



Prüfbericht-Nr.: Test report no.:	CN23UNR2 (P15C-NFC) 002	Auftrags-Nr.: Order no.:	48221068	Seite 1 von 18 Page 1 of 18
Kunden-Referenz-Nr.: Client reference no.:	N/A	Auftragsdatum: Order date:	2023-06-26	
Auftraggeber: Client:	Dot Origin Ltd Unit 7 Coopers Place, Combe Lane, Wormley, Godalming, GU8 5SZ, UK			
Prüfgegenstand: Test item:	VTAP50			
Bezeichnung / Typ-Nr.: Identification / Type no.:	VTAP50			
Auftrags-Inhalt: Order content:	FCC Part 15C Test report (NFC)			
Prüfgrundlage: Test specification:	FCC 47CFR Part 15: Subpart C Section 15.225			
Wareneingangsdatum: Date of sample receipt:	2023-06-27			
Prüfmuster-Nr.: Test sample no.:	A003445605-004			
Prüfzeitraum: Testing period:	2023-07-13			
Ort der Prüfung: Place of testing:	EMC/RF Taipei Testing Site			
Prüflaboratorium: Testing laboratory:	Taipei Testing Laboratories			
Prüfergebnis*: Test result*:	Pass			
zusammengestellt von: compiled by:	genehmigt von: authorized by:			
Datum: Date: 2023-08-09	 Ethan Shao		 Brenda Chen	
Stellung / Position:	Assistant Project Engineer		Senior Project Manager	
Sonstiges / Other:	This is a partial report for adding antenna, so we only evaluated and verify Field Strength of Fundamental Emissions and Radiated Spurious Emissions tests. The other test results are referred to the original test report no.: CN23UNR2 (P15C-NFC) 001.			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* 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
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>				

V05

TEST SUMMARY

Report Section	FCC Clause	Test Item	Result
5.1.1	15.203	Antenna Requirement	Pass
5.1.2	15.225 (a)(b)(c)	Field Strength of Fundamental Emissions	Pass
5.1.3	15.225 (d)	Radiated Spurious Emissions	Pass
-	15.225 (e)	Frequency Stability	Refer to report no.: CN23UNR2 (P15C-NFC) 001
-	15.215 (c)	20 dB Bandwidth	
-	2.1049	99% Occupied Bandwidth	
-	15.207	Mains Conducted Emission	Not Applicable

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

Contents

HISTORY OF THIS TEST REPORT	4
1. GENERAL REMARKS	5
1.1 COMPLEMENTARY MATERIALS.....	5
1.2 DECISION RULE OF CONFORMITY	5
2. TEST SITES	6
2.1 TEST LABORATORY	6
2.2 TEST FACILITY.....	6
2.3 TRACEABILITY	7
2.4 CALIBRATION	7
2.5 MEASUREMENT UNCERTAINTY	7
3. GENERAL PRODUCT INFORMATION.....	8
3.1 PRODUCT FUNCTION AND INTENDED USE	8
3.2 SYSTEM DETAILS AND RATINGS.....	8
3.3 NOISE GENERATING AND NOISE SUPPRESSING PARTS	9
3.4 SUBMITTED DOCUMENTS.....	9
4. TEST SET-UP AND OPERATION MODES.....	10
4.1 PRINCIPLE OF CONFIGURATION SELECTION	10
4.2 TEST OPERATION AND TEST SOFTWARE.....	10
4.3 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	11
4.4 TEST SETUP DIAGRAM	11
5. TEST RESULTS	12
5.1 TRANSMITTER REQUIREMENT & TEST SUITES	12
5.1.1 Antenna Requirement	12
5.1.2 Field Strength of Fundamental Emissions	13
5.1.3 Radiated Spurious Emissions	15

APPENDIX A - TEST RESULT OF RADIATED EMISSIONS

APPENDIX SP - PHOTOGRAPHS OF TEST SETUP

APPENDIX EP - PHOTOGRAPHS OF EUT

Prüfbericht - Nr.: CN23UNR2 (P15C-NFC) 002
Test Report No.

Seite 4 von 18
Page 4 of 18

HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
CN23UNR2 (P15C-NFC) 002	Original Release	2023-08-09

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

Appendix SP - Photographs of Test Setup

Appendix EP - Photographs of EUT

Applied Standard and Test Levels

Radio
FCC 47CFR Part 15: Subpart C Section 15.225
FCC 47CFR Part 2: Subpart J Section 2.1049
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
Mains Conducted Emission	± 1.65 dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a VTAP50 working at 13.56 MHz with NFC 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	VTAP50
Type Identification	VTAP50
FCC ID	2A282-VTAP50

Technical Specification of EUT

Item	EUT information
Operating Frequency	13.56 MHz
Operation Voltage	5Vdc
Modulation	ASK
Antenna Information	Refer to 5.1.1
Accessory Device	Refer to 4.3

Note:

- This report is issued as a supplementary report to TUV report no. CN23UNR2 (P15C-NFC) 001.
The difference compared with original report is adding antenna, therefore the EUT is re-tested RSE in this report.

