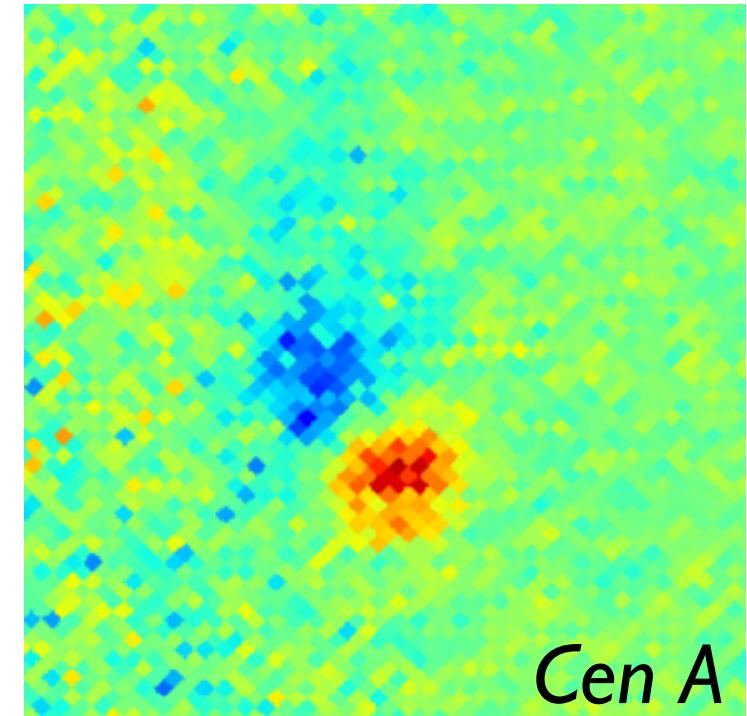
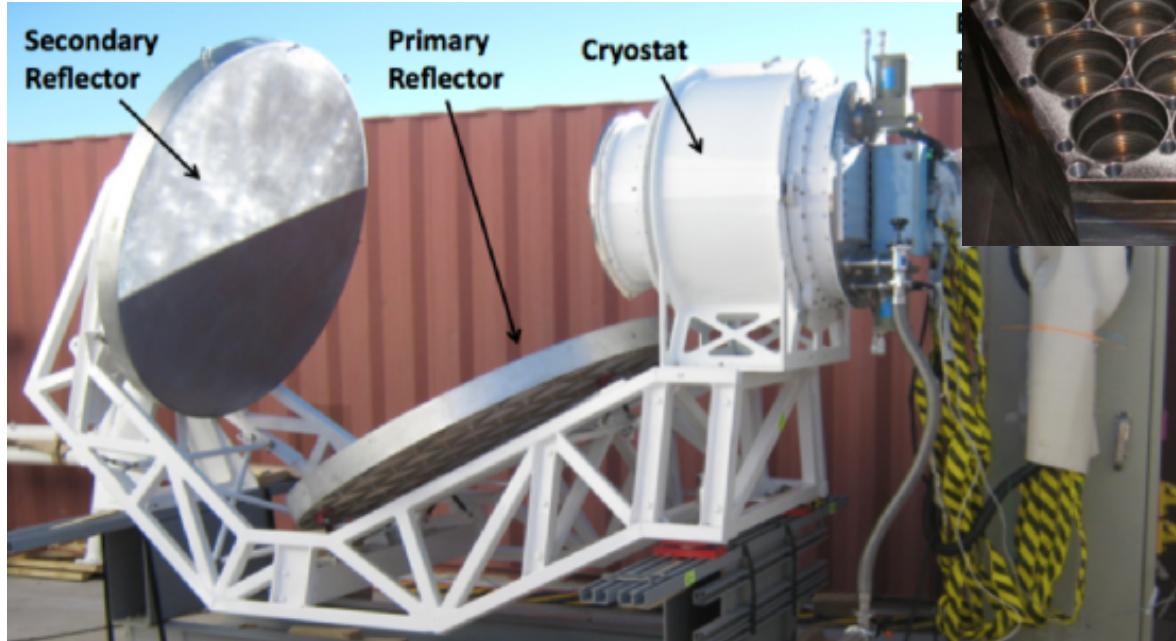


# Polarization measurements of radio sources at 43 and 95 GHz with QUIET

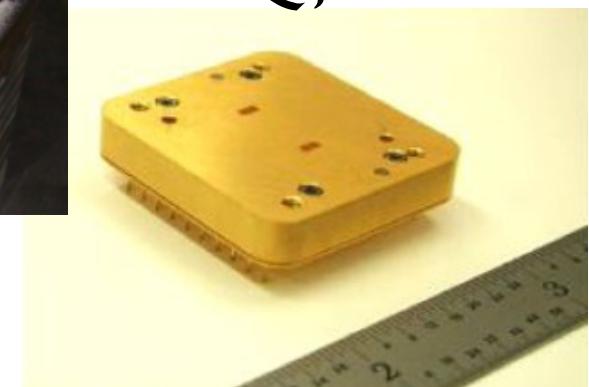
*Kevin Huffenberger*  
*Florida State University*



