

# Tianlai 16 dish array configuration

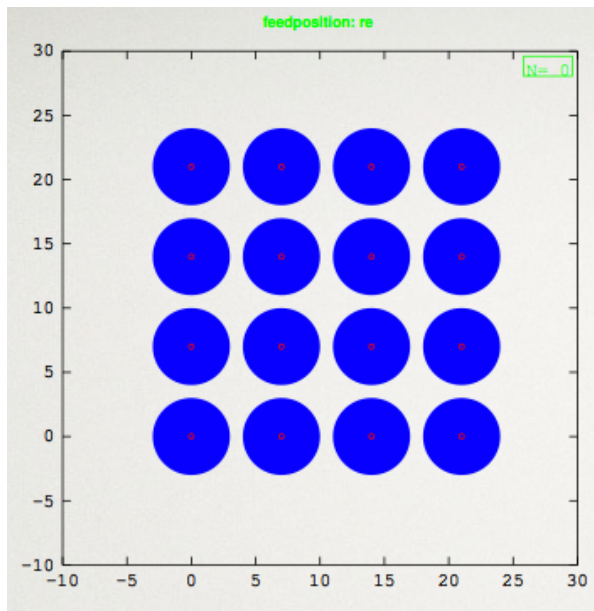
Jiao Zhang

2015.03.12

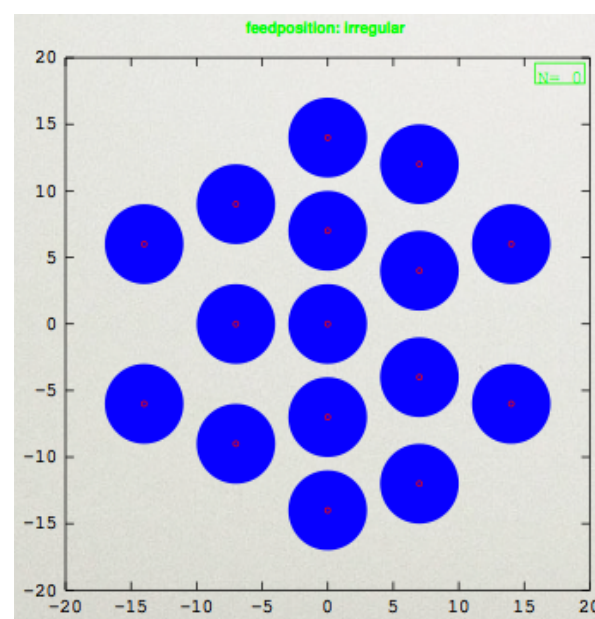
- Comparison of several configurations for Tianlai 16 dish array.
- Blocking factors as functions of dish space and zenith angle
- Computation Synthesized beams from visibilities
- Error covariance matrix

# configurations

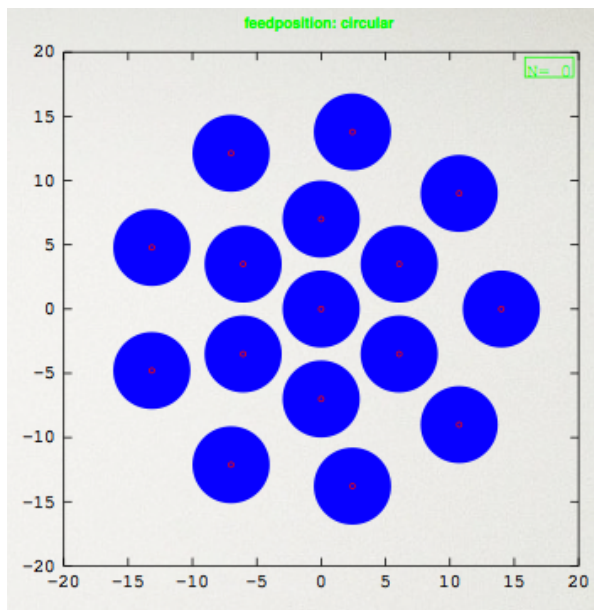
- $D = 6\text{m}$  dishes,  $D_{\text{eff}} = 5\text{m}$
- (a) regular array,  $N_{\text{b}} = 25$  baselines
- (b) irregular array,  $N_{\text{b}} = 81$  baselines
- (c) circular 1+6+9,  $N_{\text{b}} = 110$  baselines
- 5 scan:  $\text{delta} = \{0, \pm 1.5\text{deg}, \pm 3\text{deg}\}$



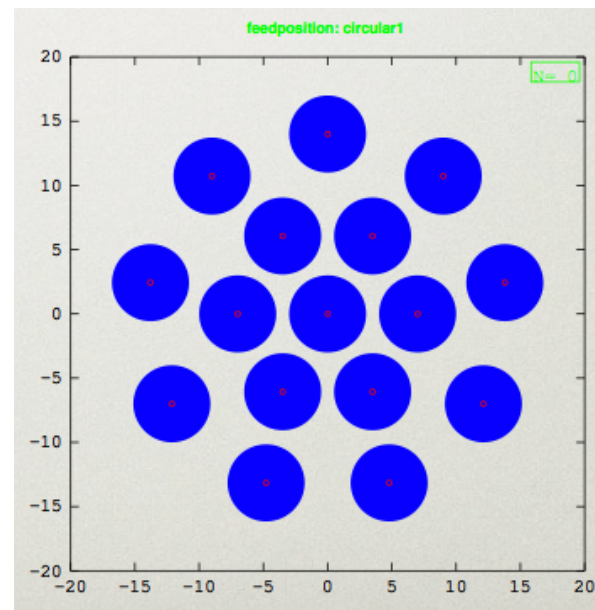
(a) regular



(b) irregular



(c) circular



(d) circular-rotated

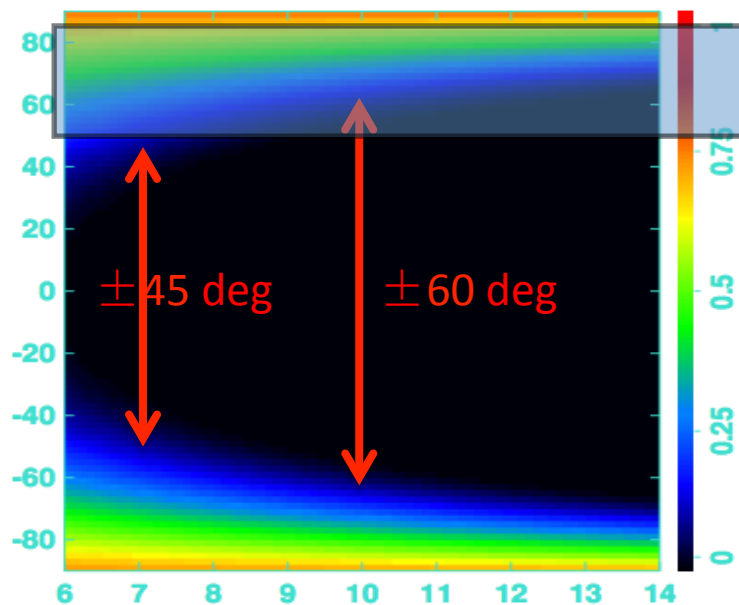
**Question : which configuration is optimalizing?**

- Parameter :  
dish size = 6m;  
dish distance?

