



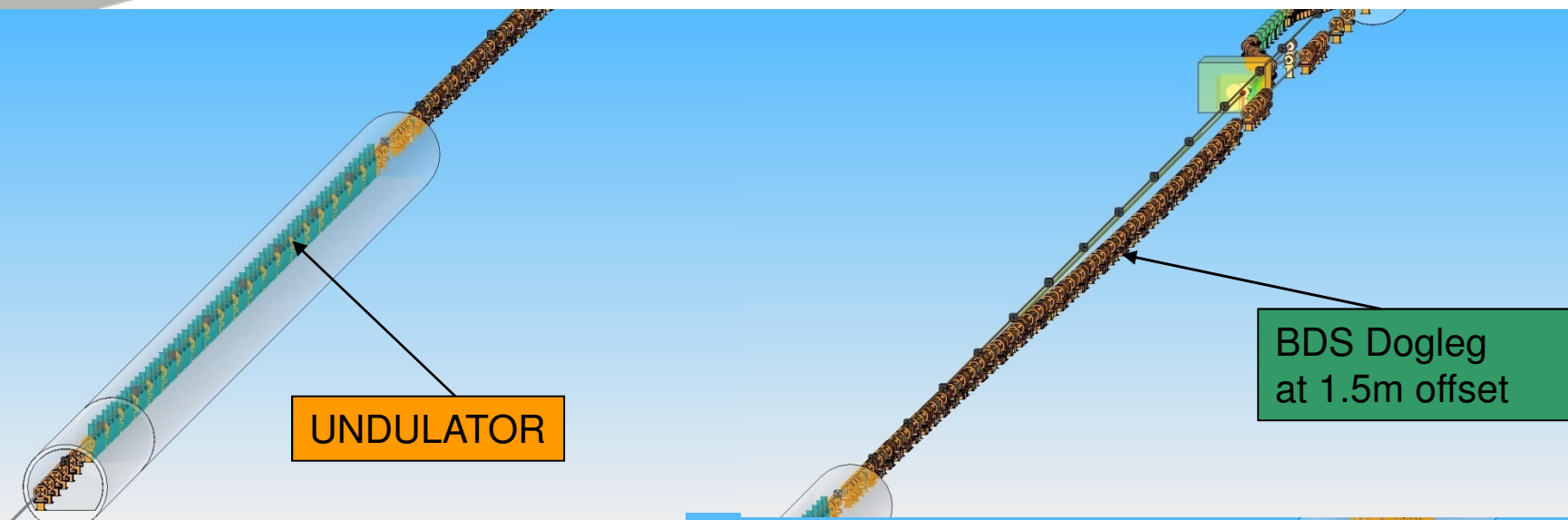
# Linear Collider Positron Source and Central Integration Update

Norbert Collomb

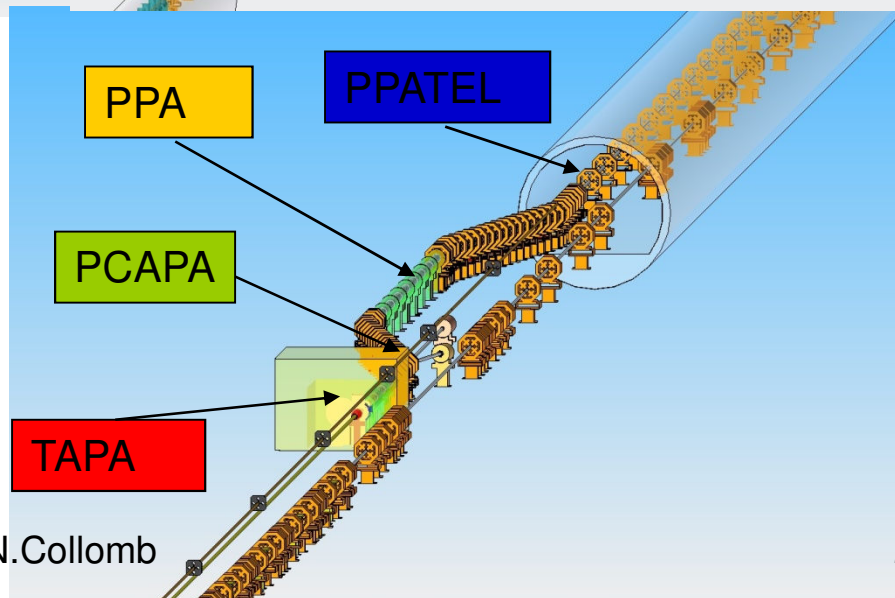
Acknowledging assistance from:

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

## Positron Source – TILC09 status

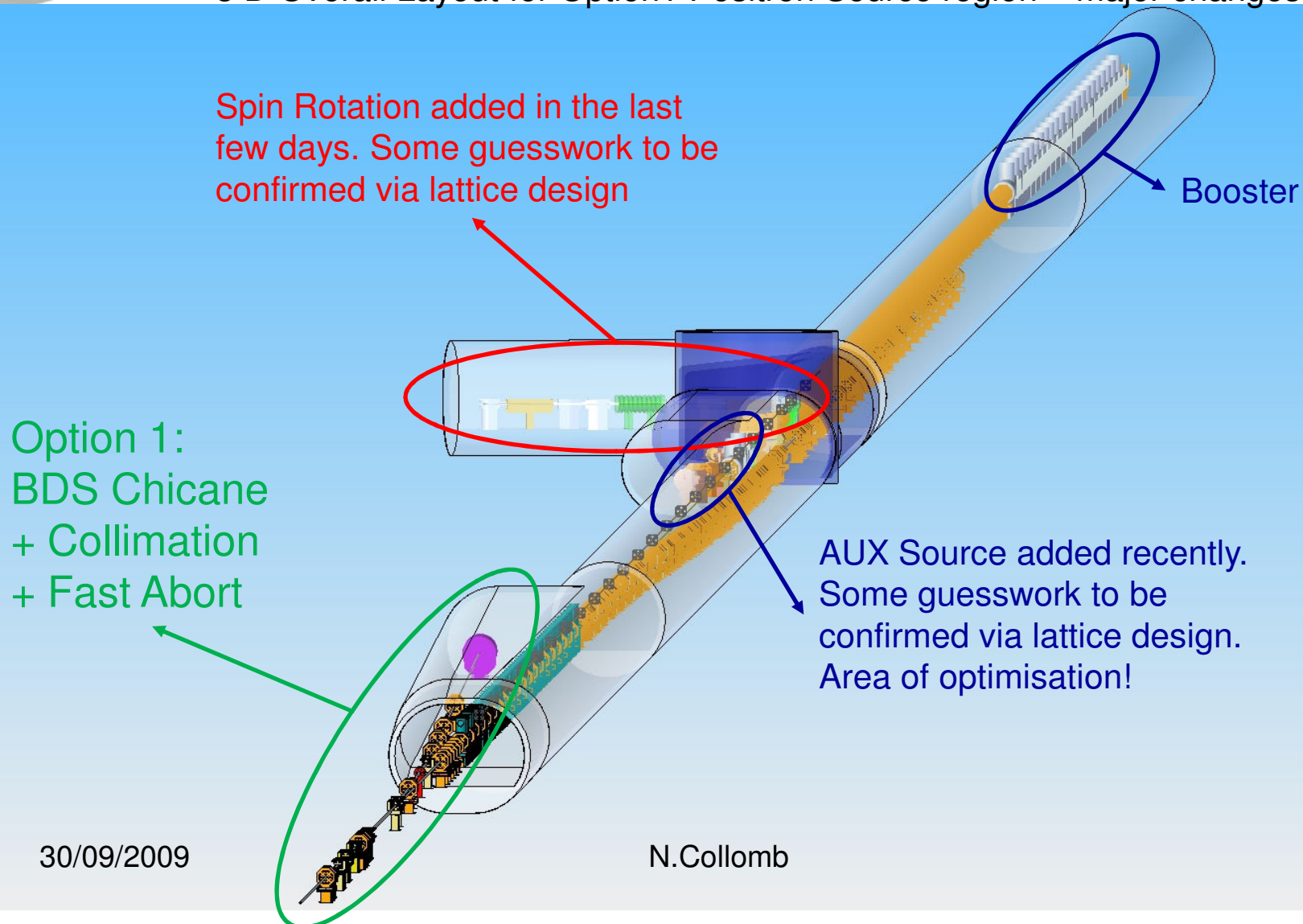


1. Undulator moved from 150 GeV to 250 GeV location.
2. PTRAN moved from ceiling into same plane as rest of machine.
3. No Auxiliary Source and 5GeV Accelerator info.
4. Spin Rotation in question, hence omitted.



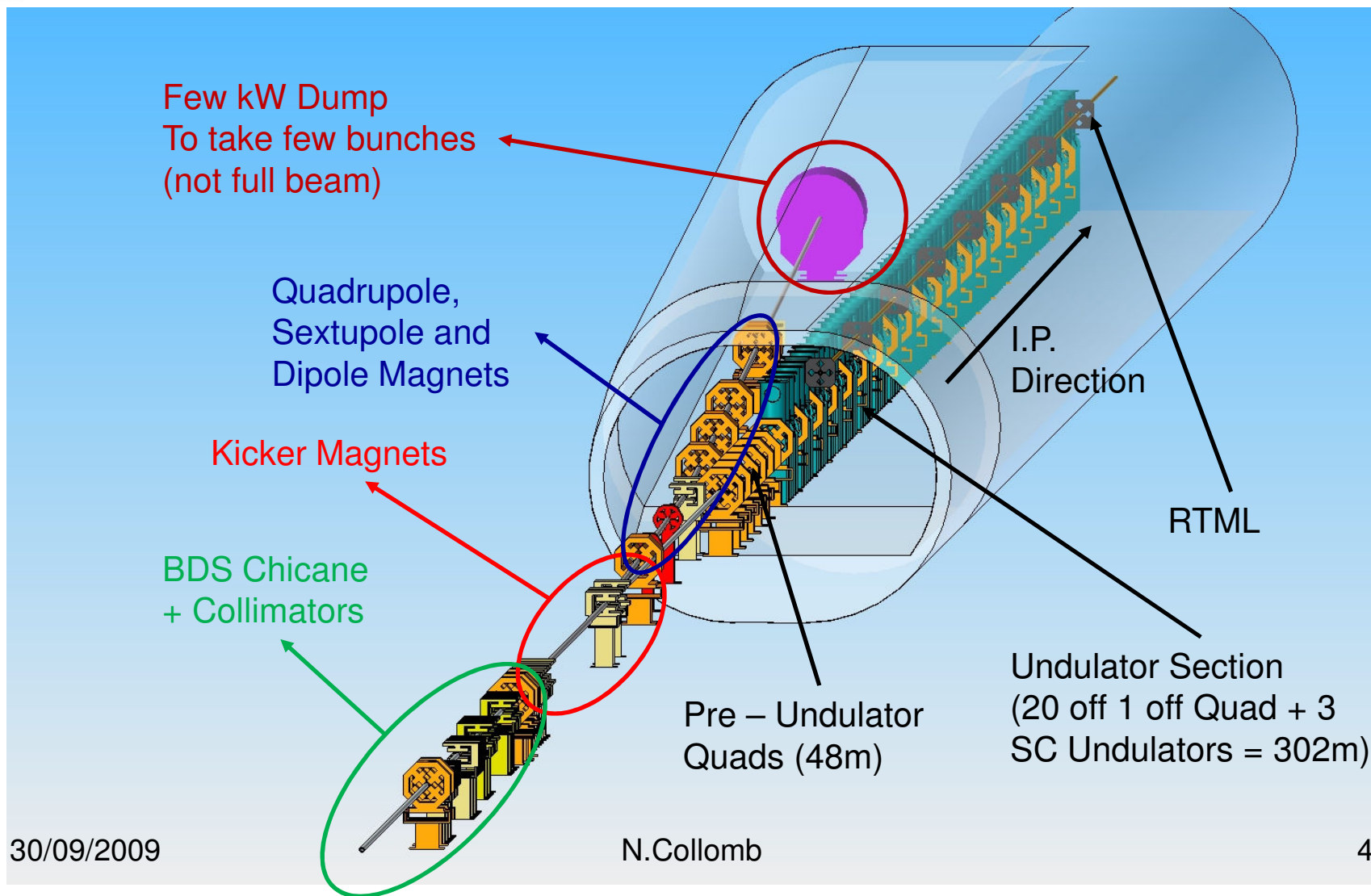
## Intensive work with other work groups resulted in current status

