

EIC interactions with CERN



Rik Yoshida

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meeting

 **Jefferson Lab**



U.S. DEPARTMENT OF
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Office of
Science



Report to IB on interactions with CERN

OUTLINE

- Why contact CERN?
- CERN/Particle Physics Planning Mechanism
- What we did so far
 - Contact made at EIC UG meeting at CUA in DC (July 2018)
 - (Informal) visit to CERN: meeting with Research Director (Eckhard Elsen, October 2018)
 - Submissions to European Particle Physics Strategy Update (December 2018)
- The Next Step
 - Strategy Update
 - The update timeline
 - The submitted 10-pagers
 - The Granada symposium
- Outlook

Why contact CERN for US EIC?

- Physics synergies
 - Heavy Ion program: ALICE and perhaps other initiatives
 - Hadron program: COMPASS and others
 - eP collider plans: LHeC, FCCeh, AWAKE(VHEeP, PePIC..)
 - Energy Frontier at LHC: “parton beam parameters”
- Accelerator R&D synergies
 - Crab Cavities
 - Energy Recovery Linac
 - SRF
 - Others..
- Detector R&D synergies
 - Shared detector R&D?
 - Use of CERN infrastructure for detector R&D?

Recognition by CERN of the US EIC program as being a valuable partner in both the physics pursued at CERN and in R&D for accelerator and detector could be very positive for US EIC, particularly for those from European Institutes.

CERN/Particle Physics Planning Mechanisms

- High Energy Physics planning in Europe is coordinated through CERN.
 - [ECFA](#) (European Committee for Future Accelerators)
Advisory to CERN management, and to CERN council (as well as other European organizations).
 - Representatives from European Countries
 - +ex officio members from CERN, DESY, INFN
 - Representatives from other organizations including NUPECC
 - European Strategy for Particle Physics Update 2018-2020 ([EPPSU](#))
 - Set up by CERN council
 - Strategy first set up in 2006: updated periodically.
 - European Strategy Group (ESG) set up by the council makes the proposal of the update.
 - Physics Preparatory Group (PPG) prepares briefing book based on *community input*.
 - Community input in the form of 10-page whitepapers at end of 2018.
 - Open symposium in Granada May 2019. Then PPG gets to work.
 - Strategy Secretary (Halina Abramowicz) chairs both ESG and PPG.
 - NUPECC is represented in this process.
- NUPECC (Nuclear Physics European Collaboration Committee) coordinates the Long Range Plan for Nuclear Physics in Europe. Has contact with CERN planning at several points.
 - Latest version was 2017.

What we did so far:

- EIC SC Invited Halina Abramowicz (former ECFA chair, present Strategy Secretary) to speak at the EIC UG meeting in DC. July 29, 2018
 - She explained the EPPSU procedure and
 - Gave the current status and outlook of (mainly) the CERN program.
 - EPPSU was just starting at that point.
- On Oct 2, 2018, Rolf Ent, Abhay Deshpande, and RY visited CERN and spoke with Eckhard Elsen (Director of Research and Computing at CERN) about the US EIC. This was an informal meeting. Reported back to EIC UG SC and BNL and JLAB and now to IB.
 - Summary: The meeting was very positive; EE was very aware of the EIC and very encouraging about strong participation of the EIC community in the Particle Physics Strategy update process at CERN/Europe. EE initiated the discussion about cooperation with CERN and gave the neutrino platform as an example of successful collaboration with a US project.

Meeting with EE (Strategy Update)

- Strategy Update (EPPSU)
 - EE strongly encouraged engagement of the US EIC community with the EPPSU process.
 - Looking for broad input, also from non-HEP fields, to create coherent plan in the international context, with complementary facilities around the world.
 - EE aware of European interest in US EIC, also physics synergies with COMPASS, heavy ions and also for high-x PDFs
 - Encouraged submission of whitepaper from US EIC both science/detector and accelerator. (“of course do this”)
 - Encouraged participation by US EIC in the Granada open symposium. “Give input, have an adequate representation, coffee and parallel session discussions are very important.”
 - “Mention of US EIC in the (strategy) document would help the local governments”

Based on this input, EIC UG asked our European colleagues to write and submit a 10-page whitepaper for EIC science to EPPSU.

