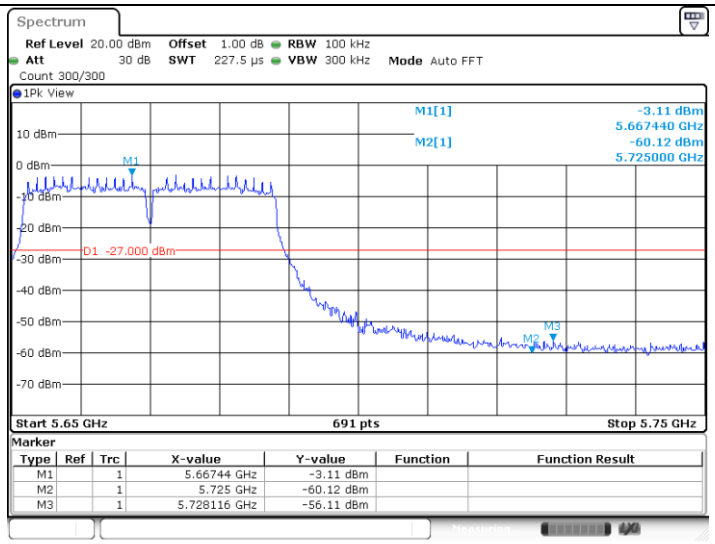

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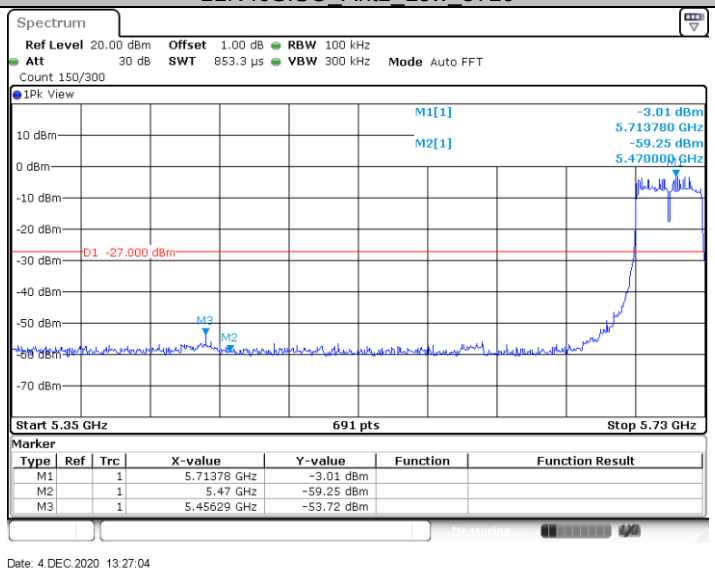

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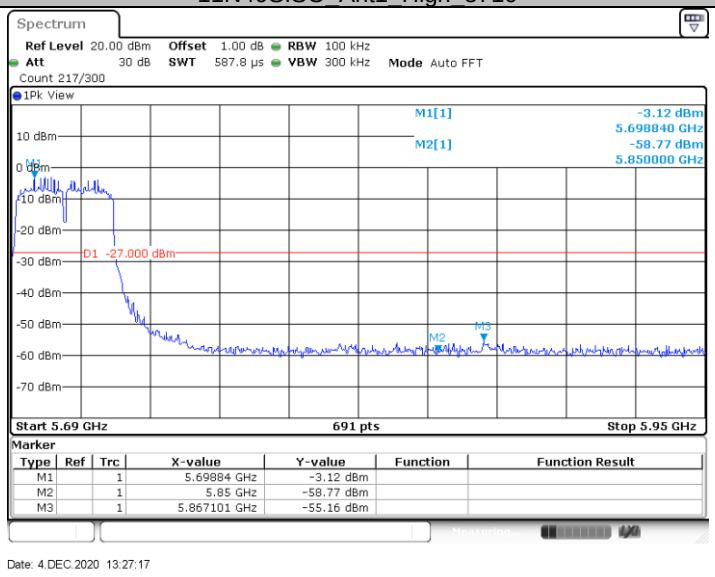

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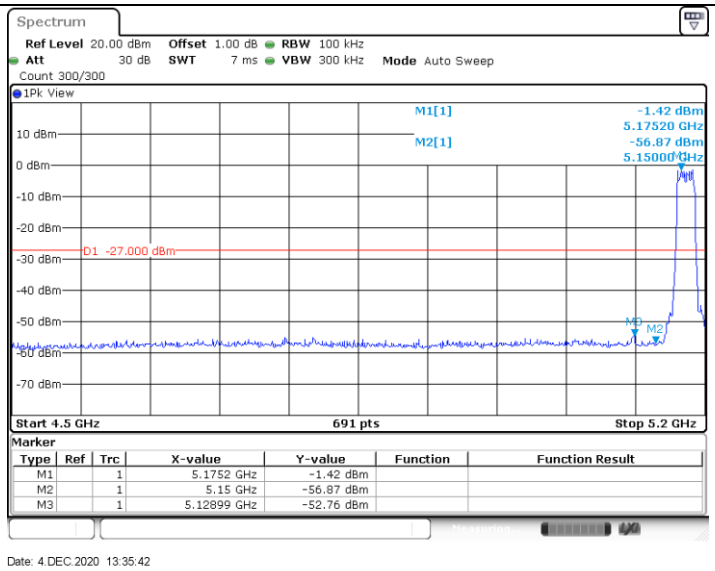
Nanshan District, Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax:
+86 755 8828 5299



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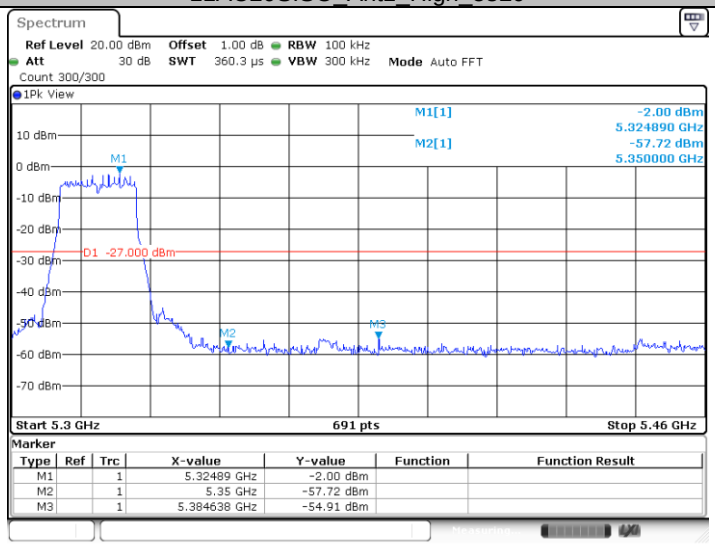

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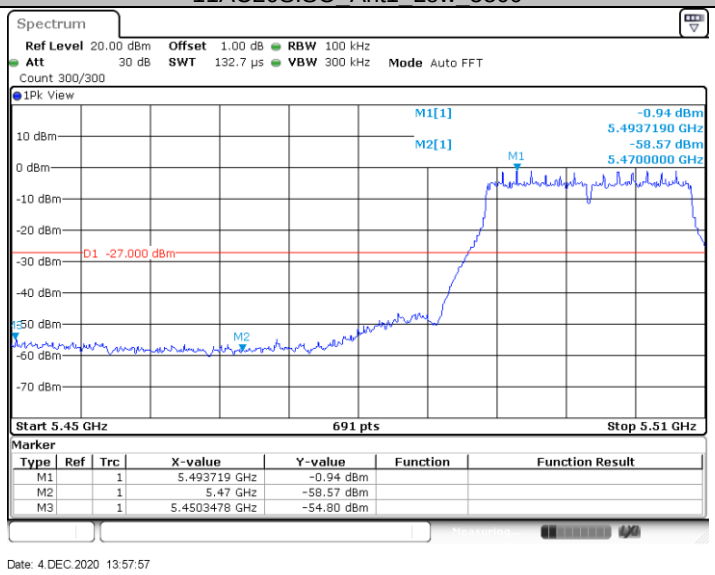

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Nanshan District, Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax:
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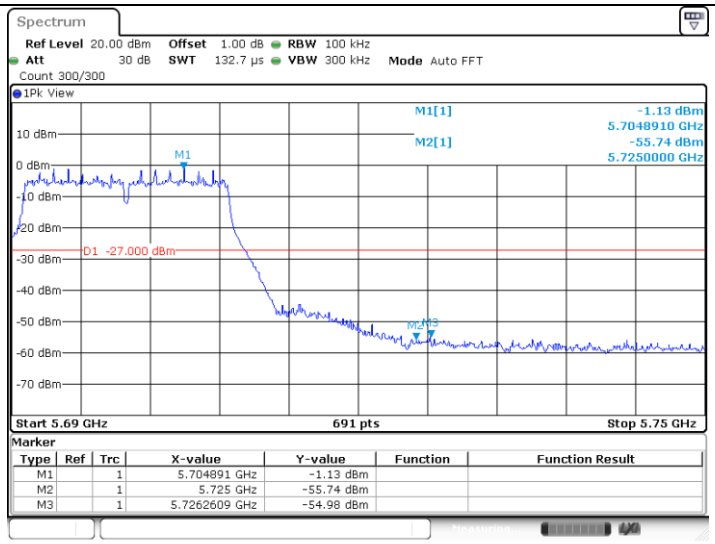

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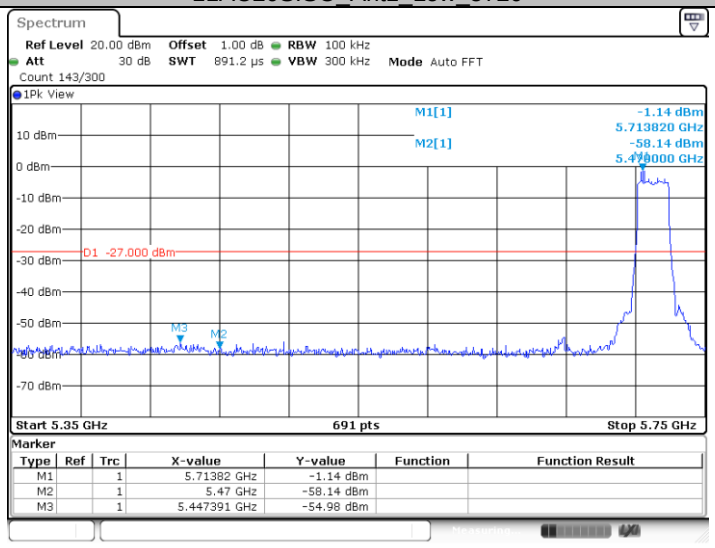

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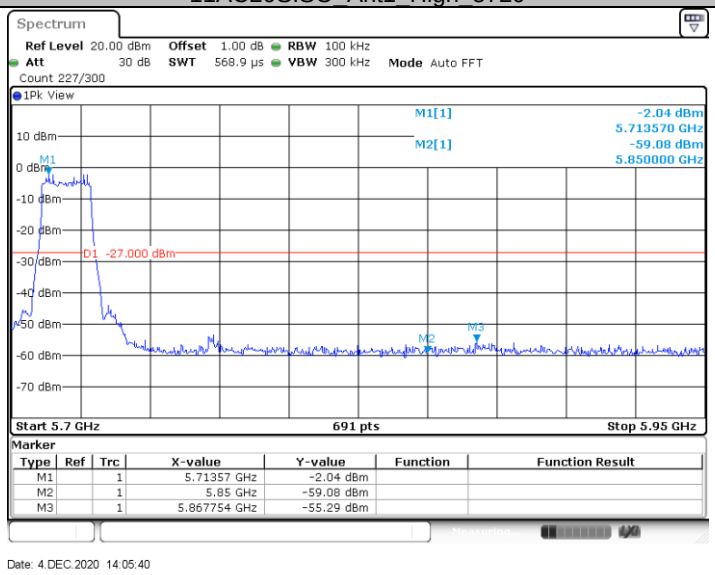

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TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
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Nanshan District, Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax:
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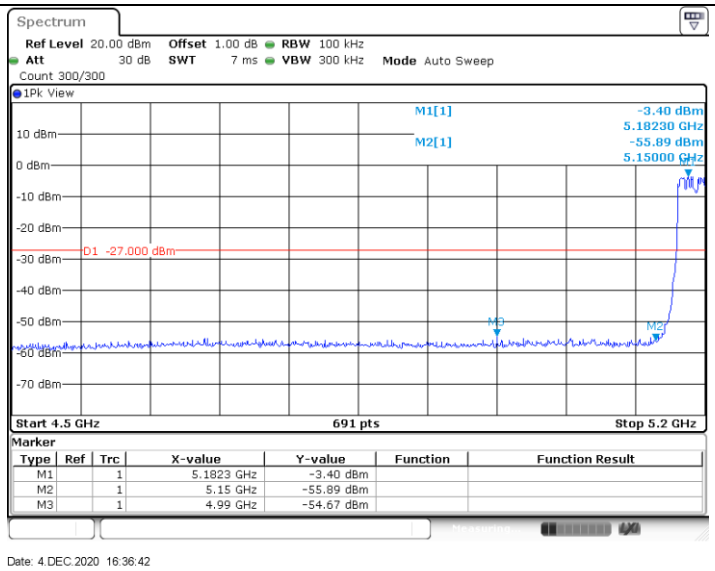

