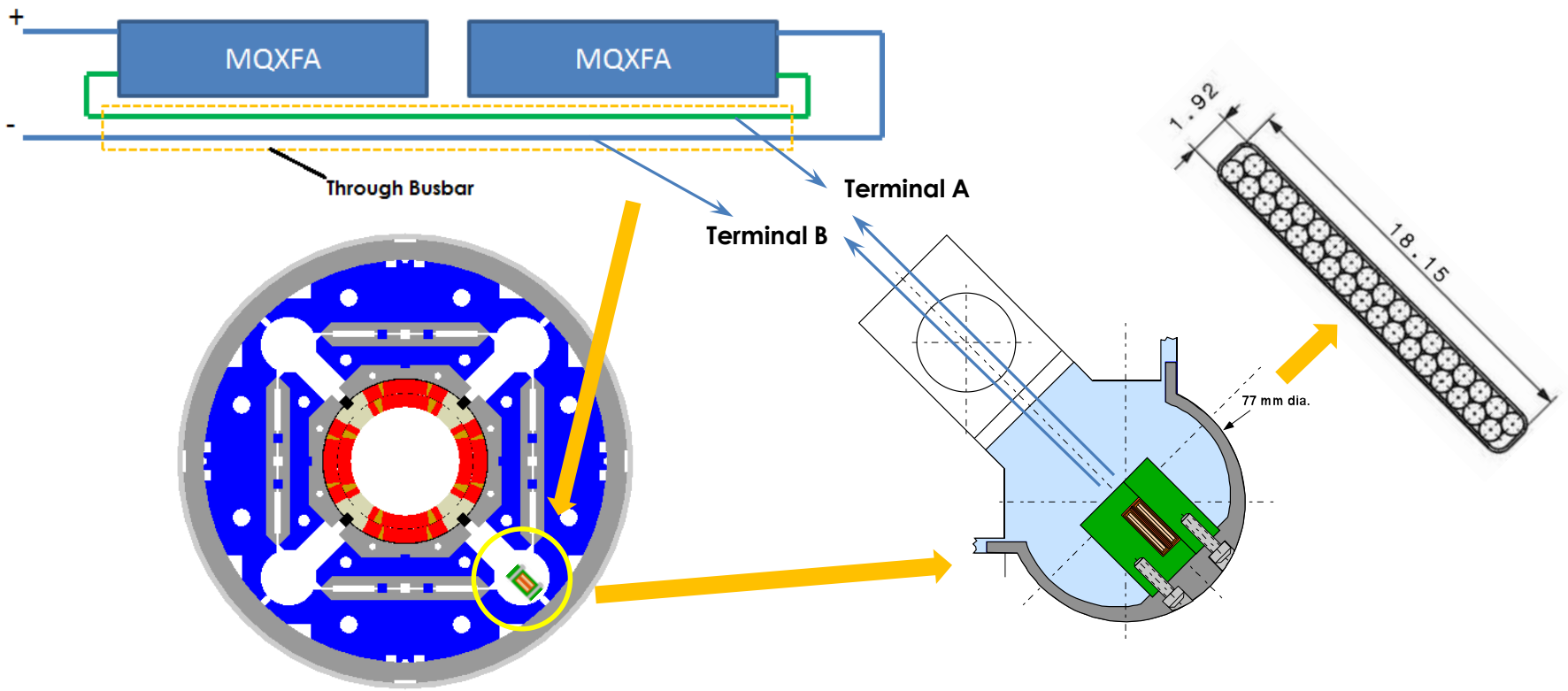
LMQXFA/B Bus and Interconnection Status

R. Bossert

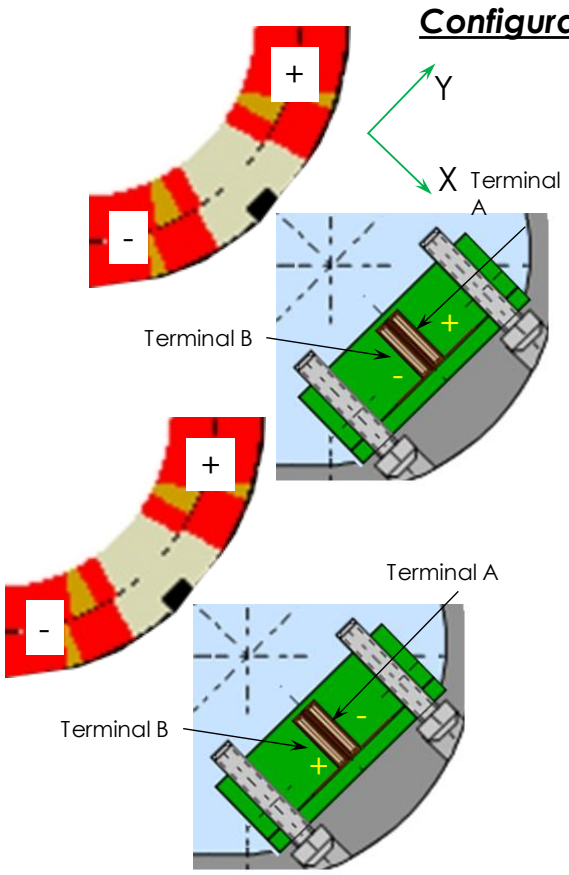
FNAL, 5/03/2018

MQXF Bus-Bar Overview



(From H. Pan)

