

## 12. Frequency Stability Measurement

### 12.1. Block Diagram of Test Setup

Same as section 8.1

### 12.2. Limit of Frequency Stability

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

### 12.3. Test Procedures

(1) To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.

(2) The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10 dB lower than the measured peak value.

(3) The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

### 12.4. Test Result

Voltage							
Test Mode	Frequency (MHz)	Voltage (Vdc)	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
11A	5180	NV	NT	-41000.00	-7.915058	20	PASS
		LV	NT	-41000.00	-7.915058	20	PASS
		HV	NT	-41000.00	-7.915058	20	PASS
	5200	NV	NT	-40000.00	-7.692308	20	PASS
		LV	NT	-40000.00	-7.692308	20	PASS
		HV	NT	-40000.00	-7.692308	20	PASS
	5240	NV	NT	-41000.00	-7.824427	20	PASS
		LV	NT	-41000.00	-7.824427	20	PASS
		HV	NT	-41000.00	-7.824427	20	PASS
	5260	NV	NT	-41000.00	-7.794677	20	PASS
		LV	NT	-41000.00	-7.794677	20	PASS
		HV	NT	-41000.00	-7.794677	20	PASS
	5280	NV	NT	-41000.00	-7.765152	20	PASS
		LV	NT	-41000.00	-7.765152	20	PASS
		HV	NT	-41000.00	-7.765152	20	PASS
	5320	NV	NT	-41000.00	-7.706767	20	PASS
		LV	NT	-41000.00	-7.706767	20	PASS
		HV	NT	-41000.00	-7.706767	20	PASS
	5500	NV	NT	-42000.00	-7.636364	20	PASS
		LV	NT	-42000.00	-7.636364	20	PASS
		HV	NT	-42000.00	-7.636364	20	PASS
	5580	NV	NT	-42000.00	-7.526882	20	PASS
		LV	NT	-42000.00	-7.526882	20	PASS
		HV	NT	-42000.00	-7.526882	20	PASS
	5700	NV	NT	-44000.00	-7.719298	20	PASS
		LV	NT	-43000.00	-7.543860	20	PASS
		HV	NT	-44000.00	-7.719298	20	PASS
	5720	NV	NT	-44000.00	-7.692308	20	PASS
		LV	NT	-44000.00	-7.692308	20	PASS
		HV	NT	-44000.00	-7.692308	20	PASS
5745	NV	NT	-45000.00	-7.832898	20	PASS	
	LV	NT	-45000.00	-7.832898	20	PASS	

	5785	HV	NT	-45000.00	-7.832898	20	PASS	
		NV	NT	-45000.00	-7.778738	20	PASS	
		LV	NT	-45000.00	-7.778738	20	PASS	
	5825	HV	NT	-45000.00	-7.778738	20	PASS	
		NV	NT	-45000.00	-7.725322	20	PASS	
		LV	NT	-45000.00	-7.725322	20	PASS	
11N40MIMO	5190	HV	NT	-45000.00	-7.725322	20	PASS	
		NV	NT	-41000.00	-7.899807	20	PASS	
		LV	NT	-41000.00	-7.899807	20	PASS	
	5230	HV	NT	-41000.00	-7.899807	20	PASS	
		NV	NT	-39000.00	-7.456979	20	PASS	
		LV	NT	-41000.00	-7.839388	20	PASS	
	5270	HV	NT	-40000.00	-7.648184	20	PASS	
		NV	NT	-41000.00	-7.779886	20	PASS	
		LV	NT	-41000.00	-7.779886	20	PASS	
	5310	HV	NT	-41000.00	-7.779886	20	PASS	
		NV	NT	-41000.00	-7.721281	20	PASS	
		LV	NT	-41000.00	-7.721281	20	PASS	
	5510	HV	NT	-40000.00	-7.532957	20	PASS	
		NV	NT	-42000.00	-7.622505	20	PASS	
		LV	NT	-42000.00	-7.622505	20	PASS	
	5550	HV	NT	-42000.00	-7.622505	20	PASS	
		NV	NT	-42000.00	-7.567568	20	PASS	
		LV	NT	-42000.00	-7.567568	20	PASS	
	5670	HV	NT	-42000.00	-7.567568	20	PASS	
		NV	NT	-43000.00	-7.583774	20	PASS	
		LV	NT	-43000.00	-7.583774	20	PASS	
	5710	HV	NT	-43000.00	-7.583774	20	PASS	
		NV	NT	-44000.00	-7.705779	20	PASS	
		LV	NT	-44000.00	-7.705779	20	PASS	
	5755	HV	NT	-44000.00	-7.705779	20	PASS	
		NV	NT	-44000.00	-7.645526	20	PASS	
		LV	NT	-45000.00	-7.819288	20	PASS	
	5795	HV	NT	-44000.00	-7.645526	20	PASS	
		NV	NT	-45000.00	-7.765315	20	PASS	
		LV	NT	-45000.00	-7.765315	20	PASS	
	11AC80MIMO	5210	HV	NT	-45000.00	-7.765315	20	PASS
			NV	NT	-41000.00	-7.869482	20	PASS
			LV	NT	-41000.00	-7.869482	20	PASS
		5290	HV	NT	-41000.00	-7.869482	20	PASS
			NV	NT	-41000.00	-7.750473	20	PASS
			LV	NT	-41000.00	-7.750473	20	PASS
5530		HV	NT	-41000.00	-7.750473	20	PASS	
		NV	NT	-43000.00	-7.775769	20	PASS	
		LV	NT	-43000.00	-7.775769	20	PASS	
5610		HV	NT	-43000.00	-7.775769	20	PASS	
		NV	NT	-43000.00	-7.664884	20	PASS	
		LV	NT	-43000.00	-7.664884	20	PASS	
5690	HV	NT	-43000.00	-7.664884	20	PASS		
	NV	NT	-44000.00	-7.732865	20	PASS		
	LV	NT	-44000.00	-7.732865	20	PASS		
5775	HV	NT	-44000.00	-7.732865	20	PASS		
	NV	NT	-45000.00	-7.792208	20	PASS		
	LV	NT	-45000.00	-7.792208	20	PASS		
		HV	NT	-45000.00	-7.792208	20	PASS	

