Linear Collider Positron Source and Central Integration Update

Norbert Collomb

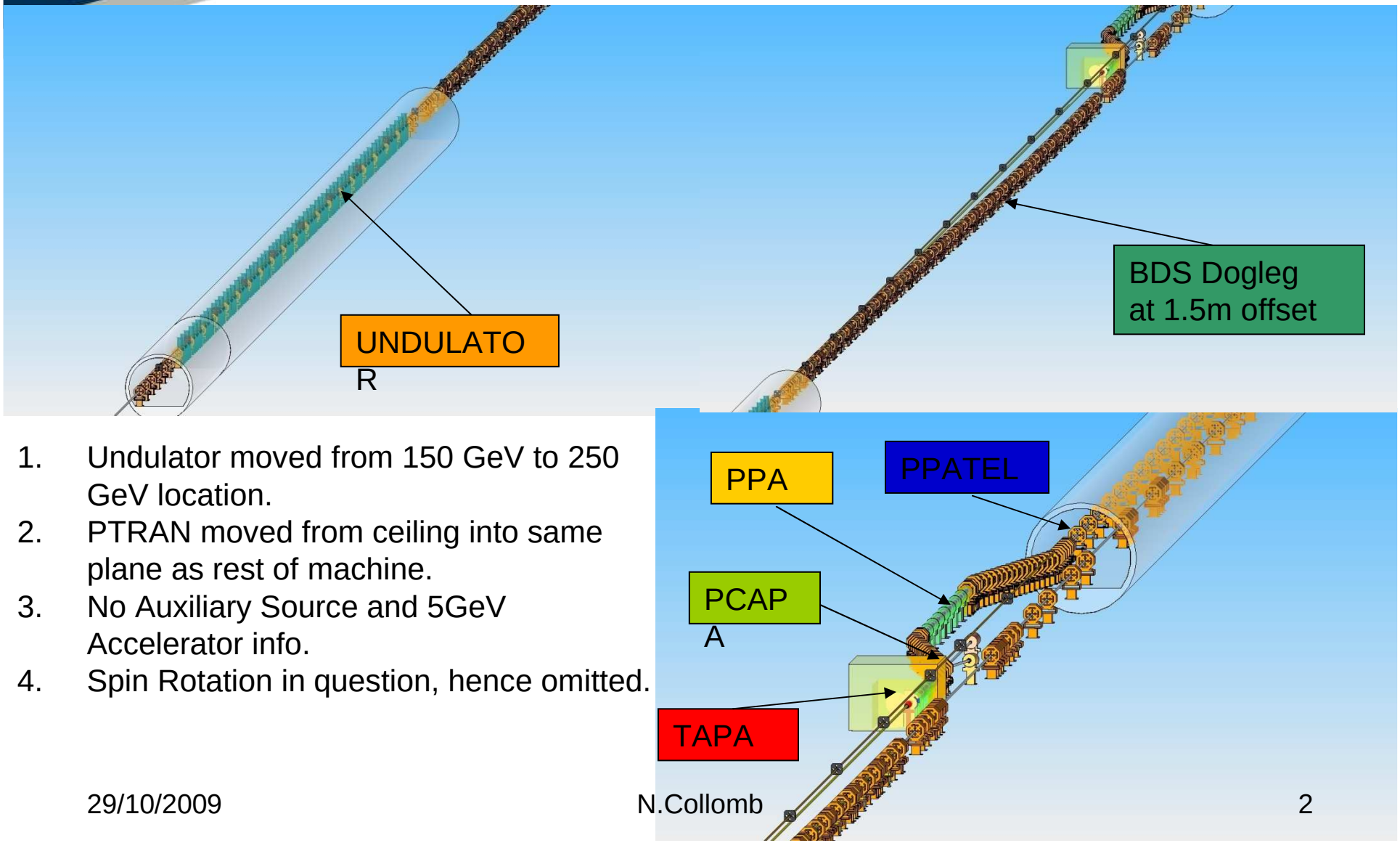
Acknowledging assistance from:

N. Walker, J. Clarke, E. Paterson, V Kuchler, J. A. Osbourne, T. Lackowski, A. Wolski, S. Guiducci, N. Solyak,…

29/10/2009

Science & Technology Facilities Council

Positron Source – TILC09 status



1. Undulator moved from 150 GeV to 250 GeV location.
2. PTRAN moved from ceiling into same plane as rest of machine.
3. No Auxiliary Source and 5GeV Accelerator info.
4. Spin Rotation in question, hence omitted.

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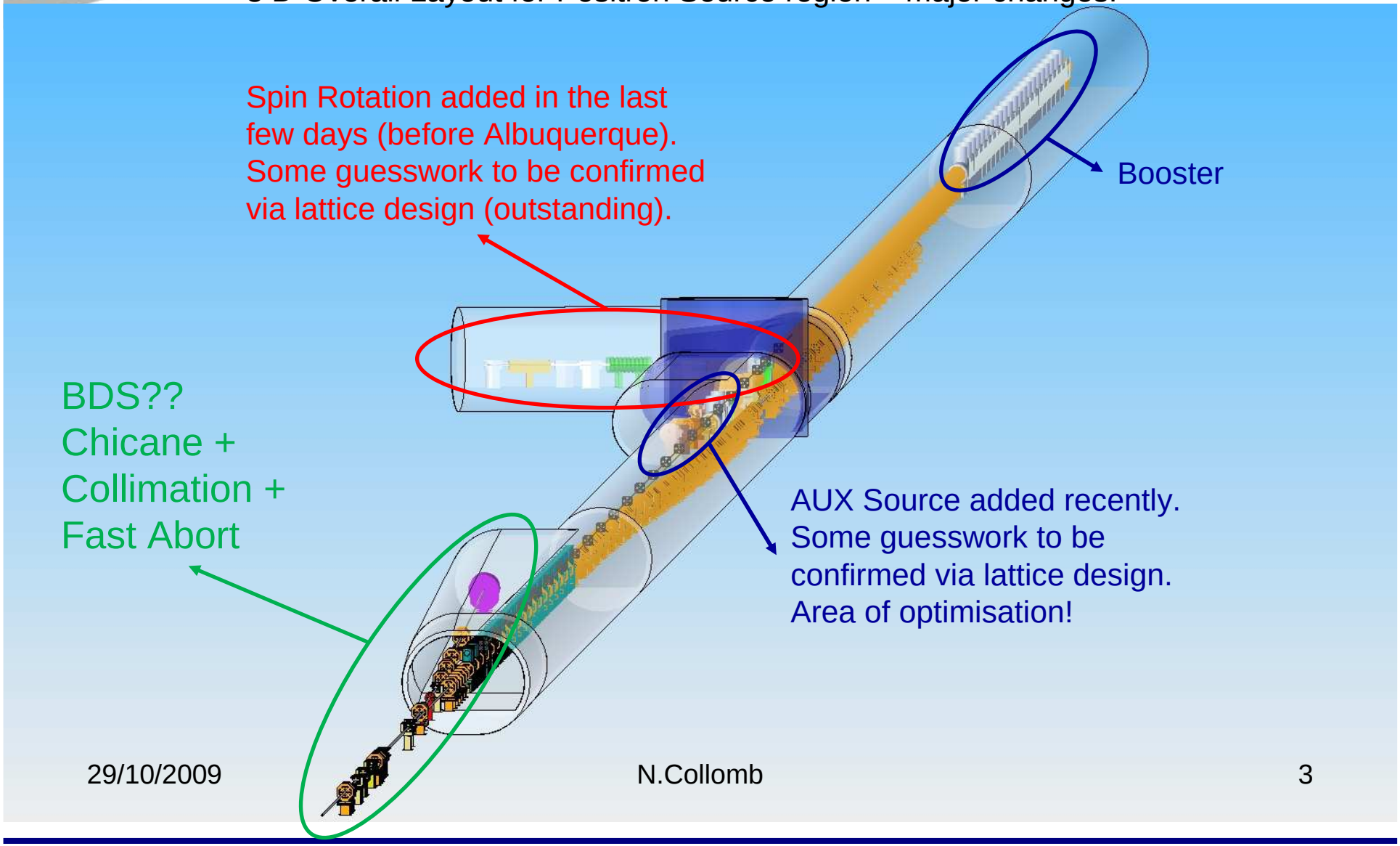
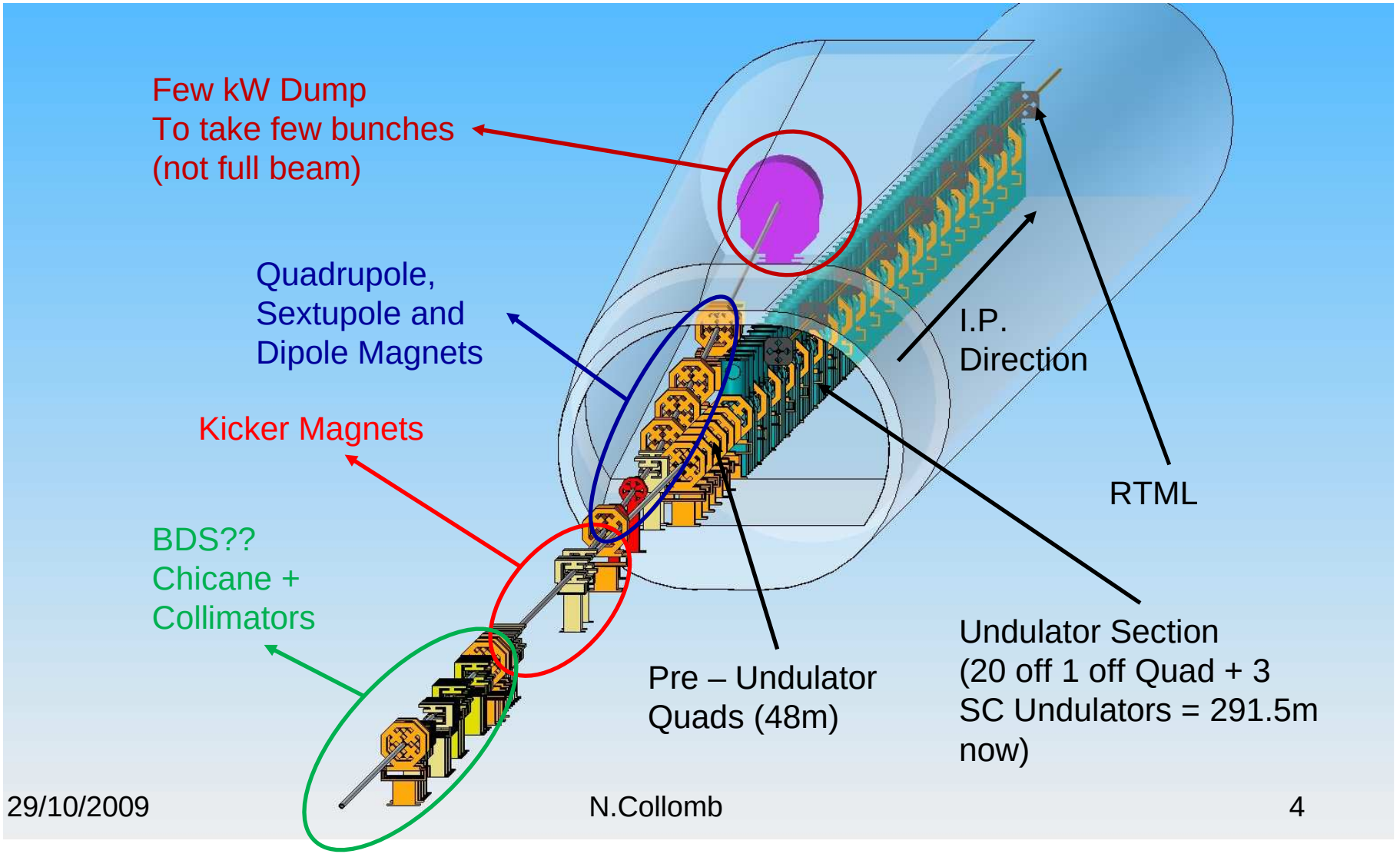
Intensive work with other work groups resulted in current status

