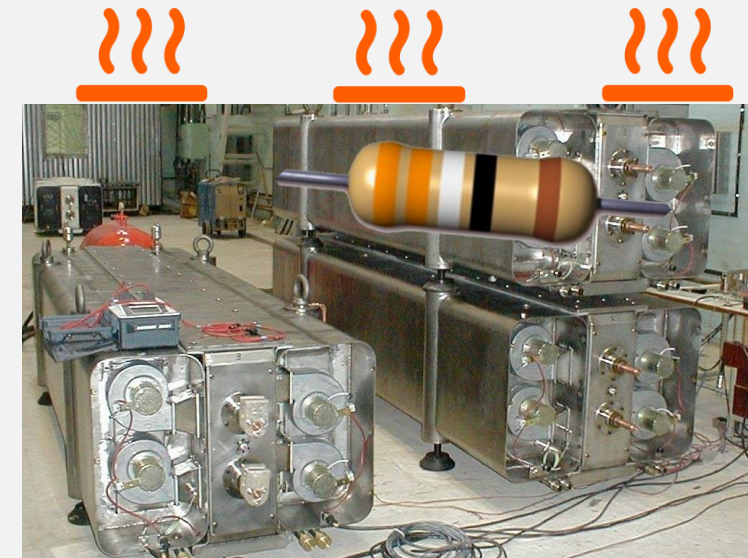
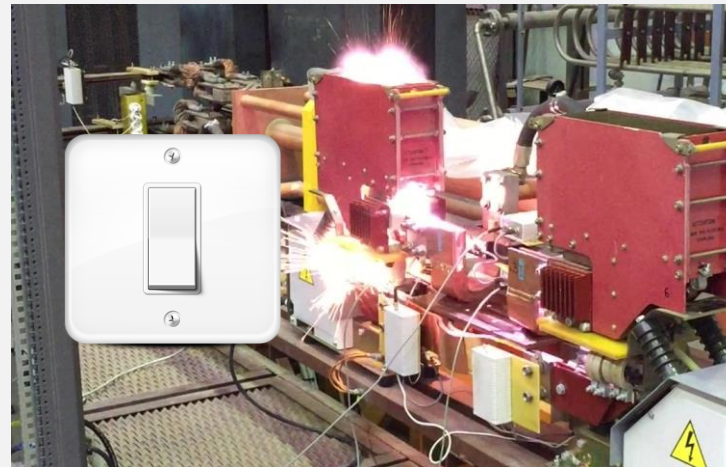
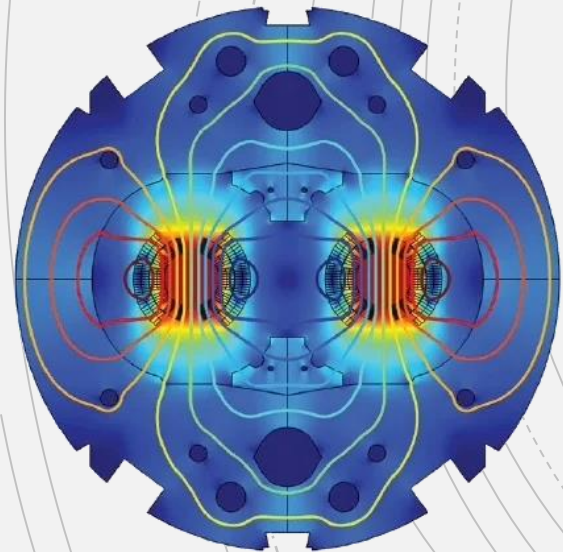
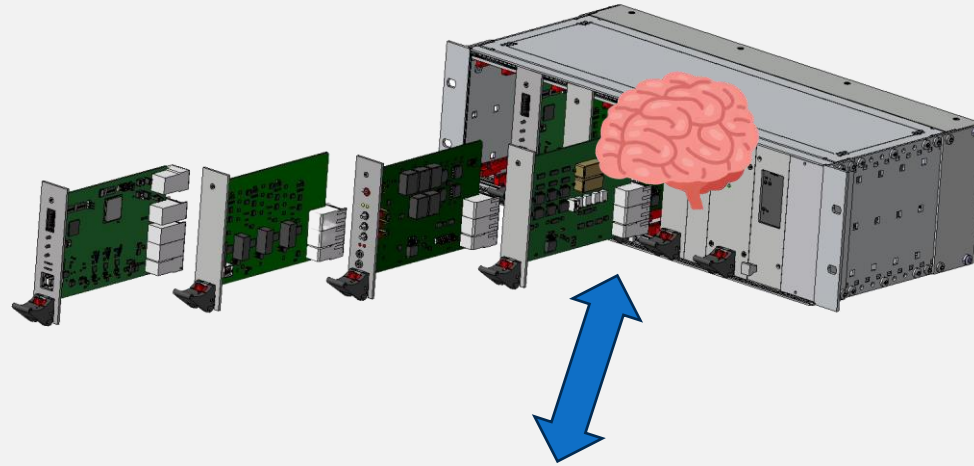


