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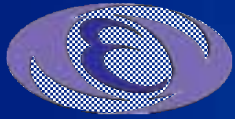
HIGH ENERGY ACCELERATOR RESEARCH ORGANIZATION

# Crab Cavity R&D

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KEKB Crab Cavity Group

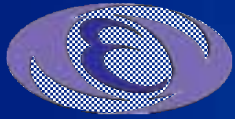
NAKAI Hiroataka



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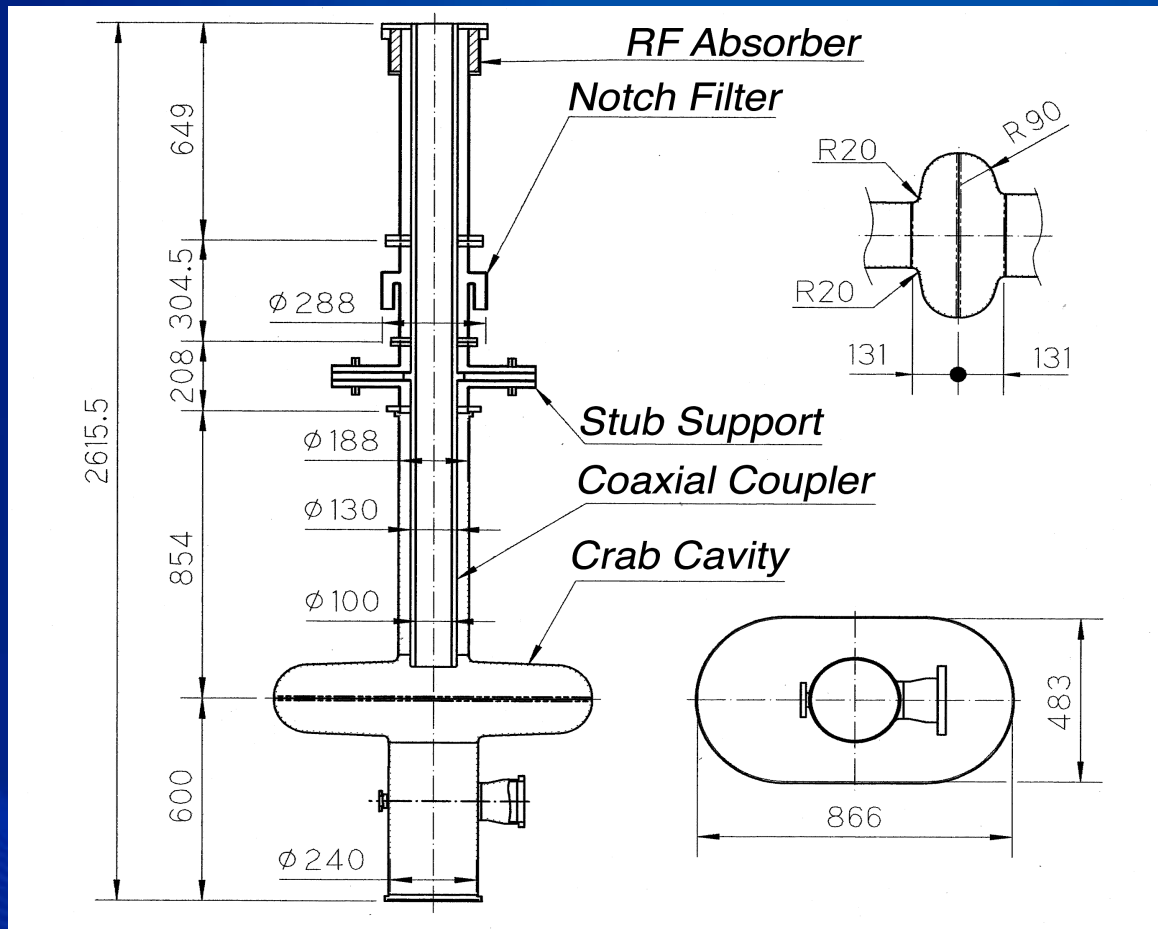
## Overview of Recent R&D

- Fabrication and measurement of 2nd crab cavity
- Design of cryostat for crab cavity
- Consideration of installation of crab cavities in KEKB

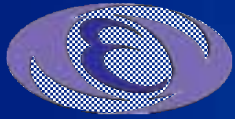


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# Design of Crab Cavity



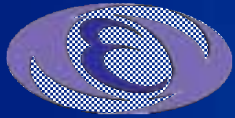
- Crab cavity
- Coaxial coupler
- Stub support
- Notch filter
- RF absorber



