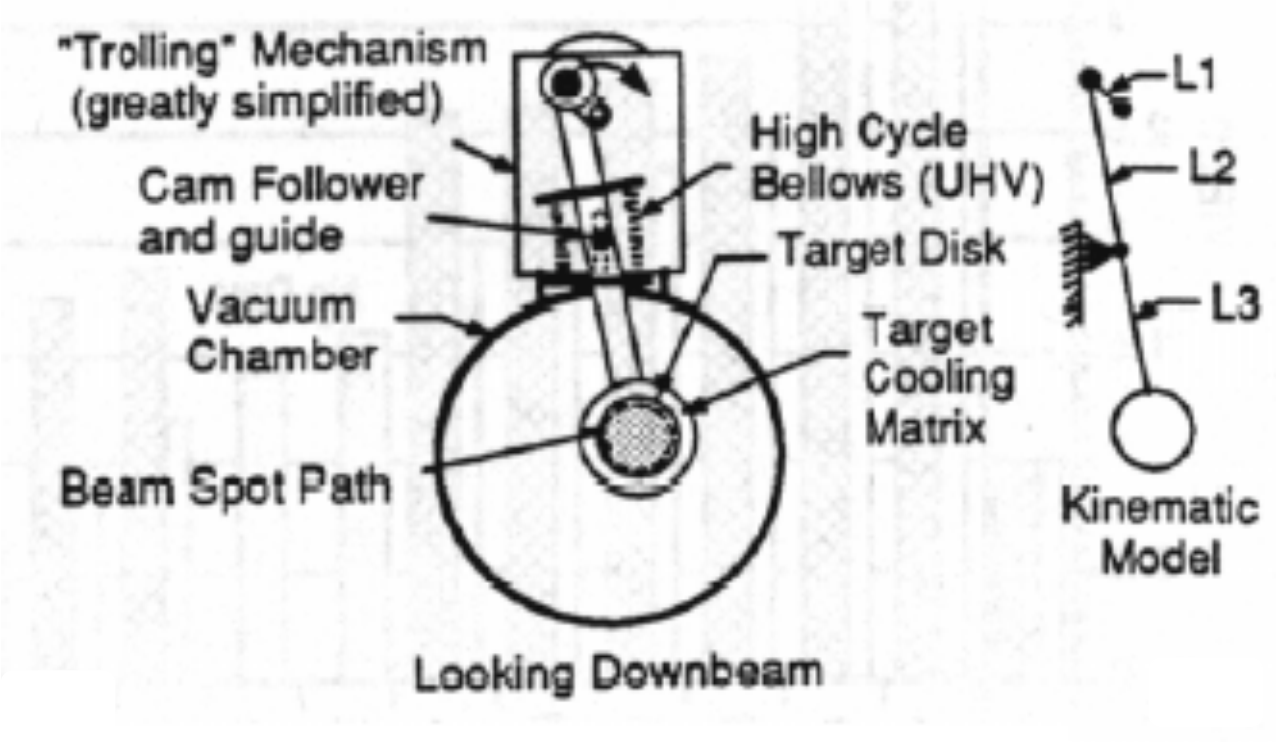
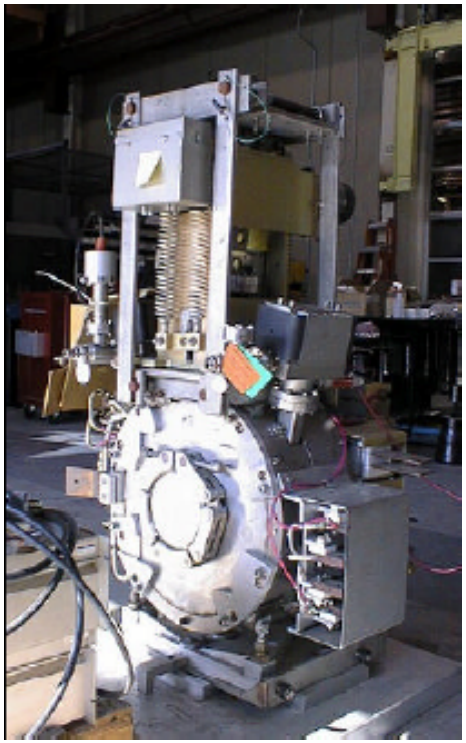
Rotating Vacuum Seal

Learning from Experiences of SLC and NLC





T. Omori (KEK), with many thanks to Marc-san

29 Oct 2009, Durham ILC e+ Meeting

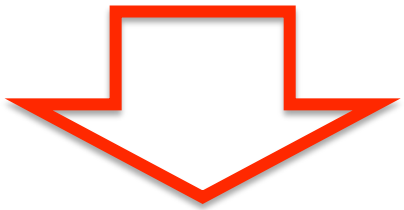
SLC and NLC targets

SLC e+ target(s):

The only e+ target(s) for a LC in which we have real operation experience.

NLC e+ target design study:

Very seriously studied (many drawings remains) by SLAC people (they have SLC experience).



Learning from SLC and NLC experiences may help ILC target design.

SLC targets

In the SLC project, three types of targets were made.
They were, in chronological order,
(a) Rotation Target (seal: ferromagnetic fluid),
(b) Stationary Target,
(c) Trolling Target (seal: bellows).

SLC Rotation Target

Specification (SLAC-PUB-4437)

- **Diameter : 0.15 m**
- **Rotation Speed : no data**
- **Tangential Speed: no data**
- **Vacuum Seal : ferromagnetic fluid**

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What happened (SLAC-PUB-4704)

