



U.S. MAGNET
DEVELOPMENT
PROGRAM

Status Report on the CORC Coil Program

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U.S. DEPARTMENT OF
ENERGY

Office of
Science

Two Related R&D programs. Magnet Design Program (MDP) and Small Business Technology Transfer (STTR)

MDP: “In-field quench studies of a long CORC cable” via one 8-turn HTS coil (S-turn in to flip the polarity) in the background field of common coil dipole

- **A good collaborative efforts between MDP partners and ACT. Regular discussion on goals, instrumentation and test planning, etc.**

STTR: “Demonstration of a high field HTS/LTS hybrid dipole” with two sets of double pancake coils made with 6+8 turns (total 28 turns) of CORC cable

- **This presentation will give the status of the MDP**

Acknowledgement

This presentation benefited from the discussions with and direct contributions from the following colleagues:

ACT: Danko van der Laan, Jeremy Weiss

ASC: Ernesto Bosque, Lance Cooley

BNL: Anis Ben Yahia, Michael Anerella, Jesse Schmalzle, Piyush Joshi, ...

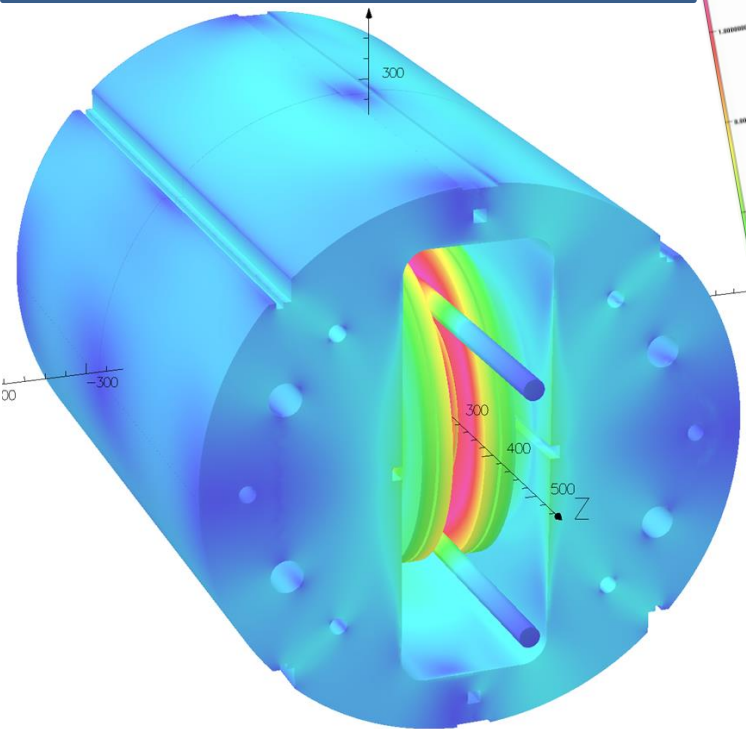
FNAL: Vadim Kashikhin, Vito Lomardo

LBNL: Xiaorong Wang, Maxim Martchevsky, Reed Teyber, Steve Gourlay

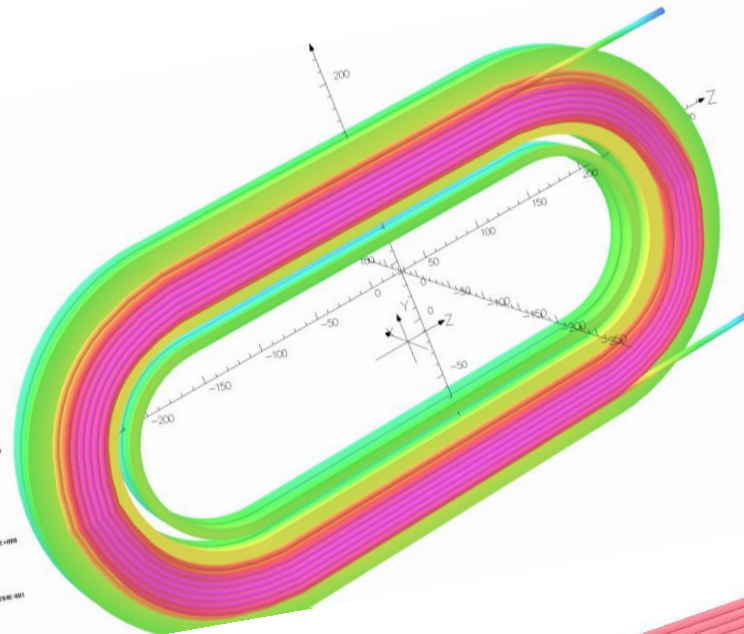
... and more

CORC Coil Programs with the Common Coil Dipole

**STTR Coils two sets:
Each with 6 and 8 turns**

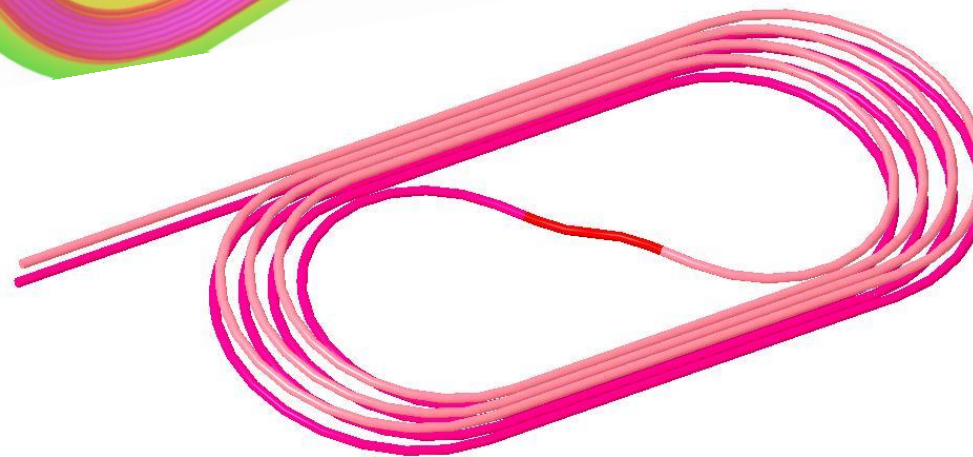


**CORC[®] coils will run in
series with the Nb₃Sn coils**



**STTR: High field Demo
(13-14 T with 10 T from LTS)**

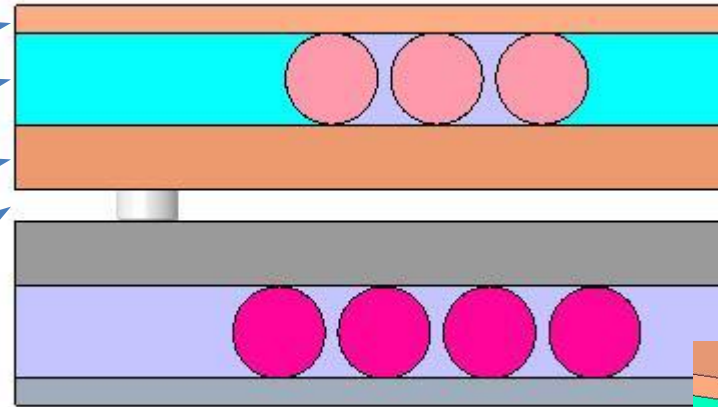
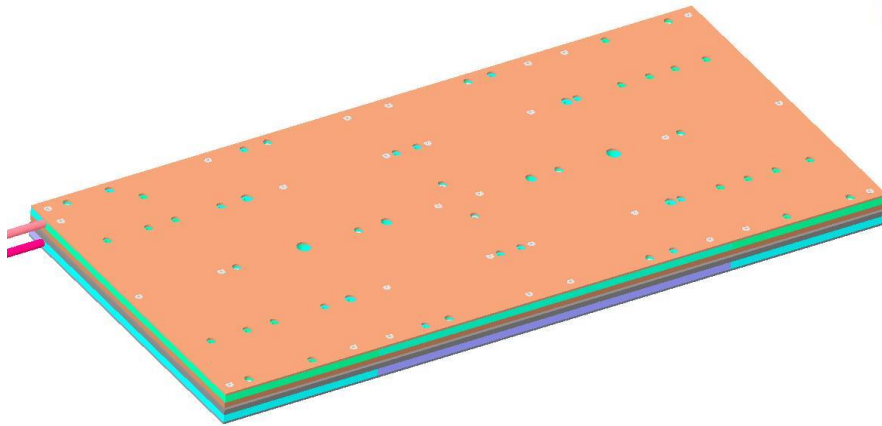
**MDP: Quench studies and
technology demo
(10.7 T with 10 T from LTS)**



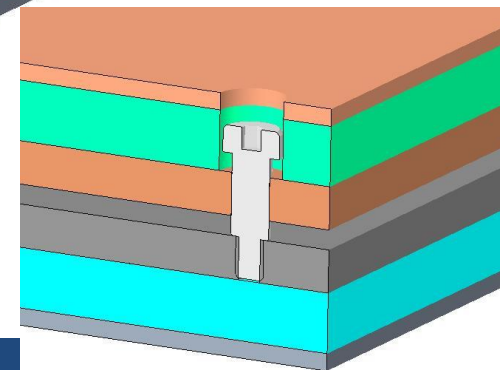
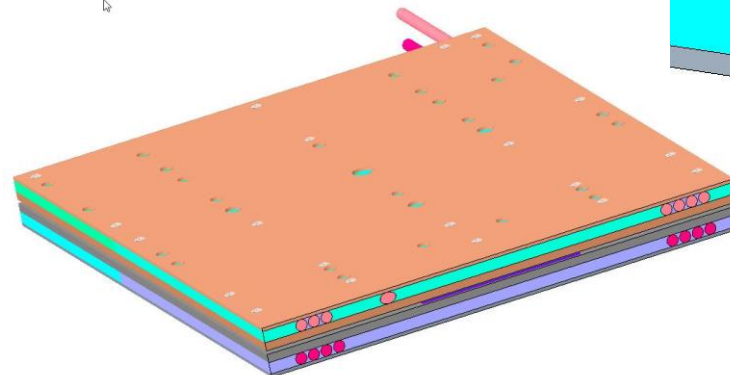
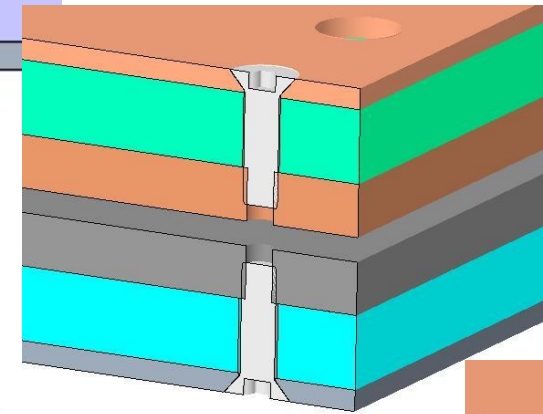
**MDP Coil
4+4 turns
with an S-turn**