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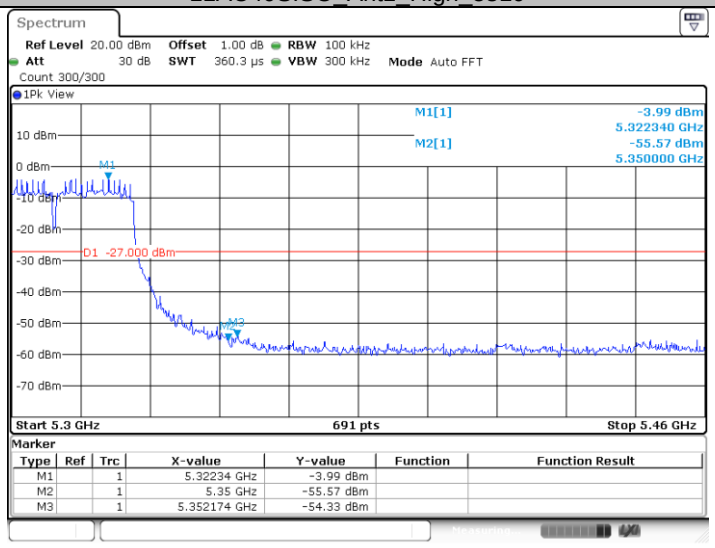

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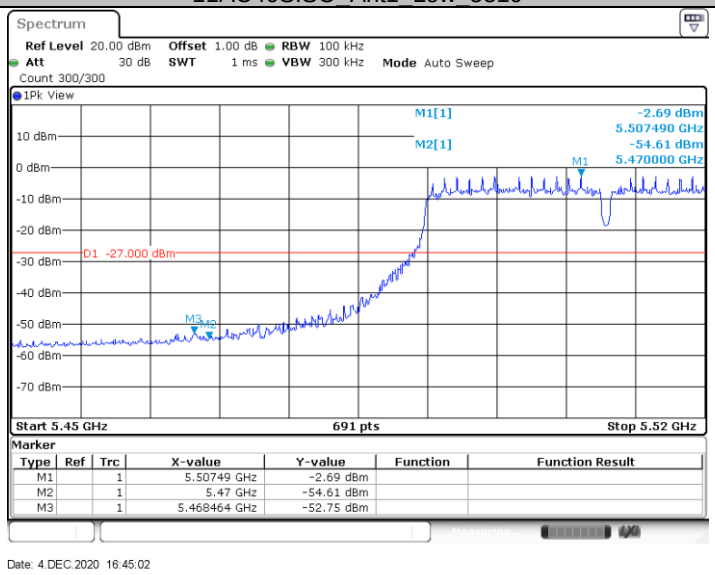

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Nanshan District, Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax:
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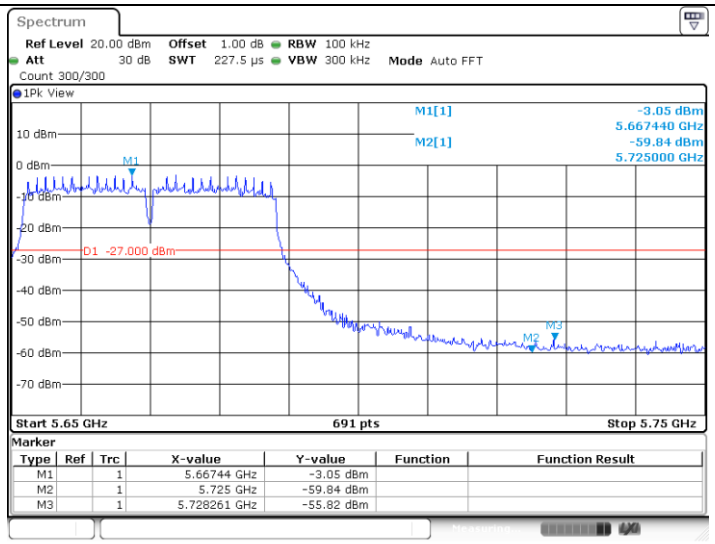

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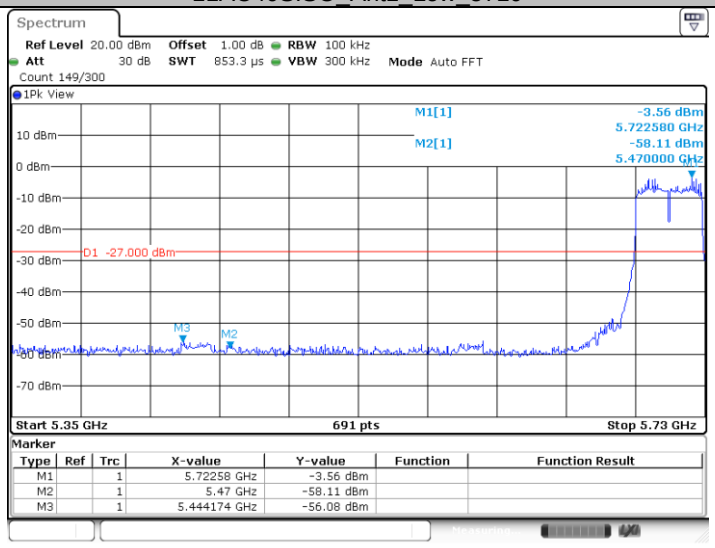

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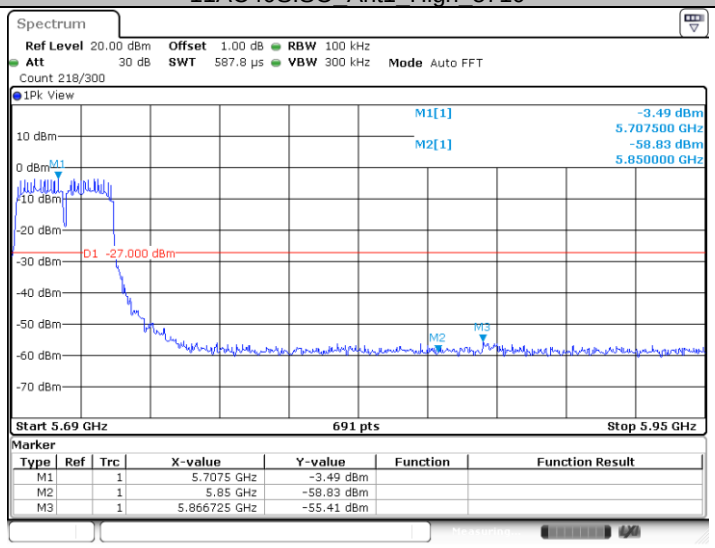

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Nanshan District, Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax:
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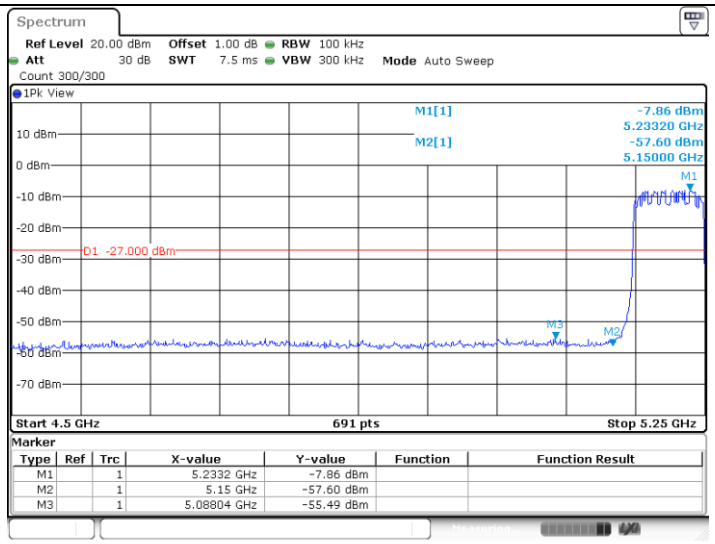

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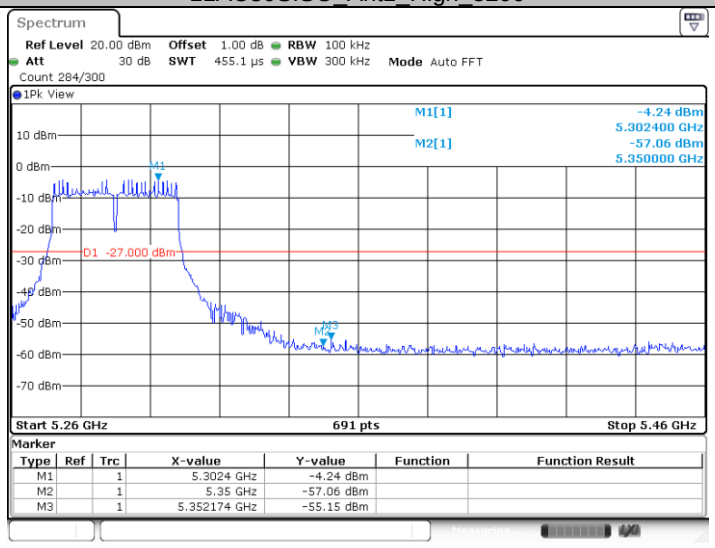

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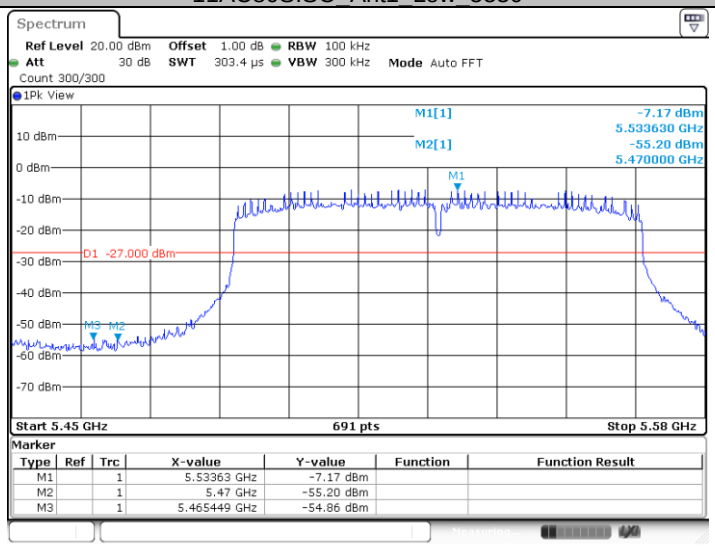

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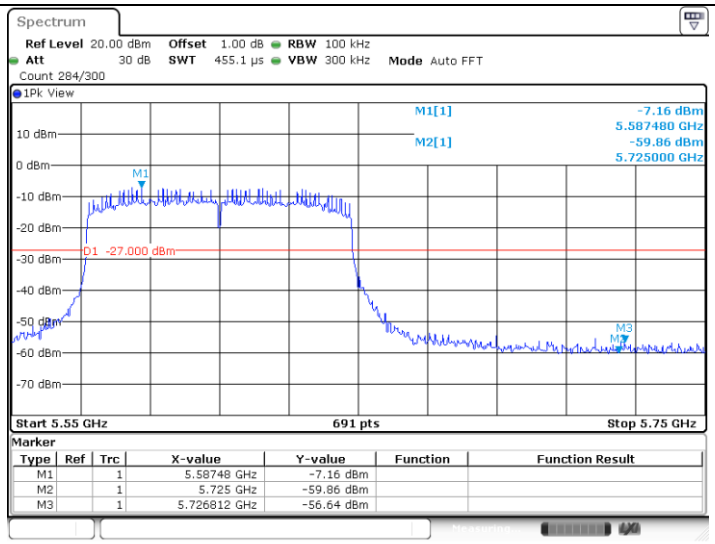

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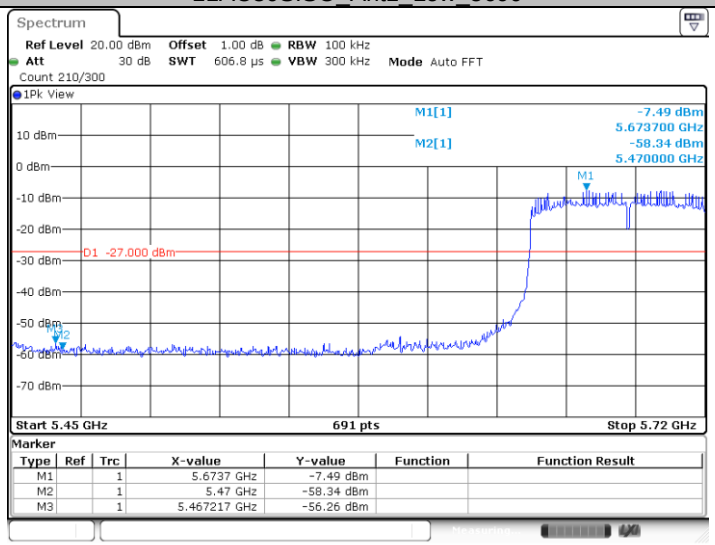

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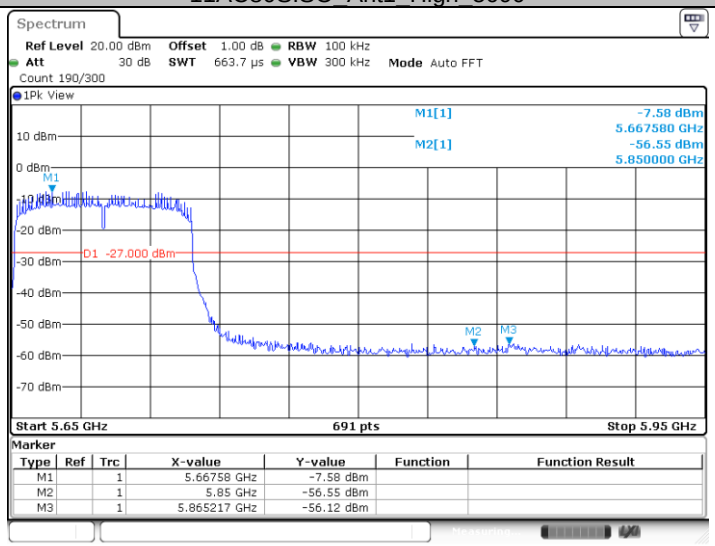

