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AFTA Coronagraph Results Subsequent to Down-Select

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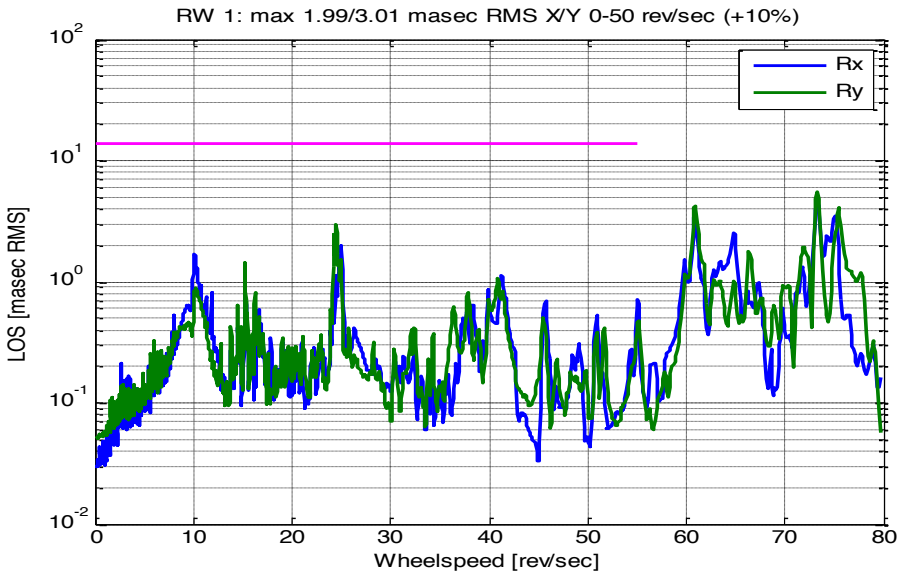
AFTA Coronagraph Current Status

- The AFTA Study Office and SDT continue to study the performance of the observatory and coronagraph for exoplanet direct imaging
- Further modeling has been done of the jitter performance of the observatory. Current best estimate is 0.4 mas after the low order wavefront suppression (see slide 3), with a goal of 0.2 mas.
- Post-processing improvement in speckle reduction is applied at the current best estimate of 10x reduction and goal of 30x reduction
- Updated models have been developed for the HLC coronagraph. The SP and PIAA have new models in development, but not evaluated here.
- Updated estimates of radial velocity exoplanet detections have been made based on the new jitter values, speckle reduction estimates and coronagraph models.

