Physics analysis in ATLAS and ATLAS Japan

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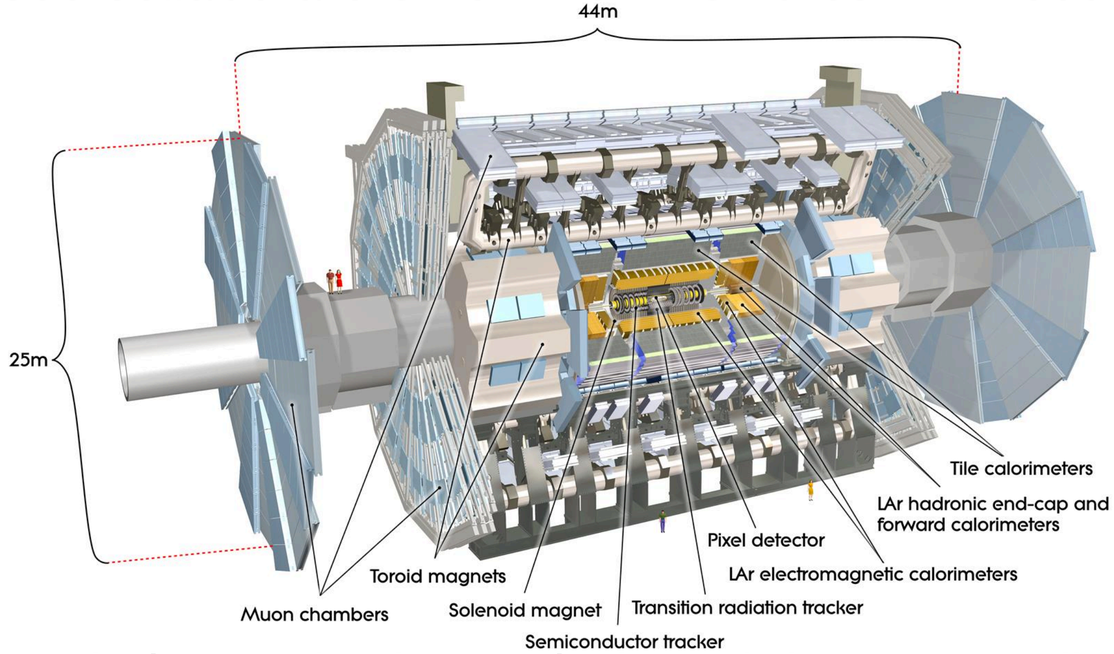
25/11/2022

1st general meeting of ILC-Japan physics working group

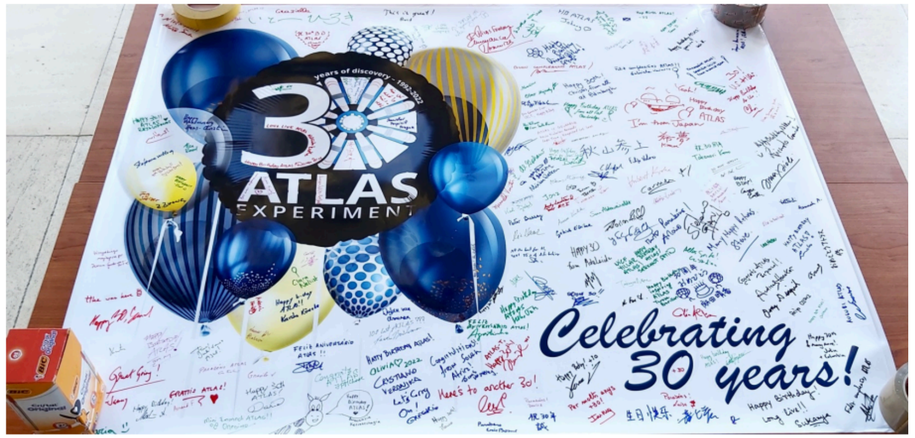
ICEPP
The University of Tokyo

ATLAS Collaboration

- ~3000 collaborators from 181 institutes in 42 countries

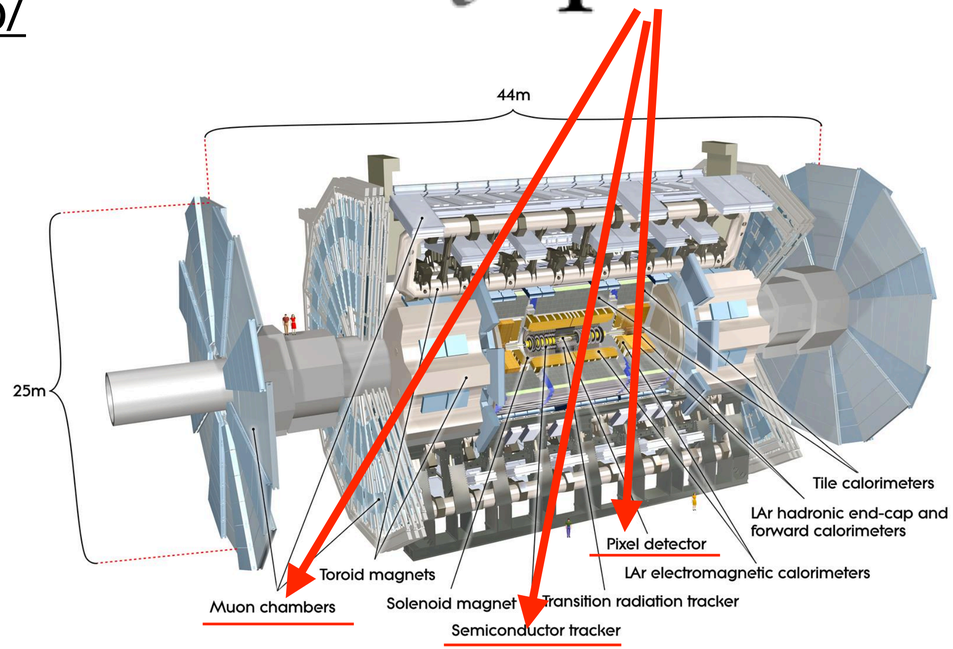


- How to balance physics analysis and detector studies?
  - The detector operation-task point (OTP) is assigned to individual collaborators
  - Significant amount of OTP is needed to be included in the author list, to take a physics-analysis group convener role, to give an ATLAS talk@conference, etc.



