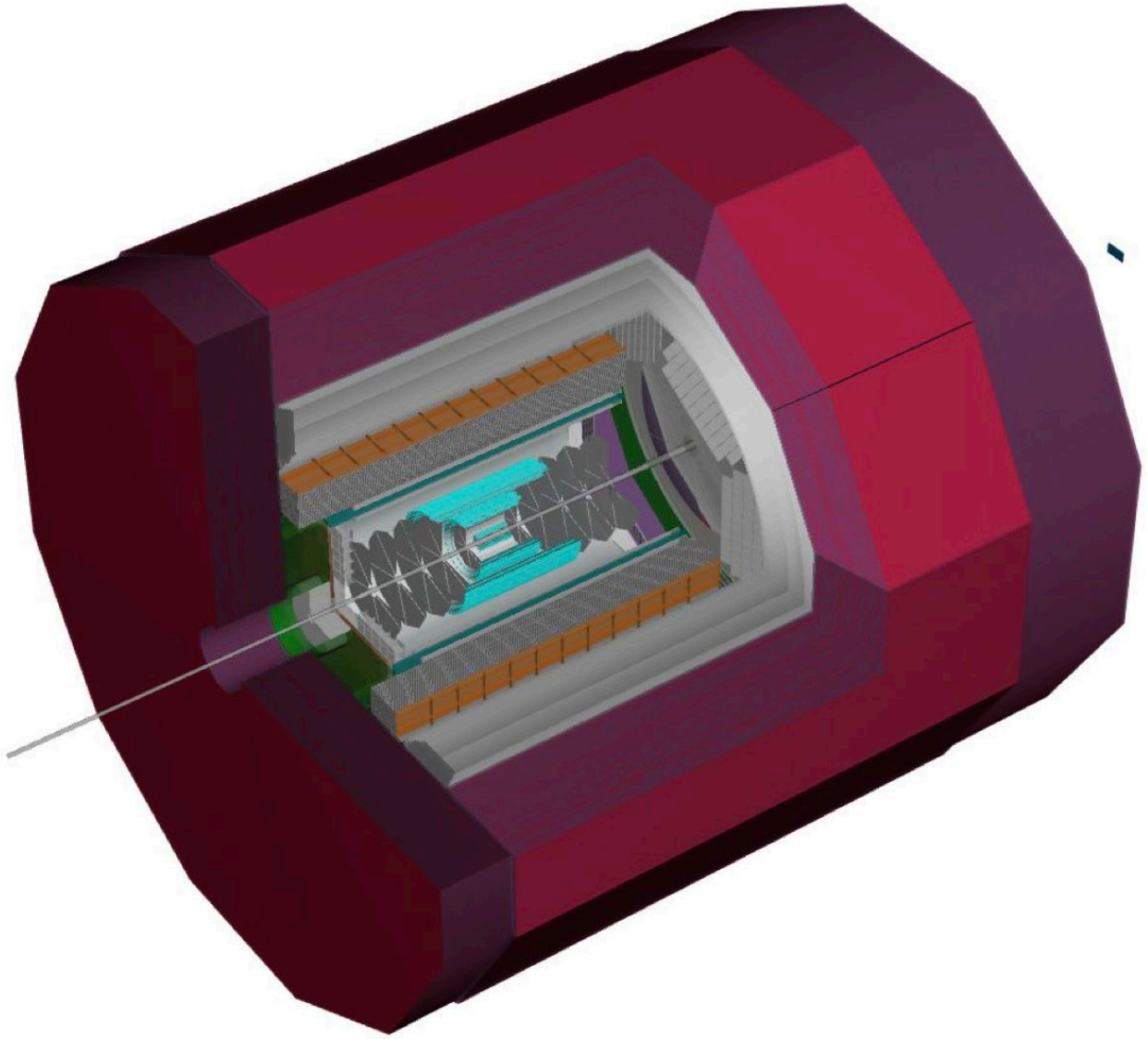
