Exhibit A
Fixed Antenna Specifications

1 Parabolic Antenna Beamwidth

This application for an experimental license includes the use of a 1.22 meter (4 ft) parabolic antenna transmitting a CW signal at frequencies between 1668.4 and 18000 MHz. Antenna beamwidth is a function of wavelength or more practically the transmit frequency. Below is the formula used to determine the peak gain as a function of efficiency (η), diameter (D) and wavelength (λ):

$$G_{peak} = 10log\left[\eta\left(\frac{\pi D}{\lambda}\right)^2\right] \tag{1}$$

The peak gain of a parabolic antenna can also be calculated as a function of efficiency (η) and the half power beamwidth(θ_{3dB}):

$$G_{peak} = 10log\left[\eta\left(\frac{70\pi}{\theta_{3dB}}\right)^2\right] \tag{2}$$

Equating 1 and 2:

$$10log\left[\eta\left(\frac{\pi D}{\lambda}\right)^2\right] = 10log\left[\eta\left(\frac{70\pi}{\theta_{3dB}}\right)^2\right] \tag{3}$$

$$\eta\left(\frac{\pi D}{\lambda}\right)^2 = \eta\left(\frac{70\pi}{\theta_{3dB}}\right)^2$$

$$\left(\frac{D}{\lambda}\right)^2 = \left(\frac{70}{\theta_{3dB}}\right)^2$$

$$\theta_{3dB} = \left(\frac{70c}{Df}\right)$$

$$\theta_{3dB} = \left(\frac{20985472060}{Df}\right) \tag{4}$$

Figure 1 shows the relationship between frequency and beamwidth for a 4 ft (1.22 meter) parabolic antenna. Table 1 shows the beamwidth for the specific frequencies in the request for an experimental license.

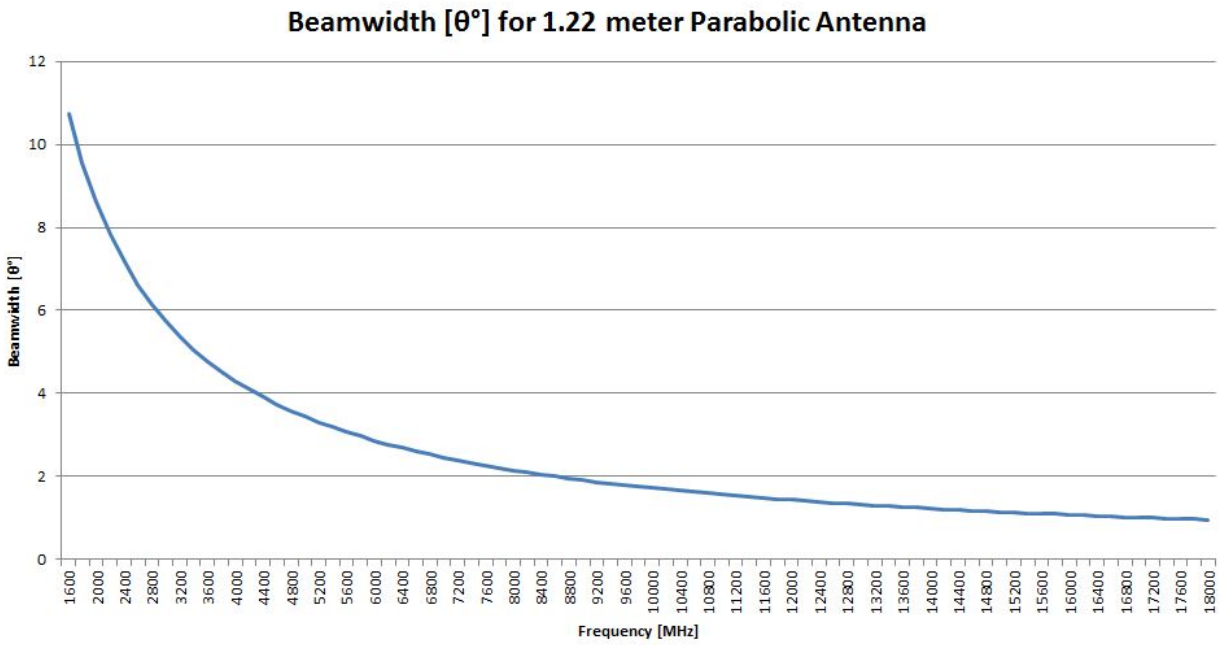

Figure 1: Beamwidth as a function of frequency [MHz]