MQXF Bus-Bar Overview (From H. Pan)



If rotate the bus-bar 45°:

When each terminal has the same current flow direction as the same side coil blocks :

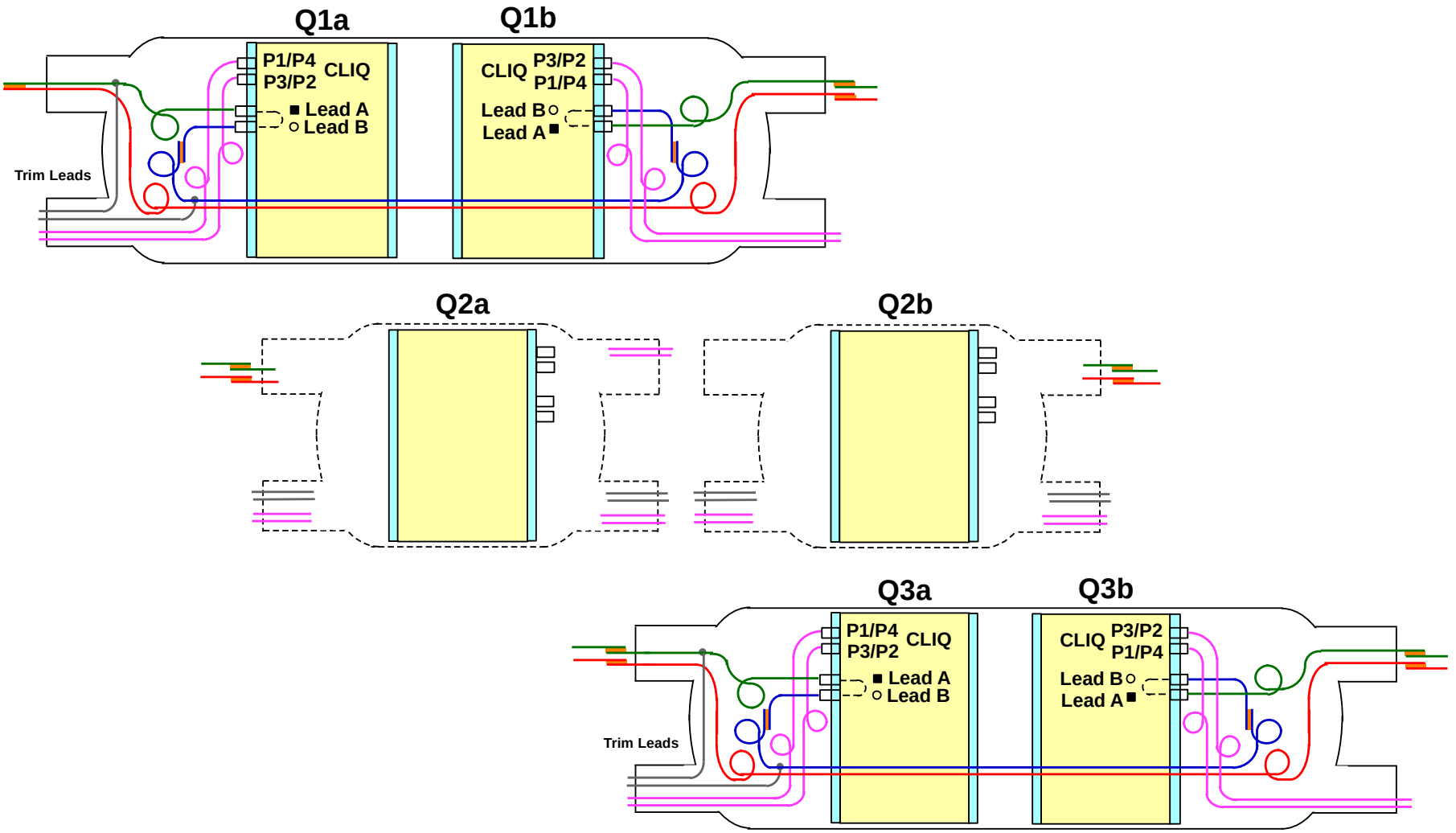
	Fx (N/m)	Fy (N/m)
Terminal A	-145	11000
Terminal B	-145	11000

- Separate force (Fy in this configuration) is polarity dependent.
- For the current position, the separate force is around 3794 N/m, which is on the similar level of configuration 1.

