

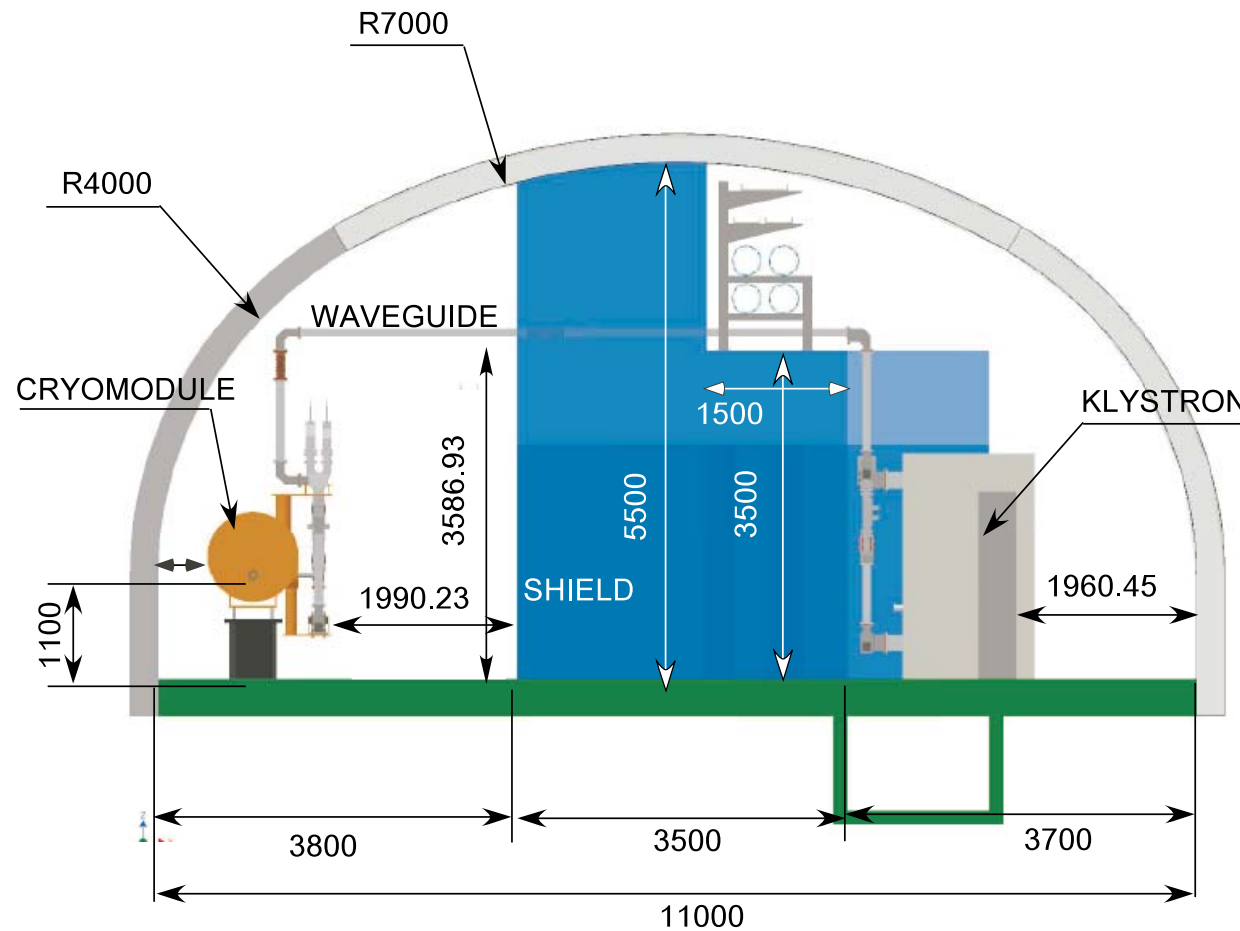
# Radiation Issues in the ILC Linac Tunnel

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# The ILC Linac Tunnel

- ILC Linac Tunnel cross section of TDR



# Radiation issues

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- According to Kubo-san's request
  - *What parameters are required for radiation issues in ML*
  - *As short as possible*
- Radiation shielding design of the ILC Linac tunnel
  - *Dose rate in service tunnel*
    - Central wall thickness, size of penetrations, access between tunnels
    - Personal and devices
  - *Radioactivity production in liquid helium, tunnel air and soil*
- These evaluations relay on beam losses scenario

# Beam loss scenario of the ILC linac

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- **Beam loss**

- *Normal operation*
- *Beam commissioning or MIs-steering*
- *System failure*
- *Dark current*
  
- *None of description in TDR*
- *Few consideration on normal state (K.Kubo at 2nd ADI)*
- *Several suggestion for system failure (E.Patterson at ADI)*
- *Beam containment and monitoring system*

# Issues to establish beam loss

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- Handle 9+9 MW beam at maximum
  - *Extremely few beam loss is assumed at this moment*
  - *Dark current loss*
  - *How do we control the beam loss*
  
- System failure
  - *What is the most probable scenario?*
  - *How do we ensure maximum credible loss?*

# What should we do now?

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- **Physics to implementation**

- Physics determines maximum gradient and beam intensity
- Technology determines beam losses to realize the physics
- Design tunnel and shielding to accommodate above items
- *Only COST can limit and go against*

