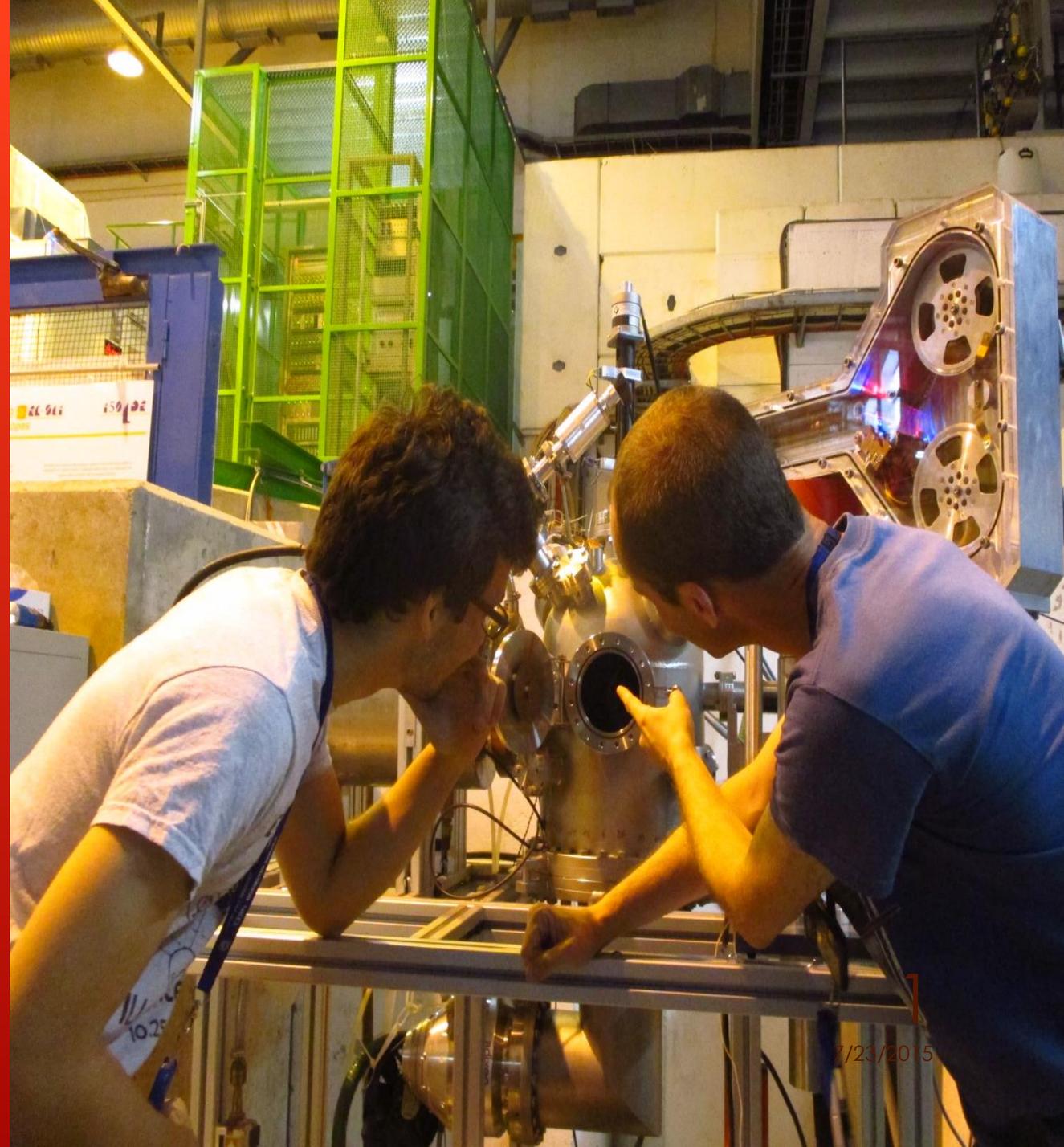


ON-LINE DIFFUSION CHAMBER: DEVELOPMENTS

Jaime E. Avilés Acosta

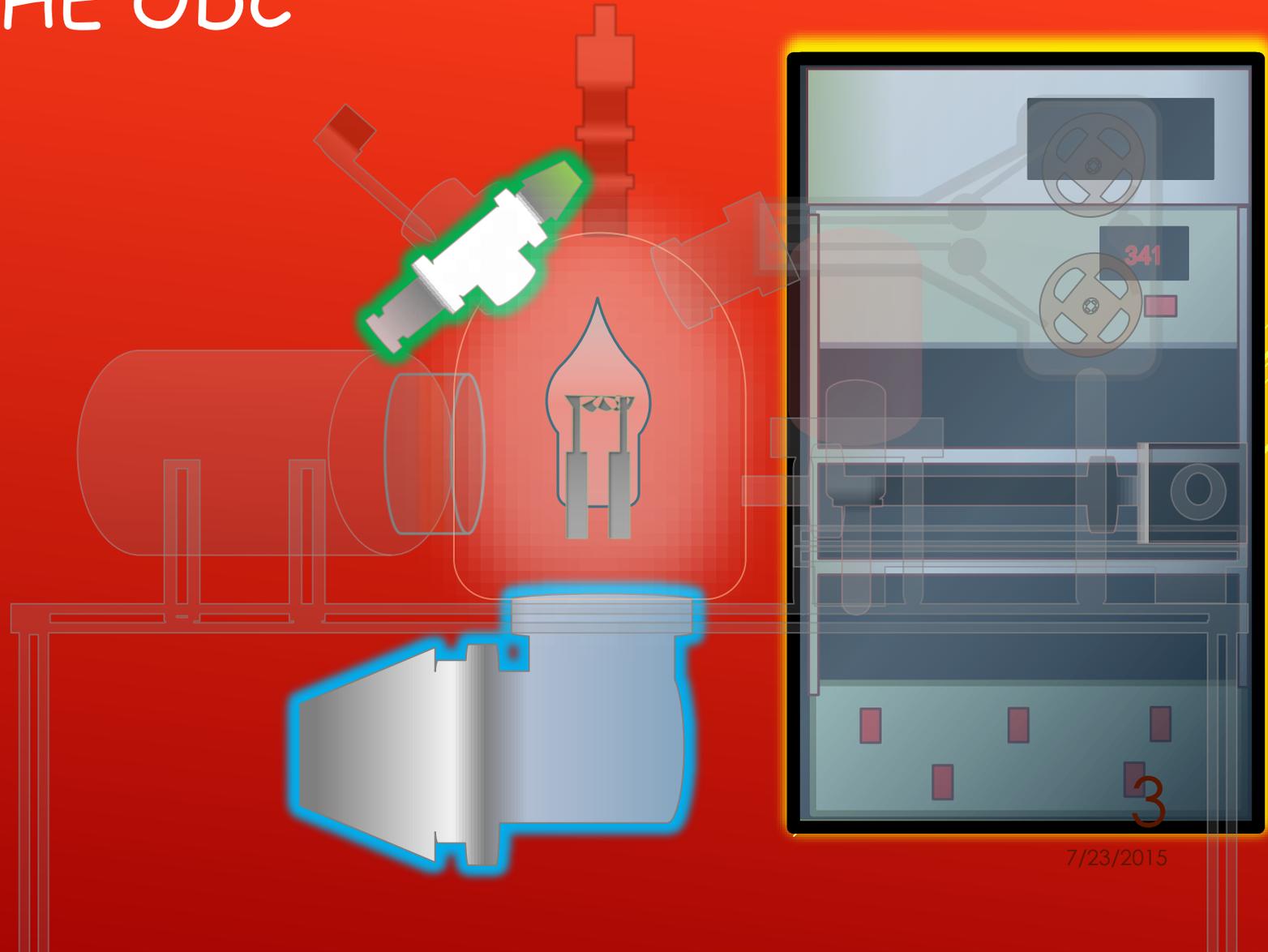


REVIEW

- ▶ ISOLDE is the premier solid state, nuclear, atomic, and bio- physics experiment in CERN.
- ▶ Radionuclides are created from a target with a p^+ beam from the PS Booster.
- ▶ Radionuclides are separated and used in experiments at ISOLDE
- ▶ The ODC uses γ -radiation from short-lived, implanted radioisotopes to study impurity diffusion in semiconductors.

