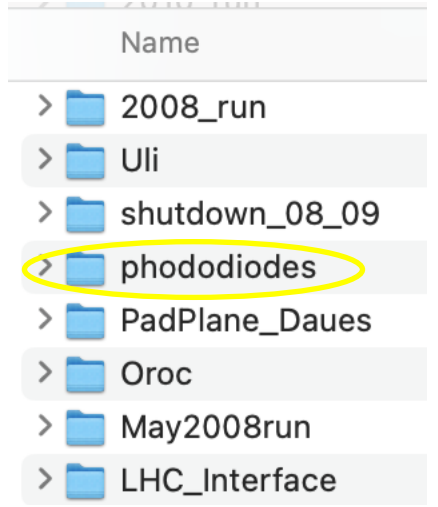
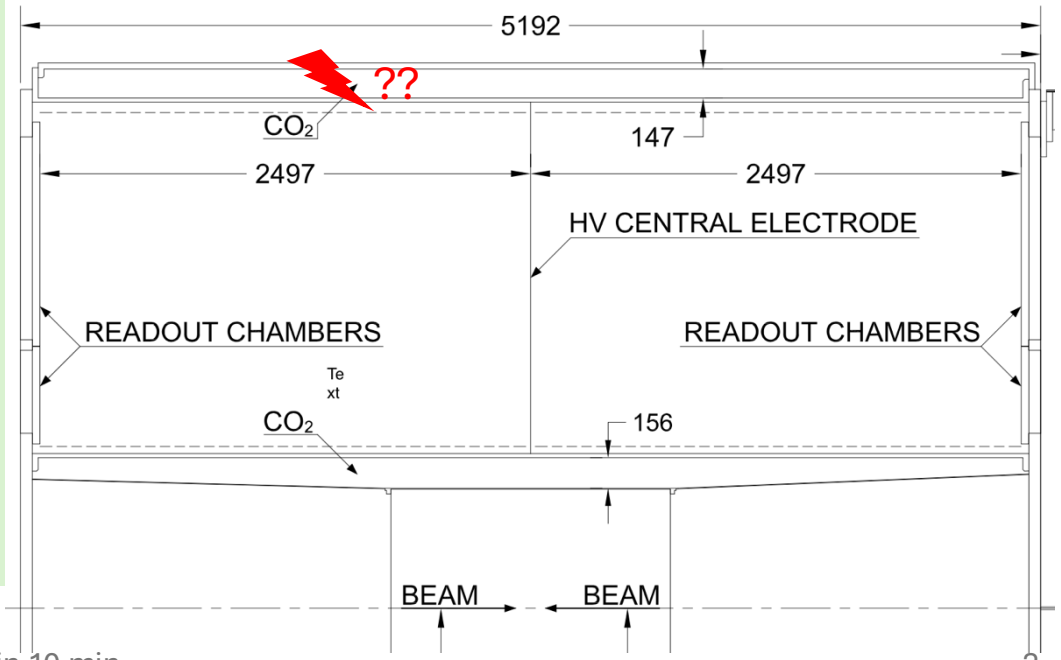
2007...



‘There was an explosion in the TPC’

- Discharge in the Field Cage HV system (100 kV) right after installation of the TPC in the cavern 😱
- Discharge across CO_2 gap?
- Stay off for a few weeks 😟
  - Task force!
  - “We have to get to the bottom of this!”





