

# Etat d'avancement Lot Aimants

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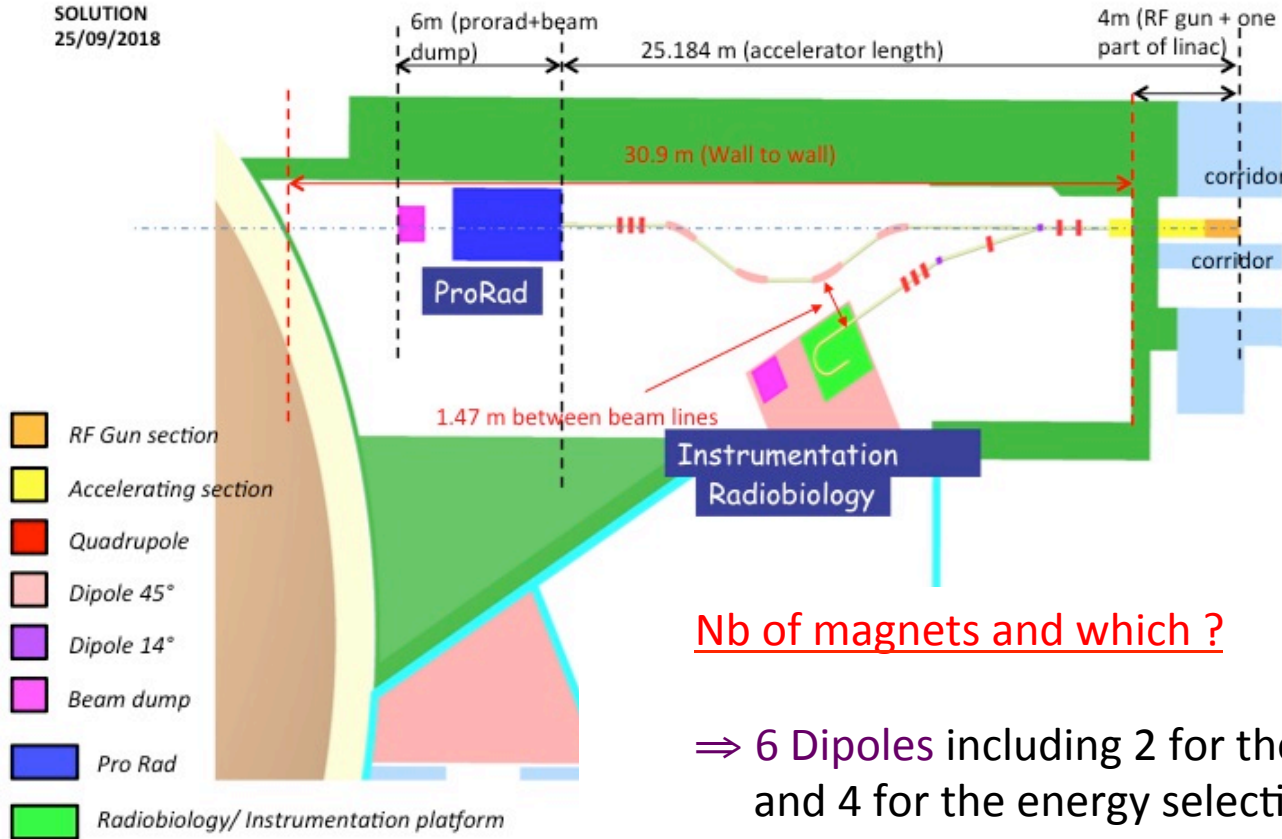
08/10/2018

