



GRB science group report

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**2005 LAT-COLLABORATION MEETING
GRB WORKING GROUP**



Topics that may translate in papers

- Simulation development
 - **Models, integration with the LAT software**
 - **Expected high energy emission**
 - **Preliminary GRB LAT sensitivity (“Post DC1 IRF”)**
- LAT sensitivity to GRB Γ
 - **Instrument Response Function MUST agree with the official ones**
 - **Estimation of the on-ground GRB alert efficiency**
 - **Estimation on the on-board GRB alert efficiency**
- On-board reconstruction/GRB Alert algorithms
 - **Addition filters to realize the GRB event buffer**
 - **Alert algorithm description and performances**
- Data Challenge 2
 - **Description of the sky model**
 - **Analysis environment**
 - **Main results from the GRB group**
- GRB properties and what we expect from the LAT
 - **Comprehensive paper on what we expect during the flight**
 - **This paper should come just before the launch, considering all the results reached by the group during the pre-launch phase.**
 - **It should consider also the new data sets available at that moment (Swift, Agile, TeV telescopes) as well as the development of new theoretical models**
- Searches of predicted QG effect in GRB time profile
 - **Introduction to QG effect**
 - **Analysis description**
 - **Expected LAT sensitivity to QG**



Coordinators, and “papers organizer”

- Paper will be associated to a “*paper organizer*”, which is tacking the responsibility of organizing the work, collecting and organizing ideas from the group.
- We have already a tentative list of people
- Coordinators, and paper organizers should guarantee the accessibility of the information to all of the group members.
- They should encourage people in participating to the work (cross checks, data analysis, simulation...)
- *We are more than 45 people but few active members! (25 people joined to our session)*
 - *Increase the number of active people, helping people to get involved!*
 - *More VRVS regularly scheduled!*
 - *Collaborations between the group members, commitments, are welcome!*
 - *All the information collected in the GRB parallel session will be posted to our confluence space*



Reports (1)

- **Felix Ryde:**
 - They developed a model with thermal component + power law component at high energy.
 - The model, which nicely fits the BATSE data, has been implemented within the LAT software (GRBtemplate) and is suitable for simulations.
- **Nicola Omodei**
 - Report on the status of the simulators (we're in good shape)
 - Recently added extra component for reproducing the Magda's burst (GRB 941017), as well as a delayed (GRB 940217)
 - LAT sensitivities studies (using DC1A IRF, GRBobs bursts)
- **David Band (via Jay Norris)**
 - GBM simulations (takes inputs from LAT simulators + GBM response functions (Marc Kippen))
 - GBM and LAT sensitivity studies



Reports (2)

- **Jay Norris and Jerry Bonnell:**
 - **LAT on-board GRB alert algorithm**
 - **Makes use of the on-board recon (interaction with the flight software already started)**
 - **Send LAT event to a GRB buffer (rates down to 30-60 Hz) (reducing by a factor of ~10)**
 - **GBM prior provides this for free for most bursts**
 - **Evaluate localization accuracy obtainable via**
 - **on-board with all ID'ed GRB photons vs.**
 - **on-ground using ~ 10 highest energy photons selected on-board, sent by an alert**
- **Brenda Dingus**
 - **She presents briefly the thesis Magda Gonzales, which contains results from joined BATSE and EGRET spectral fit, as well as detailed information, data and plots related to the 'extra' high energy emission observed (GRB 941017-like)**
- **Francesco Longo**
 - **Overview of some QG phenomenology aspects**
 - **Vacuum birefringence**
 - **Time delay effect**
 - **The basic idea is that the *time delay* is probably not the best candidate for measuring the quantum gravity energy scale, but it is worth to study in detail the capability of GLAST in GRB temporal analysis**
 - **There is still room for QG studies (the two effects are somehow independent)**
 - **Some studies have already been studied and the possibility to include a time lag as a function of the energy is included in the simulation**



DC2 preparation

- **Valerie Connaughton:**
 - **She reports on the activity of the group on DC2 simulations and GRB science tools development**
 - **GRB simulations can provide both LAT photons (standard software environment) and also GBM output ASCII file**
 - **These ASCII files are:**
 - **Burst name, trigger time, position of the bursts wrt the sc and in galactic coordinates**
 - **Burst spectral Parameters: evolution of the 4-param of the Band model**
 - **They are passed to the GBM simulator software (IDL)**
 - **Computes the GBM BGO's and NaI's responses**
 - **GBM data product**
 - **Time tagged events e.g. GLG_TTE_N1_BN050718001_V01.FIT**
 - **Response matrice e.g. GLG_CSPEC_B1_BN050718001_V01.RSP**
 - **Background spectra e.g. GLG_BCK_N7_BN050718001_V01.BAK**
 - **Other files**
 - **Rates for trigger ± 4000 s in two versions with different spectral and temporal resolution e.g. GLG_CSPEC_N9_BN050718001_V01.FIT and GLG_CTIME_N9_BN050718001_V01.FIT**
 - **Rates for day with burst GLG_CSPEC_N9_050718_V01.FIT and GLG_CTIME_N9_050718_V01.FIT**
 - **LAT and GBM analysis**
 - **Combining LAT events output file, LAT response file, GBM events file, response and background to obtain a LAT+GBM joined spectral analysis (examples shown)**
 - **DC2 goal:**
 - **Time integrated spectral analysis (minimum)**
 - **Time resolved spectral analysis (goal)**



Top 3 issues

- **Optimization of the LAT response at low energies (quick look analysis)**
 - **Application of possibly different cuts relevant to low energies**
- **Optimization of additional on-board filters (on-board analysis)**
 - **How to obtain a most accurate localization on-board vs on ground via “alert message” that transmits ~10 or fewer highest energy photons**
- **GRB LAT sensitivity (pre-flight activity)**
 - **N_{grb} per year vs N_{ph} LAT detected**
 - **vs off axis angle**
 - **vs high energy spectral index**



Multi- λ Observations

- **Special guest — Kevin Hurley's talk**
 - Much can be modeled on, adopted from Swift era efforts, experiences.
 - A primary difference: LAT error boxes > Swift's XRT
(~ 6-8" radius)
- **Prioritize our needs**
 - Topics
 - Resources
- **Take advantage from Swift**
 - GCN
 - Burst Advocate model
 - $\lambda > \lambda_{\text{GLAST}}$ IR, opt, UV, X
 - $\lambda < \lambda_{\text{GLAST}}$ TeV observation: MAGIC is already in the GCN network (A. de Angelis)



Discussion Notes

- “Needs”
 - Study to see how A_{eff} at low energy can be increased for GRBs, achieve better spectral overlap with GBM’s BGO.
 - Intense Solar Flares. Question remains on Si strip saturation in outer regions (upper layers, sides): on-board measures?
- Future work and planning
 - Will hold VRVS sessions on
 - Tutorial on running GRB simulations for various studies
 - In what parameter space shall we describe LAT GRB sensitivity?
 - Refinement of (appropriate) parameters for GRB catalog, including questions on low fluence bursts, delayed emission
 - Guidance on documentation effort for GRB tools leading up to DC2