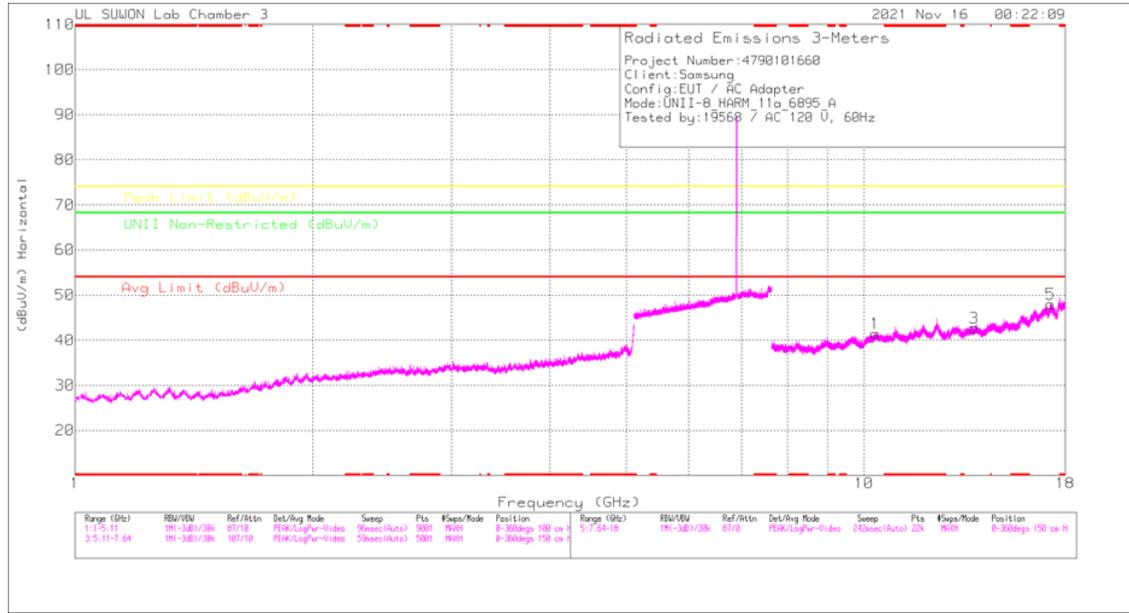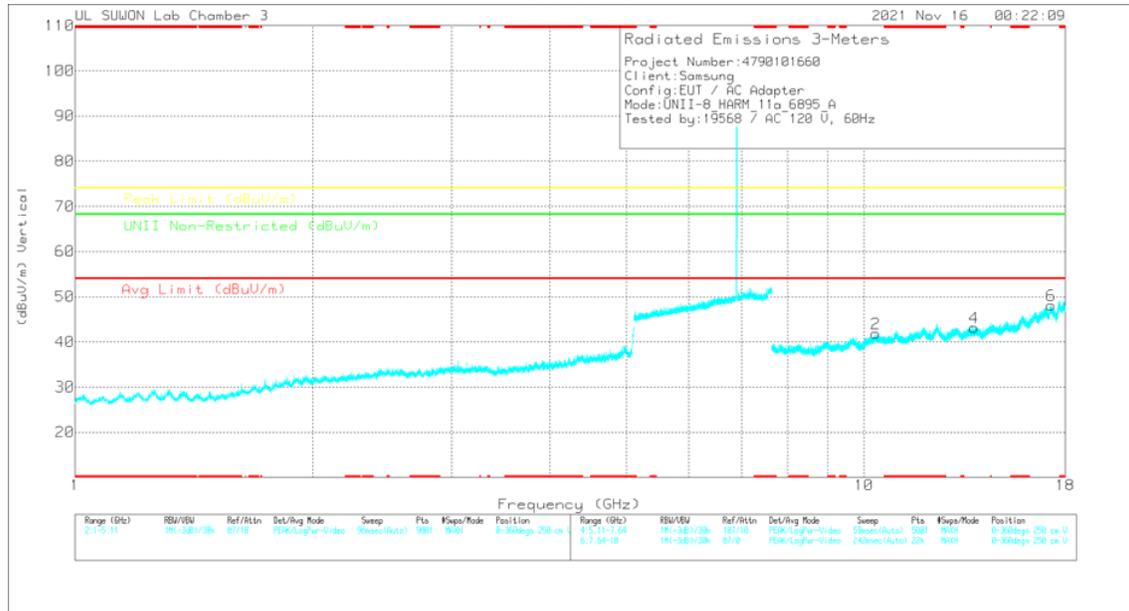## HARMONICS AND SPURIOUS EMISSIONS(WORST CASE: 802.11a / 6895 MHz)

