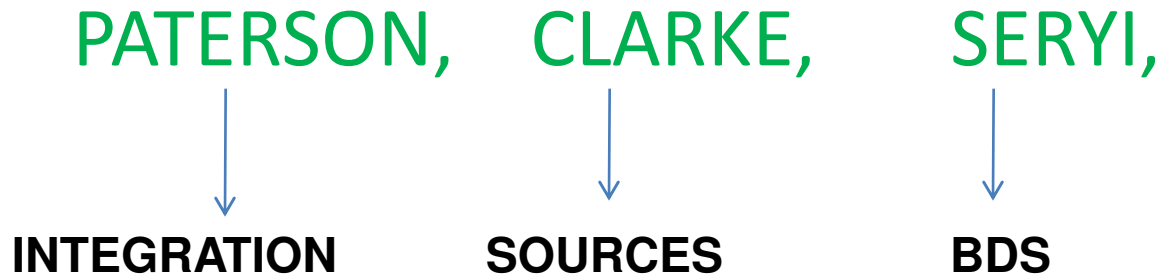
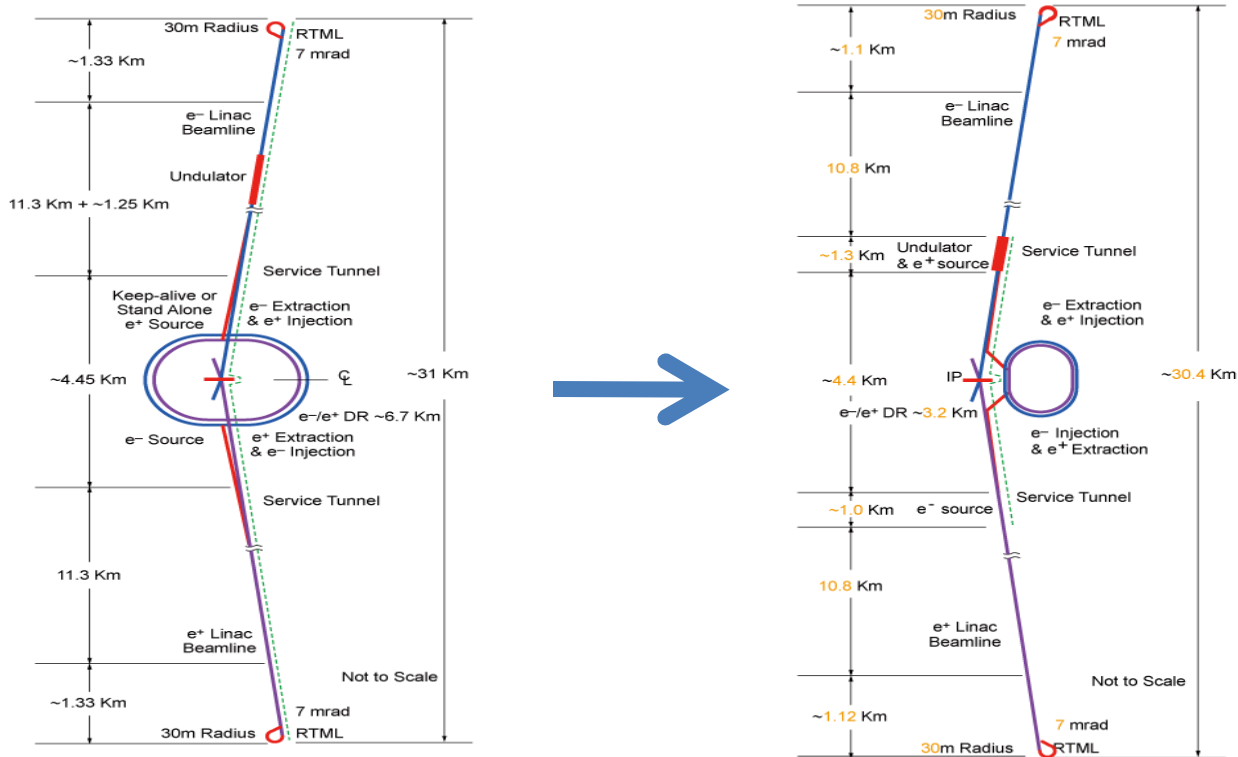