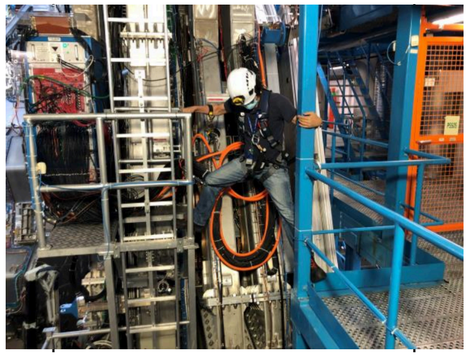
ATLAS Japan collaboration

- O(100) collaborators from 13 institutes https://atlas.kek.jp/
- Each institute is responsible for the development and operation of muon chamber or inner trackers, as well as trigger and DAQ systems

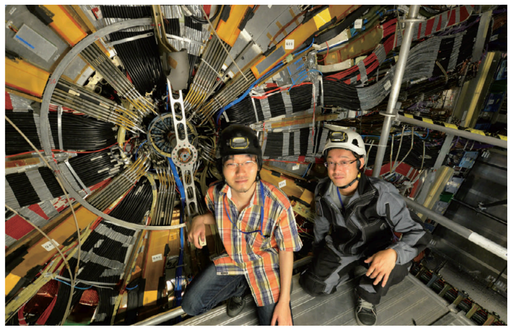


Higgs dicovery

Nakamura-san: H→ττ
Tanaka-san: H→γγ coordinator@discovery
etc. etc.

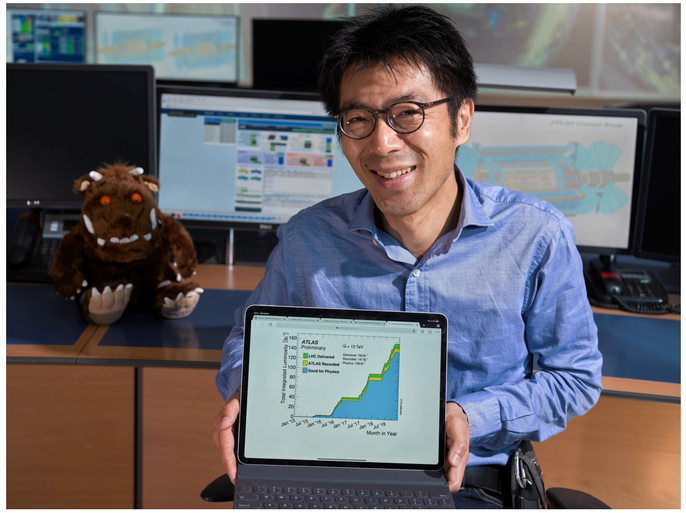


Me! jumping onto the detector at the 25m height to replace the electronics.



Oide-san, Takubo-san: installation of the new pixel detector during Run2

ATLAS Japan collaboration



Ishino-san
ATLAS Run-2 operation coordinator:
https://atlas.cern/updates/portrait/masaya-ishino

Masubuchi-san: Higgs convener now
https://twitter.com/ATLASexperiment/status/1548288775733665793

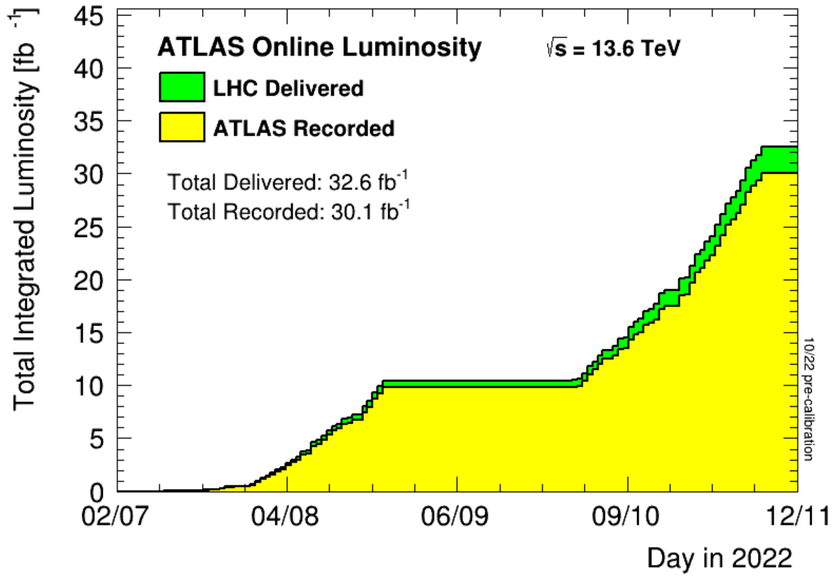
Oide-san: Online seminar on ATLAS official Youtube

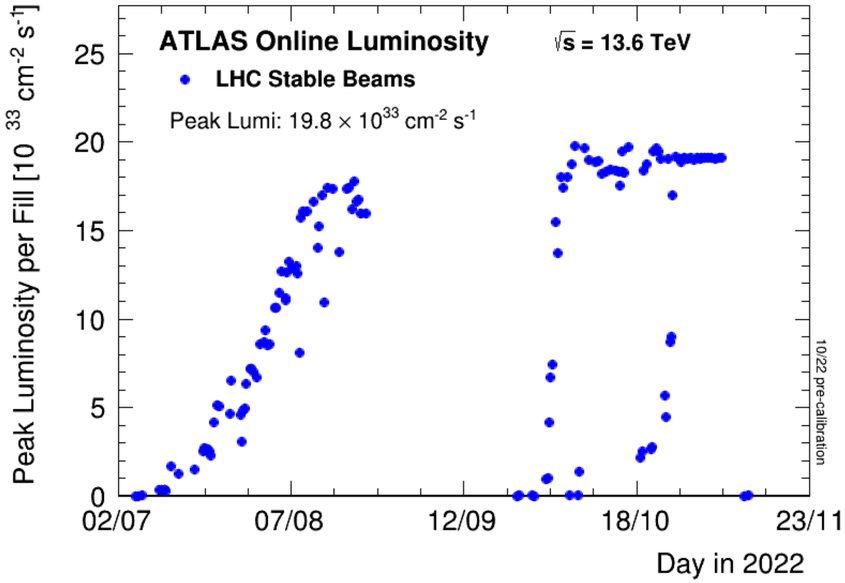
- We can find AJ collaborators everywhere for operation, upgrade, physics, management, …etc.!

