

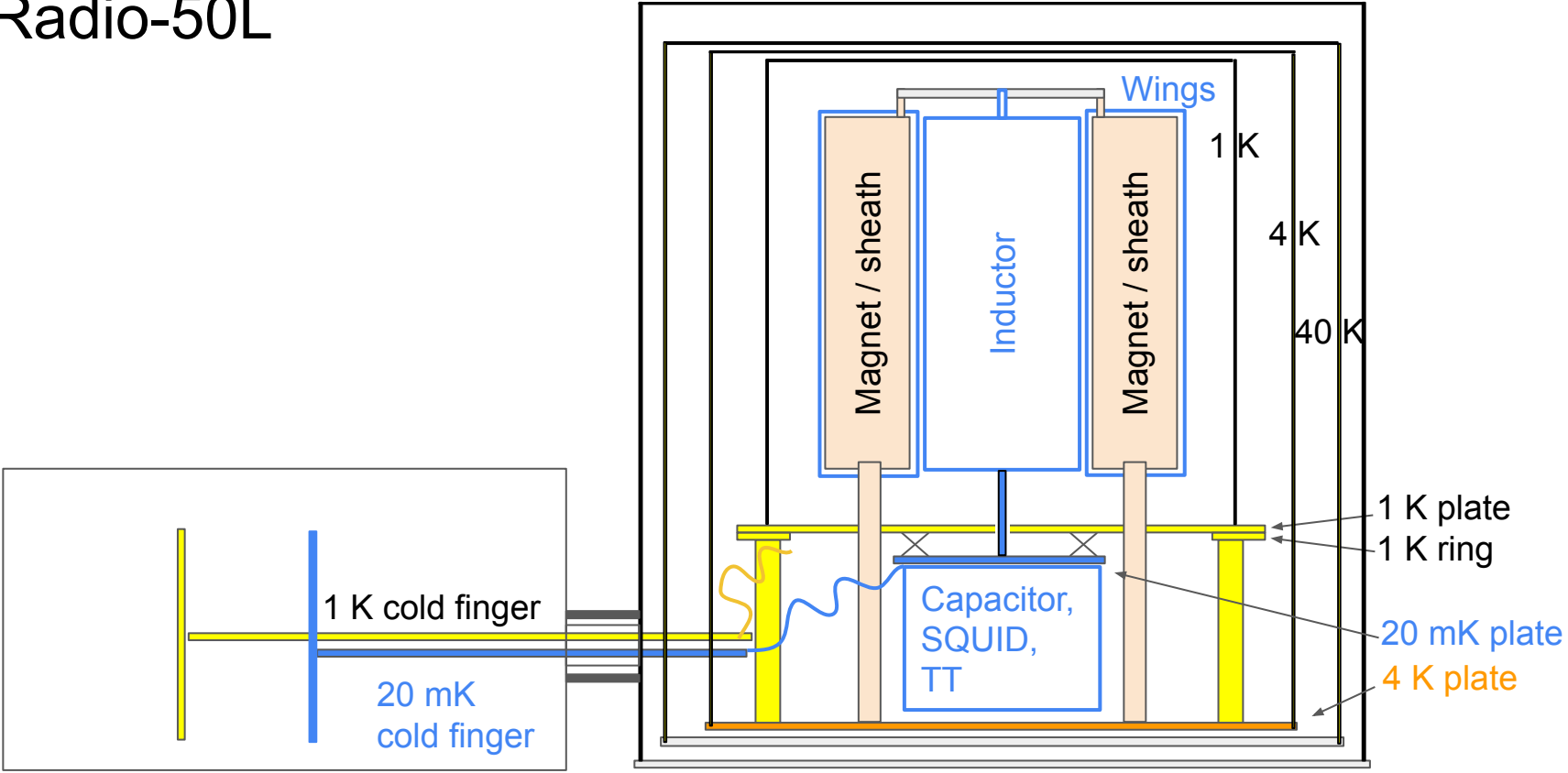
# DMRadio-50L Cryogenics

June 26, 2023

# Outline

