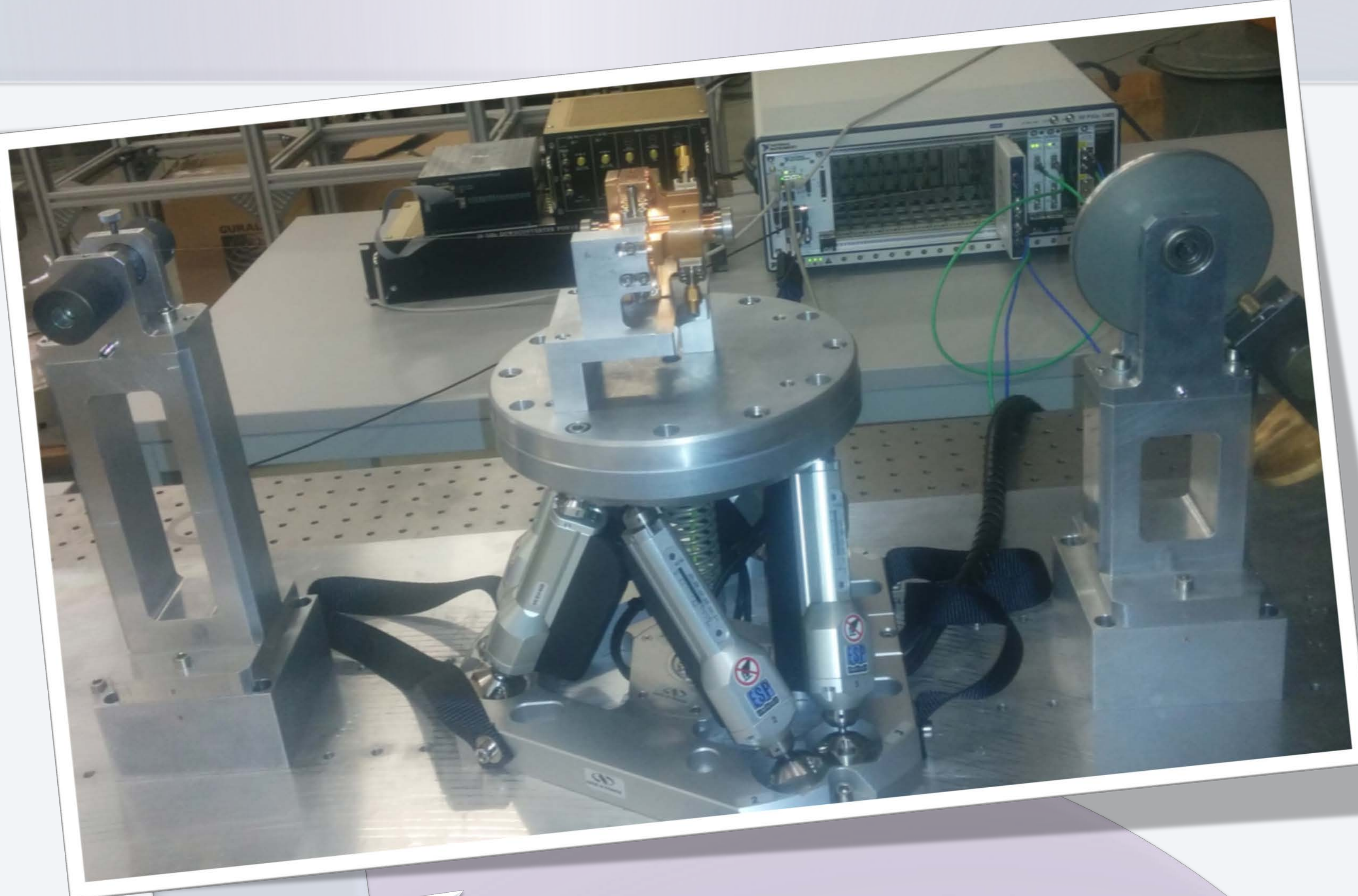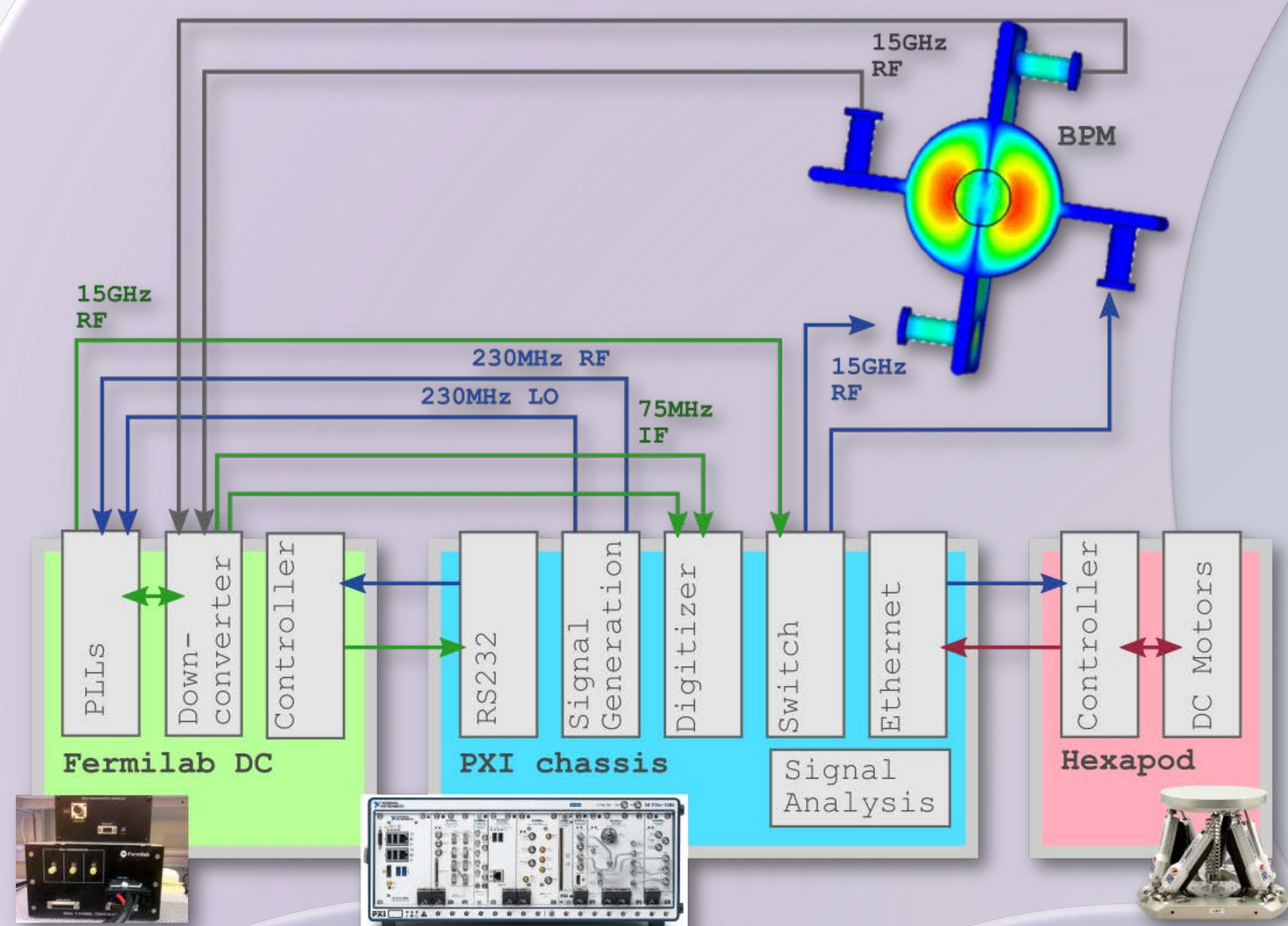# STRETCHED-WIRE TECHNIQUES AND MEASUREMENTS FOR THE ALIGNMENT OF A 15GHZ RF-BPM FOR CLIC

