Nelle slide del corso:

Il risultato della cross-correlazione dei segnali di due antenne i e j

$$V^{ij}(\tau_g) = (V^i V^j) = lim_{T\to\infty} \int_{-T/2}^{T/2} V^i(t) V^{j*}(t+\tau_g) dt$$

In the (2-D) uv-plane each visibility samples the FT of the (2-D) B(θ,ϕ)

Un teorema dimostra che la funzione di cross correlazione e la distribuzione di brillanza in cielo sono l'una la trasformata di Fourier dell'altra:

(van Cittert-Zernike theorem)

Fourier space/domain

$$V(u,v) = \int\int T(x,y) e^{2\pi i(ux+vy)} dxdy$$

$$T(x,y) = \int\int V(u,v) e^{-2\pi i(ux+vy)} dudv$$

Image space/domain

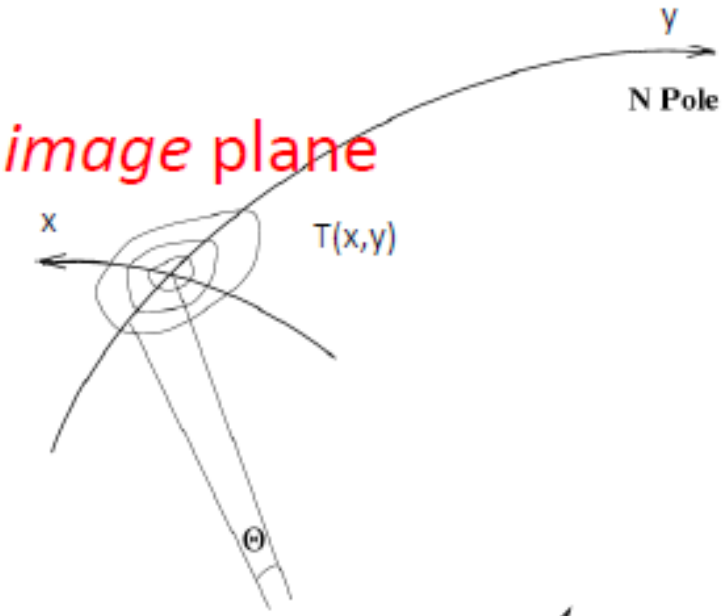
(van Cittert-Zernike theorem)

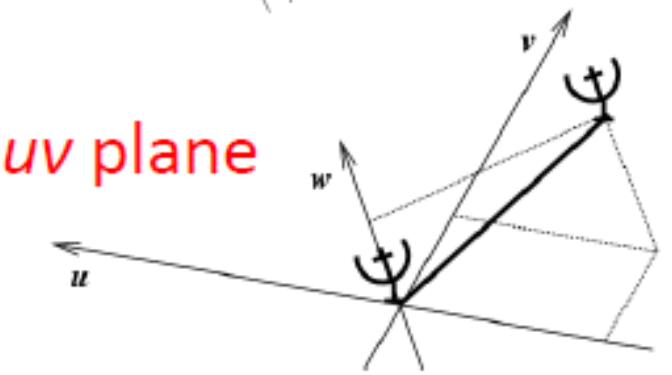
Fourier space/domain

$$V(u,v) = \int\int T(x,y) e^{2\pi i(ux+vy)} dxdy$$

$$T(x,y) = \int\int V(u,v) e^{-2\pi i(ux+vy)} dudv$$

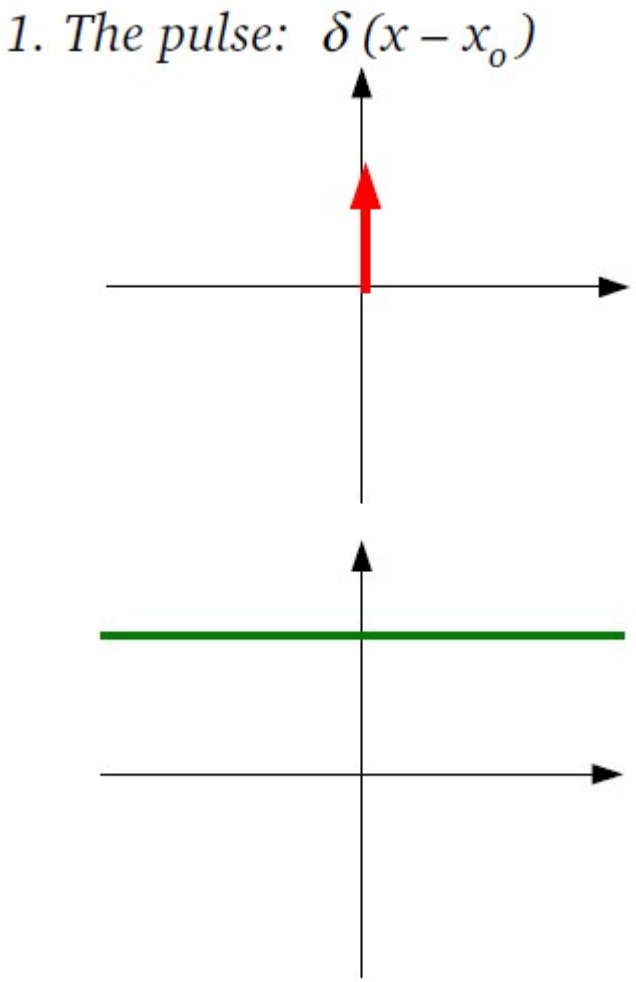
Image space/domain

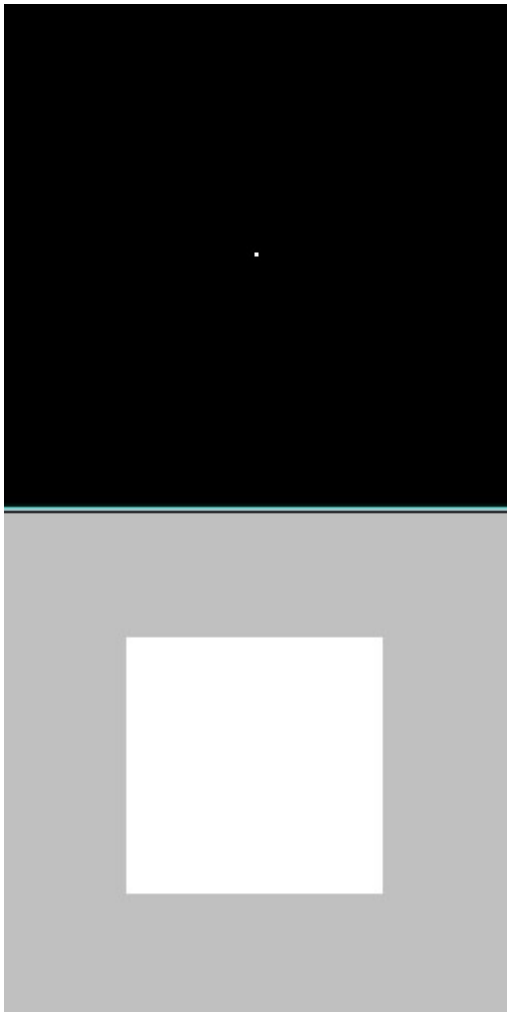




Il piano uv e' ortogonale alla linea di vista e contiene le visibilita' ottenute da ciascuna baseline. Fissata una posizione dell'array come riferimento, ogni punto identifica univocamente una baseline

