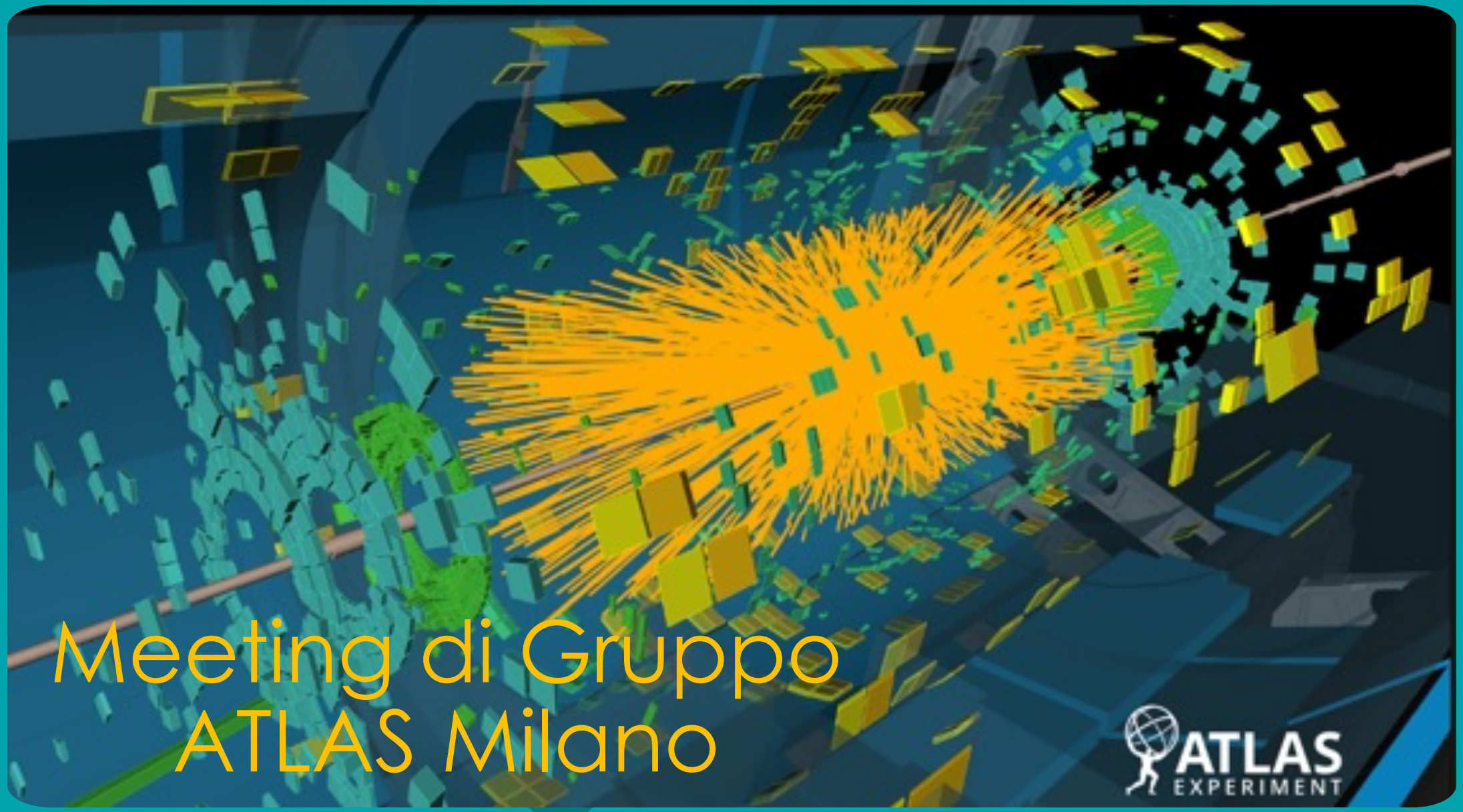


Meeting di Gruppo ATLAS Milano

27 Novembre 2024

THANKS TO TOMMASO

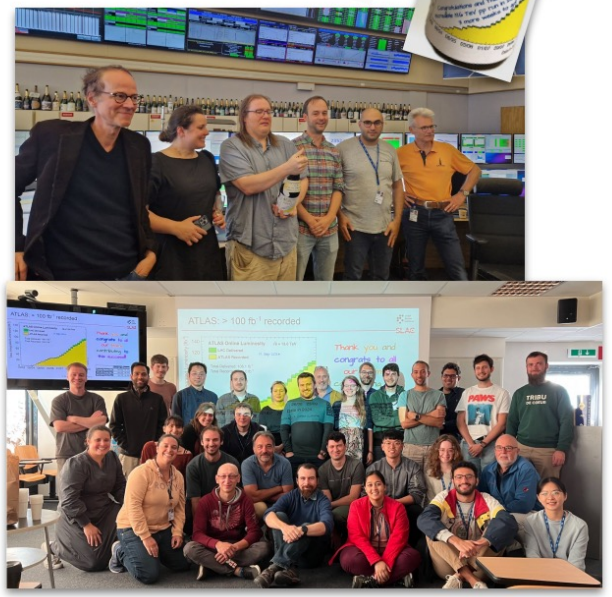
Ora puo' dedicarsi
alla sua attivita' preferita

