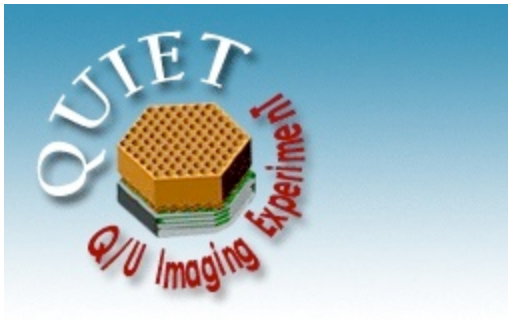
QUIET

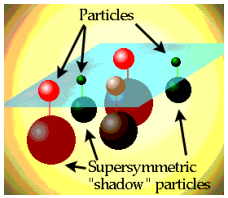


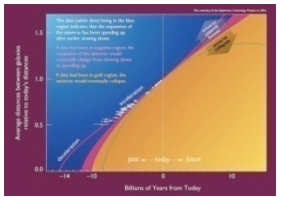
Scott Dodelson (Science case; Competitive experiment; Weaknesses; Future)

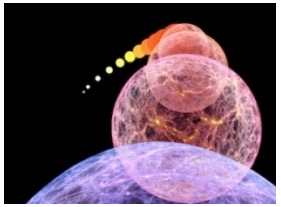
Hogan Nguyen (FNAL role; Value of Contributions)

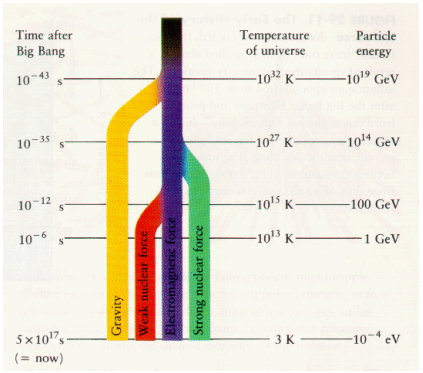
Physics Beyond the Standard Model

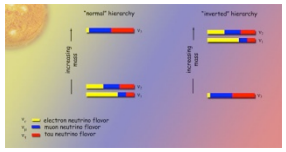
- Dark Matter
- Dark Energy
- Inflation
- Neutrino Mass







