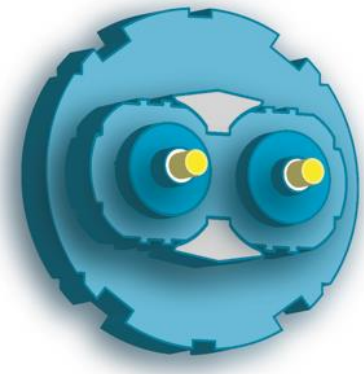


High Luminosity LHC

# Update on integration and space constraints in IR4

Catherine Magnier and Sylvain Weisz

**Main documents:**

- **HL-LHC-LSS4 Space Reservation Review, EDMS 1381203, Catherine Magnier, Yvon Muttoni & Paolo Fessia**
- **New Components at Point 4 Left, EDMS 1516193, Catherine Magnier**

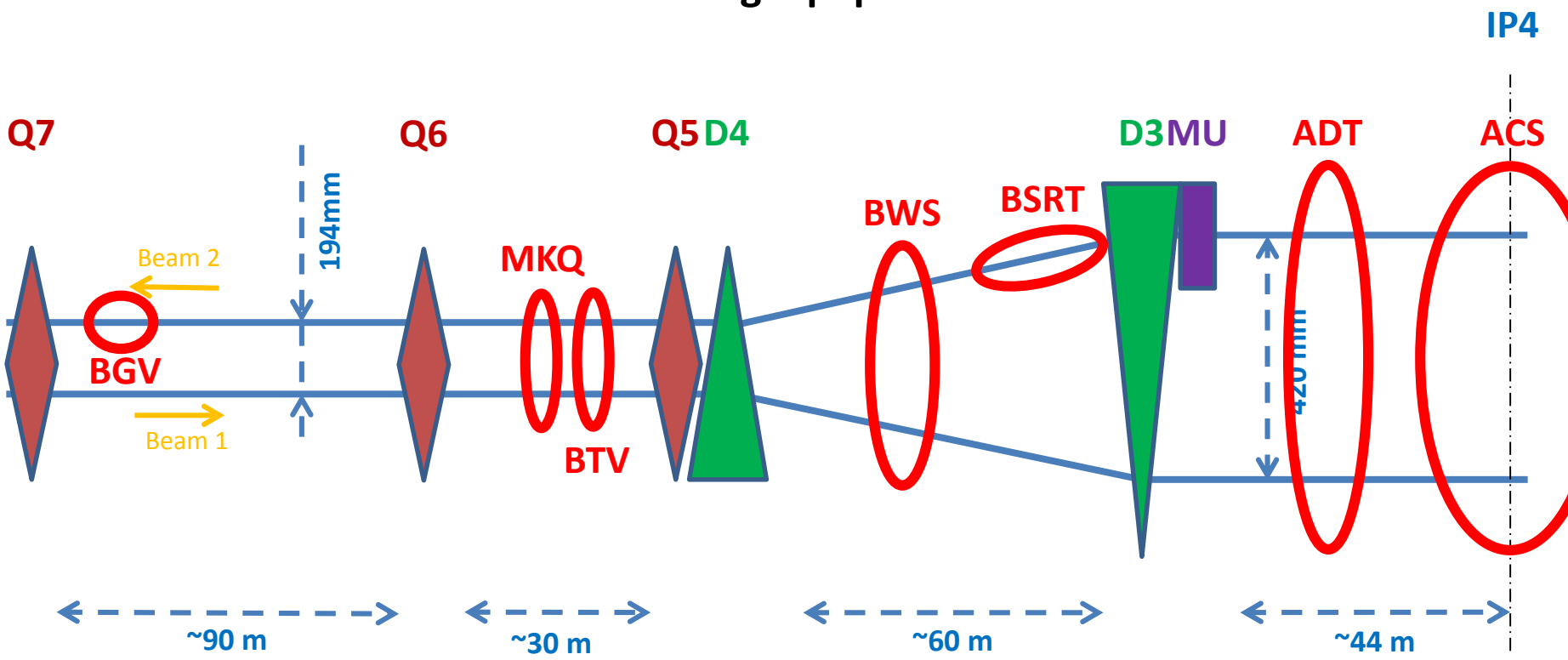
**and discussions with Ofelia Capatina, Adriana Rossi, Gianluigi Arduini, Enrico Bravin, Rama Calaga, Jean-Pierre Corso, Riccardo De Maria, Ezio Todesco, Mirko Pojer …**

## Many thanks to all

The HiLumi LHC Design Study is included in the High Luminosity LHC project and is partly funded by the European Commission within the Framework Programme 7 Capacities Specific Programme, Grant Agreement 284404.

