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**Supporting Exhibit in Reference to FCC
Special Temporary Authority (STA)
0564-EX-ST-2020**

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snc SIERRA
NEVADA
CORPORATION
INTEGRATED MISSION SYSTEMS

**18635 Jarkey Drive
Hagerstown, MD 21742**

REVISIONS					
Issues	Descriptions	Date	Author	TW/Checker	Engineering
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1.0 INTRODUCTION

1.1 GENERAL

Sierra Nevada Corporation (SNC), located at 18635 Jarkey Drive Hagerstown, MD. recently applied for a Permanent Authorization via form 442 which was denied. SNC wishes to now obtain a continuation of our Special Temporary Authority (STA) with call sign WP9XNK from the FCC which as expired on 02/29/2029. SNC is a Systems Integrator specializing in modifications to aircraft and producing Intelligence, Surveillance and Reconnaissance (ISR) systems for the United States Government as well as Foreign Military Sale. Final testing of the platform pre-delivery requires transmitting on known frequencies to exercise the installed equipment to validate performance requirements. The purpose of this exhibit is to document current needs, detail equipment that will be utilized, define the proposed test area and identify the frequency needs.

1.2 CURRENT NEEDS

SNC was recently awarded a contract with the U.S. Army to modify seven King Air Guardrail Common Sensor (GRCS) Aircraft with upgraded systems under contract NRO000-15-C-0346. Part of this contract will require re-verification (calibration) of an existing system on the aircraft. This system is a receive only system that operates in a range from 20 MHz to 1000 Mhz. To calibrate this system it will be necessary to transmit RF energy from a ground station to the aircraft while airborne across this wide span at known frequencies/amplitudes. The spectral energy received at the aircraft is then collected and analyzed to produce calibration tables used by this system during operational use. Due to the wideband nature of this system it will be necessary to transmit across the entire 20 MHz to 963 MHz band at a frequency spacing of 1.3%. These frequencies will be rounded to the nearest 5 kHz. See Table 1 below:

#	Frequency (20 MHz)
1	20
2	$20 \times 1.013 = \mathbf{20.26}$
3	$20.26 \times 1.013 = 20.52338 \Rightarrow \mathbf{20.525}$
4	$20.525 \times 1.013 = 20.791825 \Rightarrow \mathbf{20.79}$
...	
201	$261.42 \times 1.013 = 264.81846 \Rightarrow \mathbf{264.82}$
202	$264.82 \times 1.013 = 268.26266 \Rightarrow \mathbf{268.265}$
...	

Table 1: Frequency Example

It will be necessary to transmit 8 frequencies simultaneously during these calibration events. Each group of eight frequencies is defined as a Set. There are approximately 40 frequency Sets planned to cover the span of 20 MHz to 963 Mhz. The transmit system when commanded by the operator will automatically start at frequency set one, transmit that set for 10 milliseconds, end transmission and transition to frequency set two, transmit on that set for 10 milliseconds, end transmission and so on until all forty sets are complete. At the completion of all forty sets the system will start back

at frequency set one and repeat. It is anticipated that it will require one flight per day for two days. Each flight is estimated at four hours.

2.0 TRANSMITTING EQUIPMENT

To automatically generate these frequency sets and to control the transmission length and timing SNC is required to utilize special equipment. For generation of individual frequencies SNC will utilize a National Instruments PXIe Chassis outfitted with a National Instruments 5840 Vector Signal Transceiver (VST). This device is used to consolidate frequency sets, allocate timing of each set and generate the RF signal set (that contains 8 individual frequencies). The output of the VST is then applied to the input of an AR amplifier which amplifies the signal set to 100 watts. When generating multiple frequencies within the set, the 100 watt output of the amp is divided up between the individual frequencies. The output of the amplifier is cabled to a log periodic transportable antenna that will be oriented in the vertical position.

2.1 NATIONAL INSTRUMENTS 5840 VST

The signal generation of the system resides within the National Instruments PXIe-1082 Chassis. The chassis contains the following Modules: PXIe-8861 Embedded Controller, and a PXI-5480 Vector Signal Transceiver (VST). The Embedded Controller is a Windows 10 computer that executes the LabVIEW operating environment code for timing, control and generation of signal sets. The GPS timing module provides an external time source to all components within the chassis and allows stable synchronization between the aircraft and the ground station. SNC developed LabVIEW code provides the user interface. Using this code the operator can import pre-programmed signal sets and generate the frequencies necessary. The VST operates as the signal generator in this system, generating low level RF outputs that are then applied to the AR amplifier.

