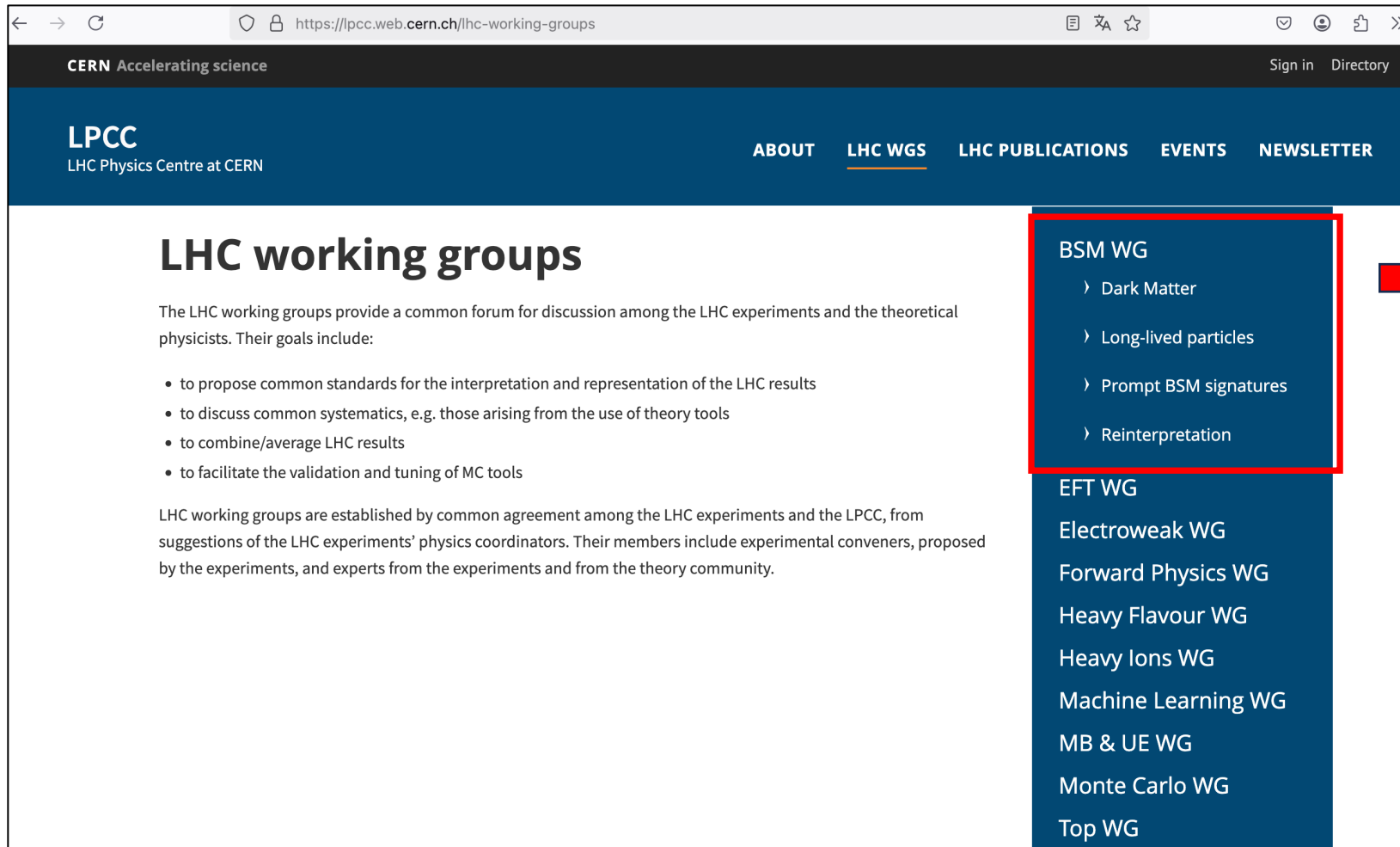


**The new BSM working group
of the LHC Physics Centre at CERN**

The LHC Physics Centre at CERN (LPCC) is a body chaired by Michelangelo Mangano aiming at coordinating the results across the LHC collaborations.