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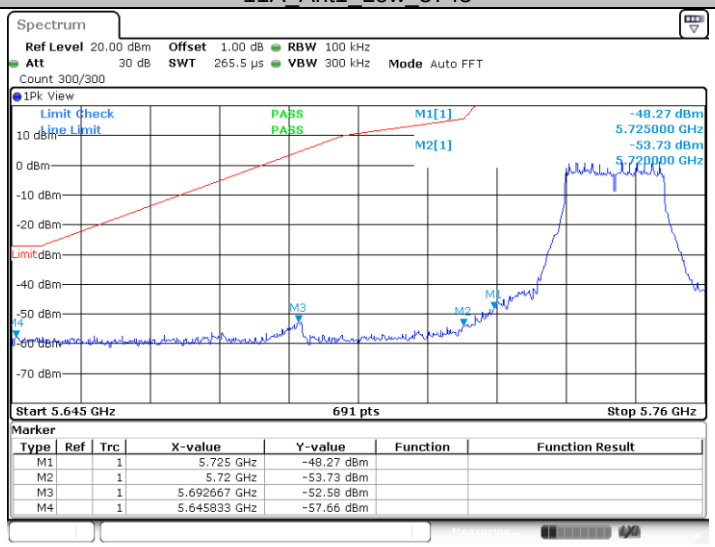
11A_Ant1_Low_5745



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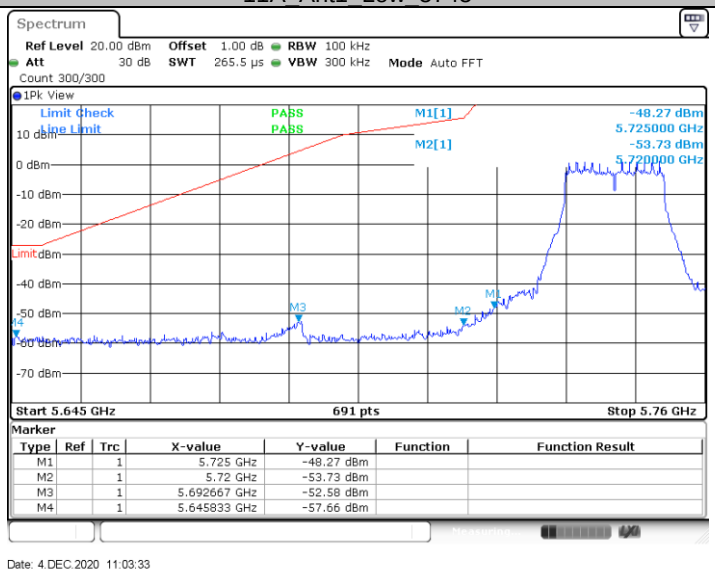

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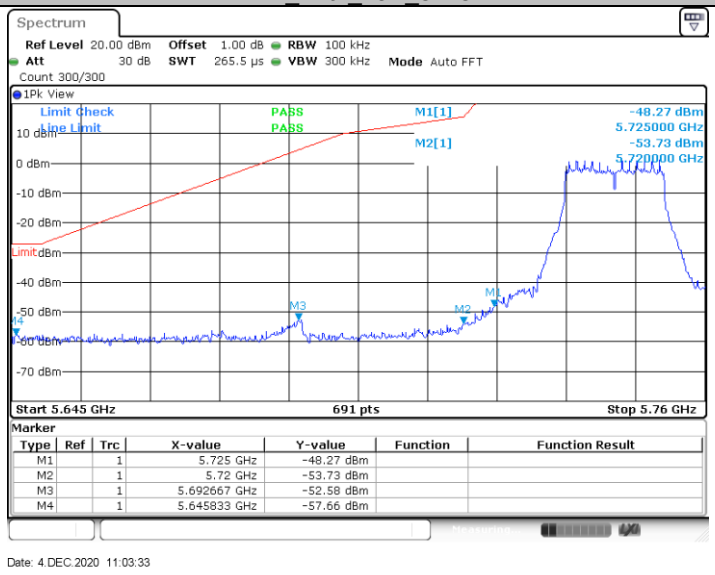

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+86 755 8828 5299

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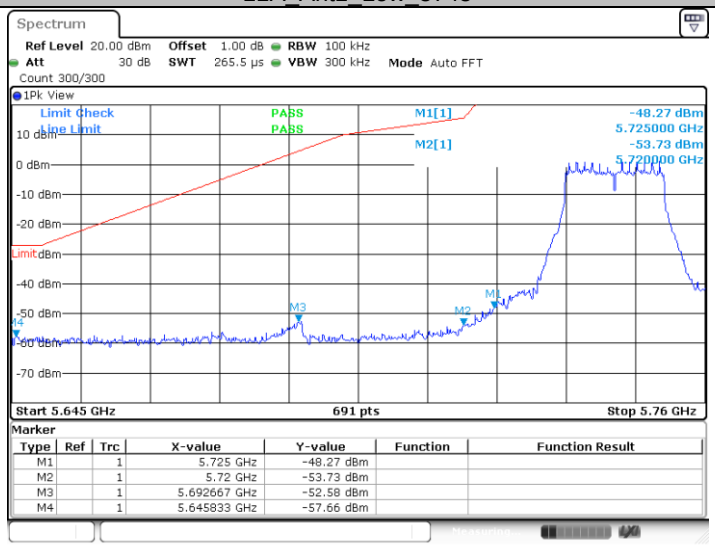

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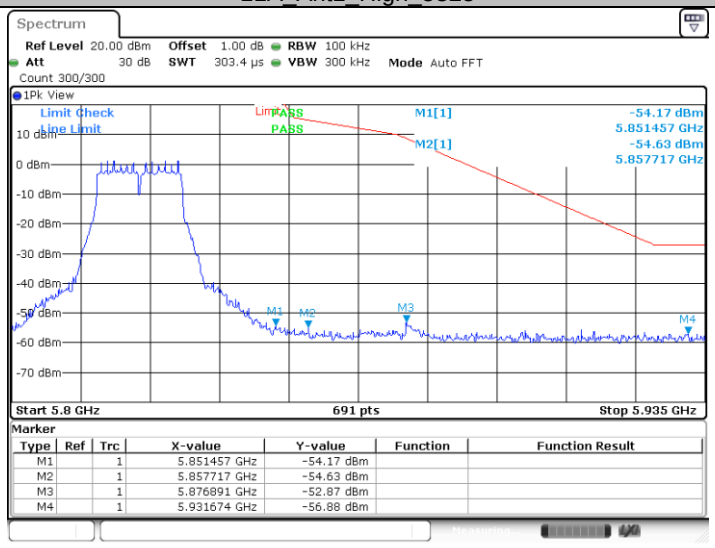

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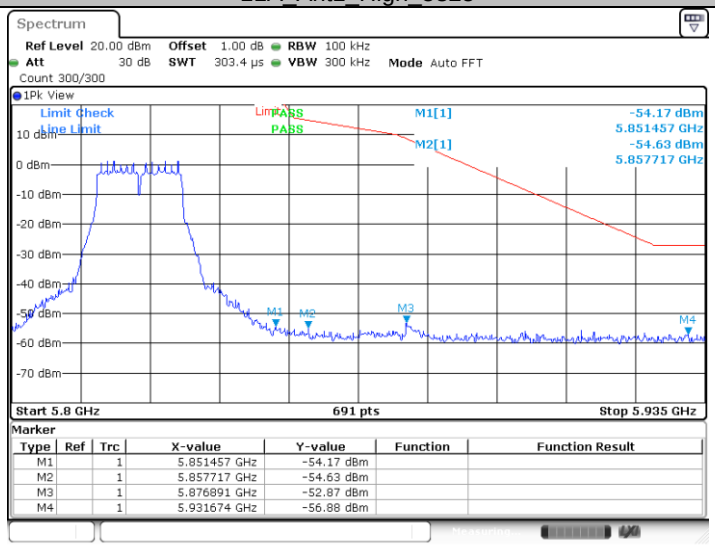

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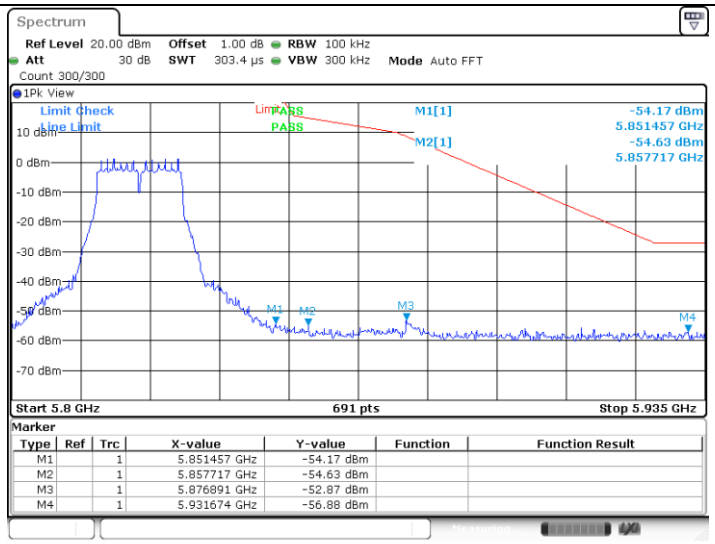

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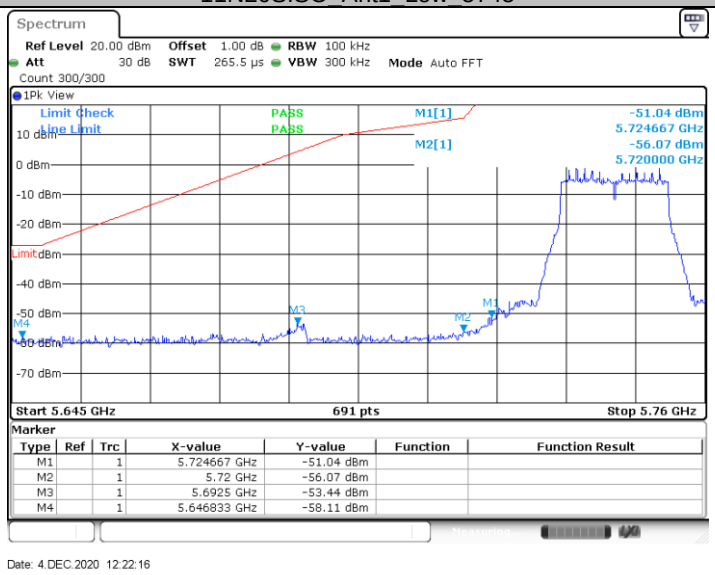

11N20SISO_Ant1_Low_5745

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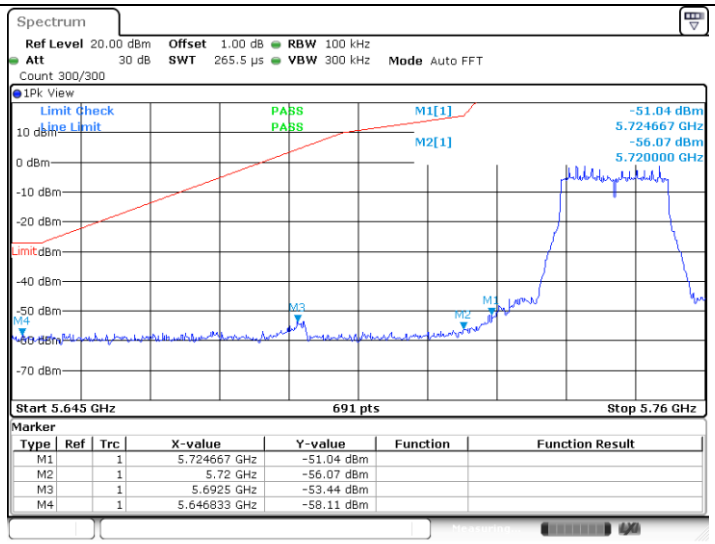

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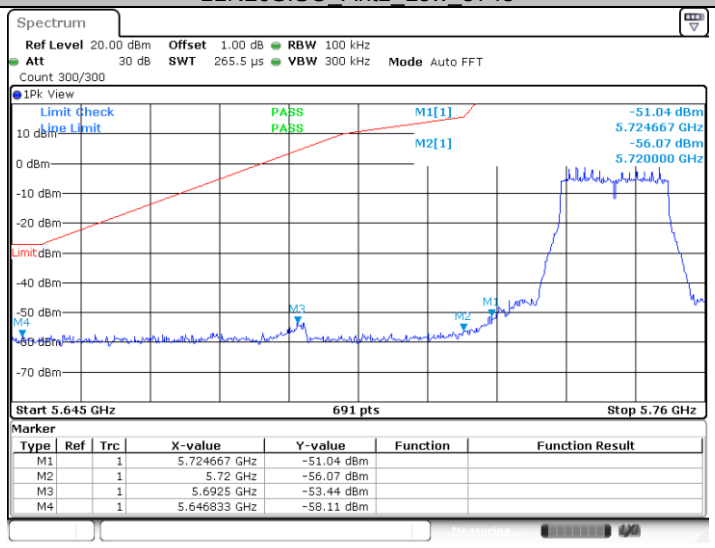

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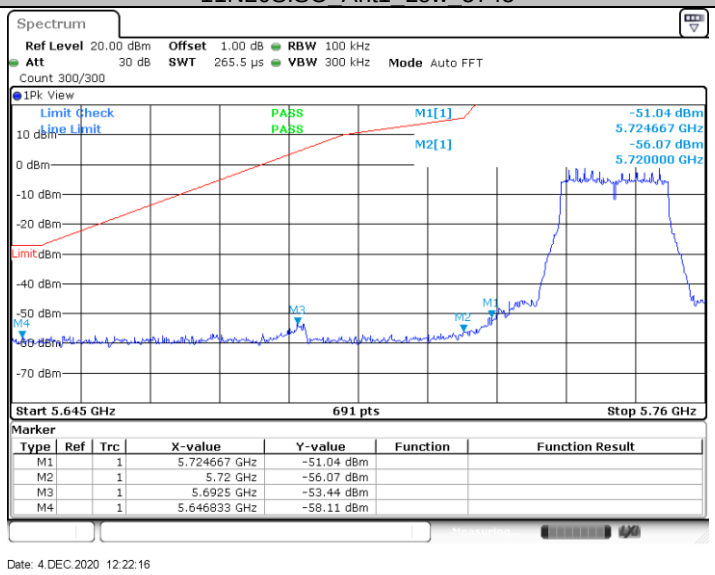