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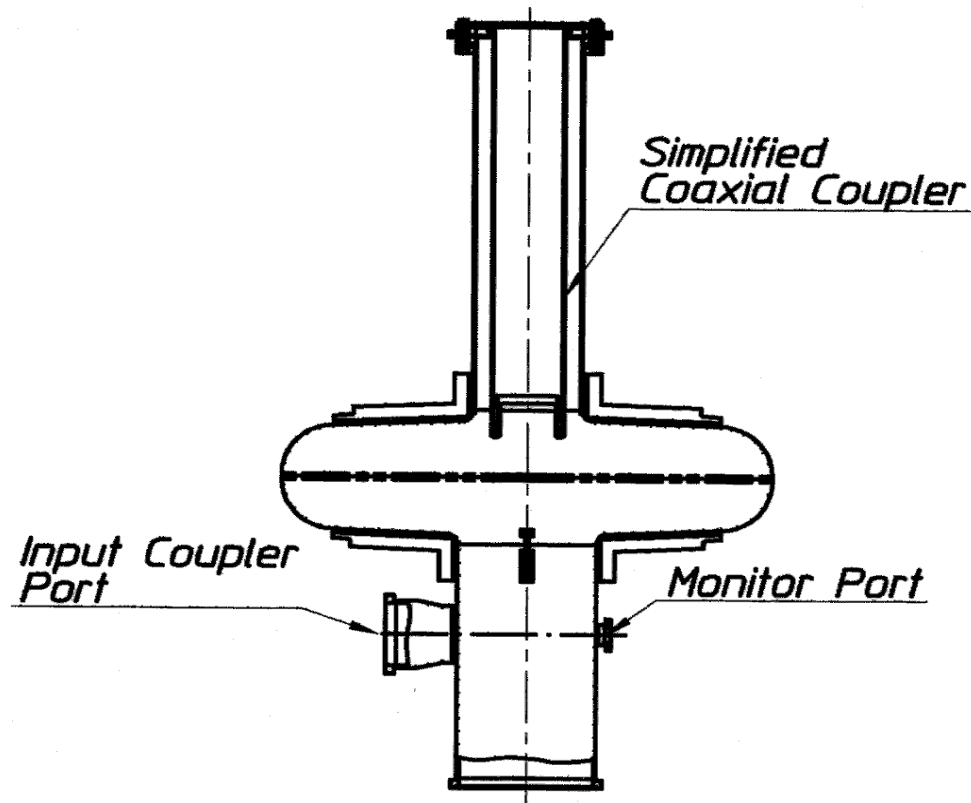
# Surface Preparation

- Ordinary procedure:
  1. Grinding
  2. Barrel polishing
  3. Electro-polishing (EP)
  4. High pressure pure water rinsing (HPR)
  5. Heat treatment
  6. High pressure pure water rinsing (HPR)

