



Compliance Certification Services (Kunshan) Inc.

Report No.: KSEM210400048201

Page: 1 of 23

TEST REPORT

Application No.: KSEM210400482CR (SHEM2101000002CR)
FCC ID: 2AYQ7FRESH-KEYRTH
Applicant: Fresh-key (Shanghai) Technology Co., Ltd
Address of Applicant: R412, Building 7, No.999 Dongye Road, Songjiang, Shanghai, China
Equipment Under Test (EUT):
EUT Name: Fresh-key RTH Data Logger
Model No.: RTH
Trade mark: Fresh-key
Standard(s): 47 CFR Part 2
 47 CFR Part 22 subpart H
 47 CFR Part 24 subpart E
Date of Receipt: 2020-12-24
Date of Test: 2021-01-11 to 2021-01-13
Date of Issue: 2021-04-12

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

Eric Lin
EMC Lab Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.



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Revision Record			
Version	Description	Date	Remark
00	Original	2021-04-12	/

Authorized for issue by:			
		Damon Zhou	
		Damon Zhou / Project Engineer	
		Eric Lin	
		Eric Lin / Reviewer	



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2 Test Summary

Test Item	FCC Rule No.	Requirements	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §22.913, §24.232	ERP≤7W(GSM850) EIRP≤2W(GSM1900)	PASS
Peak-Average Ratio	§24.232	≤13dB	PASS
Modulation Characteristics	§2.1047	Digital modulation	PASS
Bandwidth	§2.1049(h)	OBW: No limit EBW: No limit	PASS
Band Edge Compliance	§2.1051, §22.917, §24.238	≤ -13dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	PASS
Spurious emissions at antenna terminals	§2.1051, §22.917, §24.238	≤ -13dBm	PASS
Field strength of spurious radiation	§2.1051, §22.917, §24.238	≤ -13dBm	PASS
Frequency stability	§2.1055, §22.355, §24.235	≤ ±2.5ppm.	PASS



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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 3.7V 2000mAh rechargeable battery
Sample Type:	Portable production
Support Network:	GPRS, EGPRS
Operation Frequency Band:	GSM850/GSM1900
Modulation Type:	GMSK for GPRS 8PSK for EGPRS
GPRS Class:	12
EGPRS Class:	12
Antenna Type:	Integral Antenna
Antenna Gain:	-2dBi(Provided by manufacturer)
Extreme temp. Tolerance:	-20°C to +55°C
Extreme vol. Limits:	3.3VDC to 4.2VDC (nominal: 3.7VDC)
IMEI:	863188040006347



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4.2 Test Frequency

Test mode:	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
GSM850	TX	Channel 128	Channel 190	Channel 251
		824.2MHz	836.6 MHz	848.8 MHz
	RX	Channel 128	Channel 190	Channel 251
		869.2 MHz	881.6 MHz	893.8 MHz
Test mode:	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
GSM1900	TX	Channel 512	Channel 661	Channel 810
		1850.2MHz	1880.0 MHz	1909.8 MHz
	RX	Channel 512	Channel 661	Channel 810
		1930.2 MHz	1960.0 MHz	1989.8 MHz

4.3 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	48%	
Atmospheric Pressure:	1015Pa	
Temperature:	TN	25 °C
Voltage:	VL	3.3 V
	VN	3.7 V
	VH	4.2 V

NOTE: VL= lower extreme test voltage
 VN= nominal voltage
 VH= upper extreme test voltage
 TN= normal temperature



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4.4 Description of Support Units

The EUT has been tested as an independent unit.

4.5 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	2.84dB
7	Conducted Spurious emissions	0.75dB
8	RF Radiated power	4.6dB (Below 1GHz)
		4.1dB (Above 1GHz)
9	Radiated Spurious emission test	4.2dB (Below 30MHz)
		4.4dB (30MHz-1GHz)
		4.8dB (1GHz-18GHz)
		5.2dB (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.



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4.6 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.

4.7 Test Facility

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

- **CNAS (No. CNAS L4354)**

CNAS has accredited Compliance Certification Services (Kunshan) Inc. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 2541.01)**

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

- **FCC (Designation Number: CN1172)**

Compliance Certification Services Inc. has been recognized as an accredited testing laboratory.

Designation Number: CN1172.

- **ISED (CAB Identifier: CN0072)**

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

CAB Identifier: CN0072.

- **VCCI (Member No.: 1938)**

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-1600, C-1707, T-1499, G-10216 respectively.

