

“Octupole magnets design for ATF”

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“LCWS14, 6-10 October 2014 Belgrade

Referring to the contribution presented last year at LCWS13 in Tokyo...

Status of magnets studies for ATF

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Acknowledgments:

CERN CLIC Magnets Study Team: A. Aloev, A. Bartalesi, E. Solodko, P. Thonet, A. Vorozhtsov

International Workshop on Future Linear Colliders

LCWS13

11-15 November 2013, The University of Tokyo

OCTUPOLES for ATF

We were recently asked for a possible contribution to future ATF program with 2 octupole magnets, (R. Tomas: private communication, July 2013).

The required field quality is not yet fully defined, magnets is asked to be “very good” from that point of view and field quality will be specified at a 20 mm radius.

PARAMETER	UNITS	VALUE
Nominal Gradient,	T/m ³	5284
Required tunability	%	-75, +20
Integrated gradient	T/m ²	560
Aperture radius	mm	50
Iron length	m	0.100
Magnetic length	m	0.106
Coil number of turns		61
Conductor size	mm x mm	5 x 5
Ampere-turns	A	1200
Current	A	19.7
Resistance (per coil)	mΩ	14
Conductor length (per coil)	m	19.9
Conductor mass (per coil)	kg	4.5
Yoke mass	kg	56
Total mass	kg	92

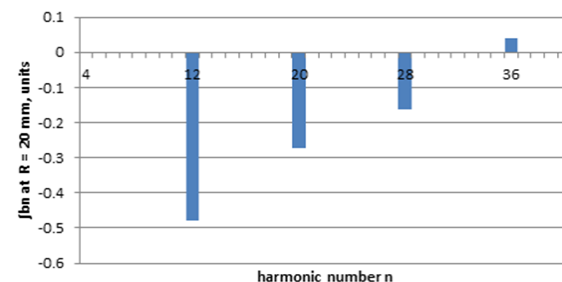
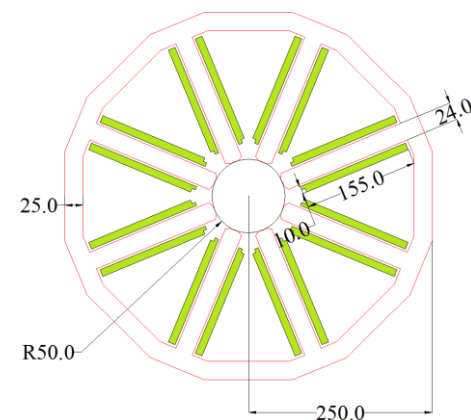
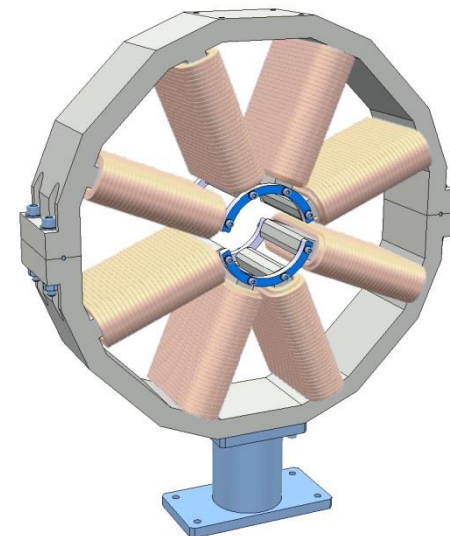
With the available parameters we have developed a conceptual magnetic design, focusing on these aspects:

➤ To get the best field quality the number of yokes part is a minimum (possibly two half-yokes).

➤ The magnet aperture will be relatively big for the following reasons:

- To avoid working with too low saturation (at -75% working point)
- To be able to insert the coils in the two half-yokes
- To improve the field quality at 20 mm radius.

➤ The outer radius is big in order to design coils with low current density.



