



U.S. MAGNET  
DEVELOPMENT  
PROGRAM

# Nb<sub>3</sub>Sn Magnets: 15 T Cos-Theta Dipole Status

MDP meeting, May 17, 2017

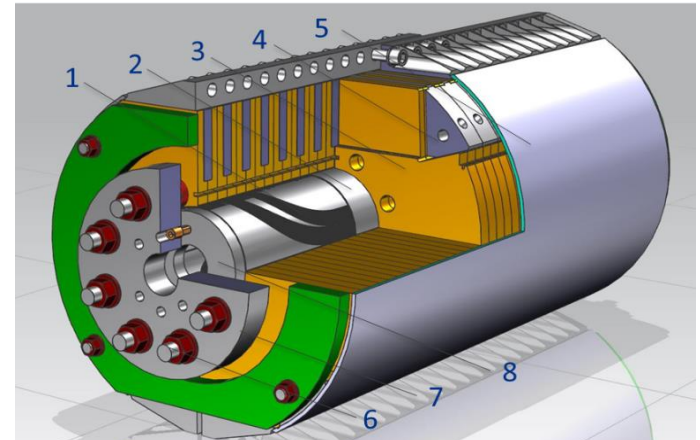
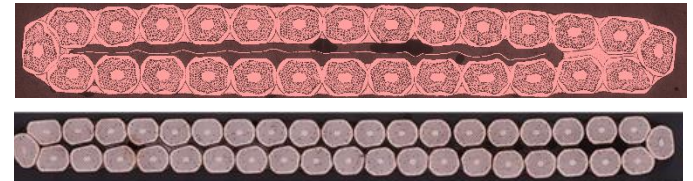
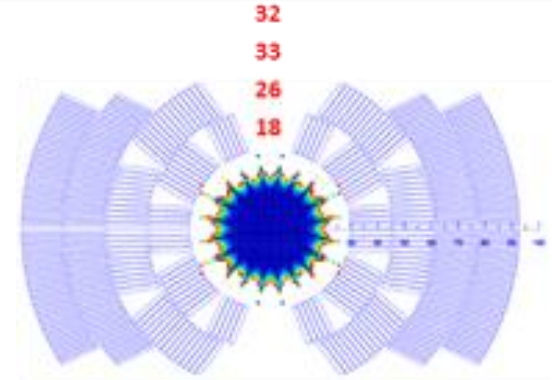
**Alexander Zlobin**

US Magnet Development Program  
Fermi National Accelerator Laboratory



# Cos-theta 15 T Dipole design

- Coil:
  - 60-mm aperture
  - 4-layer graded coil
  - $W_{sc} = 68$  kg/m/aperture
- Cable:
  - L1-L2: 28 strands, 1 mm RRP150/169
  - L3-L4: 40 strands, 0.7 mm RRP108/127
  - Insulation: E-glass tape
- Mechanical structure:
  - Thin StSt coil-yoke spacer
  - Vertically split iron laminations
  - Aluminum I-clamps
  - 12-mm thick StSt skin
  - thick end plates and StSt rods
  - Cold mass OD < 610 mm (VMTF Dewar limit)

