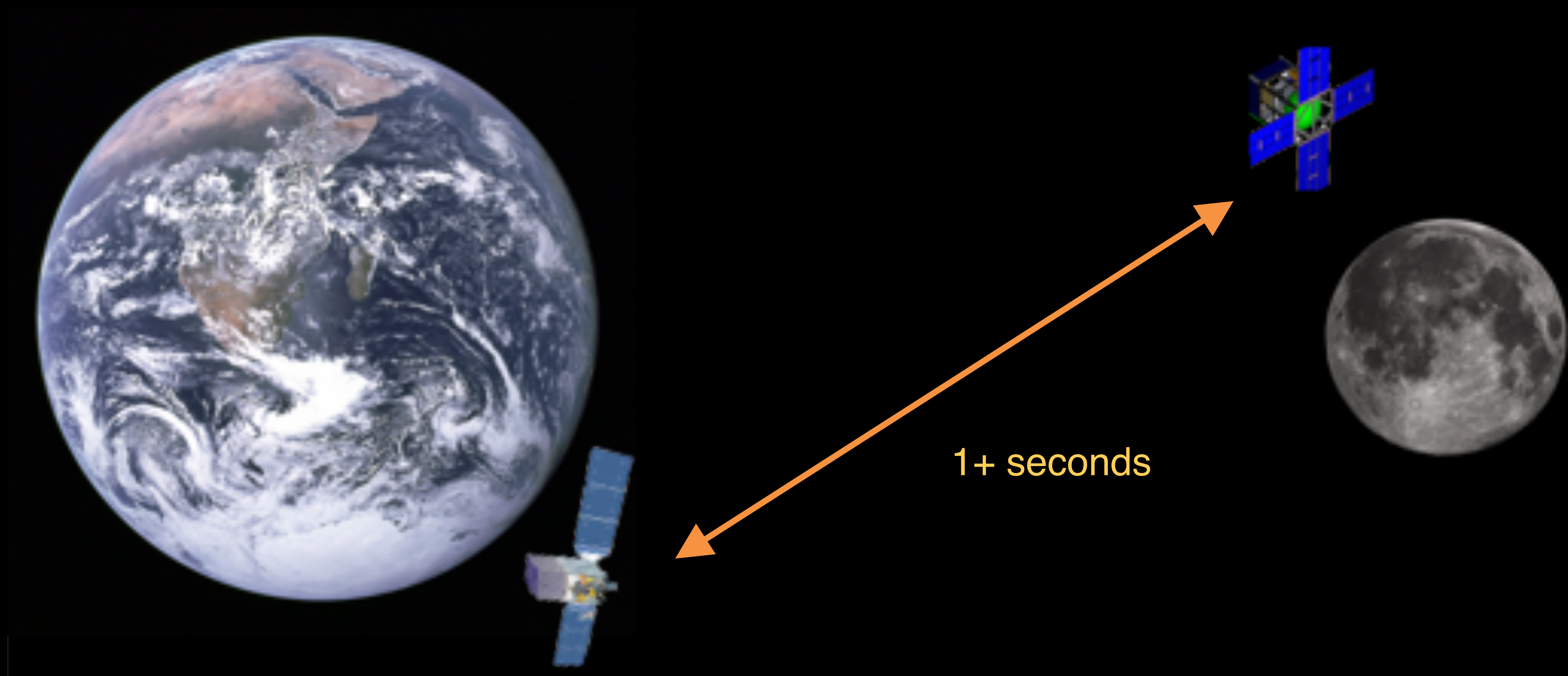
MoonBEAM

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



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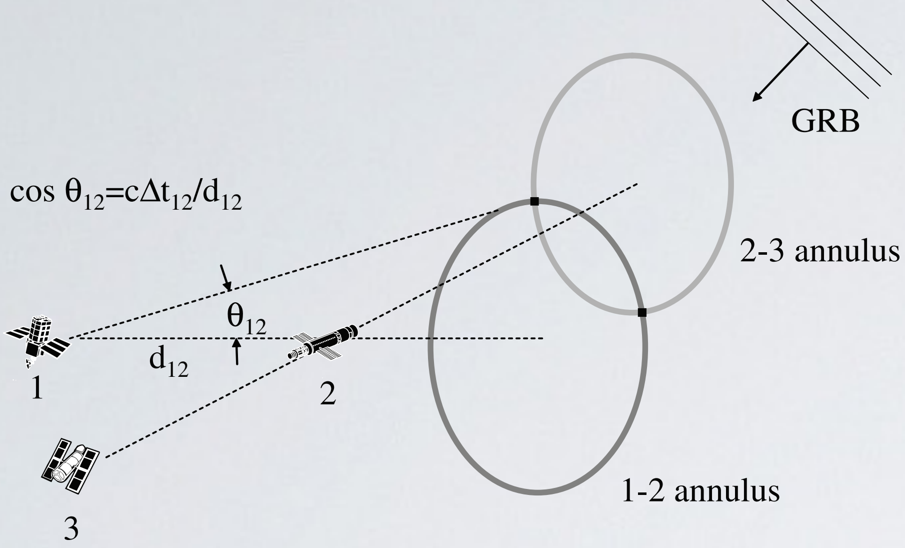
