BSRT
Beam Synchrotron Radiation Telescope

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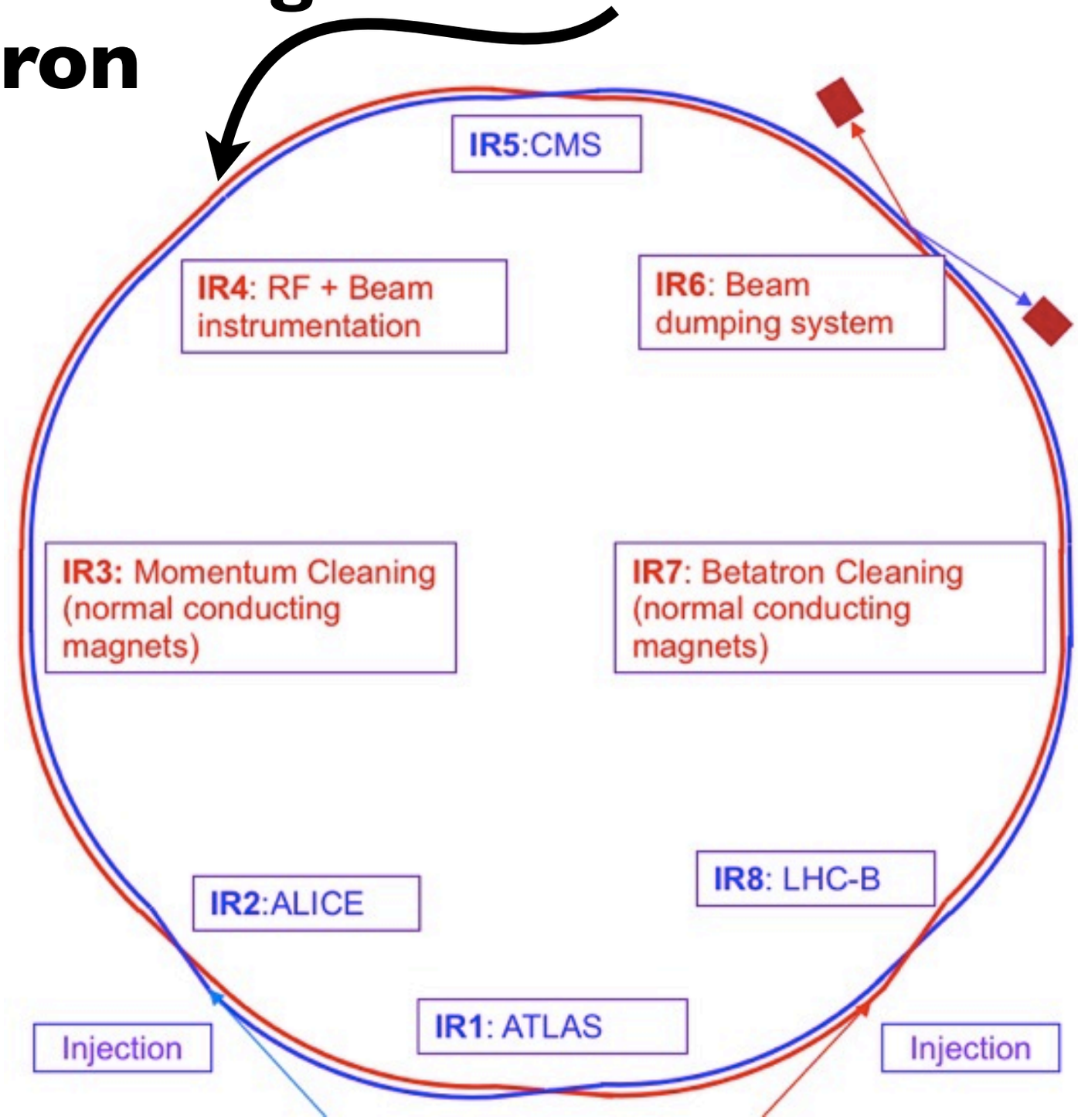
Many Thanks to Federico Roncarolo!

