Magnetic measurements at cryogenic temperature on MCOXFP1 and MCDXFP1

Lucio Fiscarelli

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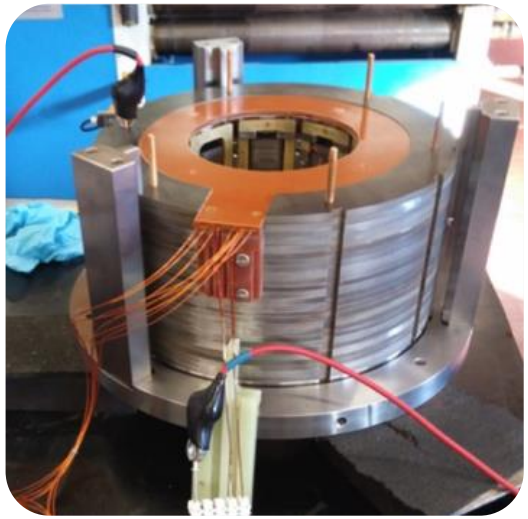
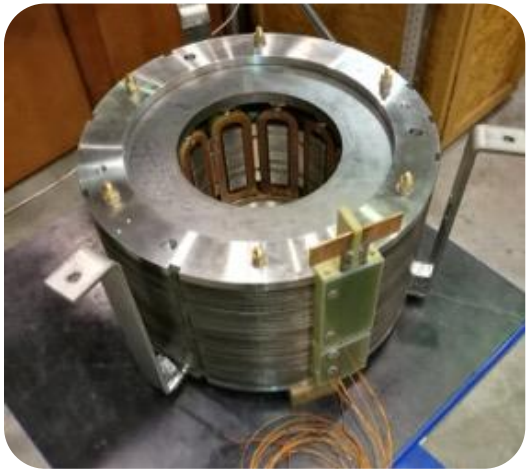
The magnets

MCOXFP	nominal	calculations
Nominal current I_{op}	105 A	105 A
integrated field @ I_{op} @ 50 mm	46 T mm	46 T mm
magnetic length	87 mm	99 mm
harmonics		b_{12}=11.6 b_{20}=-3.0



MCDXFP	nominal	calculations
Nominal current I_{op}	105 A	105 A
integrated field @ I_{op} @ 50 mm	25 T mm	26 T mm
magnetic length	95 mm	97 mm
harmonics		b_{15}=11.6 b_{25}=-0.7



Measurement setup

Rotating-coil in the helium bath (vertical setup in SM18).

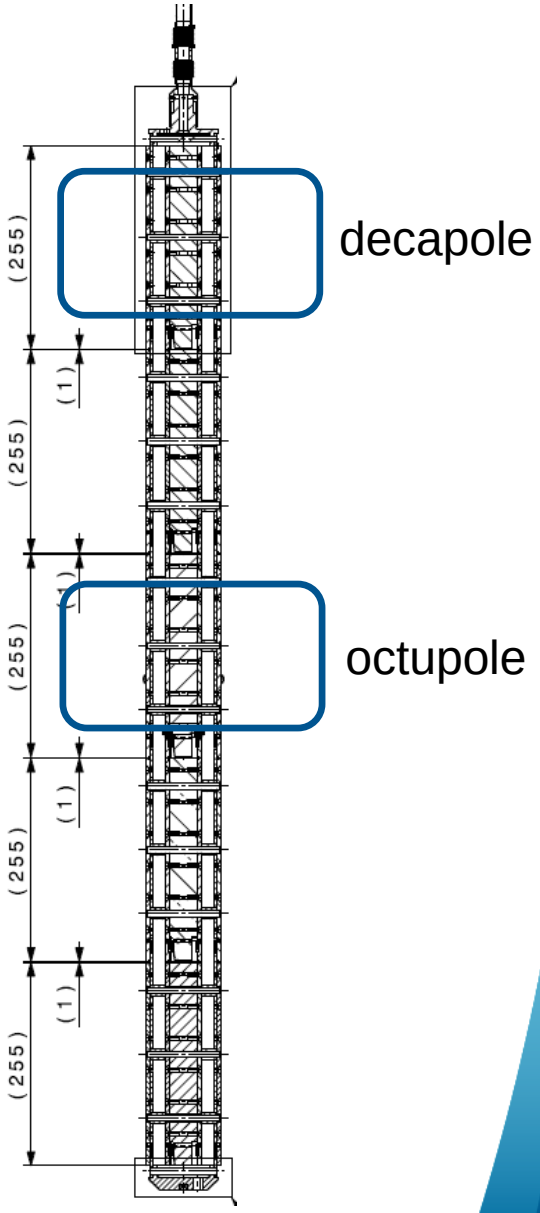
The two magnets were measured during the same cool down.