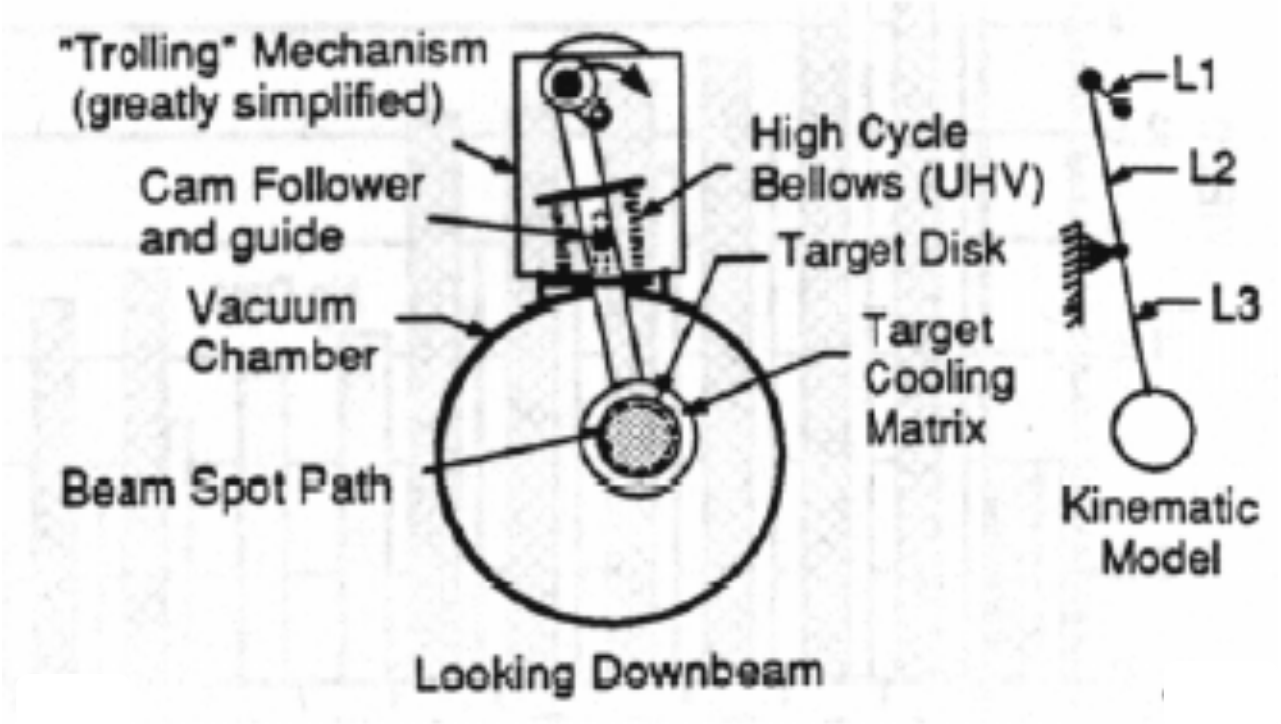
- **Capture section failed to achieve high gradient.**
- **This target was suspect (especially the ferromagnetic rotating seal) as a possible cause of contamination in the RF section.**
- **This target had never been operated in actual SLC operations.**

SLC Trolling Target

Specification

- **Tangential Speed: 0.1 m/s**
- **Vacuum Seal : bellows**

The target was used in SLC running in several years.



Mechanism similar to a piston and a crank of a reciprocating engine (piston engine)

Target head swings

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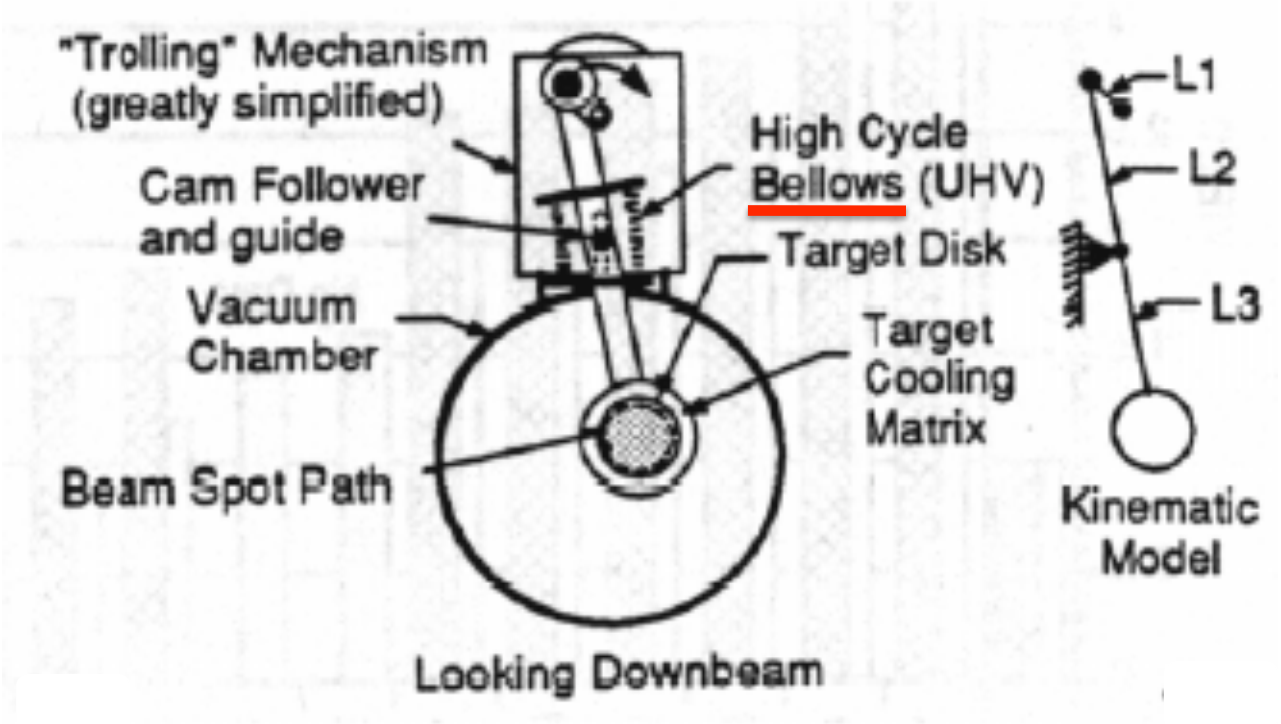

