KEK

Normal operation

0.2 μSv/h for Non-designated area

1.5 μSv/h for Supervised area

20 μSv/h for Simple controlled area

Mis-steering beam loss

1 hour integration of dose rate should not exceed 1.5 μSv/h using radiation monitor.

(Terminate injection and wait 1 hour)

1. mSv / week

Belle Experimental floor: Supervised area

LHC

Normal operation

- 0.1 μSv/h for Non-designated area
- 1 μSv/h for Supervised area
- 3 μSv/h for Simple controlled area

Total beam loss

- 0.3 mSv/h for Non-designated area
- 2.5 mSv/h for Supervised area
- 50 mSv/h for Simple controlled area

SLAC

Normal operation

0.5 μSv/h for GERT (General Employ Radiation Training)

5 μSv/h for Radiation Worker

Mis-steering

4 mSv/h

System failure

250 mSv/h and 30 mSv/event

Self-shielding detector

To evaluate strawman models

$\rightarrow$ 250 mSv/h for total (18 MW) beam loss

(SLAC system failure)

= **14 μSv/h for 1 kW beam loss**

GERT access (0.5 μSv/h) on experimental floor

Normal beam loss should be less than **36 W**

Mis-steering (4 mSv/h) on experimental floor

Beam should be turn-off less than **57 sec**

Beam loss

- 500 GeV, 18 MW beam loss

  $\rightarrow$ Design Goal : 250 mSv/h

- Beam loss point and material
  - Design is available :

    realistic component
  - Design is not available :

    pessimistic scenario, = 20 X_0 thick Cu target

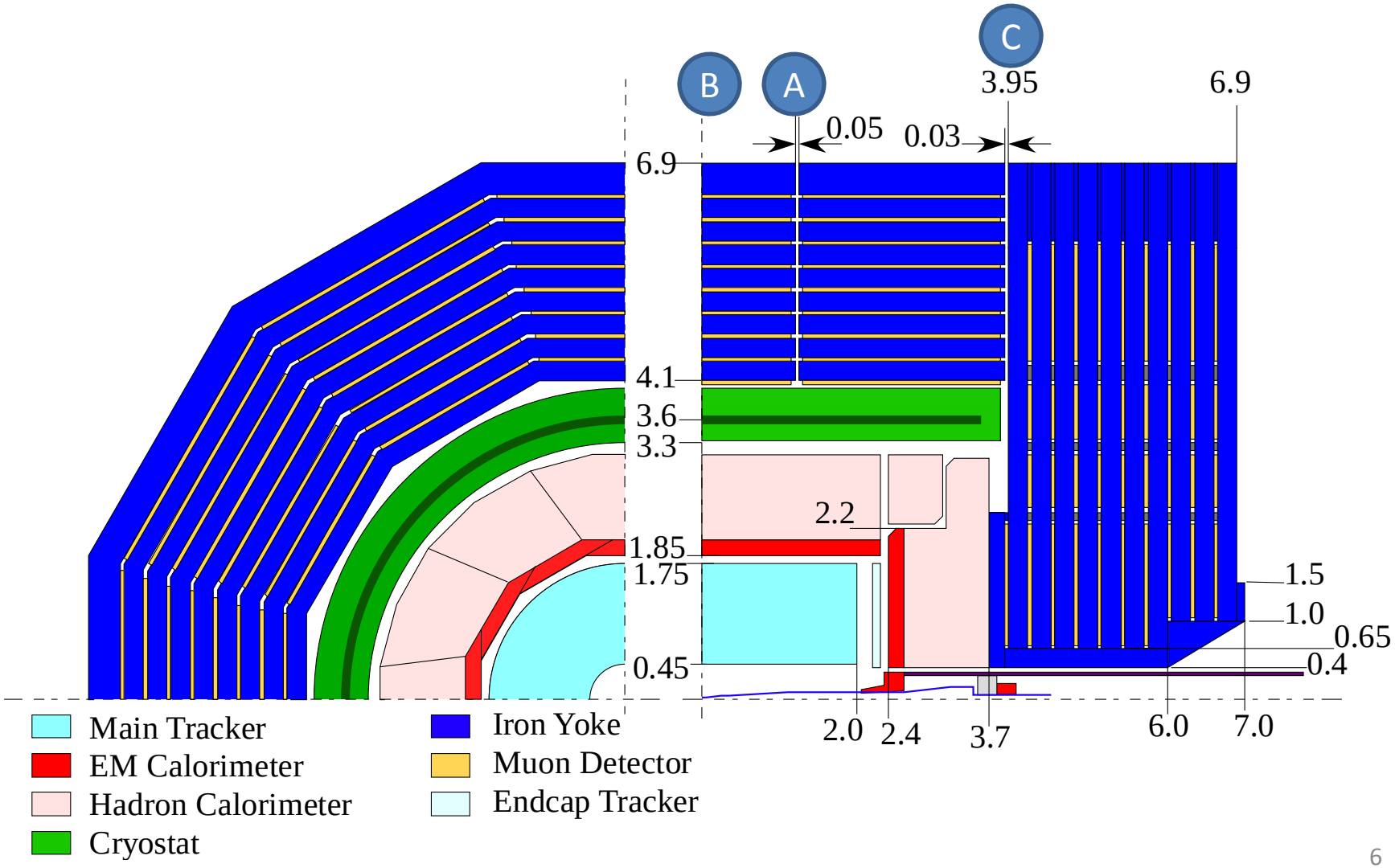
- 3D Monte-Carlo simulation
- Empirical equation