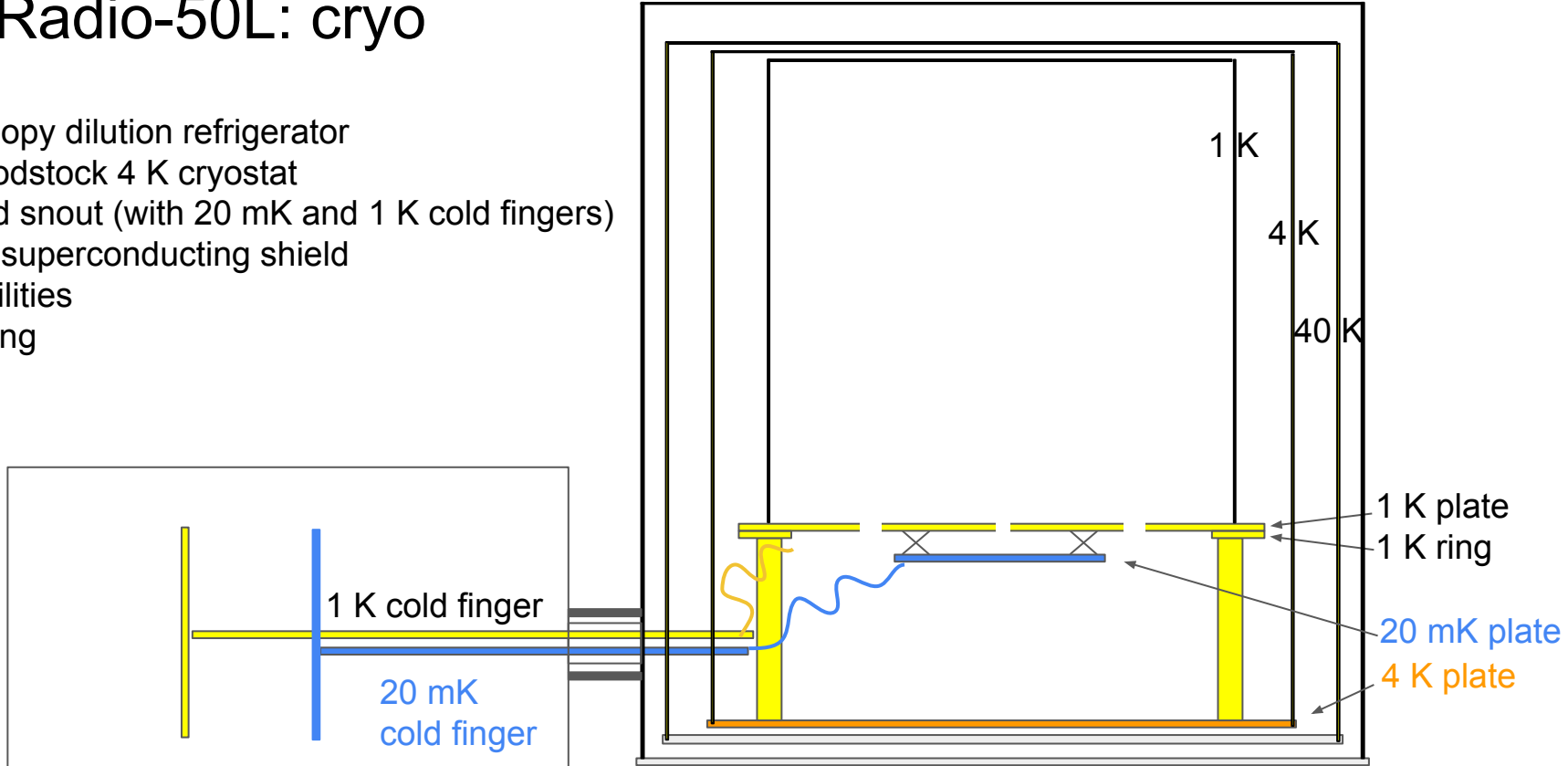
- Overview of components
- Discussion of milestones
- Timeline
- Risk identification

