NFC TEST REPORT

No.I19Z61344- IOT01

for

Smart Phone

HD1925

FCC ID: 2ABZ2-EE143

with

Hardware Version: 46
Software Version: Oxygen OS 10.0.HD61CB

Issued Date: 2019-10-30

TESTING
NVLAP LAB CODE 600118-0

Note:

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I19Z61344-IOT01	Rev.0	1st edition	2019-09-16
I19Z61344-IOT01	Rev.1	Modified the normal voltage information. Renew Figure B-1 in Page 16.	2019-10-30

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1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (ISED#: 24849). The detail accreditation scope can be found on NVLAP website

1.2. Testing Location

Location 1: CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191

Location 2: CTTL(Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China 100191

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1.3. Testing Environment

Normal Temperature:	15-35℃
Extreme Temperature:	-20/+55℃
Normal Relative Humidity:	20-75%
Normal Air Pressure	86Kpa-106Kpa

1.4. Project data

Testing Start Date:	2019-08-30
Testing End Date:	2019-09-16

1.5. Signature

Zhang Qiang

(Prepared this test report)

Pang Shuai

(Reviewed this test report)

Zhu Liang

(Approved this test report)

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2. Client Information

2.1. Applicant Information

Company Name:	OnePlus Technology （shenzhen） Co., Ltd
Address:	18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen
City:	SHENZHEN
Postal Code:	/
Country:	CHINA
Telephone:	13823398081
Fax:	/

2.2. Manufacturer Information

Company Name:	OnePlus Technology (Shenzhen) Co., Ltd.
Address:	18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen
City:	SHENZHEN
Postal Code:	/
Country:	CHINA
Telephone:	13823398081
Fax:	/

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3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	Smart Phone
Model name/HVIN	HD1925
Marketing Name/PMN	/
Brand name	ONEPLUS
FCC ID	2ABZ2-EE143
UMTS Frequency Band(s)	FDD I/II/IV/V/VIII/IX/XIX
GSM Frequency Band(s)	GSM900/1800/1900/850
E-UTRA Frequency Band(s)	FDD01/02/03/04/05/07/08/12/13/14/17/18/19/20/25/26/28/29/30/34/38/39/41/46/66/71
Extreme Temperature	0/+35℃
Nominal Voltage	3.87V
Extreme High Voltage	4.3V
Extreme Low Voltage	3.6V

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
11a	99001382005043& 990013820050438	46	Oxygen OS 10.0.HD61CB	2019-08-30
12a	990013820050255	46	Oxygen OS 10.0.HD61CB	2019-09-04

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE

AE ID*	Description	SN
AE1	Battery	Inbuilt
AE2	Charger	CH007/008
AE3	USB Cable	/
AE16	PICC Card	/

AE1

Model	BLP745
Manufacturer	Sunwoda Electronic Co.,Ltd.
Capacitance	4010mAh
Nominal voltage	3.87V

AE2

Model	WC0506A5HK
Manufacturer	SHENZHEN HUNTKEY ELECTRIC CO.,LTD.
Length of cable	/

AE3

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Model	/
Manufacturer	/
Length of cable	/

AE16

Model	PICC Card
Manufacturer	/
Length of cable	/

*AE ID: is used to identify the test sample in the lab internally.

3.4. EUT Set-ups

EUT Set-up No.	Combination of EUT and AE	Remarks
Set. NFC01	12a+ AE1+ AE2 + AE3 +AE16	--
Set. NFC02	12a+ AE1+ AE16	--
Set. NFC03	11a	--

The Transmit State of NFC: the NFC function is on. The EUT will transmit the NFC data and command continuously during the test.

The Transmit state of without modulation: The EUT will transmit the CW signal at the operating frequency.

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4. Reference Documents

4.1. Documents supplied by applicant

EUT parameters, referring to Annex A for detailed information, is supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
CFR 47 Part 2	Part 2 — Frequency Allocations and Radio Treaty Matters; General Rules and Regulations.	2018
CFR 47 Part 15	Part 15 — Radio Frequency Devices. Subpart C — Intentional Radiators. § 15.35 Measurement detector functions and bandwidths. § 15.207 Conducted limits. § 15.209 Radiated emission limits, general requirements. § 15.215 Additional provisions to the general radiated emission limitations. § 15.225 Operation within the band 13.110–14.010 MHz.	2018
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013

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5. Test Results

5.1. Summary of Test Results

No	Test Cases	Clause in Regulation	Section in This Report	Verdict
1	Electric Field Strength of Fundamental Emissions	CFR 47 § 15.225(a)	B.1	P(Set. NFC02)
2	Electric Field Strength of Outside the Allocated Bands	CFR 47 § 15.225(b) CFR 47 § 15.225(c)		P(Set. NFC02)
3	Electric Field Radiated Emissions	CFR 47 § 15.209	B.2	P(Set. NFC01)
		CFR 47 § 15.225(d)	B.3	P(Set. NFC01)
4	Frequency Tolerance	CFR 47 § 15.225(e)	B.4	P(Set. NFC03)
5	20dB Bandwidth	CFR 47 § 15.215(c)	B.5	P(Set. NFC03)
6	Conducted Emissions	CFR 47 § 15.207	B.6	P(Set. NFC01)
The measurement is carried out according to ANSI C63.10. See **ANNEX B** for details.				