CORC Coil Package

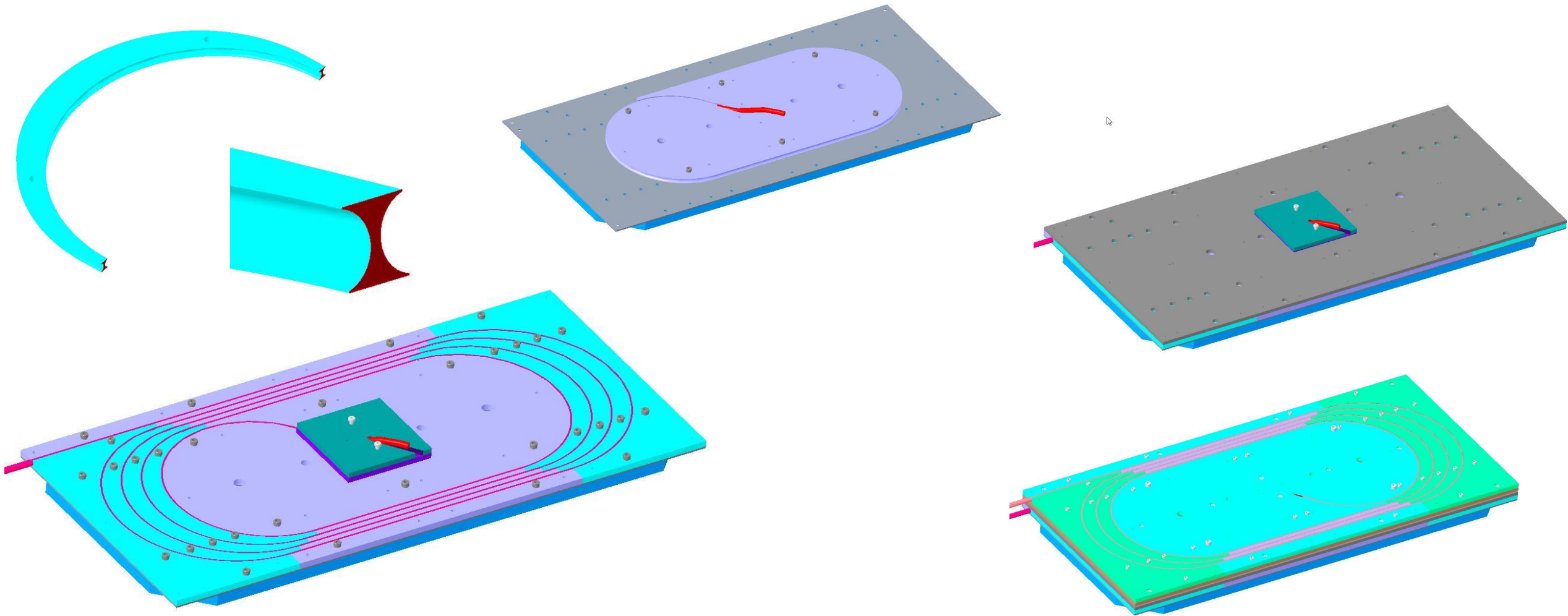
- Overall thickness – 30.3 mm
- Outer plates – 2 mm
- Coil spacers – 7 mm
- Inner plates – 5 mm
- Gap between layers – 2.3 mm



