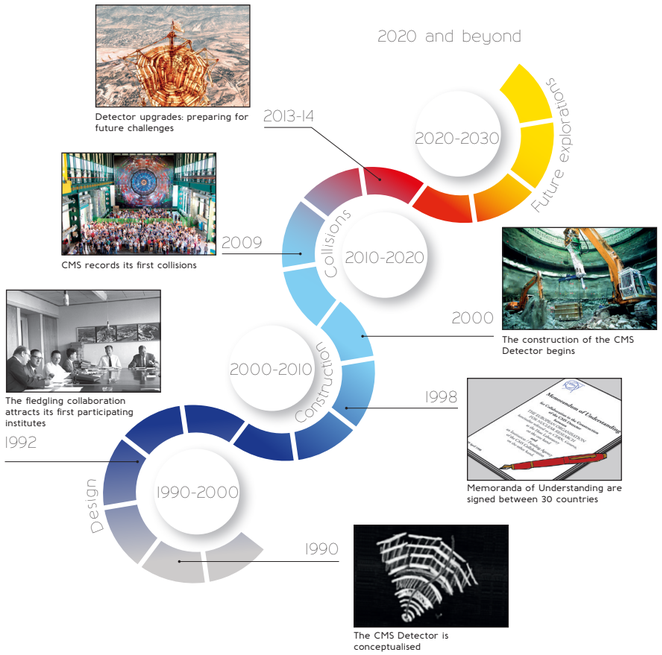
GROWING COLLABORATION

"Working in an international research environment with numerous intellectual and technical challenges is a wonderful opportunity for both young and established scientists. The competences and engagement you bring to the collaboration are welcome, and the new skills you acquire will be advantageous for your academic as well as non-academic careers."

Prof. Jorgen D'Hondt *(Vrije Universiteit Brussel)*
Chairperson of the Collaboration Board



FACTS

2840 scientists (including over 940 PhD students)
970 engineers
191 research institutes, universities and laboratories: **43** countries
4.4 x 10^{15} proton-proton collisions
64 petabytes (or over 64,000 terabytes) of data collected
Over **430** scientific publications since 2010

As of August 2015

www.cern.ch/cms
cms.secretariat@cern.ch

CMS at CERN

Global Collaboration

THE MISSION OF CMS: COLLABORATION

The CMS Collaboration brings together scientists from across the globe in a quest to advance humanity's knowledge of the very basic laws of our Universe.

The collaboration is named after the Compact Muon Solenoid, one of the general-purpose particle detectors at CERN's Large Hadron Collider. The challenges of building and operating a sophisticated piece of machinery like the CMS detector require large multinational efforts. CMS has over 3000 scientists, engineers and students from 191 institutes and universities in 43 countries, with over 80 nationalities represented. These individuals are united in their quest for knowledge about our Universe and have published over 430 scientific papers as a collaboration.

In keeping with CERN's commitment to open access for high-energy physics, the scientific results from CMS are shared openly with the world.

OVER 40 COUNTRIES WORKING TOGETHER

Archana Sharma,
India, Muon Detector

The Muon System of CMS, which gives the collaboration its middle name, is in fact made of three independent innovative gaseous detector systems operating in tandem for tagging and tracking muons efficiently. Muons zoom through CMS without being absorbed hence offer clean signatures for boosting discovery. This veteran project of more than two decades has had contributions from hundreds of collaborators from more than 20 countries.

Marc Baarmand
USA, Hadron Calorimeter (HCAL)

The HCAL by virtue of its size and technologies used – brass + scintillator and iron + quartz fibre, became an international project from the outset. The brass came from recycled WW2-era naval shells from Russia and fibres from the US. From design to commissioning, the HCAL benefited from the work of more than 300 scientists, engineers and students from ten countries in Europe, the United States and the Middle East.

Yves Sirois
France, Electromagnetic Calorimeter (ECAL)

The electromagnetic calorimeter (ECAL) is mainly made of 76,000 lead- tungstate crystals that measure the energies of electrons and photons accurately. Although the crystals themselves were manufactured over ten years in Russia and China, about two hundred and sixty collaborators from forty institutes and universities across Europe, the United States, and Asia have contributed to the construction of the ECAL, or to the associated read-out or trigger electronics.

Paula Eerola
Finland, Tracker

The 76-million-channel silicon Tracker at the heart of the CMS detector detects the trajectories of charged particles produced in the LHC's particle collisions. It can be thought of as an ultra-high-resolution camera taking 40 million pictures each second of a 20m³ volume with a precision of a tenth the width of a human hair. This delicate detector has been built and operated by around 700 collaborators from 13 countries on three continents.

INTERNATIONAL PARTNERSHIPS

"The Worldwide LHC Computing Grid, which integrates computing facilities from 170 computer centres in 40 countries, enables CMS to analyse the many petabytes of collision data recorded each year. The Grid is a global collaboration providing data analysis and management to the LHC collaborations with over 400,000 compute cores and around 500 PB of storage over ultrahigh-speed network connections."

Ian Bird, *CERN, The Worldwide LHC Computing Grid Project Leader.*