Trasformata di Fourier
di una delta di Dirac



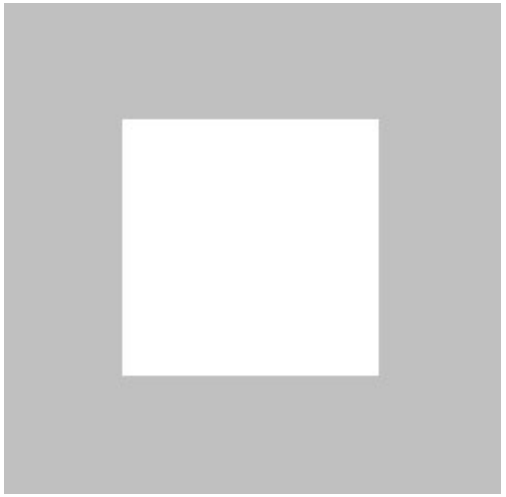


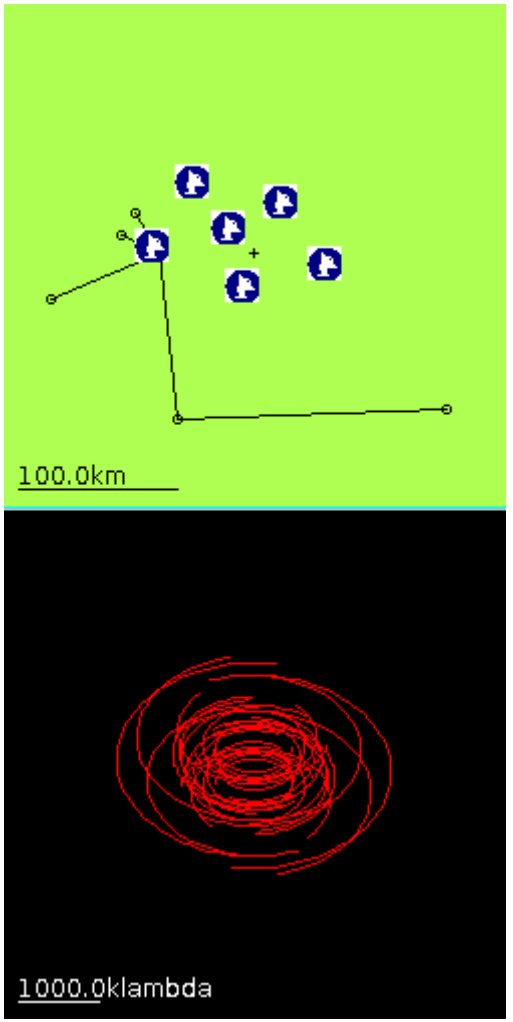
Sorgente puntiforme
nel piano del cielo

Piano uv ideale

http://www.narrabri.atnf.csiro.au/astronomy/vri.html