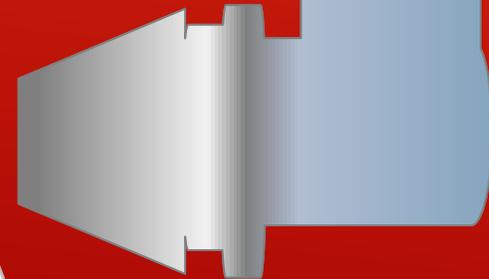
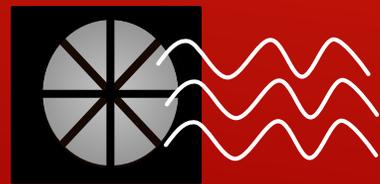
ADDITIONS TO THE ODC

- ▶ A turbo motor pump
- ▶ Two pressure gauges
- ▶ The data acquisition and controllers rack
- ▶ LED lighting inside chamber



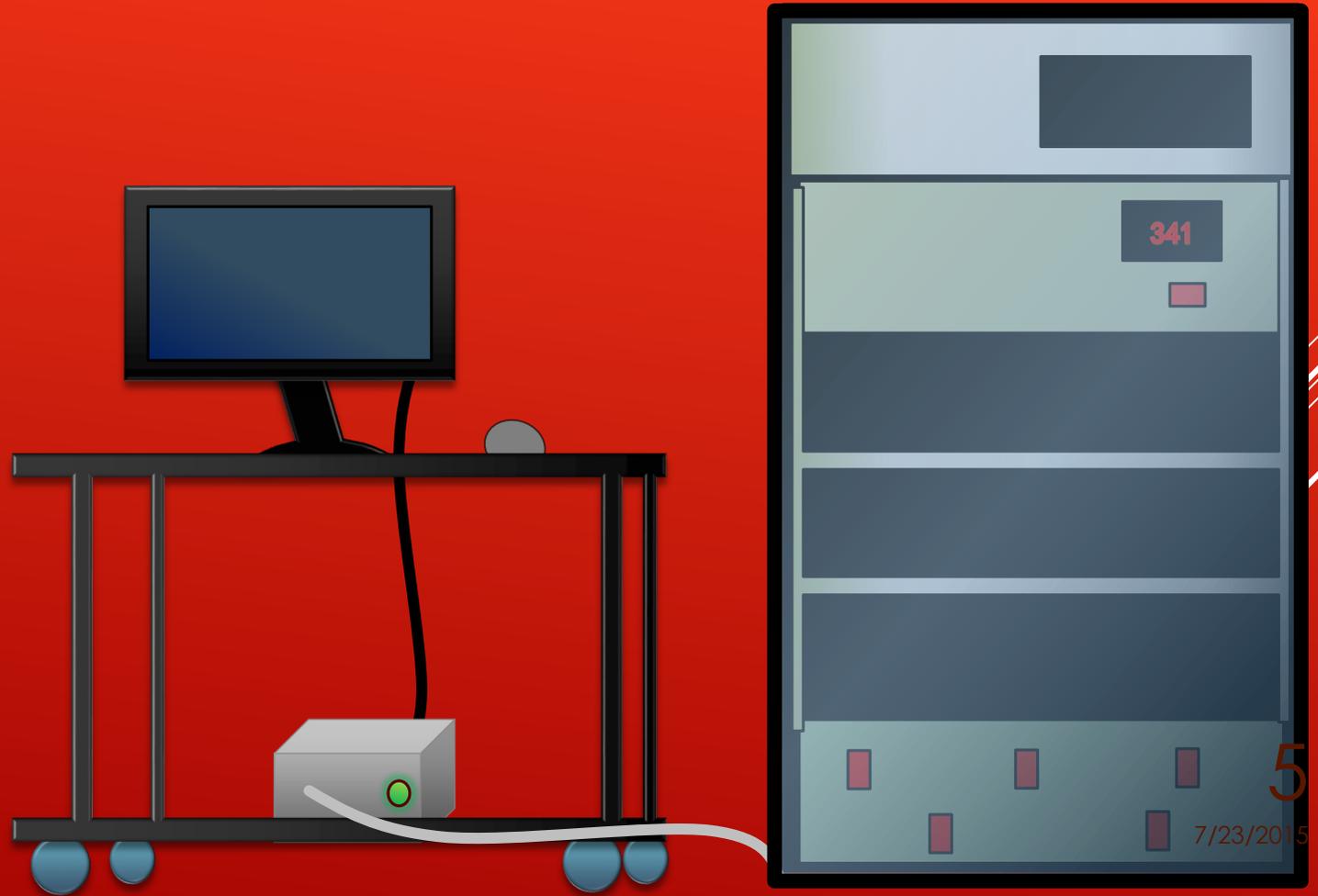
VACUUM SYSTEM

- ▶ ODC can reach a vacuum of $4 * 10^{-5}$ mbar in 4 hours.
- ▶ Cooling fan installed on turbo-pump (all previous pumps were fried by heat.)