- *In May 2014 The new proposal for the CERN-ATF2 collaboration was released...*

CERN-ATF2 midterm collaboration

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Abstract

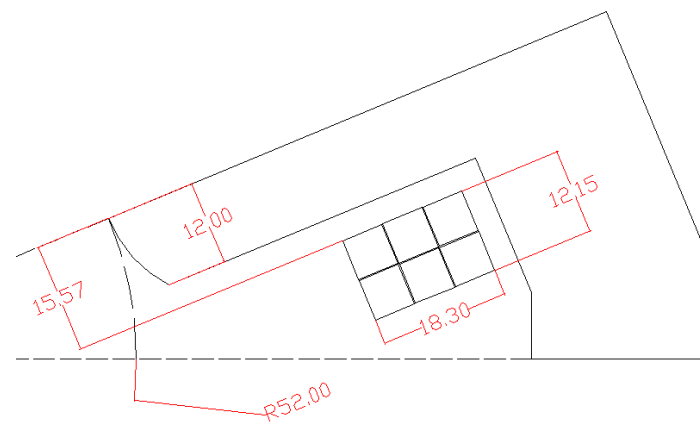
This report describes the CERN R&D midterm projects in ATF and ATF2 in the framework of an increased collaboration between KEK and CERN. Direct contributions from CERN to the operational budget of ATF are considered.

PACS numbers:

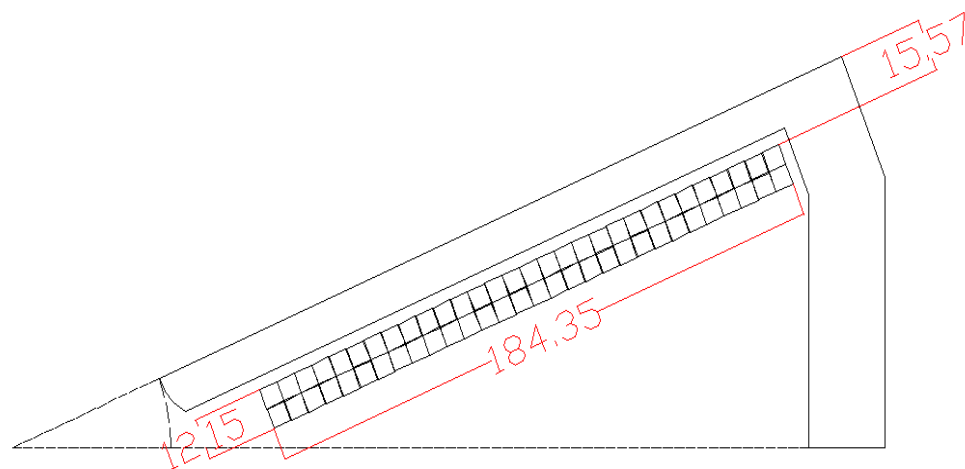
... and in August 2014 the ATF Technical Board has officially approved the proposal to procure and install the 2 octupoles.

- So we are now start the design finalization of the Octupoles that in the mid time has changed optical requirements:
 - The 2013 requirement foreseen two identical octupoles with nominal gradient of **5284 T/m³**
 - The 2014 final version specifies two different requirements:
 - OCTU1 with a nominal gradient of **708 T/m³**
 - OCTU2 with a nominal gradient of **6820 T/m³**

