TEST REPORT

Application No.:	KSCR2305000877AT
FCC ID:	OJFE62-M3-L
Applicant:	Corning Optical Communications LLC
Address of Applicant:	6 Concord Road, Shrewsbury, MA 01545 United States
Manufacturer:	Corning Optical Communications LLC
Address of Manufacturer:	6 Concord Road, Shrewsbury, MA 01545 United States
Equipment Under Test (EUT):	
EUT Name:	Remote Unit
Model No.:	E62-M3-L
Trade mark:	CORNING
Standard(s) :	FCC Part 2 FCC Part 24 FCC Part 27
Date of Receipt:	2023-05-19
Date of Test:	2023-05-19 to 2023-12-25
Date of Issue:	2023-05-25
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

* This case is based on the original case KSCR2211002212AT, and based on the original situation, the power amplifier tube suppliers of LTE band 25&band 66 and 5GNR N25&N66 were replaced. The technical specifications and parameters of the power amplifier tube are consistent with the original manufacturer. We evaluated the output power and RSE for validation testing based on changes.

Eric Lin
Laboratory Manager

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Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
00	*Original*	*2023-05-25*		*/*

Authorized for issue by:				
		cloudpeng **Cloud Peng / Project Engineer**		
		Eric Lin **Eric Lin / Reviewer**		

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2 Test Summary

2.1 1930MHz-1995MHz for FCC Part 24 subpart E

Test Item	Reference	Result
RF Output Power, Amplifier Gain and Peak to Average Ratio	§2.1046, §24.232	PASS
Conducted Spurious Emissions	§2.1051, §24.238	PASS
Out-of-band/out-of-block (including intermodulation) Emissions	ANSI C63.26 KDB 935210 D05 v01r04 935210 D02 v04r02	PASS
Radiated Spurious Emissions	§2.1051, §24.238	PASS
Occupied Bandwidth and Input-versus-output signal comparison	2.1049(h)	PASS
Frequency Stability	§2.1055, §24.235	PASS
Remark: EUT: In this whole report EUT means Equipment Under Test. Tx: In this whole report Tx (or tx) means Transmitter. Rx: In this whole report Rx (or rx) means Receiver. All modes have been tested and only record the worst test result. This product has two power supply modules, one is AC power supply module, the other is DC power supply module. We evaluated and tested all power supply modules. The worst mode is AC power supply module. This report only record the worst mode.		
Test method standard: ANSI C63.26-2015 KDB 935210 D05 Indus Booster Basic Meas v01r04 KDB 935210 D02 Signal Booster Certification v04r02		

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2.2 2110MHz-2200MHz for FCC Part 27 subpart L

Test Item	Reference	Result
RF Output Power, Amplifier Gain and Peak to Average Ratio	§2.1046, §27.50(d)	PASS
Conducted Spurious Emissions	§2.1051, §27.53(h)	PASS
Out-of-band/out-of-block (including intermodulation) Emissions	ANSI C63.26 KDB 935210 D05 v01r04 935210 D02 v04r02	PASS
Radiated Spurious Emissions	§2.1051, §27.53(h)	PASS
Occupied Bandwidth and Input-versus-output signal comparison	2.1049(h)	PASS
Frequency Stability	§2.1055, §27.54	PASS

Remark:
EUT: In this whole report EUT means Equipment Under Test.
Tx: In this whole report Tx (or tx) means Transmitter.
Rx: In this whole report Rx (or rx) means Receiver.
All modes have been tested and only record the worst test result.
This product has two power supply modules, one is AC power supply module, the other is DC power supply module. We evaluated and tested all power supply modules. The worst mode is AC power supply module. This report only record the worst mode.

