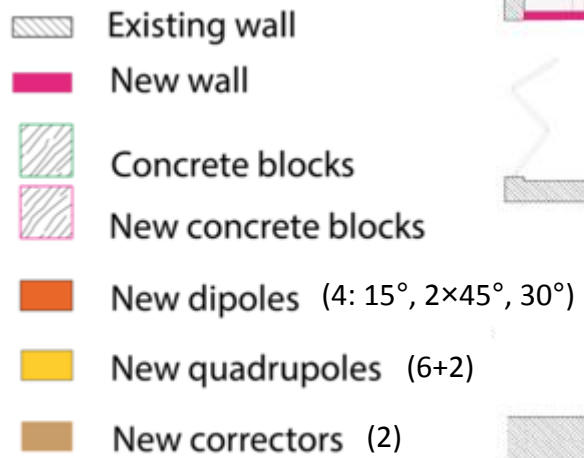
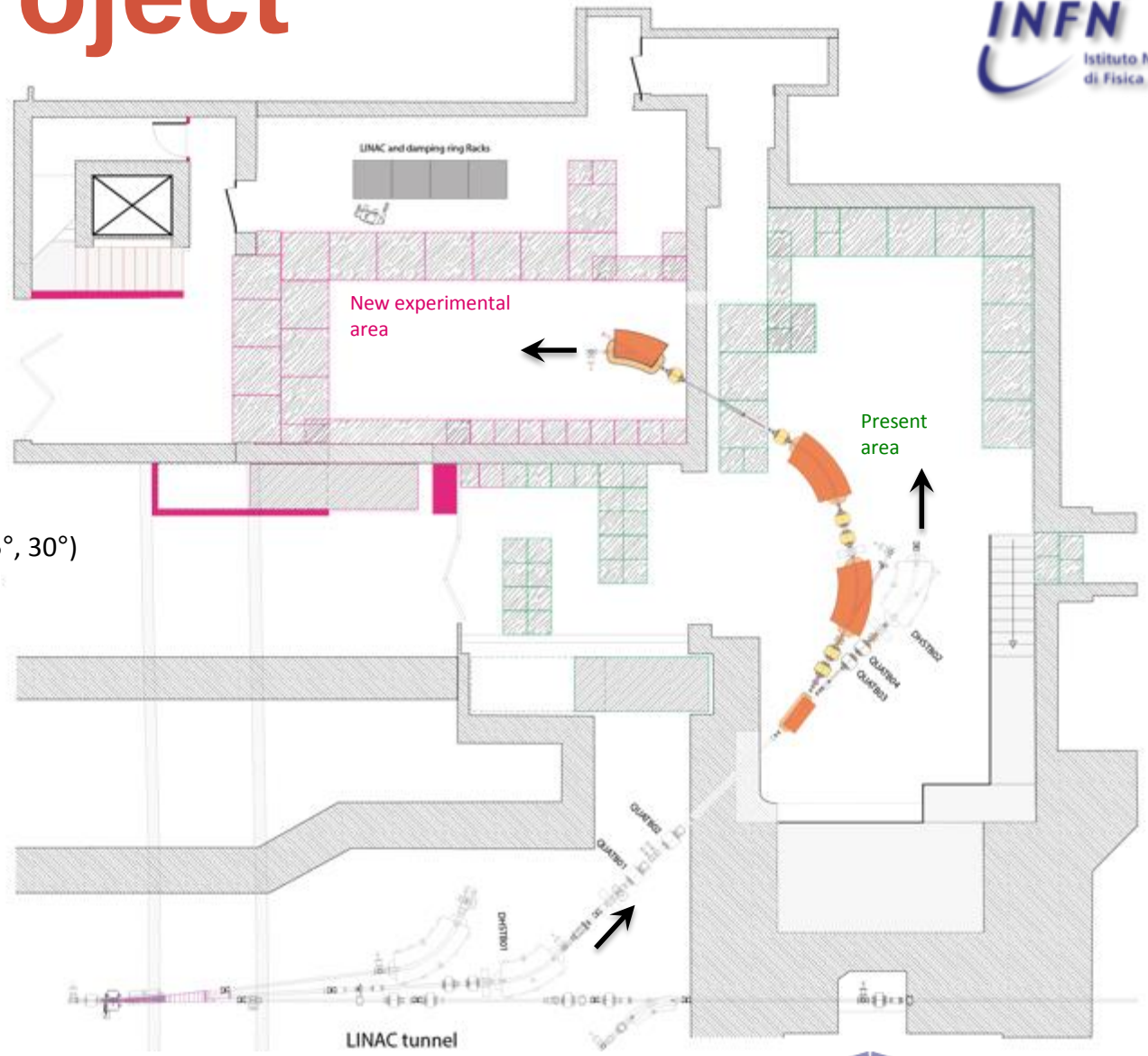
WP15.4 Status

