# Secondary Beam Lines

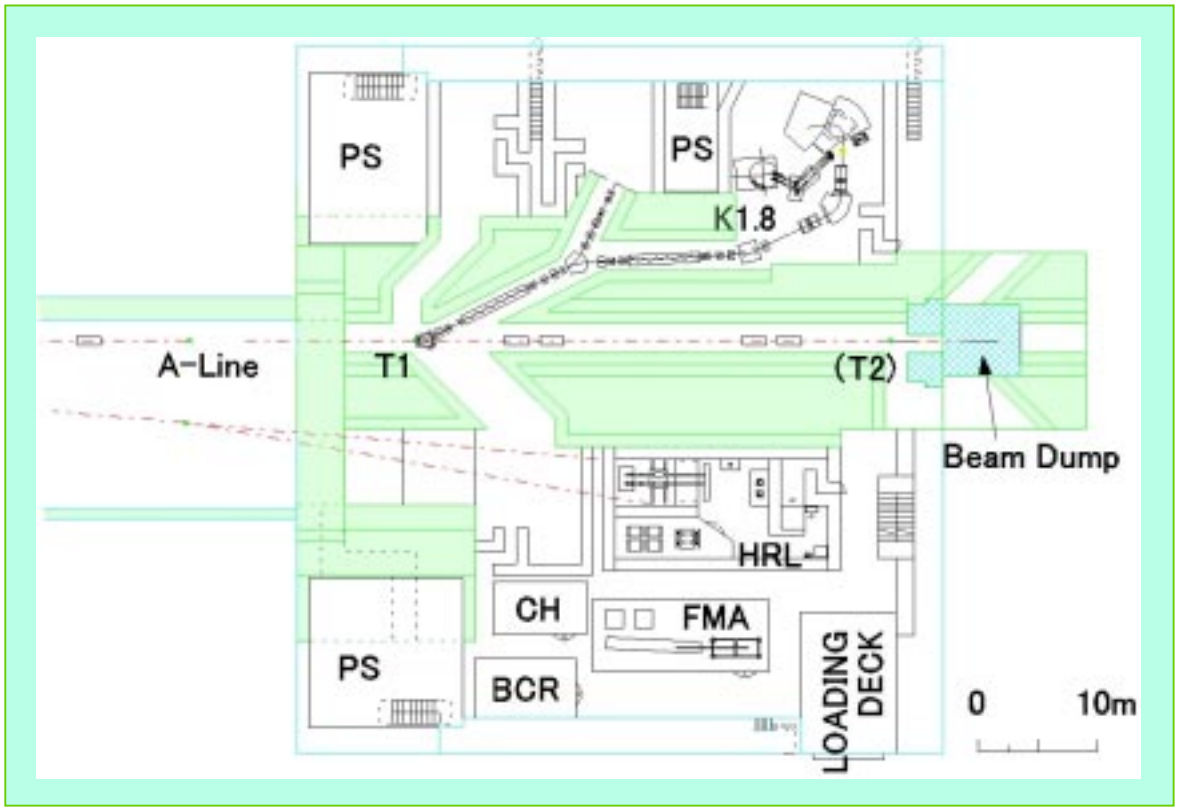
H. Noumi KEK
For Hadron Beam Line Group

1. General
   - K-Hall Layout
   - K1.8
2. Boundary Conditions
3. Conceptual Design
4. Prospect

# General

## K-Hall

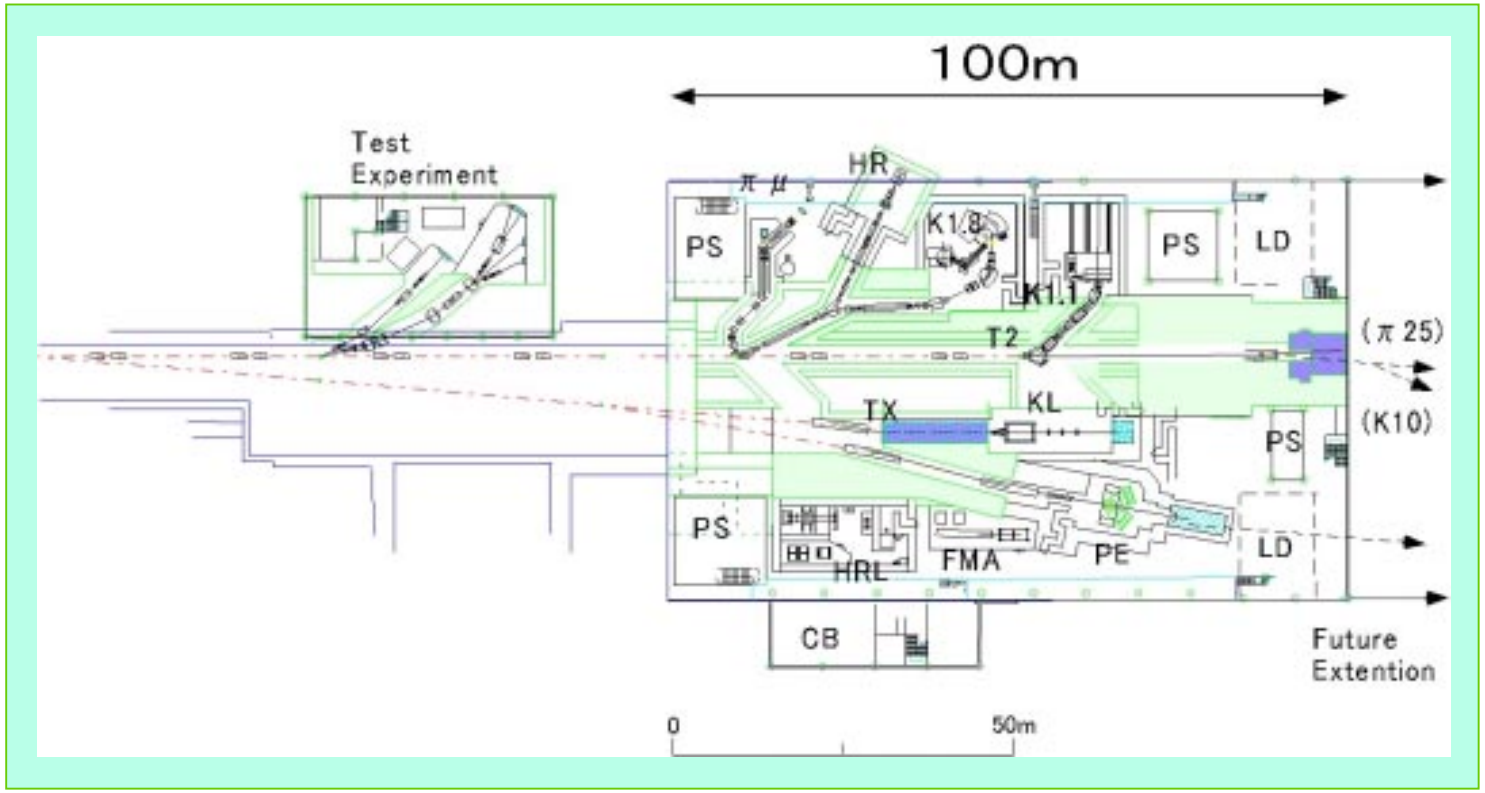
- Plan View (1st Stage)