DAQS AND CONTROLLERS

- ▶ All controllers and DAQs are connected to USB hub
- ▶ A computer is used to collect data and control all the peripherals



CHANGES TO CODE

- ▶ Wait functions modified to be shorter
- ▶ Arithmetic algorithms in code were streamlined



USER GUIDES/MANUALS BEING DRAFTED

For future users and modifications, documentation is essential, and includes...

USER GUIDES/MANUALS BEING DRAFTED

Log of changes to VI code

The format is:

Day/Month/ Year – Name of user making changes

19 June 2015 – Jaime E. Avilés Acosta

- Annotations (text boxes) added to `OnlineDiffusionChamber2v15.vi` and some sub-VIs (including `simstep-singlecommandv5sub.vi`) in their respective block panels to help explain functionality to future users and programmers.

14 July 2015 – Jaime E. Avilés Acosta

- *Changed `OnlineDiffusionChamber2v15.vi` to `OnlineDiffusionChamber2v16.vi`. It will now be referred to as the latter.*
The following changes were made to improve execution timing:
- In `OnlineDiffusionChamber2v16.vi`'s block panel, in the second sub-diagram of the flat sequence structure, in the Consumer While Loop, inside the case structure, in the case "set state tape," modified the timer for a Wait function for 100 ~~ms~~ from 500 ~~ms~~.
- In `McLennan_Tape.lvclass:McLennan_tape_set_state.vi`'s block panel, inside the case structure, in cases "1. Default" and "2", the values of the Wait functions in the second

USER GUIDES/MANUALS BEING DRAFTED

Manual for the VI's components and functions

This document concisely enumerates and describes all the sub-VIs used by the Online Diffusion Chamber VI to be fully functional. The list is in alphabetical order.

A

- ACM100-singlecommandv1sub.vi
 - Encodes signals to communicate via serial port with peripheral device (vacuum gauge). Checks for communication errors between VI and peripheral device.
- ACT-singlecommandv1sub.vi
 - Encodes signals to communicate via serial port with ACT turbo pump. Checks for communication errors between VI and peripheral device.
- Alcatel_Gauge
 - Gauge_get.vi: Acquires pressure gauge reading and displays it. Reads gauge status. Depends on ACM100-singlecommandv1sub.vi.
 - Gauge_ini.vi: Reads a configuration file for the gauge and outputs a string with the reference number of the file after using different keys for the same section. This reference string is used by Gauge_init.vi to communicate specifically to