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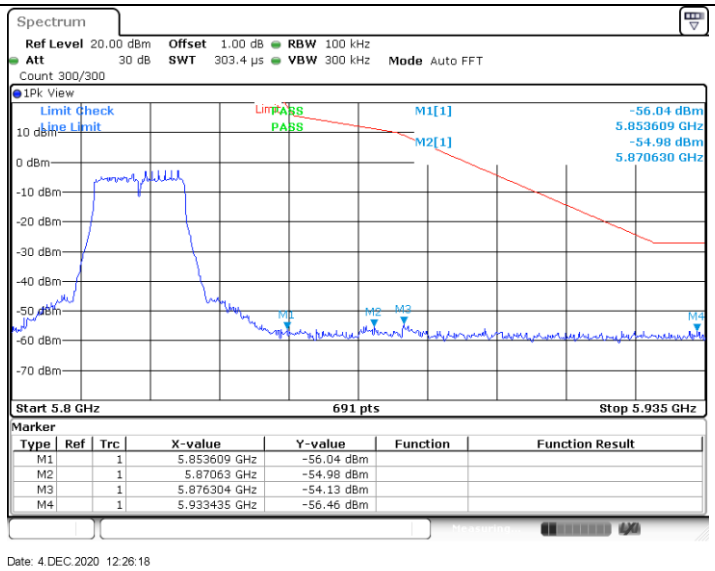

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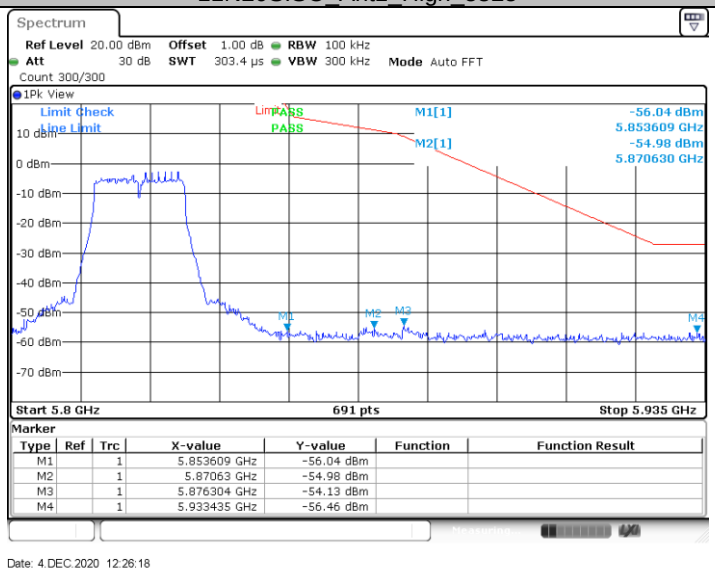

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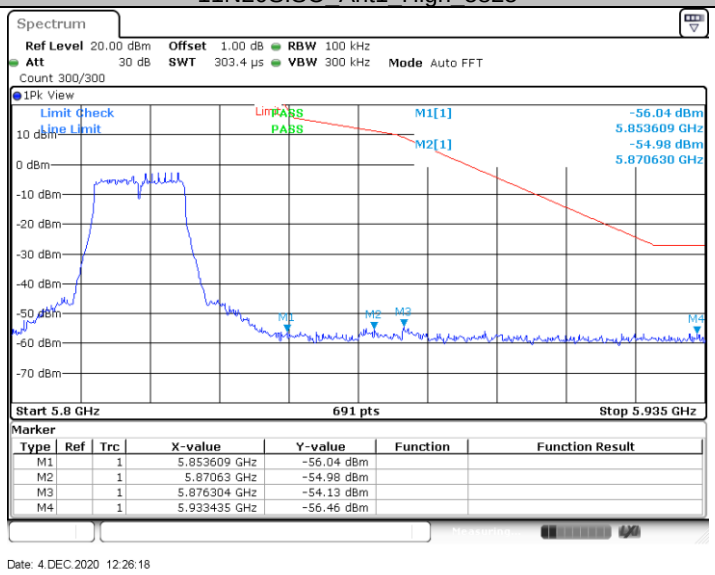

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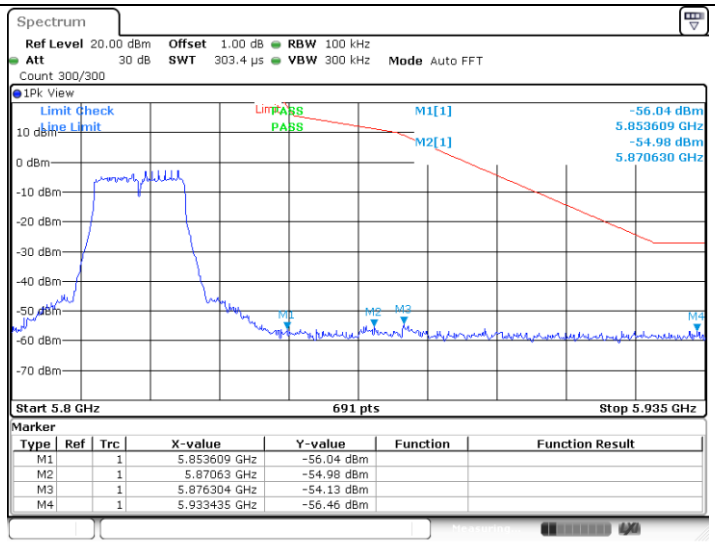

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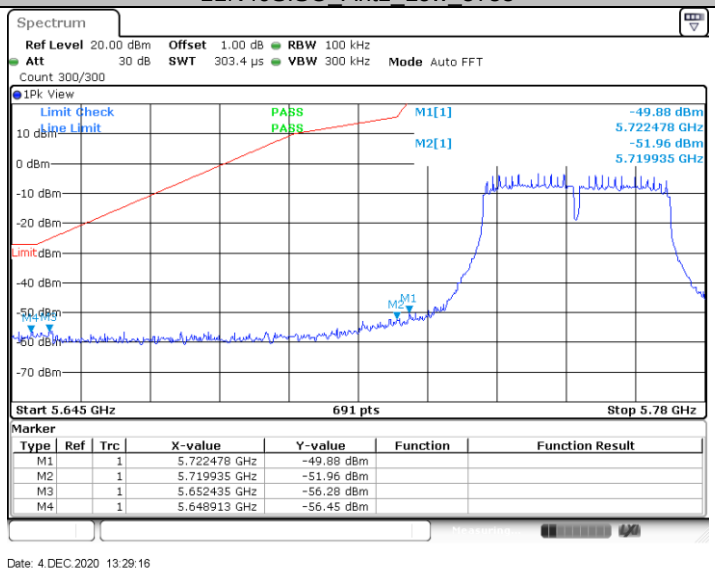

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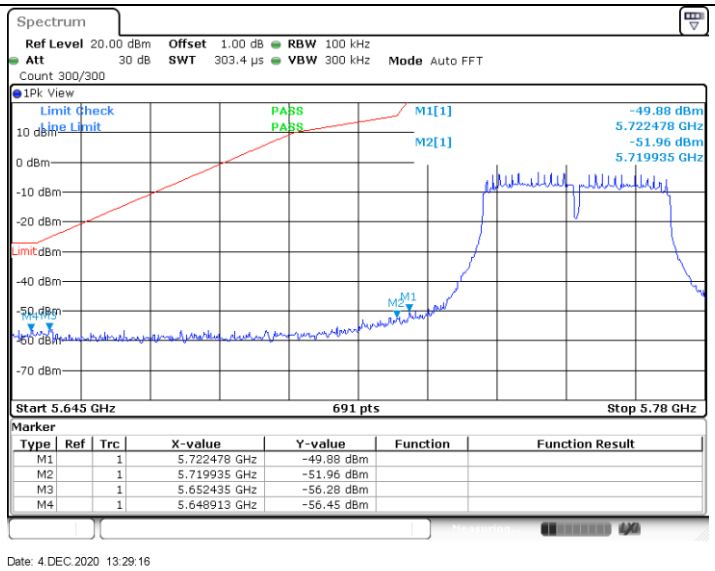

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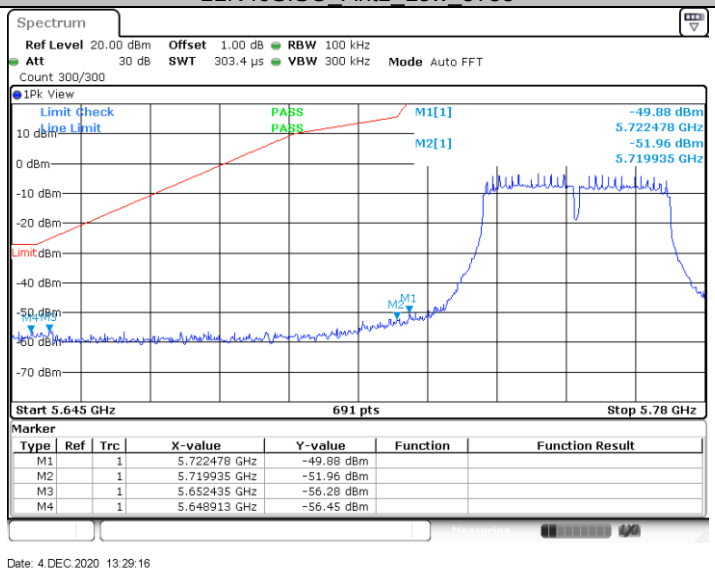

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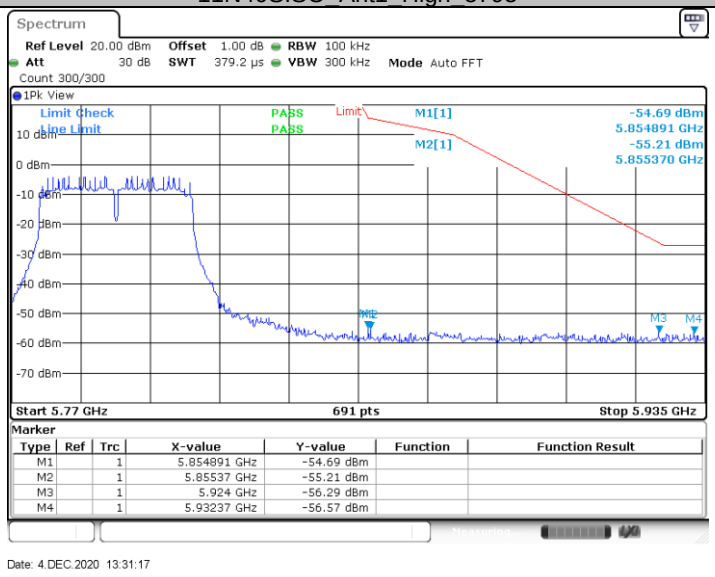

11N40SISO_Ant1_High_5795

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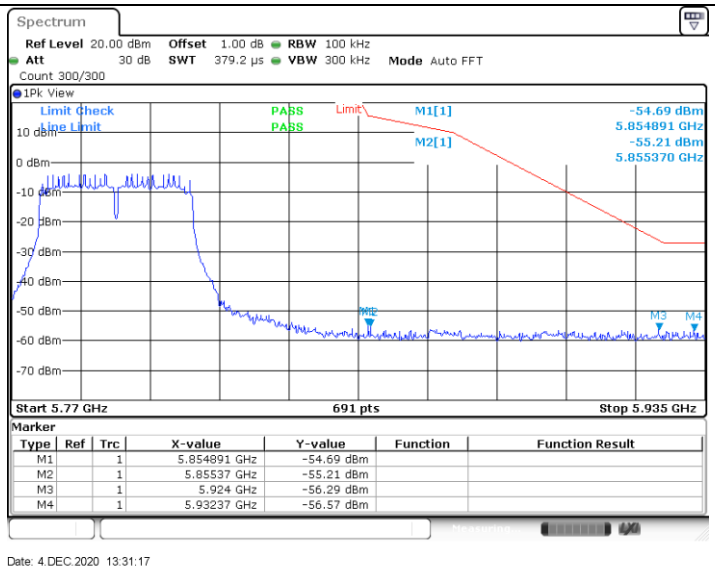

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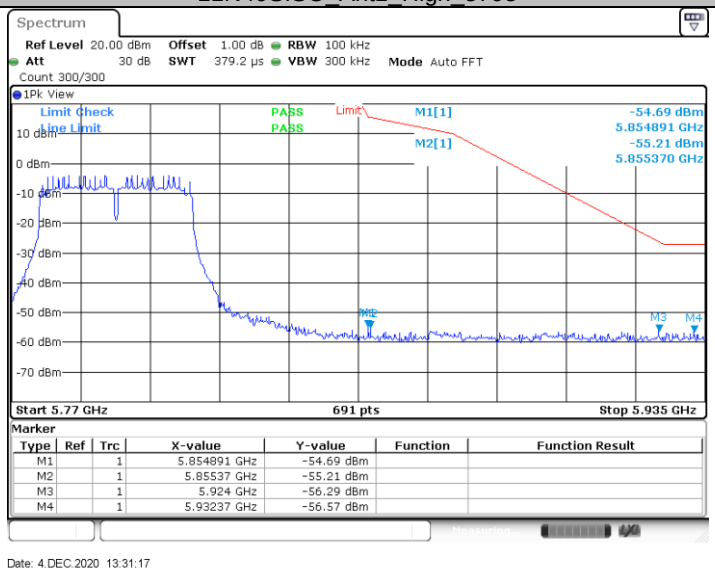