The rotating shaft has

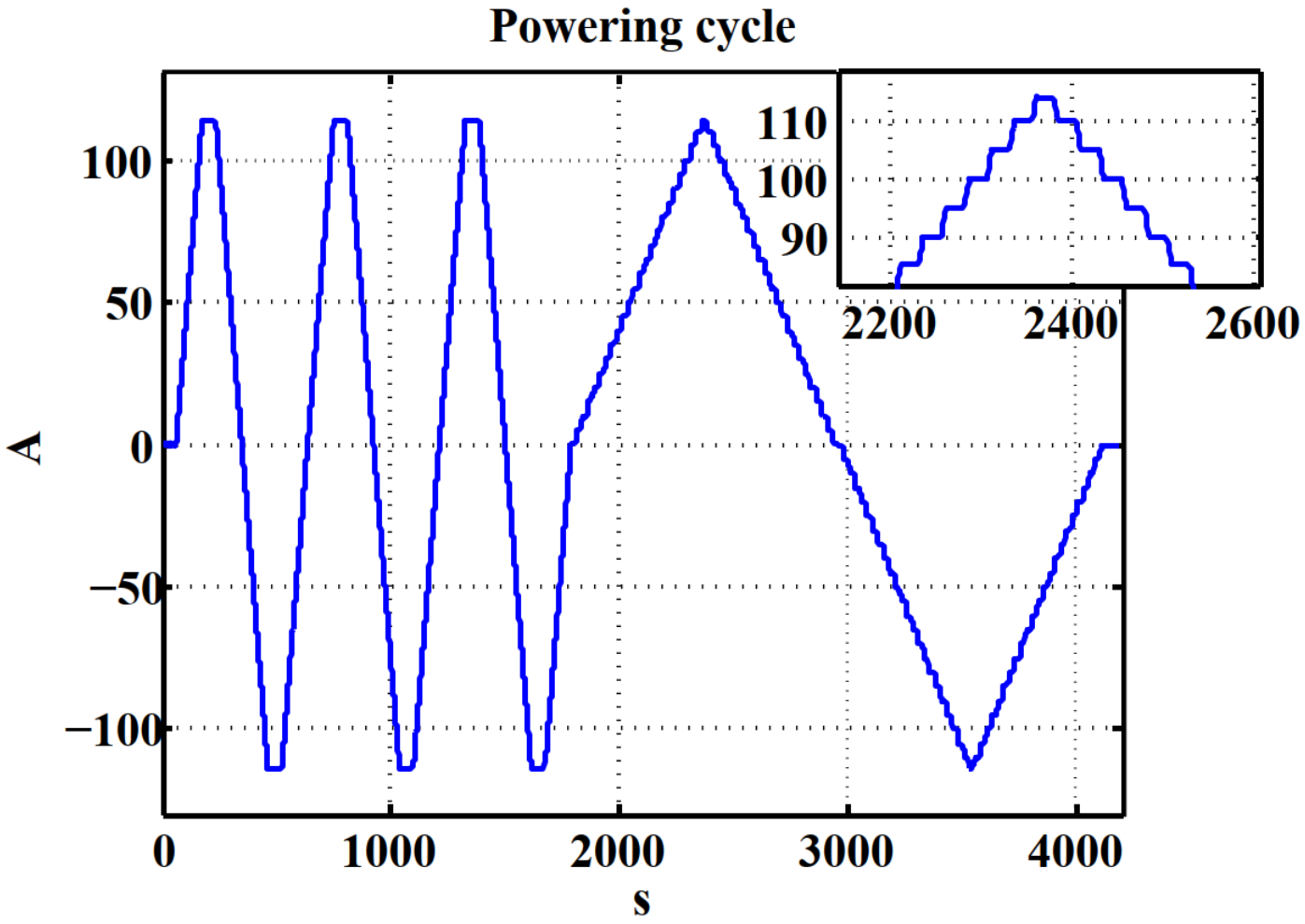
- 5 segments
- total length = 1.275 m

One segment (255 mm) is able to cover the entire integral field of one magnet.

