

***Design of the beam dump line  
for 10Hz operation***

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# Introduction

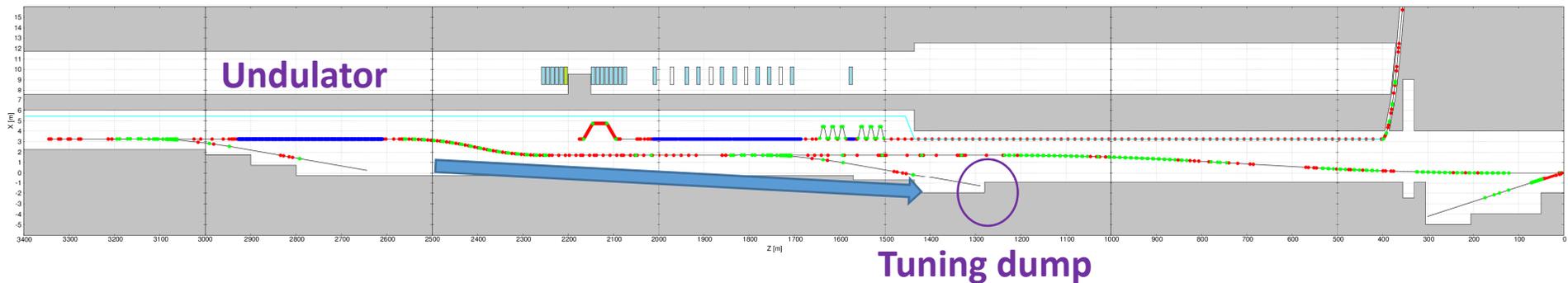
In order to make a positron for low energy operation, the 10Hz operation was proposed.

Since the beam energy of physics experiment is smaller than the electron beam for positron generation, the beam for positron generation can not use the physics experiment.

We must dump the electron beam to tuning dump (full-spec dump).

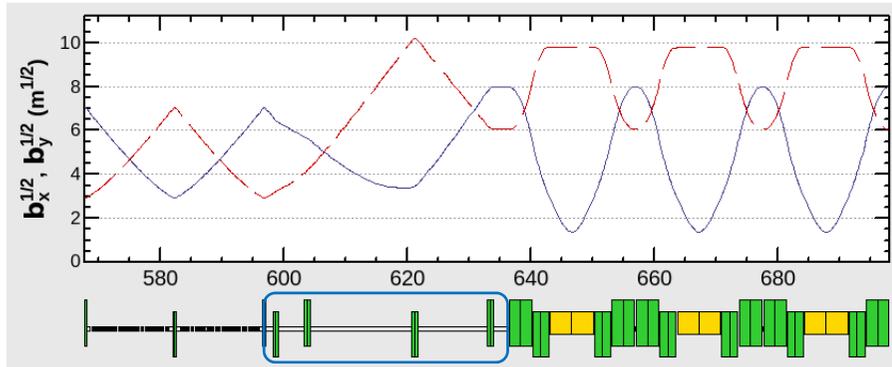
***I will introduce one of the design of the beam dumpline for 10Hz operation.***

*The beam transport in ML and undulator with different energy (100GeV to IP, and 150GeV for positron generation ) was not taken into account.*



