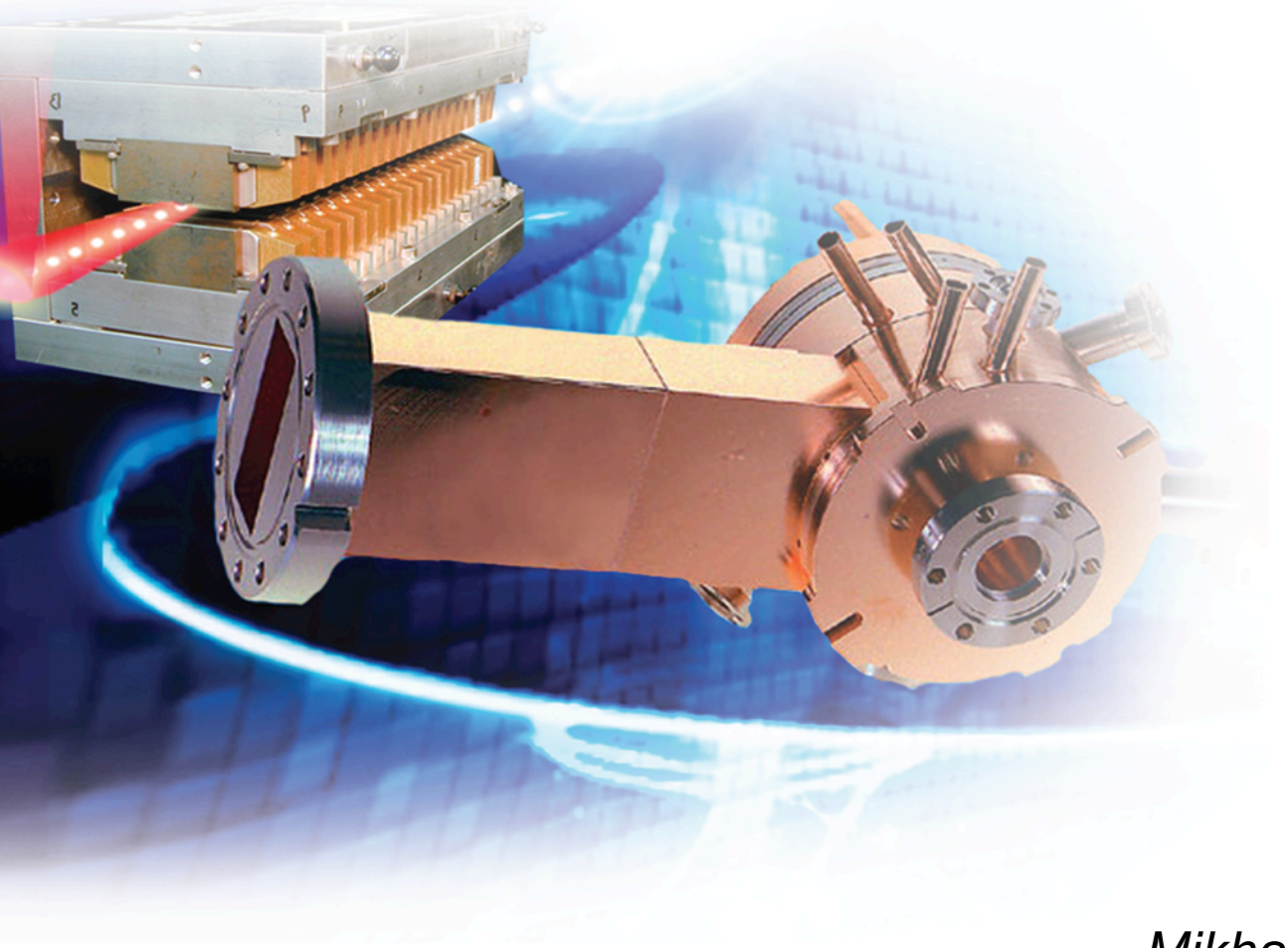


Mikhail Fedurin

Yichao Jing, Yuan Wu, Diktys Strakatis

ATF II Lattice

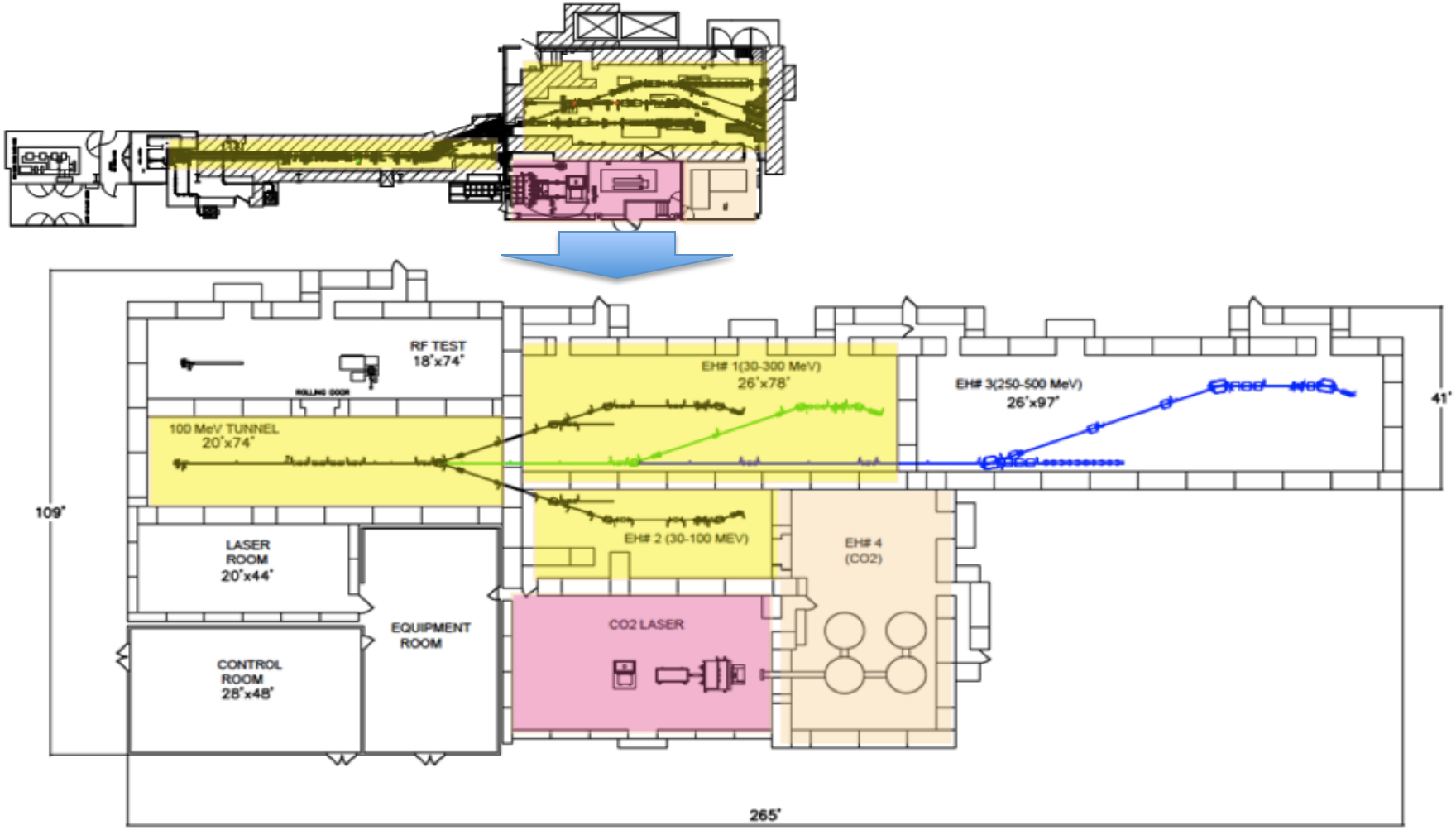
BROOKHAVEN NATIONAL LABORATORY
a passion for discovery