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Test Conditions:

For this report, all the test cases listed above were tested under normal Temperature, Voltage, humidity, and Air Pressure except the Frequency Tolerance test case. The specific conditions of Frequency Tolerance test case are as following:

Temperature	T min	-20
	T nom	20℃
	T max	50
Voltage	V min	3.6 V
	V nom	3.87 V
	V max	4.3 V
Humidity	H nom	20%-75%
Air Pressure	A nom	86Kpa-106Kpa

5.2. Terms Used in the Summary of Test Results

Terms Used in Condition Column:

T nom	Normal Temperature
T min	Low Temperature
T max	High Temperature
V nom	Normal Voltage
V min	Low Voltage
V max	High voltage
H nom	Norm Humidity
A nom	Norm Air Pressure

Terms Used in Verdict Column:

P	Pass, The EUT complies with the essential requirements in the standard.
NP	Not Perform, The test was not performed by CTTL
NA	Not Applicable, The test was not applicable
F	Fail, The EUT does not comply with the essential requirements in the standard

5.3. Statements

The test cases listed in Section 5.1 of this report for the EUT specified in Section 3 were performed by CTTL according to the reference documents in Section 4.

The EUT meets all applicable requirements of the regulations and standards in Section 4.2.

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6. Test Facilities Utilized

NO.	NAME	TYPE	SERIES NUMBER	PRODUCER	CAL. DUE DATE	CAL. INTERVAL
1.	Spectrum Analyzer	RSA3408A	B010277	Tektronix	2020-09-26	1 Year
2.	Climatic chamber	SH242	93008658	Key sight	2020-02-27	1 Year
3.	H-field Antenna	HFH2-Z2	829324/007	R&S	2020-12-03	1 Year
4.	Test Receiver	ESCI	100344	R&S	2020-02-14	1 Year
5.	Universal Radio Communication Tester	CMW500	150344	R&S	2019-12-27	1 Year
6.	Universal Radio Communication Tester	CMW500	116588	R&S	2019-12-26	1 Year
7.	LISN	ENV216	101200	R&S	2020-03-14	1 Year
8.	Test Receiver	ESU26	100235	Rohde & Schwarz	2020-03-01	1 Year
9.	BiLog Antenna	VULB9163	9163-1222	Schwarzbeck	2020-03-14	1 Year

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7. Measurement Uncertainty

Item	Uncertainty
Frequency Tolerance	*U* =77 Hz, k=2
20dB Bandwidth	*U* =77 Hz, k=2
Radiated Emissions (<1GHz)	*U* =4.86 dB, k=2
Radiated Emissions (>1GHz)	*U* =5.26 dB, k=2
Conducted emission	*U* = 3.38 dB, k=2

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ANNEX A: EUT parameters

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ANNEX B: Detailed Test Results

B.1. Electric Field Strength of Fundamental and Outside the Allocated bands

B.1.1. Reference

See Clause 4, Clause 5 of ANSI C63.10-2013 generally.

B.1.2. Measurement Methods

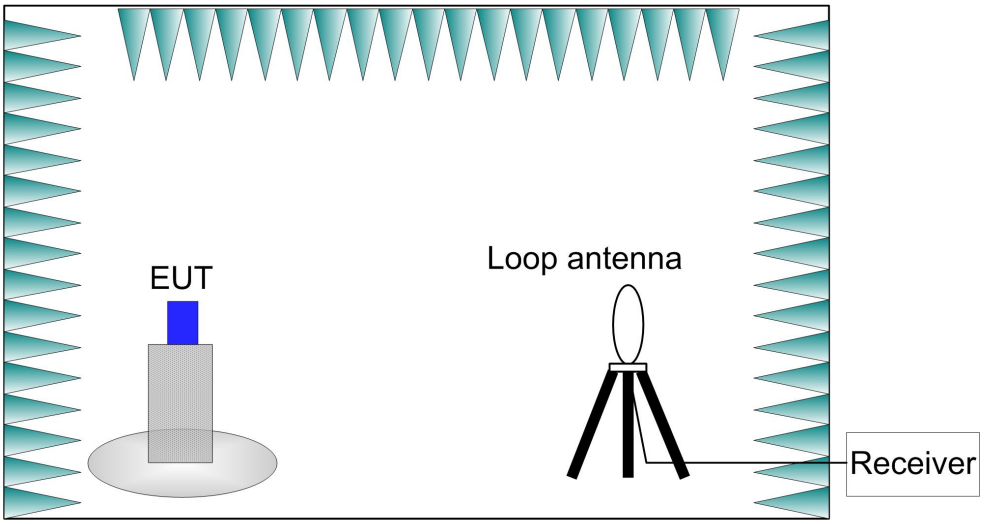
The transmitter carrier output levels (E-Field) from the EUT are measured in a semi-anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 3m from the receiving antenna. The center of the receiving loop antenna is 1.0 meter above the ground. The E-field is measured with a shielded loop antenna connected to a measurement receiver. Detected E-field was maximized by rotating the EUT through 360° and adjusting the receiving antenna polarizations. The maximization processes were repeated with the EUT positioned respectively in its three orthogonal axes. The measurements were performed with the peak detector and if required, the quasi-peak detector.