2.2 AR AMPLIFIER

The Model 100U1000 is a solid-state, self-contained, air-cooled, broadband amplifier designed for applications where instantaneous bandwidth, high gain and linearity are required. The amplifier is rated for a frequency range of 10kHz to 1000 MHz and will provide 100W(typical) minimum output power. The maximum input rating for the amplifier is 1.0 mW. The amplifier receives an RF input from the VST, amplifies it accordingly and provides an amplified signal to the antenna to be transmitted over free space. Reference Table 2 for amplifier specifications.

Table 2: Amplifier Specifications

100U1000 Electrical Specifications	
Specification	Performance
Frequency Range	10 kHz-1000 MHz
Input Impedance	1.5:1 (50 Ohm) maximum
Output Impedance	50 ohms nominal
Gain @ max setting	50 dB minimum
Flatness	+/- 1.5 dB typical, 2.0 dB max
Noise Figure	8.5 db typical
Harmonic Distortion max @100W	-20 dBc
Harmonic Distortion typ. @100W	-30 dBc
Third Order Intercept	60 dBm typical

2.3 TLP-20 ANTENNA

The TLP-20 is a tactical log periodic antenna that cover the 20 Mhz-1000 MHz frequency range and is designed for transmit and receive purposes. The antenna uses a three piece boom for quick assembly in the field and can be used in the vertical or horizontal mode. In this application it will be used in the vertical polarization mode. The antenna will provide 4-8 dbi of gain to the system. The antenna will be fastened to a mast assembly mounted on a rotator. The rotator will position the antenna to automatically track the flight path of the aircraft. Software will limit transmission to a 60 degree cone between a magnetic direction of 240 degrees to 300 degrees. This is to keep the main beam of the antenna focused during the test event. The height of the antenna above ground level is 5.2 meters (17 feet). Reference Table 3 below for electrical specification of the antenna.

Table 3: Antenna Specifications

TLP-20 Electrical Specifications	
Specification	Performance
Frequency Range	20 MHz-1000 MHz
VSWR	2.0:1 (50 Ohm) typical
Gain	4-8 dbi
Polarization	Linear
Vertical -3 dB Beamwidth	40-90 degrees
Horizontal -3 dB Beamwidth	70-140 degrees
Power Input	200 Watts

2.4 SCAN PLAN

The ground calibration source transmits multiple narrowband tones at once based upon the frequency set, while the airborne sensor collects the same multiple frequencies within a wideband tune. This is then repeated for the next set of frequencies working up through the 20 MHz to 963 MHz range. The system will then repeat this loop as the aircraft flies a predetermined flight path and RF data is collected at different arrival angles with respect to the ground station. The airborne system will collect frequency data over a 25 millisecond period, however the ground station will only be transmitting for 10 milliseconds within that period. The External Collect bars depicted below in green are the only times that ground station will be radiating RF energy. With 40 frequency sets (each containing 8 frequencies), it is anticipated that one full cycle of this plan will take 1 second. This will, however have to be repeated for a period of 4 hours to collect the necessary data.

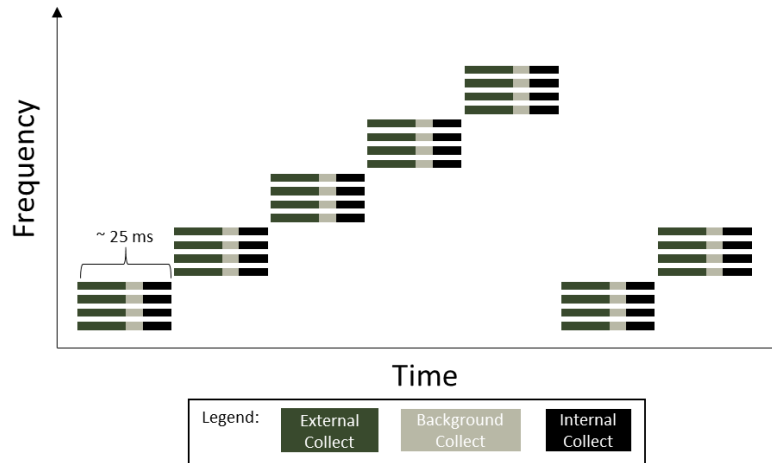


Figure 1: Scan Plan Illustration

2.5 RADIATION FREQUENCY

SNC is under contract to modify seven (7) aircraft over the next two years. It is anticipated that this testing will occur on each aircraft over a period of two days approximately 120 days apart. It is anticipated that the total number of days necessary to complete this testing will be fourteen (14).

