TEST REPORT

No. I21Z61482-EMC02

for

TCL Communication Ltd.

5G NR/LTE/WCDMA/GSM Mobile Phone

Model Name: T781S,T781SPP

FCC ID: 2ACCJN056

with

Hardware Version: 03

Software Version: 3D4Y

Issued Date: 2021-11-16

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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

Tel: +86(0)10-62304633-2512, Fax: +86(0)10-62304633-2504

Email: cttl_terminals@caict.ac.cn, website: www.caict.ac.cn

REPORT HISTORY

Report Number	Revision	Description	Issue Date
I21Z61482-EMC02	Rev.0	1st edition	2021-10-08
I21Z61482-EMC02	Rev.1	2nd edition.updata measurement method in A.2.1.	2021-10-15
I21Z61482-EMC02	Rev.2	3rd edition.Add mmW antenna information in 3.4.	2021-11-02
I21Z61482-EMC02	Rev.3	4th edition. Add note in Section 5.	2021-11-16

Note: the latest revision of the test report supersedes all previous version.

CONTENTS

1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 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 (CN0066). 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

1.3. Testing Environment

Normal Temperature: 15-35℃

Relative Humidity: 20-75%

1.4. Project Data

Testing Start Date: 2021-08-31

Testing End Date: 2021-09-30

1.5. Signature

张颖

Zhang Ying

(Prepared this test report)

安辉

An Hui

(Reviewed this test report)

张夏

Zhang Xia

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	TCL Communication Ltd.
Address /Post:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
City:	Hong Kong
Postal Code:	/
Country:	China
Telephone:	0086-755-36611722
Fax:	0086-755-36612000-81722

2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
Address /Post:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
City:	Hong Kong
Postal Code:	/
Country:	China
Telephone:	0086-755-36611722
Fax:	0086-755-36612000-81722

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

3.1. About EUT

Description	5G NR/LTE/WCDMA/GSM Mobile Phone
Model Name	T781S,T781SPP
FCC ID	2ACCJN056
Antenna	Embedded
Output power	20.44dBm maximum EIRP measured for n260
Extreme vol. Limits	4.4VDC to 3.6VDC (nominal: 3.8VDC)
Extreme temp. Tolerance	-10°C to +55°C

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of CTTL.

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
UT52a	016048000215922	03	3D4Y
UT78a	016048000215781	03	3D4Y

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

3.3. Internal Identification of AE used during the test

AE ID*	Description
AE1	Battery

AE1

Model	TLp043F1
Manufacturer	BYD
Capacitance	4360mAh
Rated Voltage	3.8V

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

3.4. EUT Antenna Description

The EUT has two antenna module of FR2. There are antenna A9 and antenna A10,See the Antenna specification.In this report,the module 0 is antenna A9,the module1 is antenna A10.We tested all combinations of module 0 and module 1， but only the worst results are given in this report.

Module 0 (antenna A9)	Chain 0
	Chain 1
	2*2
Module 1 (antenna A10)	Chain 0
	Chain 1
	2*2

Note: Chain 0 work in vertically polarization,Chain 1 work in horizontal polarization,2*2 Work in the horizontal polarization and vertical polarization superposition states.

Reference Documents

3.5. 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.

3.6. Reference Documents for testing

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

Reference	Title	Version
FCC Part 30	UPPER MICROWAVE FLEXIBLE USE SERVICE	10-1-20 Edition
ANSI C63.26	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	2015
KDB 842590	Upper Microwave Flexible Use Service v01r01	April 3, 2020

4. Laboratory Environment

Semi/Full-anechoic chamber SAC-1 (23 meters × 17meters × 10meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 M
Ground system resistance	< 4
Normalised site attenuation (NSA)	**<** ± 4 dB, 3m/10m distance, from 30 to 1000 MHz
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz

5. Summary Of Test Result

n260

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	2.1046, 30.202	Pass
2	Unwanted Emission	30.203	Pass
3	Frequency Stability	2.1055	Pass
4	Occupied Bandwidth	2.1049	Pass
5	Band Edge Compliance	2.1051, 30.203	Pass

n261

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	2.1046, 30.202	Pass
2	Unwanted Emission	30.203	Pass
3	Frequency Stability	2.1055	Pass
4	Occupied Bandwidth	2.1049	Pass
5	Band Edge Compliance	2.1051, 30.203	Pass

Terms used in Verdict column

P	Pass. The EUT complies with the essential requirements in the standard.
NP	Not Performed. The test was not performed by CTTL.
NA	Not Applicable.The test was not applicable.
BR	Re-use test data from basic model report.
F	Fail. The EUT does not comply with the essential requirements in the standard.

Explanation of worst-case configuration

The worst-case scenario for all measurements is based on the output power measurement investigation results. Output power was measured on QPSK,16QAM and 64QAM modulations. If it was found that QPSK was the worst case. All testing was performed using QPSK modulations to represent the worst case unless otherwise stated. The test results shown in the following sections represent the worst case emission.

Note: The emissions testing above 100 GHz was subcontracted.

Measurement Uncertainty

Measurement Uncertainty:

Frequency Range	Uncertainty(dB) (k=2)
30MHz-1GHz	5.18
1GHz-18GHz	5.54
18GHz-40GHz	5.26
40GHz-60GHz	3.80
60GHz-75GHz	3.76
75GHz-110GHz	3.80

6. Test Equipment Utilized

NO.	NAME	TYPE	SERIES NUMBER	PRODUCER	CAL. DUE DATE	CAL. INTERVAL
1	Signal Generator	SMF100A	104940	R&S	2021-12-09	1 year
2	Signal Generator	E8257D （60GHz）	MY59140557	Keysight	2022-01-19	1 year
3	Antenna	VULB 9163	1223	SCHWARZBECK	2022-03-22	1 year
4	Antenna	3115	6914	ETS-Lindgren	2022-02-03	1 year
5	Upconverter(50GHz-75GHz)	SMZ-75	101309	R&S	2022-01-14	1 year
6	Upconverter(75GHz-110GHz)	SMZ-110	101357	R&S	2022-01-14	1 year
7	Upconverter(110GHz-170GHz)/	82406B	ZEI00141	Ceyear	2022-02-04	1 year
8	Upconverter(170GHz-220GHz)/	82406C	ZEI00164	Ceyear	2022-02-04	1 year
9	Spectrum Analyzer	FSW67	103290	R&S	2022-02-04	1 year
10	(downconverter)Harmonic Mixer(60GHz-90GHz)	FS-Z90	101655	R&S	2022-02-04	1 year
11	(downconverter)Harmonic Mixer(75GHz-110GHz)	FS-Z110	101463	R&S	2022-01-19	1 year
12	(downconverter)Harmonic Mixer(110GHz-170GHz)/	FS-Z170	101008	R&S	2022-02-17	1 year
13	(downconverter)Harmonic Mixer(170GHz-220GHz)/	FS-Z220	101054	R&S	2021-12-14	1 year
14	Standard Gain Horn （40GHz-60GHz）	LB-19-25	J202024086	A-INFO	2022-01-14	1 year
15	Standard Gain Horn （40GHz-60GHz）	LB-19-25	J202024087	A-INFO	2022-01-14	1 year
16	Standard Gain Horn （60GHz-90GHz）	LB-12-25	J202062912	A-INFO	2022-02-17	1 year
17	Standard Gain Horn （50GHz-75GHz）	LB-15-25	J202062019	A-INFO	2021-12-14	1 year
18	Standard Gain Horn （75GHz-110GHz）	LB-10-25	J202023231	A-INFO	2022-01-27	1 year
19	Standard Gain Horn （75GHz-110GHz）	LB-10-25	J202023232	A-INFO	2022-01-27	1 year
24	DC power supply	PAS20-18	UH000695	Kikusui	2022-08-14	1 year
25	Incubator	SH-641	92009470	ESPEC	2022-02-14	1 year
26	Receiver	ESP40	100012	R&S	2022-01-03	1 year

Annex A: Measurement Results

A.1 Radiated Output Power

A.1.1 Summary

During the process of testing, the EUT was controlled via communication tester to ensure max power transmission and proper modulation.

In all cases, output power is within the specified limits.

30.202 (b) For mobile stations, the average power of the sum of all antenna elements is limited to a maximum EIRP of +43 dBm.

A.1.2.1 Method of Measurements

According to ANSI C63.26 chapter 5.2, the test site was validated to ANSI C63.4 requirements, the radiated output power were measured using the direct radiated field strength method.

The EUT was set up for the max output power with pseudo random data modulation.

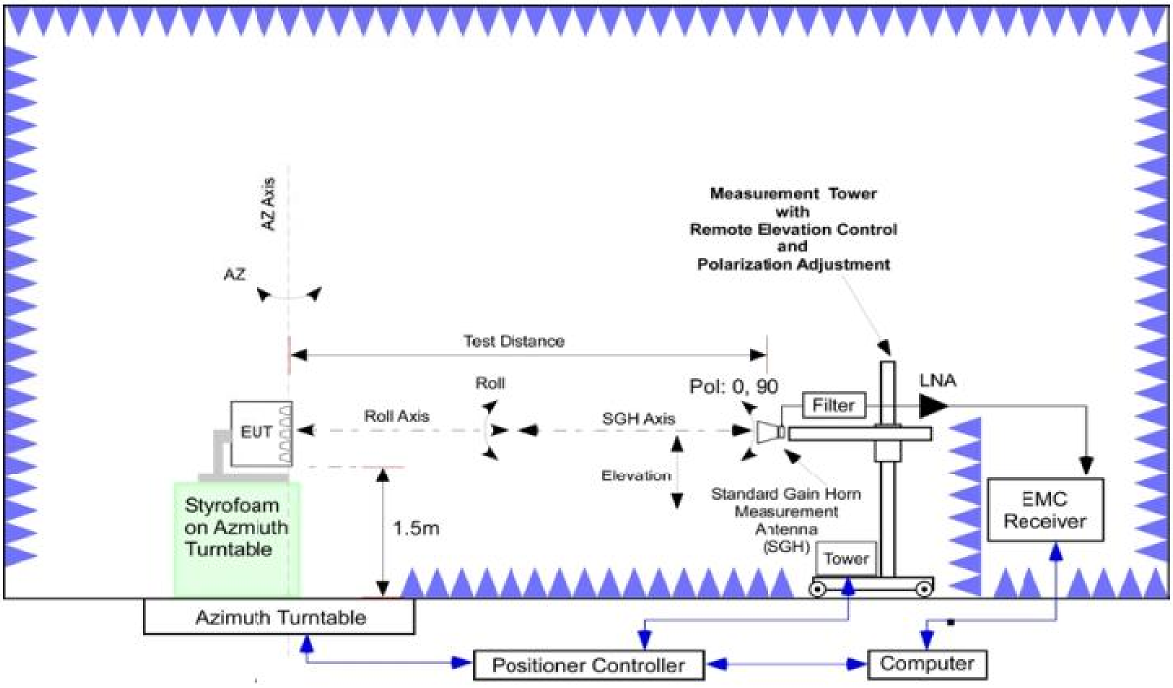
The measurements were done at 3 frequencies (bottom, middle and top of operational frequency range) for each bandwidth.

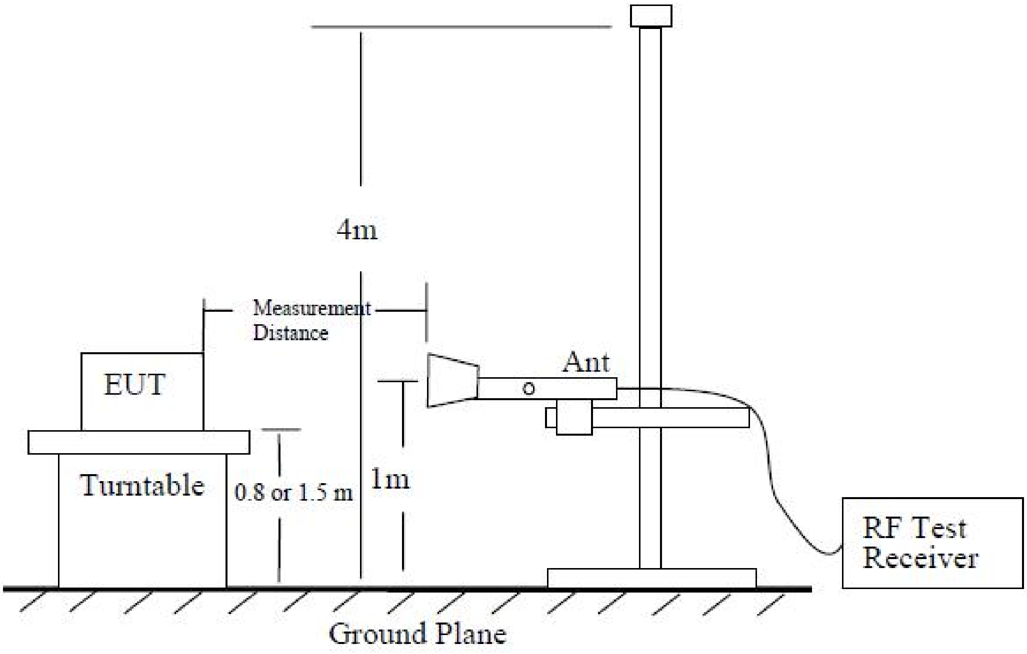
The average RF output power measurements were performed. During the measurements, the active transmission of EUT was keeping at the maximum output power level continuously.

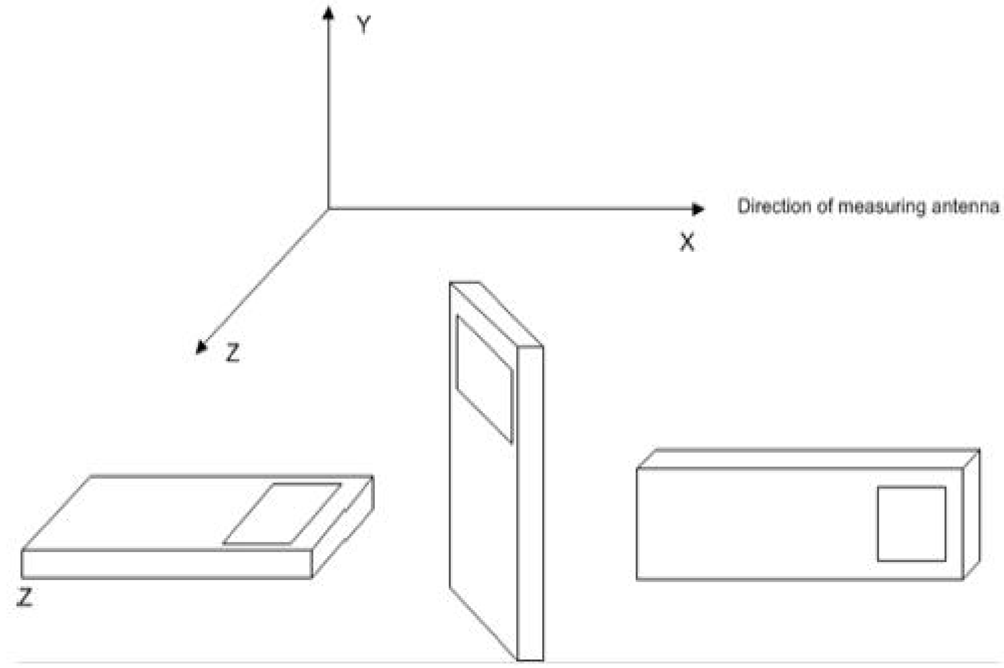
The EIRP measurement used integration method and the bandwidth was the EUT specified bandwidth, e.g, 50MHz, 100MHz.

The procedure of radiated spurious emissions is as follows:

Using the test configuration as follow, measure the radiated output power from the EUT and convert the measured received power to EIRP, as required, for comparison to the applicable limits.







The emission characteristics of the EUT can be identified from the pre-scan measurement information.

Exploratory radiated measurements (pre-scans) may be performed to determine the general EUT radiated emissions characteristics and, when necessary, the EUT-to-measurement antenna orientation that produces the maximum emission amplitude. Pre-scans shall only be used to determine the emission frequencies (i.e., not amplitude levels). The information garnered from a pre-scan can then be used to perform final compliance measurements using either the substitution or direct field strength method.

For radiated measurements performed, the EUT shall be placed on a RF-transparent table or support at a specified height above the reference ground plane with absorbers. Radiated

measurements shall be made with the measurement antenna positioned at both horizontal and vertical polarization. The measurement antenna shall be varied from 1 m to 4 m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level (i.e., field strength or received power). When orienting the measurement antenna in vertical polarization, the minimum height of the lowest element of the antenna shall clear the site reference ground plane by at least 25 cm.
For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table or support at a specified height above the ground plane with absorbers. To get the maximum power from the EUT for measurement, the EUT and its transmitting antenna(s) shall be rotated through 360°. For each mode of transmit operation to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored.