HORIZONTAL

VERTICAL

Note: Emission was scanned up to 40GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	8GHz_HP(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
10.33003	34.53	PK-U	38	-21.2	0	51.33	-	-	-	-	68.2	-16.87	0	100	H
10.33016	34.45	PK-U	38	-21.2	0	51.25	-	-	-	-	68.2	-16.95	0	100	V
13.78509	36.96	PK-U	38.9	-23.2	0	52.66	-	-	-	-	68.2	-15.54	0	100	H
13.785	37.04	PK-U	38.9	-23.2	0	52.74	-	-	-	-	68.2	-15.46	0	100	V
17.25483	33.27	PK-U	42	-17.6	0	57.67	-	-	-	-	68.2	-10.53	0	100	H
17.25468	33.6	PK-U	42	-17.6	0	58	-	-	-	-	68.2	-10.2	0	100	V

PK-U - U-NII: Maximum Peak

UL Korea, Ltd. Suwon Laboratory
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## HARMONICS AND SPURIOUS EMISSIONS TEST DATA

Mode	Freq. [MHz]	Antenna	Frequency [GHz]	Reading [dBuV]	Detector Mode	ANT Factor	Loss [dB]	DC Corr [dB]	Result [dBuV/m]	AV Limit [dBuV/m]	AV Margin [dB]	PK Limit [dBuV/m]	PK Margin [dB]	Non-Restricted [dBuV/m]	Margin [dB]	Azimuth [Degs]	Height [cm]	Polarity
802.11a	6895	MIMO	10.33003	34.53	PK-U	38.00	-21.20	0.00	51.33	-	-	-	-	68.20	-16.87	0	100	H
			10.33016	34.45	PK-U	38.00	-21.20	0.00	51.25	-	-	-	-	68.20	-16.95	0	100	V
			13.78509	36.96	PK-U	38.90	-23.20	0.00	52.66	-	-	-	-	68.20	-15.54	0	100	H
			13.78500	37.04	PK-U	38.90	-23.20	0.00	52.74	-	-	-	-	68.20	-15.46	0	100	V
			17.25483	33.27	PK-U	42.00	-17.60	0.00	57.67	-	-	-	-	68.20	-10.53	0	100	H
			17.25468	33.60	PK-U	42.00	-17.60	0.00	58.00	-	-	-	-	68.20	**-10.20**	0	100	V
	6995	MIMO	10.48632	34.28	PK-U	38.20	-21.50	0.00	50.98	-	-	-	-	68.20	-17.22	0	100	H
			10.49040	34.40	PK-U	38.20	-21.50	0.00	51.10	-	-	-	-	68.20	-17.10	0	100	V
			13.98798	36.79	PK-U	39.10	-23.20	0.00	52.69	-	-	-	-	68.20	-15.51	0	100	H
