Discussion of a Data-Mining Proposal for the CLAS Hadron Spectroscopy Working Group

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Outline

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Introduction and Motivation

The data-mining effort should serve two main purposes:

1. Preserve and prepare CLAS data (and knowledge about them) in a (perhaps) CLAS independent way for later (re-) analysis:

   ➜ Needs to be done in cooperation with nuclear working group.

   - Data are calibrated Four-Vectors (and not cross sections or other observables), Monte Carlos, cuts, etc.
   - CLAS data will be needed in the future for (1) completely new analyses, (2) for re-analyses owing to better analysis techniques, or (3) for the current (event-based) study of multi-meson reactions.
   - Cooperation with nuclear working group on database.

2. Propose analyses that are not (yet) covered by regular proposals and CAA's or have simply never been performed.

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Nuclear Data-Mining Proposal to DOE

Title: Short Distance Structure of Nuclei – Mining the Wealth of Existing Jefferson Lab Data.

Authors: 21 from 12 different institutions.

Analysis (data-mining) effort in three phases:

1. Identify the most promising physics channels ➜ CAA's
   (proposals to the collaboration; standard procedures for publications)
2. Reanalyse ("re-cook") the raw CLAS datasets ➜ Database
   (standardize cuts and corrections)
3. Analyze and combine the data from all the datasets (now in the new database) to extract systematic trends.

   ➜ Comprehensive picture of hard-scattering effects in nuclear systems.

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Physics Topics for the Hadron Spectroscopy Group

A short list of ideas that come to my mind:

1. η- and ω-mesic nuclei (e.g. from g7 dataset)
   ➜ Efforts at European facilities, Japan, etc.
2. Two-meson reactions:
   - g10: $\gamma n\,(p) \to p\,\pi^-\,X\,(p)$ with $X = \pi^0,\ \eta,\ \omega$, etc.
   - g13: Same reactions, but with linear beam polarization.
     ➜ Complementary to ELSA, MAMI, GRAAL efforts for reactions off the proton: $\gamma p \to p\,\pi^0\,X$ with $X = \pi^0,\ \eta,\ \omega$, etc.
   - g12: $\gamma p \to \Delta\rho$, higher-mass hyperon channels, etc.
     ➜ A better understanding of these reactions is important for the N^* program and will be useful for CLAS12 and GlueX.
3. Multi-meson reactions, meson spectroscopy from g12, etc.