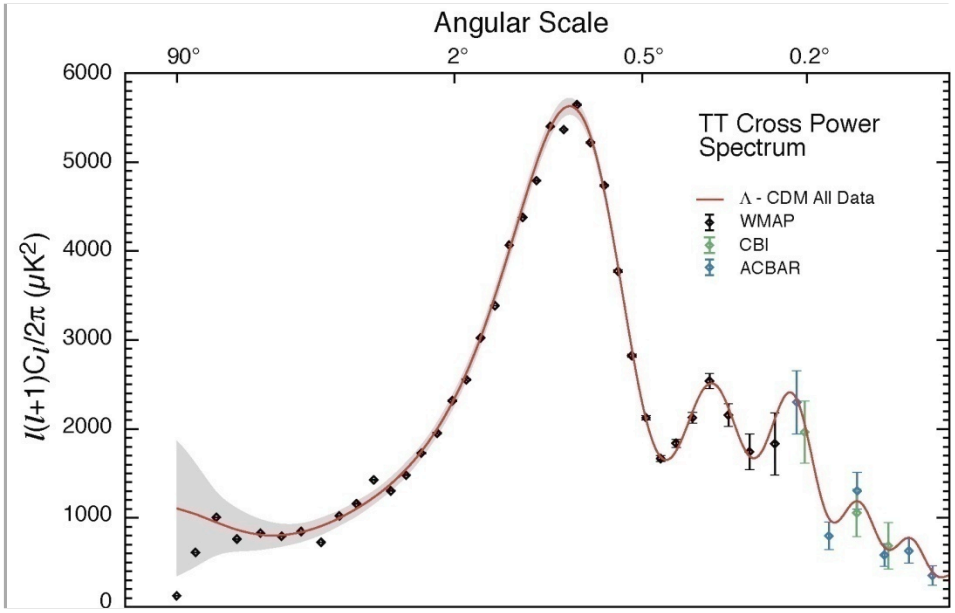




This list may well extend in both directions

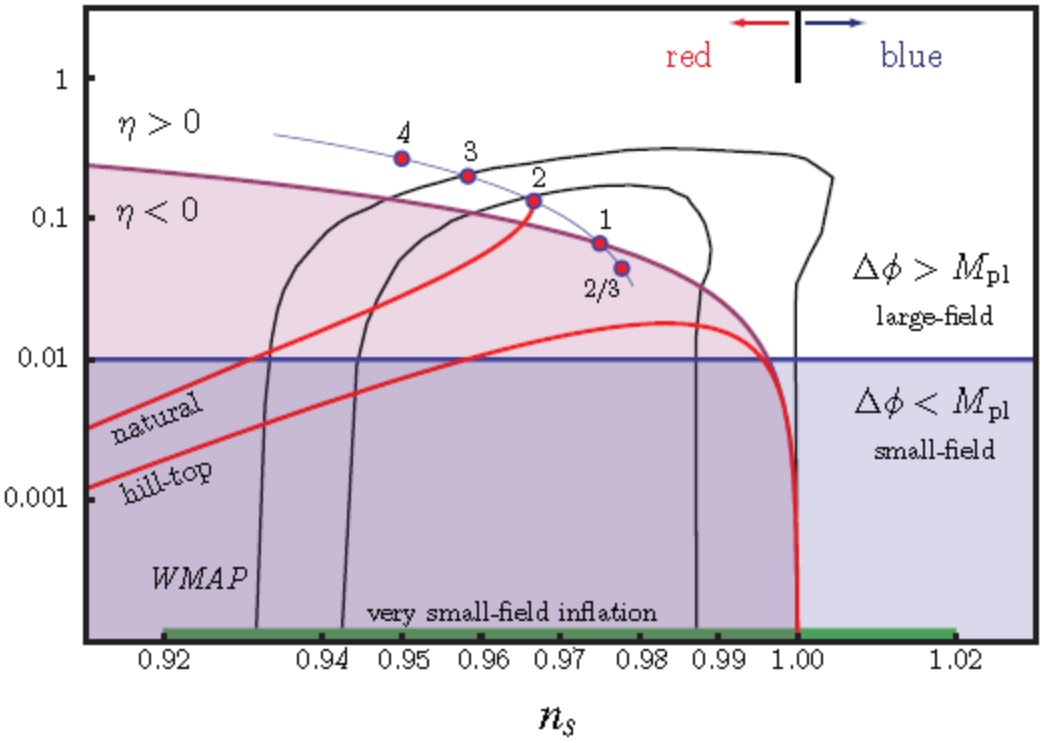
Inflation can now claim several successful *predictions*

- Flatness of the Universe
- Coherent Series of Peaks and Troughs in the CMB
- Nearly Scale Invariant Perturbations
- Gaussian Perturbations



