Phase Offset

$$S_{mn} \cdot e^{j\Phi}$$

Electrical delay

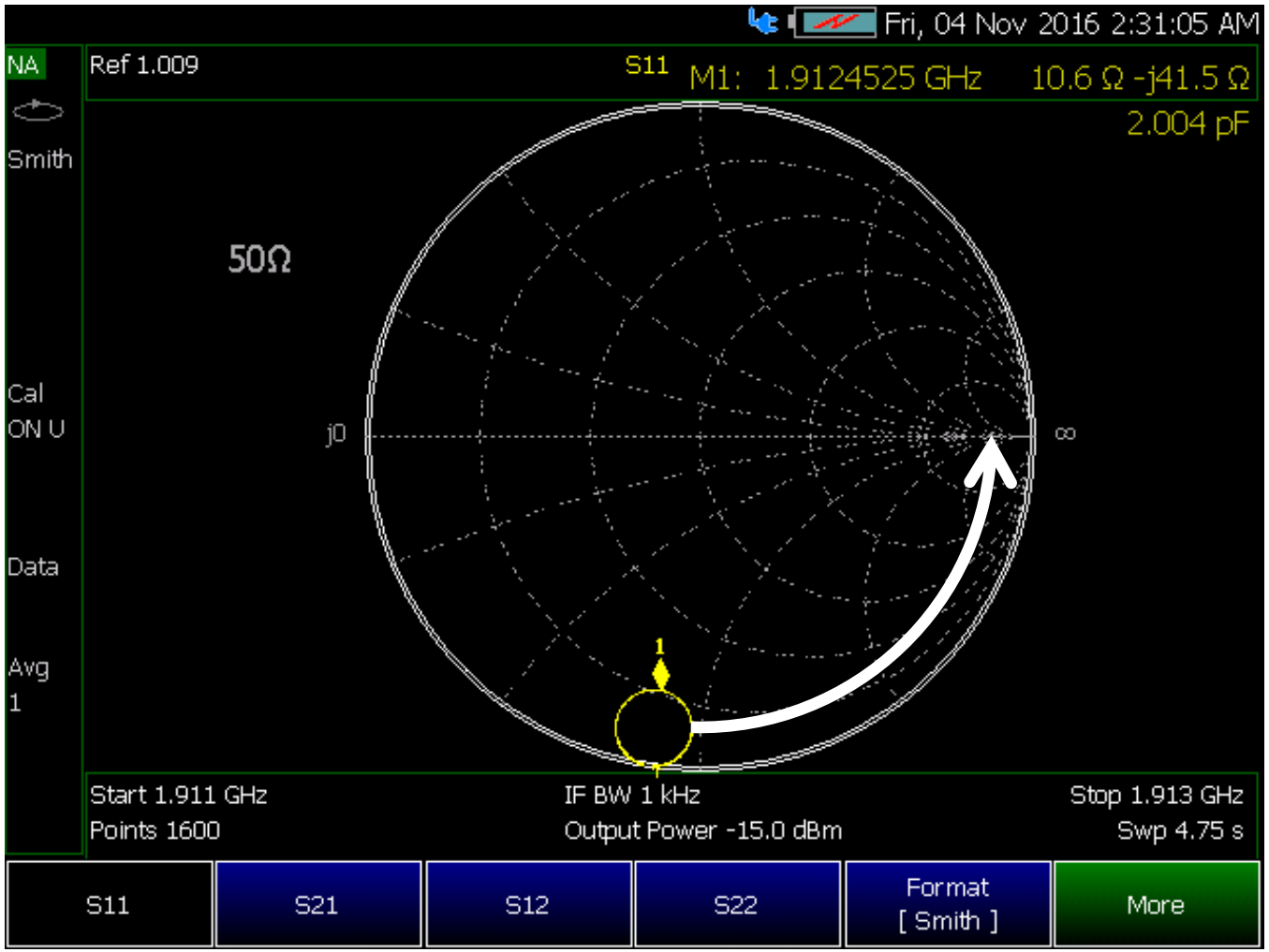