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  - **No Oil, No liquid of any kind --> No cause of contamination**
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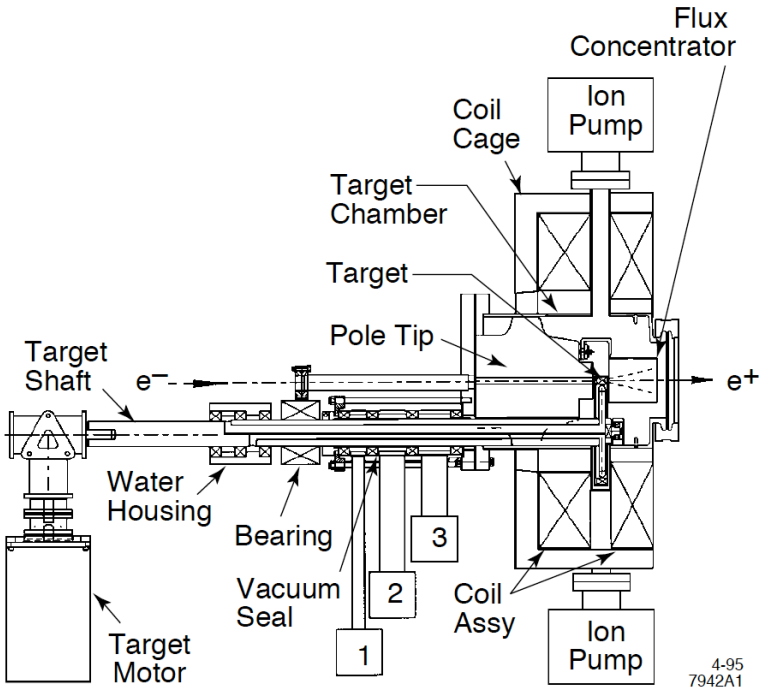
- **NLC target needs much faster tangential speed than SLC.**
- **NLC design: rotation seal other than ferromagnetic fluid.**

NLC Rotation Target Design

Specification (SLAC-PUB-6852, SLAC-PUB-7270, ZEROTH-ORDER DESIGN REPORT)

- **Diameter : 0.2 m**
- **Rotation Speed : 120 rpm** (depends on paper/document)
- **Tangential Speed : 1.2 m/s**
- **Vacuum Seal : labyrinth seals + diff. pumping**
  + face seal with carbon contacting



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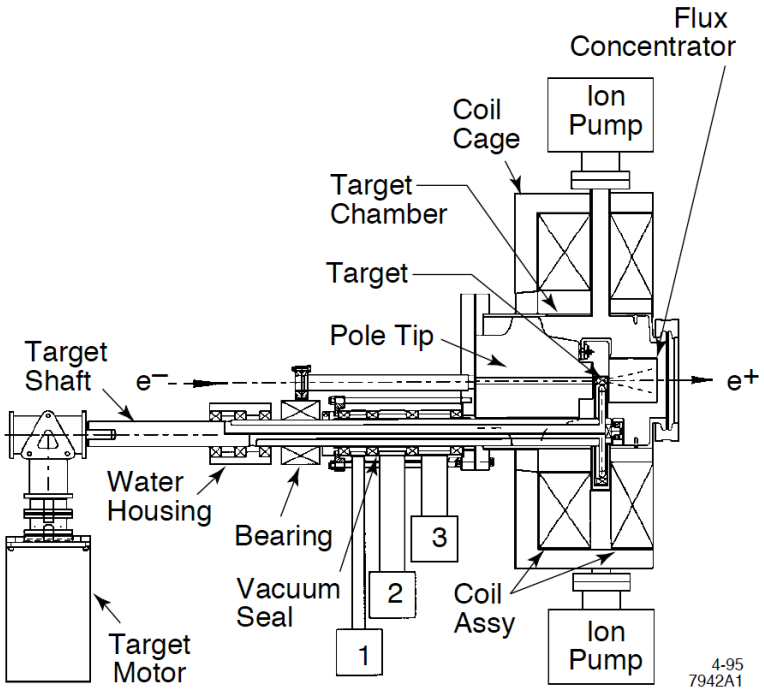

Drawing Exits,
But No Prototype

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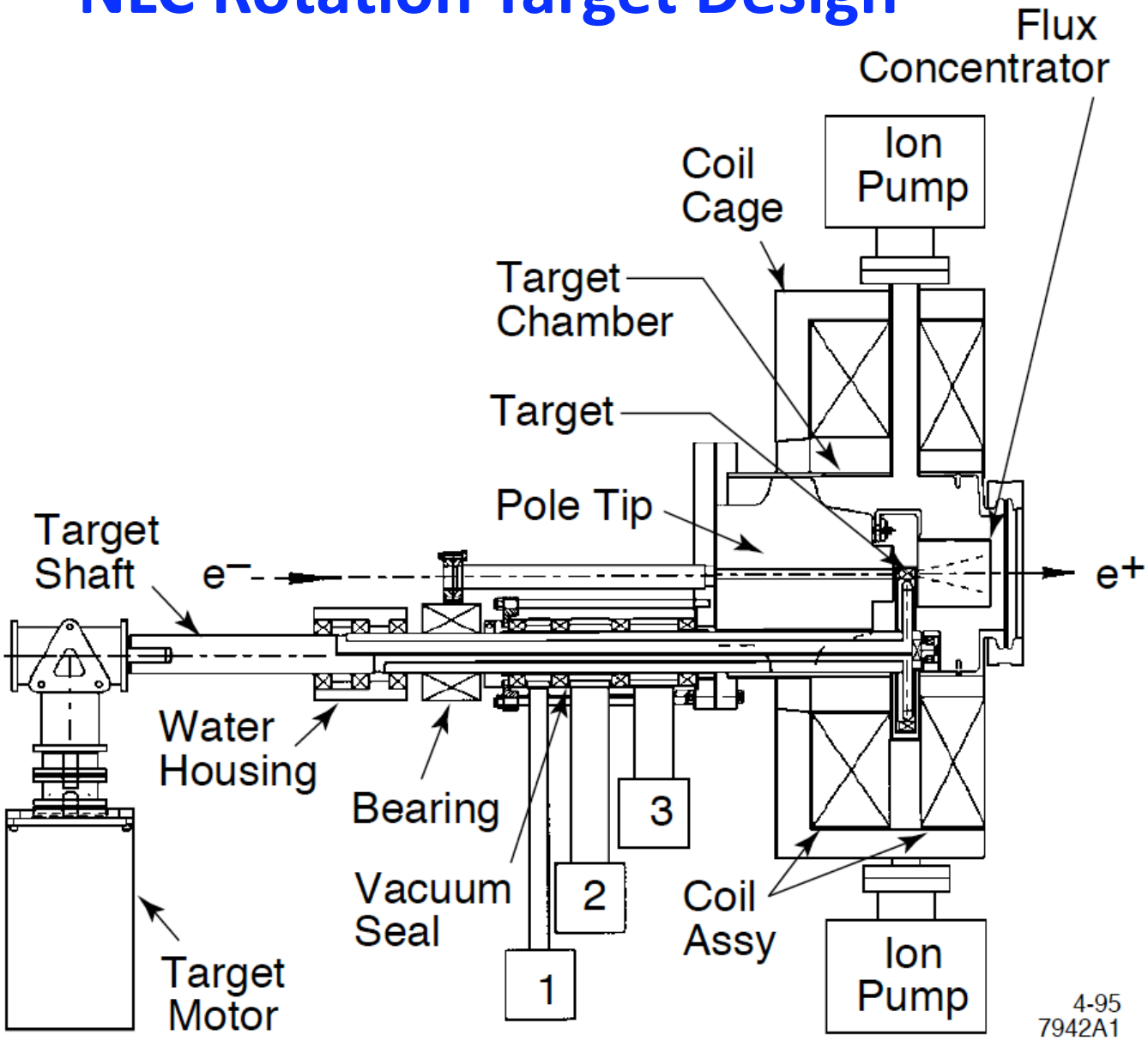