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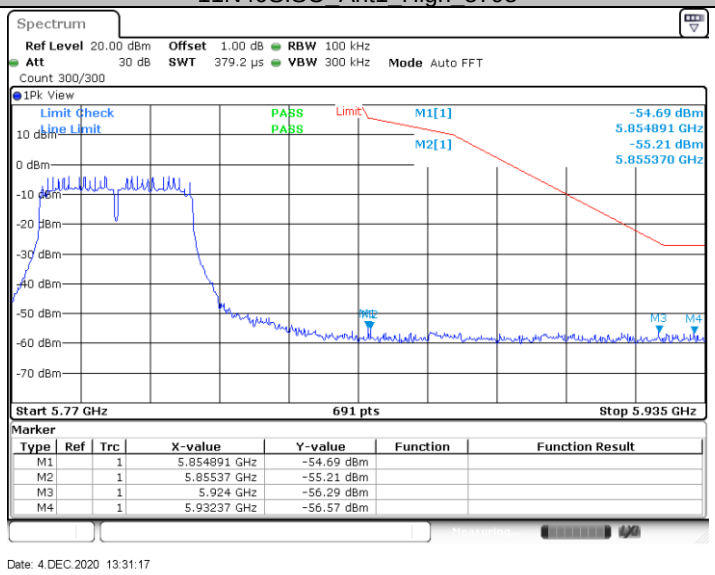

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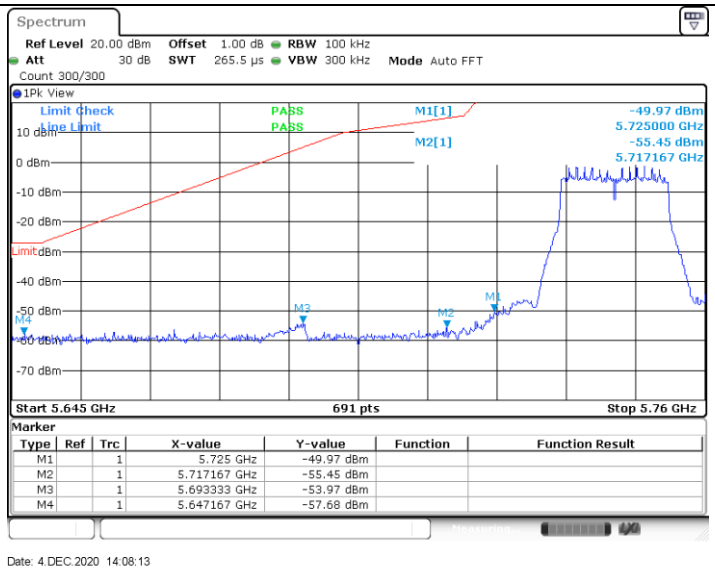

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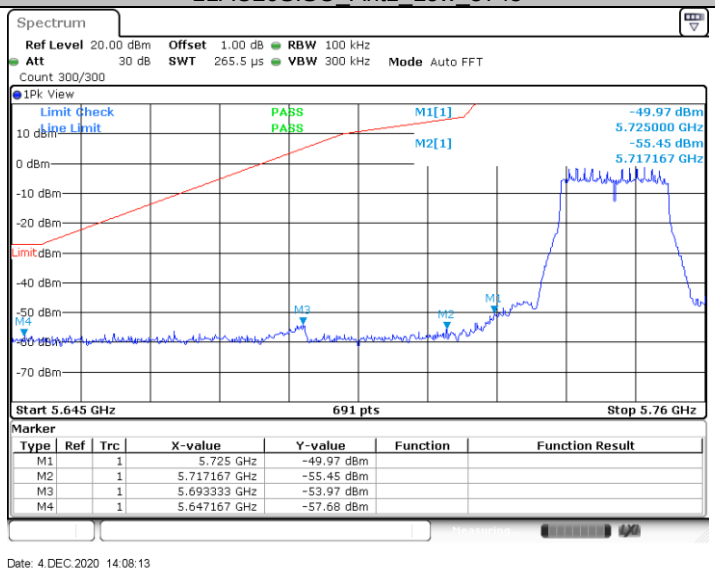

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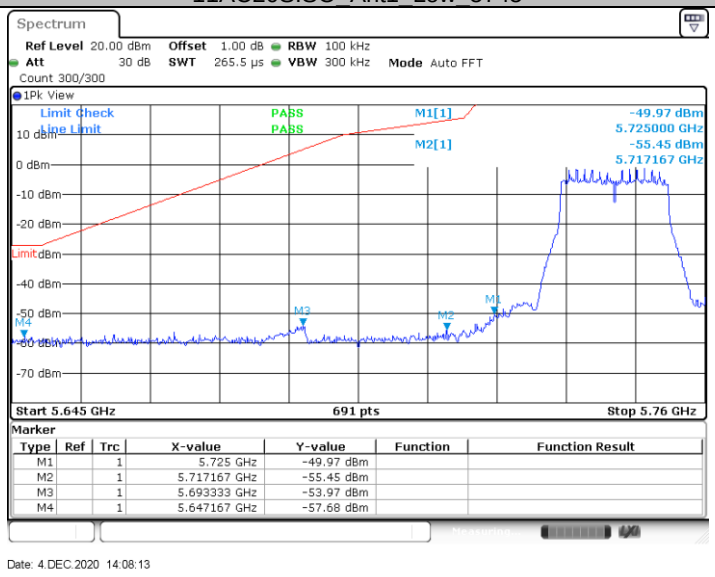
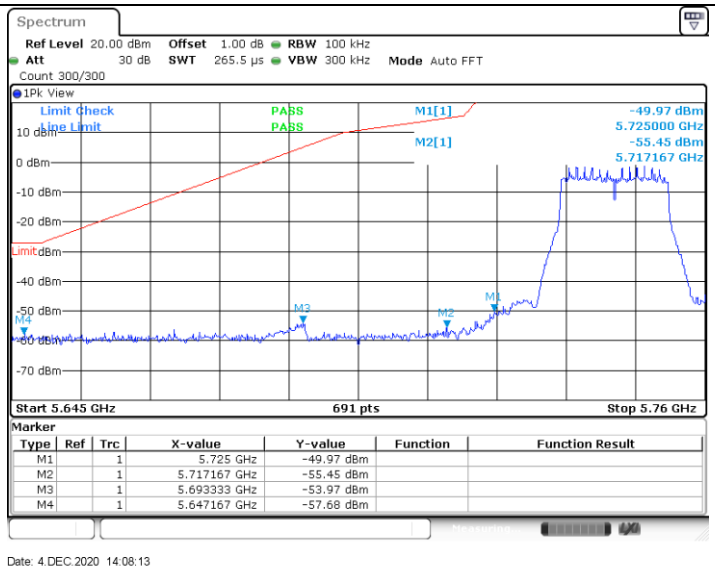
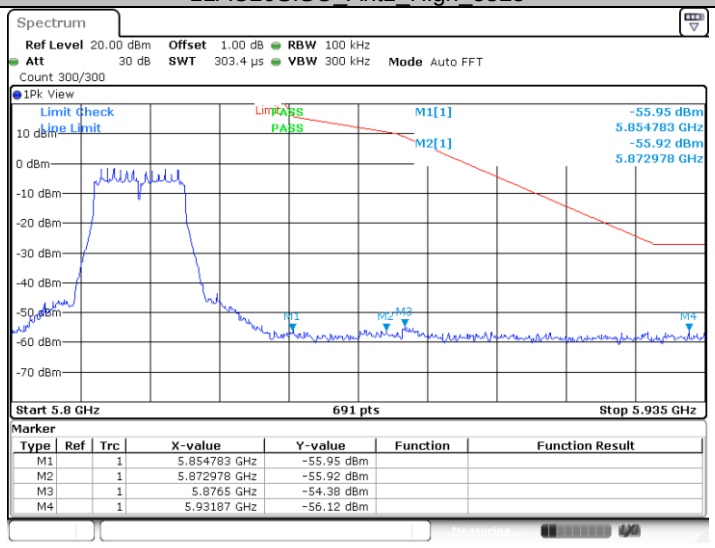