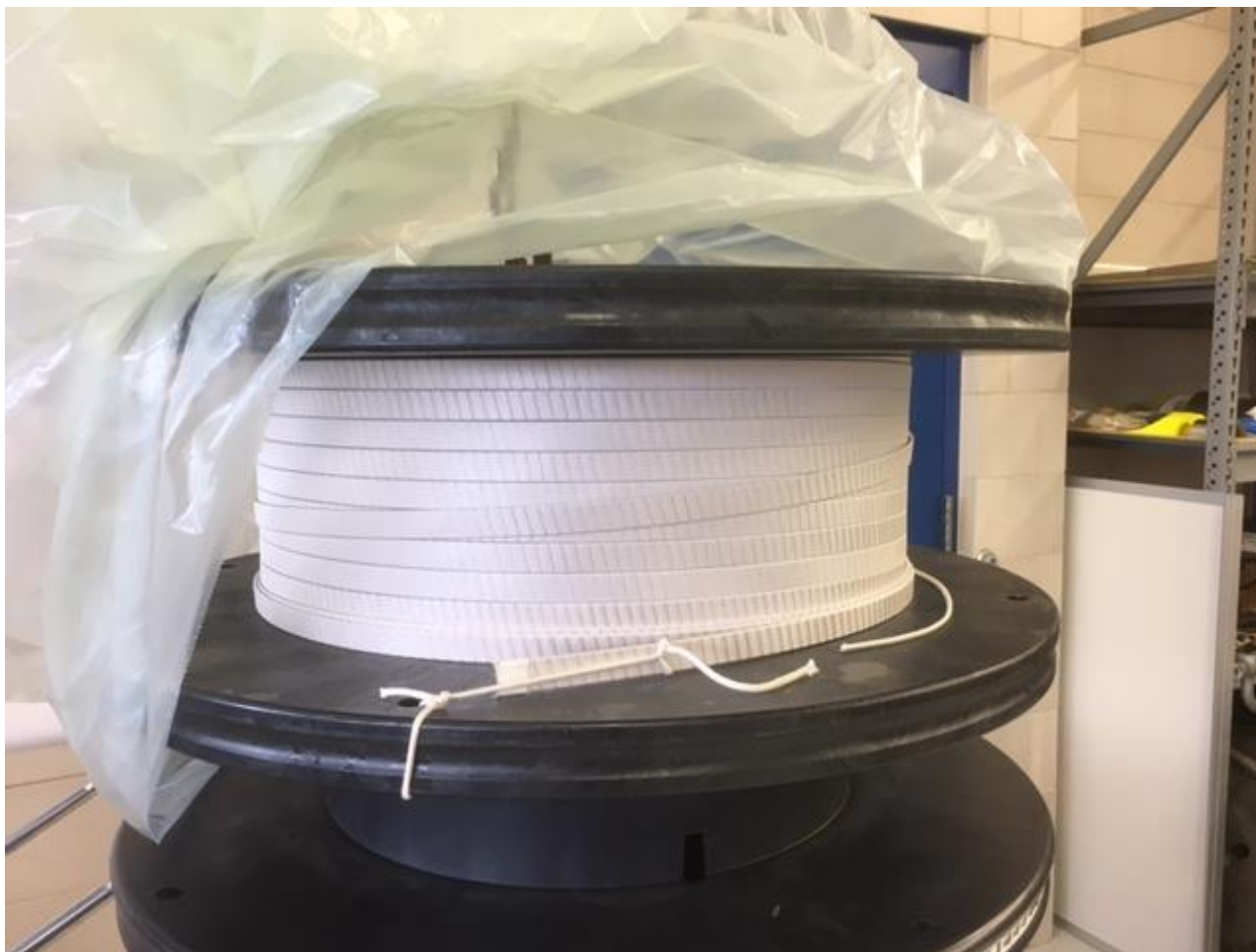






# 15 T dipole status: cable

Fabrication and insulation of 350 m of the 40-strand cable.





