

FCC PART 90

TEST REPORT

For

Alinco Incorporated, Electronics Division

Yodoyabashi Dai Building 13F, 4-4-9 Koraibashi, Chuo-Ku, Osaka 541-0043, Japan

FCC ID: PH3DR-MD500T

Report Type: Original Report	Product Type: VHF/UHF DUAL BAND TRANSCEIVER
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Report Number:	RSHD201211004-00B
Report Date:	2021-03-09
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Alinco Incorporated, Electronics Division
Tested Model	DR-MD500T
Product Type	VHF/UHF DUAL BAND TRANSCEIVER
Modulation Mode	FM/4FSK
Maximum Output Power(Conducted)	136-174MHz: High: 55W; Low: 5W 400-480MHz: High: 40W; Low: 5W
Operation Frequency	136-174MHz 400-480MHz
Power Supply	DC 13.8V
*Antenna Gain	1.0 dBi

Note*: The Maximum Antenna Gain was provided by manufacturer.

All measurement and test data in this report was gathered from production sample serial number: RSHD201211004-1.(Assigned by the BACL. The EUT supplied by the applicant was received on 2020-12-11)

Objective

This test report is prepared on behalf of *Alinco Incorporated, Electronics Division* in accordance with Part 2 and Part 90 of the Federal Communication Commissions rules.

Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s)

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of federal Regulations Title 47 Part 2, Sub-part J as well as the following individual parts:

Part 90 – Private Land Mobile Radio Service

Applicable Standards: ANSI C63.26-2015.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item	Uncertainty
Occupied Channel Bandwidth	±5%
RF output power, conducted	±0.61dB
Unwanted Emissions, radiated	30MHz~1GHz: 5.91dB 1GHz~6GHz: 4.68dB 6 GHz ~18 GHz: 4.92dB
Unwanted Emissions, conducted	±1.5dB
Temperature	±1.0°C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.26-2015.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The EUT was configured for testing in an engineering mode which was provided by the manufacturer.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

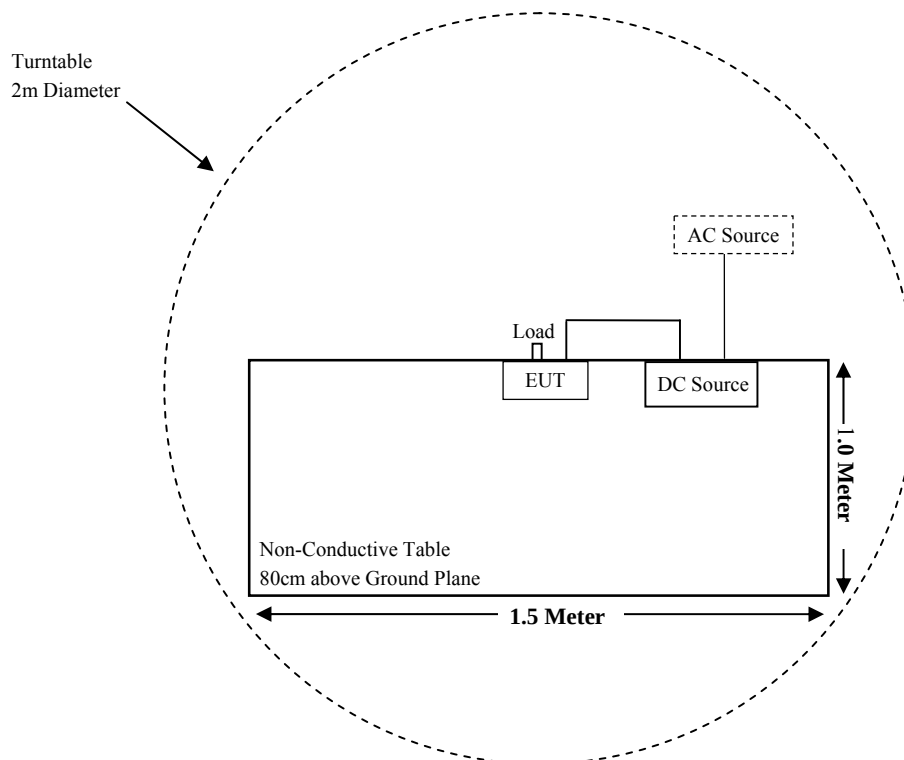
Manufacturer	Description	Model	Serial Number
EAST	DC Source	MCH-303D-II	14070562
N/A	Load	50Ω	N/A

External I/O Cable

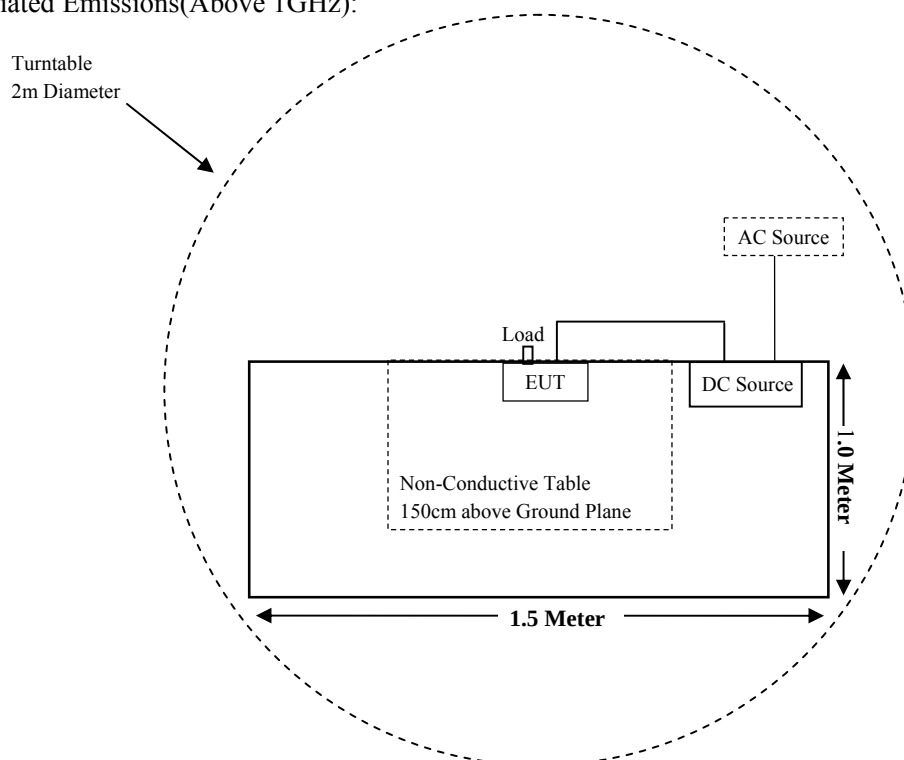
Cable Description	Length (m)	From/Port	To
Power Cable	1.2	EUT	DC Source

Block Diagram of Test Setup

For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§2.1046, §90.205	RF Output Power	Compliant
§2.1047, §90.207	Modulation Characteristic	Compliant
§2.1049, §90.209, §90.210	Occupied Bandwidth & Emission Mask	Compliant
§2.1051, §90.210	Spurious Emission at Antenna Terminal	Compliant
§2.1053, §90.210	Spurious Radiated Emissions	Compliant
§2.1055, §90.213	Frequency Stability	Compliant
§90.214	Transient Frequency Behavior	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test (Chamber 1#)					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2020-11-27	2021-11-26
Sunol Sciences	Broadband Antenna	JB3	A090314-1	2020-08-05	2023-08-04
Sunol Sciences	Bilog antenna	JB3	A060217	2020-11-28	2023-11-27
HP	Signal Generator	N5183A	MY51040755	2020-11-27	2021-11-26
Sonoma Instrunent	Pre-amplifier	310N	171205	2020-08-14	2021-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2020-08-15	2021-08-14
Radiated Emission Test (Chamber 2#)					
HP	Signal Generator	N5183A	MY51040755	2020-11-27	2021-11-26
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2020-04-01	2021-03-31
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2020-07-14	2023-07-13
ETS-LINDGREN	Horn Antenna	3115	6229	2020-01-07	2023-01-06
A.H.Systems,inc	Amplifier	PAM-0118P	512	2020-02-20	2021-02-19
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2020-08-15	2021-08-14
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048/027	2020-11-27	2021-11-26
Narda	Attenuator	30dB	030	2020-08-15	2021-08-14
BACL	Temperature & Humidity Chamber	BTH-150	30023	2020-11-25	2021-11-24
ZHAOXIN	DC Power Supply	RXN-605D	DC002	2020-10-10	2021-10-09
HP	RF communication test SET.	8920B	079	2020-04-01	2021-03-31
Alinco Incorporated, Electronics Division	RF Cable	Alinco Incorporated, Electronics Division C01	C01	Each Time	/

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §2.1046, §90.205 - RF OUTPUT POWER

Applicable Standard

FCC §2.1046 and §90.205

Test Procedure

Conducted RF Output Power:

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

Spectrum Analyzer Setting:

RB/W	Video B/W
100 kHz	300 kHz

Test Data**Environmental Conditions**

Temperature:	23.1 °C
Relative Humidity:	55 %
ATM Pressure:	101.2 kPa

The testing was performed by CK Huang on 2021-02-02.

Test Result: Compliant.

Test Mode: Transmitting

Band (MHz)	Modulation Mode	Channel Separation (kHz)	Frequency (MHz)	Power Level	Output Power (dBm)	Output Power (W)
136-174	Analog	12.5	136.025	High	46.97	49.77
				Lower	37.12	5.15
		12.5	155.000	High	47.09	51.17
				Lower	37.06	5.08
		12.5	173.975	High	47.02	50.35
				Lower	37.08	5.11
	Digital	12.5	136.025	High	46.99	50.00
				Lower	37.04	5.06
		12.5	155.000	High	47.01	50.23
				Lower	37.06	5.08
400-480	Analog	12.5	400.025	High	45.92	39.08
				Lower	36.88	4.88
		12.5	440.000	High	45.89	38.82
				Lower	36.91	4.91
		12.5	479.975	High	46.01	39.90
				Lower	37.00	5.01
	Digital	12.5	400.025	High	46.68	46.56
				Lower	36.91	4.91
		12.5	440.000	High	46.62	45.92
				Lower	36.89	4.89
		12.5	479.975	High	46.65	46.24
				Lower	37.01	5.02

Note: For 136-174MHz, the high rated power level is 55W and low rated power level is 5W.

For 400-480MHz, the high rated power level is 40W and low rated power level is 5W.

FCC §2.1047 - MODULATION CHARACTERISTIC

Applicable Standard

FCC §2.1047

(a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. for equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.

(b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

Test Procedure

Test Method: ANSI C63.26:2015

Test Data

Environmental Conditions

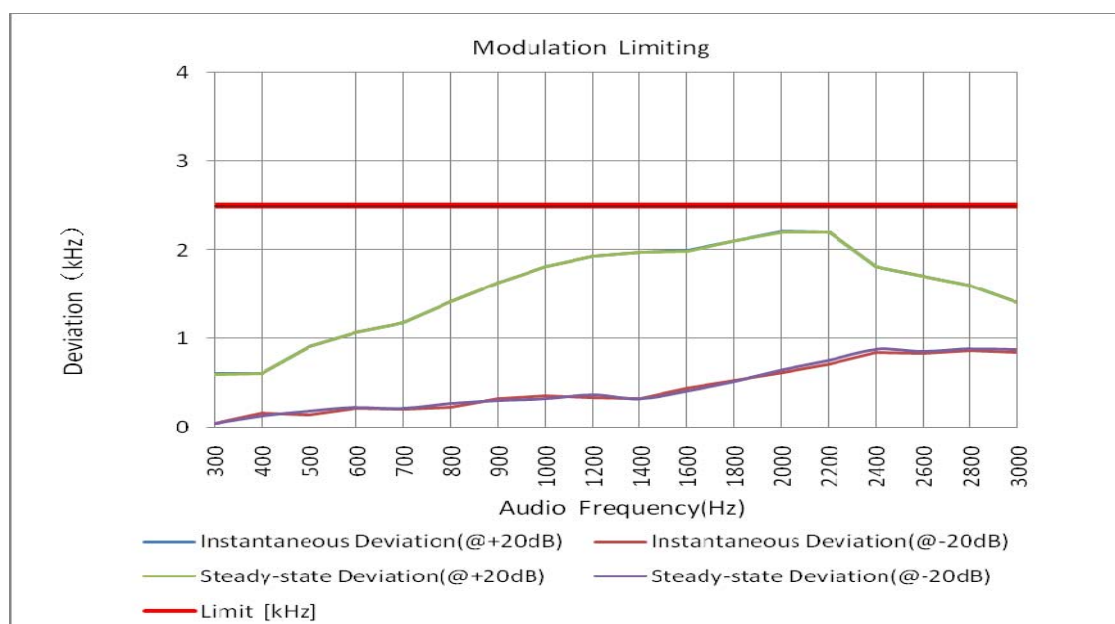
Temperature:	23.5 °C
Relative Humidity:	55 %
ATM Pressure:	101.3 kPa

The testing was performed by CK Huang on 2021-02-07.

Test Mode: Transmitting

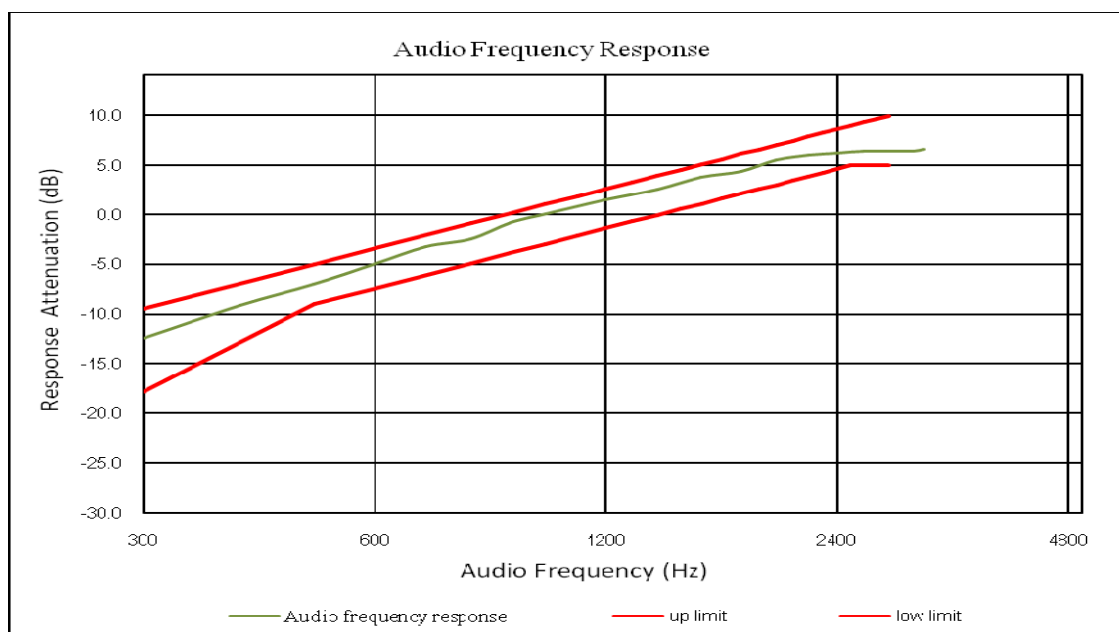
136-174 MHz Band:**MODULATION LIMITING - High Power, 12.5kHz**

Carrier Frequency: 136.025MHz					
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit (kHz)
	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)	
300	0.609	0.044	0.601	0.042	2.5
400	0.602	0.165	0.606	0.133	2.5
500	0.908	0.140	0.906	0.189	2.5
600	1.067	0.220	1.069	0.227	2.5
700	1.183	0.204	1.180	0.215	2.5
800	1.414	0.227	1.417	0.274	2.5
900	1.627	0.323	1.629	0.308	2.5
1000	1.815	0.357	1.814	0.324	2.5
1200	1.932	0.337	1.935	0.373	2.5
1400	1.976	0.324	1.980	0.328	2.5
1600	1.995	0.448	1.993	0.415	2.5
1800	2.108	0.535	2.105	0.524	2.5
2000	2.210	0.619	2.208	0.648	2.5
2200	2.208	0.714	2.206	0.762	2.5
2400	1.811	0.846	1.814	0.880	2.5
2600	1.709	0.833	1.709	0.855	2.5
2800	1.604	0.865	1.605	0.887	2.5
3000	1.402	0.849	1.406	0.875	2.5



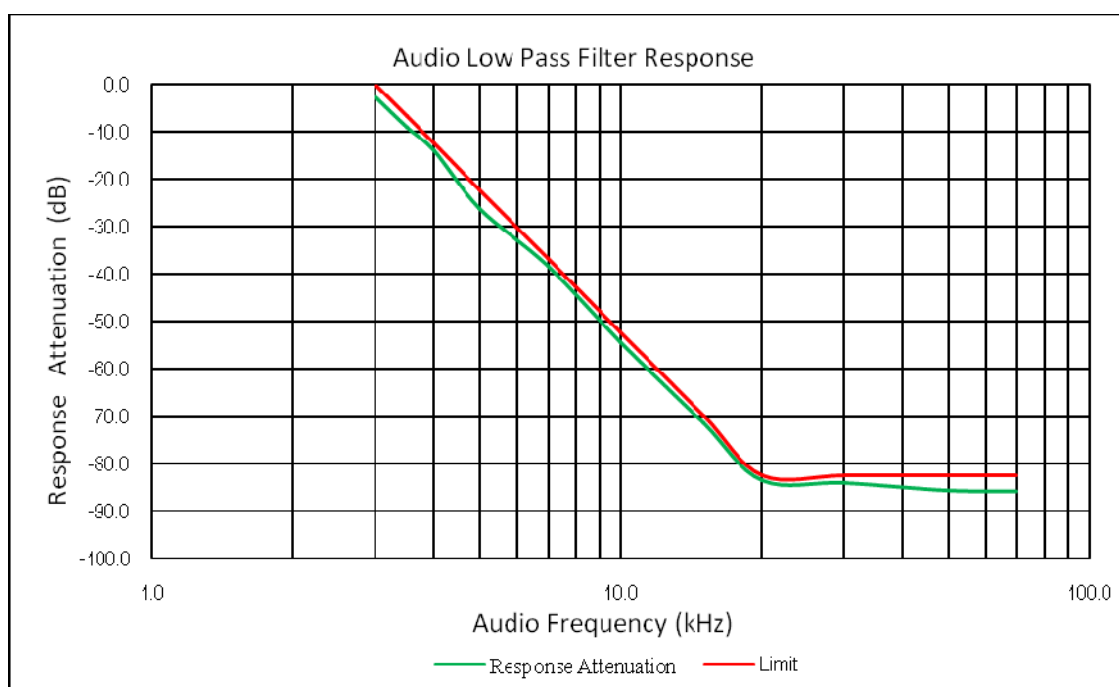
Audio Frequency Response - High Power, 12.5kHz

Carrier Frequency: 136.025MHz	
Audio Frequency (Hz)	Response Attenuation (dB)
300	-12.36
400	-9.12
500	-7.02
600	-4.96
700	-3.22
800	-2.46
900	-0.89
1000	0.00
1200	1.46
1400	2.56
1600	3.77
1800	4.39
2000	5.46
2200	5.96
2400	6.22
2600	6.34
2800	6.35
3000	6.39
3125	6.55



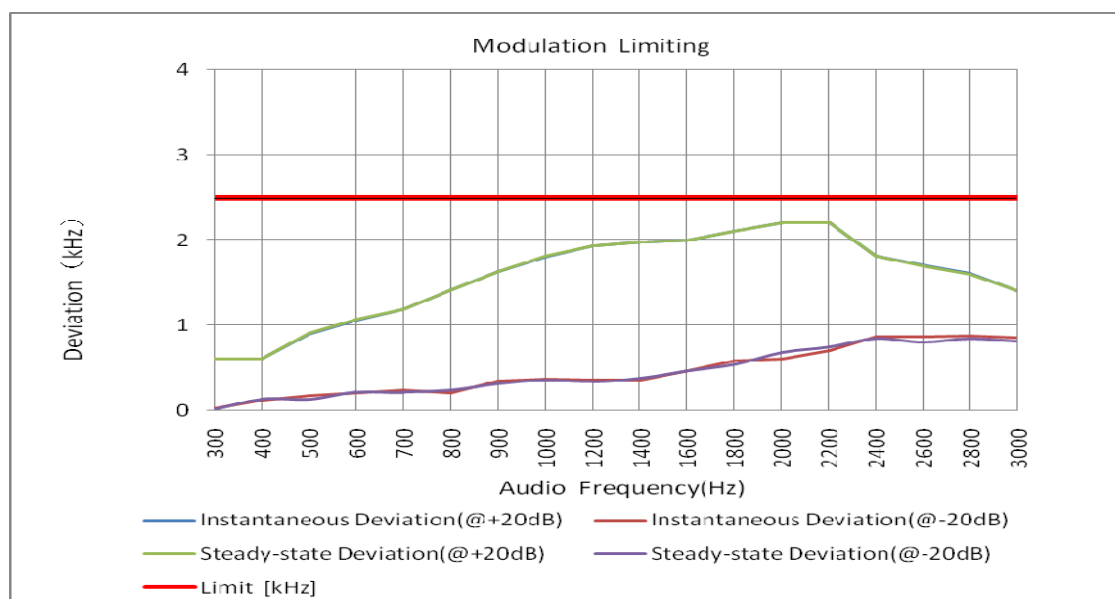
Audio Low Pass Filter Response - High Power,12.5kHz

Carrier Frequency: 136.025MHz		
Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-2.6	0
3.5	-9.1	-6.7
4.0	-14.1	-12.5
5.0	-26.1	-22.2
7.0	-38.4	-36.8
10.0	-54.3	-52.3
15.0	-71.6	-69.9
20.0	-83.6	-82.5
30.0	-84.1	-82.5
50.0	-85.7	-82.5
70.0	-85.9	-82.5



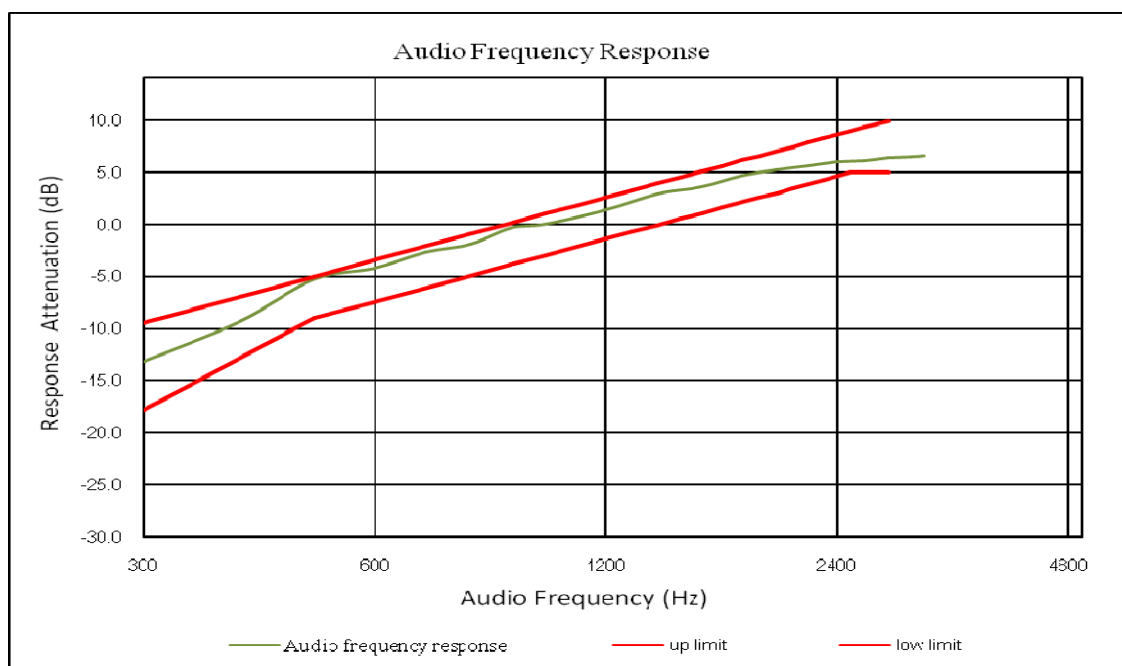
MODULATION LIMITING - High Power, 12.5kHz

Carrier Frequency: 155.000MHz					
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit (kHz)
	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)	
300	0.604	0.029	0.605	0.014	2.5
400	0.607	0.124	0.609	0.137	2.5
500	0.902	0.176	0.909	0.131	2.5
600	1.061	0.203	1.067	0.221	2.5
700	1.187	0.241	1.185	0.216	2.5
800	1.414	0.206	1.411	0.241	2.5
900	1.627	0.347	1.627	0.318	2.5
1000	1.810	0.375	1.812	0.356	2.5
1200	1.937	0.354	1.936	0.340	2.5
1400	1.973	0.359	1.975	0.376	2.5
1600	1.997	0.465	1.999	0.462	2.5
1800	2.105	0.583	2.109	0.543	2.5
2000	2.206	0.607	2.201	0.682	2.5
2200	2.208	0.709	2.208	0.743	2.5
2400	1.812	0.862	1.817	0.849	2.5
2600	1.705	0.867	1.702	0.804	2.5
2800	1.608	0.879	1.601	0.843	2.5
3000	1.409	0.854	1.403	0.807	2.5



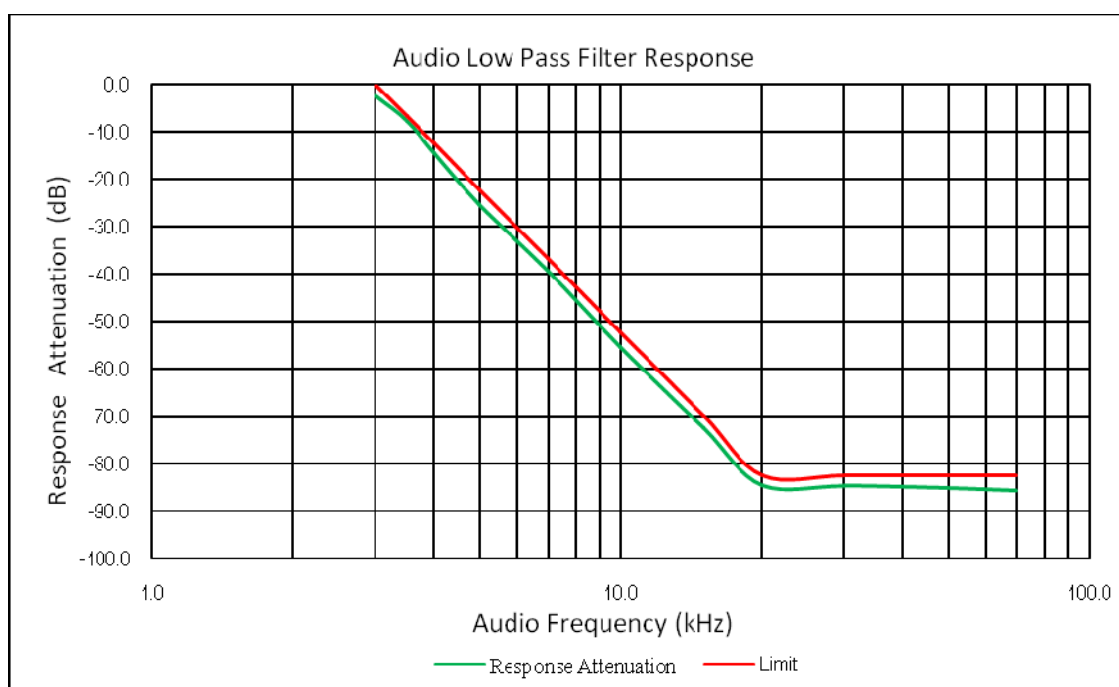
Audio Frequency Response - High Power, 12.5kHz

Carrier Frequency: 155.000MHz	
Audio Frequency (Hz)	Response Attenuation (dB)
300	-13.22
400	-9.36
500	-5.30
600	-4.18
700	-2.66
800	-1.89
900	-0.34
1000	0.00
1200	1.34
1400	2.95
1600	3.55
1800	4.66
2000	5.24
2200	5.64
2400	6.01
2600	6.13
2800	6.33
3000	6.49
3125	6.58



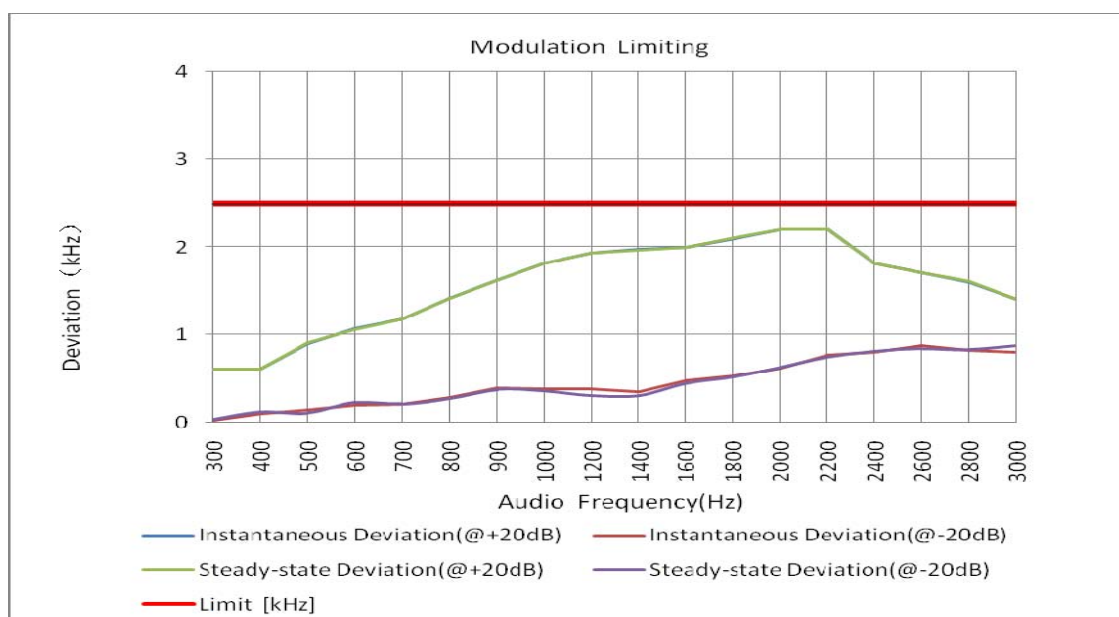
Audio Low Pass Filter Response - High Power,12.5kHz

Carrier Frequency: 155.000MHz		
Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-2.4	0
3.5	-7.6	-6.7
4.0	-14.6	-12.5
5.0	-25.3	-22.2
7.0	-39.4	-36.8
10.0	-55.4	-52.3
15.0	-72.6	-69.9
20.0	-84.6	-82.5
30.0	-84.7	-82.5
50.0	-85.1	-82.5
70.0	-85.6	-82.5



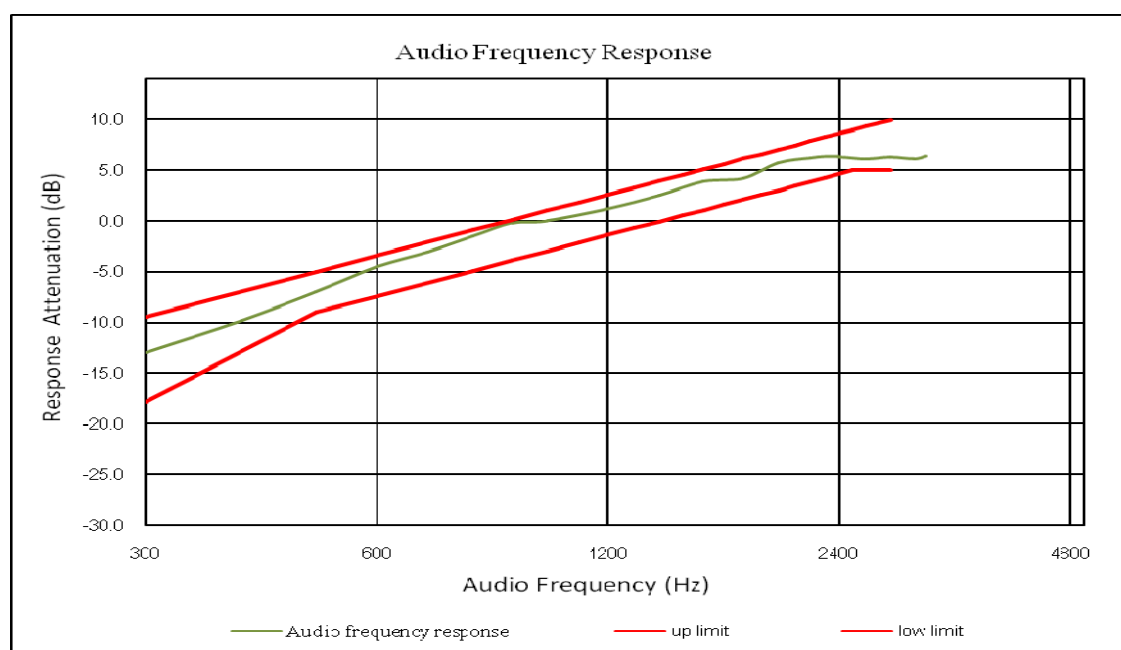
MODULATION LIMITING - High Power, 12.5kHz

Carrier Frequency: 173.975MHz					
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit (kHz)
	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)	
300	0.606	0.030	0.603	0.041	2.5
400	0.610	0.103	0.605	0.126	2.5
500	0.902	0.139	0.909	0.112	2.5
600	1.068	0.201	1.063	0.228	2.5
700	1.183	0.213	1.181	0.213	2.5
800	1.420	0.282	1.419	0.271	2.5
900	1.623	0.390	1.626	0.373	2.5
1000	1.813	0.379	1.818	0.355	2.5
1200	1.938	0.378	1.933	0.304	2.5
1400	1.980	0.353	1.971	0.303	2.5
1600	1.995	0.480	1.994	0.450	2.5
1800	2.101	0.529	2.104	0.516	2.5
2000	2.207	0.622	2.202	0.633	2.5
2200	2.207	0.766	2.201	0.743	2.5
2400	1.812	0.804	1.815	0.811	2.5
2600	1.705	0.880	1.705	0.840	2.5
2800	1.601	0.826	1.607	0.829	2.5
3000	1.406	0.801	1.404	0.876	2.5



