Adjusting Baseline Open Dragone Optics

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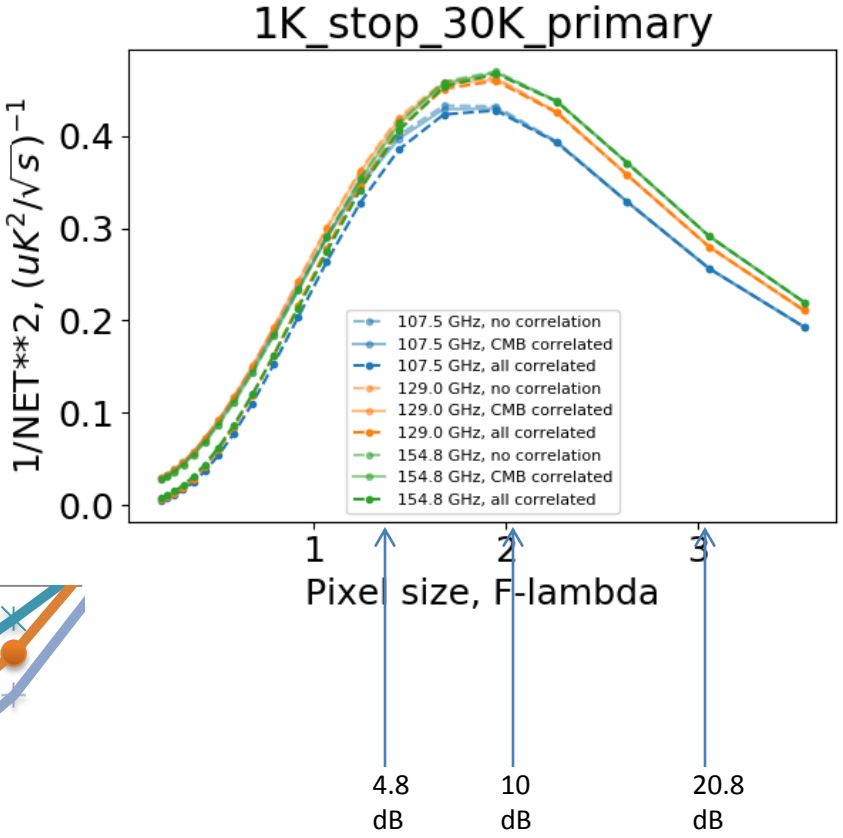
Summary

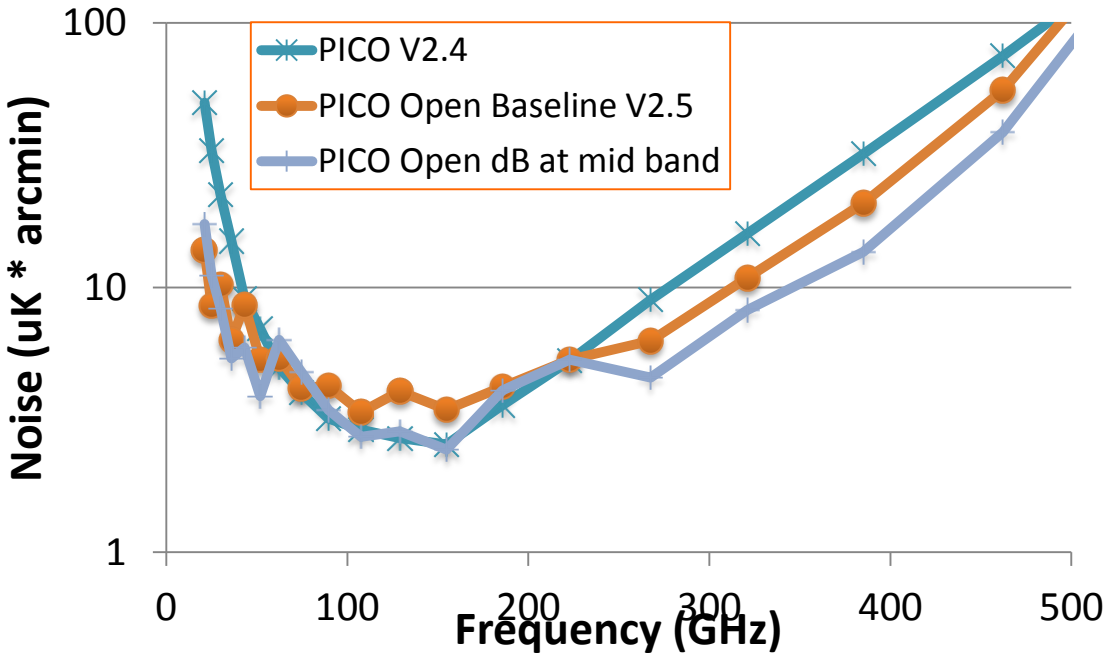
- Option of setting pixel size with middle band at 10 dB
- Update on 50 cm crossed Dragone
  - Alpha of 25 degree is possible, was 22 deg.
  - Any alpha is possible for 50 cm Open.

