

# CERTIFICATION TEST REPORT

**Report Number.** : 4791131433-E1V1

**Applicant** : SAMSUNG ELECTRONICS CO., LTD.  
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,  
GYEONGGI-DO, 16677, KOREA

**Model** : SM-A256E/DSN

**FCC ID** : A3LSMA256E

**EUT Description** : GSM/WCDMA/LTE 5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac.

**Test Standard(s)** : FCC 47 CFR PART 27 SUBPART L

**Date Of Issue:**  
2024-02-21

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Revision History

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SAMSUNG ELECTRONICS CO., LTD.  
**EUT DESCRIPTION:** GSM/WCDMA/LTE 5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac.  
**MODEL NUMBER:** SM-A256E/DSN  
**SERIAL NUMBER:** R3CW70X3Y1 (CONDUCTED);  
**DATE TESTED:** 2024-01-04 - 2024-02-21;

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 27L	Complies

UL KOREA LTD. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL KOREA LTD. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.


**Note:** The results documented in this report apply only to the tested sample, under the conditions and Modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL KOREA LTD. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL KOREA LTD. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

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Yeonhee Lim  
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## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC 47 CFR Part 2.
2. FCC 47 CFR Part 27.
3. ANSI TIA-603-E, 2016
4. ANSI C63.26, 2015
5. KDB 971168 D01 Power Meas License Digital Systems v03r01
6. KDB 971168 D02 Misc Rev Approv License Devices v02r02

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro	
<input type="checkbox"/>	Chamber 1(3m semi-anechoic chamber)
<input type="checkbox"/>	Chamber 2(3m semi-anechoic chamber)
<input type="checkbox"/>	Chamber 3(3m semi-anechoic chamber)
<input type="checkbox"/>	Chamber 4(3m Full-anechoic chamber)
<input type="checkbox"/>	Chamber 5(3m Full-anechoic chamber)

UL KOREA LTD. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.80 dB

Uncertainty figures are valid to a confidence level of 95%.

### 4.3. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 2, Clause 4.4.3 in IEC Guide 115:2021.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE 5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac.  
 This test report addresses the WWAN operational mode.

### 5.2. MAXIMUM OUTPUT POWER

#### NR Band n66

FCC Part 27						
Band	Frequency Range [MHz]	BandWidth [MHz]	Modulation	Mode	Conducted	
					Avg [dBm]	Avg [mW]
n66	1730.00 ~ 1760.00	40	DFT-s OFDM	$\pi/2$ BPSK	23.77	238.23
				QPSK	<b>23.91</b>	<b>246.04</b>
				16QAM	22.88	194.09
				64QAM	20.82	120.78
				256QAM	18.57	71.94
	CP-OFDM	QPSK	20.45	110.92		
	1725.00 ~ 1765.00	30	DFT-s OFDM	$\pi/2$ BPSK	23.82	240.99
				QPSK	23.76	237.68
				16QAM	22.92	195.88
				64QAM	20.86	121.90
				256QAM	18.79	75.68
	CP-OFDM	QPSK	20.83	121.06		
	1722.50 ~ 1767.50	25	DFT-s OFDM	$\pi/2$ BPSK	23.53	225.42
				QPSK	23.55	226.46
				16QAM	22.52	178.65
64QAM				20.84	121.34	
256QAM				18.70	74.13	
CP-OFDM	QPSK	20.76	119.12			

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a internal antenna for the supported bands with a maximum peak gain as follow:

Frequency (MHz)	Peak Gain (dBi/dBd)
NR Band n66 1710 - 1780 MHz	-0.58

### 5.4. WORST-CASE ORIENTATION

Following Modes should be considered as worst-case scenario for all other measurements.

For 5G NR n66 the worst-case scenario for all measurements is based on the average conducted output power measurement investigation results. Output power measurements were measured on  $\pi/2$  BPSK, QPSK, 16QAM, 64QAM and 256QAM modulations. It was found QPSK and 16QAM results were worst case.

This device supports NSA and SA Mode. Output Power measurements were measured on entire Mode and worst case is reported. worst case is SA Mode. So the test case is as below.

