# ePIC Collaboration Status and News

John Lajoie and Silvia Dalla Torre

ePIC General Meeting, December 1, 2023

TODAY AGENDA

## General Status and Updates

Conveners: John Lajoie (Oak Ridge National Laboratory), Silvia Dalla Torre (INFN, Trieste)

**10:30** **ePIC Collaboration News**

Speakers: John Lajoie (Oak Ridge National Laboratory), Silvia Dalla Torre (INFN, Trieste)

**10:50** **Collaboration Council News**

Speakers: Bernd Surrow (Temple University), Ernst Sichtermann (Lawrence Berkeley National Laboratory)

**11:05** **Review of CD-3A Comments and Recommendations**

Speakers: John Lajoie (Iowa State University), Silvia Dalla Torre (INFN, Trieste)

**11:25** **Discussion**

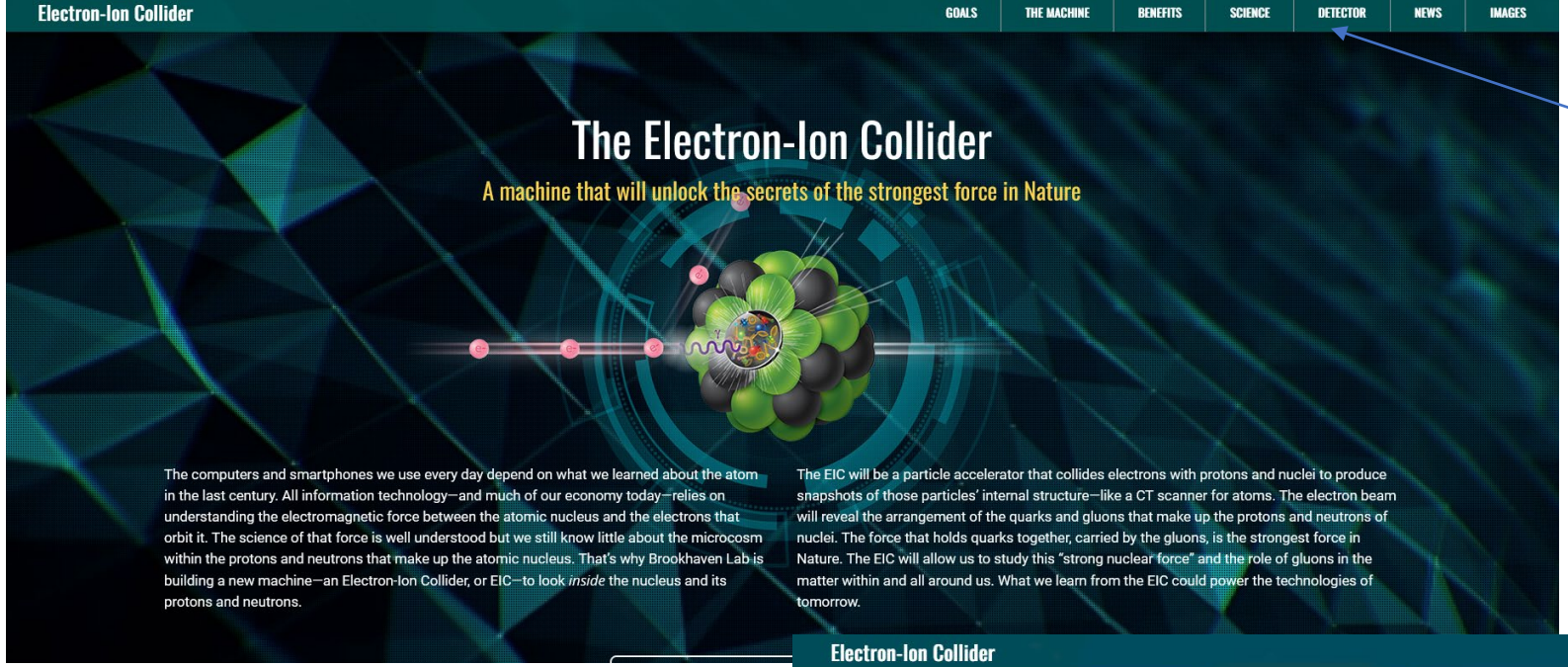
Speakers: John Lajoie (Iowa State University), Silvia Dalla Torre (INFN, Trieste)

# NEWS

Welcome to the two new Institutions joining ePIC (more news in the CC report)

- Nara Women's University
- University of Debrecen

the application for **CERN Recognized Experiment** is now submitted
Recognized Experiments Committee meeting to approve early 2024

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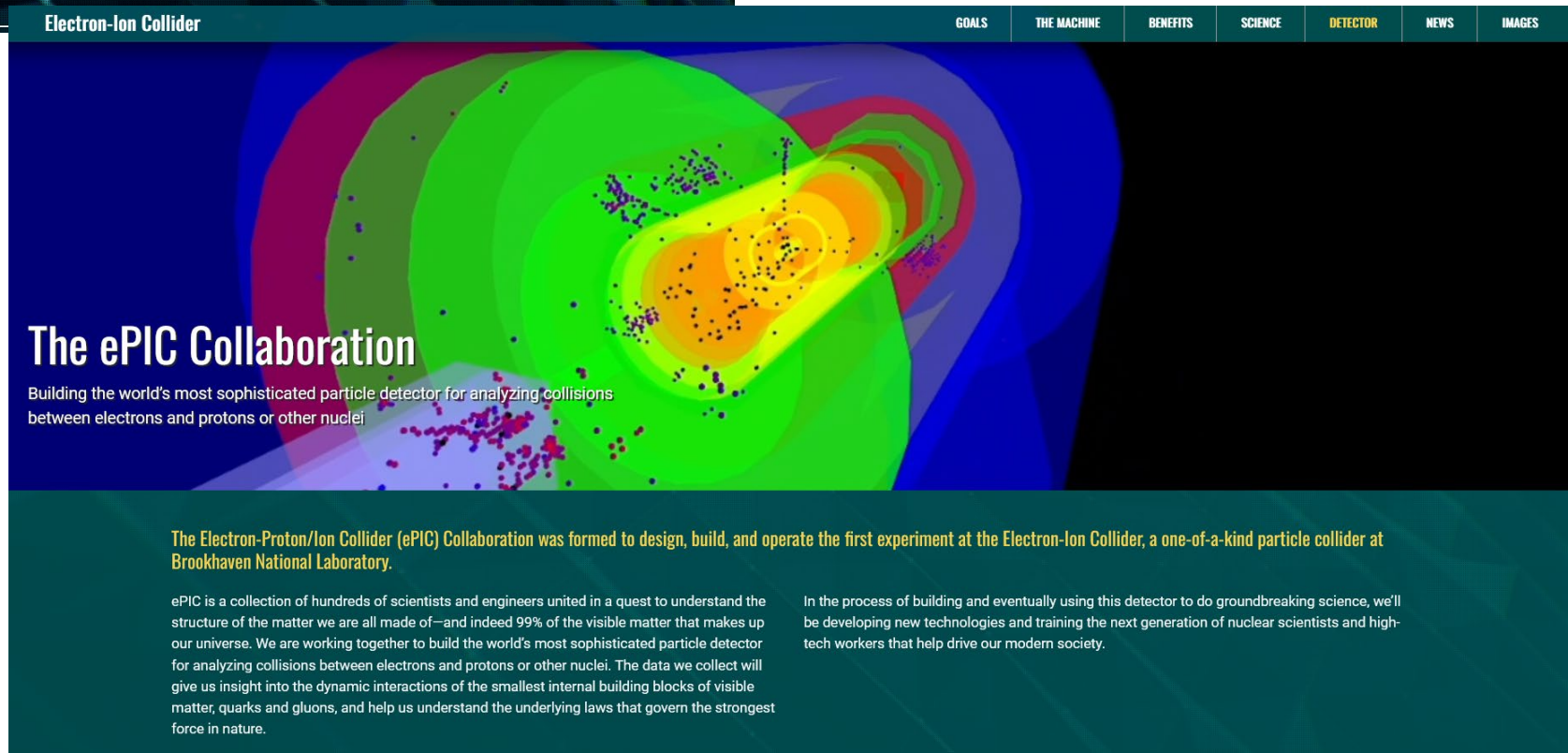
# ePIC officially on web !

Let's regard this as an initial ePIC presence on web, which will further evolve



# First EB meeting

*About EB ( a reminder)*:
The EB provides input to the Spokespersons on physics policy, instrumentation choices, and candidate suggestions for leadership positions. In addition to the 3 at-large members who will be elected by the Collaboration Council (CC), two members will be selected by the early-career group and the DEI committee. The Spokespersons can appoint additional members after endorsement by the CC. It is expected that top level activity coordinators will be members of the EB.

*Members (see also the CC chair report, later today)*

Ex officio: J. Lajoie, S. Dalla Torre
Elected at large: T. Gunji , B. Jacak, P. Newman
Selected by the early career group: F. Flor
Selected by DEI: M. Connor
appointed by SP-office: ePIC Coordinators, M. Diefenthaler, S. Fazio, R. Reed
non-voting members: E. Sichtermann, B. Surrow

**First ePIC EB meeting on November 17**

wide, open, constructive discussion
in particular:
DOE review feedback (see John's report, later today)
ePIC engagement in TDR (in the following in this report)

# ePIC COLLABORATION, agenda:

**2nd RRB meeting** in Washington on December 7-8, 2023
→ a dedicated slide follows

One more **general meeting** in 2023
Thurs, Dec. 14th @ 7:30PM ET

SP Office **meeting with Tim Hallman** Dec. 11th
Needs of research groups in ePIC

2nd **EB Meeting**
Thursday, Dec. 21

**ePIC Collaboration meeting**
ANL January 9-13,2024 → *in the next slides*

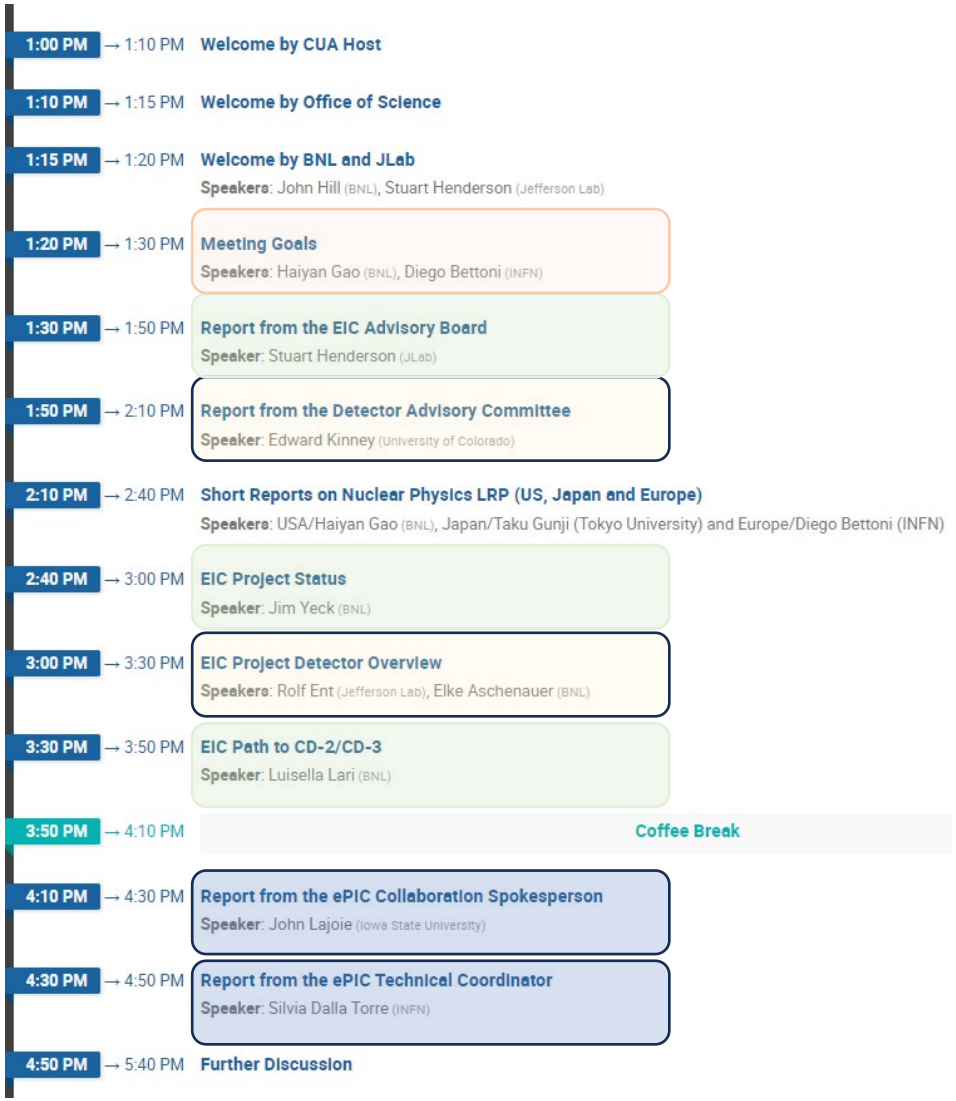
**EIC-Asia Meeting** in Taiwan Jan. 29-31, 2024