The BSM WG has been created in November

A screenshot of the LPCC website showing the 'LHC working groups' page. The page has a dark blue header with the CERN logo and navigation links. The main content area is white with a blue sidebar on the right. The sidebar lists various working groups, with the 'BSM WG' section highlighted by a red box. A red arrow points from the 'BSM WG' section to the text on the right.

← → ↻ 🔒 https://lpcc.web.cern.ch/lhc-working-groups ⌵ 🔍 ☆ 📧 👤 📁 >>

CERN Accelerating science Sign in Directory

LPCC
LHC Physics Centre at CERN

ABOUT LHC WGS LHC PUBLICATIONS EVENTS NEWSLETTER

LHC working groups

The LHC working groups provide a common forum for discussion among the LHC experiments and the theoretical physicists. Their goals include:

- to propose common standards for the interpretation and representation of the LHC results
- to discuss common systematics, e.g. those arising from the use of theory tools
- to combine/average LHC results
- to facilitate the validation and tuning of MC tools

LHC working groups are established by common agreement among the LHC experiments and the LPCC, from suggestions of the LHC experiments' physics coordinators. Their members include experimental conveners, proposed by the experiments, and experts from the experiments and from the theory community.

BSM WG

- › Dark Matter
- › Long-lived particles
- › Prompt BSM signatures
- › Reinterpretation

EFT WG

Electroweak WG

Forward Physics WG

Heavy Flavour WG

Heavy Ions WG

Machine Learning WG

MB & UE WG

Monte Carlo WG

Top WG

The BSM WG includes:
DM, LLPs, prompt BSM signatures
and Reinterpretation Forum.
Largely dominated by ATLAS/CMS
(LHCb is a newcomer here).

NB: BSM does not include flavor
and does not mention SUSY (!)

The Long Lived Particles (LLP) WG:

LPCC

LHC Physics Centre at CERN

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LHC LLP WG: Long-lived Particles at the LHC

To subscribe to the general WG mailing list, used to distribute announcements about WG meetings and available documents, go to

<http://simba3.web.cern.ch/simba3/SelfSubscription.aspx?groupName=lhc-llpwg>

Mandate:

The LHC Long-lived Particles Working Group (LHC LLP WG) brings together experimentalists and theorists to discuss the physics of new long-lived particles at the LHC. It also covers physics with unconventional experimental signatures. The WG builds on the experience of the [LLP LHC Community](#) and, preserving its main scientific objectives, it serves as a formal bridge with the relevant physics groups of the LHC experiments, to streamline the official endorsement of the WG's recommendations to the experiments. The WG will hold open meetings, typically at CERN, complementing the Workshops organized by the LLP LHC Community. The formation of dedicated subgroups, and possible closed meetings (restricted to members of the experimental collaborations), are foreseen. The goals of the working group are to:

- Facilitate communication between the experimental and theoretical LLP communities.
- Provide recommendations for benchmark models to be used in LLP interpretations.
- Develop and/or validate MC tools for event generation (e.g. dark sector showers, library of models).
- Provide recommendations to experiments on how best to present the results and facilitate reinterpretation of LLP searches.
- Discuss possible new search directions based on new input from theory and/or experiment.

Working group conveners representing the approved LHC experiments (ATLAS, CMS, FASER, LHCb, and MoEDAL) and the theory community will be appointed by each experiment and the LPCC, respectively. While the WG will focus its activity on items of direct relevance to the LHC physics programme, the participation of the broader LLP community is welcome to its open meetings.