When each terminal has the opposite current flow direction as the same side coil blocks :

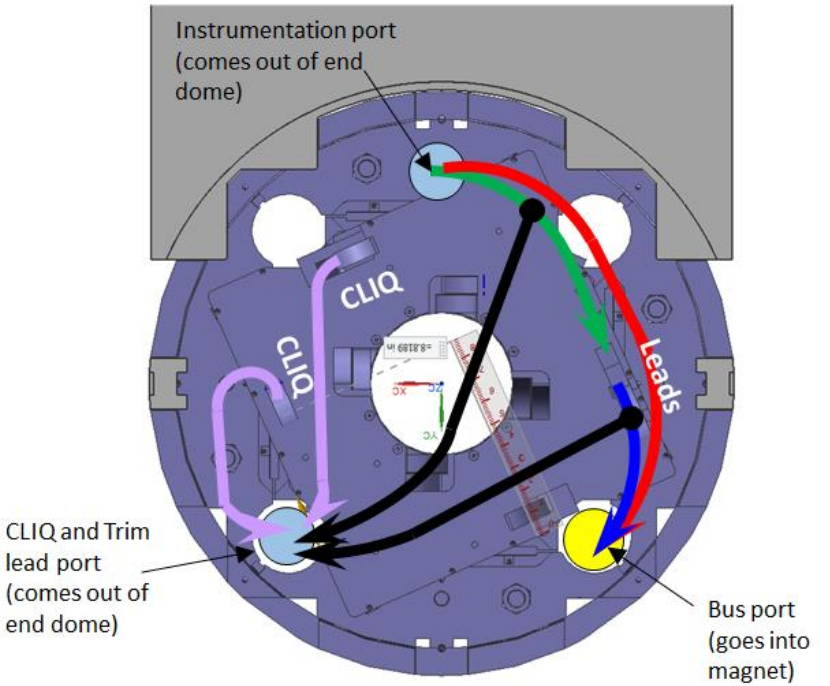
	Fx (N/m)	Fy (N/m)
Terminal A	200	3794
Terminal B	200	-3794

Expansion Loops Side View

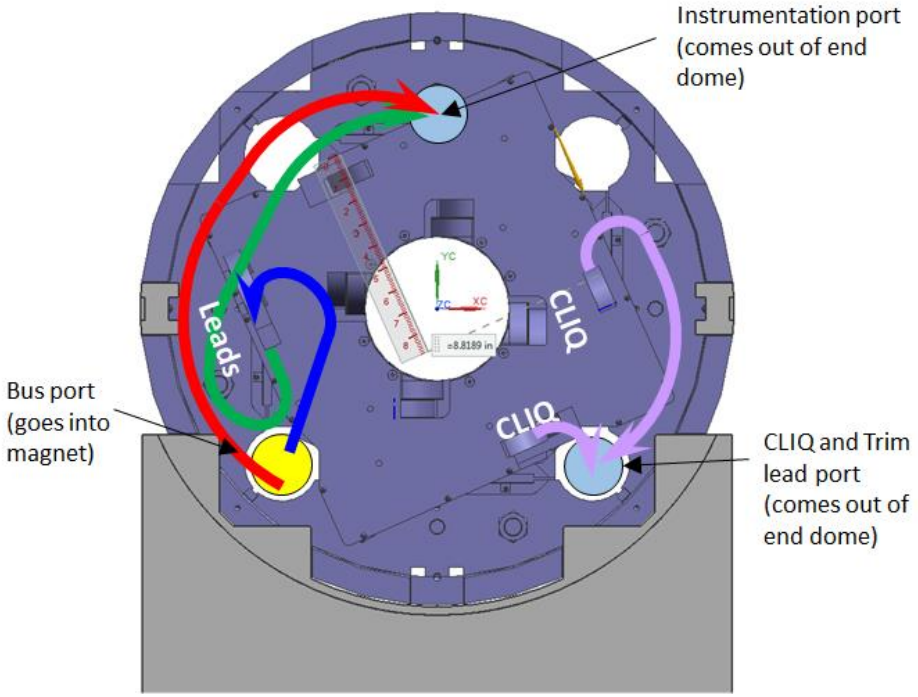


Expansion Loops End View

Q1a/Q3a



Q1b/Q3b



Key:

Green line power leads

Blue line local bus

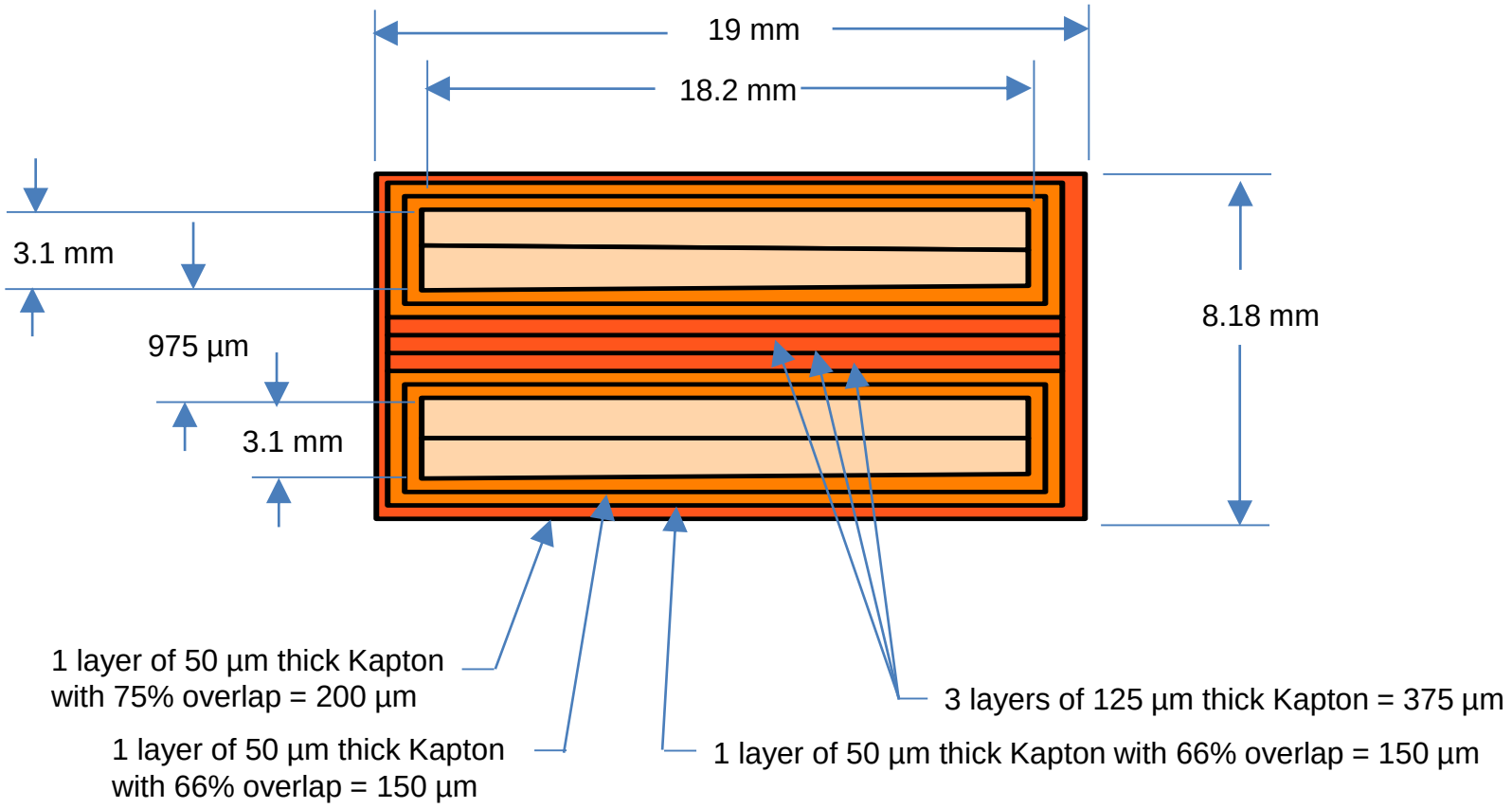
Red line through bus

Purple line CLIQ leads

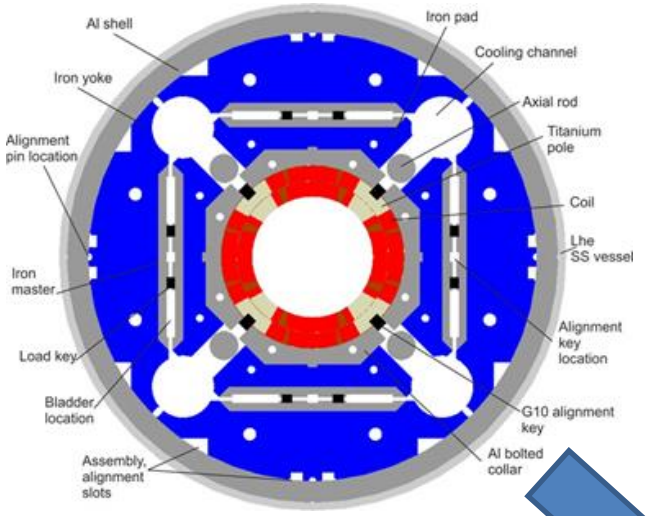
Black line trim leads

Q1b/Q3b is flipped vertically with respect to Q1a/Q3a

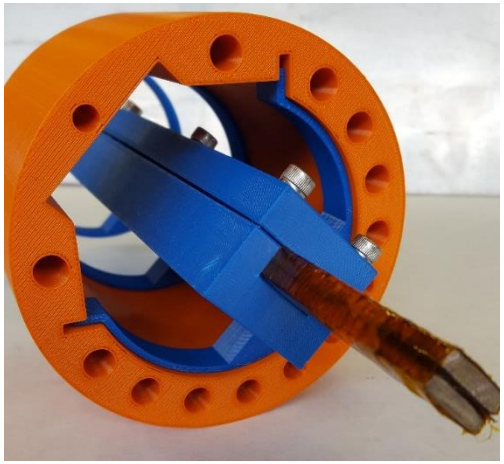
