ATF2

Magnets

Report of the effort to cool an old FFTB solid wire sextupole

Cherrill Spencer, SLAC

Member of ATF2 Magnet Team

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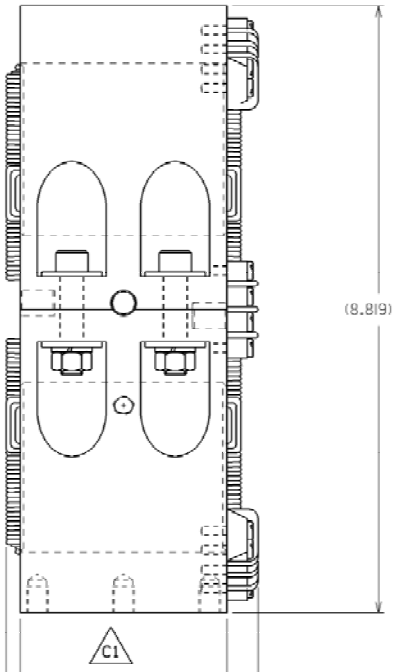
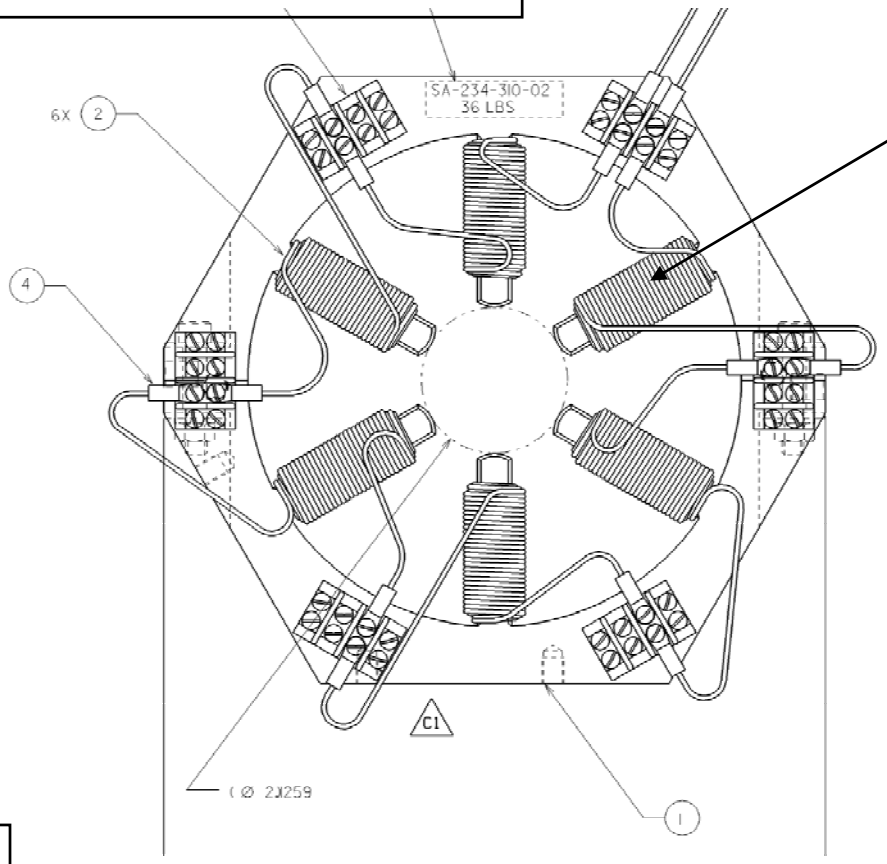
Old FFTB sextupole “2.13SX3.00” in use in ATF extraction line until it is re-configured for ATF2, then not needed there anymore. Are 2 of them!

Bore diameter: 2.1259” = 54mm





Solid steel core, 3” long = 76.2mm

#14 round solid wire coils, 3 layers, 87 turns total. Previously ran this sextupole at 8 amps and measured how hot they and rest of magnet got- see next slides.