13.6 TeV collisions going well!

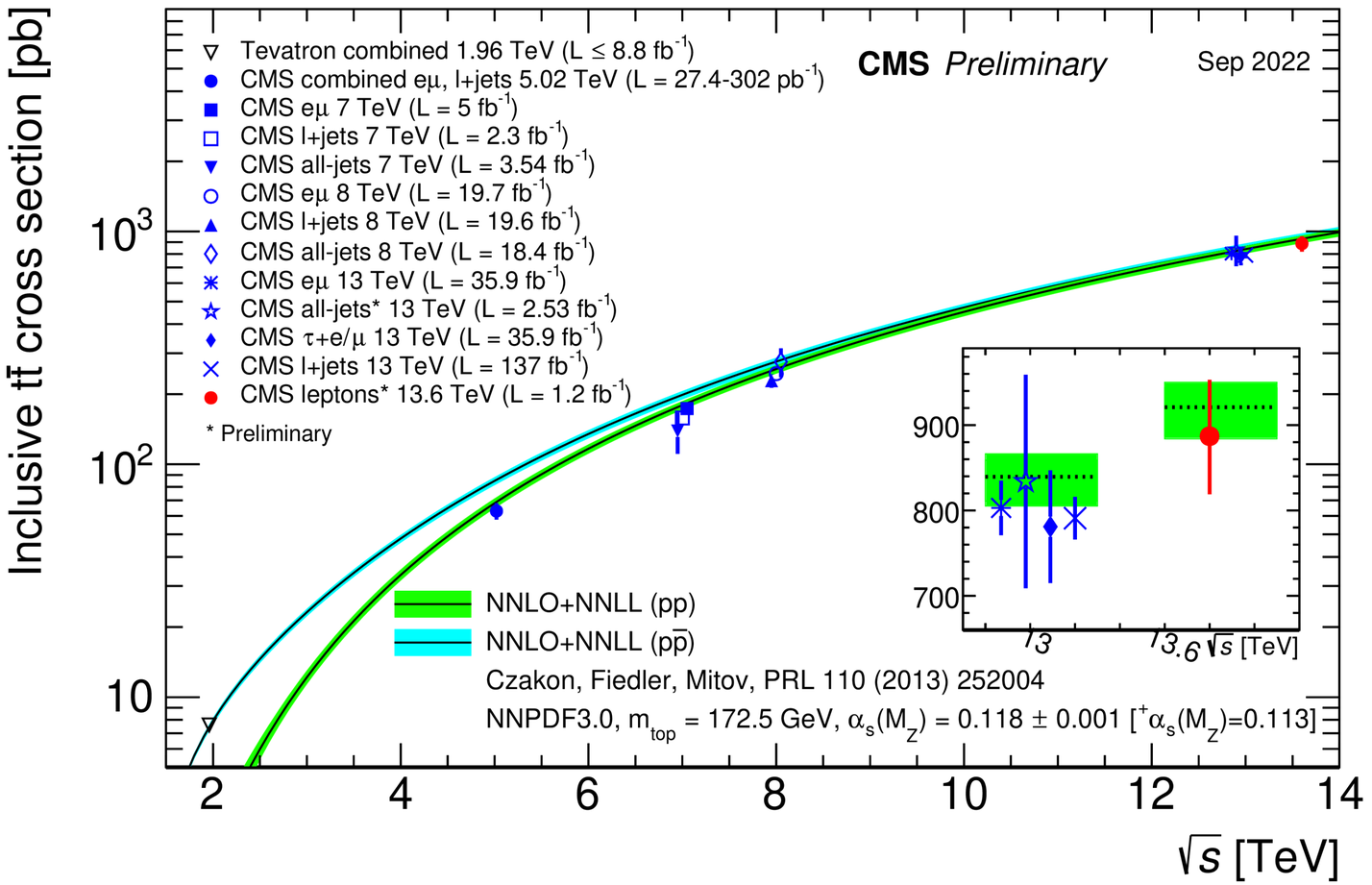
Otono-san
(SCT operation expert)

Saito-san
(muon operation expert)