Test Note:

The average EIRP reported below is calculated by:
EIRP(dBm)=Spectrum Analyzer Channel Power Level(dBm)-Antenna Factor(dBi) + Cable Loss(dB) + 20log(F)+20log(D)-27.56
Where:
F:frequency (MHz)
D:Distance(m) = 3m

A.1.2.2 Measurement Result

n260, Module0, SCS=120kHz, SISO Tx Chain 0

CP-OFDM

Bandwidth	Modulation	RB size/offset	Frequency (MHz)	Beam ID	Power (dBm)
50MHz	QPSK	100% RB	37025.04	26	13.09
		100% RB	38499.96	26	14.68
		100% RB	39975	26	17.34
		1 RB	37025.04	26	12.15
		1 RB	39975	26	15.08
	16QAM	100% RB	39975	26	16.90
	64QAM	100% RB	39975	26	14.53
100MHz	QPSK	100% RB	37050	26	13.72
		100% RB	38499.96	26	14.45
		100% RB	39949.92	26	17.52
		1 RB	37050	26	13.76
		1 RB	39949.92	26	15.77
	16QAM	100% RB	39949.92	26	17.58
	64QAM	100% RB	39949.92	26	15.05

Note: The power at the low frequency channel, middle frequency channel, high frequency channel, 1RB and full RB in QPSK was measured. The channel and RB size with the maximum power was chose, and the power of 16QAM, 64QAM and the other Beam ID were measured on that channel.

DFT

Bandwidth	Modulation	RB size/offset	Frequency (MHz)	Beam ID	Power (dBm)
50MHz	Pi/2 BPSK	100% RB	37025.04	26	13.35
		100% RB	38499.96	26	15.35
		100% RB	39975	26	16.76
		1 RB	37025.04	26	16.92
		1 RB	39975	26	12.87
	QPSK	100% RB	39975	26	17.15
	16QAM	100% RB	39975	26	17.05
	64QAM	100% RB	39975	26	16.61
100MHz	Pi/2 BPSK	100% RB	37050	26	13.77
		100% RB	38499.96	26	14.68
		100% RB	39949.92	26	17.56
		1 RB	37050	26	16.94
		1 RB	39949.92	26	12.90
	QPSK	100% RB	39949.92	26	17.63
	16QAM	100% RB	39949.92	26	17.30
	64QAM	100% RB	39949.92	26	16.93

n260, Module1, SCS=120kHz, SISO Tx Chain 1

Bandwidth	Modulation	RB size/offset	Frequency (MHz)	Beam ID	Power (dBm)
50MHz	DFT PI/2 BPSK	100% RB	37025.04	148	13.35
	DFT PI/2 BPSK	100% RB	38499.96	148	14.85
	CP QPSK	100% RB	39975	148	17.20
100MHz	DFT PI/2 BPSK	100% RB	37025.04	148	13.17
	16 QAM	100% RB	38499.96	148	15.71
	DFT QPSK	100% RB	39975	148	17.03

Note: The power at the low frequency channel, middle frequency channel, high frequency channel, 1RB and full RB in QPSK 16QAM and 64QAM was measured. The measurement results showed here are worst cases

n260, Module0, SCS=120kHz, 2*2 Tx Chain 0 Beam ID 27 + Tx Chain 1 Beam ID 155

Bandwidth	OFDM	Modulation	RB size/offset	Frequency (MHz)	Power (dBm)
50MHz	CP	QPSK	1 RB	39975	14.82
100MHz	CP	16QAM	1 RB	39975	20.44

Note: According to the measurement resuls in Chain 0 and Chain 1, the set of modulation, RB size and channel with higher power at the specified bandwidth was measured.

n261, Module1, SCS=120kHz, SISO Tx Chain 0

CP-OFDM

Bandwidth	Modulation	RB size/offset	Frequency (MHz)	Beam ID	Power (dBm)
50MHz	QPSK	100% RB	27525	18	12.19
		100% RB	27924.96	18	12.85
		100% RB	28324.92	18	14.30
		1 RB	27525	18	11.42
		1 RB	28324.92	18	14.73
	16QAM	1 RB	28324.92	18	13.34
	64QAM	1 RB	28324.92	18	11.15
100MHz	QPSK	100% RB	27550.08	18	10.32
		100% RB	27924.96	18	11.20
		100% RB	28299.96	18	12.00
		1 RB	27550.08	18	10.60
		1 RB	28299.96	18	13.09
	16QAM	1 RB	28299.96	18	12.27
	64QAM	1 RB	28299.96	18	11.66

Note:The channel with the maximum power of QPSK and 1RB was chose, and the power of 1RB, 16QAM, 64QAM and the other Beam ID were measured on that channel.

DFT

Bandwidth	Modulation	RB size/offset	Frequency (MHz)	Beam ID	Power (dBm)
50MHz	Pi/2 BPSK	100% RB	27525	18	10.97
		100% RB	27924.96	18	11.56
		100% RB	28324.92	18	12.96
		1 RB	27525	18	12.98
		1 RB	28324.92	18	10.76
	QPSK	100% RB	27525	18	13.94
	16QAM	100% RB	27525	18	12.75
	64QAM	100% RB	27525	18	12.08
100MHz	Pi/2 BPSK	100% RB	27550.08	18	10.63
		100% RB	27924.96	18	11.72
		100% RB	28299.96	18	12.44
		1 RB	27550.08	18	12.62
		1 RB	27924.96	18	10.75
	QPSK	100% RB	28299.96	18	13.33
	16QAM	100% RB	28299.96	18	13.29
	64QAM	100% RB	28299.96	18	13.02

Note:The channel with the maximum power of Pi/2 BPSK and 100% RB was chose, and the power of 100% RB, QPSK, 16QAM, 64QAM and the other Beam ID were measured on that channel.

n261, Module1, SCS=120kHz, SISO Tx Chain 1

Bandwidth	Modulation	RB size/offset	Frequency (MHz)	Beam ID	Power (dBm)
50MHz	CP QPSK	100% RB	27525	146	10.68
	CP QPSK	100% RB	27924.96	146	13.05
	CP QPSK	100% RB	28324.92	146	13.02
100MHz	DFT PI/2 BPSK	100% RB	27550.08	146	11.18
	16 QAM	100% RB	27924.96	146	12.80
	DFT QPSK	100% RB	28299.96	146	13.42

Note: The power at the low frequency channel, middle frequency channel, high frequency channel, 1RB and full RB in QPSK 16QAM and 64QAM was measured. The measurement results showed here are worst cases

n261, Module1, SCS=120kHz, 2*2 Tx Chain 0 Beam ID 18 + Tx Chain 1 Beam ID 146

Bandwidth	OFDM	Modulation	RB size/offset	Frequency (MHz)	Power (dBm)
50MHz	DFT	QPSK	100% RB	27924.96	16.64
100MHz	DFT	16QAM	100% RB	28299.96	17.07

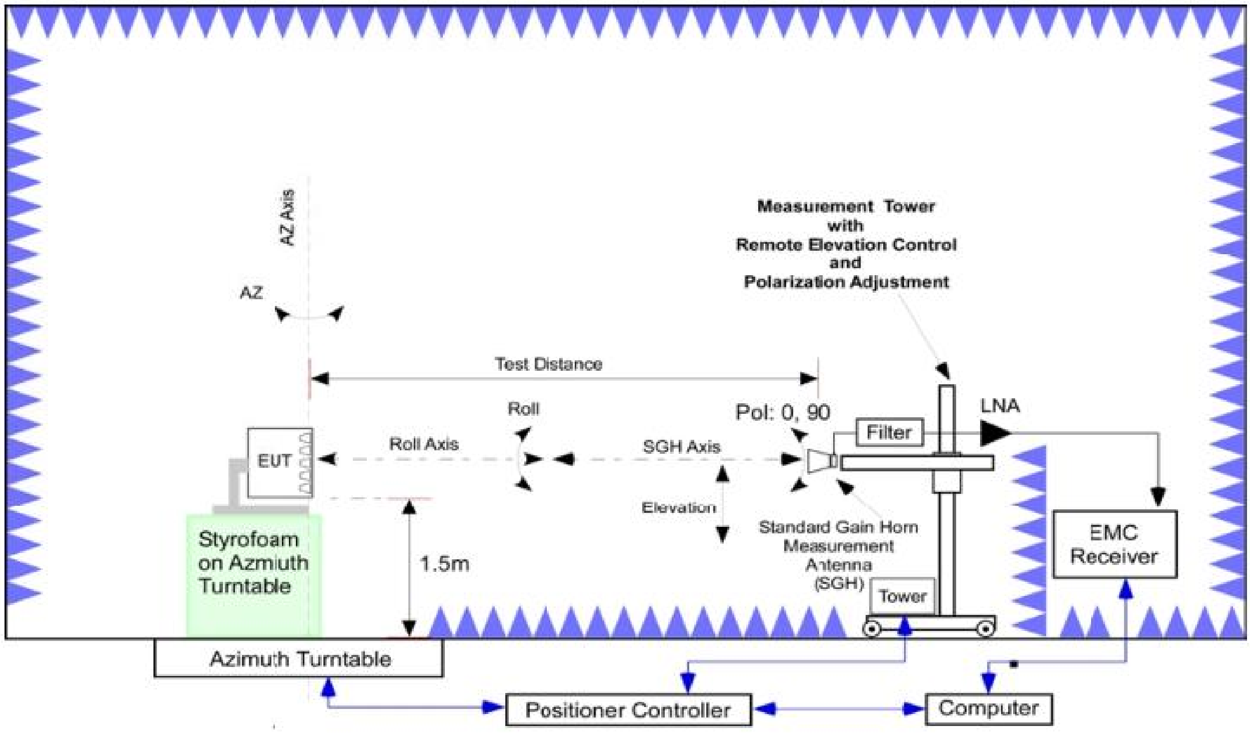
Note: According to the measurement resuls in Chain 0 and Chain 1, the set of modulation, RB size and channel with higher power at the specified bandwidth was measured.

A.2 Emission Limit

A.2.1 Measurement Method

The measurement procedures in ANSI C63.26 are used.
When required for measurements of conducted and radiated emissions, the spectrum shall be investigated from the lowest RF signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below.
If the equipment transmits below 10 GHz, unwanted emissions measurements shall be performed up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
If the equipment transmits at or above 10 GHz and below 30 GHz, unwanted emissions measurements shall be performed up to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
If the equipment transmits at or above 30 GHz, the measurements shall be performed up to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower.
In this report, the spectrum of FR2 n260 was scanned from 30 MHz to 110GHz, the spectrum of FR2 n261 was scanned from 30 MHz to 110GHz. The resolution bandwidth is set as outlined in Part 30.203.
The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of FR2 n260 and FR2 n261.
NASI C63.26 chapter 5.5.2.1: Such radiated measurements shall use substitution methods unless a test site validated to ANSI C63.4 requirements is utilized, in which case, radiated fundamental and/or unwanted emissions can be measured using the direct radiated field strength method.

The procedure of radiated spurious emissions is as follows:
Using the test configuration as follow, measure the radiated emissions directly from the EUT and convert the measured field strength or received power to ERP or EIRP, as required, for comparison to the applicable limits.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Remote Elevation Control
and
Polarization Adjustment
AZ Axis
AZ
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SGH Axis
Elevation
Standard Gain Horn
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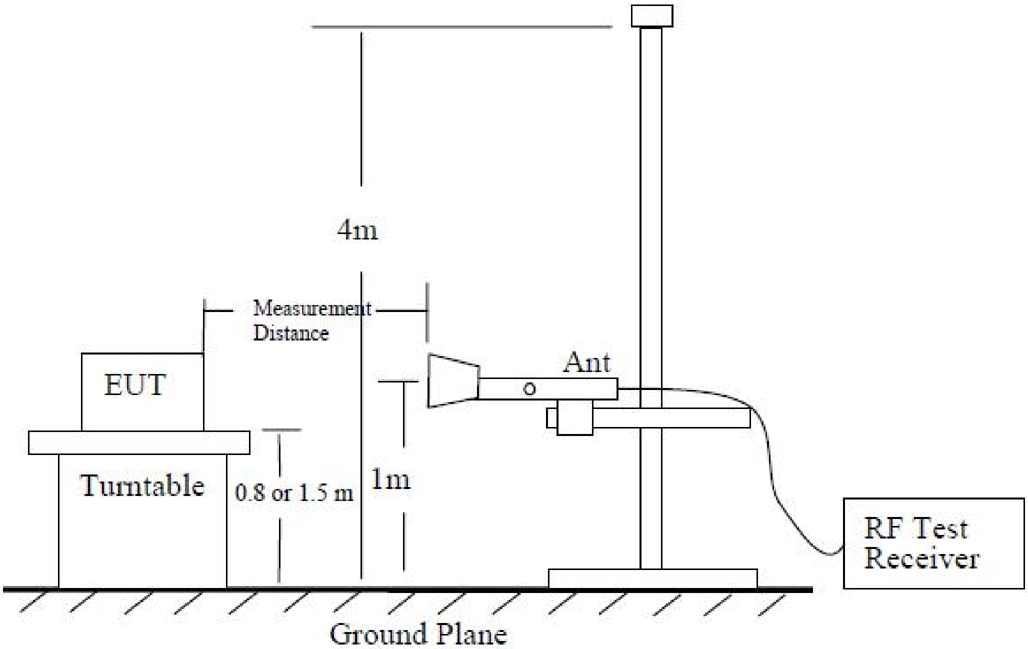
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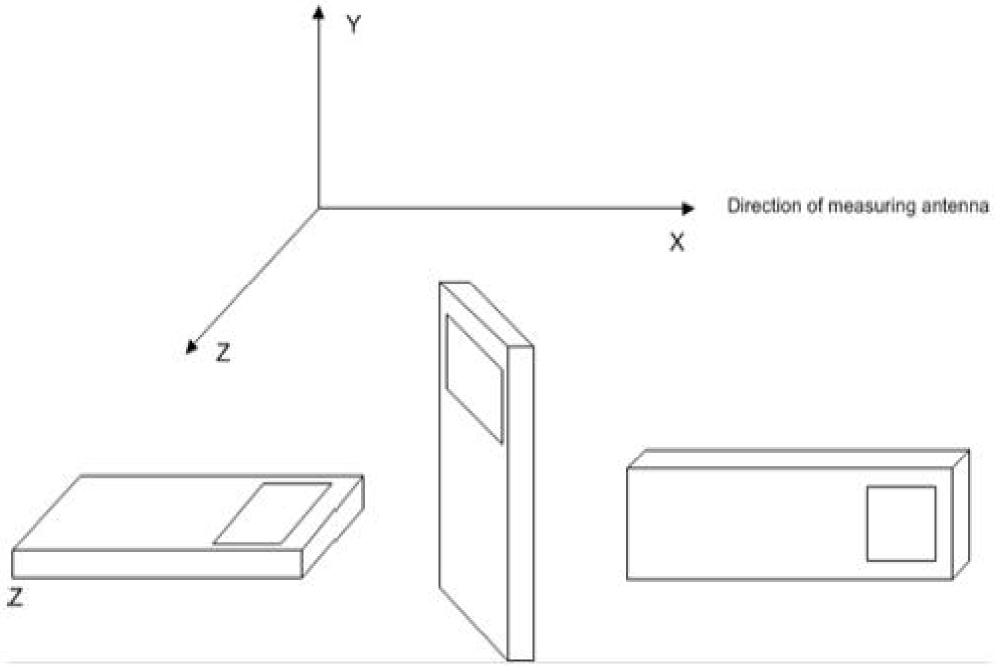


The emission characteristics of the EUT can be identified from the pre-scan measurement information.

Exploratory radiated measurements (pre-scans) may be performed to determine the general EUT radiated emissions characteristics and, when necessary, the EUT-to-measurement antenna orientation that produces the maximum emission amplitude. Pre-scans shall only be used to determine the emission frequencies (i.e., not amplitude levels). The information garnered from a pre-scan can then be used to perform final compliance measurements using either the substitution or direct field strength method.

For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 80 cm above the reference ground plane. Radiated measurements shall be made with the measurement antenna positioned in both horizontal and vertical polarization. The measurement antenna shall be varied from 1 m to 4 m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level (i.e., field strength or received power). When orienting the measurement antenna in vertical polarization, the minimum height of the lowest element of the antenna shall clear the site reference ground plane by at least 25 cm.