S. Zorzetti*, N. Galindo Munoz, M. Wendt, CERN, Geneva, Switzerland
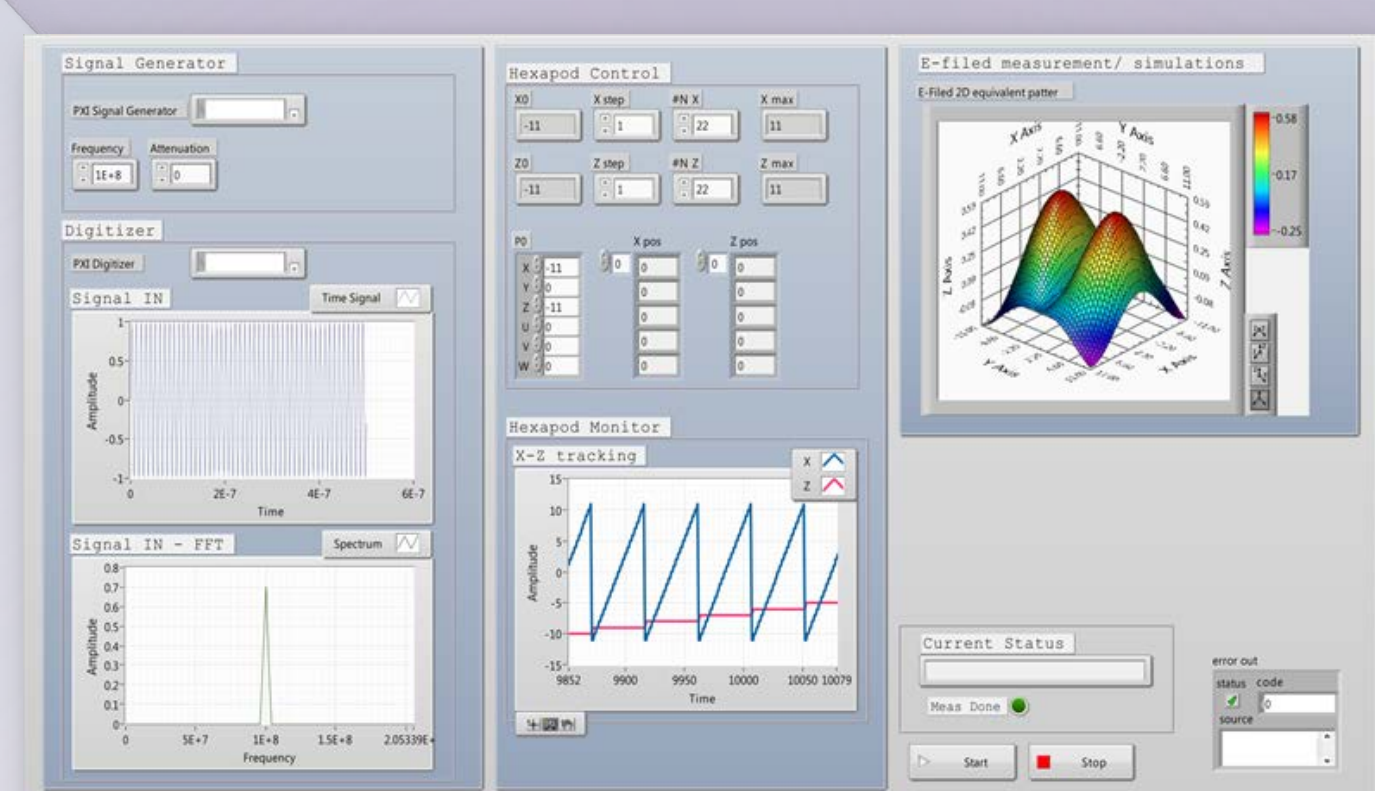
L. Fanucci, Universitá di Pisa, Pisa, Italy