With the support of



# Context

SOLUTION  
25/09/2018



## Nb of magnets and which ?

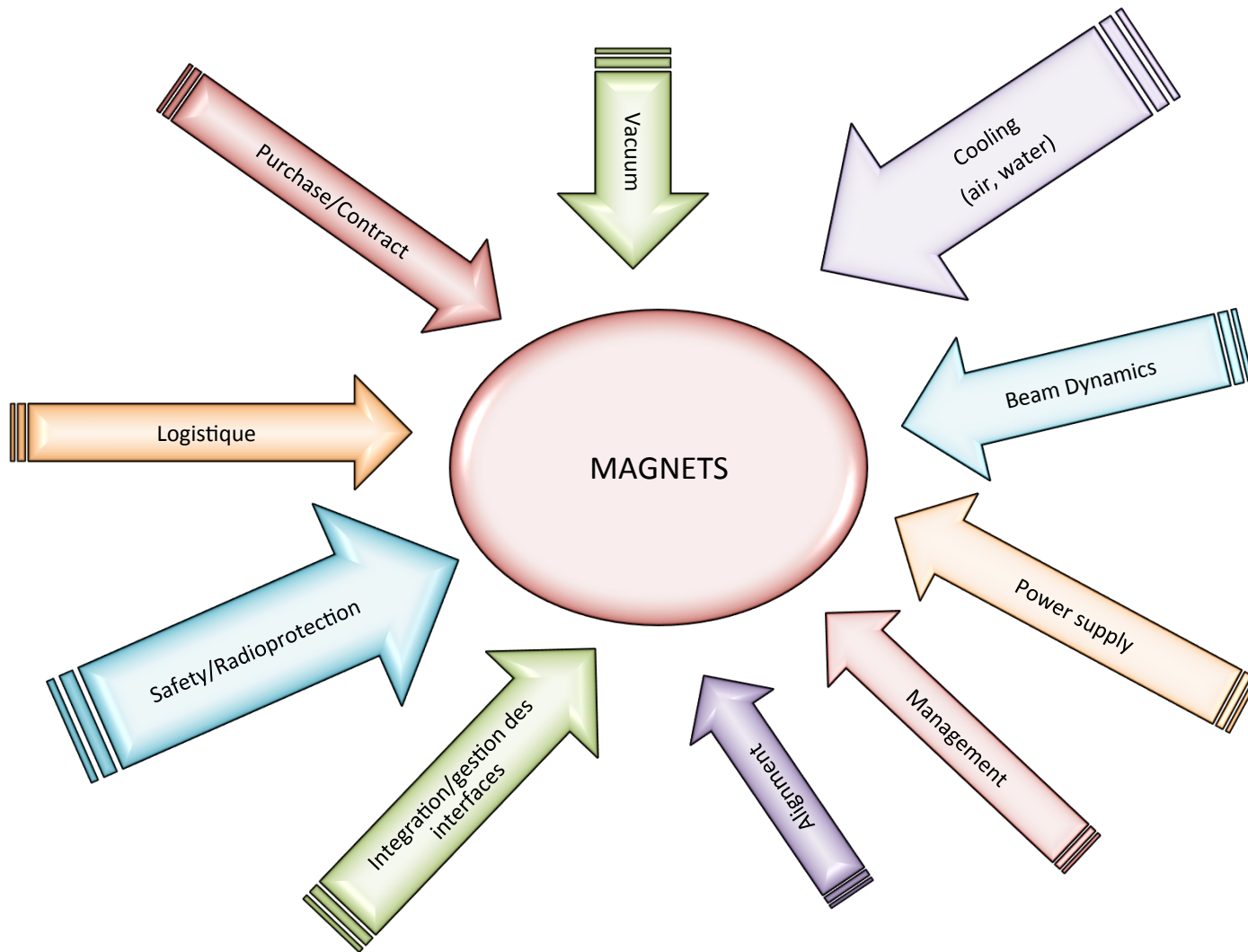
- ⇒ 6 Dipoles including 2 for the beam deviation (purple) and 4 for the energy selection of the beam (pink)
- ⇒ 9 Quadrupoles (red) for the beam focalisation
- ⇒ 6 Steerers for the beam trajectory correction

# Specifications

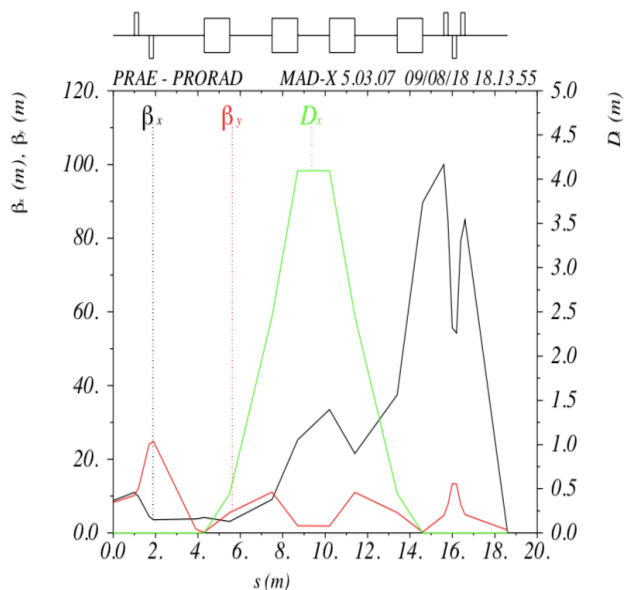
DIPOLES			QUADRUPOLES	
Bending angle (°)	45	14	Quantity	12
Quantity	4 (+2)	2	Gradient (T/m)	28
Energy max. (MeV)	150		Iron length (m)	0.2
Good field region (mm)	+/- 15		Good field region (mm)	+/- 18
Gap (mm)	40		Energy max. (MeV)	150
Iron length (m)	1.2	0.2		

