Science & Technology Facilities Council

Linear Collider AD&I Update

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

Linear Collider – AD&I

During the last 2 - 3 WebEx meetings an apparent discrepancy has been noted.

The location of the Damping Ring has been shown in two different locations.

Location 1: (work done by U.K. Sources and Damping Ring) places the Damping Rings ’inside’ the ‘V’ shape of the Positron and Electron beam.

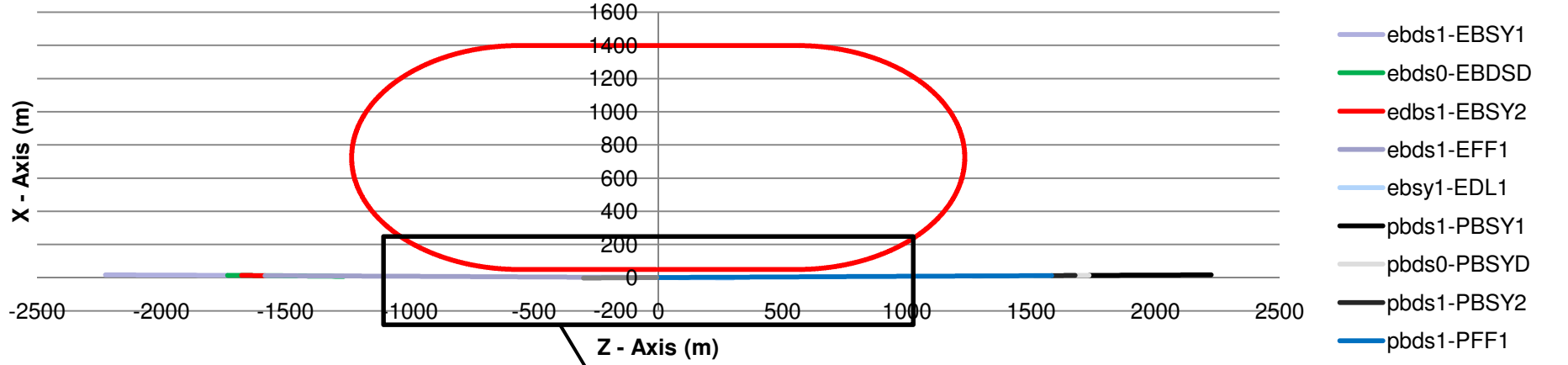
Location 2: (work done by CERN/FNAL) places the Damping Rings ‘outside’ the ‘V’ shape of the Positron and Electron beam.

We are at a stage where a decision needs to made in order to feed this info back to N. Solyak to commence work on the RTML.

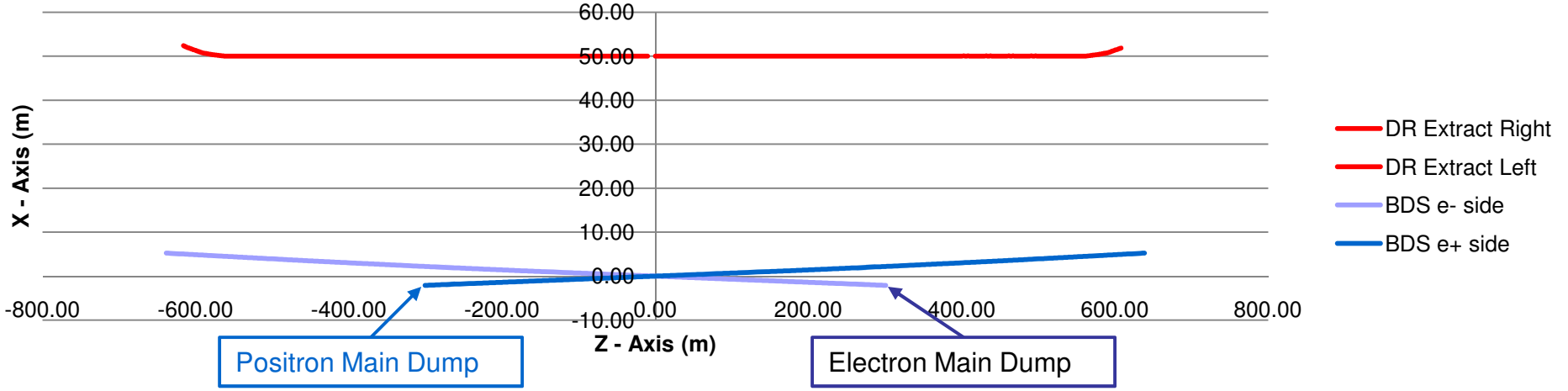
Linear Collider – Positron Source

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

BDS - RDR Layout



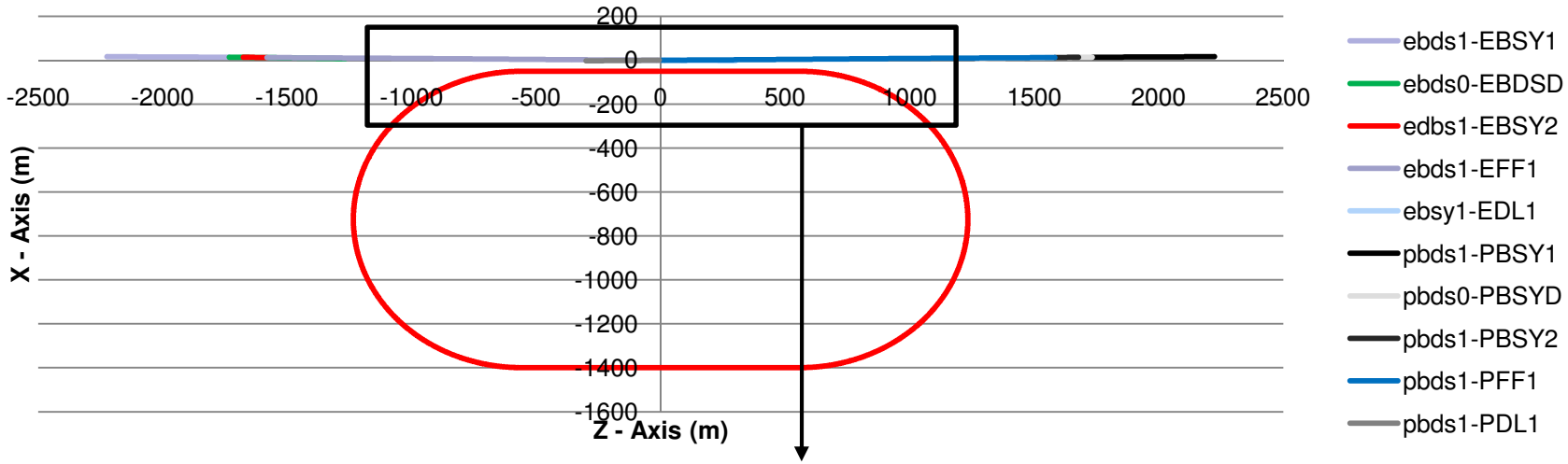
Detail around I.P.



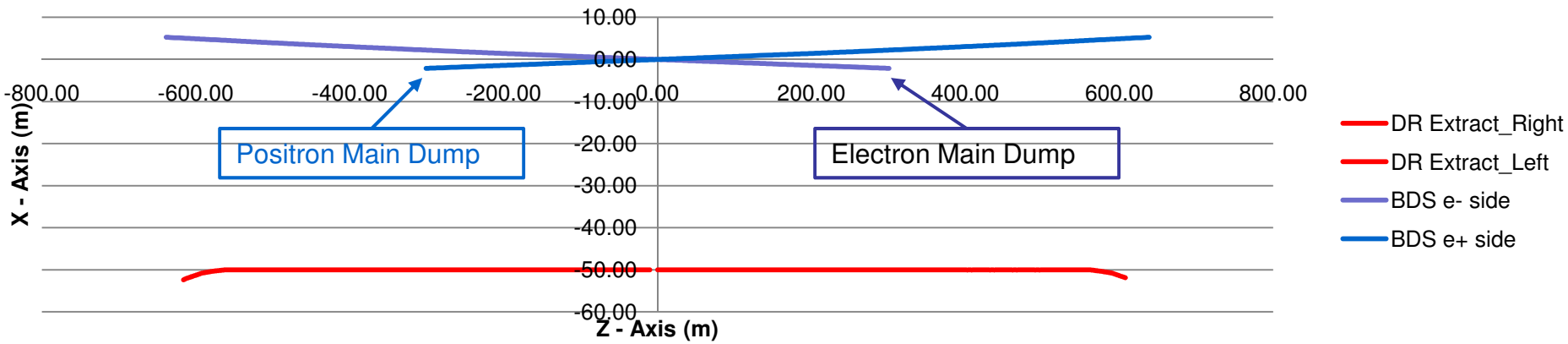
Linear Collider – AD&I

‘CERN/FNAL’ AD&I machine layout (I.P. at X:0, Y:0)

BDS - RDR Layout



Detail around I.P.