The measurement bandwidth is:

Frequency of Emission (MHz)	RBW/VBW
12.56-14.56	10/30 kHz

The E-field measured at 3m is calculated as:

E-field (dBμV/m) = Rx (dBμV) + Cable Loss (dB) + AF@3m (dB/m)



B.1.3. EUT Operating Mode and Test Conditions

The measurement of EUT is carried out under the transmit state of NFC(See 3.4).

The EUT is powered by a travel adapter.

During the measurements, the ambient temperature of the electromagnetic anechoic chamber is in the range of 15 ~ 25 ℃.

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B.1.4. Limits

Frequency Range (MHz)	E-field Strength Limit @ 30 m (μV/m)	E-field Strength Limit @ 3 m (dBμV/m)
13.560 ± 0.007	+15,848	124
13.410 to 13.553 13.567 to 13.710	+334	90
13.110 to 13.410 13.710 to 14.010	+106	81
Note: Where the limits have been defined at one distance, and a signal level measured at another, the limits have been extrapolated using the following formula: $\text{Extrapolation(dB)} = 40\log_{10}(\text{Measurement Distance}/\text{Specification Distance})$		

B.1.5. Measurement Results

Measurement results of normal conditions see Figure B-1 for different set-ups of EUT. The result displayed take into account applicable antenna factors and cable losses.

Conclusions: Set.NFC02, **PASS**.

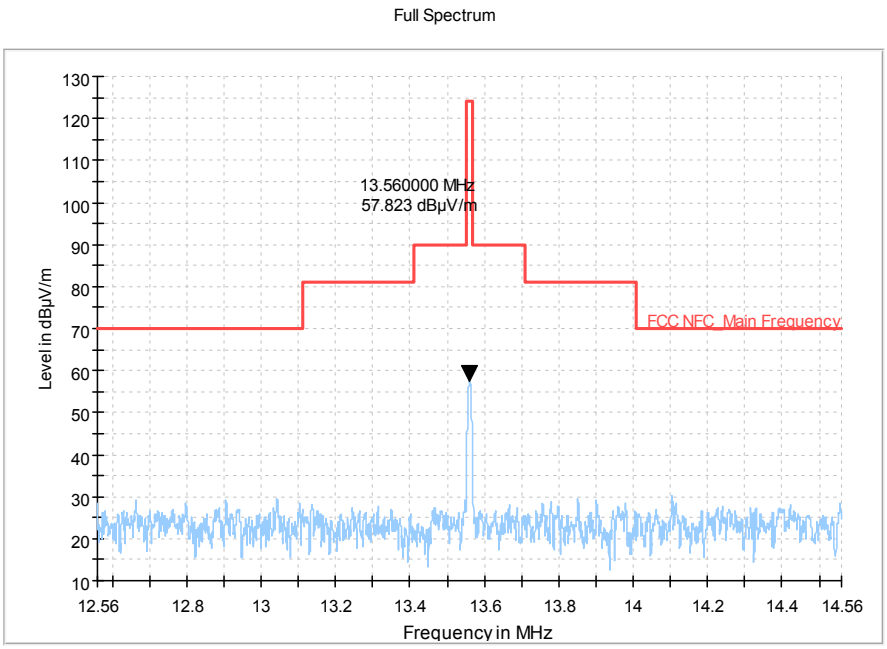

Figure B-1: Set.NFC02

B.2. Electric Field Radiated Emissions (< 30MHz)

B.2.1. Reference

See Clause 6.4 of ANSI C63.10-2013 specifically.

See Clause 4 and Clause 5 of ANSI C63.10-2013 generally.

B.2.2. Measurement Methods

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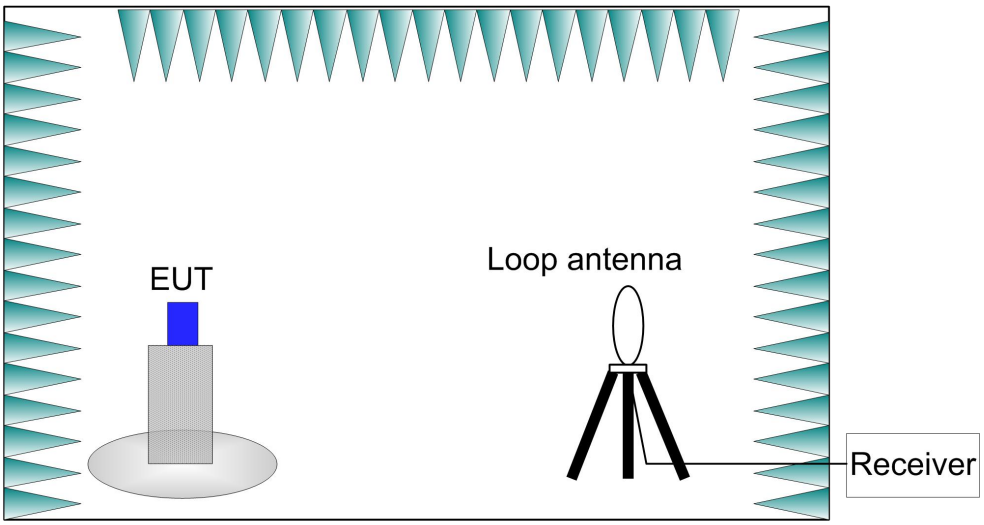
The transmitter carrier output levels (E-Field) from the EUT are measured in a semi-anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 3m from the receiving antenna. The center of the receiving loop antenna is 1.0 meter above the ground. The E-field is measured with a shielded loop antenna connected to a measurement receiver. Detected E-field was maximized by rotating the EUT through 360° and adjusting the receiving antenna polarizations. The maximization processes were repeated with the EUT positioned respectively in its three orthogonal axes. The measurements were performed with the peak detector and if required, the quasi-peak detector.

