

Prüfbericht-Nr.: <i>Test report no.:</i>	CN244MMG 001	Auftrags-Nr.: <i>Order no.:</i>	48243459	Seite 1 von 28 Page 1 of 28																								
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2024-01-29																									
Auftraggeber: <i>Client:</i>	GIPS Technology Co., Ltd. Rm. 2, 6 F., No. 395, Sec. 1, Linsen Rd., East Dist., Tainan City 70151, Taiwan (R.O.C.)																											
Prüfgegenstand: <i>Test item:</i>	UWB Tag - Watch Type																											
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	GT-320																											
Auftrags-Inhalt: <i>Order content:</i>	FCC Part 15F Test report																											
Prüfgrundlage: <i>Test specification:</i>	FCC 47CFR Part 15: Subpart F Section 15.519																											
Wareneingangsdatum: <i>Date of sample receipt:</i>	2024-05-30																											
Prüfmuster-Nr.: <i>Test sample no:</i>	A003732092-006																											
Prüfzeitraum: <i>Testing period:</i>	2024-07-17 - 2024-10-16																											
Ort der Prüfung: <i>Place of testing:</i>	EMC/RF Taipei Testing Site																											
Prüflaboratorium: <i>Testing laboratory:</i>	Taipei Testing Laboratories																											
Prüfergebnis*: <i>Test result*:</i>	Pass																											
überprüft von: <i>compiled by:</i>	genehmigt von: <i>authorized by:</i>																											
Datum: <i>Date:</i>	2024-10-17	Ausstellungsdatum: <i>Issue date:</i>	2024-10-17																									
Stellung / Position:	Senior Project Manager	Stellung / Position:	Senior Project Manager																									
Sonstiges / Other:																												
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>																										
<table><tr><td>* Legende:</td><td>1 = sehr gut</td><td>2 = gut</td><td>3 = befriedigend</td><td>4 = ausreichend</td><td>5 = mangelhaft</td></tr><tr><td></td><td>P(ass) = entspricht o.g. Prüfgrundlage(n)</td><td>F(ail) = entspricht nicht o.g. Prüfgrundlage(n)</td><td>N/A = nicht anwendbar</td><td>N/T = nicht getestet</td><td></td></tr><tr><td>* Legend:</td><td>1 = very good</td><td>2 = good</td><td>3 = satisfactory</td><td>4 = sufficient</td><td>5 = poor</td></tr><tr><td></td><td>P(ass) = passed a.m. test specification(s)</td><td>F(ail) = failed a.m. test specification(s)</td><td>N/A = not applicable</td><td>N/T = not tested</td><td></td></tr></table>					* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft		P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet		* Legend:	1 = very good	2 = good	3 = satisfactory	4 = sufficient	5 = poor		P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested	
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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>																												

Prüfbericht-Nr.:
Test report no.:

CN244MMG 001

Seite 2 von 28
Page 2 of 28

Anmerkungen
Remarks

- | | |
|----------|--|
| 1 | <p>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.</p> <p><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></p> |
| 2 | <p>Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. Informationen zur Verifizierung der Authentizität unserer Dokumente erhalten Sie auf folgender Webseite: go.tuv.com/digital-signature</p> <p><i>As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. For information on verifying the authenticity of our documents, please visit the following website: go.tuv.com/digital-signature</i></p> |
| 3 | <p>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.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.
Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i></p> |
| 4 | <p>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.</p> <p><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></p> |

Prüfbericht - Nr.: **CN244MMG 001**
Test Report No.Seite 3 von 28
Page 3 of 28

TEST SUMMARY

Report Section	FCC Clause	Test Item	Result
5.1.1	15.203	Antenna Requirement	Pass
5.1.2	15.519(c)(e),15.521(g)	EIRP	Pass
5.1.3	15.209,15.521(c)(d)(h),15.519(c)(d)	Radiated Spurious Emissions	Pass
5.1.4	15.503,15.521(e)	UWB Bandwidth	Pass
5.1.5	15.519(a)(1)	Cease Transmission Time	Pass
5.2.1	15.207	Mains Conducted Emission	Pass

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Contents

HISTORY OF THIS TEST REPORT	5
1. GENERAL REMARKS	6
1.1 COMPLEMENTARY MATERIALS.....	6
1.2 DECISION RULE OF CONFORMITY	6
2. TEST SITES	7
2.1 TEST LABORATORY	7
2.2 TEST FACILITY.....	7
2.3 TRACEABILITY	8
2.4 CALIBRATION	8
2.5 MEASUREMENT UNCERTAINTY	8
3. GENERAL PRODUCT INFORMATION.....	9
3.1 PRODUCT FUNCTION AND INTENDED USE	9
3.2 SYSTEM DETAILS AND RATINGS.....	9
3.3 NOISE GENERATING AND NOISE SUPPRESSING PARTS	10
3.4 SUBMITTED DOCUMENTS.....	10
4. TEST SET-UP AND OPERATION MODES	11
4.1 PRINCIPLE OF CONFIGURATION SELECTION	11
4.2 TEST OPERATION AND TEST SOFTWARE.....	11
4.3 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	12
4.4 TEST SETUP DIAGRAM	13
5. TEST RESULTS	14
5.1 TRANSMITTER REQUIREMENT & TEST SUITES	14
5.1.1 Antenna Requirement	14
5.1.2 EIRP	15
5.1.3 Radiated Spurious Emissions	18
5.1.4 UWB Bandwidth	23
5.1.5 Cease Transmission Time	25
5.2 MAINS EMISSION	27
5.2.1 Mains Conducted Emission.....	27

APPENDIX A - TEST RESULT OF RADIATED EMISSIONS & MAINS CONDUCTED EMISSION

APPENDIX SP - PHOTOGRAPHS OF TEST SETUP

APPENDIX EP - PHOTOGRAPHS OF EUT

Prüfbericht - Nr.: **CN244MMG 001**
Test Report No.