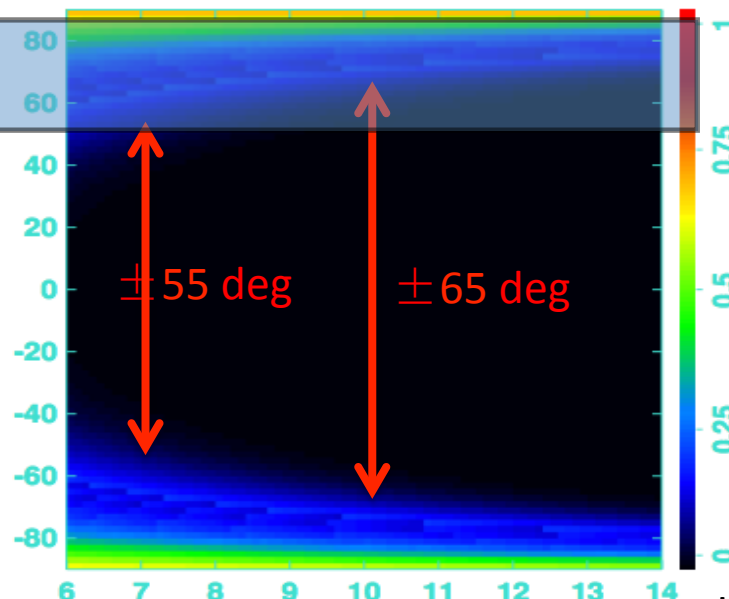
# Blocking factors

X : distance  
(meter)  
Y : zenith angle

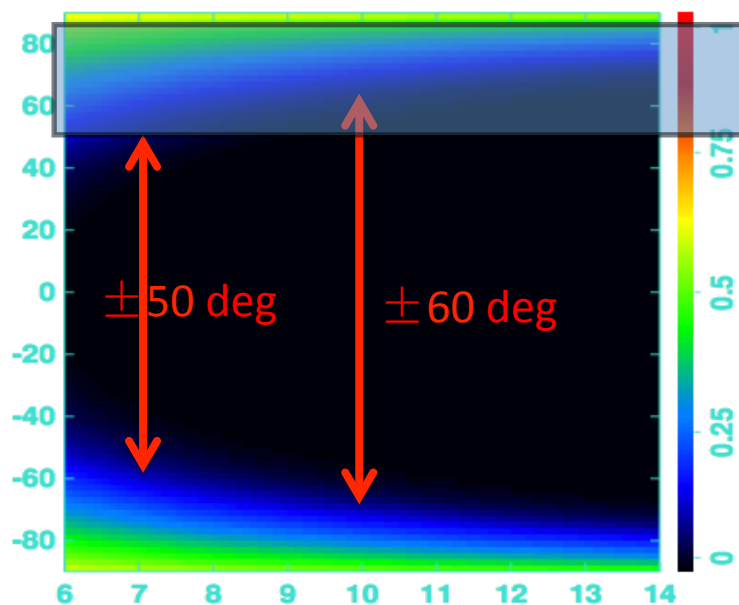
a: 16 dishes regular case



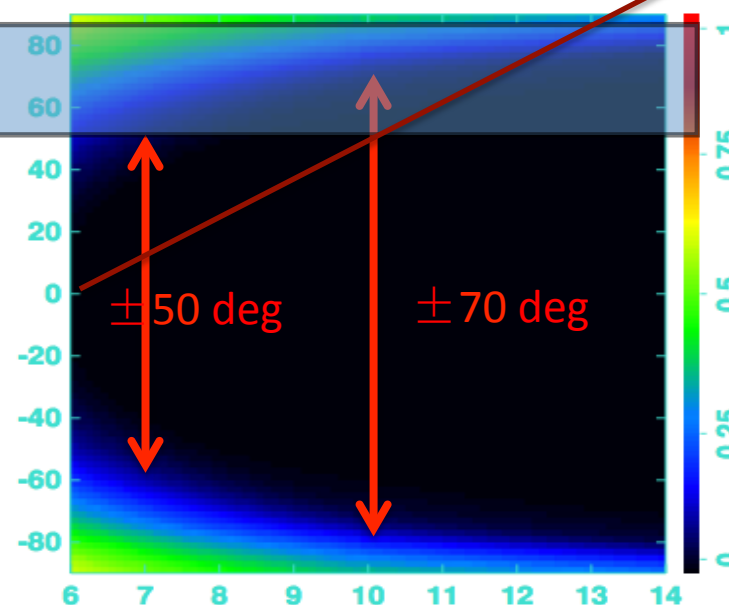
b: 16 dishes Irregular case



c: 16 dishes circle case



d: 16 dishes circle\_rotated case

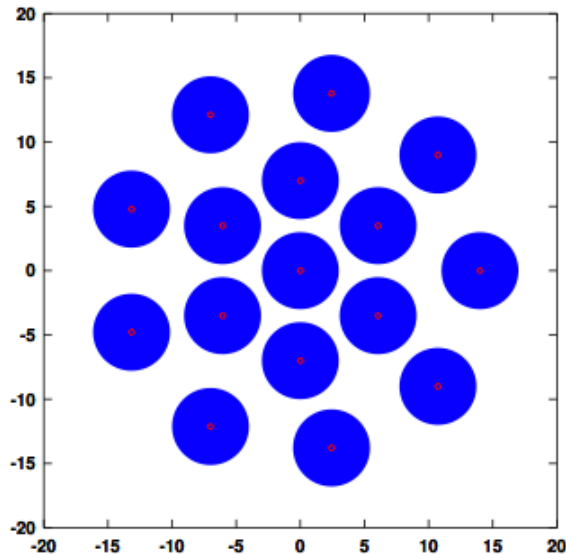


Latitude ~ 45 deg

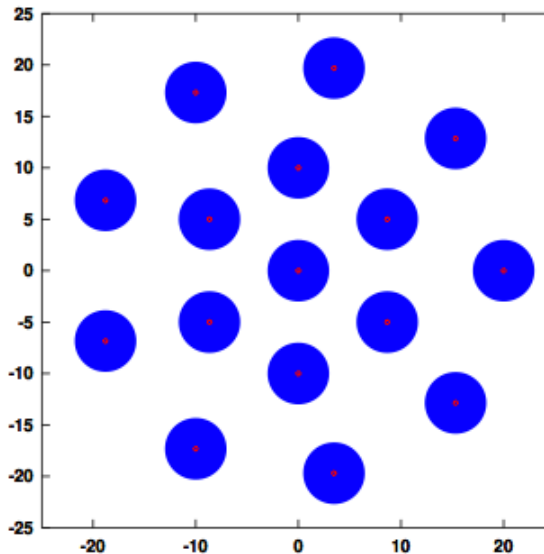
# Beam shapes

- Compute the reconstructed from the visibilities (without noise) for an input map with point sources at center
- Frequency 1200MHz

