

The logo for Wigner, featuring a stylized 'W' with a red and black graphic element above it, followed by the word 'Wigner' in a bold, black, sans-serif font.

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Accelerators

The discovery of the Higgs boson in 2012 had been anticipated for almost fifty years. This peculiar particle provides the pedestal for the theory that describes the particles and their interactions of the known matter in the Universe. It might also easily play an important role in the expansion of this knowledge. The custom designed experimental apparatus, accelerators and detectors, necessary for the discovery employ cutting edge technologies. Our group at the HAS Wigner Research Center for Physics has significantly contributed to the construction of the detectors, the data acquisition and analysis. The presentation will introduce some interesting aspects of the experiment.

A few important publications:

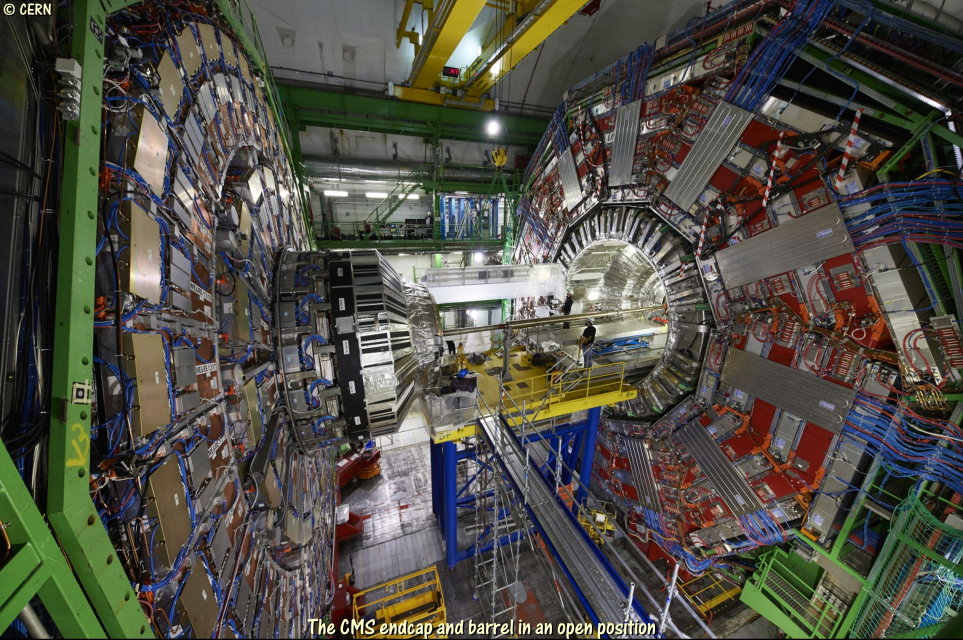
- * Vami T.A., Veszpremi V., for the CMS Collaboration (2018) Study of the CMS Phase I Pixel Pilot Blade Reconstruction. In: Liu ZA. (eds) Proceedings of International Conference on Technology and Instrumentation in Particle Physics 2017. TIPP 2017. Springer Proceedings in Physics, vol 213. Springer, Singapore
- * V. Veszpremi, Performance verification of the CMS Phase-I Upgrade Pixel detector, 2017 JINST 12 C12010
- * W. Adam, incl V. Veszpremi et al, Test beam demonstration of silicon microstrip modules with transverse momentum discrimination for the future CMS tracking detector, 2018 JINST 13 P03003
- * M. Dragicevic, incl V. Veszpremi et al, Test beam performance measurements for the Phase I upgrade of the CMS pixel detector, 2017 JINST 12 P05022
- * W. Adam, incl. V. Veszpremi et al, P-Type Silicon Strip Sensors for the new CMS Tracker at HL-LHC, 2017 JINST 12 P06018

- * [2235], Sirunyan A M, Tumasyan A, Csanad M, Filipovic N, Pasztor G, Veres G I, Bencze G, Hajdu C, Horvath D, Sikler F, Veszpremi V, Zsigmond A J, Beni N, Karancsi J, Makovec A, Molnar J, Szillasi Z, Bartók M, Woods N, Observation of the Higgs boson decay to a pair of τ leptons with the CMS detector, PHYSICS LETTERS B 779: pp. 283-316. (2018)
- * [2257], Sirunyan AM, Tumasyan A, Csanad M, Filipovic N, Pasztor G, Surányi O, Veres GI, Bencze G, Hajdu C, Horvath D, Sikler F, Veszpremi V, Beni N, Karancsi J, Makovec A, Molnar J, Szillasi Z, Bartók M, Trocsanyi ZL, Ujvari B, Woods N, Evidence for the Higgs boson decay to a bottom quark-antiquark pair, PHYSICS LETTERS B 780: pp. 501-532. (2018)
- * [2302], Sirunyan AM, Tumasyan A, Bartok M, Csanad M, Filipovic N, Nagy MI, Pasztor G, Suranyi O, Veres GI, Bencze G, Hajdu C, Horvath D, Sikler F, Veszpremi V, Vesztergombi G, Beni N, Karancsi J, Makovec A, Molnar J, Szillasi Z, Trocsanyi ZL, Woods N, Observation of $(t\bar{t})$ over $\bar{t}t$ Production, PHYSICAL REVIEW LETTERS 120:(23) Paper 231801. 17 p. (2018)