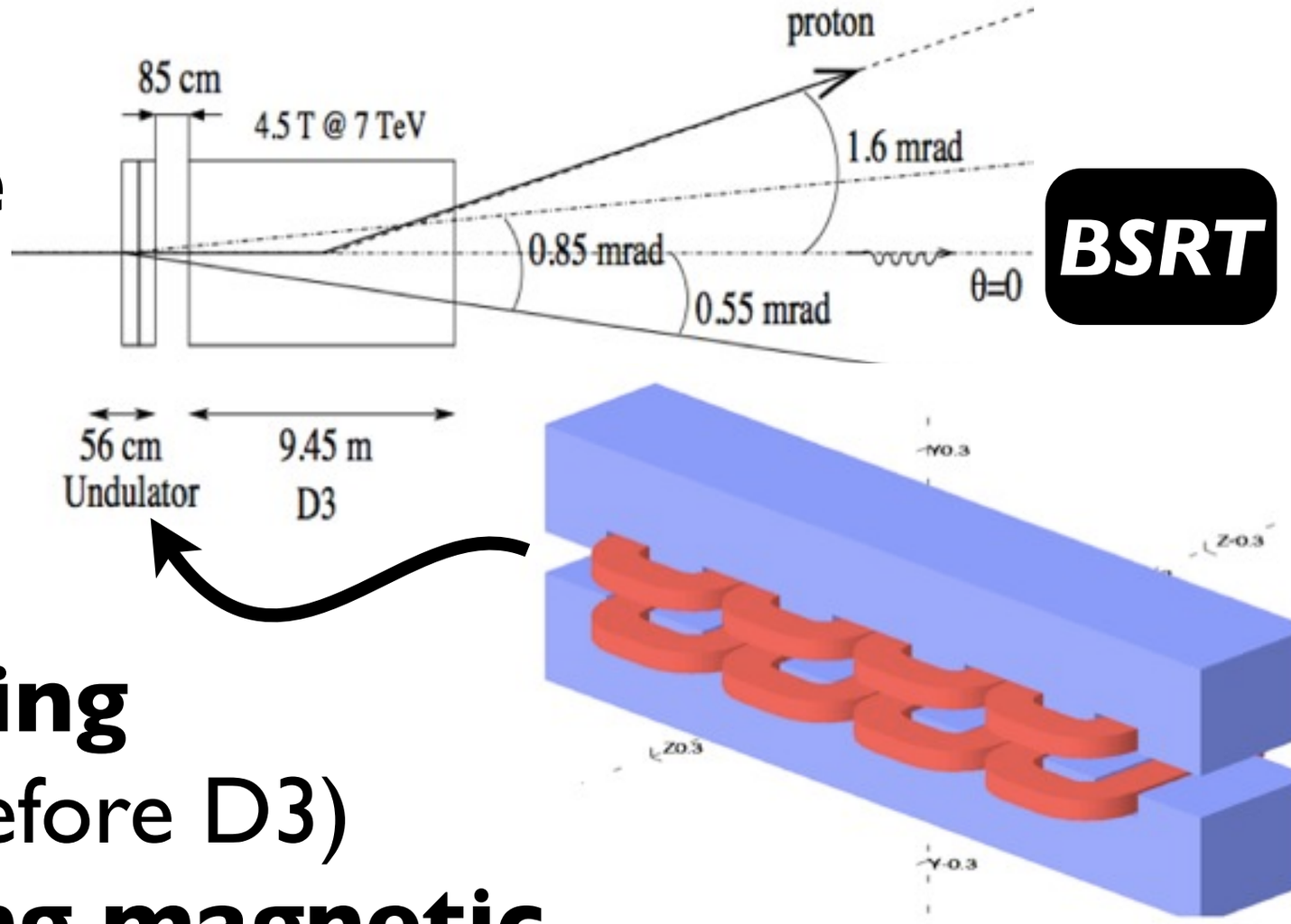
BSRT Position

- **After the D3 dipole magnet in IR4 BSRT detects synchrotron light due to**
  - ➡ **Deflection by D3**
    - ✳ **E > 1.5-2 TeV**
  - ➡ **An "undulator"**
    - ✳ **450 GeV < E < 2-3 TeV**