From old mag mst estimate about 3.6A for SF1 and ~6.5 A for SD0 to reach required ∫S.dl

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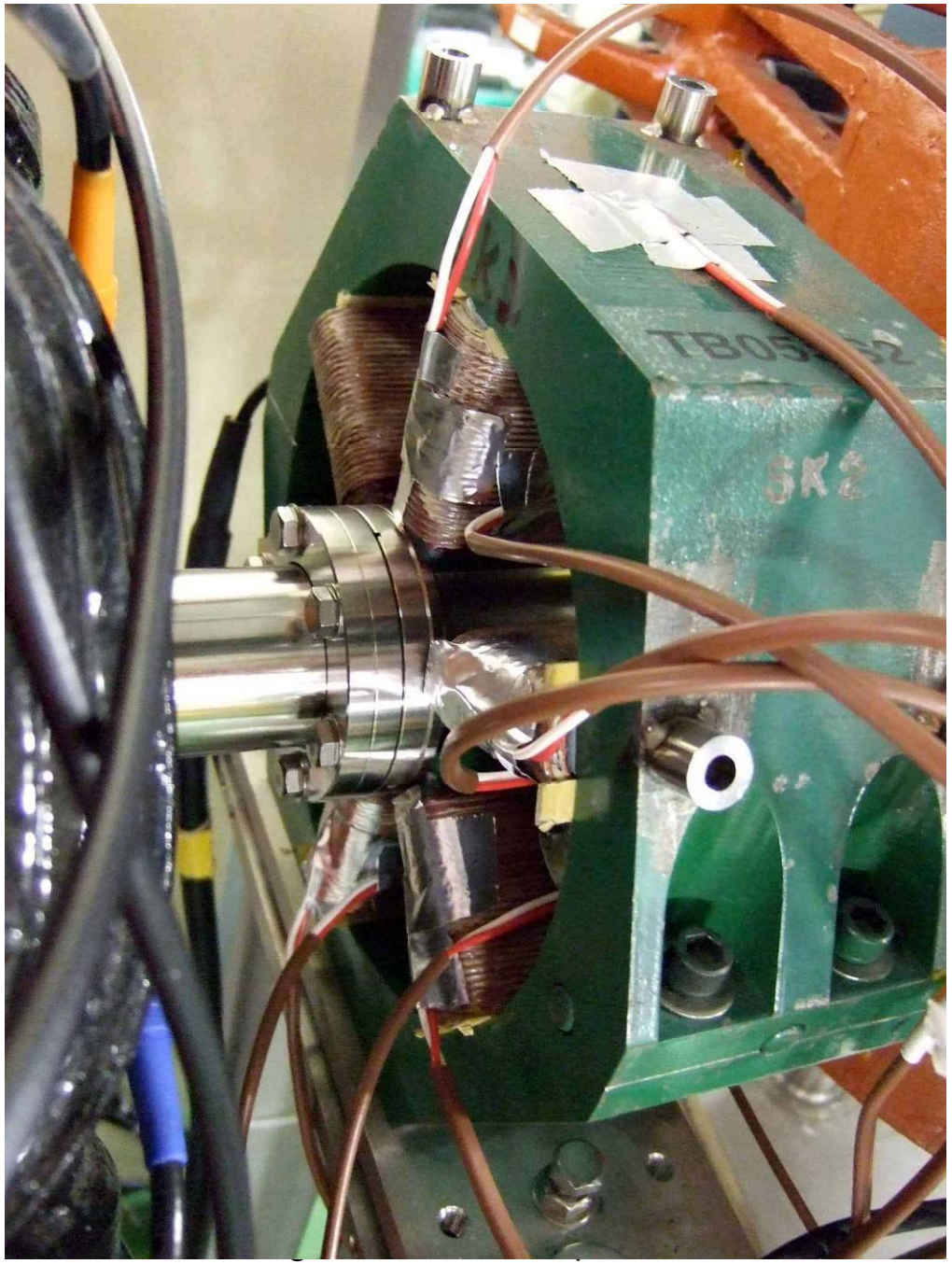
OLD FFTB solid wire sextupole with 2.13” bore diameter and 3.0” long steel core.

In the ATF extraction line at KEK.

With 10 thermocouples attached to various coils and top and bottom of core



Terunuma-san ran sextupole at 2,4,and 8 amps and measured temperatures in various places

