**Exhibit A**

**Fixed Antenna Specifications**

# 1 Parabolic Antenna Beamwidth

This application for an experimental license includes the use of a 0.019 meter (0.75 inch) conical horn antenna transmitting a CW signal at frequencies between 33 to 36 GHz. 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 ($\theta_{3dB}$)

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

Equating 1 and 2:

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

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

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

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

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

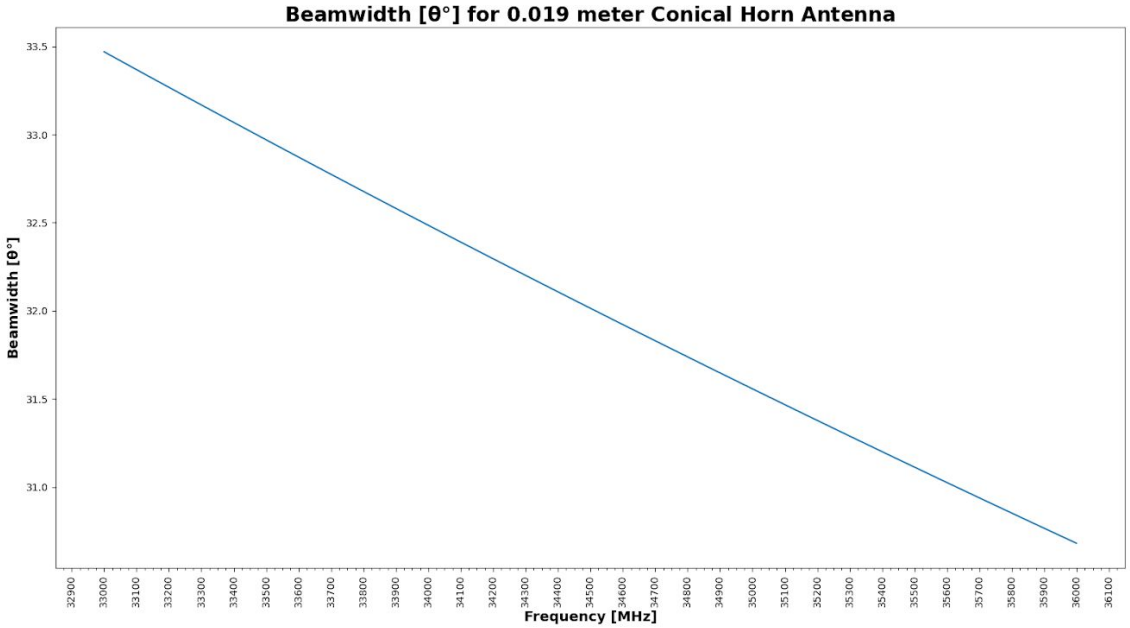


Figure 1: Beamwidth as a function of frequency [MHz]

At 36,000 MHz, the newly requested frequency, the beamwidth for the 0.019 meter conical antenna is 30.68°.

# 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.

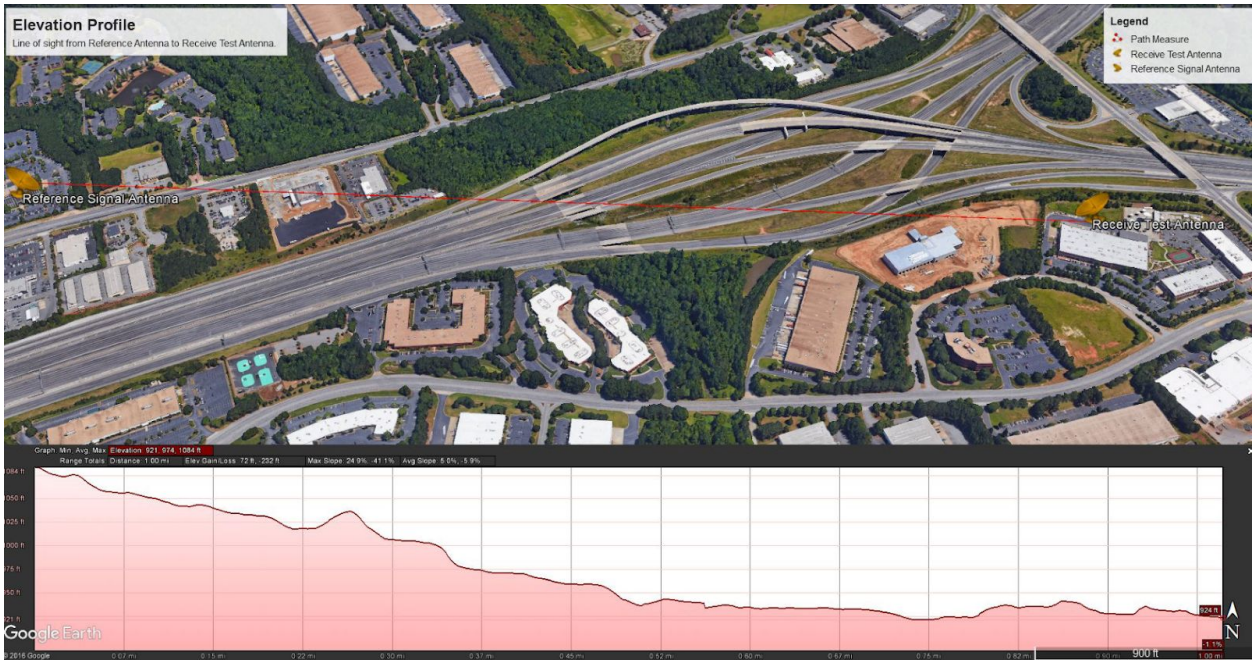


Figure 2: Elevation profile between Reference Signal Antennas and Receive Test Antenna

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

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

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

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

$$= 1.7° \tag{6}$$