4.8 Deviation from Standards

None

4.9 Abnormalities from Standard Conditions

None



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5 Equipment List

RF Conducted Test

Item	Equipment	Manufacturer	Model	Serial Number	Cal Date	Cal. Due Date
1	Test Software	BST	TST PASS	V 1.1.0	N.C.R	N.C.R
2	Spectrum Analyzer	Agilent	E4446A	MY44020154	04/22/2020	04/21/2021
3	Spectrum Analyzer	Keysight	N9020A	MY53420174	09/25/2020	09/24/2021
4	Spectrum Analyzer	Keysight	N9020A	MY55370209	10/19/2020	10/18/2021
5	Signal Generator	Agilent	E8257C	MY43321570	10/18/2020	10/18/2021
6	MXG Vector Signal Generator	Agilent	N5182A	MY50142015	09/25/2020	09/24/2021
7	Universal Radio Communication Tester	R&S	CMU200	109525	10/19/2020	10/18/2021
8	Universal Radio Communication Tester	R&S	CMW500	159275	10/19/2020	10/18/2021
9	Power Meter	Anritsu	ML2495A	1445010	04/21/2020	04/20/2021
10	Switcher	CCSRF	FY562	KS301219	10/19/2020	10/18/2021
11	AC Power Source	EXTECH	6605	1570106	N.C.R	N.C.R
12	DC Power Supply	Agilent	E3632A	MY50340053	N.C.R	N.C.R
13	6dB Attenuator	Mini-Circuits	NAT-6-2W	15542-1	N.C.R	N.C.R
14	Power Divider	AISI	IOWOPE2068	PE2068	N.C.R	N.C.R
15	Filter	MICRO-TRONICS	BRM50701	5	N.C.R	N.C.R
16	Conducted test cable	/	RF01-RF04	/	04/21/2020	04/22/2021
17	Temp. / Humidity Chamber	TERCHY	MHK-120AK	X30109	04/21/2020	04/20/2021

RF Radiated Test

Item	Equipment	Manufacturer	Model	Serial Number	Cal Date	Cal. Due Date
1	Test Software	Farad	EZ-EMC	CCS-03A1	N/A	N/A
2	Spectrum Analyzer	R&S	FSV40	101493	10/19/2020	10/18/2021
3	Signal Generator	Agilent	E8257C	MY43321570	10/10/2020	10/18/2021
4	Loop Antenna	COM-POWER	AL-130R	10160008	04/29/2019	04/28/2021
5	Bilog Antenna	TESEQ	CBL 6112D	35403	06/22/2019	06/21/2021
6	Bilog Antenna	SCHWARZBECK	VULB9160	9160-3342	04/29/2019	04/28/2021
7	Horn-antenna(1-18GHz)	Schwarzbeck	BBHA9120D	267	10/26/2020	10/25/2022
8	Horn-antenna(1-18GHz)	ETS-LINDGREN	3117	00143290	02/22/2021	02/21/2023
9	Horn Antenna(18-40GHz)	Schwarzbeck	BBHA9170	BBHA9170171	02/22/2021	02/21/2024
10	Pre-Amplifier(30MHz~18GHz)	CCSRF	AMP1277	1	10/19/2020	10/18/2021
11	Pre-Amplifier(0.1~26.5GHz)	EMCI	EMC012645	980060	04/21/2020	04/20/2021
12	Low Pass Filter	MICRO-TRONICS	VLFX-950	RV142900829	N.C.R	N.C.R
13	High Pass Filter	Mini-Circuits	VHF-1200	15542	N.C.R	N.C.R
14	Filter (5450MHz~5770 MHz)	MICRO-TRONICS	BRC50704-01	2	N.C.R	N.C.R
15	Filter (5690 MHz~5930 MHz)	MICRO-TRONICS	BRC50705-01	4	N.C.R	N.C.R
16	Filter (5150 MHz~5350 MHz)	MICRO-TRONICS	BRC50703-01	2	N.C.R	N.C.R
17	Filter (885 MHz~915 MHz)	MICRO-TRONICS	BRM14698	1	N.C.R	N.C.R



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18	Filter (815 MHz~860 MHz)	MICRO-TRONICS	BRM14697	1	N.C.R	N.C.R
19	Filter (1745 MHz~1910 MHz)	MICRO-TRONICS	BRM14700	1	N.C.R	N.C.R
20	Filter (1922 MHz~1977 MHz)	MICRO-TRONICS	BRM50715	1	N.C.R	N.C.R
21	Filter (2550 MHz)	MICRO-TRONICS	HPM13362	5	N.C.R	N.C.R
22	Filter (1532 MHz~1845 MHz)	MICRO-TRONICS	BRM50713	1	N.C.R	N.C.R
23	Filter (2.4GHz)	MICRO-TRONICS	BRM50701	5	N.C.R	N.C.R
24	RE test cable	/	RE01-RE04	/	04/21/2020	04/22/2021



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6 Radio Spectrum Matter Test Results