3 D Overall Layout for Positron Source region – major changes.



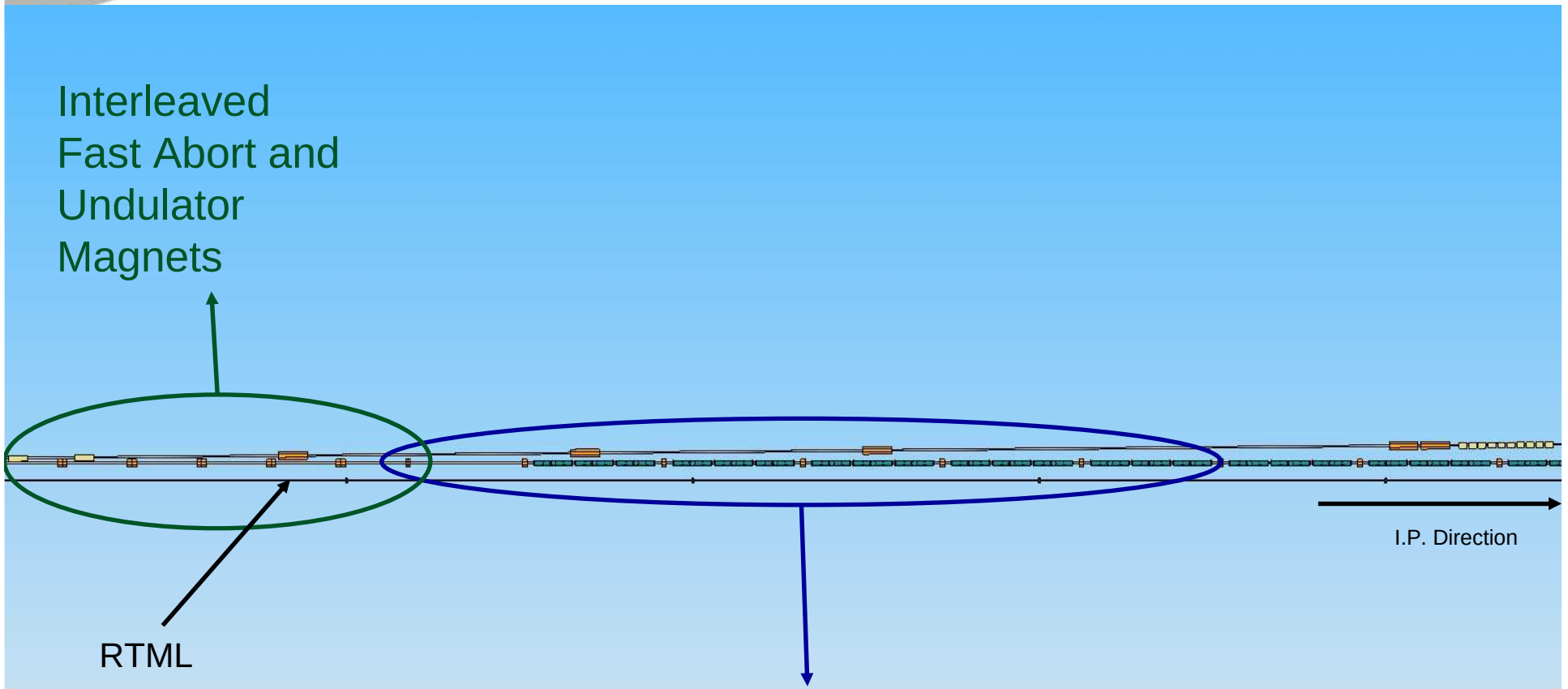
Positron Source – AD&I

3 D Layout Positron Source BDS Fast Abort region.



Positron Source – AD&I

3 D Layout Positron Source BDS Fast Abort region.



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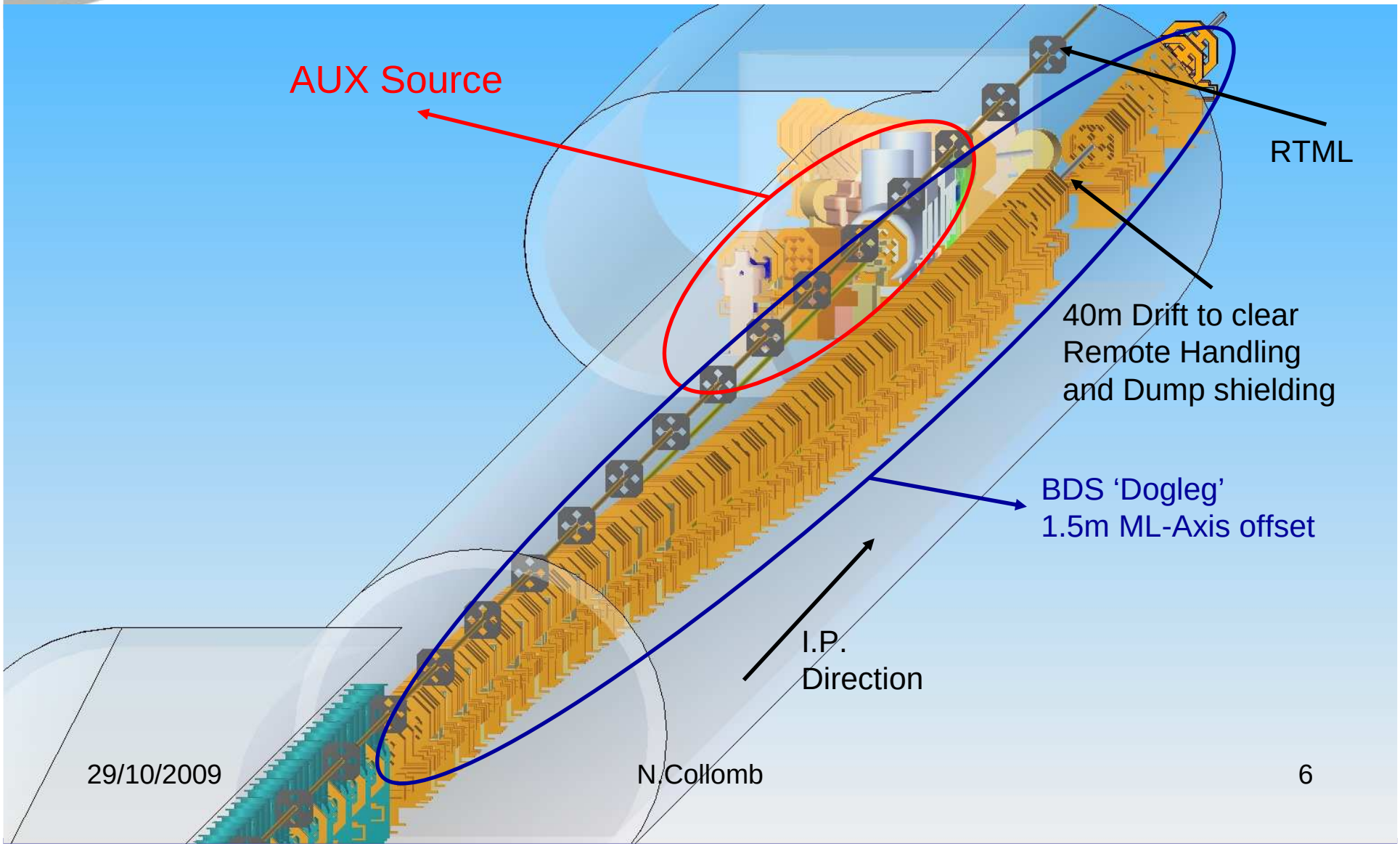
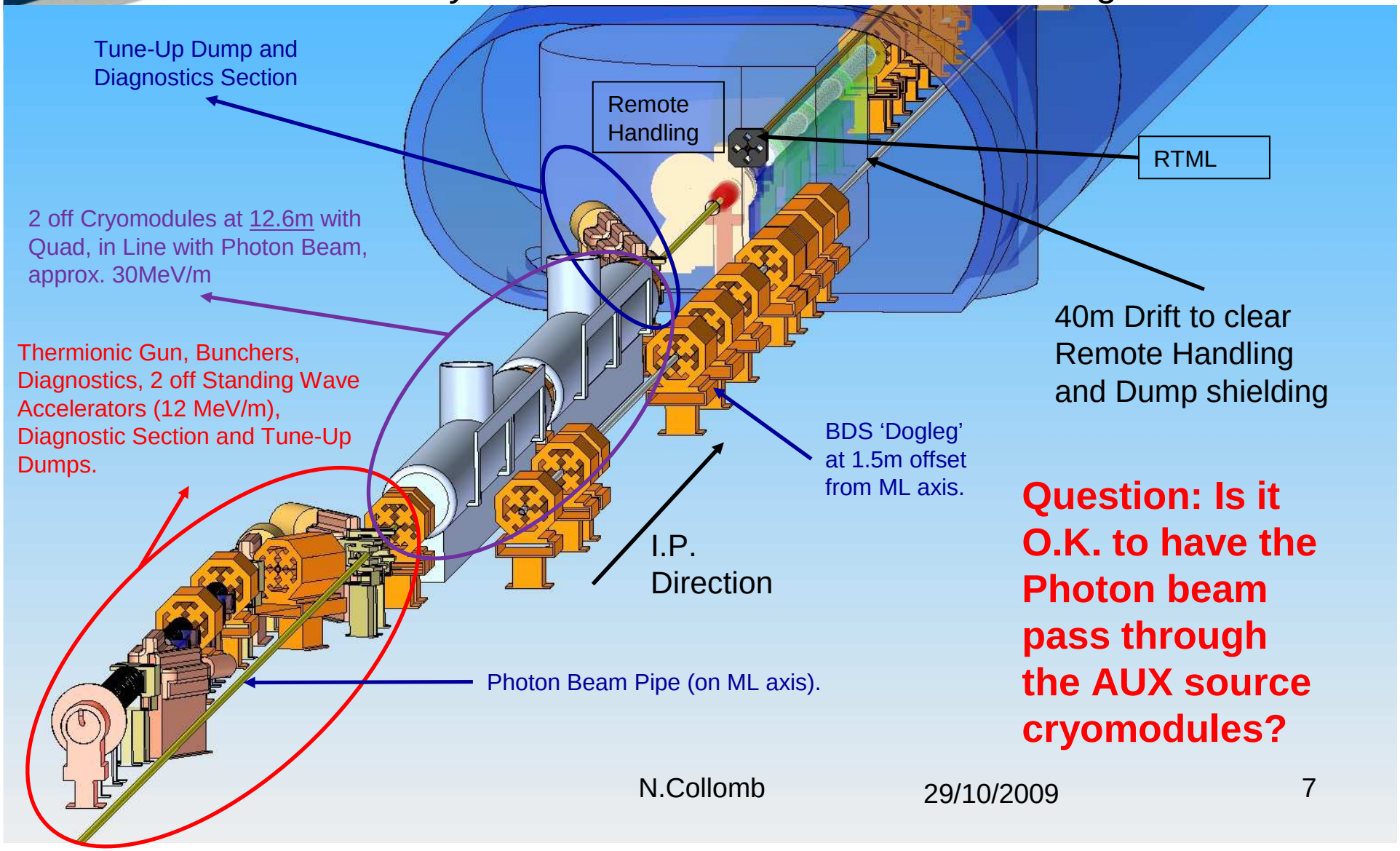
Positron Source – AD&I

