


**ELECTROMAGNETIC EMISSIONS  
COMPLIANCE REPORT**

**Applicant:** CASTLES TECHNOLOGY CO., LTD.  
6F, NO. 207-5, SEC. 3, BEIXIN RD., XINDIAN DISTRICT,  
NEW TAIPEI CITY 231030, TAIWAN (R.O.C)

**Manufacturer:** CASTLES TECHNOLOGY CO., LTD.  
6F, NO. 207-5, SEC. 3, BEIXIN RD., XINDIAN DISTRICT,  
NEW TAIPEI CITY 231030, TAIWAN (R.O.C)

**Product Name:** Smart module

**Brand Name:** 

**Model No.:** SLM500

**Report Number:** TERF2408002264E2

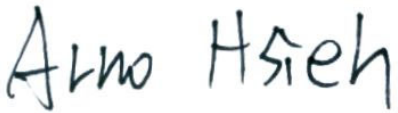
**FCC ID** WIYSLM500QA

**IC:** 27350-SLM500QA

**Date of EUT Received:** August 1, 2024

**Date of Test:** August 12, 2024~August 26, 2024

**Issue Date:** October 15, 2024

*Approved By*   
**Arno Hsieh**

**We hereby certify that:**

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.26-2015 and the energy emitted by the sample EUT comply with FCC rule part 2, 22H & 24E & 27C & 90S and ISSED RSS-Gen, 130, 132, 133, 139, 199.

The results of this report relate only to the sample identified in this report.

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## Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TERF2408002264E2	00	Original	September 5, 2024	Susan Lin	
TERF2408002264E2	01	Add maximum output power	October 8, 2024	Susan Lin	*
TERF2408002264E2	02	Update section 4.2	October 15, 2024	Susan Lin	*

**Note:**

- 1、The remark "\*" indicates modification of the report upon requests from certification body.

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## 1 GENERAL PRODUCT INFORMATION

### 1.1 Product Description

Product Name:	Smart module
Brand Name:	 <b>CASTLES</b> TECHNOLOGY
Model No.:	SLM500
Hardware Version:	V1F.00
Firmware Version:	N/A
EUT Series No.:	196242025220
Product Name of Host:	POS Terminal
Brand Name of Host:	 <b>CASTLES</b> TECHNOLOGY
Model No. of Host:	S1E2-UPT
Power Supply:	9Vdc from Adapter
Test Software (Name/Version):	Default

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## 1.2 Antenna Designation

Antenna Type	Antenna Model No.
Dipole	S1E2-UPT
<b>Note:</b> Transmission frequencies in this test report are only available by the above antenna(s).	

Modulation	Frequency (MHz)	Peak Antenna Gain (dBi)
LTE-Band 2	1850 ~ 1910	2.4
LTE-Band 4	1710 ~ 1755	2.21
LTE-Band 5	824 ~ 849	2.67
LTE-Band 7	2500 ~ 2570	1.64
LTE-Band 12	699 ~ 716	4.52
LTE-Band 13	777 ~ 787	3.97
LTE-Band 17	704 ~ 716	4.52
LTE-Band 25	1850 ~ 1915	2.4
LTE-Band 26	824 ~ 849	2.67
LTE-Band 26 Part 90	814 ~ 824	3.32
LTE-Band 66	1710 ~ 1780	2.21

**Note:** Antenna information is provided by the applicant.

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### 1.3 Test Methodology of Applied Standards

FCC 47 CFR Part 2, 22H, 24E, 27C, Part 90.

ISED RSS-GEN Issue 5 Amendment 2 Feb. 2021

ISED RSS-130 Issue 2 Feb. 2019,

ISED RSS-133 Issue 7, Jul. 2024

ISED RSS-199 Issue 4 July 2023

ANSI C63.26-2015

KDB971168 D01 Power Meas license Digital System v03r01

KDB412172 D01 Determining ERP and EIRP v01r01

ISED RSS-132 Issue 4 Jan. 2023

ISED RSS-139 Issue 4 Amendment  
Oct. 2022

### 1.4 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1	TW0027	TW3702
		SAC 2		
		SAC 3		
		Conduction 1		
		Conducted 1		
		Conducted 2		
		Conducted 3		
		Conducted 4		
		Conducted 5		
		Conducted 6		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction C	TW0028	
		SAC C		
		SAC D		
		SAC G		
		Conducted A		
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
Conducted G				
<b>Note:</b> Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.				

