ETSI EN 303 413 V1.2.1 (2021-04)

TEST REPORT

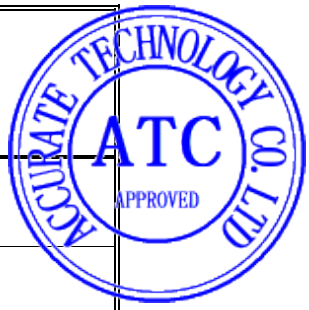
For

Shenzhen Huafurui Technology Co., Ltd.

Unit 1401 & 1402, 14/F, Jinqi Zhigu Mansion (No.4 Building of Chongwen Garden), Crossing of the Liuxian Street and Tangling Road, Taoyuan Street, Nanshan District, Shenzhen, P.R. China

Tested Model: NOTE 9

Report Type:	**Product Type:**
Original Report	Smartphone



Report Number: SZ1210419-12396E-22D

Report Date: 2021-05-18

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Smartphone
Tested Model	NOTE 9
Trade mark	CUBOT
Frequency Range	BDS B1I: 1559-1610MHz (RX); GPS L2C:1215-1300 (RX)
Modulation Technique	BPSK
Voltage Range	DC 3.85V from battery or DC 5V from adapter.
Date of Test	2021-05-09
Sample serial number	SZ1210419-12396E-RF-S1
Received date	2021-04-05
Sample/EUT Status	Good condition
Adapter 1 information	Model: HJ-0501500-UK Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5V, 1.5A
Adapter 2 information	Model: HJ-0501500W2-EU Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5V, 1.5A

Objective

This test report is in accordance with ETSI EN 303 413 V1.2.1 (2021-04), Satellite Earth Stations and Systems (SES); Global Navigation Satellite System (GNSS) receivers; Radio equipment operating in the 1 164 MHz to 1 300 MHz and 1 559 MHz to 1 610 MHz frequency bands; Harmonised Standard for access to radio spectrum.

The objective is to determine the compliance of EUT with ETSI EN 303 413 V1.2.1 (2021-04).

Test Methodology

All measurements contained in this report were conducted with ETSI EN 303 413 V1.2.1 (2021-04).

Measurement Uncertainty

Parameter		Uncertainty
Spurious Emissions, Radiated	9k-30MHz	±2.66dB
	30MHz-1000MHz	±4.28dB
	1GHz-18GHz	±4.98dB
	18GHz-26.5GHz	±5.06dB

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a typical fashion (as normally used by a typical user).

EUT Exercise Software

No exercise software.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT.

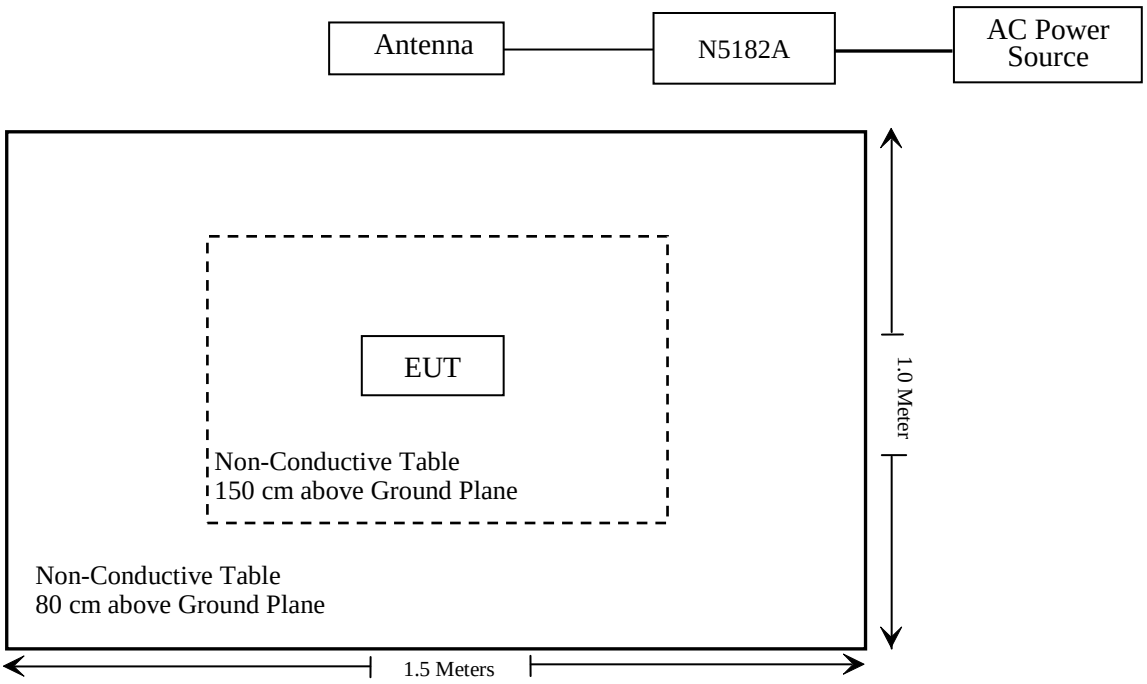
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
KEYSIGHT	VECTOR SIGNAL GENERATOR	N5182A	MY50143401