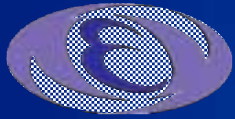


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# Measurement Setup

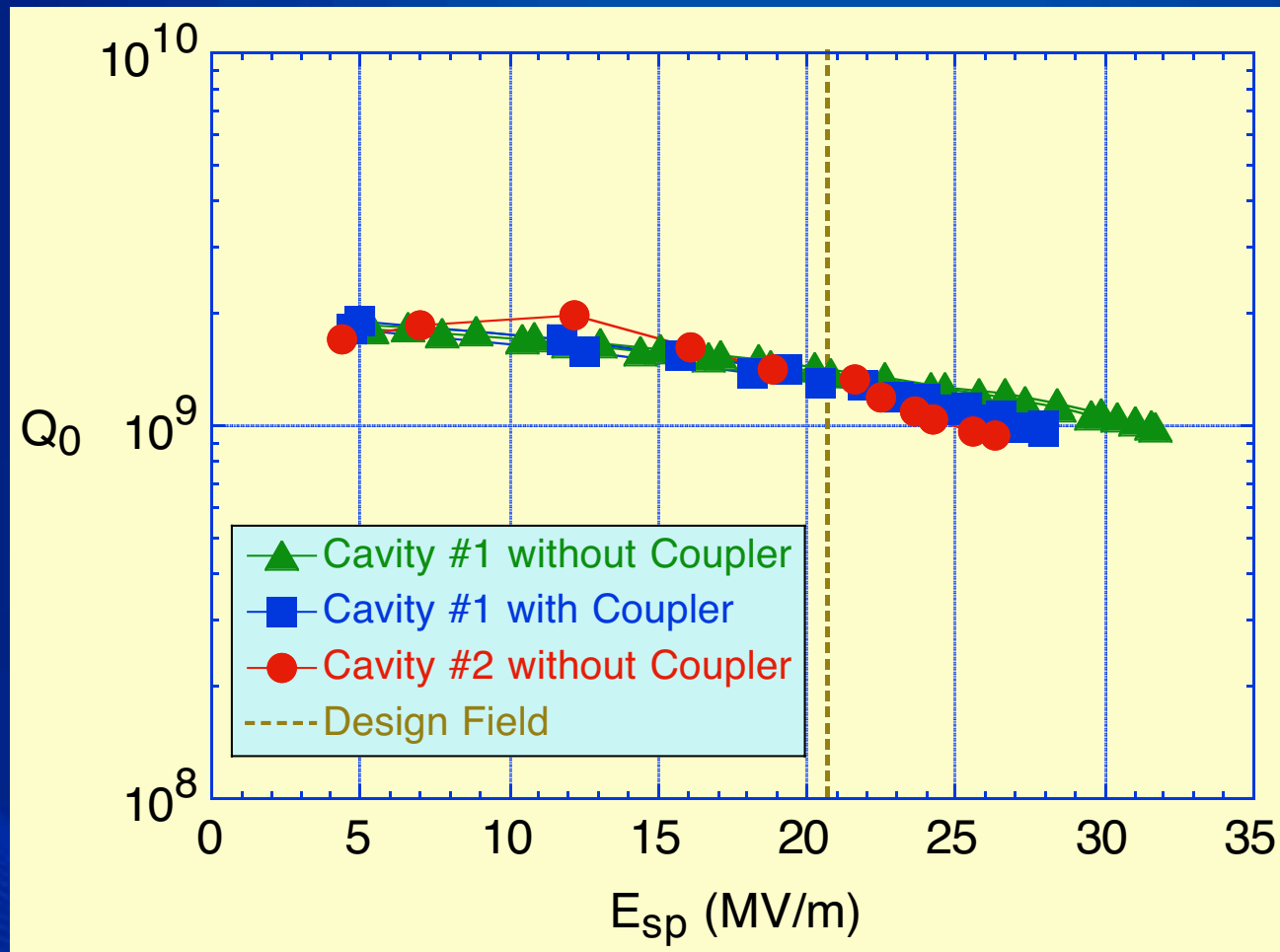


- Measurements at 4.2 K
  - cavity only
  - with simplified coaxial coupler

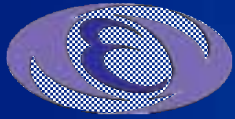


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# Performance of 2nd Cavity

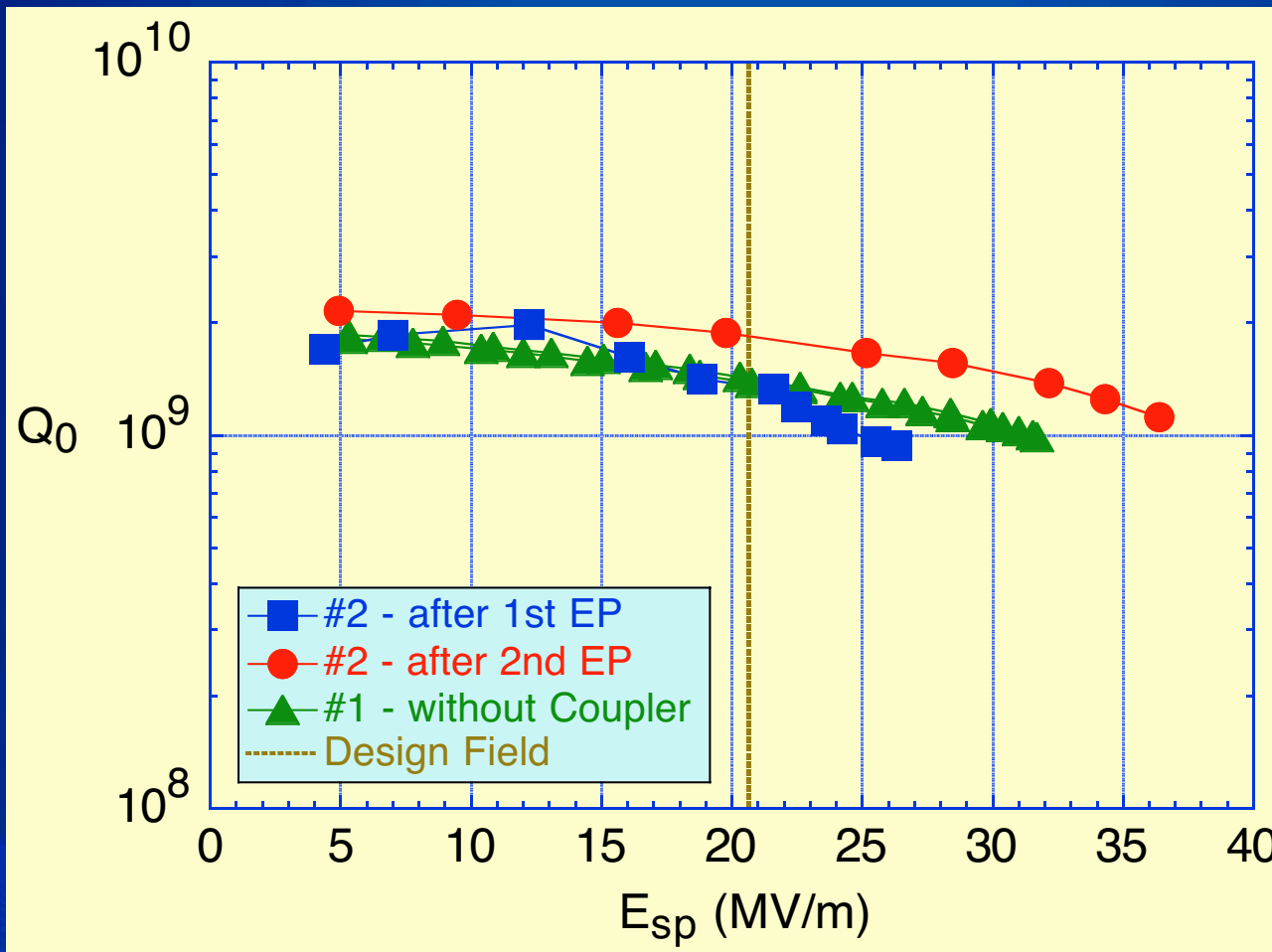


- Ordinary surface preparation for #2
- Comparison with best performance of #1

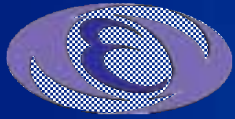


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# Improvement with 2nd EP



