BFEM Telemetry data vs. Rescued data(3)

-- Brief summary of what we found and what we plan to do --

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Note 1): This work was done with help of JJ and Tony.
Note 2): If you want to know about this issue in more detail, please see previous reports distributed locally. They are
http://www.slac.stanford.edu/~mizuno/GLAST/Balloon/Telemetry_vs_Rescued/BfemTelemetry_vs_Rescued_2002-11-14.ppt(pdf) and
http://www.slac.stanford.edu/~mizuno/GLAST/Balloon/Telemetry_vs_Rescued/BfemTelemetry_vs_Rescued_2002-11-26_mod.ppt(pdf).

Introduction

•We have been trying to reproduce the obtained BFEM data with Geant4 simulator and cosmic-ray flux models, but failed. The hit rate of each layer and the topmost hit layer distribution is reproduced very well in shape, but the number of layers with hit (track length) is not.
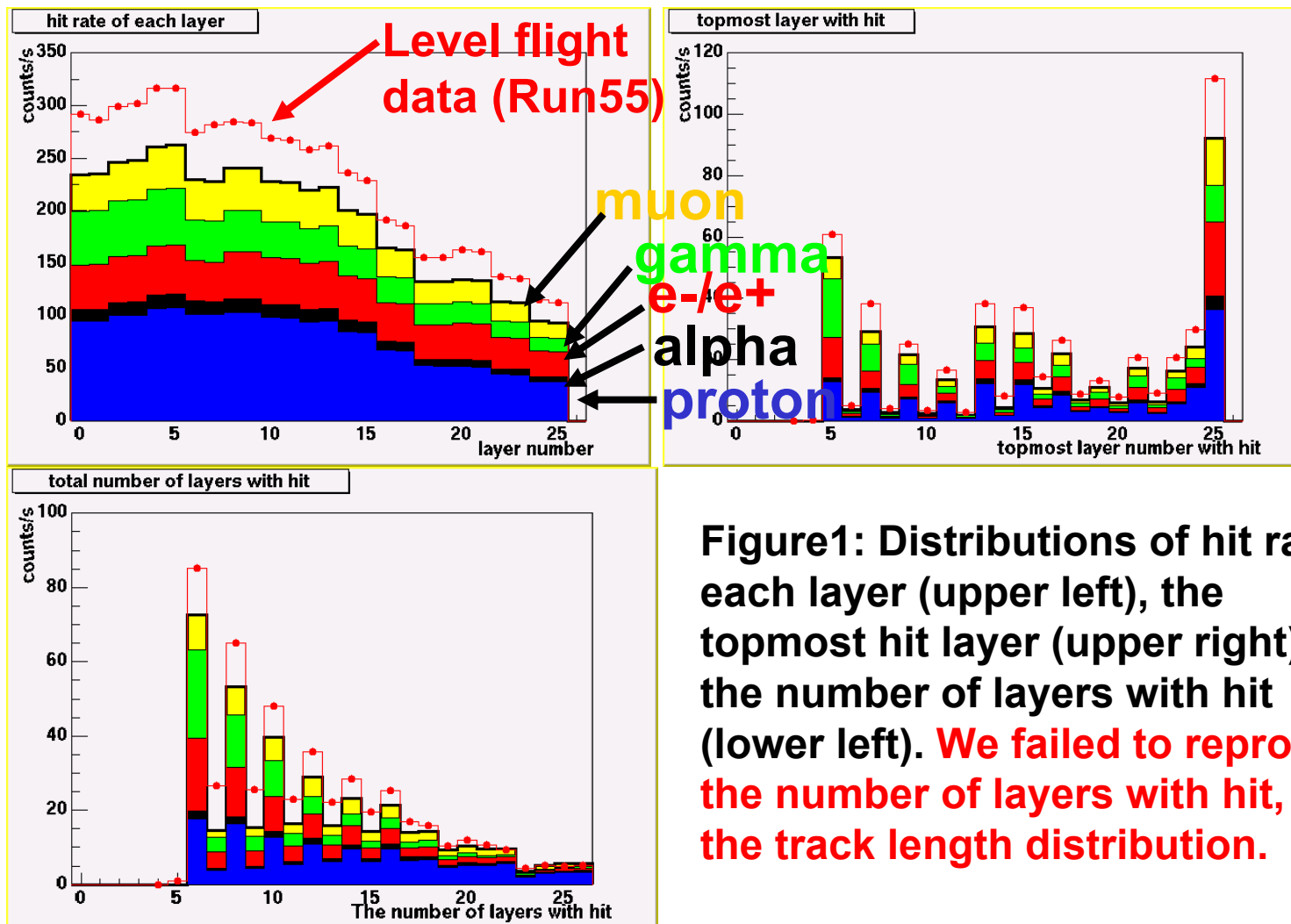

