



Майнор. Астрофизика.

Семинар 2. (09.09)

① Coaxial cable ϵ $1 \mu\text{m}$

$$1 \mu\text{m} = 1000 \text{nm}$$

$$\epsilon_0 = 3.86 \cdot 10^{33} \text{ erg/cm}$$

$$1 \mu\text{m} = 3.26 \text{ cl. 2} = 3.1 \cdot 10^{18} \text{ cm}$$

$$M_{\odot} = +4.8 \quad \text{c } 10 \mu\text{m}$$

$$\frac{d_2}{d_1} = \frac{1000 \text{nm}}{10 \mu\text{m}} = 100$$

$$\frac{f_2}{f_1} = \left(\frac{1}{100}\right)^2 = 10^{-4}$$

$$M_{\text{total}} = +4.8 + 10 = 14.8 \text{ m}$$

$$S = \pi R^2 = \pi \left(\frac{\varnothing}{2}\right)^2 \sim \varnothing^2$$

$$f = \frac{1}{4d^2}$$

$$\Delta m = 5 \rightarrow \frac{f_1}{f_2} = 100$$

$$\Delta m = 10 \text{ m}$$

$$m_{\text{es, m}} = \underline{\underline{6}}^{\text{m}}$$

$$D_2 = 0,8 \text{ cm}$$

$$m = 14,8^{\text{m}}$$

$$D_T = ?$$

$$\Delta m = 8,8^{\text{m}}$$

$$\frac{f_1}{f_2} = 100 \quad \frac{\Delta m}{5} = 10 \quad \frac{2 \cdot 8,8}{5} = 10 \quad \frac{2 \cdot 8,8}{5} = 10 \quad \frac{3,52}{5} \approx 3300$$

$$\frac{f_1}{f_2} = \frac{S_1}{S_2}$$

$$S \sim D^2 \quad D \sim \sqrt{S} \sim \sqrt{f}$$

$$D_T = D_2 \cdot \sqrt{\frac{f_1}{f_2}} =$$

$$= 0,8 \cdot \sqrt{3300} \text{ cm} = 4/6 \text{ cm}$$

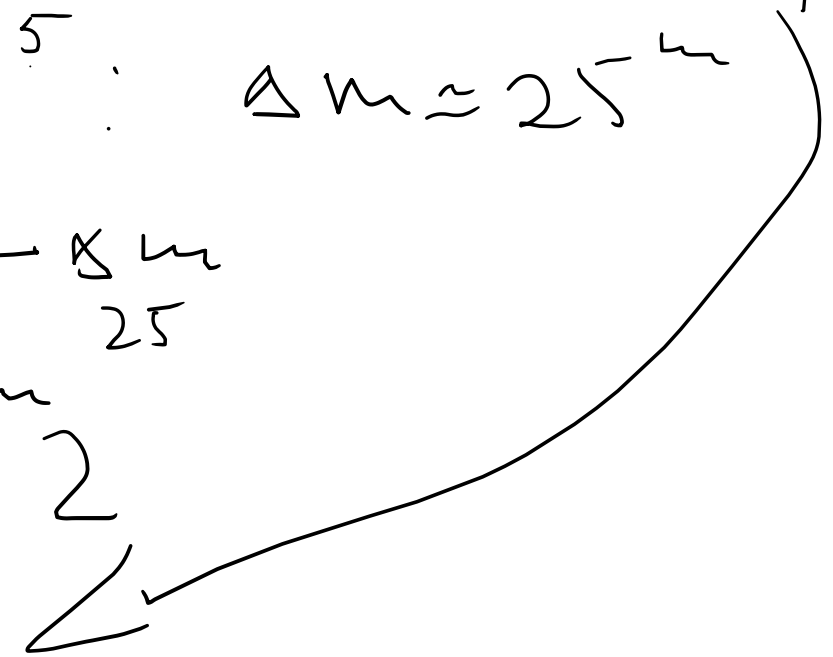
2) Тангенс ϵ / макс. аб. ред.