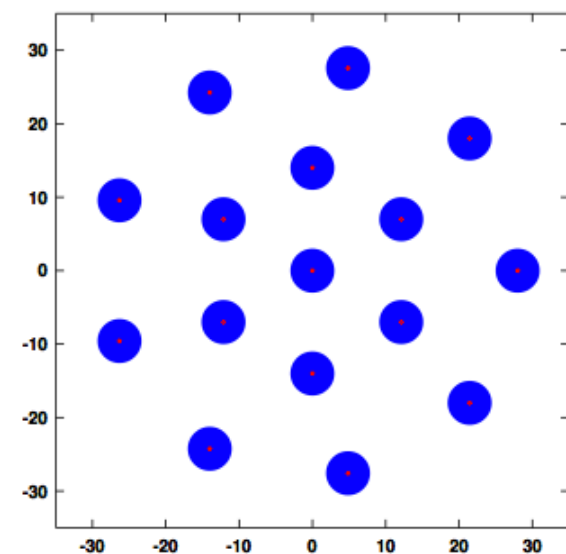
circular d\_sep = 7m

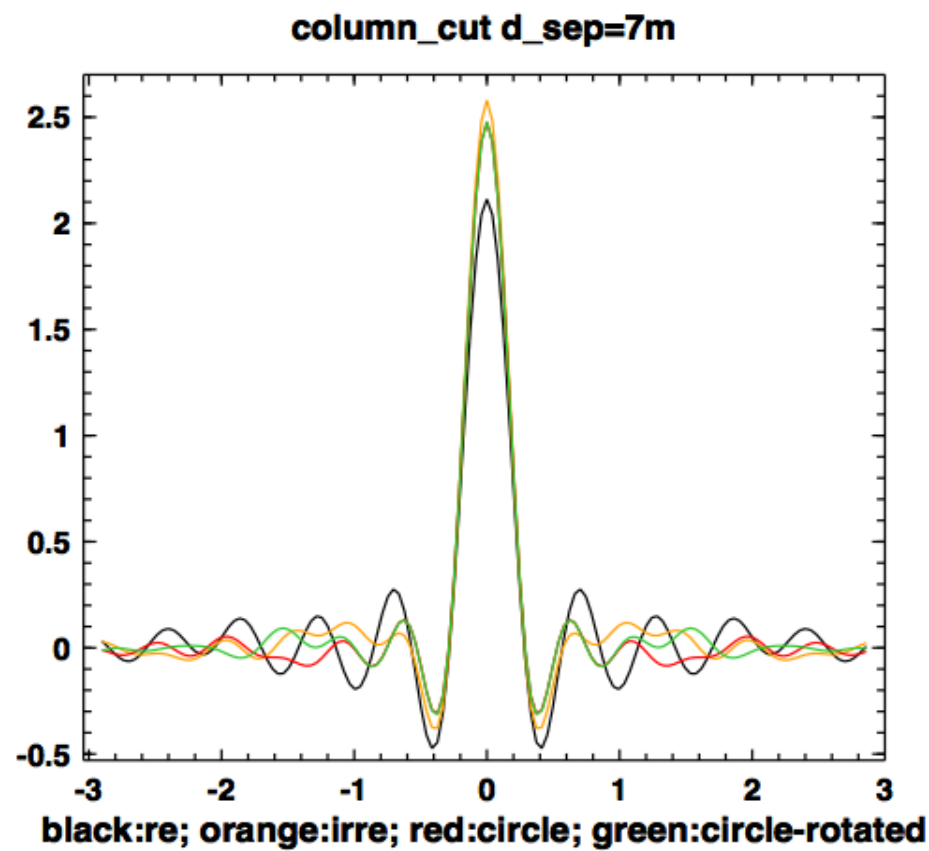
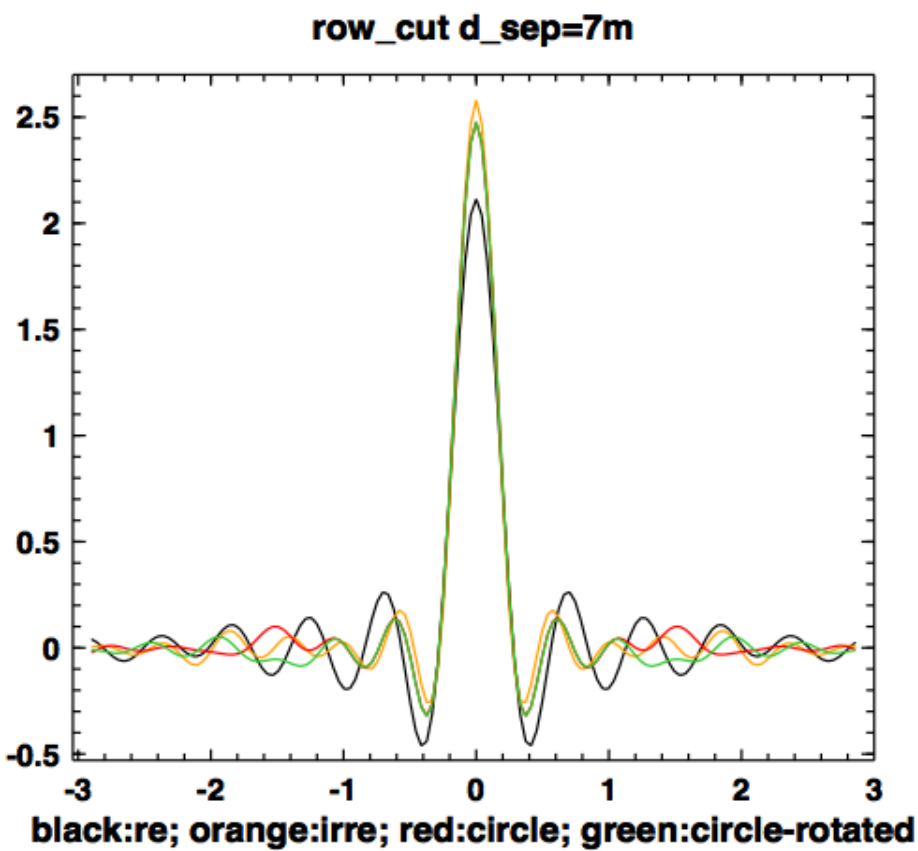
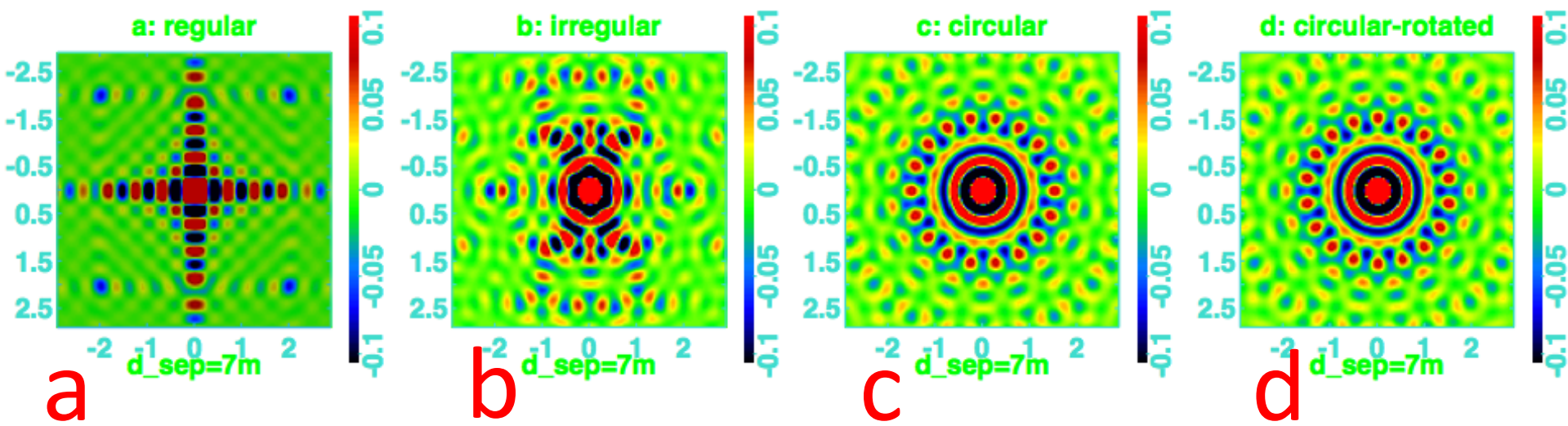