			13.99590	35.64	PK-U	39.10	-23.20	0.00	51.54	-	-	-	-	68.20	-16.66	0	100	V
			17.49582	32.19	PK-U	42.00	-17.40	0.00	56.79	-	-	-	-	68.20	-11.41	0	100	H
			17.48082	31.74	PK-U	42.00	-17.30	0.00	56.44	-	-	-	-	68.20	-11.76	0	100	V
	7115	MIMO	* 10.66662	33.32	PK-U	38.40	-21.30	0.00	50.42	-	-	74.00	-23.58	-	-	0	100	H
			* 10.67618	33.62	PK-U	38.40	-21.30	0.00	50.72	-	-	74.00	-23.28	-	-	0	100	V
			14.23090	35.93	PK-U	39.50	-23.40	0.00	52.03	-	-	-	-	68.20	-16.17	0	100	H
			14.23198	35.37	PK-U	39.50	-23.40	0.00	51.47	-	-	-	-	68.20	-16.73	0	100	V
			* 17.79154	31.93	PK-U	41.90	-16.90	0.00	56.93	-	-	74.00	**-17.07**	-	-	0	100	H
			* 17.78964	31.59	PK-U	41.90	-16.90	0.00	56.59	-	-	74.00	-17.41	-	-	0	100	V
802.11ax (HE20) 4RU Spot-check	6995	MIMO	10.49801	34.33	PK-U	38.20	-21.50	0.00	51.03	-	-	-	-	68.20	-17.17	0	100	H
			10.49478	34.43	PK-U	38.20	-21.50	0.00	51.13	-	-	-	-	68.20	-17.07	0	100	V
			13.98481	36.17	PK-U	39.10	-23.10	0.00	52.17	-	-	-	-	68.20	-16.03	0	100	H
			13.99669	36.53	PK-U	39.10	-23.20	0.00	52.43	-	-	-	-	68.20	-15.77	0	100	V
			17.48557	31.81	PK-U	42.00	-17.40	0.00	56.41	-	-	-	-	68.20	-11.79	0	100	H
			17.48413	31.81	PK-U	42.00	-17.40	0.00	56.41	-	-	-	-	68.20	-11.79	0	100	V
802.11ax (HE80) 18RU Spot-check	6945	MIMO	10.42357	34.56	PK-U	38.10	-21.10	0.00	51.56	-	-	-	-	68.20	-16.64	0	100	H
			10.41698	34.13	PK-U	38.10	-21.10	0.00	51.13	-	-	-	-	68.20	-17.07	0	100	V
			13.89737	35.98	PK-U	39.00	-23.40	0.00	51.58	-	-	-	-	68.20	-16.62	0	100	H
			13.89487	35.92	PK-U	39.00	-23.30	0.00	51.62	-	-	-	-	68.20	-16.58	0	100	V
			17.36270	31.74	PK-U	42.00	-17.80	0.00	55.94	-	-	-	-	68.20	-12.26	0	100	H
			17.36045	31.98	PK-U	42.00	-17.70	0.00	56.28	-	-	-	-	68.20	-11.92	0	100	V

