BEAM DIAGNOSTICS CONTROL SYSTEM UPGRADE OF IPM LINAC

P. Navidpour†, S. Mohammadi Alamouti, Z. Rezaei
Iranian Light Source Facility (ILSF),
Institute for Research in Fundamental Sciences (IPM), Tehran, Iran

Abstract

A series of upgrades has now begun to industrialize the applications of the experimental IPM electron LINAC. This includes upgrading the control system of the diagnostics tools and adding new tools and equipment to the system as well. The aim is to build an integrated control system to collect and manage all diagnostics signals. This will allow us to continuously monitor and archive all of the beam parameters for LINAC performance analysis and improvement. It is hence decided to migrate from LabVIEW to an EPICS-based control system which has many ad-vantages in this regard. In the meantime, it is also re-quired to employ more modern equipment with better control interfaces and add some extra diagnostics tools to the system as well. So during this upgrade, most of the job would be developing new control interfaces and high-level applications accordingly. In this paper, after a brief summary of the current diagnostics tools and our motivation for this upgrade, the scheme of the new control system and how different parts are integrated to the EPICS framework will be described.

About the Upgrade

The Iranian Light Source Facility (ILSF) has been cooperating with IPM in controlling, maintaining, and upgrading the IPM LINAC.

Current control system:

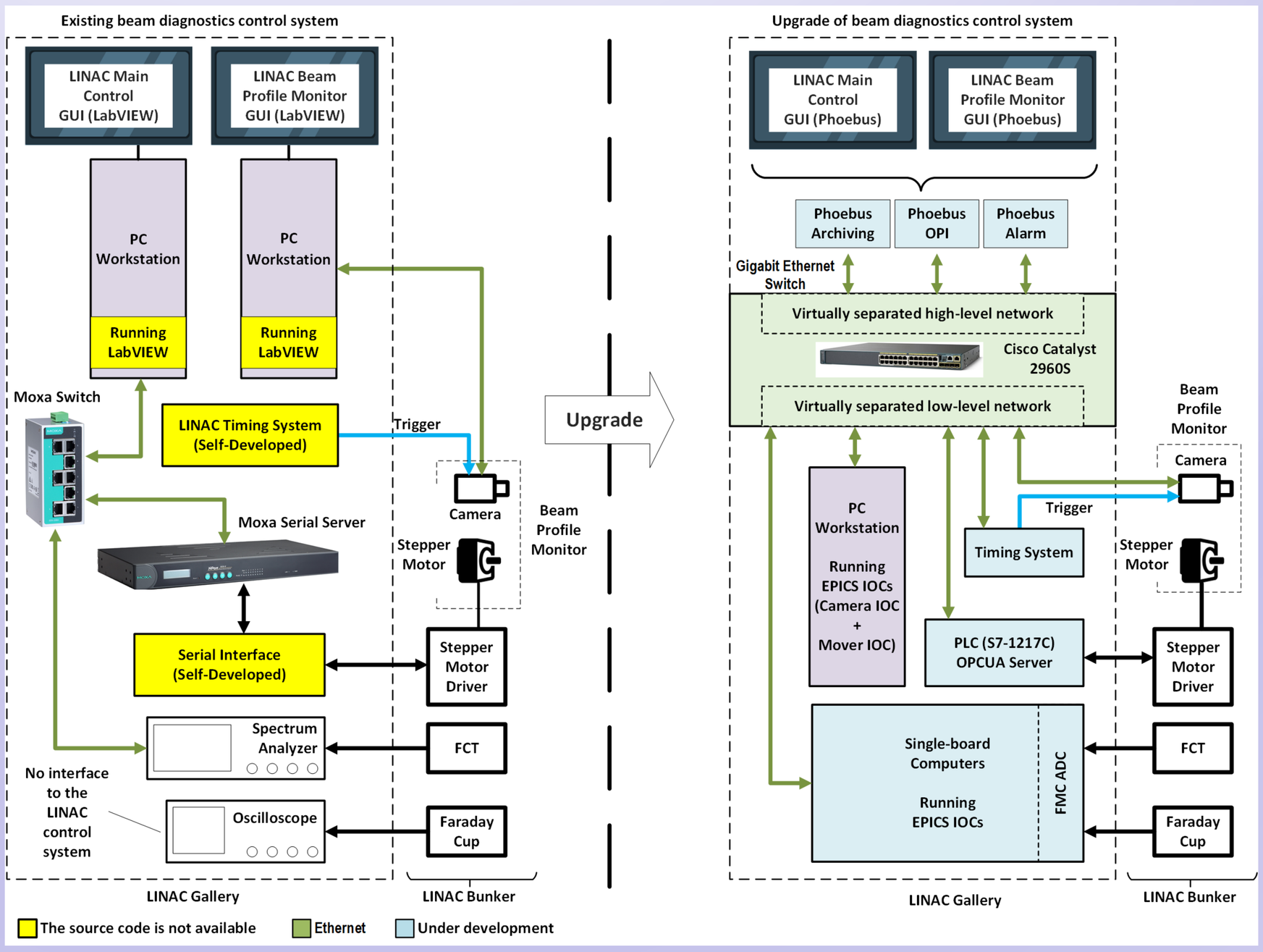
1. LabVIEW source codes are not available
2. Lacks standardization

