RADIO POINT SOURCE CONFUSION IN B-MODE EXPERIMENTS

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OBSERVATIONS

- Complete sample of sources >1 Jy @ 22 GHz with declination > -34 from WMAP5 catalogue

- Re-observed using VLA D-configuration (ie high resolution)

  - 8.4 GHz (X-band)
  - 22GHz (K-band)
  - 43 GHz (Q-band)

- Polarized emission was detected >10mJy in

  - 123 sources at X-band
  - 169 sources at K-band
  - 167 sources at Q-band

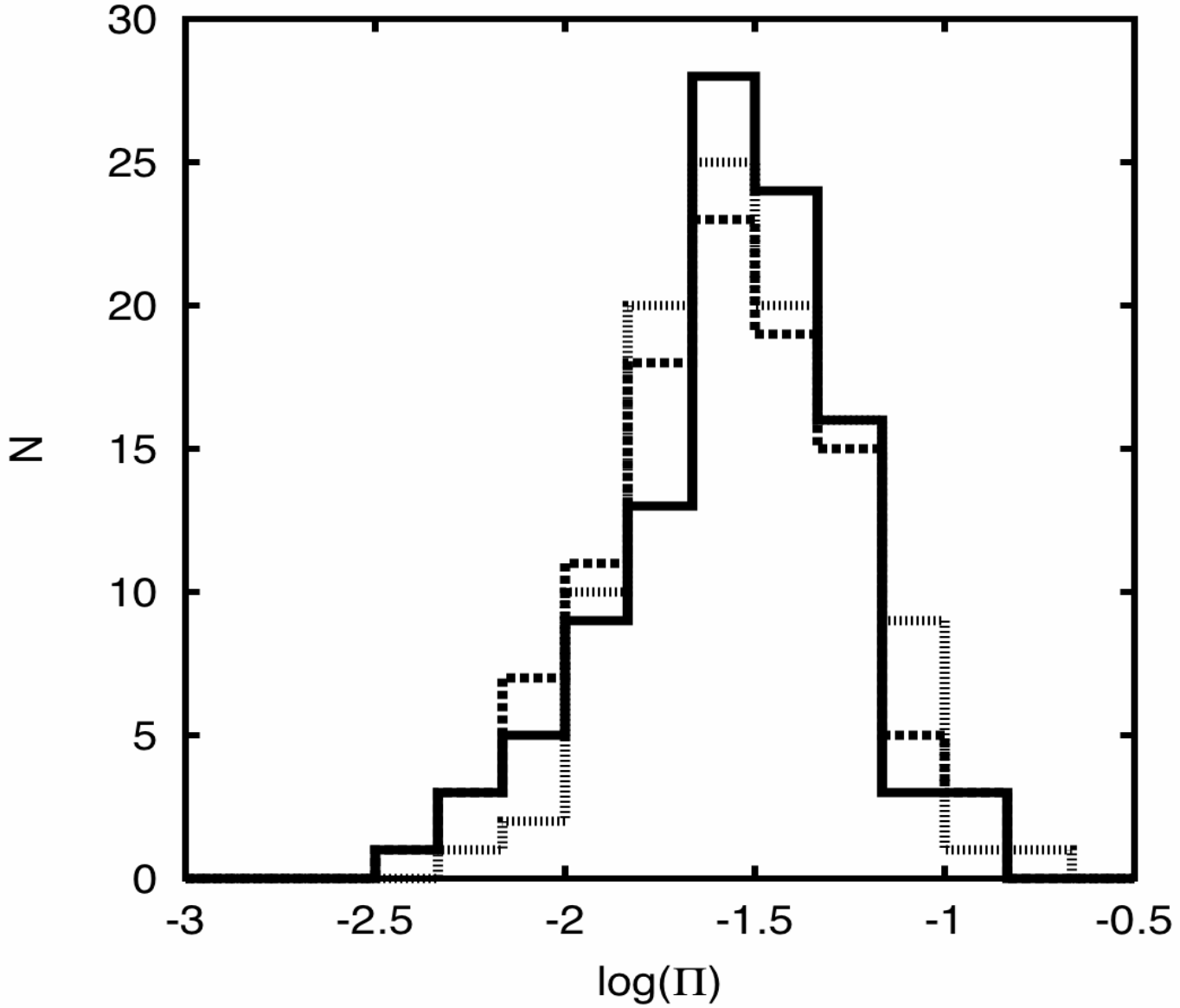
- Contemporaneous sample of 105 sources detected at each frequency – this should be free of the effects of variability