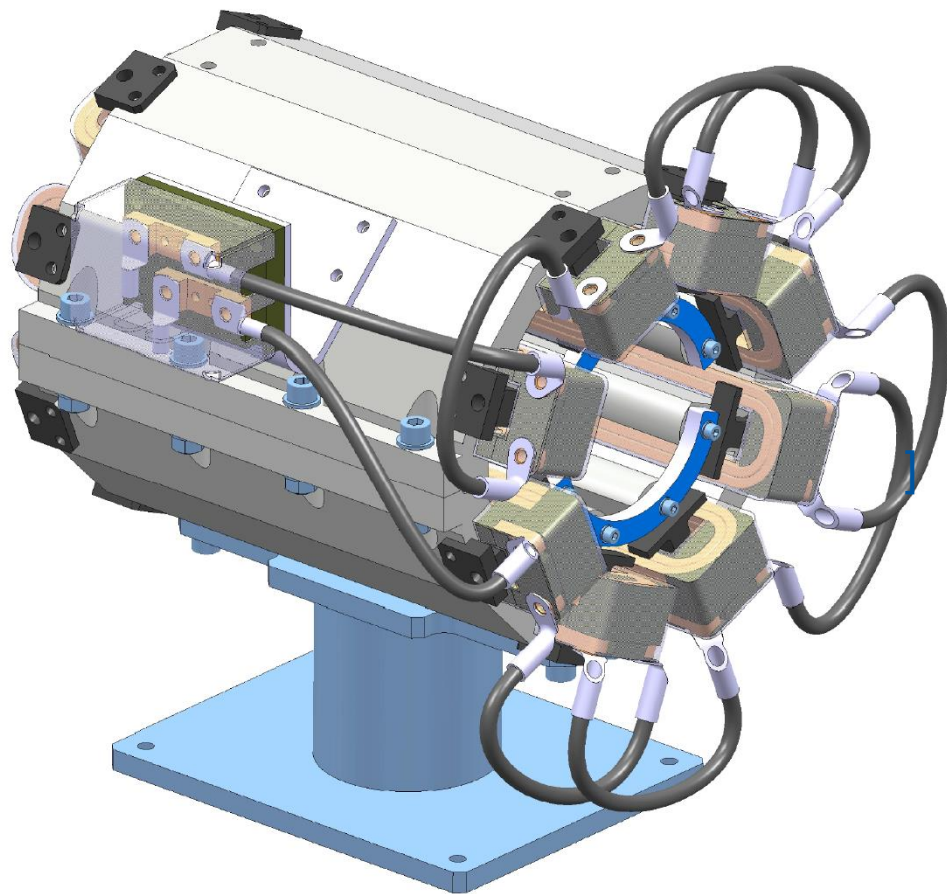
	OCTU1	OCTU2
Integrated gradient [T/m ²]	177*120%	1705*120%
Gradient [T/m ³]	708	6820
Tunability [%]	-90/+20	90/+20
Magnetic length [mm]	300	300
Aperture radius [mm]	52	52
Ampere-turns [A] (per coil)	180	1800
Number or turns (per coil)	6	60
Current [A]	30	30
Voltage [V]	0.51	5.1
Max Current density [A/mm ²]	0.9	0.9
Max. Power [W]	15.2	152
Min/Max Pole field [Gauss]	13/166	134/1600
Resistance [mOhm]	17	170
Conductor length [m]	35	350
Conductor mass [kg]	11	110
Total magnet mass [kg]	78	320
Max. magnet length [mm]	360	360
Max. outer radius [mm]	135	300