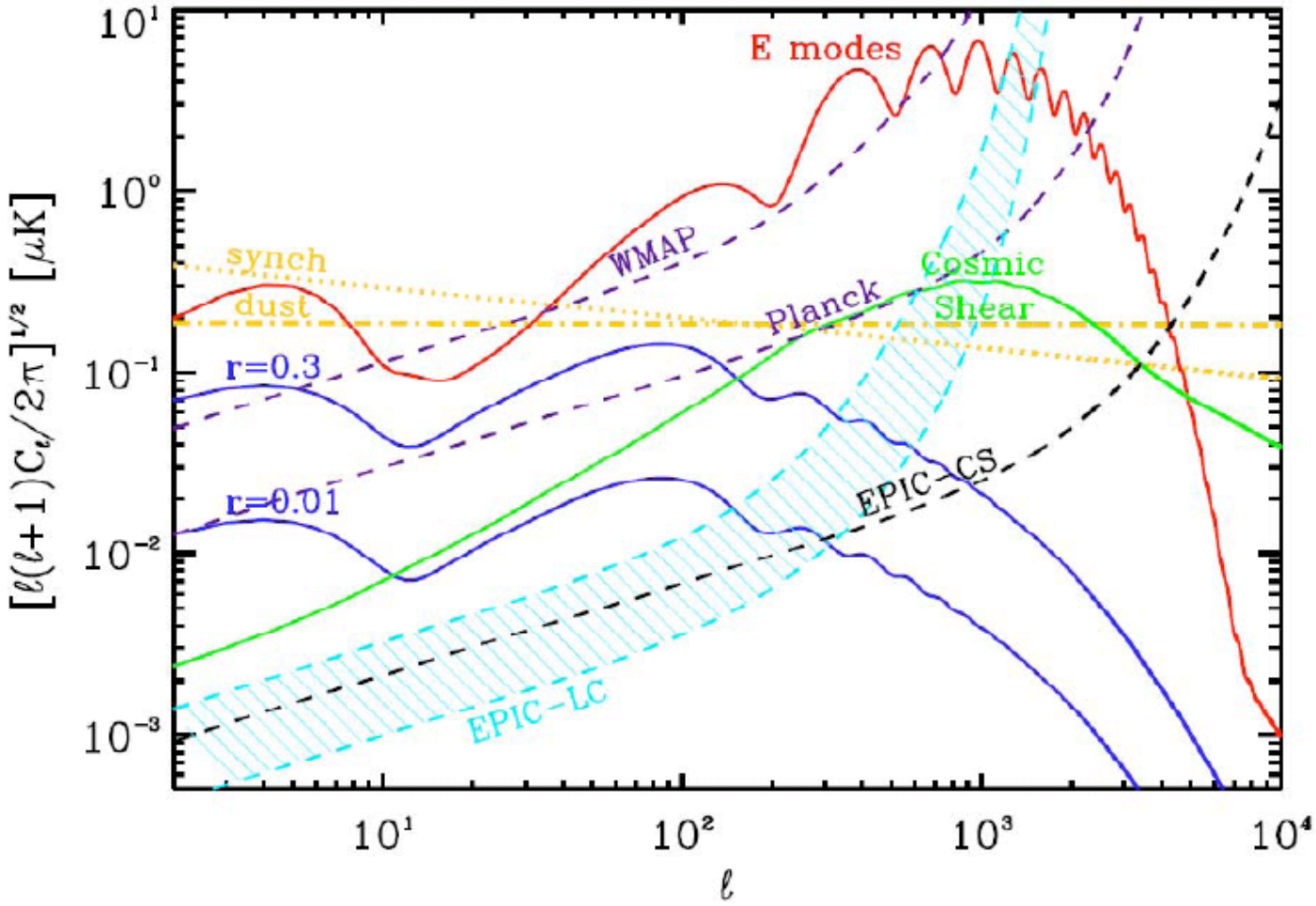
One remaining untested prediction is primordial gravitational waves