# Schematic Layout of Left part of Straight Section at LHC Point 4

## Existing Equipment



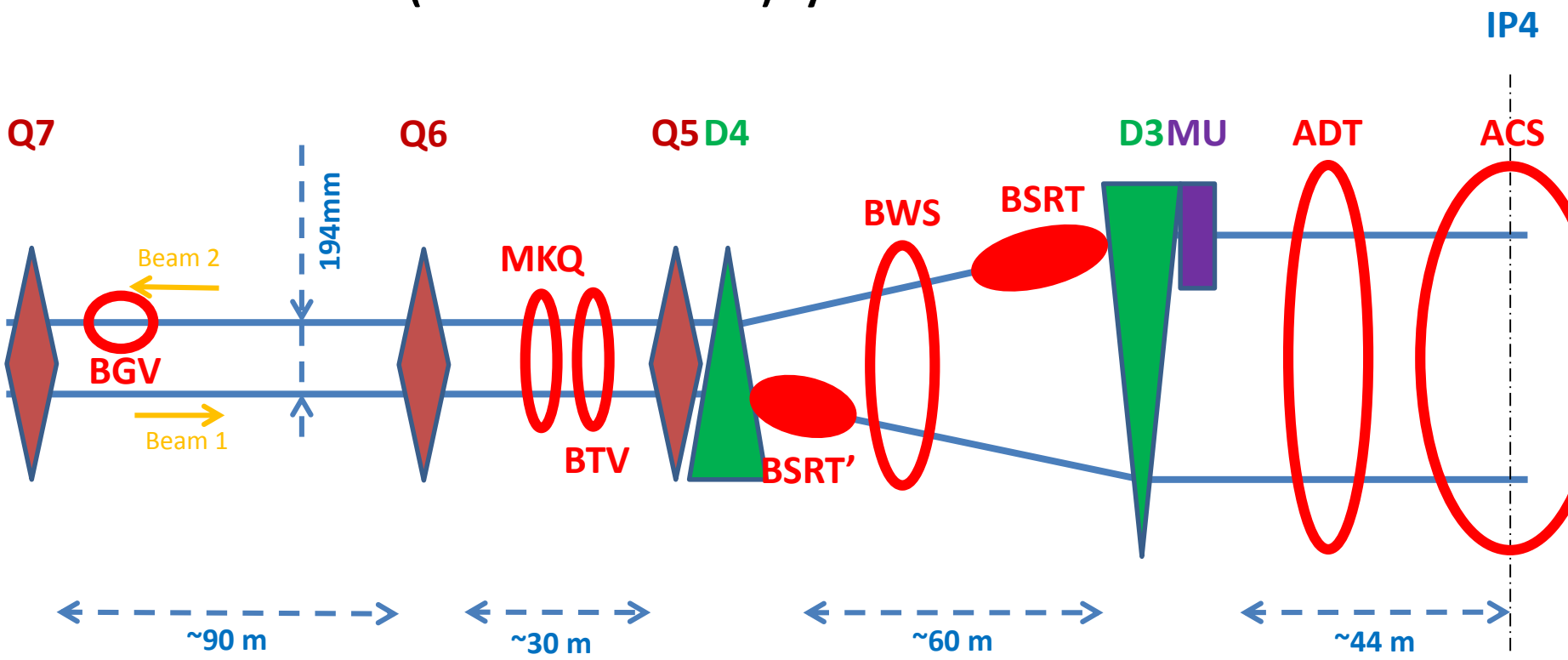
- Studies at point 4 (1/3):
  - Construction of an optical light path and optical hutch for the existing synchrotron light monitors in LSS4 (EDMS 1371100)

    Summary : from existing BSRTM to UA43. The optical path requires a reservation of 200mm diameter and must be as short as possible. Optical hutch in UA43, (10m2, [2.5mx4m])

  - Construction of a new optical light extraction system for synchrotron light diagnostics in LSS4 with associated optical path and optical hutch (EDMS 1371099)

