Maximum angular size sensitivity of an interferometer

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Let us assume a circularly symmetric Gaussian source of FWHM θ, i.e. with a brightness distribution

$$\exp\left\{-4\ln 2\left(\frac{x}{\theta}\right)^2\right\}.$$

The normalized source visibility, given by the Fourier Transform of the brightness distribution, is

$$\exp\left\{-\ln 2\left(\frac{u_\lambda}{2\ln 2/\pi\theta}\right)^2\right\},$$

where the projected baseline u_λ is measured in wavelengths. The source visibility goes to half intensity for a projected baseline u_λ^m given by

$$u_\lambda^m\,\theta = 2\ln 2/\pi.$$

This can be considered as the minimum interferometer baseline necessary to be sensitive to a source of angular size θ.

Or, the other way around, if the minimum baseline of an interferometer is u_λ^m, the maximum angular size to which the interferometer is sensitive is given by θ. In practical units,

$$\left[\frac{u_\lambda^m}{\mathrm{k}\lambda}\right]\left[\frac{\theta}{\mathrm{arcsec}}\right] = 91.0.$$