Ratio of GW/ Scalar Perturbations

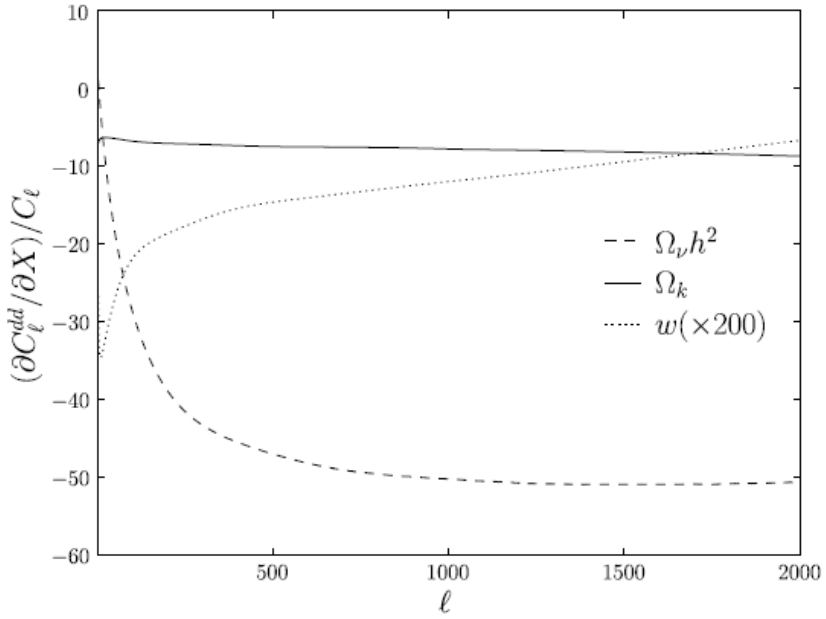


Constraints in this plane correspond to probing physics at the GUT scale!

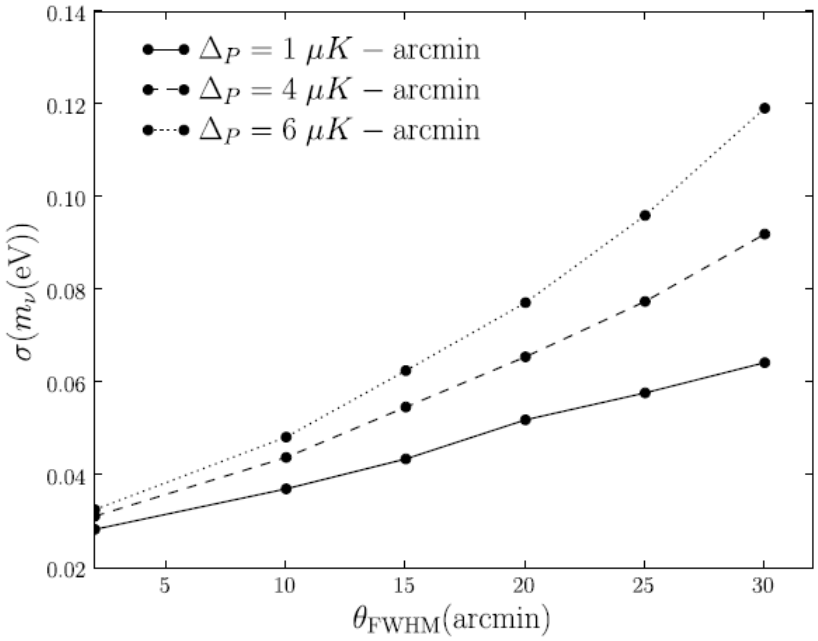
The best way to test this prediction is by measuring polarization of CMB