NR Band	NSA	SA
n66	LTE B2, B5, B12, B13	Standard alone

- Conducted Spurious Emission

Highest conducted output power setting for each bands				
NR Band	Frequency (MHz)	Bandwidth (MHz)	RB size	RB offset
66	1730.00	40	1	108
	1745.00		1	108
	1760.00		1	108



## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacture	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37W61WENTASEA	N/A
Data Cable	SAMSUNG	EP-DN980	GH39-02117A	N/A

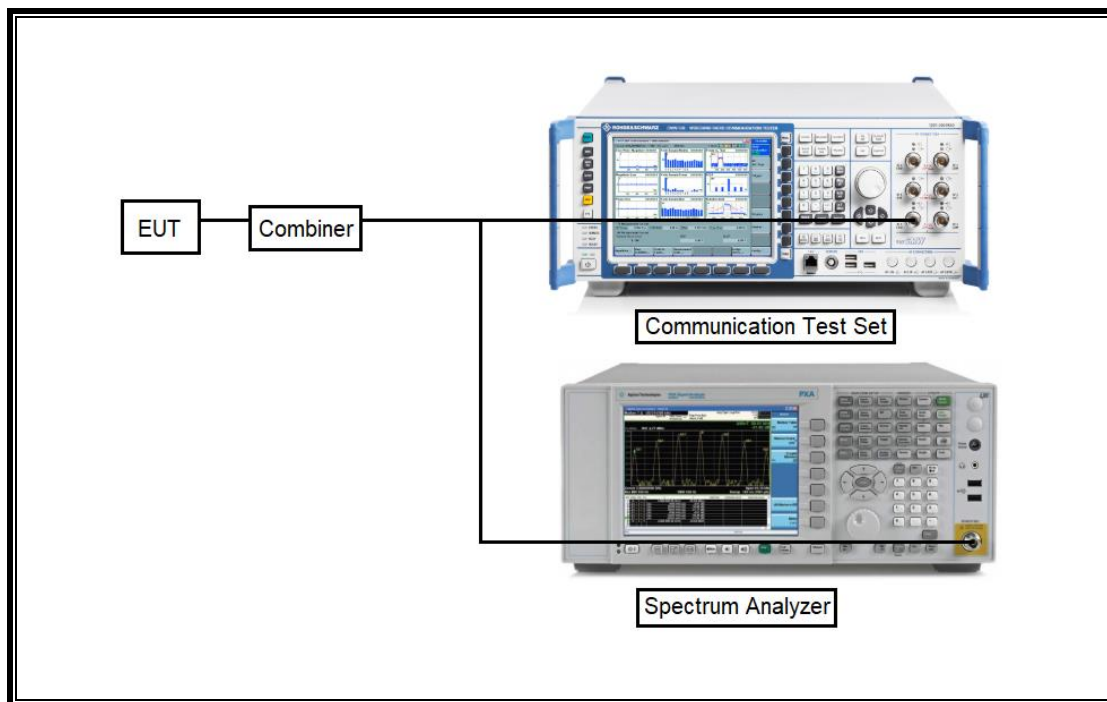
### I/O CABLE

I/O Cable List						
Cable No.	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C Type	Shielded	1.0 m	N/A

### TEST SETUP

The EUT is continuously communicated with the call box during the tests.

### SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Communications Test Set	R&S	CMW500	169797	2024-07-23
DC Power Supply	Agilent / HP	E3640A	MY54226395	2024-07-24
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	2024-07-25
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	2024-07-24
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9030B	MY57143717	2024-07-24
Attenuator	PASTERNAK	PE7087-10	A009	2024-07-24
Attenuator	PASTERNAK	PE7087-10	A001	2024-07-24
Attenuator	PASTERNAK	PE7087-10	A008	2024-07-27
Attenuator	PASTERNAK	PE7004-10	2	2024-07-23
Attenuator	PASTERNAK	PE7395-10	A011	2024-07-25
Temperature Chamber	ESPEC	SH-642	93001109	2024-07-24
Power Splitter	MINI-CIRCUITS	WA1534	UL003	2025-01-02
Power Splitter	MINI-CIRCUITS	WA1534	UL004	2025-01-02
UXM 5G Wireless Test Platform	KEYSIGHT	E7515B	MY57510655	2025-01-03
UL Software				
Description	Manufacturer	Model	Version	
Antenna port test software	UL	CLT	Ver 3.4	
Antenna port test software (5G NR FR1)	UL	UL iM	Ver 1.06	

