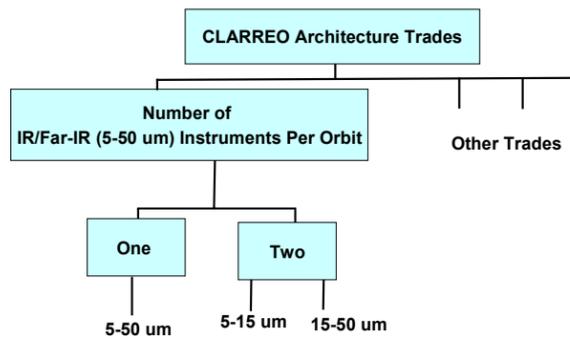


## CORSAIR High Efficiency InfraRed Beamsplitter

CLARREO Workshop  
October 21-23, 2008  
David Jordan &  
Dr. Zoran Milanovic

Engineered for life

## Introduction



## Introduction

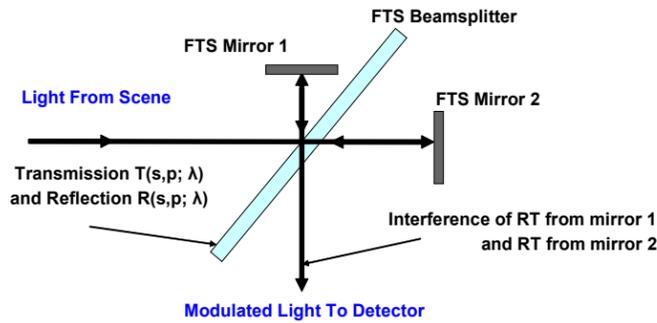
- Advantages & disadvantages of 1 instrument per orbit
- Advantages
  - Volume
  - Mass
  - Power
  - Cost
- Disadvantages
  - Broadband beamsplitter performance

**CORSAIR Instrument Incubator Program High Efficiency InfraRed Beamsplitter activity will develop a broadband beamsplitter to enable a 1 instrument architecture**

## Top Level Requirements

- Beamsplitter Function
  - To modulate the optical signal through two beam interference
- Top Level Requirements to accomplish the function
  - High modulation efficiency (high 4RT)
  - No spectral gaps in the optical passband
    - Spectral regions that measure water, clouds, CO<sub>2</sub>, etc are important to the CLARREO science objectives
    - Gaps in these regions seriously degrade the science output of CLARREO

## Beamsplitter 4RT Requirement

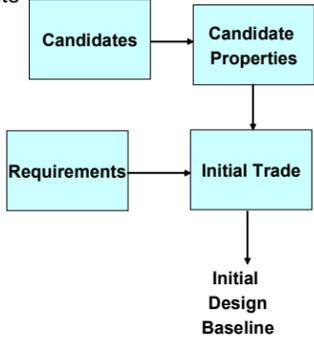


## Beamsplitter 4RT Requirement

- For an ideal beamsplitter,  $R = T = 0.5$  and modulation is maximized
- The beamsplitter efficiency metric is 4RT
- The metric equals 1 for a perfect beamsplitter and indicates the degradation in modulation due to imperfections

## Initial Trade Study

Initial trade study evaluated candidates against requirements



## Initial Trade Study

Initial material survey identifies viable substrate and coating candidates

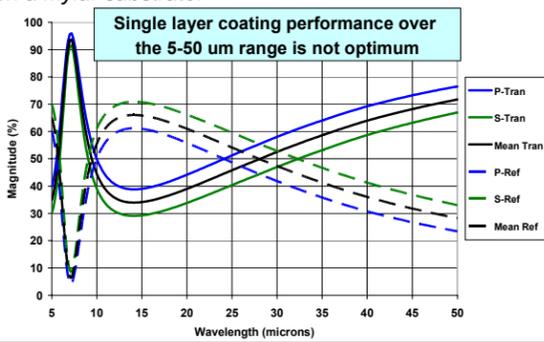
Material	Substrate Upper Cutoff Wavelength (um, approximate)	Substrate Spectral Gaps (um, approximate)	Viable Substrate Candidate	Viable Coating Candidate
KBr	28			x
KRS-5	44			
KI	40			
TlBr	40			
CsBr	38			
CsI	50		x	x
AgBr	30			
Mylar			x	
Polypropylene		7-13	x	
Ge	200	25-35		x
Si	200	10-12		x
Diamond, Type IIa colorless	40+	5-7	x	x