circular d\_sep = 10m

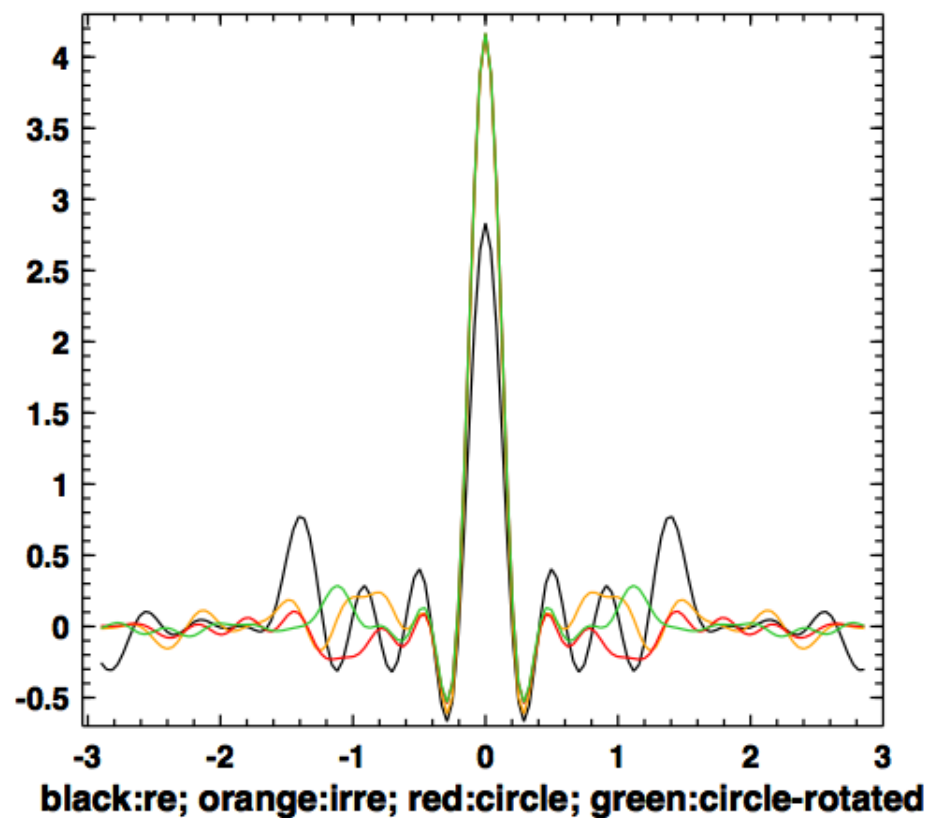
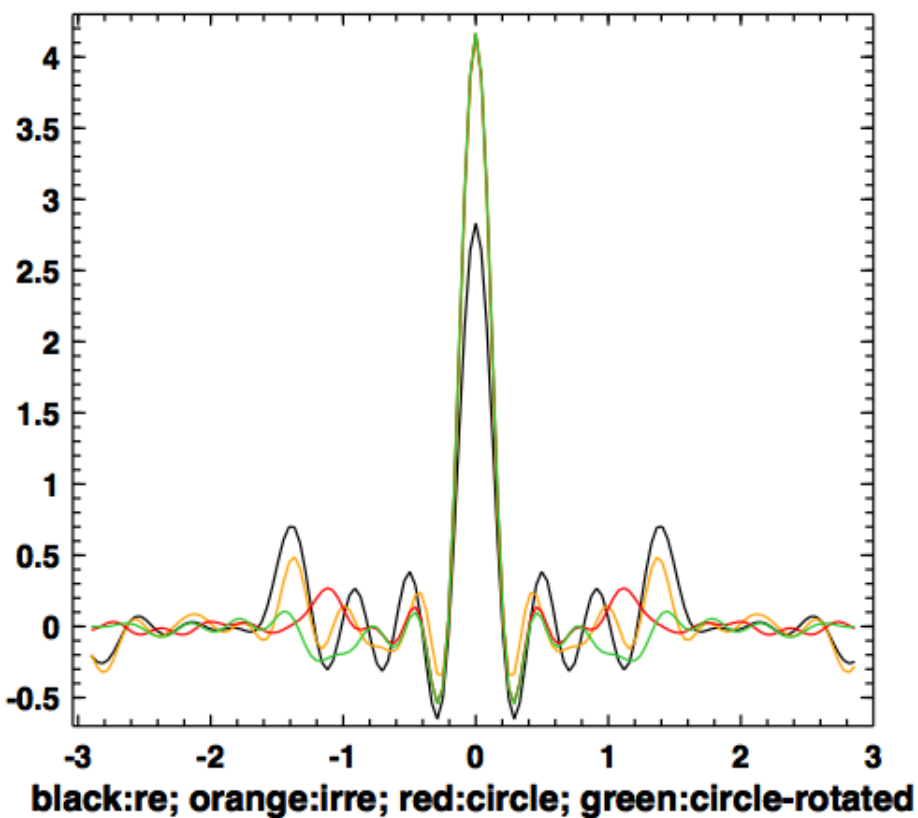
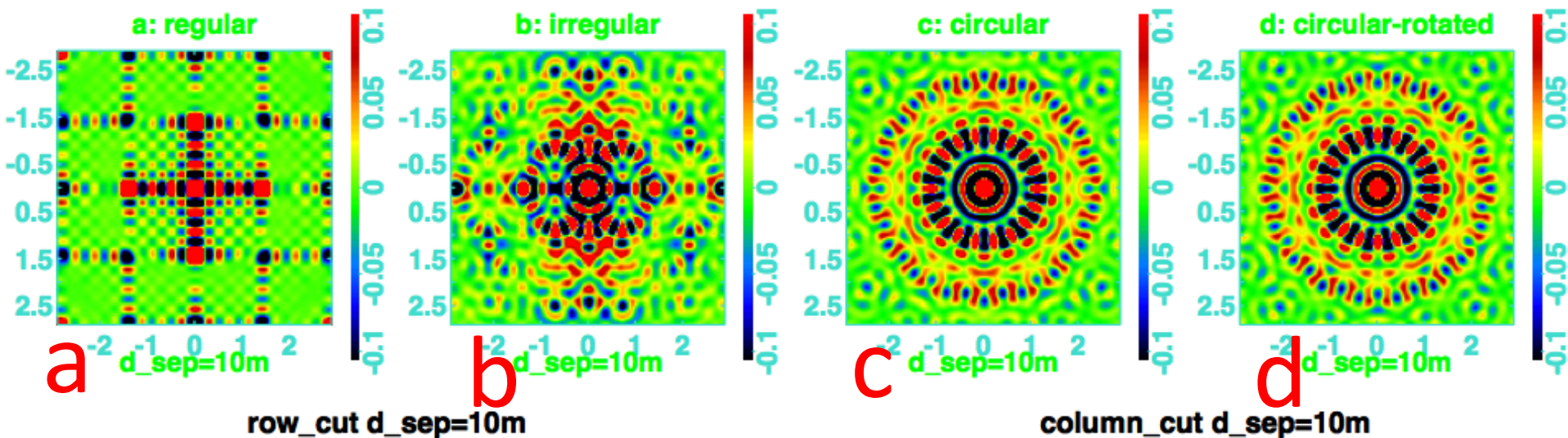