### 1.5 Special Accessories

No special accessories were used during testing.

### 1.6 Equipment Modifications

There was no modifications incorporated into the EUT.

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### 1.7 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m\*6m\*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

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## 2 SYSTEM TEST CONFIGURATION

### 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT Exercise

The EUT (Transmitter) was operated in the continuous transmission mode employed with the simulator of the Base Station that fixates at test default channels to fix the Tx frequency which was for the purpose of the measurements.

### 2.3 Test Procedure

#### 2.3.1 Conducted Measurement at Antenna Port

The EUT is placed on a table which is 0.8 m above ground plane. A low loss of RF cable was used to connect the antenna port of EUT to measurement equipment.

#### 2.3.2 Radiated Emissions (ERP/EIRP)

The EUT is placed on a turn table, for emission measurements below 1 GHz is 0.8 m above ground plane, for emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both Horizontal and Vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

### 2.4 Measurement Results Explanation Example

#### For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

#### Note:

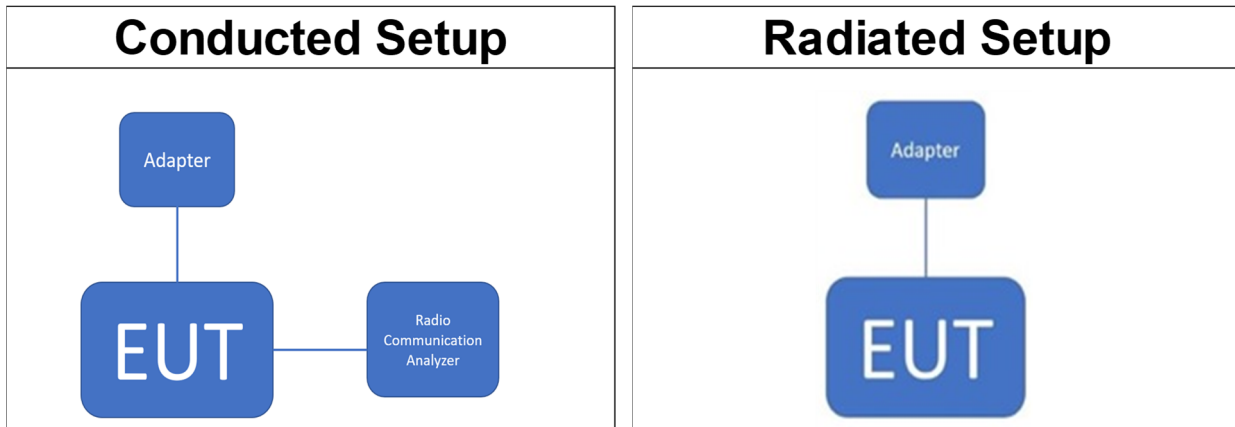
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

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## 2.5 Test Configuration



**Note:** Radio Communication Analyzer is placed in remote side for radiated test.

## 2.6 Control Unit(s)

Conducted Emission Test Site: Conducted E					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
AC Adapter	Castles	PW04-945A	N/A	N/A	N/A
Cable	HOMESHUN	N/A	N/A	N/A	N/A
Cable	TAI-CHING	CABLE FOR MARS1000 DC JACK	N/A	N/A	N/A

Radiated Emission Test Site: SAC C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
AC Adapter	Castles	PW04-945A	N/A	N/A	N/A
Cable	HOMESHUN	CABLE FOR S1U2 HSG 4.2PITCH 2X3P FEMALE AND RJ45 8P8C FEMALE X2 TO HSG 2X10P 2.0PITCH L:750MM	N/A	N/A	N/A
Cable	TAI-CHING	CABLE FOR MARS1000 DC JACK	N/A	N/A	N/A

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### 3 SUMMARY OF TEST RESULTS

