11.9.4. Test results

Test Date (yy-mm-dd): 2024-05-15

Normal condition: Temp:26.2℃, Humid: 43%, Atmospheric Pressure:101kpa

Supply Voltage: AC 110V, 50Hz

11.9.4.1. 800MHz Band (Downlink: 861MHz ~862MHz, Uplink: 816MHz ~ 817MHz)

Frequency range		Max. Spurious Limit(dBm)	RBW (kHz)	Max. Spurious mark Level (dBm)	Margin[1*] (dB)	Result
(1) Downlink transmit mode (Frequency range: 861MHz~862MHz)						
Lowest frequency 861.0125MHz	9kHz~1GHz	-13.0	100	-40.0	27.0	PASS
	1GHz~8.6GHz	-13.0	100	-29.5	16.5	PASS
Highest frequency 861.9875MHz	9kHz~1GHz	-13.0	100	-39.8	26.8	PASS
	1GHz~8.6GHz	-13.0	100	-29.6	16.6	PASS
(2) Uplink transmit mode(Frequency range: 816MHz~817MHz)						
Lowest frequency 816.0125MHz	9kHz~1GHz	-13.0	100	-40.1	27.1	PASS
	1GHz~8.6GHz	-13.0	100	-29.5	16.5	PASS
Highest frequency 816.9875MHz	9kHz~1GHz	-13.0	100	-40.2	27.2	PASS
	1GHz~8.6GHz	-13.0	100	-28.8	15.8	PASS
NOTE 1:[1*]--Margin= specification limit -Maximum mark level.						

---------- The following blanks ----------

11.10. Frequency stability

Test requirement:	KDB 935210 D05 clause 4.8 FCC PART 2 1055(a)(2) FCC PART 90.213 FCC PART 90.219 (e)(4)(i)
Test Method:	KDB 935210 D05/4.8 FCC PART 2 1055(b)

11.10.1. Limit

Section 90.219(e)(4)(i) requires that a signal being retransmitted by an amplifier, repeater, or industrial booster meets the frequency stability requirements of Section 90.213. However, this requirement presumes that the EUT processes an input signal in ways that can influence the output signal frequency/frequencies; however, most signal boosters do not incorporate an oscillator). If the amplifier, booster, or repeater does not alter the input signal in any way, then a frequency stability test may not be required.

When performing frequency stability measurements on these types of devices, the instability associated with the EUT must be isolated from any frequency instability associated with the measurement instrumentation. One method for realizing such isolation is to connect the reference clock input of the signal generator to the reference output of the frequency counter, to confirm that any frequency instability is associated with the EUT, and is not due to differences between the reference oscillators internal to the measurement instrumentation.

Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table 10.10-1.

Table 10.10-1Frequency stability limits

frequency range(MHz)	Minimum Frequency Stability(ppm)
816-817/861-862	±1.5

NOTE 1: RF channels to be tested for single-carrier: Lowest frequency and Highest frequency.
NOTE 2: Modulation type is CW.