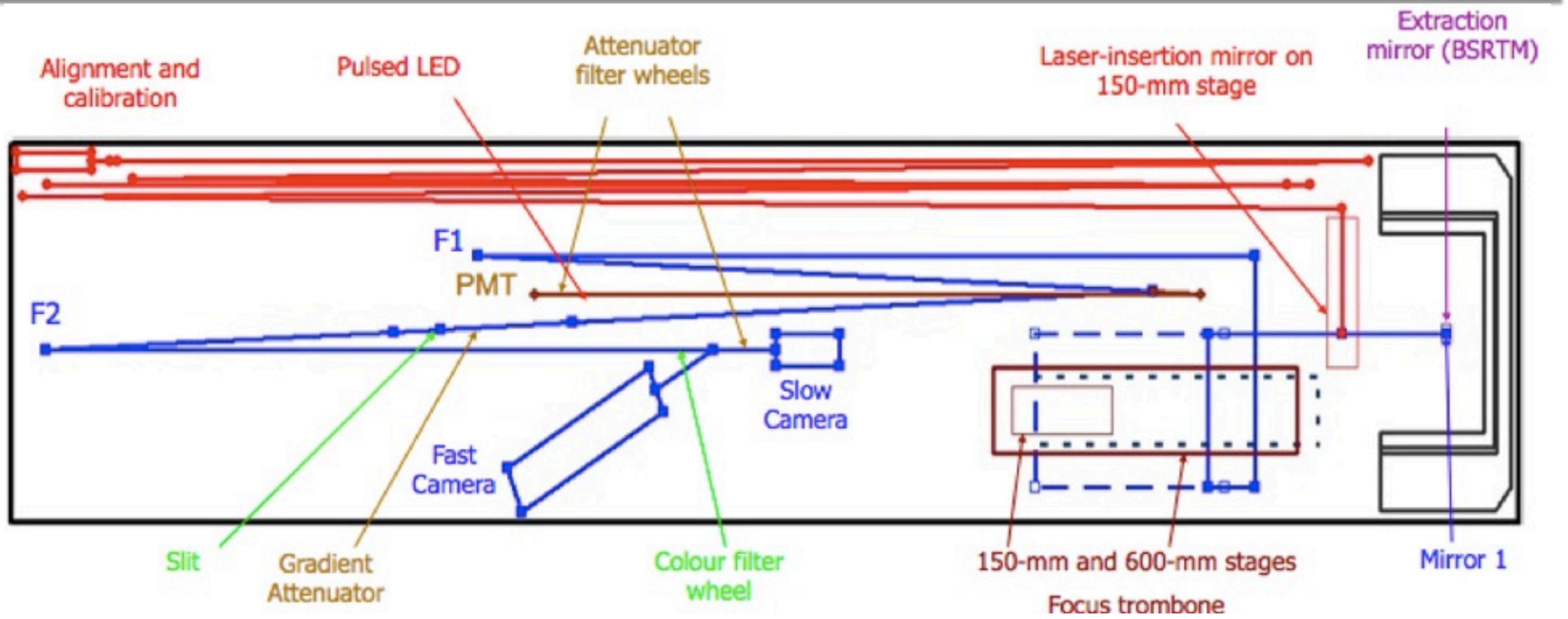
Sources for the BSRT

- **The p-beam is deflected by the D3 dipole**
  - ➡ **Synchrotron light is radiated**



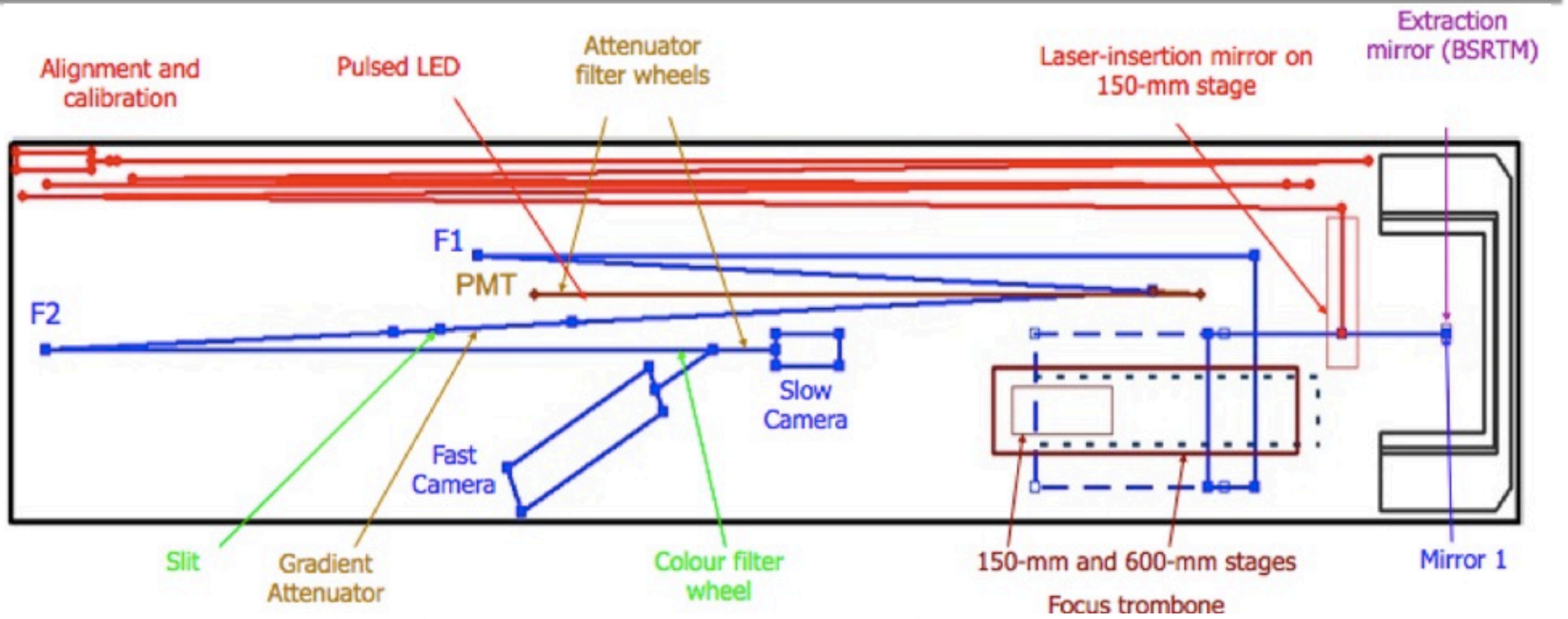
- **A superconducting undulator** (just before D3) **has four variating magnetic poles that variates B_y**
  - ➡ **The beam radiates enough synchrotron light also at low energies, < 3 TeV**