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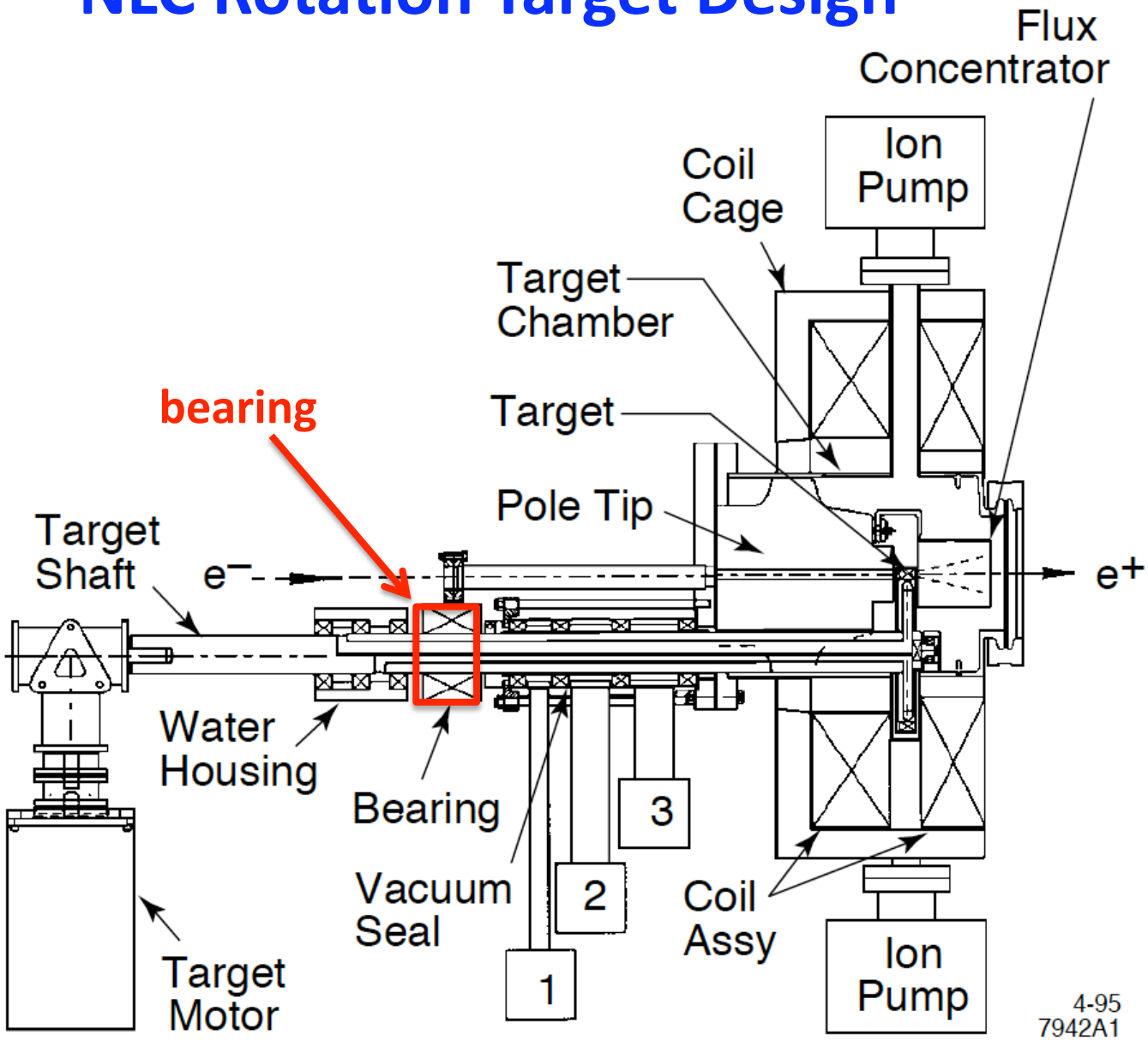

