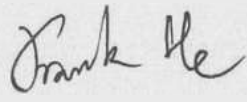
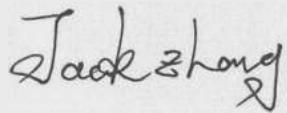


Test report No:
20B1041R-RF-JP-P01V01

2.4GHz Wideband Low Power Data Communication System Test Report

Product Name	S14BL
Trademark	S14BL
Model and /or type reference	S14BL
Applicant's name / address	System Loco Ltd Parkfield, Greaves Road, Lancaster
Test method requested, standard	ARIB STD-T66 Article 2 Paragraph 1 Item 19 of the Ordinance Concerning Technical Regulations
Verdict Summary	IN COMPLIANCE
Documented by (name / position & signature)	Kitty Li/Project Assistant 
Reviewed by (name / position & signature)	Frank He/ Technical Supervisor 
Approved by (name / position & signature)	Jack Zhang/ Supervisor 
Date of issue	2021-01-08
Report template No	Template_STD-T66-RF-V1.0

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COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Nov. 30, 2020
Date (start test)	Nov. 30, 2020
Date (finish test)	Jan. 05, 2021

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	: Equipment Under Test
QP	: Quasi-Peak
CAV	: CISPR Average
AV	: Average
CDN	: Coupling Decoupling Network
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
BW	: Bandwidth
AM	: Amplitude Modulation
PM	: Pulse Modulation
HCP	: Horizontal Coupling Plane
VCP	: Vertical Coupling Plane
U_N	: Nominal voltage
T_x	: Transmitter
R_x	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
20B1041R-RF-JP-P01V01	V1.0	Initial issue of report.	2021-01-08

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with with ARIB STD-T66.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
4. The test results presented in this report relate only to the object tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
 - Chapter 1.1 General Description of the Item(s);
 - Chapter 1.2 Antenna Informaion;
 - Chapter 1.3 Channel List.

USED EQUIPMENT

Output Power and Output Power Tolerance / Spread Bandwidth and Spread Factor / Occupied Bandwidth /
Frequency Tolerance / Transmitter Spurious Emissions / Receiver Spurious Emissions / TR8

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
4TX MIMO Power Sensor	Keysight	X8750A	MY59400102	2020.02.11	2021.02.10
Rx PER Monitoring Unit	Agilent	N/A	11706190075	N/A	N/A
DC Power Supply	IDRC	CD-035-020PR	977272	N/A	N/A
Spectrum Analyzer	Agilent	N9010A	MY55370495	2020.04.17	2021.04.16
Signal Analyzer	R&S	FSV	104212	2020.12.28	2021.12.27
Temperature/Humidity Meter	RTS	RTS-8S	RF08	2020.08.13	2021.08.12

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%. The Uncertainties comply with standard required as below.

Test item	Uncertainty
Output Power and Output Power Tolerance	± 1.27 dB
Spread Bandwidth and Spread Factor	± 150 Hz
Occupied Bandwidth	± 1.27 dB
Frequency Tolerance	± 150 Hz
Transmitter Spurious Emissions	± 1.27 dB
Receiver Spurious Emissions	± 1.27 dB
Carrier Sensing	± 1.27 dB

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Product Name..... :	S14BL
Model No. :	S14BL
Trademark	S14BL
Manufacturer..... :	System Loco Ltd
Manufacturer Address..... :	Parkfield, Greaves Road, Lancaster

Wireless specification..... :	Special 2.4GHz wireless
Operating frequency range(s)	2400~2483.5MHz
Type of Modulation..... :	FSK
Data Rate	1Mbps
Number of channel..... :	3

Rated power supply	Voltage and Frequency	
	☐	AC: 220 – 240 V, 50/60 Hz
	☐	AC: 100 – 240 V, 50/60 Hz
	☐	DC: 3.2~4.2 Vdc
	☒	Battery: 3 Vdc
	☐	PoE: 48V
Mounting position..... :	☒	Table top equipment
	☐	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☐	Head-mounted equipment
	☐	Other: RF module

Note: This product has only Transmitt mode, so only Transmitt test items are evaluated.

1.2 Antenna Information

Antenna model / type number	N/A		
Antenna serial number	N/A		
Antenna Delivery	☒	1TX + 1RX	
	☐	2TX + 2RX	
	☐	Others:.....	
Antenna technology	☒	SISO	
	☐	MIMO	☐ CDD
			☐ Beam-forming
Antenna Type	☐	External	☐ Dipole
			☐ Sectorized
	☒	Internal	☐ Monopole
			☒ PCB
			☐ Metal Monopole Antenna
			☐ Ceramic chip
			☐ Others
Antenna Gain.....	-2.04 dBi		

1.3 Channel List

Working Frequency of Each Channel: (For Special 2.4GHz wireless)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
37	2402 MHz	38	2426 MHz	39	2480 MHz	--	--

Note: The General Description of the Item, antenna information and Channel List for the EUT in clause 1 are provided and confirmed by the client.

2 DESCRIPTION OF TEST SETUP

2.1 Operating mode(s) used for tests

During the tests the following operating mode(s) has(have) been used.