Piano uv ideale





Piano uv campionato durante l' osservazione

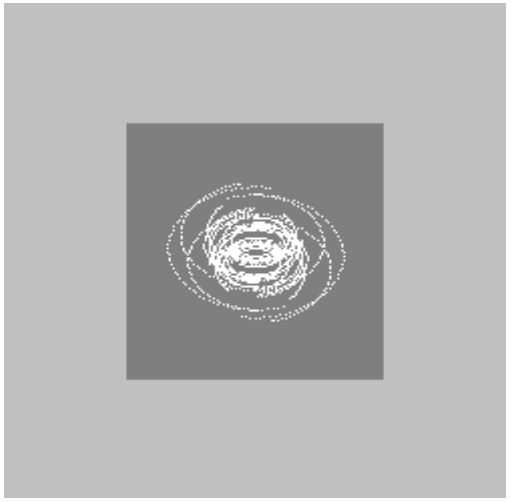
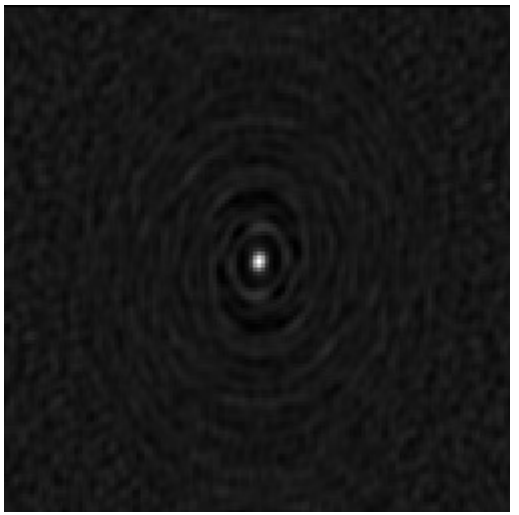
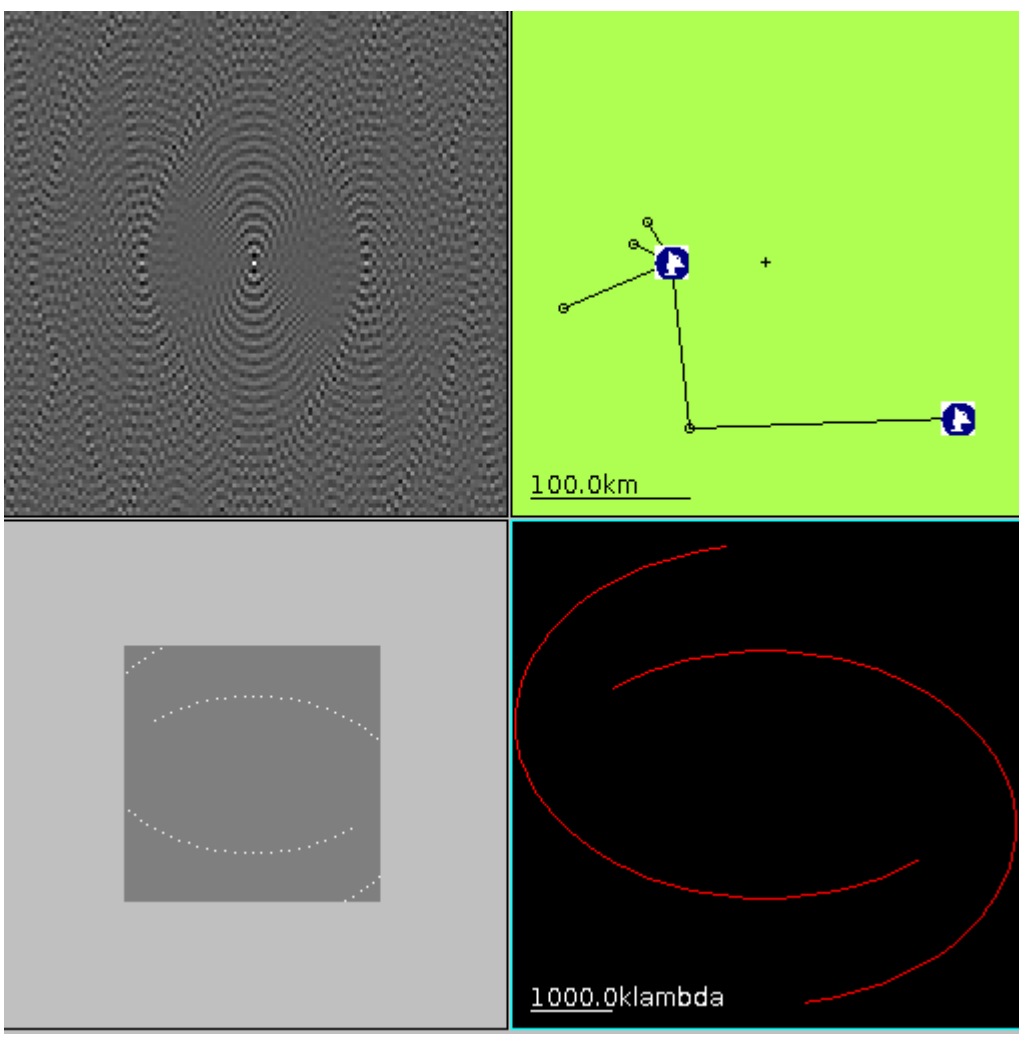
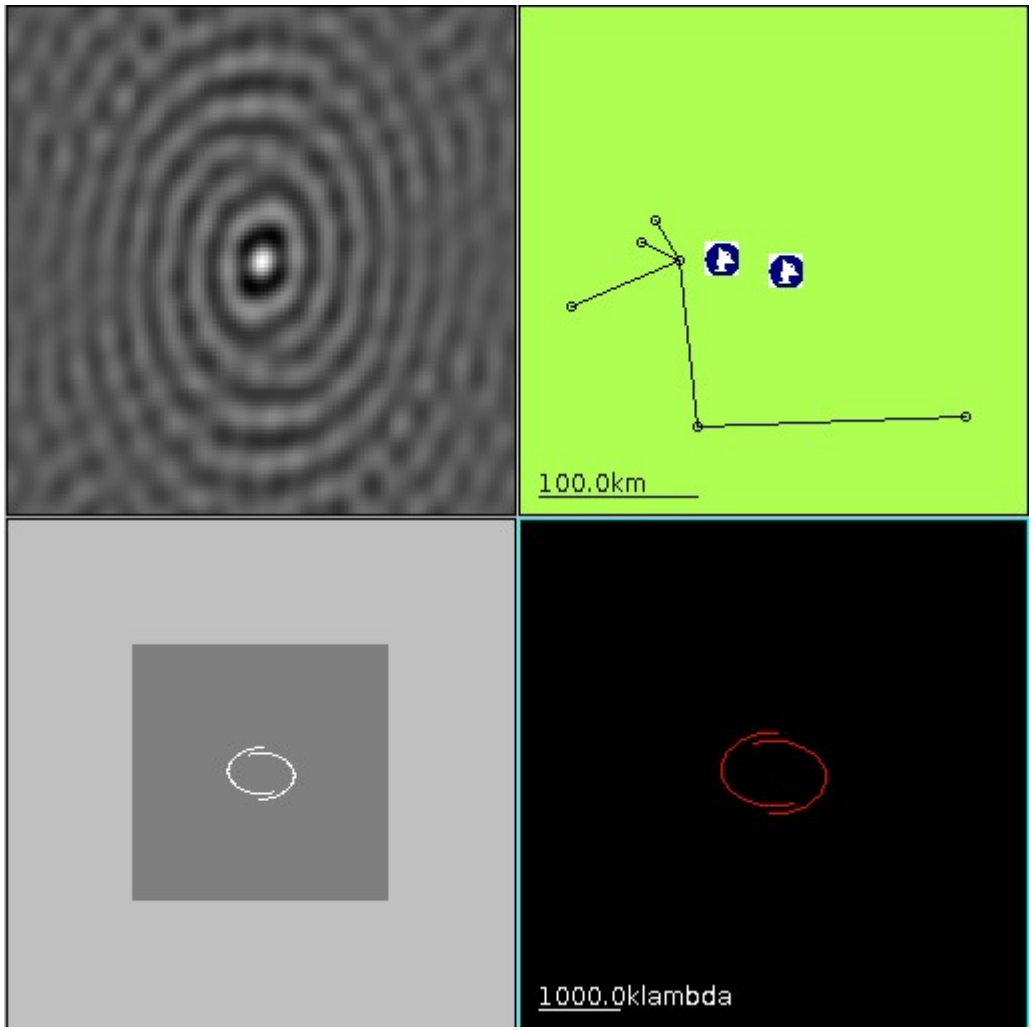