Seite 5 von 28
Page 5 of 28

HISTORY OF THIS TEST REPORT

Revision	Description	Date Issued
R01	Original Release	2024-10-17

Prüfbericht - Nr.: **CN244MMG 001**
Test Report No.Seite 6 von 28
Page 6 of 28

1. General Remarks

1.1 Complementary Materials

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

Appendix A - Test Result of Radiated Emissions & Mains Conducted Emission

Appendix SP - Photographs of Test Setup

Appendix EP - Photographs of EUT

Applied Standard and Test Levels

Radio
FCC 47CFR Part 15: Subpart F Section 15.519
ANSI C63.10:2013

1.2 Decision Rule of Conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

2. Test Sites

2.1 Test Laboratory

Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

2.2 Test Facility

Taipei Testing Laboratories

No.458-18, Sec. 2, Fenliao Rd., Linkou Dist.,
New Taipei City 244
Taiwan (R.O.C.)
FCC Registration No.: 180491
ISED Registration No.: 25563

2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

All measurement uncertainty values are shown with a coverage factor of $k=2$ to indicate a 95% level of confidence.

Emission Measurement Uncertainty

Parameter	Uncertainty
Radiated Emission (9 kHz ~ 30 MHz)	± 1.15 dB
Radiated Emission (30 MHz ~ 200 MHz)	± 1.30 dB
Radiated Emission (200 MHz ~ 1 GHz)	± 1.30 dB
Radiated Emission (1 GHz ~ 18 GHz)	± 1.54 dB
Radiated Emission (18 GHz ~ 40 GHz)	± 2.52 dB
Mains Conducted Emission	± 1.65 dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a UWB Tag - Watch Type working at 4492.8MHz with UWB function.
For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 System Details and Ratings

Basic Information of EUT

Item	EUT information
Kind of Equipment/Test Item	UWB Tag - Watch Type
Type Identification	GT-320
FCC ID	2A6S5-GT320

Technical Specification of EUT

Item	EUT information
Operating Frequency	4492.8 MHz
Operation Voltage	5Vdc (USB)
Modulation	PAM
Antenna Information	Refer to 5.1.1
Accessory Device	Refer to 4.3

3.3 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.4 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum emission level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Setup for testing: The Equipment Under Test (EUT) features a BLE interface, enabling control through an app installed on a cellphone.

It was used to enable the operation modes listed as below.

Test Software	UWB-Tag-BLE-Monitor_V1.0.8_20240423.apk
---------------	---

The samples were used as follows:
A003732092-006

Full test was applied on all test modes, but only worst case was shown.

EUT Configure Mode	Applicable To				Description
	EIRP	Radiated Spurious Emissions	OBW Bandwidth	Mains Conducted Emission	
-	√	√	√	√	-

Note:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when position on **Z-plane**.
2. "-" means no effect.

EIRP

- ☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Frequency (MHz)	Tested Frequency (MHz)
-	4492.8	4492.8

Radiated Spurious Emission

- ☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Frequency (MHz)	Tested Frequency (MHz)
-	4492.8	4492.8

UWB Bandwidth

- ☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Frequency (MHz)	Tested Frequency (MHz)
-	4492.8	4492.8

Prüfbericht - Nr.: CN244MMG 001
 Test Report No.

 Seite 12 von 28
 Page 12 of 28

Mains Conducted Emission

- ☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Frequency (MHz)	Tested Frequency (MHz)
-	4492.8	4492.8

Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
Radiated Spurious Emissions	23.5-25.7 °C	51-57 %	Roger Liao
Field Strength of Fundamental Emissions	23.5-25.7 °C	51-57 %	Roger Liao
Mains Conducted Emission	21.2 °C	59 %	Chuan Chu

4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

Accessory of EUT

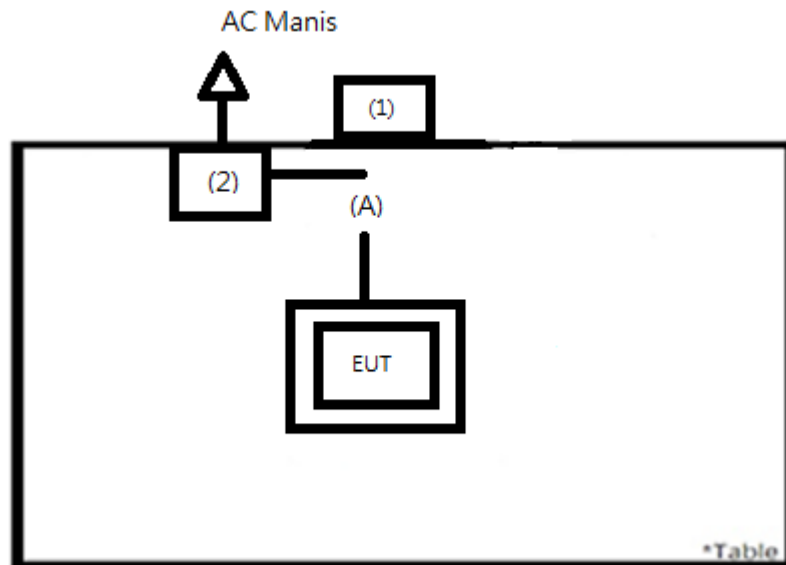
No.	Product	Brand	Model	Description
A	Charger Cable	GIPS	CH-GT320	Length: 60cm For Radiated Test, Mains Conducted Test

Support Unit

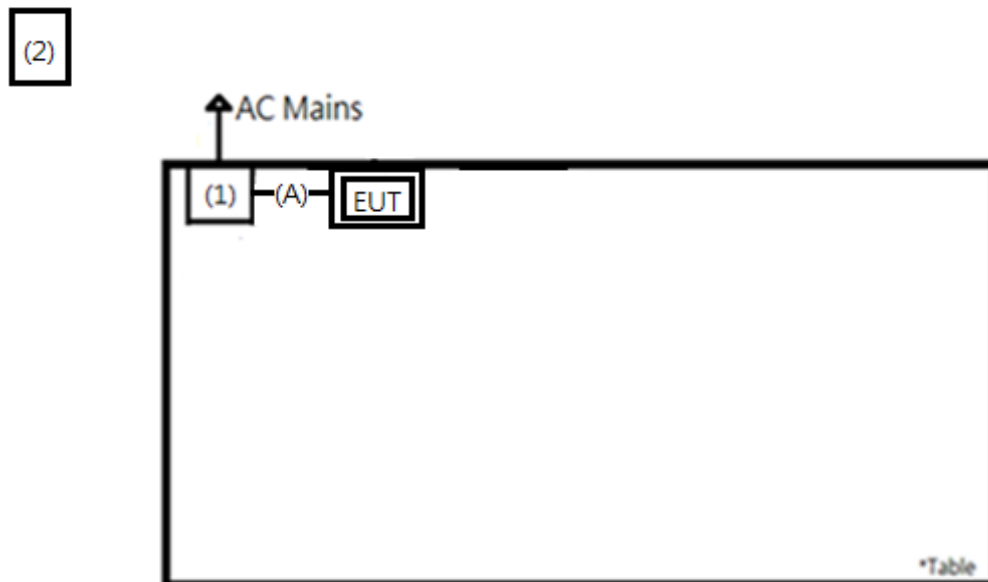
Support Unit								
No.	Description	Brand	Model	S/N	Shielded	Ferrite Core (Qty)	Length (cm)	Remark
Radiated Test								
1	Mobile Phone	OPPO	CPH2325	-	-	-	-	-
2	Adapter	OPPO	VC56JACH	J119492AC1009359	-	-	-	-
Mains Conducted Test								
1	Adapter	OPPO	VC56JACH	J119492AC1009359	-	-	-	-
2	Mobile Phone	OPPO	CPH2325	-	-	-	-	-
Conducted Test								
-	Mobile Phone	OPPO	A55	YDOVUCWOCYV8ZTJV	-	-	-	-