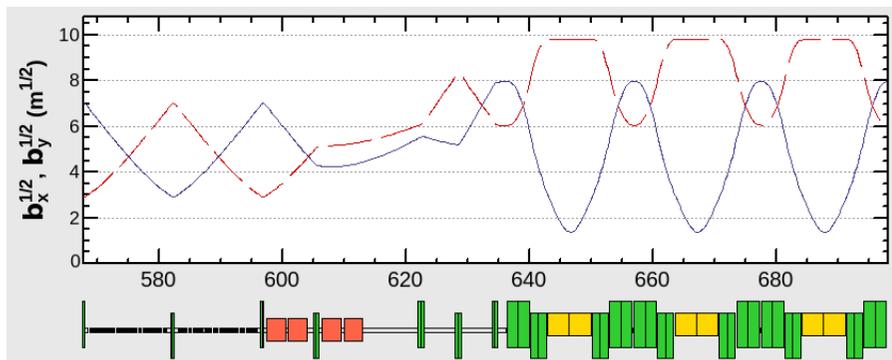
# Beam extraction after undulator

## Original beamline design



Undulators      Matching Section      Dogleg

## Modified beamline design for 10Hz operation

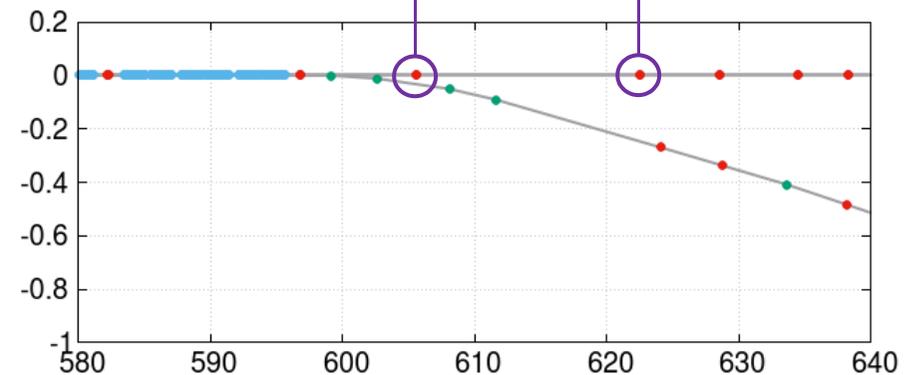


### 24cm from BDS line

- extracted beam goes outside of the quadrupole magnet.

### 3cm from BDS line

- extracted beam goes inside of the quadrupole magnet.  
- need a large aperture magnet