# CENTRAL REGION INTEGRATION OF SOURCES, BDS, DR's and RTML

AAP Review



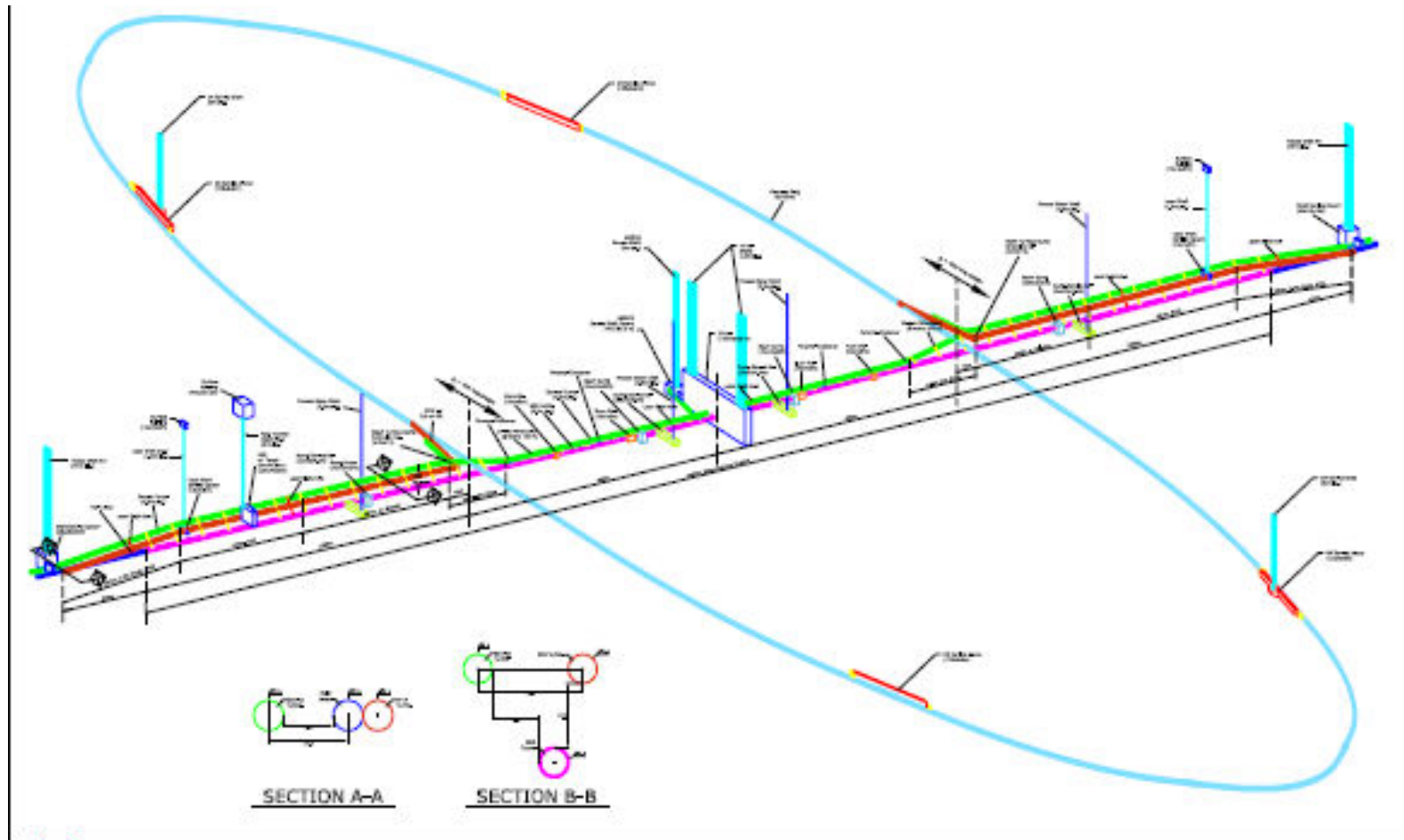
# RDR v SB2009



**Central Region is +/- 3 km from IR and < 20% of total length**

# RDR Central Region

With 3 tunnels, 1 support and 2 beam, on different planes, 10m separation, plus six fold symmetric DR.



# Development of Central Region

- Damping Ring design development to improve its own layout of RF, wigglers, injection, extraction systems leads to the present race-track lattice with the inj/ext together in the same straight.
- This opened up many possible alternative geometries of the central region which led to the concept of **integrating the E+/- sources with the BDS** and it's part in SB2009

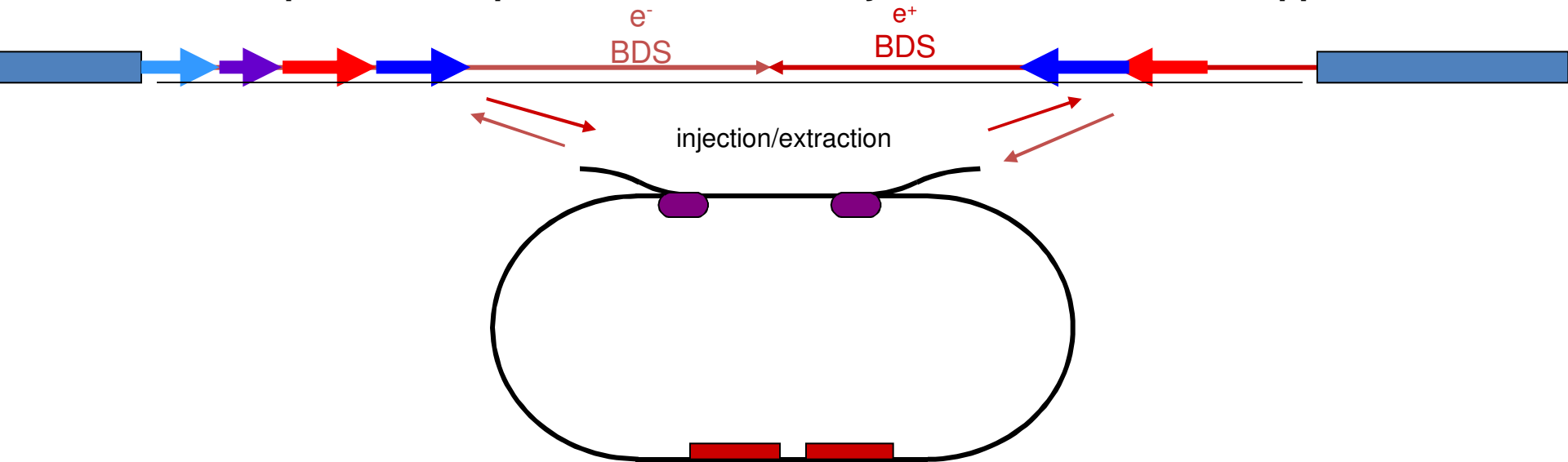
# Central Region Systems Integration

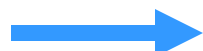



5 GeV Boosters share tunnel with BDS

E- Gun and injector share tunnel with BDS

Undulator + Aux Injector + E+ Tgt-Capture-Accel + Booster share tunnel with BDS

No Independent Keep Alive source and only two tunnels, beam + support



-  Undulator
  -  E+/- Warm Accel
  -  E+ Tgt + Capture + Accel
  -  5GeV Injector Booster
- e<sup>+</sup> wiggler and rf      e<sup>-</sup> wiggler and rf

