JUNO PMT Workshop
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GCU Production tests

On behalf Padova JUNO group
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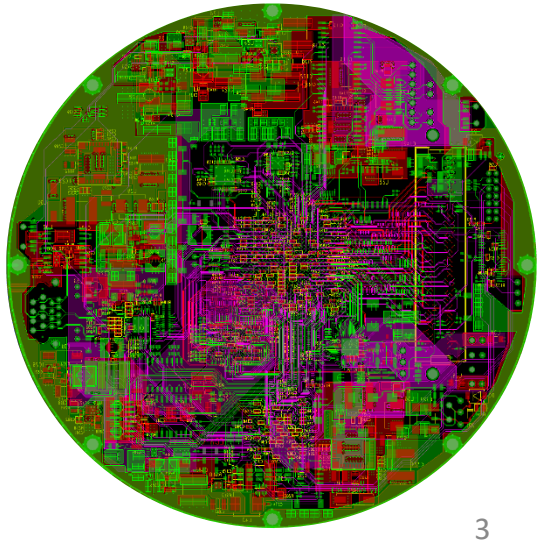
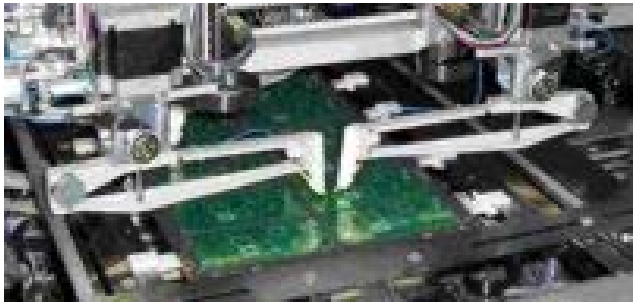
GCU Production tests

- Very preliminary ideas on the test flow for the GCU production.
- Matter for discussion and suggestions.

Post PCB production tests

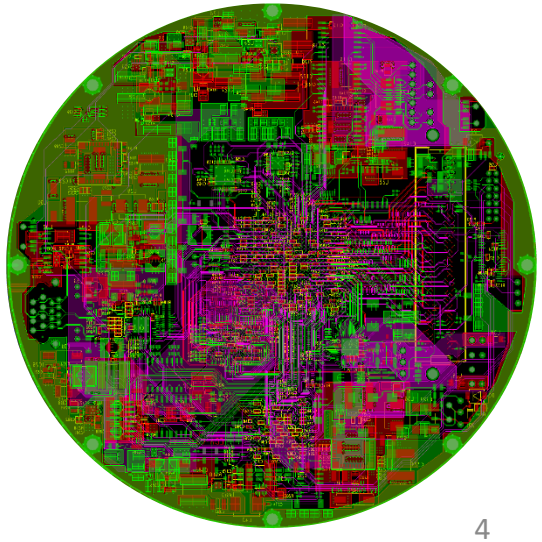
- Connectivity test on bed of nails.
  Requires a PCB appropriately designed (test points) and the construction of a specific equipment (bed of nails).
- Alternatives:
  flying probes. Less expensive but too slow for big productions.





