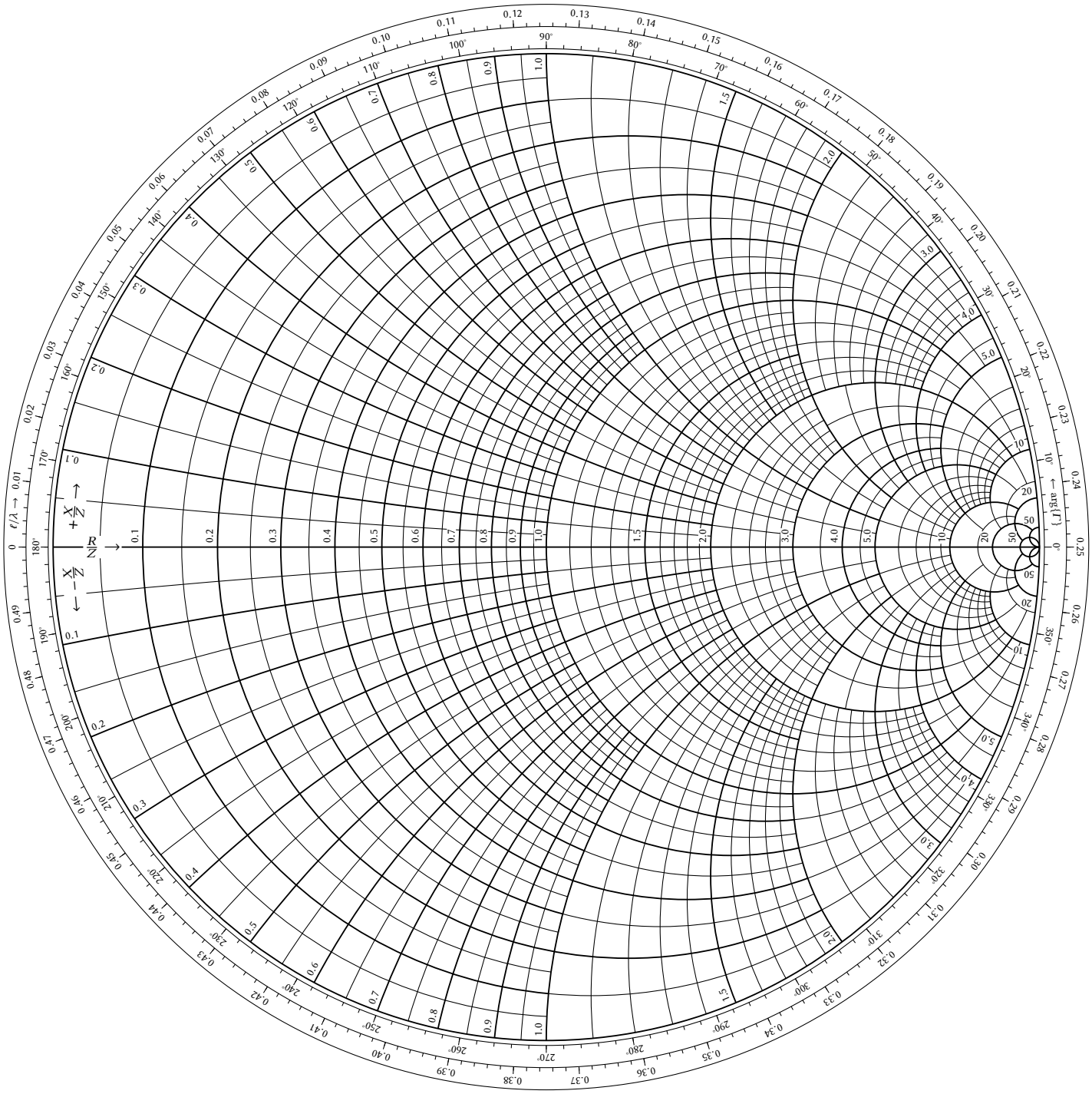

Reflectivity $|\Gamma| \longrightarrow$

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

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Available from http://www.siart.de/lehre/sheets.xhtml.
This Smith chart was typeset in LaTeX using the PSTricks package (T. van Zandt, D. Girou, H. Voß).

Info: Plotting the Smith chart

In order to plot a high-quality, fine structured Smith chart, it is advisable to draw the circles arcwise rather than drawing full circles, all of them passing through the point $\Gamma = 1$. To achieve this you need to know the angles where to start and where to end the respective arc. In this appendix the formulas for computing the radii, the center points, and the intersects between arbitrary circles in the Smith chart are given. They can easily be derived from the transform relation

$$\Gamma(z) = \frac{z-1}{z+1} \tag{1}$$

where $\Gamma = \chi + \mathrm{j}\zeta$ is the reflection coefficient and $z = r + \mathrm{j}x$ is the normalised impedance. Coordinates of all interesting points are given as real and imaginary parts of complex numbers in the Γ plane. From (1) we find the relations

$$\left(\chi - \frac{r}{1+r}\right)^2 + \zeta^2 = \left(\frac{r}{1+r}\right)^2 \qquad r = \text{const} \tag{2a}$$

$$(\chi - 1)^2 + \left(\zeta - \frac{1}{x}\right)^2 = \left(\frac{1}{x}\right)^2 \qquad x = \text{const} \tag{2b}$$

describing circles where $r = \text{const}$ and where $x = \text{const}$, respectively.

	center point	radius	intersect
$r = \text{const}$	$\frac{r}{1+r}$	$\frac{1}{1+r}$	$\frac{r+\mathrm{j}x-1}{r+\mathrm{j}x+1}$
$x = \text{const}$	$1+\mathrm{j}\frac{1}{x}$	$\frac{1}{x}$	

Table 1: Center points and radii of the circles $r = \text{const}$ and $x = \text{const}$ in the Γ plane. Use those points to compute start and end angles of the desired arcs.

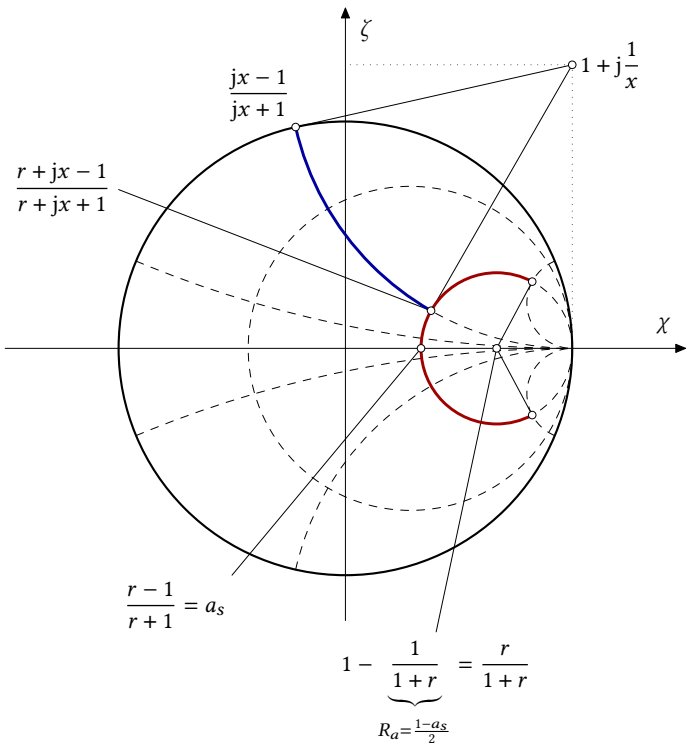

Fig. 1: The circular coordinate lines in the Smith chart: their center points and their intersects.