

Conclusions concerning the CLIC Pre-alignment workshop on HLS and WPS sensors

All the presentations of the workshop, including the conclusion can be found at:
<http://clic-pral.web.cern.ch/clic-pral/>

4 key objectives were defined in this workshop:

- To inventory the existing WPS and HLS sensors.
- To record the means, methods and conditions of tests on these sensors
- To define the tests to be performed on these sensors during the inter-comparison
- To establish a basis for inter-comparison and envisage collaboration between labs in the frame of the CLIC project.

The inventory of the existing WPS and HLS sensors

A preliminary inventory of existing HLS and WPS was proposed.

HLS from 3 different technologies are used by the labs: capacitive (HLS from FOGALE Nanotech, Tevatron, BINP and Edi Meier), ultra-sonic (DESY and BINP) and CCD (SSRF).

Concerning the WPS, 3 technologies are proposed: capacitive (FOGALE Nanotech), RF inductive (SLAC) and CCD (Open Source Instruments, and under development at DESY).

The record of the means, methods and conditions of tests on these sensors

We must distinguish sensors from alignment systems.

Concerning the calibration of capacitive sensors, a stable bench is dedicated at ESRF for absolute calibration of HLS (against a metallic target) and WPS.

Long term measurements are already under way at Fermilab, with capacitive HLS (from FOGALE, BINP and Tevatron) and ultra-sonic HLS (from BINP).

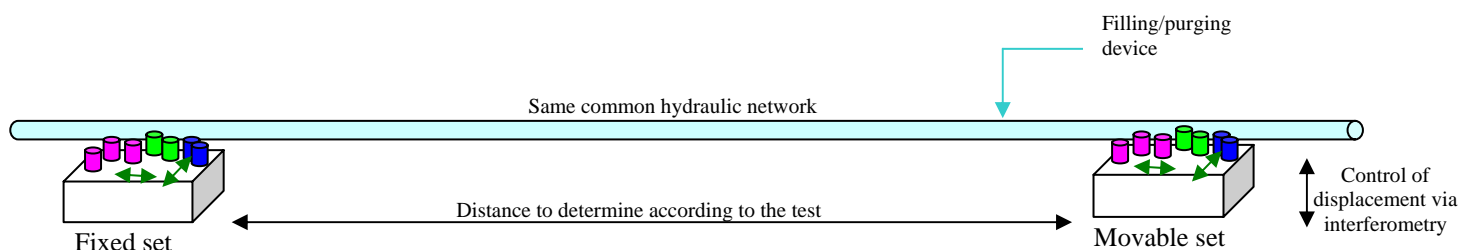
The definition of the tests to be performed on these sensors during the inter-comparison

From the metrology point of view, a calibration reference is needed in order to control instrumentation. As this is not so easy dealing with alignment systems like HLS and WPS, came the idea of an inter-comparison between different types of sensors.

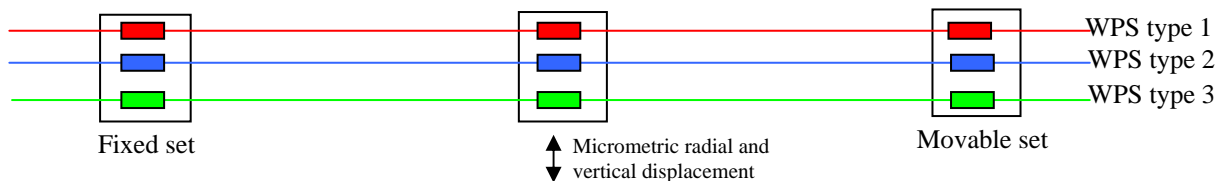
Concerning the HLS system, the leveling between two groups of different types of HLS sensors could be analyzed, one set being on a fixed point, one set moving.

One set would consist of several sensors (number to be defined, 3 per type being interesting from the statistic point of view) of several technologies (capacitive, CCD, ultra-sonic).

Concerning the calibration of HLS systems, the system could be calibrated thanks to filling/purging devices, following the scheme below (very first proposal):



Concerning the WPS systems, mainly 3 types of sensors are ready for an inter-comparison: CERN optical WPS, the capacitive WPS from FOGALE, and the RF WPS in use at SLAC. As it is complicated to displace these last sensors, there would be a possibility to test the WPS sensors at SLAC, with WPS sensors laid on 3 blocks, the position of the middle block being computed by the sensors at the extremity.



Establishment of a basis for an inter-comparison

The collaboration between labs could use the frame of the CLIC project (CTF3 collaborations), where a Memorandum of Understanding (MoU) for a multi-lateral collaboration has been signed by all labs, the contribution of each lab being detailed in a specific addendum. The link to the MoU is given here:

http://clic-meeting.web.cern.ch/clic-meeting/CTF3_Coordination_Mtg/Table_MoU.htm

Three other types of HLS could participate to the tests: from NSRL, PSI, and perhaps ultra sonic HLS from DESY.

All these HLS can perform measurements with respect to the same hydraulic network, which consists of still water and anti algae. Other details dealing with the acquisition (software, format of data) would have to be discussed.

CERN will perform some irradiation tests on HLS and WPS sensors (total ionization dose, total dependence rate, single events), as well as on the associated material (wires, pipes) and proposes to other labs to participate if interested. At ESRF, there is also a possibility to insert equipment in the tunnel.

The key question concerning the CLIC pre-alignment was reminded by Robert Ruland from SLAC: “is the wire really a straight line?” One facility could provide a beginning of answer at CERN: the alignment system comparison bench (link: <https://edms.cern.ch/document/605929/1>). David Martin underlined that the first tests carried at ESRF using a theodolite, showed that wire measurements versus theodolite ones were not entirely correlated.

As a conclusion, CERN will introduce some proposals of tests in the coming weeks. We hope your lab will take part into these tests.

We would like to thank you again for your participation and interest in that subject.

Other interesting links:

CLIC webpage: <http://clic-study.web.cern.ch/CLIC-Study/>

CLIC pre-alignment webpage: <http://clic-alignment.web.cern.ch/clic-alignment/>