# General

## K-Hall (cont.)

- Plan View (2nd Stage)



# *General*

## *K1.8*

- Physics Requests (from LoI)

| | |
|---|---|
| Intensity | $>10^7$ $K^-$ /s @1.8 GeV/c |
| Purity | $K/\pi > 2$ |
| Resolution | $\Delta p/p < 10^{-3}$ |
| Beam Size | ASAP? |

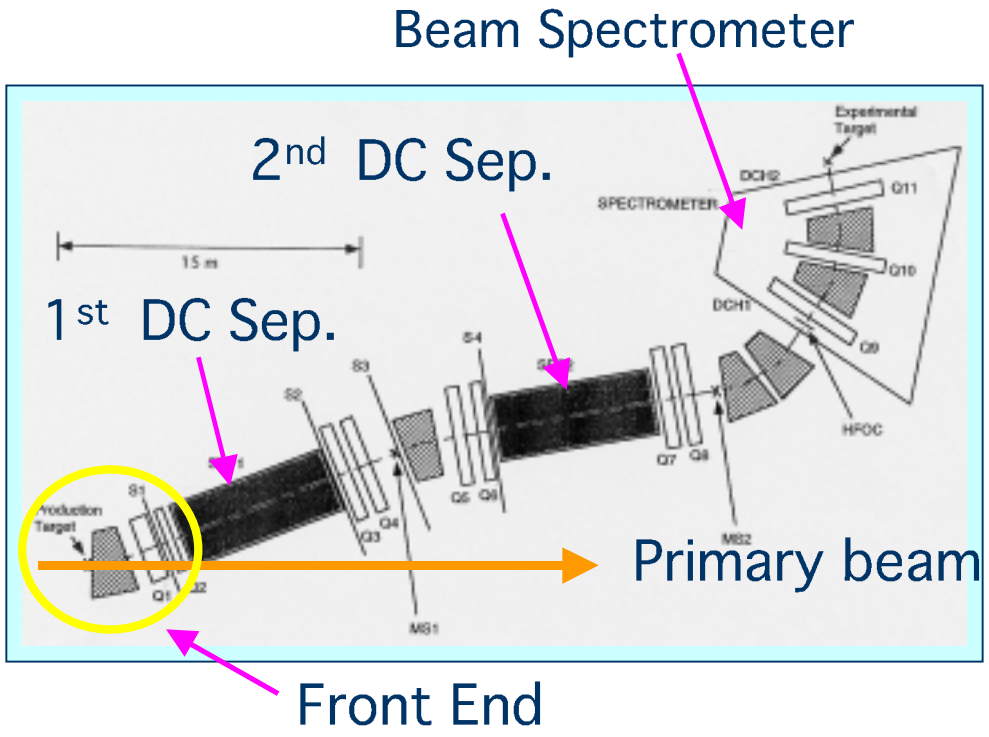
# General

## K1.8 (cont.)

- 1st Design

  J. Doornbos
  KEK Report 97-5

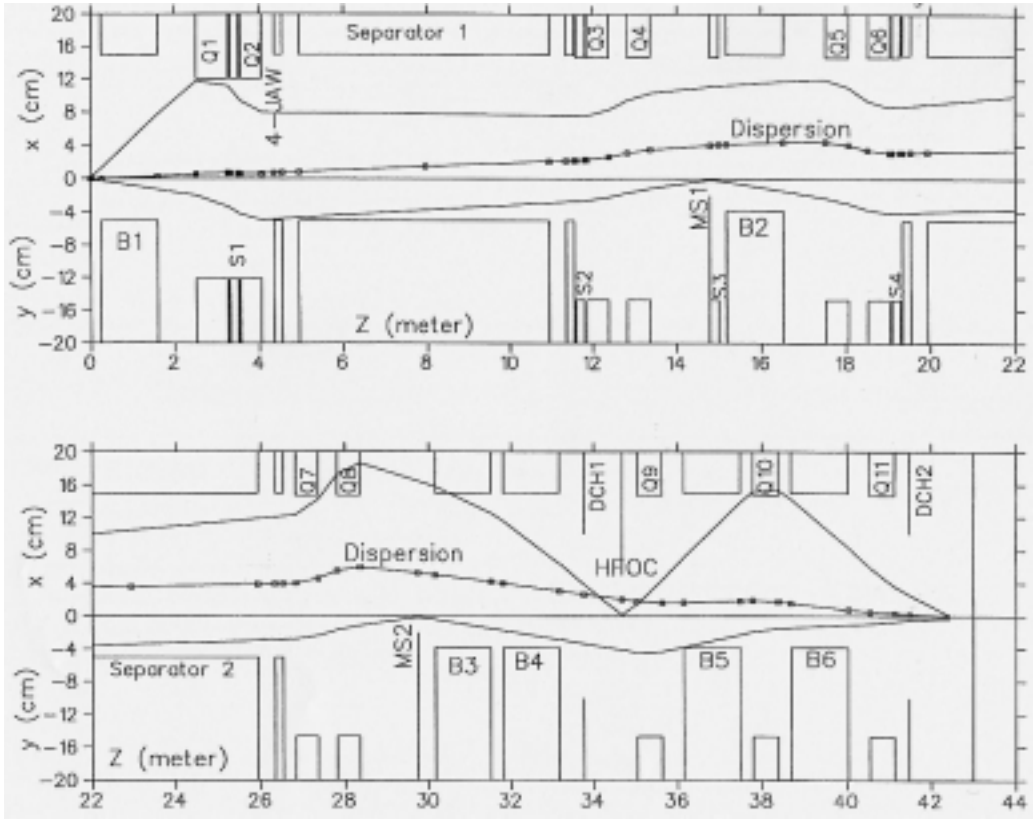
To be Realistic,
Fix Open Problems



# General

## K1.8 (cont.)

- Optics



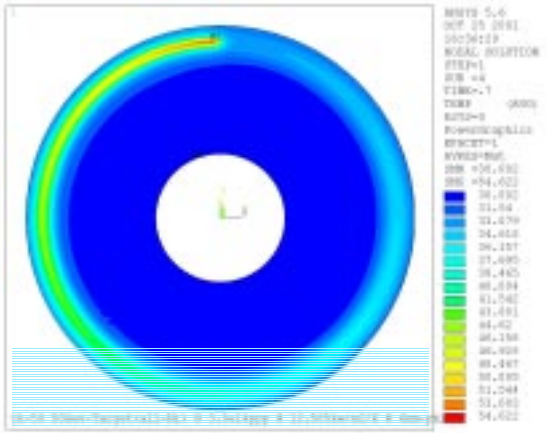
# Boundary Conditions

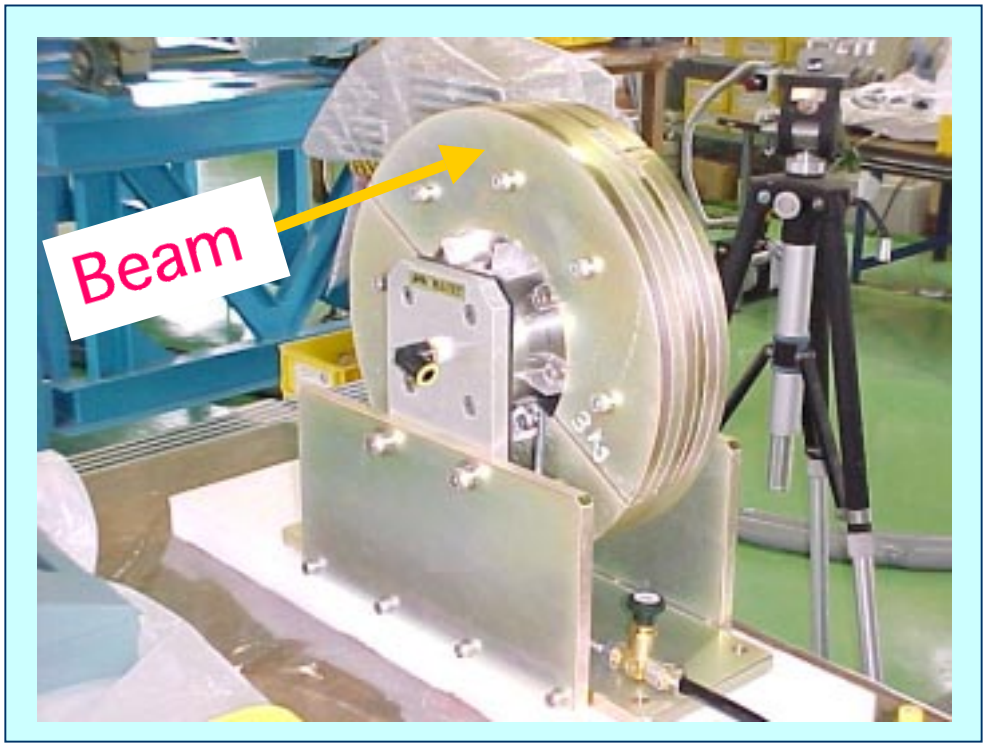
- High Power Primary Beam
  - 750 kW(300 Tp of 50 GeV every 3.42 s)
  - 30% loss at TGT
    - → heat & radiation protections
      - Front-End Elements
      - 1st DC Separator
- Other Boundaries
  - K-Hall(Exp. Area, Radiation Shield,etc.)
  - Match to HR Beam Line in Future