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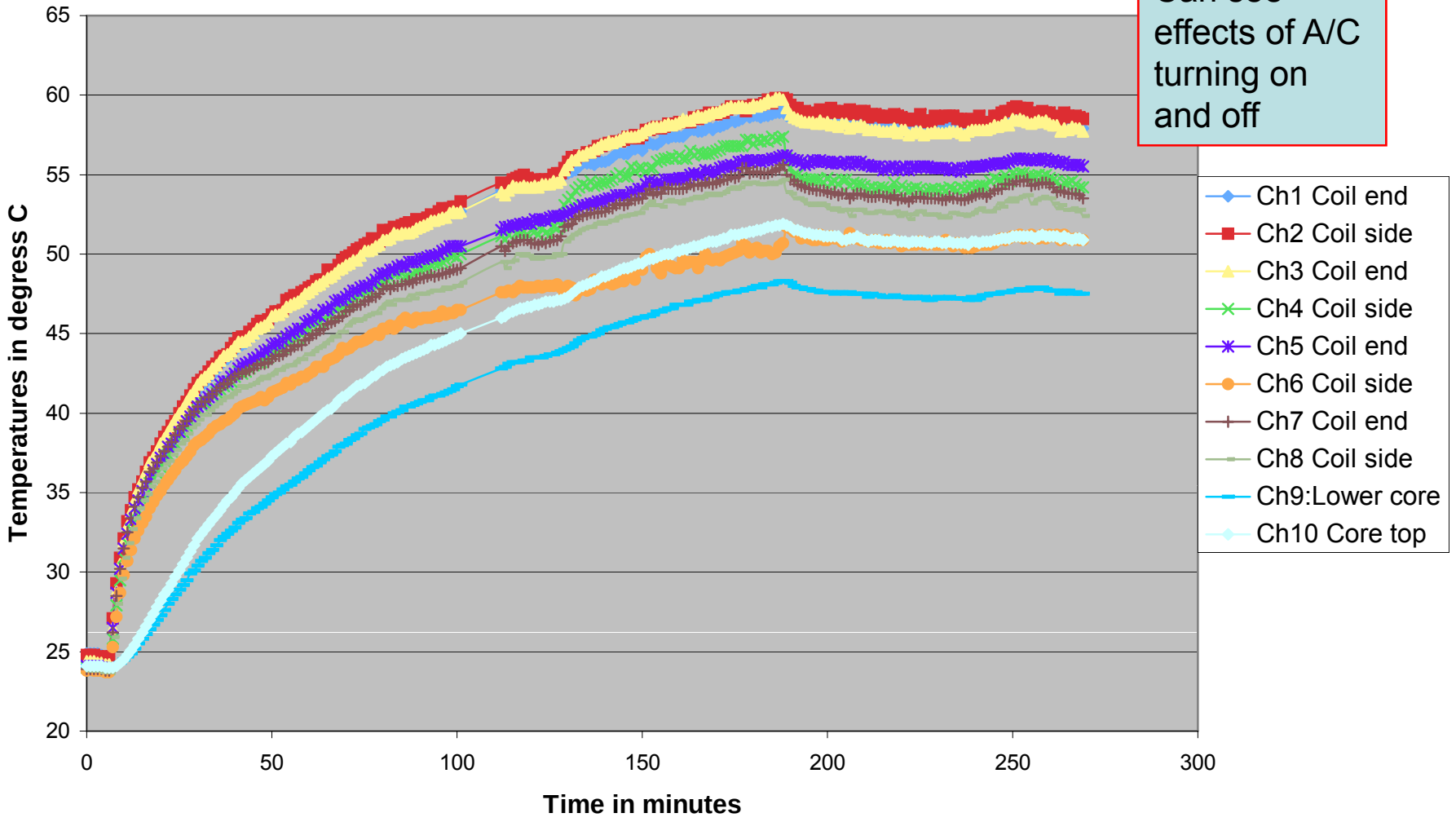
FFTB SOLID WIRE SEXTUPOLE RUNNING at 8AMPS: temperatures in 10 places

Can see effects of A/C turning on and off



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Preliminary conclusions on using these sextupoles for ATF2 SD0&SF1

- Can run them to get required strength without heating coils too much from epoxy point of view
- But too long a time to come to constant temp and too large a temperature rise for FD usage
- Decided to find 4th sextupole still at SLAC and design some cooling tubes to run LCW over the coils
- Harmonics (measured in 1993) satisfy requirements

