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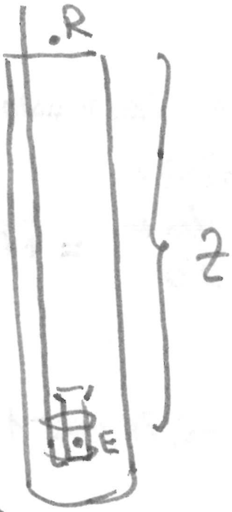
4. a.



(~~În conjurăm Receiver-ul~~ (We surround the reciver with aluminium foil)

R(dBm)	z(cm)
-61	~~48~~ 10
-80	12,5
-100	15
-120	17,5
-65	10,5
-69	11
-75	11,5
-77	12
-86	13
-91	13,5
-94	14
-97	14,5
-105	15,5
-109	16
-113	16,5
-118	17

$P \propto e^{2i(i\mu z)} \Leftrightarrow P \propto e^{-\mu z}$

$P_{emis} = ct.$

~~$P_{receptionat} = \frac{P_{emis}}{4R}$~~

$\Rightarrow$ Rd $R(dBm) = \underset{ct.}{K} - \underbrace{\frac{20}{\ln 10} \cdot \mu z}_{graph}$ $\Rightarrow \underset{(graph)}{tg\gamma} = -9{,}14\, cm^{-1}$

$9{,}14 = \frac{20}{\ln 10} \mu \Rightarrow \mu = 1{,}05\, cm^{-1}$

$\mu = 105\, m^{-1}$ $(= \mu_1)$

4.b. We will work exactly as in 4a., but for every tube we have:

$d = 59mm$		$d = 100mm$		$d = 41mm$	
R(dBm)	z(cm)	R(dBm)	z(cm)	R(dBm)	z(cm)

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~~$B = -8{,}24 \cdot 10^{-3}$ cm~~

~~$A = 1{,}14$ cm^{-1}~~

with regression parameter being 0,97, that means that $\mu \propto \frac{1}{d^2}$, which verifies our hypothesis.

5. $\nu_{emitter} = [200\,MHz ; 5\,GHz]$

$\Rightarrow$ ~~$\lambda_{emitter}$~~ $= \lambda_{air} \simeq \dfrac{c_{air}}{\nu_{emitter}}$

$\Rightarrow \lambda_{air} \simeq [0{,}667\,m ; 16{,}667\,m]$

$$c_w = \frac{c_{air}}{n_w}$$

$$\Rightarrow \nu_{emit} \cdot \lambda_w = \frac{\nu_{emit} \cdot \lambda_{air}}{n_w}$$

$$\Rightarrow n_w = \frac{\lambda_{air}}{\lambda_w} = \frac{4}{3}$$

* At 3) and 4) we must take in account how the waves reflect off tubes inner surfaces. So that's why it's our choice to isolate the emitter with aluminium foil or not. (At 4 we used aluminium foil only at $d = 46\,mm$).

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