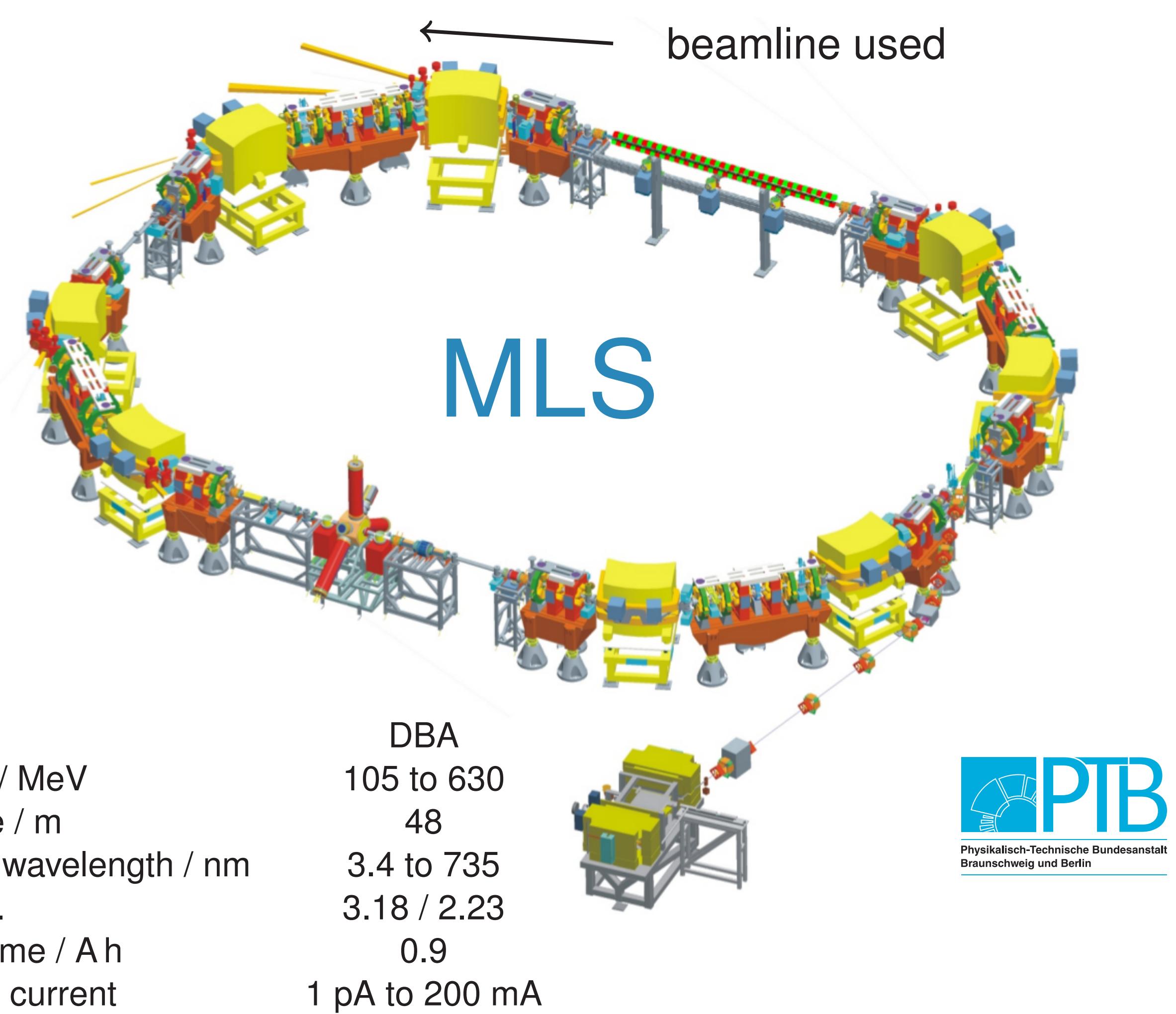


## Introduction

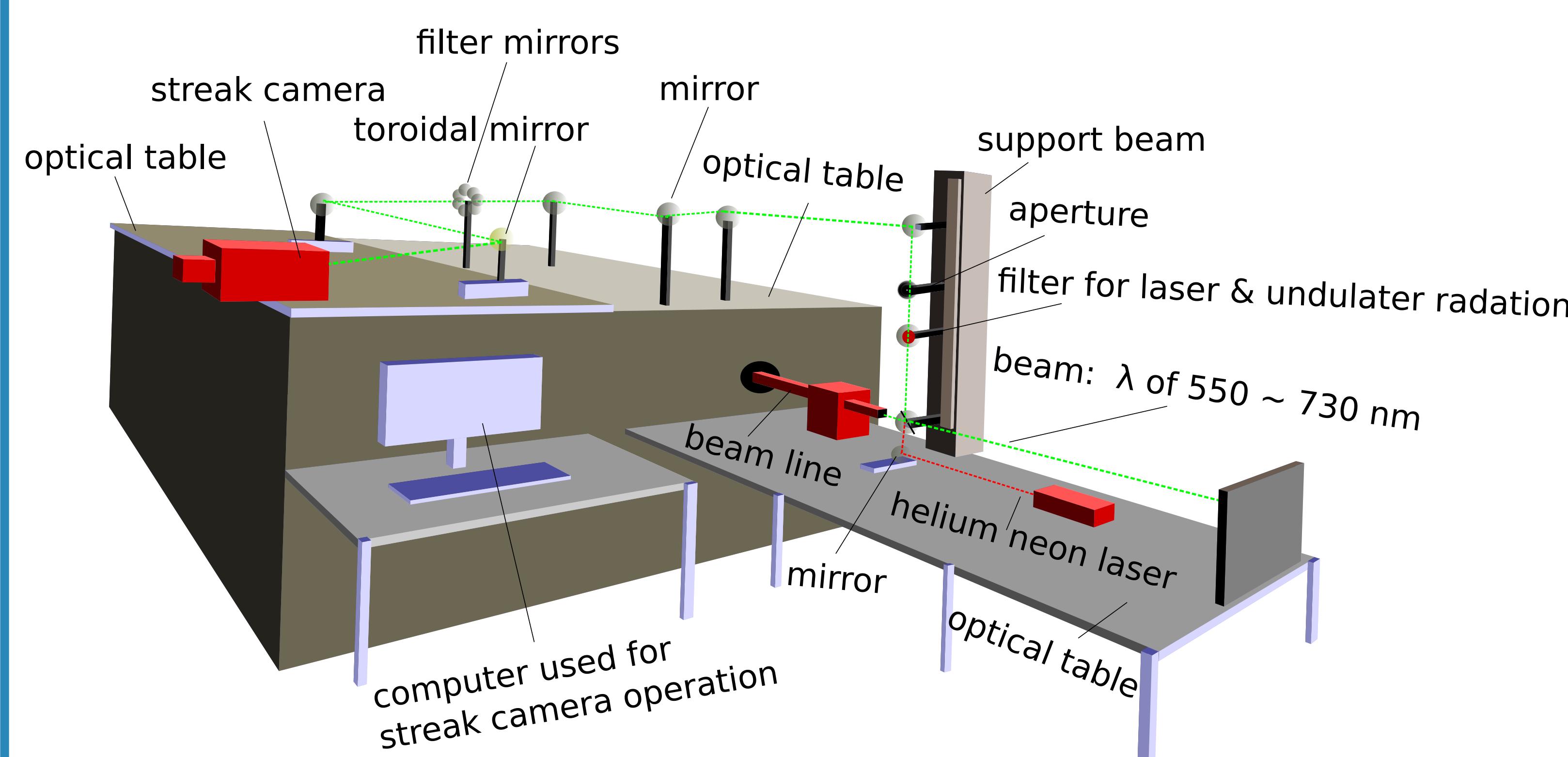
The Helmholtz-Zentrum Berlin is a facility that operates two synchrotron light sources: BESSY II and the MLS. One of the long term goals at these facilities is to continually make bunch lengths as short as possible in the storage rings. A way to go about this is through lattice design, and an important part of lattice design involves picking a good working point to avoid the tune resonances of the machine. A tune resonance program was therefore developed which can be used to view the current working point of any machine given a few parameters.