The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.

For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table or support at a nominal height of 1.5 m above the ground plane. When maximizing the emissions from the EUT for measurement, the EUT and its transmitting antenna(s) shall be rotated through 360°. For each mode of operation to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored.

Final measurements shall be performed for the worst case combination(s) of variable technical parameters that result in the maximum measured emission amplitude, record the frequency and amplitude of the highest fundamental emission (if applicable), and the frequency and amplitude data for the six highest-amplitude spurious emissions.

Test Setting:

Detector=RMS

Trace mode=trace average

Sweep time= auto couple

Number of sweep points ≥2*span/RBW

The trace was allowed to stabilize

RBW=1MHz, VBW=3MHz

The average EIRP reported below is canculated by:

30M-1GHz:

ERP(dBm)=Spectrum Analyzer Level(dBm)+Total loss(dB)-2.15

1GHz-18GHz：

EIRP(dBm)= Spectrum Analyzer Level(dBm)+Total loss(dB)

18GHz-60GHz:

EIRP(dBm)= Spectrum Analyzer Level(dBm)-Antenna Factor(dBi) + Cable Loss(dB) + 20log(F)+20log(D)-27.56

60GHz-110GHz:

EIRP(dBm)= Spectrum Analyzer Level(dBm)-Antenna Factor(dBi) + converter Loss(dB) + 20log(F)+20log(D)-27.56

Where:

F:frequency (MHz)

D:Distance(m)

Frequency Range	Distance(m)
30MHz-1GHz	3
1GHz-18GHz	3
18GHz-40GHz	3
40GHz-60GHz	3
60GHz-75GHz	3
75GHz-110GHz	3

A.2.2 Measurement Limit

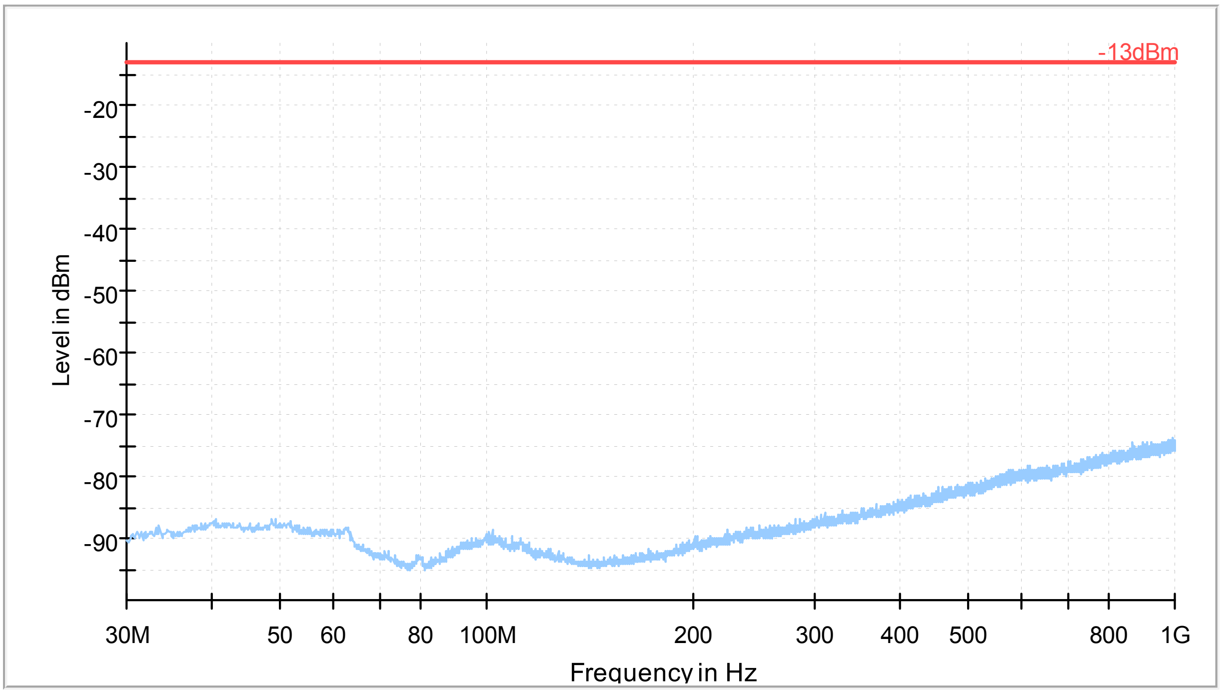
Part 30.203 specify that the total radiated power of any emission outside a licensee's frequency block shall be −13 dBm/MHz or lower. However, in the bands immediately outside and adjacent to the licensee's frequency block, having a bandwidth equal to 10 percent of the channel bandwidth, the conductive power or the total radiated power of any emission shall be −5 dBm/MHz or lower.

A.2.3 Measurement Results

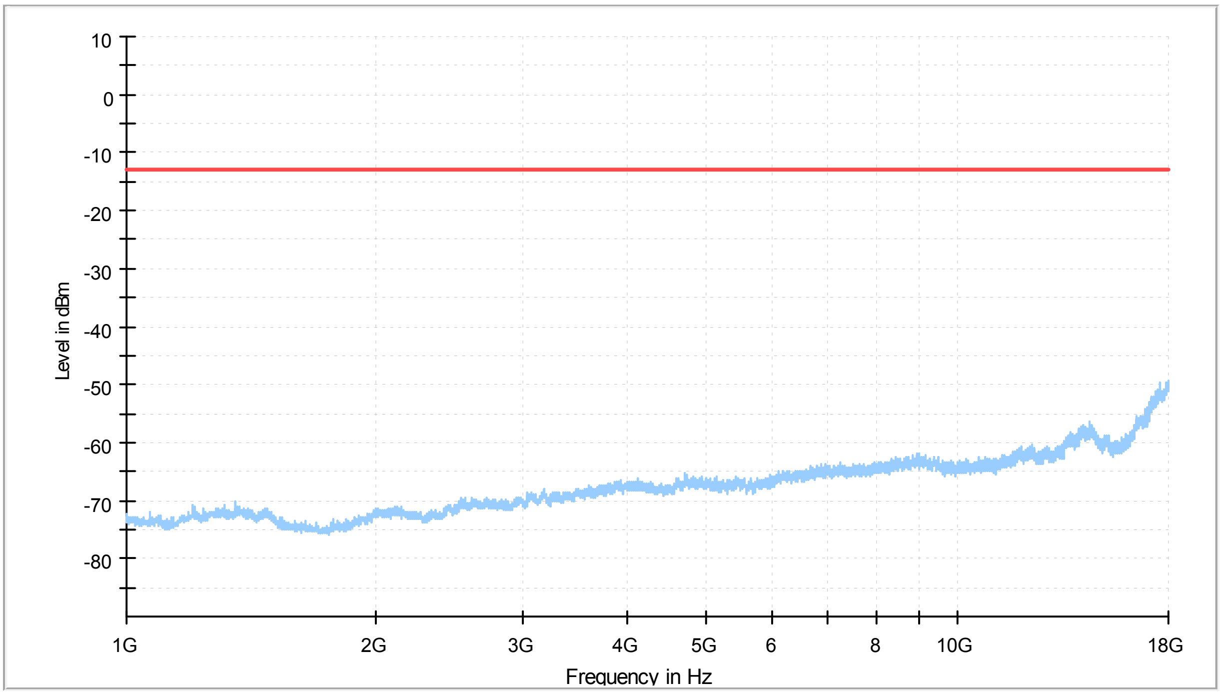
Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the FR2 n260 and n261. It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the FR2 n260 and n261 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.The evaluated frequency range is from 30MHz to 100GHz for n261 and n260.

A.2.4 Measurement Results Table(worst case of all power)

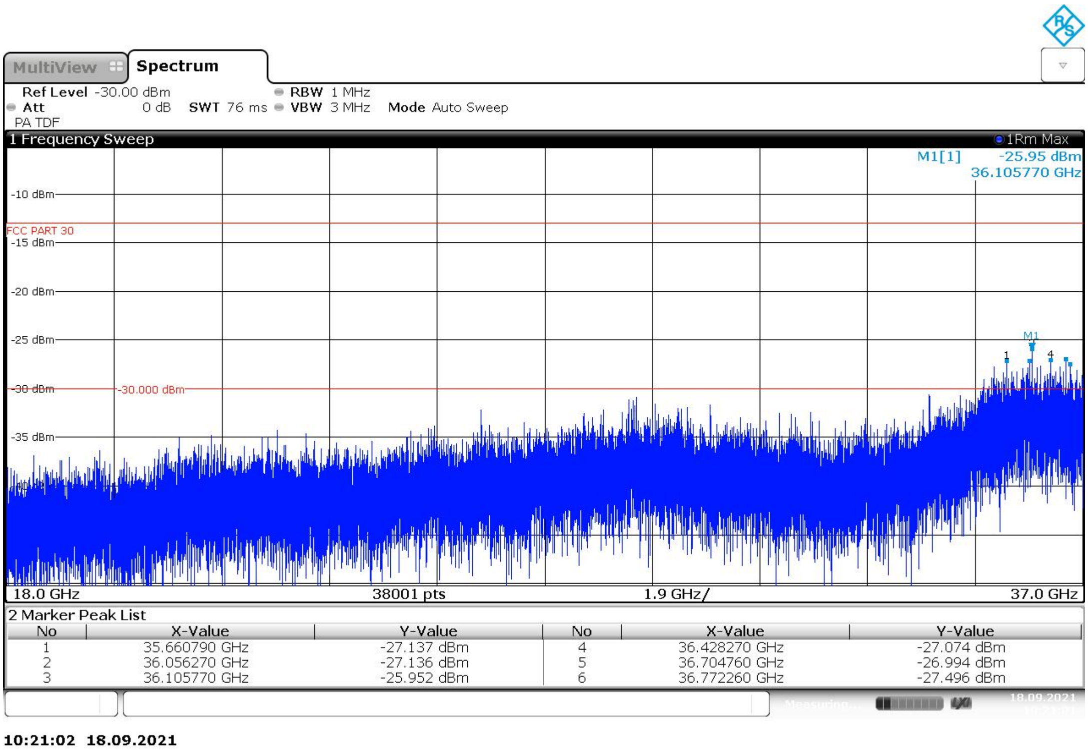
Frequency	Antenna	Modulation	Bandwidth	Channel	Frequency Range	Result
n260	Module0	PUSCH CP, QPSK	100MHz /1RB	Low	30MHz-110GHz	Pass
				Middle	30MHz-110GHz	Pass
				High	30MHz-110GHz	Pass
n261	Module0	PUSCH DFT, 16QAM	100MHz /100%RB	Low	30MHz-110GHz	Pass
				Middle	30MHz-110GHz	Pass
				High	30MHz-110GHz	Pass