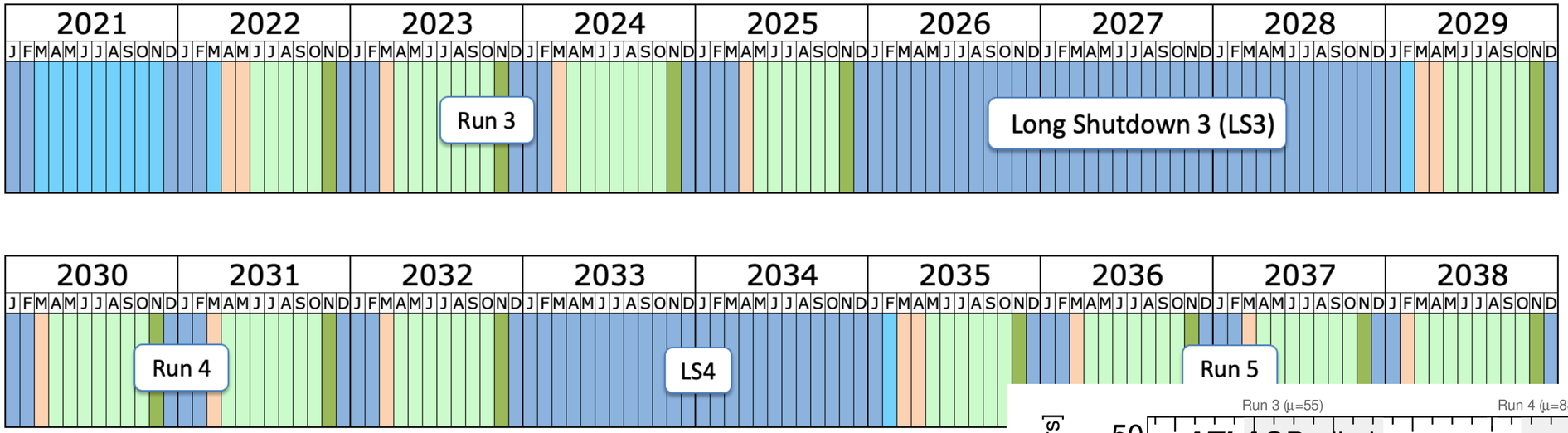


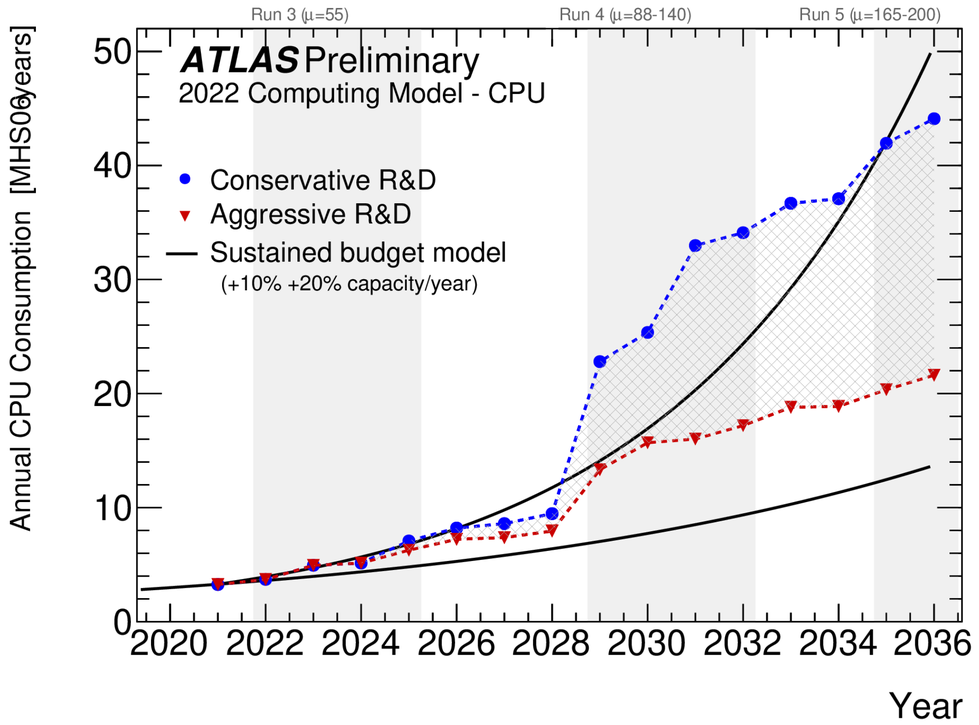
First 13.6 TeV results



- Many other results will be published in early next year!

