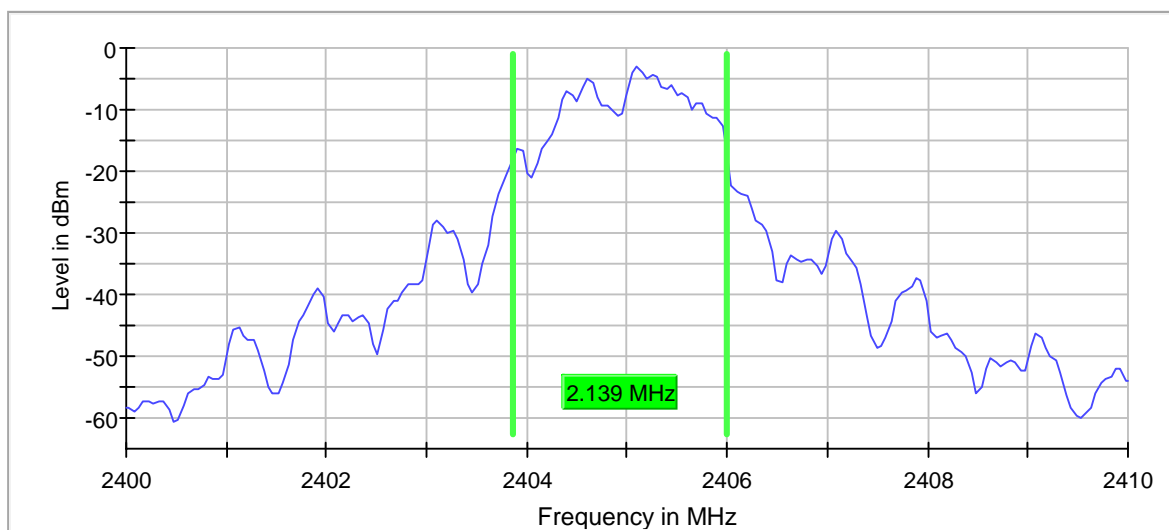
DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Limit Min BE L (MHz)	Band Edge Right (MHz)	Limit Max BE R (MHz)
2405.000	2.14	---	---	2403.855721	2400.000000	2405.995025	2483.500000
2445.000	2.19	---	---	2443.805970	2400.000000	2445.995025	2483.500000
2480.000	2.14	---	---	2478.855721	2400.000000	2480.995025	2483.500000

#### Limits: Clause 4.3.2.7.3

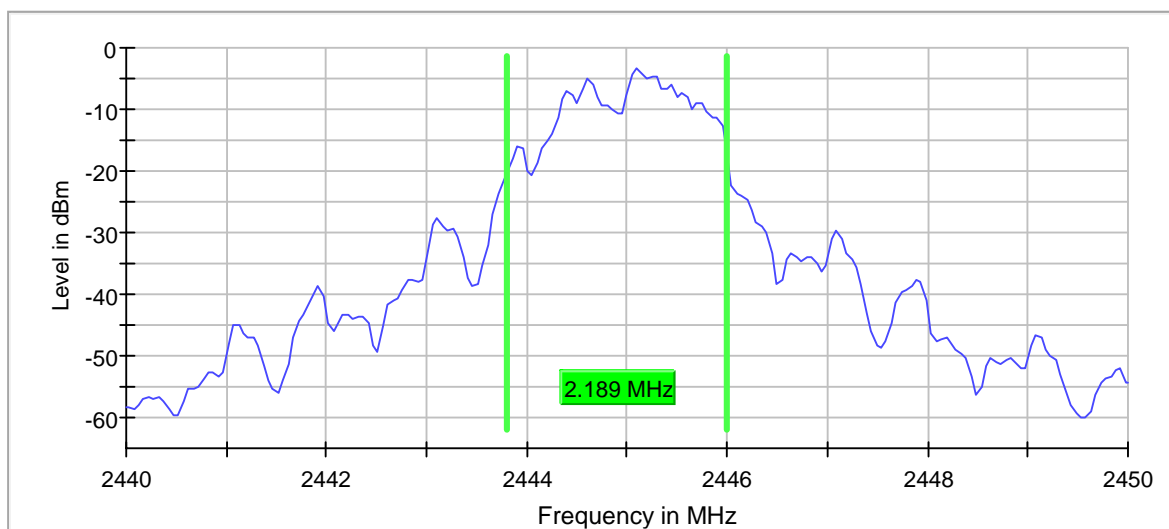
The Occupied Channel Bandwidth shall fall completely within the 2400 – 2483.5 MHz band.  
In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz

Test Equipment Used: 1,2,5

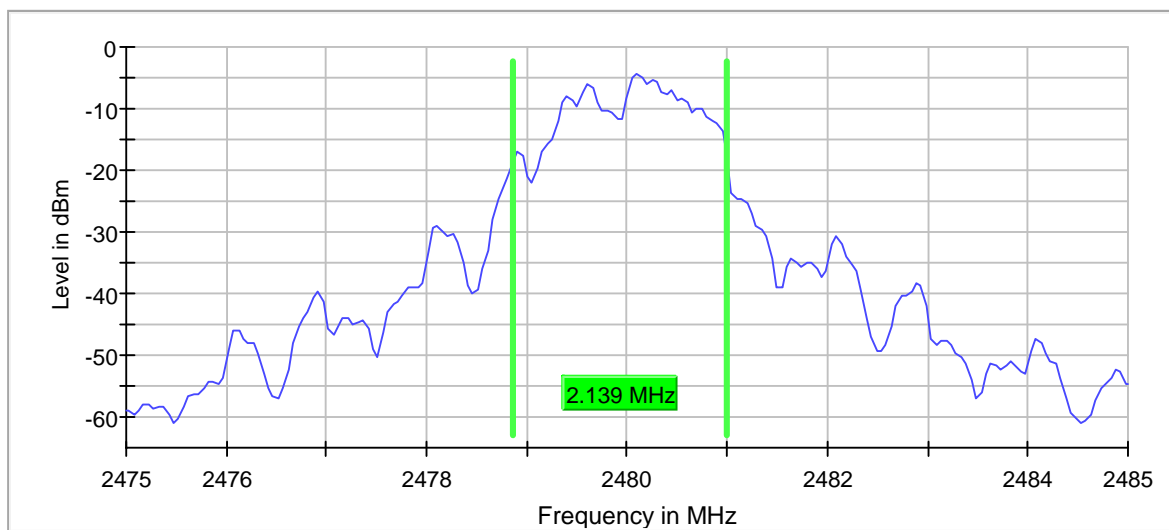
## Low Frequency



## Middle Frequency



## High Frequency





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

ETSI EN 300 328 subclause 4.3.2.8

##### Ch2405MHz

Frequency (MHz)	level (dBm)	Limit (dBm)	Result
2396.221392	-51.9	-20.0	PASS
2396.360696	-51.5	-20.0	PASS
2397.360696	-49.8	-20.0	PASS
2398.360696	-50.2	-10.0	PASS
2398.500000	-48.9	-10.0	PASS
2399.500000	-45.5	-10.0	PASS
2484.000000	-55.7	-10.0	PASS
2485.000000	-53.9	-10.0	PASS
2485.139304	-54.7	-10.0	PASS
2486.139304	-54.7	-20.0	PASS
2487.139304	-54.4	-20.0	PASS
2487.278608	-52.1	-20.0	PASS

##### Ch2480MHz

Frequency (MHz)	level (dBm)	Limit (dBm)	Result
2396.221392	-54.7	-20.0	PASS
2396.360696	-54.6	-20.0	PASS
2397.360696	-53.8	-20.0	PASS
2398.360696	-54.1	-10.0	PASS
2398.500000	-55.3	-10.0	PASS
2399.500000	-54.8	-10.0	PASS
2484.000000	-40.2	-10.0	PASS
2485.000000	-45.0	-10.0	PASS
2485.139304	-45.2	-10.0	PASS
2486.139304	-48.4	-20.0	PASS
2487.139304	-49.6	-20.0	PASS
2487.278608	-49.8	-20.0	PASS

#### Limits: Clause 4.3.2.8.3

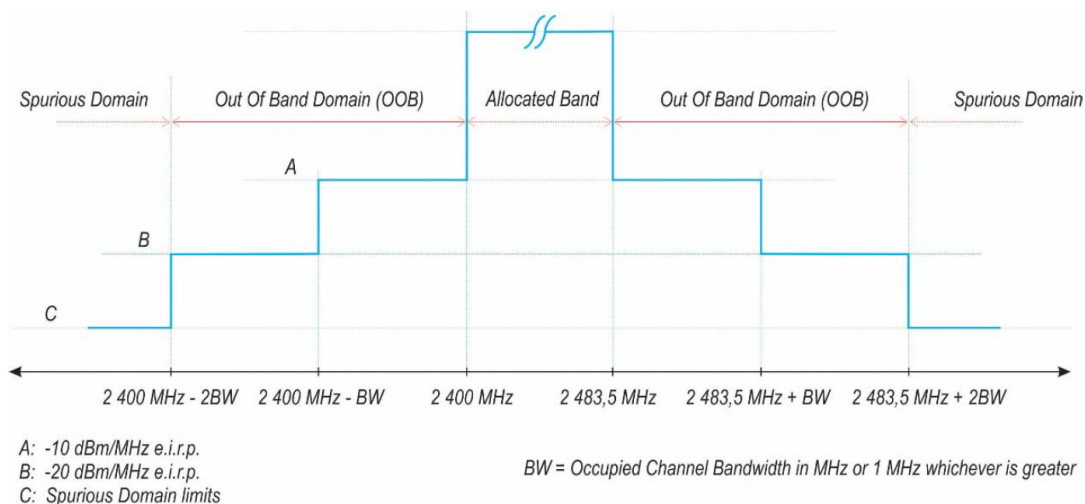
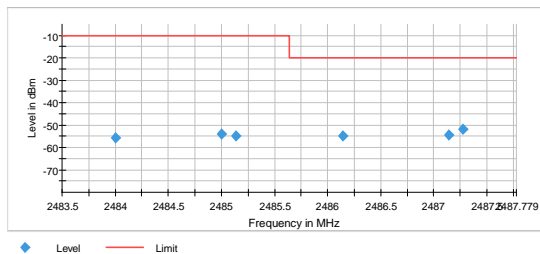
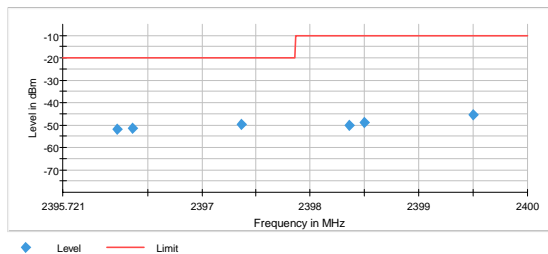


Figure 1: Transmit mask

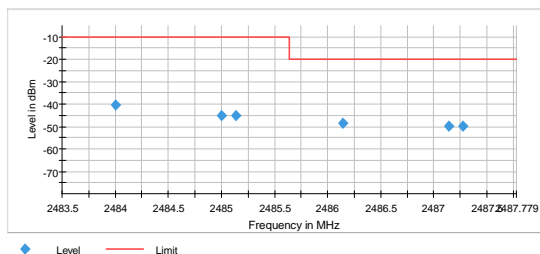
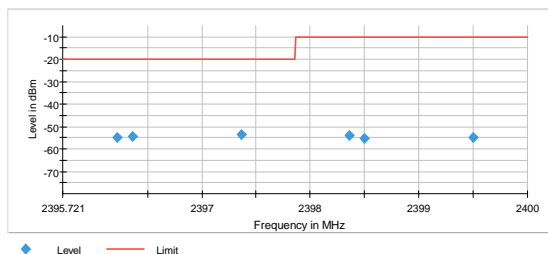
Out of Band Domain	Limit (dBm/MHz)
A	-10 dBm/MHz e.i.r.p.
B	-20 dBm/MHz e.i.r.p.

Test Equipment Used: 1,2,5

## Ch2405MHz



## Ch2480MHz



#### 4.9 Transmitter spurious emissions - Radiated (Operating)

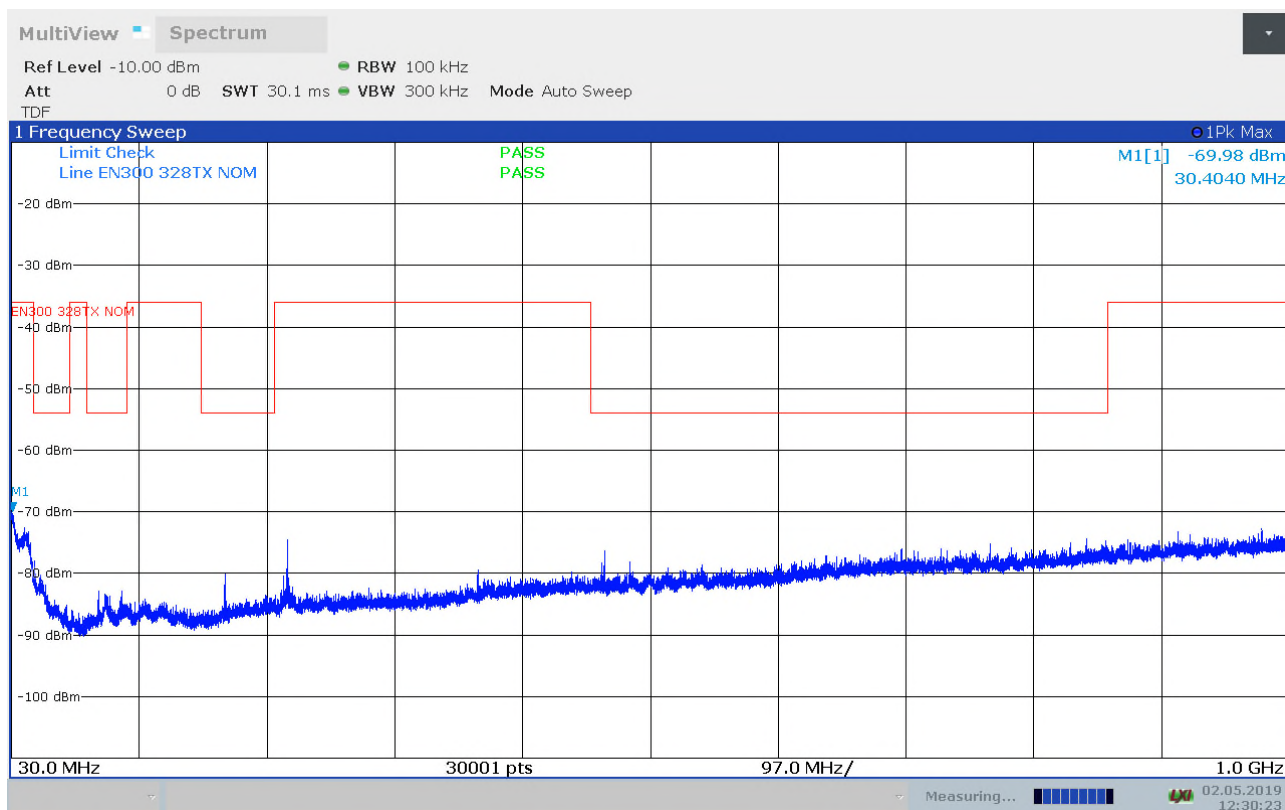
ETSI EN 300 328 subclause 4.3.2.9

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			$\leq 2\text{GHz} - \pm 1.1 \text{ dB}$ $2\text{GHz} - 18 \text{ GHz} - \pm 2.0 \text{ dB}$