3 D Overall Layout for Option1 Positron Source region – major changes.



# Positron Source – AD&I

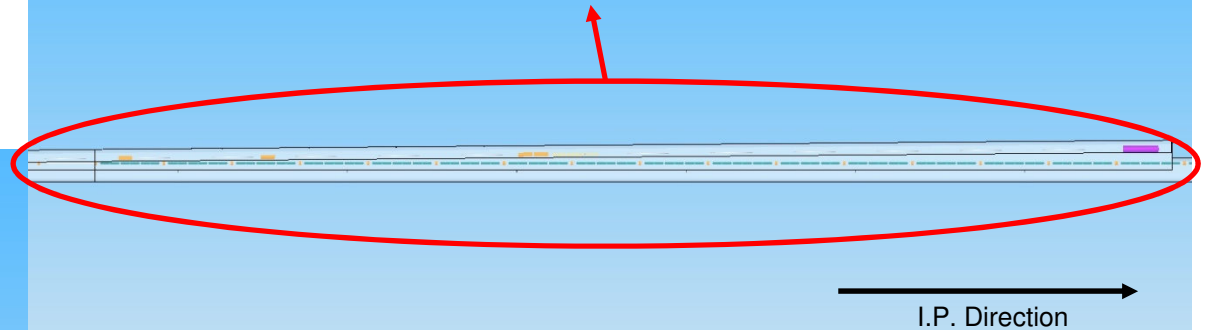
## 3 D Layout Positron Source BDS Fast Abort region.



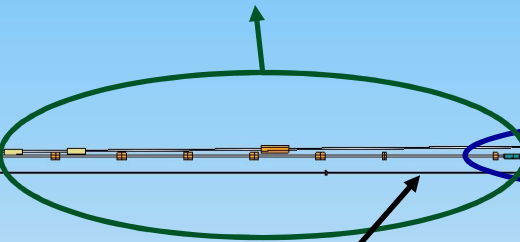
# Positron Source – AD&I

3 D Layout Positron Source BDS Fast Abort region.

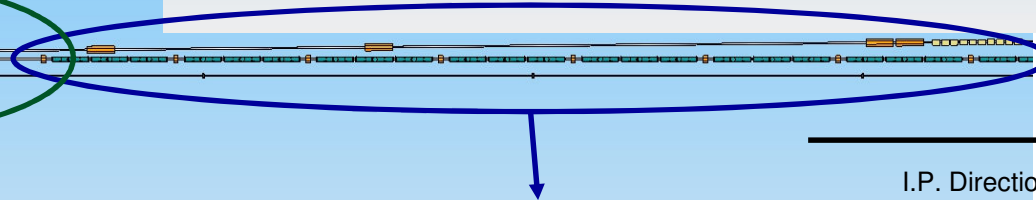
Is an Alcove like this feasible?  
(9.5° off axis) – CFS answer: yes



