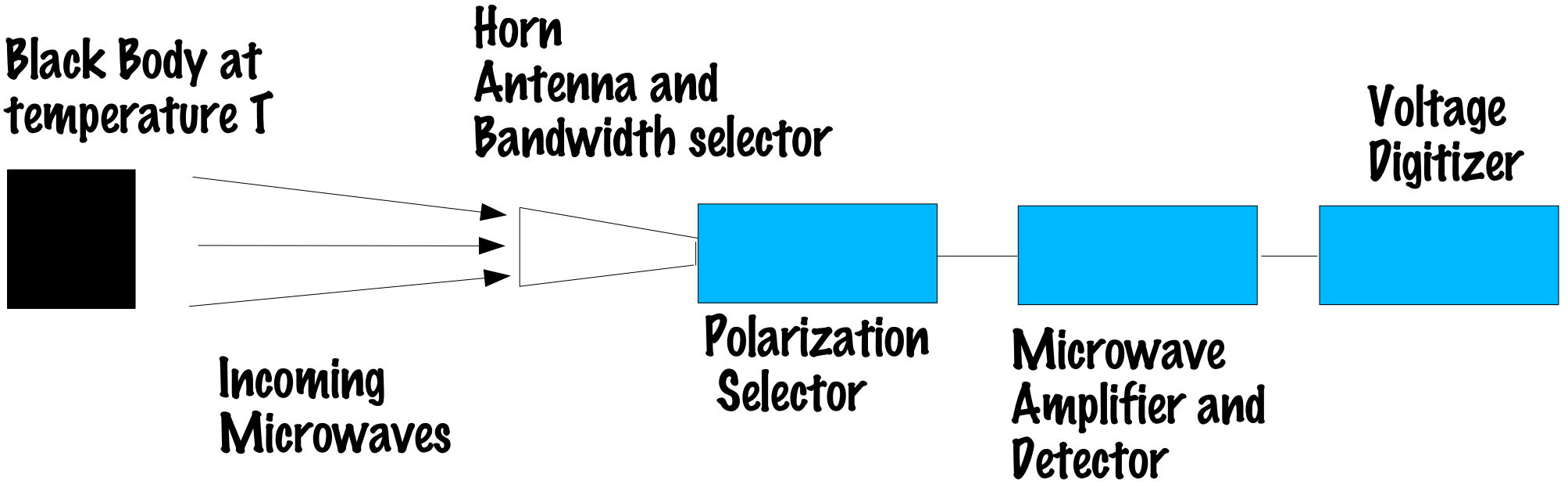
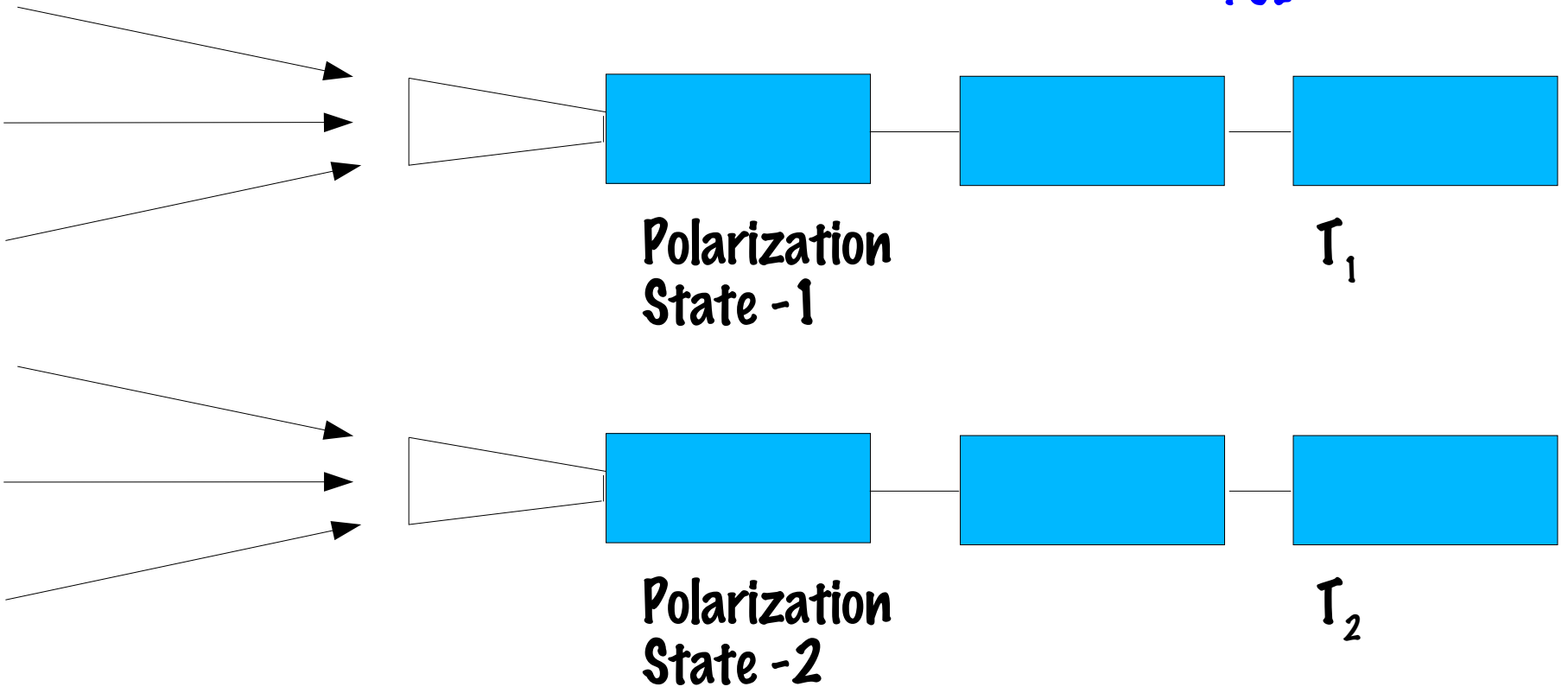
Conceptual Overview of the QUIET Technique