6.1 Effective (Isotropic) Radiated Power Output Data

Test Requirement: §2.1046, §22.913, §24.232
 Test Method: ANSI C63.26, KDB 971168 D01 v03
 Limit: $ERP \leq 7W(GSM850)$
 $EIRP \leq 2 W(GSM1900)$

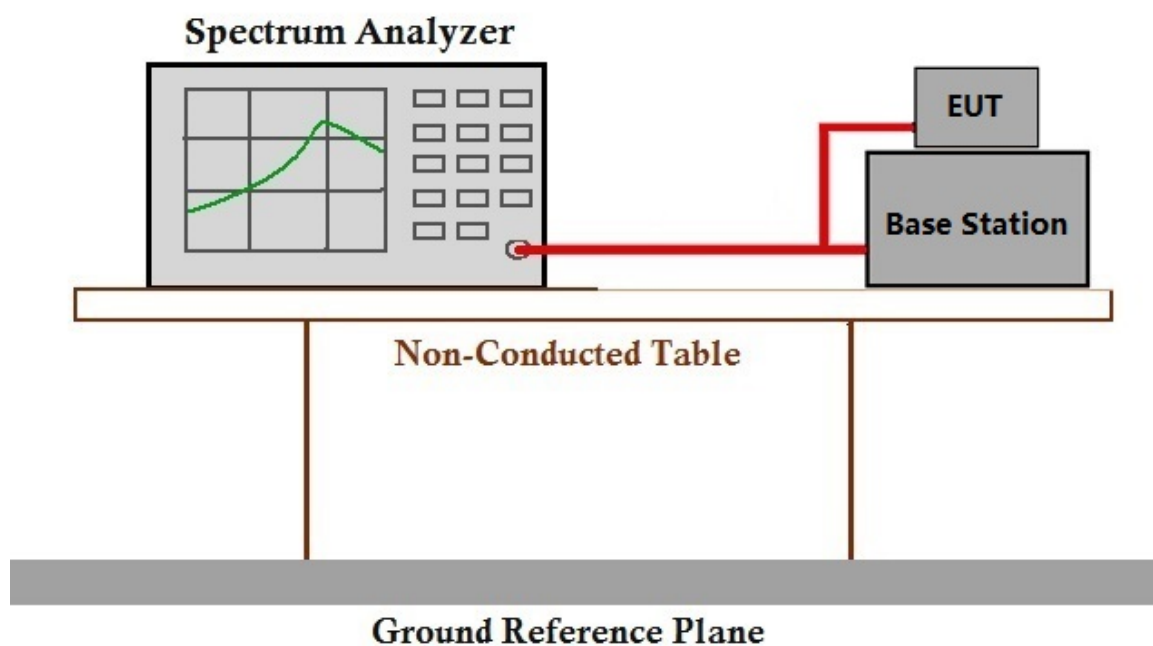
6.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 68.2 % RH Atmospheric Pressure: 1030 mbar

Test mode: I: Tx mode, Keep the EUT in transmitting mode.

6.1.2 Test Setup Diagram



6.1.3 Measurement Data

Please refer to Appendix A for KSEM210400048201-Band EGSM850 & Appendix B for KSEM210400048201-Band PCS1900



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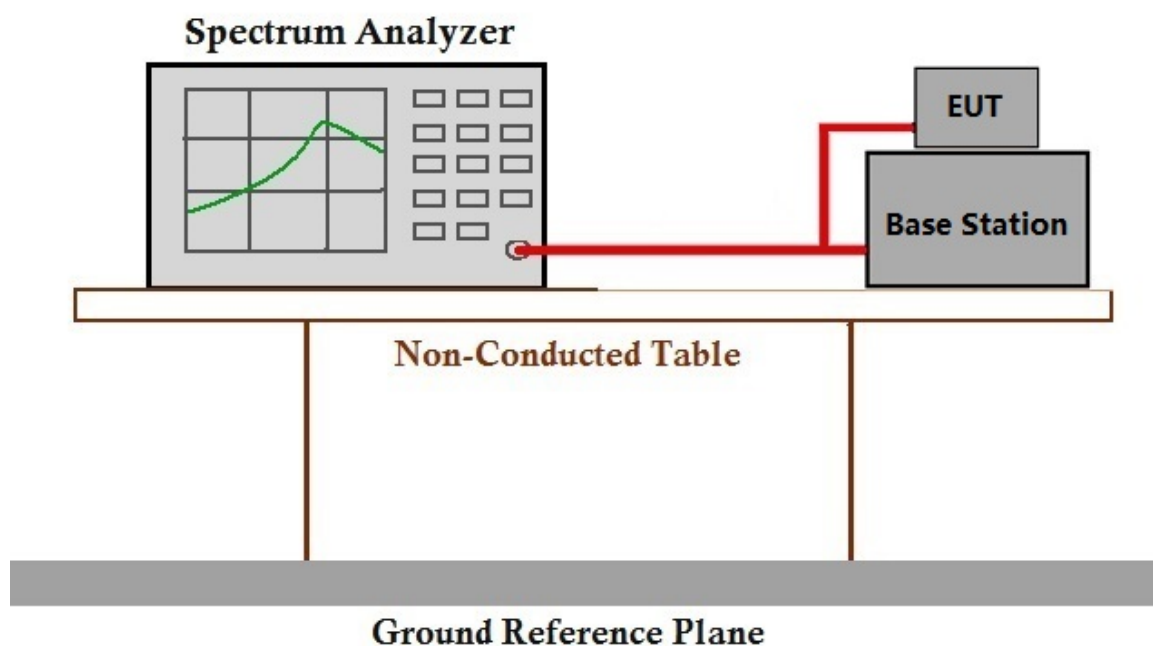
6.2 Peak-Average Ratio

