

**EMULATION OF THE SLOW - CONTROL**

**FOR**

**THE PANDA CLUSTER - JET GENERATOR**

**PRESENTED BY**

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Why emulation seems to be a necessary step in the project

- Safety considerations:

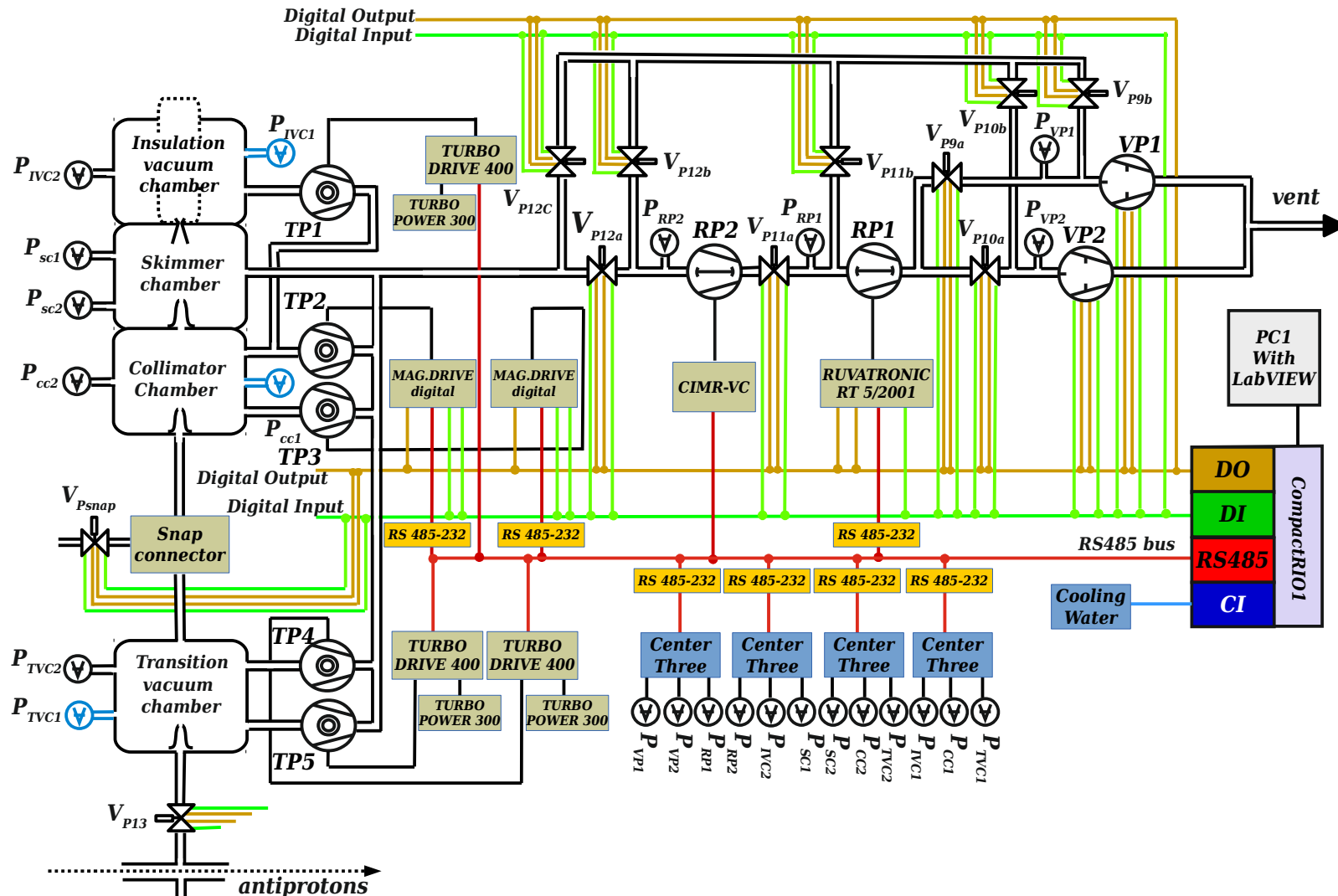
To avoid damage of the costly components of the cluster - jet generator (and the beam-dump) vacuum system by erroneous operation of the slow-control system in the course of its development,

- Organizational considerations:

To decouple development of the cluster - jet generator proper, at least temporarily, from the development of the slow-control system. Such a situation is met right now ==> the generator is being dismantled at Uni - Muenster and transported to FZ - Juelich for installation on the proton beam of COSY.