Optical System



- **The synchrotron light is deviated into the optical system by an extraction mirror**
- **... and guided** (by other mirrors) **to CCD cameras (2010; only the "Slow Camera")**

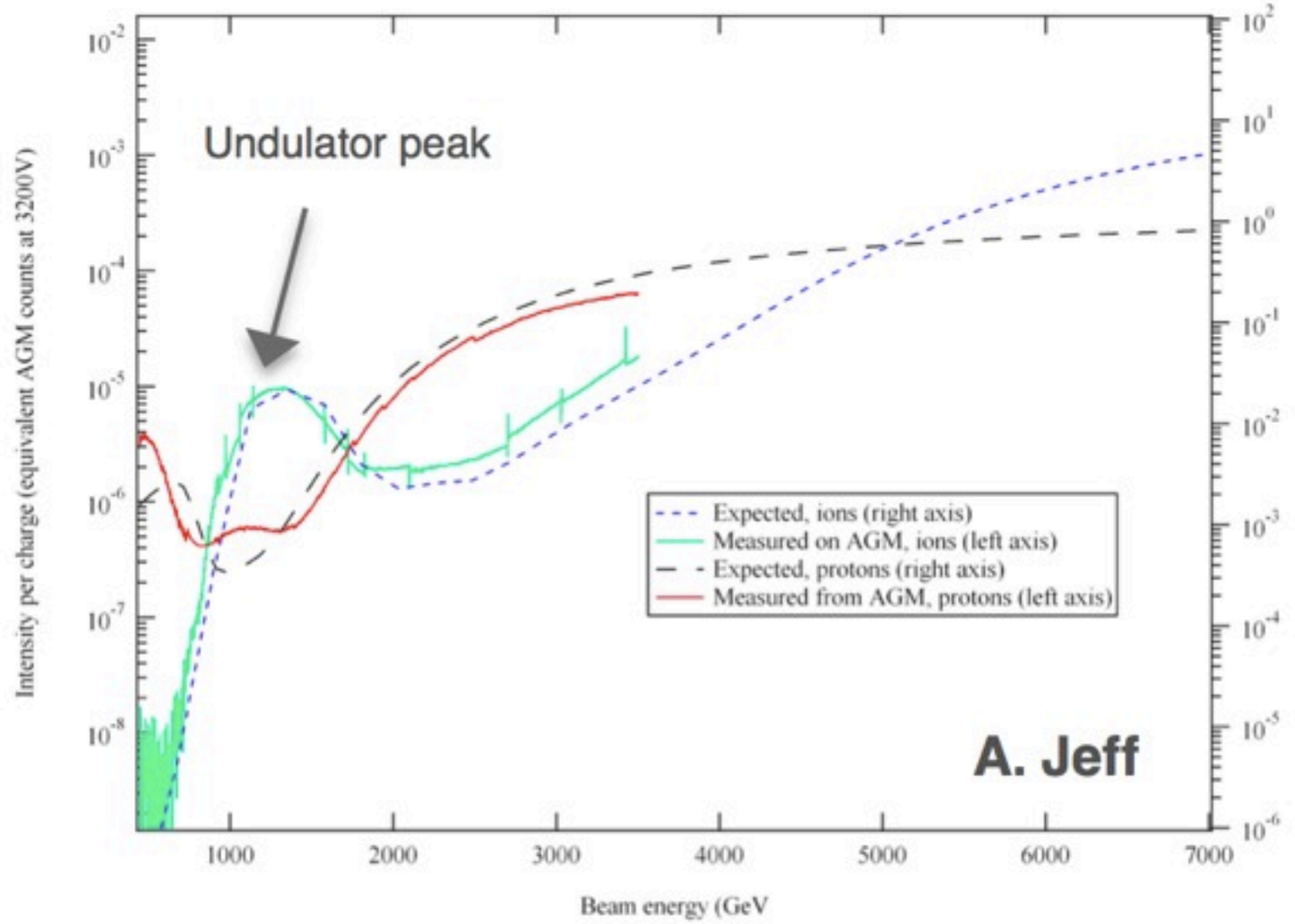
Optical System



- **To optimize the resolution BSRT has**
  - ➡ **movable stages** (for focusing depending on source)
  - ➡ **optical filters for light colour and density**
  - ➡ **adjustable video camera gains**

