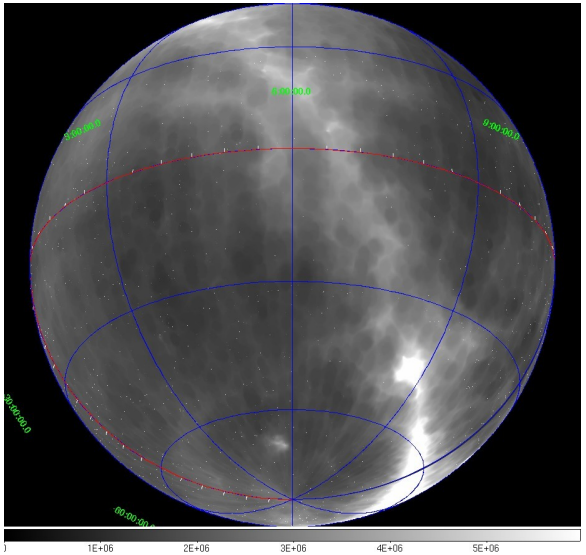
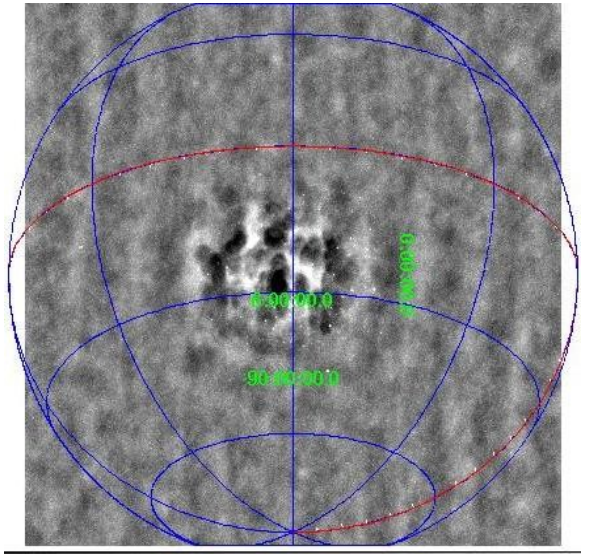


MAPS



Randall Wayth

(CfA)

MAPS

=

"MIT Array Performance Simulator"

=

a tool to simulate the response of the array up to the output of the correlator

The need for accurate sims

- enabling data processing algorithm development and testing
  - engineering: calibration, imaging, integration
  - science: extracting results from the copious data
- validating assumptions that have gone into design
- steering decisions for intermediate arrays (32T)

The need for accurate sims

- enabling data processing algorithm development and testing
  - engineering: calibration, imaging, integration
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- validating assumptions that have gone into design
- steering decisions for intermediate arrays (32T)

- = credibility, confidence

MWA simulation requirements

- realistic antenna beams
- all-sky
- polarized input, response, correct for alt/az
- diffuse sky background (Galaxy)
- ionospheric effects
- frequency dependent