Internal Bus Bar details

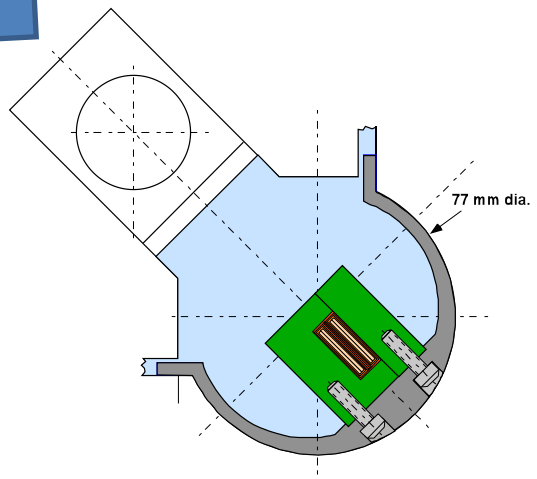


Through Bus Internal Assembly



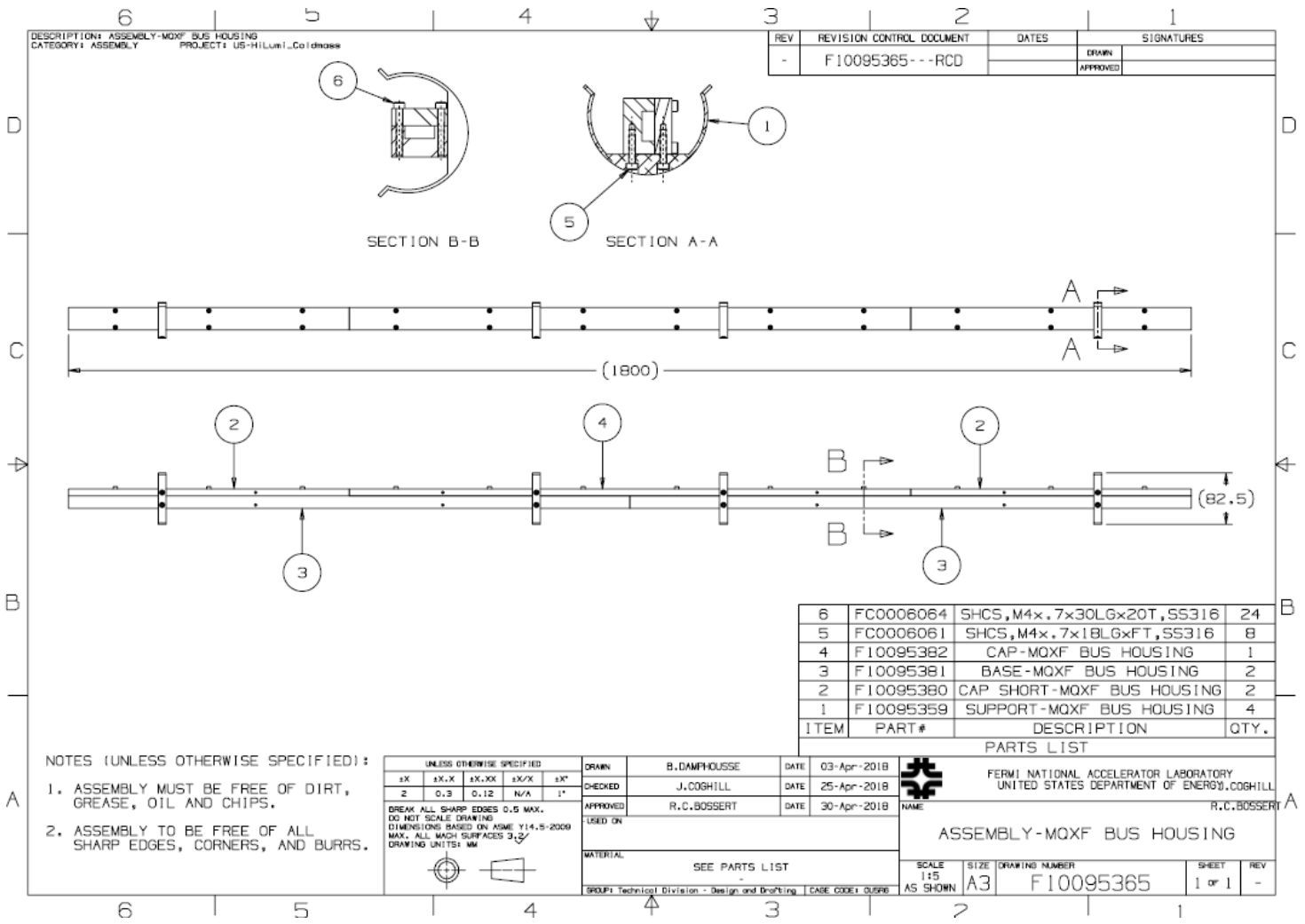
The current design is well within the maximum “budget” of 25.8 sq. cm. necessary to accommodate the total flow area required.