*silvia.zorzetti@cern.ch

The **PACMAN** project focuses on the study of the pre-alignment between the **Main Beam Quadrupole (MBQ)** and the resonant cavity **Beam Position Monitor (RF-BPM).** The followed pre-alignment methodology consists of the characterization of the single components on separate **test benches** and the integration of those on a dedicated support, aligning the respective **electro-magnetic centres** with stretched-wire measurement techniques achieving **micrometric precision**.

## 15GHz RF-BPM Test Bench



## Measurement Methods



Magnitude and phase simulations

- **Signal Excitation (S31):** By means of a coaxial line the signal is propagated from the signal launcher to the BPM cavity. The **wire is excited** with a continuous sine-wave at 15GHz and the signal is picked up by the lateral waveguides.
- **Perturbation Analysis (S43, S53):** The **RF cavity BPM is excited** by feeding a continuous sinewave at 15GHz through one of the four lateral waveguides, and the signal is picked up by the opposite or the adjacent one.

## E- field Measurements Intensity Charts



**Electric field equivalent pattern reconstruction**: the signal acquired can be either proportional or inverse proportional to the magnitude of the electric field.

## Repeatability and Resolution Studies



- 1μm resolution proved so far
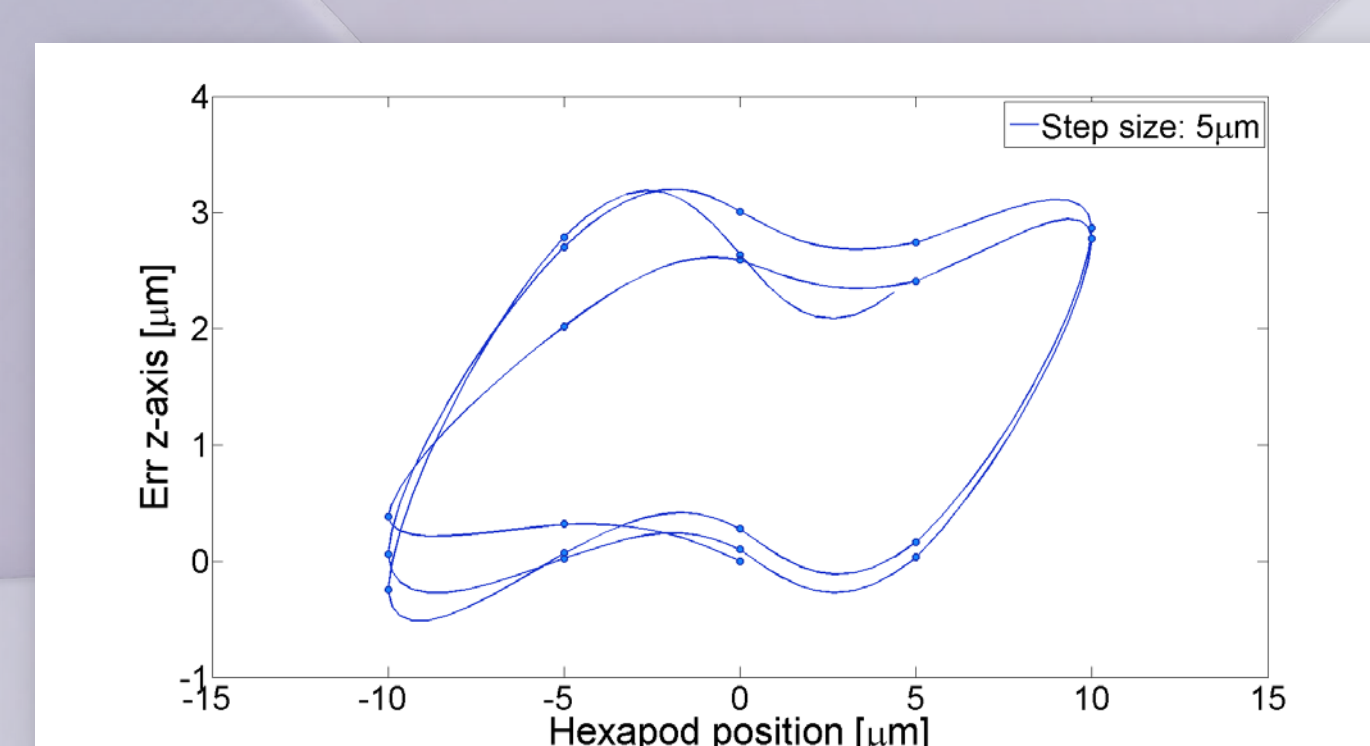- 2.5mdB bi-directional repeatability

