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Utilizzo del segnale temporale di ECAL nell'analisi di CMS

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The CMS ECAL is a high-resolution electromagnetic crystal calorimeter which relies upon precision calibration in order to achieve and maintain its design performance. The combination of the scintillation timescale of the PbWO₄, the electronic pulse shaping and the sampling rate allows for an excellent time resolution to be obtained with the ECAL. This is important in CMS in many respects. The better the precision of time measurement and synchronization, the larger the rejection of backgrounds with a broad time distribution. Precise time measurement also makes it possible to identify particles predicted by different models beyond the Standard Model such as photons from the decay of long-lived new particles that reach the calorimeter out of time with respect to particles traveling at the speed of light from the interaction point. The ECAL time information can be exploited also in the diphoton decay channel of the Higgs boson for photon identification purpose and as an alternative method to determine the position of the primary vertex in events with low tracks multiplicity. Challenges, methodologies and results for techniques that exploit the ECAL time are discussed. The expected performance is assessed for the forthcoming data taking after the LHC long shutdown.

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