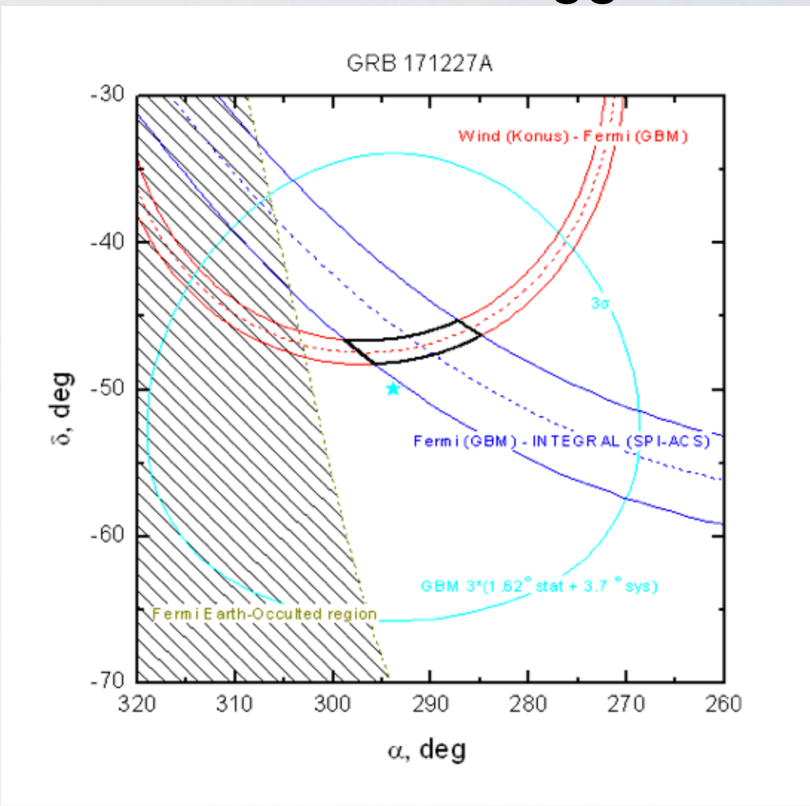


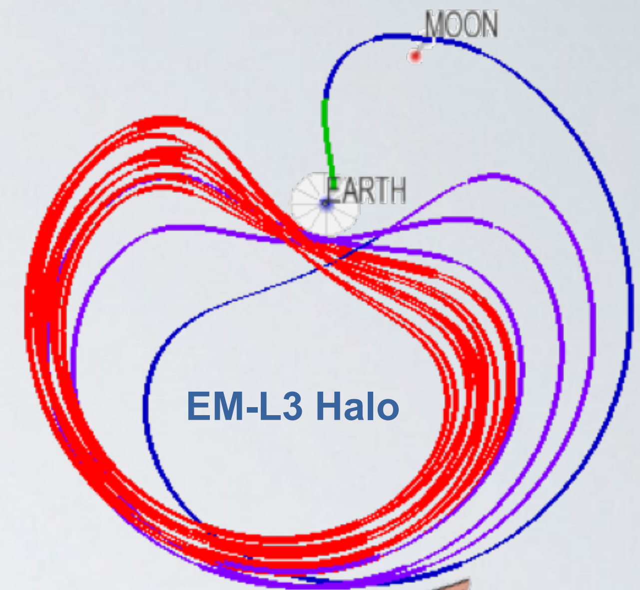
GRB 171227A: IPN localization took ~39 hours after trigger time.