- **Starting CFS basic design**

- *It is not conceptual, close to engineering implementation*
  - More accurate cost estimation
- *The design should be proceeded based on approved documents*
  - TDR and several change requests

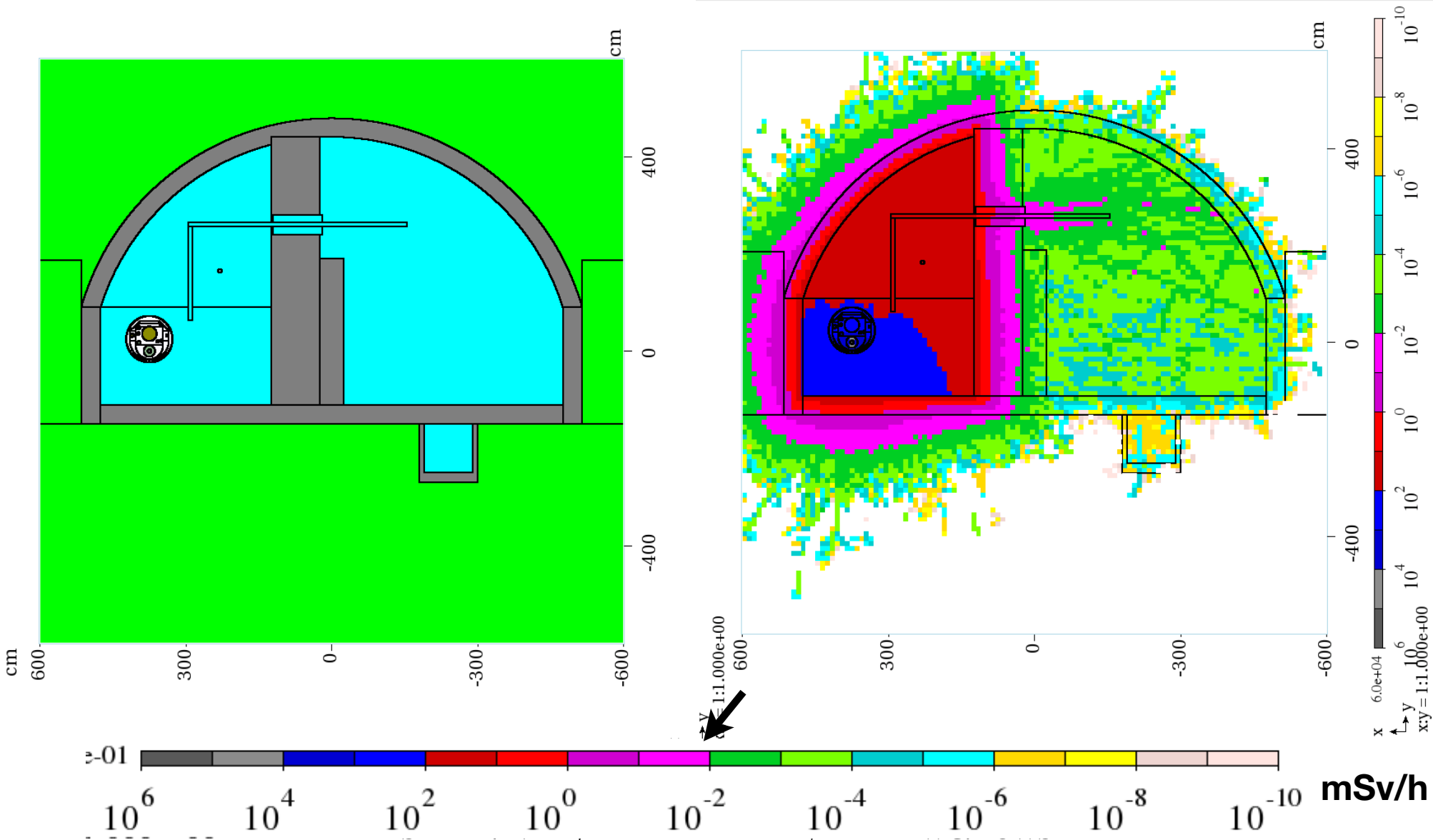
# Beam loss to radiation shielding design

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- *Dark current*
  - Reported by N.Solyak
    - Confirm simulation results using existing facility
- *Normal operation*
  - Beam gas coulomb, beam gas Bremsstrahlung, Anything else?
- *System failure*
  - The minimum response time is about 10% of the train
- *Beam containment system and MPS*
- *Beam commissioning phase*
- **More realistic numbers are requested for entire ML tunnel**

# Dose rate for dark current

Normal loss : 6.875e10eps (50nA per cavity eq.) due to dark current





# The other items should be evaluated

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- *Dark current + Normal operation beam loss*
  - Tritium production in liquid helium
  - Radioactivity production in tunnel air
  - Radioactivity production of soil surrounding the tunnel
  - Shielding design for access hall
  - Damage to electronics
  
- *System failure*
  - Shielding design for access hall

# Conclusion

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- *Current beam loss scenario from radiation shielding design point of view*
  - It is required for CFS basic planing
  - Still we have several unknown parameters
  - Dark current study is in progress, check simulation using existing facilities.
  - Feedback from experience of cryo-module construction