**ePIC Software and Computing meeting** @ CERN April 22nd-26th

Next-to-next ePIC collaboration meeting @ Lehigh U., July 22-27/28, 2024

# RRB – 2nd meeting in the coming week (Dec. 7-8, 2023)

*A walk through the agenda to get a flavor about items and goals at this second RRB mtg*



1:00 PM → 1:10 PM **Welcome by CUA Host**

1:10 PM → 1:15 PM **Welcome by Office of Science**

1:15 PM → 1:20 PM **Welcome by BNL and JLab**
Speakers: John Hill (BNL), Stuart Henderson (Jefferson Lab)

1:20 PM → 1:30 PM **Meeting Goals**
Speakers: Haiyan Gao (BNL), Diego Bettoni (INFN)

1:30 PM → 1:50 PM **Report from the EIC Advisory Board**
Speaker: Stuart Henderson (JLab)

1:50 PM → 2:10 PM **Report from the Detector Advisory Committee**
Speaker: Edward Kinney (University of Colorado)

2:10 PM → 2:40 PM **Short Reports on Nuclear Physics LRP (US, Japan and Europe)**
Speakers: USA/Haiyan Gao (BNL), Japan/Taku Gunji (Tokyo University) and Europe/Diego Bettoni (INFN)

2:40 PM → 3:00 PM **EIC Project Status**
Speaker: Jim Yeck (BNL)

3:00 PM → 3:30 PM **EIC Project Detector Overview**
Speakers: Rolf Ent (Jefferson Lab), Elke Aschenauer (BNL)

3:30 PM → 3:50 PM **EIC Path to CD-2/CD-3**
Speaker: Luisella Lari (BNL)

3:50 PM → 4:10 PM **Coffee Break**

4:10 PM → 4:30 PM **Report from the ePIC Collaboration Spokesperson**
Speaker: John Lajoie (Iowa State University)

4:30 PM → 4:50 PM **Report from the ePIC Technical Coordinator**
Speaker: Silvia Dalla Torre (INFN)

4:50 PM → 5:40 PM **Further Discussion**

8:45 AM → 9:15 AM **Report from the ePIC Computing Coordinator**
Speaker: Markus Diefenthaler (Jefferson Lab)

9:15 AM → 9:45 AM **Host labs' computing support and partner expectations**
Speakers: Amber Boehnlein (Jefferson Lab), Eric Lancon (BNL)

9:45 AM → 10:15 AM **Discussion on Threshold for Member versus Observer Countries**
Speakers: Haiyan Gao (BNL), Diego Bettoni (INFN)

10:15 AM → 10:45 AM **Coffee Break**

10:45 AM → 11:15 AM **Common Funds**
Speakers: Elke Aschenauer (BNL), Rolf Ent (Jefferson Lab), Jim Yeck

11:15 AM → 12:00 PM **Further Discussion on Agreements & Common Funds**
Speakers: Haiyan Gao (BNL), Diego Bettoni (INFN)

12:00 PM → 1:00 PM **Lunch Break**

1:00 PM → 2:00 PM **Comments by Members (Funding Agency Representatives)**
Speakers: Haiyan Gao (BNL), Diego Bettoni (INFN)

2:00 PM → 2:30 PM **Comments by Observers**
Speakers: Diego Bettoni (INFN), Haiyan Gao (BNL)

2:30 PM → 2:50 PM **Comments by Host Agency-DOE/NP**
Speaker: Timothy Hallman (Department of Energy, Office of Nuclear Physics)

2:50 PM → 3:10 PM **Further Discussion on Key Topics of 2nd RRB meeting**
Speakers: Haiyan Gao (BNL), Diego Bettoni (INFN)

3:10 PM → 3:30 PM **Next Meeting (Topics, Dates, Venue)**
Speakers: Diego Bettoni (INFN), Haiyan Gao (BNL)

3:30 PM → 3:50 PM **Meeting Summary**
Speakers: Haiyan Gao (BNL), Diego Bettoni (INFN)

# NEXT ePIC COLLABORATION MEETING

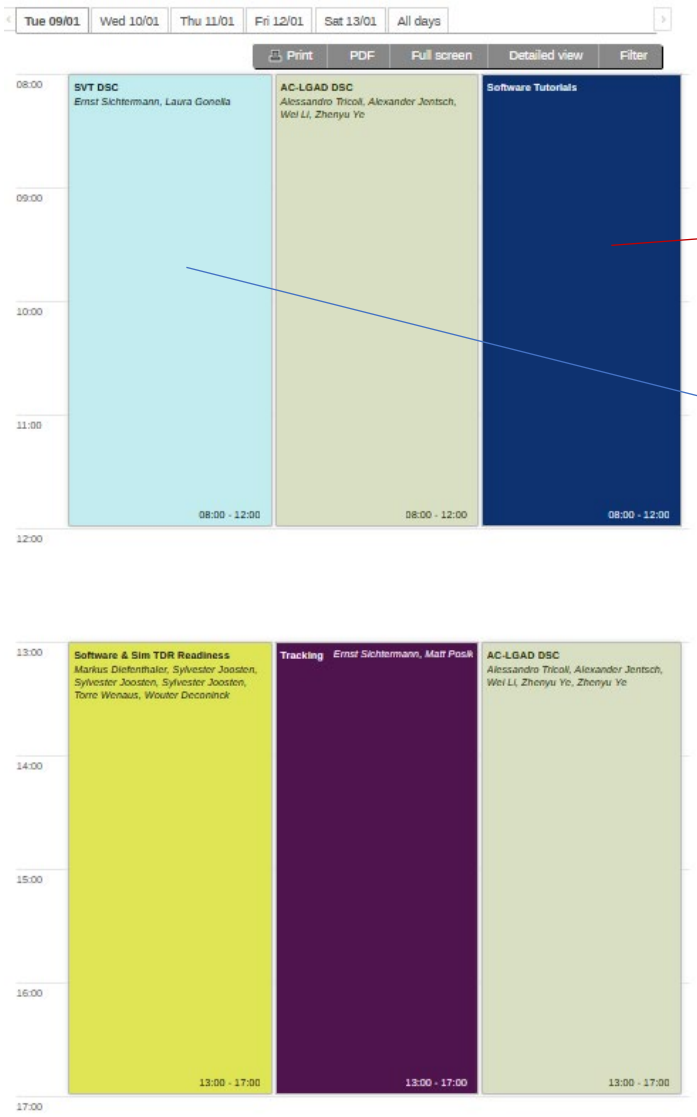
Jan 9-13, 2024 @ ANL

- 3 days of parallel sessions and workfests
- followed by 2 days of plenary sessions

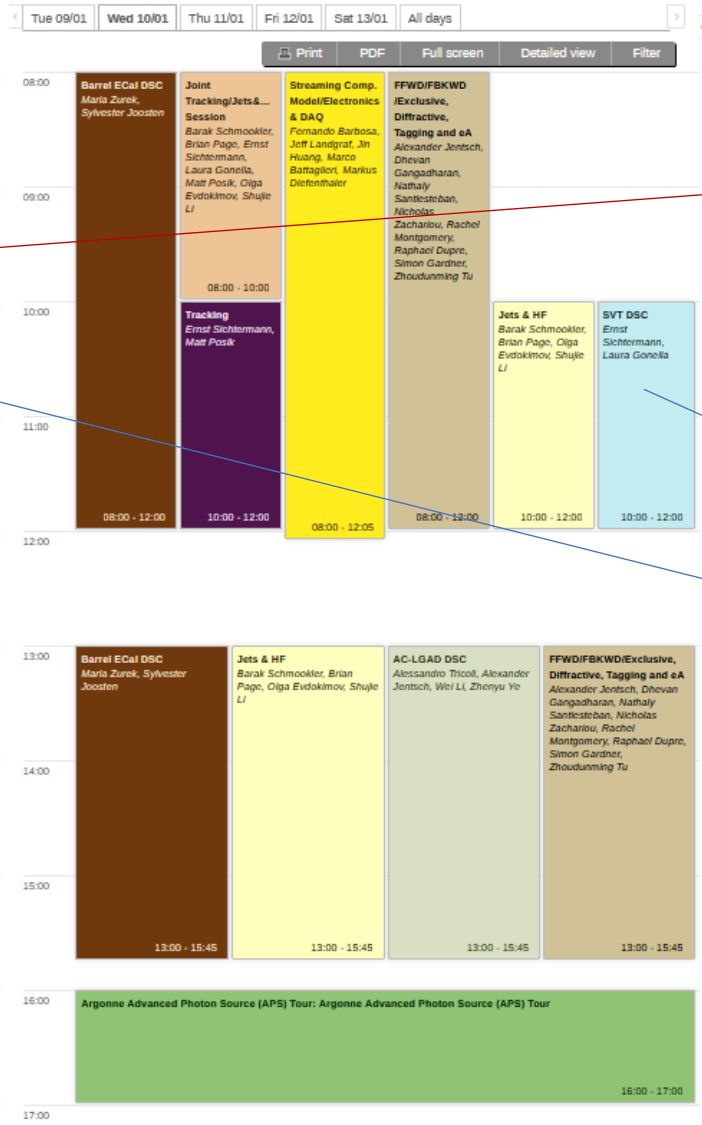
- URGENT !!!
  - Register: the deadline for **registration** and **site-access** request is **December 5th for foreign nationals** and **December 12th for US citizens**.

# FOCUS ON WORKFESTS

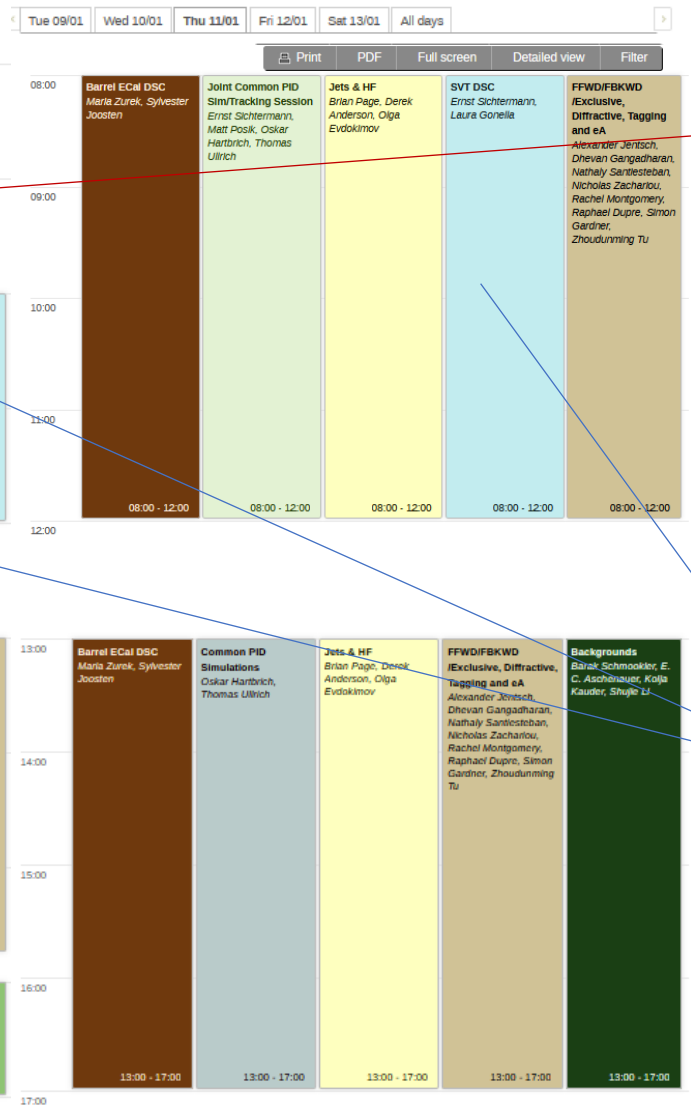
## Tuesday 1/9




## Wednesday 1/10




## Thursday 1/11




**Software tutorials:**

- Collaborative Development Environment
- Working with Simulation Output
- Detector Simulation and Digitization
- Reconstruction Algorithms
- Developing Benchmarks

A unique opportunity for newcomers in ePIC software and to get deeper in the matter

