



Test report

Number: T251-0xxx/17
Project file: C20171222
Date: 2017-08-21
Pages: 59

Product: Reader board HF NFC

Type reference: ST25R3911B-DISCO

Ratings: USB: 5 VDC 5%/500 mA;
Operating clock frequency: 13.56 MHz
Protection class: III

Trademark: STMicroelectronics Austria GmbH

Applicant: STMicroelectronics Austria GmbH
Kratkystrasse 2, AT-8020 Graz, Austria

Manufacturer: ASTRON Electronic GmbH
Feistritz 333, AT-9613 Feistritz an der Gail, Austria

Place of manufacture: ASTRON Electronic GmbH
Feistritz 333, AT-9613 Feistritz an der Gail, Austria

Summary of testing

Testing method: ANSI C63.10-2013

Testing location: SIQ Ljubljana, Trpinčeva ulica 37 A, SI-1000 Ljubljana, Slovenia

Remarks: Date of receipt of test items: 2017-04-04
Number of items tested: 2
Date of performance of tests: 2017-04-25 - 2017-05-23
The test results presented in this report relate only to the items tested.
The product complies with the requirements of the testing methods.

/

Tested by: Andrej Škof

Approved by: Marjan Mak

The report shall not be reproduced except in full.



CONTENTS	page
1 GENERAL	3
1.1 EQUIPMENT UNDER TEST	3
2 TEST SUMMARY	5
2.1 OPERATING VOLTAGES/FREQUENCIES USED FOR TESTING	5
3 CONVERSION FACTORS AND ALL OTHER FORMULAS	6
4 EMISSION TESTS	7
4.1 OCCUPIED BANDWIDTH (§2.202 OF FCC 47 CRF 15 AND CLAUSE 6.6 OF RSS-GEN ISSUE 4)	7
4.2 ANTENNA REQUIREMENTS (§15.203)	10
4.3 RESTRICTED BANDS OF OPERATION (§15.205 OF FCC 47 CRF 15 AND TABLE 6 OF RSS-GEN ISSUE 4)	11
4.4 CONDUCTED EMISSION MEASUREMENT (§15.107, §15.207 OF FCC 47 CRF 15 AND TABLE 3 OF RSS-GEN ISSUE 4)	12
4.5 RADIATED EMISSION MEASUREMENT (§15.109, §15.209 OF FCC 47 CRF 15 AND TABLES 4 AND 5 OF RSS-GEN ISSUE 4)	29
4.6 BANDWIDTH OF THE EMISSION (§15.215)	51
4.7 SPECTRUM MASK (§15.225 (A)-(D) OF FCC 47 CRF 15 AND ANNEX B.6 OF RSS-210 ISSUE 9)	54
4.8 FREQUENCY TOLERANCE OF THE CARRIER SIGNAL (§15.225 (E))	57
5 TEST EQUIPMENT	59

1 GENERAL

History sheet			
Date	Report No.	Change	Revision
2017-08-21	T251-0FCC/17	Initial Test Report issued.	--

Environmental conditions:

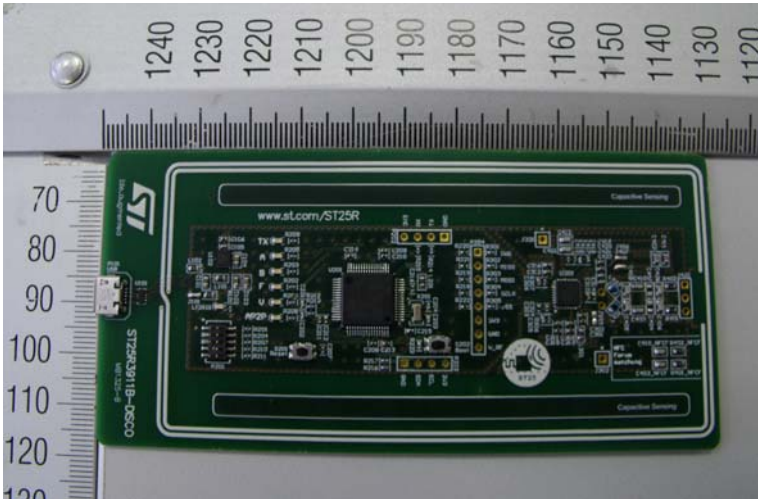
Ambient temperature: 15°C to 35°C
 Relative humidity: 30% to 60%
 Atmospheric pressure: 860 mbar to 1060 mbar

1.1 Equipment under test

Reader board HF NFC

Type: **ST25R3911B-DISCO**
 FCC ID: YCPST25R3911BDISCO

Tested SIQ sample number: S20172498 (original sample)
 Tested SIQ sample number: S20173130 (sample with dummy load)



Picture of EUT



1.1.1 General product information

Product	Reader Board HF NFC
Type / Model	ST25R3911B-DISCO
Supply voltage of transmitter	5 VDC via USB
Operating frequency	13,56 MHz (NFC tag)
Antenna type	105 mm x 52 mm, two turns antenna etched on the PCB
Modulation type:	ISO14443A, ISO14443B, ISO15693 and FeliCa™
Hardware version:	MB1325-B01
Software version:	SW (PC GUI): 1.0.4.0 FW (MCU): 1.0.4.0
Card reading/Writing distance	From 10 mm to 45mm with CLOUD-ST25TA tag

1.1.2 Auxiliary equipment used during testing

- Laptop: HP EliteBook 8560p
- Test software ST25R3911B Discovery GUI, Version: 1.0.4.0

2 TEST SUMMARY

STANDARD	Tested		Sample	
	yes	no	pass	not pass
ANSI C63.10-2013				
FCC 47 CFR Part 15, Subpart B (§15.107, §15.109)				
FCC 47 CFR Part 15, Subpart C (§2.202, §15.203, §15.205, §15.207, §15.209, §15.215, §15.225 (a-d), §15.225 (e))	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
RSS-210 Issue 9 (Annex B.6)				
RSS-Gen issue 4 (clause 6.6 and tables 3,4,5 and 6)				

Clause (FCC 47 CFR Part 15)	Clause (RSS-Gen issue 4)	Clause (RSS-210 issue 9)	Test description	Section within the report	Conclusion
§15.107			Conducted emission	4.4	PASS
§15.109			Radiated emission	4.5	PASS

Clause (FCC 47 CFR Part 15)	Clause (RSS-Gen issue 4)	Clause (RSS-210 issue 9)	Test description	Section within the report	Conclusion
§2.202	6.6		Occupied bandwidth	4.1	PASS
§15.203			Antenna requirements	4.2	PASS
§15.205	Table 6		Restricted bands of operation	4.3	PASS
§15.207	Table 3		Conducted emission	4.4	PASS
§15.209	Table 4 and 5		Radiated emission – general requirements	4.5	PASS
§15.215			20 dB Bandwidth	4.6	PASS
§15.225 (a-d)		Annex B.6	Operation within the band 13.110-14.010 MHz	4.7	PASS
§15.225 (e)		Annex B.6	Carrier Frequency stability	4.8	PASS

2.1 Operating voltages/frequencies used for testing

Clause (FCC 47 CFR Part 15)	Clause (RSS-Gen issue 4)	Clause (RSS-210 issue 9)	Test description	Operating conditions
§15.107			Conducted emission	120 V / 60 Hz
§15.109			Radiated emission	120 V / 60 Hz (PC power)
§2.202	6.6		Occupied bandwidth	5 VDC via USB
§15.203			Antenna requirements	/
§15.205	Table 6		Restricted bands of operation	5 VDC via USB
§15.207	Table 3		Conducted emission	5 VDC via USB
§15.209	Table 4 and 5		Radiated emission – general requirements	5 VDC via USB
§15.215			20 dB Bandwidth	5 VDC via USB
§15.225 (a-d)		Annex B.6	Operation within the band 13.110-14.010 MHz	5 VDC via USB
§15.225 (e)		Annex B.6	Carrier Frequency stability	4.25 VDC - 5.75 VDC

3 CONVERSION FACTORS AND ALL OTHER FORMULAS

Unit	Conversion unit	Formula of conversion
$\text{dB}\mu\text{V}$	$\text{dB}\mu\text{V/m}$	$\text{dB}\mu\text{V/m} = \text{dB}\mu\text{V} + \text{AF}$
$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$	$\text{dB}\mu\text{V/m} = 20\log(X(\mu\text{V/m})/1\mu\text{V})$

Test distance stated in standard	Test distance of measurement	Conversion factor
3 m	3 m	/
10 m	3 m	20dB/decade (over 30 MHz)
		40dB/decade (under 30 MHz)

4 EMISSION TESTS

4.1 Occupied bandwidth (§2.202 of FCC 47 CFR 15 and clause 6.6 of RSS-Gen Issue 4)

Requirement §2.202

The frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission. In some cases, for example multichannel frequency-division systems, the percentage of 0.5 percent may lead to certain difficulties in the practical application of the definitions of occupied and necessary bandwidth; in such cases a different percentage may prove useful.

The occupied bandwidth according to ANSI C63.10 is measured as the frequency range defined by the points that are 26 dB down relative to the maximum level of the modulated carrier. The resolution bandwidth of the spectrum analyzer shall be set to a value greater than 5.0% of the allowed bandwidth. If no bandwidth specifications are given, the following guidelines are used:

Fundamental frequency	Minimum resolution bandwidth
9 kHz to 30 MHz	1 kHz
30 MHz to 1000 MHz	10 kHz
1000 MHz to 40 GHz	100 kHz

The video bandwidth shall be at least three times greater than the resolution bandwidth.

Conclusion:

PASS; Occupied bandwidth is 2,26 kHz

Requirement RSS-Gen Issue 4

If not specified in the applicable RSS the occupied bandwidth is measured as the 99% emission bandwidth.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

The trace data points are recovered and are directly summed in linear 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 and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is also recorded. The span between the two recorded frequencies is the occupied bandwidth.

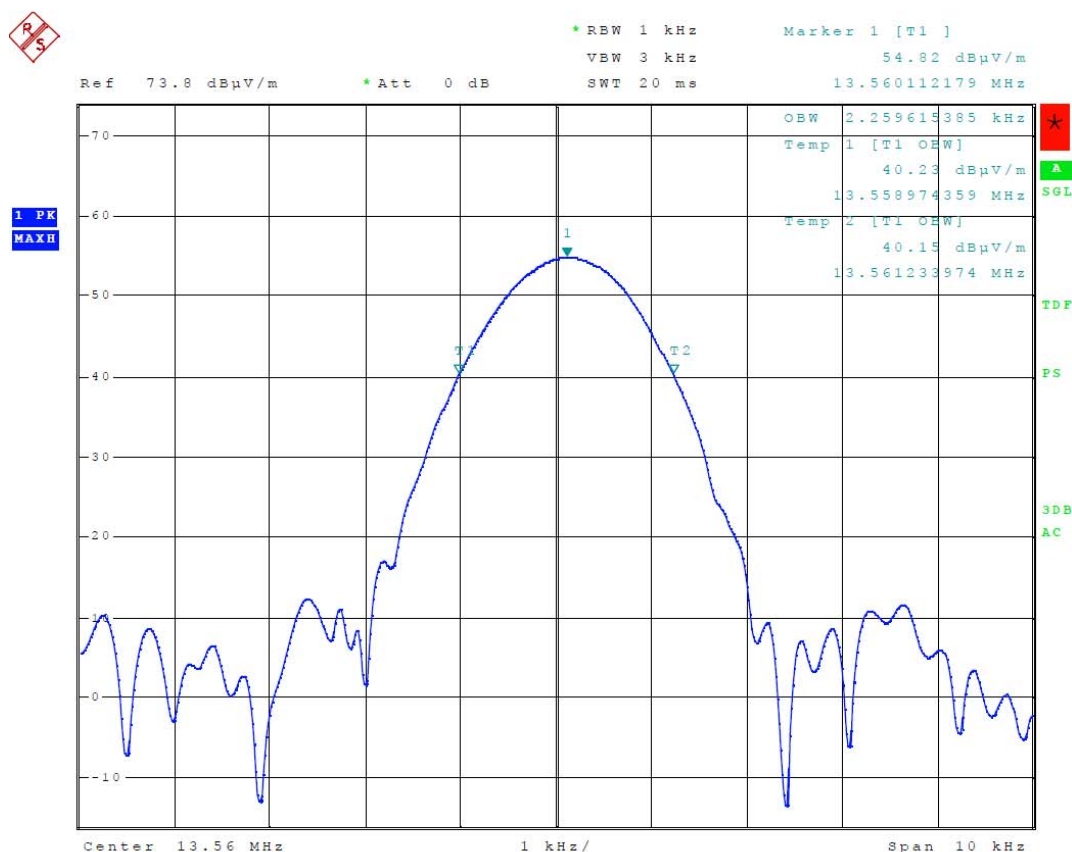
C20171222

02.Jun 17 23:41

Meas Type	99% OCCUPIED BANDWIDTH
Equipment under Test	ST25R3911B-DISCO
Manufacturer	STMicroelectronics Austria GmbH
OP Condition	WAITING
Operator	Andrej Skof
Test Spec	
Antenna: 340 deg, Sample: 20 deg	

Sweep Settings Screen A

Center Frequency	13.560000 MHz	Ref Level	73.800 dBμV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	10.000000 kHz	Ref Position	100.000 %
Start Frequency	13.555000 MHz	Level Range	90.000 dB
Stop Frequency	13.565000 MHz	RF Att	0.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	20.00 ms	Y-Axis	LOG