# Boundary Conditions

## Front End of K1.8

- Target
  - Y. Yamanoi et. al.
  - Ni-Disk $^{t}$6cm
  - Water Cooled

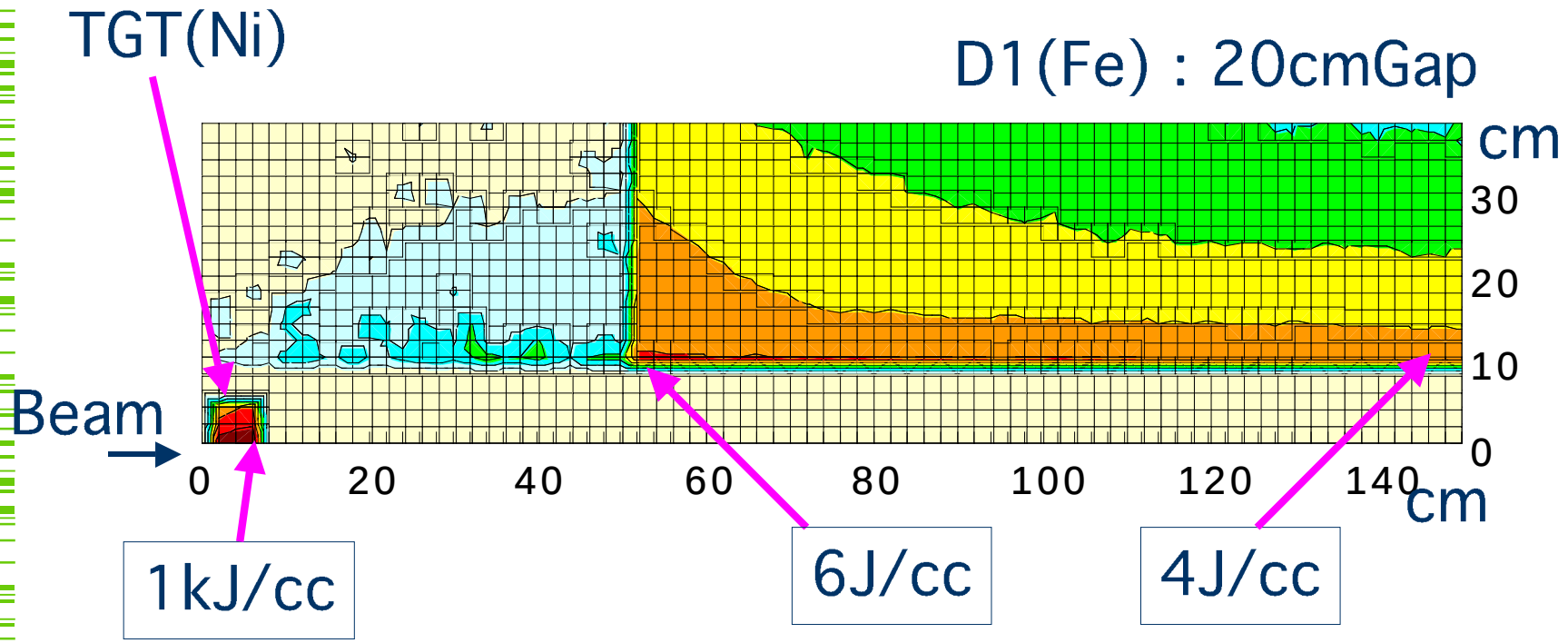




# Boundary Conditions

## Front End of K1.8 (cont.)

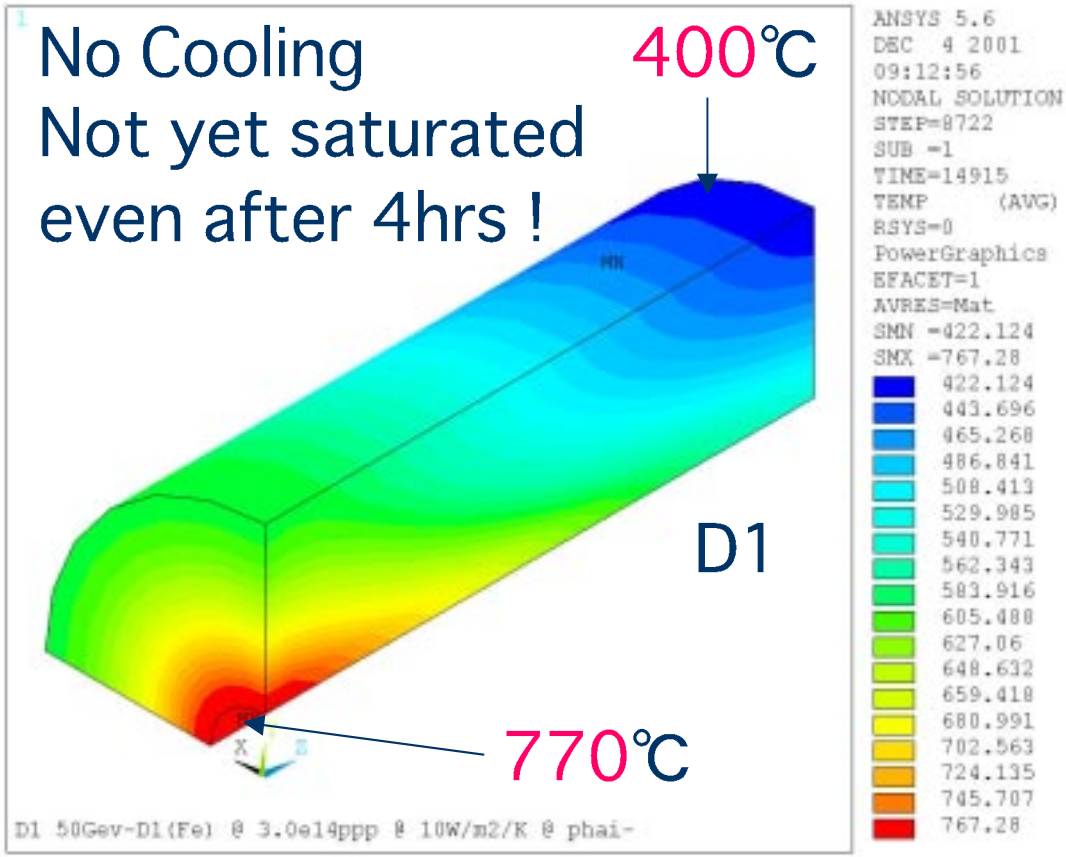
- Energy Deposit MARS Simulation by Y. Sato