# QUIET = Q/U Imaging Experiment

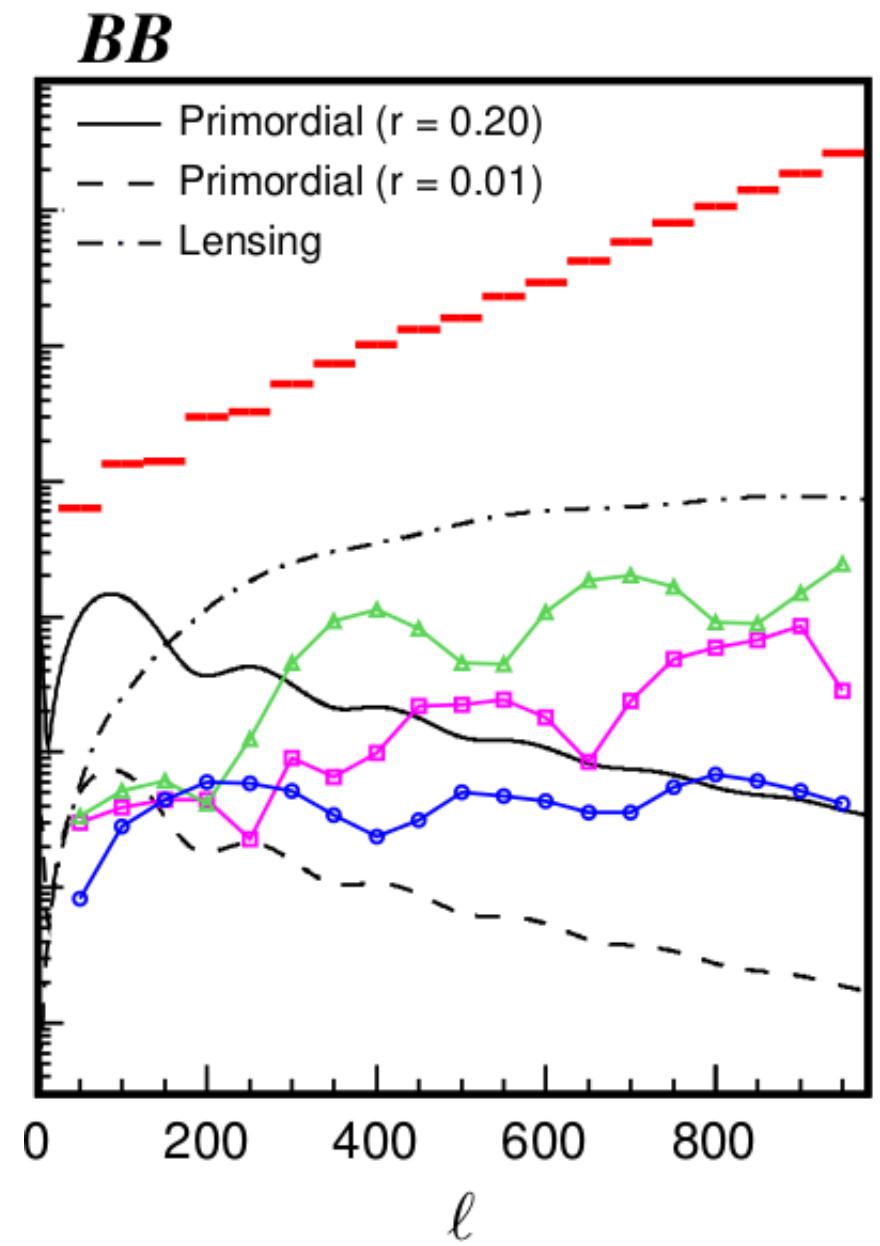
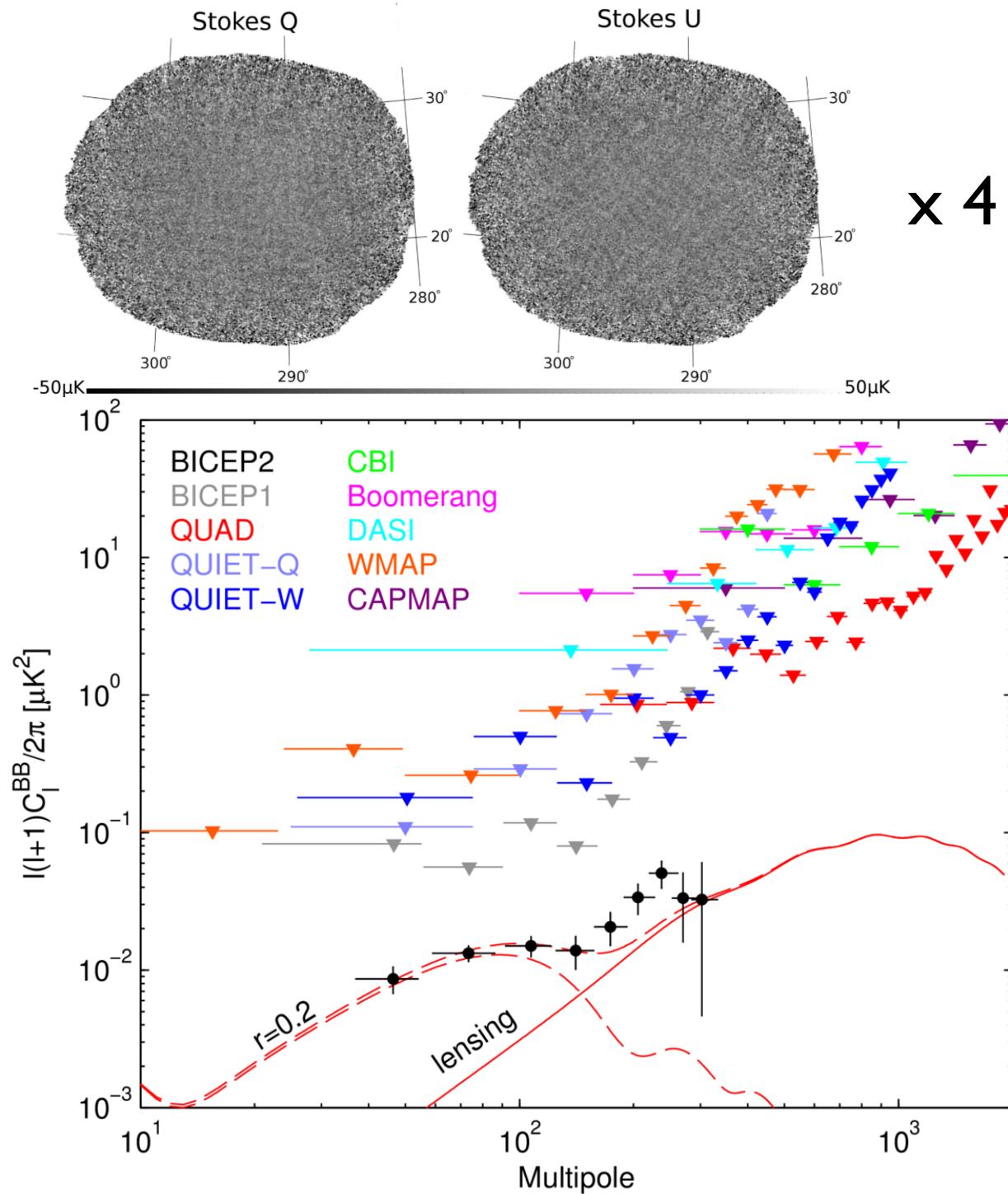


