

UNIVERSITÀ

DEGLI STUDI

DI MILANO

CONSTRUCTION AND COLD TEST OF THE SUPERFERRIC OCTUPOLE FOR THE LHC LUMINOSITY UPGRADE

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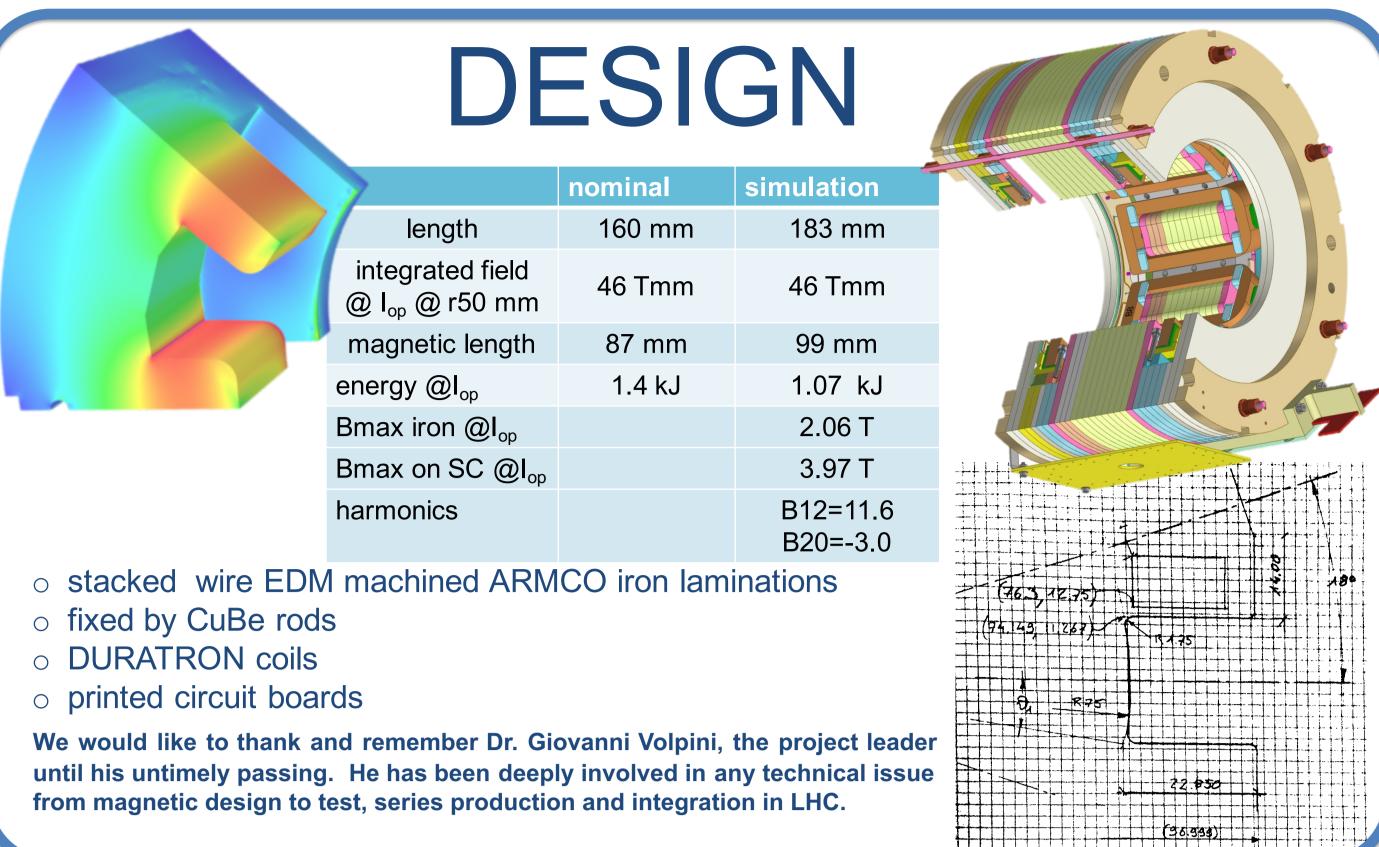


