Beam Dumps

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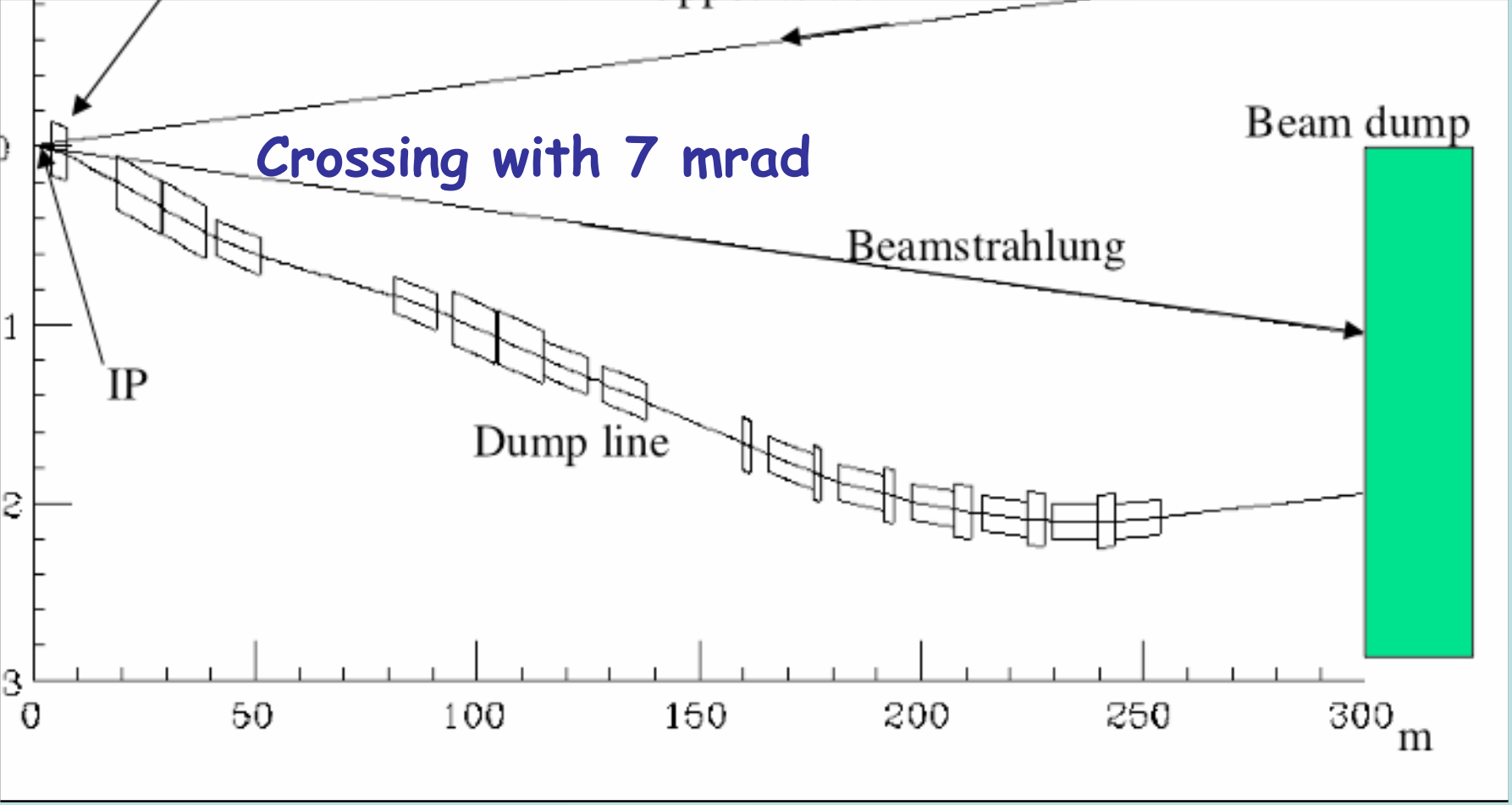
KEK

ese are results studied by GLC Conventional Facility Study
oup.
udy on ILC beam dump system is going to be started.)

diation problem was studied in detail by S. Ban et al. of KEK
diation Science Center.