The measurement bandwidth is:

Frequency of Emission (MHz)	RBW/VBW
0.009-0.15	100/300 Hz
0.15-30	10/30 kHz

The E-field measured at 3m is calculated as:
E-field (dBμV/m) = Rx (dBμV) + Cable Loss (dB) + AF@3m (dB/m)



B.2.3. EUT Operating Mode and Test Conditions

The measurement of EUT is carried out under the transmit state of NFC(See 3.4).
The EUT is powered by a travel adapter.
During the measurements, the ambient temperature of the electromagnetic anechoic chamber is in the range of 15 ~ 25 ℃.

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B.2.4. Limits

Frequency Range (MHz)	E-field Strength Limit @ 30m (mV/m)	E-field Strength Limit @ 3m (dBμV/m)
0.009-0.490	2400/F(kHz)	129-94
0.490-1.705	24000/F(kHz)	74-63
1.705-30	30	70
Note: Where the limits have been defined at one distance, and a signal level measured at another, the limits have been extrapolated using the following formula: $\text{Extrapolation(dB)} = 40\log_{10}(\text{Measurement Distance}/\text{Specification Distance})$		

B.2.5. Measurement Results

Measurement results of normal conditions see Figure B-2 for different set-ups of EUT. The result displayed take into account applicable antenna factors and cable losses.

Conclusions: Set.NFC01, **PASS**.

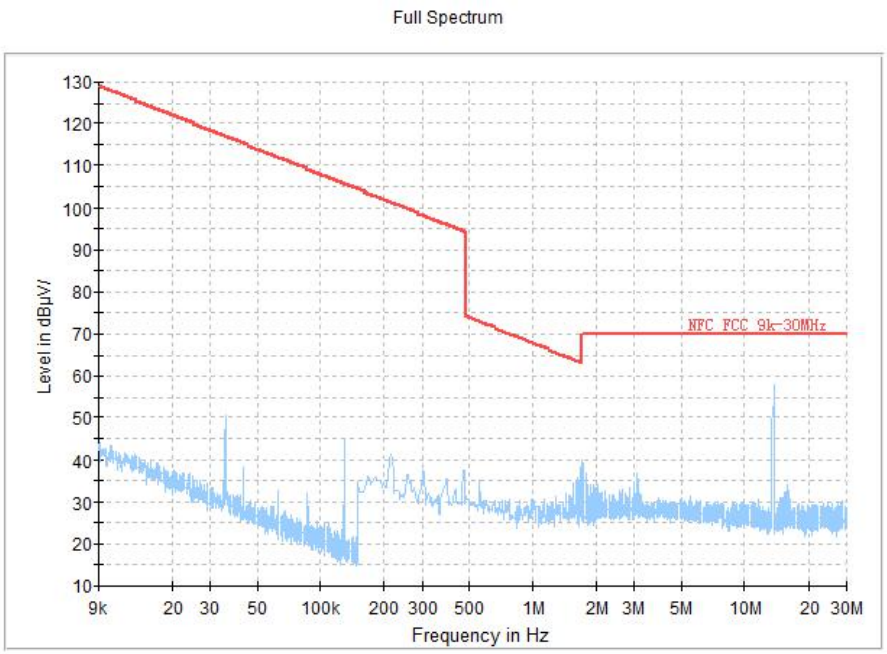

Figure B-2: Set.NFC01

B.3. Electric Field Radiated Emissions (≥30MHz)

B.3.1. Reference

See Clause 6.5 of ANSI C63.10-2013 specifically.

See Clause 4 and Clause 5 of ANSI C63.10-2013 generally.

B.3.2. Measurement Methods

The electric field radiated emissions from the EUT are measured in a semi-anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 10m

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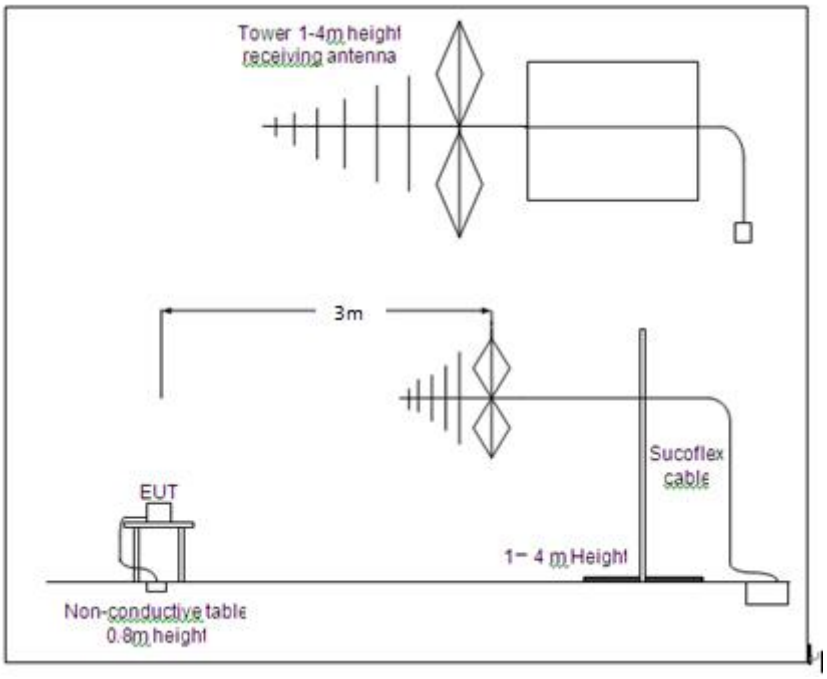
from the receiving antenna. The receiving antennas connected to a measurement receiver. In order to search for maximum field strength emitted from the EUT, the receiving antenna can be moved between the height of 1.0 m to 4.0 m. Detected E-field was maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna positions for both vertical and horizontal antenna polarizations. The maximization processes were repeated with the EUT positioned respectively in its three orthogonal axes. The measurements were performed with the peak detector and if required, the quasi-peak detector.

