


Prüfbericht-Nr.: <i>Test report no.:</i>	ULR- TC568820300000036F	Auftrags-Nr.: <i>Order no.:</i>	166238819 180	Seite 1 von 35 Page 1 of 35
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	NA	Auftragsdatum: <i>Order date:</i>	25-02-2020	
Auftraggeber: <i>Client:</i>	MATICA Technologies AG, Theresienhoehe 30, Munich, Germany, Postal index Number-80339			
Prüfgegenstand: <i>Test item:</i>	Direct to card printer			
Bezeichnung / Serien -Nr.: <i>Identification / Serial no.:</i>	MC310			
Auftrags-Inhalt: <i>Order content:</i>	Testing and Issue of FCC & ISSED Grant			
Prüfgrundlage: <i>Test specification:</i>	FCC Part15 subpartc -15.225 RSS 210 Issue 10 & RSS Gen Issue 5			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2020-07-30			
Prüfmuster-Nr.: <i>Test sample no.:</i>	A002879175-001 A002879175-002			
Prüfzeitraum: <i>Testing period:</i>	2020-07-30 - 2020-08-24			
Ort der Prüfung: <i>Place of testing:</i>	Wireless laboratory, Bangalore			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (India) Pvt. Ltd. 27/B, 2nd Cross, Electronic City, Phase 1 Bangalore – 560 100, Karnataka			
Prüfergebnis*: <i>Test result*:</i>	Pass			
Datum: <i>Date:</i>	2020-08-18	Ausstellatum: <i>Issue date:</i>	2020-12-07	
Stellung / Position:	Srinivasa B R Engineer	Stellung / Position:	Mahammadgouse Kaladagi Assistant Manager	
Sonstiges / Other:	FCC ID: 2AT78-MC310 IC ID: 25413-MC310			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient N/T = not tested
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i></p>				

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Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000036F

Seite 2 von 35

Page 2 of 35

TEST SUMMARY

Test Item	FCC Clause	ISED Clause	Test results	Remarks
Occupied Channel bandwidth	FCC 215 Section C	RSS Gen Issue 5 Section 6.5	Pass	-
Frequency tolerance	FCC part 15 Subpart C Section 15.225 (e)	RSS 210 Issue 10 Annex B.6	Pass	-
Field Strength Measurement within the band 13.110-14.010 MHz	FCC part 15 Subpart C Section 15.225 (a,b,c,d) / (15.209)	RSS 210 Issue 10 Annex B.6	Pass	-
Radiated spurious emissions	FCC 15.209/15.205	RSS-Gen Issue 5, Section 8.9 / 8.10	Pass	-
Conducted Emissions on a.c Power Lines	FCC 15.207	RSS-Gen Issue 5, Section 8.8	Pass	-
Antenna requirement	FCC 15.203	NA	Pass	-

Discipline: Electronics Testing
Group: EMC Test Facility

Prüfbericht - Nr.:

ULR-TC568820300000036F

Seite 3 von 35

Test Report No.:

Page 3 of 35

REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
ULR-TC568820300000036F	01	Initial version	22-09-2020
ULR-TC568820300000036F	02	Updated as per Reviewer comments	22-09-2020
ULR-TC568820300000036F	03	Updated as per Reviewer comments	17-11-2020
ULR-TC568820300000036F	04	Updated as per Reviewer comments	01-12-2020
ULR-TC568820300000036F	05	Updated as per Reviewer comments	07-12-2020

Table of Contents

1	GENERAL REMARKS	5
1.1	Complimentary Materials	5
2	TEST SITES	6
2.1	Testing Facilities.....	6
2.2	List of Test and Measurement Instruments.....	6
3	GENERAL PRODUCT INFORMATION.....	7
3.1	Product Function and Intended Use.....	7
3.2	Ratings and System Details of Equipment Under Test.....	7
3.3	Measurement Uncertainty:	8
3.4	TUV Test sample identification details.	8
4	TEST SET-UP AND OPERATION MODE	9
4.1	Principle of Configuration Selection	9
4.2	Operation and Software of the EUT	9
4.3	Test modes – data rates and modulations	9
4.4	Special Accessories and Auxiliary Equipment	9
4.5	Countermeasures to achieve EMC Compliance	9
5	Operational Description	10
6	Block Diagram.....	11
7	TEST METHODOLOGY	12
7.1	Conducted Spurious Emission Test on AC Power Line.....	12
7.1.1	Test Setup Configuration	12
7.2	Radiated Emission Test	13
7.2.1	Test Setup Configuration	13
8	TEST RESULTS	15
8.1	Occupied channel bandwidth & 20 dB bandwidth.....	15
8.2	Frequency tolerance	17
8.3	Field Strength Measurement within the band 13.110-14.010 MHz.....	24
8.4	Spurious Radiated Emissions	27
8.5	Conducted Spurious Emission Test on AC Power Line.....	32
9	LIST OF TABLES.....	35
10	LIST OF FIGURES.....	35

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000036F

Seite 5 von 35

Page 5 of 35

1 GENERAL REMARKS

1.1 Complimentary Materials

All attachments are integral part of this test report. This applies especially to the following items.

1. TEST SETUP PHOTOS
- 2: EUT EXTERNAL PHOTOS
- 3: EUT INTERNAL PHOTOS
- 4: FCC LABEL AND LABEL LOCATION
- 5: BLOCK DIAGRAM
- 6: SPECIFICATION OF EUT
- 7: SCHEMATIC DIAGRAM
- 8: BILL OF MATERIAL
- 9: USER MANUAL
- 10: MAXIMUM PERMISSIBLE EXPOSURE

2 TEST SITES

2.1 Testing Facilities

TUV Rheinland (India) Private Limited
27/B, 2nd Cross Road,
Electronic City Phase 1,
Bangalore – 560 100.
India

TUV Rheinland (India) Private Limited
108 , Beside ISBR Business School,
Electronic city Phase I,
Bangalore - 560 100.

2.2 List of Test and Measurement Instruments

Table 1: List of test and measurement instruments

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Test Items Used
EMI Receiver	Rohde & Schwarz	ESW 44	1827231	4.43 SP3	10/12/2020	Yearly	Radiated Spurious Emission
Active loop antenna	Frankonia	FMZ	LAX-10-800	-	15/07/2020	Yearly	
Biconical Antenna	Schwarzbeck	BBA 9106+VHB B 9124	9124-01117	-	12/12/2020	Yearly	
Log - Periodical Antenna	Schwarzbeck	VUSLP 9111B	9111B-324	-	12/12/2020	Yearly	
10m Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Spectrum Analyser	Agilent	E4407B	US4119 2772		10/08/2021	Yearly	Antenna Port-Measurments
Signal Analyser	Rohde & Schwarz	FSV7	101644	-	27/12/2020	Yearly	
Environmental Chamber	Envisys	EM80-40H	ET/022/14-15	-	26/07/2021	Yearly	
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100811	-	04/08/2021	Yearly	Conducted AC Power line Test
LISN	Rohde & Schwarz	ENV216	100022	-	04/09/2021	Yearly	
ESW44	Rohde & Schwarz	ESW44	101732	-	10/12/2020	Yearly	

Table 2: Instrument application Software versions

Sl. No	Test Type	Application software	Version
1	Radiated spurious emission measurement- 10 meter Semi Anechoic Chamber	EMC 32	10.60.00

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

The MC310 is a thermal transfer technology direct-to-card printer for high quality card delivery. Designed for rigorous use, MC310 is extremely robust and provides high security card issuance. It is ideal for card issuance in medium and large quantities. MC310 has different versions based on market needs with model names MC310s, MC315, MC320, MC325, MC330, MC335, MC340, MC345, MC350, MC355, MC360, MC365, MC370, MC375, MC380, MC385, MC390, MC395 S3110 & K310.

Its main features are:

- Printing module using color dye sublimation and resin monochrome retransfer 300 dpi print head (11.8 dots/mm) & prints on PVC, PVC Composite, PET, ABS, PET and re-printable cards.
- A flip-over module which allows dual-sided printing
- Magnetic stripe encoder ISO 7811 which enables ISO 1, 2 and 3 magnetic encoding
- Dual contact and contactless smart card encoder
- Automatic ribbon recognition by means of 13.56 MHz RFID unit
- Connectivity interface via an USB and Ethernet

3.2 Ratings and System Details of Equipment Under Test

Table 3: Ratings and System Details as declared by the client*

Radio Protocol		RFID
Operating Frequency Range		13.553 to 13.567
No. of Channels		Single
Supporting Data Rates		424 Kbit/s (supports up to 848 Kbit/s)
Maximum Measured field strength (Radiated)		69.120 dBμV/m
Modulation		ASK
Emission designator		320HA1D
Number of antennas		Two
Antenna Gain		NA
Antenna Type		Integrated PCB trace loop antenna
Supply Voltage to Product		24VDC (from 110 to 120 VAC, 60Hz Power Adapter)
Environmental conditions	Storage	Min/max storage temperature: -5°C to +70 °C (23°F to 158°F)
	Operating	Min/max operating temperature: 15° to 30 °C (59°F to 86°F)
EUT Dimension (H x W x L) mm		253 x 200 x 395

***Disclaimer:**

The information/data is supplied by the client and the same is considered to arrive at the final value. Any changes made apart from the specified specification, can directly impact on the tests results. Refer the products user manual for more details.

3.3 Measurement Uncertainty:

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$

Table 4: Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 1.5 \text{ dB}$
Power Spectral Density, conducted	$\pm 3 \text{ dB}$
Unwanted Emissions, conducted	$\pm 3 \text{ dB}$
All emissions, radiated	$\pm 6 \text{ dB}$
Temperature	$\pm 3 \text{ }^{\circ}\text{C}$
Supply Voltages	$\pm 3 \%$
Time	$\pm 5 \%$

Note: The Listed Measurement Uncertainties are the worst-case uncertainty, for the respective test cases. Above Table is for reporting purpose only and not used in determining Final Pass/Fail verdict.

3.4 TUV Test sample identification details.

Sample ID	Test sample type
A0028797175-002	Conducted test sample
A002879175-001	Radiated test sample

4 TEST SET-UP AND OPERATION MODE

4.1 Principle of Configuration Selection

Transmission was enabled with highest possible duty cycle on 13.56 MHz channel.

4.2 Operation and Software of the EUT

MC310 direct to card printer has following product variants

Product Marketing name(PMN) :

MC310,MC315,MC320,MC325,MC330,MC335,MC340,MC345,MC350,MC355,MC360,MC365,MC370,MC375,MC380,MC385,MC390,MC395,MC310s, S3110, K310

Hardware Version (HVIN): MC310

Software name: Printer Native driver MC310 and RD-Dcp2 test software

Software Version (FVIN): NA

Test Firmware name: MC310

Note: All test cases was performed on the MC310 model and other variants MC310s, S3110 & K310 are identical, hence worst case testing was performed on highest configuration i.e. MC310

4.3 Test modes – data rates and modulations

EUT has two RFID transmitters(Matica RFID & HID RFID transmitter), following table mention the test mode details used for EUT testing.

Test mode	Test cases	Port of measurement
a	1. Frequency tolerance 2. Occupied channel bandwidth & 20 dB bandwidth	Antenna port of Matica RFID is accessed using u.fl connector and intended emissions are coupled to spectrum analyser using u.fl connector and coaxial cable
b	1. Frequency tolerance 2. Occupied channel bandwidth & 20 dB bandwidth	HID RFID has a permanently attached trace loop antenna, intended emissions from the HID RFID are coupled to spectrum analyser using near field probe.
c	1. Field Strength Measurement within the band 13.110-14.010 MHz 2. Radiated spurious emissions	Measurements were made by simultaneously operating both transmitter from the antenna as required for EUT end application

4.4 Special Accessories and Auxiliary Equipment

- 110 VAC to 24VDC certified adaptor & Test laptop to configure the EUT.