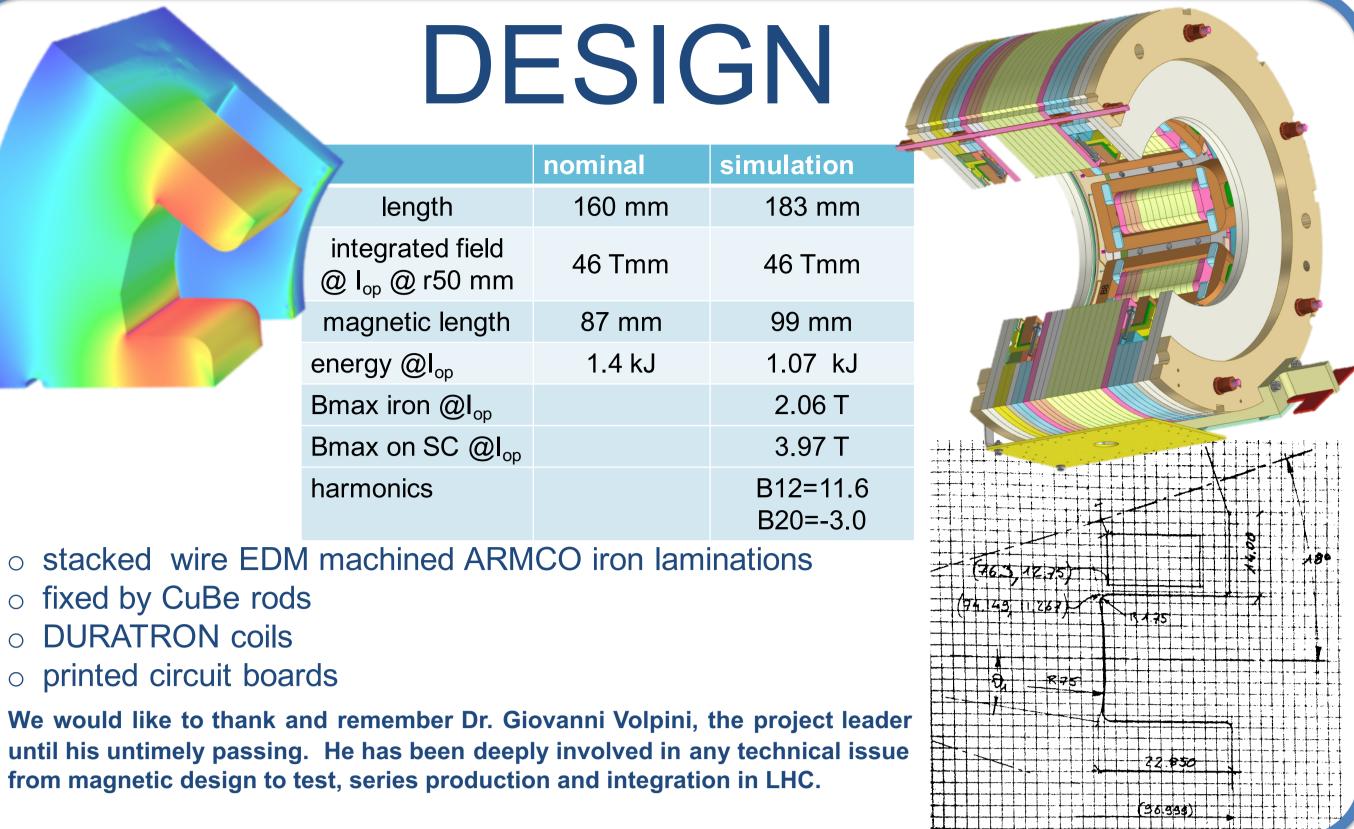
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ASSEMBLY copper 2 mm wide 0.035 mm thick alignment frame CuBe rods spacers fixed longitudinally wedges in position the wedges are fixed 2 printed boards (PCB - ARLON®) NbTi wire soldered test at room temperature w and w/o 77 K thermal cycle no Cu or NbTi detachment no difference was measured