Test Mode	Mode1: Transmit by 1Mbps(FSK)
-----------	-------------------------------

2.2 Accessories Information

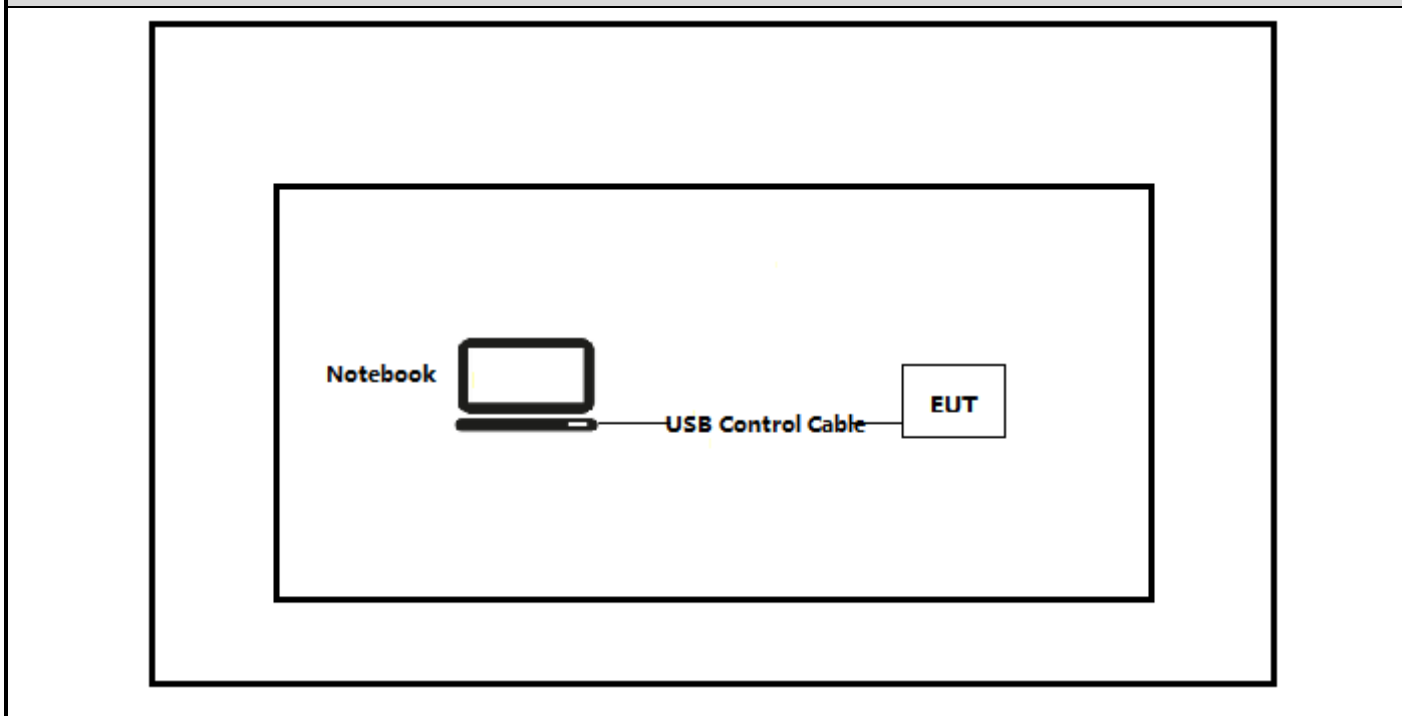
Accessories Information	Brand/model name	Cable		
		Length used during test [m]	Attached during test	Shielded
USB-serial Cable	N/A	1m	☒	☐

2.3 Auxiliary equipment / Test software for the EUT

Auxiliary equipment	Type / Version	Manufacturer	Supplied by
Notebook	Think pad L440	Lenovo	Adapter
software	Type / Version	Manufacturer	Supplied by
SecureCRT	N/A	N/A	N/A

2.4 Test Configuration / Block diagram used for tests

Test setup Diagram- Conducted test



2.5 Testing process

1	Setup the EUT as shown in Section 2.3.
2	Run the software "SecureCRT" on the notebook computer.
3	Configure the test mode, the test channel, and the data rate.
4	Verify that the EUT works properly.

3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
ARIB STD-T66	2014	SECOND GENERATION LOW POWER DATA COMMUNICATION SYSTEM/ WIRELESS LAN SYSTEM
--	--	--
--	--	--
--	--	--

3.2 Deviation(s) from the Standard(s) / Test Specification(s)

No deviation

3.3 Overview of results

Test Item – ARIB STD-T66				
Performed Test Item	Normative References	Test Performed	Verdict	Remark
Output Power and Output Power Tolerance	Ministry of Internal Affairs and Communications notification Article 88	Yes	PASS	--
Spread Bandwidth and Spread Factor	Ministry of Internal Affairs and Communications notification Article 88	Yes	PASS	--
Occupied Bandwidth	Ministry of Internal Affairs and Communications notification Article 88	Yes	PASS	
Frequency Tolerance	Ministry of Internal Affairs and Communications notification Article 88	Yes	PASS	
Transmitter Spurious Emissions	Ministry of Internal Affairs and Communications notification Article 88	Yes	PASS	
Receiver Spurious Emissions	Ministry of Internal Affairs and Communications notification Article 88	N/A	N/A	--

4 TEST RESULTS

4.1 Output Power and Output Power Tolerance

VERDICT: PASS

4.1.1 Limit

Standard

ARIB STD-T66

Output Power

- | | |
|-------------------------------------|---|
| ☒ | Channel Power of DSSS, the limit should $\leq 10\text{mW/MHz}$ |
| ☐ | Channel Power of FHSS, the limit should $\leq 3\text{mW/MHz}$ |
| ☒ | Channel Power of OFDM |
| ☐ | Nominal Bandwidth = 20MHz, the limit should $\leq 10\text{mW/MHz}$ |
| ☐ | Nominal Bandwidth = 40MHz, the limit should $\leq 5\text{mW/MHz}$ |
| ☒ | Channel Power of other situation, the limit should $\leq 10\text{mW}$ |

