# How many GRB?

Consider prompt and afterglow observations separately.

- prompt - grb location needs to be observable within minutes of the trigger
- afterglow – grb location needs to be observable that night.

Assumptions

- 50 LAT grb/year
- ACTs need position accuracies to ~ +-1 deg (LAT bursts only).
- ground arrays do not require a well localised position (LAT+GBM bursts).

# Prompt Observations – ACTs

Assuming that ACTs are making observations 8 hours/night for 20 nights a month, this means that the ACT are making observations ~1/6 of the time (I think that this is generous).

- 8 LAT bursts per year will occure while ACTs are making observations

about 20% of the sky is accessible to an ACT (assuming that they can slew anywhere within 55 deg of zenith)

- 1-2 LAT bursts per year that the ACTs can slew to.

However, we will not obtain onboard detections and locations for all these bursts. Assuming that we detect/localise 25 GRB/year then

- 0.5-1 LAT bursts/year can be followed up by ACTs.

A well (and promptly) localised LAT burst within the observable field of an ACT will be a rare and valuable thing.

- We must be prepared.
- We should encourage the ACTs to treat these as very high priority observations. The observing time required is small and the science returns are high.
- I think that the rates are low enough that it would probably not be worthwhile trying to decide on criteria to select a subset for observations.

# Prompt Observations – Ground Arrays

Do not need to slew so they can observe the entire GRB from start to finish. Ground-arrays observe ~20% of the sky. So assuming 200 grb/year in the Operate 24 hours/day.

200/5 = 50 grb/year observed (GBM bursts)
and
50/5 = 10 grb/year observed (LAT bursts)

Would observe enough GRB to allow systematic studies of prompt GeV-TeV properties of GRB. Probably not sensitive enough to find high energy afterglows.

# Afterglow observations – ACTs

The GRB location does have to be within the observable ACT sky at the trigger time, it just needs to be observable that night. This increases the sky coverage by a factor of a few. Also, the notices do not need to arrive so rapidly so the LAT offline GRB detection rate is appropriate here.

- 5-10 LAT bursts per year could be followed up by ACTs for high energy afterglow observations.

This rate might be high enough that we might want to select out the most promising targets for ACT observations. We definitely want to have ACT followup on GRB where we see find afterglows in the LAT data. Should we start thinking about how we will search for afterglows in the quicklook analysis?

# A Final Word

It would be worthwhile to check and refine all the assumptions made in this calculation.

- ACT on time/month
- Fraction of observable sky
- Fraction of GRB detected/localised by LAT onboard.

etc.