



Impacts of Modified Observing Strategies on other* LAT Science & Criteria for Switching * not GC Dark Matter line

Seth Digel KIPAC/SLAC on behalf of the Large Area Telescope Collaboration

Fermi White Paper Evaluation Meeting College Park, 25 July 2013



Impacts on Non-DM Line LAT Science

- Briefly: An Option 3-class observing strategy mitigates much of the loss of observing efficiency and sky monitoring capability that Option 1 or a pointed observation would have
- We assume that planned pointed observations, e.g., for monitoring campaigns, still would be considered if the observing strategy were changed
- Not surprisingly, the (moderate) negative impacts are primarily for variable sources
- Much of the remaining impacts are incremental, as exposure would be accumulating on top of several years of primarily survey-mode observations
- The LAT team's White Paper has specifics for AGN, Catalog, Galactic Diffuse, Extragalactic Diffuse, GRB, Other DM, Pulsars & Other Galactic, and Solar System studies



Selected Impacts: Blazars

• One measure is exposure relative to survey mode



- For a sky survey mission observing a variable and unpredictable gamma-ray sky, the capability to search for bright transients anywhere remains important, as is the need to monitor sources (i.e., to generate light curves) [next slides]
- By these measures, Option 3 is not so bad (and Option 4 is better)



Graphical Illustration of Exposure and Exposure Uniformity

• Survey mode for reference, here 1 GeV





Aside on Exposures





Selected Impacts: Pulsars

 For the 47 pulsars that are timed by the LAT (because they are radio quiet or hard to time at other wavelengths) the median exposure with Option 3 is about 95% of that for survey mode. Worst-off pulsar has 50% of survey mode exposure





More Selected Impacts

- Extragalactic diffuse and anisotropy studies: Loss of exposure for |b| > 30° is 20% (at 10 GeV) with Option 3. Minor impact on accumulation and no impact on anisotropy analysis
- Favoring the GC (or any direction) increases sensitivity to faint, long-duration (>2 ks) GRBs
- Option 3 greatly increases the East-West exposure to the Earth limb, useful for positron/electron studies



Exposure at 1.1 GeV Nadir angle 65° 54 days

Of course, exposure to the Earth limb will increase the number of Earth limb gamma rays with small inclination angles (and the overall average exposure on the sky)



 For a modified observing strategy favoring the GC, dwarf spheroidal galaxies will accumulate exposure less quickly than they would if survey mode were continued



For the worst off dwarf, the rate of exposure accumulation for Option 3 is probably up to a few times slower than for Survey mode - but building on ~5 years of survey mode exposure



Criteria for Adopting a Modified Observing Strategy

- These were defined under the assumption that the Mission was considering switching only after August 2014
- By that time we expect to have
 - More LAT data
 - Pass 8 event reconstruction and classification in production
 - Possibly a better understanding of instrumental systematic uncertainties
 - Perhaps information from H.E.S.S. II observations
- Anticipating a difficult discussion in August 2014, we defined objective criteria for switching

(133 GeV line NOT excluded below LAT detection limit by H.E.S.S. II) AND (TS(Pass 8, 6 years, 133 GeV, R3) > 15, after accounting for systematics)





- The negative impacts from adopting an observing strategy favoring the Galactic Center primarily relate to variable sources
 - And to a some extent decreased overall exposures
 - Of course, not all of the impacts would be negative
- Option 3 (or better) considerably mitigates negative impacts on overall LAT science relative to a pointed or standard pointed + survey observation
 - It would at least double the rate of accumulation of exposure in the GC region