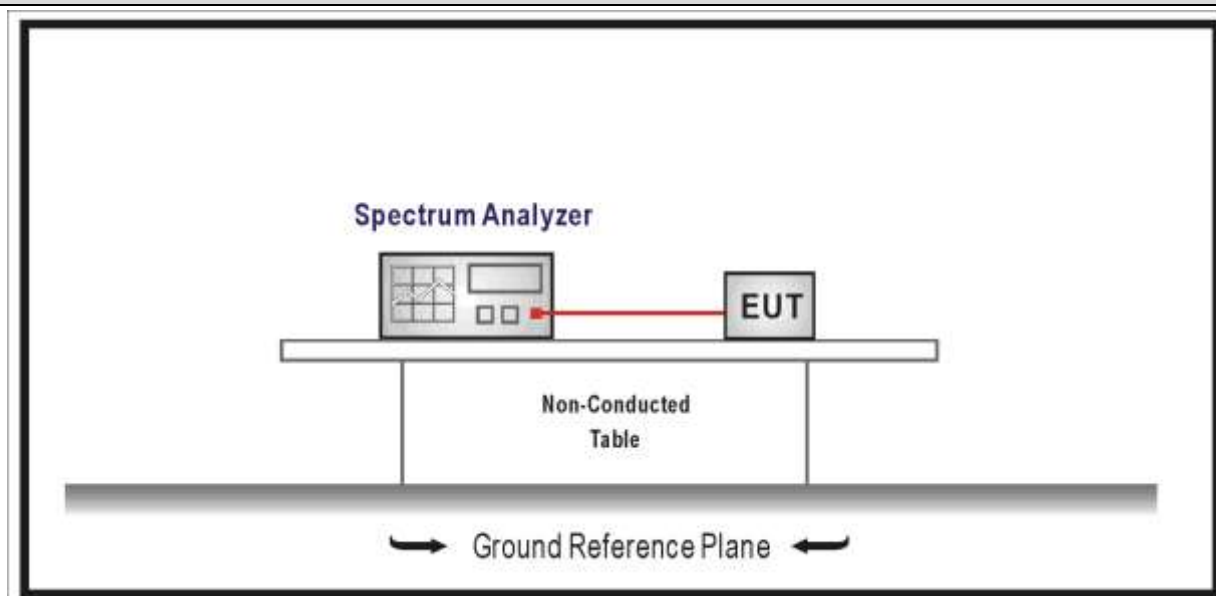
E.I.R.P.

- | | |
|-------------------------------------|-----------------------------------|
| ☒ | Undirected: 12.14dBm/MHz or less |
| ☐ | Directional: 22.14dBm/MHz or less |

Output Power Tolerance

- | | |
|-------------------------------------|--------------------------------------|
| ☒ | Output Power Tolerance: +20% to -80% |
|-------------------------------------|--------------------------------------|

4.1.2 Test Set up



4.1.3 Test Procedure

References Rule

☒ ARIB STD-T66

Step 1

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

1. A sample detector function must be used.
2. A measurement instrument with an integrated 1MHz power bandwidth function may be used to automate the test process.
3. Connect the power meter to the IF output of the spectrum analyzer.
4. Set zero span of spectrum analyzer and 'Maximum Hold' than test result will show in power.

4.1.4 Test Data

Product	:	S14BL
Test Item	:	Output Power
Test Site	:	TR8
Test Mode	:	Mode 1

Antenna Gain: -2.04 dBi				
Frequency (MHz)	Real Value (dBm)	Limit (dBm)	Real Value (EIRP) (dBm)	Limit (EIRP) (dBm)
2402	1.74	10	-0.30	12.14
2426	0.90	10	-1.14	12.14
2480	-0.15	10	-2.19	12.14
Real Value (EIRP) = Real Value + Antenna Gain				

Frequency (MHz)	Declared Output (mW)	Total Reading Value (mW)	Tolerance (%)	Limit
2402	1.5	1.49	-0.48	+20% to -80%
2440	1.5	1.23	-17.98	+20% to -80%
2480	1.5	0.97	-35.60	+20% to -80%
Note: Deviation = (Total Reading Value - Declared Output Power) / Declared Output Power * 100%				

4.2 Spread Bandwidth and Spread Factor

VERDICT: PASS

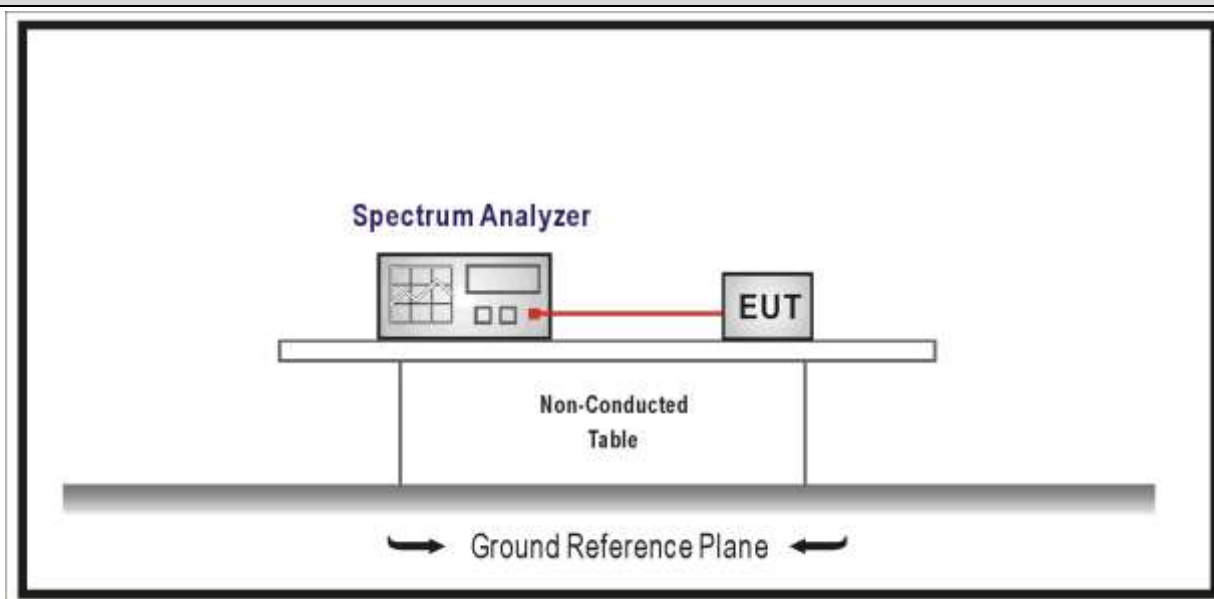
4.2.1 Limit

Standard

ARIB STD-T66

Spread Bandwidth ≥ 500 kHzSpread Factor ≥ 5 for 2400 – 2483.5 MHz, ≥ 10 for 2471 – 2497 MHz