The measurement bandwidth is:

Frequency of Emission (MHz)	RBW/VBW
30-1000	120kHz



B.3.3. EUT Operating Mode and Test Conditions

The measurement of EUT is carried out under the transmit state of NFC(See 3.4).

EUT1 had been connected to a travel adapter.

During the measurements, the ambient temperature of the electromagnetic anechoic chamber is in the range of 15 ~ 25 ℃.

B.3.4. Limits

Frequency Range (MHz)	E-field Strength Limit @ 3m (mV/m)	E-field Strength Limit @ 3m (dBμV/m)	E-field Strength Limit @ 10m (dBμV/m)
30-88	100	40	30
88-216	150	43.5	33.5
216-960	200	46	36
960-1000	500	54	44

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B.3.5. Measurement Results

Measurement results of normal conditions see Figure B-3 for different set-ups of EUT. The result displayed take into account applicable antenna factors and cable losses.

Conclusions: Set.NFC01, **PASS**.

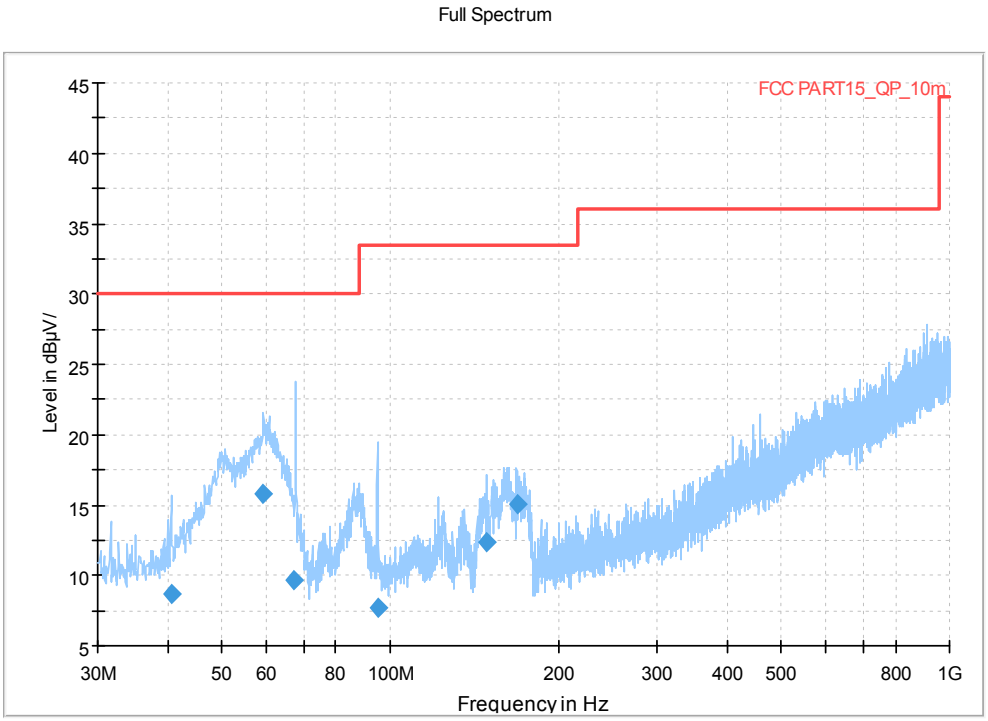

Figure B-3: Set.NFC01

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
40.670000	8.64	30.00	21.36	1000.0	120.000	400.0	V	98.0
59.211000	15.81	30.00	14.19	1000.0	120.000	102.0	V	30.0
67.350000	9.72	30.00	20.28	1000.0	120.000	116.0	V	-29.0
95.073000	7.67	33.50	25.85	1000.0	120.000	125.0	V	265.0
148.756000	12.39	33.50	21.13	1000.0	120.000	112.0	V	23.0
168.622000	15.06	33.50	18.46	1000.0	120.000	125.0	V	300.0

B.4. Frequency Tolerance

B.4.1. Reference

See Clause 6.8 of ANSI C63.10-2013 specifically.

See Clause 4 and Clause 5 of ANSI C63.10-2013 generally.