    Summary : between D4&D3,extraction with an in vacuum mirror located at 20m from D4 toward D3 , optical path from RA43 to UA43 will be at least 100mm diameter as short as possible, optical hutch in UA43 (10m2, [2.5mx4m])

# Schematic Layout of Left part of Straight Section at LHC Point 4 with new (or modification of) synchrotron radiation monitors



- Studies at point 4 (2/3) :

  - Installation of a set of  fast wirescanner for HL-LHC (EDMS 1371094)

    Summary : installation of 2 fast wirescanners per beam and per plane. Total length 500mm, located next the existing scanners at point 4 (L&R). A detector will be located some 10/20m downstream of the scanner (no data for this detector)

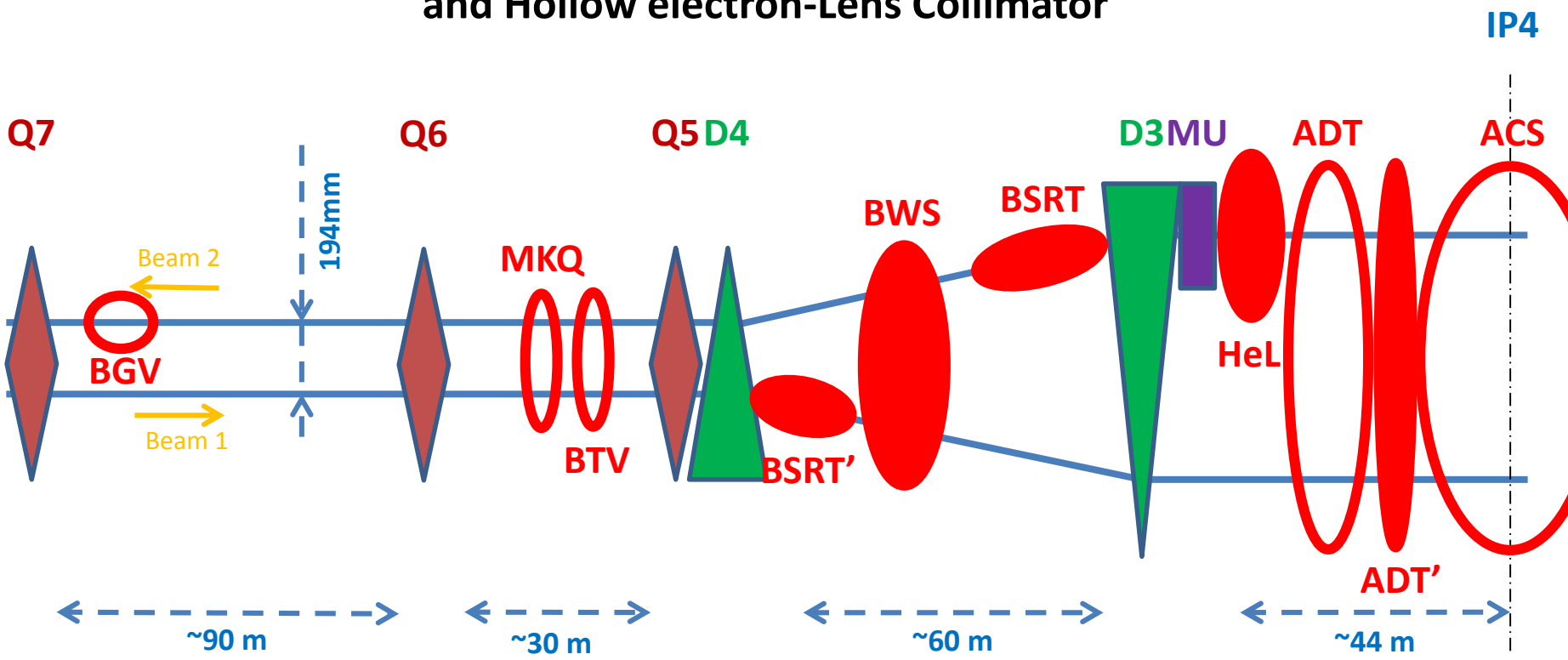
  - Installation of a new set of ADT (EDMS 1363180)

    Summary : a place is already reserved for this installation. No more data in the specification about size, exact place….