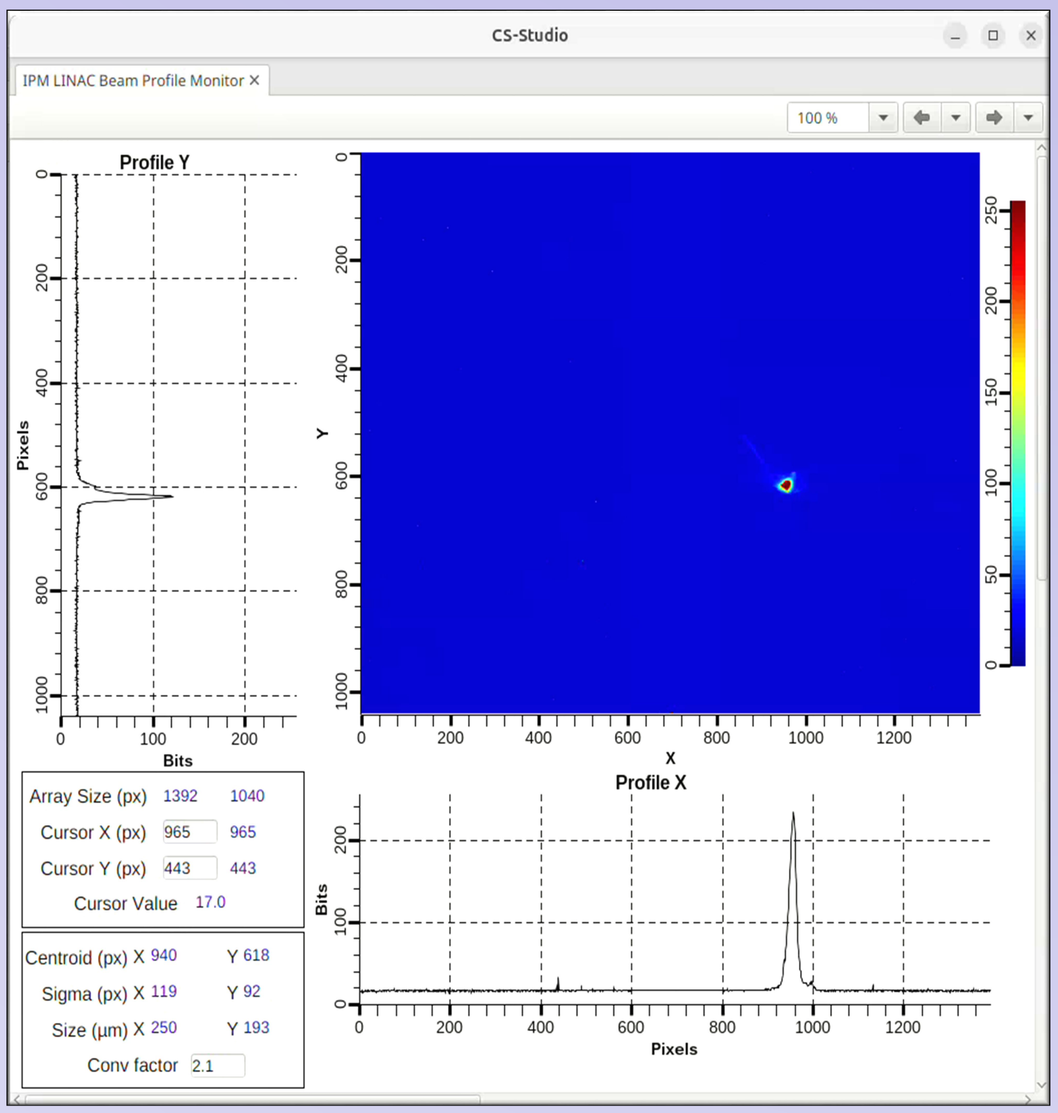
Planned upgraded design:

1. Migration from LabVIEW to EPICS
2. CSS (Phoebus) GUI
3. S7-300 to S7-1200 PLC system
4. Adding other new tools and equipment

Table 1: Summary of the developed EPICS IOCs

Controllable Device	EPICS Support Modules
GigE Camera	areaDetector
Screen Mover	S7NODAVE and OPCUA





Developed phoebus screen for IPM LINAC beam profile monitor

jAi-BM-141 camera with the movable lens

Table 2: Resource Usage of the IOC and Phoebus

Plugins	ADAravis IOC	Phoebus
PVA	CPU: 4-5% RAM: 257 MB	CPU: 7-9% RAM: 1.1 GB
PVA + BADPIX	CPU: 14-15% RAM: 282 MB	CPU: 7-9% RAM: 1 GB
PVA + BADPIX + STATS	CPU: 18-19% RAM: 286 MB	CPU: 9-12% RAM: 1 GB

Beam Profile Monitor

Evaluation setup:

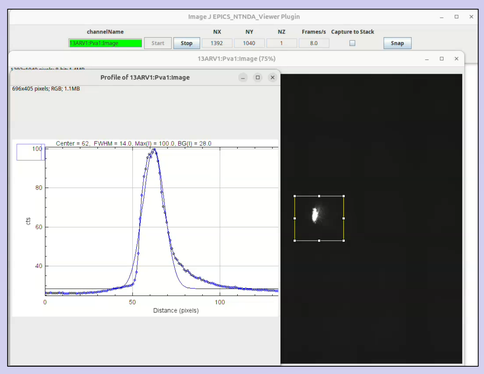
1. jAi-BM-141 GigE camera
2. Movable lens (focal point ~42 mm)
3. Calibration screen (0.5mm resolution)
4. Movable aperture
5. Laser

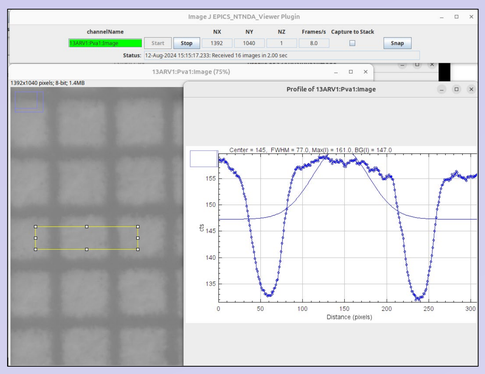
Software tools:

- EPICS IOC: areaDetector (ADAravis)
- Phoebus (ADAravis, commonPlugins)
- ImageJ (EPICS-NTND-Viewer, gaussian profiler)

PC:

- Core i7-5500U CPU
- 16 GB DDR3 RAM
- 100 Mbps network card





ImageJ plugins to visualize the image array data

Calibration screen

Contact: p.navidpour@ipm.ir