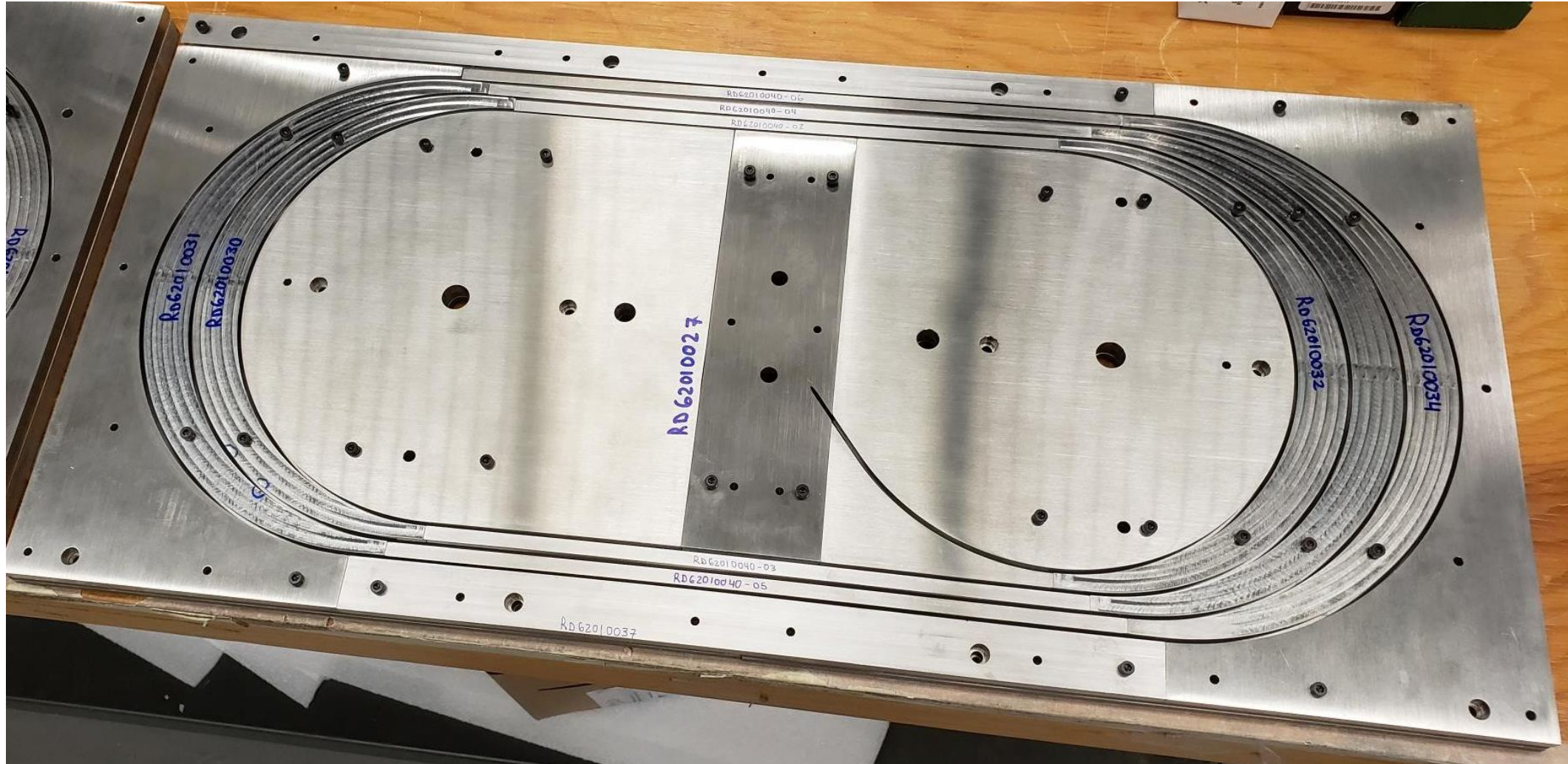
- Each layer held together with flat head screws
- Assembly held with shoulder screws to allow separation of layers.



