

Noise and focal plane models

September 26, 2017

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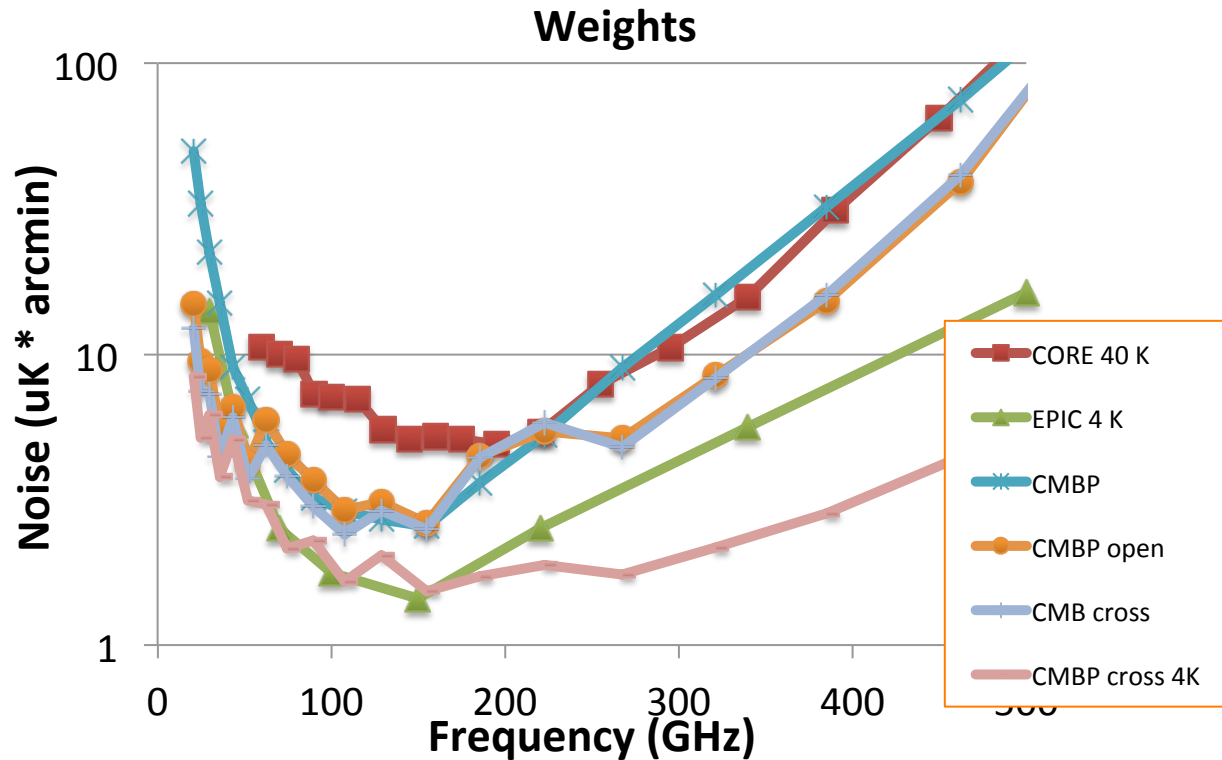
Status

- Comparison of Qi's new crossed dragone with open dragone from past presentations.
- Comparison of coma-corrected open dragone from Richard Hills with open dragone from past presentations.
- Ability to optimize choice of edge taper.
- Including correlated noise (still in progress)

- Next steps:
 - Sensitivity loss of Qi's crossed if we go to 10, 20, 30 K.
 - Include updated readout noise in code
 - Add thermal filters to light path

