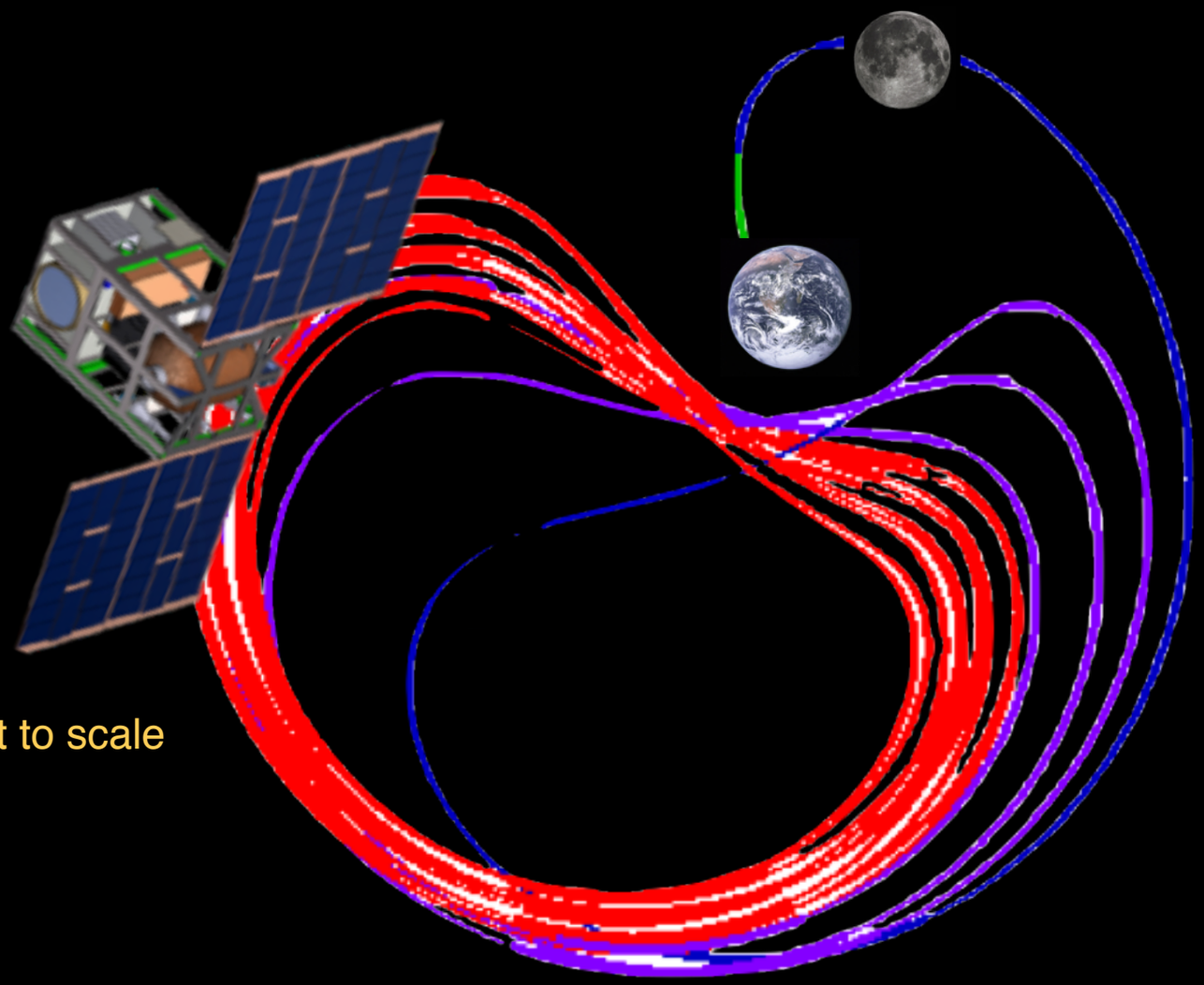
MoonBEAM

A beyond Earth-orbit GRB detector for multi-messenger astronomy



*not to scale

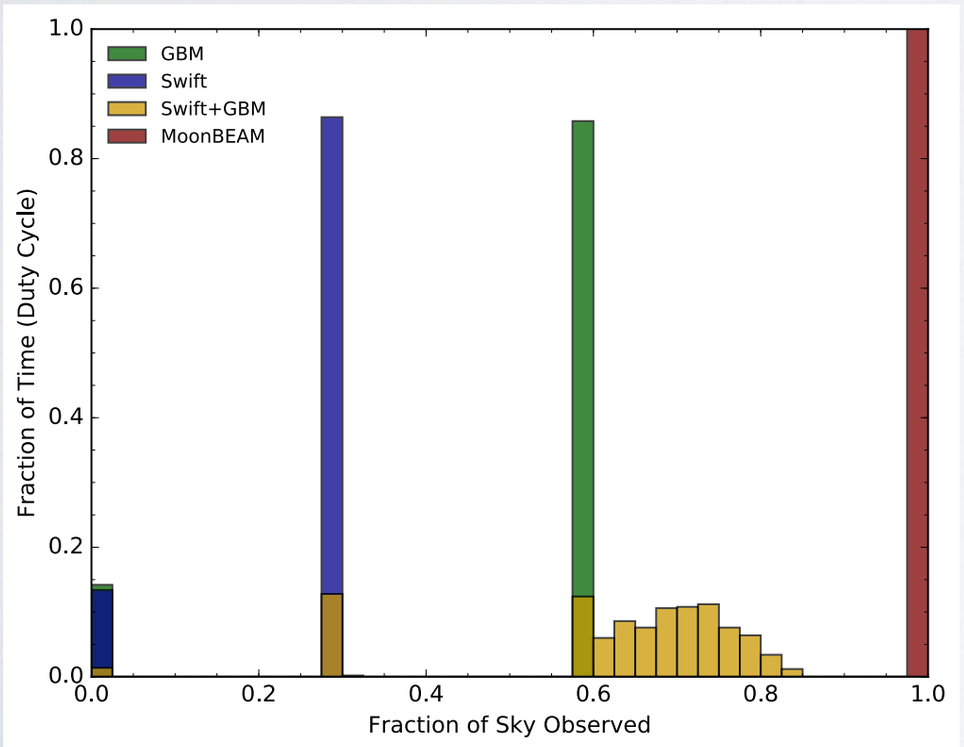
C. Michelle Hui (NASA/MSFC)