Test method standard:
ANSI C63.26-2015
KDB 935210 D05 Indus Booster Basic Meas v01r04
KDB 935210 D02 Signal Booster Certification v04r02

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4 General Information

4.1 Details of E.U.T.

Product Name:	Remote Unit
Device type	Booster
Model No.:	E62-M3-L
Antenna Type:	External
Antenna Gain:	12 dBi for 1930MHz to 1995MHz (Provided by manufacturer) 12 dBi for 2110MHz to 2200MHz (Provided by manufacturer)
Power Supply:	DC 48V ± 20% or AC 100-240V~50/60Hz
Type of Modulation	5G NR: CP-OFDM: QPSK, 16QAM, 64QAM, 256QAM LTE: QPSK, 16QAM, 64QAM, 256QAM
Frequency Band:	1930MHz to 1995MHz 2110MHz to 2200MHz
Power Control Method:	ALC
Temperature Range:	-40℃ to 55℃
Antenna Delivery:	SISO

Note:

1.This case is based on the original case KSCR2211002212AT, and based on the original situation, the power amplifier tube suppliers of LTE band 25&band 66 and 5GNR N25&N66 were replaced. The technical specifications and parameters of the power amplifier tube are consistent with the original manufacturer. We evaluated the output power and RSE for validation testing based on changes.

2.The antenna gain value is provided by the customer. The test lab will not be responsible for wrong test result due to incorrect information about antenna gain values.

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4.2 Description of Support Units

Description	Manufacture	Model No.	S/N
Notebook	ThinkPad	K27	/

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4×10^{-8}
2	Timeout	2s
3	Duty Cycle	0.37%
4	Occupied Bandwidth	3%
5	RF Conducted Power	0.6dB
6	RF Power Density	2.9dB
7	Conducted Spurious Emissions	0.75dB
8	RF Radiated Power	5.2dB (Below 1GHz)
		5.9dB (Above 1GHz)
9	Radiated Spurious Emission Test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-18GHz)
		5.4dB (Above 18GHz)
10	Temperature Test	1°C
11	Humidity Test	3%
12	Supply Voltages	1.5%
13	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.4 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

No tests were sub-contracted.

Note:

1.SGS is not responsible for wrong test results due to incorrect information (e.g., max. internal working frequency, antenna gain, cable loss, etc) is provided by the applicant. (If applicable).

2.SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (If applicable).

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

• FCC

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

• ISED

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 2324E

• VCCI

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600, C-11707, T-11499, G-10216 respectively.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Item	Equipment	Manufacturer	Model	Inventory No	Cal Date	Cal. Due Date
RF Conducted Test						
1	Spectrum Analyzer	Keysight	N9020A	KUS1911E004-2	08/22/2022	08/21/2023
2	Spectrum Analyzer	Keysight	N9020A	KUS2001M001-2	08/22/2022	08/21/2023
3	Spectrum Analyzer	Keysight	N9030B	KSEM021-1	02/03/2023	02/02/2024
4	Signal Generator	R&S	SMBV100B	KSEM032	03/16/2023	03/15/2024
5	Signal Generator	R&S	SMW200A	KSEM020-1	08/22/2022	08/21/2023
6	Signal Generator	Agilent	N5182A	KUS2001M001-1	08/22/2022	08/21/2023
7	Radio Communication Test Station	Anritsu	MT8000A	KSEM001-1	08/22/2022	08/21/2023
8	Radio Communication Analyzer	Anritsu	MT8821C	KSEM002-1	03/16/2023	03/15/2024
9	Universal Radio Communication Tester	R&S	CMW500	KUS1911E004-1	08/22/2022	08/21/2023
10	Switcher	CCSRF	FY562	KUS2001M001-3	08/22/2022	08/21/2023
11	AC Power Source	EXTECH	6605	KS301178	N.C.R	N.C.R
12	DC Power Supply	Aglient	E3632A	KS301180	N.C.R	N.C.R
13	Conducted Test Cable	Thermax	RF01-RF04	CZ301111-CZ301120	02/03/2023	02/02/2024
14	Temp. / Humidity Chamber	TERCHY	MHK-120AK	KS301190	11/16/2022	11/15/2023
15	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-5	03/22/2023	03/21/2024
16	Software	BST	TST-PASS	/	N/A	N/A
RF Radiated Test						
1	Spectrum Analyzer	R&S	FSV40	KUS1806E003	08/22/2022	08/21/2023
2	Universal Radio Communication Tester	R&S	CMW500	KSEM009-1	03/16/2023	03/15/2024
3	Signal Generator	Agilent	E8257C	KS301066	08/22/2022	08/21/2023
4	Loop Antenna	COM-POWER	AL-130R	KUS1806E001	03/18/2023	03/17/2025
5	Bilog Antenna	TESEQ	CBL 6112D	KUS1806E005	06/29/2021	06/28/2023
6	Bilog Antenna	SCHWARZBECK	VULB9160	CZ301016	04/13/2021	04/12/2024
7	Horn-antenna(1-18GHz)	Schwarzbeck	BBHA9120D	KS301079	04/02/2022	04/01/2024
8	Horn-antenna(1-18GHz)	ETS-LINDGREN	3117	KS301186	02/21/2023	02/20/2024
9	Horn Antenna(18-40GHz)	Schwarzbeck	BBHA9170	CZ301058	02/26/2023	02/25/2024
10	Horn Antenna(18-40GHz)	Schwarzbeck	BBHA9170	KS301187	02/22/2023	02/21/2024
11	Amplifier(30MHz~18GHz)	PANSHAN TECHNOLOGY	LNA:1~18G	KSEM010-1	01/17/2023	01/16/2024
12	Amplifier(18~40GHz)	COM-POWER	PAM-840A	KUS1710E001	01/21/2023	01/20/2024
13	RE Test Cable	REBES MICROWAVE	/	CZ301097	11/12/2022	11/11/2023
14	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-4	03/22/2023	03/21/2024
15	Software	Faratronic	EZ_EMC-v 3A1	/	N/A	N/A