Neutrino Mass Comes for Free



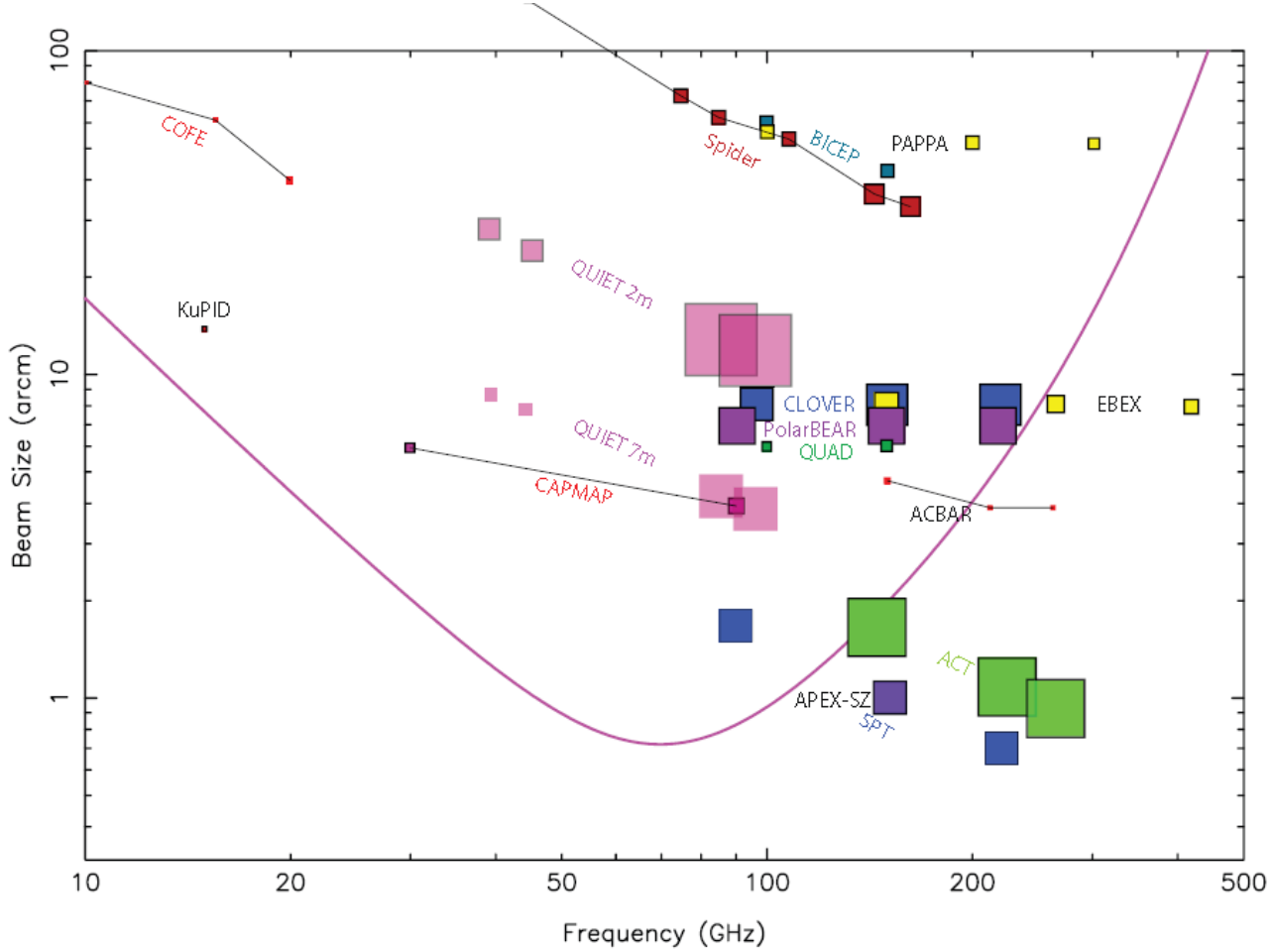
Infer deflection spectrum from CMB polarization; this is sensitive to neutrino mass (different dependence than DE)