Q,U not I



Q band: 43 GHz  
W band: 95 GHz

# QUIET CMB Results



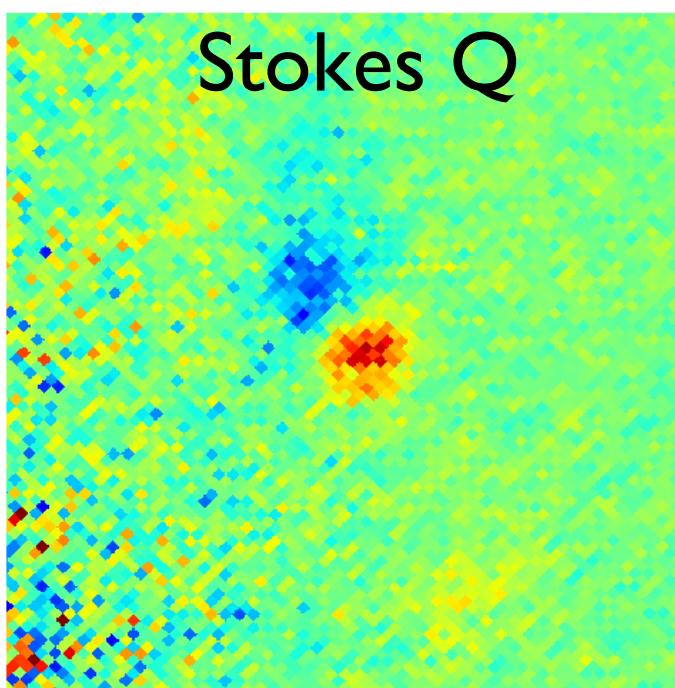
- Systematic Errors**
- Absolute Responsivity, Window Function
  - I to Q/U Leakage
  - Angle, Relative Responsivity, Pointing
  - Scan-synchronous Signal, Far Sidelobes



**Cen A**

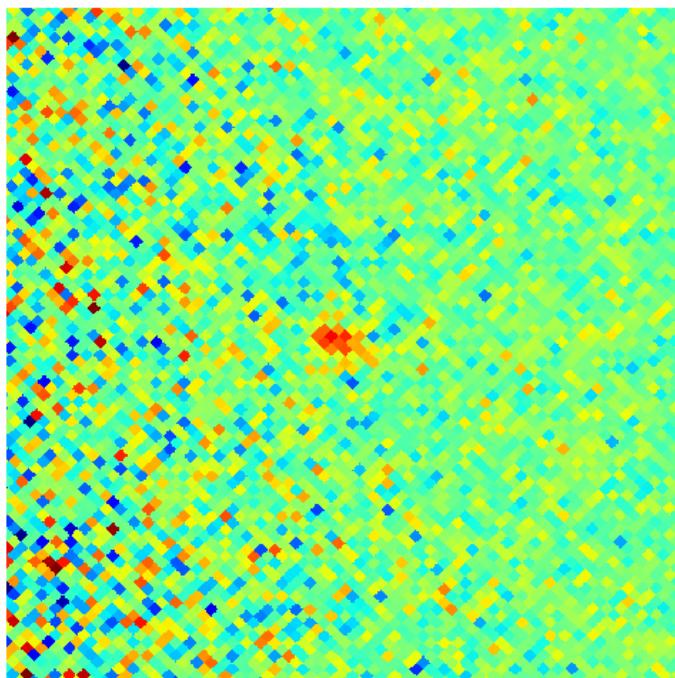
Q, U gal coords  
CMB convention

Q band 43 GHz



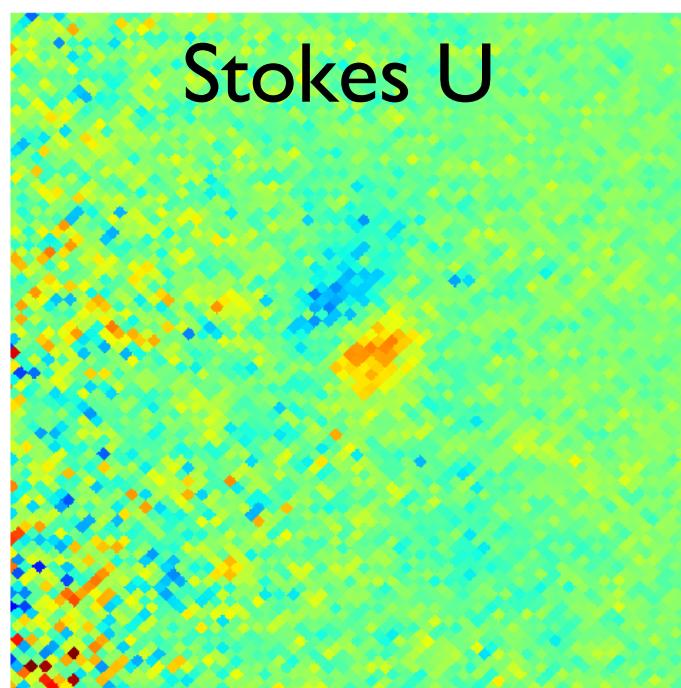
-1.8e+03                    1.8e+03  $\mu\text{K}$

W band 95 GHz



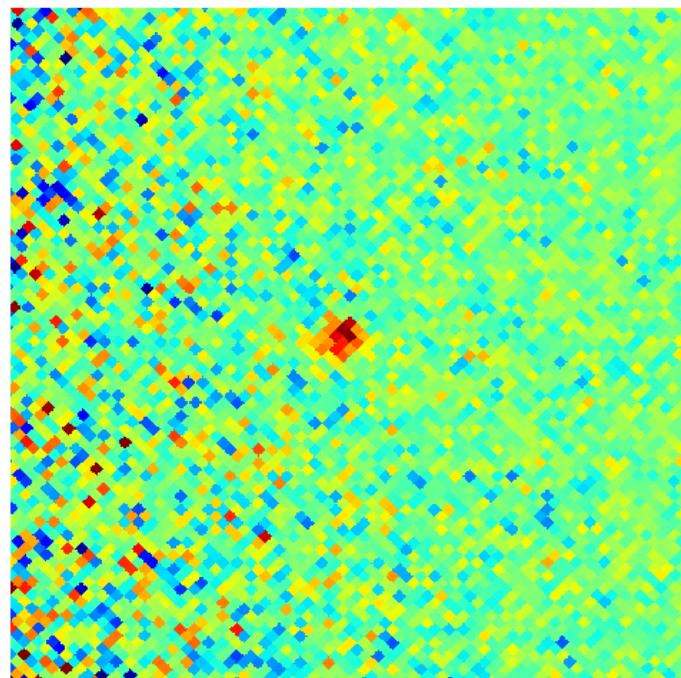
-500                    500  $\mu\text{K}$