Figure1: Distributions of hit rate of each layer (upper left), the topmost hit layer (upper right) and the number of layers with hit (lower left). We failed to reproduce the number of layers with hit, or, the track length distribution.

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TKR data size distribution(1)

•**As shown by Figure1, the number of short track events in BFEM data is larger than that predicted by simulation. We examined both the BFEM data and simulation in detail. To make a long story short, we found that BFEM telemetry prefers events of smaller data size. During an ascent, we have not only telemetry data but also data stored in hard disk (recovered by Tony). We compare telemetry data and rescued data in pages 4,5, and 6.**
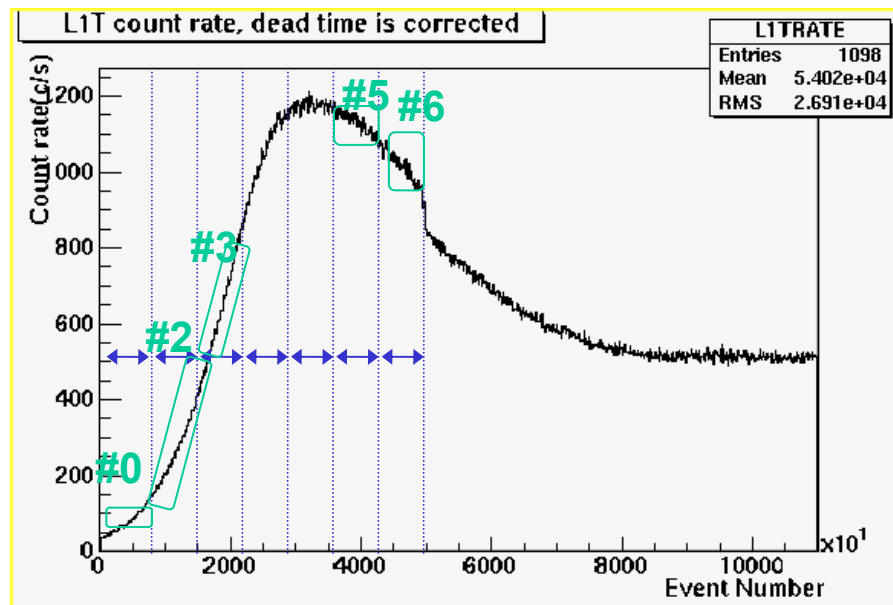