4.2.2 Test Setup



4.2.3 Test Procedure

References Rule
☒ ARIB STD-T66

Step 1

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

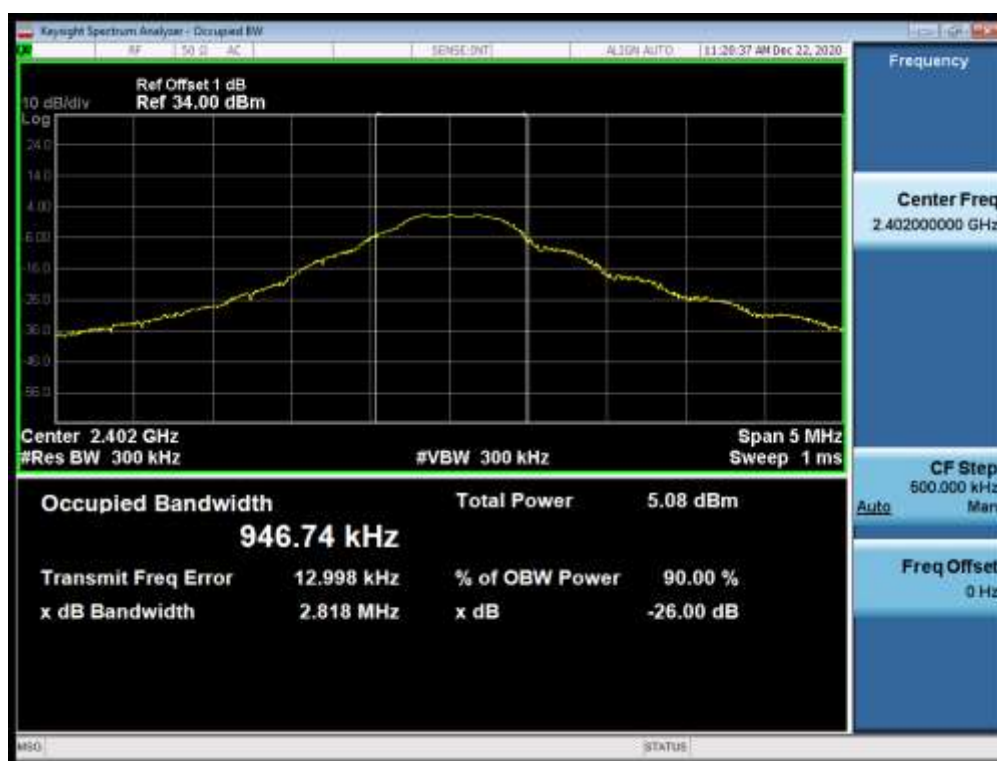
1. A positive peak detector function must be used.
2. A measurement instrument with an integrated 90% power bandwidth function may be used to automate the test process
3. A The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slow, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result
4. 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

4.2.4 Test Data

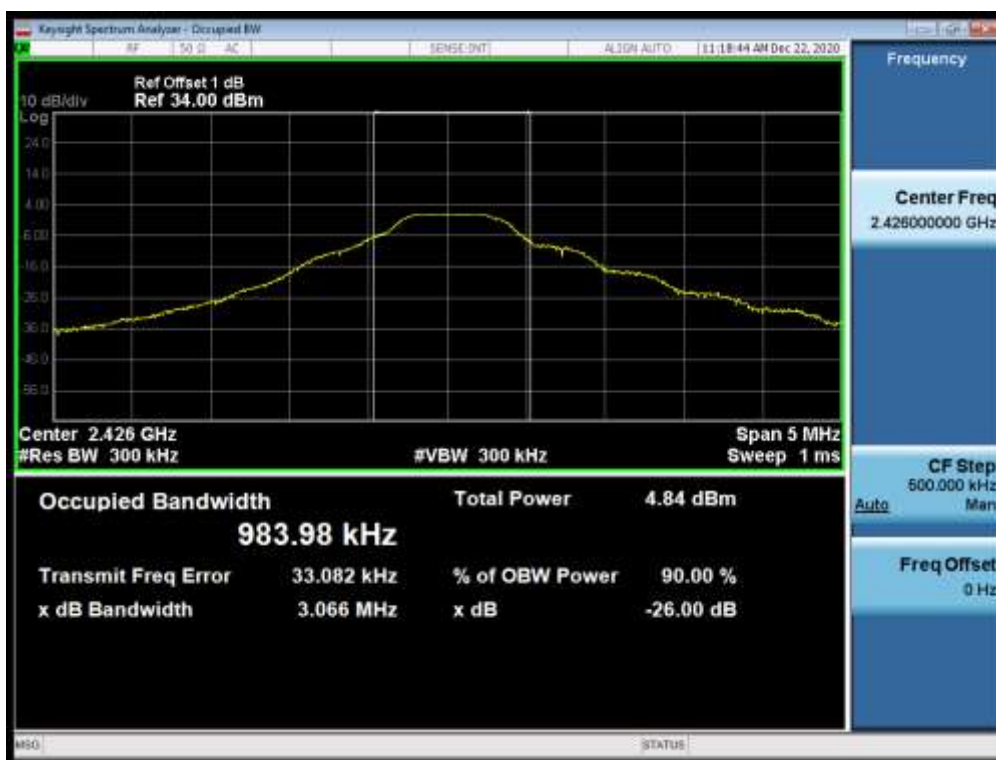
Product	:	S14BL
Test Item	:	Spread Bandwidth
Test Site	:	TR8
Test Mode	:	Mode 1

Channel No.	Frequency (MHz)	90% Bandwidth (kHz)	Limit (kHz)
37	2402	946.74	≥ 500
38	2426	983.98	≥ 500
39	2480	910.61	≥ 500