**SVT DSC**
Ernst Sichtermann, Laura Gonella

All the technical aspects of SVT addressed in the 3 sessions

# FOCUS ON WORKFESTS

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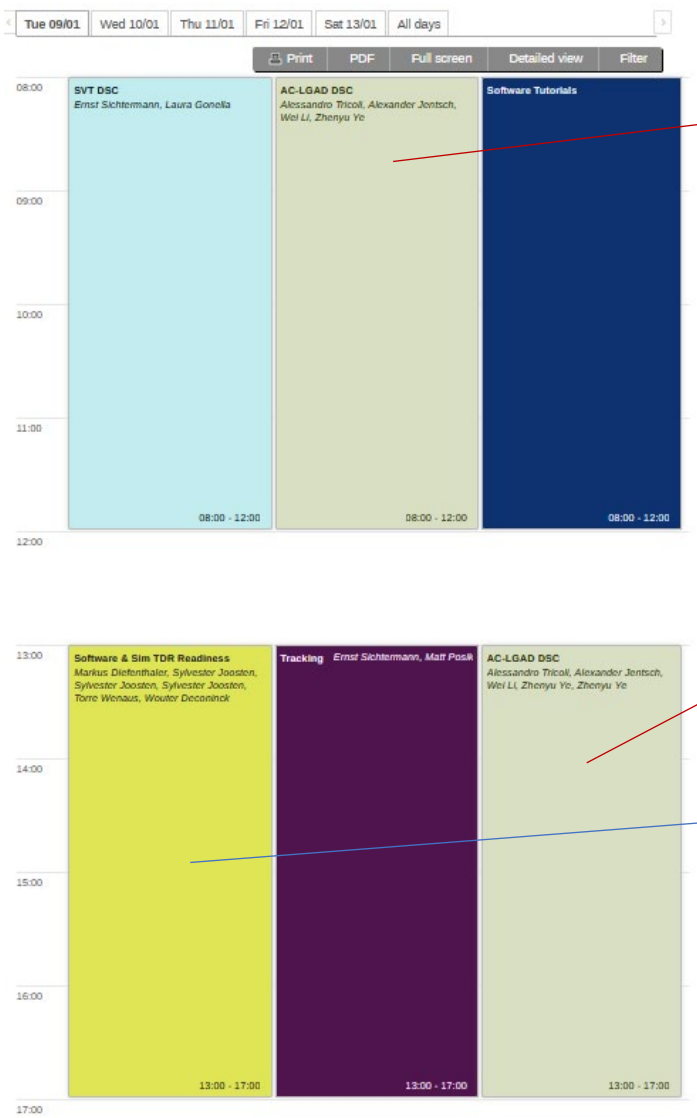


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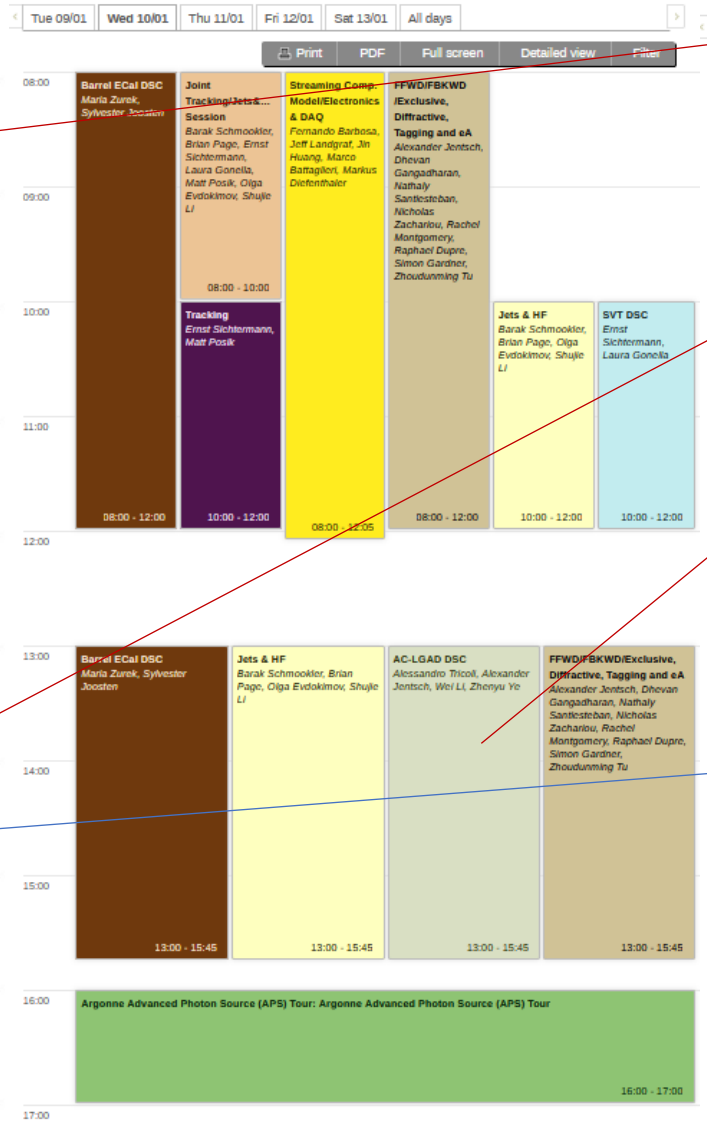


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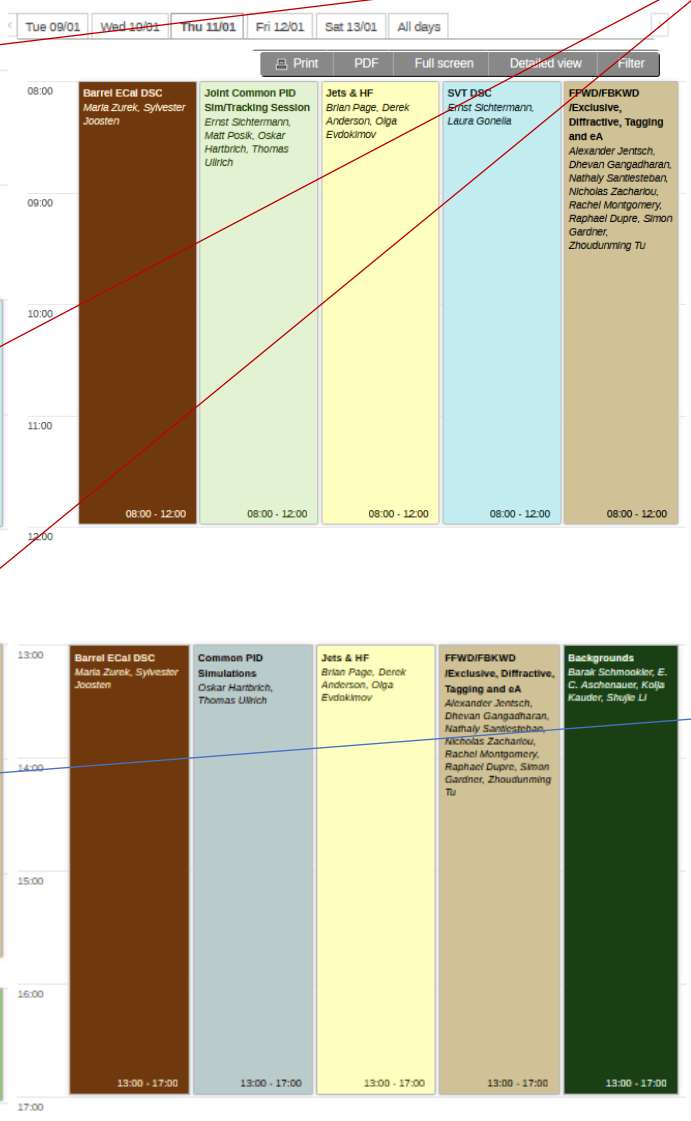


**AC-LGAD DSC**
Alessandro Tricoli, Alexander Jentsch, Wei Li, Zhenyu Ye

All the technical aspects of SVT addressed in the 3 sessions , bringing together a widely international DSC

**Software & Sim TDR Readiness**
Markus Diefenthaler, Sylvester Joosten, Torre Wenaus, Wouter Deconinck

Addressing:
*simulation, digitization, reconstruction, analysis, modeling*
in preparation for a dedicated **plenary session**

# FOCUS ON WORKFESTS

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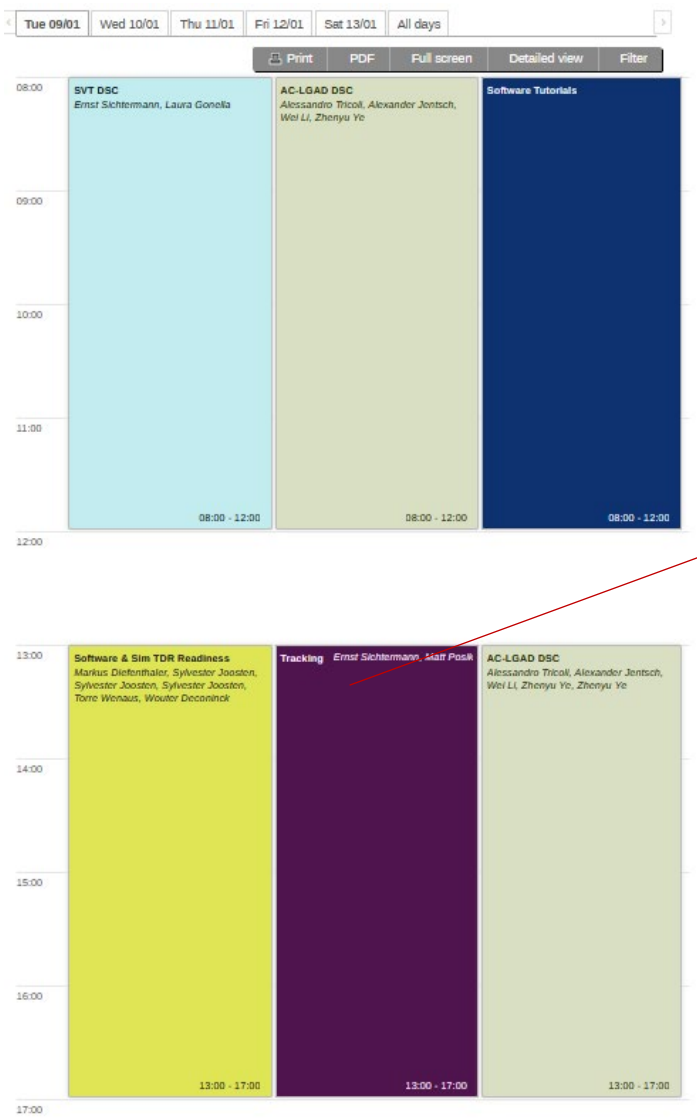


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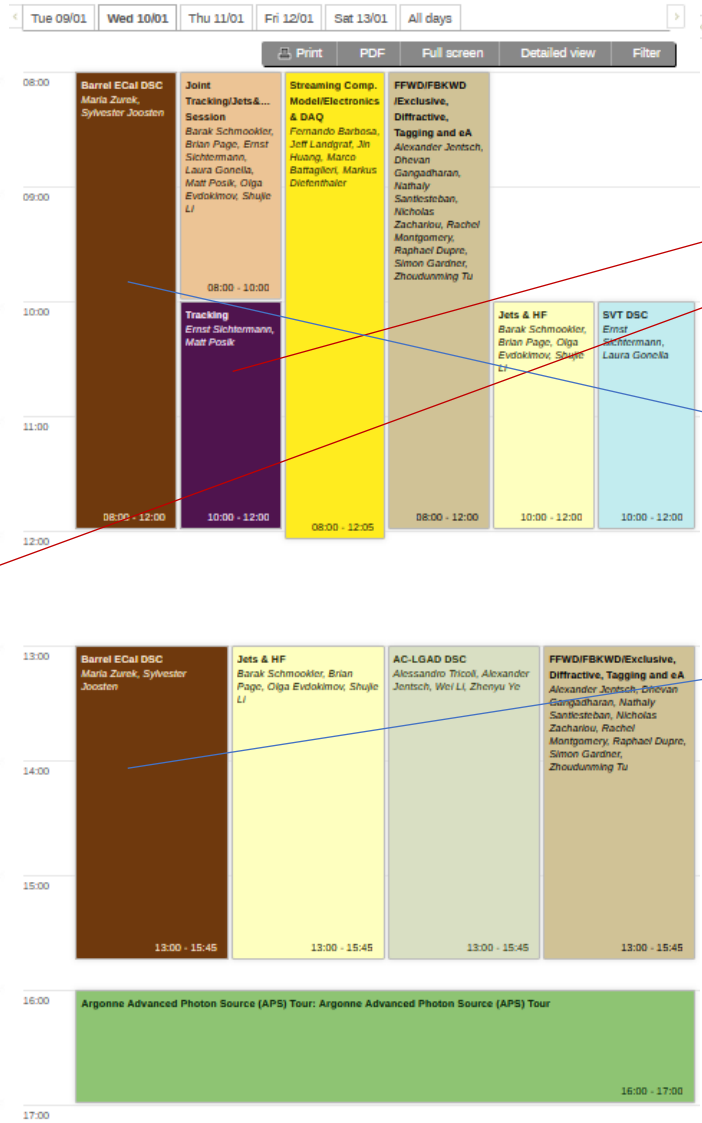