$\frac{1 \text{ макс. аб. ред.}}{\epsilon} \sim 100 \text{ маг} = 10^{11} \text{ км}$
 $\langle \epsilon \rangle \sim 0,1 \text{ } \odot$ [1 шаг = 10^{18} см]
 $\epsilon = 10^{10} \text{ } \odot$ $d = 10^{24} \text{ см} \approx 3 \cdot 10^5 \text{ пс}$

a) M_T $M_{\odot} = 4,8^m$: $(100)^5$: $\Delta m \approx 25^m$

$M_T \approx -20^m = M_{\odot} - 8^m$
 $\frac{4,8}{25}$

$m = M - 5 \lg \frac{10 [7 \text{ пс}]}{d} \approx 2,2^m$
 \uparrow
300000



$$8) \quad \frac{10 \mu\text{C}}{3000000 \mu\text{F}} \quad \& \quad \frac{f_5}{f_{0,10 \mu\text{C}}} = \frac{10^{10}}{\left(\frac{3000000}{10}\right)^2} = \frac{10^{10}}{9 \cdot 10^8} \approx 10$$

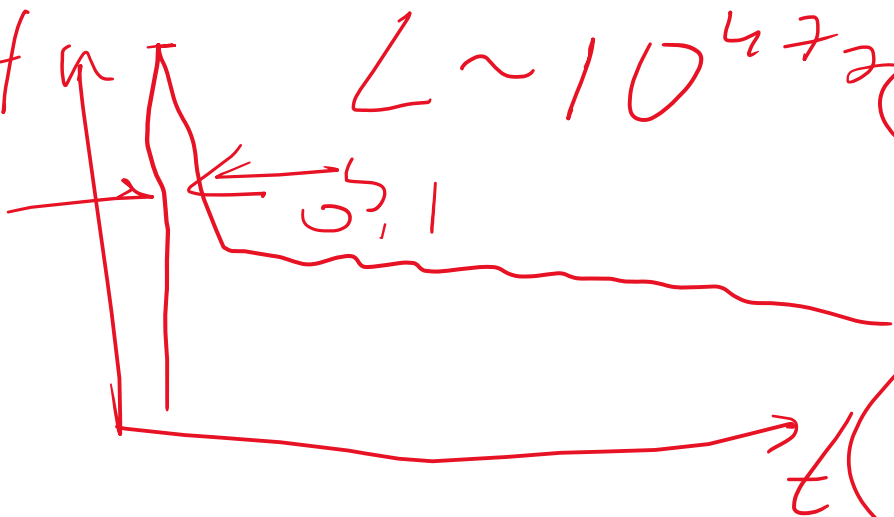
$$M_1 - M_2 = -2,5 \lg\left(\frac{f_1}{f_2}\right)$$