# Boundary Conditions

## Front End of K1.8 (cont.)

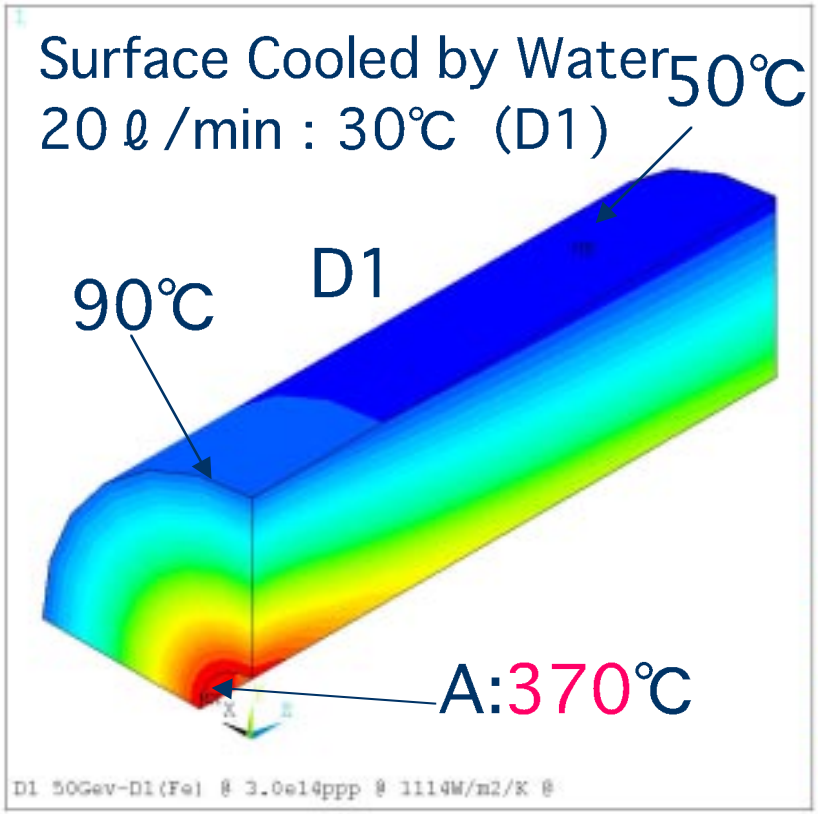
- Thermal Revolution(1/4 Model) ANSYS by M. Minakawa



