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Status of the TTC upgrade

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The TTC (Timing, Trigger and Control) system broadcasts the timing signals from the LHC machine to the experiments. Once at the detector level, it integrates the trigger information and local synchronous commands with these signals, for transmission to several thousands of destinations. The equipment for this second part of the system is fully produced, but the main network between the machine and the experiments required to be upgraded to ensure its easy maintenance. The design work began at the end of 2005 The new modules will be tested during the summer 2006 and the structured test beam in September 2006. A status of this design work will be done, including the description of the main modules, the results of the tests done on the prototype and the plans for production and support of this system.

Summary

The TTC (Timing, Trigger and Control) system broadcasts the timing signals from the LHC machine to the experiments. At the detector level, it integrates the trigger information and local synchronous commands with these signals, for transmission via optical fibres to several thousands of destinations. If the support of the TTC system at the level of the detectors is well in hand, the main network between the machine and the experiments required re-development to ensure its easy maintenance.

A proposal to upgrade the TTC backbone was signed in November 2005 by all the involved parties. This document includes the method and the implementation of the transmission of the RF timing signals to the experiments, the way these signals are received and used by the TTC system inside the experiments, and the division of responsibilities between users and support groups.

The technical solution which has been chosen is a compromise between the short development time remaining before the start of the LHC, the requirement of a jitter free solution, and the need of a team available 24hours a day to ensure the on-call support of this critical system. It is thus based on the solution selected by the AB/RF group to transmit the timing signals, using one analog

optical link per signal
from SR4 (where the RF signals are generated) to each of
the experiments.

The final system will consist of VME transmitter boards in the
SR4, and of TTC
receiver crates on the experiments'side, including a VME
controller and VME modules
to receive the optical signal (RF_Rx), select the sources,
adjust their delays and
reduce their jitter (RF2TTC), and distribute them to the
experiments (TTC Fanout).
The design of the prototypes of all of these modules is now
finished and is currently
being reviewed before being manufactured in May-June.
Drivers to control the
selection and the phase adjustment of the signals are
currently being written and
will be distributed to experiments.

As the use of analog transmission links is very expensive
and not really essential
for 70% of the timing signals to be distributed by the AB/RF
group (including the
Bunch Clocks and the Orbit signals used by the TTC system),
the PH/ESS group is
working in parallel on a digital optical link which could
replace the analog one
without any disadvantage.

The complete system, developed by PH/ESS in collaboration
with AB/RF, PH/MIC and the
four experiments, will be ready for the summer to be fully
tested before the
September structured test beam. During these 2 weeks of
structured test beam, the two
systems (RD12 and the upgraded one) will be installed in
parallel, to compare their
performances and validate the new design.

A status of the system design will be presented, including
the description of the
main modules, the results of the first tests done on the
prototype and the plans for
production and support of this system.

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