Photon Intensity

- **Intensity measurements by the PMT** (see previous slide) **and simulations gives synchrotron light intensity as a function of beam energy**

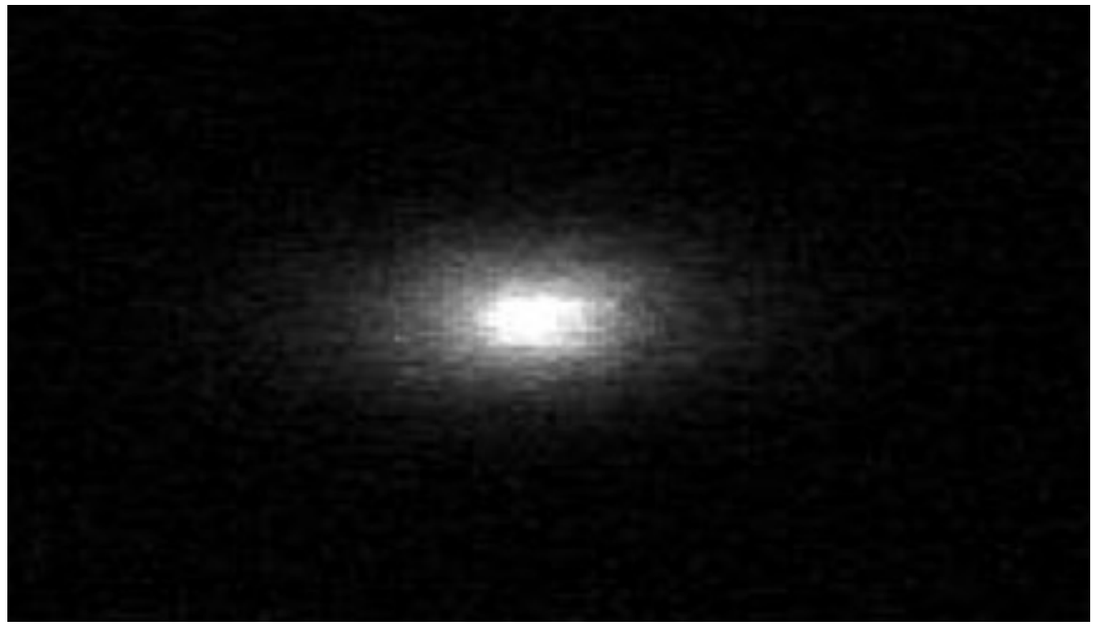


Simulation performed with Synchrotron Radiation Workshop (SRW) code

- **Measurements agree with theory**

Video Camera

- **The camera is a** "Proxicam HL4 S NIR"
- **Beam images are recorded at 1 Hz and published each sec.**