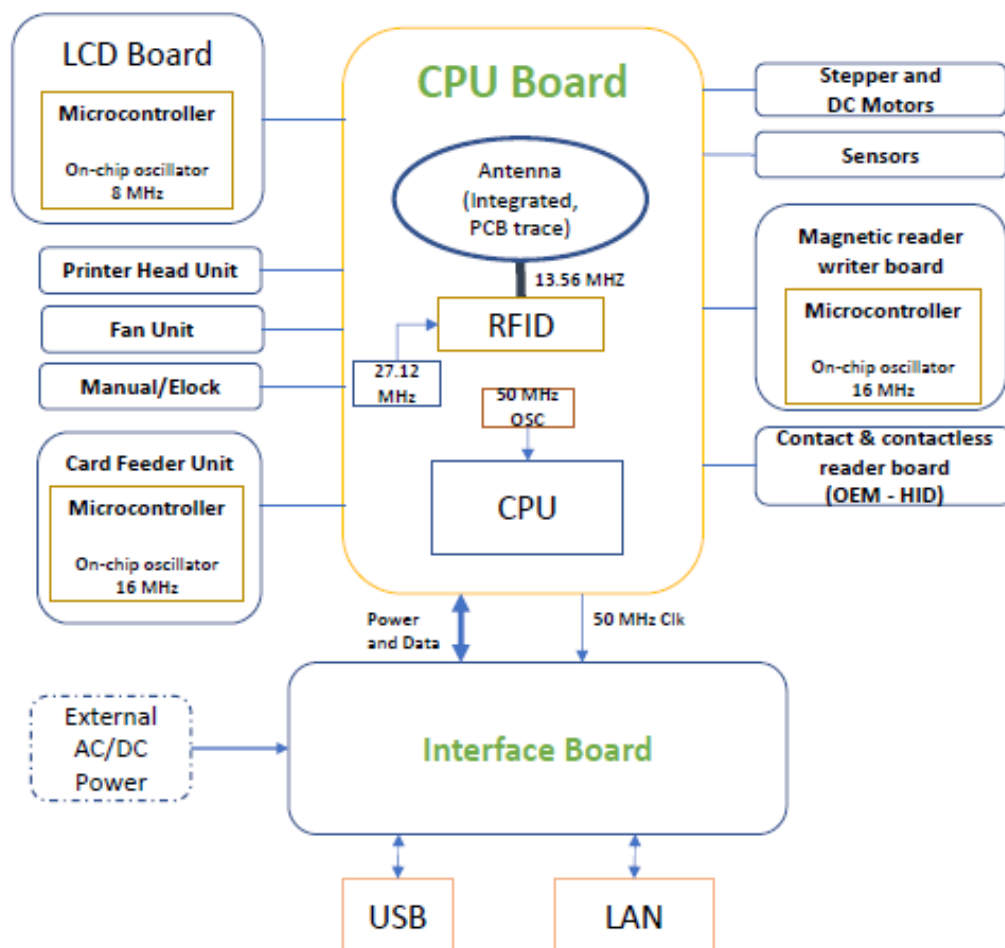
4.5 Countermeasures to achieve EMC Compliance

- None

5 Operational Description

1. Blank cards are placed into the card feeder cartridge.
 2. Printing commands are issued from a PC through USB or LAN port.
 3. The print data will be saved on RAM memory of the printer (up to 5 panel data: Y, M, C, K, Uv).
 4. The card will be taken from feeder (via the flip-over or encoding station)
 5. A new yellow panel of the ink ribbon will be detected and moved to its starting point.
 6. A new panel of film will be detected and moved to the printable location and the thermal head will be positioned to print location.
 7. Yellow data of memory will be printed to the card by heating the yellow panel of film by the thermal Head.
 8. After printing yellow panel, the thermal head will be moved.
 9. Magenta panel will be moved to the starting point.
 10. The printed film will be repositioned to the printable location and the thermal head will be moved down.
 11. Magenta data of RAM memory will be printed to the card using thermal head.
 12. After printing magenta panel, the thermal head will be moved up.
 13. Cyan panel will be adjusted to the starting point.
 14. The film will be repositioned to the printable location and the thermal head will be down.
 15. Cyan data of RAM memory will be printed to the card using thermal head.
 16. After printing cyan panel, the thermal head will be moved up.
 17. Black panel will be moved to the starting point.
 18. The film will be repositioned to the printable location and the thermal head will be moved down.
 19. Black data of RAM memory will be printed to the card using thermal head.
 20. After printing black panel, the thermal head will be moved up.
 21. The card will be taken from feeder (via the flip-over or encoding station) and then laminated together with the printed retransfer film by means of heating rollers.
 22. At the end the card will be then excited.
- Based on user application:
- 23 For contact & contact less chip encoding the contact or contact less chip cards are moved to contact & contact less chip encoder, integrated in the printer & encoding is done by sending information from PC through USB port.
 24. For magnetic stripe encoding, magnetic stripe encoding cards are moved to the magnetic strip encoding station & encoding is done.

6 Block Diagram



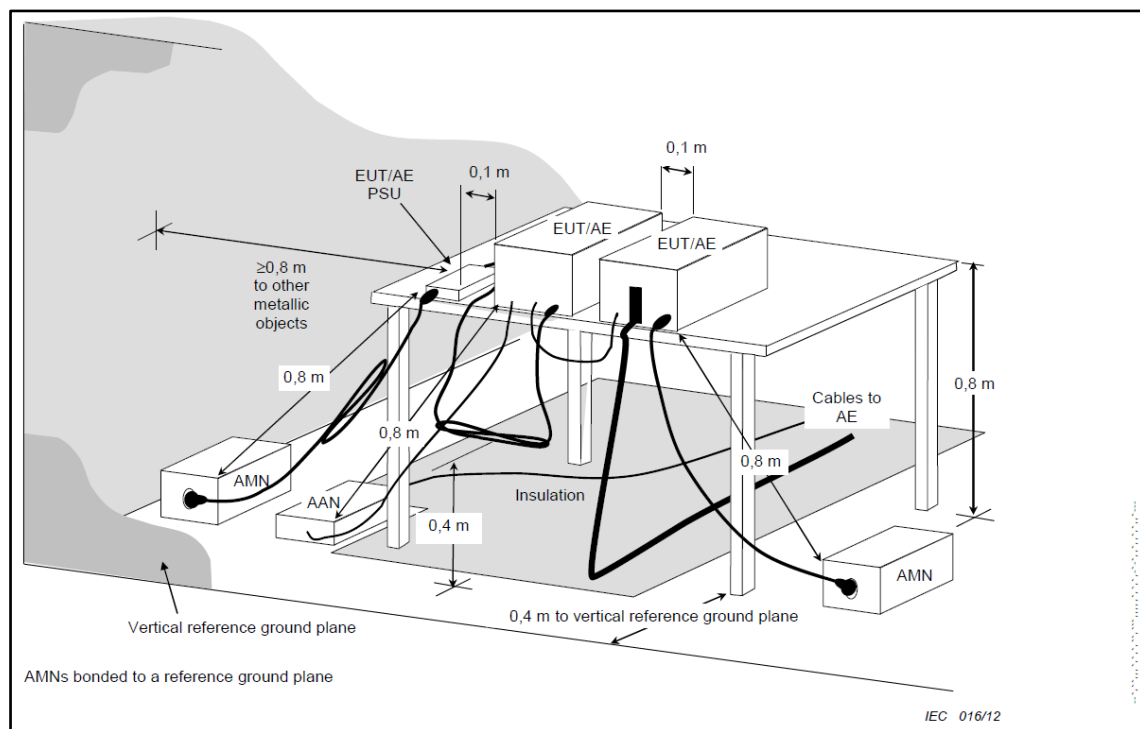
7 TEST METHODOLOGY

7.1 Conducted Spurious Emission Test on AC Power Line

Measured levels of ac power-line conducted emission across the 50Ω LISN port (to which the EUT is connected). All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer.

The device is placed on the test table, raised 80cm above the reference ground plane. The vertical conducting plane is located 40cm to the rear of the device. AC Conducted emission measurement is made over frequency range from 150kHz to 30MHz, this measurement was performed with EUT powered by 2 methods and both method are tested individually, one with an AC adaptor with 110V AC 60Hz supply and second with Wireless charger with supply 110V AC 60Hz.

7.1.1 Test Setup Configuration



7.2 Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.10-2013. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable for below 1 GHz & 1.5 m height for above 1 GHz measurement, and the EUT is 3 meters far from the measuring antenna. The turntable was rotated 360° for obtaining the maximum emission. The height of the measuring antennas was scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000 MHz was performed by horn antenna, The measurement below 30 MHz was performed by loop antenna, Measurement from 30 MHz to 200 MHz was performed by Baloon and Biconical Antenna, and measurement from 200 MHz to 1 GHz was performed by Log-Periodic Antenna.

The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded

Note: Measured Emissions (dBμV/m) = Received Emissions(dBμV) + Antenna Factor(dB)+ Cable Loss(dB) – Pre-amplifier Gain(dBi)