- Application of 2nd EP + HPR ( $\sim 5 \mu\text{m}$ )
- Better than #1

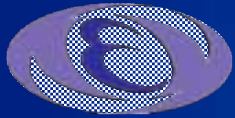


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# Cryostat Design Concept

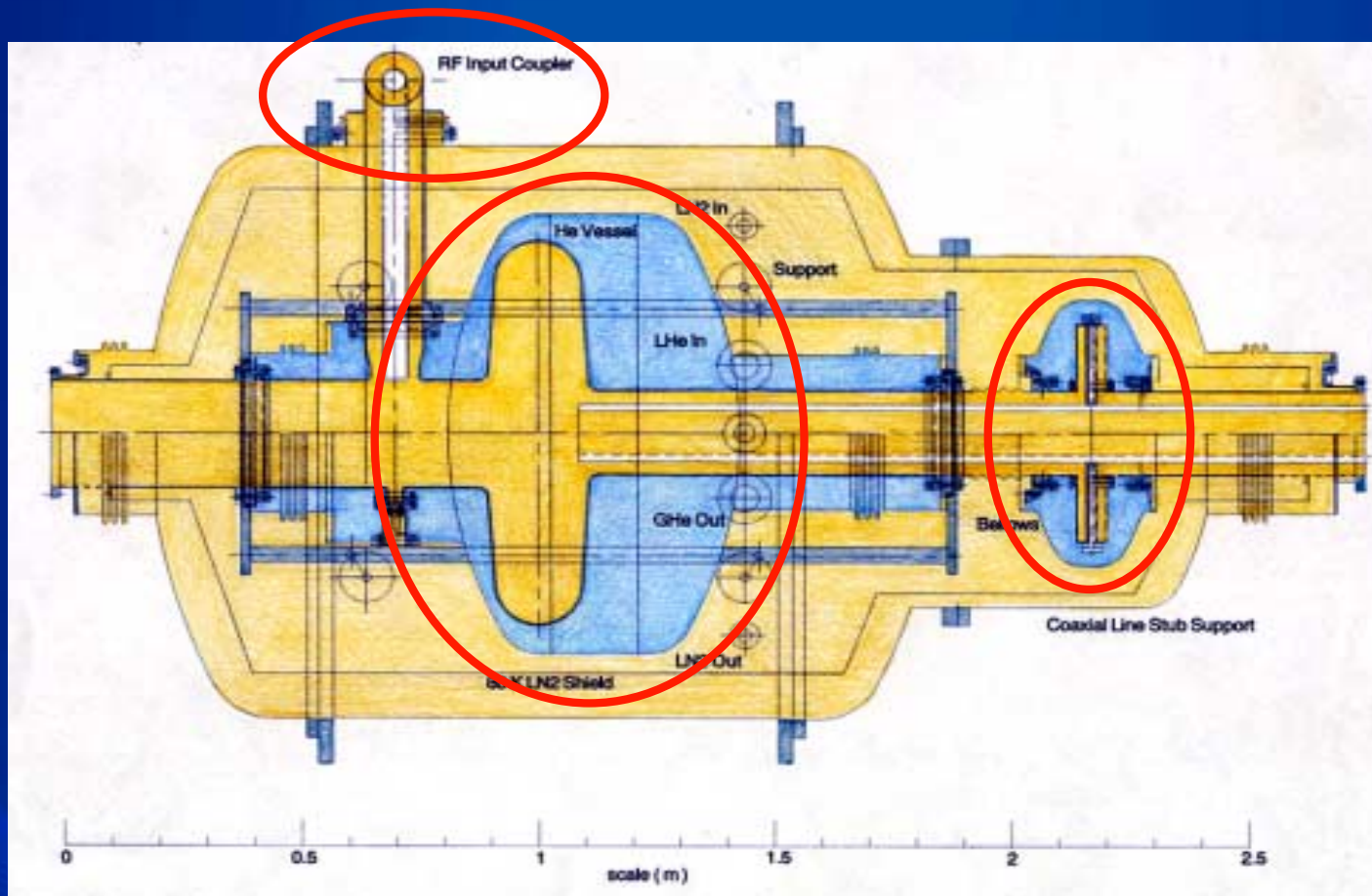
- Limitation of available space in tunnel
  - HER close to LER
- Cryogenic transfer lines
  - helium and nitrogen
- RF transmission lines
- Long coaxial coupler
  - cooling and support



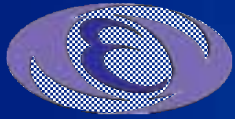


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# Cryostat Design (Top View)