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11.10.2. Test configuration

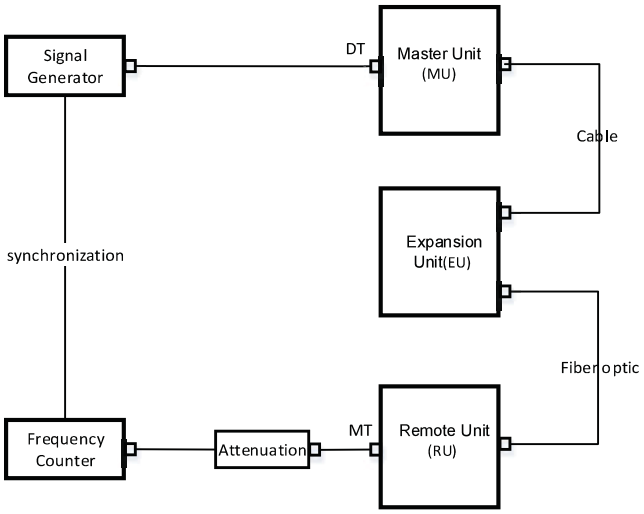

Figure 11.10-1 Downlink connection diagram

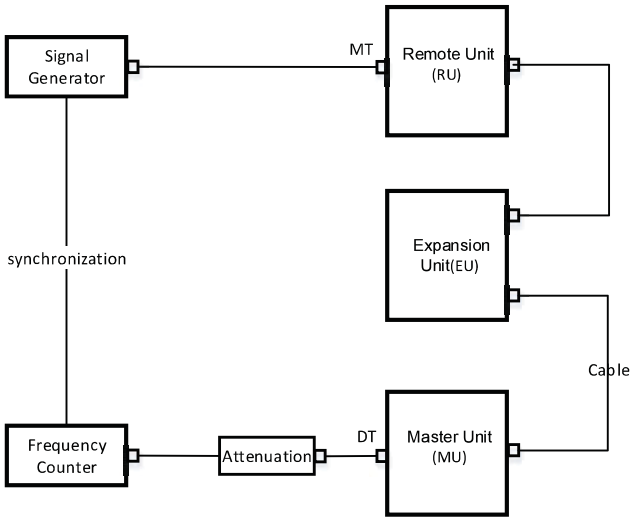

Figure 11.10-2 Uplink connection diagram

11.10.3. Test procedures

11.10.3.1.FCC PART 2 1055(a) (2)

§2.1055 Measurements required: Frequency stability.

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From −30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(2) From −20° to + 50° centigrade for equipment to be licensed for use in the Maritime Services under part 80 of this chapter, except for Class A, B, and S Emergency Position Indicating Radiobeacons (EPIRBS), and equipment to be licensed for use above 952 MHz at operational fixed stations in all services, stations in the Local Television Transmission Service and Point-to-Point Microwave Radio Service under part 21 of this chapter, equipment licensed for use aboard aircraft in the Aviation Services under part 87 of this chapter, and equipment authorized for use in the Family Radio Service under part 95 of this chapter.

(3) From 0° to + 50° centigrade for equipment to be licensed for use in the Radio Broadcast Services under part 73 of this chapter.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

———— The following blanks ————

11.10.3.2.ANSI C63.26-2015 clause 5.6.3

5.6.3 Procedure for frequency stability testing

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage.

The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency determining circuit element shall be made subsequent to this initial set-up. Frequency stability is tested:

a) At 10 °C intervals of temperatures between −30 °C and +50 °C at the manufacturer's rated supply voltage, and

b) At +20 °C temperature and ±15% supply voltage variations. If a product is specified to operate over a range of input voltage then the −15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage.

During the test all necessary settings, adjustments and control of the EUT have to be performed without disturbing the test environment, i.e., without opening the environmental chamber. The frequency stabilities can be maintained to a lesser temperature range provided that the transmitter is automatically inhibited from operating outside the lesser temperature range. For handheld equipment that is only capable of operating from internal batteries and the supply voltage cannot be varied, the frequency stability tests shall be performed at the nominal battery voltage and the battery end point voltage specified by the manufacturer. An external supply voltage can be used and set at the internal battery nominal voltage, and again at the battery operating end point voltage which shall be specified by the equipment manufacturer.

If an unmodulated carrier is not available, the mean frequency of a modulated carrier can be obtained by using a frequency counter with gating time set to an appropriately large multiple of bit periods (gating time depending on the required accuracy). Full details on the choice of values shall be included in the test report.

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage.

The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency determining circuit element shall be made subsequent to this initial set-up. Frequency stability is tested:

a) At 10 °C intervals of temperatures between −30 °C and +50 °C at the manufacturer's rated supply voltage, and

b) At +20 °C temperature and ±15% supply voltage variations. If a product is specified to operate over a range of input voltage then the −15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage.

During the test all necessary settings, adjustments and control of the EUT have to be performed without disturbing the test environment, i.e., without opening the environmental chamber. The frequency stabilities can be maintained to a lesser temperature range provided that the transmitter is automatically inhibited from operating outside the lesser temperature range. For handheld equipment that is only capable of operating from internal batteries and the supply voltage cannot be varied, the frequency stability tests shall be performed at the nominal battery voltage and the battery end point voltage specified by the manufacturer. An external supply voltage can be used and set at the internal battery nominal voltage, and again at the battery operating end point voltage which shall be specified by the equipment manufacturer.

If an unmodulated carrier is not available, the mean frequency of a modulated carrier can be obtained by using a frequency counter with gating time set to an appropriately large multiple of bit periods (gating time depending on the required accuracy). Full details on the choice of values shall be included in the test report.