4.4 Test Setup Diagram

<Radiated Spurious Emissions mode>



<Mains Conducted Emission mode>



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

Requirement Use of approved antennas only

According to the manufacturer declaration, the EUT has an antenna with a directional gain of -3.53 dBi. The antenna is a Dielectric Chip Antenna with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

5.1.2 EIRP

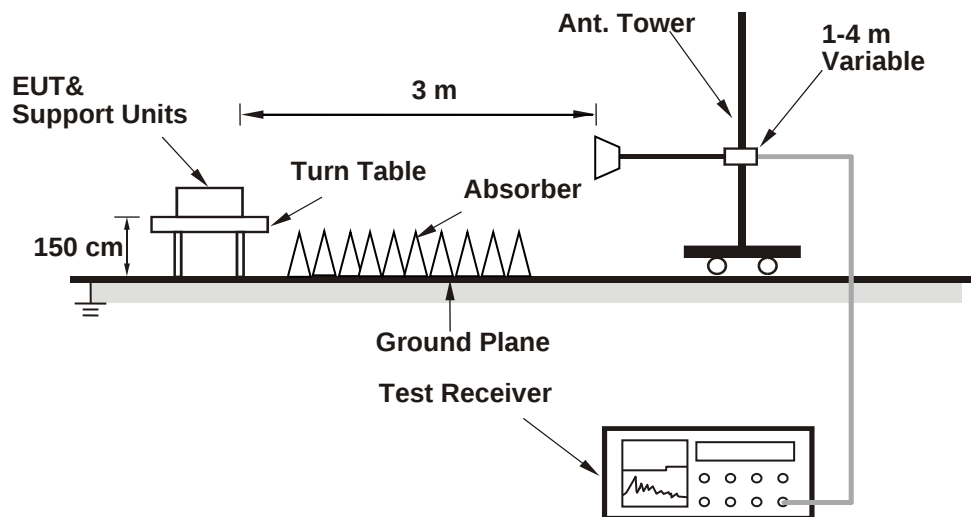
Limit

15.519(c) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in § 15.521.

15.521(g) When a peak measurement is required, it is acceptable to use a resolution bandwidth other than the 50 MHz specified in this subpart. This resolution bandwidth shall not be lower than 1 MHz or greater than 50 MHz, and the measurement shall be centered on the frequency at which the highest radiated emission occurs, fM. If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be $20 \log (RBW/50)$ dBm where RBW is the resolution bandwidth in megahertz that is employed. This may be converted to a peak field strength level at 3 meters using $E(\text{dBuV/m}) = P(\text{dBm EIRP}) + 95.2$. If RBW is greater than 3 MHz, the application for certification filed with the Commission must contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo).

Prüfbericht - Nr.: CN244MMG 001
Test Report No.

Seite 16 von 28
Page 16 of 28

Test Instruments

Test date: 2024-07-26 ~ 2024-10-16

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Above 1GHz					
Signal Analyzer	R&S	FSV40	101509	2024/4/24	2025/4/23
Horn Antenna	ETS-Lindgren	3117	00218930	2024/2/22	2025/2/20
Amplifier	EM	EM01G18GA	60967	2024/4/2	2025/4/1
HF-AMP + AC source	EMCI	EMC184045SE	980657	2024/1/24	2025/1/22
Horn Antenna	SCHWARZBECK	BBHA 9170	00890	2024/5/2	2025/5/1
30MHz ~ 1GHz					
Receiver	R&S	ESR7	102109	2024/2/23	2025/2/21
Bilog Antenna	SCHWARZBECK	VULB-9168	00951	2024/3/29	2025/3/28
LF-AMP	Agilent	8447D	2944a107722	2024/3/20	2025/3/19
Below 30MHz					
Receiver	R&S	ESR7	102109	2024/2/23	2025/2/21
Loop Antenna	SCHWARZBECK	FMZB 1519B	00215	2024/1/4	2025/1/2

Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) or 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna 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.
- d. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.
4. The Radiated Emissions testing was performed in the X(E1), Y(H) and Z(E2) axis orientation. The worst-case Axis orientation is recorded in this test report.

Test Results

Channel	Frequency (MHz)	Measured Field Strength (dBuV/m)	Limit (RBW 50MHz) (dBuV/m)	Correction factor (50MHz to 1MHz)	Limit (dBuV/m)	Margin (dB)	Results	Polar(H/V)
3	4492.8	51.9	95.2	-33.98	61.22	-9.32	Pass	H
	4492.8	49.42	95.2	-33.98	61.22	-11.80	Pass	V

Note:

1. BW correction factor = $20 \log (\text{RBW}/50\text{MHz})$
2. $E(\text{dBuV/m}) = P(\text{dBm EIRP}) + 95.2$

5.1.3 Radiated Spurious Emissions

Limit

The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in § 15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Frequencies (MHz)	EIRP in dBm	Measurement Distance (meters)
960-1610	-75.3	3
1610-1990	-63.3	3
1990-3100	-61.3	3
3100-10600	-41.3	3
Above 10600	-61.3	3

