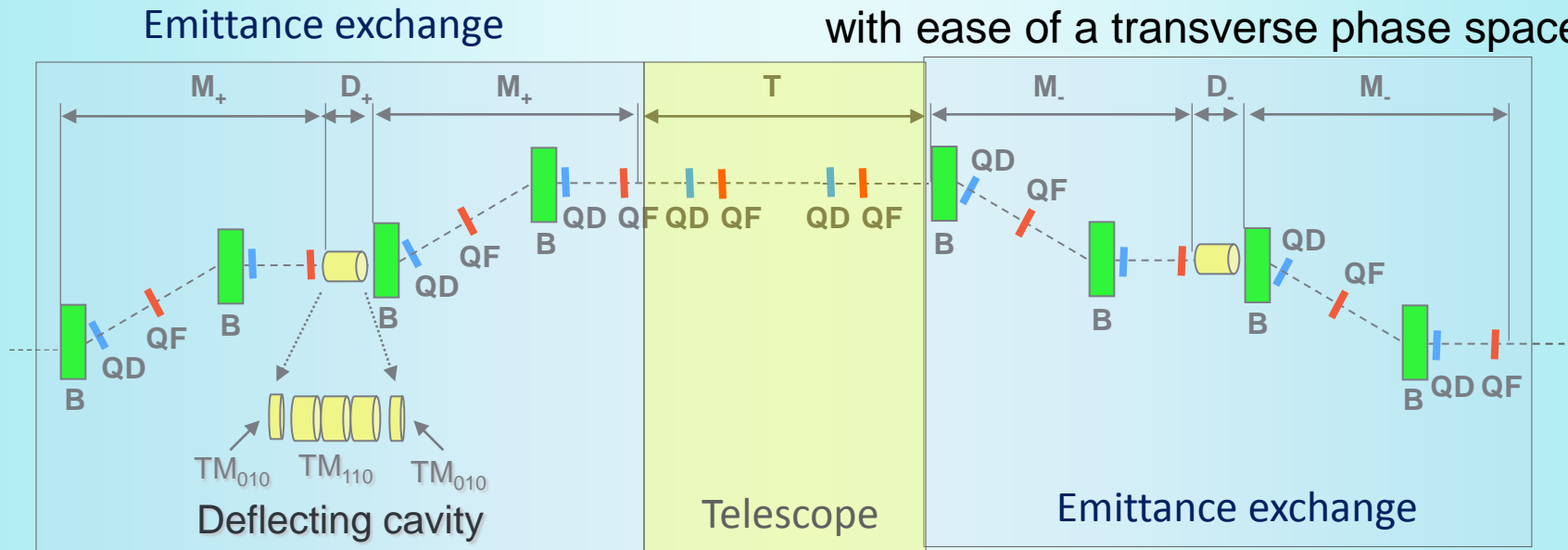


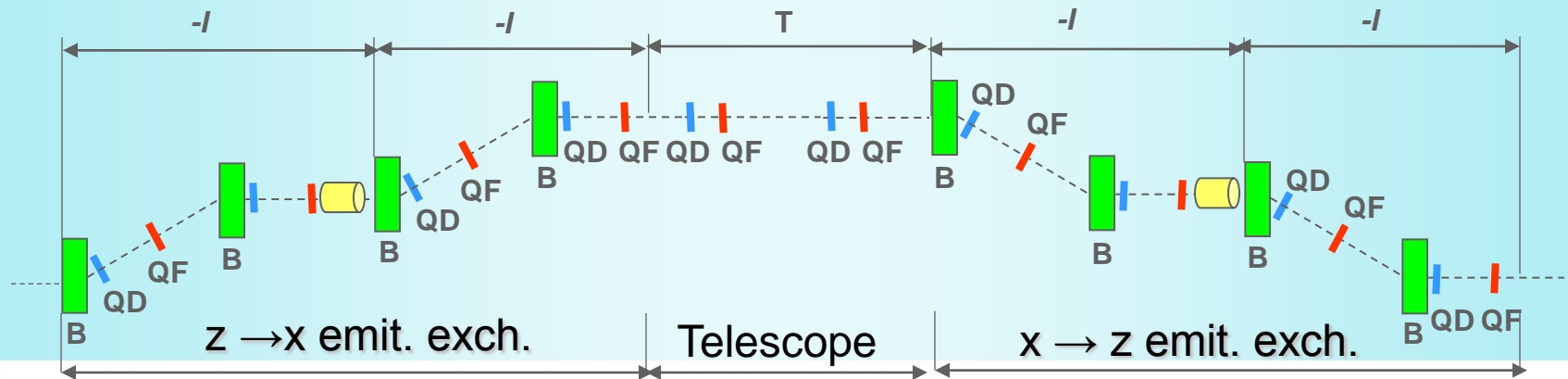
Efficient manipulation of electrons in the longitudinal phase space

