

Prüfbericht-Nr.: <i>Test report no.:</i>		NN24ZU84 001		Auftrags-Nr.: <i>Order no.:</i>		168460807		Seite 1 von 21 <i>Page 1 of 21</i>	
Kunden-Referenz-Nr.: <i>Client reference no.:</i>		N/A		Auftragsdatum: <i>Order date:</i>		2024-02-01			
Auftraggeber: <i>Client:</i>		Ti-Lane Precision Electronic Co. Ltd No.6 Bldg North, Jiada Indus. Park, Yanluo St. GuangDong, China							
Prüfgegenstand: <i>Test item:</i>		NACS EV Charging Connector							
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>		66X14-XX, 66X15-XX (Trademark: Ti-lane)							
Auftrags-Inhalt: <i>Order content:</i>		Test Report							
Prüfgrundlage: <i>Test specification:</i>		CFR47 FCC Part 15: Subpart C Section 15.231 CFR47 FCC Part 15: Subpart C Section 15.209							
Wareneingangsdatum: <i>Date of sample receipt:</i>		2024-02-01		Please refer to Photo Document					
Prüfmuster-Nr.: <i>Test sample no.:</i>		A003656364-001							
Prüfzeitraum: <i>Testing period:</i>		2024-02-28 - 2024-02-29							
Ort der Prüfung: <i>Place of testing:</i>		TÜV Rheinland (Shenzhen) Co., Ltd.							
Prüflaboratorium: <i>Testing laboratory:</i>		TÜV Rheinland (Shenzhen) Co., Ltd.							
Prüfergebnis*: <i>Test result*:</i>		Pass							
geprüft von: tested by:				genehmigt von: authorized by:					
X				X					
Datum: <i>Date:</i> 2024-03-27				Ausstellungsdatum: <i>Issue date:</i> 2024-03-27					
Stellung / Position:		Sachverständige(r)/Expert			Stellung / Position:		Sachverständige(r)/Expert		
Sonstiges / <i>Other:</i>		FCC ID: 2BFID-13EA2BFID							
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:		P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)		N/A = nicht anwendbar		N/T = nicht getestet	
* Legend:		P(ass) = passed a.m. test specification(s)		F(ail) = failed a.m. test specification(s)		N/A = not applicable		N/T = not tested	
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 above mentioned 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>									

VOS

Prüfbericht-Nr.: NN24ZU84 001
Test report no.:

Seite 2 von 21
Page 2 of 21

Anmerkungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. <i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i>
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. <i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i>

Prüfbericht - Nr.: NN24ZU84 001
Test Report No.:

Seite 3 von 21
Page 3 of 21

Test Summary

5.1.1 ANTENNA REQUIREMENT

RESULT: Pass

5.1.2 DEACTIVATION OF THE TRANSMISSION

RESULT: Pass

5.1.3 20dB EMISSION BANDWIDTH

RESULT: Pass

5.1.4 99%dB BANDWIDTH

RESULT: Pass

5.1.5 FIELD STRENGTH OF FUNDAMENTAL AND UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

RESULT: Pass

6.1.1 ELECTROMAGNETIC FIELDS

RESULT: Pass

Contents

1	GENERAL REMARKS	5
1.1	COMPLEMENTARY MATERIALS	5
2	TEST SITES	5
2.1	TEST FACILITIES	5
2.2	LIST OF TEST AND MEASUREMENT INSTRUMENTS.....	5
2.3	TRACEABILITY	6
2.4	CALIBRATION	6
2.5	MEASUREMENT UNCERTAINTY.....	6
2.6	LOCATION OF ORIGINAL DATA.....	6
2.7	STATUS OF FACILITY USED FOR TESTING.....	6
3	GENERAL PRODUCT INFORMATION	7
3.1	PRODUCT FUNCTION AND INTENDED USE.....	7
3.2	RATINGS AND SYSTEM DETAILS	7
3.3	INDEPENDENT OPERATION MODES	7
3.4	NOISE GENERATING AND NOISE SUPPRESSING PARTS.....	7
3.5	SUBMITTED DOCUMENTS.....	7
4	TEST SET-UP AND OPERATION MODES	8
4.1	PRINCIPLE OF CONFIGURATION SELECTION	8
4.2	TEST OPERATION AND TEST SOFTWARE.....	8
4.3	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	8
4.4	COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE.....	8
4.5	TEST SETUP DIAGRAM	9
5	TEST RESULTS	10
5.1	ESSENTIAL REQUIREMENTS OF STANDARD	10
5.1.1	<i>Antenna Requirement</i>	<i>10</i>
5.1.2	<i>Deactivation of the Transmission</i>	<i>11</i>
5.1.3	<i>20dB Emission Bandwidth</i>	<i>12</i>
5.1.4	<i>99%dB Bandwidth</i>	<i>13</i>
5.1.5	<i>Field strength of fundamental and Unwanted Emissions in the Spurious Domain</i>	<i>14</i>
6	SAFETY HUMAN EXPOSURE	19
6.1	RADIO FREQUENCY EXPOSURE COMPLIANCE	19
6.1.1	<i>Electromagnetic Fields.....</i>	<i>19</i>
7	PHOTOGRAPHS OF THE TEST SET-UP	20
8	LIST OF TABLES.....	21

1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

N/A

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

No. 362 Huanguan Road Middle, Longhua District, 518110, Shenzhen, P. R. China.