FCC Rules	IC Rules	Description Of Test	Result
§2.1046(a)	RSS-GEN §6.12	RF Power Output	Compliant
§22.913(a)(5) §24.232(c) §27.50(b)(10) §27.50(c)(10) §27.50(d)(4) §27.50(h)(2) §90.635	RSS-130 §4.6 RSS-132 §5.4 RSS-133 §6.4 RSS-139 §6.5 RSS-199 §4.4	ERP/ EIRP measurement	Compliant
§2.1053 §22.917(a) §24.238(a) §27.53(c)(2),(4) §27.53(f) §27.53(g) §27.53(h) §27.53(m)(4) §90.691(a)(1)(2)	RSS-GEN §6.13 RSS-130 §4.7 RSS-132 §5.5 RSS-133 §5.6 RSS-139 §5.6 RSS-199 §5.6	Field Strength of Spurious Radiation	Compliant

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## 4 DESCRIPTION OF TEST MODES

### 4.1 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Pre-Scan has been conducted to determine the worst-case scenario from all possible combinations among available modulations, data rates and antenna ports, the worst case configurations listed below for the final test.
3. The field strength of radiated emission was measured as the EUT positioned in different orthogonal planes (E1/E2/H) based on actual usage of the EUT to pre-scan the emissions for determining the worst case scenario.

### 4.2 Measurement Configuration

Test Items				Max. Output Power												
Band	Test Channel			Bandwidth (MHz)						Modulation				RB #		
	L	M	H	1.4	3	5	10	15	20	QPSK	16QAM	64QAM	256QAM	1	Half	Full
2	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
4	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
5	V	V	V	V	V	V	V	-	-	V	V	V	V	V	V	V
7	V	V	V	-	-	V	V	V	V	V	V	V	V	V	V	V
12	V	V	V	V	V	V	V	-	-	V	V	V	V	V	V	V
13	V	V	V	-	-	V	V	-	-	V	V	V	V	V	V	V
17	V	V	V	-	-	V	V	-	-	V	V	V	V	V	V	V
25	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
26	V	V	V	V	V	V	V	V	-	V	V	V	V	V	V	V
26 P90	V	V	V	V	V	V	V	-	-	V	V	V	V	V	V	V
66	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V

E-UTRA Band	Test Channel	Channel Bandwidth (MHz)	Modulation	Resource Block Allocation	
				RBs allocated	RB Offset
2	18615 、 18900 、 19185	3	QPSK	1	7
4	20000 、 20175 、 20350	10	QPSK	1	25
5	20407 、 20525 、 20643	1.4	QPSK	3	3
7	20800 、 21100 、 21400	10	QPSK	1	25
12	23017 、 23095 、 23173	1.4	QPSK	1	2
13	23205 、 23230 、 23255	5	QPSK	1	13
17	23780 、 23790 、 23800	10	QPSK	1	25
25	26115 、 26365 、 26615	15	QPSK	1	38
26	26805 、 26915 、 27025	3	QPSK	1	7
26 90S	26697 、 26740 、 26783	1.4	QPSK	3	2
66	132072 、 132322 、 132572	20	QPSK	1	50

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
Power Density	+/- 0.61 dB
RF Power Output	+/- 0.97 dB
ERP/ EIRP measurement	+/- 2.15 dB
	+/- 2.15 dB
Emission Bandwidth	+/- 1.38 Hz
Out of Band Emissions at Antenna Terminals and Band Edge	+/- 0.77 dB
Peak to Average Ratio	+/- 0.97 dB
Frequency Stability vs. Temperature	+/- 1.48 Hz
Frequency Stability vs. Voltage	+/- 1.48 Hz
Temperature	+/- 0.6 °C
Humidity	+/- 3 %
DC / AC Power Source	+/- 1 %

Radiated Spurious Emission Measurement Uncertainty			
Polarization: Vertical	+/-	1.89 dB	9kHz~30MHz
	+/-	4.15 dB	30MHz - 1000MHz
	+/-	3.43 dB	1GHz - 18GHz
	+/-	3.86 dB	18GHz - 40GHz
Polarization: Horizontal	+/-	1.89 dB	9kHz~30MHz
	+/-	4.02 dB	30MHz - 1000MHz
	+/-	3.43 dB	1GHz - 18GHz
	+/-	3.86 dB	18GHz - 40GHz
Radiated Spurious Emission	+/-	2 dB	33GHz-50GHz
	+/-	1.59 dB	50GHz-60GHz
	+/-	1.7 dB	60GHz-90GHz
	+/-	1.64 dB	90GHz-140GHz
	+/-	3.83 dB	140GHz-220GHz