$$S_{mn} \cdot e^{j\omega\tau}$$

Group delay

$$t_g = -\frac{d}{d\omega}\angle S_{mn}$$

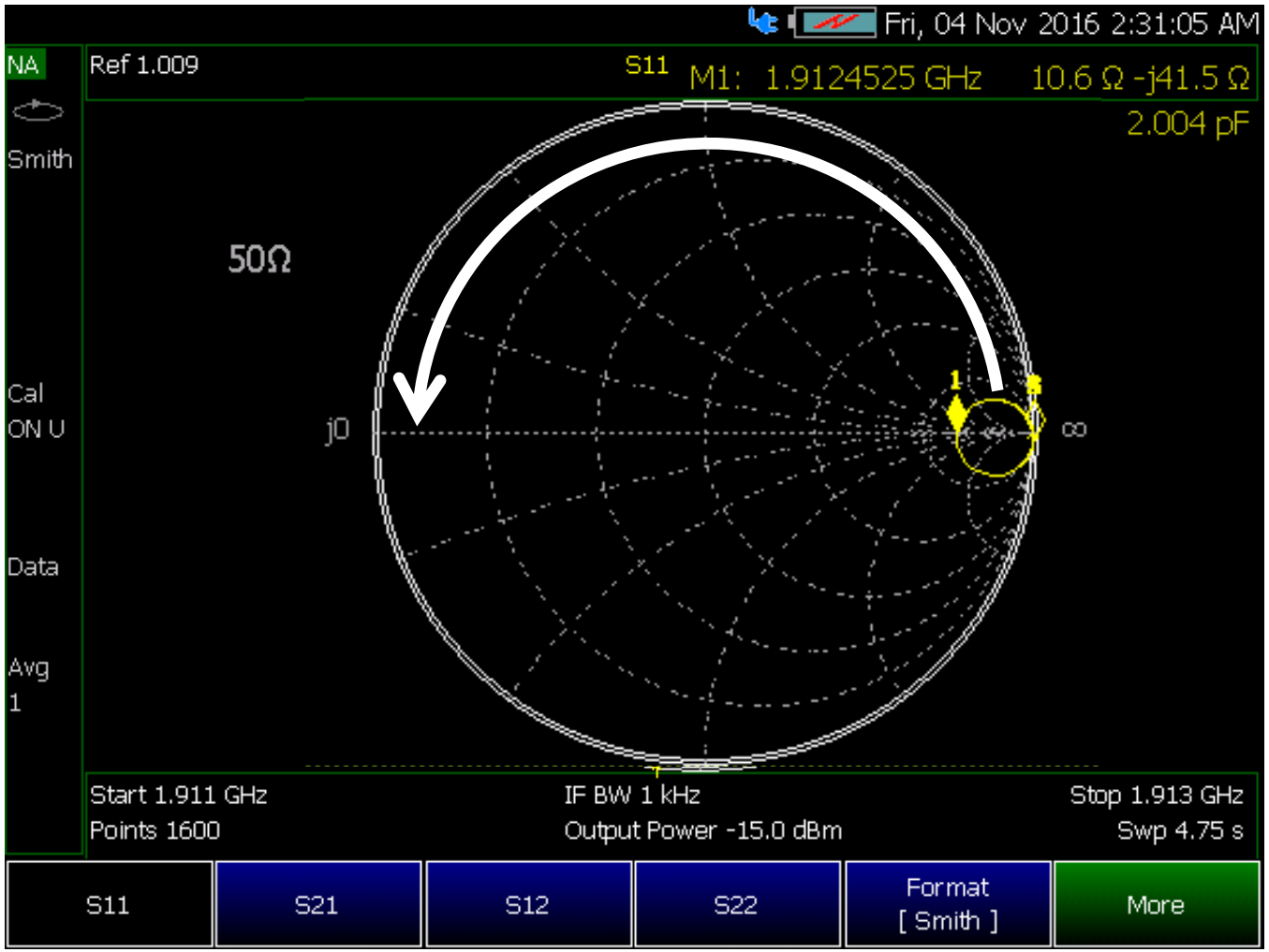