3 D Layout Positron Source ‘BDS Dogleg’ region.



Positron Source – AD&I

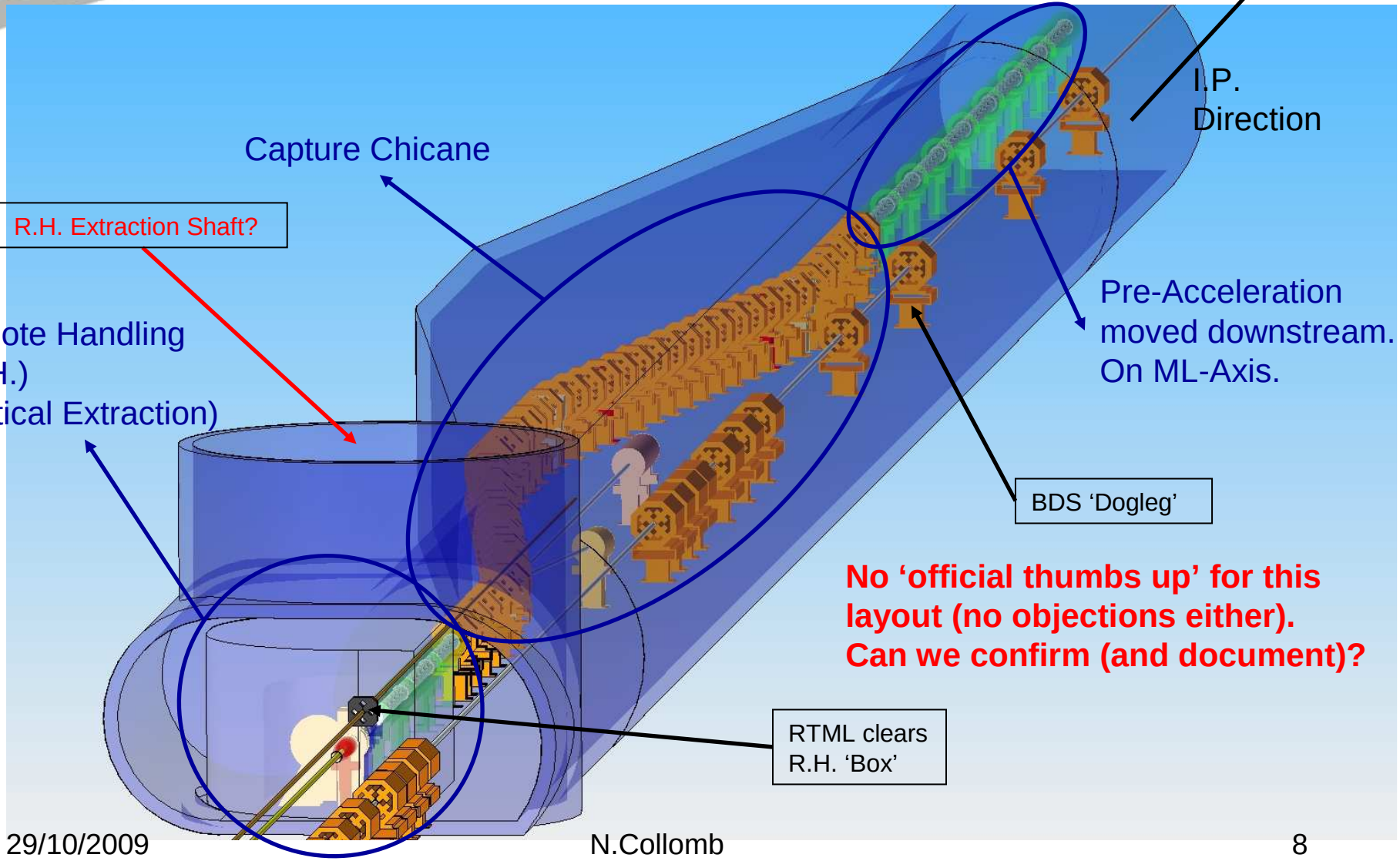
3 D Layout Positron Source 'AUX Source' region.



Question: Is it O.K. to have the Photon beam pass through the AUX source cryomodules?

Positron Source – AD&I

3 D Layout Positron Source 'Target Area'.



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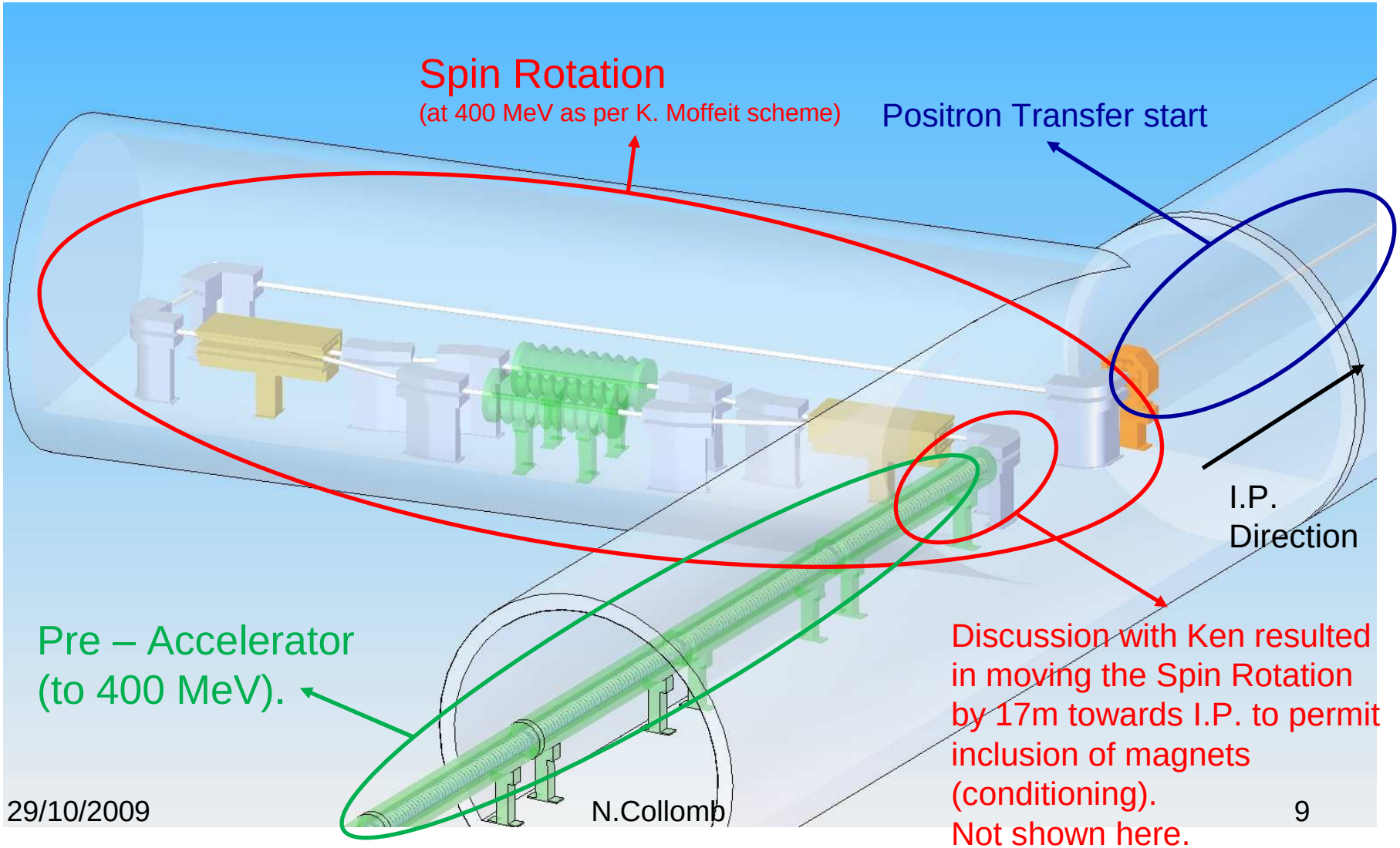
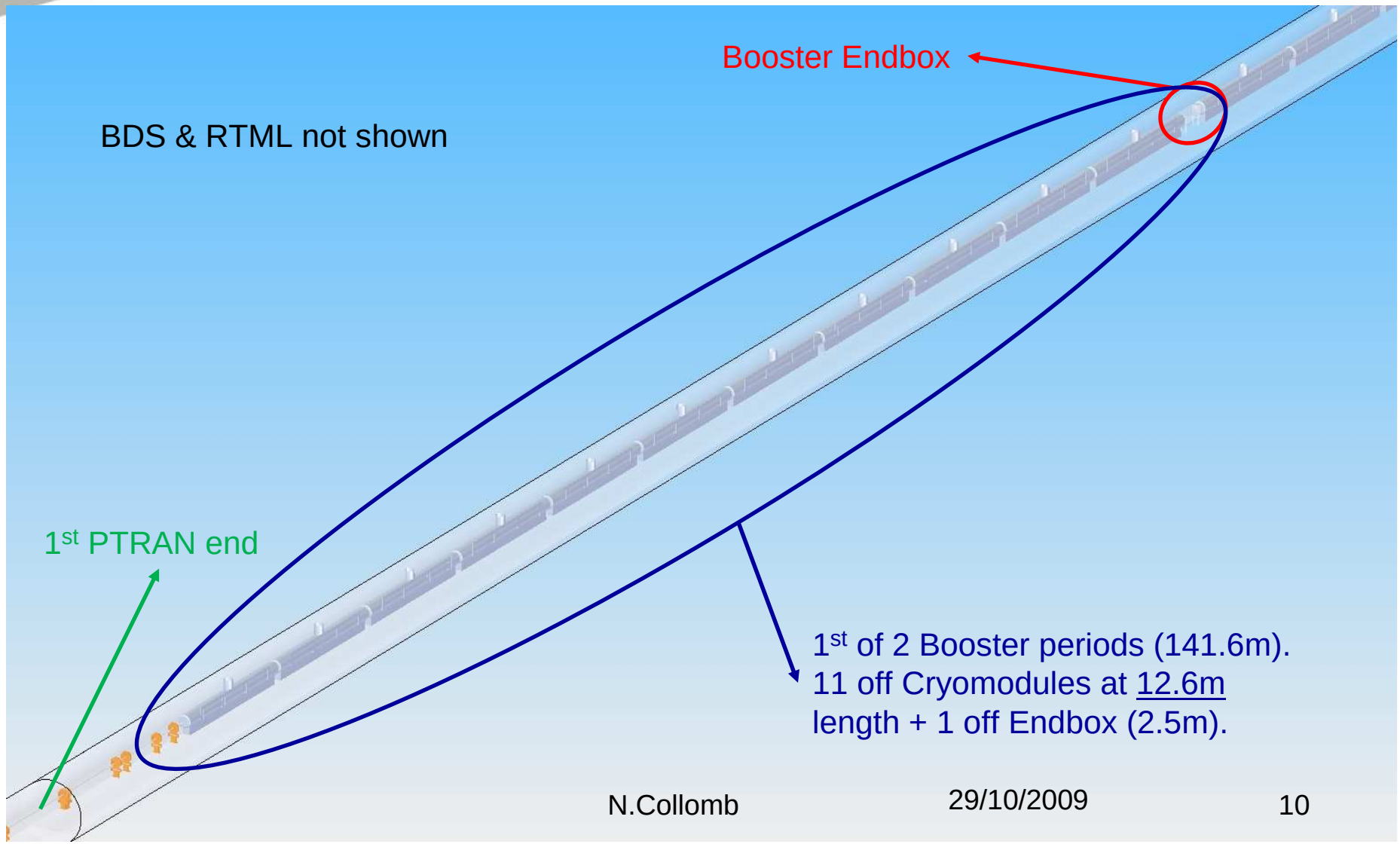
Positron Source – AD&I