$$M_5 = 4,8 - 2,5 \lg(10) = 2,3$$

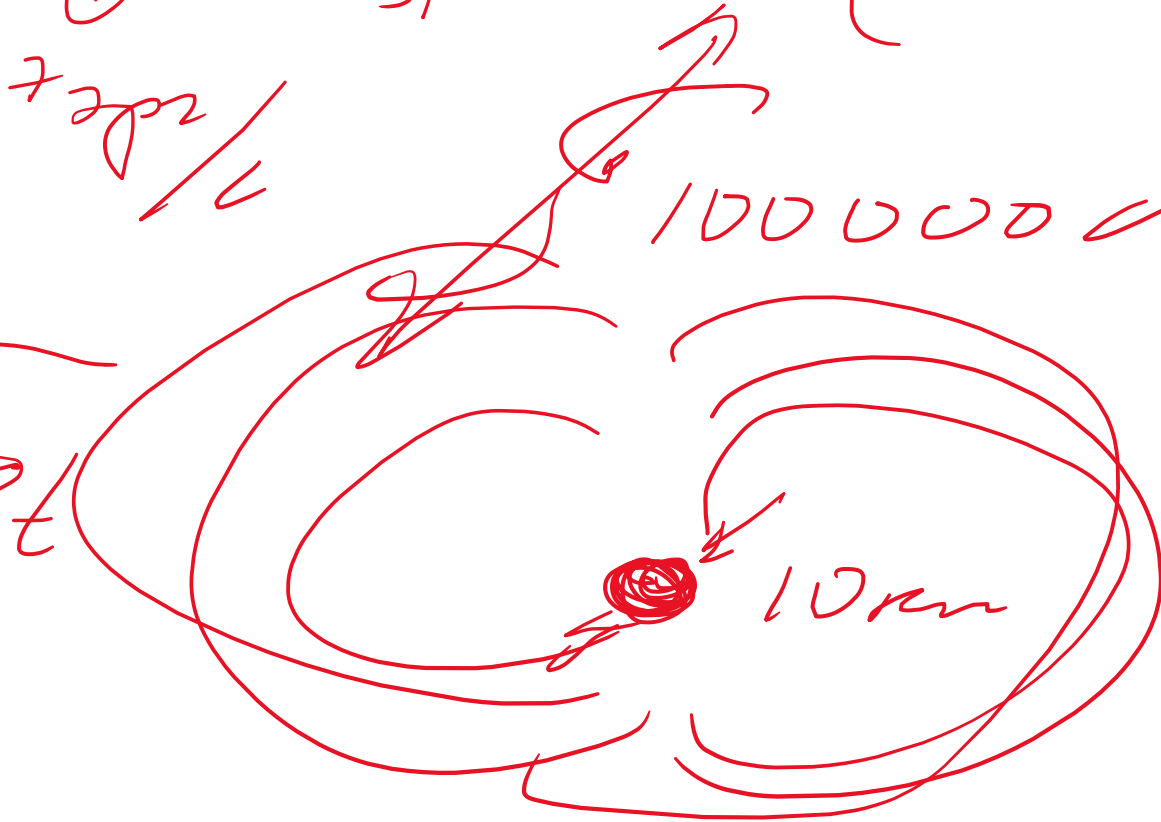
3) Вспышка марсианца

$$L_f \approx 10^{10} \sim 10^{11} L_{\odot} = 3,86 \cdot 10^{33} \text{ W} \cdot (10^{10} - 10^{11}) \sim 10^{44} \frac{\text{J}}{\text{с}}$$

$$f_{\text{н}} \sim 10^{47} \text{ эрг/с}$$



1000000 d-лет.



$$\Delta t = 0,1 \text{ c}$$

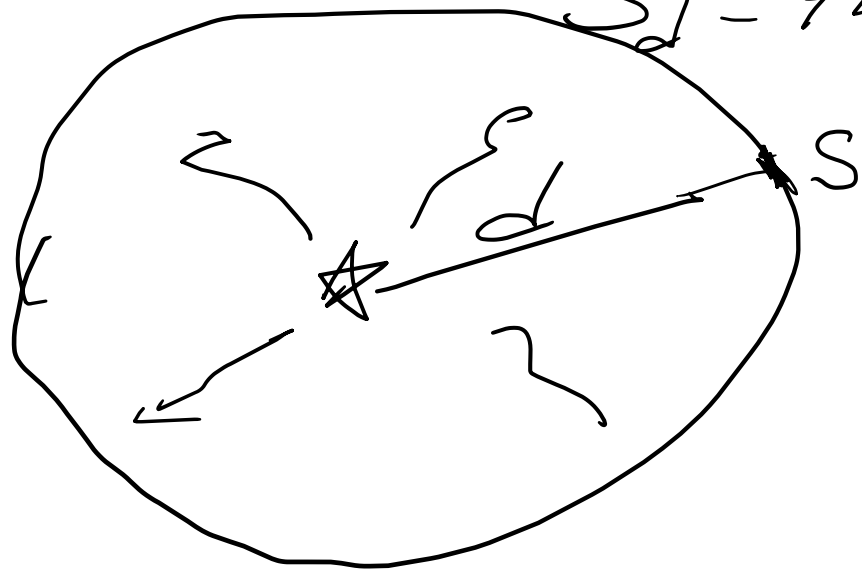
$$\bar{E} \approx 10^4 \text{ Дж/м}^2$$

$$E_{\gamma} = h\nu = 100 \text{ кэВ}$$

↑
h₀₀₅.
Пленка

раствор

$$v = c/\lambda$$



$$S_d = 4\pi d^2$$

\sqrt{W}

$$S \approx 1000 \text{ cm}^2$$

1 фотон.

$$25 \pm 5$$

$$9 \pm 3$$

$$c) \quad \angle = \frac{F}{R \cdot t} = \frac{10^{46} \text{ J}}{0,1 \text{ c}} = 10^{47} \text{ J/c}$$

$$F_f = \frac{100 \text{ kdB}}{10^5 \text{ dB}} \cdot 1,6 \cdot 10^{-12} \quad \text{1 dB} = 1,6 \cdot 10^{-12} \text{ J}$$

$$= 1,6 \cdot 10^{-7} \text{ J}$$

$$E = 10^{46} \text{ J} \Rightarrow N = \frac{10^{46}}{1,6 \cdot 10^{-7}} = 6 \cdot 10^{52}$$

$$h a \text{ cm}^2 \quad \frac{N}{4\pi d^2} \cdot S = 1$$

$$d = \sqrt{\frac{N \cdot S}{4\pi}} = 2,2 \cdot 10^8 \text{ cm} = 0,7 \text{ Gpc}$$