  - Installation of a Hollow e-Lens (EDMS 1366525)

    Summary : one device per beam, one by side. Exact longitudinal location TBD, but it will requires 6/8 m long space reservation and a beam/beam separation of 420mm. Needs cryogenics!

# Schematic Layout of Left part of Straight Section at LHC Point 4 with additional Wire Scanners, Transverse Dampers and Hollow electron-Lens Collimator



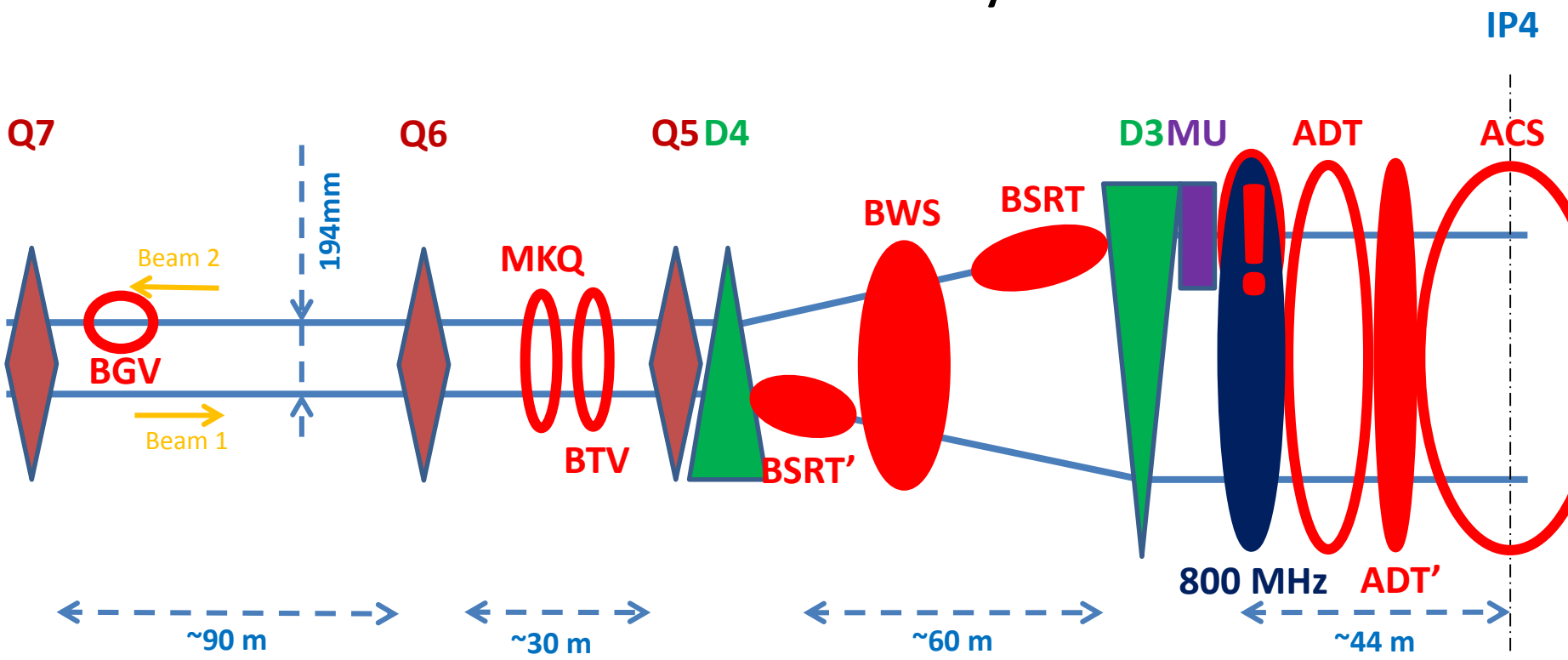
- Studies at point 4 (3/3) :

  - Installation of new set of 800MHz RF cryo-cavities

    First design of a two cell cryo-module just received : need to account for 2 modules of 2.7m each plus vacuum valves ➔ ~ 7m in total….