## 7. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Results
2.1046	Conducted Output Power	N/A	Conducted	Pass
2.1049	Occupied Bandwidth (99%)	N/A		Pass
27.53(h)	Conducted Band Edge / Conducted Spurious Emission	-13 dBm		Pass
27.54	Frequency Stability	2.5 ppm		Pass

## 8. CONDUCTED RESULTS

### 8.1. CONDUCTED OUTPUT POWER

#### Test Procedure

Per KDB 971168 D01 Power Meas License Digital Systems v03r01;

The transmitter output was connected to E7515B Test set and configured to operate at maximum power.

#### NOTE

5G NR: All Waveforms (CP-OFDM vs DFT-s\_OFDM) and modulations ( $\pi/2$  BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All Modes of operation were investigated and the worst case configuration results are reported in this section.

#### RESULTS

See the following pages.

### 8.1.1. CONDUCTED AVERAGE OUTPUT POWER

#### NR Band n66

BW (MHz)	Modulation	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
					Measured Pwr (dBm)				
					346000 1730.00 MHz	349000 1745.00 MHz	352000 1760.00 MHz		
40 MHz	DFT-s-OFDM	π/2 BPSK	1	1	22.72	23.41	23.13	0.0	24.5
			1	108	23.25	23.59	23.29	0.0	24.5
			1	214	23.33	23.24	23.26	0.0	24.5
			108	0	22.20	22.36	22.95	0.5	24.0
			108	54	23.20	23.77	23.38	0.0	24.5
			108	108	22.37	22.67	22.88	0.5	24.0
		216	0	22.12	22.74	22.81	0.5	24.0	
		QPSK	1	1	22.76	23.32	23.14	0.0	24.5
			1	108	23.41	<b>23.91</b>	23.31	0.0	24.5
			1	214	23.34	23.46	23.31	0.0	24.5
			108	0	22.22	22.52	22.48	1.0	23.5
			108	54	23.20	<b>23.86</b>	23.40	0.0	24.5
			108	108	22.39	22.72	22.39	1.0	23.5
		16QAM	216	0	22.13	22.80	22.31	1.0	23.5
			1	1	21.85	22.31	22.07	1.0	23.5
			1	108	22.47	22.88	22.71	1.0	23.5
			1	214	22.48	22.46	22.35	1.0	23.5
		64QAM	1	1	20.38	20.82	20.80	2.5	22.0
1	1		18.23	18.44	18.57	4.5	20.0		
256QAM	1	1	18.23	18.44	18.57	4.5	20.0		
CP-OFDM	QPSK	1	1	20.28	20.45	20.37	3.0	21.5	
BW (MHz)	Modulation	Mode	RB Allocation	RB offset	Measured Pwr (dBm)			MPR	Tune-up Limit
					Measured Pwr (dBm)				
					345000 1725.00 MHz	349000 1745.00 MHz	353000 1765.00 MHz		
30 MHz	DFT-s-OFDM	π/2 BPSK	1	1	23.28	22.90	23.27	0.0	24.5
			1	80	23.71	23.49	23.34	0.0	24.5
			1	158	23.70	23.22	23.30	0.0	24.5
			80	0	22.34	22.22	22.29	0.5	24.0
			80	40	23.68	22.20	23.34	0.0	24.5
			80	80	23.82	22.40	22.37	0.5	24.0
		160	0	22.65	22.41	22.30	0.5	24.0	
		QPSK	1	1	23.34	22.92	23.29	0.0	24.5
			1	80	23.75	23.55	23.36	0.0	24.5
			1	158	<b>23.76</b>	23.24	23.33	0.0	24.5
			80	0	22.38	22.25	22.32	1.0	23.5
			80	40	<b>23.71</b>	23.48	23.35	0.0	24.5
			80	80	22.77	22.45	22.38	1.0	23.5
		160	0	22.70	22.45	22.31	1.0	23.5	
		16QAM	1	1	22.42	22.05	22.33	1.0	23.5
			1	80	22.84	22.68	22.45	1.0	23.5
			1	158	22.92	22.31	22.35	1.0	23.5
		64QAM	1	1	20.86	20.52	20.85	2.5	22.0
256QAM	1	1	18.42	18.47	18.79	4.5	20.0		
CP-OFDM	QPSK	1	1	20.39	20.51	20.83	3.0	21.5	
BW (MHz)	Modulation	Mode	RB Allocation	RB offset	Measured Pwr (dBm)			MPR	Tune-up Limit
					Measured Pwr (dBm)				
					344500 1722.50 MHz	349000 1745.00 MHz	353500 1767.50 MHz		
25 MHz	DFT-s-OFDM	π/2 BPSK	1	1	22.82	23.03	23.22	0.0	24.5
			1	67	23.12	23.43	23.28	0.0	24.5
			1	131	23.00	23.30	23.36	0.0	24.5
			64	0	22.11	22.37	22.33	0.5	24.0
			64	35	23.28	23.53	23.39	0.0	24.5
			64	69	22.17	22.51	22.41	0.5	24.0
		128	0	22.26	22.52	22.37	0.5	24.0	
		QPSK	1	1	22.82	23.06	23.24	0.0	24.5
			1	67	23.11	<b>23.44</b>	23.29	0.0	24.5
			1	131	23.00	23.32	23.38	0.0	24.5
			64	0	22.13	22.39	22.35	1.0	23.5
			64	35	23.30	<b>23.55</b>	23.41	0.0	24.5
			64	69	22.18	22.54	22.43	1.0	23.5
		128	0	22.27	22.53	22.38	1.0	23.5	
		16QAM	1	1	22.02	22.13	22.33	1.0	23.5
			1	67	22.33	22.52	22.36	1.0	23.5
			1	131	22.22	22.37	22.48	1.0	23.5
		64QAM	1	1	20.52	20.62	20.84	2.5	22.0
256QAM	1	1	18.35	18.50	18.70	4.5	20.0		
CP-OFDM	QPSK	1	1	20.42	20.61	20.76	3.0	21.5	