Test Requirement: §24.232
 Test Method: ANSI C63.26, KDB 971168 D01 v03
 Limit: ≤13dB

6.2.1 E.U.T. Operation

Operating Environment:
 Temperature: 22.7 °C Humidity: 68.2 % RH Atmospheric Pressure: 1030 mbar
 Test mode: I: Tx mode, Keep the EUT in transmitting mode.

6.2.2 Test Setup Diagram



6.2.3 Measurement Data

Please refer to Appendix A for KSEM210400048201-Band EGSM850 & Appendix B for KSEM210400048201-Band PCS1900



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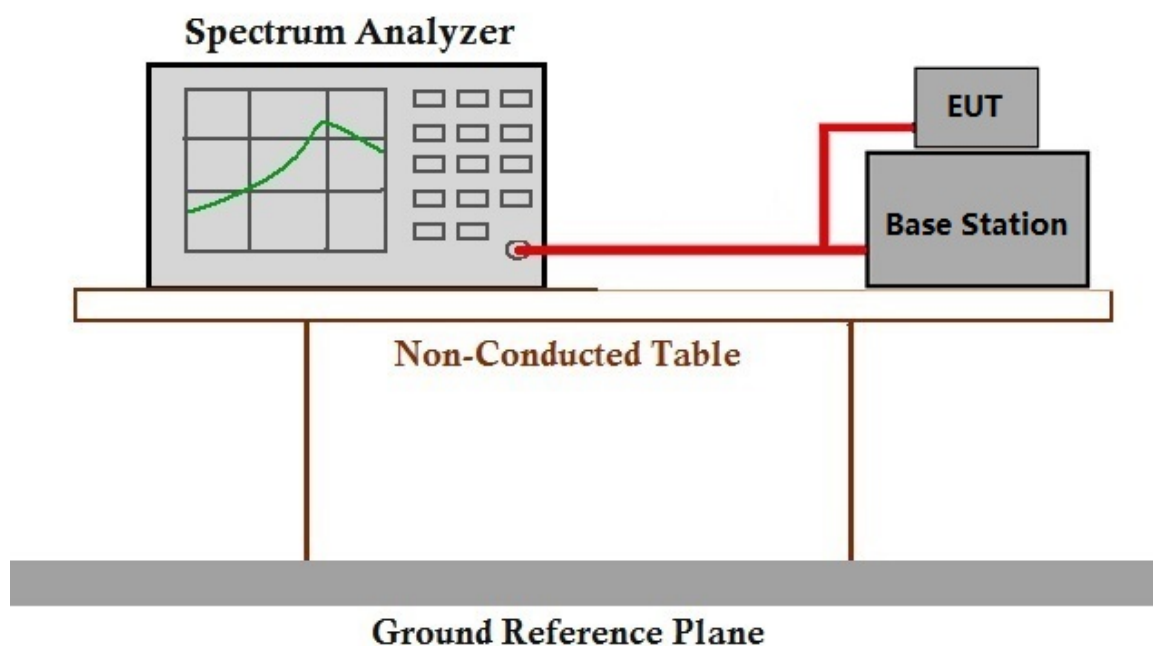
6.3 Bandwidth

Test Requirement: §2.1049(h), §22.917, §24.238
Test Method: ANSI C63.26, KDB 971168 D01 v03
Limit: OBW: No limit
EBW: No limit

6.3.1 E.U.T. Operation

Operating Environment:
Temperature: 22.7 °C Humidity: 68.2 % RH Atmospheric Pressure: 1030 mbar
Test mode: I: Tx mode, Keep the EUT in transmitting mode.

