Avi Loeb, Aug 14, 2021

Infrared Emission from UAP

Figure 8 on page 22 of the attached paper implies that the surface temperature of the Space Shuttle reaches a value of $T_s \sim 1200\,K$ for a Mach number, $M \sim 25$, and an airplane wing reaches $T_s \sim 500\,K$ at $M \sim 3$.

The resulting infrared luminosity of the surface of a UAP of radius r, moving at $M \sim 3$, would be:

$$L_{IR} \sim \sigma T_s^4 \times \pi r^2 = 10^{11}\,\frac{erg}{s} \times \left(\frac{r}{1\,m}\right)^2 \quad \text{for } T_s \sim 500\,K$$

where $\sigma = 5.7 \times 10^{-5}\,erg/cm^2 \cdot s \cdot deg^4$ is the Stefan-Boltzmann constant.

For a telescope of diameter, d, at a distance, D, this gives a photon count rate of,

$$\frac{dN_{IR}}{dt} = \left(\frac{L_{IR}}{3kT_s}\right) \times \left(\frac{\frac{\pi}{4} d^2}{4\pi D^2}\right) = 3 \times 10^{14}\,\frac{photons}{s} \left(\frac{r}{1\,m}\right)^2 \left(\frac{d}{1\,m}\right)^2 \left(\frac{D}{10\,km}\right)^{-2}$$

at a blackbody wavelength of,

$$\lambda_{IR} \sim 3\,\mu m \left(\frac{T_s}{500\,K}\right)^{-1} \quad \text{for the peak of } B_\lambda.$$

This flux is larger by an order of magnitude than the thermal emission rate off surfaces at room temperature and can easily be detected with IR sensors.