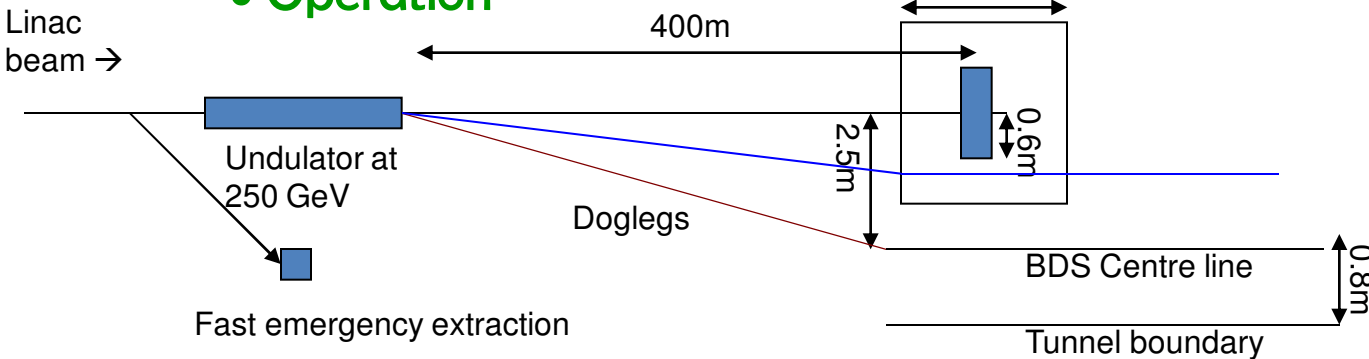
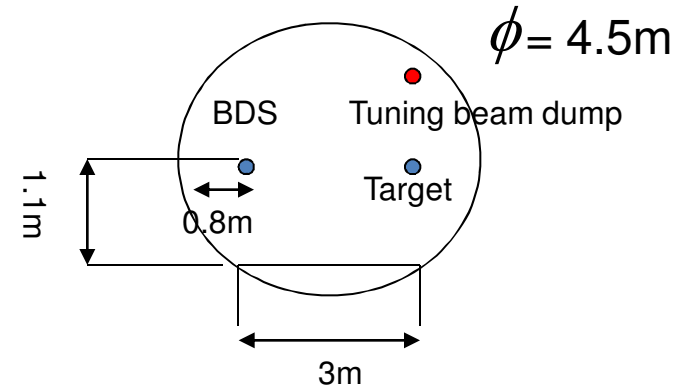
# Continuing Development of Concept

- With a great deal of cooperative effort between the Technical Systems Designers and the CF&S team the concept is developed into a practical design.
- Much of the effort was in developing the Linac through E+ source region where the RDR was only conceptual. In SB2009 the integrated design required more detail design in both lattices and engineering layouts.

# Central region integration : Minimum Machine, BDS

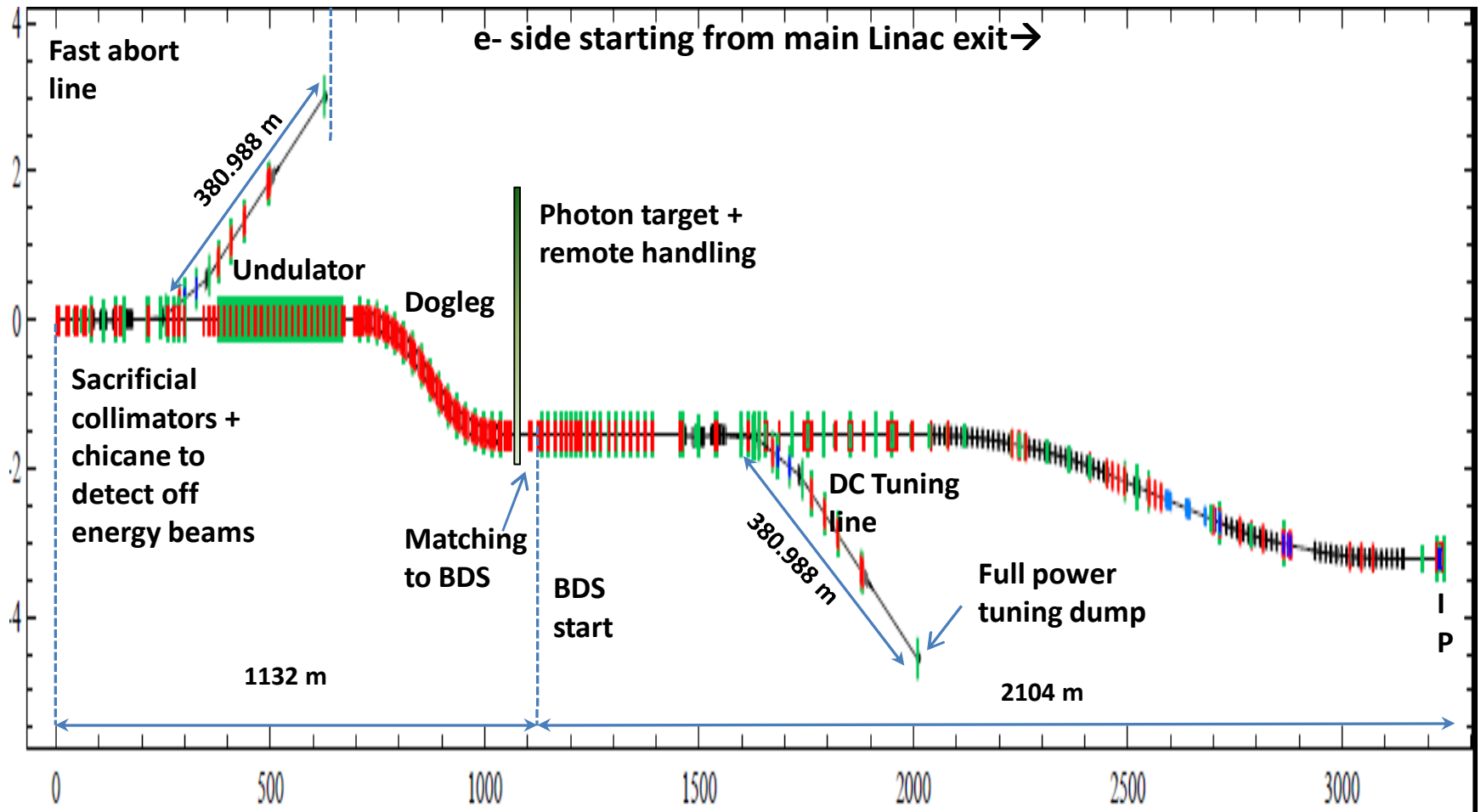
Integration studies needed:

- Radiation
- Optics
- Engineering
- Installation
- Commissioning
- Operation



- 2.5m can be reduced to up to 1.5m if beam passes through a drift space for ~40-50m without any components through the remote shielding block of the target.
- If 2.5 m, not enough space for tuning beam line. Take the beam vertically to beam dump?

# Example of integrated lattice for BDS that goes with E+ system design



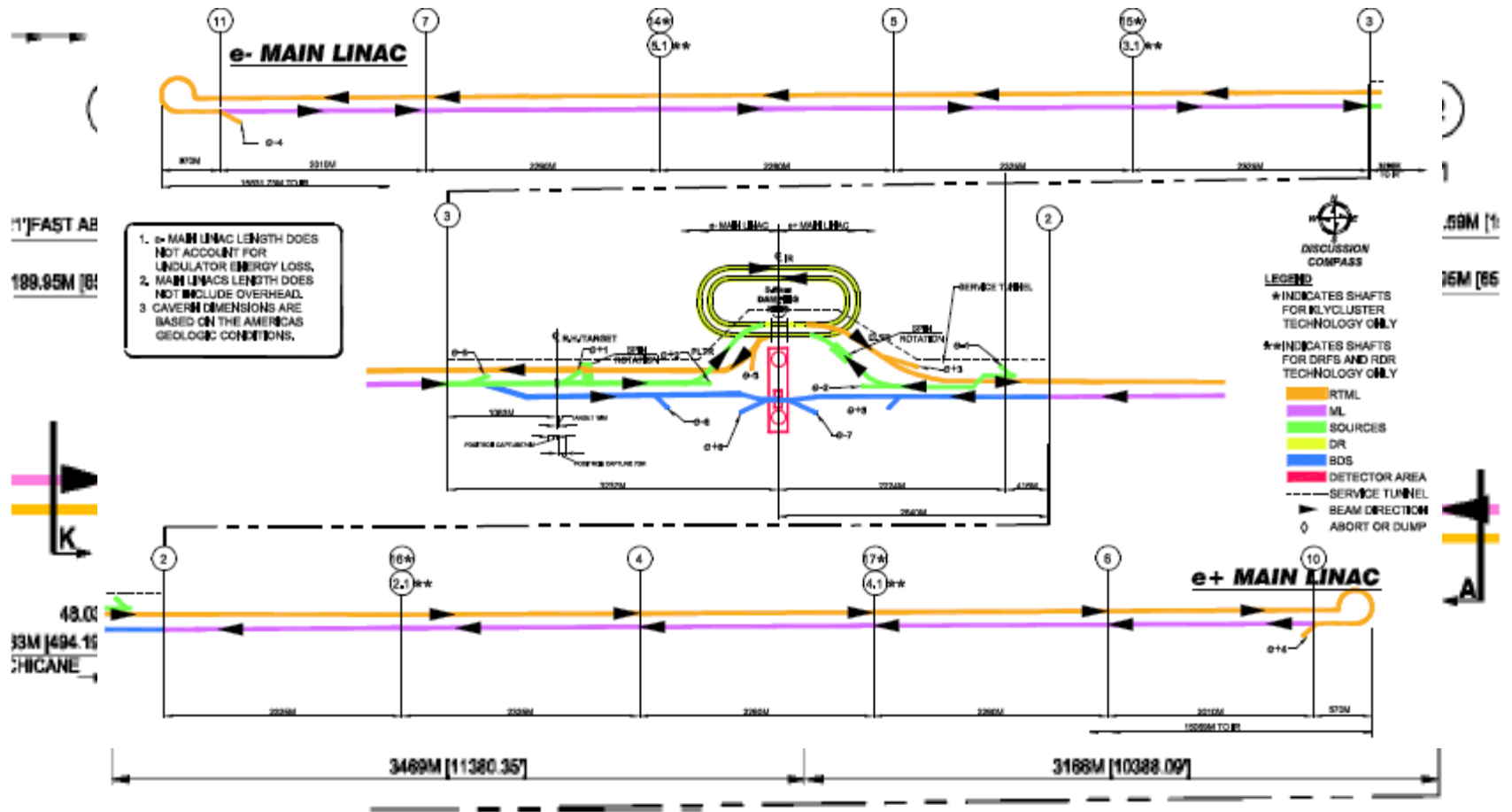