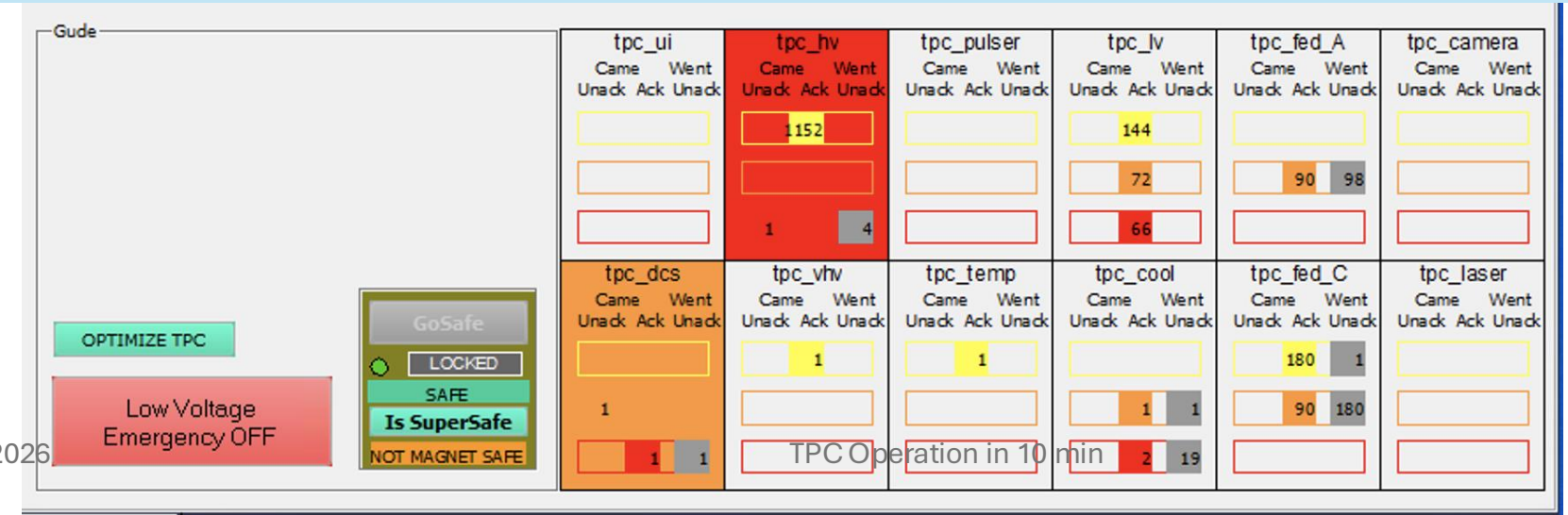
A few water droplets…

- Resistor chain to power the Field Cage strips to degrade the voltage is mounted on a water-cooled Resistor Rod, which contained residual water from cooling tests
  - two close droplets got charged up to opposite potentials…
- After fully commissioning the cooling, with circulating water, the Field Cage was operational again
- Uff! 😀



TPC operation during running

- Run 1: task force, getting to the bottom of many things
  - HV, LV, readout, gas…
- Run 2: task force, getting to the bottom of many things
  - HV, LV, readout, gas…
- Run 3: task force, getting to the bottom of many things
  - HV, LV, readout, gas…

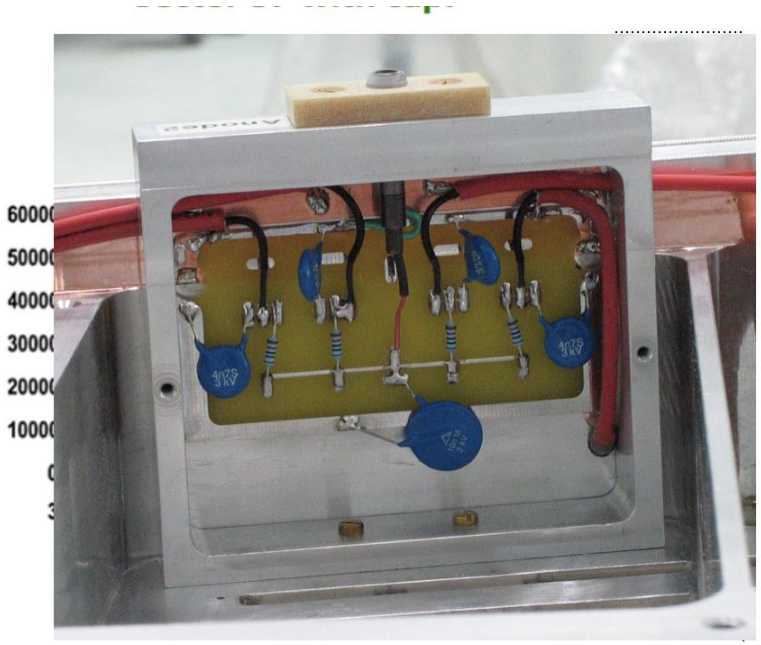


But also improve and upgrade (“consolidate”)