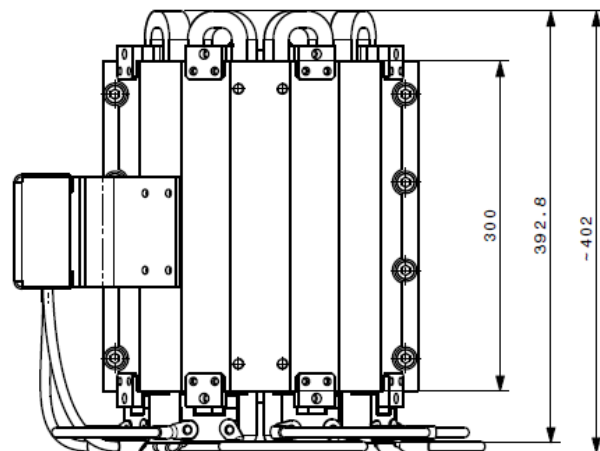
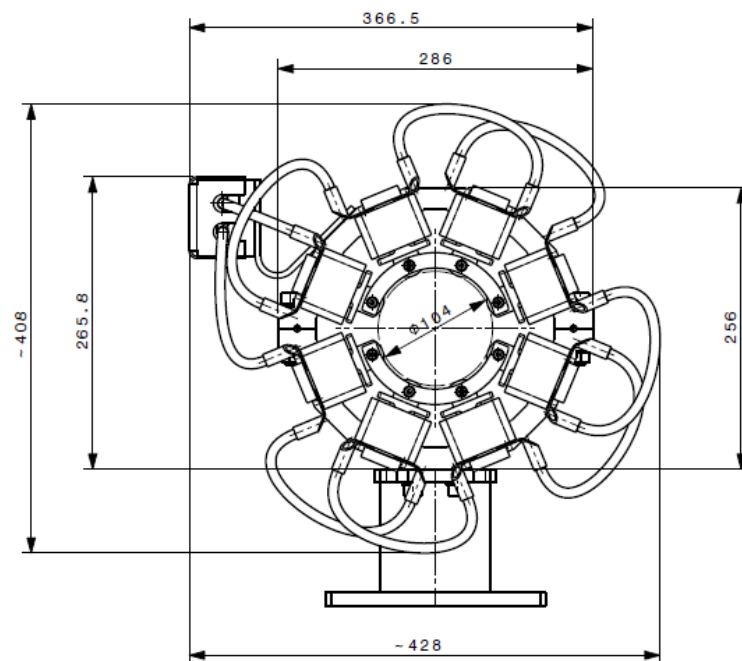
OCTU1