# Continuing Development of Concept

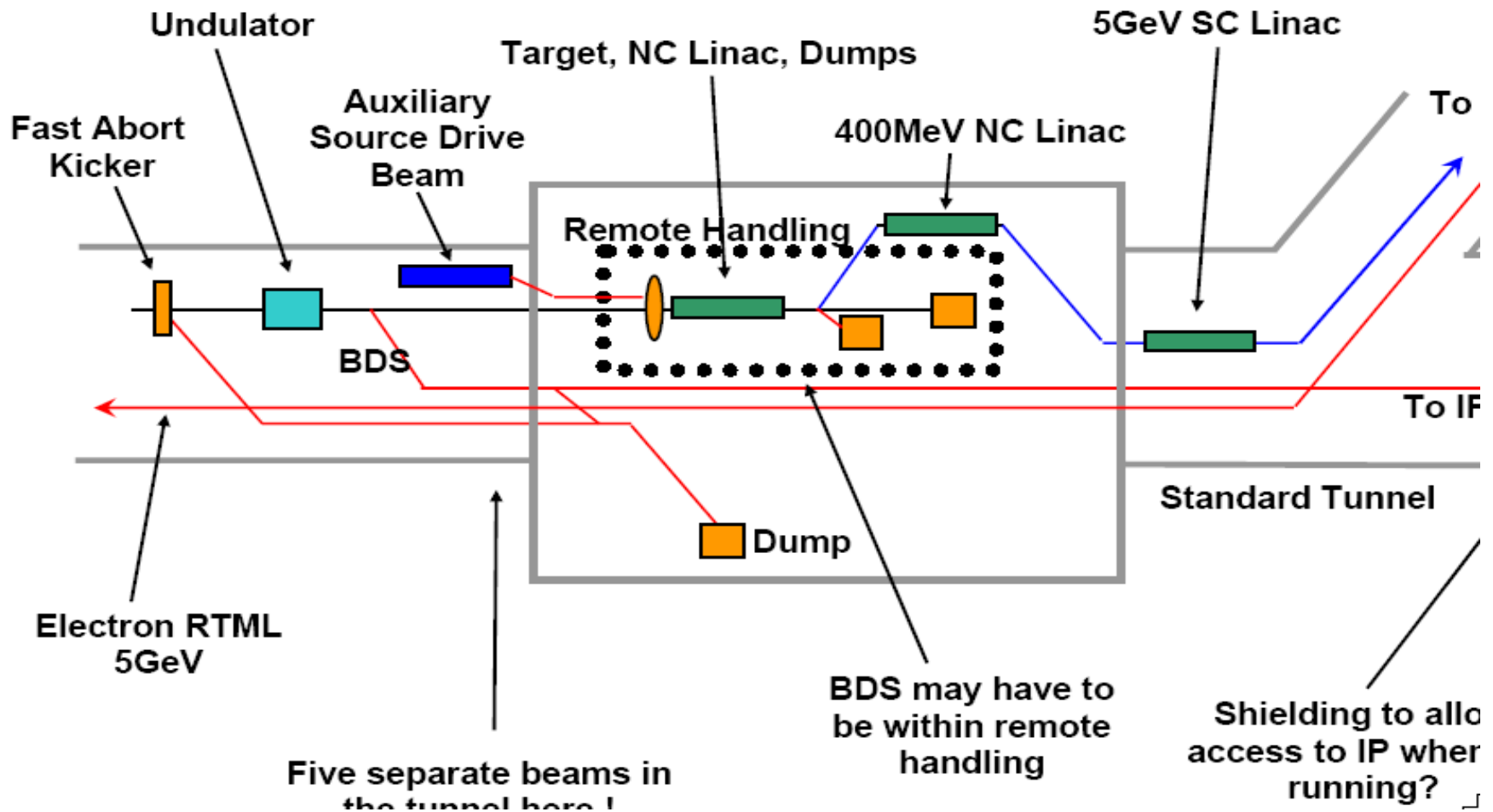
- There is now a better understanding that this region has a complex CF&S design around the positron source whether it is placed at the end of the linac or at the 150 GeV point.
- The electron source is much simpler and requires little change from the RDR and a straight forward CF&S design.