7.2.1 Test Setup Configuration

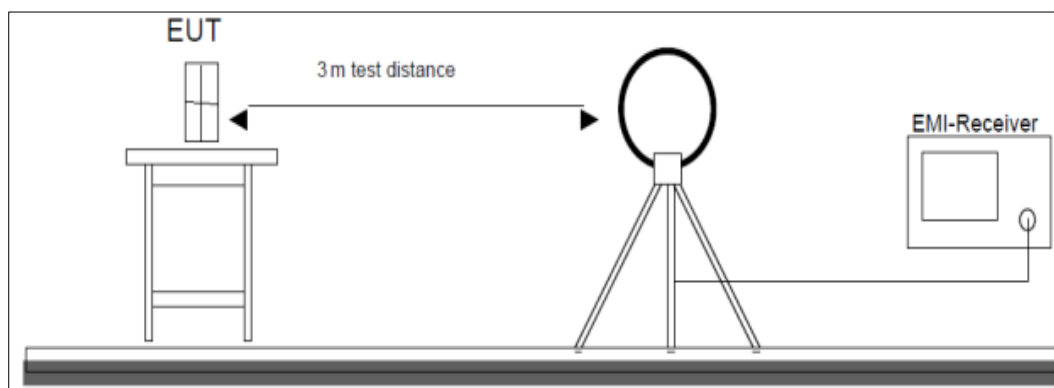


Figure 1: Frequency Range 9 kHz- 30 MHz

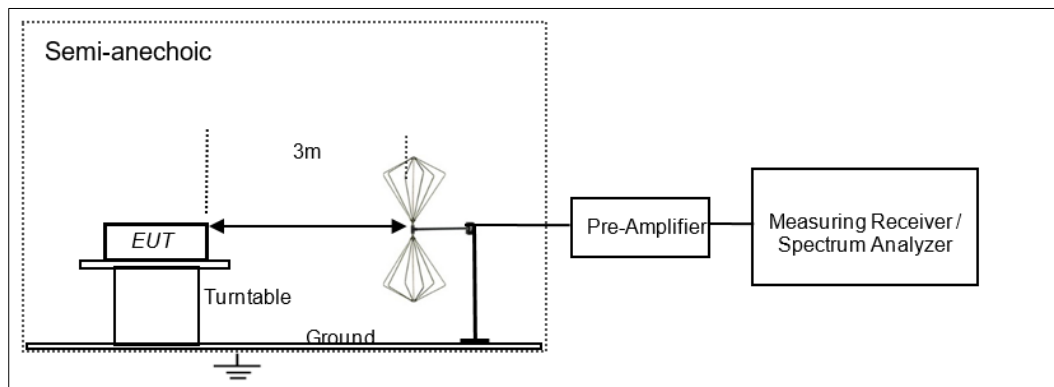


Figure 2: Frequency Range 30 MHz – 200 MHz

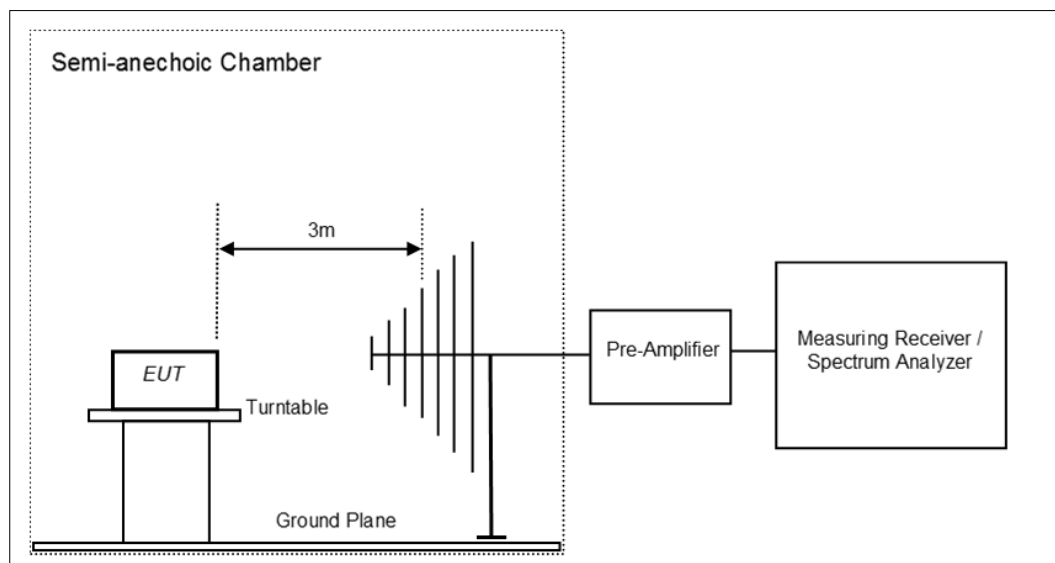


Figure 3: Frequency Range 200 MHz - 1GHz

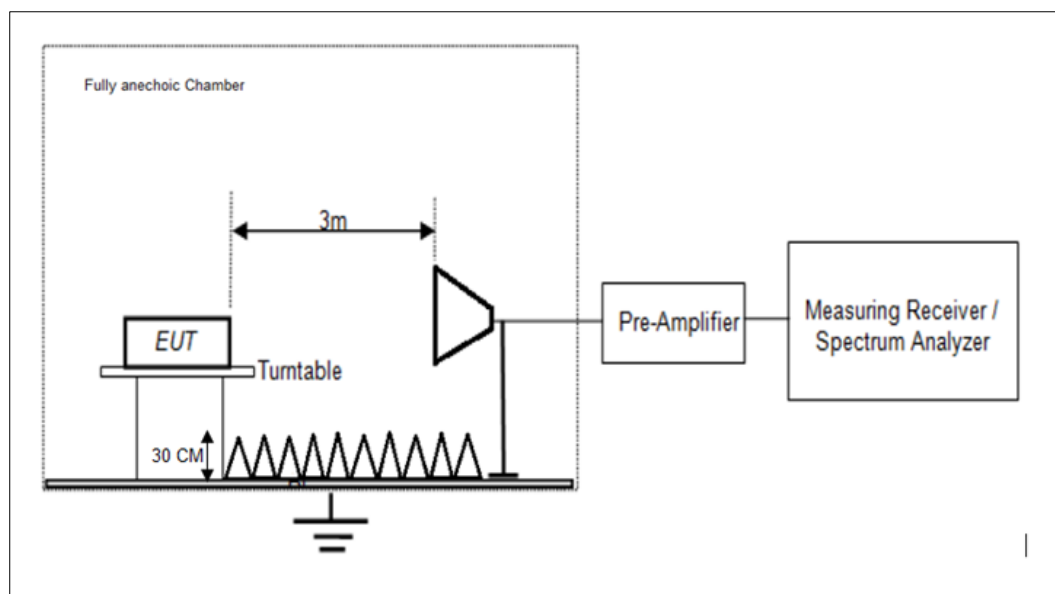


Figure 4: Frequency Range above 1 GHz

Note: Radiated test cases was performed on the MC310 model and other variants MC310s, S3110 & K310 are identical, hence worst case testing was performed on highest configuration i.e. MC310

8 TEST RESULTS

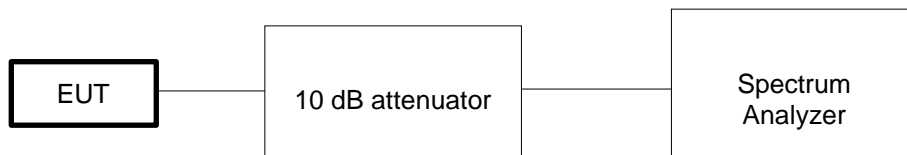
8.1 Occupied channel bandwidth & 20 dB bandwidth

Result

Pass

Test Specification	FCC 15 215 Section c /RSS Gen Issue 5 section 6.7
Test Method	Subclause 6.9.3 of ANSI C63.10
Measurement Bandwidth	200 Hz
Detector	Peak
Requirements	Operation of the EUT must be within the assigned frequency band i.e 13.553MHz to 13.567MHz

Test Setup



Test Condition

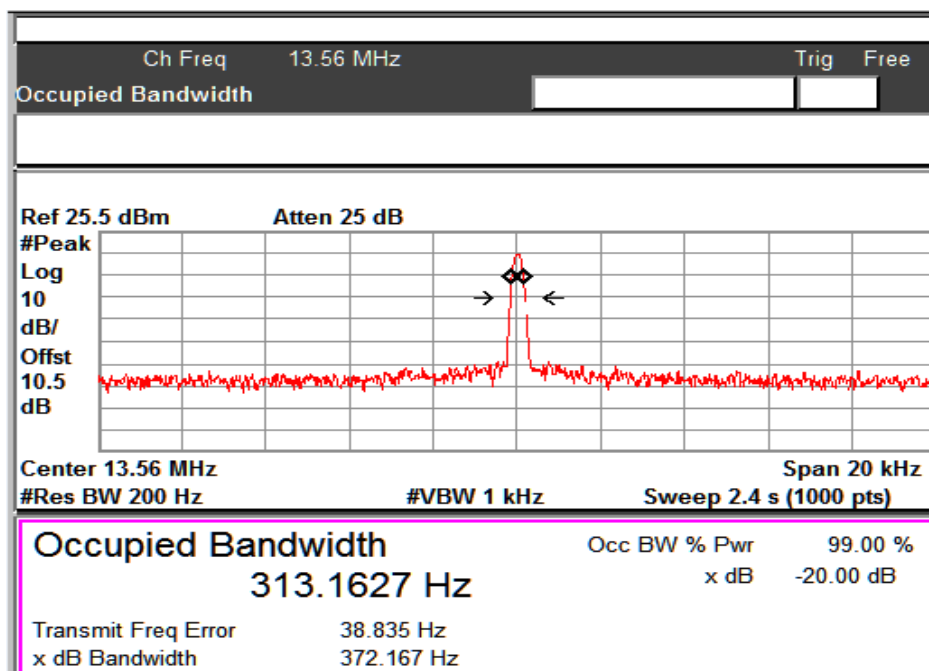
Normal Test Condition:

Temperature (Norm) = + 25 °C Voltage = 120VAC, 60 Hz Through Power adaptor Relative humidity: 62%

Note: This test case was performed on the MC310 model and other variants MC310s, S3110 & K310 are identical, hence worst case testing was performed on highest configuration i.e. MC310

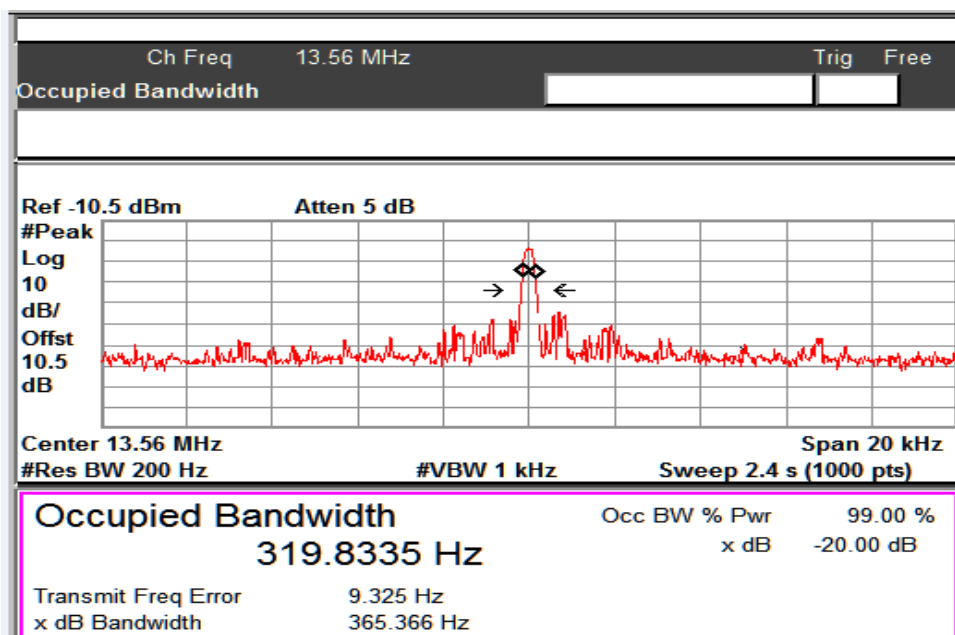
Test plots 1: Occupied & 20 dB bandwidth measurement plots

Test Mode a: EUT is configured to **Test Mode a** as defined in the clause 4.3 Test modes – data rates and modulations



Remark: Use of 1 to 5 % RBW is not practical for this modulation, hence RBW of 200 Hz is used

Test Mode b: EUT is configured to **Test Mode b** as defined in the clause 4.3 Test modes – data rates and modulations



Remark: Remark: Use of 1 to 5 % RBW is not practical for this modulation, hence RBW of 200 Hz is used

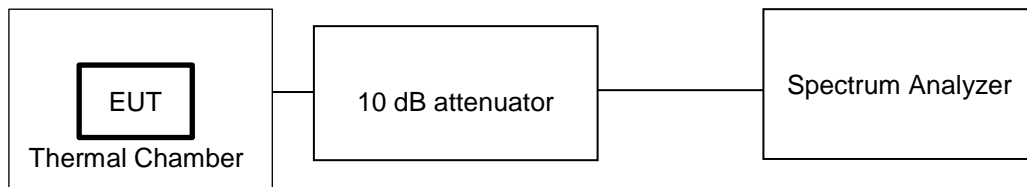
8.2 Frequency tolerance

Result

Pass

Test Specification	FCC part 15 Subpart C 15.225 (e) / RSS 210 Issue Issue 10 Annex B section B.6 (b)
Test Method	Subclause 6.8 of ANSI C63.10
Measurement Bandwidth	30 Hz
Detector	Peak detector
Requirement	The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ as per FCC and as per ISED the carrier frequency stability shall not exceed ± 100 ppm.

Test Setup:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25°C Voltage = 120 VAC, 60 Hz through power adaptor

Relative humidity: 62 %

Extreme Temperature:

Nominal temperature: 15 °C to 30 °C

Extreme temperatures : -20 °C to + 50 °C with temperature variation step of 10°C

Extreme supply voltage:

Lower extreme: 102 VAC

Higher extreme: 138 VAC

Note: This test case was performed on the MC310 model and other variants MC310s, S3110 & K310 are identical, hence worst case testing was performed on highest configuration i.e. MC310

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000036F

Seite 18 von 35

Page 18 of 35

Test results:

Table 5: Frequency tolerance results

Test Mode a: EUT is configured to **Test Mode a** as defined in the clause 4.3 Test modes – data rates and modulations

Channel Frequency	Temp	Voltage	Measured Frequency	Frequency deviation	Frequency deviation limit
(Hz)	(°C)	(Volts)	(MHz)	(Hz)	(Hz)
13.560000	Normal (25°)	Normal (120VAC)	13.559971	29	±1356
13.560000	-20°		13.560058	-58	±1356
13.560000	-10°		13.560029	-29	±1356
13.560000	0°		13.560000	0	±1356
13.560000	10°		13.559971	29	±1356
13.560000	20°		13.559942	58	±1356
13.560000	30°		13.559942	58	±1356
13.560000	40°		13.559942	58	±1356
13.560000	Extreme (50°)		13.559953	47	±1356
13.560000	Normal (25°)	+15%	13.559971	29	±1356
13.560000		-15%	13.559971	29	±1356

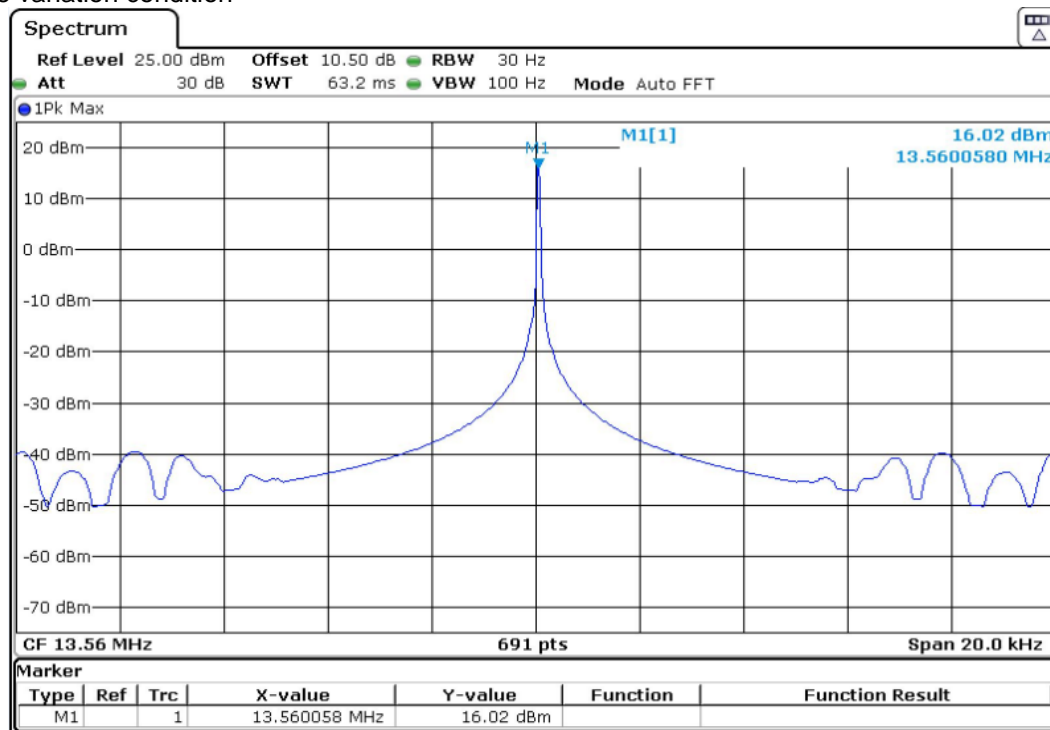
Test Mode b: EUT is configured to **Test Mode b** as defined in the clause 4.3 Test modes – data rates and modulations