- QUIET measures the instantaneous Microwave Power, which has units of Watts.

- Equivalent, conceptually, to a Black Body at some Temperature T.

The Polarization Temperature (T_{POL})



Polarization Temperature $T_{POL} = T_1 - T_2$

All CMB Pol experiments aim to measure T_{POL} versus sky position. They differ in the execution.

Signal Seen by Detector

CMB Polarization (T_{POL} << 1 μK)

Galactic Magnetic fields, dust, sychroton radiation (T_{POL} = few mK)

CMB (T = 3K)

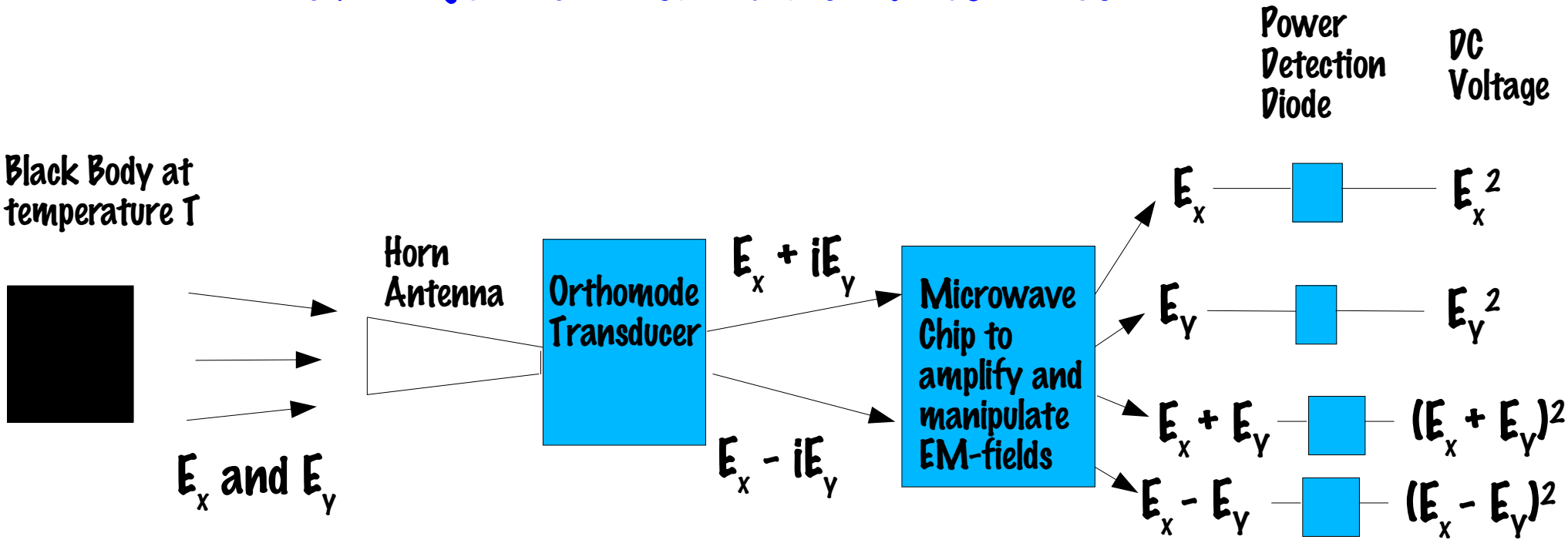
Terrestrial Bkg (10-20K)

Internal System Electronic Noise (20 K)

The Experimental Challenge

- Use low temperature electronics to reduce system temperature
- Use dry environment (Chile mountain desert or SouthPole) to minimize terrestrial Background
- Use Multiple Frequency Bands to calibrate and subtract astrophysical foreground contamination
- Take LONG sky exposures and use HUGE detector arrays to reduce statistical error

