

# Slow control of the Cluster-Jet Target

at the verge of Milestone M8

(a Status Report)

**B. Zwieglinski**

National Centre for Nuclear Research (Warsaw)

and

**J. Tarasiuk**

National Centre for Nuclear Research/  
Faculty of Physics, University of Warsaw

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The Detector Control System Coordinator Florian Feldbauer started a discussion within the EPICS Community with the following statement:

"for the Detector Control System of the PANDA Experiment we are using EPICS as control software. Only our target system group has implemented their control system for the prototype using a CompactRIO from National Instruments.

I have seen, that NI provides a so called EPICS Server I/O Server plugin which, as far as I understood, can be used on the CompactRIO system to publish shared variables as PVs to EPICS CA Clients."

and a question:

I'd like to know if anyone has experience using the CompactRIO with EPICS?

Does the plugin support fields like HIHI, HHSV, ADEL, MDEL?

## **This statement and questions revived a vivid discussion, which demonstrated that:**

1. The NI EPICS Server I/O Server has a very limited EPICS functionality e.g. supporting fields like HIHI, HHSV, but not ADEL or MDEL,
2. Another issue of a worry that resulted from this discussion is the way NI EPICS Server I/O Server handles error input: Instead of passing the error, it simply skips to copy new (invalid) data to the shared memory. Thus when a device breaks, EPICS will happily read the last good value. And EPICS will put a current time stamp on the old data. Thus, for an operator sitting at the end, there is no way to see problem in EPICS.

The software scheme which has been developed in recognition of these problems is presented on the following page. It completely avoids application of the widely criticized NI EPICS Server I/O Server. As an added value in this LabVIEW - EPICS hybrid, it has been considered application of an EPICS Sequencer. It permits to build an overall control program as a state machine, possessing all states for the proper operation of the cluster target within the PANDA detector control system.