- Field Homogeneity determines precision of beam energy.

# Interactions



# Status : ECS DIPOLE



## Initial parameters :

$$\sigma_x = 6.53\text{mm} \Rightarrow \pm 8\sigma_x = 105\text{mm}$$

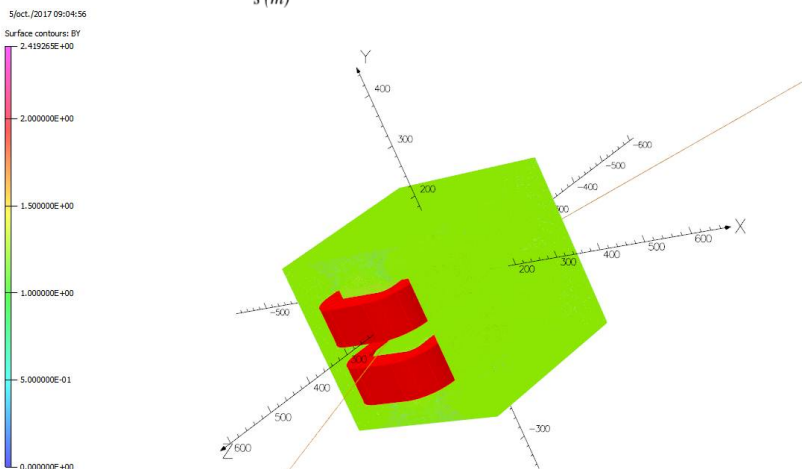
$$\sigma_y = 1.43\text{mm} \Rightarrow \pm 10\sigma_y = 30\text{mm}$$

$$\text{Deviation angle} = 45^\circ$$

$$E = 150\text{MeV}$$

$$\text{GFR} = \pm 15\text{mm}$$

$$\text{Gap} = 40\text{mm}$$



## Main parameters of the yoke @ 150 MeV

Gap (mm)	40
Center magnetic field (T)	1,0643
Curvature radius (°)	45
Pole width (mm)	120
Pole height (mm)	90
Yoke length (mm)	347
Yoke thickness (mm)	350
Chamfer entrance/exit (mm)	10*10

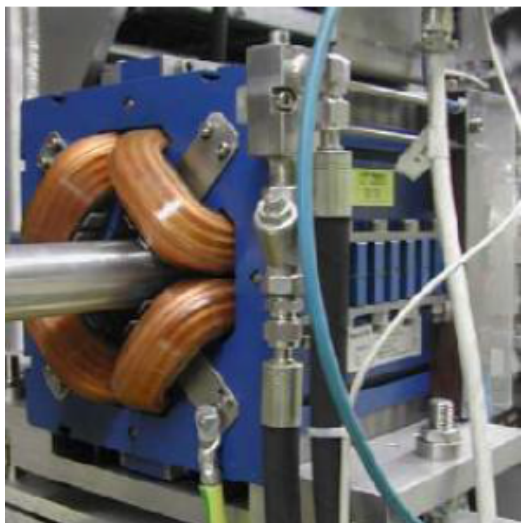
## Main parameters of the coil @ 150 MeV

Ampere-turns	18000
Number of double pancakes vertical	6
Number of double pancakes horizontal	10
Number of turns	60
Current (A)	300
Conductor size (mm)	7*7
Cooling diameter conductor size (mm)	4
Number of circuits	4
Current density (A/mm <sup>2</sup> )	8,28
Conductor length (m)	78,00
Résistance/magnet (ohm)	3,85E+01
Voltage drop/magnet (V)	23,08
Power/magnet (kW)	6,92
Number of cooling circuits	4
Water temperature rise (°C)	6
Pressure drop (bar)	7
Flow rate/magnet (l/mn)	2,24
Cooling water speed (m/s)	2,97
Reynolds number	0,03