# DMRadio-50L



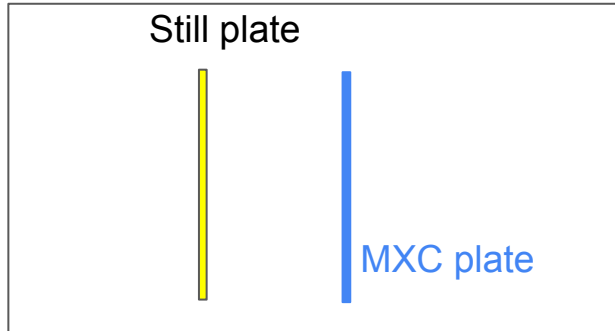
# DMRadio-50L: cryo

- Snoopy dilution refrigerator
- Woodstock 4 K cryostat
- Cold snout (with 20 mK and 1 K cold fingers)
- 1 K superconducting shield
- Facilities
- Wiring



# DMRadio-50L: cryo

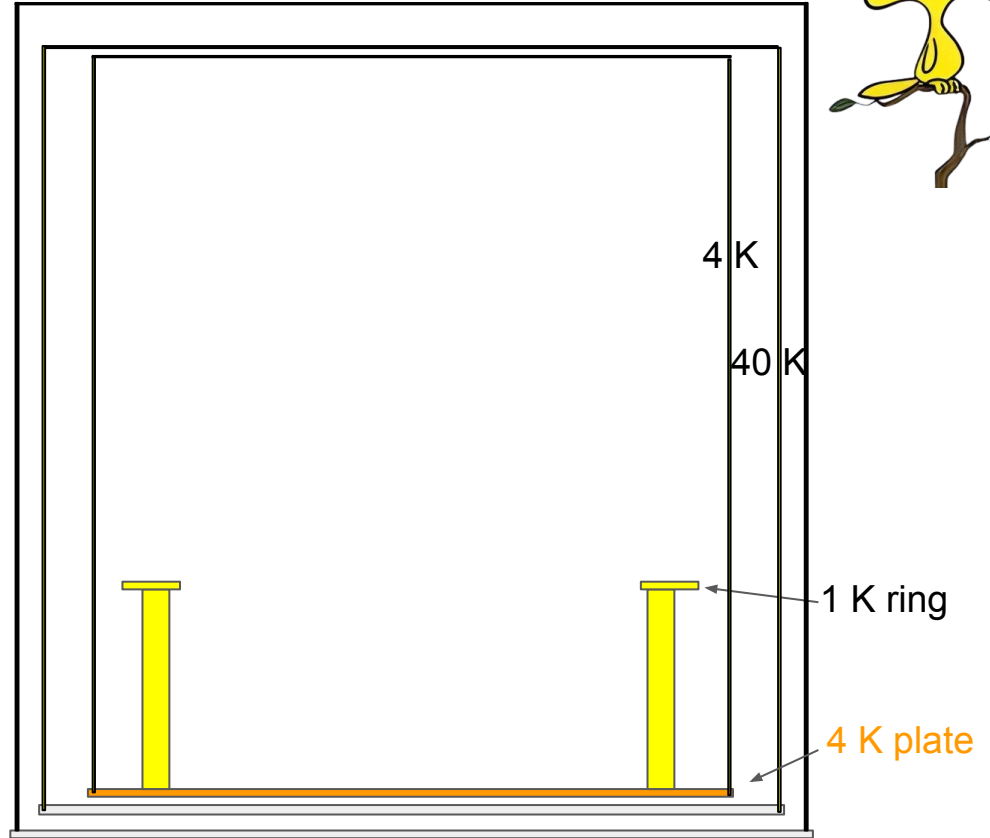
- **Snoopy dilution refrigerator**
- Woodstock 4 K cryostat
- Cold snout (with 20 mK and 1 K cold fingers)
- 1 K SC shield and 20 mK plate
- Facilities
- Wiring