Stokes U



-1.8e+03                    1.8e+03  $\mu\text{K}$

4°



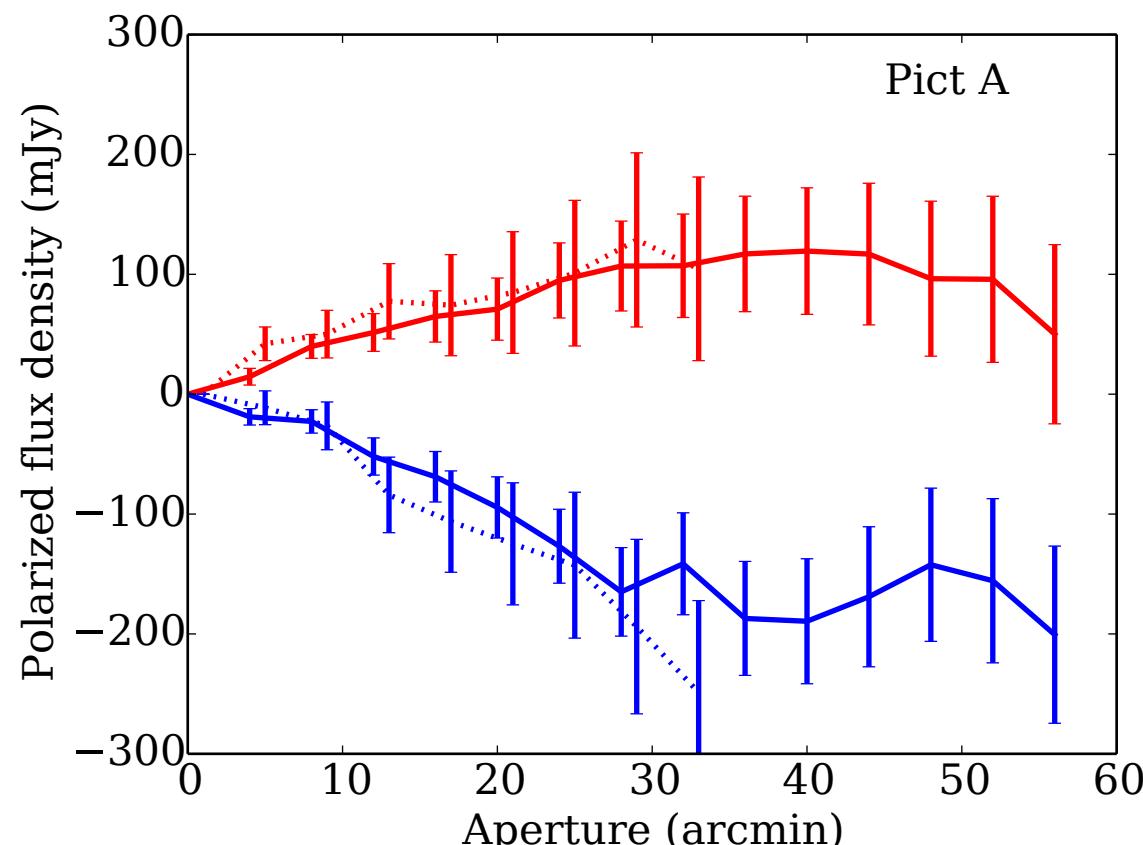
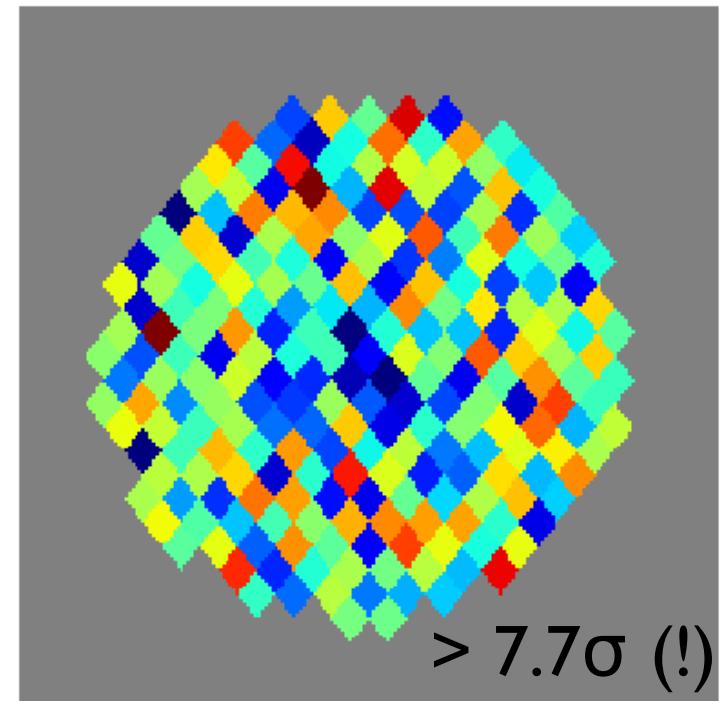
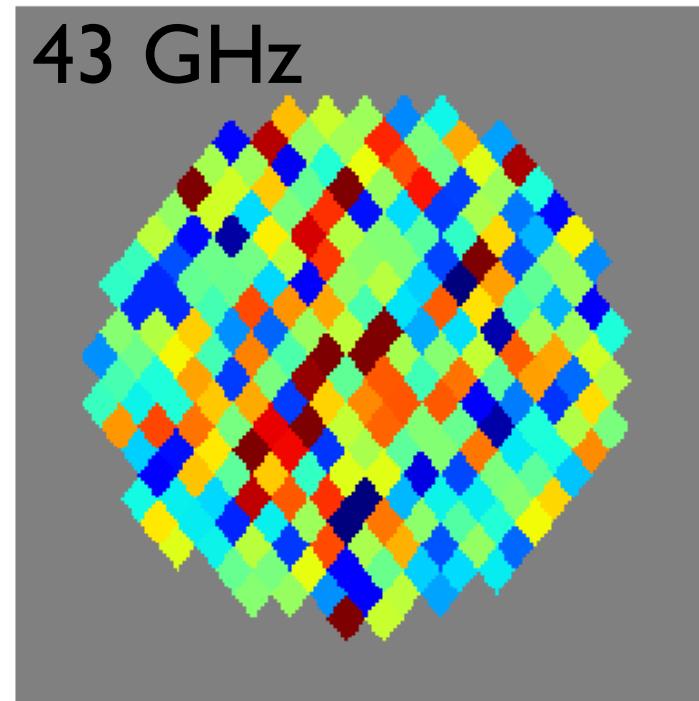
-500                    500  $\mu\text{K}$