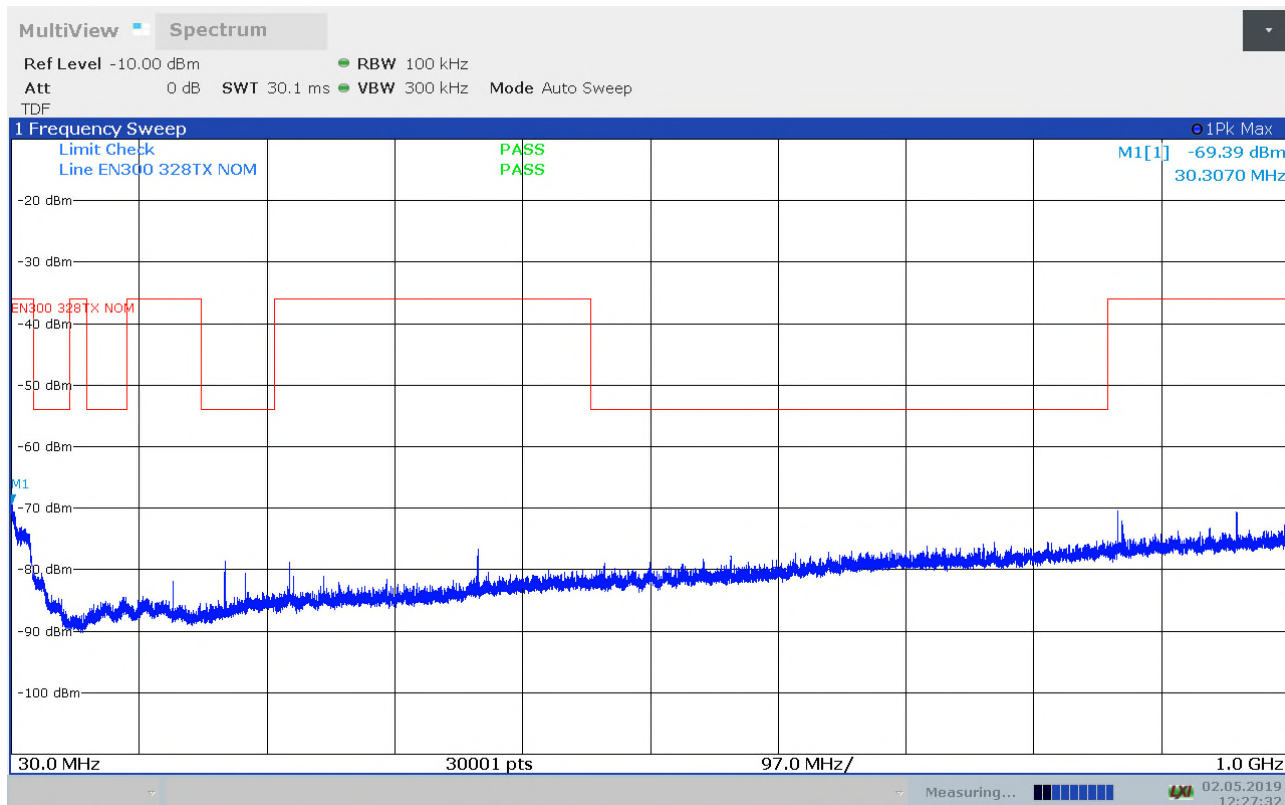
##### Limits: Clause 4.3.2.9.3

Frequency Range	Maximum power e.r.p. ( $\leq 1 \text{ GHz}$ ) e.i.r.p. ( $> 1 \text{ GHz}$ )	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

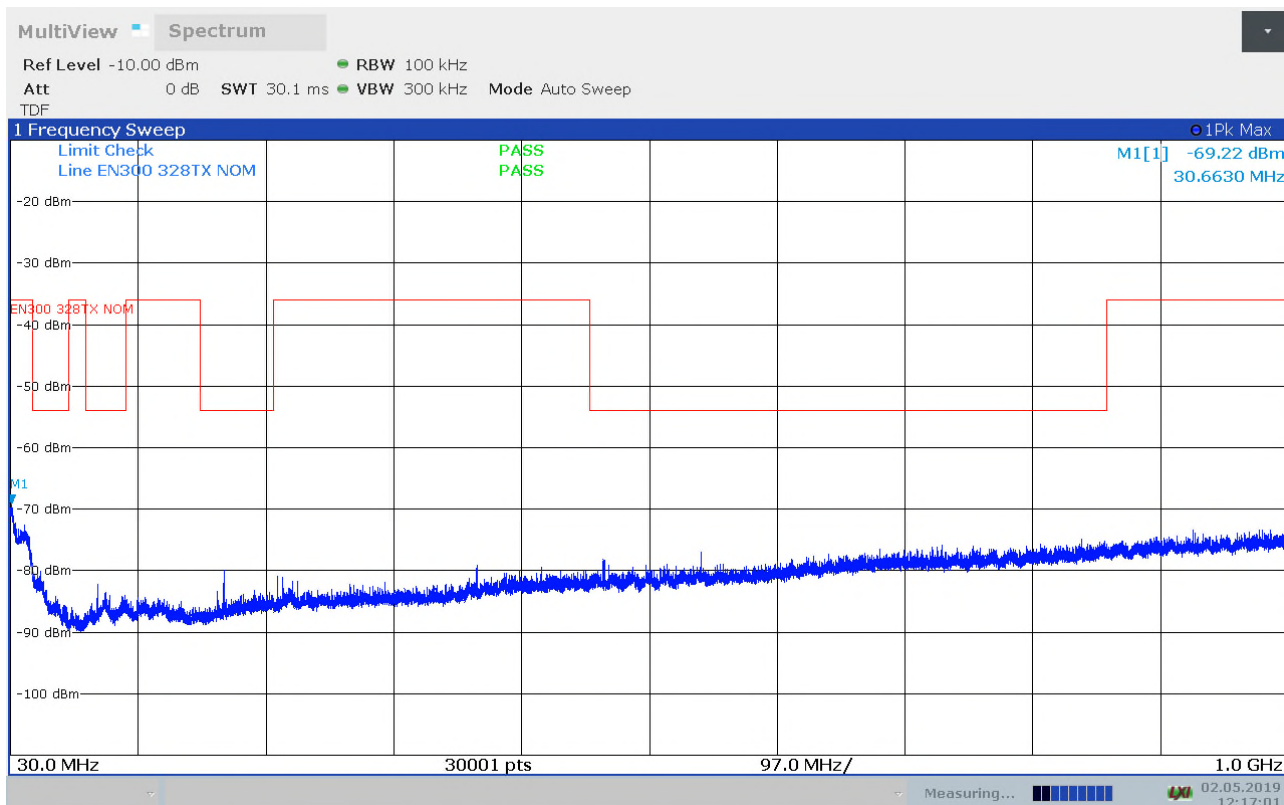
Test Equipment Used: 6,9,10,11



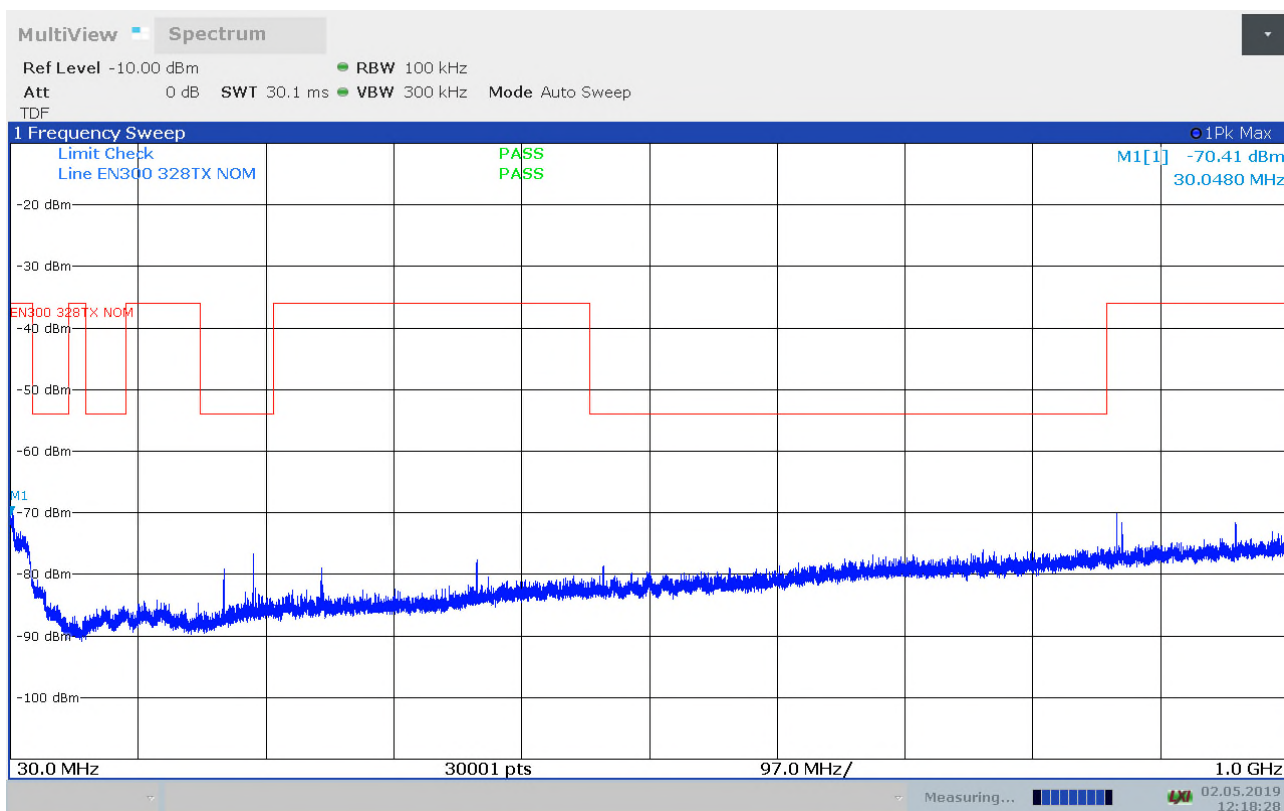
Radiated Emissions, 30 -1000MHz, 2405MHz, VP



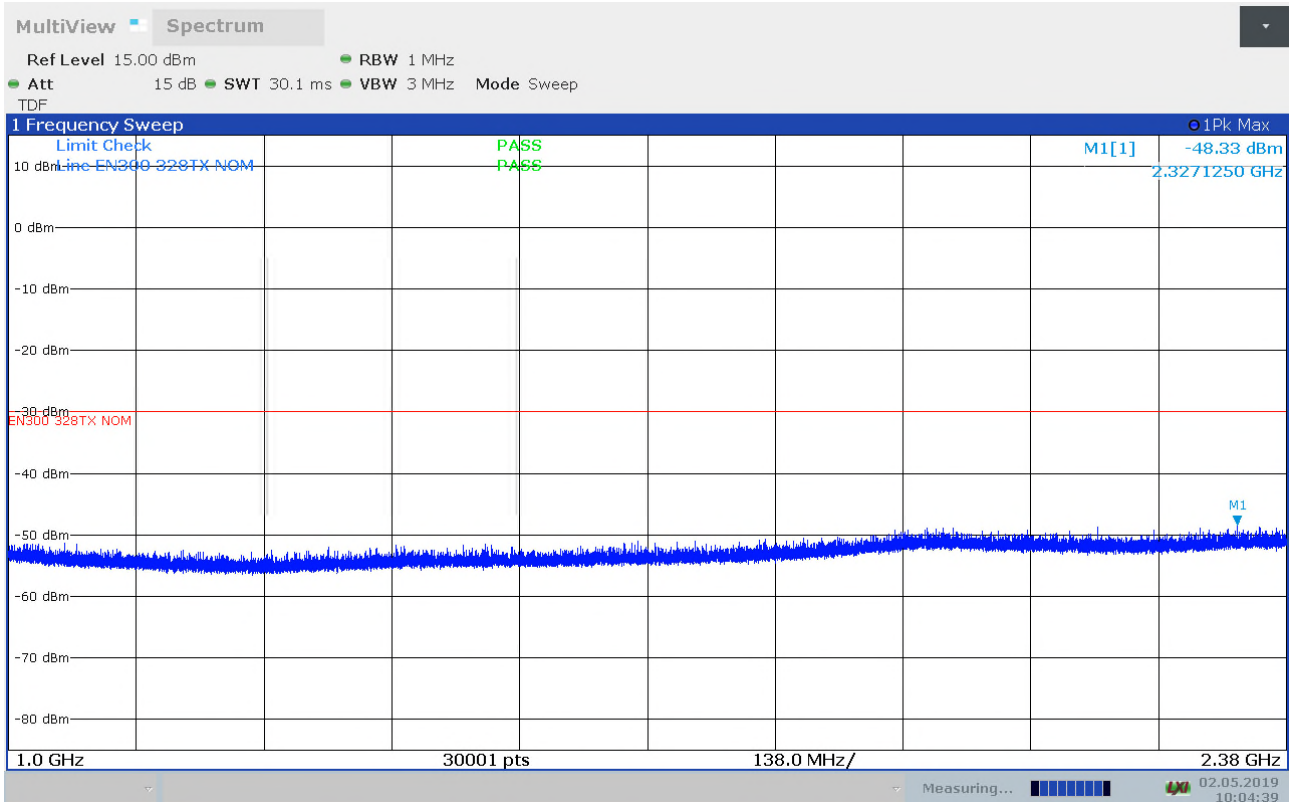
Radiated Emissions, 30 -1000MHz, 2405MHz, HP