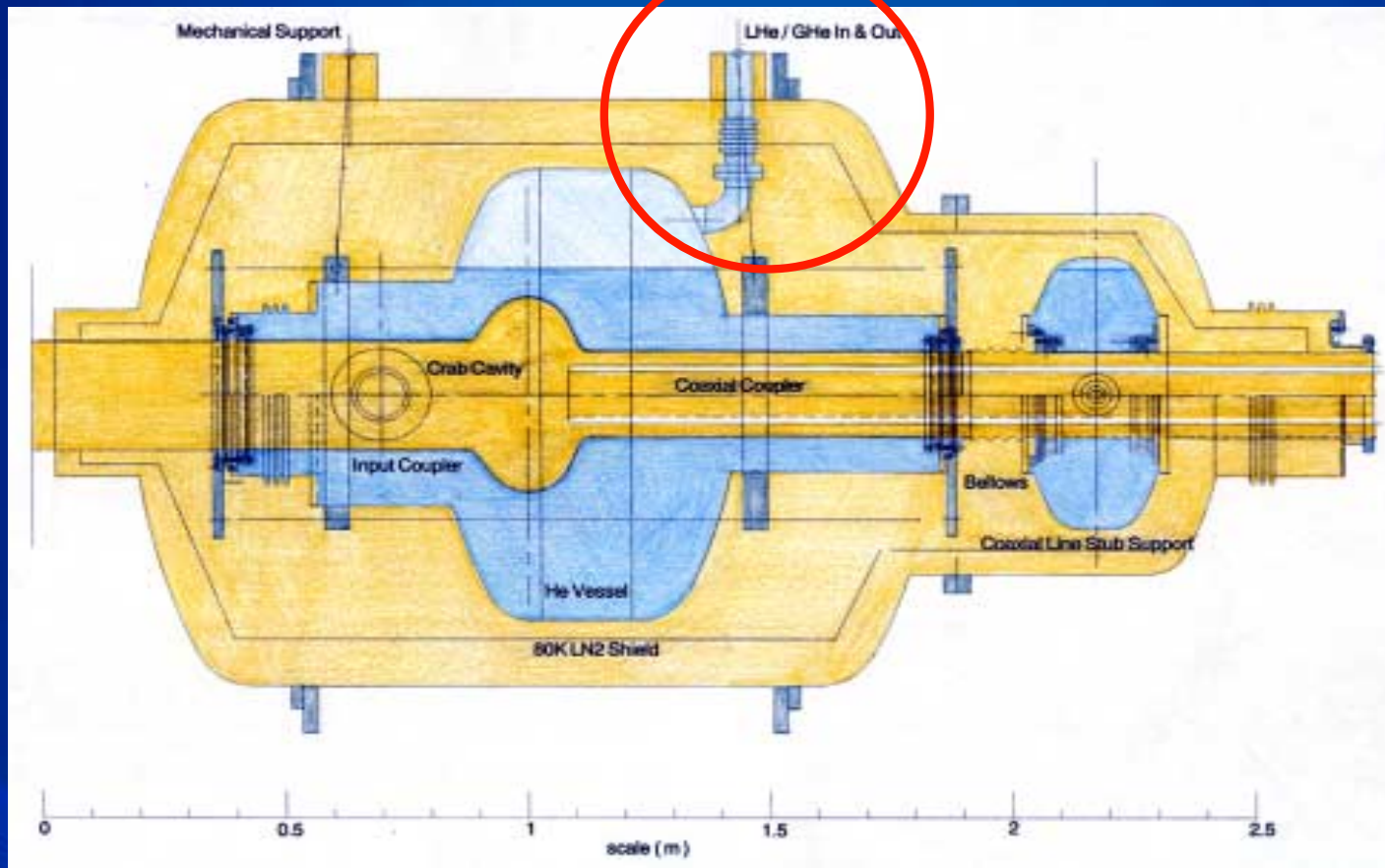


- RF port on side
- Jacket-type helium vessels

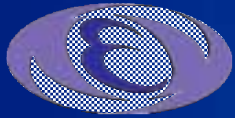


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# Cryostat Design (Side View)