BSM WG

› Dark Matter

› Long-lived particles

Conveners:

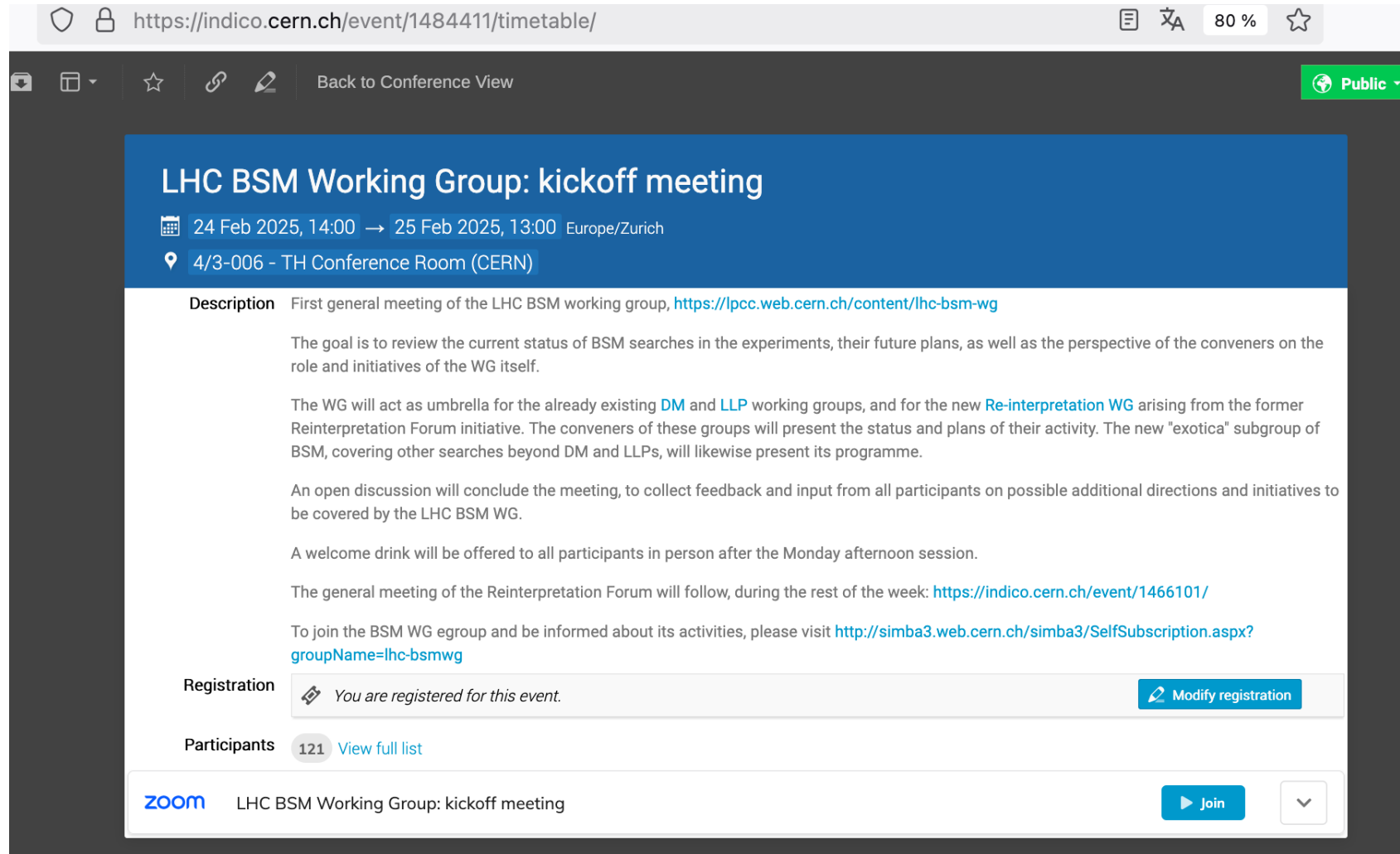
- ATLAS: Dominique Trischuk
- CMS: Alberto Escalante del Valle
- FASER: Dave Casper
- LHCb: Gaia Lanfranchi and Andrii Usachov
- MoEDAL: James Pinfold
- SND@LHC: Cristovao Vilela
- Theory: André Lessa
- Reach all through lhc-llpwg-admin@cern.ch

LHCb conveners appointed by Fred (Blanc).