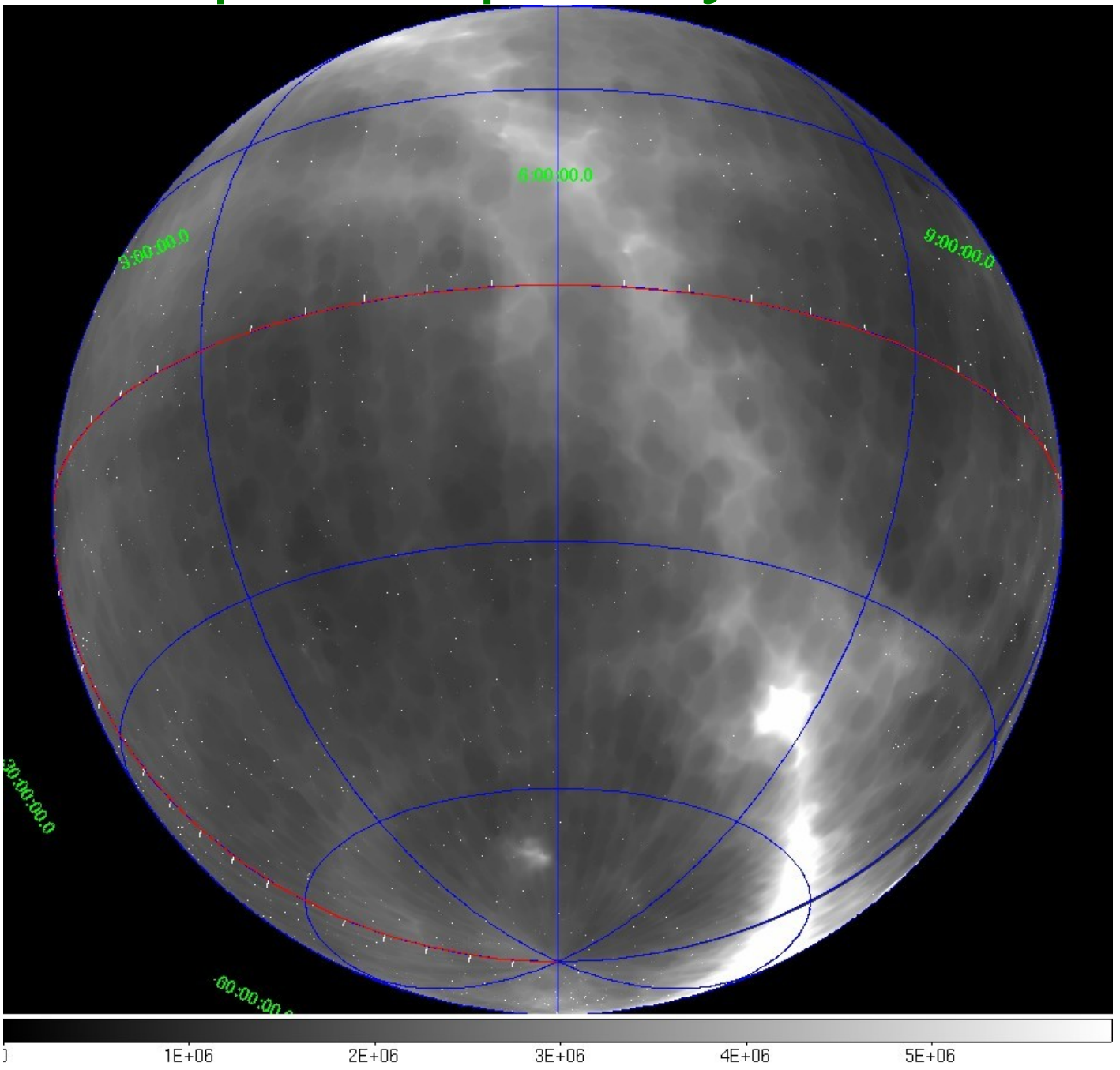
About MAPS

- MAPS simulates what an interferometer sees, from antennas through to correlator
- Developed at Haystack (Cappallo, Doeleman, Lonsdale, Oberoi, et al.)
- Significant enhancements for MWA:
  - antenna beams
  - polarized response
  - all-sky

MAPS provides:

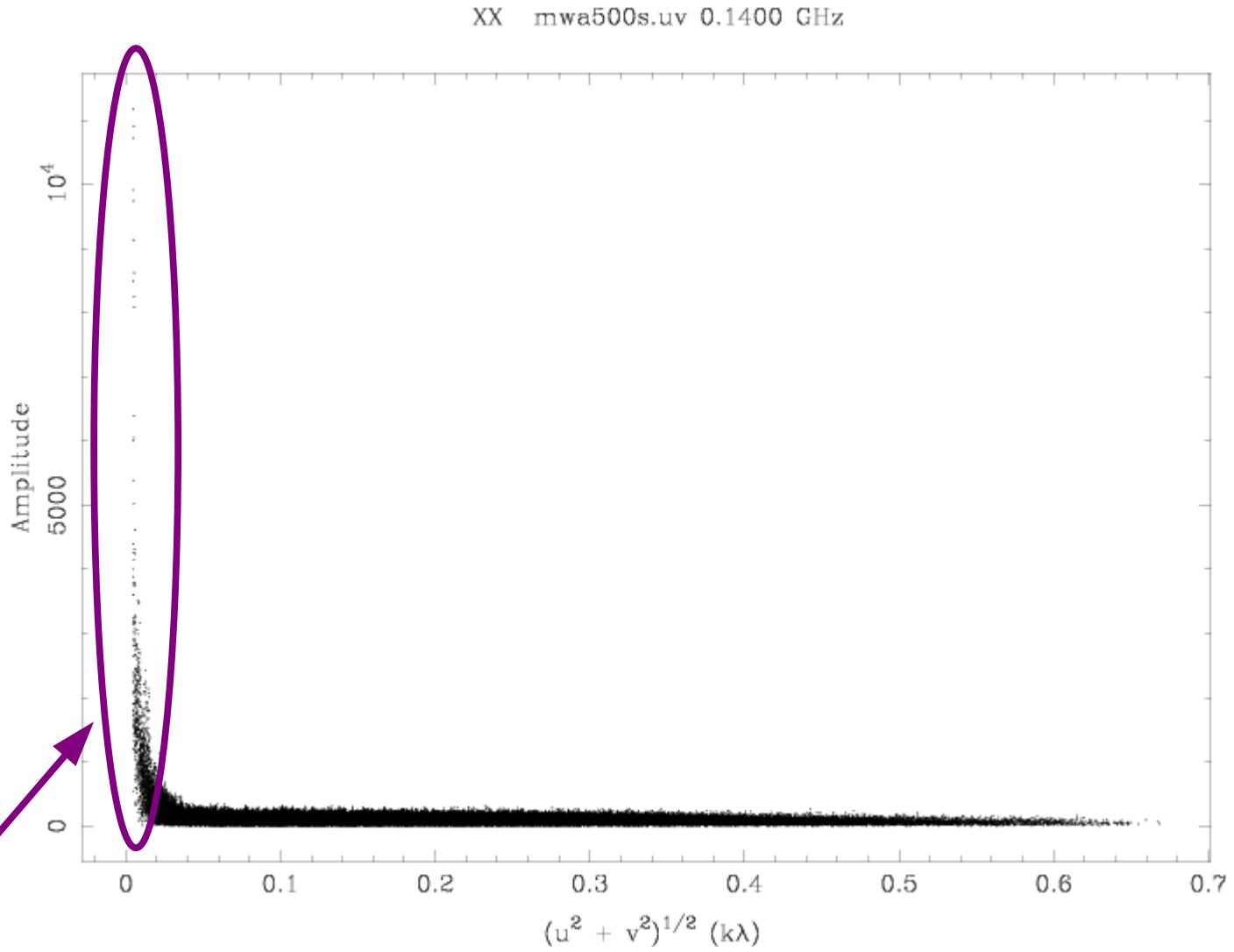
- analytic, but non-ideal antenna beams
- all-sky
- polarized input, response, correct for alt/az
  - currently only linear pol output (XX,YY,XY,YX)
- diffuse sky background
- ionospheric effects (no Faraday rotation)
- frequency dependent
- standard, easy integration with RTS, Miriad via UVFITS