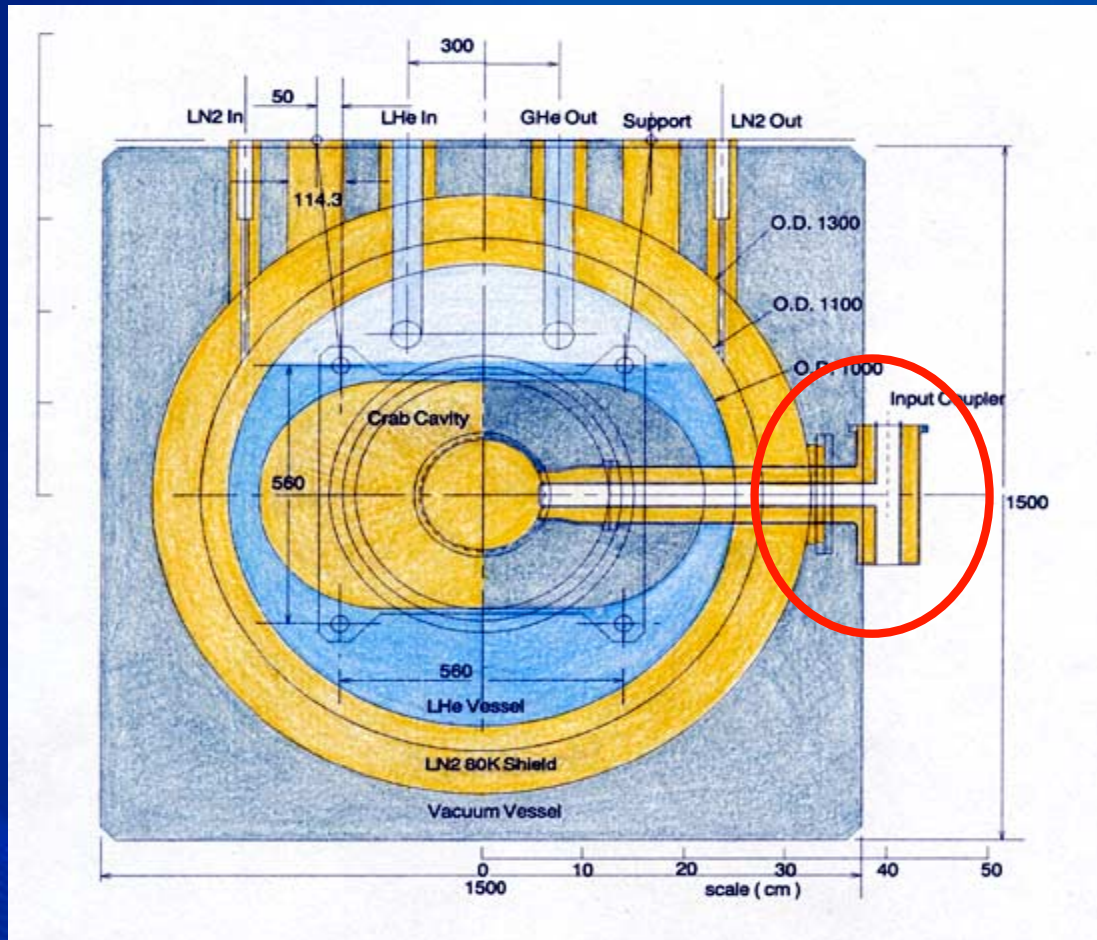


- Cryogenic ports on top

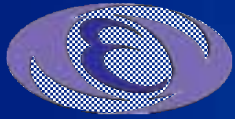


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# Cryostat Design (End View)



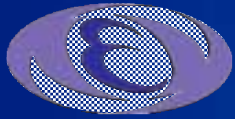
- Interference of RF coupler with LER wiggler magnets



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# Crab Cavity Installation

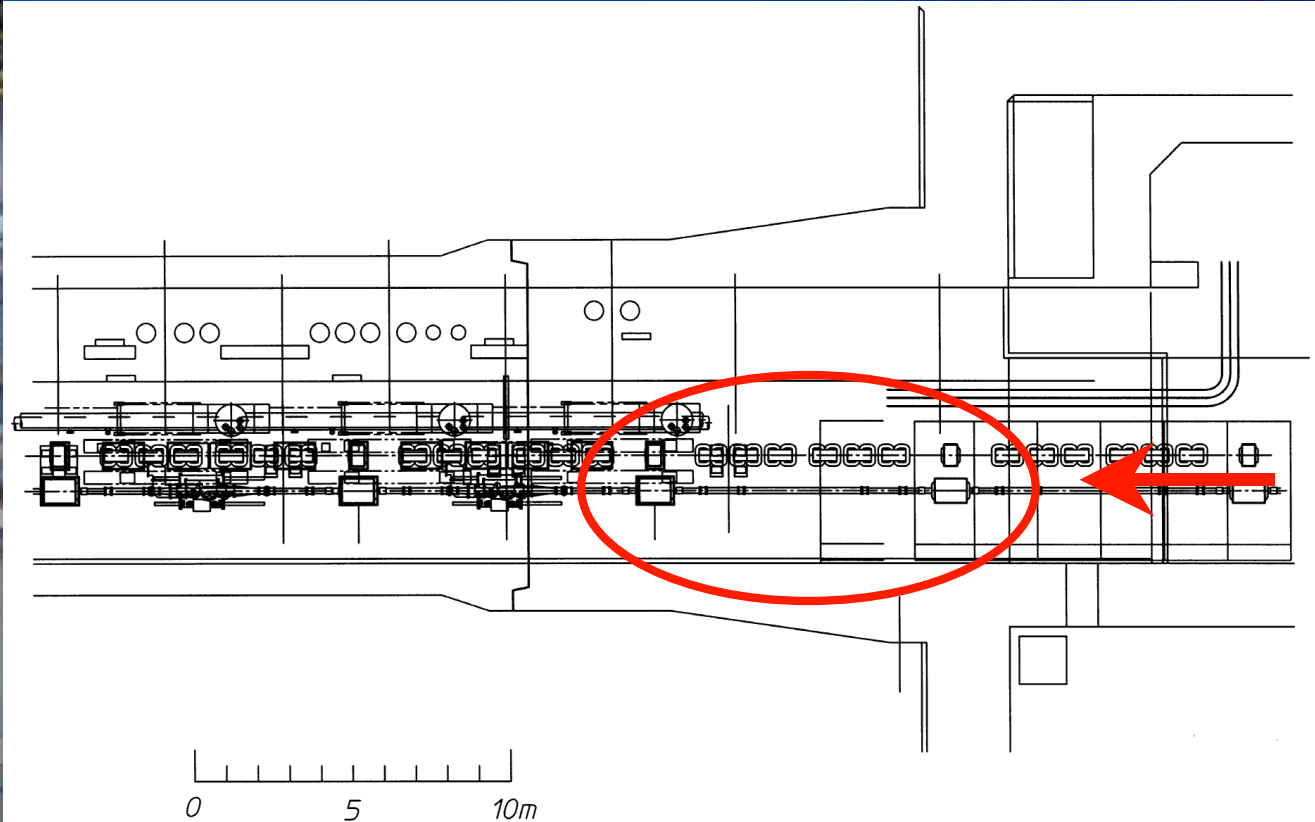
- Research into crab cavities in KEKB
  - one cavity in HER (determined)
  - one cavity in LER (proposed for more effect)
- Cavities at Nikko Exp. Section (D10)
  - refrigeration system at Nikko
  - cryogenic port available in tunnel