AFTA Pointing Jitter Analysis

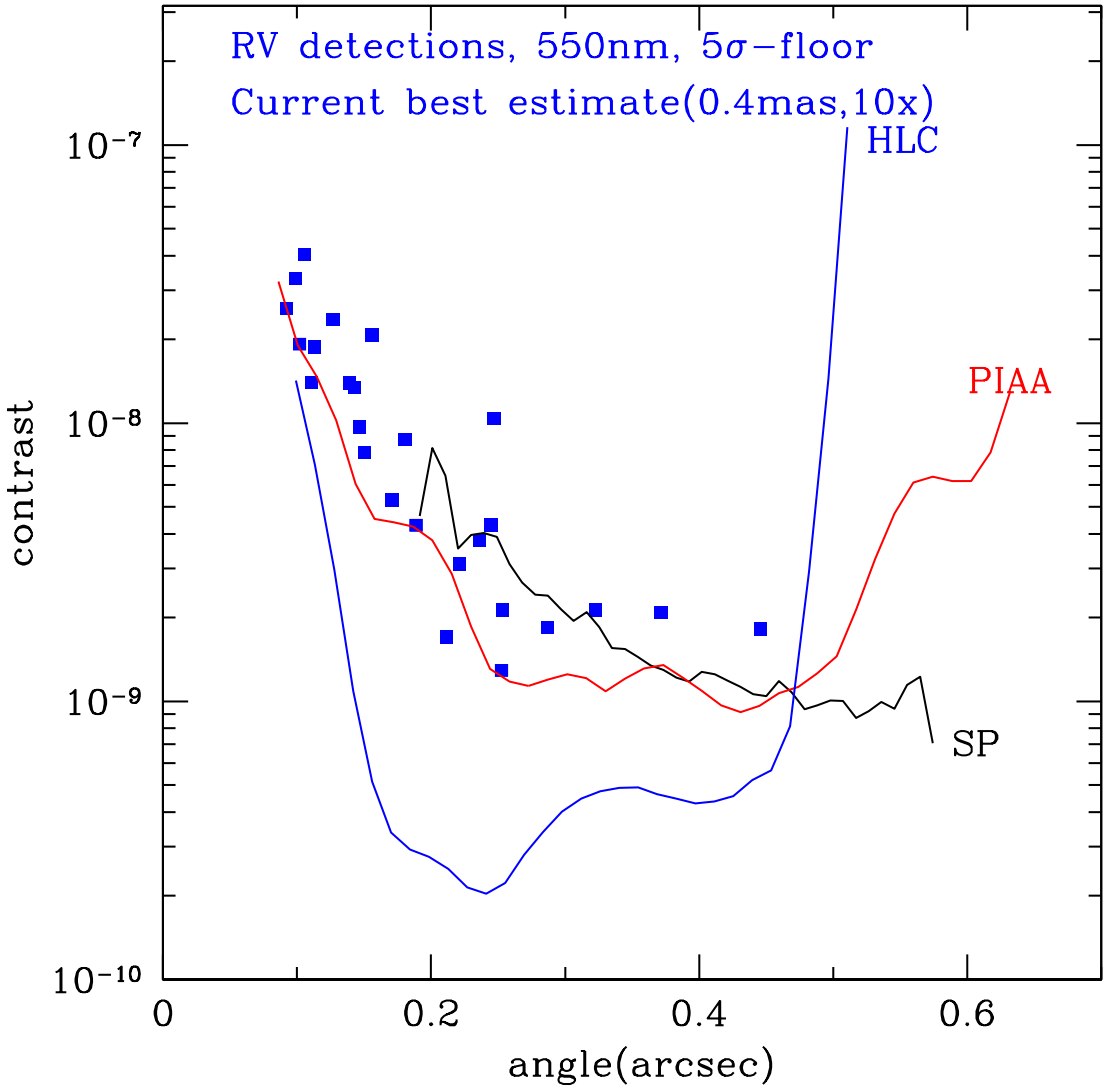
- The Study Office continues to increase the fidelity of the observatory jitter model.
- Results were recently completed that incorporated damping into the finite element model inherent in the existing telescope hardware interface.
- The results indicate telescope LOS jitter less than 4 mas over a wide range of wheel speeds. This equates to 0.4 mas after LOWFS.



- Much work lies ahead as the design of the observatory matures and the structural model fidelity is increased to track that design.
- Numerous opportunities exist for further jitter reduction: operational constraints, momentum management, structural redesign, along with an ETE integrated pointing simulation under development to incorporate further fidelity into the jitter projections.

