FETS BPM Wire-Rig Interim Report

GEB 20-08-2014

Jake Gale worked during the summer to run the wire-rig experiment (Fig. 1), and wrote code to analyse the results (in Python).

The work showed that it is possible to position the 0.35 mm diameter wire to much better than 100 µm at the geometric centre of the bore of the BPM, using the method of just touching the wire against the internal surface of the BPM and also by using a semi-circular mandrel with a slot for the wire.

The wire-rig setup can position the wire anywhere in the BPM, and the electrode signals are read out from a four-channel scope. The wire position vs electrode signals (delta/sum) can be plotted, and a linear region of the BPM can be found. The linear region has a radius of ~4.5mm from the centre. One of the first plots taken is shown in Fig. 2 (steps of 2 mm, with the BPM centre at [0,0]).

The main purpose of the wire-rig is to obtain calibration, or sensitivity, constants for each BPM and to determine the electrical offset (if any). It appears the aluminium frame affects the sensitivity of the electrodes. This was demonstrated by turning the wire support frame at 45^{o} to the mover axes – the sensitivity constants were within about 3% of each other, as opposed to 10% when the frame was parallel to one pair of opposing electrodes. A Perspex frame is being assembled in the workshop at RHUL to eliminate the amount of conductive material near the BPM and wire.

A lot of data has been collected and analysed for the wire-rig and will be presented at the next FETS meeting.

One production BPMs have been shipped to RHUL, but the manufacturer has offset the electrode mounting holes wrt the BPM centre. This make aligning the electrodes in the BPM quite problematic, and they should be returned to the manufacture for correct machining.

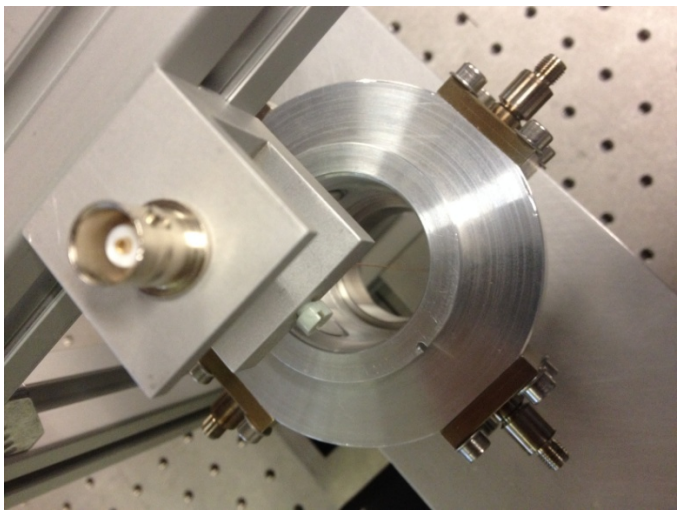

Figure 1 Wire-rig with BPM and wire.

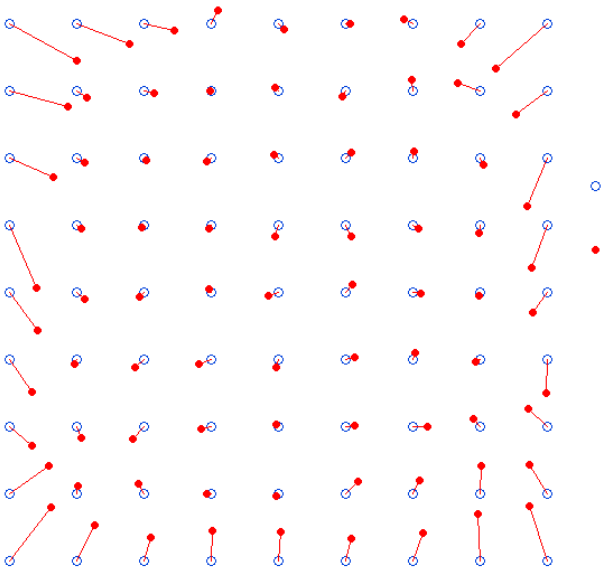

Figure 2 First plot showing actual and calculated wire position