Channel Frequency	Temp	Voltage	Measured Frequency	Frequency deviation	Frequency deviation limit
(MHz)	(°C)		(MHz)	(Hz)	(Hz)
13.560000	Normal (25°)	Normal (120 VAC)	13.559942	58	±1356
13.560000	-20°		13.560162	-162	±1356
13.560000	-10°		13.560162	-162	±1356
13.560000	0°		13.560139	-139	±1356
13.560000	10°		13.560093	-93	±1356
13.560000	20°		13.560023	-23	±1356
13.560000	30°		13.559977	23	±1356
13.560000	40°		13.559954	46	±1356
13.560000	Extreme (50°)		13.559954	46	±1356
13.560000	Normal (25°)	+15%	13559942	58	±1356
13.560000		-15%	13559942	58	±1356

Test plots 2: Frequency tolerance measurement plots

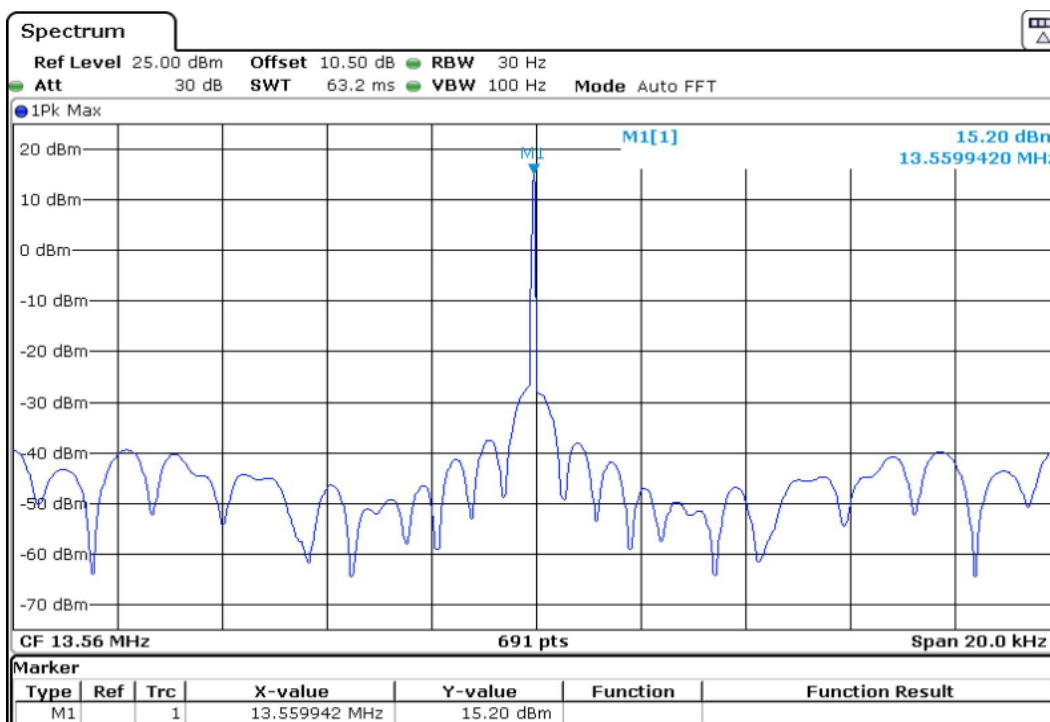
Test Mode a: EUT is configured to **Test Mode a** as defined in the clause 4.3 Test modes – data rates and modulations

Temperature variation condition



Temperature: -20° C

Supply voltage: Nominal



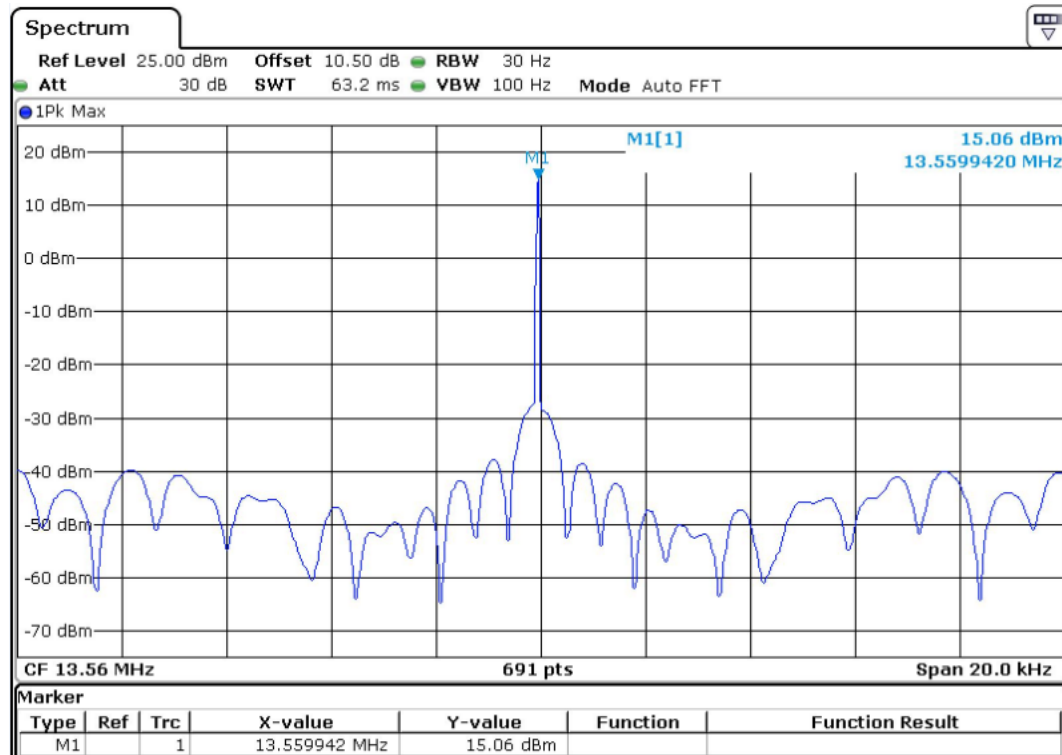
Temperature: +20° C

Supply voltage: Nominal

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000036F

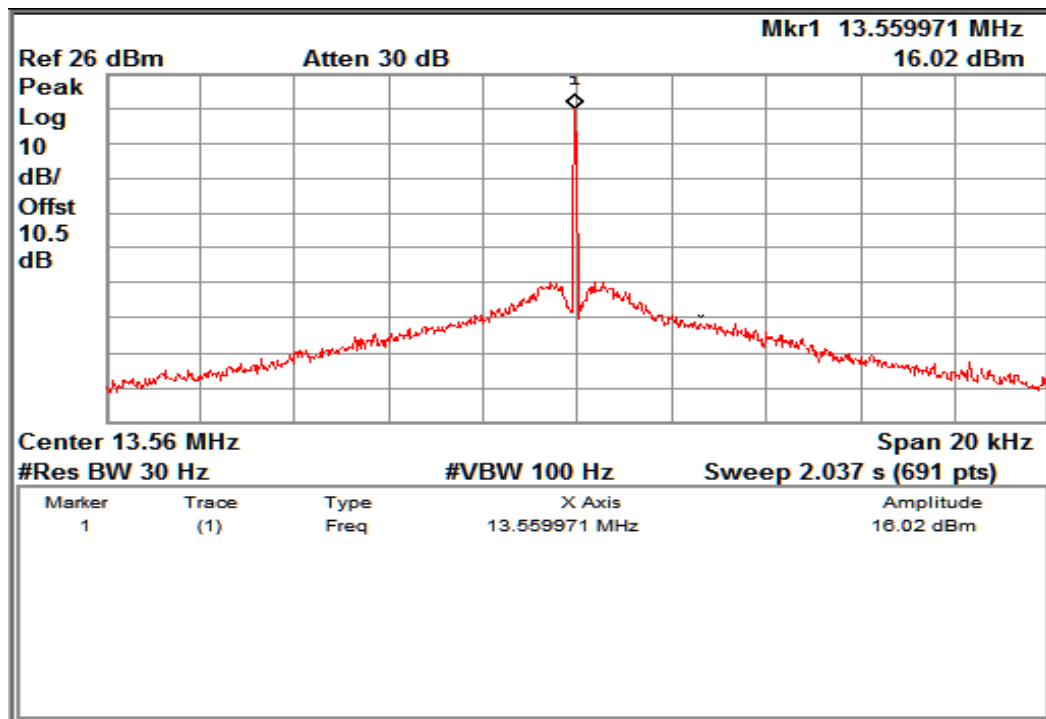
Seite 20 von 35
Page 20 of 35



Temperature: +40° C

Supply voltage: Nominal

Voltage variation condition



Temperature: Nominal

Supply voltage: 102 VAC

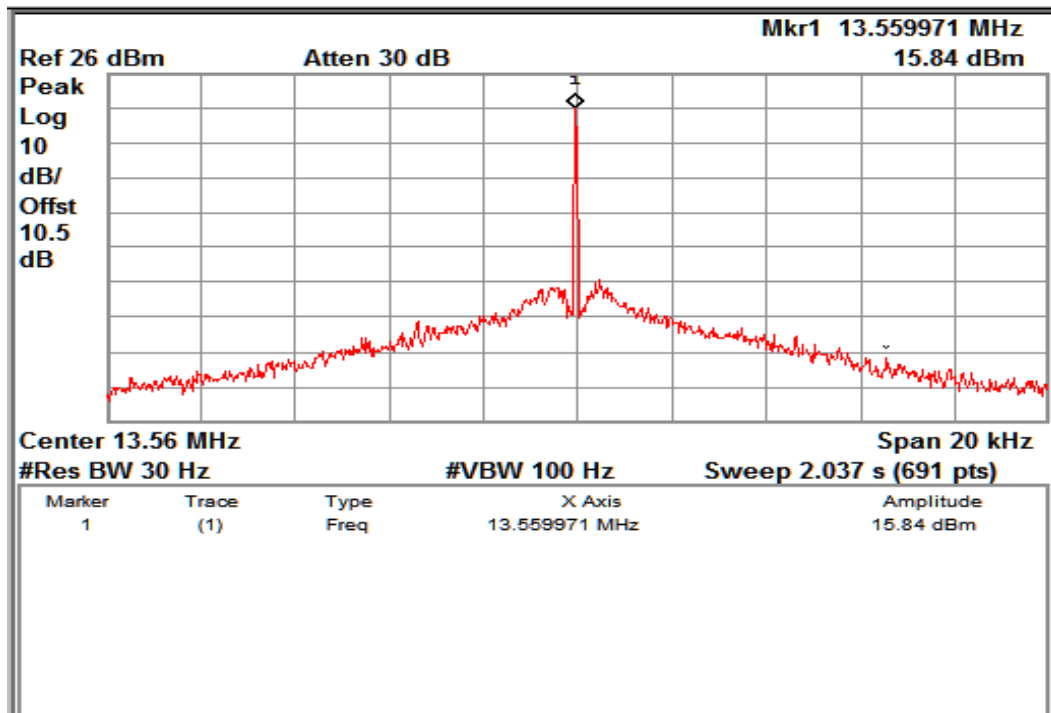
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000036F

