

Galileons

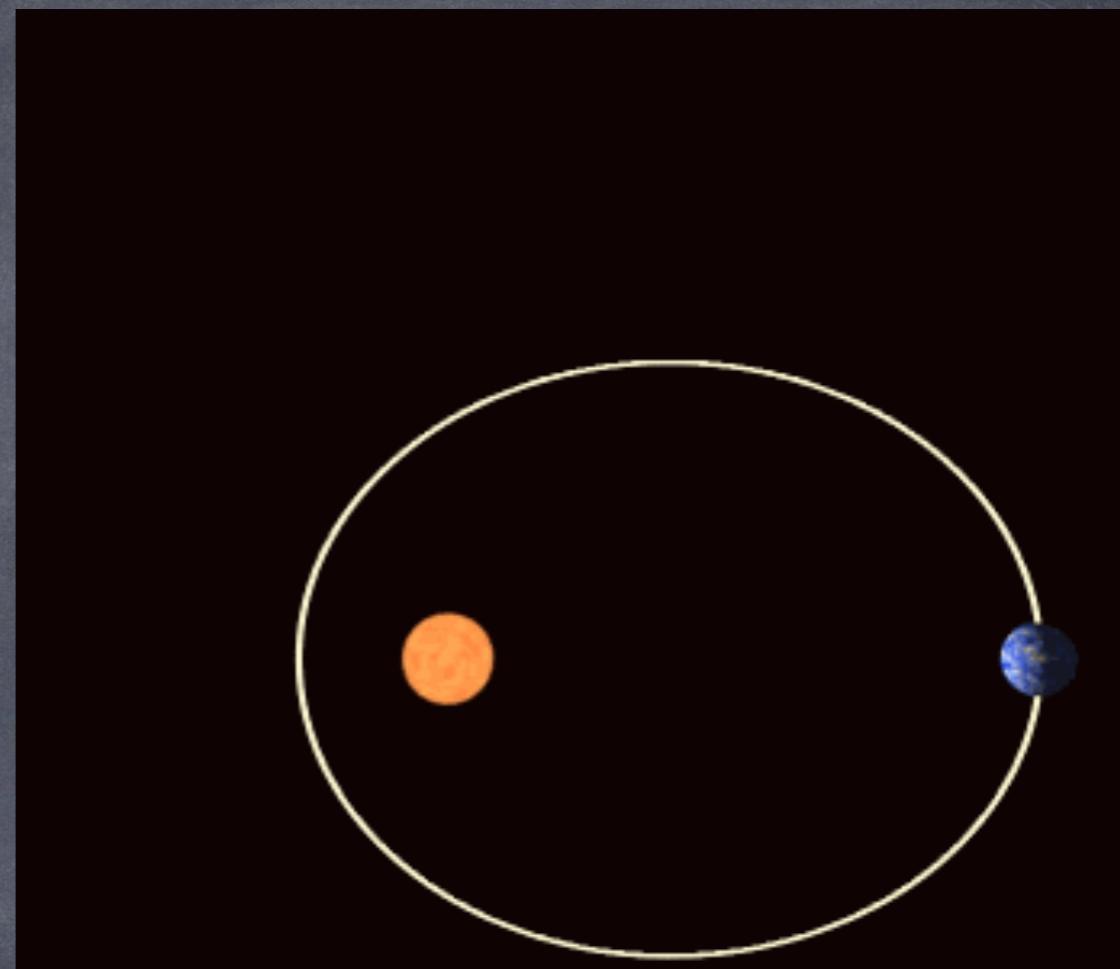
Moon's orbit

Dvali, Gruzinov & Zaldarriaga, hep-ph/0212069

Dvali, Hofmann & Khoury, hep-th/0703027

$$\pi(r) \sim \Lambda_s^3 r_\star^2 \left(\frac{r_\star}{r} \right)^{1/2}$$

