• What has changed from last time?
  – Bug fix.
  – Ported into Milinda
  – New badrun selection.
• Selecting good/bad runs/subruns
• Results from 1032 days of REC data.
  – Many time periods (14 months, Peter's 3 yr, and all REC data.)
  – Use Gus's skymap class in Root to study time dependence.
What's new with this update?

- Results at presented at last meeting
  - Had a bug in code that identified BADMAPS
    - Bad map was included, and next “good” map excluded. Funky Crab results that Brenda saw.

- Ported galactic plane map making utilities to Milinda framework
  - Useful activity. Found above bug, and a few more minor bugs in this activity.
  - Code added to CVS for anyone who's interested.

- Bad Run utility developed.
  - Use SubRunDB facility of Milinda and BadRun list of Wystan/Peter.
  - All added to Milinda for everyone to use.
Good/Bad SubRuns for GP

- Updated global list good runs/subruns
  - Originally from Wystan
  - Added Peter's list of excluded runs
    - ADC calibs (Not Laser runs)
    - “Known Bad” data. (Trigger card tests, etc)
  - Now badrun list is loaded automagically in Milinda using the SubRunDB() facility.
- Updated list of “quality” criteria, cut criteria
  - Avg's of nhitas, nhitmu, nfit, fit/hit, etc
  - Rate of events, fit rate, x2 passing rate, etc.
  - Also loaded by SubRunDB() facility.
X2 passing rate by subrun

- Did not rescale before extracting
- X2 passing rate by subrun and vs time.
- Cut:
  - JD: 2590-2774
  - Req: 0.14-0.21
  - Others:
  - Req: 0.05-0.10
- Will rescale
Fraction fit by subrun

- Nfit/Nevents by subrun
- Originally thought to require >0.80
- Concerned about seasonal effect.
- Scaled to >0.75
Event rate by subrun

- 2 “epochs” appear
  - Pre JD 2000
    - Req: 1000-1600
  - Post JD 2000
    - Req: 1300-2000
- Increases in rate seem offset by decreases in frac fit
  - Constant rate of “good stuff”...
Average NhitAS

- **Req: 70-125**
  - Just remove far out entries
- **Trigger card (post JD 2350) seems more stable.**
- **Similar (but less variation in MU)**
  - **Req: 95-145 in MU**
Average NFIT

- Again, cut just to remove far removed entries
- Req: 44-70
Average Fit/Hit ratio

- \( \frac{n_{\text{Fit}}}{n_{\text{Hit}}} \) averaged over all events in SR.
- Very stable over operation.
- Req: 0.46-0.62
Time Error Rates

- Time errors are events where the GPS time error bit is >4
- Bogus events are events that show time jumps
- Req:
  - TimeError < 0.0003
  - Bogus < 0.0005
How much of an effect on livetime?

- With all cuts applied, ~96% of nSubruns pass quality cuts.
- For GP analysis, additional cut require Run stability (next...)

Frac Fit post other cuts
Run stability

- Require a run to have at least 5 subruns
  - Used to remove small short runs, most likely detector was being “played with”.
- In first 14 months of data, 8% of livetime cut total
  - Subrun quality
  - Good/Bad Run
  - Run stability cut
Run Selection Comments

- Most runs fail on many accounts.
  - If average nhitas is out of line, most likely rate, nhitmu, and nfit are bad too.
- Runs identified as ADC runs in badrun list will also be cut by stability cut, since they are short runs.
- Overall, expect a small effect on GP.
  - Larger than one might expect?
    - Peter has noted many “bad periods” of data that have a large effect in his analysis
    - Periods when people are messing with the detector
GP analysis status

- I've run my new tuned up analysis on all REC data on disk at Maryland.
  - 3 data sets considered:
    - Original 14 m set- JD 1745 – 2161  334 live days
    - Peter's 3 yr set   - JD 1745 – 2839  868 live days
    - All REC data      - JD 1745 – 3030 1032 live days
- 8 hr maps are summed to generate “day” maps.
  - Used Gus's tools to study time evolution of GP signal.
- Maps generate using the ROI exclusion method I've described before.
Crab Nebula in 8hr maps (3y set)

- Brenda was looking at the maps from last time, found problems with Crab in them.
- Now, Crab is OK.
  - Gus allsky 2hr maps:
    - 8451.8 events
    - 5.58 $\sigma$
  - My 8hr GP maps
    - 7576.5 events
    - 5.88 $\sigma$
  - Quality cuts would be useful elsewhere
## Some Results

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1032 day 8hr skymaps
Profile plots in galactic coords.

No significant “floor” observed in this data. (+2.9E-5 +/- 4.0 E-5)
Comparison with Peter's result

- **Selected:**
  - JD 1745 – 2839
  - DEC 10-60 cut
  - IG +/- 5 degree
- I'm using my run selection criteria
- Peter is using his selection criteria
- We are not trying to select the exact same set of events

- **My results:**
  - On: 237565472
  - Off: 237512832.3
  - Excess: +52639.7
  - + 3.38 sigma

- **Peter's results:**
  - On: 238025840
  - Off: 237956016
  - Excess: 69817.3
  - +4.01 sigma

- 0.2% diff in “On”
- ~30% diff in excess
Time study of Galactic Excess

- I've used Gus's skymap tools in Root to generate a “daily” galactic plane excess plots
  - I sum my maps together until the START of the next map is on the next day. All maps are not 24 hours in length, but represent “about a day”.
  - These tools are also available in CVS.
    - Code still needs some comments and cleanup
    - Maps are on scratch disks at UMD
- This includes all 1032 days of data.
- Can search for any periods of abnormal signal increases or deficits.
Conclusions

- Results from GP look good.
  - ~4 sigma for Inner Galaxy region
- Agreement between Peter and myself is pretty good.
- What I need to do next with my analysis:
  - Somehow, account for anistropy of background.
    - No large “floor” seen for IG region.
  - A few minor changes to my subrun selection
  - Investigate the lowest nhit triggered events