- Catalogue presented in Jackson et al – MNRAS 401 1388 (2010)

- Interpretation presented in Battye et al – arXiv:1003.5846

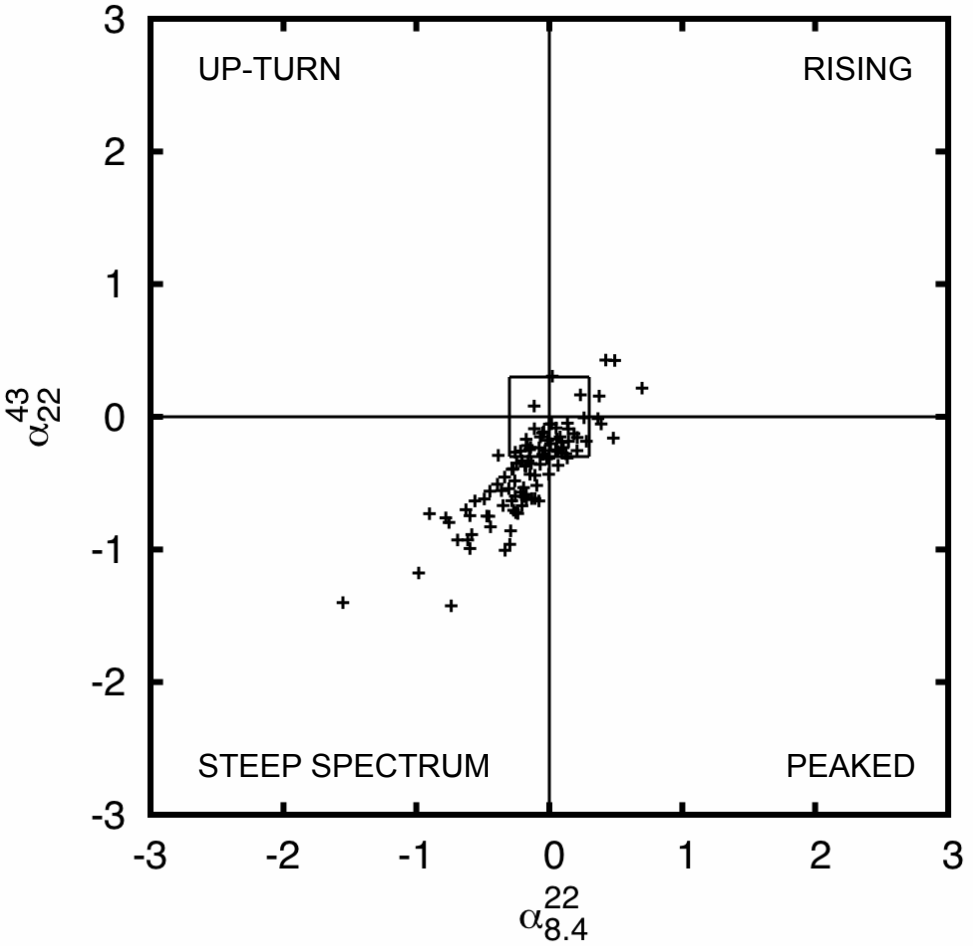
FRACTIONAL POLARIZATION

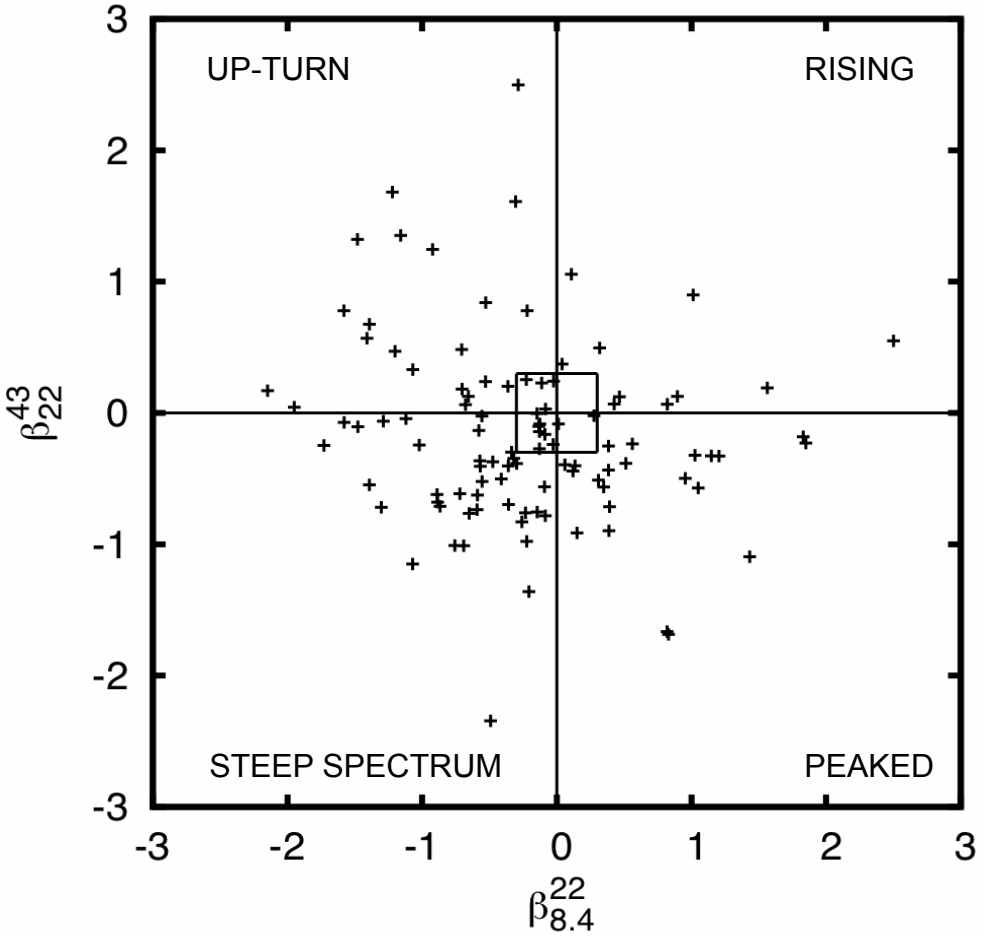
median ~ 2% & average for detected sources ~ 3.5%