CH37 2402MHz



CH38 2426MHz

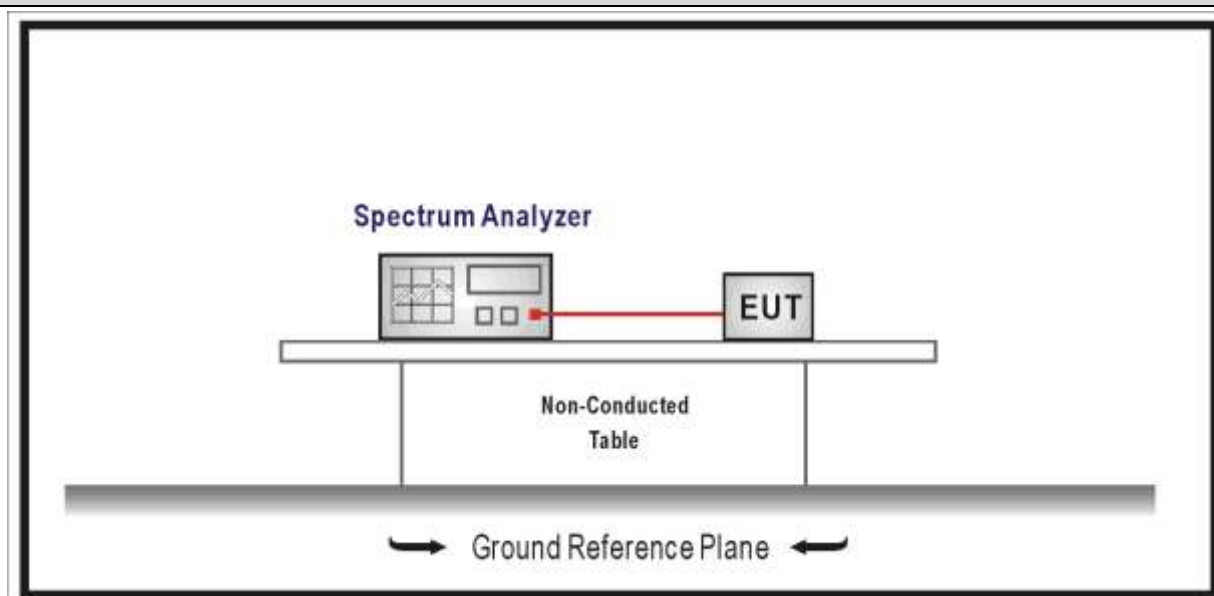


CH39 2480MHz



4.3 Occupied Bandwidth**VERDICT: PASS****4.3.1 Limit**

Standard		ARIB STD-T66
☐	Channel Power of DSSS, the limit should ≤ 26 MHz	
☐	Channel Power of FHSS, the limit should ≤ 83.5 MHz	
☐	Channel Power of OFDM	
	☐ Nominal Bandwidth=20MHz, the limit should ≤ 26 MHz	
	☐ Nominal Bandwidth=40MHz, the limit should ≤ 38 MHz	
☒	Channel Power of other situation, the limit should ≤ 26 MHz	

4.3.2 Test Setup

4.3.3 Test Procedure

References Rule

☒ ARIB STD-T66

Step 1

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

1. A positive peak detector function must be used.
2. A measurement instrument with an integrated 99% power bandwidth function may be used to automate the test process.
3. The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slow, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.
4. 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

4.3.4 Test Data

Product	:	S14BL
Test Item	:	Occupied Bandwidth
Test Site	:	TR8
Test Mode	:	Mode 1

Channel No.	Frequency (MHz)	99% Bandwidth (MHz)	Limit (MHz)
37	2402	1.9950	≤ 26
38	2426	2.0865	≤ 26
39	2480	1.9644	≤ 26