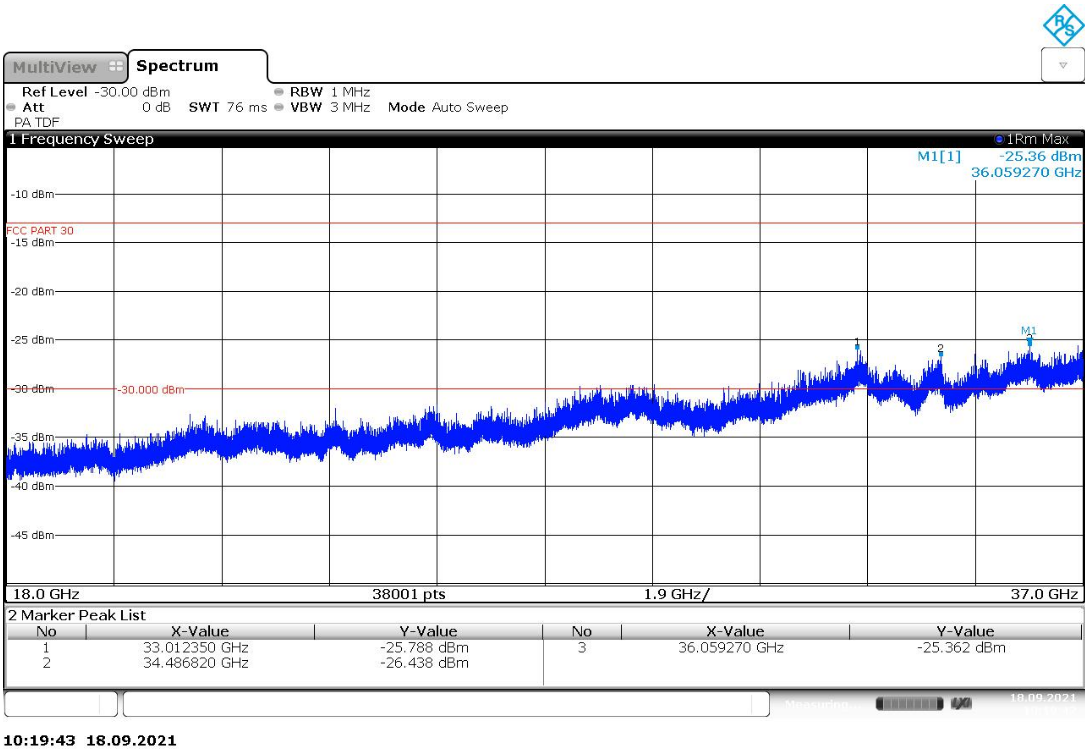
n260, High Channel,30MHz-1GHz



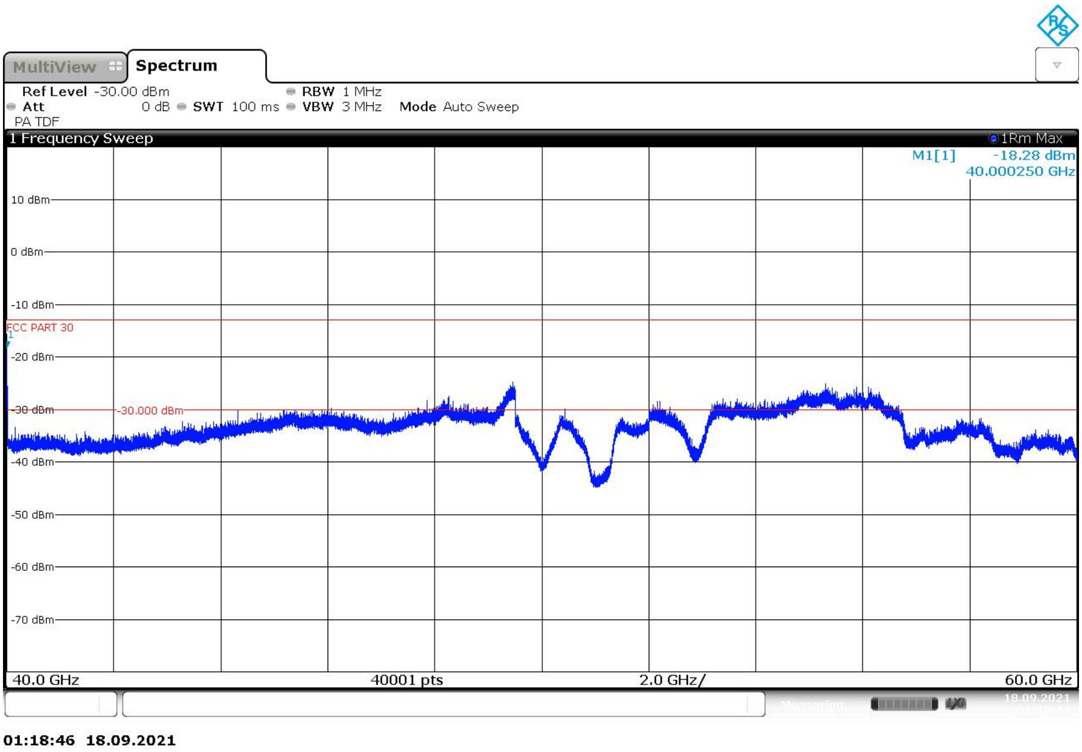
n260, High Channel ,1GHz-18GHz



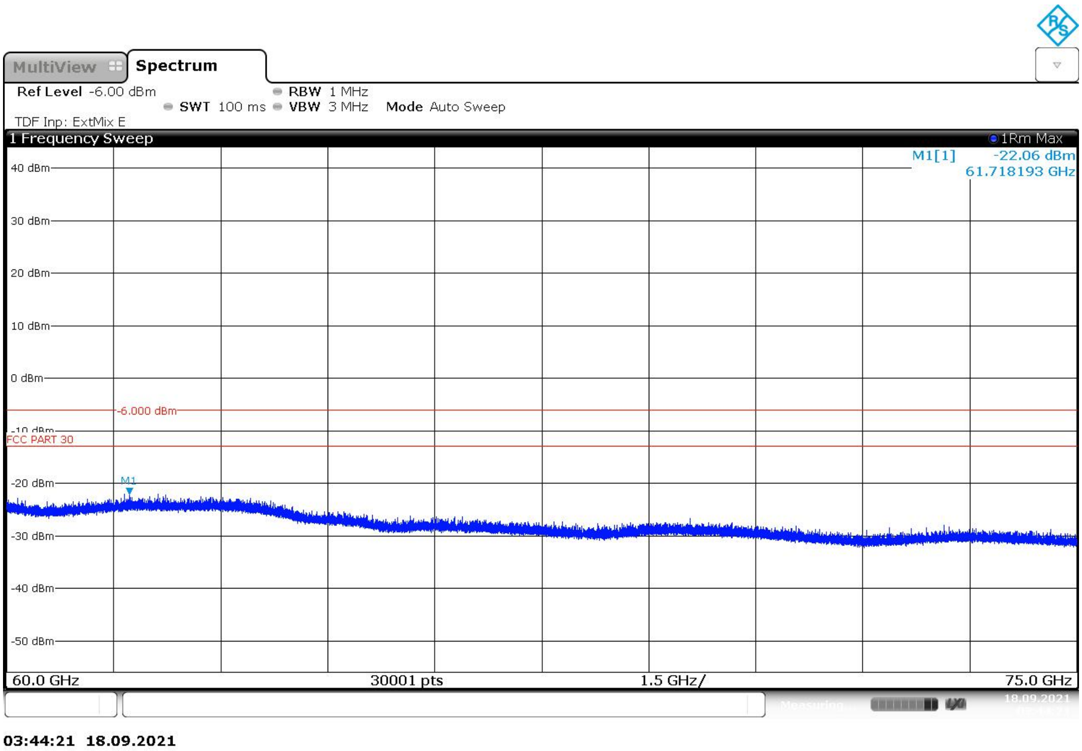
n260, High channel, 18GHz-40GHz, H



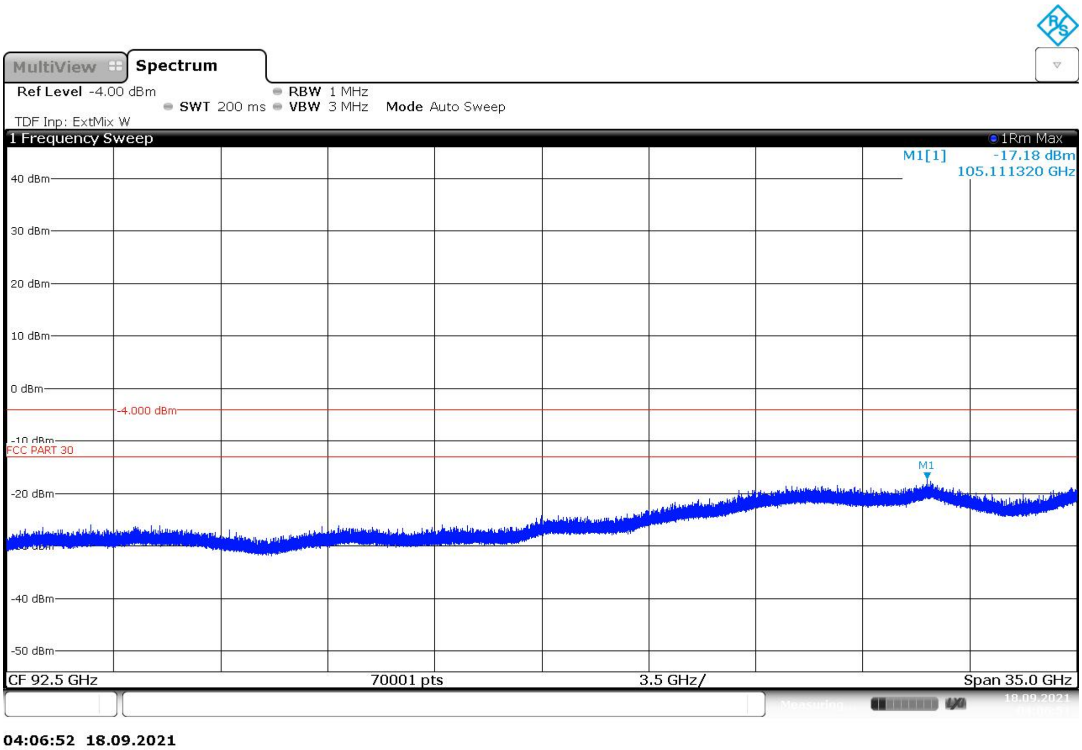
n260, High channel, 18GHz-40GHz, V



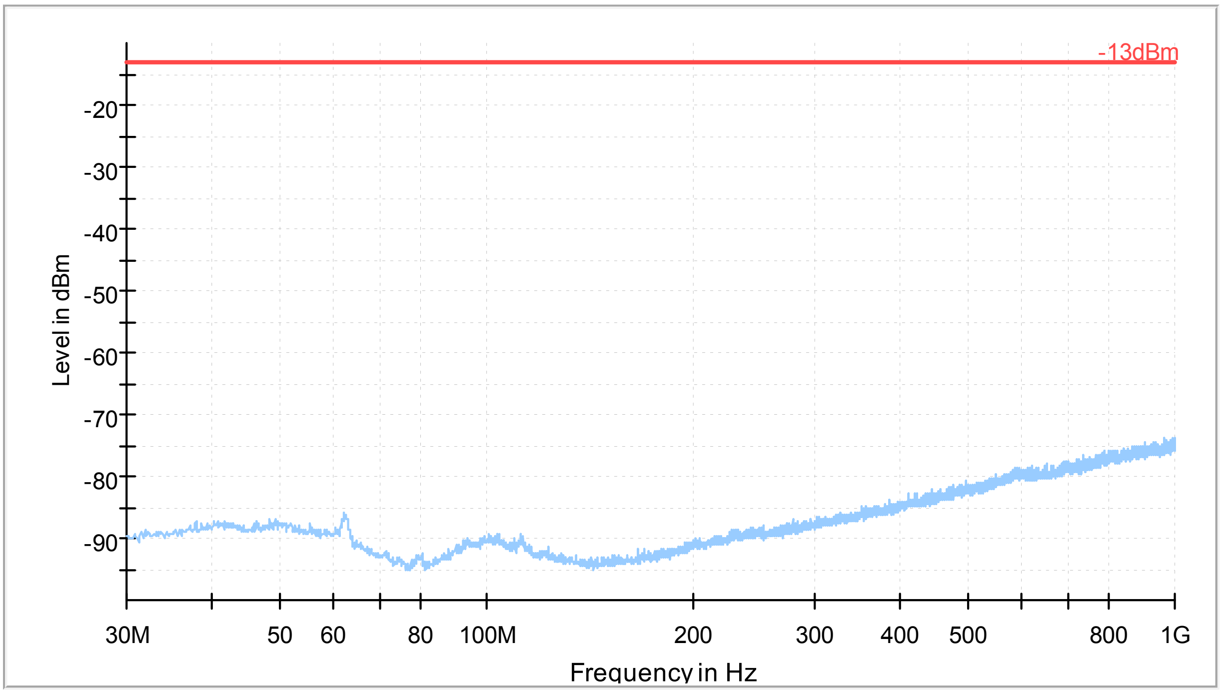
n260, High channel, 40GHz-60GHz



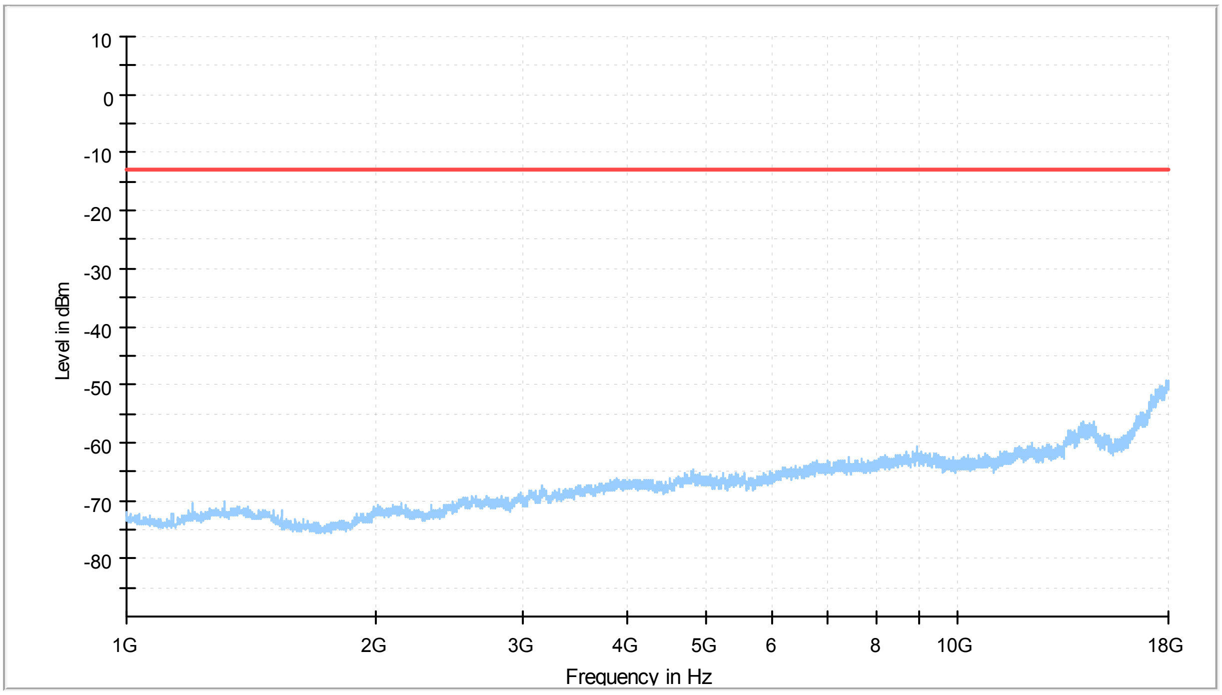
n260, High channel, 60GHz-75GHz



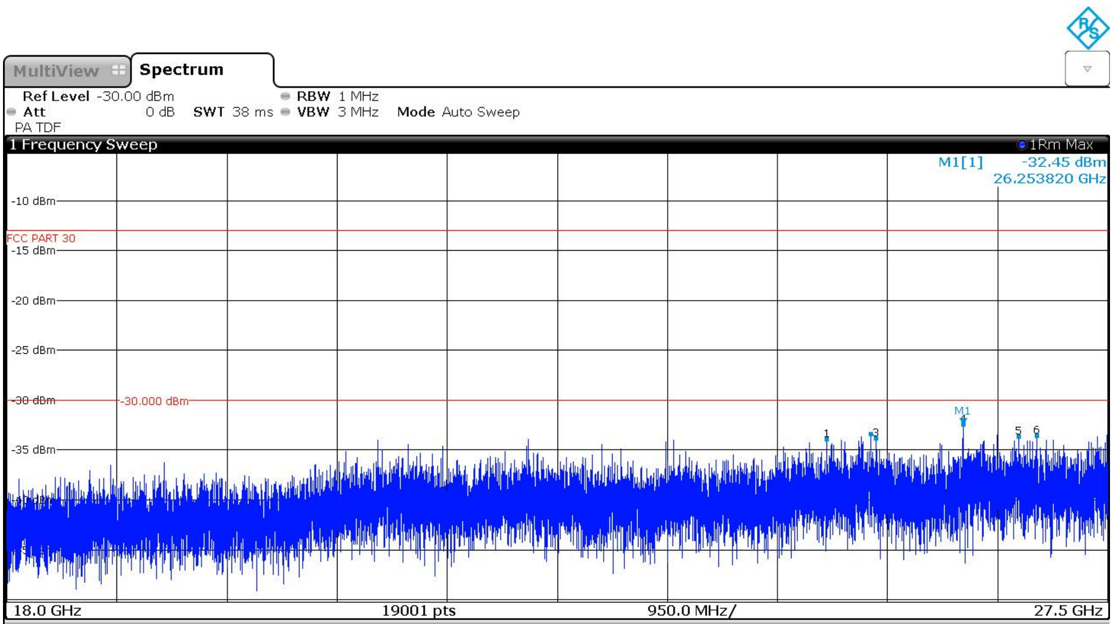
n260, High channel, 75GHz-110GHz



n261, High Channel,30MHz-1GHz



n261, High Channel ,1GHz-18GHz



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	25.074380 GHz	-33.952 dBm	4	26.253820 GHz	-32.448 dBm
2	25.456360 GHz	-33.357 dBm	5	26.730290 GHz	-33.692 dBm
3	25.496860 GHz	-33.846 dBm	6	26.884280 GHz	-33.586 dBm

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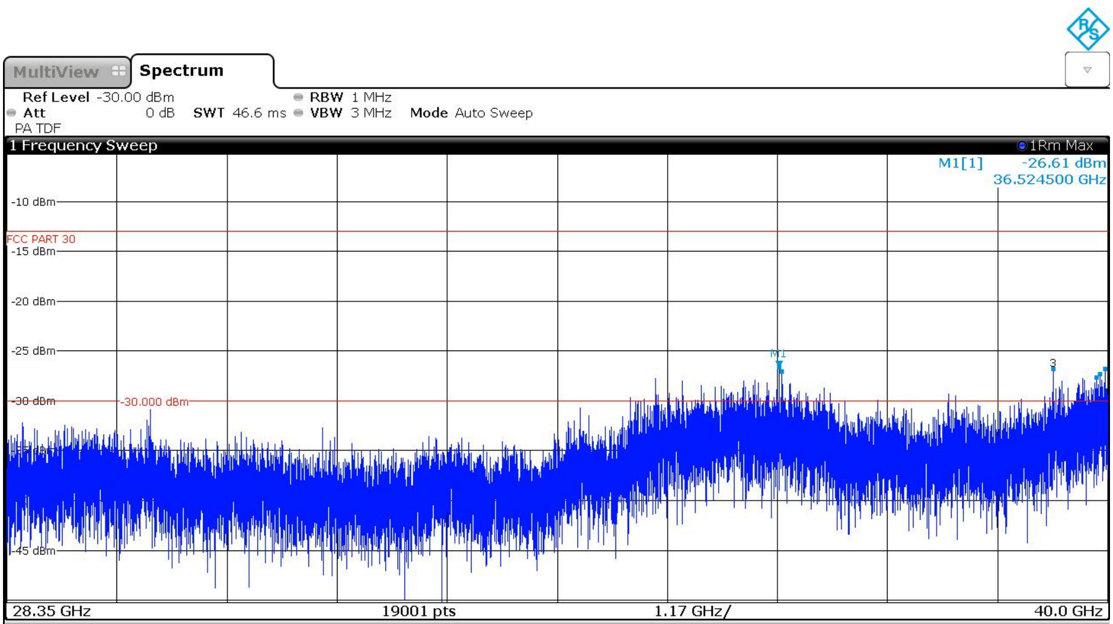

2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	36.524500 GHz	-26.610 dBm	4	39.881360 GHz	-27.694 dBm
2	36.549020 GHz	-27.093 dBm	5	39.915700 GHz	-27.357 dBm
3	39.422130 GHz	-26.779 dBm	6	39.969650 GHz	-26.767 dBm