FCC Accreditation Designation No.: 694916

ISED wireless device testing laboratory: 25069

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Equipment	Manufacturer	Model	Serial No.	Cal. until
EMI Test Receiver	R&S	ESR 7	102021	2024-07-25
Signal Analyzer	R&S	FSV 40	101439	2024-07-25
System Controller Interface	R&S	SCI-100	S10010038	N/A
Filterbank	R&S	Wlan	100759	2024-07-25
OSP	R&S	OSP 120	102040	N/A
Pre-amplifier	R&S	SCU08F1	08320031	2024-07-25
Amplifier	R&S	SCU-18F	180070	2024-07-25
Amplifier	R&S	SCU40A	100475	2024-07-25
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	2024-08-06
Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	2024-08-06
Active Loop Antenna	Schwarzbeck	FMZB 1513	302	2024-08-06
Test software	R&S	EMC32 (V10.60.10)	N/A	N/A
Control PC	Dell	OptiPlex 7050	36NV9P2	N/A
3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC17151-SAC	2024-06-22

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Table 2: Measurement Uncertainty

Parameter	Uncertainty (k=2)
RF output power, conducted	± 0.99 dB
Occupied Channel Bandwidth	± 2.08 %
All emissions, radiated	± 4.17 dB

2.6 Location of Original Data

The original copies of all test data taken during actual testing were in this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at No. 362 Huanguan Road Middle, Longhua District, 518110, Shenzhen, P. R. China. is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The EUT is a NACS EV Charging Connector with 315MHz transmitter.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 3: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment:	NACS EV Charging Connector
Type Designation:	66X14-XX, 66X15-XX All models are same in electronic aspects, only the model number and plastic shell shape are different.
Trademark:	Ti-lane
FCC ID:	2BFID-13EA2BFID
Operating Voltage:	DC 5V~12V
Testing Voltage:	DC 12V
Technical Specification of 433MHz	
Operating Frequencies:	315MHz
Modulation Type:	OOK
Antenna Type:	Integral Antenna
Antenna Gain :	1.55dBi

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Transmitting with operating frequency 315MHz
- B. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form
- User Manual
- ID Label and Location Info
- Operation Description

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10: 2013.

According to clause 3.1, all tests were performed on model 66X14-XX in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 4: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N
DC power supply	KIKUSUI	PAN35-5A	YM002997