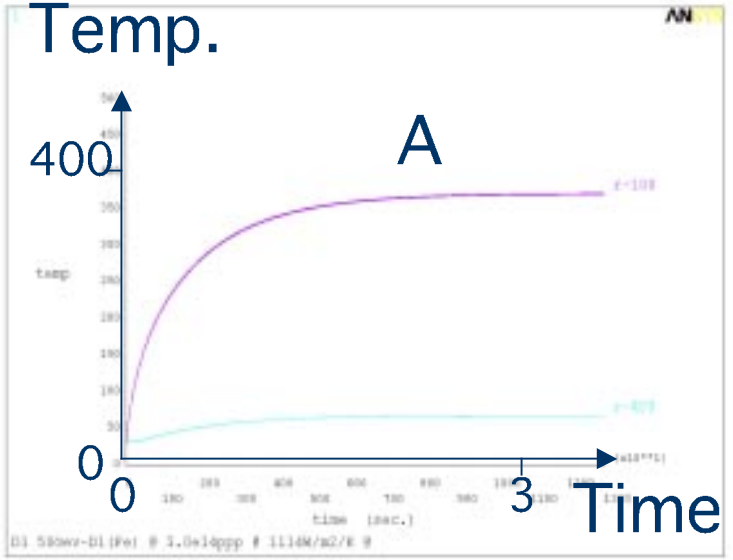
# Boundary Conditions

## Front End of K1.8 (cont.)

- Thermal Revolution(1/4 Model) ANSYS by M. Minakawa



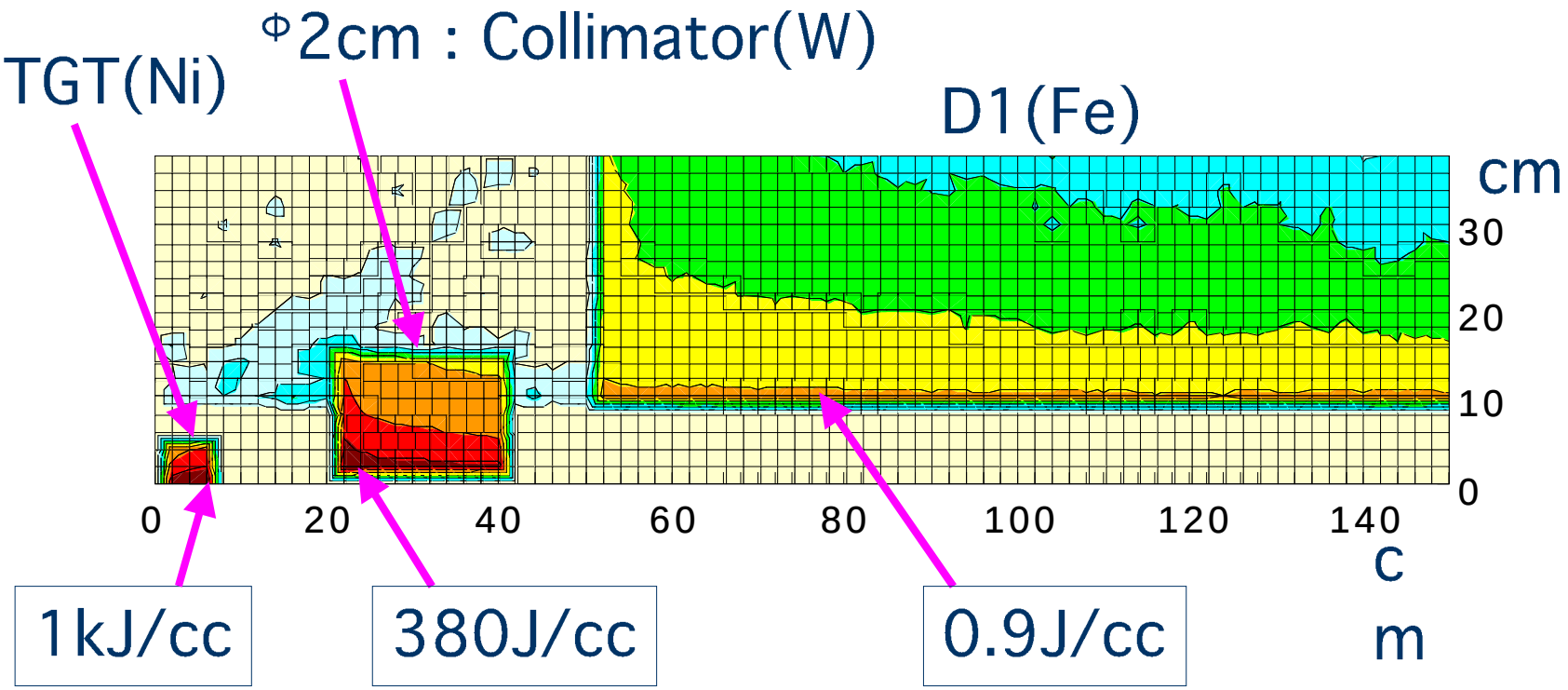

Time revolution



# Boundary Conditions

## Front End of K1.8 (cont.)

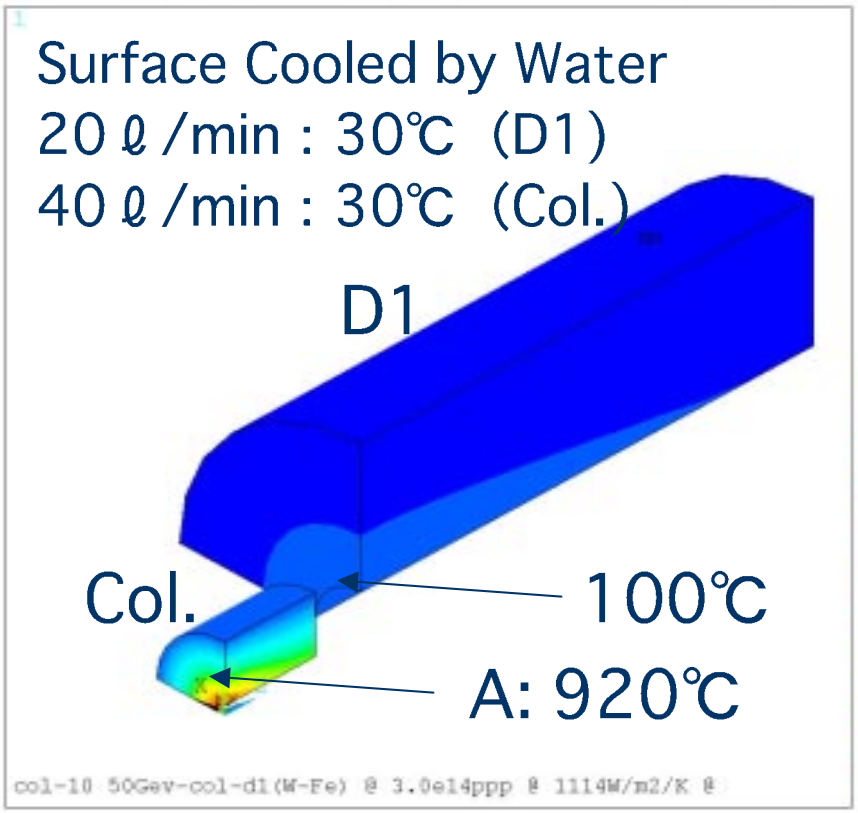
- Energy Deposit MARS Simulation by Y. Sato