Immagine ottenuta facendo l'antitrasformata di Fourier di V(u,v)



Una sorgente puntiforme vista da
1 singola baseline (8h di osservazione)

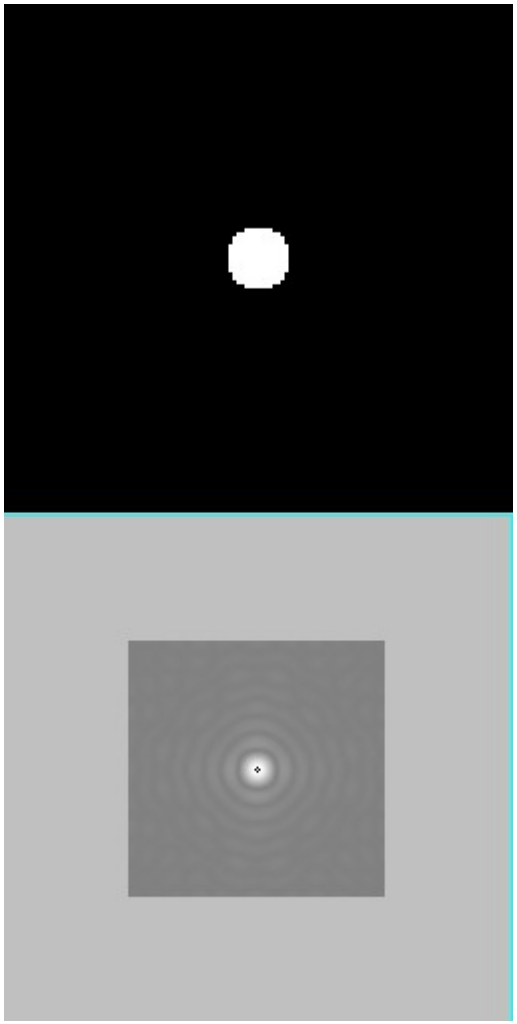


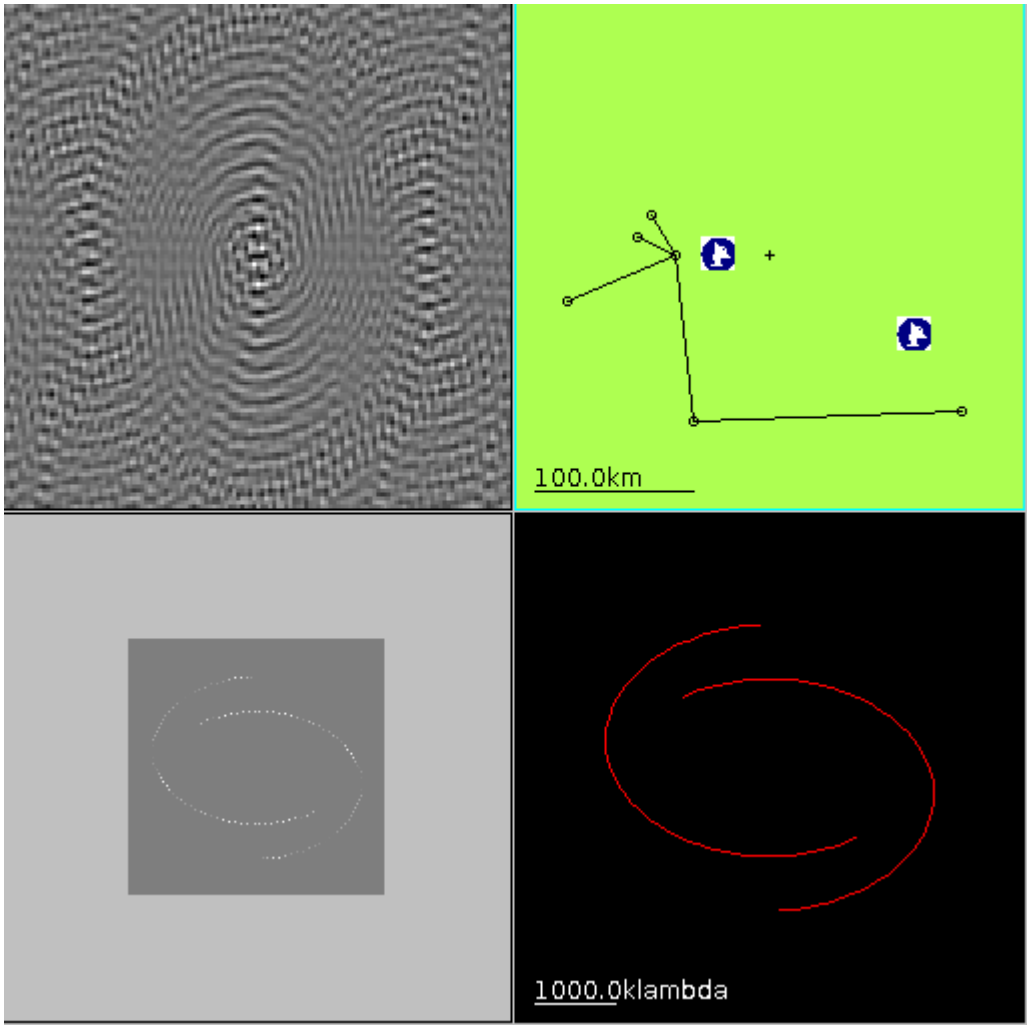


Baseline lunga

baseline corta

Un disco uniforme

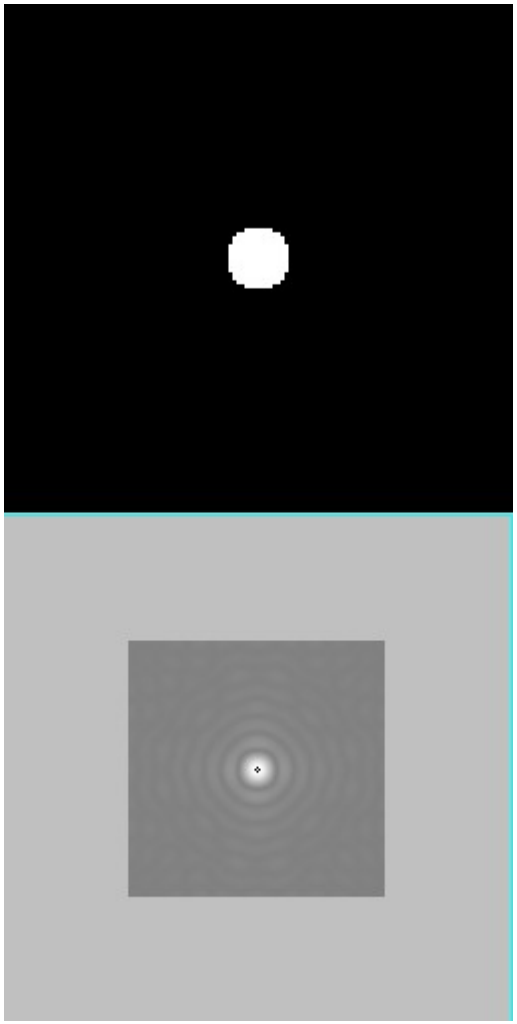


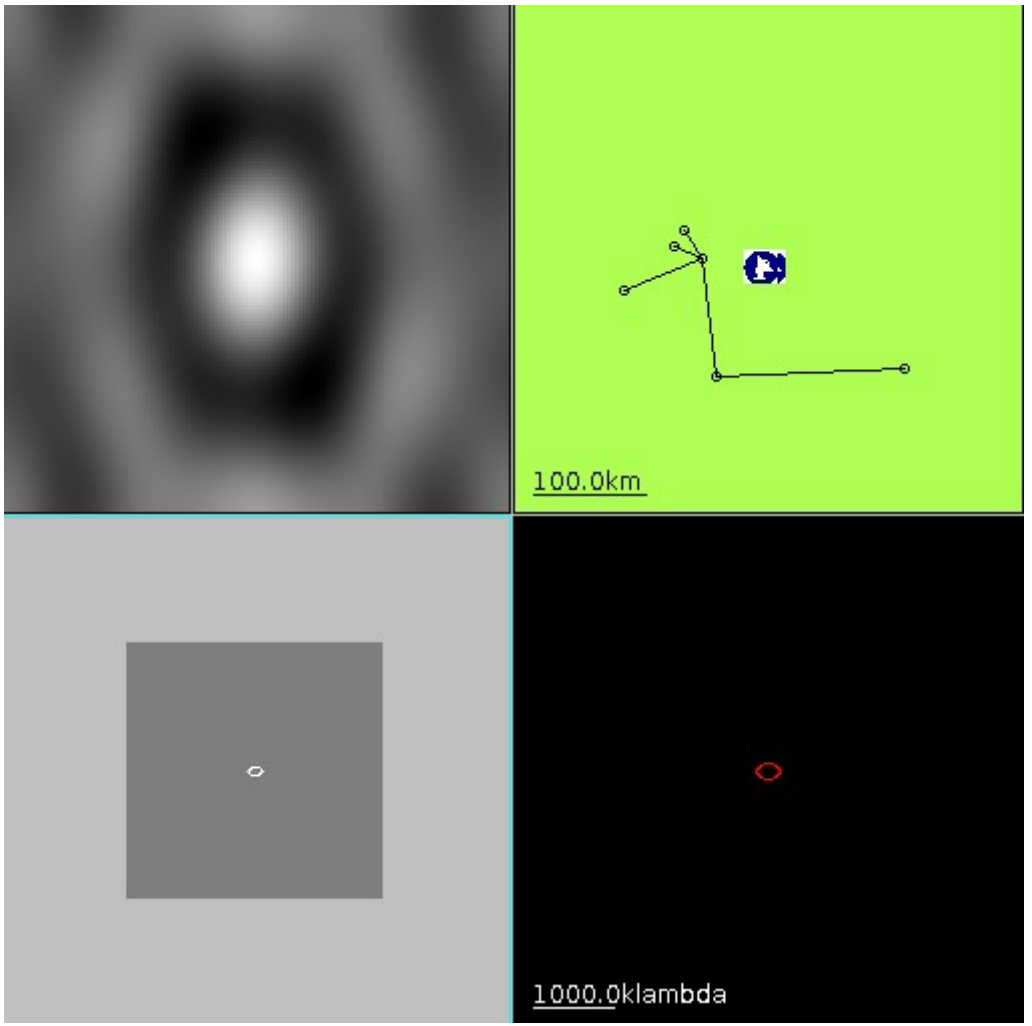


Baseline lunga

L'emissione e' completamente filtrata via.