USER GUIDES/MANUALS BEING DRAFTED

Introduction to the ODC's code

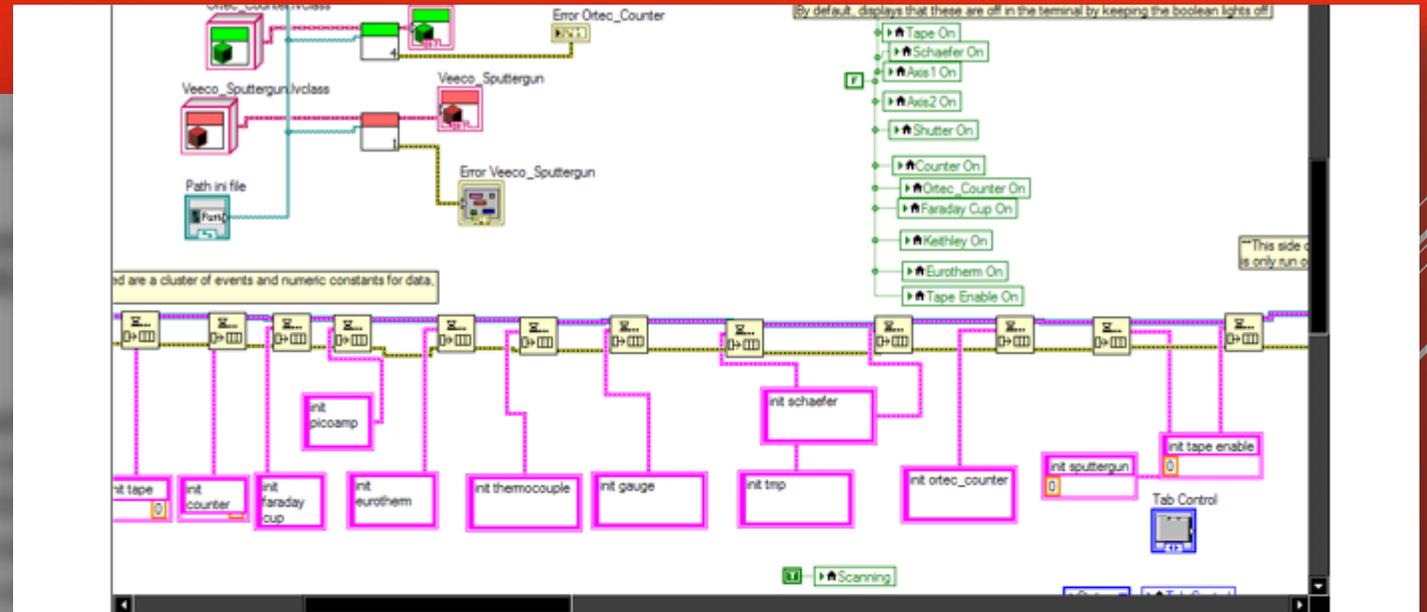


Figure 2. The first sight of the block panel tends to be overwhelming at first. Here we see classes on the top left, a queue on the bottom, and boolean lights on the top right. Their function will be explained later on.

If you don't have experience in LabView, your first reaction will probably be to panic. Take a couple of deep breaths. It only *looks* complicated, and we will break down how this code works, step-by-step. You probably have not noticed because the block panel is so large, but the whole program is actually just a flat sequence structure, that is, a collection of sub-diagrams where code is run