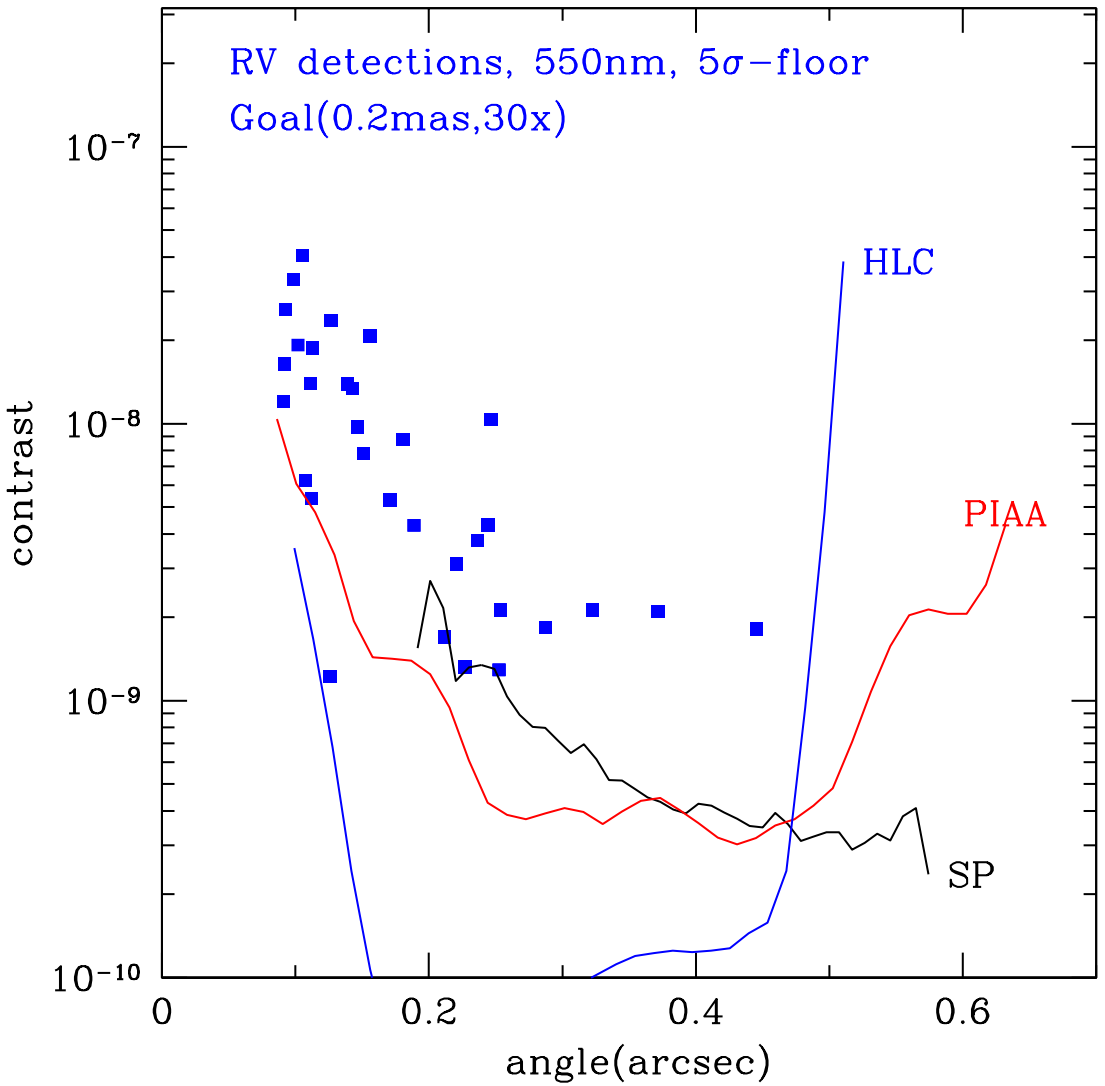
Contrast vs Angle from Star

Current best estimate jitter & post-processing factor



Contrast vs Angle from Star

Goal jitter & post-processing factor



AFTA RV Exoplanet Detection Estimates

- RV exoplanet detections are estimated based on imaging of radial velocity planets from the current RV catalog

Configuration	Architecture	radial range (arcsec)	median 5σ detection floor contrast (10^{-10})	# RV planets, 550nm band, 6-month campaign	# spectral bands per target, 6-month campaign
Prime (OMC: Occulting Mask Coron.)	**SP**	0.19 - 0.57	13 4	4 7	4.3 4.9
	HL	0.10 - 0.51	5 1	18 19	4.3 4.2
Backup	**PIAA**	0.09 - 0.63	19 6	23 30	3.2 4.3

Note 1. Two rows for contrast and # RV images columns are for cases of
- Current Best Estimate: 0.4 mas RMS jitter & 1 mas star, 10x post-processing factor (slide 4)
- Goal: 0.2 mas RMS jitter & 1 mas star, 30x post-processing factor (slide 5)

Note 2. Spectral bands are 10% wide, centered at 450, 550, 650, 800, 950 nm