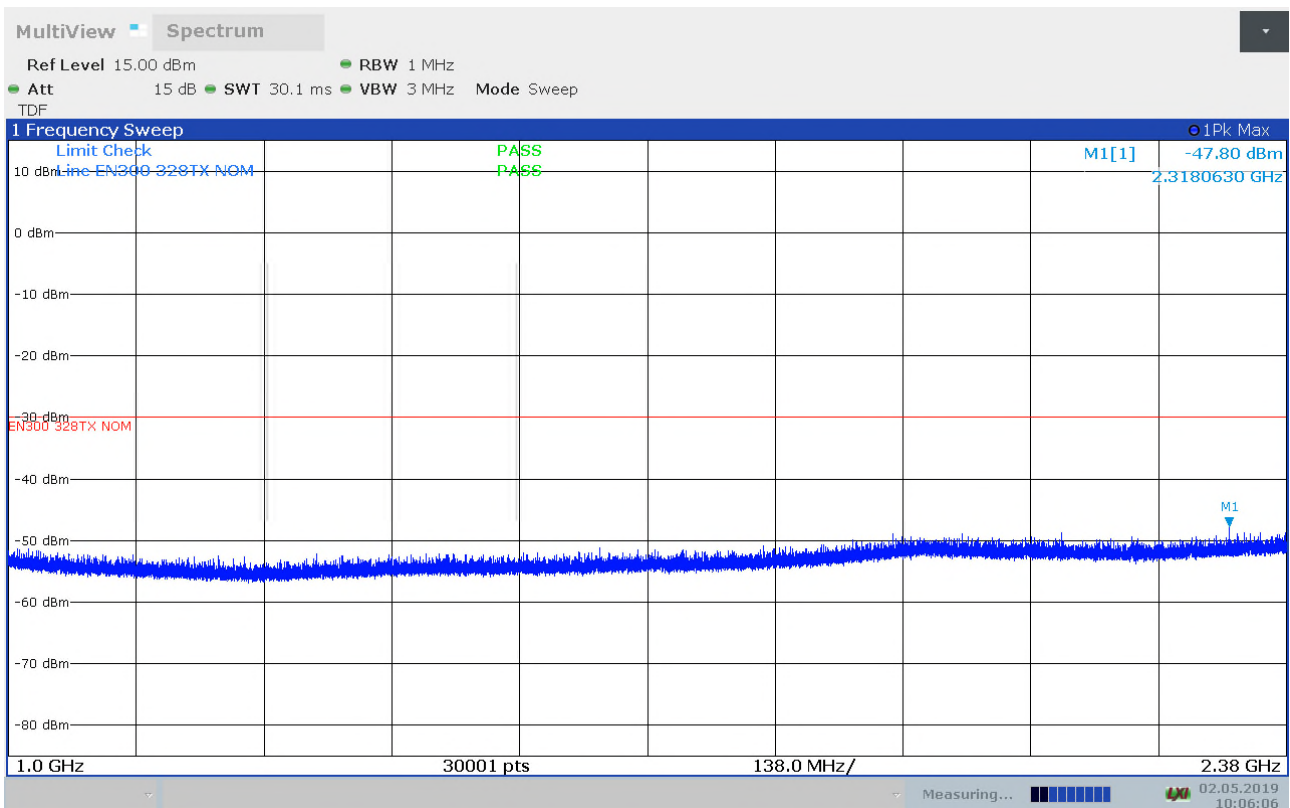
Radiated Emissions, 30 -1000MHz, 2480MHz, VP



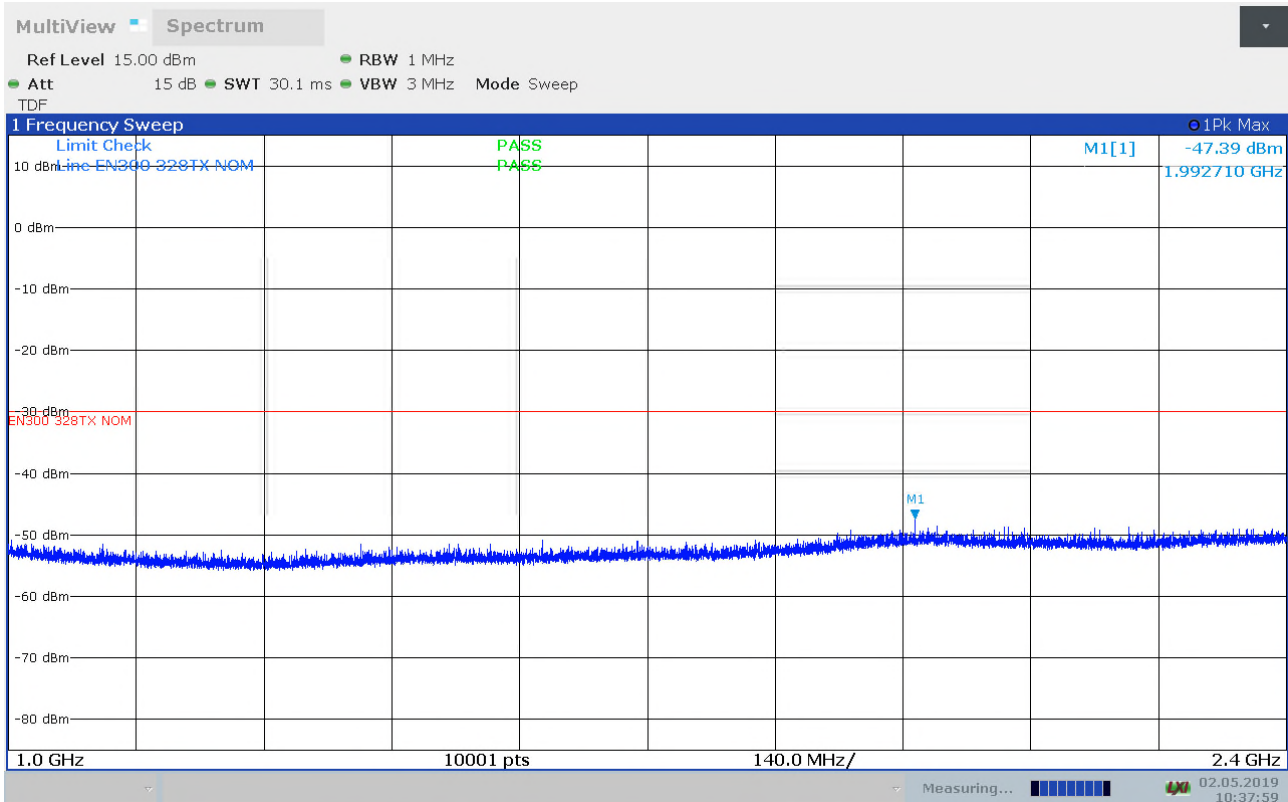
Radiated Emissions, 30 -1000MHz, 2480MHz, HP



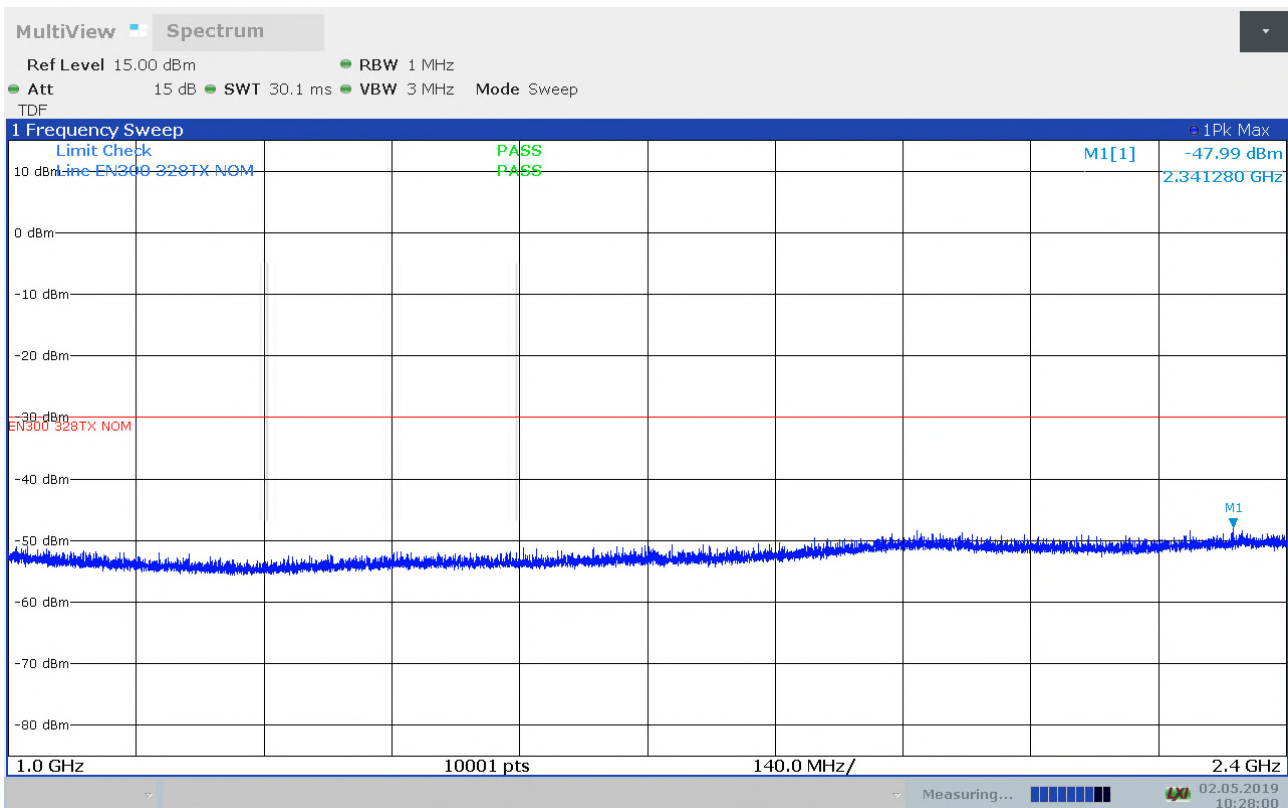
Radiated Emissions, 1 – 2.38GHz, 2405MHz, VP (PK scan)



Radiated Emissions, 1 – 2.38GHz, 2405MHz, HP (PK scan)

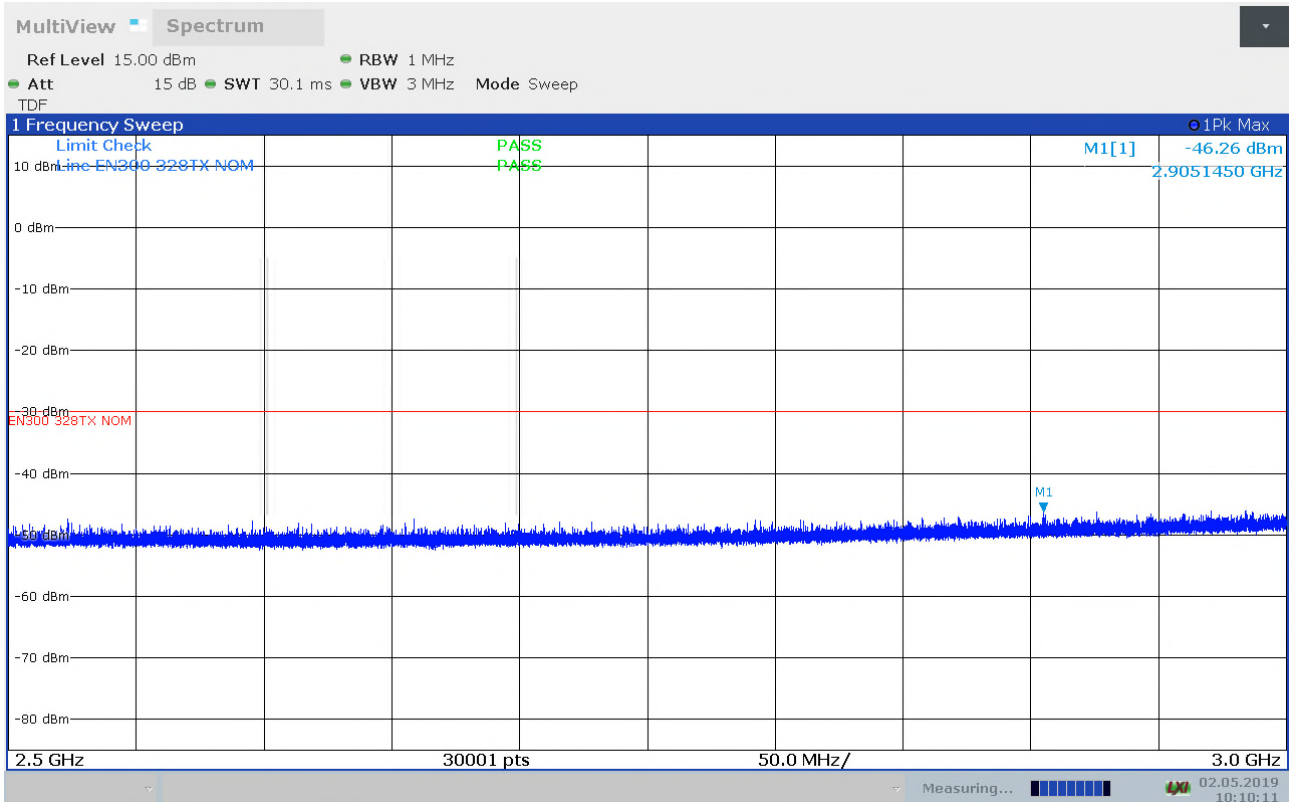


Radiated Emissions, 1 – 2.4GHz, 2480MHz, VP (PK scan)

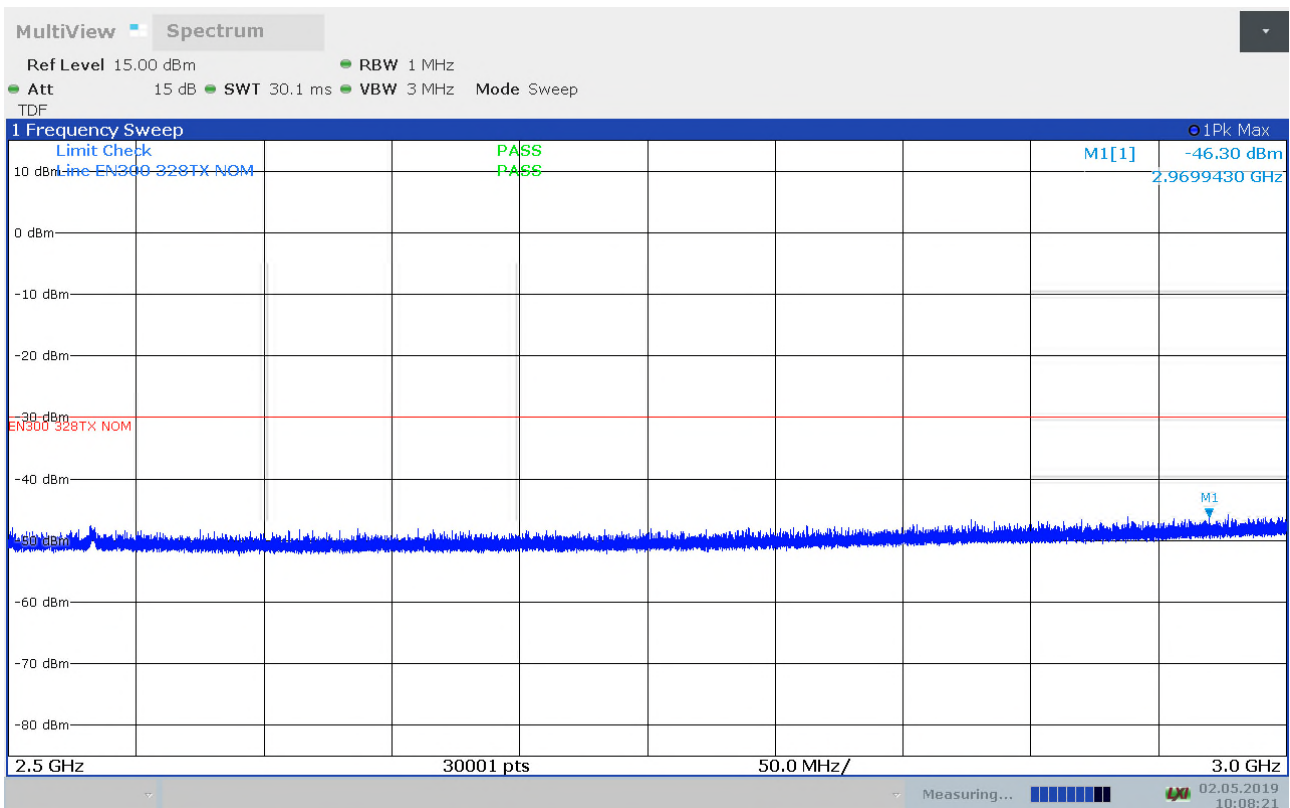


Radiated Emissions, 1 - 2.4GHz, 2480MHz, HP (PK scan)