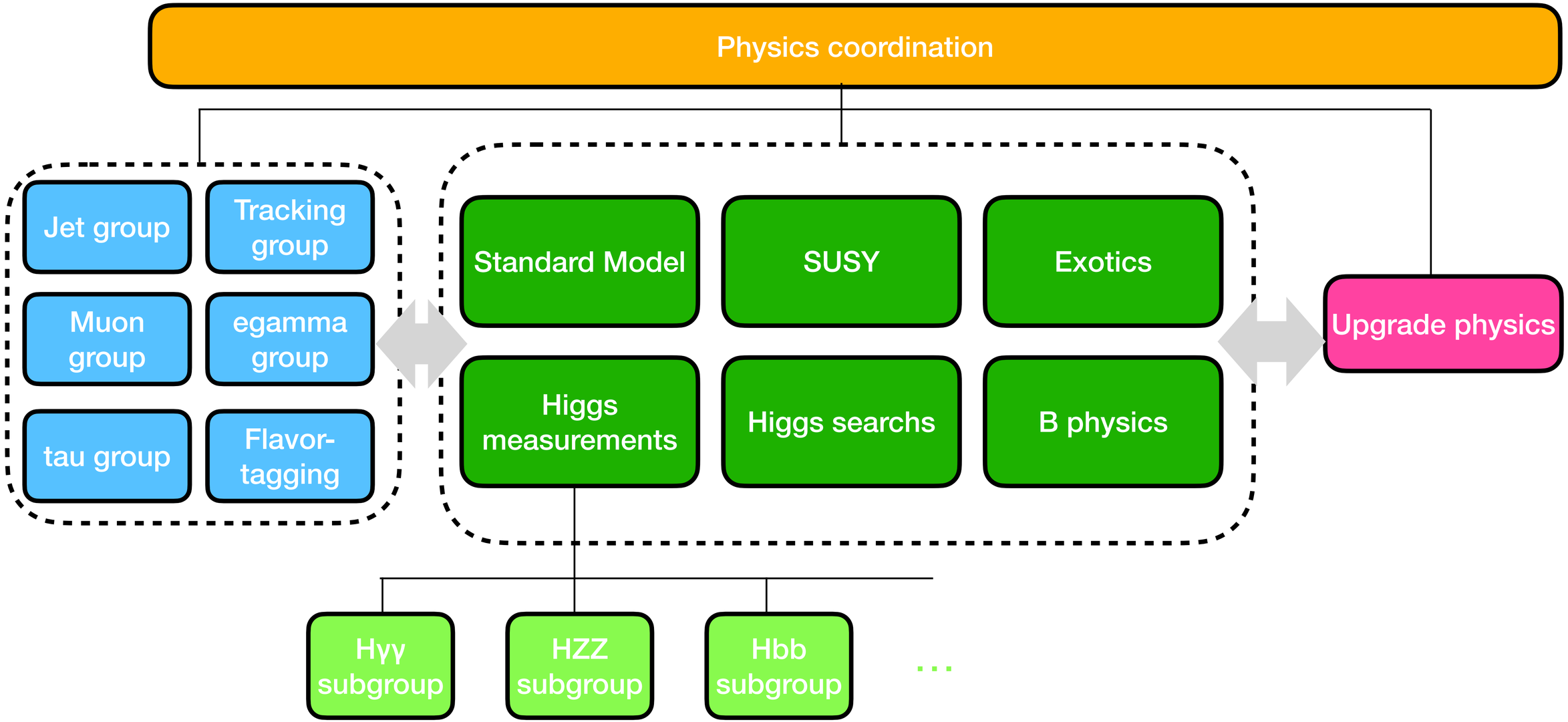
Operation plans for Run3 and beyond



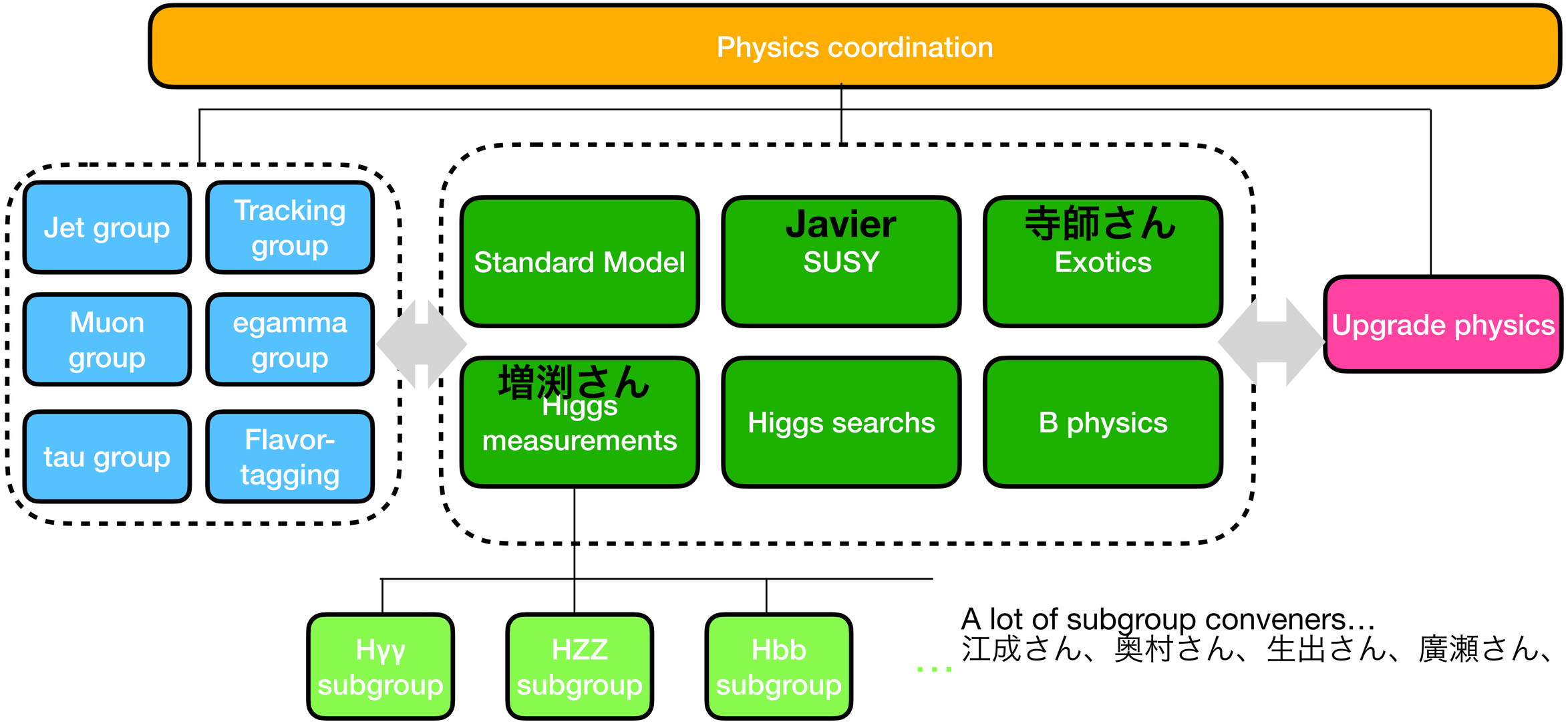


- ICEPP promotes the development of computing too
- Serves as a Tier-2 center of the Grid computing