Temperature							
Test Mode	Frequency (MHz)	Voltage (Vdc)	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
11A	5180	NV	-20	-41000.00	-7.915058	20	PASS
		NV	-10	-41000.00	-7.915058	20	PASS
		NV	0	-41000.00	-7.915058	20	PASS
		NV	10	-41000.00	-7.915058	20	PASS
		NV	20	-41000.00	-7.915058	20	PASS
		NV	30	-41000.00	-7.915058	20	PASS
		NV	40	-41000.00	-7.915058	20	PASS
		NV	50	-41000.00	-7.915058	20	PASS
	5200	NV	-20	-40000.00	-7.692308	20	PASS
		NV	-10	-40000.00	-7.692308	20	PASS
		NV	0	-40000.00	-7.692308	20	PASS
		NV	10	-40000.00	-7.692308	20	PASS
		NV	20	-40000.00	-7.692308	20	PASS
		NV	30	-40000.00	-7.692308	20	PASS
		NV	40	-40000.00	-7.692308	20	PASS
		NV	50	-40000.00	-7.692308	20	PASS
	5240	NV	-20	-41000.00	-7.824427	20	PASS
		NV	-10	-41000.00	-7.824427	20	PASS
		NV	0	-41000.00	-7.824427	20	PASS
		NV	10	-41000.00	-7.824427	20	PASS
		NV	20	-41000.00	-7.824427	20	PASS
		NV	30	-41000.00	-7.824427	20	PASS
		NV	40	-41000.00	-7.824427	20	PASS
		NV	50	-41000.00	-7.824427	20	PASS
	5260	NV	-20	-41000.00	-7.794677	20	PASS
		NV	-10	-41000.00	-7.794677	20	PASS
		NV	0	-41000.00	-7.794677	20	PASS
		NV	10	-41000.00	-7.794677	20	PASS
		NV	20	-41000.00	-7.794677	20	PASS
		NV	30	-41000.00	-7.794677	20	PASS
		NV	40	-41000.00	-7.794677	20	PASS
		NV	50	-41000.00	-7.794677	20	PASS
	5280	NV	-20	-41000.00	-7.765152	20	PASS
		NV	-10	-41000.00	-7.765152	20	PASS
		NV	0	-41000.00	-7.765152	20	PASS
		NV	10	-41000.00	-7.765152	20	PASS
		NV	20	-41000.00	-7.765152	20	PASS
		NV	30	-41000.00	-7.765152	20	PASS
		NV	40	-41000.00	-7.765152	20	PASS
		NV	50	-41000.00	-7.765152	20	PASS
	5320	NV	-20	-41000.00	-7.706767	20	PASS
		NV	-10	-40000.00	-7.518797	20	PASS
		NV	0	-40000.00	-7.518797	20	PASS
		NV	10	-40000.00	-7.518797	20	PASS
		NV	20	-40000.00	-7.518797	20	PASS
		NV	30	-40000.00	-7.518797	20	PASS
		NV	40	-40000.00	-7.518797	20	PASS
		NV	50	-40000.00	-7.518797	20	PASS
5500	NV	-20	-42000.00	-7.636364	20	PASS	
	NV	-10	-42000.00	-7.636364	20	PASS	
	NV	0	-42000.00	-7.636364	20	PASS	
	NV	10	-42000.00	-7.636364	20	PASS	
	NV	20	-42000.00	-7.636364	20	PASS	
	NV	30	-42000.00	-7.636364	20	PASS	
	NV	40	-42000.00	-7.636364	20	PASS	
	NV	50	-42000.00	-7.636364	20	PASS	
5580	NV	-20	-42000.00	-7.526882	20	PASS	