Seite 21 von 35

Page 21 of 35

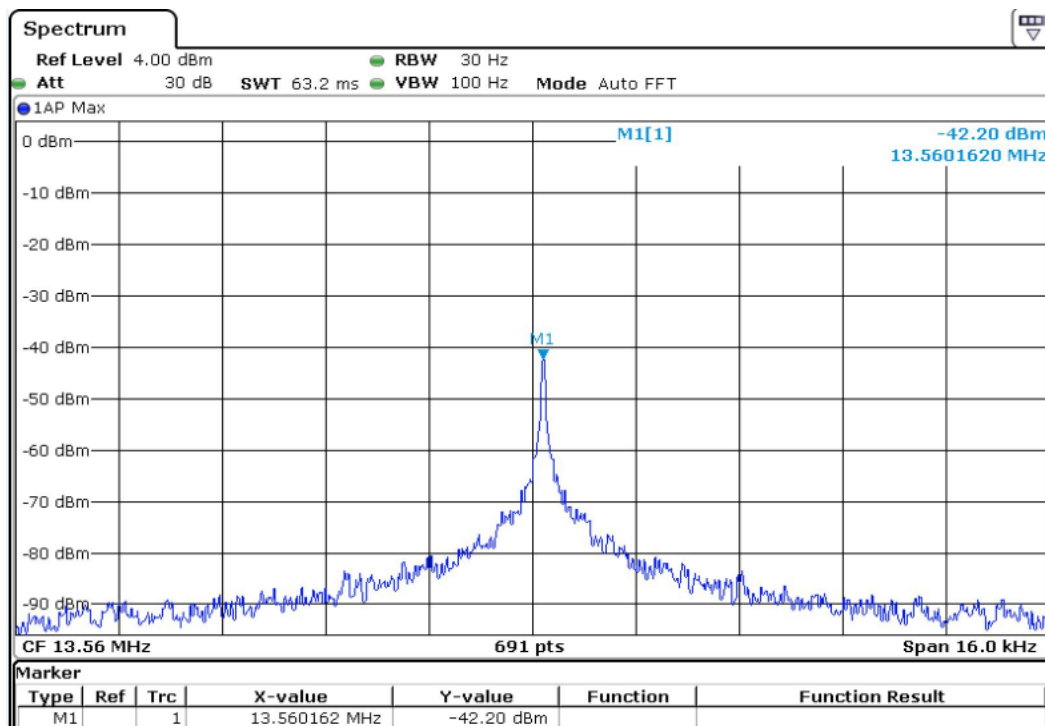


Temperature: Nominal

Supply voltage: 138 VAC

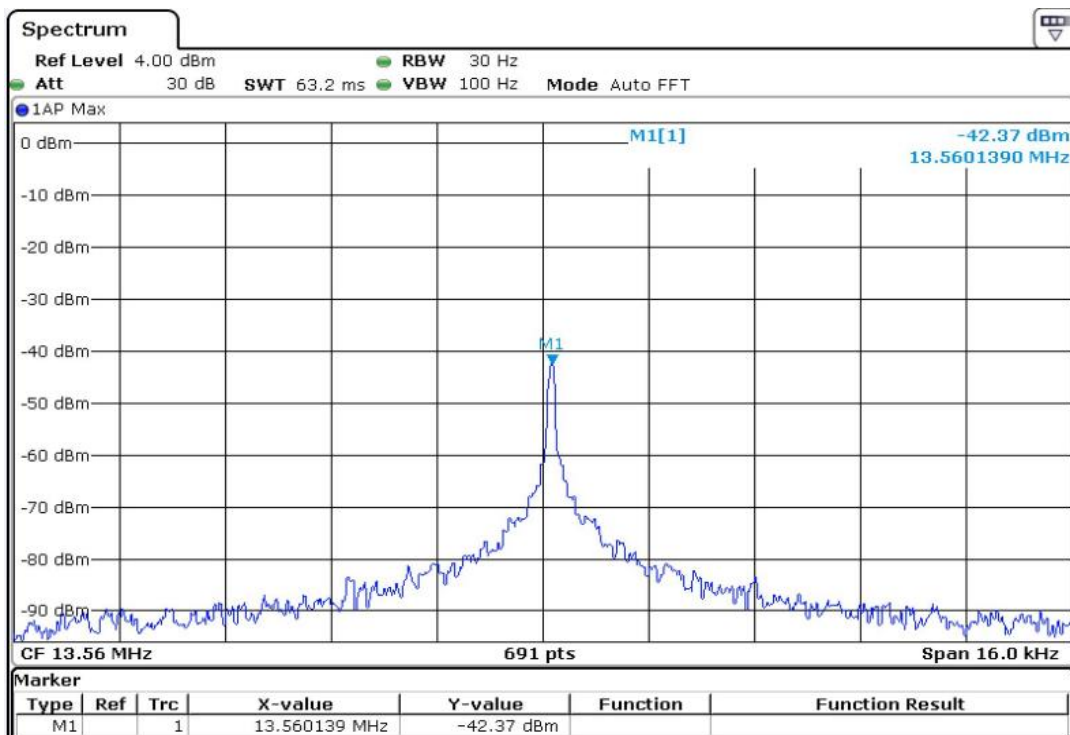
Test Mode b: EUT is configured to **Test Mode b** as defined in the clause 4.3 Test modes – data rates and modulations

Temperature variation condition



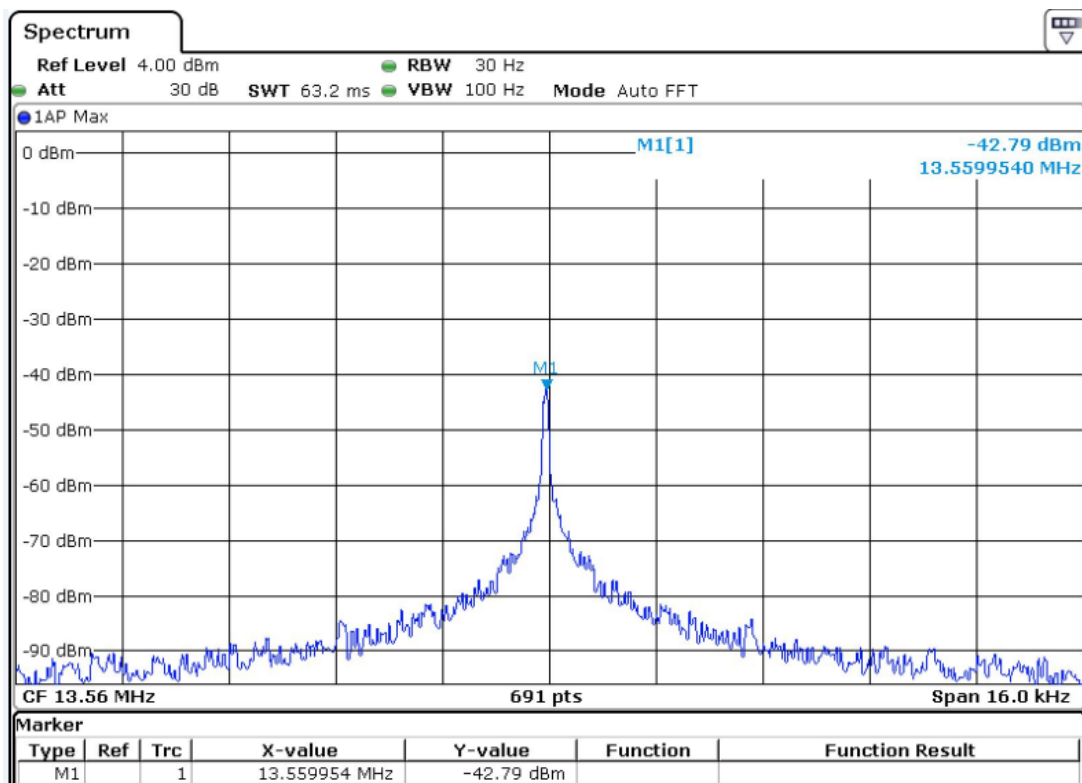
Temperature: -20° C

Supply voltage: Nominal



Temperature: 0° C

Supply voltage: Nominal



Temperature: 50° C

Supply voltage: Nominal

Prüfbericht - Nr.:

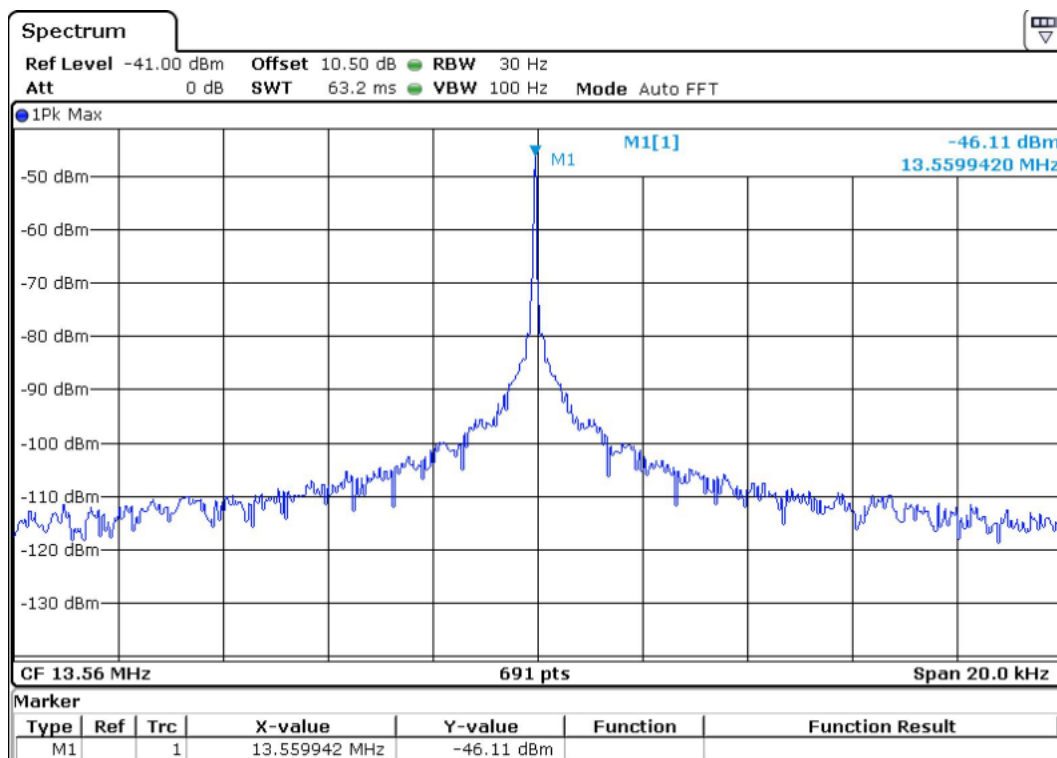
Test Report No.:

ULR-TC568820300000036F

Seite 23 von 35

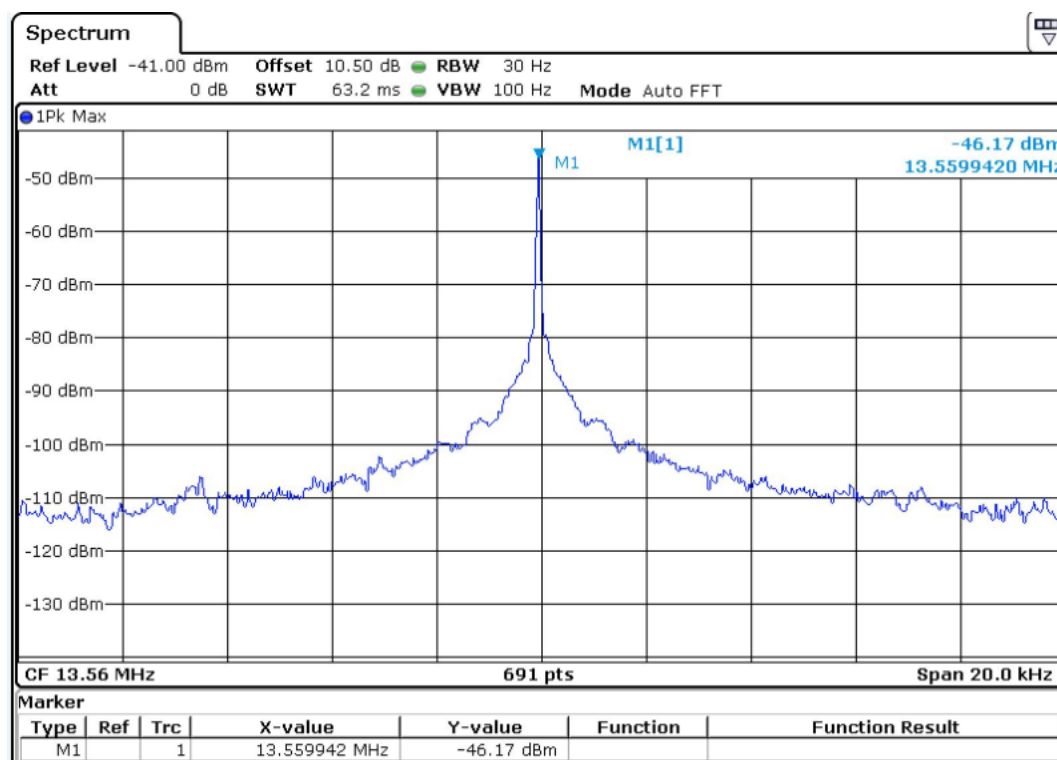
Page 23 of 35

Voltage variation condition:



Temperature: +25 C

Supply voltage: 102 VAC



Temperature: +25 C

Supply voltage: 138 VAC

8.3 Field Strength Measurement within the band 13.110-14.010 MHz

Result

Pass

Test Specification	FCC part 15 Subpart C Section 15.225 (a,b,c,d) / RSS 210 Issue 10 Section B.6
Test Method	ANSI C 63.10 – 2013
Measurement Location	Semi Anechoic Chamber
Measuring Distance	3 m
Detector	Peak detector
Requirement	As mentioned in the below Table 6: Field strength limits in 13.110-14.010 MHz operation
Test setup	Refer Radiated Emission Test

Table 6: Field strength limits in 13.110-14.010 MHz operation

Frequency	Field strength ($\mu\text{V/m}$)	Field strength limit for 30 meter distance	Field strength limit for 3 meter distance
(MHz)		(dB $\mu\text{V/m}$)	(dB $\mu\text{V/m}$)
13.553 -13.567	15848	83.99	123.99
13.410-13.553 and 13.567 -13.710	334	50.47	90.47
13.110 -13.410 and 13.710-14.010	106	40.5	80.5

Note: As per the 15.31 Section f(2) , distance correction factor of 40dB/decade is used to convert Field strength limit from 30 meter to 3 meter measurement antenna distance.