# Pict A

Lobe sep.  
 $\sim 8'$

1°

beams:  
27' & 13'



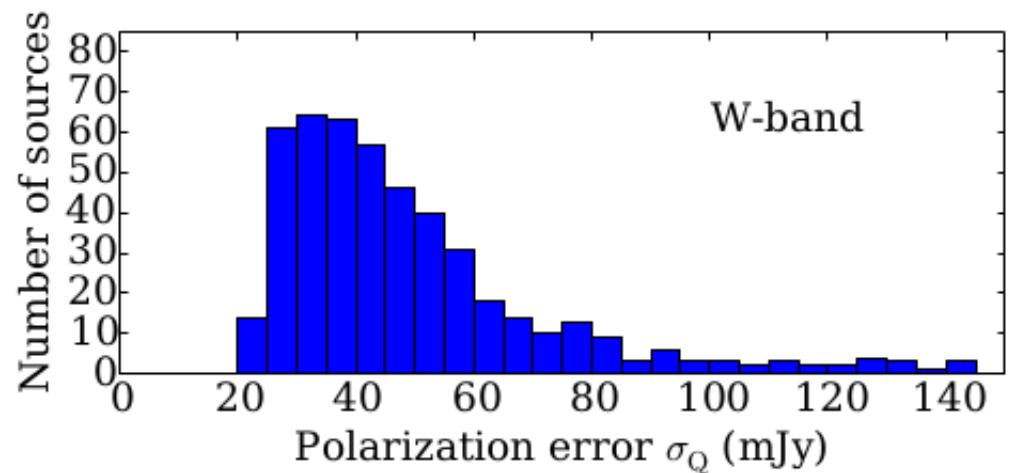
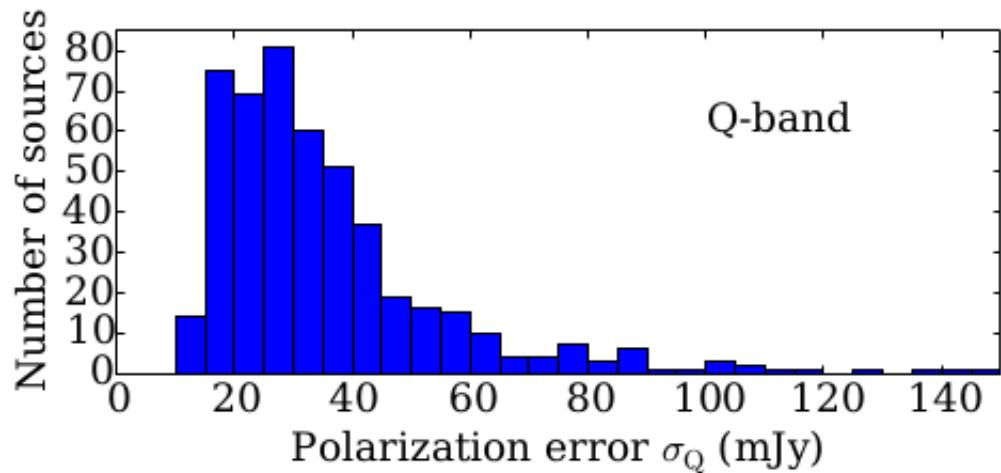
-50  $\mu\text{K}$  50