U.S. DEPARTMENT OF ENERGY | Office of Science

ATF II Lattice. Concept.

- Have to contain all present ATF advantages:
  - Bright beam
  - Flexible, tunable lattice
  - Bunch compression
  - Mask technique
  - Small beam at IP
  - Adjustable spectrometer
- + New e-beam capabilities

ATF need more space

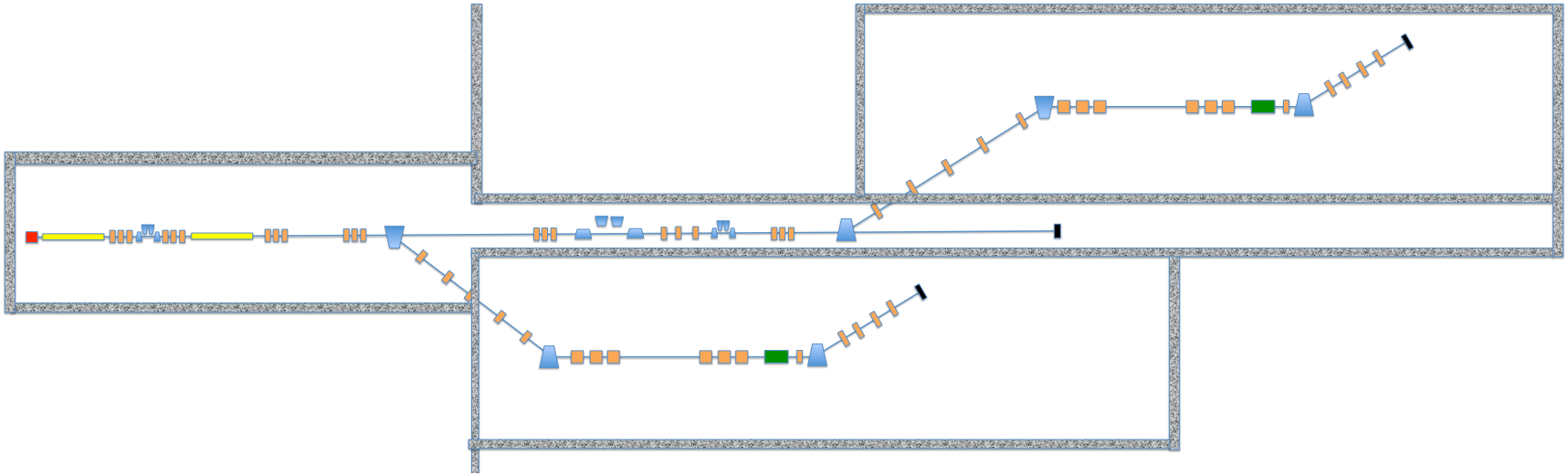


ATF II Lattice.
New e-beam parameter

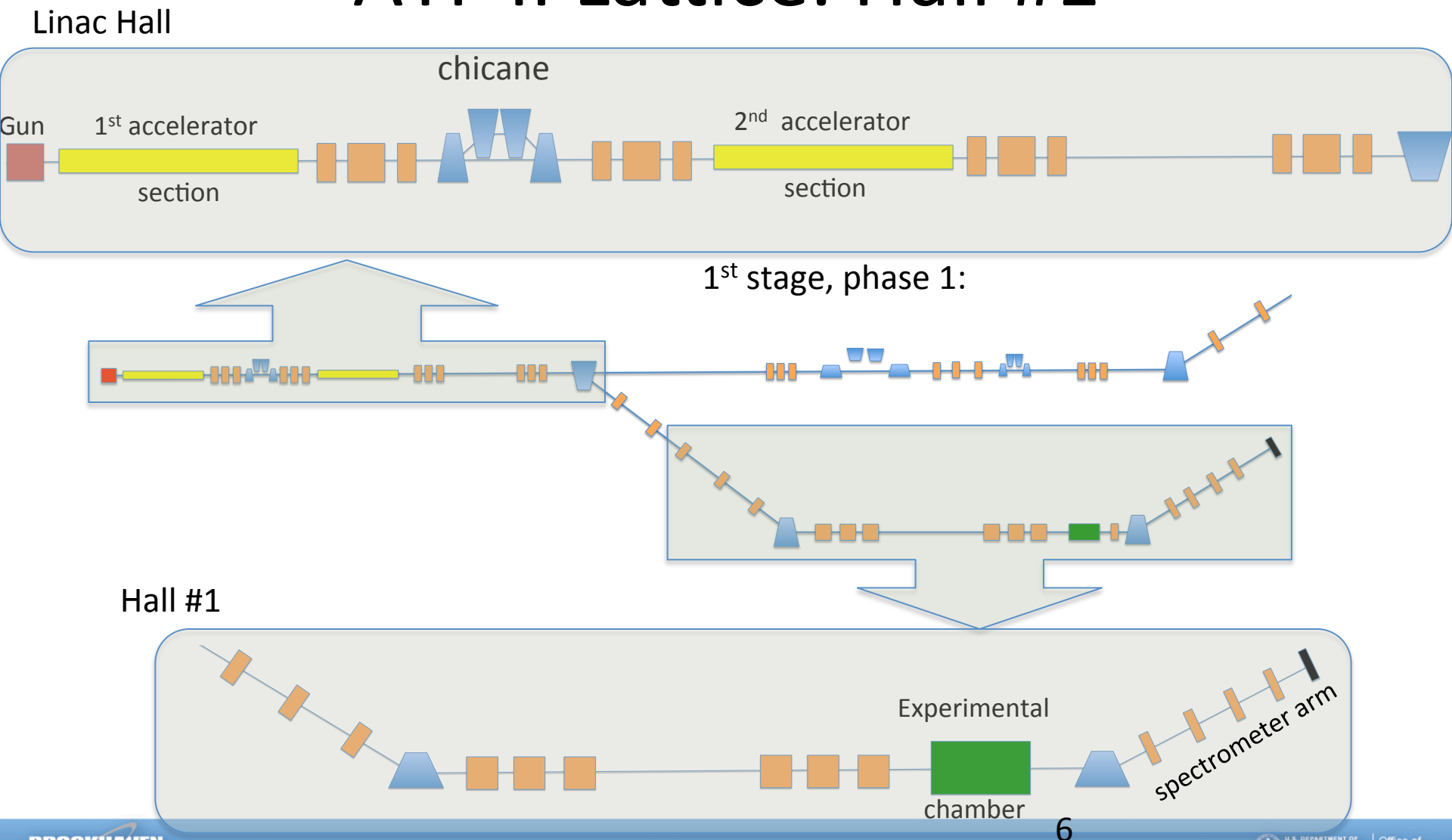
10 fsec bunch!