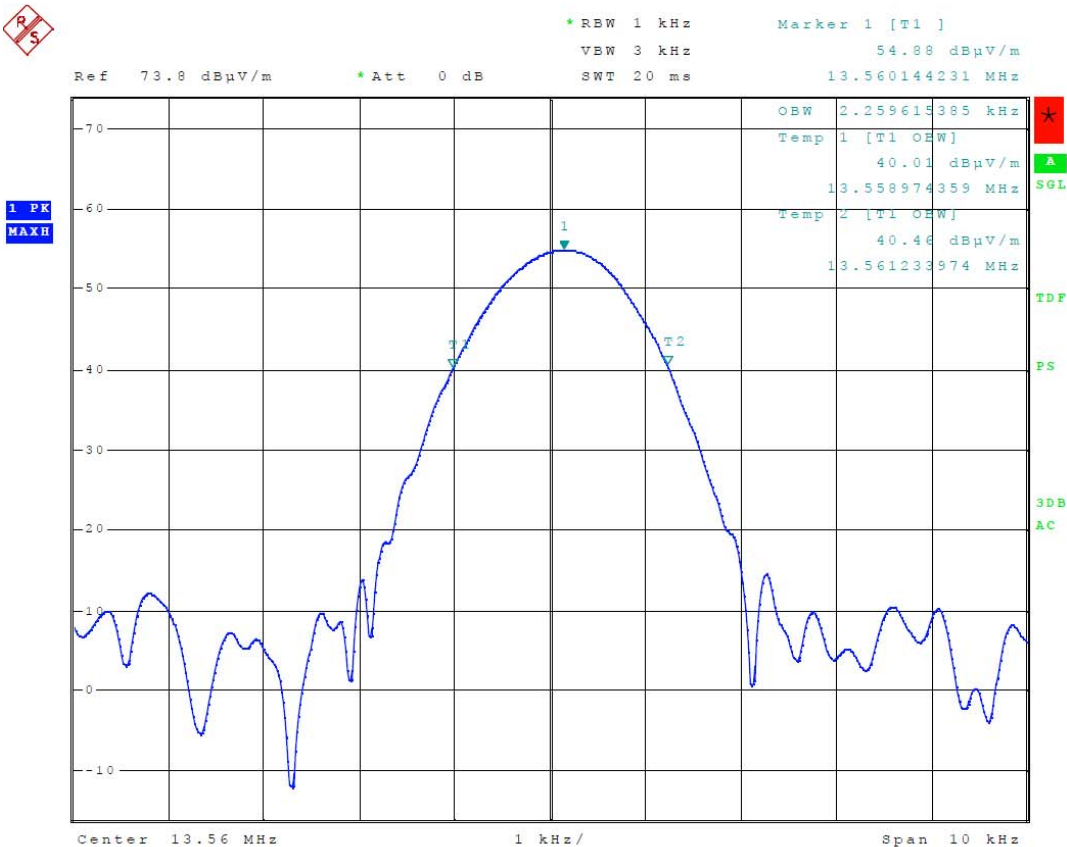
C20171222

02.Jun 17 23:40

Meas Type 99% OCCUPIED BANDWIDTH
Equipment under Test ST25R3911B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition READING
Operator Andrej Skof
Test Spec
Antenna: 340 deg, Sample: 20 deg

Sweep Settings Screen A

Center Frequency	13.560000 MHz	Ref Level	73.800 dBμV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	10.000000 kHz	Ref Position	100.000 %
Start Frequency	13.555000 MHz	Level Range	90.000 dB
Stop Frequency	13.565000 MHz	RF Att	0.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	20.00 ms	Y-Axis	LOG





4.2 Antenna requirements (§15.203)

Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Conclusion:

PASS; EUT has PCB antenna which is not detachable

4.3 Restricted bands of operation (§15.205 of FCC 47 CRF 15 and Table 6 of RSS-Gen Issue 4)

4.3.1 Requirement

Except as shown in paragraph (d) of §15.205 only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6

4.3.2 Test results

See Radiated emission results under 4.4 Radiated emission and 4.6 Spectrum mask.



4.4 Conducted emission measurement (§15.107, §15.207 of FCC 47 CFR 15 and Table 3 of RSS-Gen Issue 4)

4.4.1 Requirement

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.5	66 – 56*	56 – 46*
0.5 to 5.0	56	46
5.0 to 30.0	60	50

* Decreases with the logarithm of the frequency.

The shown limits in table shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

- For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.
- For all other carrier current systems: 1000 µV within the frequency band 535-1705 kHz, as measured using a 50 µH/50 ohms LISN.
- Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as appropriate.

4.4.2 Test procedure

- As per clause 6.2 from ANSI C63.10-2013.
- The EUT is placed on a non-conductive 0.8 meters high table, 0.4 meters from the vertical conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). LISN provide 50 Ohm / 50 µH + 5 Ohm of coupling impedance for the measuring instrument.
- Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
- AC power lines of EUT are checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz is searched using PEAK, QUASI-PEAK and AVERAGE function of the receiver to determine compliance with Section 15.207 limits outside the transmitter's fundamental emission band. Bandwidth is set to 9 kHz.
- Measurement repeated with a dummy load in lieu of the antenna to determine compliance with Section 15.207 limits within the transmitter's fundamental emission band.

4.4.3 Test results

Device passed the requirements stated



ROHDE & SCHWARZ

C20171222

Meas Type CONDUCTED EMISSION
 Equipment under Test ST25R391B-DISCO
 Manufacturer STMicroelectronics Austria GmbH
 OP Condition STANDBY; 120 V, 60 Hz
 Operator ANDREJ SKOF

Test Spec

PHASE

Time Domain Scan (1 Range)

Scan Start: 150 kHz
 Scan Stop: 30 MHz
 Detector: Trace 1: MAX PEAK Trace 2: Average
 Transducer: ENV216

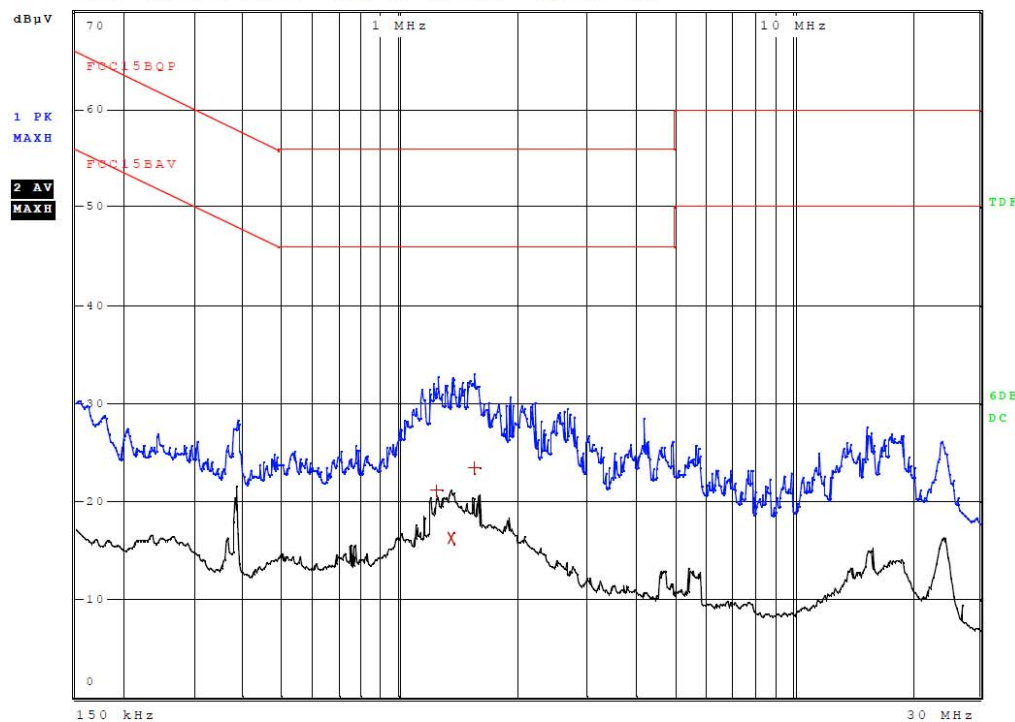
Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



REBW 9 kHz

MT 1 s

Step TD AUTO PULSE Att 10 dB AUTO PREAMP OFF



**C20171222**

Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition STANDBY; 120 V, 60 Hz
Operator ANDREJ SKOF
Test Spec
 PHASE

Final Measurement

Meas Time: 1 s
Margin: 25 dB
Subranges: 3

Trace	Frequency	Level (dBμV)	Detector	Delta Limit/dB
2	1.351500000 MHz	16.30	CISPR Averag	-29.70
1	1.545000000 MHz	23.53	Quasi Peak	-32.47
1	1.245750000 MHz	21.07	Quasi Peak	-34.93

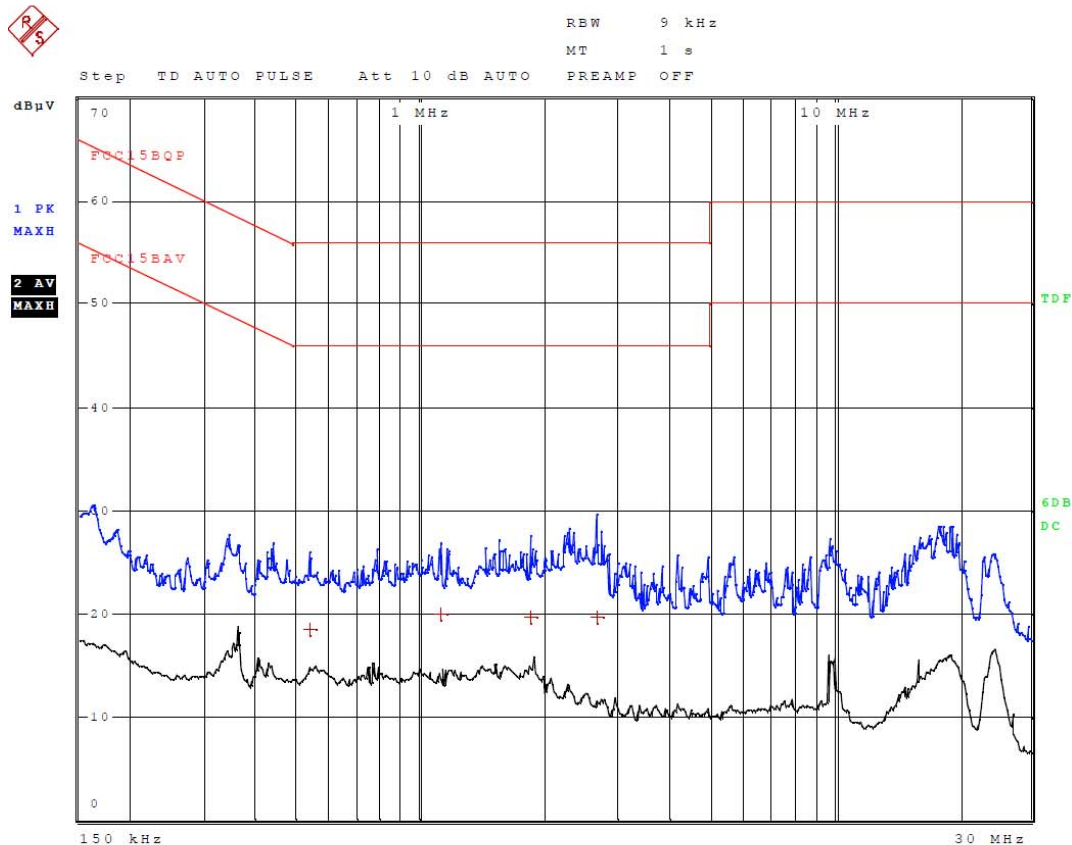
C20171222

Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition STANDBY; 120 V, 60 Hz
Operator ANDREJ SKOF
Test Spec
 NEUTRAL

Time Domain Scan (1 Range)

Scan Start: 150 kHz
Scan Stop: 30 MHz
Detector: Trace 1: MAX PEAK Trace 2: Average
Transducer: ENV216

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



**C20171222**

Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition STANDBY; 120 V, 60 Hz
Operator ANDREJ SKOF
Test Spec
 NEUTRAL

Final Measurement

Meas Time: 1 s
Margin: 30 dB
Subranges: 4

Trace	Frequency	Level (dBμV)	Detector	Delta Limit/dB
1	1.115250000 MHz	19.94	Quasi Peak	-36.06
1	1.853250000 MHz	19.67	Quasi Peak	-36.33
1	2.667750000 MHz	19.62	Quasi Peak	-36.38
1	539.250000000 kHz	18.45	Quasi Peak	-37.55

Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition Uin: 120 V, 60 Hz, READING
Operator ANDREJ SKOF
Test Spec
PHASE

Time Domain Scan (1 Range)

Scan Start: 150 kHz
Scan Stop: 30 MHz
Detector: Trace 1: MAX PEAK Trace 2: Average
Transducer: ESH2-Z5

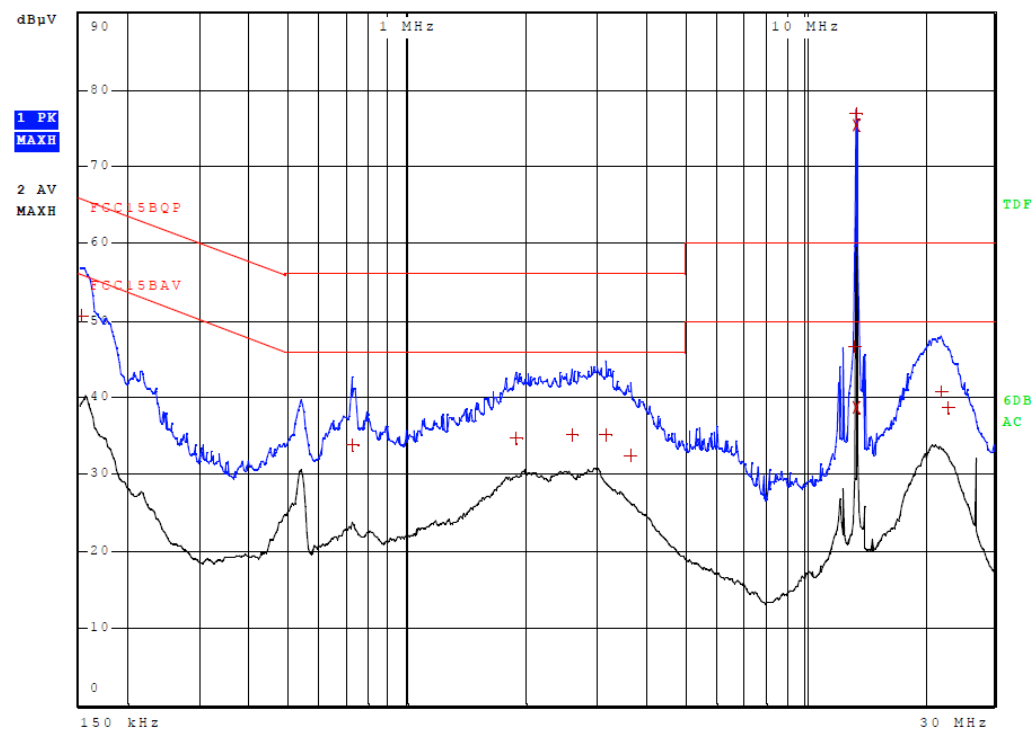
Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