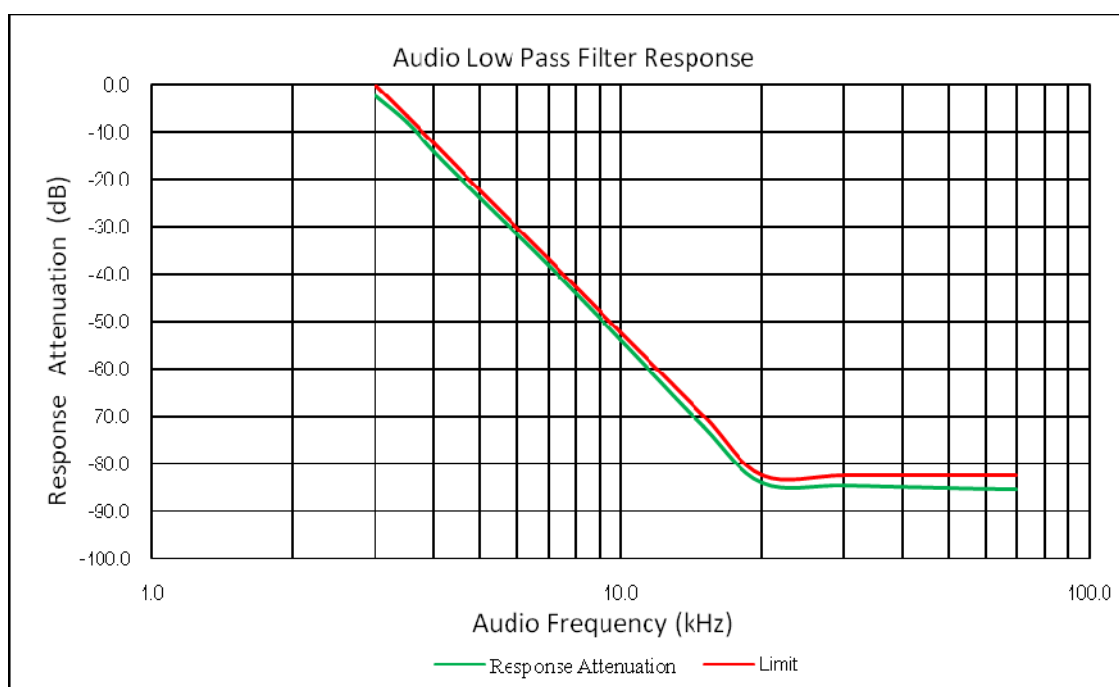
Audio Frequency Response - High Power, 12.5kHz

Carrier Frequency: 173.975MHz	
Audio Frequency (Hz)	Response Attenuation (dB)
300	-13.02
400	-9.76
500	-7.02
600	-4.55
700	-3.02
800	-1.56
900	-0.22
1000	0.00
1200	1.22
1400	2.51
1600	3.85
1800	4.17
2000	5.69
2200	6.22
2400	6.31
2600	6.08
2800	6.25
3000	6.12
3125	6.37



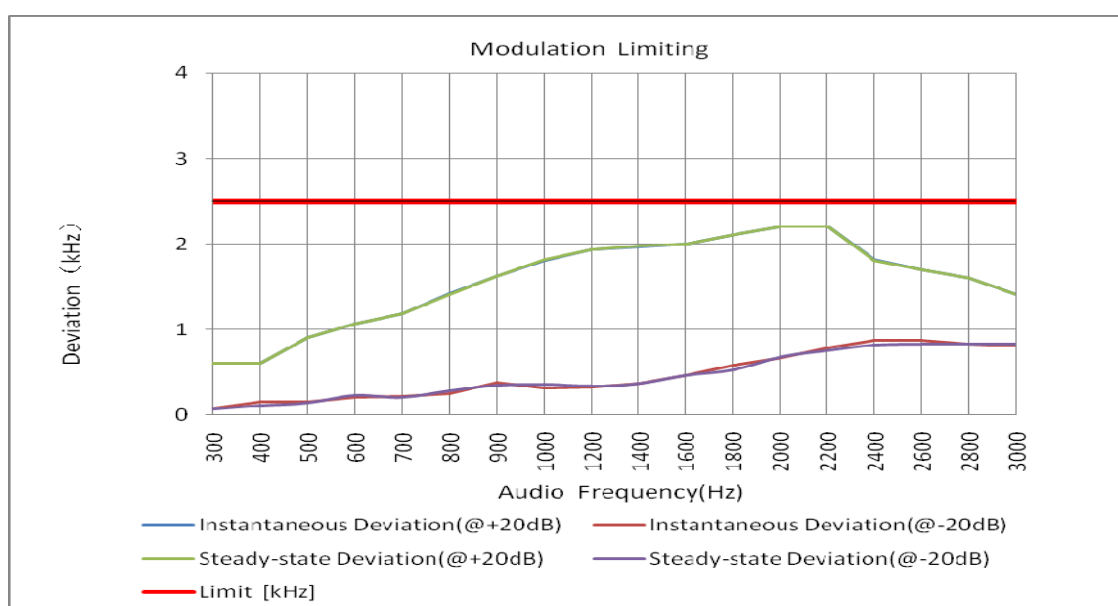
Audio Low Pass Filter Response - High Power,12.5kHz

Carrier Frequency: 173.975MHz		
Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-2.4	0
3.5	-7.9	-6.7
4.0	-14.2	-12.5
5.0	-23.9	-22.2
7.0	-38.1	-36.8
10.0	-53.9	-52.3
15.0	-72.4	-69.9
20.0	-84.1	-82.5
30.0	-84.6	-82.5
50.0	-85.2	-82.5
70.0	-85.4	-82.5



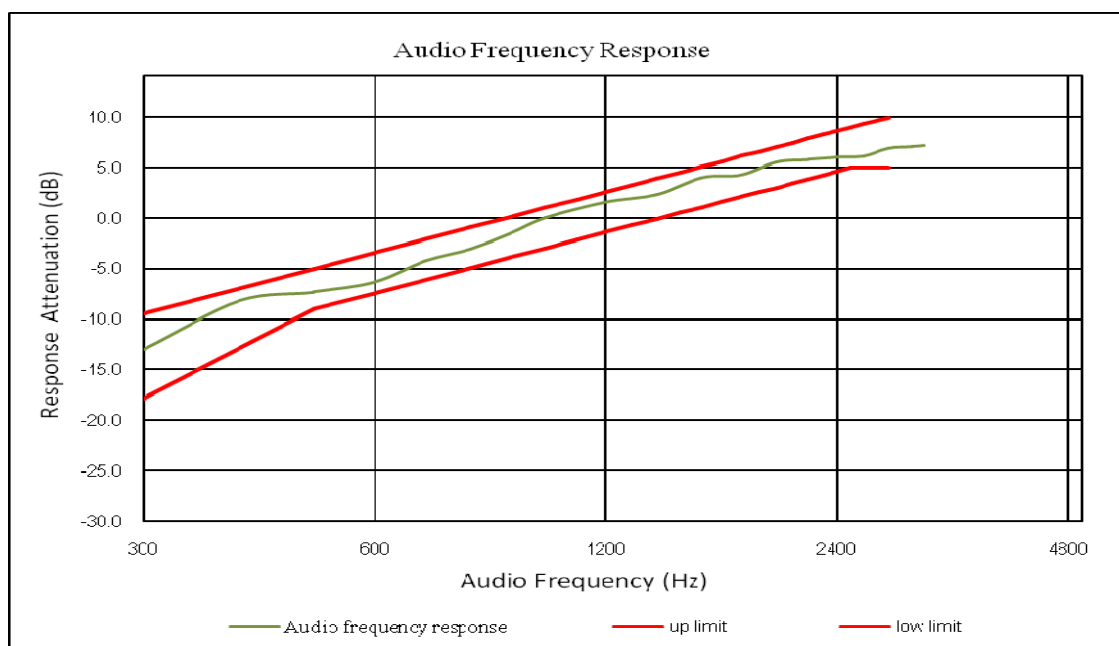
400-480 MHz Band:**MODULATION LIMITING - High Power, 12.5kHz**

Carrier Frequency: 400.025MHz					
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit (kHz)
	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)	
300	0.607	0.074	0.605	0.069	2.5
400	0.607	0.158	0.601	0.109	2.5
500	0.908	0.158	0.906	0.138	2.5
600	1.065	0.204	1.061	0.229	2.5
700	1.182	0.213	1.183	0.205	2.5
800	1.419	0.249	1.412	0.284	2.5
900	1.626	0.383	1.624	0.342	2.5
1000	1.812	0.316	1.819	0.352	2.5
1200	1.932	0.330	1.937	0.341	2.5
1400	1.971	0.369	1.976	0.365	2.5
1600	1.995	0.466	1.995	0.462	2.5
1800	2.109	0.581	2.109	0.524	2.5
2000	2.201	0.671	2.202	0.680	2.5
2200	2.200	0.787	2.205	0.757	2.5
2400	1.819	0.871	1.812	0.814	2.5
2600	1.701	0.871	1.701	0.826	2.5
2800	1.601	0.830	1.607	0.831	2.5
3000	1.406	0.808	1.409	0.828	2.5



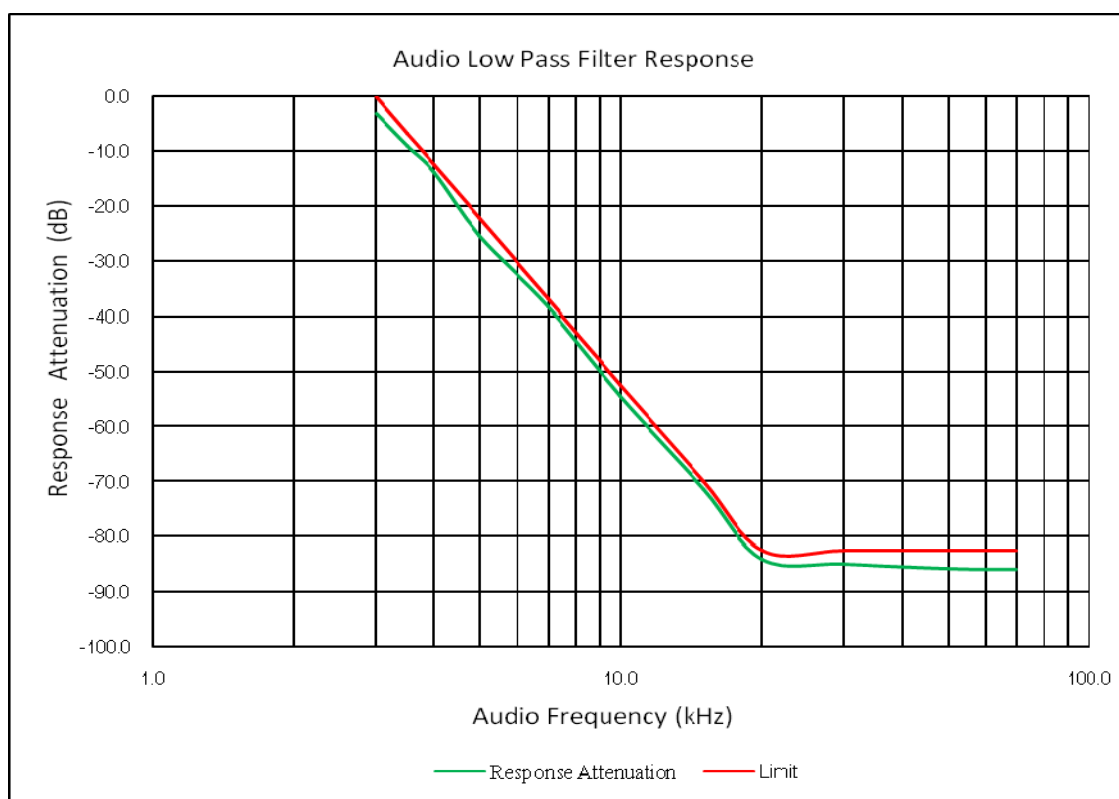
Audio Frequency Response - High Power, 12.5kHz

Carrier Frequency: 400.025MHz	
Audio Frequency (Hz)	Response Attenuation (dB)
300	-13.01
400	-8.21
500	-7.33
600	-6.38
700	-4.22
800	-3.02
900	-1.53
1000	0.00
1200	1.56
1400	2.33
1600	4.01
1800	4.26
2000	5.55
2200	5.77
2400	6.01
2600	6.12
2800	6.89
3000	7.02
3125	7.13



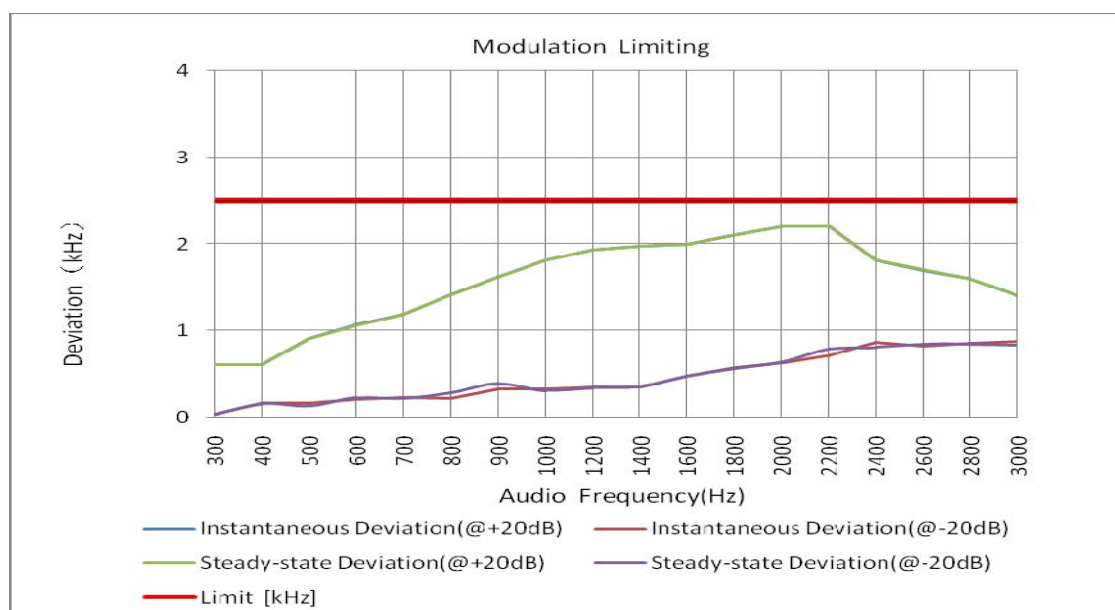
Audio Low Pass Filter Response - High Power,12.5kHz

Carrier Frequency: 400.025MHz		
Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-3.1	0
3.5	-9.0	-6.7
4.0	-13.9	-12.5
5.0	-25.4	-22.2
7.0	-38.2	-36.8
10.0	-54.4	-52.3
15.0	-71.3	-69.9
20.0	-84.1	-82.5
30.0	-84.9	-82.5
50.0	-85.8	-82.5
70.0	-85.9	-82.5



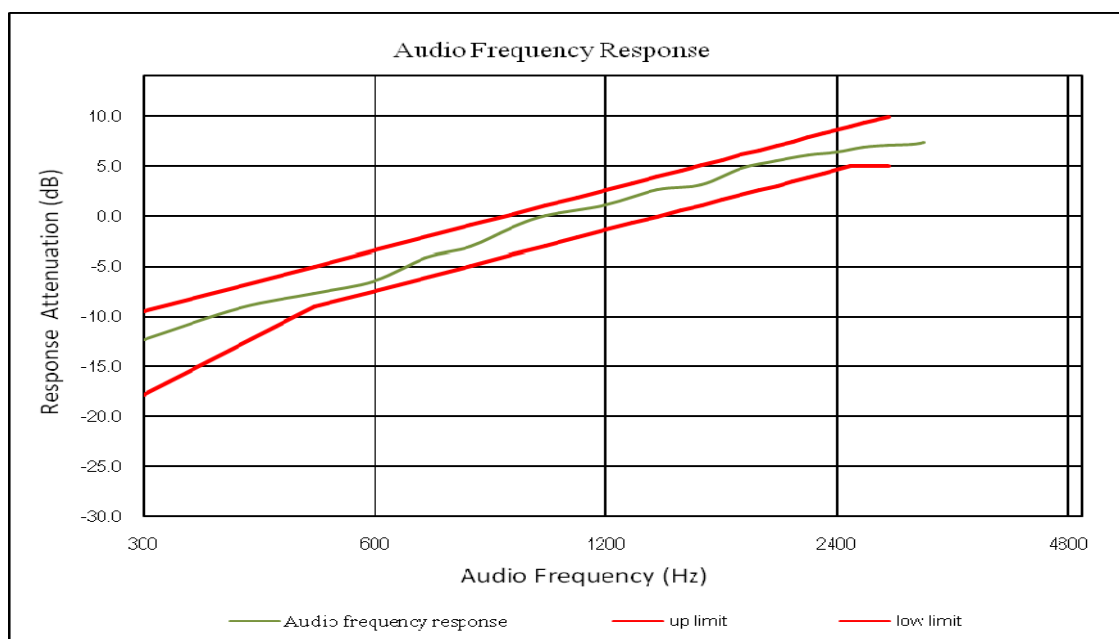
MODULATION LIMITING - High Power, 12.5kHz

Carrier Frequency: 440.000MHz					
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit (kHz)
	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)	
300	0.607	0.035	0.607	0.037	2.5
400	0.604	0.160	0.602	0.157	2.5
500	0.908	0.170	0.905	0.133	2.5
600	1.068	0.209	1.061	0.225	2.5
700	1.186	0.225	1.185	0.224	2.5
800	1.412	0.216	1.411	0.288	2.5
900	1.625	0.325	1.624	0.388	2.5
1000	1.816	0.322	1.817	0.310	2.5
1200	1.938	0.344	1.936	0.343	2.5
1400	1.978	0.349	1.977	0.354	2.5
1600	1.994	0.473	2.000	0.477	2.5
1800	2.106	0.572	2.104	0.565	2.5
2000	2.204	0.624	2.202	0.639	2.5
2200	2.202	0.716	2.206	0.788	2.5
2400	1.811	0.868	1.815	0.807	2.5
2600	1.702	0.819	1.703	0.845	2.5
2800	1.605	0.859	1.601	0.846	2.5
3000	1.404	0.872	1.405	0.830	2.5



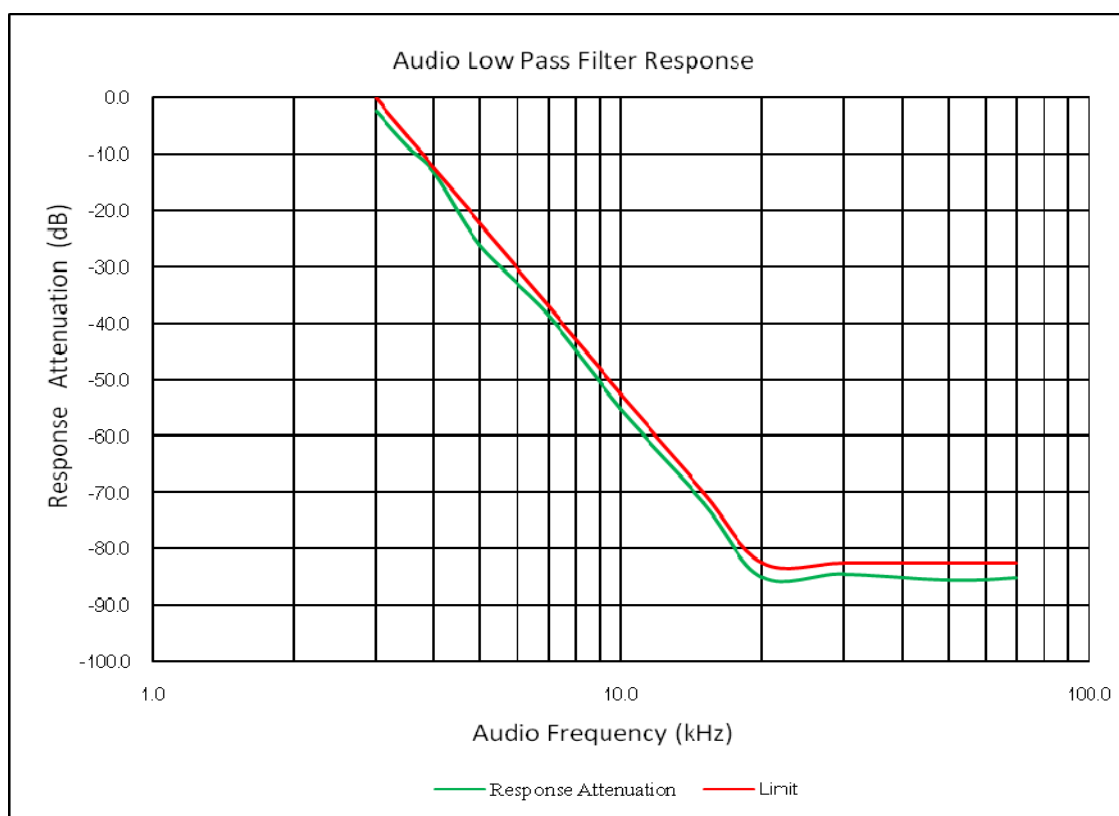
Audio Frequency Response - High Power, 12.5kHz

Carrier Frequency: 440.000MHz	
Audio Frequency (Hz)	Response Attenuation (dB)
300	-12.33
400	-9.12
500	-7.66
600	-6.45
700	-4.12
800	-3.02
900	-1.22
1000	0.00
1200	1.12
1400	2.63
1600	3.13
1800	4.76
2000	5.46
2200	6.12
2400	6.39
2600	6.87
2800	7.01
3000	7.12
3125	7.33



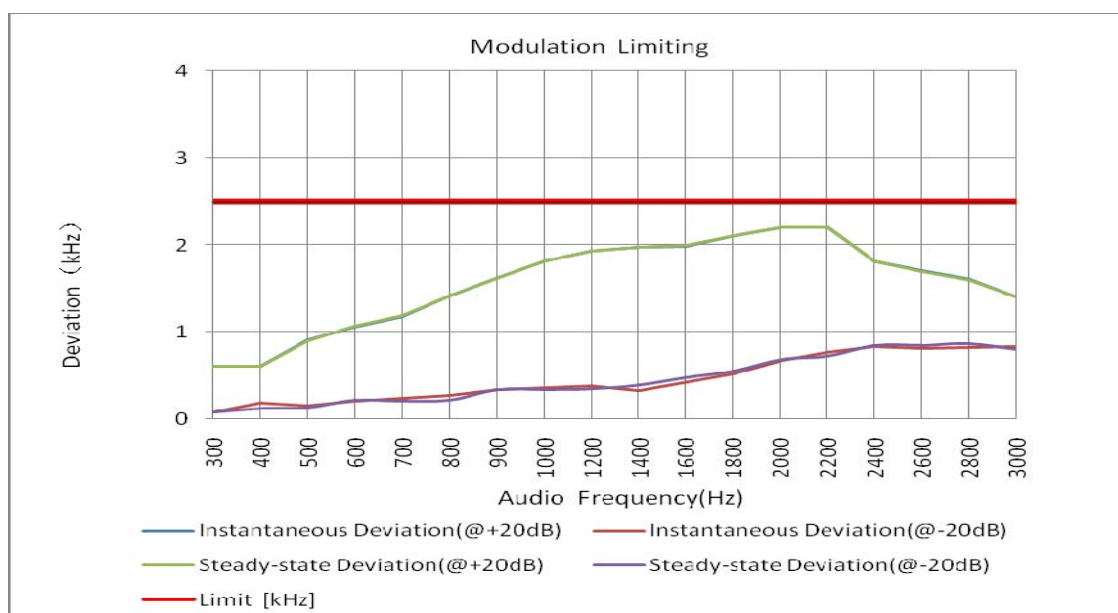
Audio Low Pass Filter Response - High Power,12.5kHz

Carrier Frequency: 440.000MHz		
Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-2.2	0
3.5	-8.6	-6.7
4.0	-13.3	-12.5
5.0	-25.9	-22.2
7.0	-38.5	-36.8
10.0	-55.0	-52.3
15.0	-71.8	-69.9
20.0	-85	-82.5
30.0	-84.4	-82.5
50.0	-85.5	-82.5
70.0	-85.2	-82.5



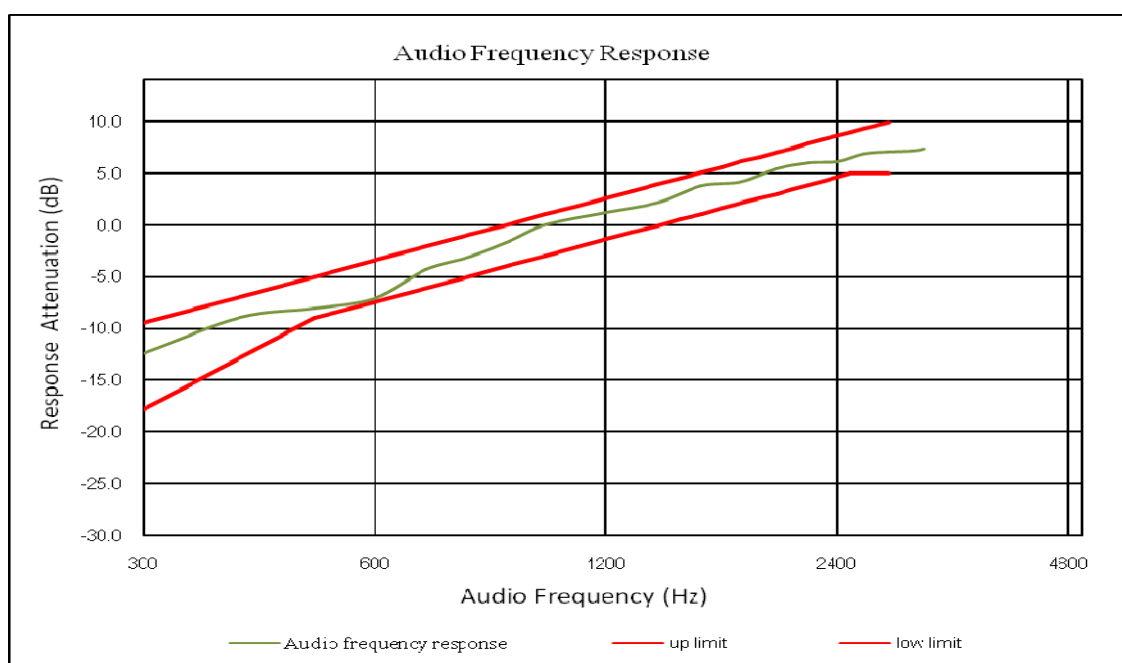
MODULATION LIMITING - High Power, 12.5kHz

Carrier Frequency: 479.975MHz					
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit (kHz)
	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)	
300	0.606	0.074	0.609	0.081	2.5
400	0.607	0.190	0.605	0.121	2.5
500	0.909	0.150	0.901	0.134	2.5
600	1.064	0.203	1.066	0.217	2.5
700	1.180	0.239	1.189	0.209	2.5
800	1.417	0.277	1.412	0.219	2.5
900	1.625	0.342	1.620	0.341	2.5
1000	1.812	0.357	1.816	0.343	2.5
1200	1.935	0.385	1.930	0.349	2.5
1400	1.973	0.322	1.973	0.388	2.5
1600	1.991	0.420	1.997	0.480	2.5
1800	2.106	0.516	2.108	0.549	2.5
2000	2.209	0.675	2.202	0.688	2.5
2200	2.205	0.767	2.201	0.722	2.5
2400	1.813	0.830	1.816	0.844	2.5
2600	1.709	0.815	1.702	0.848	2.5
2800	1.606	0.825	1.601	0.871	2.5
3000	1.401	0.835	1.401	0.801	2.5



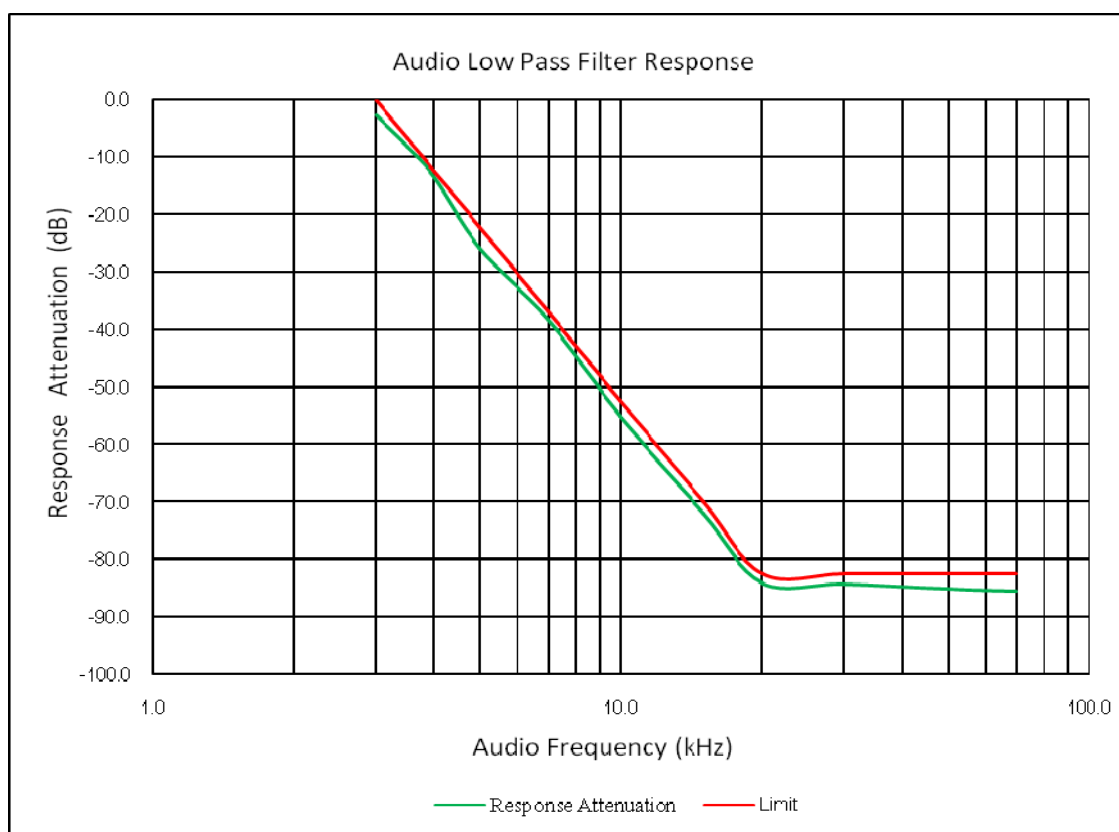
Audio Frequency Response - High Power, 12.5kHz

Carrier Frequency: 479.975MHz	
Audio Frequency (Hz)	Response Attenuation (dB)
300	-12.36
400	-8.98
500	-8.12
600	-7.12
700	-4.33
800	-3.02
900	-1.52
1000	0.00
1200	1.22
1400	2.12
1600	3.76
1800	4.13
2000	5.41
2200	6.01
2400	6.13
2600	6.85
2800	7.02
3000	7.12
3125	7.33



Audio Low Pass Filter Response - High Power,12.5kHz

Carrier Frequency: 479.975MHz		
Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-2.6	0
3.5	-8.1	-6.7
4.0	-13.5	-12.5
5.0	-25.8	-22.2
7.0	-38.2	-36.8
10.0	-55.0	-52.3
15.0	-72.0	-69.9
20.0	-84.1	-82.5
30.0	-84.2	-82.5
50.0	-85.2	-82.5
70.0	-85.5	-82.5



FCC §2.1049, §90.209, §90.210 - OCCUPIED BANDWIDTH

Applicable Standard

FCC §2.1049, §90.209 and §90.210.

Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 100 Hz or 300 Hz and the spectrum was recorded in the frequency band.

Test Data**Environmental Conditions**

Temperature:	22.5-23.1 °C
Relative Humidity:	50-55 %
ATM Pressure:	101.5-102.1 kPa

The testing was performed by CK Huang from 2021-02-03 to 2021-03-08.

Test Mode: Transmitting

Modulation Mode	fc (MHz)	Channel Separation (kHz)	Power Level	99% Occupied Bandwidth (kHz)	26dB Bandwidth (kHz)
Analog	136.025	12.5	High	9.820	10.220
			Low	9.820	10.220
	155.000	12.5	High	9.820	10.220
			Low	9.820	10.220
	173.975	12.5	High	9.820	10.120
			Low	9.820	10.220
	400.025	12.5	High	9.820	10.220
			Low	9.820	10.220
	440.000	12.5	High	9.820	10.220
			Low	9.820	10.220
	479.975	12.5	High	9.920	10.220
			Low	9.820	10.220
Digital	136.025	12.5	High	7.315	9.619
			Low	6.814	9.018
	155.000	12.5	High	7.415	9.719
			Low	7.315	9.519
	173.975	12.5	High	7.315	10.120
			Low	7.415	9.519
	400.025	12.5	High	7.214	9.319
			Low	7.315	9.519
	440.000	12.5	High	7.214	9.519
			Low	7.415	9.719
	479.975	12.5	High	7.014	9.319
			Low	7.114	9.319

Note: Emission bandwidth was based on calculation method instead of measurement.

For FM Mode (Channel Spacing: 12.5 kHz)

Emission Designator 11K0F3E

In this case, the maximum modulating frequency is 3.0 kHz with a 2.5 kHz deviation.

$BW = 2(M+D) = 2*(3.0 \text{ kHz} + 2.5 \text{ kHz}) = 11 \text{ kHz} = 11K0$

F3E portion of the designator represents an FM voice transmission

Therefore, the entire designator for 12.5 kHz channel spacing FM mode is 11K0F3E.

For Digital Mode (Channel Spacing: 12.5 kHz)

Emission Designator 7K60F1D and 7K60F1E

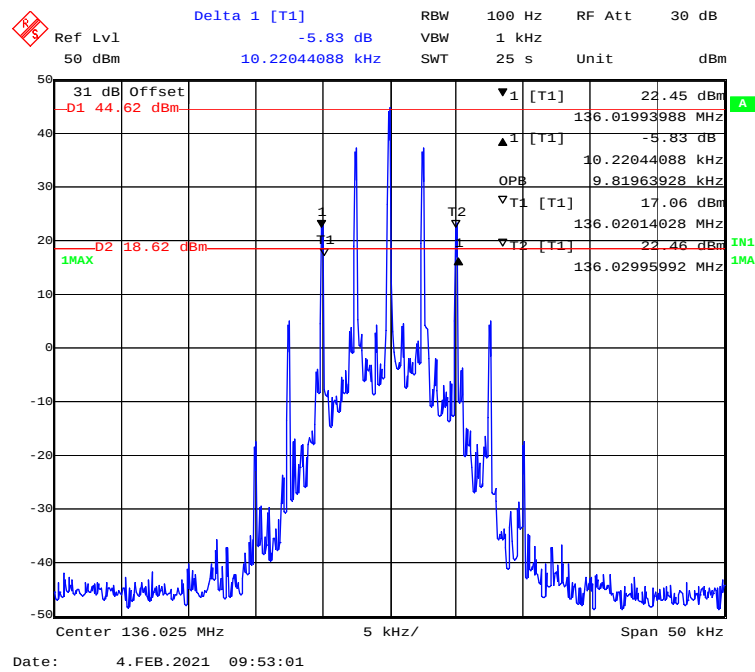
The 99% energy rule (title 47CFR 2.1049) was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.60 kHz. The emission mask was obtained from 47CFR 90.210(d).