3 D Layout Positron Source ‘Spin Rotation’ region.

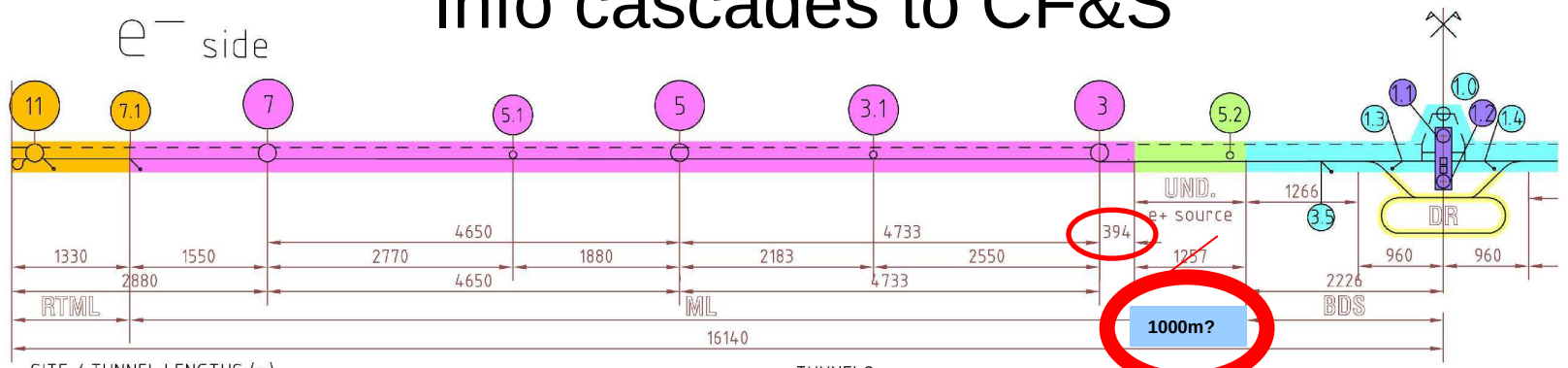


Positron Source – AD&I

3 D Layout for Positron Source ‘Booster region’.



Info cascades to CF&S



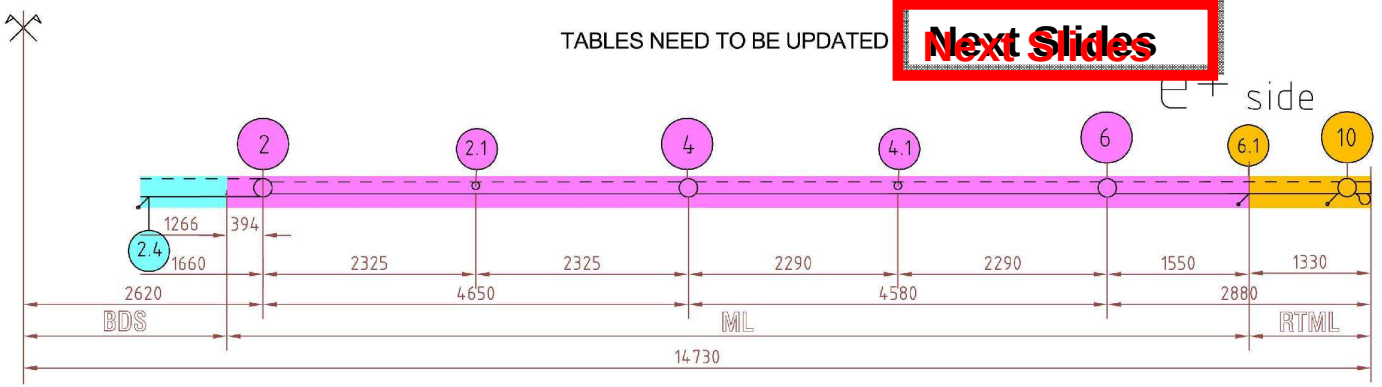
SITE / TUNNEL LENGTHS (m)

e– side + Undulator ML + RTML	e+side ML + RTML	BDS + sources	DR	TOTAL
13 914 / 27 948	12 504 / 25 128	4452 / 12 236	0 / 6704	30 870 / 72 016

TUNNELS

Area	e- inject.,KAS beam + serv	DR	RTML beam + serv	ML beam + serv	BDS beam + serv	BDS Survey
Øm	4.5	0	4.5 + 4.5	4.5 + 4.5	4.5 + 4.5	1.5 x 2.2

TABLES NEED TO BE UPDATED **Next Slides**



SHAFTS

Point	1.0	1.1	1.2	2	3	3.3	5.2	4	5	6	7	10	11	12/C	13/A
Øm	9	16	16	14	14	4	4	14	14	9	9	14	14	9	9

BORINGS

Point	2.1, 3.1, 4.1, 5.1	2.2, 3.2	1.3, 1.4, 2.4, 3.5
Øm	1.50		

SHAFT BASE CAVERNS

Point	2, 3, 4, 5, 6, 7, 10, 11
(LxWxH) m	49 x 16 x 18 + 3 storeys

MUON WALL WIDENINGS

Point	1.3, 1.4
(LxWxH) m	25 x7x6 +15x7x6

SOURCES CAVERNS

Point	Undulator 5.2	KAS 3.3	2.2, 3.2
(LxWxH) m	21 161m3	6 574m3	7 X 15 X 7.5

DR ALCOVES

Point	12/C, 13/A	B, D, E, F
(LxWxH) m	75 x 10 x 10 + 1 storey	16 x 8 x 8

DETECTORS HALL

Point	1.1, 1.2	1.0
(LxWxH) m	120 x 25 x 39	40 x 15 x 15

BEAM DUMPS CAVERNS (↖)

Point	SOURCES 2.3, 3.4	RTML 6.1, 7.1, 10, 11	BDS 1.3, 1.4, 2.4, 3.5
(LxWxH) m	5 x 4 x 4		20 x 9 x 15 + 1 storey

BEAM DUMP SERVICE HALLS (↖)

Point	BDS 1.3, 1.4, 2.4, 3.5
(LxWxH) m	30x20x 10

ILC - RE-BASELINING PROPOSALS

UndulatorArea moved, KAS deleted, Dumping Ring 3.2km

EUROPEAN REGION

GROUP : TS-CE
CIVIL ENGINEERING
SUPERVISOR : J.OSBORNE
DESIGNER : A.KOSMICKI

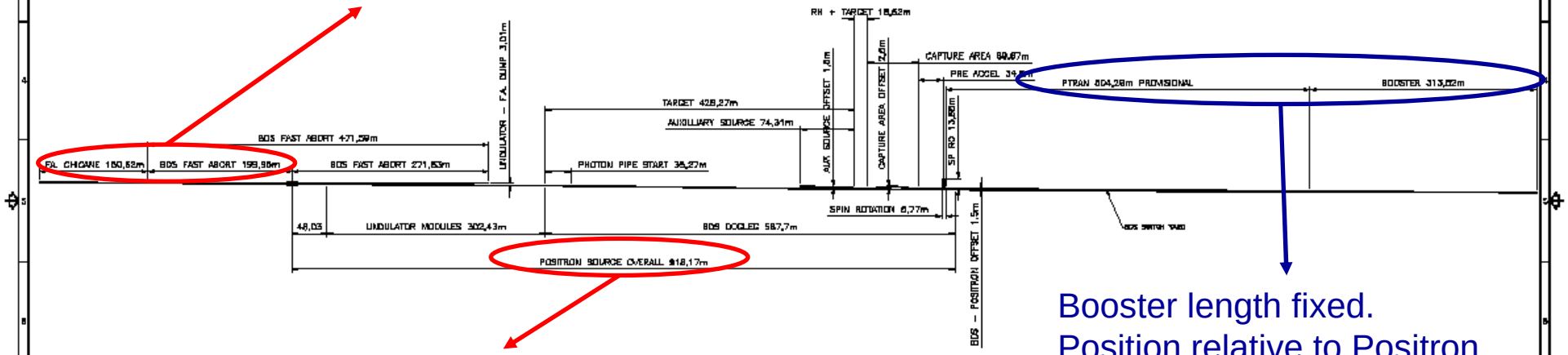
SCALE : 1/50000(A3_FORMAT) DATE: JUNE_4TH_2009

ILC-.CE-1.1649.0022 SIZE 3 INDICE

Positron Source – AD&I

2 D Layout for Positron Source region as per Albuquerque workshop.

BDS Chicane, Collimation and Fast Abort Extraction (350m).

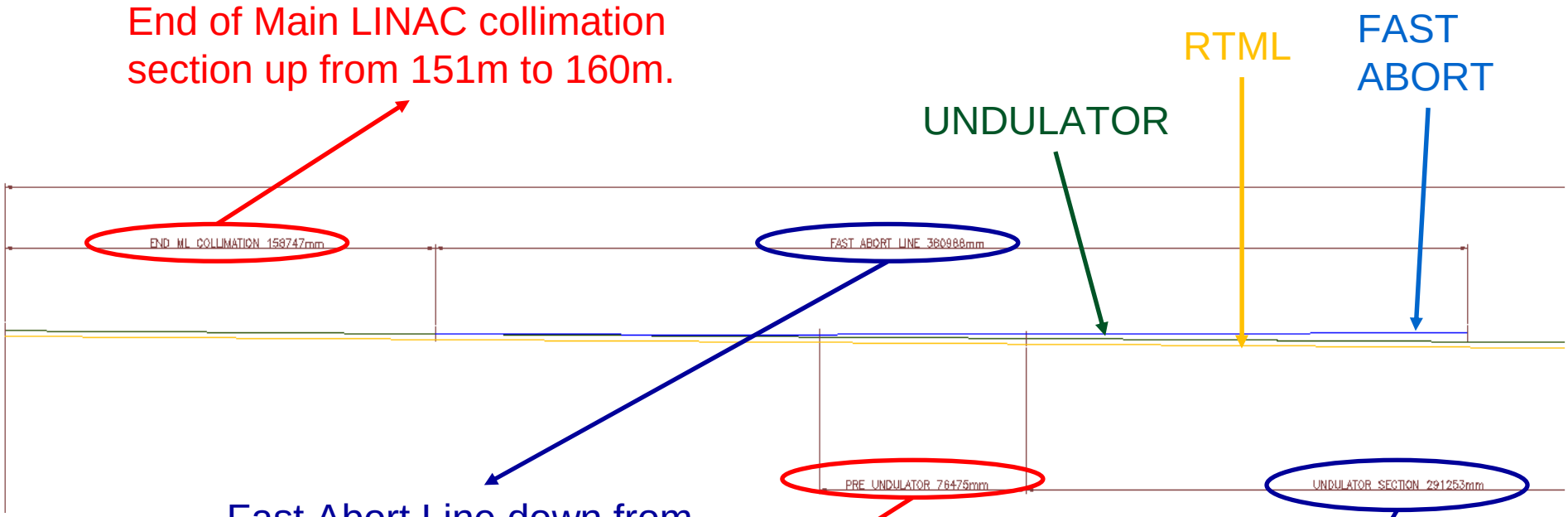


Positron Source length currently at approx. 920m.

Booster length fixed.
Position relative to Positron Source can vary in steps of 16.8m either direction.

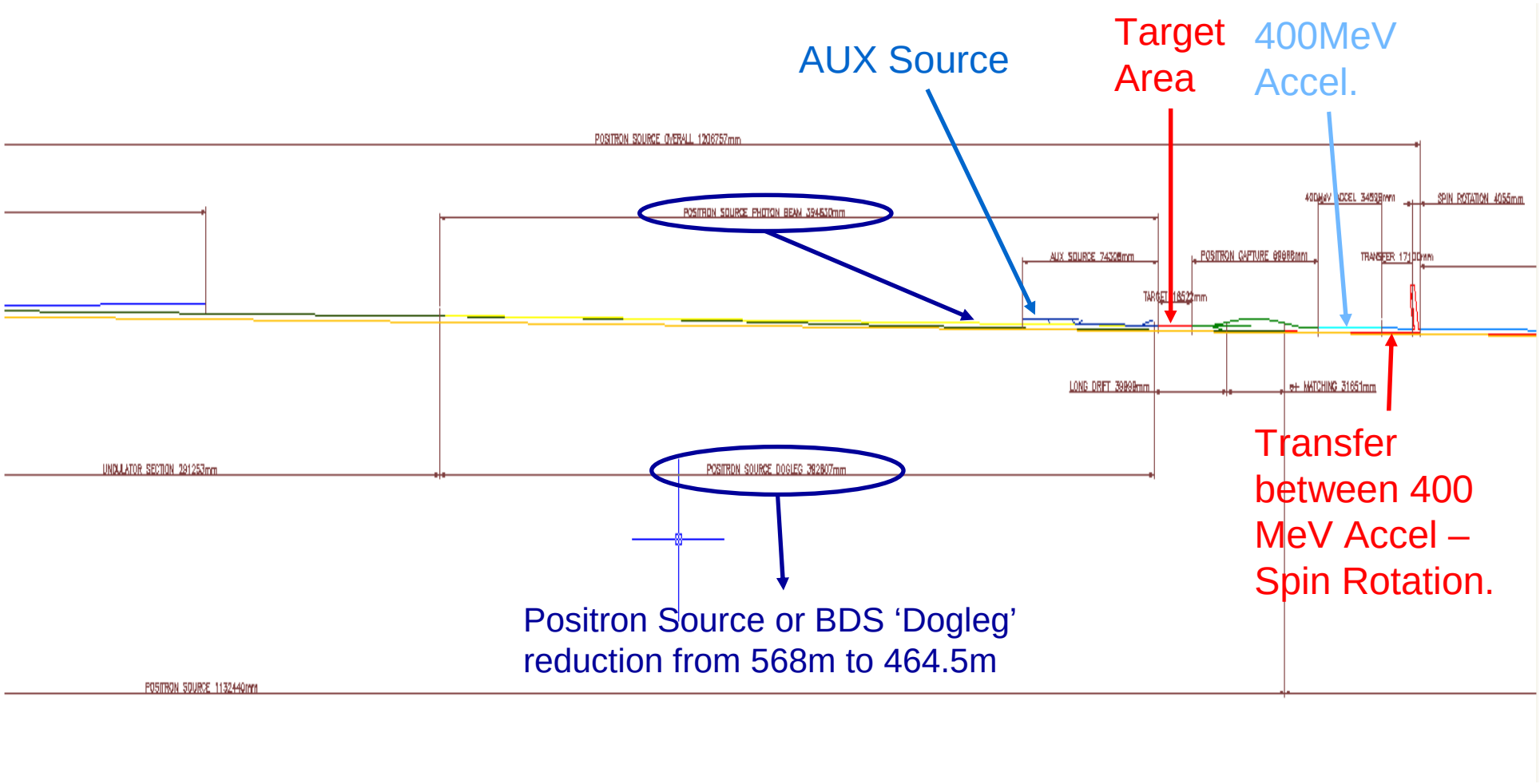
Positron Source – AD&I

2 D Layout for Positron Source region (*since* Albuquerque).



Positron Source – AD&I

2 D Layout for Positron Source region *since* Albuquerque.



Positron Source – AD&I

Summary

The Positron Source overall layout can be considered complete (Booster Position and remaining Positron Transfer will require update).

