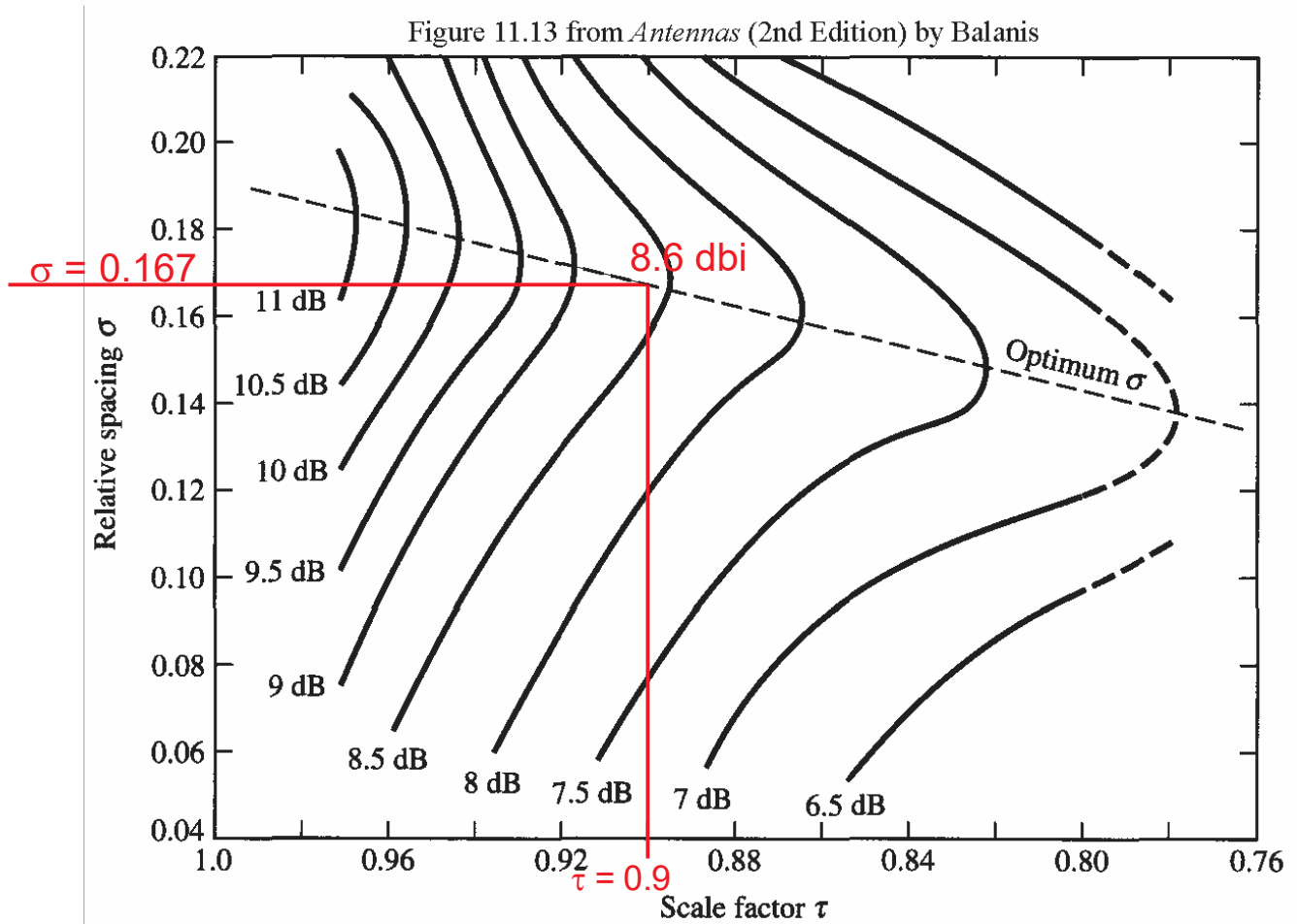


EE 483/583 Antennas for Wireless Communications Quiz #7 (Spring 2025)

Name KEY

Instructions: Open notes. Place answers in indicated spaces and **show/indicate all work** for credit.