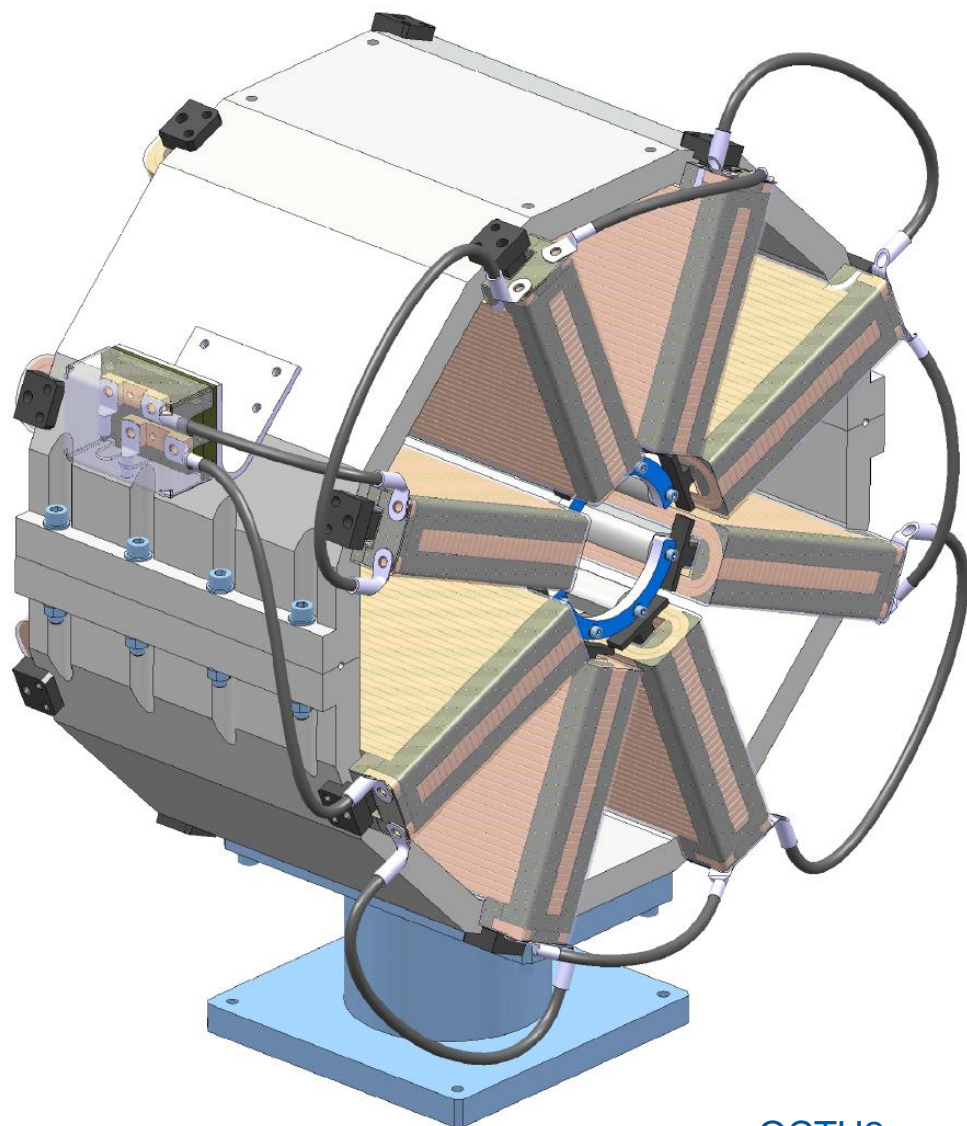


OCTU2

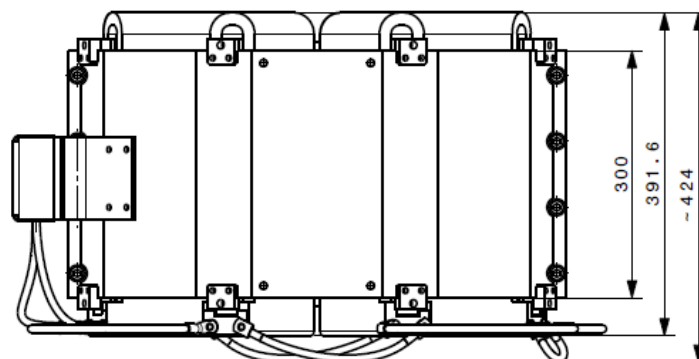
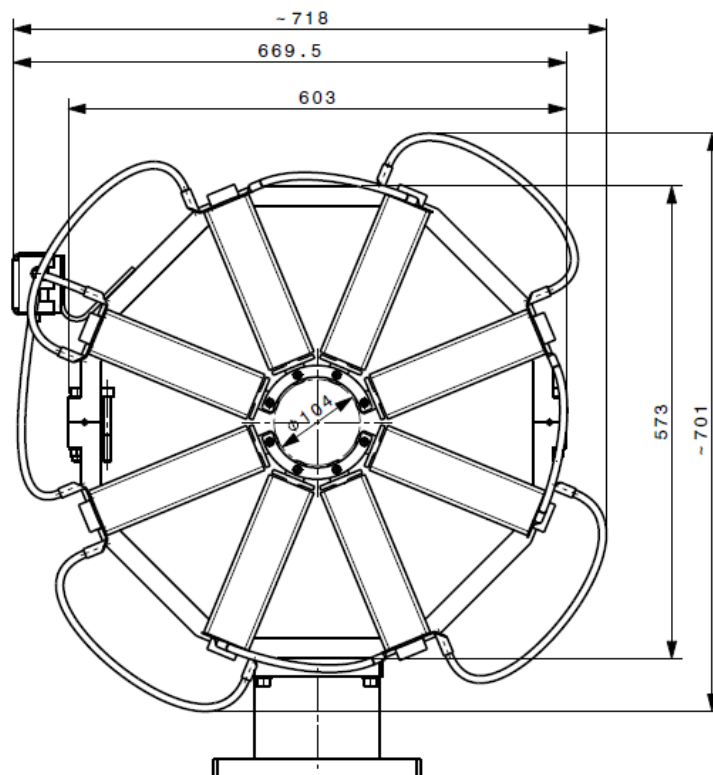


OCTU1





OCTU2



Status:

- We are completing the technical design
- Following activities will be:
 - Procurement of the main components (conductor, yokes)
 - Manufacturing of the coils
 - Assembly
 - Magnetic measurements
- We target the summer 2015 for completion and delivery to ATF.

(Note: we are NOT looking at the magnets supports and at the power supply)

Thanks for your attention