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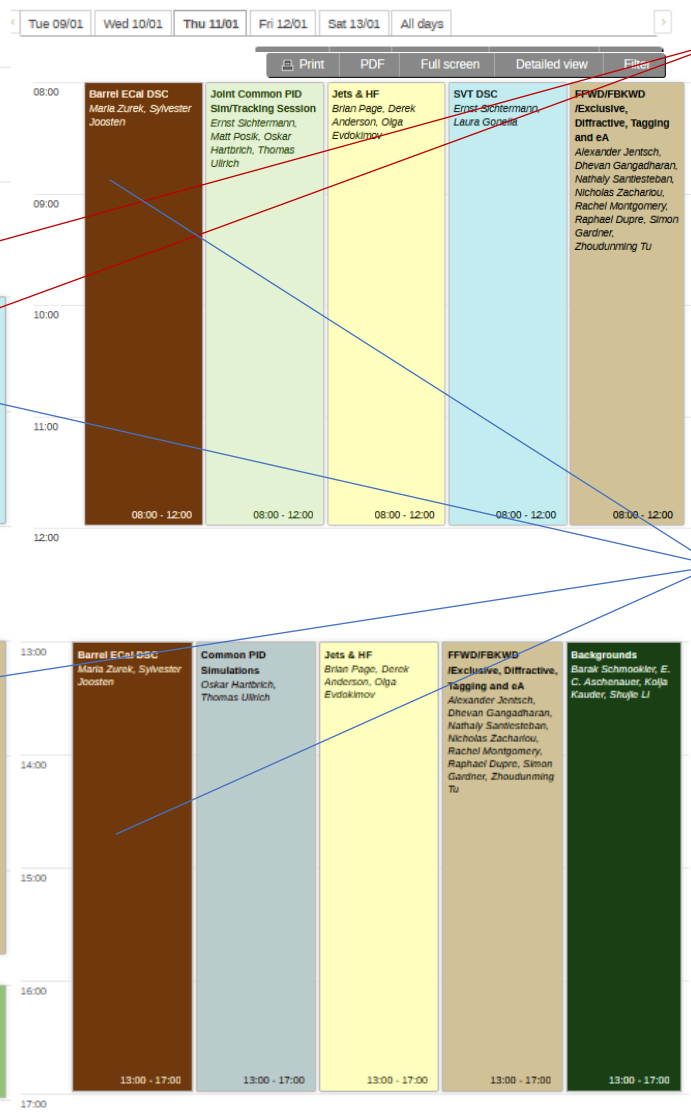


**Tracking**
Ernst Sichtermann, Matt Posik

Addressing:
- Trackfinding, projections (Tuesday)
- Material budget aspects (Wednesday)

Also in view of joint sessions

**Barrel ECal DSC**
Maria Zurek, Sylvester Joosten

Addressing:
*Technical aspects (Astropix, mechanics and integration, …) and simulation aspects*

Particular attention dedicated to planning within a wide DSC

# FOCUS ON WORKFESTS

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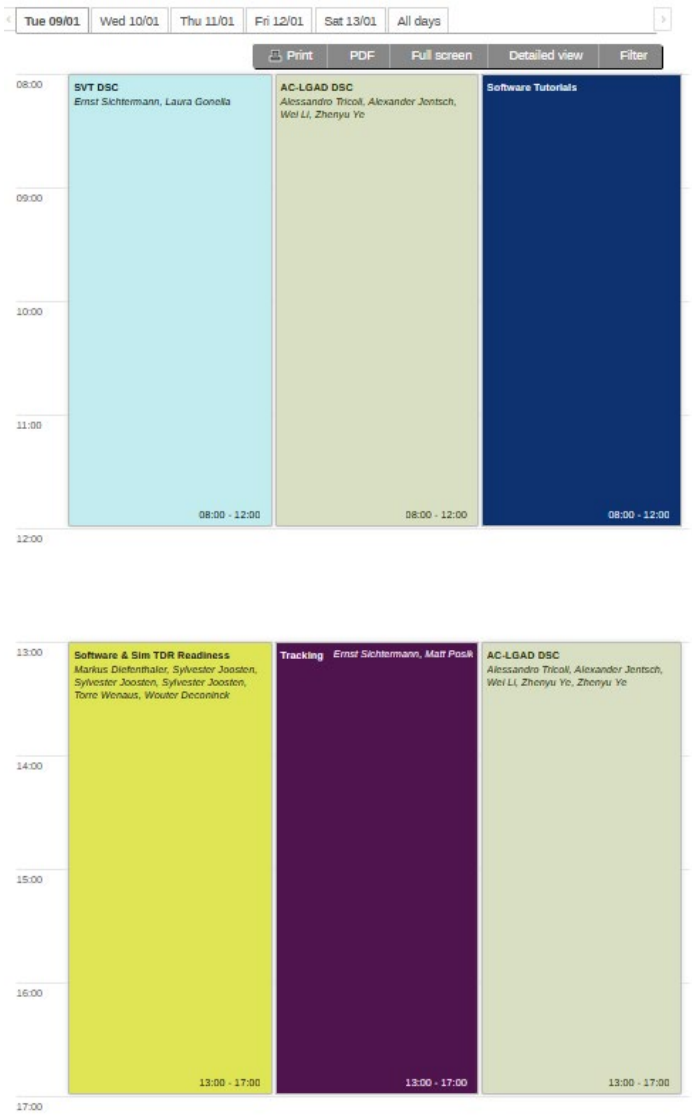


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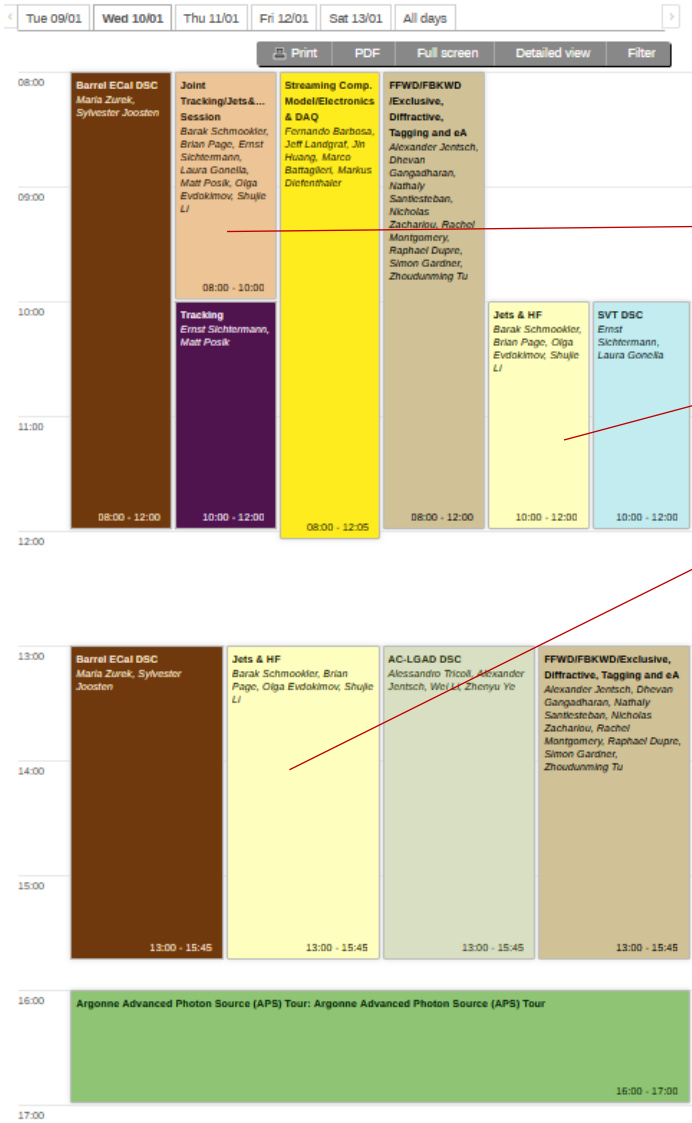


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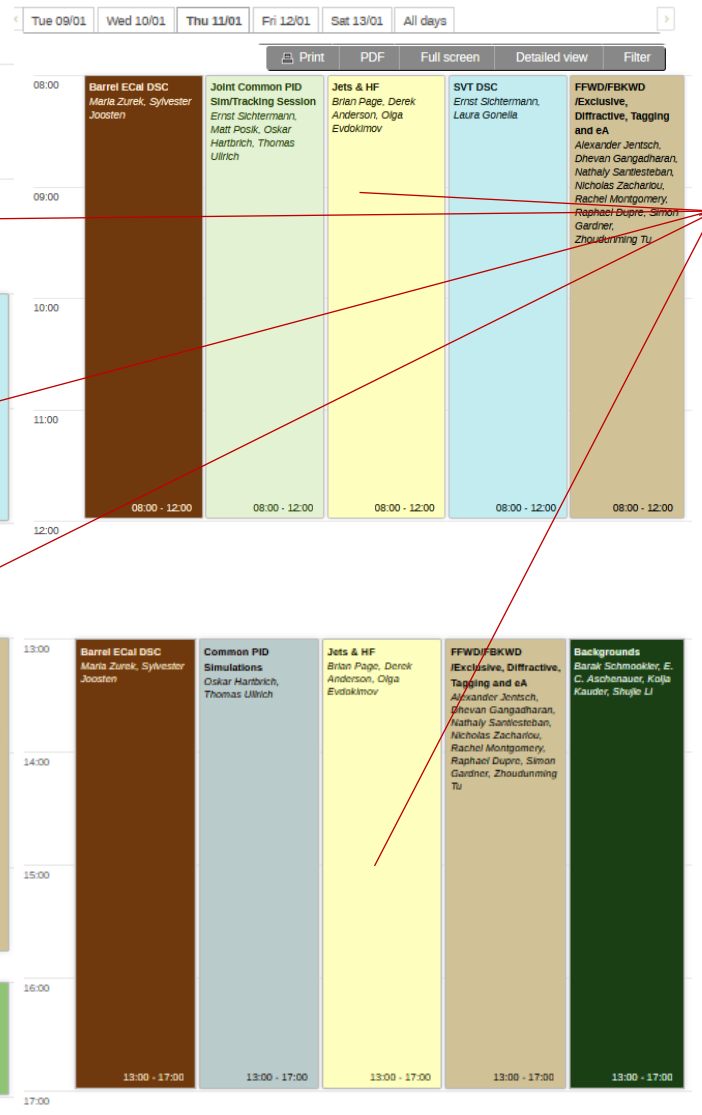


**Jets & HF**
Barak Schmookler, Brian Page, Olga Evdokimov, Shujie Li

&

**Joint Tracking/Jets&HF/SVT Session**
Barak Schmookler, Brian Page, Ernst Sichtermann, Laura Gonella, Matt Posik, Olga Evdokimov, Shujie Li

Physics and analysis aspects with clear link to detector requirements and reconstruction tools (tracking, particle flow)

# FOCUS ON WORKFESTS

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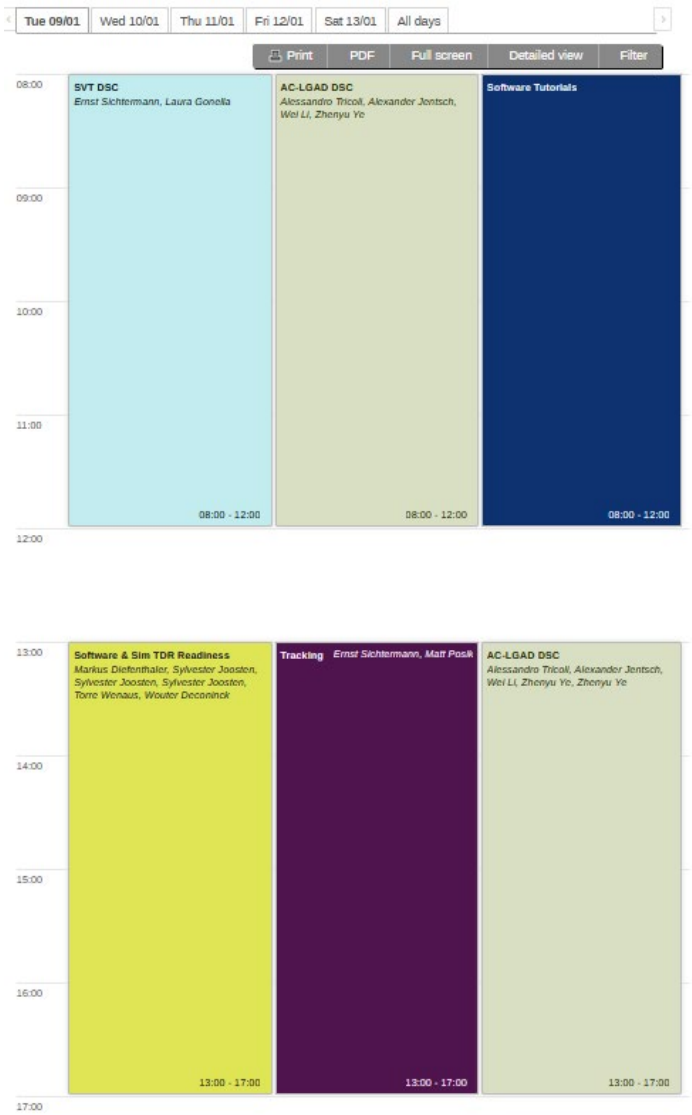