Figure2: L1T count rate of Run54 (during ascent). Run54 consists of 16 small runs, and run#0, #2, #3, #5 and #6 are recovered from the disk (i.e., rescued data).
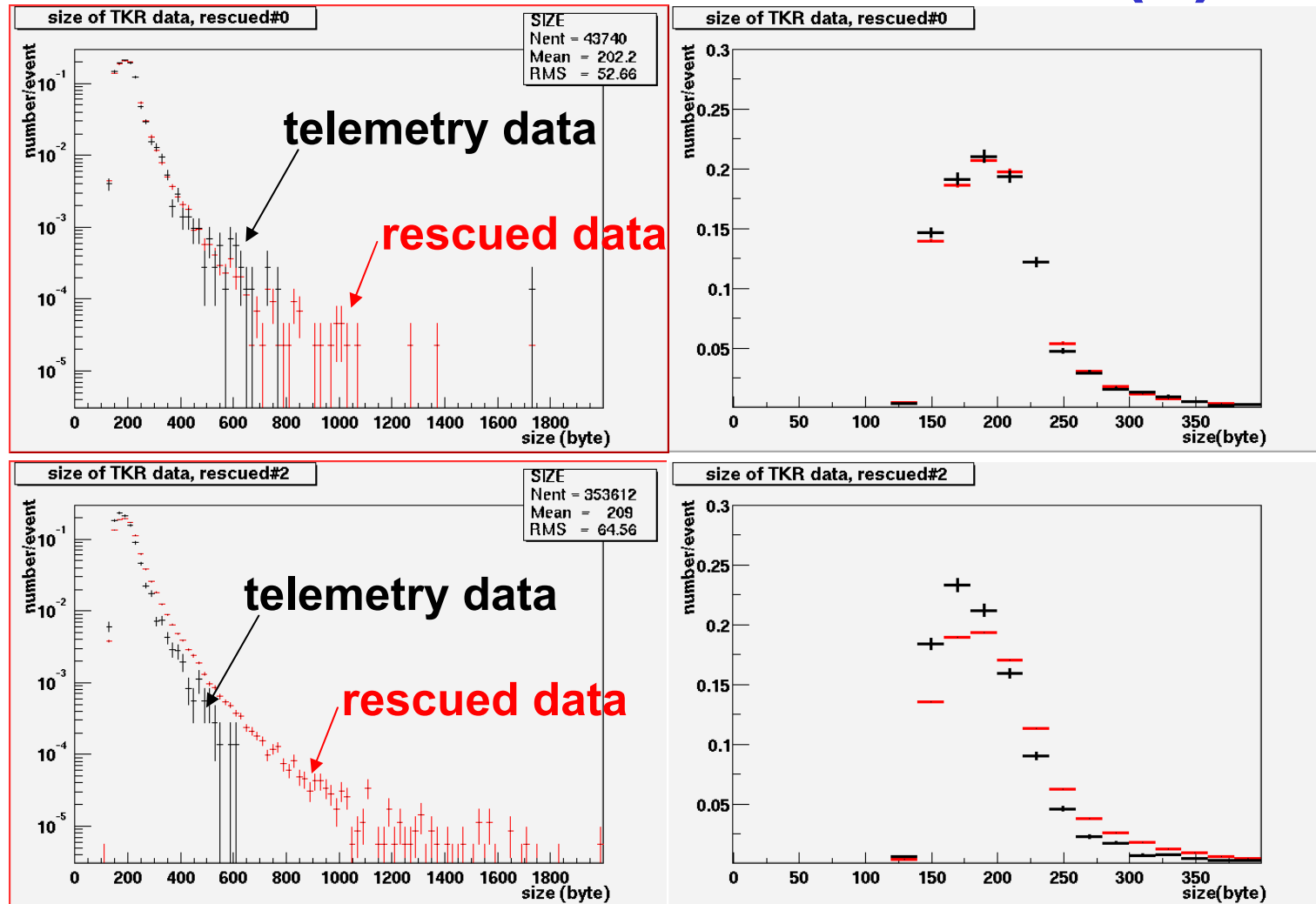
TKR data size distribution(2)