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6 Test Results

6.1 Test conditions

Input voltage:	AC 120V/60Hz	
Test voltage	Normal	AC 120V/60Hz
	Extreme	AC 102V-AC138V
Operating Environment:		
Test Temperature:	Normal	22°C~26°C
	Extreme	-40~55° C
Humidity:	46%~56% RH	
Atmospheric Pressure:	990~1005mbar	
Test Requirement:	The RF output power of the EUT was measured at the antenna port, by adjusting the input power of signal generator to drive the EUT to get to maximum output power point and keep the EUT at maximum gain setting for all tests. The device should be tested on downlink. For detail test Modulation and Frequency, please refer to 7.2.	

Remark:

FIBER-OPTIC AND OTHER SIMILAR RF DISTRIBUTION SYSTEMS

Fiber-optic distribution systems are a type of in-building radiation system that receives RF signals from an antenna, distributes the signal over fiber-optic cable, and then retransmits at another location for example within a building or tunnel. Most fiber-optic systems are signal boosters; however, some may be boosters. These systems generally have two enclosures typically called host (or local or donor unit) and remote. Some systems may also have an optional expander box for fan-out to multiple remotes. The system transmits downlink signals from the remote unit to handsets, portables, or clients, and transmits uplink signals via from the host unit. Usually but not always the uplink goes through an intermediate amplifier to a “donor” antenna. Therefore both uplink and downlink must be tested, unless filing effectively documents how connection of uplink to donor antenna with or without an intermediate amplifier will be prevented, such as for always only a cabled connection to a base station. Fiber-optic systems are not amplifiers (AMP equipment class) – they are equipment class TNB or PCB. The same approval procedures also apply for multiple-enclosure systems connected by coax cable.

Synonyms and related terms: in-building radiation system, coverage enhancer, distributed antenna system, fiber-optic distribution system, converter, donor antenna

Typical in-building or distributed antenna systems can consist of five different components (enclosures), not counting antennas:

1) host unit

a) transmits uplink to base station via antenna thru coax, ***passive interface unit***, or ***active interface unit*** (amplifier)

b) sends base-station downlink via fiber-optic or coax to ***remote***

c) receives handset uplink via fiber-optic or coax from ***remote***

d) optional connection to ***expansion unit*** via fiber-optic

e) separate FCC ID from ***remote***, unless electrically identical

f) ***non-transmitting host unit***

i) connects directly to a base station via coax cable but does not connect to antenna or amplifier

ii) Part 15 digital device subject to Verification, no FCC ID

2) remote unit

a) receives base-station downlink via fiber-optic or coax from ***host***, transmits via antenna to handsets

b) returns handset uplink via fiber-optic or coax to ***host***

c) separate FCC ID from ***remote***, unless electrically identical

3) fiber-optic expansion unit

a) fiber-optic or coax from ***host***

b) fiber-optic or coax fan-out to ***remote(s)***

c) Part 15 digital device subject to Verification, no FCC ID

4) RF expansion unit

a) internal or external device used to add band(s) and/or transmit mode(s) to a ***remote***

b) operates only when connected to a ***remote unit*** as part of a booster system

c) contains signal-processing functions to convert baseband signal into modulated RF signal

d) use equipment class PCB or TNB for an ***RF expansion unit*** (the associated ***remote*** uses an equipment class Bxx per **Table C.1** of this document, e.g., B2I)