Phase Offset

$$S_{mn} \cdot e^{j\Phi}$$



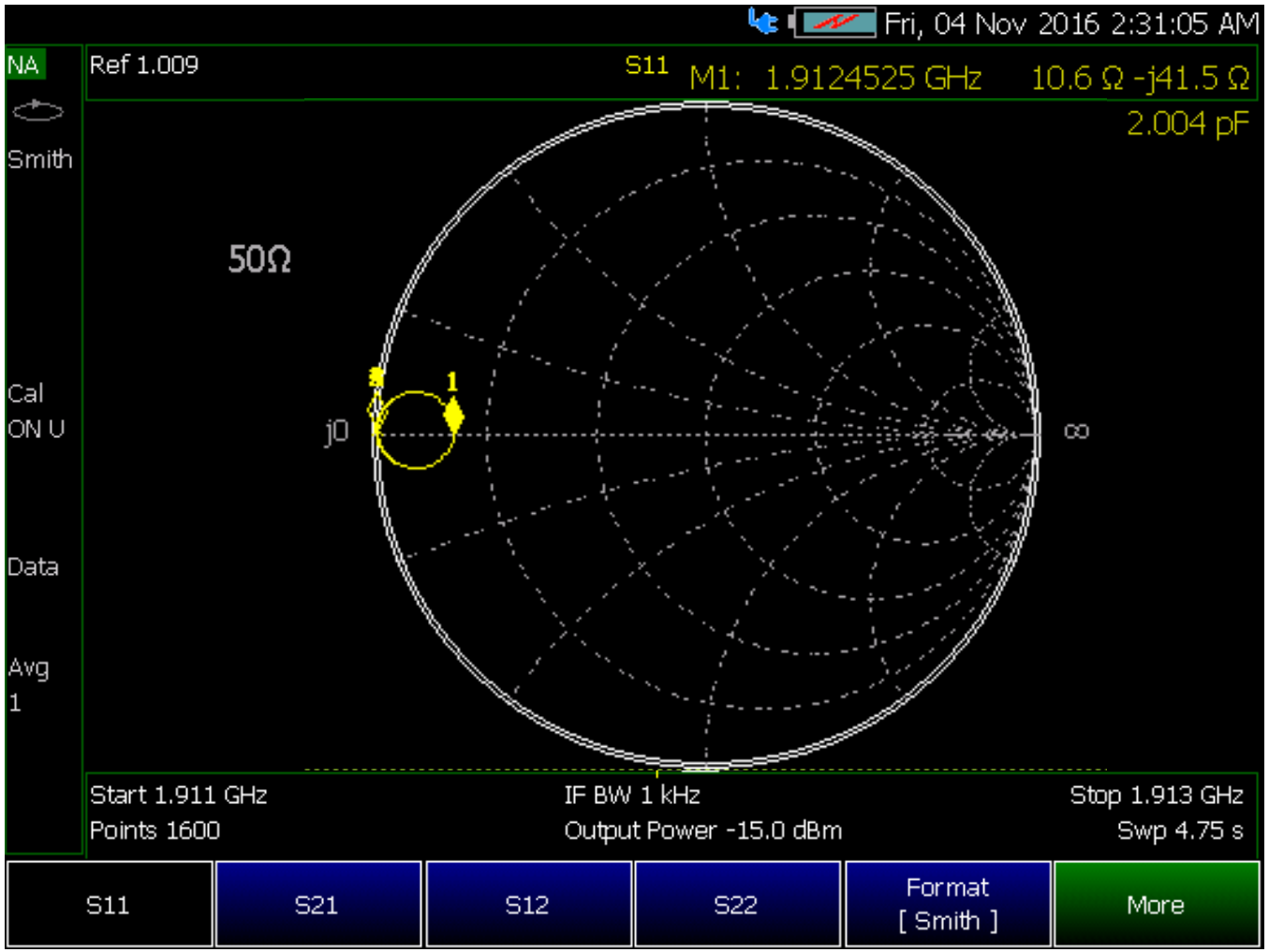
Phase Offset

$$S_{mn} \cdot e^{j\Phi}$$