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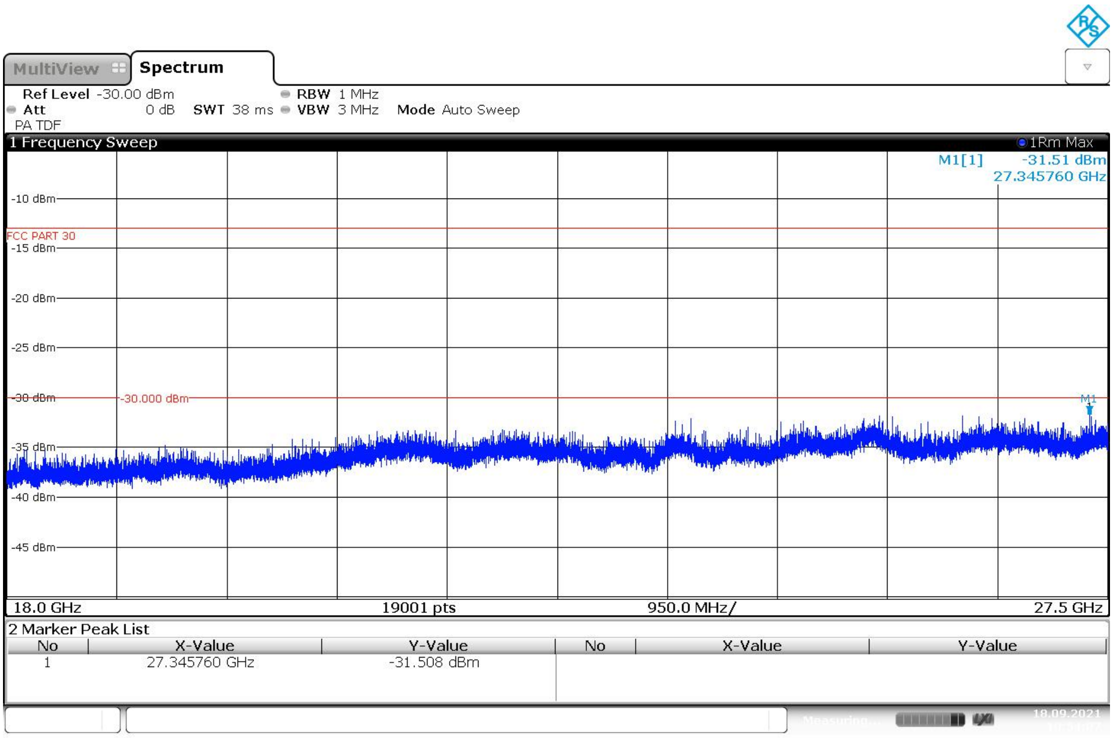
n261, High channel, 18GHz-40GHz, H



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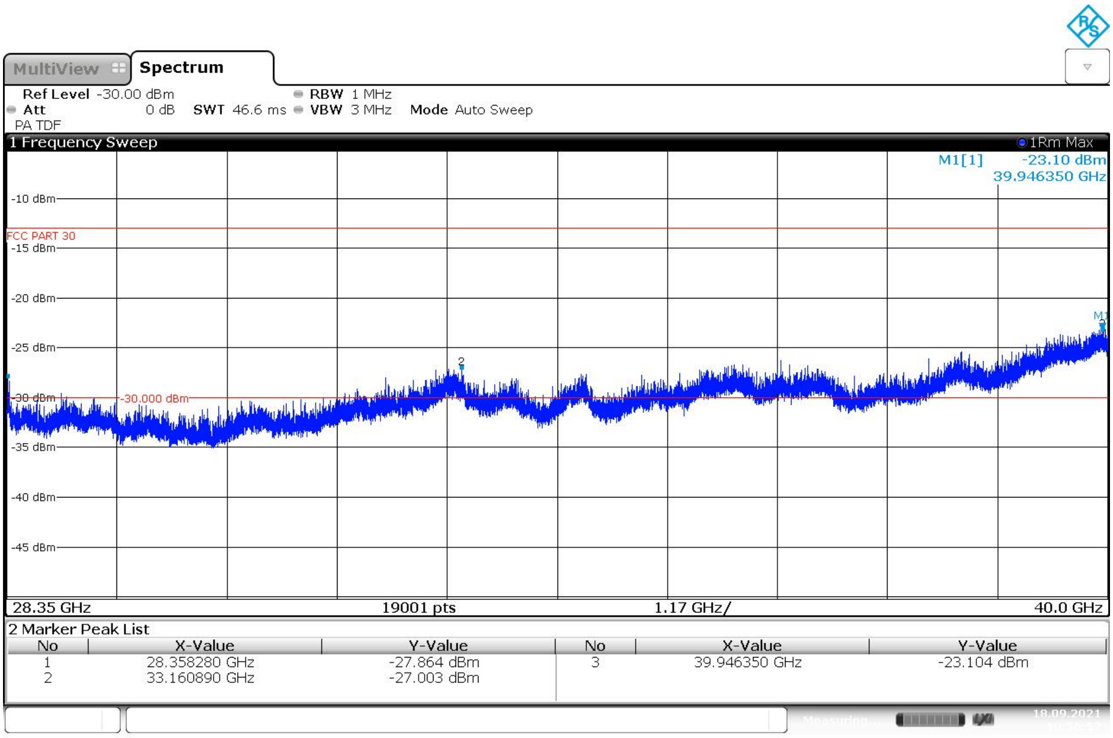

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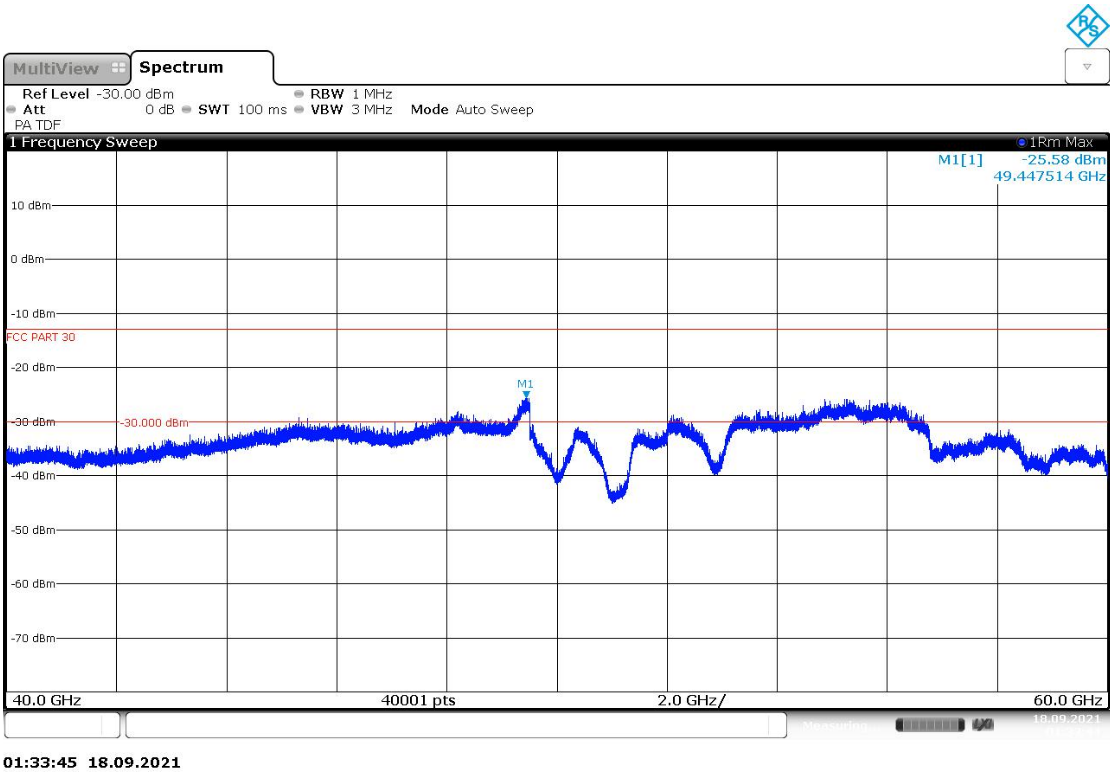
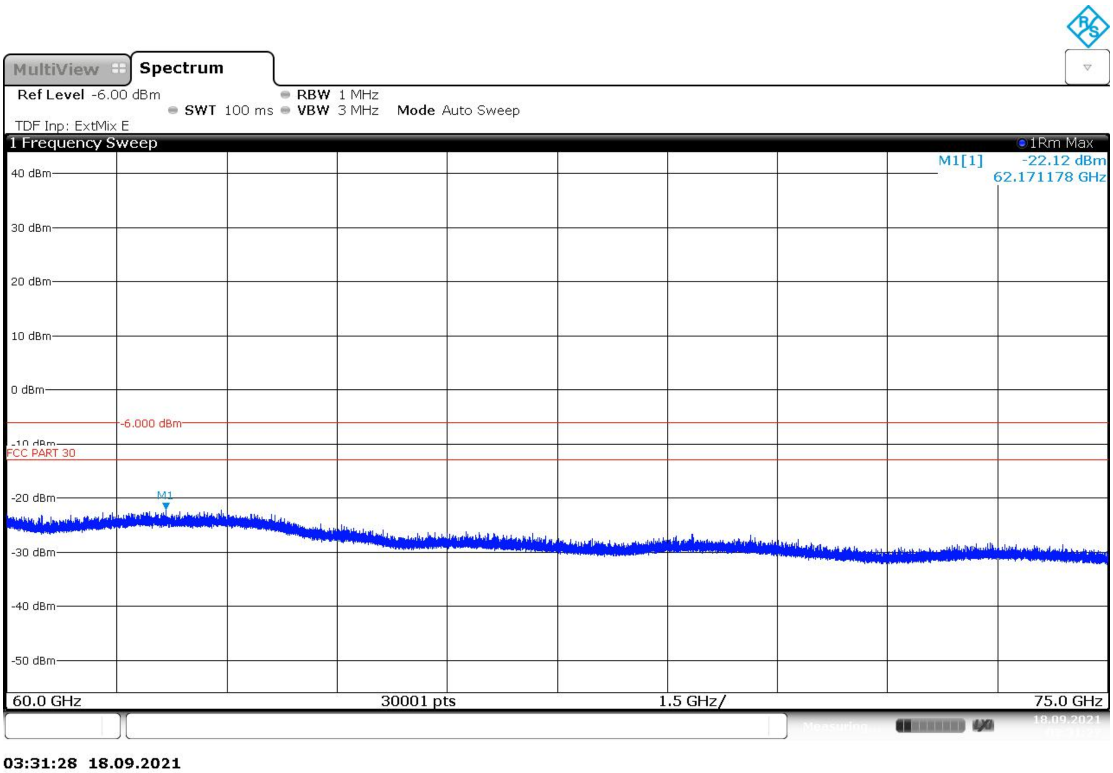
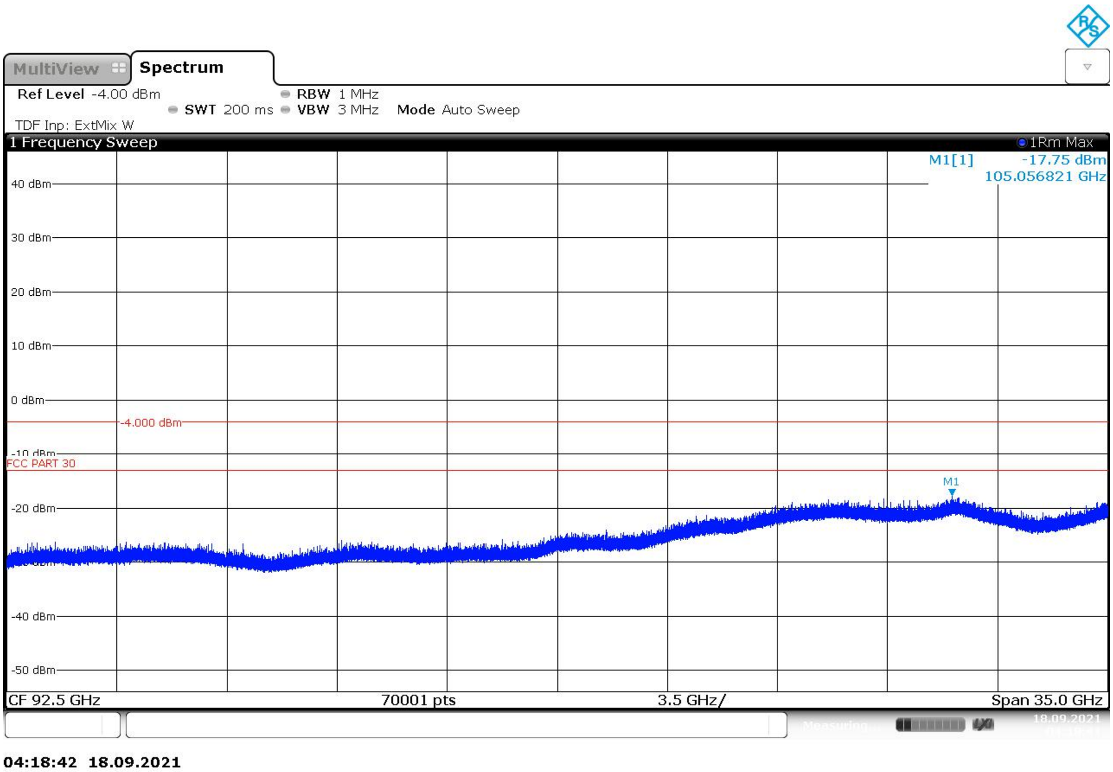
n261, High channel, 18GHz-40GHz, V



n261, High channel, 40GHz-60GHz



n261, High channel, 60GHz-75GHz



n261, High channel, 75GHz-110GHz

A.3 Frequency Stability

$2.1055

A.3.1 Method of Measurement

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage. Two reference points are established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation shall be identified as F_L and F_H respectively.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃.
3. With the EUT, powered via nominal voltage, connected to the CMW500, and in a simulated call on middle channel for each LTE band, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50℃.
7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the center channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 ℃increments from -30℃ to +50℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of the lower, higher and nominal voltage. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress.

A.3.2 Measurement results

n260, PUSCH DFT QPSK, 1RB
Frequency Error vs Temperature
OPERATING FREQUENCY: 39999920000Hz

POWER （VDC）	TEMP (℃)	FREQUENCY (Hz)	Freq. Dev (Hz)	Deviation (%)
3.8	+20(REF)	39996850000	/	/
	-30	39996900000	-50000	-0.000125%
	-20	39996938000	-88000	-0.000220%
	-10	39996950000	-100000	-0.000250%
	+0	39996913000	-63000	-0.000158%
	+10	39997125000	-275000	-0.000688%
	+20	39996850000	0	0.000000%
	+30	39996950000	-100000	-0.000250%
	+40	39996663000	187000	0.000468%
	+50	39996600000	250000	0.000625%
3.6	+20	39996813000	37000	0.000093%
4.4	+20	39996700000	150000	0.000375%

n261, PUSCH DFT QPSK, 1RB
Frequency Error vs Temperature
OPERATING FREQUENCY: 28349960000Hz

POWER （VDC）	TEMP (℃)	FREQUENCY (Hz)	Freq. Dev (Hz)	Deviation (%)
3.8	+20(REF)	28347138000	/	/
	-30	28347363000	-225000	-0.000794%
	-20	28347400000	-262000	-0.000924%
	-10	28347550000	-412000	-0.001453%
	+0	28347288000	-150000	-0.000529%
	+10	28347400000	-262000	-0.000924%
	+20	28347138000	0	0.000000%
	+30	28347338000	-200000	-0.000705%
	+40	28347025000	113000	0.000399%
	+50	28347163000	-25000	-0.000088%
3.6	+20	28347263000	-125000	-0.000441%
4.4	+20	28347275000	-137000	-0.000483%

A.4 Occupied Bandwidth

Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the mid frequencies frequency. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.

The measurement method is from ANSI C63.26:

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts.

b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.

d) Set the detection mode to peak, and the trace mode to max-hold.