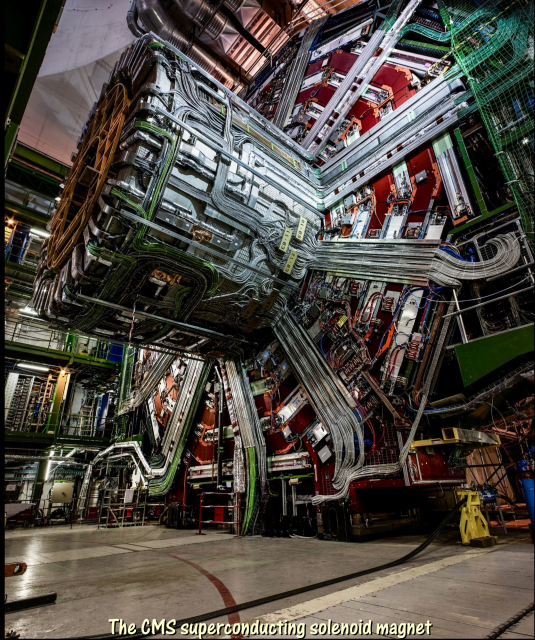
- * [2249], Sirunyan AM, Tumasyan A, Csanad M, Filipovic N, Pasztor G, Suranyi O, Veres GI, Bencze G, Hajdu C, Horvath D, Sikler F, Veszpremi V, Zsigmond AJ, Beni N, Karancsi J, Makovec A, Molnar J, Szillasi Z, Bartok M, Trocsanyi ZL, Ujvari B, Woods N, Inclusive Search for a Highly Boosted Higgs Boson Decaying to a Bottom Quark-Antiquark Pair, PHYSICAL REVIEW LETTERS 120:(7) Paper 071802. 18 p. (2018)
- * [2258], Sirunyan AM, Tumasyan A, Csanad M, Filipovic N, Pasztor G, Suranyi O, Veres GI, Bencze G, Hajdu C, Horvath D, Sikler F, Veszpremi V, Beni N, Karancsi J, Makovec A, Molnar J, Szillasi Z, Bartok M, Trocsanyi ZL, Ujvari B, Woods N, Search for supersymmetry in proton-proton collisions at 13 TeV using identified top quarks, PHYSICAL REVIEW D 97:(1) Paper 012007. 29 p. (2018)



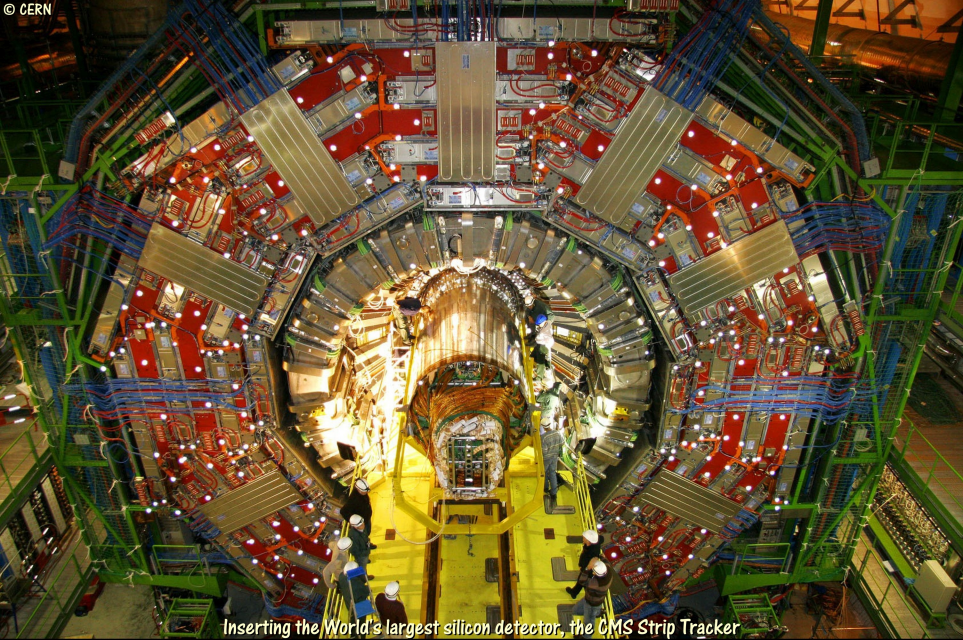
The dipole magnets in the LHC tunnel at Point 1