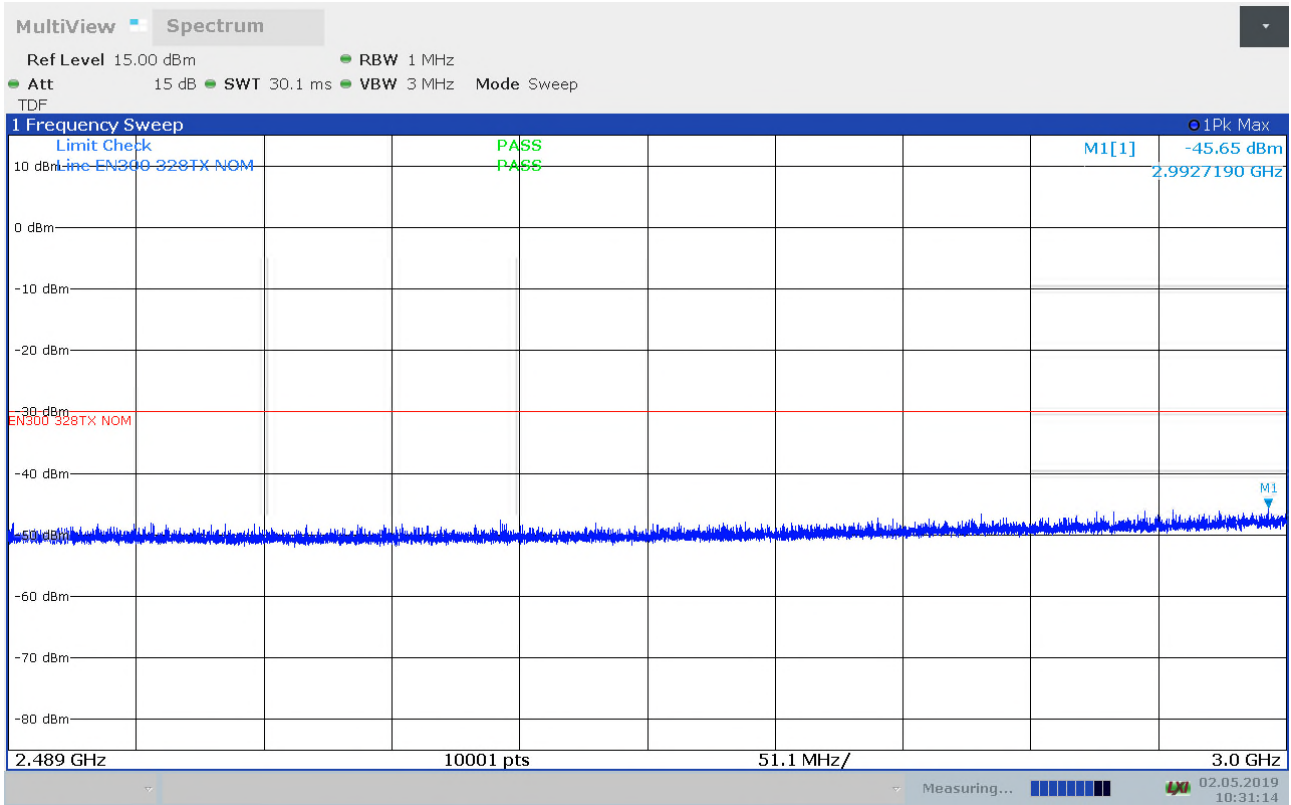


Radiated Emissions, 2.5 - 3GHz, 2405MHz, VP (PK scan)

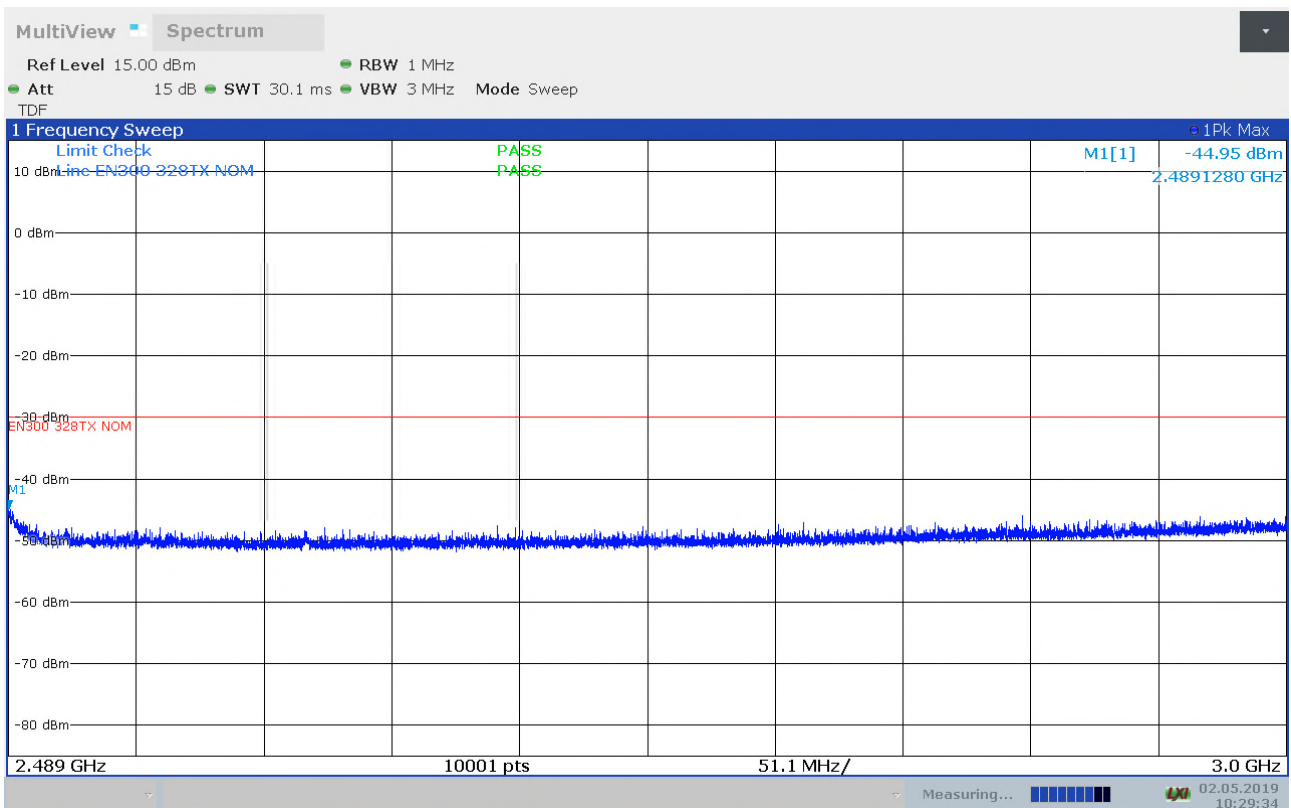


Radiated Emissions, 2.5 - 3GHz, 2405MHz, HP (PK scan)

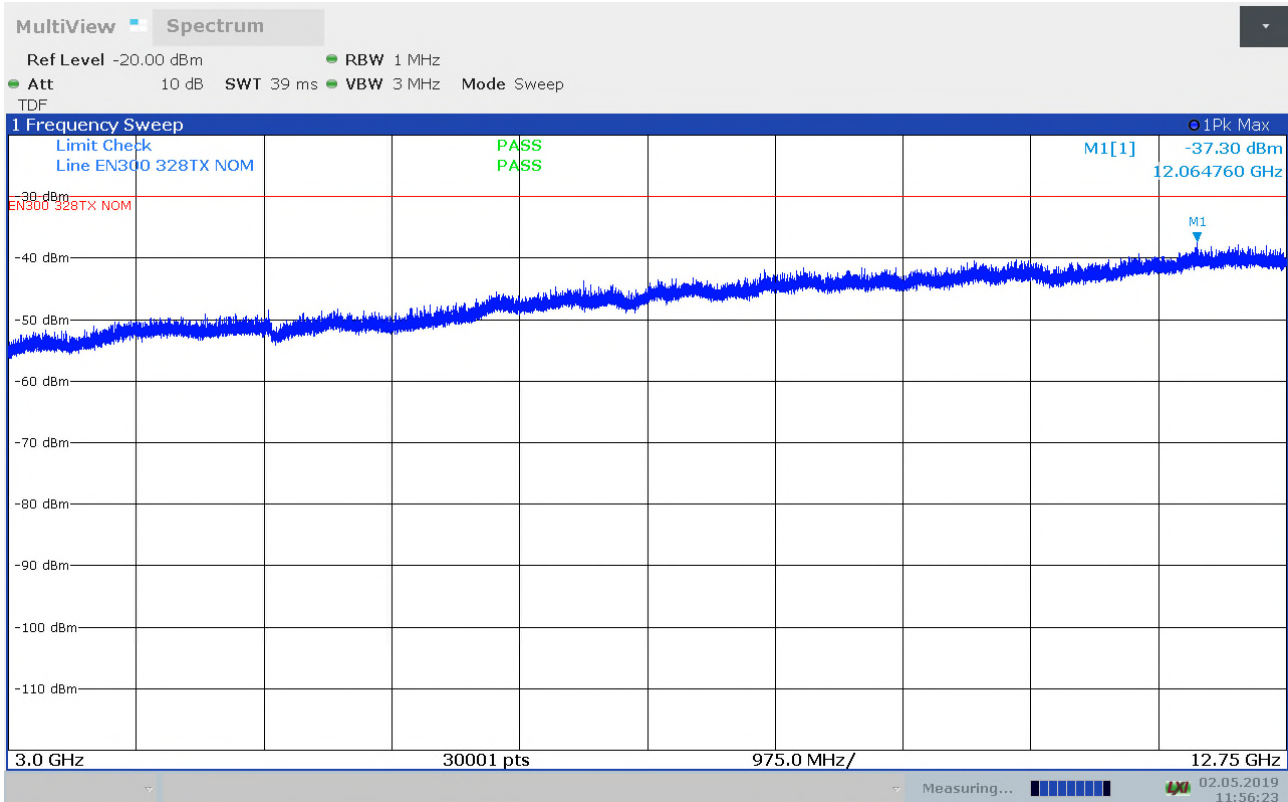




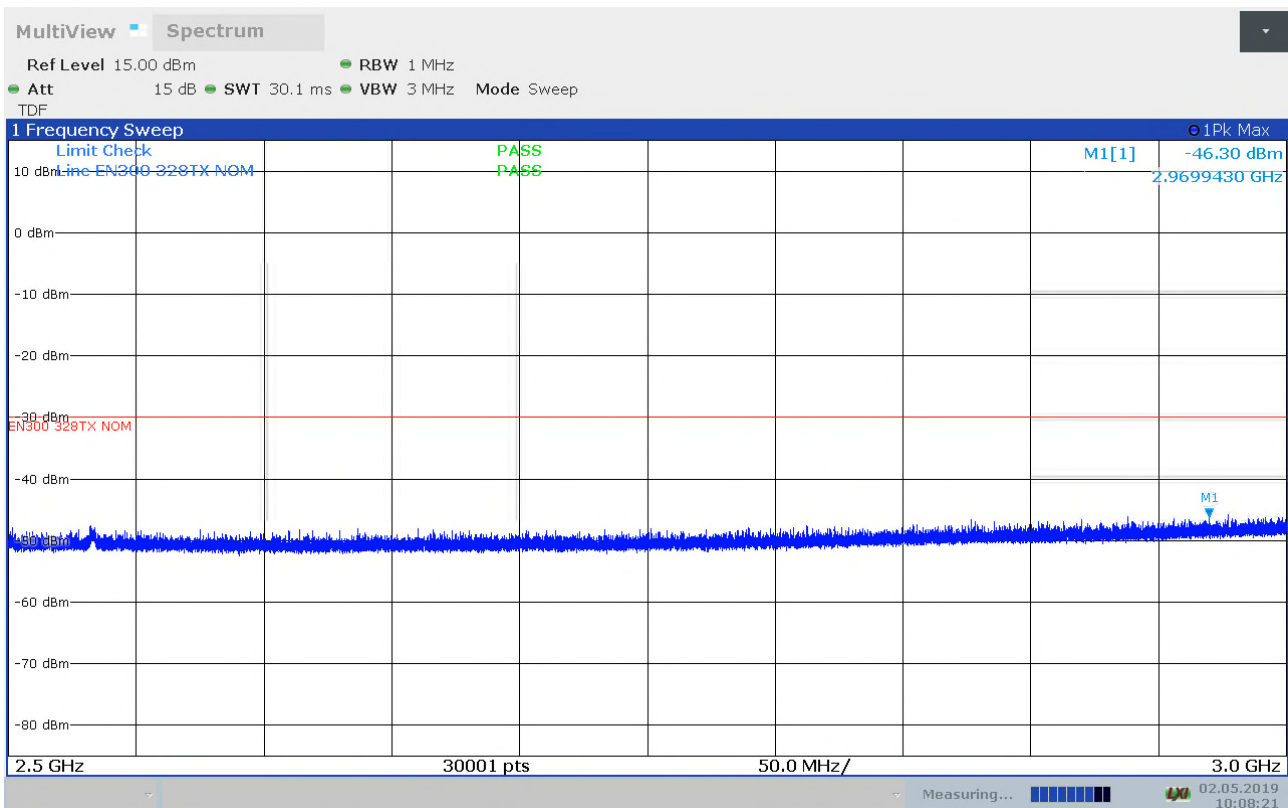
Radiated Emissions, 2.4879 - 3GHz, 2480MHz, VP (PK scan)