Need to fit 20 meter advanced bunch compressor configuration (10 fsec, 800 amp)© Yichao Jing (next talk)

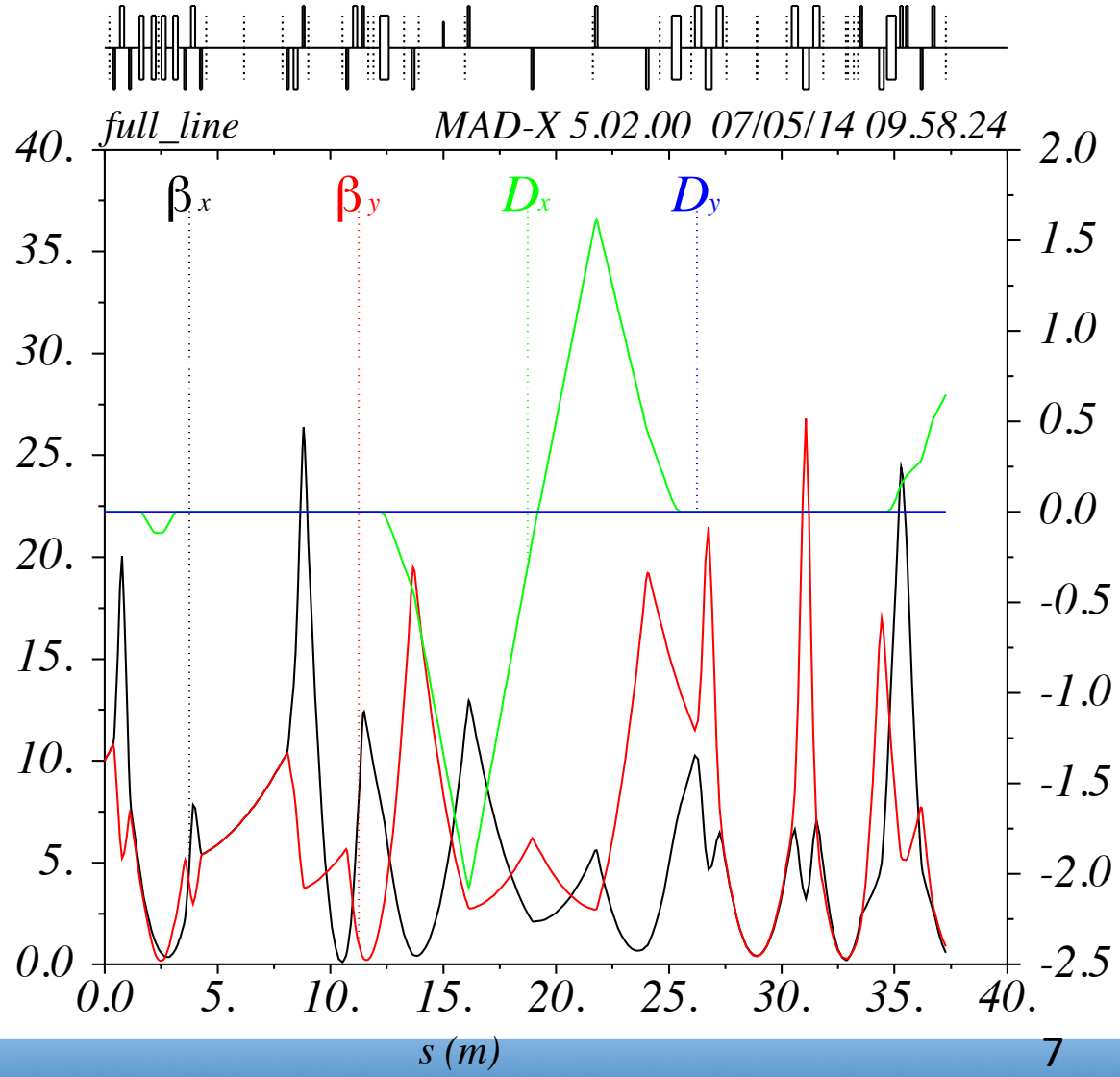
ATF II Lattice. Stage 1 upgrade configuration with bunch compression