Example – input sky for LST 6h



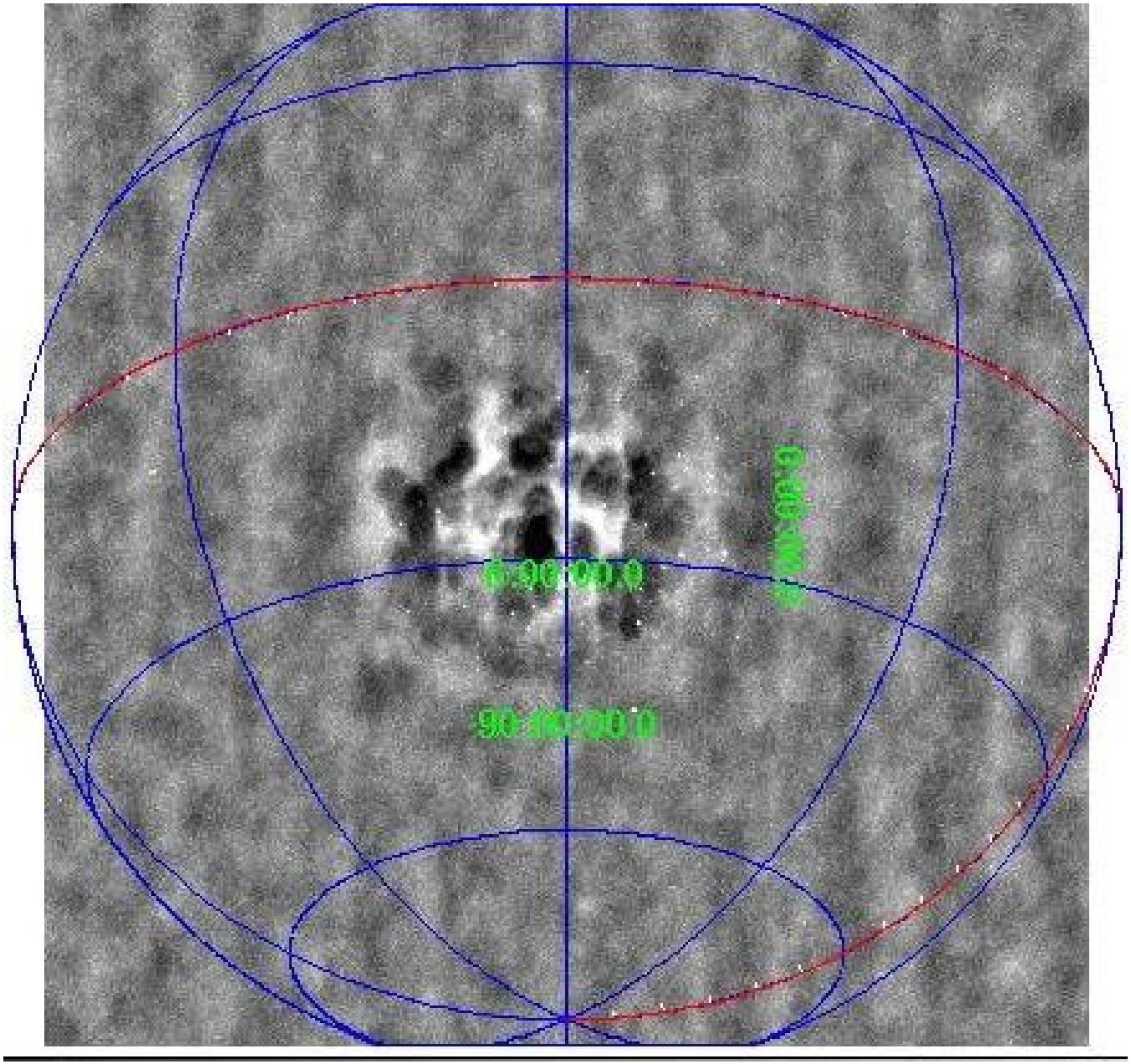
Pure Stokes I input (in this example)