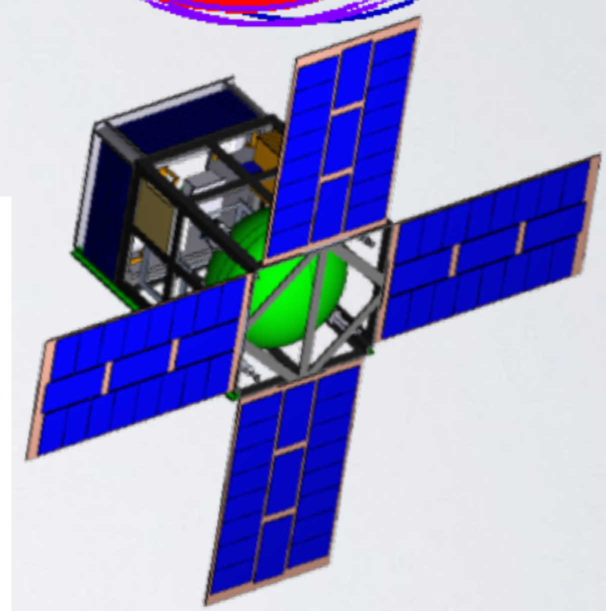


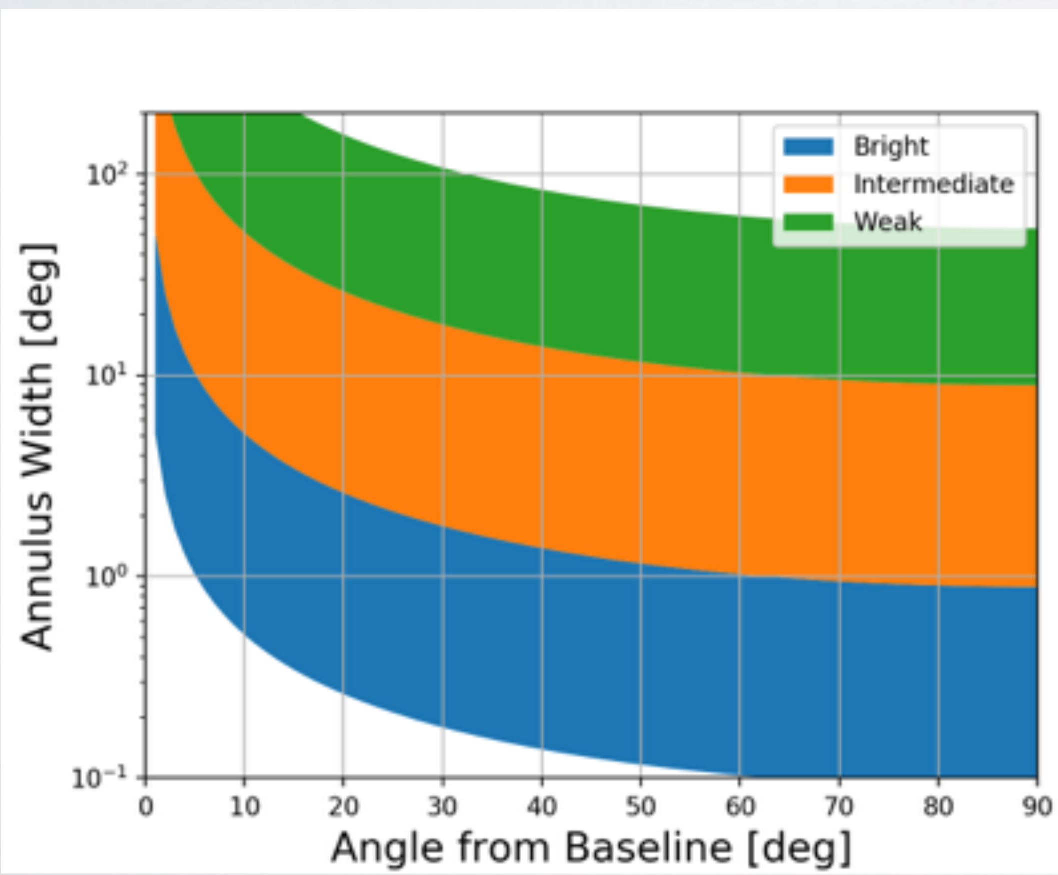
- Adding another instrument in a different orbit will increase the number of GRB detections and improve localization via arrival time difference.
- The Interplanetary Gamma-Ray Burst Timing Network demonstrated an average improvement by a factor of 180 relative to *Fermi*-GBM when combining with additional detection from another spacecraft in a different planetary orbit.
- Why near the Moon:
  - Low Earth Orbit is <0.1s, improvement to only top 5% brightest short GRBs.
  - Outside of the Tracking and Data Relay Satellite (TDRS) network, data downlinks delay prevents rapid followup. In cislunar space, fast communication is still possible with current technology and limitations.

