Probing inflation: the future

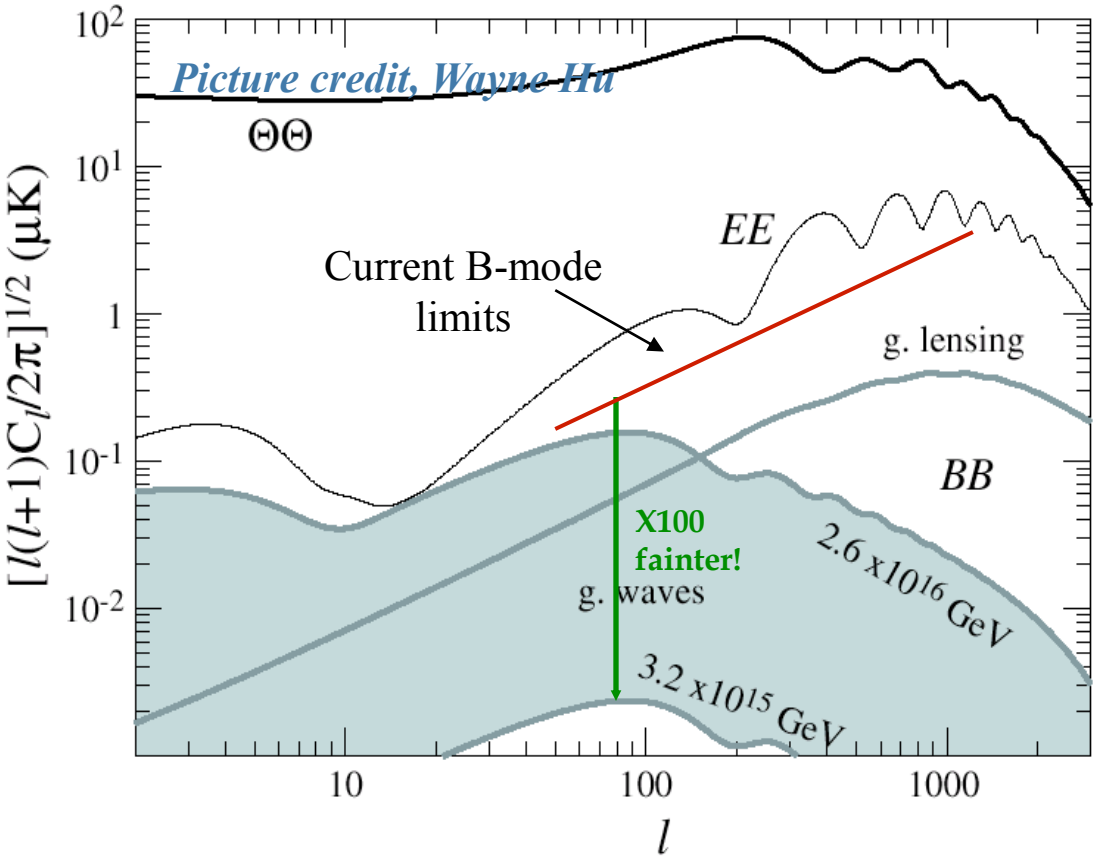
Label	Definition	Physical Origin	Current Status	Section
A_s	Scalar Amplitude	V, V'	$(2.445 \pm 0.096) \times 10^{-9}$	§3.4
n_s	Scalar Index	V', V''	0.960 ± 0.013	§3.4
α_s	Scalar Running	V', V'', V'''	only upper limits	§3.4
A_t	Tensor Amplitude	V (Energy Scale)	only upper limits	§3.4
n_t	Tensor Index	V'	only upper limits	§3.4
r	Tensor-to-Scalar Ratio	V'	only upper limits	§3.4
Ω_k	Curvature	Initial Conditions	only upper limits	§6.2
$f_{\rm NL}$	Non-Gaussianity	Non-Slow-Roll, Multi-Field	only upper limits	§5.3
S	Isocurvature	Multi-Field	only upper limits	§5.4
$G\mu$	Topological Defects	End of Inflation	only upper limits	§6.1

See review Baumann et al., arXiv:0811.3919

CMB measurements will continue to play a key role in determining these parameters