Physics analysis group structure

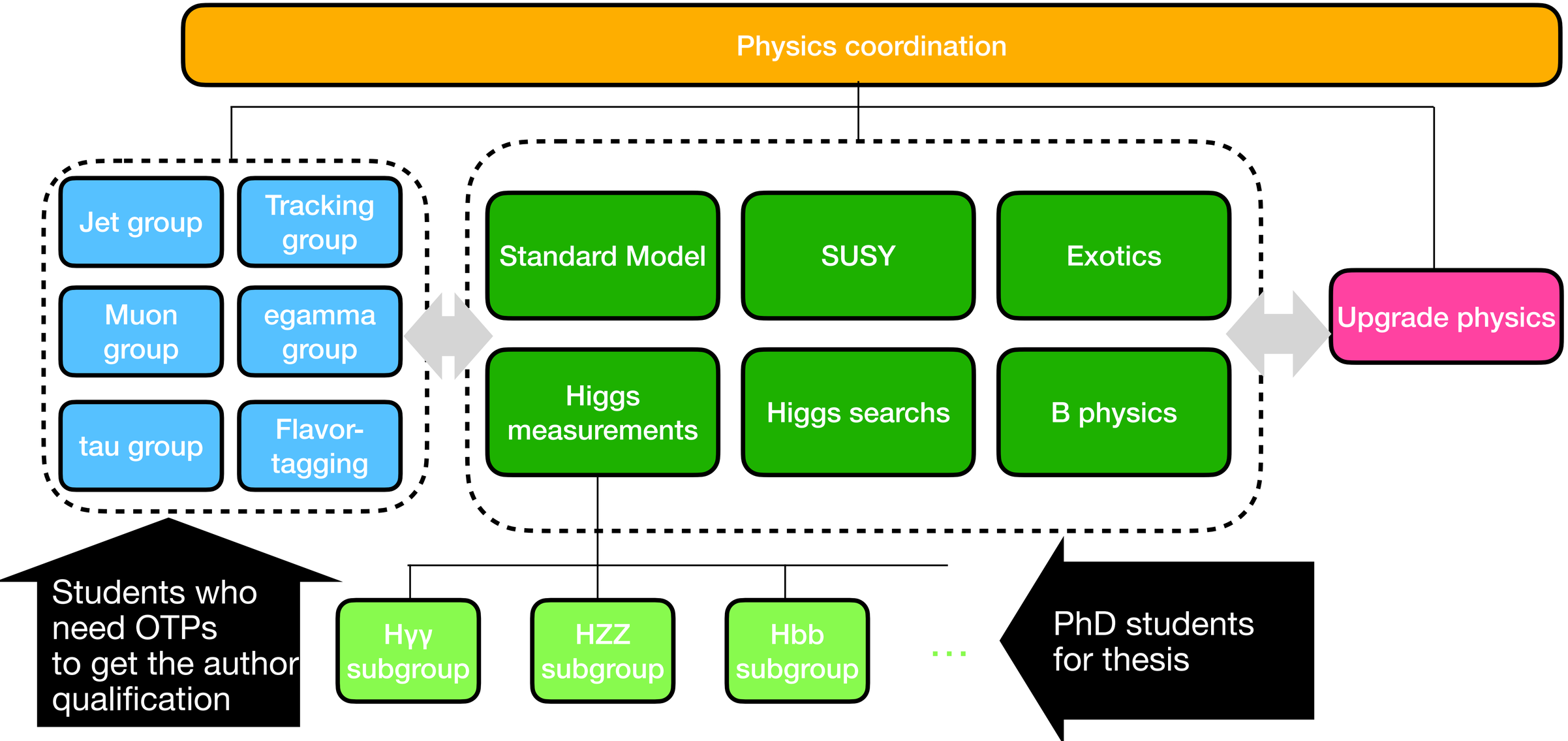


ATLAS Japan contributions



A lot of subgroup conveners…
江成さん、奥村さん、生出さん、廣瀬さん、野辺、

Person power and student commitments



Analysis review process

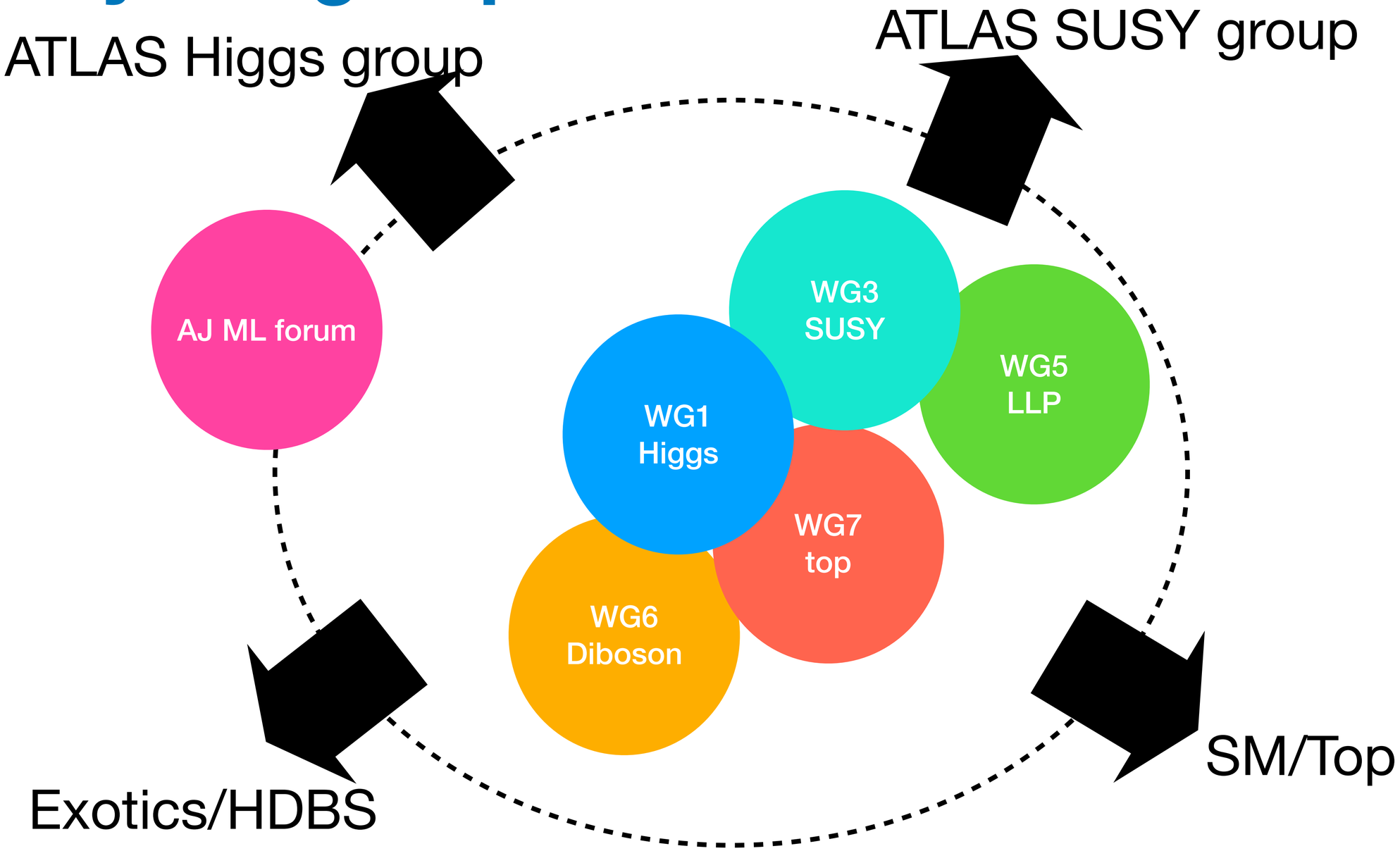
- Kick-off meeting inside the subgroup to form the analysis team
  - Generate MC samples (need approval to use the bulk grid resources)
  - Build the analysis framework (a lot of common frameworks, no need to write the code from the scratch)
- **Subgroup approval** (to check the technical matters, incl. statistical treatment)
  - Analysis gets unblinded
- **Group approval** (to review physics matters)
- **ATLAS approval** (circulate the results to all collaborators)
- Typically, it takes 2-3 years between kick off and publication……

  - In addition, in Run3, it takes ~2 years to double the data statistics (140/fb in Run2 -> 250/fb in Run3)
  - Need the strategy for new students to graduate in time
  - Important to study the new analysis technique and new phase spaces not explored yet

