



Radiation Limits for NC Magnets in IR3 and IR7: MBW and MQW

Suitbert Ramberger, AT-MEL-MI

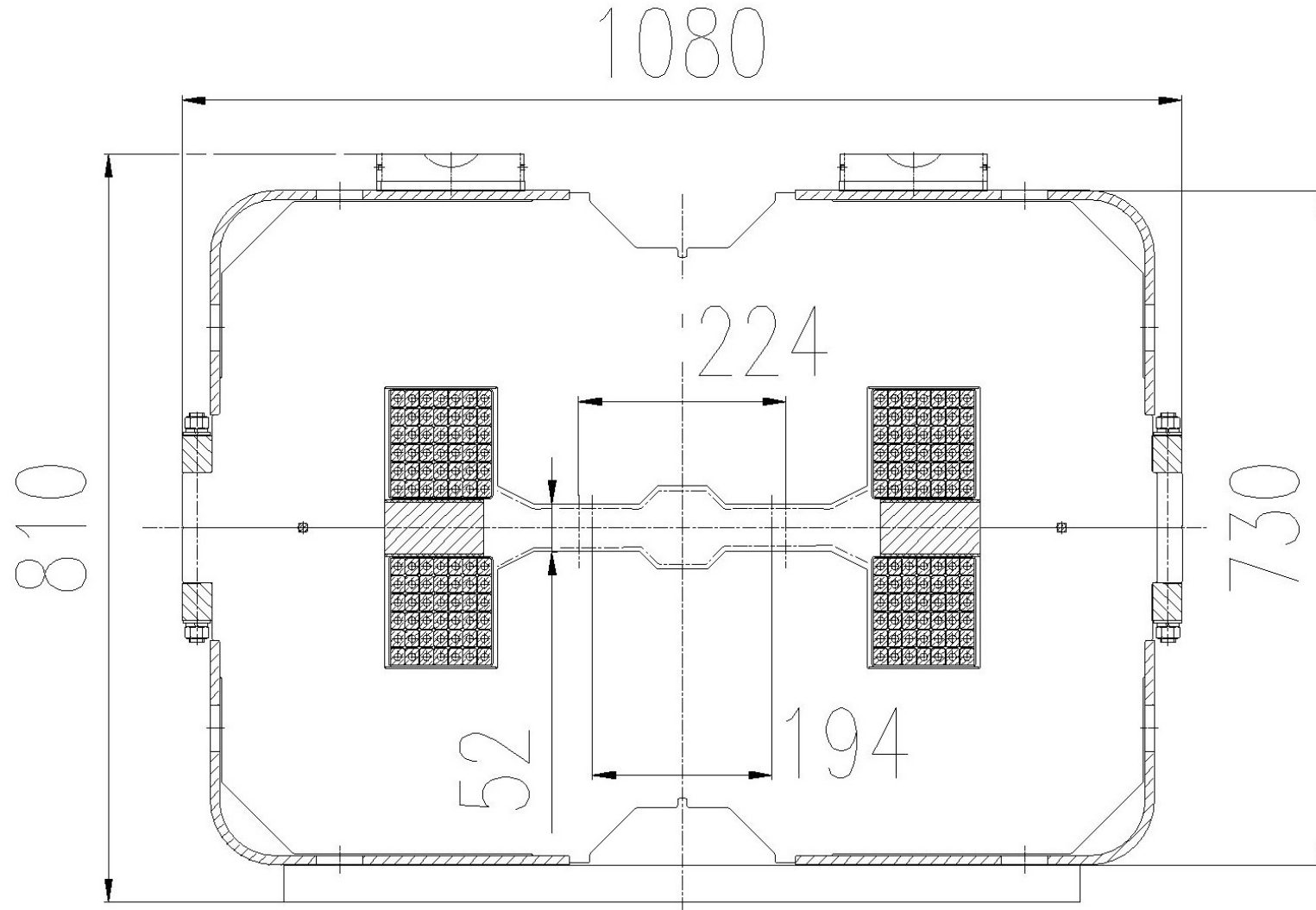


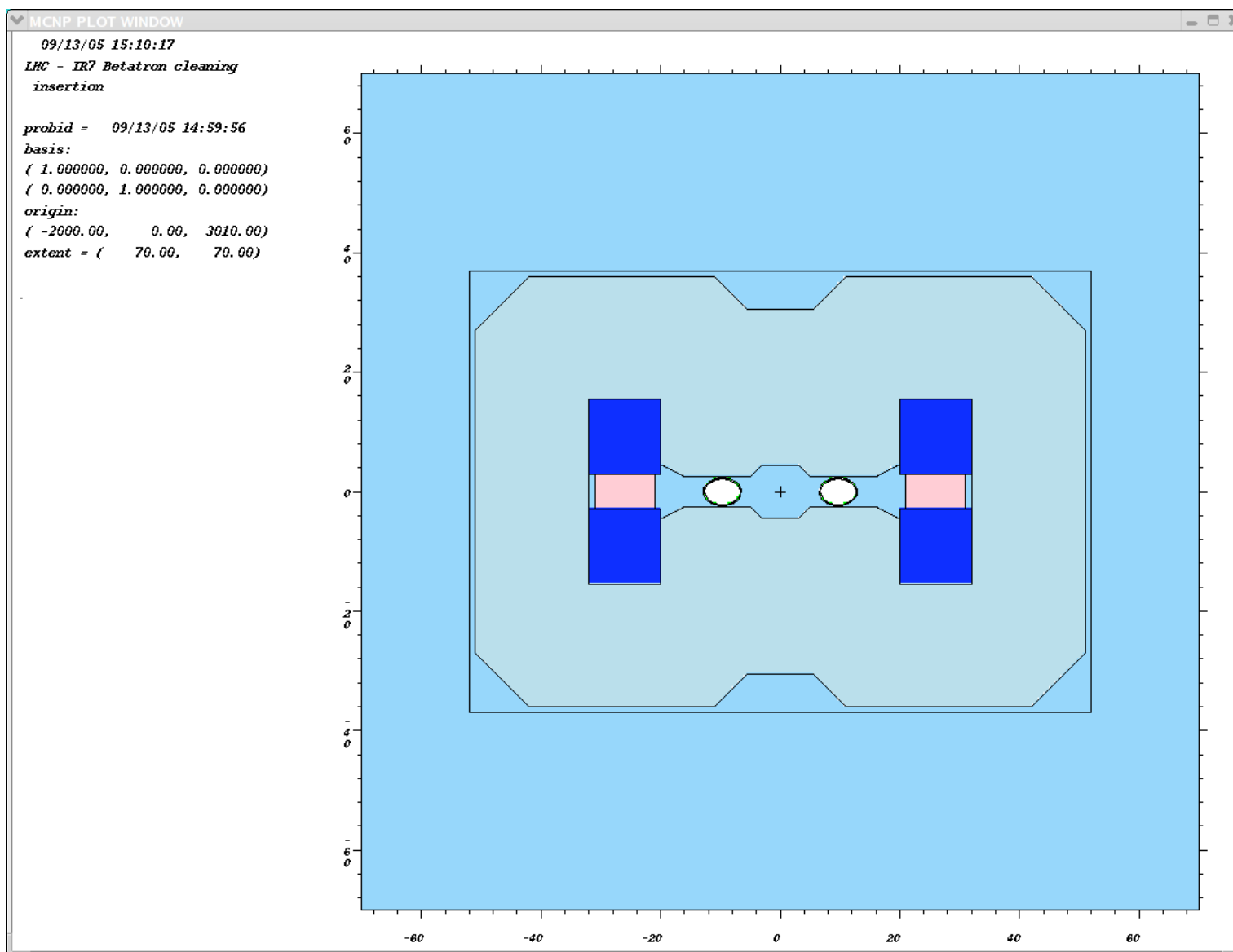
