























10. FREQUENCY STABILITY

10.1. Test Procedure

- (1) Connect the EUT RF output port to spectrum analyzer via calibrated coaxial cable and suitable attenuator (if necessary).
- (2) Activates the EUT System and execute the software prepared for test, if necessary.
- (3) The operating frequency measured by using frequency counter function of spectrum analyzer (*1) .
- (4) Frequency stability measurement was carried out from the high temperature to low temperature in order.

[Note]

- (*1) Spectrum Analyzer Set Up Conditions
- | | |
|----------------------|---------------------|
| Center Frequency | : Carrier frequency |
| Resolution bandwidth | : 1kHz |
| Video bandwidth | : 10kHz |
| Detector function | : Peak |
| Function | : Frequency counter |



10.2. Test Results

11a/n-HT20/ac-HT20

Test Condition		Original Frequency (MHz)	Measured Frequency (MHz)	Tolerance (kHz)	Tolerance (ppm)
Temp.	Voltage				
20deg.C	3.3V	5180.00	5179.976606	-23.394	-4.5162
		5220.00	5219.976081	-23.919	-4.5822
		5240.00	5239.975145	-24.855	-4.7433
		5745.00	5744.971851	-28.149	-4.8997
		5785.00	5784.971651	-28.349	-4.9004
		5825.00	5824.973421	-26.579	-4.5629
0deg.C	3.3V	5180.00	5179.998902	-1.098	-0.2120
		5220.00	5220.003054	3.054	0.5851
		5240.00	5240.002140	2.140	0.4084
		5745.00	5745.003600	3.600	0.6266
		5785.00	5785.003021	3.021	0.5222
		5825.00	5825.003206	3.206	0.5504
	3.135V	5180.00	5180.000140	0.140	0.0270
		5220.00	5220.002792	2.792	0.5349
		5240.00	5240.003145	3.145	0.6002
		5745.00	5745.002847	2.847	0.4956
		5785.00	5785.003245	3.245	0.5609
		5825.00	5825.002774	2.774	0.4762
	3.465V	5180.00	5180.001306	1.306	0.2521
		5220.00	5220.001084	1.084	0.2077
		5240.00	5240.002887	2.887	0.5510
		5745.00	5745.003585	3.585	0.6240
		5785.00	5785.003149	3.149	0.5443
		5825.00	5825.003221	3.221	0.5530
60deg.C	3.3V	5180.00	5180.030125	30.125	5.8156
		5220.00	5220.030054	30.054	5.7575
		5240.00	5240.027998	27.998	5.3431
		5745.00	5745.031298	31.298	5.4479
		5785.00	5785.032151	32.151	5.5576
		5825.00	5825.030149	30.149	5.1758
	3.135V	5180.00	5180.022547	22.547	4.3527
		5220.00	5220.022452	22.452	4.3011
		5240.00	5240.021660	21.660	4.1336
		5745.00	5745.024165	24.165	4.2063
		5785.00	5785.024821	24.821	4.2906
		5825.00	5825.023620	23.620	4.0549
	3.465V	5180.00	5180.033072	33.072	6.3846
		5220.00	5220.033024	33.024	6.3264
		5240.00	5240.032845	32.845	6.2681
		5745.00	5745.036148	36.148	6.2921
		5785.00	5785.037117	37.117	6.4161
		5825.00	5825.037187	37.187	6.3840