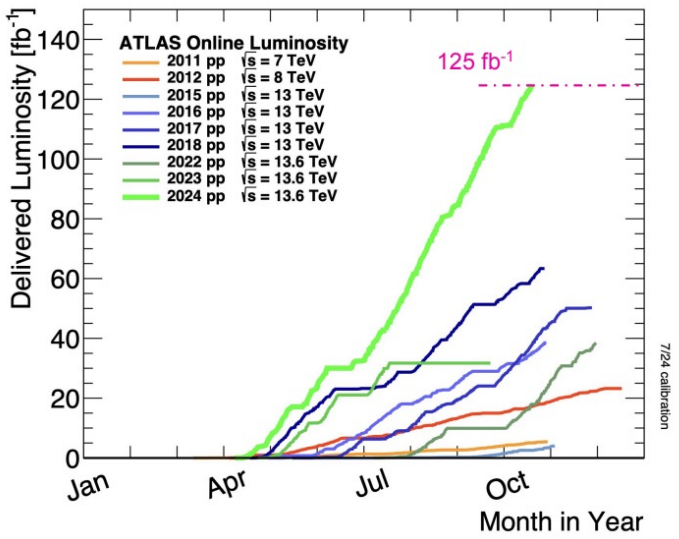
DATA TAKING NEWS

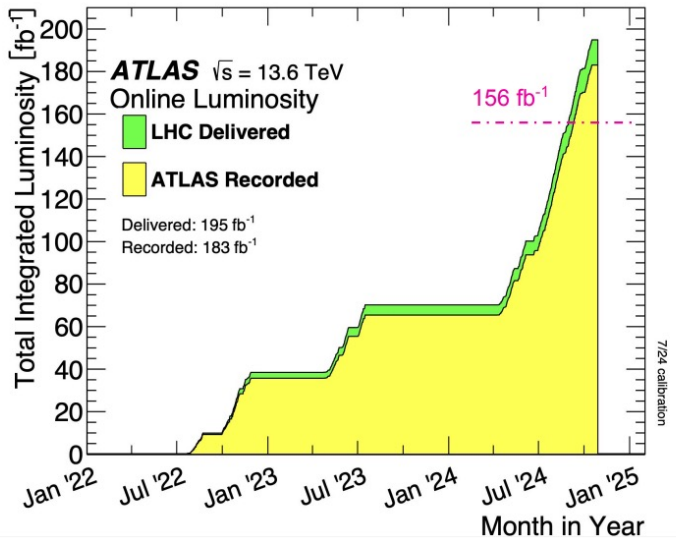
13.6 TeV pp data-taking in 2024

2024 has been an extremely impressive year for pp data-taking!
Congratulations and a huge thank you to the LHC and injector complex for the excellent performance in 2024!!

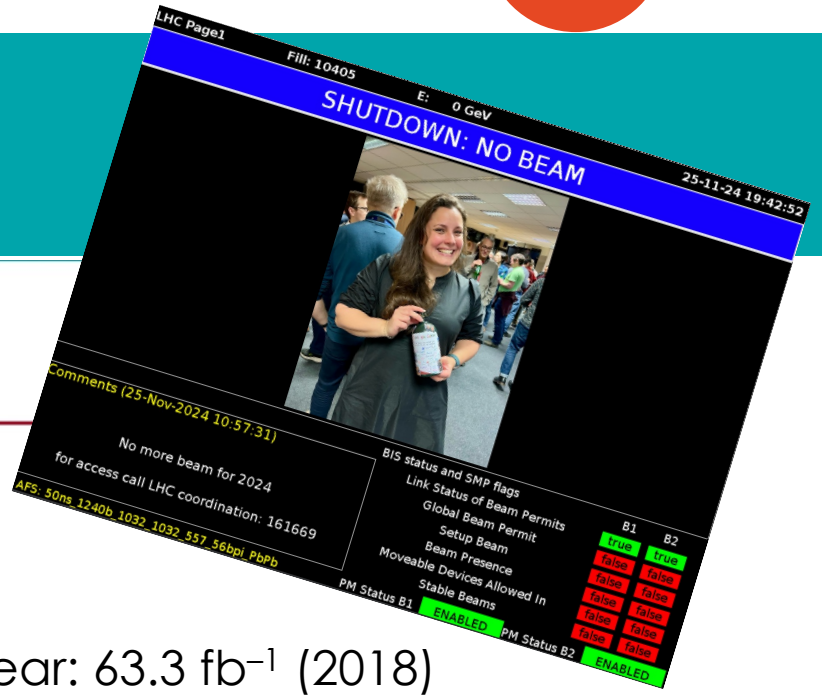
- Exceeded predictions: **Delivered an integrated luminosity of 125 fb^{-1}**
- Surpassed the Run-2 data-set (156 fb^{-1}) in Run 3 (195 fb^{-1})







DATA TAKING NEWS

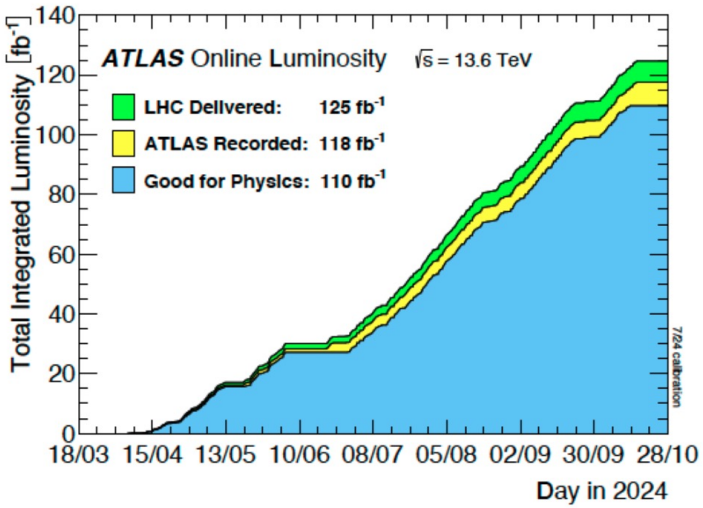


13.6 TeV pp data-taking

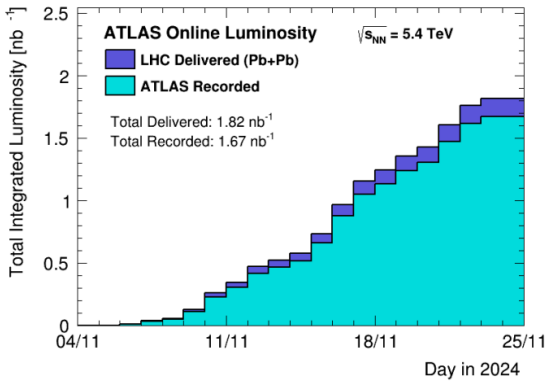
2024 Run completed on the 24th of November