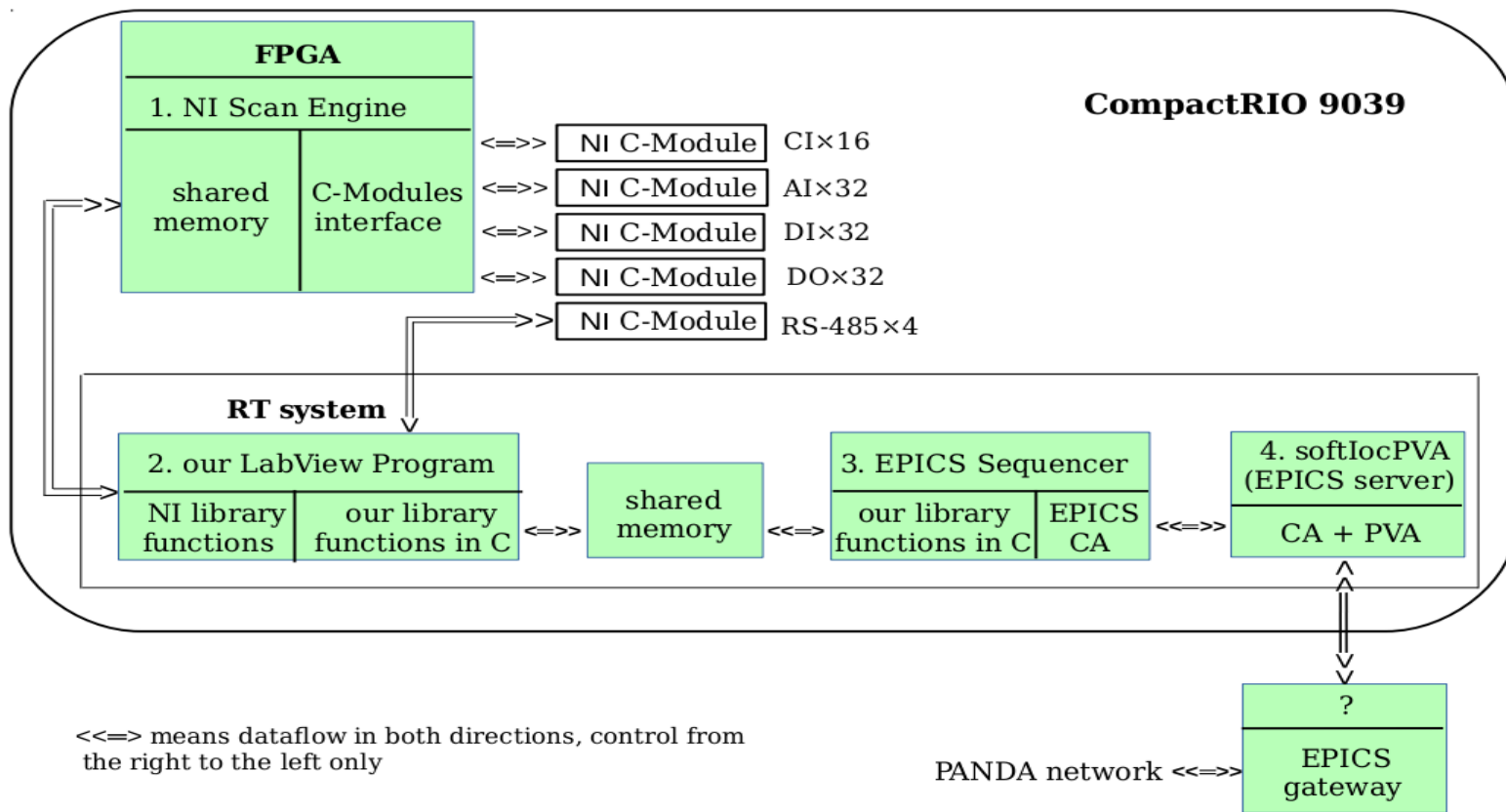


Fig. 1. A suggested scheme of software to control the cluster-jet source and beam-dump.

A detailed explanation of its operation has been presented by J. Tarasiuk at the DCS Session on Tue. Oct. 27. Critical remarks on behalf of the audience (F. Feldbauer, B. Hetz) indicated that its basic concept requires reworking.

In particular it has been stressed that the EPICS Sequencer and the shared memory have been misused in this scheme.

It has been unanimously decided that the proper concept should be sought for and decided upon in a correspondence exchanged between Jerzy T. and Florian Feldbauer. I should kindly remind, however, that any work beyond Jan. 01, 2021 will require a signed Addendum 3 to the Contract. The paper work should start right now.

## **A summary**

The Cluster-Jet Target control system will use two Compact RIO's 9039 (RIO=Reconfigurable I/O), one to serve the cluster-jet source and one to serve the cluster-jet beam-dump. At present we dispose one of them.

In the final PANDA they will be installed in the vicinity of source on top of the PANDA solenoid, and in a rack close to the beam-dump, which is underneath the solenoid. The cost of the missing Compact RIO 9039 (fully equipped with the C-modules and power supplies) will be covered by NCBJ.

At the moment I am not fully aware which LabVIEW programs (licences) we will need to purchase together with the second cRIO-9039. It will be clarified in the nearest future and if necessary incorporated into the bill.

## **Placement of the elements of beam-dump vacuum equipment and slow-control infrastructure in a rack nearby the beam-dump**

A letter from the Technical Coordinator, dated middle of Jan. 2016 indicated a possible placement of the said equipment. The present Collaboration Meeting makes an excellent occasion to recall that message and to make a claim of the rack space then indicated to us. There are two places foreseen for us, indicated on the next page with the green arrows. The upper rack is an integral part of the cluster jet source. The planned usage of the lower one will be detailed on Page 11; on Page 10 are indicated its dimensions:700x1830x800mm (WxHxD).