## LabVIEW Interface



A LabVIEW interface acquires the RF data and controls and monitors the hexapod.
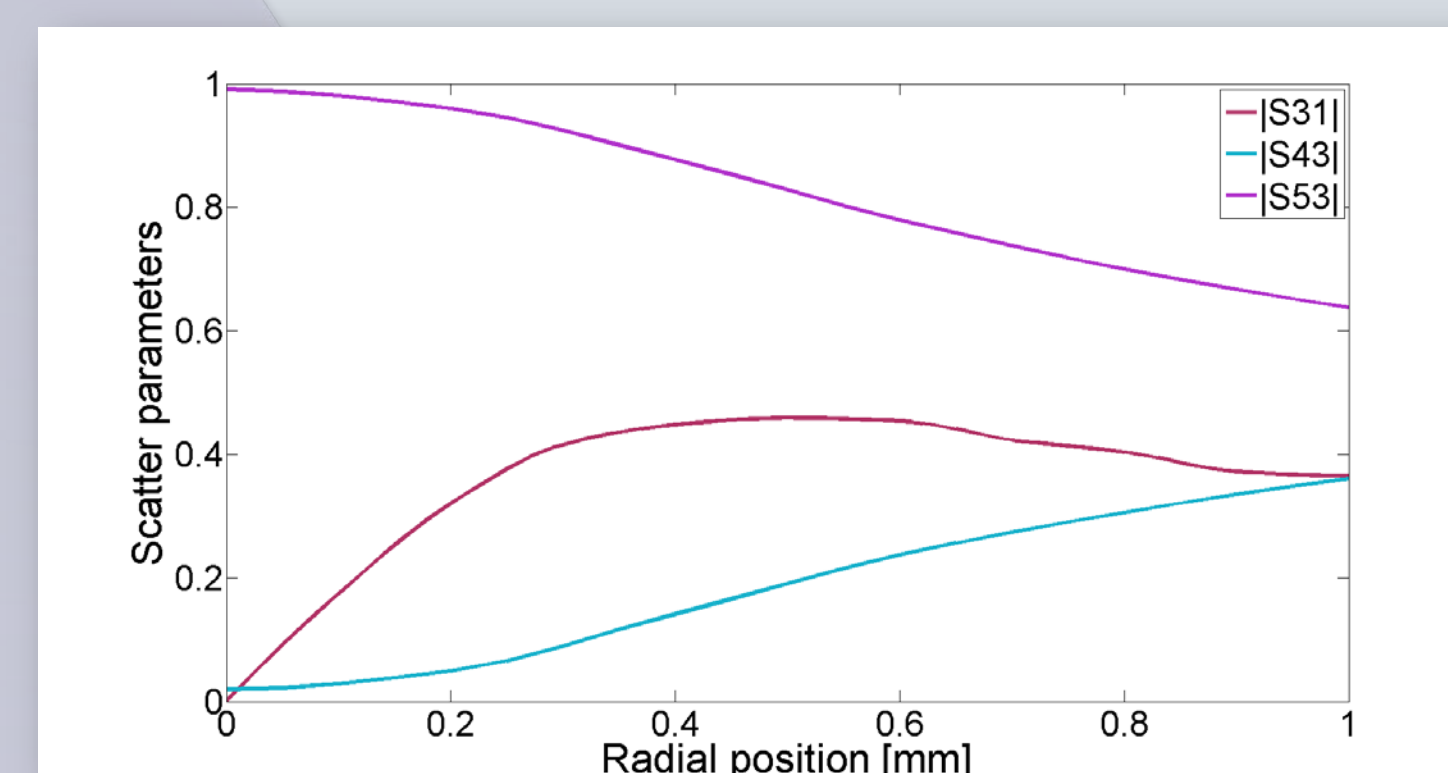
## Hexapod Validation