RBW 9 kHz

MT 1 s

Step TD AUTO PULSE Att 10 dB AUTO PREAMP OFF



Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition Uin: 120 V, 60 Hz, READING
Operator ANDREJ SKOF
Test Spec
 PHASE

Final Measurement

Meas Time: 1 s
Margin: 15 dB
Subranges: 12

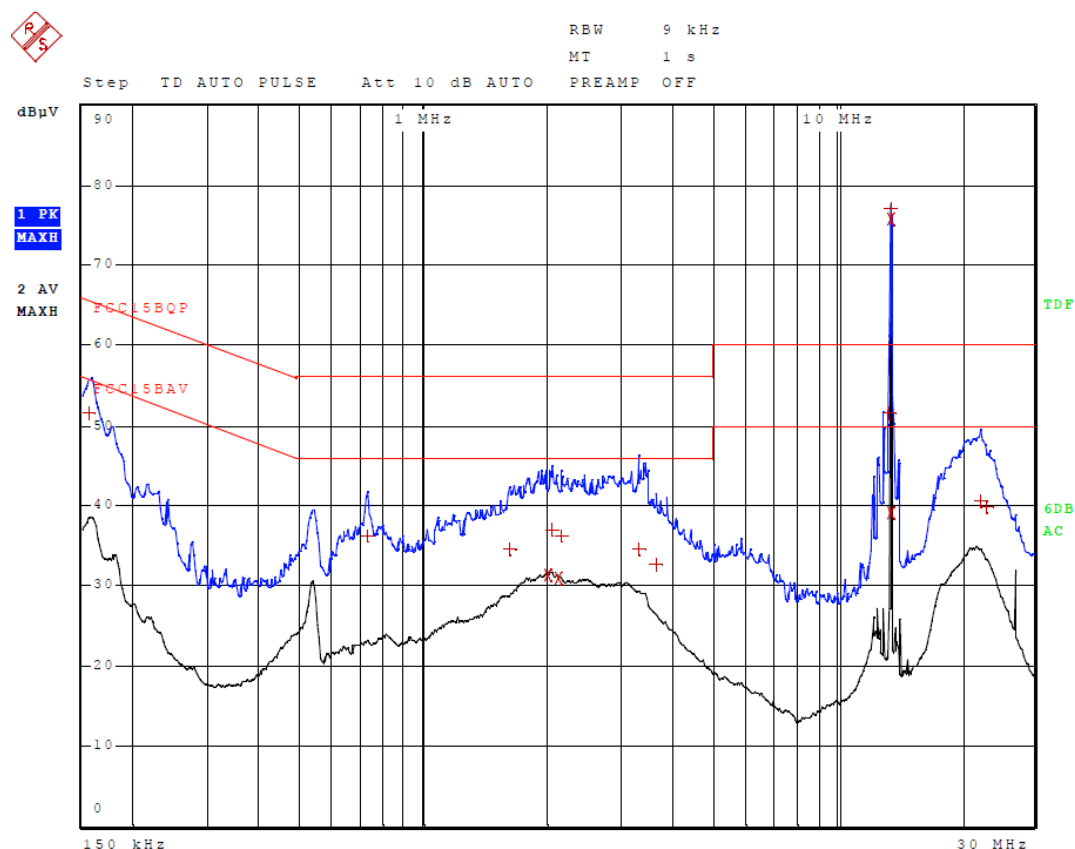
Trace	Frequency	Level (dB μ V)	Detector	Delta Limit/dB
2	13.560000000 MHz	75.43	CISPR Averag	25.43
1	13.560000000 MHz	76.93	Quasi Peak	16.93
2	13.548750000 MHz	38.75	CISPR Averag	-11.25
1	13.454250000 MHz	46.63	Quasi Peak	-13.37
1	152.250000000 kHz	50.66	Quasi Peak	-15.21
1	22.179750000 MHz	40.81	Quasi Peak	-19.19
1	3.158250000 MHz	35.05	Quasi Peak	-20.95
1	2.593500000 MHz	35.00	Quasi Peak	-21.00
1	1.887000000 MHz	34.78	Quasi Peak	-21.22
1	23.039250000 MHz	38.62	Quasi Peak	-21.38
1	726.000000000 kHz	33.75	Quasi Peak	-22.25
1	3.648750000 MHz	32.43	Quasi Peak	-23.57

Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition Uin: 120 V, 60 Hz, READING
Operator ANDREJ SKOF
Test Spec
 NEUTRAL

Time Domain Scan (1 Range)

Scan Start: 150 kHz
 Scan Stop: 30 MHz
 Detector: Trace 1: MAX PEAK Trace 2: Average
 Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition Uin: 120 V, 60 Hz, READING
Operator ANDREJ SKOF
Test Spec
 NEUTRAL

Final Measurement

Meas Time: 1 s
Margin: 15 dB
Subranges: 15

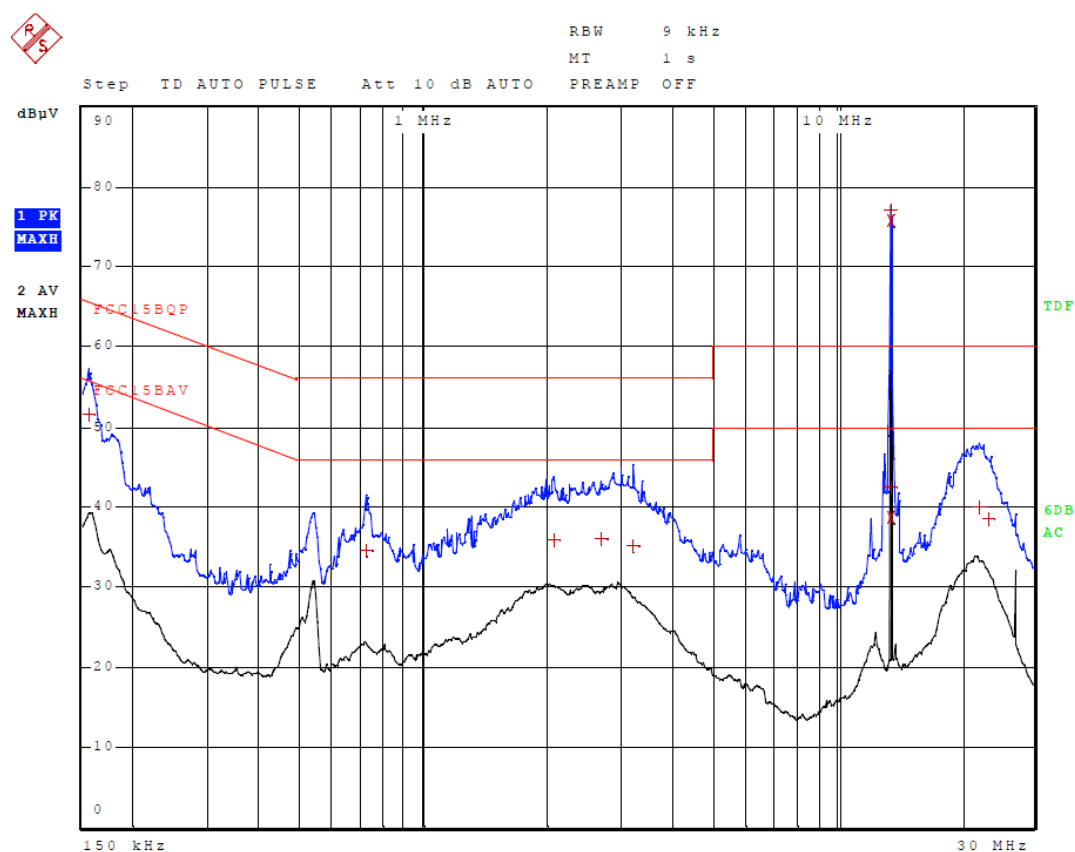
Trace	Frequency	Level (dBμV)	Detector	Delta Limit/dB
2	13.5600000000 MHz	75.77	CISPR Averag	25.77
1	13.5600000000 MHz	77.10	Quasi Peak	17.10
1	13.3485000000 MHz	51.48	Quasi Peak	-8.52
2	13.5487500000 MHz	38.98	CISPR Averag	-11.02
1	156.7500000000 kHz	51.59	Quasi Peak	-14.04
2	2.0017500000 MHz	31.25	CISPR Averag	-14.75
2	2.1277500000 MHz	30.86	CISPR Averag	-15.14
1	2.0490000000 MHz	36.96	Quasi Peak	-19.04
1	22.2922500000 MHz	40.52	Quasi Peak	-19.48
1	2.1637500000 MHz	36.21	Quasi Peak	-19.79
1	730.5000000000 kHz	36.19	Quasi Peak	-19.81
1	23.0685000000 MHz	39.87	Quasi Peak	-20.13
1	1.6192500000 MHz	34.56	Quasi Peak	-21.44
1	3.3337500000 MHz	34.43	Quasi Peak	-21.57
1	3.6375000000 MHz	32.59	Quasi Peak	-23.41

Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition Uin: 120 V, 60 Hz, WAITING
Operator ANDREJ SKOF
Test Spec
PHASE

Time Domain Scan (1 Range)

Scan Start: 150 kHz
Scan Stop: 30 MHz
Detector: Trace 1: MAX PEAK Trace 2: Average
Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2





Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition Uin: 120 V, 60 Hz, WAITING
Operator ANDREJ SKOF
Test Spec
 PHASE

Final Measurement

Meas Time: 1 s
Margin: 15 dB
Subranges: 11

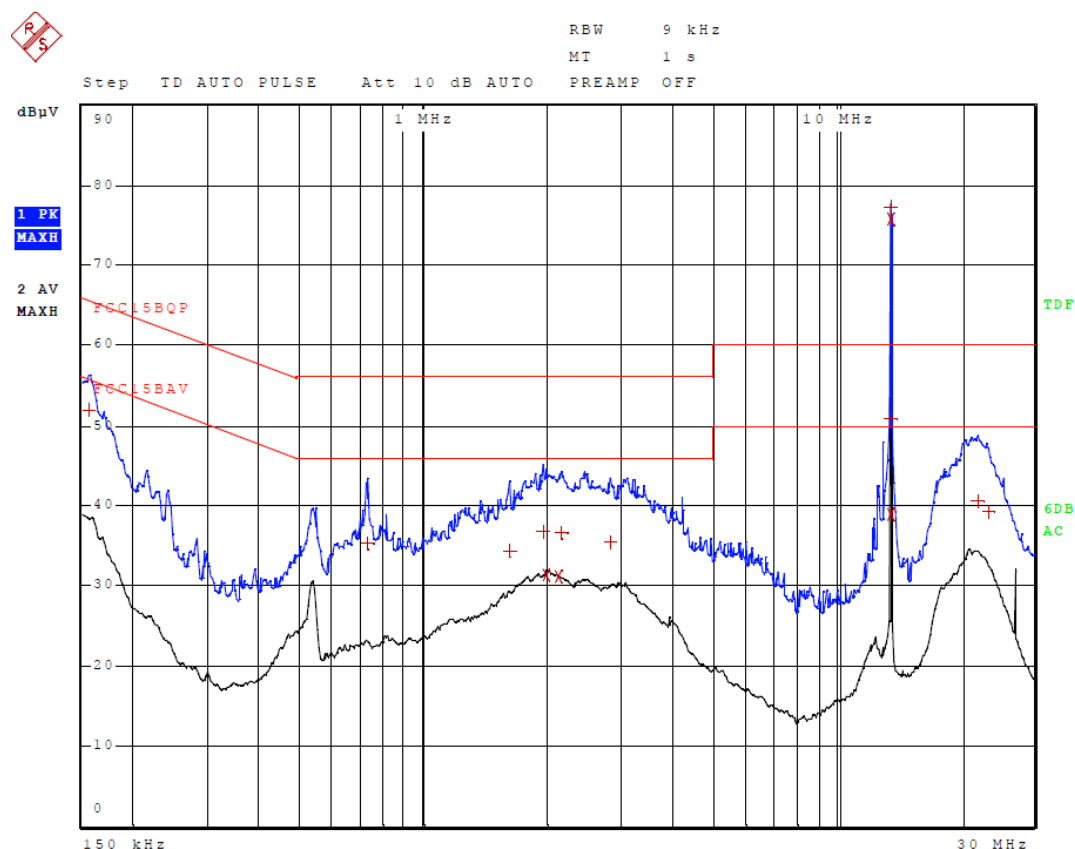
Trace	Frequency	Level (dBμV)	Detector	Delta Limit/dB
2	13.560000000 MHz	75.71	CISPR Averag	25.71
1	13.560000000 MHz	77.10	Quasi Peak	17.10
2	13.548750000 MHz	38.71	CISPR Averag	-11.29
1	154.500000000 kHz	51.54	Quasi Peak	-14.21
1	13.481250000 MHz	42.38	Quasi Peak	-17.62
1	2.681250000 MHz	36.09	Quasi Peak	-19.91
1	22.105500000 MHz	39.90	Quasi Peak	-20.10
1	2.058000000 MHz	35.76	Quasi Peak	-20.24
1	3.214500000 MHz	35.05	Quasi Peak	-20.95
1	726.000000000 kHz	34.47	Quasi Peak	-21.53
1	23.309250000 MHz	38.41	Quasi Peak	-21.59

Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition Uin: 120 V, 60 Hz, WAITING
Operator ANDREJ SKOF
Test Spec
 NEUTRAL

Time Domain Scan (1 Range)

Scan Start: 150 kHz
 Scan Stop: 30 MHz
 Detector: Trace 1: MAX PEAK Trace 2: Average
 Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition Uin: 120 V, 60 Hz, WAITING
Operator ANDREJ SKOF
Test Spec
 NEUTRAL

Final Measurement

Meas Time: 1 s
Margin: 15 dB
Subranges: 14

Trace	Frequency	Level (dBμV)	Detector	Delta Limit/dB
2	13.5600000000 MHz	75.75	CISPR Averag	25.75
1	13.5600000000 MHz	77.16	Quasi Peak	17.16
1	13.5330000000 MHz	50.75	Quasi Peak	-9.25
2	13.5487500000 MHz	38.83	CISPR Averag	-11.17
1	154.5000000000 kHz	51.81	Quasi Peak	-13.95
2	1.9927500000 MHz	31.21	CISPR Averag	-14.79
2	2.1232500000 MHz	31.12	CISPR Averag	-14.88
1	1.9522500000 MHz	36.76	Quasi Peak	-19.24
1	2.1592500000 MHz	36.61	Quasi Peak	-19.39
1	21.8715000000 MHz	40.50	Quasi Peak	-19.50
1	2.8320000000 MHz	35.48	Quasi Peak	-20.52
1	23.1517500000 MHz	39.24	Quasi Peak	-20.76
1	730.5000000000 kHz	35.21	Quasi Peak	-20.79
1	1.6170000000 MHz	34.31	Quasi Peak	-21.69

