Additional Antenna Information

The Astro Digital US, Inc. ("Astro Digital") earth station is comprised of one UHF antenna array comprised of two phased individual Yagi antennas. The system operates in half-duplex mode such that the antennas, working with a T/R switch, alternate between transmit mode and receive mode. The antennas are held in position relative to one another by a single cross-mast. The antenna system is oriented by an Az-El rotator positioned at the center of the cross-mast. The characteristics of each Yagi antenna are given in Table A-1, and the characteristics of the overall antenna array are given in Table A-2. The antenna patterns of the array are provided in Figures A-1 and A-2. Astro Digital notes that the 1x2 arrangement of the antenna array produces an elliptical beam pattern as described below with the narrower cut in the azimuth direction.

Table A-1: Single UHF Yagi Characteristics

Parameter	Value
Manufacturer:	M^2 Antenna Systems, Inc.
Model:	402CP42
Frequency Range:	399.5 – 408.0 MHz[1]
Gain:	18.7 dBi
Beamwidth:	23.0°
Front-to-Back Ratio:	16.2 dB
Axial Ratio:	1.5 dB
Polarization:	RHCP
Feed Type:	Folded Dipole
Feed Impedance:	50 Ohms (Unbalanced)
Maximum VSWR:	1.5:1
Boom Length:	245" (6.22 m)
Max. Element Length:	14.5" (0.368 m)
Turning Radius:	148" (3.76 m)

Table A-2: Four UHF Yagi Array Characteristics

Parameter	Value
Frequency Range:	399.5 – 408.0 MHz[2]
Transmit Gain:	20.0 dBi
Receive Gain:	20.5 dBi
TX & RX Half Power Beamwidth:	12° (Azimuth) X 23° (Elevation)
Polarization:	RHCP

[1] This value only reflects the antenna capability. Astro Digital's specifically-authorized channels are listed in its space station license grant. *See* Stamp Grant, Astro Digital, IBFS File No. SAT-LOA-20170508-00071 ¶¶ 8-9 (granted in part and deferred in part Aug. 1, 2018); *see also* Exhibit A, Narrative at nn.4-5.

[2] *See supra* note 1.