The QUIET Polarization Module



Simultaneous Measurement of all Polarization Quantities in a SINGLE CHIP

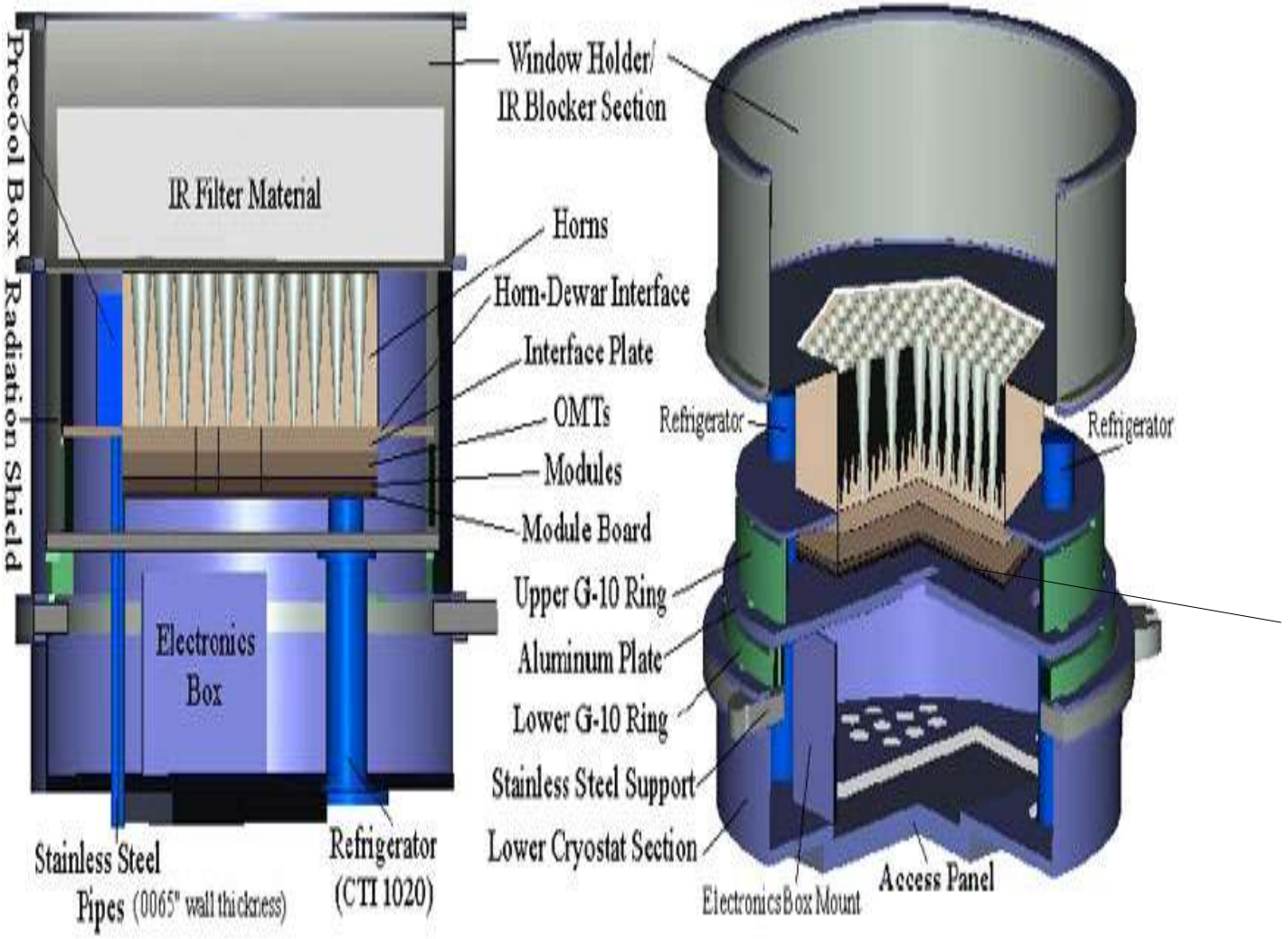
E_x^2 E_y^2 $(E_x + E_y)^2$ $(E_x - E_y)^2$

* The execution is very different for Bolometer-based Detectors
** No Heterodyning Performed

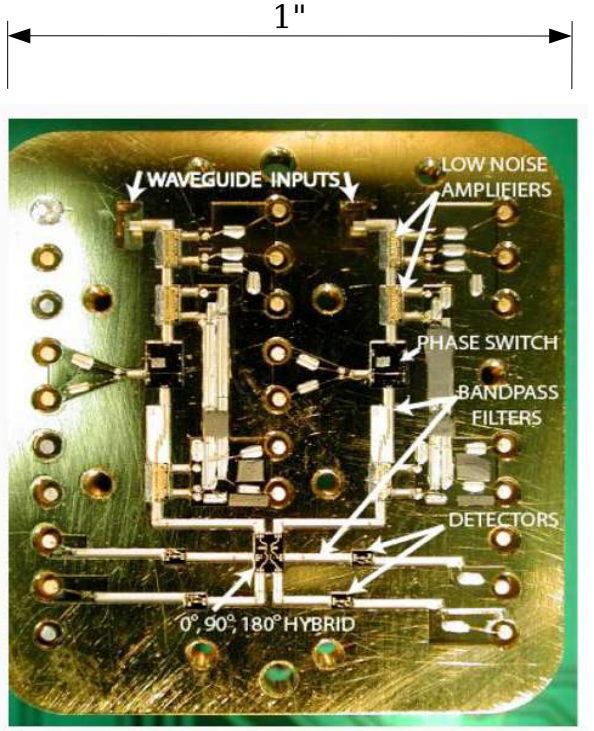
A QUIET Cryostat

(91 detectors shown)