Example – 500T snapshot



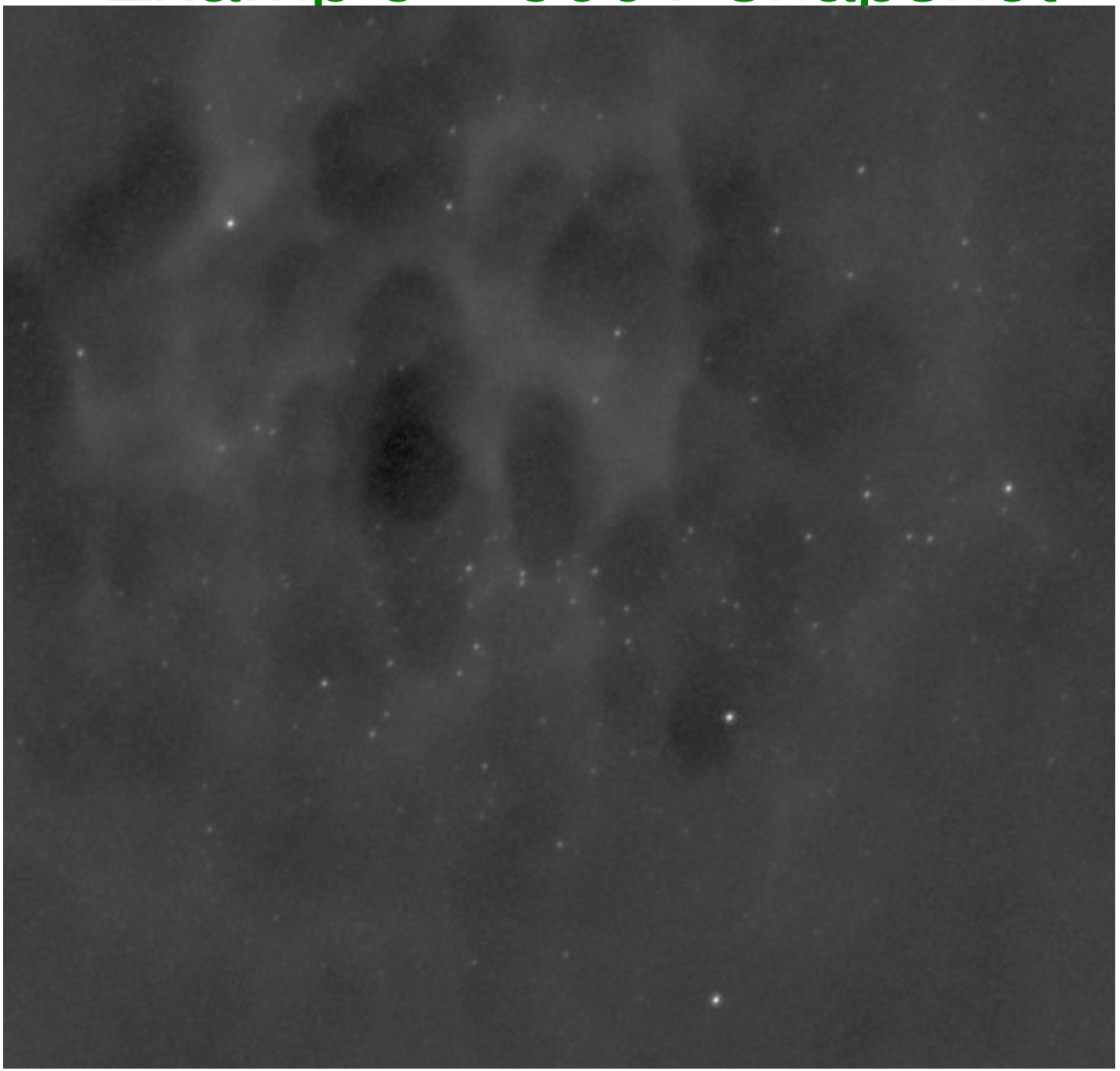
Huge power on short baselines

Example – 500T snapshot



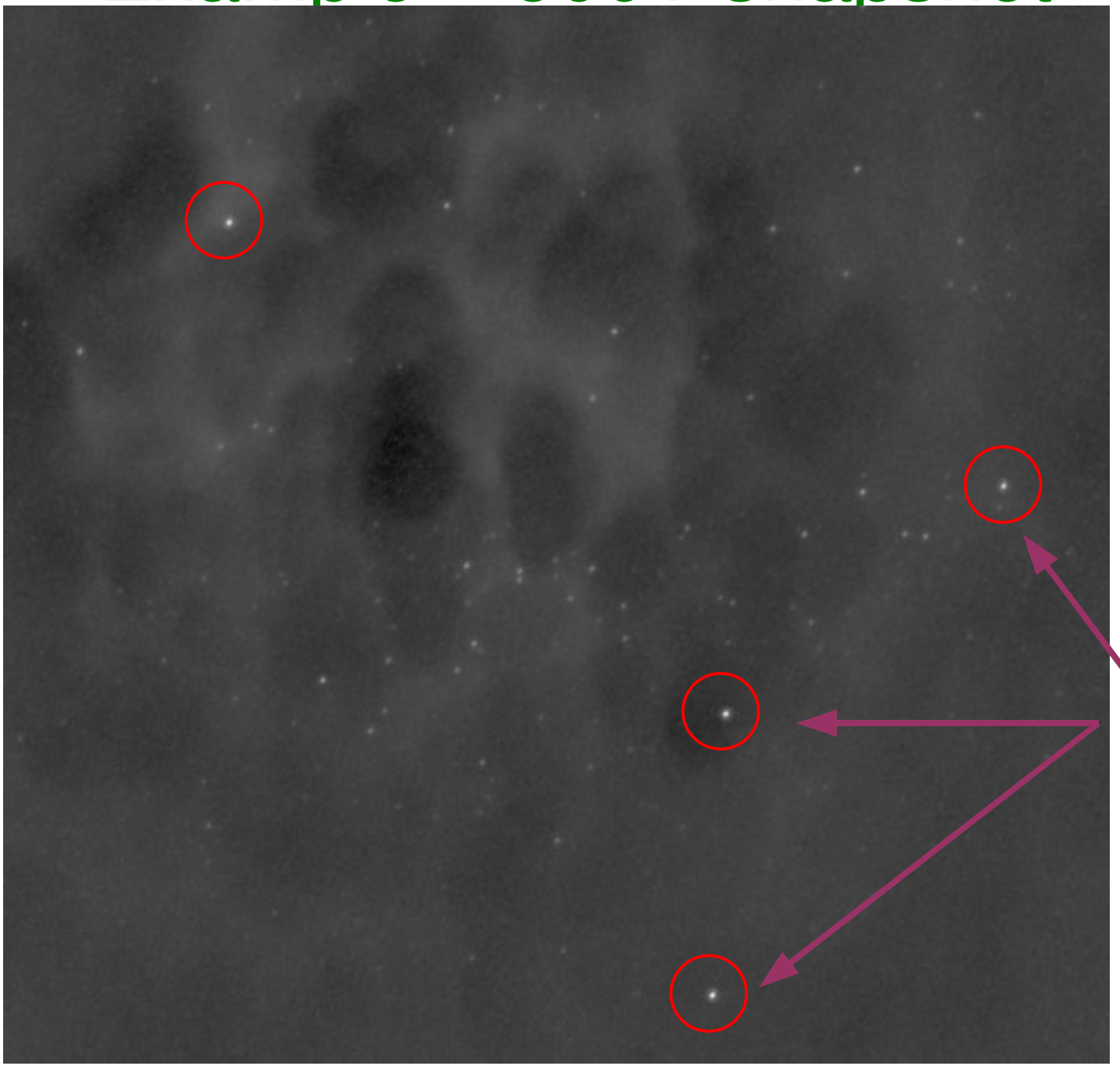
Note: zscale stretch!!