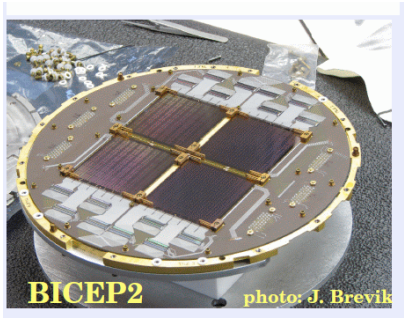
$$V(\phi) = V|_\star + V'|_\star (\phi - \phi_\star) + \frac{1}{2} V''|_\star (\phi - \phi_\star)^2 + \frac{1}{3!} V'''|_\star (\phi - \phi_\star)^3 + \cdots$$

What do we need?

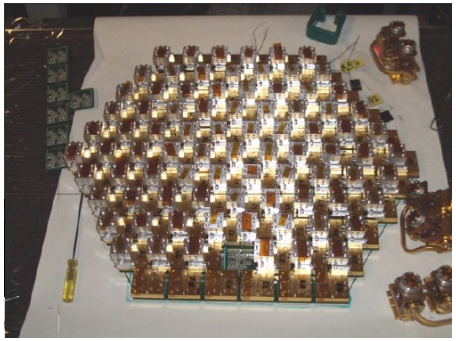


$$\Delta C_l \propto \sqrt{A}\left(\frac{\Delta T^2}{n_{QU}\tau\, B}\right)$$

A – total sky area observed
ΔT – sensitivity per QU $\mu Ks^{1/2}$
n_{QU} – number of Q, U measurements in the focal plane
B – bandwidth
τ – total observing time