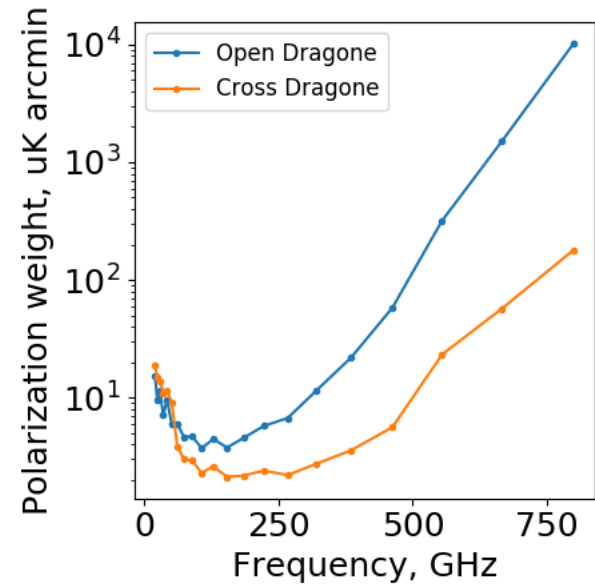
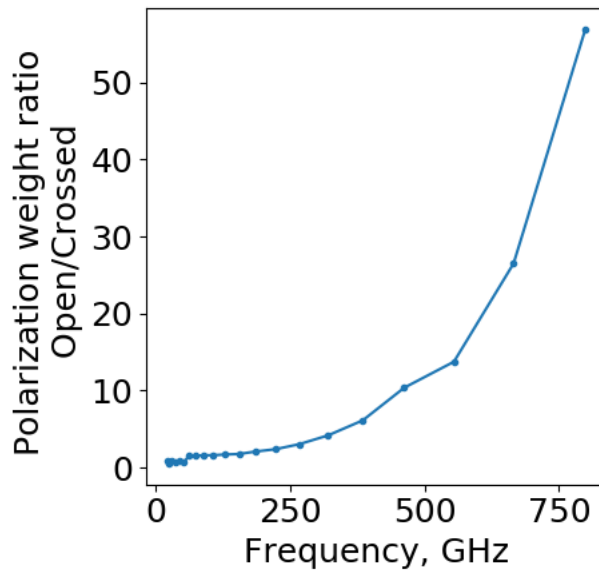
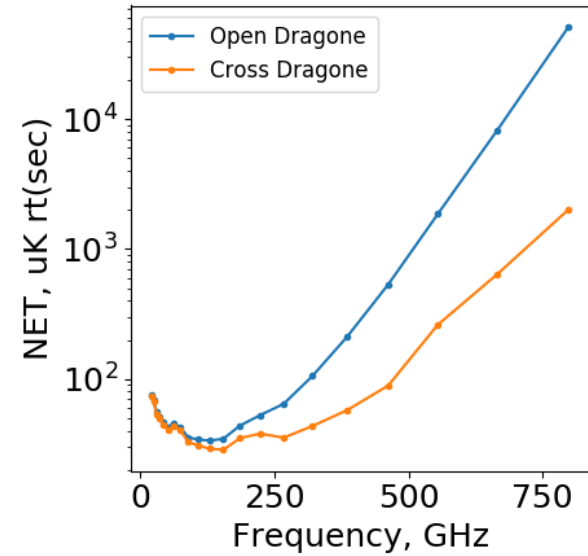
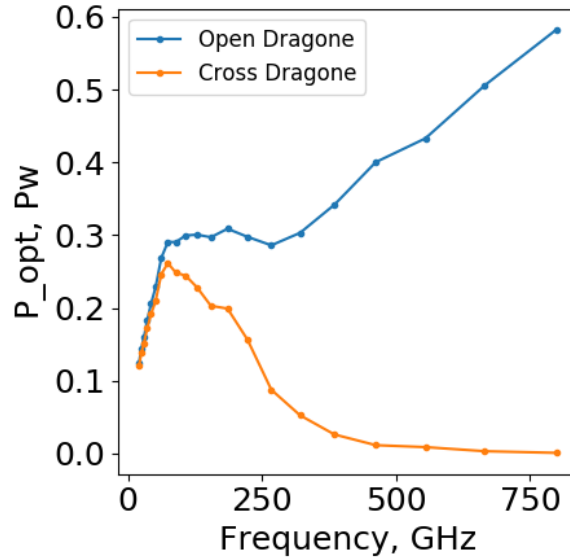
Polarization weight, 4K system