5) ***passive interface unit***

a) contains attenuators, splitters, combiners

b) coax cable connection between ***host*** and base-station

c) passive device, no FCC ID

6) ***active interface unit***

a) amplifies uplink signal from ***host unit*** for transmit by donor antenna

b) attenuates downlink from donor antenna

c) coax cable connection between ***host*** and ***active interface unit***

d) usually has separate FCC ID; in some cases could be combined/included with ***host*** as one enclosure

GENERAL DEFINITIONS FOR CERTIFICATION PURPOSES:

The following three general definitions follow from those stated in the Part 22, 24, 27 and 90 rule sections as listed above. Two of the definitions replace previous EAB internal definitions given for booster, booster and extender. The general term “extender” is the same as booster, but booster should be used rather than extender. The general term “translator” is the same as booster, but booster should be used rather than translator.

External radio frequency power amplifier (ERFPA) - any device which, (1) when used in conjunction with a radio transmitter signal source, is capable of amplification of that signal, and (2) is not an integral part of a radio transmitter as manufactured. The EAS equipment class AMP is used only for an ERFPA device inserted between a transmitter (TNB/PCB) and an antenna (has only one antenna port) ***Booster***

is a device that automatically reradiates signals from base transmitters without channel translation, for the purpose of improving the reliability of existing service by increasing the signal strength in dead spots. An “in-building radiation system” is a signal booster. These devices are not intended to extend the size of coverage from the originating base station. A booster can be either single or multiple channels.

Booster is a device that retransmits the signals of other stations. Boosters are different from boosters in that they can include frequency translation and can extend coverage beyond the design of the original base station. A booster is typically single channel but can also be multiple channels.

ERFPA (AMP) and boosters/boosters (TNB/PCB) can generally be authorized for all rule parts except 15 and 18.

Tests should be done with each typical signal. e.g., for F3E emissions use 2500 Hz with 2.5 or 5 kHz deviation. Use of CW signal for some tests is acceptable in lieu of actual emission, in some cases when CW signal gives worst case.

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6.2 Test Procedure & Measurement Data

6.2.1 RF Output Power and Amplifier Gain

Test Requirement: §2.1046, §24.232, §27.50

Test Method: KDB 935210 D05 Indus Booster Basic Meas v01r04

EUT Operation:

Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

Application: Cellular Band RF output ports

Test Configuration:

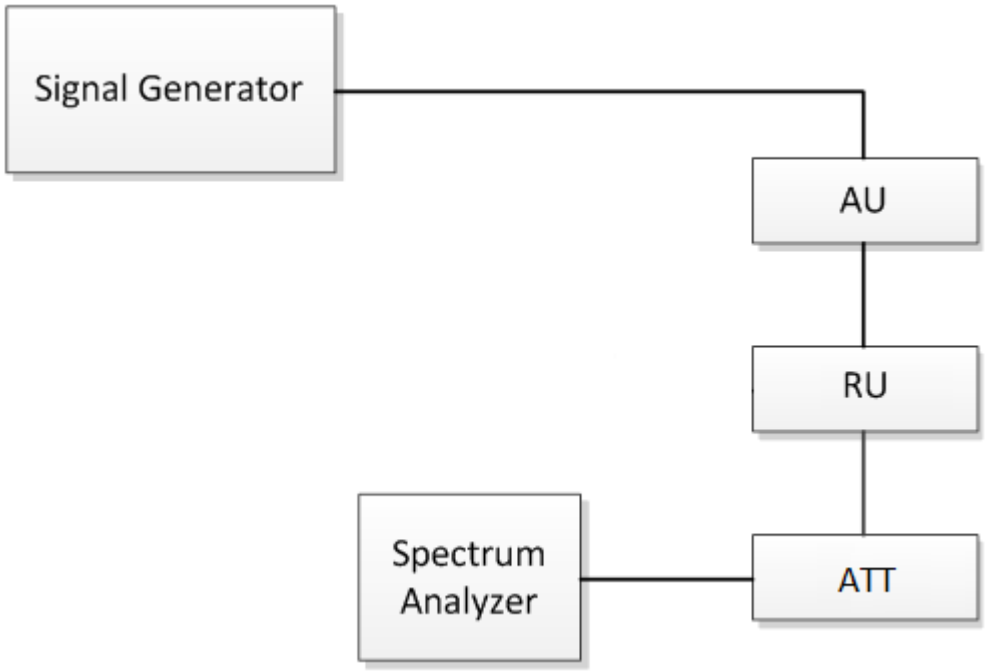

Fig.1 RF Output Power test configuration

Test Procedure:	RF output power test procedure: a) Connect a signal generator to the input of the EUT. b) Configure to generate the AWGN (broadband) test signal. c) The frequency of the signal generator shall be set to the frequency f0 as determined from 3.3. d) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary. e) Set the signal generator output power to a level that produces an EUT output level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below. f) Measure and record the output power of the EUT; use 3.5.3 or 3.5.4 for power measurement. g) Remove the EUT from the measurement setup. Using the same signal generator settings, repeat the power measurement at the signal generator port, which was used as the input signal to the EUT, and record as the input power. EUT gain may be calculated as described in 3.5.5. h) Repeat steps f) and g) with input signal amplitude set to 3 dB above the AGC threshold level. i) Repeat steps e) to h) with the narrowband test signal. j) Repeat steps e) to i) for all frequency bands authorized for use by the EUT. Amplifier gain test procedure: After the mean input and output power levels have been measured as described in the preceding subclauses, the mean gain of the EUT can be determined from: Gain (dB) = output power (dBm) - input power (dBm). Peak to Average Ratio: Please according to KDB 971168 D01 clause 5.7.
Remark:	The system continuously monitors the input power.

6.2.1.1 Measurement Record:

Please refer to Appendix I for KSCR2305000877AT-LTE+NR-B25

Please refer to Appendix J for KSCR2305000877AT-LTE+NR-B66

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6.2.2 Radiated Spurious Emissions

Test Requirement: §2.1051, §24.238, §27.53

Test Method: KDB 935210 D05 Indus Booster Basic Meas v01r04

EUT Operation:

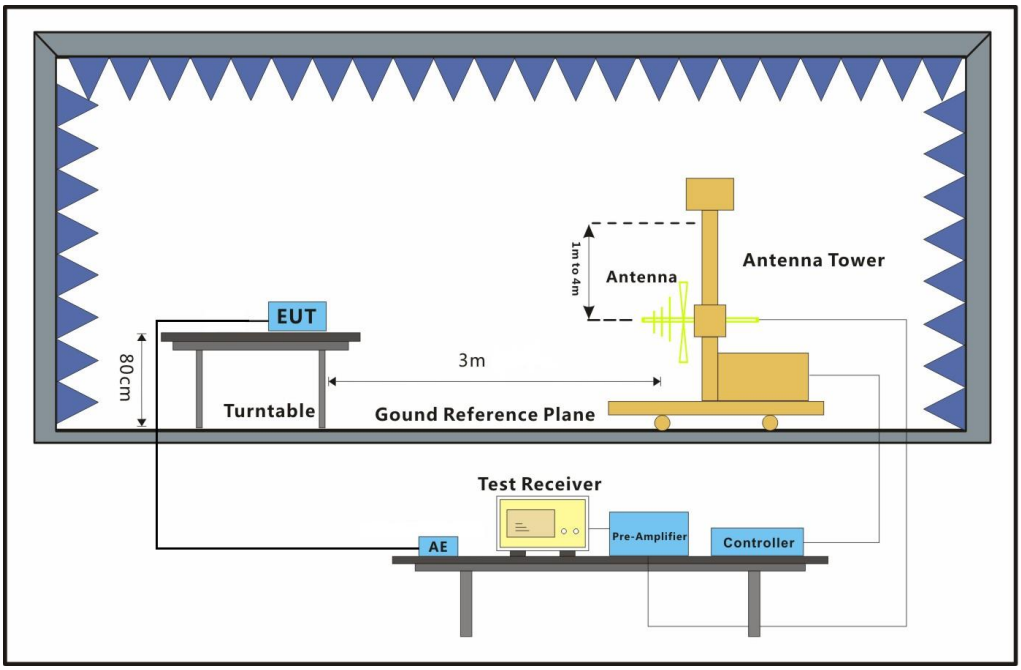
Status: Drive the EUT to maximum output power.