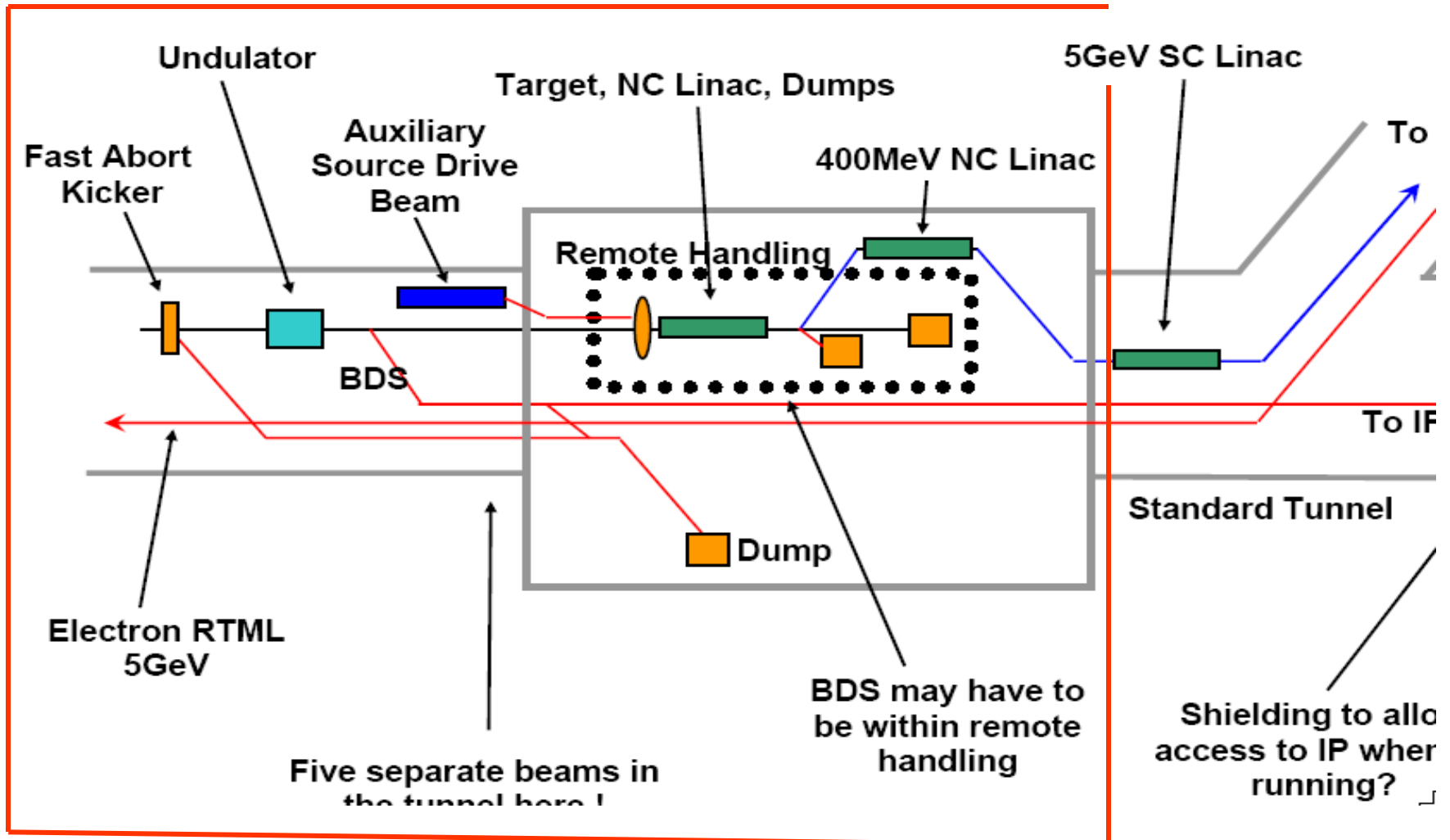
# Central Region Integration - CFS



# E+ SOURCE in SB 2009



# E+ SOURCE showing (in box) what would be replicated at 150 GeV for (RDR') design



# The Integrated Central Region has

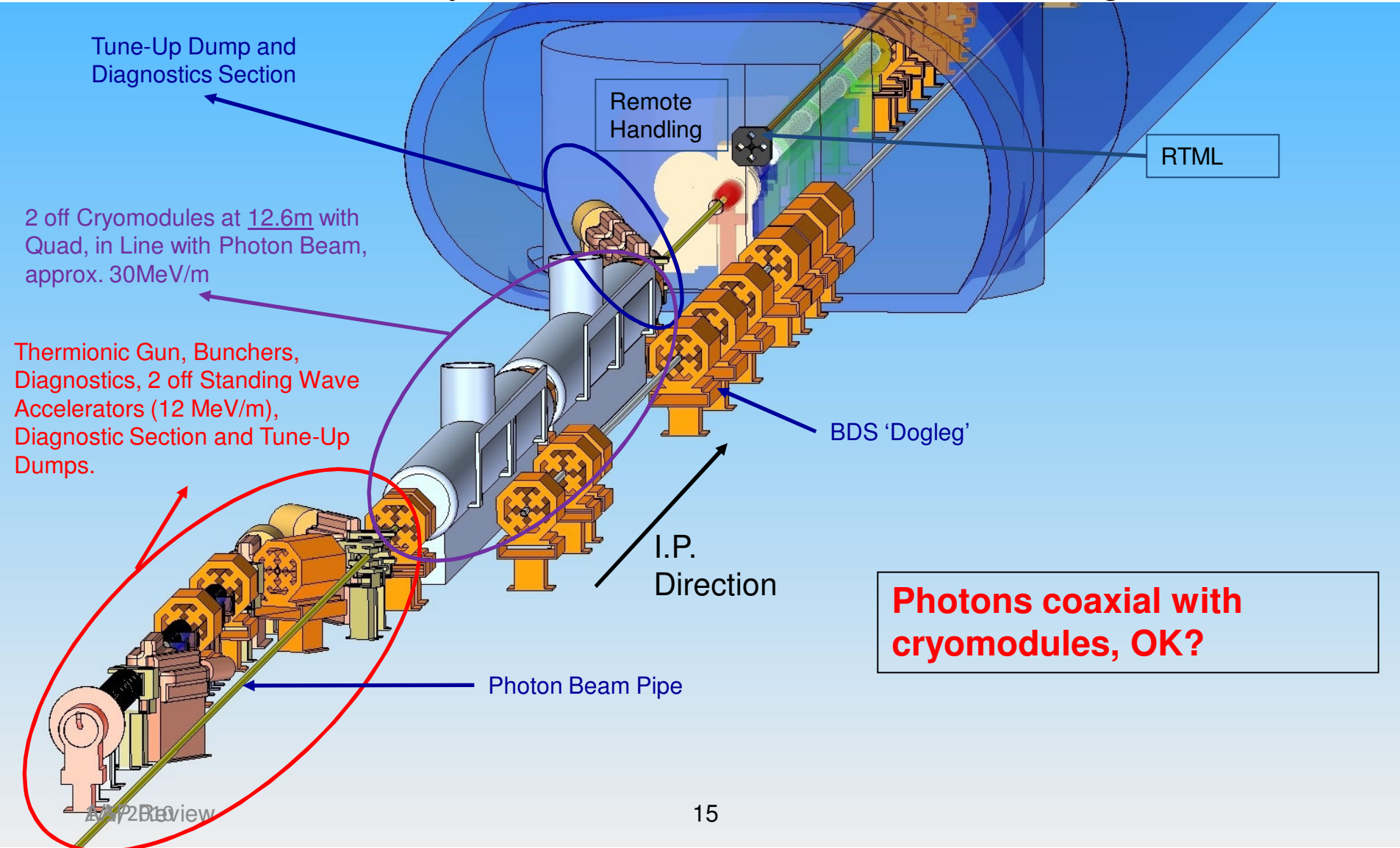
- Approx 5 km less tunnel, 30%
- Has a layout which is compatible (no changes) with either a 3.2 or 6.4 km Damping Ring
- Fewer shafts and vaults than RDR central region
- Has only one High Radiation Material Handling shaft and vault (down from 2) and it is close to the central campus
- A support tunnel to handle both the high power equipment, RF, PS, etc but also the one-off system specific instrumentation and electronics for sources and BDS.