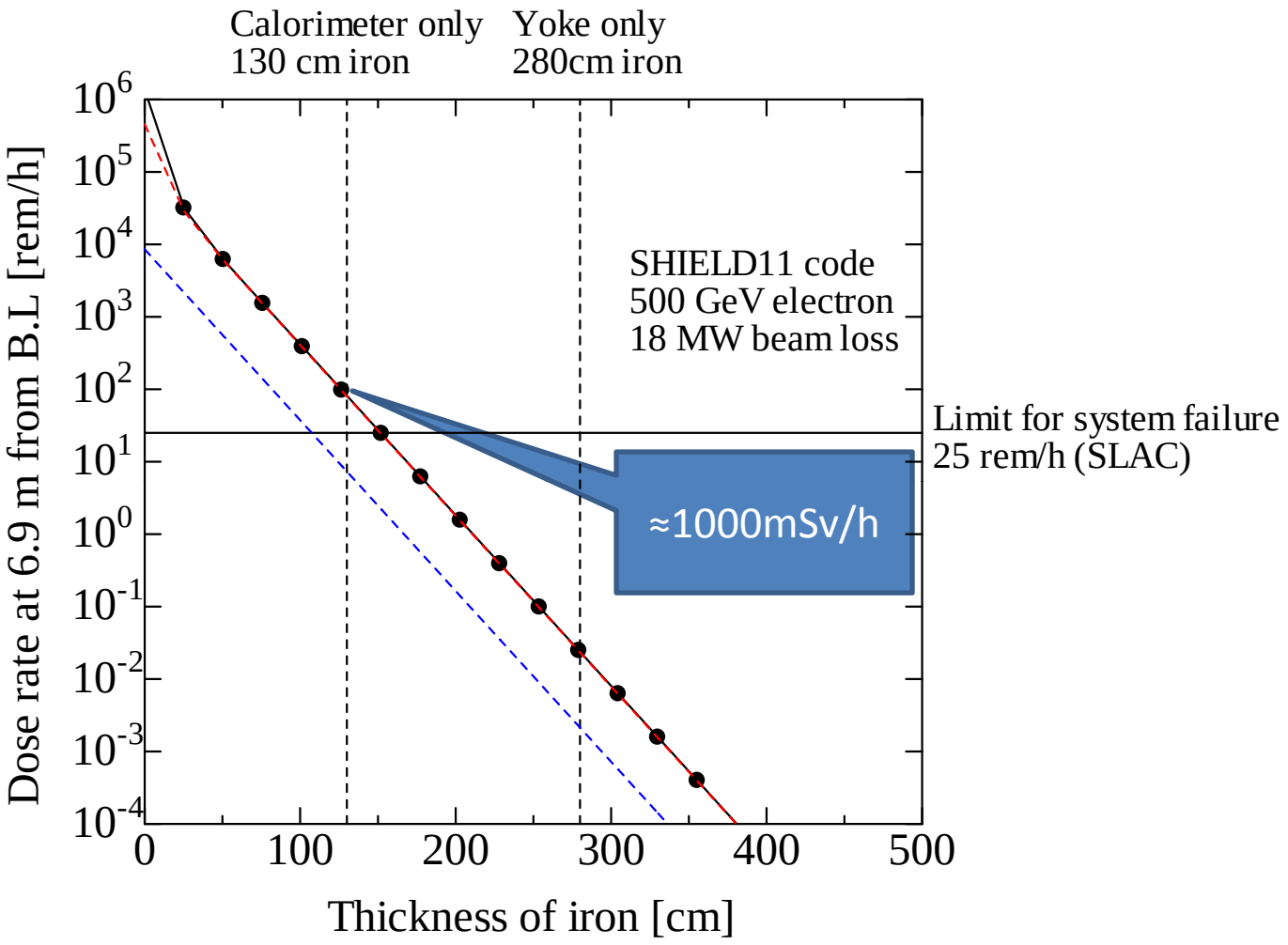
Iron thickness; Yoke 280cm, Calorimeter(s) 130cm x XX%