Interleaved  
Fast Abort and  
Undulator  
Magnets



RTML

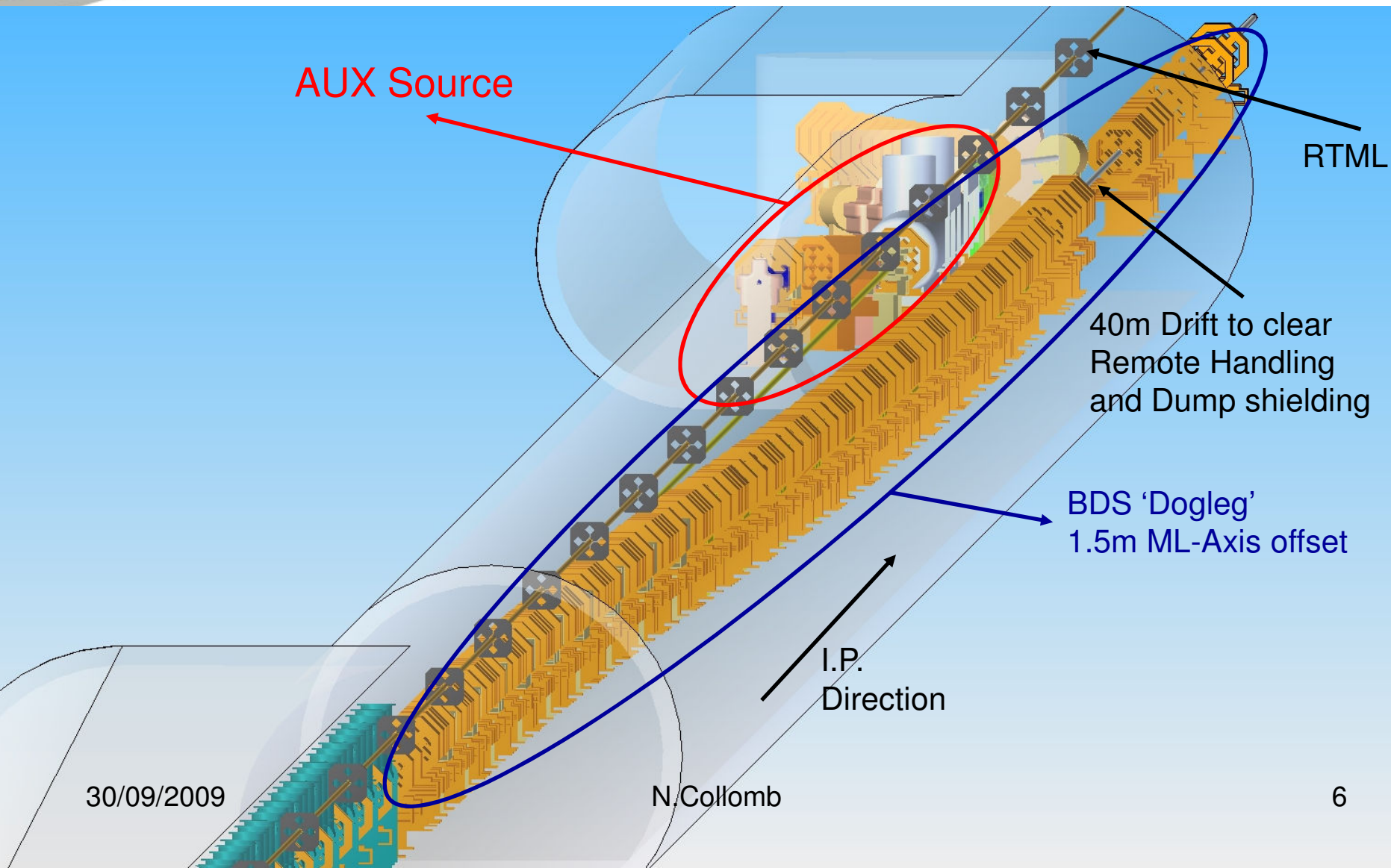


Sufficient clearance between Fast  
Abort Magnets and Undulator Modules



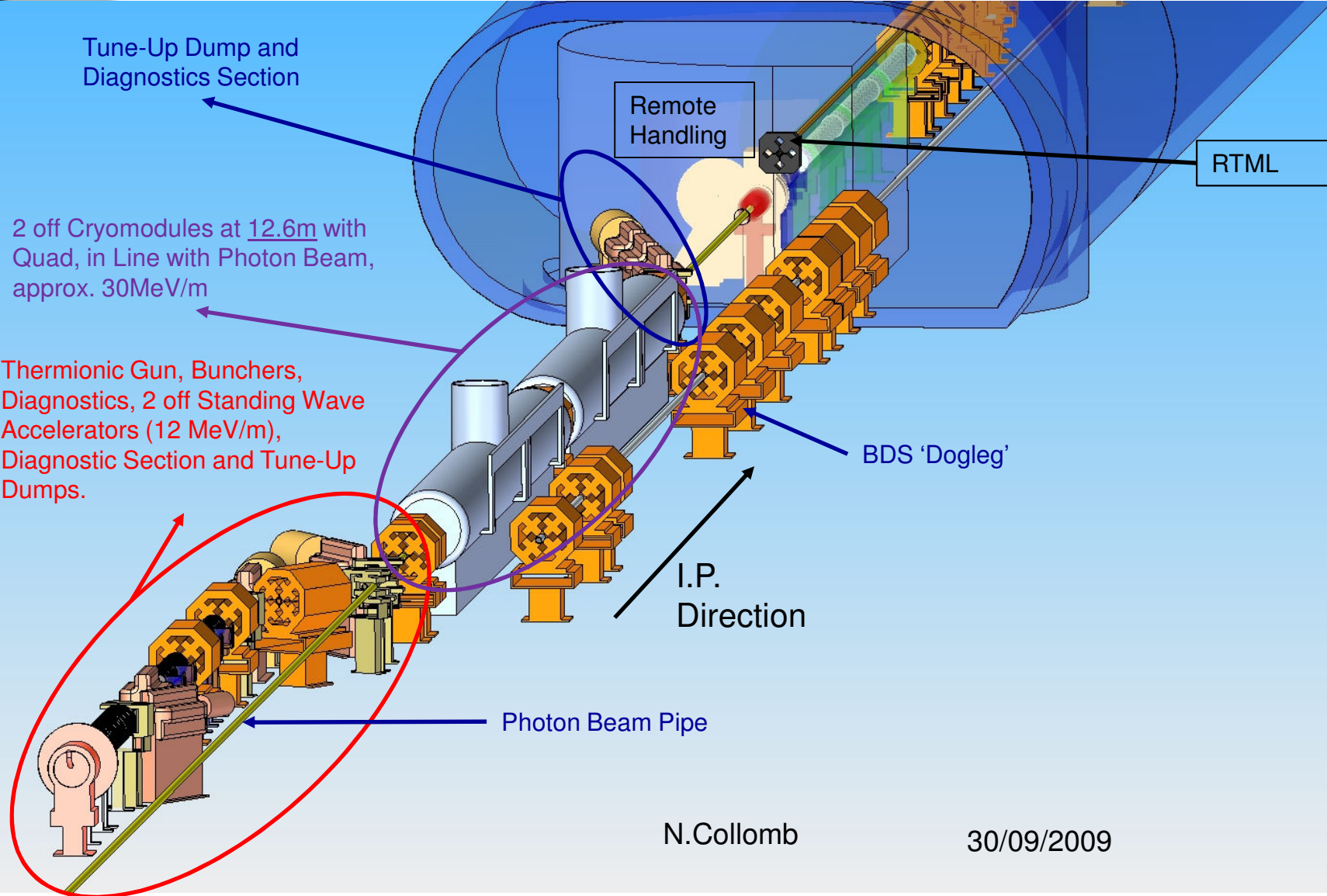
# Positron Source – AD&I

3 D Layout Positron Source ‘BDS Dogleg’ region.



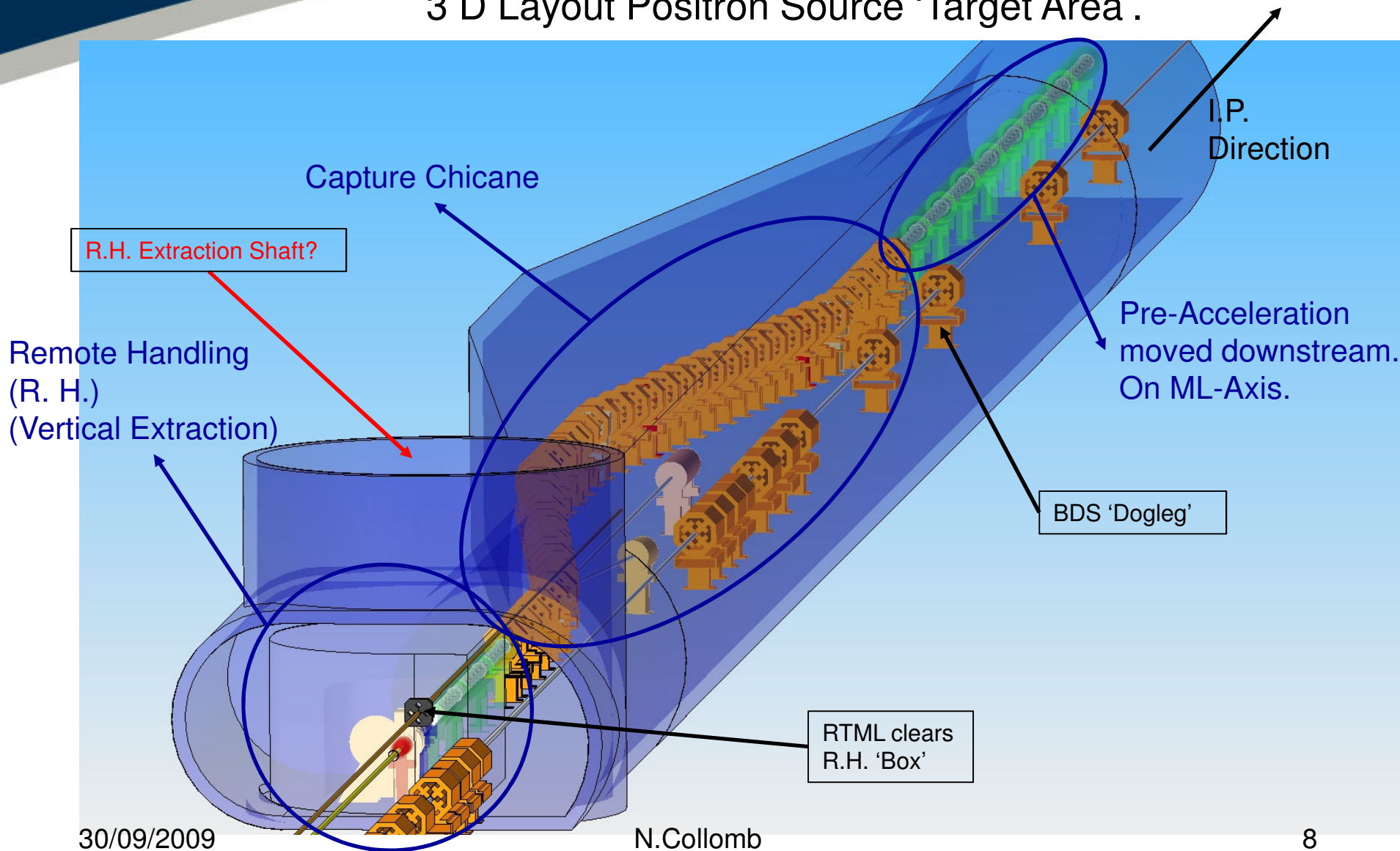
# Positron Source – AD&I

## 3 D Layout Positron Source ‘AUX Source’ region.



# Positron Source – AD&I

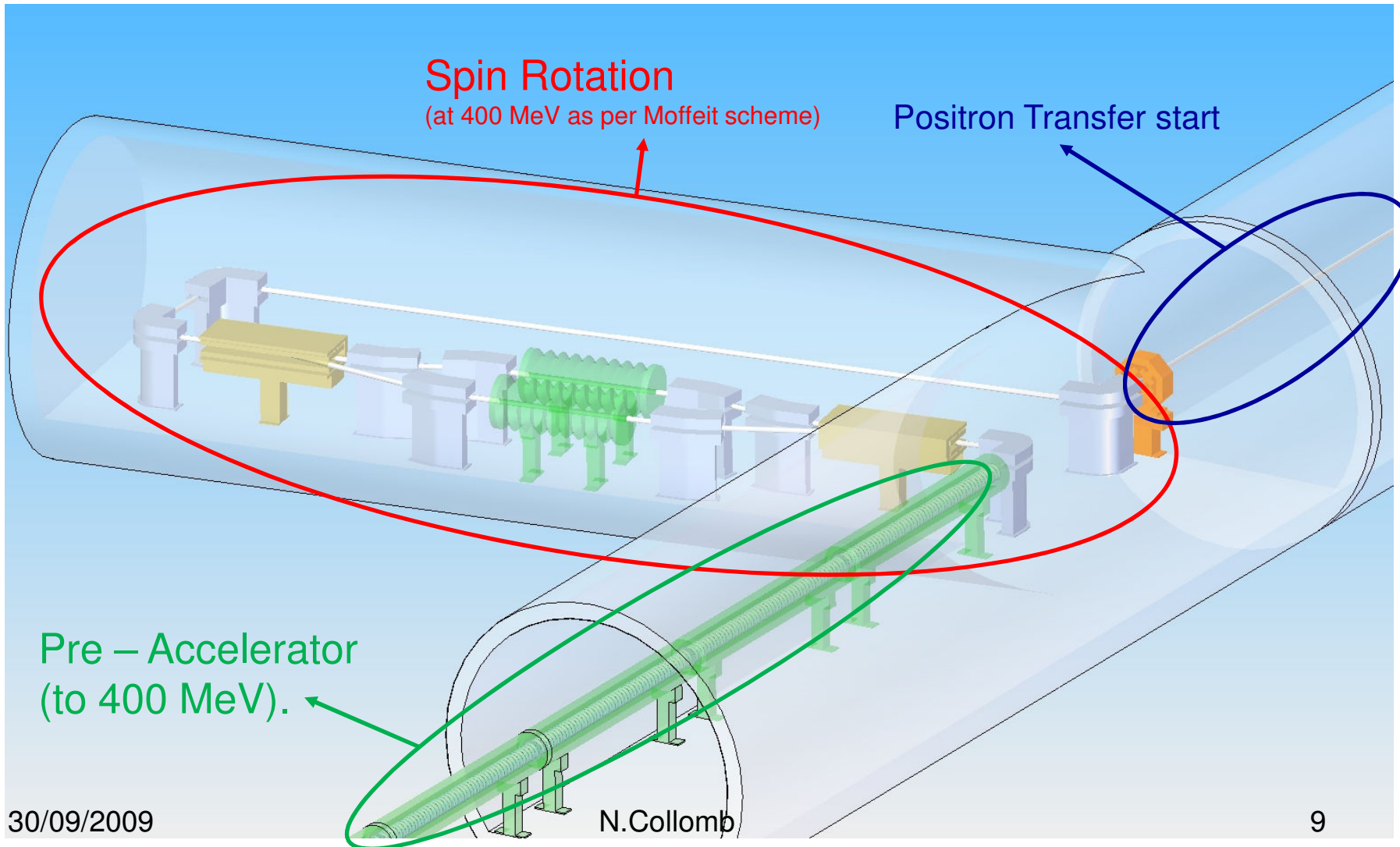
## 3 D Layout Positron Source 'Target Area'.