Conditions: Normal conditions

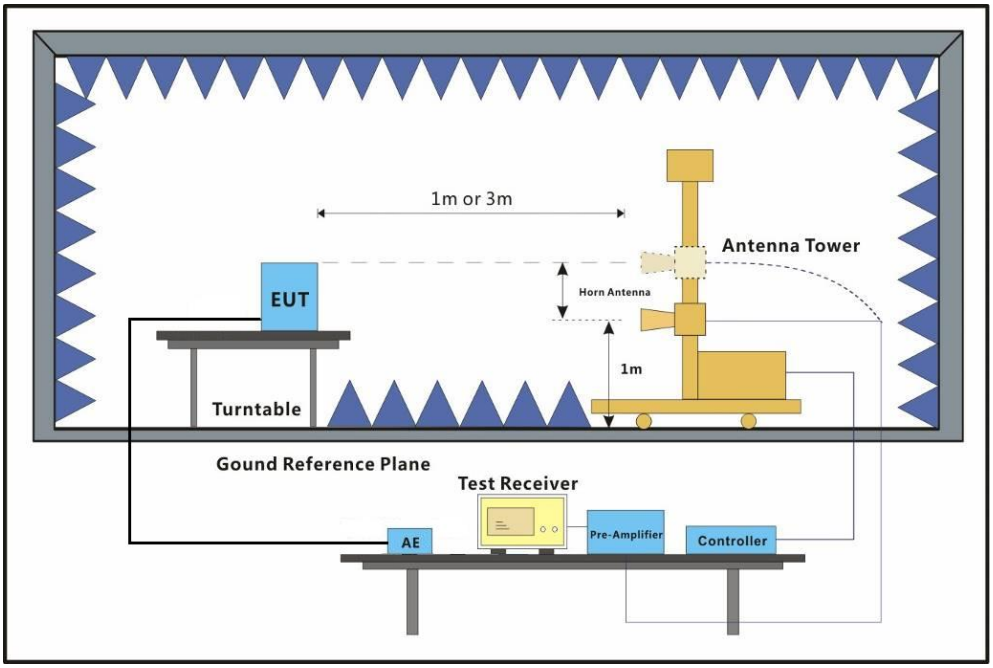
Application: Enclosure

Test Configuration:

30MHz to 1GHz emissions:



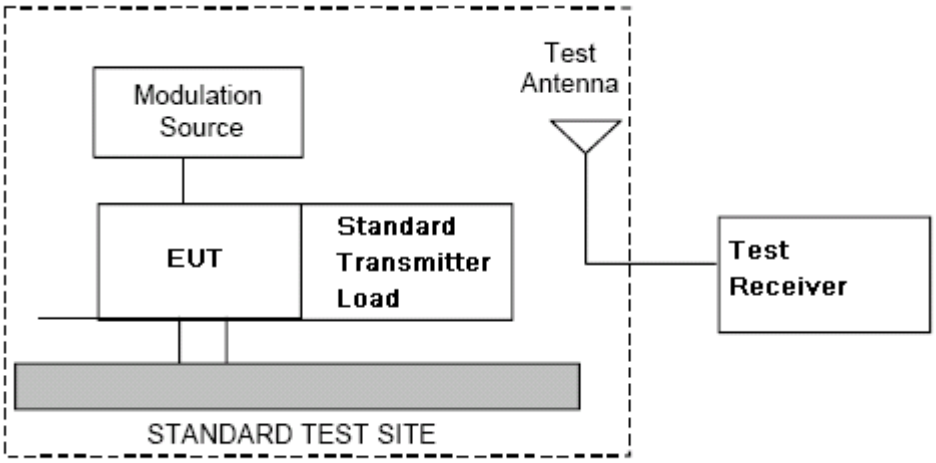
1GHz to 40GHz emissions:



Test Procedure:

1. Test the background noise level with all the test facilities;
2. Keep one transmitting path, all other connectors shall be connected by normal power or RF leads;
3. Select the suitable RF notch filter to avoid the test receiver or spectrum analyzer produce unwanted spurious emissions;
4. Keep the EUT continuously transmitting in max power;
5. Read the radiated emissions of the EUT enclosure.