An optimum LPDA has a directivity of 8.6 dBi and frequency range of 170-220 MHz. Find the relative spacing σ , scale factor τ , apex half-angle α (deg), length l_1 (cm) of longest LPDA element, and estimated length of shortest element l_N (cm). Show all work on given figures. Let $c = 2.998 \times 10^8$ m/s in calculations.



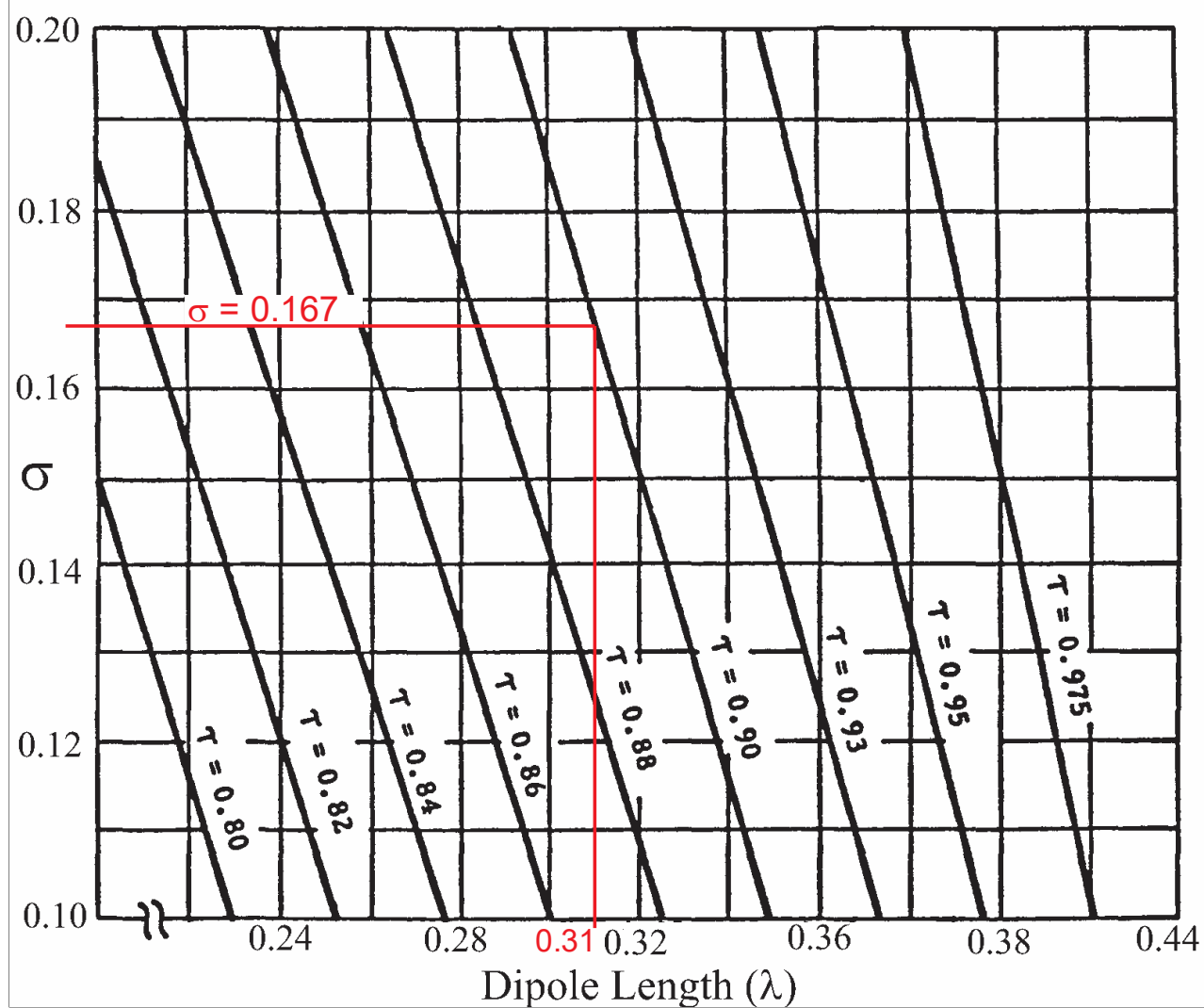
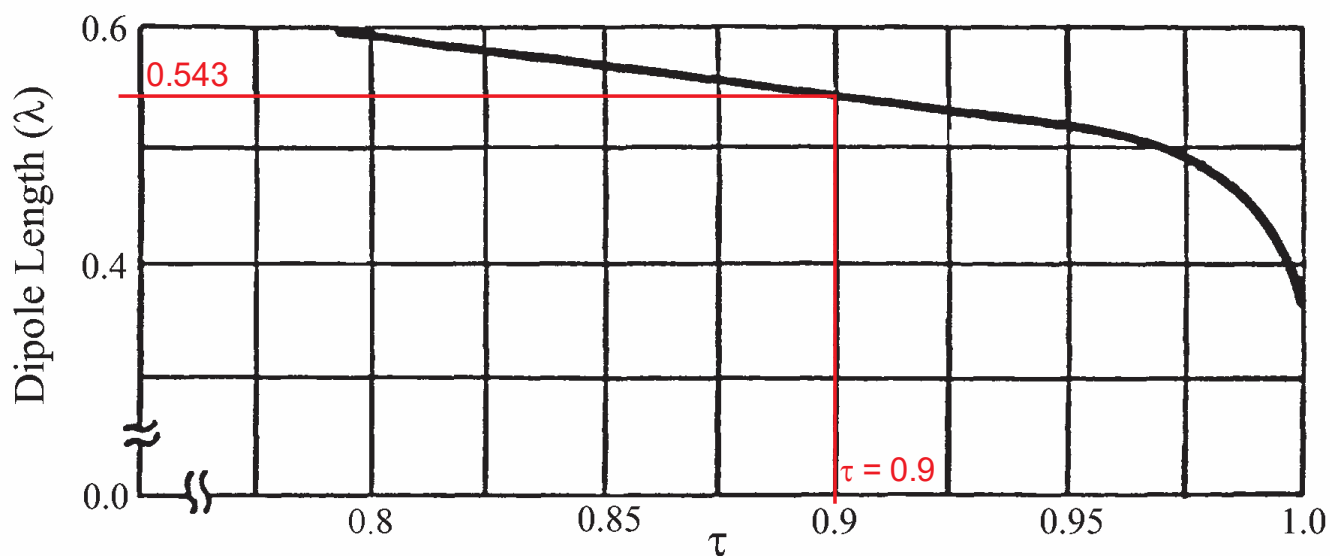
$$\alpha = \tan^{-1} \left(\frac{1-\tau}{4\sigma} \right) = \tan^{-1} \left(\frac{1-0.9}{4(0.167)} \right) \Rightarrow \underline{\alpha = 8.513988^\circ}$$

$$\lambda_{\max} = \frac{c}{f_{\min}} = \frac{2.998 \cdot 10^8}{170 \cdot 10^6} = 1.763529412 \text{ m} = 176.353 \text{ cm}$$

Using top fig. on next page & τ , $l_1 = 0.543\lambda_{\max} = 0.543(176.353) \Rightarrow \underline{l_1 = 95.75965 \text{ cm}}$

$$\lambda_{\min} = \frac{c}{f_{\max}} = \frac{2.998 \cdot 10^8}{220 \cdot 10^6} = 1.362727 \text{ m} = 136.273 \text{ cm}$$

From bottom fig. on next page w/ τ & σ - $l_N = 0.31\lambda_{\min} = 0.31(136.273) \Rightarrow \underline{l_N = 42.245 \text{ cm}}$



$$\sigma = \underline{0.167} \quad \tau = \underline{0.90} \quad \alpha = \underline{8.514^\circ} \quad l_1 = \underline{95.760 \text{ cm}} \quad l_N = \underline{42.245 \text{ cm}}$$