Linear Collider – AD&I

Both have advantages and disadvantages concerning the physics and physical aspects.

U.K. model

Advantages:

- Short tunnels,
- Share shafts (D.R. + Target Hall, Interaction Point),
- Inside ‘V’ shape to avoid any possible radiation from Main Dumps,
- Simpler Physics and room for RTML components.

Disadvantages:

- Service tunnel around Target Hall interference,
- To avoid interference, D.R. offset needs to increase to approx. 65m instead the current 50m,
- ‘S’ shape of beam more distinct (larger angles)?

Linear Collider – AD&I

CERN/FNAL model

Advantages:
- Shallow ‘S’ shape beam can be achieved,
- Target Hall design can remain as is,
- Offset can remain at 50m,
- Service Tunnel does not have to come ‘up and over’.

Disadvantages:
- Longer Tunnels and more of them,
- More shafts required,
- Complexity increases for beam line,
- Radiation risk from Main Beam Dumps(crossover?),
- Eliminates option to combine BDS Dumps?

Linear Collider – AD&I

Can we make a decision soon as to the side of the Damping Ring.

Since we are assembled here, we can investigate the physical aspects.

The work done by Tom (see next slide) is of great help in determining the Physical constraints.

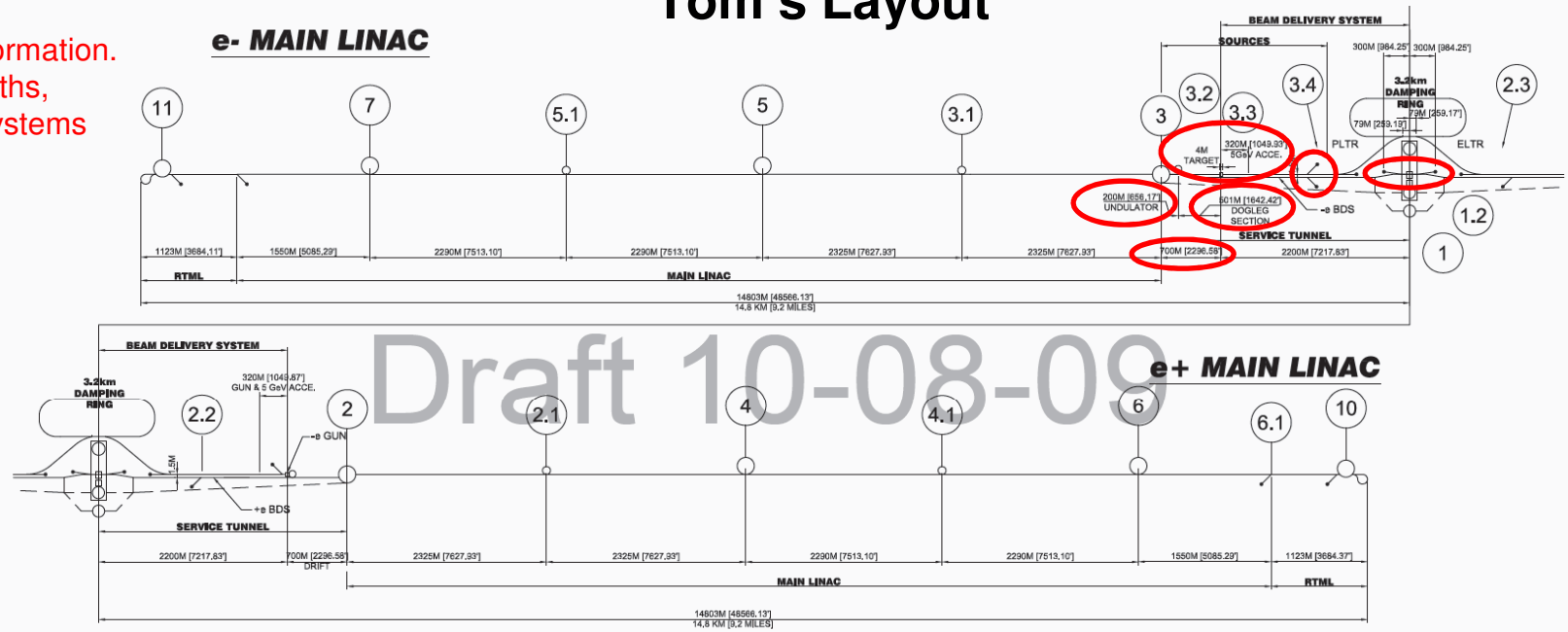
N. Solyak can aid in the decision for Physics reasons.

Also noted was the inversion of the ‘V’ on drawings (T. Lackowski). Although not detrimental at this stage, HOWEVER bad habits tend to stick and lead to confusion later on. Please inform and update Tom about this.

Linear Collider – AD&I

Incorrect Information.
Discuss lengths, position of systems and quantity.

Tom's Layout



SITE / TUNNEL LENGTHS (M)

e- SIDE ML + RTML	e+ SIDE ML + RTML	B.D.S. + SOURCES + SERVICE	DAMPING RING	TOTAL
13233	13233	5800 + 5800 + 1800	3238	43104

TUNNELS

AREA	e- INJECT. , KAS BEAM	D.R.	R.T.M.L. BEAM	MAIN LINAC BEAM	B. D. S. BEAM + SERVICE	B. D. S. SURVEY
Ø M	5,2	5.2	5.2	5.2	5.2 + 5.2	1,5 + 2,2

SHAFTS

POINT	1.0	1.1	1.2	2	3	3.3	5.2	4	5	6	7	10	11	12/C	13/A
Ø M	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	3	1,50	

SHAFT BASE CAVERNS

POINT	2, 3, 4, 5, 6, 7, 10, 11
(L x W x H)m	49 x 16 x 18 + 3 STORIES

SOURCES CAVERNS

POINT	UNDULATOR	KAS, 3.3	e- INJECTION	2.2, 3.2
(L x W x H)m	21161 m³	6574 m³	110 x 15 x 10 27.5 x 22 x 15	7 x 15 x 7.5