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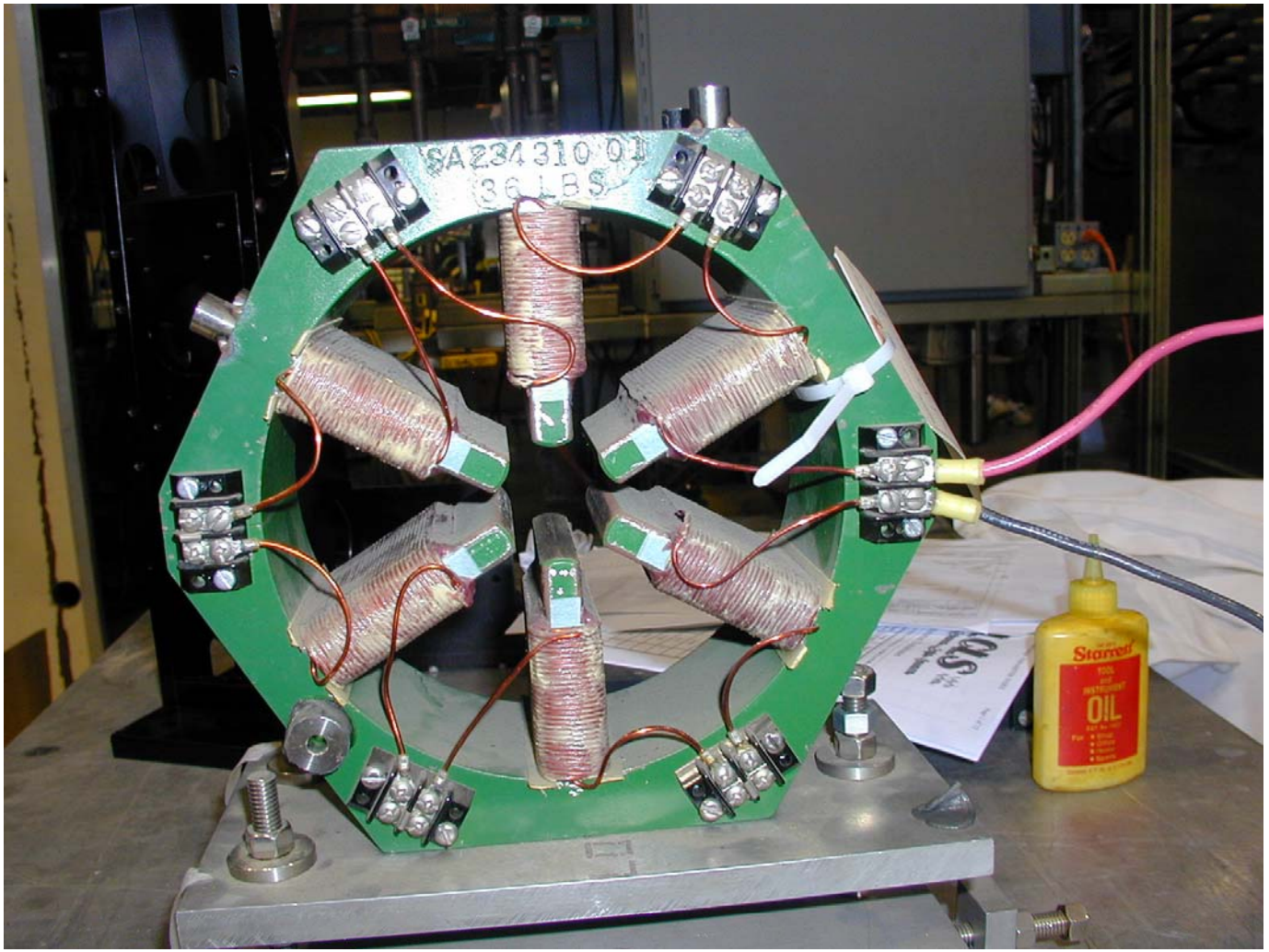
Old FFTB sextupole- lots of space to put refrigerator tubing around coils