A schematic of the bunch compressor

(manipulate longitudinal phase space with ease of a transverse phase space)



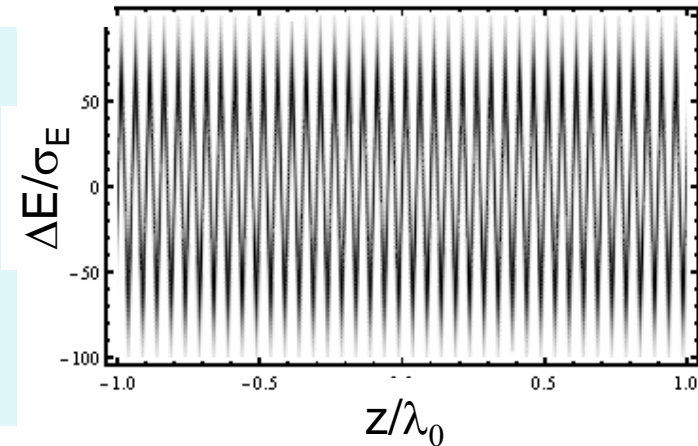
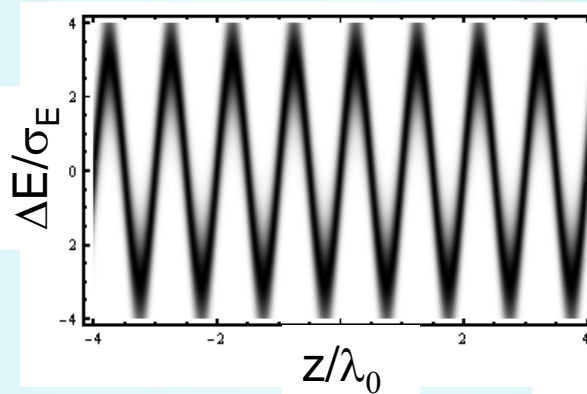
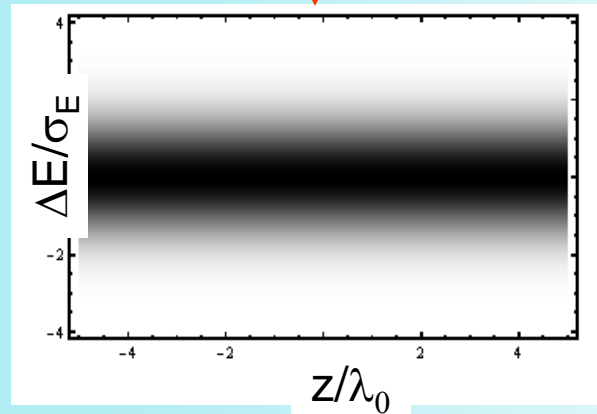
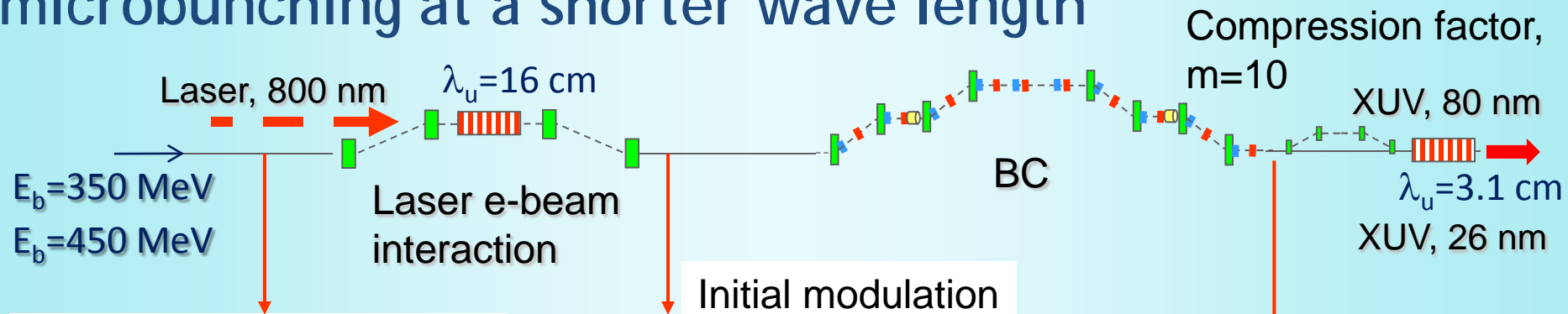
Focusing properties of individual sections