Example – 500T snapshot



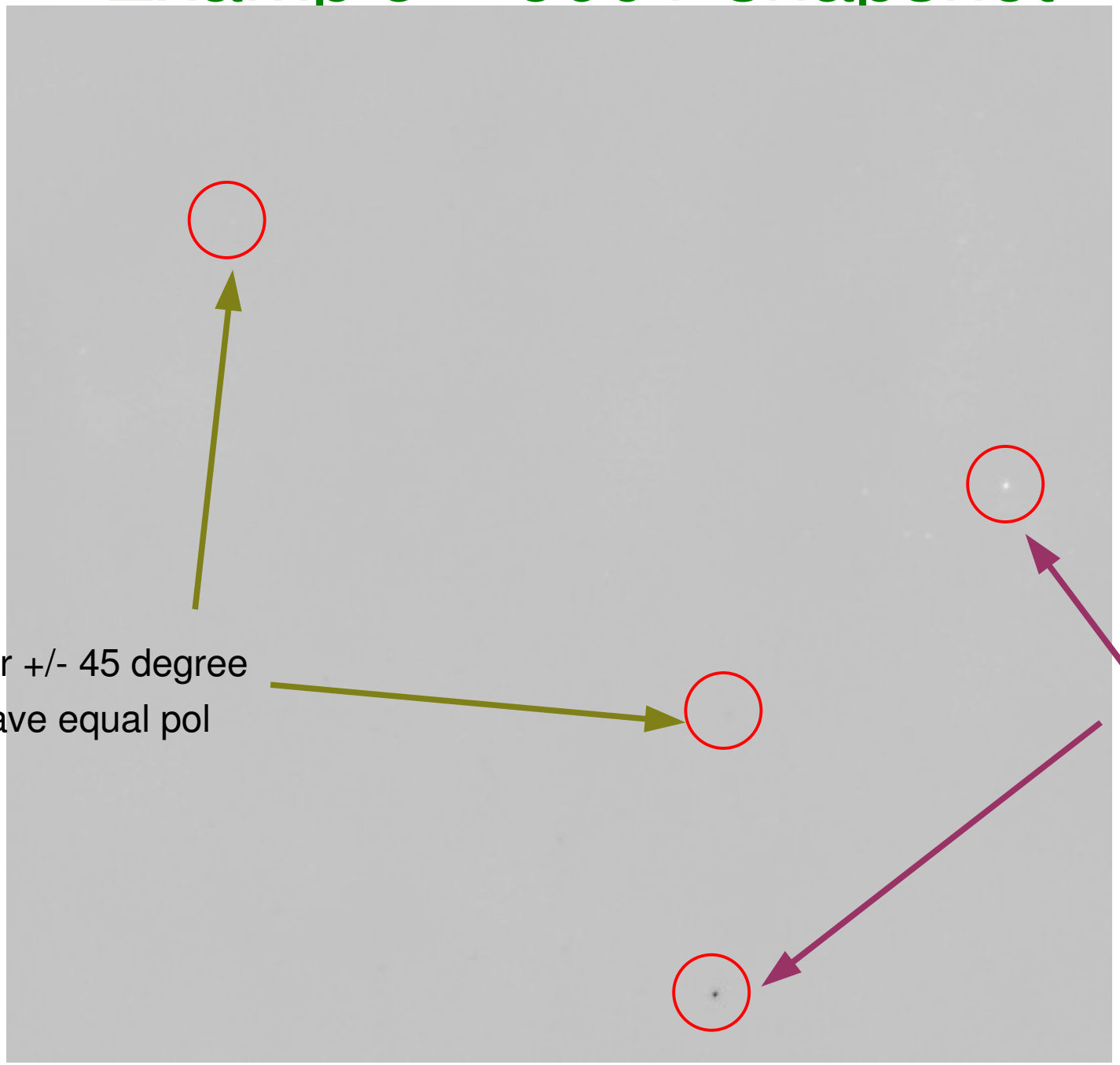
Example – 500T snapshot

Stokes I



Example – 500T snapshot