Another way of looking into bunch lengths at HZB is through diagnostic tools. A new streak camera was recently purchased for BESSY II, but is currently being setup and tested at the MLS where the old streak camera also resides. The setup proved to be quite a challenge because of the placement of the camera and beamline. An optical setup that needed to provide three degrees of freedom was setup; this setup also provided the opportunity to operate both streak cameras (old and new) at the same time and compare measurements.



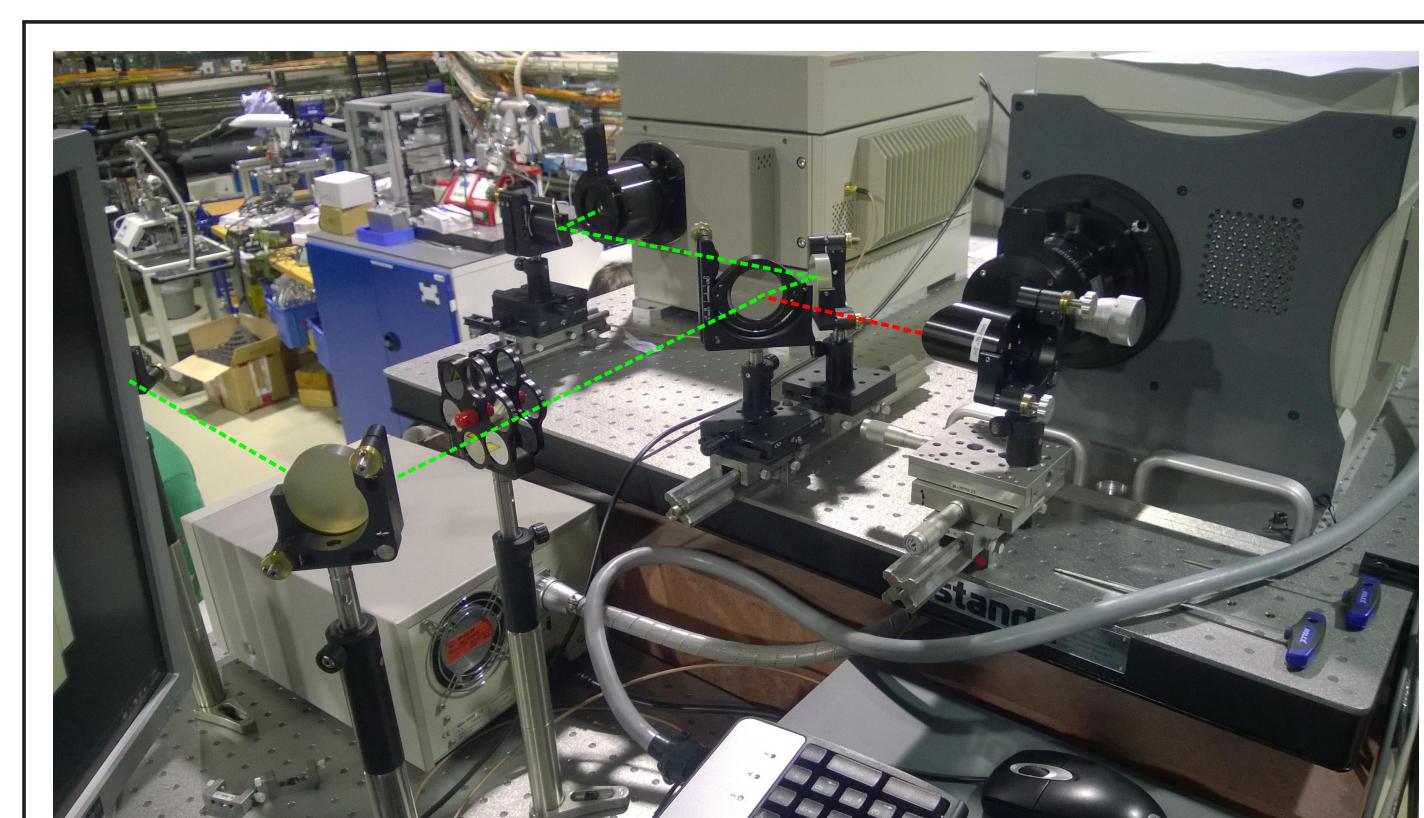
## Setup

### Setup



optical table setup for dual streak camera operation

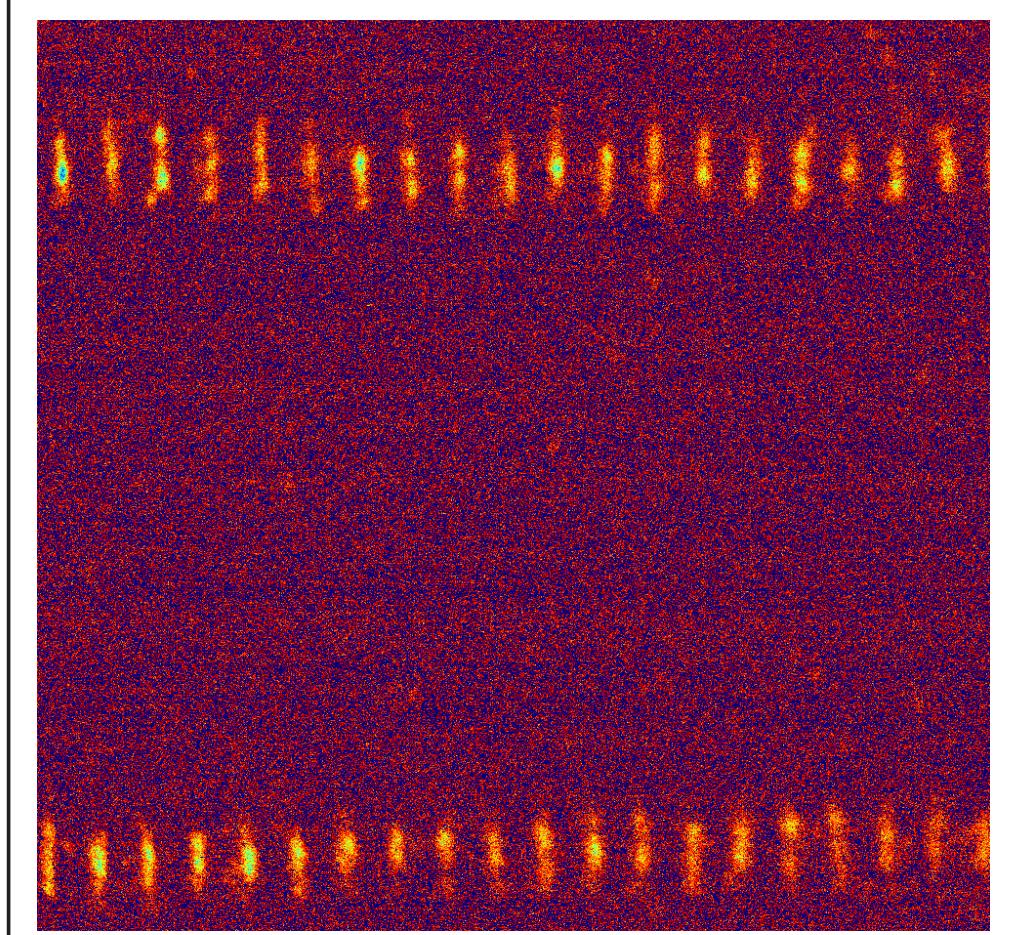
The toroidal mirrors, along with a splitter and a normal mirror, on the optical table are placed on rail systems in order to provide multiple degrees of freedom to adjust for the horizontal and vertical focuses of the beam