6.3.2 Test Setup Diagram



6.3.3 Measurement Data

Please refer to Appendix A for KSEM210400048201-Band EGSM850 & Appendix B for KSEM210400048201-Band PCS1900



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6.4 Band Edge Compliance

Test Requirement: §2.1051, §22.917, §24.238

Test Method: ANSI C63.26, KDB 971168 D01 v03

Limit: $\leq -13\text{dBm}/1\% \cdot \text{EBW}$, in 1 MHz bands immediately outside and adjacent to the frequency block.

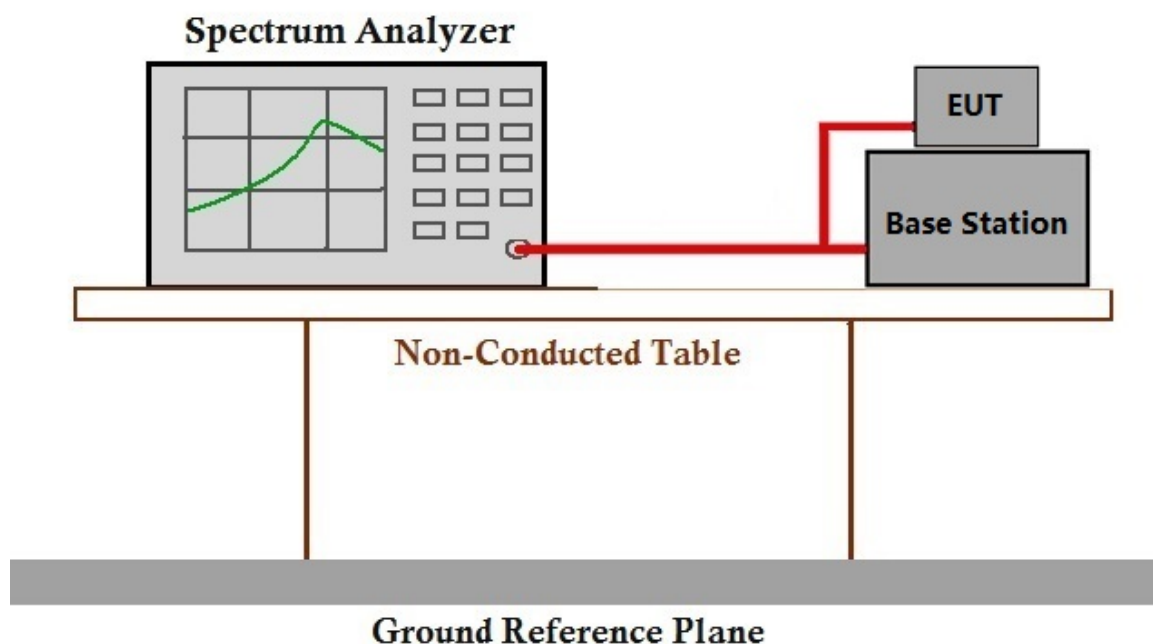
6.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 68.2 % RH Atmospheric Pressure: 1030 mbar

Test mode: I: Tx mode, Keep the EUT in transmitting mode.

6.4.2 Test Setup Diagram



6.4.3 Measurement Data

Please refer to Appendix A for KSEM210400048201-Band EGSM850 & Appendix B for KSEM210400048201-Band PCS1900



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6.5 Spurious emissions at antenna terminals

Test Requirement: §2.1051, §22.917, §24.238

Test Method: ANSI C63.26, KDB 971168 D01 v03

Limit: $\leq -13\text{dBm}$

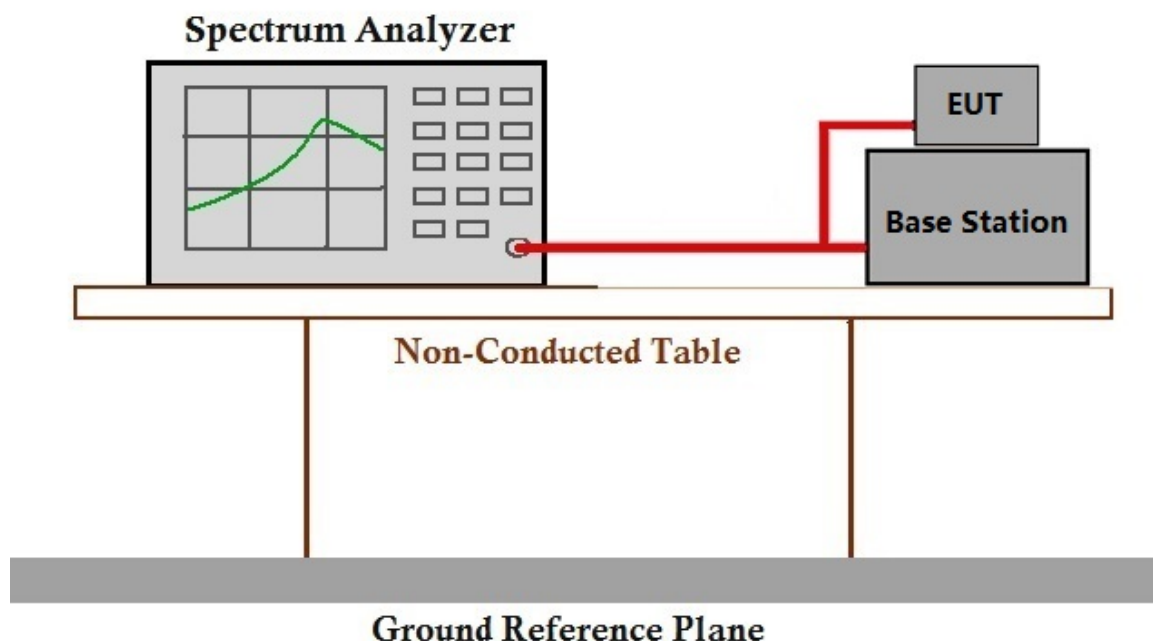
6.5.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 68.2 % RH Atmospheric Pressure: 1030 mbar