11.10.4. Test results

Test Date (yy-mm-dd): 2024-05-21

Normal condition: Temp:26.0℃, Humid: 46%, Atmospheric Pressure:101kpa

Extreme test conditions:

Temp range: -30℃~+50℃ Test Date: 2024-05-21

11.10.4.1.Downlink

11.10.4.1.1. The Lowest frequency is 861.0125MHz

Temperature (℃)	Voltage	Intput carrier Frequency (MHz)	Comparison of deviation value between output frequency and input frequency(Hz)	Limit (ppm)	Frequency stability (ppm)	Result
-30	AC 93.5V(110*85%)	861.0125	0.9	±1.5	0.0010	PASS
	AC 110V	861.0125	1.0	±1.5	0.0012	PASS
	AC 126.5V(110*115%)	861.0125	-1.0	±1.5	-0.0012	PASS
-20	AC 93.5V(110*85%)	861.0125	-1.1	±1.5	-0.0013	PASS
	AC 110V	861.0125	-0.5	±1.5	-0.0006	PASS
	AC 126.5V(110*115%)	861.0125	0.6	±1.5	0.0007	PASS
-10	AC 93.5V(110*85%)	861.0125	1.2	±1.5	0.0014	PASS
	AC 110V	861.0125	-1.1	±1.5	-0.0013	PASS
	AC 126.5V(110*115%)	861.0125	-0.5	±1.5	-0.0006	PASS
0	AC 93.5V(110*85%)	861.0125	0.7	±1.5	0.0008	PASS
	AC 110V	861.0125	0.6	±1.5	0.0007	PASS
	AC 126.5V(110*115%)	861.0125	-0.2	±1.5	-0.0002	PASS
10	AC 93.5V(110*85%)	861.0125	-0.1	±1.5	-0.0001	PASS
	AC 110V	861.0125	-1.2	±1.5	-0.0014	PASS
	AC 126.5V(110*115%)	861.0125	-0.4	±1.5	-0.0005	PASS
20	AC 93.5V(110*85%)	861.0125	0.2	±1.5	0.0002	PASS
	AC 110V	861.0125	0.9	±1.5	0.0010	PASS
	AC 126.5V(110*115%)	861.0125	0.5	±1.5	0.0006	PASS
30	AC 93.5V(110*85%)	861.0125	1.1	±1.5	0.0013	PASS
	AC 110V	861.0125	-0.1	±1.5	-0.0001	PASS
	AC 126.5V(110*115%)	861.0125	0.6	±1.5	0.0007	PASS
40	AC 93.5V(110*85%)	861.0125	-0.4	±1.5	-0.0005	PASS
	AC 110V	861.0125	1.2	±1.5	0.0014	PASS
	AC 126.5V(110*115%)	861.0125	0.3	±1.5	0.0003	PASS
50	AC 93.5V(110*85%)	861.0125	0.0	±1.5	0.0000	PASS
	AC 110V	861.0125	1.1	±1.5	0.0013	PASS
	AC 126.5V(110*115%)	861.0125	0.2	±1.5	0.0002	PASS
NOTE: The test result is accurate to 4 decimal places.						

11.10.4.1.2. The Highest frequency is 861.9875MHz

Temperature (℃)	Voltage	Intput carrier Frequency (MHz)	Comparison of deviation value between output frequency and input frequency(Hz)	Limit (ppm)	Frequency stability (ppm)	Result
-30	AC 93.5V(110*85%)	861.9875	1.0	±1.5	0.0012	PASS
	AC 110V	861.9875	-0.3	±1.5	-0.0003	PASS
	AC 126.5V(110*115%)	861.9875	-0.4	±1.5	-0.0005	PASS
-20	AC 93.5V(110*85%)	861.9875	-0.7	±1.5	-0.0008	PASS
	AC 110V	861.9875	0.7	±1.5	0.0008	PASS
	AC 126.5V(110*115%)	861.9875	-1.2	±1.5	-0.0014	PASS
-10	AC 93.5V(110*85%)	861.9875	-1.2	±1.5	-0.0014	PASS
	AC 110V	861.9875	-1.1	±1.5	-0.0013	PASS
	AC 126.5V(110*115%)	861.9875	0.5	±1.5	0.0006	PASS
0	AC 93.5V(110*85%)	861.9875	-0.7	±1.5	-0.0008	PASS
	AC 110V	861.9875	-0.9	±1.5	-0.0010	PASS
	AC 126.5V(110*115%)	861.9875	-0.7	±1.5	-0.0008	PASS
10	AC 93.5V(110*85%)	861.9875	-0.3	±1.5	-0.0003	PASS
	AC 110V	861.9875	0.5	±1.5	0.0006	PASS
	AC 126.5V(110*115%)	861.9875	-0.4	±1.5	-0.0005	PASS
20	AC 93.5V(110*85%)	861.9875	0.5	±1.5	0.0006	PASS
	AC 110V	861.9875	-0.9	±1.5	-0.0010	PASS
	AC 126.5V(110*115%)	861.9875	0.4	±1.5	0.0005	PASS
30	AC 93.5V(110*85%)	861.9875	0.4	±1.5	0.0005	PASS
	AC 110V	861.9875	0.1	±1.5	0.0001	PASS
	AC 126.5V(110*115%)	861.9875	-0.7	±1.5	-0.0008	PASS
40	AC 93.5V(110*85%)	861.9875	-1.1	±1.5	-0.0013	PASS
	AC 110V	861.9875	-0.9	±1.5	-0.0010	PASS
	AC 126.5V(110*115%)	861.9875	1.0	±1.5	0.0012	PASS
50	AC 93.5V(110*85%)	861.9875	0.5	±1.5	0.0006	PASS
	AC 110V	861.9875	0.7	±1.5	0.0008	PASS
	AC 126.5V(110*115%)	861.9875	0.7	±1.5	0.0008	PASS
NOTE: The test result is accurate to 4 decimal places.						

