TTC
RD-12

Timing, Trigger and Control Systems for LHC Detectors

Honeywell, Aldermaston, Birmingham Univ., CERN, Darmstadt GSI, Lemo, Ecublens and Worthing, Lisbon, Lab. Instrum. e Particules, Paris VI and VII Univ., Rutherford Appleton Lab., Valencia Univ., Vienna, Inst. Kernphysik, Technische Universitaet

Honeywell, Aldermaston
Ashton M. Humphries J.
Birmingham Univ.
Villalobos Baillie O.
CERN
Christiansen J. Cittolin S. Farthouat P. Gällnö P. Jacobsson R. Jarron P. Marchioro A. Moreira P. Pollet L. Racz A. Savioz J.-J. Taylor B.G. Varela, J.
Darmstadt GSI
Schmidt H.R.
Lemo, Ecublens and Worthing
Hubert J.-C. McFarlane G.
Lisbon, Lab. Instrum. e Particules
Da Silva, J.C.
Paris VI and VII Univ.
Genat J.-F.
Rutherford Appleton Lab
Hallsal R.N.J. Haynes W.J.
Valencia Univ.
Ferrer-Prieto J.
Vienna, Inst. Kernphysik, Technische Universtaet
Toifl, T.H.

Spokesman: Taylor B.G.

At the LHC, precise bunch clock and machine orbit timing signals must be broadcast over distances of several km from the Prevessin Control Room to the four experiment areas, beam instrumentation around the ring and other destinations. At the LHC experiments themselves, quite extensive distribution systems are also required for the transmission of timing, trigger and control (TTC) signals to large numbers of front-end electronics controllers from a single location in the vicinity of the central trigger processor. The systems must control the detector synchronization and deliver the necessary fast signals and messages that are phased with the LHC clock, orbit or bunch structure. These include the bunch-crossing clock, level-1 trigger decisions, bunch and event numbers, as well as test signals and broadcast commands. A common solution to this TTC system requirement is expected to result in important economies of scale and permit a rationalization of the development, operational and support efforts required.

LHC Common Project RD12 is developing a multi-function optoelectronic TTC system which can meet the requirements of central signal broadcasting and local

distribution at the different subdetectors of the experiments. Laser transmitters, modulators, encoders, a VMEbus interface and a machine interface are being developed as well as a subminiature radiation-hard optical fibre connector, active device mount and photodetector/preamplifier. A radiation-hard timing receiver ASIC is being designed which will generate the full range of decoded signals for electronics controllers from a single input and PMC receiver modules are being developed to facilitate initial applications and for the reception of beam-synchronous timing messages.

The system incorporates programmable coarse and fine deskew facilities to compensate for different particle flight times and detector, electronics, propagation and test generator delays. It can also transmit asynchronous slow controls and data such as individually-addressed channel enables and calibration parameters to several thousand destinations.

WWW home page: http://www.cern.ch/TTC/intro.html

References

DRDC/90-62/P15, DRDC/91-22/P15 Add.1, DRDC/92-10/SR, DRDC/93-22/SR, DRDC/94-16/SR, LHCC/95-26/SR, LHCC/97-29/LEB/SR, LHCC/98-38/LEB/SR, LHCC 2000-002/LEB/SR