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

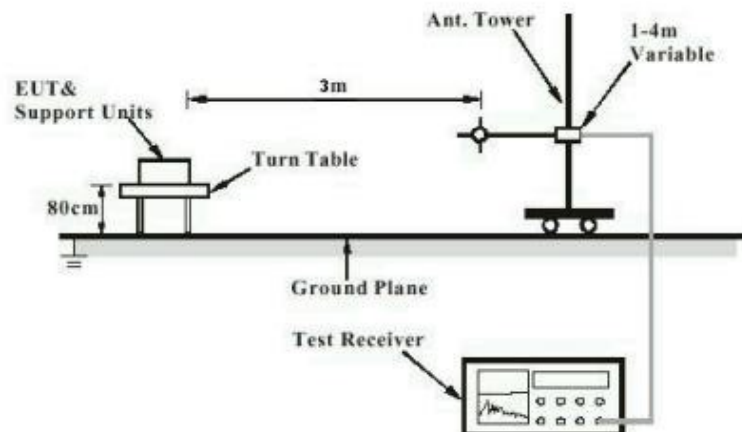


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

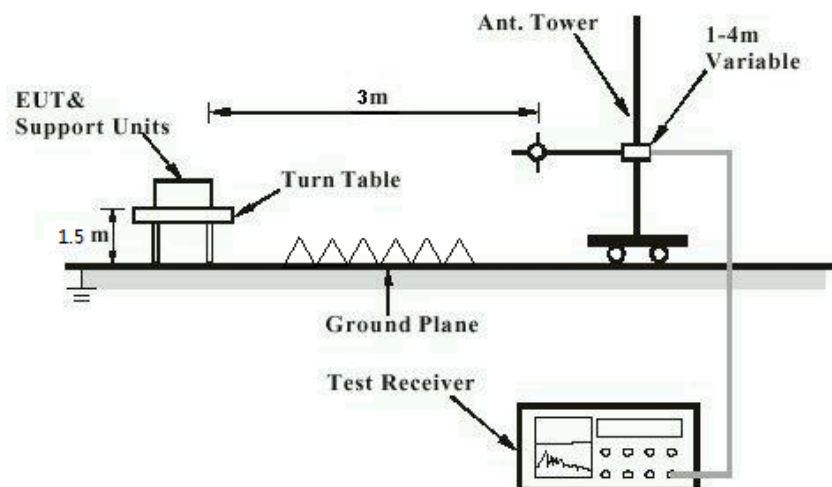
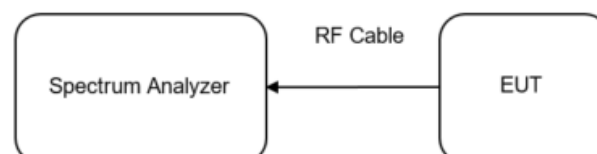


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5 Test Results

5.1 Essential Requirements of Standard

5.1.1 Antenna Requirement

RESULT:

Pass

Test Specification

Test standard	:	FCC Part 15.203 RSS-Gen Clause 6.8
Limit	:	the use of antennas with directional gains that do not exceed 6 dBi

According to the antenna test sheet, the EUT has a PCB Layout Antenna, the directional gain of antenna are 1.55dBi for 315MHz. Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

5.1.2 Deactivation of the Transmission

RESULT:

Pass

Test Specification

Test standard	: FCC Part 15.231, RSS-210 Issue 10 RSS-Gen Issue 5
Basic standard	: ANSI C63.10: 2013
Test requirement	: FCC Part 15.231 (a)(1), RSS-210 A1.1 (a) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
Limits	: will automatically deactivate the transmitter within not more than 5 seconds of being released.
Kind of test site	: Shielded Room

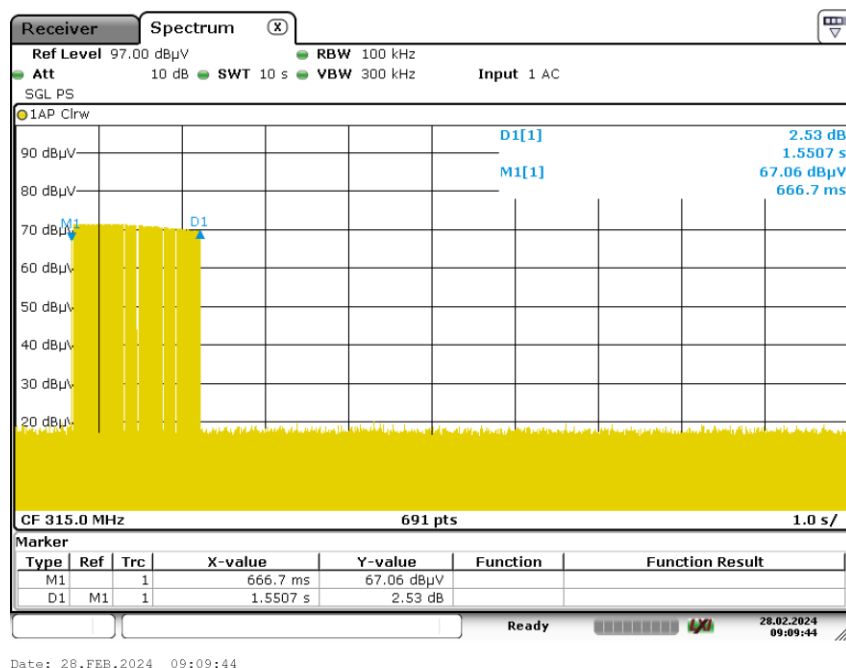
Test Setup

Date of testing	: 2024-02-28
Input voltage	: DC 12V
Operation mode	: A
Ambient temperature	: 19.8 °C
Relative humidity	: 54 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to below plot.