Figure3: TKR data size distribution of rescued data #0 (upper figures) and #2 (lower figures). Left panel shows an overview and right one shows an expanded distribution. No significant difference is seen in #0, but clear difference is observed in data #2. There, telemetry prefers data of smaller size.
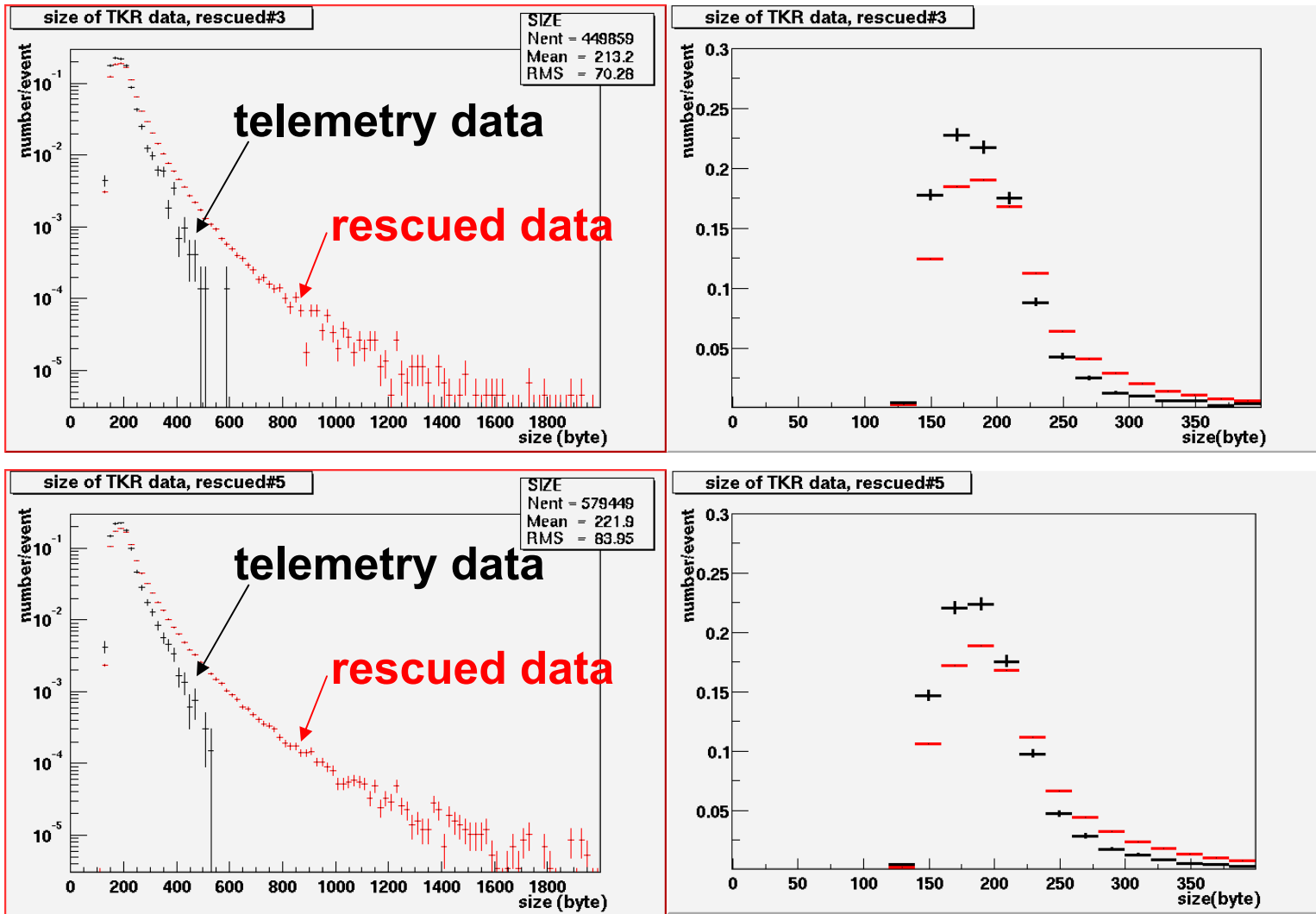
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TKR data size distribution(3)

Figure4: The same as Figure3, but for run #3 and #5 instead of #0 and #2. Telemetry prefers data of smaller size. Similar difference is observed in #6.