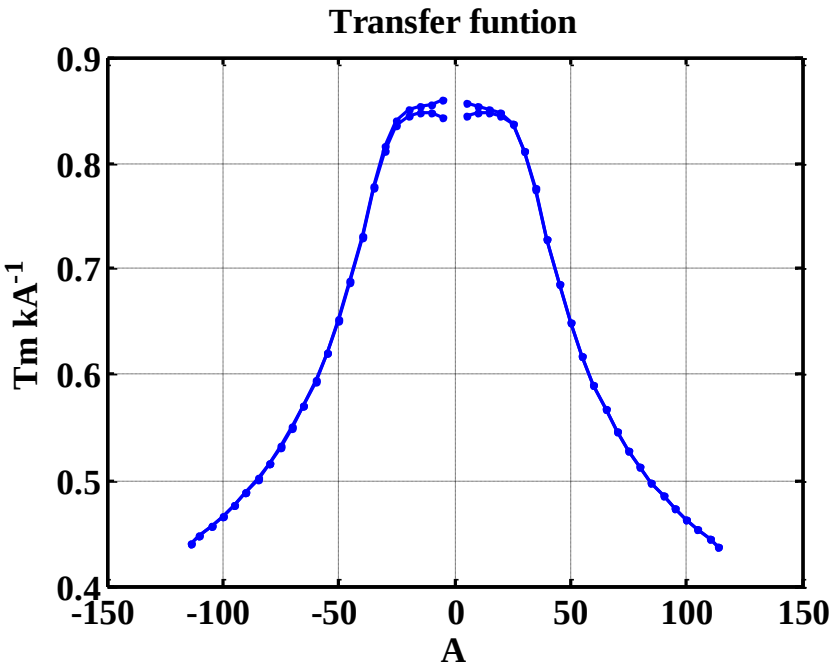
<u>The reference radius is 50 mm</u>



Powering cycle for MM



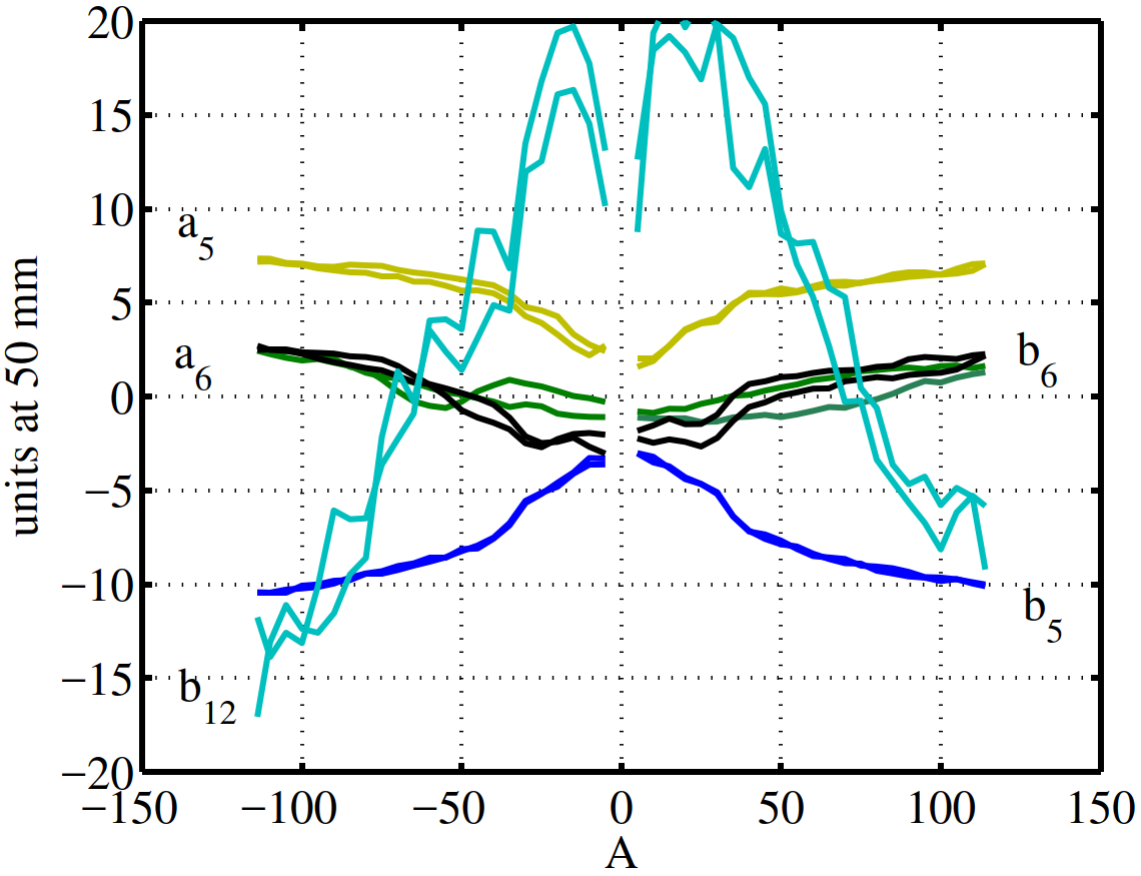
Octupole: TF



Octupole	
Nominal current I_{op}	105 A
Integrated field @ I_{op} @ 50 mm	47.6 T mm
Saturation	47%
Residual magnetization	0.032 T mm