→ Appears to be independent of frequency 8.4GHz and 43GHz

SPECTRAL INDEX 2-COLOUR DIAGRAMS





Total intensity : $I \sim \nu^{\alpha}$

Polarization : $P \sim \nu^{\beta}$

→ No apparent correlation in the polarization spectral indices

MODELLING THE CONFUSION NOISE

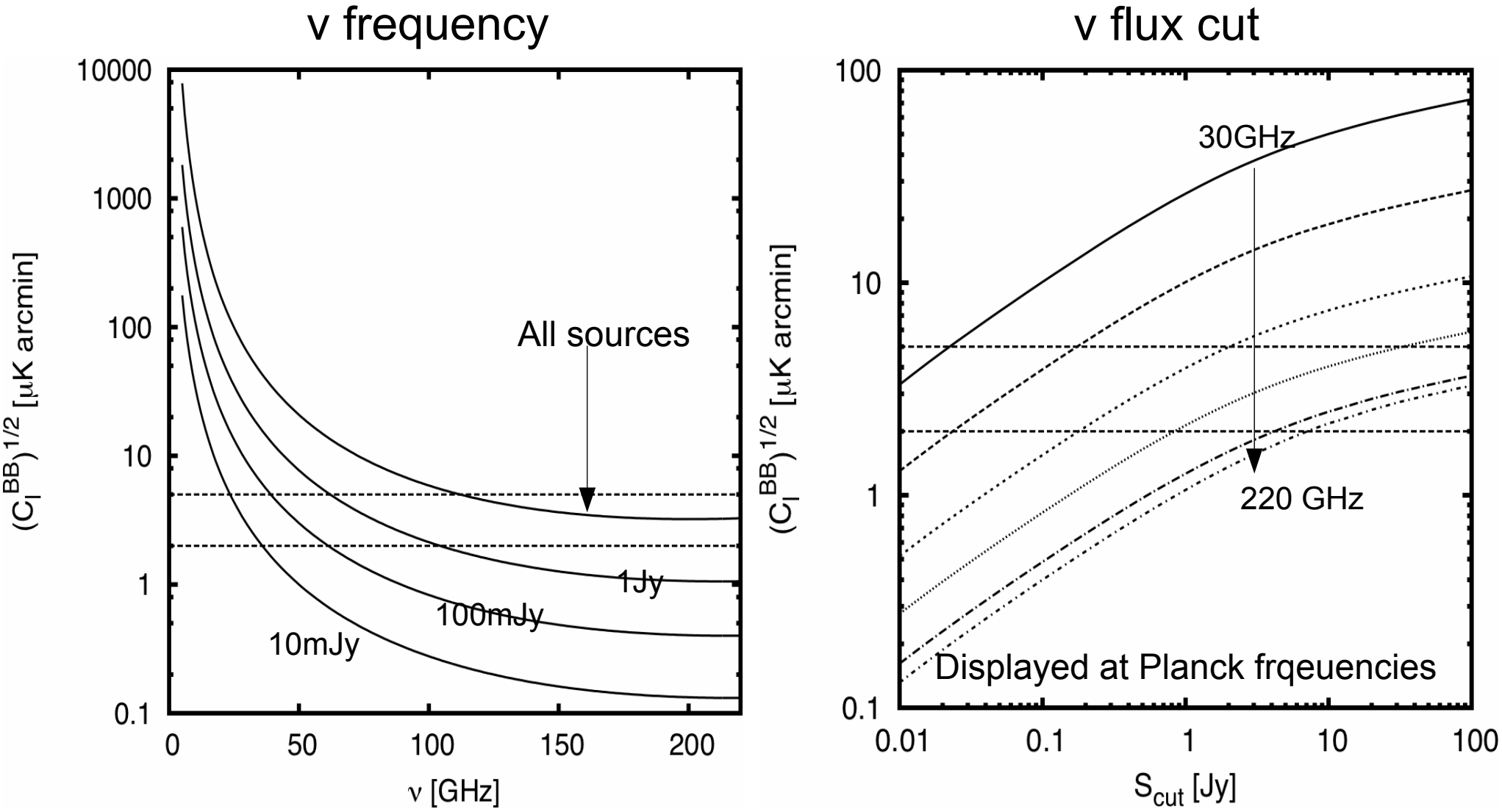
Components of the model are :

- dN/dS @ 30GHz from Toffolatti et al 1998
- Frequency extrapolation using measured distn 22-43GHz
- takes into account the observed composition of flat and steep spectrum sources
- Measured RMS fractional polarization independent of frequency
- 3.9%
- $C_\ell^P = \langle \Pi^2 \rangle \left(\frac{dB}{dT}\right)^{-2} \int_0^{S_{\rm cut}} S^2 \frac{dN}{dS} dS$