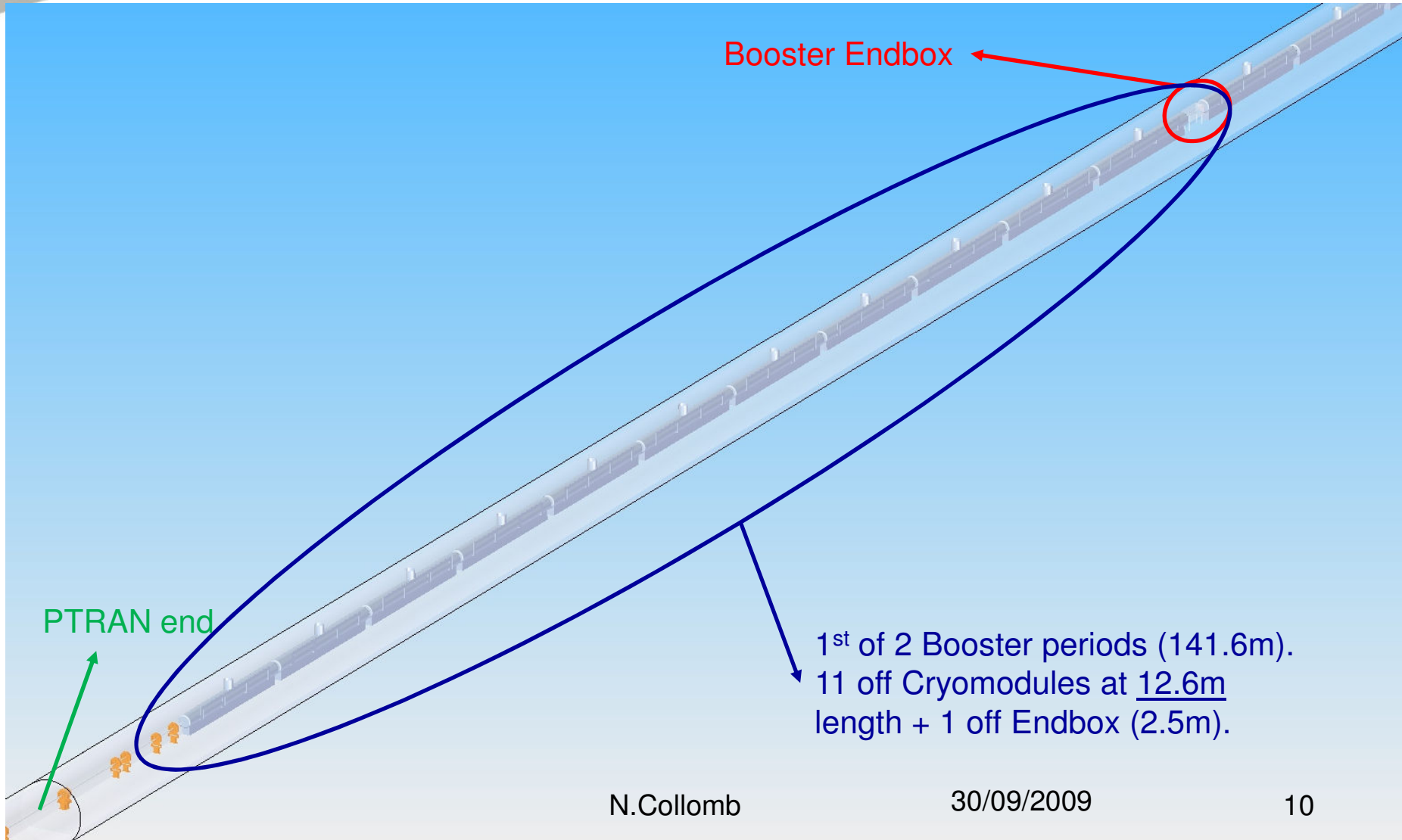
# Positron Source – AD&I

3 D Layout Positron Source ‘Spin Rotation’ region.

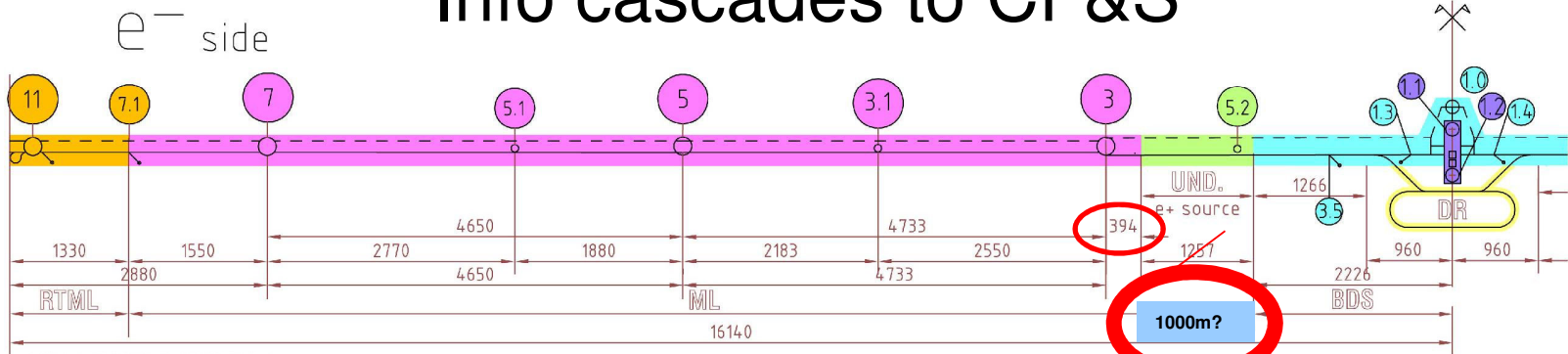


# Positron Source – AD&I

## 3 D Layout for Positron Source ‘Booster region’.



# Info cascades to CF&S



SITE / TUNNEL LENGTHS (m)

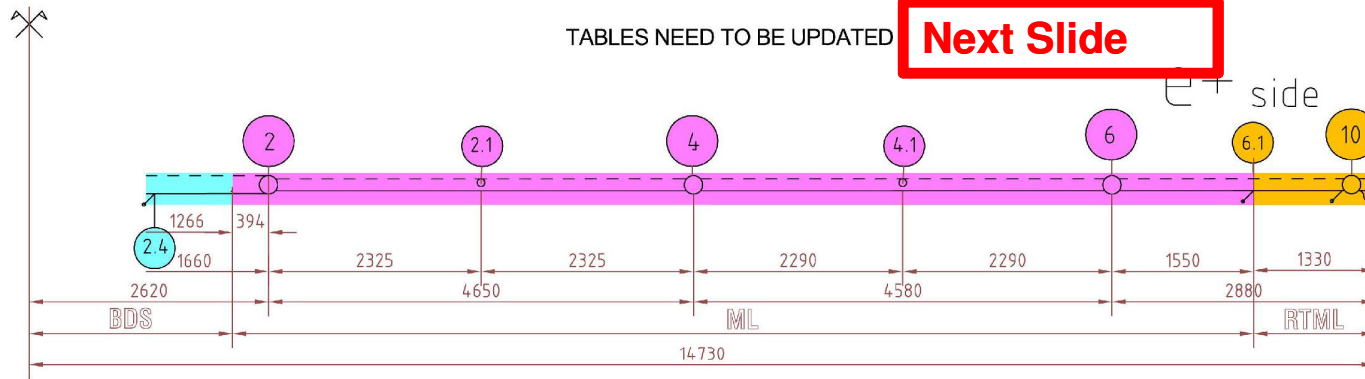
e- side + Undulator ML + RTML	e+ side ML + RTML	BDS + sources	DR	TOTAL
13 914 / 27 948	12 504 / 25 128	4452 / 12 236	0 / 6704	30 870 / 72 016

TUNNELS

Area	e- inject.,KAS beam + serv	DR	RTML beam + serv	ML beam + serv	BDS beam + serv	BDS Survey
φm	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 Slide**



Legend :

- RTML
- ML
- DR
- Sources e- KAS
- BDS
- Detectors Area

SHAFTS

Point	1.0	1.1	1.2	2	3	3.3	5.2	4	5	6	7	10	11	12/C	13/A
φm	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
φm	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 x 7 x 6 + 15 x 7 x 6

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	30 x 20 x 10

BEAM DUMP SERVICE HALLS ( \ )

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

## ILC - RE-BASLINING 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

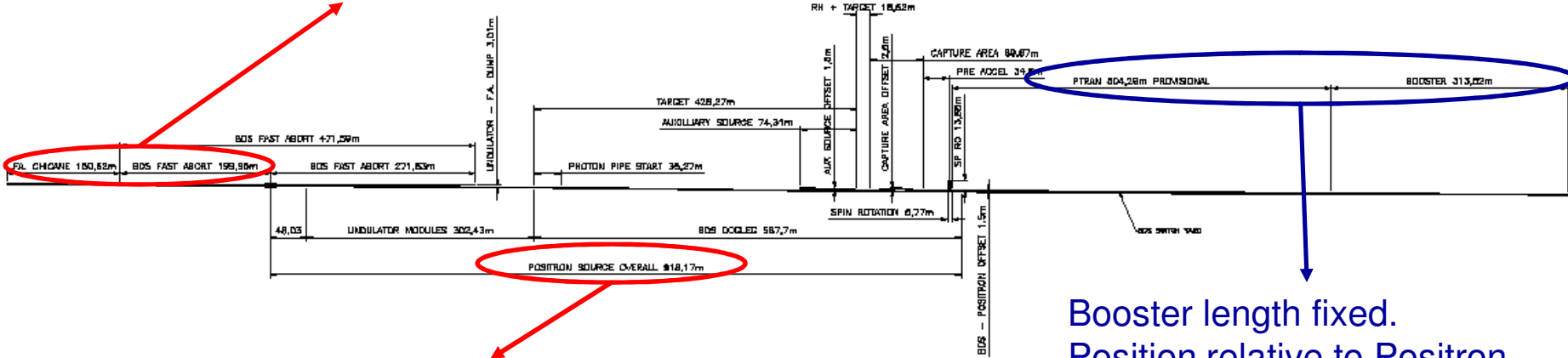
ILC-.CE-1.1649.0022

SIZE INDICE  
3

# Positron Source – AD&I

## 2 D Layout for Option1 Positron Source region.

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.

Converting this 2 D data into 3 D has taken place as depicted in the following slides.

30/09/2009

N.Collomb

RELEASE STATUS	WIP
VERSION SPEC	YYYY
INTERNAL SPEC	YYYY
EXTERNAL	YYYY
TELEMARKETS UNLESS OTHERWISE NOTED	
LINEAR DIMENSIONS UP TO 50 ± 0.25; OVER 50 ± 1.0	
ANGULAR DIMENSIONS ± 0.1°	
SCALE	1:1
ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED	
DATE	30/09/09
BY	NC
CHKD	
APPV	
CDR	
PROJECT	POSITRON SOURCE INTEGRATION SECTION
DRAWING NO.	AD-238-30000
REVISION	2
DATE	12
APPROVED BY	
DATE	

# Positron Source – AD&I

## Summary

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

The purpose of this meeting is to trigger some discussions about the Auxiliary Source location and the Spin Rotation proposal.

CAD models can be distributed now or after Beam Delivery lattice design update.

Based on the above discussions, new or modified layout needs to be created.

Note, certain system lengths (Cryomodules) and positions ought to be near a sufficiently large access shaft.

Remote Handling change over process and space requirement investigation/development is high on priority list.

Individual systems need to be developed further (are we at a stage where we can go into more detail?)

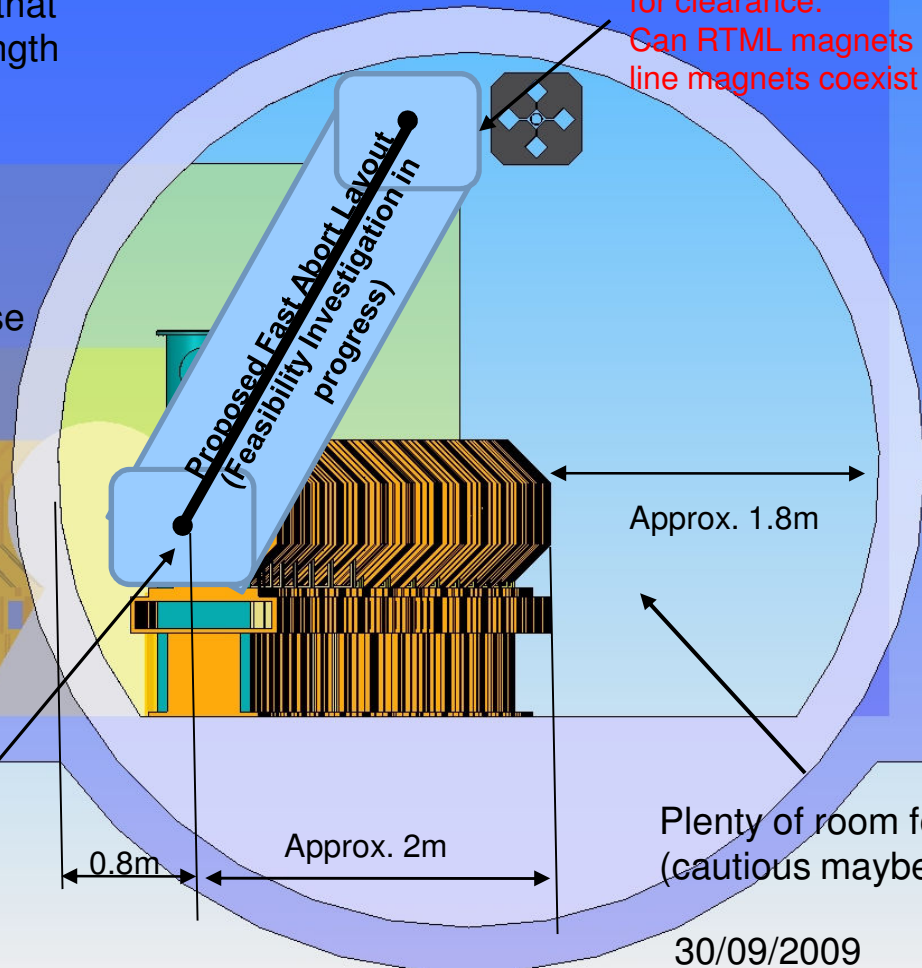


## AD&I e+ layout Option2

Last not least for the observant, there is an Option2 currently under investigation. This where the Fast Abort is taken downstream to the original location (approximately) to combine it with the Diagnostics Dump.