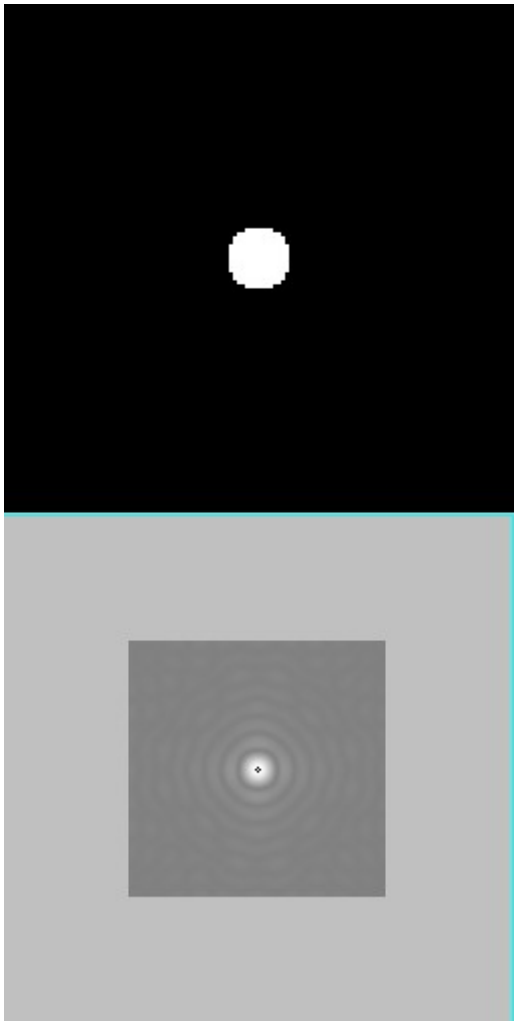
Un disco uniforme

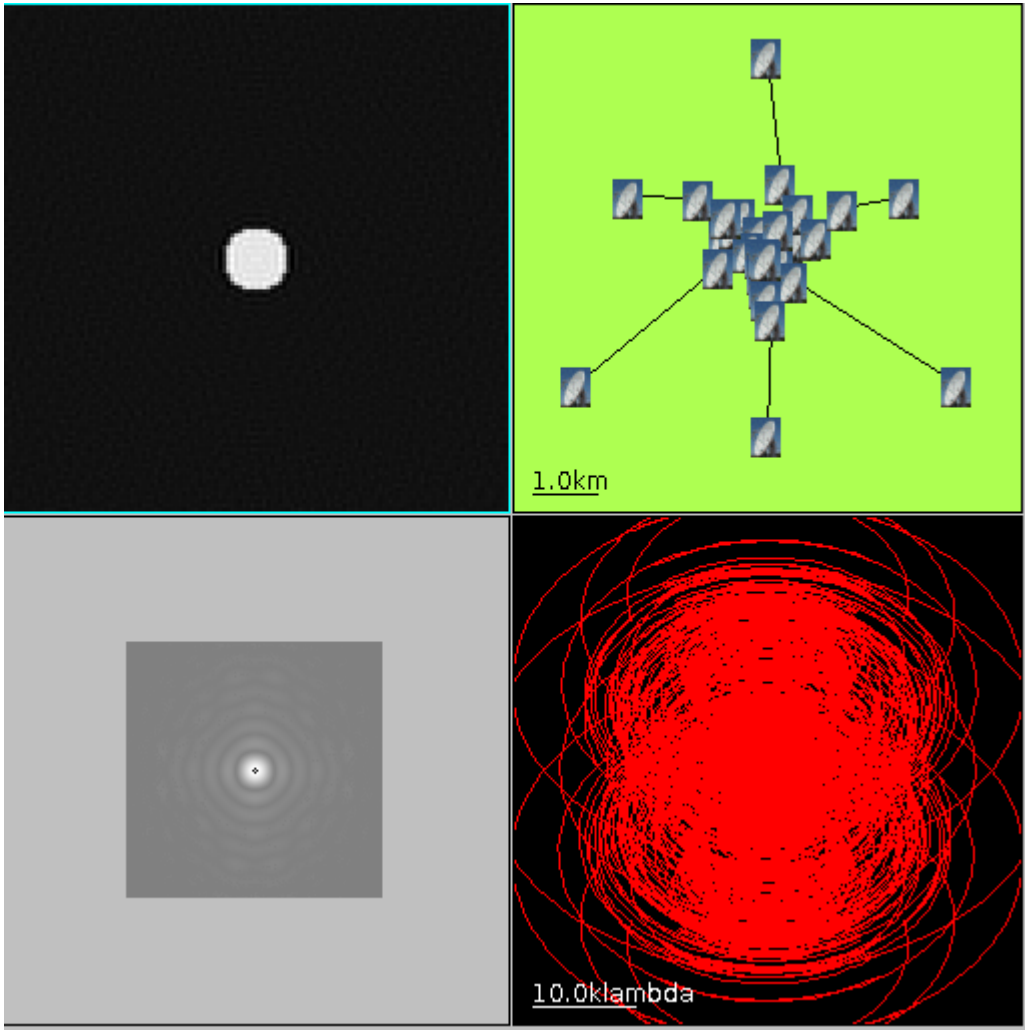




Baseline corta

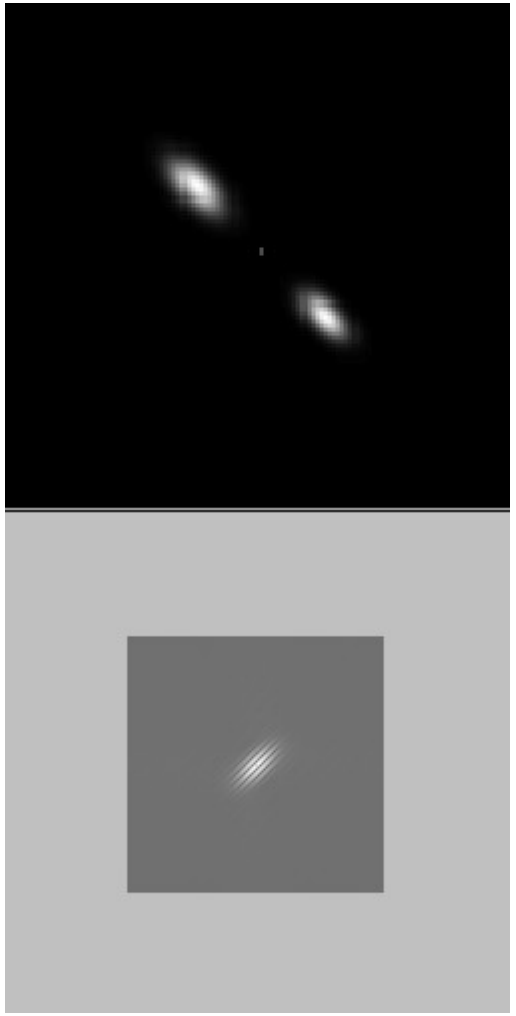
Un disco uniforme

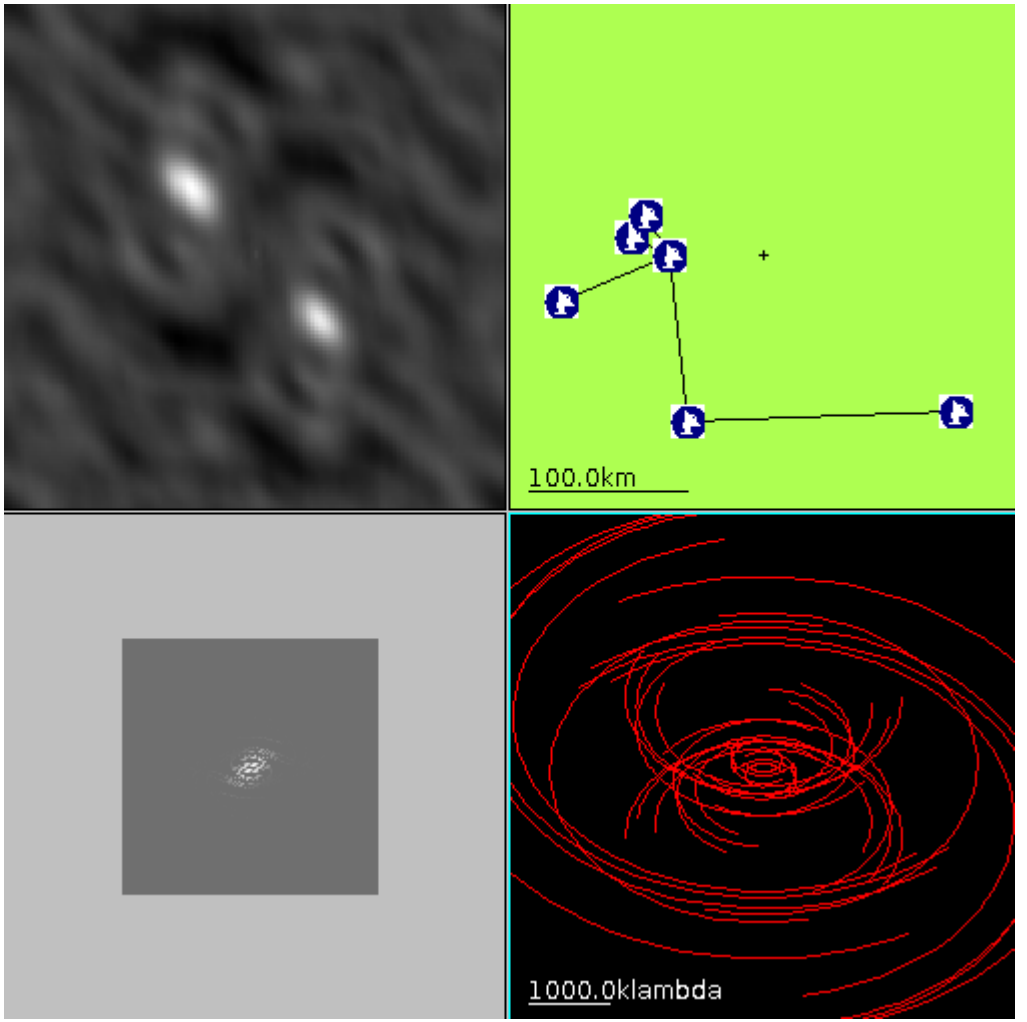




36 antenne campionano quasi uniformemente il piano uv e l'immagine prodotta e' quasi perfetta