The average EIRP reported below is canculated by:

EIRP(dBm)=Spectrum Analyzer Channel Power Level(dBm)-Antenna Factor(dBi) + Cable Loss(dB) + 20log(F)+20log(D)-27.56

Where:

F:frequency (MHz)

D:Distance(m)=3m

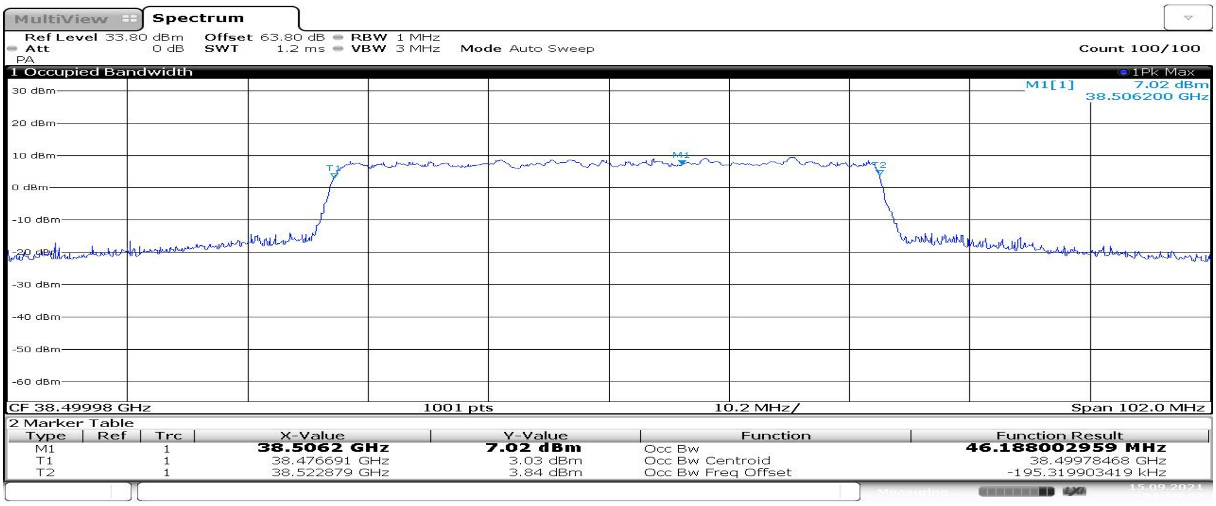
n260, Module0, SCS=120kHz, SISO Tx Chain 0

CP-OFDM

Bandwidth	Modulation	Frequency (MHz)	Beam ID	Occupied Bandwidth (99%) (MHz)
50MHz	QPSK	37025.04	26	46.05
		38499.96	26	**46.19**
		39975	26	**46.20**
	16QAM	39975	26	46.10
	64QAM	39975	26	**46.23**
100MHz	QPSK	37050	26	94.32
		38499.96	26	**94.58**
		39949.92	26	**94.49**
	QAM	39949.92	26	94.34
	64QAM	39949.92	26	**94.57**

Note1:The channel with the maximum power of QPSK was chose, and the 16QAM, 64QAM and the other Beam ID were measured on that channel. The maximum occupied bandwidth figures were showed in the following two pages.

n260, 50MHz Bandwidth, CP-OFDM, Middle Channel 38499.96MHz, QPSK (99% BW)



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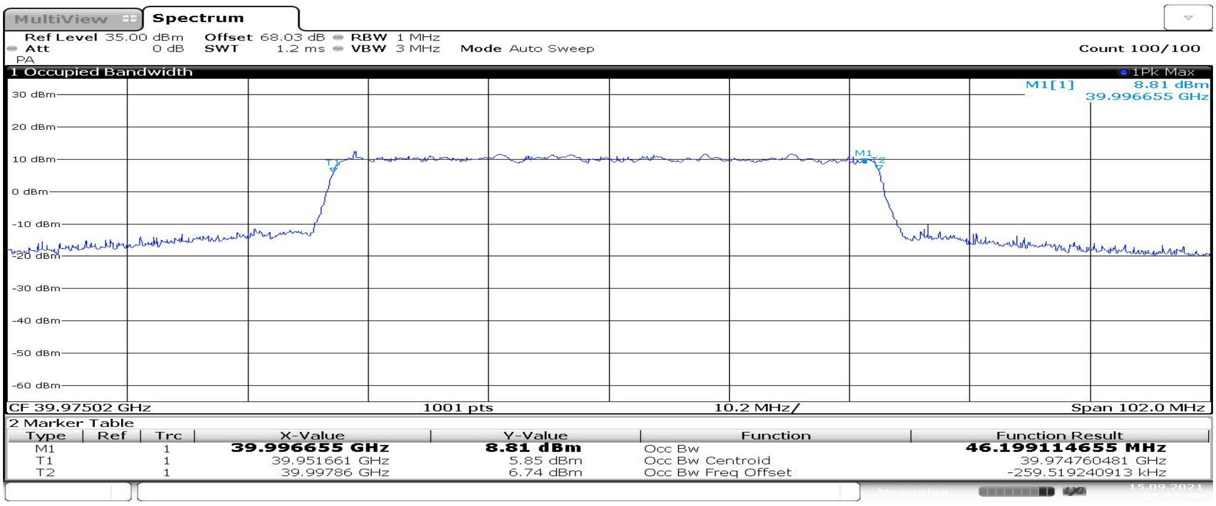
n260, 50MHz Bandwidth,CP-OFDM,High Channel 39975MHz, QPSK (99% BW)



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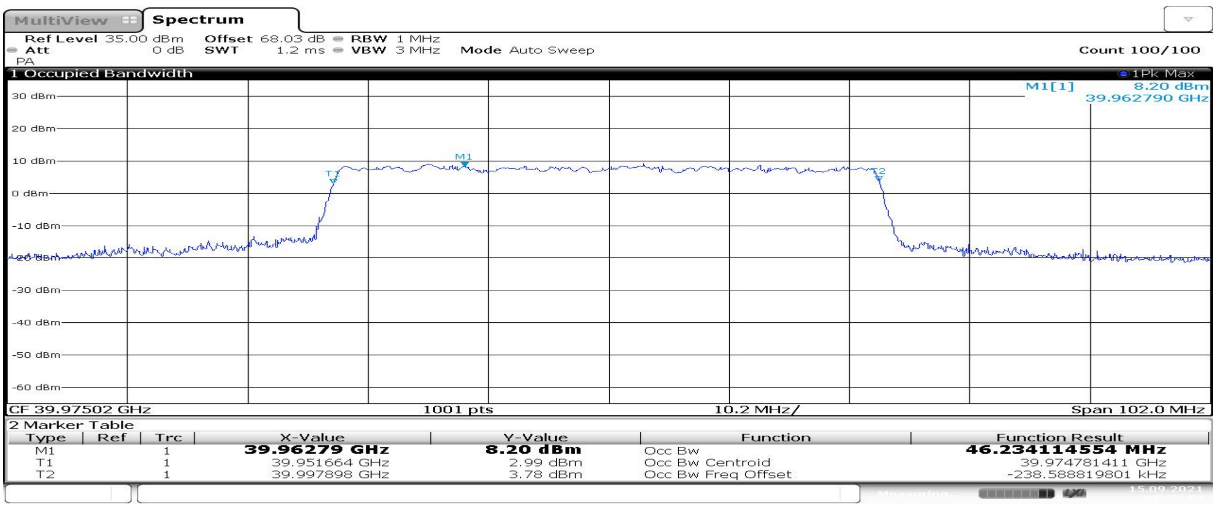
n260, 50MHz Bandwidth,CP-OFDM,High Channel 39975MHz, 64AQAM (99% BW)



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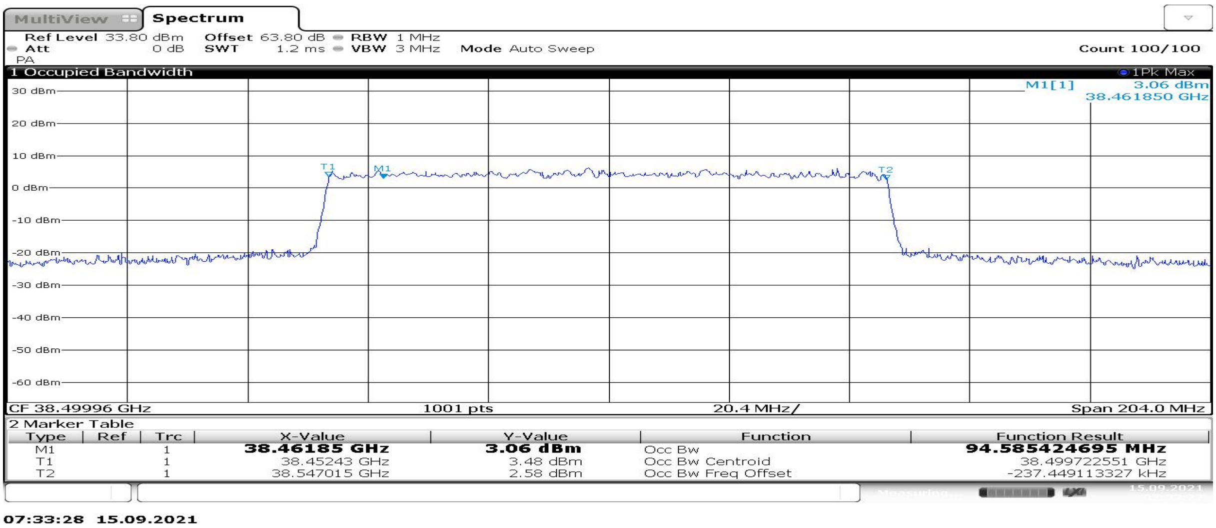
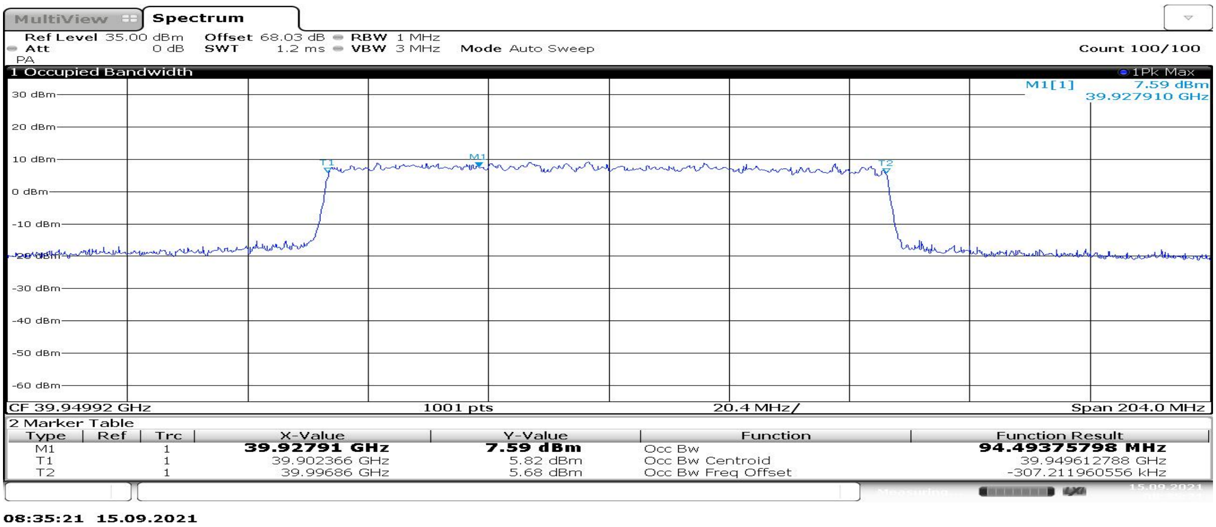
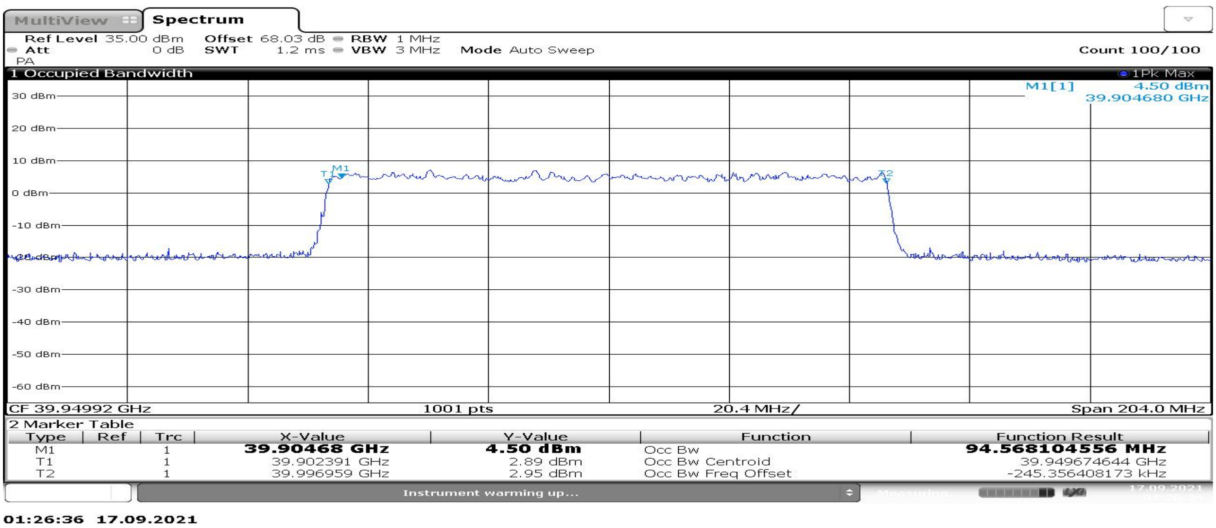
n260, 100MHz Bandwidth, CP-OFDM, Middle Channel 38499.96MHz, QPSK (99% BW)



n260, 100MHz Bandwidth, CP-OFDM, High Channel 39949.92MHz, QPSK (99% BW)



n260, 100MHz Bandwidth, CP-OFDM, High Channel 39949.92MHz, 64AQAM (99% BW)



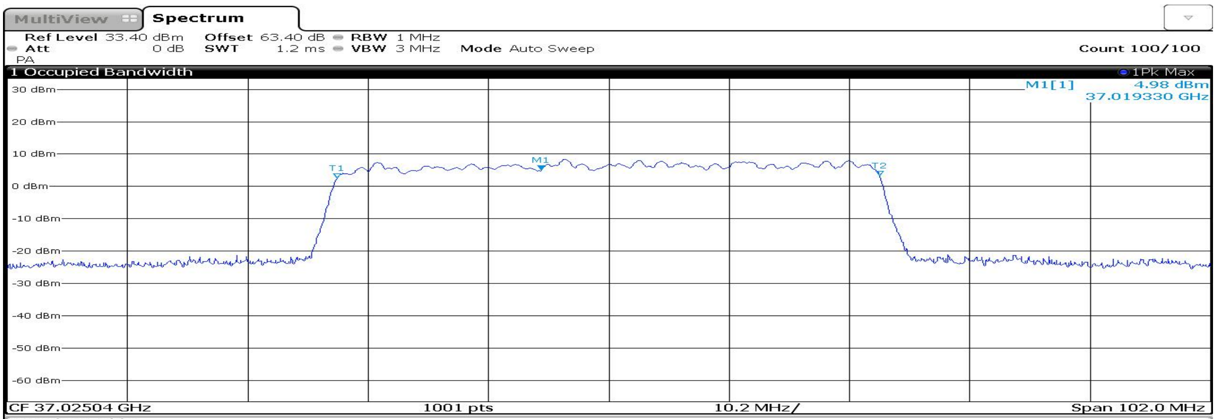
n260, Module0, SCS=120kHz, SISO Tx Chain 0

DFT

Bandwidth	Modulation	Frequency (MHz)	Beam ID	Occupied Bandwidth (99%) (MHz)
50MHz	Pi/2 BPSK	37025.04	26	45.93
		38499.96	26	45.99
		39975	26	**46.03**
	QPSK	39975	26	**46.03**
	16QAM	39975	26	45.97
	64QAM	39975	26	**46.00**
100MHz	Pi/2 BPSK	37050	26	91.58
		38499.96	26	**91.69**
		39949.92	26	**91.67**
	QPSK	38499.96	26	91.59
	16QAM	39949.92	26	91.62
	64QAM	39949.92	26	**91.83**

Note1:The channel with the maximum power of Pi/2 BPSK was chose, and the QPSK,16QAM, 64QAM and the other Beam ID were measured on that channel. The maximum occupied bandwidth figures were showed in the following two pages.

n260, 50MHz Bandwidth, CP-OFDM,High Channel 39975MHz, Pi/2 BPSK (99% BW)



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**37.01933 GHz**	**4.98 dBm**	Occ Bw	**45.934040439 MHz**
T1		1	37.00202 GHz	2.60 dBm	Occ Bw Centroid	37.024986958 GHz
T2		1	37.047954 GHz	3.32 dBm	Occ Bw Freq Offset	-53.04209655 kHz

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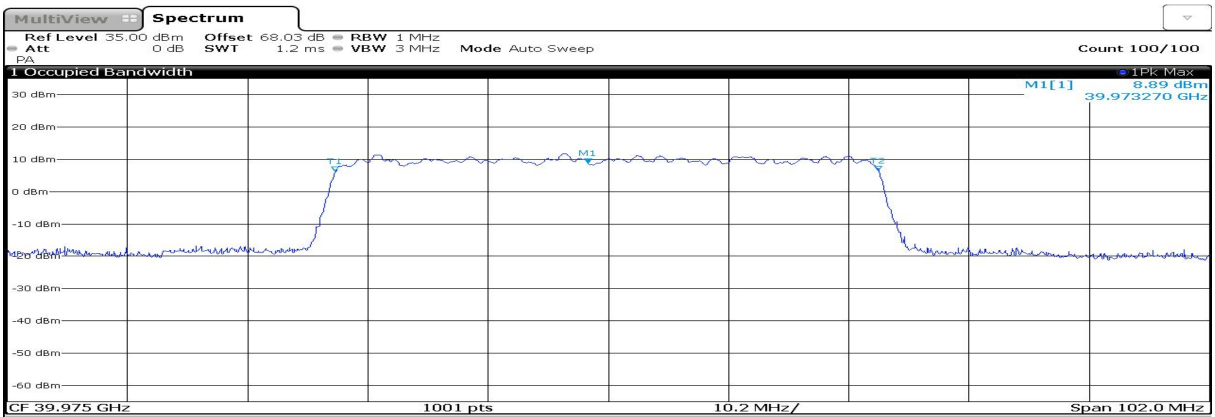
n260, 50MHz Bandwidth,CP-OFDM,High Channel 39975MHz, QPSK (99% BW)