→
$$\frac{\delta\Phi}{\Phi} \sim \left(\frac{r}{r_\star} \right)^{3/2}$$



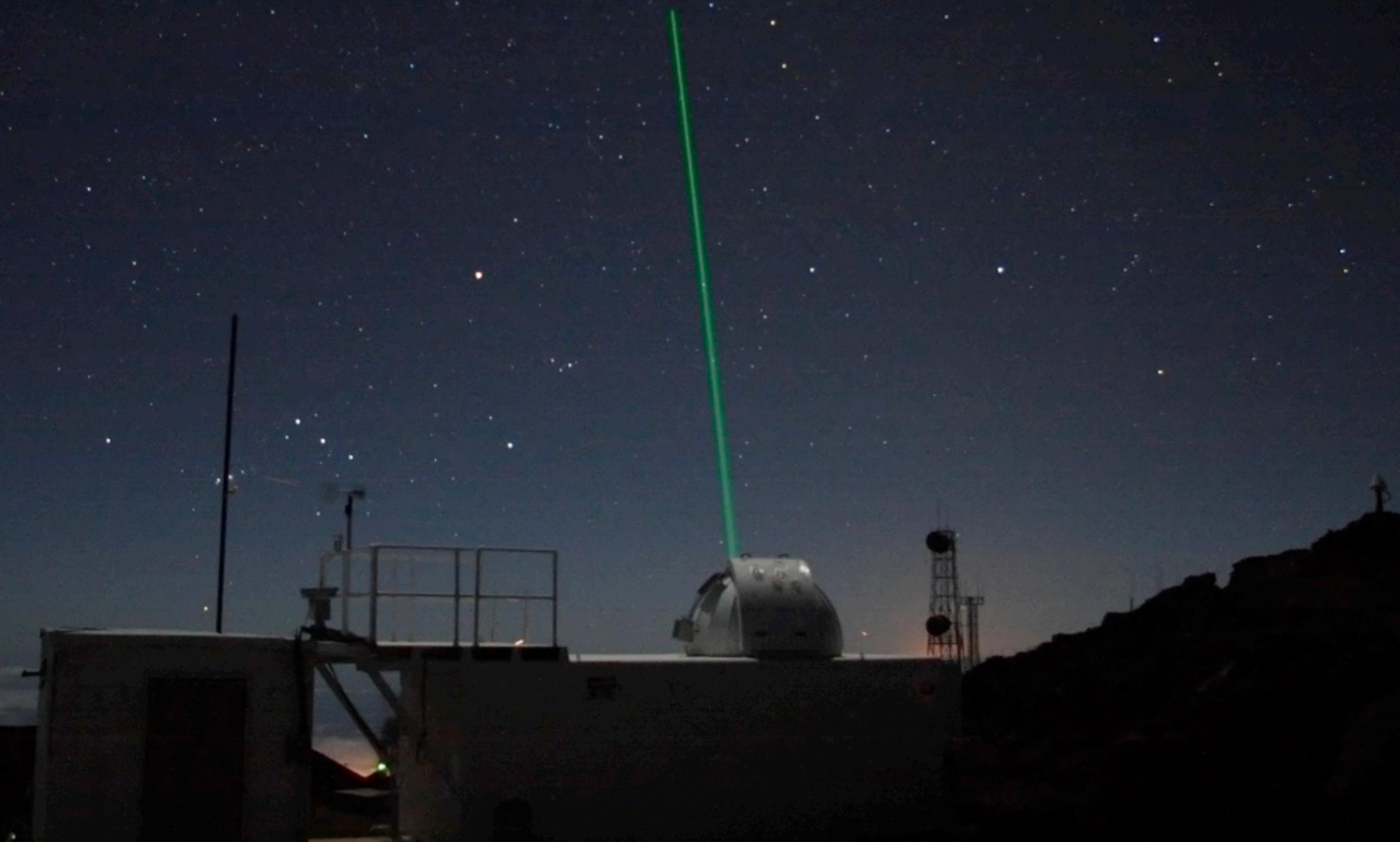
For the Moon: $r_{\text{Sch}}^\oplus = 0.886 \text{ cm}$