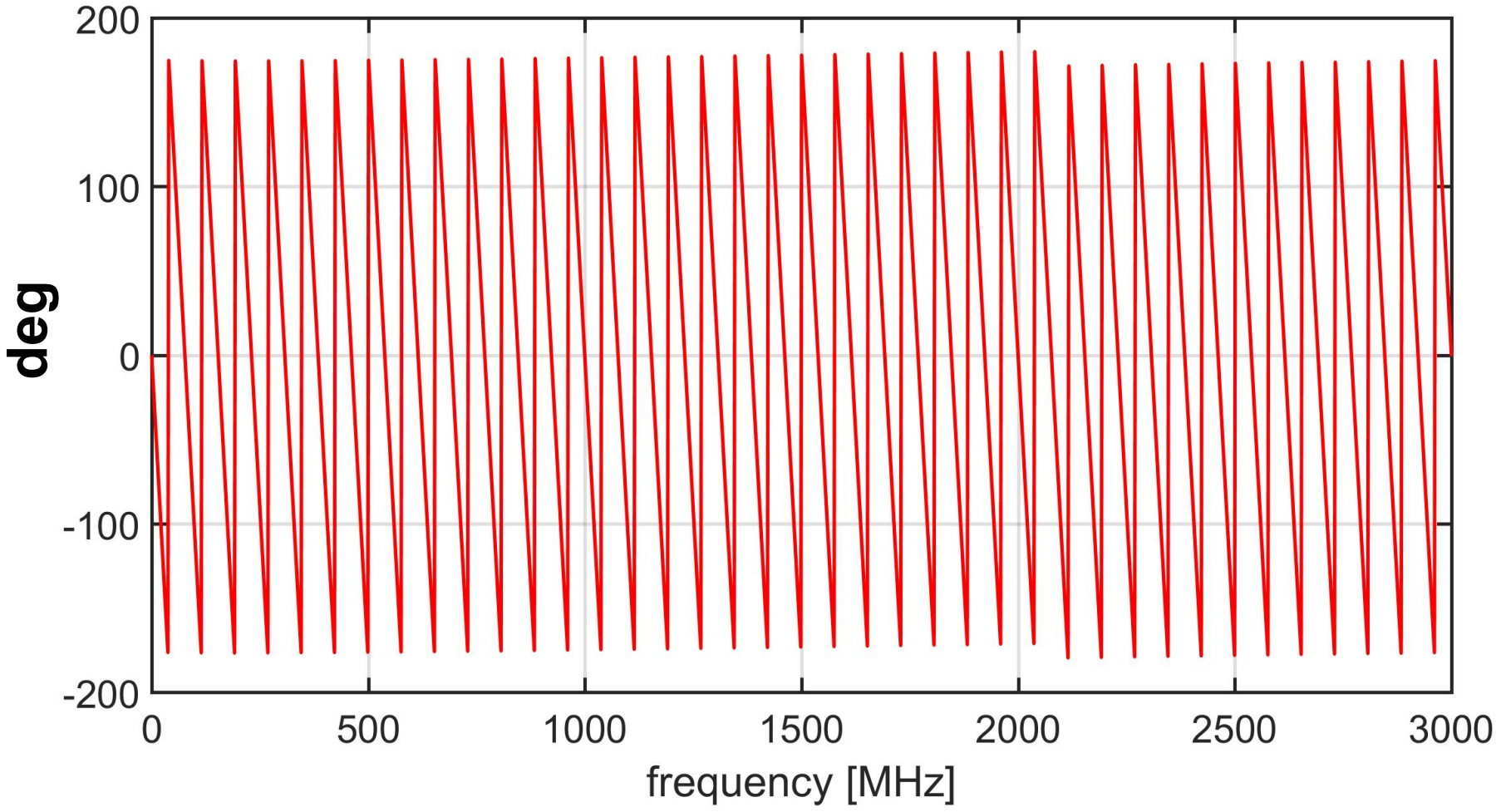
Phase Offset

$$S_{mn} \cdot e^{j\Phi}$$



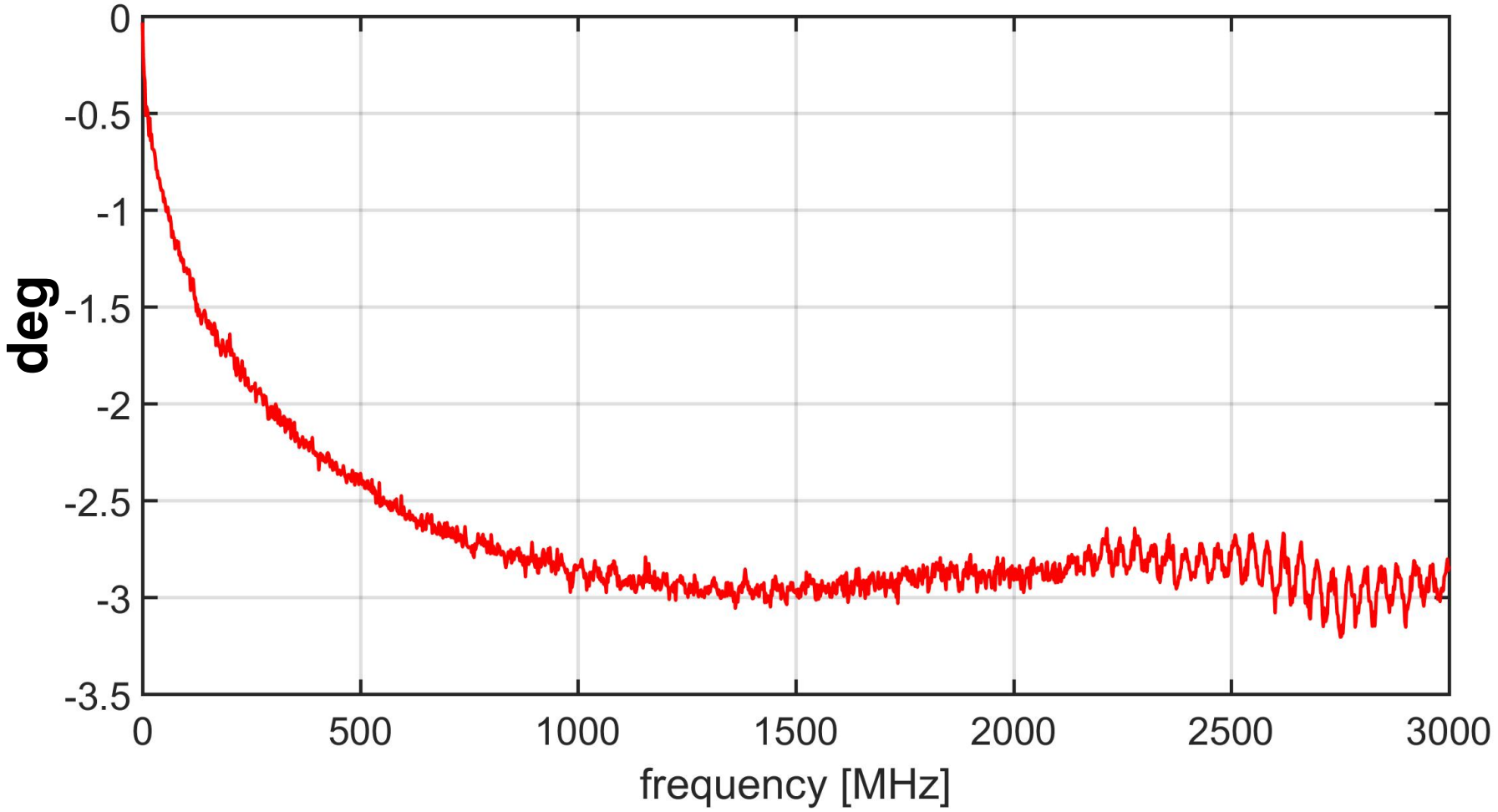