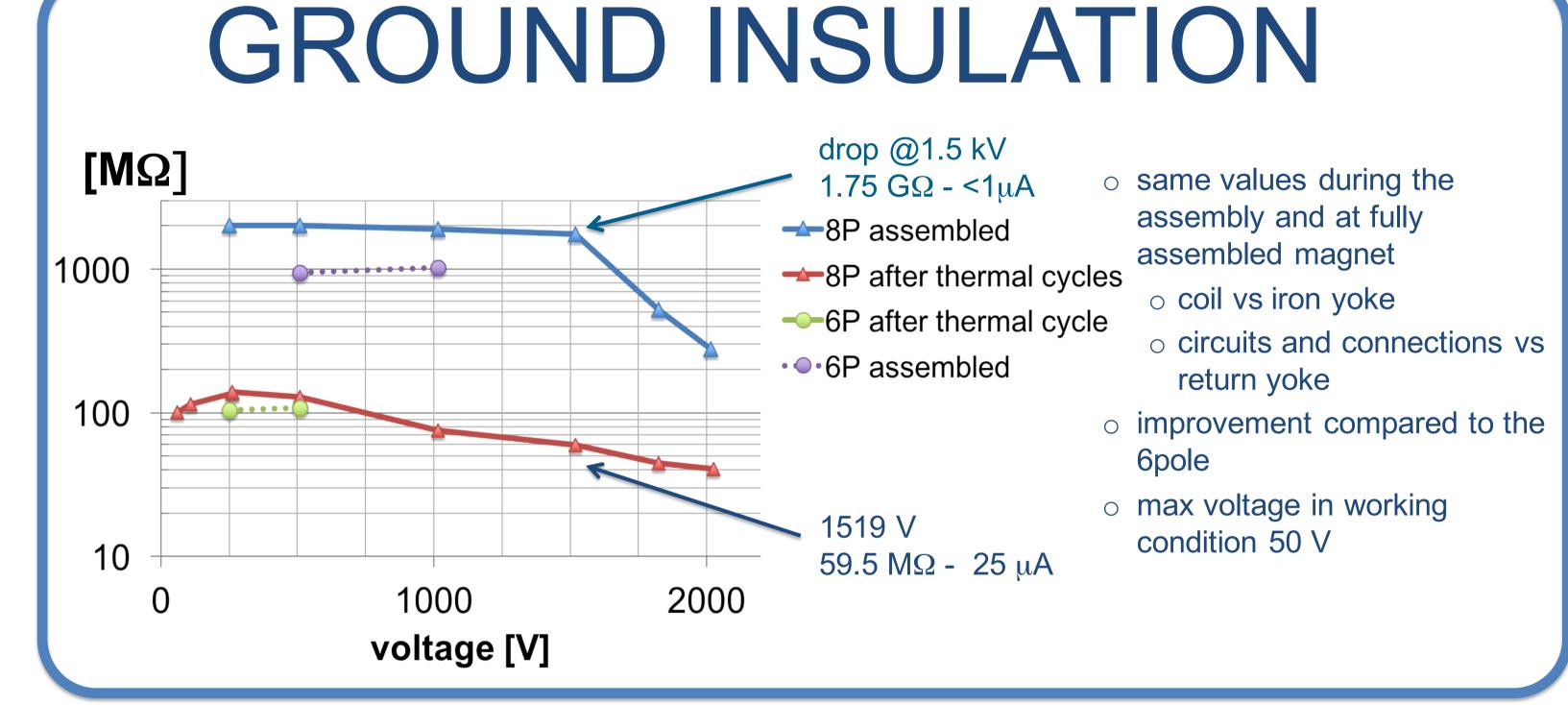
COILS' DEVELOPMENT 4.2 K SINGLE COIL TEST **Cross section** windings nominal current single coil's cold test: 2 training quenches reached short sample sample 247 A QUENCH resistance $[\Omega]$ Aluminum nitride (AIN) Diam. 2 mm - 1 mm thick 13,300 by INTELLION S.a.r.l. **HEATERS** 13,280 two heaters are installed 13,260 on coil B5 the duratron thickness was reduced by hand – mean 13,240 ·····1 st dev on coil B6 a Φ 2 mm AIN ceramic insert in the hole 13,220 ·····1 st dev quench induced at 4.2 K, I= 73 A: 4.4 J Vs 10.1 J (AIN) 13,200 · 1 turn COILS' ASSESSMENT · 1 turn