Good for physics:

- L=110 fb^{-1} in 2024 ⇒ Record pp L, double previous peak year: 63.3 fb^{-1} (2018)
- L=169 fb^{-1} total Run3 ⇒ Expected to end Run3 with ~ double integrated Lumi wrt Run2
- L=140 fb^{-1} total Run2



PbPb data taking during November

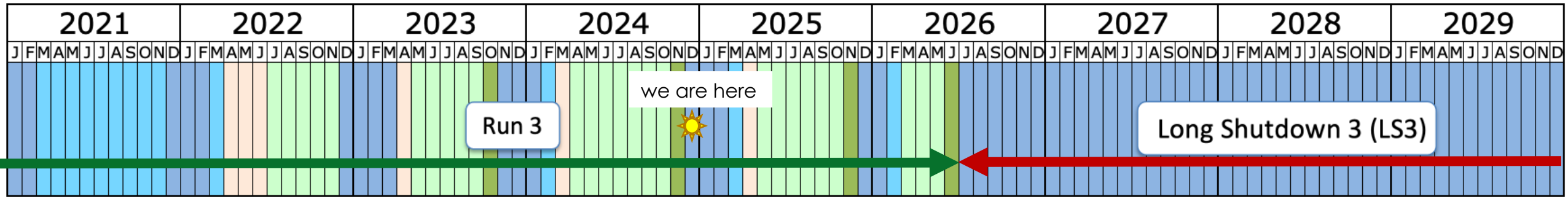


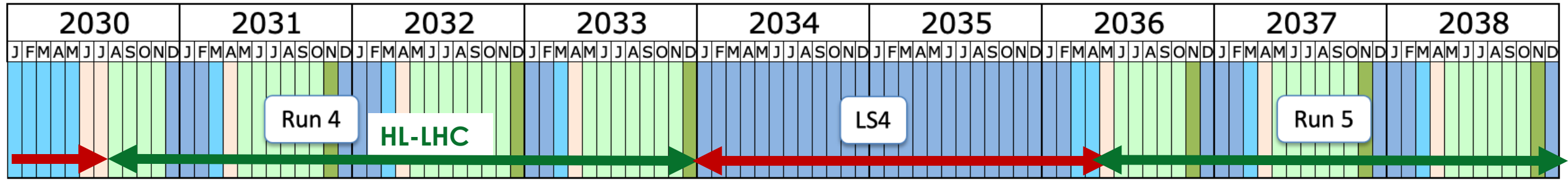
Successful heavy ion data taking:

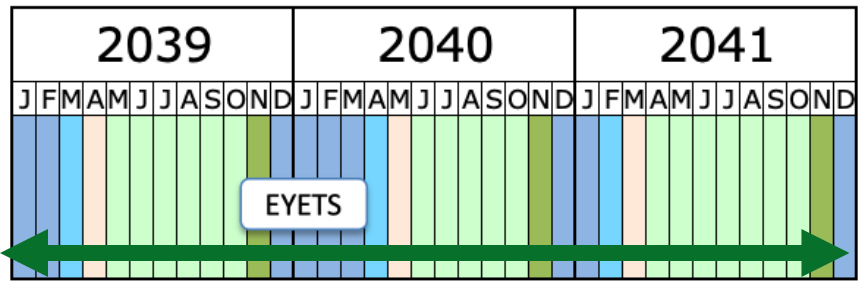
- Delivered L =1.82 fb^{-1}
- Recorded L= 1.67 fb^{-1}

For comparison: ATLAS recorded 1.71 fb^{-1} in 2023 heavy ion run

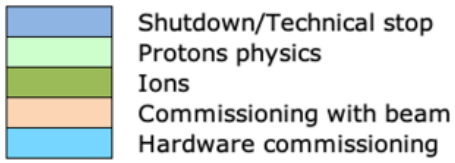
LHC NEWS







Last update: November 24



Nuova schedula prevede un anno aggiuntivo prima della fase HL_LHC:

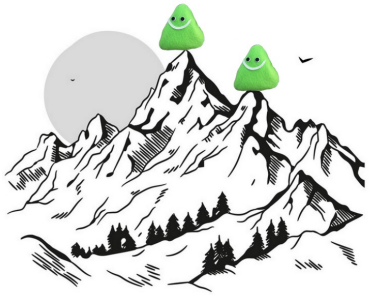
=> Run 3 esteso fino a giugno 2026

=> Partenza HL-LHC: estate 2030

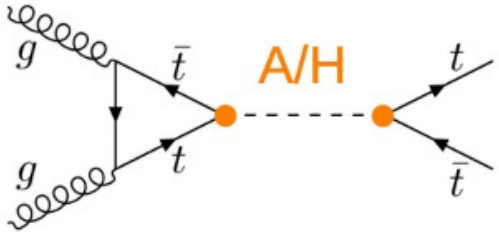
Siamo nel YETS che durera' 19 settimane,