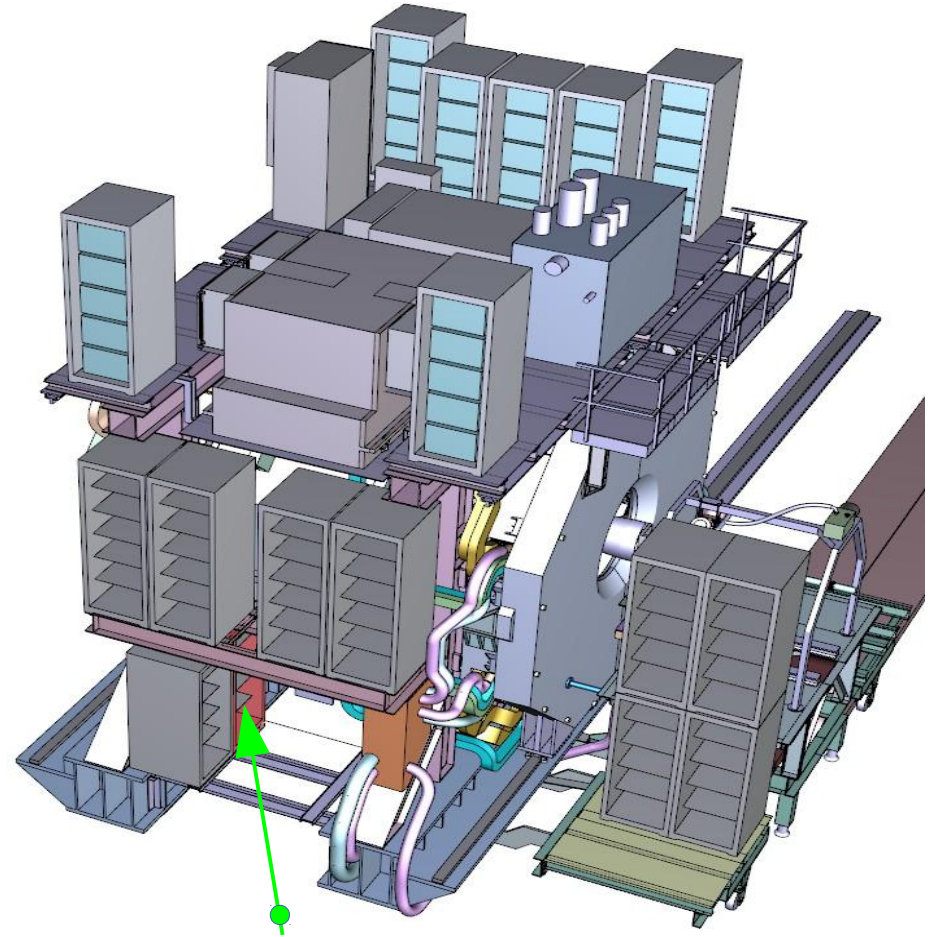
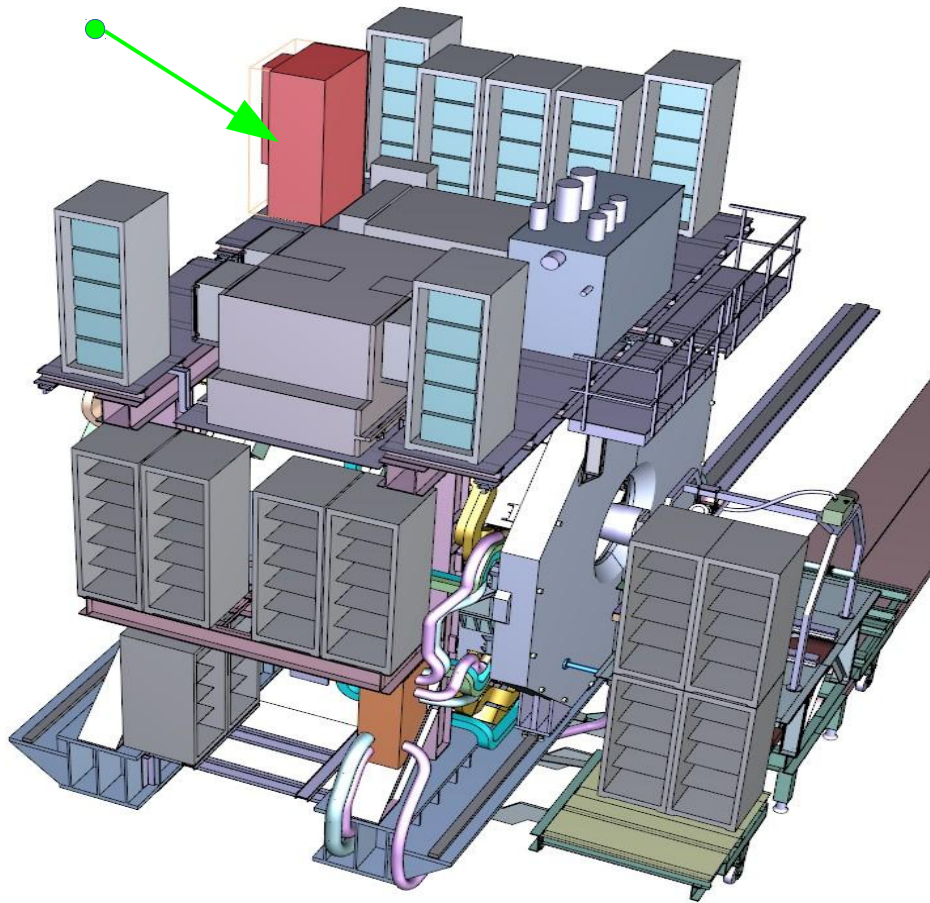


Fig. 2. Two places for Target controls (from the Technical Coordinator)