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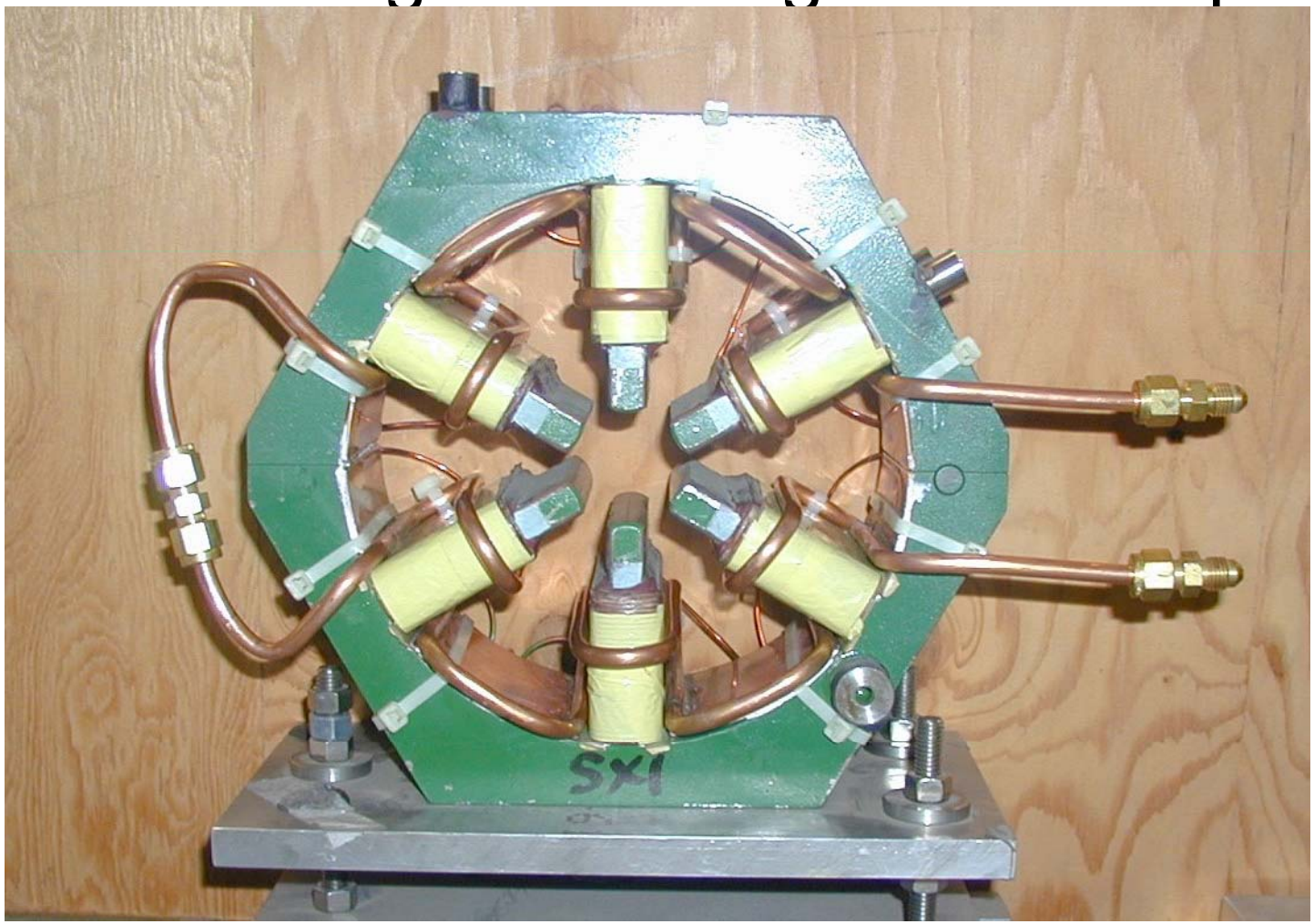
Old FFTB sextupole with custom designed cooling tubes and plates



The cooling circuit is one assembly and it all slides into the magnet from one side.

The circuit can be split into 2 separate parts when the magnet is split.

