Request of Experimental Vibrations studies of the reinforced concrete slab on the PX56 shaft at the LHC, Point 5.

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INTRO

The platform concept is one of the technical solutions for the push-pull of the detectors at the next Linear Collider. Preliminary studies call for a ~ 20 x 20 x 2 m^3 reinforced concrete slab, which is able to stand the static requirements. Further studies are needed to determine the dynamic characteristics and to verify if they meet the nanometric stability requirements of the Final Focus system. Due to the large scale of the structures, it is difficult to carry on experimental study on meaningful prototypes. FEA is used instead but there is a need of meaningful benchmarks to validate the model and correctly interprets the results.

The concrete slab on the top of the PX56 shaft at the LHC Point 5 has dimensions very close to the push-pull platform, although it has been designed to work under static loads and to provide radiation shielding. The experimental characterization of the vibration and dynamic performances of this structure represents a unique full-scale benchmark of the numerical model used in the FEA of the Linear Collider Platform.

There are no doubts that these measurements could also be of interest to the CLIC experimental community.

Set of experimental vibration measurements:

1. Spectra of the absolute displacements on various locations on the top of the platform, P_1, P_2, P_3, P_4, P_5, with the reference points PREF1, PREF2, being the ground seismicity the source of vibration.
2. Transfer functions on various locations on the top of the platform P1-2-3-4-5 with respect to the reference points
3. Relative PSD spectra, P_{12}, P_{13}, P_{24}, P_{34} (Coherence) (can be calculated from the previous measurements)
4. Internal Damping of the Reinforced Concrete
5. Modal Shapes, Natural Frequencies, Damping factor

The measurements from 1 to 4 can be done at the beginning, being based on standard instrumentation already available at CERN. The test should take of the order of ~2 days.

The experimental modal analysis of the platform (5) should allow to visualize the Modal Shapes but the large size of the structure requires an excitation system of large capacity, able to inject enough energy to excite the structure. This measurement can be postponed to a later time, waiting for further discussions with CMS and understanding the requirements and the safety issue related to shakers of large capacity.

Environmental setting during the measurements.

Although the interest is focused on the evaluation of the Transfer Function and the modal analysis of the platform, the noise level induced by the technical equipment must be kept low to avoid unnecessary pollution of the ground vibration. The heavy handling operations with the crane and the unnecessary vibrating plant (cooling, pumps, etc.) should be turned of where possible, and this will be discussed with CMS technical coordination.

Manpower.

The measurements could be performed by the EN division at CERN that, beside a long experience on the subject, disposes of all the instrumentation required.

DATA.

The measurements should be made available to the ILC/CLIC community in form of written report with processed data and as raw files in electronic format, to be analyzed by the external Institutes/Labs.

References.

1] "*Ground vibration measurements and* Experiment *parts motion measurement at CMS",*
CERN EDMS N. ***1027459***

*2] "*Functional Requirements on the Design of the Detectors and the Interaction Region of an e+e- Linear Collider with a Push-Pull Arrangement of Detectors", ILC-NOTE-2009-050

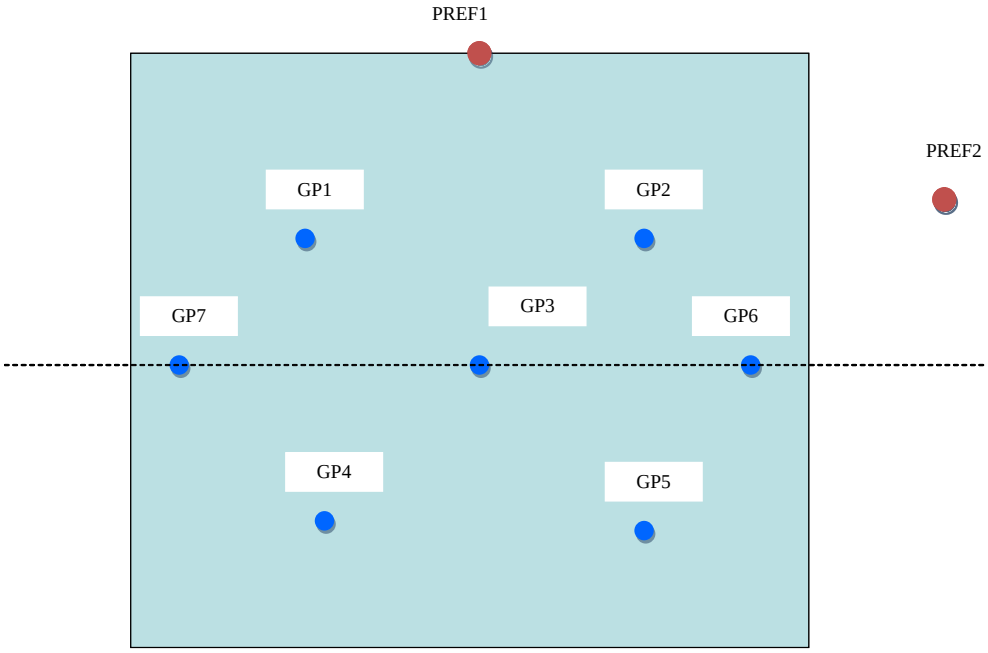

Fig.1, Position of the geophones on the platform