



# Technology Roadmap for the Far-IR

Dave Leisawitz, NASA GSFC



# NASA Technology Roadmap Input to the NRC

3-14-2011

To: Joe Alexander, Staff Officer  
NASA Technology Roadmap: Instruments and Computing Panel

From: FIR Community organizing group

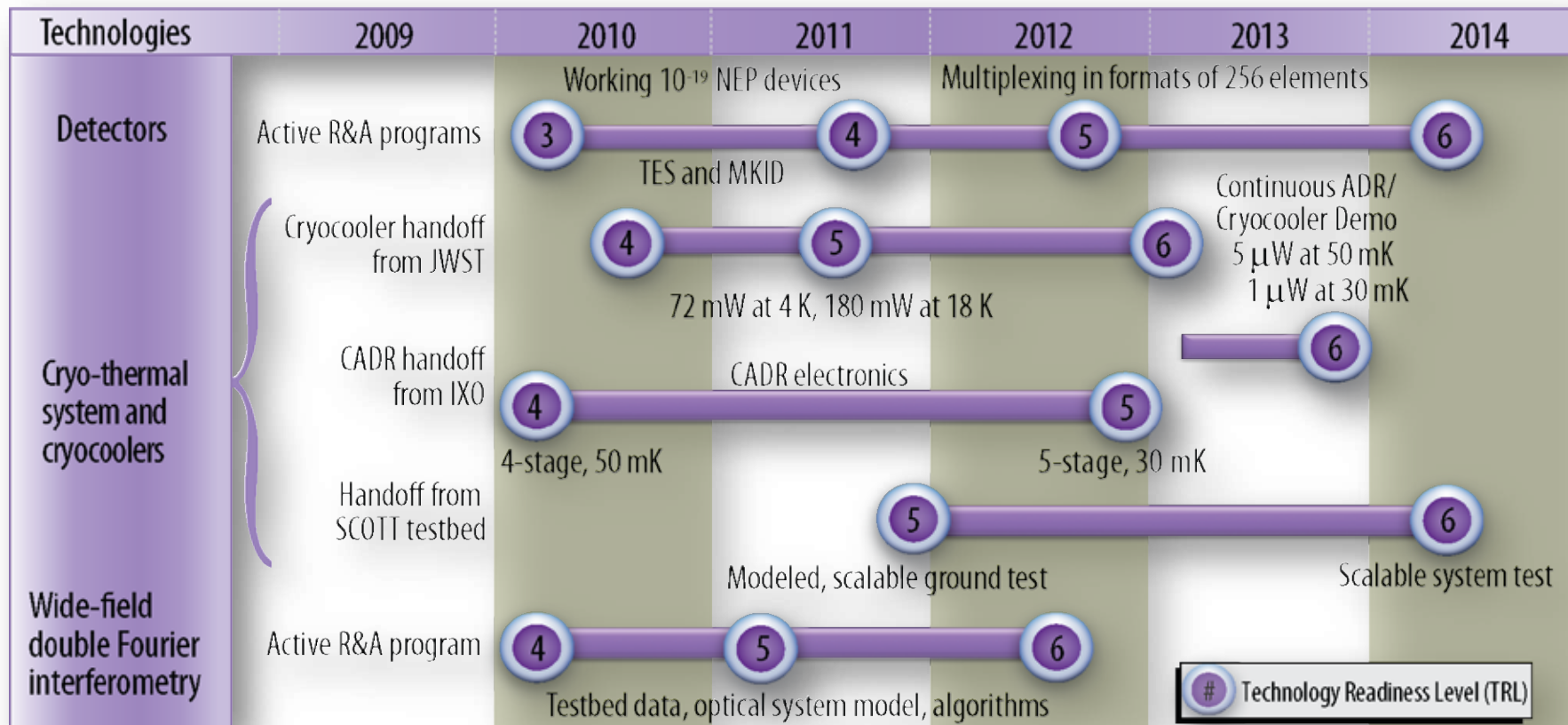
Dear Joe :

The NASA Space Technology areas roadmap presents a plan for future agency investment strategy that will meet established goals. As representatives of the far infrared astronomy community, we would like to contribute suggestions to enhance the *Science Instrument, Observatories, and Sensor Systems* (SIOSS, Technology Area 08) roadmap, now under review by the NRC. This input has been requested by the NRC.

- Detectors
- Large, cold telescopes
- Passive cooling
- Active cooling

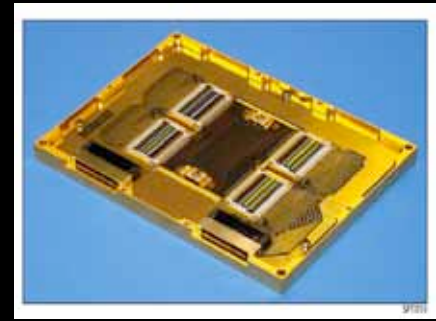


# Technology Roadmap for SPIRIT





# Detectors



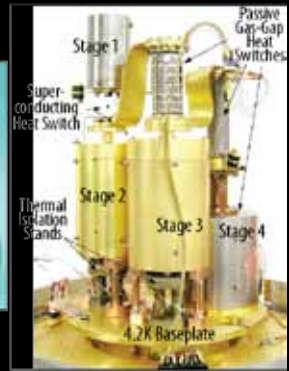
- **Enables:** astrophysical background-limited sensitivity
- **Requirements:** 14x14 pixels, NEP  $\sim 10^{-19}$  W/Hz<sup>1/2</sup>, 200  $\mu$ sec time constant
- **Most promising:** TES bolometers and MKIDs
- **Requires:** T  $\sim 30 - 50$  mK focal plane
- **Current TRL 3**
- **Time to TRL 6 4 years**
- **Cost to TRL 6**
- **Funding external to AD International (e.g., SRON)**
- **Key infrastructure:** GSFC, JPL, NIST facilities
- **Stretch goal:** photon-counting detectors