A(Barrel Gap): Iron 130xXX%cm

B(Barrel) : Iron 130xXX%cm+280xXX%cm

C(End yoke Gap): Iron 180cm + α or 280xXX%cm





To accommodate KEK rule, 1mSv/week :

1 [mSv/h] / 1000 [mSv/h] x 3600 [s] = 3.6 [s]

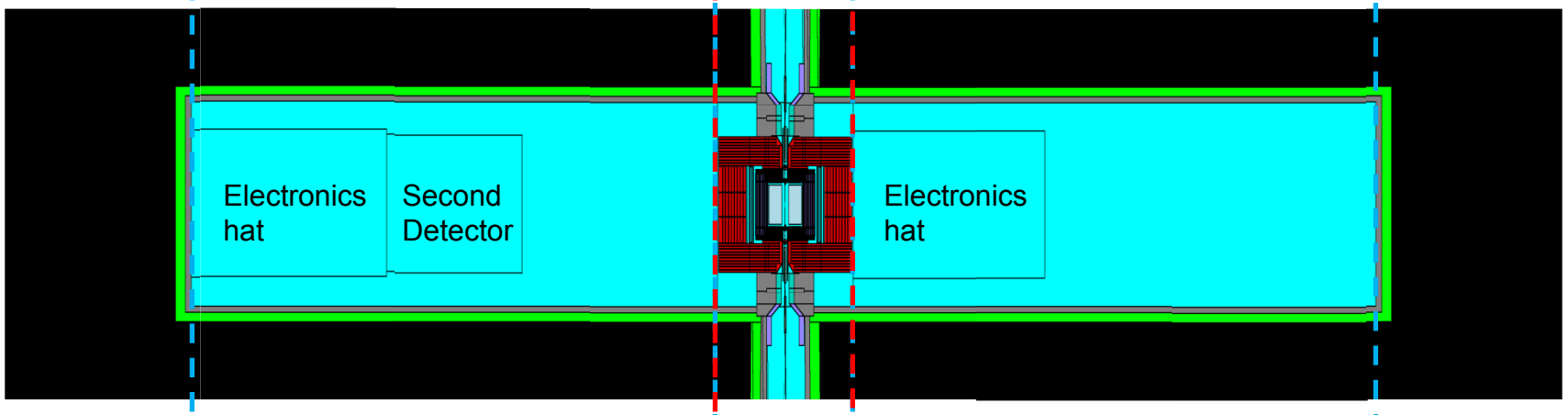
The system turning off both beam within 3.6 sec must be required