		NV	-10	-42000.00	-7.526882	20	PASS
		NV	0	-43000.00	-7.706093	20	PASS
		NV	10	-42000.00	-7.526882	20	PASS
		NV	20	-42000.00	-7.526882	20	PASS
		NV	30	-42000.00	-7.526882	20	PASS
		NV	40	-42000.00	-7.526882	20	PASS
		NV	50	-43000.00	-7.706093	20	PASS
	5700	NV	-20	-44000.00	-7.719298	20	PASS
		NV	-10	-44000.00	-7.719298	20	PASS
		NV	0	-44000.00	-7.719298	20	PASS
		NV	10	-44000.00	-7.719298	20	PASS
		NV	20	-44000.00	-7.719298	20	PASS
		NV	30	-44000.00	-7.719298	20	PASS
		NV	40	-44000.00	-7.719298	20	PASS
	5720	NV	50	-44000.00	-7.719298	20	PASS
		NV	-20	-44000.00	-7.692308	20	PASS
		NV	-10	-44000.00	-7.692308	20	PASS
		NV	0	-44000.00	-7.692308	20	PASS
		NV	10	-44000.00	-7.692308	20	PASS
		NV	20	-44000.00	-7.692308	20	PASS
		NV	30	-44000.00	-7.692308	20	PASS
	5745	NV	40	-44000.00	-7.692308	20	PASS
		NV	50	-44000.00	-7.692308	20	PASS
		NV	-20	-45000.00	-7.832898	20	PASS
		NV	-10	-45000.00	-7.832898	20	PASS
		NV	0	-45000.00	-7.832898	20	PASS
		NV	10	-45000.00	-7.832898	20	PASS
		NV	20	-45000.00	-7.832898	20	PASS
	5785	NV	30	-45000.00	-7.832898	20	PASS
		NV	40	-45000.00	-7.832898	20	PASS
		NV	50	-45000.00	-7.832898	20	PASS
		NV	-20	-45000.00	-7.778738	20	PASS
		NV	-10	-45000.00	-7.778738	20	PASS
		NV	0	-45000.00	-7.778738	20	PASS
		NV	10	-45000.00	-7.778738	20	PASS
	5825	NV	20	-45000.00	-7.778738	20	PASS
		NV	30	-45000.00	-7.778738	20	PASS
		NV	40	-45000.00	-7.778738	20	PASS
		NV	50	-45000.00	-7.778738	20	PASS
		NV	-20	-45000.00	-7.725322	20	PASS
		NV	-10	-45000.00	-7.725322	20	PASS
		NV	0	-45000.00	-7.725322	20	PASS
5190	NV	10	-45000.00	-7.725322	20	PASS	
	NV	20	-45000.00	-7.725322	20	PASS	
	NV	30	-45000.00	-7.725322	20	PASS	
	NV	40	-45000.00	-7.725322	20	PASS	
	NV	50	-45000.00	-7.725322	20	PASS	
	NV	-20	-41000.00	-7.899807	20	PASS	
	NV	-10	-41000.00	-7.899807	20	PASS	
5230	NV	0	-41000.00	-7.899807	20	PASS	
	NV	10	-41000.00	-7.899807	20	PASS	
	NV	20	-41000.00	-7.899807	20	PASS	
	NV	30	-41000.00	-7.899807	20	PASS	
	NV	40	-41000.00	-7.899807	20	PASS	
	NV	50	-41000.00	-7.899807	20	PASS	
	NV	-20	-40000.00	-7.648184	20	PASS	
11N40MIMO	NV	-10	-40000.00	-7.648184	20	PASS	
	NV	0	-40000.00	-7.648184	20	PASS	
	NV	10	-40000.00	-7.648184	20	PASS	
	NV	20	-40000.00	-7.648184	20	PASS	