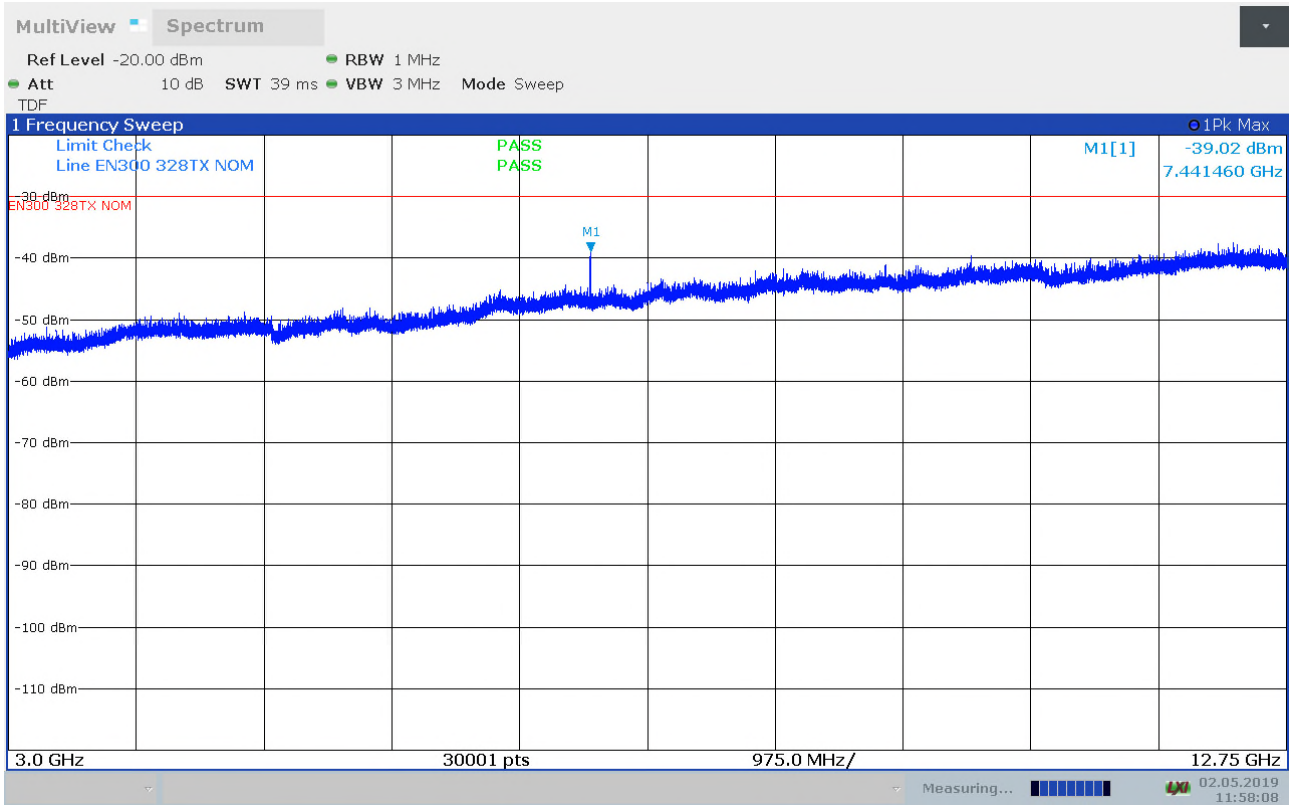
Radiated Emissions, 2.4879 - 3GHz, 2480MHz, HP (PK scan)



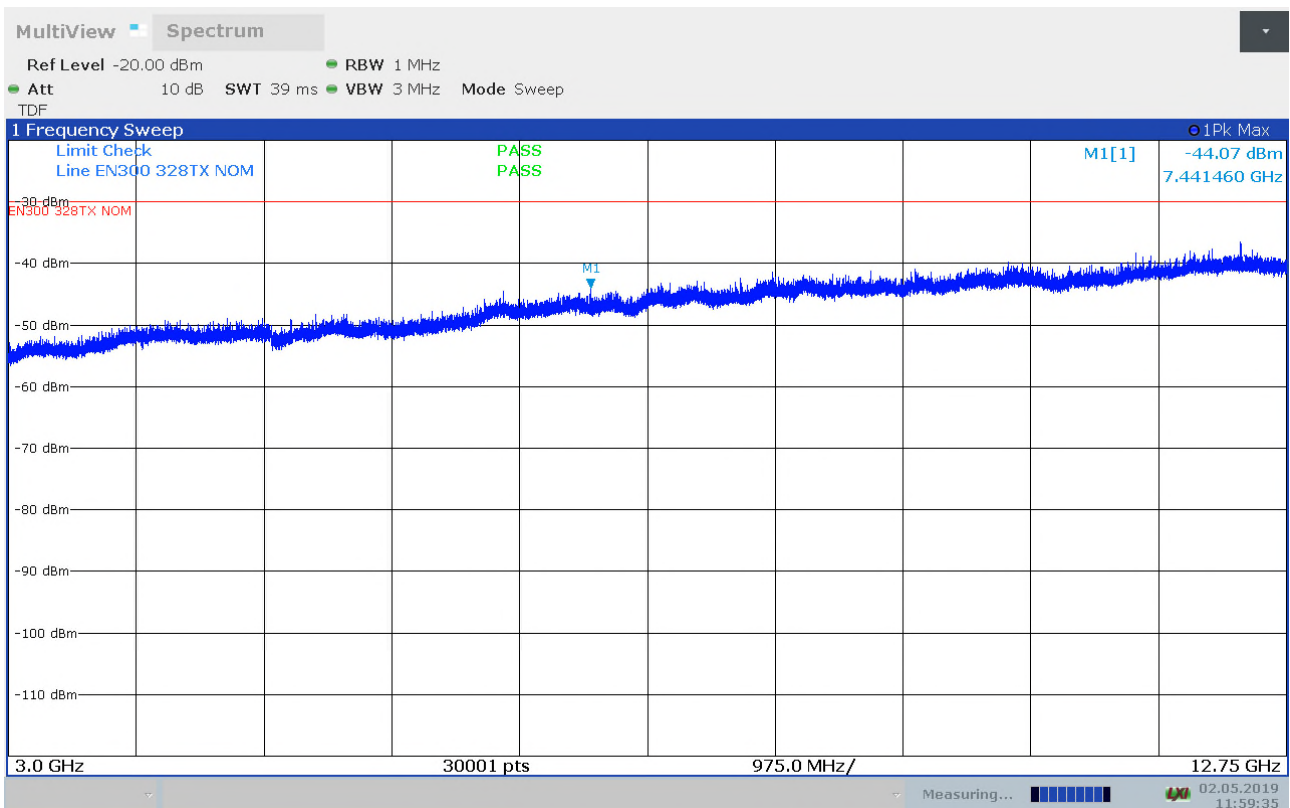
Radiated Emissions, 3 – 12.75GHz, 2405MHz, HP (PK)



Radiated Emissions, 3 – 12.75GHz, 2405MHz, VP (PK)



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



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

#### 4.10 Receiver spurious emissions - Radiated

ETSI EN 300 328 subclause 4.3.2.10

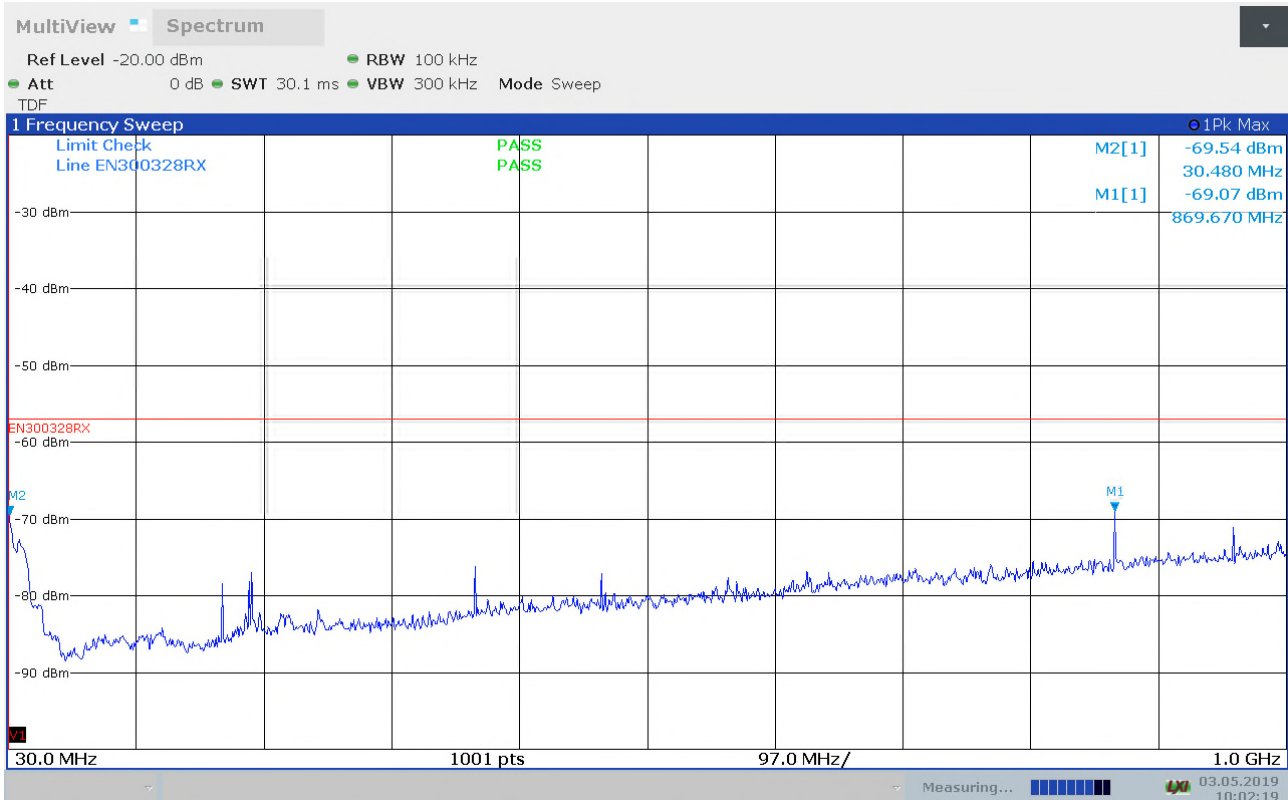
Frequency (MHz)	Detector	Polarization	Spurious Emission Level (dBm)
30 – 1000 (all others)	PK	VP/HP	< -63
1000 – 12750 (all others)	PK	VP/HP	< -53

Because of large background noise, the RBW of 100 kHz is used for pre-scan for frequencies above 6GHz.