Coil & Structure Parts, as Designed



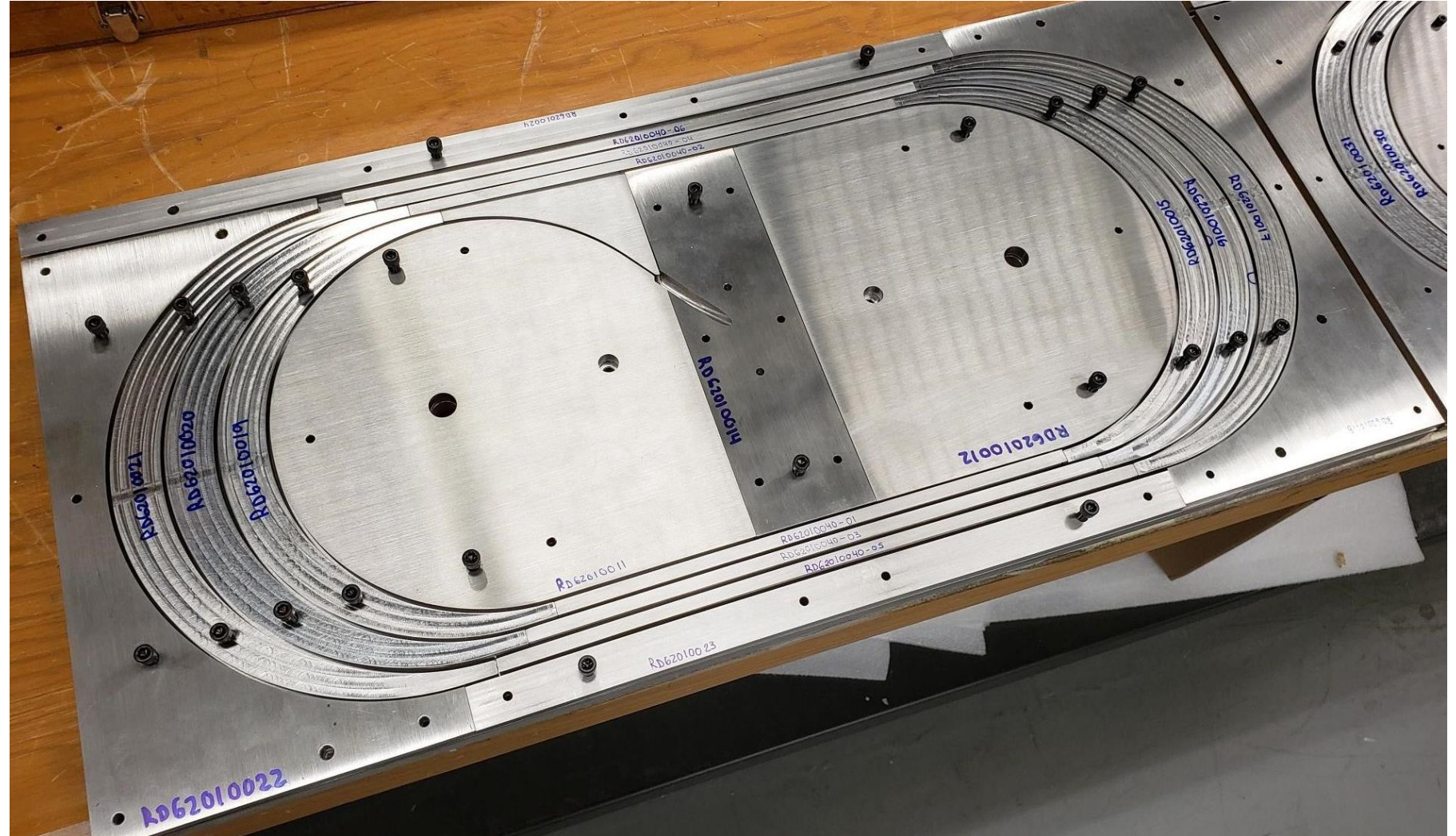
Parts, as Made or Delivered (1) (all parts in hand now)