Post mounting tests

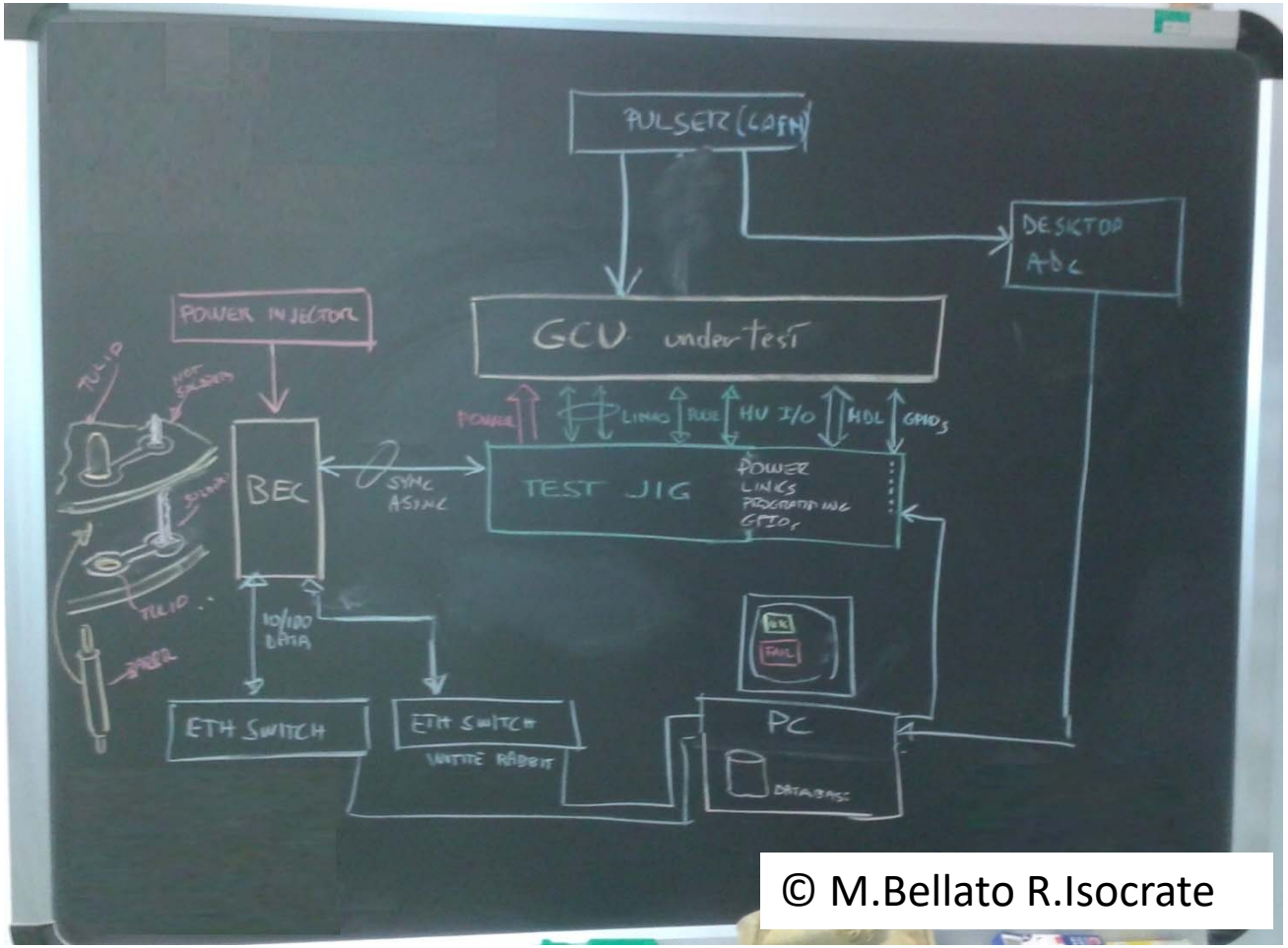
- Visual inspection.
- BGA radiography.
- Conformity test on bed of nails:
  not a complete functionality test; rejects boards that behaves differently from the "working sample".
- Burn-in:
  48 hours at 70°C with power supply and monitoring the power consumption.



Functional test

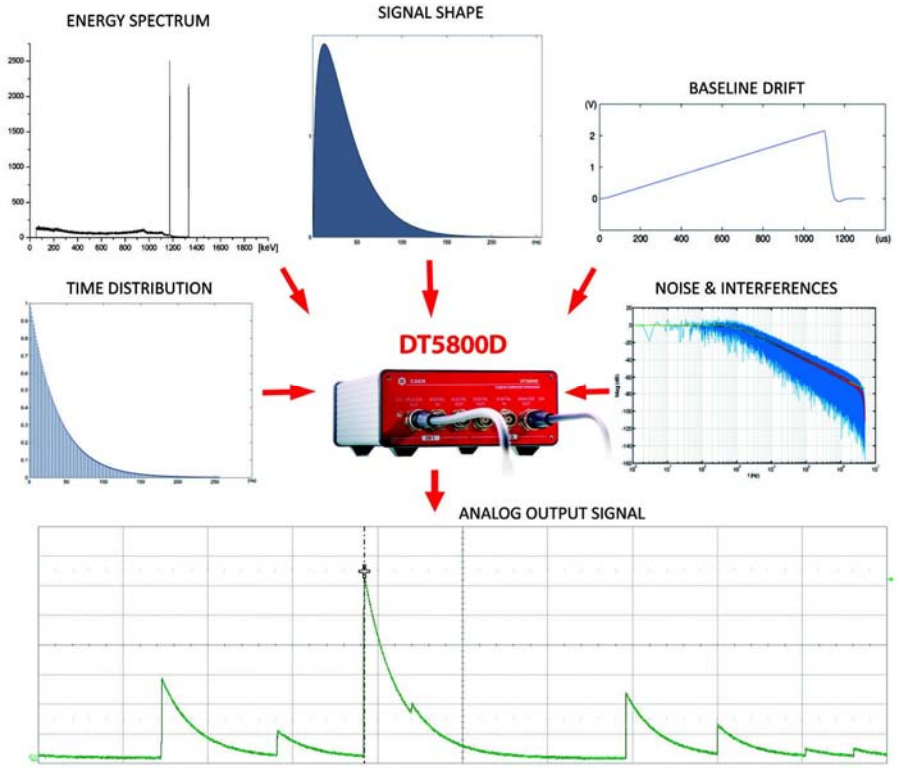
- After burn-in all the boards will be functionally tested at the factory.
- The same test will be performed on a random sample at LNL after delivery.