Radiation control area classification of IR hall

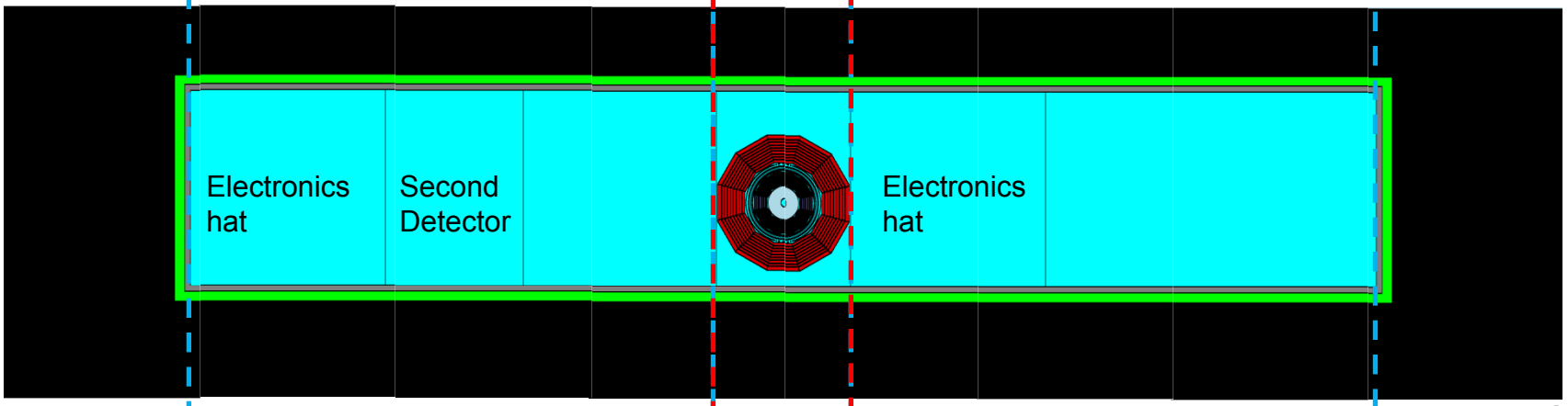
Keep out
Accessible

Induced activity ?

