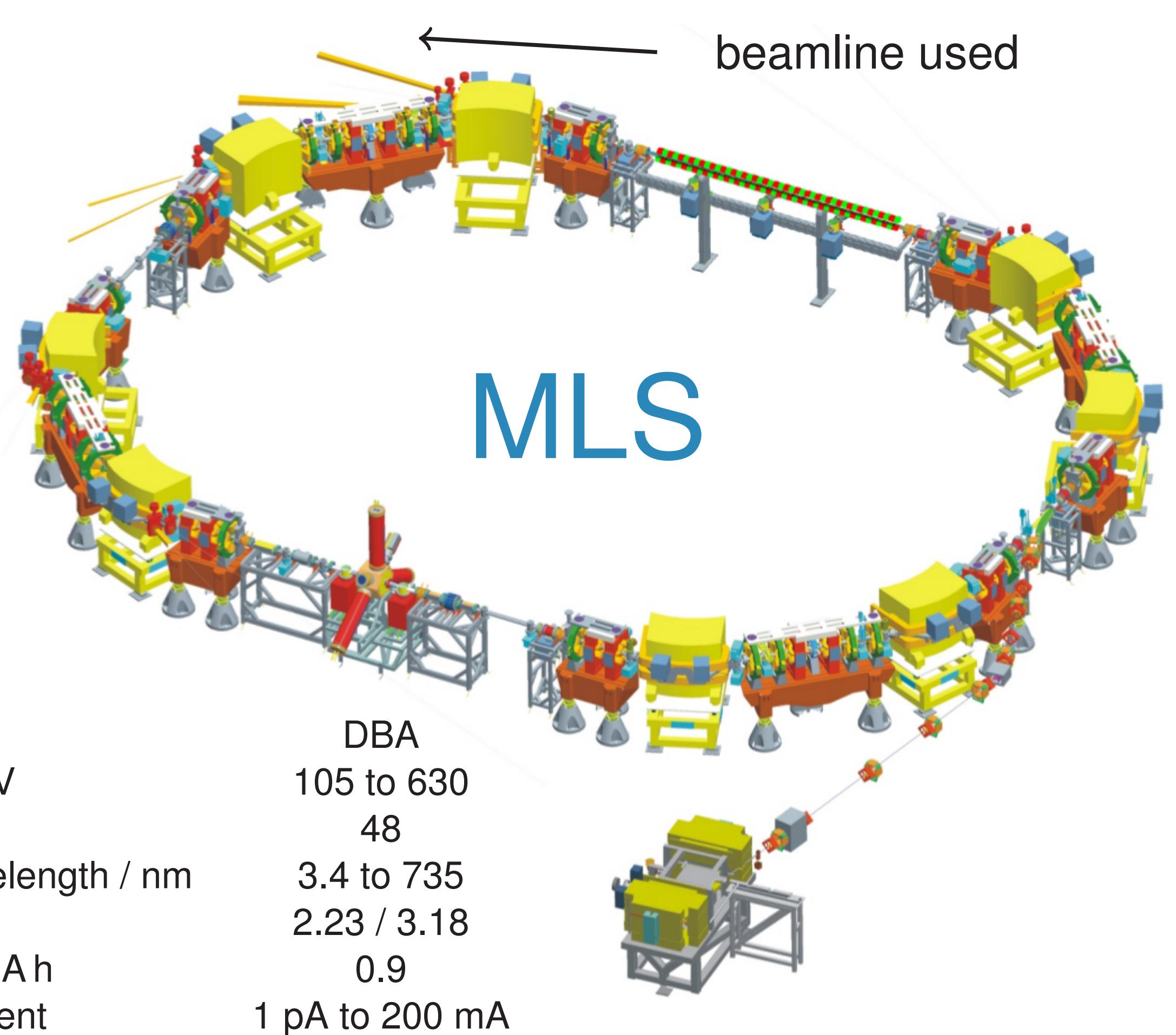


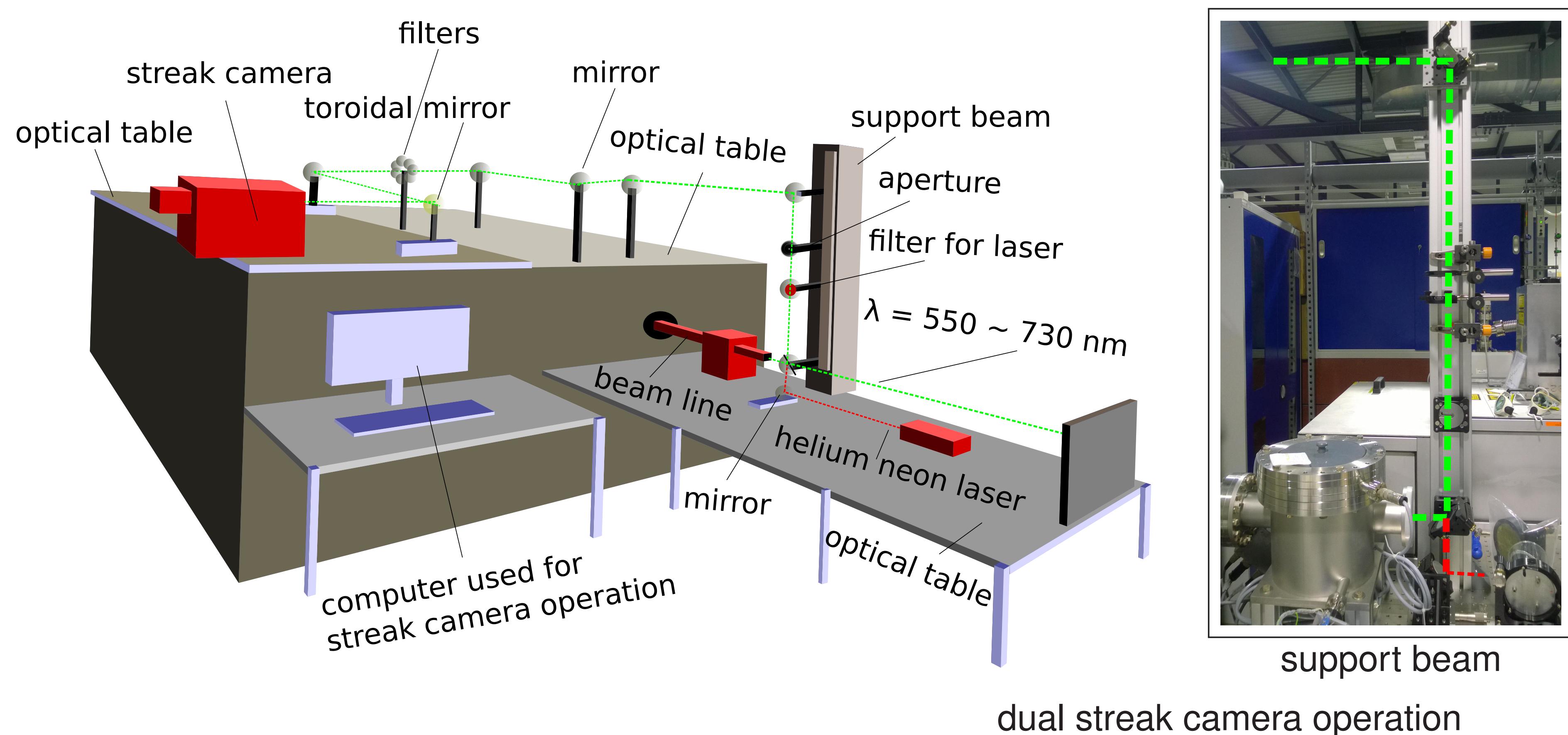
## Introduction

The Helmholtz-Zentrum Berlin is a facility that operates two synchrotron light sources: BESSY II and the MLS. One of the long term goals of this center is to continually make bunch lengths as short as possible in storage rings. A way to go about this is through lattice design by changing the momentum compaction factor. 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 and resonance lines given only a few input parameters from the EPICS control systems.

