

BPMs for collimator wakefield studies

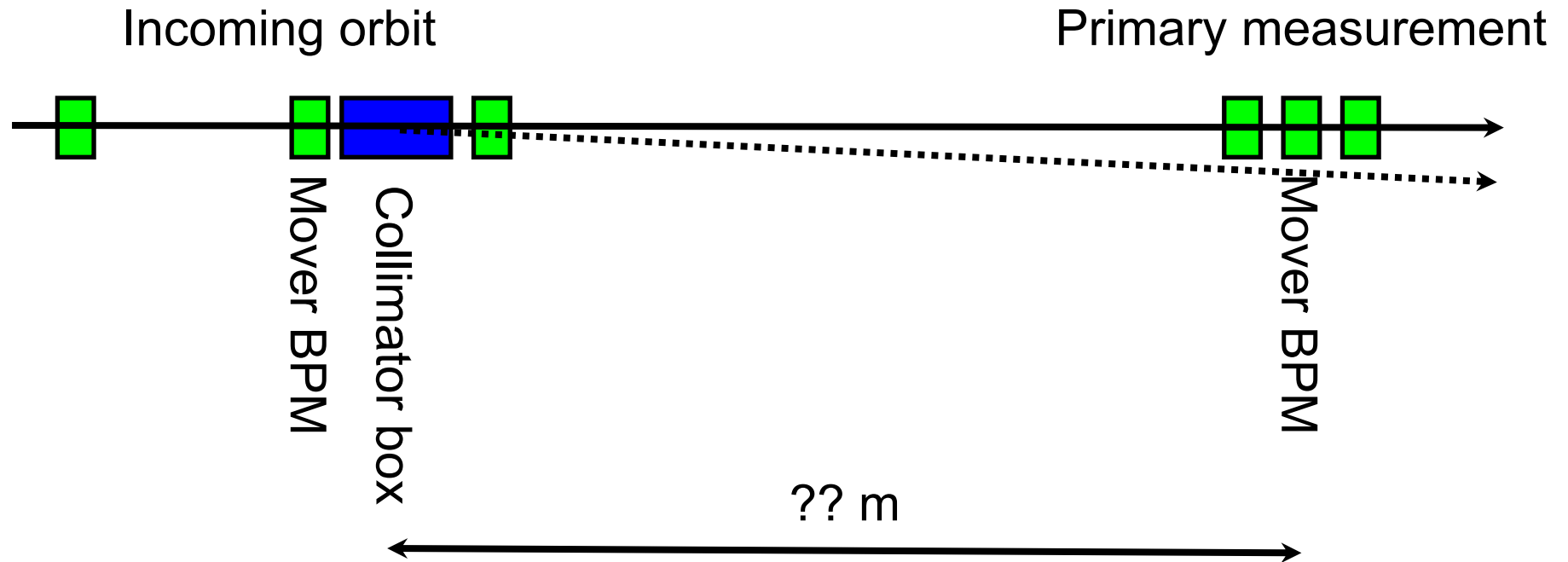
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<https://www.pp.rhul.ac.uk/twiki/bin/view/JAI/BeamPosition>

Introduction

- Requirements
 - Number of BPMs required
 - Resolution and stability
 - Clear aperture?
- Calibration
 - Mover systems
 - RF calibration tone
- Related questions
 - Layout of BPMs
 - Incoming orbit variation and jitter?

Layout idea (BPM perspective)



- Detailed simulations needed
- Some ideas/problems common to the ESA spectrometer (<http://iopscience.iop.org/1748-0221/6/02/P02002> and refs)
- 2 BPMs on movers
- 2 Triplet like systems

BPMs for collimator kicks

- Available BPMs
 - Recycle from old ESA experiments (readout, electronics?)
 - Resolution ~ 250 nm, μm -level stability
- C-band BPMs
 - Possibly 3 ATF2 C-band ~ 30 nm
- RHUL-Diamond design
 - Have design for cavities (mostly based on ATF2 C-band) which can be fabricated
 - Cold tests this Summer, beam in Autumn
- **What are the specifications?**

Experience at ESA

- Completely separate groups
 - Bunch length, BPMs, collimator wakes
- No online data analysis
 - Data analysis performed offline long after (>days) data taking
- Mechanical installation was not great
- Recycled BPMs
 - Variable performance
 - Resolution ranging 250 nm – a few um
- Calibration procedure
 - Calibration drifts between BPM/Collimator beam measurements
 - BBA

Proposed improvements

- ATF2 developments
 - 30 nm BPMs routinely available
 - Online analysis (calibration, resolution, beam jitter)
 - Calibration tone (remove scale uncertainties)
- Entirely possible to have corrected kick angles during the course of collimator measurements
 - Removal of orbit jitter and scale changes
 - Corrections to timing, electronics gain and optics changes

BPM system costs

	Units	Cost (\$)	Total (\$)
BPM	6-8	20k	120k
Mover (x-y axes)	2	10k	20k
Electronics	6-8	5k	30k
Readout	2	5k	10k
Cable/consumables	-	10k	10k
Total			190k

- Cost for 30 nm resolution system
- Significantly cheaper if recycle cavities/electronics
- Still ~50k/BPM including effort, at least 1 experienced RA
- Exploring synergies with the quad stabilisation and energy measurement studies could be cheaper and more efficient