Stokes Q

Stokes U

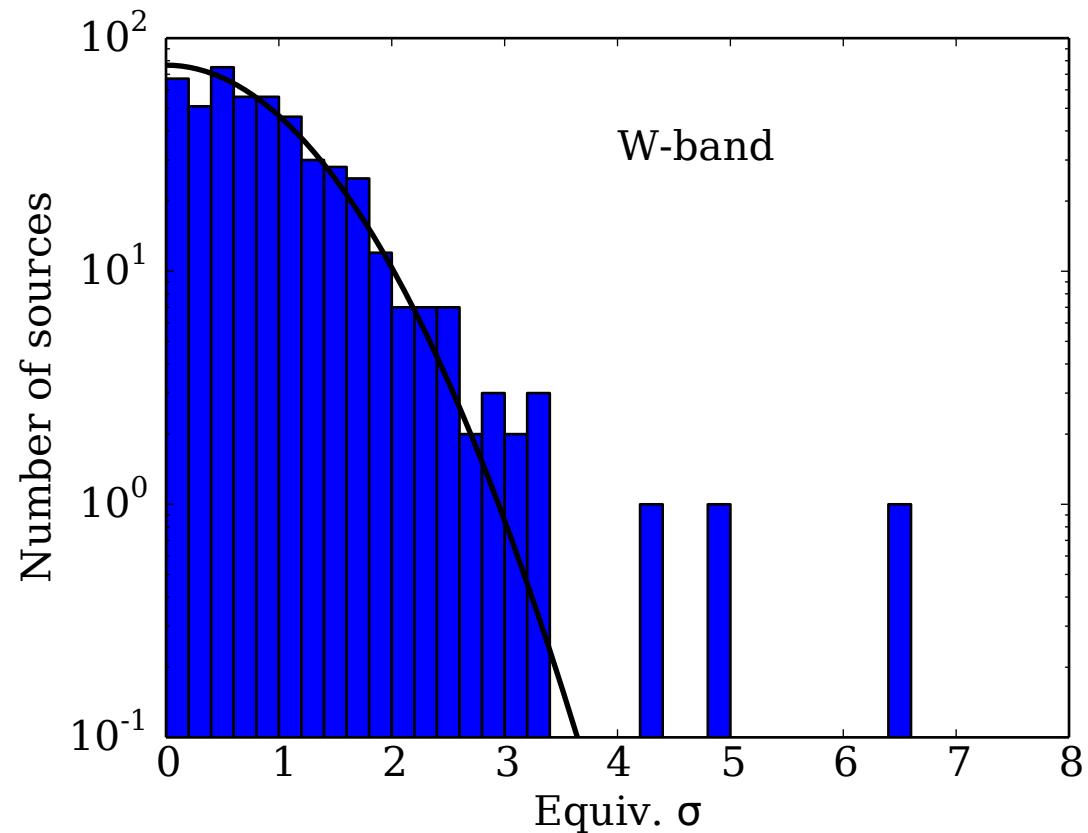
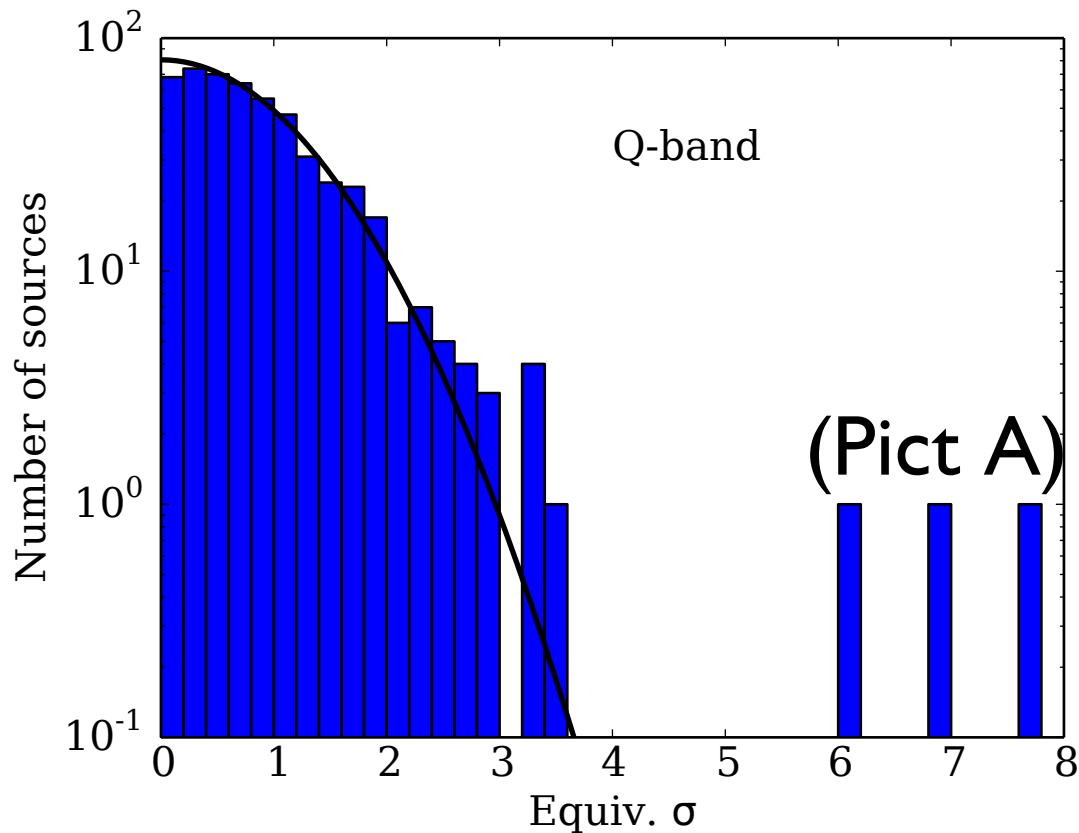
# Method for point-like sources

1. Build template for source shape (beam/psf + pix win.)
2. Measure Stokes Q,U on ~480 sources from Australia Telescope 20 GHz survey (all  $> 5\sigma$ ) (Murphy+ 2010)