11n-HT40/ac-HT40

Test Condition		Original Frequency (MHz)	Measured Frequency (MHz)	Tolerance (kHz)	Tolerance (ppm)
Temp.	Voltage				
20deg.C	3.3V	5190.00	5189.975691	-24.309	-4.6838
		5230.00	5229.976174	-23.826	-4.5556
		5755.00	5754.972718	-27.282	-4.7406
		5795.00	5794.973193	-26.807	-4.6259
0deg.C	3.3V	5190.00	5190.002184	2.184	0.4208
		5230.00	5230.002666	2.666	0.5098
		5755.00	5755.003211	3.211	0.5579
		5795.00	5795.002884	2.884	0.4977
	3.135V	5190.00	5190.003291	3.291	0.6341
		5230.00	5230.002440	2.440	0.4665
		5755.00	5755.002871	2.871	0.4989
		5795.00	5795.005000	5.000	0.8628
	3.465V	5190.00	5190.002504	2.504	0.4825
		5230.00	5230.002646	2.646	0.5059
		5755.00	5755.002804	2.804	0.4872
		5795.00	5795.002766	2.766	0.4773
60deg.C	3.3V	5190.00	5190.028236	28.236	5.4405
		5230.00	5230.028216	28.216	5.3950
		5755.00	5755.032001	32.001	5.5606
		5795.00	5795.031924	31.924	5.5089
	3.135V	5190.00	5190.022362	22.362	4.3087
		5230.00	5230.022132	22.132	4.2317
		5755.00	5755.026335	26.335	4.5760
		5795.00	5795.025708	25.708	4.4362
	3.465V	5190.00	5190.034569	34.569	6.6607
		5230.00	5230.034747	34.747	6.6438
		5755.00	5755.039278	39.278	6.8250
		5795.00	5795.038553	38.553	6.6528



11ac-HT80

Test Condition		Original Frequency (MHz)	Measured Frequency (MHz)	Tolerance (kHz)	Tolerance (ppm)
Temp.	Voltage				
20deg.C	3.3V	5210.00	5209.977549	-22.451	-4.3092
		5775.00	5774.976730	-23.270	-4.0294
0deg.C	3.3V	5210.00	5210.002984	2.984	0.5727
		5775.00	5775.003337	3.337	0.5778
	3.135V	5210.00	5210.003258	3.258	0.6253
		5775.00	5775.003120	3.120	0.5403
	3.465V	5210.00	5210.002682	2.682	0.5148
		5775.00	5775.003693	3.693	0.6395
60deg.C	3.3V	5210.00	5210.029378	29.378	5.6388
		5775.00	5775.031878	31.878	5.5200
	3.135V	5210.00	5210.023855	23.855	4.5787
		5775.00	5775.027110	27.110	4.6944
	3.465V	5210.00	5210.035701	35.701	6.8524
		5775.00	5775.038663	38.663	6.6949

<p>[Calculation method]</p> <p>Tolerance (kHz) = Result - Frequency Tolerance (ppm) = Tolerance (kHz) / Channel Frequency * 10⁶</p>
<p>[Test Condition]</p> <p>(1) EUT operation : non-modulation (2) Temperature and voltage tolerance : EUT specification (Declare of Applicant) Operation temperature : 0 ° deg C ~ + 60 ° deg C Operation voltage : DC 3.3V ± 5%</p>

Tested Date	Environment	
	Temperature	Humidity
21 November 2017	20 °C	30 %



11. TEST EQUIPMENT

• Conducted Emission

KEC No.	Equipment	Manufacturer	Model No.	Last Cal.	Next Cal.
AT-144	Low Power Attenuator	HUBER+SUHNER	6810.01.A	2017/06	2018/06
FL-110	LISN	KYORITSU	KNW-242	2017/06	2018/06
MM-252	RF Relay Matrix	TSJ	RFM-E121	2017/06	2018/06
SA-067	Test Receiver	Keysight Technologies	N9038A	2017/09	2018/09

• Emission Bandwidth

• Peak Power Spectral Density

KEC No.	Equipment	Manufacturer	Model No.	Last Cal.	Next Cal.
AT-148	Fixed Attenuator	Anritsu	41KC-10	2017/04	2018/04
SA-065	Signal Analyzer	Agilent	N9030A	2016/12	2017/11

• Maximum Conducted Output Power

KEC No.	Equipment	Manufacturer	Model No.	Last Cal.	Next Cal.
AT-148	Fixed Attenuator	Anritsu	41KC-10	2017/04	2018/04
VV-061	Power Meter	Agilent	N1912A	2017/11	2018/11
VV-061-1	Wideband Power Sensor	Agilent	N1921A	2017/11	2018/11