Potential to hit the lower limit of 0.05 eV

QUIET is one of the leading CMB experiments

Bigger is better: Size proportional to number of detectors X Integration time



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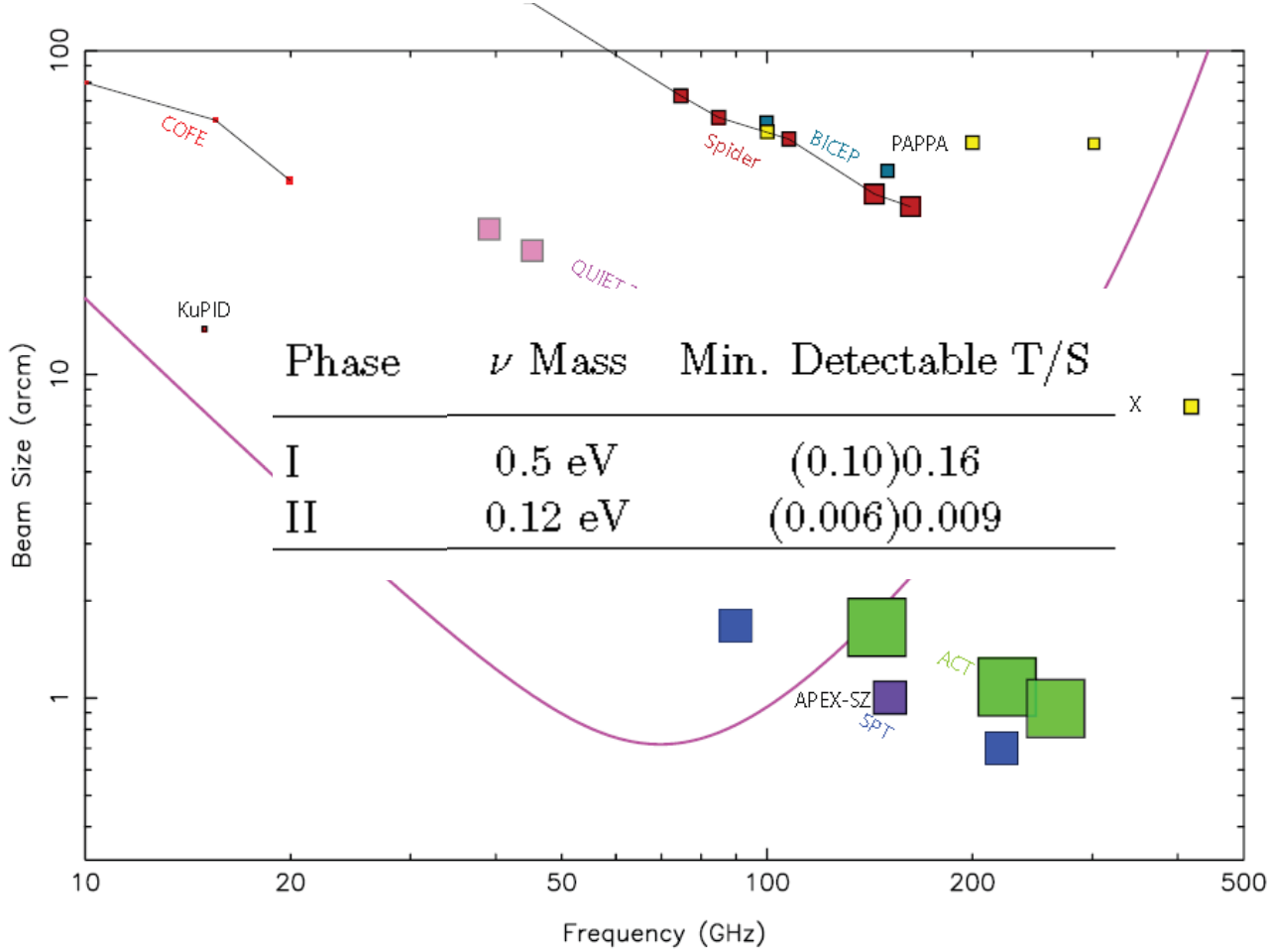

Phase	ν Mass	Min. Detectable T/S
I	0.5 eV	(0.10)0.16
II	0.12 eV	(0.006)0.009

Weaknesses (aka Challenges)

- Late Start (perceived leaders are Princeton, Berkeley, Caltech) but see Hogan's talk!
- HEMT's: both a strength (QUIET is the only experiment using them and low frequencies are essential for foreground discrimination) and a weakness (Weiss Report: ``*highest priority needs to be given to the development of bolometer-based polarization sensitive receivers.*'')
- Analysis: Have yet to contribute to QUIET analysis

The Future

- This will not be the last generation of CMB experiments
- U. Chicago hosts 2 leading experiments with two different technologies (with 20% overlap)
- FNAL and ANL have the resources that will be essential to the next generation (which will have ~10^4-10^5 detector elements)
- Chicagoland can be the leader in the next generation of CMB experiments