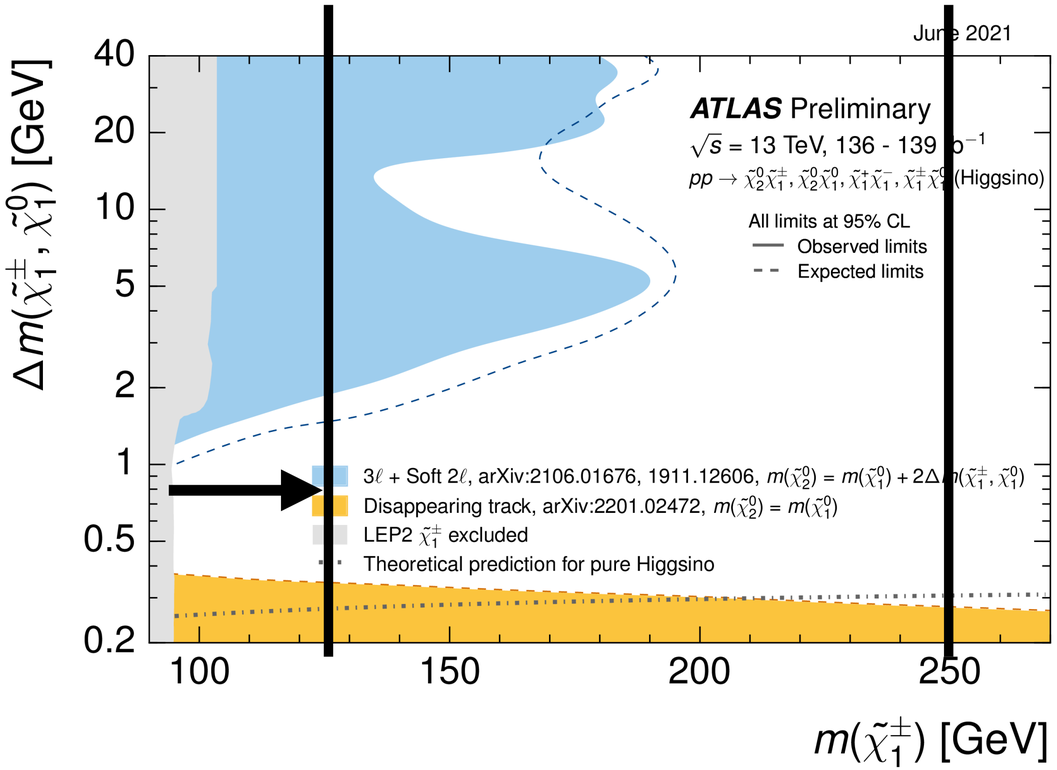
“ATLAS Japan Physics” group

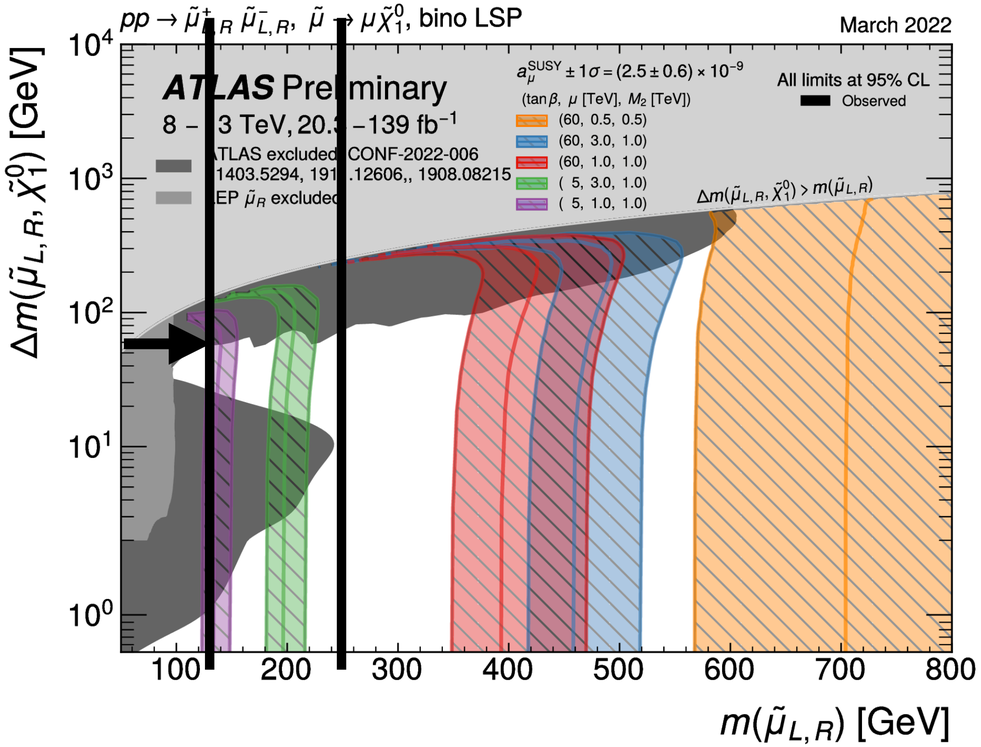
- Formed in 2018
  - Beyond the boundary of the home institutes inside ATLAS Japan
  - To strengthen the visibilities in ATLAS central
  - For better communications between students, to reduce the waste of time during the ramp-up of the analysis
  - Staff members volunteering to mentor students, instead they can get person power for the analysis which they are interested in
- 5 subgroups (next slide);
- I became to the leader of AJ Physics since 2021

AJ Physics group structure



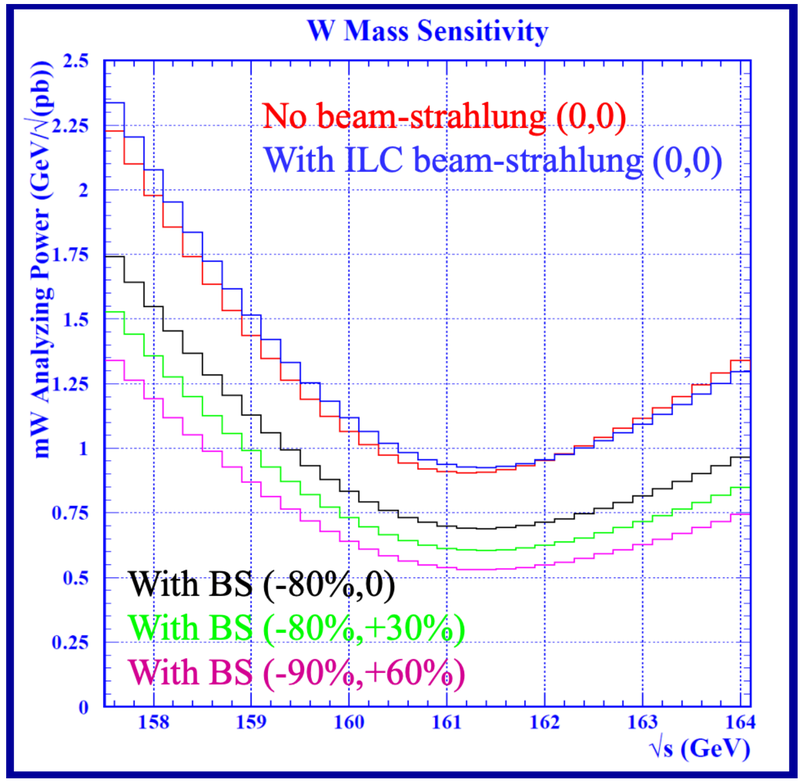
Electroweak SUSY direct production

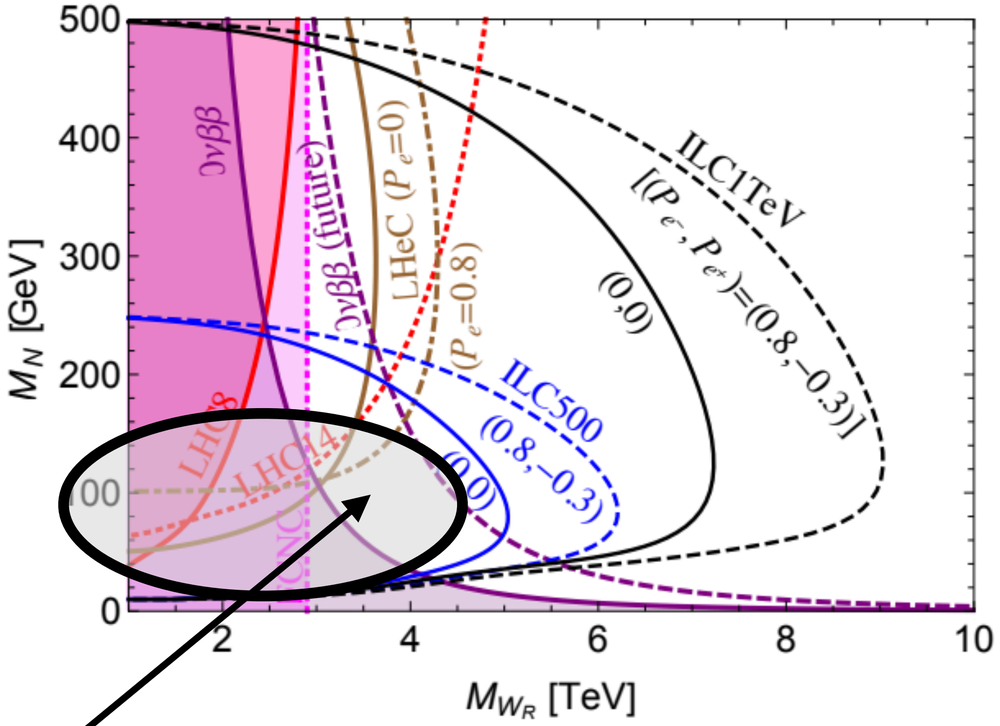




Beam polarization and electroweak physics

- W mass scan (2MeV?) c.f. CDF ~10MeV, ATLAS Run1 ~20MeV, FCCee 0.2MeV
- Heavy neutrino searches