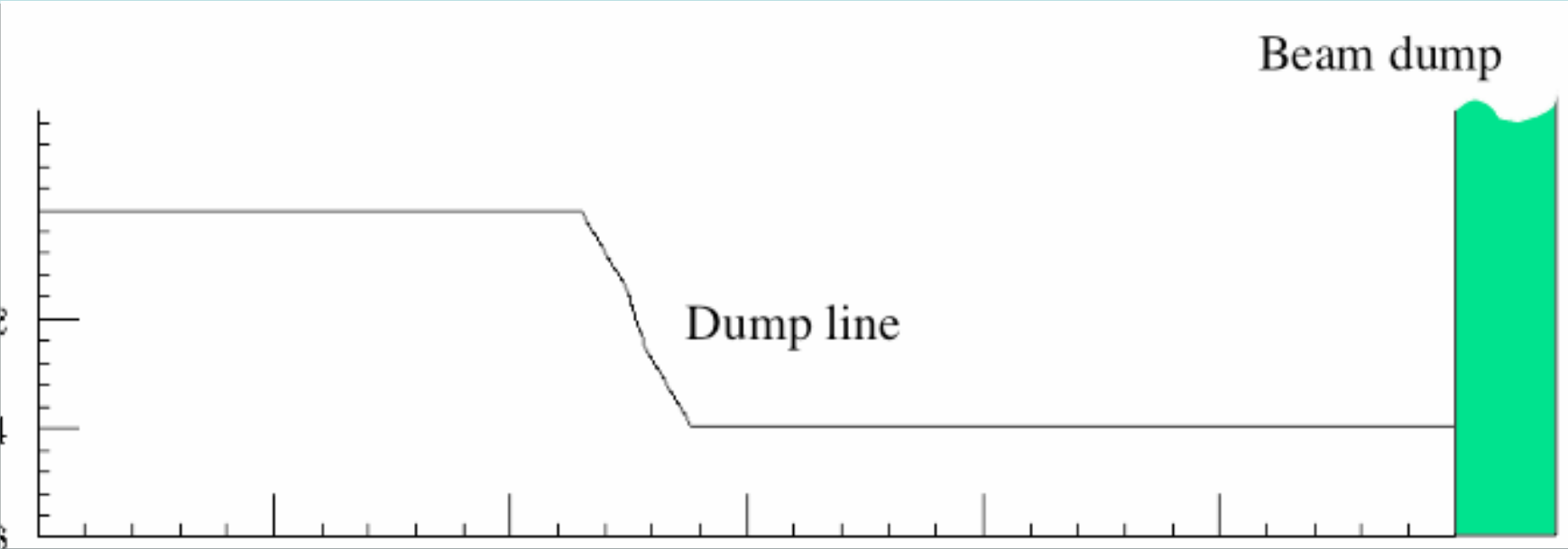
stem and layout were studied and designed under the coope
ion with Nikken Sekkei Ltd., Hitachi Engineering Co., Ltd. a
achi High-Technologies Corporation.



Apertures
Shields ?

Background
neutrons,
photons
to be estimate
the BDS-SIM.

Better with larg
crossing angle
mrad ?



Beam Du
1.6m-dia. x

mped power of 500 GeV beam
12 MW (e+, e- 11 MW, Gamma 1 MW)

nension: 9 m long x 1.6 m diameter
(25 radiation length)
ter pressure: 1 M Pa
ter flow: 333 m^3/h
ount of water in the dump: 20 m^3
Recovery tank: 60 m^3 … three times larger than beam dump
ount of H_2 production in the water: 3L/s
H_2 Recombiner : 10 L/s … three times larger than H_2 produc

Recombiner must be placed higher than Beam Dump, and
covery Tank must be lower than Beam Dump.

estimate radioactivity in the water,
Cross Section Calculation Code : PICA3/GEM

nount of Radioactivity in the water
Be-7: 60 TBq
C-11: 96 TBq
N-13: 72 TBq
O-15: 280 TBq

ventilation system
Exchange the air in the dump hall (3200 m^3) in 1.5 hours

tivation in soil around the dump hall
Na-22 in the soil is less than IAEA Exemption Level, 10 Bq/

Amount of Radioactivity in Ion-exchangers

Estimated using the data for the KEK Proton Synchrotron Cooling Water System

Nuclei	Half life	Amount of activity(GBq)	Dose μ Sv/h@1m
Be-7	53.29Day	60000	428000
Co-58	70.86Day	57.6	7550
Co-57	271.7Day	14.7	258
Mn-54	312.1Day	12.9	1430
Co-56	77.23Day	4.96	2100
Co-60	5.271Year	1.59	485

eam dump

Recovery tank for beam dump water

to H2 recombiner

Purifier
(10 m^3/h)

H2 recombiner
cooling system

<Primary loop>

<Secondary loop>

FCV

FCV

一次ループ熱交換器

二次ループ熱交換器

(A)

(B)

(A)

(B)

一次ループ循環ポンプ
(333m^3/h)

二次ループ循環ポンプ
(400m^3/h)

ater pump for primary system
(333 m^3/h)

Water pump for secondary system
(400 m^3/h)

Inside

Outside

Heat exchanger

Third cooling
system
(500 m^3/h)

to

from

(500m^3/h)