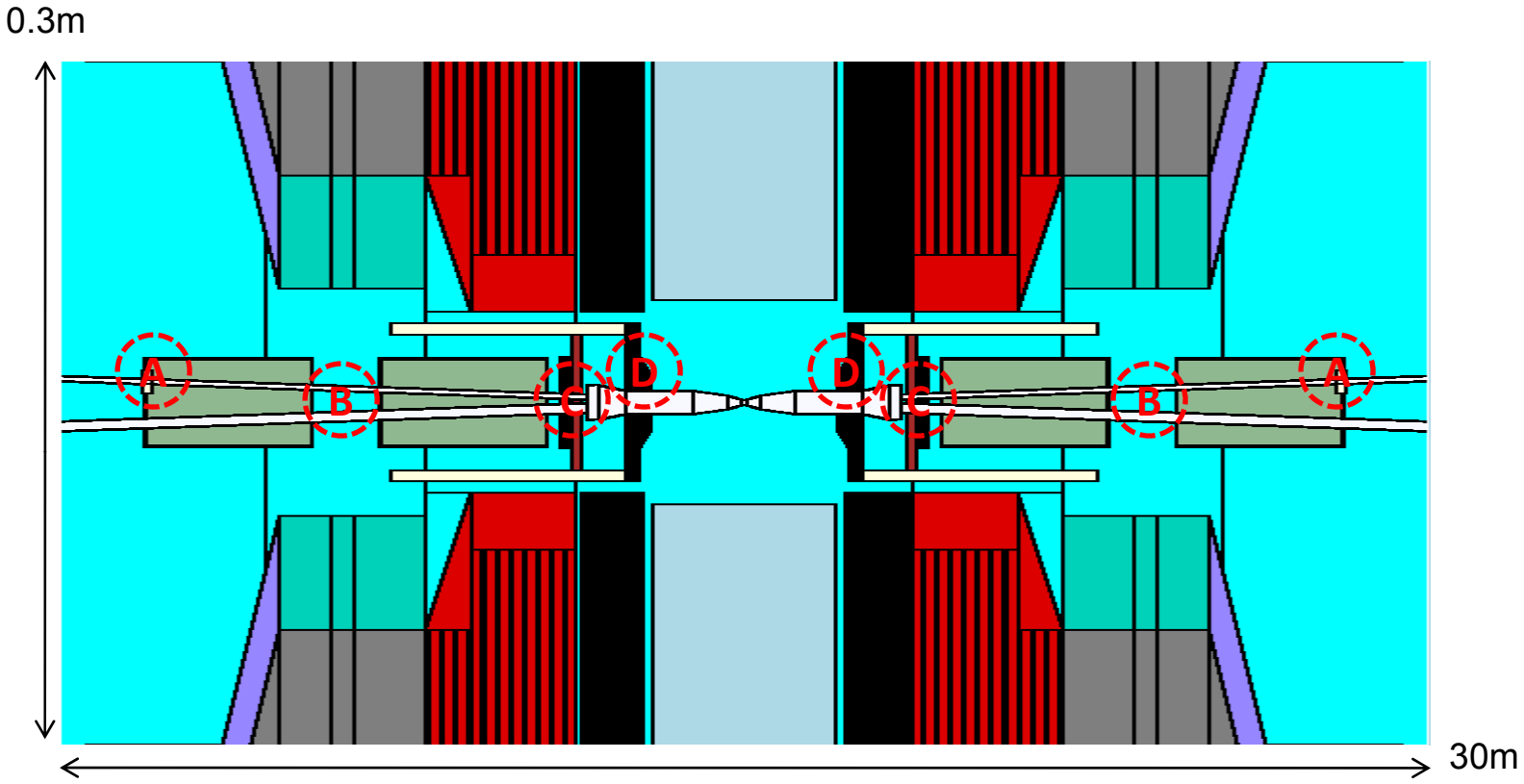
Plan view (20mx80m)



Elevation view (20mx80m)



Source term of radiation in IR hall



Beam loss points with thick components (Normal, Accidental)

A: Final doublet protection collimator (≈0 W, 18 MW)

B: Vacuum valve and flange (≈0 W, 18 MW)