March 2017

The project


Existing wall
New wall
Concrete blocks
New concrete blocks
New dipoles (4: 15°, 2×45°, 30°)
New quadrupoles (6+2)
New correctors (2)


LINAC and damping ring Racks
New experimental area
Present area
LINAC tunnel

Status

- Workshop with companies in the field of magnet construction, in order to:
  - Have magnets with a very good correspondence with specifications
  - Speed-up delivery
  - Have a better control on design and validation phase (especially magnetic measurements)
  - Improve KTT
- Provide to the producer not only detailed specifications, but an advanced design of the required magnets
- This means some delay on the bids wrt to the schedule, that should be re-absorbed by the fact that the **designs are practically already done by us**:
  - Complete magnetic calculation, including beam quality, pole design, iron quality, saturation…
  - Complete design of coils: electrical, mechanical, thermo-hydraulic
  - Complete design of overall mechanical structure (plates, bolts, alignment) and supports
- Almost 20 companies in the field of electro-mechanic constructions, magnets, power supplies and UHV technology
- A full day in Bologna, on Mar. 1st 2017

Status

- All bids for magnets procurement out ~~by the end of January~~ March
  - But **we will provide to the supplier a detailed design**
- Civil engineering ~~preliminary~~ project approved
  - Working on the executive one (external company)
- BTF closed to the users from **mid July** (apart 2-3 weeks in Sep.)
- Design slightly modified in order to avoid modifications of the line inside the LINAC tunnel
  - Brings interference with the operation of the collider complex to ≈0
  - Easier installation (and alignment)
  - Also requires 1 quad less (slightly increased the gradient of the other quads)
- Vacuum requirements relaxed: the two BTF lines will be separated by the main LINAC vacuum by a 0.5 mm Be window (already existing); design modified in order to host pumping ports
  - Vacuum components design on-going

Project reviewed and simplified, final version being prepared

- Infrastructure and installation:
  - Thermic, hydraulic and electric calculations completed
  - Specs for “on-the-shelf” power supplies
  - Cooling and power supply for new line started

Team

Magnets
- Line design, simulation and optimization
  - B. Buonomo, C. Di Giulio, L. Foggetta
- Magnetic, electric and thermo-hydraulic calculation and design
  - F. Iungo, R. Ricci, C. Sanelli, L. Sabbatini, A. Vannozzi:
- Mechanical design
  - R. Mascio, L. Pellegrino, G. Sensolini:
- Preparation, measurements, installation
  - B. Bolli, S. Martelli, F. Sardone:

Cooling and power supply
- S. Cantarella, R. Ceccarelli, R. Ricci, U. Rotundo

Vacuum
- D. Alesini, S. Bini, L. Foggetta, V. Lollo

Timing
- A. Drago, A. Stella

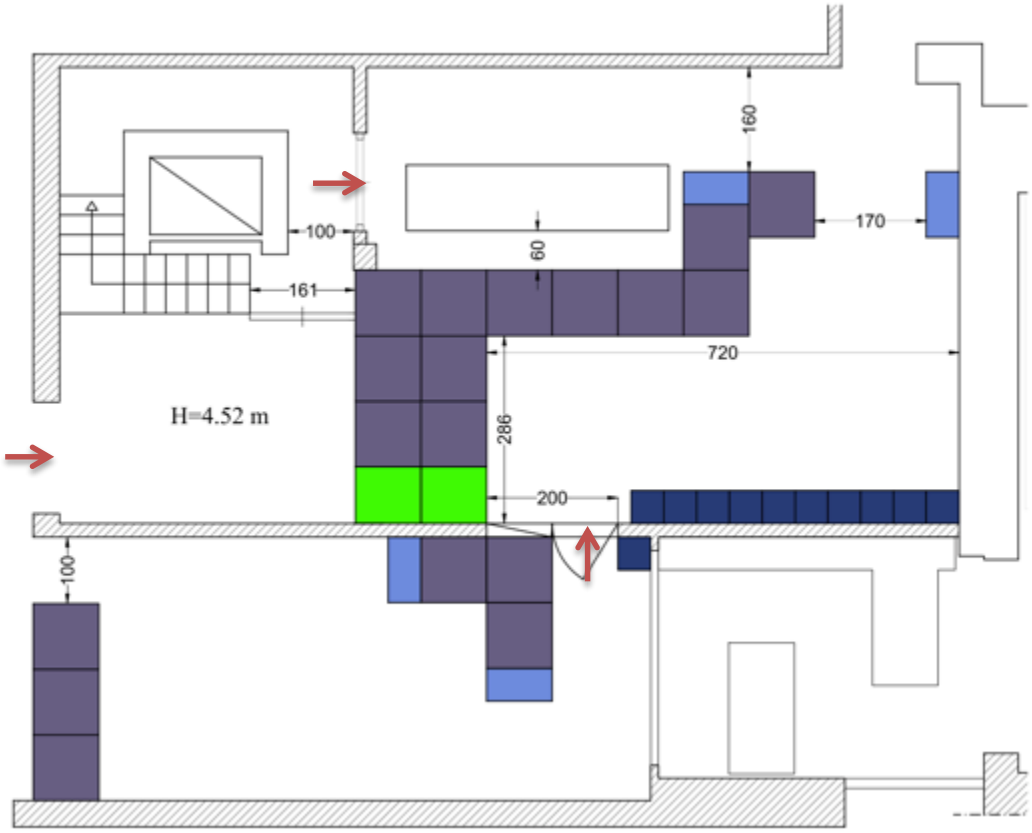
Controls
- L. Foggetta, C. Di Giulio, A. Michelotti, A. Stecchi

