

# The CMS Experiment at the Large Hadron Collider (LHC) of CERN – Project Trigger

Main research topic at the research institution (current)

Start: 30.09.1993, planned end: 31.12.2020

## **Summary:**

During the reporting period the CMS detector took data with cosmic muons and the first LHC proton beams. The trigger components developed by the project group, the Global Trigger, the Global Muon Trigger, the Drift Tube Trigger Track Finder, the central Trigger Control System and the Trigger Supervisor, were in constant use as an integrated system. Their task is the selection of all events interesting from the point of view of physics or important for system integration. They were essential for the recording of the first accelerator data and of cosmic muons.

Development and coordination of the level-1 trigger offline software were also principal areas of activity, and new trigger concepts for the upgrade program of CMS have been worked out.

## **Collaborators:**

Arnold, Bernhard	since 01.07.2008
Bergauer, Herbert	since 30.11.1993
Draxl, Helmut	from 28.07.2008 to 05.09.2008
Draxl, Wolfgang	from 28.07.2008 to 05.09.2008
Eichberger, Markus	since 01.07.2008
Erö, Janos	since 01.04.1998
Ghete, Vasile Mihai	since 01.03.2005
Hammer, Josef (trainee)	from 28.07.2008 to 05.09.2008
Hörmann, Natascha (PhD student)	since 01.12.2006
Jeitler, Manfred	since 02.06.2004
Kasieczka, Gregor (trainee)	since 30.06.2008
Kastner, Kurt	since 30.11.1993
Magrans De Abril, Ildelfons	from 01.08.2004 bis 31.12.2008
Mikulec, Ivan	since 15.02.2005
Mittermayr, Franz (trainee)	from 07.07.2008 to 14.09.2008
Neuherz, Barbara	since 01.01.2004
Padrta, Michael	since 30.11.1993
Oberegger, Margit	since 01.07.2008
Rohringer, Herbert	since 30.11.1993
Schreiner, Thomas	since 02.11.2004
Strauss, Josef	since 01.01.2002
Taurok, Anton	since 30.11.1993
Teischinger, Florian (graduate student)	since 15.03.2008
Themel, Thomas (trainee)	since 30.06.2008
Wagner, Philipp (trainee)	since 13.07.2007
Walzel, Gerhard	since 30.11.1993
<b>Wulz, Claudia-Elisabeth – project leader</b>	since 30.11.1993

### ***Review:***

The CMS Trigger project group's main areas of work were the level-1 offline software as well as the operation and further development of the trigger components designed by the group. These are the Global Trigger (GT), the Trigger Control System (TCS), the Global Muon Trigger (GMT) and the regional drift tube muon trigger (Drift Tube Track Finder, DTTF). Without these components it would not be possible to record data in CMS. They performed excellently during the entire reporting period, and in particular during the short run with the first proton beams delivered by the LHC. The trigger system was specifically configured and timed in for this operation.

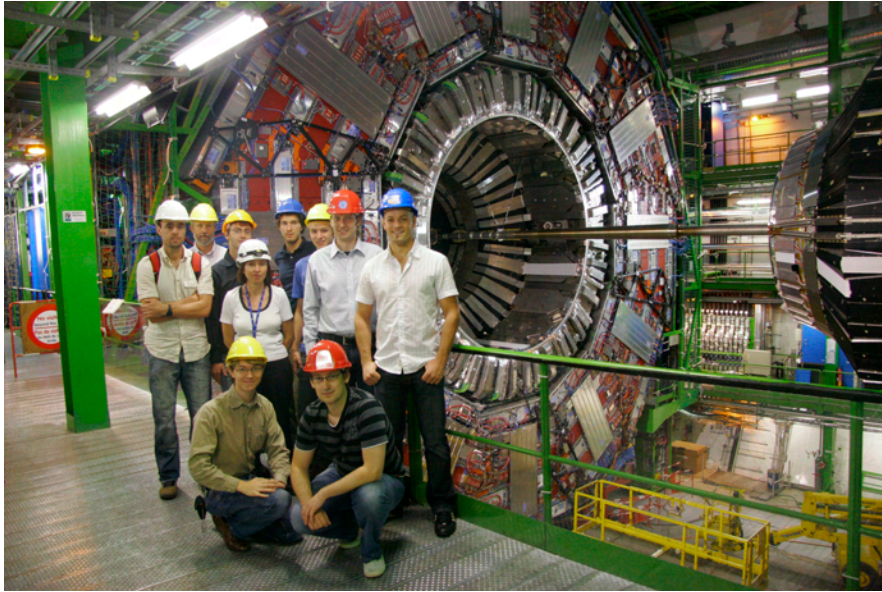
The complete trigger hardware was installed in the electronics cavern of the experiment. Firmware upgrades were performed, in particular for the DTTF and the Global Trigger. They contributed significantly to the success of the CMS-wide trigger commissioning operations.

