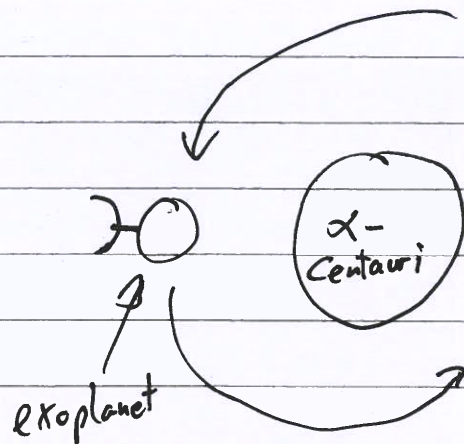
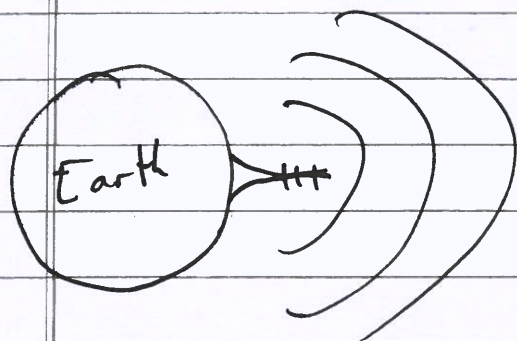


Friday, April 11, 2025

#1

Question: Could aliens on an exoplanet in the α -Centauri system detect human radiowave emissions?



The most powerful radio transmitters on Earth have a power of about $2000 \text{ kW} = 2 \text{ MW}$
 $= 2 \times 10^6 \text{ Watts}$

What is the power/area = intensity of the radio-waves when they reach α -Centauri

$$\text{distance to } \alpha\text{-Centauri} = 4.4 \text{ light years} = 4.16 \times 10^{13} \text{ km}$$
$$4.4 \times (9.4 \times 10^{12} \text{ km}) = 4.16 \times 10^{16} \text{ m}$$
$$= R_{\alpha}$$

$$\text{Intensity} = \frac{\text{Power}}{\text{Area}} = \frac{2 \times 10^6 \text{ W}}{1.089 \times 10^{34} \text{ m}^2} = 1.84 \times 10^{-28} \text{ W/m}^2$$

$$\text{Area} = \frac{1}{2} \times 4\pi R_{\alpha}^2 = 1.089 \times 10^{34} \text{ m}^2$$

Detection by a 1 km-wide dish telescope (Alien's Telescope)

$$\text{Area of dish} = \pi R_{\text{dish}}^2 = (3.1415) \left(\frac{1000}{2} \right)^2 = 7.85 \times 10^5 \text{ m}^2$$

Total power detected: $P_{\alpha} = \text{Intensity} \times \text{Area of dish}$

$$= (1.84 \times 10^{-28} \text{ W/m}^2) (7.85 \times 10^5 \text{ m}^2)$$

$$= 1.44 \times 10^{-22} \text{ W}$$

$$= 1.44 \times 10^{-7} \text{ fW}$$

femto watts

Very limit of detectable
with cryogenic detectors

(might be detectable
... might not be)