Test mode: I: Tx mode, Keep the EUT in transmitting mode.

6.5.2 Test Setup Diagram



6.5.3 Measurement Data

Please refer to Appendix A for KSEM210400048201-Band EGSM850 & Appendix B for KSEM210400048201-Band PCS1900



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6.6 Field strength of spurious radiation

Test Requirement: §2.1051, §22.917, §24.238,
 Test Method: ANSI C63.26, KDB 971168 D01 v03
 Limit: $\leq -13\text{dBm}$

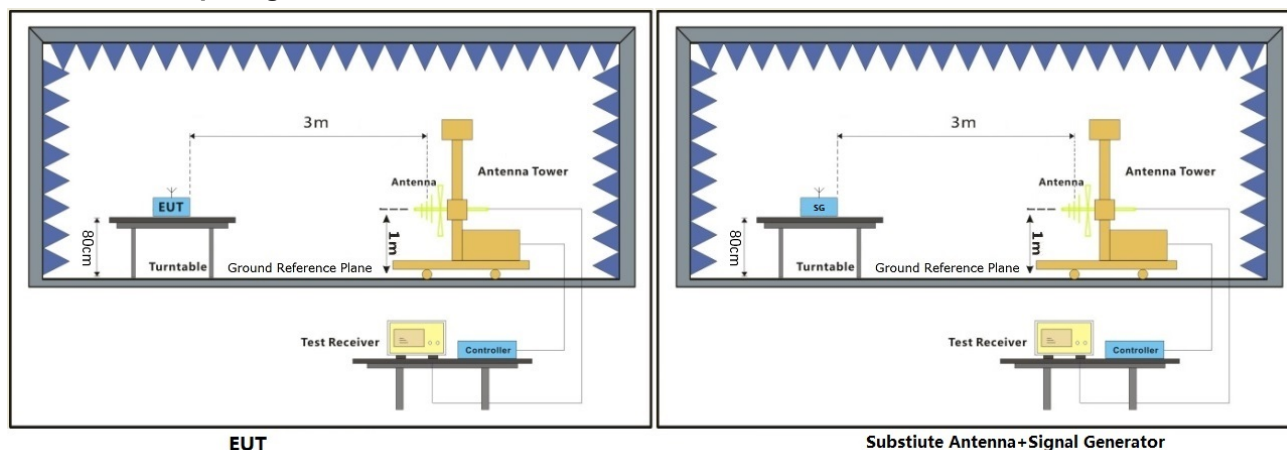
6.6.1 E.U.T. Operation

Operating Environment:

Temperature: 22.7 °C Humidity: 68.2 % RH Atmospheric Pressure: 1030 mbar

Test mode: I: Tx mode, Keep the EUT in transmitting mode.

6.6.2 Test Setup Diagram



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6.6.3 Measurement Procedure and Data

Test Procedure:

- (1) On a test site, the EUT shall be placed on a turntable and in the position closest to the normal use as declared by the user.
- (2) The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- (3) The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- (4) The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- (5) The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
- (6) The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- (7) The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
- (8) The maximum signal level detected by the measuring receiver shall be noted.
- (9) The measurement shall be repeated with the test antenna set to horizontal polarization.
- (10) Replace the antenna with a proper Antenna (substitution antenna).
- (11) The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
- (12) The substitution antenna shall be connected to a calibrated signal generator.
- (13) If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- (14) The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
- (15) The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
- (16) The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
- (17) The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.