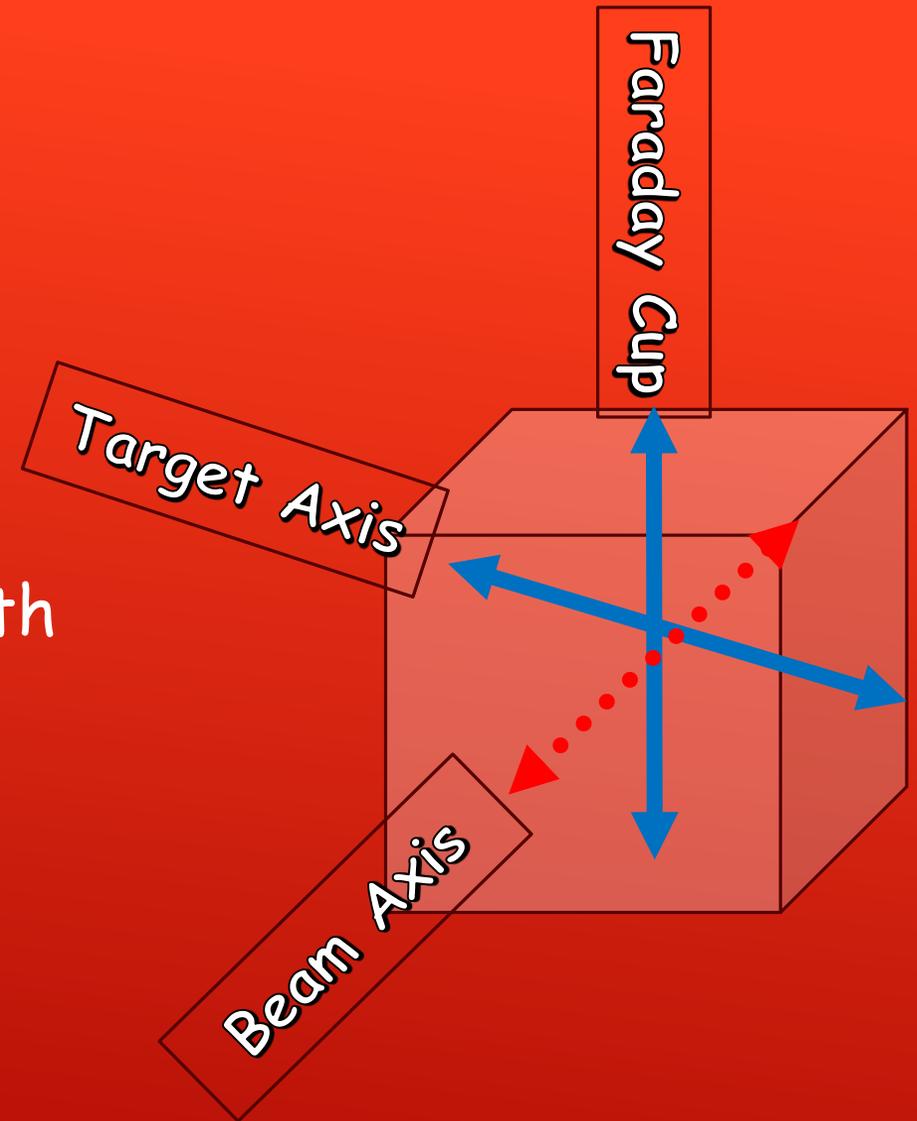
HALOGEN LED

- ▶ Added inside chamber to improve visibility
- ▶ Lower chance of dropping your phone/flashlight inside chamber
- ▶ Looks cute



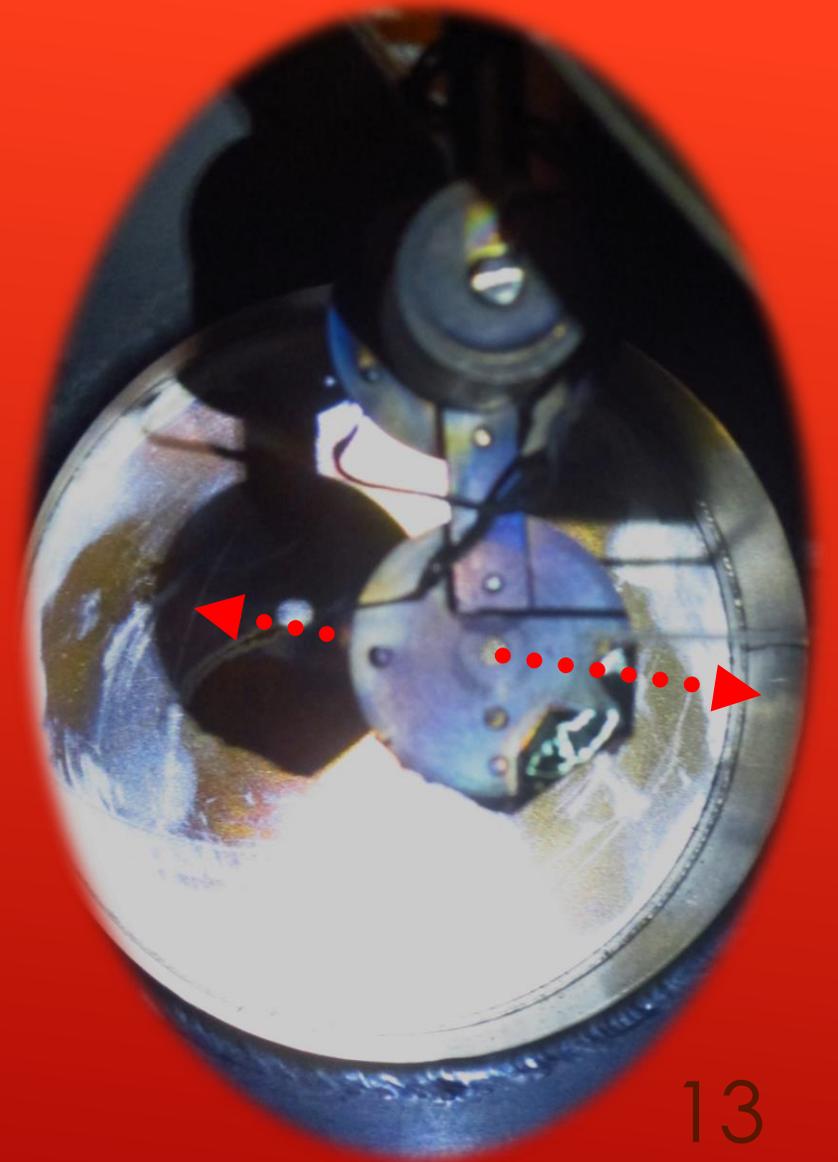
FARADAY CUP + MANIPULATOR ARM CALIBRATION