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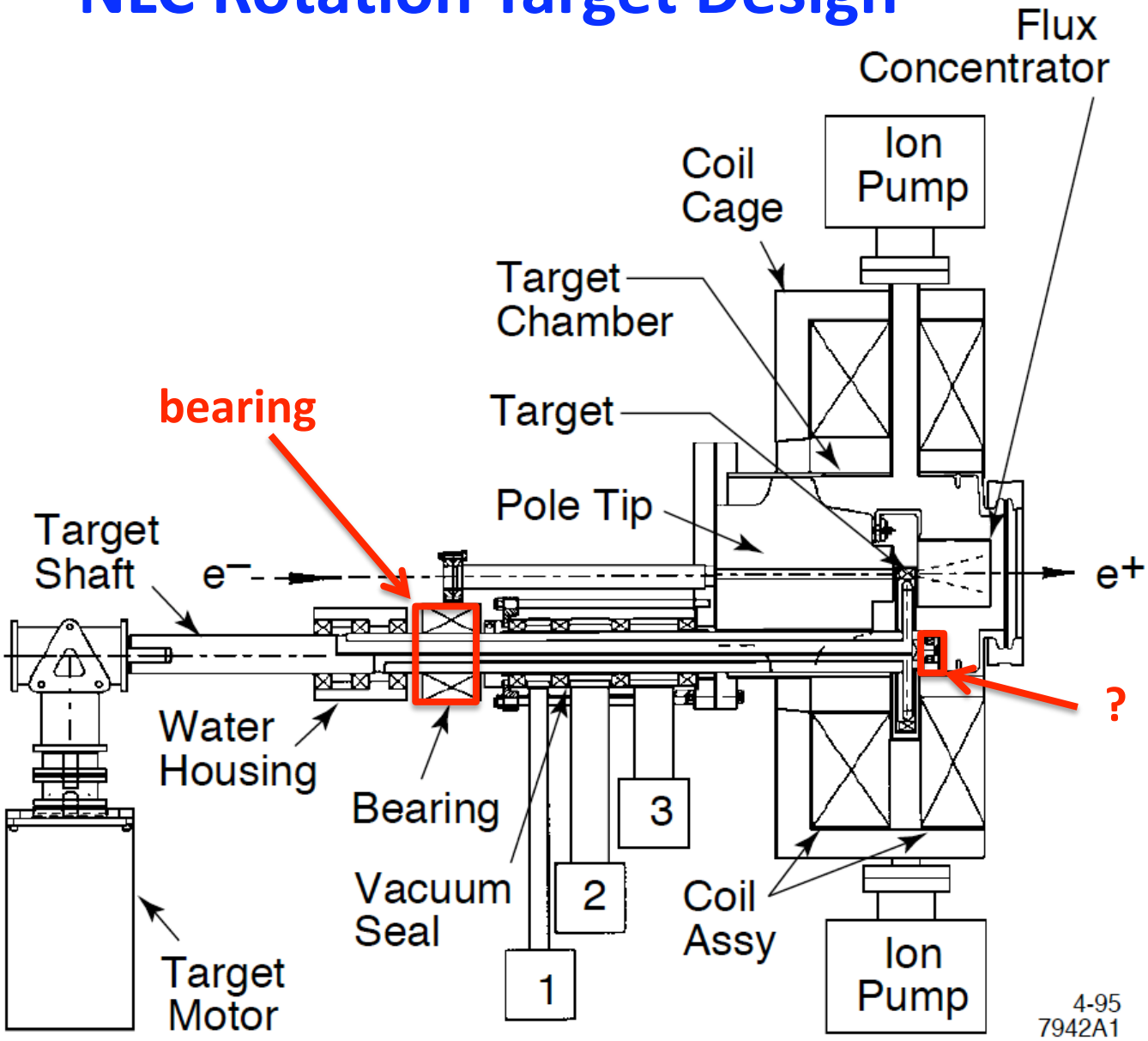

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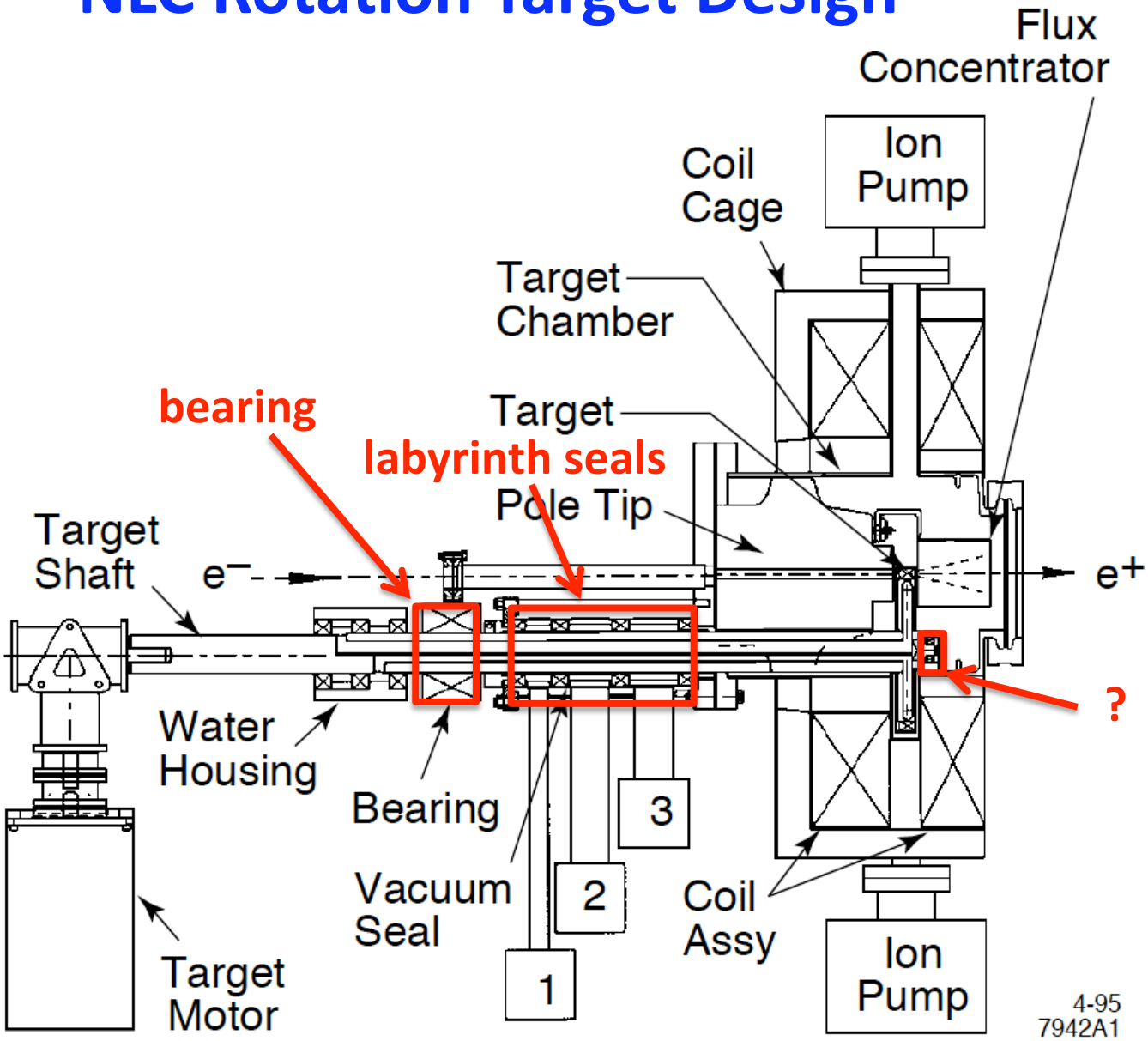