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How the preference affects the data

- As we have seen, BFEM telemetry tends to pick up events of smaller size when the trigger rate is high. How this affects the obtained data? As shown below, **BFEM prefers events where the number of hit strip is small**. This also means that **BFEM prefers events of short track length** (the number of layers with hit is small).
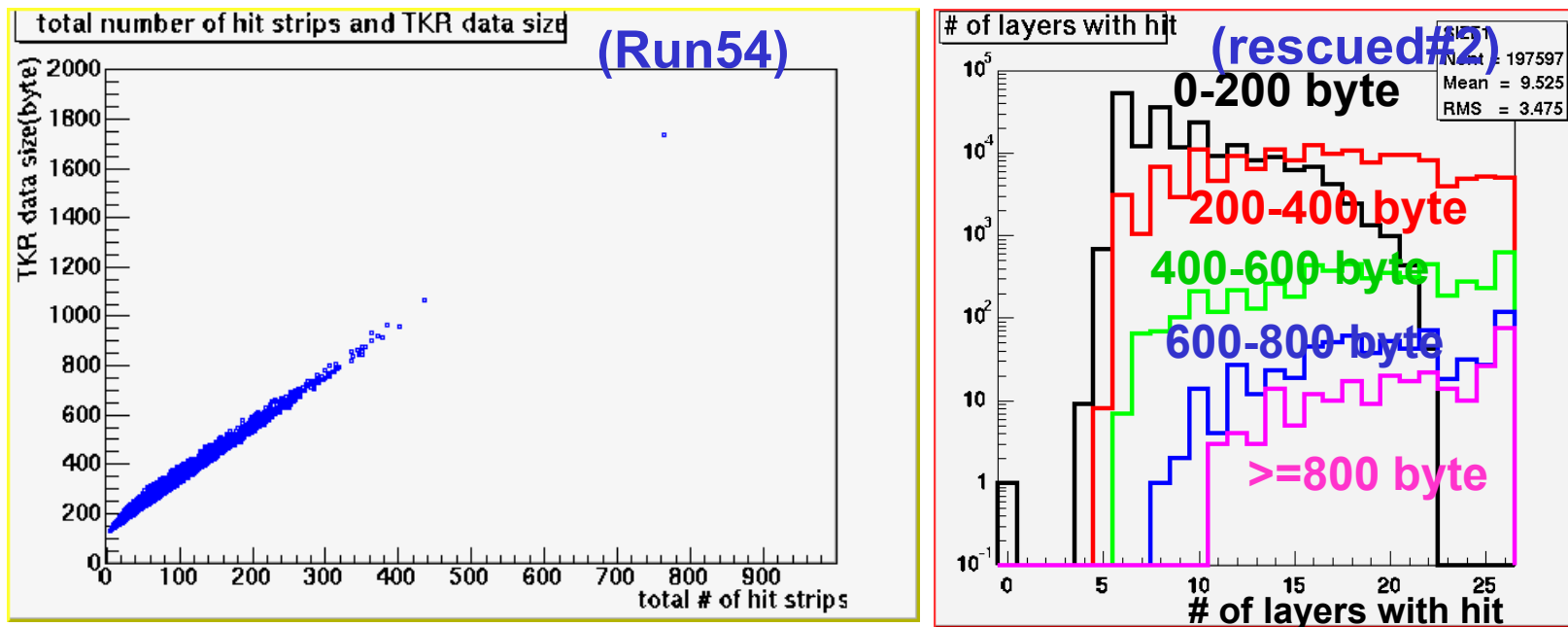
- Figure5: (left) The relation between the number of strips with hit and the TKR data size. (right) The number of layers with hit distribution of rescued data #2, where events are divided into 5 based on the TKR data size.

Summary

•It had already been reported that track length distributions differ between BFEM telemetry data and simulation prediction. (p.2)
•TKR data size were compared between telemetry data and rescued data, and we found that BFEM telemetry prefers events of smaller size. (pp.3-5)
•This could affect the number of hit strip/track length distribution in BFEM telemetry data. (p.6)

Future plan

•Is there any way to extract unbiased events from the telemetry data? -> Probably no. It is impossible to compensate the lost data.
•Instead, we plan to apply telemetry sampling algorithm to rescued data and simulation data.