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11.10.4.2.Uplink

11.10.4.2.1. The Lowest frequency is 816.0125MHz

Temperature (℃)	Voltage	Intput carrier Frequency (MHz)	Comparison of deviation value between output frequency and input frequency(Hz)	Limit (ppm)	Frequency stability (ppm)	Result
-30	AC 93.5V(110*85%)	816.0125	1.4	±1.5	0.0017	PASS
	AC 110V	816.0125	-0.3	±1.5	-0.0004	PASS
	AC 126.5V(110*115%)	816.0125	-0.6	±1.5	-0.0007	PASS
-20	AC 93.5V(110*85%)	816.0125	-0.4	±1.5	-0.0005	PASS
	AC 110V	816.0125	0.9	±1.5	0.0011	PASS
	AC 126.5V(110*115%)	816.0125	0.4	±1.5	0.0005	PASS
-10	AC 93.5V(110*85%)	816.0125	-0.5	±1.5	-0.0006	PASS
	AC 110V	816.0125	-0.7	±1.5	-0.0009	PASS
	AC 126.5V(110*115%)	816.0125	-1.0	±1.5	-0.0012	PASS
0	AC 93.5V(110*85%)	816.0125	-0.5	±1.5	-0.0006	PASS
	AC 110V	816.0125	0.9	±1.5	0.0011	PASS
	AC 126.5V(110*115%)	816.0125	1.1	±1.5	0.0013	PASS
10	AC 93.5V(110*85%)	816.0125	-1.0	±1.5	-0.0012	PASS
	AC 110V	816.0125	-0.8	±1.5	-0.0010	PASS
	AC 126.5V(110*115%)	816.0125	-1.1	±1.5	-0.0013	PASS
20	AC 93.5V(110*85%)	816.0125	-1.1	±1.5	-0.0013	PASS
	AC 110V	816.0125	0.8	±1.5	0.0010	PASS
	AC 126.5V(110*115%)	816.0125	-0.6	±1.5	-0.0007	PASS
30	AC 93.5V(110*85%)	816.0125	1.1	±1.5	0.0013	PASS
	AC 110V	816.0125	0.9	±1.5	0.0011	PASS
	AC 126.5V(110*115%)	816.0125	0.4	±1.5	0.0005	PASS
40	AC 93.5V(110*85%)	816.0125	-0.8	±1.5	-0.0010	PASS
	AC 110V	816.0125	-0.6	±1.5	-0.0007	PASS
	AC 126.5V(110*115%)	816.0125	0.4	±1.5	0.0005	PASS
50	AC 93.5V(110*85%)	816.0125	-0.7	±1.5	-0.0009	PASS
	AC 110V	816.0125	0.5	±1.5	0.0006	PASS
	AC 126.5V(110*115%)	816.0125	-1.0	±1.5	-0.0012	PASS
NOTE: The test result is accurate to 4 decimal places.						