Tests of the beam - target interaction are scheduled in August 2018 (more on that from A.Kh. presentation).

# An overview of the cluster - jet generator vacuum system and interfaces to its vacuum devices



## Elements of the vacuum system and interfaces to the CompactRIO-NI cRIO-9039

- Valves: operated by current pulses from Digital Outputs [DO]  
Status (Open, Closed) indicated via Digital Inputs [DI]
- Vacuum sensors: Current values converted into digital form in the Center Three units. Available at their outputs in the RS232 format.
- Vacuum pumps
  - Forevacuum
    - Rotary vane pumps VP1, VP2: turned on and off by current pulses from DO, status indication and ErrorSignal received into DI inputs,
    - Roots pumps RP1 - RUVATRONIC RT5/2001 - turned on by a start pulse and turned off by a stop pulse from DO, status of operation (On/Off) indicated into DI,
    - RP2 - CIMR-VC(Yaskawa) - turned on by a start pulse and turned off by a stop pulse from DO, status of operation (On/Off) indicated into DI,
  - High Vacuum
    - Turbomolecular pumps TP1, TP4, TP5 - TURBO.DRIVE400: turned on and off by current pulses from DO, status indication and ErrorSignal received into DI inputs, possibility to receive some detailed parameters of operations via the RS485 interface,
    - Turbomolecular pumps TP2, TP3 (heavy duty) - MAG.DRIVEiM
    - The pumps are turned on by a signal from DO and turned off by its disappearance. Status signals On/Off are indicated by a signal/or its absence at an input to DI. An error signal is sent to another input of DI.

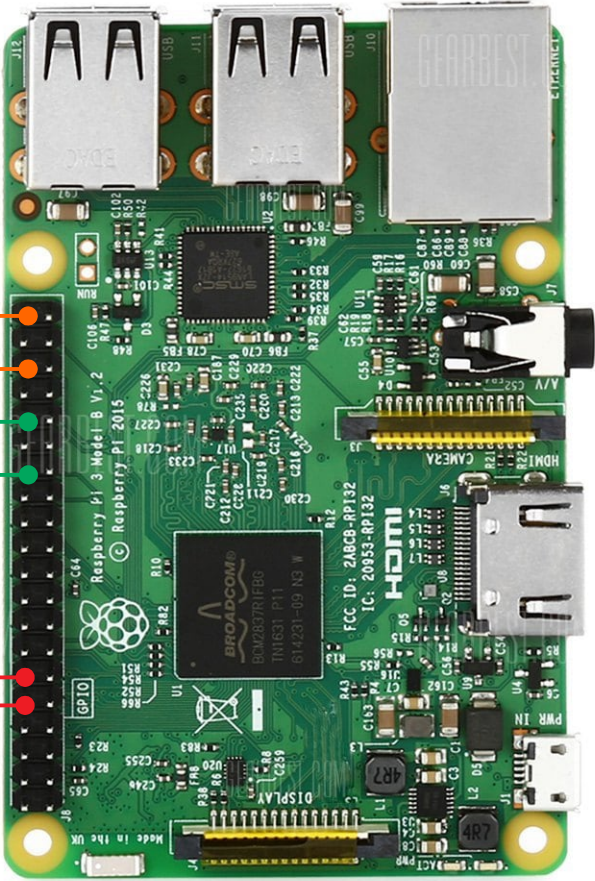
## **Slow-control system emulation**

In the slow-control system emulation we intend to use Raspberry Pi controllers (e.g. RaspberryPi 3, Model B) as elements responding in a definite, programmed way to commands sent from the cRIO-9039, and the response that follows is that expected on this occasion from the real interface. RaspberryPi's will be programmed in Linux. We expect that with a few Raspberries it will be possible to emulate the vacuum system previously shown.

On the occasion of the proposed test system several questions arise to be answered by our WWUM colleagues:

- Do you consider building such a system by us worthwhile?
- Will it be possible with the proposed scheme to prove by its operation that switching from emulation, at a certain stage of its advancement, to the real vacuum system will not have any wrong consequences?
- At what time frame?

# Elements of the slow-control emulation



**Raspberry Pi**

**Thank you for your attention**