

Optional assignment

With this assignment it is possible to get 5 extra points to add to the written exam. This must be done: Detailed results must be shown and motivated to get full score. You must hand in the assignment in written form no later than 15:00 2011-11-21. DO NOT forget to mark your solutions with name and "person number".

The transmitter at a radio station has a maximum output power of 30 dBm. The radio station has a 6 meter coaxial cable feeding the antenna, the attenuation of cable is 0.2 dB / meter. The omnidirectional antenna has a gain of 3 dB. Bob is driving his car, happy after a week of hard studies at Halmstad University, toward the country side listening to the above mentioned radio station at 95.4 MHz. The radio in his car has a sensitivity of -70 dBm and the antenna on the top of the car has a no gain. Calculate the maximum distance that Bob will be able to listening to the radio station.

Answer in short:

$$30 - (0,2 \cdot 6) + 3 - L_{fs} = -70$$

$$\begin{aligned} L_{fs} &= +30 + 70 + 3 - 1,2 \\ &= 101,8 \text{ dB} \end{aligned}$$

$$\begin{aligned} L_{fs} &= 32,44 + 20 \log(d) + 20 \log(f) \\ 101,8 - 32,44 - 20 \log(95,4) &= 20 \log(d) \end{aligned}$$

$$\log(d) = \frac{29,77}{20}$$

$$\log(d) = 1,49$$

$$10^{\log(d)} = 10^{1,49}$$

$$d = 30,8 \text{ km}$$

Answer: The maximum distance becomes 30,8 km.