

Searches for CP violation in the top-quark sector with CMS at the LHC, CPT violation phenomenology, and Tracker Endcap metrology for the HL-LHC upgrade.

My thesis investigates new sources of CP violation in the top-quark sector within the CMS collaboration at the LHC, addressing the matter–antimatter asymmetry. Exploiting the top quark’s large mass as a probe of beyond-the-Standard-Model physics, the analysis uses Run 2 data at 13 TeV. The single top t-channel process is used to probe CPV within an Effective Field Theory framework. A complementary phenomenology study explores CPT violation through reinterpretation of LHC data.

In parallel, I contribute to the CMS Phase-2 Tracker upgrade for the High-Luminosity LHC. My work involves metrological studies of the endcap “Dees,” mechanical structures with two-phase CO₂ cooling, ensuring they meet the required precision for qualification.