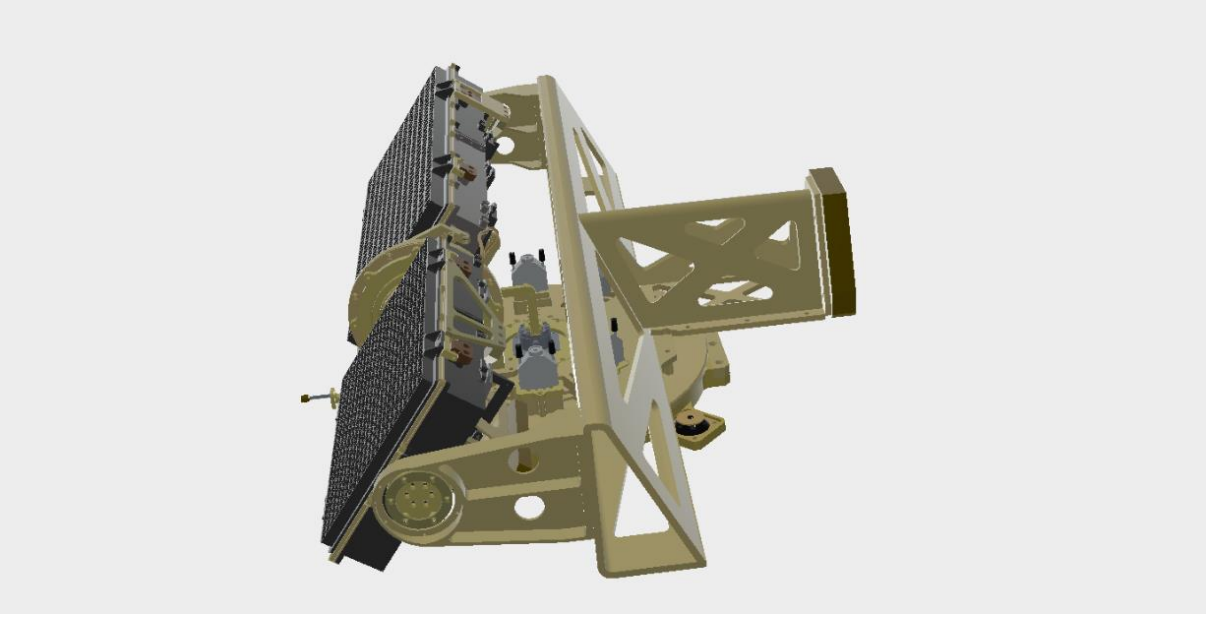
Operational Concept, L3-Datron's Flat Panel Commercial/Mil Ka Band SATCOM Antenna, Hawaii Technology Demo, Sept 2018

Introduction:

L3 Datron has been in the SATCOM on the move business for over 15 years. We have had experience with different aperture technologies, but have predominantly sold parabolic reflector based solutions. To answer the industry need for ever lower profile designs, we have created our first flat panel array based antenna. One of our largest customers is the United States Marine Corp. They are supporting this effort by way of including the antenna in a technology demonstration in Hawaii this September. We are trying to arrange for space on a commercial Ka transponder and temporary FCC approval, possibly on an experimental basis, in that time window. Even though this is a mobile antenna, it will not be in motion during the demonstration. It will be fixed on a table, next to the intended vehicle, as part of a VIP display. Location: Kaneohe Bay, Hawaii, USMC Base.

Antenna Basics:

The antenna is composed of two flat panel arrays. One is the transmit aperture and the other is receive. The TX array has the full 2 GHz from 29-31 available instantaneously. The down conversion however only passes either the upper or the lower half of the range on to the modem. The RX array similarly covers 19.2-21.2 GHz but only passes half of that range to the modem.



The TX array has dimensions of 11.5 inches wide by 7 inches high. The RX array has dimensions of 17.5 inches wide by 7 inches high. The supporting gimbal is a standard elevation over azimuth configuration.

Polarization is circular. Both TX and RX arrays are independently electronically selectable. Therefore, they can be configured for both co- or cross pol operation.

The antenna is steered by an ACU that is receiving inputs from GPS and a 3rd party inertial navigation system. We have used the same equipment to gain both FCC and ARSTRAT WGS approvals in the past. What we are proposing for September though is **static** "At-The-Halt" operation. The antenna will not be

vehicle mounted and will be stationary so pointing errors will be less than 0.2 degrees 100% of the time.