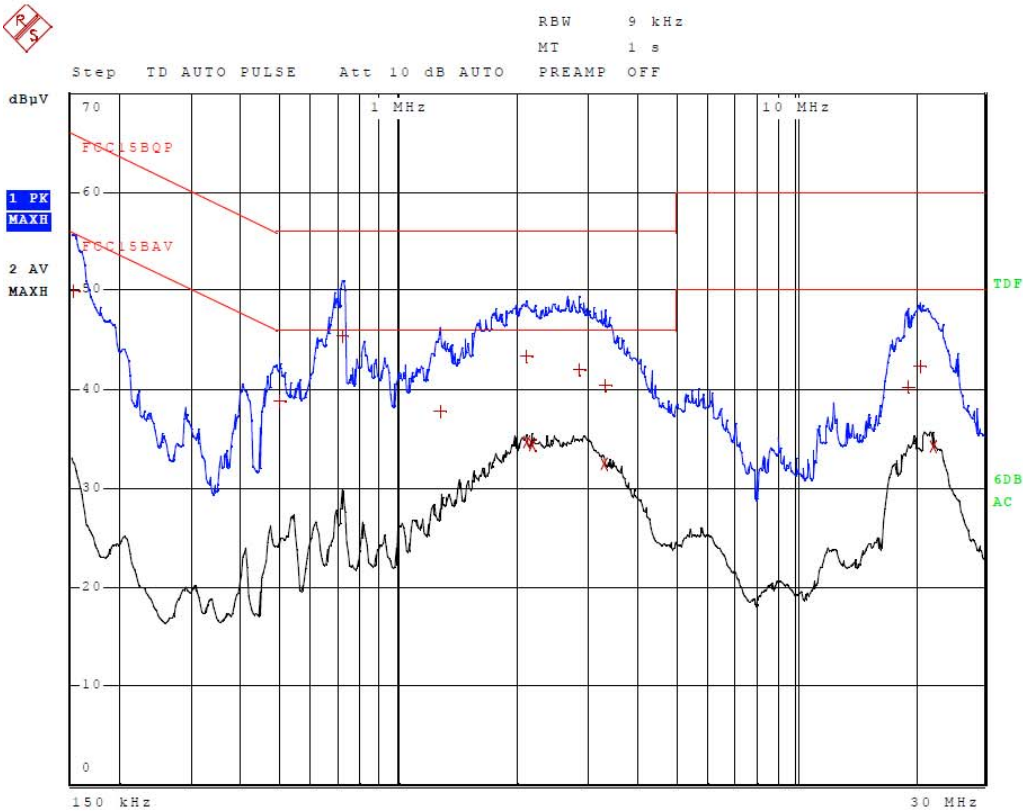
Measurement with a dummy load in lieu of the antenna:

Meas Type CONDUCTED EMISSION
 Equipment under Test ST25R391B-DISCO
 Manufacturer STMicroelectronics Austria GmbH
 OP Condition Uin: 120 V, 60 Hz; with Dummy load
 Operator ANDREJ SKOF
 Test Spec
 PHASE

Time Domain Scan (1 Range)

Scan Start: 150 kHz
 Scan Stop: 30 MHz
 Detector: Trace 1: MAX PEAK Trace 2: Average
 Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	20 ms	Auto	0 dB	INPUT2



Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition Uin: 120 V, 60 Hz; with Dummy load
Operator ANDREJ SKOF
Test Spec
 PHASE

Final Measurement

Meas Time: 1 s
Margin: 15 dB
Subranges: 13

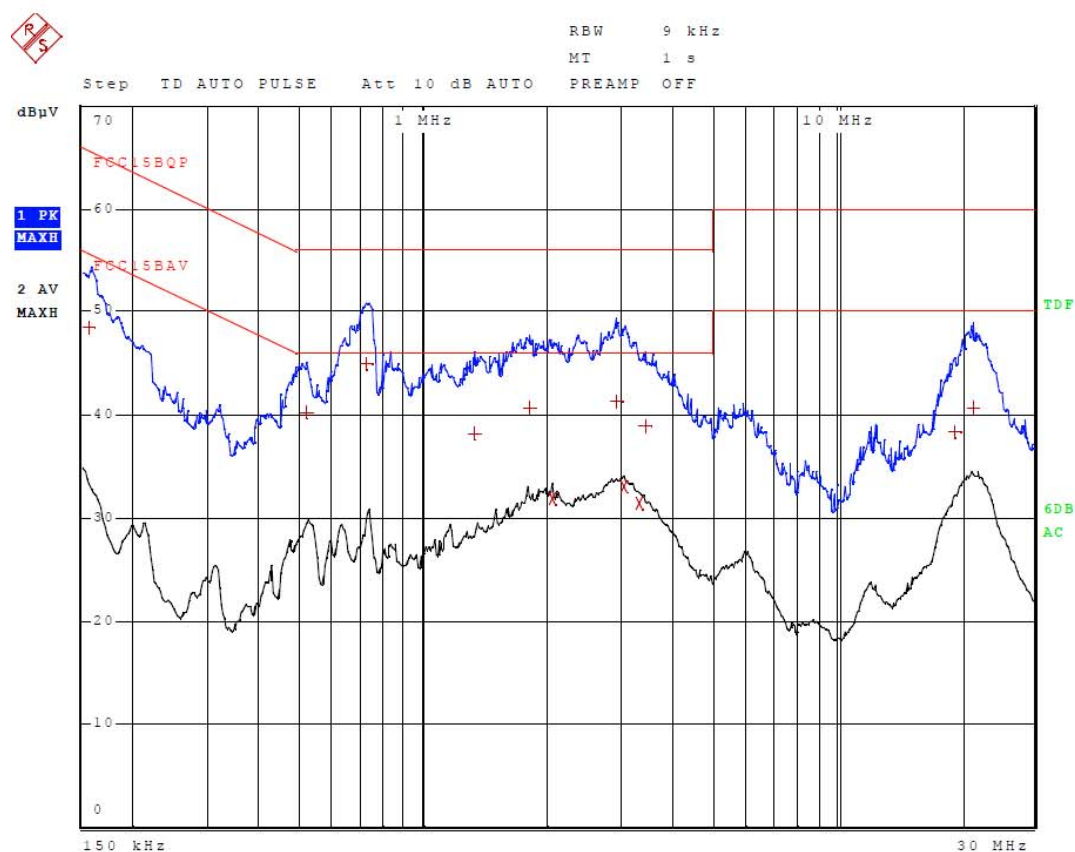
Trace	Frequency	Level (dB μ V)	Detector	Delta Limit/dB
1	719.250000000 kHz	45.32	Quasi Peak	-10.68
2	2.103000000 MHz	34.56	CISPR Averag	-11.44
2	2.175000000 MHz	34.36	CISPR Averag	-11.64
1	2.094000000 MHz	43.38	Quasi Peak	-12.62
2	3.306750000 MHz	32.41	CISPR Averag	-13.59
1	2.845500000 MHz	41.96	Quasi Peak	-14.04
1	3.329250000 MHz	40.34	Quasi Peak	-15.66
2	22.209000000 MHz	34.24	CISPR Averag	-15.76
1	152.250000000 kHz	49.86	Quasi Peak	-16.02
1	498.750000000 kHz	38.75	Quasi Peak	-17.27
1	20.591250000 MHz	42.25	Quasi Peak	-17.75
1	1.272750000 MHz	37.75	Quasi Peak	-18.25
1	19.214250000 MHz	40.23	Quasi Peak	-19.77

Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition Uin: 120 V, 60 Hz; with Dummy load
Operator ANDREJ SKOF
Test Spec
 NEUTRAL

Time Domain Scan (1 Range)

Scan Start: 150 kHz
Scan Stop: 30 MHz
Detector: Trace 1: MAX PEAK Trace 2: Average
Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	20 ms	Auto	0 dB	INPUT2



Meas Type CONDUCTED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition Uin: 120 V, 60 Hz; with Dummy load
Operator ANDREJ SKOF
Test Spec
 NEUTRAL

Final Measurement

Meas Time: 1 s
Margin: 15 dB
Subranges: 12

Trace	Frequency	Level (dBµV)	Detector	Delta Limit/dB
1	728.250000000 kHz	44.94	Quasi Peak	-11.06
2	3.050250000 MHz	32.98	CISPR Averag	-13.02
2	2.053500000 MHz	31.83	CISPR Averag	-14.17
2	3.322500000 MHz	31.45	CISPR Averag	-14.55
1	2.919750000 MHz	41.21	Quasi Peak	-14.79
1	1.797000000 MHz	40.65	Quasi Peak	-15.35
1	521.250000000 kHz	40.22	Quasi Peak	-15.78
1	156.750000000 kHz	48.48	Quasi Peak	-17.15
1	3.426000000 MHz	38.83	Quasi Peak	-17.17
1	1.331250000 MHz	38.15	Quasi Peak	-17.85
1	21.441750000 MHz	40.61	Quasi Peak	-19.39
1	19.239000000 MHz	38.26	Quasi Peak	-21.74

4.5 Radiated emission measurement (§15.109, §15.209 of FCC 47 CRF 15 and Tables 4 and 5 of RSS-Gen Issue 4)

4.5.1 Requirement

Frequency Range (MHz)	Limits (dBμV/m)	Test distance (m)
0.009 to 0.490	$20 \cdot \log(2400/F(\text{kHz}))$	300
0.490 to 1.705	$20 \cdot \log(24000/F(\text{kHz}))$	30
1.705 to 30.0	30	30
30 to 88	40**	3
88 to 216	43.5**	3
216 to 960	46**	3
Above 960	54	3

** Except as provided in paragraph below, fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.

Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications

4.5.2 Test procedure

Measurements from 9 kHz to 30 MHz

- As per clause 6.4 from ANSI C63.10-2013
- Radiated emission in the frequency range 9 kHz to 30 MHz are measured Active loop Antenna.
- First preliminary measurements were performed in Semi-anechoic chamber at a distance of 3 m using active loop antenna.
- The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table and antenna was rotated 360 degrees to determine the position of the highest radiation.
- Final measurements were done at a distance of 10 m at Open Area Test Site due to low emissions measured during preliminary measurements acc. to the clauses from Part 15, Sections 15.31(d) and 15.31(f)(2). Test results were extrapolated by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Measurements from 30 MHz to 1 GHz

- As per clause 6.5 from ANSI C63.10-2013
- The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of variable-height antenna tower.
- The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to PEAK and QUAS-PEAK Detect Function and Specified Bandwidth with Maximum Hold Mode.
- The highest points would be re-tested one by one using the quasi-peak method.

4.5.3 Test results

Device passed the requirements stated

Preliminary measurements at 3 m:



C20171222

03.May 17 14:01

Meas Type RADIATED EMISSION
 Equipment under Test ST25R391B-DISCO
 Manufacturer STMicroelectronics Austria GmbH
 OP Condition READING
 Operator ANDREJ SKOF

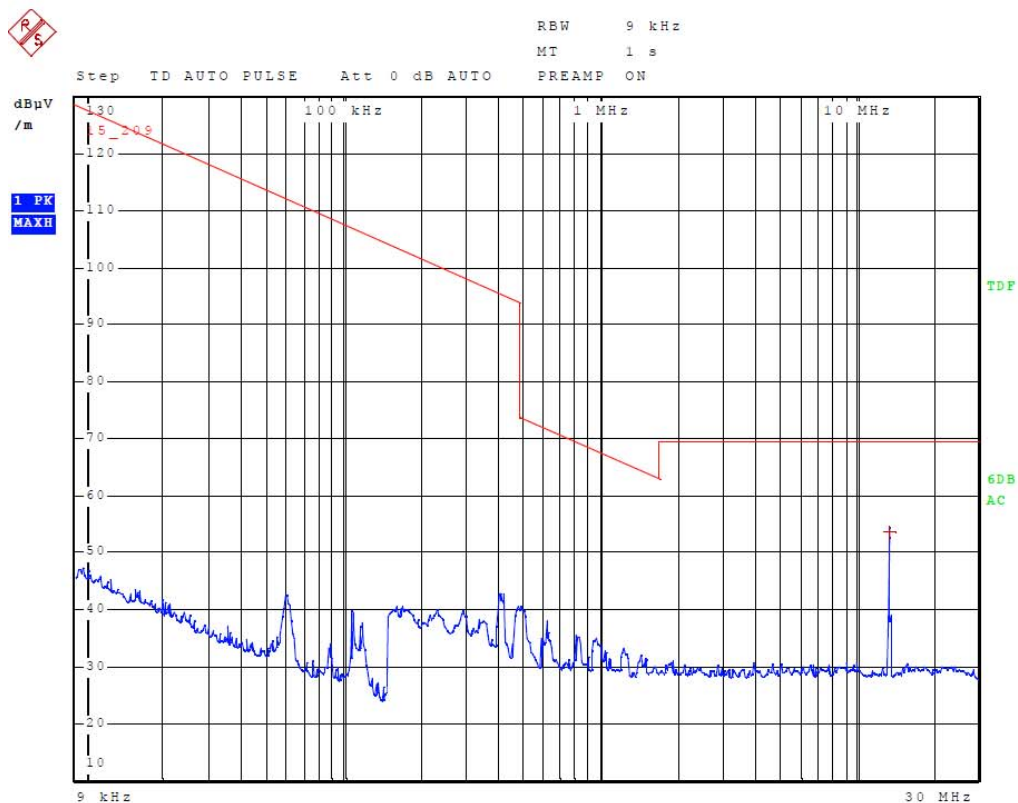
Test Spec

Antenna: 0 deg, Sample: 0 deg

Time Domain Scan (2 Ranges)

Scan Start: 9 kHz
 Scan Stop: 30 MHz
 Detector: Trace 1: MAX PEAK
 Transducer: HFH2-Z2V

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	300 ms	Auto	20 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	20 dB	INPUT2



**C20171222**

03.May 17 14:01

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition READING
Operator ANDREJ SKOF

Test Spec

Antenna: 0 deg, Sample: 0 deg

Final Measurement

Meas Time: 1 s
Margin: 20 dB
Subranges: 1

Trace	Frequency	Level (dB μ V/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	53.51	Quasi Peak	-15.99