UCE3

Presented by Martin Grigorov
TE-MPE-MP

Energy Extraction Basics

- Superconducting magnet circuits store energy in their magnetic field
- Energy extraction system extracts the energy to dump resistors to protect the magnets
- Electronics control the whole energy extraction process



Contactors



Vacuum 2kA/600A



13kA



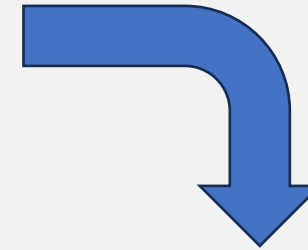
North Area



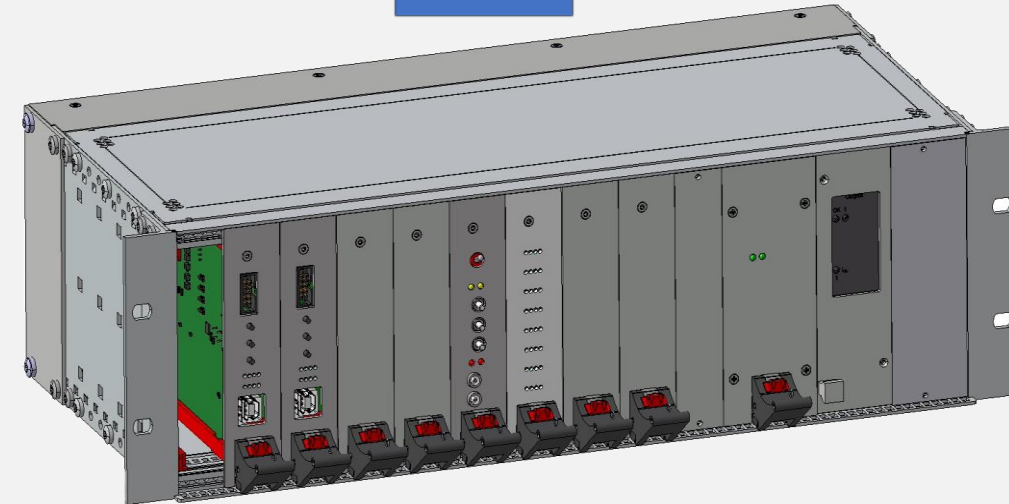
IGBTs



FRESCA



UCE3