MBW magnet, IR3 / IR7

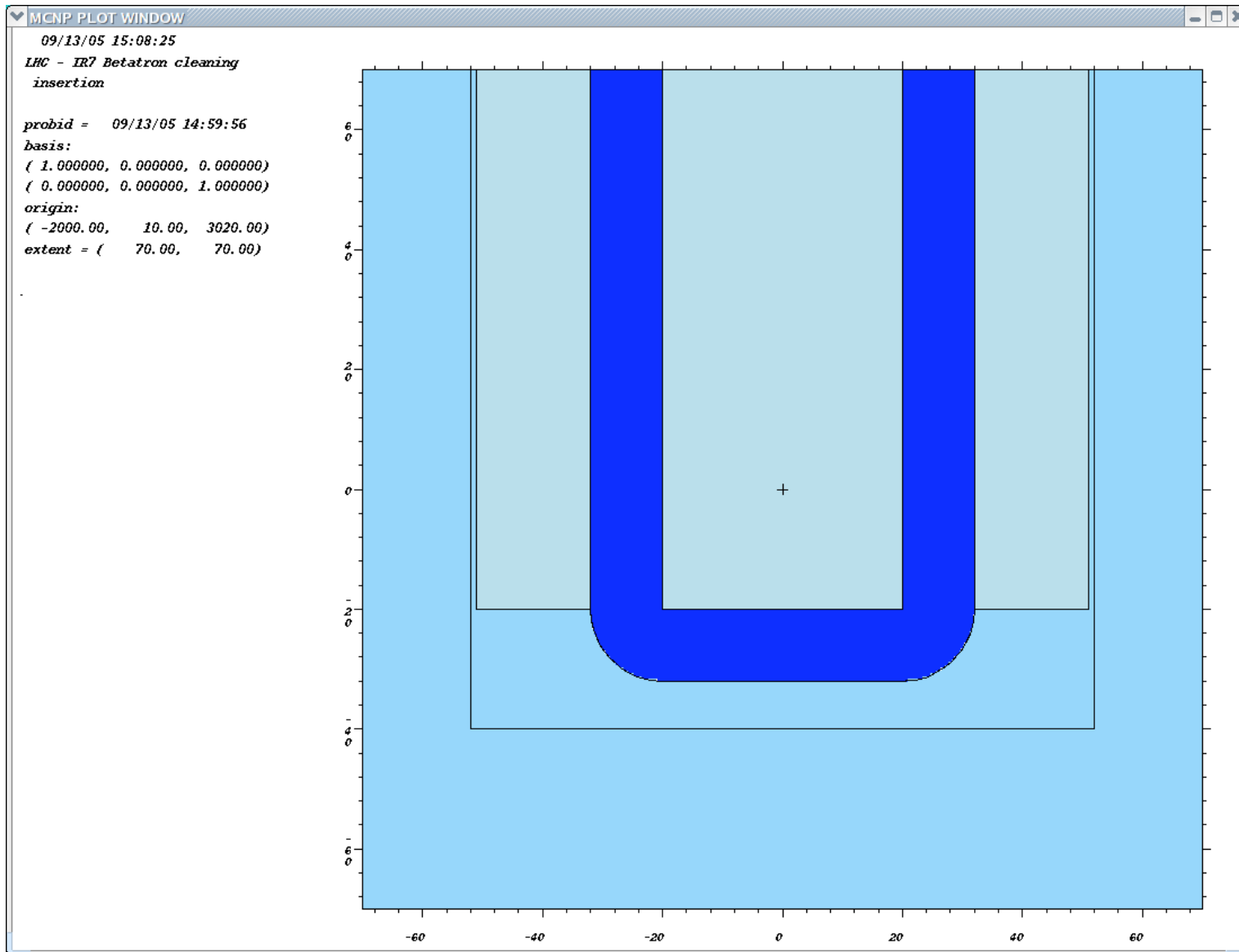
AT-MEL