Report Type	Report No.	Antenna Design Difference
Original	CN23UNR2 (P15C-NFC) 001	Internal Antenna
Series	CN23UNR2 (P15C-NFC) 002	Adding Antenna

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 EUT has a serial interface which makes it possible to read data from the NFC reader. The NFC reader is permanently on.

Test Software	None.
---------------	-------

The samples were used as follows:

A003445605-004

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

EUT Configure Mode	Applicable To				Description
	Radiated Spurious Emissions	Frequency Stability	20 dB 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 Y-plane.
2. "-" means no effect.

Radiated Spurious Emissions

- ☒ 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)
-	13.56	13.56

Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
Radiated Spurious Emissions	23.4-24.9 °C	61-63 %	Chuan Chu

4.3 Special Accessories and Auxiliary Equipment

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

Accessory of EUT

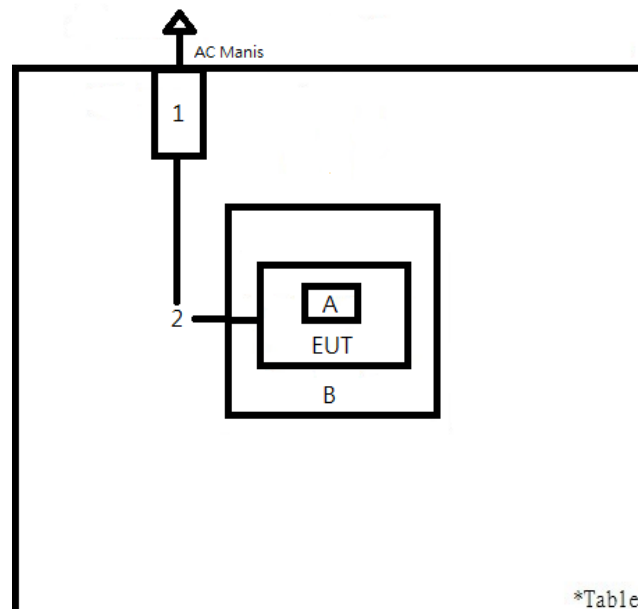
None.

Support Unit

Radiated Tests					
No.	Description	Brand	Model	S/N	Remark
A	NFC Card	DOT ORIGIN	-	-	-
B	Antenna board	DOT ORIGIN	-	-	-
1	Adapter	OPPO	VC56JACH	-	-
2	USB Cable	TUV	TUV-01	-	100 cm non-shielded cable w/o core

4.4 Test Setup Diagram

<Radiated Spurious Emissions Mode>



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

Requirement Use of approved antennas only

The antenna is internal (PCB printed) loop 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.

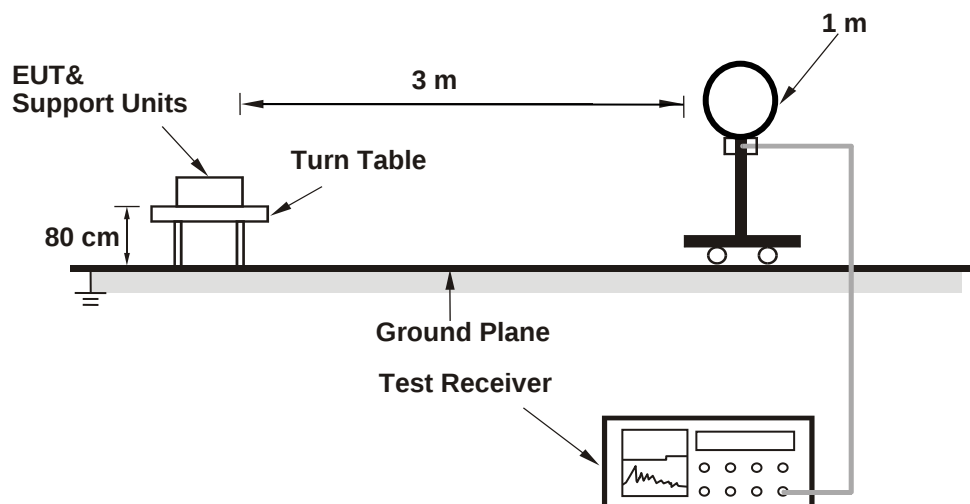
5.1.2 Field Strength of Fundamental Emissions

Limit

- The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup



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

Test Instruments

Test Date: 2023/7/13

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
30MHz ~ 1GHz					
Receiver	R&S	ESR7	102109	2023/2/24	2024/2/23
Bilog Antenna	SCHWARZBECK	VULB9618	00951	2023/3/31	2024/3/30
LF-AMP	Agilent	8447D	2944A107722	2023/3/22	2024/3/20
9kHz ~ 30MHz					
Receiver	R&S	ESR7	102109	2023/2/24	2024/2/23
Loop Antenna	SCHWARZBECK	FMZB 1519B	00215	2023/1/4	2024/1/3

Test Procedures

- 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: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.