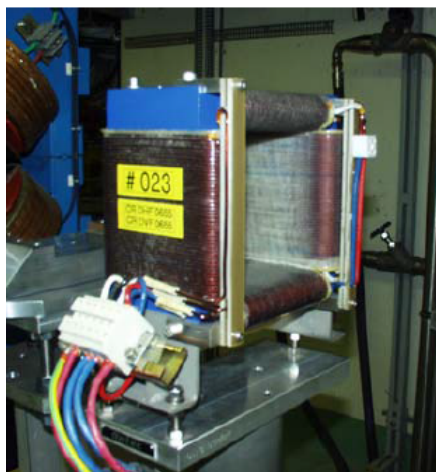
**STATUS : Pre-design is finished**

# Status : Quadrupoles

➔ Recuperation of CTF3 quadrupoles (12) and steerers (6)



Quantity	Value
effective length	224 mm
mechanical length	200 mm
inscribed radius	29 mm
magnetic gradient	$B' \text{ [T/m]} = 0.0574 I \text{ [A]}$
focal length	$f \text{ [m]} = 0.259 \frac{P \text{ [MeV/c]}}{I \text{ [A]}}$
max. allowed current	200 A
max. dissipated power	2 kW
max. I & U of power supply	
cooling	



$$\alpha \text{ [mrad]} \cdot p \text{ [MeV/c]} = 65.4 \cdot I \text{ [A]} \pm 19.6$$

All dipole correctors are fed by  $\pm 10/20$  A  
&  $\pm 60/30$  V power supplies

Power supplies ?

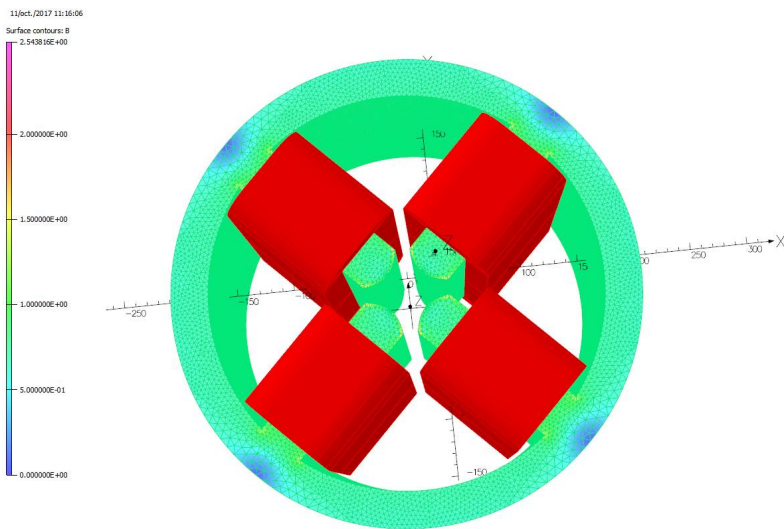
# Status : Quadrupoles

## Initial parameters :

$$R = 20\text{mm}$$

$$k = 28\text{m}^{-2}$$

$$E = 150\text{ MeV}$$



Opera  
CORNING

## Main parameters of the yoke @ 150 MeV

Gap (mm)	40
Center magnetic field gradient (T/m)	14,6059
Pole width (mm)	40
Pole height (mm)	120
Yoke length (mm)	300
Yoke thickness (mm)	190
Chamfer entrance/exit (mm)	0

## Main parameters of the coil @ 150 MeV

Ampere-turns	2400
Number of double pancakes vertical	12
Number of double pancakes horizontal	20
Number of turns	240
Current (A)	10
Conductor size (mm)	2*5
Current density (A/mm <sup>2</sup> )	1,00
Conductor length (m)	194,00
Résistance/magnet (ohm)	3,26E-01
Voltage drop/magnet (V)	13,04
Power/magnet (kW)	0,13

Integrated magnetic field  $B^2 = -0.07063\text{ T.m}$

Magnetic gradient  $G = -14.6059\text{ T/m}$

Magnetic length = 366 mm

**STATUS :** Pre-design is finished

# What it remains to do

- Design of 14° dipoles : March 2019
- Finalisation of 45° ECS dipoles design : March 2019
- Study of beam energy measurement dipoles with G. Quéméner : August 2019
- Mechanical drawings of all dipoles for a tender call
  - 14° & 45° dipoles drawings : May 2019

**Call for tender : July 2019 at the latest**