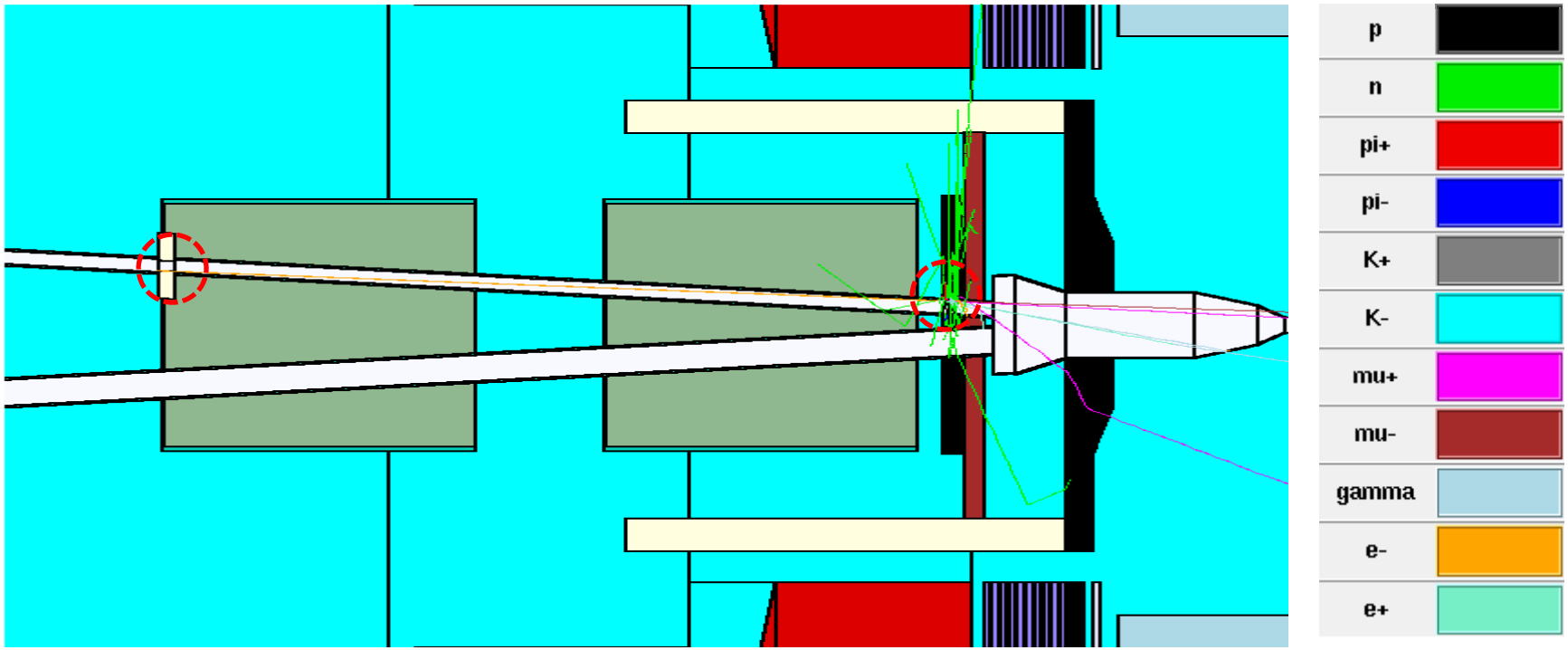
C: Beam calorimeter (<1 W, 18 MW)

D: Luminosity calorimeter (<1 W, 18 MW)

Pseudo target : Iron 12” L x 2” r (17 X_0 L x 2.8 X_0 r)

Source condition 1; Beam hits beam calorimeter

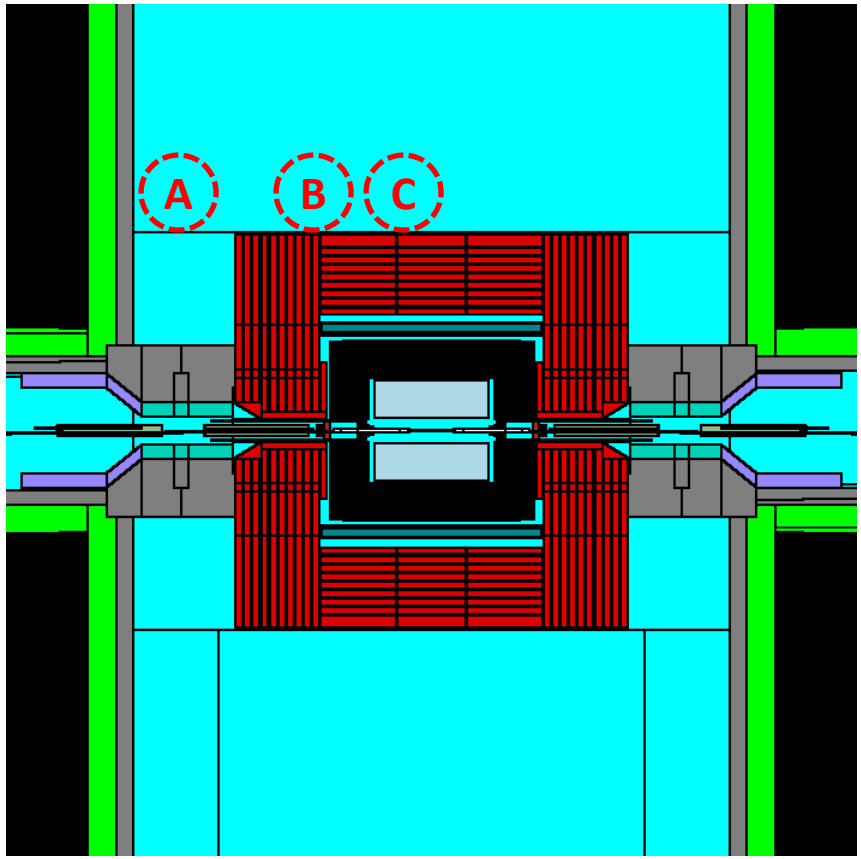
Beam hits beam calorimeter after passing through final doublet protection collimator