**C20171222**

03.May 17 14:10

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition READING
Operator ANDREJ SKOF

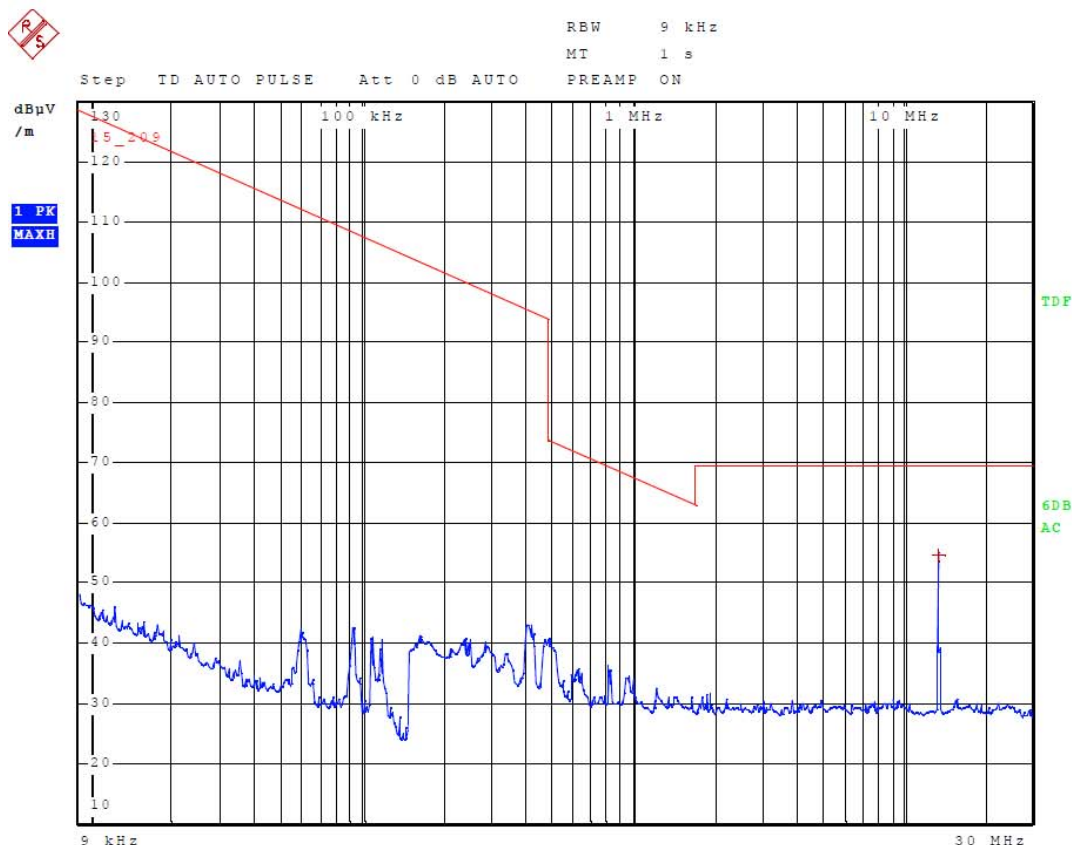
Test Spec

Antenna: 340 deg, Sample: 20 deg

Time Domain Scan (2 Ranges)

Scan Start: 9 kHz
 Scan Stop: 30 MHz
 Detector: Trace 1: MAX PEAK
 Transducer: HFH2-Z2V

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	300 ms	Auto	20 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	20 dB	INPUT2



**C20171222**

03.May 17 14:10

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition READING
Operator ANDREJ SKOF

Test Spec

Antenna: 340 deg, Sample: 20 deg

Final Measurement

Meas Time: 1 s
Margin: 20 dB
Subranges: 1

Trace	Frequency	Level (dB μ V/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	54.39	Quasi Peak	-15.11

**C20171222**

03.May 17 13:59

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition WAITING
Operator ANDREJ SKOF

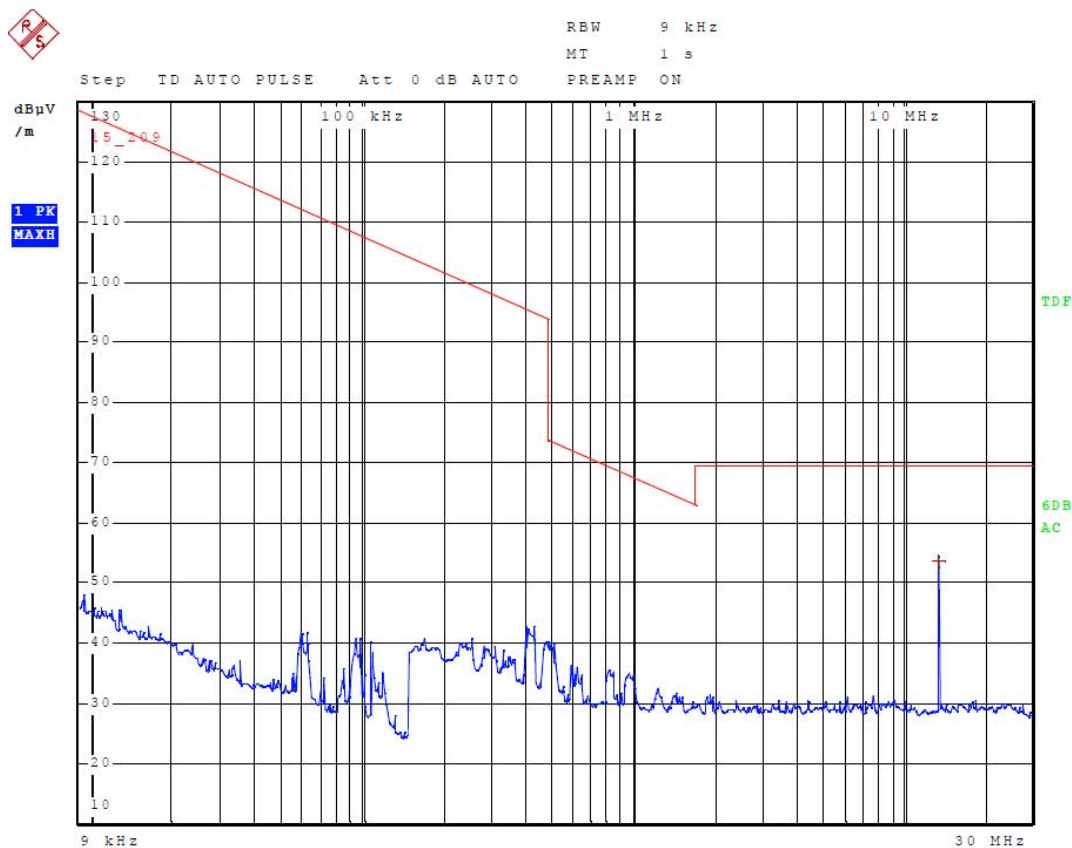
Test Spec

Antenna: 0 deg, Sample: 0 deg

Time Domain Scan (2 Ranges)

Scan Start: 9 kHz
 Scan Stop: 30 MHz
 Detector: Trace 1: MAX PEAK
 Transducer: HFH2-Z2V

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	300 ms	Auto	20 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	20 dB	INPUT2



**C20171222**

03.May 17 13:59

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition WAITING
Operator ANDREJ SKOF

Test Spec

Antenna: 0 deg, Sample: 0 deg

Final Measurement

Meas Time: 1 s
Margin: 20 dB
Subranges: 1

Trace	Frequency	Level (dB μ V/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	53.59	Quasi Peak	-15.91

**C20171222**

03.May 17 14:12

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition WAITING
Operator ANDREJ SKOF

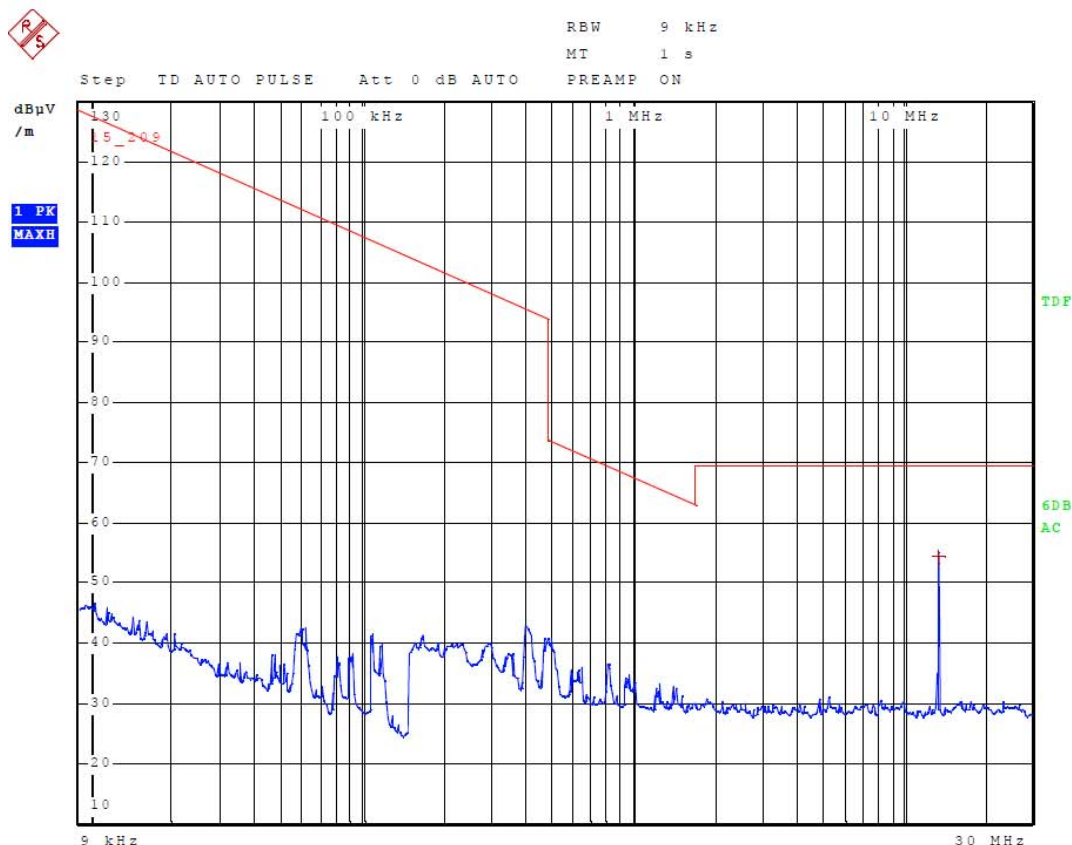
Test Spec

Antenna: 340 deg, Sample: 20 deg

Time Domain Scan (2 Ranges)

Scan Start: 9 kHz
 Scan Stop: 30 MHz
 Detector: Trace 1: MAX PEAK
 Transducer: HFH2-Z2V

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	300 ms	Auto	20 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	20 dB	INPUT2



**C20171222**

03.May 17 14:12

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition WAITING
Operator ANDREJ SKOF

Test Spec

Antenna: 340 deg, Sample: 20 deg

Final Measurement

Meas Time: 1 s
Margin: 20 dB
Subranges: 1

Trace	Frequency	Level (dB μ V/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	54.29	Quasi Peak	-15.21



Final measurement at 10 m on OATS

Results with measuring distance of 10 m				
Mode	Frequency (MHz)	Measured value (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Reading	13.56	37.65	104.00	66.35
Waiting	13.56	37.49	104.00	66.51

Calculated value from 10 m to 30 m						
Mode	Frequency (MHz)	Measured value at 10 m (dB μ V/m)	Correction factor from 10 m to 30 m (dB)	Calculated value at 30 m (dB μ V/m)	Limit at 30 m (dB μ V/m)	Margin (dB)
Reading	13.56	37.65	20	17.65	84.00	66.35
Waiting	13.56	37.49	20	17.49	84.00	66.51

NOTE: Antenna factor and cable loss are included in measurement correction.

Final measurements from 30 MHz to 1 GHz



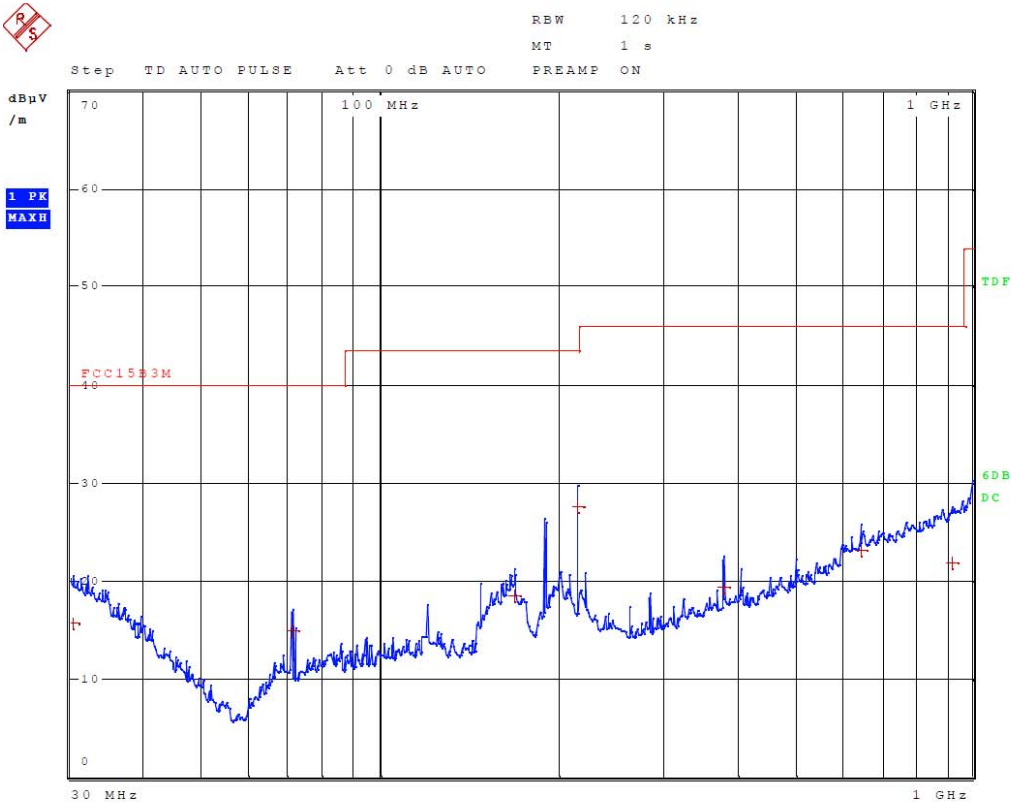
C20171222

Meas Type RADIATED EMISSION
 Equipment under Test ST25R391B-DISCO
 Manufacturer STMicroelectronics Austria GmbH
 OP Condition STANDBY
 Operator ANDREJ SKOF
 Test Spec
 VERTICAL 100 cm, 270 deg