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11.10.4.2.2. The Highest frequency is 816.9875MHz

Temperature (℃)	Voltage	Intput carrier Frequency (MHz)	Comparison of deviation value between output frequency and input frequency(Hz)	Limit (ppm)	Frequency stability (ppm)	Result
-30	AC 93.5V(110*85%)	816.9875	-1.6	±1.5	-0.0020	PASS
	AC 110V	816.9875	0.5	±1.5	0.0006	PASS
	AC 126.5V(110*115%)	816.9875	-0.6	±1.5	-0.0007	PASS
-20	AC 93.5V(110*85%)	816.9875	0.4	±1.5	0.0005	PASS
	AC 110V	816.9875	-0.4	±1.5	-0.0005	PASS
	AC 126.5V(110*115%)	816.9875	0.5	±1.5	0.0006	PASS
-10	AC 93.5V(110*85%)	816.9875	0.7	±1.5	0.0009	PASS
	AC 110V	816.9875	0.6	±1.5	0.0007	PASS
	AC 126.5V(110*115%)	816.9875	-0.9	±1.5	-0.0011	PASS
0	AC 93.5V(110*85%)	816.9875	-0.9	±1.5	-0.0011	PASS
	AC 110V	816.9875	-1.0	±1.5	-0.0012	PASS
	AC 126.5V(110*115%)	816.9875	-0.4	±1.5	-0.0005	PASS
10	AC 93.5V(110*85%)	816.9875	1.0	±1.5	0.0012	PASS
	AC 110V	816.9875	1.2	±1.5	0.0015	PASS
	AC 126.5V(110*115%)	816.9875	-0.7	±1.5	-0.0009	PASS
20	AC 93.5V(110*85%)	816.9875	0.8	±1.5	0.0010	PASS
	AC 110V	816.9875	-1.0	±1.5	-0.0012	PASS
	AC 126.5V(110*115%)	816.9875	-0.2	±1.5	-0.0002	PASS
30	AC 93.5V(110*85%)	816.9875	-1.2	±1.5	-0.0015	PASS
	AC 110V	816.9875	-0.5	±1.5	-0.0006	PASS
	AC 126.5V(110*115%)	816.9875	1.1	±1.5	0.0013	PASS
40	AC 93.5V(110*85%)	816.9875	-1.0	±1.5	-0.0012	PASS
	AC 110V	816.9875	1.1	±1.5	0.0013	PASS
	AC 126.5V(110*115%)	816.9875	-0.4	±1.5	-0.0005	PASS
50	AC 93.5V(110*85%)	816.9875	-0.5	±1.5	-0.0006	PASS
	AC 110V	816.9875	-0.7	±1.5	-0.0009	PASS
	AC 126.5V(110*115%)	816.9875	-0.4	±1.5	-0.0005	PASS
NOTE: The test result is accurate to 4 decimal places.						

---------- The following blanks ----------

11.11. Radiated spurious emissions

Test requirement:	KDB 935210 D05 clause 4.9 FCC PART 2.1053 FCC PART 90.219 (e)(3)
Test Method:	KDB 935210 D05 clause 4.9 ANSIC63.26-2015/5.5 ANSI/TIA 603-E-2016 ANSI/TIA-102.CAAA-E-2016

11.11.1. Requirements

11.11.1.1.KDB 935210 D05 clause 4.9

4.9 Spurious emissions radiated measurements

This measurement is intended to produce test data necessary to demonstrate compliance to the radiated spurious emission requirements specified in Section 2.1053 of the FCC rules. This test is intended to capture any emissions that radiate directly from the case, cabinet, control circuits, etc., instead of via the antenna output port, and thus would not be captured in conducted spurious emission measurements. See KDB Publication 971168 [R8] for measurement procedure guidance.

11.11.1.2.FCC PART 2.1053

§2.1053 Measurements required: Field strength of spurious radiation.

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.

(2) All equipment operating on frequencies higher than 25 MHz.

(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.

(4) Other types of equipment as required, when deemed necessary by the Commission.

[39 FR 5919, Feb. 15, 1974. Redesignated and amended at 63 FR 36599, July 7, 1998]

According to FCC PART 2.1053 requirement, this test was performed to measure radiated spurious emissions from the EUT. The test is intended to capture any emissions that radiate directly from the case, cabinet, control circuits, etc., instead of via the antenna output port, and thus would not be captured in conducted spurious emission measurements.

Spurious emissions of zone enhancers shall be suppressed as much as possible, Any emissions must be attenuated below the power (P) of the highest emissions contained within the authorized, by at least:$43+10*\log_{10} P$ or 70dB, whichever is less stringent, where P is the total RF output power of the test tones in Watts. Since $43+10*\log_{10} P$ is less stringent than 70dB, that limit was used.

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