Few examples of application



Compression of the laser induced energy modulation for microbunching at a shorter wave length

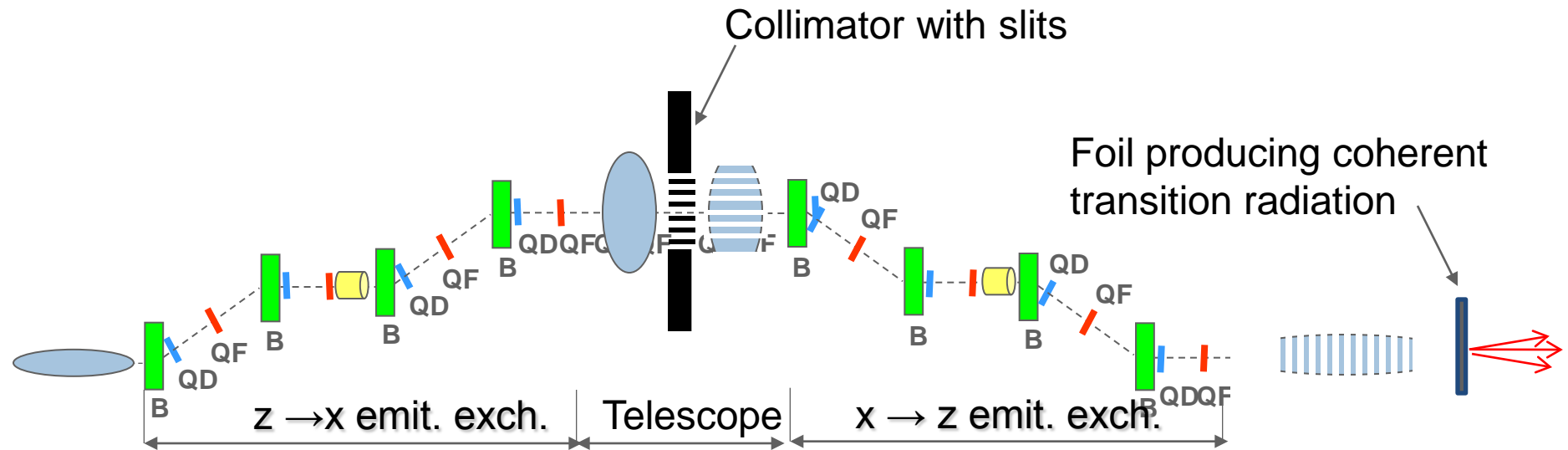


Bunching efficiency at m -th harmonic of modulating frequency:

HGHG:	$ b_m \propto e^{-\frac{1}{2} \left(\frac{m \sigma_E}{\Delta E} \right)^2}$
EEHG:	$ b_m \propto m^{-1/3} \frac{\sigma_E}{\Delta E}$
This method:	$ b_m \propto m^0$

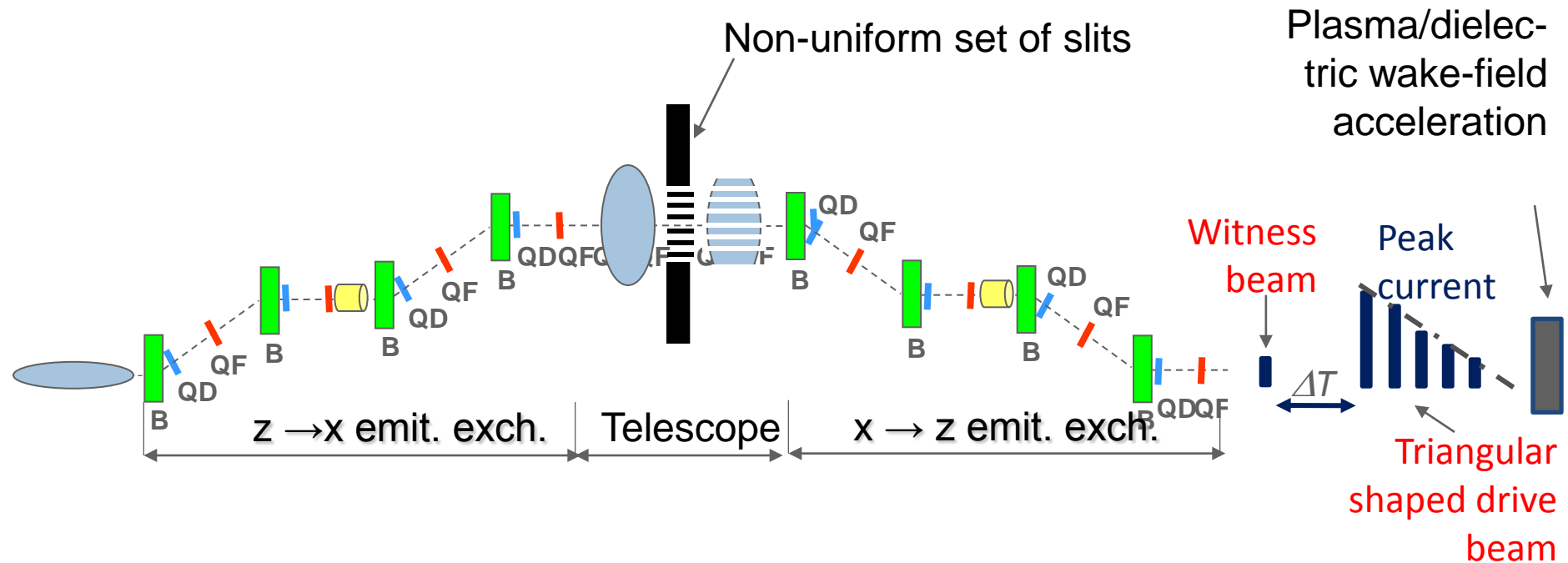
Plots of longitudinal phase space at various locations

It is possible to create a sequence of a tightly spaced microbunches using a sequence of slits



Using demagnification of the beam size before slits and magnification after the slits can help to obtain a real tight spacing of microbunches