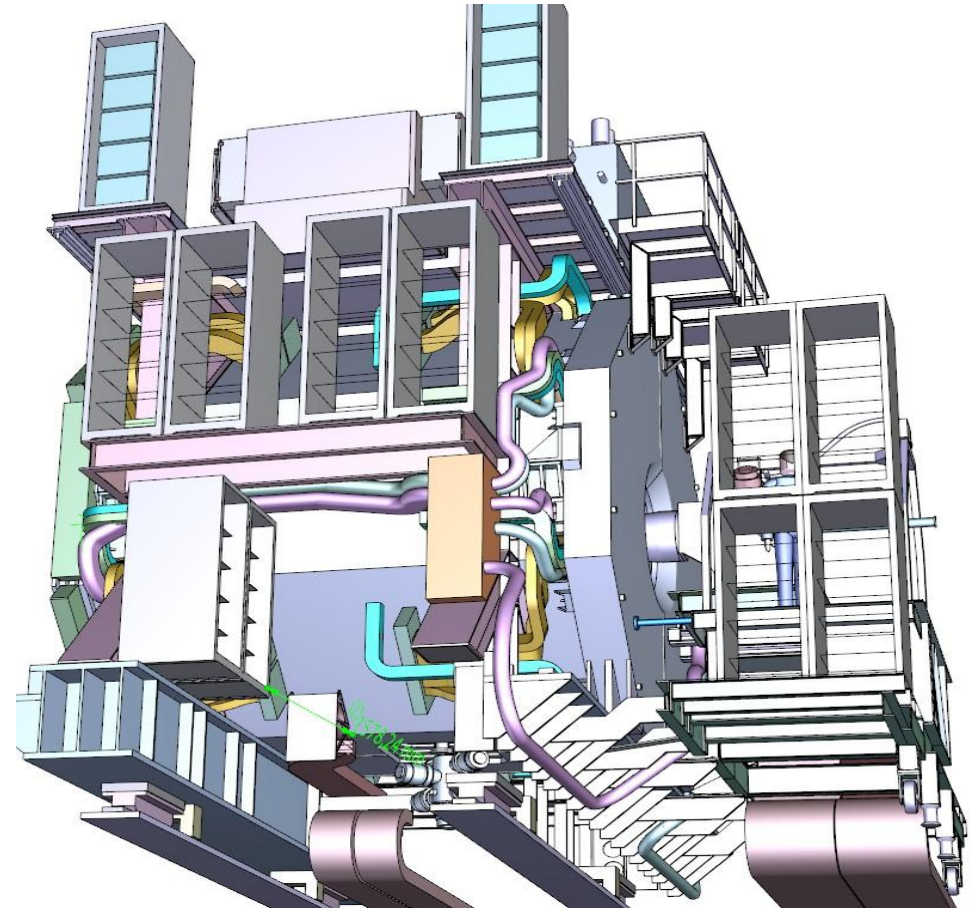
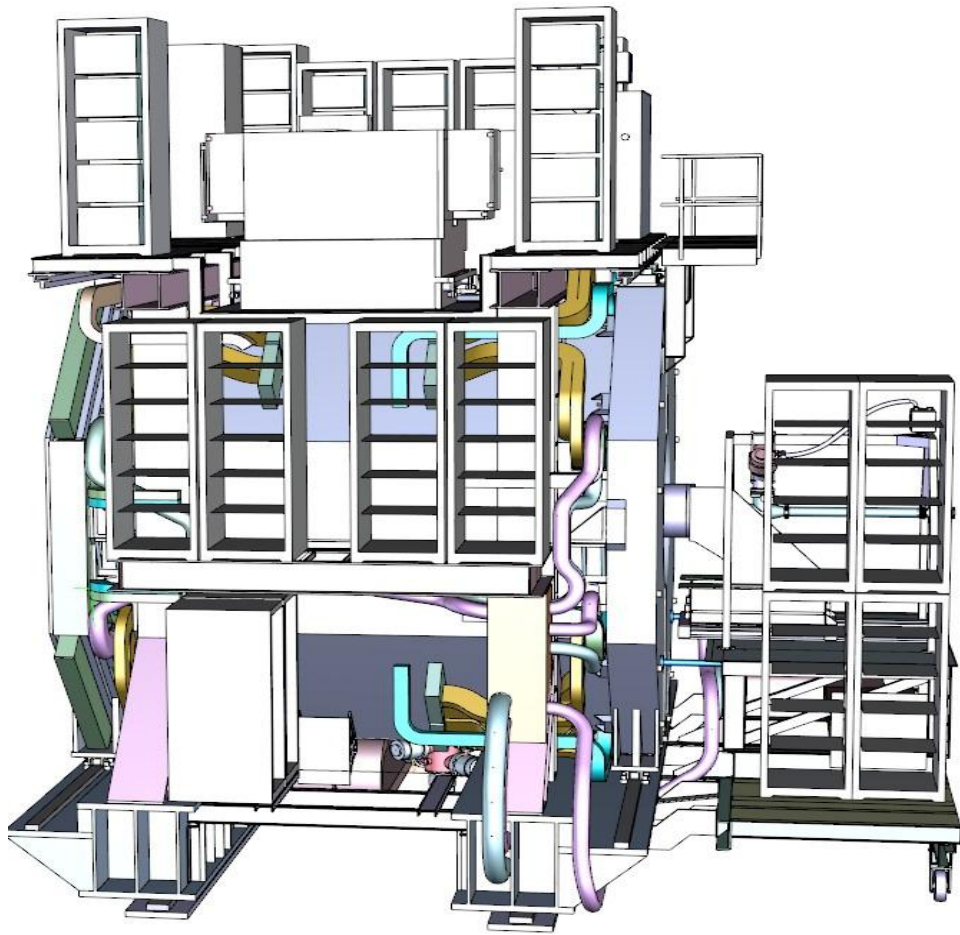
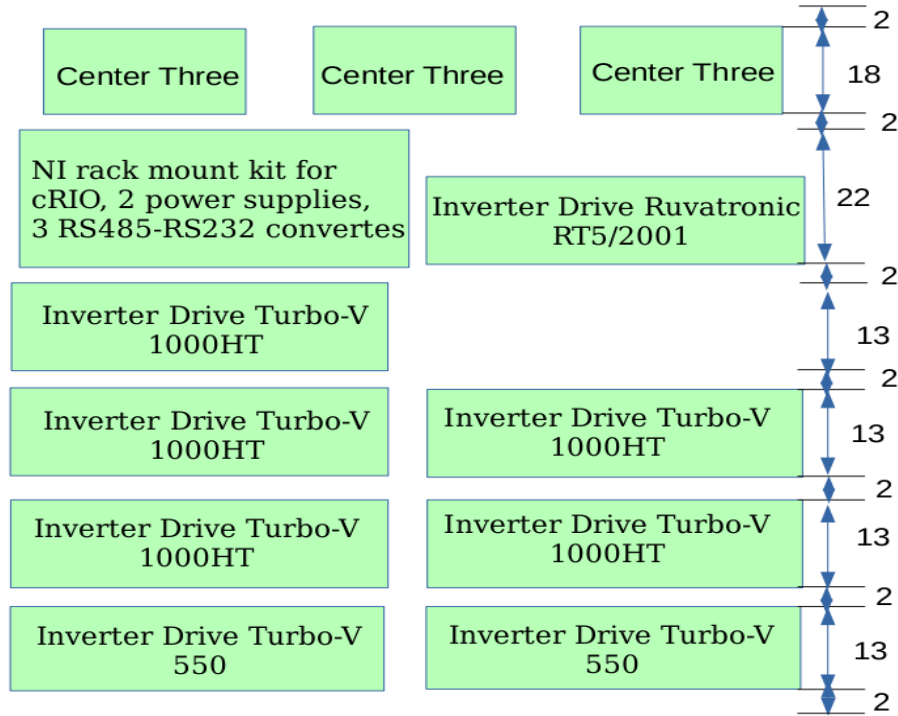