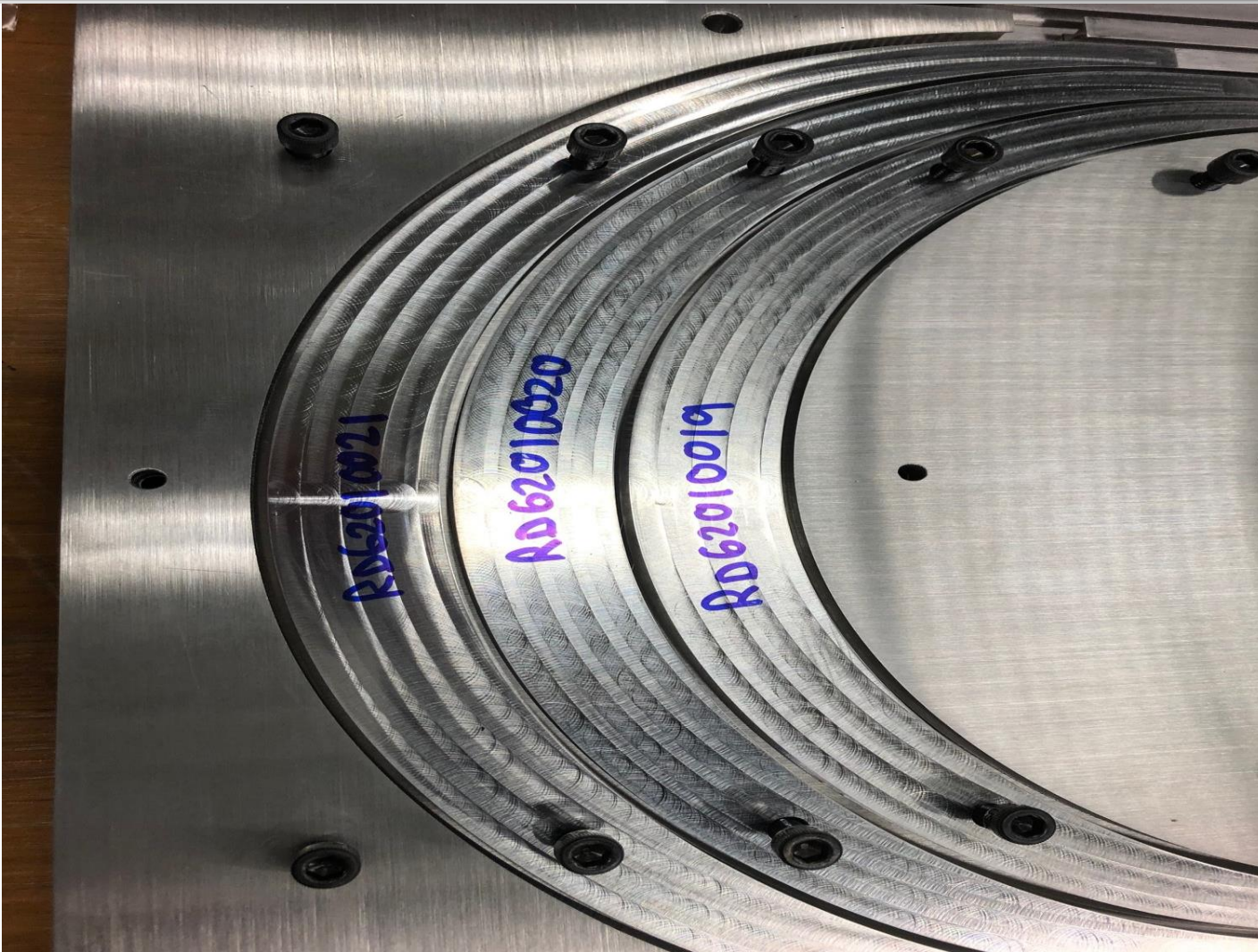
Parts for one-side of the coil

Parts, as Made or Delivered (2)

Parts for the