An essential activity consisted in the fast analysis of the muon data recorded with and without magnetic field. During the reporting period important software developments were also made, such as for the Trigger Menu Editor and the linking of the trigger hardware parameters to the database structures of the experiment. New control panels and monitoring programs provided useful tools for the shift crews during the data taking periods. The contributions to the level-1 offline software, particularly for the Global Trigger, were essential for creating suitable trigger menus. The Trigger Supervisor Coordinator received a special 2008 CMS Award for his Ph.D. work.

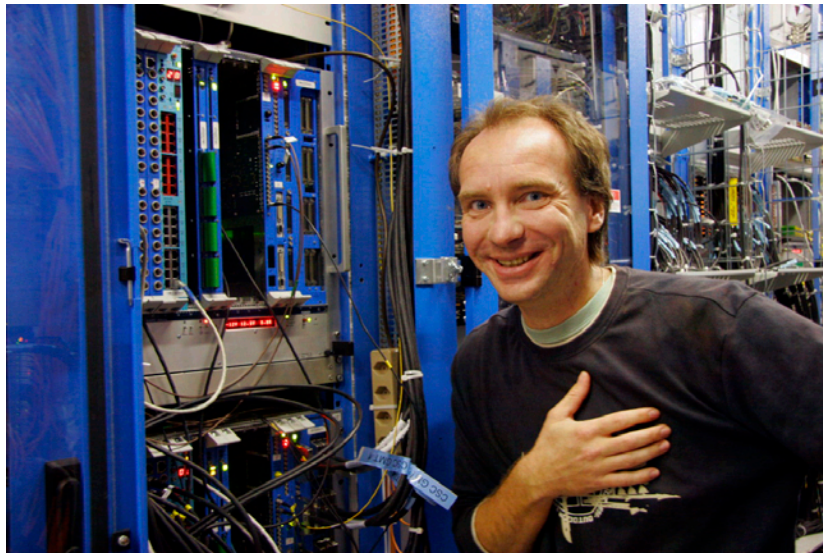
The first concept of a new Global Trigger for the operation at Super LHC was presented. A new type of input board adapted to receive input optical links has already been developed and is ready for production.

The Tier-2 Grid centre in Vienna as well as physics analysis activities received support from the group. Selected group members held the following management and other positions in CMS:

- Deputy Trigger Project Manager
- Muon Trigger Coordinator
- Trigger Run Field Manager
- Global Trigger Coordinator
- Global Muon Trigger Coordinator
- DTTF Coordinator
- Trigger Supervisor Coordinator
- Level-1 Trigger Software Technical Coordinator
- CMS Editorial Board Member for Trigger and Data Acquisition
- Trigger Coordination Editor
- Participation in Analysis Review Committees
- Chair of the Election Committee for the CMS Spokesperson 2010-2011



*Members of the project group CMS Trigger in the experiment cavern*



*Ivan Mikulec in front of the Vienna trigger electronics*