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

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## 6 MEASUREMENT EQUIPMENT USED

### 6.1 Conducted Measurement

Conducted Emission Test Site: Conducted E					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Coaxial Cables	Woken	00100A1F1A185C	RF71	11/15/2023	11/14/2024
Radio Communication Analyser	Anritsu	MT8821C	6262044739	11/30/2023	11/29/2024

### 6.2 Radiated Measurement

Radiated Emission Test Site: SAC C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
3m Site NSA	SGS	966 chamber C	N/A	03/02/2024	03/01/2025
Band Rejection Filter	Micro Tronics	BRM50701-01	RF201	11/15/2023	11/14/2024
Band Rejection Filter	Titan Microwave	T04N63592050S01	23040703-3	11/15/2023	11/14/2024
Band Rejection Filter	Titan Microwave	T04N800100050S01	23040703-5	11/15/2023	11/14/2024
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-300	11/02/2023	11/01/2024
Coaxial Cable	Huber+Suhner	EMC106-SM-SM-9100	150704	11/15/2023	11/14/2024
Coaxial Cable	Huber+Suhner	RG 214/U	W22.03	11/15/2023	11/14/2024
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	MY17388/4	11/15/2023	11/14/2024
EMI Test Receiver	R&S	ESU 40	100363	04/30/2024	04/29/2025
Horn Antenna	Schwarzbeck	BBHA9120D	1187	01/24/2024	01/23/2025
Horn Antenna	Schwarzbeck	BBHA9170	185	08/15/2024	08/14/2025
Lowpass Filter	Woken	EWT-56-0019	RF173	11/15/2023	11/14/2024
Pre-Amplifier	EMC Instruments	EMC118A45SE	980789	11/15/2023	11/14/2024
Pre-Amplifier	EMC Instruments	EMC18405SEE	980881	11/15/2023	11/14/2024
Pre-Amplifier	EMC Instruments	EMC330	980096	11/15/2023	11/14/2024
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	04/10/2024	04/09/2025
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R

**NOTE:** N.C.R refers to Not Calibrated Required.

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## 7 STANDARD APPLICABLE

### 7.1 Maximum Output Power

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals.

#### 7.1.1 ERP/EIRP LIMIT

According to FCC §2.1046

##### **FCC 22.913(a)**

(5) mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

##### **FCC 24.232(c)**

Mobile and portable stations are limited to 2 W EIRP.

##### **FCC 27.50 (b)**

(9) Control stations and mobile stations transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 30 watts ERP.

(10) Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

##### **FCC 27.50(c)**

(9) Control and mobile stations in the 698-746 MHz band are limited to 30 watts ERP.

(10) Portable stations (hand-held devices) are limited to 3 watts ERP.

##### **FCC 27.50(d)**

(4) Mobile, and portable (hand-held) stations operating in the 1710-1755 MHz, 1695-1710 MHz and 1755-1780 MHz bands are limited to 1W EIRP.

##### **FCC 27, 50(h)**

(2) Mobile and other user stations transmitting in the BRS and EBS bands are limited to 2 W EIRP.

##### **FCC 90.635(b)**

Mobile station is limited to 100W ERP

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### RSS-130 §4.6

The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment operating in 698-756 and 777-787 MHz.

### RSS-132 §5.4

The transmitter output power shall be measured in terms of average power. The equivalent radiated power (e.r.p.) shall not exceed 7 watts for mobile equipment and 3 watts for portable equipment.

The effective isotropic radiated power (e.i.r.p.) shall not exceed the limits specified in SRSP-503 for base station equipment.