Electrical delay

$$S_{mn} \cdot e^{j\omega\tau}$$

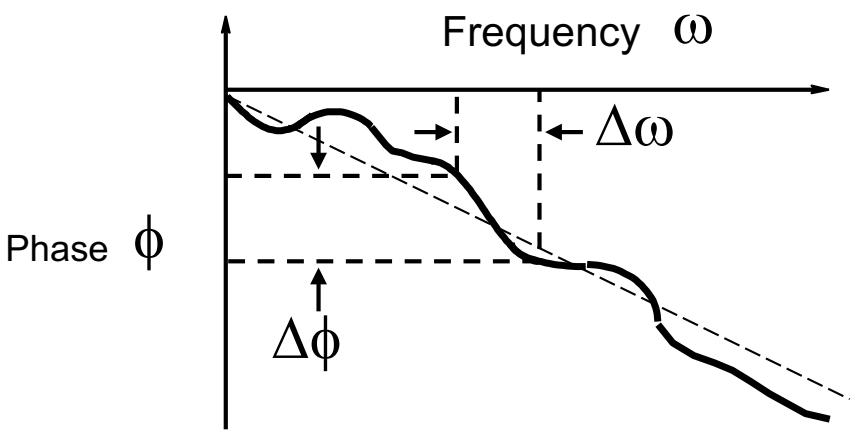