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**39.97327 GHz**	**8.89 dBm**	Occ Bw	**46.027486115 MHz**
T1		1	39.951864 GHz	6.29 dBm	Occ Bw Centroid	39.974877978 GHz
T2		1	39.997892 GHz	6.50 dBm	Occ Bw Freq Offset	-122.021523636 kHz

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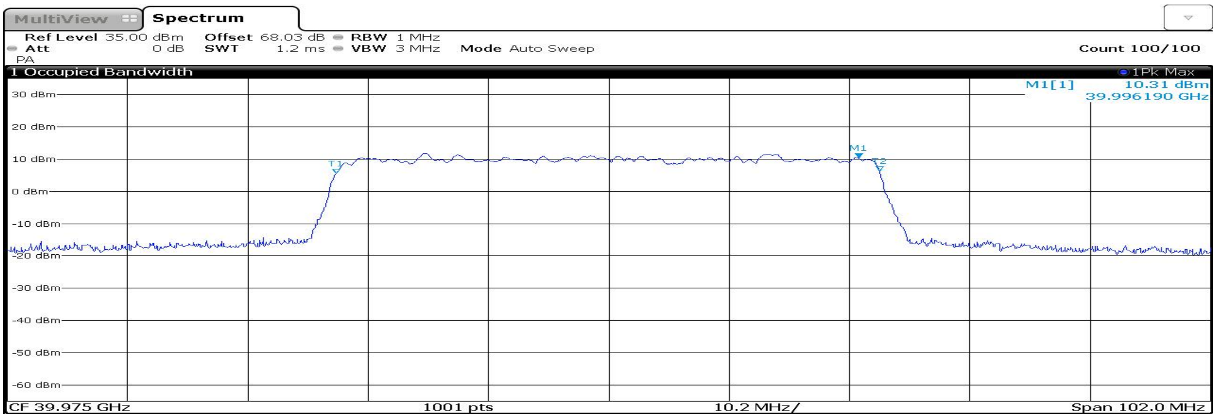
n260, 50MHz Bandwidth,CP-OFDM,High Channel 39975MHz, 64QAM (99% BW)



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**39.99619 GHz**	**10.31 dBm**	Occ Bw	**46.030342743 MHz**
T1		1	39.951874 GHz	5.53 dBm	Occ Bw Centroid	39.974889561 GHz
T2		1	39.997905 GHz	6.28 dBm	Occ Bw Freq Offset	-110.438651382 kHz

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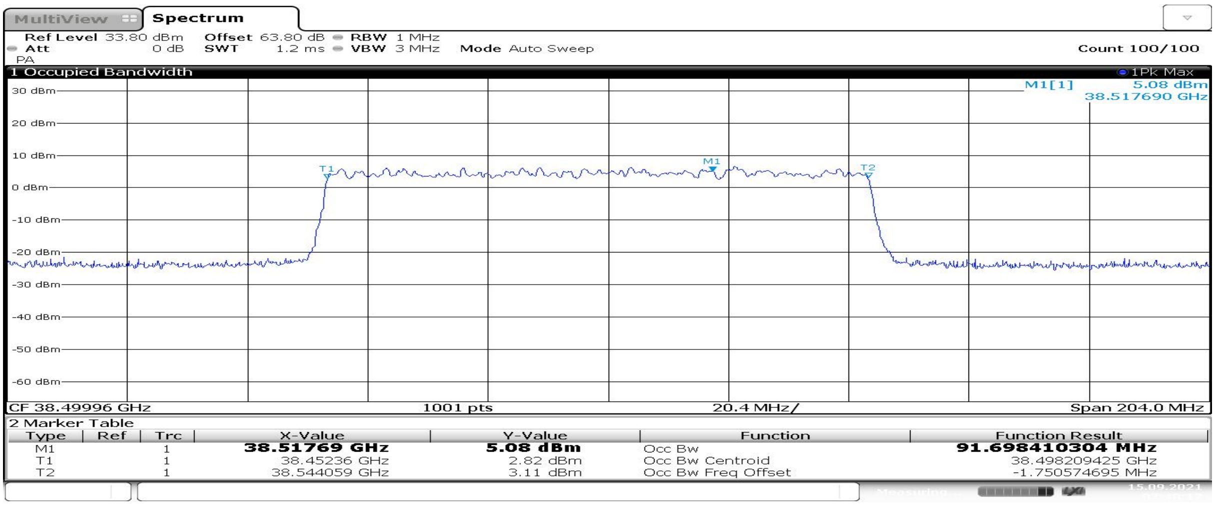
n260, 100MHz Bandwidth, CP-OFDM, Middle Channel 38499.96MHz, Pi/2 BPSK (99% BW)



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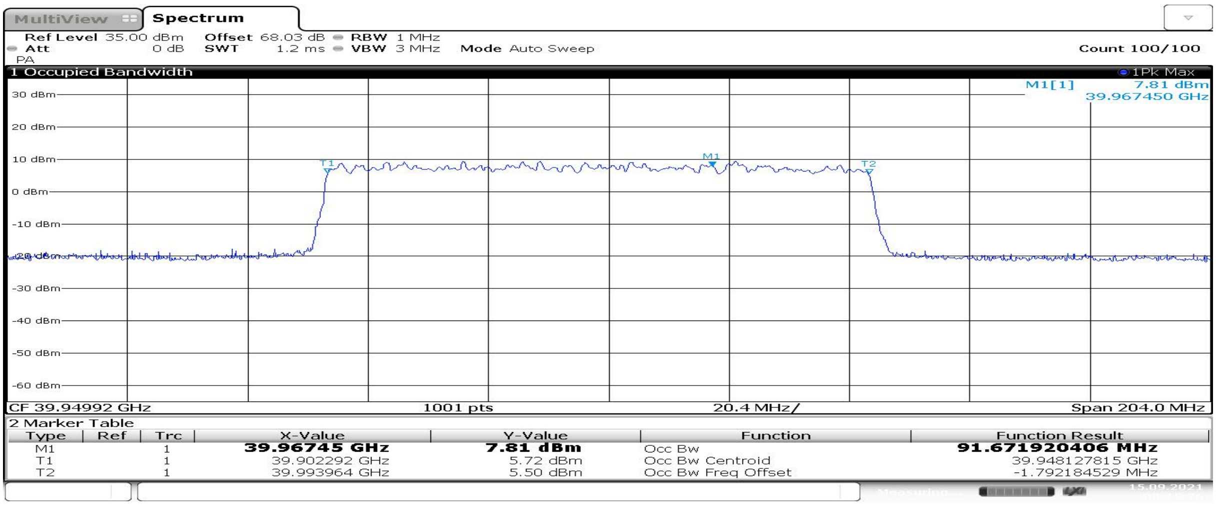
n260, 100MHz Bandwidth, CP-OFDM, High Channel 39949.92MHz, Pi/2 BPSK (99% BW)



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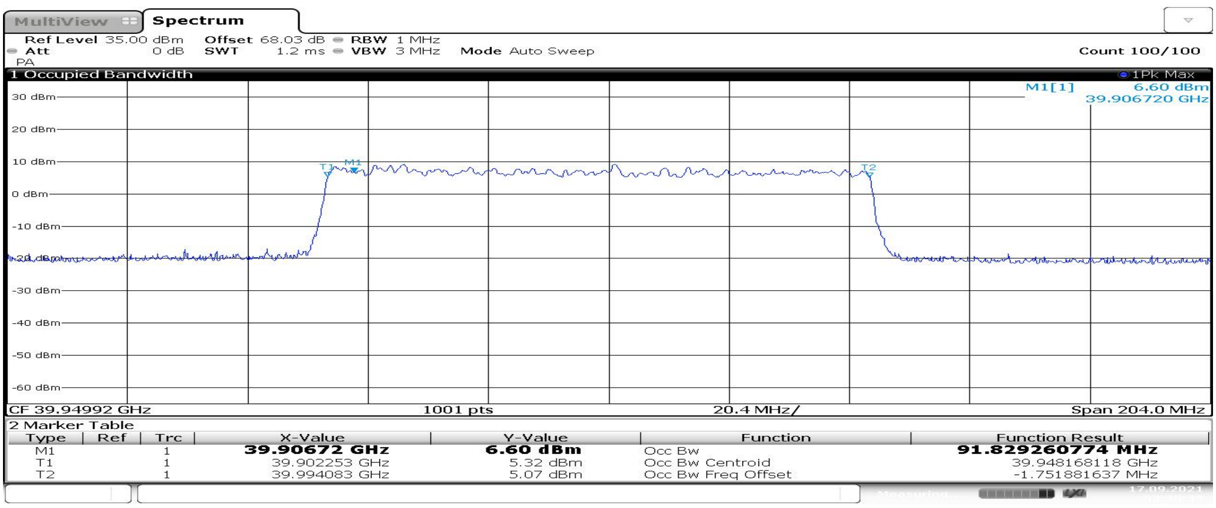
n260, 100MHz Bandwidth, CP-OFDM, High Channel 39949.92MHz, 64QAM (99% BW)



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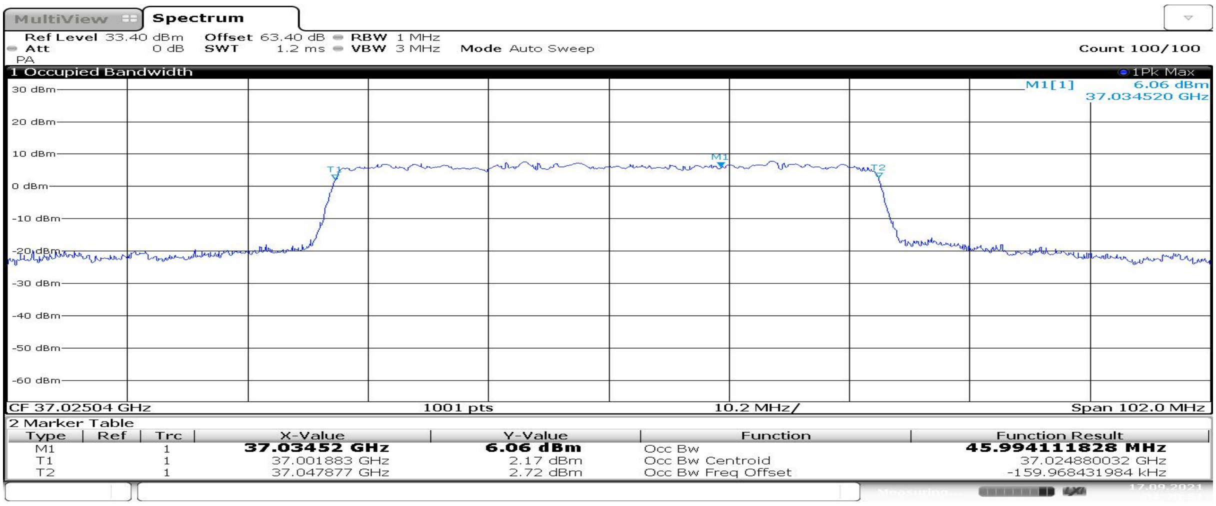
n260, Module1, SCS=120kHz, SISO Tx Chain 1

Bandwidth	Modulation	Frequency (MHz)	Beam ID	Occupied Bandwidth (99%) (MHz)
50MHz	CP QPSK	37025.04	148	45.99
	CP QPSK	39975	148	46.03
	DFT PI/2 BPSK	37025.04	148	45.96
100MHz	CP QPSK	37050	148	94.41
	CP QPSK	38499.96	148	94.27
	CP 64QAM	39949.92	148	94.76

Note: We tested the different modulation, different Beam ID, different Number of RB, different Channe, the measurement results showed here are worst cases.

n260, 50MHz Bandwidth, CP-OFDM,Low Channel 37025.04MHz, QPSK (99% BW)



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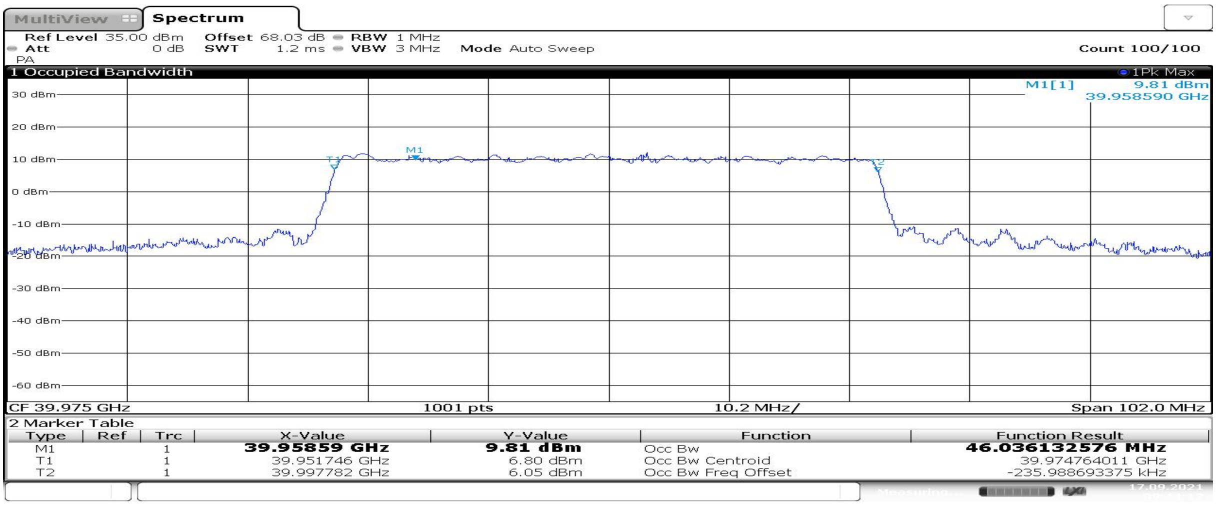
n260, 50MHz Bandwidth, CP-OFDM,High Channel 39975MHz, QPSK (99% BW)



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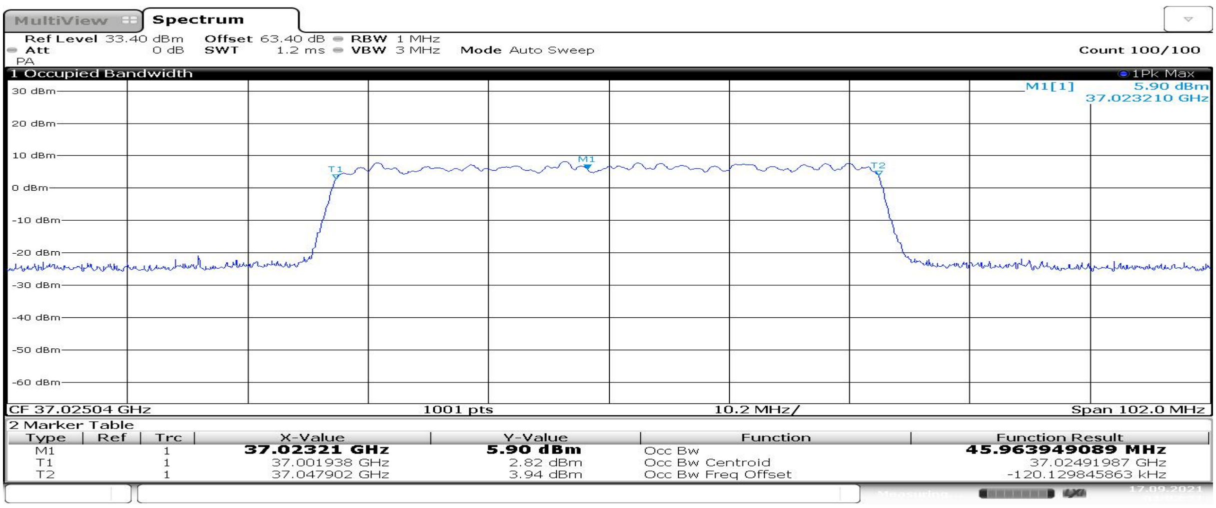
n260, 50MHz Bandwidth, DFT-OFDM,Low Channel 37025.04MHz, Pi/2 BPSK (99% BW)