Test Results

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

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

Limit at 30m = 15848 (uV/m)

****Limit at 3m** = $20 \cdot \log(15848) + 40 \log(30\text{m}/3\text{m})$ (dBuV/m)
= 84+40 (dBuV/m)
= 124 (dBuV/m)

Please refer to Appendix A.

5.1.3 Radiated Spurious Emissions

Limit

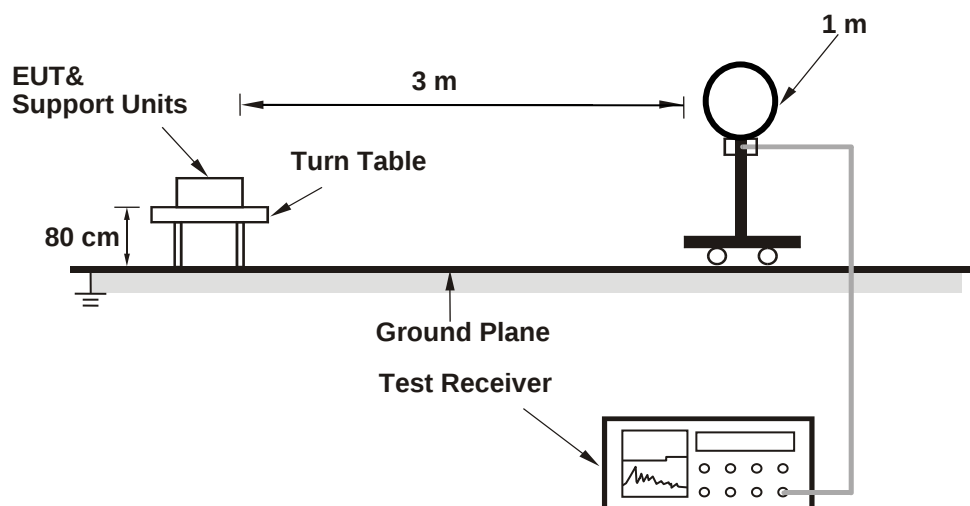
The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209 as below table:

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

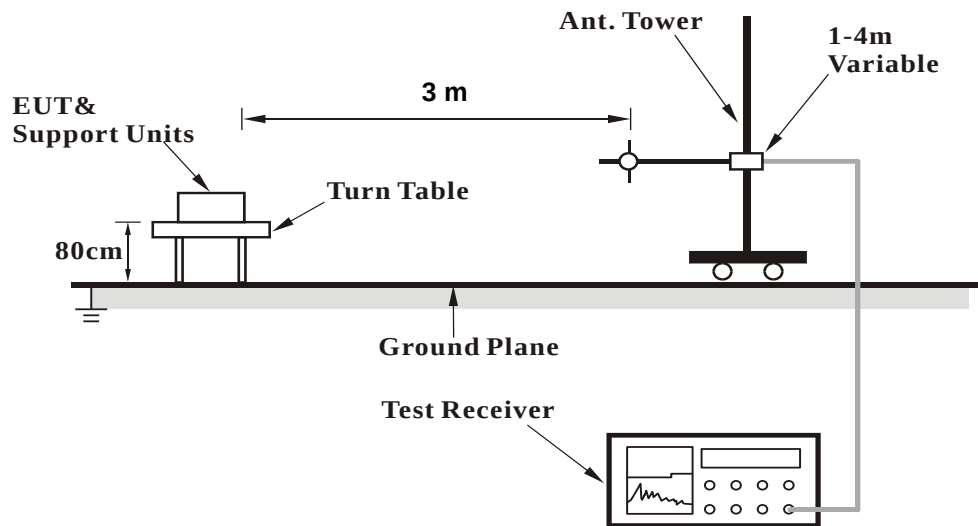
Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup

<Radiated Emissions below 30 MHz>



<Radiated Emissions 30 MHz to 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.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency are 9-90 kHz, 110-490 kHz and 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 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. All modes of operation were investigated and the worst-case emissions are reported.
3. 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.
4. 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.: CN23UNR2 (P15C-NFC) 002
Test Report No.

Seite 18 von 18
Page 18 of 18

Test Results

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

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

Please refer to Appendix A.