The hexapod has been validated with a CMM, to confirm the vendor specifications.
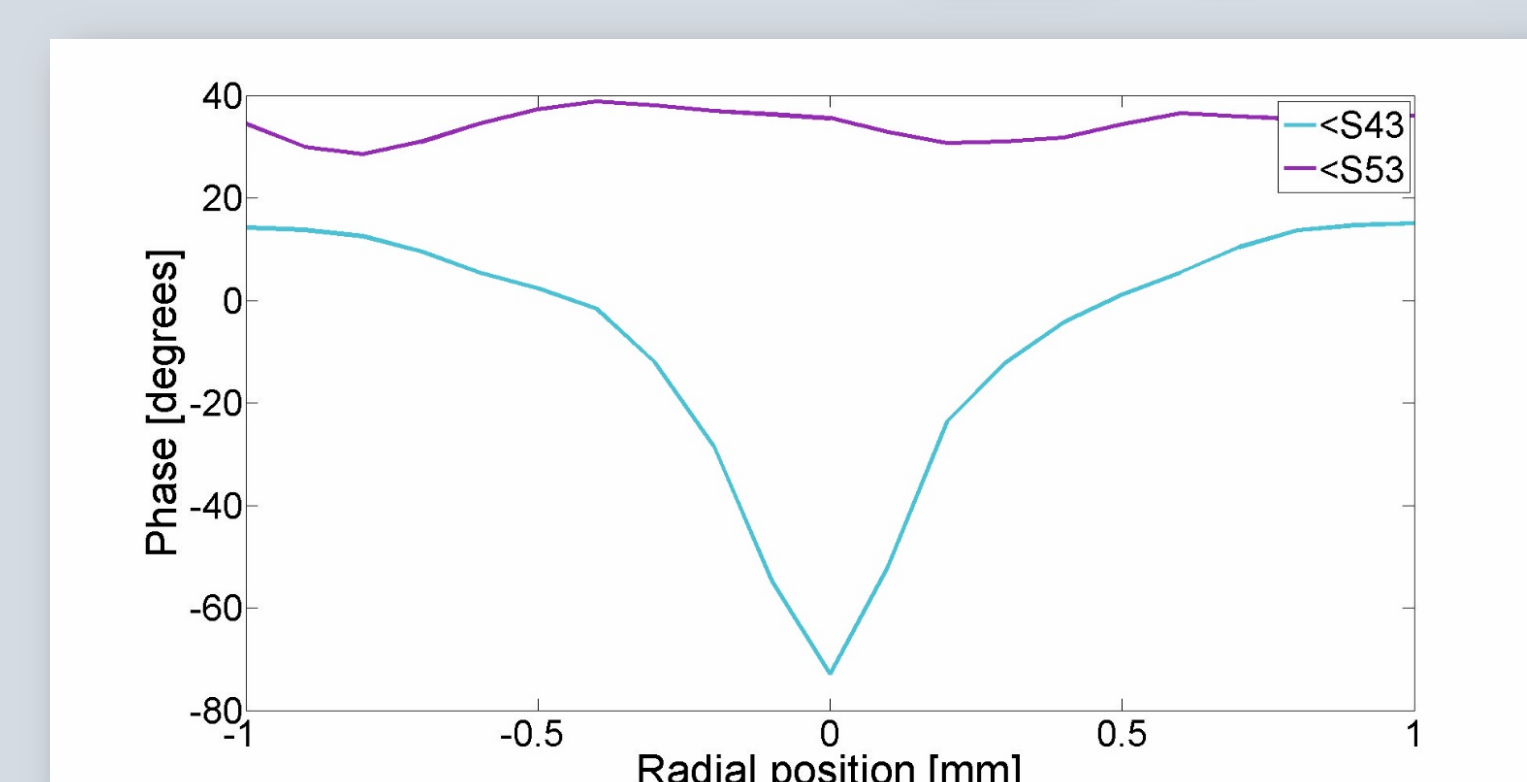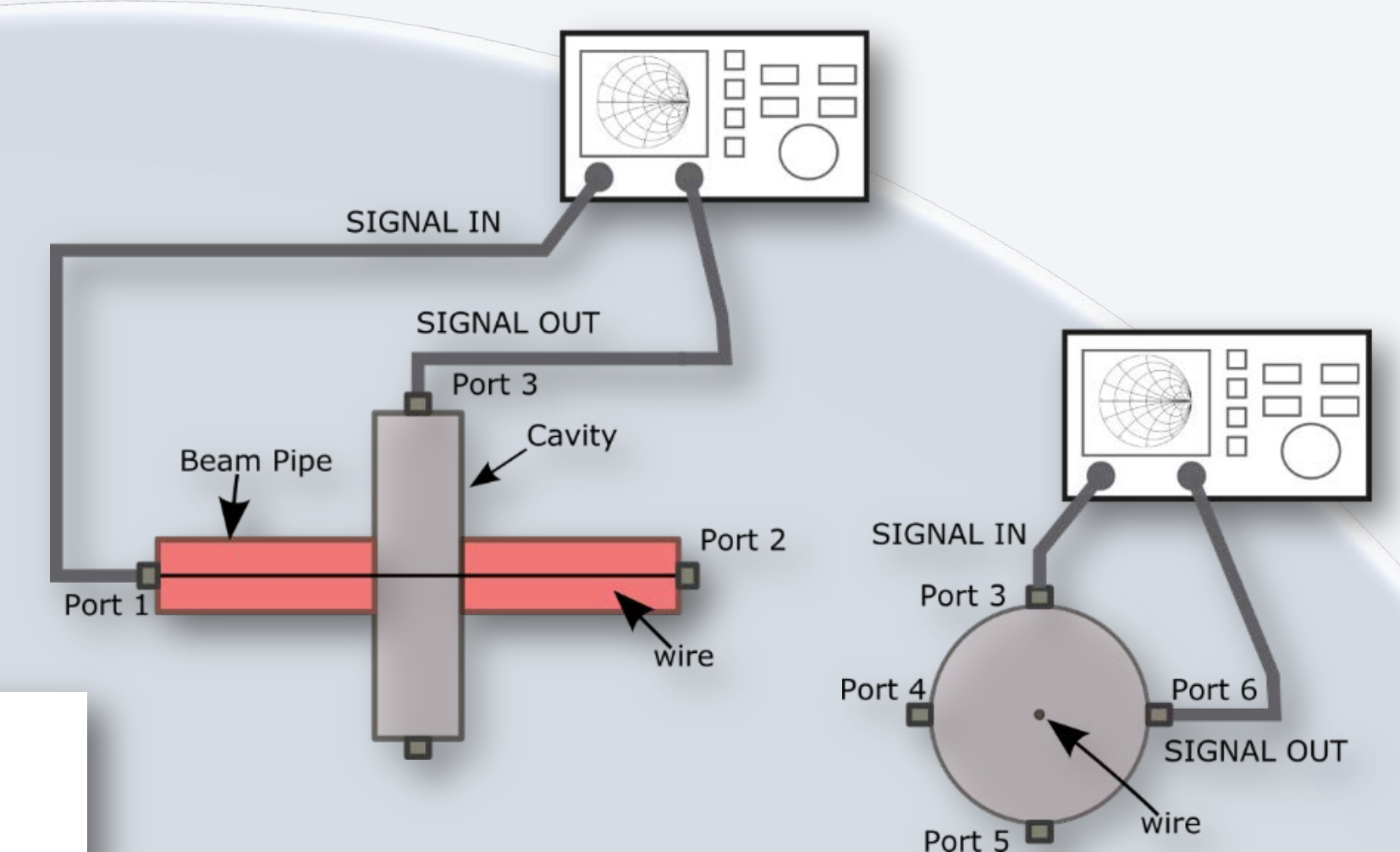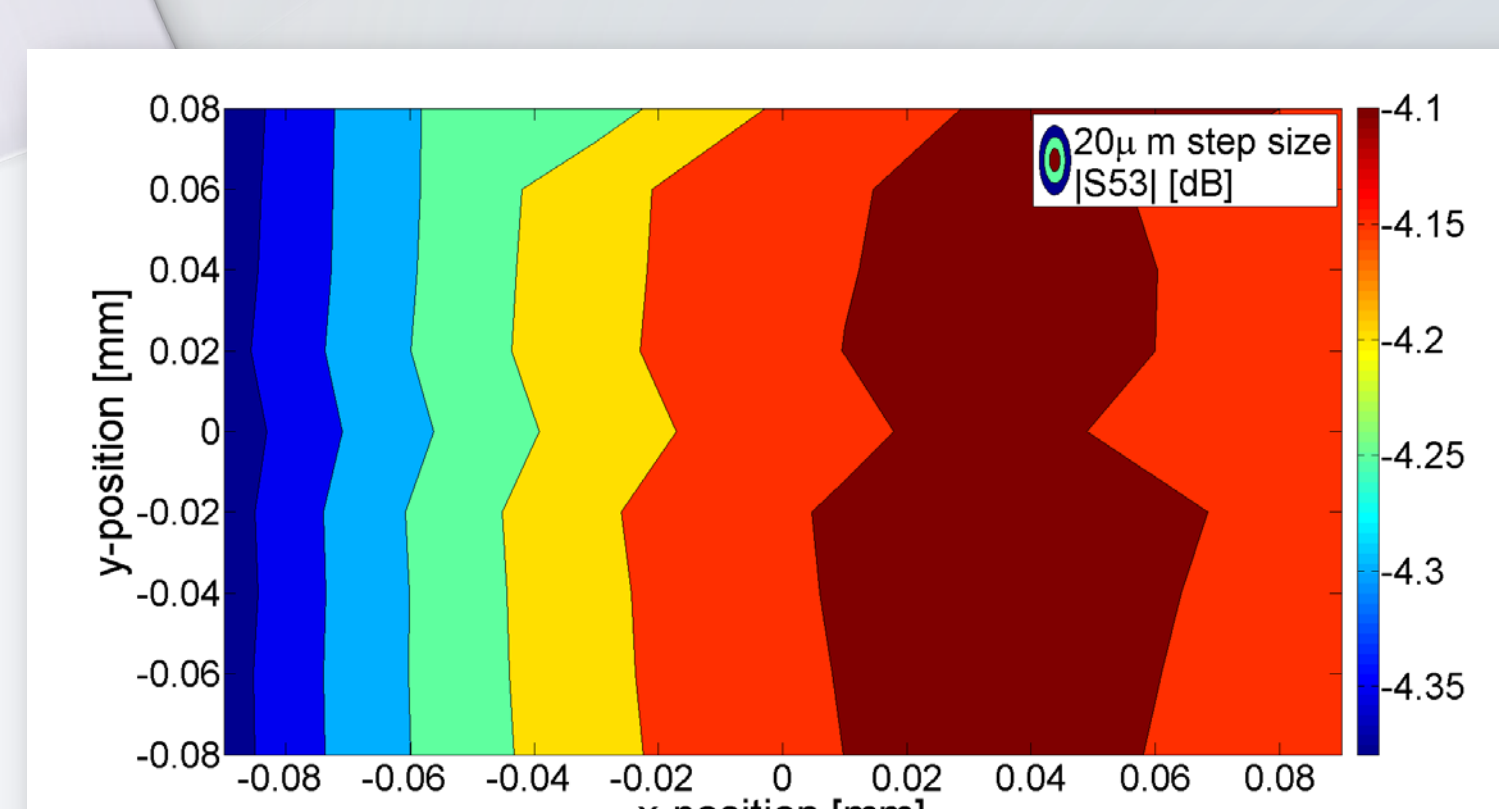