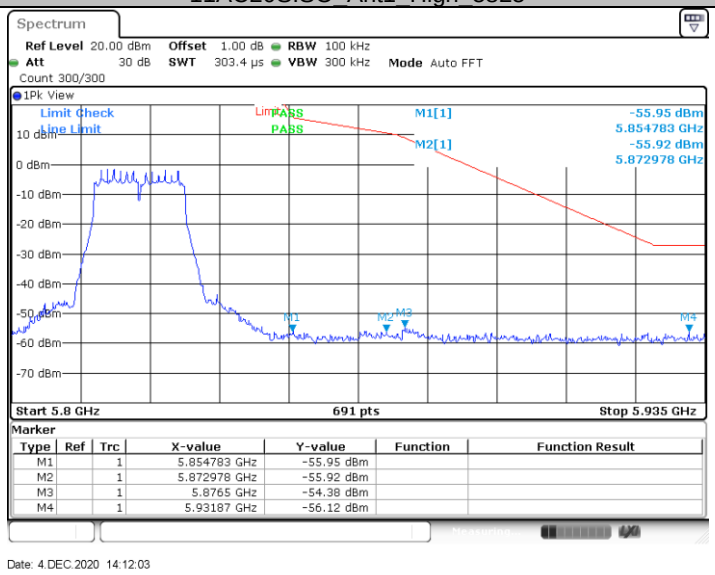
11AC20SISO_Ant1_Low_5745



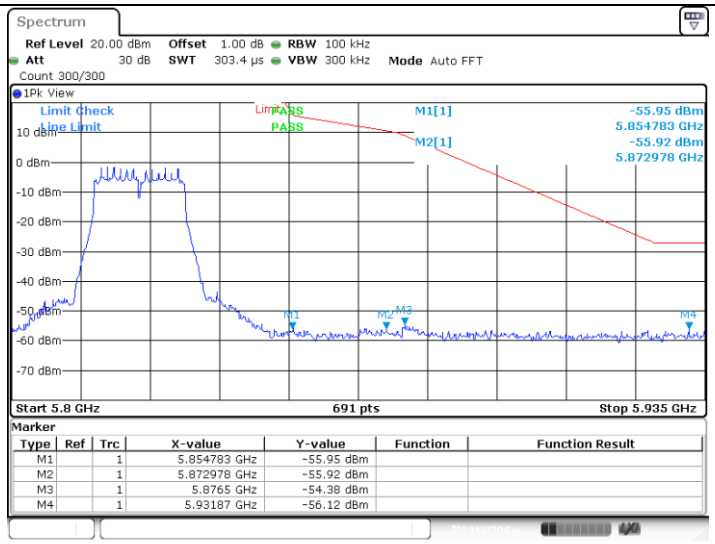
11AC20SISO_Ant1_High_5825



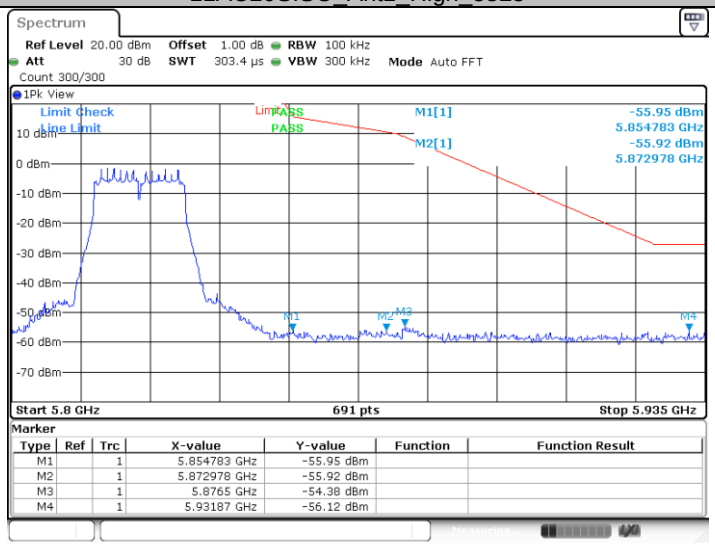
11AC20SISO_Ant1_High_5825



11AC20SISO_Ant1_High_5825



11AC20SISO_Ant1_High_5825



11AC40SISO_Ant1_Low_5755

11AC40SISO_Ant1_Low_5755

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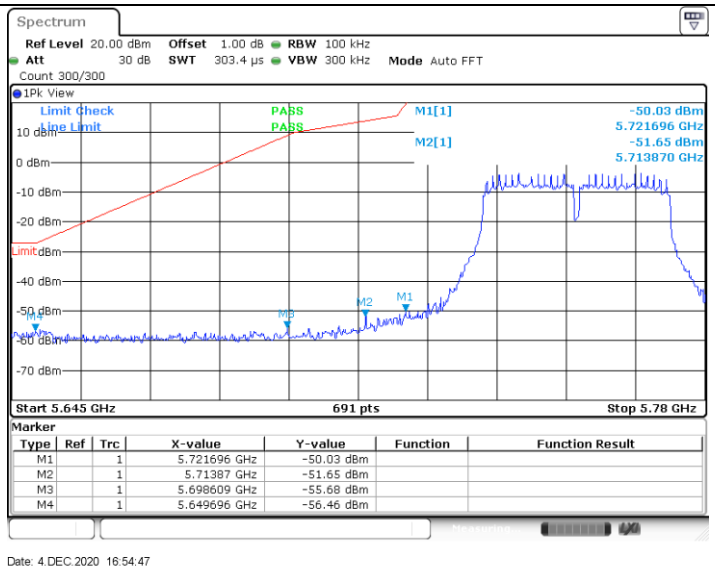
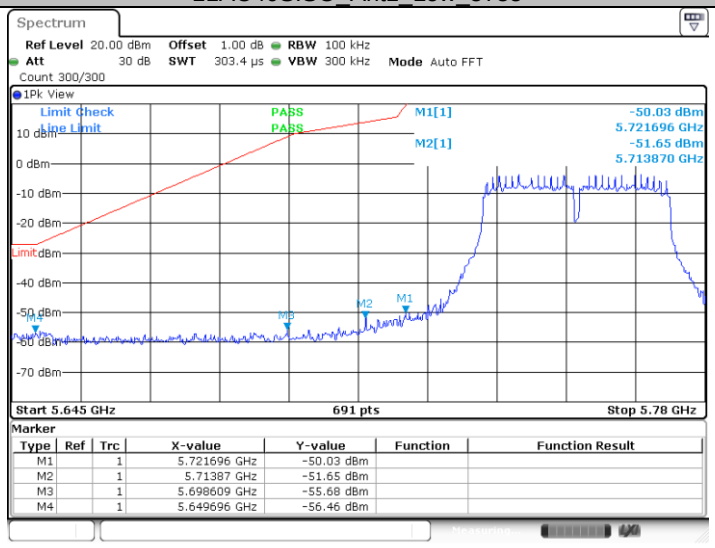
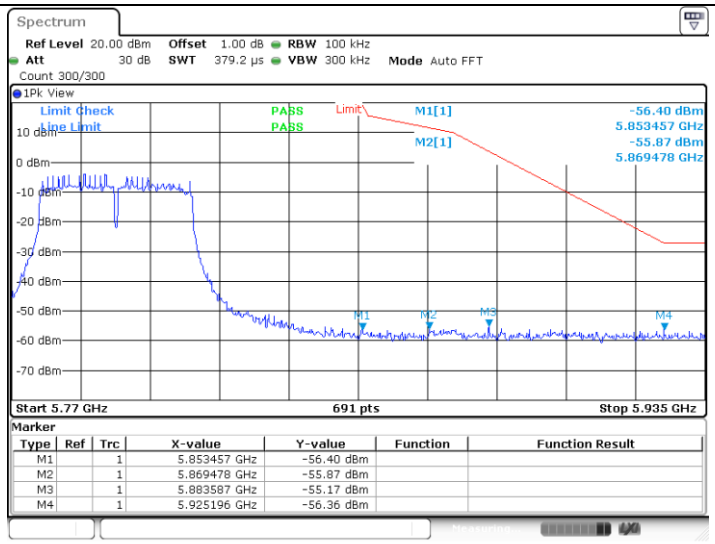