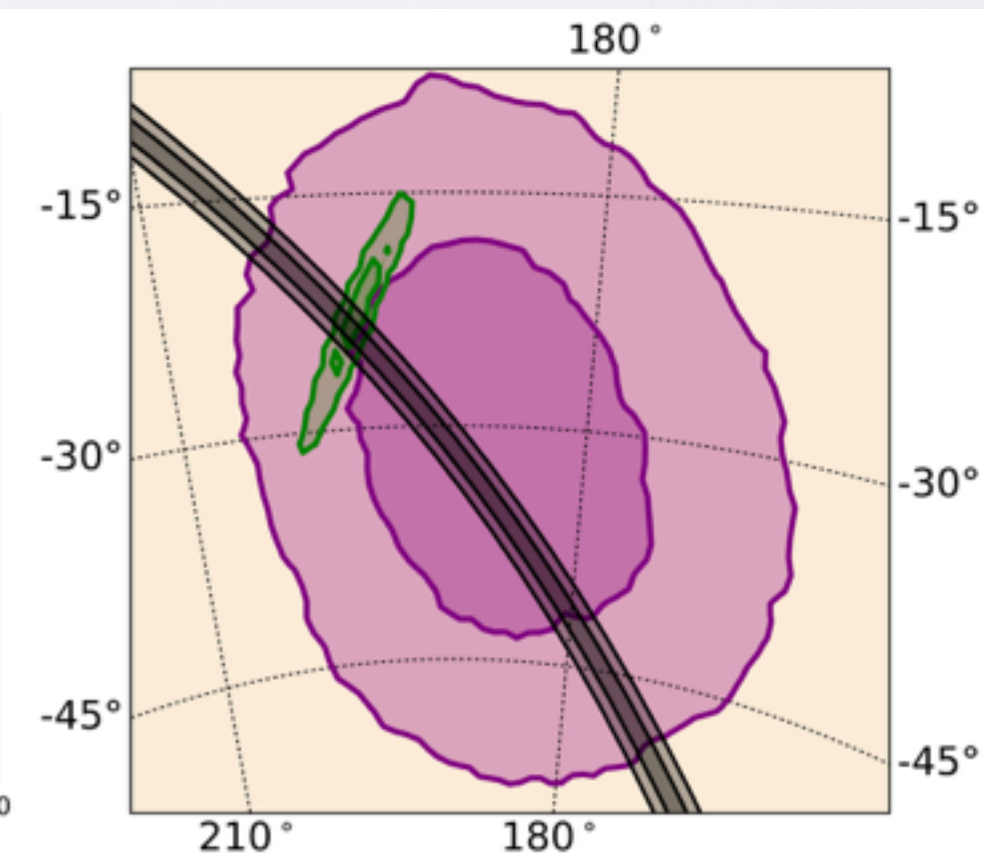
MoonBEAM

- 12U CubeSat with high TRL components, most already flight tested.
- 2-year mission duration, 1-year minimum.
- Earth-Moon L3 halo orbit provides a baseline of 0.3-2.1s when paired with an instrument at low-Earth orbit.
- Science instrument is 5 detector modules (NaI + SiPM) positioned to maximize sky coverage.
  - Expected detection rate ~37 short GRBs/year.
- A reduction of >50% in localization area is achievable for short GRBs with average brightness at a baseline angle of 45deg.









GW170817
GRB 170817A
intermediate GRB with 45deg baseline