La presa dati ripartira' a maggio 2025

CMS EXCESS

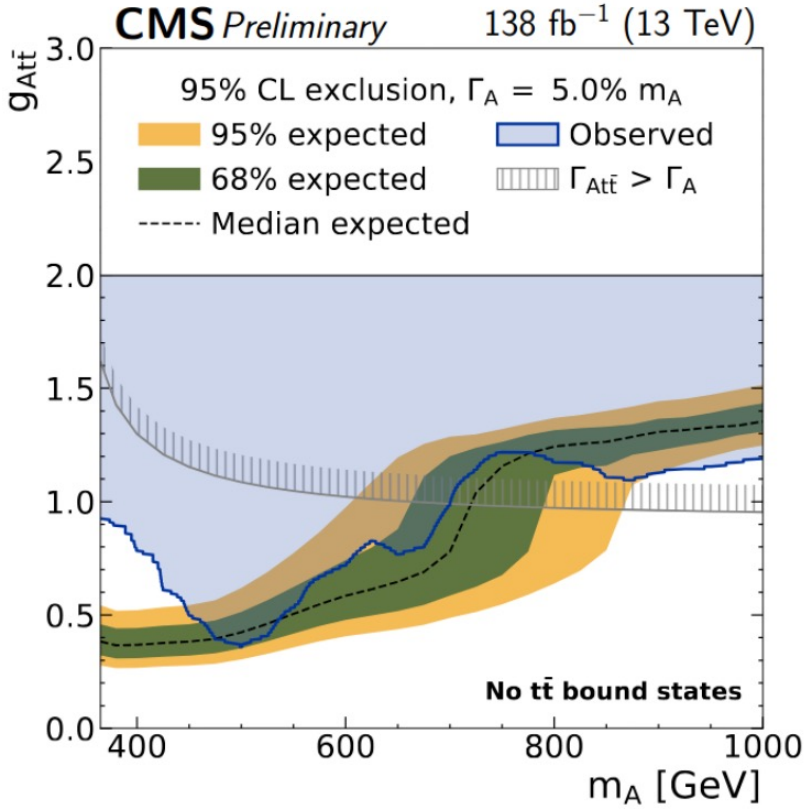


Search for A/H→tt̄



A search for heavy pseudoscalar or scalar bosons decaying to a top quark pair ($t\bar{t}$) in final states with one or two charged leptons.

CMS-PAS-HIG-22-013



Observed > 5σ excess of data above SM background prediction close to the $t\bar{t}$ production threshold and it significantly favors the pseudoscalar signal hypothesis over the scalar hypothesis.

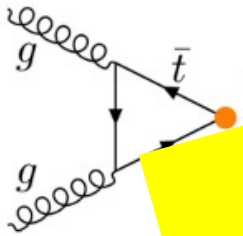
Consistent with presence of ttbar quasi-bound state ("toponium") $\sigma(\eta_t) = 7.1$ pb, uncertainty of 11%

The invariant mass of the reconstructed $t\bar{t}$ system and angular variables sensitive to its spin state are used to discriminate against the standard model $t\bar{t}$ background.

Consistent also with pseudoscalar A boson with m_A= 365 GeV

CMS EXCESS

Search for A/H→tt̄



A se… …ar or scalar bosons …t) in final states with …ons.

CMS-PAS-HIG-22-013

Observed > 5σ exce… …ove SM background prediction close to th… …production threshold and it significantly favors the pseudoscalar signal hy… over the scalar hypothesis.

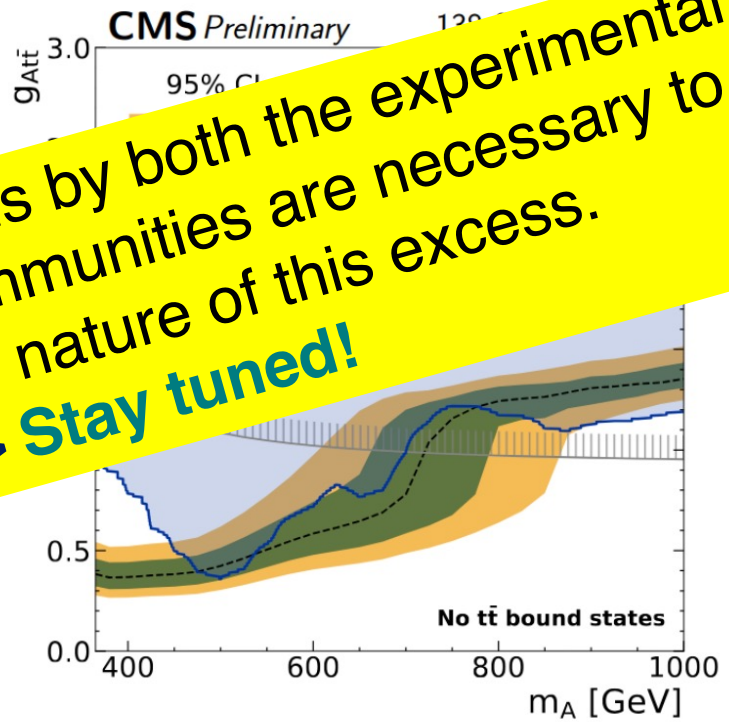
Consistent with presence of ttbar quas… ("toponium") σ(η$_t$) = 7.1 pb, uncertaint…

The invariant mass of the reconstructed … …em and variables sensitive to its spin state are used to discriminate against the standard model t t̄ background.

ATLAS search observed no significant deviation from SM expectation ⇒ under investigation (see Katharina B. talk)

Further investigations by both the experimental and theoretical communities are necessary to elucidate the nature of this excess.

⇒ Stay tuned!



Consistent also with pseudoscalar A boson with m_A= 365 GeV

ATLAS NEWS

Our colleagues in Russia are leaving

This is the final week of Russian membership at CERN and ATLAS before the International Cooperation Agreement expires end of Nov 2024, following the decision by CERN Council in response to Russia's ongoing war against Ukraine

We thank our Russian colleagues for more than 30 years of broad and skilled contributions to ATLAS
with an unfailing collaborative spirit, including their very constructive attitude during these difficult transition years

- **Eight teams from Russia signed the original ATLAS Letter of Intend in 1992**. They, and others joining later, contributed to the design, construction, maintenance and operation of the Inner Detector (SCT, TRT, ID-Gen), LAr and Tile Calorimeters, Muon Spectrometer, and Trigger & Data Acquisition. They also built the feet and rails system which supports the barrel toroid and allows to slide detector components, and they contributed to the magnet system and to Technical Coordination
- **Russian groups strongly contributed to the Phase-I upgrade of ATLAS**: Muon NSW, LAr digital trigger electronics, Tile scintillator upgrade, DAQ upgrade (FELIX readout and networking), and the preparation of other systems for Run 3
- **Groups from Russia also strongly engaged in the ATLAS Phase-II upgrades:** ITk (Pixel, Common), LAr, Tile, Muon, HGTD, Common fund
- **Our colleagues from Russia further made invaluable contributions to software, computing, data preparation, performance, and – of course – to our successful physics programme**