External I/O Cable

Cable Description	Length (m)	From Port	To
/	/	/	/

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

ETSI EN 303 413 V1.2.1 (2021-04)	Description of Test	Test Result
§ 4.2.1	GUE adjacent frequency band selectivity test	Compliance
§ 4.2.2	Receiver spurious emissions test	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Test Receiver	ESR	101817	2020/12/24	2021/12/23
SONOMA INSTRUMENT	Amplifier	310 N	186131	2020/12/25	2021/12/24
A.H. Systems, inc.	Preamplifier	PAM-0118P	531	2020/07/08	2021/07/07
Schwarzbeck	Bilog Antenna	VULB9163	9163-194	2021-01-05	2023-01-04
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021-01-05	2023-01-04
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-655	2021-01-05	2023-01-04
Schwarzbeck	Horn Antenna	BBHA9170	9170-359	2021-01-05	2023-01-04
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2020/12/24	2021/12/23
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	154606	2020/12/25	2021/12/24
Rohde & Schwarz	Vector Signal Generator	SMBV100A	260434	2020/12/24	2021/12/23
AGILENT	Vector Signal Generator	N5182A	MY50143401	2020/12/25	2021/12/24

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

ETSI EN 303 413 V1.2.1 (2021-04) §4.2.1 – GUE ADJACENT FREQUENCY BAND SELECTIVITY TEST

Applicable Standard

Clause 5.4 contains the procedure for testing the GUE adjacent frequency band selectivity performance.

It is recognized that alternative test methods may exist. If an alternate test method is chosen to demonstrate conformance, then it shall be ensured and declared in the test report that any alternative test method used yields results identical to those described in the present document.

Test Procedure

For GUE utilizing the 1 559 MHz to 1 610 MHz RNSS band:

1) Configure the GNSS signal generator to simulate those GNSS and GNSS signals from table 4-1 declared as supported by the GUE, with power levels and other details as specified in clause B.2.

2) With the adjacent frequency signal switched off, the EUT shall be given sufficient time to acquire all simulated satellites from the declared GNSS system(s).

2) Record the baseline C/N0 value(s) reported by the EUT. Sufficient filtering shall be used to obtain a stable value. C/N0 may be averaged across all the satellites in view for each GNSS constellation. However, C/N0 shall not be averaged across satellite signals in different GNSS constellations. For a multi-GNSS EUT, there shall be a separate C/N0 value recorded for each GNSS constellation and each GNSS signal supported.

4) The adjacent frequency signal generator shall be configured to generate the signal defined in table 4-4, at the first test point centre frequency and signal power level as specified in table 4-2.

5) The adjacent frequency signal shall be switched on, and the EUT's C/N0 value(s) recorded as in step 3) to measure the degradation with respect to the baseline value(s) recorded in step 3).

6) Test point Pass/Fail Criteria: If the C/N0 degradation from step 5) does not exceed the value in equation 4-1, then this test point is set to "pass". If the C/N0 degradation exceeds the value in equation 4-1, then this test point is set to "fail." For a multi-GNSS and multi-signal EUT, there shall be a separate pass/fail determination for each GNSS and for each GNSS signal supported. If the C/N0 degradation exceeds the value in equation 4-1 for any supported GNSS or supported GNSS signal, then this test point is set to "fail".

7) Step 1) through step 6) shall be repeated for all test point centre frequencies (and associated signal power level) specified in table 4-2.