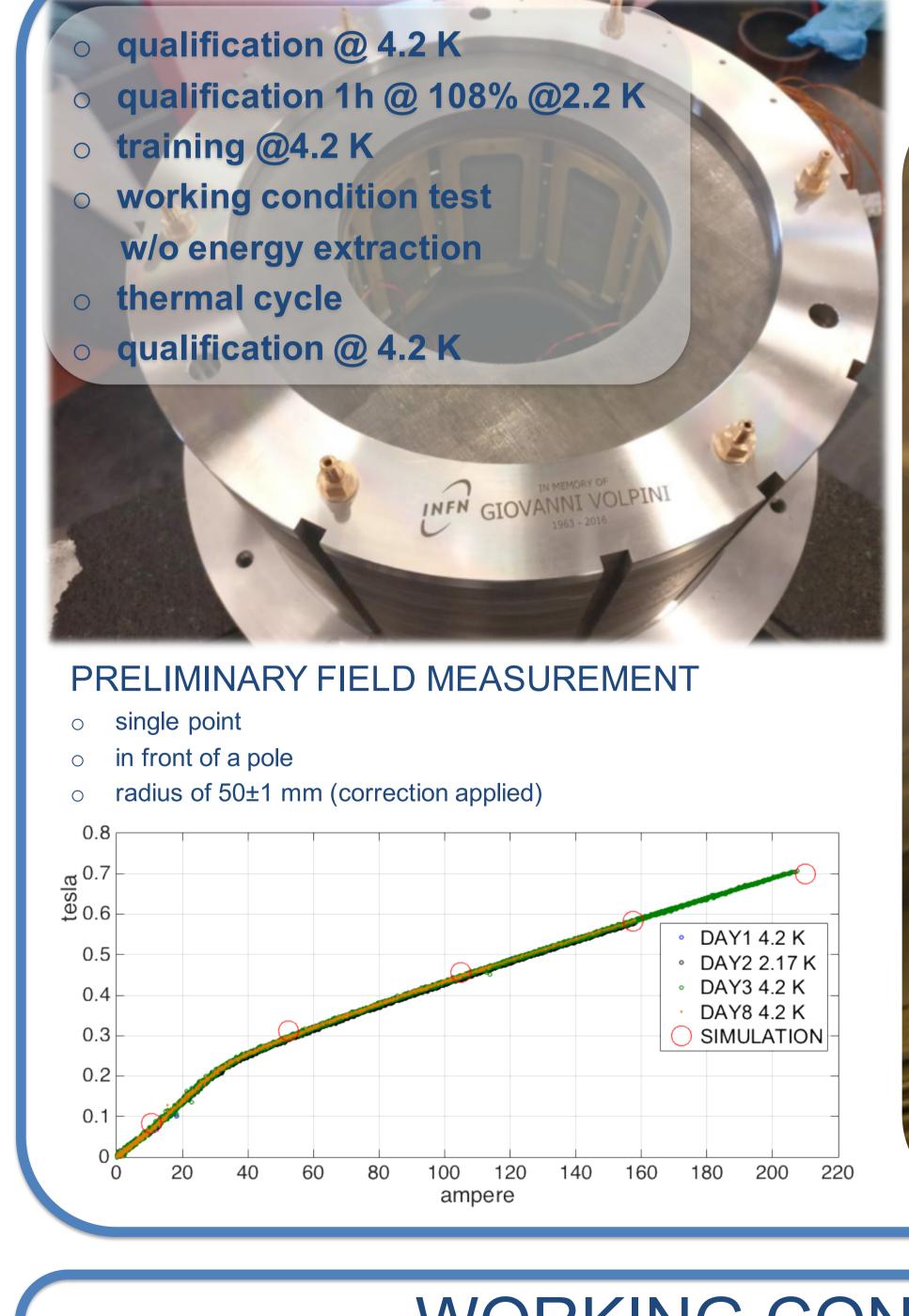
13,180

13,160

1 2 3 4 5 6 7 8 9 10 11 12