Preliminary Beam Studies (Deepa and James) indicate that this solution may increase length of machine by approx. 300m. This solution could further increase cost in terms of equipment required (virtually duplicating part of the BDS). Maintenance cost will increase the running cost of the ILC. Starting to look expensive.

Need to check Remote Handling Area for clearance.  
Can RTML magnets and abort beam line magnets coexist in close proximity?

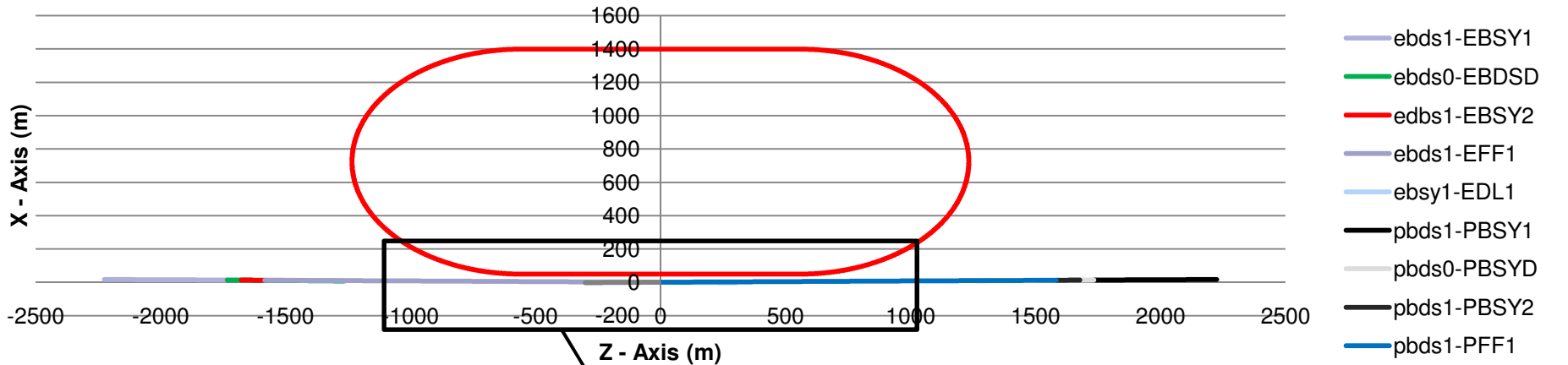


250 GeV Beam from Main Linac to be taken to ceiling (diagonally up and towards I.P). Lattice design is complex and Beam acceptance is governing this. Installation and maintenance could be difficult!!