## Measurements

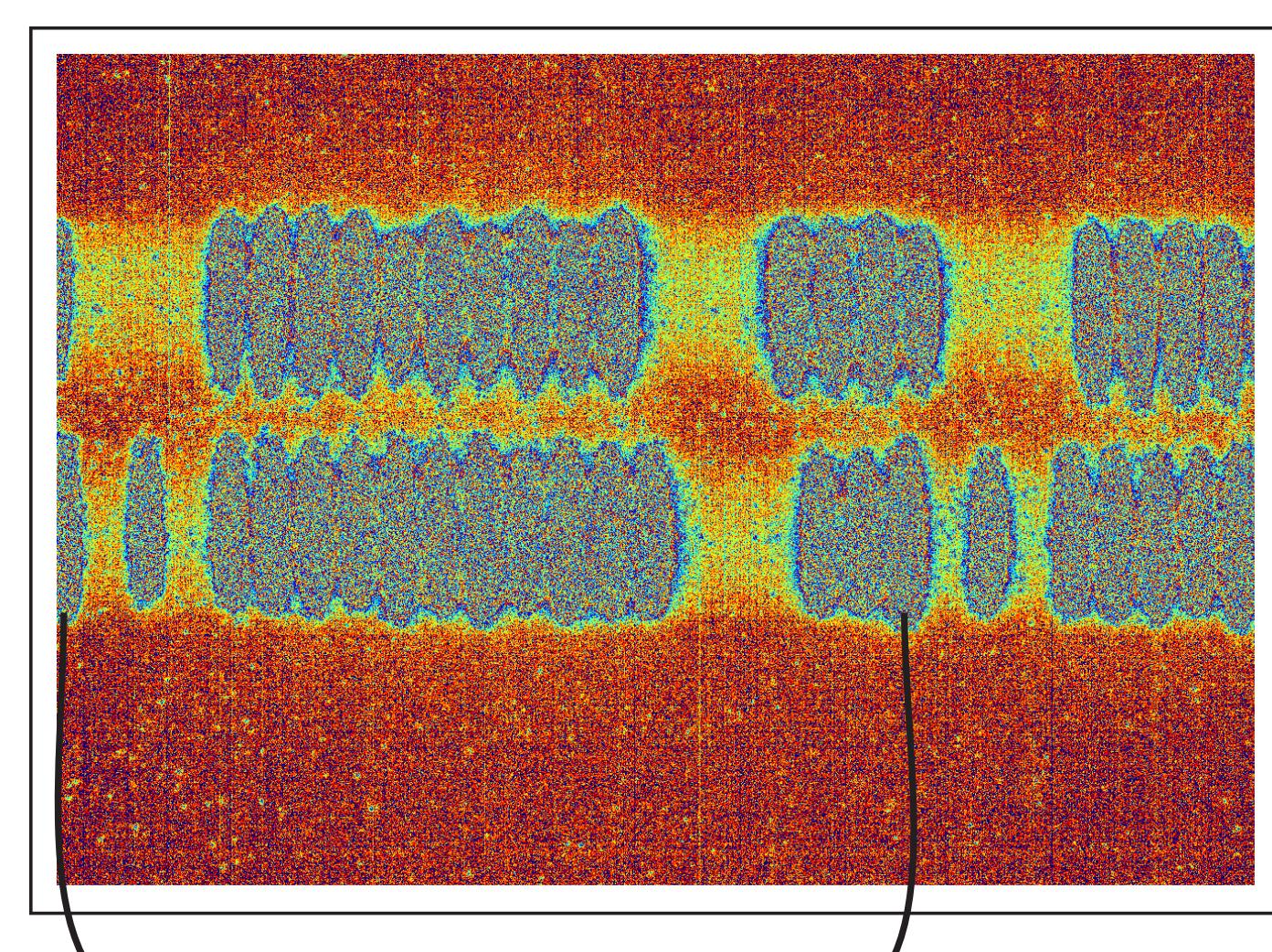
### Measurements

old camera, horizontal bunch length