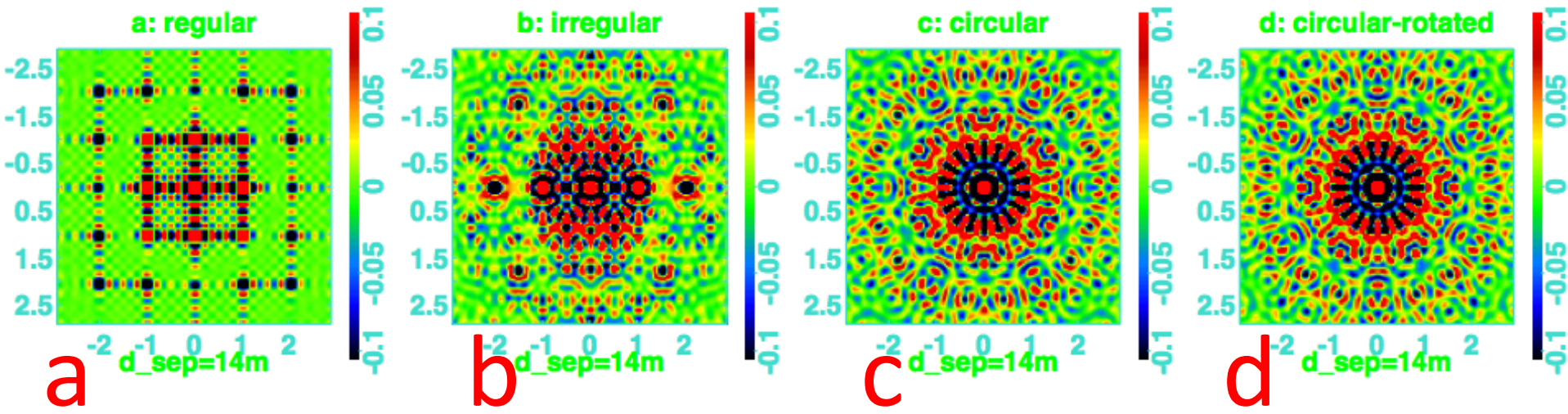
circular d\_sep = 14m





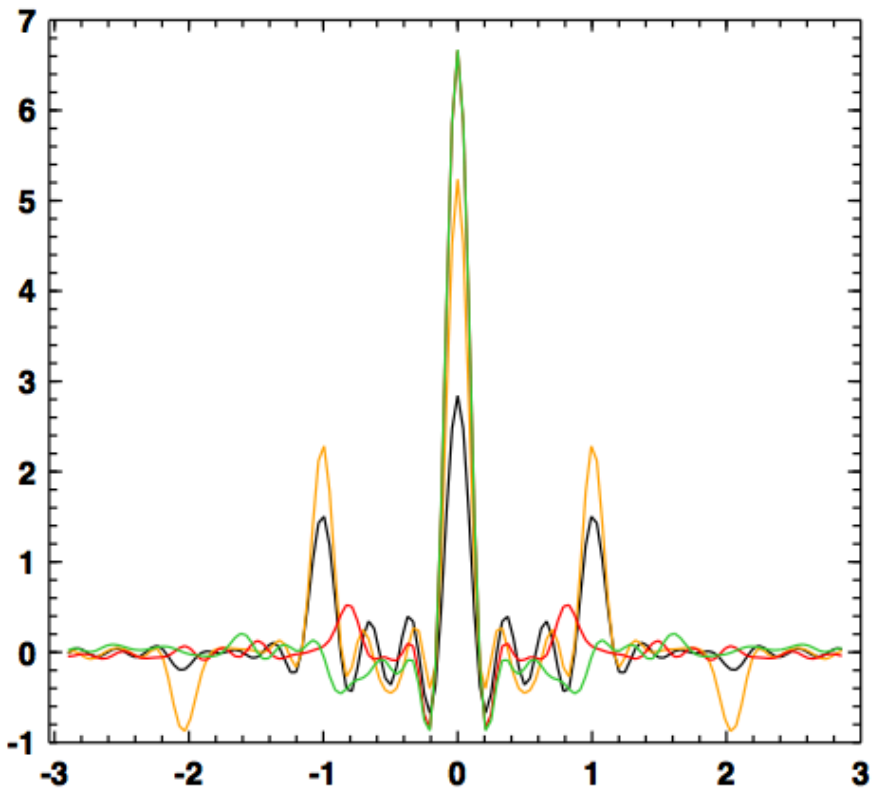




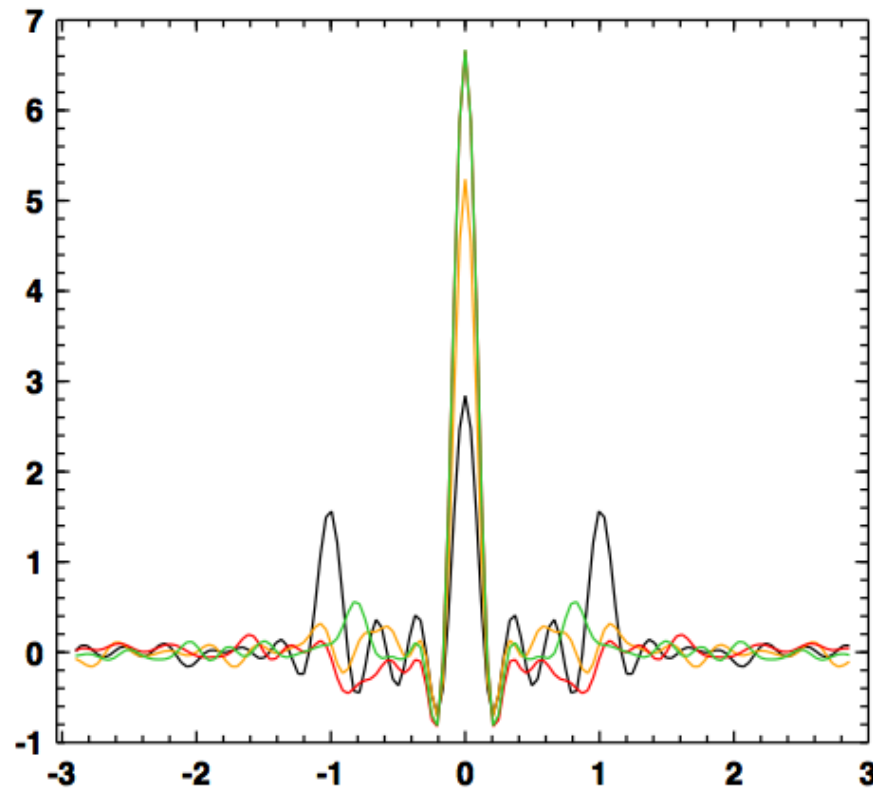


row\_cut  $d_{sep}=14m$