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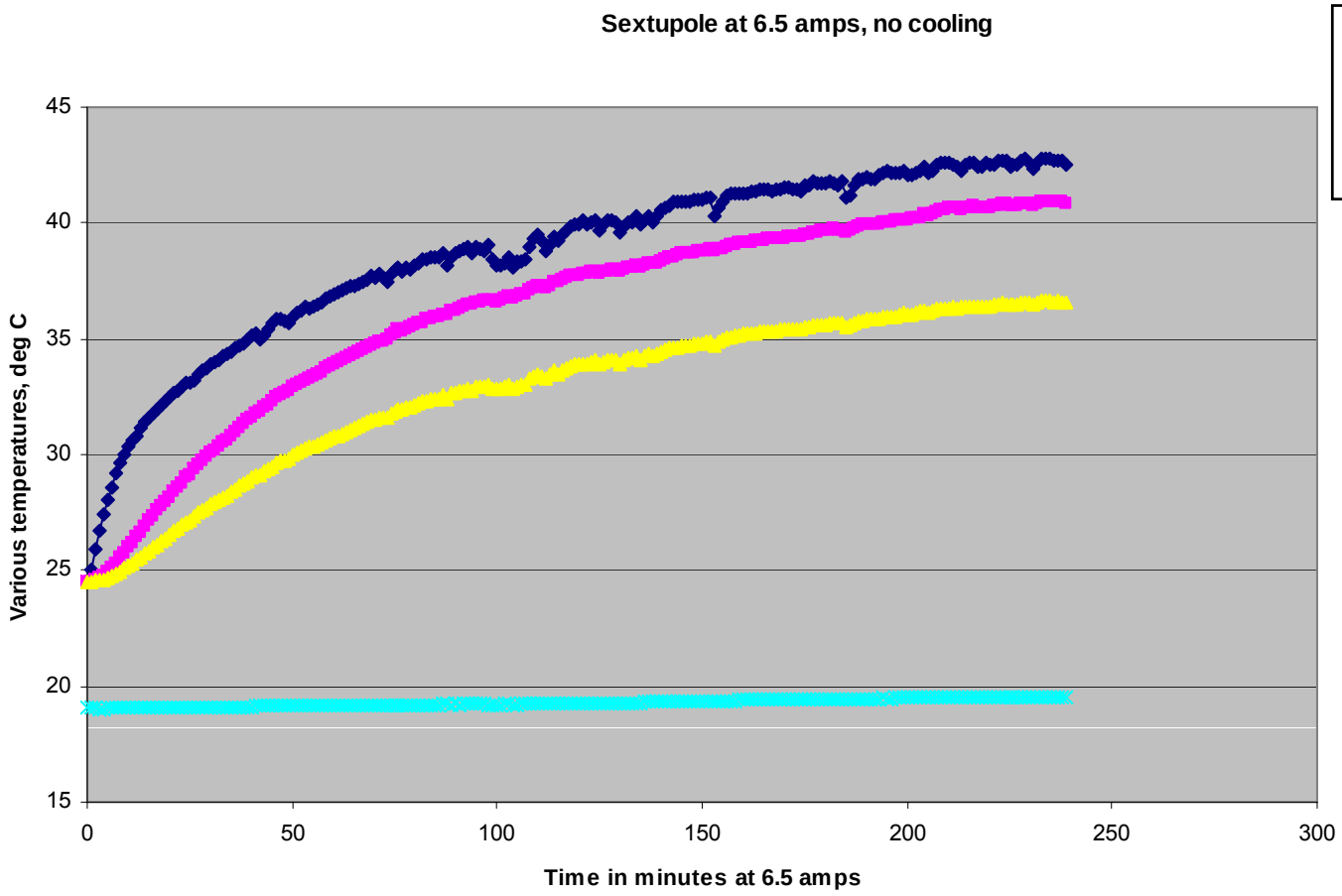
Old FFTB sextupole running at 6.5 amps



Coil temp increases by ~ 18°C

Need to minimize flow of heat from coils to magnet stand

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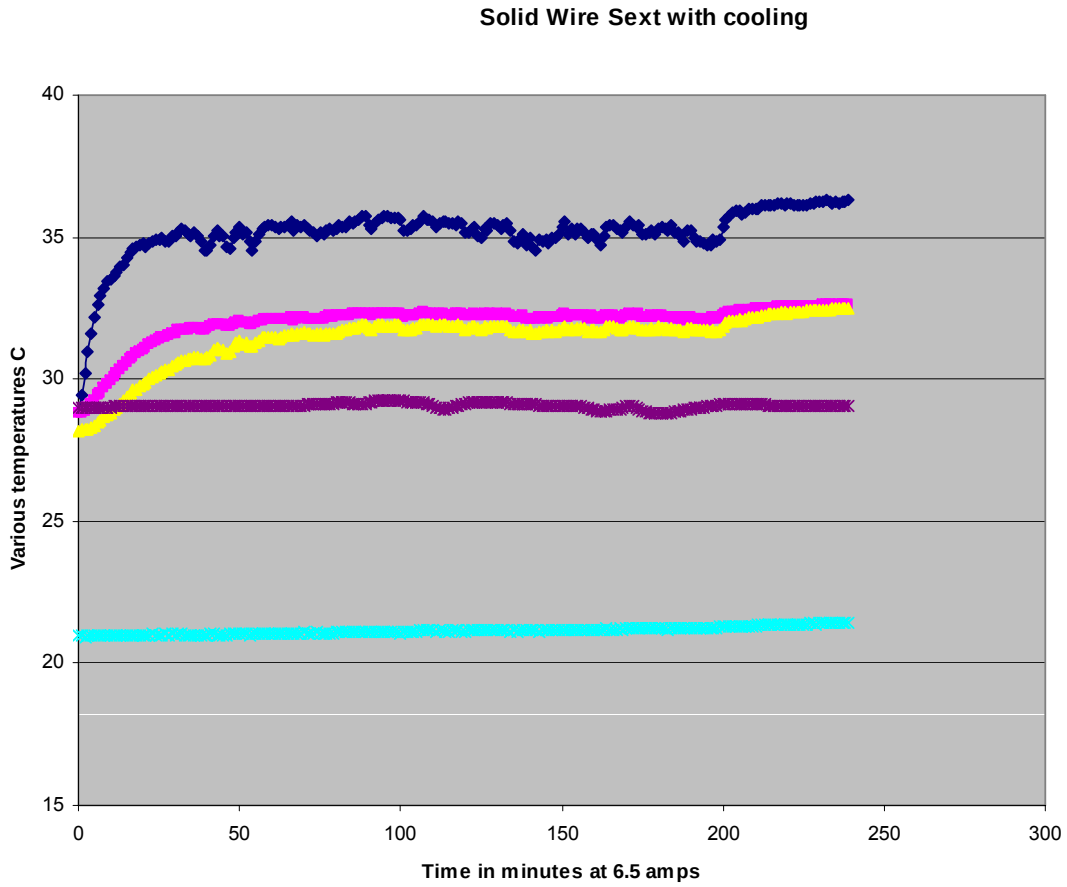
Have loops of copper tubing pressed onto coil surfaces & copper sheets on inside of outer core ring. ~ 1gpm LCW passing thro' loops