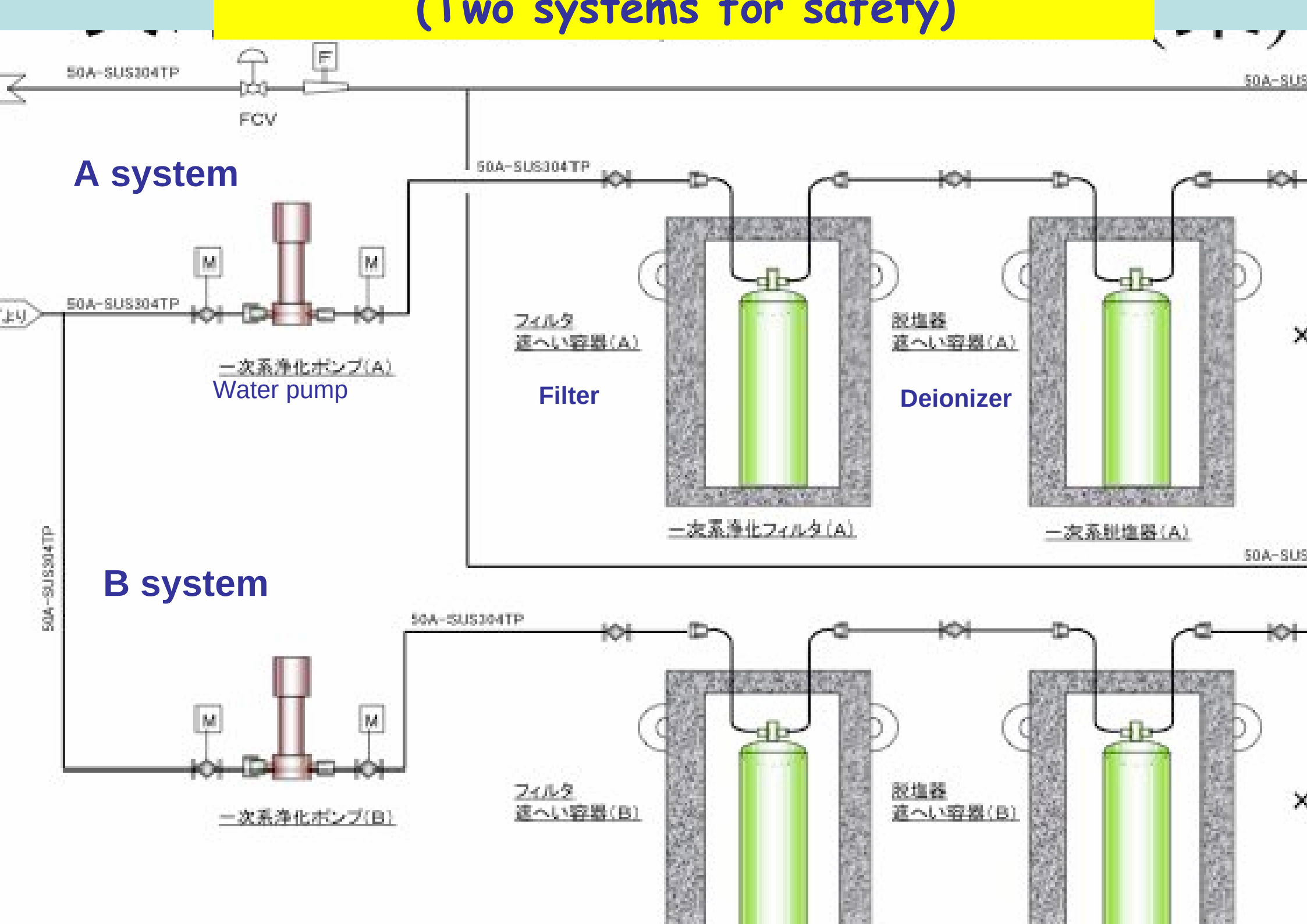
一次ループ

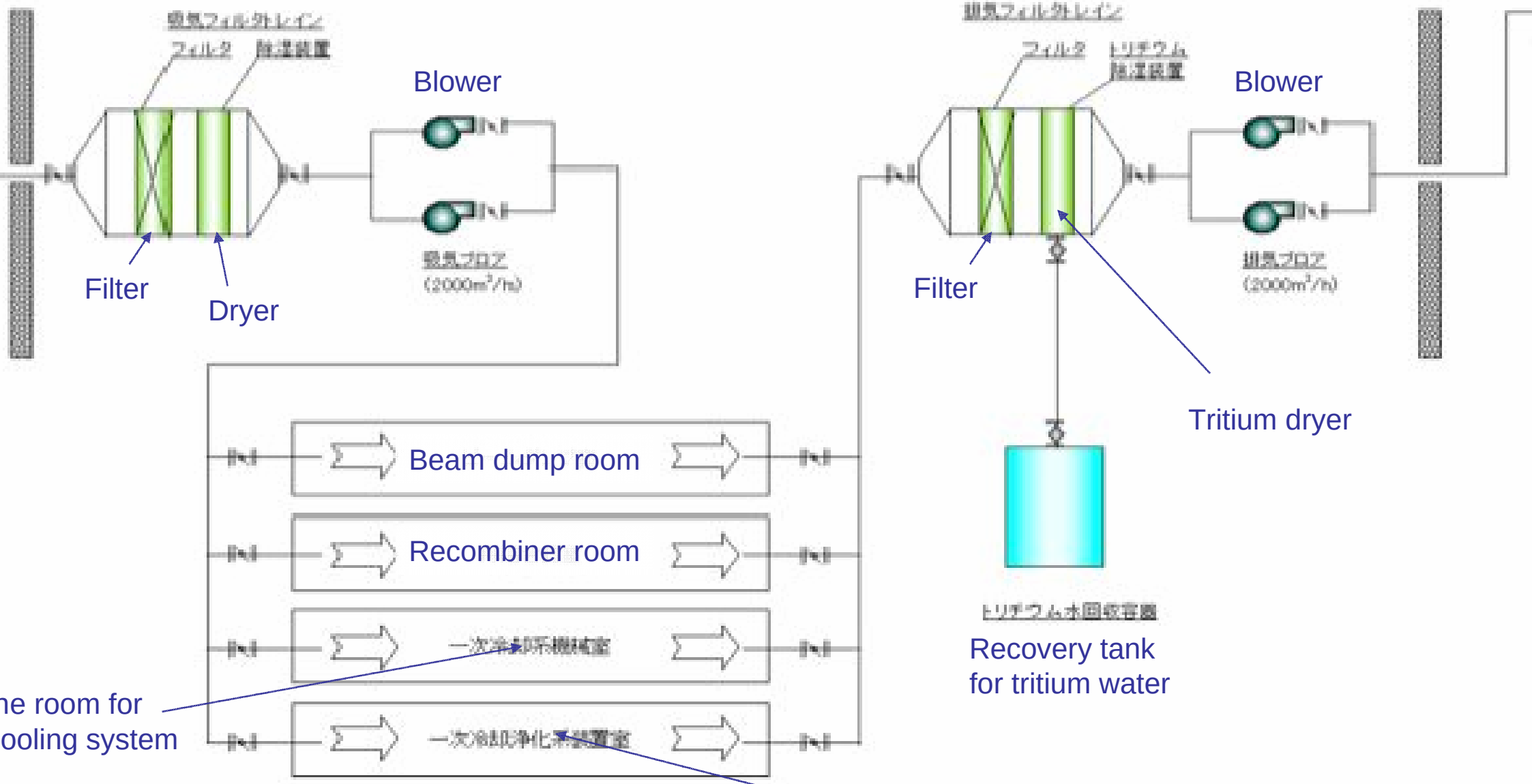
中間ループ

冷却ループ

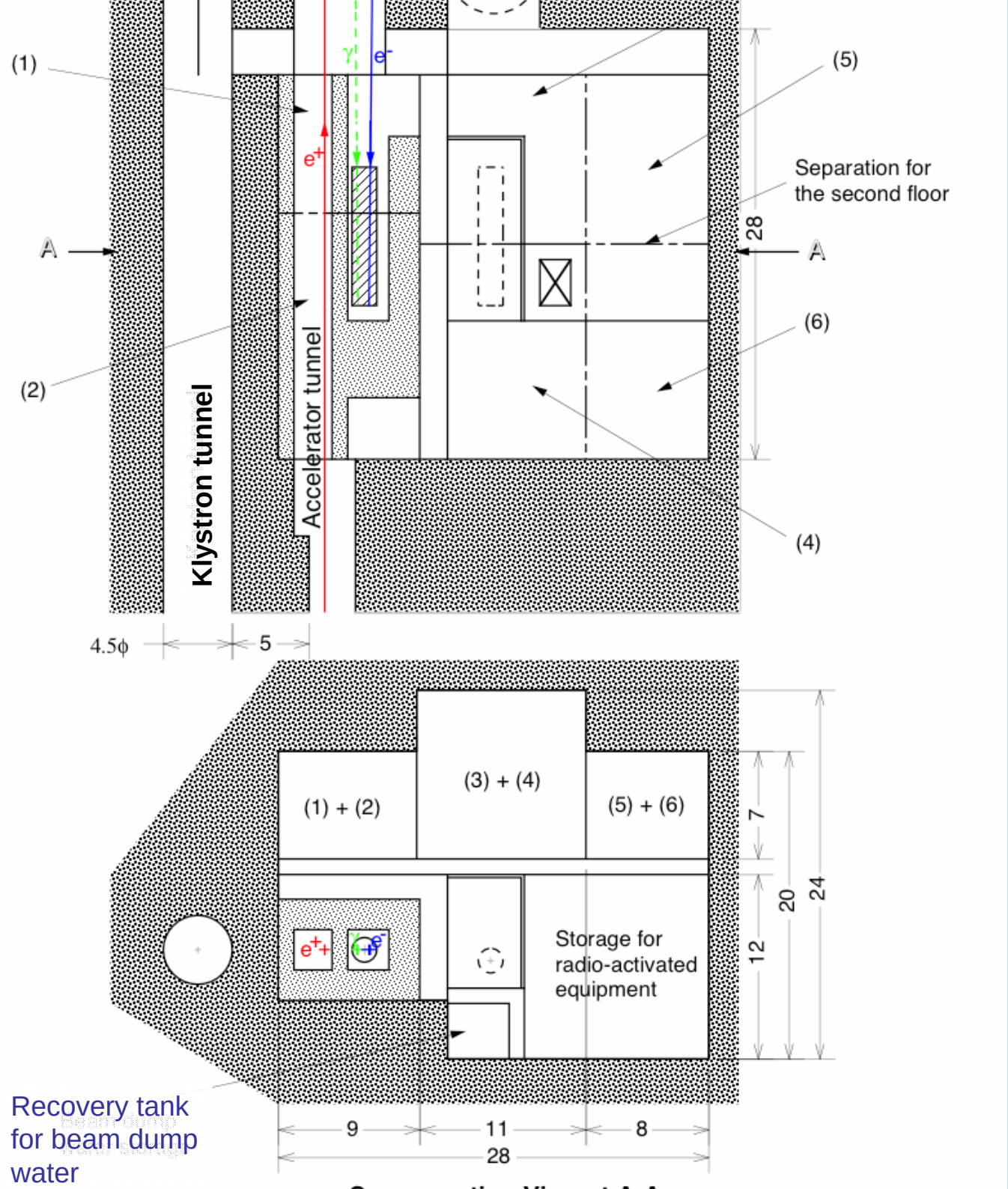
熱 収 支

(Two systems for safety)




Blower
Filter
Dryer
Blower
Filter
Tritium dryer
Beam dump room
Recombiner room
Recovery tank
for tritium water
ne room for
ooling system