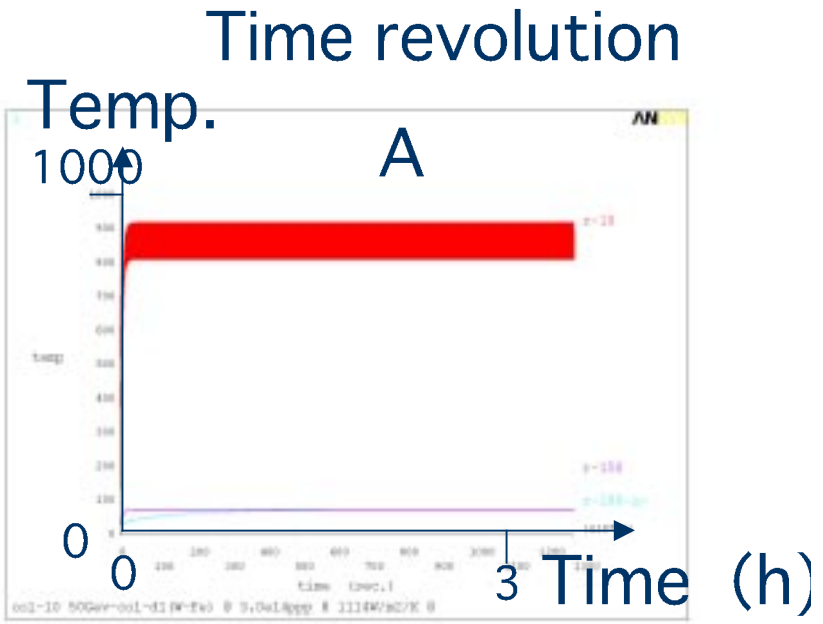


# Boundary Conditions

## Front End of K1.8 (cont.)

- Thermal Revolution(1/4 Model) ANSYS by M. Minakawa

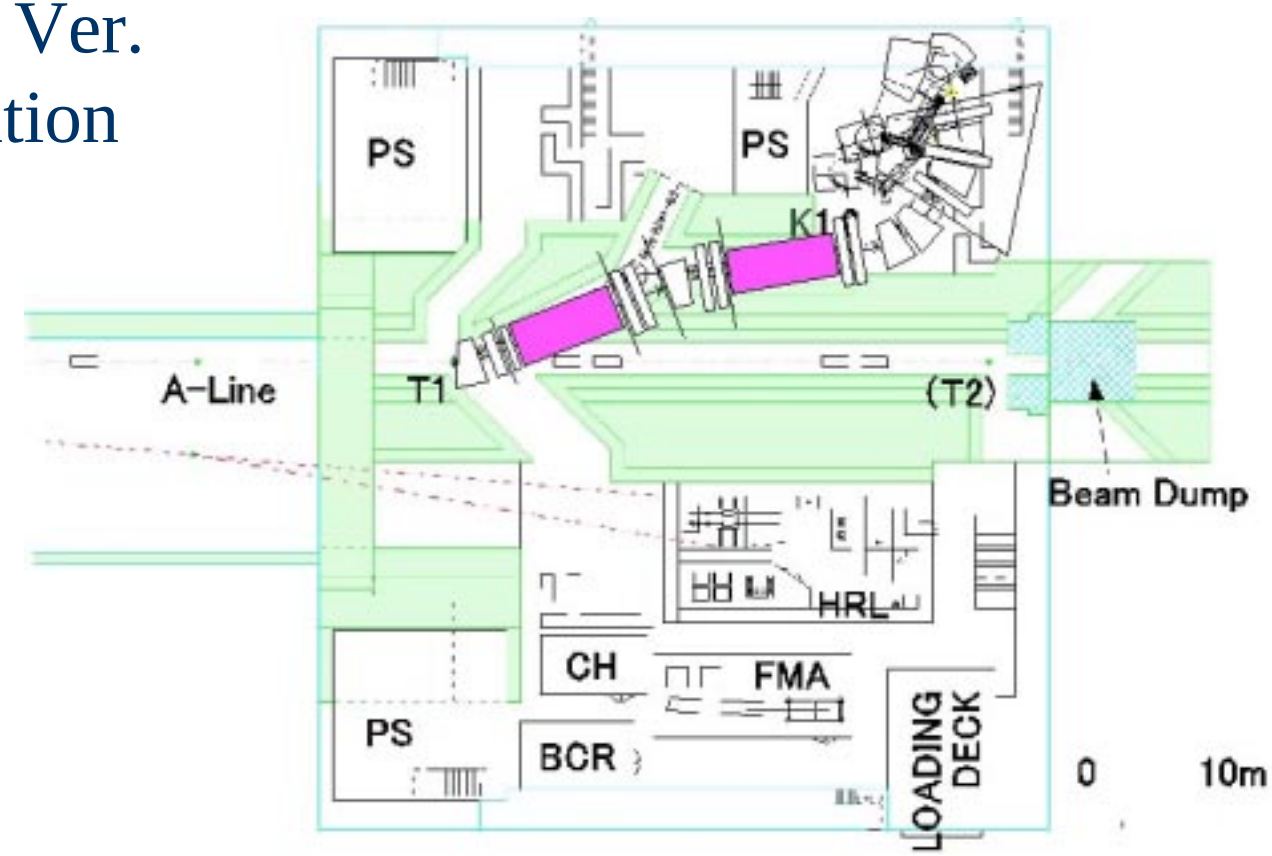


# Boundary Conditions

## K-Hall Boundary

- K1.8 1st Ver. Substitution



# Conceptual Design

## Front End + Double Sep. + Beam Spectrometer

Modified D6/1st K1.8 → Ver. 2nd K1.8