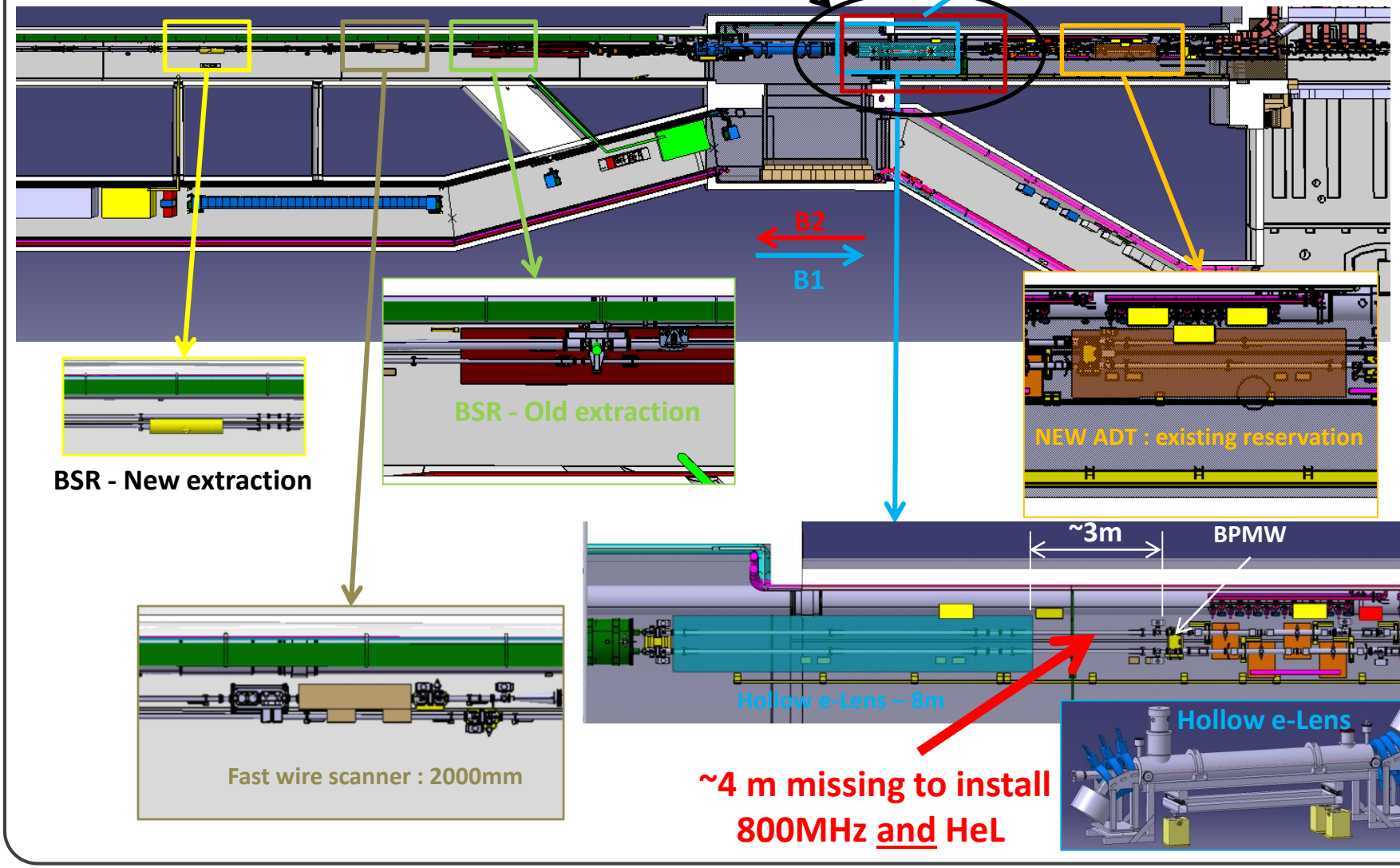
    These modules would just fit transversely, with beam1/beam2 allocation optimized to take care of the QRL bellows.