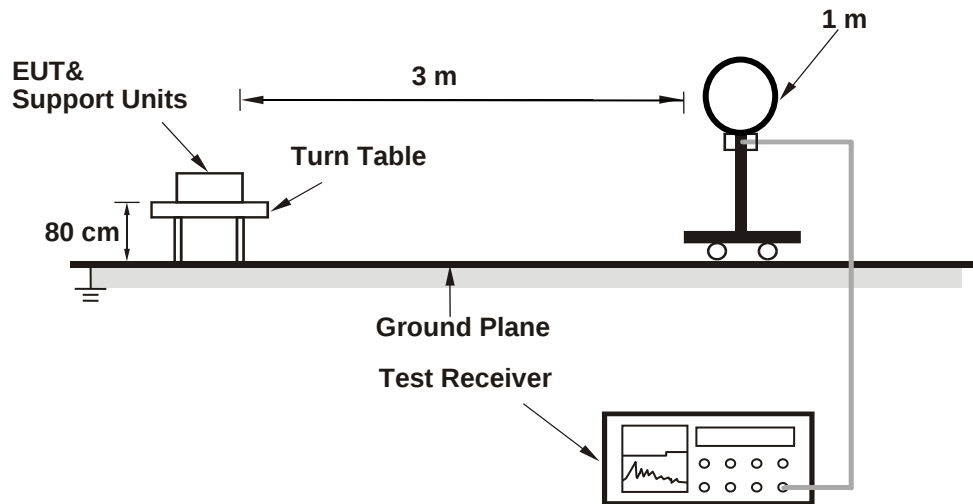
UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequencies (MHz)	EIRP in dBm	Measurement Distance (meters)
1164-1240	-85.3	3
1559-1610	-85.3	3

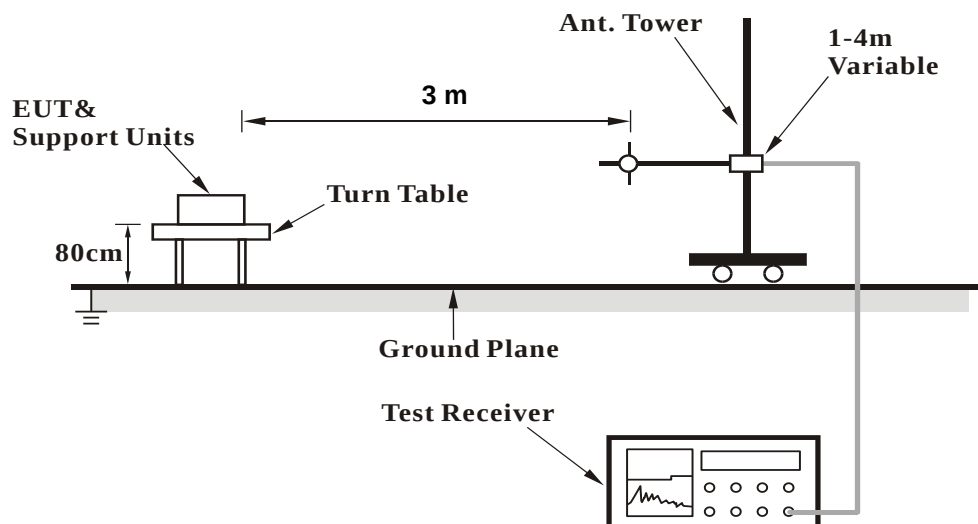
Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup

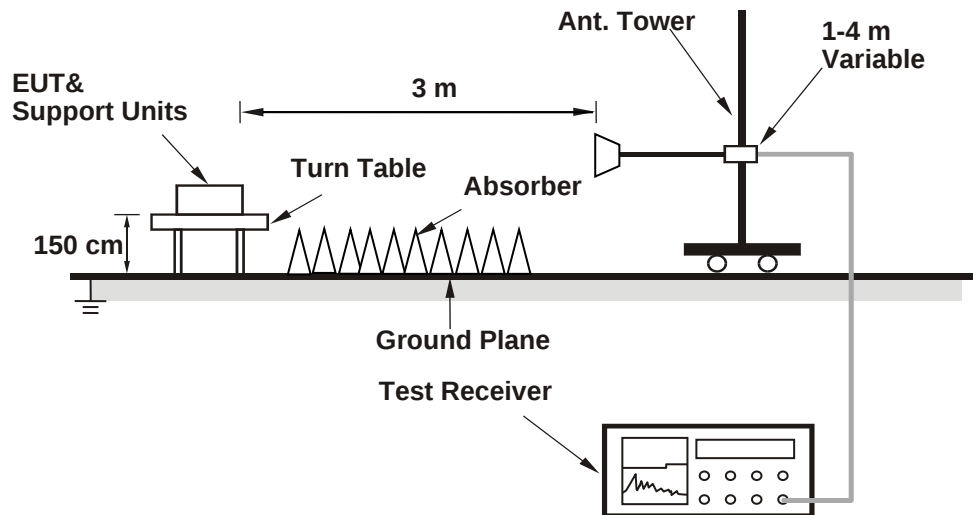
<Radiated Emissions below 30 MHz>



<Radiated Emissions 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

Test Instruments

Please refer to 5.1.2 Instruments

Test Procedures**For Radiated Emissions below 30 MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel (OPEN), perpendicular (CLOSE), and ground-parallel (GROUND) orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated Emissions above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna 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.
- d. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.
4. The Radiated Emissions testing was performed in the X(E1), Y(H) and Z(E2) axis orientation. The worst-case Axis orientation is recorded in this test report.
5. The emission levels of other frequencies (including the 10th harmonic of the highest fundamental frequency) are very lower than the limit and are not shown in the test report.

Prüfbericht - Nr.: **CN244MMG 001**
Test Report No.

Seite 22 von 28
Page 22 of 28

Test Results

Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) – Amplifier (dB)

Level (dBuV/m) = Reading (dBuV) + Factor (dB/m)

E(dBuV/m) = P(dBm EIRP) + 95.2

Please refer to Appendix A.

Prüfbericht - Nr.: CN244MMG 001
Test Report No.