$$\text{k dB} = \underline{\underline{10000 \text{ dB}}}$$

$$100 \text{ kdB} = 100 \cdot 10000 = 10^5$$



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Часть 2

5) Препятствие и лез. год $D = 6 \mu$

$$\Delta t = 60 \text{ сек}$$

$$n_n = 10 \text{ фотоны}$$

$$S = \pi \left(\frac{D}{2} \right)^2$$

Вера $M_V \approx 0^m$

$$f_{\text{max}} = 10^6 \frac{\text{фот}}{\text{см}^2 \cdot \text{с}}$$

$$n = f \cdot S \cdot \Delta t$$

$$f_n = \frac{n_n}{S \cdot \Delta t} = \frac{n_n}{\pi \left(\frac{D}{2} \right)^2 \Delta t} = \frac{4n_n}{\pi D^2 \Delta t} = \frac{4 \cdot 10}{\pi (600)^2 \cdot 60}$$
$$\approx 5 \cdot 10^{-7} \frac{\text{фот}}{\text{см}^2 \cdot \text{с}}$$

$$\rightarrow \frac{f_n}{f_{\text{max}}}$$

$$\frac{5 \cdot 10^{-7}}{10^6} = 5 \cdot 10^{-13} = \frac{1}{2 \cdot 10^{12}} = \frac{1}{100^6} \rightarrow 5^m \cdot 6 = 30^m$$

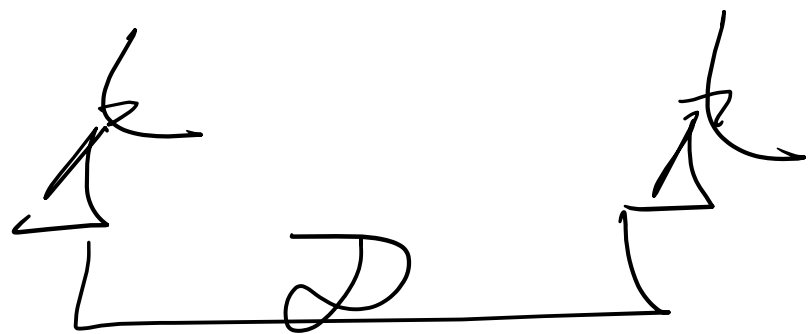
$\Delta m = ?$

$$m_n = 31^m$$

3

Угол зрения.

~~θ~~ $\theta = 1,22 \frac{\lambda}{D}$
 $\angle \theta = \text{радиан}$

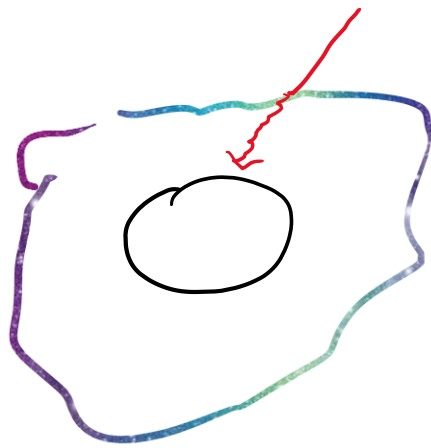


$$a) \theta = 1''$$

$$\lambda = 6 \cdot 10^{-5} \text{ cm}$$

$$D = \frac{1,22 \cdot \lambda}{\theta [r-g]}$$

$$= 15 \text{ cm}$$



$$\theta = 1,22 \frac{\lambda}{D}$$

$$p = 9 \rightarrow ''$$

$$= \frac{1,22 \cdot 6 \cdot 10^{-5} \text{ cm}}{1 / 206265} = 1,22 \cdot 6 \cdot 2,06 \text{ cm} =$$



$$\theta) \quad \lambda = 21 \text{ cm} \quad \text{FAST} \quad D = 500 \text{ m}$$

$$\theta = 1,22 \cdot 206265 \frac{0,21 \text{ m}}{500 \text{ m}} \approx 100''$$

$$1' = 60''$$

38) $E = 10^{46}$ эр² $\Delta t = 0,1$ с, $S = 1000 \text{ м}^2$

$h\nu = 100 \text{ кэВ}$

10 ~~1~~ фотонов
25

$L = 10^{47}$ эр²/с

$F_{\text{min}} = \frac{10^5 \text{ эВ} \cdot 1,6 \cdot 10^{-12} \text{ эВ}^{-1}}{1000 \text{ м}^2 \cdot 0,1 \text{ с}} = 1,6 \cdot 10^{-9} \frac{\text{эр}^2}{\text{м}^2 \cdot \text{с}}$

$F = \frac{L}{4\pi d^2}$

$d = \sqrt{\frac{L}{4\pi \cdot F_{\text{min}} \cdot 10}} = \sqrt{\frac{10^{47}}{4\pi \cdot 1,6 \cdot 10^{-9} \cdot 10}} \approx \sqrt{10} \cdot 2,2 \cdot 10^{27} \text{ см} \approx 7 \text{ Гпс}$

$\frac{1}{\sqrt{25}} = \frac{1}{5}$