315MHz Transmitter:

Carrier Frequency	Shutdown Time	Limit
315MHz	1.55s	≤5s



5.1.3 20dB Emission Bandwidth

RESULT:
Pass
Test Specification

Test standard	: FCC Part 15.231 RSS-Gen Issue 5
Basic standard	: ANSI C63.10: 2013
Test requirement	: FCC Part 15.231 (c)
Limit	: FCC Part 15.231 (c)
Kind of test site	: Shielded Room

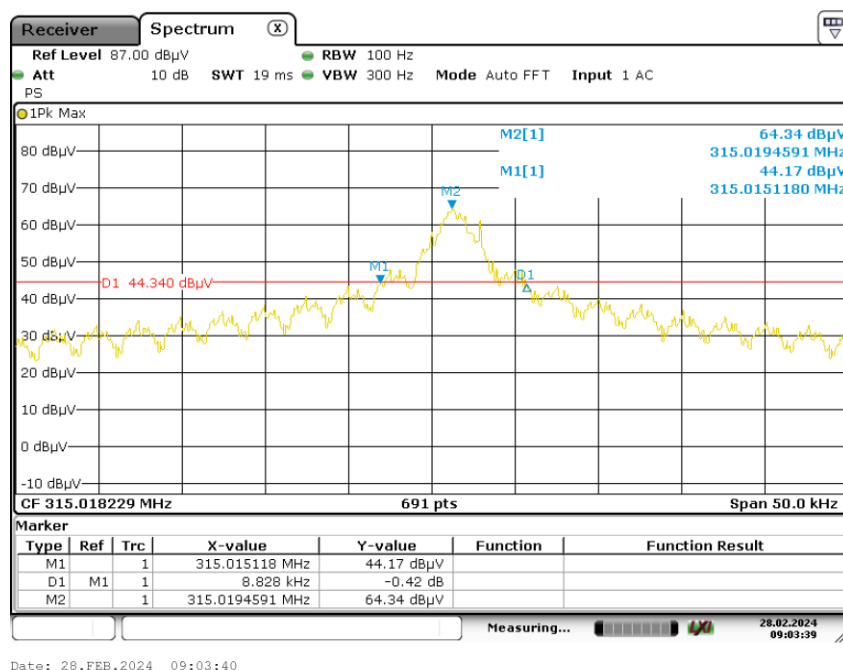
Test Setup

Date of testing	: 2024-02-28
Input voltage	: DC 12V
Operation mode	: A
Ambient temperature	: 20.6 °C
Relative humidity	: 54 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to below plot.

315MHz Transmitter:

Test Channel (MHz)	20dB Bandwidth (kHz)	Limit (MHz)
315	8.83	$315 * 0.25\% = 0.788$



5.1.4 99%dB Bandwidth

RESULT:
Pass
Test Specification

Test standard : RSS-Gen clause 6.7
 Basic standard : ANSI C63.10: 2013
 Kind of test site : Shielded Room

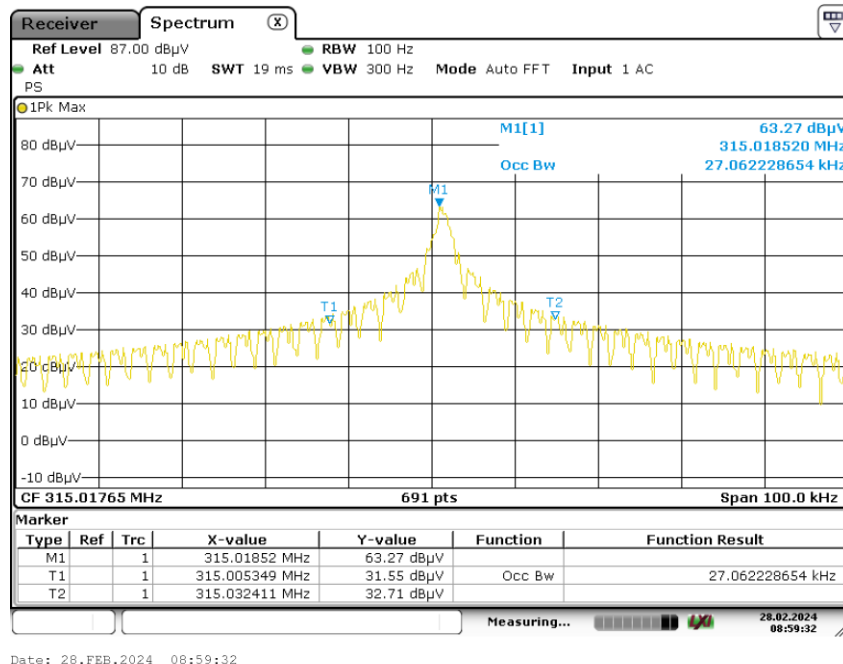
Test Setup

Date of testing : 2024-02-28
 Input voltage : DC 12V
 Operation mode : A
 Ambient temperature : 20.6 °C
 Relative humidity : 39 %
 Atmospheric pressure : 54 kPa

For the measurement records, refer to below plot.