Sasha Zaitsev led the Russian groups since the beginning

TRT endcap rings at PNPI (2002)

LAr endcap presampler installation (2005)

ATLAS NEWS

- At the end of February 2025, **Andreas Hoecker** will end his mandate as ATLAS Spokesperson.
- We propose to make a book for Andreas with greeting cards from all 185 Institutions with your messages and signatures, in the spirit of the ones made for Peter Jenni (2009), Fabiola Gianotti (2013), Dave Charlton (2017), and Karl Jakobs (2021).
- The idea is that you can, for example, write a message on behalf of your team, insert pictures, add the signatures of your team members, etc. Please feel free to personalise the page to your pleasure, including hand-written and scanned messages and/or drawings.
- **Please return the Powerpoint file to Martine Desnyder-Ivesdal by email, by Wednesday 18 December at the latest.**

Ci sono volontari?

LOCAL NEWS

- Discussione tesi dottorato di **Elena**: 19 dicembre alle 14.30 👏👏
  - Commissione: Fabio Cerutti, Pamela Ferrari e Mauro Donega'
  - Previsto pranzo con commissione a cui tutti sono invitati

- **Alessandro** ha vinto il similfellow (inizia il 1 marzo 2025) 🥳🥳

- Rinnovato assegno per **Anna** che ha anche completato la sua qualifica per diventare ATLAS author 💪💪

- In questi giorni **Sonia e Antonio** sono impegnati nei colloqui per assegni di ricerca 🤞🤞

GRANTS/BORSE/CONCORSI

- **"ATLAS Software Development Grants"**
  - deadline for application: **Friday 6 December 2024**
  - Around five candidates will be selected to spend about six months at CERN for training and work on priority software projects.
  - All applicants should hold a valid contract at an ATLAS institute for at least one year from March 2025. Graduate students may exceptionally be considered.
  - https://twiki.cern.ch/twiki/pub/AtlasProtected/OfflineActivityCoordinationBoard/Software-Development-Grant-Proposals-2025.pdf

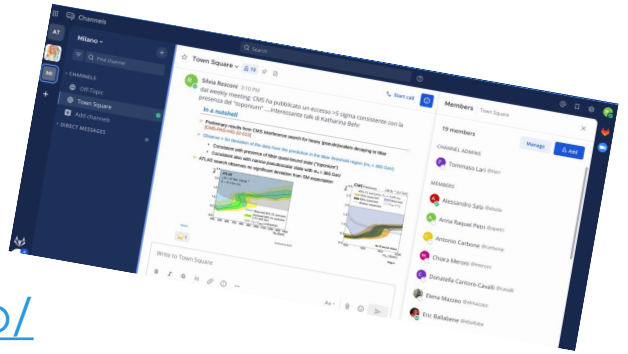
- **Borse CSN1 in laboratori stranieri** (CERN, DESY, FNAL….) da sfruttarsi da Maggio 2025
  - laureandi/laureati triennali (magistrali) - borse di 1 mese (3 mesi)
  - Raccolti i programmi di ricerca: **Leonardo e Ruggero** hanno sottomesso 2 argomenti.
  - Bando a Gennaio

- **Bando Concorso da Ricercatore INFN (terzo livello):**
  - deliberato nel Direttivo di Ottobre, bando uscira' a Dicembre.
  - Suddivisione: 40 posti «sperimentali», 10 posti «teorici»
  - Sedi di lavoro a scelta del candidato

MEETINGS/TOOLS/WEB PAGE

- **Meeting di Gruppo:**
  - Slot per meeting di Gruppo: **Mercoledi' mattina alle 11:00**
  - Meeting aperti a tutto il Gruppo ATLAS (invitati tutti gli "active members")
  - Meeting ristretti (staff + TD + post-doc)
  - Frequenza: ogni 2,3 settimane e aperto/ristretto a seconda delle esigenze.

- **Uso di Mattermost** per scambio rapido di news/vignette:
  - Attualmente 19 members
  - Scaricare la app e collegarsi al Mattermost server URL: https://mattermost.web.cern.ch/
  - Oppure interfaccia web: https://mattermost.web.cern.ch/atlas-milano/



- **pag web del gruppo ATLAS Milano** sul sito mi.infn.it e' vuota
  - Contattato A. Baldini + S. Rognoni per implementazione, sulla falsariga del sito unimi.
  - Aggiungere info su disponibilita' di tesi (?)

EVENTI

- **Pontremoli and Occhialini's scientific legacy** (12 Novembre): https://www.sif.it/corsi/pontremoli-occhialini-2024 (link ai talk)
- **Pixel Week** in Milano (9-12 Dicembre): https://indico.cern.ch/event/1442035/
- **End of the year physics workshop**, CERN (11-13 Dicembre): https://indico.cern.ch/event/1475731/
- **Workshop dell' INFN dedicato alla presentazione ed alla discussione dell' Input alla prossima European Strategy for Particle Physics**, presso l' Università di Milano Bicocca, 4 Febbraio 2025 (agenda tbd)
- **Prossimo meeting di Gruppo (natalizio)**: il 18 dicembre