It is understood that the Spin Rotation and Auxiliary Source can remain where modelled (subject to official confirmation). Action on ???

CAD models can be distributed now that the Beam Delivery lattice design has been updated (ACAD info has gone to TAG leaders and PMs). Action on CF&S to convert Beam data into meaningful presentation material – almost complete.

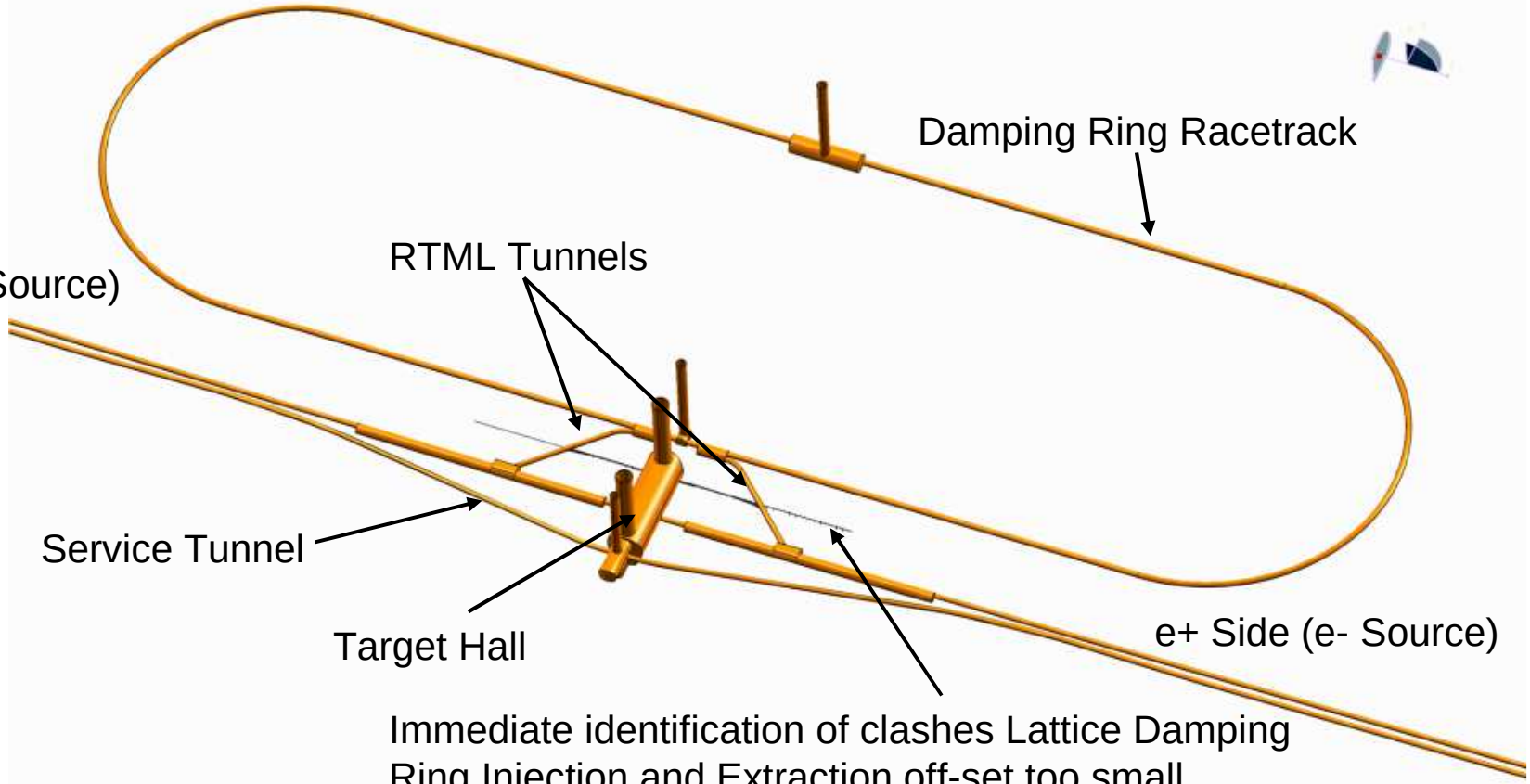
Note, certain system lengths (Cryomodules) and positions ought to be near a sufficiently large access shaft. This is a positioning issue and does not affect cost, civil construction or the principle layout. Action – leave where it is for the time being.

Remote Handling change over process and space requirement investigation/development is high on priority list (still). Action on self.

Is the ‘Fast Abort’ line and the ‘Dogleg’ part of the Positron Source or BDS? If so, where does one end and the other start? Action on PMs/Ewan/Positron Source – BDS TAG leaders? Details in AD&I Central Integration summary.

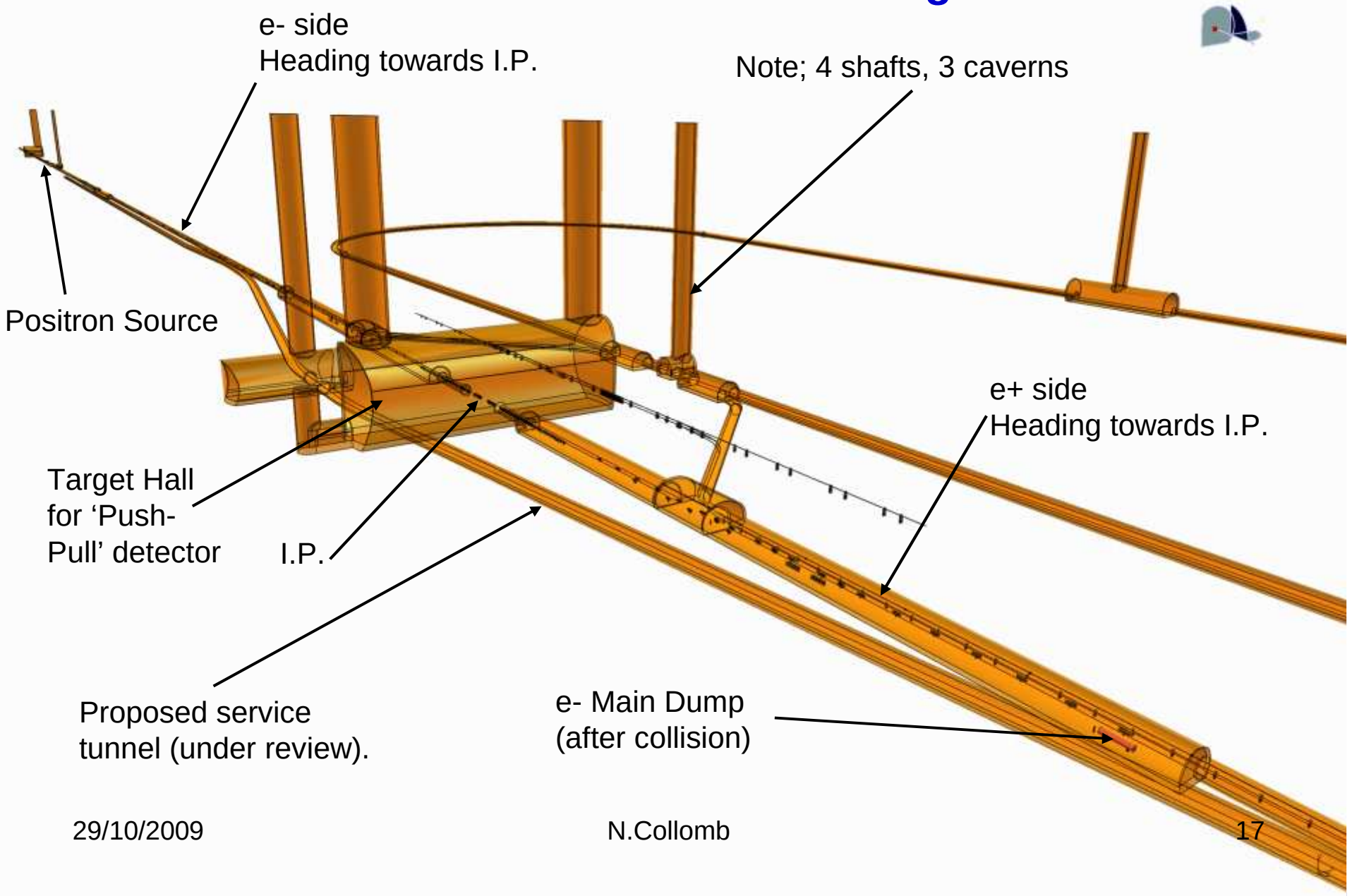
Central Integration – AD&I

For the first time; Lattice Design components and CF&S 3D CAD combined.