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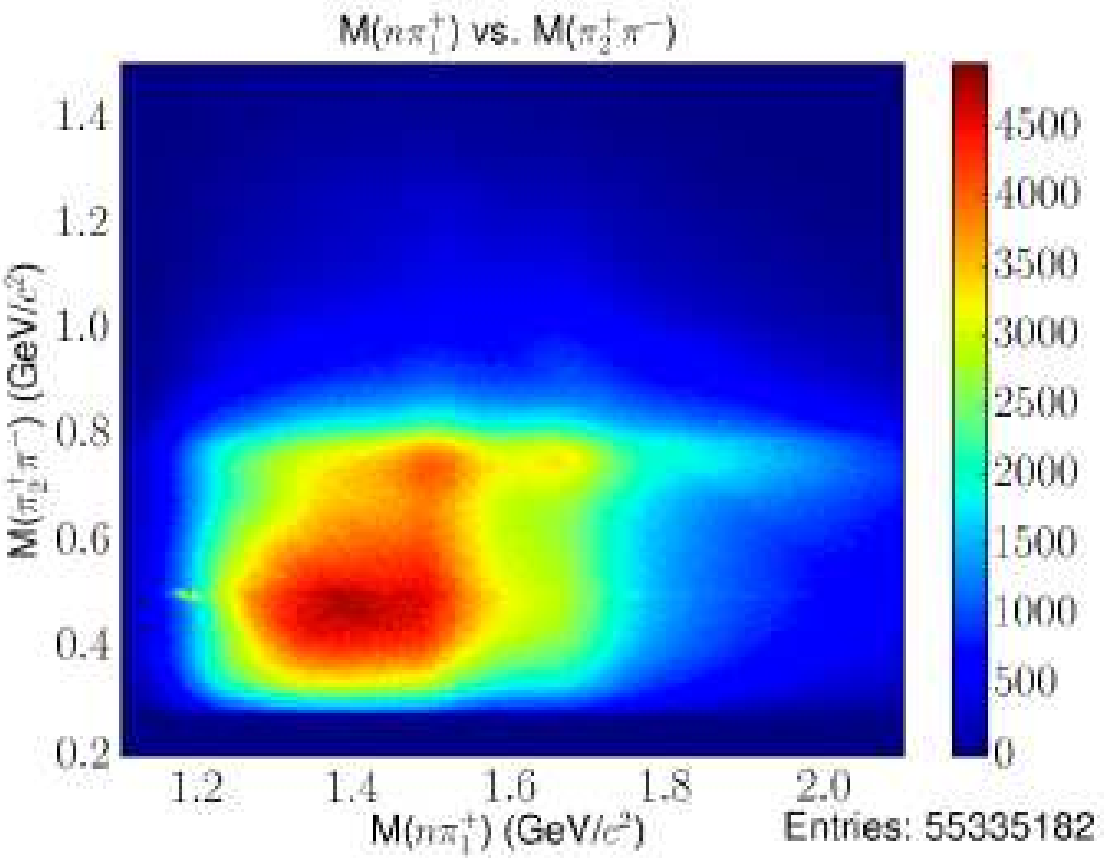
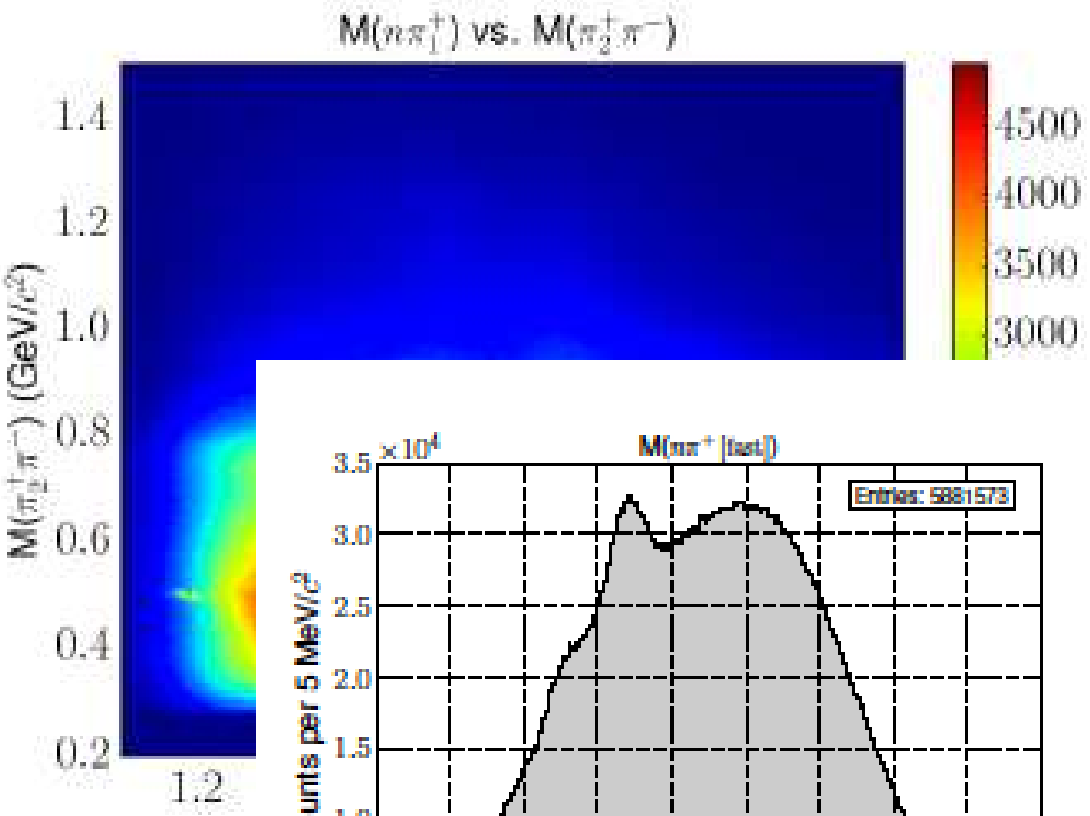
Analysis of $\gamma p \rightarrow n\,\pi^+\pi^+\pi^-$ from g12