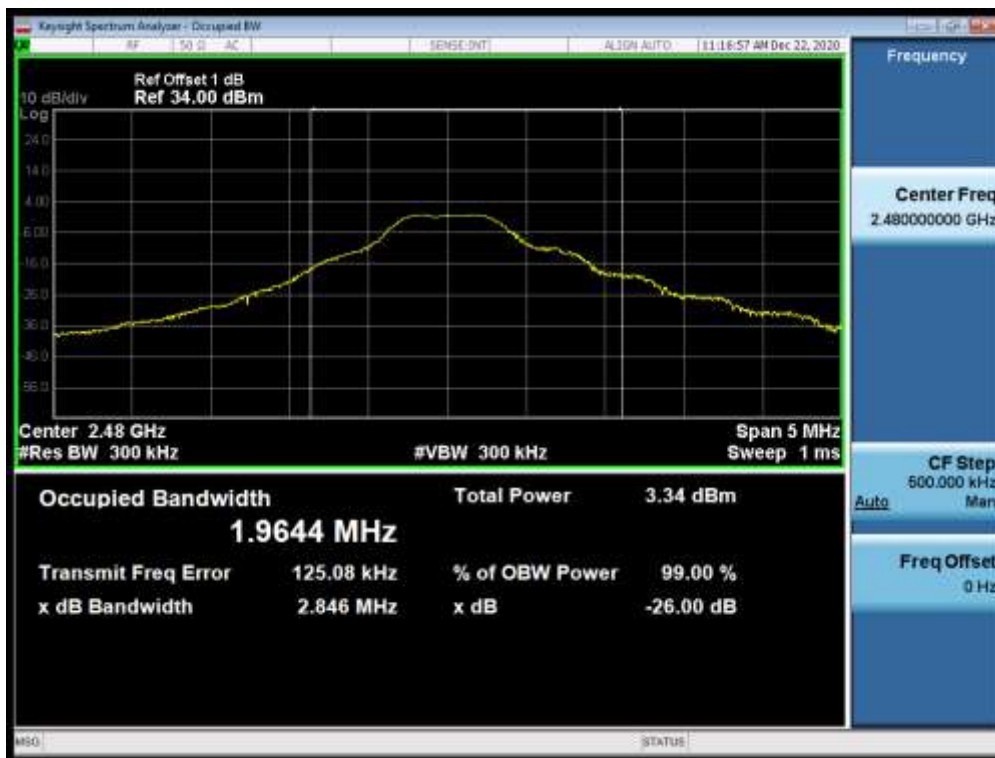
CH37 2402MHz



CH38 2426MHz



CH39 2480MHz



4.4 Frequency Tolerance

VERDICT: PASS

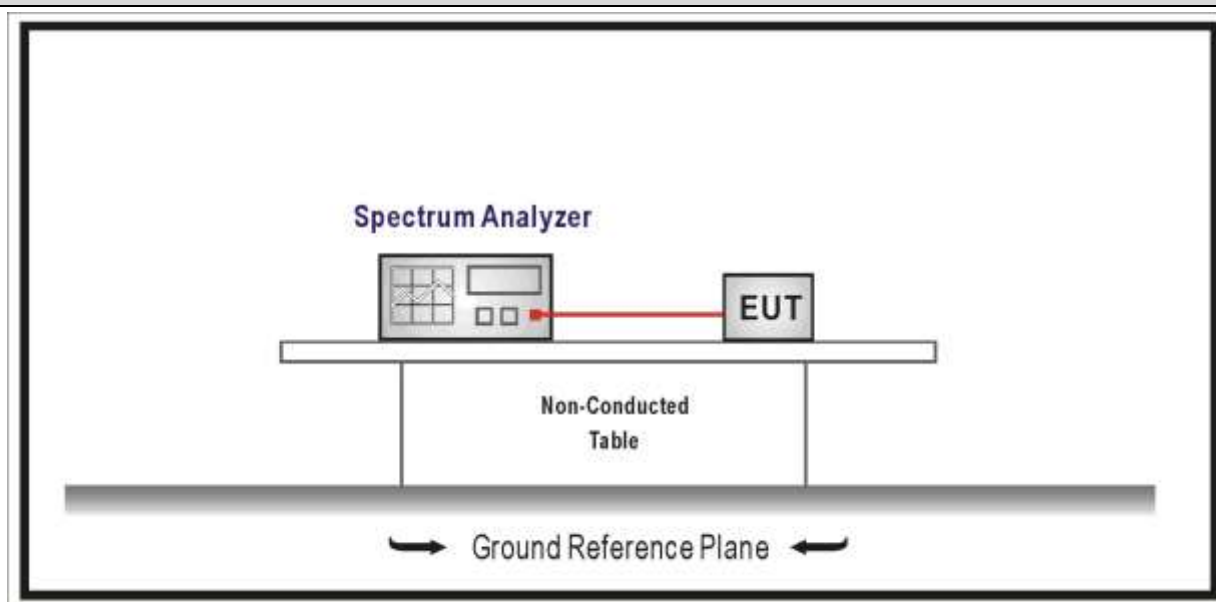
4.4.1 Limit

Standard

ARIB STD-T66

$\leq \pm 50$ ppm

4.4.2 Test Setup



4.4.3 Test Procedure

References Rule

☒	ARIB STD-T66
-------------------------------------	--------------

Step 1

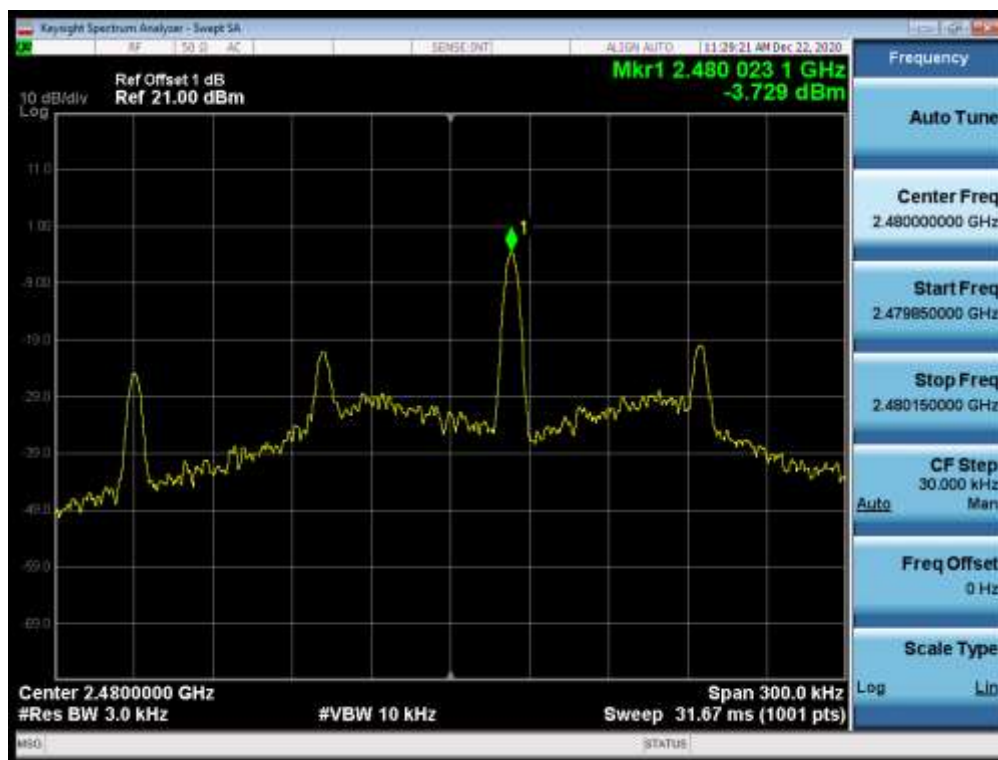
A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

1. A positive peak detector function must be used.
2. The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slow, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.
3. 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