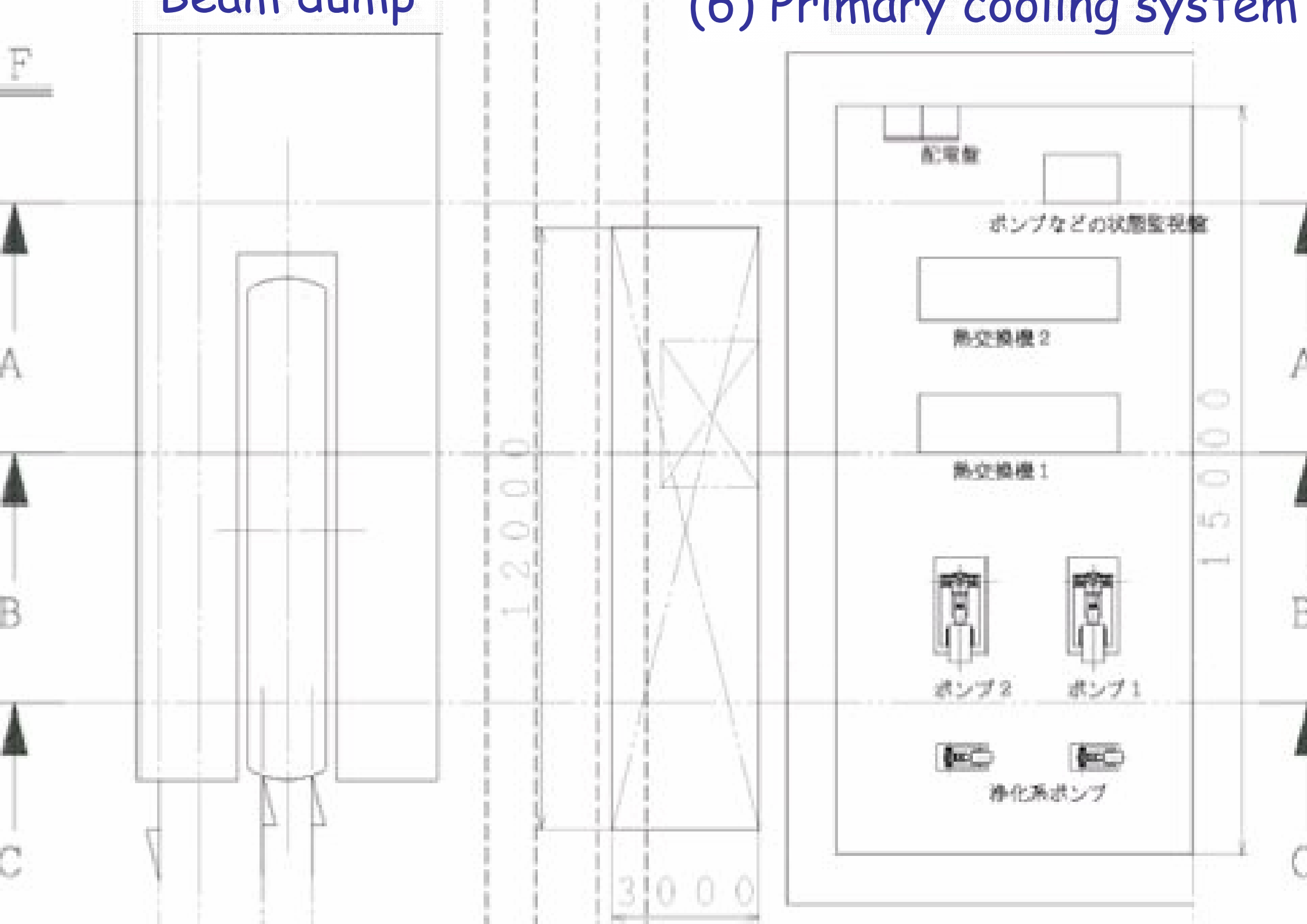
Layout

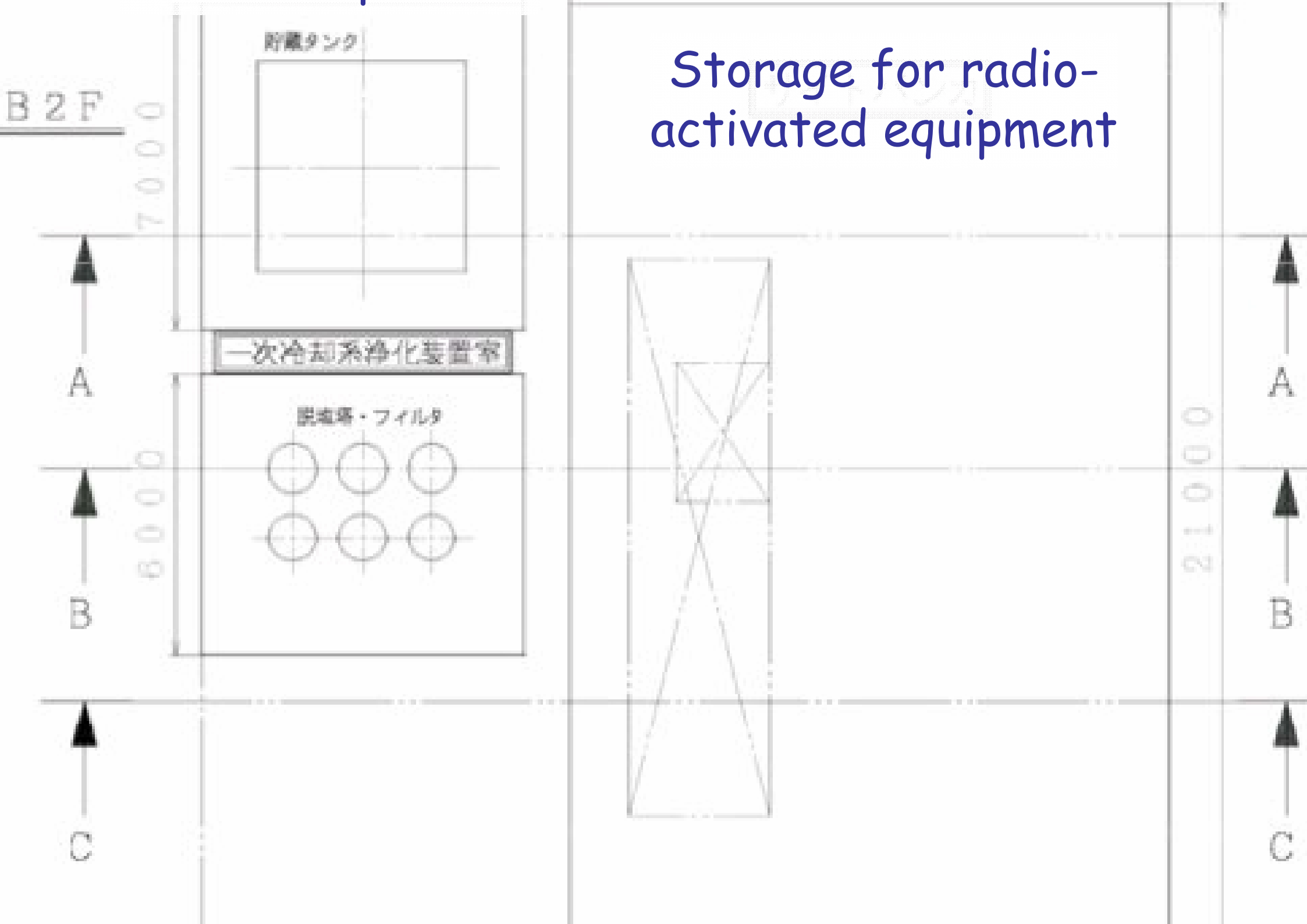


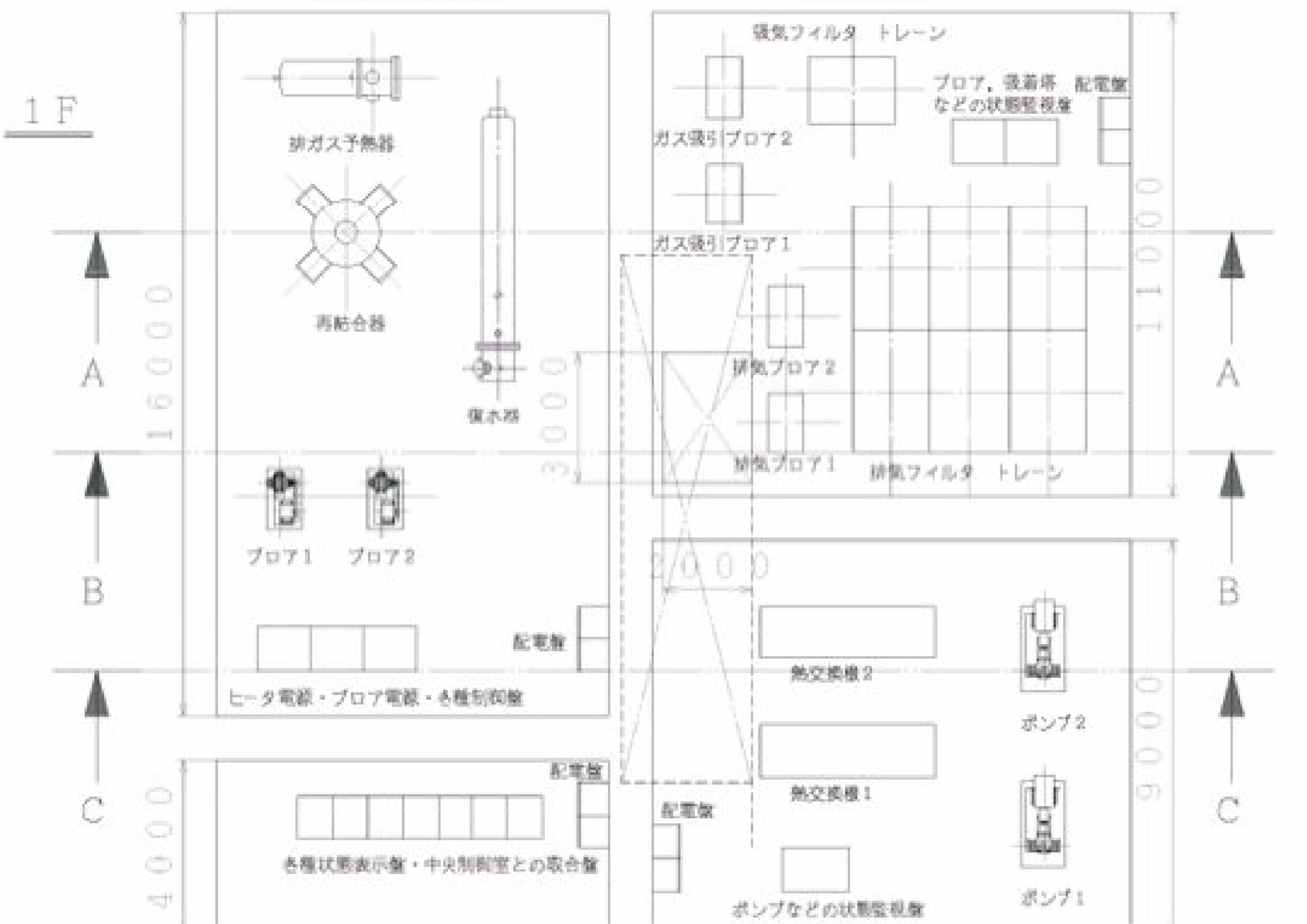
Recovery tank for beam dump water

Beam dump

(6) Primary cooling system




Storage for radio-activated equipment
B2F
貯蔵タンク
一次冷却系浄化装置室
脱塩塔・フィルタ
7000
6000
2100
A
B
C


1F
排ガス予熱器
再結合器
復水器
ブロア1
ブロア2
配電盤
ヒータ電源・ブロア電源・各種制御盤
各種状態表示盤・中央制御室との取合盤
吸気フィルタ　トレーン
ブロア，吸着塔などの状態監視盤
ガス吸引ブロア2
ガス吸引ブロア1
排気ブロア2
排気ブロア1
排気フィルタ　トレーン
熱交換機2
熱交換機1
ポンプ2
ポンプ1
ポンプなどの状態監視盤
A
B
C
16000
3000
2000
11000
4000
9000

etailed study on following items is needed:

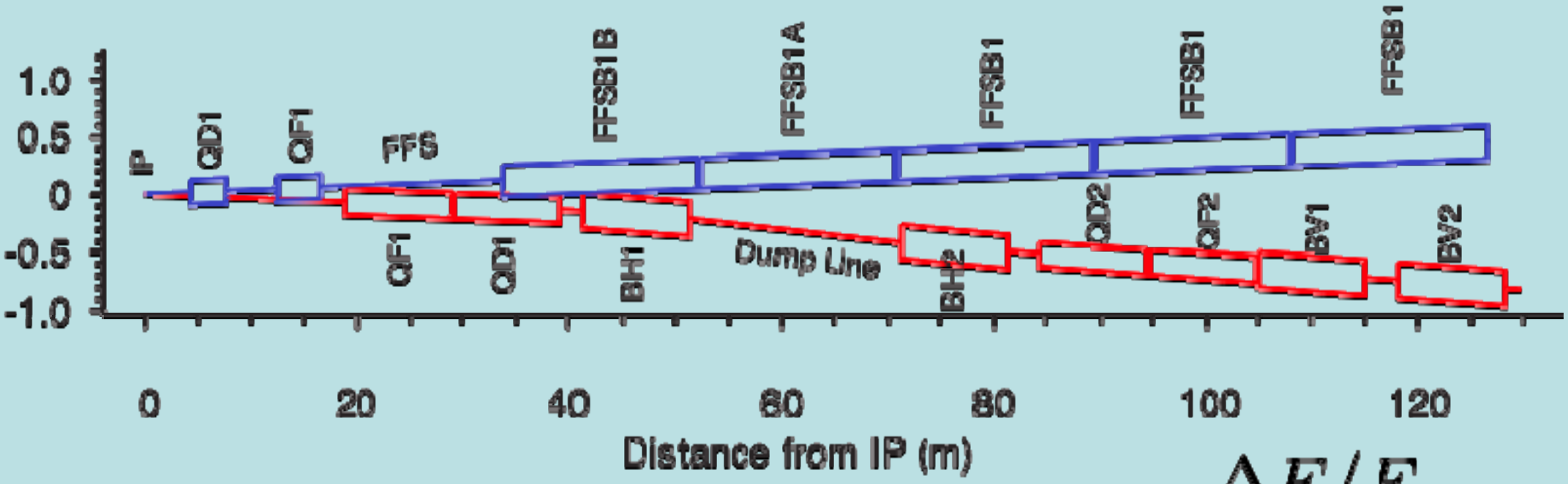
- Beam dump structure
- Beam window
- Scenario how to change the beam window
- How to move used beam dump to the storage room
- How to move used radio-activated equipment to the storage room
- Maintenance scenario for each equipment
- etc. …..

eed to study the case that tritium water in the beam dump leaks in the
ow to remove the water from the air completely.

eed to update to ILC version

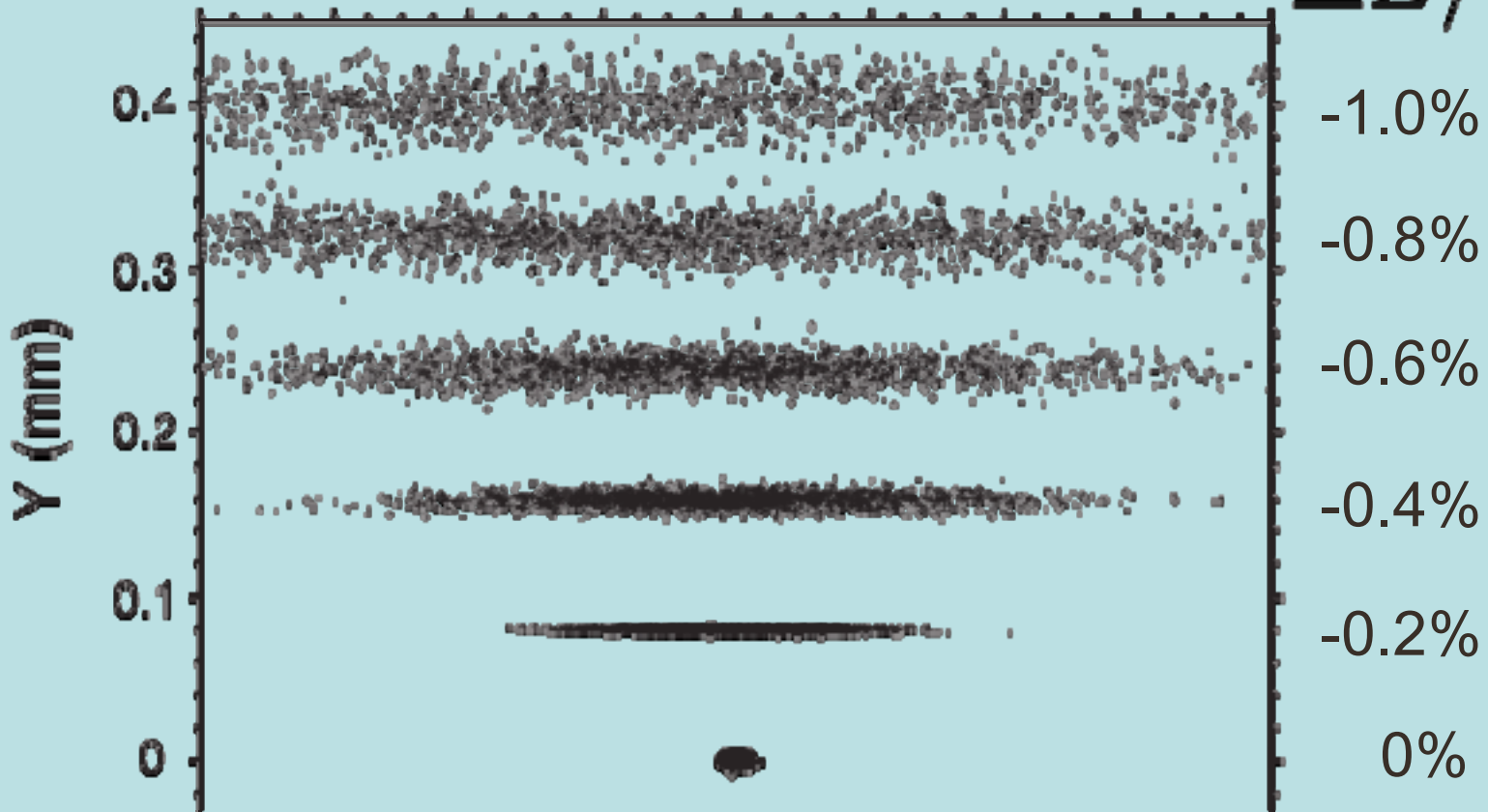
- Beam power: 11MW --> 23MW
- Power of bremss-gamma: 1MW --> 2MW

