



# Progress report

(27 March - 28 April)

---

Speaker:

*Isakov Artem, TPU*

Supervisor:

*Svetlana Kushpil, PhD, NPI, Rez*

Scientific advisor

Filip Krizek, PhD, NPI, Rez



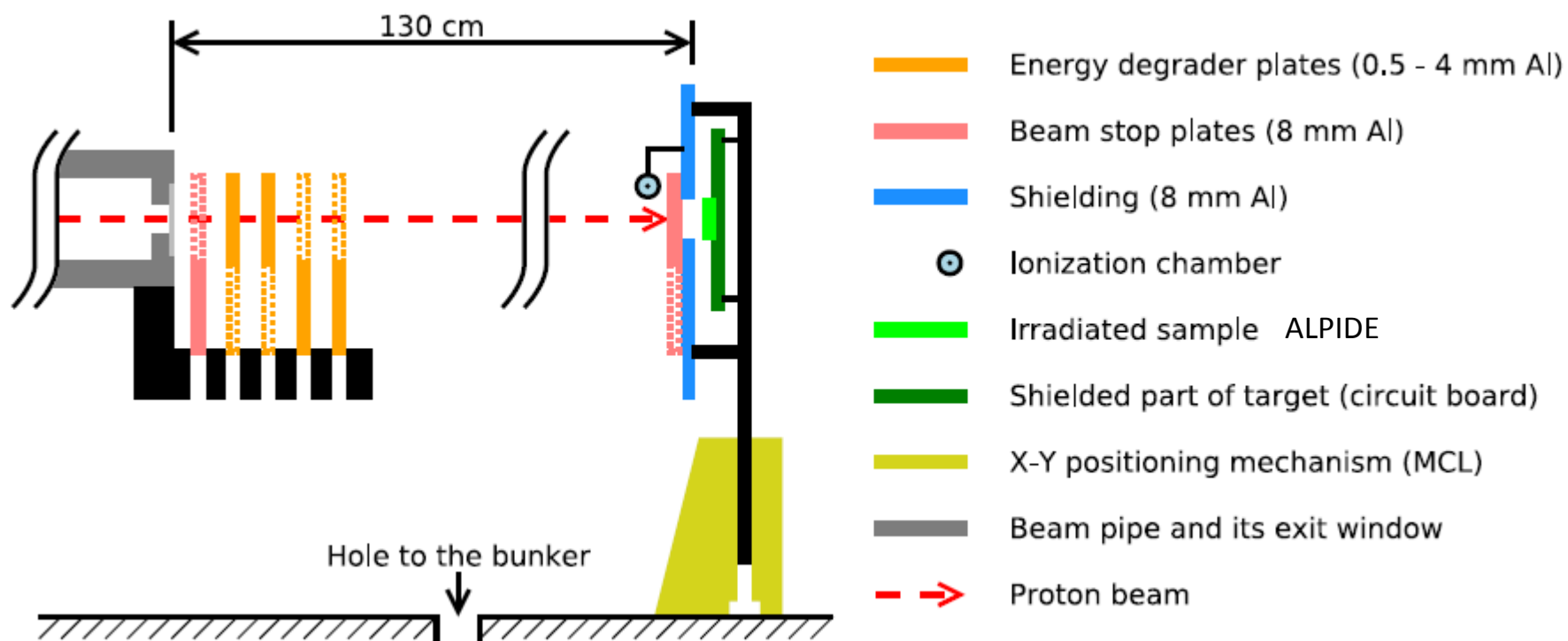
# OUTLOOK

---

- Sketch of the installation for cyclotron test
- Motivation
- Choice of IDE (Integrated Development Environment)
- Architecture of program
- Results
- Tests



# Sketch of the installation [1]





# Motivation

---

Current software for the installation for the cyclotron test does not fully meet requirements on performance.

Needs to design new multithread driver for installation with the same functions as previous software, such as:

- Controlling MCL moving table
- Reading value of current from UNIDOS ionization chamber
- Controlling system of degrader plates
- Perform logging experimental data
- Perform primary data processing (fitting beam profile, calculation of dose and flux)