F1D and F1E portion of the designator indicates digital information.

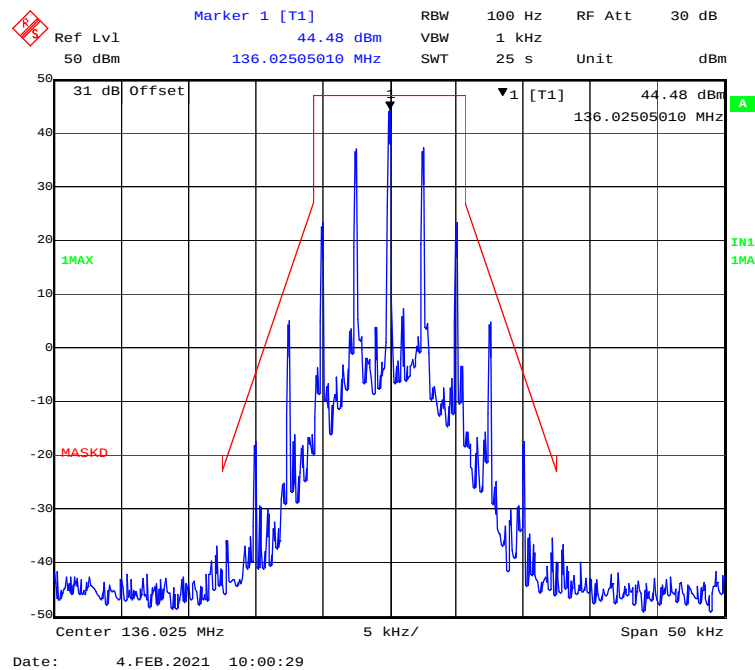
Therefore, the entire designator for 12.5 kHz channel spacing digital mode is 7K60F1D and 7K60F1E.

For Analog Mode:

Frequency 136.025 MHz: 99% Occupied & 26 dB Bandwidth-High Power-12.5kHz



Emission Mask D



Delta 1 [T1]

Ref Lvl -4.17 dB

RBW 100 Hz RF Att 20 dB

VBW 1 kHz

SWT 25 s Unit dBm

40 dBm

31 dB Offset

D1 35.87 dBm

D2 9.87 dBm

1MAX

▼1 [T1] 13.19 dBm

▲1 [T1] -4.17 dB

OPB 9.81963928 kHz

▽T1 [T1] 9.13 dBm

▽T2 [T1] 13.20 dBm

136.01993988 MHz

136.02014028 MHz

136.02995992 MHz

Center 136.025 MHz

5 kHz/

Span 50 kHz

Date: 4.FEB.2021 10:50:45

Marker 1 [T1]

Ref Lvl 35.15 dBm RBW 100 Hz RF Att 20 dB

40 dBm 136.02505010 MHz VBW 1 kHz Unit dBm

SWT 25 s

31 dB Offset

LIMIT CHECK : PASSED

35.15 dBm

136.02505010 MHz

1MAX

MSKDD

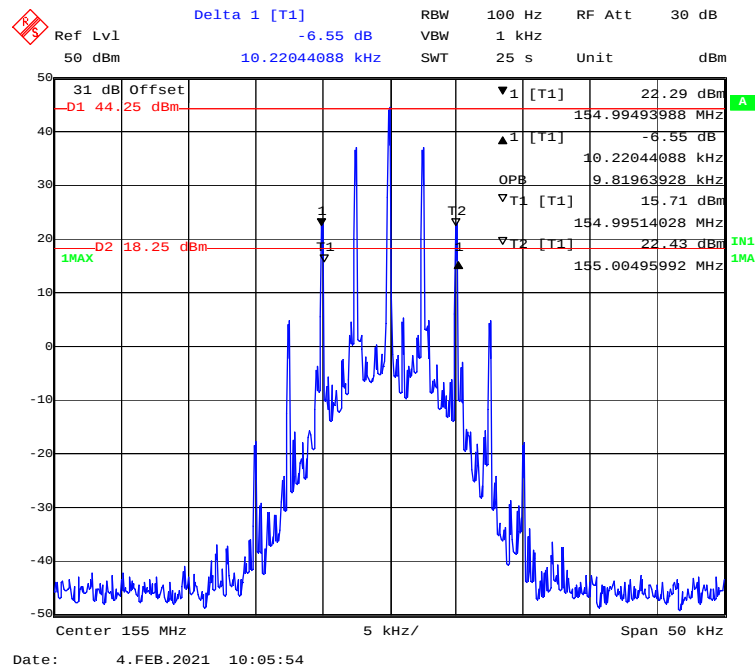
Center 136.025 MHz

5 kHz/

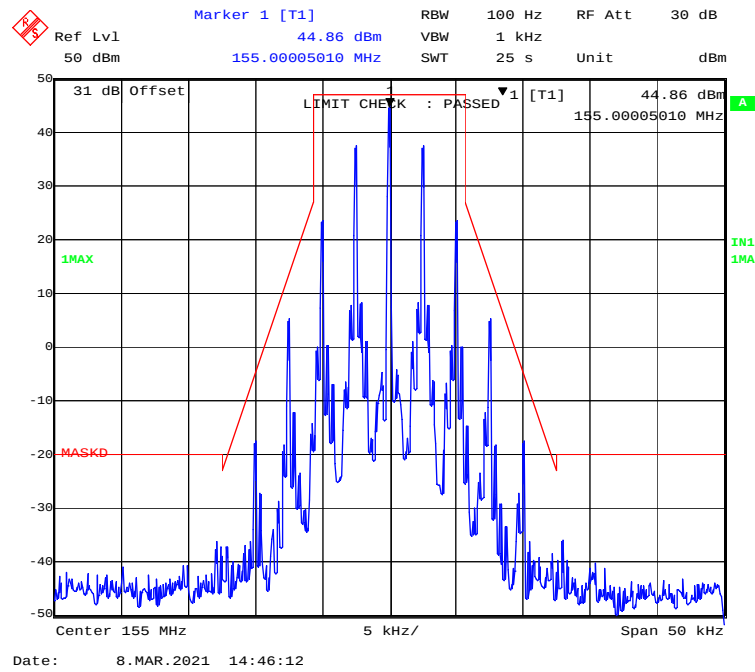
Span 50 kHz

Date: 8.MAR.2021 14:37:57

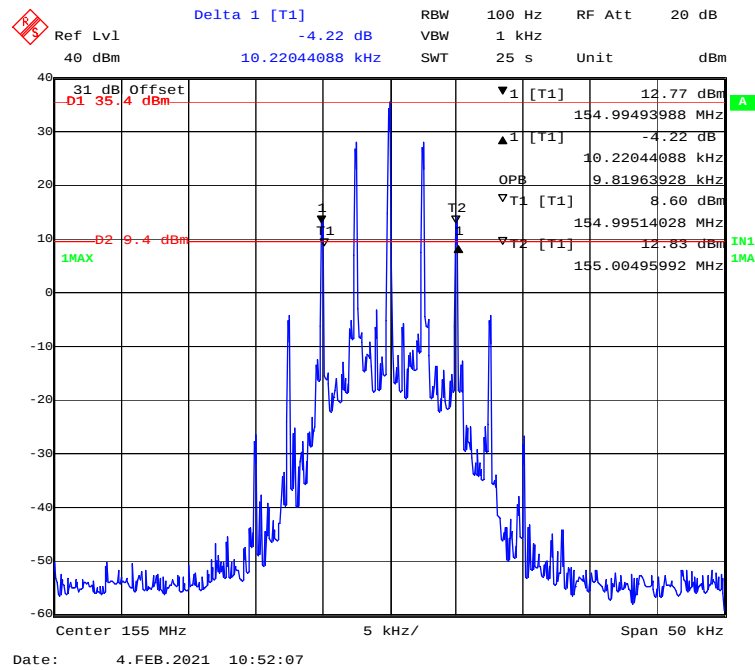
Frequency 155.000 MHz: 99% Occupied & 26 dB Bandwidth-High Power-12.5kHz



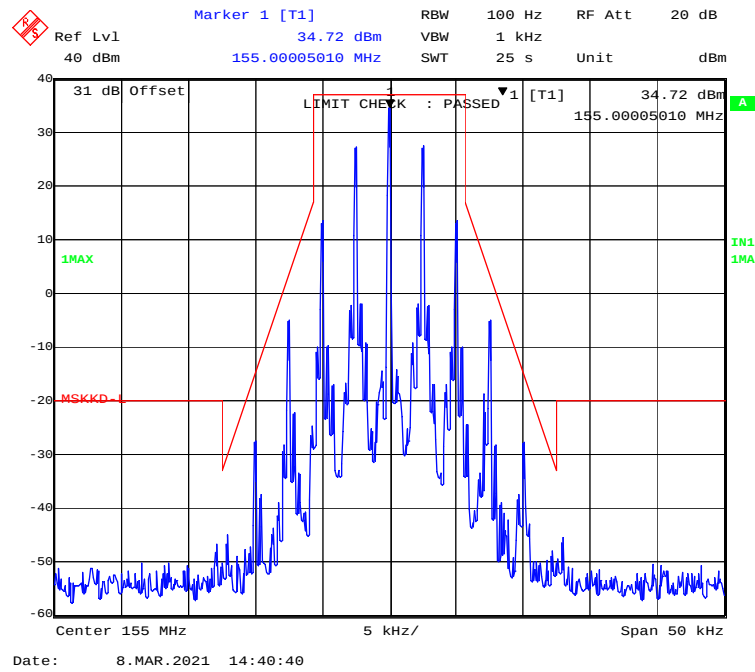
Emission Mask D

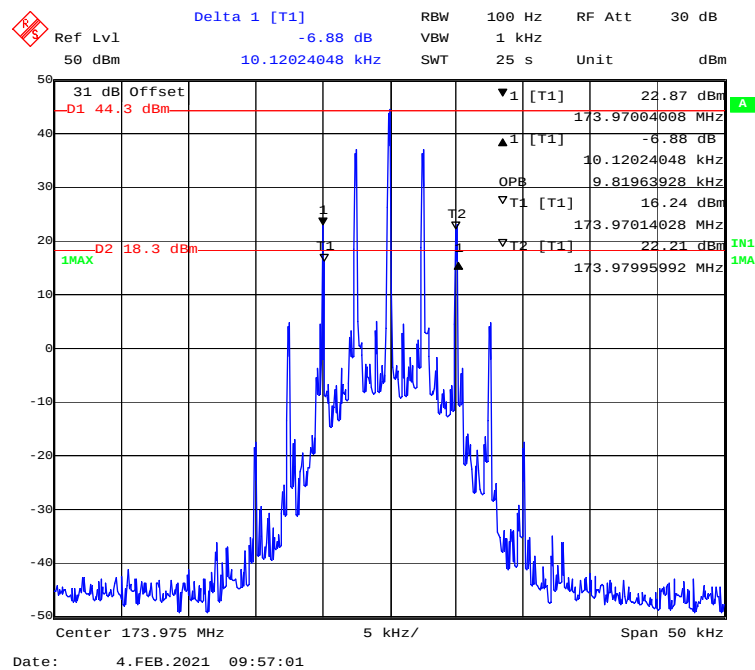
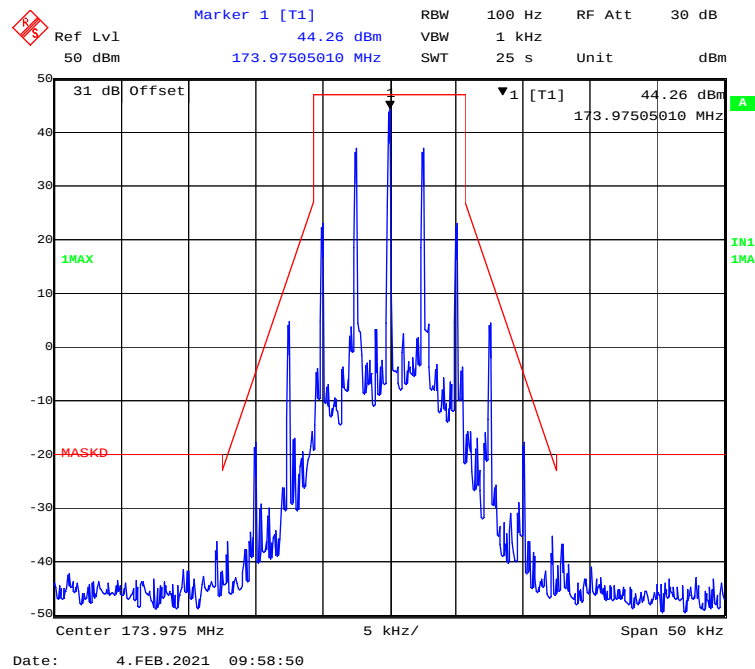


Frequency 155.000 MHz: 99% Occupied & 26 dB Bandwidth-Low Power-12.5kHz



Emission Mask D



Frequency 173.975 MHz: 99% Occupied & 26 dB Bandwidth-High Power-12.5kHz**Emission Mask D**

Delta 1 [T1]

Ref Lvl 40 dBm

RBW 100 Hz

RF Att 20 dB

VBW 1 kHz

SWT 25 s

Unit dBm

Center 173.975 MHz

Span 50 kHz

10.22044088 kHz

-3.61 dB

-9.8 dB

1MAX

IN1

1MA

Ref Lvl 35.09 dBm RBW 100 Hz RF Att 20 dB
 40 dBm 173.975010 MHz SWT 1 kHz Unit dBm

31 dB Offset
 LIMIT CHECK : PASSED
 1 [T1]
 35.09 dBm
 173.975010 MHz

1MAX
 MSK-KD
 IN1
 1MA

Center 173.975 MHz 5 kHz/ Span 50 kHz

Date: 8.MAR.2021 14:41:54

Delta 1 [T1]

Ref Lvl -2.15 dB

50 dBm 10.22044088 kHz

RBW 100 Hz RF Att 30 dB

VBW 1 kHz

SWT 25 s Unit dBm

31 dB Offset

D1 41.43 dBm

1MAX D2 15.43 dBm

▼1 [T1] 18.28 dBm

▲1 [T1] -2.15 dB

OPB 9.81963928 kHz

▼T1 [T1] 16.34 dBm

▼T2 [T1] 18.28 dBm

400.01993988 MHz

400.02014028 MHz

400.02995992 MHz

Center 400.025 MHz

5 kHz/

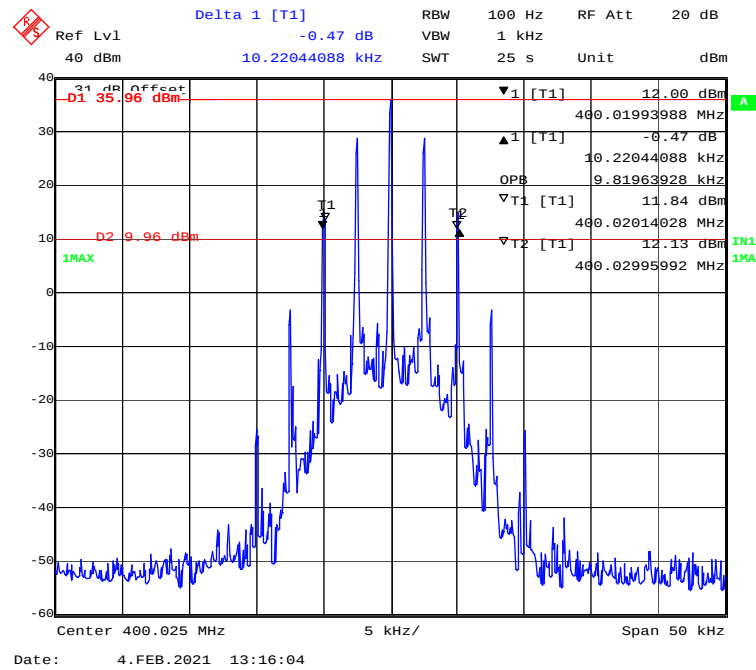
Span 50 kHz

Date: 4.FEB.2021 11:15:44

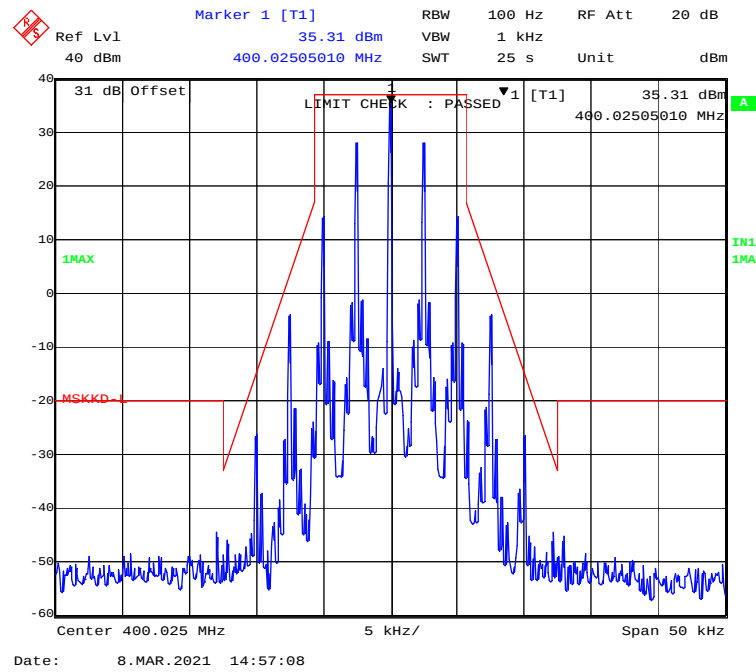
Ref Lvl 50 dBm
 Marker 1 [T1] 41.18 dBm
 RBW 100 Hz
 VBW 1 kHz
 SWT 25 s
 RF Att 30 dB
 Unit dBm

31 dB Offset
 1MAX
 MASKD
 1 [T1]
 41.18 dBm
 400.02505010 MHz
 IN1 1MA
 Center 400.025 MHz
 5 kHz/
 Span 50 kHz
 Date: 4.FEB.2021 11:22:01

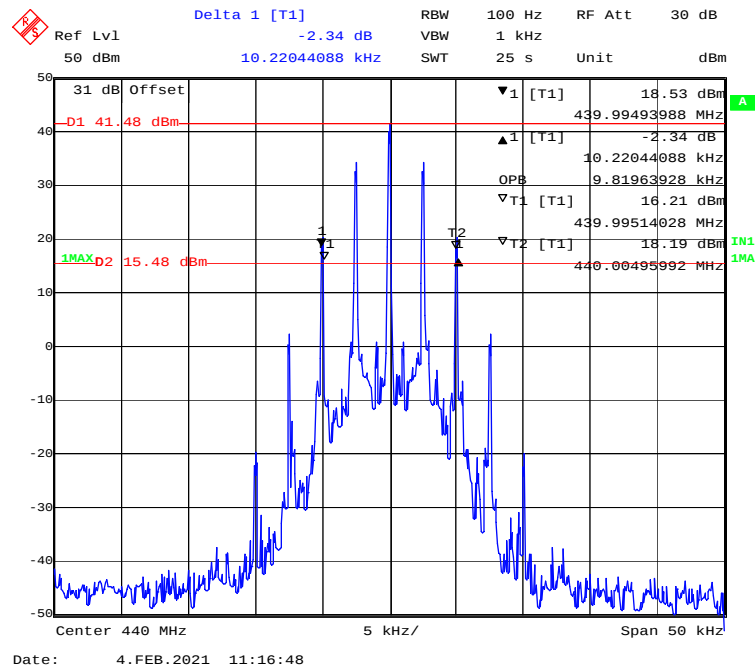
Frequency 400.025 MHz: 99% Occupied & 26 dB Bandwidth-Low Power-12.5kHz



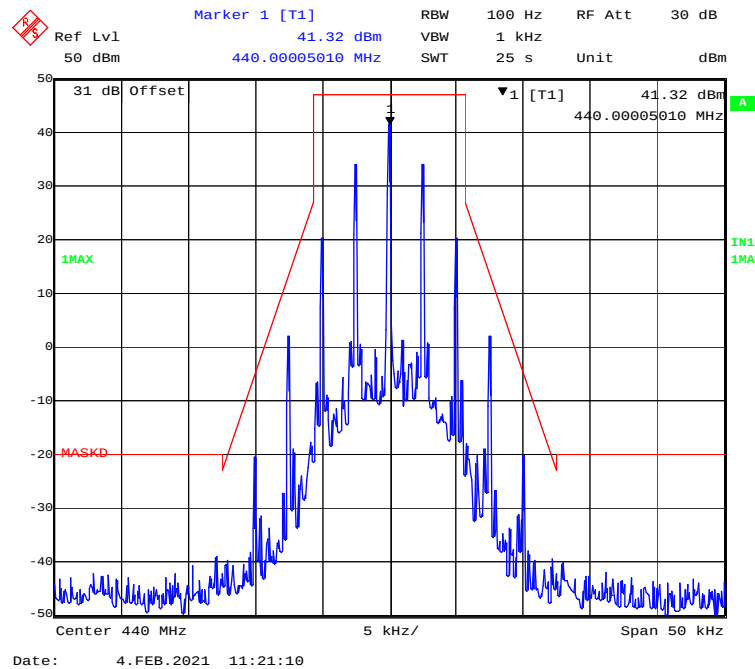
Emission Mask D



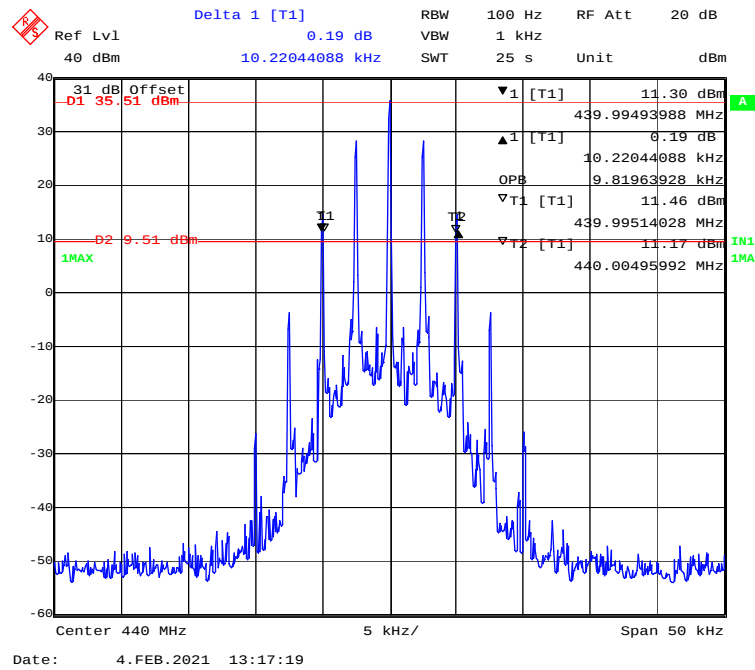
Frequency 440.000 MHz: 99% Occupied & 26 dB Bandwidth-High Power-12.5kHz



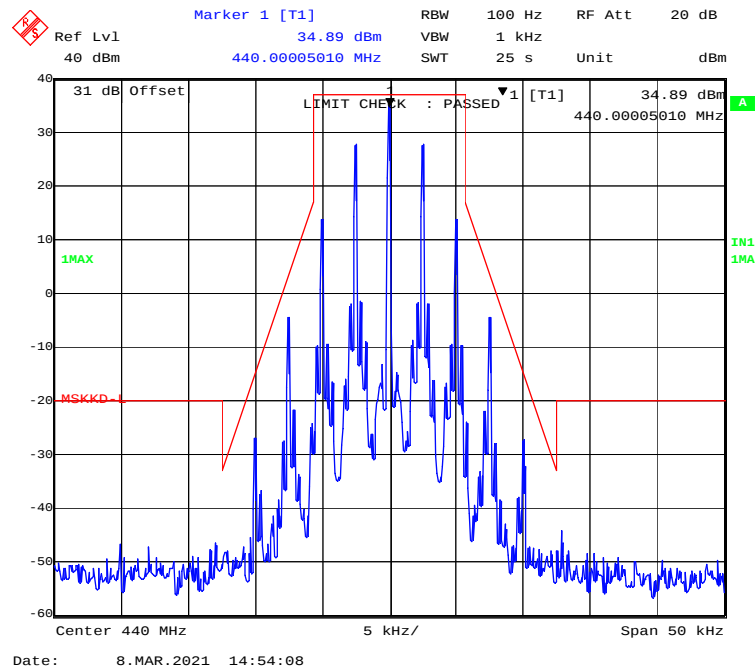
Emission Mask D

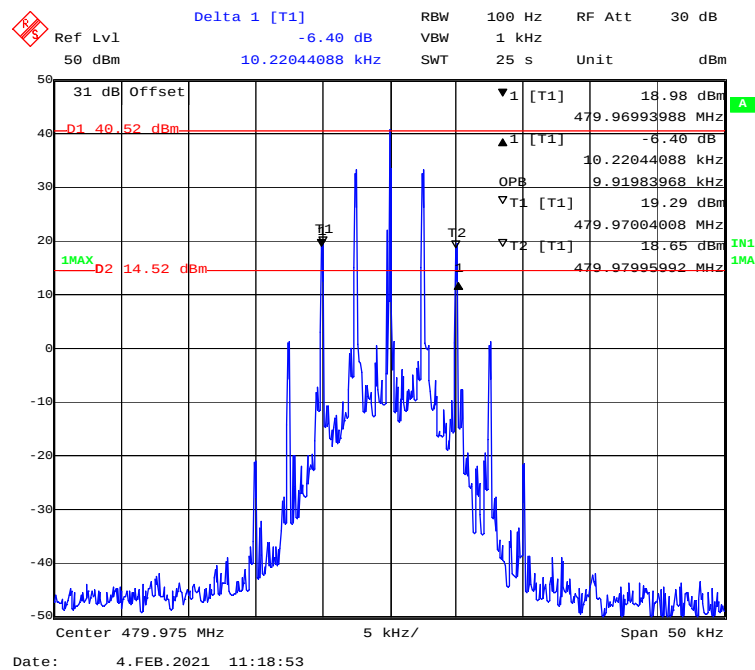
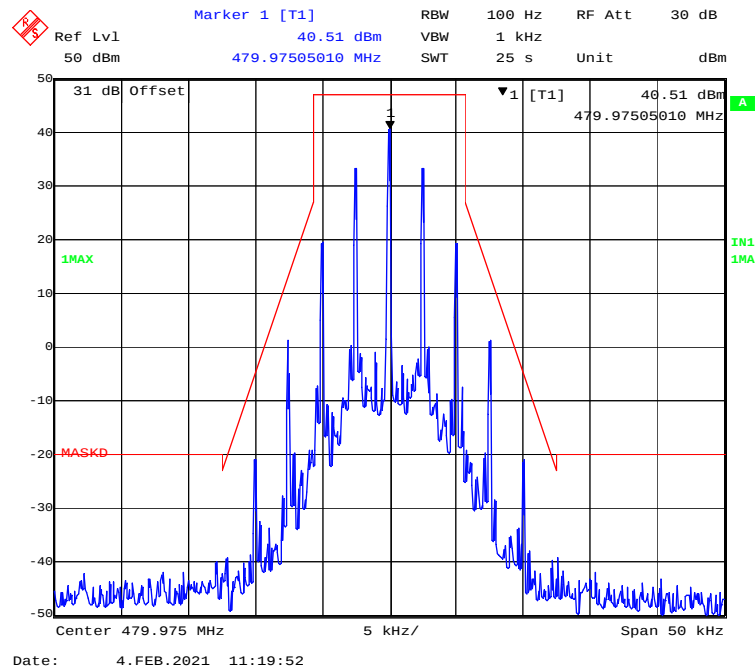


Frequency 440.000 MHz: 99% Occupied & 26 dB Bandwidth-Low Power-12.5kHz

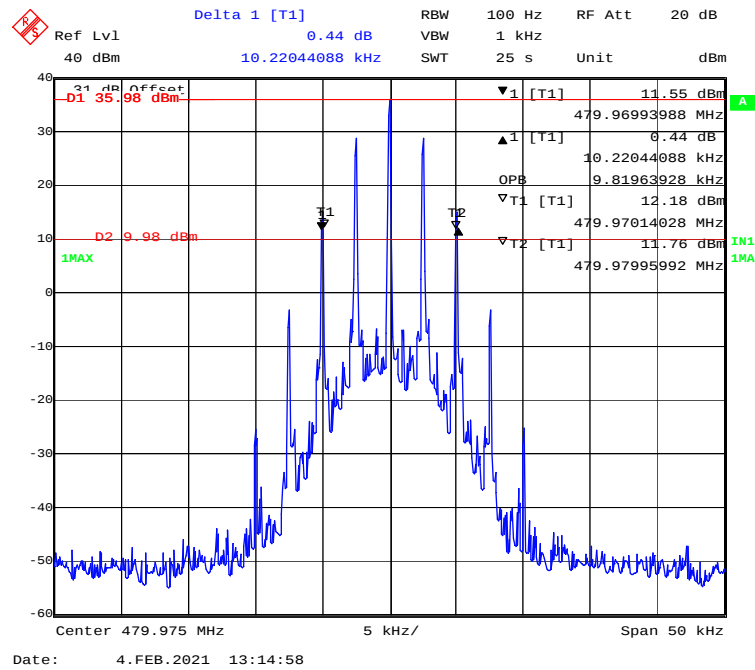


Emission Mask D

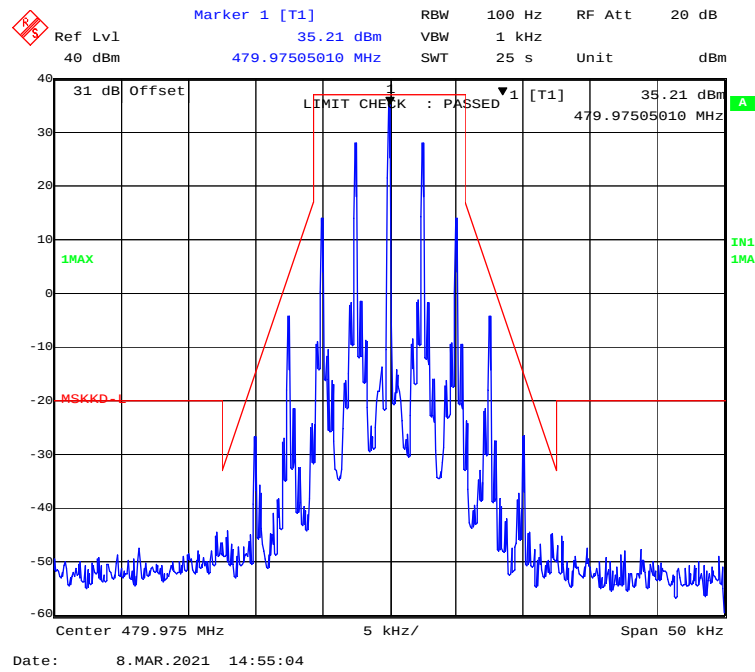


Frequency 479.975 MHz: 99% Occupied & 26 dB Bandwidth-High Power-12.5kHz**Emission Mask D**

Frequency 479.975 MHz: 99% Occupied & 26 dB Bandwidth-Low Power-12.5kHz

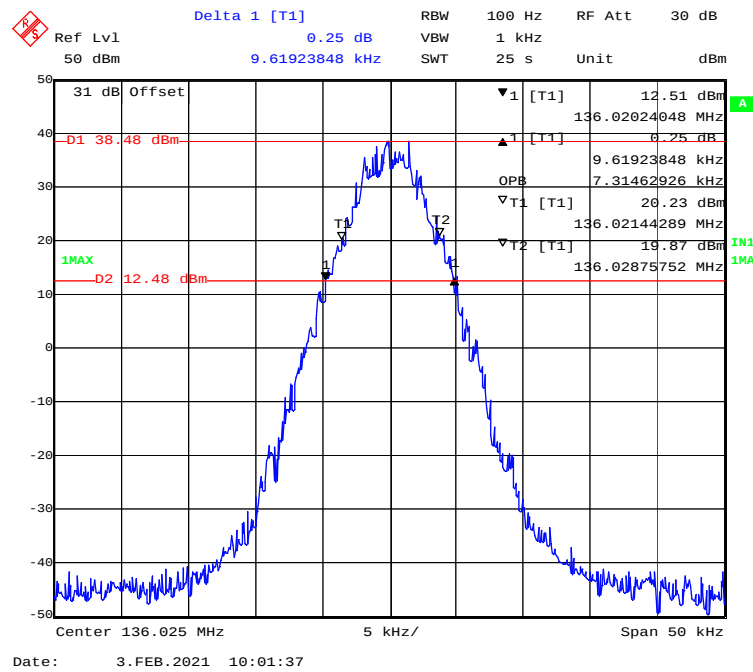


Emission Mask D

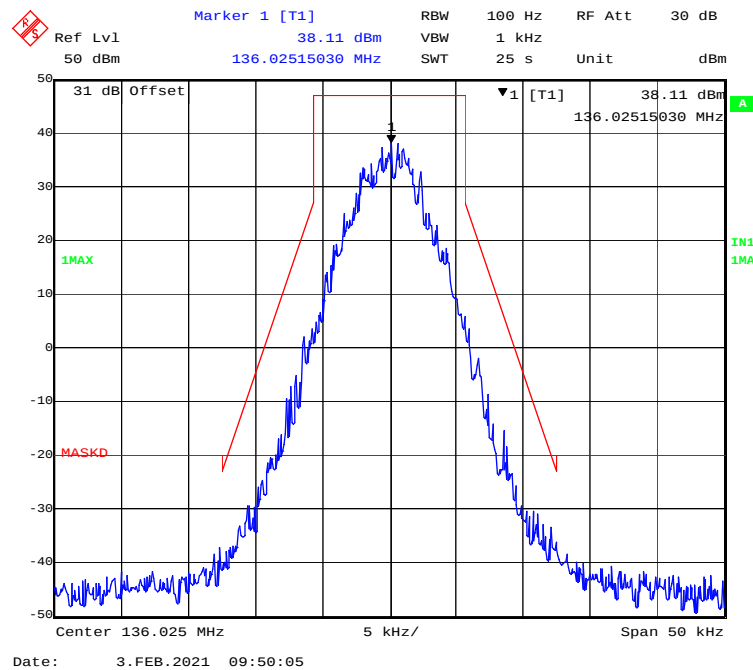


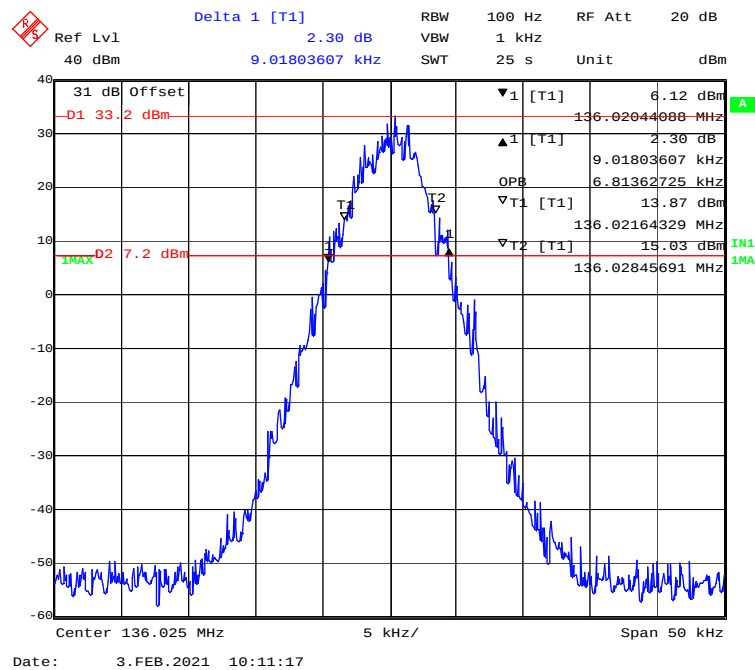
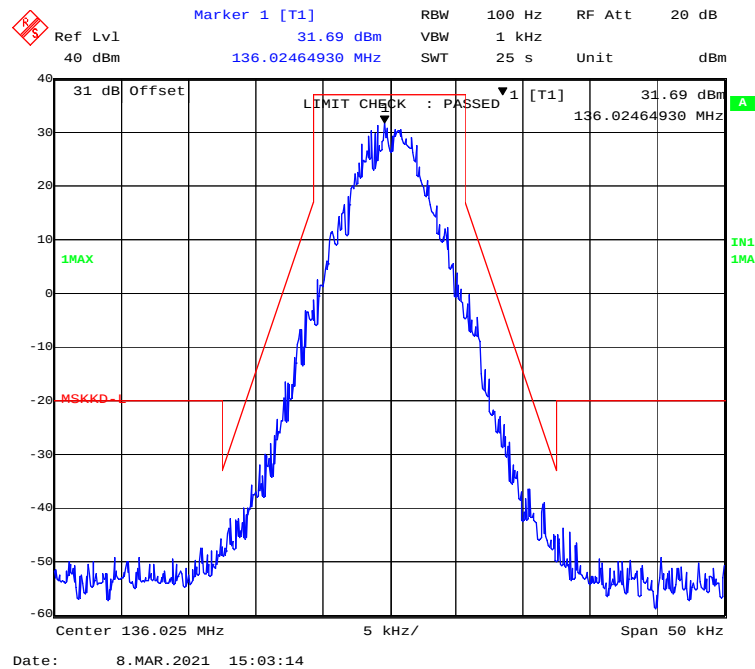
For Digital Mode:

Frequency 136.025 MHz: 99% Occupied & 26 dB Bandwidth-High Power-12.5kHz

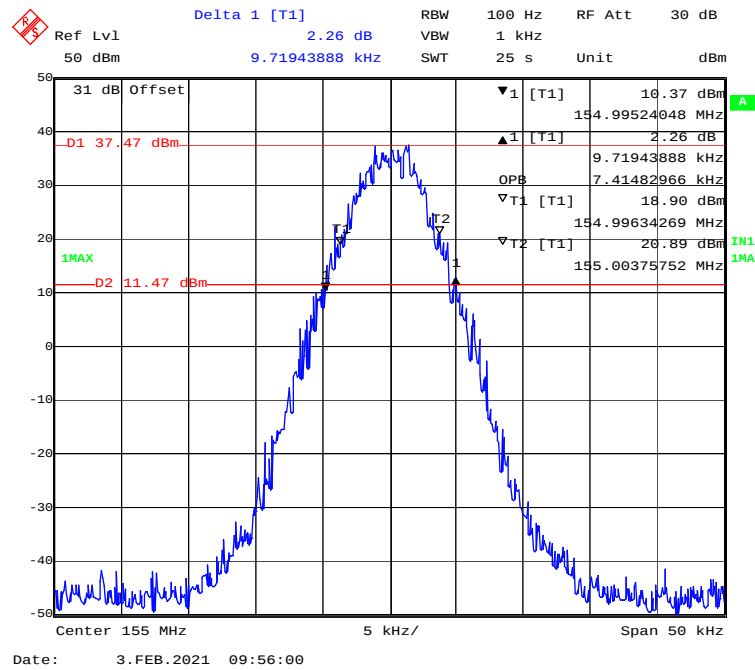


Emission Mask D

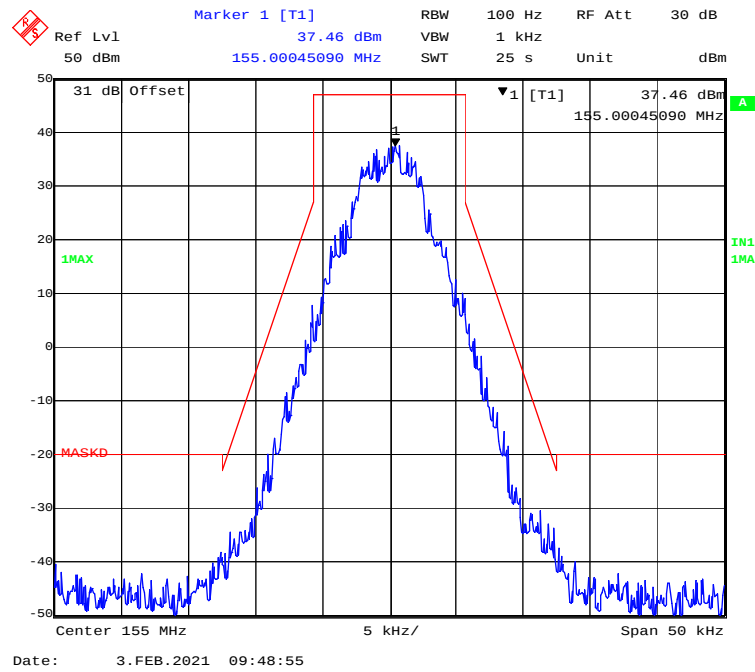


Frequency 136.025 MHz: 99% Occupied & 26 dB Bandwidth-Low Power-12.5kHz**Emission Mask D**

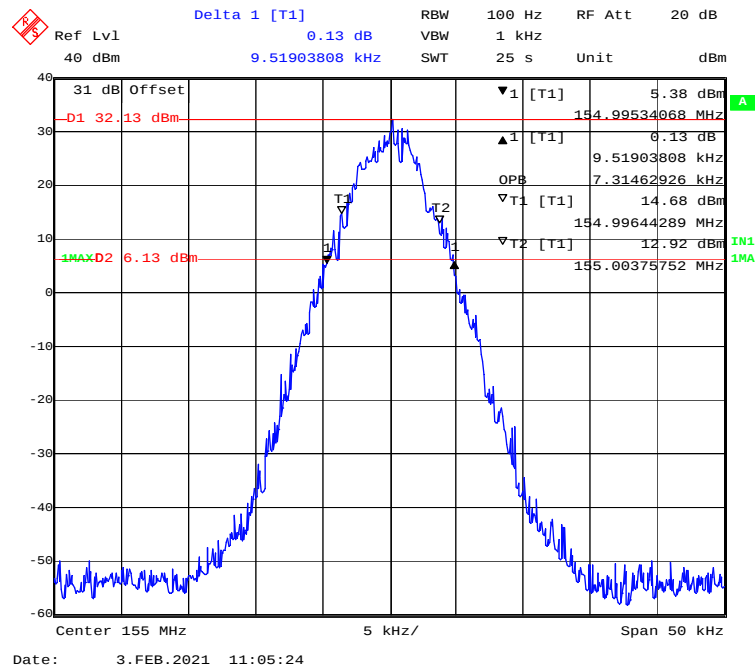
Frequency 155.000 MHz: 99% Occupied & 26 dB Bandwidth-High Power-12.5kHz



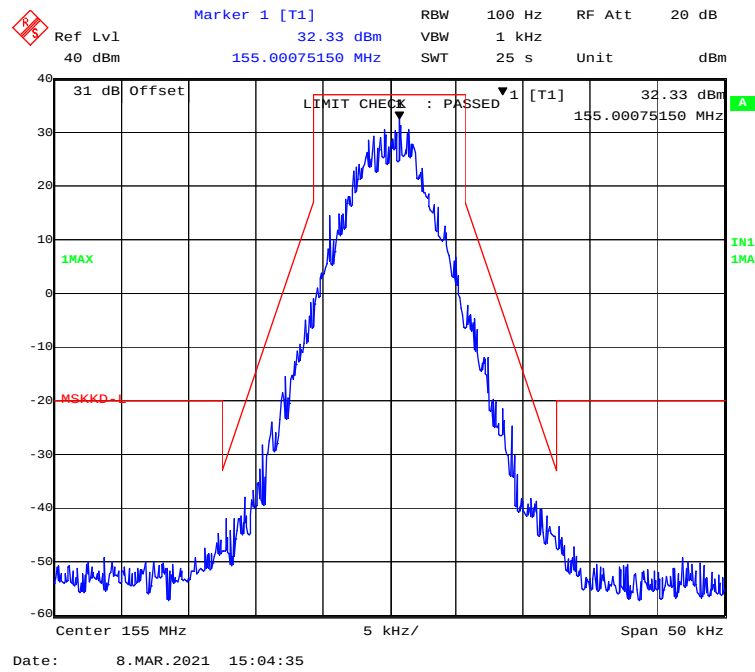
Emission Mask D



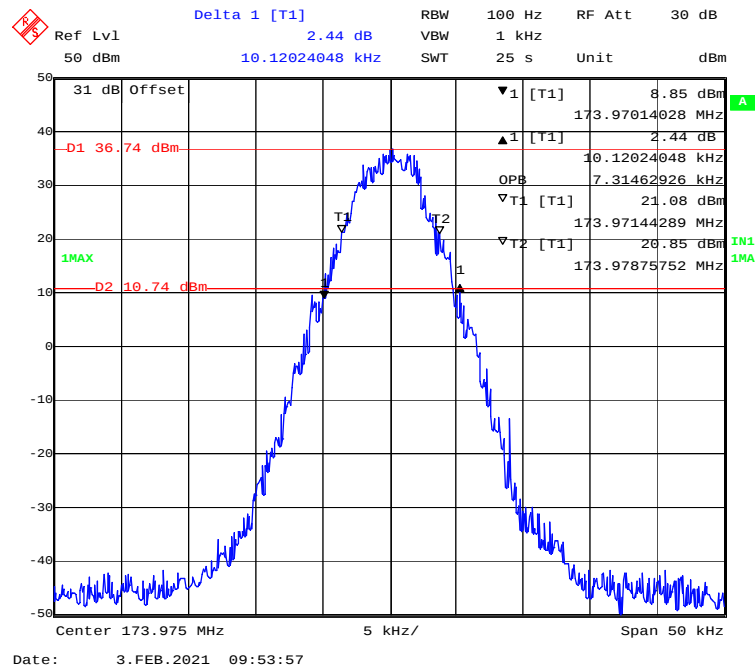
Frequency 155.000 MHz: 99% Occupied & 26 dB Bandwidth-Low Power-12.5kHz



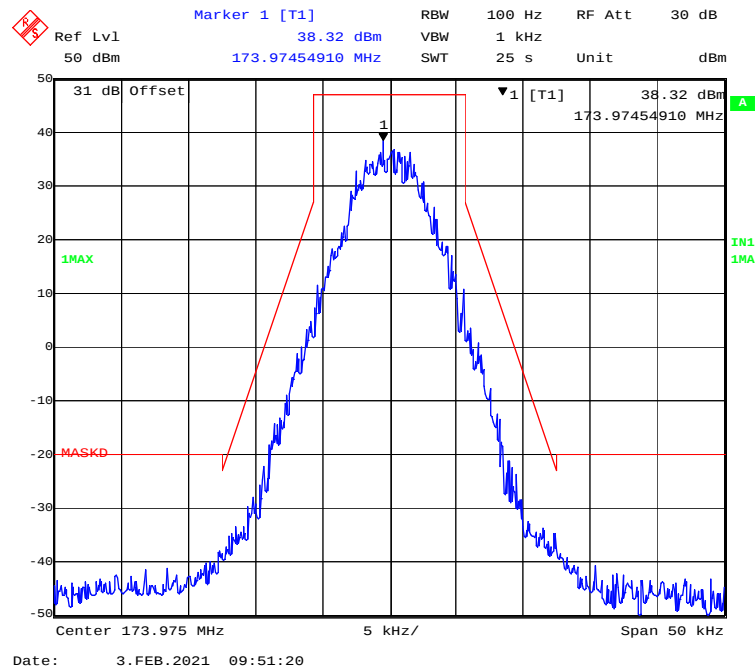
Emission Mask D



Frequency 173.975 MHz: 99% Occupied & 26 dB Bandwidth-High Power-12.5kHz



Emission Mask D



Delta 1 [T1]

Ref Lvl 0.53 dB

40 dBm

9.51903808 kHz

RBW 100 Hz

VBW 1 kHz

SWT 25 s

RF Att 20 dB

Unit dBm

31 dB Offset

D1 32.98 dBm

1MAX D2 6.98 dBm

▼1 [T1] 6.61 dBm

▲1 [T1] 0.53 dB

OPB 9.51903808 kHz

7.41482966 kHz

▽T1 [T1] 12.92 dBm

173.97024048 MHz

▽T2 [T1] 12.86 dBm

173.97134269 MHz

173.97875752 MHz

Center 173.975 MHz

5 kHz/

Span 50 kHz

Date: 3.FEB.2021 10:40:20

Marker 1 [T1] RBW 100 Hz RF Att 20 dB
 Ref Lvl 30.87 dBm VBW 1 kHz
 40 dBm 173.97565130 MHz SwT 25 s Unit dBm

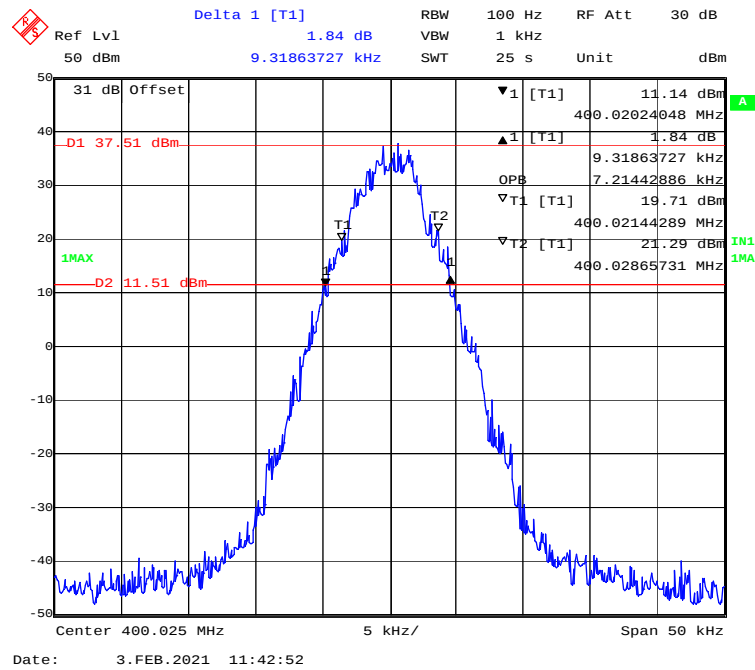
31 dB Offset
 LIMIT CHECK : PASSED 1 [T1]
 173.97565130 MHz 30.87 dBm

1MAX
 MSKDD

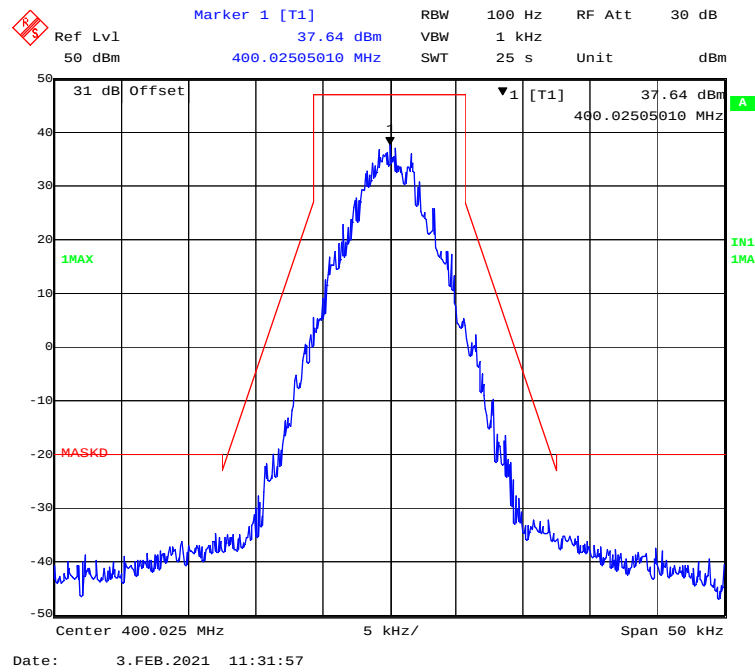
Center 173.975 MHz 5 kHz/ Span 50 kHz

Date: 8.MAR.2021 15:05:59

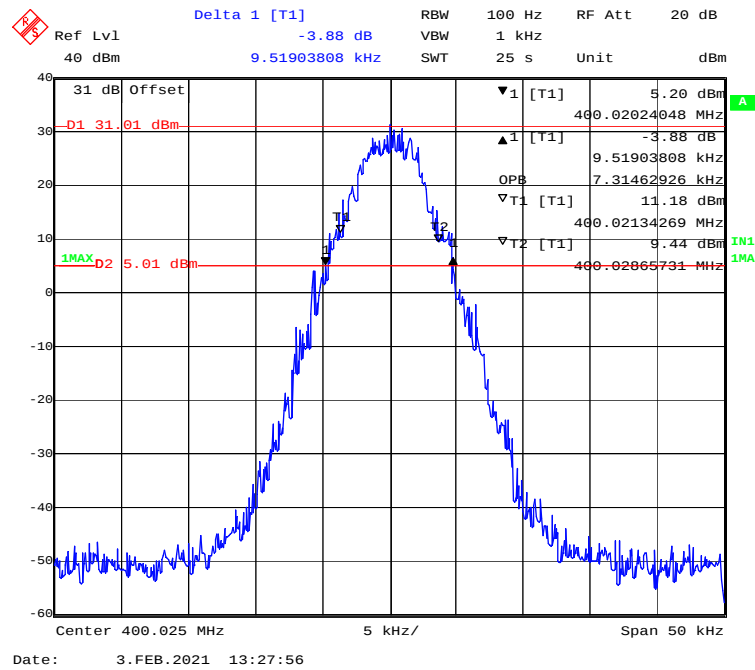
Frequency 400.025 MHz: 99% Occupied & 26 dB Bandwidth-High Power-12.5kHz



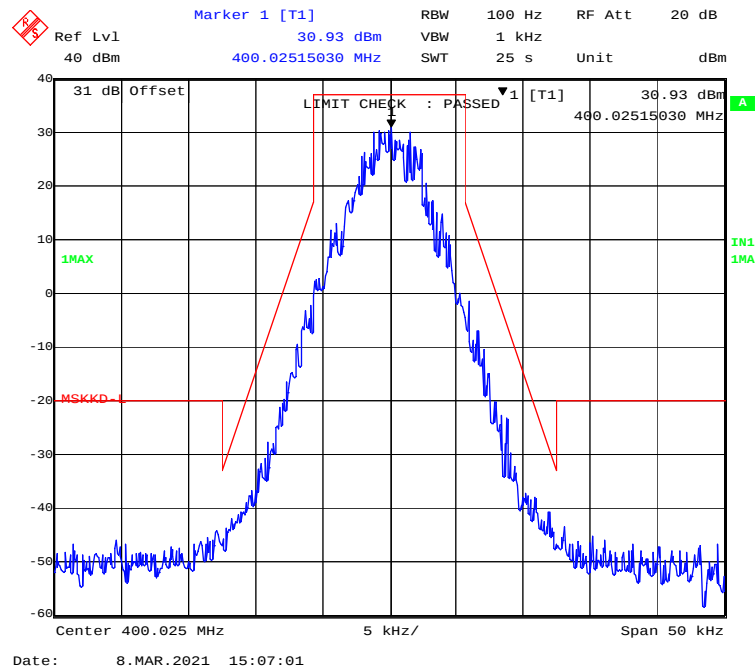
Emission Mask D



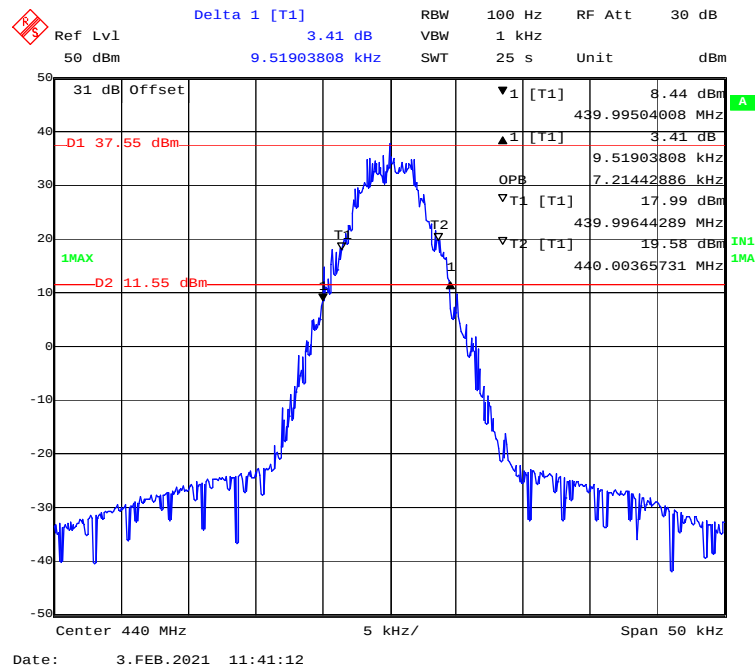
Frequency 400.025 MHz: 99% Occupied & 26 dB Bandwidth-Low Power-12.5kHz



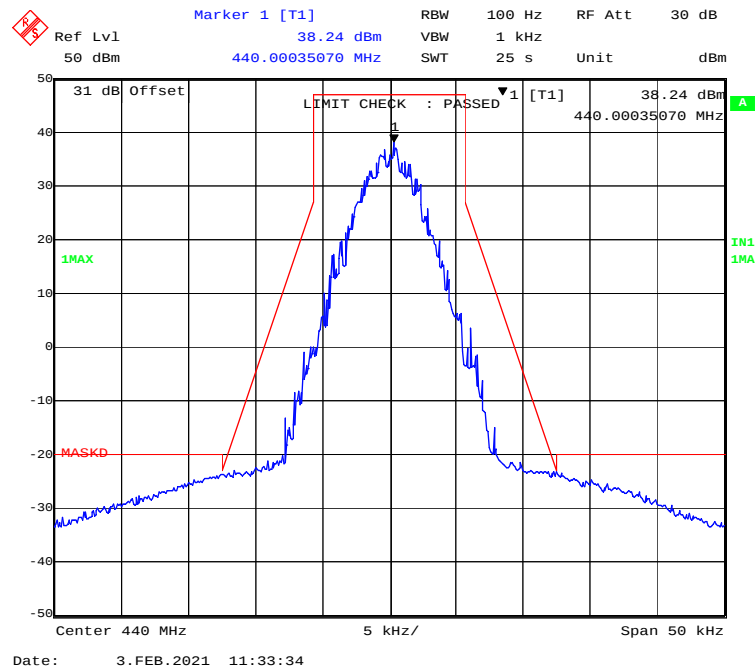
Emission Mask D



Frequency 440.000 MHz: 99% Occupied & 26 dB Bandwidth-High Power-12.5kHz



Emission Mask D



Delta 1 [T1] 0.87 dB
 Ref Lvl 40 dBm
 RBW 1 kHz
 100 Hz
 RF Att 20 dB
 Unit dBm
 7.71943888 kHz
 439.9954008 MHz
 5.24 dBm
 0.87 dB
 7.71943888 kHz
 7.41482966 kHz
 11.94 dBm
 439.99634269 MHz
 10.79 dBm
 440.00375752 MHz
 31 dB Offset
 D1 31.3 dBm
 1MAX D2 5.3 dBm
 T1
 T2
 Center 440 MHz
 5 kHz/
 Span 50 kHz
 Date: 3.FEB.2021 13:26:03

Marker 1 [T1]

Ref Lvl 40 dBm

30.66 dBm

440.00045090 MHz

RBW 100 Hz

VBW 1 kHz

SWT 25 s

Unit dBm

31 dB Offset

LIMIT CHECK : PASSED

1

[T1]

30.66 dBm

440.00045090 MHz

1MAX

MSK-KD

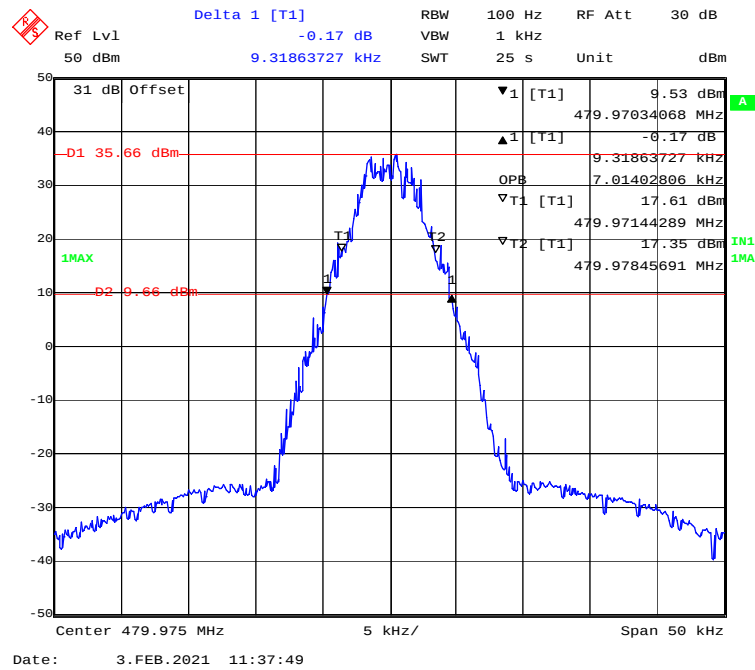
Center 440 MHz

5 kHz/

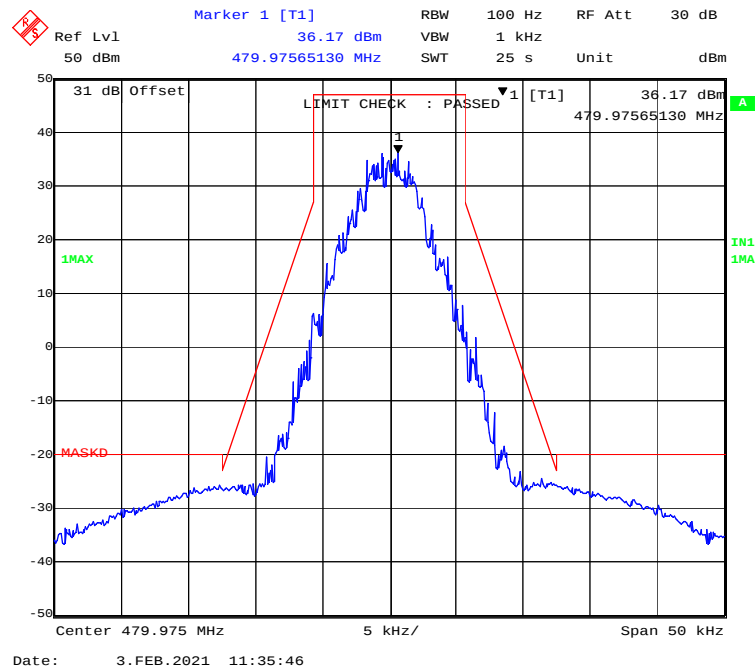
Span 50 kHz

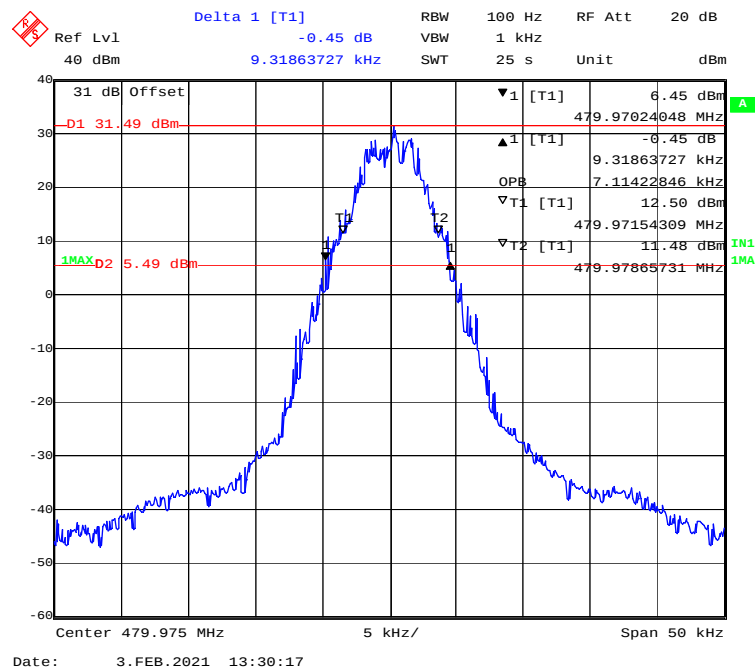
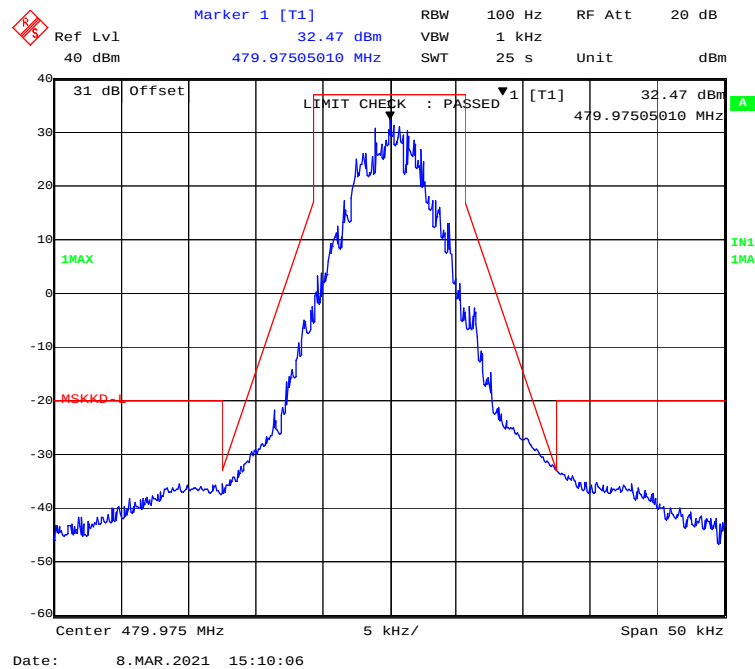
Date: 8.MAR.2021 15:16:40

Frequency 479.975 MHz: 99% Occupied & 26 dB Bandwidth-High Power-12.5kHz



Emission Mask D



Frequency 479.975 MHz: 99% Occupied & 26 dB Bandwidth-Low Power-12.5kHz**Emission Mask D**

FCC §2.1051 & §95.1779 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

FCC §2.1051 and §90.210

Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for below 1GHz, and 1MHz for above 1GHz. sufficient scans were taken to show any out of band emissions up to 10th harmonic.

Test Data

Environmental Conditions

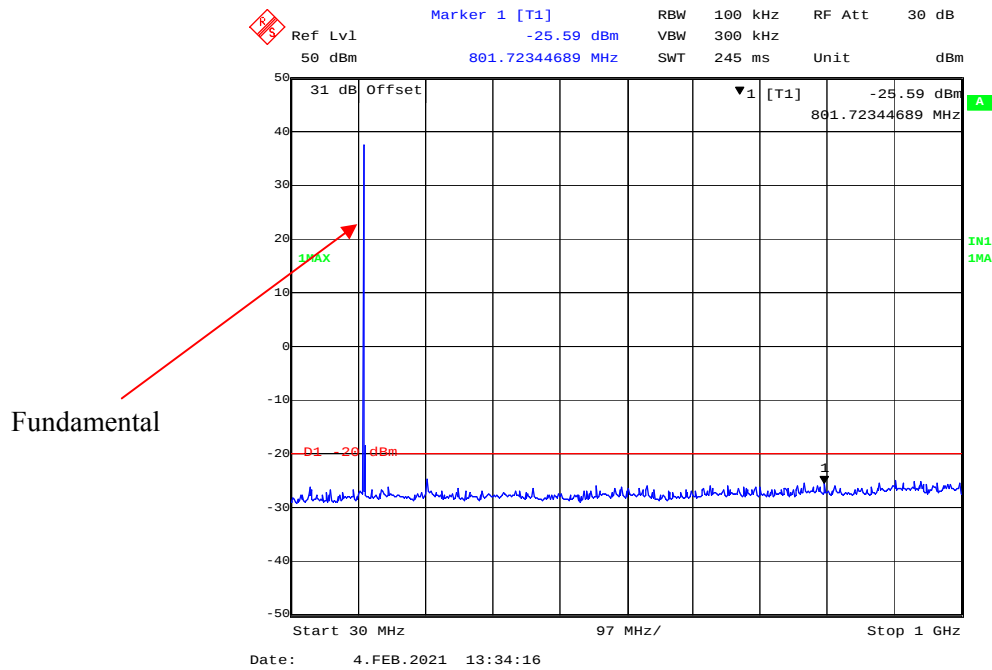
Temperature:	22.5 °C~23.1 °C
Relative Humidity:	50 %~55 %
ATM Pressure:	101.5 kPa~102 kPa

The testing was performed by CK Huang from 2021-02-03 to 2021-02-04.

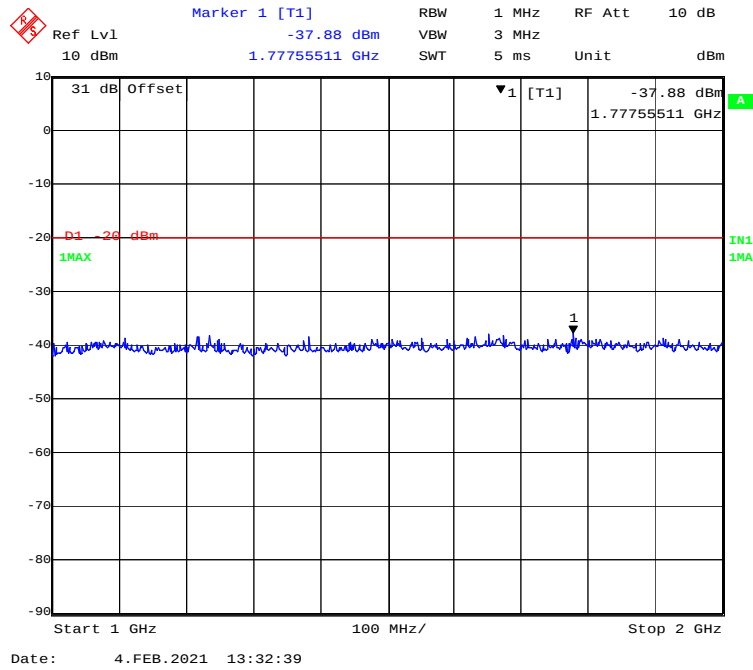
Test Mode: Transmitting

Please refer to the following plots.