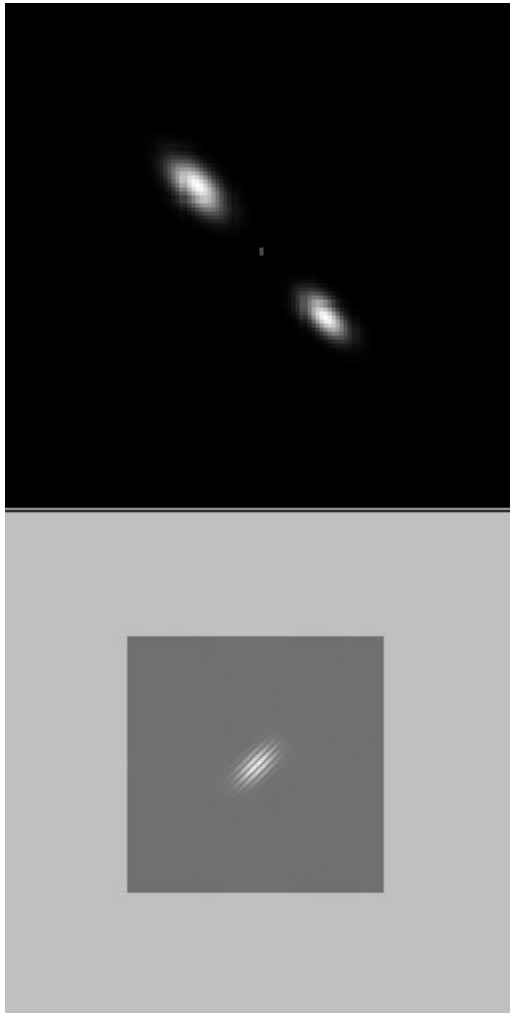
Una radiosorgente

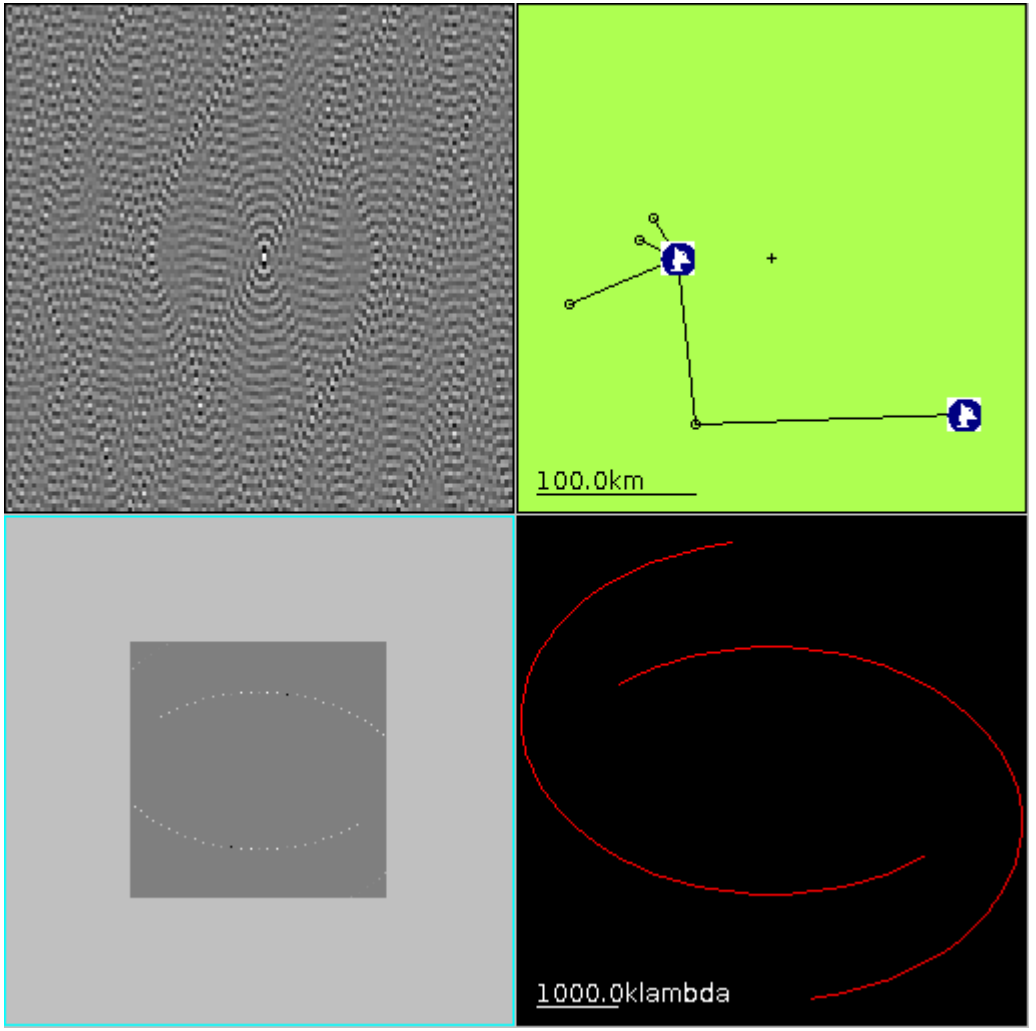




6 antenne (MERLIN) osservazione di 8 h

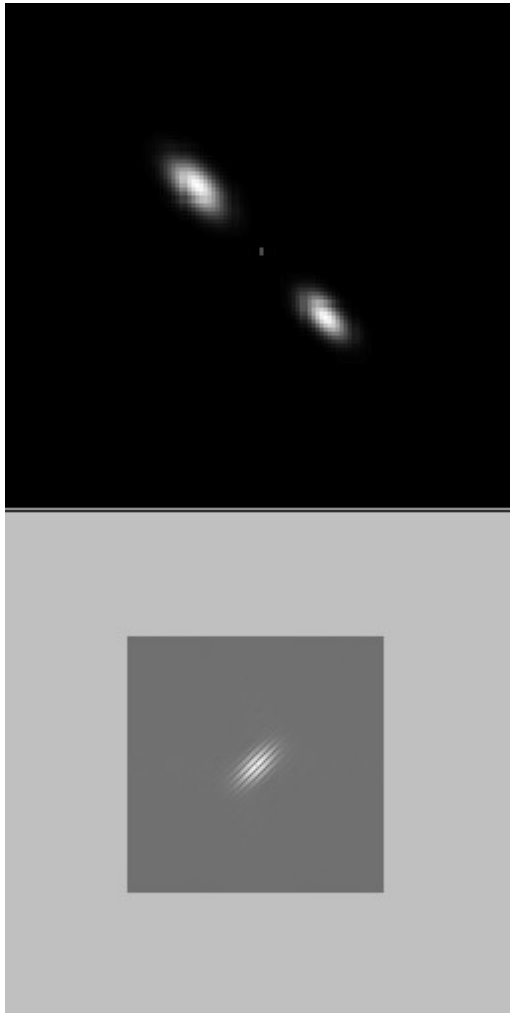
Una radiosorgente