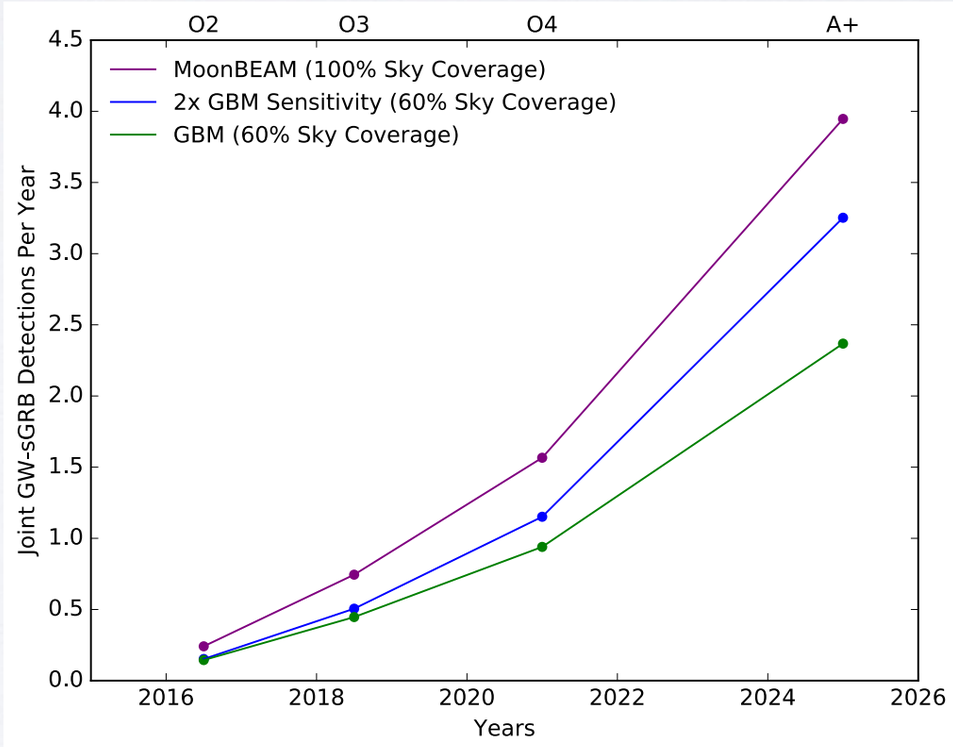
MSFC: D. Kocevski, T. Littenberg, C. Wilson-Hodge, J. Wood
UAH: M. Briggs, P. Jenke
USRA: C. Fletcher, A. Goldstein, O. Roberts
GSFC: E. Burns, J. Perkins, J. Racusin, J. R. Smith