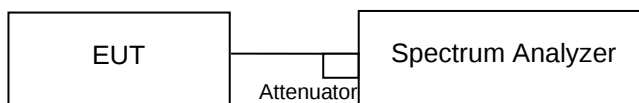
Seite 23 von 28
Page 23 of 28

5.1.4 UWB Bandwidth

Limit The frequency at which the highest radiated emission occurs, fM, must be contained within the UWB bandwidth.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV	101512	2024/02/22	2025/02/20	2024/7/17	2024/9/4

Test Procedure

The frequency at which the maximum power level is measured with the peak detector is designated fM. The peak power measurements shall be made using a spectrum analyzer or EMI receiver with a 1 MHz resolution bandwidth and a video bandwidth of 1 MHz or greater. The instrument shall be set to peak detection using the maximum-hold trace mode. The outermost 1 MHz segments above and below fM, where the peak power falls by 10 dB relative to the level at fM, are designated as fH and fL, respectively:

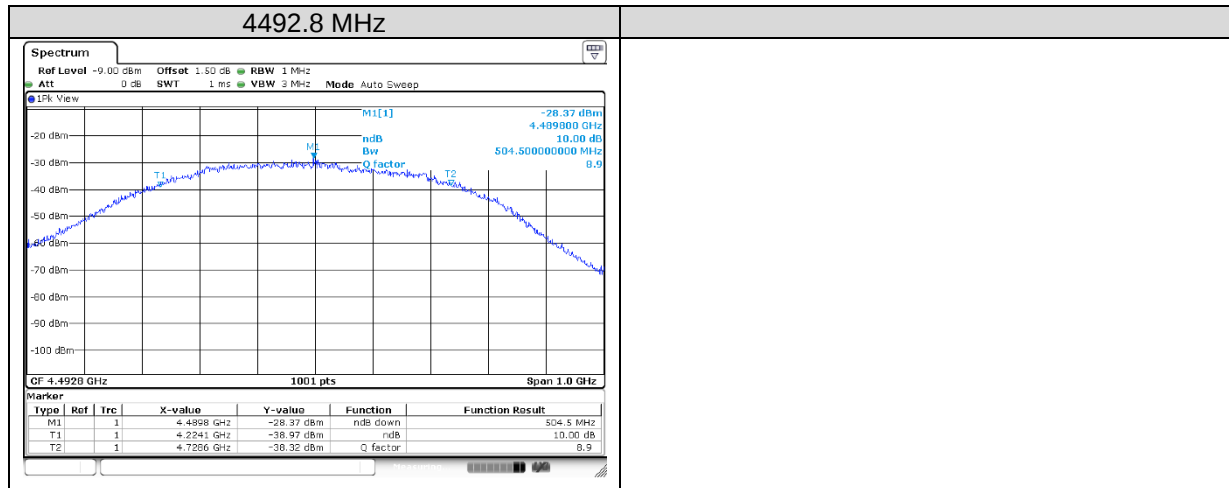
- For the lowest frequency bound fL, the emission is searched from a frequency lower than fM that has, by inspection, a peak power much lower than 10 dB less than the power at fM and increased toward fM until the peak power indicates 10 dB less than the power at fM. The frequency of that segment is recorded.
- This process is repeated for the highest frequency bound fH, beginning at a frequency higher than fM that has, by inspection, a peak power much lower than 10 dB below the power at fM. The frequency of that segment is recorded.
- The two recorded frequencies represent the highest fH and lowest fL bounds of the UWB transmission, and the -10 dB bandwidth (B - 10) is defined as $(fH - fL)$.⁸² The center frequency (fc) is mathematically determined from $(fH - fL) / 2$.
- The fractional bandwidth is defined as $2(fH - fL) / (fH + fL)$.
- Determine whether the -10 dB bandwidth $(fH - fL)$ is ≥ 500 MHz, or whether the fractional bandwidth $2(fH - fL) / (fH + fL)$ is ≥ 0.2 .

Prüfbericht - Nr.: CN244MMG 001
Test Report No.

Seite 24 von 28
Page 24 of 28

Test Results

Frequency (MHz)	FL (GHz)	FH (GHz)	10 dB Bandwidth (MHz)	Limit (MHz)	Result
4492.8	4.2241	4.7286	504.5	≥500	Pass



5.1.5 Cease Transmission Time

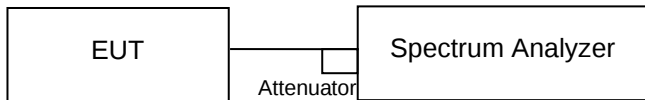
Limit

15.519(a)(1) UWB devices operating under the provisions of this section must be hand held, i.e., they are relatively small devices that are primarily hand held while being operated and do not employ a fixed infrastructure.

A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

Kind of Test Site Shielded room

Test Setup



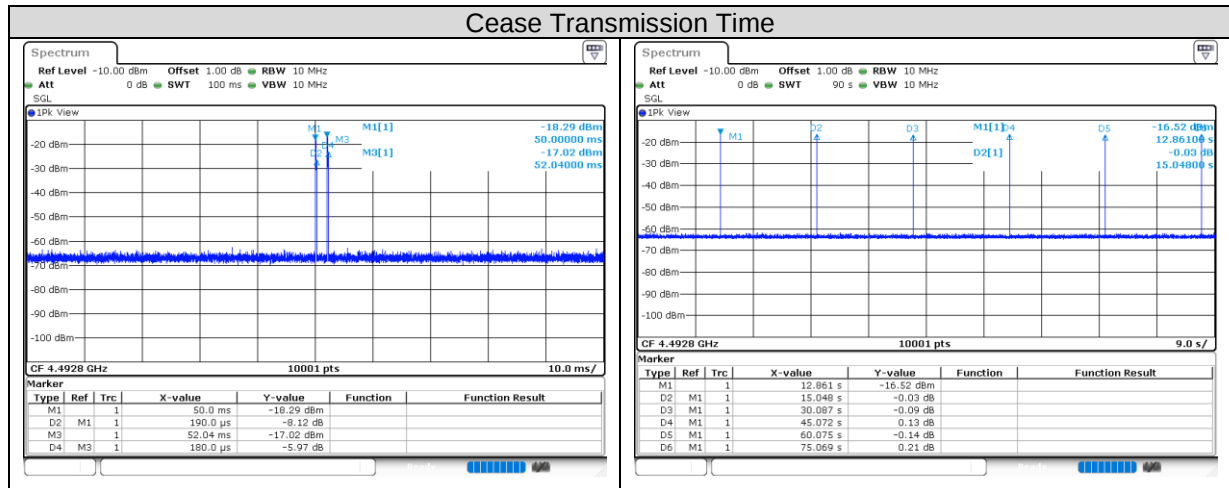
Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV	101512	2024/02/22	2025/02/20	2024/7/17	2024/9/4

Test Procedures

Transmission is monitored when the EUT initiates the UWB link with the accessory.

Test Results



Note: According to KDB 393764 D01 Q4, an acknowledgement of reception must continue to be received by the UWB device at least once every 10 seconds, or else the device shall cease transmission of any information other than periodic signals for use in the establishment or re-establishment of a communications link with an associated receiver.