In order to study shortest bunches, diagnostic tools are needed. A new streak camera was recently purchased for the MLS, and was setup at a beamline above the machine on the second floor. The setup proved to be quite a challenge because of the placement of the camera and beamline. An optical path that needed six degrees ( $x, x', y, y', z, z'$ ) of freedom was setup; this setup also provided the opportunity to operate the old streak camera along side the new camera simultaneously and compare measurements.

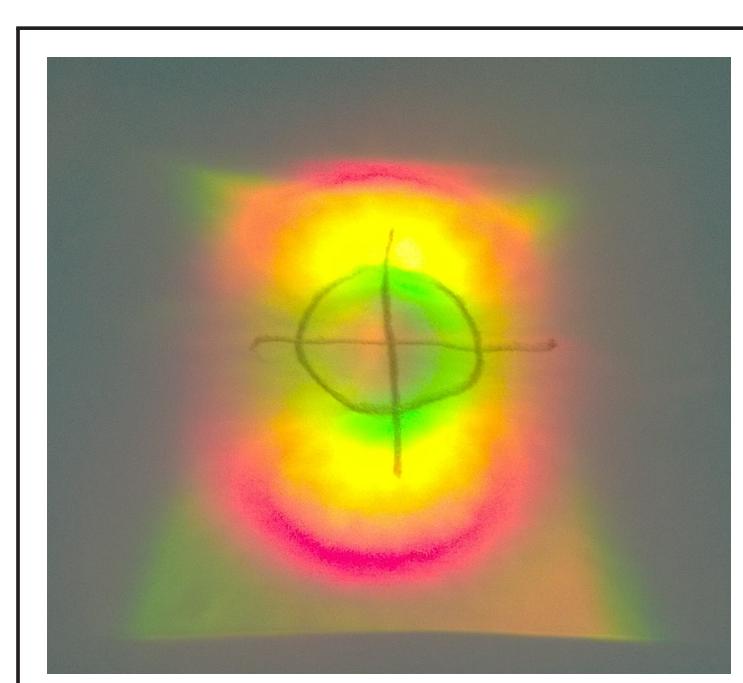


## Streak Camera

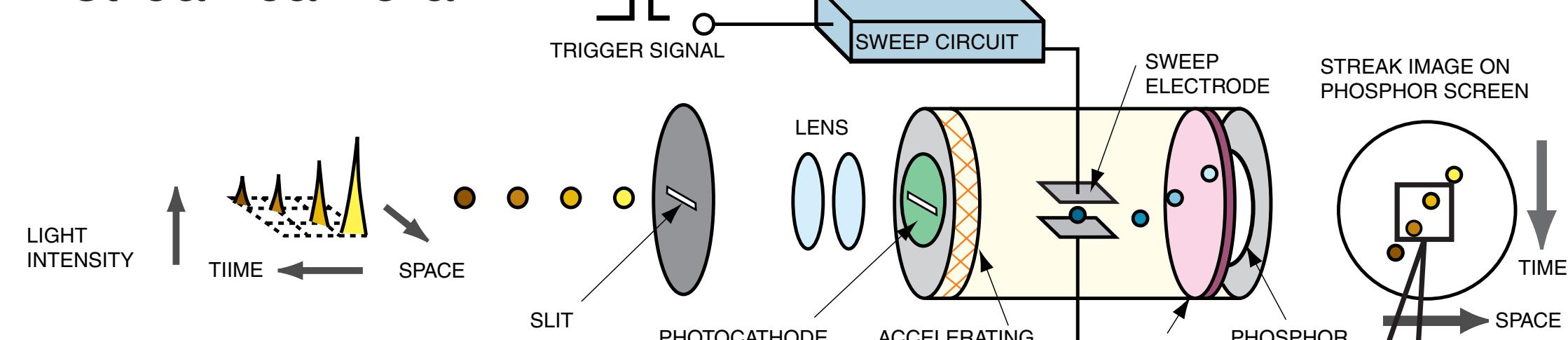


The toroidal mirrors, along with a splitter and a plane mirror, on the optical table are placed on rail systems in order to provide multiple degrees of freedom to adjust for the horizontal and vertical focuses of the beam

