

S-26.3100 RF AND MICROWAVE ENGINEERING

Exam 6.5.2013, at 10-12 a.m., in lecture hall I256

Part B, 70-79 min. (10:30 – 11:59 a.m.), use of literature and own notes allowed.

Maximum 10 points for each problem.

Please use a separate sheet for each problem!

(Kaikkiin tehtäviin saa vastata suomeksikin!)

*Answer all problems with **careful reasoning**, i.e. not only with equations and a numerical answer, but also with sufficient explanations and documenting intermediate steps.*

B1.

Design a microstrip-line-based Wilkinson power divider with maximum power-split ratio K^2 . The frequency of operation is 1 GHz, the port impedance is 50 ohms (at all ports), the substrate permittivity is 2.0, and substrate thickness is 0.85 mm. The maximum width of a microstrip line is 5 mm and the minimum width is 0.25 mm (10 p.).

(Hint: you may use iteration - try integer numbers first. And you can assume the thickness of the microstrip to be negligible)

$$\text{Ans.: } K \approx 2 \quad (\text{i.e., } 6 \text{ dB})$$

B2.

A two-tone input with 6 dB difference in the two signal levels is applied to a nonlinear component. What is the relative power ratio of the resulting two third-order intermodulation products $2\omega_1 - \omega_2$ and $2\omega_2 - \omega_1$ if ω_1 and ω_2 are close together? (10 p.)

$$\text{Ans.: } 6 \text{ dB}$$