5.2 Mains Emission

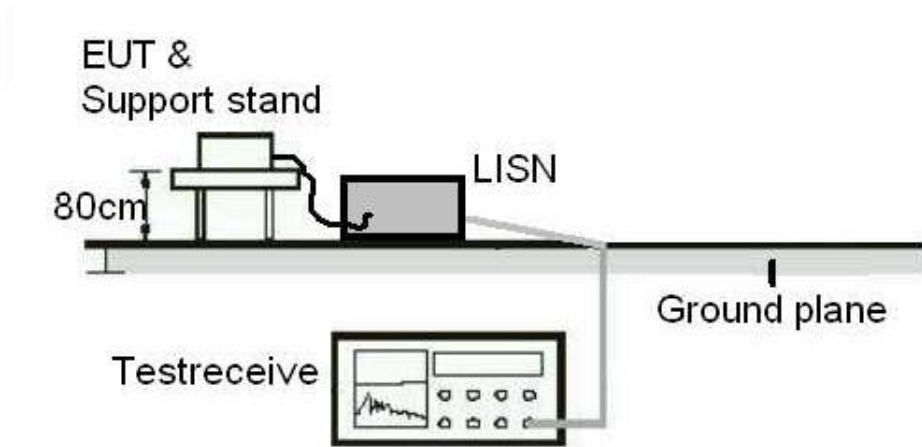
5.2.1 Mains Conducted Emission

Limit

Mains Conducted emissions as defined in §15.207 must comply with the mains conducted emission limits.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Test date: 2024-08-02

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Two-Line V-Network	Rohde & Schwarz	ENV216	101938	2023/10/23	2024/10/21
EMI Test Receiver	R&S	ESCI	101094	2023/11/27	2024/11/25

Prüfbericht - Nr.: **CN244MMG 001**
Test Report No.

Seite 28 von 28
Page 28 of 28

Test Procedures

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

Test Results

Please refer to Appendix A.

Appendix A: Test Results of Radiated Spurious Emissions & Mains

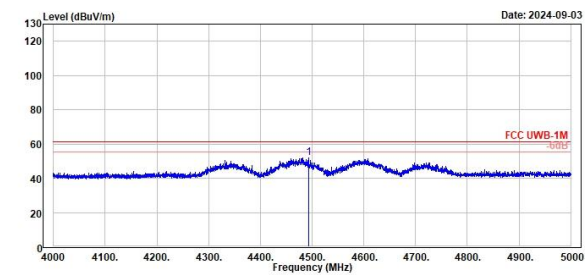
Conducted Emission Test

Fundamental Emissions, 4492.8MHz

Horizontal



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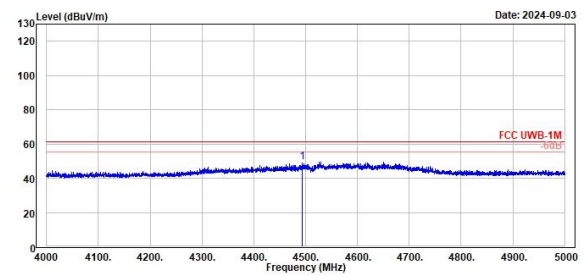


Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1 4492.80	51.90	43.66	8.24	61.22	-9.32		337	64	Peak	Horizontal	

Vertical



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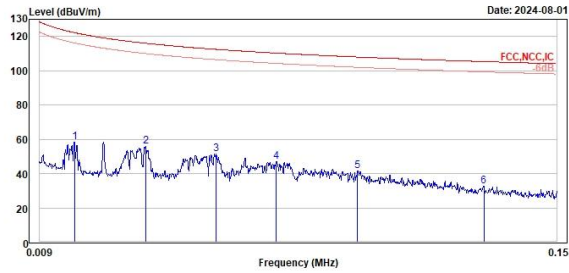
Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1 4492.80	49.42	41.18	8.24	61.22	-11.80		100	317	Peak	Vertical	

Spurious Emissions, Tx Mode, 9kHz ~ 30MHz

9kHz~150kHz(Open)



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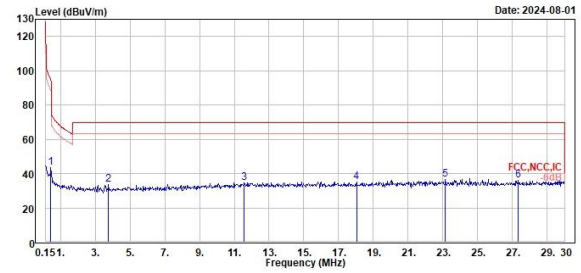


Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	0.02	58.35	39.40	18.95	122.20	-63.85	100	179	Peak	Open	
2	0.04	55.98	36.29	19.69	116.02	-60.04	100	183	Peak	Open	
3	0.06	51.52	32.14	19.38	112.44	-60.92	100	179	Peak	Open	
4	0.07	47.01	27.96	19.05	110.26	-63.25	100	201	Peak	Open	
5	0.10	41.50	22.89	18.61	107.98	-66.48	100	179	Peak	Open	
6	0.13	32.75	14.14	18.61	105.31	-72.56	100	184	Peak	Open	

150kHz~30MHz(Open)



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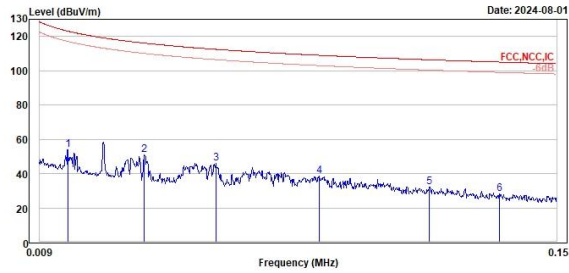
Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	0.45	43.48	24.41	19.07	94.57	-51.09	100	186	Peak	Open	
2	3.76	33.56	14.37	19.19	69.50	-35.94	100	116	Peak	Open	
3	11.58	34.61	13.42	21.19	69.50	-34.89	100	339	Peak	Open	
4	18.03	35.07	13.11	21.96	69.50	-34.43	100	315	Peak	Open	
5	23.13	36.63	14.34	22.29	69.50	-32.87	100	111	Peak	Open	
6	27.34	36.21	13.79	22.42	69.50	-33.29	100	290	Peak	Open	

Spurious Emissions, Tx Mode, 9kHz ~ 30MHz

9kHz~150kHz(Close)