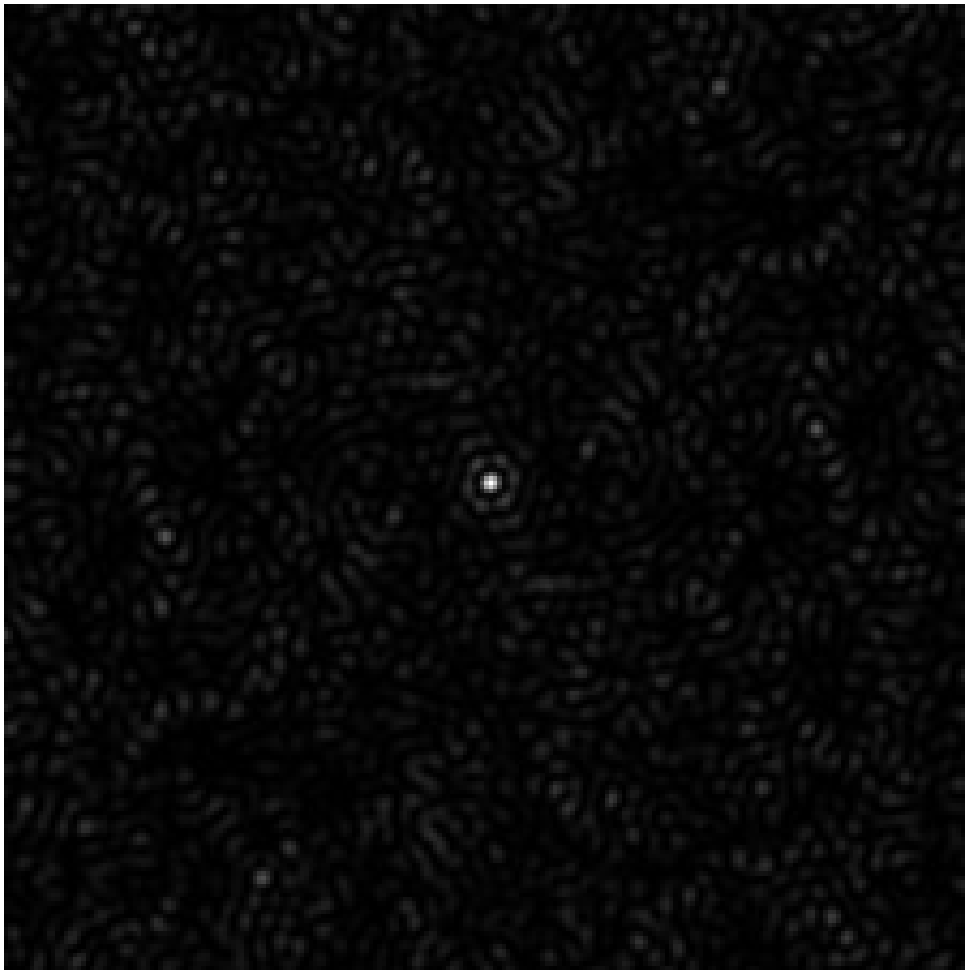
Stokes Q



sources near +/- 45 degree diagonals have equal pol mixing

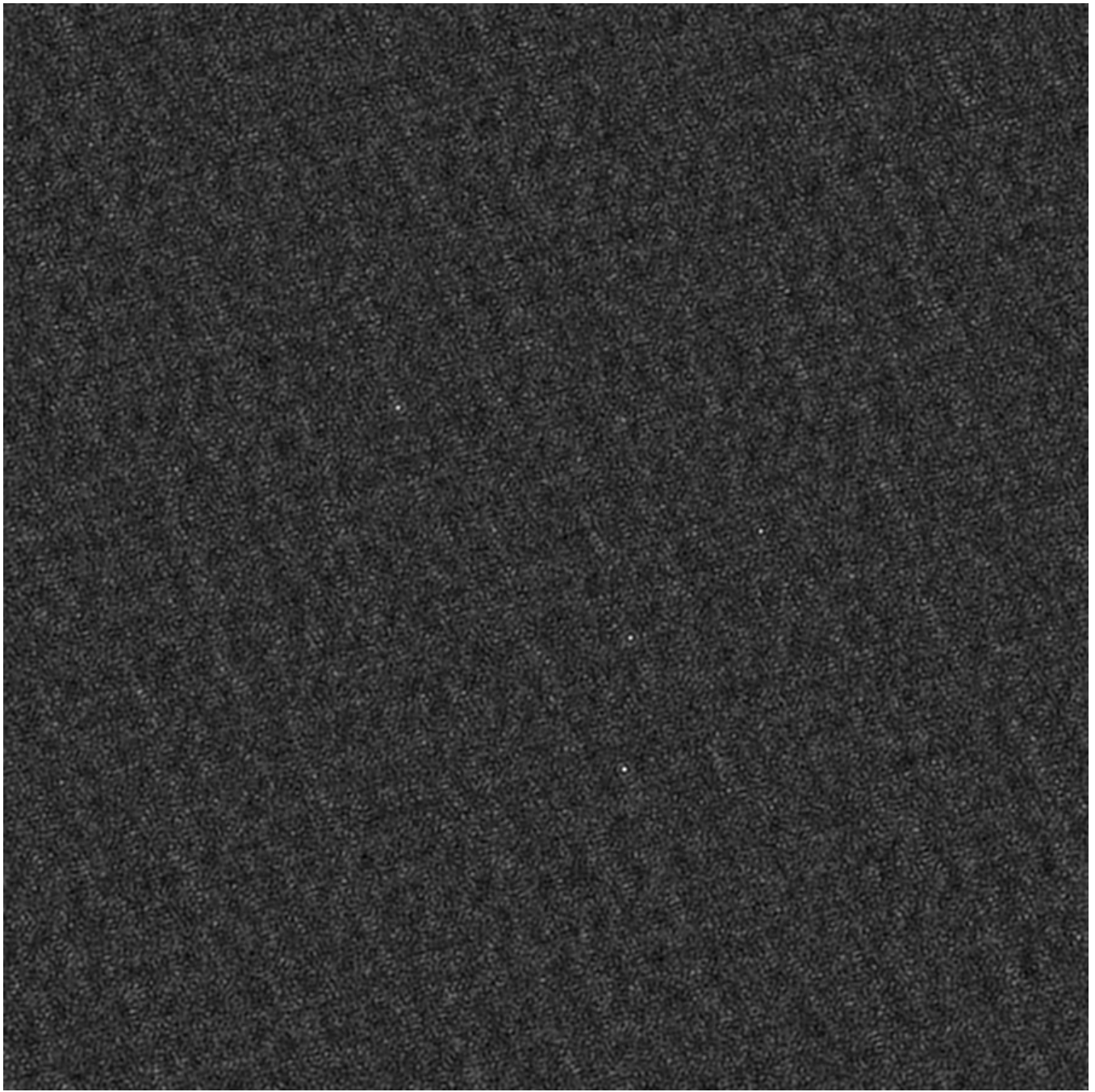