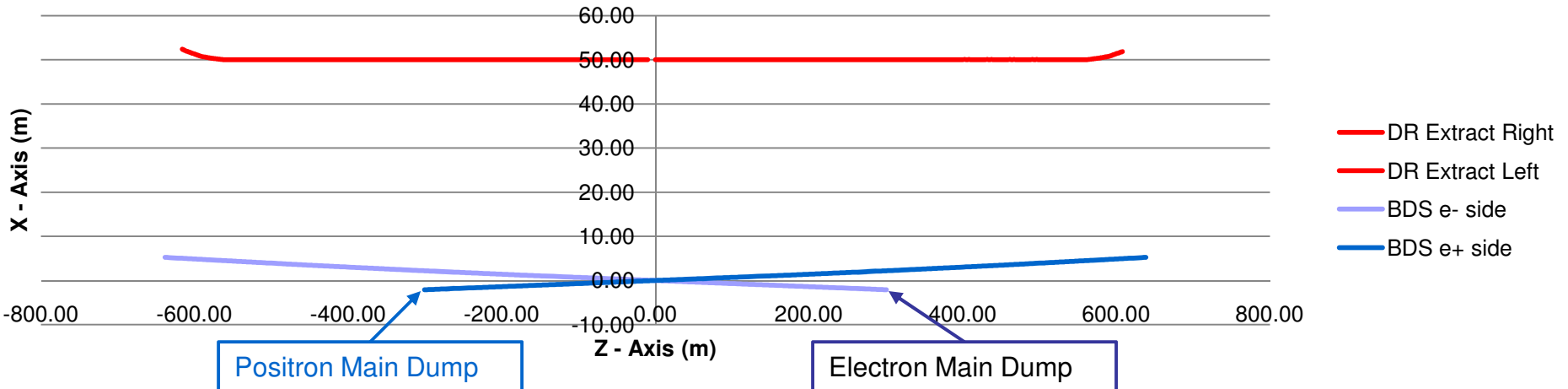
# Central Integration – AD&I

## ‘U.K.’ AD&I machine layout (I.P. at Z:0, X:0)

### BDS - RDR Layout

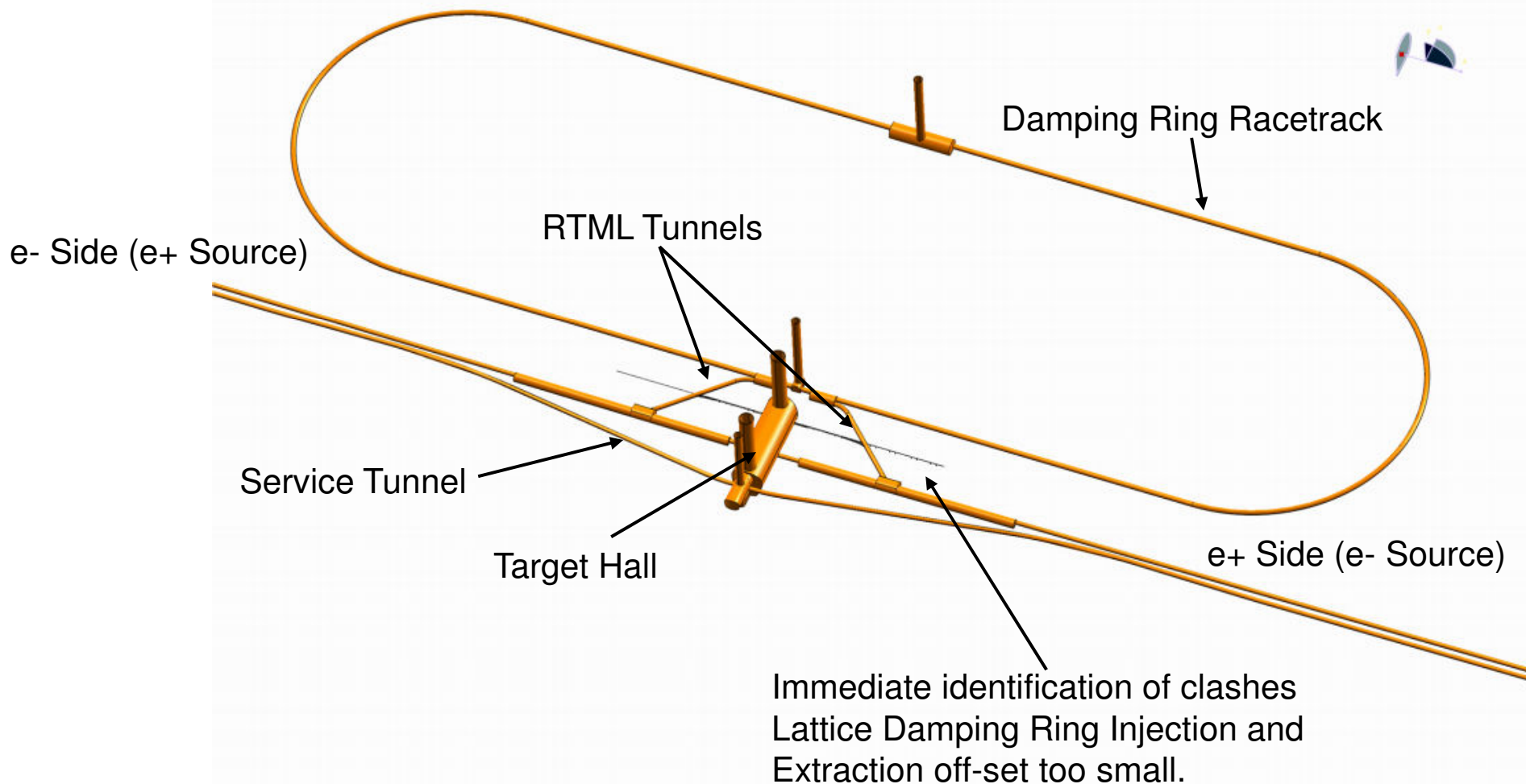


### Detail around I.P.

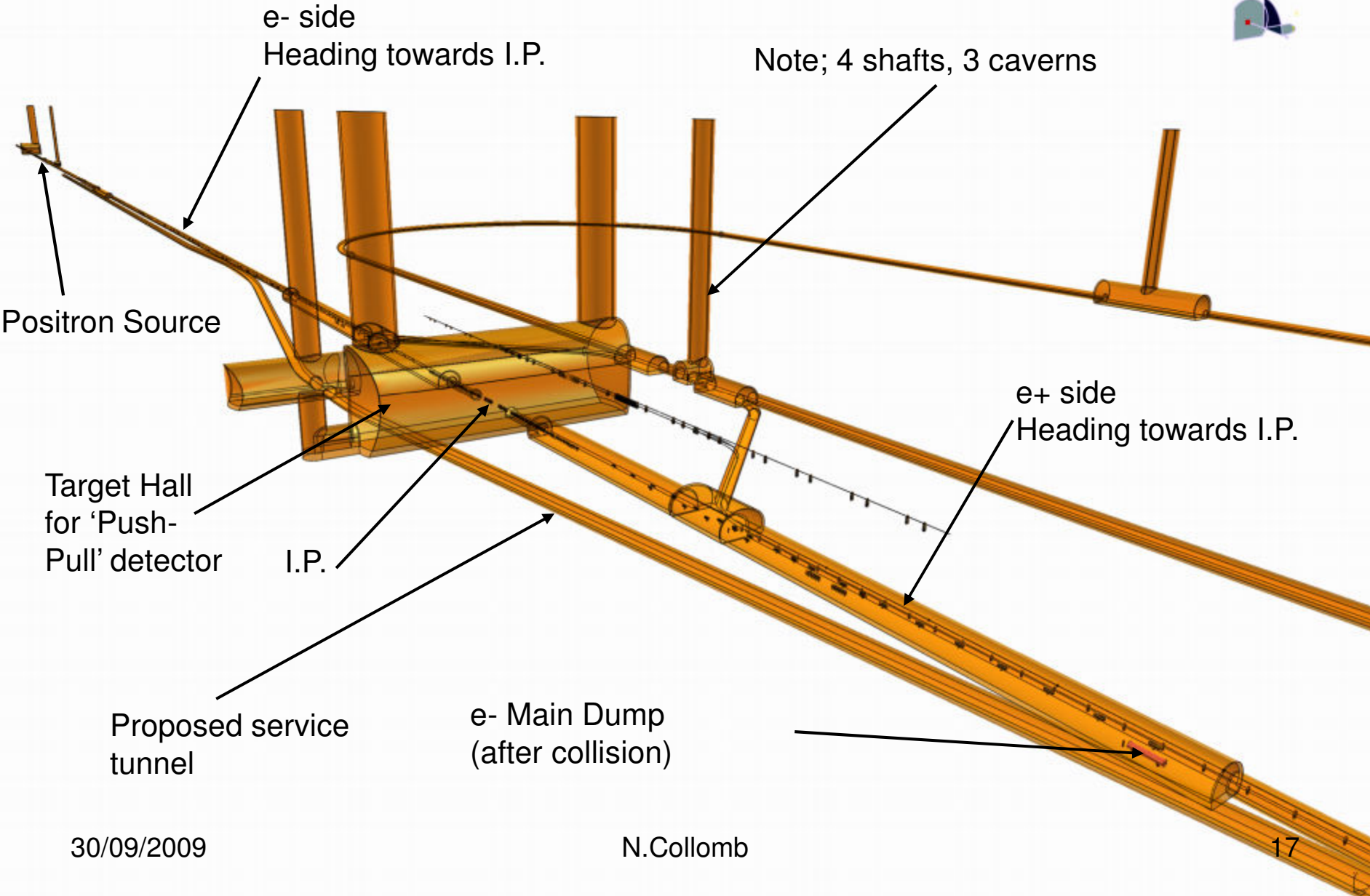


## Central Integration – AD&I

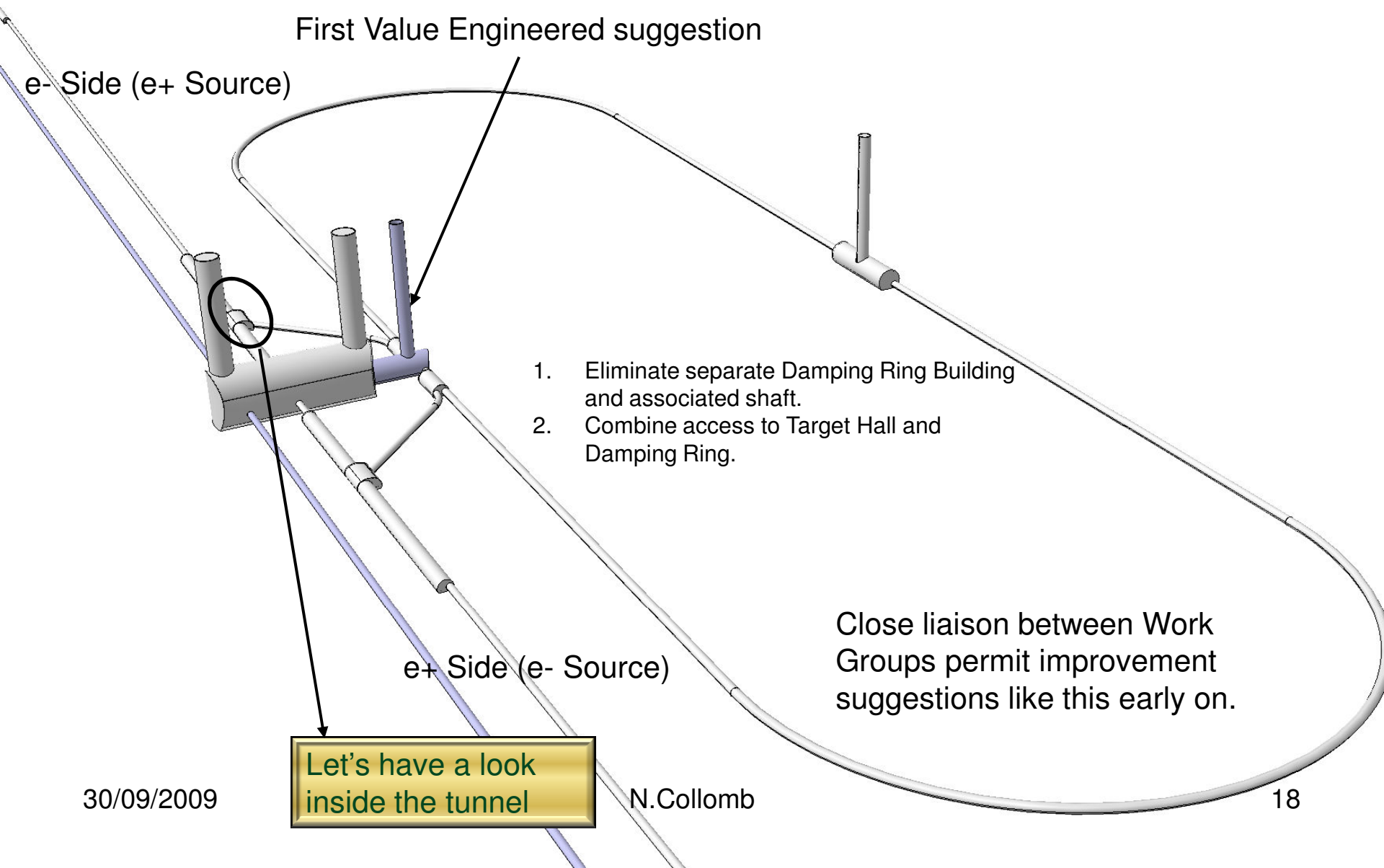
For the first time; Lattice Design components and CF&S 3D CAD combined.



# Central Integration – AD&I



# 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.

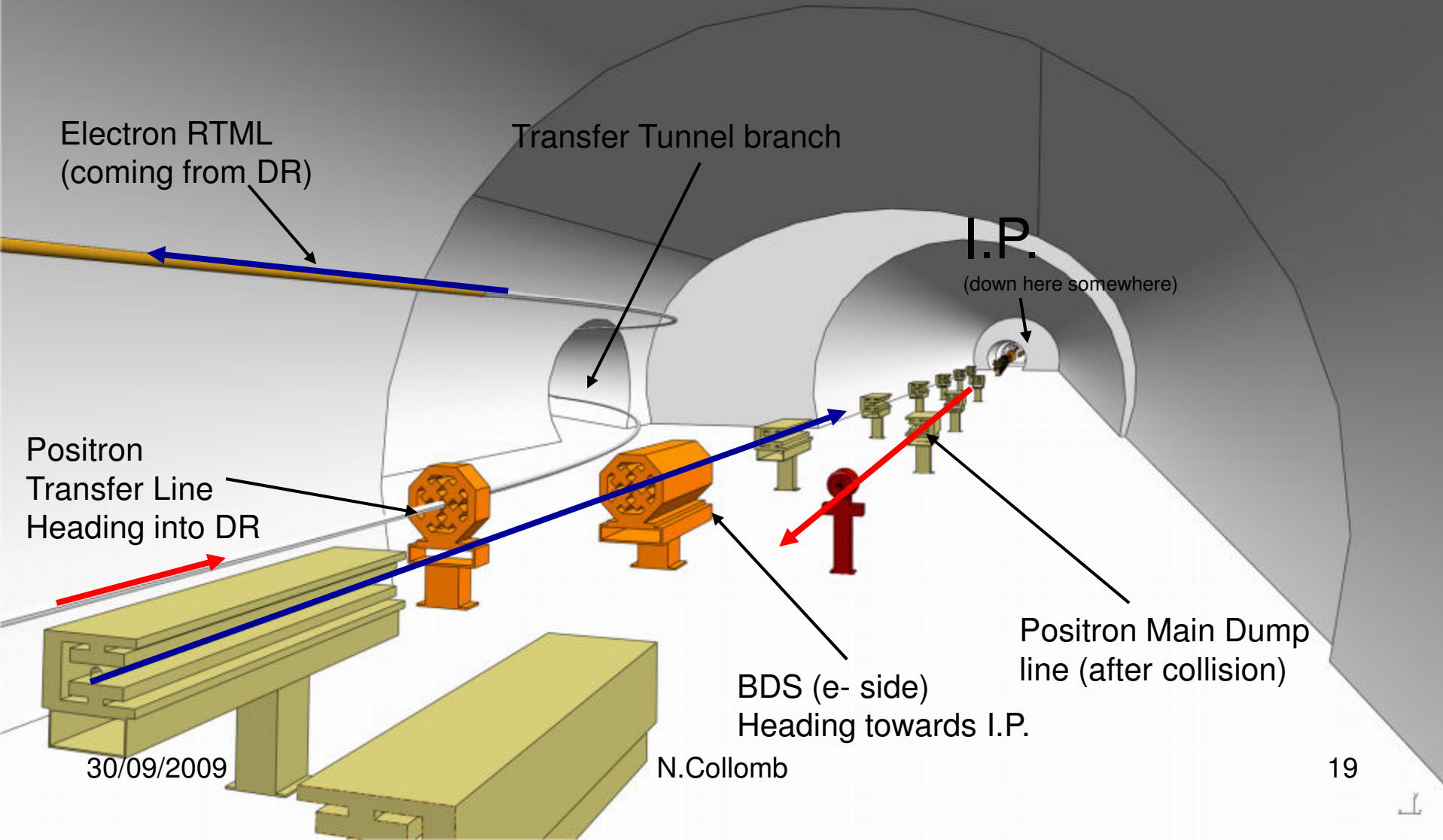
Let's have a look inside the tunnel



# Central Integration – AD&I



- Electron Beam direction
- Positron Beam direction



Electron RTML  
(coming from DR)

Transfer Tunnel branch

I.P.  
(down here somewhere)

Positron  
Transfer Line  
Heading into DR

Positron Main Dump  
line (after collision)