## L1-2 parts procurement at CERN

RE: Delivery dates of the parts



Daniel Schoerling

Today, 5:01 AM

Alexander Zlobin; Igor Novitski

👍 Reply all | ▾

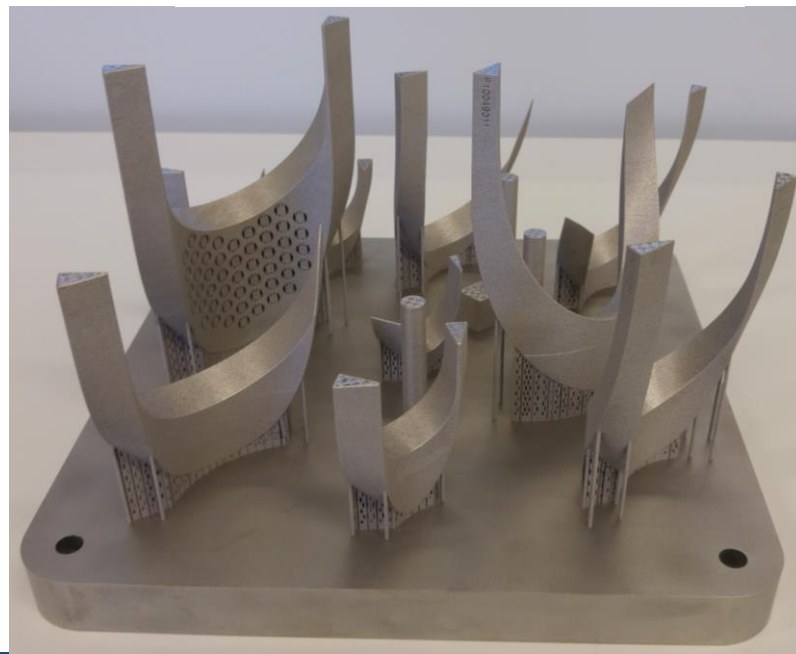


Dear Sasha,

As anticipated before I send you below an update of the delivery dates of the parts. You will see that there is a small issue with the pole production. They postponed several times the delivery of the pre-series and have now confirmed that they want to deliver next week the pre-series. I will discuss with them, once they delivered the pre-series to accelerate the production for the series.

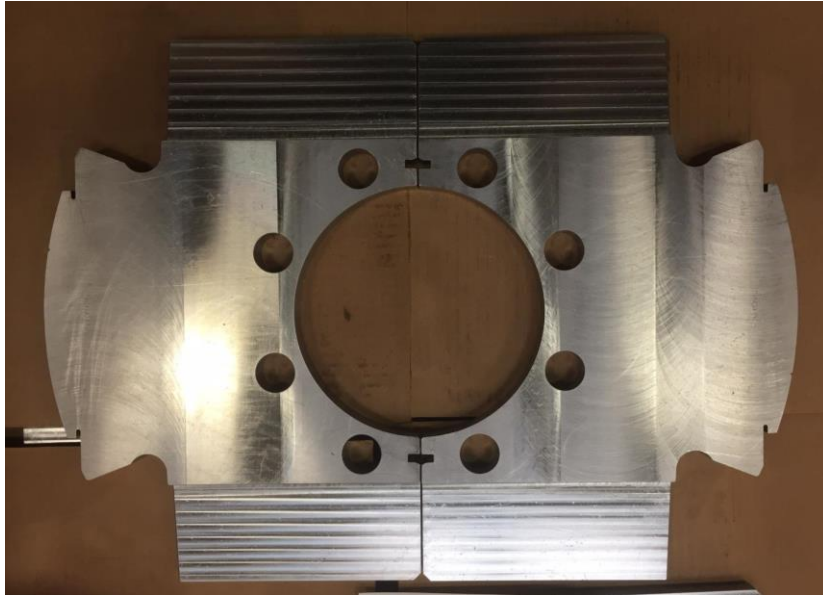
Best regards,  
Daniel

	Pre-series	Series (availability at CERN)
Saddle	20 March 2017 (all parts accepted, except part 54822)	Parts will be produced until 30/05/2017, company will also do QC, for-crosschecking some parts will be already QC before that date at CERN
Pole	19 May 2017	
Wedge Ti	No pre-series	30/05/2017 (+2 weeks for measurement at CERN)
Wedge Discup	No pre-series	30/05/2017 (+2 weeks for measurement at CERN)
End spacers	-First set of end spacers (non-conform) shipped (arrival at FNAL ~15/03/2017) -Second set measured and accepted (27/03/2017)	All parts are produced, some will be measured (9 parts), ~3 weeks for measurements





# Procurement: FNAL/LBNL



## Procurement at FNAL

- skin contact tooling
- L1/2 curing tooling
- reaction retort (new quote)
- iron laminations
  - 24 lams in QC
- 1/2" 316LN shell
- Al dummy coils for MM
- L4 Cu trace received