A through bus, using the first prototype bus and bus housing, will be installed in MQXFSM1 and used during the MQXFSM1e test.

Through Bus Housing

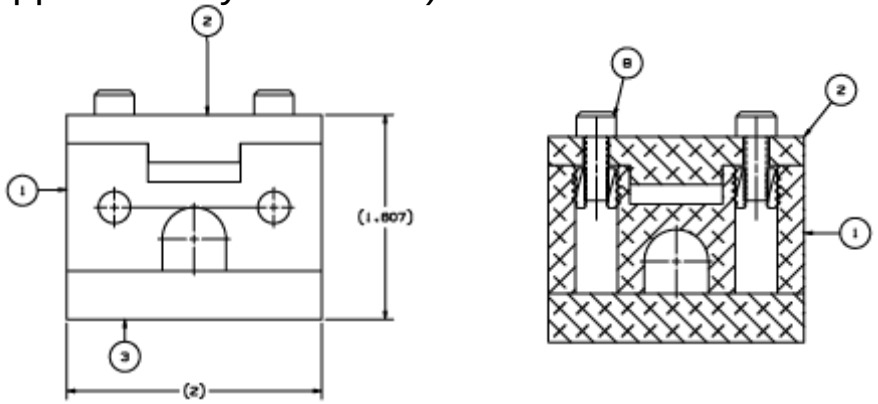


One complete housing with supports (2 meters long) has been ordered and will be used for the demonstration on MQXFS1e

Tooling – Bus Soldering Fixture

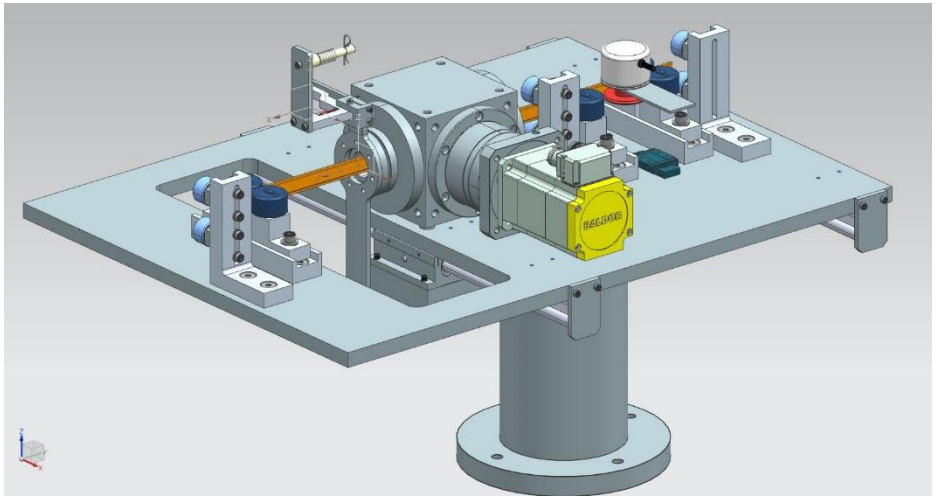
The fixture for soldering long busses is currently being manufactured. This fixture was previously used to solder the busses for the MQXB magnets.