Functional test (2)



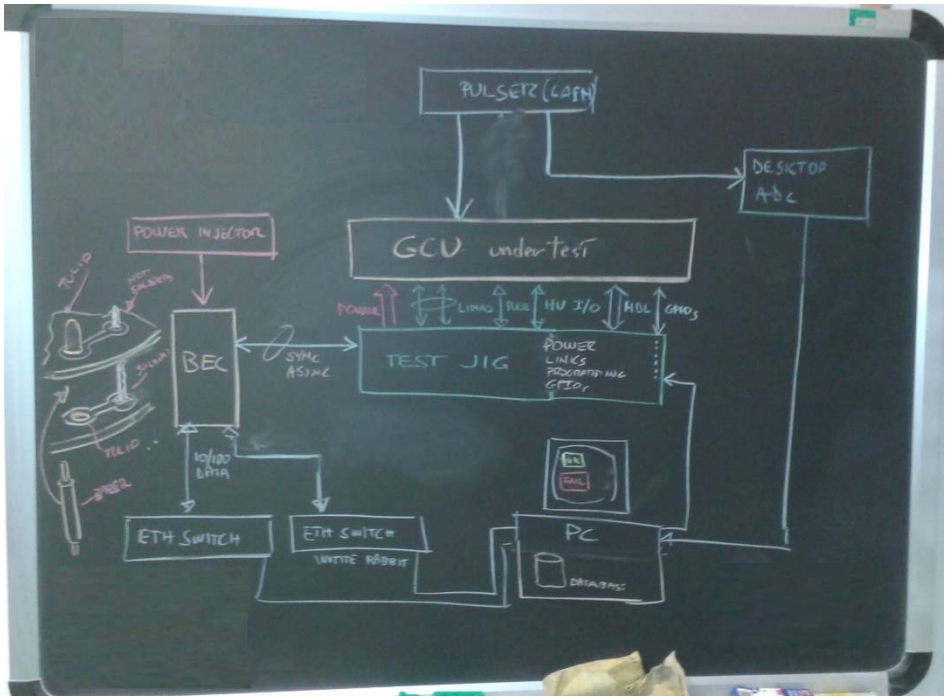
Functional test (3)

The core of the test jig is the CAEN DT5800D detector emulator.



the system is able to emulate with high accuracy a radiation detection system from the detector output to its related front-end electronics. The user must provide: the signal shape distribution, the required energy spectrum, the time distribution, the noise characterization, and the baseline drift.
The signal shape can be generated either by using the system internal database, or using recorded shapes from the experimental setup. The same is true for the energy spectrum. It is possible to create several emission lines through the tool itself, or to import a file in the format of CVS/ANSI N42.42, or to use the internal database electronics. The user can choose a Poisson or any arbitrary time distributions. It is also possible to emulate white noise, 1/f noise, random walk, as well as interferences. The characterization of the baseline drift can be also added.

Functional test (4)



The two outputs of the DT5800D can be used to compare the GCU processed data with the ones foreseen by the software, and provide a quick pass/fail test.

The implementation if this test jig requires a significant hardware and software development (manpower problems?)

Some rough estimation about the mass production

~20,000 GCU to be produced within ~1 year

$\Rightarrow$ 2,000 GCU/month $\Rightarrow$ 100 GCU/day

- Burn-in chamber has to have a capacity of 200 GCU. Not very big, but requires adequate power supply and monitoring capability.
- Functional test must process ~15 GCU/hour. Most likely many test jig must be provided (3 to 6 probably; depends on the workshifts of the factory). DT5800D costs 8,000€!

Thank you