The CMS endcap and barrel in an open position



The CMS superconducting solenoid magnet

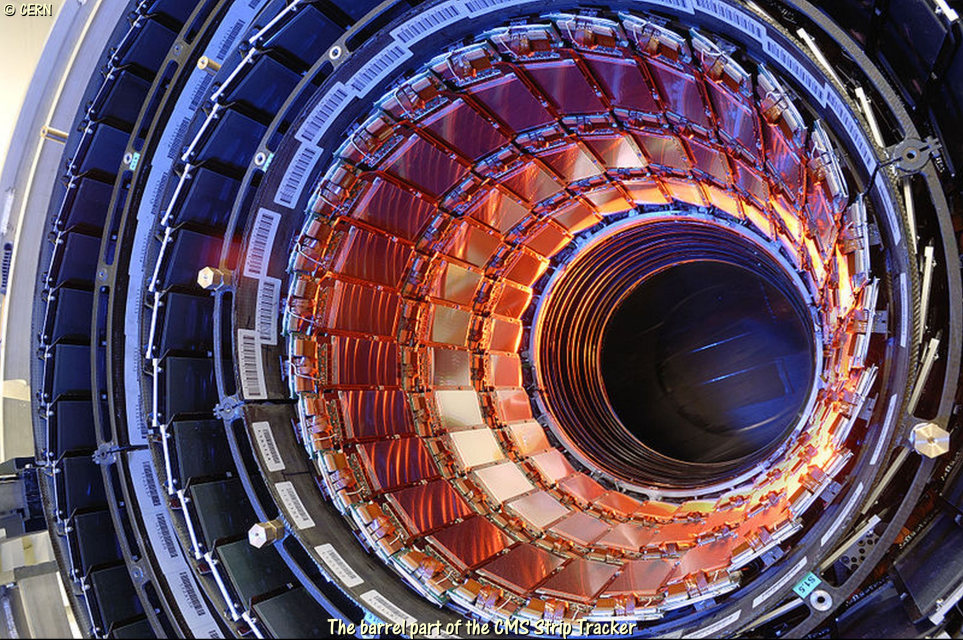


Inserting the World's largest silicon detector, the CMS Strip Tracker

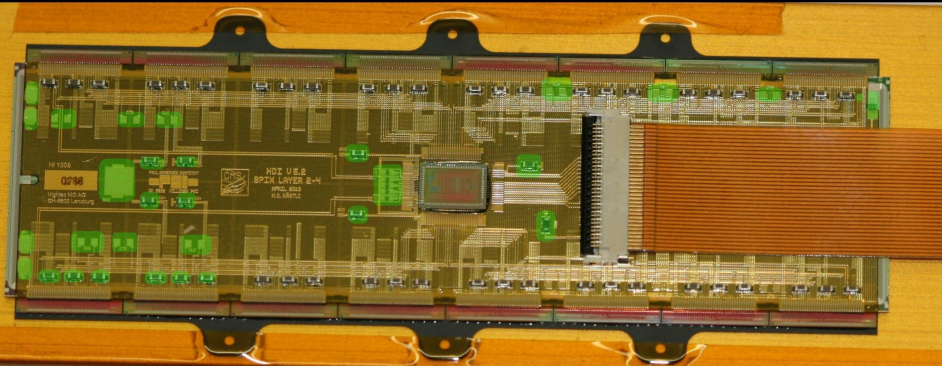