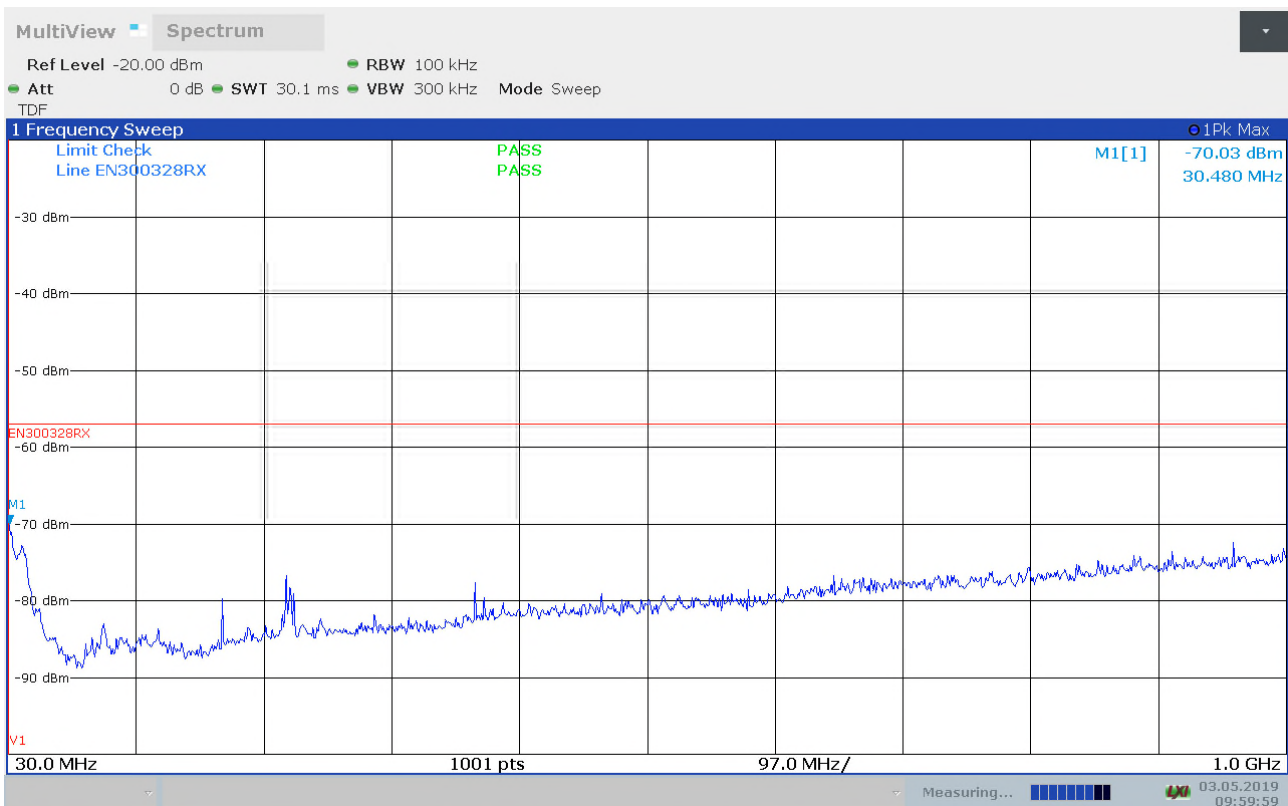
##### Limits: Clause 4.3.2.10.3

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

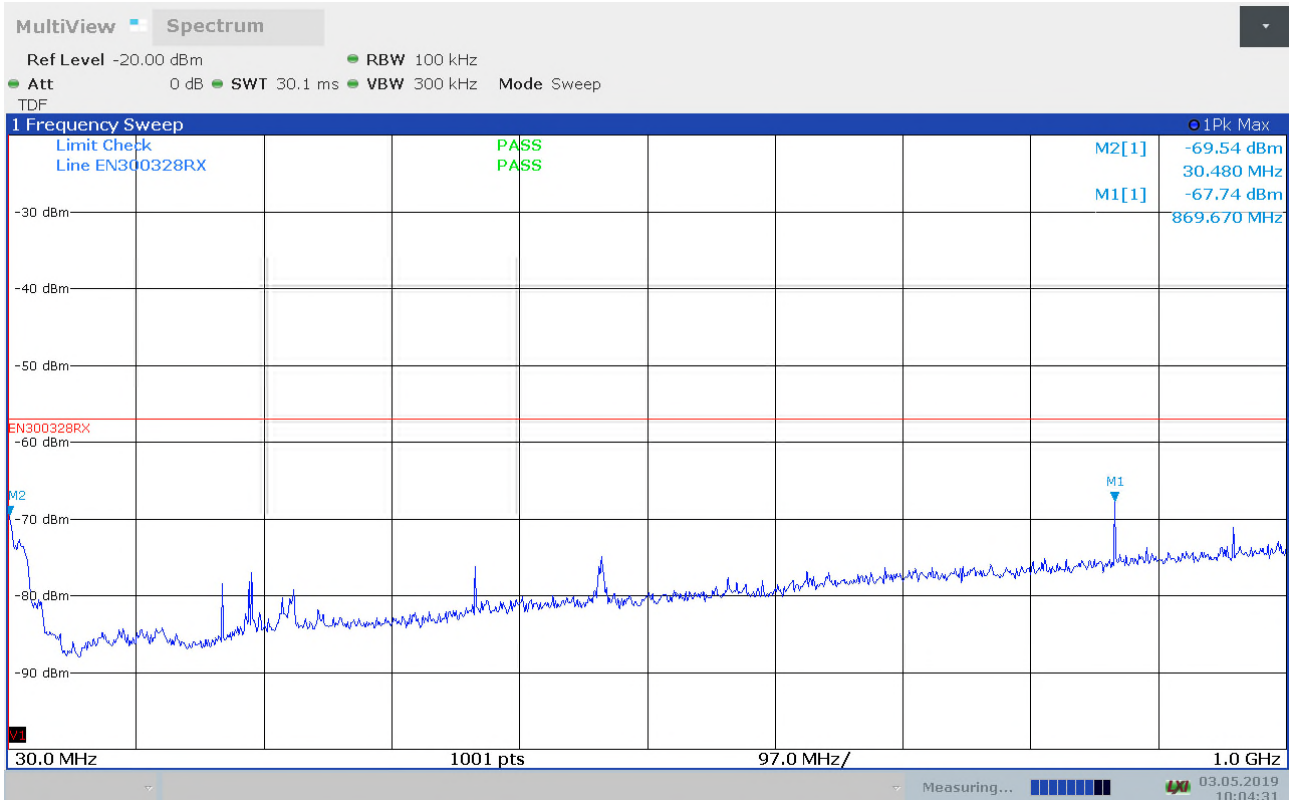
**Test Equipment Used:** 6,8,9,11



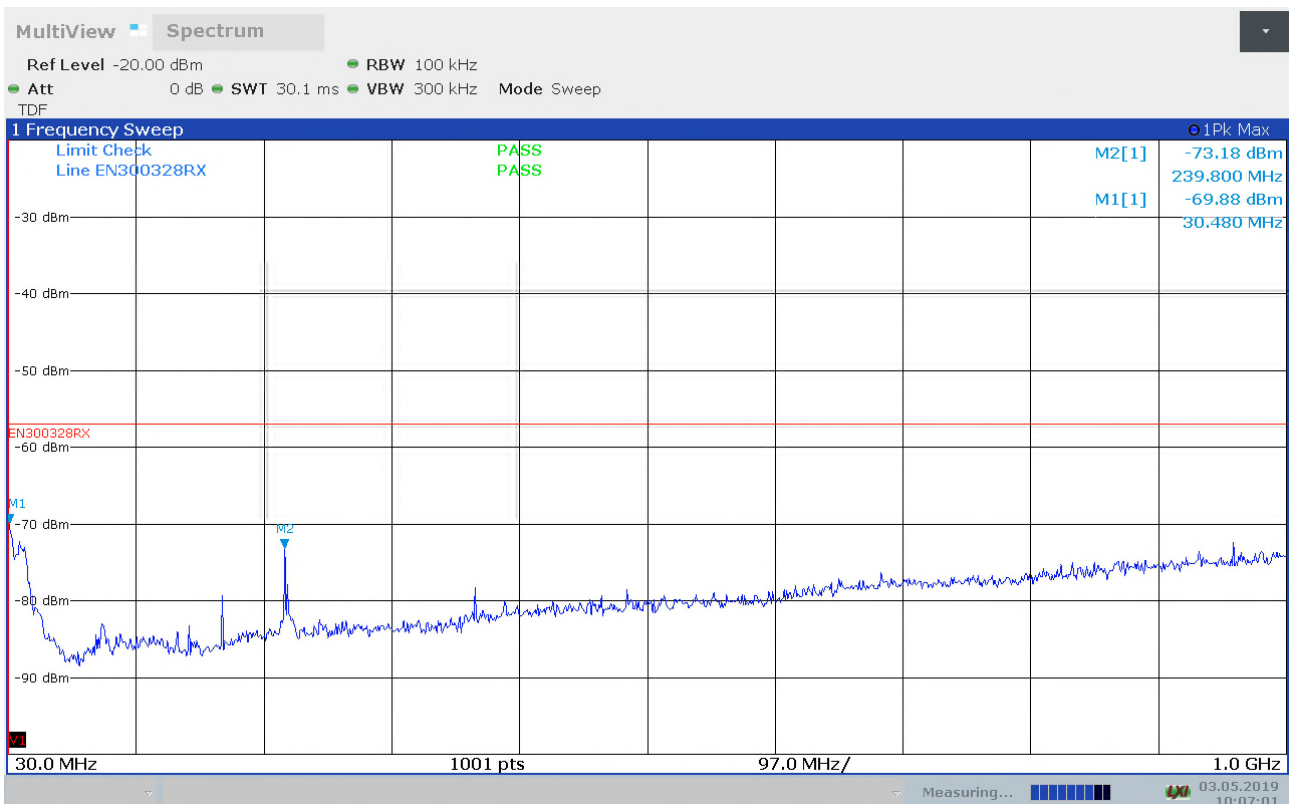
#### Receiver Emissions, radiated, 30 -1000 MHz, ch2405MHz,HP