DAMPING RING

POINT	B, D, E, F	12/C, 13/A
(L x W x H)m	16 x 8 x 8	75 x 10 x 10 + 1 STORY

DETECTORS HALL

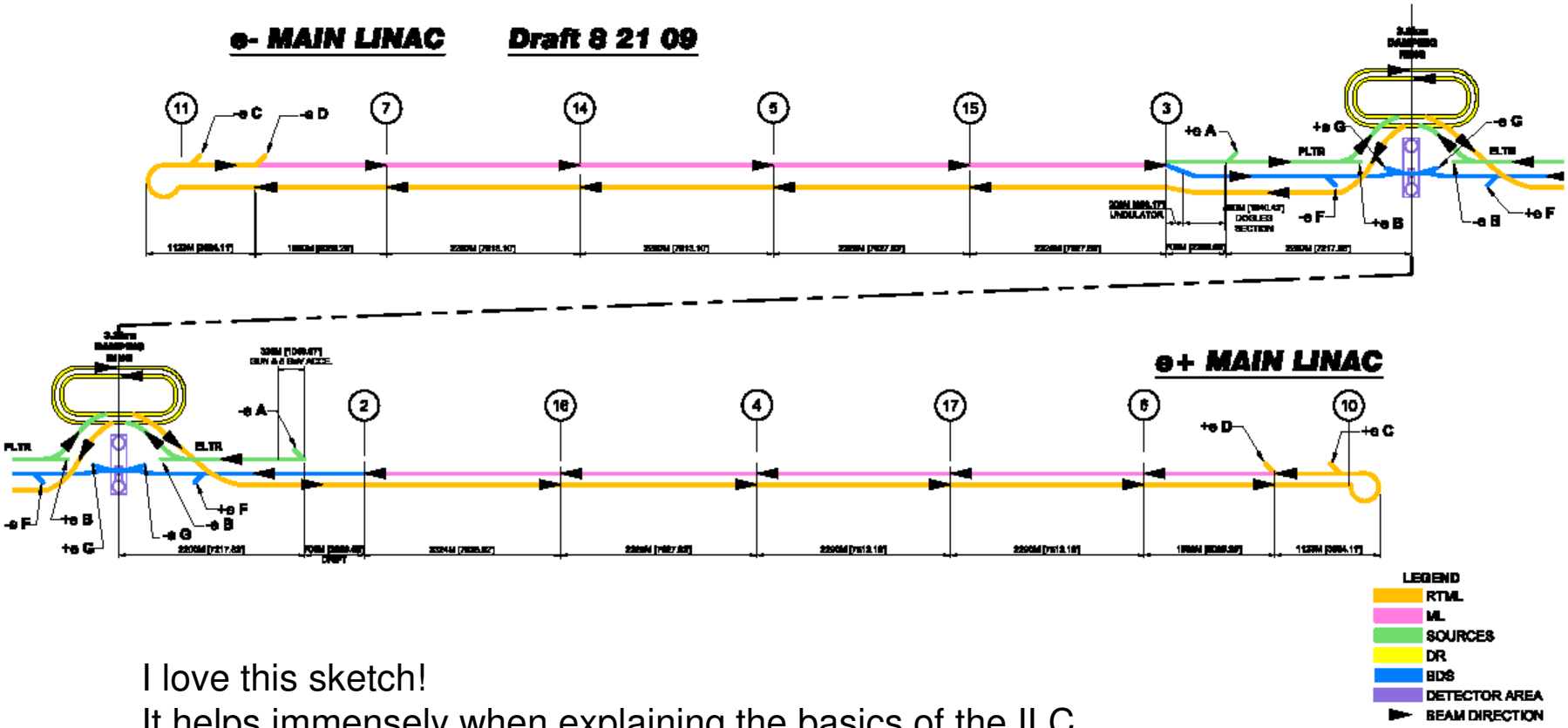
POINT	1.1, 1.2	1.0
(L x W x H)m	120 x 25 x 39	40 x 15 x 15

MAIN BEAMLINE DUMPS ( )

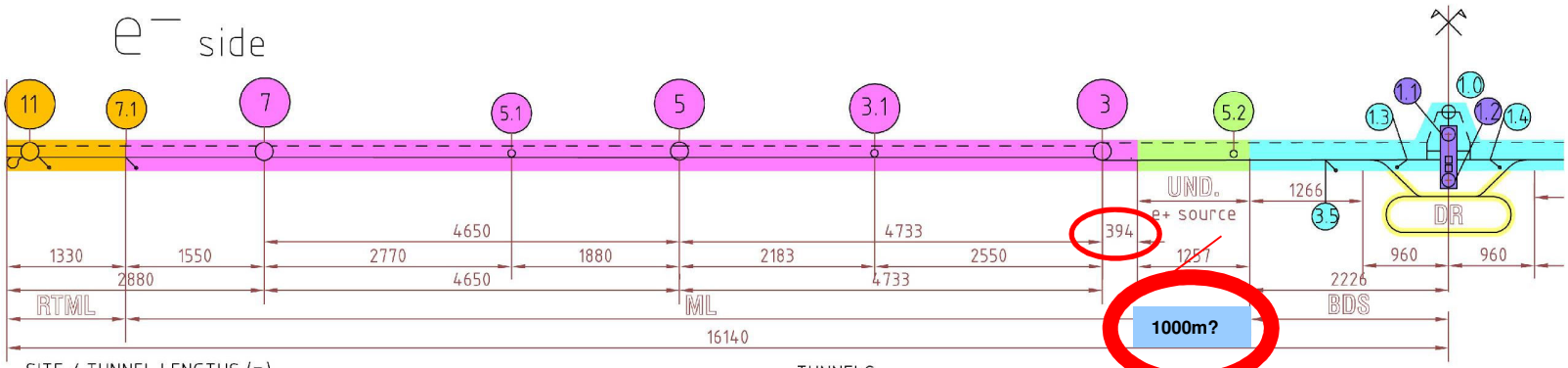
POINT	BDS 1.3, 1.4, 2.4, 3.5
(L x W x H)m	30 x 20 x 10

Update required.
Discuss spatial requirements on info available.

Linear Collider – AD&I



I love this sketch!
It helps immensely when explaining the basics of the ILC.
Thank you Tom.



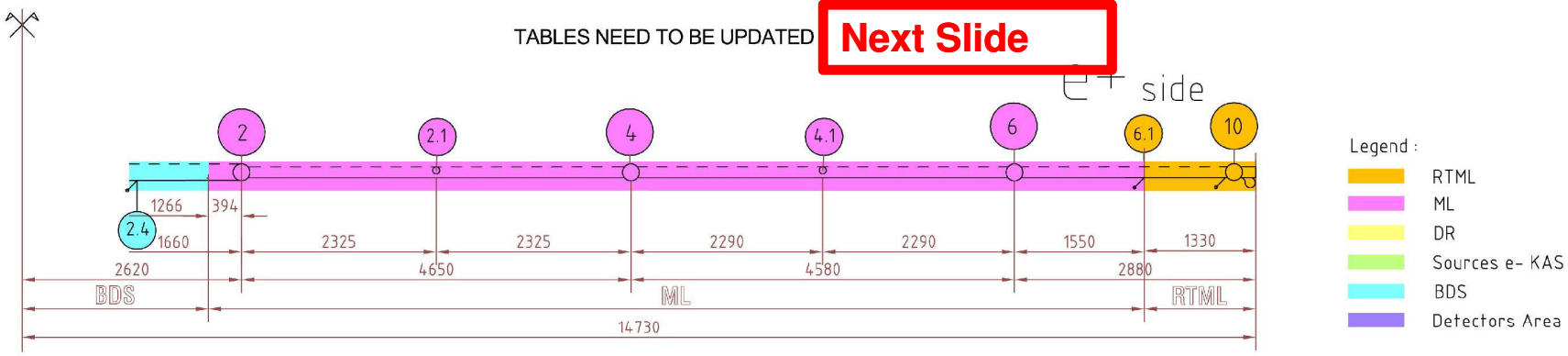
SITE / TUNNEL LENGTHS (m)

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 Slide**



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

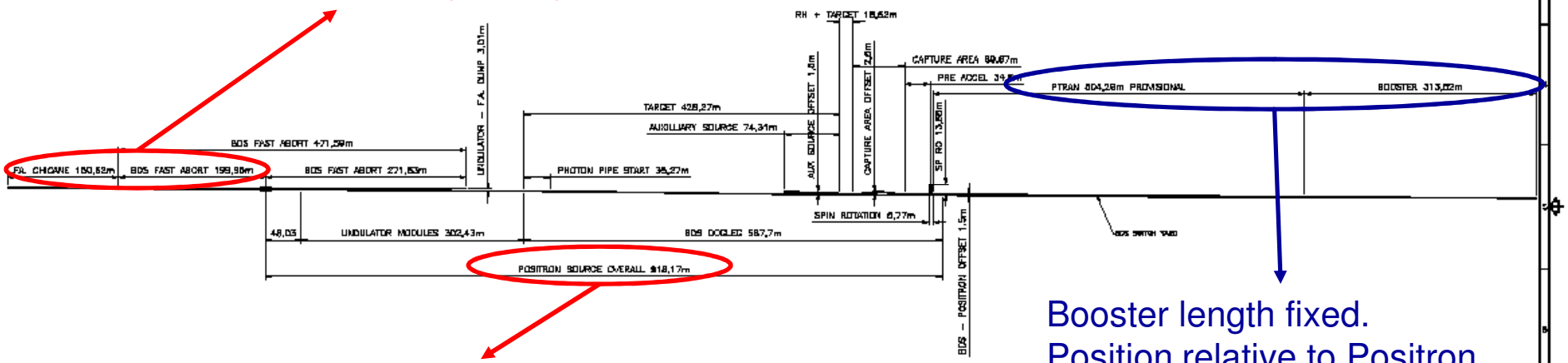
SCALE : 1/50000(A3_FORMAT) DATE: JUNE_4TH_2009