# The Integrated Central Region has several issues to be addressed in TDP 2

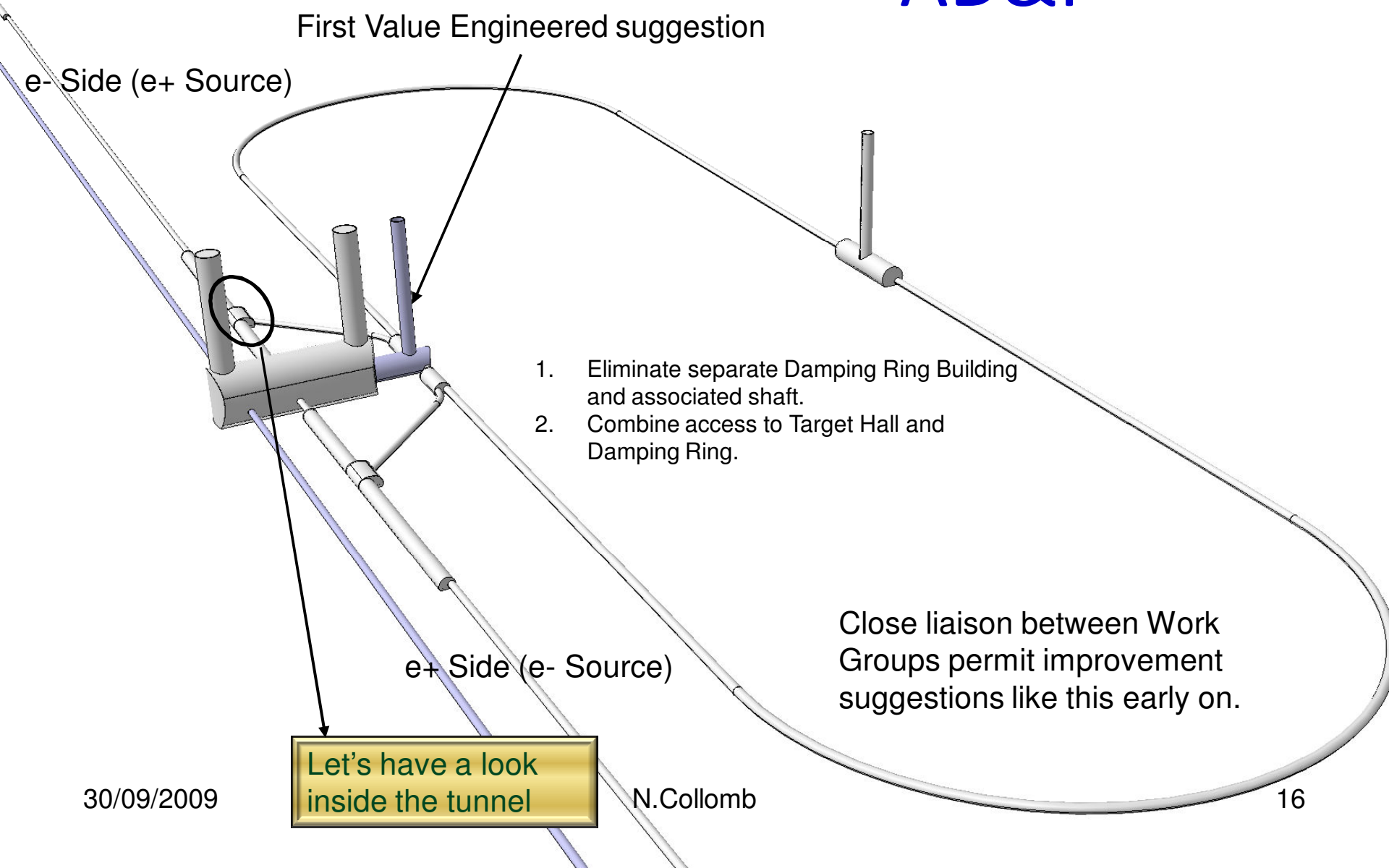
- Further cost and layout optimization based on new baseline----- early decision beneficial!
- Further develop the GDE wide effort to have a common 3D Engineering Drawing System that will allow realistic study of models of installation and maintenance of systems. This has never been attempted up until now! Examples in next slides.
- A new baseline will allow an updated plan for CF&S and Technical Component construction schedules which will be an important component of TDP2