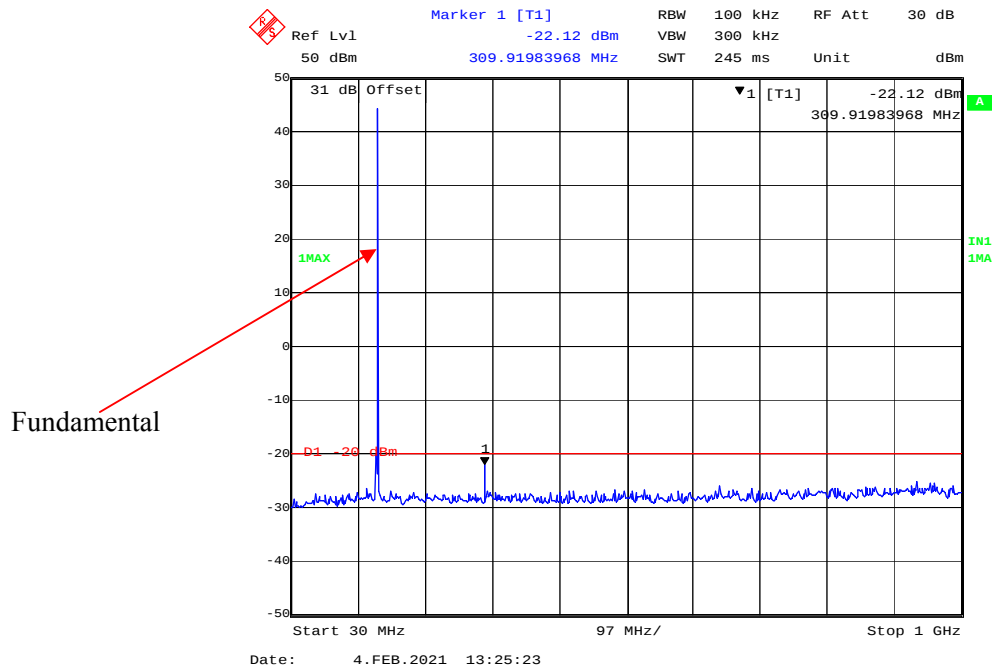
Frequency:136.025 MHz, 30 MHz – 1 GHz, Low Power-12.5kHz



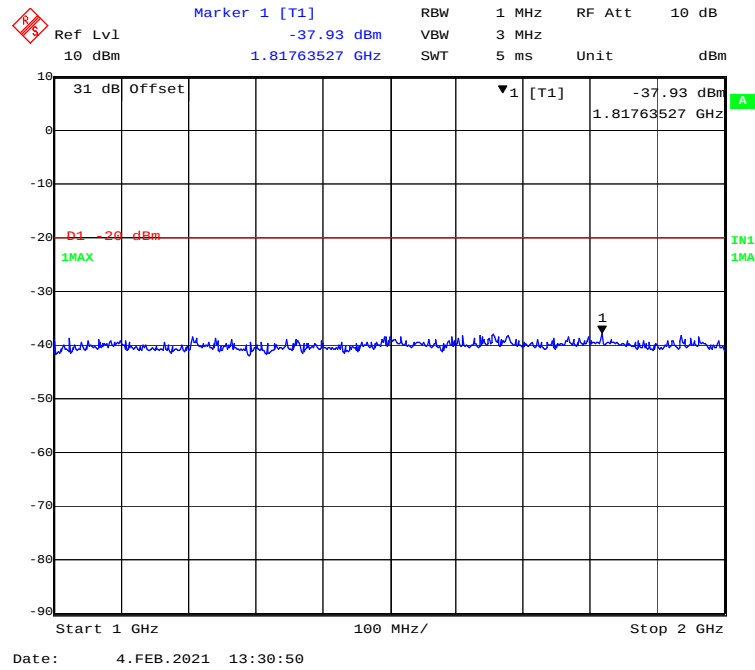
Frequency:136.025 MHz, 1 GHz - 2 GHz, Low Power-12.5kHz



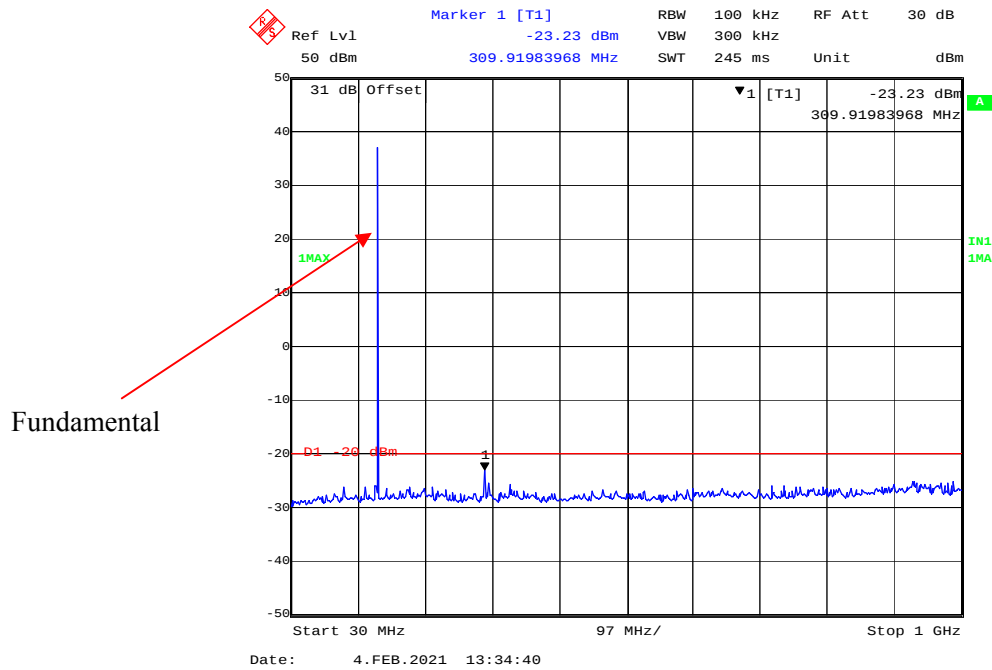
Frequency:155.000 MHz, 30 MHz – 1 GHz, High Power-12.5kHz



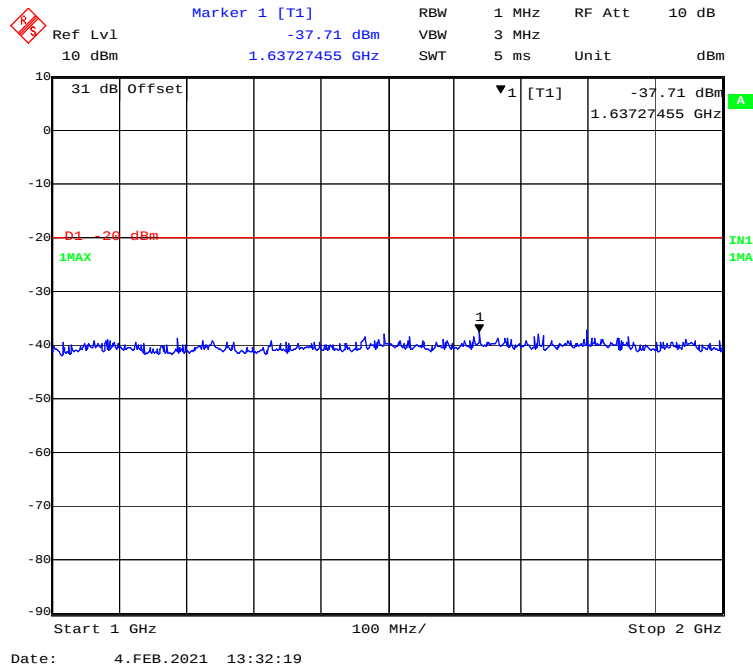
Frequency:155.000 MHz, 1 GHz - 2 GHz, High Power-12.5kHz



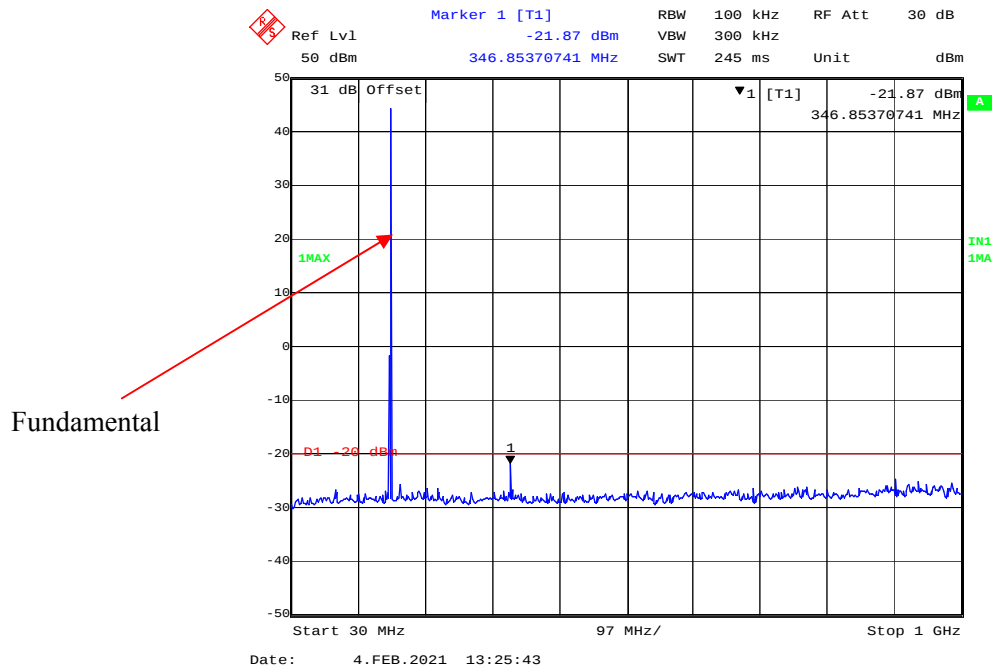
Frequency:155.000 MHz, 30 MHz – 1 GHz, Low Power-12.5kHz



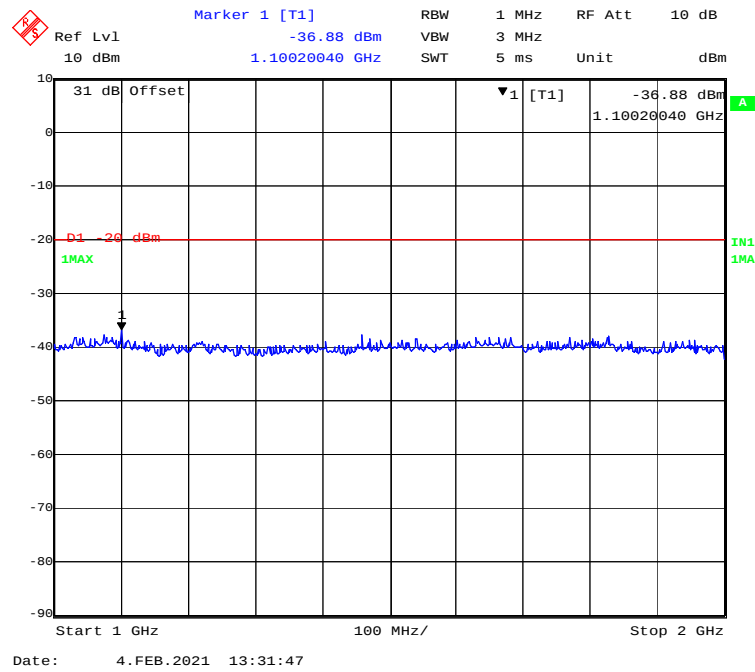
Frequency:155.000 MHz, 1 GHz - 2 GHz, Low Power-12.5kHz



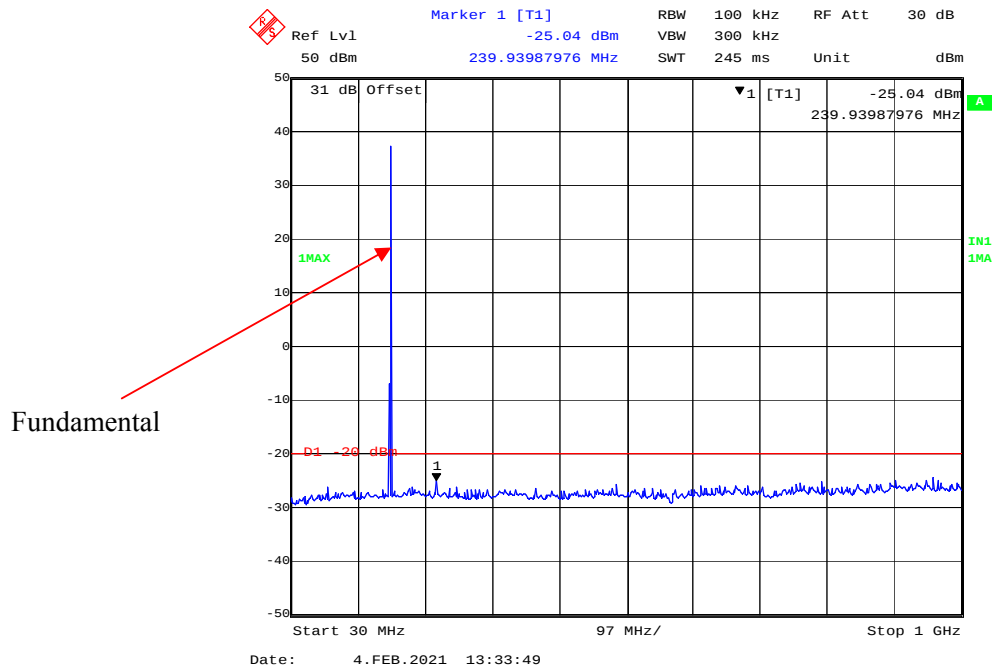
Frequency:173.975 MHz, 30 MHz – 1 GHz, High Power-12.5kHz



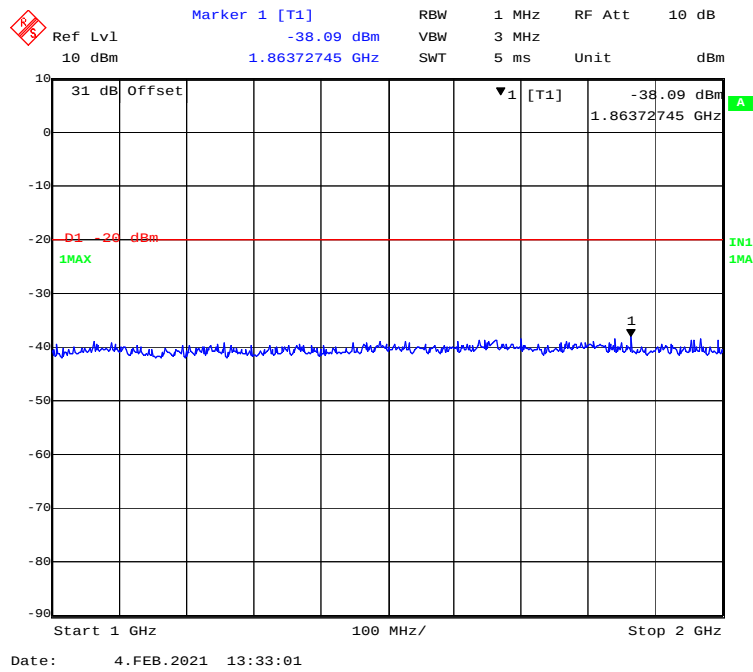
Frequency:173.975 MHz, 1 GHz - 2 GHz, High Power-12.5kHz



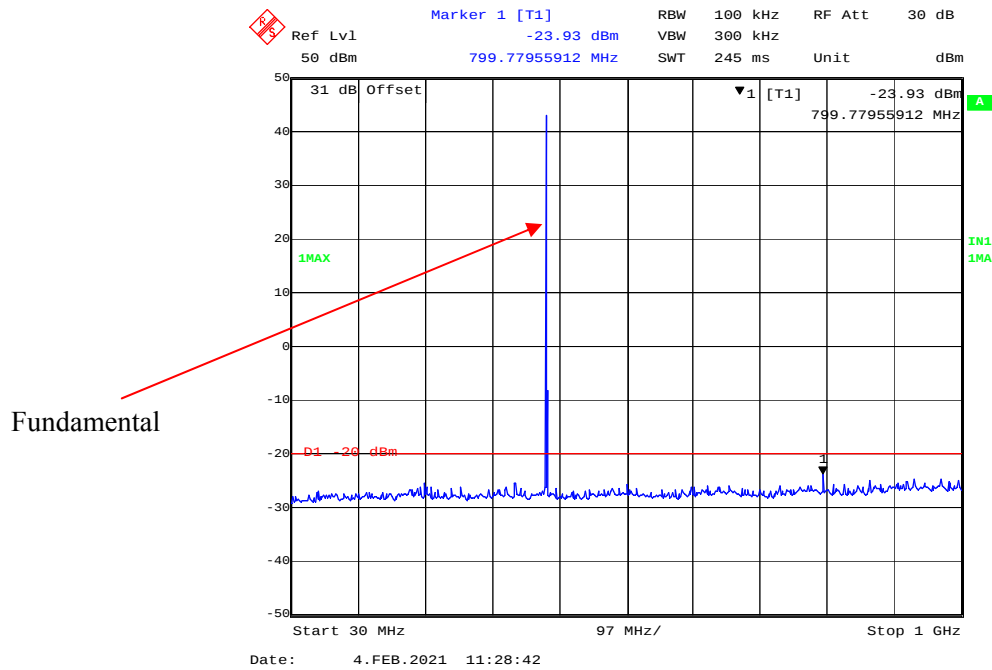
Frequency:173.975 MHz, 30 MHz – 1 GHz, Low Power-12.5kHz



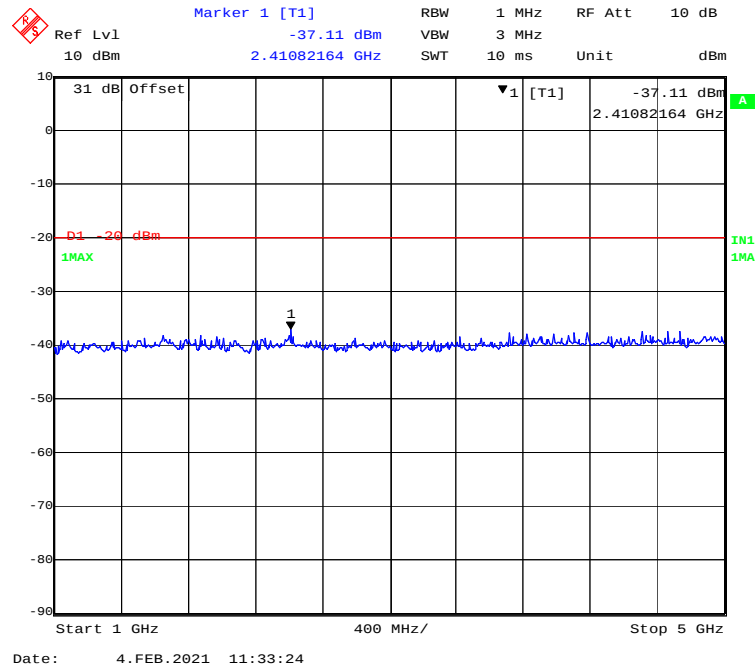
Frequency:173.975 MHz, 1 GHz - 2 GHz, Low Power-12.5kHz



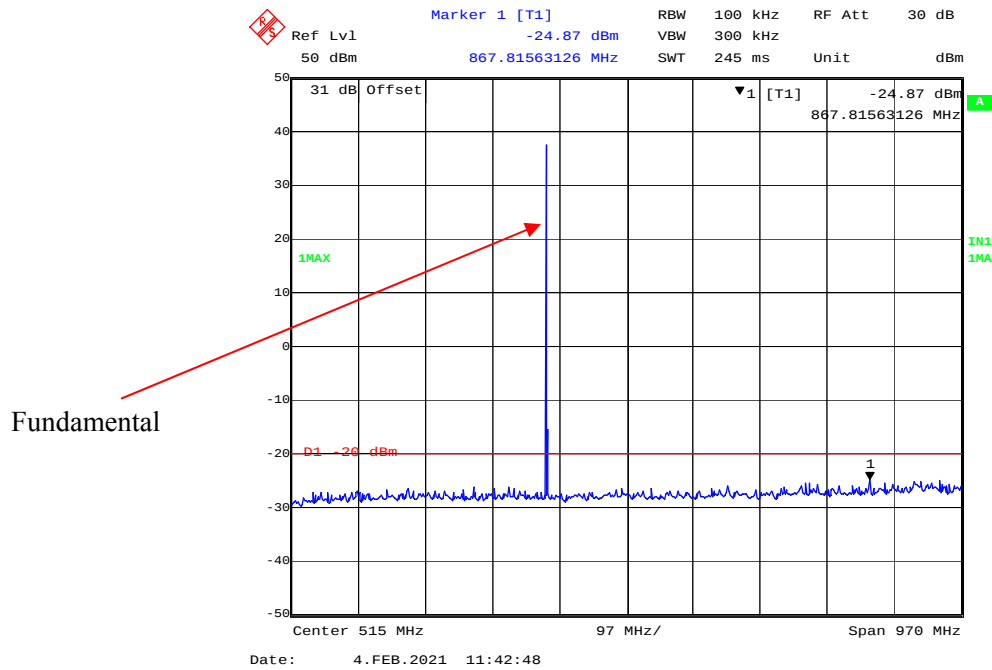
Frequency: 400.025 MHz, 30 MHz – 1 GHz, High Power-12.5kHz



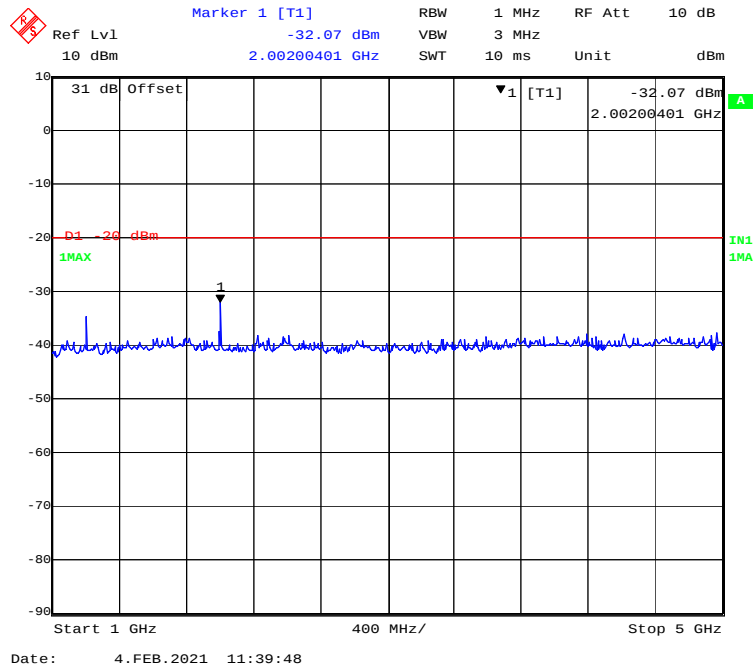
Frequency: 400.025 MHz, 1 GHz - 5 GHz, High Power-12.5kHz



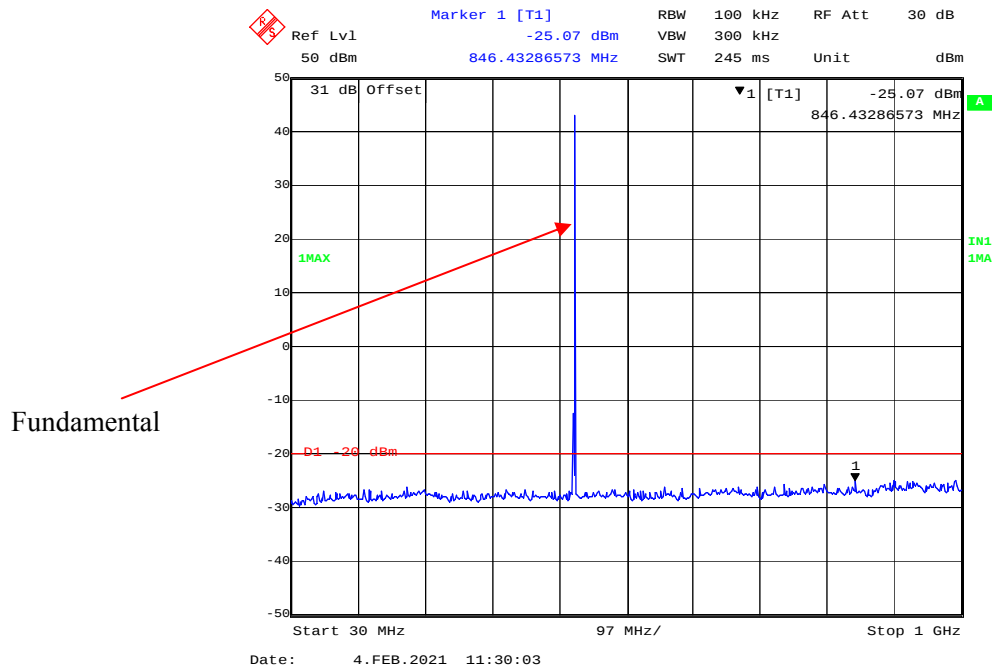
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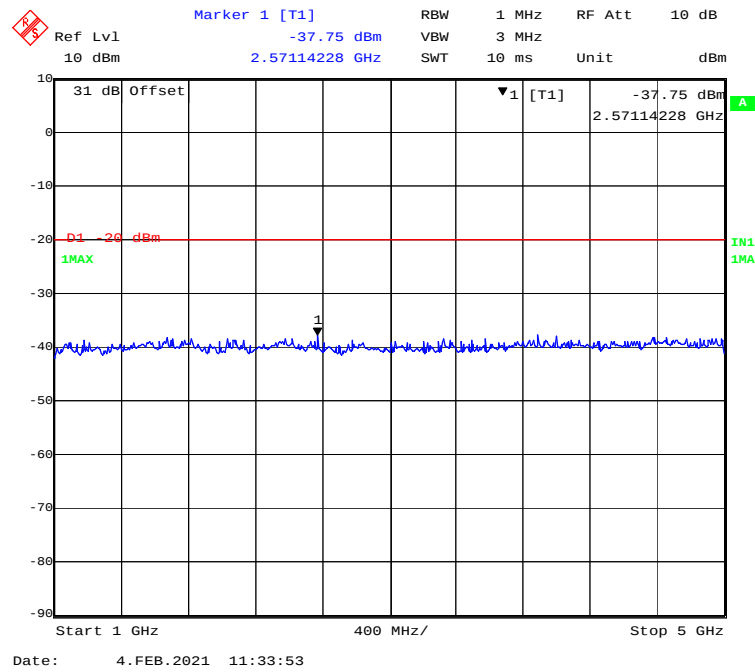
Frequency: 400.025 MHz, 1 GHz - 5 GHz, Low Power-12.5kHz



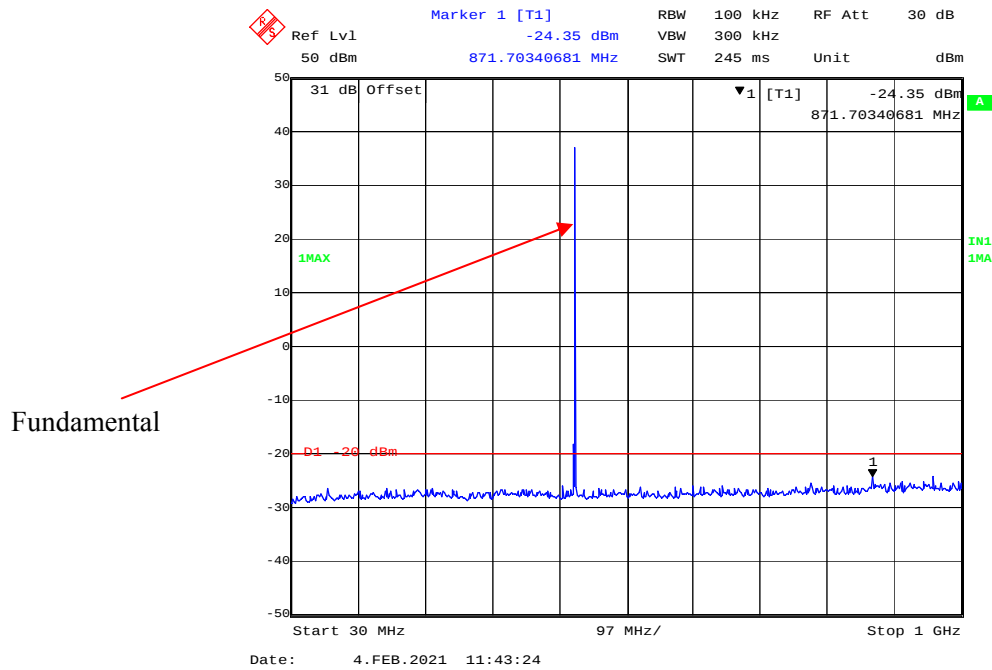
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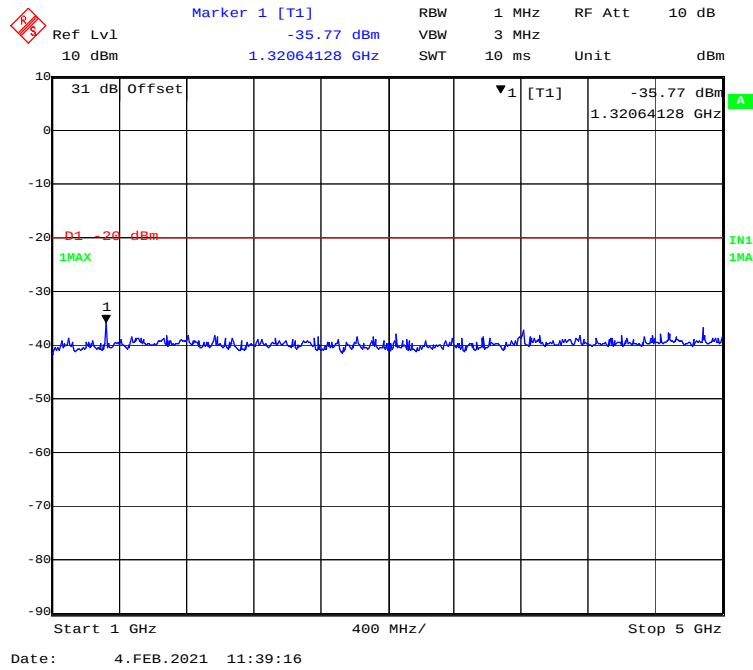
Frequency: 440.000 MHz, 1 GHz - 5 GHz, High Power-12.5kHz



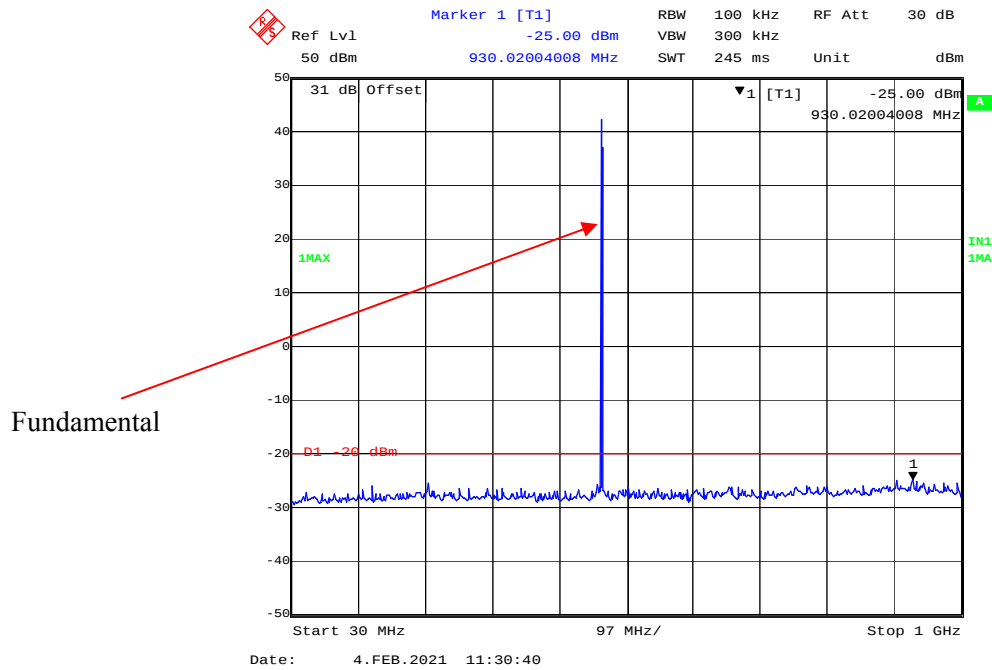
Frequency: 440.000 MHz, 30 MHz – 1 GHz, Low Power-12.5kHz



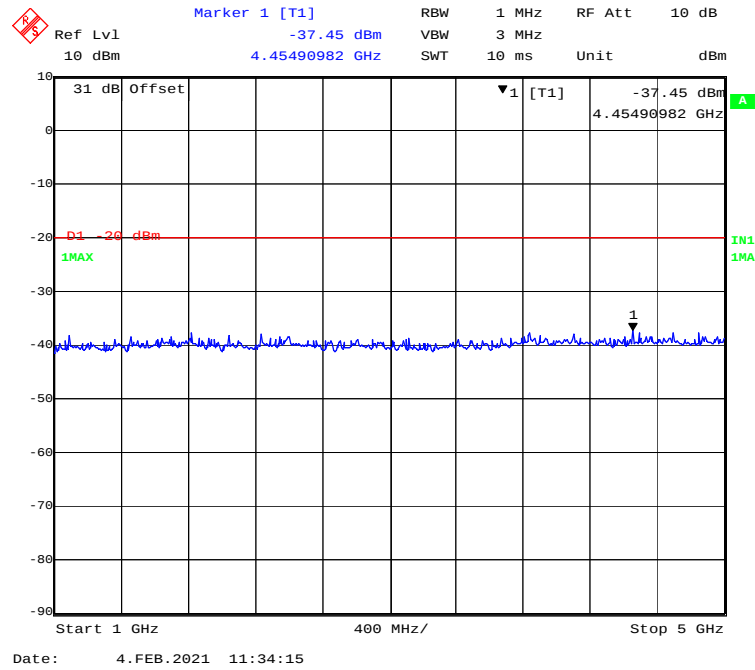
Frequency: 440.000 MHz, 1 GHz - 5 GHz, Low Power-12.5kHz