2.6 SIGNAL CHARACTERISTICS

SNC will generate signals across the band of 20 MHz to 963 MHz. Up to eight individual carriers will be generated for each frequency set. Approximately forty frequency sets will be generated for 10 milliseconds each. The power level of each carrier signal will be 10 W maximum with an maximum individual signal bandwidth of .5 kHz measured at the -3db point. See Figure 2 spectral plot.

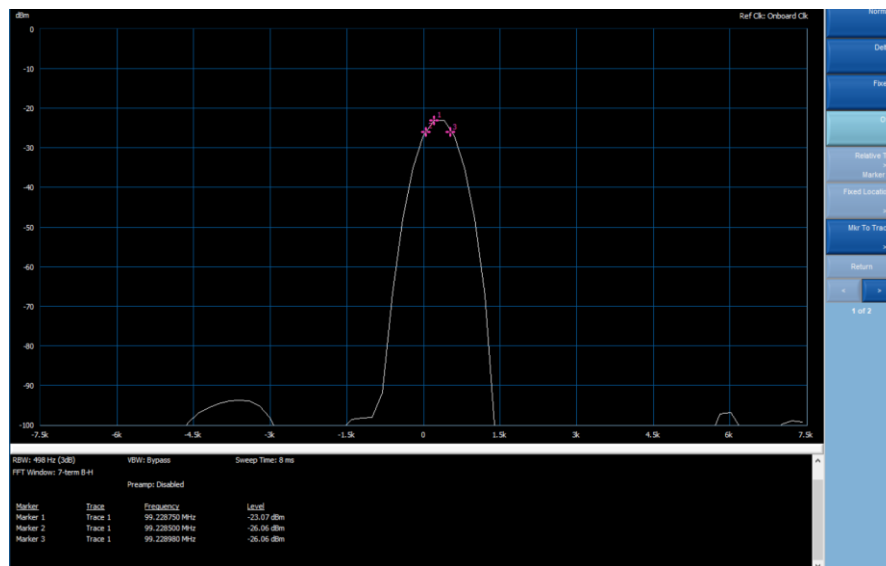


Figure 2: Single Carrier Plot

3.0 TEST SITE

The proposed test site will include a fixed location for the ground transmit equipment as well as airspace to the West of Hagerstown Regional Airport. The ground transmit equipment will be housed in an enclosed trailer which will be moved to the ramp area. Figure 3 represents the location of the ground transmit location and transmit azimuth directions. For testing the directional azimuth will be limited from 240 degrees to 300 degrees creating a 60 degree transmit cone to the west. No transmit operations will be conducted between 300 degrees and 240 degrees.