Radio-protection
- A. Esposito, O. Frasciello

Civil Engineering
- O. Cerafogli, S. Incremona

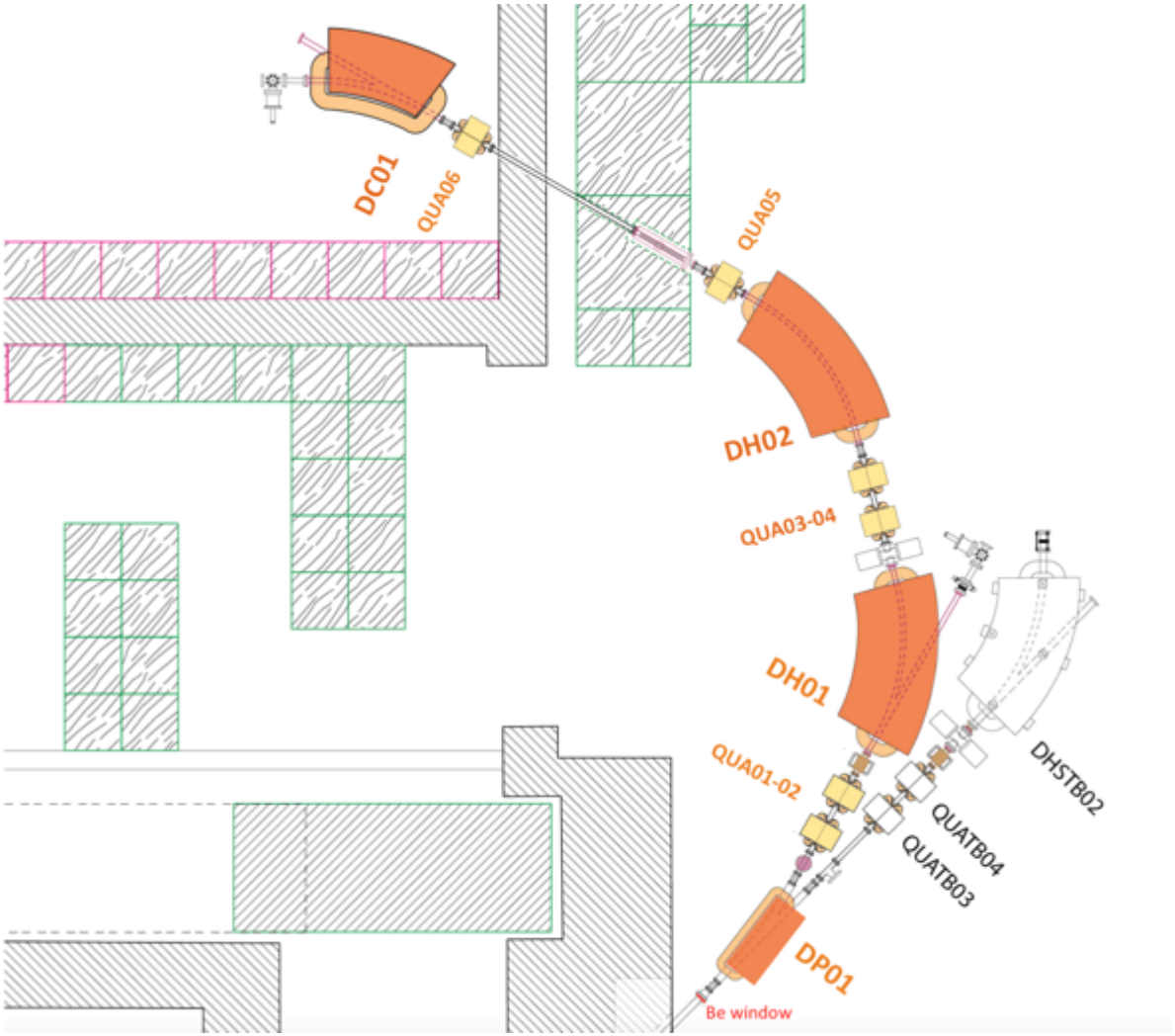
Diagnostics
- C. Di Giulio, L. Foggetta, E. Spiriti, A. Stella