ILC-.CE-1.1649.0022 | SIZE 3 | INDICE

Linear Collider – AD&I

2 D Layout for Option1 Positron Source region.

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



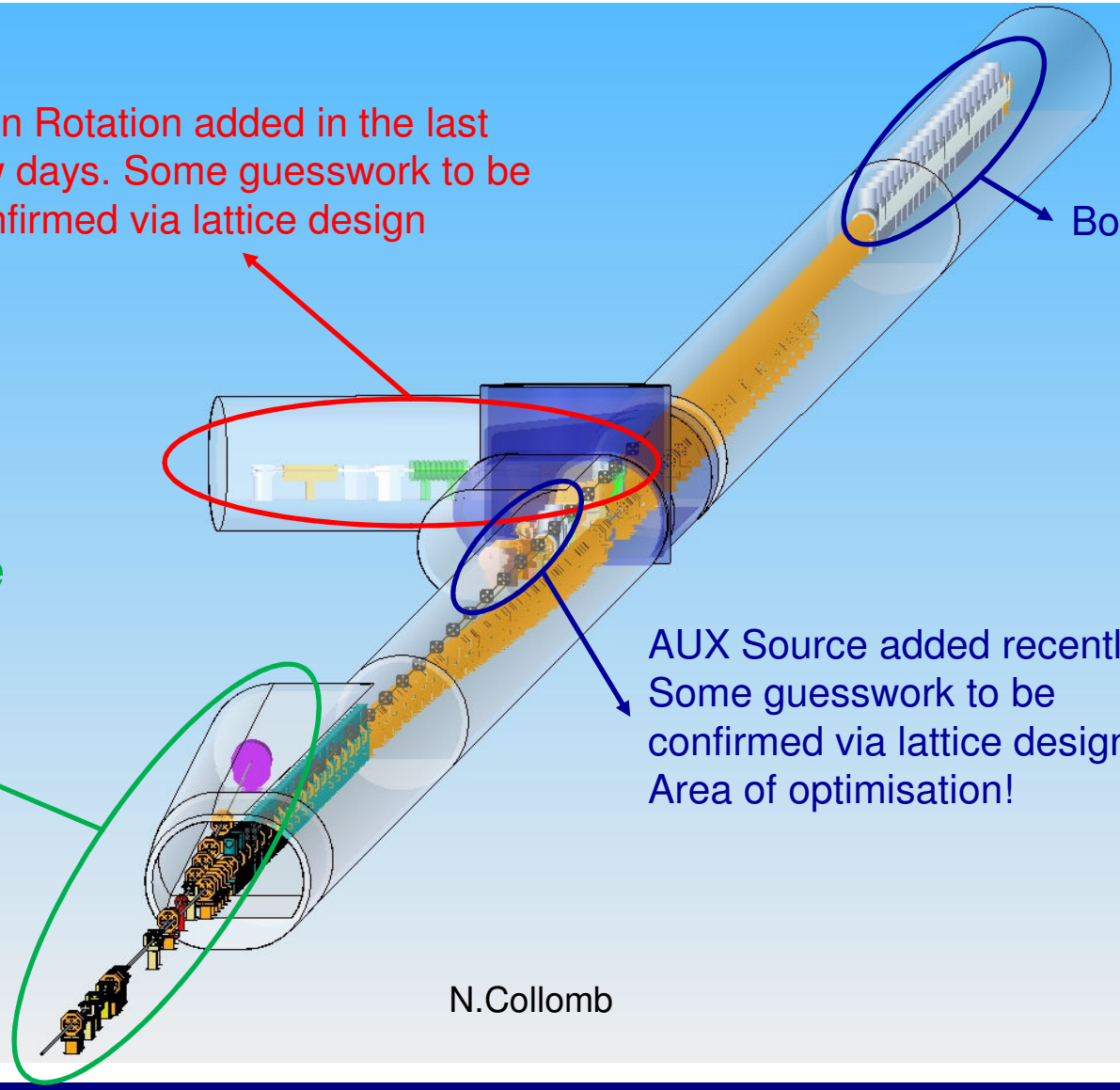
Positron Source length currently at approx. 920m.

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.