Measured field at nominal is 5% larger than calculations

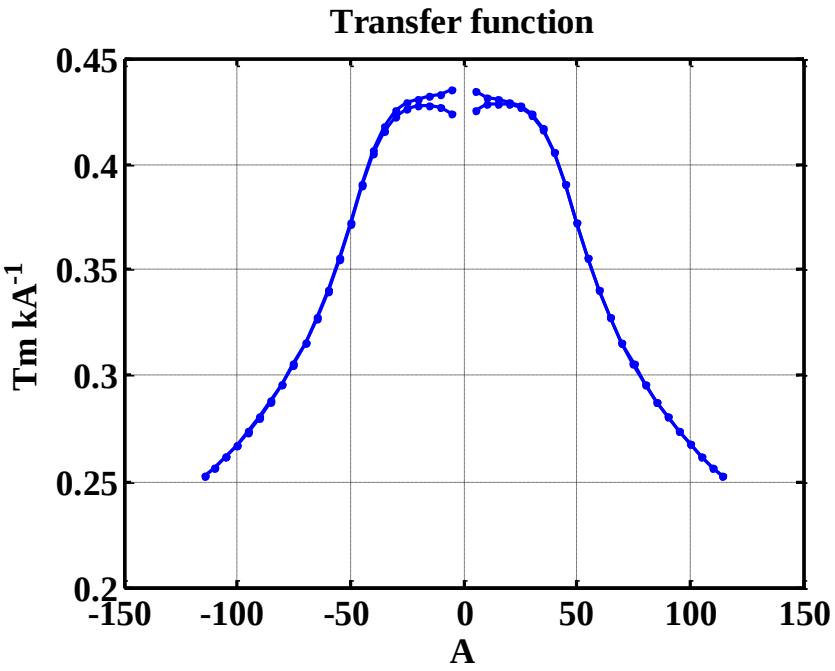
Octupole: multipoles



Multipoles measured at nominal current (105 A) and expressed in units at reference radius of 50 mm

n	b_n	a_n
1	-12	-3
2	-4	-9
3	0	0
4	10000	0
5	-10	8
6	2	2
7	-1	1
8	1	-1
9	1	-2
10	-4	-2
11	-2	-2
12	-10	-
13	-	-
14	-	-
15	-	-