Civil engineering



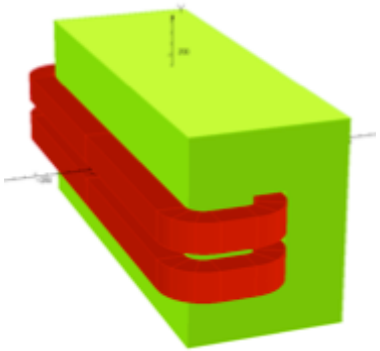
- For speeding up the execution of the building modifications, we **removed the motorized shielded door** (on the side of the external wall), replacing it with a removable structure of concrete blocks (chicane)
- Much easier (and cheaper): the only modification to the building structure is the opening of two (normal) doors

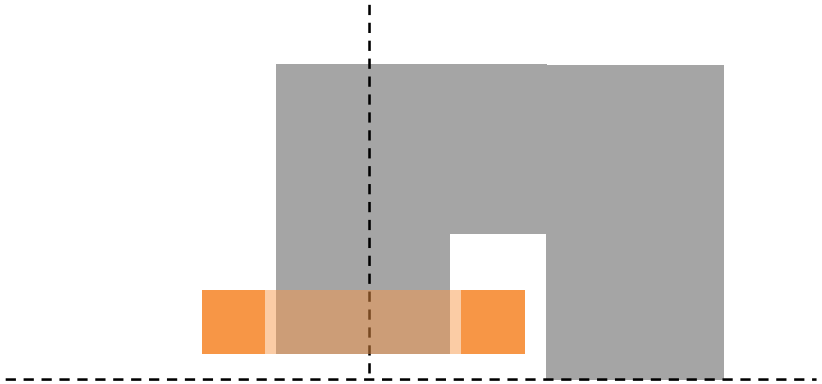
Magnets

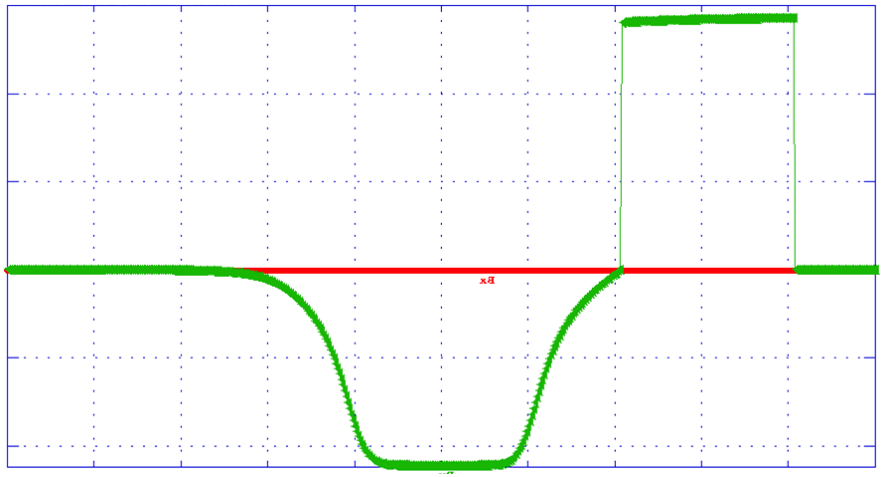

DC01
QUA06
QUA05
DH02
QUA03-04
DH01
QUA01-02
DH5TB02
QUATB04
QUATB03
DP01
Be window

Fast 15° dipole

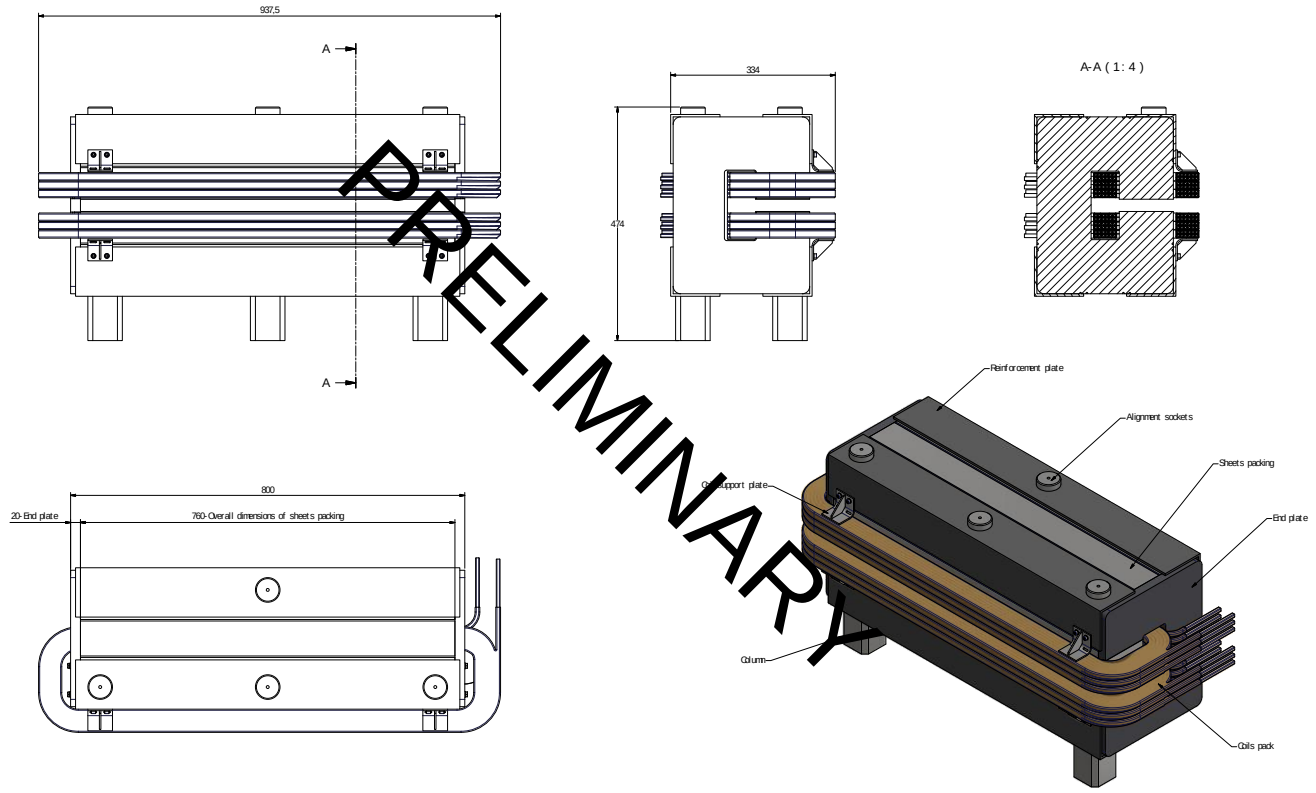
- Study magnetic field in the **gap** (and in the return) vs. iron **material**, **size**, **shape**
- Current vs. coil conductor **section**, **length**, **type, n of coils**
- Calculate thermo-hydraulic parameters







Fast 15° dipole



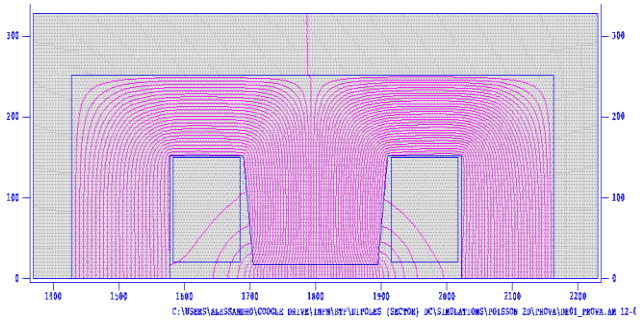
Fast dipole: full specs

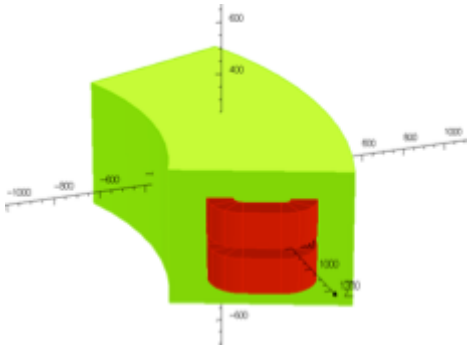
GENERAL DATA	