#### Receiver Emissions, radiated, 30 -1000 MHz, ch2405MHz,VP

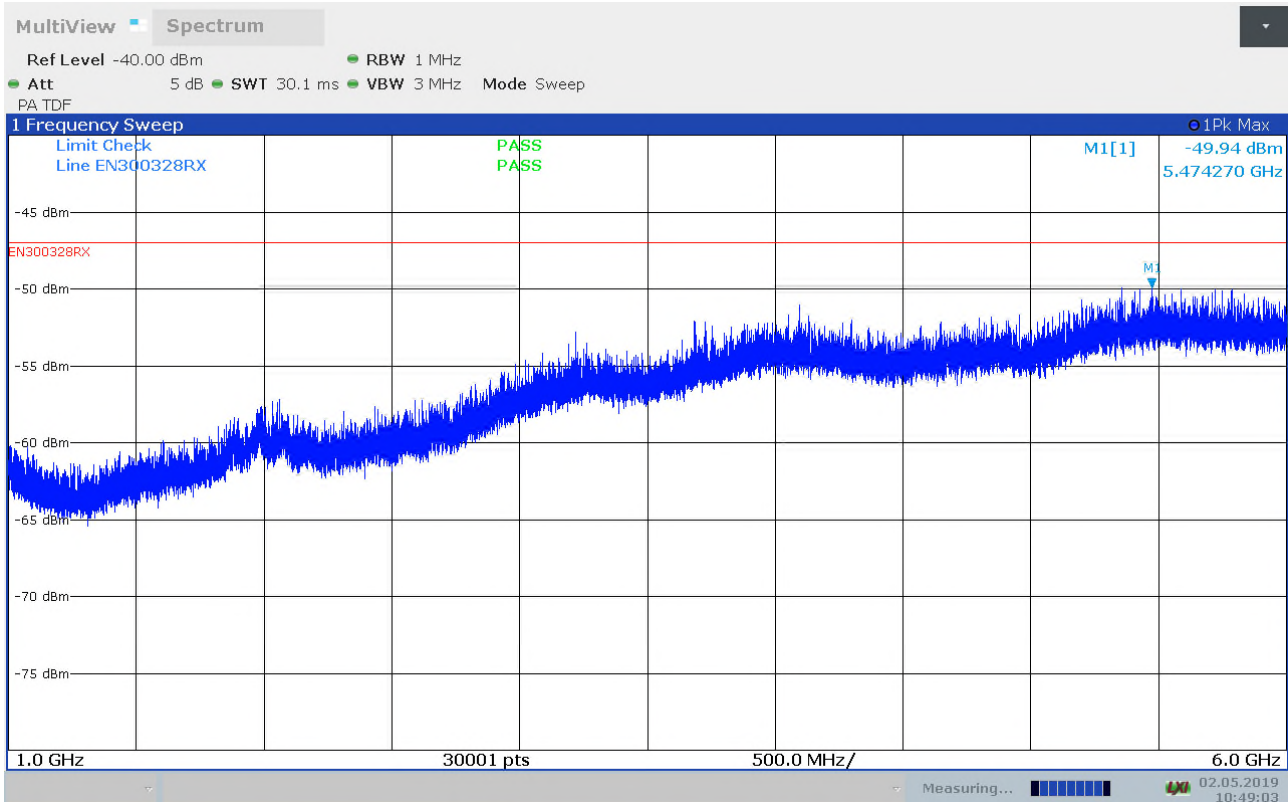


#### Receiver Emissions, radiated, 30 - 1000MHz, ch2480MHz,HP

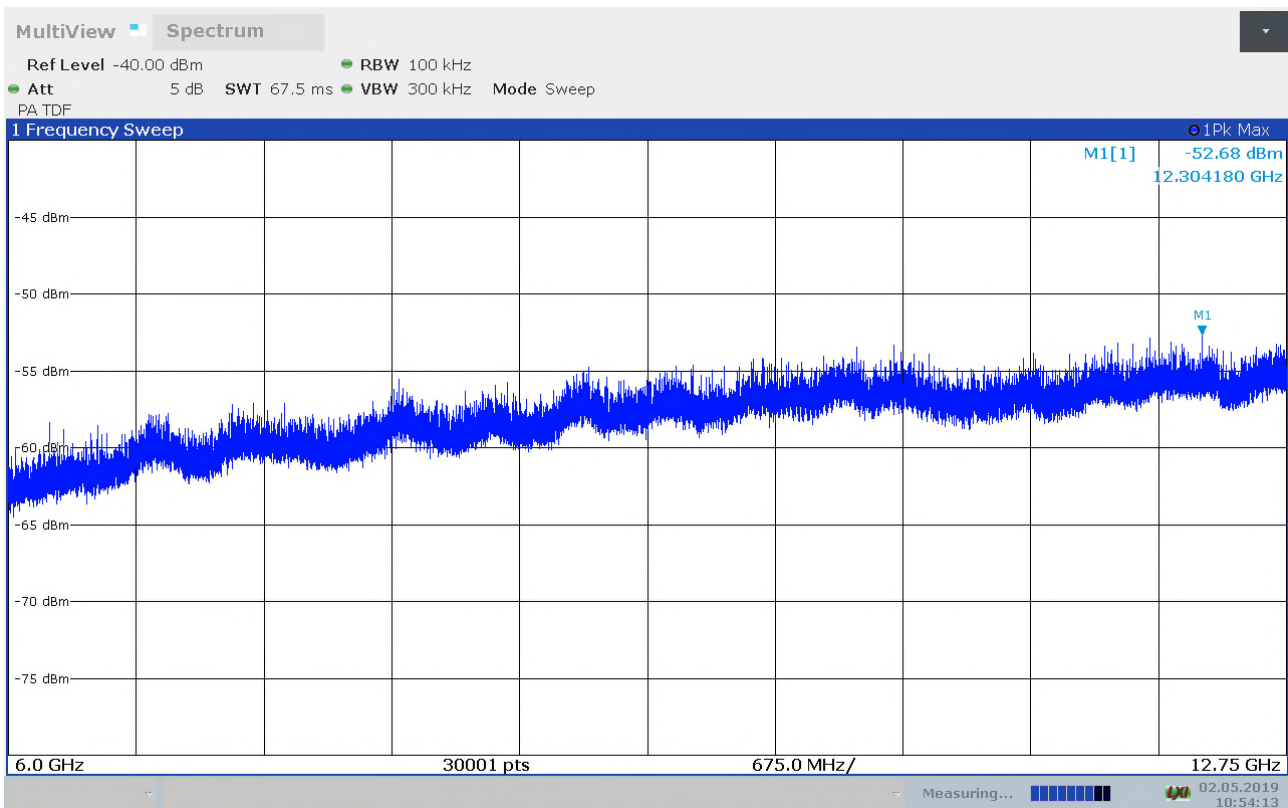


#### Receiver Emissions, radiated, 30 - 1000MHz, ch2480MHz,VP

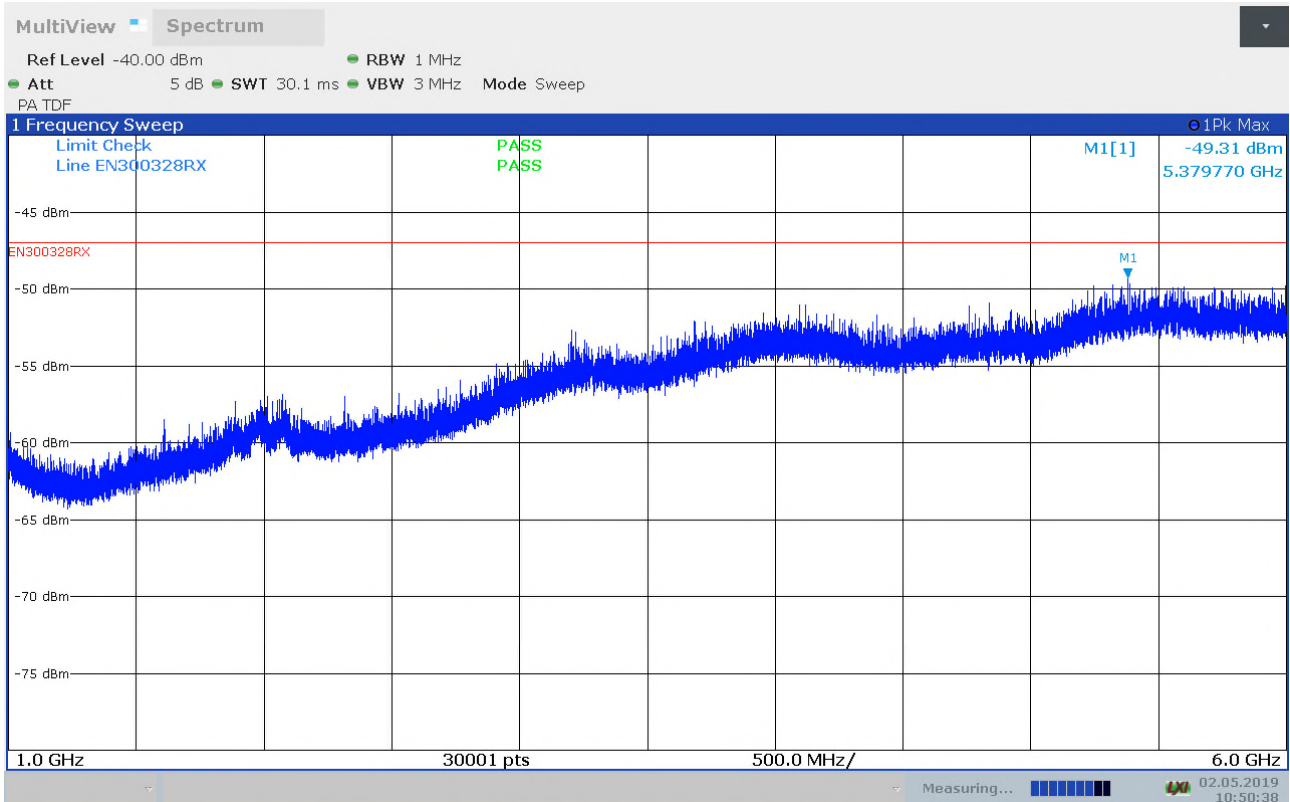




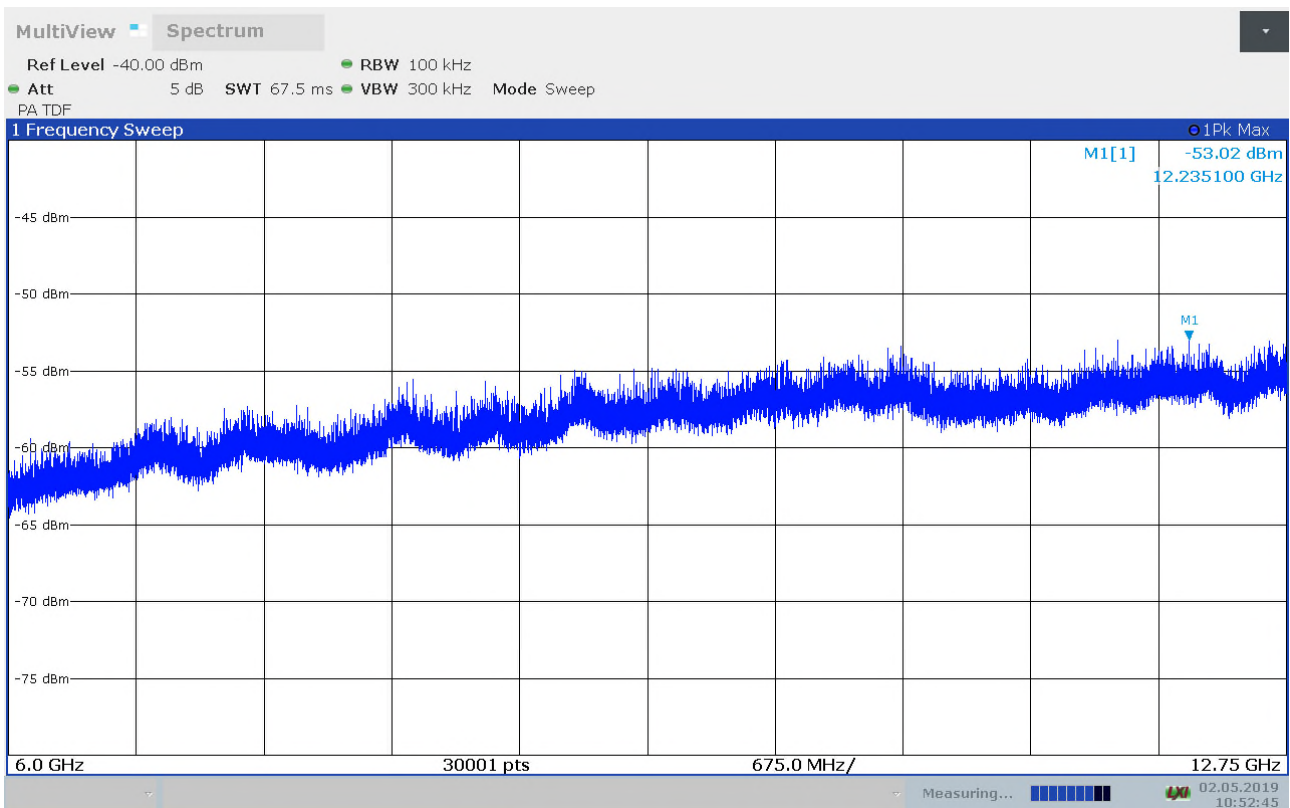
Receiver Emissions, radiated, 1 - 6GHz, ch2405MHz,HP, PK scan



Receiver Emissions, radiated, 6 - 12.75GHz, ch2405MHz,HP, PK, pre-scan

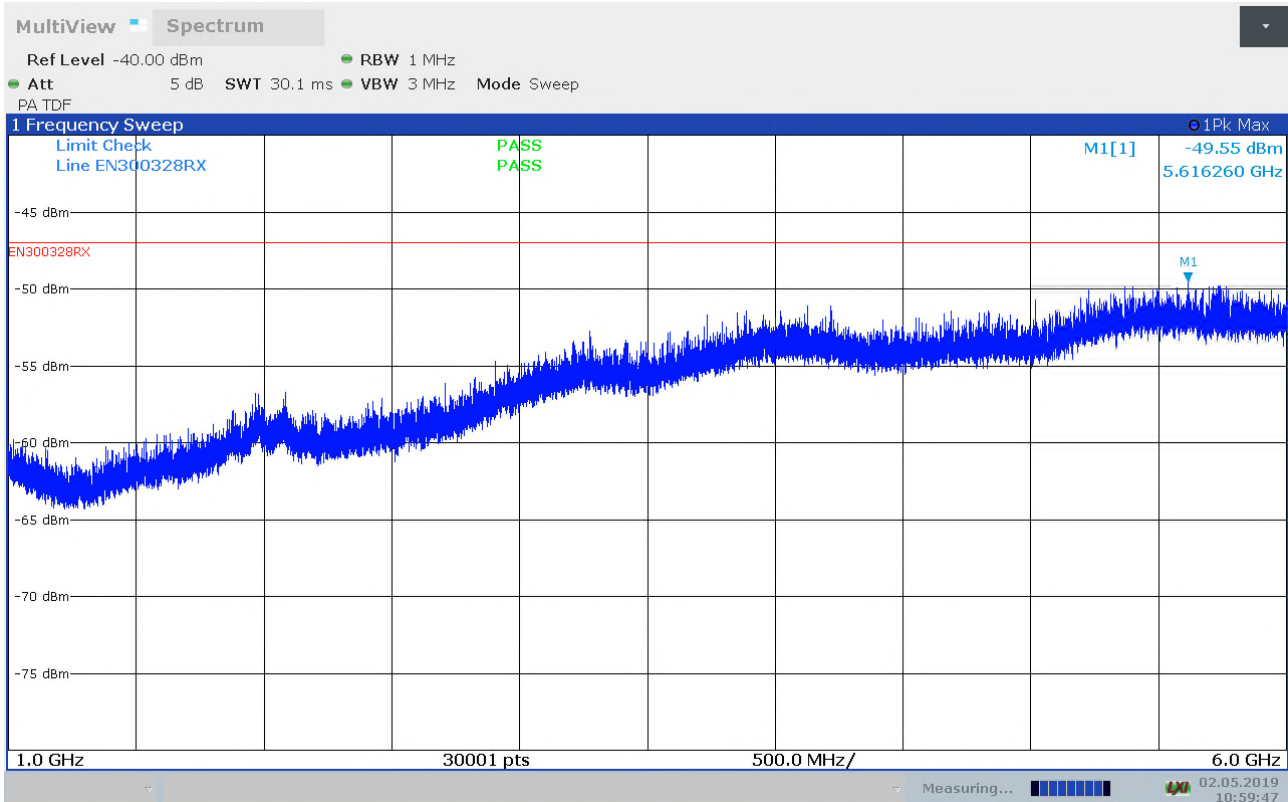


Receiver Emissions, radiated, 1 - 6GHz, ch2405MHz,VP, PK , scan

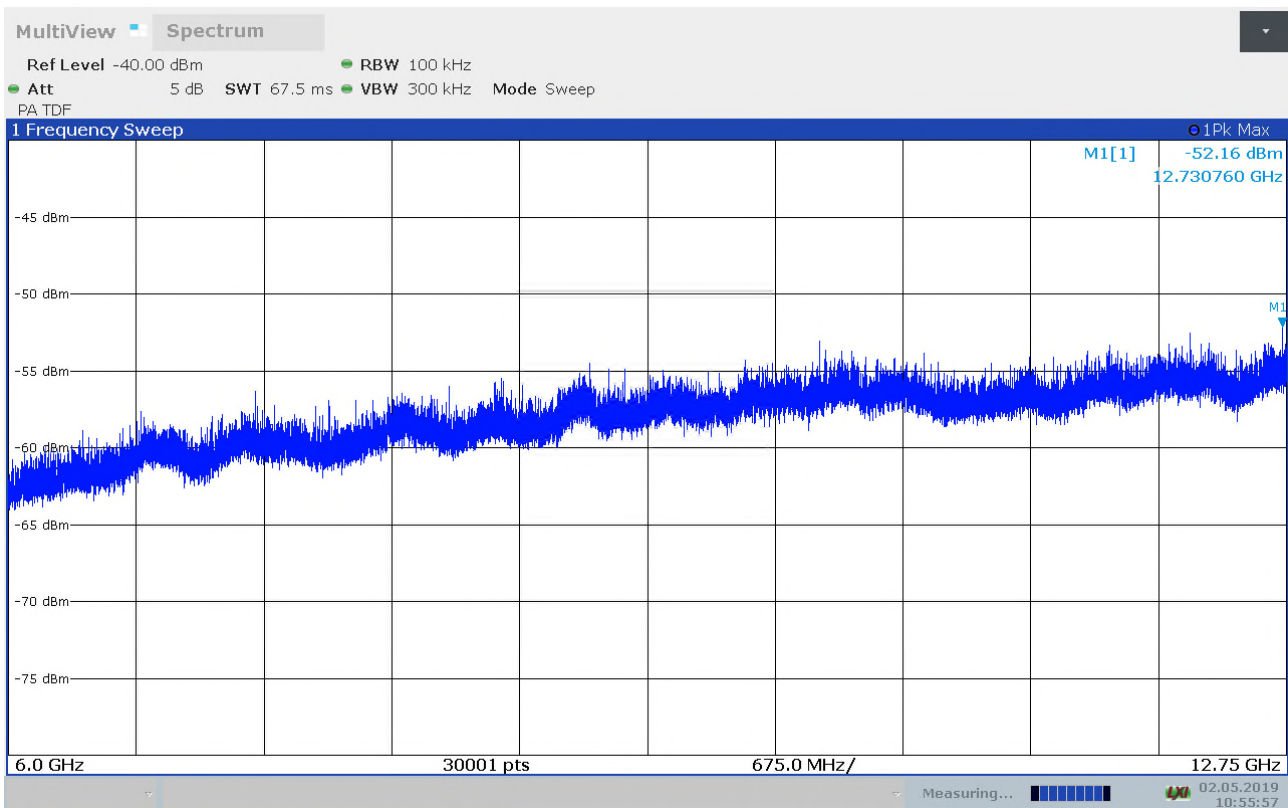


Receiver Emissions, radiated, 6 - 12.75GHz, ch2405MHz,VP, PK , pre-scan

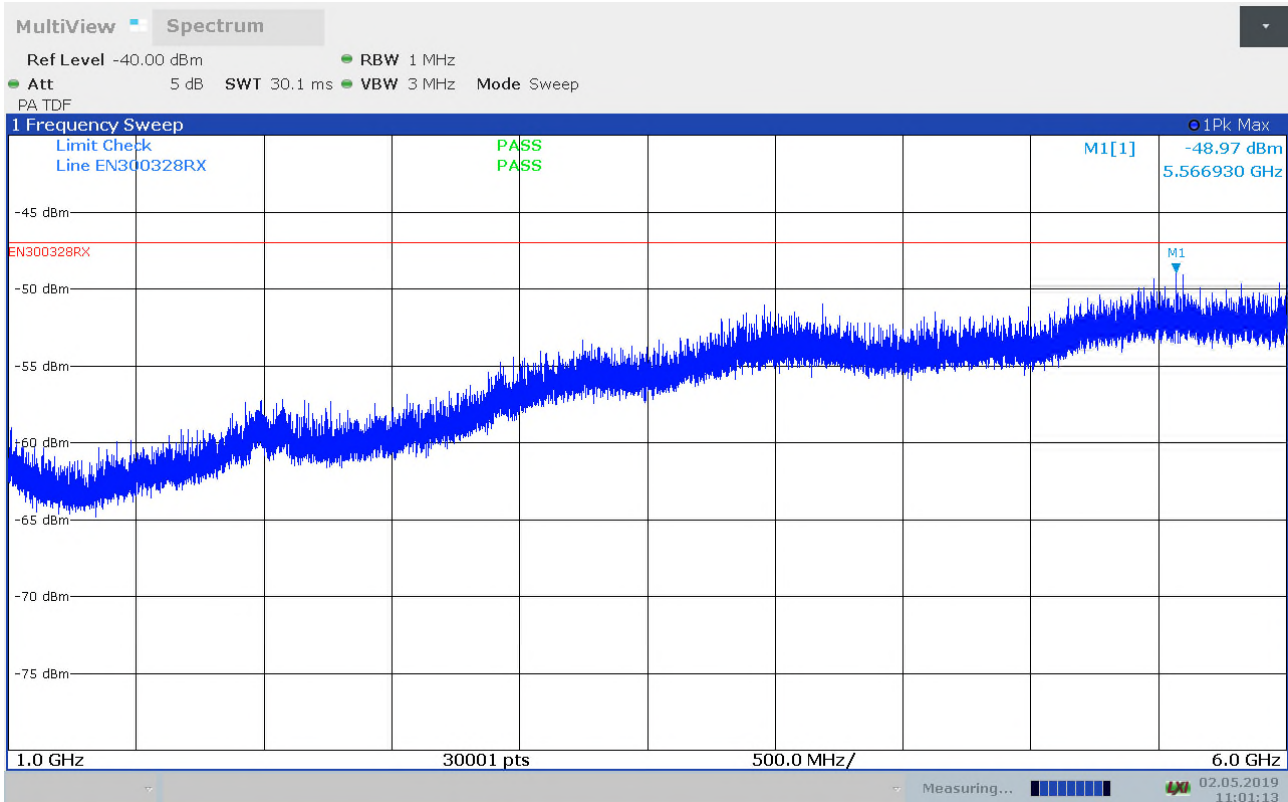




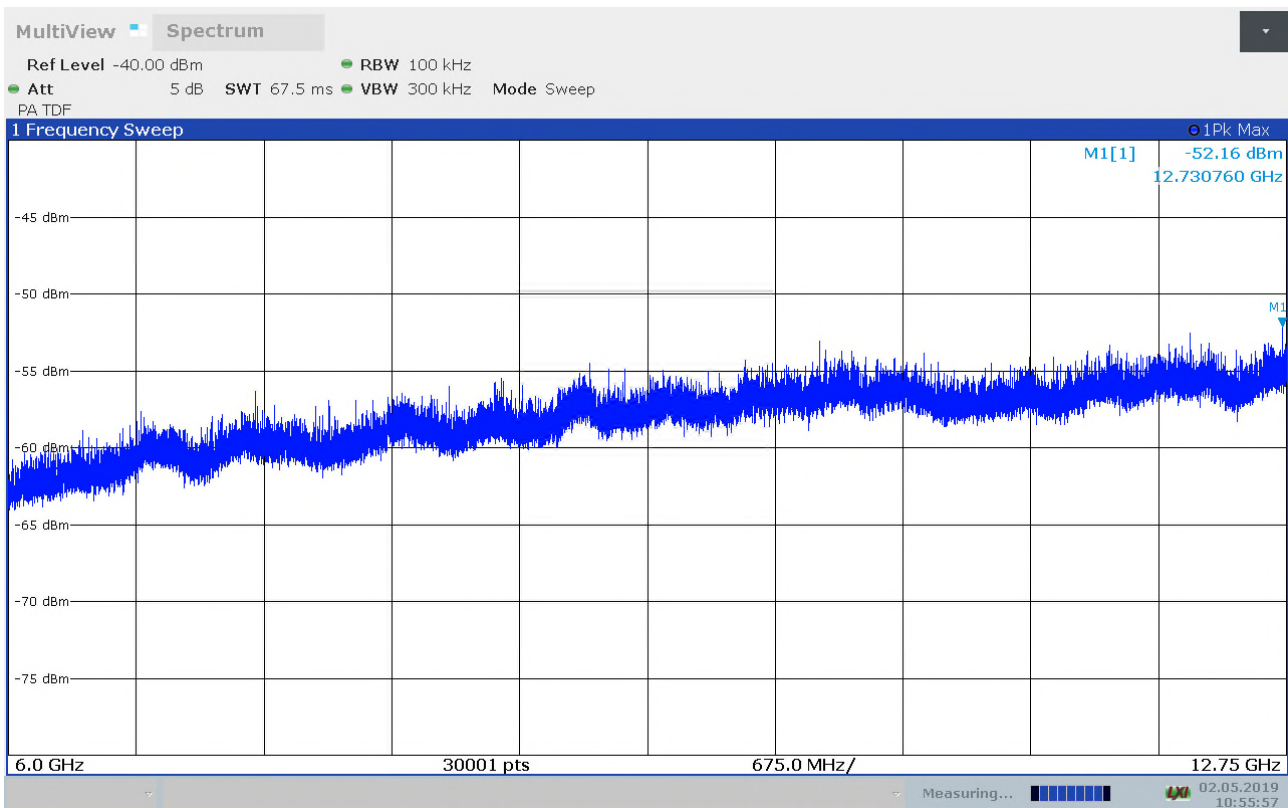
Receiver Emissions, radiated, 1 - 6GHz, ch2480MHz,VP, PK scan