Detectors use
High Electron Mobility
Transistors (HEMT) to
detect microwaves



A QUIET Electronic
Module tuned for
detecting 90 GHz
microwaves

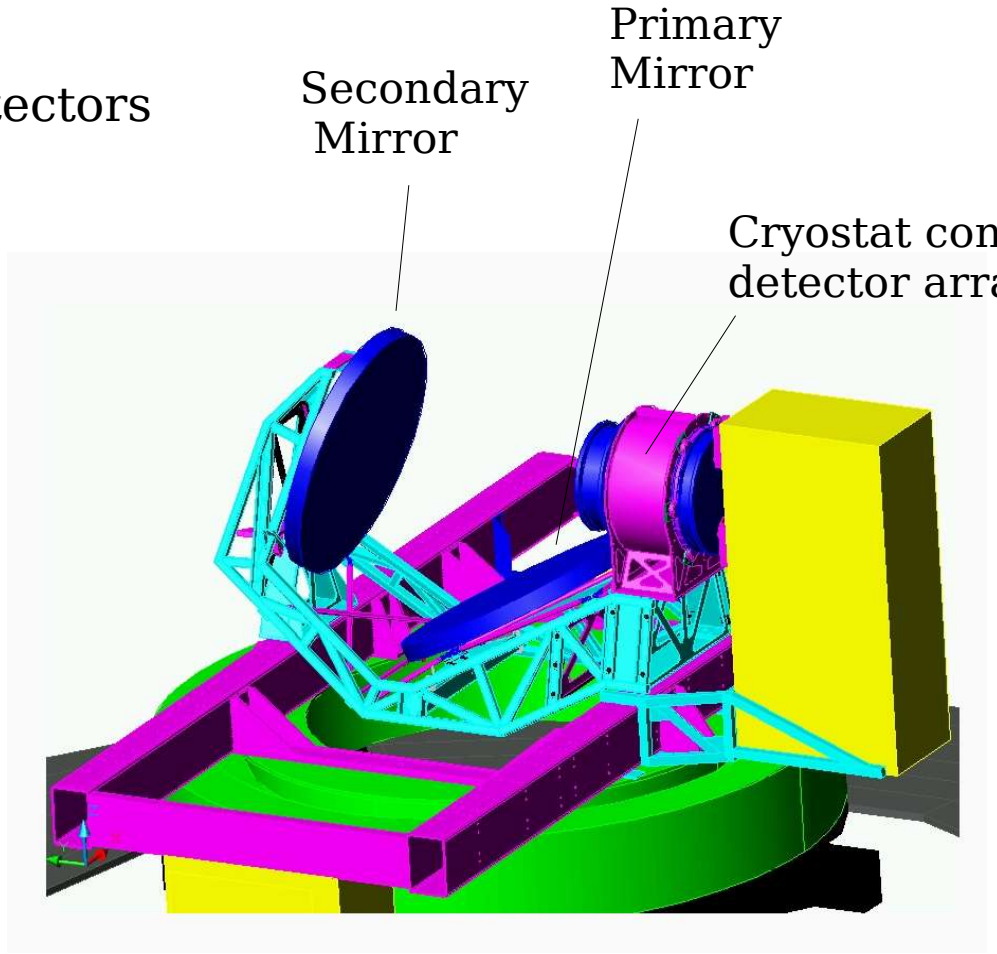


The QUIET Experiment

QUIET Phase-1 (funded): ~ 110 detectors

QUIET Phase-2 (unfunded): ~1300 detectors

Planned 3+ year operation in the Atacama Plateau, Chile.
(~5000 meters AGL).



First run in fall 2008 with an array of 19 Q-band (40 GHz) detectors.

Second Run in Spring 2009 with an array of 91 W-band (90 GHz) detectors