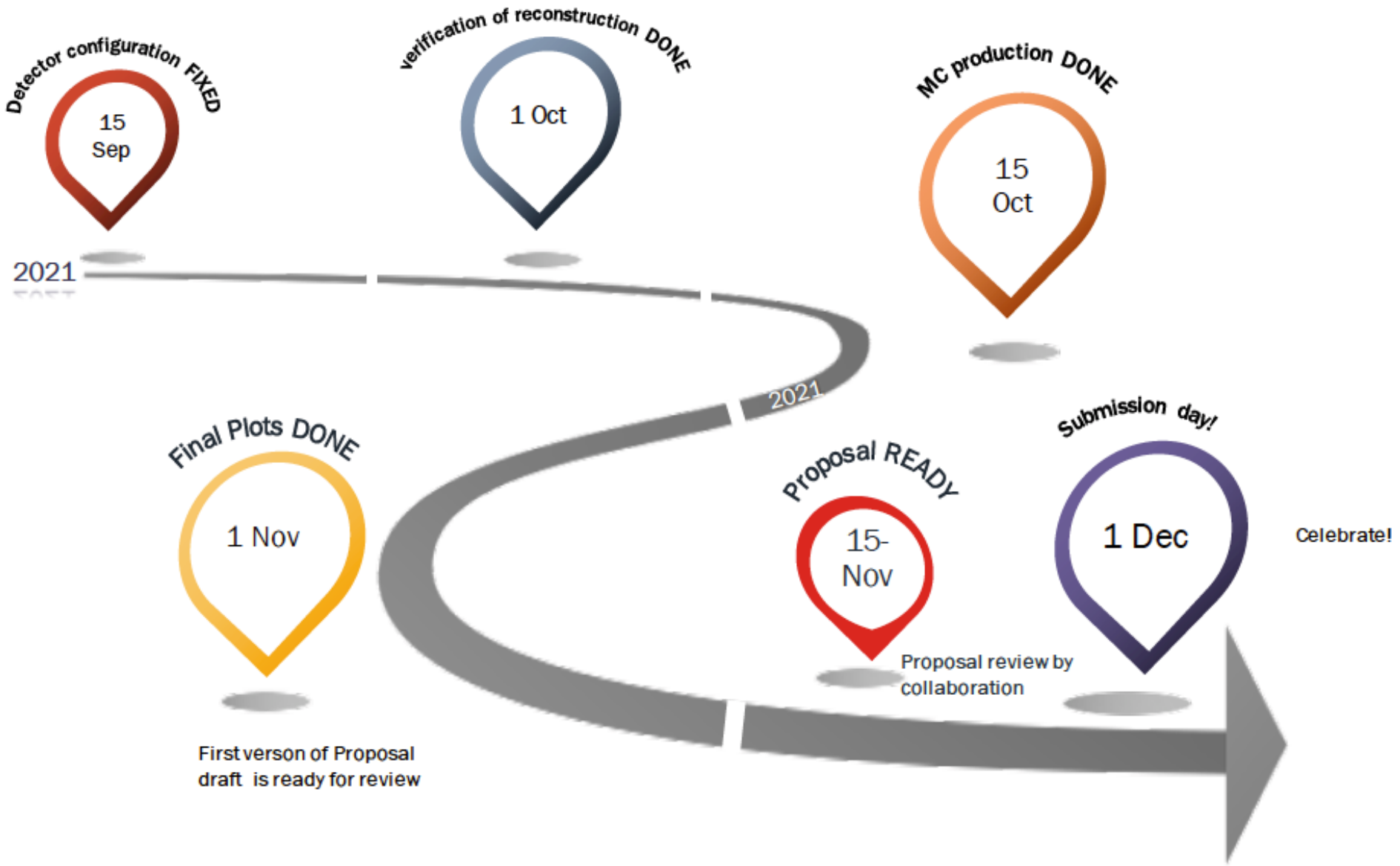
# Proposal preparation