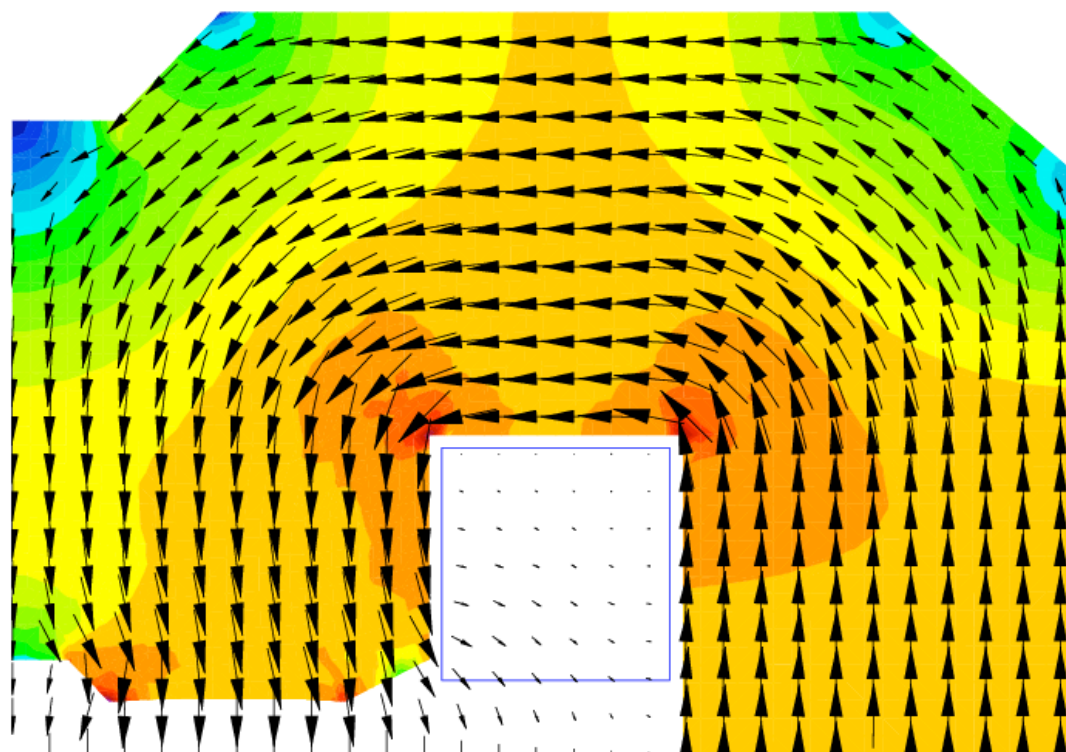
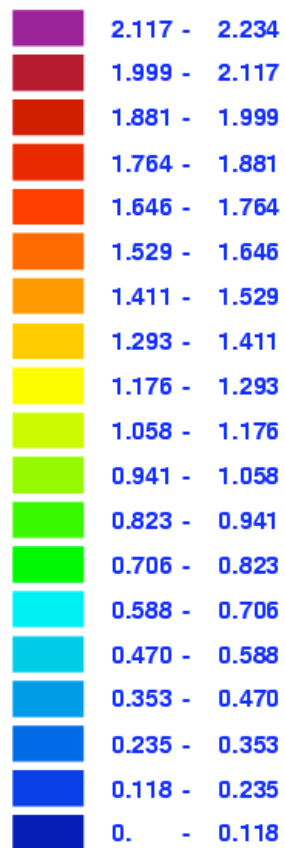