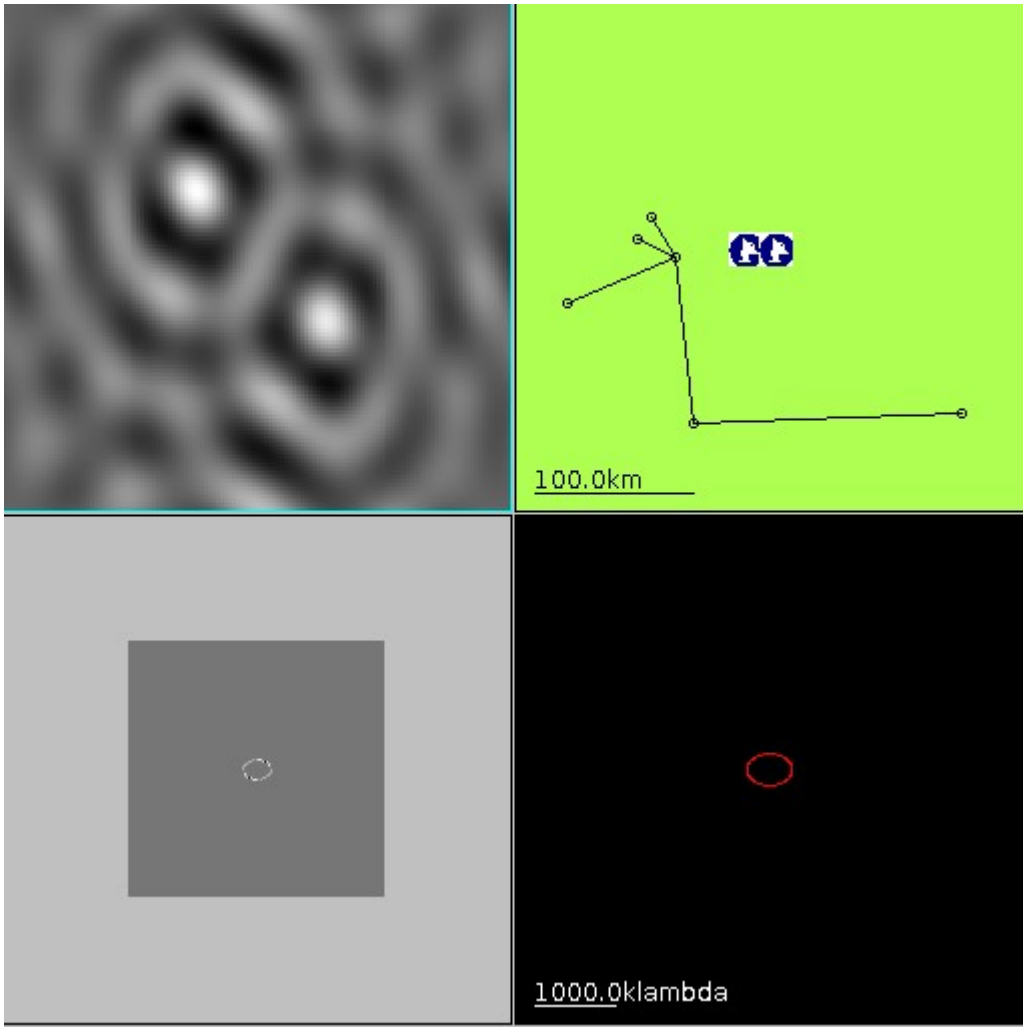




2 antenne distanti

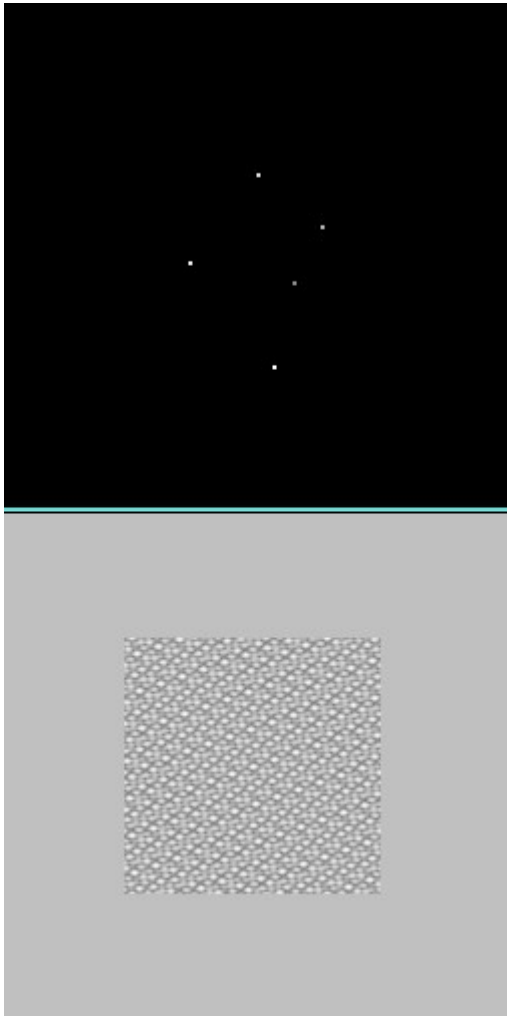
Una radiosorgente

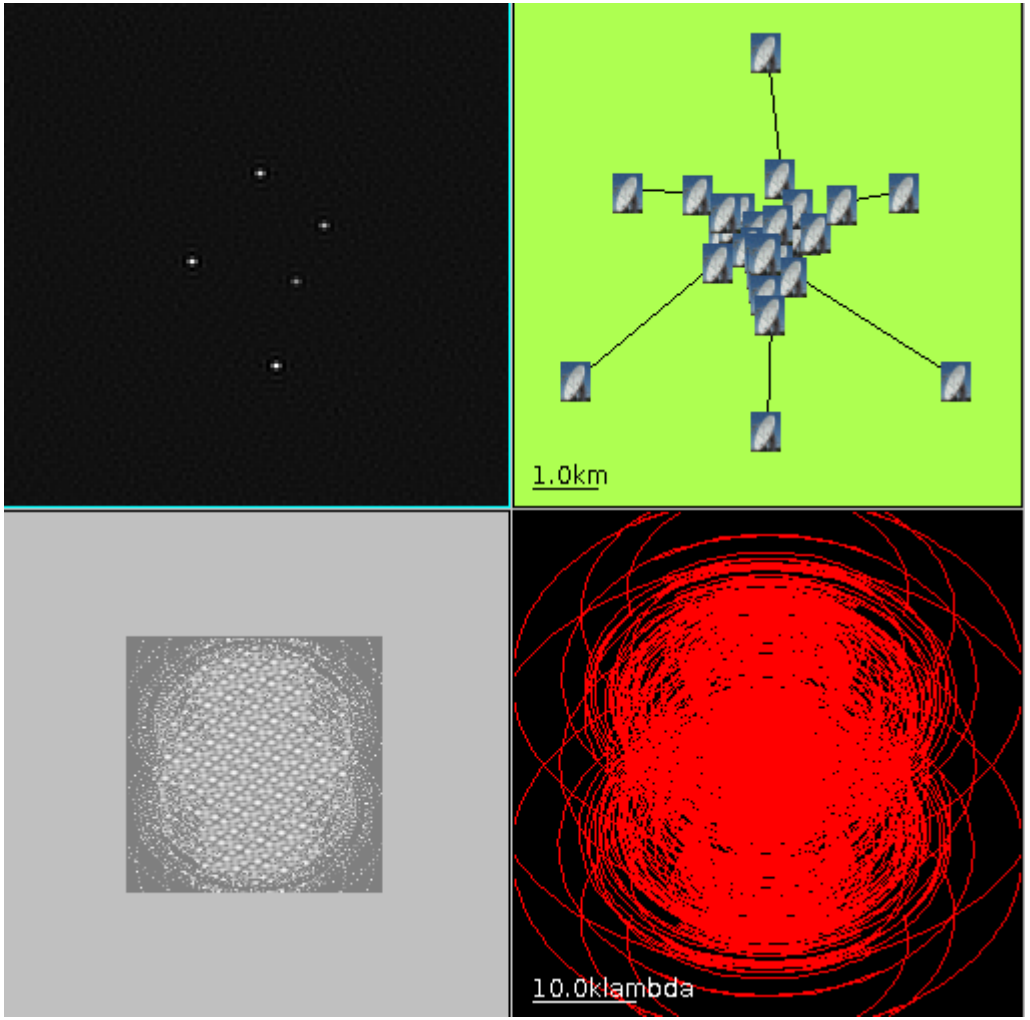




2 antenne vicine

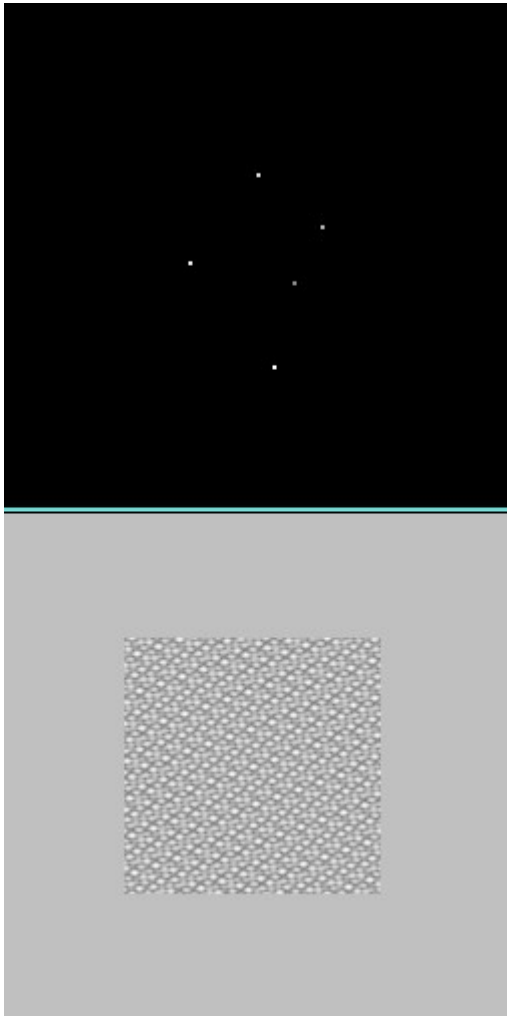
Croce del sud