Upgrade HV power supplies: independent channel sources, trip delay



Remove decoupling HV capacitors (they store energy released in discharges and kill preamps



Optimise connectivity of LV power

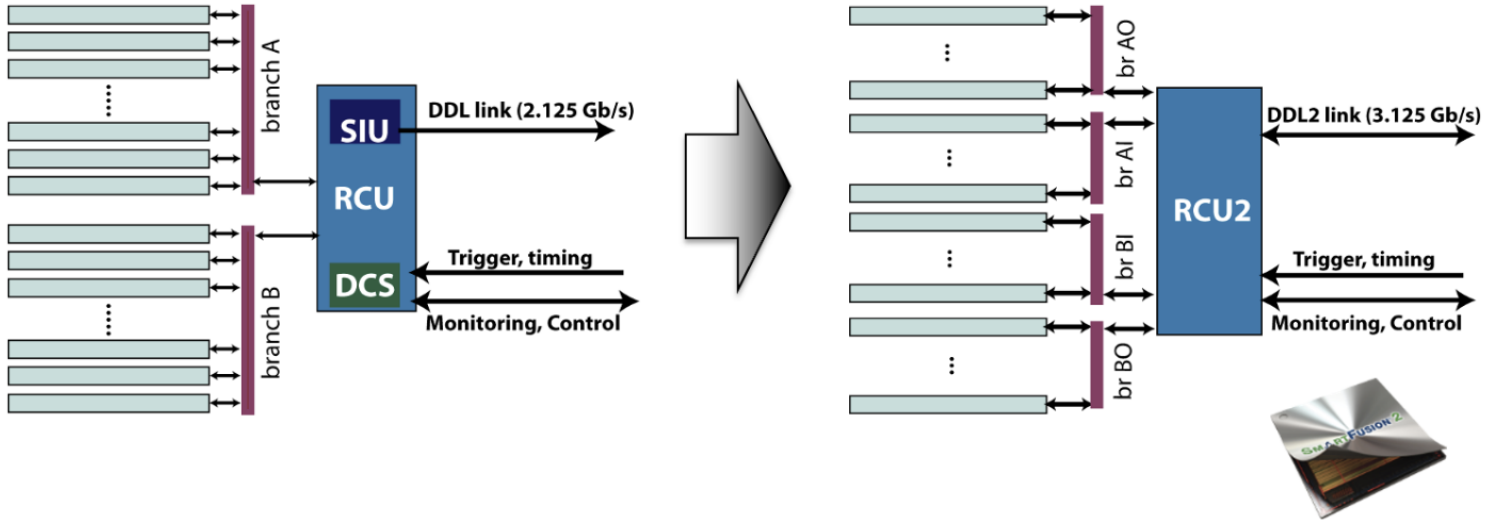


Run 1

Keep improving and upgrading

Run 2

- Faster readout (RCU2) for Run 2



- Change the gas back and forth

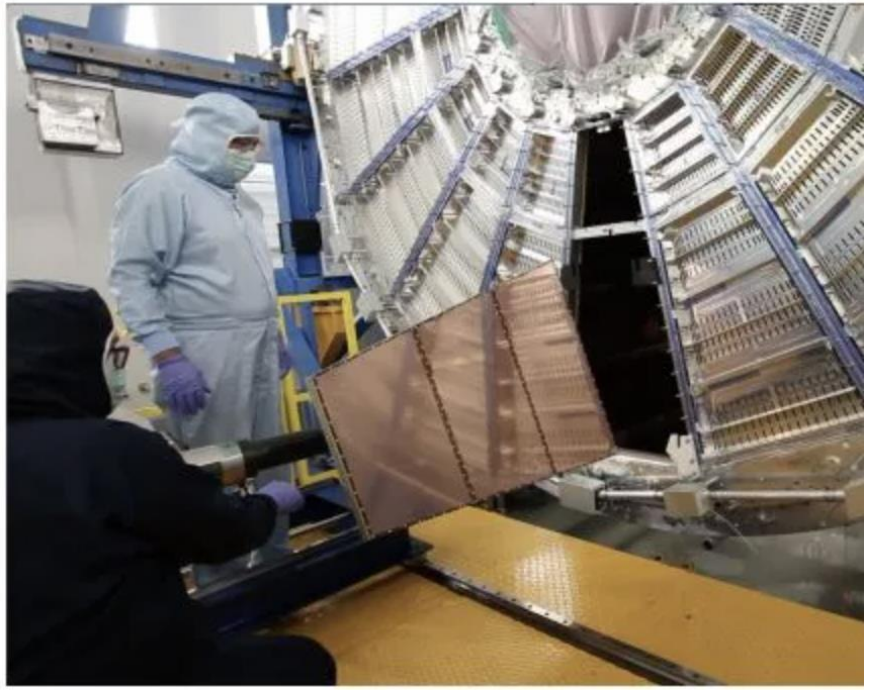
Until 2015:

- **2 parallel read-out branches**
- **Read-out link DDL**
- **Complex Read-out unit:**
  - **RCU board (2 FPGAs)**
  - **DCS mezzanine card (1 FPGA)**
  - **SIU mezzanine card (1 FPGA)**
- **Susceptible to SEUs**

From 2016:

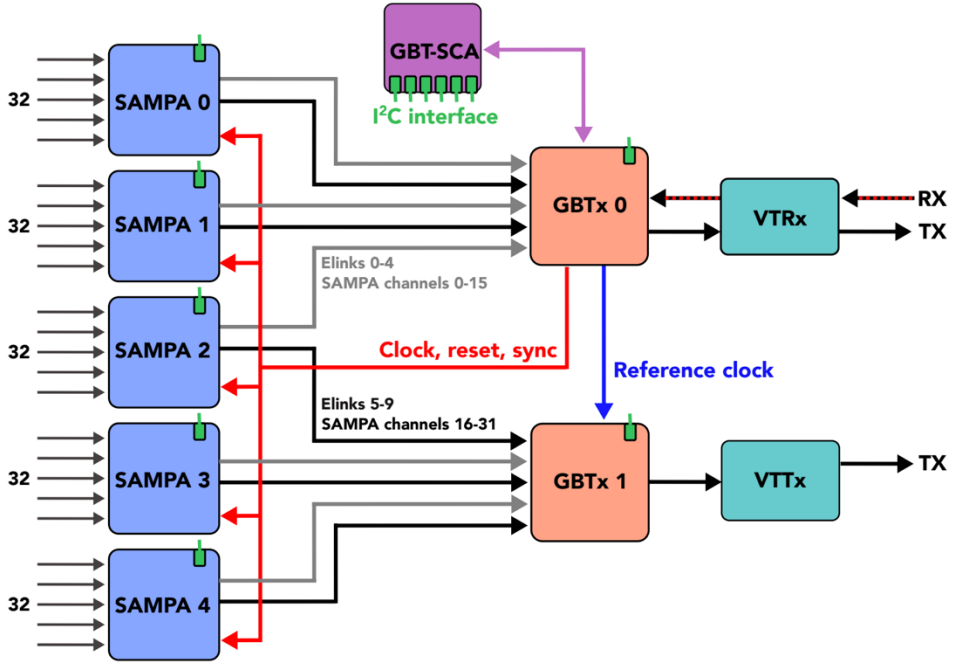
- **Increase to 4 parallel read-out branches**
- **Read-out link DDL2 with larger bandwidth**
- **Use only 1 radiation tolerant FPGA**
- **Double the readout performance for Pb-Pb data taking**

Upgrade for Run 3: streamline operation



GEM-based chambers

Automatic trip recovery
FC: get to the bottom



Continuous readout

Lots of firmware
On-the-fly error resetting

Summary of TPC operation during ~20 years

- Just like any other detector: get to the bottom, improve, upgrade, consolidate
  - i.e. try to get the best possible data and not be called at nights
  - anyway, the offline calibrators made miracles with whatever data we provided

- As TPC operators, we got used to be under the spotlight, but fortunately the current DG doesn’t know us…