EIC_NET meeting

Update Sez. di Genova

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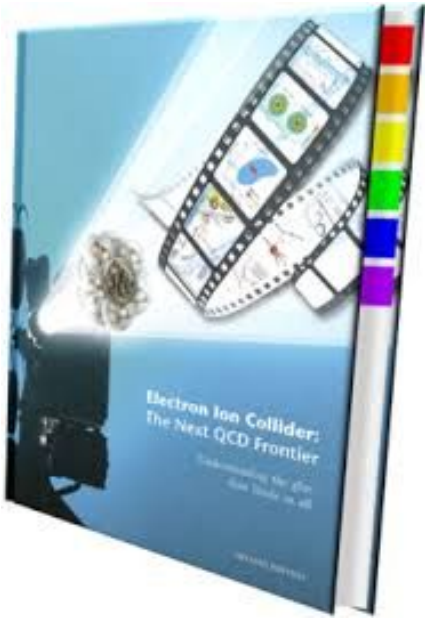
Physics Case Study: heavy-quarks spectroscopy

- Thanks to the high luminosity and energy, EIC represents an attractive opportunity for hadron spectroscopy measurements in the heavy quarks sector.
- Unique topics @ EIC:
  - Heavy flavour in nuclear medium
  - Diffractive physics (difficult in LHCb due to limited kinematic coverage)
  - Reactions involving many neutrals in final state (thanks to the large calorimeter coverage)
  - XYZ spectroscopy in the bottom sector
- The official EIC physics white-paper **does not include** (for the moment) a spectroscopy part
- This is the right time to start this activity, to be able to provide feedback to ongoing detector design studies

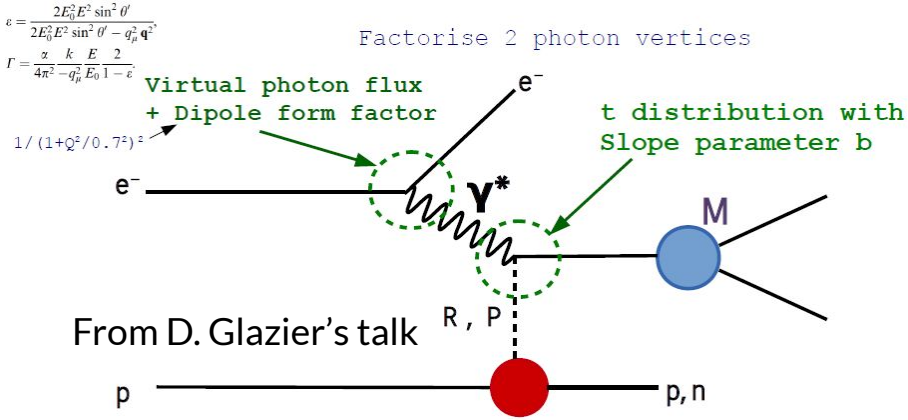


Physics Case Study: heavy-quarks spectroscopy

A working group involving both theorist and experimentalists has been formed, with a kick-off meeting at ECT* in Dec. 2018. Current status:

- Few exclusive channels studied in the quasi-real photoproduction approximation
  - J/ψ, X(3872), Y
  - Back-of the envelope rate calculation and kinematic properties of final state particles
- Preliminary contacts with EIC software group to setup a detector simulation framework

A new group meeting will be hold during the EIC user group meeting in Paris.