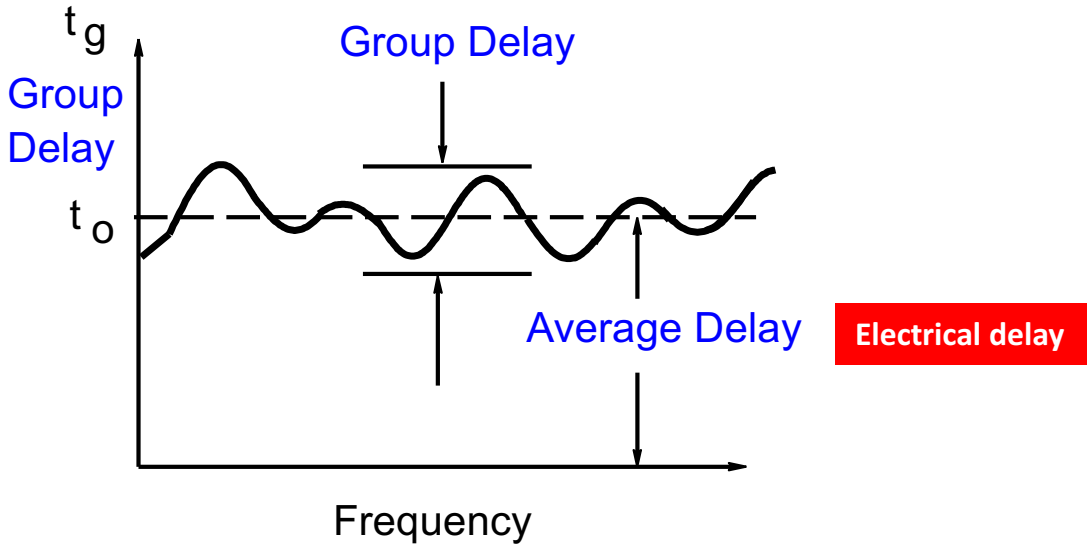
Electrical delay

$$S_{mn} \cdot e^{j\omega\tau}$$



What is group delay?





