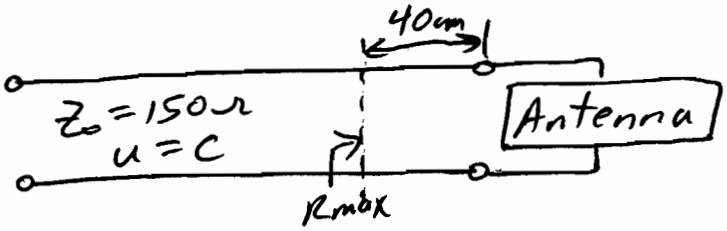
11.46 An antenna, connected to a 150 Ω lossless line, produces a standing wave ratio of 2.6. If measurements indicate that voltage maxima are 120 cm apart and that the last maximum is 40 cm from the antenna, calculate

(a) The operating frequency

(b) The antenna impedance

(c) The reflection coefficient (assume that $u = c$).



a) Voltage Maxima are 120cm apart $\Rightarrow \lambda/2 = 120\text{cm}$

Therefore $\lambda = 240\text{cm}$ $\quad f = \frac{u}{\lambda} = \frac{2.9979 \times 10^8}{2.4}$

$$f = 124.9\ \text{MHz}$$

b) * Draw circle of radius $S = 2.6$ (use VSWR scale) centered on Smith Chart. Locate and plot $r_{max} = 2.6 = S$. Move a distance of $\frac{40\text{cm}}{240\text{cm}/\lambda} = 0.166\lambda$ "TOWARD THE LOAD" from r_{max} to $z_{ANT} = 0.49 + j0.47\ \Omega$

$$Z_{ANT} = Z_o z_{ANT} = 73.5 + j70.5\ \Omega$$

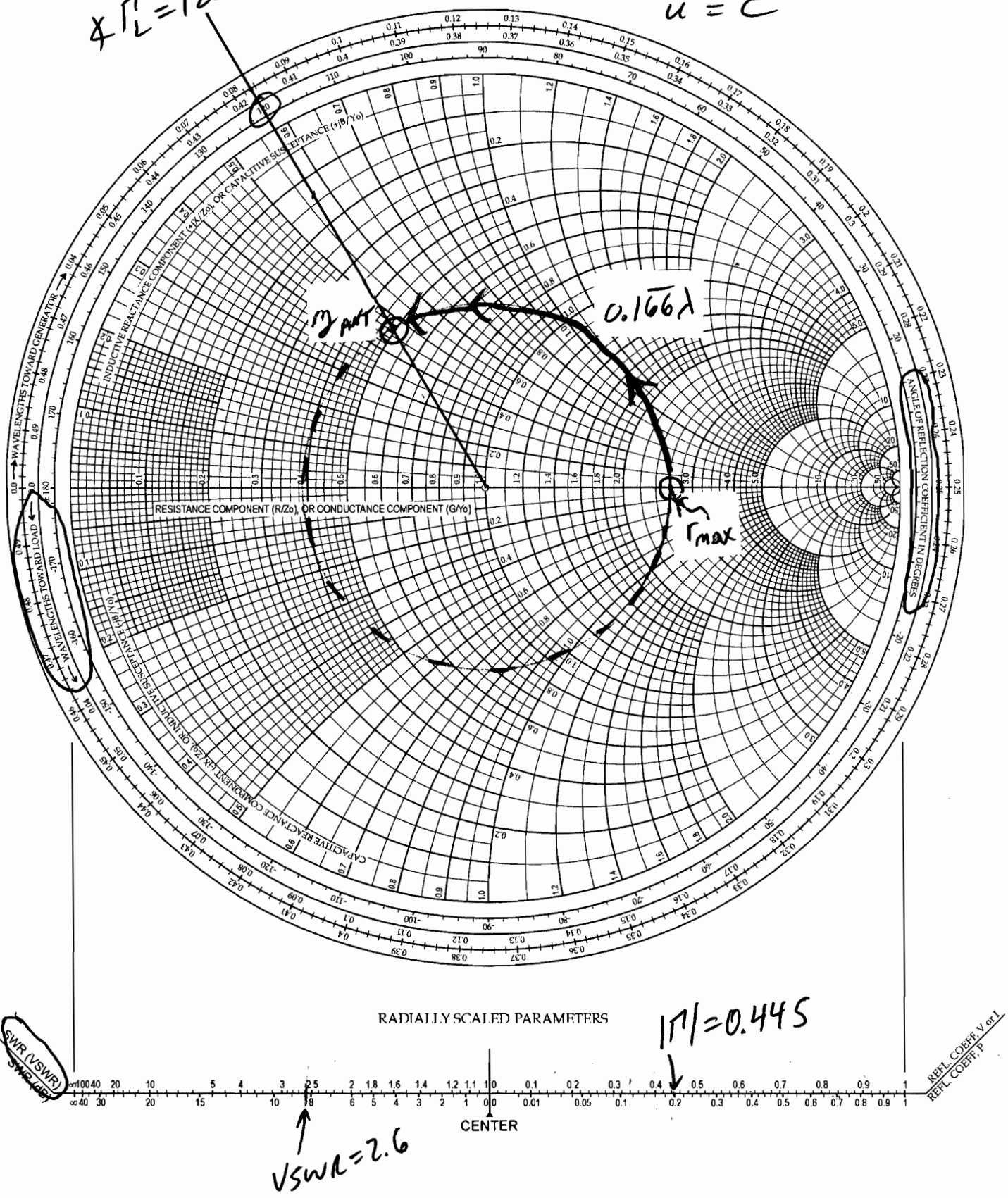
c) Use compass on $|\Gamma|$ scale at bottom of Smith Chart to get $|\Gamma_L| = 0.445 = |\Gamma_{ANT}|$

Use "ANGLE OF REFLECTION COEFFICIENT..." scale to read $\angle\Gamma_L = 120° = \angle\Gamma_{ANT}$

$$\Gamma_{ANT} = \Gamma_L = 0.445\angle 120°$$

Simple Smith Chart

Problem 11.46
$z_0 = 150\,\Omega$
$u = c$



RADIALLY SCALED PARAMETERS

$|\Gamma| = 0.445$

SWR (VSWR)

REFL COEFF, V or I
REFL COEFF, P

CENTER

$VSWR = 2.6$