

# EOS – be.h

## Workpackage 6: Transversal developments on prompt and displaced objects

F. Blekman, G. Bruno  
be.h welcome meeting  
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# Work Package 6 in a nutshell as announced

- **Goal:** development of novel, basic software reconstructions tools for CMS
  - **Prompt jets:**
    - global flavor-tagging approach (b, c,  $\tau$ , g and q-jets) – mostly in place but taus are not yet integrated
  - **Displaced objects**
    - extend global tagger to displaced ( $>\sim 1\text{cm}$ ) jets.
    - Develop displaced  $\mu$  and e reconstruction and identification
- **Team:**
  - F. Blekman (VUB), G. Bruno (UCL), B. Clerboux (ULB), J. D'Hondt (VUB), D. Dobur (UG), S. Lowette (VUB),
  - PhD8 (VUB – F. Blekman) – 100%
  - PhD10 (UCL – G. Bruno) – 50%
  - Also expected to contribute: all people working on connected tasks (see next slide)

- WP2: multi-jet analyses  $ttW/Z$ ,  $tHj?$ ,  $HH$ ; PhD4 (UCL/VUB Andrea/Jorgen), PhD5 (UCL/UG Andrea/Didar), PD9 (UCL, Vincent)
- WP2: ? Off-shell  $H \rightarrow VV$  in  $ggF$  and  $VBF$  ? and  $VBS$  ; PhD3(ULBexp/UA Pascal/Nick), PhD4(ULBexp/UA, Laurent/Pierre), PD8 (ULBexp, Pascal/Laurent)
- WP3: resonances ?  $H/A \rightarrow A/H/h$   $Z \rightarrow llbb$  ? PhD6 (UCL, Christophe)
- WP4: hidden sector hadrons (displaced vertices,  $b$  and  $\tau$ -jets), PD10 (VUB, Steven); long-lived dark  $Z$  (ULBexp/VUB, Barbara/Steven)
- WP5: sterile neutrinos – displaced  $e, \mu, \tau$ , hadrons; PhD10(UCL Giacomo), PhD9(ULBexp/UG, Barbara/Didar), PD12 (UG, Didar), PD13(UG, Didar/Michael)

# Specific plans for displaced B-tagging

- Sensitivity of displaced BSM with heavy flavours is now a hot topic in CMS
- Including leadership (Steven L) and contributions from various groups
  - sTops->Displaced Leptons (Freya, last result '15 data) (contains displaced b-jets but are not included in analysis)
  - Gluinos/stops displaced b-jets (Freya)
- Tools: Only one effort with  $\sim$ b-tagging in CMS and not from Belgium (and not ported back to collaboration)
  - But (AFAIK, Steven L might know more) most are relying on no b-tagging at all

# Specific plans for displaced leptons

- Status

- Hadronically decaying taus: nothing done so far in CMS
- Electrons and muons :
  - efforts made within specific analyses
  - based on simple criteria (impact parameter, stand-alone reco)
  - no generic tools made available to the collaboration

- Plans

- For the moment develop displaced hadronic tau reco within the long-lived HNL search
- Displaced muon identification also being investigated (by other groups) in the same analysis

- [A.R.Sahasransu.pdf](#)
- Experiences:
  - Deep network to classify prompt photon from  $\pi^0$  and beam halo using a granular calorimeter (arXiv 1808.03987).
  - Estimation of top quark mass from CMS open data.
  - **Master:** Discharge study in triple GEM detectors.
- Work Plan:
  - Now - Learn the existing b-tagging tools and become CMS author.
  - Jan - April, 2019 - Validation: Monitor changes in heavy flavour tagging in the software. Familiarize with the relevant observables.
  - April - July, 2019 - Commissioning: Study heavy flavour performance in the  $t\bar{t}$  channel.
  - Longer term: Use or improve the displaced heavy flavour tagging.
  - 3rd - 4th year: Search for new physics involving long-lived hadrons.

- Bachelor degree at University of Bari (IT).  
Thesis title: "Study of muon decay  $W$  and  $Z$  gauge bosons using the data collected by CMS"
- Master degree at University of Bari (IT).  
Thesis title: "Searching for double Higgs production in  $bb4l$  channel with the CMS experiment at LHC"



My interest in Elementary Particles Physics has grown during my University career; I am strongly motivated to understand the subatomic world from both a theoretical and an experimental point of view. In particular, during my thesis, I studied the  $HH \rightarrow bbZZ \rightarrow bb4l$  process with the data of 2016 collected by CMS and I set an upper limit on the signal strength equal to 171 @ 95% C.L. This work gave me the opportunity to deepen my knowledge in Standard Model of particle physics, especially in the Higgs sector, and also to learn how a physical analysis is performed. I'm also interested in the development of detectors: I took part in a test beam to study the performance of the Drift Chamber for the Future Accelerator project and now I'm working at Fermilab to test the modules of the Outer Tracker detector for the CMS experiment.

# Jessica Prisciandaro (Postdoc – FNRS CR)

## Jessica Prisciandaro

- FNRS Chargé de recherche at UCL



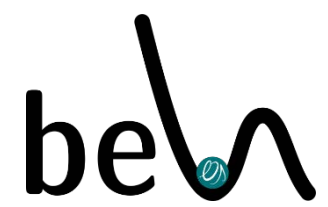
## Background and expertise:

- Member of LHCb collaboration for 7 years
- Worked on rare B meson and Kaon decays

## Currently:

- Joined CMS collaboration since January 2018
- Working on long lived particles searches:
  - Heavy Stable Charged Particles (HSCP)
  - Long lived Heavy Neutral Lepton (HNL)





Anyone one else is welcome !  
wp6-beh@cern.ch