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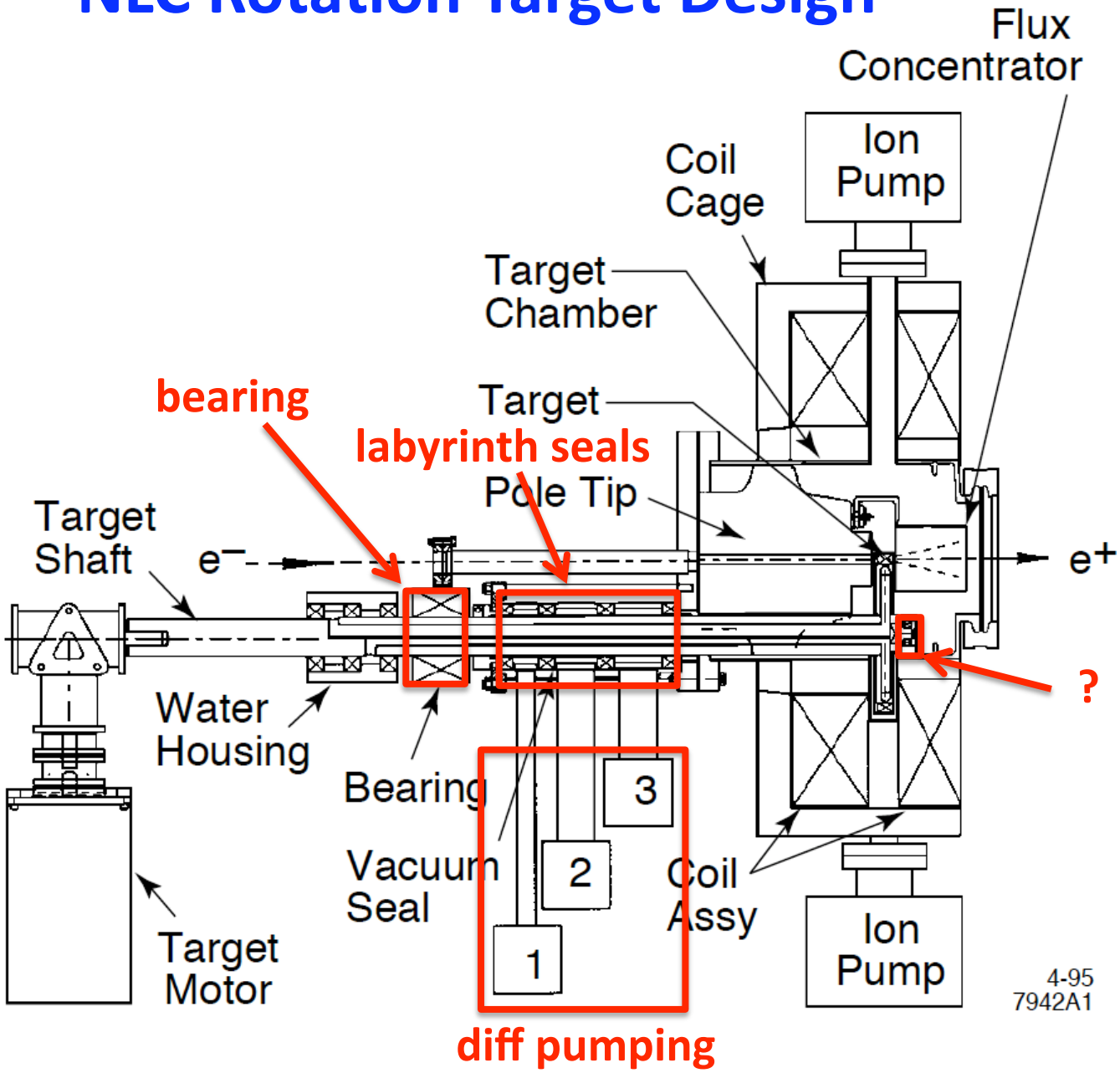