B.4.2. Measurement Methods

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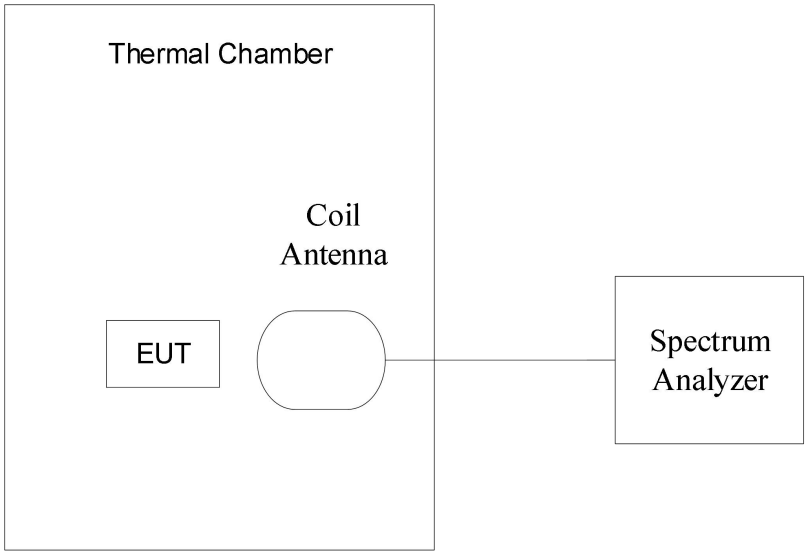

The transmitter output signal was picked up by coil antenna connected to the frequency counter. The center frequency was measured with 30Hz RBW and 1kHz span.
During the test, the EUT was placed in a thermal chamber until thermal balance and lasting appropriate time.

B.4.3. EUT Operating Mode and Test Conditions

The measurement of EUT is carried out under the transmit state of without modulation(See 3.4).
EUT had been not connected to a travel adapter.
Operation Temperature: T min, T nom, and T max with V nom.
Operation Voltage: V min and V max with T nom.

B.4.4. Test Layouts

See B.4.2.

B.4.5. Limits

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency.

B.4.6. Measurement Results

Measurement results see Table B-1 for different test conditions.
Conclusions: Set.NFC03, **PASS**.

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TableB-1: Frequency Stability VS Temperature and Voltage

Temperature	Voltage	Frequency Error (MHz)			
		Startup	2 Min Later	5 Min Later	10 Min Later
T min	V nom	13.559715625	13.559761875	13.559771875	13.559766875
T max	V nom	13.559709375	13.559665625	13.55966125	13.5596575
T nom	V nom	13.5596675	13.55968375	13.559705625	13.559801875
T nom	V min	13.559715625	13.559730625	13.559725	13.55972875
T nom	V max	13.559725	13.5597125	13.5597375	13.5599875

Temperature	Voltage	Frequency Error (%)			
		Startup	2 Min Later	5 Min Later	10 Min Later
T min	V nom	-0.002	-0.002	-0.002	-0.002
T max	V nom	-0.002	-0.002	-0.002	-0.003
T nom	V nom	-0.002	-0.002	-0.002	-0.001
T nom	V min	-0.002	-0.002	-0.002	-0.002
T nom	V max	-0.002	-0.002	-0.002	0.000

B.4.7. Measurement Uncertainty

Measurement uncertainty: *U* =77 Hz, k=2

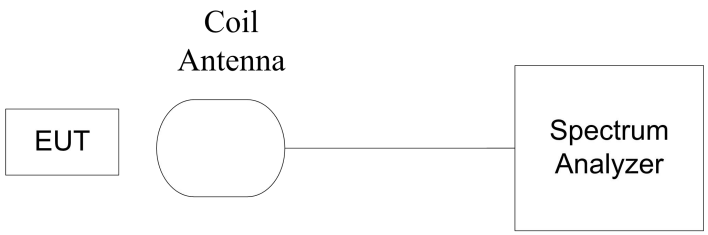
B.5. 20dB Bandwidth

B.5.1. Reference

See Clause 6.9 of ANSI C63.10-2013 specifically.
See Clause 4 and Clause 5 of ANSI C63.10-2013 generally.

B.5.2. Measurement Methods

The transmitter output signal was picked up by coil antenna to the spectrum analyzer.
The transmitter output signal was picked up by coil antenna connected to the spectrum analyzer. The bandwidth of the center frequency was measured with 140Hz RBW, 420Hz VBW and 14kHz span.



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B.5.3. EUT Operating Mode and Test Conditions

The measurement of EUT is carried out under the transmit state of NFC and without modulation(See 3.4).

EUT had been not connected to a travel adapter..

During the measurements, the ambient temperature is in the range of 15 ~ 25 ℃.

B.5.4. Test Layouts

See B.5.2.

B.5.5. Limits

The 20dB bandwidth shall be less than 80% of the permitted frequency band. For 13.56 MHz NFC, the permitted frequency band is 14kHz, so the limit is 11.2 kHz.

B.5.6. Measurement Results

Measurement results see Figure B-4.

Conclusions: Set.NFC03, **PASS**.