Beam energy (MeV)	1000
Curvature radius (m)	3
Gap (mm)	25
Pole width (mm)	110
Nominal flux density (T)	1,11
Bending angle (deg)	15
N per pole (turns)	36
Ampere-turns/pole	11052
Yoke Width (mm)	277
Yoke Height (mm)	359
Yoke Length (mm)	760
Overall Length (mm)	329
Overall Height (mm)	359
Overall Length (mm)	913
Good Field Region (mm)	±25
Field quality (ΔB/B)	6,4E-03
Integrated Field quality (ΔIB/IB)	2,3E-03
Total weight (kg)	516
ELECTRICAL INTERFACE	
Conductor dimension	7x7 Φ4
Nominal Current (A)	316
Nominal Resistive Voltage (V)	113
Rtot (Ω)	0,078
Nominal inductance (H)	0,029
Nominal Power (kVA)	35
Maximum Line Cable lenght (m)	20
Proposed cable cross section (mm^2)	95
Proposed Output PS Current (A)	330
Proposed Output PS Voltage (V)	130
Proposed Output PS Power (kVA)	42,9
WATER COOLING	
Number of pancakes per pole	3
Number of pancake circuits	6
Number of series circuits	2
ΔT water (°C)	15
Maximum Water flow (m^3/s)	0.117
Maximum Water velocity (m/s)	1,55
Maximum ΔP (bar)	2,94