- ▶ Target's 0mm position must coincide with Faraday cup axis



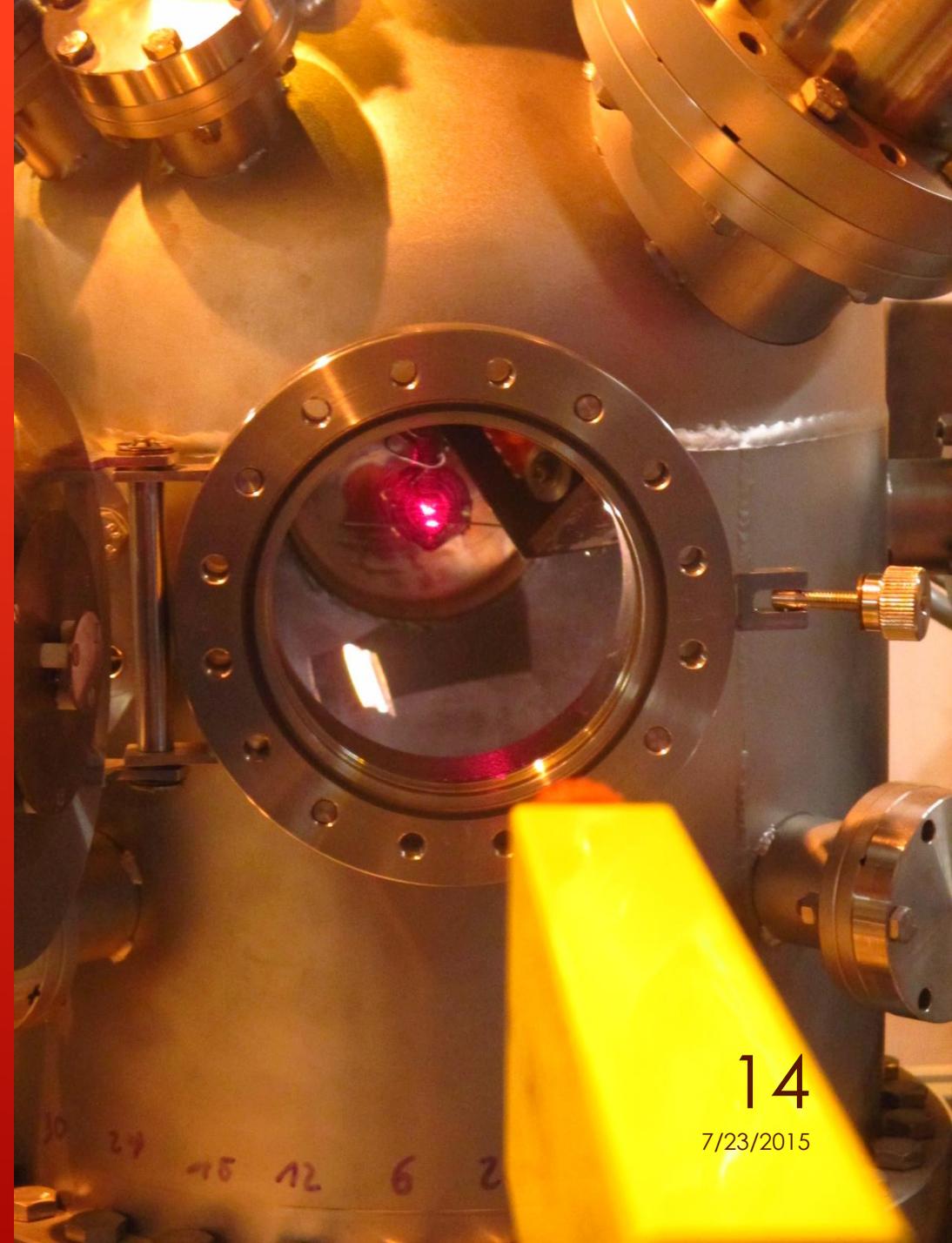
FARADAY CUP + MANIPULATOR ARM CALIBRATION

- ▶ Target's 0mm position must coincide with Faraday cup axis
- ▶ Faraday Cup's preset positions need to coincide with implantation beam axis



FARADAY CUP + MANIPULATOR ARM CALIBRATION

- ▶ Calibration was done by laser
- ▶ Though, beam line calibration is yet to be done (ODC is not connected to beam line)