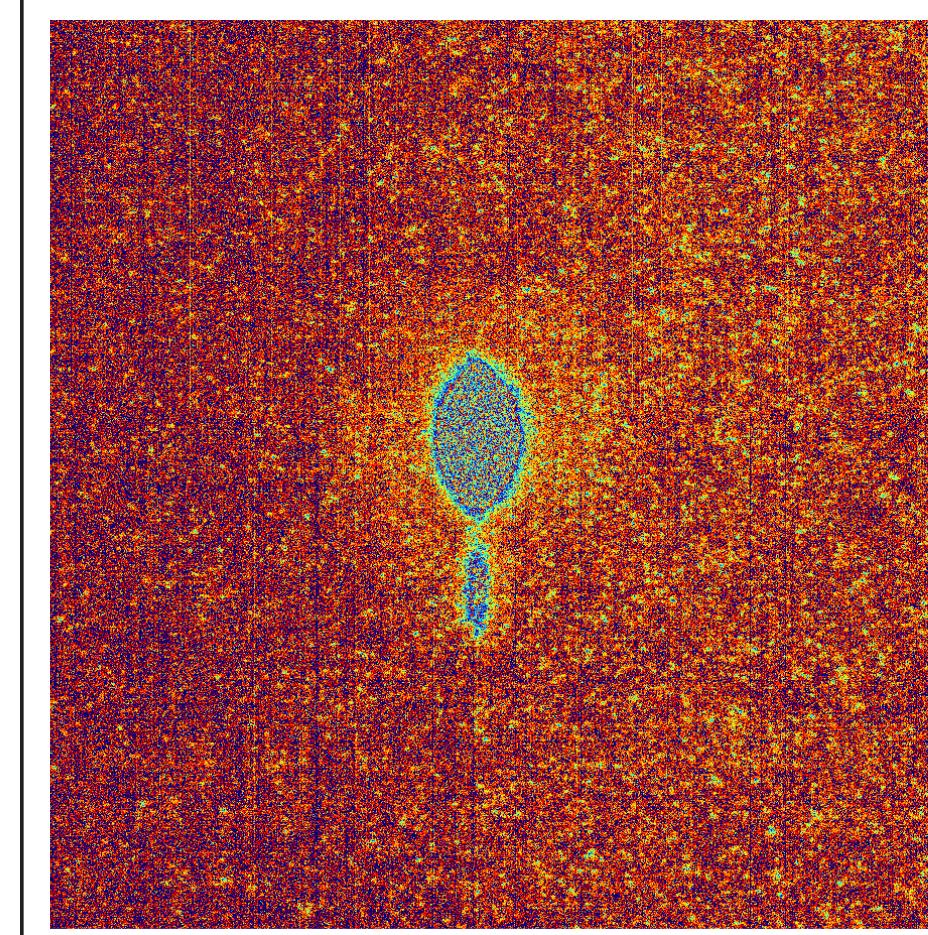


The new streak camera has a much more improved ability to filter out noise and white light