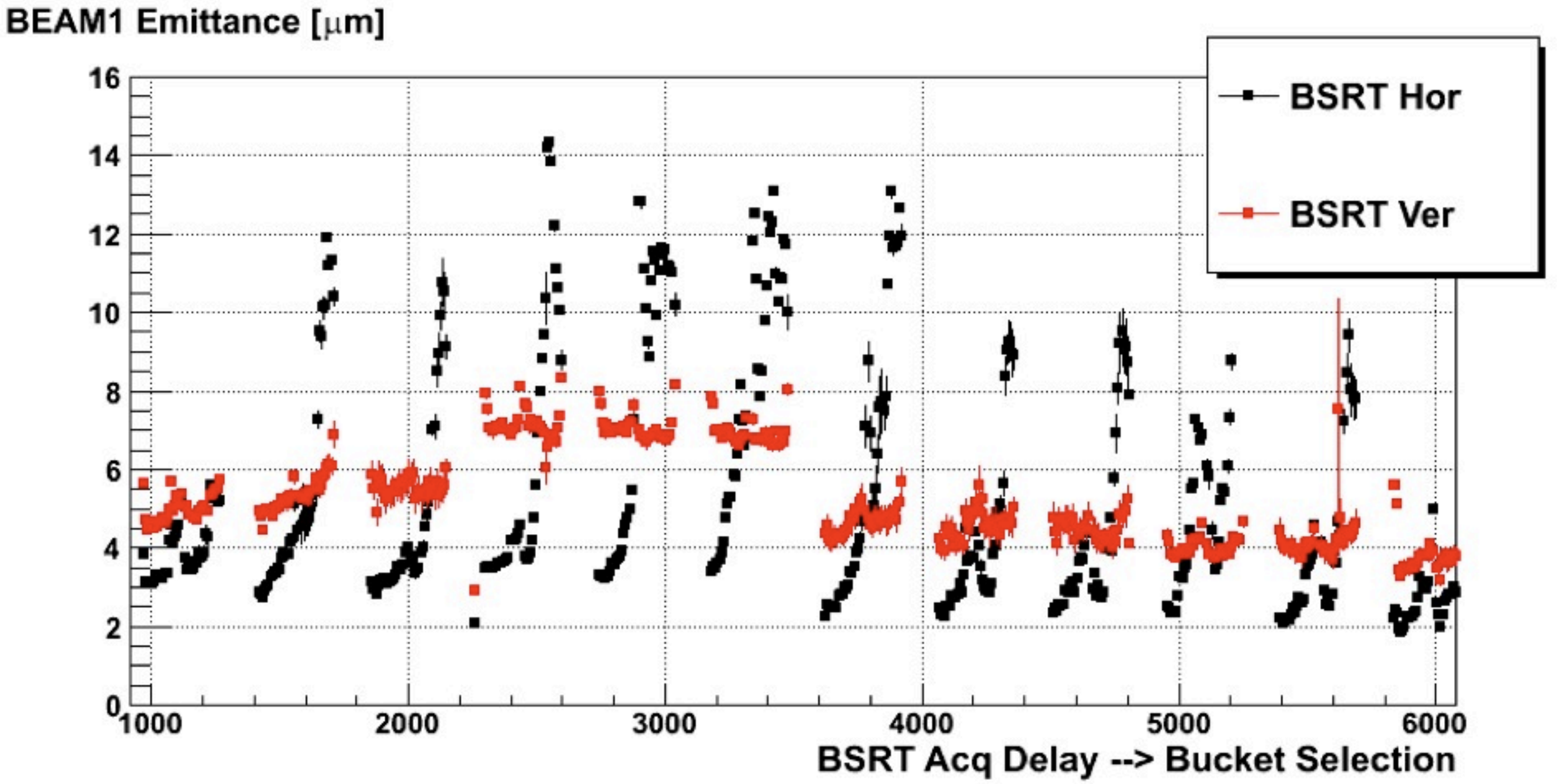
Pilot bunch with 5e9 protons

- **DC Mode: Averaging over all bunches and 20 ms**
- **PULSED Mode: Averaging over time gates** (min 25 ns) **that can be connected to certain bunches**
- **Gaussian fits on beam images provide horizontal and vertical emittances** (see next slide)

Results from 18th Nov.

- **Transversal emittance measurements of 12 proton trains with 48 bunches each**

(each point is average of ~5 seconds)



Correction Factors

- **Results from BSRT can however be biased by e.g. possible installation inaccuracies**
- **The Wire Scan (WS) Monitors are therefore used as reference**

➡ **Correction factors are applied to the measured BSRT emittances, $\sigma = \sqrt{\sigma_{meas}^2 - \sigma_{corr}^2}$, so that results gets as close as possible to the WS results**

➡ **Example of BSRT correction factors:**

Protons after 22 Oct		450 GeV	3500 GeV
B1	H	0.60	0.50
	V	0.95	0.55

Corrected BSRT Results

- **After correction BSRT results align good with the WS results:**