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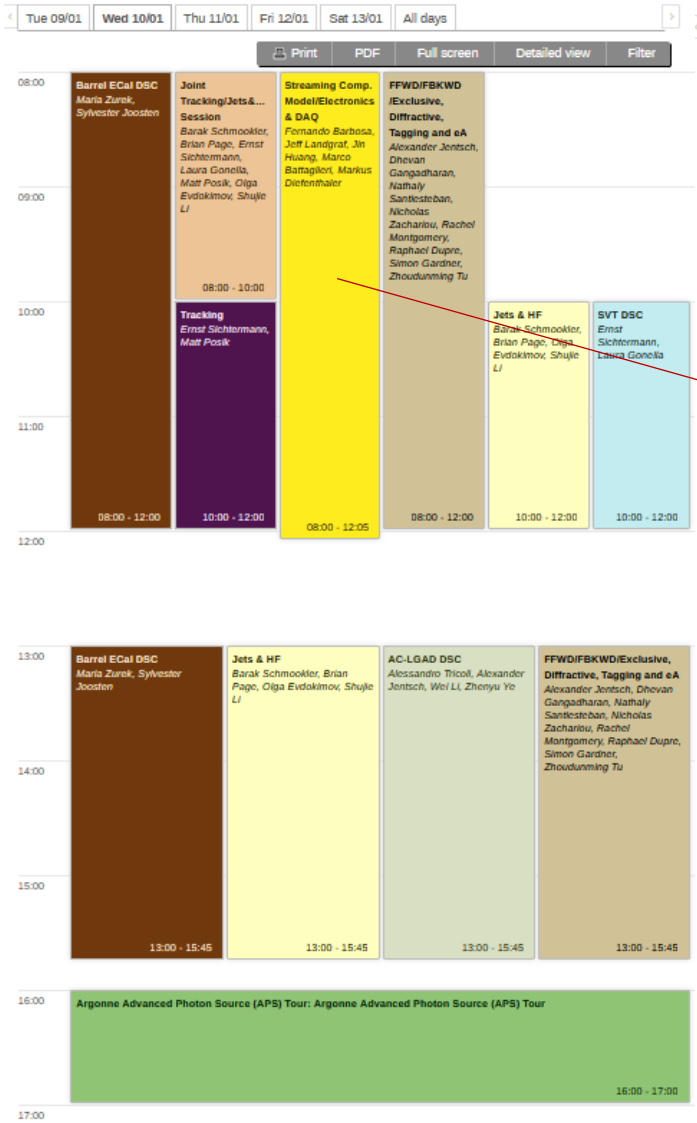


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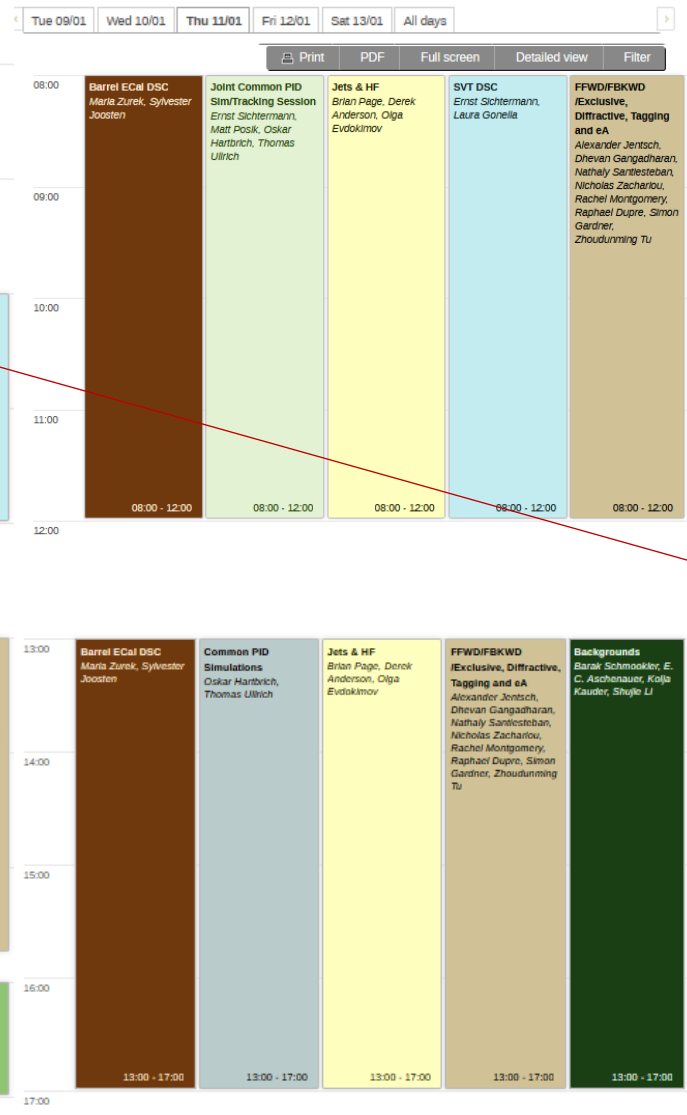


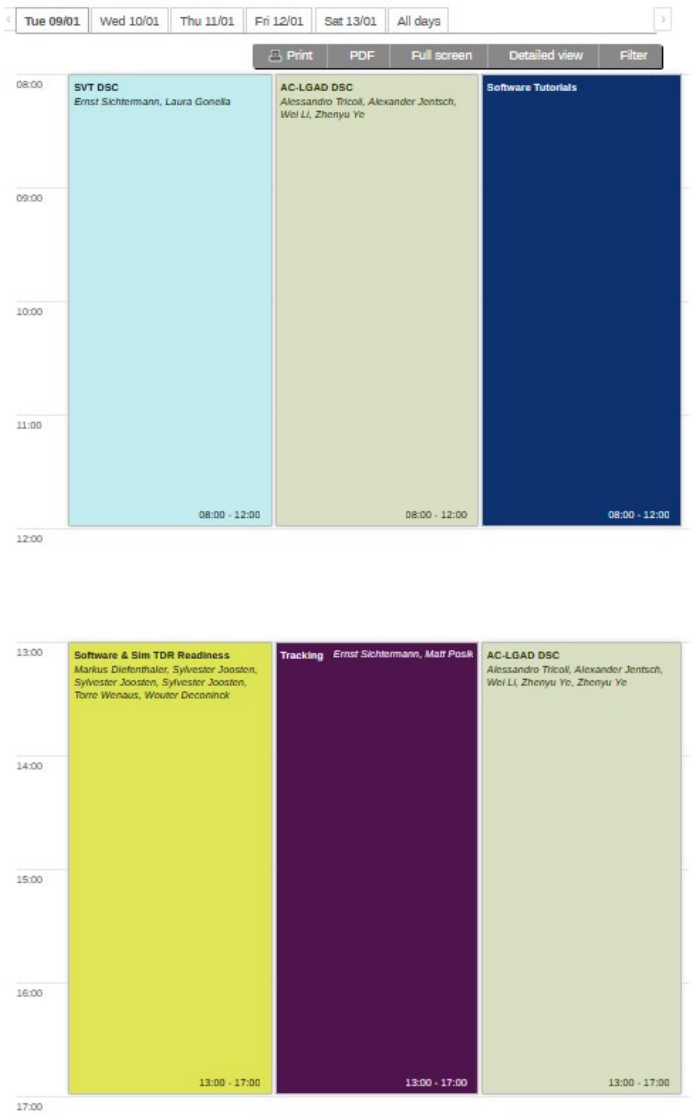

**Streaming Comp. Model/Electronics & DAQ**
Fernando Barbosa, Jeff Landgraf, Jin Huang, Marco Battaglieri, Markus Diefenthaler

focus on:
*calibration, data reduction,*
*timing aspects*

Introductory illustration for newcomers are also foreseen

# FOCUS ON WORKFESTS

## Tuesday 1/9

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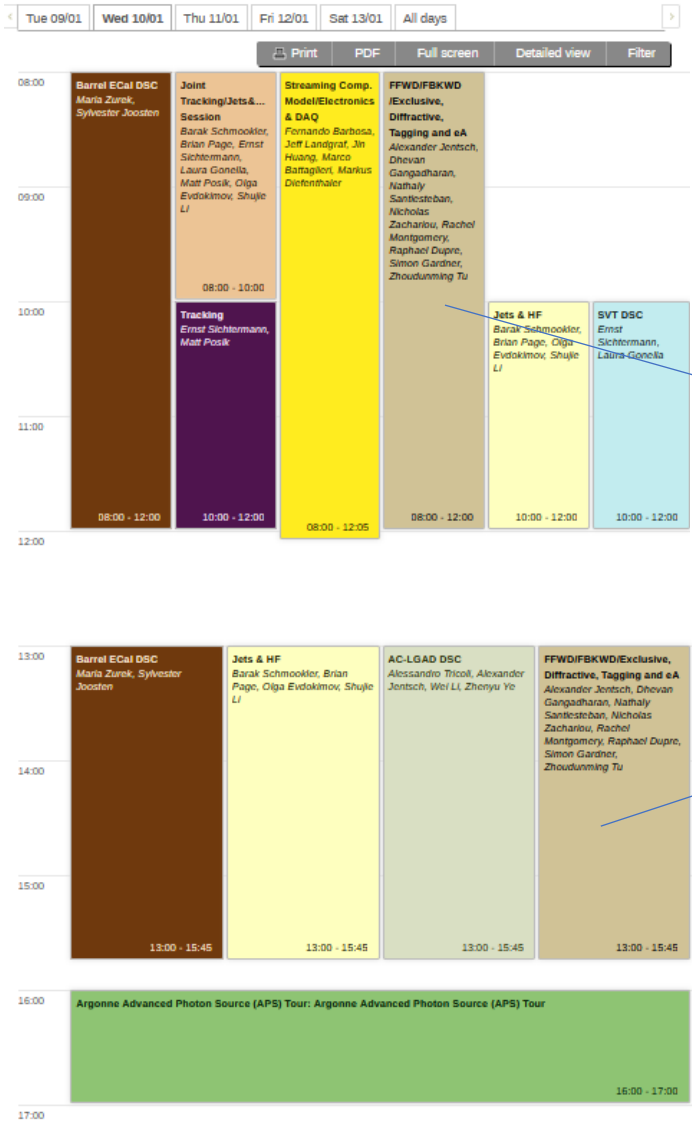
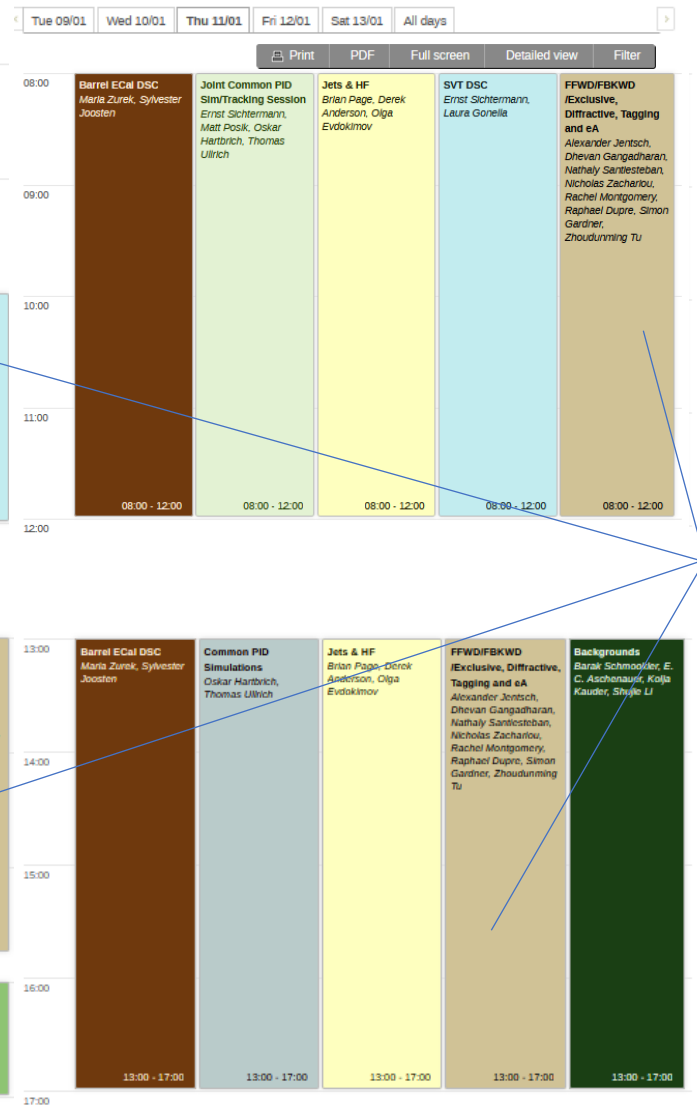