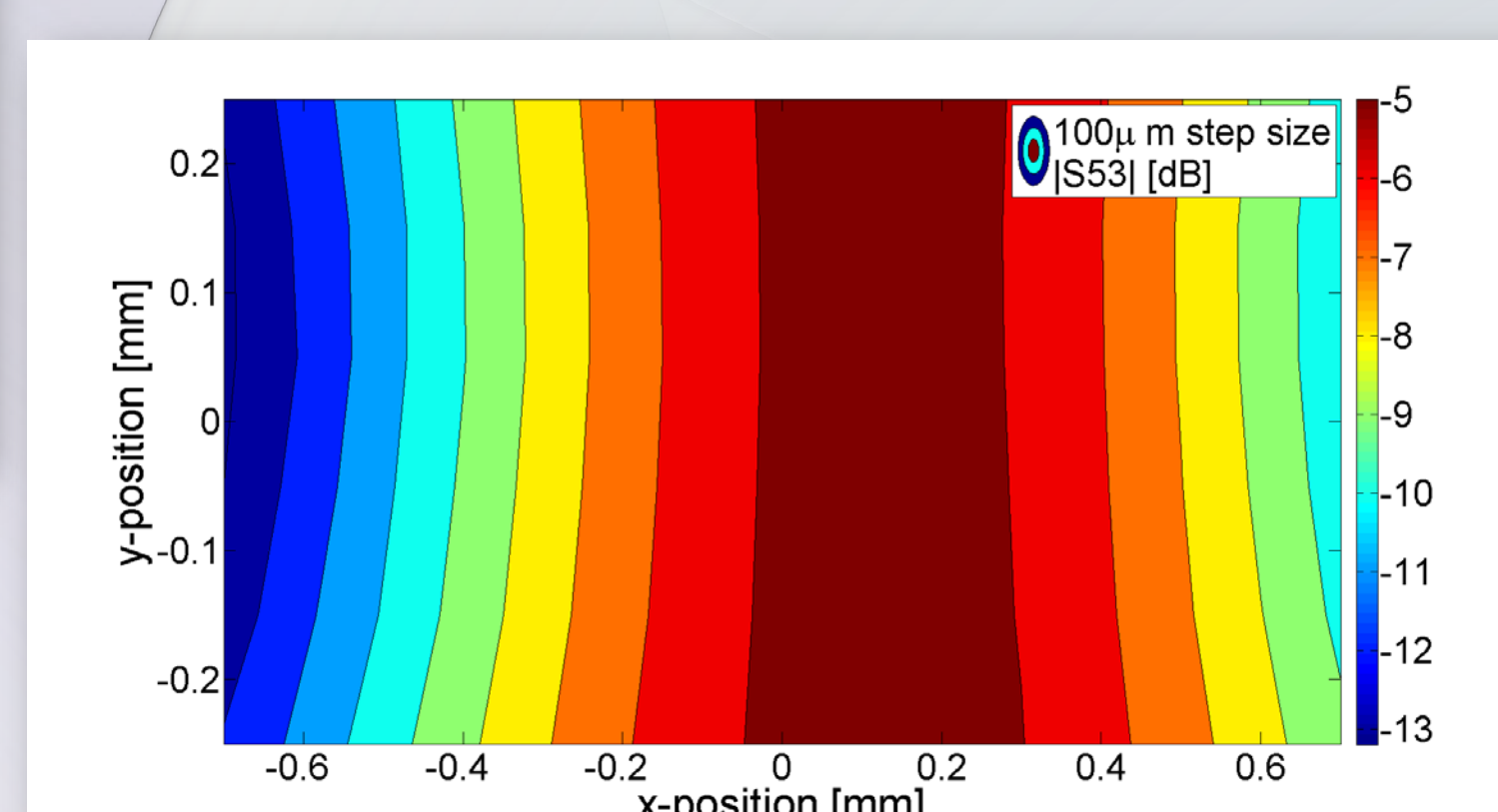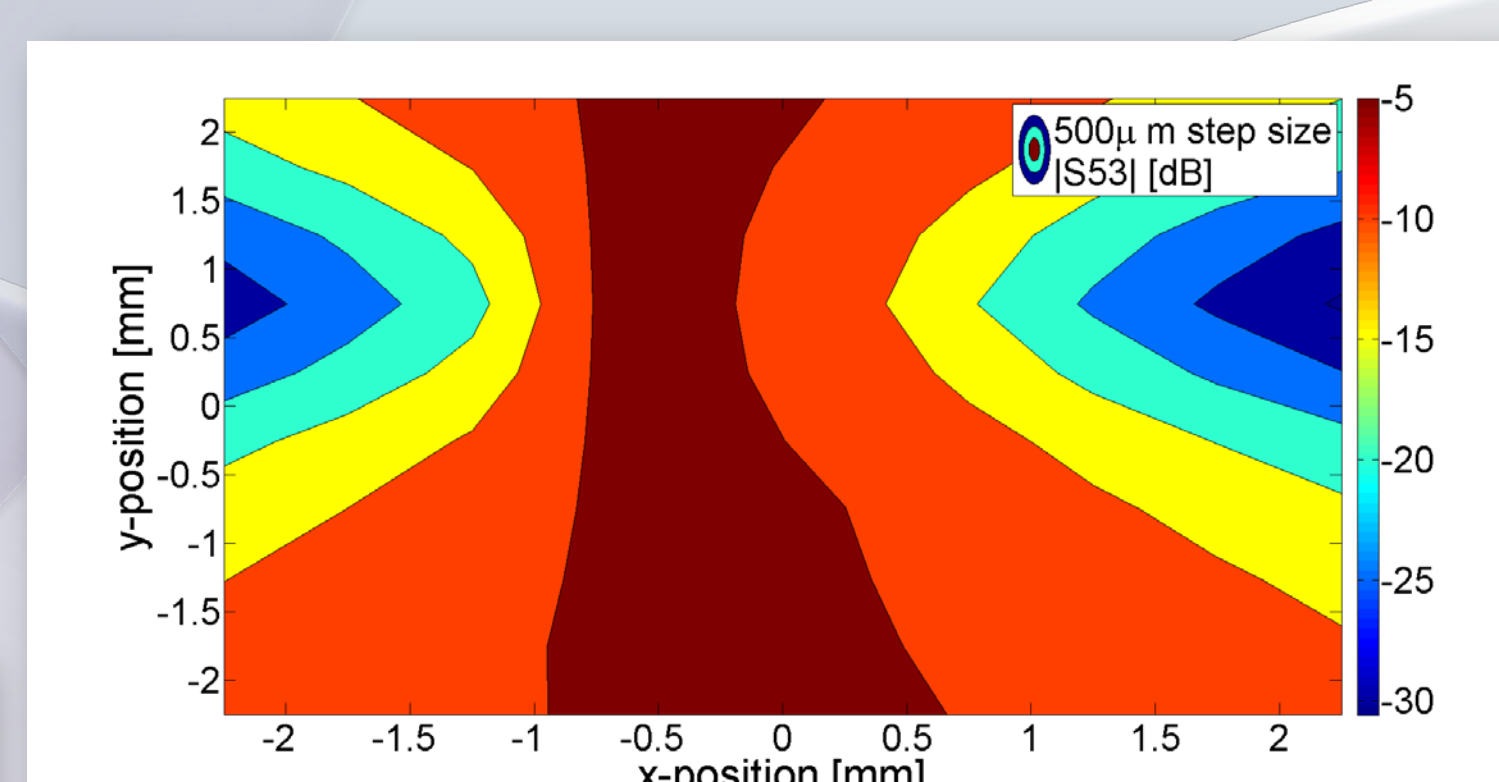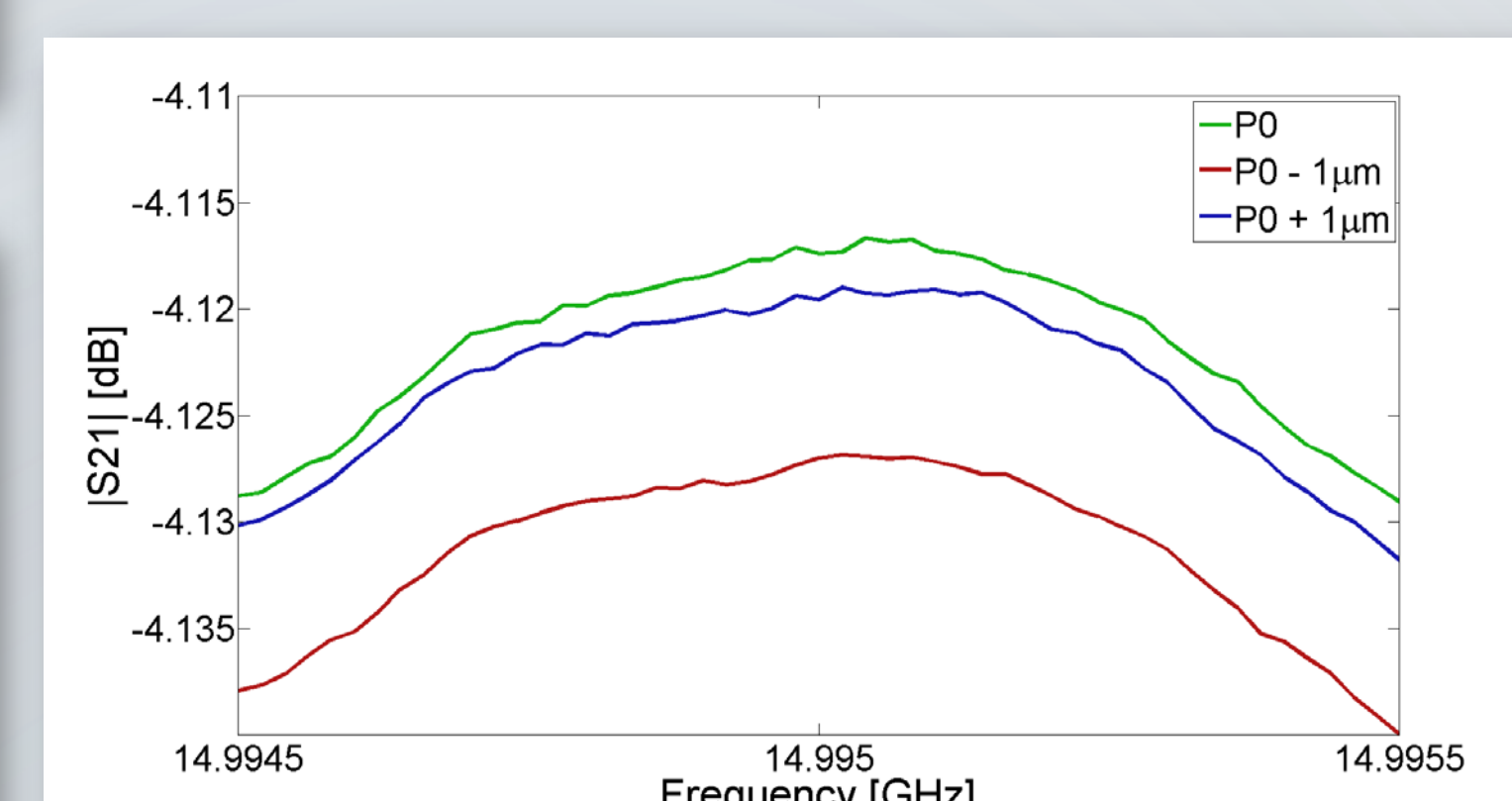
**BPM Test Bench components:**
- **Downconverter**: Provided by *Fermilab*, downconvert the RF signal coming from the BPM (15GHz) to Intermediate Frequency (IF) at 75MHz.
- **Hexapod**: 6 DOF translation stage
  - (X, Y, Z) Minimum step size: (0.5, 0.5, 0.25)μm;
  - (X, Y, Z) Bi-dir repeatability: (4, 4, 2)μm.
- **NI PXI**: Control the downconverter, perform signal generation, acquisition and processing.

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