Fig. 3. Possible places for a crate near Beam-dump (from the Technical Coordinator)



All distances in cm.

Fig. 4. Foreseen usage of the rack

A drawing, which I do not quote here, has the rack's mark and supply chain: M1:rack37\_U2 <--> supply\_chain\_barrel\_1506;

The planned usage of the rack foresees the following:

1. Inverter Drives for the seven turbo-pumps of VARIAN,
2. Inverter Drive for the small Roots pump RUVAC 2000 of Leybolds,
3. CompactRIO-9039 and smaller equipment inside a steel box with handles,
4. Three vacuum measuring units of Leybolds, called Center Three. They will occupy approximately 1080mm i.e. more than a half of rack's height of 1830mm.

The total power consumption of the listed equipment is estimated at 5.4 kW, which certainly calls for an efficient cooling both in the working as well as in the parking positions.

Last, but not least are the following items to be recalled to the audience:

1. An interconnecting cable between the 'lower' and 'upper' CompactRIO's,
2. The gateway server (whether on the cost list of NCBJ, or the common fund),
3. An optical link to the control room from gateway via the above mentioned supply\_chain\_barrel\_1506,
4. A connection of the target control with the accelerator control room will possibly also be a relevant item, because there are two valves in the target line, which should be opened and closed in coordinated way with a HESR operator.

**THANK YOU FOR YOUR ATTENTION!**