BICEP2 90 GHz array
n_{QU}=128

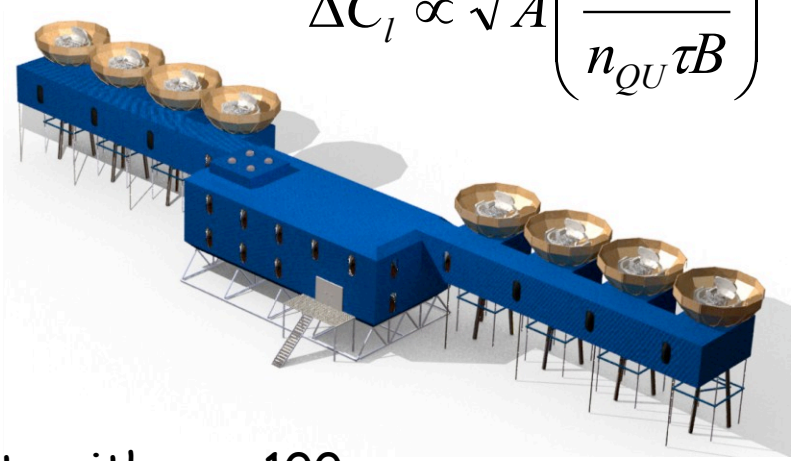


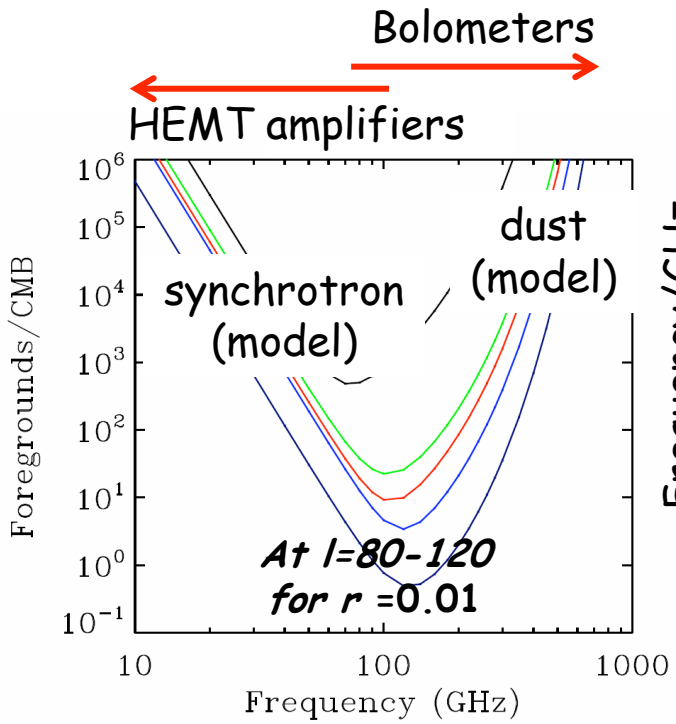
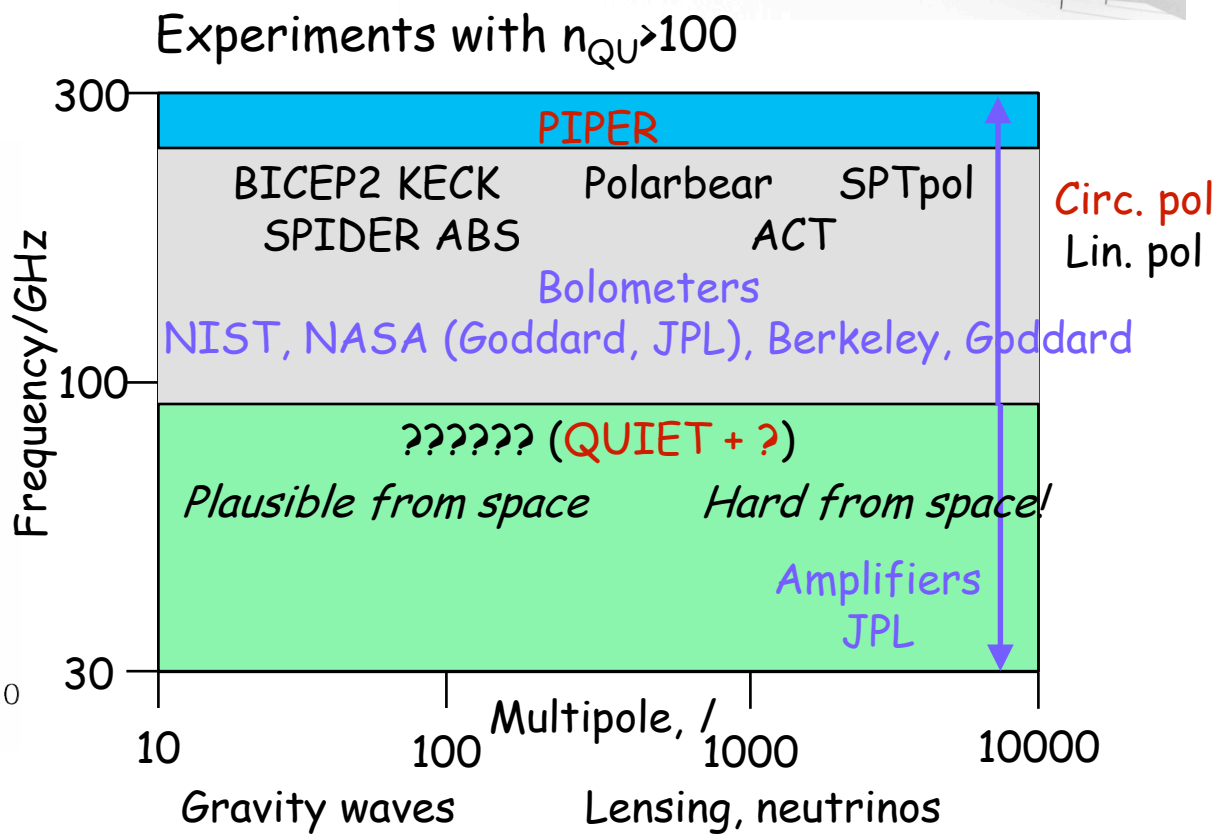
QUIET I 90 GHz array
n_{QU}~88

The future

- **These are *not* table-top small investigator projects costing <1-2M**
- 20,000+ detectors
- **Range of measurement techniques for systematics control**
- **Data analysis issues; distribution to wide community**

$$\Delta C_l \propto \sqrt{A}\left(\frac{\Delta T^2}{n_{QU}\tau B}\right)$$





Dunkley et al., 2009
Foreground study