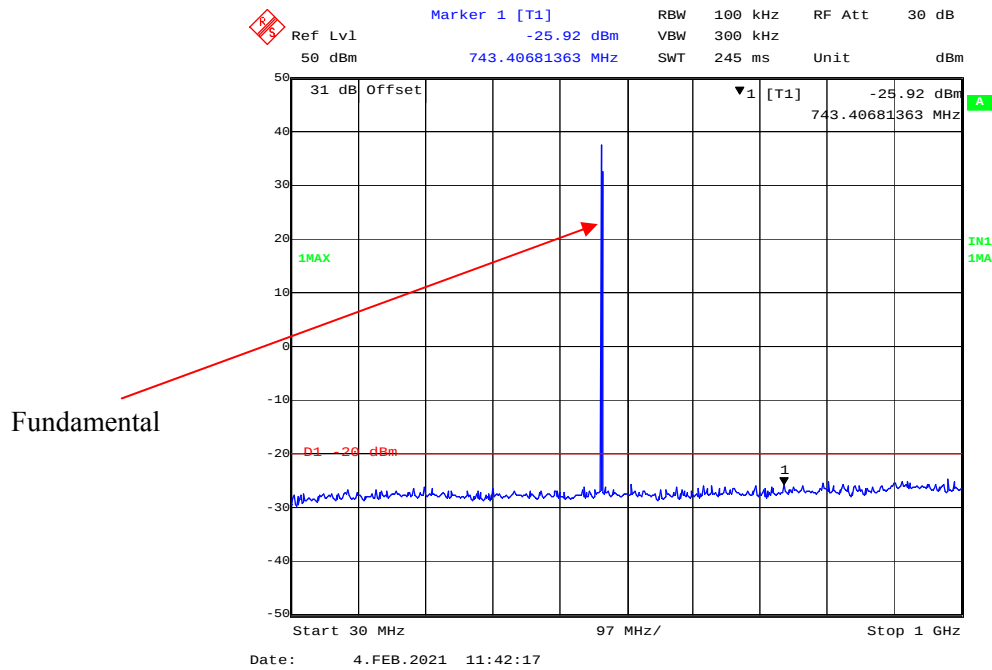
Frequency: 479.975 MHz, 30 MHz – 1 GHz, High Power-12.5kHz



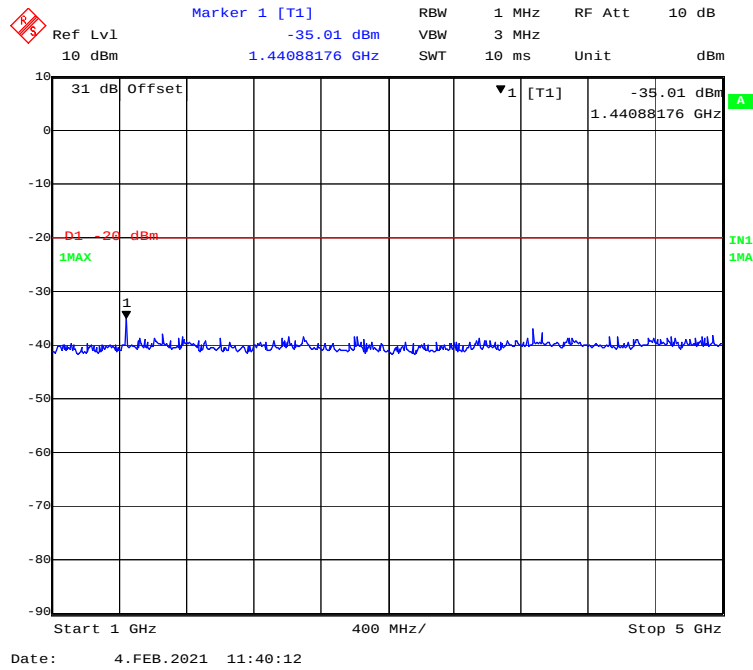
Frequency: 479.975 MHz, 1 GHz - 5 GHz, High Power-12.5kHz



Frequency: 479.975 MHz, 30 MHz – 1 GHz, Low Power-12.5kHz

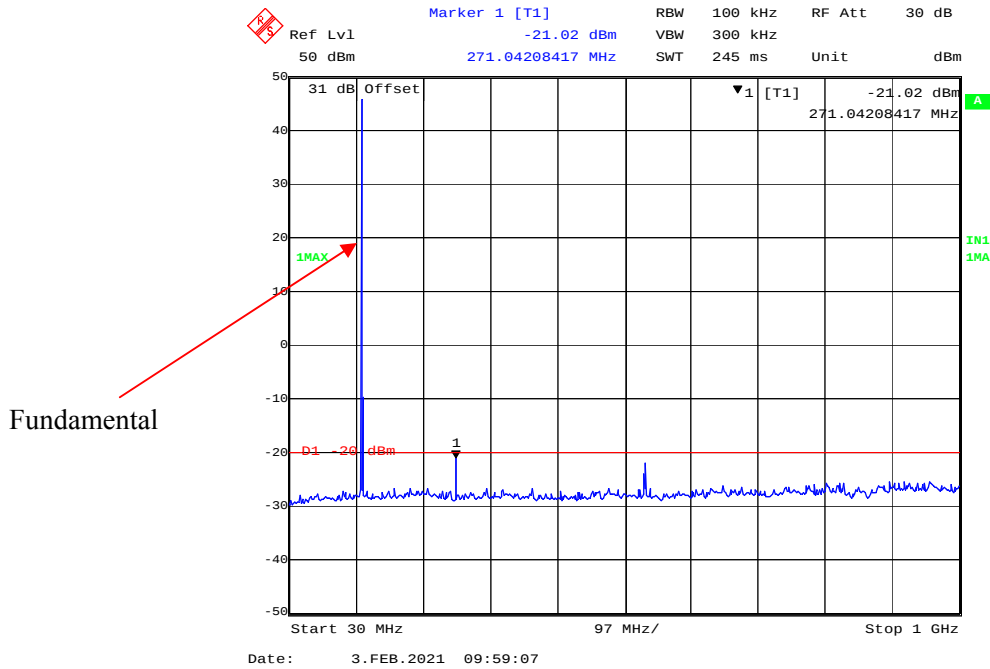


Frequency: 479.975 MHz, 1 GHz - 5 GHz, Low Power-12.5kHz

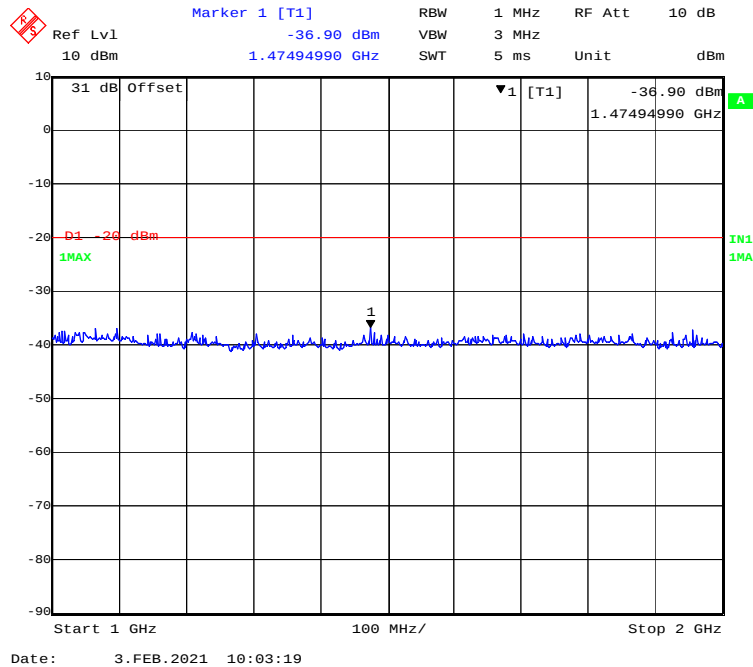


For Digital Mode:

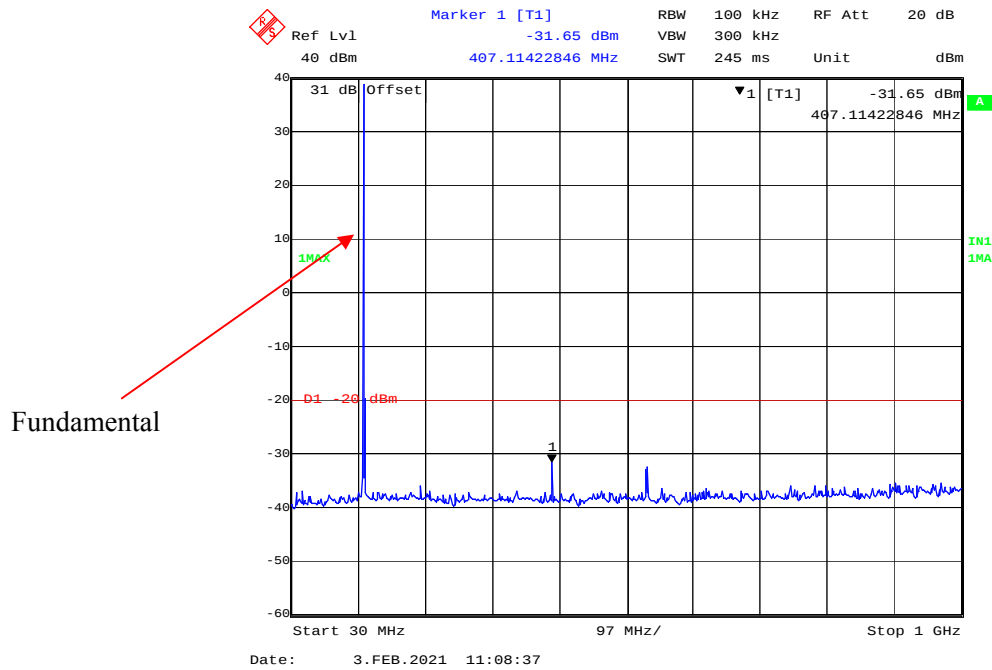
Frequency: 136.025 MHz, 30 MHz – 1 GHz, High Power-12.5kHz



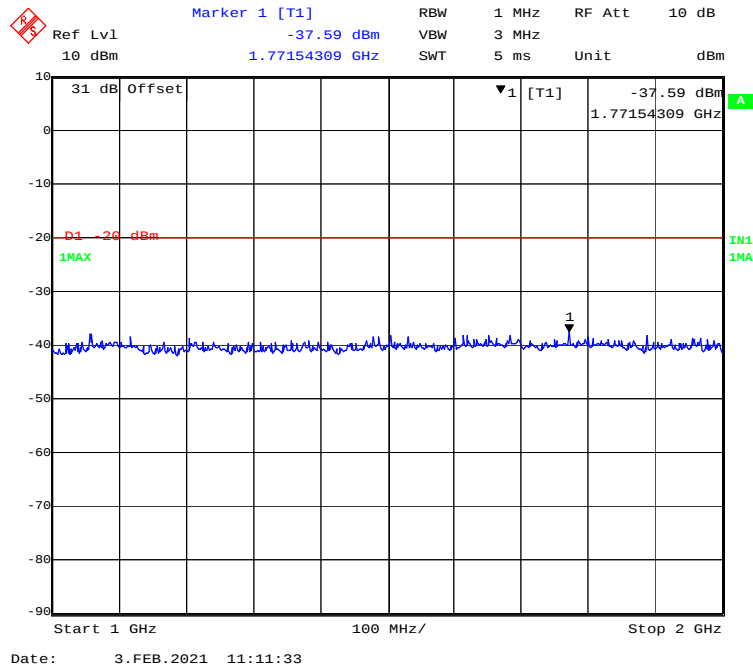
Frequency: 136.025 MHz, 1 GHz - 2 GHz, High Power-12.5kHz



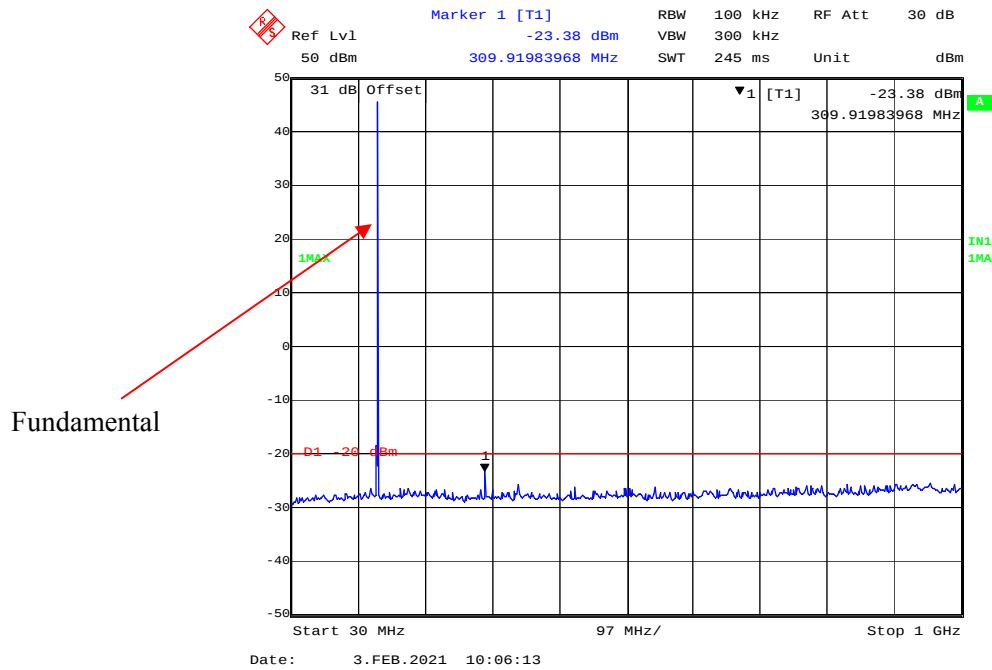
Frequency:136.025 MHz, 30 MHz – 1 GHz, Low Power-12.5kHz



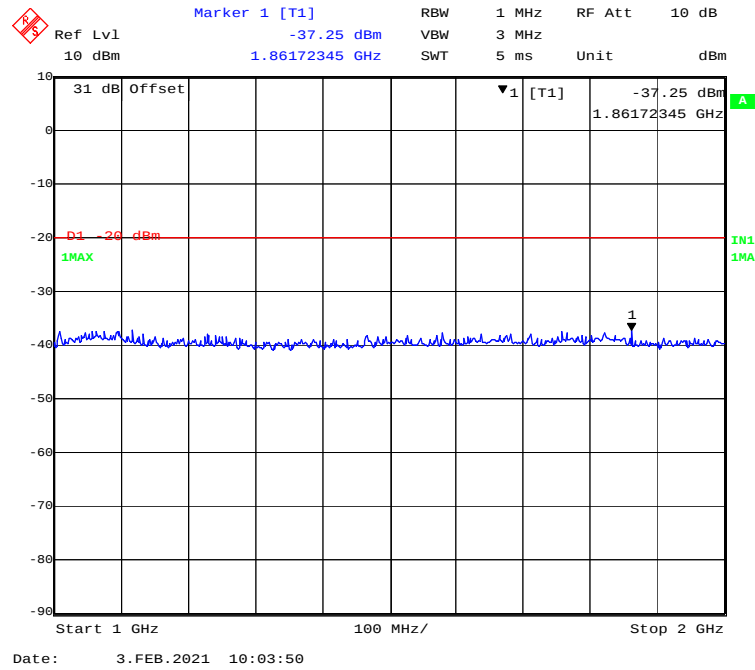
Frequency:136.025 MHz, 1 GHz - 2 GHz, Low Power-12.5kHz



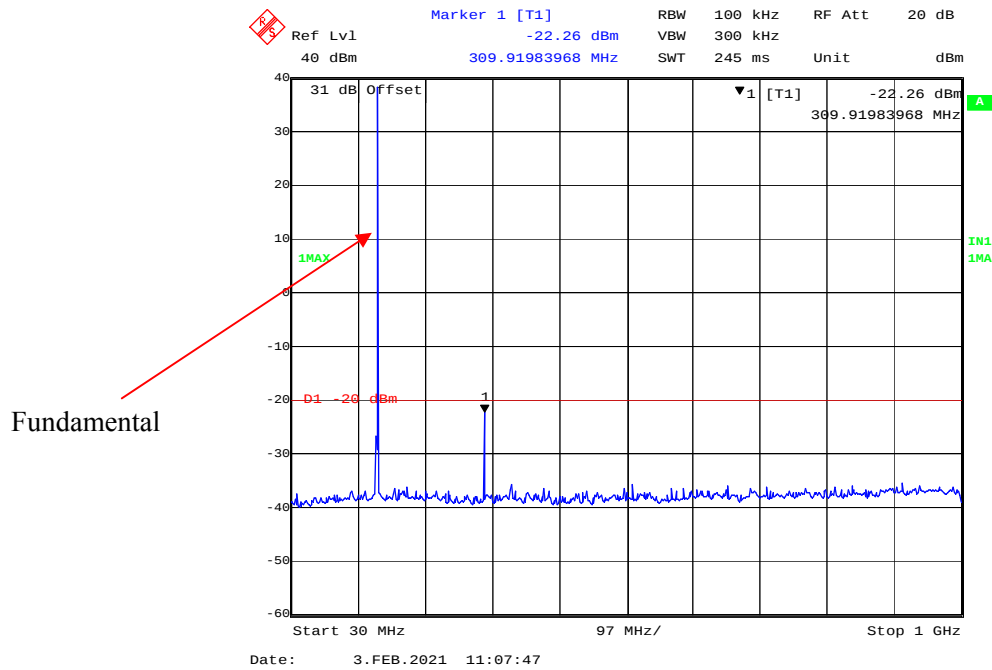
Frequency:155.000 MHz, 30 MHz – 1 GHz, High Power-12.5kHz



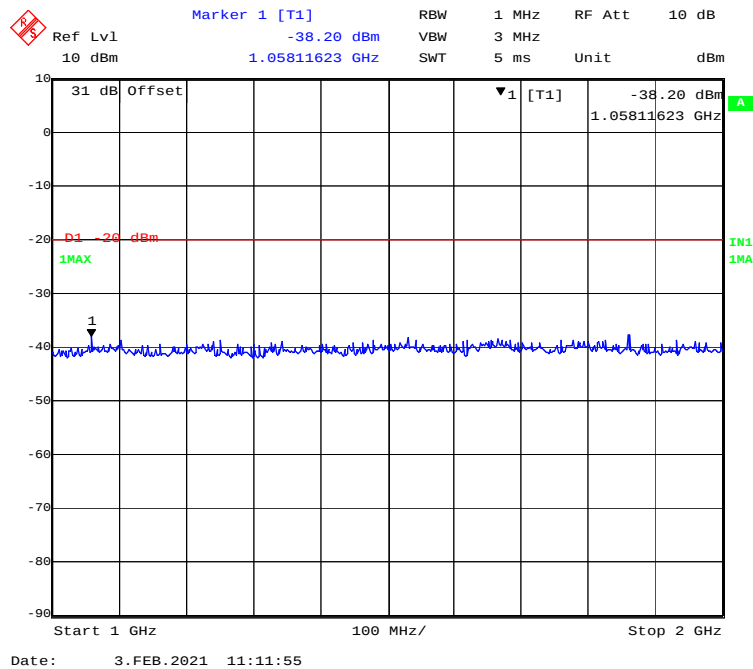
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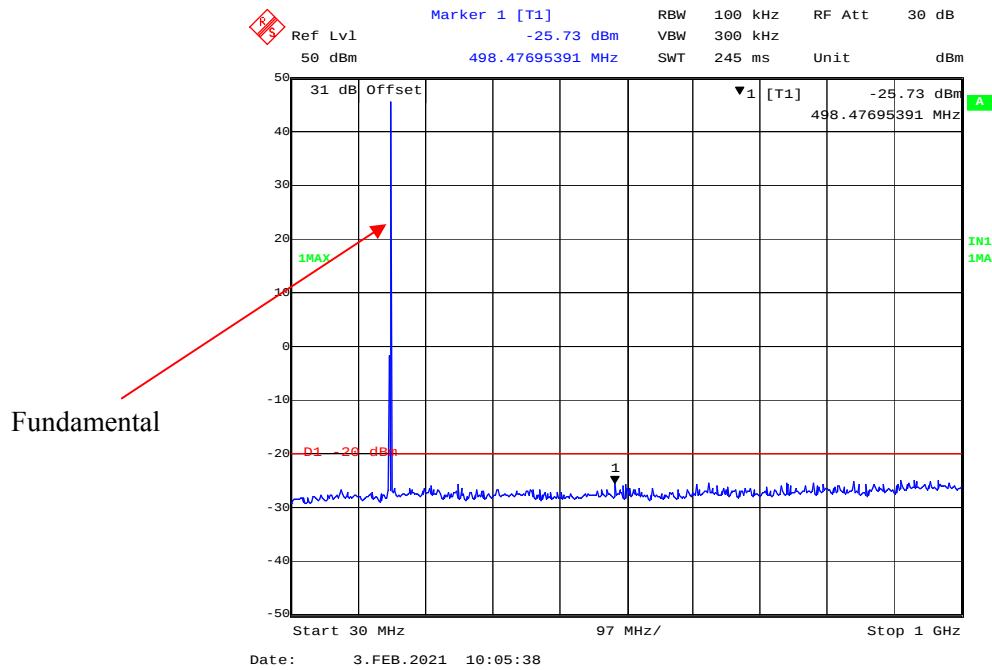
Frequency:155.000 MHz, 30 MHz – 1 GHz, Low Power-12.5kHz



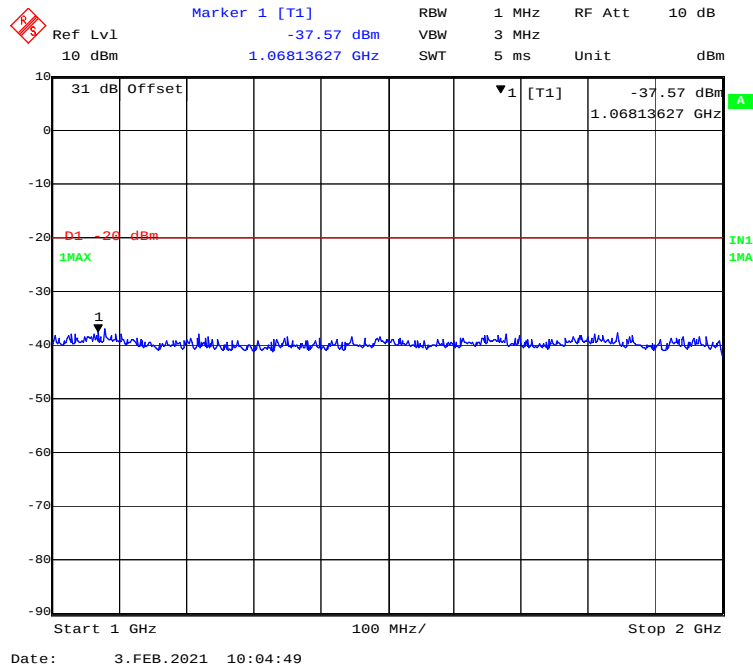
Frequency:155.000 MHz, 1 GHz - 2 GHz, Low Power-12.5kHz



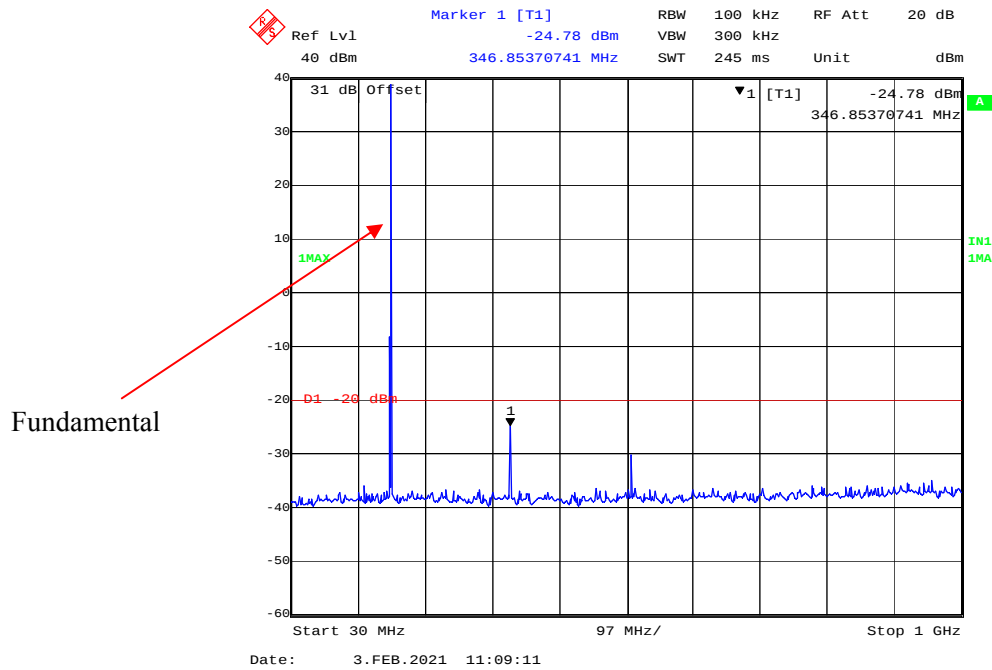
Frequency:173.975 MHz, 30 MHz – 1 GHz, High Power-12.5kHz



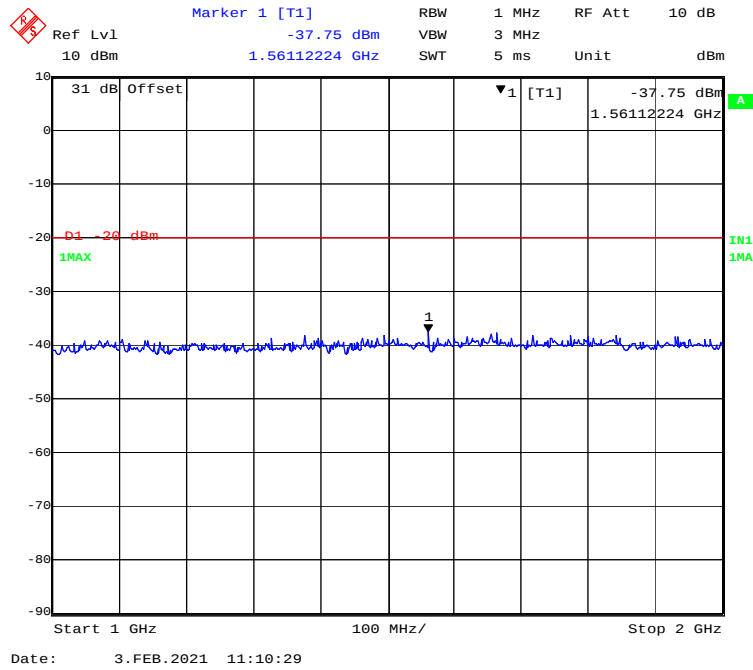
Frequency:173.975 MHz, 1 GHz - 2 GHz, High Power-12.5kHz



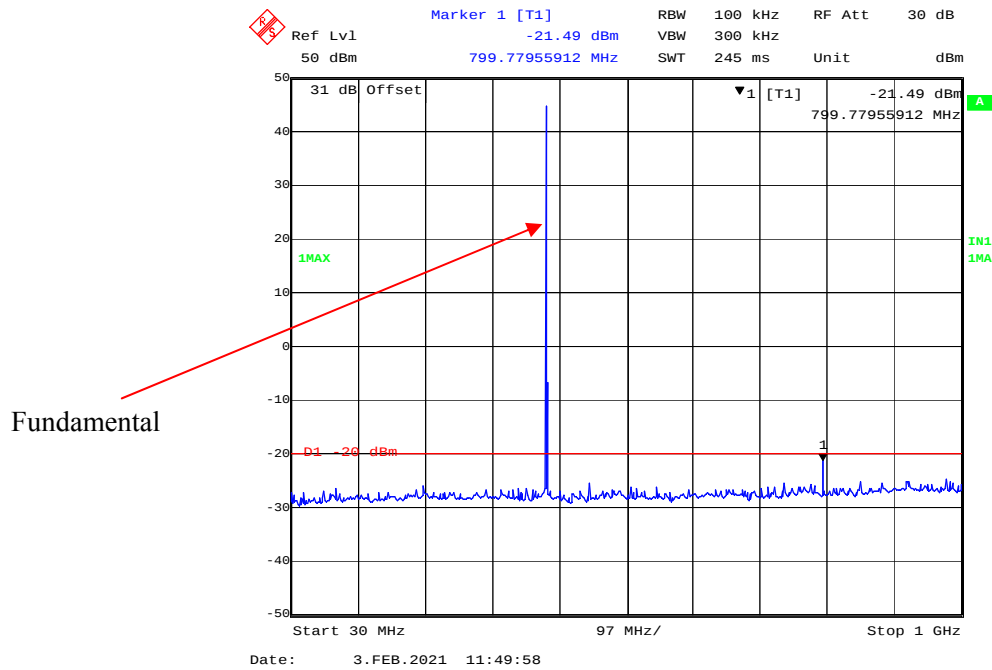
Frequency:173.975 MHz, 30 MHz – 1 GHz, Low Power-12.5kHz



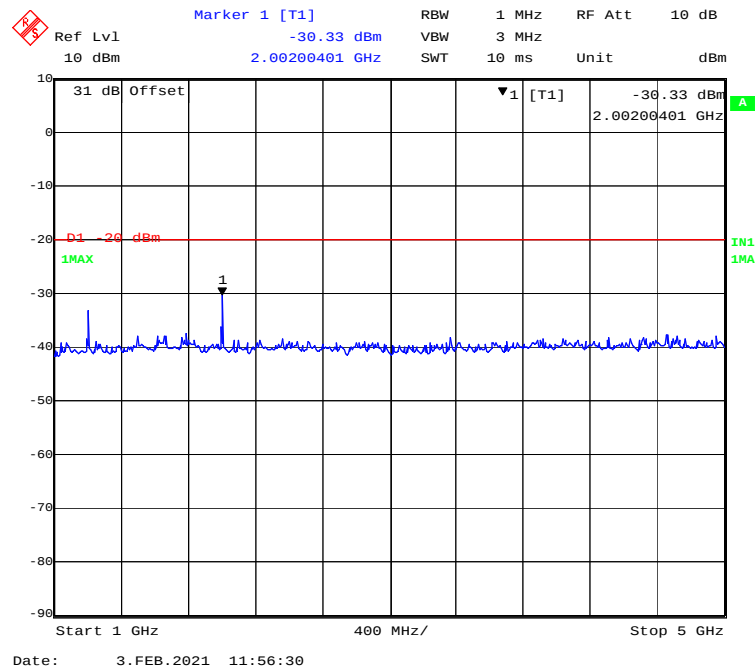
Frequency:173.975 MHz, 1 GHz - 2 GHz, Low Power-12.5kHz



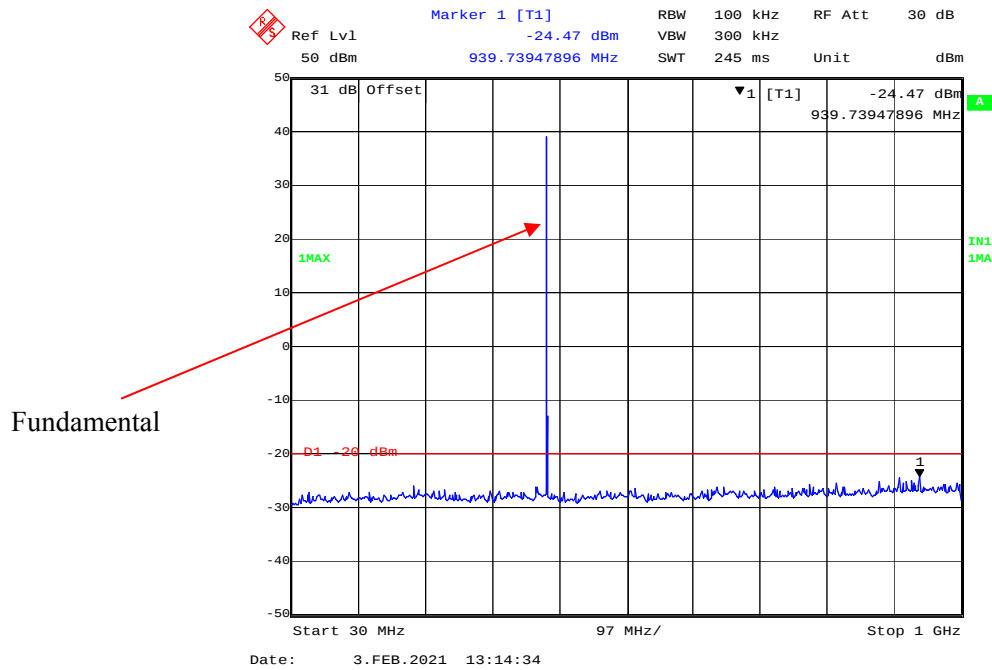
Frequency: 400.025 MHz, 30 MHz – 1 GHz, High Power-12.5kHz



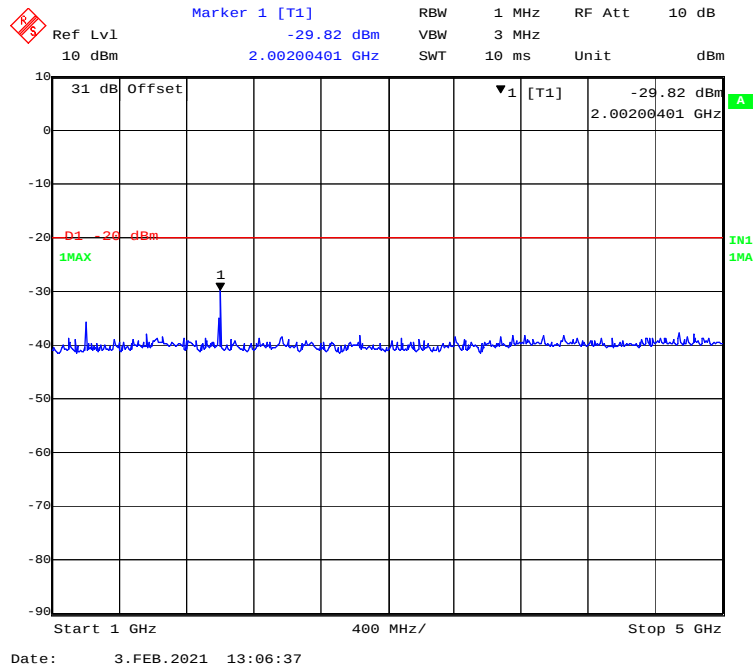
Frequency: 400.025 MHz, 1 GHz - 5 GHz, High Power-12.5kHz