Radiated Emissions Test Procedure:



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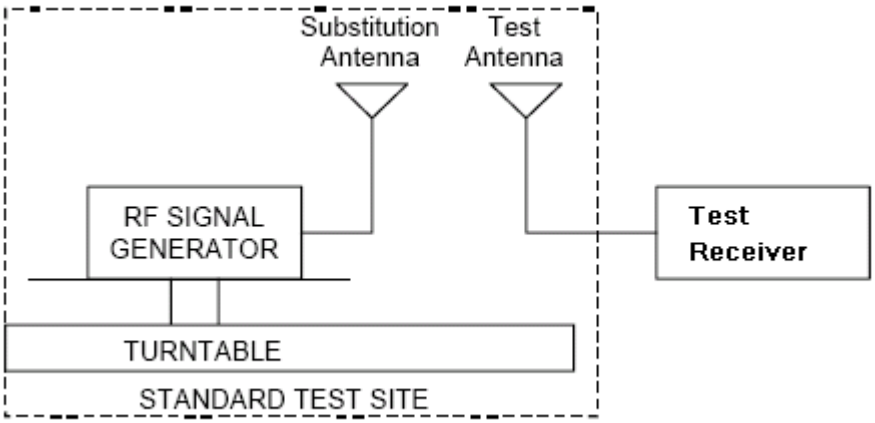
a) Connect the equipment as illustrated.
b) Adjust the spectrum analyzer for the following settings:
   1) Resolution Bandwidth = 100 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1GHz.
   2) Video Bandwidth = 300 kHz for spurious emissions below 1 GHz, and 3 MHz for spurious emissions above 1 GHz.
   3) Sweep Speed slow enough to maintain measurement calibration.
   4) Detector Mode = Positive Peak.
c) Place the transmitter to be tested on the turntable in the standard test site, The transmitter is transmitting into a no radiating load that is placed on the turntable. The RF cable to this load should be of minimum length.
d) Measurements shall be made from30MHz to 10 times of fundamental carrier, except for the region close to the carrier equal to ± the carrier bandwidth.
e) Key the transmitter without modulation or normal modulation base the standard.
f) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Then the turntable should be rotated 360° to determine the maximum reading. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.
g) Repeat step f) for each spurious frequency with the test antenna polarized vertically.



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h) Reconnect the equipment as illustrated.

i) Keep the spectrum analyzer adjusted as in step b).

j) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.

k) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a no radiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

l) Repeat step k) with both antennas vertically polarized for each spurious frequency.

m) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps k) and l) by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:

Pd(dBm) = *Pg*(dBm) – *cable loss* (dB) + *antenna gain* (dB)

where:

Pd is the dipole equivalent power and

Pg is the generator output power into the substitution antenna.

NOTE:

1) It is permissible to use other antennas provided they can be referenced to a dipole.

2) For below 1GHz signal, the *antenna gain* (dB) is dBd, and for above 1GHz signal, the *antenna gain* (dB) is dBi

3) Effective radiated power (e.r.p) refers to the radiation of a half wave tuned dipole instead of an isotropic antenna. There is a constant difference of 2.15 dB between e.i.r.p. and e.r.p.
e.r.p (dBm) = e.i.r.p. (dBm) - 2.15

4) For this test, the AU and EU are put outside of the chamber; connect to the RU through the optical fiber

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6.2.2.1 Measurement Record:

Please refer to Appendix I for KSCR2305000877AT-LTE+NR-B25

Please refer to Appendix J for KSCR2305000877AT-LTE+NR-B66

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7 Photographs - Test Setup

Please refer to test setup photo

8 Photographs - EUT Constructional Details

Please refer to external and internal photo

--The End of Report--

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