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The TOTEM precision clock distribution system.

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To further extend the measurement potentialities for the experiment at luminosities where the pile-up and multiple tracks in the proton detectors make it difficult to identify and disentangle real diffractive events from other event topologies, TOTEM has proposed to add a timing measurement capability to measure the time-of-flight difference between the two outgoing protons. For such a precise timing measurements, a clock distribution system that empowers time information at spatially separate points with picosecond range precision, is needed.

For the clock distribution task, TOTEM will adopt an adaptation of the Universal Picosecond Timing System, developed for the FAIR (Facility for Antiproton and Ion Research) facility at GSI, actually installed as BUTIS system.

In this system an optical network, using dense wavelength division multiplex (DWDM) technique, is used to transmit two reference clock signals from the counting room to a grid of receivers in the tunnel. To these clocks another signal is added that is reflected back and used to continuously measure the delays of every optical transmission line; these delay measurements will be used to correct the time information generated at the detector location.

The usage of the DWDM make it possible to transmit multiple signals generated with different wavelengths, over a common single mode fibers. Moreover allows to employ standard telecommunication modules conform to international standards like the ITU (International Telecommunications Union) ones.

The prototype of this system, showed that the influence of the transmission system on the jitter is negligible and that the total jitter of the clock transmission, is practically due to the inherent jitter of clock sources and the end user electronics.

By the time of the Conference, the system will be commissioned in the interaction point 5 (IP5) TOTEM control room. Details on the system design, tests and characterization, will be given in this contribution.

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