Note1. Pk - Peak detector, RMS - RMS detectior
Note2. * - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

12. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)
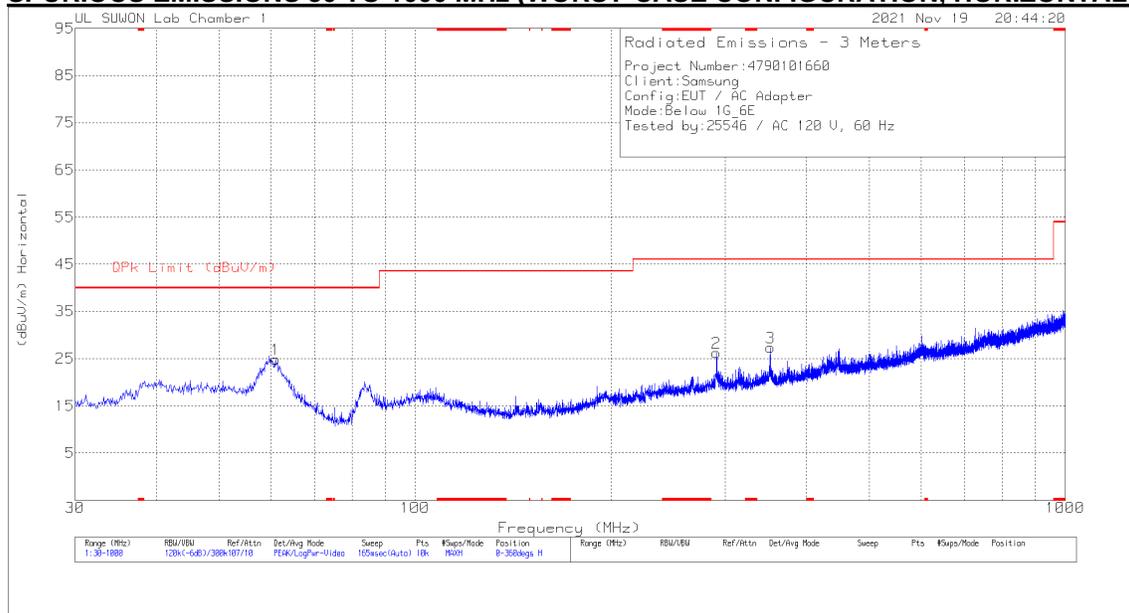
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)
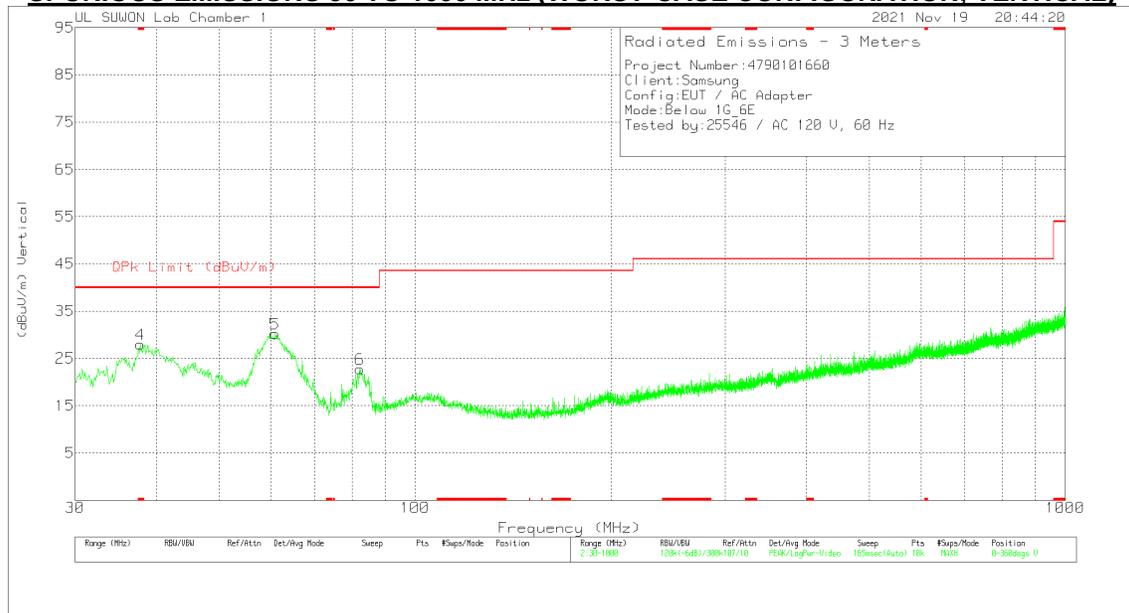
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_750	Below_1G[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	61.04	37.11	Pk	18.4	-30.7	24.81	40	-15.19	0-360	300	H
2	290.93	35.78	Pk	19.1	-28.6	26.28	46.02	-19.74	0-360	100	H
3	351.846	34.69	Pk	21	-28.3	27.39	46.02	-18.63	0-360	100	H
4	* 37.76	41.3	Pk	17.8	-31.1	28	40	-12	0-360	200	V
5	60.846	42.54	Pk	18.4	-30.7	30.24	40	-9.76	0-360	200	V
6	82.186	40.19	Pk	13.1	-30.5	22.79	40	-17.21	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

13.   Contention Based Protocol

13.1.   OVERVIEW

13.1.1.   LIMITS

FCC

§15.407 (d) (6)
KDB 987594 D02

Indoor access points, subordinate devices and client devices operating in the 5.925-7.125 GHz band (herein referred to as unlicensed devices) are required to use technologies that include a contention-based protocol to avoid co-channel interference with incumbent devices sharing the band. To ensure incumbent co-channel operations are detected in a technology-agnostic manner, unlicensed devices are required to detect co-channel radio frequency energy (energy detect) and avoid simultaneous transmission.