Performance Tables:

The following table shows basic features of the antenna

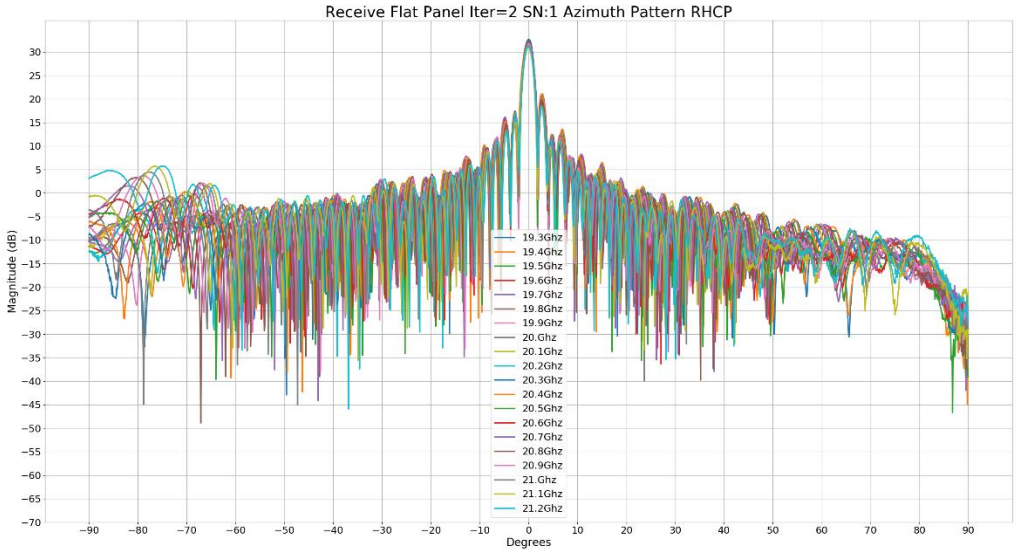
Parameter	Value	Notes
TX (Commercial)		
Gain	33.5 dB	average
Beamwidth AZ	1.79 deg	mid band
Beamwidth EL	3.86 deg	mid band
Axial Ratio	1.2 dB	average
TX (Military)		
Gain	33.5 dB	average
Beamwidth AZ	1.73 deg	mid band
Beamwidth EL	3.73 deg	mid band
Axial Ratio	0.9 dB	average
RX (Commercial)		
Gain	32 dB	average
Beamwidth AZ	1.76 deg	mid band
Beamwidth EL	5.78 deg	mid band
Axial Ratio	1.7 dB	average
RX (Military)		
Gain	31.5 dB	average
Beamwidth AZ	1.67 deg	mid band
Beamwidth EL	5.50 deg	mid band
Axial Ratio	1 dB	average

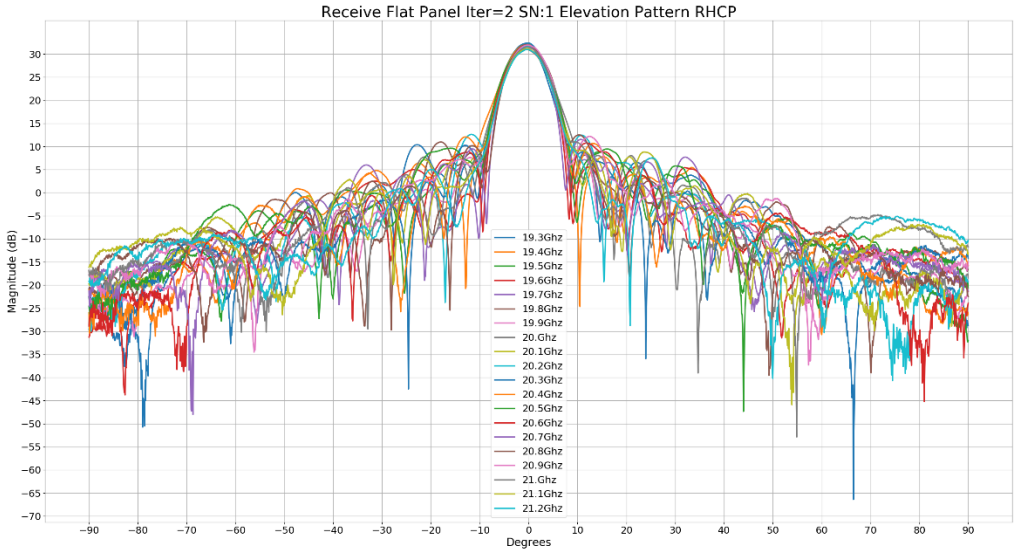
With our LNB and SSPA we will have the following nominal RX and TX performance levels:

Parameter	Value	Notes
Average value across 2 GHz		
EIRP	41 dBW	8W linear SSPA
G/T	11 dB/k	LNB Noise Figure 1.3dB