## Procurement at LBNL

- L4 SS traces
  - traces for 1<sup>st</sup> L3-4 coil received





# L3-4 coil #1 winding/curing



Outer coil (L3) curing

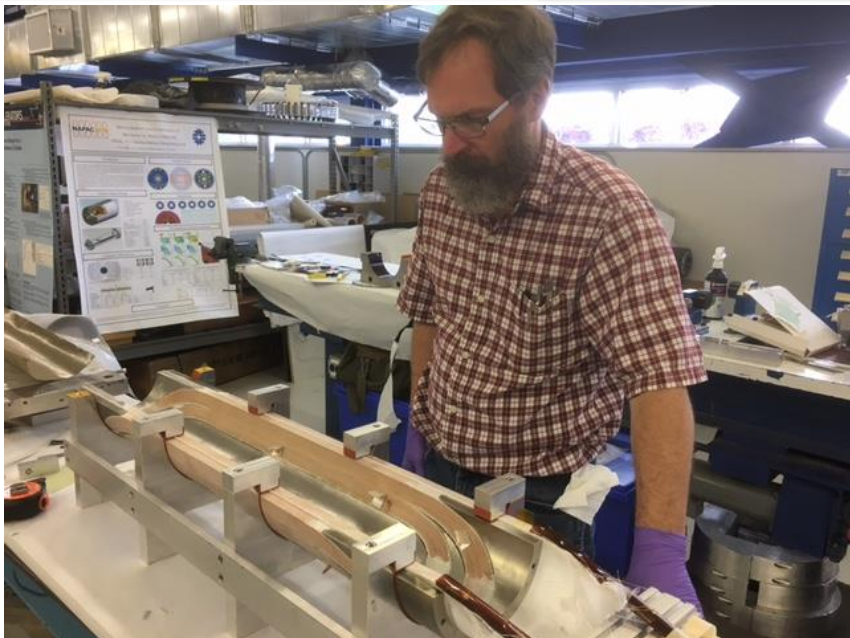


Outer coil (L4) winding