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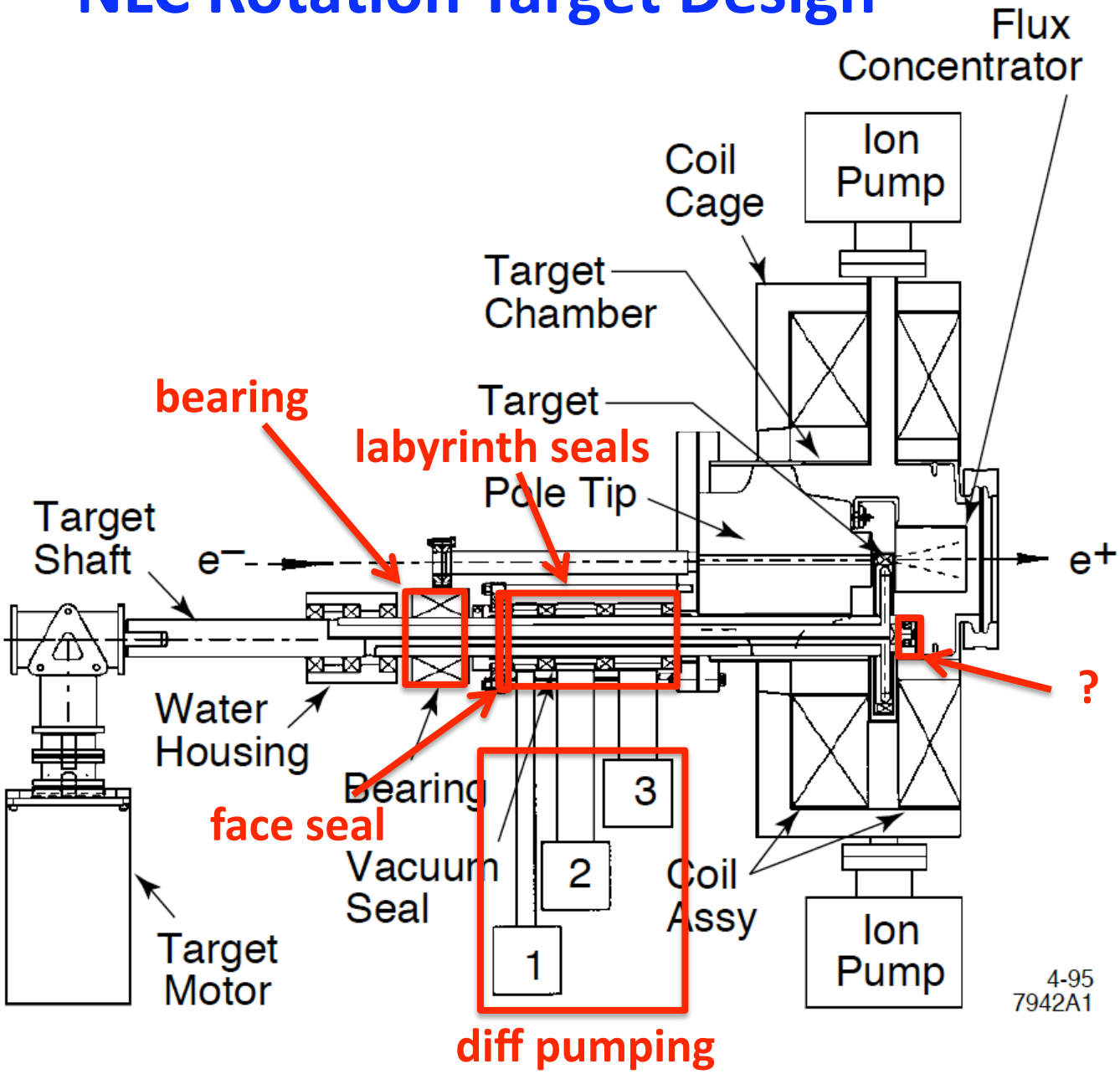
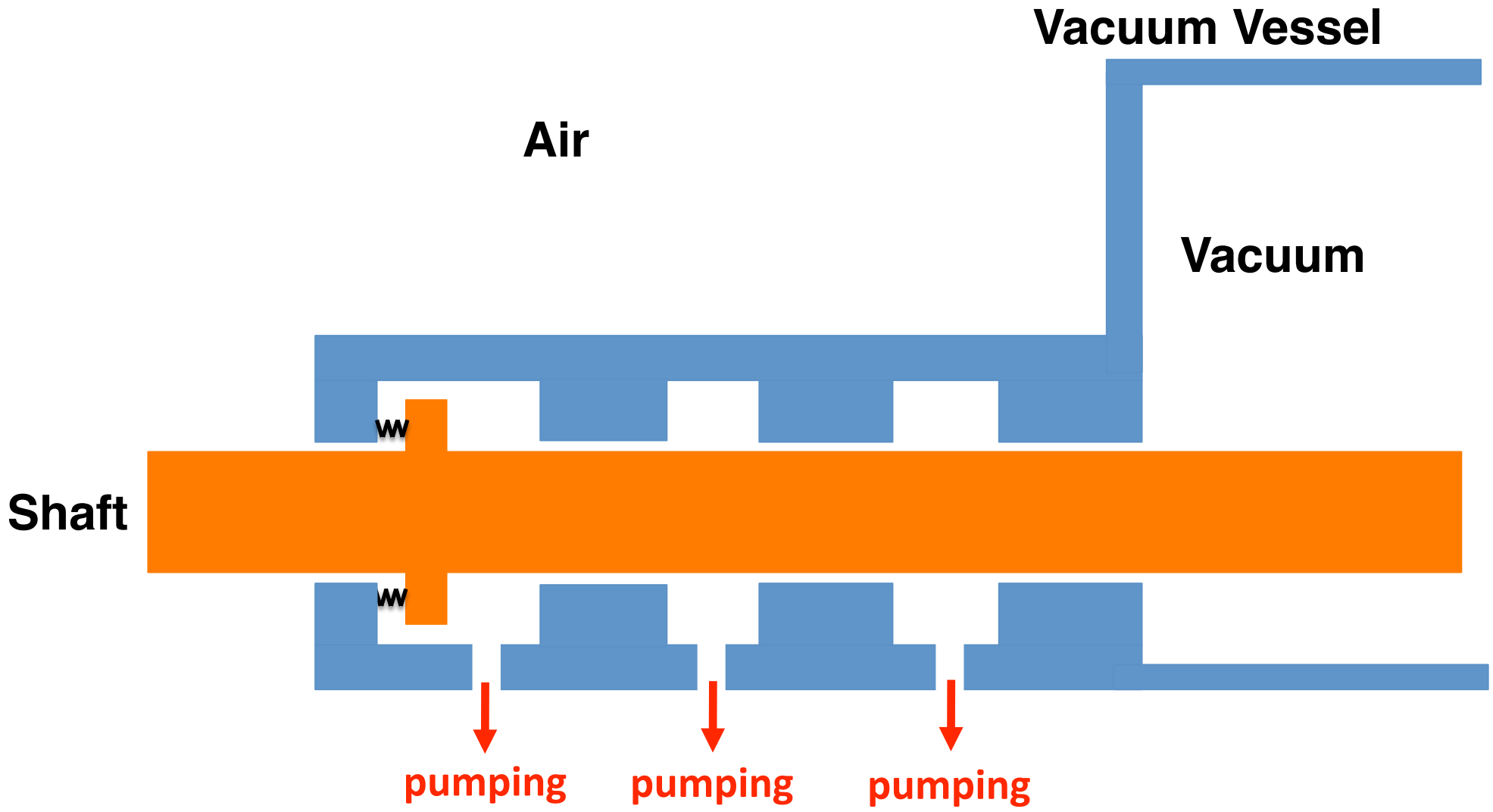