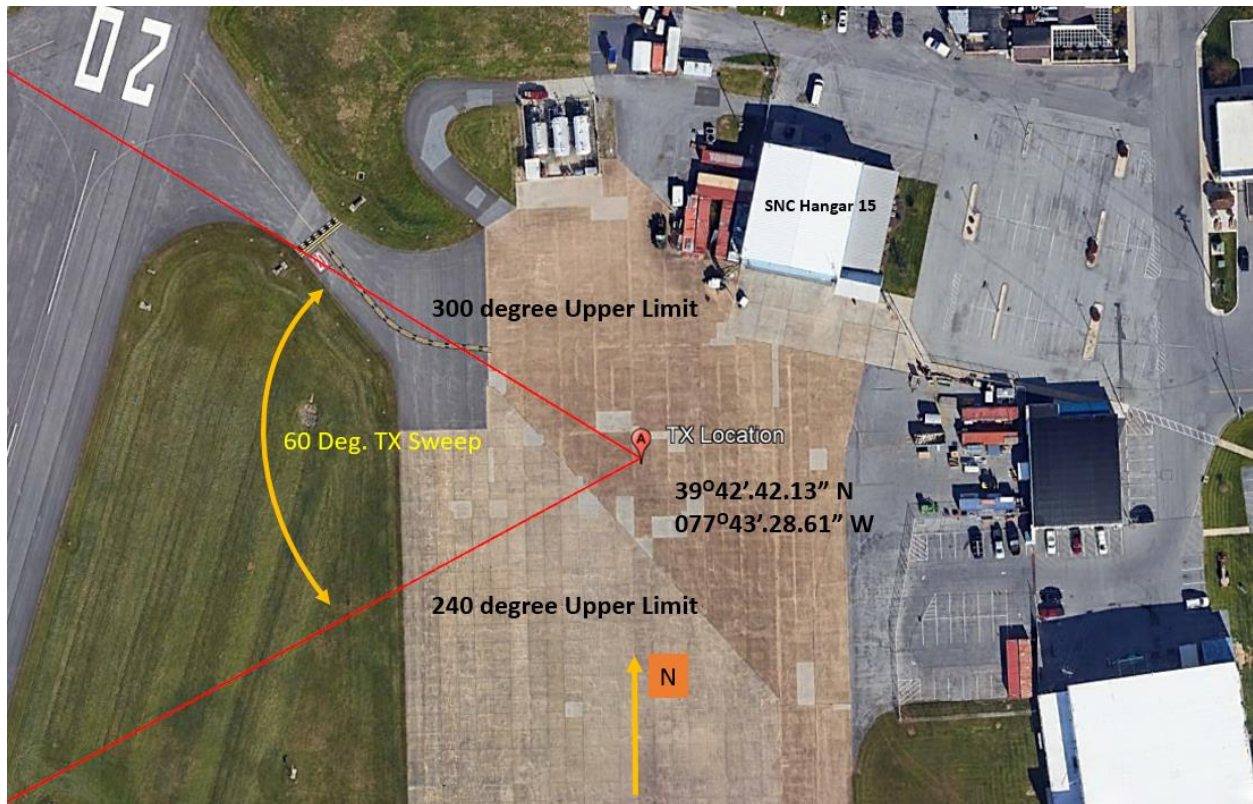


Figure 3: Ground Test Site

The flight test area is to the west of the ground test sight. The aircraft will fly established arcs starting at a distance of 24 miles from the ground test site in both a north/south and south/north direction. During these test arcs the ground station will emit RF energy at the aircraft in pre-programmed frequency sets. At the termination of the test arcs transmit operations will cease, the aircraft will turn around and fly the test arc in the opposite direction. When the aircraft is established on the flight path transmit operations will begin again throughout the test arc. The flight routes will be repeated at various altitudes during the collection effort. The aircraft will collect this spectral data for use in development of calibration tables that will be eventually used for the system under test in an operational environment. Figure 4 provides a larger overview and represent the anticipated flight area, depicts the transmit site location, azimuth limits of transmit operations and flight tracks. It is intended to complete these calibration flights during periods of darkness from 2200 hours to 0600. This reduces the amount of ambient RF noise.