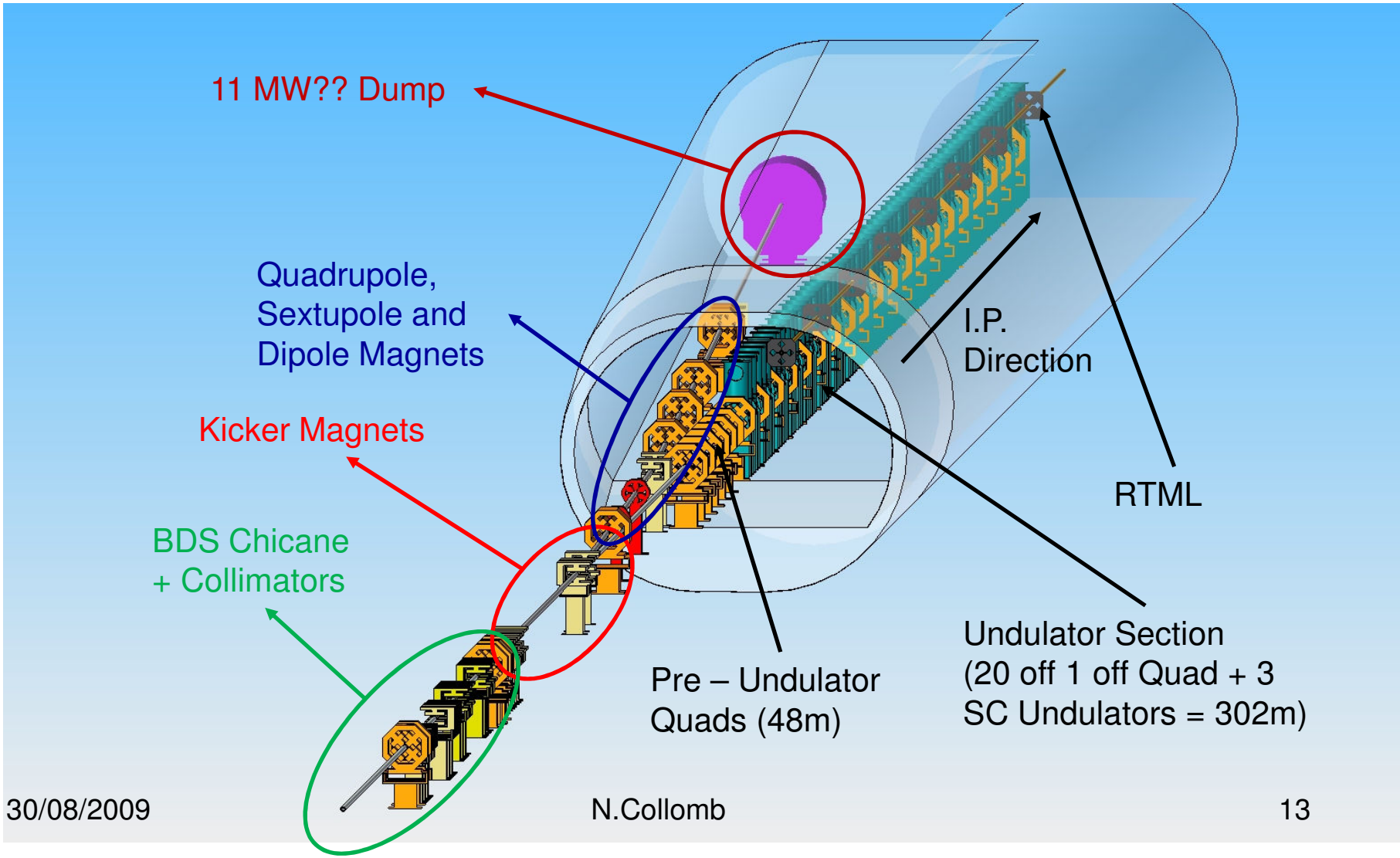
Linear Collider – AD&I

3 D Overall Layout for Option1 Positron Source region.



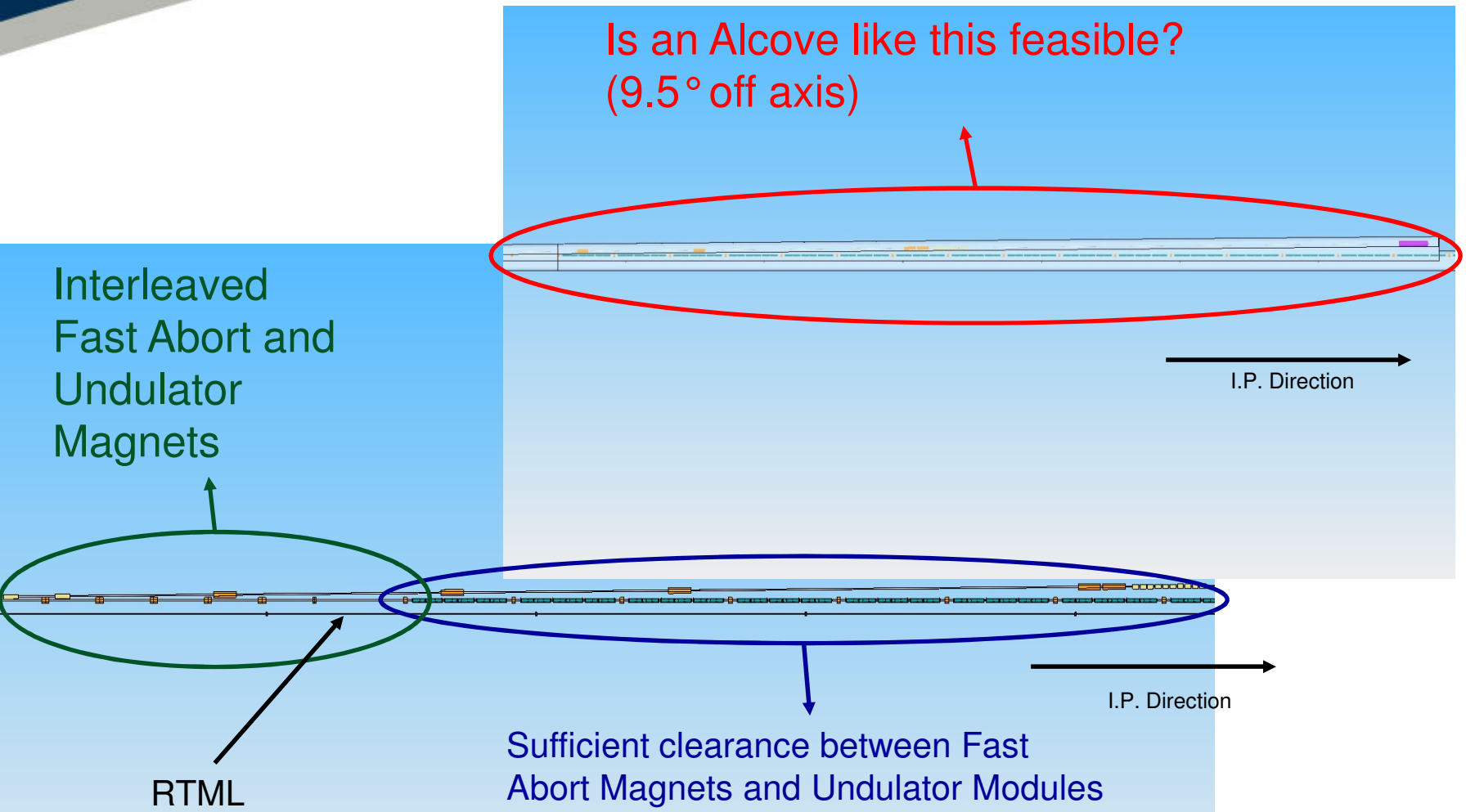
Linear Collider – AD&I

3 D Layout Positron Source BDS Fast Abort region.



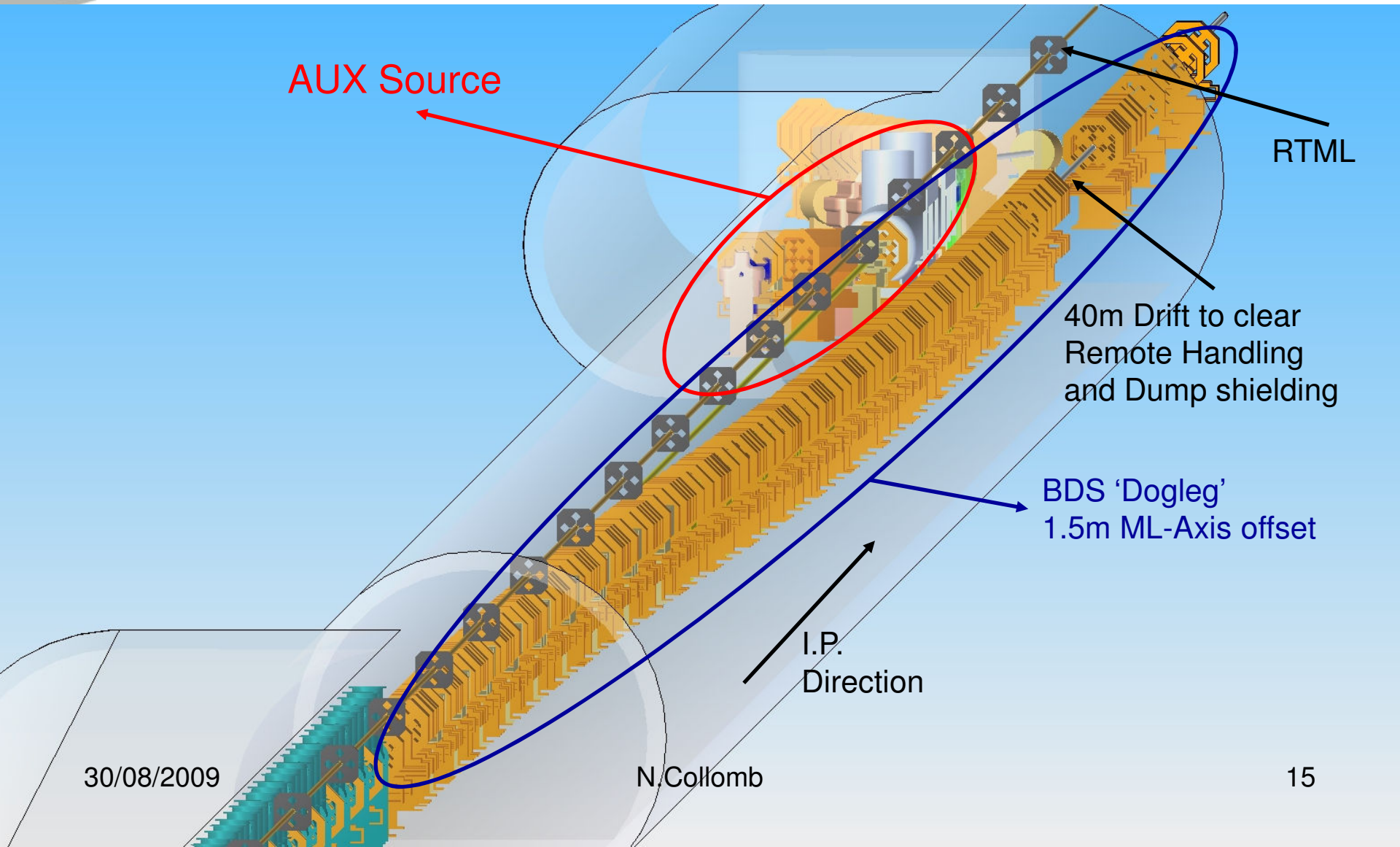
Linear Collider – AD&I

3 D Layout Positron Source BDS Fast Abort region.