- Improving optics for baseline Open Dragone
  - Goals:
    - Increase clearance between focal plane and edge rays
    - Increase available DLFOV
    - Reduce overall system size
  - Status:
    - Larger DLFOV at low frequency, 30% increase in area
    - Focal plane clearance now 50 cm
    - low frequency
  - Next steps:
    - Optimize optics to improve DLFOV at CMB frequencies
      - Partially done. Improving inputs to optimizer and constraints on optimizer.
    - Calculate case with removal of lowest 2 bands

Pixel size set by middle band

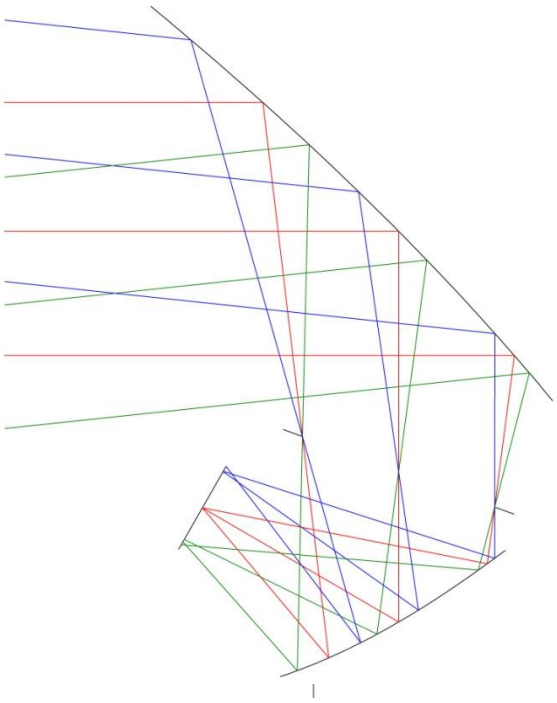
- Pixel size so middle band at 10 dB
  - Edge taper: 4.8, 10, 20.8 dB
- Reduces pixel size, increases number and sensitivity
- No consideration of what effect 4.8 dB edge taper has on sidelobes
- More sensitivity than needed at lowest bands
  - Plan to optimize mirrors to improve DLFOV



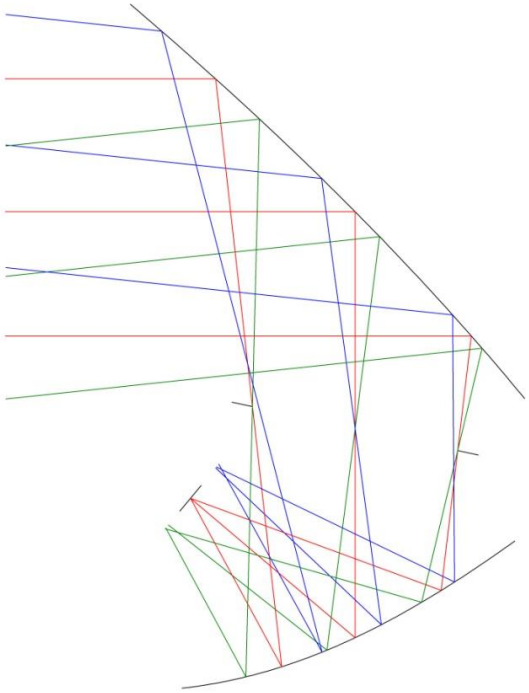


Open Dragone Optics

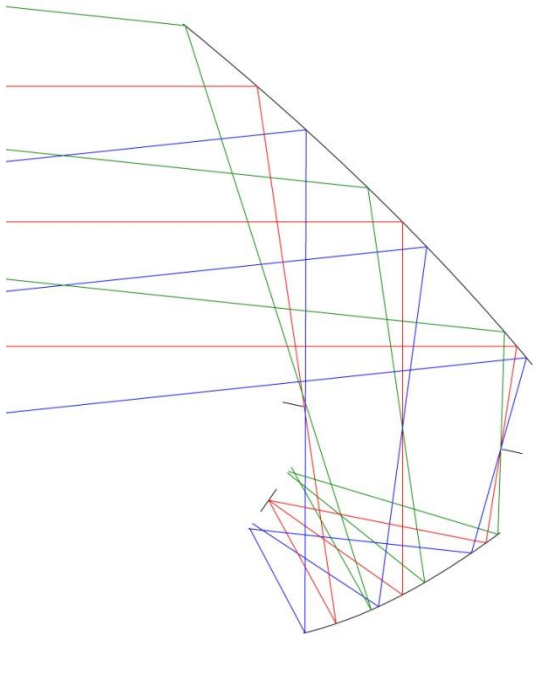
- Focal plane to ray distance increased
  - from 36 cm (baseline) to 50 cm (V3.D and V4)
- FOV increased in V3.D (30% more area)
- General scalings:
  - Increasing focal plane to ray clearance further reduces DLFOV
  - Reducing size reduces DLFOV
  - Moving the stop away from secondary increases DLFOV and shrinks primary



Baseline



Optics V3.D



Optics V4

Open Dragone Optics

- Current focal plane areas, m^2
- DLFOV at 150 GHz is biggest limit on sensitivity
- Plan is to optimize mirror shapes
  - increase DLFOV at mid frequencies
  - This is what Richard Hills saw when doing this optimization.

f/1.42 instead of f/1.5

	Baseline Optics	Coma corrected baseline (Hills)	Version 3.D optics
Pixel	**Area (m^2)**	**Area (m^2)**	**Area (m^2)**
A, 48 GHz	0.16	0.19	0.20
B, 58 GHz	0.12	0.16	0.15
C, 145 GHz	0.032	0.063	0.034
D, 174 GHz	0.024	0.050	0.025
E, 433 GHz	0.005	0.019	0.004
F, 520 GHz	0.003	0.015	0.003
G,H,I, 899 GHz	0.001	0.011	0.001

Typical limiting frequency

Open Dragone Sensitivities

- Optimizing mirrors allows us to trade low frequency pixels for high frequency pixels
  - 1 'A' pixel = 9 'C' pixels
- Plan is to sacrifice 50 GHz sensitivity for 150 GHz
  - This requires optimizing mirrors to improve DLFOV at 150 GHz
  - Richard Hills coma correction is an example of this.
  - Currently implementing same correction.