First kick-off meeting held at CERN 24th-25th of February

120 participants (only 3 from LHCb, and only 1 in presence...)

The idea is to meeting every 6-12 months and touch base with experimental results and theory progress.



The image shows a screenshot of an Indico event page. The browser address bar at the top displays the URL <https://indico.cern.ch/event/1484411/timetable/>. The page title is "LHC BSM Working Group: kickoff meeting". The event dates are "24 Feb 2025, 14:00 → 25 Feb 2025, 13:00" in the "Europe/Zurich" time zone, and the location is "4/3-006 - TH Conference Room (CERN)". The "Description" section contains several paragraphs: the first states the goal is to review BSM searches and future plans; the second explains the WG will act as an umbrella for existing DM and LLP groups and a new Re-interpretation WG; the third mentions an open discussion to collect feedback; the fourth notes a welcome drink after the Monday session; and the fifth states the Reinterpretation Forum meeting will follow. It also provides links to the LHC BSM WG website, a link to join the BSM WG egroup, and a link to the Reinterpretation Forum meeting. The "Registration" section shows "You are registered for this event." with a "Modify registration" button. The "Participants" section shows "121" participants with a "View full list" link. At the bottom, there is a Zoom integration bar with the text "LHC BSM Working Group: kickoff meeting" and a "Join" button.

https://indico.cern.ch/event/1484411/timetable/

Back to Conference View

Public

LHC BSM Working Group: kickoff meeting

24 Feb 2025, 14:00 → 25 Feb 2025, 13:00 Europe/Zurich

4/3-006 - TH Conference Room (CERN)

Description First general meeting of the LHC BSM working group, <https://lpsc.web.cern.ch/content/lhc-bsm-wg>

The goal is to review the current status of BSM searches in the experiments, their future plans, as well as the perspective of the conveners on the role and initiatives of the WG itself.

The WG will act as umbrella for the already existing [DM](#) and [LLP](#) working groups, and for the new [Re-interpretation WG](#) arising from the former Reinterpretation Forum initiative. The conveners of these groups will present the status and plans of their activity. The new "exotica" subgroup of BSM, covering other searches beyond DM and LLPs, will likewise present its programme.

An open discussion will conclude the meeting, to collect feedback and input from all participants on possible additional directions and initiatives to be covered by the LHC BSM WG.

A welcome drink will be offered to all participants in person after the Monday afternoon session.

The general meeting of the Reinterpretation Forum will follow, during the rest of the week: <https://indico.cern.ch/event/1466101/>

To join the BSM WG egroup and be informed about its activities, please visit <http://simba3.web.cern.ch/simba3/SelfSubscription.aspx?groupName=lhc-bsmwig>

Registration You are registered for this event. [Modify registration](#)