coils' number



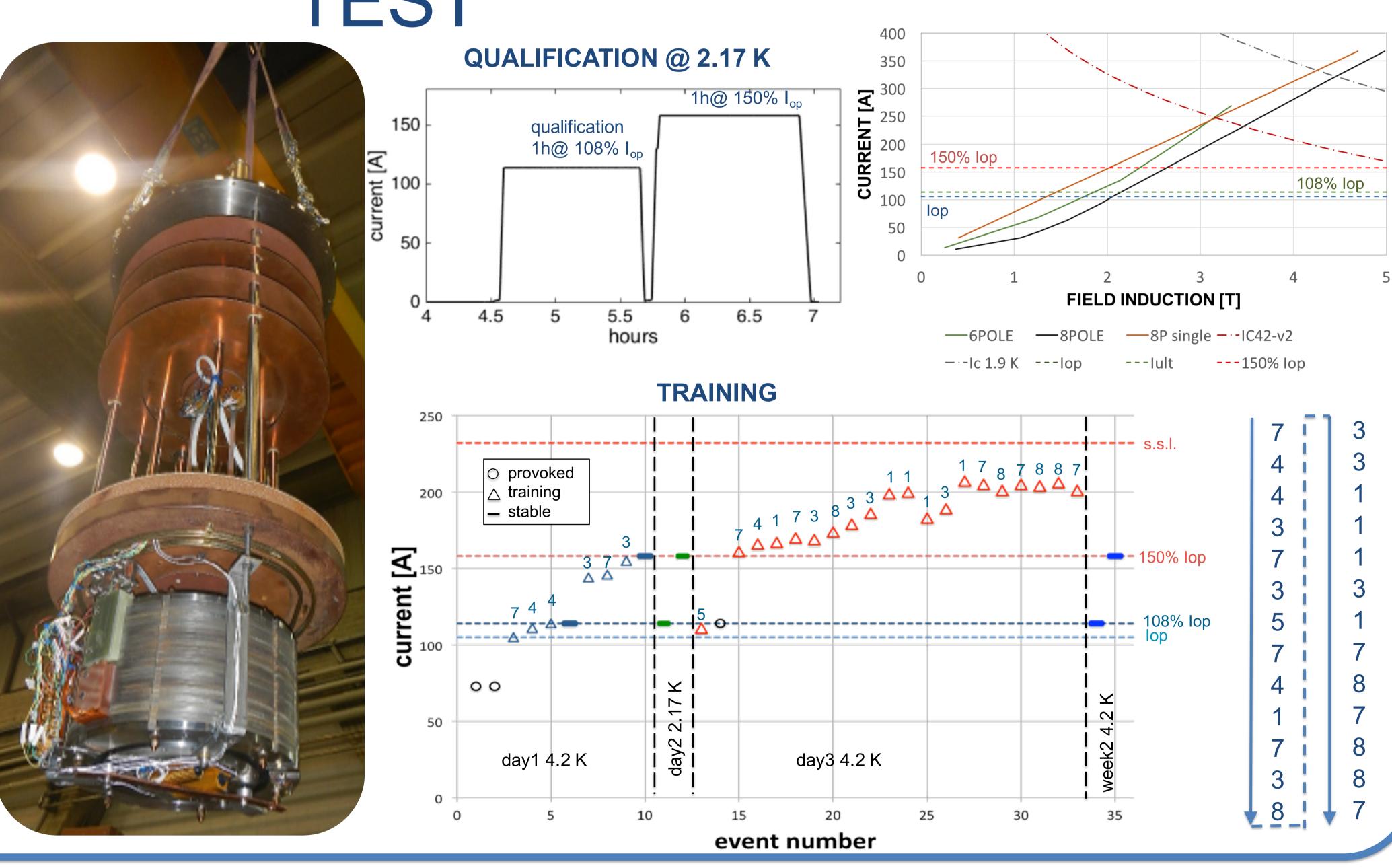


(system dependent)