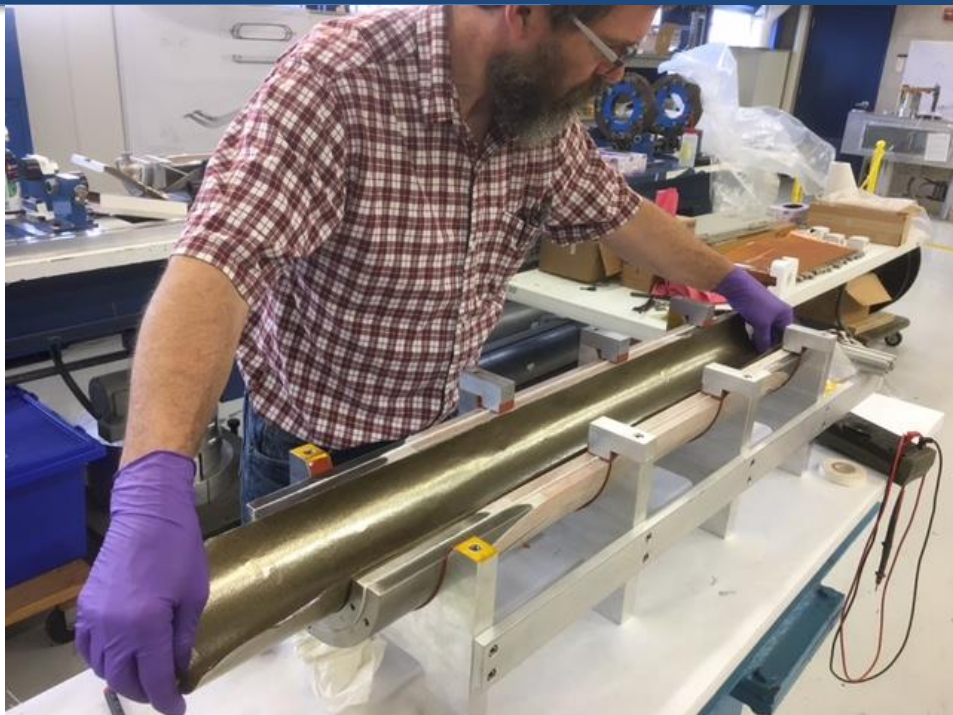
# Preparation to impregnation







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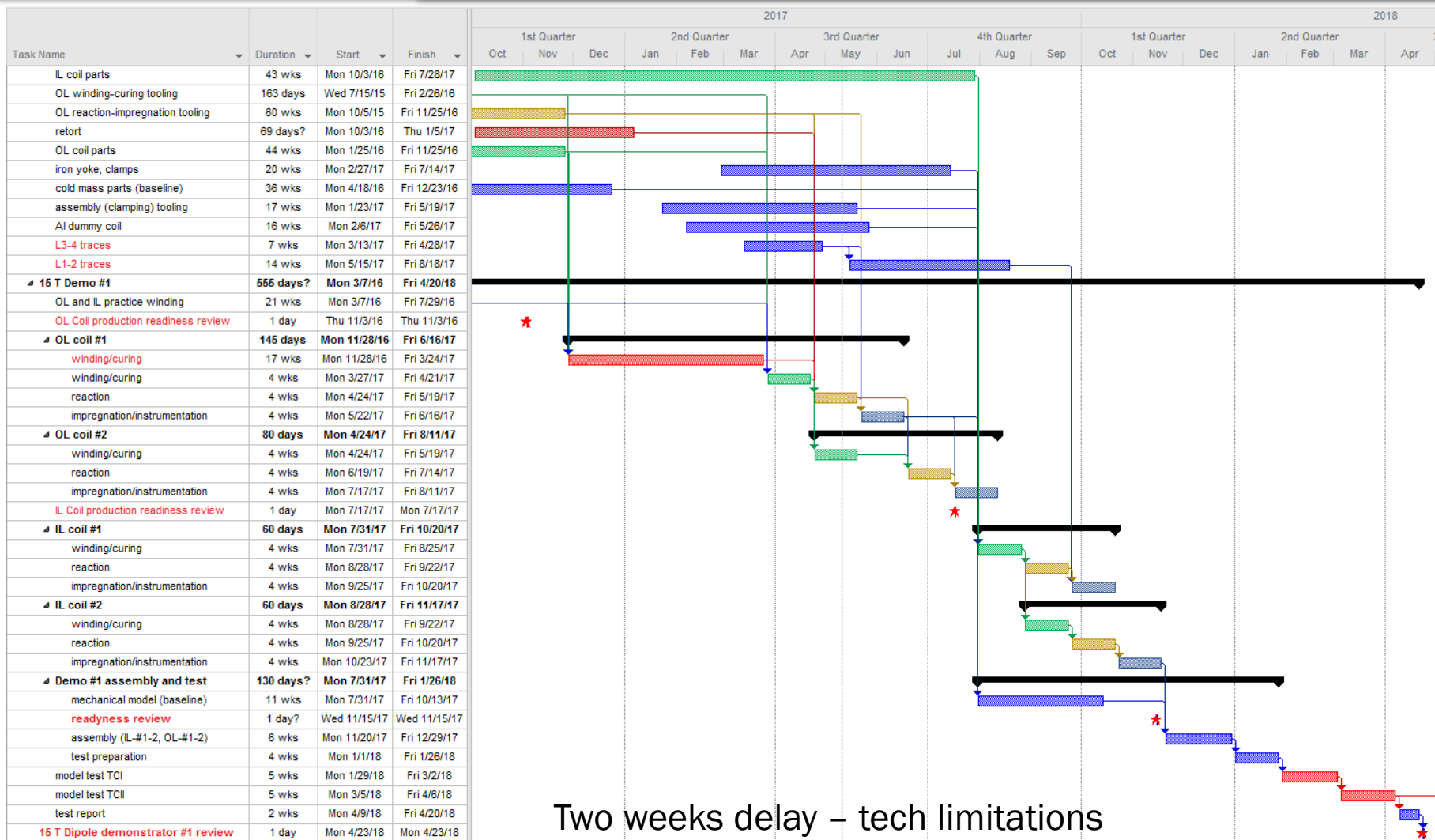
# Preparation to L3-4 coil #2 winding