4.4.4 Test Data

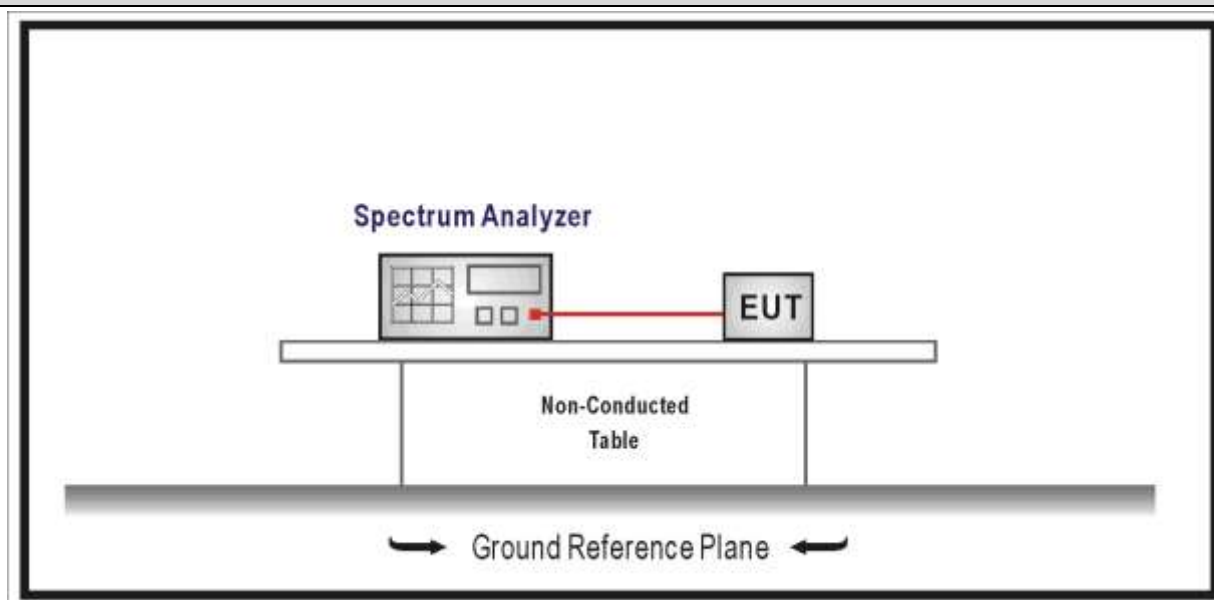
Product	:	S14BL
Test Item	:	Frequency Tolerance
Test Site	:	TR8
Test Mode	:	Transmit (carrier)

Channel No.	Frequency (MHz)	Reading Value (MHz)	Tolerance (ppm)	Limit (ppm)
37	2402	2402.022	9.16	$\leq \pm 50$
38	2426	2426.022	9.07	$\leq \pm 50$
39	2480	2480.023	9.27	$\leq \pm 50$



4.5 Transmitter Spurious Emission**VERDICT: PASS****4.5.1 Limit****Standard** ARIB STD-T66

- | | |
|-------------------------------------|---|
| ☒ | Frequency between 10 – 2387 MHz, $\leq 2.5\mu\text{W}$ |
| ☒ | Frequency between 2387 – 2400 MHz, $\leq 25\mu\text{W}$ |
| ☒ | Frequency between 2483.5 – 2496.5 MHz, $\leq 25\mu\text{W}$ |
| ☒ | Frequency between 2496.5 – 12750, $\leq 2.5\mu\text{W}$ |

4.5.2 Test Setup

4.5.3 Test Procedure

References Rule

☒	ARIB STD-T66
-------------------------------------	--------------

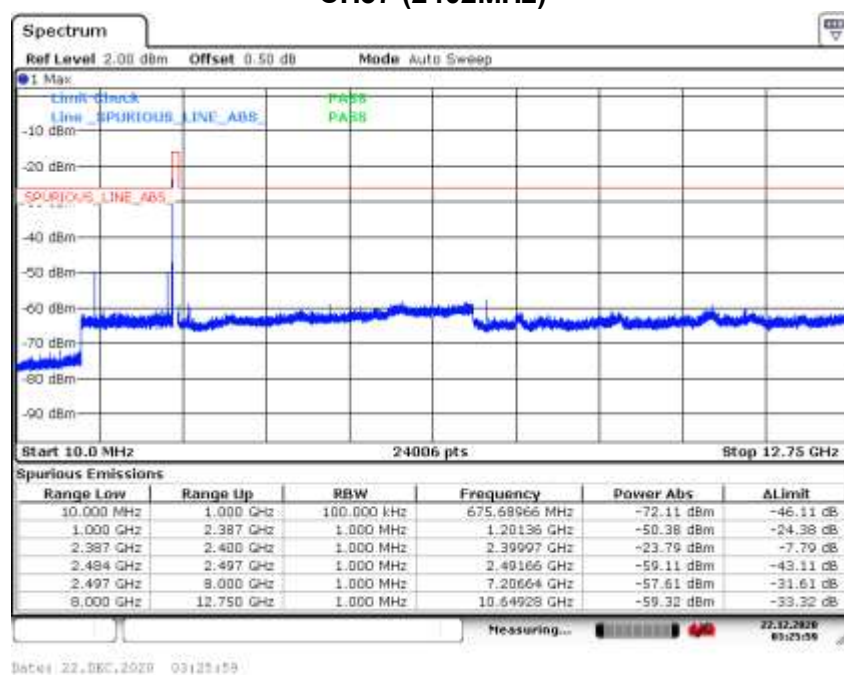
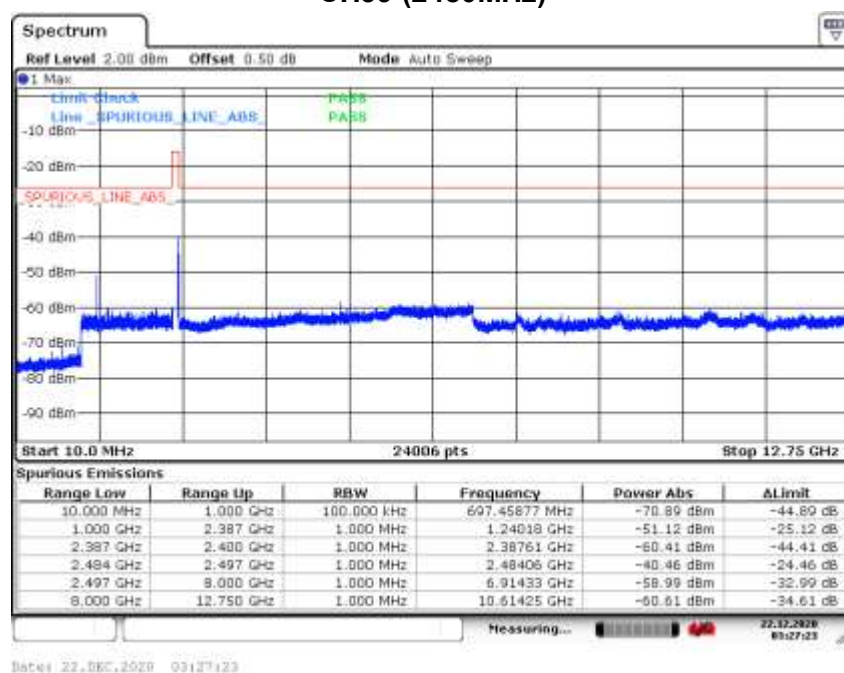
Step 1