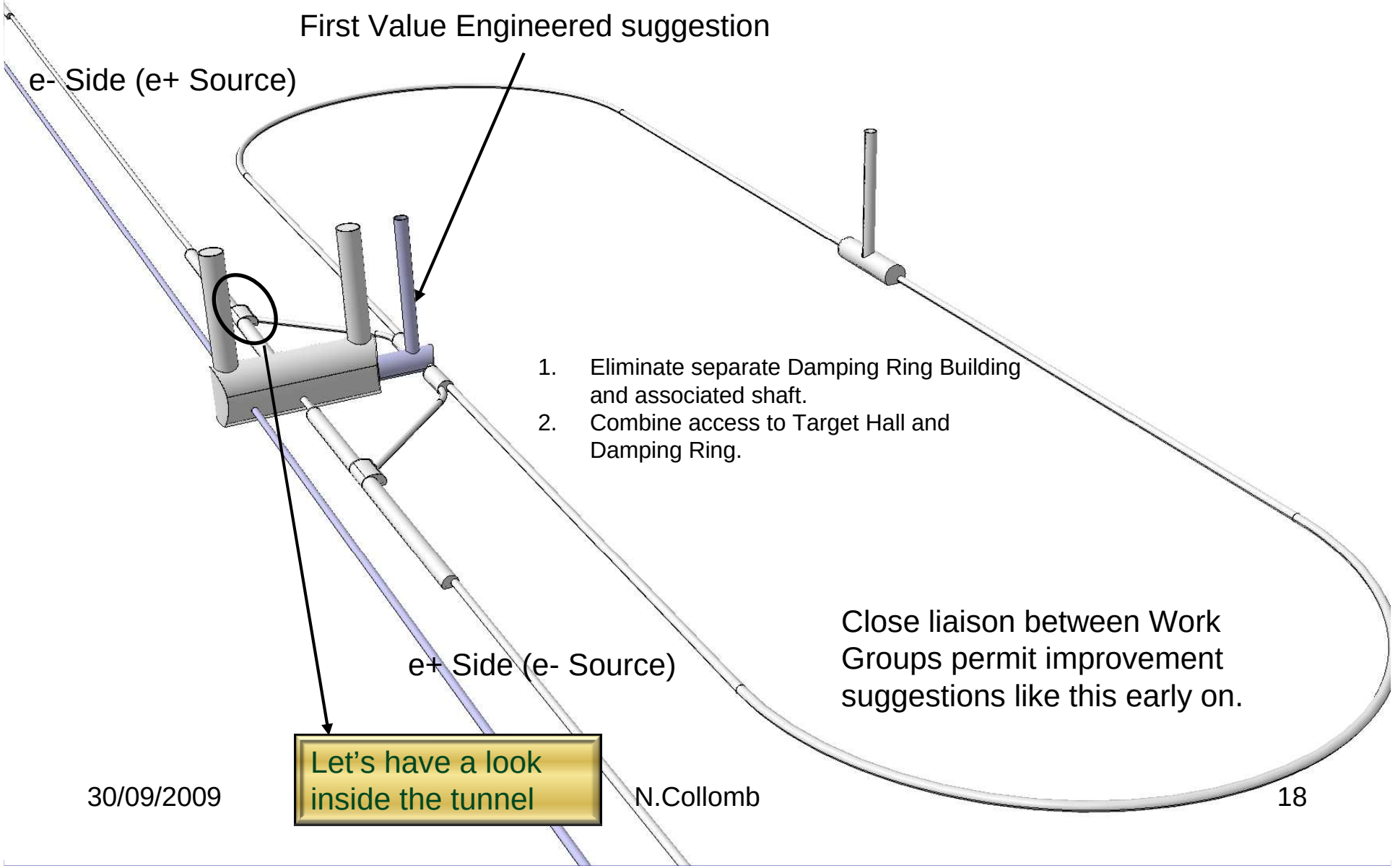


Immediate identification of clashes Lattice Damping Ring Injection and Extraction off-set too small.
Issue resolved during Albuquerque meeting. Off-set determined to be 90m. ACAD updated. 3D info update in progress.

Central Integration – AD&I



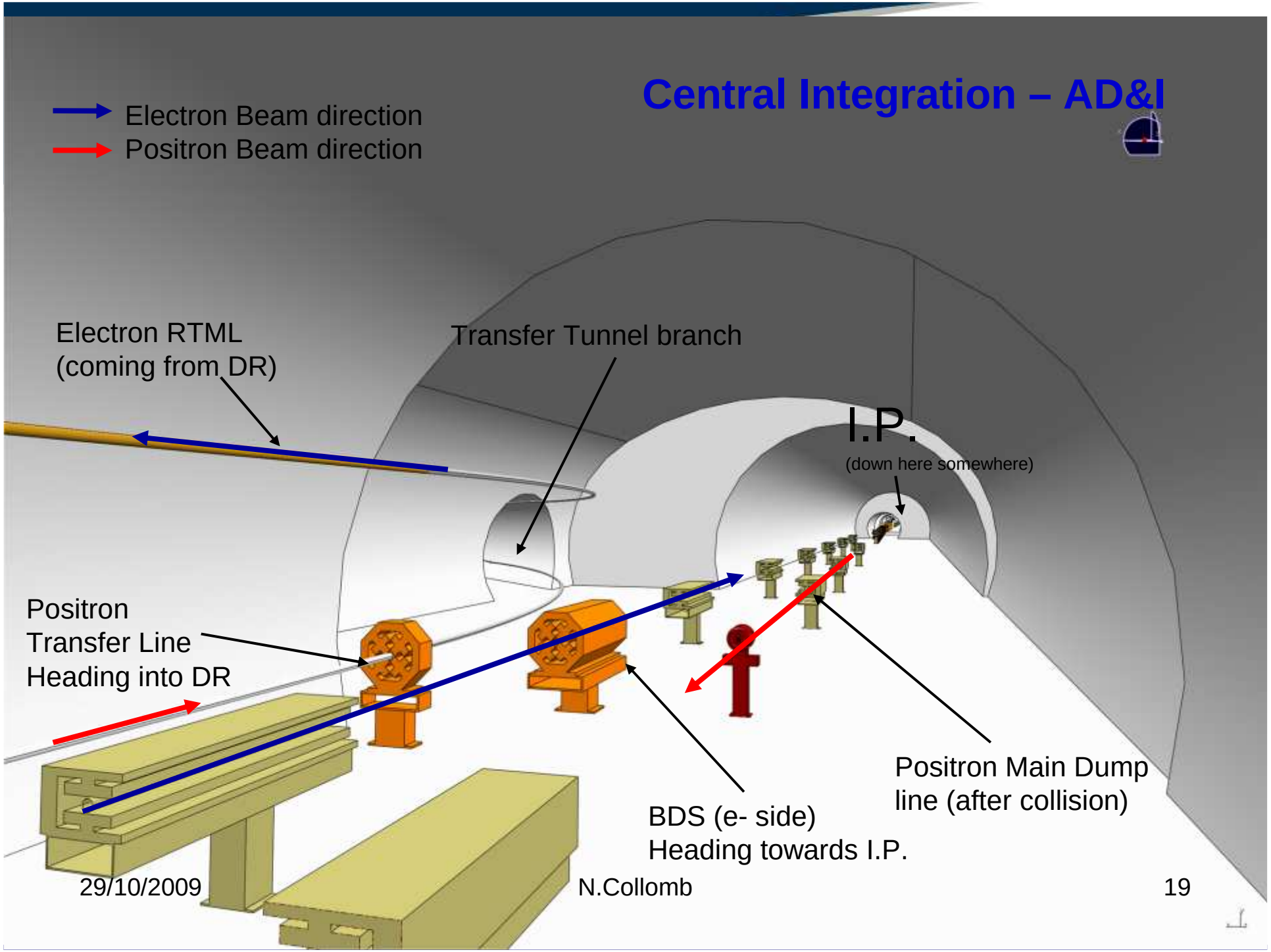
Central Integration – AD&I



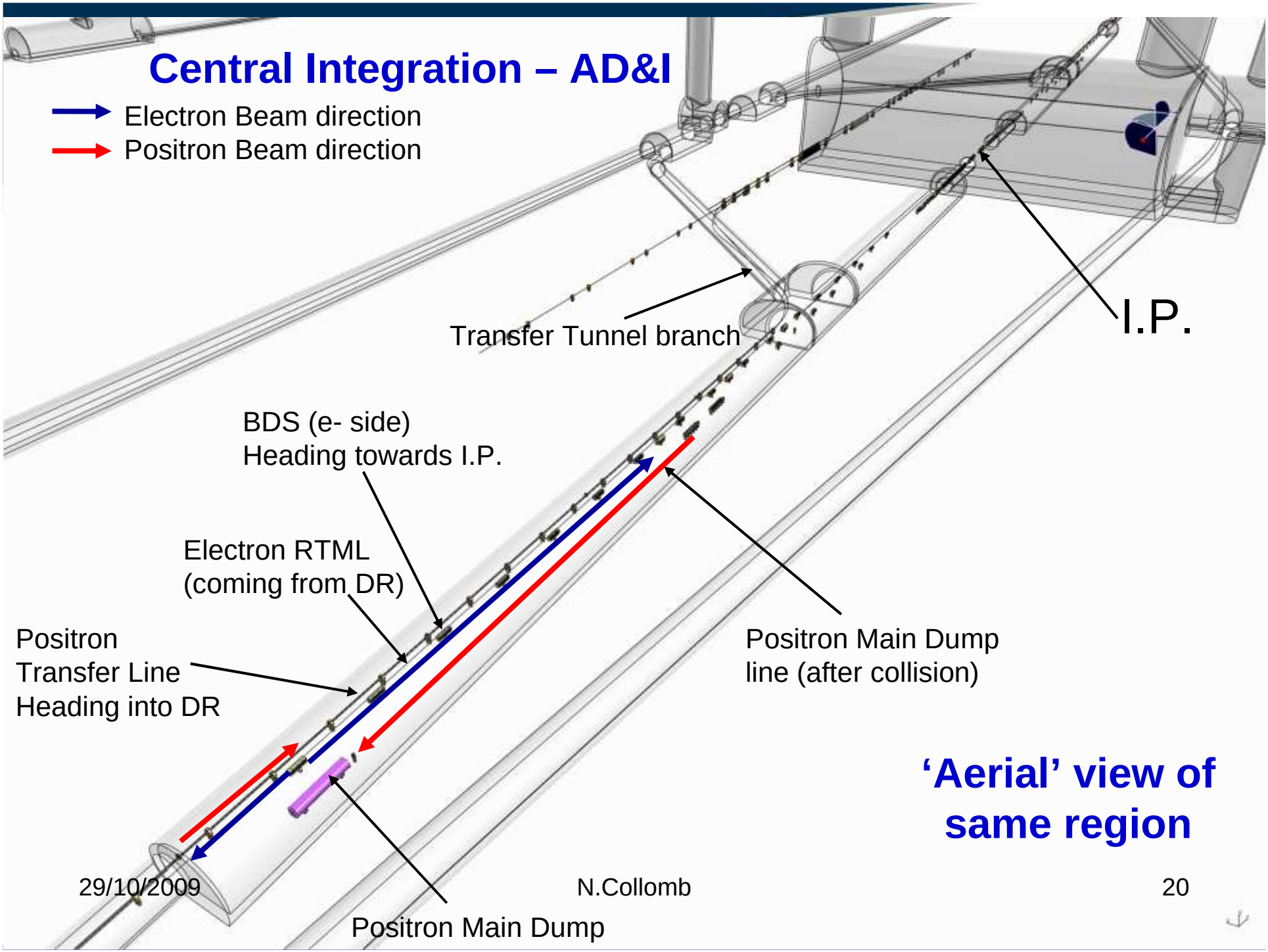
1. Eliminate separate Damping Ring Building and associated shaft.
2. Combine access to Target Hall and Damping Ring.