3. Evaluate probability by chance of measurement
4. MC, ML measurement of polarization magnitude

# Number vs significance

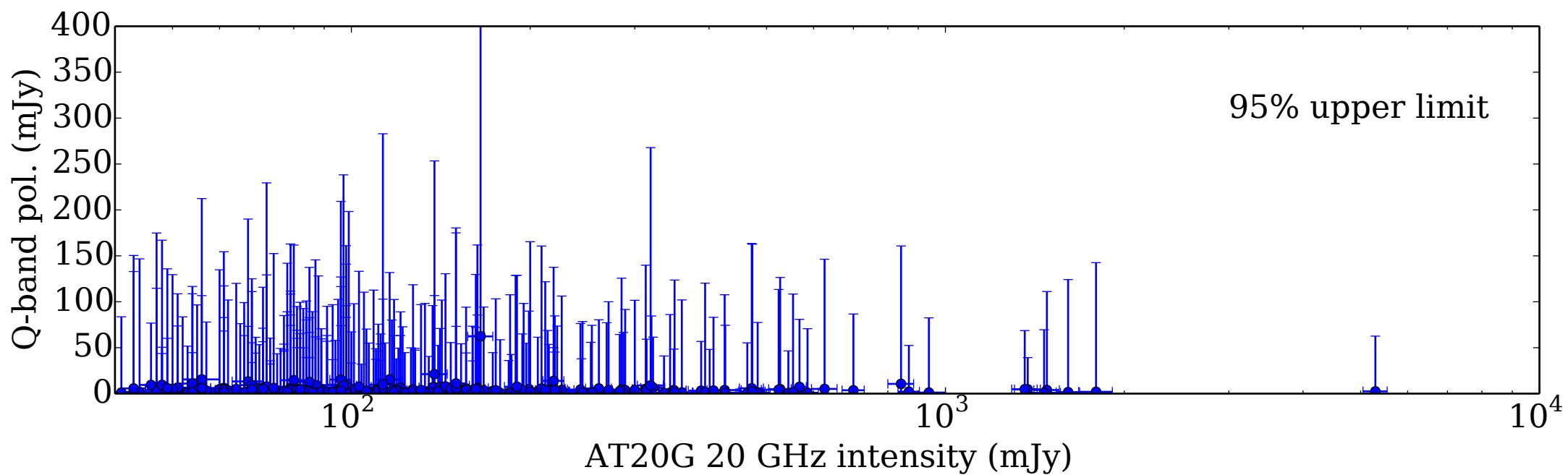
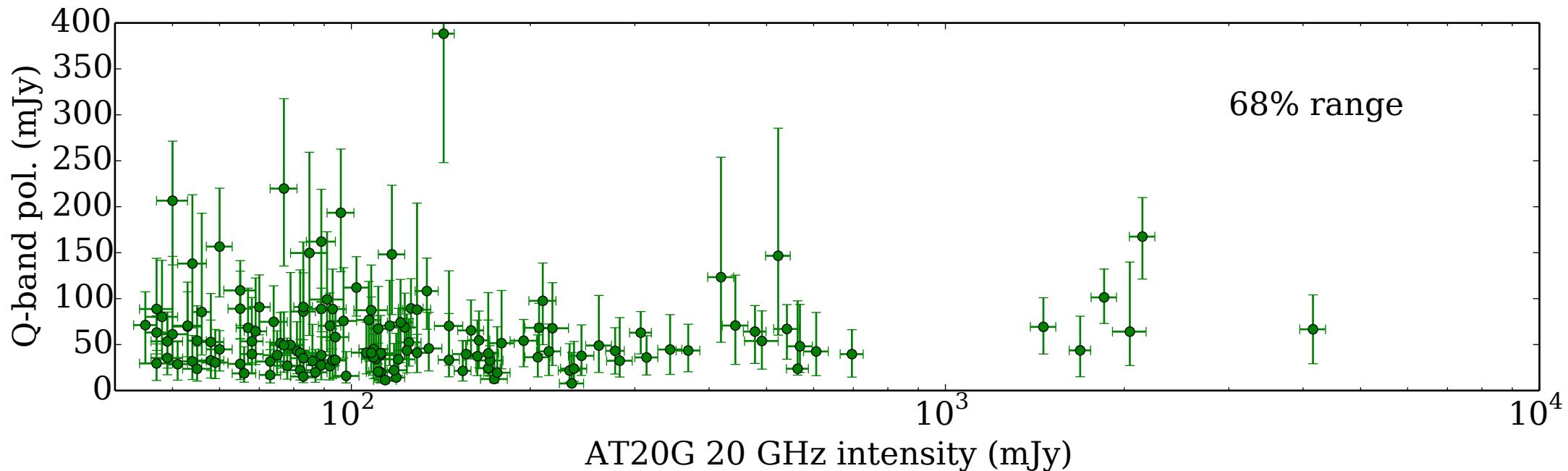


Expect 3.3 sources at  $> 2.7 \sigma$  from noise alone

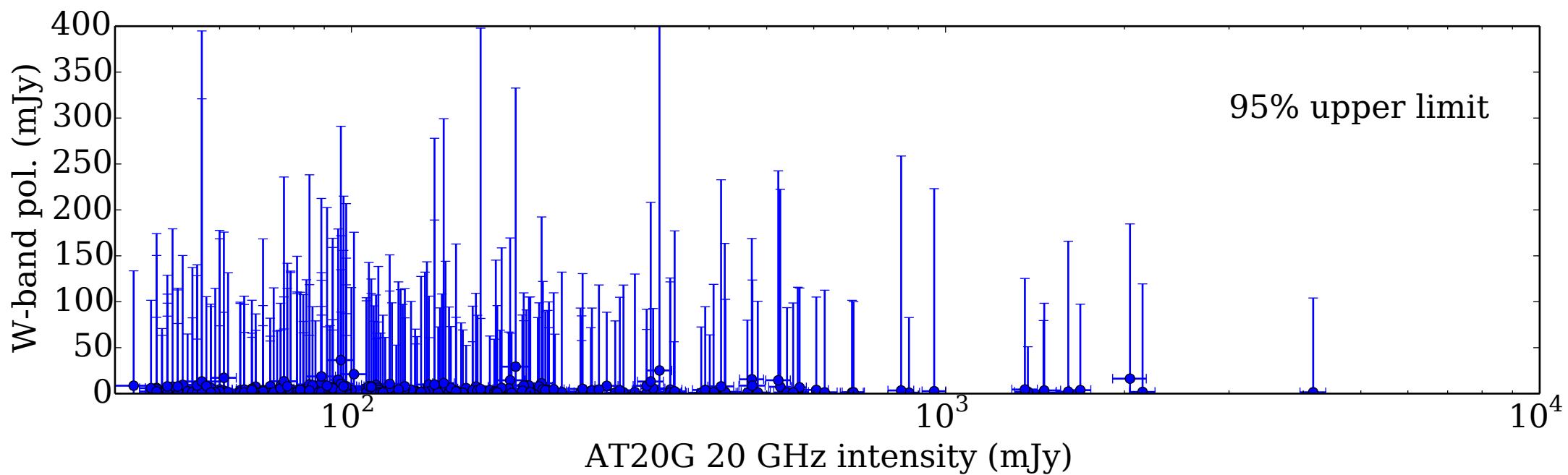
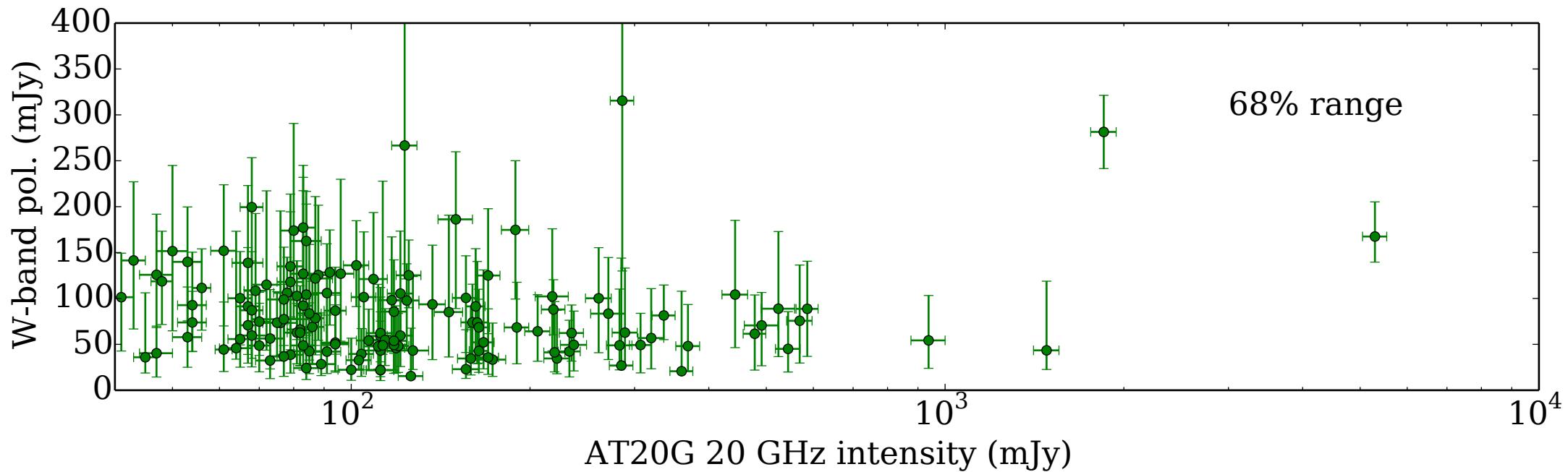
43 GHz: found 11