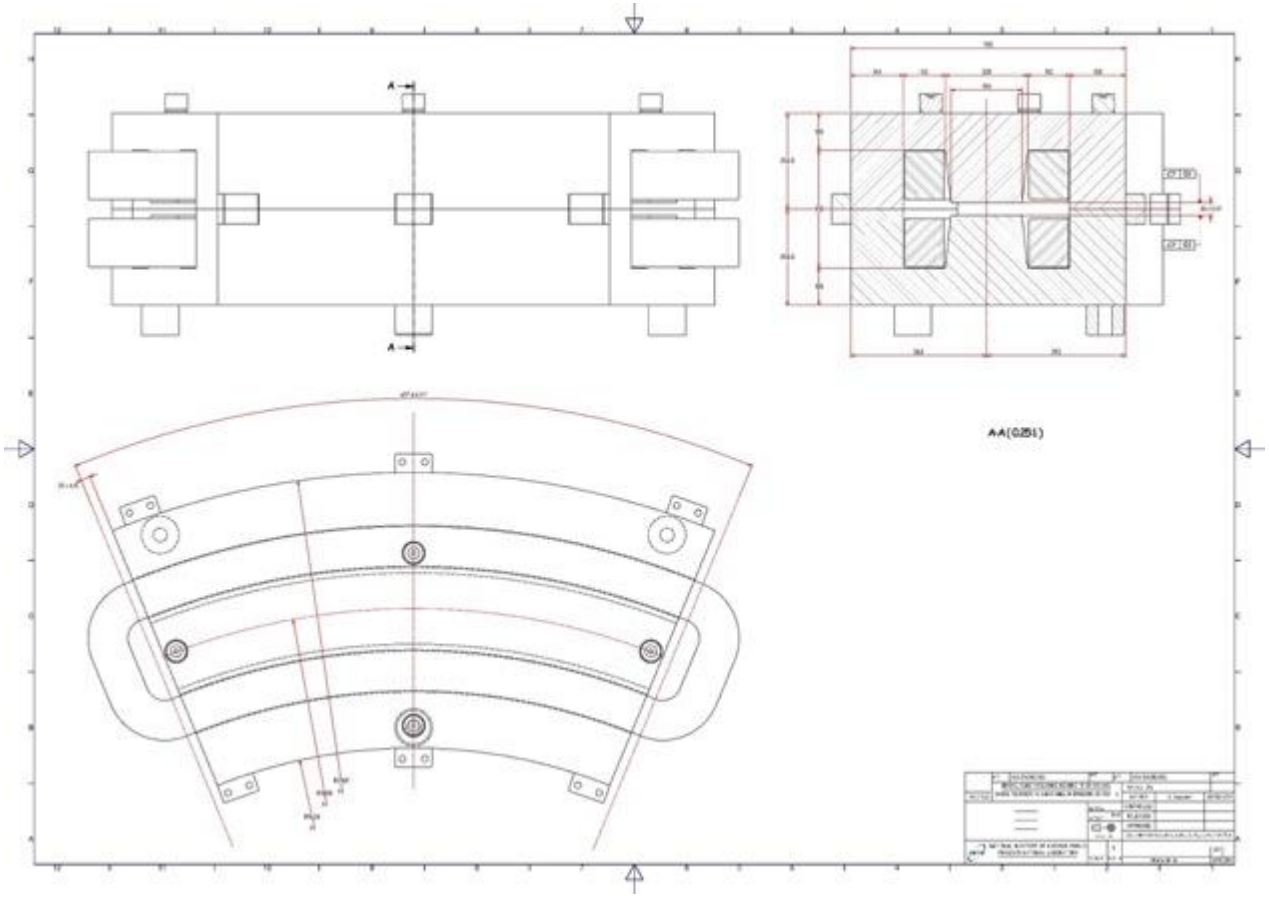
IRON			
V (mm3)	PACK FAC	d (kg/dm3)	Weight (kg)
6,75E+07	0,96	7,85	509
COILS			
V (mm3)	FILL FAC	d (kg/dm3)	Weight (kg)
9.46E+06	0,59	8,9	50