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

Central Integration – AD&I



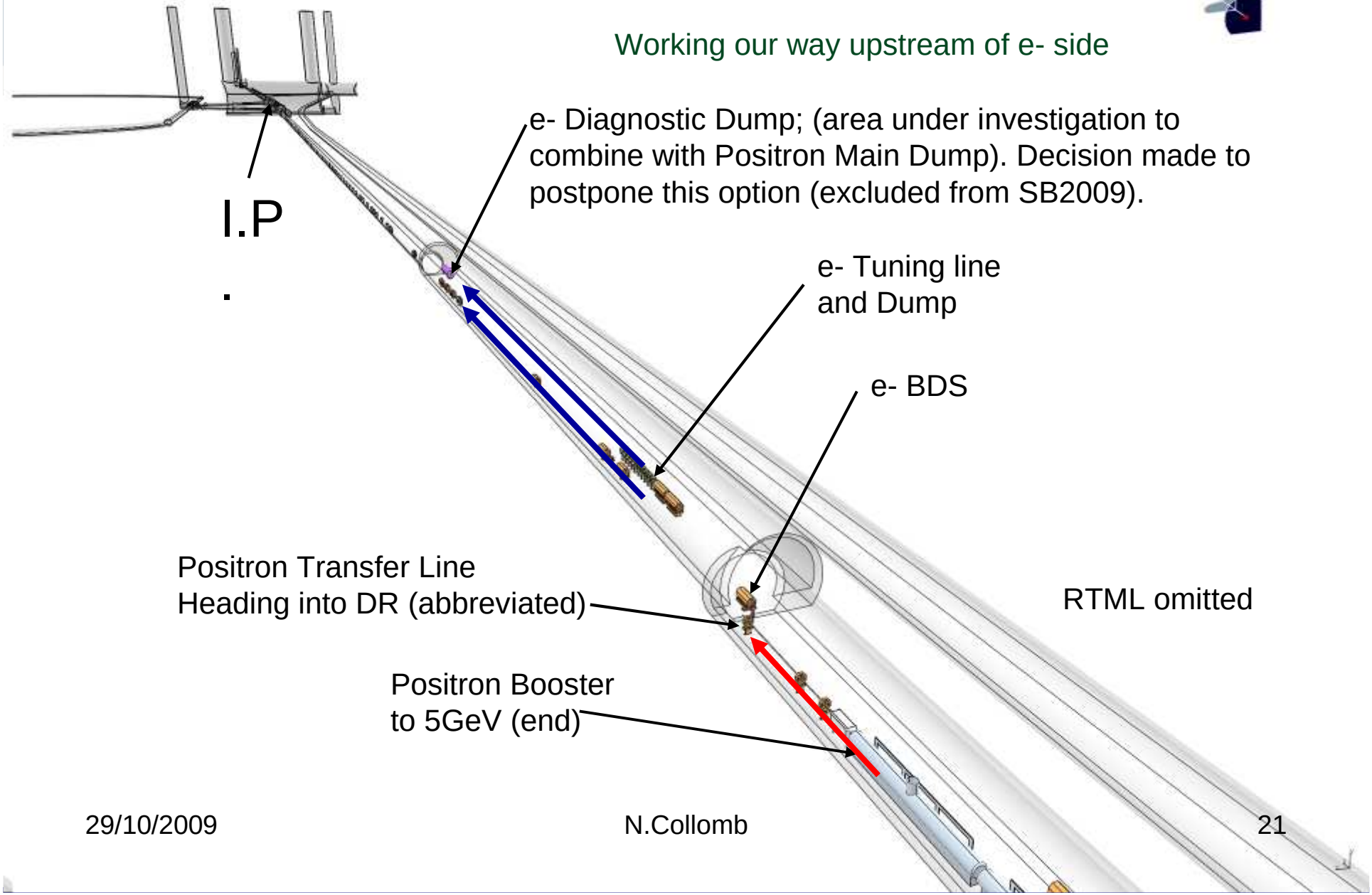
Central Integration – AD&I



'Aerial' view of same region

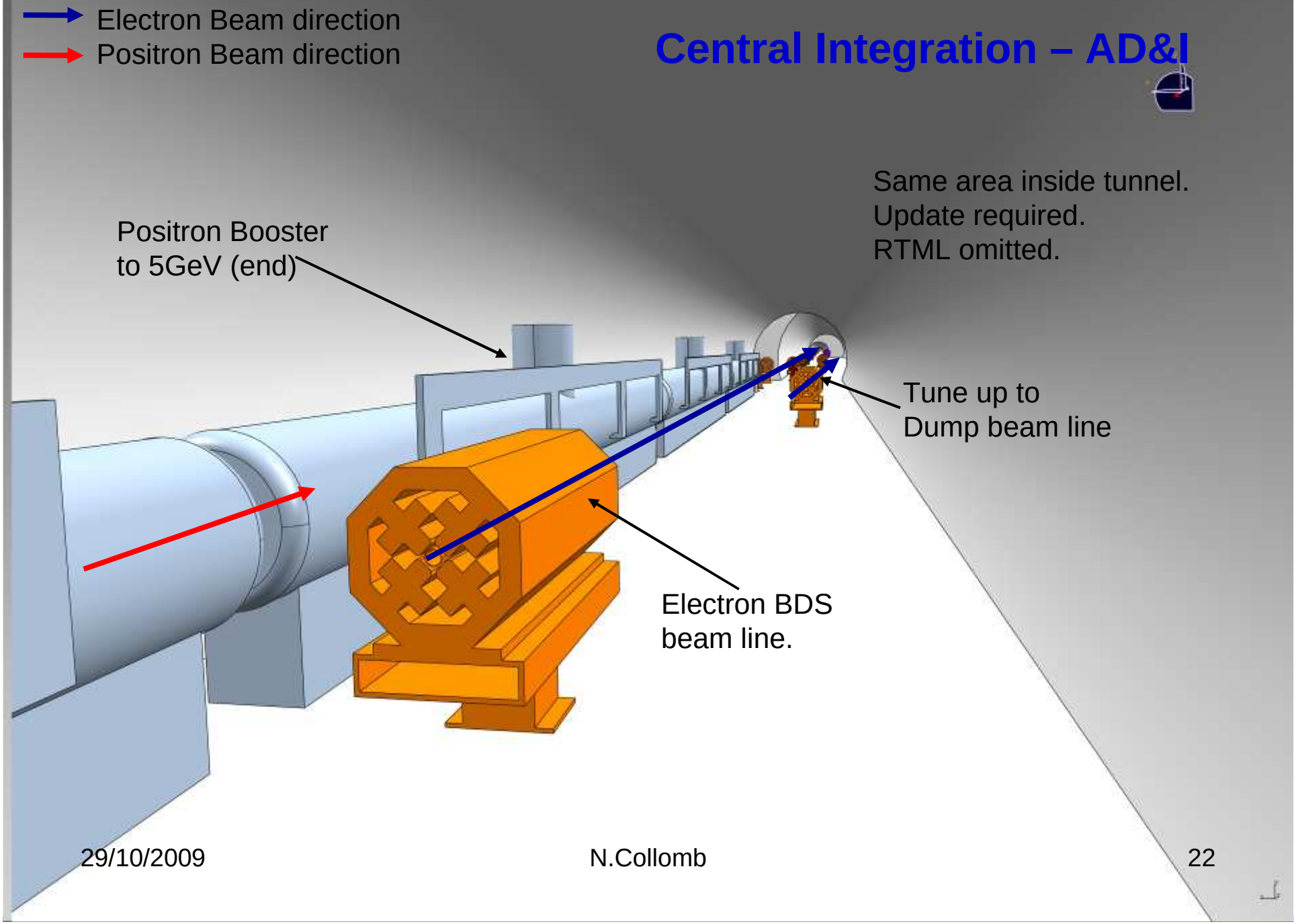
Central Integration – AD&I

Working our way upstream of e- side



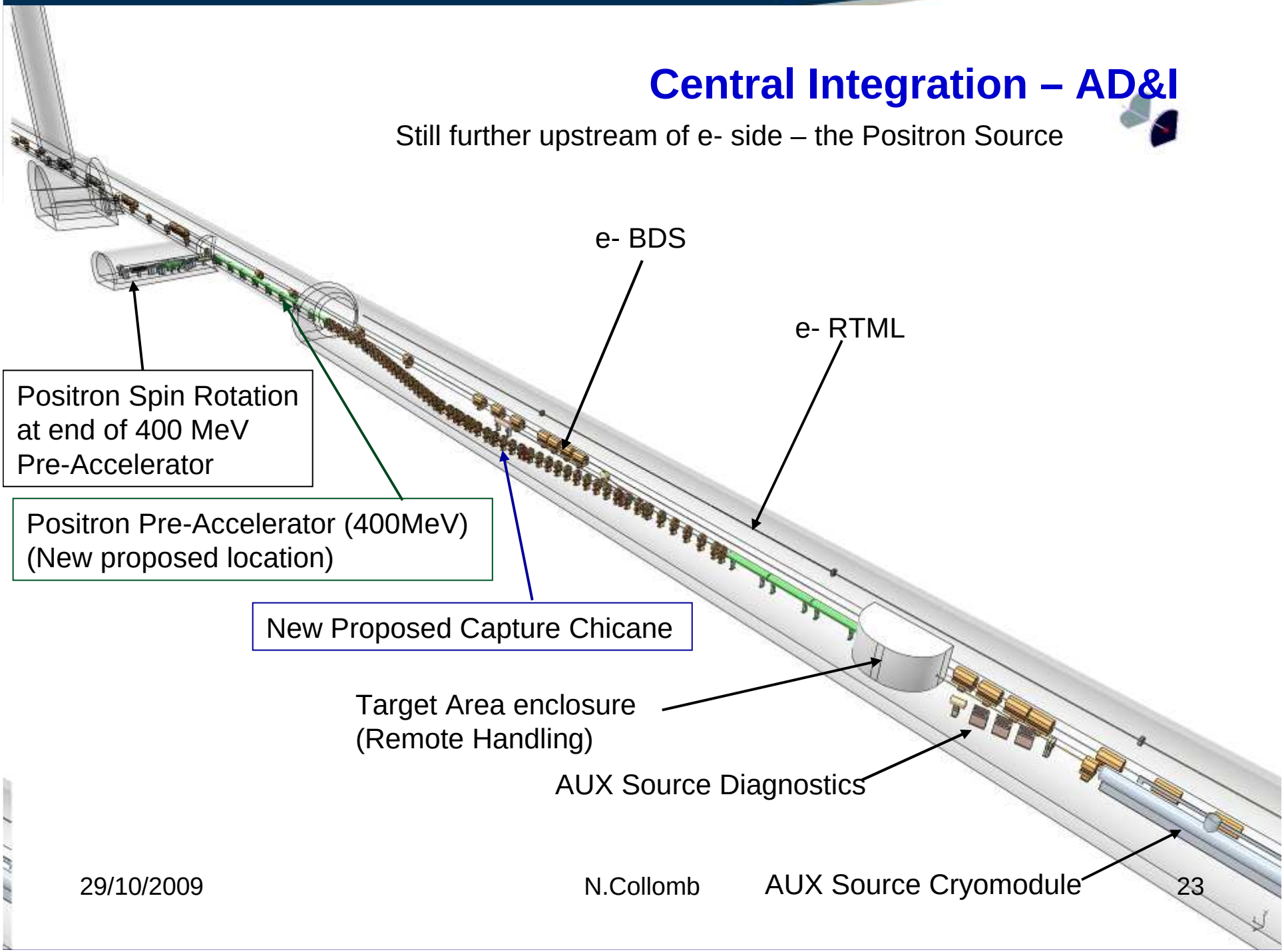
Central Integration – AD&I

Electron Beam direction
Positron Beam direction

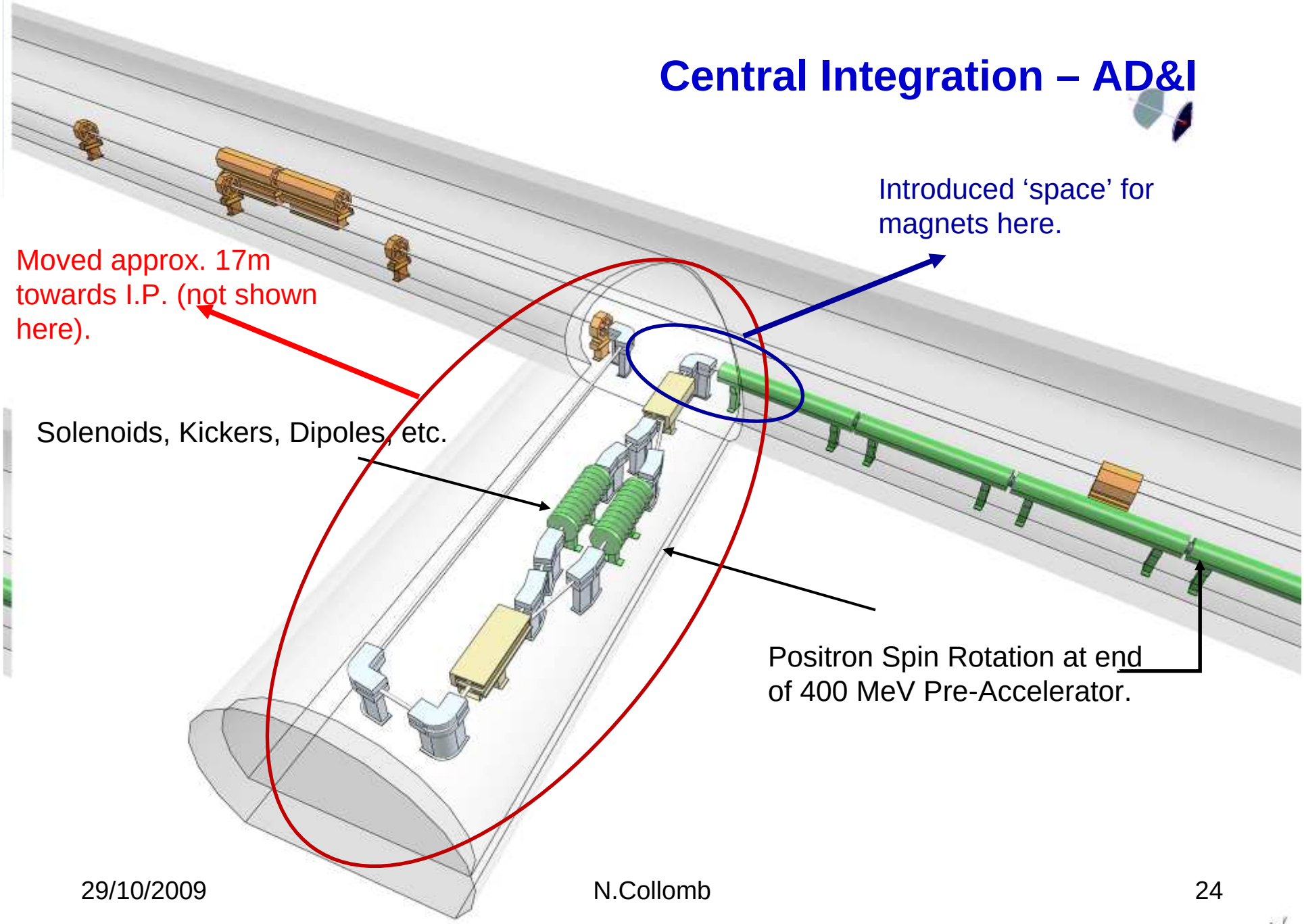


Central Integration – AD&I

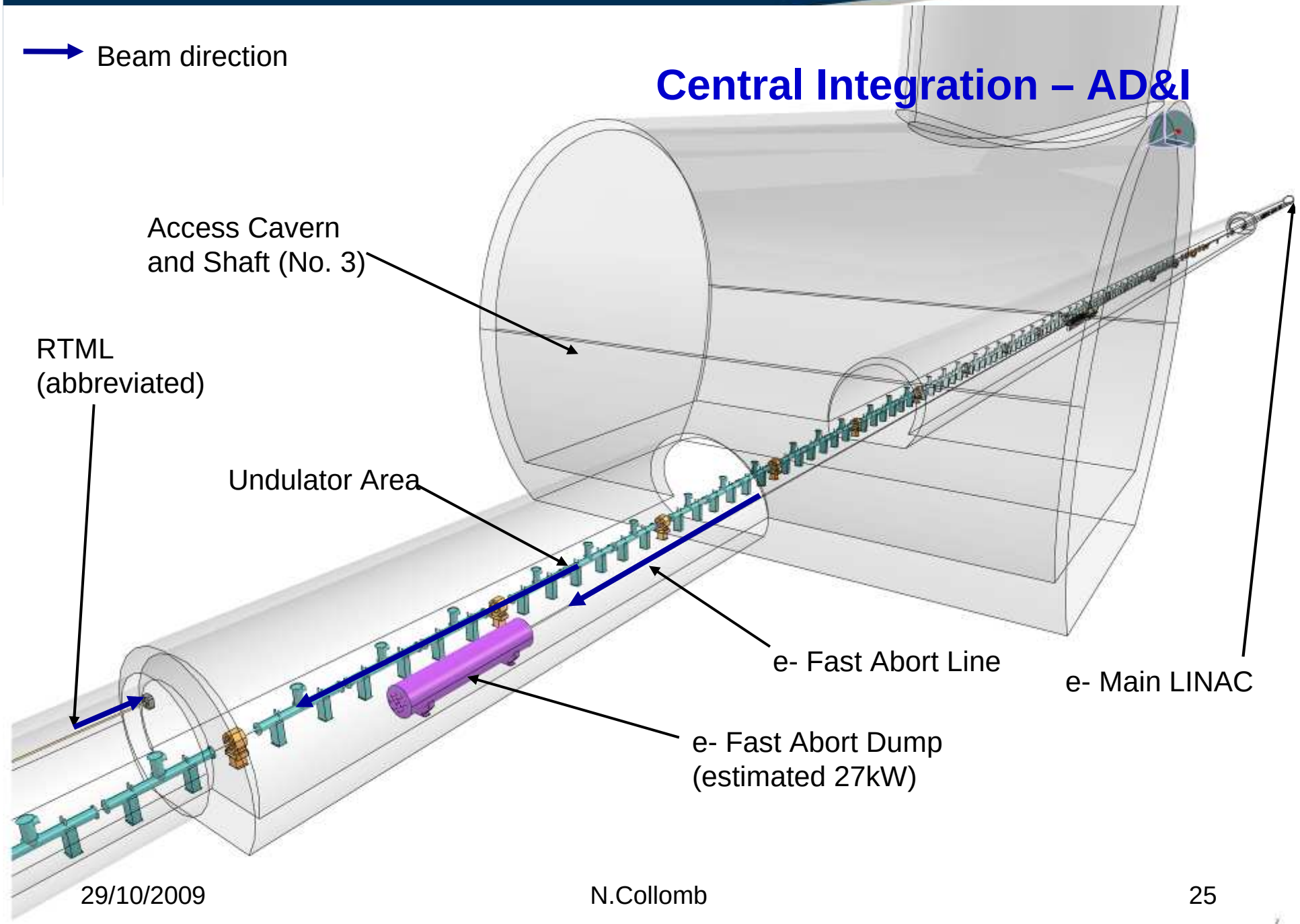
Still further upstream of e- side – the Positron Source



Central Integration – AD&I



Central Integration – AD&I



Central Integration – AD&I

Summary

There are a number of Beam lines which have been omitted due to time constraints.

Some improvements are being incorporated already.

Further value engineering opportunities are being identified and noted.

BDS lattice design has been optimised.

Updates of CAD 2D complete.
CAD 3D updates are made as quickly as possible.

Note, this is a first step in the Overall Layout integration and there are many risk highlights. It is felt that huge progress has been made and continues to do so. There seems to be a light at the end of the tunnel!!

I'd like to go as far as saying that a big proportion of the fluidity of the machine has been solidified. Don't forget that some areas are best guesstimates and need to be confirmed by physicists.

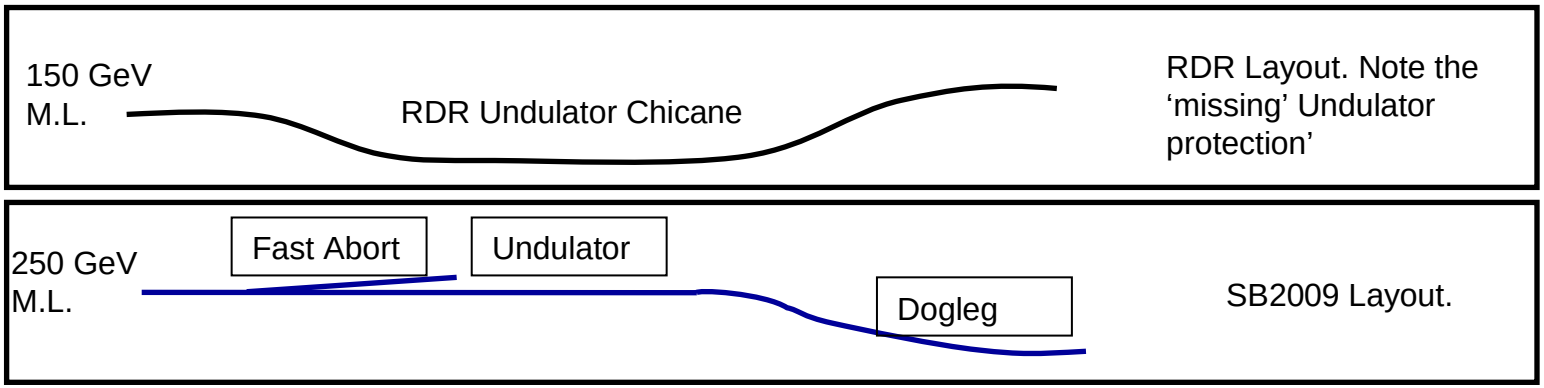
It was agreed after some discussion that the SB2009 design needs to be frozen in order to enable us to create 'accurate' costing, complete tunnel, cavern and shaft estimate and associated services layout.