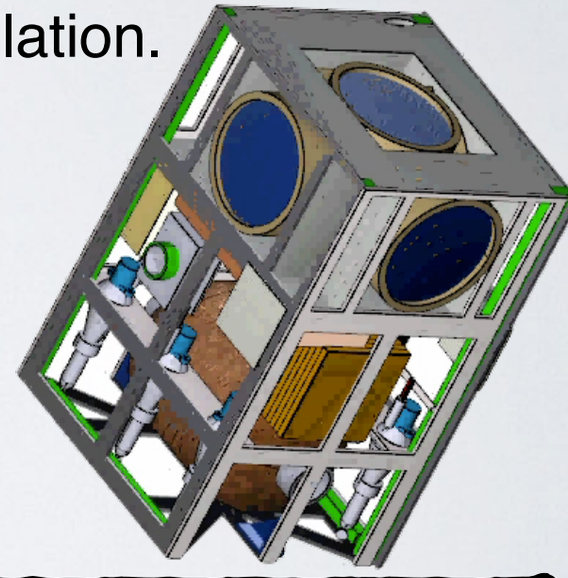
MoonBEAM

Moon Burst Energetics All-sky Monitor

- 2-year SmallSat mission concept to detect gamma-ray bursts.
- Science instrument is 5 detector modules (NaI/CsI phoswich + SiPM) positioned to maximize sky coverage.
- Cislunar orbit at L3 point of Earth-Moon system (95,500 — 665,000 km from Earth).
  - ▸Earth occults < 0.1% of sky at maximum.
  - ▸High duty cycle, no SAA passage.
  - ▸More stable background compared to Low Earth Orbit.
  - ▸Additional localization improvement with IPN-like timing triangulation.