## 8.2. PEAK TO AVERAGE RATIO

### Test Procedure

Per KDB 971168 D01 Power Meas License Digital Systems v03r01;

The transmitter output was connected to E7515B Test set and configured to operate at maximum power. The PAR were measured on the Spectrum Analyzer.

### Test Spec

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

### NOTE

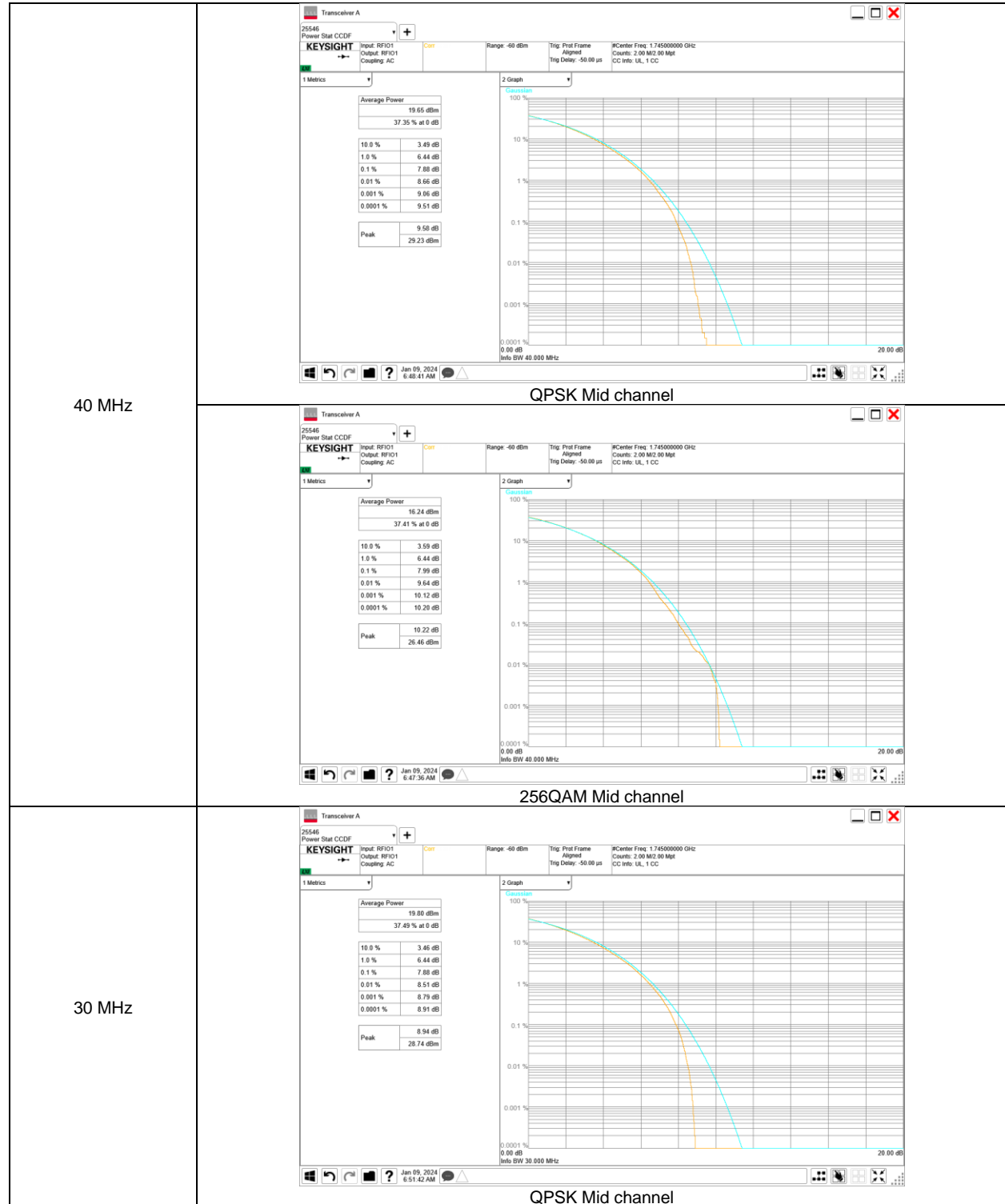
5G NR: All Waveforms (CP-OFDM vs DFT-s\_OFDM) and modulations ( $\pi/2$  BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All Modes of operation were investigated and the worst case configuration results are reported in this section.