315MHz Transmittter:

Test Channel (MHz)	99% Bandwidth (kHz)	Limit (MHz)
315	27.06	--



Prüfbericht - Nr.: NN24ZU84 001
Test Report No.:Seite 14 von 21
Page 14 of 21

5.1.5 Field strength of fundamental and Unwanted Emissions in the Spurious Domain

RESULT:

Pass

Test Specification

Test standard	: FCC Part 15.231 & FCC Part 15.205 & FCC Part 15.209 RSS-210 Issue 10 & RSS-Gen Issue 5
Basic standard	: ANSI C63.10: 2013
Test requirement	: FCC Part 15.231 (b)(1)(2)(3) RSS-Gen Table 5
Limit	: FCC Part 15.231 (b), RSS-210 A1.2
Kind of test site	: 3m Semi-anechoic Chamber

Test Setup

Date of testing	: 2024-02-28 to 2024-02-29
Input voltage	: DC 12V
Operation mode	: A
Ambient temperature	: Refer to test result
Relative humidity	: Refer to test result
Atmospheric pressure	: 101 kPa

Remark:

Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

The measurement results below 30MHz was greater than 20dB below the limit, so only the radiated spurious emissions from 30MHz to 3.2GHz were reported.

For the measurement records, refer to the following pages.

Prüfbericht - Nr.: NN24ZU84 001
Test Report No.:

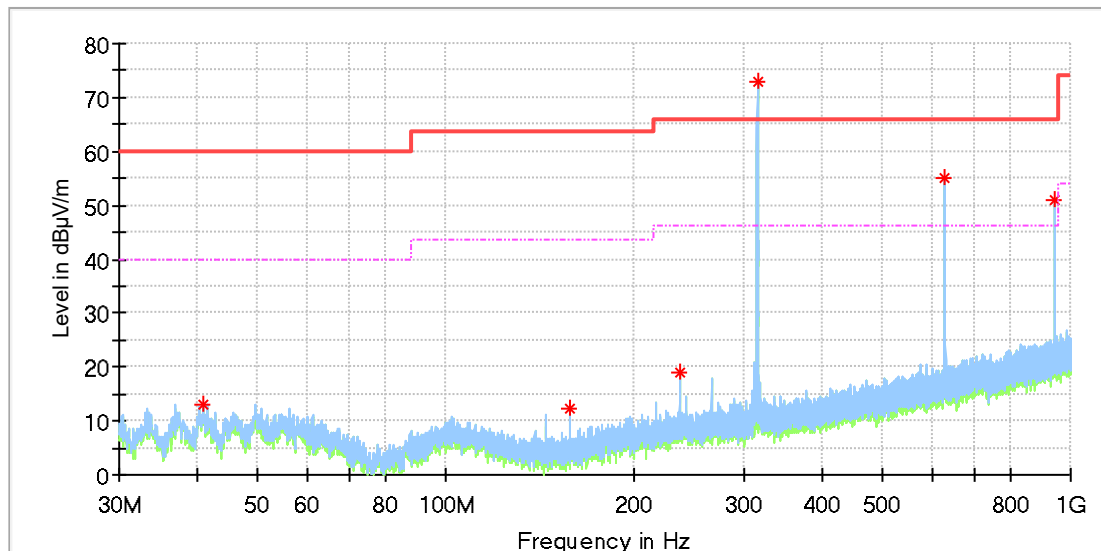
Seite 15 von 21
Page 15 of 21

315MHz Transmitter:

Up to 1GHz

EUT Information

EUT Name:	NACS
Model:	65X14-XX
Test Mode:	315M
Order No/Sample No:	168460807/A003656364-002
Test Voltage::	DC 12V From DC Source
Remark:	Temp 23 Humi:56%
Test Standard:	FCC 15.231
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