Test Condition

Normal Test Condition:

Temperature (Norm) = + 24.8°C Voltage = 110 VAC, 60 Hz through power adaptor Relative humidity: 61.76 %

Extreme Temperature:

Nominal temperature: 15 °C to 30 °C

Extreme temperatures : -20 °C to + 50 °C with temperature variation step of 10°C

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000036F

Seite 25 von 35

Page 25 of 35

Note: Radiated test cases was performed on the MC310 model and other variants MC310s, S3110 & K310 are identical, hence worst case testing was performed on highest configuration i.e. MC310

Test results:

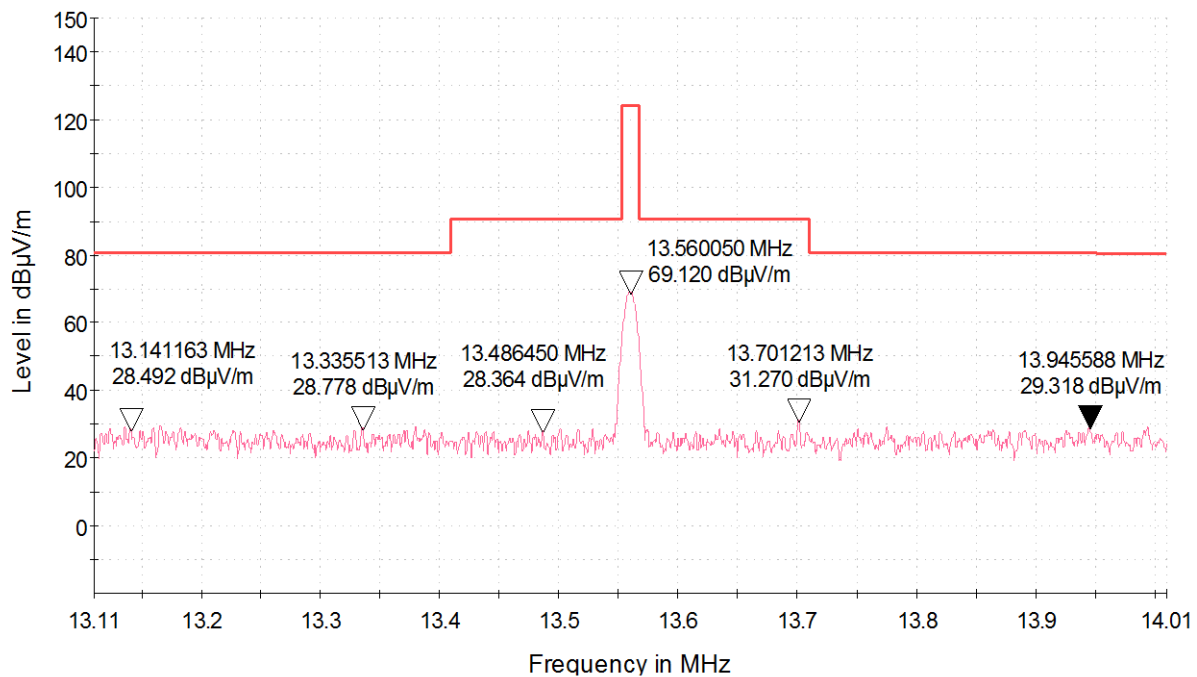
Table 7: Field Strength Measurement within the band 13.110-14.010 MHz

Note: EUT Is Configured to Test modes – data rates and modulations

Antenna Polarization	Frequency range (MHz)	Measured frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Parallel	13.11-13.41	13.34	28.770	80.50	-51.73
	13.41-13.553	13.49	28.360	90.47	-62.11
	13.553-13.567	13.56	69.120	123.99	-54.87
	13.567-13.71	13.70	31.270	90.47	-59.20
	13.71-14.01	13.95	29.310	80.50	-51.19
Perpendicular	13.11-13.41	13.32	29.538	80.50	-50.96
	13.41-13.553	13.48	29.810	90.47	-60.66
	13.553-13.567	13.56	64.350	123.99	-59.64
	13.567-13.71	13.66	29.610	90.47	-60.86
	13.71-14.01	13.92	28.050	80.50	-52.45

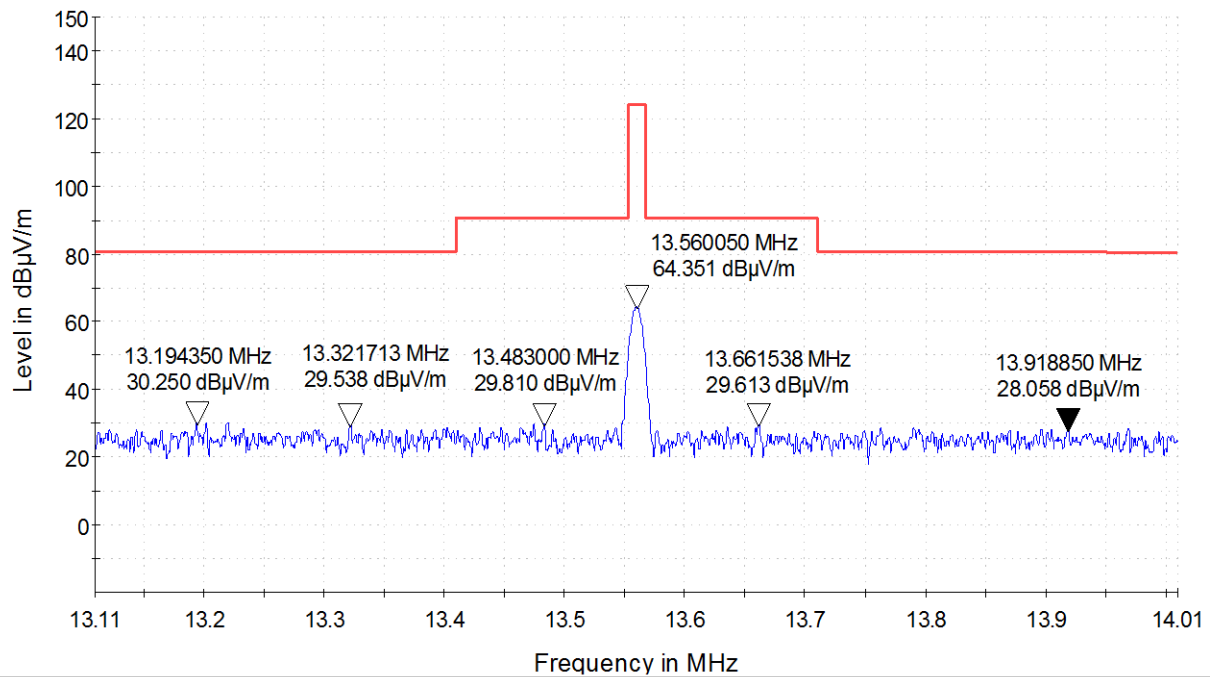
Note: Field strength limits are converted to 3mts measurement distance.

Test plots 3: Spectrum Emission mask in the frequency range 13.110 MHz to 14.010 MHz



Frequency range: 13.11MHz to 14.01 MHz

Antenna polarization: Parallel



Frequency range: 13.11MHz to 14.01 MHz

Antenna polarization: Perpendicular

8.4 Spurious Radiated Emissions

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (d) / (15.209 & 15.205) / IC RSS-GEN, Section 8.9 and 8.10
Test Method	ANSI C63.10
Measurement Location	Semi anechoic chamber
Measurement Bandwidth	100 kHz for frequency range < 1GHz
Detector	Refer remarks below
Measuring Distance	3 m
Requirement	As per the limits mentioned in the below table
Test setup	Refer TEST METHODOLOGY

Table 8: Transmitter limits for Radiated emission

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Distance of Measurement (m)
0.009 – 0.490	2400/F(kHz)	48.50 – 13.80	300*
0.490 – 1.705	24000/F(kHz)	33.80 – 23.00	30*
1.705 -30	30	29.54	30*
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Remark: * The limit shows in the table above of frequency range 0.009 – 0.490, 0.490 – 1.705 MHz and 1.705-30MHz is at 300 meter, 30 meter and 30 meter range respectively, which corresponds to 128.51 – 93.80, 73.80 – 62.96 and 69.54 dBμV/m at 3m range by extrapolation calculation and the measurement of loop antenna.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

Test Conditions:

Normal Test Condition:

Temperature (Norm) = + 24.8°C Voltage = 110 VAC, 60 Hz through power adaptor Relative humidity: 61.76 %

Extreme Temperature:

Nominal temperature: 15 °C to 30 °C

Extreme temperatures : -20 °C to + 50 °C with temperature variation step of 10°C

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000036F

Seite 28 von 35

Page 28 of 35

Note: Radiated test cases was performed on the MC310 model and other variants MC310s, S3110 & K310 are identical, hence worst case testing was performed on highest configuration i.e. MC310

Test results:

Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY for more details

Test results for frequency range 9kHz – 30MHz

No emissions found in frequency range 9 kHz to 30 MHz other than EUT intended power at 13.56MHz, and other measured spurious emission levels are below 20dB from the limit line, hence not reported

Test results for frequency range 30MHz to 200MHz

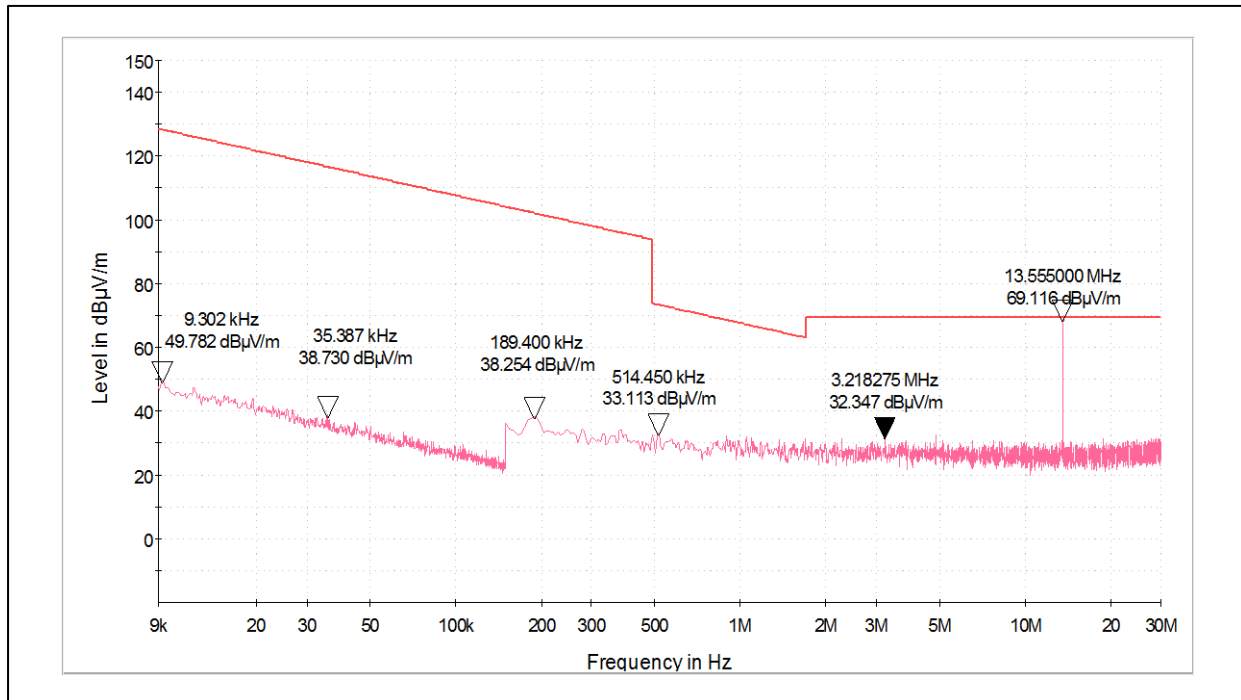
Table 9: Spurious emissions in the frequency range 30MHz to 200MHz

Antenna Polarization	Measured Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Vertical	40.682	33.41	40.00	-6.59
Vertical	47.061	9.54	40.00	-30.46
Vertical	53.662	13.71	40.00	-26.29
Vertical	78.159	39.04	40.00	-0.96
Vertical	78.364	11.24	40.00	-28.76
Vertical	149.161	40.91	43.50	-2.59
Horizontal	77.659	36.12	40.00	-3.88
Horizontal	77.839	4.68	40.00	-35.32
Horizontal	78.143	3.93	40.00	-36.07
Horizontal	78.43	38.60	40.00	-1.40
Horizontal	149.161	40.75	43.50	-2.75
Horizontal	176.281	35.61	43.50	-7.89