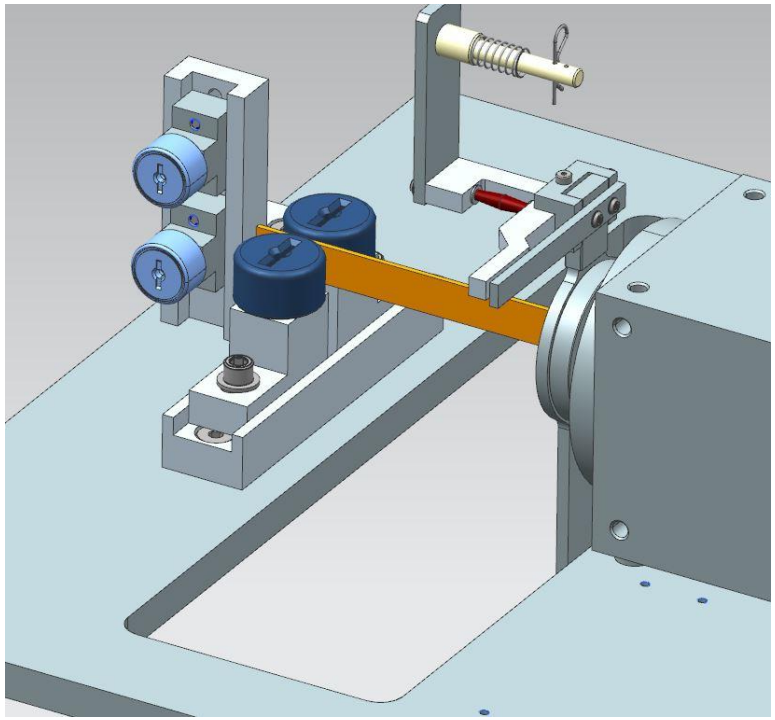
It will be suitable for the MQXF busses with some minor rework (machining the opening for the bus and lengthening the fixture from 8 meters to approximately 11 meters).



The reworked fixture will be used to make the bus for the demonstration on MQXFS1e