Time Domain Scan (1 Range)

Scan Start: 30 MHz
 Scan Stop: 1 GHz
 Detector: Trace 1: MAX PEAK
 Transducer: S2_HL562

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	5 ms	Auto	20 dB	INPUT2



**C20171222**

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition STANDBY
Operator ANDREJ SKOF

Test Spec
 VERTICAL 100 cm, 270 deg

Final Measurement

Meas Time: 1 s
Margin: 25 dB
Subranges: 7

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	215.970000000 MHz	27.55	Quasi Peak	-15.95
1	648.030000000 MHz	23.09	Quasi Peak	-22.91
1	924.900000000 MHz	21.91	Quasi Peak	-24.09
1	30.330000000 MHz	15.61	Quasi Peak	-24.39
1	168.000000000 MHz	18.45	Quasi Peak	-25.05
1	71.280000000 MHz	14.86	Quasi Peak	-25.14
1	380.340000000 MHz	19.41	Quasi Peak	-26.59

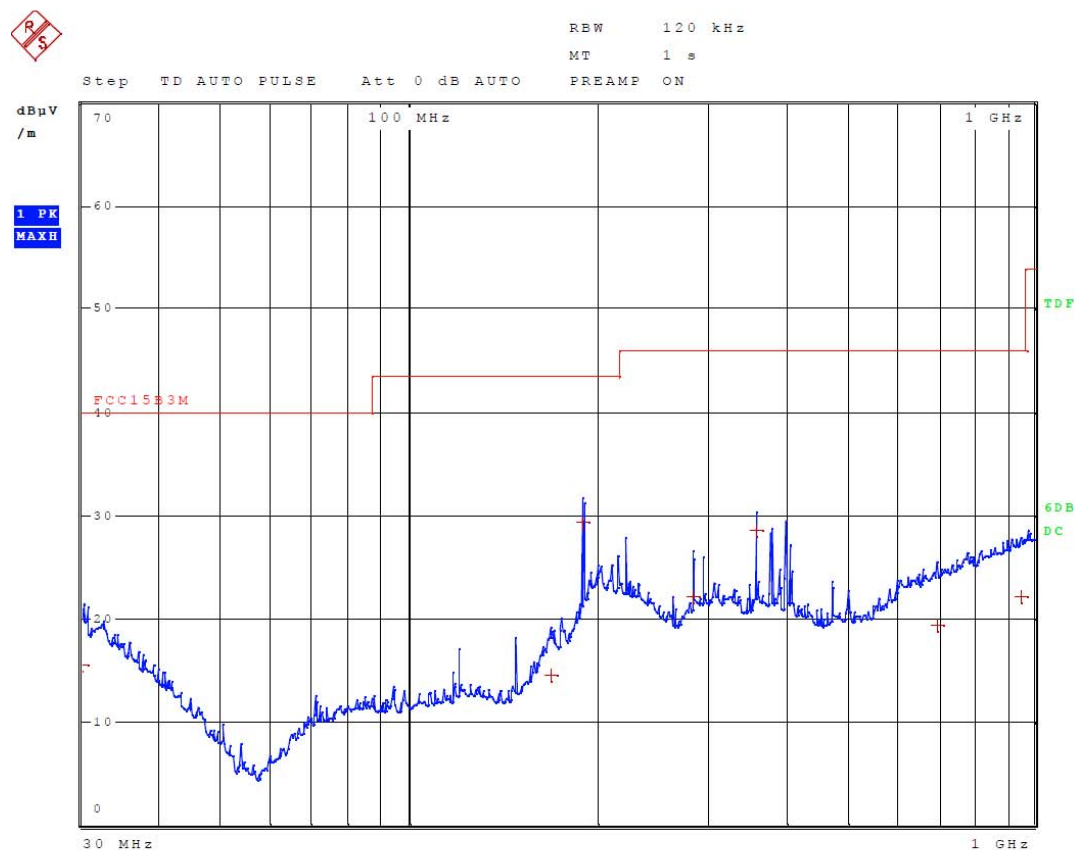
C20171222

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition STANDBY
Operator ANDREJ SKOF
Test Spec
 HORIZONTAL 100 cm, 90 deg

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: S2_HL562

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	5 ms	Auto	20 dB	INPUT2



**C20171222**

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition STANDBY
Operator ANDREJ SKOF

Test Spec
 HORIZONTAL 100 cm, 90 deg

Final Measurement

Meas Time: 1 s
Margin: 25 dB
Subranges: 7

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	189.180000000 MHz	29.36	Quasi Peak	-14.14
1	360.000000000 MHz	28.66	Quasi Peak	-17.34
1	283.710000000 MHz	22.12	Quasi Peak	-23.88
1	948.480000000 MHz	22.07	Quasi Peak	-23.93
1	30.060000000 MHz	15.51	Quasi Peak	-24.49
1	699.090000000 MHz	19.28	Quasi Peak	-26.72
1	168.480000000 MHz	14.47	Quasi Peak	-29.03


ROHDE & SCHWARZ
C20171222

27.Apr 17 10:06

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition READING A TAG
Operator Andrej Skof
Test Spec
 VERTICAL 100 cm, 0 deg

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B-3M

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2

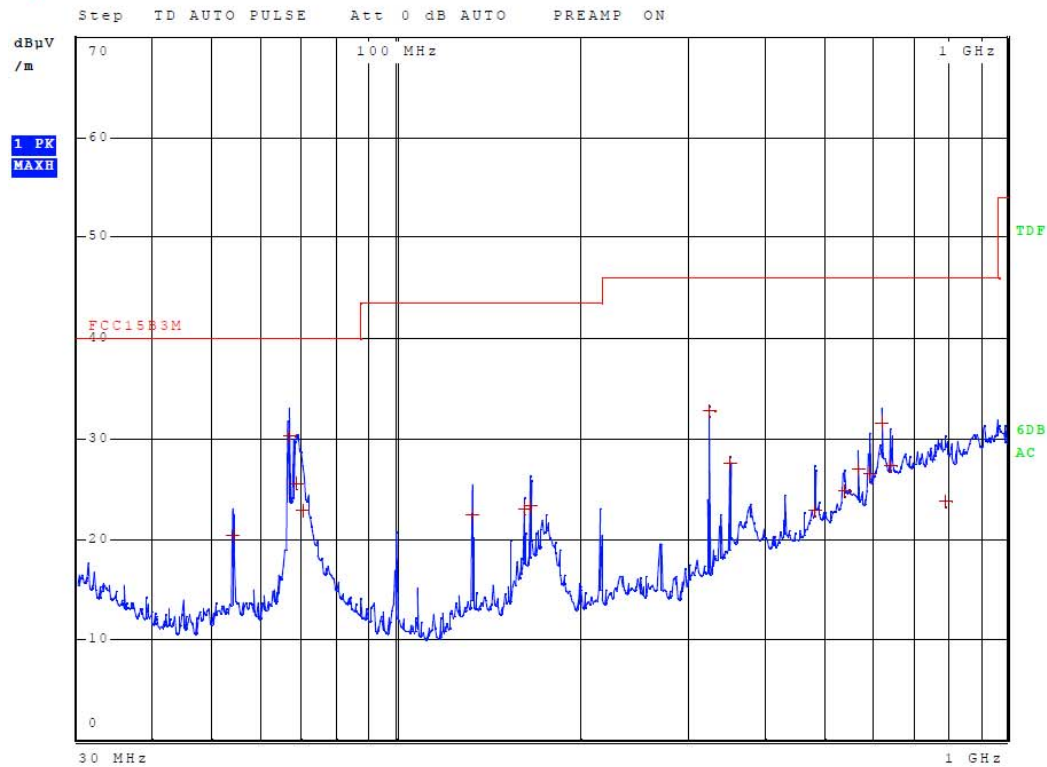


RBW 120 kHz

MT 1 s

Att 0 dB AUTO

PREAMP ON



**C20171222**

27.Apr 17 10:06

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition READING A TAG
Operator Andrej Skof

Test Spec
 VERTICAL 100 cm, 0 deg

Final Measurement

Meas Time: 1 s
Margin: 20 dB
Peaks: 16

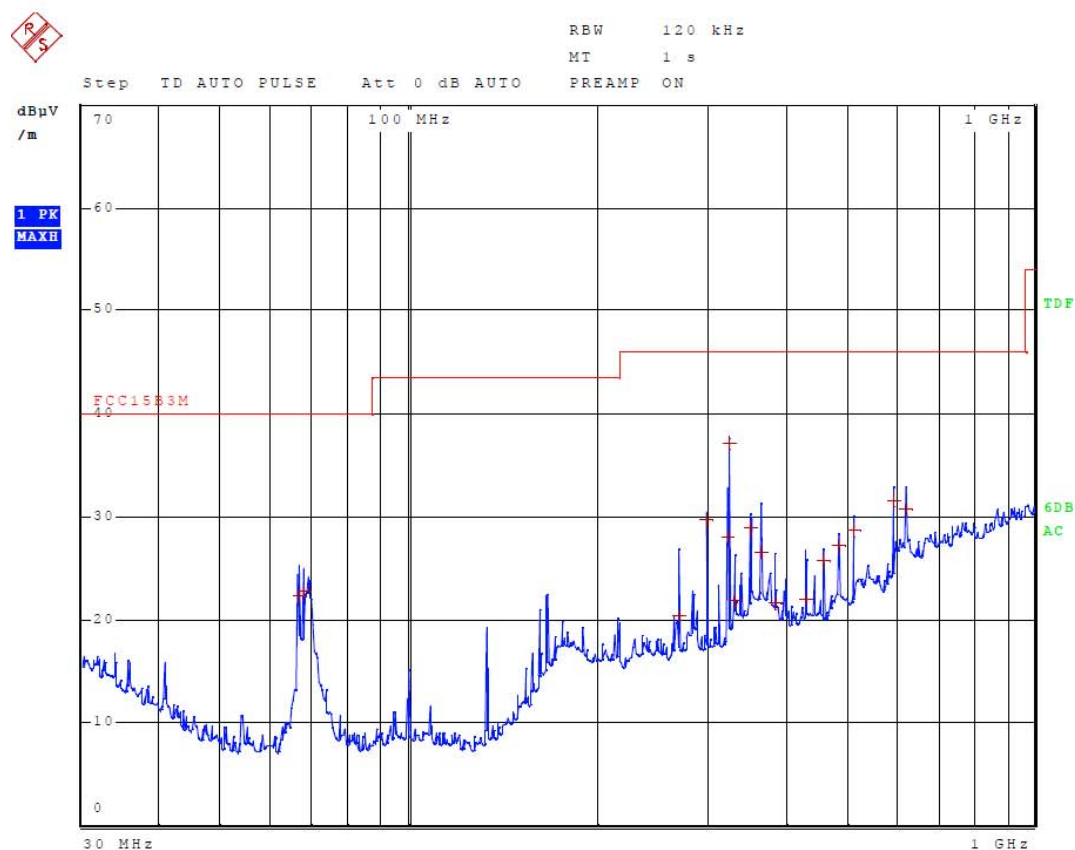
Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	66.630000000 MHz	30.18	Quasi Peak	-9.82
1	325.440000000 MHz	32.79	Quasi Peak	-13.21
1	623.760000000 MHz	31.58	Quasi Peak	-14.42
1	68.670000000 MHz	25.48	Quasi Peak	-14.52
1	70.080000000 MHz	22.91	Quasi Peak	-17.09
1	352.560000000 MHz	27.60	Quasi Peak	-18.40
1	646.500000000 MHz	27.33	Quasi Peak	-18.67
1	569.520000000 MHz	26.94	Quasi Peak	-19.06
1	594.930000000 MHz	26.49	Quasi Peak	-19.51
1	53.940000000 MHz	20.36	Quasi Peak	-19.64
1	165.990000000 MHz	23.31	Quasi Peak	-20.19
1	162.060000000 MHz	23.04	Quasi Peak	-20.46
1	132.810000000 MHz	22.45	Quasi Peak	-21.05
1	542.430000000 MHz	24.84	Quasi Peak	-21.16
1	795.180000000 MHz	23.75	Quasi Peak	-22.25
1	484.860000000 MHz	22.91	Quasi Peak	-23.09

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition READING A TAG
Operator Andrej Skof
Test Spec
 HORIZONTAL 100 cm, 0 deg

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B-3M

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



**C20171222**

27.Apr 17 10:04

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition READING A TAG
Operator Andrej Skof