- Interlayer insulation



# 15 T dipole schedule

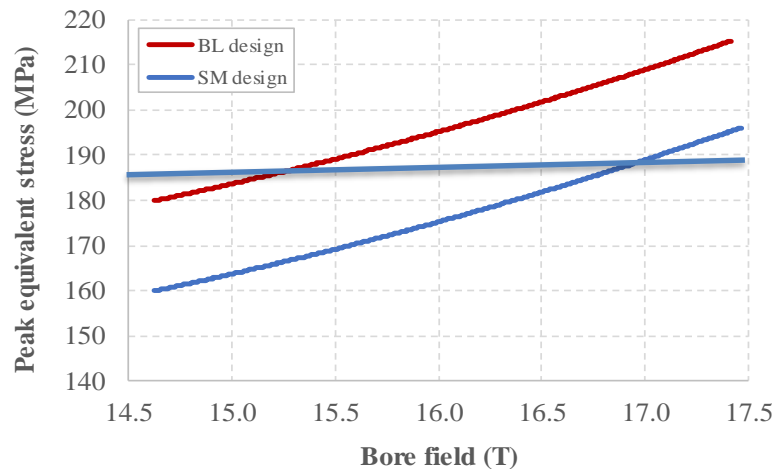
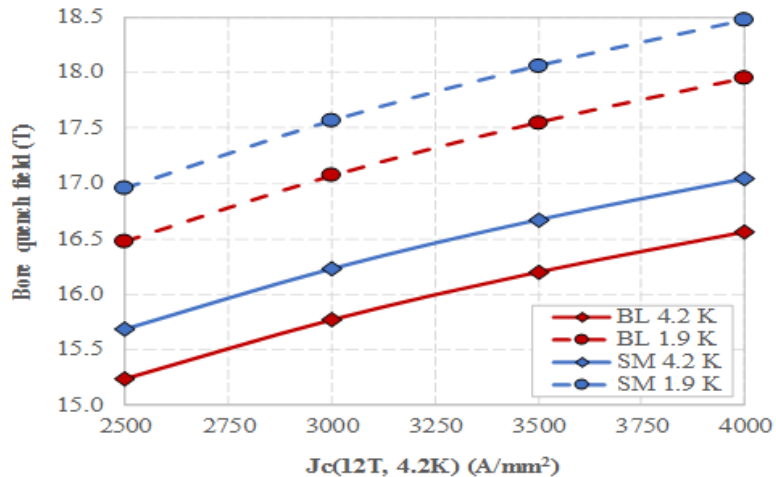
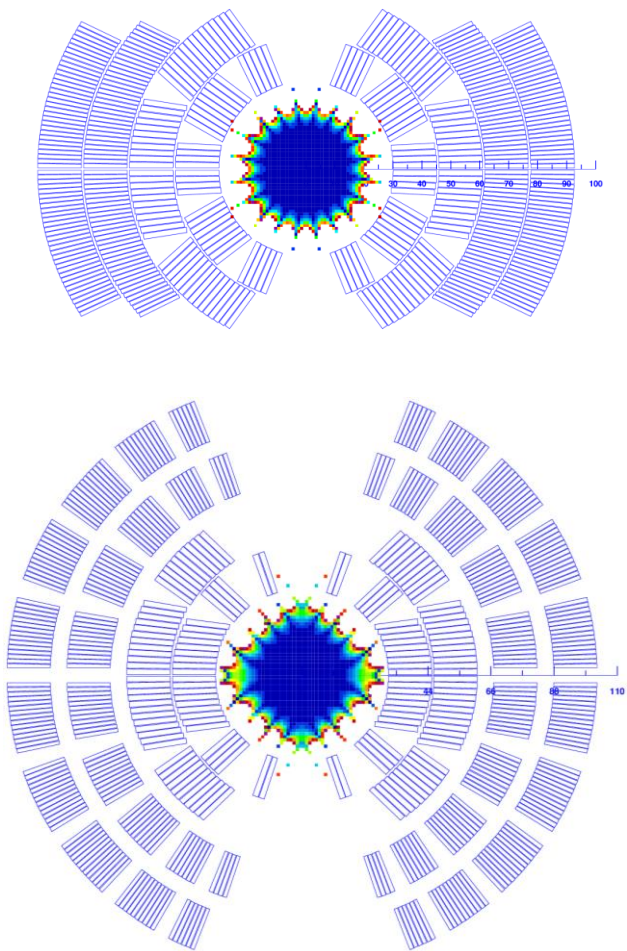


Two weeks delay – tech limitations





# Design studies: 17 T dipole with SM



- Paper and poster at IPAC2017