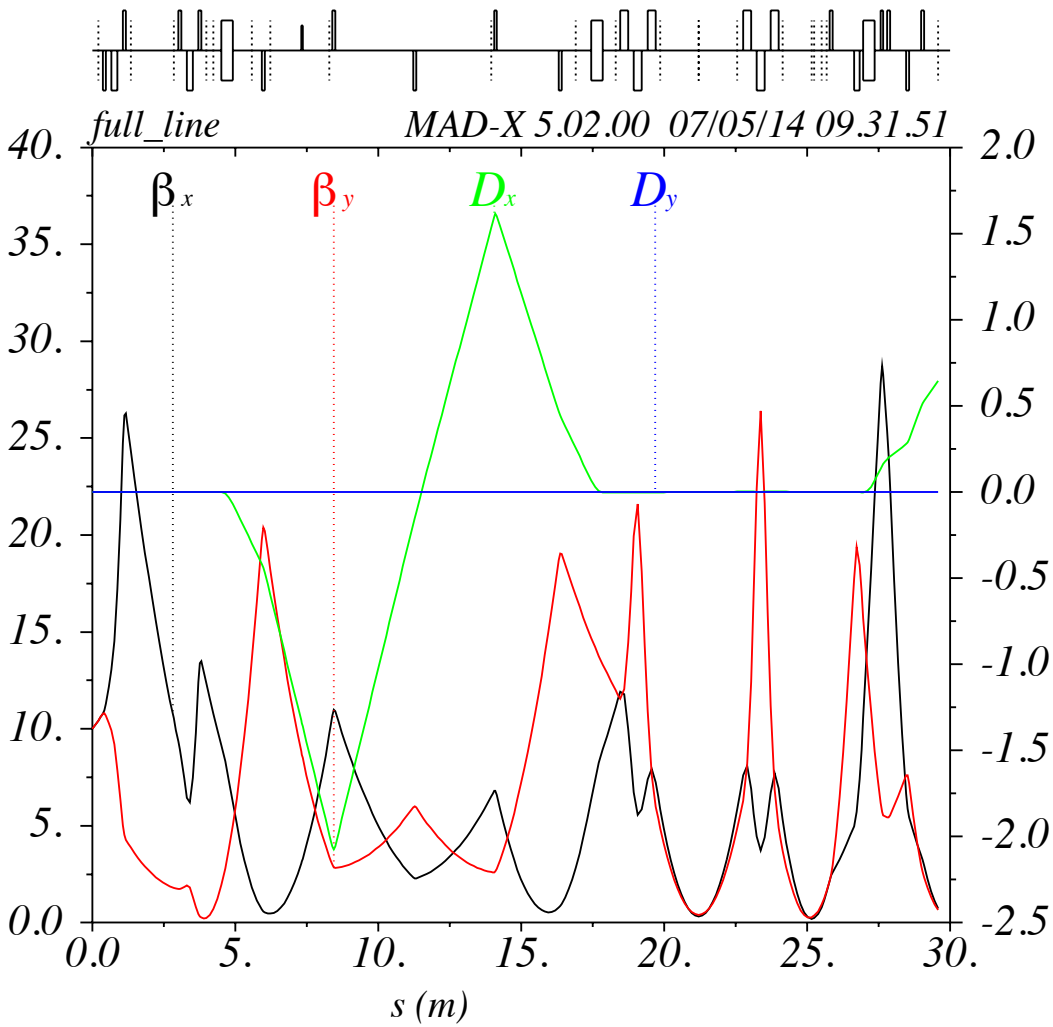
ATF II Lattice. Hall #1



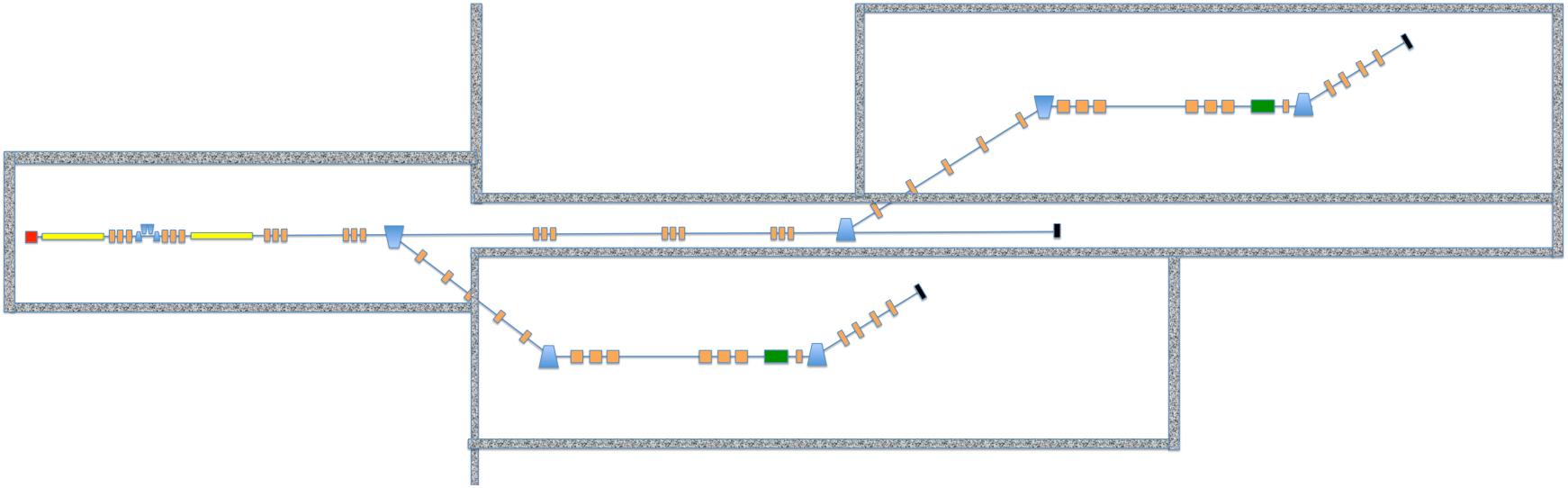
ATF II Lattice. 70 MeV beamline



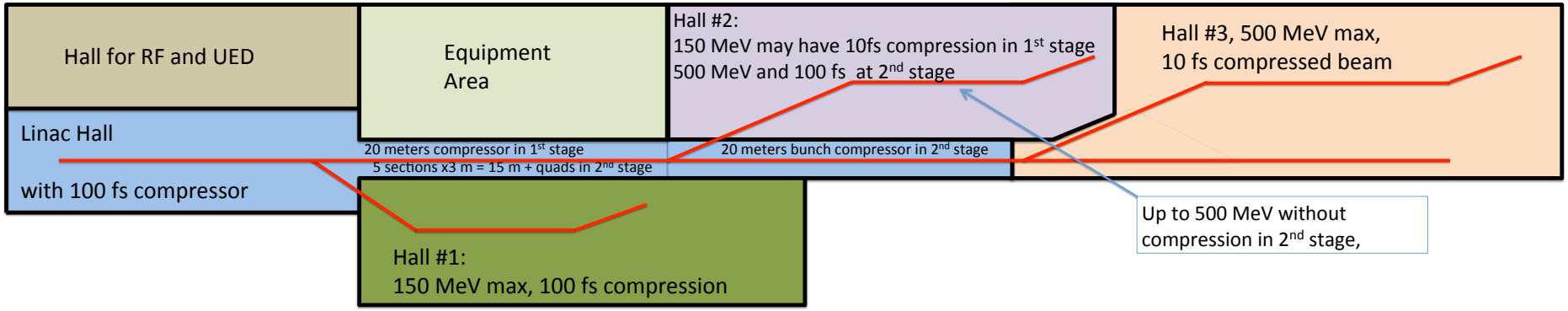
ATF II Lattice. 150 MeV beamline



ATF II Lattice. Stage 1 upgrade configuration without bunch compressor



ATF II Lattice. Thinking about 2nd stage upgrade



500 MeV /70 MeV => 7 acc sections