Power supply specs calculated assuming for ramping+stabilization **≈100 ms**

DC dipoles





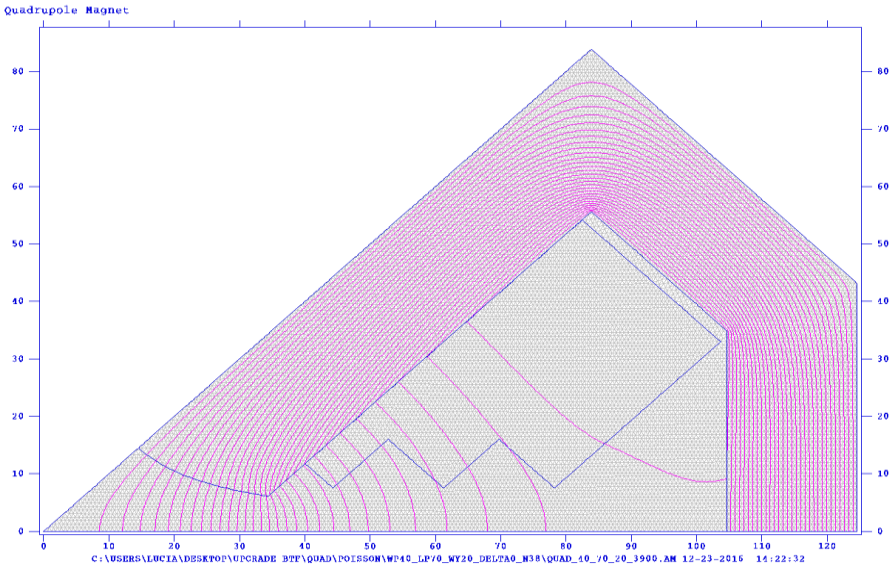


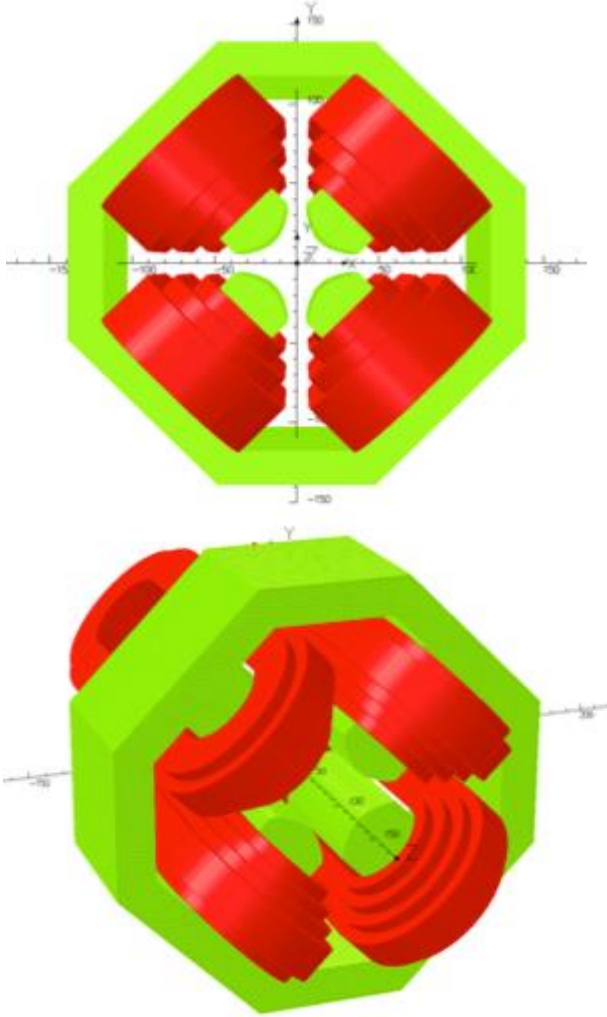
DC dipoles: full specs

GENERAL DATA	
Beam energy (MeV)	921
Curvature radius (m)	1,8
Gap (mm)	35
Pole width at the gap (mm)	190
Pole width at the yoke (mm)	220
Nominal flux density (T)	1,7056
Bending angle (deg)	45,00
N per pole (turns)	120
Iron Width (mm)	735
Overall Width	780
Overall Height (mm)	503
Overall Lenght (mm)	1672
Good Field Region (mm)	±15
Field quality (ΔB/B)	4,29E-04
Integrated Field quality (ΔIB/IB)	3,78E-04
Total weight (kg)	4006
ELECTRICAL INTERFACE	
Conductor dimension	9.5x9.5 Φ5.5
Nominal Current (A)	262
Nominal Resistive Voltage (V)	72
Rtot (Ω)	0,276
Nominal inductance (H)	0,423
Nominal Voltage on magnet (V) with a 10 s raising time (V)	83
Nominal Power (kVA)	22
Maximum Line Cable lenght (m)	20
Proposed cable cross section (mm^2)	95
Proposed Output PS Current (A)	280
Proposed Output PS Voltage (V)	95
Proposed Output PS Power (kVA)	26,6
WATER COOLING	
Number of pancake per pole	6
Number of Turn per pancake	(10 H 2 V)
ΔT water (°C)	15
Maximum Water flow (m^3/s)	3,44E-04
Maximum Water velocity (m/s)	1,21
Maximum ΔP (bar)	3,82