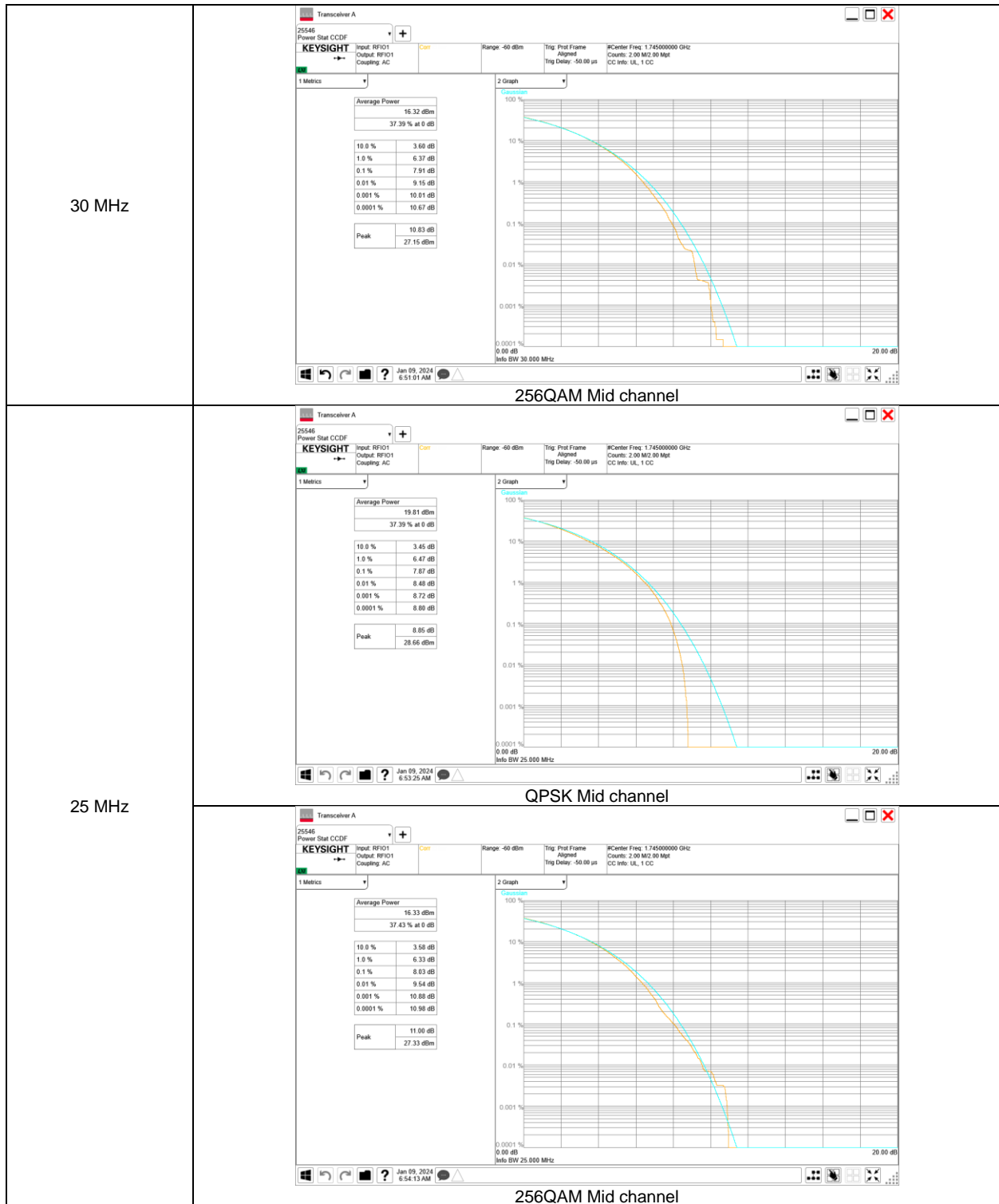
### RESULTS

See the following pages.

### 8.2.1. CONDUCTED PEAK TO AVERAGE RESULT

#### NR Band n66 CP-OFDM





### 8.3. OCCUPIED BANDWIDTH

**RULE PART(S)**

FCC: §2.1049

**LIMITS**

For reporting purposes only

**TEST PROCEDURE**

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at middle channel in each band. The -26dB bandwidth was also measured and recorded.

(KDB 971168 D01 Power Meas License Digital Systems v03r01)

**- NR Band n66 CP-OFDM**

Band	BW	Modulation	Frequency [MHz]	99% BW (MHz)	-26dB BW (MHz)
NR n66	40M	QPSK	1745.0	38.703	41.450
		16QAM		38.652	41.440
	30M	QPSK		28.704	31.240
		16QAM		28.608	31.370
	25M	QPSK		23.766	25.250
		16QAM		23.827	25.740



### 8.3.1. OCCUPIED BANDWIDTH RESULTS

#### NR Band n66 CP-OFDM



## 8.4. BAND EDGE EMISSIONS

### RULE PART(S)

FCC: §27. 53

### LIMITS

Part 27.53:

(h) The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  dB.

### TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

The transmitter output was connected to E7515B Test set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

### 5G NR

- a) Set the RBW = 1 - 1.5 % of OBW(Typically limited to a minimum RBW of 1% of the OBW)
- b) Set VBW  $\geq 3 \times$  RBW;
- c) Set span  $\geq 1.5$  times the OBW;
- d) Sweep time = Auto;
- e) Detector = RMS;
- f) Ensure that the number of measurement points  $\geq 2 \times$  Span/RBW;
- g) Trace Mode = Average (100);

**NOTE1**

Note that the spurious emissions outside of the channel include narrowband signals. These signals are all below the -13dBm / -25dBm limits. Although the measurement bandwidth is less than the reference bandwidth of 1MHz no addtional correction is applied as ANSI C63.26 section 4.2.3 only requires the correction to be applied when the OBW of the emission being measured is wider than the measurement bandwidth (Where the OBW of the signal under measurement is less than the RBW of the measuring instrument, no bandwidth correction or integration will be required.) Plots for low and high channels show the level of the emission measured with the reduced bandwidth and the level of the same emission measured using the integration method over the 1MHz reference bandwidth are very close, indicating the emissions are narrowband.