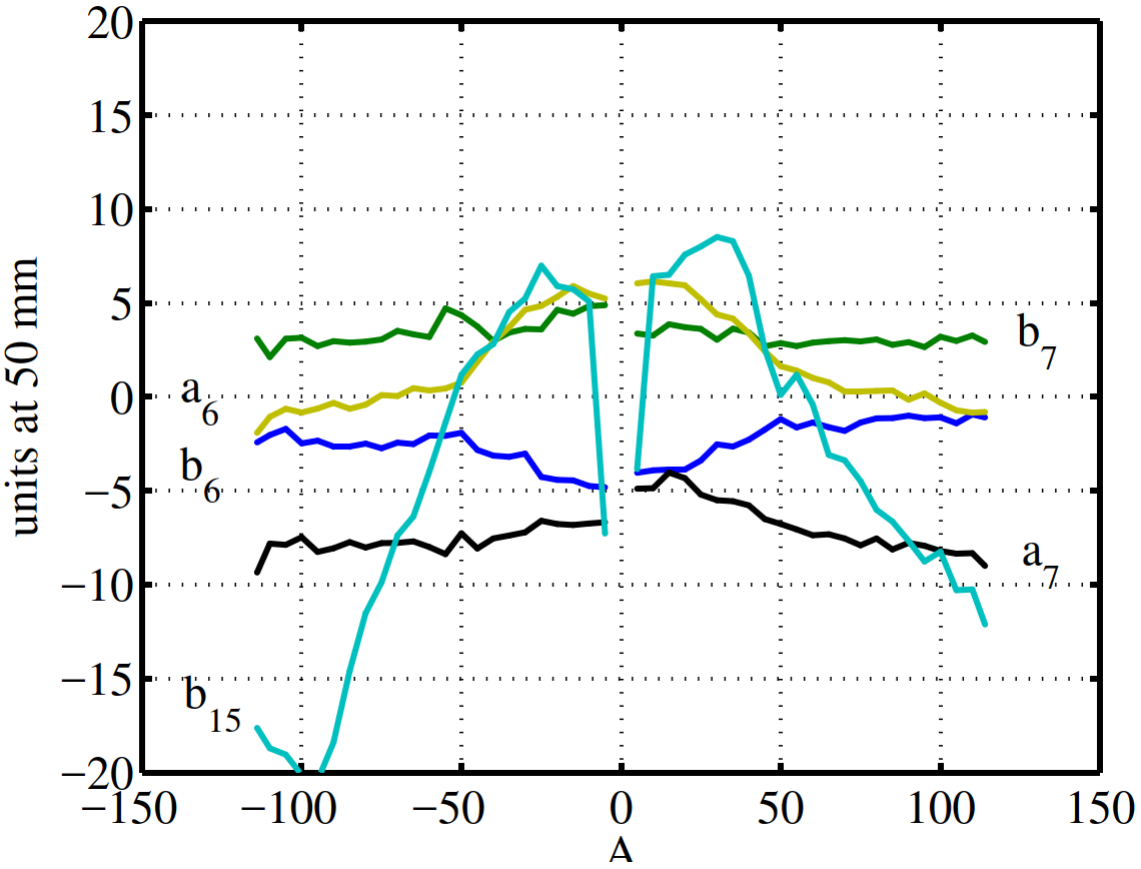
Decapole: TF



Decapole	
Nominal current I_{op}	105 A
Integrated field @ I_{op} @ 50 mm	27.5 T mm
Saturation	39%
Residual magnetization	0.022 T mm

Measured field at nominal is 5% larger than calculations

Decapole: multipoles



Multipoles measured at nominal current (105 A) and expressed in units at reference radius of 50 mm

n	b_n	a_n
1	0	-2
2	-23	13
3	4	9
4	0	0
5	10000	0
6	-1	0
7	4	-8
8	-1	2
9	-3	4
10	-3	-3
11	5	14
12	-	-
13	-	-
14	-	-
15	-16	-

Conclusions

- MCOXFP1 and MCDXFP1 have been tested at 1.9 K
- TF and multipoles have been measured
  - Transfer function 5% larger than calculation
  - Residual magnetization ~1‰ of nominal field
  - Multipoles are well within specifications (100 units) at all field levels