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

1. A positive peak detector function must be used.
2. A measurement instrument with an integrated 99% power bandwidth function may be used to automate the test process.
3. The measurement instrument bandwidth and span must be set sufficiently with, and, the scan time set sufficiently slow, to ensure all major modulation products are captured. Note that the measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.
4. 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

4.5.4 Test Data

Product	:	S14BL
Test Item	:	Transmitter Spurious Emission
Test Site	:	TR8
Test Mode	:	Mode 1

CH37 (2402MHz)**CH39 (2480MHz)**

4.6 Receiver Suprious Emission

VERDICT: N/A

4.6.1 Limit

Standard

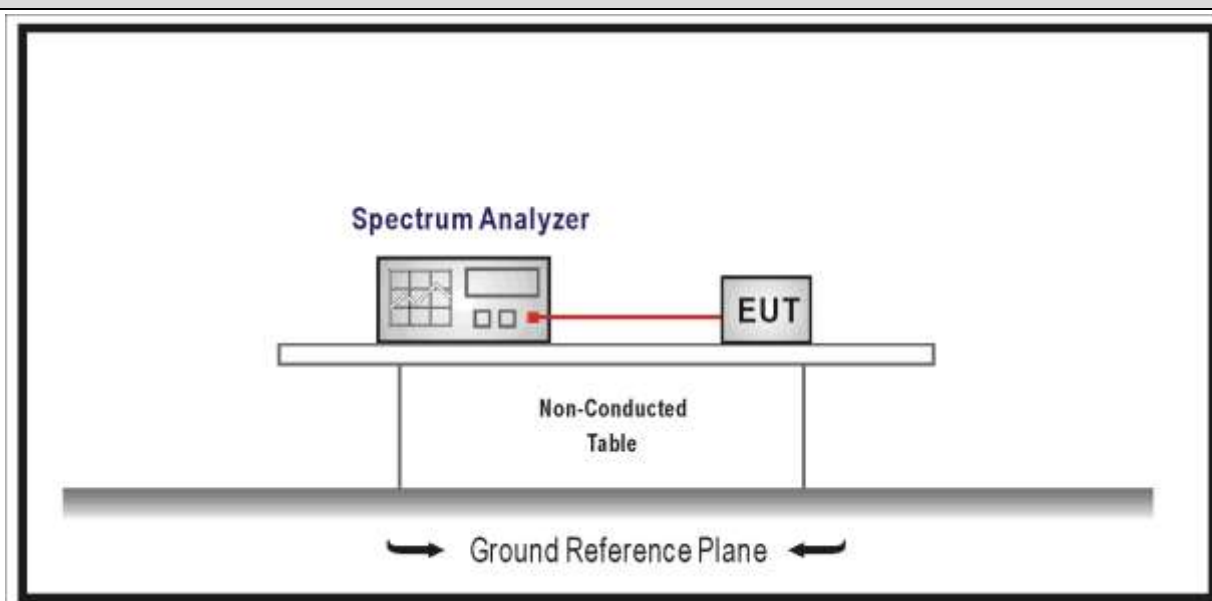
ARIB STD-T66

<= 4nW for 10 – 1000 MHz

<= 20nW for 1000 – 3000 MHz

<= 20nW for 3000 – 8000 MHz

4.6.2 Test Setup



4.6.3 Test Procedure

References Rule
☒ ARIB STD-T66

Step 1

A spectrum analyzer or similar device shall be used to observe a sample of the modulated transmitter's radio frequency power output.

1. A positive peak detector function must be used.
2. The measurement instrument bandwidth and span must be set sufficiently with, and the scan time set sufficiently slowly, to ensure all major modulation products are captured. Note that
3. The measurement bandwidth should also be set sufficiently narrow to avoid adding significant error to the test result.
4. 'Maximum Hold' mode may be used to accumulate the measurement result over several scans provided the emission is repetitive in nature.

4.6.4 Test Data

N/A

5 CONFORMING THE STRUCTURE THAT IS DIFFICULT TO OPEN

The Radio Equipment:	
☐	Use Special Screw
☒	Metal Shielding is Soldered
☐	Use Ball Grid Array (BGA)
☐	RF module/Chip Pins > 20
☐	RF module/Chip Pins distance < 1.5 mm

The high-frequency section and modulation section (except for the antenna system) are not capable of being opened easily.

6 SETUP PHOTO AND EUT PHOTO

Remark: The test setup photo and EUT Photo please see appendix.

_____ The End_____