## Initial Trade Study

- Initial trade study identified several substrate and coating materials that show promise
- Initial design activities used these materials to explore viable solutions
- Viable solutions were identified and an initial baseline was selected
- Future, more detailed studies will refine the initial activities and compare the trade candidates against the baseline

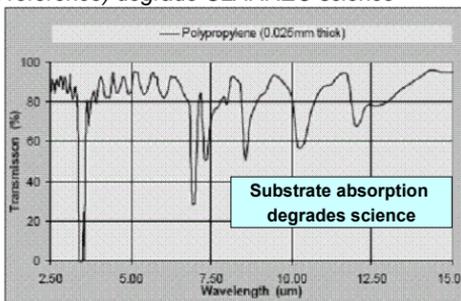
## Initial Design

Reflection and transmission curves for a germanium coating on a Mylar substrate.



## Initial Design

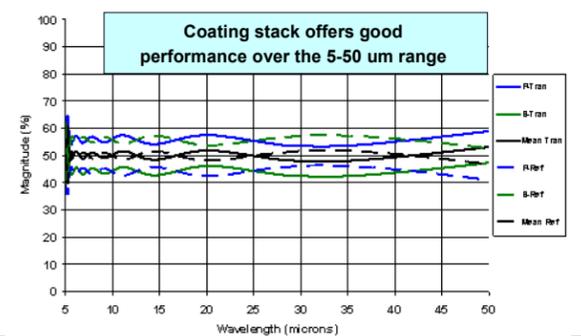
Polypropylene substrate absorption features near 10 um (from reference) degrade CLARREO science



Reference: Temperature Measurements with Radiation Thermometers, page 34, www.laninstrument.com/infrared/downloads/pdf/temperature\_measurement\_radiation\_thermometers.pdf

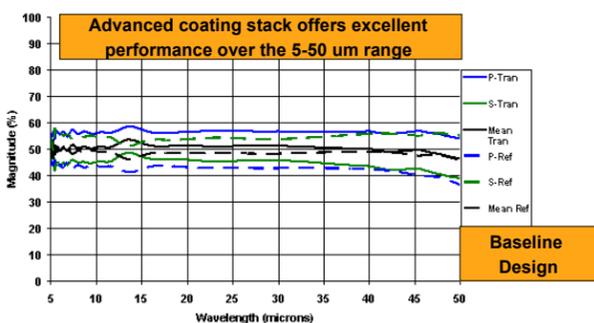
## Initial Design

Reflection and transmission curves for a coating stack on a Cesium Iodine substrate.

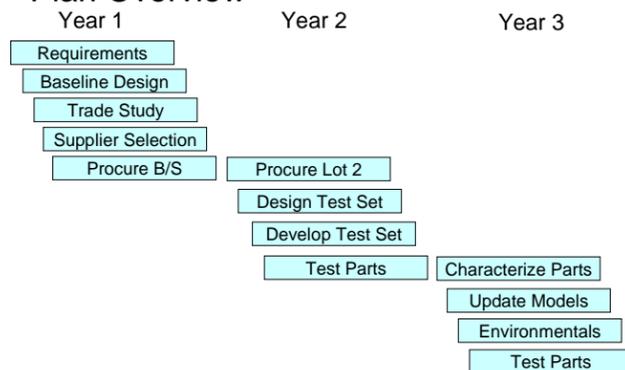


## Initial Design

Reflection and transmission curves for a more advanced



## Plan Overview



## Summary

- A high efficiency broadband beamsplitter offers significant advantages to CLARREO
- An initial study shows promising options
- An Instrument Incubator Program activity will develop the beamsplitter for CLARREO

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