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Frequency (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization
1648.400	-50.95	-13	-37.95	Horizontal
2472.600	-58.22	-13	-45.22	Horizontal
3296.800	-53.10	-13	-40.10	Horizontal
1648.400	-54.10	-13	-41.10	Vertical
2472.600	-57.44	-13	-44.44	Vertical
3296.800	-56.15	-13	-43.15	Vertical

GSM850- Middle channel				
Frequency (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization
1672.800	-59.96	-13	-46.96	Horizontal
2509.200	-58.17	-13	-45.17	Horizontal
3345.600	-55.77	-13	-42.77	Horizontal
1672.800	-54.64	-13	-41.64	Vertical
2509.200	-60.93	-13	-47.93	Vertical
3345.600	-55.47	-13	-42.47	Vertical

GSM850- High channel				
Frequency (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization
1697.600	-61.09	-13	-48.09	Horizontal
2546.400	-62.52	-13	-49.52	Horizontal
3395.200	-56.52	-13	-43.52	Horizontal
1697.600	-52.85	-13	-39.85	Vertical
2546.400	-62.48	-13	-49.48	Vertical
3395.200	-56.60	-13	-43.60	Vertical



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GSM1900-Low channel				
Frequency (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization
3700.400	-53.26	-13	-40.26	Horizontal
5550.600	-51.10	-13	-38.10	Horizontal
7400.800	-46.90	-13	-33.90	Horizontal
3700.400	-47.81	-13	-34.81	Vertical
5550.600	-47.42	-13	-34.42	Vertical
7400.800	-46.65	-13	-33.65	Vertical

GSM1900-Middle channel				
Frequency (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization
3760.000	-42.01	-13	-29.01	Horizontal
5640.000	-53.62	-13	-40.62	Horizontal
7520.000	-48.12	-13	-35.12	Horizontal
3760.000	-42.75	-13	-29.75	Vertical
5640.000	-50.75	-13	-37.75	Vertical
7520.000	-45.66	-13	-32.66	Vertical

GSM1900-High channel				
Frequency (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization
3819.600	-52.62	-13	-39.62	Horizontal
5729.400	-53.30	-13	-40.30	Horizontal
7639.200	-44.24	-13	-31.24	Horizontal
3819.600	-54.27	-13	-41.27	Vertical
5729.400	-48.68	-13	-35.68	Vertical
7639.200	-40.98	-13	-27.98	Vertical

Remark:

We have tested all modulation and all Bandwidth, but only the worst case data presented in this report.



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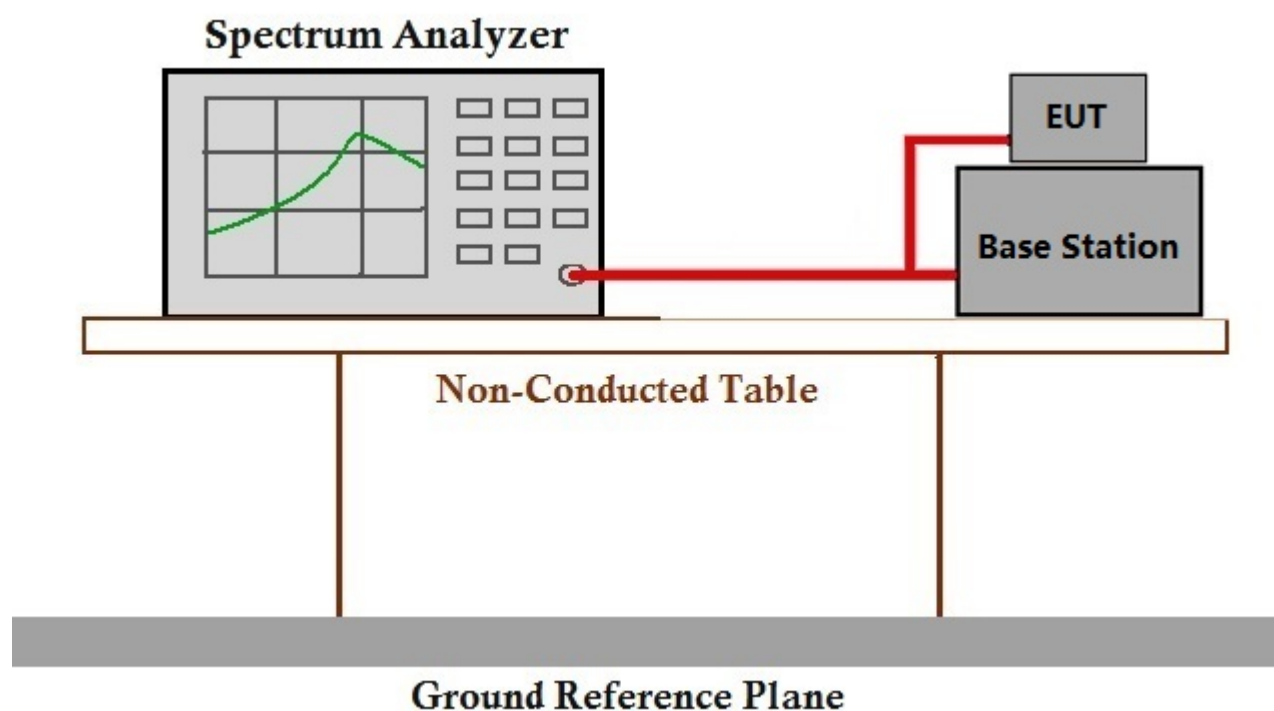
6.7 Frequency stability

Test Requirement: §2.1055, §22.355, §24.235
 Test Method: ANSI C63.26, KDB 971168 D01 v03
 Limit: $\leq \pm 2.5\text{ppm}$.