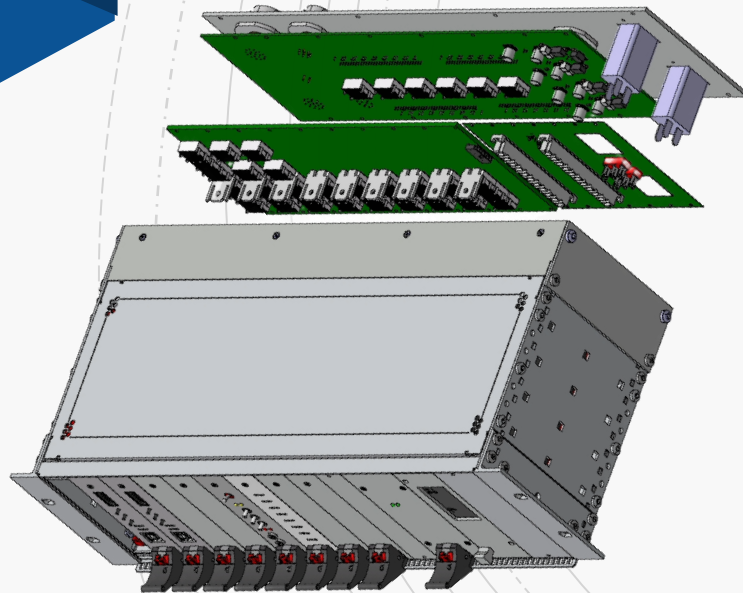


Motivation for Universal Control Electronics

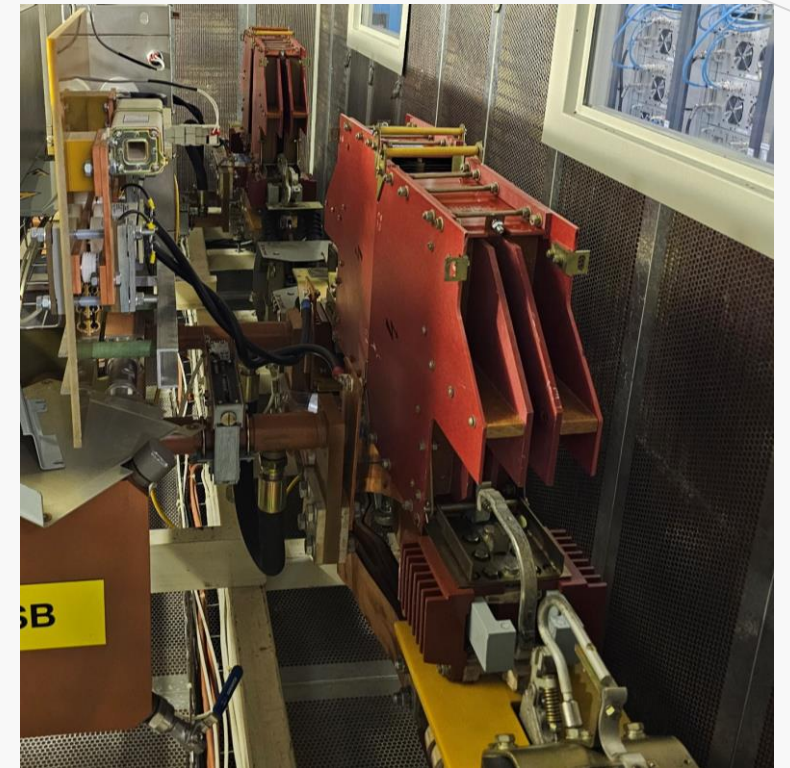
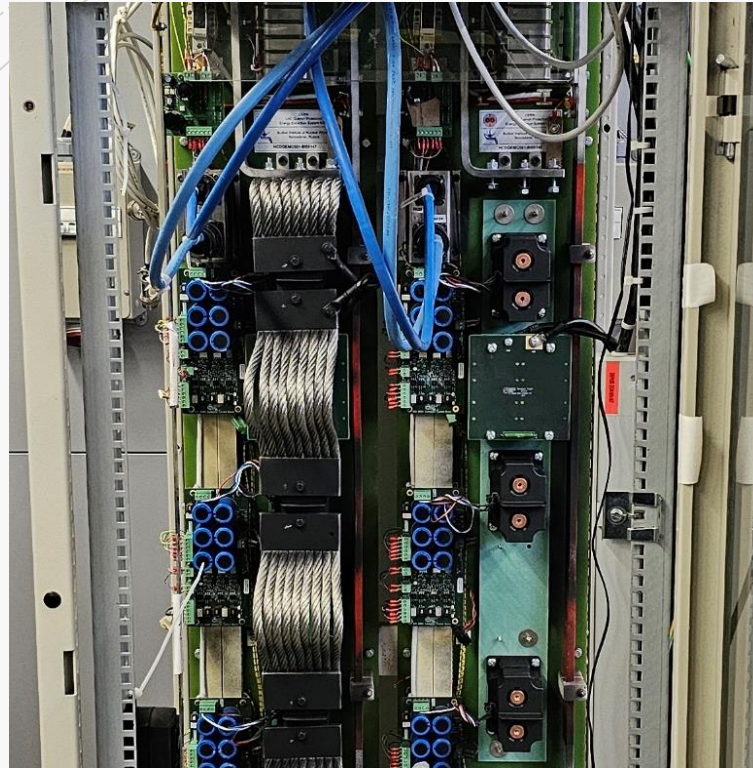
- Versatility and reduced complexity
- Radiation tolerance
- Improved maintainability

Structure

- 11 boards shared between all energy extraction systems
- Only the back panel varies between systems
- Designed with redundancy in mind
- All cards have spare outputs for future needs