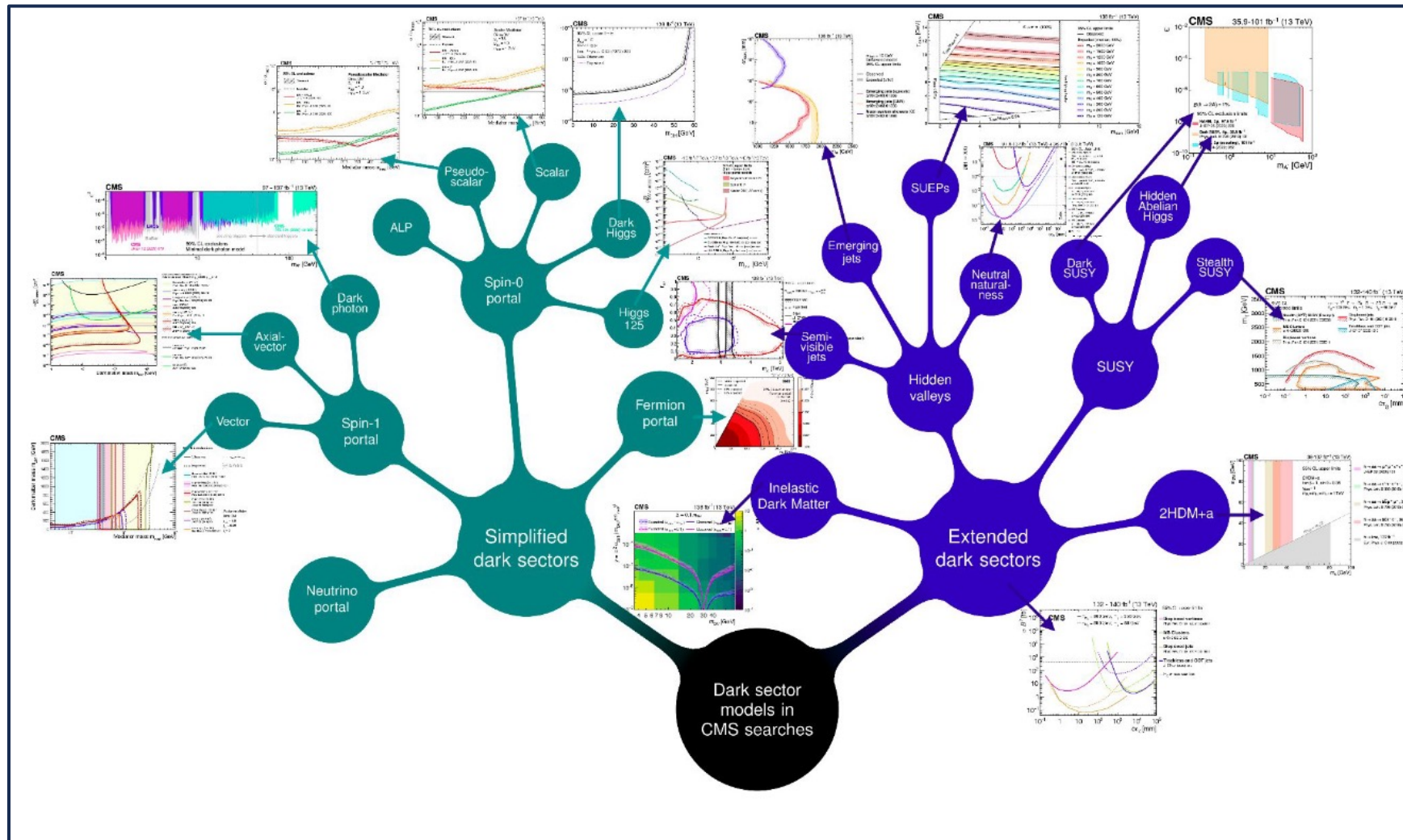
Participants 121 [View full list](#)

zoom LHC BSM Working Group: kickoff meeting [Join](#)

Dark Sector in full swing in ATLAS and CMS:

See for example the CMS review: Dark sector searches - arXiv:2405.13778

LHCb should try to catch up, at least for dark sector in visible final states, DM (== missing ET) for us is impossible



Already quite a few papers published in LHCb...

Direct BSM searches in Run 1/2

(displaced) leptons

- Dark photon [PRL 120 \(2018\) 061801](#),
[PRL 124 \(2020\) 041801](#)
- Low-mass dimuon resonances [JHEP 10 \(2020\) 156](#)
- Dimuon resonance in the Y mass region [JHEP 09 \(2018\) 147](#)
- Majorana neutrino [PRL 112 \(2014\) 131802](#)
- Light boson from $b \rightarrow s$ decays [PRL 115 \(2015\) 161802](#),
[PRD 95 \(2017\) 071101](#)
- (heavy) LLPs decaying to $e^\pm \mu^\pm \nu$ [EPJC 81 \(2021\) 261](#)

jets (heavy)