BACK-UP

ATLAS NEWS

Publications & Physics results

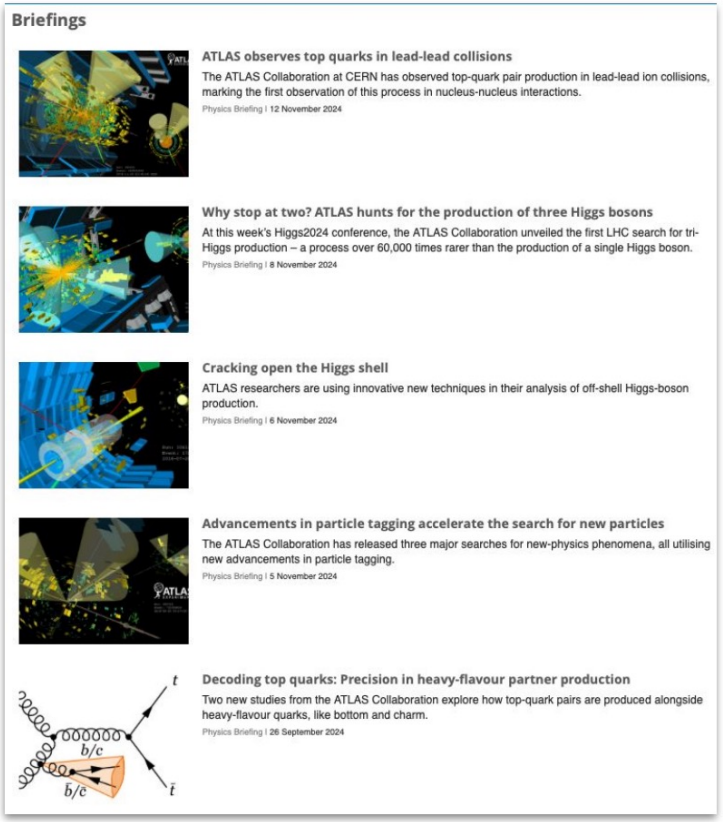
Publication status in 2024: 113 papers released so far

- In total: 385 on full Run-2 and 13 papers on Run-3 data-set

Since the last LHCC meeting in September, quite some new ATLAS results

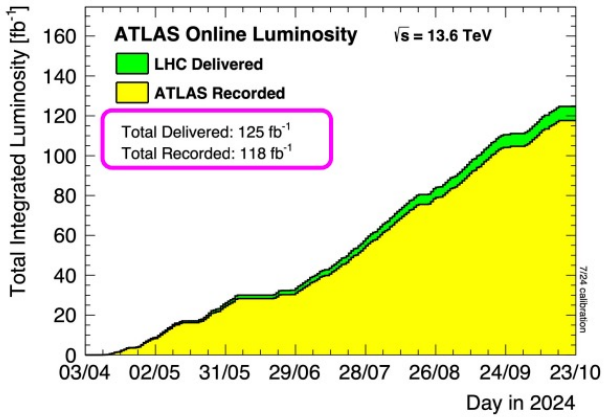
- 16 papers
- 4 conference notes and 3 public notes
- 5 new physics briefings

https://atlas.cern/Updates/Briefing



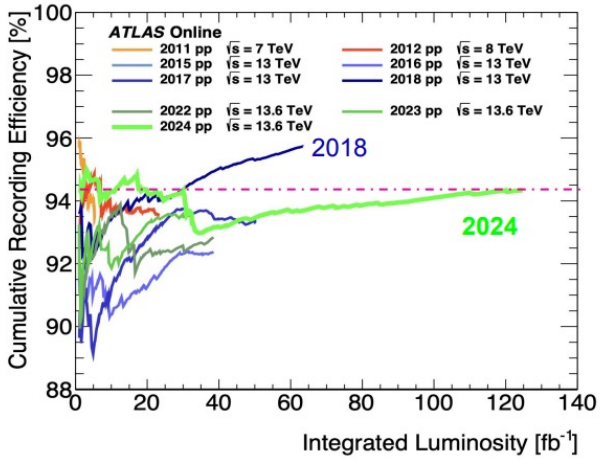
ATLAS NEWS

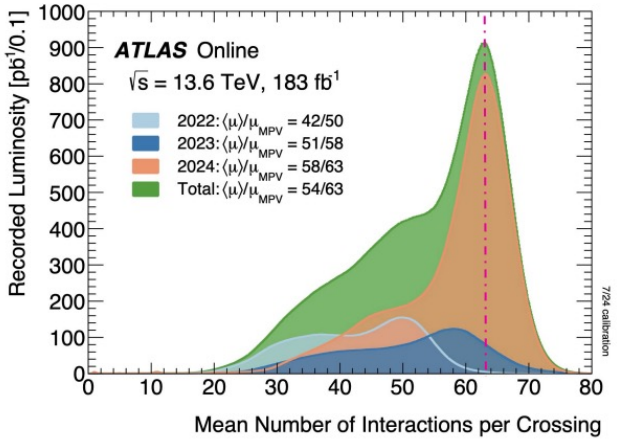
ATLAS operation performance in 2024

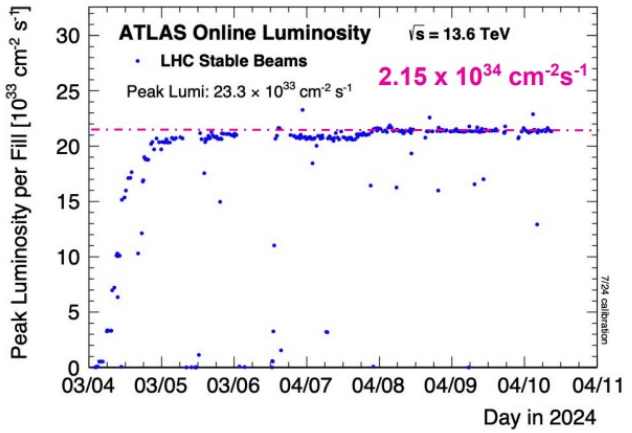


Data-taking efficiency of 94.3%, on the rise throughout 2024 (and Run 3)

- 2nd best data-taking year so far (at higher pileup / luminosity with levelling)
- Levelled at **pileup of 64** and **luminosity** of **2.15 x 10^{34} $cm^{-2}s^{-1}$**
- Thanks to:
  - Phase-I upgrades
  - Experience and expertise gained in operating our detector
  - Addressing also the smaller inefficiencies causing data loss



