Contribution ID: **280** Type: **Oral presentation**

Upgrades toward a comprehensive QGP detector at CMS for the high luminosity LHC era

Thursday, 7 April 2022 15:20 (20 minutes)

The Compact Muon Solenoid (CMS) detector at the CERN Large Hadron Collider (LHC) will undergo an extensive Phase II upgrade program to prepare for the more challenging conditions of the High-Luminosity LHC (HL-LHC) in the high energy particle and nuclear physics program. A new time-of-flight layer is designed to measure minimum ionizing particles (MIPs) with a time resolution of $\sim$30 ps and to provide hermetic coverage up to a pseudorapidity of $|\eta|$=3. This mip timing detector (MTD) will provide excellent particle identification (PID) via TOF in QCD and heavy ion physics for the LHC Run 4 and beyond. Together with the extended coverage of tracking ($|\eta| < 4$) and calorimetry ($|\eta| < 5$), the MTD will enable a broad range of unique measurements and realize a comprehensive QGP detector for heavy ion physics. Moreover, the measurement of forward neutrons and photons in Zero Degree Calorimeters, or ZDCs, is essential for event classification and triggering. In order to reach the required luminosities, the LHC interaction regions will be completely remodeled, necessitating the need to build new ZDCs that are both thinner and much more radiation hard. This challenge motivated the formation of a joint project between ATLAS and CMS to build new ZDCs for Run 4. After introducing the technology and status of the MTD and ZDC projects, we present the performance of a broad CMS heavy ion physics program with TOF-PID at the HL-LHC, including heavy flavor dynamics in (3+1)D, QGP medium response to high-p_{T} parton energy loss at wide jet cone angles, collectivity in small systems, fluctuations and transport of initially conserved charges, and light nuclei physics.

Primary author: CMS

Presenter: STAHL LEITON, Andre Govinda (CERN)

Session Classification: Parallel Session T15: Future facilities and new instrumentation

Track Classification: Future facilities and new instrumentation