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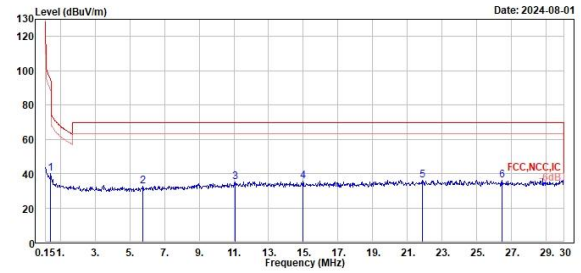


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	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	0.02	53.98	35.16	18.82	123.10	-69.12	100	245	Peak	Close		
2	0.04	50.80	31.10	19.70	116.12	-65.32	100	249	Peak	Close		
3	0.06	46.21	26.83	19.38	112.46	-66.25	100	262	Peak	Close		
4	0.09	38.32	19.51	18.81	108.98	-70.66	100	259	Peak	Close		
5	0.12	31.99	13.43	18.56	106.36	-74.37	100	247	Peak	Close		
6	0.13	28.06	9.44	18.62	105.03	-76.97	100	247	Peak	Close		

150kHz~30MHz(Close)



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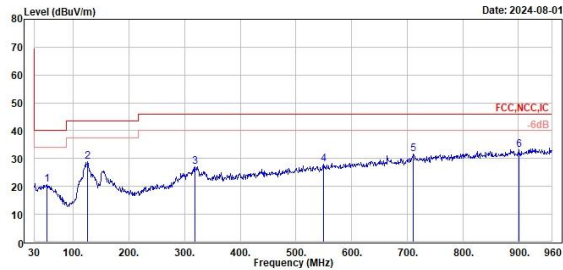
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	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	0.45	39.96	20.89	19.07	94.57	-54.61	100	255	Peak	Close		
2	5.76	32.50	12.77	19.73	69.50	-37.00	100	183	Peak	Close		
3	11.08	34.87	13.74	21.13	69.50	-34.63	100	270	Peak	Close		
4	14.96	35.43	13.84	21.59	69.50	-34.07	100	209	Peak	Close		
5	21.05	36.06	13.80	22.26	69.50	-33.44	100	152	Peak	Close		
6	26.45	36.23	13.84	22.39	69.50	-33.27	100	77	Peak	Close		

Spurious Emissions, Tx Mode, 30MHz ~ 960MHz

Horizontal



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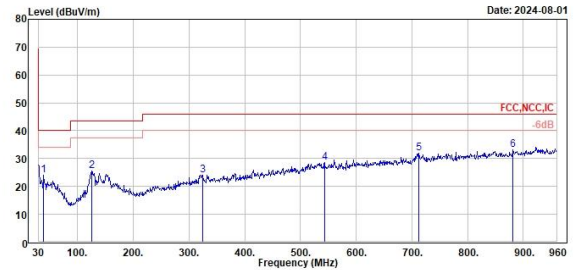


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	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	52.32	20.57	27.53	-6.96	40.00	-19.43		277	360	Peak	Horizontal	
2	125.79	28.80	38.24	-9.44	43.50	-14.70		300	300	Peak	Horizontal	
3	318.30	27.09	32.77	-5.68	46.00	-18.91		100	246	Peak	Horizontal	
4	549.87	27.89	28.81	-0.92	46.00	-18.11		200	185	Peak	Horizontal	
5	711.69	31.72	29.54	2.18	46.00	-14.28		100	92	Peak	Horizontal	
6	900.46	33.24	28.42	4.82	46.00	-12.76		300	110	Peak	Horizontal	

Vertical



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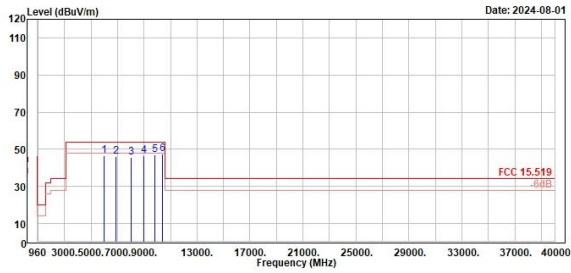
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	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	39.30	23.94	31.88	-7.94	40.00	-16.06		100	32	Peak	Vertical	
2	125.79	25.60	35.04	-9.44	43.50	-17.90		100	65	Peak	Vertical	
3	324.81	24.14	29.70	-5.56	46.00	-21.86		100	312	Peak	Vertical	
4	543.36	28.73	29.94	-1.21	46.00	-17.27		300	340	Peak	Vertical	
5	712.62	31.84	29.66	2.18	46.00	-14.16		300	349	Peak	Vertical	
6	881.88	33.02	28.39	4.63	46.00	-12.98		300	210	Peak	Vertical	

Spurious Emissions, Tx Mode, 960MHz ~ 40GHz

Horizontal



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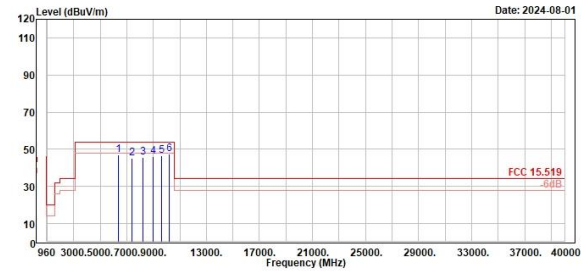


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	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	5961.74	46.66	36.73	9.93	54.00	-7.34	100	17	Peak	Horizontal		
2	6870.88	46.23	36.34	9.89	54.00	-7.77	100	6	Peak	Horizontal		
3	8028.59	45.64	36.08	9.56	54.00	-8.36	100	168	Peak	Horizontal		
4	9017.92	46.72	37.17	9.55	54.00	-7.28	100	293	Peak	Horizontal		
5	9838.04	47.18	37.11	10.07	54.00	-6.82	100	266	Peak	Horizontal		
6	10394.15	47.34	37.22	10.12	54.00	-6.66	100	307	Peak	Horizontal		