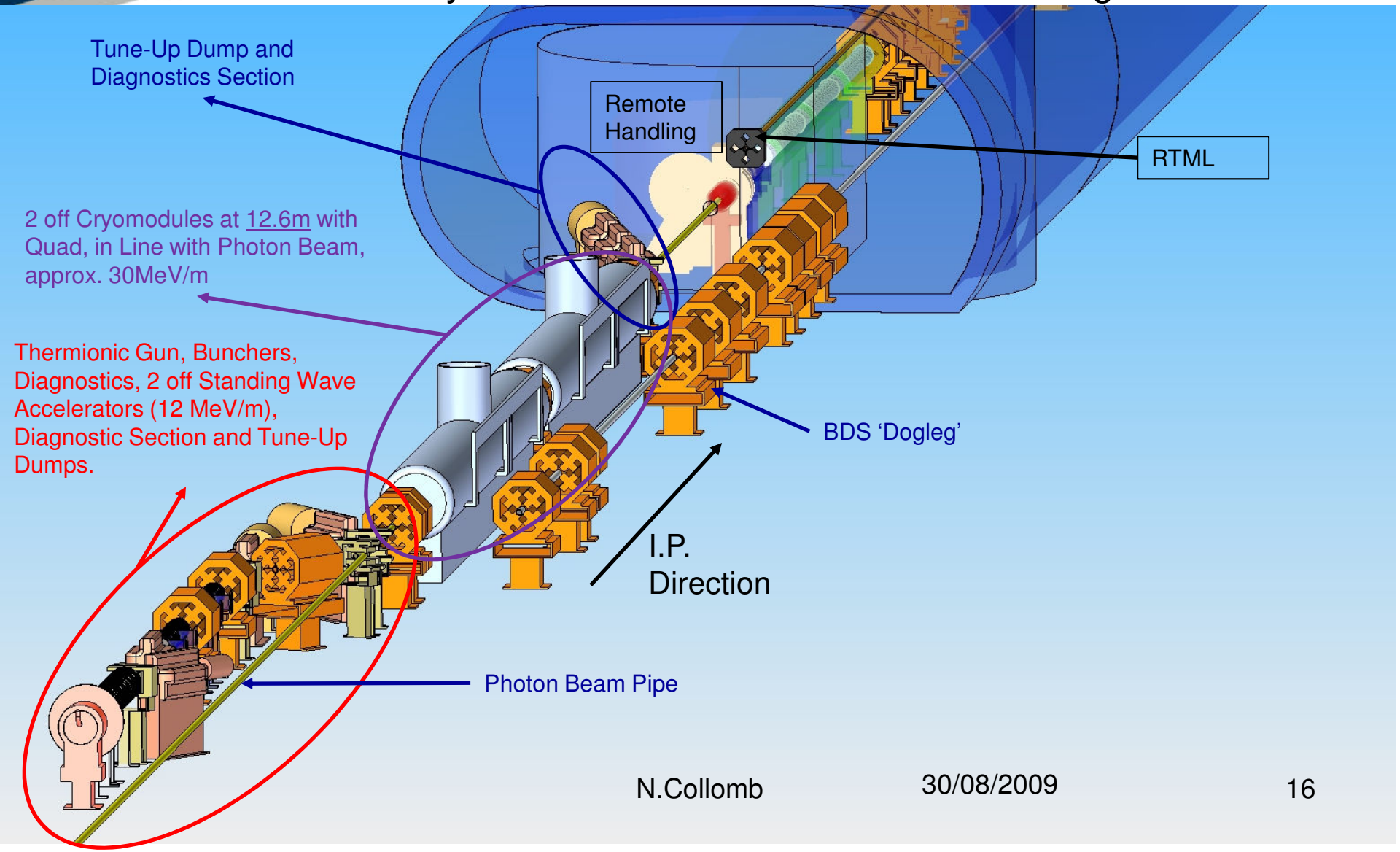
Linear Collider – AD&I

3 D Layout Positron Source 'BDS Dogleg' region.



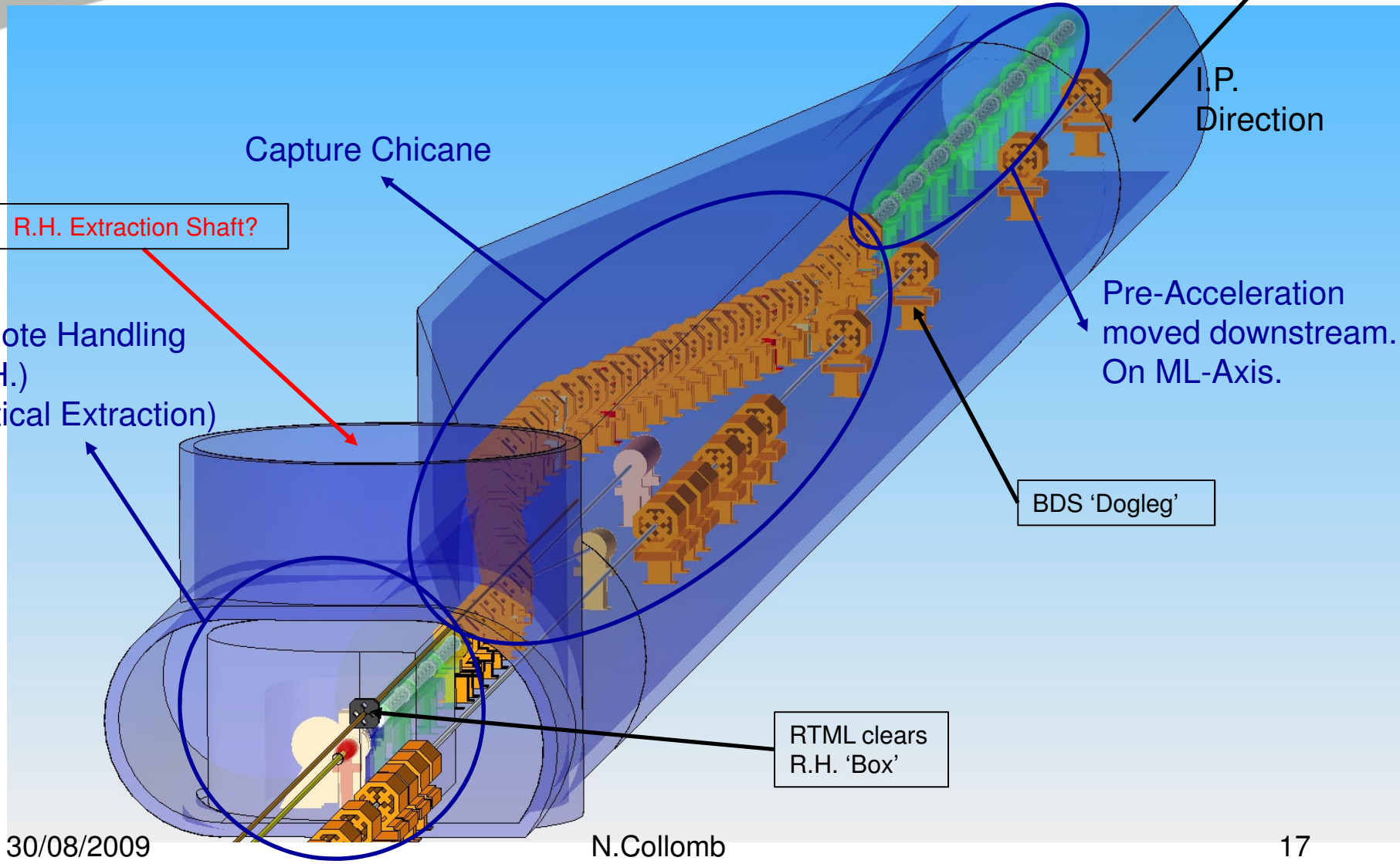
Linear Collider – AD&I

3 D Layout Positron Source 'AUX Source' region.



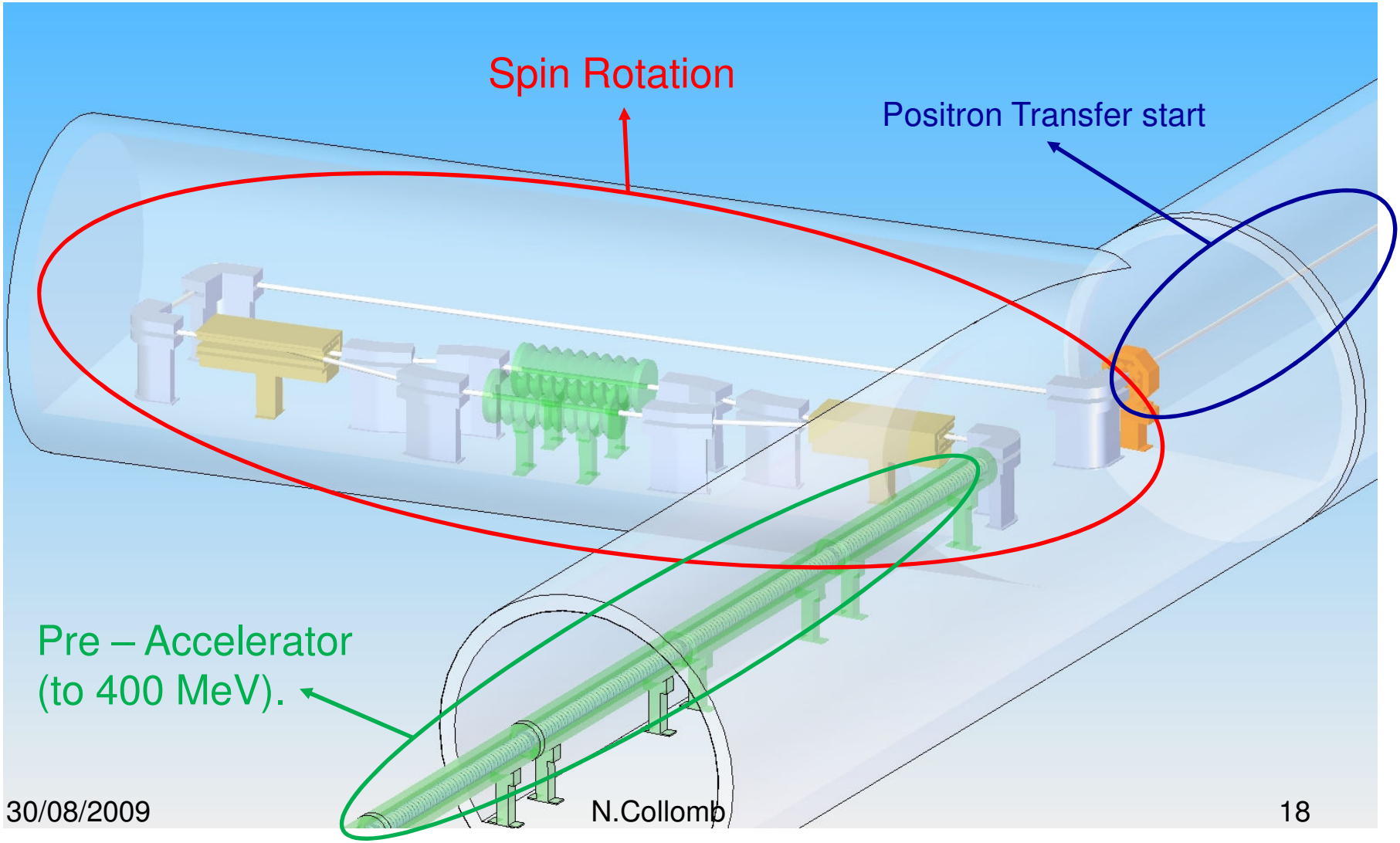
Linear Collider – AD&I

3 D Layout Positron Source 'Target Area'.



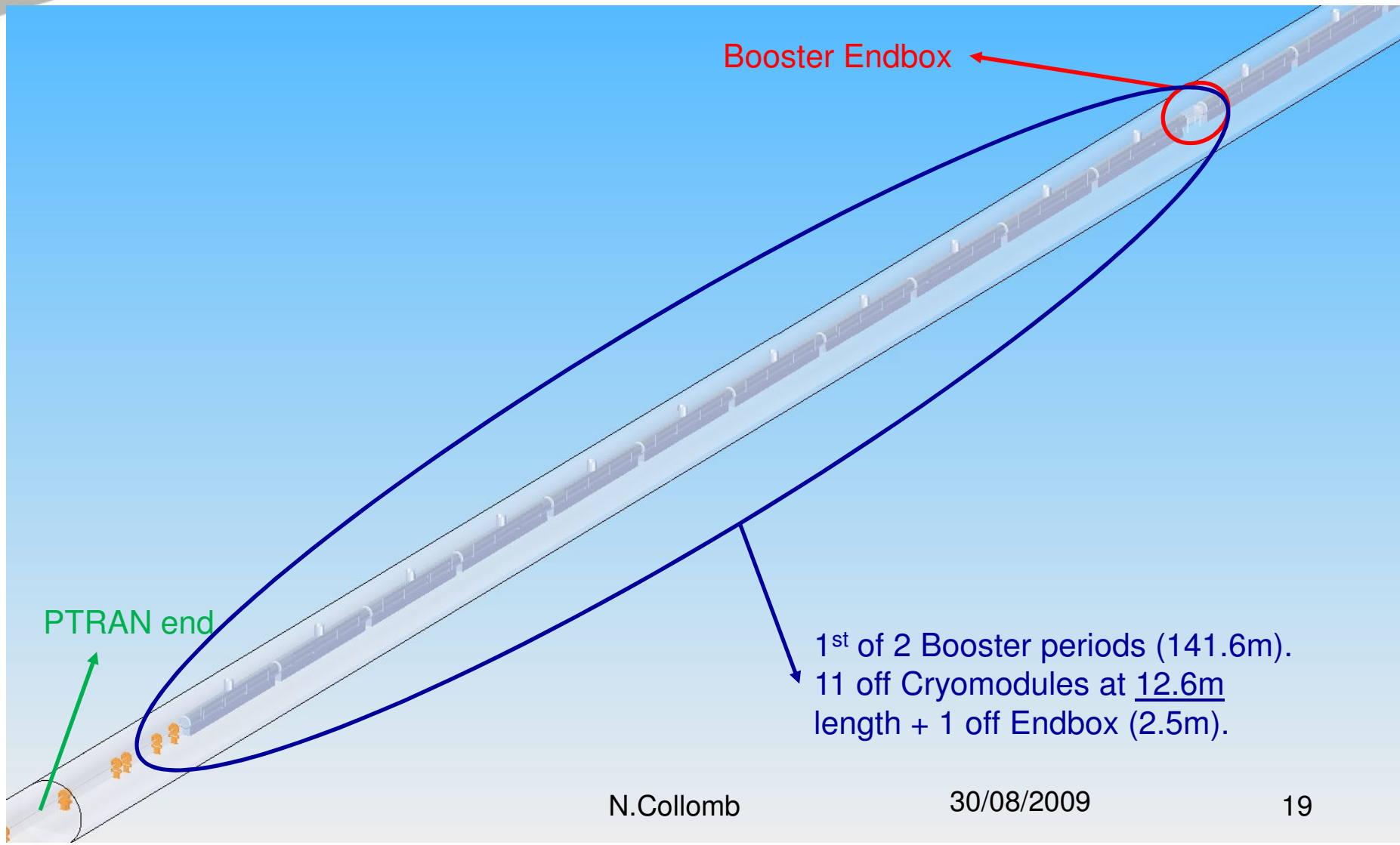
Linear Collider – AD&I

3 D Layout Positron Source 'Spin Rotation' region.



Linear Collider – AD&I

3 D Layout for Positron Source 'Booster region'.



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 update all relevant Workgroups and discuss feasibility of proposal.

CAD models can be distributed now or after 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.