• Spurious Emission (Radiated) 30-1000MHz

KEC No.	Equipment	Manufacturer	Model No.	Last Cal.	Next Cal.
AM-028	Pre-Amplifier	Anritsu	Anritsu	2017/04	2018/04
AN-094	Biconical Antenna	Schwarzbeck	VHA9103/BBA9106	2017/04	2018/04
AN-250	LPDA Antenna	Schwarzbeck	UHALP9108A	2017/04	2018/04
AT-159	Fixed Attenuator	Anritsu	MP721B	2017/04	2018/04
FS-099	Test Receiver	ROHDE & SCHWARZ	ESS	2017/01	2018/01
MM-530	RF Relay Matrix Unit	TSJ	RFM-E321	2017/04	2018/04
SA-059	Spectrum Analyzer	Agilent	N9010A	2017/07	2018/07

• Spurious Emission (Radiated) Above 1GHz

KEC No.	Equipment	Manufacturer	Model No.	Last Cal.	Next Cal.
AM-053	Pre-Amplifier	HP	8449B	2017/05	2018/05
AM-131	Pre-Amplifier	TOYO	TPA0118-36	2017/03	2018/03
AN-357	DRG Antenna	ETS LINDGREN	3117	2017/04	2018/04
AN-104	Std. Gain Horn Antenna	Scientific-Atlanta	12-5.8	2017/04	2020/04
AN-107	Std. Gain Horn Antenna	Scientific-Atlanta	12A-18	2017/05	2020/05
AN-109	Std. Gain Horn Antenna	Scientific-Atlanta	12A-26	2017/05	2020/05
AN-145	Std. Gain Horn Antenna	Scientific-Atlanta	12-12	2017/04	2020/04
AN-210	Std. Gain Horn Antenna	Scientific-Atlanta	12-8.2	2017/04	2020/04
AN-337	DRG Horn Antenna	ETS LINDGREN	3117	2017/04	2018/04
AT-148	Fixed Attenuator	Anritsu	41KC-10	2017/04	2018/04
FL-223	Band-stop Filter	TOYO	9BRM5250/T600	2017/04	2018/04
FL-224	Band-stop Filter	TOYO	6BRM5600/T700	2017/04	2018/04
FS-111	Test Receiver	ROHDE & SCHWARZ	ESW26	2017/03	2018/03
SA-065	Signal Analyzer	Agilent	N9030A	2016/12	2017/11



• Spurious Emission (Conducted) Below 30MHz

KEC No.	Equipment	Manufacturer	Model No.	Last Cal.	Next Cal.
AT-148	Fixed Attenuator	Anritsu	41KC-10	2017/04	2018/04
SA-067	Test Receiver	Keysight Technologies	N9038A	2017/09	2018/09

Note : (*1) KEC checked the performance, before using this device.

The overall program of calibration and verification of equipment is designed and operated so as to ensure that measurements made by KEC are traceable to the national standards of measurement or equivalent abroad.



APPENDIX A (DECLARATION OF COMPLIANCE TO MAXIMUM PERMISSIBLE EXPOSURE LIMITS FOR HUMANS)

The Model U9W33 with 5150-5850MHz transmitter complies with Maximum permissible exposure limits for humans as called out in §1.1310. It is exempt from Maximum Permissible Exposure based on its operating frequency, and power density 0.005mW/cm².

Calculation formula :

$$S = PG / 4\pi D^2$$

S : power density (W/m²)

P : peak output power (W)

G: antenna gain (isotropic)

D: measurement distance (m)

Where :

• Ant A

P = 12.66dBm at 5755 MHz, 11n-HT40 (see 29 page)

G = -1.73dBi

• Ant B

P = 12.13dBm at 5755 MHz, 11n-HT40 (see 29 page)

G = -0.68dBi

Therefore :

$$S(W/m^2) = \frac{(10^{\frac{12.66}{10}} \times 10^{-3} \times 10^{\frac{-1.73}{10}}) + (10^{\frac{12.13}{10}} \times 10^{-3} \times 10^{\frac{-0.68}{10}})}{4 \times \pi \times 0.2 \times 0.2} = 0.05$$

$$S \doteq 0.005 \text{ (mW/cm}^2\text{)}$$

This would be less than 1mW/cm² when the separation distance between the user and the device's radiating element is no less than 20cm.