Inside the main building with the life-size photo of the CMS detector





The barrel part of the CMS Strip Tracker



A barrel pixel sensor module prototype

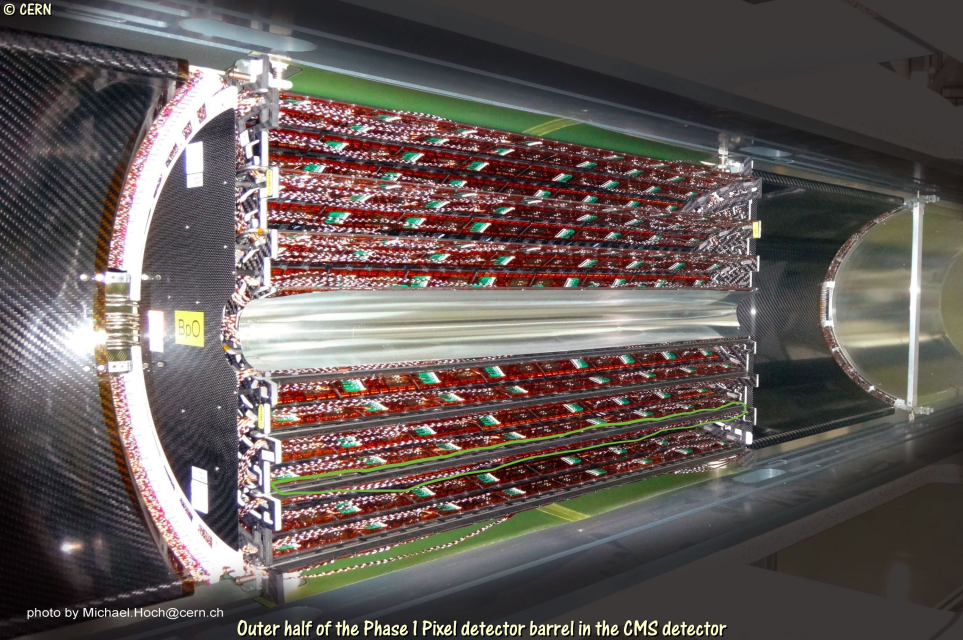
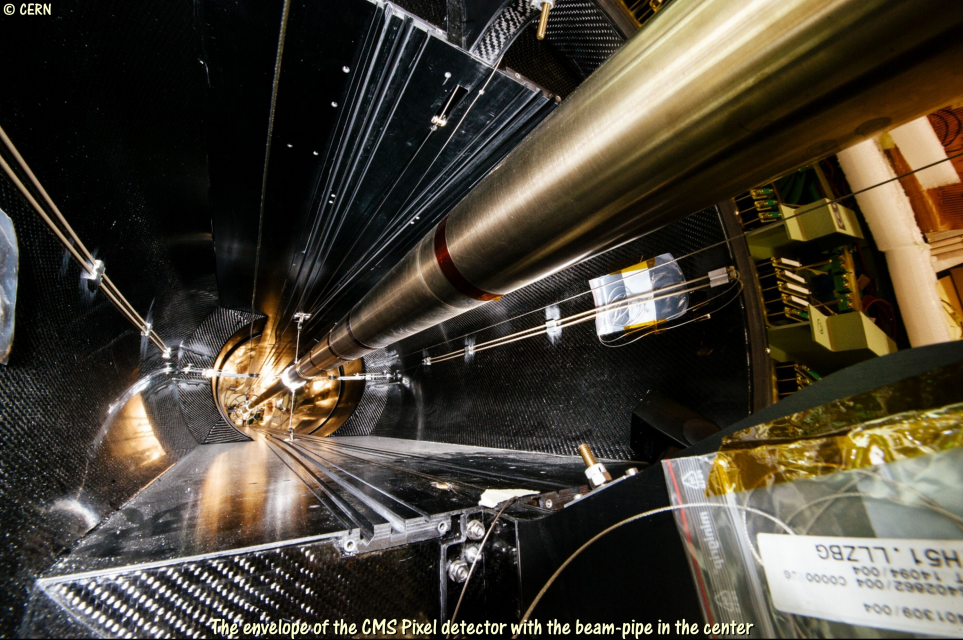
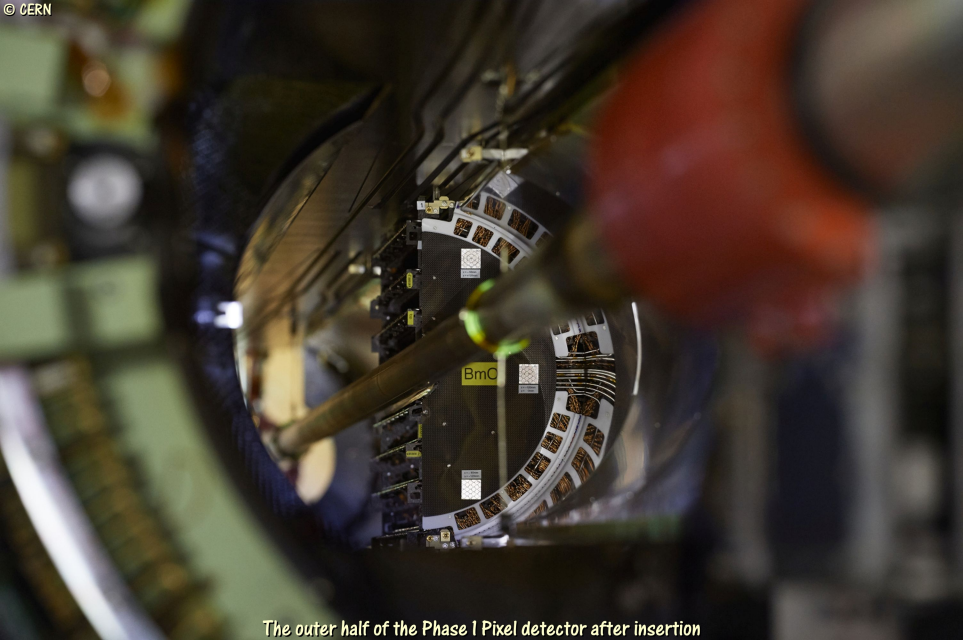