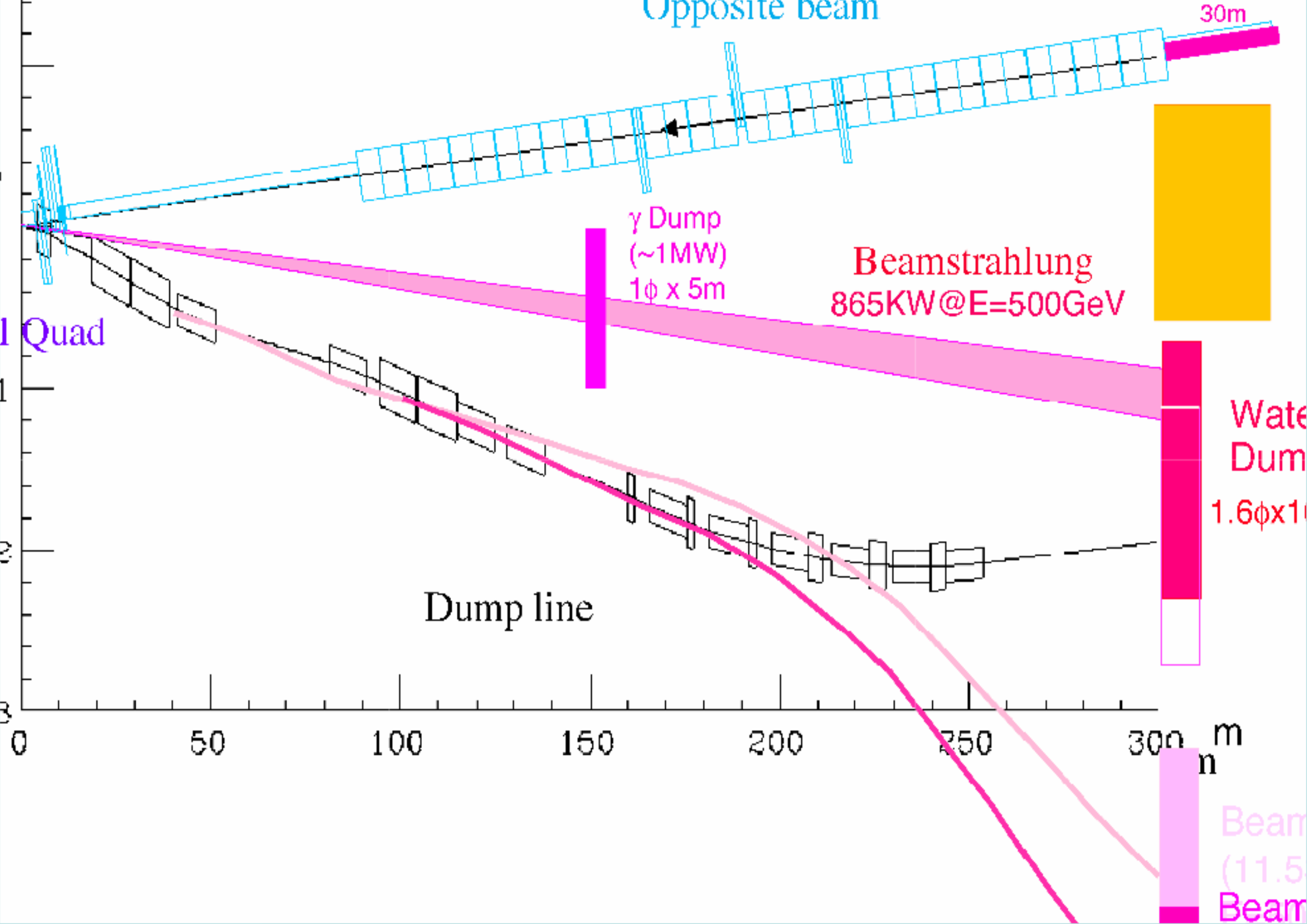
GLC 1TeV



2nd
140

n Spot
2nd FP




Opposite beam
30m
γ Dump
(~1MW)
1φ x 5m
Beamstrahlung
865KW@E=500GeV
Quad
Dump line
0
50
100
150
200
250
300
m