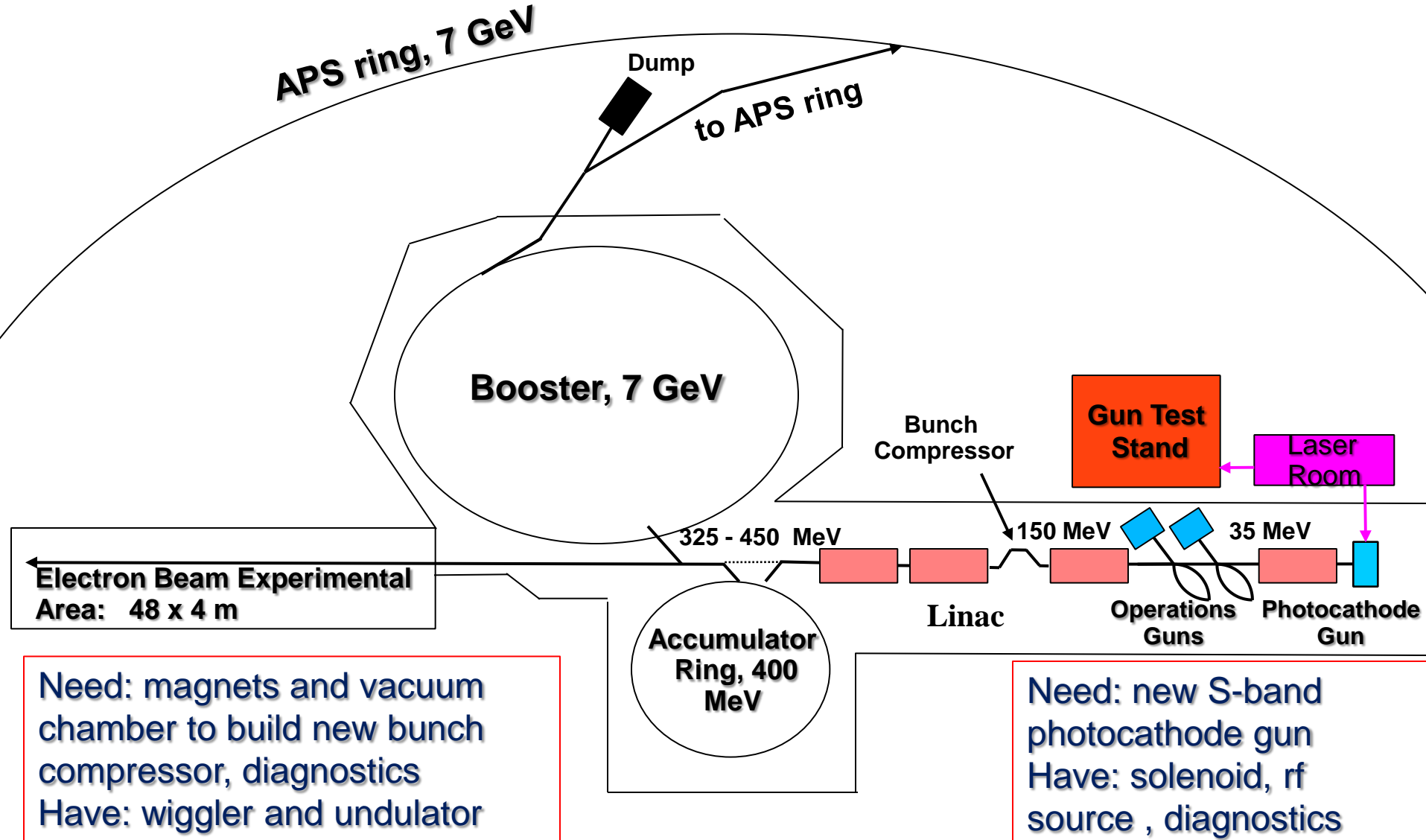
Wake-field acceleration



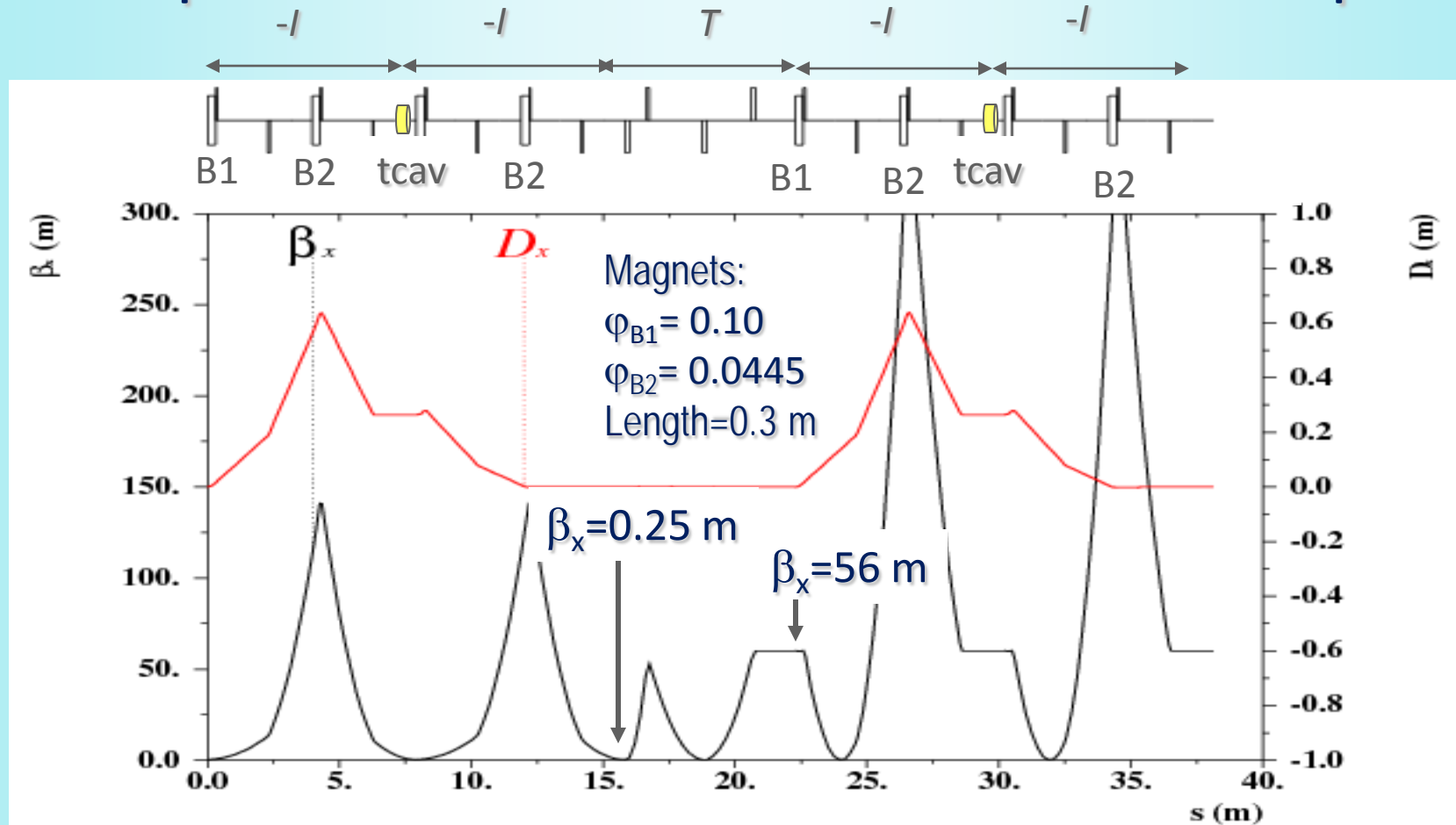
Shaping e-bunch peak current to control and prepare a coherent wake-field excitation

A proposal to do a test experiment at the APS Injector

Injector is available ~ 40 days/year (parallel to APS operation)



An example of the lattice for a new bunch compressor



Lattice functions for a bunch compressor with a telescopic factor $m=15$.
Note, matching of the vertical beta-function was not pursued.