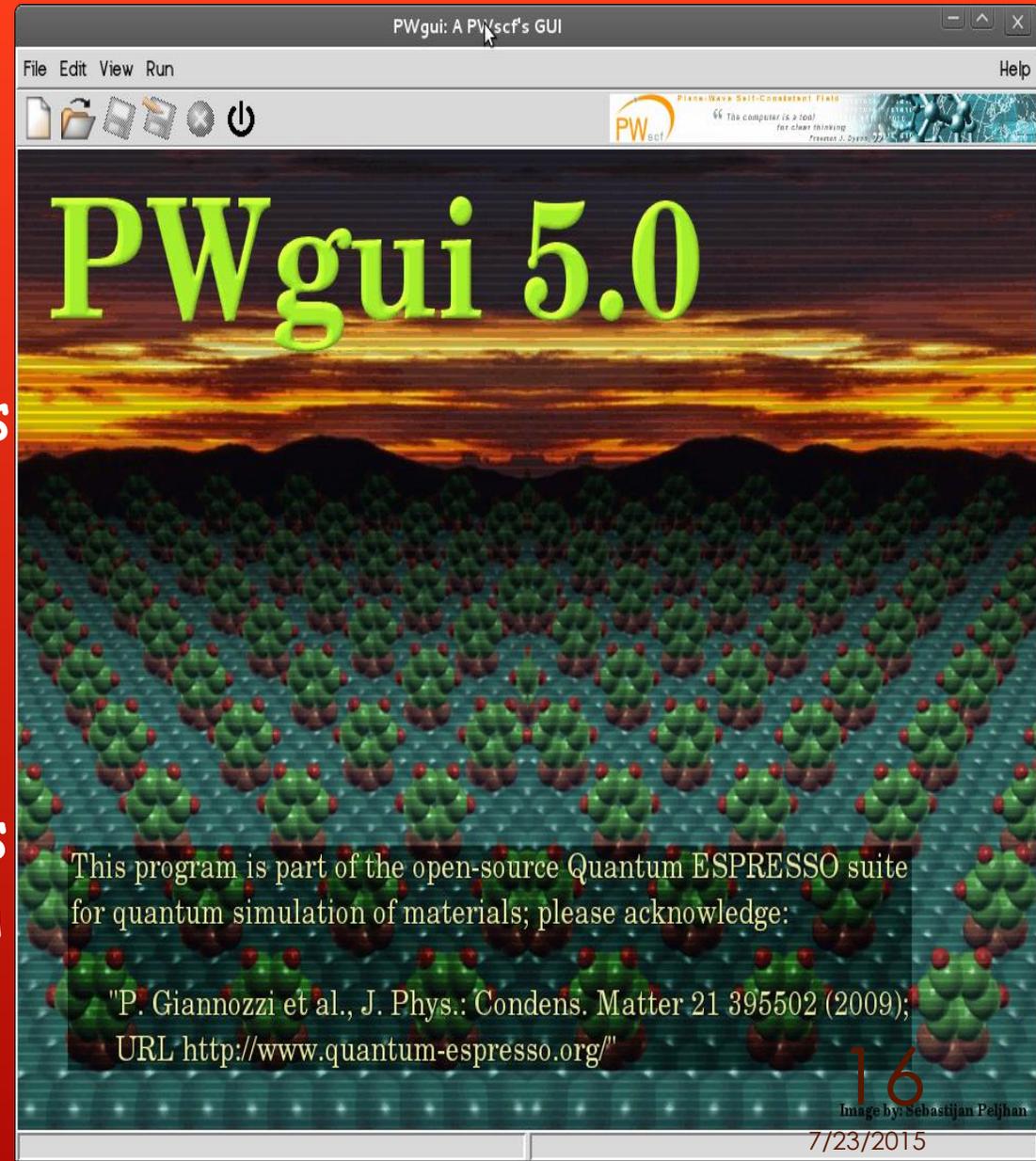


NEXT MILESTONES...

- ▶ Replace battery in uninterruptible power supply (UPS) system
- ▶ Cool $Ge-\gamma$ detector to 40-70 K
- ▶ Use flat-sequence structures to time execution of the ODC VI
- ▶ Calibrate ion gun (+ ablation rate), install Ar canister
- ▶ Streamlining plug-in to beam line
- ▶ Creating user guide for ODC

SIDE PROJECT: QUANTUM ESPRESSO

- ▶ QE is an open-source program that uses Density Functional Theory (and its generalizations) to calculate electronic structures and model materials in the nanoscale.
- ▶ Working through slides from workshops on a Linux, figuring out how to install on Windows



Barcelona





Bastille Day
in Ferney-
Voltaire

DJ Dice at
the Official
Summer
Student
Party



18

7/23/2015

Questions?