# Cryocoolers



SPT018

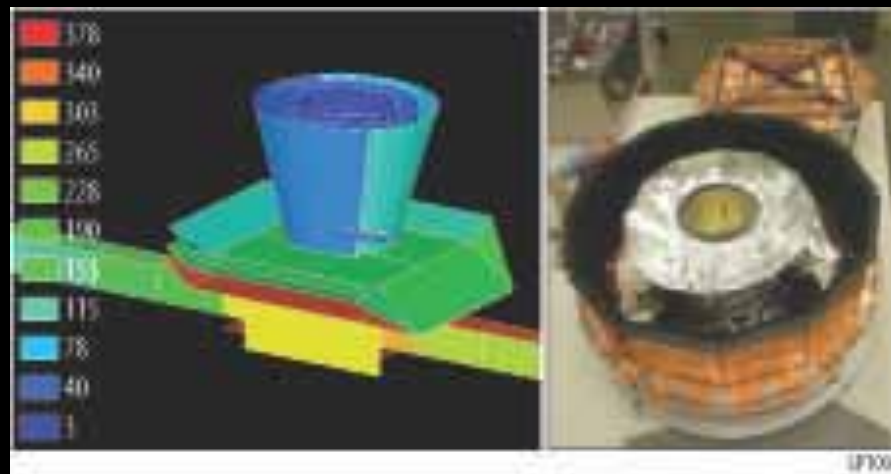


- **Enables:** background-limited sensitivity; lower launch mass; longer lifetime
- **Requirements:** 72 mW at 4 K, 180 mW at 18 K; 5  $\mu$ W at 50 mK, 1  $\mu$ W at 30 mK
- **Most promising:** JWST MIRI cooler w/  $^3\text{He}$ ; C-ADR
- **Requires:** 4 K optics;  $\sim$ 30 mK focal plane
- **Current TRL 4**
- **Time to TRL 6 3 years**
- **Cost to TRL 6 TBD**



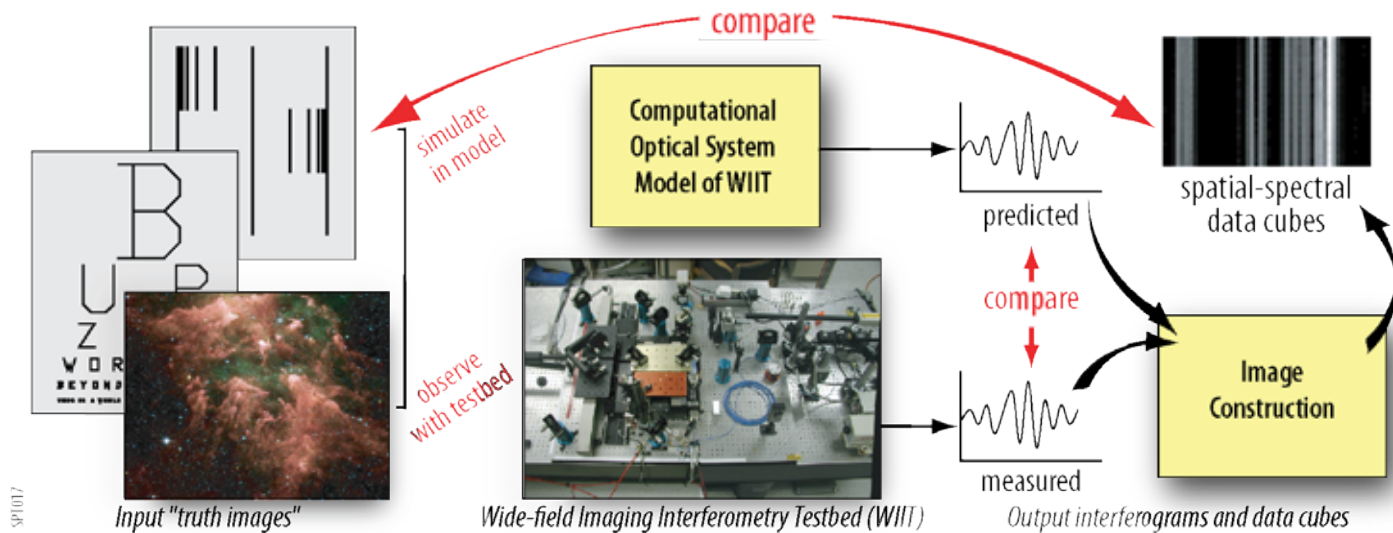
# Cryo-thermal System

- Integrate cryocoolers into subscale Engineering Test Unit with solar simulator
- Verify understanding of system thermal performance with computational model





# Wide-field Spatio-Spectral Interferometry



- Present TRL: 4
- Time to TRL 6: 3 years
- Cost to reach TRL 6: \$0.5M



# Spectrometers

- Compact architectures (e.g., Bradford's BLISS, Moseley's  $\mu$ Spec)