

# NEWS FROM HEPHY

---

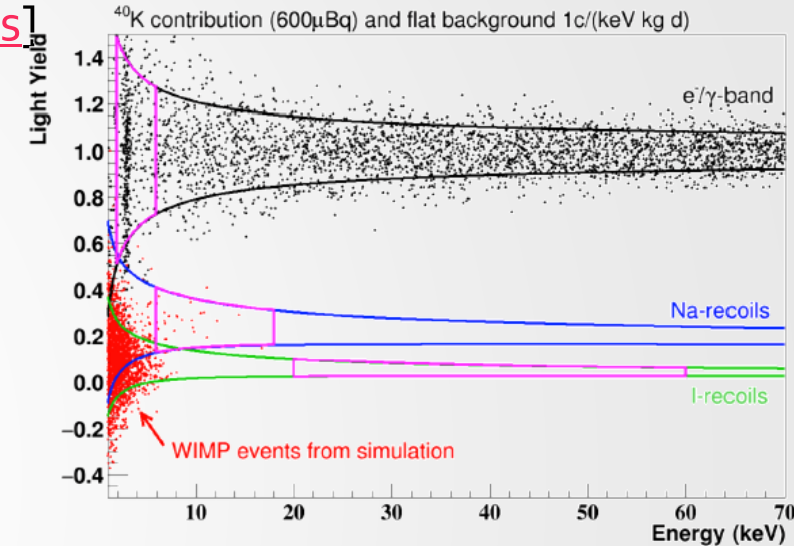
February 26<sup>th</sup>, 2021

R. Schöpfbeck

# COSINUS & BELLE

- Cosinus (with TU Wien) experiment [[Hephy-Cosinus](#)] [[Homepage Cosinus](#)]

- Cryogenic direct detection experiment using NaI crystal to verify the DAMA/Libra annual modulation
  - Dual readout: heat signal and scintillating light
- Spokesperson F. Reindl
- → Approved by LNGS (Gran Sasso) [[LNGS - Cosinus](#)]



- Belle II @ SuperKEKB

- Luminosity record  $2.4 \cdot 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ . Set for  $400\text{-}500 \text{ fb}^{-1}$  in 2021

- new Belle group structure

- Christoph Schwanda:  $V_{cb}$  and  $V_{ub}$  measurements
- → Ginaluca Inguglia: ERC starting grant (since Nov 1<sup>st</sup>)

"[InterLeptons](#): a search for new interactions at Belle II using Leptons"

- Belle II searches with leptons and  $E_T^{\text{miss}}$  targeting DM in  $Z'$  decays [[Phys. Rev. Lett. 124, 141801](#)], LFUV decays of tau leptons, LVF decays of the Y resonances



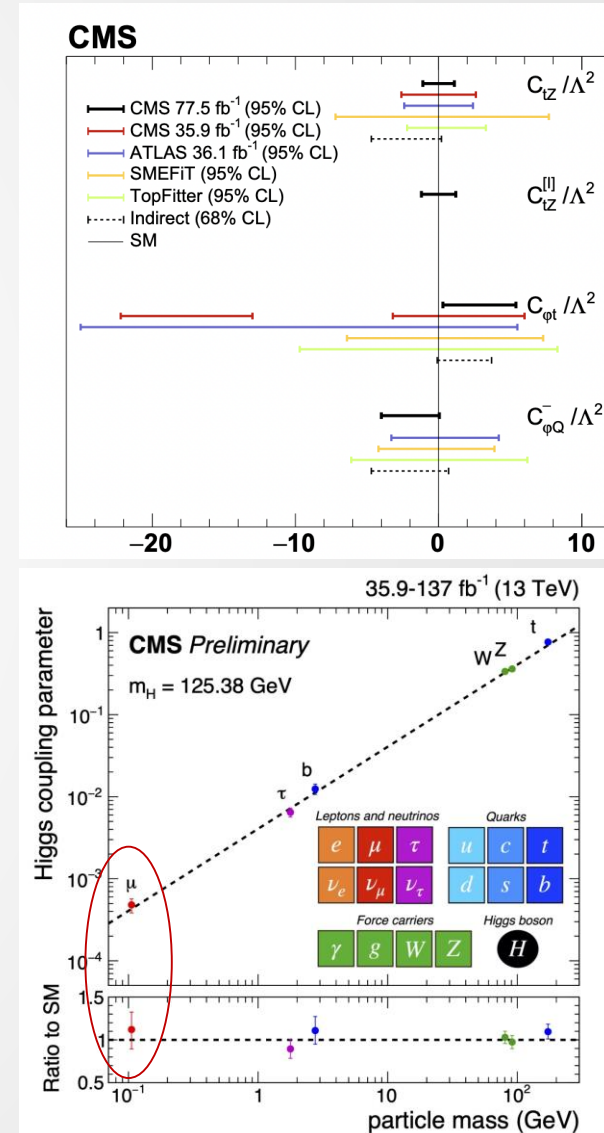
# CMS EXPERIMENT

- HEPHY Data Analysis

- Supersymmetry** : first search using full Run II dataset [[Eur. Phys. J. C 81 \(2021\) 3](#)] [FWF]; Ongoing: compressed top squarks [DKPI] and together with Etvoes University
- Top Physics**: ttZ differential x-sec [[JHEP 03 \(2020\) 056](#)] [FWF] Ongoing: tt $\gamma$  differential x-sec + EFT [FWF], New: tWZ process cross section – [FWF]
- Higgs  $\rightarrow \tau\tau$  and VH**: Run II measurements on track for Moriond'21 [[EWK](#)] [[QCD](#)]. New effort starting in VH final states.
- Long lived particles**: Ongoing: Run-II displaced  $2\mu$  search targeting [EPS 2021](#) [FWF]
- LHC (Re-) Interpretation**: [Smodels](#) [together with members from Graz University] is consolidating and new ML based approach [Protomodels](#) [[arXiv](#)]

- News from the collaboration

- 1000th paper milestone: Nov. 2020 [[link](#)]
- W. Adam completed his term as one of the two L1 Physics Coordinators (2018-2020)
- CMS: Evidence for Higgs coupling to 2nd generation fermions:  $H \rightarrow \mu\mu$  [[press release](#)]



# HARDWARE

---

- CMS Tracker: sensor in production (responsibility in testing)
- CMS HGCAL (HL-LHC calorimetry upgrade):  
R&D not complete; HEPHY involvement in design, simulation, irradiation, prototype testing
- MedAustron Proton-CT
  - [first data-taking with full setup](#) ; upgrade with TOF
  - Low Flux [[arxiv](#)]: Reduce intensity for measuring single particles; [new FFG Bridge project](#) to deal with beam positioning & monitoring for the low intensities  
synergy with CMOS R&D and ToF-LGAD für Proton-CT

# THEORY

---

- Theory group consolidated
  - Theoretical astroparticle physics (J. Pradler, Xiaoyong Chu ) collider phenomenology (H. Eberl)
  - Forschungsgruppe `Strong DM` (HEPHY & University of Graz)