Running at 6.5amps, magnet stand under magnet increases temp by ~3° C while coil increases by ~7° C

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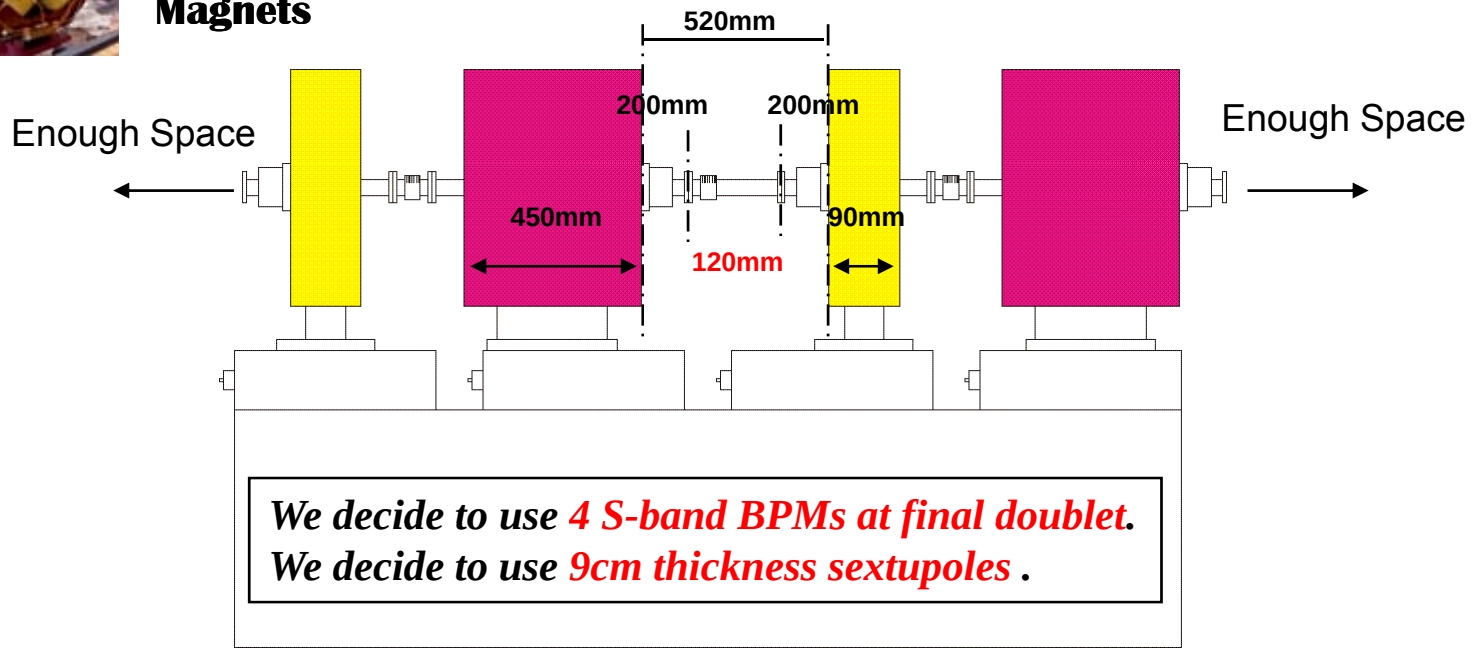
Is this cool enough for the FD sextupoles, SD0 and SF1?