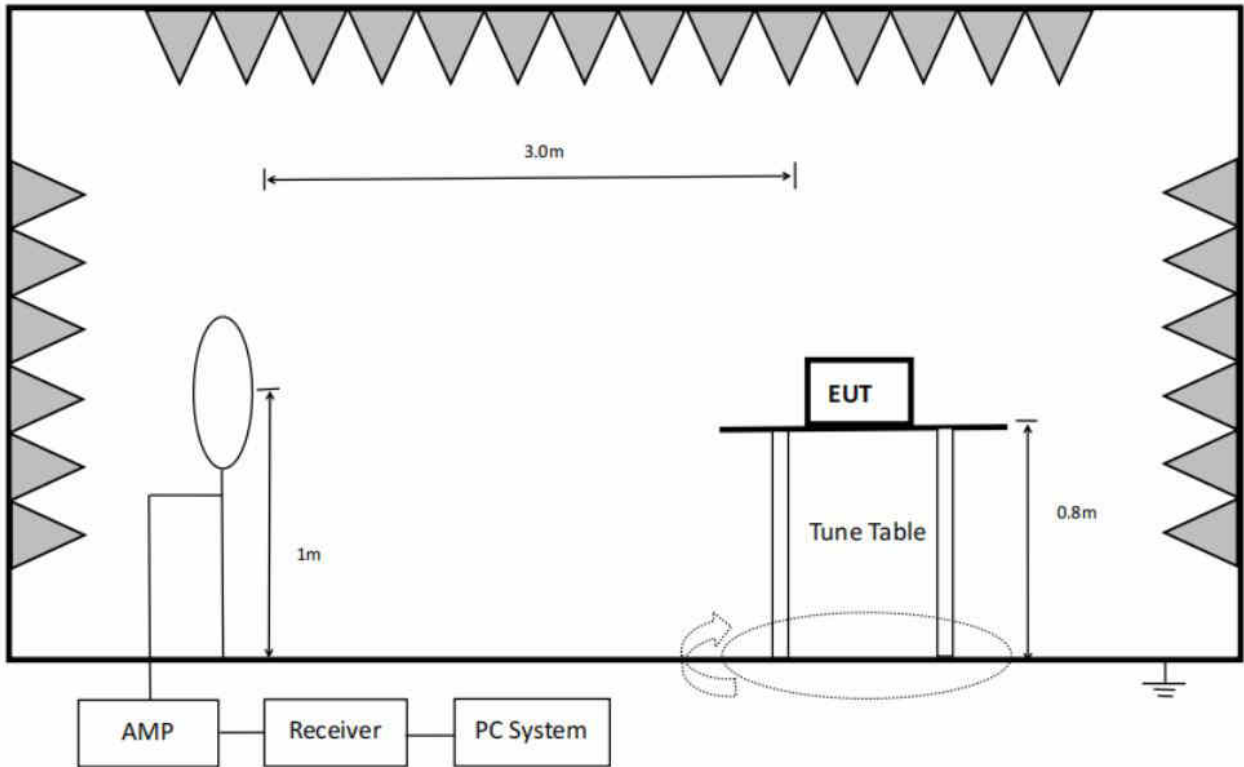
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		NV	40	-40000.00	-7.648184	20	PASS	
		NV	50	-40000.00	-7.648184	20	PASS	
	5270	NV	-20	-40000.00	-7.590133	20	PASS	
		NV	-10	-40000.00	-7.590133	20	PASS	
		NV	0	-40000.00	-7.590133	20	PASS	
		NV	10	-40000.00	-7.590133	20	PASS	
		NV	20	-40000.00	-7.590133	20	PASS	
		NV	30	-40000.00	-7.590133	20	PASS	
		NV	40	-40000.00	-7.590133	20	PASS	
		NV	50	-40000.00	-7.590133	20	PASS	
		5310	NV	-20	-40000.00	-7.532957	20	PASS
			NV	-10	-40000.00	-7.532957	20	PASS
	NV		0	-40000.00	-7.532957	20	PASS	
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	NV		30	-40000.00	-7.532957	20	PASS	
	NV		40	-40000.00	-7.532957	20	PASS	
	5510	NV	-20	-42000.00	-7.622505	20	PASS	
		NV	-10	-42000.00	-7.622505	20	PASS	
		NV	0	-42000.00	-7.622505	20	PASS	
		NV	10	-42000.00	-7.622505	20	PASS	
		NV	20	-42000.00	-7.622505	20	PASS	
		NV	30	-42000.00	-7.622505	20	PASS	
		NV	40	-42000.00	-7.622505	20	PASS	
	5550	NV	-20	-42000.00	-7.567568	20	PASS	
		NV	-10	-42000.00	-7.567568	20	PASS	
		NV	0	-42000.00	-7.567568	20	PASS	
		NV	10	-42000.00	-7.567568	20	PASS	
		NV	20	-42000.00	-7.567568	20	PASS	
		NV	30	-42000.00	-7.567568	20	PASS	
		NV	40	-42000.00	-7.567568	20	PASS	
	5670	NV	-20	-43000.00	-7.583774	20	PASS	
		NV	-10	-43000.00	-7.583774	20	PASS	
		NV	0	-43000.00	-7.583774	20	PASS	
		NV	10	-43000.00	-7.583774	20	PASS	
		NV	20	-43000.00	-7.583774	20	PASS	
		NV	30	-43000.00	-7.583774	20	PASS	
		NV	40	-43000.00	-7.583774	20	PASS	
	5710	NV	-20	-44000.00	-7.705779	20	PASS	
		NV	-10	-44000.00	-7.705779	20	PASS	
		NV	0	-44000.00	-7.705779	20	PASS	
		NV	10	-44000.00	-7.705779	20	PASS	
		NV	20	-44000.00	-7.705779	20	PASS	
		NV	30	-44000.00	-7.705779	20	PASS	
		NV	40	-44000.00	-7.705779	20	PASS	
	5755	NV	-20	-45000.00	-7.819288	20	PASS	
		NV	-10	-45000.00	-7.819288	20	PASS	
		NV	0	-45000.00	-7.819288	20	PASS	
		NV	10	-45000.00	-7.819288	20	PASS	
		NV	20	-45000.00	-7.819288	20	PASS	
		NV	30	-45000.00	-7.819288	20	PASS	
		NV	40	-45000.00	-7.819288	20	PASS	
	5795	NV	-20	-45000.00	-7.765315	20	PASS	