Also new software should allow extension in the next measurements



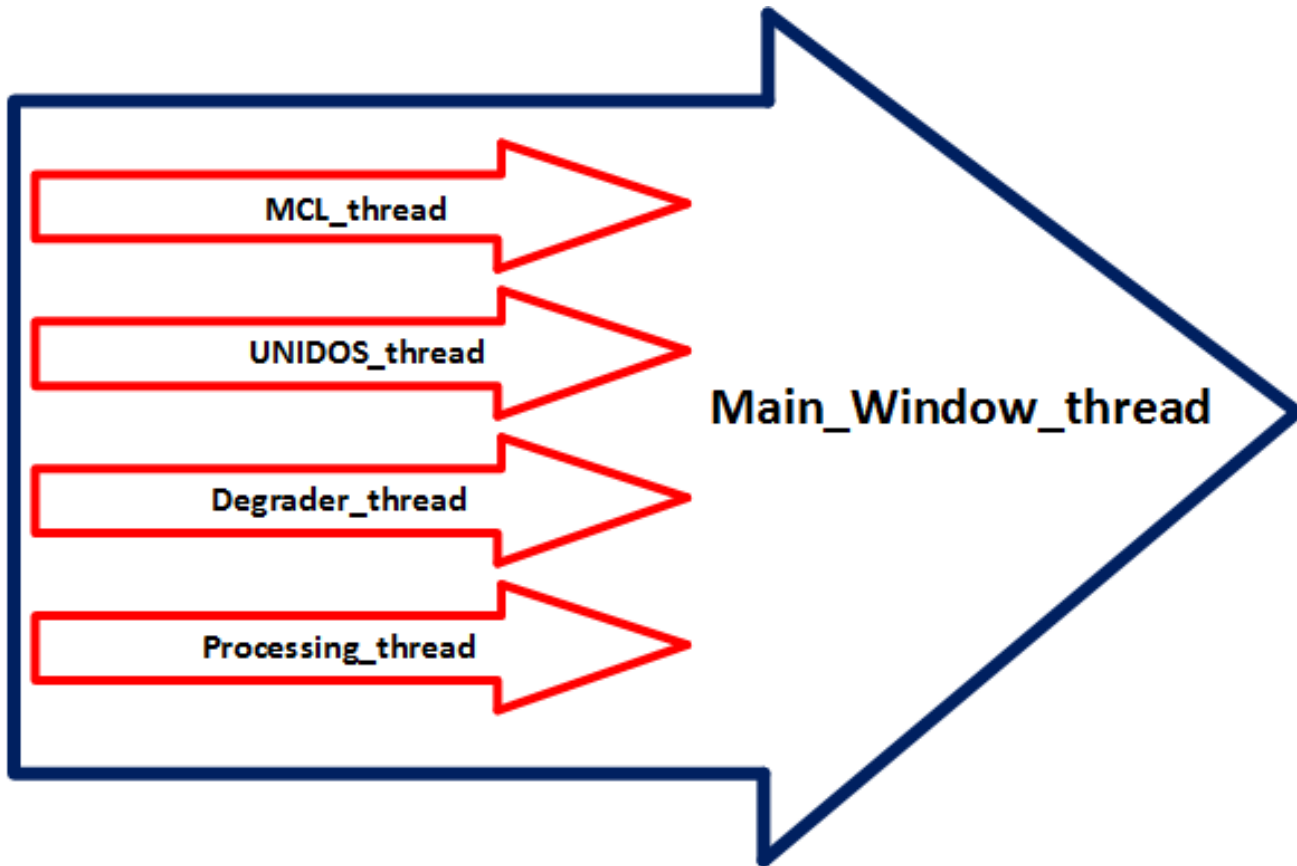
# Choice of IDE

Framework QT and IDE QT Creator were chosen as software environment this work

Lab View	QT Creator
<ul style="list-style-type: none"><li>+ Default multithreading</li><li>+ Easy connection with device</li><li>+ Cross Platforming</li></ul>	<ul style="list-style-type: none"><li>+ <b>C++</b></li><li>+ Freeware (for non-commercial use)</li><li>+ <b>Graphics editor of the UI</b></li><li>+ Lots of examples and help notes</li><li>+ Cross Platforming</li></ul>
<ul style="list-style-type: none"><li>- Demo period 30 days</li><li>- <b>Difficulties with creation of big projects</b></li><li>- Complicated creation of the UI</li><li>- <b>Lack of experience</b></li></ul>	<ul style="list-style-type: none"><li>- There is no absolute multi thread solution</li><li>- Heavy size of programs</li></ul>