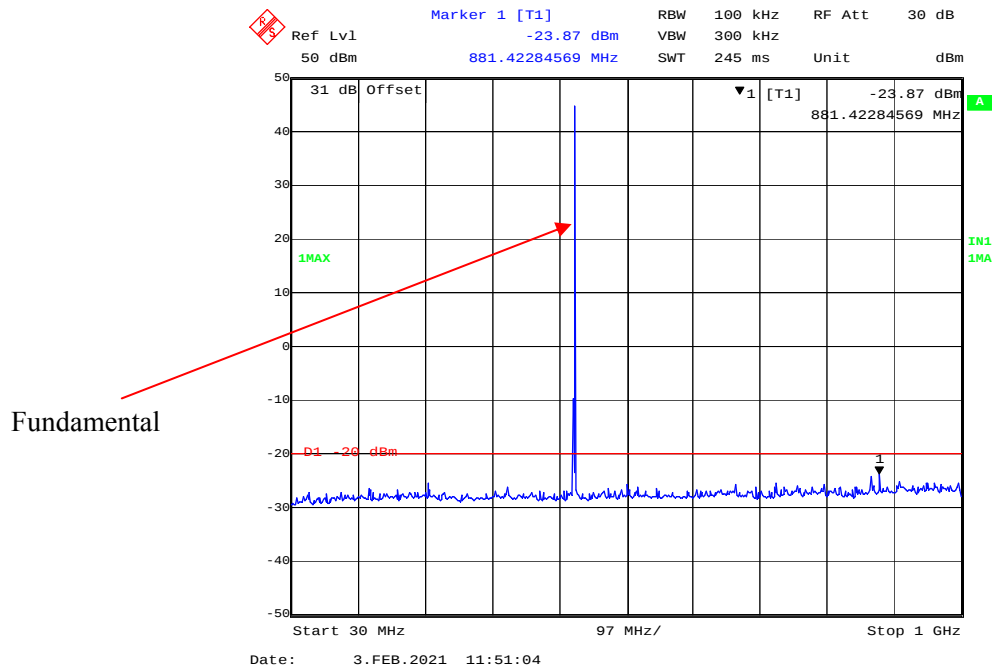
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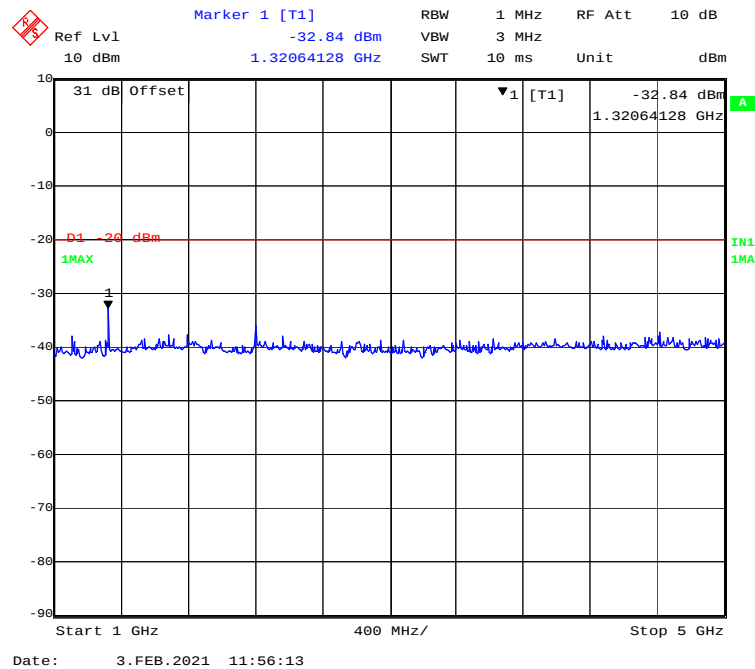
Frequency: 400.025 MHz, 1 GHz - 5 GHz, Low Power-12.5kHz



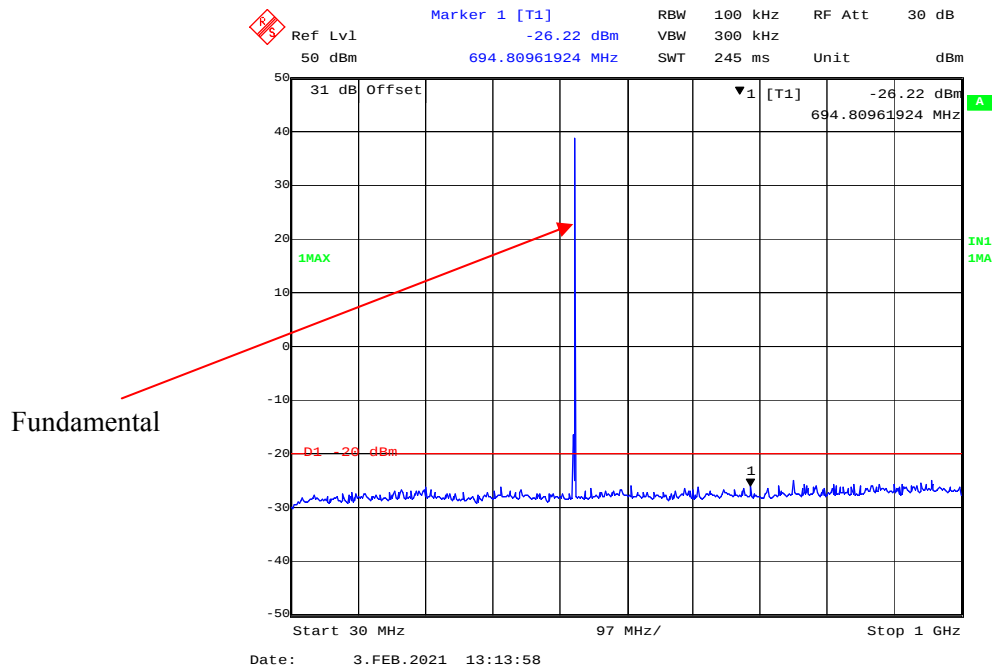
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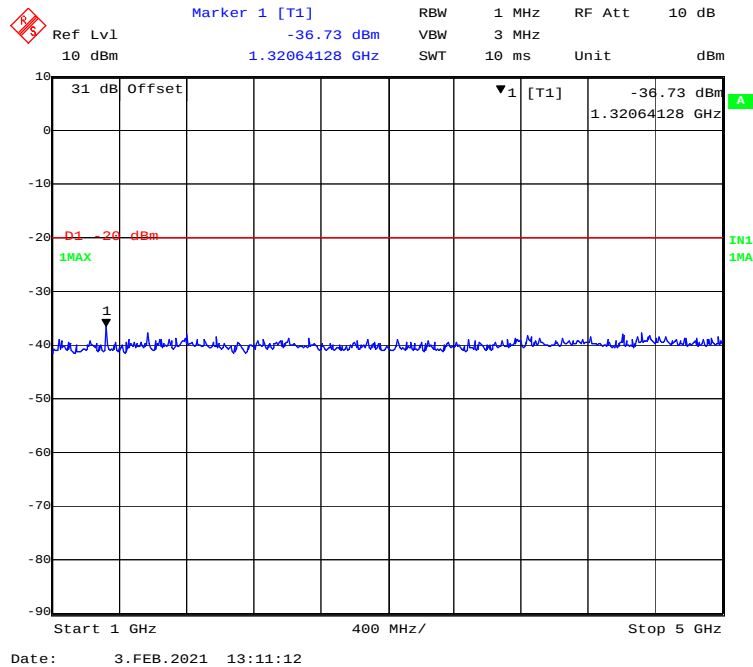
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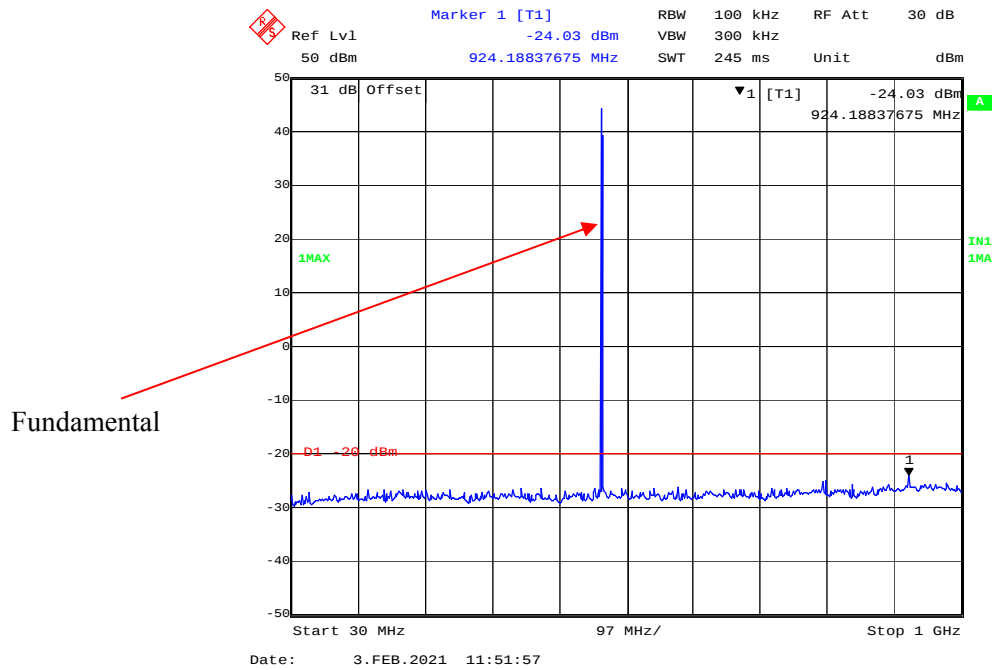
Frequency: 440.000 MHz, 30 MHz – 1 GHz, Low Power-12.5kHz



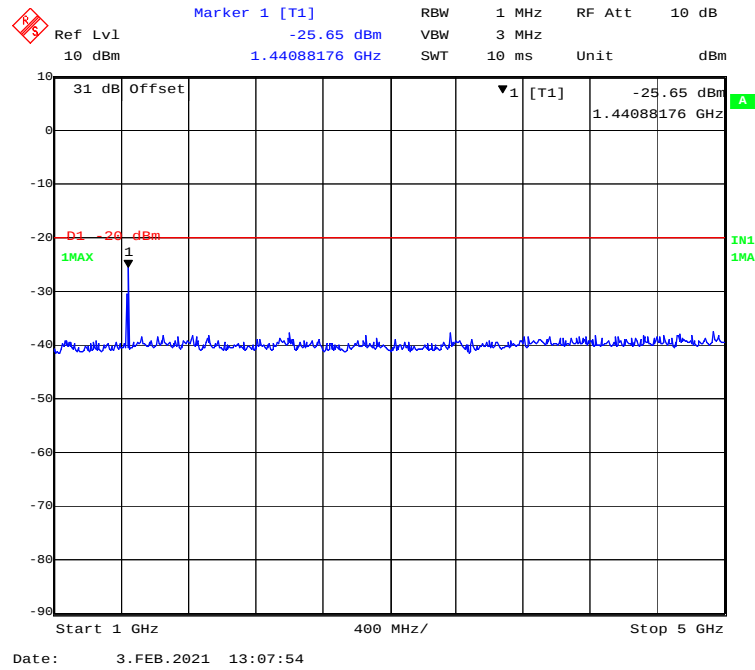
Frequency: 440.000 MHz, 1 GHz - 5 GHz, Low Power-12.5kHz



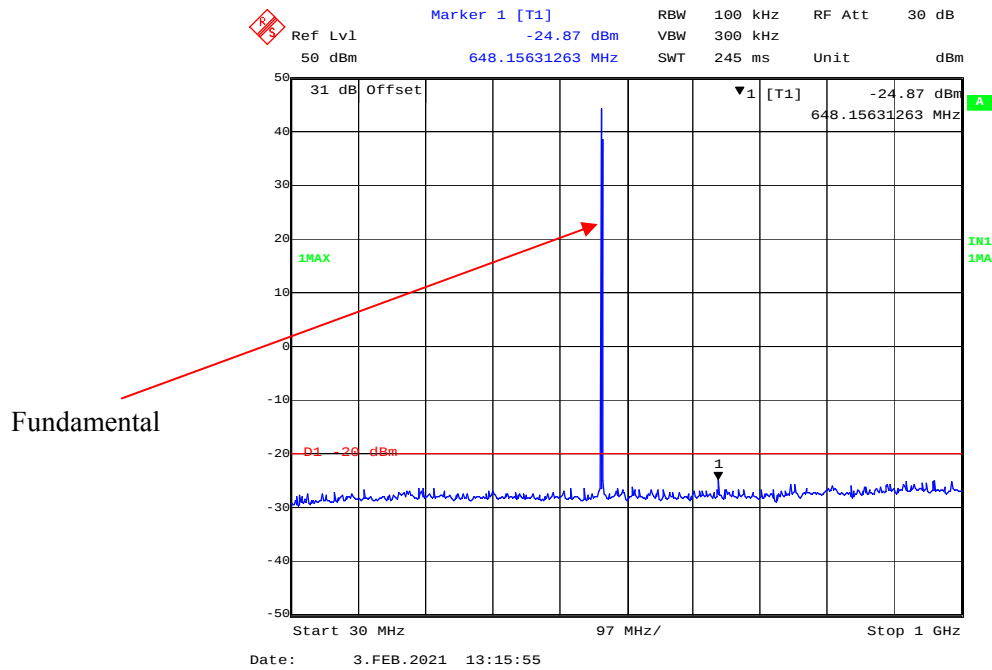
Frequency: 479.975 MHz, 30 MHz – 1 GHz, High Power-12.5kHz



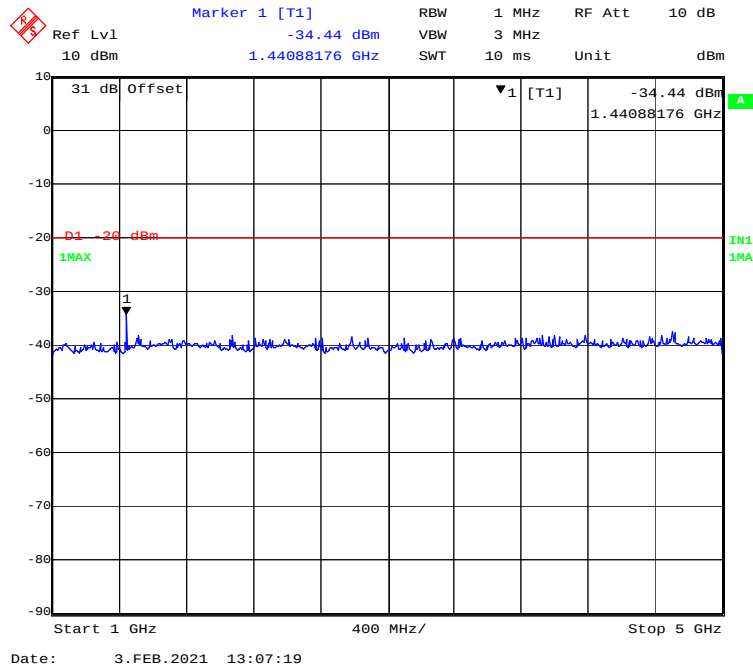
Frequency: 479.975 MHz, 1 GHz - 5 GHz, High Power-12.5kHz



Frequency: 479.975 MHz, 30 MHz – 1 GHz, Low Power-12.5kHz



Frequency: 479.975 MHz, 1 GHz - 5 GHz, Low Power-12.5kHz



FCC §2.1053 & §90.210 - RADIATED SPURIOUS EMISSION**Applicable Standard**

FCC §2.1053, §90.210

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to teeth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001)-the absolute level

Test Data**Environmental Conditions**

Temperature:	23.3 °C
Relative Humidity:	54 %
ATM Pressure:	101.2 kPa

The testing was performed by CK Huang on 2021-02-06.

Test Mode: Transmitting

30MHz-5GHz:**136-174 MHz Band:**

Frequency (MHz)	Receiver Reading (dBuV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd /dBi)			
Analog, Frequency : 136.025MHz(12.5kHz)										
272.05	81.98	209	150	H	-22	0.45	-2.21	-24.66	-20	4.66
272.05	81.62	44	150	V	-22.36	0.45	-2.21	-25.02	-20	5.02
1224.225	75.07	314	150	H	-38.75	0.8	7.43	-32.12	-20	12.12
1224.225	73.73	330	150	V	-40.09	0.8	7.43	-33.46	-20	13.46
Analog, Frequency : 155.000MHz(12.5kHz)										
310	86.52	273	150	H	-20.94	0.47	-2.01	-23.42	-20	3.42
310	87.25	226	150	V	-20.21	0.47	-2.01	-22.69	-20	2.69
1395	72.95	306	150	H	-41.21	0.82	7.91	-34.12	-20	14.12
1395	71.84	342	150	V	-42.32	0.82	7.91	-35.23	-20	15.23
Analog, Frequency : 173.975MHz(12.5kHz)										
347.95	88.3	268	150	H	-20.09	0.47	-1.77	-22.33	-20	2.33
347.95	87.58	145	150	V	-20.81	0.47	-1.77	-23.05	-20	3.05
1565.775	70.99	333	150	H	-42.93	0.83	8.3	-35.46	-20	15.46
1565.775	70.43	9	150	V	-43.49	0.83	8.3	-36.02	-20	16.02
Digital, Frequency : 136.025MHz(12.5kHz)										
272.05	84.62	305	150	H	-19.36	0.45	-2.21	-22.02	-20	2.02
272.05	84.95	51	150	V	-19.03	0.45	-2.21	-21.69	-20	1.69
1224.225	72.5	175	150	H	-41.32	0.8	7.43	-34.69	-20	14.69
1224.225	72.17	13	150	V	-41.65	0.8	7.43	-35.02	-20	15.02
Digital, Frequency : 155.000MHz(12.5kHz)										
309.19	87.58	175	150	H	-19.88	0.47	-2.01	-22.36	-20	2.36
309.19	86.48	287	150	V	-20.98	0.47	-2.01	-23.46	-20	3.46
1395	72.42	38	150	H	-41.74	0.82	7.91	-34.65	-20	14.65
1395	71.11	83	150	V	-43.05	0.82	7.91	-35.96	-20	15.96
Digital, Frequency : 173.975MHz(12.5kHz)										
347.94	88.27	240	150	H	-20.12	0.47	-1.77	-22.36	-20	2.36
347.94	87.17	261	150	V	-21.22	0.47	-1.77	-23.46	-20	3.46
1565.775	71.51	289	150	H	-42.41	0.85	8.3	-34.96	-20	14.96
1565.775	71.01	290	150	V	-42.91	0.85	8.3	-35.46	-20	15.46

400-480 MHz Band:

Frequency (MHz)	Receiver Reading (dBuV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd /dBi)			
Analog, Frequency : 400.025MHz(12.5kHz)										
800.05	74.63	86	100	H	-23.59	0.62	-1.25	-25.46	-20	5.46
800.05	73.13	200	150	V	-25.09	0.62	-1.25	-26.96	-20	6.96
1200.075	80.19	56	150	H	-33.58	0.8	7.36	-27.02	-20	7.02
1200.075	81.08	156	150	V	-32.69	0.8	7.36	-26.13	-20	6.13
Analog, Frequency : 440.000MHz(12.5kHz)										
880	71.34	335	150	H	-24.55	0.63	-1.01	-26.19	-20	6.19
880	70.4	111	100	V	-25.49	0.63	-1.01	-27.13	-20	7.13
1320	80.16	88	100	H	-33.85	0.81	7.7	-26.96	-20	6.96
1320	79.66	34	150	V	-34.35	0.81	7.7	-27.46	-20	7.46
Analog, Frequency : 479.975MHz(12.5kHz)										
959.95	73.13	257	150	H	-24.11	0.66	-1.19	-25.96	-20	5.96
959.95	72.63	267	100	V	-24.61	0.66	-1.19	-26.46	-20	6.46
1439.925	81.08	108	100	H	-33.17	0.82	8.03	-25.96	-20	5.96
1439.925	80.38	107	150	V	-33.87	0.82	8.03	-26.66	-20	6.66
Digital, Frequency : 400.025MHz(12.5kHz)										
800.05	73.63	336	100	H	-24.59	0.62	-1.25	-26.46	-20	6.46
800.05	72.24	167	150	V	-25.98	0.62	-1.25	-27.85	-20	7.85
1200.075	79.08	180	150	H	-34.69	0.8	7.36	-28.13	-20	8.13
1200.075	80.05	332	150	V	-33.72	0.8	7.36	-27.16	-20	7.16
Digital, Frequency : 440.000MHz(12.5kHz)										
880	71.1	80	150	H	-24.79	0.63	-1.01	-26.43	-20	6.43
880	70.5	68	100	V	-25.39	0.63	-1.01	-27.03	-20	7.03
1320	79.96	291	100	H	-34.05	0.81	7.7	-27.16	-20	7.16
1320	80.81	266	150	V	-33.2	0.81	7.7	-26.31	-20	6.31
Digital, Frequency : 479.975MHz(12.5kHz)										
959.95	72.34	355	150	H	-24.9	0.66	-1.19	-26.75	-20	6.75
959.95	72.87	110	100	V	-24.37	0.66	-1.19	-26.22	-20	6.22
1439.925	80.91	250	100	H	-33.34	0.82	8.03	-26.13	-20	6.13
1439.925	81.21	40	150	V	-33.04	0.82	8.03	-25.83	-20	5.83

Note:

Absolute Level = Substituted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level.

FCC§2.1055 (d), §90.213 - FREQUENCY STABILITY

Applicable Standard

FCC §2.1055, §90.213

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

Test Data**Environmental Conditions**

Temperature:	23.3 °C
Relative Humidity:	54 %
ATM Pressure:	101.2 kPa

The testing was performed by CK Huang on 2021-02-05.

Test Mode: Transmitting

For 136-174 MHz Band:

Analog,Reference Frequency:136.025MHz(12.5kHz)				
Temperature (°C)	Voltage (V_{DC})	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	136.02512	0.88	± 5
-20		136.02519	1.40	
-10		136.02515	1.10	
0		136.02519	1.40	
10		136.02518	1.32	
20		136.02512	0.88	
30		136.02515	1.10	
40		136.02514	1.03	
50		136.0251	0.74	
20	12.4	136.02519	1.40	
20	15.2	136.02512	0.88	

Analog,Reference Frequency:155.000MHz(12.5kHz)				
Temperature (°C)	Voltage (V_{DC})	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	155.00019	1.23	± 5
-20		155.00015	0.97	
-10		155.00011	0.71	
0		155.00011	0.71	
10		155.00015	0.97	
20		155.00012	0.77	
30		155.00016	1.03	
40		155.0001	0.65	
50		155.00015	0.97	
20	12.4	155.00012	0.77	
20	15.2	155.00019	1.23	

Analog,Reference Frequency:173.975MHz(12.5kHz)				
Temperature (°C)	Voltage (V _{DC})	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	173.97518	1.03	±5
-20		173.97513	0.75	
-10		173.97518	1.03	
0		173.97516	0.92	
10		173.9751	0.57	
20		173.97515	0.86	
30		173.97511	0.63	
40		173.97519	1.09	
50		173.97517	0.98	
20	12.4	173.97515	0.86	
20	15.2	173.97511	0.63	

Digital,Reference Frequency:136.025MHz(12.5kHz)				
Temperature (°C)	Voltage (V _{DC})	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	136.02508	0.59	±5
-20		136.02503	0.22	
-10		136.02509	0.66	
0		136.02505	0.37	
10		136.02503	0.22	
20		136.02508	0.59	
30		136.02501	0.07	
40		136.02504	0.29	
50		136.0251	0.74	
20	12.4	136.02507	0.51	
20	15.2	136.02501	0.07	

Digital,Reference Frequency:155.000MHz(12.5kHz)				
Temperature (°C)	Voltage (V _{DC})	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	155.0001	0.65	±5
-20		155.0001	0.65	
-10		155.00011	0.71	
0		155.0002	1.29	
10		155.00016	1.03	
20		155.00018	1.16	
30		155.00013	0.84	
40		155.00019	1.23	
50		155.00012	0.77	
20	12.4	155.00012	0.77	
20	15.2	155.00017	1.10	

Digital,Reference Frequency:173.975MHz(12.5kHz)				
Temperature (°C)	Voltage (V _{DC})	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	173.97517	0.98	±5
-20		173.97517	0.98	
-10		173.97512	0.69	
0		173.97512	0.69	
10		173.97514	0.80	
20		173.97516	0.92	
30		173.97514	0.80	
40		173.97516	0.92	
50		173.97519	1.09	
20	12.4	173.97514	0.80	
20	15.2	173.97512	0.69	

For 400-480 MHz Band:

Analog,Reference Frequency:400.025MHz(12.5kHz)				
Temperature (°C)	Voltage (V_{DC})	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	400.02564	1.60	±2.5
-20		400.02567	1.67	
-10		400.02563	1.57	
0		400.02567	1.67	
10		400.02561	1.52	
20		400.02569	1.72	
30		400.02564	1.60	
40		400.02568	1.70	
50		400.02566	1.65	
20	12.4	400.02565	1.62	
20	15.2	400.02561	1.52	

Analog,Reference Frequency:440.000MHz(12.5kHz)				
Temperature (°C)	Voltage (V_{DC})	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	440.00069	1.57	±2.5
-20		440.00065	1.48	
-10		440.0006	1.36	
0		440.00062	1.41	
10		440.00068	1.55	
20		440.00062	1.41	
30		440.00062	1.41	
40		440.00068	1.55	
50		440.00063	1.43	
20	12.4	440.00061	1.39	
20	15.2	440.00063	1.43	

Analog,Reference Frequency:479.975MHz(12.5kHz)				
Temperature (°C)	Voltage (V _{DC})	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	479.97567	1.40	±2.5
-20		479.97561	1.27	
-10		479.97567	1.40	
0		479.9757	1.46	
10		479.97561	1.27	
20		479.97561	1.27	
30		479.97565	1.35	
40		479.97568	1.42	
50		479.97566	1.38	
20	12.4	479.97563	1.31	
20	15.2	479.97561	1.27	

Digital,Reference Frequency:400.025MHz(12.5kHz)				
Temperature (°C)	Voltage (V _{DC})	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	400.02563	1.57	±2.5
-20		400.02568	1.70	
-10		400.02565	1.62	
0		400.02567	1.67	
10		400.02564	1.60	
20		400.02566	1.65	
30		400.02566	1.65	
40		400.02567	1.67	
50		400.02567	1.67	
20	12.4	400.02568	1.70	
20	15.2	400.02565	1.62	

Digital,Reference Frequency:440.000MHz(12.5kHz)				
Temperature (°C)	Voltage (V _{DC})	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	440.00067	1.52	±2.5
-20		440.00062	1.41	
-10		440.00062	1.41	
0		440.00063	1.43	
10		440.00067	1.52	
20		440.00061	1.39	
30		440.00061	1.39	
40		440.00065	1.48	
50		440.00062	1.41	
20	12.4	440.00066	1.50	
20	15.2	440.00069	1.57	

Digital,Reference Frequency:479.975MHz(12.5kHz)				
Temperature (°C)	Voltage (V _{DC})	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	479.97566	1.38	±2.5
-20		479.97562	1.29	
-10		479.97563	1.31	
0		479.97564	1.33	
10		479.97563	1.31	
20		479.97568	1.42	
30		479.97562	1.29	
40		479.97565	1.35	
50		479.97565	1.35	
20	12.4	479.97564	1.33	
20	15.2	479.97567	1.40	

FCC §90.214 - TRANSIENT FREQUENCY BEHAVIOR

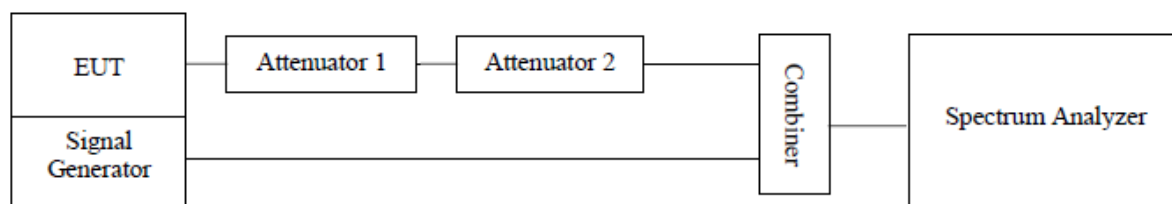
Applicable Standard

Regulations: FCC §90.214

Test method: ANSI C63.26.

Test Procedure

- a) Connect the EUT and test equipment as shown on the following block diagram.
- b) Set the Spectrum Analyzer to measure FM deviation, and tune the RF frequency to the transmitter assigned frequency.
- c) Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at ± 12.5 kHz deviation and set its output level to -100dBm.
- d) Turn on the transmitter.
- e) Supply sufficient attenuation via the RF attenuator to provide an input level to the Spectrum Analyzer that is 40 dB below the maximum allowed input power when the transmitter is operating at its rated power level. Note this power level on the Spectrum Analyzer as P0.
- f) Turn off the transmitter.
- g) Adjust the RF level of the signal generator to provide RF power equal to P0. This signal generator RF level shall be maintained throughout the rest of the measurement.
- h) Remove the attenuation 1, so the input power to the Spectrum Analyzer is increased by 30 dB when the transmitter is turned on.
- i) Adjust the vertical amplitude control of the spectrum analyzer to display the 1000 Hz at ± 4 divisions vertically centered on the display. Set trigger mode of the Spectrum Analyzer to "Video", and tune the "trigger level" on suitable level. Then set the "trigger offset" to -10ms for turn on and -15ms for turn off.
- j) Turn on the transmitter and the transient wave will be captured on the screen of Spectrum Analyzer. Observe the stored display. The instant when the 1 kHz test signal is completely suppressed is considered to be ton. The trace should be maintained within the allowed divisions during the period t1 and t2.
- k) Then turn off the transmitter, and another transient wave will be captured on the screen of Spectrum Analyzer. The trace should be maintained within the allowed divisions during the period t3.



Test Data**Environmental Conditions**

Temperature:	23.3 °C
Relative Humidity:	54 %
ATM Pressure:	101.2 kPa

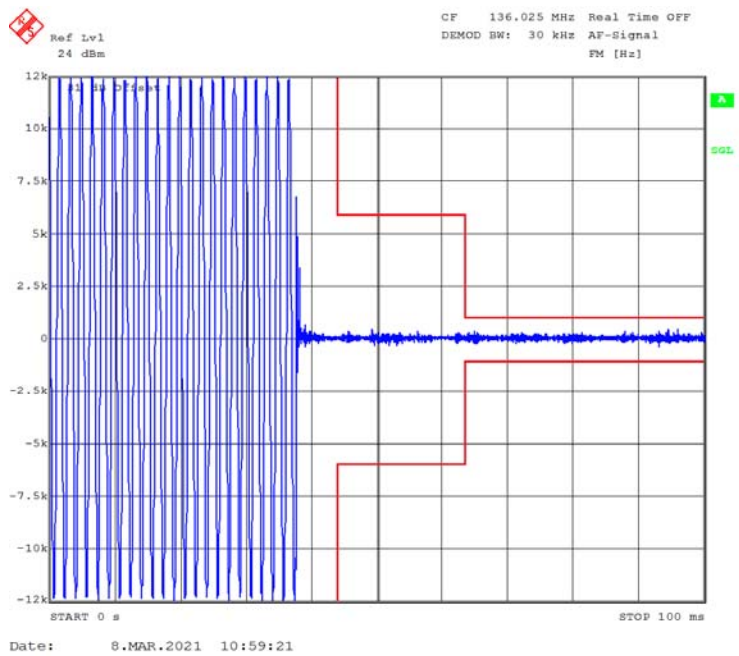
The testing was performed by CK Huang on 2021-03-08.