SGRB rate estimate
30-70/year
*assuming single-crystal detector

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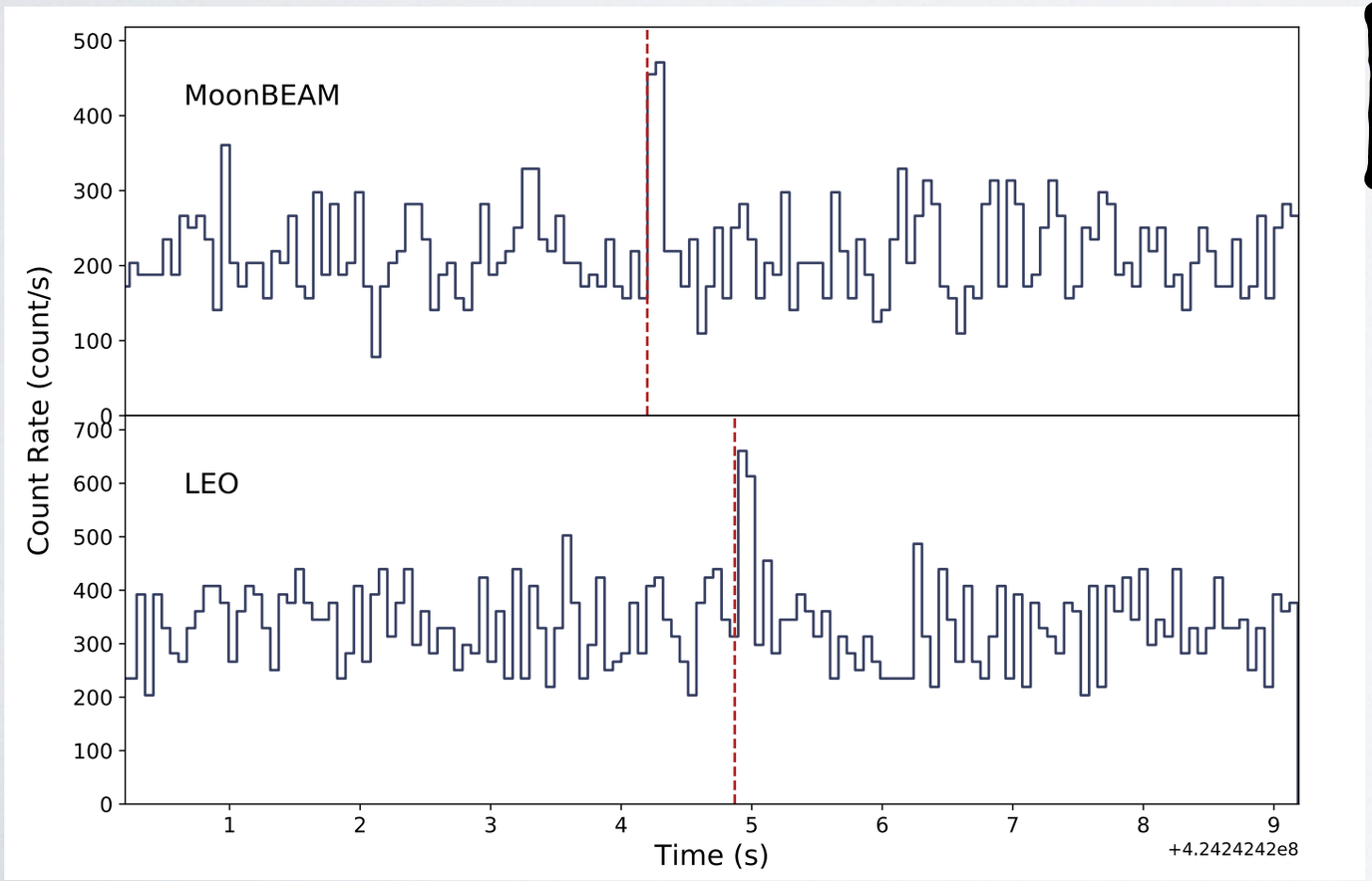
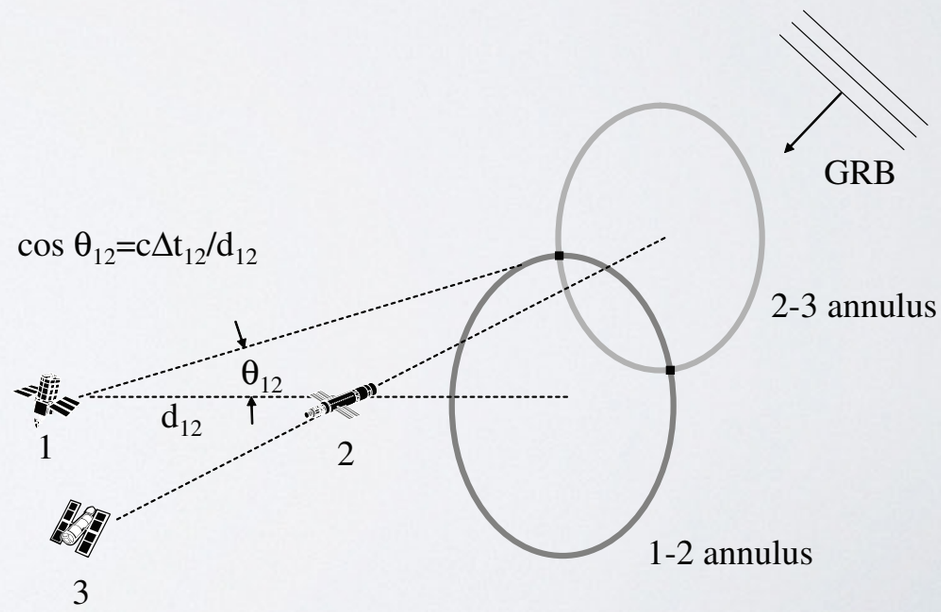


Median-bright GRB at 45deg baseline
MoonBEAM average distance from Earth



Hurley et al. ApJS 207, 39 (2013)

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MoonBEAM localization of an average GRB
MoonBEAM + LEO instrument timing annulus
Combined posterior (loc area reduced by factor of 3)