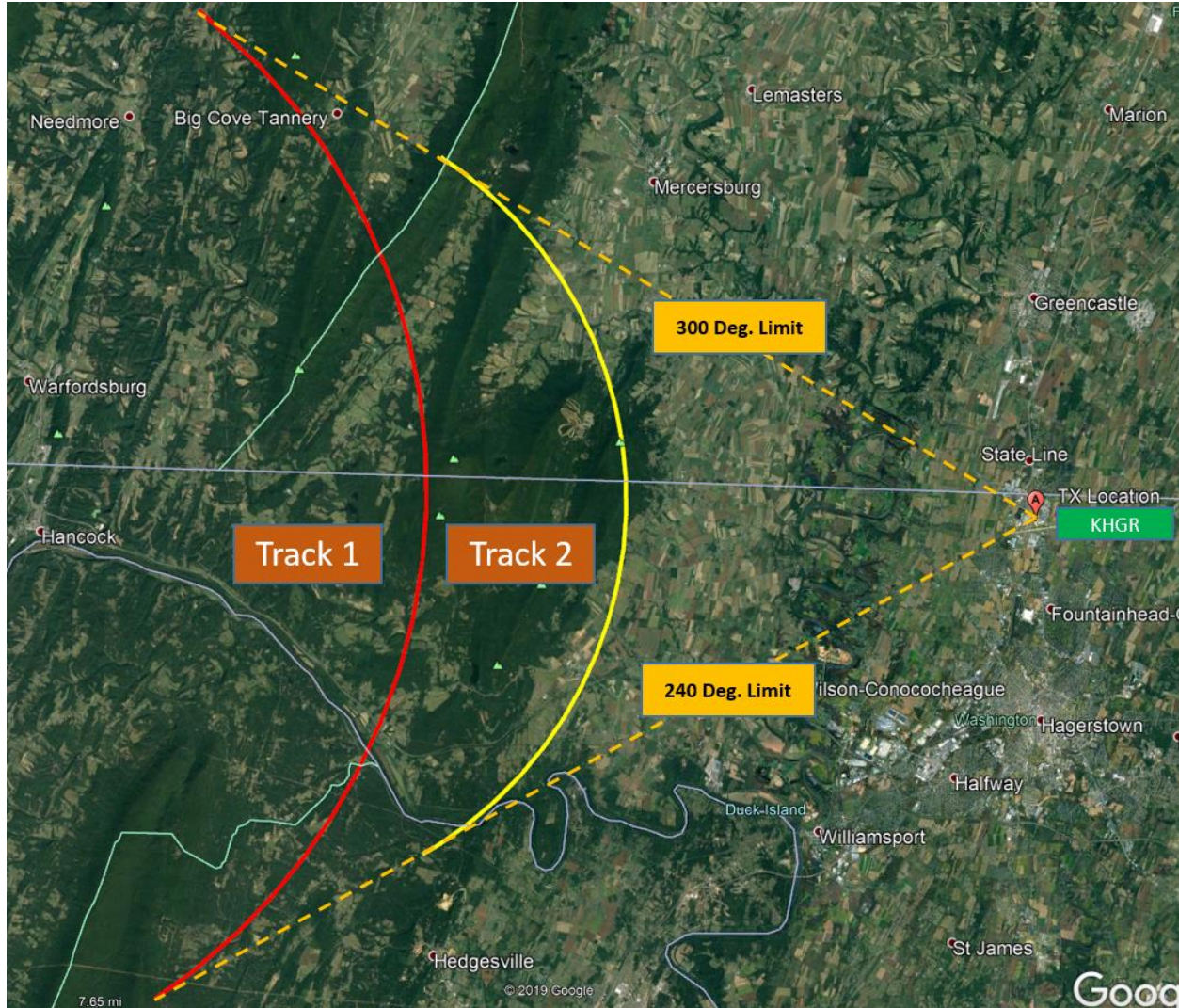


Figure 4: Flight Test Overview

4.0 REQUESTED FREQUENCIES

Appendix A of this document lists the frequencies that SNC is requesting to add to our current Fixed Authorization. The frequencies requested are a filter of the frequencies granted under STA WP9XNK and are frequencies in which no limitations or special conditions were placed as part of that existing STA.

5.0 ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Description
FCC	Federal Communication Commission
GPS	Global Positioning System
GRCS	Guardrail Common Sensor
ISR	Intelligence, Surveillance and Reconnaissance
RF	Radio Frequency
SNC	Sierra Nevada Corporation
STA	Special Temporary Authority
VST	Vector Signal Transceiver

APPENDIX A REQUESTED FREQUENCIES

The frequencies listed within this Appendix a filter of frequencies that were authorized to SNC under STA WP9XNK. These frequencies had no special conditions applied per that authorization.

