Exercise 12.1

In this exercise, we use lossless 50 Ω cables with v = 196E6 m/s. The two elements in a stub matching are referred to as the stub and the line.

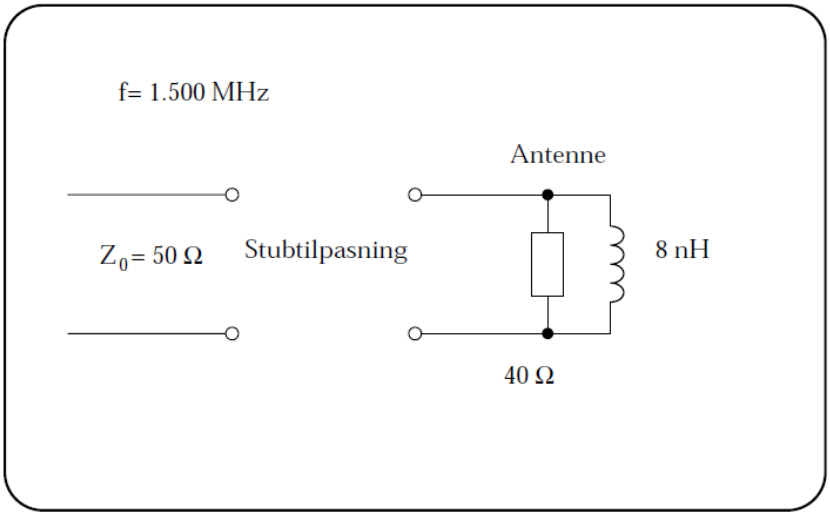
a. Perform a single stub matching for a load consisting of 10 Ω in series with 27 nH to a 50 Ω cable at a frequency of 150 MHz. Provide the lengths in both degrees and meters. Use the shortest line and an open stub.

b. After the matching is done, what is the SWR on the stub, the line, and the cable?

Exercise 12.2

At a frequency of 1500 MHz, an antenna can be represented by an impedance equivalent to a 40 Ω resistor in parallel with an 8 nH inductor. The antenna needs to be matched to 50 Ω using a single stub matching. The matching is done using lossless 50 Ω cables with C = 150 pF/m.

Use the provided Smith chart for the stub matching calculation.



a. Calculate the propagation velocity and wavelength for the cables used in the matching. Provide the wavelength in millimeters.

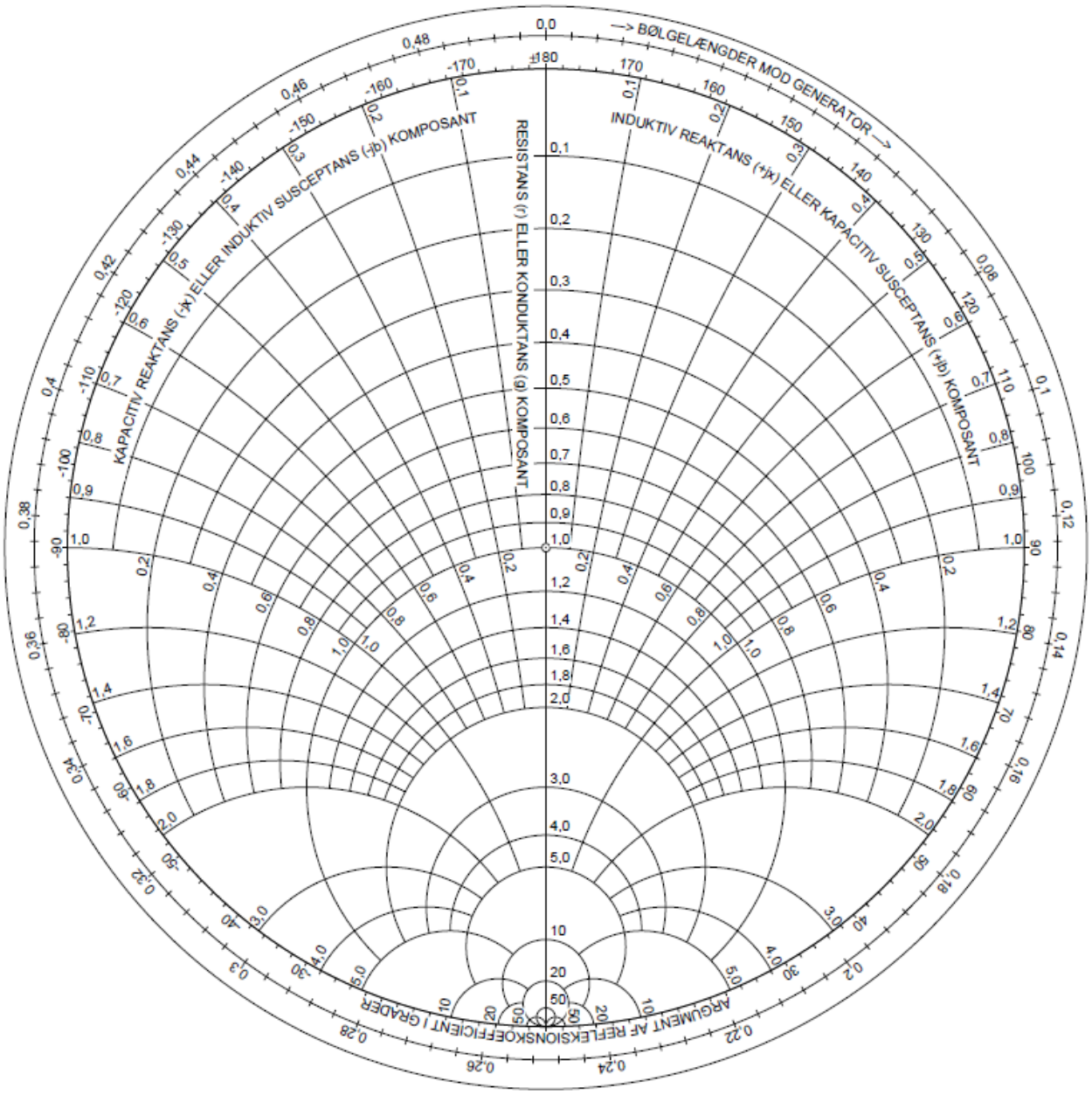
b. Perform the stub matching on the Smith chart. Use the principal solution with a short line and an open stub. The graphical construction on the chart is considered as the solution to this question. Draw and clearly mark each part of the construction! Choosing the wrong line and stub type (short/long, open/short) counts as an error.

c. Provide the lengths of the line and the stub in both wavelengths and millimeters.

d. Calculate the impedance of the stub.

e. If a closed stub is desired instead of an open stub, calculate the length and impedance of the closed stub.

f. Could the stub matching be done with 75 Ω cables? Justify your answer.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RESISTANS (r) ELLER KONDUKTANS (g) KOMPOSANT
KAPACITIV REAKTANS (-jx) ELLER INDUKTIV SUSCEPTANS (-jb) KOMPOSANT
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