Frequency [MHz]	**Beamwidth [°]**
1747	9.88
2200	7.82
2250	7.64
3649	4.71
4200	4.10
8900	1.93
12700	1.35
18000	0.96

Table 1: Relationship between frequency and beamwidth.

2 Orientation of Beam

The transmit antenna located at 33° 57′ 48” N by 84° 6′ 51” W is orientated in the horizontal plane 91.50° from true North and in the vertical plane −1.7° from the horizontal plane. Figure 2 shows the elevation profile of the path between the transmit and receive antennas.

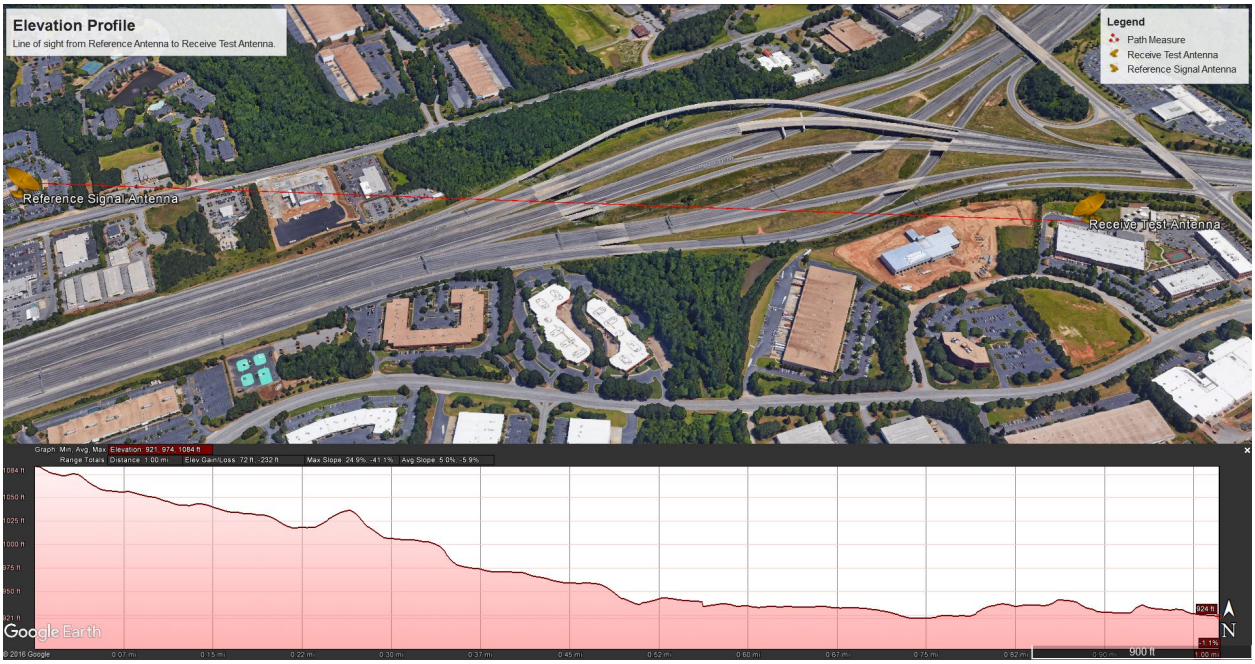

Figure 2: Beamwidth as a function of frequency [MHz]

Calculation of the vertical orientation of the beam is shown below:

$$tan(\theta) = \frac{1084ft - 927ft}{5280ft} \tag{5}$$

$$= \frac{157}{5280}$$

$$\theta_{3dB} = arctan\left(\frac{157}{5280}\right)$$

$$= 1.7^{\circ} \tag{6}$$