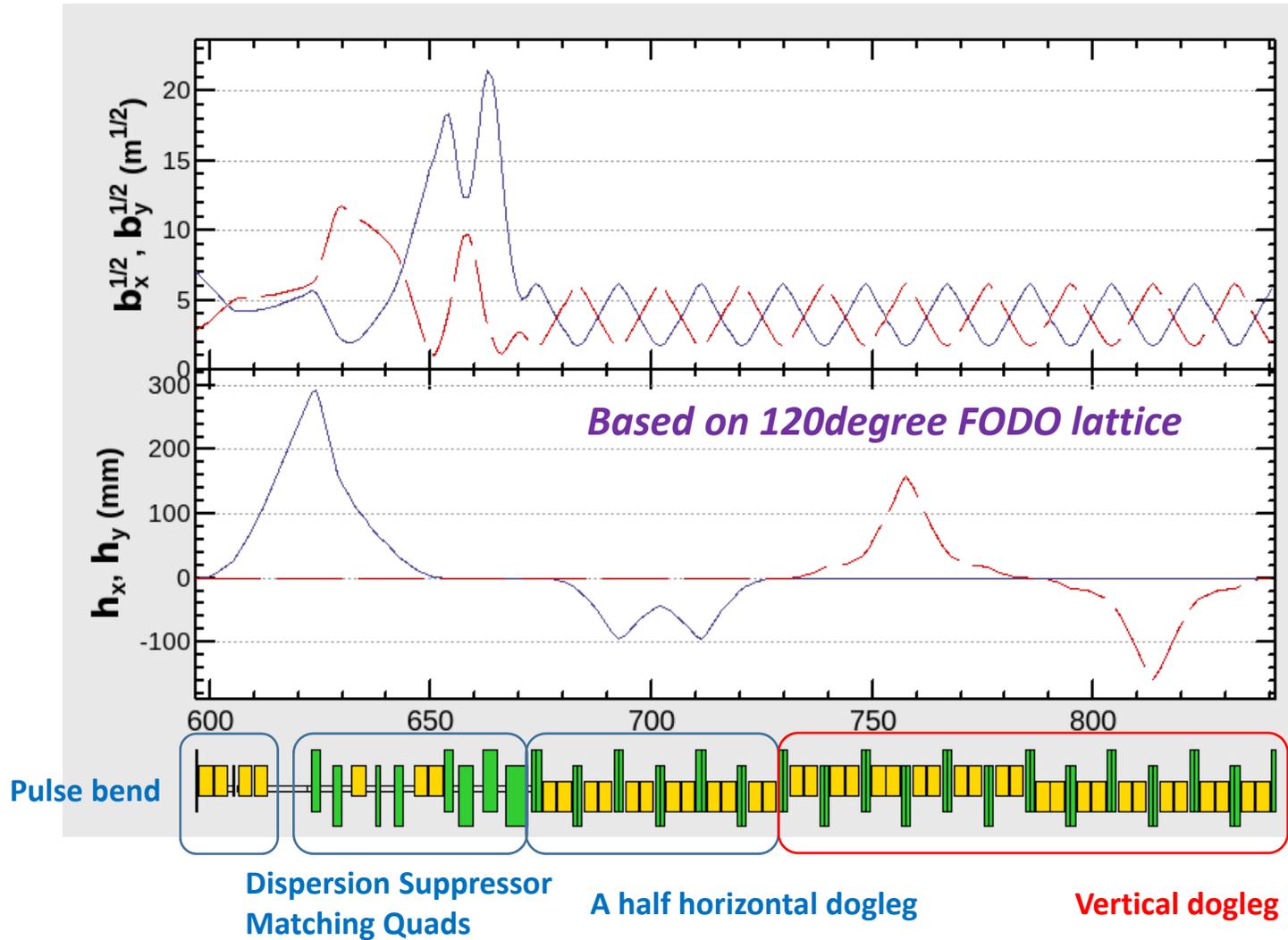


- Arrangement of matching quads were changed (same beamline length).
- Put the pulse bending magnets ( 5kG ) for beam extraction.