		NV	-10	-45000.00	-7.765315	20	PASS
		NV	0	-45000.00	-7.765315	20	PASS
		NV	10	-45000.00	-7.765315	20	PASS
		NV	20	-45000.00	-7.765315	20	PASS
		NV	30	-45000.00	-7.765315	20	PASS
		NV	40	-45000.00	-7.765315	20	PASS
		NV	50	-45000.00	-7.765315	20	PASS
11AC80MIMO	5210	NV	-20	-41000.00	-7.869482	20	PASS
		NV	-10	-41000.00	-7.869482	20	PASS
		NV	0	-41000.00	-7.869482	20	PASS
		NV	10	-41000.00	-7.869482	20	PASS
		NV	20	-41000.00	-7.869482	20	PASS
		NV	30	-41000.00	-7.869482	20	PASS
		NV	40	-41000.00	-7.869482	20	PASS
	5290	NV	50	-41000.00	-7.869482	20	PASS
		NV	-20	-41000.00	-7.750473	20	PASS
		NV	-10	-41000.00	-7.750473	20	PASS
		NV	0	-41000.00	-7.750473	20	PASS
		NV	10	-41000.00	-7.750473	20	PASS
		NV	20	-41000.00	-7.750473	20	PASS
		NV	30	-41000.00	-7.750473	20	PASS
	5530	NV	40	-41000.00	-7.750473	20	PASS
		NV	50	-41000.00	-7.750473	20	PASS
		NV	-20	-43000.00	-7.775769	20	PASS
		NV	-10	-43000.00	-7.775769	20	PASS
		NV	0	-43000.00	-7.775769	20	PASS
		NV	10	-43000.00	-7.775769	20	PASS
		NV	20	-42000.00	-7.594937	20	PASS
	5610	NV	30	-43000.00	-7.775769	20	PASS
		NV	40	-43000.00	-7.775769	20	PASS
		NV	50	-43000.00	-7.775769	20	PASS
		NV	-20	-43000.00	-7.664884	20	PASS
		NV	-10	-43000.00	-7.664884	20	PASS
		NV	0	-43000.00	-7.664884	20	PASS
		NV	10	-43000.00	-7.664884	20	PASS
	5690	NV	20	-43000.00	-7.664884	20	PASS
		NV	30	-43000.00	-7.664884	20	PASS
		NV	40	-43000.00	-7.664884	20	PASS
		NV	50	-43000.00	-7.664884	20	PASS
		NV	-20	-44000.00	-7.732865	20	PASS
		NV	-10	-44000.00	-7.732865	20	PASS
		NV	0	-44000.00	-7.732865	20	PASS
	5775	NV	10	-44000.00	-7.732865	20	PASS
		NV	20	-44000.00	-7.732865	20	PASS
		NV	30	-44000.00	-7.732865	20	PASS
		NV	40	-44000.00	-7.732865	20	PASS
		NV	50	-44000.00	-7.732865	20	PASS
		NV	-20	-45000.00	-7.792208	20	PASS
		NV	-10	-45000.00	-7.792208	20	PASS
		NV	0	-45000.00	-7.792208	20	PASS
		NV	10	-45000.00	-7.792208	20	PASS
		NV	20	-45000.00	-7.792208	20	PASS
		NV	30	-45000.00	-7.792208	20	PASS
		NV	40	-45000.00	-7.792208	20	PASS
		NV	50	-45000.00	-7.792208	20	PASS