Electrical delay

$$\text{Group Delay } (t_g) = \frac{-d\,\phi_{rad}}{d\,\omega} = \frac{-1}{360^{o}} * \frac{d\,\phi}{d\,f}$$

ϕ_{rad} in radians

ω in radians/sec

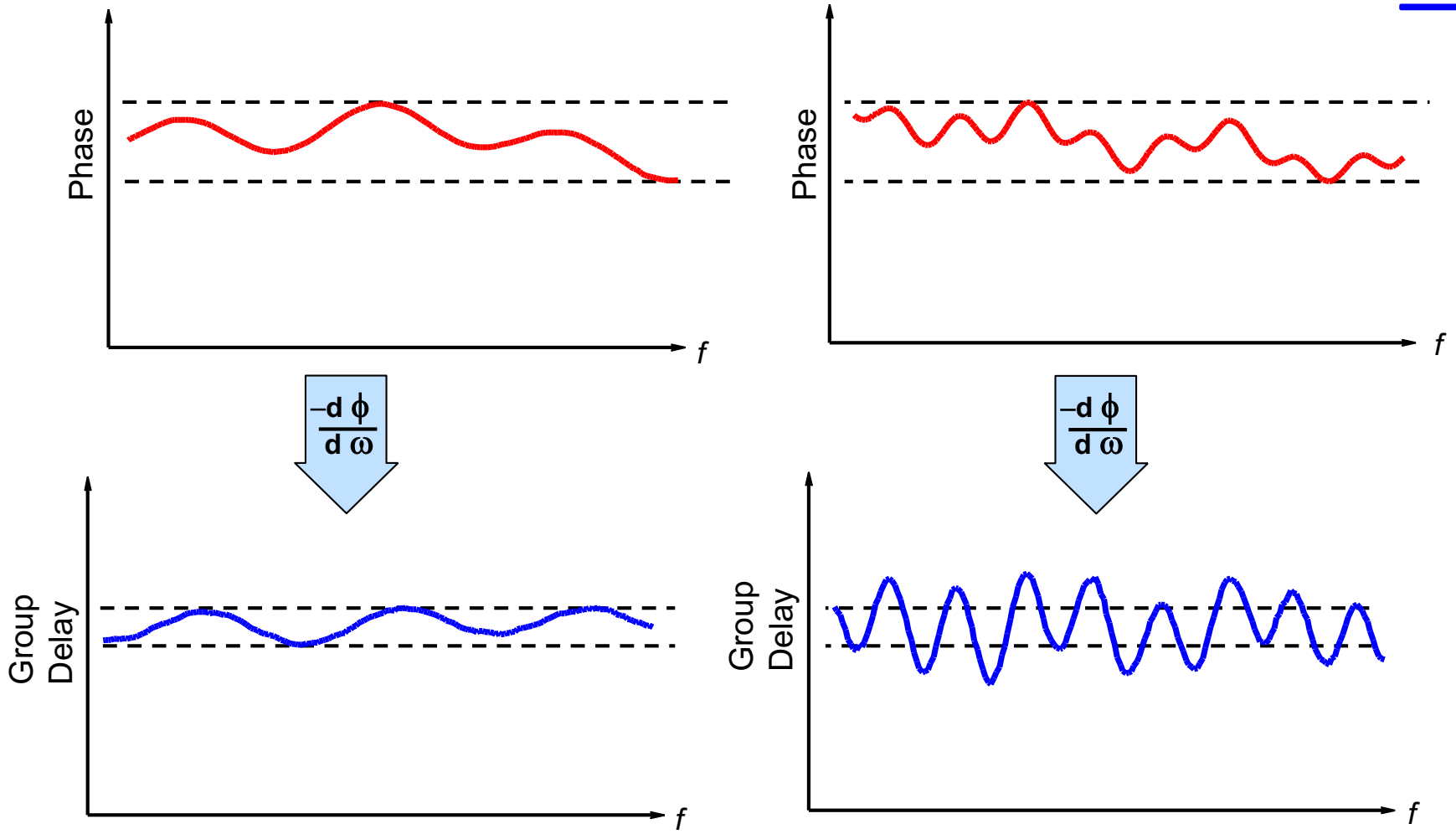
ϕ in degrees

f in Hz ($\omega = 2\pi f$)

Deviation from constant group delay indicates distortion

Average delay indicates transit time

Why measure group delay?



Same p-p phase ripple can result in different group delay