√ inductance

✓ voltages

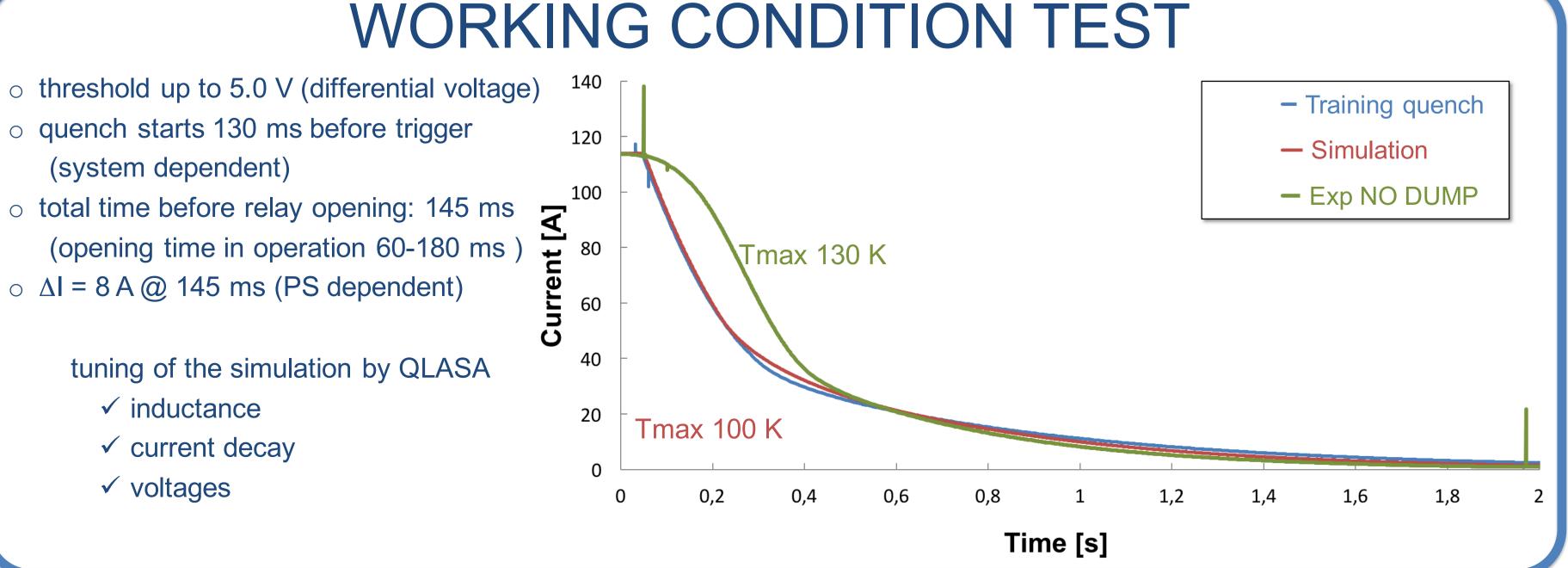
✓ current decay



o geometry average $\sigma = 0.13$ mm

 \circ HV: > 1.8 G Ω @ 5 KV

o resistance: 1 turn accuracy



CONCLUSION

The second prototype of the five High Order corrector magnets for the Hi Lumi LHC upgrade has been designed, manufactured and tested at INFN LASA laboratory.

The octupole has been successfully qualified at its ultimate current in He II at 2.17 K and reached 89.2 % of short sample limit at 4.2 K.

field Preliminary measurements reproduced are electromagnetic simulations.

A quench study to reproduce the operation without energy extraction has been performed and the experimental results are reproduced by the QLASA simulations.