Status of the Stripline Beam Position Monitor Development for the CLIC Drive Beam**


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ABSTRACT

In collaboration with SLAC, LAPP and IFIC, a first prototype of a stripline Beam Position Monitor (BPM) for the CLIC Drive Beam and its associated readout electronics has been successfully tested in the CLIC Test Facility linac (CTF3) at CERN. In addition, a modified prototype with downstream terminated striplines is under development to improve the suppression of unwanted RF signal interference. This paper presents the results of the beam tests, the most relevant aspects for the modified stripline BPM design and its expected improvements.

THE COMPACT LINEAR COLLIDER (CLIC)

The Power Extraction and Transfer Structures (PETS) close to the BPMs longitudinal position signals of the CLIC Drive Beam BPM Prototype with shortened electrodes.

BEAM TESTS OF A STRIPLINE PROTOTYPE (SHORTENED ELECTRODES)

- Compact model fits into the quadrupole vacuum chamber.
- Length L chosen for the transfer function to have a zero at 12GHz (bunch cancellation in the central part of the train).
- SIC damping ring added to absorb trapped modes at 12GHz.

Position estimates as δkδL/L, being k the linear calibration coefficient and δ the difference, 1 the sum of opposite electrode signals.

- Analog signal shaping required for correct acquisition of short and intense BPM electrode signals → integration / Low-Pass (LP) filtering before ADC.

Pick-up installed in Test Beam Line (TBL), at position 0860, with 45° rotation.

Two test scenarios: low (6MW) and high power (60MW) RF interference from the decelerating structures (PETS).

Beam steered in /±5mm range in horizontal and vertical plane for sensitivity test by moving quadrupole QDR0800, BPS0850 and BPS0910 as reference BPMs.

Reduced vertical sensitivity than theoretically expected (100mV).

The effect of a 10 times higher RF PETs power is a ~190μm offset in both planes.

CONCLUSIONS

- Expected performance of the first stripline BPM prototype and its acquisition electronics during CTF3 beam tests: expected signals, levels and radiation-hardness.
- The presence of high power RF interfences from the PETs has an influence in the offset, which seems to be caused by insufficient suppression of 12GHz CLIC RF fields.
- The problem is addressed by the development of a new stripline prototype with improved notch filter effect at 12GHz, providing also the possibility of loop-thru calibration via the downstream ports.
- Prototypes under test at CTF3 and will be compared to a simulated coaxial BPM.