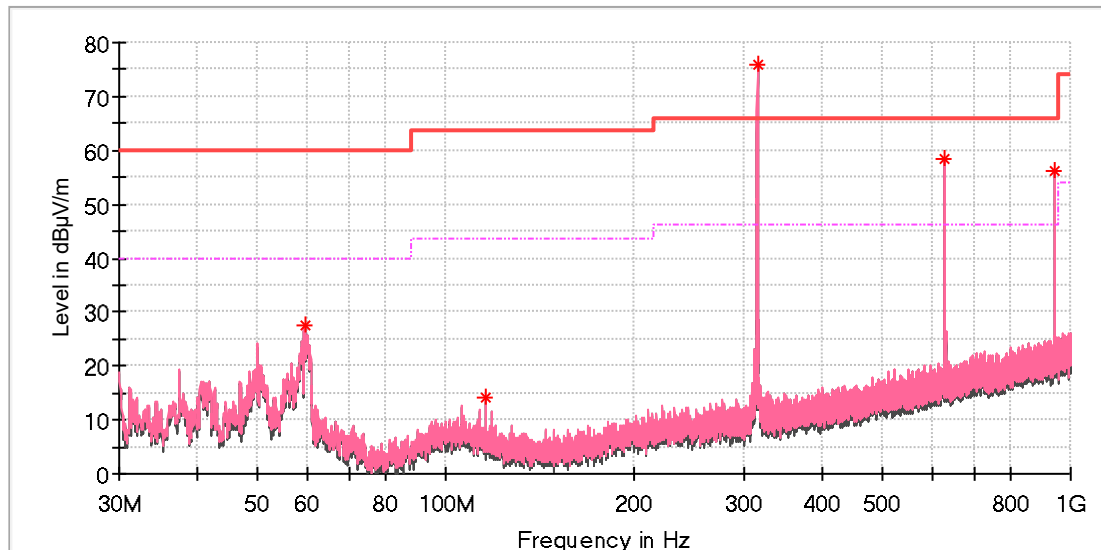
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
40.931154	13.11	---	40.00	26.89	100.0	H	312.0	-20.2
157.517692	12.29	---	43.50	31.21	100.0	H	105.0	-22.1
236.274231	19.09	---	46.00	26.91	100.0	H	46.0	-18.2
315.030769	72.85	---	95.62	19.77	100.0	H	137.0	-16.2
315.030769	---	66.83	75.62	8.79	100.0	H	137.0	-16.2
630.056923	54.92	---	75.62	20.70	100.0	H	0.0	-9.7
630.056923	---	48.90	55.62	6.72	100.0	H	0.0	-9.7
945.083077	50.92	---	75.62	24.70	100.0	H	94.0	-4.9
945.083077	---	44.90	55.62	10.72	100.0	H	94.0	-4.9

Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---	---

EUT Information

EUT Name: NACS
Model: 65X14-XX
Test Mode: 315M
Order No/Sample No: 168460807/A003656364-002
Test Voltage:: DC 12V From DC Source
Remark: Temp 23 Humi:56%
Test Standard: FCC 15.231
Tested By: Kei Zhang
Reviewed By: Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
59.398462	27.66	---	40.00	12.34	100.0	V	140.0	-19.2
115.621154	14.28	---	43.50	29.22	100.0	V	239.0	-20.2
315.030769	76.07	---	95.62	19.55	100.0	V	185.0	-16.2
315.030769	---	70.05	75.62	5.57	100.0	V	185.0	-16.2
630.056923	58.36	---	75.62	17.26	100.0	V	217.0	-9.7
630.056923	---	52.34	55.62	3.28	100.0	V	217.0	-9.7
945.083077	56.19	---	75.62	19.43	100.0	V	119.0	-4.9
945.083077	---	50.17	55.62	5.45	100.0	V	119.0	-4.9

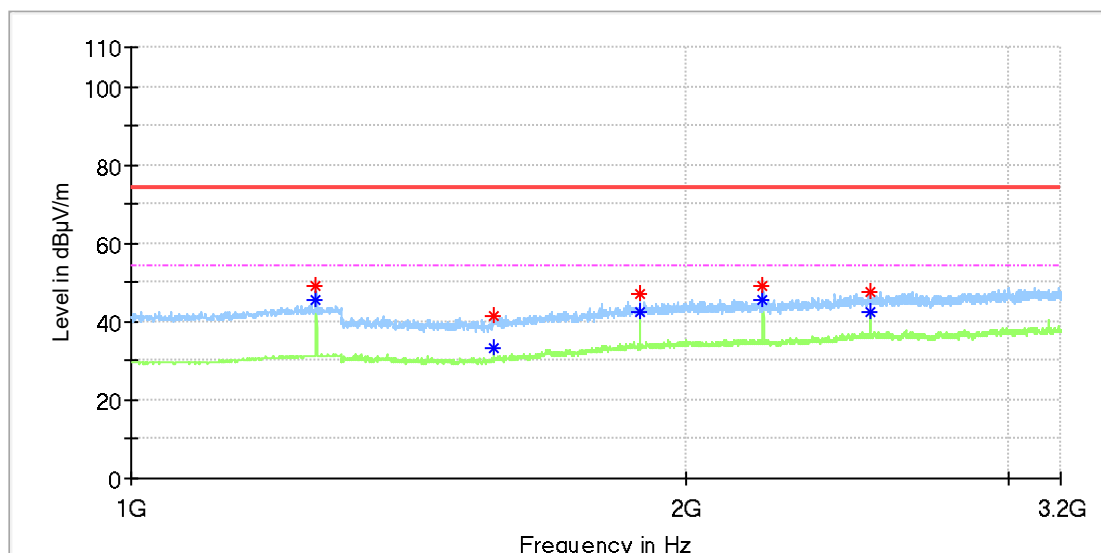
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---	---