#	Frequency (MHz)	Power	BW	#	Frequency (MHz)	Power	BW	#	Frequency (MHz)	Power	BW	#	Frequency (MHz)	Power	BW
1	20	10 W	.5 kHz	26	27.62	10 W	.5 kHz	51	39.165	10 W	.5 kHz	76	56.22	10 W	.5 kHz
2	20.26	10 W	.5 kHz	27	27.98	10 W	.5 kHz	52	39.675	10 W	.5 kHz	77	56.95	10 W	.5 kHz
3	20.525	10 W	.5 kHz	28	28.345	10 W	.5 kHz	53	40.19	10 W	.5 kHz	78	57.69	10 W	.5 kHz
4	20.79	10 W	.5 kHz	29	28.715	10 W	.5 kHz	54	40.71	10 W	.5 kHz	79	58.44	10 W	.5 kHz
5	21.06	10 W	.5 kHz	30	29.09	10 W	.5 kHz	55	41.24	10 W	.5 kHz	80	59.2	10 W	.5 kHz
6	21.335	10 W	.5 kHz	31	29.47	10 W	.5 kHz	56	41.775	10 W	.5 kHz	81	60	10 W	.5 kHz
7	21.61	10 W	.5 kHz	32	29.855	10 W	.5 kHz	57	42.32	10 W	.5 kHz	82	60.75	10 W	.5 kHz
8	21.89	10 W	.5 kHz	33	30.245	10 W	.5 kHz	58	42.87	10 W	.5 kHz	83	61.54	10 W	.5 kHz
9	22.175	10 W	.5 kHz	34	30.64	10 W	.5 kHz	59	44.56	10 W	.5 kHz	84	62.34	10 W	.5 kHz
10	22.465	10 W	.5 kHz	35	31.04	10 W	.5 kHz	60	45.14	10 W	.5 kHz	85	63.15	10 W	.5 kHz
11	22.755	10 W	.5 kHz	36	31.445	10 W	.5 kHz	61	46.32	10 W	.5 kHz	86	63.97	10 W	.5 kHz
12	23.05	10 W	.5 kHz	37	31.855	10 W	.5 kHz	62	46.92	10 W	.5 kHz	87	64.8	10 W	.5 kHz
13	23.35	10 W	.5 kHz	38	32.27	10 W	.5 kHz	63	47.53	10 W	.5 kHz	88	65.64	10 W	.5 kHz
14	23.655	10 W	.5 kHz	39	32.69	10 W	.5 kHz	64	48.15	10 W	.5 kHz	89	66	10 W	.5 kHz
15	23.965	10 W	.5 kHz	40	33.115	10 W	.5 kHz	65	48.775	10 W	.5 kHz	90	67.36	10 W	.5 kHz
16	24.275	10 W	.5 kHz	41	33.545	10 W	.5 kHz	66	49.41	10 W	.5 kHz	91	68.235	10 W	.5 kHz
17	24.59	10 W	.5 kHz	42	33.98	10 W	.5 kHz	67	50.05	10 W	.5 kHz	92	69.12	10 W	.5 kHz
18	24.91	10 W	.5 kHz	43	34.42	10 W	.5 kHz	68	50.7	10 W	.5 kHz	93	70.02	10 W	.5 kHz
19	25.235	10 W	.5 kHz	44	34.865	10 W	.5 kHz	69	51.36	10 W	.5 kHz	94	70.93	10 W	.5 kHz
20	25.565	10 W	.5 kHz	45	36.245	10 W	.5 kHz	70	52.03	10 W	.5 kHz	95	72	10 W	.5 kHz
21	25.895	10 W	.5 kHz	46	36.715	10 W	.5 kHz	71	52.705	10 W	.5 kHz	96	72.785	10 W	.5 kHz
22	26.23	10 W	.5 kHz	47	37.19	10 W	.5 kHz	72	53.39	10 W	.5 kHz	97	75.66	10 W	.5 kHz
23	26.57	10 W	.5 kHz	48	37.675	10 W	.5 kHz	73	54	10 W	.5 kHz	98	76	10 W	.5 kHz
24	26.915	10 W	.5 kHz	49	38.165	10 W	.5 kHz	74	54.79	10 W	.5 kHz	99	77.64	10 W	.5 kHz
25	27.265	10 W	.5 kHz	50	38.66	10 W	.5 kHz	75	55.5	10 W	.5 kHz	100	78.65	10 W	.5 kHz