Unlicensed low-power indoor devices must detect co-channel radio frequency power that is at least -62 dBm or lower. Upon detection of energy in the band, unlicensed low power indoor devices must vacate the channel (in which incumbent signal is transmitted) and stay off the incumbent channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm)1 . The -62 dBm (or lower) threshold is referenced to a 0 dBi antenna gain.

To ensure incumbent operations are reliably detected in the band, low power indoor devices must detect RF energy throughout their intended operating channel. For example, an 802.11 device that plans to transmit a 40 MHz- wide signal (on a primary 20 MHz channel and a secondary 20 MHz channel) must detect energy throughout the entire 40 MHz channel. Additionally, low-power indoor devices must detect co-channel energy with 90% or greater certainty.

13.1.2. TEST AND MEASUREMENT SYSTEM

CONDUCTED METHOD SYSTEM BLOCK DIAGRAM
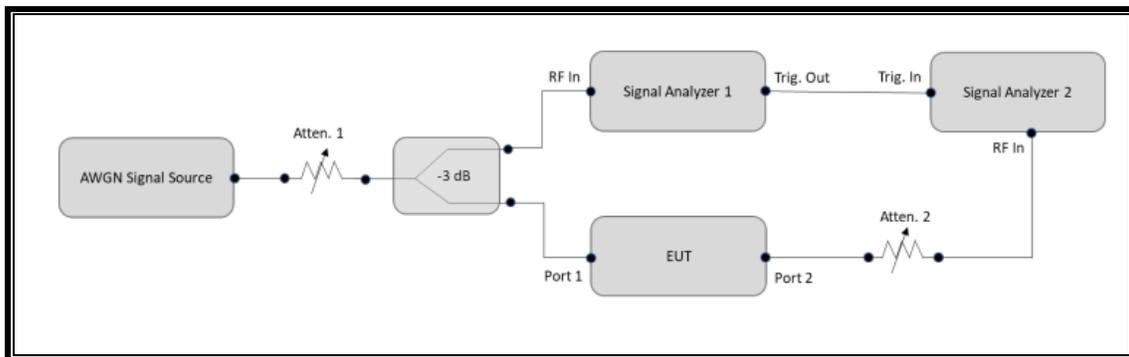
TEST SETTING

1) Configure the EUT to transmit with a constant duty cycle.
2) Set the operating parameters of the EUT including power level, operating frequency, modulation and bandwidth.
3) Set the signal analyzer center frequency to the nominal EEUT channel center frequency. The span range of the signal analyzer shall be between two times and five times the OBW of the EUT. Connect the output port of the EUT to the signal analyzer 2, as shown in Figure 2. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.
4) Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters set at step two.
5) Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
6) Set the AWGN signal power to an extremely low level (more than 20 dB below the -62 dBm threshold). Connect the AWGN signal source, via a 3-dB splitter, to the signal analyzer 1 and the EUT as shown in Figure 2.
7) Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.
8) Monitor the signal analyzer 2 to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.
9) (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.
10) Refer to Table 1 to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step 5, choose a different center frequency for the AWGN signal and repeat the process.

TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	S/N	Next Cal Due
Spectrum Analyzer	Keysight	N9030B	MY60070693	2022-01-03
Spectrum Analyzer	Agilent	N9030A	MY54170614	2022-08-04
Vector Signal Generator	R&S	SMW200A	107161	2022-06-24
Combiner	WEINSCHEL	WA1534	UL001	2022-01-27
Attenuator	WEINSCHEL	WA76-30-21	A015	2022-08-03
Attenuator	PASTERNACK	PE7087-10	A001	2022-08-03
Attenuator	PASTERNACK	PE7087-10	A008	2022-08-03

## SUPPORT EQUIPMENT

The following support equipment was utilized for the DFS tests documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Wireless Access Point	ASUS	GT-AXE11000	M3IAJF200742	MSQ-RTAXJF00
Notebook PC (Controller/Server)	HP	HP EliteDesk 800 G1 TWR	CZC4125J25	DoC