- Massive LLPs decaying semileptonically [EPJC 82 \(2022\) 4, 373](#)
- HNL in $W^\pm \rightarrow \mu^\pm \mu^\pm jet$ [EPJC 81 \(2021\) 248](#)
- $LLP \rightarrow jet jet$ [EPJC 77 \(2017\) 812](#)
- $LLP \rightarrow \mu + jets$ [EPJC 77 \(2017\) 224](#)

But results still (in large majority) marginal because based on long tracks

Dark Photons from Drell-Yan
and from D^* , η , π^0 decays (long tracks)
(Long Tracks)

Dark Higgs from b-decays and
from Higgs decays with dimuon final state
(Downstream, T-tracks)

LHCb
FIP searches now

ALP with fermion couplings
(downstream, T-tracks)

Heavy Neutral Leptons
(Downstream, T-tracks)

ALP with photon/gluon couplings
(prompt photons)

Hidden Valley Dark pions
(Displaced jets)

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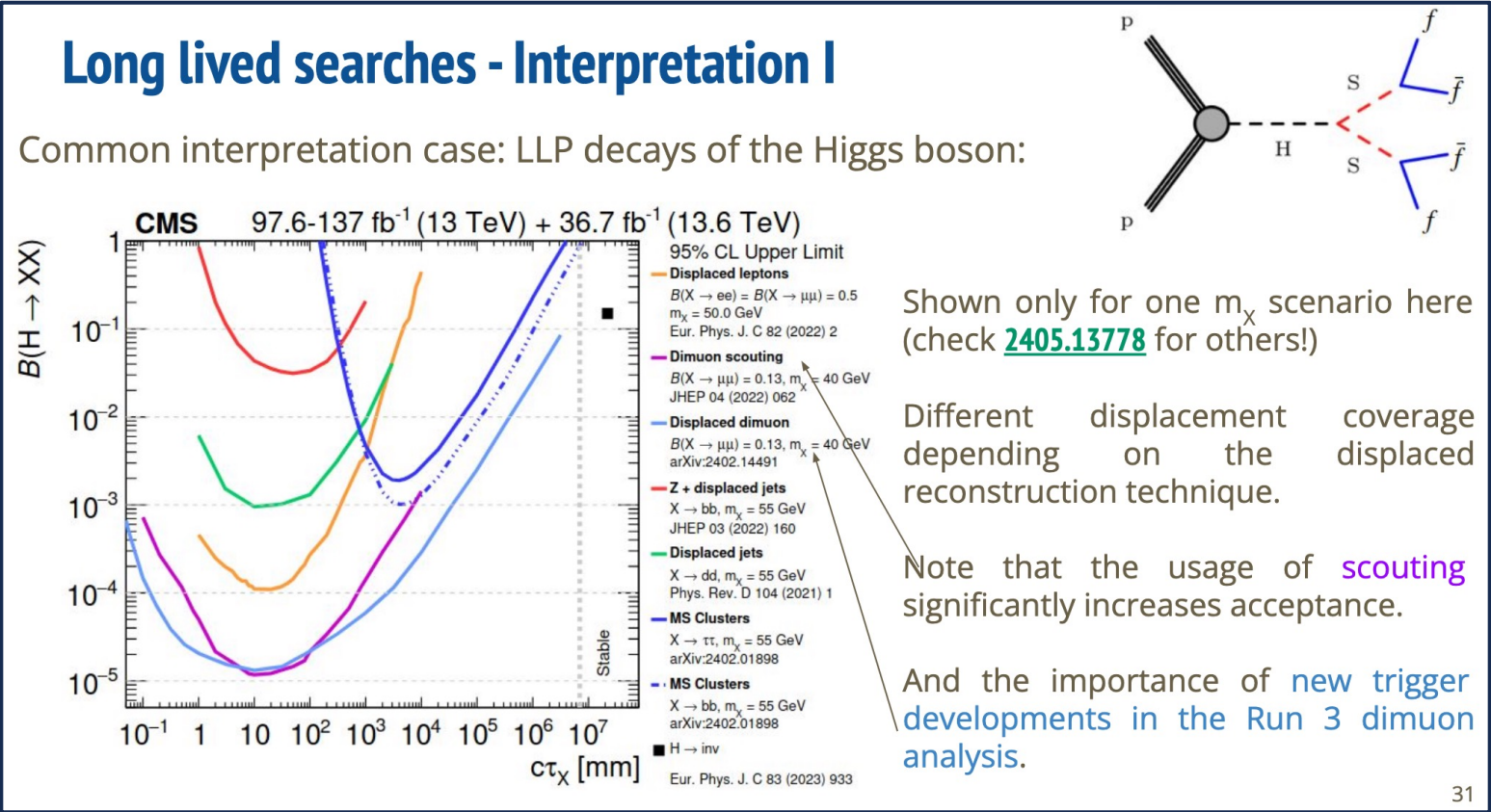
A problem that we should try to solve at the LPCC:

ATLAS/CMS work with « signatures » and not with « benchmarks »:

- this opens up the problem of « re-interpreting » results if they want to compare with the rest of the world
- reinterpretation requires a huge amount of information (efficiency maps, background distributions, kinematics, etc) that represents a (large!) overload for any analysis.
- even when re-interpreting they plot results in a way that is not compatible with the others.

An example of re-interpretation for the Dark Higgs model:

CMS (and ATLAS) way of showing results

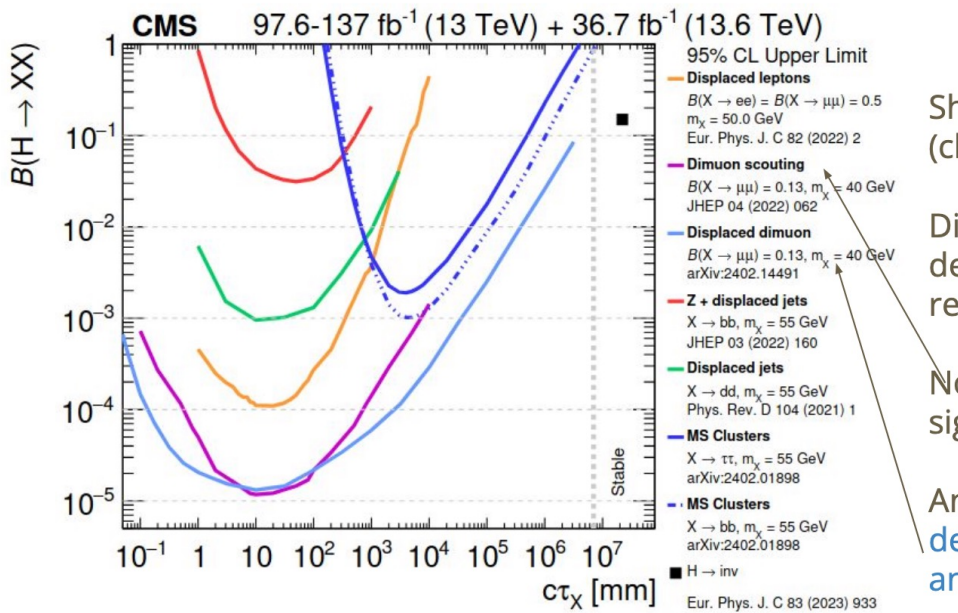
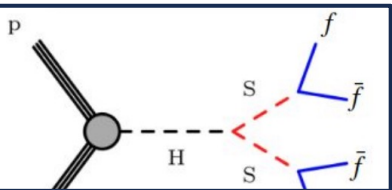


An example of re-interpretation for the Dark Higgs model:

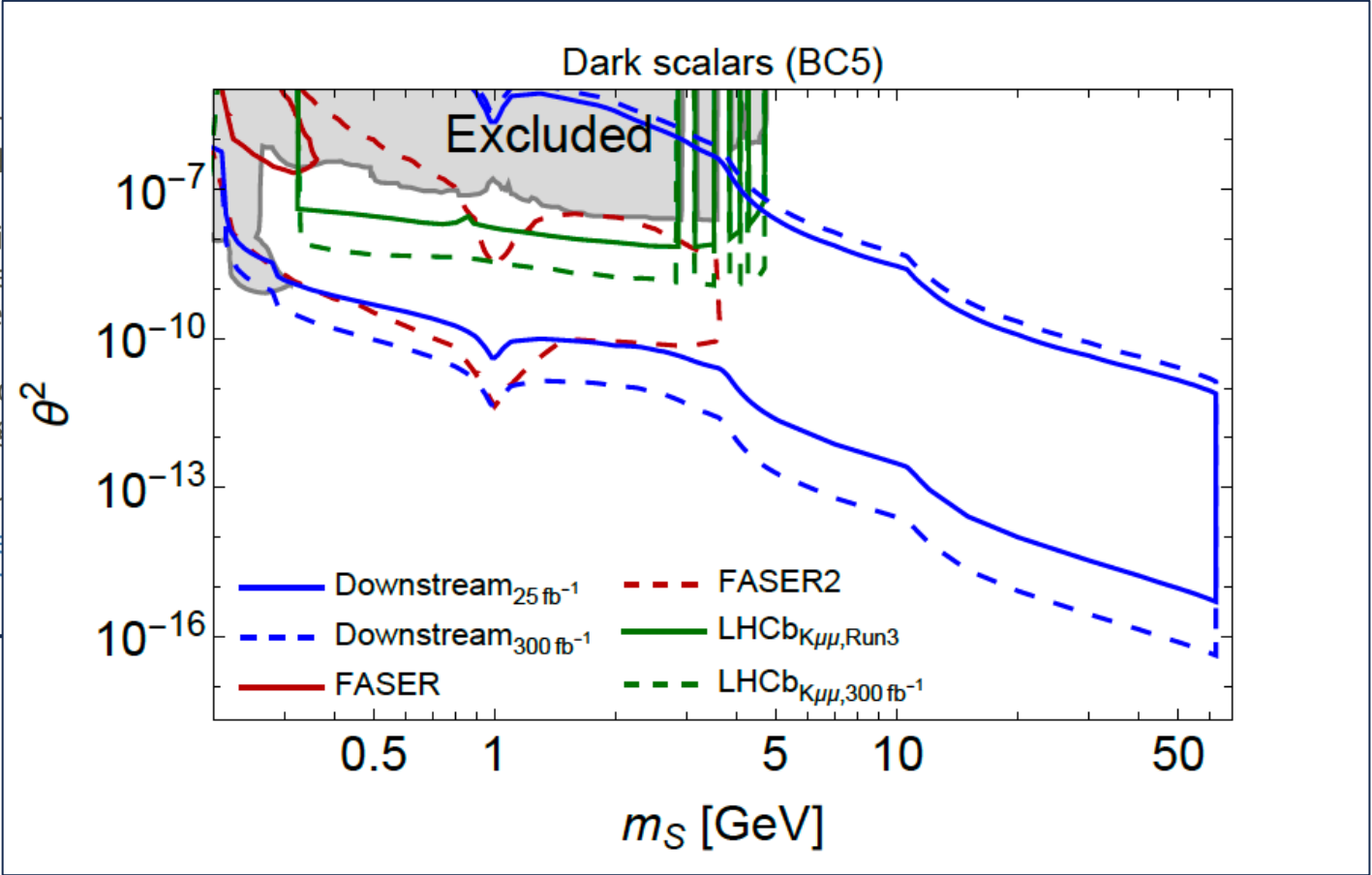
CMS (and ATLAS) way of showing results

Long lived searches - Interpretation I

Common interpretation case: LLP decays of the Higgs boson:



.. and the rest of the world...



Conclusions:

- It is a long way but the premises seem good.
- Next BSM General meeting will be held in November (10-12 November).
- In the meantime LHCb is organizing its own activity, with weekly meetings (Wednesday, 15:30) and an annual workshop (FIPs@LHCb) in the Council Chamber:
 - 2025: 8-11 February – Proceedings almost ready
 - 2026: 18-20 February