For GUE utilizing the 1 164 MHz to 1 300 MHz RNSS bands:

For a GUE also utilizing the RNSS bands in the 1 164 MHz to 1 300 MHz range, the test method in clause 5.4.3 (step 1) through step 7), inclusive), shall be repeated using the adjacent frequency test point centre frequencies and associated signal power levels specified in table 4-3.

If the EUT passes the C/N0 degradation tests as defined in both clause 5.4.3 and clause 5.4.4, the EUT shall be deemed to "pass". If the C/N0 degradation test fails tests as defined in either or both of clause 5.4.3 or clause 5.4.4, the EUT shall be deemed to "fail".

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2021-05-09.

EUT operation mode: Receiving

Supported GNSS	Frequency band (MHz)	Test point centre frequency (MHz)	Measured C/N_0			Limit (dB)	Result
			Without interfering signal (dB-Hz)	With interfering signal (dB-Hz)	Decrease of C/N_0 (dB)		
GPS L2C	960 - 1164	1154	36	36	0	1	Pass
	1300 - 1350	1310	36	36	0	1	Pass

Supported GNSS	Frequency band (MHz)	Test point centre frequency (MHz)	Measured C/N_0			Limit (dB)	Result
			Without interfering signal (dB-Hz)	With interfering signal (dB-Hz)	Decrease of C/N_0 (dB)		
BDS B1I	1518-1525	1524	40	40	0	1	Pass
	1525-1549	1548	40	40	0	1	Pass
	1549-1559	1554	40	40	0	1	Pass
	1610-1626	1615	40	40	0	1	Pass
	1626-1640	1627	40	40	0	1	Pass

Note: The C/N_0 was tested in engineering mode.

Test Result: Compliant.

ETSI EN 303 413 V1.2.1 (2021-04) §4.2.2 –RECEIVER SPURIOUS EMISSIONS TEST

Test conditions

See clause 5.1 for the environmental test conditions. These measurements shall only be performed at the normal test conditions stated in clause 5.1.

Testing shall be performed when the EUT is in receive-only operating mode and the manufacturer shall ensure that the receiver remains active for the duration of the test. For this reason, GNSS signals may be required for this test. The manufacturer shall indicate whether GNSS signals were present or not in the test report.

The level of spurious emissions shall be measured as, either:

a) their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the EUT (cabinet radiation); or

b) the effective radiated power when radiated by cabinet and antenna in case of an EUT with integral antenna and with no temporary antenna connector.

Test Procedure

Pre-scan:

The procedure in step 1) to step 4) below shall be used to identify potential unwanted emissions of the EUT:

1) The sensitivity of the spectrum analyser should be such that the noise floor is at least 12 dB below the limits given in table 4-5.

2) The emissions over the range 30 MHz to 1 000 MHz shall be identified.

Spectrum analyser settings:

. Resolution bandwidth: 100 kHz

. Video bandwidth: 300 kHz

. Filter type: 3 dB (Gaussian)

. Detector mode: Peak

. Trace Mode: Max Hold
. Sweep Points: ⩾19 400 (for spectrum analysers not supporting this high number of sweep points, the frequency band may be segmented)

. Sweep time: Auto

Wait for the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.5.2.1.3 and compared to the limits given in table 4-5.

3) The emissions over the range 1 GHz to 8,3 GHz shall be identified.

Spectrum analyser settings:

. Resolution bandwidth: 1 MHz

. Video bandwidth: 3 MHz

. Filter type: 3 dB (Gaussian)

. Detector mode: Peak

. Trace Mode: Max Hold

. Sweep Points: ≥14 600 (for spectrum analysers not supporting this high number of sweep points, the frequency band may be segmented)

. Sweep time: Auto

Wait for the trace to stabilize. Any emissions identified during the sweeps above that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.5.2.1.3 and compared to the limits given in table 4-5.

4) In case of conducted measurements on smart antenna systems (equipment with multiple receive chains), step 2) and step 3) shall be repeated for each of the active receive chains, A_{ch}.

The limits used to identify emissions during this pre-scan shall be reduced by $10\times \log_{10}(A_{ch})$.

Measurement of the emissions identified during the pre-scan:

The procedure in step 1) to step 4) below shall be used to accurately measure the individual unwanted emissions identified during the pre-scan measurements above. This method assumes the spectrum analyser has a Time Domain Power function.