# Schematic Layout of Left part of Straight Section at LHC Point 4 with 800 MHz Harmonic System



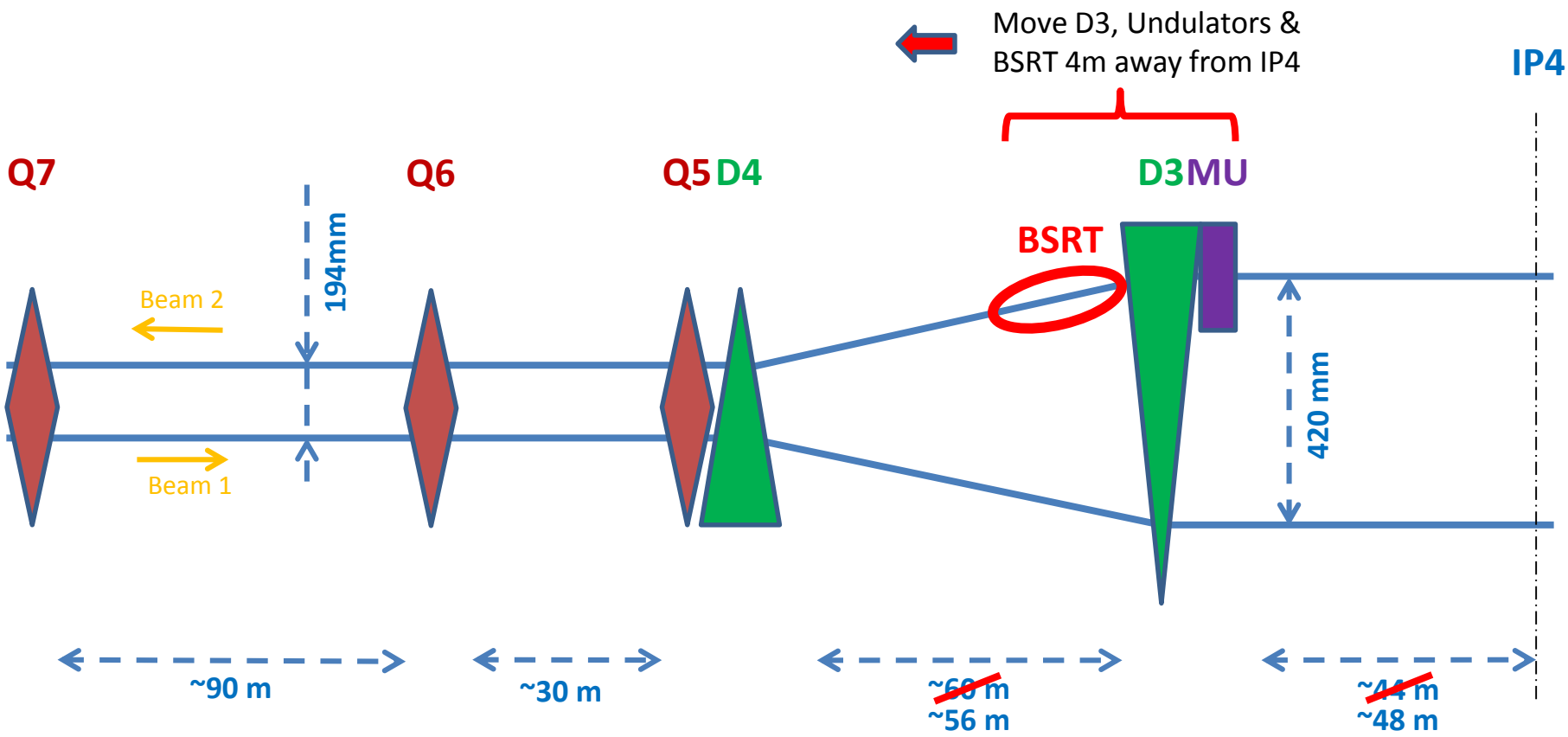
- Point 4 left : Over view HL LHC device to install

**Conflict between HeL and 800 MHz Cavities**



# Schematic Layout of Left part of Straight Section at LHC Point 4

## Preliminary Proposition to Install 800 MHz Cavities and HeL




**D3 and D4 are 72m apart (centre to centre) and 4m represents 5.6% of this distance**

**➔ within margin from nominal (7 TeV) to ultimate (7.54 TeV)**

# Preliminary Conclusions

- The Central part of the Long Straight Section at point 4, with beam separation of 420 mm, is not long enough to fit all known demands;
- The additional space required (~4m left and right of IP4) could be made available moving the D3 separation dipoles closer to D4;
- This would absorb the margin between «Nominal» and «Ultimate» energies that is part of the design of the D3, D4 magnets (based on RHIC coils)

➔ Is that an option that can be pursued?

- Precise longitudinal positions will be dependant on the optics;
- Strong transverse space constraints to be accounted for, on-going studies;
- Please tell us about additional demands for space allocation in LSS4 that we have not identified …