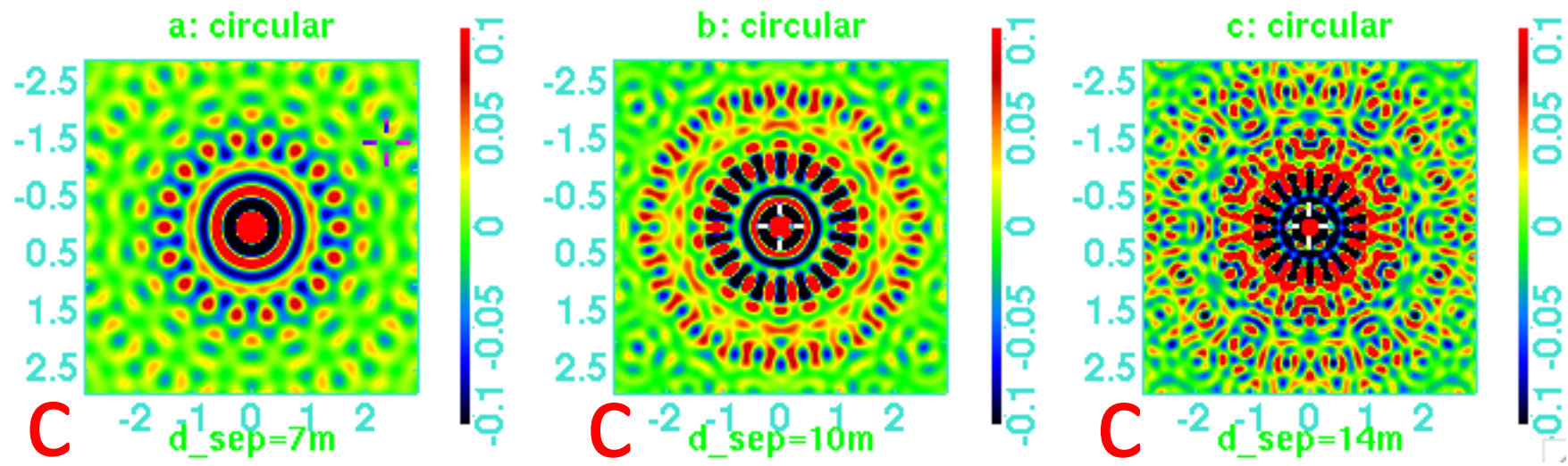
column\_cut  $d_{sep}=14m$



black:re; orange:irre; red:circle; green:circle-rotated

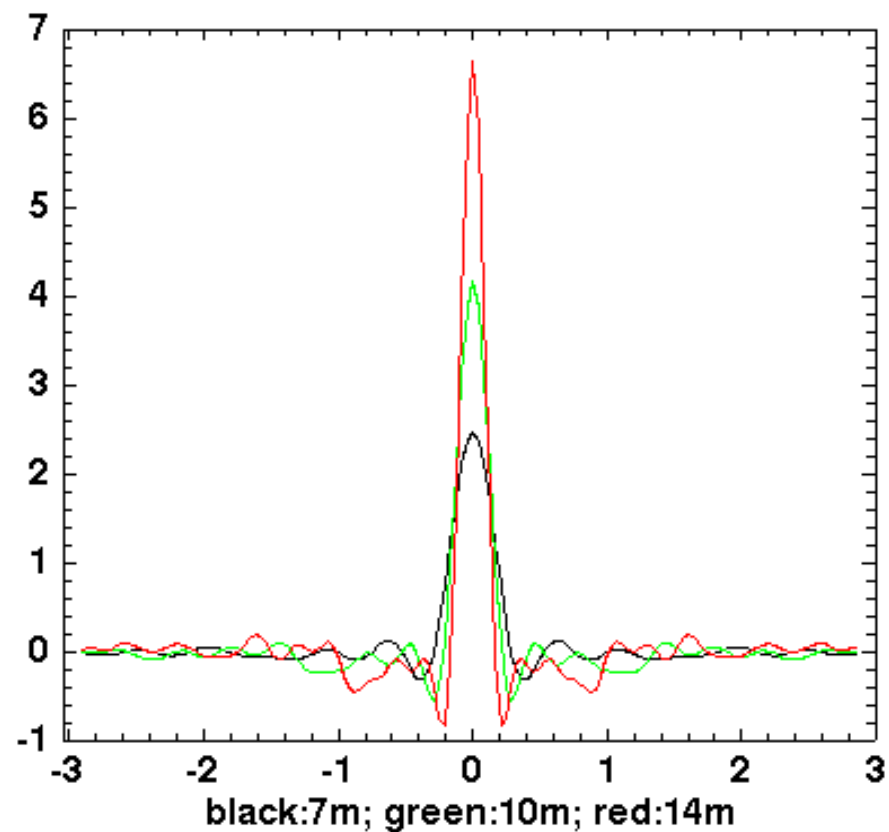
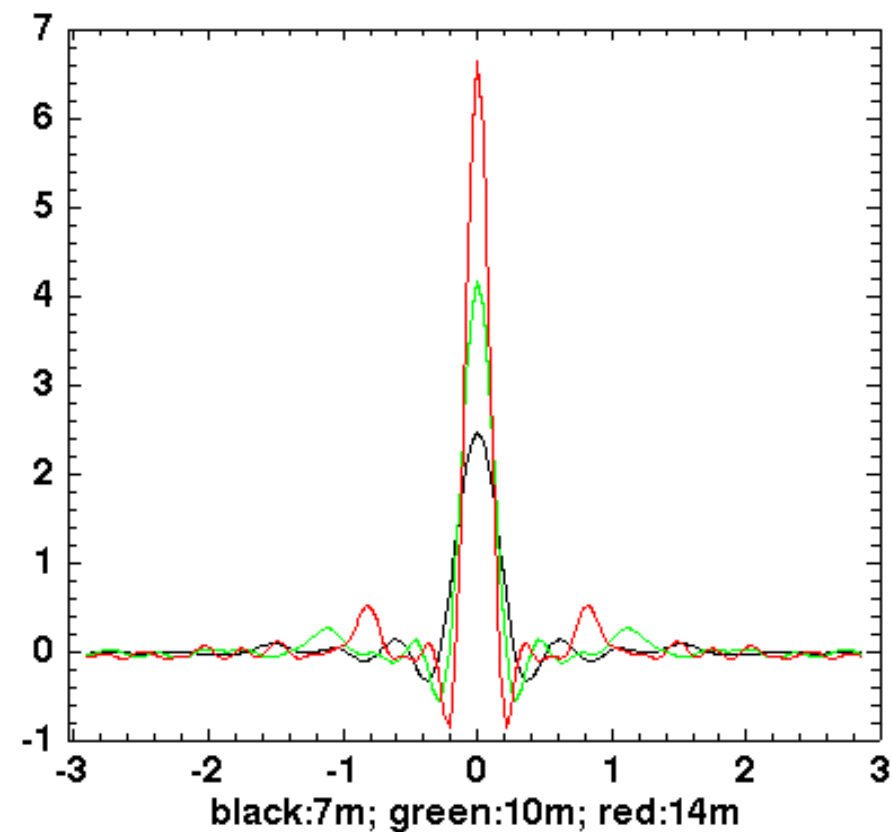