### RSS-133 §5.5

The maximum power spectral density of the equipment, measured in terms of average values, shall comply with the limits specified in table 2. These limits are either specified in terms of equivalent isotropically radiated power (e.i.r.p.) or TRP for the purpose of certification and may not apply to all deployment scenarios. Consult SRSP-510 for more deployment details in the bands 1850-1915 MHz and 1930-1995 MHz. AAS equipment with eight antenna elements or less can demonstrate compliance with the e.i.r.p limit specified for non-AAS equipment in table 2, instead of the TRP limit.

**Table 2: Maximum power spectral density of equipment**

Equipment type	Maximum power spectral density
Non-AAS fixed station and base station	3280 W/MHz e.i.r.p
AAS fixed station and base station	46 dBm/MHz TRP
Subscriber equipment	2 W /channel bandwidth e.i.r.p

### RSS-139 §5.5

The maximum output power of the equipment shall comply with the limits specified below. In the tables, maximum power refers to the equivalent isotropically radiated power (e.i.r.p.) or total radiated power (TRP), measured in terms of average values.

The limits in this RSS are specified for the purpose of certification and may not apply to all deployment scenarios. Consult SRSP-513 and SRSP-519 for more details on the bands 2110-2180 MHz and 2180-2200 MHz respectively

**Table 3: Maximum power of equipment in the band 1710-1780 MHz**

Equipment type	Maximum power
Fixed station and base station	30 dBm e.i.r.p./channel bandwidth
Subscriber equipment	30 dBm e.i.r.p./channel bandwidth

**Table 4: Maximum power of equipment in the band 2110-2180 MHz**

Equipment type	Maximum power
Non-AAS fixed station and base station	65 dBm e.i.r.p./MHz

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AAS fixed station and base station	46 dBm TRP/MHz
Subscriber equipment	30 dBm e.i.r.p./channel bandwidth

Table 5: Maximum power of equipment in the band 2180-2200 MHz	
Equipment type	Maximum power
Non-AAS base station	65 dBm e.i.r.p./MHz
AAS base station	46 dBm TRP/MHz

**RSS-199 §5.5**

For Subscriber equipment other than fixed subscriber equipment operating in the Band 2500-2690MHz, the e.i.r.p. shall not exceed 2 W.

**7.2 Field Strength Of Spurious Radiation Measurement**

According to FCC §2.1053,

**FCC §22.917(a), §24.238(a), §27.53(h), §90.543(e)(3)**

**RSS-130 §4.7, RSS-132 §5.5, RSS-133 §5.6, RSS-139 §5.6, RSS-199 §5.6**

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

**FCC §27.53(g)**

Compliance for operations in the 600 MHz, 698-746 MHz, 746-758 MHz and the 776-788 MHz band with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

- (2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB;
- (3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than  $76 + 10 \log(P)$  dB in a 6.25 kHz band segment, for base and fixed stations;
- (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than  $65 + 10 \log(P)$  dB in a 6.25 kHz band segment, for mobile and portable stations;

**FCC §27.53(h)(1)**

(h) *AWS emission limits*—(1) *General protection levels*. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, 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.

**FCC §27.53(m) (4) (6)**

For mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log(P)$  dB on all frequencies between the channel edge and 5 megahertz from the channel edge,  $43 + 10 \log(P)$  dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and  $55 + 10 \log(P)$  dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than  $43 + 10 \log(P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log(P)$  dB at or below 2490.5 MHz. Mobile Satellite Ser-

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vice licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

**Measurement procedure.** Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

#### RSS-199 §5.6

For the unwanted emission limits, in the 1 MHz band immediately outside and adjacent to the frequency block group, the power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth for fixed stations, base stations, and fixed subscriber equipment, and 2% for subscriber equipment other than fixed subscriber equipment. Beyond this 1 MHz band, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% or 2% of the occupied bandwidth, as applicable.

For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors), where applicable, of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in the tables below.

**Table 5: Unwanted emission limits for subscriber equipment other than fixed subscriber equipment**

Offset from the edge of the frequency block or frequency block group (MHz)	Unwanted emission limits
0-1	-10 dBm/(2% of OB*)
1-5	-10 dBm/MHz
5-X**	-13 dBm/MHz
≥ X	-25 dBm/MHz

\*OB is the occupied bandwidth

\*\* X is 6 MHz or the equipment occupied bandwidth, whichever is greater

In addition to complying with the limits in table 5, subscriber equipment other than fixed subscriber equipment shall not exceed -13 dBm/MHz on all frequencies between 2490.5 MHz and 2496 MHz, and -25 dBm/MHz at or below 2490.5 MHz.