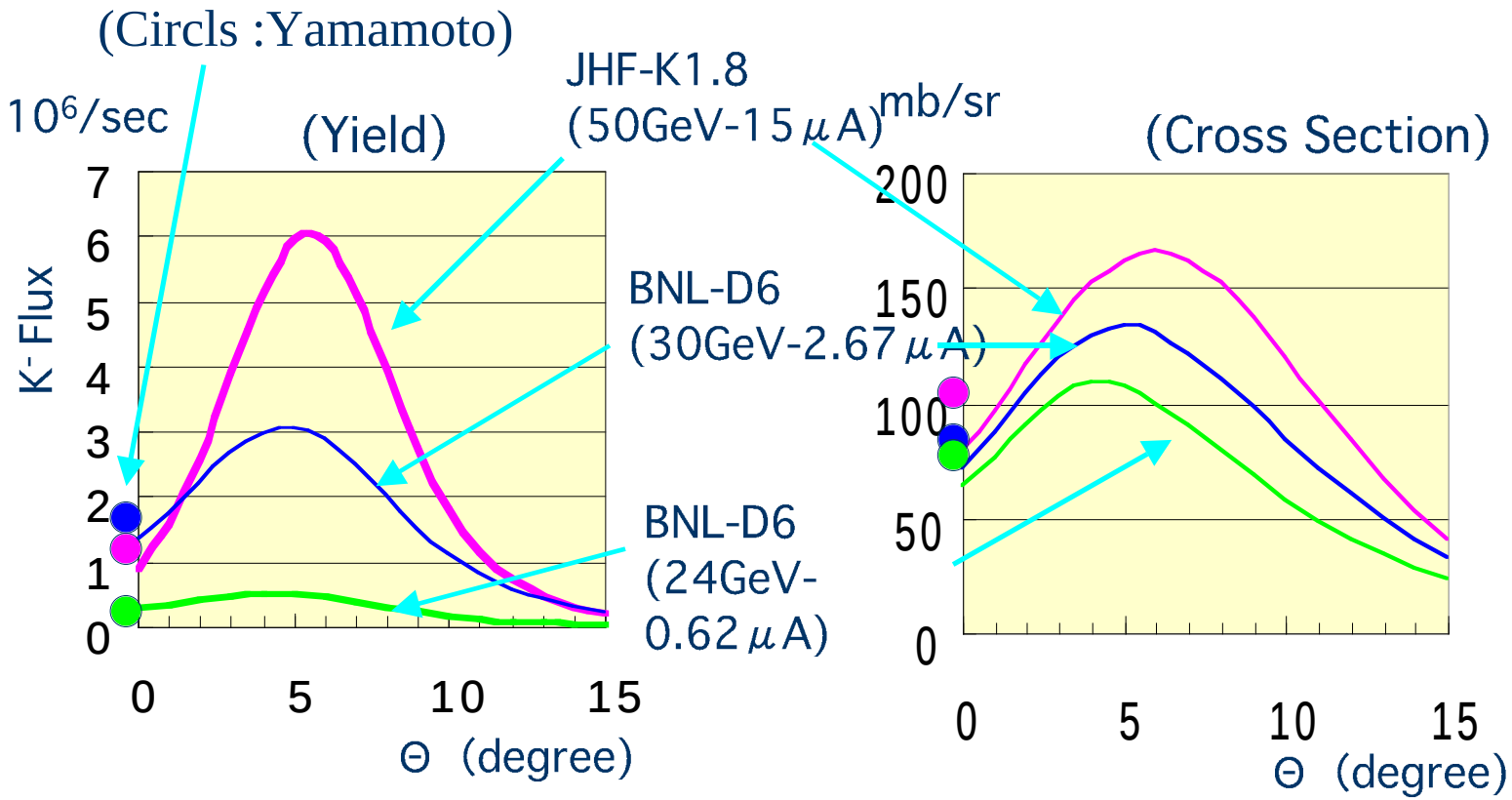
| | BNL-D6 | 1st K1.8 | 2nd K1.8 |
|---|---|---|---|
| Target | Pt 9cm | Ni 6cm | ? |
| Acceptance (msr・%) | 6.17 * | 4.6 | |
| Length (m) | 31.6 | 42 | |
| $K^-$ Flux @1.8GeV/c | 1(3M/spill) | ~12? | |
| Mom. Resolution | 3e-3 | 1.9e-4 | |
| Purity ($K^-/\pi^-$) | 0.4 *(1) | | |