new camera, horizontal bunch length



single bunch measurement



tune resonance program source code



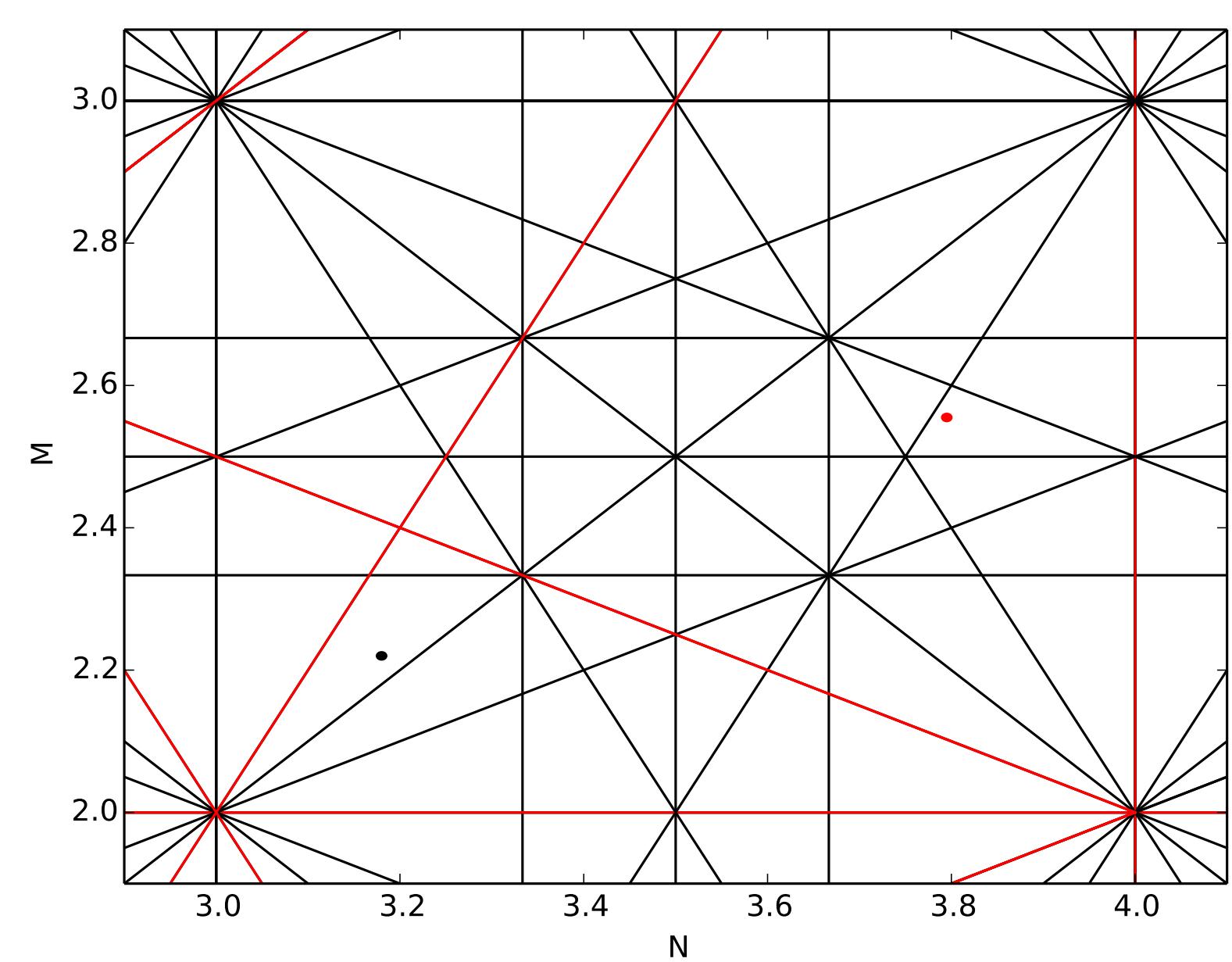
## Tune Resonance Program

### Details & Features

- developed in python
- contains GUI built with wxpython
- integrated with EPICS through the use of pyepics
- live mode that displays current non-integer working point
- given integer part, can display phase advance resonance lines and unit working point
- various customizability options available

### Pictures & Examples

Third order structural and phase advance resonance lines for the MLS



Fifth order difference resonance lines ordered by color