6.7.1 E.U.T. Operation

Operating Environment:
 Temperature: 22.7 °C Humidity: 68.2 % RH Atmospheric Pressure: 1030 mbar
 Test mode: I: Tx mode, Keep the EUT in transmitting mode.

6.7.2 Test Setup Diagram



6.7.3 Measurement Data

Please refer to Appendix A for KSEM210400048201-Band EGSM850 & Appendix B for KSEM210400048201-Band PCS1900



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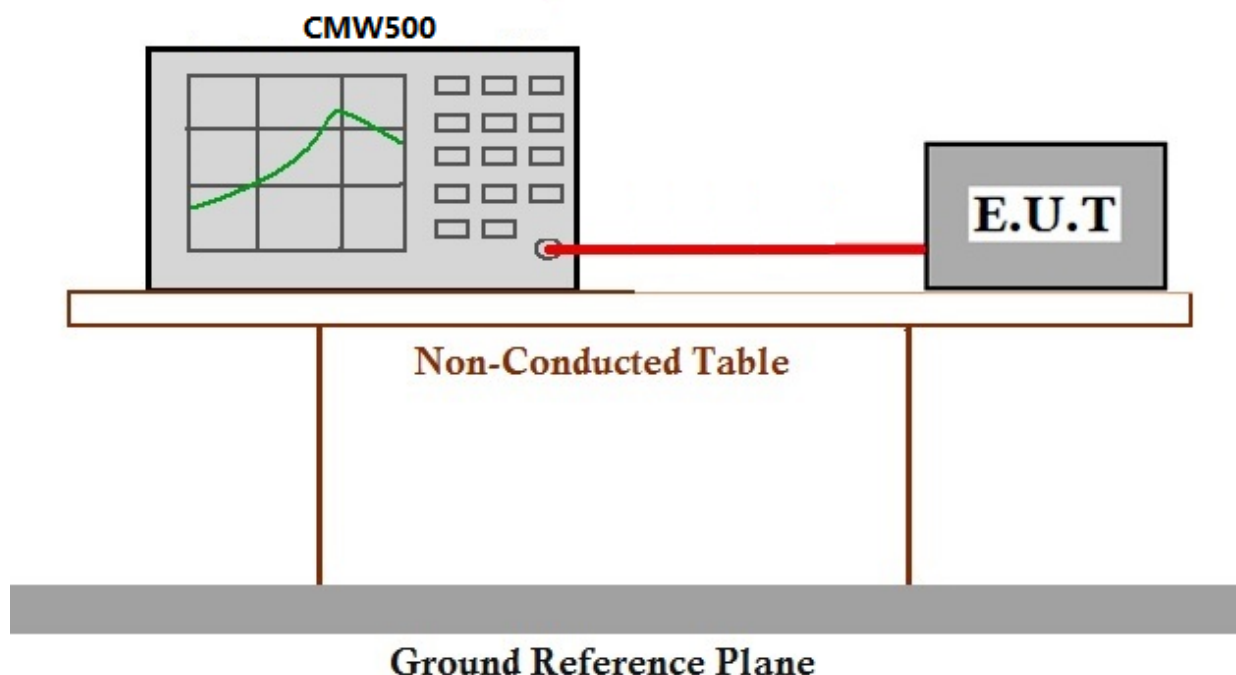
6.8 Modulation Characteristics

Test Requirement: §2.1047
Test Method: ANSI C63.26, KDB 971168 D01 v03
Limit: Digital modulation

6.8.1 E.U.T. Operation

Operating Environment:
Temperature: 22.7 °C Humidity: 68.2 % RH Atmospheric Pressure: 1030 mbar
Test mode: I: Tx mode, Keep the EUT in transmitting mode.

6.8.2 Test Setup Diagram



6.8.3 Measurement Data

Please refer to Appendix A for KSEM210400048201-Band EGSM850 & Appendix B for KSEM210400048201-Band PCS1900



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7 Test Setup Photographs

Refer to the < Test Setup photos-FCC>.

8 EUT Constructional Details

Refer to the < Internal Photos >.

- End of the Report -



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