~2 Jy sources

Example 32T - snapshot



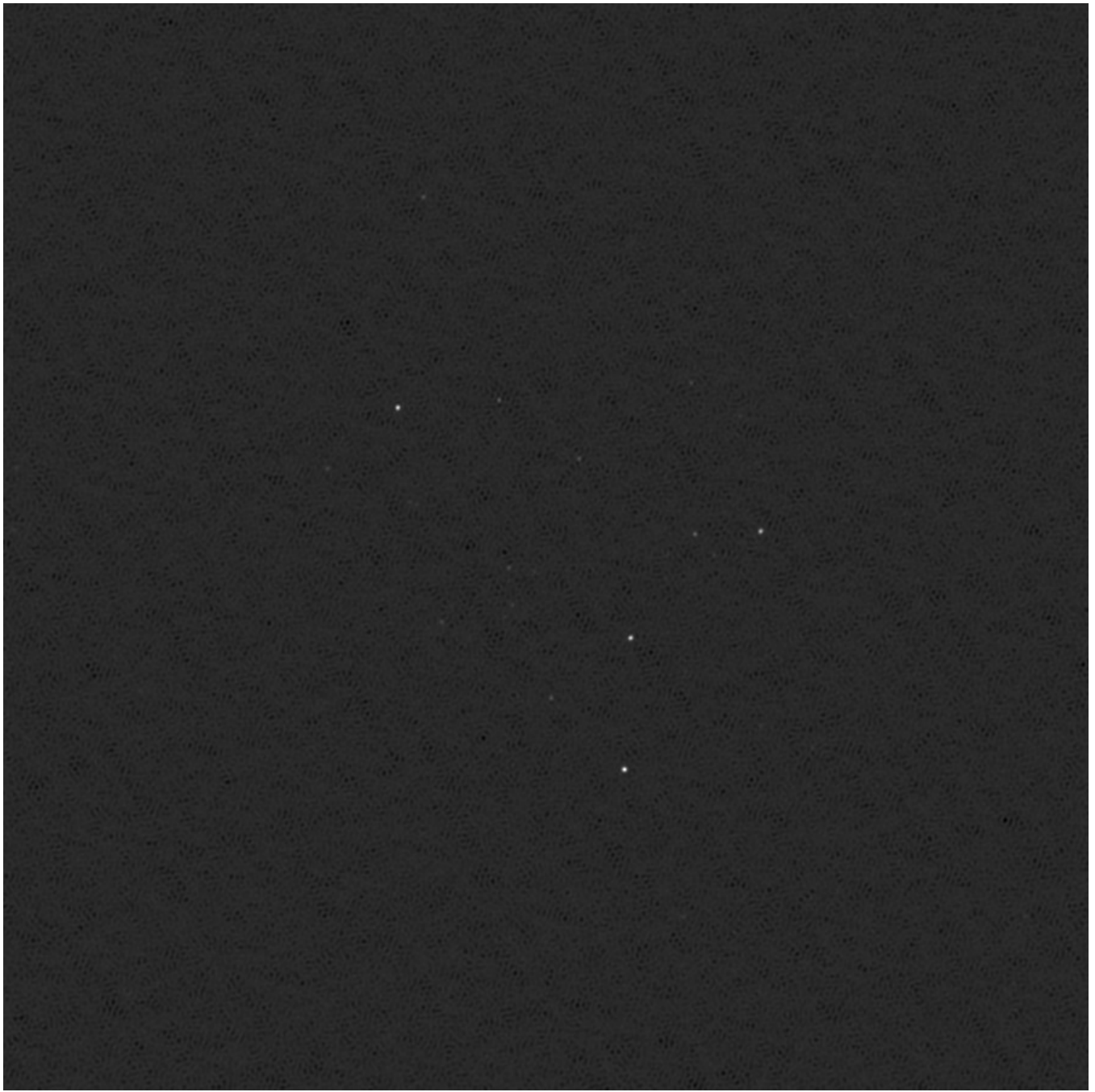
32T snapshot beam has sidelobes at the ~10% level