IRON			
V (mm3)	PACK FAC	d (kg/dm3)	Weight (kg)
3,99E+08	1	7,86	3140
COILS			
V (mm3)	FILL FAC	d (kg/dm3)	Weight (kg)
9,5E+07	0,599	8,9	506

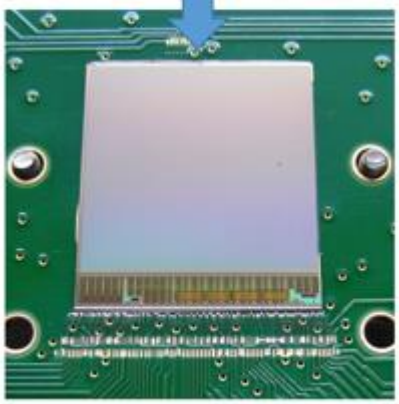
Quadrupoles





Second line diagnostics

M28 (Ultimate) sensor glued and bonded on the hole of the PCB (2x2 cm area, thickness 50 μm)

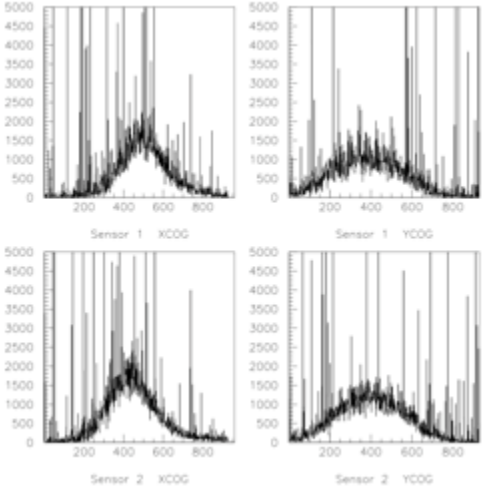


Beam

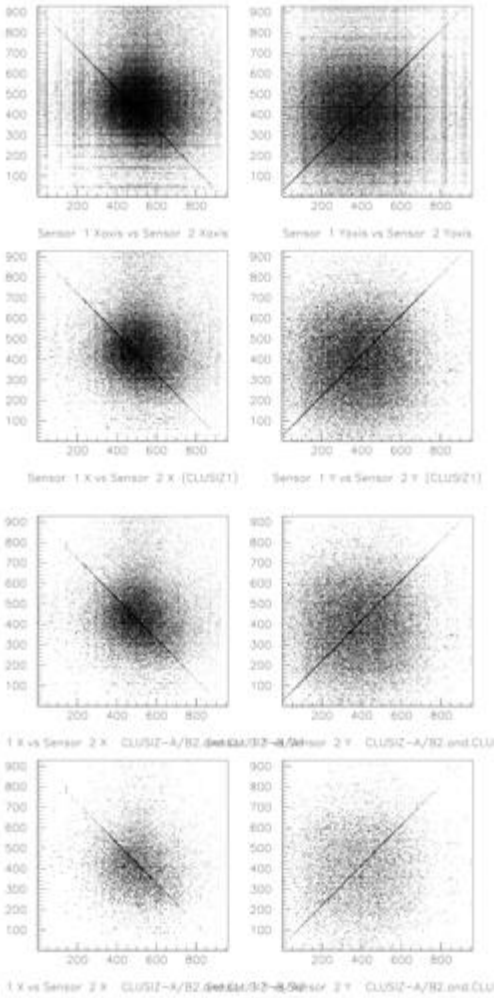
- 4 M28 setup tested on beam
- DAQ working

Second line diagnostics

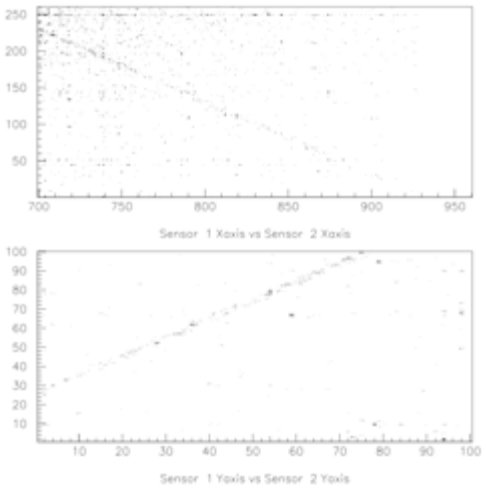
Beam profile (450 MeV electrons)



Cluster correlation vs. cluster size



Coordinate correlation



- System working properly: clear tracks
- Now working on tracking

D15.4

Considering the time margin needed for:

- Magnetic measurements (in house to speed up delivery time)
- Installation
- Commissioning of the new line

In addition, DAFNE collider run has been extended by three months (from Dec. ’17 to end of Mar. ‘18), also shifting maintenance schedule of the complex in the next months.

Move the deliverable from **M30** to **M35**