11AC40SISO_Ant1_Low_5755



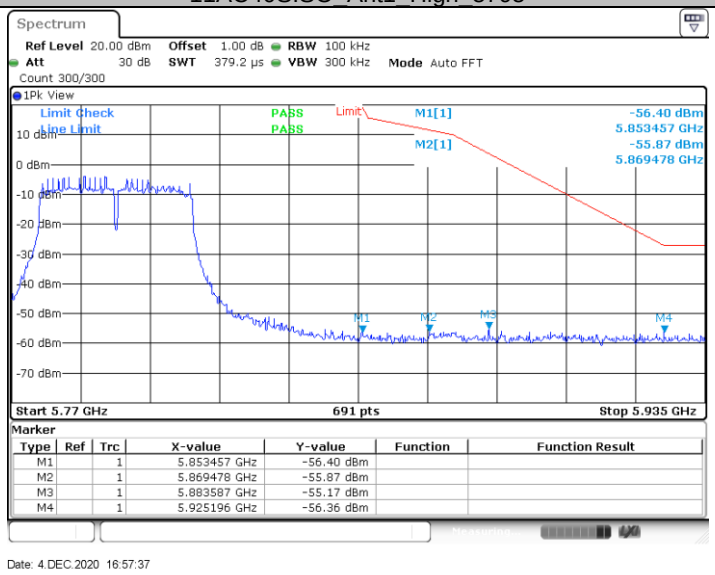
11AC40SISO_Ant1_Low_5755

11AC40SISO_Ant1_High_5795

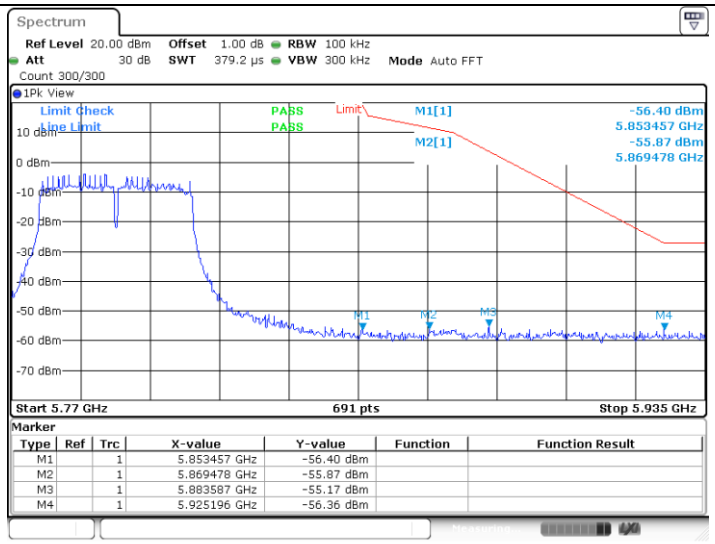


11AC40SISO_Ant1_High_5795

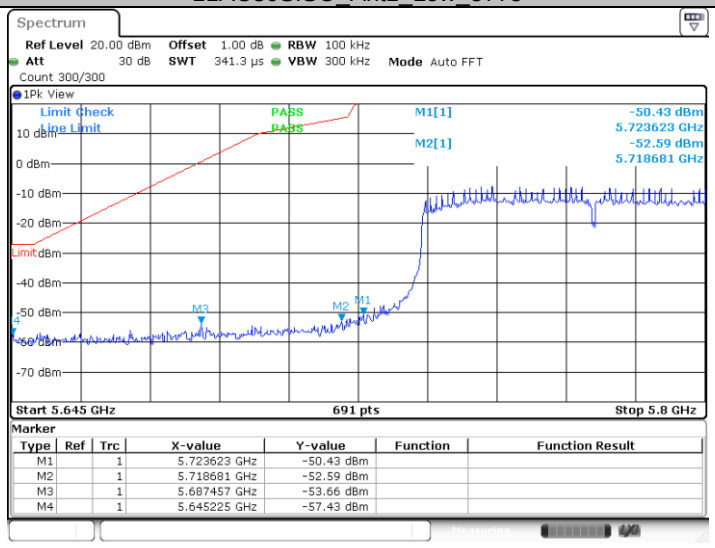
11AC40SISO_Ant1_High_5795



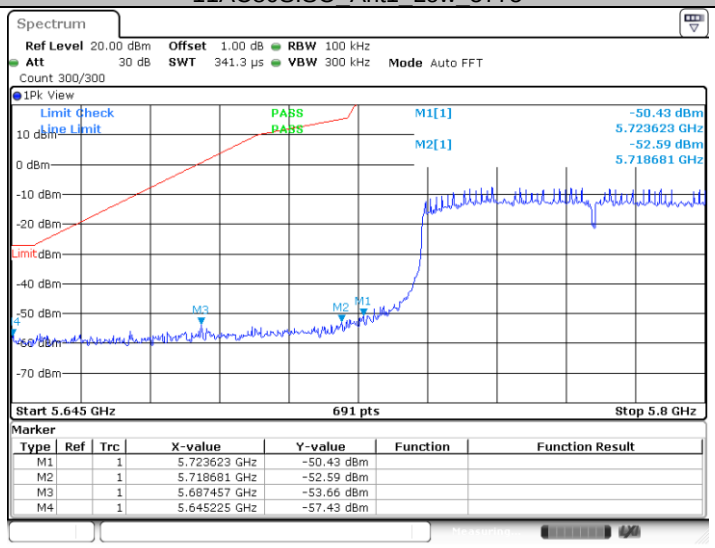
11AC40SISO_Ant1_High_5795



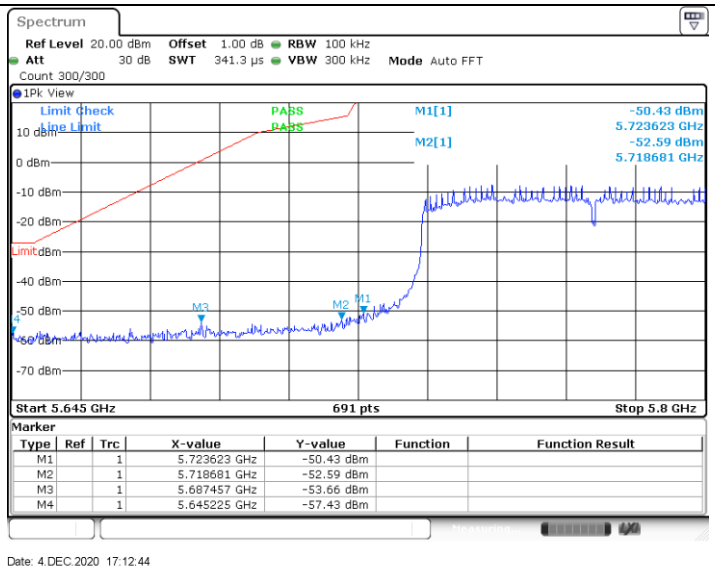
11AC80SISO_Ant1_Low_5775



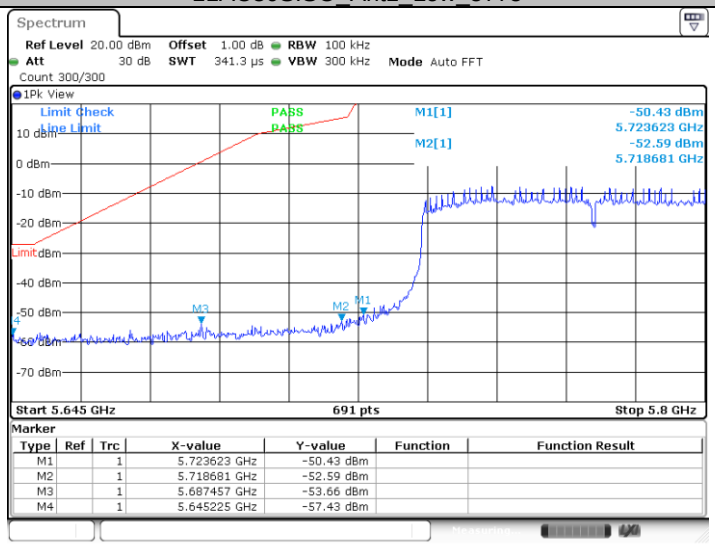
11AC80SISO_Ant1_Low_5775



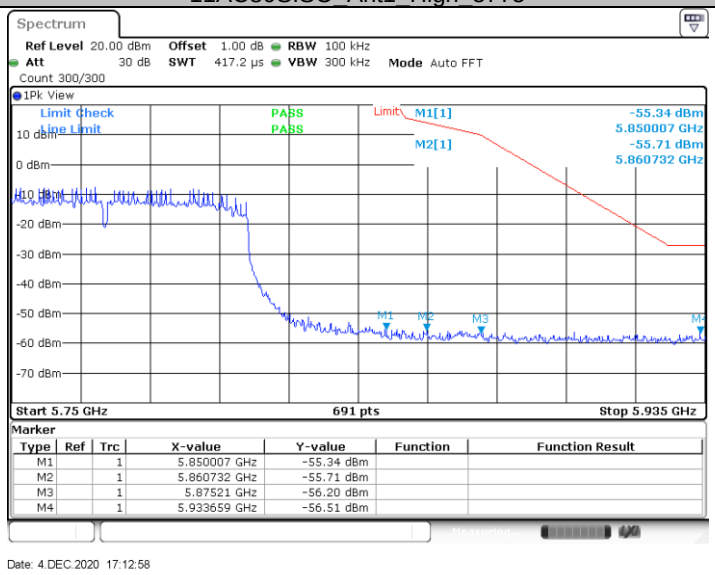
11AC80SISO_Ant1_Low_5775



11AC80SISO_Ant1_Low_5775



11AC80SISO_Ant1_High_5775



11AC80SISO_Ant1_High_5775

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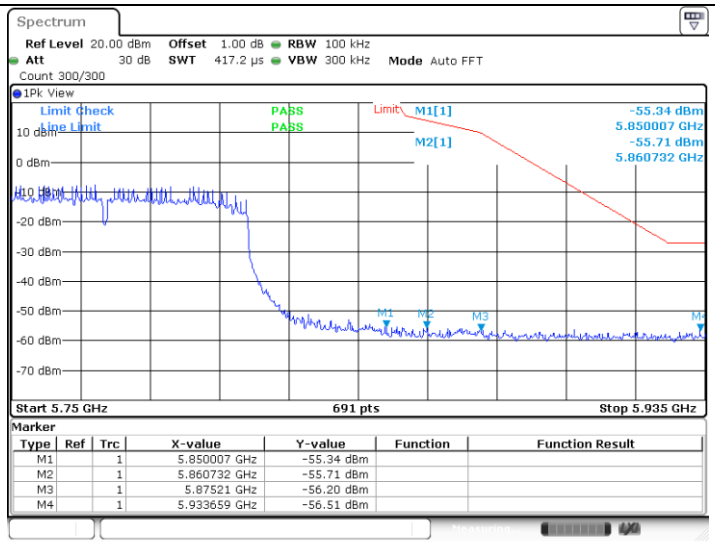
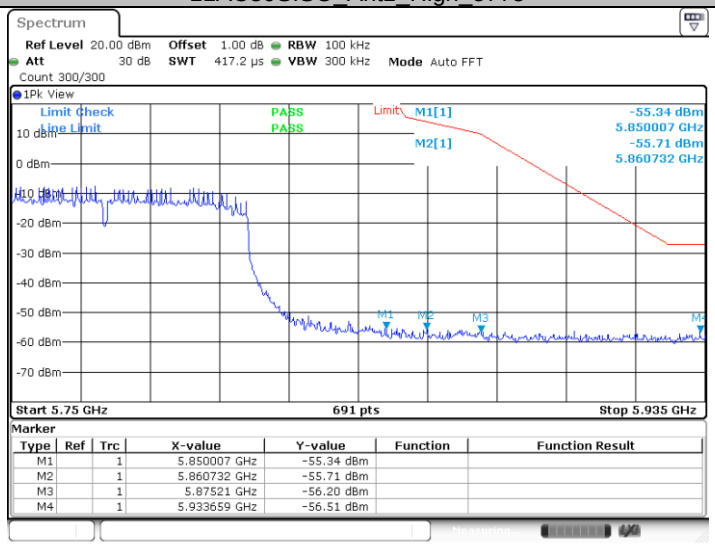
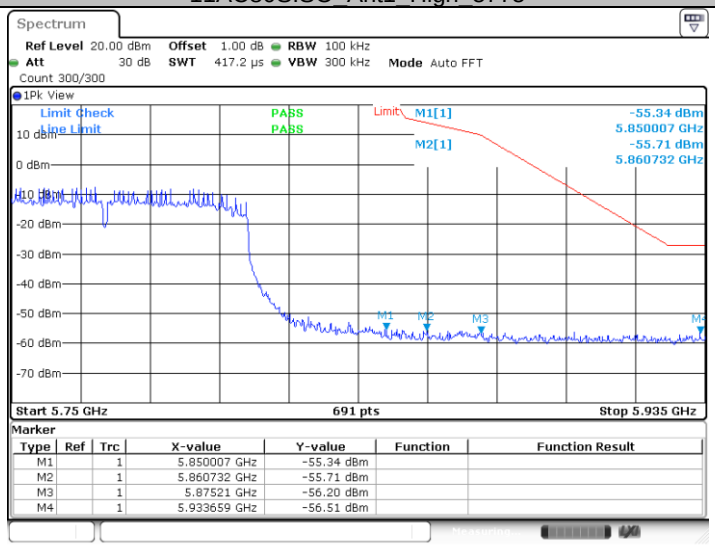


11AC80SISO_Ant1_High_5775



11AC80SISO_Ant1_High_5775



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9.6 Frequencies Stability

Test Method

1. The EUT was placed on 0.8m height table, the RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Set Centre Frequency of the channel under test.
3. Set Detector PEAK
4. Set RBW: 10KHz, VBW: 3RBW
5. Set Span: Encompass the entire emissions bandwidth (EBW) of the signal.
6. Allow the trace to stabilize, find the peak value of the power envelope and record the frequency, then calculated the frequency drift.

The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.
User manual temperature is 0℃ to +40℃, normal Temperature is +20℃.

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 users manual.

Test Results (All conditions and all modes were performed, only list Worst-Case in the report)

Remark: NV is normal Voltage: 7.2Vdc, HV is High Voltage: 8.28Vdc, LV is Low Voltage: 6.12Vdc, NT is normal Temperature: +20℃.

TestMode	Antenna	Channel	Voltage [Vdc]	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Verdict
11AC20SISO	Ant1	5180	NV	NT	-50000	-9.65251	PASS
			LV	NT	-52900	-10.212355	PASS
			HV	NT	-53900	-10.405405	PASS
		5200	NV	NT	-54900	-10.557692	PASS
			LV	NT	-55900	-10.75	PASS
			HV	NT	-55900	-10.75	PASS
		5240	NV	NT	-55900	-10.667939	PASS
			LV	NT	-56900	-10.858779	PASS
			HV	NT	-56900	-10.858779	PASS
		5260	NV	NT	-57900	-11.007605	PASS
			LV	NT	-57900	-11.007605	PASS
			HV	NT	-57900	-11.007605	PASS
		5280	NV	NT	-57900	-10.965909	PASS
			LV	NT	-58900	-11.155303	PASS
			HV	NT	-58900	-11.155303	PASS
		5320	NV	NT	-58900	-11.071429	PASS
			LV	NT	-58900	-11.071429	PASS
			HV	NT	-58900	-11.071429	PASS
		5500	NV	NT	-60900	-11.072727	PASS
			LV	NT	-60900	-11.072727	PASS
			HV	NT	-60900	-11.072727	PASS
		5580	NV	NT	-61900	-11.09319	PASS
			LV	NT	-61900	-11.09319	PASS
			HV	NT	-61900	-11.09319	PASS
		5700	NV	NT	-62900	-11.035088	PASS
			LV	NT	-63900	-11.210526	PASS

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			HV	NT	-63900	-11.210526	PASS
		5720	NV	NT	-62900	-10.996503	PASS
			LV	NT	-63900	-11.171329	PASS
			HV	NT	-63900	-11.171329	PASS
		5745	NV	NT	-64900	-11.29678	PASS
			LV	NT	-63900	-11.122715	PASS
			HV	NT	-64900	-11.29678	PASS
		5785	NV	NT	-63900	-11.045808	PASS
			LV	NT	-64900	-11.218669	PASS
			HV	NT	-64900	-11.218669	PASS
		5825	NV	NT	-64900	-11.141631	PASS
			LV	NT	-64900	-11.141631	PASS
			HV	NT	-64900	-11.141631	PASS
11AC40SISO	Ant1	5190	NV	NT	-57900	-11.156069	PASS
			LV	NT	-57900	-11.156069	PASS
			HV	NT	-57900	-11.156069	PASS
		5230	NV	NT	-57900	-11.070746	PASS
			LV	NT	-57900	-11.070746	PASS
			HV	NT	-57900	-11.070746	PASS
		5270	NV	NT	-58900	-11.176471	PASS
			LV	NT	-58900	-11.176471	PASS
			HV	NT	-58900	-11.176471	PASS
		5310	NV	NT	-58900	-11.092279	PASS
			LV	NT	-58900	-11.092279	PASS
			HV	NT	-58900	-11.092279	PASS
		5510	NV	NT	-60900	-11.052632	PASS
			LV	NT	-61900	-11.23412	PASS
			HV	NT	-61900	-11.23412	PASS
		5550	NV	NT	-61900	-11.153153	PASS
			LV	NT	-61900	-11.153153	PASS
			HV	NT	-61900	-11.153153	PASS
		5670	NV	NT	-62900	-11.093474	PASS
			LV	NT	-62900	-11.093474	PASS
			HV	NT	-63900	-11.269841	PASS
		5710	NV	NT	-63900	-11.190893	PASS
			LV	NT	-63900	-11.190893	PASS
			HV	NT	-63900	-11.190893	PASS
		5755	NV	NT	-63900	-11.103388	PASS
			LV	NT	-63900	-11.103388	PASS
			HV	NT	-63900	-11.103388	PASS
		5795	NV	NT	-63900	-11.026747	PASS
			LV	NT	-64900	-11.19931	PASS
			HV	NT	-64900	-11.19931	PASS
11AC80SISO	Ant1	5210	NV	NT	-57900	-11.113244	PASS
			LV	NT	-57900	-11.113244	PASS
			HV	NT	-57900	-11.113244	PASS
		5290	NV	NT	-58900	-11.134216	PASS
			LV	NT	-58900	-11.134216	PASS
			HV	NT	-58900	-11.134216	PASS
		5530	NV	NT	-60900	-11.012658	PASS
			LV	NT	-61900	-11.19349	PASS
			HV	NT	-61900	-11.19349	PASS
		5610	NV	NT	-61900	-11.033868	PASS
			LV	NT	-62900	-11.212121	PASS
			HV	NT	-62900	-11.212121	PASS
		5690	NV	NT	-62900	-11.054482	PASS
			LV	NT	-62900	-11.054482	PASS
			HV	NT	-63900	-11.230228	PASS
		5775	NV	NT	-63900	-11.064935	PASS
			LV	NT	-64900	-11.238095	PASS
			HV	NT	-64900	-11.238095	PASS

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TestMode	Antenna	Channel (MHz)	Voltage [Vdc]	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Verdict
11AC20SISO	Ant1	5180	NV	0	-54900	-10.598456	PASS
			NV	10	-54900	-10.598456	PASS
			NV	20	-54900	-10.598456	PASS
			NV	30	-54900	-10.598456	PASS
			NV	40	-55900	-10.791506	PASS
		5200	NV	0	-56900	-10.942308	PASS
			NV	10	-55900	-10.75	PASS
			NV	20	-56900	-10.942308	PASS
			NV	30	-56900	-10.942308	PASS
			NV	40	-56900	-10.942308	PASS
		5240	NV	0	-56900	-10.858779	PASS
			NV	10	-57900	-11.049618	PASS
			NV	20	-57900	-11.049618	PASS
			NV	30	-57900	-11.049618	PASS
			NV	40	-57900	-11.049618	PASS
		5260	NV	0	-57900	-11.007605	PASS
			NV	10	-57900	-11.007605	PASS
			NV	20	-57900	-11.007605	PASS
			NV	30	-57900	-11.007605	PASS
			NV	40	-57900	-11.007605	PASS
		5280	NV	0	-58900	-11.155303	PASS
			NV	10	-58900	-11.155303	PASS
			NV	20	-58900	-11.155303	PASS
			NV	30	-58900	-11.155303	PASS
			NV	40	-58900	-11.155303	PASS
		5320	NV	0	-58900	-11.071429	PASS
			NV	10	-58900	-11.071429	PASS
			NV	20	-59900	-11.259398	PASS
			NV	30	-58900	-11.071429	PASS
			NV	40	-58900	-11.071429	PASS
		5500	NV	0	-60900	-11.072727	PASS
			NV	10	-60900	-11.072727	PASS
			NV	20	-61900	-11.254545	PASS
			NV	30	-61900	-11.254545	PASS
			NV	40	-61900	-11.254545	PASS
		5580	NV	0	-62900	-11.272401	PASS
			NV	10	-62900	-11.272401	PASS
			NV	20	-62900	-11.272401	PASS
			NV	30	-61900	-11.09319	PASS
			NV	40	-62900	-11.272401	PASS
		5700	NV	0	-63900	-11.210526	PASS
			NV	10	-63900	-11.210526	PASS
			NV	20	-63900	-11.210526	PASS
			NV	30	-63900	-11.210526	PASS
			NV	40	-63900	-11.210526	PASS
		5720	NV	0	-63900	-11.171329	PASS
			NV	10	-63900	-11.171329	PASS
			NV	20	-63900	-11.171329	PASS
			NV	30	-63900	-11.171329	PASS
			NV	40	-63900	-11.171329	PASS
		5745	NV	0	-63900	-11.122715	PASS
			NV	10	-64900	-11.29678	PASS
			NV	20	-64900	-11.29678	PASS
			NV	30	-63900	-11.122715	PASS
			NV	40	-64900	-11.29678	PASS
		5785	NV	0	-64900	-11.218669	PASS
			NV	10	-64900	-11.218669	PASS
			NV	20	-64900	-11.218669	PASS
			NV	30	-64900	-11.218669	PASS
			NV	40	-64900	-11.218669	PASS

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		5825	NV	0	-64900	-11.141631	PASS
			NV	10	-64900	-11.141631	PASS
			NV	20	-64900	-11.141631	PASS
			NV	30	-64900	-11.141631	PASS
			NV	40	-64900	-11.141631	PASS
11AC40SISO	Ant1	5190	NV	0	-57900	-11.156069	PASS
			NV	10	-57900	-11.156069	PASS
			NV	20	-57900	-11.156069	PASS
			NV	30	-57900	-11.156069	PASS
			NV	40	-57900	-11.156069	PASS
		5230	NV	0	-58900	-11.26195	PASS
			NV	10	-58900	-11.26195	PASS
			NV	20	-58900	-11.26195	PASS
			NV	30	-58900	-11.26195	PASS
			NV	40	-58900	-11.26195	PASS
		5270	NV	0	-58900	-11.176471	PASS
			NV	10	-58900	-11.176471	PASS
			NV	20	-58900	-11.176471	PASS
			NV	30	-58900	-11.176471	PASS
			NV	40	-58900	-11.176471	PASS
		5310	NV	0	-59900	-11.280603	PASS
			NV	10	-59900	-11.280603	PASS
			NV	20	-59900	-11.280603	PASS
			NV	30	-59900	-11.280603	PASS
			NV	40	-58900	-11.092279	PASS
		5510	NV	0	-61900	-11.23412	PASS
			NV	10	-61900	-11.23412	PASS
			NV	20	-61900	-11.23412	PASS
			NV	30	-61900	-11.23412	PASS
			NV	40	-61900	-11.23412	PASS
		5550	NV	0	-61900	-11.153153	PASS
			NV	10	-61900	-11.153153	PASS
			NV	20	-61900	-11.153153	PASS
			NV	30	-61900	-11.153153	PASS
			NV	40	-61900	-11.153153	PASS
		5670	NV	0	-63900	-11.269841	PASS
			NV	10	-63900	-11.269841	PASS
			NV	20	-63900	-11.269841	PASS
			NV	30	-63900	-11.269841	PASS
			NV	40	-63900	-11.269841	PASS
		5710	NV	0	-63900	-11.190893	PASS
			NV	10	-63900	-11.190893	PASS
			NV	20	-63900	-11.190893	PASS
			NV	30	-63900	-11.190893	PASS
			NV	40	-63900	-11.190893	PASS
		5755	NV	0	-64900	-11.27715	PASS
			NV	10	-63900	-11.103388	PASS
			NV	20	-64900	-11.27715	PASS
			NV	30	-64900	-11.27715	PASS
			NV	40	-63900	-11.103388	PASS
		5795	NV	0	-64900	-11.19931	PASS
			NV	10	-64900	-11.19931	PASS
			NV	20	-64900	-11.19931	PASS
			NV	30	-64900	-11.19931	PASS
			NV	40	-64900	-11.19931	PASS
11AC80SISO	Ant1	5210	NV	0	-57900	-11.113244	PASS
			NV	10	-57900	-11.113244	PASS
			NV	20	-57900	-11.113244	PASS
			NV	30	-57900	-11.113244	PASS
			NV	40	-57900	-11.113244	PASS
		5290	NV	0	-58900	-11.134216	PASS
			NV	10	-58900	-11.134216	PASS
			NV	20	-58900	-11.134216	PASS
			NV	30	-58900	-11.134216	PASS

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			NV	40	-58900	-11.134216	PASS
		5530	NV	0	-61900	-11.19349	PASS
			NV	10	-61900	-11.19349	PASS
			NV	20	-61900	-11.19349	PASS
			NV	30	-61900	-11.19349	PASS
			NV	40	-61900	-11.19349	PASS
		5610	NV	0	-62900	-11.212121	PASS
			NV	10	-62900	-11.212121	PASS
			NV	20	-62900	-11.212121	PASS
			NV	30	-62900	-11.212121	PASS
			NV	40	-62900	-11.212121	PASS
		5690	NV	0	-63900	-11.230228	PASS
			NV	10	-63900	-11.230228	PASS
			NV	20	-63900	-11.230228	PASS
			NV	30	-63900	-11.230228	PASS
			NV	40	-63900	-11.230228	PASS
		5775	NV	0	-64900	-11.238095	PASS
			NV	10	-64900	-11.238095	PASS
			NV	20	-64900	-11.238095	PASS
			NV	30	-64900	-11.238095	PASS
			NV	40	-64900	-11.238095	PASS

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9.7 Dynamic Frequency Selection (DFS)

General Test Condition

Parameteers of EUT	
Frequency	5250 – 5350 MHz & 5470 – 5725 MHz
Operational Mode	Slave
Modulation:	OFDM
Channel Bandwidth:	20 MHz , 40 MHz，80 MHz

Note: This device was functioned as a Slave device during the DFS

Test requirement

The manufacturer shall whether the EUT is capable of operating as a master and a client. Id the EUT is capable of operating in more than one operating mode then each operating mode shall be tested separately.