Table 10: Spurious emissions in the frequency range 200MHz to 1GHz

Antenna Polarization	Measured Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Vertical	312.268	13.15	46.02	-32.87
Vertical	375.004	22.46	46.02	-23.56
Vertical	500.002	43.98	46.02	-2.04
Vertical	562.497	33.70	46.02	-12.32
Vertical	711.702	25.36	46.02	-20.66
Vertical	937.727	22.45	46.02	-23.57
Horizontal	250.004	43.78	46.02	-2.24
Horizontal	312.184	21.51	46.02	-24.51
Horizontal	374.999	24.46	46.02	-21.56
Horizontal	437.188	18.77	46.02	-27.25
Horizontal	562.491	16.66	46.02	-29.36
Horizontal	937.476	19.40	46.02	-26.62

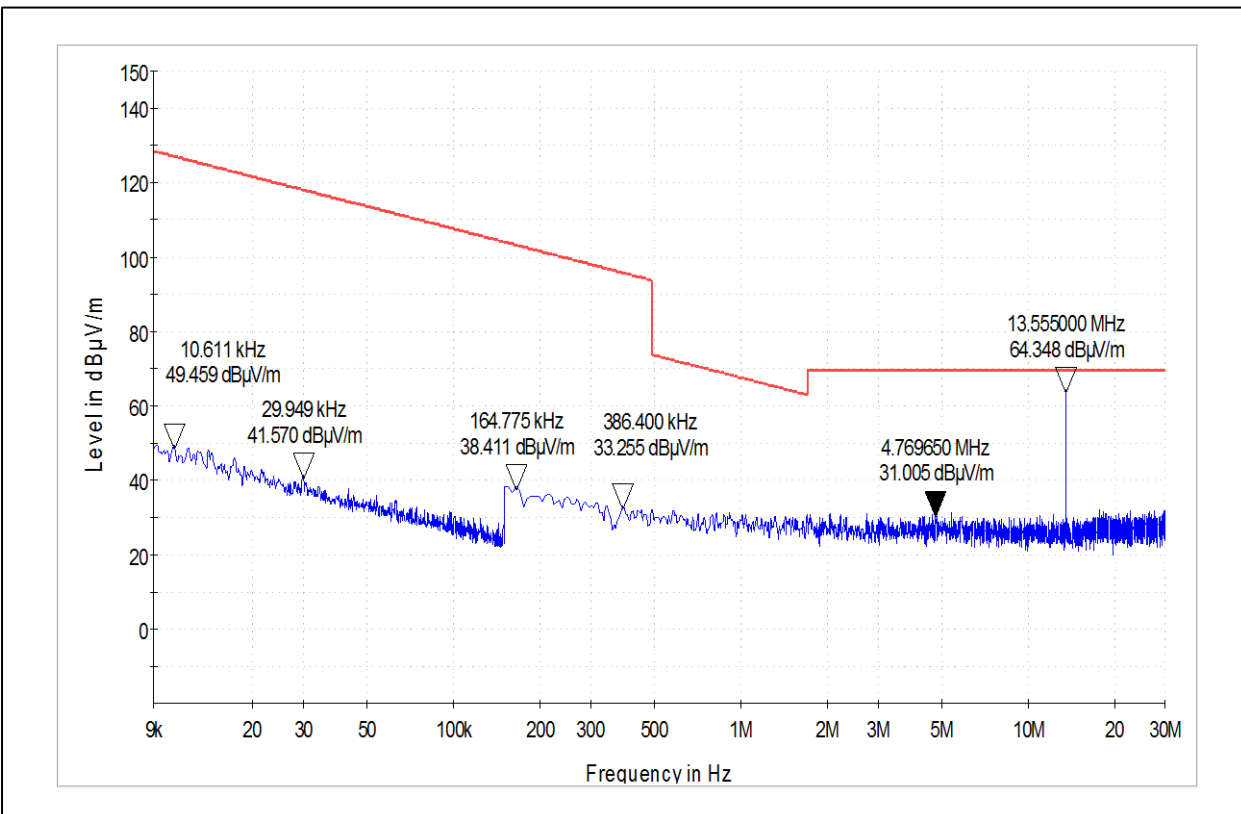
Test plots 4: Worst case spurious emissions in 9KHz to 1GHz measurement range.