Above 1GHz

EUT Information

EUT Name:	NACS
Model:	65X14-XX
Test Mode:	315M
Order No/Sample No:	168460807/A003656364-002
Test Voltage::	DC 12V From DC Source
Remark:	Temp 23 Humi:56%
Test Standard:	FCC 15.231
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical Freqs

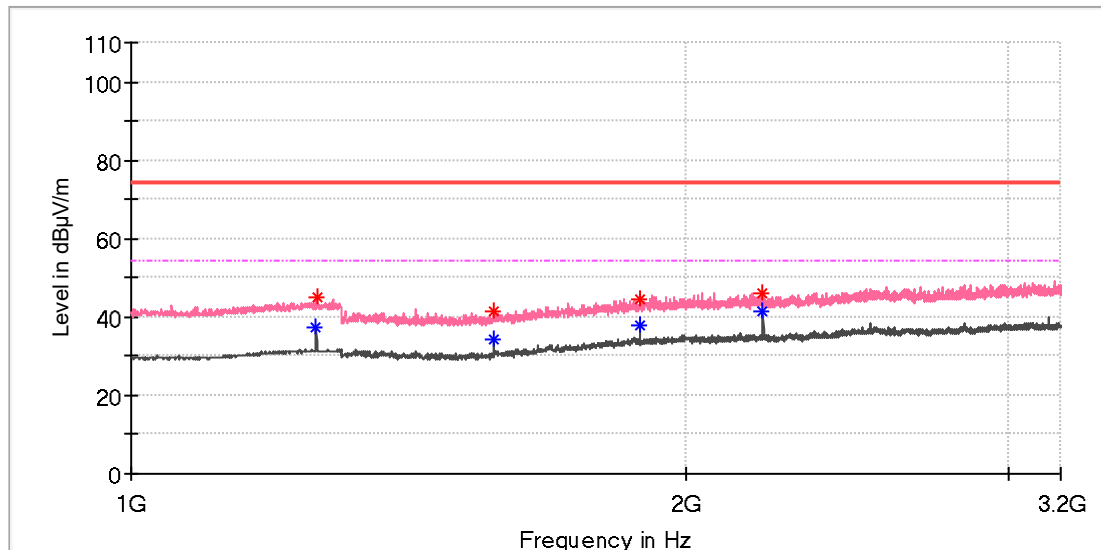
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1260.000000	---	45.51	54.00	8.49	150.0	H	286.0	1.9
1260.500000	49.04	---	74.00	24.96	150.0	H	312.0	1.9
1575.258333	---	33.12	54.00	20.88	150.0	H	355.0	1.8
1575.258333	41.54	---	74.00	32.46	150.0	H	355.0	1.8
1889.600000	---	42.28	54.00	11.72	150.0	H	294.0	5.5
1889.600000	47.13	---	74.00	26.87	150.0	H	294.0	5.5
2205.058333	---	45.45	54.00	8.55	150.0	H	257.0	6.3
2205.058333	48.93	---	74.00	25.07	150.0	H	257.0	6.3
2519.958333	47.82	---	74.00	26.18	150.0	H	294.0	7.5
2519.958333	---	42.49	54.00	11.51	150.0	H	294.0	7.5

Final Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---		---	---

EUT Information

EUT Name: NACS
Model: 65X14-XX
Test Mode: 315M
Order No/Sample No: 168460807/A003656364-002
Test Voltage:: DC 12V From DC Source
Remark: Temp 23 Humi:56%
Test Standard: FCC 15.231
Tested By: Kei Zhang
Reviewed By: Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1260.000000	---	37.44	54.00	16.56	150.0	V	38.0	1.9
1261.000000	44.86	---	74.00	29.14	150.0	V	38.0	1.9
1574.700000	---	34.36	54.00	19.64	150.0	V	210.0	1.8
1575.258333	41.29	---	74.00	32.71	150.0	V	210.0	1.8
1890.158333	44.37	---	74.00	29.63	150.0	V	82.0	5.5
1890.158333	---	38.11	54.00	15.89	150.0	V	82.0	5.5
2205.058333	45.83	---	74.00	28.17	150.0	V	355.0	6.3
2205.058333	---	41.55	54.00	12.45	150.0	V	355.0	6.3

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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6 Safety Human Exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT:

Pass

Test Specification

Test standard

: CFR47 FCC Part 2: Section 2.1093
CFR47 FCC Part 1: Section 1.1310
FCC KDB Publication 447498 D01 v06

FCC/IC requirements

FCC requirement: Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1093 this device has been defined as a portable device. SAR test exclusion considerations per KDB 447498 D01 v06 4.3.1 a)