- Only SD0 will run at 6.5 amps, only heat source
- Adjacent QD0 is water cooled and its coils' temperature will increase by 1.77°C to 2.1 °C, depending on the water pressure. The magnet core will warm up too.
- SD0 magnet stand temperature increase is ~3°C with water cooling loops
- Is this a small enough temperature rise from a magnet position stability point of view for a magnet in the final doublet region?
- What effect might a temperature rise have on the BPM?
- Thermal equilibrium will be reached in about 50 minutes

ATF2 Around Final Doublet – Monitor Configuration

Magnets



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To remind us of how close the magnets are on the FD table.

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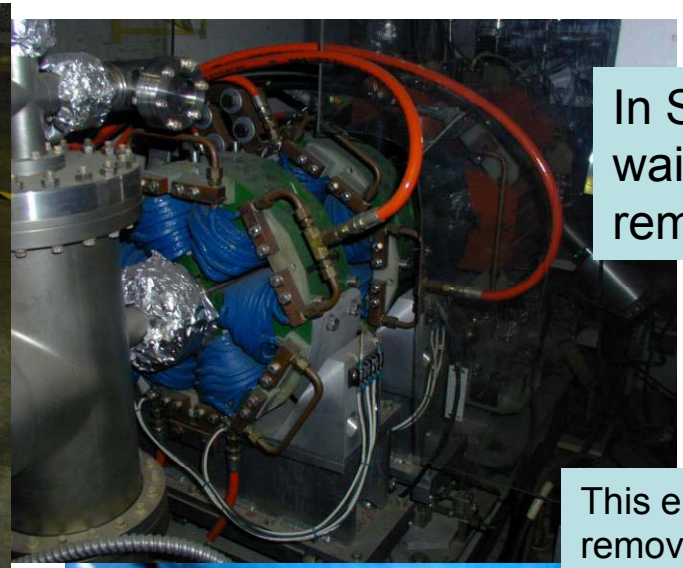
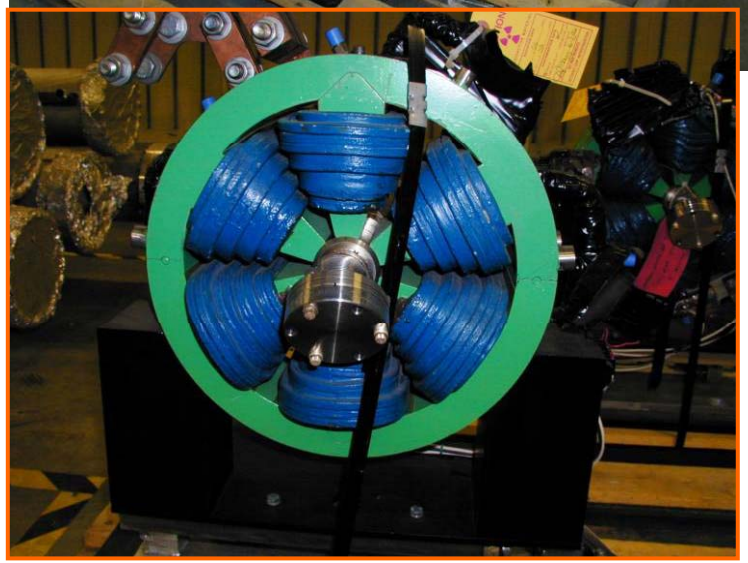
Photos of the SLC "SX3" style sextupoles we will be using for ATF2 FF sextupoles

In Magnet Shop on supports that might be modified



In SLC FF- waiting to be removed



This epoxy will be removed

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Comments on ATF2 usage of the 1.625SX3.53 sextupoles

- The 3 magnets for the FF sextupoles do not need any modification.
- A special adaptor will be used to match the BPM to the sextupole's end

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Future tasks to prepare the ATF2 sextupoles: will take rest of 2007

- Refurbish 3 water-cooled sextupoles from SLC
- Magnetically measure one of them to check its low current behavior and harmonic content
- Design and fabricate special cradles for holding sextupoles – must be finely adjustable in roll
- Design and fabricate special fixtures for holding some alignment target on top of magnet- discussions needed to find suitable alignment process and equipment
- Magnetically measure all 3 sextupoles after modifications and refurbishment