- Edge tapers:
 - 10, 21, 43 dB
 - $2 F \cdot \lambda$ spacing
- System designed by Qi to limit sidelobes, f-number = 3.0
- Focal plane limited by vignetting below 150 GHz.
 - This limited area for low frequency pixels.
 - Decreased the number of pixels in lowest 2 bands relative to the higher bands.
- Full sky and 4 yr mission at 100% observing.
- 7k detectors



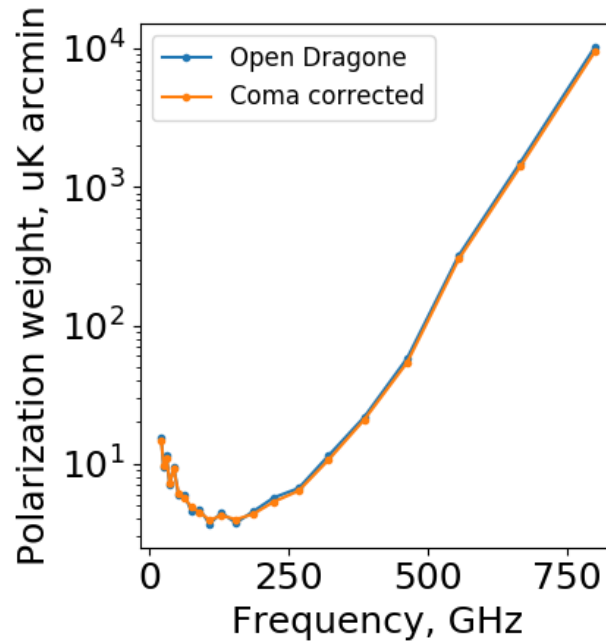
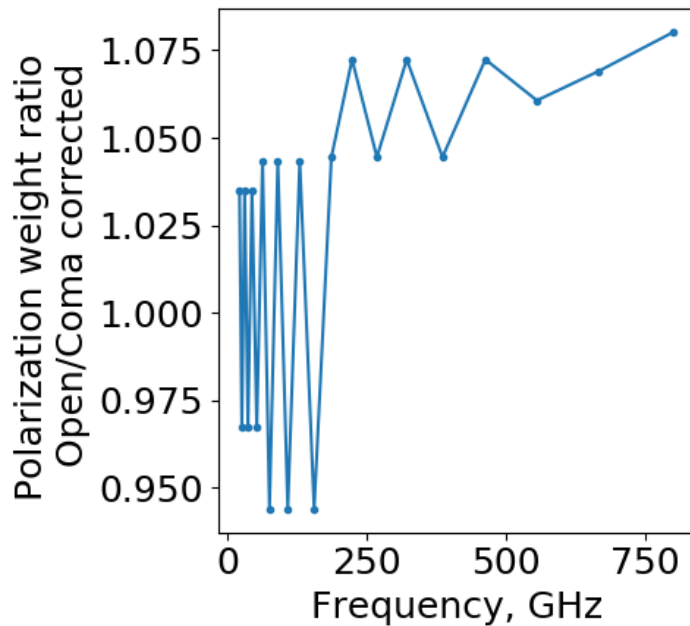
4K Crossed system vs Open Dragone

- White noise levels per detector.
- Cold mirrors have the most effect at high frequencies.



Coma corrected Open Dragone

- Using increased DLFOV from Richard Hills' coma corrected open dragone.
- NET per detector is identical.
- More detectors lowers NET, but only slightly.
 - Dependent on how I distribute number of pixels per band.
- This gives more flexibility to weight higher bands more heavily.
 - i.e. we could remove 1 pixel at low frequency and add 10 pixels in the CMB bands
- Full sky and 4 yr mission at 100% observing.
- Coma corrected: 3,162 detectors
- Old Open: 3,062 detectors



Optimizing edge taper

- Calculate mapping speed, $1/\text{NET}^2$ for a fixed focal plane area
 - Area = $50 F \lambda$ at each frequency
- Vary edge taper, recalculate, and find the maximum mapping speed
- Including correlated Bose photon noise
 - If more than 1 pixel samples an Airy disc, the Bose noise is correlated and adds coherently.
 - This needs to be refined to include near-field effects of the mirrors properly.
- Example of Open dragon. Same system as past telecons. Currently we used $2 F \lambda$ pixels.