## Thursday 1/11




**FFWD/FBKWD/Exclusive, Diffractive, Tagging and eA**

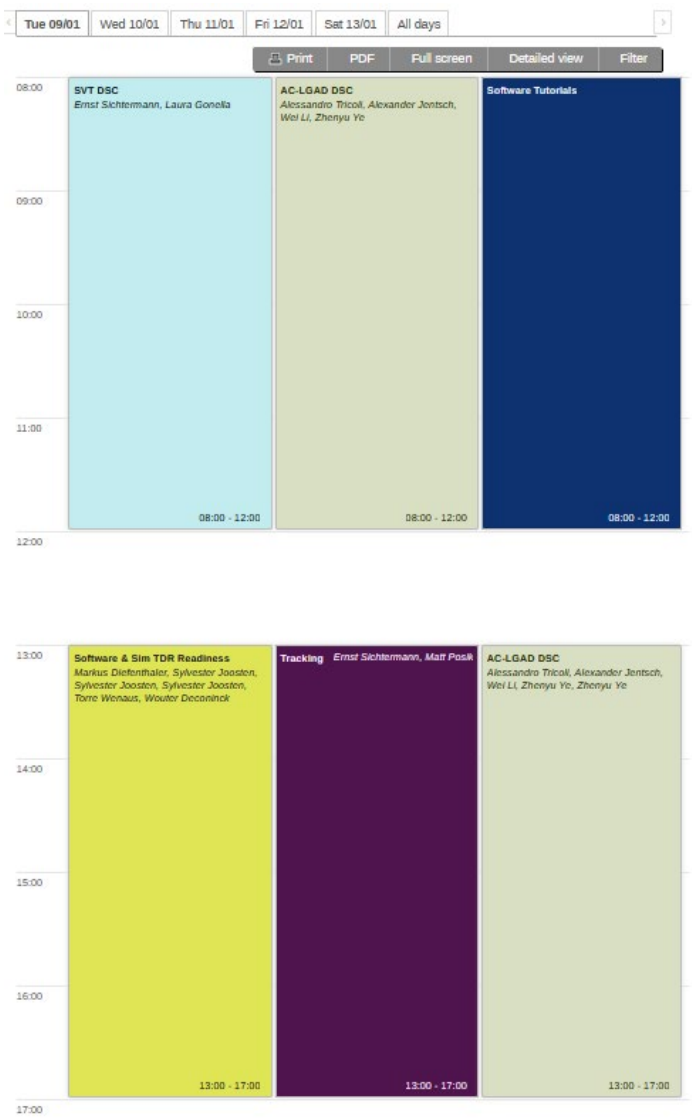
Alexander Jentsch, Dhevan Gangadharan, Nathaly Santiesteban, Nicholas Zachariou, Rachel Montgomery, Raphael Dupre, Simon Gardner, Zhoudunming Tu

- Starting from a review of previous proposals, progress towards planning material for the TDR
- detector implemented
- approach to banchmarks

- Introductory illustration for newcomers are also foreseen

# FOCUS ON WOKFESTS

## Tuesday 1/9

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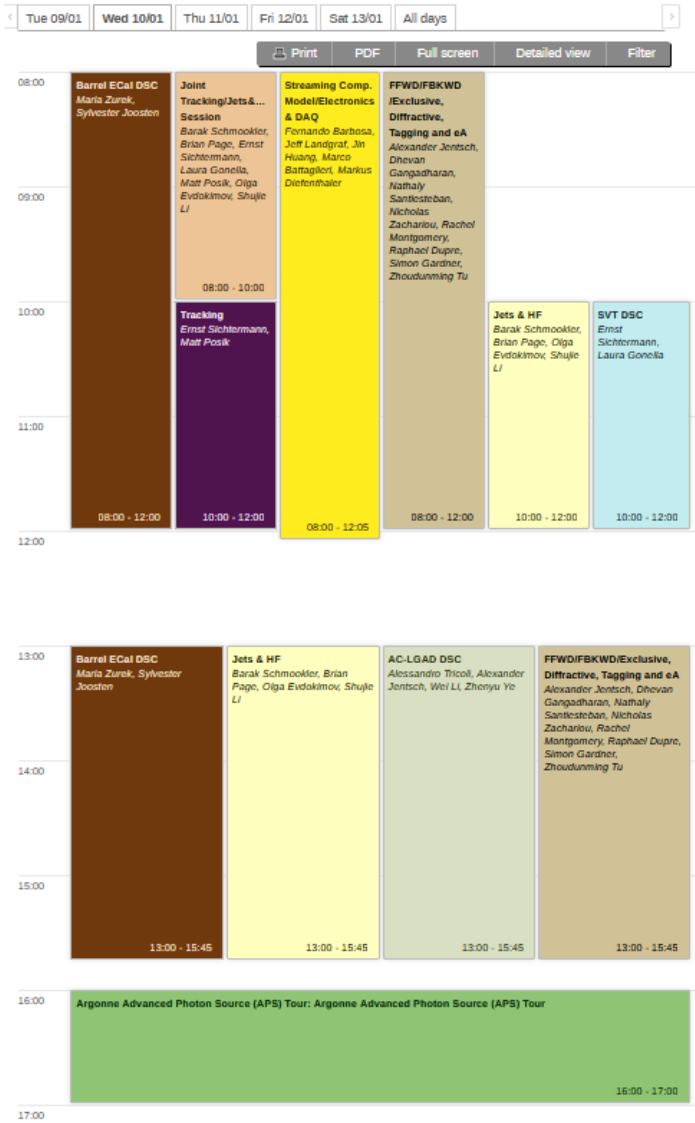


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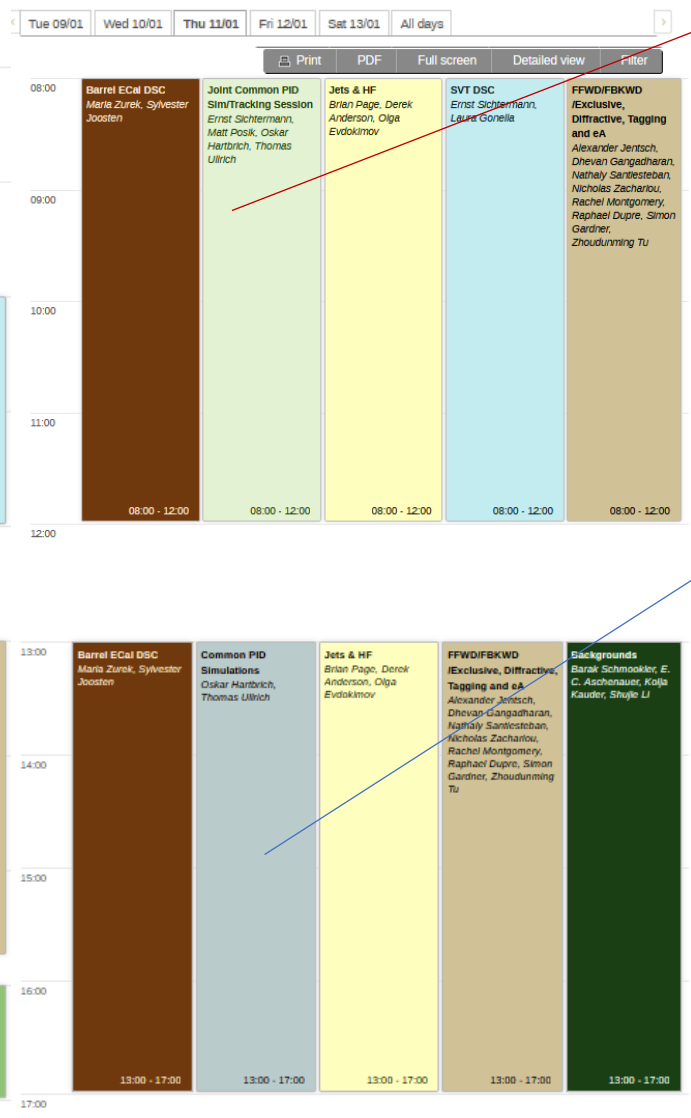



**Joint Common PID Sim/Tracking Session**
Ernst Sichtermann, Matt Posik, Oskar Hartbrich, Thomas Ullrich

Addressing:

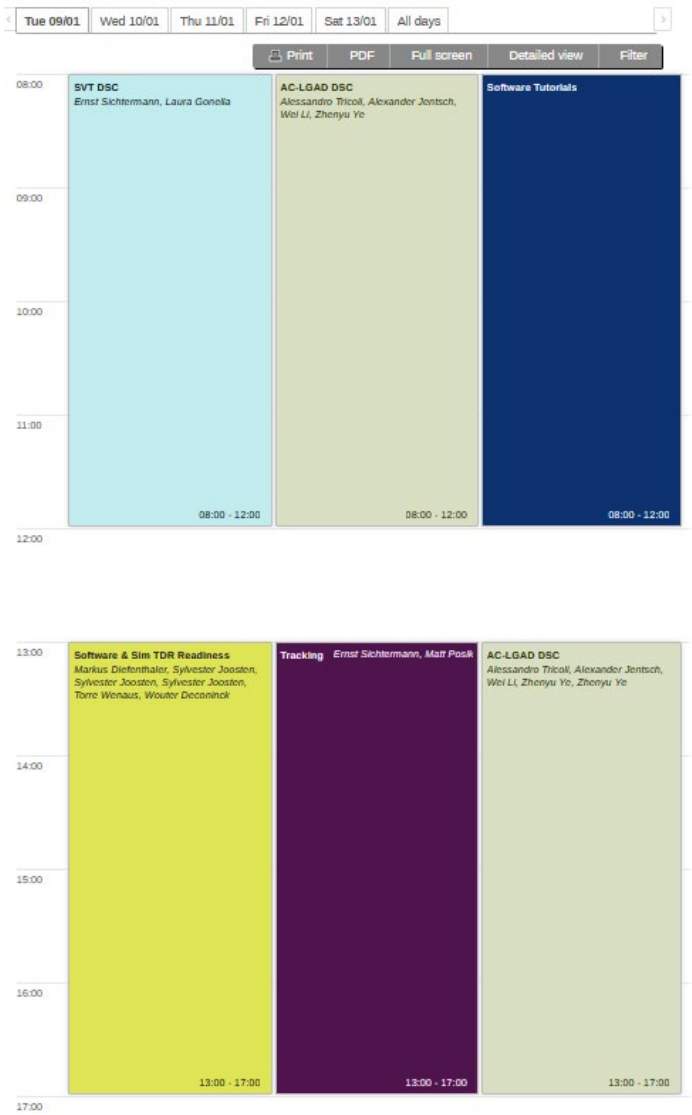
- All the crosscutting aspects between tracking supporting PID and vice versa

**Common PID Simulations**
Oskar Hartbrich, Thomas Ullrich

Grouping the community of 3 DSCs to advance in simulation and reconstruction in a complex sector with limited dedicated workforce

# FOCUS ON WORKFESTS

## Tuesday 1/9

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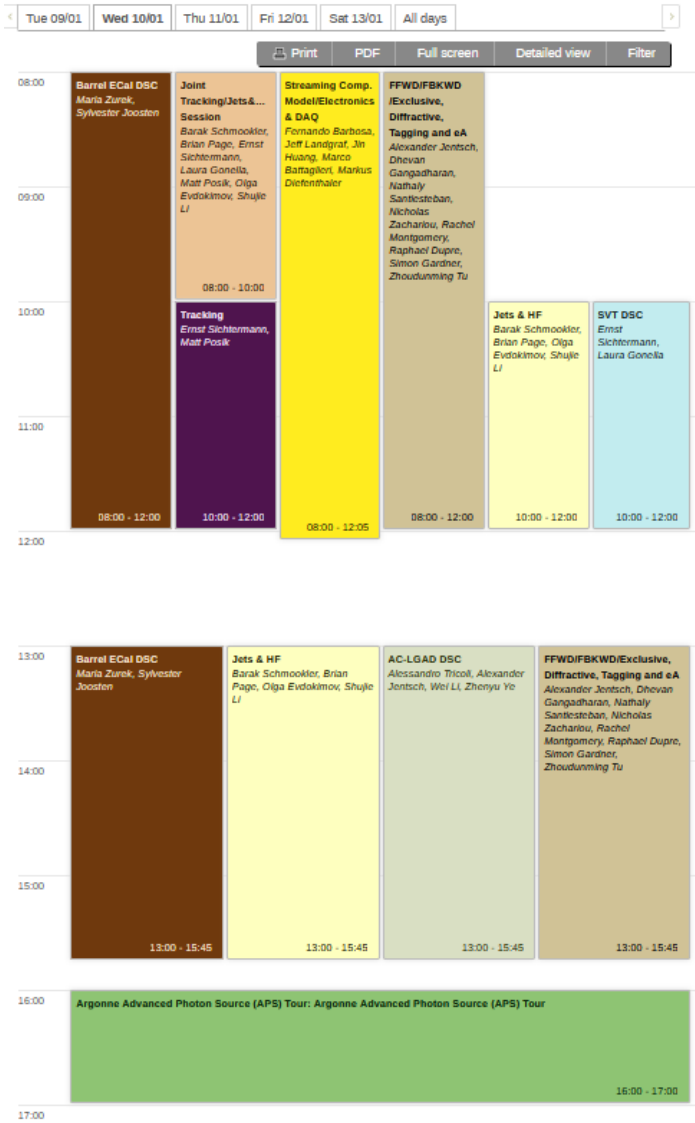


