



Short Model Electrical tests

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- I. When?
- II. What type of test?
- III. Examples :
 - Continuity test using a sound tester
 - Coil discharge test
 - Dielectric measurement

When?

ELECTRICAL TESTS are performed at each important step during coil/magnet fabrication process

MQXFS example (EDMS 1904945)

Tests performed on single coils (Poles)

- Before reaction – PBR
- After reaction – PAR
- After impregnation - PAI
- After impregnation with instrumentation– PAIWI

Tests performed on assembled coils (Magnet)

- After coil pack assembly – ACPA
- After mechanical structure loading operation – AL
- After longitudinal loading – ALL
- After magnet interconnection - AI
- Final magnet test before delivery - FINAL

What type of test?

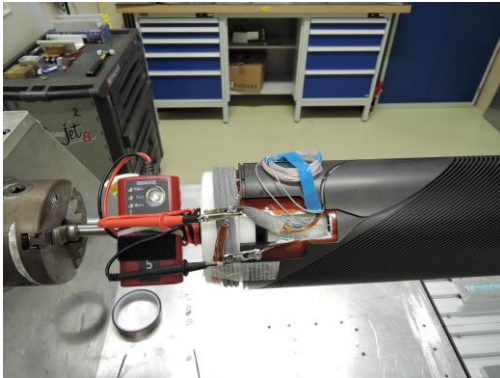
Most common tests performed in 927 laboratory :

- Resistance measurement
Coils, Quench heaters, Voltage taps, Instrumentation
- Inductance measurement
- Capacitance measurement
- Dielectric measurement
 - Between coils / QH / instrumentation / spacers / ground
 - Insulation (up to 5kV; 30s)
 - Current leakage (up to 5kV; 5min)
- Discharge test on coils
 - Up to 5kV or 120V/turn
- Discharge test on quench heaters
 - Up to 900V or 80A/QH

Examples :

Continuity sound tester (“Bipper”):

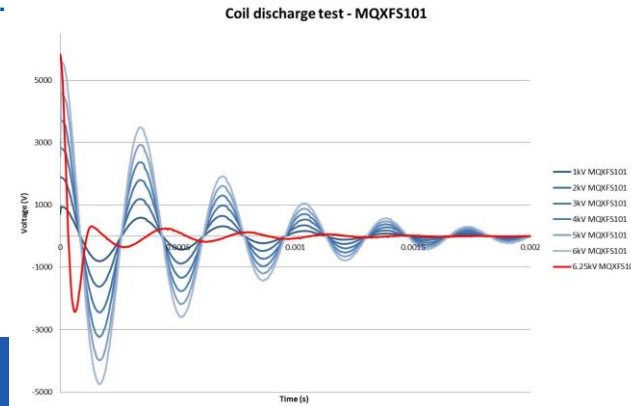
- Used to check during winding the insulation between cable and ground (winding device).
- Threshold level not precise (Really simple and cheap device)
- Sounds below $\approx 200\text{k}\Omega$ (Elbro) or $\approx 10\text{k}\Omega$ (Benning) (sound means short circuit)
- Device used : Elbro 2511 / Benning Dutest Pro



Examples :

Coil discharge test :

- Measure the response of the coil after a voltage pulse.
- Difficult to analyze (L dependent). Curve are compared between coils or at different discharge levels.
- Check the frequency and the envelope decay.
- Device developed by Elytt Energy in 2014 for the CERN : Epower Syst CDG 7000 generator
- Relevant parameters: $2\mu F$ / 7000V / I_{max} 1200A / L $35\mu H$ / R_{int} 200m Ω
- Example :



Examples :

Dielectric measurement:

- Insulation measurement / Hipot test.
- Commercial insulation tester
- Apply high voltage and measure resistance and current leakage after 30s and 5min
- Device to measure high resistance : $k\Omega$ to $T\Omega$ (Hygro, T and time dependent)
- Device used in 927 laboratory: Megger S1 1054-2
- Main parameters : max. voltage 10 000V / different modes / Remote control via USB
- New Megger: ramp function
- Demo : Insulation between coil and Quench-Heater on RMC coil