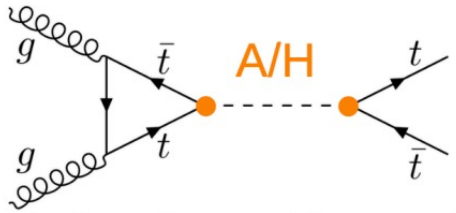




CMS NEWS

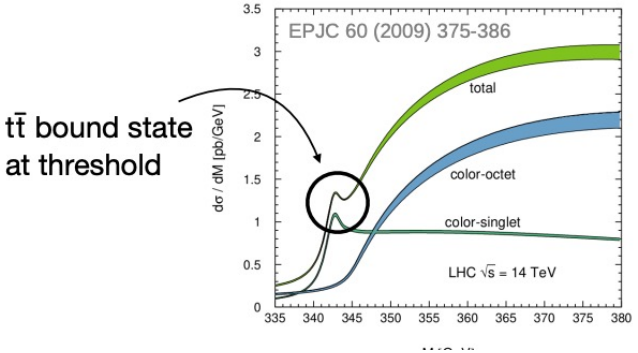
CMS-PAS-HIG-22-013

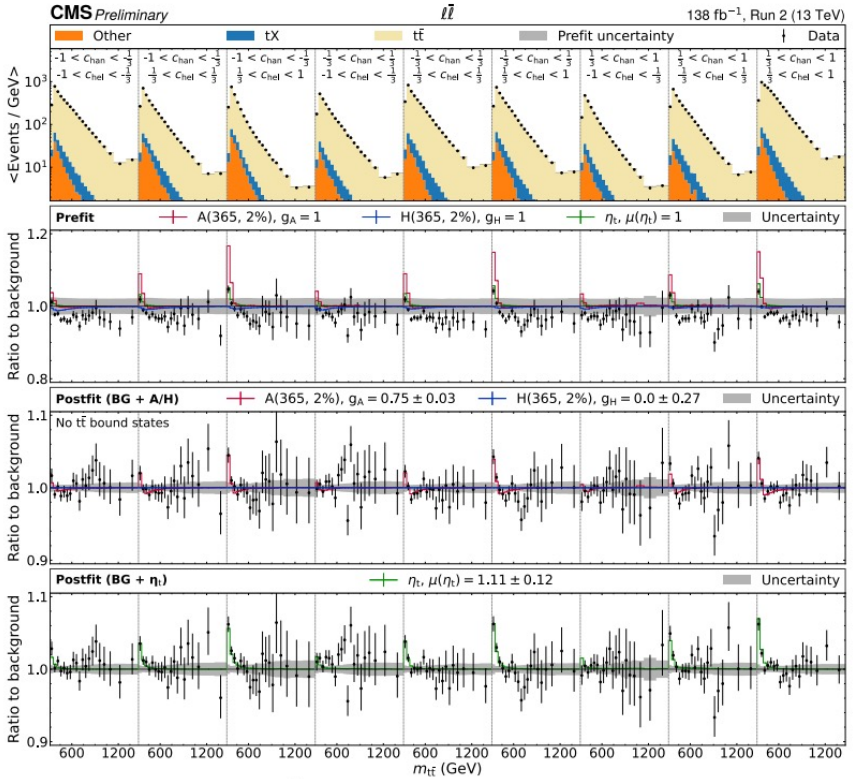
Search for A/H→tt̄



Spin correlation observables used to distinguish between 0^+ and 0^- hypotheses

Test A, H, and η_t (pseudoscalar $t\bar{t}$ bound state) hypotheses





Excess observed in $t\bar{t}$ threshold region

significance > 5σ

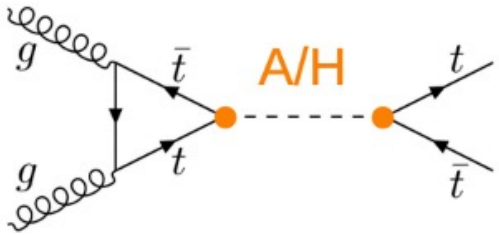
pseudoscalar hypothesis favoured, $\sigma_{\eta t}$ = 7.1 pb, 11% uncertainty

10

CMS NEWS

CMS-PAS-HIG-22-013

Search for A/H→$t\bar{t}$



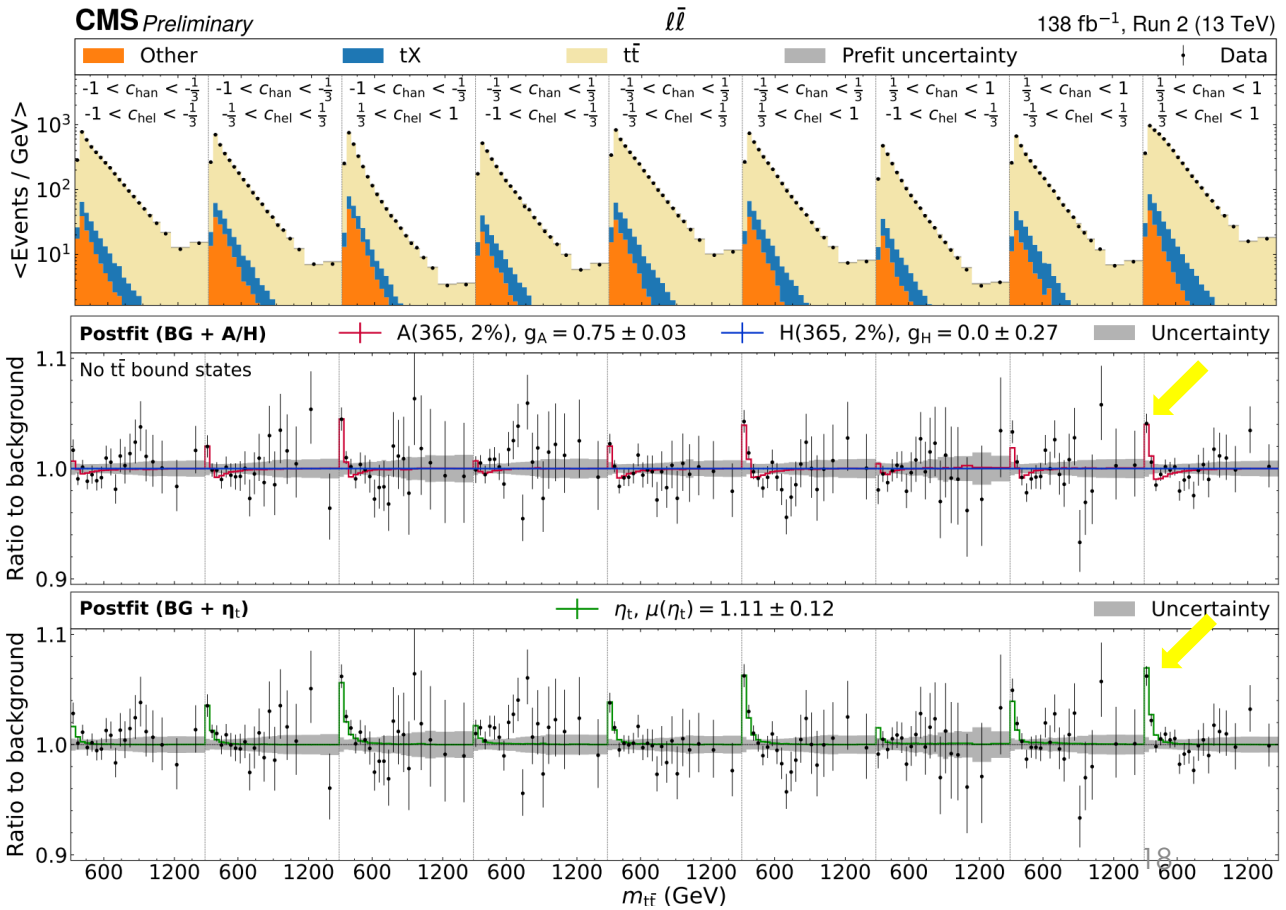
Signal tested: A, H, and η_t (pseudoscalar tt bound state, "toponium")