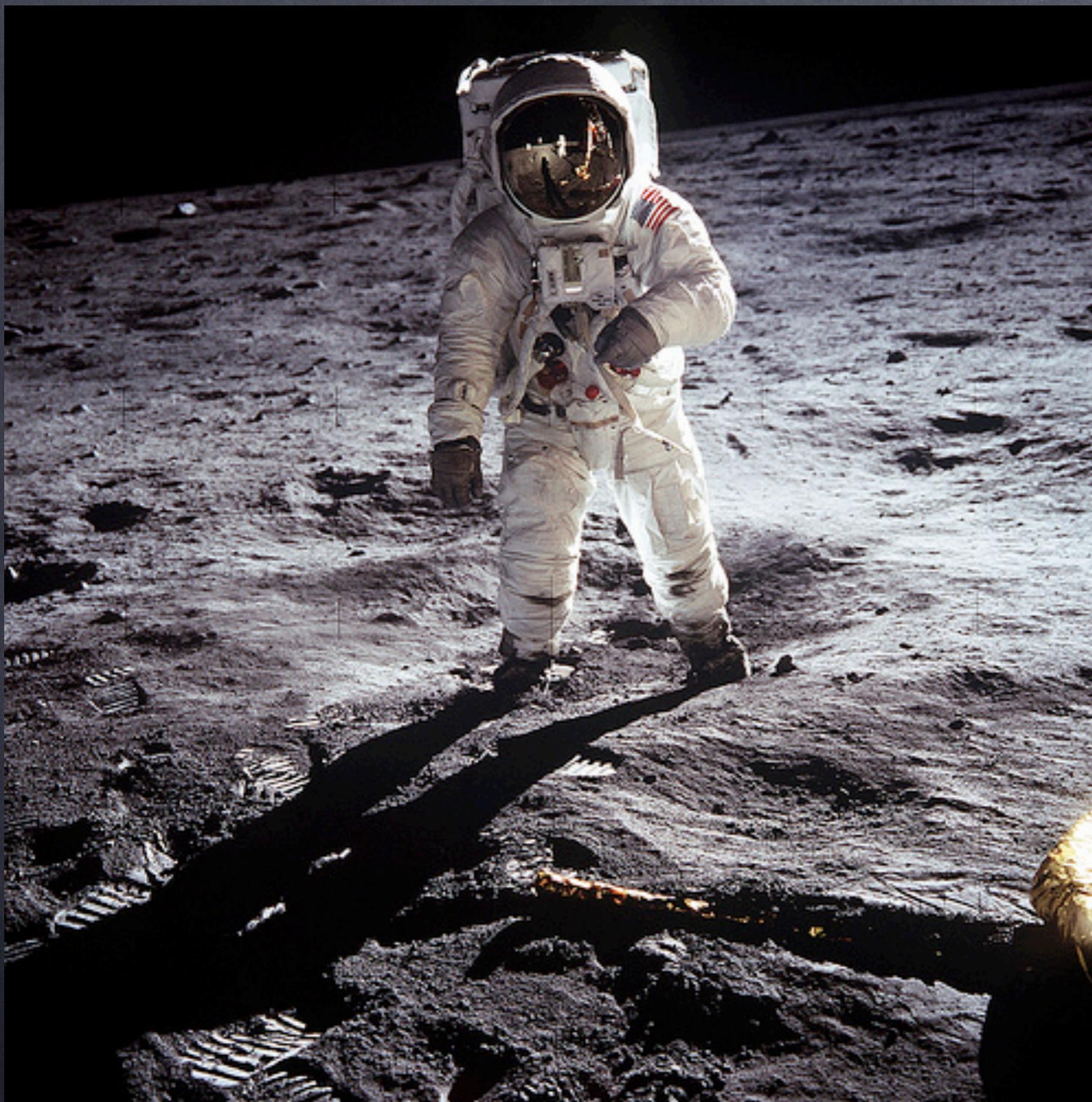
$$r = 3.84 \times 10^{10} \text{ cm}$$

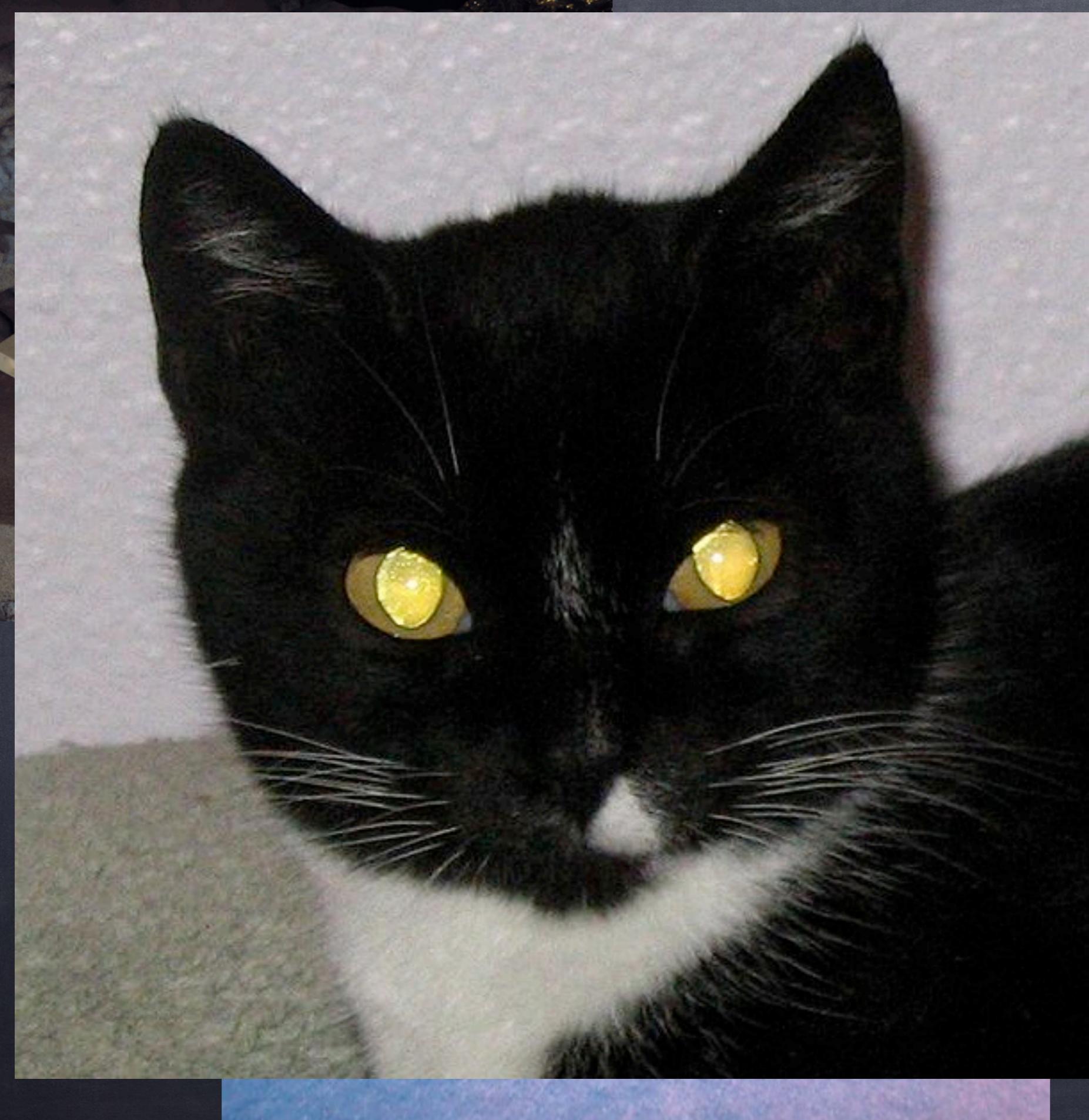
$$\Lambda_s = (H_0^2 M_{\text{Pl}})^{1/3} \simeq (1000 \text{ km})^{-1}$$

→
$$\frac{\delta\Phi}{\Phi} = 1.4 \times 10^{-12}$$

Lunar Laser Ranging









30 years of LLR data

$\sim \mathcal{O}(\text{cm})$ accuracy in Earth-Moon distance!

Currently:

$$\frac{\delta\Phi}{\Phi} \lesssim 10^{-11}$$

Apollo:

- Laser pulses $\sim 10^{-10}$ s
- 10^{17} photons per pulse
- $\lesssim 10$ photons back per pulse!

Forecast:

$$\frac{\delta\Phi}{\Phi} \lesssim 10^{-12}$$