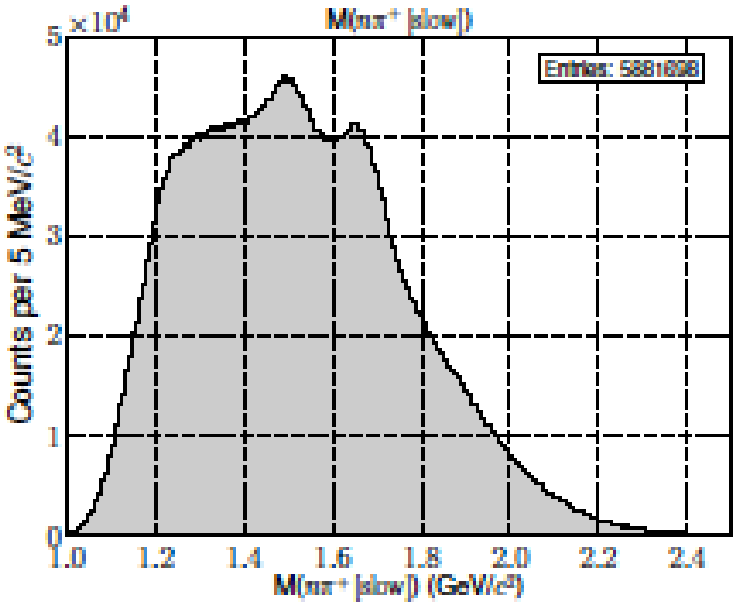


➜ No cut on E_γ

$\pi_2^+\pi^-$ vs. $n\,\pi_{1,\,\mathrm{fast}}^+$

Analysis of $\gamma p \to n\,\pi^+\pi^+\pi^-$ from g12





➜ $E_\gamma > 4.4$ GeV

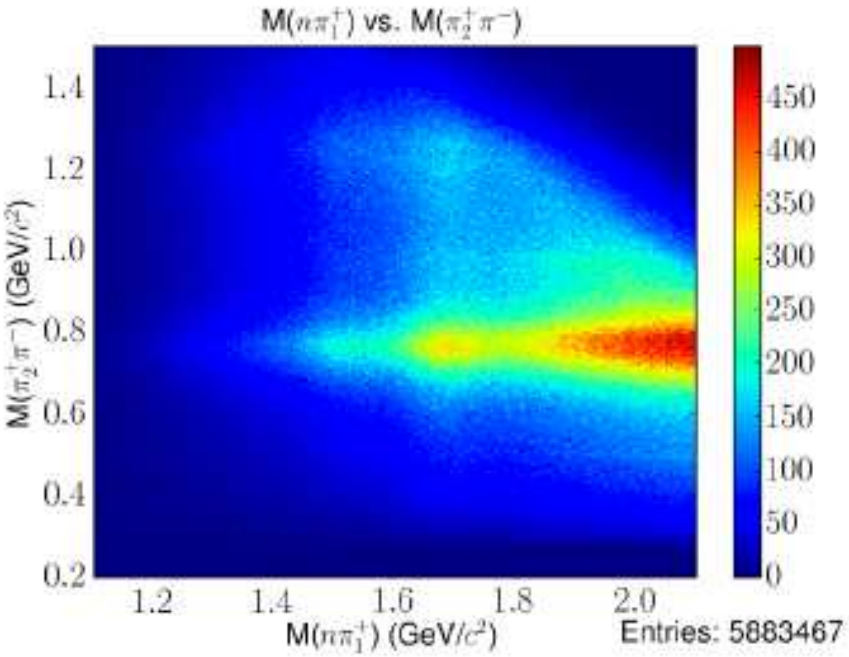
Analysis of $\gamma p \to n\,\pi^+\pi^+\pi^-$ from g12

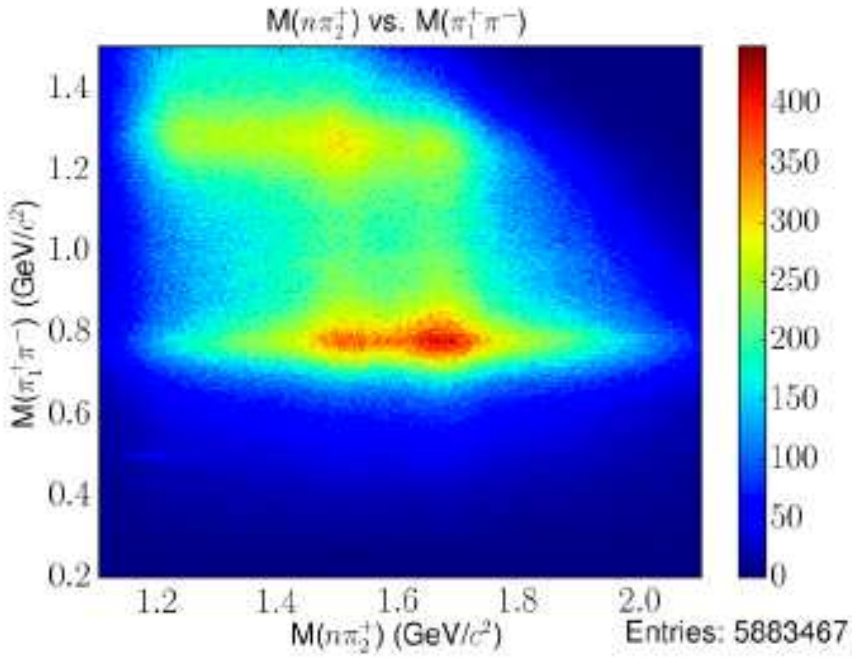
1. $\gamma p \to B^{**}\,\pi \to B^{*}\,\pi\pi \to n\,\pi^+\pi^+\pi^-$
2. $\gamma p \to B^{*}\,\rho \to n\,\pi^+\pi^+\pi^-$

➜ $E_\gamma > 4.4$ GeV

Low $|t'|$ transfer?

Small θ_{lab} $[\pi_2^+]$?





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Technical Details

Remaining analyses using FROST and g14 HDice data. Manpower?

Items to discuss (in random order):

- JLab support for data storage.
- Database ➜ Cooperation with Nuclear Group (Larry, Gagik)
- Who is interested in signing such a data-mining proposal?
  - This requires to identify and/or to share physics topics.
  - For the proposal, the usual things are also needed from each author (CV, etc.) and (Co-) PI (CV, current support, etc.).
- Photo- and Electroproduction
- Timeline?