=> Observed > 5σ excess close to the $t\bar{t}$ production threshold

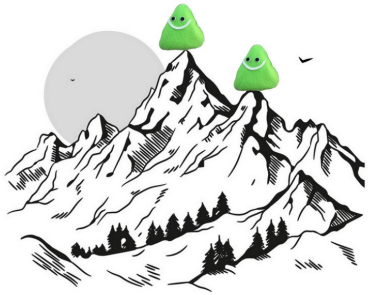
Consistent with presence of ttbar quasi-bound state ("toponium") $\sigma(\eta_t)$ = 7.1 pb, uncertainty of 11%

Consistent also with narrow pseudoscalar state with m(A) = 365 GeV

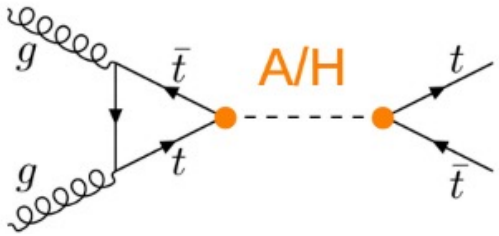
Split 1L and 2L regions into bins of angular variables sensitive to spin state of the ttbar system



CMS EXCESS

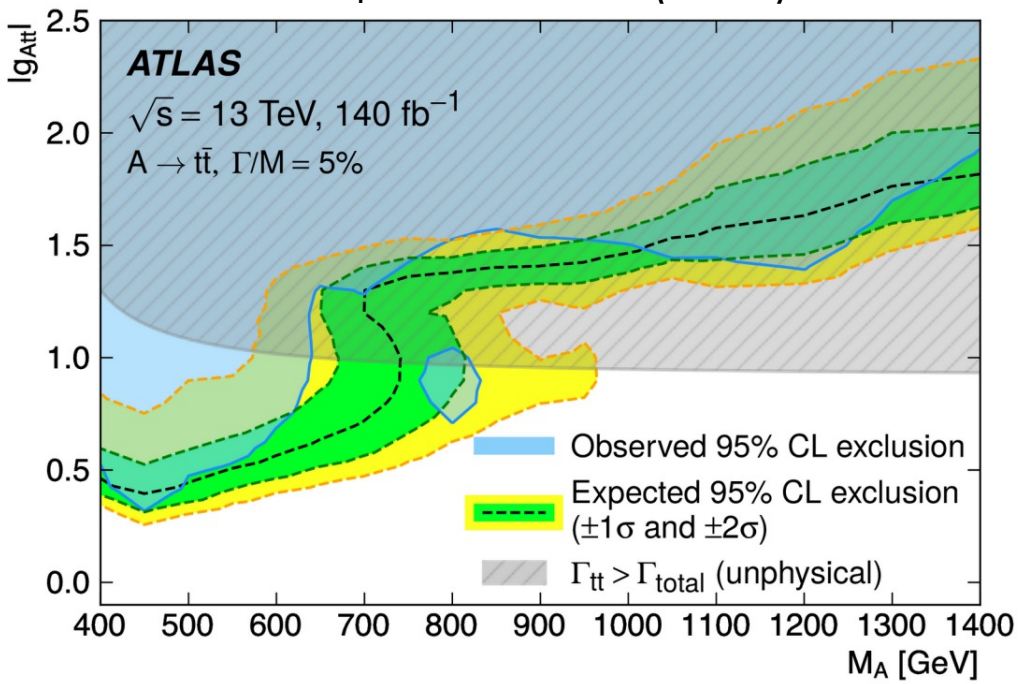


Search for A/H→tt̄



A search for heavy pseudoscalar or scalar bosons decaying to a top quark pair ($t\bar{t}$) in final states with one or two charged leptons.

ATLAS Paper: JHEP 08 (2024) 013



Observed > 5σ excess of data above SM background prediction close to the $t\bar{t}$ production threshold and it significantly favors the pseudoscalar signal hypothesis over the scalar hypothesis.

Consistent with presence of ttbar quasi-bound state ("toponium") $\sigma(\eta_t) = 7.1$ pb, uncertainty of 11%

The invariant mass of the reconstructed $t\bar{t}$ system and variables sensitive to its spin state are used to discriminate against the standard model $t\bar{t}$ background.

Consistent also with pseudoscalar A boson with $m_A = 365$ GeV