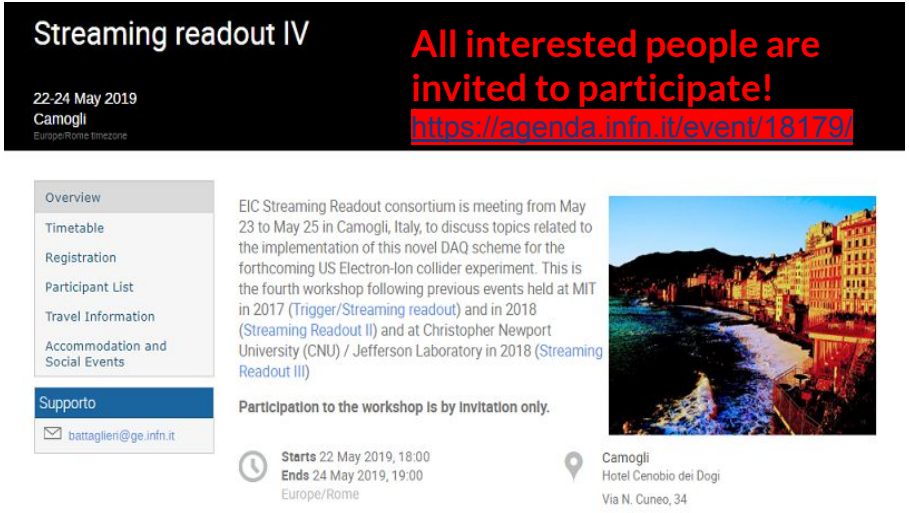
Hardware activity: streaming readout

In 2018, a consortium (**eRD23**: JLAB, BNL, CUA, MIT, **INFN**) was formed to work on the development of a streaming TDAQ system for EIC detectors. A proposal submitted to the EIC R&D program was approved, with (limited) funds to support a (MC-based) case study for this new approach. Different workshops have been organized: next in **Camogli (22-24 May 2019).**

Workshop goals:

- Review the status of streaming-readout compatible technologies (including data transport and software)
- Discuss about **validation strategies** for this new approach
- Prepare the new proposal for 2019 R&D call
  - Consider a proto-EIC detector, at nominal luminosity, and compare the traditional approach with the triggerless case

A second workshop will be organized at BNL in fall 2019

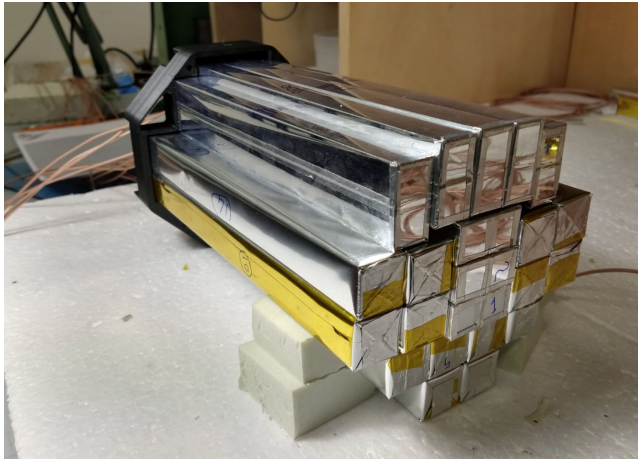


Hardware activity: streaming readout

A key aspect of the consortium activity is the streaming readout approach **validation.**

In April 2019, we characterized a matrix of $PbWO_4$ crystals with cosmic rays, comparing performances obtained from a full streaming readout system with those - for the same detector - from a triggered setup.

- Triggered system: CAEN v1730 digitizers + JLab trigger boards
- Streaming readout-system: Wave-Brd digitizer board (INFN-RM e INFN-GE) + Tridas software (INFN-BO)



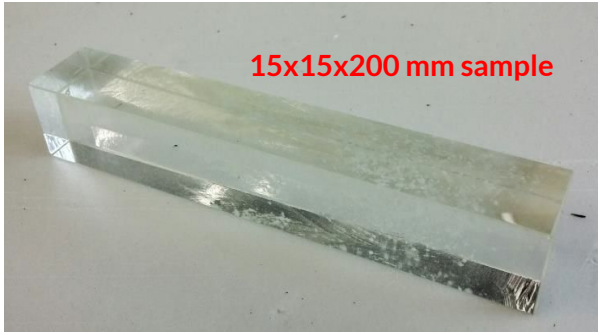
Preliminary results demonstrated the high performances of the system: these will be discussed at the streaming readout workshop.

Next steps:

- Characterization of a small $PbWO_4$ calorimeter with e^- beam at DESY (detector design, construction and commissioning by MIT)

A dedicated Post-Doc will be hired to work on this activity through "Ministero degli Esteri - progetti di Grande Rilevanza" funds

Hardware activity: lead-glasses



Electromagnetic calorimeter have a key role in any EIC detector design.

- Small angles: leading option is a PbWO4-based homogeneous calorimeter
- Larger angles: **glass-ceramic scintillators** may provide an attractive and cost-effective option.

Ongoing development in eRD1: we plan to characterize lead-glass samples produced at CUA using a cosmic-rays telescope currently being constructed.

- Measure the main parameters of a large number of samples (light yield, rad. length, timing)
- Test different readout options

Stato finanziario: missioni

Assegnato	5k
Speso	4.5k
Residuo	0.5k
Spese previste	5k **(+3k)**

Spese effettuate:

- 2 missioni USA x 2 persone (EIC R&D meeting, streaming readout tests a JLab)

Spese previste:

- EIC R&D meeting @ BNL: **1.5k**
- EIC user meeting (2 persone): **2.0k**
- Streaming readout workshop @ BNL: **1.5k**
- Streaming readout test-beam @DESY: **3.0k**
  (sub-judice to beam-time approval and detector readiness):