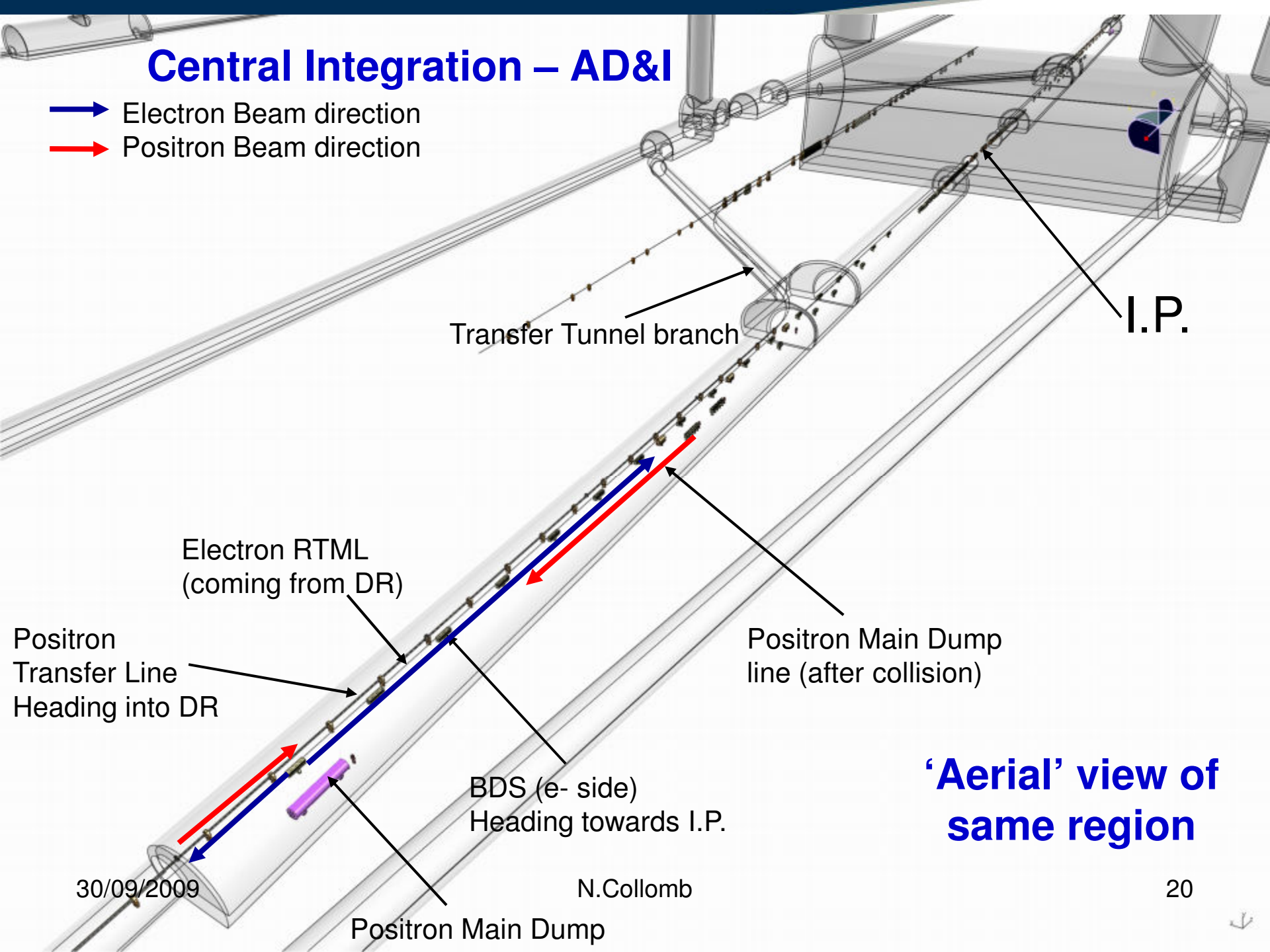
BDS (e- side)  
Heading towards I.P.

30/09/2009

N.Collomb

# Central Integration – AD&I

- ➔ Electron Beam direction
- ➔ Positron Beam direction



**‘Aerial’ view of same region**

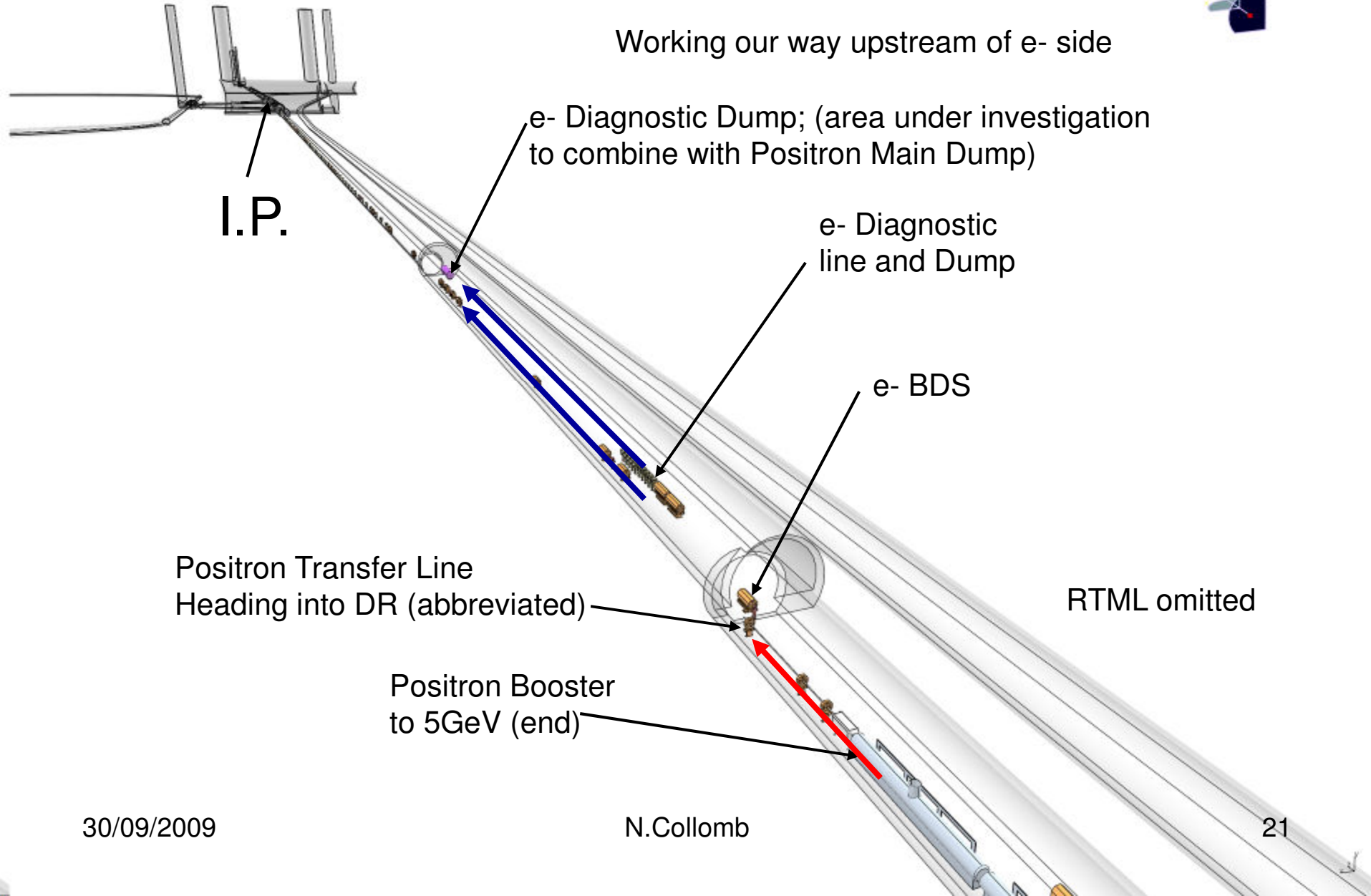


→ Electron Beam direction  
→ Positron Beam direction

# Central Integration – AD&I



Working our way upstream of e- side



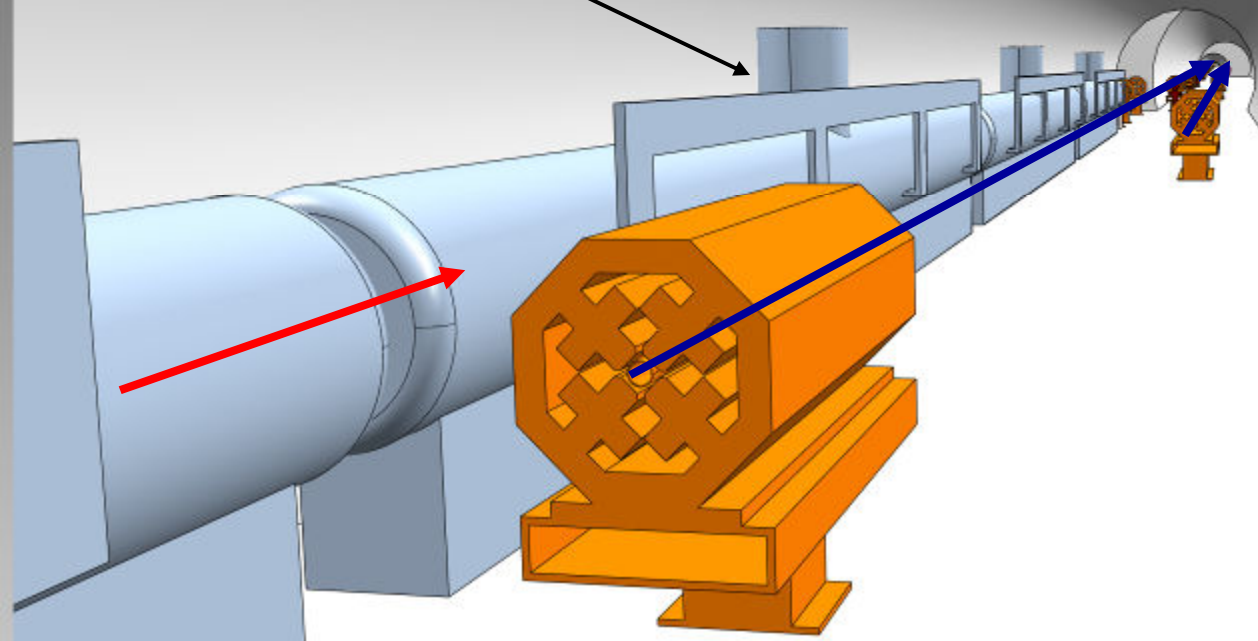
→ Electron Beam direction  
→ Positron Beam direction

# Central Integration – AD&I



Positron Booster  
to 5GeV (end)