*P.H.Pile et. al., NIMA321(1992)48

( ) : Measured at 24GeV 14Tp/spill(E906)

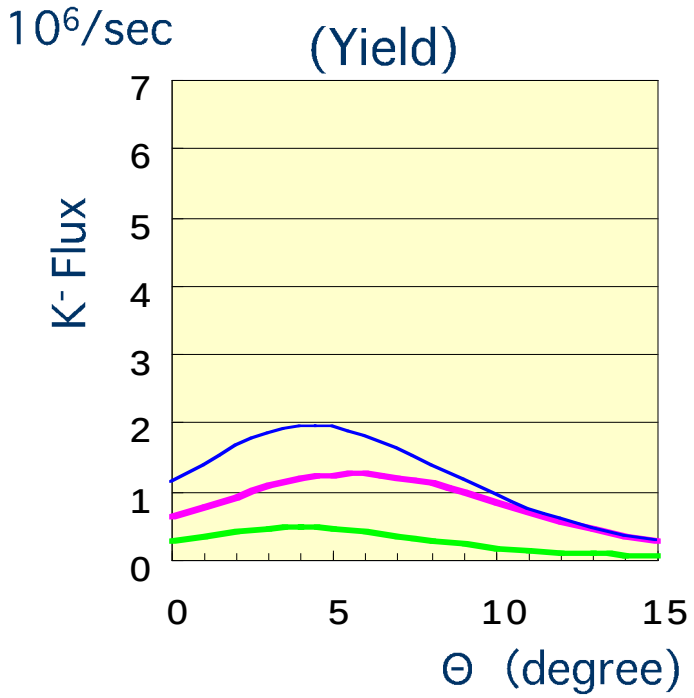
# Conceptual Design
## $K^-$ Flux @ 1.8 GeV/c

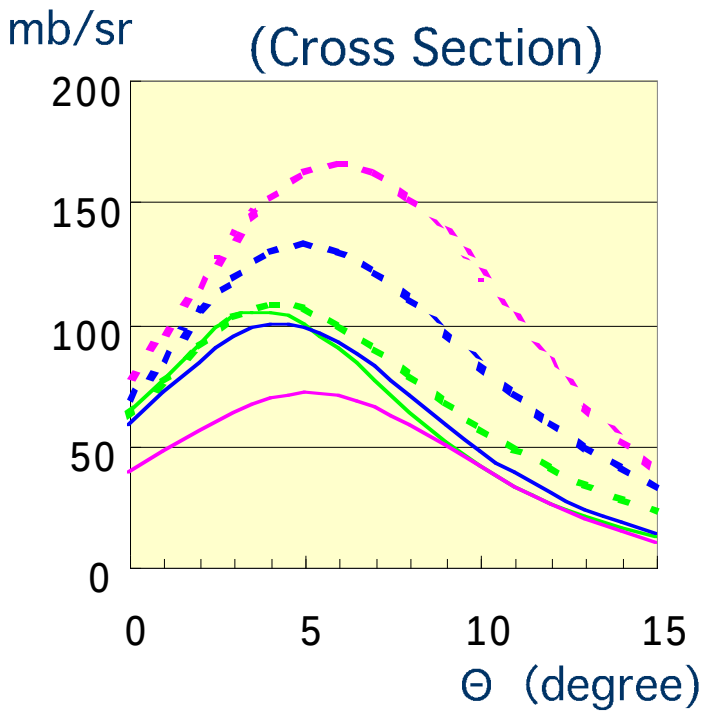
- Angular Distribution (Sanford-Wang)



# Conceptual Design
## $K^-$ Flux @ 1.8 GeV/c

- Angular Distribution (Sanford-Wang) (Kinematic Ref. Corr.)



# Prospect

- Need Optimization(or Compromization)
  - Front-End Layout
    - Heat-Radiation Protection
    - Collimation – Acceptance
      - Production Angle – Yield/Match to BSO
  - Double-Stage DC Separator
    - Length – $K^-$ Purity/Intensity
  - Spectrometer
    - Resolution – $K^-$ Purity/Intensity