Receiver Emissions, radiated, 6 - 12.75GHz, ch2480MHz,VP, PK , pre-scan



Receiver Emissions, radiated, 1 - 6GHz, ch2480MHz,HP, PK , scan



Receiver Emissions, radiated, 6 - 12.75GHz, ch2480MHz,HP, PK , pre-scan

## 4.11 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* PER %
§	2 380	-31.1	LED 1
§	2 503,5	-31.1	LED 1
§	2 300	-31.1	LED 1
§	2 583,5	-31.1	LED 1

EN 300 328 V2.2.1:

Wanted signal mean power from companion device (dBm)	Blocking signal frequency [MHz]	Blocking signal power [dBm] (see note 4)	Observed criteria* PER %
§	2 380	-26.1	LED 1
§	2 504	-26.1	LED 1
§	2 300	-26.1	LED 1
§	2 584	-26.1	LED 1

Tested for channels 2405MHz and ch2480MHz.

\*manufacturer declared performace criteria:

Observed the LEDs on the board, the Receiver. LED1-3 means the following:

- LED1: 95 or more of the 100 packets was received the last second.
- LED2: 90 or more of the 100 packets was received the last second.
- LED3: 80 or more of the 100 packets was received the last second.

OCBW : 1890000Hz

Blocking signal power with antenna gain of 0dBi

$P_{min} = < -100$  dBm for channel 2405MHz and for channel 2480MHz

§ Wanted signal level:  $P_{min} + 6$  dB: -94 dBm (according to V2.1.1)

And for v2.2.1 the lowest  $P_{min}$  of the alternatives provided in the standard is used, -91 dBm.

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 (%)
$P_{\min} + 6 \text{ dB}$	2 380 2 503,5	-57	CW	<10*
$P_{\min} + 6 \text{ dB}$	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 328v2.2.1

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
$(-139 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}) + 10 \text{ dB})$ or $(-74 \text{ dBm} + 10 \text{ dB})$ whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to  $P_{\min} + 26 \text{ dB}$  where  $P_{\min}$  is the minimum level of wanted signal 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: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

\*manufacturer declared performance criteria:

**Test Equipment Used:** 1,3,4, 19 – 26 and nRF52840-DK as transmitter

## 4.12 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



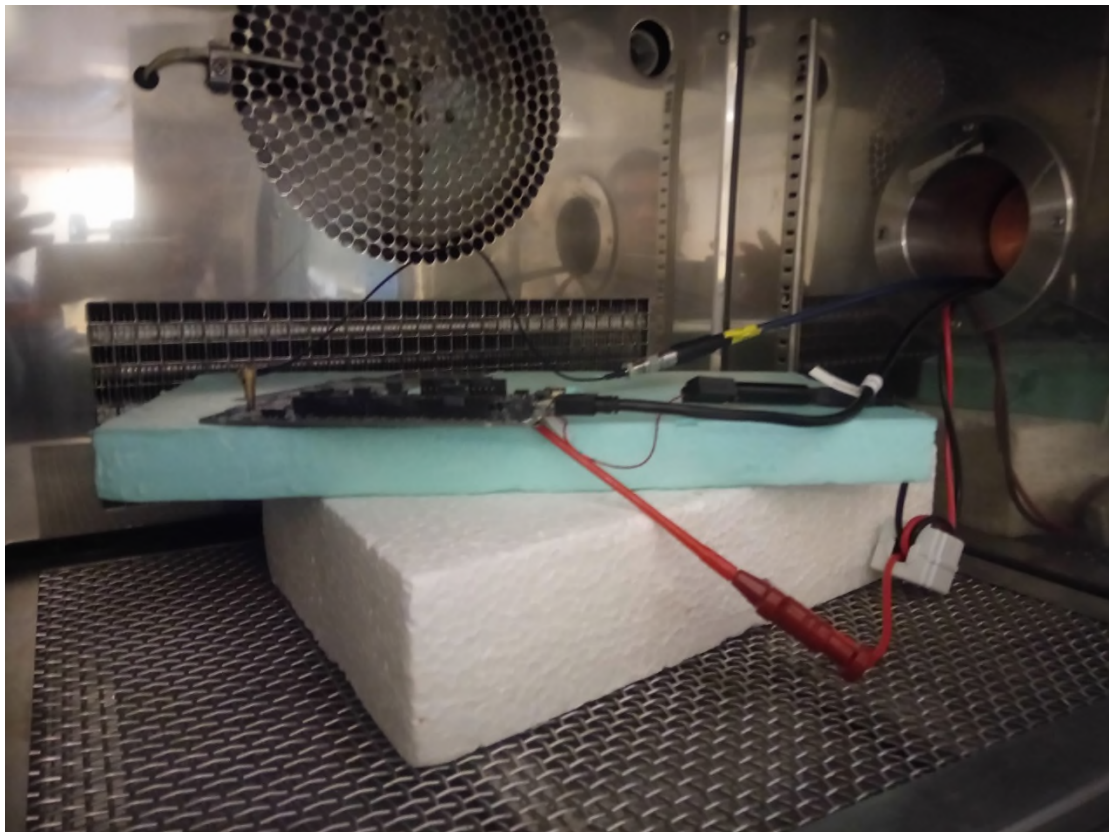
YZ – plane, Radiated measurements



XZ- plane, Radiated measurements



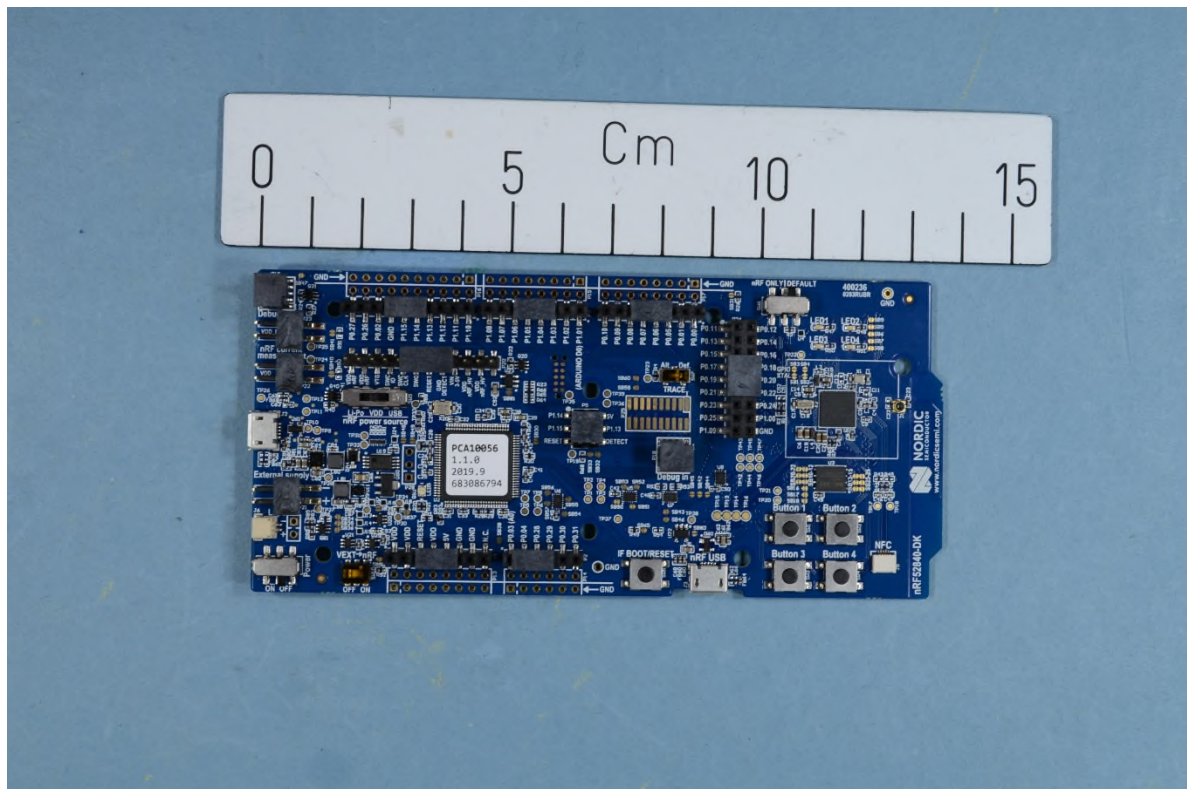
XY-Plane, Radiated measurements



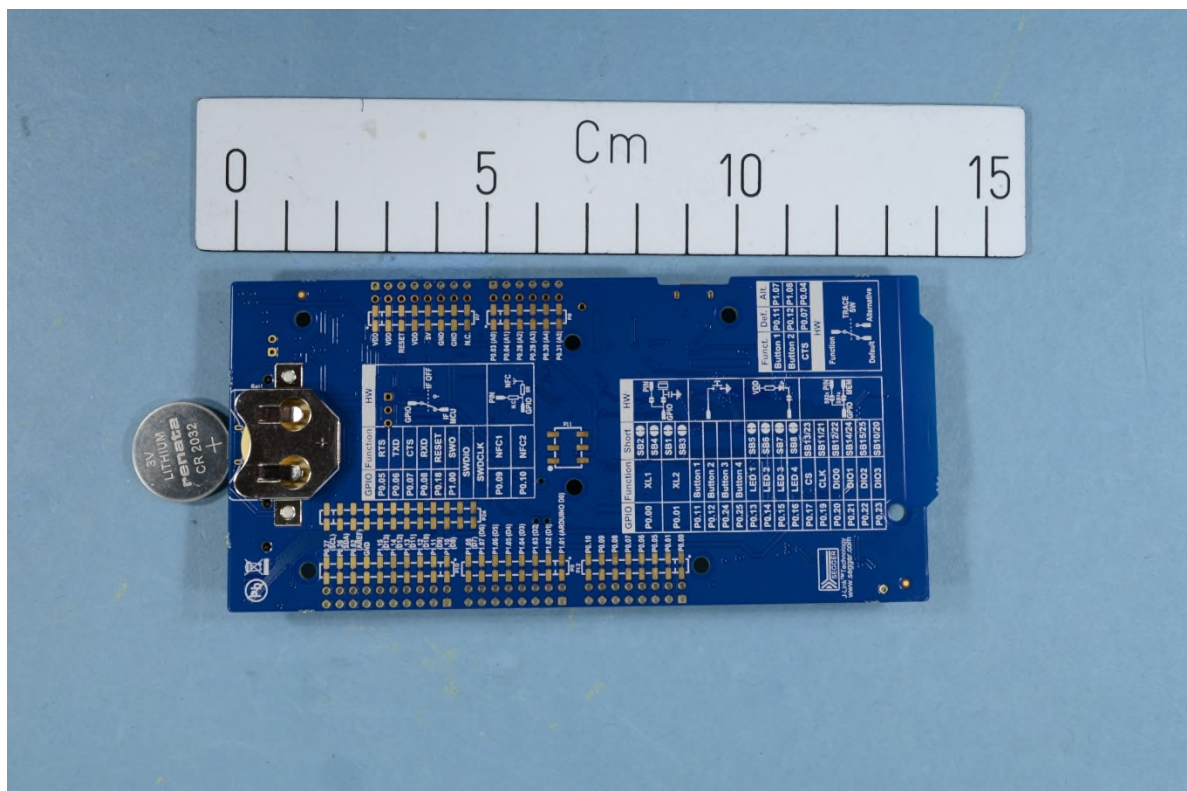
Climatic measurements



## 7 PHOTOGRAPHS OF THE EUT



nRF52840-DK – Front side



nRF52840-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	2019.01	2020.01
2.	LR 1657	Power meter	Rohde & Schwarz	OSP –B157	2019.01	2020.01
3.	LR 1655	Vector Signal generator	Rohde & Schwarz	SMBV 100A	2019.01	2020.01
4.	LR 1656	Signal generator	Rohde & Schwarz	SMB100A	2019.01	2020.01
5.	-	EMC 32, TS899 (Soft ware)	Rohde & Schwarz	V9.26.00/1.26.01	N/A	
6.	LR 1640	Spectrum Analyzer	Rohde & Schwarz	FSW26	2019.01	2020.01
7.	LR 1673	Attenuator	NARDA	4768-10	Cal b4 use	
8.	LR 1552	Pre-Amplifier	Miteq	JS4	2018.08	2019.08
9.	LR 1226	Double Ridged Horn Antenna	EMCO	3115	2008.11	2020.11
10.	LR 1614	Highpass Filter	Trilithic	6HC3000/18000	Cal b4 use	
11.	LR 1734	Biconical-log hybrid antenna	Sunol Sciences	JB3	2018.05	2021.05
12.	LR 1083	Climatic Chamber	ACS	TY 80	2019.03	2020.03
13.	LR1619	HP filter	Wainwright Instr.	WHKX6.5/18G-8	N/A	
14.	LR 102	Antenna, Horn	Sivers	PM7320X	2008.12	2020.12
15.	LR 101	Antenna, Horn	Systron	DBF-5230	2008.12	2020.12
16.	LR 1480	Antenna, Horn	Narda	638	2008.12	2020.12
17.	LT 666	Power Supply	Oltronix	B300	Cal b4 use	
18.	LT 5218	Multimeter, Digital	Fluke	45	2018.11	2020.11
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.	LR1743	RF signal generator	Rohde & Schwarz	SMBV100B	2019.01	2021.01
25.	N3662	Varriable attenuator	Hewlett-Packard	8494B	Cal b4 use	
26.	N3663	Varriable attenuator	Hewlett-Packard	8496B	Cal b4 use	

## Revisions

Revision #	Date	Order #	Description
00	2019-10-02	372254	First issued