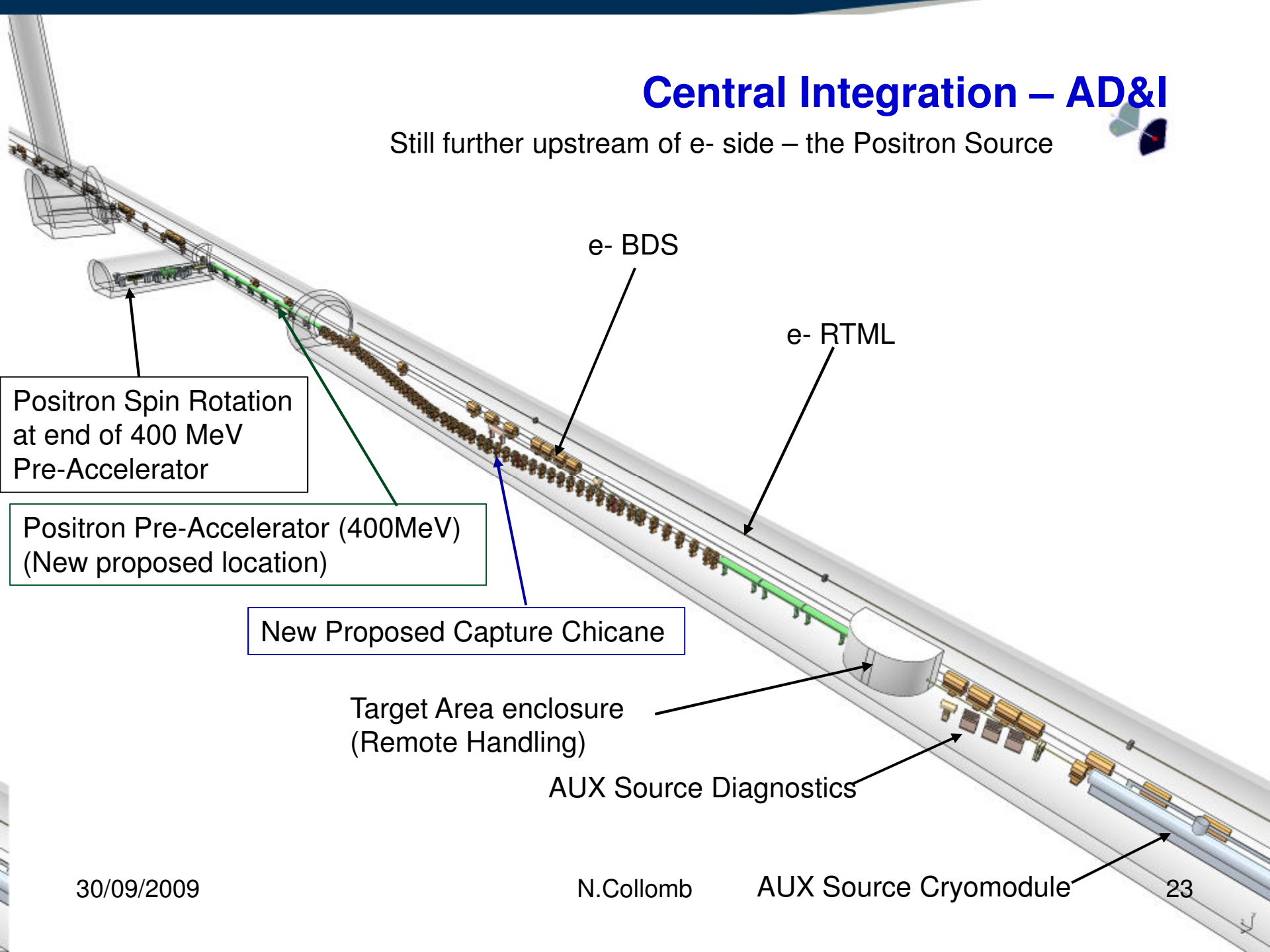
Same area inside tunnel.  
Update required.  
RTML omitted.



# Central Integration – AD&I



Still further upstream of e- side – the Positron Source



Positron Spin Rotation  
at end of 400 MeV  
Pre-Accelerator

Positron Pre-Accelerator (400MeV)  
(New proposed location)

New Proposed Capture Chicane

Target Area enclosure  
(Remote Handling)

AUX Source Diagnostics

AUX Source Cryomodule

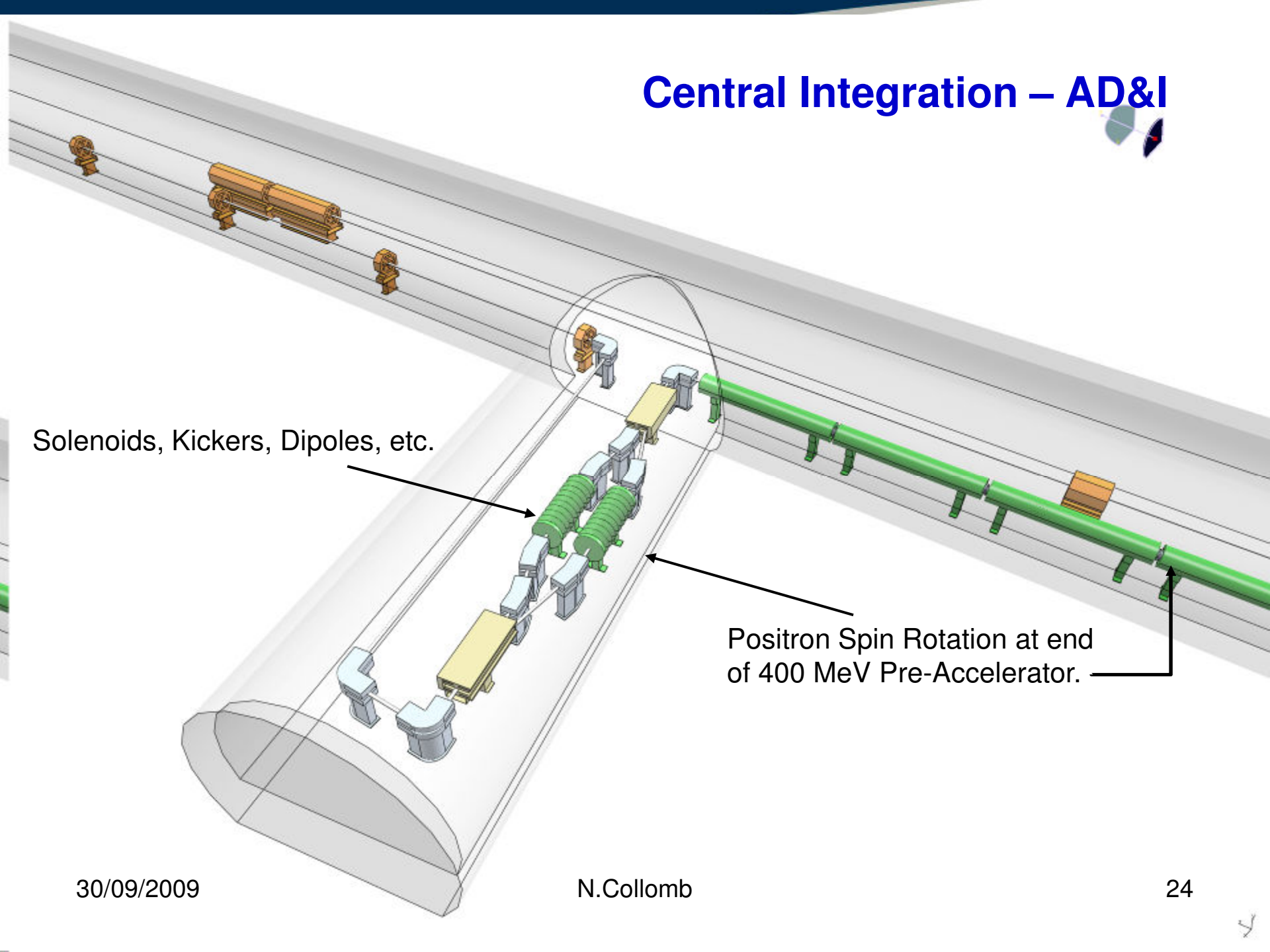


# Central Integration – AD&I



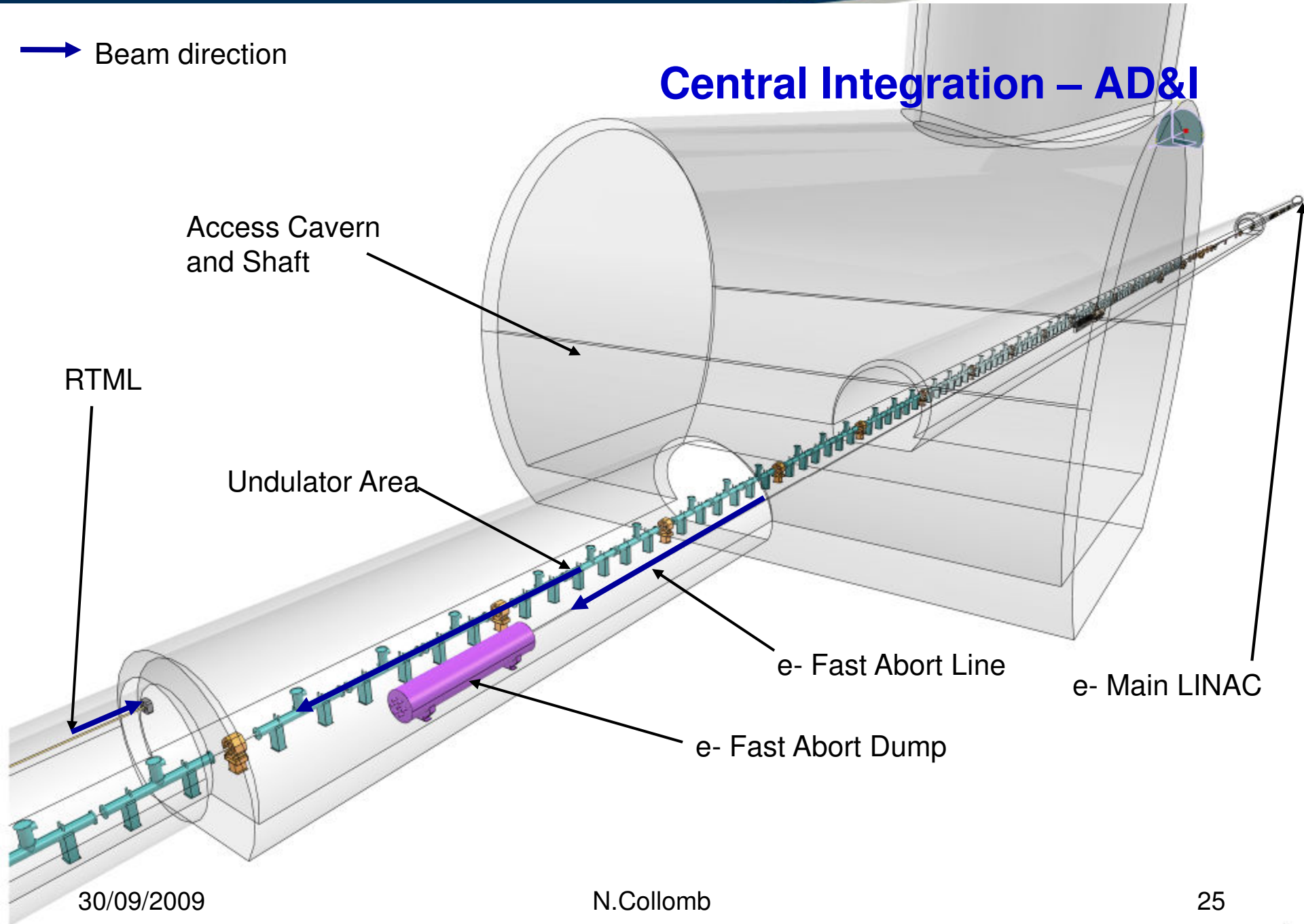
Solenoids, Kickers, Dipoles, etc.

Positron Spin Rotation at end of 400 MeV Pre-Accelerator.



→ Beam direction

# 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.

BDS lattice design is being optimised (as we speak).

Updates of CAD (2D and 3D) are made as quickly as possible after new info is available.

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.

I'd like to thank everyone for their collaboration and excellent communication.