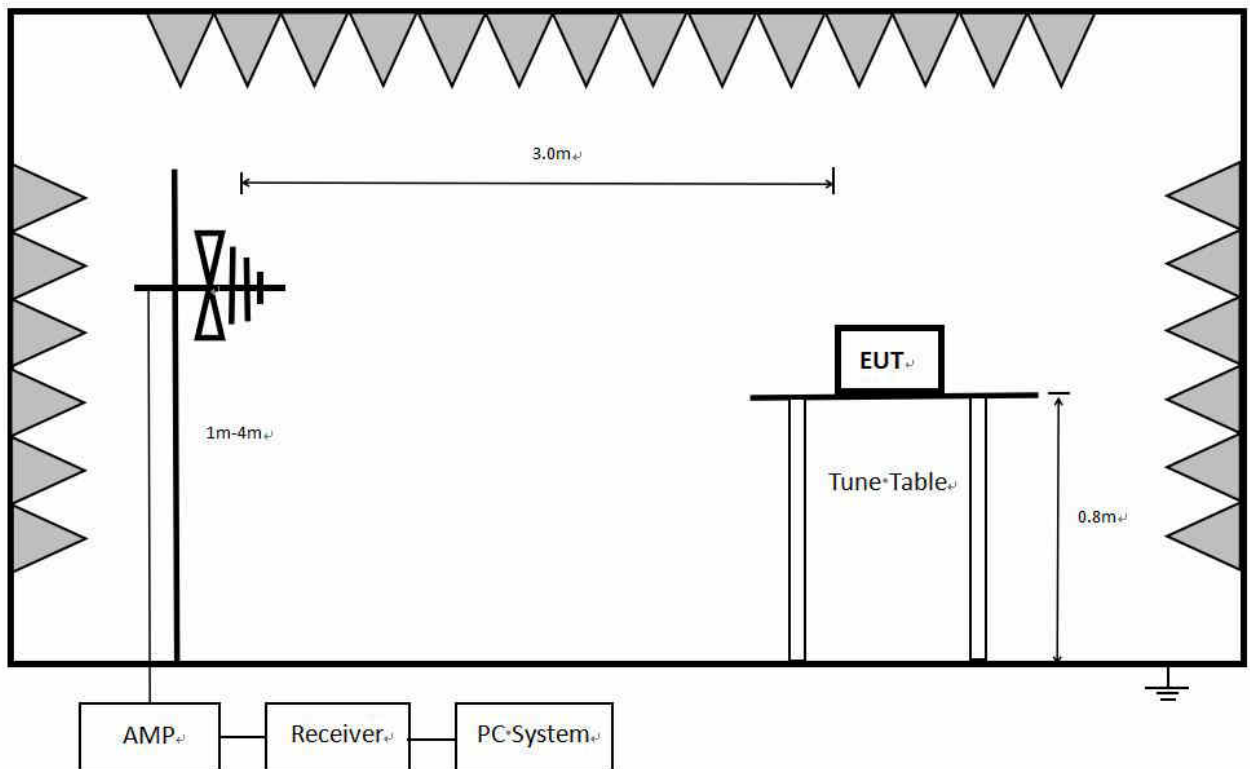
### 13. Radiated Emission

#### 13.1. Block Diagram of Test Setup

In 3 m Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:

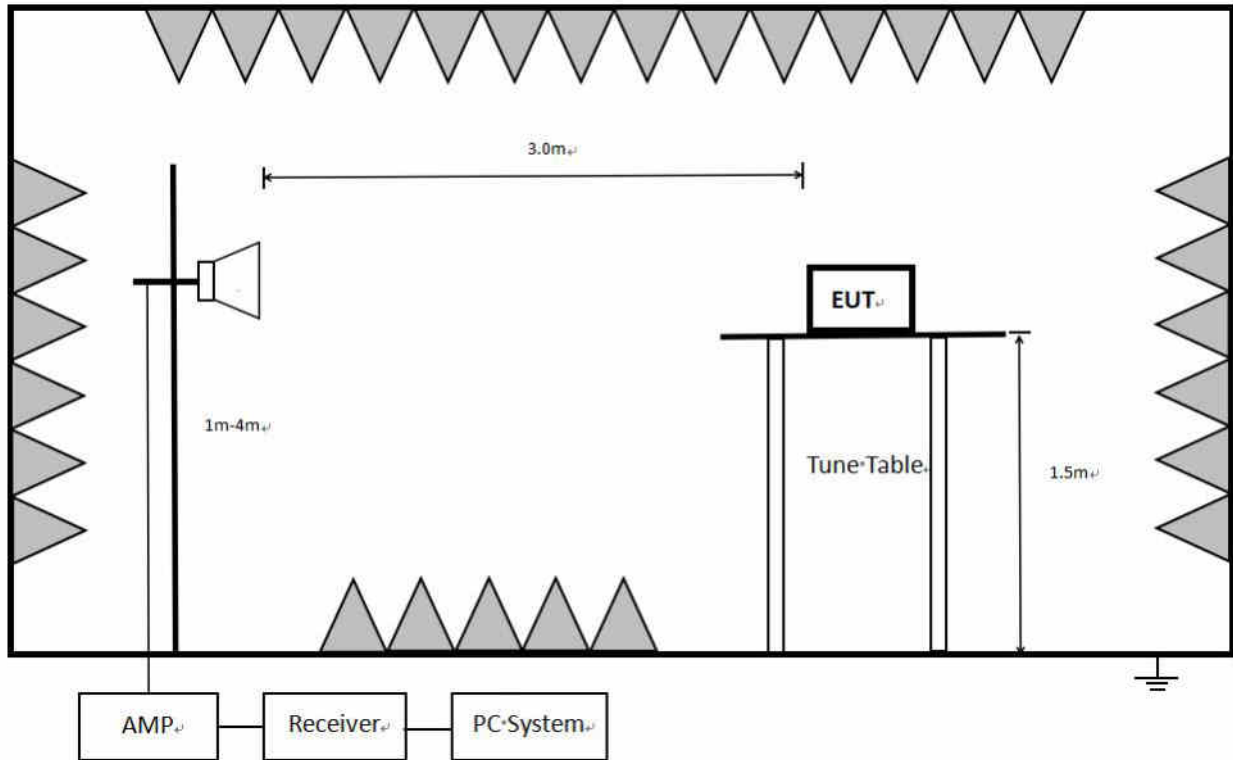


In 3 m Anechoic Chamber, test setup diagram for 30 MHz - 1 GHz:





In 3 m Anechoic Chamber, test setup diagram for frequency above 1 GHz:



Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

### 13.2. Limit

(1) FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
<sup>1</sup> 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.1772&4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.2072&4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	( <sup>2</sup> )
13.36-13.41			

<sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup>Above 38.6

## (2) FCC 15.209 Limit.

Frequency MHz	Distance Meters	Field strengths limit	
		$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009 ~ 0.490	300	$2400/F(\text{kHz})$	$67.6-20\log(F)$
0.490 ~ 1.705	30	$24000/F(\text{kHz})$	$87.6-20\log(F)$
1.705 ~ 30.0	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm / MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm / MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm / MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of  $-17$  dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of  $-27$  dBm / MHz.