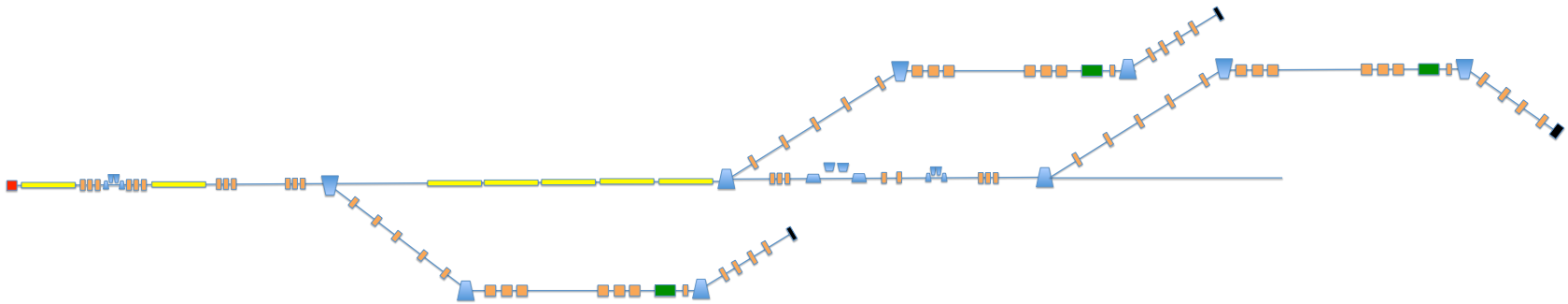
2 acc sections in Linac Hall => 150 MeV for Hall #1

2+5 acc sections in Hall #2 => 150+ 350 MeV

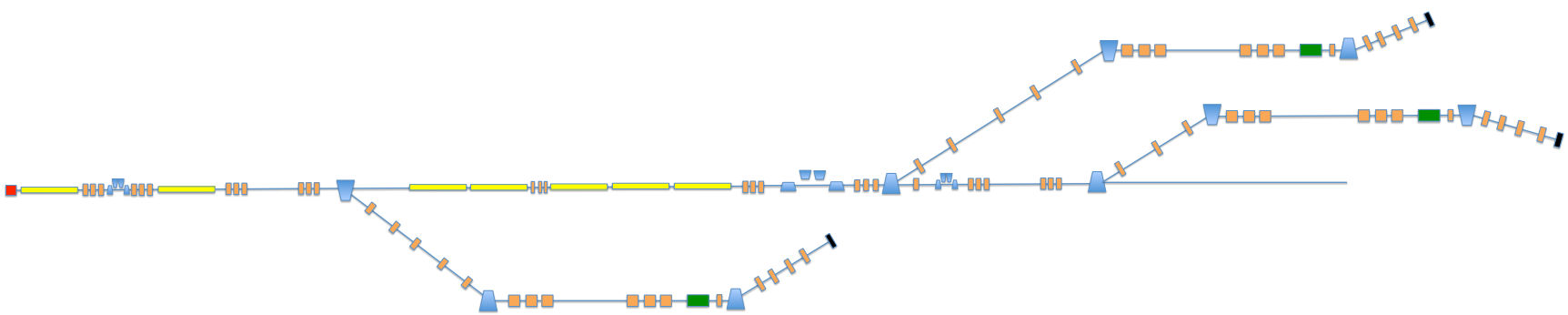
5 x3 m = 15 m – will fit in to 2nd stage compressor length

Shifting compressor configuration to 500 MeV line

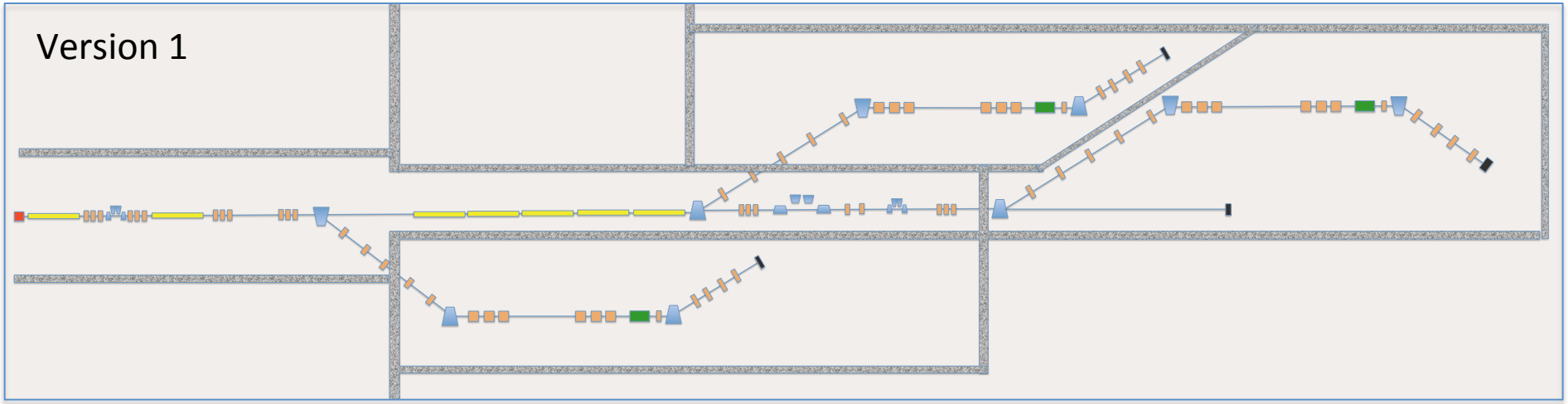
ATF II Lattice. 150 MeV and 500 MeV beamlines