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

Measurement Record

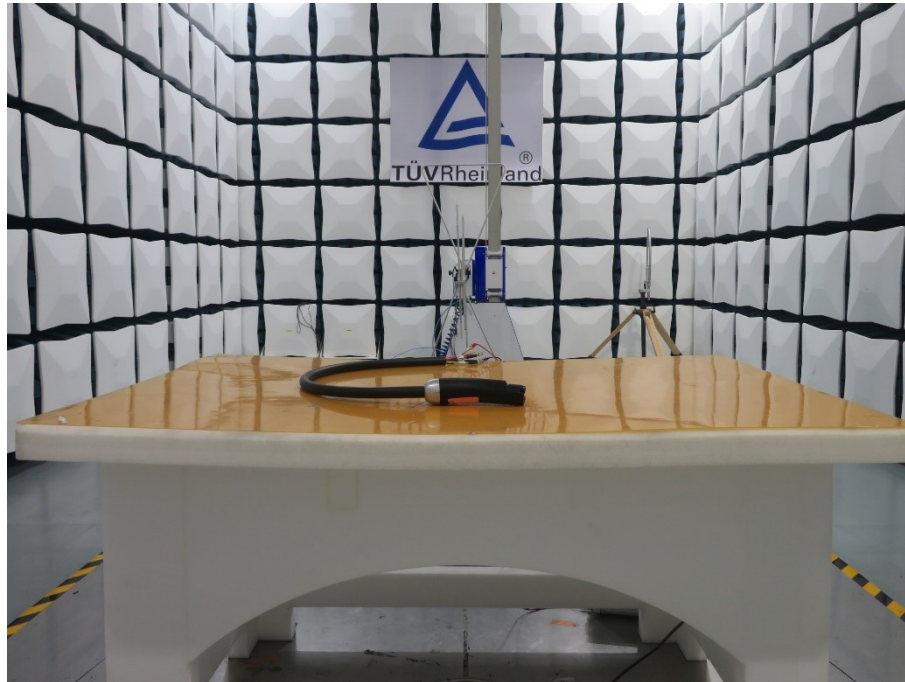
The minimum distance for the EUT is less than 5mm.

The maximum time averaged e.i.r.p. of 315MHz: 70.05dBuV/m @3m = -27.33dBm < 1mW

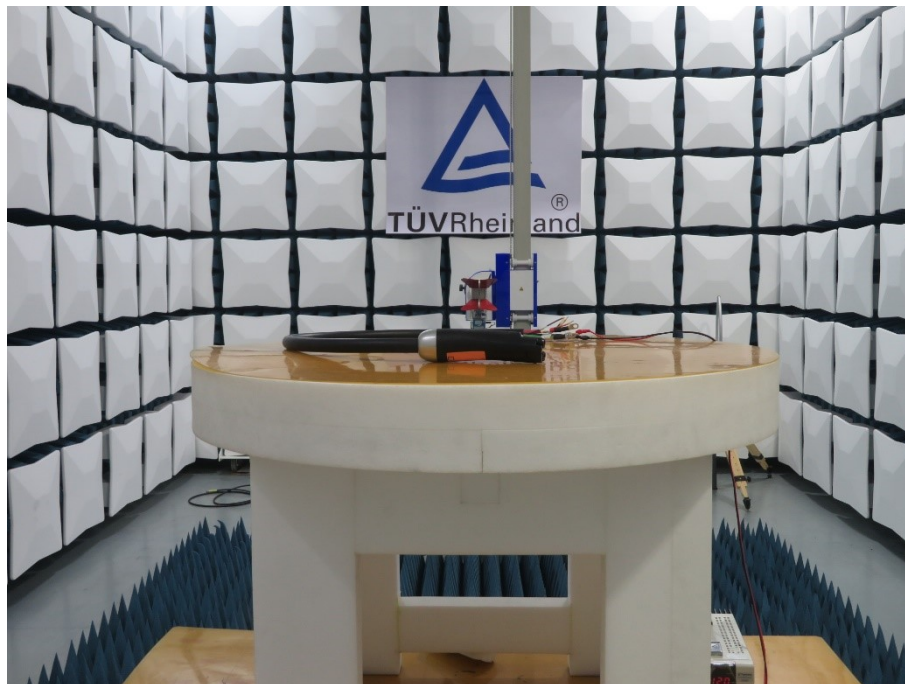
According to KDB 447498 D01 v06 4.3.1 a)

EUT is compliance with the RF exposure.

7 Photographs of the Test Set-Up



Setup of Radiated Spurious Emissions up to 1GHz



Setup of Radiated Spurious Emissions above 1GHz

8 List of Tables

Table 1: List of Test and Measurement Equipment.....	5
Table 2: Measurement Uncertainty.....	6
Table 3: Technical Specification of EUT	7
Table 4: List of Accessories and Auxiliary Equipment.....	8