# Upstream Horizontal & Vertical Doglegs

180cm shifted for horizontal

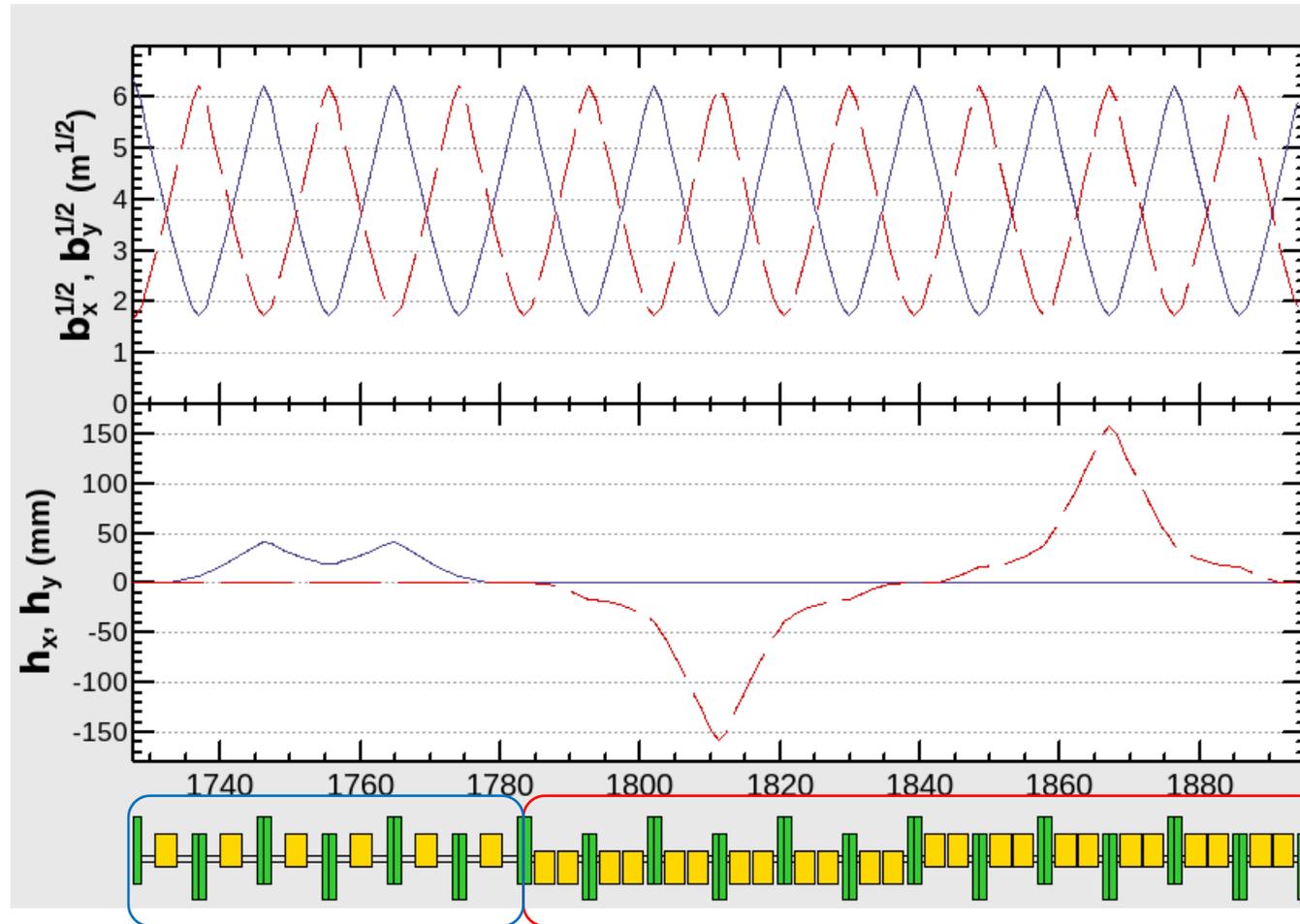
120cm shifted for vertical



# *Dounstream Horizontal Bends & Vertical Doglegs*

9.5mrad horizontal arc

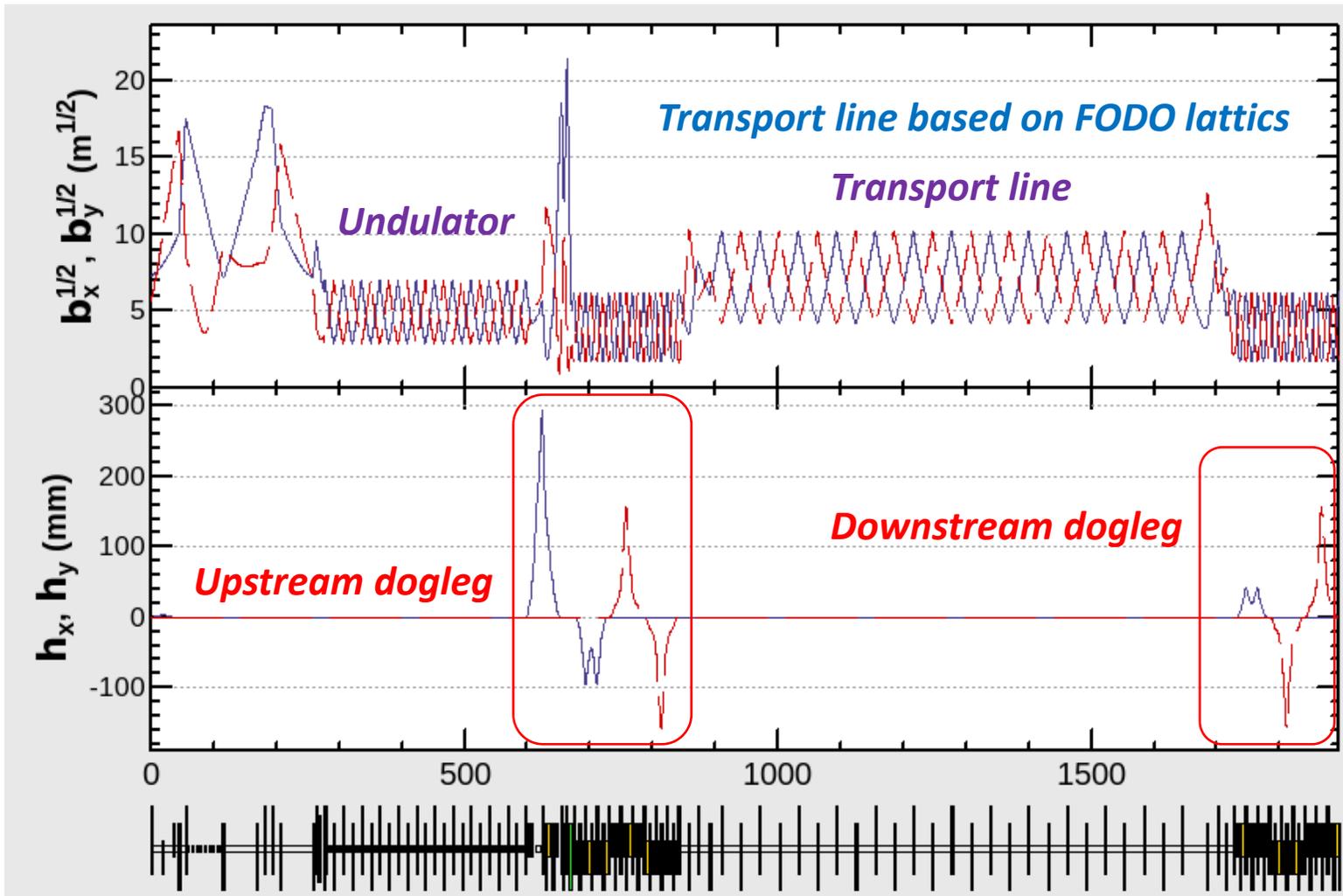
120cm shifted back for vertical



Horizontal arc based on  
a half horizontal dogleg