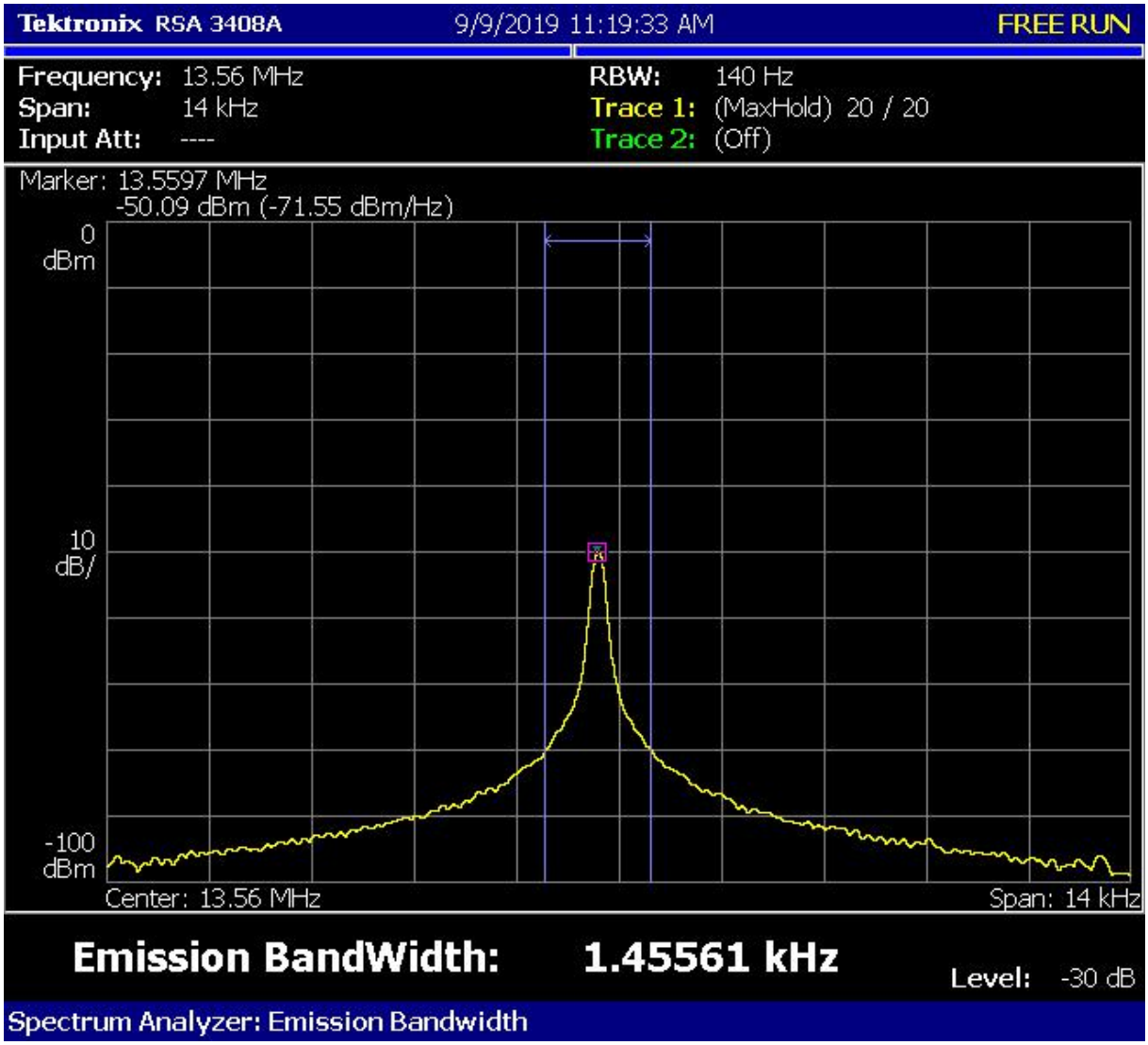

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Figure B-4: Set.NFC03

B.5.7. Measurement Uncertainty

Measurement uncertainty: *U* =77 Hz, k=2

B.6. Conducted emission

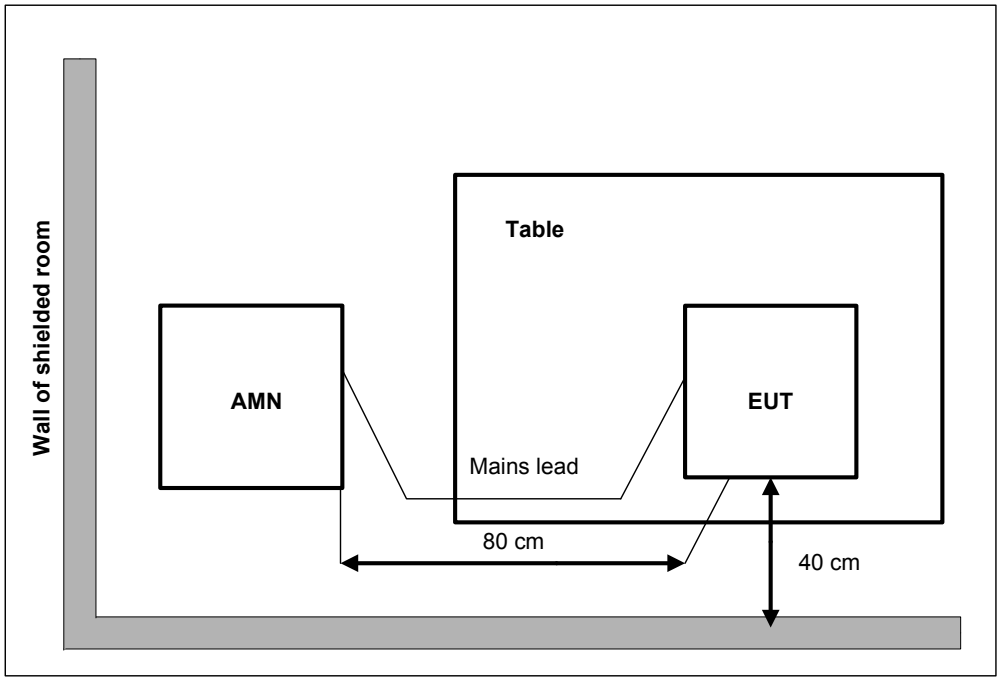
B.6.1. Reference

See Clause 6.2 of ANSI C63.10-2013 specifically.
See Clause 4 and Clause 5 of ANSI C63.10-2013 generally.

B.6.2. Measurement Methods

The conducted emissions from the AC port of the EUT are measured in a shielding room. The EUT is connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection was performed. The measurements were performed with a quasi-peak detector and if required, an average detector.
The conducted emission measurements were made with the following detector of the test receiver: Quasi-Peak / Average Detector.
The measurement bandwidth is:

Frequency of Emission (MHz)	RBW/VBW
0.15-30	9kHz



B.6.3. EUT Operating Mode and Test Conditions

The measurement of EUT is carried out under the transmit state of NFC(See 3.4).
The EUT is powered by a travel adapter.
During the measurements, the ambient temperature is in the range of 15 ~ 25 ℃.

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B.6.4. Limits

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Average Limit (dBμV)
0.15 to 0.5	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50

B.6.5. Measurement Results

Measurement results see Figure B-5.

Conclusions: Set.NFC01, **PASS**.

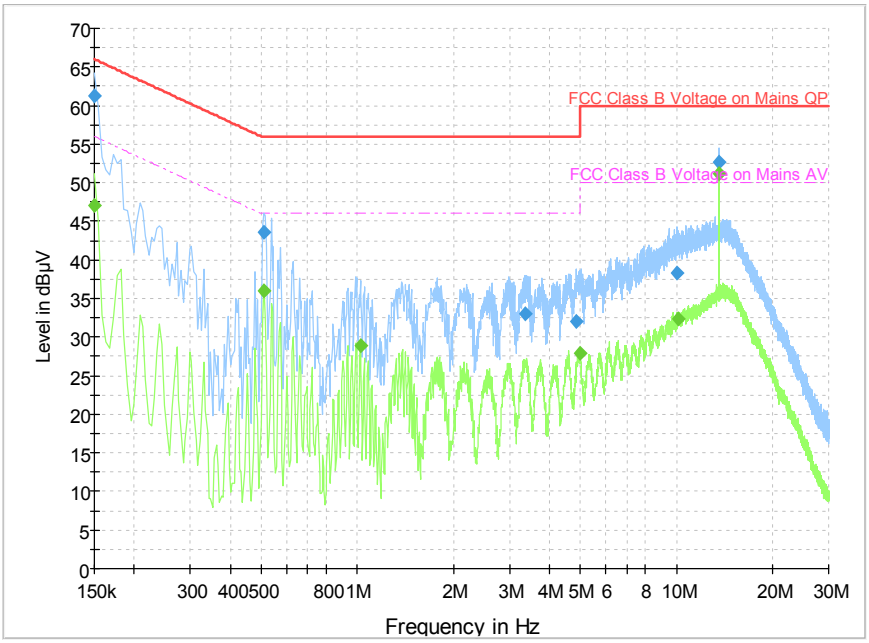

Figure B-5: Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.150000	61.2	2000.0	9.000	On	L1	30.7	4.8	66.0	