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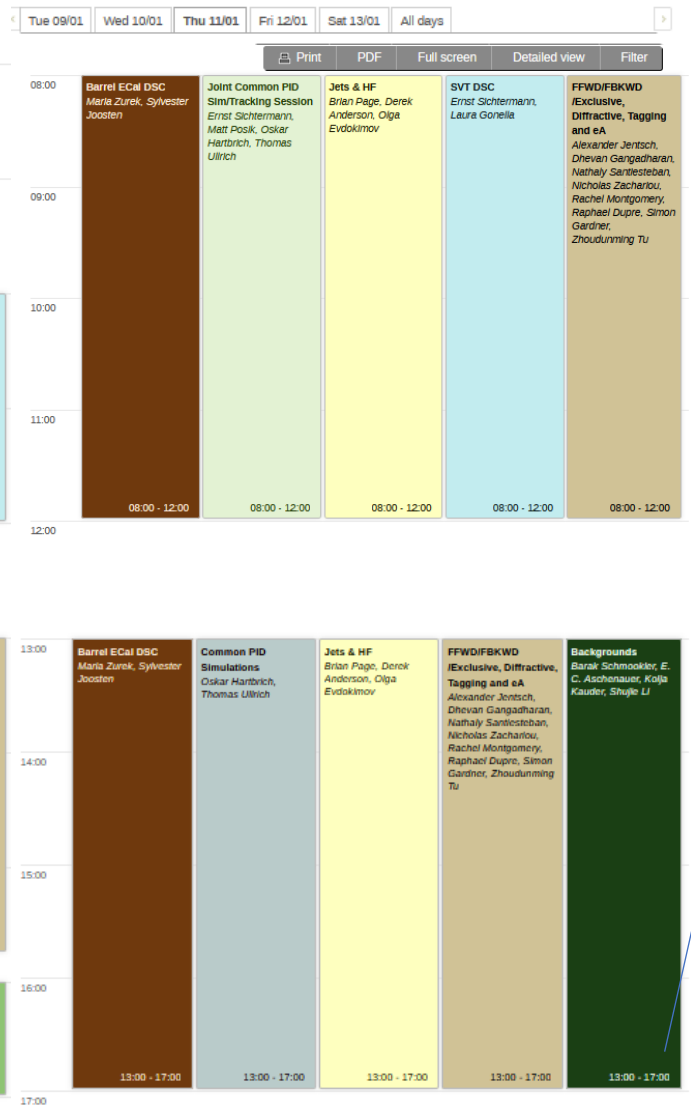
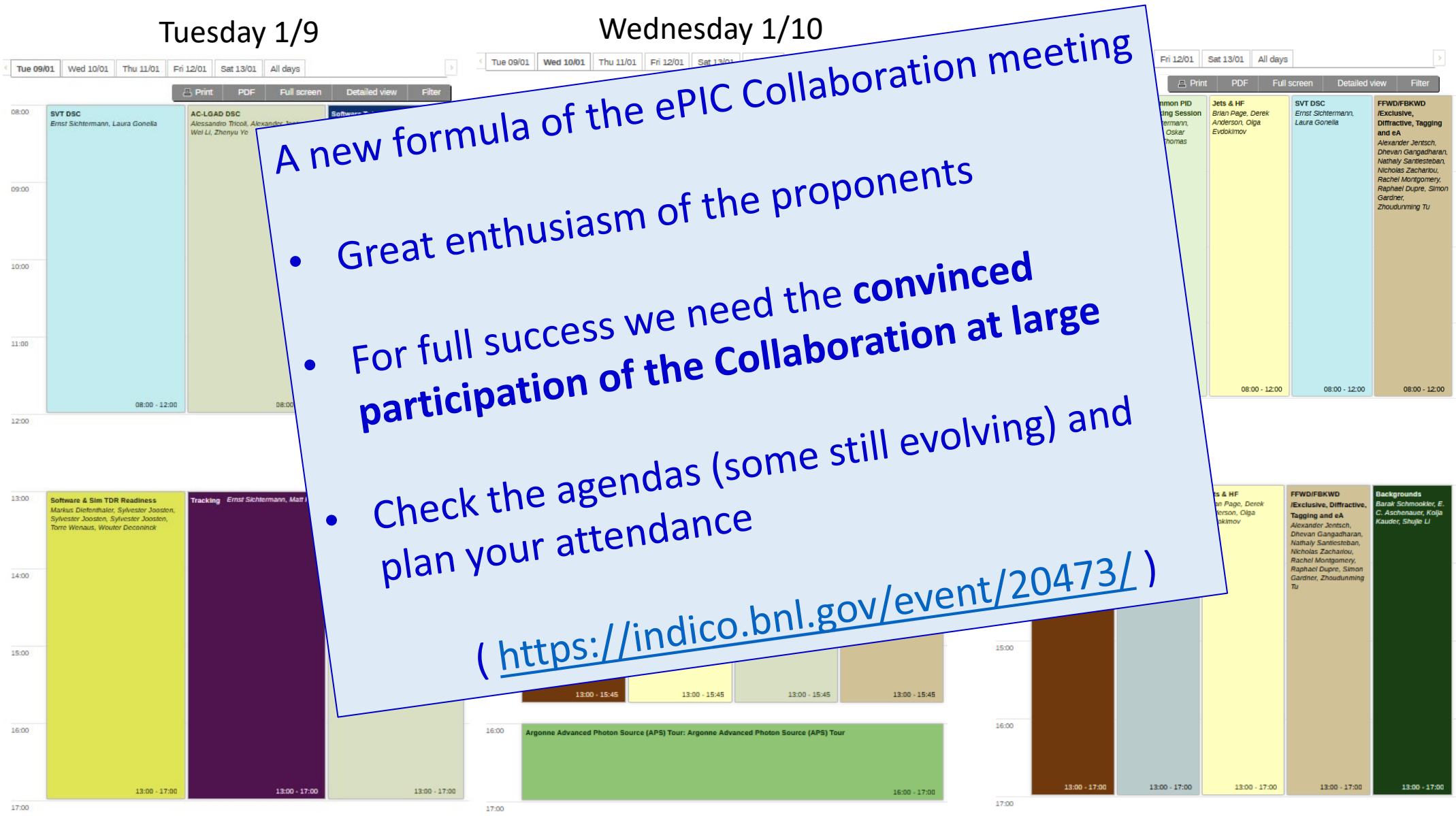



**Joint Backgrounds + Tracking**
Barak Schmookler, E. C. Aschenauer, Kolja Kauder, Shujie Li

Focus on:

- deepening the understanding how time information in ACTS can be used to improve tracking performance with background present

# FOCUS ON WORKFEST




A new formula of the ePIC Collaboration meeting

- Great enthusiasm of the proponents
- For full success we need the **convinced participation of the Collaboration at large**
- Check the agendas (some still evolving) and plan your attendance

( https://indico.bnl.gov/event/20473/ )

# NEWS from DSCs

The **barrel HCAL DSC** no longer has John as the DSL

there are two new people who will serve as Co-DSL's:

- Megan Connors (GSU) : mconnnors@gsu.edu
- Stefan Bathe (Baruch) : stefan.bathe@baruch.cuny.edu

The Pair Spectrometer and High Rate Calorimetry DSC's now merged into one new DSC, which we will call the **"Luminosity Detectors" DSC**

Nick Zachariou and Krzysztof Piotrzkowski will be co-DSL's of the new DSC

Dhevan Gangadharan will continue to serve as DSTC for the Pair Spectrometer

The **Gaseous Trackers DSC** is starting regular DSC meetings to support the transition from the R&D phase to the TDR preparatory phase

first meeting: Thursday December 7 at 9.00 am ET

# TIC meetings, NEWS

**An update to the structure suggested by a deeper analysis of the ePIC collaboration**

**Technical Coordinator Office (TC-office)**

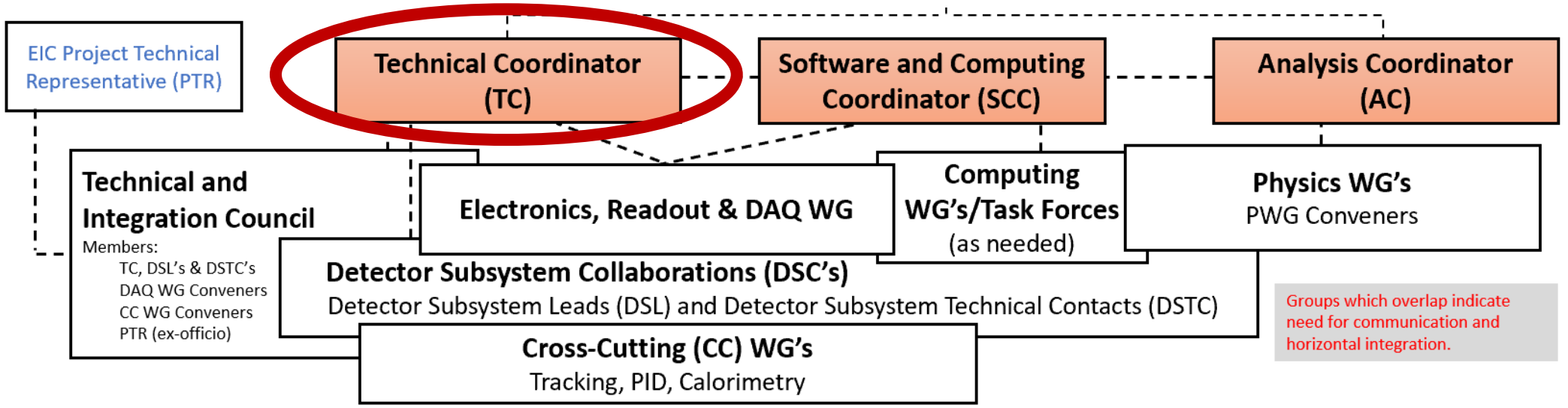
**Silvia Dalla Torre**
**Acting as TC**

**TC-office members**

Prakhar Garg (Yale)

Oskar Hartbrich (ORNL)

Matt Posik (Temple)



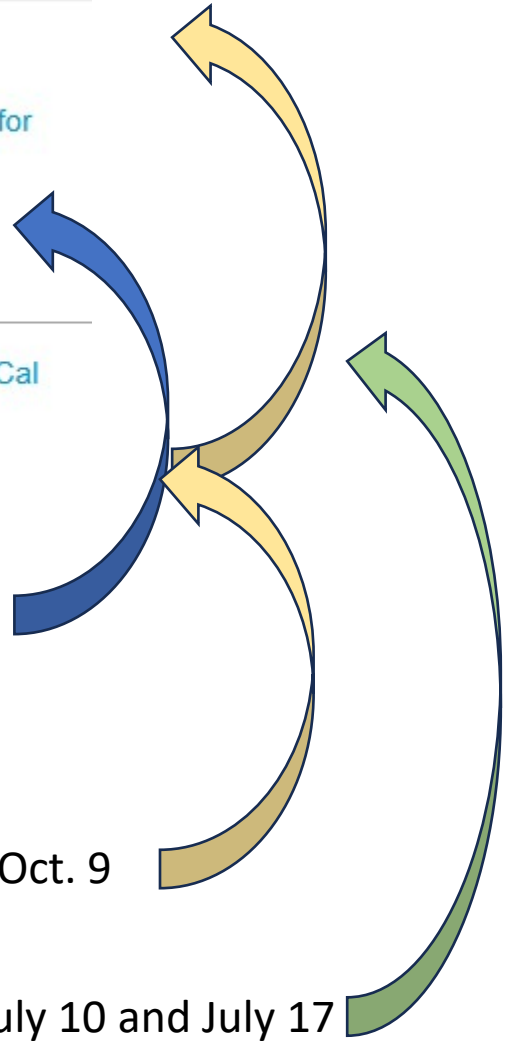
# TIC meetings, NEWS

December 2023

- 18 Dec TIC meeting - ZDC updates, converge towards Design definition
- 11 Dec TIC meeting - integration update from the project engineers; collect information for radhard studies
- 04 Dec TIC meeting - electronics status; photon sensor update for Cherenkov devices

November 2023

- 27 Nov TIC meeting - Update about electronics open points (transceivers, HGCROC); fCal updates
- 20 Nov TIC meeting - EIC R&D for 2024; ZDC: requirements, radiation dose, updates
- 13 Nov TIC meeting - NO TIC MEETING THIS WEEK
- 06 Nov TIC meeting - photosensors for Cherenkov subsystems and risk mitigation



ZDC also discussed at TIC meeting on Oct. 9

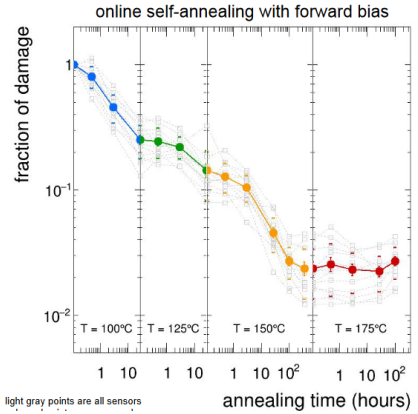
HGCROC/EICROC also discussed at TIC meetings on July 10 and July 17

# TIC meeting on November 6

06 Nov TIC meeting - photosensors for Cherenkov subsystems and risk mitigation

The single photon detection by **SiPMs** is **continuously consolidated** by the progress of the R&D. New outcomes of the thermal annihilation → **SiPM lifetime about 3 times longer** than in previous studies

**Risk mitigation**: introducing a x 10 safety factor, operating at lower temperature (-40 degrees), selecting higher efficiency SiPM sensors by larger SPADs (50 --> 70 mm), improving the annealing protocol



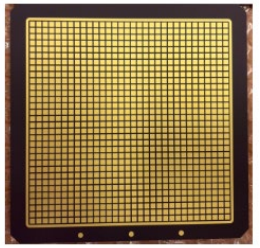

delivery of the first 5 samples of **HRPPDs** :Jan-Mar 2024

**HRPPD validation**: no automatic scanning station will be available in 2024

**source of risk**: extrapolating from 5 samples only

**mitigation by commercial MCP-PMTs** is unclear (see below)

ACTION ITEMS: Elaborate and present a detailed plan for the characterization and validation at a coming TIC meeting in Dec. 2023



Commercial MCP-PMTs: lack of extended dedicated studies within ePIC, interfacing them with EICROC is an urgent missing exercise.

