Laser-based Profile and Divergence Measurement at CERNs LINAC4

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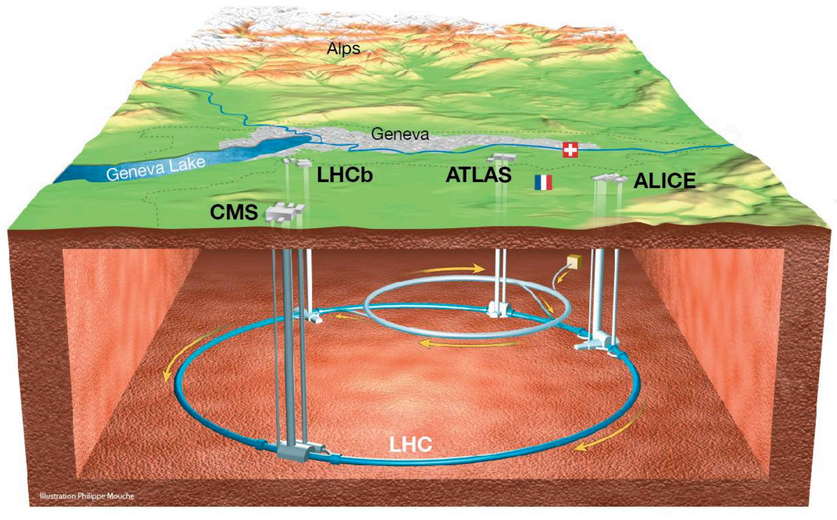
ABSTRACT

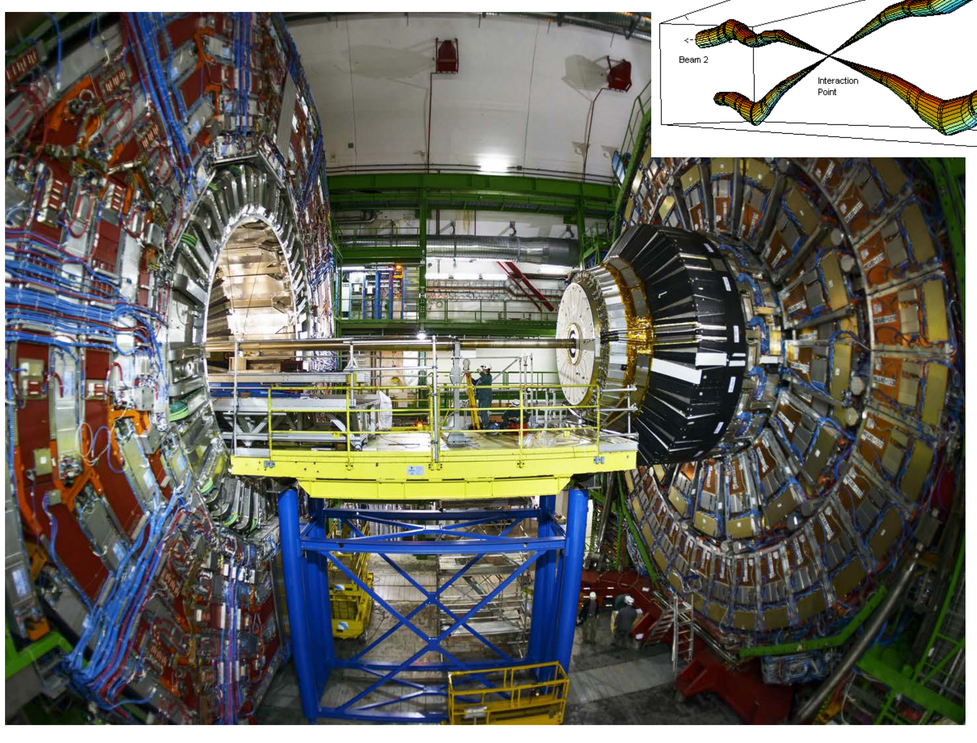
The Large Hadron Collider (LHC) accelerates protons to virtually speed of light and brings the two particle beams into collision. The fragments of these collisions are analysed by physicists from all over the world, who try to find new particles and answers to the mysteries of the universe. To investigate very rare processes, the number of collisions is crucial. Therefore CERN updates its accelerator infrastructure and builds a new linear accelerator (LINAC4) in order to raise the collision-rate by a factor of 10.
A profound knowledge of the beam parameters is essential to reach this aim. Therefore a novel type of instrument based on a laser and diamond detector was developed to measure the beam profile and its divergence at LINAC4.

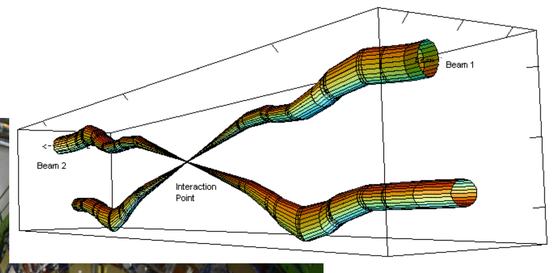
MOTIVATION – LHC



The 27 km long tunnel of the LHC, with its experiments and the preaccelerators. LINAC4 is situated right after the source of the particles which will be used at the LHC.