Nominal strength	1.42 T
Nominal current	720 A
Ultimate current	810 A
Magnetic length	3.4 m
Aperture	52 mm
Overall length	3.8 m
Yoke length	3.4 m
Yoke width	1080 mm
Yoke height	730 mm
Overall weight	18000 kg
Water flow	19 l/min
Power dissipation	29 kW









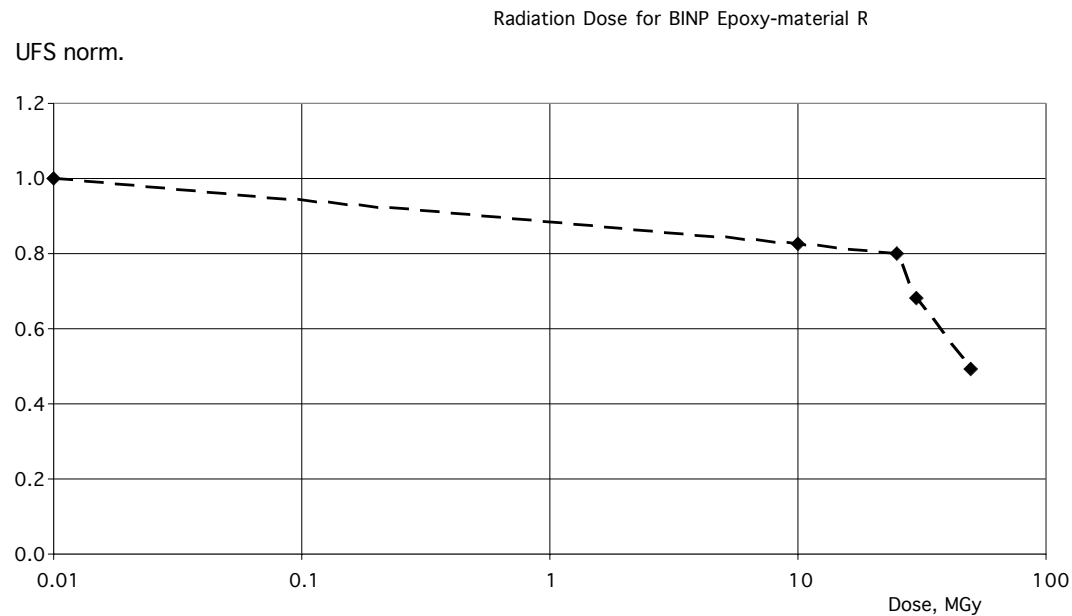
Laboratory situation without force cycles at 6kGy/h.

Smaller effects than from long-term irradiation (~factor 2!).

Indicative in direct material comparison.

Electrical Degradation follows Mechanical Degradation (Ref. Marc Tavlet)

MBW: R567 Epoxy Resin w/o fiber-glass
 BINP EPK-1 (ED-16, MA, MGF-9, TEa)