At the same time, BNL and JLAB wrote a combined EIC accelerator 10-page whitepaper and submitted it to EPPSU.

Meeting with EE(collaboration with CERN)

- CERN / US EIC collaboration possibilities
 - “Neutrino Platform R&D Infrastructure”: built at a few hundred-M CHF level with annual operation cost of CHF12M (small for CERN). Used for DUNE, proto-DUNE and other neutrino projects. (some are unrelated to DUNE, e.g. near detector for T2K).
 - New R&D experimental area in Preveessin site (North area extension: EHN1) sub-GeV to ~ 10 GeV
 - EE encouraged European colleagues in EIC think about similar model of detector development, possibly even using the same infrastructure as the Neutrino Platform, in the future.
 - EE said that one should only think about “Recognized Experiment at CERN” status once the US EIC project is well established.

Note(RY): Neutrino Platform is a rather large undertaking at CERN based on MoUs from over 100 institutes and containing many (>15) projects including proto-Dune, ICARUS, T2K near detector.. Etc.

We did not discuss in detail how this type of arrangement might be applied to EIC.

Next Step

- EPPSU timeline

- Open symposium in Granada, May 13-16, 2019. Last step in the community input. Physic Preparatory Group gets to work.
- PPG finishes the Physics Briefing Book. Done with "consultation and consensus building" at this stage. September, 2019
- Strategy Update Drafting (by the Strategy Update Group), January, 2020
- March 2020, Strategy Update submitted to CERN council.
- May 2020, Council (probably) approves the update

The means the last opportunity for the input is at Granada.

EIC-SC organized the first discussion among EIC concerned Granada attendees (probably 10 or so).

Next Step

10-page submissions to EPPSU (there are 160)

- Those mentioning EIC
 - US EIC input (#99)
 - US EIC Accelerator Input (#74)
 - Others related and mentioning/discussing US EIC (coordinated submission)
 - “DIS” document: EIC, LHeC, FCC-eh, VHEeP
 - QCD Theory
 - “Roadmap” Inputs mentioning US EIC
 - Canada, INFN, IRFU, German-Hadron Physics, Czech Republic, Italian-HI, Sweden, NUPECC
- Those not mentioning EIC but related
 - Electron-Ion colliders: LHeC 159, FCCeh 140, AWAKE (VHEeP, PePIC) 58,35,50
 - Heavy Ion Program: 110, 48, 37, 47
 - Hadron physics program: COMPASS(143), LHC Spin(111), Fixed Target program (67), [Nuclear Structure: Isolde(39)]
 - Accelerator: PERLE (147)
 - Further afield: Detector R&D(ECFA Detector Panel 68), Monte Carlo Generators and computing (114, 53, etc..)
- Countries submitting roadmaps w/o EIC (not all countries submitted)
 - Belgium, UK, China, Japan, Spain, Netherlands, Russia, Israel, Finland, Poland, Norway, Austria, Romania, Slovenia, Switzerland

Outlook

- What is our long-term goal for a partnership with CERN? Could be:
 - Optimistically: establish something like the neutrino platform
 - CERN/European institutes use CERN infrastructure for detector R&D for EIC.
 - CERN/European institutes use CERN infrastructure to test and build components of detectors that are used at the EIC.
 - Examples from Neutrino Platform
 - ICARUS detector retooled at CERN and used in SBN program at Fermilab
 - Proto-DUNE at CERN tests technologies for DUNE
 - T2K near detector made at CERN and shipped to J-PARC
 - Establish scientific partnership in certain areas
 - Joint studies for HI/EIC connection, CERN Hadron program/EIC connection, Energy-Frontier/EIC synergy(PDFs)
 - Monte Carlo Generators, detector simulations, software/computing
 - Establish joint accelerator R&D
 - Other ideas?
- While all of this this is a bit far away, the next step is to be included in the Strategy Update document.
 - To lowest order we need a "mention" to support European EIC physicists.
 - We would like it to be the basis of collaboration with CERN.