photo by Michael.Hoch@cern.ch

Outer half of the Phase I Pixel detector barrel in the CMS detector



The envelope of the CMS Pixel detector with the beam-pipe in the center



The outer half of the Phase I Pixel detector after insertion



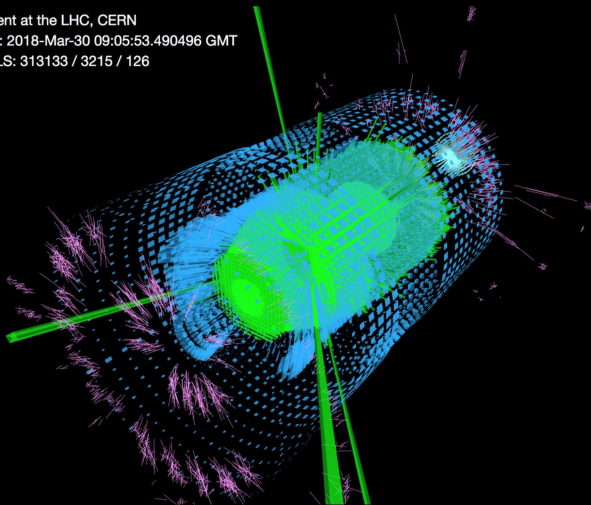
Installation of the CMS Phase I Pixel forward detector



CMS Experiment at the LHC, CERN

Data recorded: 2018-Mar-30 09:05:53.490496 GMT

Run / Event / LS: 313133 / 3215 / 126



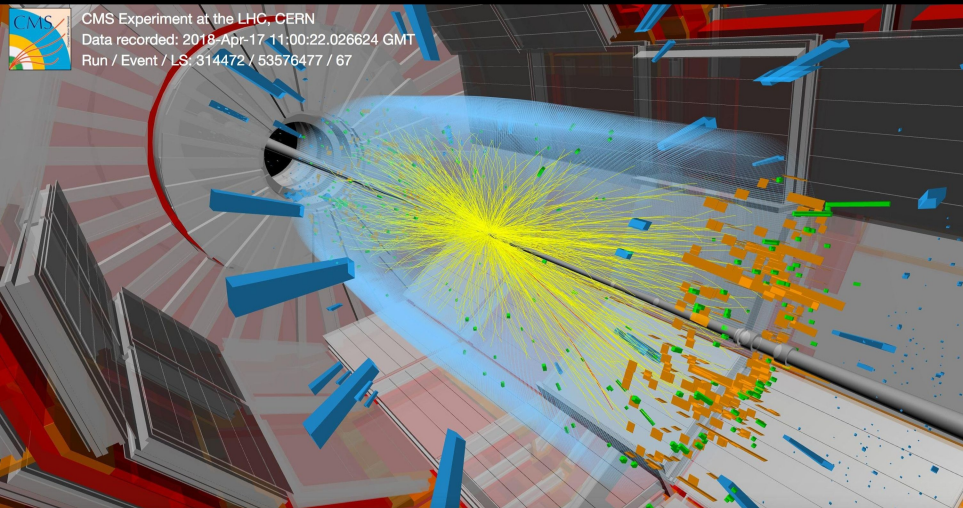
Beam splashes seen by the CMS detector at the restart of the LHC in 2018



CMS Experiment at the LHC, CERN

Data recorded: 2018-Apr-17 11:00:22.026624 GMT

Run / Event / LS: 314472 / 53576477 / 67



Collisions recorded by the CMS detector at the start of the 2018 physics run



The Globe of Science and Innovation in front of CERN