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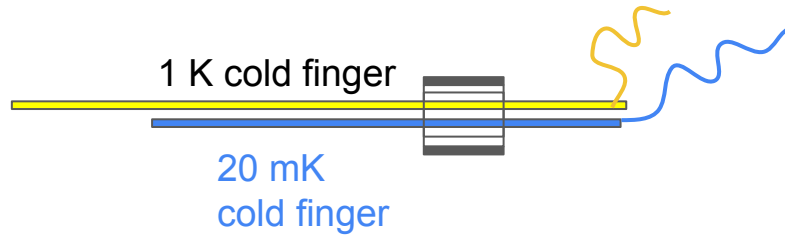
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- Four Nine Design: Caleb Schreibeis, Jerry Schmaing
- Heat switch 4 K to 1 K ring
- Can cool to 4 K
- PT 425



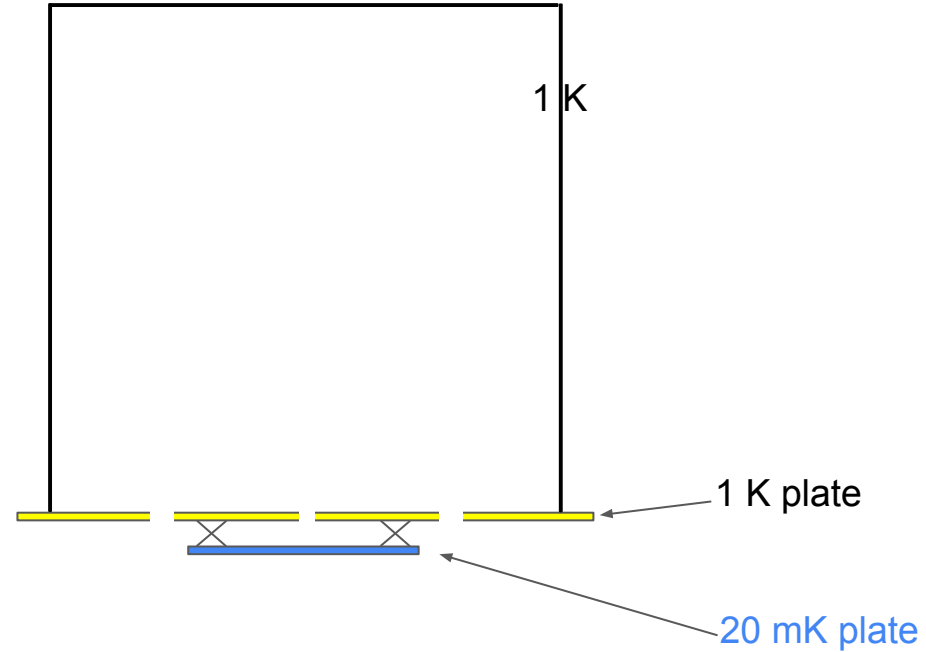
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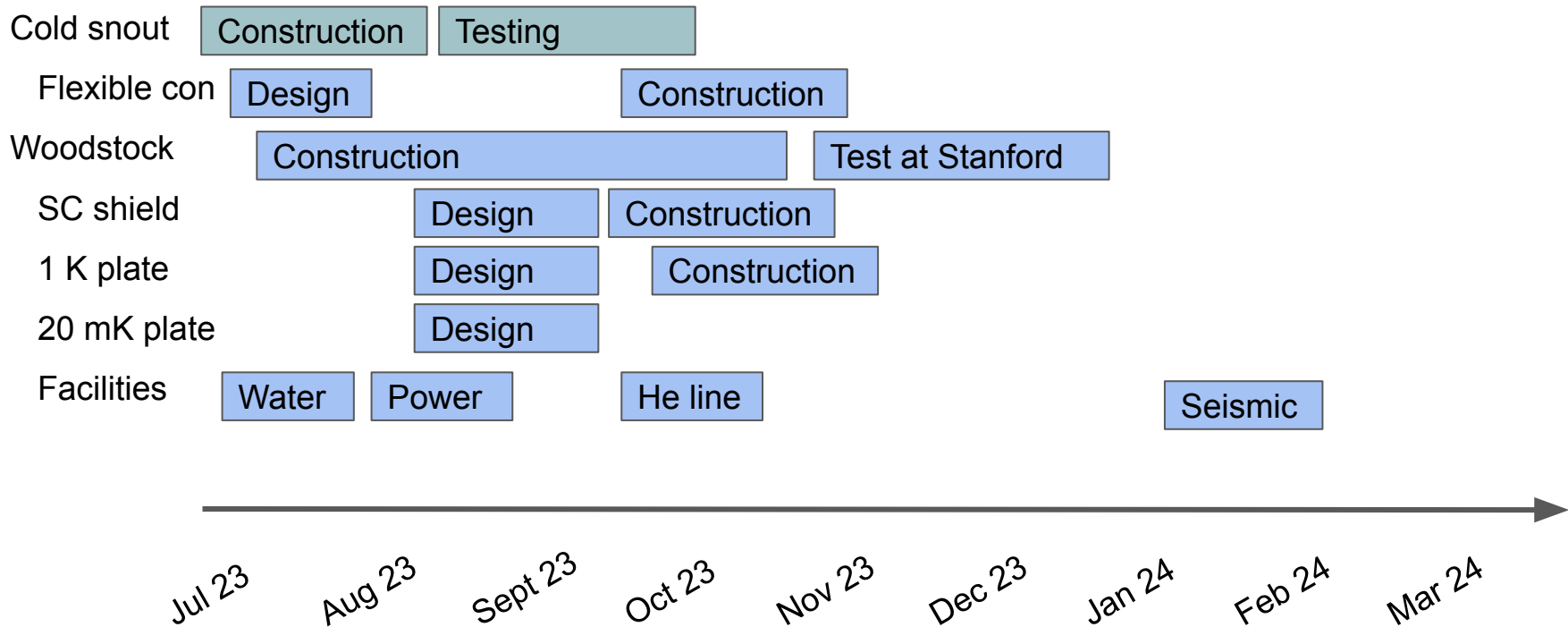