1) The level of the emissions shall be measured using the following spectrum analyser settings:
- Measurement Mode: Time Domain Power.

- Centre Frequency: Frequency of the emission identified during the pre-scan.

- Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz).

- Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz).

- Frequency Span: Zero Span.

- Sweep mode: Single Sweep.

- Sweep time: 30 ms.

- Sweep points: ⩾ 30 000.

- Trigger: Video (for burst signals) or Manual (for continuous signals).

- Detector: RMS.

2) Set a window where the start and stop indicators match the start and end of the burst with the highest level and record the RMS value of the power measured within this window. If the spurious emission to be measured is a continuous transmission, the measurement window shall be set to the start and stop times of the sweep.

3) In case of conducted measurements on smart antenna systems (equipment with multiple receive chains), step 2) shall be repeated for each of the active receive chains, Ach. Sum the measured power (within the observed window) for each of the active receive chains.

4) The value defined in step 3) shall be compared to the limits defined in table 4-5.

Radiated measurement:

The test site as described in ETSI EN 300 328 [1], annex B and the applicable measurement procedures as described in ETSI EN 300 328 [1], annex C shall be used.

The test procedure is further described in clause 5.5.2.1.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2021-05-09.

Test Mode: Receiving (GPS L2C was worst case)

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
286.75	-68.5	288	1.4	H	-3.68	-72.18	-57	15.18
286.75	-69.3	168	1.6	V	-3.4	-72.7	-57	15.7
1436.51	-64.32	219	1.1	H	-0.77	-65.09	-47	18.09
1436.51	-66.04	46	1.6	V	-0.77	-66.81	-47	19.81

Note:
Absolute Level = Reading Level + Substituted Factor
Substituted Factor contains: SG Level - Cable loss+ Antenna Gain
Margin = Limit - Absolute Level

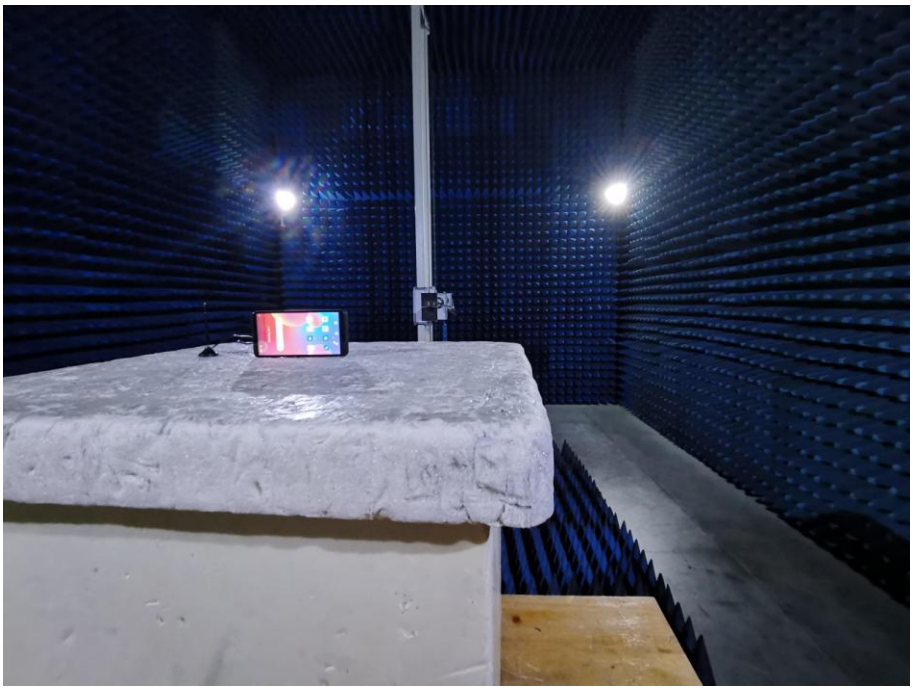
EXHIBIT A - EUT PHOTOGRAPHS

Please refer to the Attachment.

EXHIBIT B – TEST SETUP PHOTOGRAPHS

Radiated Spurious Emissions Test View (Below 1GHz)

Radiated Spurious Emissions Test View (Above 1GHz)



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