Frequency range: 9 KHz to 30MHz

Detector: Peak

Antenna polarization: Parallel



Frequency range: 9 KHz to 30MHz

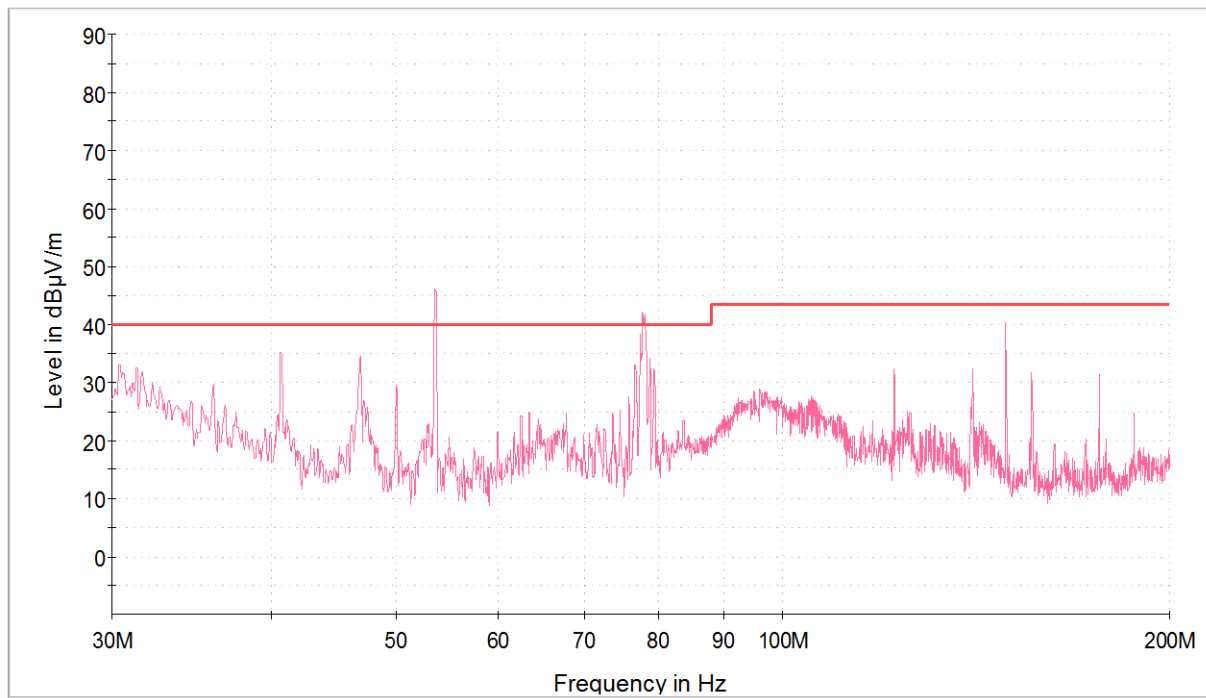
Detector: Peak

Antenna polarization: Perpendicular

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000036F

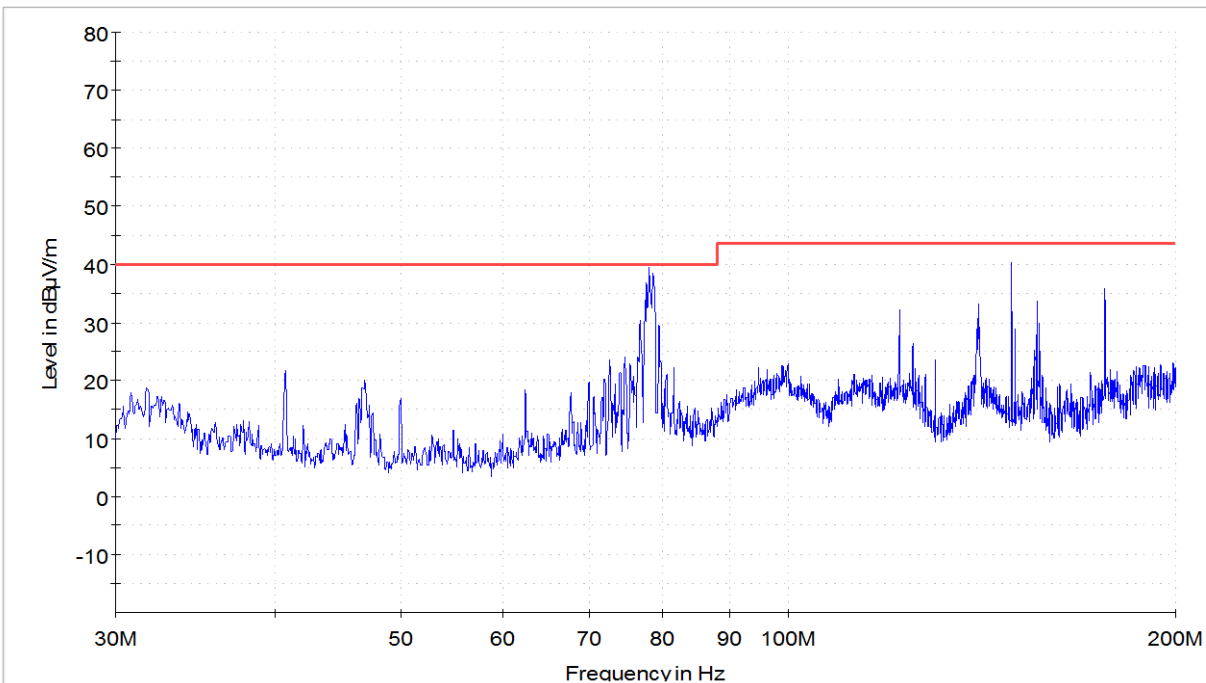
Seite 30 von 35
Page 30 of 35



Frequency range: 30MHz to 200MHz

Detector: Peak

Antenna polarization: Vertical



Frequency range: 30MHz to 200MHz

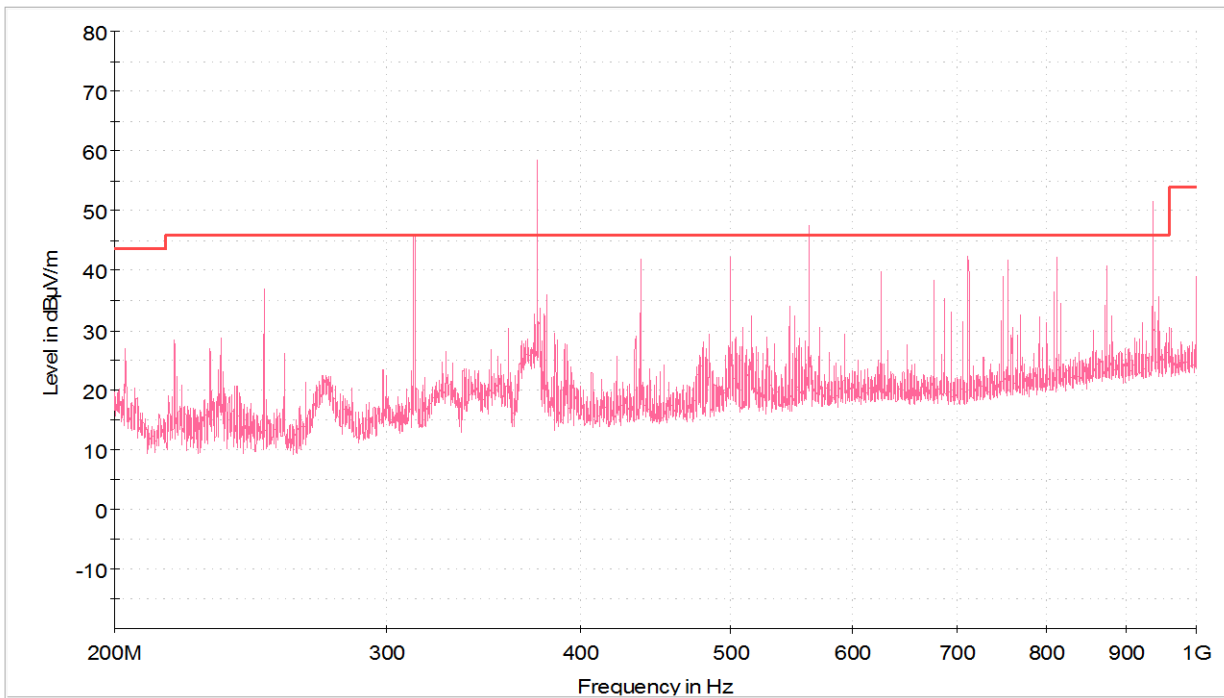
Detector: Peak

Antenna polarization: Horizontal

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000036F

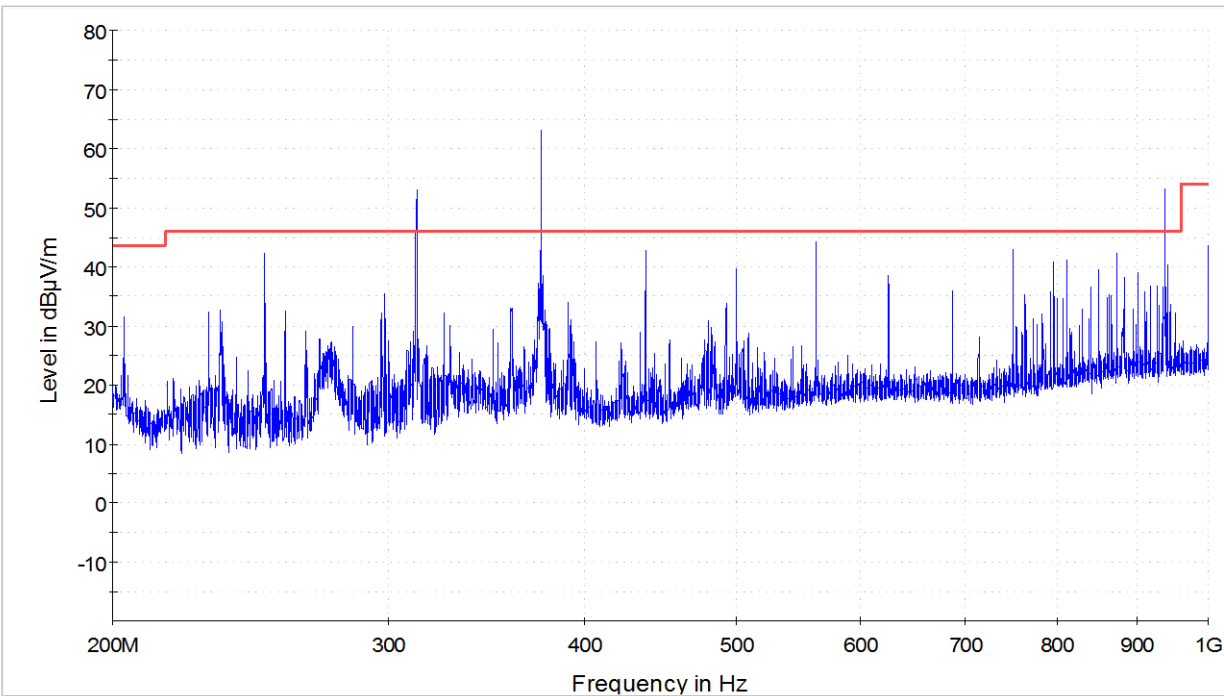
Seite 31 von 35
Page 31 of 35



Frequency range: 200MHz to 1GHz

Detector: Peak

Antenna polarization: Vertical



Frequency range: 200MHz to 1GHz

Detector: Peak

Antenna polarization: Horizontal

8.5 Conducted Spurious Emission Test on AC Power Line

Result

Pass

Test Specification : FCC Part 15 Section 15.207 / RSS Gen Issue 5 Section 8.8
Test Method : ANSI C 63.10-2013
Testing Location : Screened room
Measurement Bandwidth : 9kHz
Frequency Range : 150kHz – 30MHz
Supply Voltage : 110VAC,60Hz
Test Method : Refer TEST METHODOLOGY

Limits of section 15.207

Frequency of emission (MHz)	QP Limit (dBμV)	AV Limit (dBμV/m)
0.15 – 0.5	66 – 56*	56 – 46*
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency

Test Conditions:

Normal Temperature = +24°C Voltage (V norm) = 110V AC, 60Hz supply RH = 64 %

Note: This test case was performed on the MC310 model and other variants MC310s, S3110 & K310 are identical, hence worst case testing was performed on highest configuration i.e. MC310

Prüfbericht - Nr.:

Test Report No.:

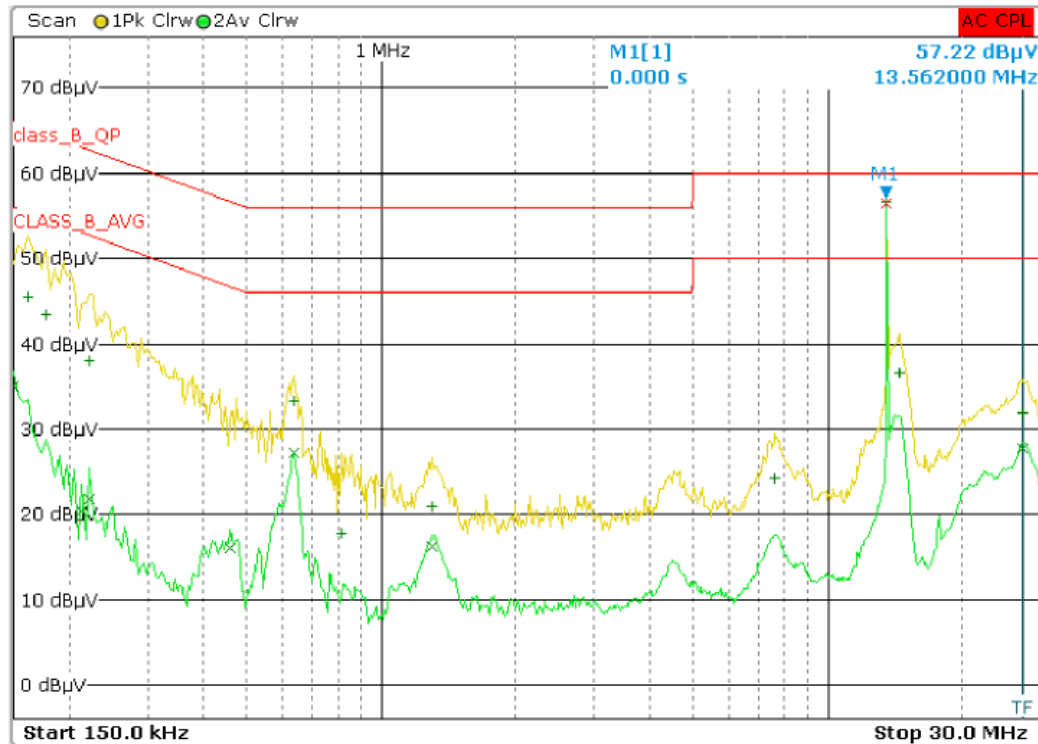
ULR-TC568820300000036F

Seite 33 von 35

Page 33 of 35

Test result:

Power: 110VAC_ 60HZ_LINE



Graph: Line

Trace	Frequency	Level (dBμV)	Phase	Detector	Delta Limit/dB
2	13.562000000 MHz	56.49		Average	6.49
1	13.562000000 MHz	56.57		Quasi Peak	-3.43
2	638.000000000 kHz	27.13		Average	-18.87
1	162.000000000 kHz	45.46		Quasi Peak	-19.90
2	150.000000000 kHz	35.03		Average	-20.97
1	178.000000000 kHz	43.34		Quasi Peak	-21.24
2	27.414000000 MHz	27.64		Average	-22.36
1	638.000000000 kHz	33.25		Quasi Peak	-22.75
1	14.446000000 MHz	36.64		Quasi Peak	-23.36
1	222.000000000 kHz	37.93		Quasi Peak	-24.81
1	27.410000000 MHz	31.87		Quasi Peak	-28.13
2	1.298000000 MHz	16.26		Average	-29.74
2	458.000000000 kHz	16.11		Average	-30.62
2	222.000000000 kHz	21.88		Average	-30.86
2	214.000000000 kHz	20.44		Average	-32.61
1	1.298000000 MHz	20.91		Quasi Peak	-35.09
1	7.634000000 MHz	24.15		Quasi Peak	-35.85
1	814.000000000 kHz	17.79		Quasi Peak	-38.21

Prüfbericht - Nr.:

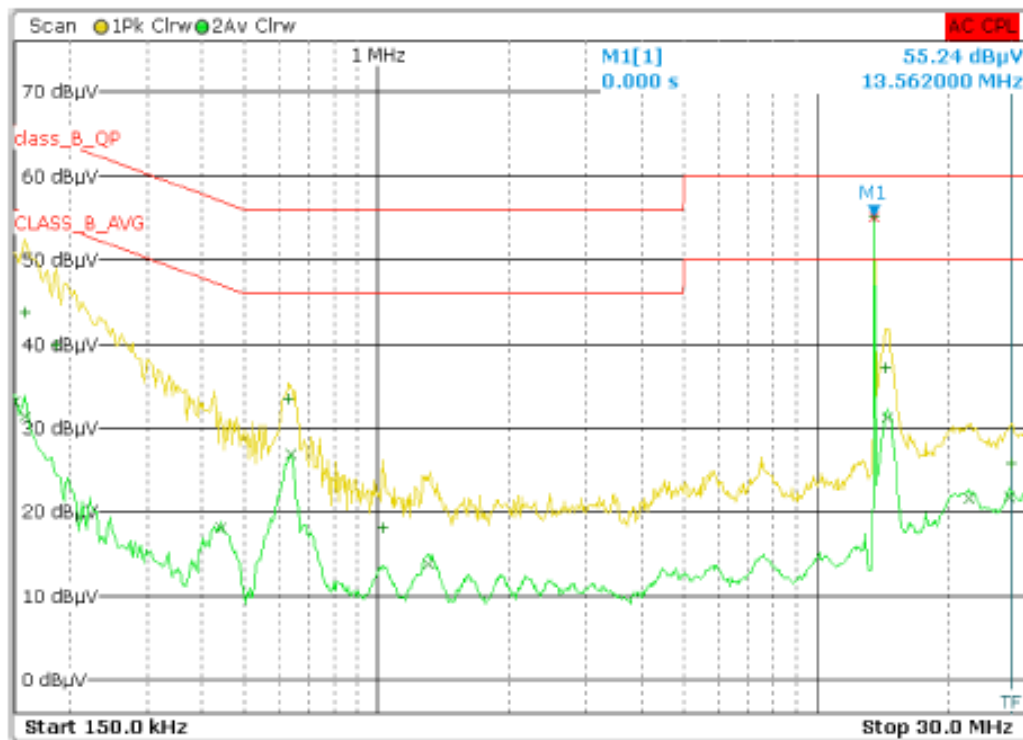
Test Report No.:

ULR-TC568820300000036F

Seite 34 von 35

Page 34 of 35

Power: 110VAC_60HZ_NEUTRAL



Graph: Neutral

Trace	Frequency	Level (dBμV)	Phase	Detector	Delta Limit/dB
2	13.562000000 MHz	55.10		Average	5.10
1	13.562000000 MHz	55.01		Quasi Peak	-4.99
2	14.446000000 MHz	31.29		Average	-18.71
2	638.000000000 kHz	26.85		Average	-19.15
1	158.000000000 kHz	43.67		Quasi Peak	-21.90
1	630.000000000 kHz	33.45		Quasi Peak	-22.55
1	14.438000000 MHz	37.19		Quasi Peak	-22.81
2	150.000000000 kHz	33.12		Average	-22.88
2	158.000000000 kHz	31.38		Average	-24.19
1	186.000000000 kHz	39.85		Quasi Peak	-24.36
2	27.658000000 MHz	21.78		Average	-28.22
2	22.258000000 MHz	21.63		Average	-28.37
2	442.000000000 kHz	18.10		Average	-28.92
2	1.310000000 MHz	13.78		Average	-32.22
1	27.718000000 MHz	25.79		Quasi Peak	-34.21
1	1.030000000 MHz	18.11		Quasi Peak	-37.89

Note: 13.56MHz is a fundamental frequency of the EUT, when antenna terminal is terminated fundamental amplitude is lowering below the limit line.

9 LIST OF TABLES

Table 1: List of test and measurement instruments	6
Table 2: Instrument application Software versions	6
Table 3: Ratings and System Details as declared by the client*	7
Table 4: Measurement Uncertainty	8
Table 5: Frequency tolerance results.....	18
Table 6: Field strength limits in 13.110-14.010 MHz operation	24
Table 7: Field Strength Measurement within the band 13.110-14.010 MHz	25
Table 8: Transmitter limits for Radiated emission	27
Table 9: Spurious emissions in the frequency range 30MHz to 200MHz	28
Table 10: Spurious emissions in the frequency range 200MHz to 1GHz	28

10 LIST OF FIGURES

Figure 1: Frequency Range 9 kHz- 30 MHz	13
Figure 2: Frequency Range 30 MHz – 200 MHz	13
Figure 3: Frequency Range 200 MHz - 1GHz	14
Figure 4: Frequency Range above 1 GHz	14

***** END OF TEST REPORT*****