Barbara Jacak

Sept. 10, 2021

ATHENA


Detector configuration FIXED
15 Sep
verification of reconstruction DONE
1 Oct
MC production DONE
15 Oct
2021
2021
Final Plots DONE
1 Nov
Proposal READY
15-Nov
Submission day!
1 Dec
Celebrate!
Proposal review by collaboration
First verson of Proposal draft is ready for review

# Overview

- Outline being rearranged by physics goal, following NAS report, rather than by working group
- Overleaf document editing ongoing
- To discuss today:
  1. Basic outline
  2. We are rearranging the 2-3 golden channels per PWG

     identify the most demanding ➔ show how well we do it ➔ argue that easier ones will certainly be doable with the same performance
  3. Detector chapter thinking
  4. Page limits
  5. Templates for working groups

# Detector – 22 pages

- **Requirements in YR & achieved(?) 1 page or a table?**
- **Magnet 2 pages**
- **Tracking System 5 pages**
  - Si pixel vertex detector, incl. intro to next gen pixel technology (2 pages)
  - Si tracking barrel & disks (1 page)
  - Gas micropattern detectors (1 page)
  - Hybrid tracker (1 page)
- **EM Calorimeters 3 pages**
  - High resolution crystal electron endcap (1 page)
  - Barrel & hadron endcap EMCAL (2 pages)
- **Hadronic Calorimeters 2 pages**
- **Particle Identification 4 pages**
  - DIRC
  - RICH Detectors

# Detector – continued (25 pages total)

- Far Forward and Far Backward Detectors 2 Pages
- Polarimetry and Beam Monitoring 2 Pages
- Data Acquisition and readout electronics 1 Page
- Software 1 Page
- Integration Principles 1 Page
- Upgrade Path 1 Page

# Detector subsystem template

1) Name of system / Purpose and scope

2) Describe Technology. Refer to Yellow Report: differences, improvements?

3) Expected performance of system versus requirements including a table

4) Limitations if any for EIC physics

5) Discussion of Risks and R&D needs

(e.g. Is it a well-established technology or an emerging one? Are there comparable systems in operation using this technology? Will R&D provide risk mitigation, and on what timescale? Is there a backup technology? What would performance or cost impact be?)

***Include at least one performance plot within the page limit***

6) Upgrade path, if any

# EIC science with ATHENA (16 pages)

- Origin of Spin (~6.5 pages)
  - DIS at small x with unpolarized & polarized beams (2 pages)
  - 3D gluon momentum imaging through heavy flavor & jets (2 pages)
  - 3D quark momentum imaging through hadrons (1 page)
  - 3D spatial imaging via DVCS & TCS (1.5 page)
- Origin of Mass (~3.5 pages)
  - Gluon form factors through DVMP on nucleons (1.5 pages)
  - 3D gluon spatial imaging/GPDs via J/$\psi$ and $\Upsilon$ (1 page)
  - threshold dependence of $\Upsilon$ photo/electroproduction (1 page)
- Gluons in Nuclei (~ 5 pages) (see next slide for detail)
- Other opportunities (~1 pages)
  - How hadrons emerge from partons

# EIC science, continued

- Gluons in Nuclei
- Nuclear PDFs & saturation
  - DIS & SIDIS (1 page)
  - Electro/photoproduction of phi (0.5 page)
  - Jet observables & correlations in CNM (1 page)
  - Jet substructure studies of CNM (0.75 page)
  - Heavy quark probes (0.75 page)
- Energy loss and transport in dense matter
  - Precision probes via SIDIS (0.5 page)
  - Jet and jet substructure probes at small x (0.5 page)

# Physics topic template

- State Big Question Addressed + 1 paragraph description of the measurement & importance. Refer to White Paper, NAS study, etc..
- Note advantages of Athena for making this measurement (e.g. precision, acceptance, PID, redundancy, etc)
- Species & polarization; are multiple beam energy/particle combinations needed?
- Which Athena detector elements are essential?
  - What are the requirements for resolutions, PID?
  - What integrated luminosity is needed for a significant measurement?
- Is this suitable for early (1st 3 years) physics program?

please draft **1 page per science goal including text and figures** (!)

NB:

- We should assume 10 fb-1 for Year 1, and 100 fb-1 per year after ~2-3 years. This will be split among energy/species combinations run in a given year!
- Objective is to start with 1 x 10^33 luminosity, and grow beyond that
- Objective is to start with 60%(50%) proton (electron) polarization; ultimate goal is 70% each

# The final 20 pages

4. The ATHENA Collaboration
    1. Collaboration structure
    2. Membership, strengths and breadth
    3. International contributions

5. Cost & Schedule