Back Panel										
Vacuum 600A/2kA		Contactors		13kA		FRESCA		North Area		IGBTs
Motherboard										
Motherboard establishes the interconnections between the boards themselves and the back panel										
AMS	Control 1	Control 2	FSPA	Analogue Conditioning 1	Analogue Conditioning 2	Interlock	Driver 1	Driver 2	PSU	
Commnication with CERN IT Infrastructure	128 GPIO IGLOO2 Based FPGA USB/JTAG	128 GPIO IGLOO2 Based FPGA USB/JTAG	Fast and Slow Power Abort Remote/Local Control System Reset	4x20bit ADCs 1Mbit Sampling -20V to 20V Range 4x1mA Source for PT100	4x20bit ADCs 1Mbit Sampling -20V to 20V Range 4x1mA Source for PT100	32 Channels SPI coms	12 Channels 6 OR Outputs 6 AND Outputs 6 Relays 6 Isolated Transistor Outputs	12 Channels 6 OR Outputs 6 AND Outputs 6 Relays 6 Isolated Transistor Outputs	Custom DC-DC Power Supply 3x12V Outputs 3A Per Output	



Systems

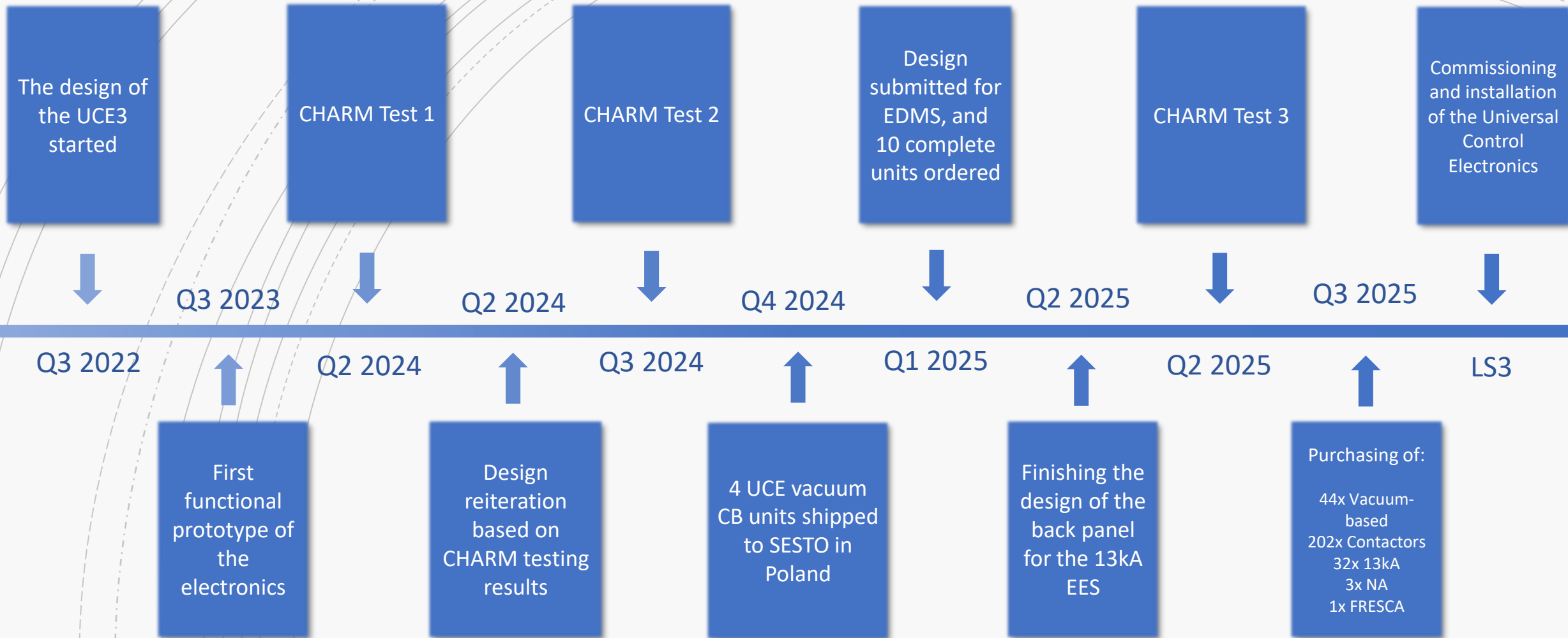
Three systems are currently actively developed for the UCE upgrade scheduled for LS3:

1. Vacuum 2kA/600A
2. Contactors
3. 13kA electro-mechanical CBs.



CHARM

- Prototype board-level tests
- System-level successful past 500Gy
- Third test scheduled for Q2 2025.



Project Timeline





Thank you for your
attention!