other-side of the coil



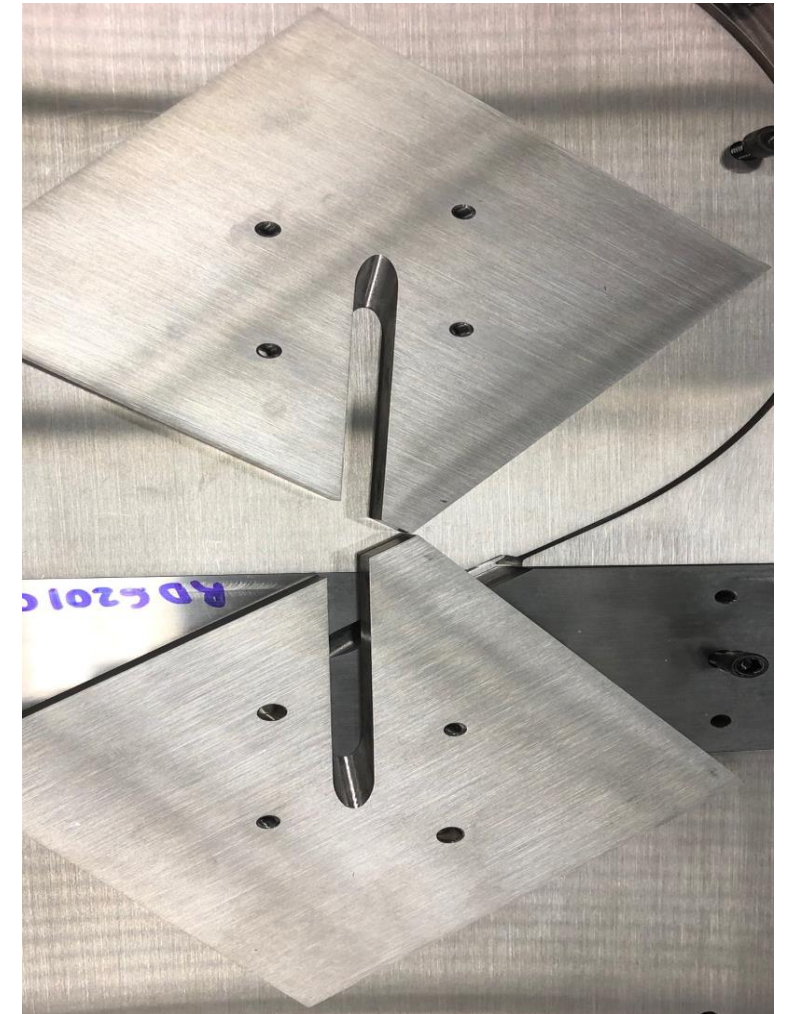
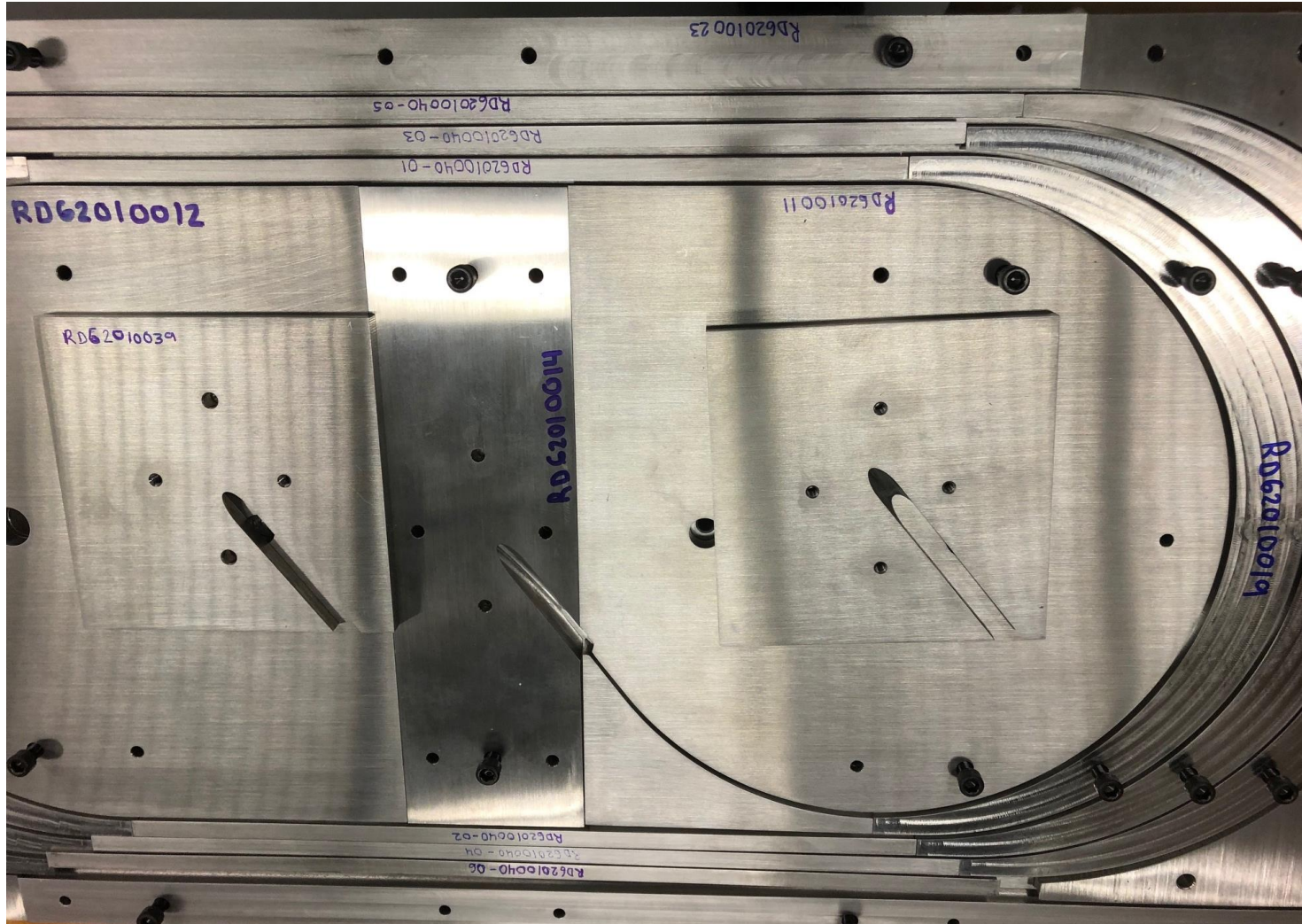
Coil Parts