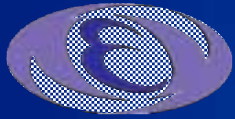


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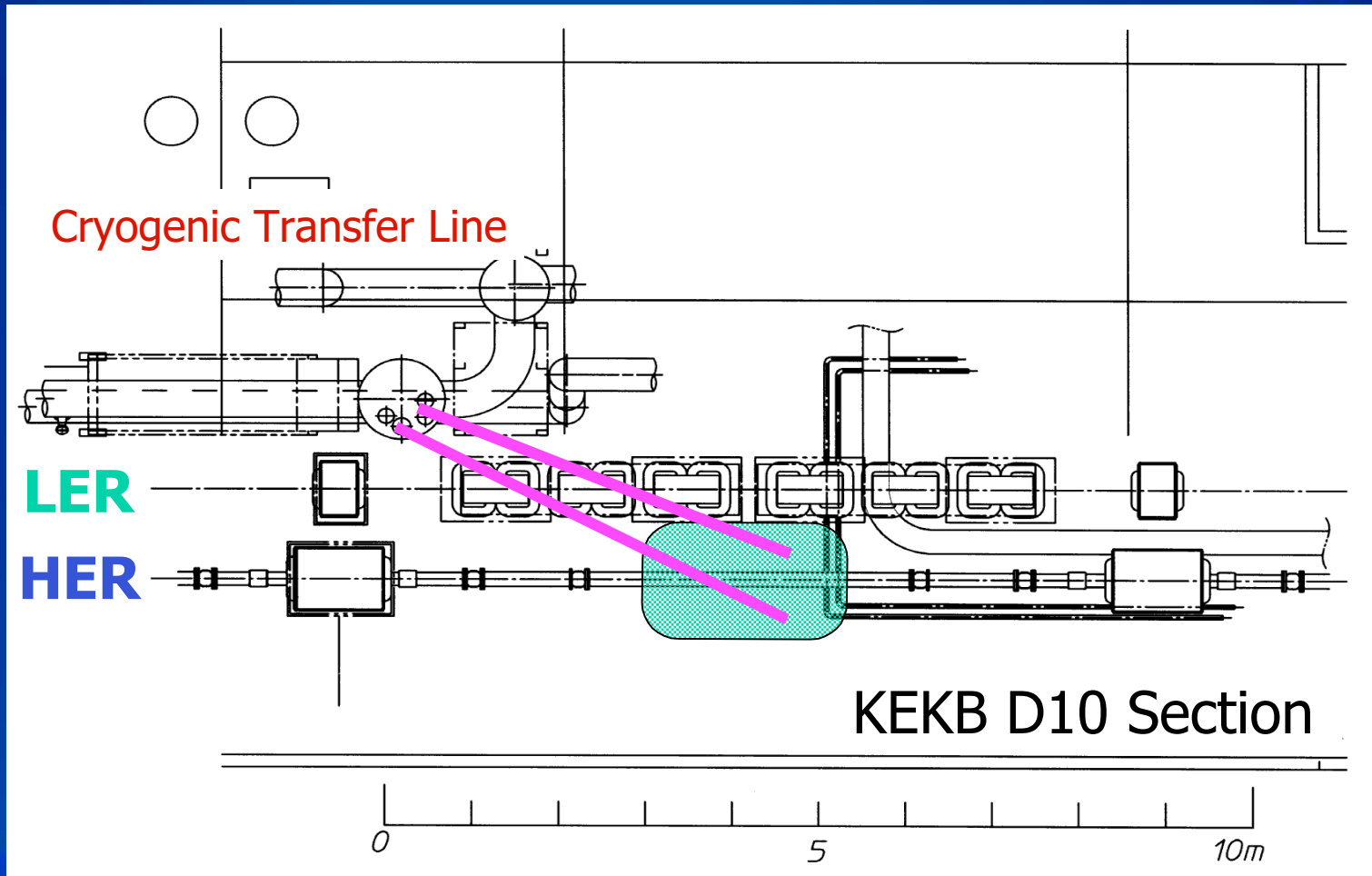
# D10 Section of KEKB