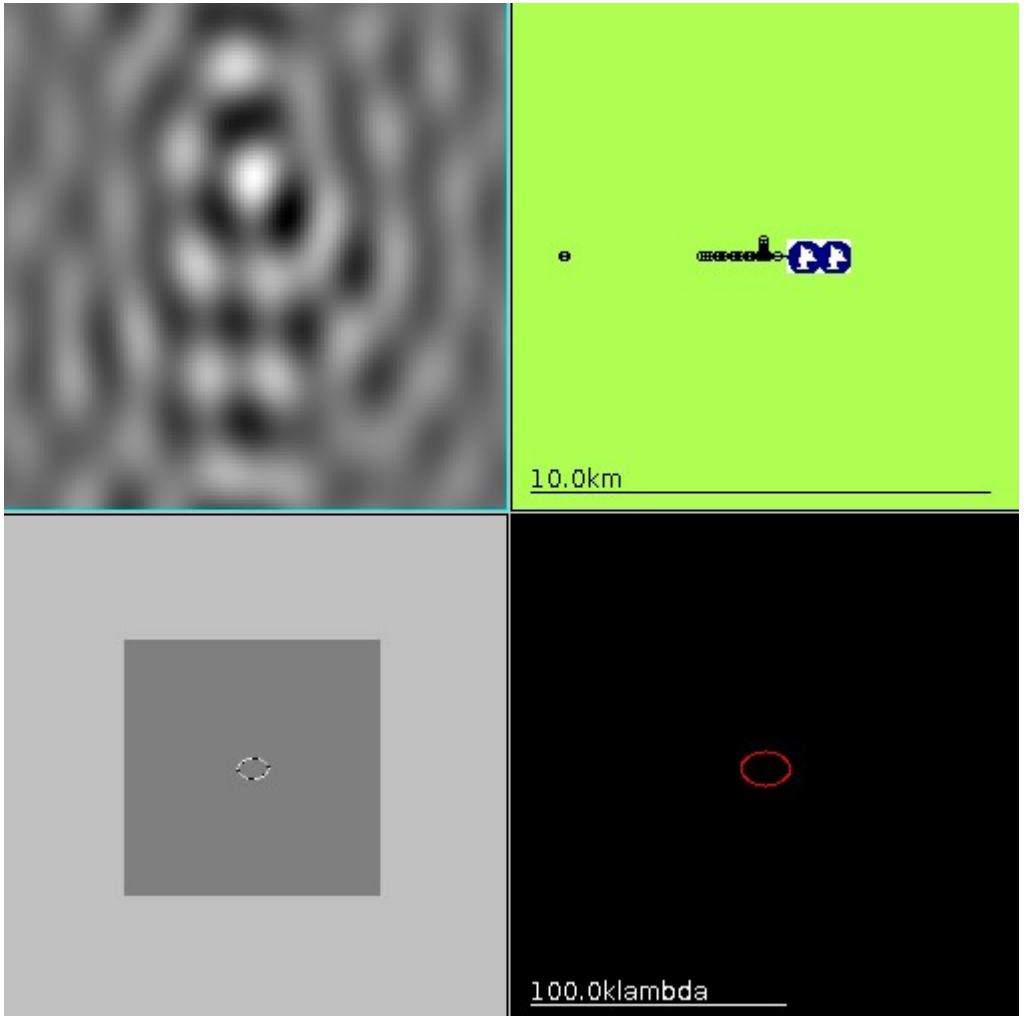




ASKAP (36 antenne)

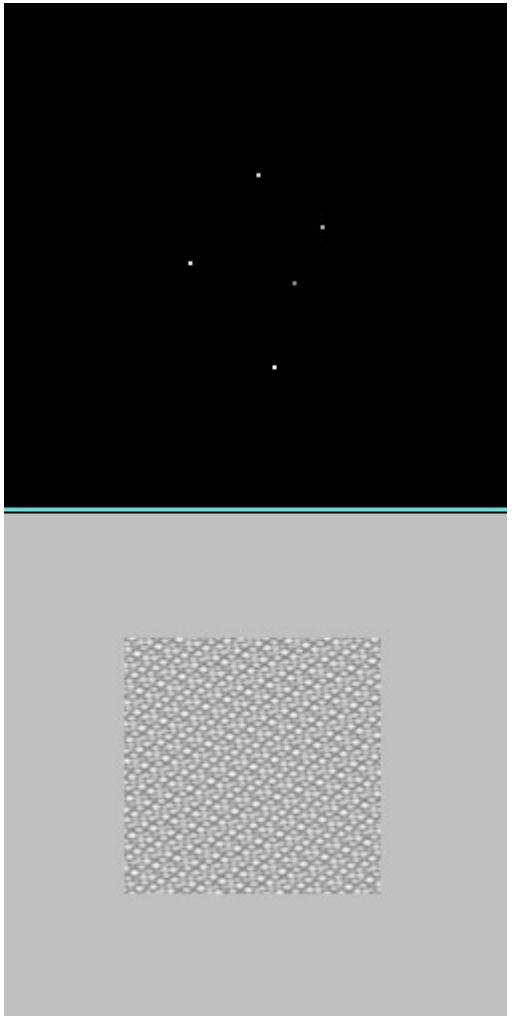
Croce del sud

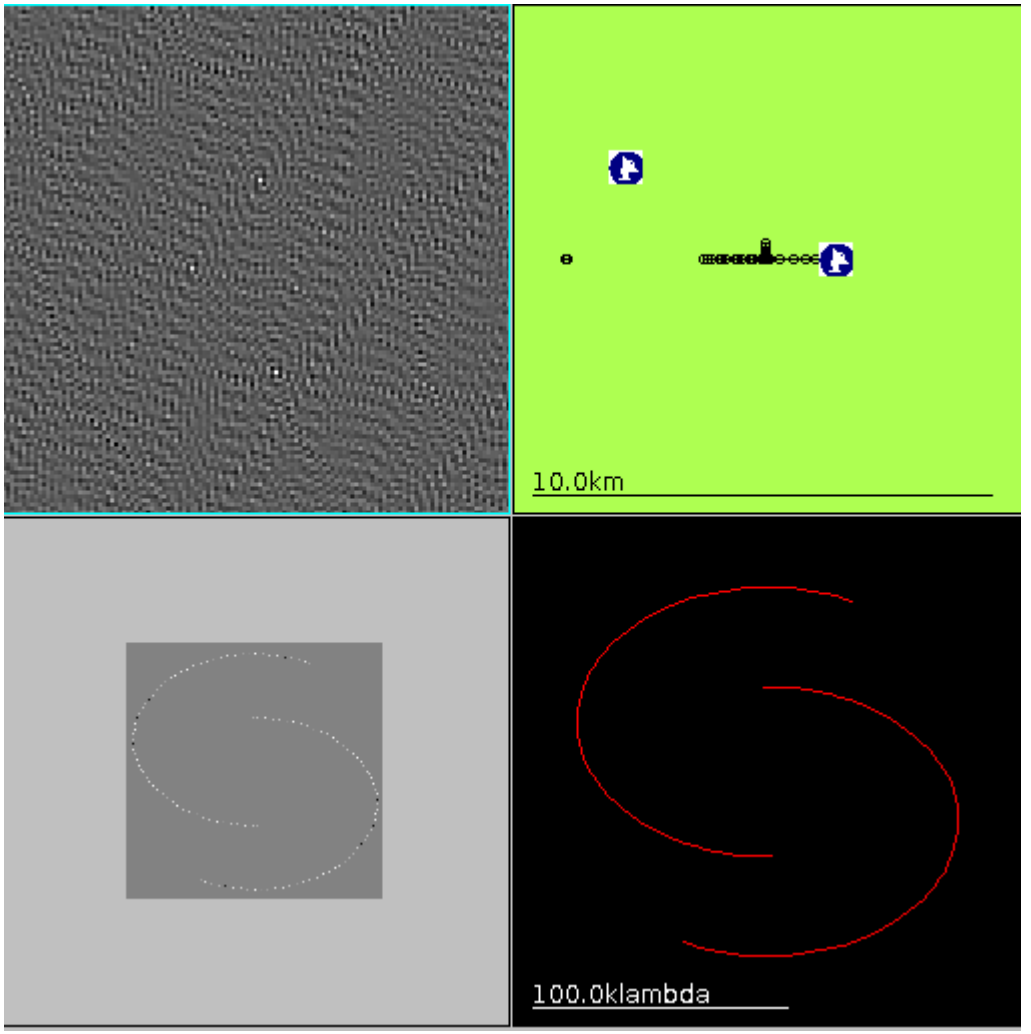




2 antenne vicine

Croce del sud





2 antenne lontane