(5) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(6) The provisions of §15.205 apply to intentional radiators operating under this section.

$$-27 \text{ dBm/MHz Limit} = 95.2 + \text{EIRP (dBm)} = 95.2 - 27 = 68.2 \text{ dB}\mu\text{V}/\text{m}$$

Note:

(1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3\text{m}}(\text{dB}\mu\text{V}/\text{m}) = \text{Limit}_{30\text{m}}(\text{dB}\mu\text{V}/\text{m}) + 40\text{Log}(30\text{m}/3\text{m})$$

(3) Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions or comply with 15.209 limits.

### 13.3. Test Procedure

Below 30 MHz:

The setting of the spectrum Analyzer

RBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
VBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
Sweep	Auto
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013
2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of 1 meter height antenna tower.
5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
6. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field site. Therefore, sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KdB 414788.

Below 1 GHz and above 30 MHz:

The setting of the spectrum Analyzer

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80 cm above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Above 1 GHz:

RBW	1 MHz
VBW	PEAK: 3 MHz AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 1.5m above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.

6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for AVG measurements. For the Duty Cycle please refer to clause 8.1.ON TIME AND DUTY CYCLE.

7. Restriction band: Investigated frequency range from 5.15-5.25 GHz, 5250-5350 GHz, 5470-5725 GHz, 5.725-5.85 GHz.

All restriction band should comply with 15.209, other emission should be at least 20 dB below the fundamental.

Note 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

Note 2: The EUT does not support simultaneous transmission.

Note 3: The EUT was fully exercised with external accessories during the test. In the case of multiple accessory external ports, an external accessory shall be connected to one of each type of port.

### 13.4. Test Result

PASS. (See below detailed test result)

All the emissions except fundamental emission from 9kHz to 40GHz were comply with 15.209 limit.

Note1: According exploratory test, the emission levels are 20 dB below the limit detected from 9 kHz to 30 MHz and 18 GHz to 40 GHz, so the final test was performed with frequency range from 30 MHz to 18 GHz and recorded in below.

Note2: For emissions below 1 GHz, according exploratory explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions below 1 GHz, the final test was only performed with EUT working in 11a mode.

Note3: For below test data, when the limit tabular marked “/” means this frequency point is the fundamental emission and no need comply with this limit.

Note 4: As specified in 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in 15.407(b)(4)). However, an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit

Note 5: For emissions Above 1 GHz, all mode have been tested, 11a is worse case and recorded in report.