ILC250?
Cover the gap btw 0νββ and LHC

Summary

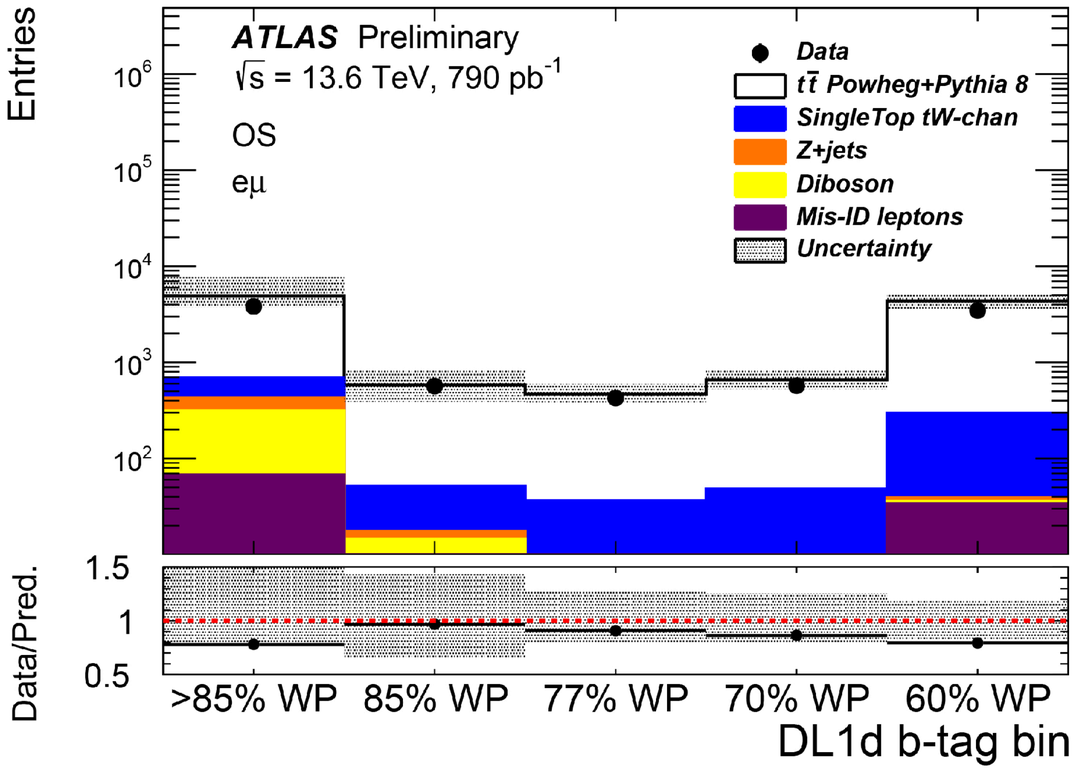
- Structure of the ATLAS physics analysis and how ATLAS Japan students are involved in that has been presented
- International collaboration is essential for the good results
- Physics analysis is balanced with the detector operation tasks
- ATLAS Japan physics group works fine to help students to cope with the long and complex review process in ATLAS
  - We need to improve the review procedure more
  - Also need the innovations in the analysis for Run3 and beyond
- ILC physics will give a hint to build the new analysis idea at the LHC, and vice versa

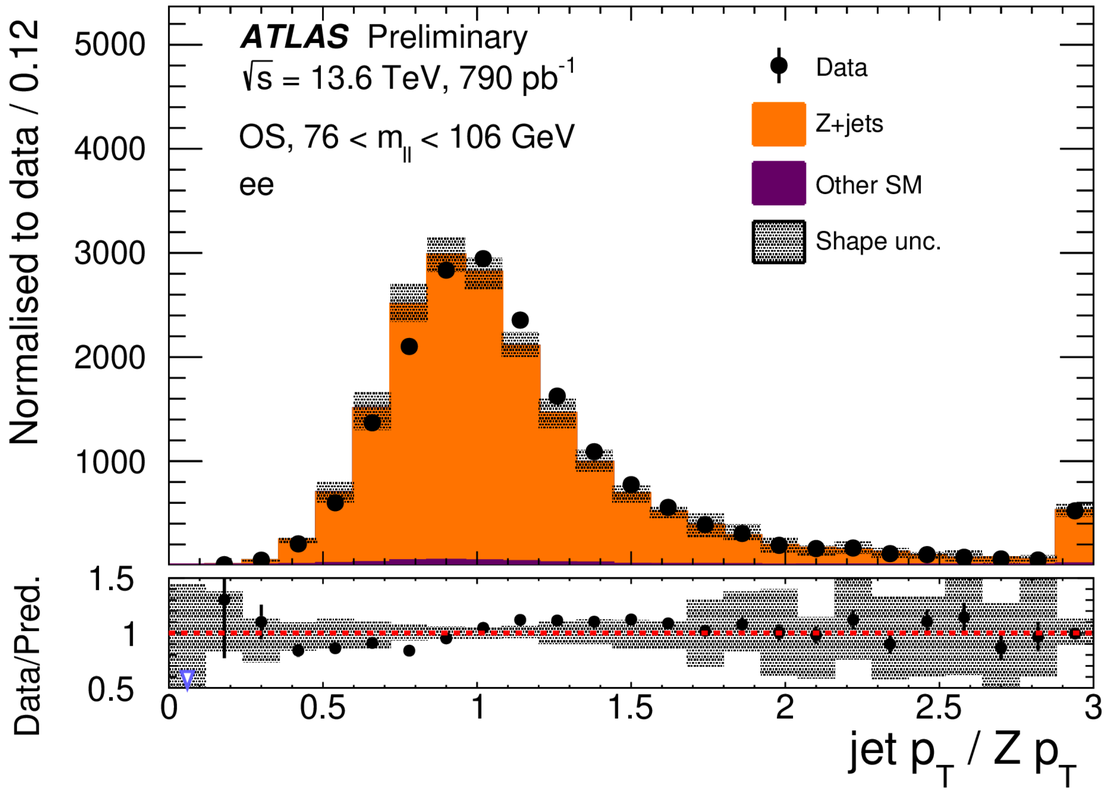
Backup

ATLAS 13.6 TeV public plots

https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PLOTS/JETM-2022-007/

https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PLOTS/FTAG-2022-003/





ATLAS *Preliminary*

2022 Computing Model - CPU: 2031, Conservative R&D

Tot: 33.8 MHS06*y