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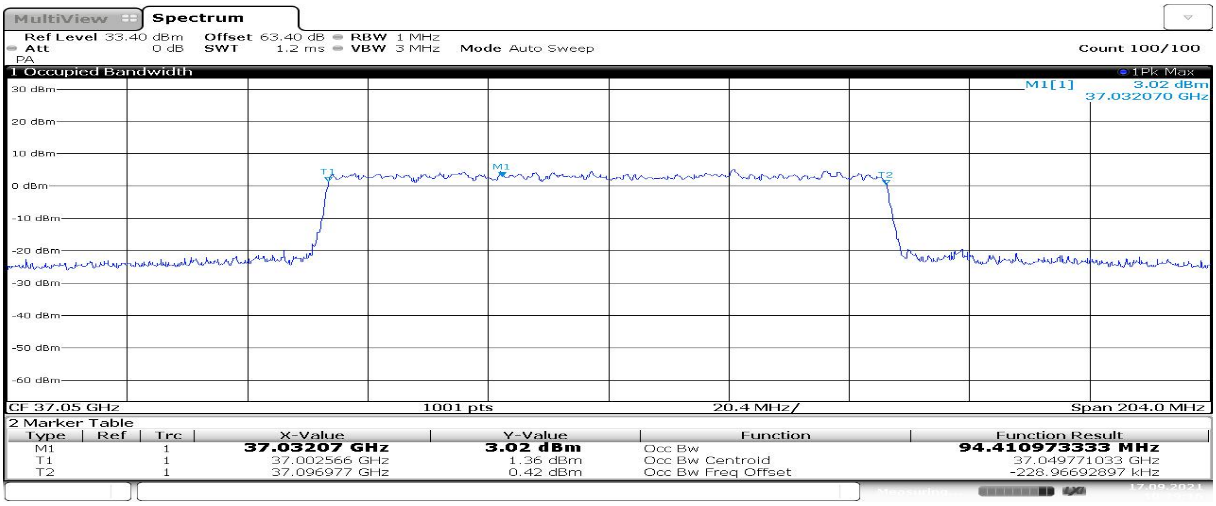
n260, 100MHz Bandwidth, CP-OFDM, Low Channel 37050MHz, QPSK (99% BW)



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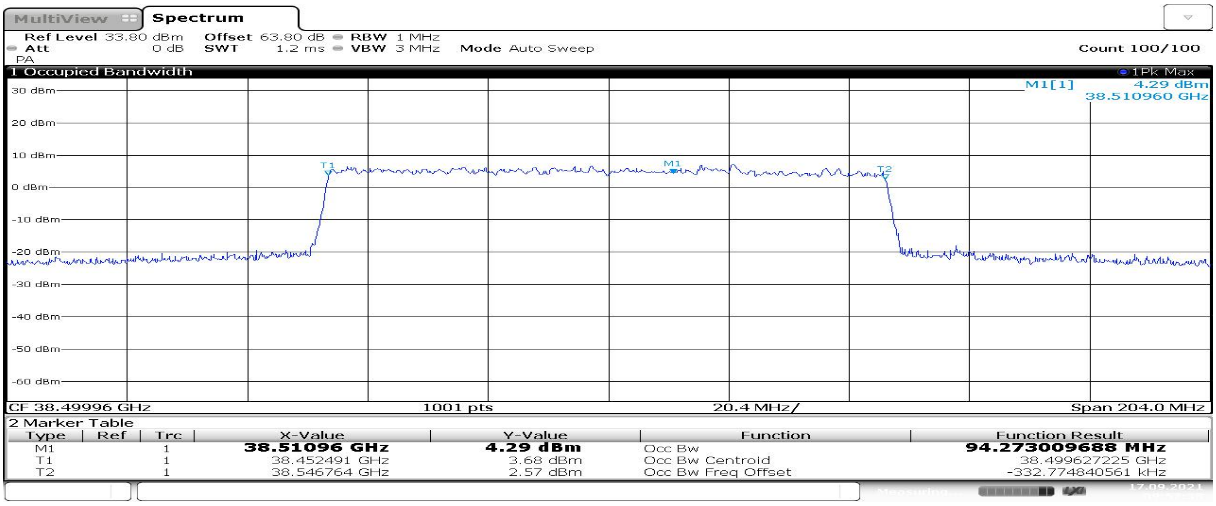
n260, 100MHz Bandwidth, CP-OFDM, MID Channel 38499.96MHz, QPSK (99% BW)



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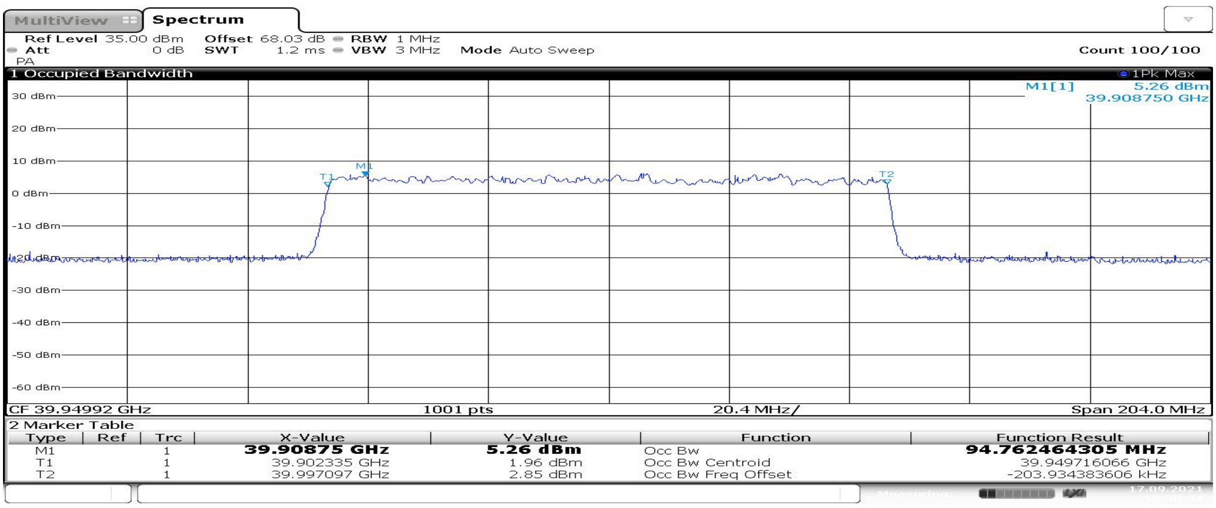
n260, 100MHz Bandwidth, CP-OFDM, High Channel 39949.92MHz, 64QAM (99% BW)



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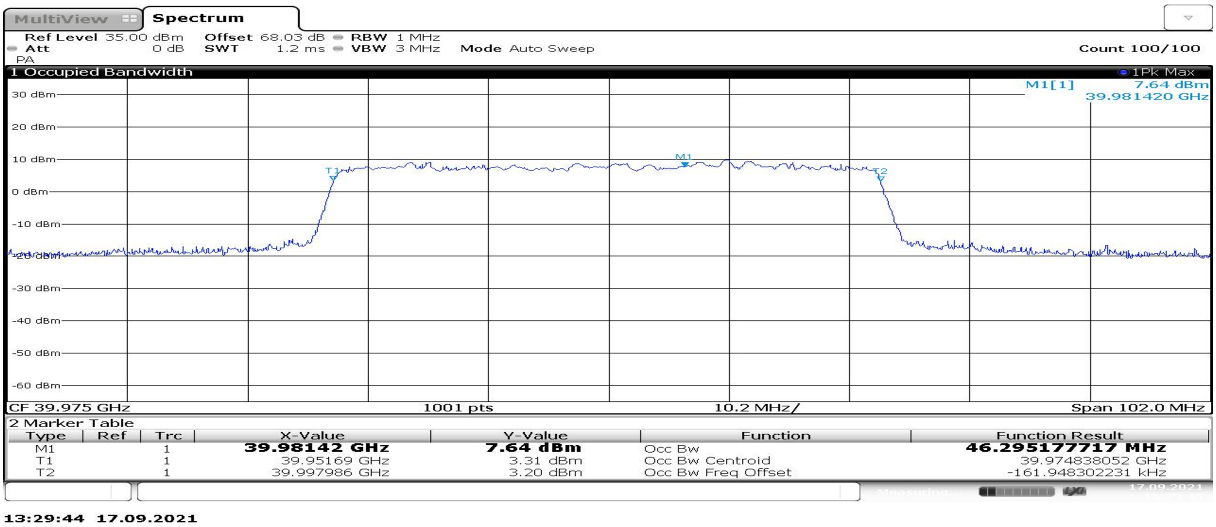
Module0, SCS=120kHz, 2*2 Tx Chain 0 Beam ID 27 + Tx Chain 1 Beam ID 155

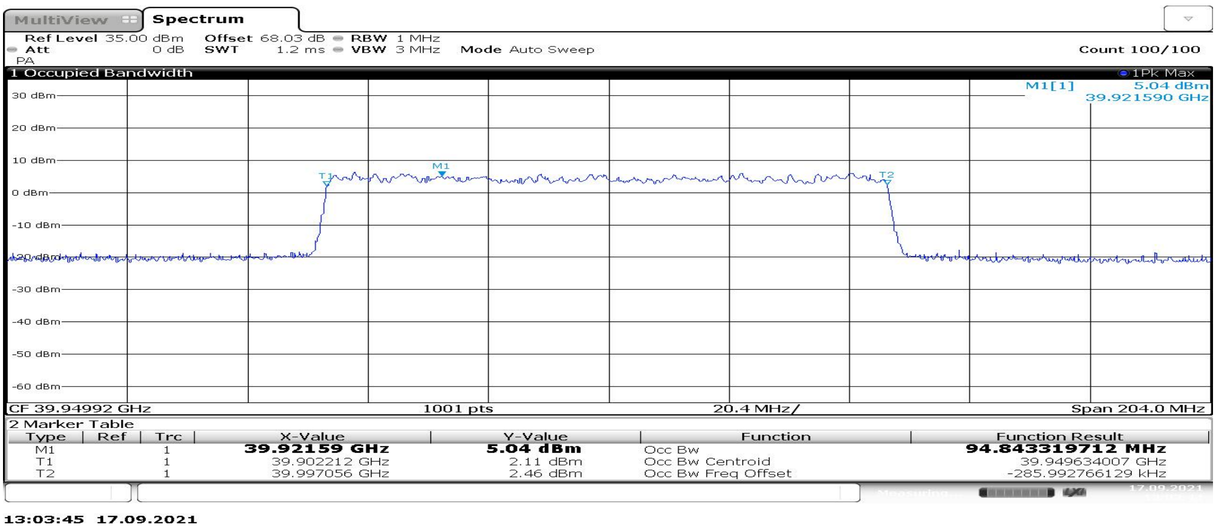
Bandwidth	Modulation	Frequency (MHz)	Beam ID	Occupied Bandwidth (99%) (MHz)
50MHz	CP QPSK	39975	27+155	46.30
100	CP 64QAM	39949.92	27+155	94.84

Note: We tested the different modulation, different Beam ID, different Number of RB, different Channe, the measurement results showed here are worst cases.

n260, 50MHz Bandwidth, CP-OFDM,High Channel 39975MHz, QPSK (99% BW)



n260, 100MHz Bandwidth, CP-OFDM,High Channel 39949.92MHz, 64QAM (99% BW)



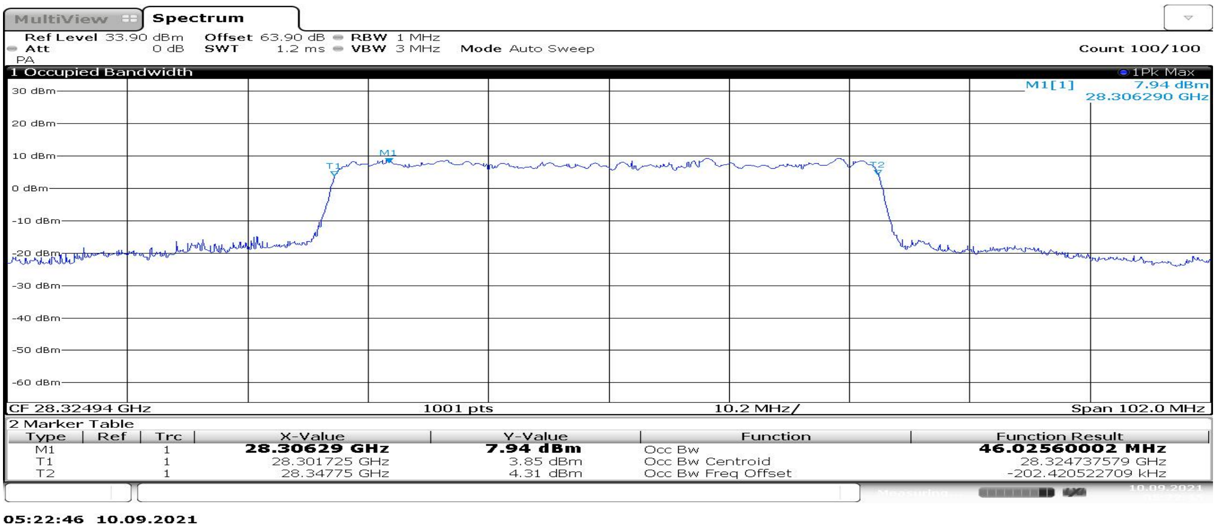
n261, Module0, SCS=120kHz, SISO Tx Chain 0

CP-OFDM

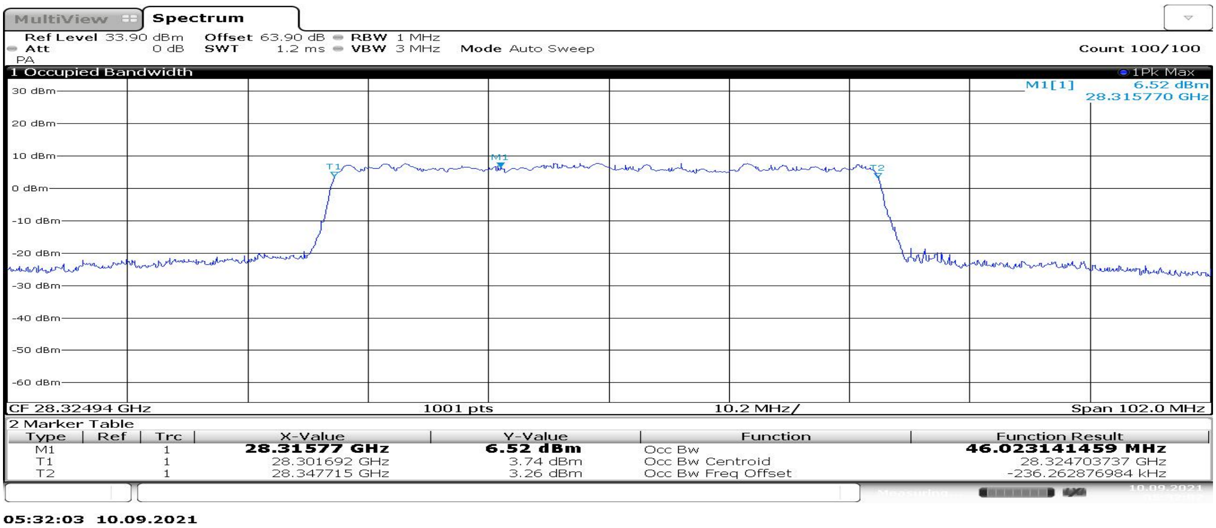
Bandwidth	Modulation	Frequency (MHz)	Beam ID	Occupied Bandwidth (99%) (MHz)
50MHz	QPSK	27525	18	46.00
		27924.96	18	46.00
		28324.92	18	46.02
	16QAM	28324.92	18	46.03
	64QAM	28324.92	18	46.02
100MHz	QPSK	27550.08	18	94.60
		27924.96	18	94.48
		28299.96	18	94.36
	QAM	27550.08	18	94.19
	64QAM	27550.08	18	94.39

Note1:The channel with the maximum power of QPSK was chose, and the 16QAM, 64QAM and the other Beam ID were measured on that channel. The maximum occupied bandwidth figures were showed in the following two pages.

n261, 50MHz Bandwidth, CP-OFDM, High Channel 28324.92MHz, QPSK (99% BW)



n261, 50MHz Bandwidth,CP-OFDM,High Channel 28324.92MHz, 16QAM (99% BW)



n261, 50MHz Bandwidth,CP-OFDM,High Channel 28324.92MHz, 64AQAM (99% BW)