**NOTE2**

For Band-Edge extended:

CH BW (MHz)	RB Used (kHz)	CF for emissions more than 100kHz	CF for emissions more than 1MHz
1.4	15	+8.2 dB	+18.2 dB
3	30	+5.2 dB	+15.2 dB
5	51	+2.9 dB	+12.9 dB
10	100	N/A	+10.0 dB
15	150	N/A	+8.2 dB
20	200	N/A	+7.0 dB

For the band edge value measured in [RB Used], even if [CF for emissions reference bandwidth 100kHz/1MHz] is applied, it is below -13dBm.

**NOTE3**

5G NR: All Waveforms (CP-OFDM vs DFT-s\_OFDM) and modulations ( $\pi/2$  BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All Modes of operation were investigated and the worst case configuration results are reported in this section.

**RESULTS**

See the following pages.

### 8.4.1. BAND EDGE RESULT

#### NR Band n66



40MHz



30MHz



25MHz

## 8.5. CONDUCTED SPURIOUS EMISSIONS

### RULE PART(S)

FCC: §27.53

### LIMITS

Part 27.53:

(h) The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  dB.

### TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold Mode using a peak detector to ensure that the worst-case emissions were caught.

- a) Set the RBW = 1 MHz for emissions above 1 GHz  
(Tests were performed 1MHz [Worst case], to sweep 1 time for all frequency range)
- b) Set VBW  $\geq 3 \times$  RBW;
- c) Set span  $\geq 1.5$  times the OBW;
- d) Sweep time = auto couple;
- e) Detector = rms;
- f) Ensure that the number of measurement points = Max (40001);
- g) Trace Mode = average;

### NOTE1

5G NR: All Waveforms (CP-OFDM vs DFT-s\_OFDM) and modulations ( $\pi/2$  BPSK, QPSK, 16QAM, 64QAM, 256QAM) were investigated to determine the worst case configuration. All Modes of operation were investigated and the worst case configuration results are reported in this section.

### NOTE2

Please refer to section 5.4 for bandwidth and RB setting about 5G NR bands.

### RESULTS

See the following pages.

### 8.5.1. OUT OF BAND EMISSIONS RESULT

#### NR Band n66





## **8.6. FREQUENCY STABILITY**

### **RULE PART(S)**

FCC: §2.1055, §27.54

### **LIMITS**

Part 27.54

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

### **TEST PROCEDURE**

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

### **NOTE**

Test were performed each lowest or highest frequency on the modulation condition of more wide bandwidth.(Please refer to section 9.1.1 OBW results)

### **RESULTS**

See the following pages.

**8.6.1. OUT OF BAND EMISSIONS RESULT**

**NR Band n66 (Lowest Frequency: 16QAM / Highest Frequency: 16QAM)**

Test Date	2024-01-05
Test Engineer	25546

Limit		1710	1780	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1710.2536	1779.7478		
Extreme (50C)		1710.2536	1779.7478	3.4	0.002
Extreme (40C)		1710.2536	1779.7478	4.7	0.003
Extreme (30C)		1710.2536	1779.7478	5.3	0.003
Extreme (10C)		1710.2536	1779.7478	2.6	0.001
Extreme (0C)		1710.2536	1779.7478	3.0	0.002
Extreme (-10C)		1710.2536	1779.7478	3.0	0.002
Extreme (-20C)		1710.2536	1779.7478	3.4	0.002
Extreme (-30C)		1710.2536	1779.7478	3.2	0.002
20C	15%	1710.2536	1779.7478	4.6	0.003
	-15%	1710.2536	1779.7478	1.7	0.001
	End Point	1710.2536	1779.7478	1.9	0.001

**END OF REPORT**