Example 32T – snapshot



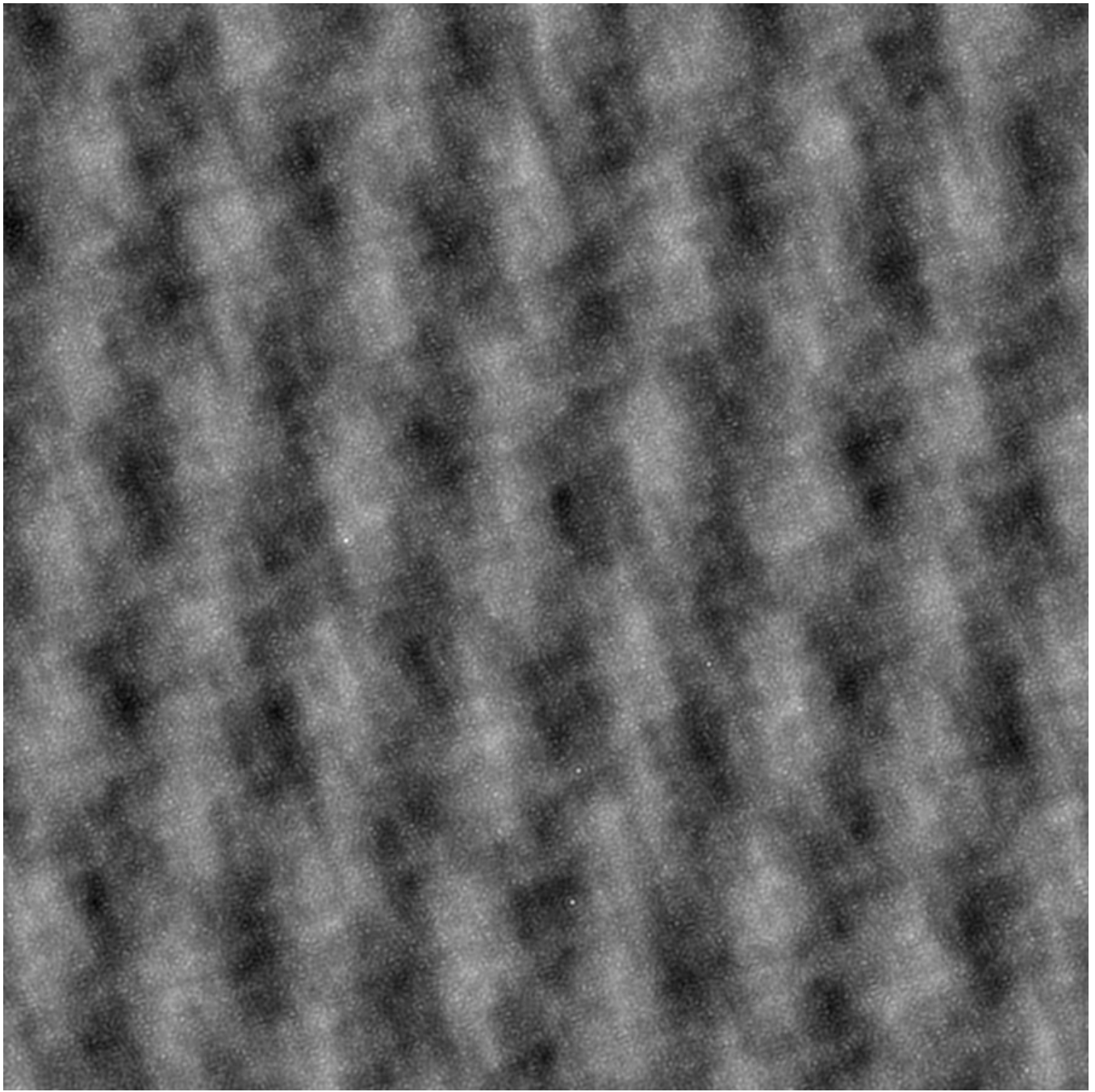
dirty map

Example 32T - snapshot (no sky)



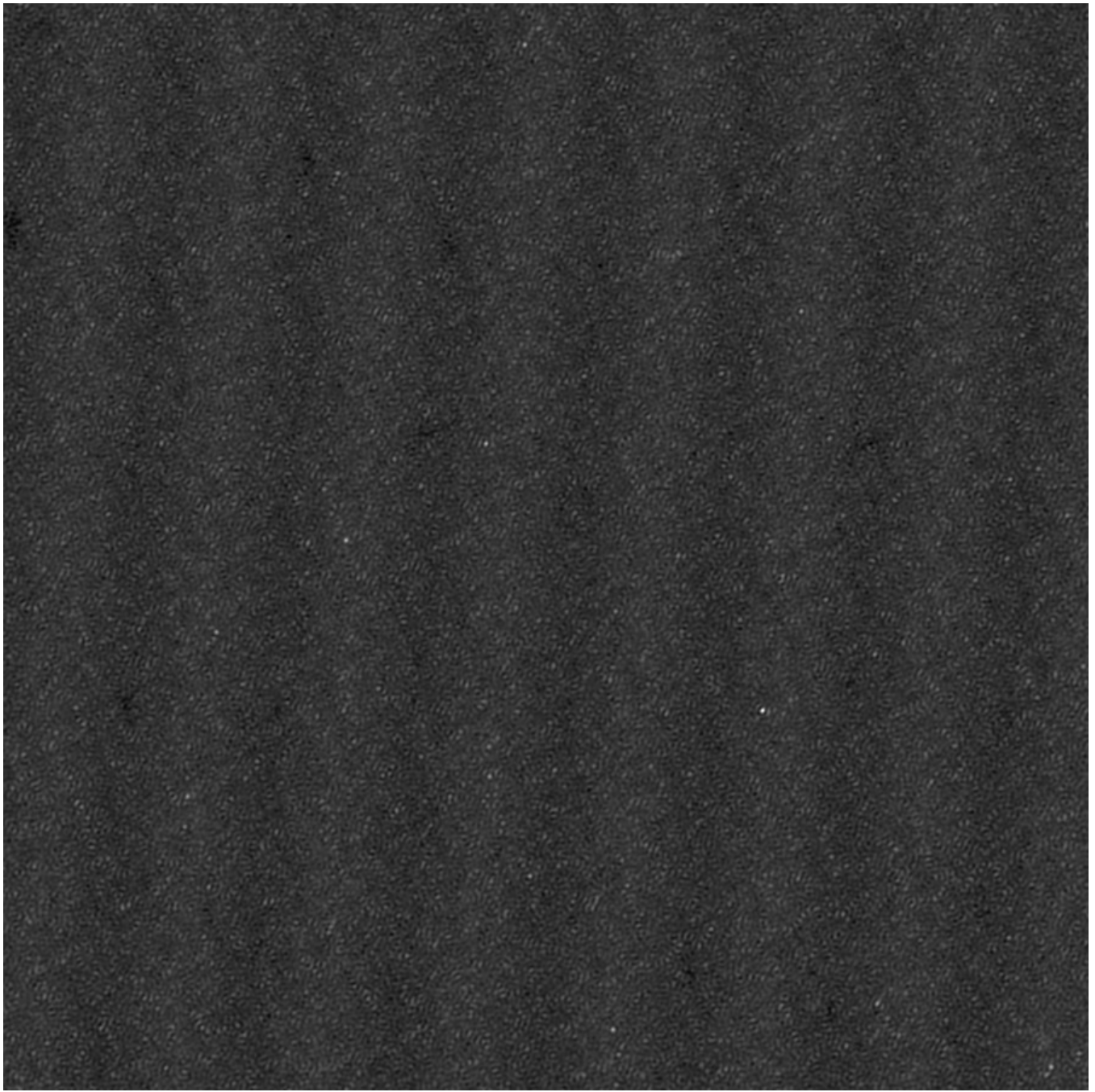
cleaned image

Example 32T - snapshot (with sky)



dirty map

Example 32T - snapshot (with sky)



cleaned image

Summary

- Can do
  - all sky, realistic (point + diffuse) sky
  - realistic antennas
  - polarized in and out
  - ionosphere
  - frequency dependent
- Still to do
  - faraday rotation