MQW magnet, IR3 / IR7

AT-MEL



Nominal strength 35 T/m

Nominal current 710 A

Ultimate current 810 A

Magnetic length 3.1 m

Aperture 46 mm

Overall length 3.4 m

Yoke length 3.1 m

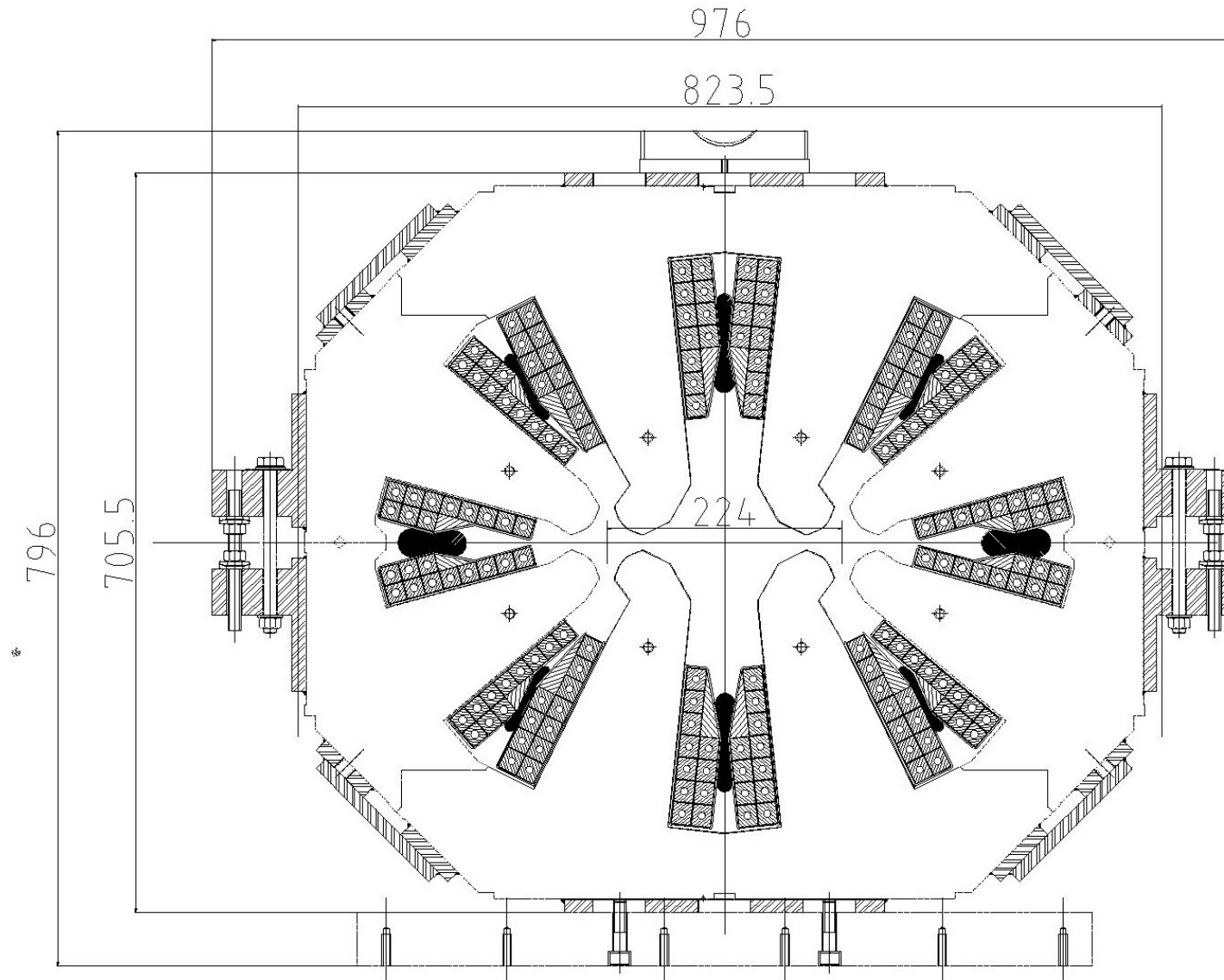
Yoke width 800 mm

Yoke height 680 mm

Overall weight 11000 kg

Water flow 12 l/min

Power dissipation 20 kW

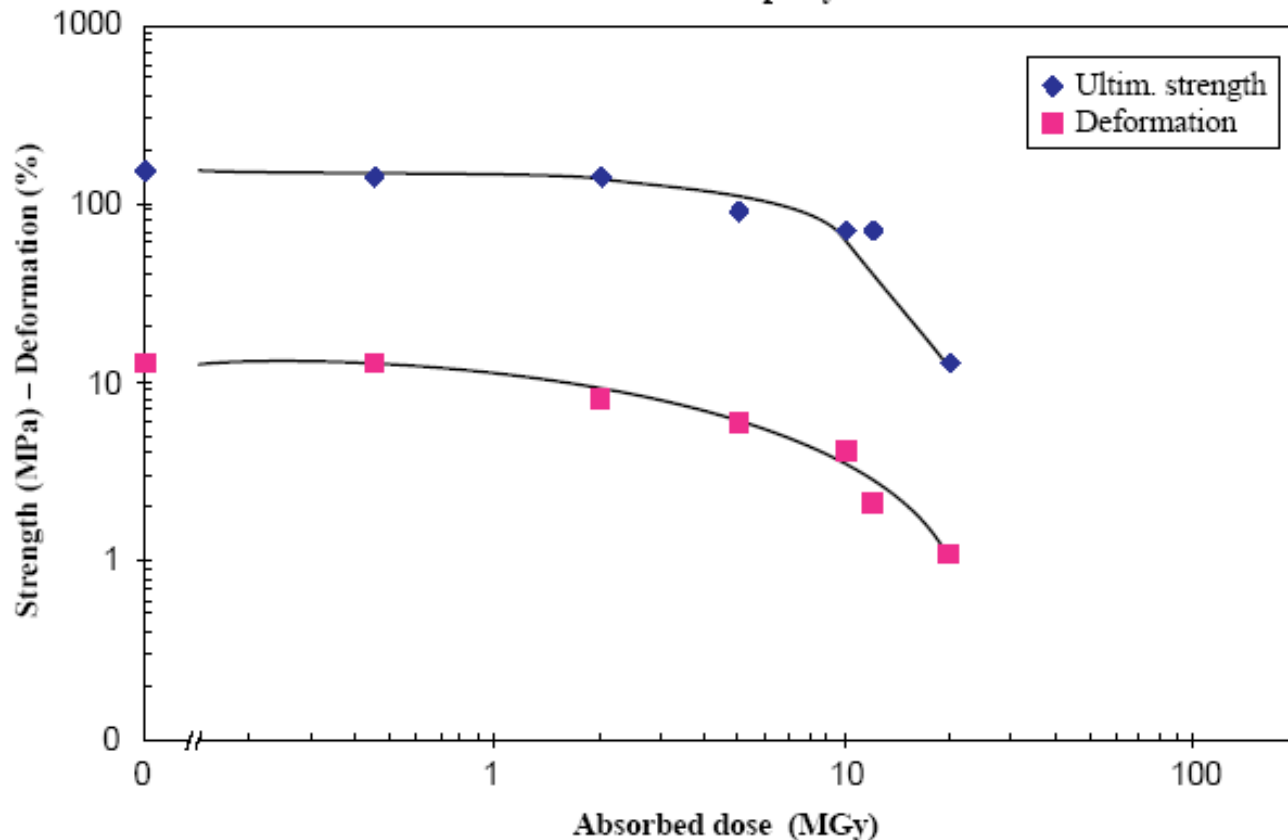


Irradiation at 180kGy/h except for 12MGy at 0.5kGy/h.

MQW: R422 Epoxy Resin w/o fiber-glass

MY745 (50) + EPN1138 (50) + CY221 (20) + HY905 (120) + DY073 (0.3)

Radiation effect on Epoxy resin R 422





See Publication:

'Absorbed Doses and Radiation Damage during the 11 Years of LEP Operation', H. Schönbacher and M. Tavlet, CERN-TIS-2002-010-DI-PP

Doses up to 22 MGy with only a single exception of ~100 MGy on dipole 161.

Valuable comparisons of short-term and long-term irradiation.

Most critical magnets so far in transfer lines close to target

e.g. SPS – North Area

all magnets with special design for >100MGy: MgO insulation or Asbestos

BUT maximum doses 0.5MGy/yr

QNL.B no breakdowns over ~30yrs

MTN DC-magnets ditto

MSN fast pulsed septa died after ~20yrs

not a reference for LHC due to materials...



- Keep in mind: Failure is a statistical process!
- Target: 30MGy over 10years of nominal operation

3MGy/yr