Band	Channel Spacing (kHz)	Transient Period (ms)	Transient Frequency(kHz)	Result
136-174MHz	12.5	<5(t ₁)	±12.5	Pass
		<20(t ₂)	±6.25	
		<5(t ₃)	±12.5	
400-480MHz	12.5	<10(t ₁)	±12.5	Pass
		<25(t ₂)	±6.25	
		<10(t ₃)	±12.5	

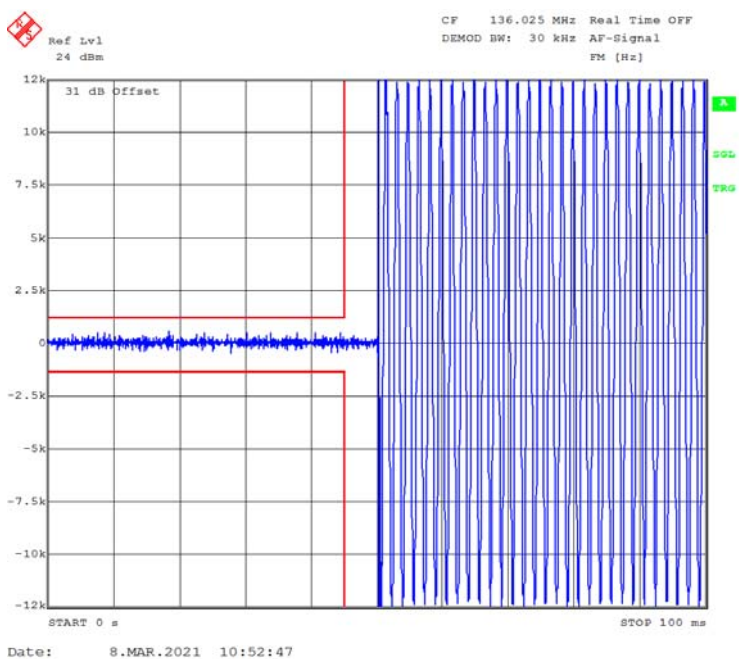
Please refer to the following plots:

Frequency:136.025 MHz, High Power-12.5kHz

Turn on

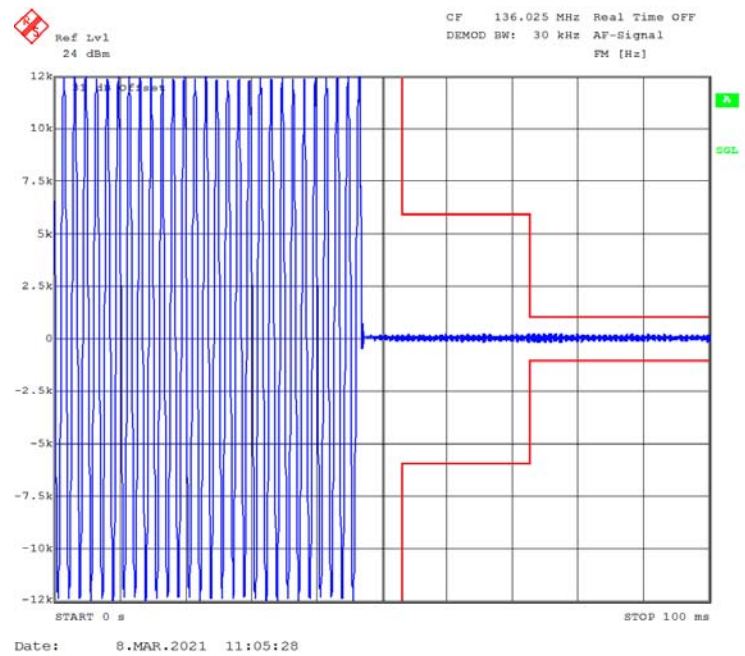


Turn off

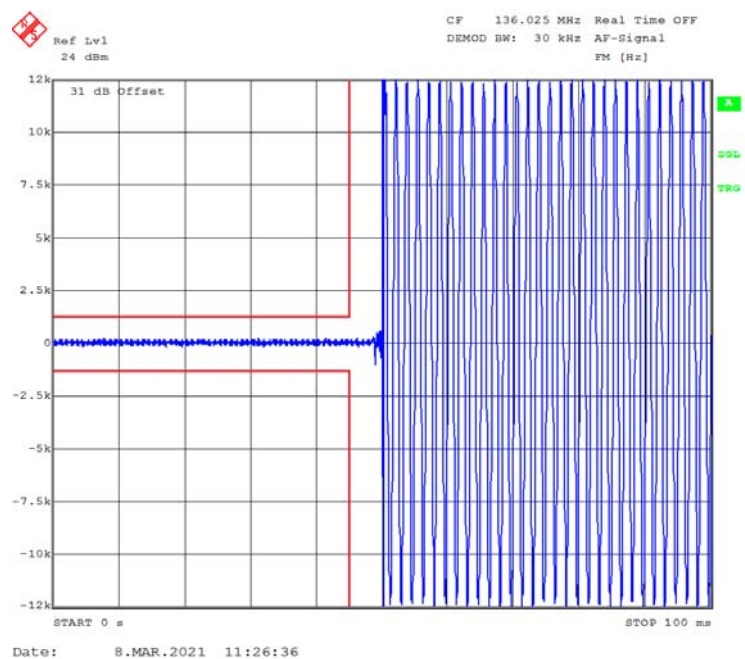


Frequency:136.025 MHz, Low Power-12.5kHz

Turn on

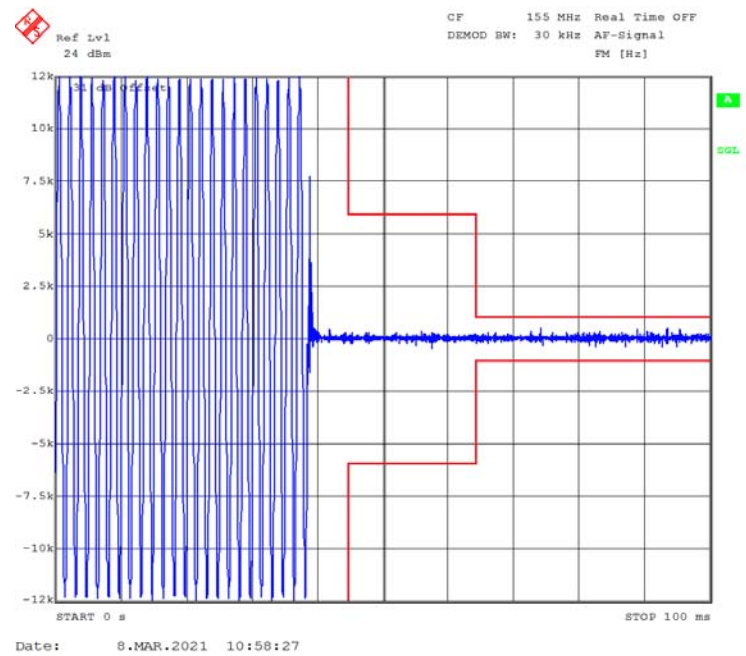


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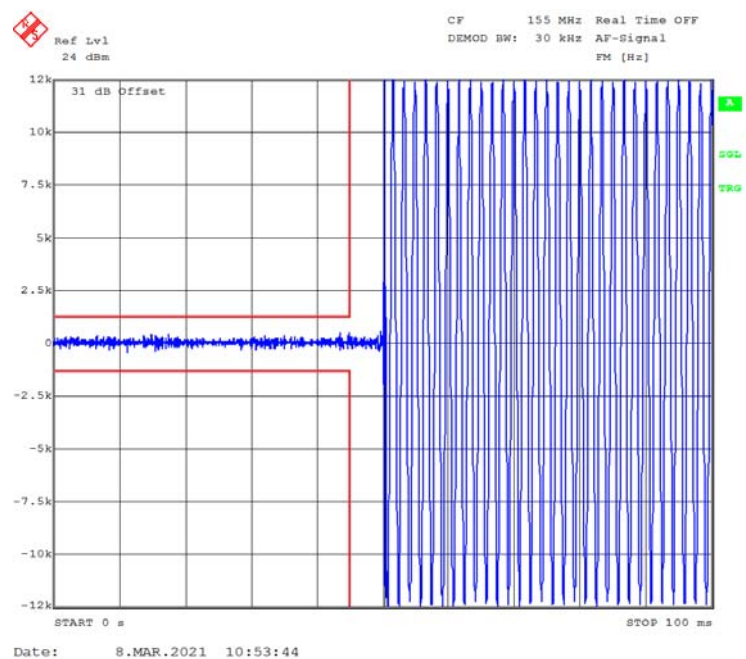


Frequency:155.000 MHz, High Power-12.5kHz

Turn on

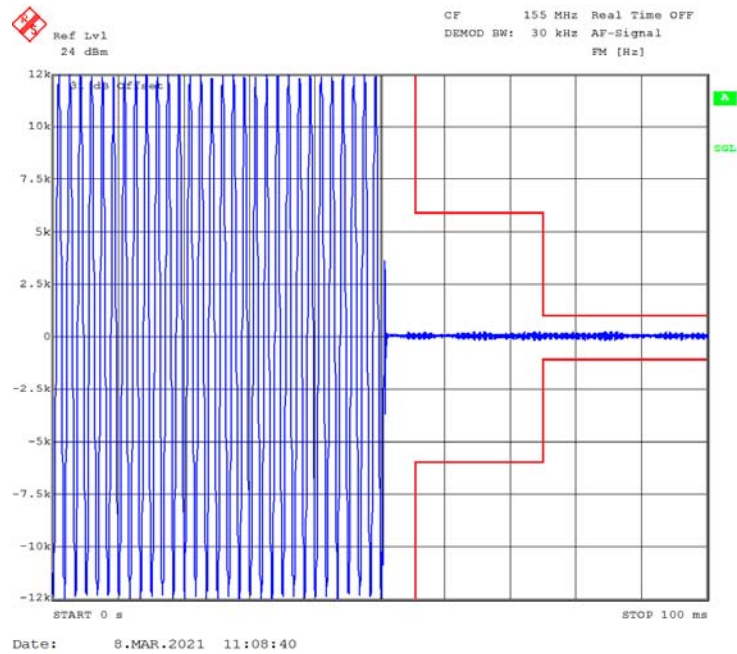


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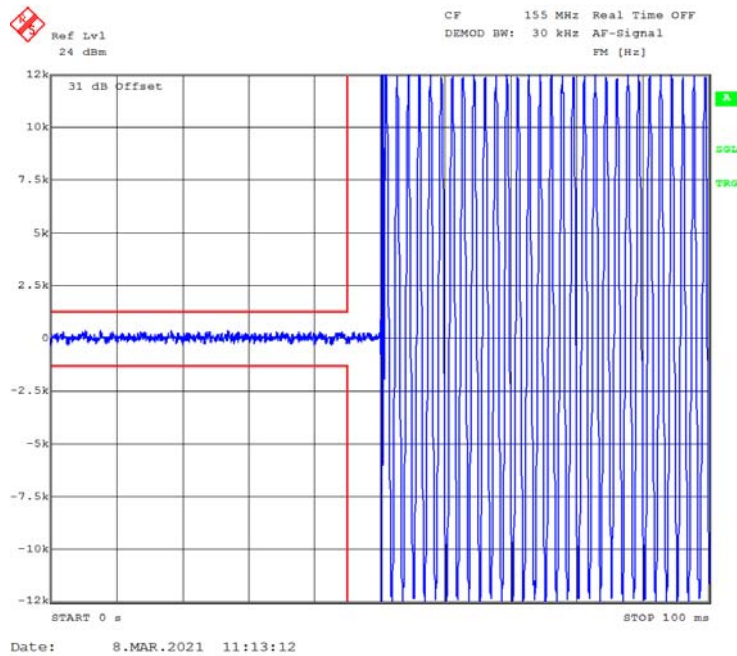


Frequency:155.000 MHz, Low Power-12.5kHz

Turn on

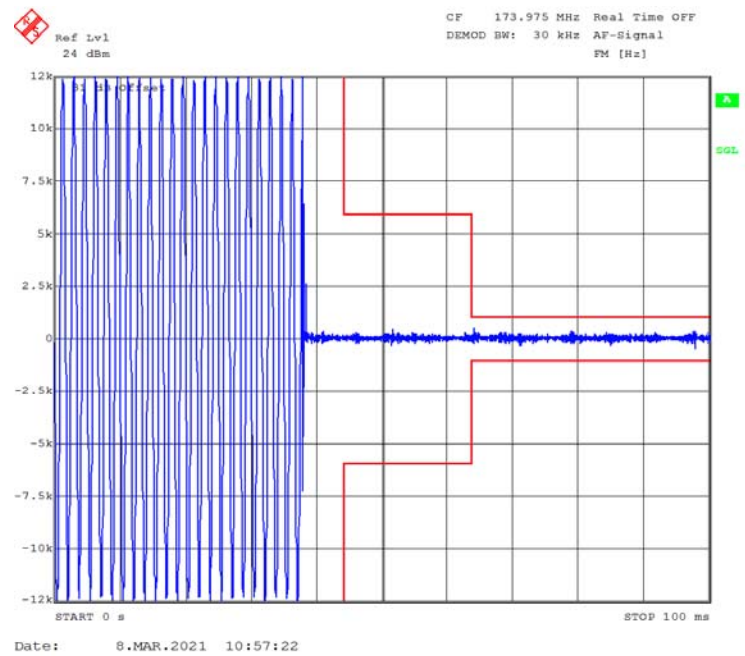


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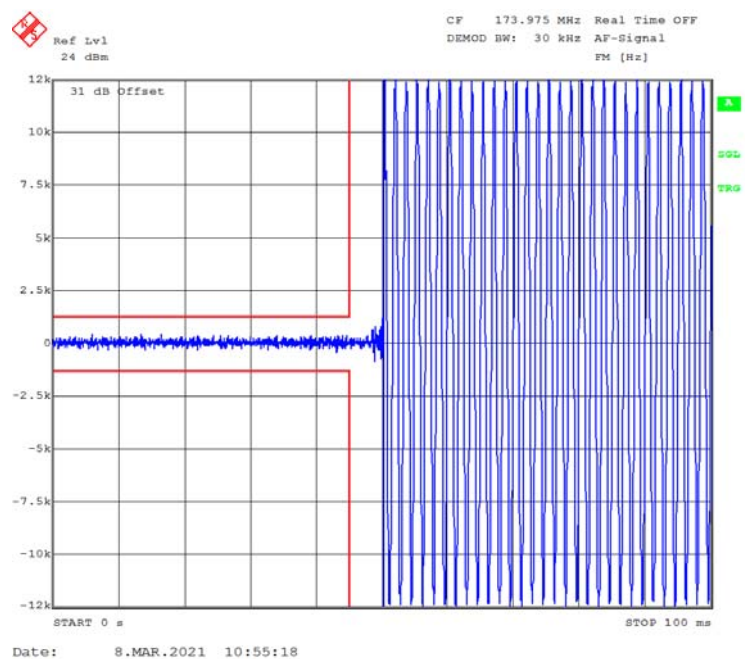


Frequency:173.975 MHz, High Power-12.5kHz

Turn on

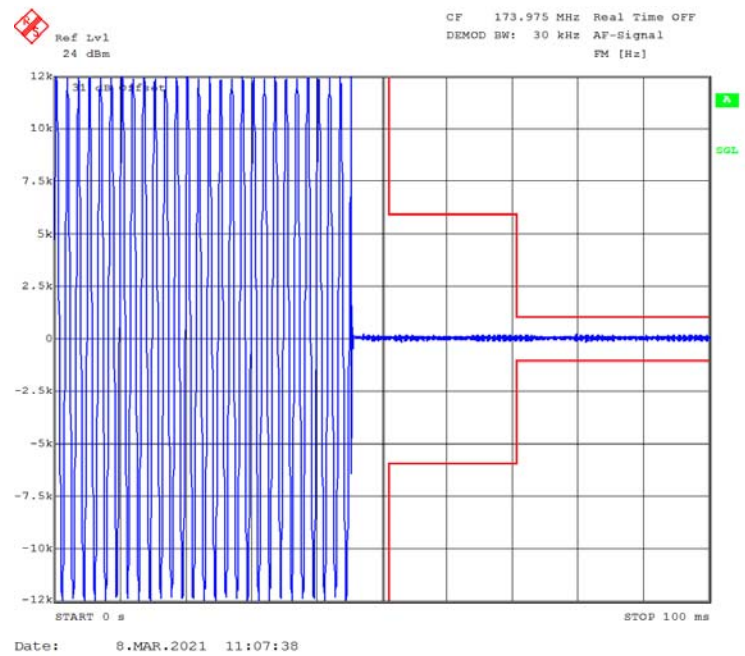


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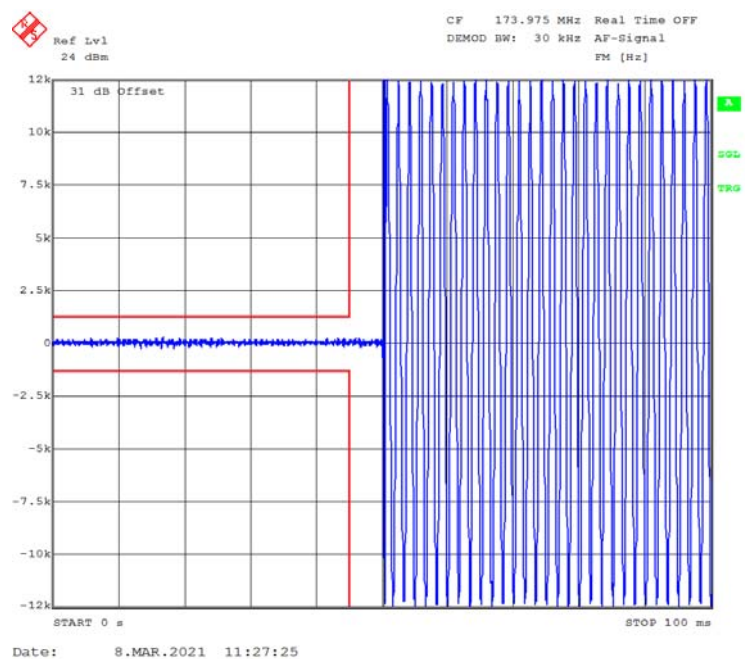


Frequency:173.975 MHz, Low Power-12.5kHz

Turn on

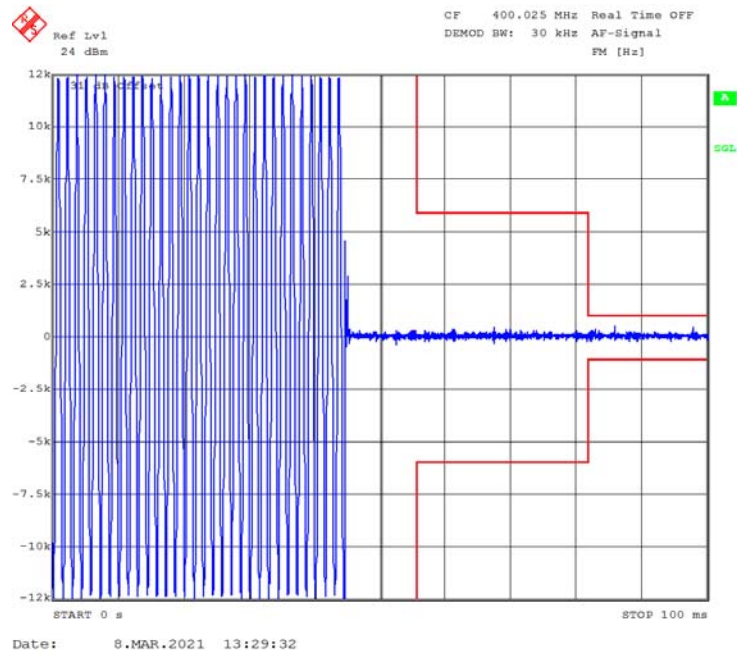


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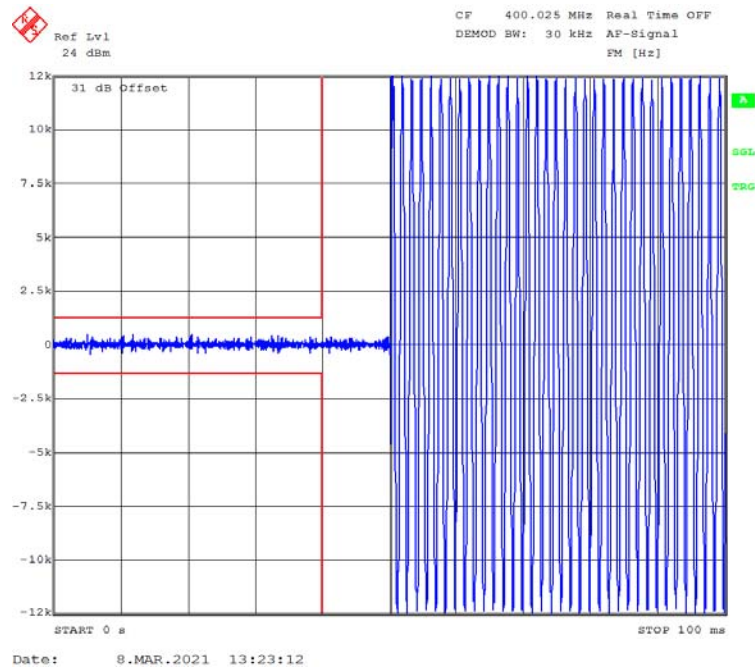


Frequency:400.025 MHz, High Power-12.5kHz

Turn on

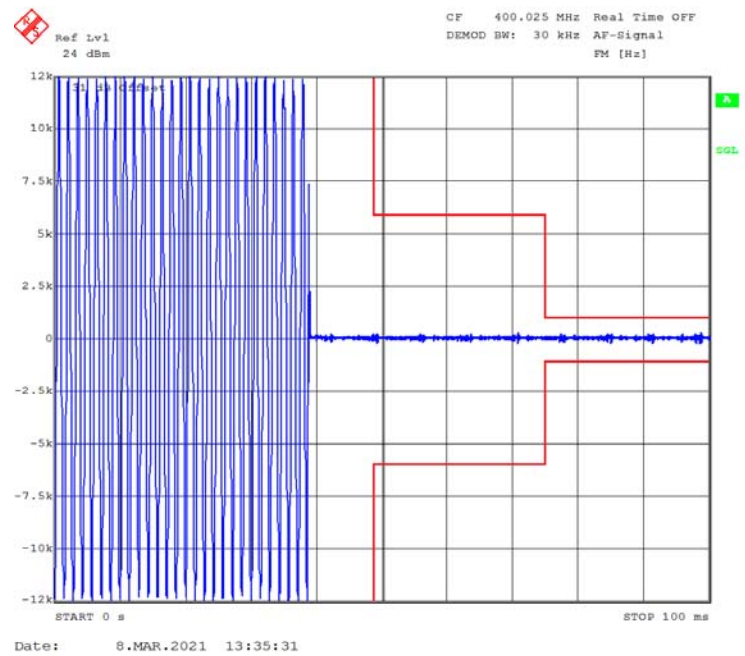


Turn off

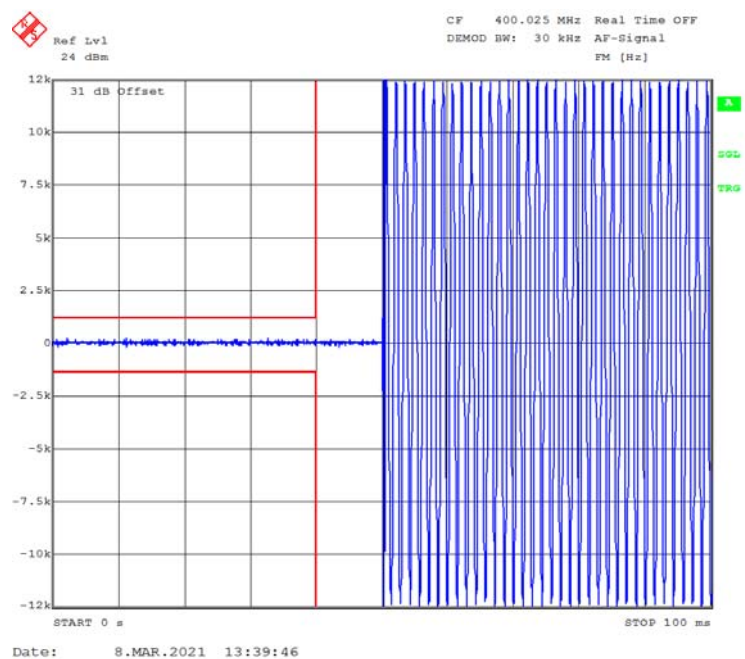


Frequency:400.025 MHz, Low Power-12.5kHz

Turn on

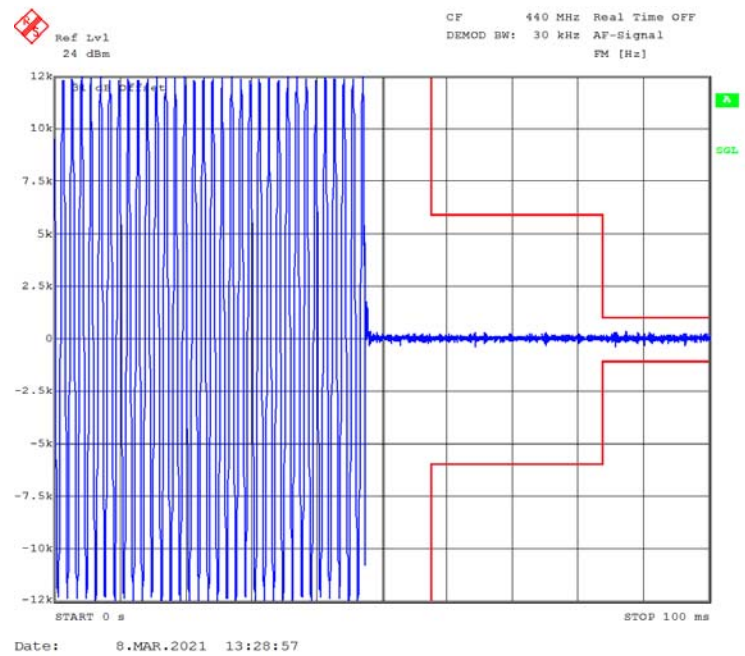


Turn off

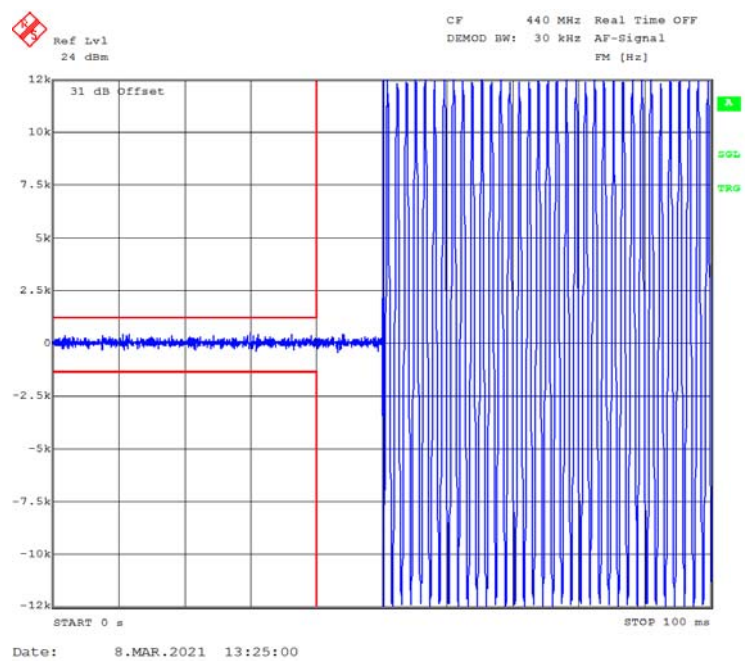


Frequency:440.000 MHz, High Power-12.5kHz

Turn on

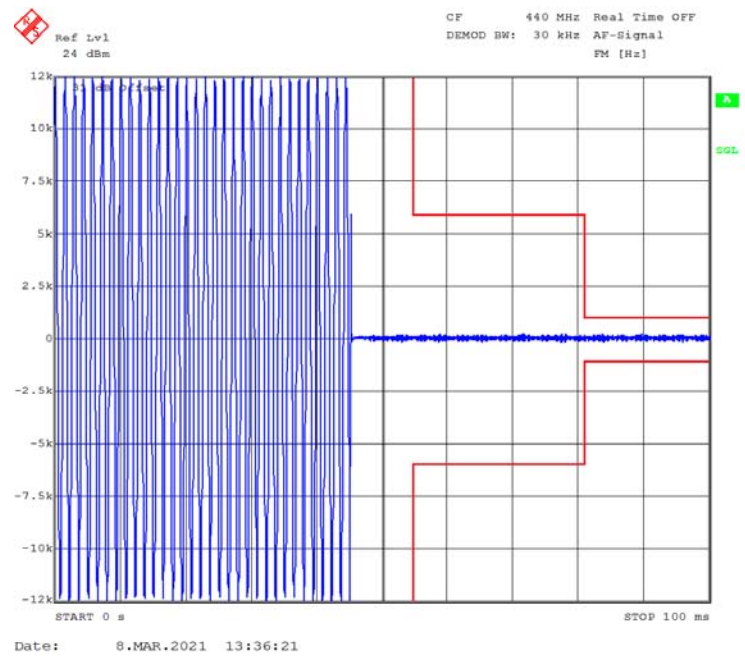


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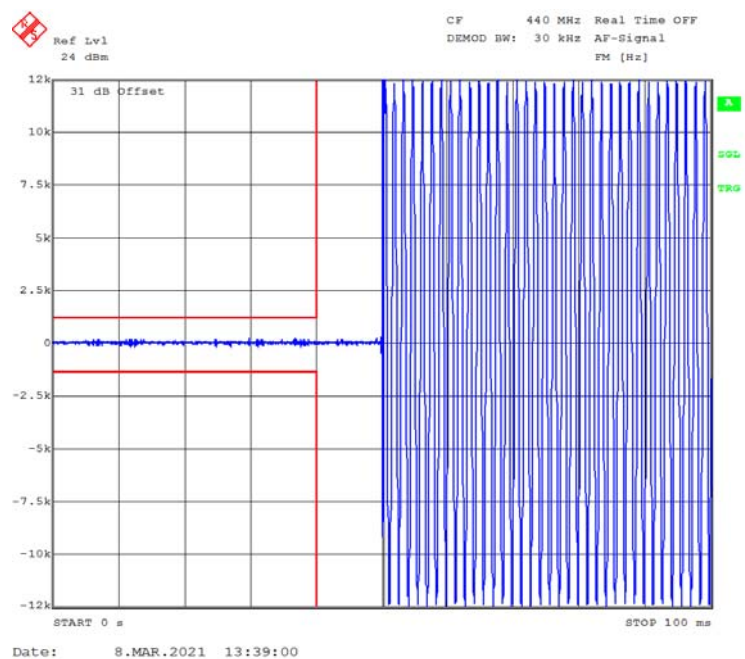


Frequency:440.000 MHz, Low Power-12.5kHz

Turn on

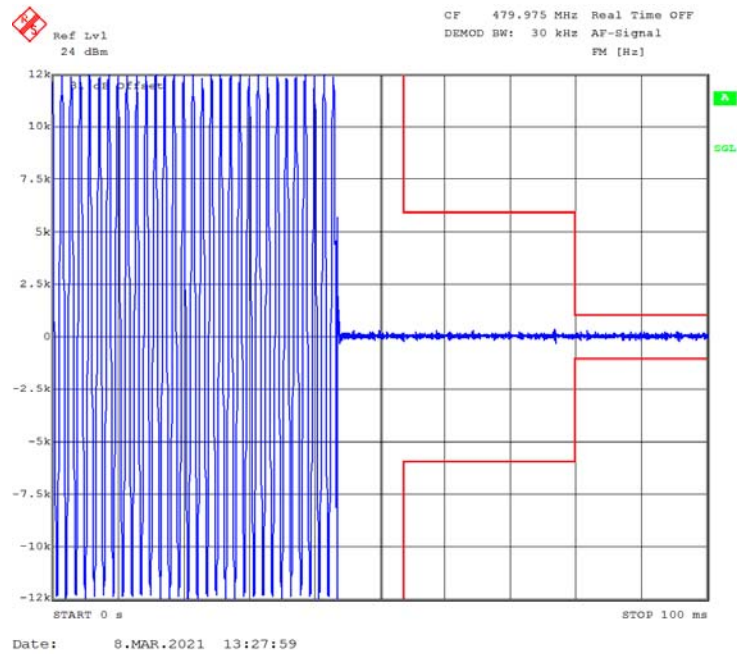


Turn off

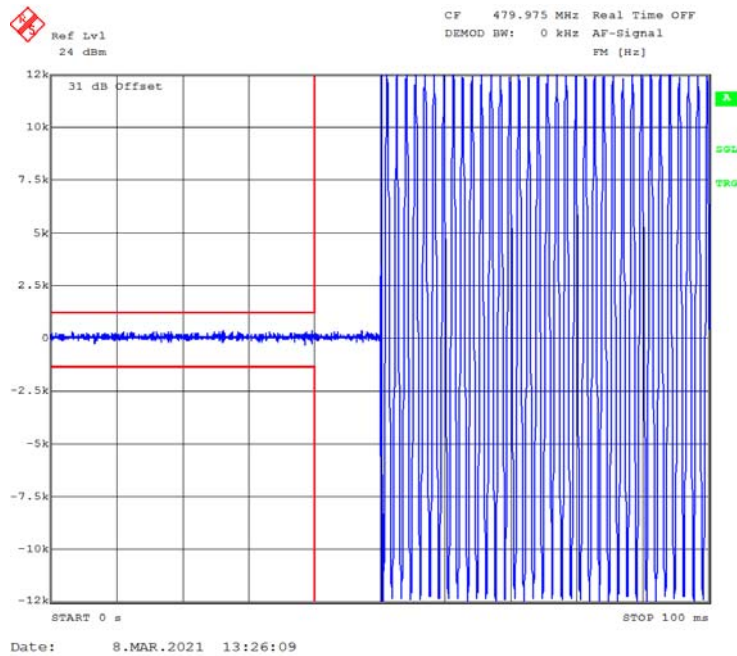


Frequency:479.975 MHz, High Power-12.5kHz

Turn on

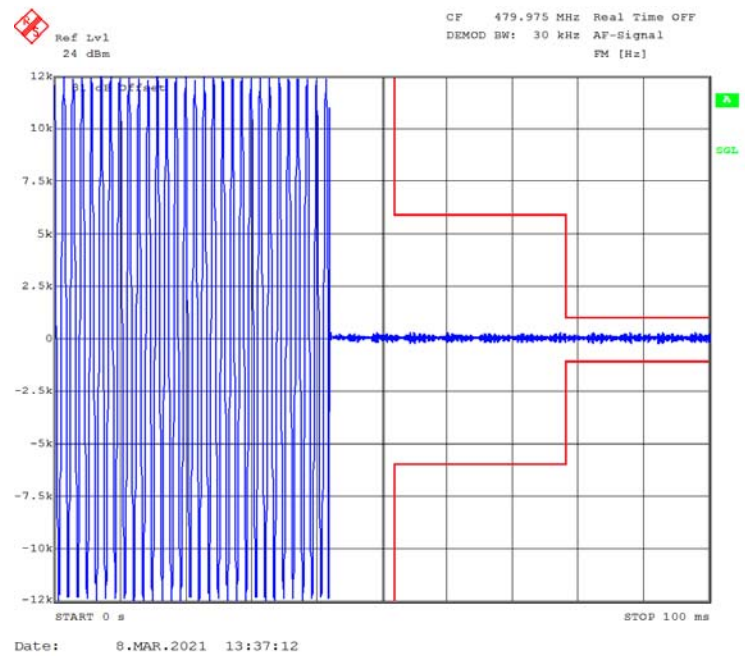


Turn off

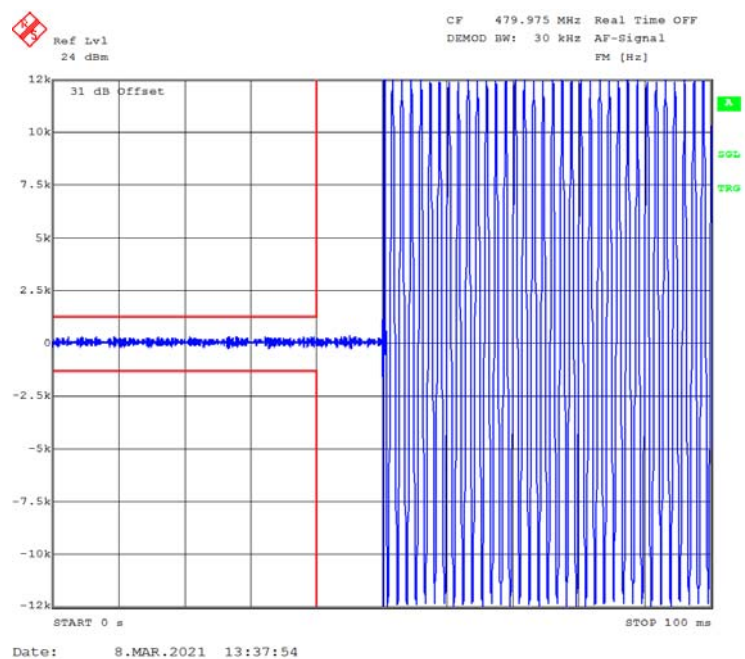


Frequency:479.975 MHz, Low Power-12.5kHz

Turn on



Turn off



Declarations

1: BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

2: Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

3: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

4: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

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******* END OF REPORT*******