black:re; orange:irre; red:circle; green:circle-rotated



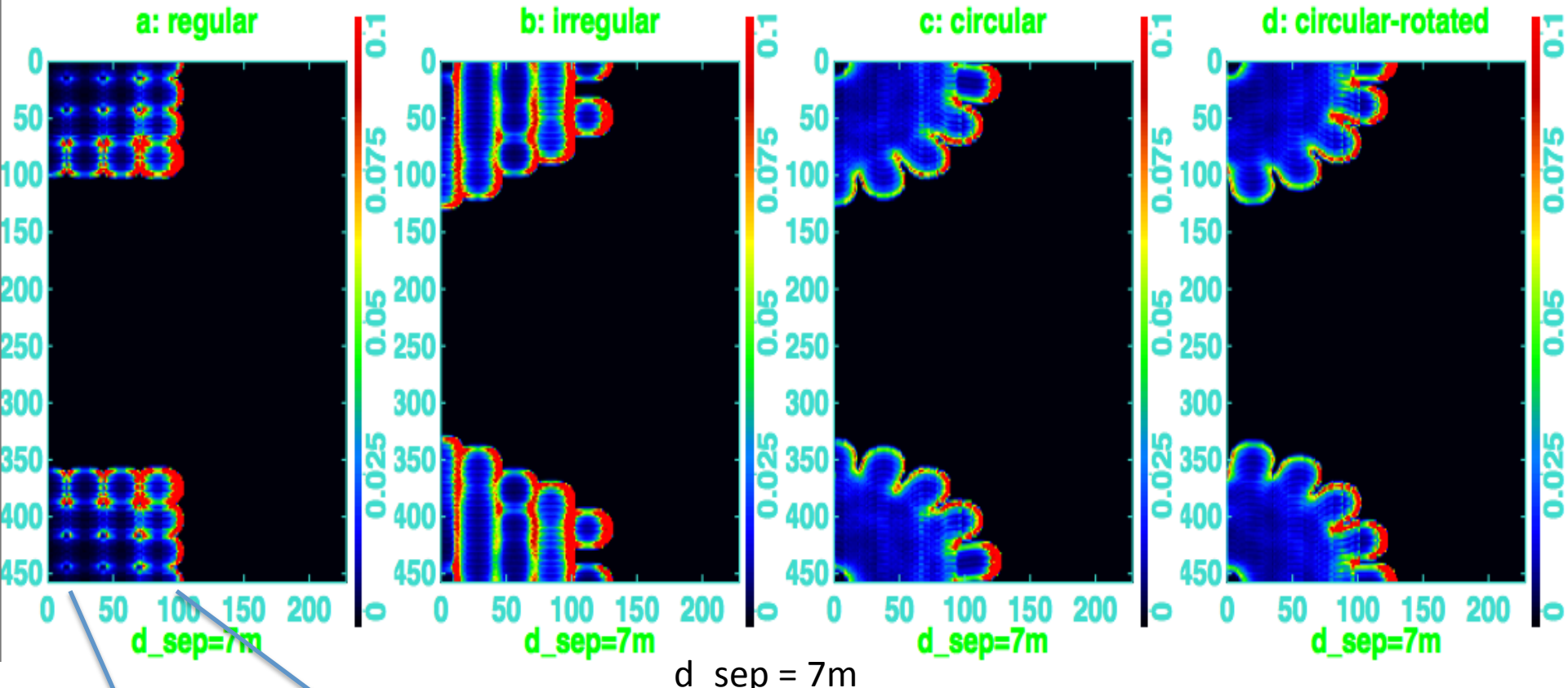
row\_cut circle

column\_cut circle



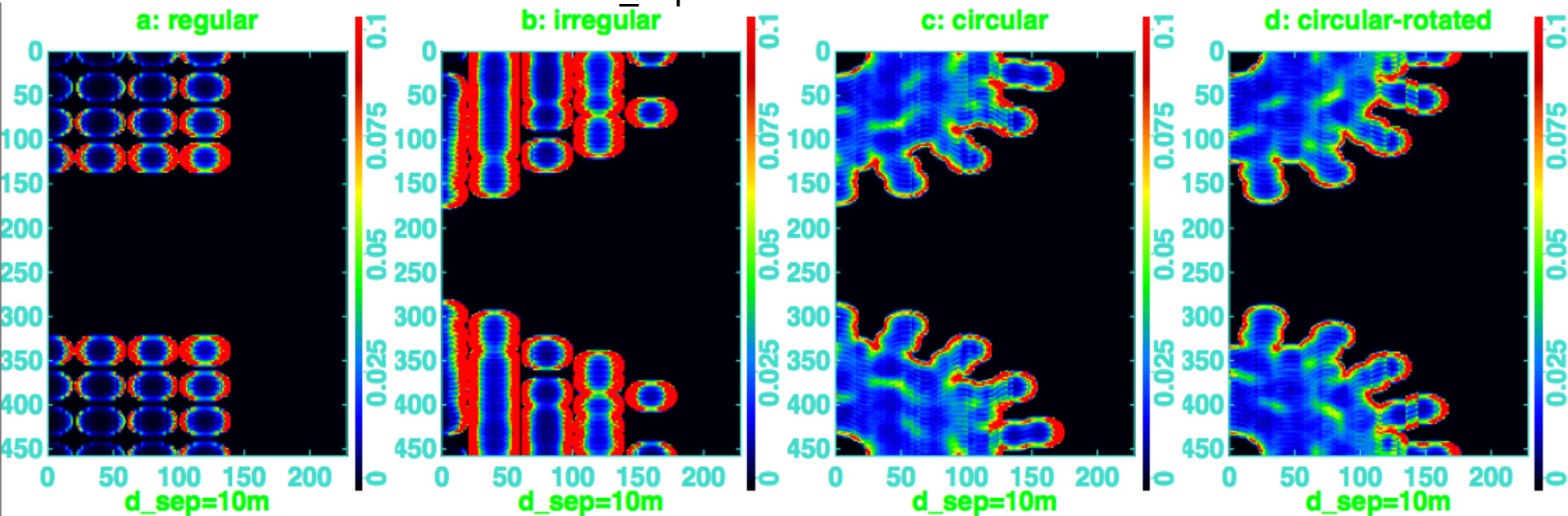


# Diagonal of the error covariance matrix for four configurations

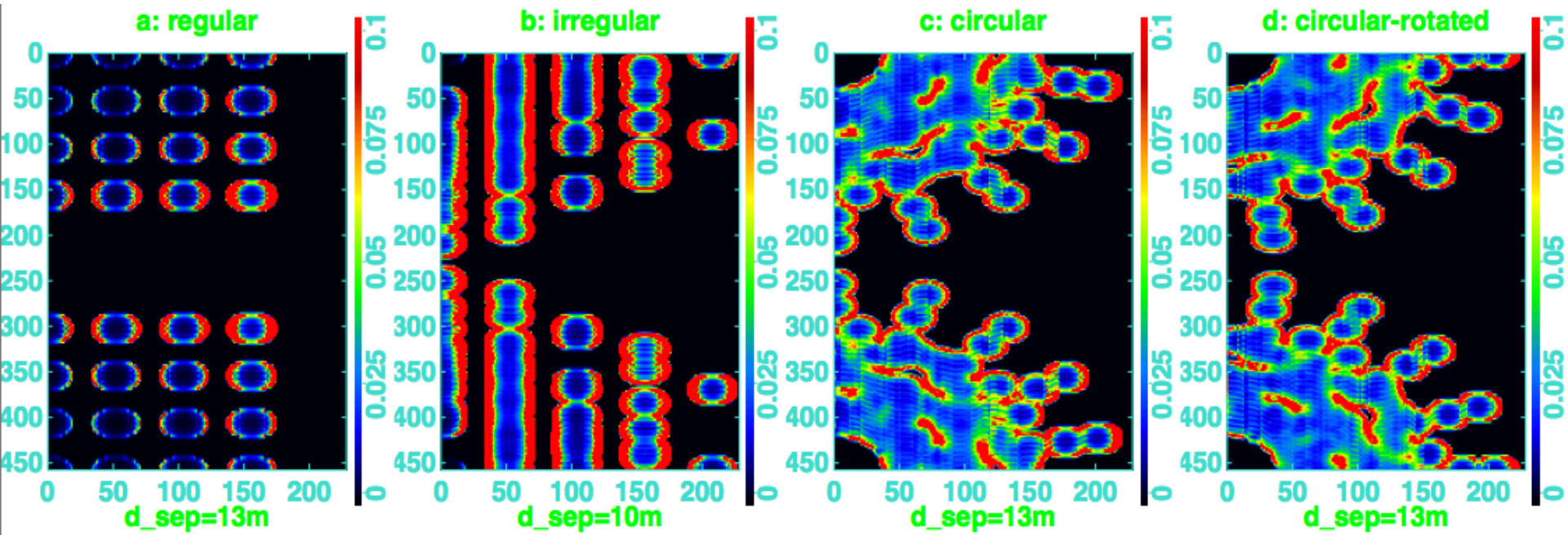


$u=20 \rightarrow 2.9 \text{ deg}$ ;  $u=100 \rightarrow 34'$

d\_sep = 10m



d\_sep = 13m



- Better synthesized beams with more independent baselines  $\rightarrow$  more uniform  $(u,v)$  plane coverage, better isotropy of the synthesized beam
- Larger dishes distance, better blocking effect, but more side lobe of the synthesized beams.
- For large dishes distance, there are some gaps inside of the whole  $(u,v)$  coverage. This will bring us mode mixing.