Central Integration – AD&I

Summary (Dogleg ownership)

To return to the issue of which part of the Positron Fast Abort line and Dogleg falls under who's responsibility, 2 arguments are:

The initial RDR chicane was the Positron WG's responsibility, hence eliminating the chicane's pre Undulator 'Dogleg' means that the remaining Dogleg (although heavily modified) is still part of the Positron Source system.



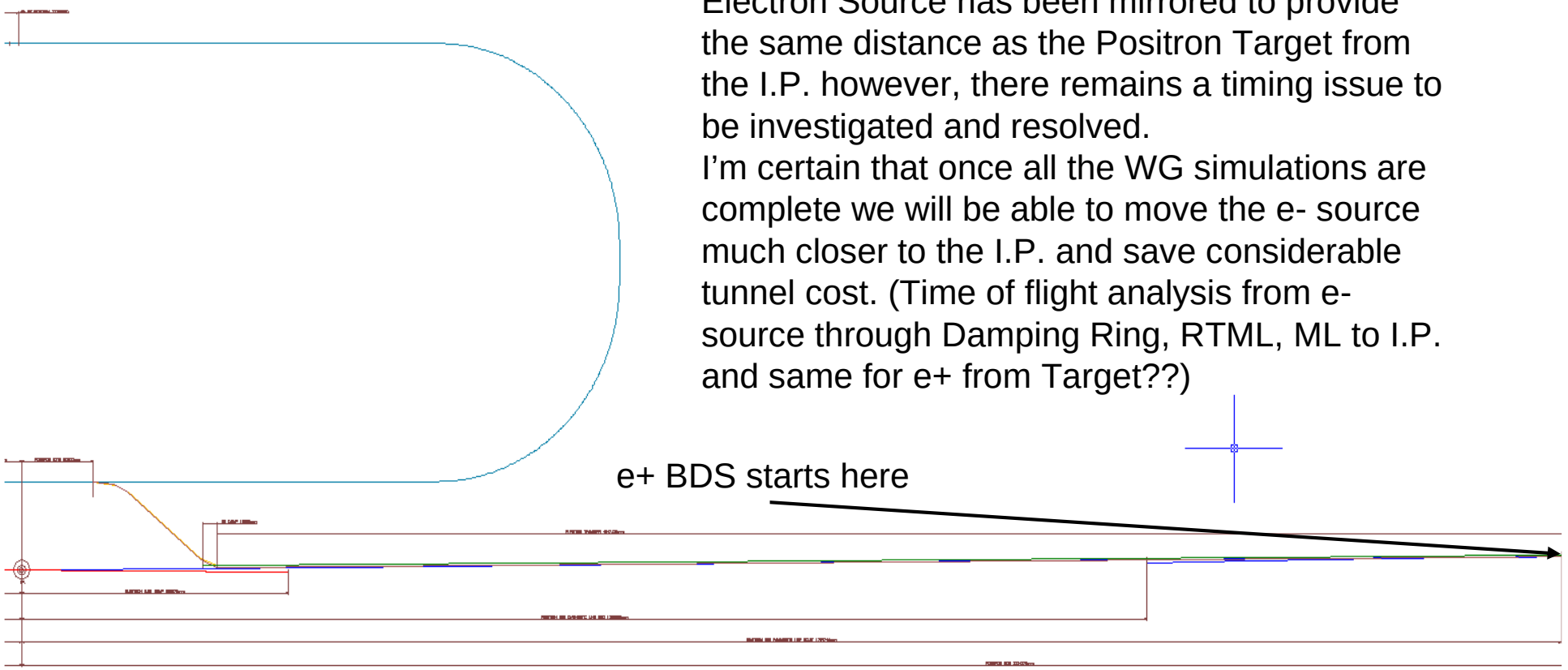
Another argument is that the Dogleg influences optics, in short BDS, and thus requires it to be included in the BDS studies.

There are more pro and con arguments and lets not dwell on them. The consequence of the AD&I change and inclusion is that one WG will have a lot more work to do and an appreciable increase in system cost (previously omitted).

Central Integration – AD&I

Summary (Timing highlight)

Illustration below shows Positron BDS with length 2226m.



Electron Source has been mirrored to provide the same distance as the Positron Target from the I.P. however, there remains a timing issue to be investigated and resolved.
I'm certain that once all the WG simulations are complete we will be able to move the e- source much closer to the I.P. and save considerable tunnel cost. (Time of flight analysis from e- source through Damping Ring, RTML, ML to I.P. and same for e+ from Target??)

Central Integration – AD&I

Summary

Illustration below shows an extract from the ‘fixed goalpost’ AutoCAD layout.
The e- BDS is reduced in length from 2226m to 2104m.
It is assumed the BDS ‘start’ is at the end of the ‘Dogleg’, which includes the 40m Drift to clear the Remote Handling Area and 31.6m of matching.