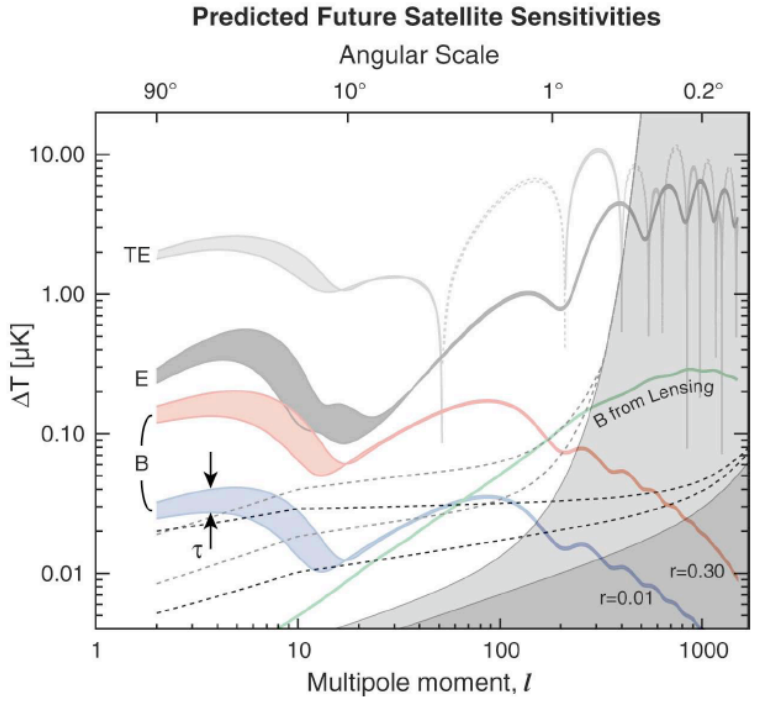
Weiss *et al.*, plan



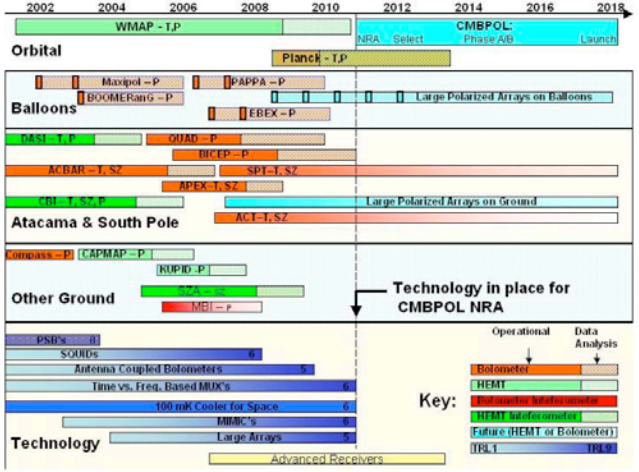


Figure 10.1: Schematic timeline of research programs observing CMB small-scale temperature fluctuations, CMB polarization, and technology development are needed f development, first at the component l by 2011 for the CMBPOL mission op

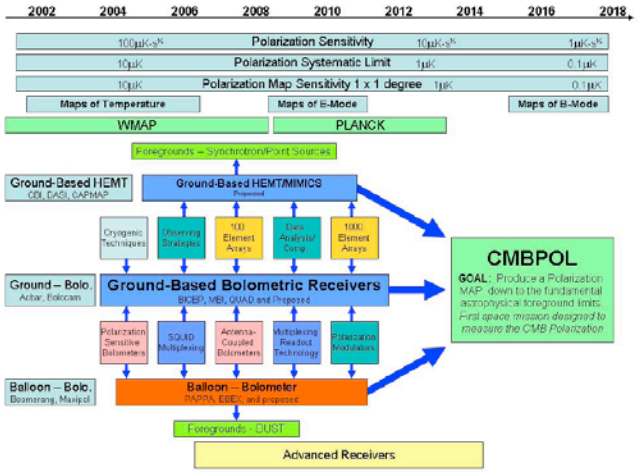


Figure 10.2: The elements of the CMB polarization research timeline showing the range of improvements in sensitivity expected and the activities that need to be carried out to realize a space-borne CMB polarization measurement in the next decade.

Planning post-TFCR

NASA

- *PPPDT*:S. Hanany (chair), C. Bennett , J. Bock, J. Borrill, J. Gundersen G. Hinshaw, A. Kogut, L. Krauss, A. Lee, A. Miller, S. H. Moseley, L. Page, C. Lawrence, T. Readhead, P. Timbie
- *Adv. Mission Concept Study*: S. Meyer, J. Bock, J. Borrill, A. Cooray, S. Dodelson, J. Dunkley, K. Gorski, S. Hanany, G. Hinshaw, K. Irwin, B. Keating, A. Kogut, C. Lawrence, A. Lee, A. Miller, L. Page, J. Ruhl, M. Seiffert, M. Shimon, M. Zaldarriaga

NSF

- By review and report, no formal assessment group

Coauthors in blue were original Weiss Report coauthors.

CMB Programs

Table 1: Future Suborbital CMB Polarization Experiments.

	Technology	FWHM (arcmin)	Frequency (GHz)	Detector Pairs	Modulator
US-led balloon-borne:					
EBEX (Oxley et al., 2004)	TES	8	150/250/410	398/199/141	HWP
Spider (Montroy et al., 2006)	TES	60/40/30	96/145/225	288/512/512	HWP/Scan
PIPER I	TES	21/15	200/270	2560/2560	VPM
PIPER II	TES	14	350/600	2560/2560	VPM
US-led ground-based:					
ABS(Staggs et al., 2008)	TES	30	150	200	HWP
ACTpol(Fowler et al., 2007)	TES	2.2/1.4/1.1	90/145/217	~ 1000	Scan
BICEP 2(Nguyen et al., 2008)	TES	37	150	256	HWP/Scan
Keck Array(Nguyen et al., 2008)	TES	55/37/26	100/150/220	288/512/512	HWP/Scan
MBI(Korotkov et al., 2006)	NTD	60	100	4	Int.
Poincare(Chuss, 2008)	TES	84/30/24	40/90/150	36/300/60	VPM
PolarBeaR(Lee et al., 2008)	TES	7/3.5/2.4	90/150/220	637	HWP
QUIET I(Samtleben, 2008)	MMIC	20/10	44/90	~100/1000	ϕ-switch
SPTpol(Ruhl et al., 2004)	TES	1.5/1.2/1.1	90/150/225	~ 1000	Scan
European-led ground-based:					
BRAIN(Polenta et al., 2007)	TES	60	90/150	256/512	Int.
C_ℓOVER(Piccirillo et al., 2008)	TES	7.5/5.5/5.5	97/150/225	3x96	HWP
QUIJOTE(Rubino-Martin et al., 2008)	HEMT	54-24	10-30	34	HWP

Notes: Abbreviations in the modulator column are for halfwave plates (HWP), pure scanning (Scan), scanning with stepped HWP (HWP/Scan), variable-delay polarization modulators (VPM), waveguide phase switch (ϕ-switch) and interferometers (Int.); experiments with no hardware polarization modulator are indicated by a dash, and will reconstruct polarization via their scan modulation only.

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Current (FY10) funding

- NASA: $6.2M for suborbital missions, detector development, supporting technology, graduate students (NESSFs)
- NSF: ~$5M For ground-based experiments both in operation and under development; technology; theory and computation