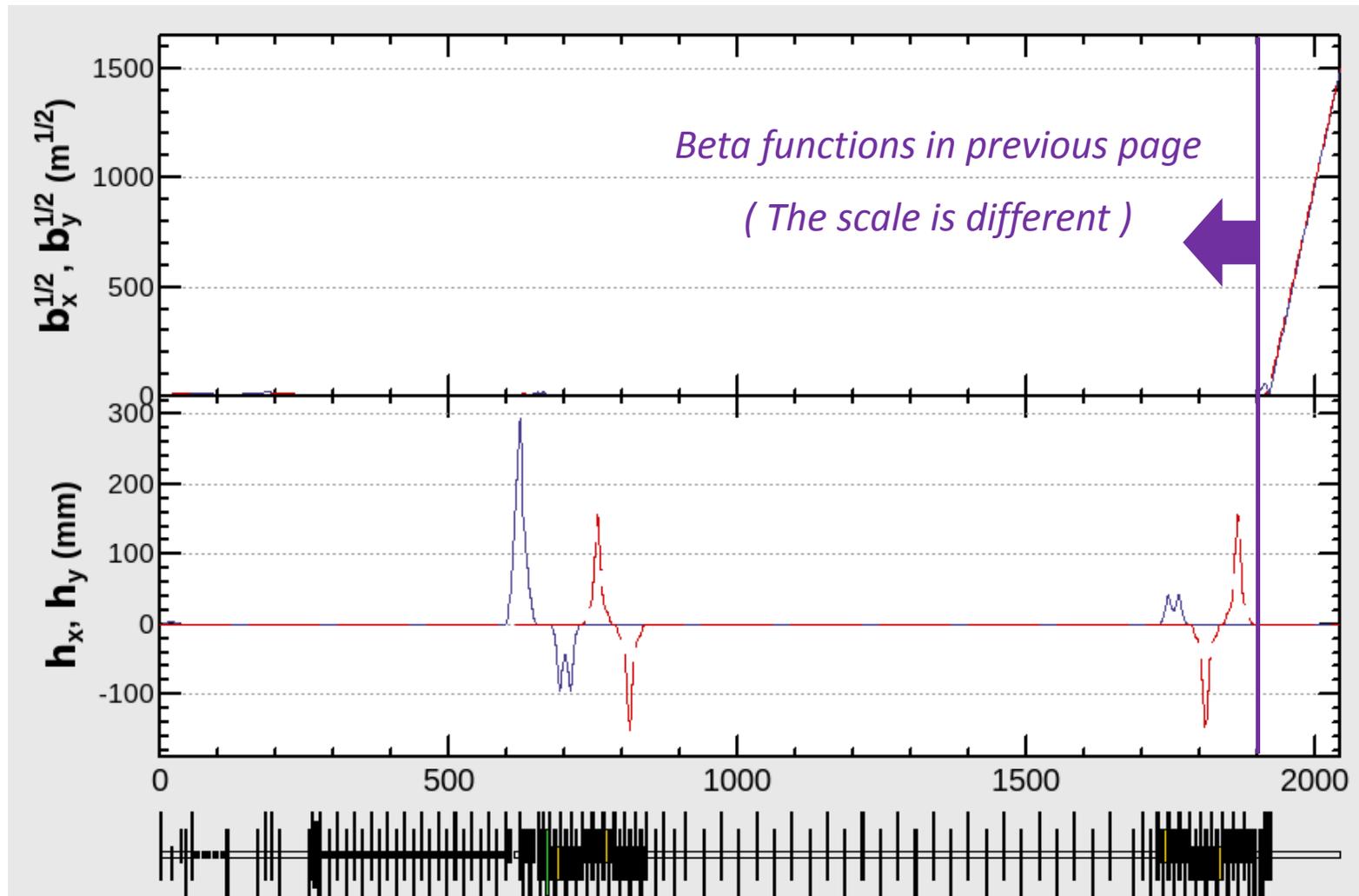
Vertical Dogleg

# The beam optics of total transport beamline

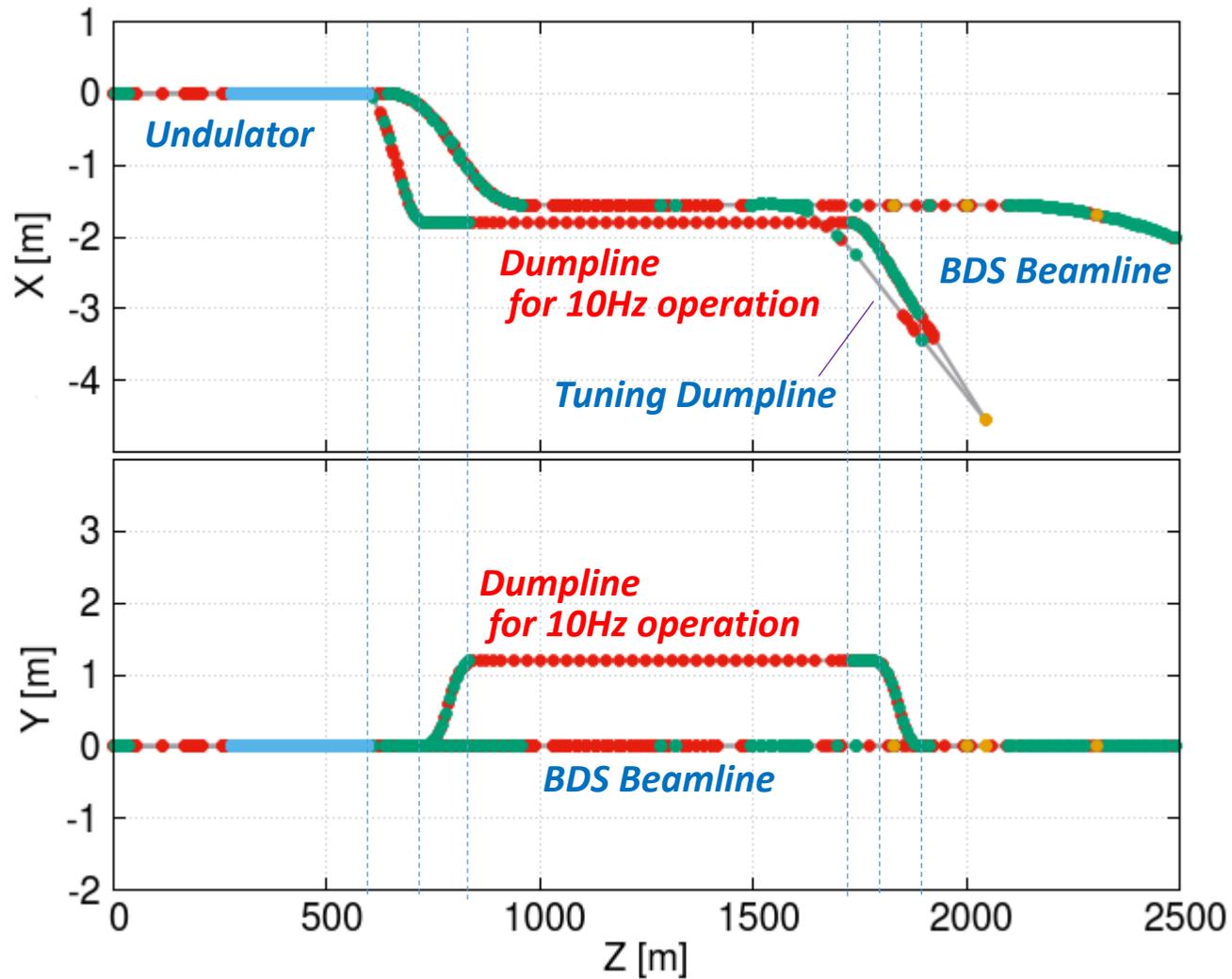


## The beam optics to the tuning dump

*Beam size at dump was increased to minimize the damage of dump window.*



# Geometry of the beam transport line from undulator to tuning dump



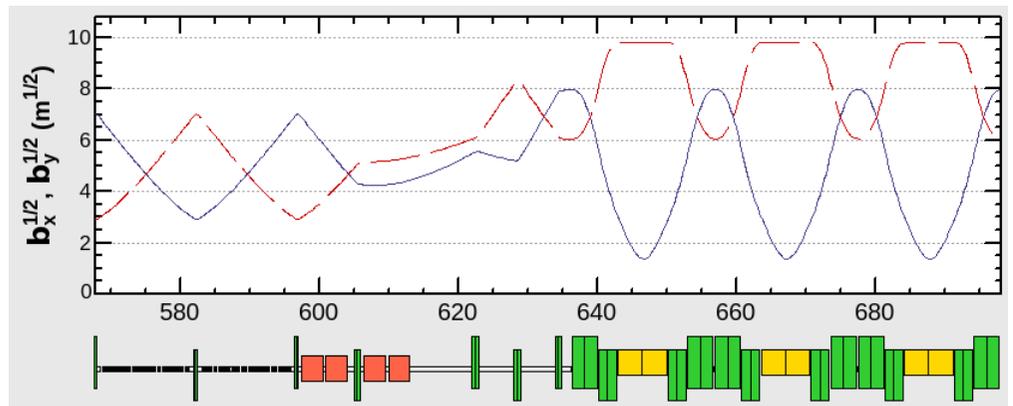
## Comment

It is better to lengthen the matching section in between undulator and dogleg in order to make the beamline design reliable, even though I designed the beam transport line by the present beamline arrangement.

We must put additional matching quadrupoles to BDS beamline, because the beam energy for BDS and dumpline and matching parameters were different. ( 1 matching quadrupole is common for BDS and dumpline. )

But, we do not have enough space to put the additional matching quadrupoles.

- *Remove some undulators for 10Hz operation ?*
- *The total beamline lengthen ?*



Put additional 1 or 2 quads  
Common for both beamline