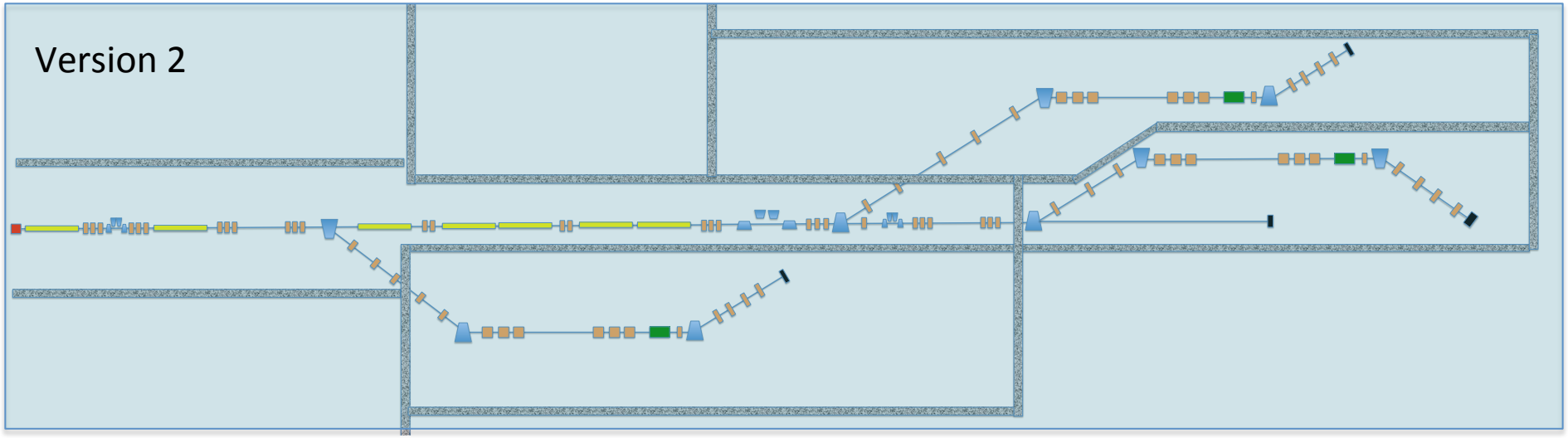
OR:



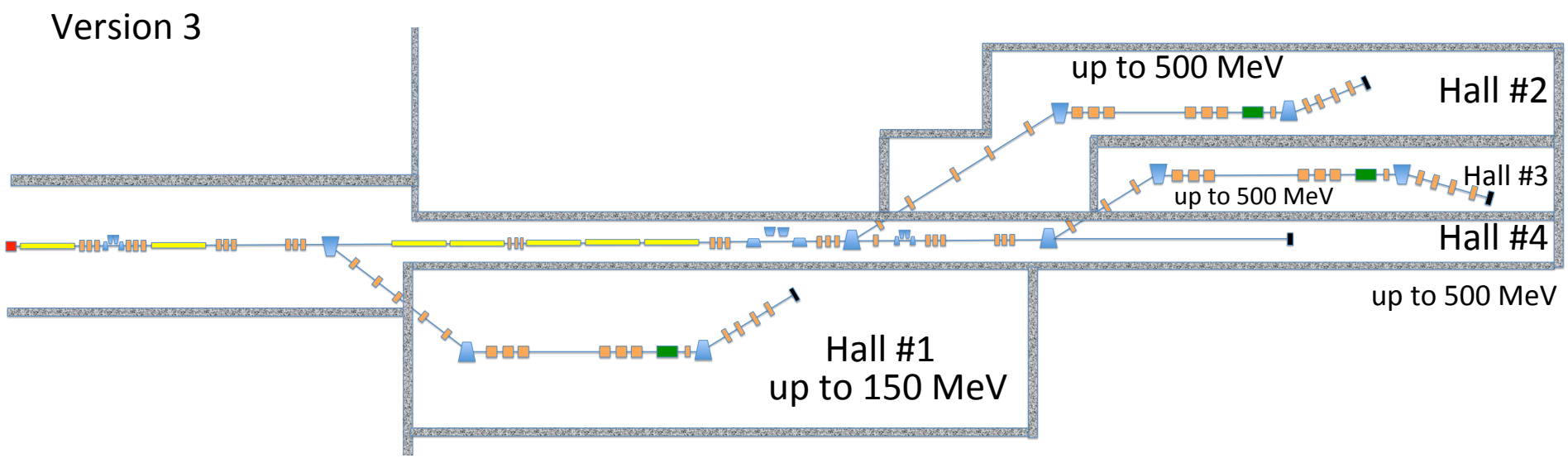
ATF II Lattice. 150 MeV and 500 MeV beamlines



OR:

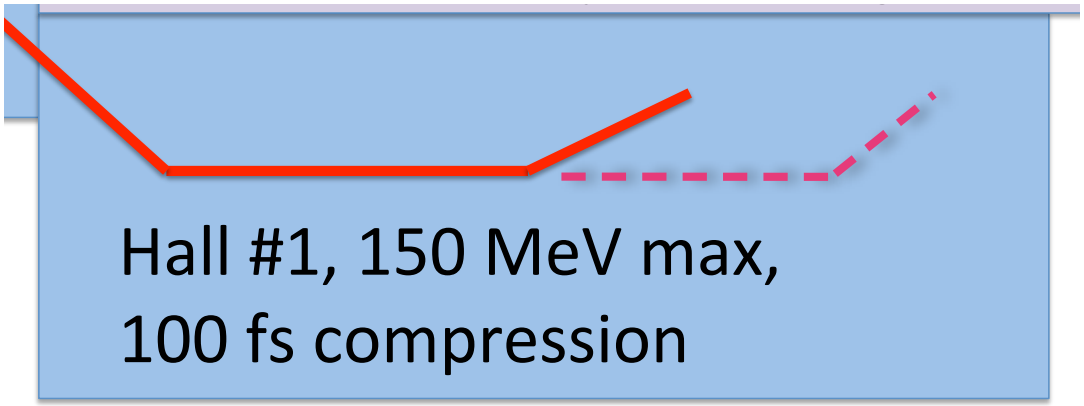


ATF II Lattice. 150 MeV and 500 MeV beamlines

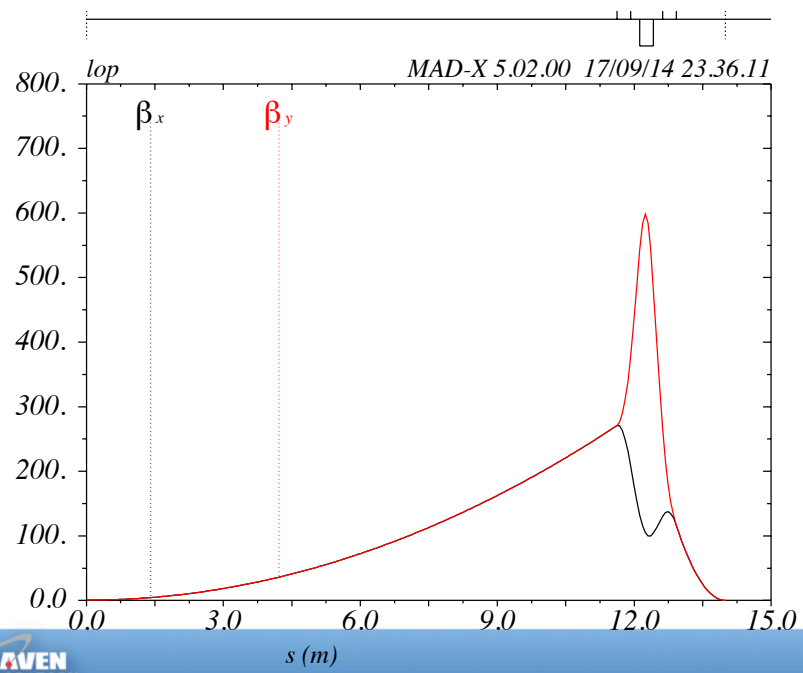


4 independent experimental halls!

ATF II Lattice. Small beams



Besides PMQ triplets (with short focus length!) used in experimental chambers, ATF II experimental halls will have possibility to extend beamlines to get tunable small beamsize

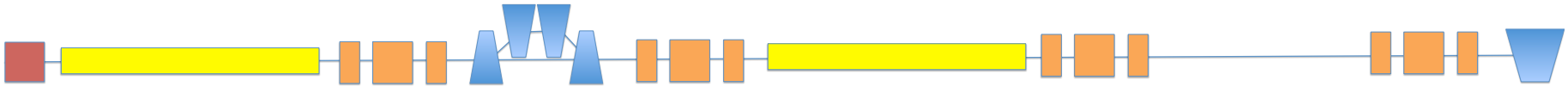


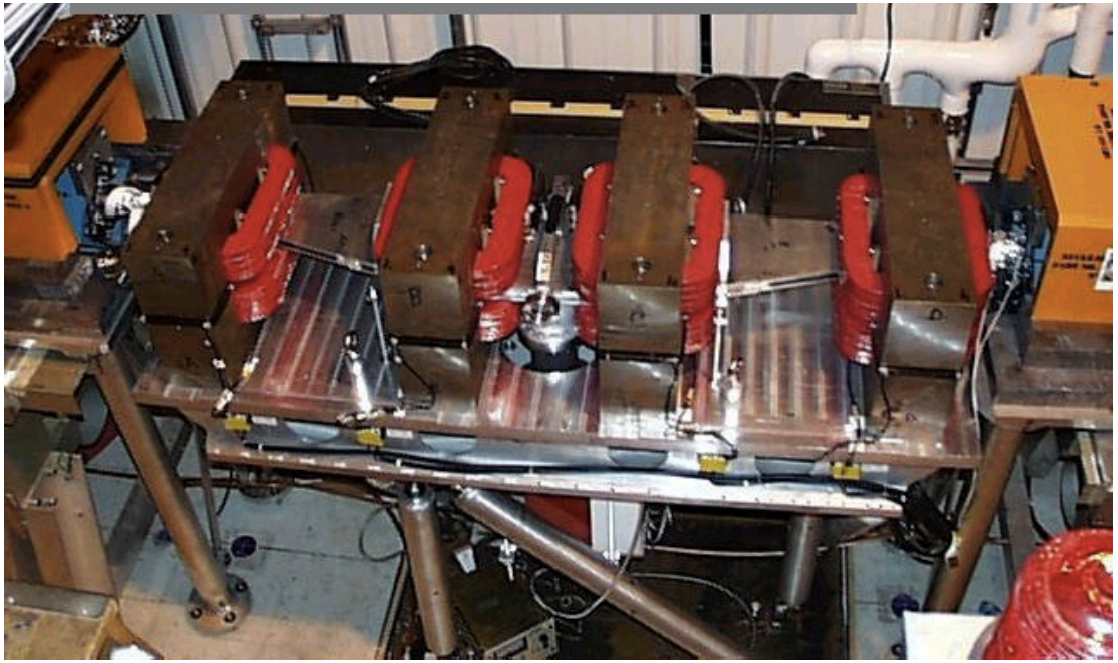
10 meter extension with IP fixed at 1.5 m after triplet will allow to get beam as small as 5 μm in transvers size

ATF II Lattice. Bunch compression

- Two bunch compression schemes will be applied at ATF II:
  - Bunch compressor after 1st accelerator section with possibility to compress beam to sub-picosecond bunches
  - Advanced bunch compressor configuration with compression down to 10 fs bunch length. (will be present by Yichao Jing in the next talk)