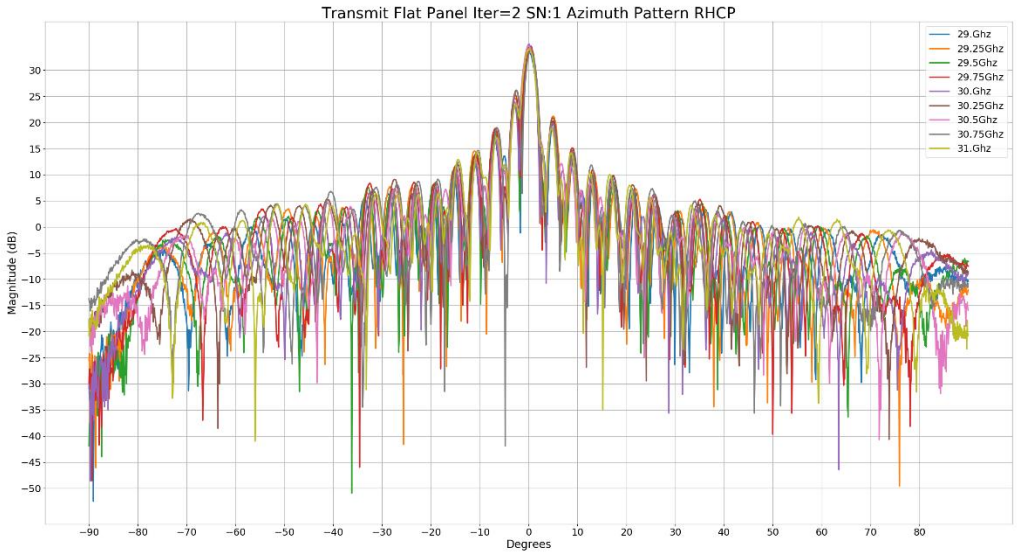
Some Pattern Plots:

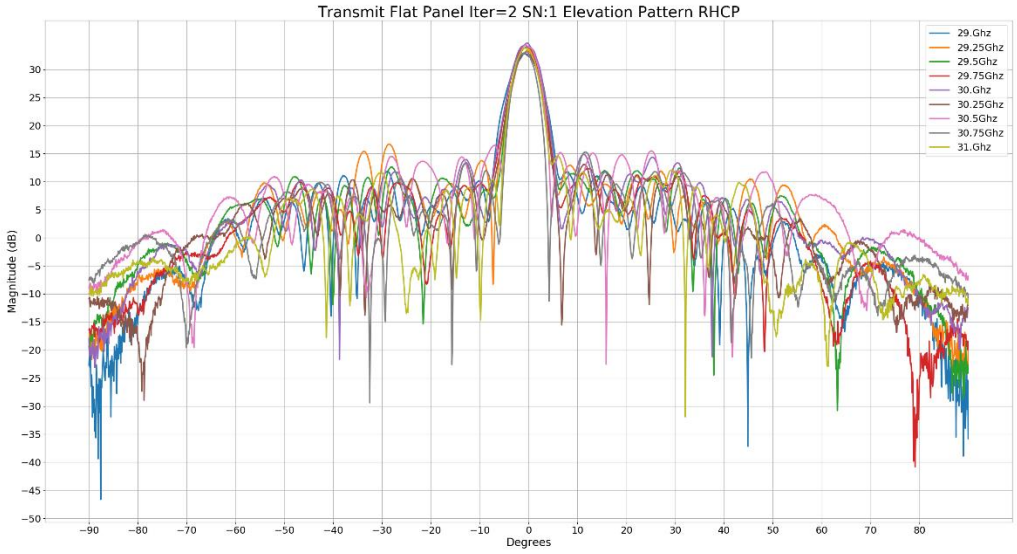
Receive band azimuth and elevation:





Transmit band azimuth and elevation:





Skew Angle:

For this Hawaii demonstration, we will provide to the satellite operator the exact composite pattern from the antenna to the target satellite as seen by the geo-stationary arc. Because the demonstration is ATH, that data may be pre-determined. EIRP spectral density will be managed accordingly. Transmission could be as simple as a CW signal, but we would like to get approval for up to 512 kbps.

Network:

The antenna will not be part of a network. No multiple access scheme will be in place. Single carrier operation only (SCPC) will be employed.

Muting:

We currently mute according to FCC 25.226, as well as over-temp, horizon mask, vehicle mask and an external user interlock.

End Note:

We hope to gain permission to purchase a small bandwidth allocation for occasional use during September 2018. We will not be made part of the USMC network, but will rather be off to the side as a live independent exhibit. The image below shows the antenna receiving Anik-F2's 20.199 GHz beacon at our location in Simi Valley, CA. It is representative of our simple plan for Hawaii.

Please feel free to contact us for any additional information that is needed.

Contact:
Peter Richardson
Sr. Systems Engineer
peter.richardson@L3T.com
L3 Technologies – Datron
200 W. Los Angeles Av
Simi Valley, CA
805-584-1717 x 3179