**Production timeline** is unknown both for Photek and for Photonis.

The **workforce** dedicated to commercial MCP-PMT characterization is precious, but **too limited.**

ACTION ITEMS: The production timeline for a sizeable set of sensors from Photek and from Photonis presented at a coming TIC meeting in Dec. 2023, as well as dedicated workforce, that must increase.

# TIC meeting on November 20

20 Nov TIC meeting - EIC R&D for 2024; ZDC: requirements, radiation dose, updates

Relevant progress in addressing the ZDC matter has been registered.

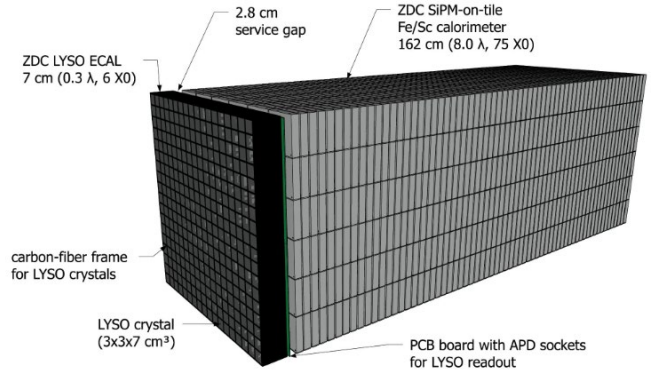
The **requirements** have been reviewed and it has been underlined that **good space resolution both for photons and for neutrons is also needed**, a requirement that received less attention in the past.

**Previous studies of ZDC radiation dose** using FLUKA and cross-checking with HERA data. EIC layout not up-to-date.
Indication: a peak neutron fluence near $10^{13}/cm^2/y$.

**Updated radiation dose evaluation** using up-to-date machine and ePIC detector configurations have been illustrated. Using the present layout baseline and two different software approaches (Geant3 and GCALOR; Geant3 and FLUKA) the fluence is in the range a few units $10^{12}/cm^2/y$.

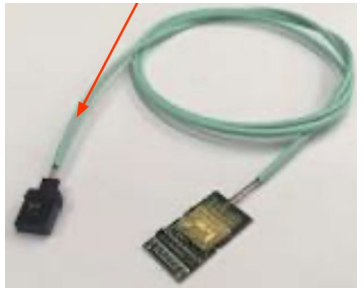
**Further reduction** can be obtained by **modifying the ZDC structure**, as non negligible contribution to the fluence is generated by the calorimeter material itself.

An update of the performance of **ZDC SiPM-on-tile has been provided, including a proposed LYSO + Fe/Sc calorimeter** combination,
with indications that it meets all the ZDC requirements.



# TIC meeting on November 27

27 Nov TIC meeting - Update about electronics open points (transceivers, HGCROC); fCal updates



**VTRx transceiver** (CERN designed and single shot production): survey of collaboration needs.

- dRICH needs it (small footprint!); quantity estimation provided
- ToF layers: commercial transceiver options can be fully adequate
- MPGDs: not ready to commit and commercial options look adequate
- MAPS: information expected on Dec. 4

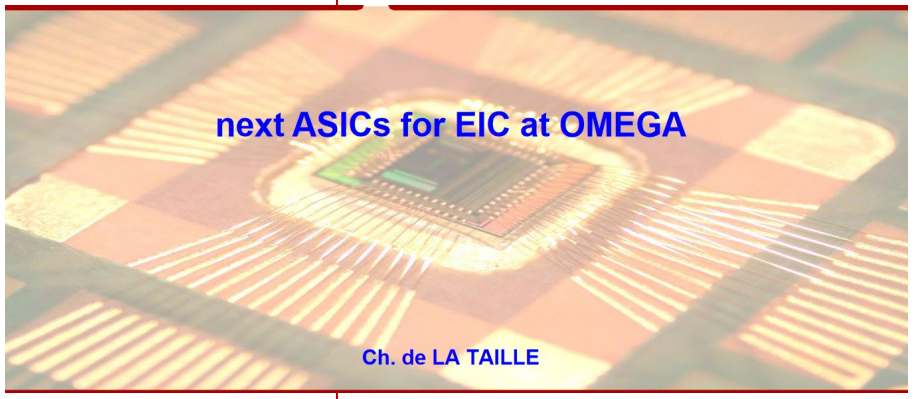
**H2GCROC3A tests on-going**, mainly from the lab (testbeam could last only 0.5h!)

**ePIC-related OMEGA group planning for 2024**:

CALOROC (=H2GCROC (SiPM)) for EIC, backend EIC specific

Need to choose HGCROC pin-pin compatibility (64 ch) or HKROC size (32ch)
2 versions : conservative (ADC/ToT), improved (multi-gain)
Mid/fall 2024 tbd

EICROC Possibly EICROC0A with improved digital noise and low power ADC
EICROC1 (4 or 8)*16 channels, Probably not yet with EIC readout
Mid/fall 2024 especially if Engineering Run chosen




**ACTION ITEM**: ask for longer term planning

FECal –update

- Proposal to reduce the radius based on simulation studies of ~ 6 months ago

**ACTION ITEM**: further simulations needed with up-to-date ePIC layout, where service materials are included

# TIC meeting, radiation hardness studies

December 2023

- 18 Dec TIC meeting - ZDC updates, converge towards Design definition
- 11 Dec TIC meeting - integration update from the project engineers; collect information for radhard studies
- 04 Dec TIC meeting - electronics status; photon sensor update for Cherenkov devices

Dear DSLs,

several items in ePIC require radiation hardness studies.
Among them: FEE ASICs, other electronic components, in particular FPGAs when sitting
in the CD volume, glues, plastic components, polymeric materials, foams, and more.
An organized effort is the best approach also considering booking time slots at the irradiation facilities,
possible costs charged to the users, shared monitoring of the effective dose,
reduced need of workforce in case of integrated efforts.

This e-mail is to start a campaign of acquisition of the information.
The information requested is the nature and size of the samples to be tested, the
nature of the needed irradiation, the doses of interest, preferred
irradiation facility options (if any).

Please, be ready to provide this information by December 11, when
the matter will be discussed at the TIC meeting. Thank you.

Best greetings, Silvia

# ePIC engagement in TDR

What follows is an **initial information** about a process that is being designed.

The initiative started from the SP-office
Initial feedback from

- CC management
- ePIC Coordinators
- EB

collected and integrated.

PM promptly informed and positive reaction expressed.

**NEXT STEP**: discuss with the **whole Collaboration** at the ePIC Collaboration meeting in January, where there will be a dedicated plenary session.

**TODAY COMMUNICATION**: to make the whole Collaboration aware and let you the time to think about and contribute with your feedback at ePIC Collaboration meeting.

# Technical Design Report (TDR) – Detector, the needs

From the Project Management talk, ePIC Meeting, Warsaw, July 2023

Chapter 2: Physics Goals and Requirements *(should be short, < 50 pages)*

- 2.1 EIC Context and History (like CDR 2.2 or YR section 1)
- 2.2 The Science Goals of the EIC and the Machine Parameters (like CDR 2.3)
- 2.3 The EIC Science (follow YR structure)
- 2.4 Scientific Requirements

Chapter 3: Interaction Region 6 Overview (Elke/Rolf contributing)

Chapter 8: Experimental Systems *(can be long such that we can use as standalone detector TDR)*

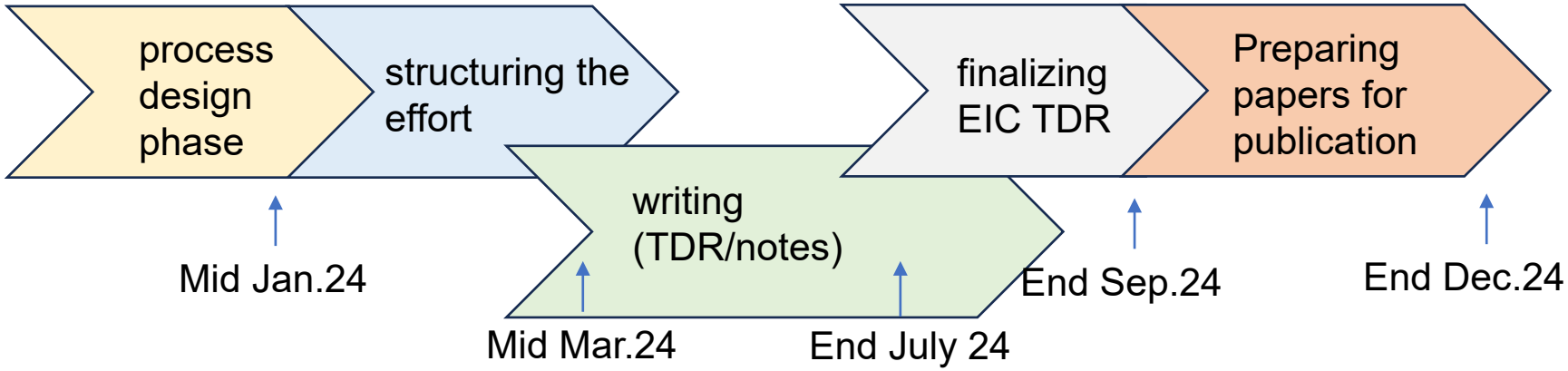
- 8.1 Experimental Equipment Requirements Summary (like CDR 8.2)
- 8.2 General Detector Considerations and Operations Challenges (YR 10, CDR 8.3)
- 8.3 EIC Detector
- 8.4 Detector R&D Summary
- 8.5 Detector Integration
- 8.6 Detector Commissioning and Pre-Operations

Chapter 11: Commissioning (Elke/Rolf contributing)

Appendix-B: Integration of a Second Experiment (mainly emphasizing feasibility, luminosity sharing, polarization with two experiments, and first-order checks of magnets/acceptance)

# TDR – the ePIC goals and timelines

- The ePIC contributions to the EIC TDR (Chapters 2,8)
  - The EIC TDR is the top priority
  - Precise timescale driven by EIC project requirements
- Scientific production/dissemination
  - An extended version of the ePIC detector section from the EIC TDR with appropriate front matter, published in a scientific journal (such as NIMA, JINST, PRC, …)
    - *Derived from TDR Chapter 8*
  - An ePIC Physics Performance long paper published in a scientific journal (such as NIMA, JINST, PRC, …)
    - *Derived and expanded from TDR Chapter 2 (Section 2.3)*



# TDR – structuring the effort

**TDR**

- **PM Serves as the "managing editors" for the ePIC Contributions to the EIC TDR**

- **TDR Chapter 2**
  - ***Holistic detector performance*** (short form)
    - The TC Office acts as "editor"
    - Organized/supervised by CC WG conveners
  - ***Physics performance and science reach*** (short form)
    - The ACs acting as "editors"
    - The Physics WGs as subgroups for text drafting

- **TDR Chapter 8**
  - ***Detector description and basic performance***
    - Project CAMs/Collab. DSL's acting as "co-editors" for their sections
    - The DSCs provide studies, material, text, etc.
  - ***Software, Analysis and Data Preservation***
    - Project CAMs and SCCs acting as "editors"
    - The electronics/DAQ CC WG and the software WGs

**ePIC publications**

- **SP Office serves as the "managing editors" for the ePIC publications**

- **ePIC Physics Performance Publication:**
  - ***Holistic detector performance*** (extended text)
    - The TC Office acts as "editor"
    - Organized/supervised by CC WG conveners
  - ***Physics performance and science reach*** (extended text)
    - The ACs acting as "editors"
    - The Physics WGs as subgroups for text drafting

- **ePIC Detector Publication**
  - ***Detector description and basic performance***
    - DSL's acting as "editors" for their sections
    - The DSCs provide studies, material, text, etc.
  - ***Software, Analysis and Data Preservation***
    - SCCs acting as "editors"
    - The electronics/DAQ CC WG and the software WGs for text drafting

# SUMMARIZING

- ePIC is a **growing Collaboration** with two new Institutions joining

- **ePIC structure is moving toward completion** (EB at work, TC-office and more, as we will hear from the CC Chair's report)

- **A rich ePIC calendar** in front of us, where the **ePIC Collaboration meeting in January 2024** is the major near-term appointment
  - New format of the Collaboration meeting: your engagement is key for its success
  - Let me iterate: urgent to register!

- **TIC in full swing** , further burst thanks to the newly established TC-office
  - Help us identifying and addressing all technical aspects that require attention and help

- **TDR considerations**
  - Of course, key for CD2/CD3, namely to advance with project according to timelines
  - ePIC engagement central to contribute to TDR success
  - Let's make it an opportunity to reinforce the collaboration engagement and coherence by producing scientific outcome: our ePIC papers