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**§90.691 Emission mask requirements for EA-based systems**

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

**RSS-130 §4.7.1**

Compliance for operations in the 617-652 MHz, 663-698 MHz, 698-756 MHz and the 777-787 MHz band, the unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least  $43 + 10 \log_{10} p$  (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

**RSS-130 §4.7.2**

In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:

the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:

$76 + 10 \log_{10} p$  (watts), dB, for base and fixed equipment and  
 $65 + 10 \log_{10} p$  (watts), dB, for mobile and portable equipment

the e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

**RSS-132 §5.5**

i. Equipment shall meet the unwanted emission limits specified below:

In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated below the transmitter output power P (dBW) by at least  $43 + 10 \log(p)$  dB.

ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated below the transmitter output power P (dBW) by at least  $43 + 10 \log(p)$  dB. If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

p is the output power specified in watts.

**RSS-133 §5.6**

Unwanted emissions shall be measured in terms of average values while the transmitter is operating at the manufacturer's rated power and modulated as specified in RSS-Gen.

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Equipment shall meet the unwanted emission limits, specified in table 3, outside each frequency block group. For each channel bandwidth supported by the equipment under test, the unwanted emissions shall be measured and reported for two channel frequencies: one located as close as possible to the low end and one located as close as possible to the high end of the equipment's operating frequency range. For the unwanted emission limits, in the 1 MHz bands immediately outside and adjacent to the frequency block group, the power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth (OBW). Beyond these 1 MHz bands, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth may be used, provided that the Personal Communications Service Equipment Operating in the Bands 1850-1915 MHz and 1930-1995 MHz RSS-133 6 measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% of the OBW, as applicable. For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors), where applicable, of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in the table 3.

**Table 3: Unwanted emission limits for all equipment**

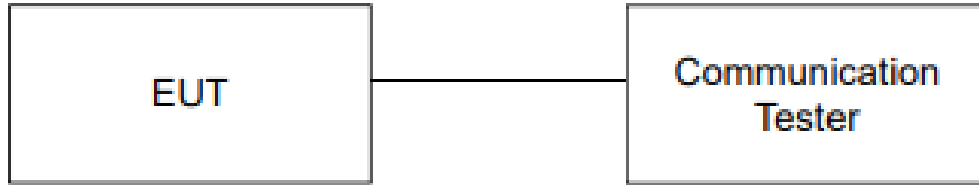
Offset frequency from the edge of the frequency block group (MHz)	Unwanted emission limits
≤1	-13 dBm/(1% of OB*)
>1 MHz	-13 dBm/MHz