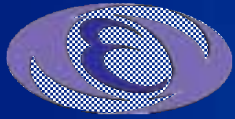




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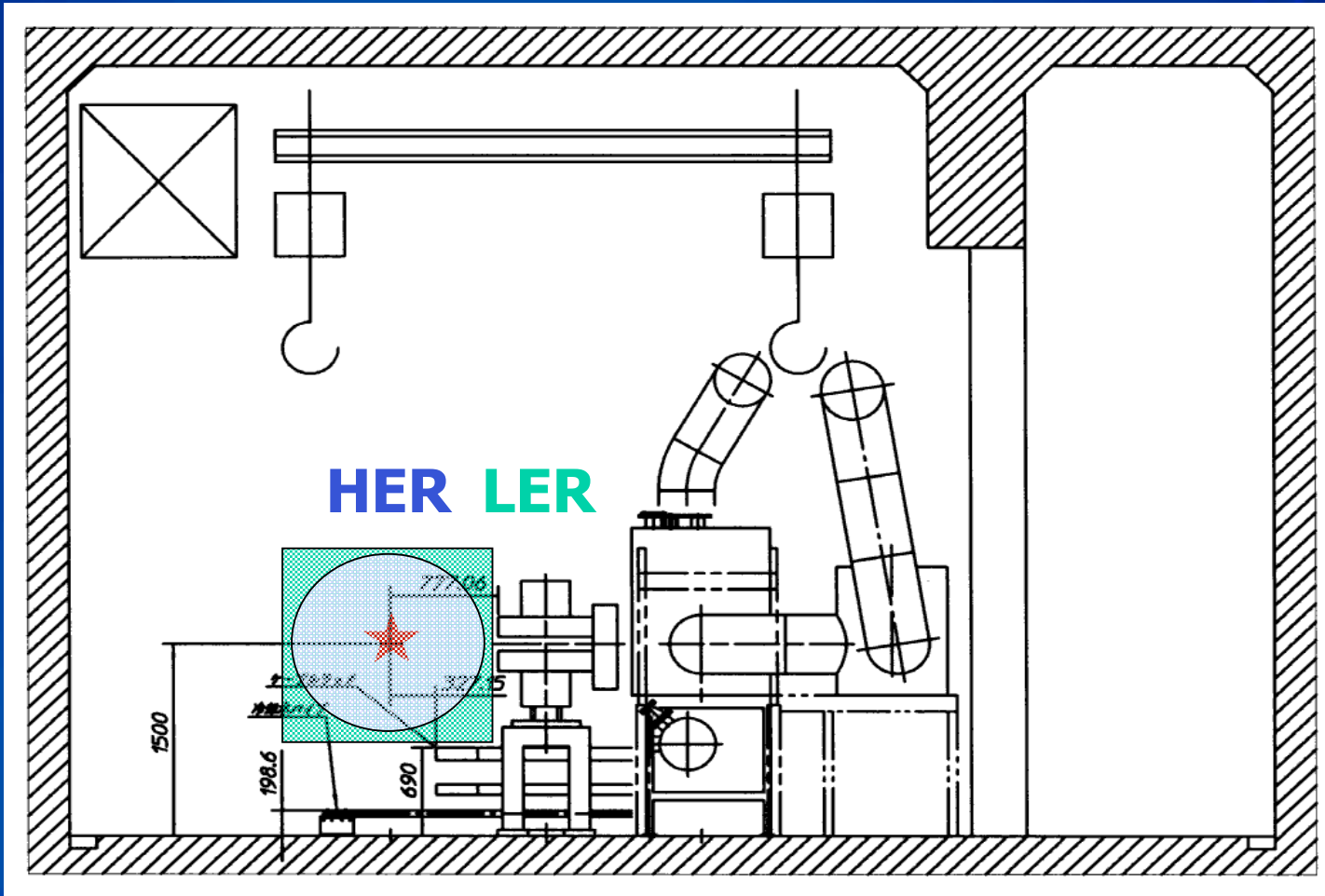
# Cavity Location (Top View)

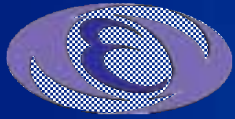




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# Cavity Location (Cross Section)



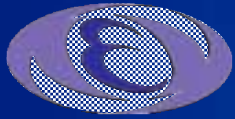


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# Summary 1

- Established surface preparation
- Cryostat
  - conceptual design completed
  - detailed design in progress
  - development of individual parts





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## Summary 2

- Installation of crab cavities in KEKB under consideration
  - location of crab cavities
  - modification of refrigeration system