Limitations : at low flux density cut and high frequency

- should be OK upto ~ 100mJy and ~ 100 GHz

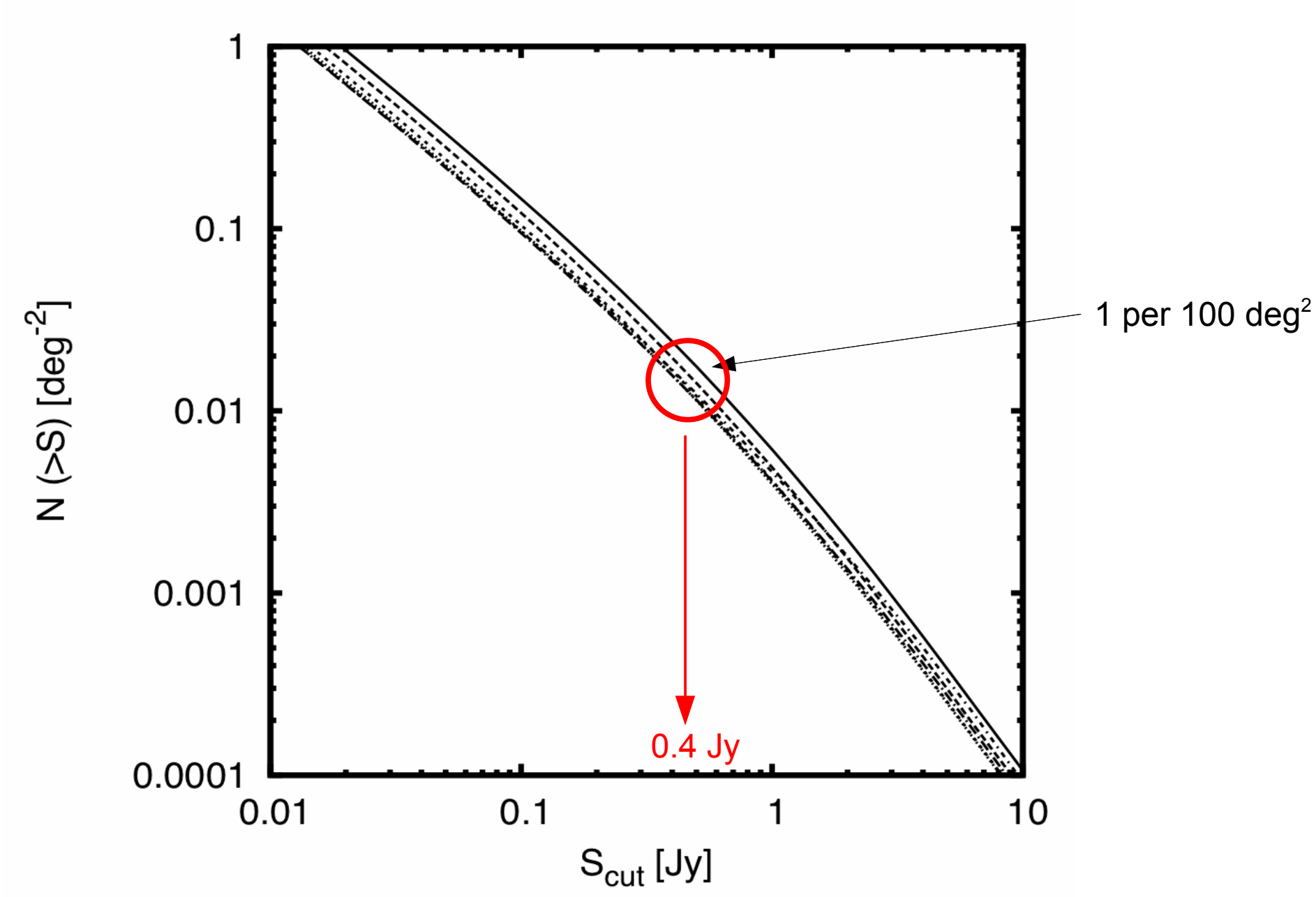
B-MODE NOISE PREDICTIONS



Horizontal lines are 5 & 2 μk arcmin

NB extrapolation is most accurate at high flux and low frequency

NUMBER OF SOURCES



COSMIC INFRARED BACKGROUND

- Sub-millimetre galaxies are likely to have low polarization
  - Arp 220 is less that 1.5% polarized @ 350GHz
- But they are highly corrrelated

$$C_\ell^P = \langle \Pi^2 \rangle \left(\frac{dB}{dT}\right)^{-2} \left[\int_0^{S_{\rm cut}} S^2 \frac{dN}{dS} dS + w_\ell \left(\int_0^{S_{\rm cut}} S \frac{dN}{dS} dS\right)^2\right]$$

- Estimate of the Poisson contribution

$$\sqrt{C_\ell^{BB}} = \frac{\langle \Pi^2 \rangle^{1/2}}{0.01} \times (0.5 \text{ or } 0.7) \mu K \, \text{arcmin}$$

- $w_\ell \approx 10^{-6}\,\text{sr}$ ⟶ corrleated component ~ 30 times larger

POWER SPECTRUM RECONSTRUCTION

- using PURE C_l method

(Preece & Battye 2010)