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## 8 TEST SETUP

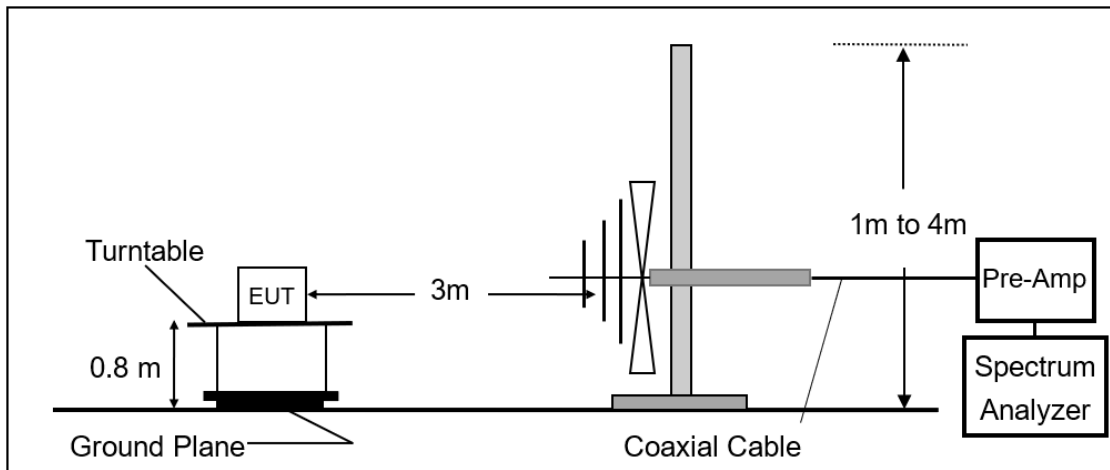
### 8.1 Maximum Output Power



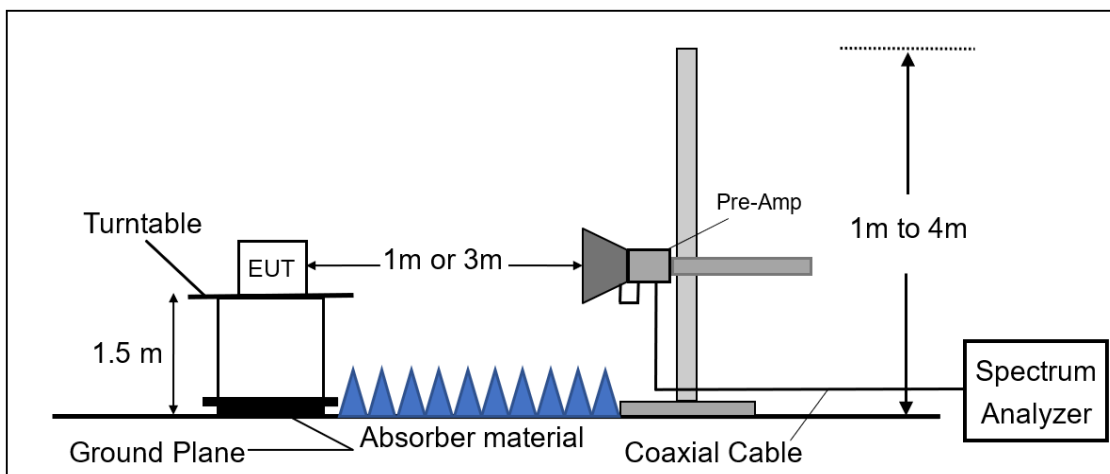
**Note:** Measurement setup for testing on Antenna connector

### 8.2 Field Strength of Spurious Radiation Measurement

Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.



Radiated Emission Test Set-Up, Frequency Above 1GHz.



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## 9 TEST PROCEDURE

### 9.1 Maximum Output Power

#### 9.1.1 Output Power Measurement Applicable Guidance

The transmitter output was connected to a communication tester. Transmitter output was read off the communication tester in dBm. The power output at the transmitter antenna port was determined by the communication tester reading.

KDB 971168 D01 Power Meas License Digital System as the supplemental test methodology to adjust the proper setting obtaining the measurement results.

All LTE bands conducted average power is obtained from the simulator telecommunication test set.

#### 9.1.2 Determining ERP and/or EIRP from conducted RF output power measurements

According to KDB 412172 D01 Power Approach,

$$EIRP = P_T + G_T - L_C,$$

$$ERP = EIRP - 2.15,$$

Where:

- ERP or EIRP = effective radiated power or equivalent isotropically radiated power (expressed in the same units as  $P_T$ , typically dBW, dBm, or power spectral density (PSD)<sup>2</sup>), relative to either a dipole antenna (ERP) or an isotropic antenna (EIRP);
- $P_T$  = transmitter output power, expressed in dBW, dBm, or PSD;
- $G_T$  = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
- $L_C$  = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

### 9.2 Field Strength of Spurious Radiation Measurement

The EUT was placed on a non-conductive; the measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

$$ERP \text{ (dBm)} = SG \text{ Level (dBm)} + \text{Antenna Gain (dBd)} + \text{Cable Loss (dB)}$$

$$EIRP \text{ (dBm)} = SG \text{ Level (dBm)} + \text{Antenna Gain (dBi)} + \text{Cable Loss (dB)}$$

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## 10 MEASUREMENT RESULTS

Please refer to the Annex A-Measurement Results.

*~ End of Report ~*

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