Compact Myon Solenoid (CMS)





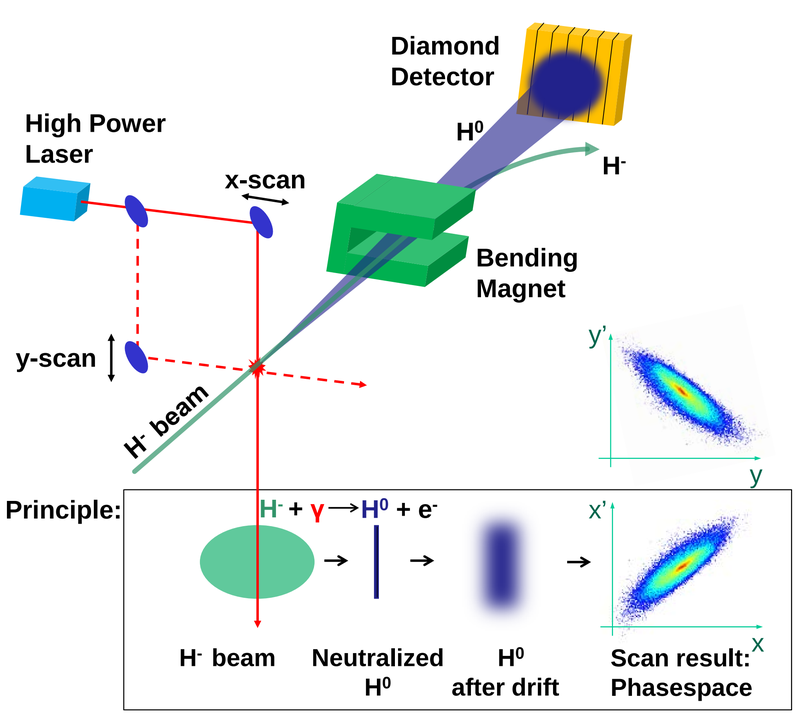
FRAMEWORK – LINAC4

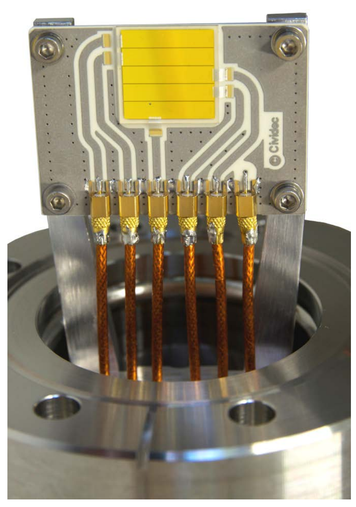
LINAC4 is a 80 m long linear accelerator currently in commissioning. It will be the first acceleration stage for hydrogen ions towards the LHC.

LINAC4 will deliver high brightness beams in order to increase the collision-rate of the LHC experiments by a factor of 10.

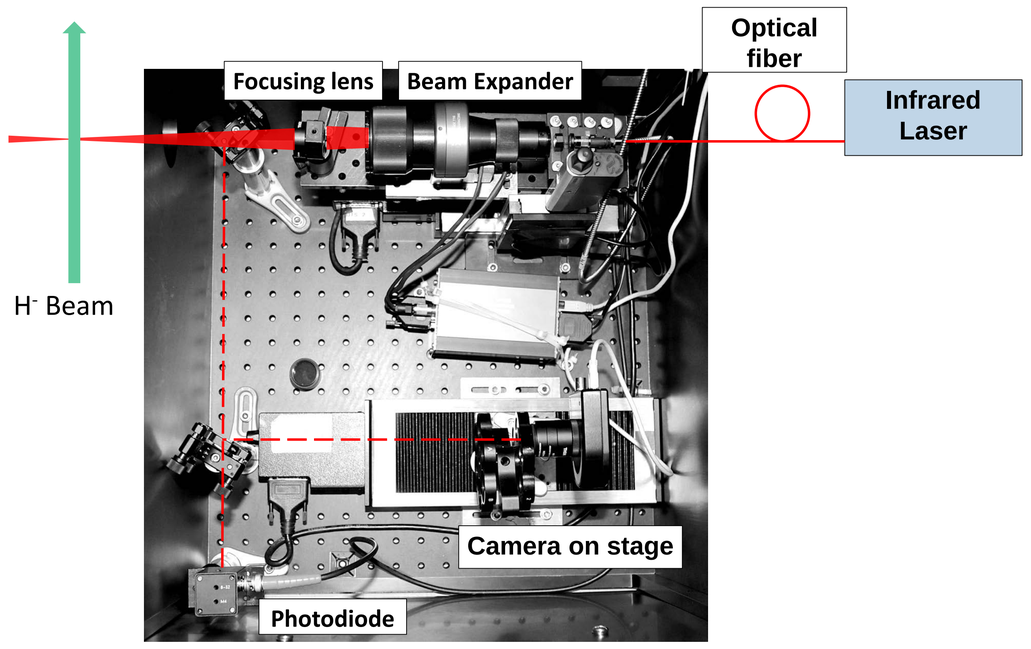
Measurement of the beam profile and divergence is essential, to check the performance of the machine and avoid beam losses.

PROJECT – BEAM PROFILE & DIVERGENCE MEASUREMENT





Diamond Strip-Detector



Laser Focus setup & Laser Diagnostics

ACKNOWLEDGMENTS

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