Vertical



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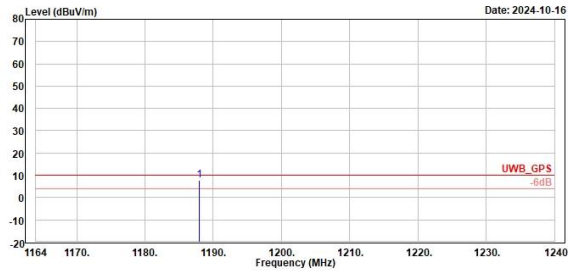
	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	6390.75	46.85	36.91	9.94	54.00	-7.15	100	224	Peak	Vertical		
2	7370.05	45.12	35.46	9.66	54.00	-8.88	100	187	Peak	Vertical		
3	8234.08	45.42	35.82	9.60	54.00	-8.58	100	360	Peak	Vertical		
4	9015.91	46.22	36.68	9.54	54.00	-7.78	100	311	Peak	Vertical		
5	9639.37	46.44	36.69	9.75	54.00	-7.56	100	208	Peak	Vertical		
6	10223.75	47.46	37.27	10.19	54.00	-6.54	100	143	Peak	Vertical		

GPS band, Tx Mode, 1164 ~ 1240MHz

Horizontal



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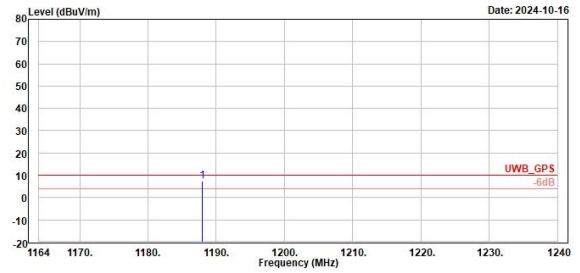


Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1 1187.94	7.73	7.68	0.13	9.90	-2.17	208	120	Average	Horizontal		

Vertical



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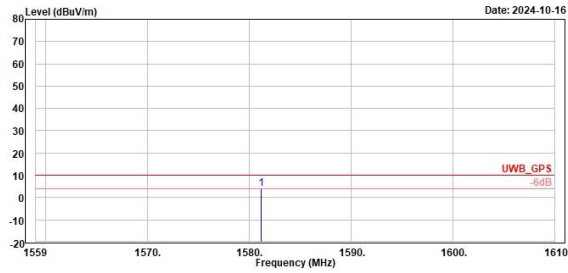
Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1 1187.94	7.50	7.37	0.13	9.90	-2.40	100	76	Average	Vertical		

GPS band, Tx Mode, 1559 ~ 1610MHz

Horizontal



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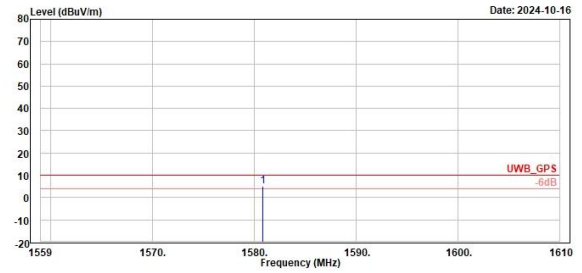


Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1 1581.19	3.77	3.10	0.67	9.90	-6.13	288	172	Average	Horizontal		

Vertical



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Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1 1580.83	4.92	4.26	0.66	9.90	-4.98	254	203	Average	Vertical		

Mains Conducted Emission, Tx Mode, 150kHz ~ 30MHz

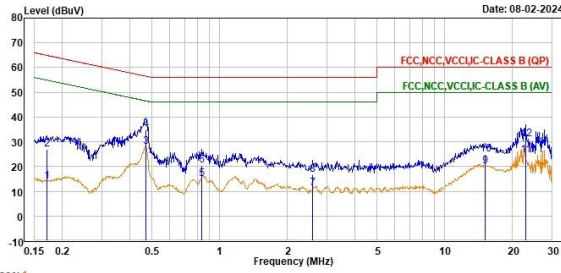
Worst Band

(Line)

(Neutral)



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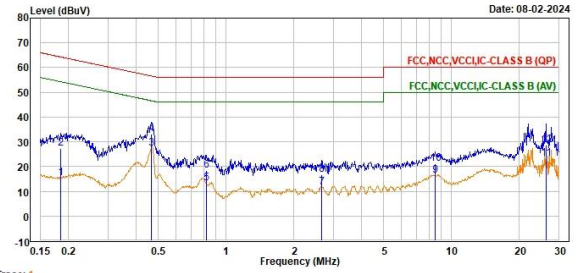


Trace: 1

	Freq	Level	Read	Limit	Over	Remark	Pol/Phase	Note
	MHz	dBuV	Level Factor	Line	Limit			
				dB	dBuV	dB		
1	0.17	14.00	4.37	9.63	54.97	-40.97	Average	line1
2	0.17	26.89	17.26	9.63	64.97	-38.08	QP	line1
3	0.47	27.90	18.27	9.63	46.52	-18.62	Average	line1
4	0.47	34.94	25.31	9.63	56.52	-21.58	QP	line1
5	0.83	14.81	5.17	9.64	46.00	-31.19	Average	line1
6	0.83	20.29	10.65	9.64	56.00	-35.71	QP	line1
7	2.60	11.10	1.44	9.66	46.00	-34.90	Average	line1
8	2.60	16.73	7.07	9.66	56.00	-39.27	QP	line1
9	15.16	20.11	10.35	9.76	50.00	-29.89	Average	line1
10	15.16	24.99	15.23	9.76	60.00	-35.01	QP	line1
11	22.92	24.57	14.82	9.75	50.00	-25.43	Average	line1
12	22.92	30.92	21.17	9.75	60.00	-29.08	QP	line1



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Trace: 1

	Freq	Level	Read	Limit	Over	Remark	Pol/Phase	Note
	MHz	dBuV	Level Factor	Line	Limit			
				dB	dBuV	dB		
1	0.18	15.25	5.62	9.63	54.26	-39.01	Average	neutral
2	0.18	27.14	17.51	9.63	64.26	-37.12	QP	neutral
3	0.47	27.32	17.69	9.63	46.60	-19.28	Average	neutral
4	0.47	33.21	23.58	9.63	56.60	-23.39	QP	neutral
5	0.82	13.22	3.58	9.64	46.00	-32.78	Average	neutral
6	0.82	18.46	8.82	9.64	56.00	-37.54	QP	neutral
7	2.66	11.53	1.86	9.67	46.00	-34.47	Average	neutral
8	2.66	16.73	7.06	9.67	56.00	-39.27	QP	neutral
9	8.50	16.51	6.74	9.77	50.00	-33.49	Average	neutral
10	8.50	21.09	11.32	9.77	60.00	-38.91	QP	neutral
11	26.35	23.18	13.31	9.87	50.00	-26.82	Average	neutral
12	26.35	28.54	18.67	9.87	60.00	-31.46	QP	neutral