#	Frequency (MHz)	Power	BW	#	Frequency (MHz)	Power	BW	#	Frequency (MHz)	Power	BW	#	Frequency (MHz)	Power	BW
101	79.67	10 W	.5 kHz	126	128.485	10 W	.5 kHz	151	194.23	10 W	.5 kHz	176	500	10 W	.5 kHz
102	80.705	10 W	.5 kHz	127	130.155	10 W	.5 kHz	152	196.755	10 W	.5 kHz	177	506	10 W	.5 kHz
103	81.755	10 W	.5 kHz	128	131.845	10 W	.5 kHz	153	198	10 W	.5 kHz	178	512	10 W	.5 kHz
104	82	10 W	.5 kHz	129	137.055	10 W	.5 kHz	154	201.905	10 W	.5 kHz	179	518	10 W	.5 kHz
105	83.895	10 W	.5 kHz	130	138.835	10 W	.5 kHz	155	204	10 W	.5 kHz	180	524	10 W	.5 kHz
106	84.985	10 W	.5 kHz	131	140.64	10 W	.5 kHz	156	207.19	10 W	.5 kHz	181	530	10 W	.5 kHz
107	86.09	10 W	.5 kHz	132	142.47	10 W	.5 kHz	157	210	10 W	.5 kHz	182	536	10 W	.5 kHz
108	87.21	10 W	.5 kHz	133	144.32	10 W	.5 kHz	158	212.615	10 W	.5 kHz	183	542	10 W	.5 kHz
109	88	10 W	.5 kHz	134	146.195	10 W	.5 kHz	159	216	10 W	.5 kHz	184	548	10 W	.5 kHz
110	89.4	10 W	.5 kHz	135	148.095	10 W	.5 kHz	160	223.89	10 W	.5 kHz	185	554	10 W	.5 kHz
111	90.6	10 W	.5 kHz	136	150.02	10 W	.5 kHz	161	400.365	10 W	.5 kHz	186	560	10 W	.5 kHz
112	91.8	10 W	.5 kHz	137	151.97	10 W	.5 kHz	162	405.57	10 W	.5 kHz	187	566	10 W	.5 kHz
113	93	10 W	.5 kHz	138	153.945	10 W	.5 kHz	163	421.59	10 W	.5 kHz	188	572	10 W	.5 kHz
114	94.2	10 W	.5 kHz	139	155.945	10 W	.5 kHz	164	427.07	10 W	.5 kHz	189	578	10 W	.5 kHz
115	95.4	10 W	.5 kHz	140	157.97	10 W	.5 kHz	165	432.62	10 W	.5 kHz	190	584	10 W	.5 kHz
116	96.8	10 W	.5 kHz	141	160.025	10 W	.5 kHz	166	438.245	10 W	.5 kHz	191	590	10 W	.5 kHz
117	98	10 W	.5 kHz	142	162.105	10 W	.5 kHz	167	443.94	10 W	.5 kHz	192	596	10 W	.5 kHz
118	99.2	10 W	.5 kHz	143	164.21	10 W	.5 kHz	168	449.71	10 W	.5 kHz	193	602	10 W	.5 kHz
119	100.6	10 W	.5 kHz	144	177.44	10 W	.5 kHz	169	461.475	10 W	.5 kHz	194	620	10 W	.5 kHz
120	101.8	10 W	.5 kHz	145	180	10 W	.5 kHz	170	467.475	10 W	.5 kHz	195	626	10 W	.5 kHz
121	103.2	10 W	.5 kHz	146	182.08	10 W	.5 kHz	171	470	10 W	.5 kHz	196	632	10 W	.5 kHz
122	104.6	10 W	.5 kHz	147	184.445	10 W	.5 kHz	172	476	10 W	.5 kHz	197	638	10 W	.5 kHz
123	105.8	10 W	.5 kHz	148	186	10 W	.5 kHz	173	482	10 W	.5 kHz	198	644	10 W	.5 kHz
124	107.2	10 W	.5 kHz	149	189.275	10 W	.5 kHz	174	488	10 W	.5 kHz	199	650	10 W	.5 kHz
125	122.015	10 W	.5 kHz	150	192	10 W	.5 kHz	175	494	10 W	.5 kHz	200	656	10 W	.5 kHz

#	Frequency (MHz)	Power	BW
201	662	10 W	.5 kHz
202	668	10 W	.5 kHz
203	674	10 W	.5 kHz
204	680	10 W	.5 kHz
205	686	10 W	.5 kHz
206	692	10 W	.5 kHz
207	770	10 W	.5 kHz
208	782	10 W	.5 kHz
209	800	10 W	.5 kHz
210	806	10 W	.5 kHz
211	830	10 W	.5 kHz
212	836	10 W	.5 kHz
213	842	10 W	.5 kHz
214	848	10 W	.5 kHz
215	903.31	10 W	.5 kHz
216	915.055	10 W	.5 kHz
217	926.95	10 W	.5 kHz
218	939	10 W	.5 kHz
219	951.205	10 W	.5 kHz
220	963.57	10 W	.5 kHz