95 GHz: found 12

# 43 GHz polarization vs 20 GHz intensity



# 95 GHz polarization vs 20 GHz intensity



AT20GJ042840-375619,  $3.22\sigma$  (Q-band),  $6.58\sigma$  (W-band)

flux density (mJy)

3500

3000

2500

2000

1500

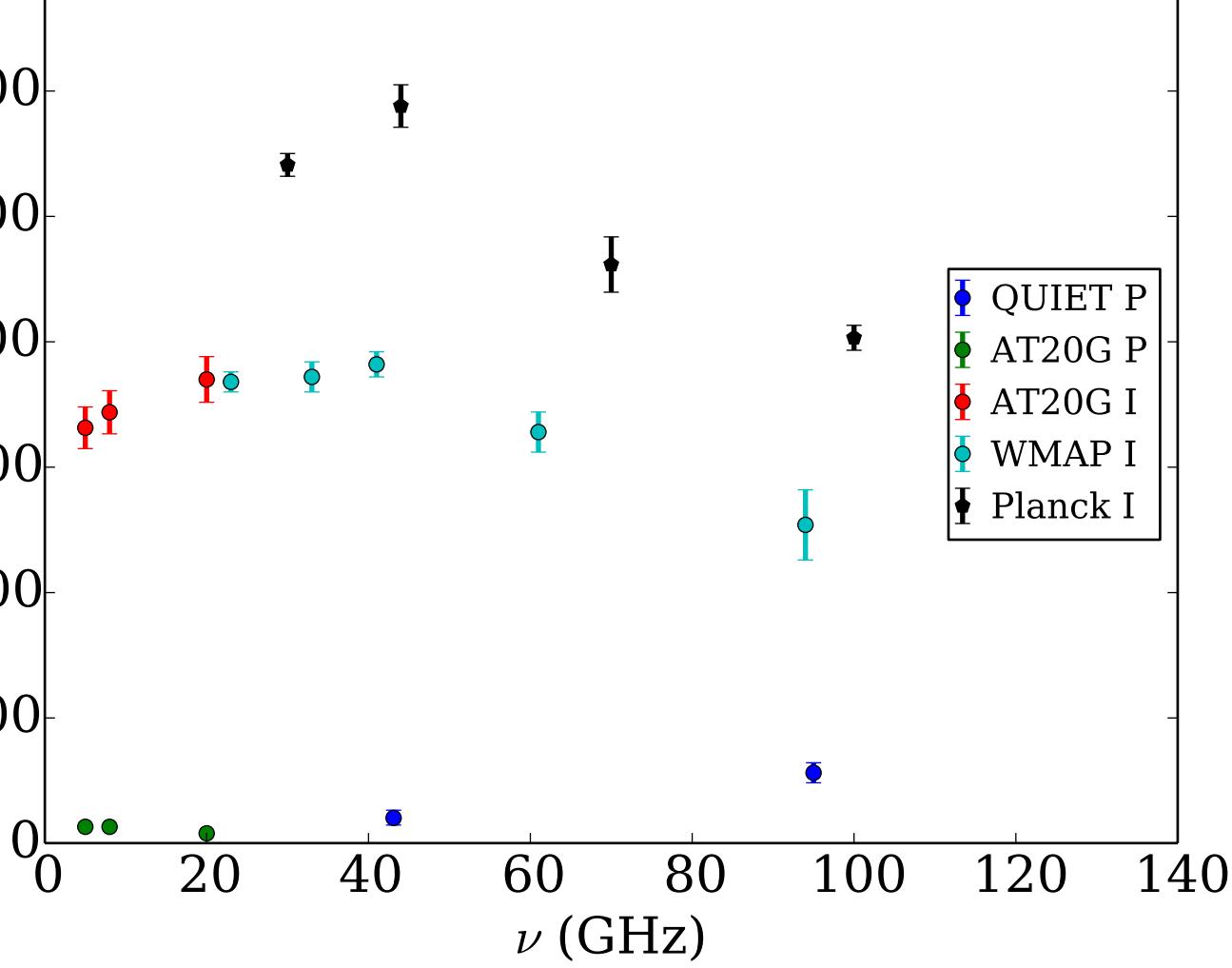
1000

500

0

 $\nu$  (GHz)

- QUIET P
- AT20G P
- AT20G I
- WMAP I
- Planck I



AT20GJ123045-312123,  $3.29\sigma$  (Q-band),  $2.78\sigma$  (W-band)

flux density (mJy)

200

150

100

50

0

$\nu$  (GHz)

- QUIET P
- AT20G P
- AT20G I

~10

~20

~40

~80

~100

~120

~140

~180

~140

~100

~110

~135

~185

~135

~105

~85

~95

~15

~15

~10

~10

# Conclusions

QUIET measured polarization at the locations of ~480 radio sources at 43 GHz and 95 GHz.

Several detections of polarized emission; many upper limits.

No immediately clear trend between 20 GHz intensity and higher frequency polarization.

SEDs of sources are diverse and interesting.

Look for our catalog on arxiv this summer!