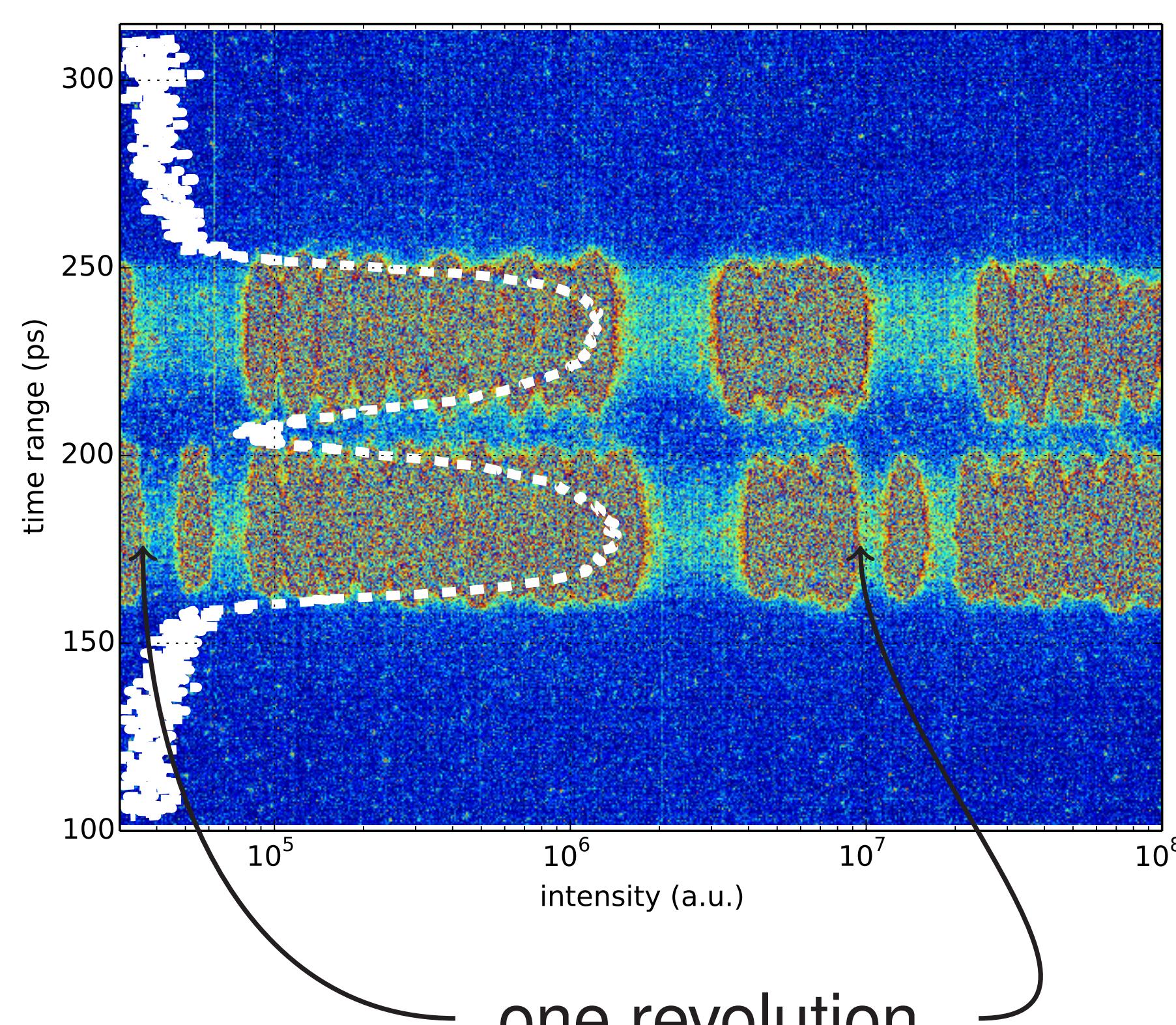
image of beam



operational principle for the streak camera

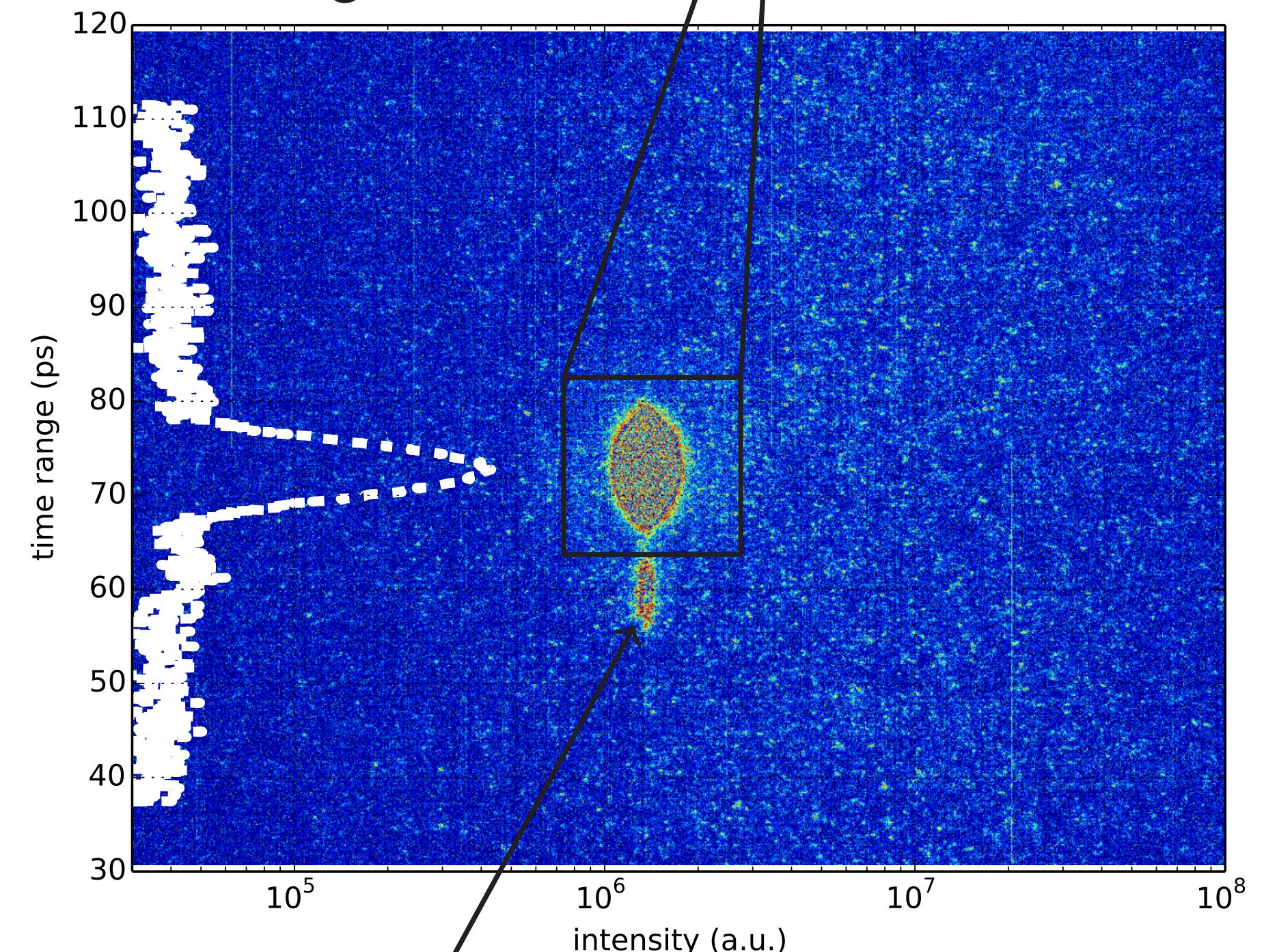


multi bunch measurement