# Positron Source – AD&I

## 3 D Layout Positron Source 'AUX Source' region.



# Central Integration – AD&I



First Value Engineered suggestion

e- Side (e+ Source)

1. Eliminate separate Damping Ring Building and associated shaft.
2. Combine access to Target Hall and Damping Ring.

e+ Side (e- Source)

Close liaison between Work Groups permit improvement suggestions like this early on.

Let's have a look inside the tunnel

30/09/2009

N.Collomb

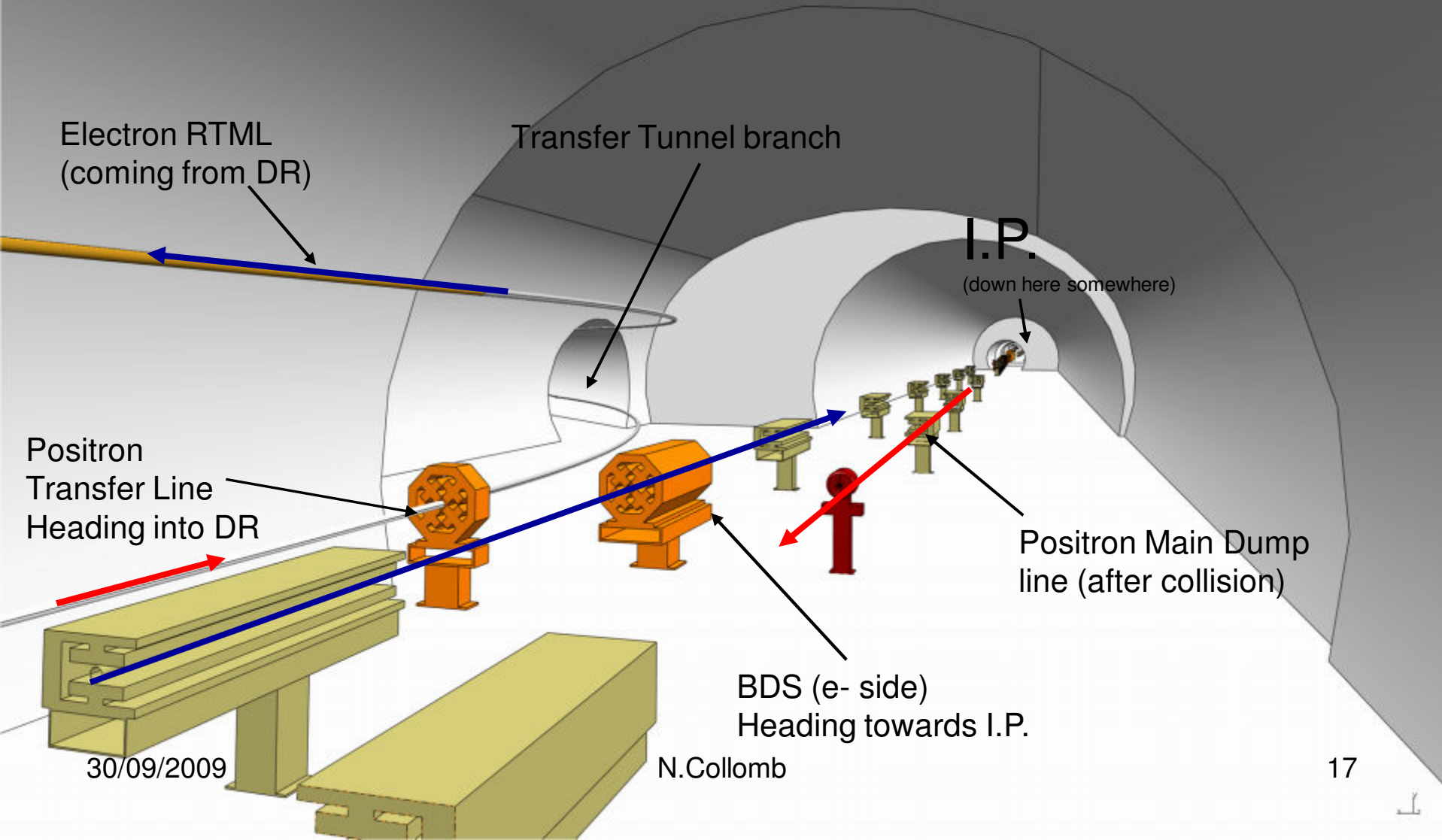
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# Central Integration – AD&I



- Electron Beam direction
- Positron Beam direction



# Integration of Sources and BDS

## PRO's and CON's

- Saves 5 km of tunnel and other CF&S costs while maintaining a support tunnel for equipment that requires hands on availability with beam on.
- E+ systems design now better understood and 150 GeV and end of linac designs would be similar.
- Many systems and above ground services would now be close to a Central Lab Campus
- Leaves Linac layouts flexible regarding energy staging scenarios.
- Does the concentration of systems into a single tunnel and close proximity have a large negative impact on maintenance and operation? This requires more work.