DFS Applicability

Requirement	Operational Mode		
	Master	Client Without Radar Detection	**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
Uniform Spreading	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

DFS Applicability During Normal Operation

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Yes	Not required
Uniform Spreading	Yes	Yes	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

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Test Limited

According to KDB 905462 D02 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 to facilitate 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.	

Calibration of Radar Waveform

(1) A 50ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master.
(2) The interference Radar Detection Threshold Level is -62dBm+3.7dB+1.5dB=-55.8dBm that had been taken into account the output power range and antenna gain.
(3) 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 3MHz. The spectrum analyzer had offset -1.5dB to compensate RF cable loss 1.5dB.
(4) The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was -62dBm+3.7dB+1.5dB=-55.8dBm. Capture the spectrum analyzer plots on short pulse radar waveform.

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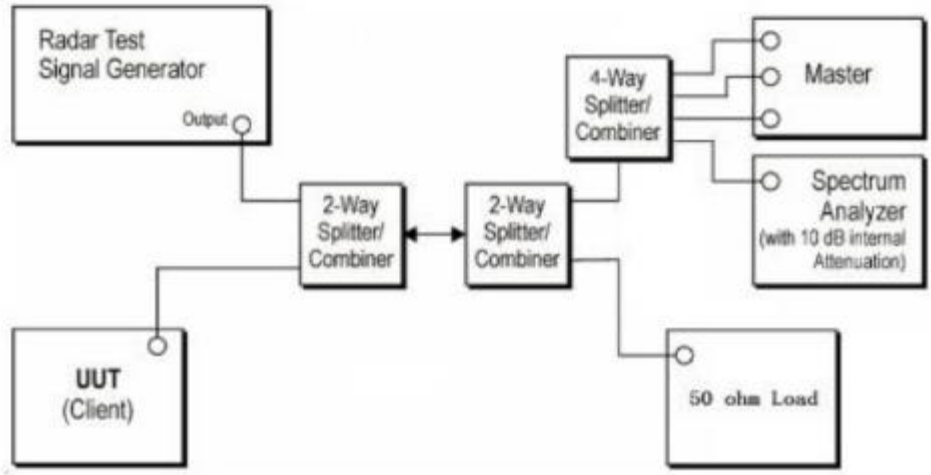
Conducted Calibration Setup:



Radar Waveform Calibration result:

Channel Closing Transmission Time, Channel Move Time and Non-Occupancy Period.

Block Diagram of test setup test procedure.

(1) The Radar Pulse generator is setup to provide a pulse at frequency that the master and client are operating, A type 0 radar pulse with a 1us pulse width and a 1428us PRI is used for the testing.
(2) The vector signal generator is adjusted to provide the radar burst (18 pulses) at the level of approximately -55.8dBm at the antenna of the master device.
(3) A trigger is provided from the pulse generator to the DFS monitoring system in order to capture the traffic and the occurrence of the radar pulse.
(4) EUT will associate with the master at channel. The file “iperf.exe” specified by the FCC is streamed from the PC 2 through the master and the client device to the PC 1 and played in full motion video using test software in order to properly load the network for the entire period of the test.
(5) When radar burst with a Level equal to the DFS Detection Threshold +1dB is generated on the operating channel of the U-NII device. At time T0 the radar waveform generator sends a burst of pulse of the radar waveform at Detection threshold +1dB.
(6) Observer the transmissions of the EUT at the end of the radar Burst on the Operating channel. Measure and record the transmissions form the UUT during The observation time (channel move time). One 15 seconds plot is reported for the short pulse radar type 0. The plot for the short pulse radar burst. The channel move time will be calculated based on the zoom in 600ms plot of the short pulse radar type.
(7) Measurement of the aggregate duration of the channel closed transmission time method. With the spectrum analyzer set to zero span tuned to the center frequency of the EUT operating channel at the radar simulated frequency, peak detection, and max hold, the dwell time per bin is given by: Dwell (3.0)=S(12000ms)/B(4000); where dwell time per spectrum analyzer sampling bin, S is sweep time and B is the number of spectrum analyzer sampling bins. An upper bound of the aggregate duration of the intermittent control signals of channel closing transmission time is calculated by: C(ms)=N X Dwell (0.3ms); where C is the closing time, N is the number of spectrum analyzer sampling bins (intermittent control signals) showing a U-NII transmission and dwell is the dwell time per bin.
(8) Measurement the EUT for more than 30 minutes following the channel move time to verify that no transmission or beacons occur on this channel.

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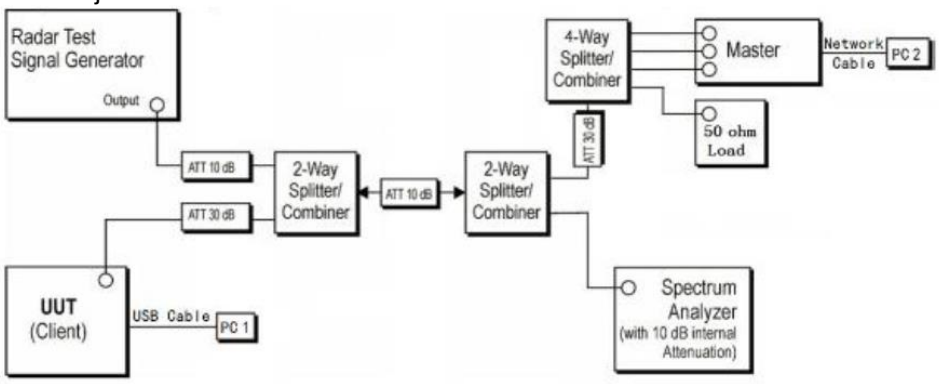
Test Setup:
Setup for client with injection at the master.



Test Result

Clause	Test Parameter	Remarks	Pass/Fail
15.407	DFS Detection Threshold	No Applicable	N/A
15.407	Channel Availability Check time	No Applicable	N/A
15.407	Channel Move time	Applicable	Pass
15.407	Channel Closing Transmission Time	Applicable	Pass
15.407	Non-Occupancy Period	Applicable	Pass
15.407	Uniform Spreading	No Applicable	N/A
15.407	U-NII Detection Bandwidth	No Applicable	N/A

TestMode	Channel	CCT[ms]	Limit[ms]	CMT[ms]	Limit[ms]	Verdict
11AC80SISO	5290	6.45	60	457.95	10000	PASS

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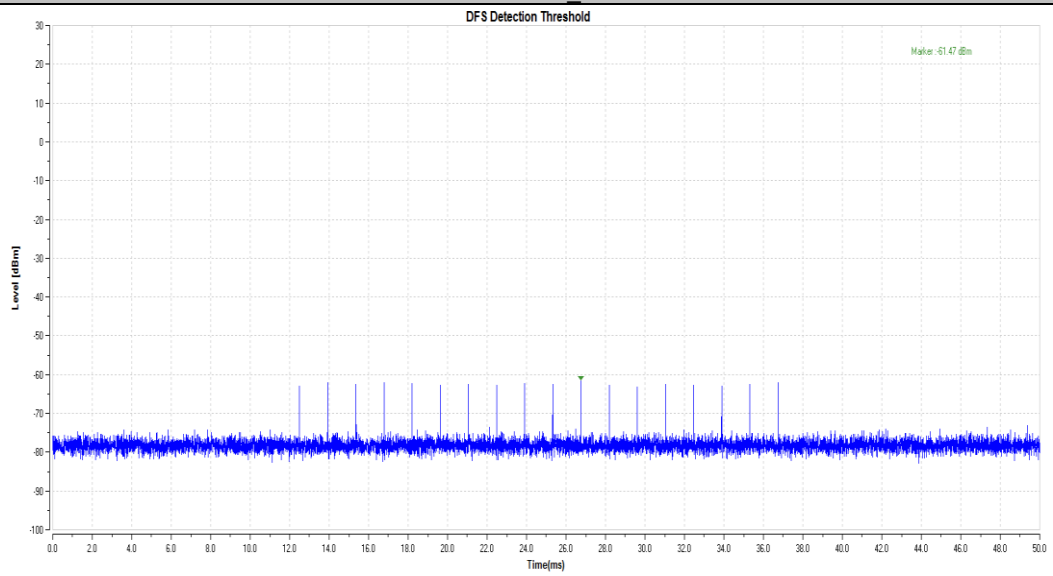
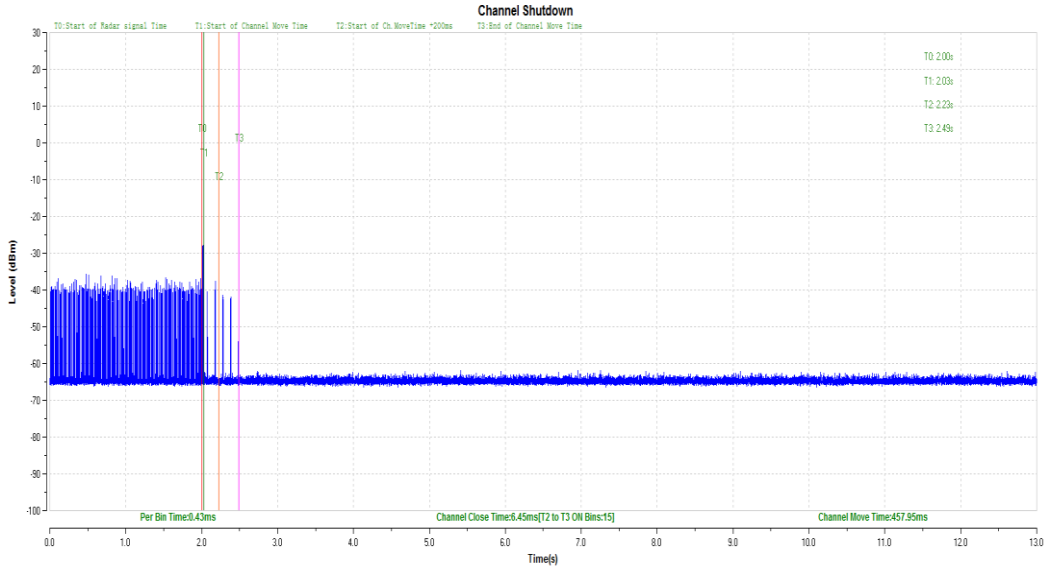
Test Graphs

11AC80SISO_5290



11AC80SISO_5290



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10 Test Equipment List

Conducted Emission Test

Description	Manufacturer	Model no.	Serial no.	cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2021-6-29
LISN	Rohde & Schwarz	ENV4200	100249	2021-6-12
Attenuator	Shanghai Huaxiang	TS2-26-3	080928189	2021-6-21
Test software	Rohde & Schwarz	EMC32	Version9.15.00	N/A

Radiated Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2021-6-29
High Pass Filter (HPF)	UCL	UCL-BPF1-7G	1504005103	2021-6-28
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2021-8-20
Horn Antenna	Rohde & Schwarz	HF907	102295	2021-6-22
Wideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	12827	2021-7-12
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2021-6-21
Pre-amplifier	Rohde & Schwarz	SCU 40A	100432	2021-7-16
Attenuator	Agilent	8491A	MY39264334	2021-6-21
3m Semi-anechoic chamber	TDK	9X6X6	----	2022-10-28
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

RF conducted test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2021-6-21
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2021-6-21
Power Splitter	Weinschel	1580	SC319	2021-7-7
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2021-6-21
Test software	Tonscend	System for BT/WIFI	Version 2.6	N/A

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11 System Measurement Uncertainly

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted Emission 150kHz-30MHz (for test using AMN ENV432 or ENV4200)	3.62dB
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.81dB; Vertical: 4.89dB;
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.69dB; Vertical: 4.68dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 4.89dB; Vertical: 4.87dB;
Uncertainty for Conducted RF test	RF Power Conducted: 1.16dB Frequency test involved: 0.6×10^{-7} or 1%

---The End---

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