one revolution

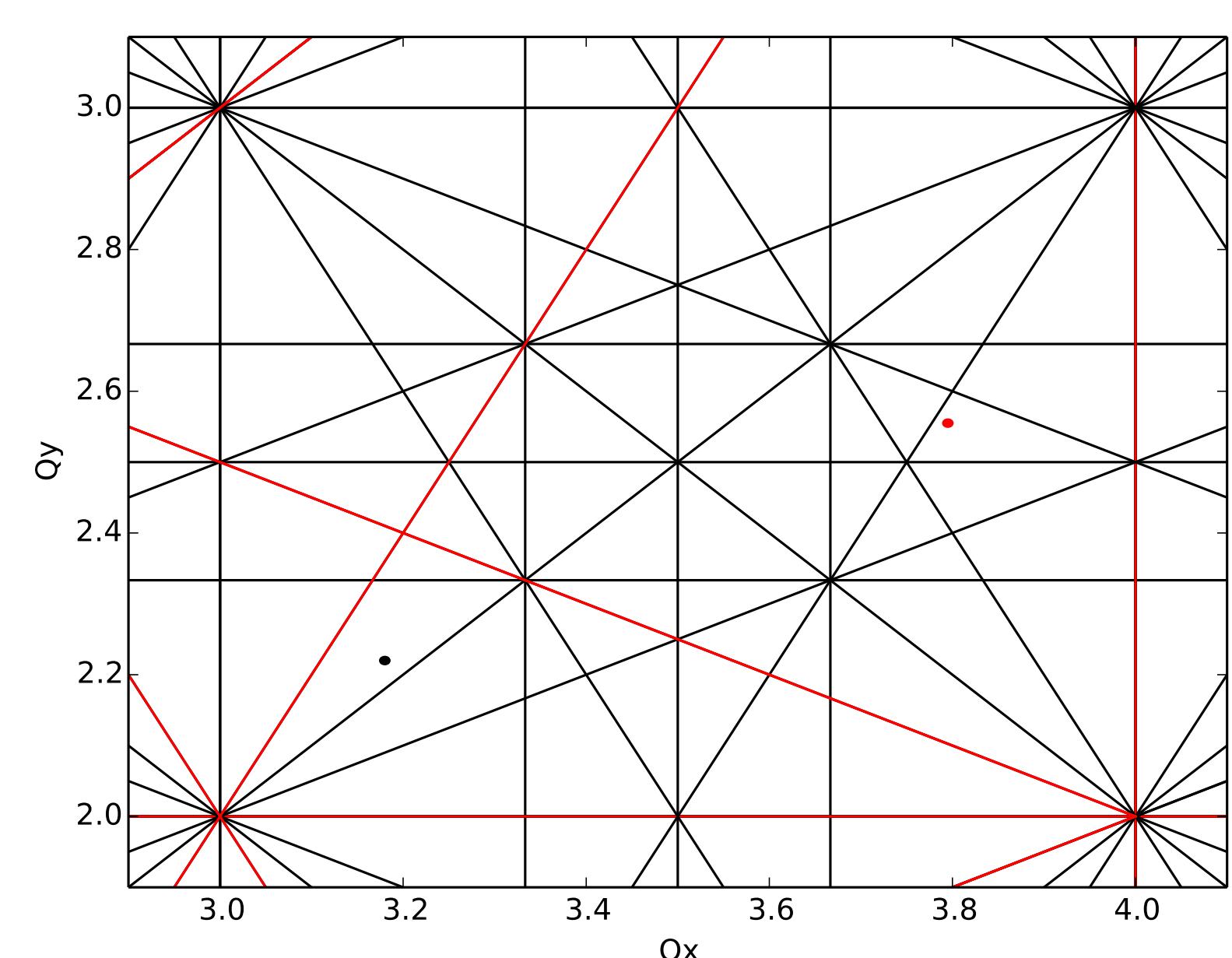
single bunch measurement



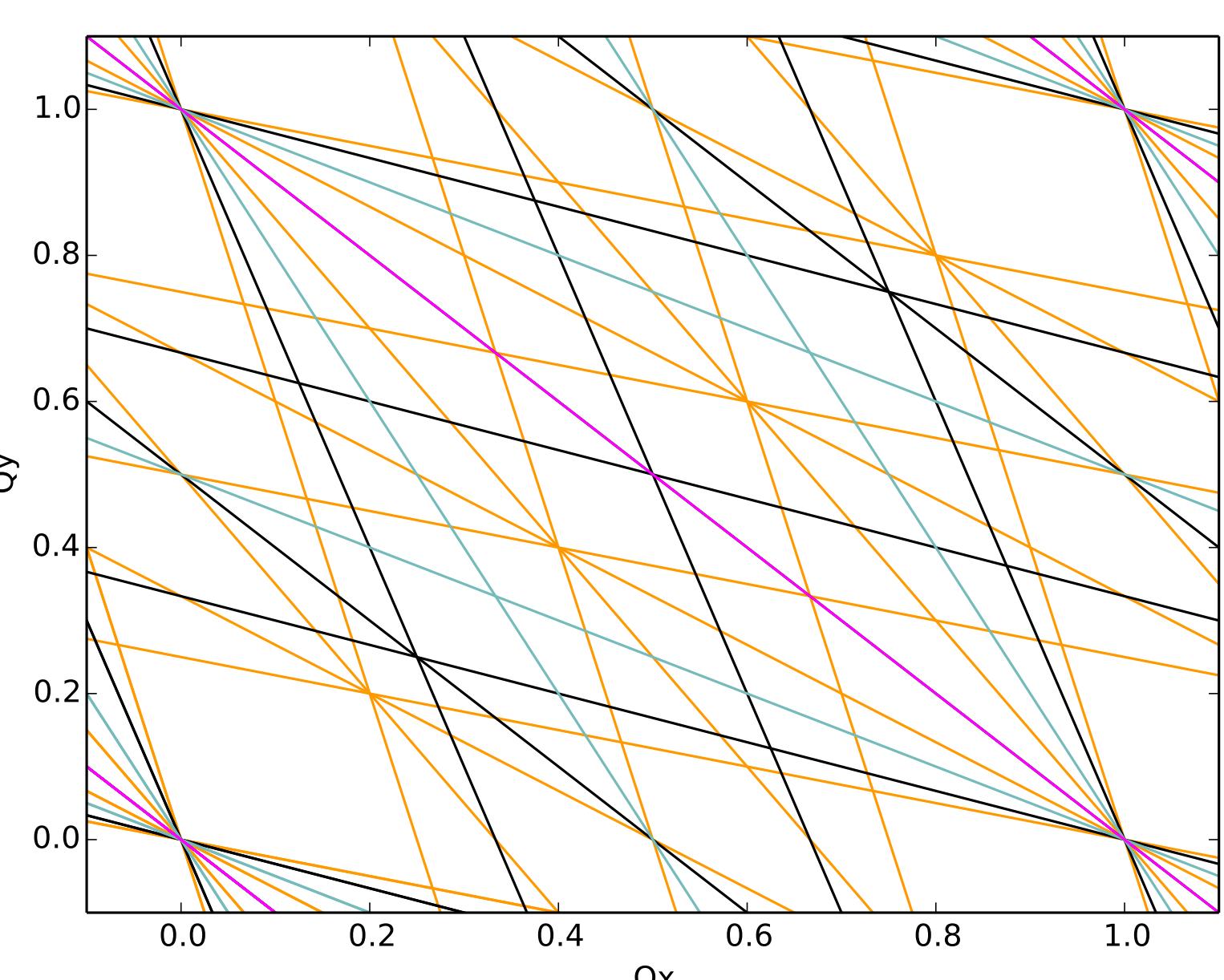
## Tune Resonance Program

### Examples

Third order structural and phase advance resonance lines for the MLS



Fifth order difference resonance lines ordered by color



### Program features

- developed in python
- contains GUI built with wxpython
- integrated with control system tools (epics) through the use of the module 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