Test Spec
 HORIZONTAL 100 cm, 0 deg

Final Measurement

Meas Time: 1 s
Margin: 20 dB
Peaks: 16

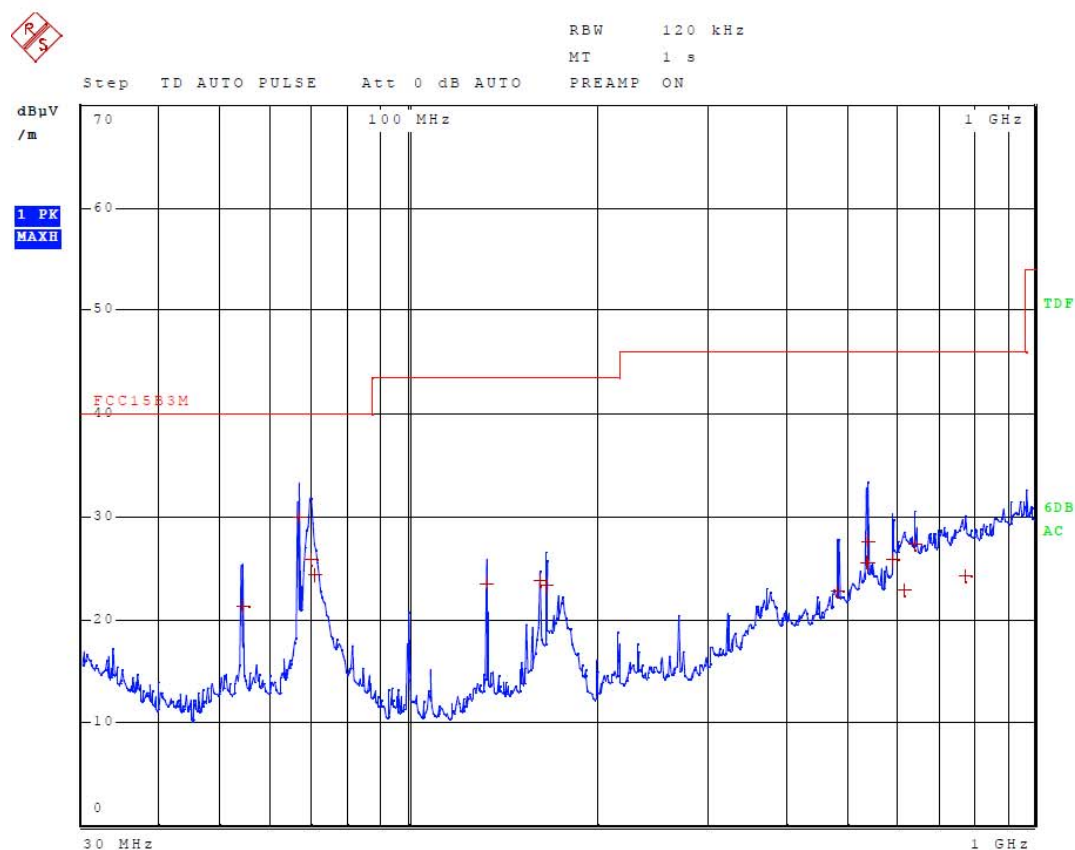
Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	325.440000000 MHz	37.20	Quasi Peak	-8.80
1	596.640000000 MHz	31.58	Quasi Peak	-14.42
1	623.790000000 MHz	30.63	Quasi Peak	-15.37
1	298.320000000 MHz	29.60	Quasi Peak	-16.40
1	352.560000000 MHz	28.95	Quasi Peak	-17.05
1	67.800000000 MHz	22.70	Quasi Peak	-17.30
1	515.280000000 MHz	28.64	Quasi Peak	-17.36
1	66.630000000 MHz	22.26	Quasi Peak	-17.74
1	323.280000000 MHz	28.04	Quasi Peak	-17.96
1	488.160000000 MHz	27.09	Quasi Peak	-18.91
1	366.510000000 MHz	26.53	Quasi Peak	-19.47
1	461.040000000 MHz	25.70	Quasi Peak	-20.30
1	431.010000000 MHz	21.92	Quasi Peak	-24.08
1	331.980000000 MHz	21.79	Quasi Peak	-24.21
1	385.260000000 MHz	21.62	Quasi Peak	-24.38
1	270.390000000 MHz	20.37	Quasi Peak	-25.63

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition WAITING FOR A TAG
Operator Andrej Skof
Test Spec
 VERTICAL 100 cm, 0 deg

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B-3M

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



**C20171222**

27.Apr 17 10:01

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition WAITING FOR A TAG
Operator Andrej Skof

Test Spec
 VERTICAL 100 cm, 0 deg

Final Measurement

Meas Time: 1 s
Margin: 20 dB
Peaks: 15

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	66.630000000 MHz	30.00	Quasi Peak	-10.00
1	69.480000000 MHz	25.82	Quasi Peak	-14.18
1	70.380000000 MHz	24.36	Quasi Peak	-15.64
1	540.870000000 MHz	27.52	Quasi Peak	-18.48
1	646.470000000 MHz	27.33	Quasi Peak	-18.67
1	54.060000000 MHz	21.30	Quasi Peak	-18.70
1	162.210000000 MHz	23.70	Quasi Peak	-19.80
1	132.810000000 MHz	23.46	Quasi Peak	-20.04
1	165.990000000 MHz	23.34	Quasi Peak	-20.16
1	592.560000000 MHz	25.76	Quasi Peak	-20.24
1	540.360000000 MHz	25.51	Quasi Peak	-20.49
1	539.580000000 MHz	25.47	Quasi Peak	-20.53
1	777.240000000 MHz	24.24	Quasi Peak	-21.76
1	620.910000000 MHz	22.84	Quasi Peak	-23.16
1	484.890000000 MHz	22.75	Quasi Peak	-23.25

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition WAITING FOR A TAG
Operator Andrej Skof
Test Spec
 HORIZONTAL 100 cm, 0 deg

Time Domain Scan (1 Range)

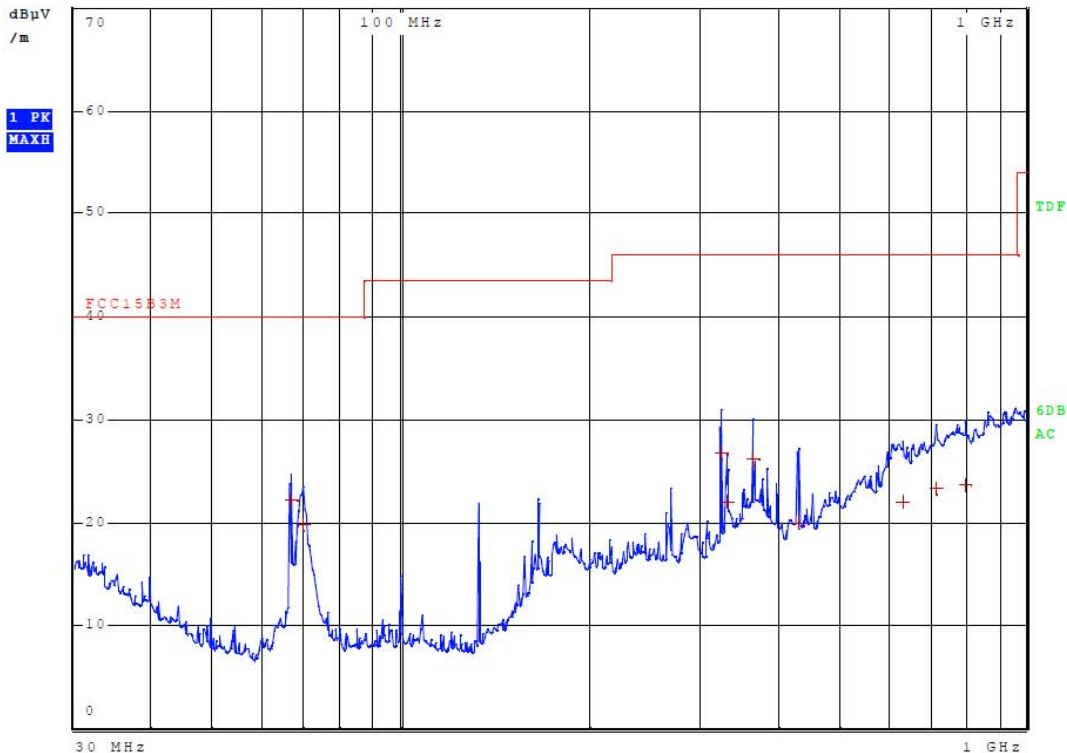
Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B-3M

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



RBW 120 kHz
 MT 1 s
 PREAMP ON

Step TD AUTO PULSE Att 0 dB AUTO



**C20171222**

27.Apr 17 10:03

Meas Type RADIATED EMISSION
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition WAITING FOR A TAG
Operator Andrej Skof

Test Spec
 HORIZONTAL 100 cm, 0 deg

Final Measurement

Meas Time: 1 s
Margin: 20 dB
Peaks: 9

Trace	Frequency	Level (dBμV/m)	Detector	Delta Limit/dB
1	66.600000000 MHz	22.15	Quasi Peak	-17.85
1	324.480000000 MHz	26.67	Quasi Peak	-19.33
1	365.190000000 MHz	26.03	Quasi Peak	-19.97
1	69.600000000 MHz	19.75	Quasi Peak	-20.25
1	798.990000000 MHz	23.59	Quasi Peak	-22.41
1	719.190000000 MHz	23.30	Quasi Peak	-22.70
1	635.910000000 MHz	22.03	Quasi Peak	-23.97
1	333.180000000 MHz	21.92	Quasi Peak	-24.08
1	432.780000000 MHz	19.88	Quasi Peak	-26.12

4.6 Bandwidth of the emission (§15.215)

4.6.1 Requirements

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through 15.257 and in subpart E of FCC Part 15, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.6.2 Test procedure

1. As per Clause 6.9.2 from ANSI C63.10-2013
2. The EUT is placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table is rotated 360 degrees to determine the position of the highest radiation.
3. The EUT is set 3 m away from the interference-receiving antenna.
4. Resolution bandwidth is set to a value greater than 5% of the allowed bandwidth.

4.6.3 Test results

Device passed the requirements stated



ROHDE & SCHWARZ

C20171222

03.May 17 14:25

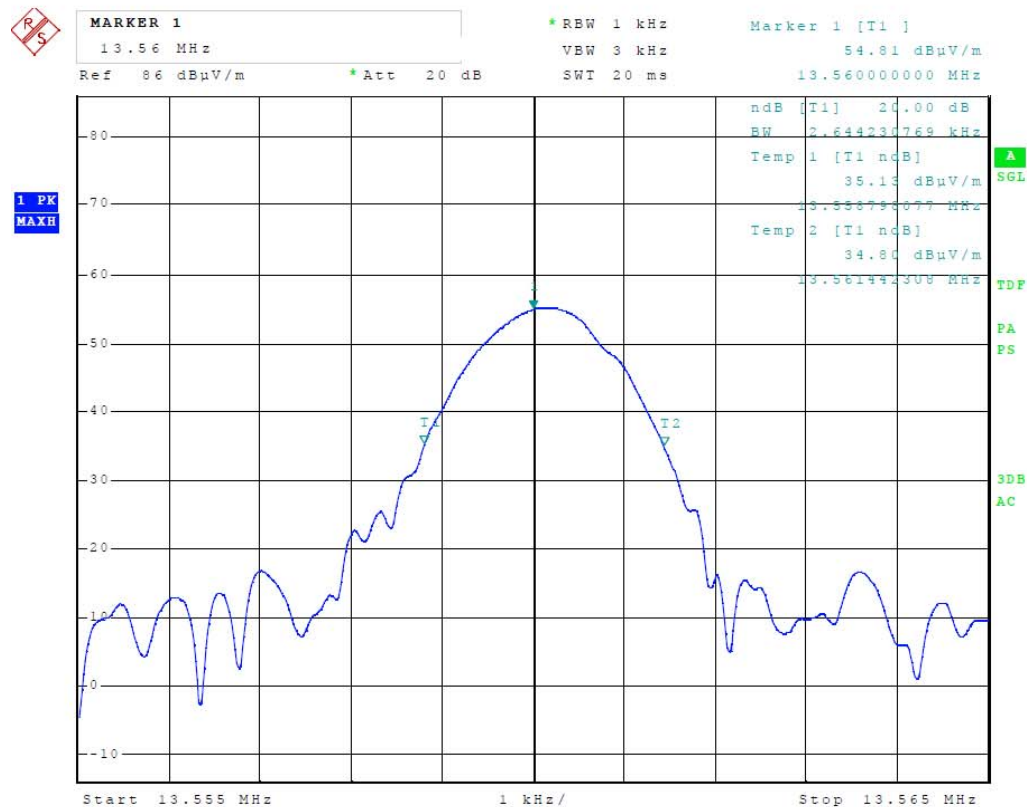
Meas Type OCCUPIED BANDWIDTH
 Equipment under Test ST25R391B-DISCO
 Manufacturer STMicroelectronics Austria GmbH
 OP Condition READING
 Operator ANDREJ SKOF

Test Spec

Antenna: 340 deg, Sample: 20 deg

Sweep Settings Screen A

Center Frequency	13.560000 MHz	Ref Level	86.000 dBuV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	10.000000 kHz	Ref Position	100.000 %
Start Frequency	13.555000 MHz	Level Range	100.000 dB
Stop Frequency	13.565000 MHz	RF Att	20.000 dB
RBW	1.000000 kHz	X-Axis	LIN
VBW	3.000000 kHz	Y-Axis	LOG
Sweep Time	20.00 ms		

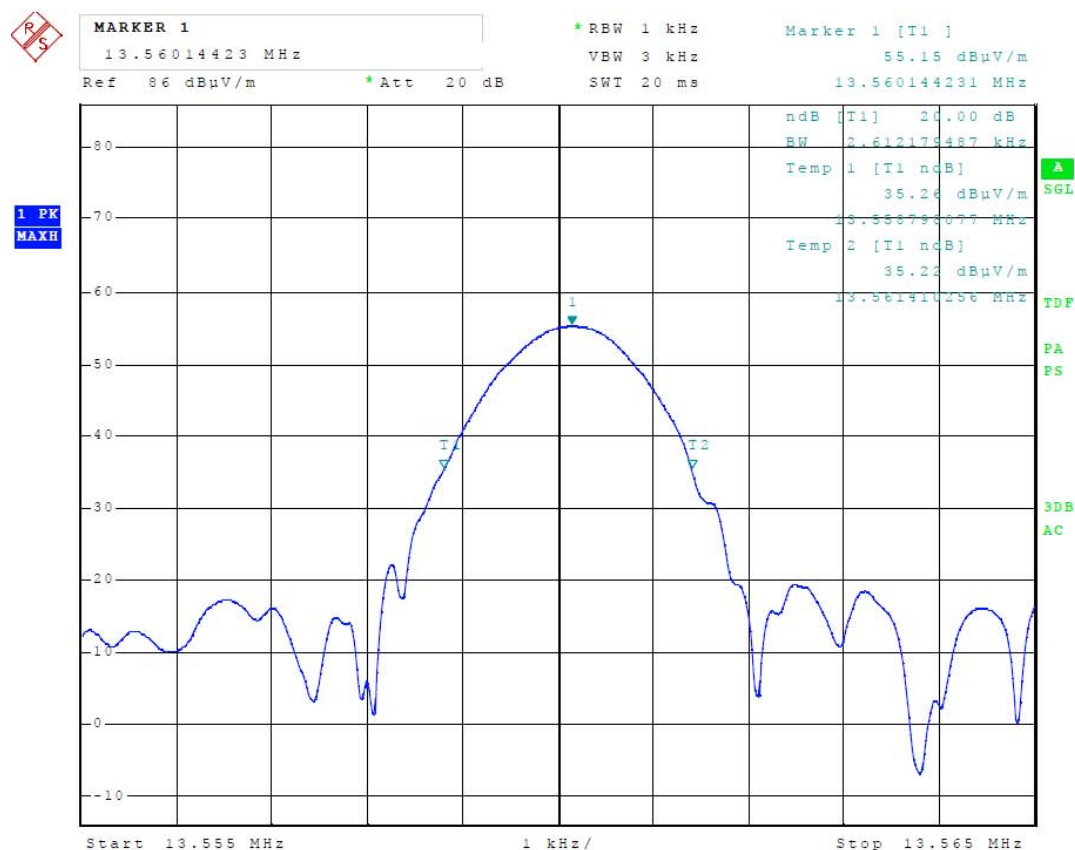


Meas Type OCCUPIED BANDWIDTH
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition WAITING
Operator ANDREJ SKOF

Test Spec
 Antenna: 340 deg, Sample: 20 deg

Sweep Settings Screen A

Center Frequency	13.560000 MHz	Ref Level	86.000 dBuV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	10.000000 kHz	Ref Position	100.000 %
Start Frequency	13.555000 MHz	Level Range	100.000 dB
Stop Frequency	13.565000 MHz	RF Att	20.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	20.00 ms	Y-Axis	LOG



Frequency (MHz)	Permitted frequency band (MHz)	20 dB bandwidth (kHz)	PASS/FAIL
13.56	13.110 – 14.010	2.64	PASS



4.7 Spectrum mask (§15.225 (a)-(d) of FCC 47 CRF 15 and Annex B.6 of RSS-210 issue 9)

4.7.1 Requirements

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters. Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters. Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters. The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

4.7.2 Test procedure

1. As per clause 6.4 from ANSI C63.10-2013
2. The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
3. The EUT was set 3 m away from the interference-receiving antenna.
4. Frequencies with maximum emission were retested on OATS.
5. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.