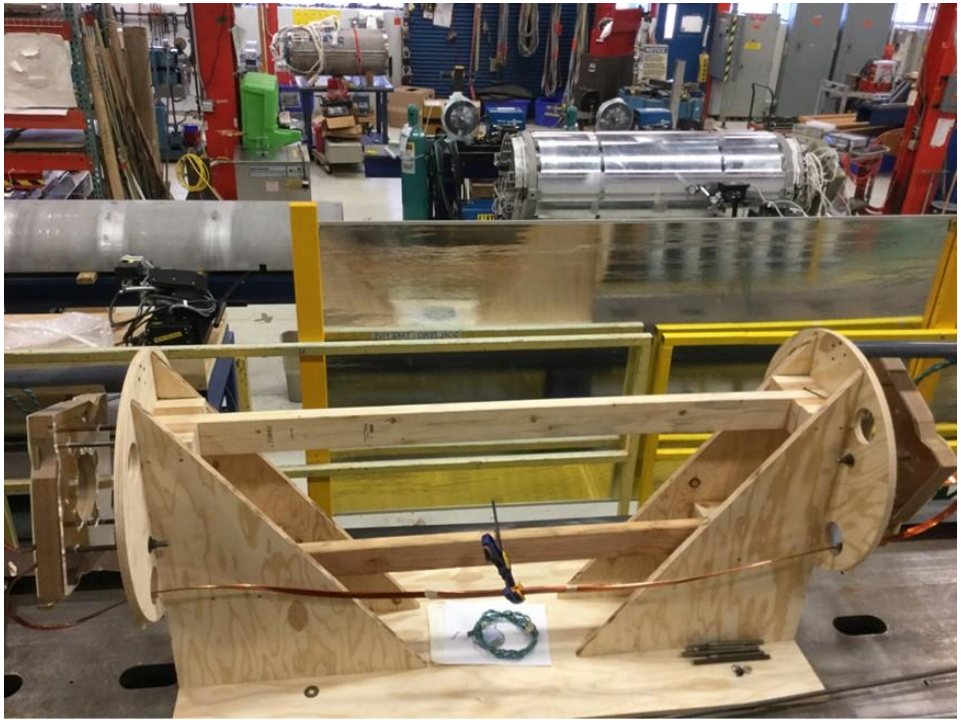
Tooling – Bus wrapping fixture



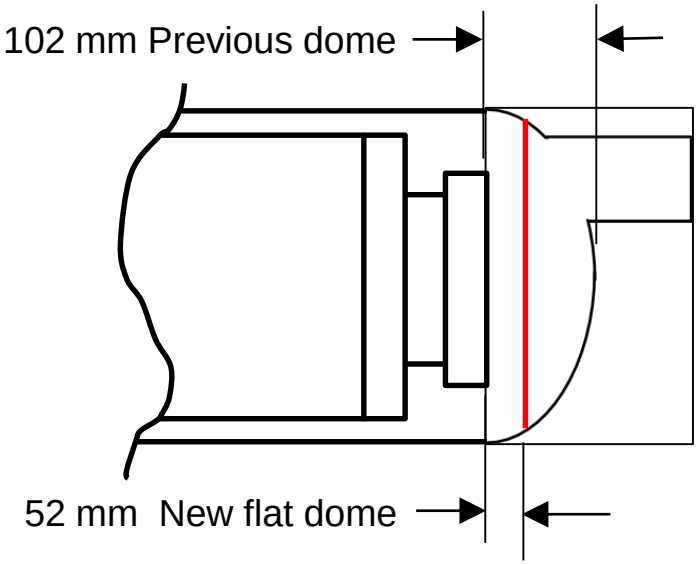


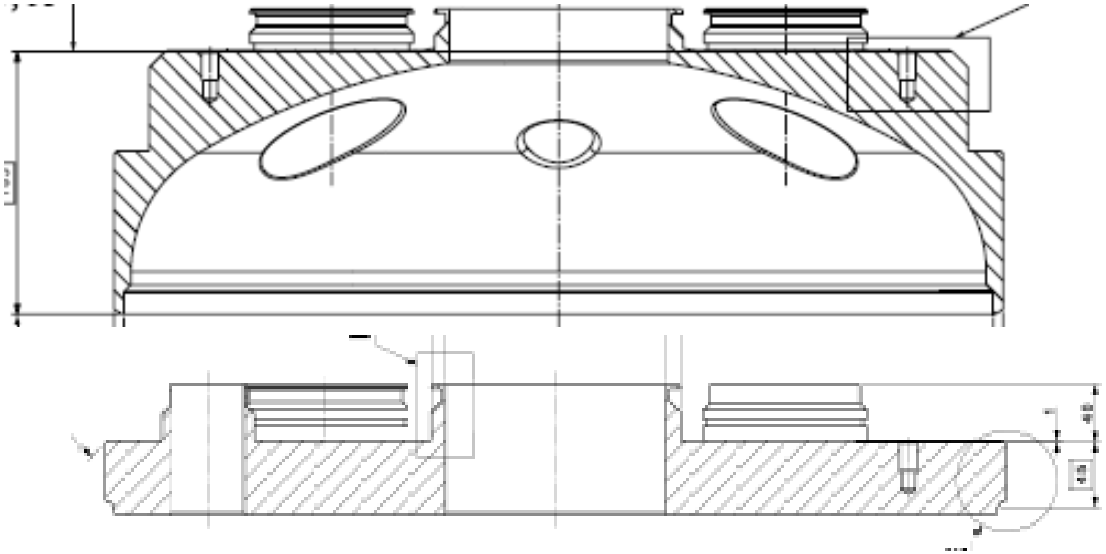
The “Iteration #1” version of the bus wrapping fixture has been completed. Complete busses have been wrapped at 2 meters long. The device is capable of wrapping busses of any length. This machine will be used to wrap the bus for the demonstrator to be used in MQXFS1e.

Interconnection Mockup



Space Inside Dome





- There was approximately 102 mm of space inside the dome between the splice housing (pizza box) and the farthest extent of the dome cover.
- The new flat dome has only about 52 mm (I believe) between the dome inside surface and the pizza box. This may be insufficient to allow the loops to expand adequately.

Needed to Finish Mockup and design

- Need to know current dome configuration (will assume it is consistent with LHCLMQXF_S0002 until we hear otherwise). It currently looks like there is only 52mm between the splice box (pizza box) and the flat interior of the end plate.
- Need to know exactly where the CLIQ leads and trim leads exit.
- Are there trim leads only on Q1a and Q3a? Or other magnets?
- Would like to obtain a piece of the actual CLIQ leads.
- I need to understand what all the longitudinal parameters are (magnet lengths, space inside of dome, length from magnet aluminum shell to dome, to splice box, etc, as well as the numbers for the Q2 magnets, so I can determine the lead lengths.
- Need to establish fixed points to determine how much expansion will be needed for the loops.

Summary

- Design of bus and bus housing is well underway.
- Initial prototype parts are designed and currently being manufactured.
- Tooling for the prototype bus soldering and wrapping is ready or almost ready to use.
- Interconnection mockup is lagging slightly behind schedule, but focus will shift to that work now.
- MQXFS1e will include a demonstrator bus.
- Still need to understand fixed points, busses for Q2 and how to support the bus inside the end dome.
- Still need mechanical, magnetic and thermal analysis of current bus and position (Maybe Heng Pan could help us with the thermal and magnetic analysis).
- New flat dome may not have enough space for expansion loops.