0.510000	43.6	2000.0	9.000	On	N	19.8	12.4	56.0	
3.372000	33.0	2000.0	9.000	On	N	19.6	23.0	56.0	
4.870500	32.0	2000.0	9.000	On	N	19.6	24.0	56.0	
10.086000	38.3	2000.0	9.000	On	N	19.7	21.7	60.0	
13.560000	52.7	2000.0	9.000	On	N	19.8	7.3	60.0	

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Final Result 2

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.150000	47.0	2000.0	9.000	On	L1	30.7	9.0	56.0	
0.510000	35.9	2000.0	9.000	On	N	19.8	10.1	46.0	
1.023000	28.9	2000.0	9.000	On	N	19.7	17.1	46.0	
4.978500	27.9	2000.0	9.000	On	N	19.6	18.1	46.0	
10.122000	32.4	2000.0	9.000	On	N	19.7	17.6	50.0	
13.560000	51.3	2000.0	9.000	On	N	19.8	-1.3	50.0	

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ANNEX C: Persons involved in this testing

Test Item	Tester
20dB Bandwidth	Zhou Bin
Frequency Tolerance	Zhou Bin
Electric Field Strength of Fundamental and Outside the Allocated bands	Yanhanchen
Electric Field Radiated Emissions (< 30MHz)	LiPengfei
Electric Field Radiated Emissions (≥30MHz)	LiPengfei
Conducted Emissions	Shisuolan

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ANNEX D: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 600118-0

Telecommunication Technology Labs, CAICT
Beijing
China

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2019-09-26 through 2020-09-30
Effective Dates

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

For the National Voluntary Laboratory Accreditation Program

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

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