### 13.5. Original Test Data

Below 1 GHz and above 30 MHz test data Refer to appendix A

Above 1 GHz test data Refer to appendix B



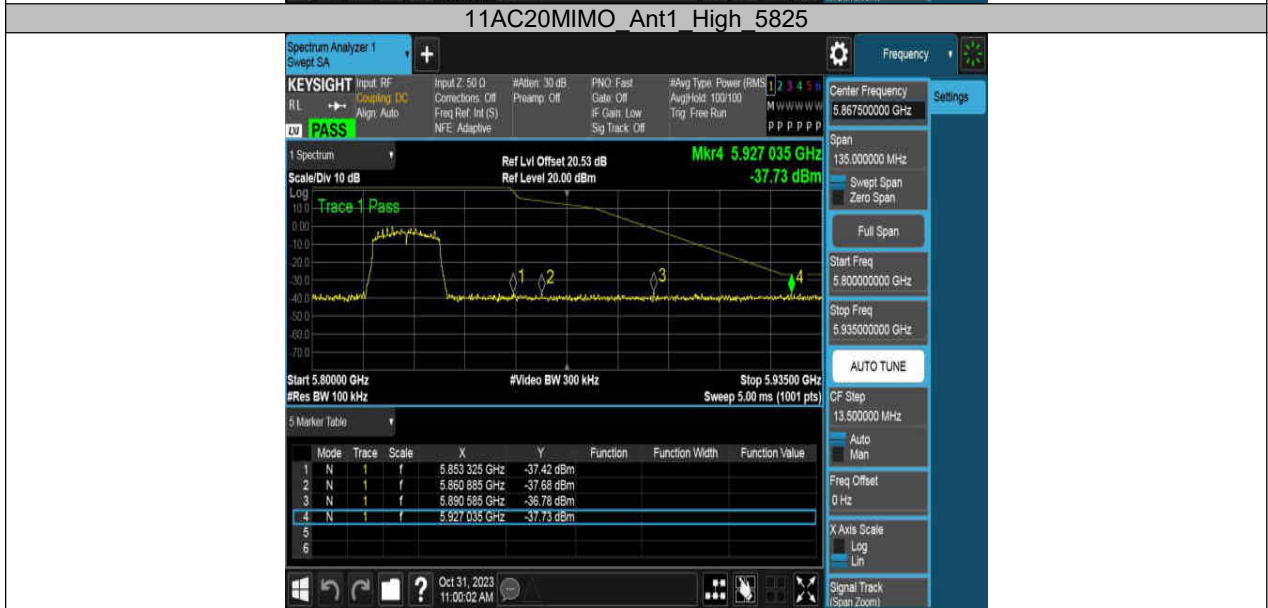












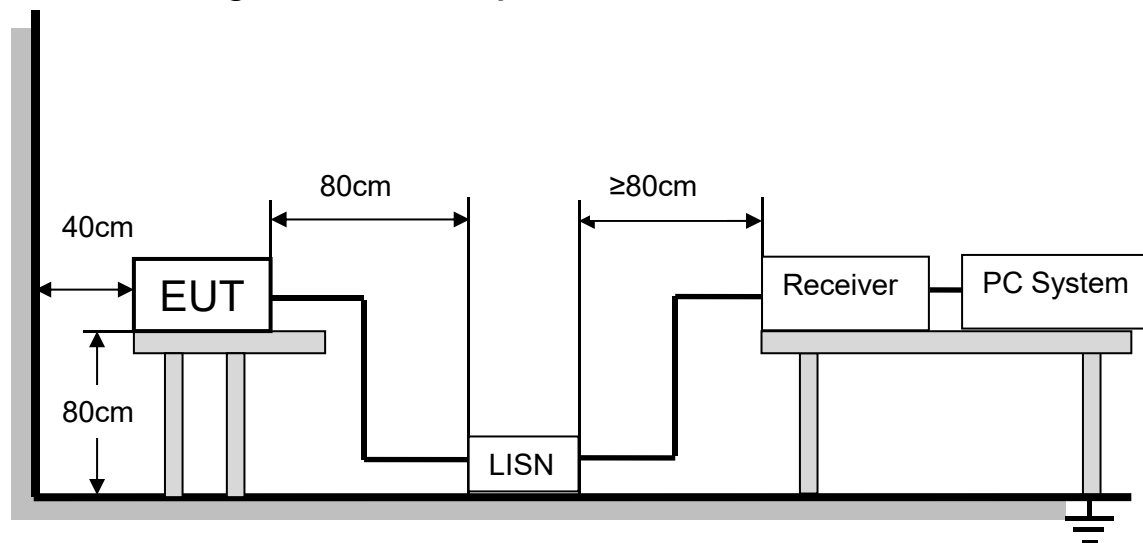






## 14. AC Power Line Conducted Emissions

### 14.1. Block Diagram of Test Setup



The EUT is put on a table of non-conducting material that is 80 cm high. The vertical conducting wall of shielding is located 40 cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through an Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

### 14.2. Limits

Please refer to CFR 47 FCC §15.207 (a) and ISED RSS-Gen Clause 8.8.

Frequency (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note 1: \* Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

### 14.3. Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 kHz.

#### **14.4. Test Result**

According to 15.207, power Line Conducted Emission is not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

## 15. Dynamic Frequency Selection

### 15.1. Applicability of DFS Requirements

A U-NII network will employ a DFS function to detect signals from radar systems and to avoid co-channel operation with these systems. This applies to the 5250-5350 MHz and/or 5470-5725 MHz bands.

Within the context of the operation of the DFS function, a U-NII device will operate in either Master Mode or Client Mode. U-NII devices operating in Client Mode can only operate in a network controlled by a U-NII device operating in Master Mode.

**Table 1: Applicability of DFS Requirements Prior to Use of a Channel**

Requirement	Operational Mode		
	<input type="checkbox"/> Master	<input checked="" type="checkbox"/> Client Without Radar Detection	<input type="checkbox"/> Client with Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

**Table 2: Applicability of DFS requirements during normal operation**

Requirement	Operational Mode	
	<input type="checkbox"/> Master Device or Client with Radar Detection	<input checked="" type="checkbox"/> Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	<input type="checkbox"/> Master Device or Client with Radar Detection	<input checked="" type="checkbox"/> Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required

Note: Frequencies selected for statistical performance check should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.



## 15.2. Limit

### (1) DFS Detection Thresholds

**Table 3: DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection**

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP $\geq$ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.  
 Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.  
 Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KdB Publication 662911 D01.

### (2) DFS Response Requirements

**Table 4: DFS Response Requirement Values**

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.  
 Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required facilitating a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.  
 Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

## 15.3. Parameters of Radar Test Waveform

This section provides the parameters for required test waveforms, minimum percentage of successful detection, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the

number of pulses will be utilized for the random determination of specific test waveforms.

Table 5 Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A	Roundup $\left\{ \frac{1}{360} \right\}$	60%	30
		Test B			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
<p>Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.</p> <p>Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a</p> <p>Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A</p>					

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B. Test aggregate is average of the percentage of successful detections of short pulse radar types 1-4

#### 15.4. Calibration of Radar Waveform

Radar Waveform Calibration Procedure:

A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master

The interference Radar Detection Threshold Level is  $-62\text{dBm} + 0\text{dBi} + 1\text{dB} = -61\text{dBm}$  that had been taken into account the output power range and antenna gain.

The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz. The spectrum analyzer had offset  $-1.0\text{dB}$  to compensate RF cable loss  $1.0\text{dB}$ .

The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was  $-62\text{dBm} + 0\text{dBi} + 1\text{dB} = -61\text{dBm}$ . Capture the spectrum analyzer plots on short pulse radar waveform.