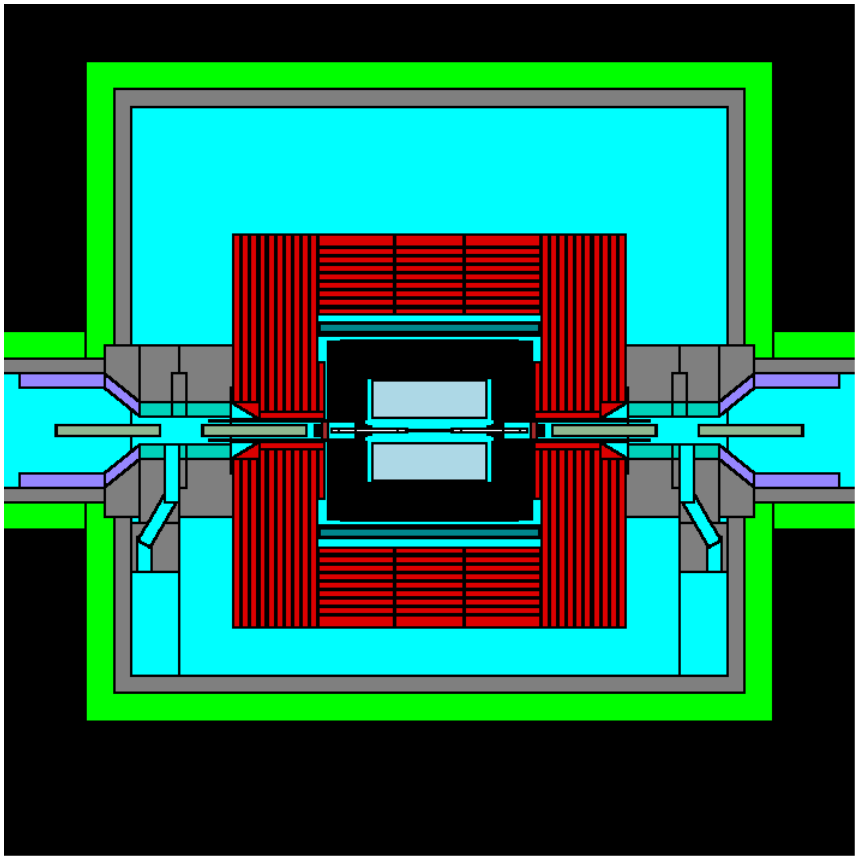
1 m x 15 m

Points of interest for dose rate evaluation

Plan view



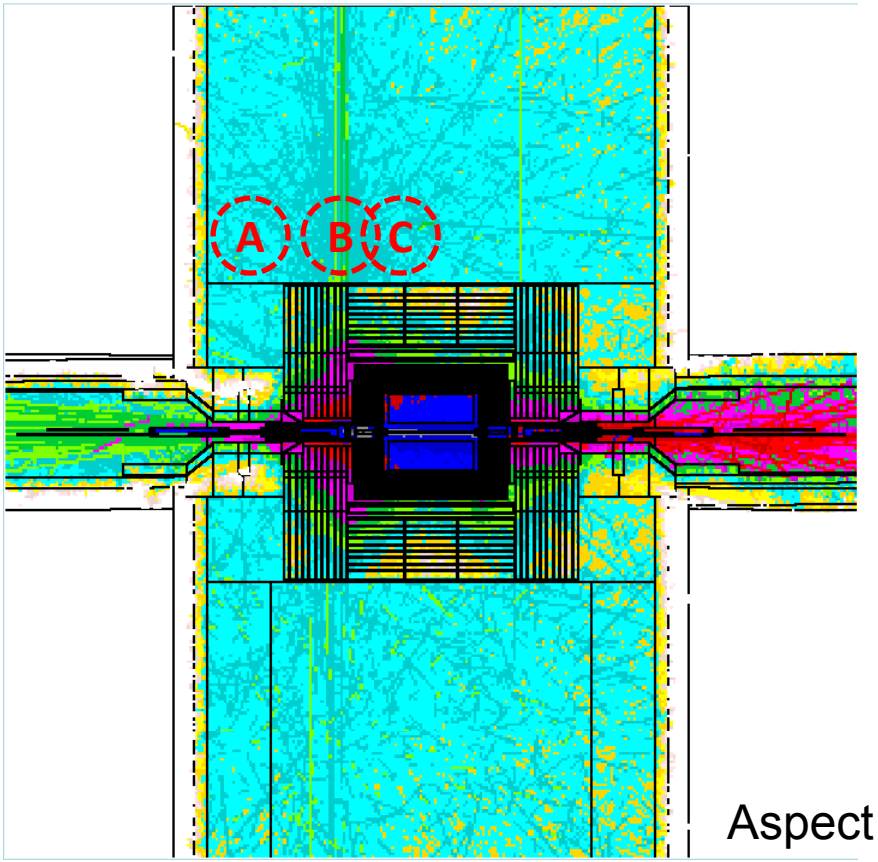
Elevation view



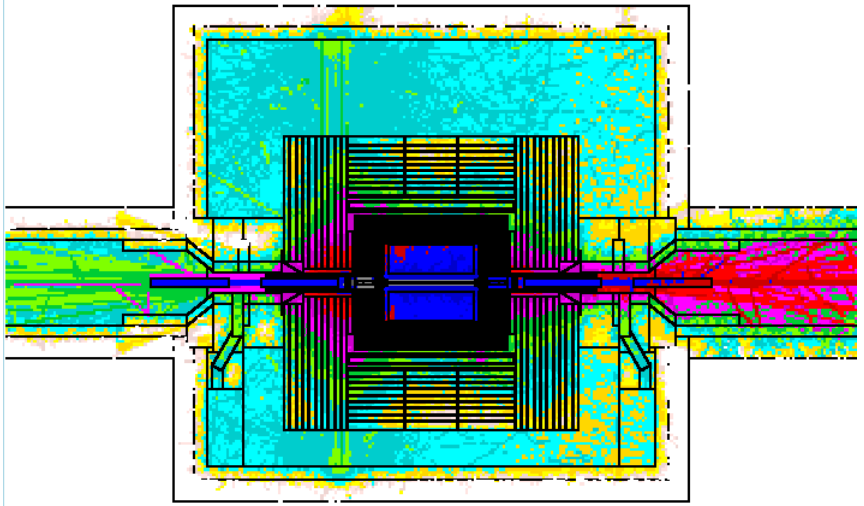
Aspect ratio 1:1 (20 m x 20m)

Result of dose rate evaluation in IR hall

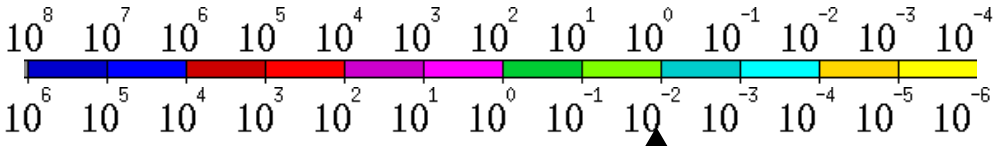
Plan view



Elevation view



Aspect ratio 1:1 (20 m x 20m)



[mrem/h/kW]

[mSv/h/kW]

1.39×10^{-2} [mSv/h/kW] (250mSv/h / 18 MW)