13.2. TEST RESULTS

13.2.1. AWGN Sample signal
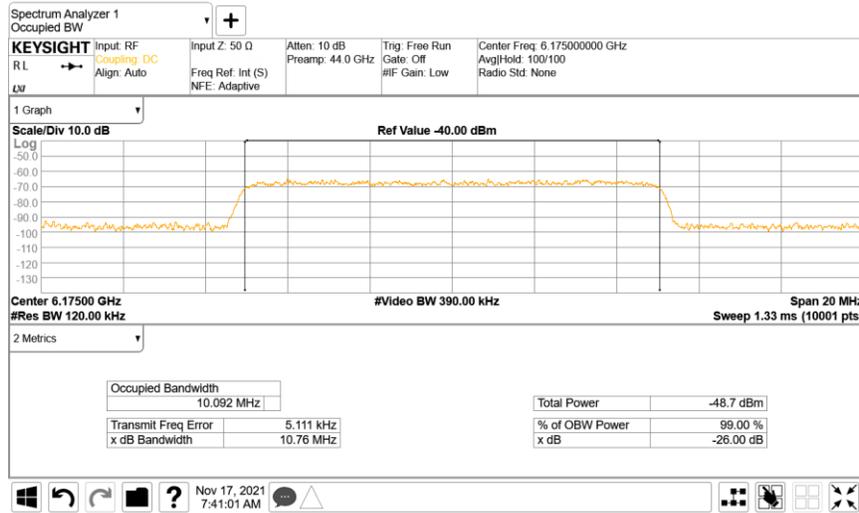
13.2.2. Contention Based Protocol Timing Plot

13.2.3. Contention Based Protocol – Incumbent Detection & Trial Results

Band	Channel	Freq	BW	Inc. Freq	Detection power level	Detection limit	Gain	Detection limit (include Gain)	Margin
5	45	6175	20	6175	-81.80	-62	-4.4	-66.4	-15.40
	47	6185	160	6115	-69.78	-62	-4.4	-66.4	-3.38
				6185	-73.01	-62	-4.4	-66.4	-6.61
				6255	-74.91	-62	-4.4	-66.4	-8.51
6	101	6455	20	6455	-81.74	-62	-4.4	-66.4	-15.34
	111	6505	160	6435	-78.98	-62	-4.4	-66.4	-12.58
				6495	-81.90	-62	-4.4	-66.4	-15.50
				6575	-81.93	-62	-4.4	-66.4	-15.53
7	149	6695	20	6695	-82.90	-62	-4.4	-66.4	-16.50
	143	6665	160	6595	-68.09	-62	-4.4	-66.4	-1.69
				6655	-69.18	-62	-4.4	-66.4	-2.78
				6735	-69.23	-62	-4.4	-66.4	-2.83
8	213	7015	20	7015	-82.87	-62	-6.5	-68.5	-14.37
	207	6985	160	6915	-69.24	-62	-6.5	-68.5	-0.74
				6975	-69.07	-62	-6.5	-68.5	-0.57
				7055	-69.08	-62	-6.5	-68.5	-0.58

Band	Channel	Freq	BW	Inc. Freq	1	2	3	4	5	6	7	8	9	10	Detection Rate(%)
5	45	6175	20	6175	O	O	O	O	O	O	O	O	O	O	100
	47	6185	160	6115	O	O	O	O	O	O	O	O	O	O	100
				6185	O	O	O	O	O	O	O	O	O	O	100
				6255	O	O	O	O	O	O	O	O	O	O	100
6	101	6455	20	6455	O	O	O	O	O	O	O	O	O	O	100
	111	6505	160	6435	O	O	O	O	O	O	O	O	O	O	100
				6495	O	O	O	O	O	O	O	O	O	O	100
				6575	O	O	O	O	O	O	O	O	O	O	100
7	149	6695	20	6695	O	O	O	O	O	O	O	O	O	O	100
	143	6665	160	6595	O	O	O	O	O	O	O	O	O	O	100
				6655	O	O	O	O	O	O	O	O	O	O	100
				6735	O	O	O	O	O	O	O	O	O	O	100
8	213	7015	20	7015	O	O	O	O	O	O	O	O	O	O	100
	207	6985	160	6915	O	O	O	O	O	O	O	O	O	O	100
				6975	O	O	O	O	O	O	O	O	O	O	100
				7055	O	O	O	O	O	O	O	O	O	O	100

END OF TEST REPORT