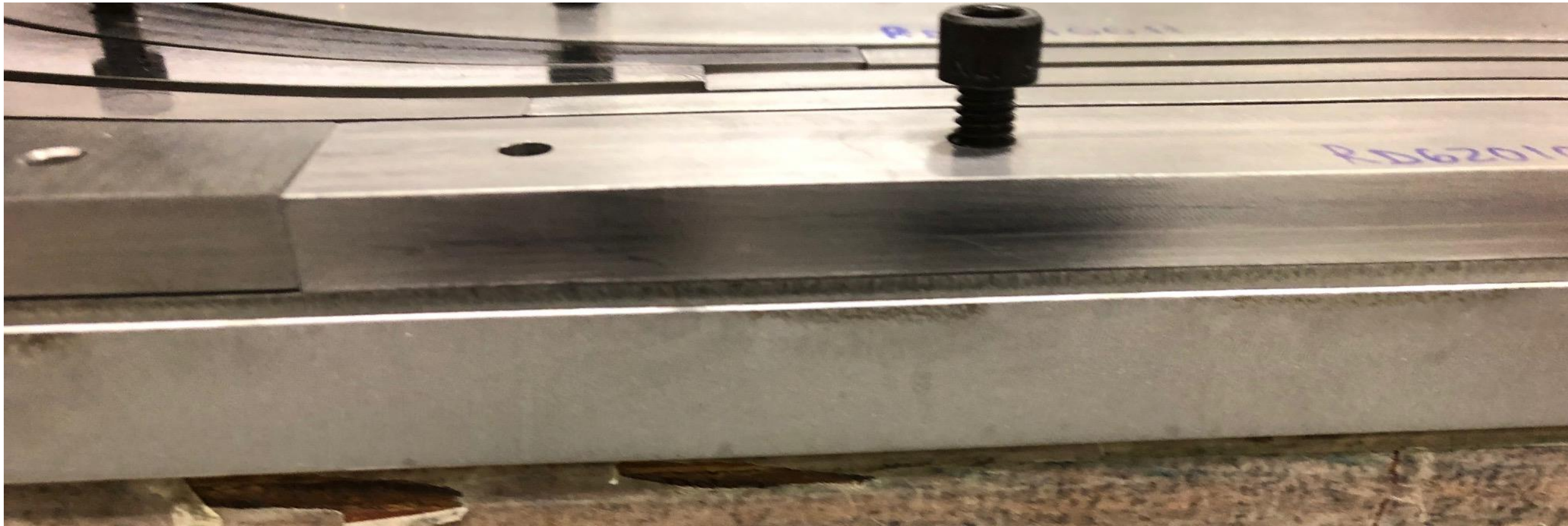
Coil Parts



Coil Parts



Coil Parts



Summary and Schedule

- A good collaborative effort between different partners with regular meeting and discussions on all aspects of the program
- Coil parts received. All meet requirement except one (not a showstopper)
- These parts are being sent to ACT for further inspection and to adjust their cable design. ACT will also investigate routing of v-tap wire and insulation
- BNL to receive back coil parts and practice cable from ACT in about a month
- BNL will do practice winding (including investigation of winding machine)
- ACT to provide CORC cable in about 3 months
- Coil construction and test preparation will take another 3 months
- Target test date is by the end of 2021

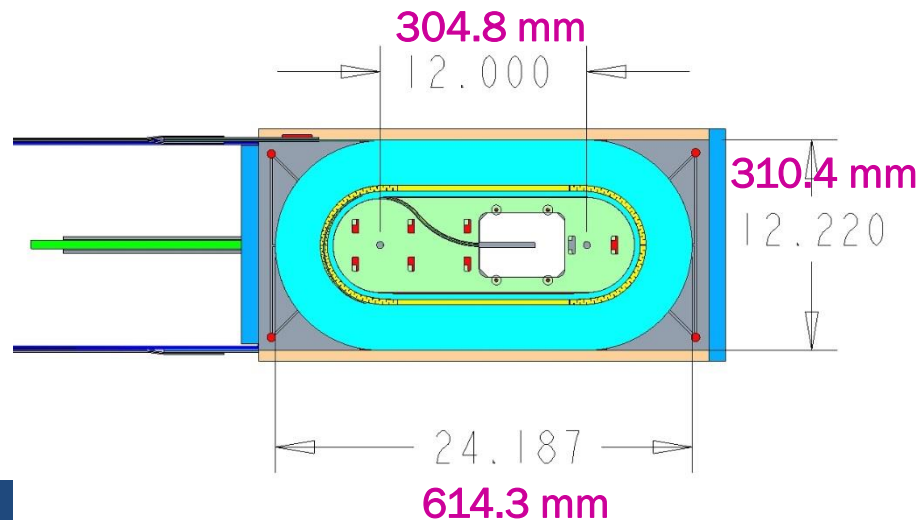
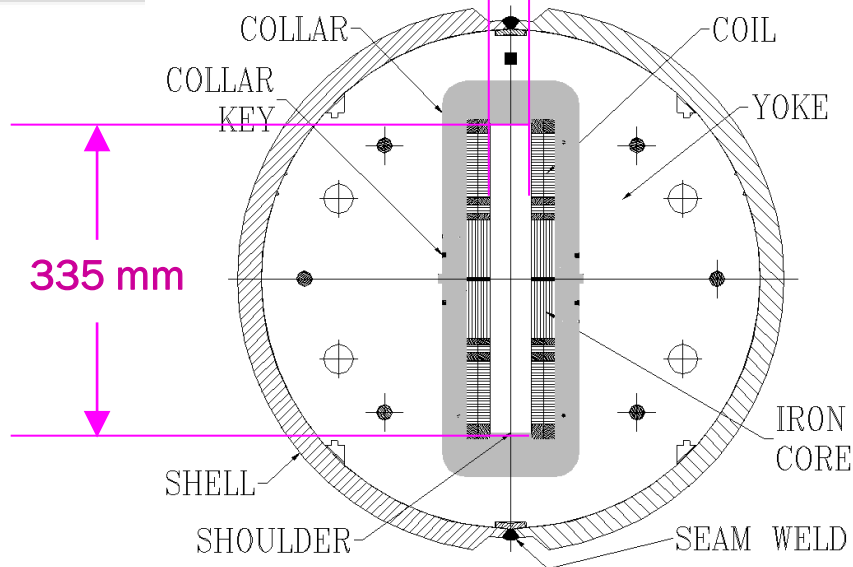


EXTRA SLIDES



31 mm

Parameters of BNL Dipole DCC017



- Two layer, 2-in-1 common coil design
- 10.2 T bore field, 10.7 T peak field at 10.8 kA short sample current
- **31 mm horizontal aperture**
- **335 mm vertical aperture**
 - **A unique feature for insert coil or cable testing**
- 0.8 mm, 30 strand Rutherford cable
- 70 mm minimum bend radius
- 85 mm coil height
- 614 mm coil length
- One spacer in body and one in ends
- Iron over ends
- Iron bobbin
- Stored Energy@Quench ~0.2 MJ