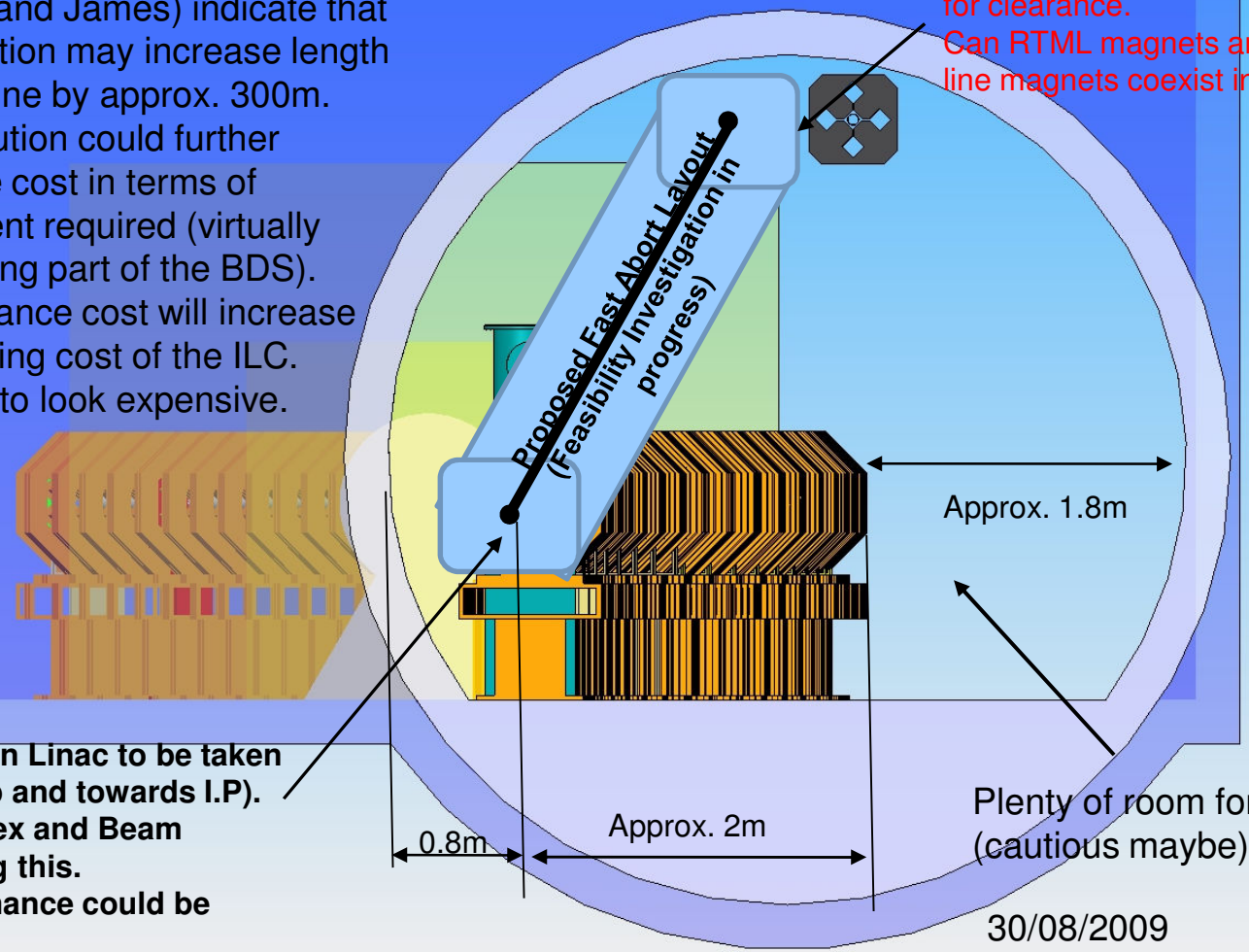
Individual systems need to be developed further (are we at a stage where we can go into more detail?)

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!!

Plenty of room for access (cautious maybe)

Linear Collider – AD&I

Discussion Summary

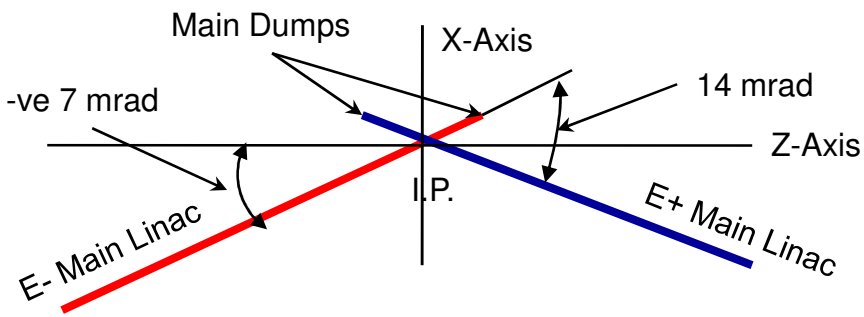
Discussion details (refer to slide number):

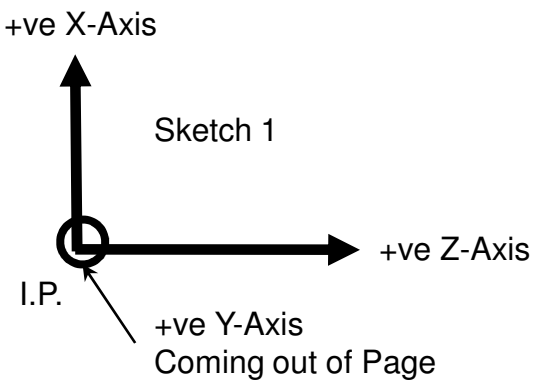
The Damping Rings are on the opposite side as the Main Beam Dumps (slide 3).

The orientation of the Main Linac has been clarified by Nick Walker (misconception to RDR Fig. 2.3-2).

The I.P. is the Datum. The 'Z – Axis' points to the 'right' and the 'X – Axis' to the top in the Plan View (as was). See sketch 1 below.

The Lattice files do NOT have a rotation. The person converting the data into Excel format for engineering purposes must adopt the convention as follows:
The Main Linac angle has been defined with a –ve 7 mrad to the horizontal Z-Axis giving a crossing angle of 14 mrad.

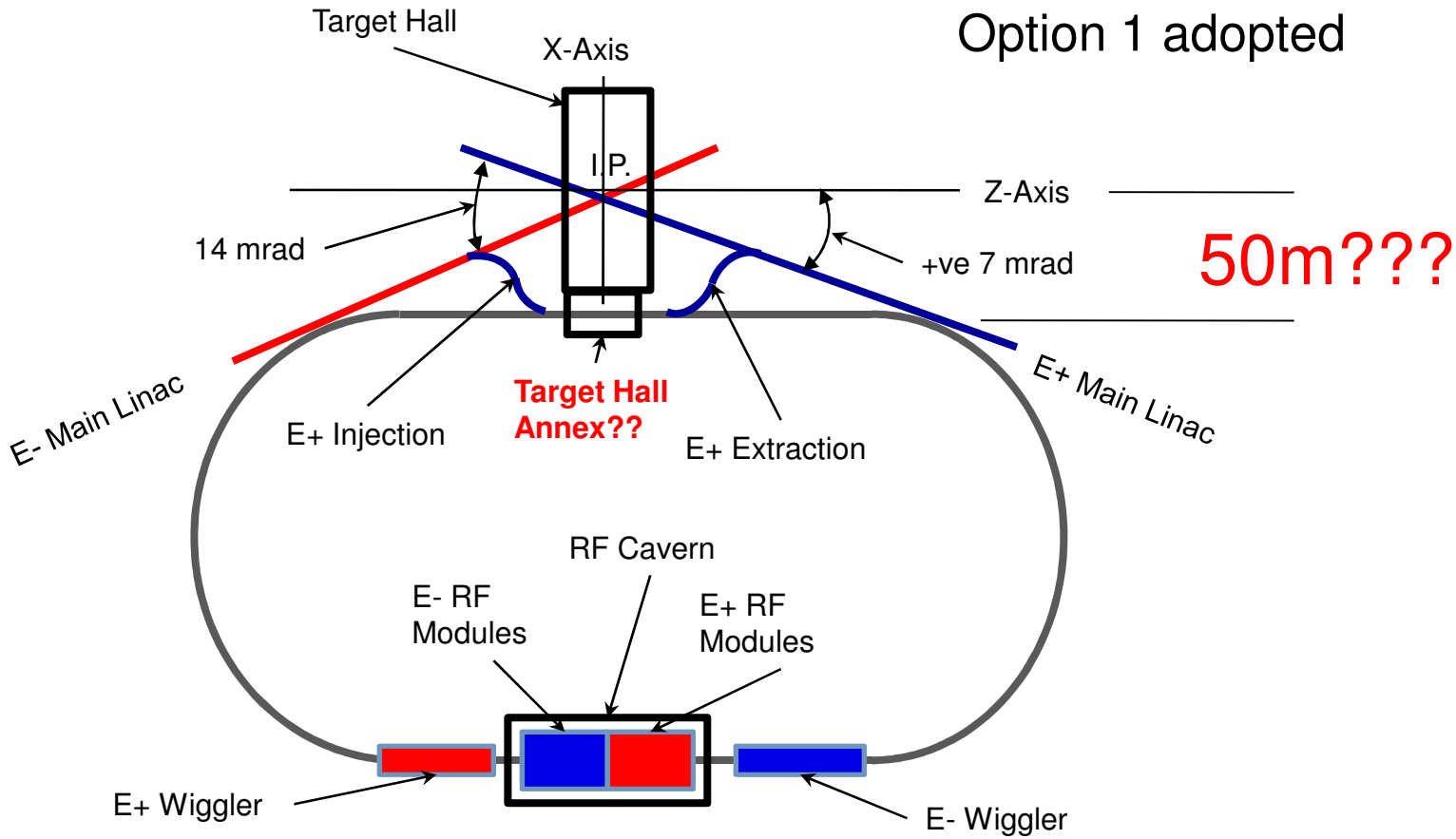




Linear Collider – AD&I

Discussion Summary

Option 1 adopted



NOT TO SCALE