Vacuum Seal Design of NLC Rotation Target



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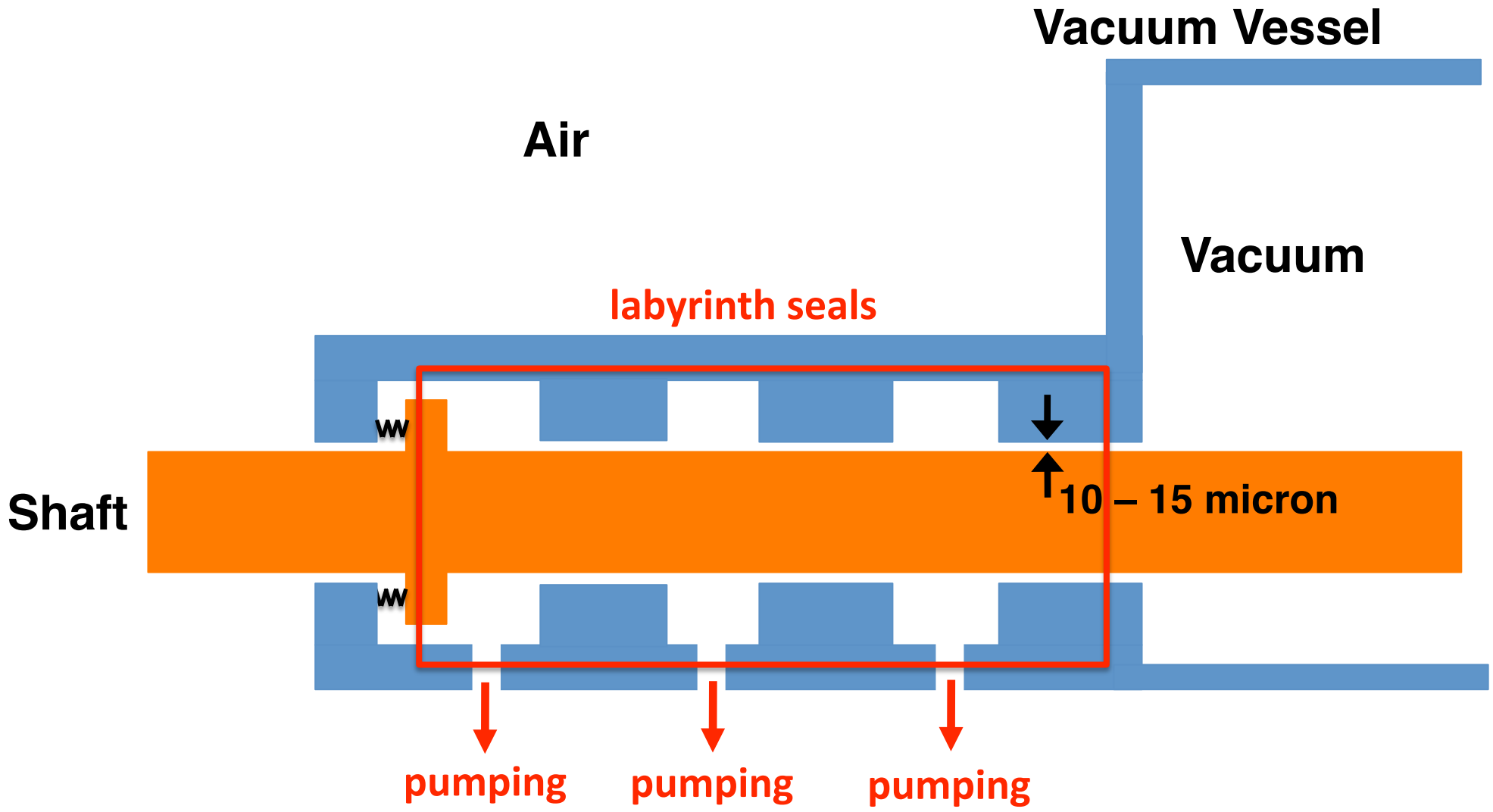

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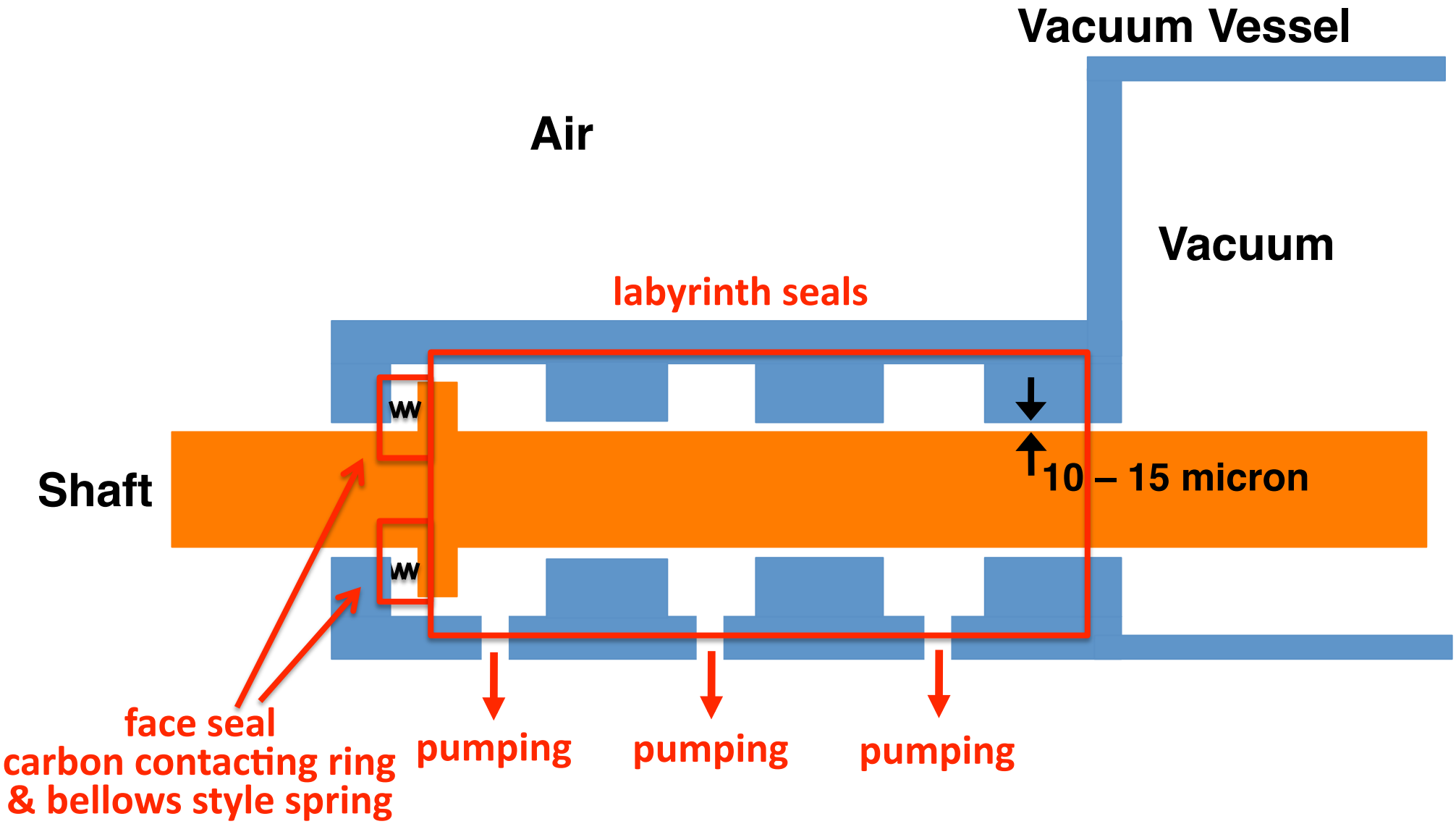

Summary

- We need to develop rotation vacuum seal for ILC.
  - Try ferromagnetic seal again?
  - Try labyrinth seal?
  - New Idea?