

# 1st EPS TIG Hands-on Event for Science, Technology and Interfaces

**Abstract**—This is the 1st EPS Technology and Innovation Group’s (TIG) Maker Event for Science, Technology and Interfaces at IdeaSquare, CERN. The purpose of the event is to offer young physicists and engineers new hands-on skills in hardware, software and related interfaces.

## I. DAY 1: INTRODUCTION TO CERN TECHNOLOGIES AND IDESQUARE

In the morning we saw what CERN is and how their expertise is improving a lot of technologies in the world. We then visited the CMS experiment.

## II. VISIT TO EXPERIMENT(S)

We visited the CMS experiment, it was really cool!

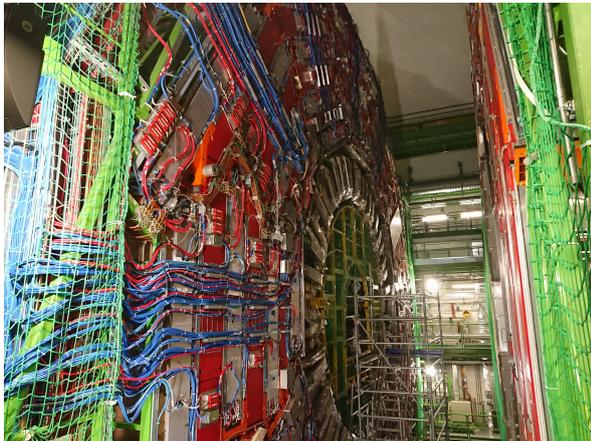


Fig. 1: tunnel

In the afternoon, we learn about intellectual property, e.g. patents and copyrights. We visited the Ideasquare lab

## III. DAY 2: RAPID PROTOTYPING, RASPBERRY PI, BUILDING DETECTORS AND INTERFACES

First of all we broke the ice and some eggs with a rapid prototyping session called the Egg Challenge.

During the first session we learn about Raspberry Pi and did a little experiment with ultrasounds, trying to measure distances and printing them in the screen.

For the second session we split up in 5 groups:

- Problem-solving and communication;
- Opto-mechanics and sensor positioning;
- Electronics;
- Interferometer interfacing and data acquisition;
- Data analysis.

All the groups worked on the same experiment in parallel, trying to cooperate in synergy. This was difficult because

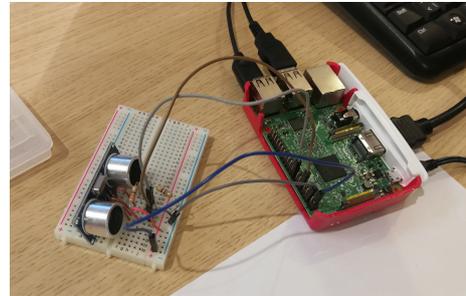


Fig. 2: Raspberry experiment measuring distances with ultrasounds.

most of the tasks were sequential and interdependent, thus communication represented a key activity during the whole process.

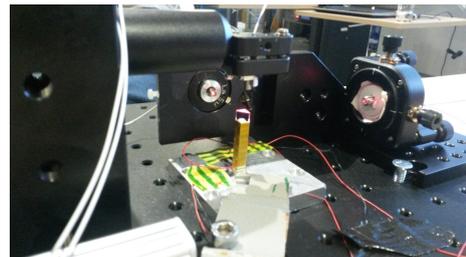


Fig. 3: Interferometer apparatus

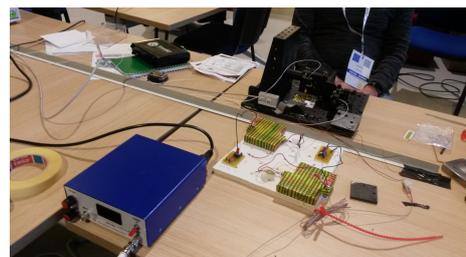
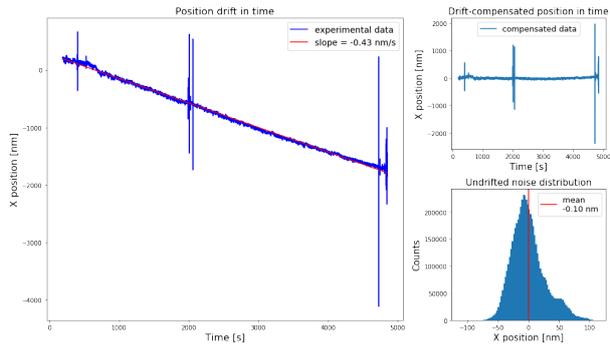


Fig. 4: Experimental setup

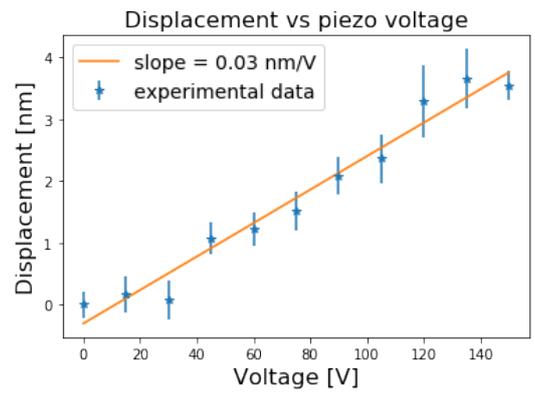
Some major issues arose during the experiment, namely

- Prism shape and channels cross-talk
- Channels drift compensation
- Laser alignment with piezo-stack faces

In the end we were able to make a full analysis of a single channel, measuring both the environmental-caused drift of the position and the real displacement of the piezo-stack as a function of the voltage.



(a) Background analysis and drift detection



(b) Nanometer displacement as a function of the piezo voltage



Fig. 6: Participants: Carlo Cabras, Marcello Campajola, Ferdinanda Consoli, Leonardo Cristella, Mauro Cutuli, Nicola Dainese, Evgenii Fedorov, Luigi Ferrentino, Mpho Gololo, Domenico Irrera, Magdalena Anna Kaja, Federico La Rosa, Thabo James Lepota, Antoine Loncle, Stefano Mancone, Sara Morales Vigo, Michele Mormile, Valentina Paiano, Noemi Pino, Guillermo Reales Gutierrez, Melissa Lucia Scalisi, James Southall-Andrews, Aleksandar Terzic, Francesco Vidaich.