# Cryogenics design components

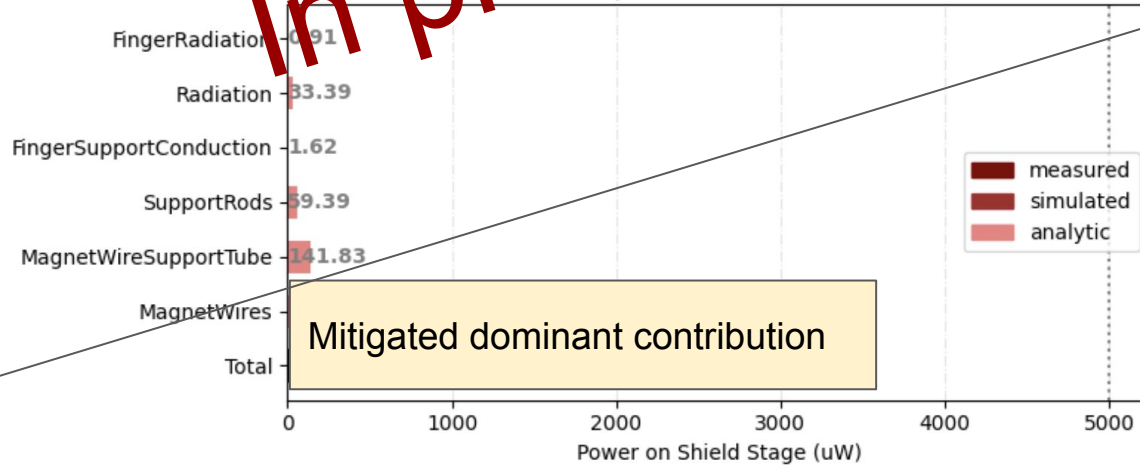
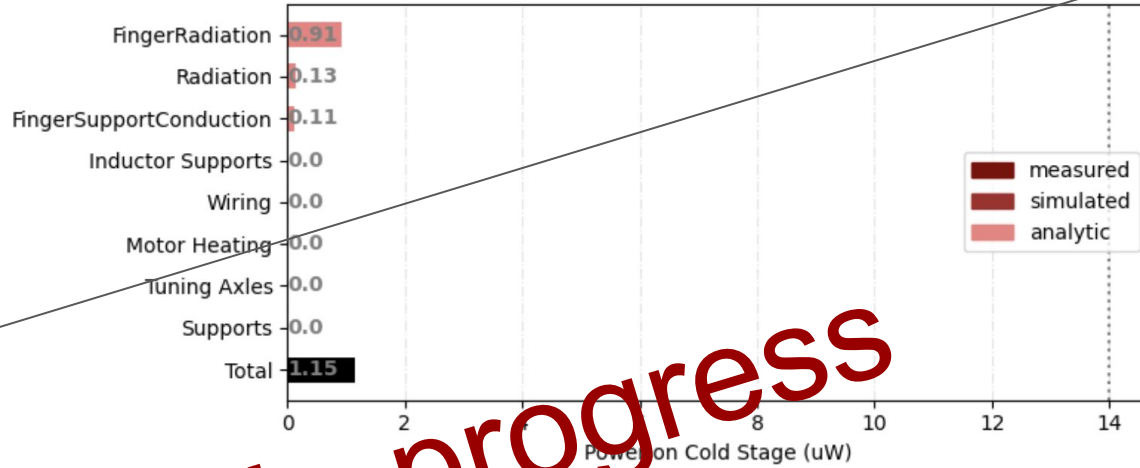
- ❑ BlueFors “Snoopy” dilution refrigerator
- ❑ Cold snout (Aya Keller)
  - ❑ 20 mK cold finger, connection to MXC plate
  - ❑ 1 K cold finger, connection to still plate
  - ❑ Puck to support cold fingers
  - ❑ Testing setup: thermal shields (4 K, 40 K, vacuum), second puck
  - ❑ Operating setup: thermal shields
  - ❑ Operating setup: flexible connections to Woodstock (20 mK, 1 K, 4 K, 40 K)
- ❑ FourNine Design “Woodstock”
  - ❑ Interface: cold snout (dimensions, height, etc)
  - ❑ Interface: magnet infrastructure (leads, PC switch, diode tower, etc)
  - ❑ Interface: 1 K plate, 1 K SC shield
- ❑ Wiring
- ❑ Facilities: compressor housing, crane, seismic anchoring of FourNine system

# Cryogenics design milestones

- BlueFors “Snoopy” dilution refrigerator
- Cold snout
  - ✓ Rough cold snout design
  - ✓ Design and build the puck
  - Finalize cold snout testing plan and order parts - July 15
  - Finalize flexible shield connections to Woodstock and order parts - July 28
  - Finalize flexible cold finger connections to Woodstock and order parts - July 28
  - Test cooling power at end of cold fingers, test puck - September 1
- FourNine Design “Woodstock”
  - Finalize Woodstock design (interface info) - July 31
  - Design 1 K plate and order - October 1
  - Design 1 K SC shield and order - October 1
- Wiring
- Facilities: compressor housing, crane, seismic anchoring of FourNine system



# DMRadio-50L Thermal Budget



**In progress**

# Cryogenics risks / unresolved issues

## Risks

- Interface resistance (hard to predict, need to measure)
- Alignment of components (cold snout)
- Schedule risk (need to gain a better understanding of lead times)

## Information needed

- What is the magnet infrastructure? Where does it need to fit? - for Woodstock
- What are all the design elements that affect the 1 K plate?
- Improve understanding of thermal budget