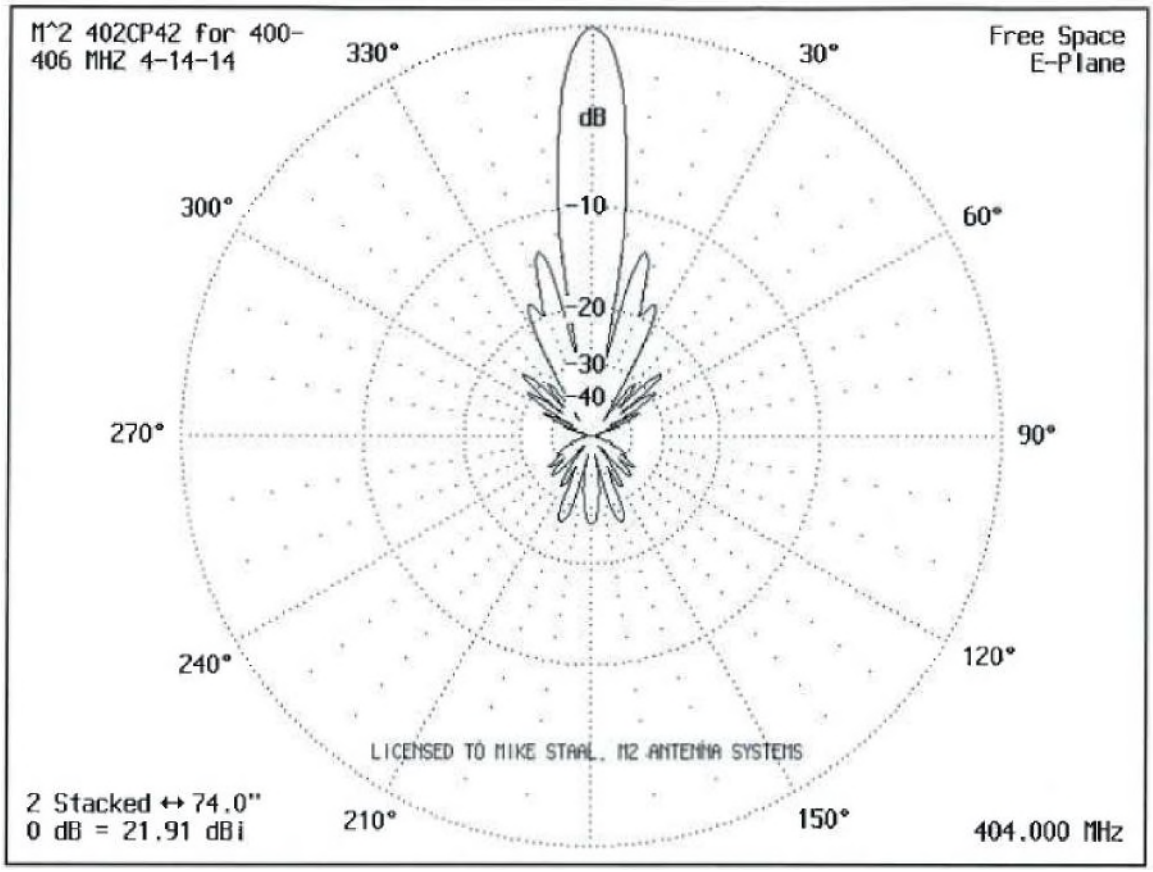

Figure A-1: Astro Digital 2 Yagi UHF Antenna Array – Azimuth Pattern

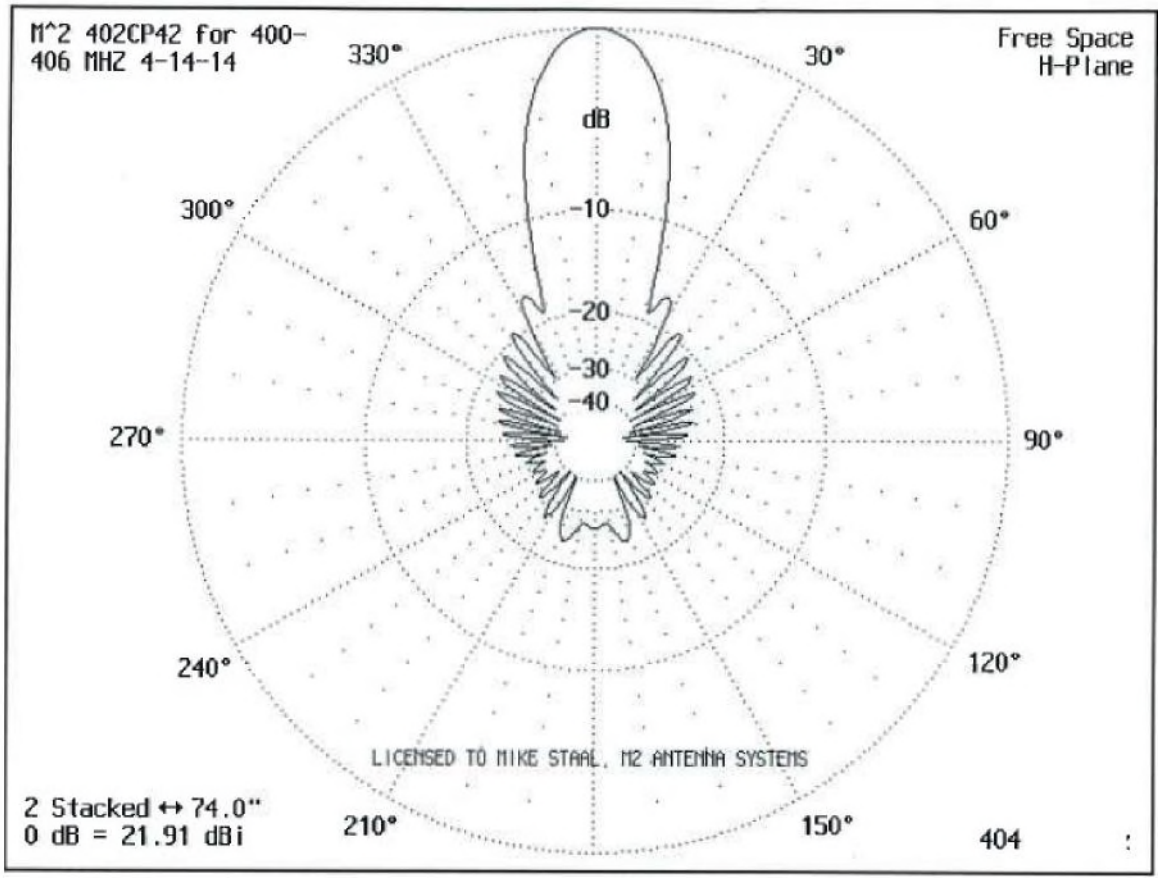

Figure A-2 Astro Digital 2 Yagi UHF Antenna Array – Elevation Pattern