4.7.3 Test results

Device passed the requirements stated



C20171222

03.May 17 14:21

Meas Type SPECTRUM MASK
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition READING
Operator ANDREJ SKOF

Test Spec

Antenna: 340 deg, Sample: 20 deg

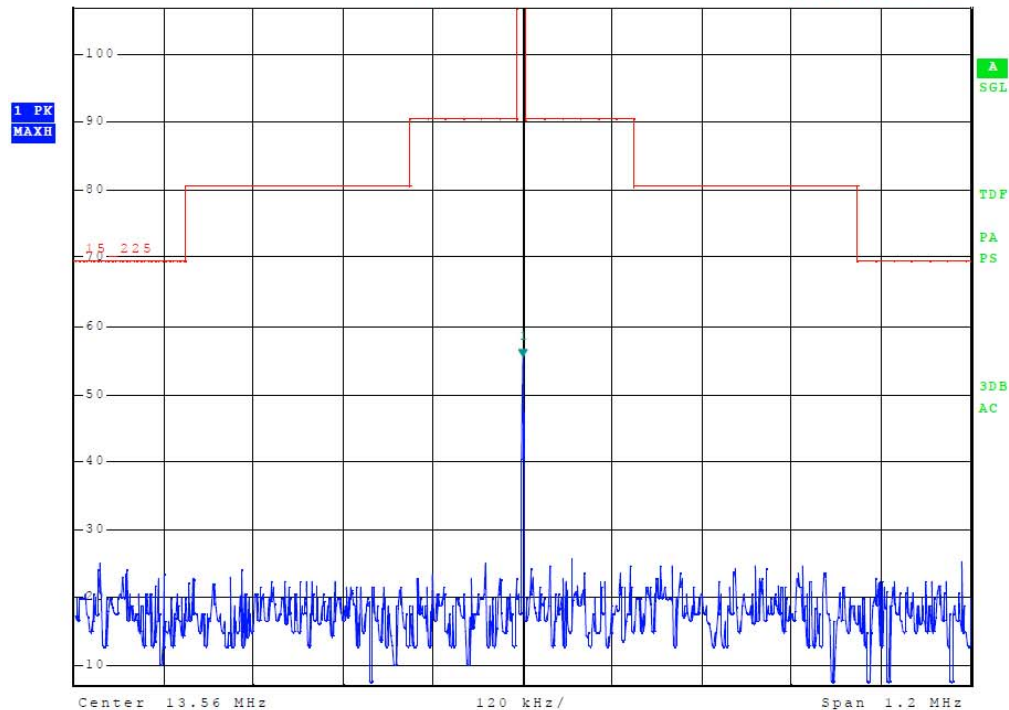
Sweep Settings Screen A

Center Frequency	13.560000 MHz	Ref Level	107.000 dBμV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	1.200000 MHz	Ref Position	100.000 %
Start Frequency	12.960000 MHz	Level Range	100.000 dB
Stop Frequency	14.160000 MHz	RF Att	20.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	1.20 s	Y-Axis	LOG



*RBW 1 kHz Marker 1 [T1]
VBW 3 kHz 55.17 dBμV/m
SWT 1.2 s 13.560000000 MHz

Ref 107 dBμV/m *Att 20 dB



**C20171222**

03.May 17 14:20

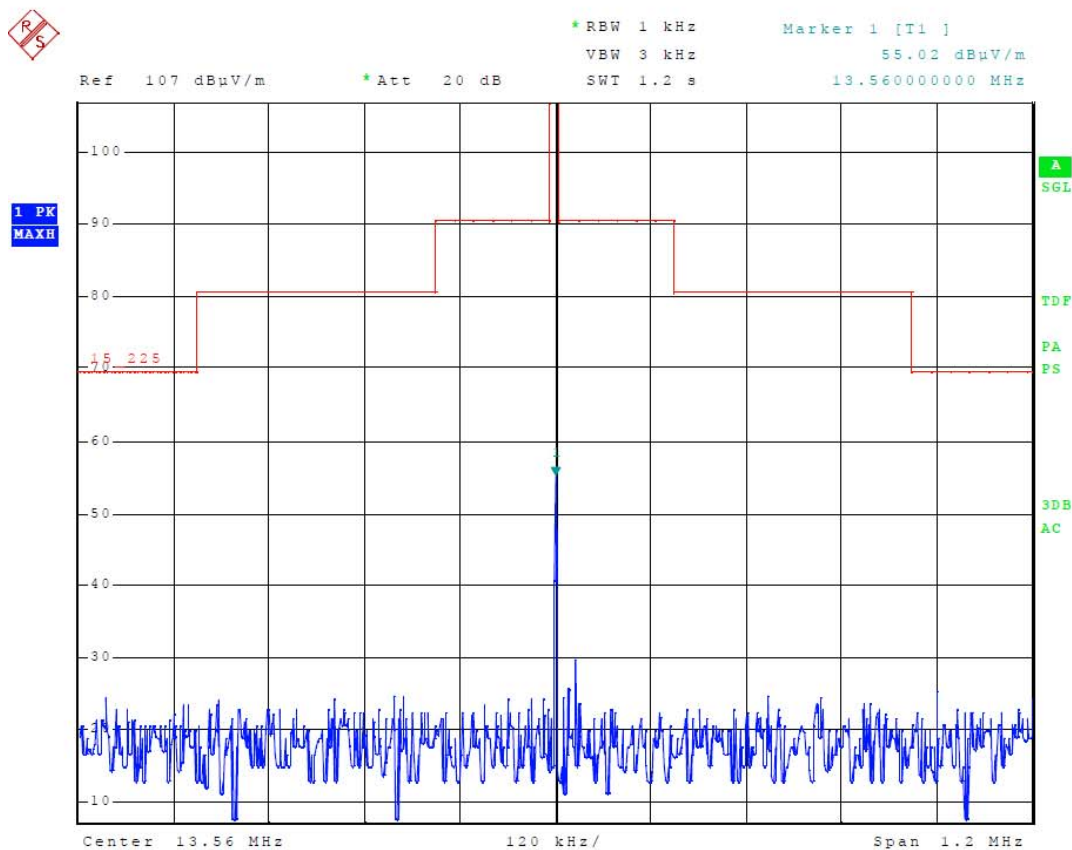
Meas Type SPECTRUM MASK
Equipment under Test ST25R391B-DISCO
Manufacturer STMicroelectronics Austria GmbH
OP Condition WAITING
Operator ANDREJ SKOF

Test Spec

Antenna: 340 deg, Sample: 20 deg

Sweep Settings Screen A

Center Frequency	13.560000 MHz	Ref Level	107.000 dBuV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	1.200000 MHz	Ref Position	100.000 %
Start Frequency	12.960000 MHz	Level Range	100.000 dB
Stop Frequency	14.160000 MHz	RF Att	20.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	1.20 s	Y-Axis	LOG



4.8 Frequency tolerance of the carrier signal (§15.225 (e))

4.8.1 Requirement

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

4.8.2 Test procedure

1. As per clause 6.8 from ANSI C63.10-2013.
2. The frequency tolerance of the carrier signal is measured over a temperature variation of -20 °C to +50 °C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 °C.
3. If the EUT provides an antenna connector the spectrum analyzer is connected to this port. In cases where the EUT does not provide an antenna connector a test fixture is used.
4. The peak detector of the spectrum analyzer is selected and the resolution bandwidth as well as the video bandwidth is set to values appropriate to the shape of the spectrum of the EUT.
5. While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized.



4.8.3 Test results

Device passed the requirements stated

Temperature (°C)	Supply voltage (V DC)	Minutes after switch on	Measured Frequency (MHz)	Allowed tolerance (kHz)	Measured tolerance (kHz)	RESULT
50	5,00	0	13,560116800	Fref±1.356 kHz	-0,059	PASS
50	5,00	2	13,560117800	Fref±1.356 kHz	-0,058	PASS
50	5,00	5	13,560120800	Fref±1.356 kHz	-0,055	PASS
50	5,00	10	13,560121800	Fref±1.356 kHz	-0,054	PASS
40	5,00	0	13,560127800	Fref±1.356 kHz	-0,048	PASS
40	5,00	2	13,560117800	Fref±1.356 kHz	-0,058	PASS
40	5,00	5	13,560117800	Fref±1.356 kHz	-0,058	PASS
40	5,00	10	13,560118800	Fref±1.356 kHz	-0,057	PASS
30	5,00	0	13,560159700	Fref±1.356 kHz	-0,016	PASS
30	5,00	2	13,560134800	Fref±1.356 kHz	-0,041	PASS
30	5,00	5	13,560134800	Fref±1.356 kHz	-0,041	PASS
30	5,00	10	13,560126800	Fref±1.356 kHz	-0,049	PASS
20	4,25	0	13,560188700	Fref±1.356 kHz	0,013	PASS
20	4,25	2	13,560177700	Fref±1.356 kHz	0,002	PASS
20	4,25	5	13,560174700	Fref±1.356 kHz	-0,001	PASS
20	4,25	10	13,560174700	Fref±1.356 kHz	-0,001	PASS
20	5,00	0	13,560194800	Fref±1.356 kHz	0,019	PASS
20	5,00	2	13,560182800	Fref±1.356 kHz	0,007	PASS
20	5,00	5	13,560177800	Fref±1.356 kHz	0,002	PASS
20	5,00	10	13,560175800	Fref	0,000	PASS
20	5,75	0	13,560198700	Fref±1.356 kHz	0,023	PASS
20	5,75	2	13,560180700	Fref±1.356 kHz	0,005	PASS
20	5,75	5	13,560175700	Fref±1.356 kHz	0,000	PASS
20	5,75	10	13,560174700	Fref±1.356 kHz	-0,001	PASS
10	5,00	0	13,560245994	Fref±1.356 kHz	0,070	PASS
10	5,00	2	13,560229167	Fref±1.356 kHz	0,053	PASS
10	5,00	5	13,560223558	Fref±1.356 kHz	0,048	PASS
10	5,00	10	13,560220353	Fref±1.356 kHz	0,045	PASS
0	5,00	0	13,560255609	Fref±1.356 kHz	0,080	PASS
0	5,00	2	13,560250000	Fref±1.356 kHz	0,074	PASS
0	5,00	5	13,560245192	Fref±1.356 kHz	0,069	PASS
0	5,00	10	13,560250000	Fref±1.356 kHz	0,074	PASS
-10	5,00	0	13,560244833	Fref±1.356 kHz	0,069	PASS
-10	5,00	2	13,560253647	Fref±1.356 kHz	0,078	PASS
-10	5,00	5	13,560256051	Fref±1.356 kHz	0,080	PASS
-10	5,00	10	13,560256051	Fref±1.356 kHz	0,080	PASS
-20	5,00	0	13,560215987	Fref±1.356 kHz	0,040	PASS
-20	5,00	2	13,560243231	Fref±1.356 kHz	0,067	PASS
-20	5,00	5	13,560244833	Fref±1.356 kHz	0,069	PASS
-20	5,00	10	13,560244032	Fref±1.356 kHz	0,068	PASS

5 TEST EQUIPMENT

Manufacturer & Description	Model No.	SIQ No.	Last Calibration	Next Calibration	Used
ETS, Anechoic chamber	RFD-F/A-100	103949	2015-11	2017-11	X
Rohde & Schwarz, RFI test receiver	ESU8	105187	2015-11	2017-11	X
Rohde & Schwarz, RFI receiver	ESU26	106897	2016-02	2018-02	/
EMCO, Antenna	3142B	104351	2015-09	2017-09	X
EMCO, Antenna	3115	103002	2015-09	2017-09	/
Rohde & Schwarz, Test Probe Antenna	HFH2-Z4	SN:879743/12	N/A	NA	X
Rohde & Schwarz, Loop Antenna	HFH2-Z2	SN: 879605/15	2015-09	2017-09	X
Heinrich Deisel, Turn table	DS 420.00	103337	N/A	NA	X
ETS, Antenna tower	2175	/	N/A	NA	X
ETS, Controller for turn table and antenna tower	2090	/	N/A	NA	X
Rohde & Schwarz, Artificial main network	ESH 2-Z5	106899	2015-05	2017-05	X
Rohde & Schwarz, Artificial main network	ENV216	106765	2016-09	2018-09	/
Rohde & Schwarz, Current probe	EZ-17	106862	2016-11	2018-11	/
Schwarzbeck, High voltage probe	TK 9420	106898	2015-05	2017-05	/
Kambič, Temperature chamber	I-190 CK	107298	N/A	NA	X
Iskra, DC power source	MA 4181	IKM 1790	N/A	NA	X
Fluke, Digital Multimeter	179	2839652	2016-11	2018-11	X
Fluke, Digital Multimeter	179	2839648	2016-11	2018-11	X