ATF II Lattice. Bunch compression





SDL chicane:
Optimized for 80 MeV
R56 = 3.5 cm

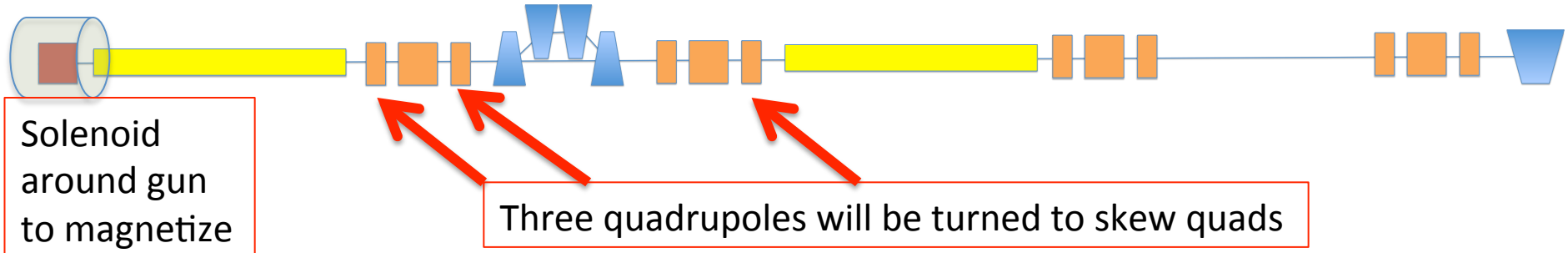
ATF II Lattice.
New e-beam parameter

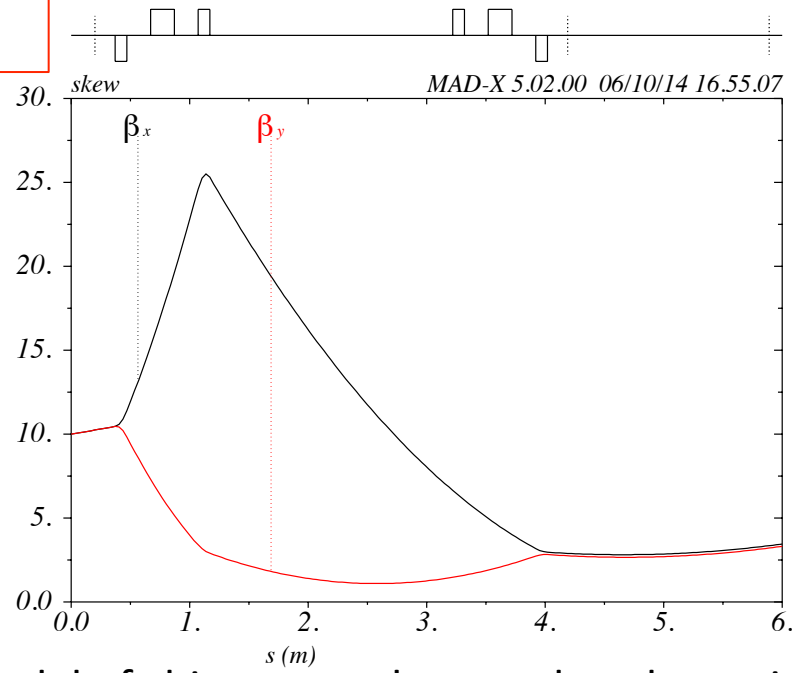
Flat beam!

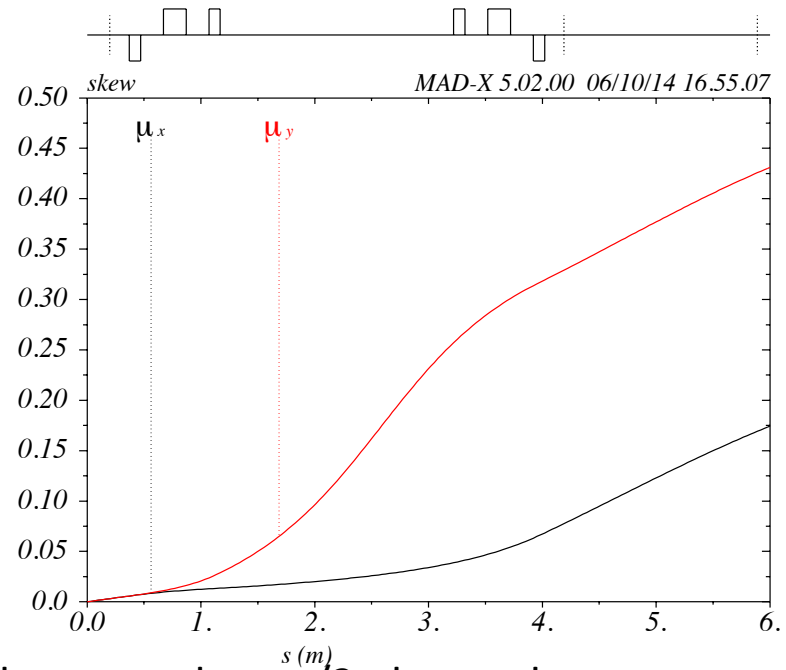
- Flat beam will help to use the beam at micron size structures.

- Flat beam can be used to suppress CSR in dipole magnets and chicane with shielding plates to increase bunch peak current

ATF II Lattice. Flat beam



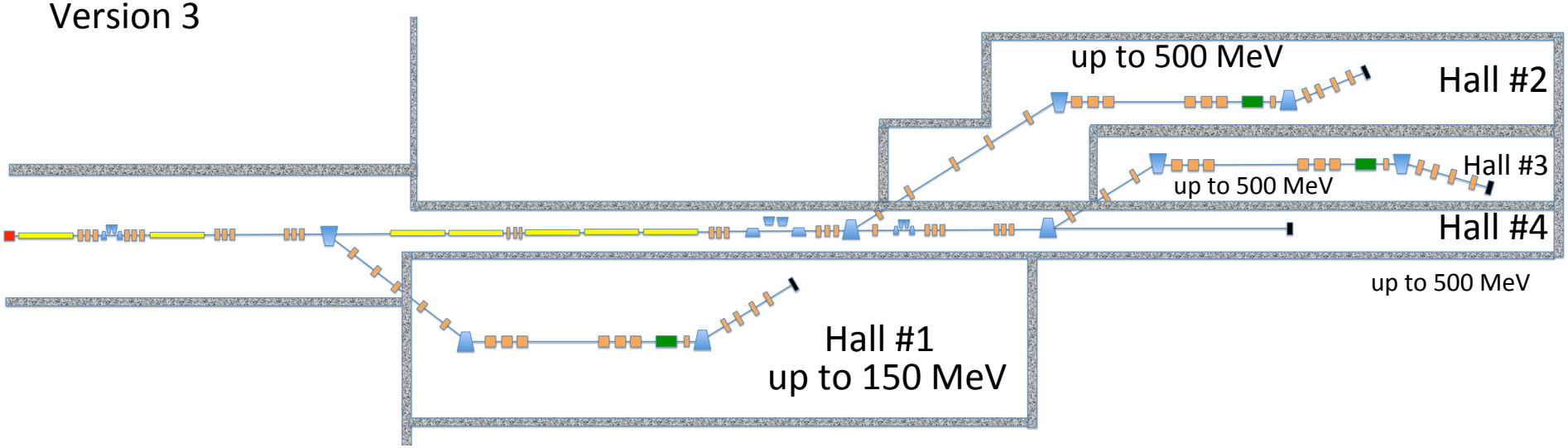




MAD model of chicane quads turned to skew triplet to produce $\pi/2$ phase advance difference between horizontal and vertical planes

ATF II Lattice. Flat beam advantage.

Version 3



With flat beam configuration CSR can be suppressed in dipoles and bunch compressors

ATF II Lattice. Summary

- Two independent Experimental Halls with 150 MeV e-beam layout will have potential to extend to FOUR independent halls, three of them will have 500 MeV beam at 2nd stage upgrade.
- Small 5-μm beam besides PMQ in experimental chamber it can be easy tuned in extended beamline
- Two different bunch compressor schemes will produce 10 fs and 100 fs beams
- Flat beam option can be usable by users at IP for micron size structures and for suppression CSR in the dipoles and bunch compressor.

Thank you!