# Threads architecture of the program



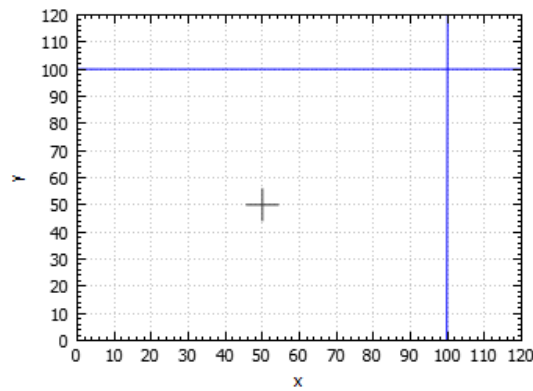


# Screenshot of UI

1

MCL.com  On/Off    Degradar.com  On/Off    UNIDOS.com  On/Off

MCL Position

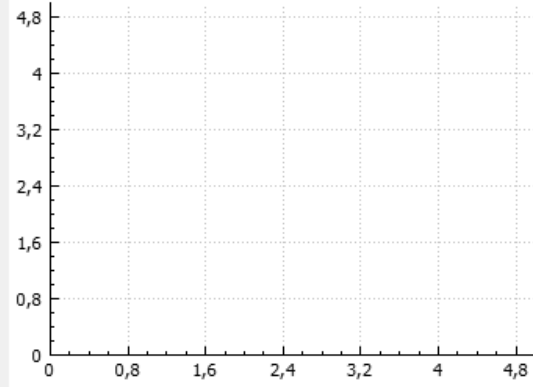


50 X/mm    50 Y/mm    Current Position  
0 X/mm    0 Y/mm    Here  
0 X/mm    0 Y/mm    Move  
0 X/mm    0 Y/mm    Move

Calibrate

2

Scan Beam Profile



Scan along

X     Y

Fit Gaus

Save Fit

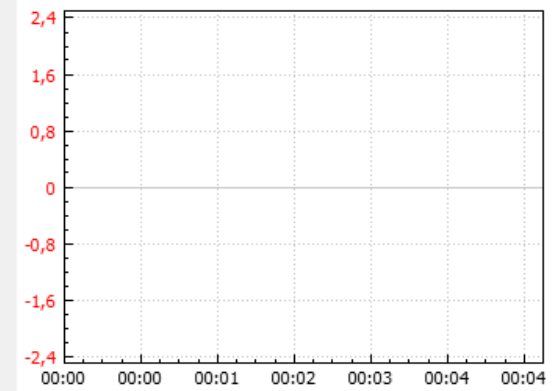
0 Scan min [mm]    99 Scan max [mm]  
1 Step [mm]    0 Fix position [mm]

Start Scan

Abort Scan

3

Beam Monitoring



START Beam Monitoring

START Refreshing

Constrain monitoring interval to last 0 min

START Beam integration

Reach target dose ON

0 Scale

0 Target dose [krad]

4

Abs1     0.5     1     2     Abs2

Check Degradar State

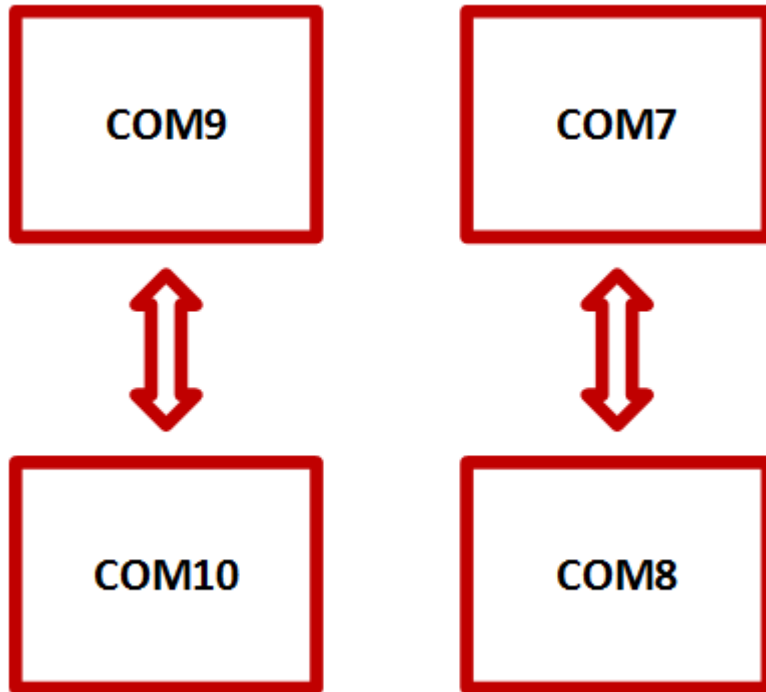
k [pA^-1 cm^-2 s^-1] = 0  
E of p hitting sample [MeV] = 0  
LET in Si [MeV/(mg/cm2)] = 0

5

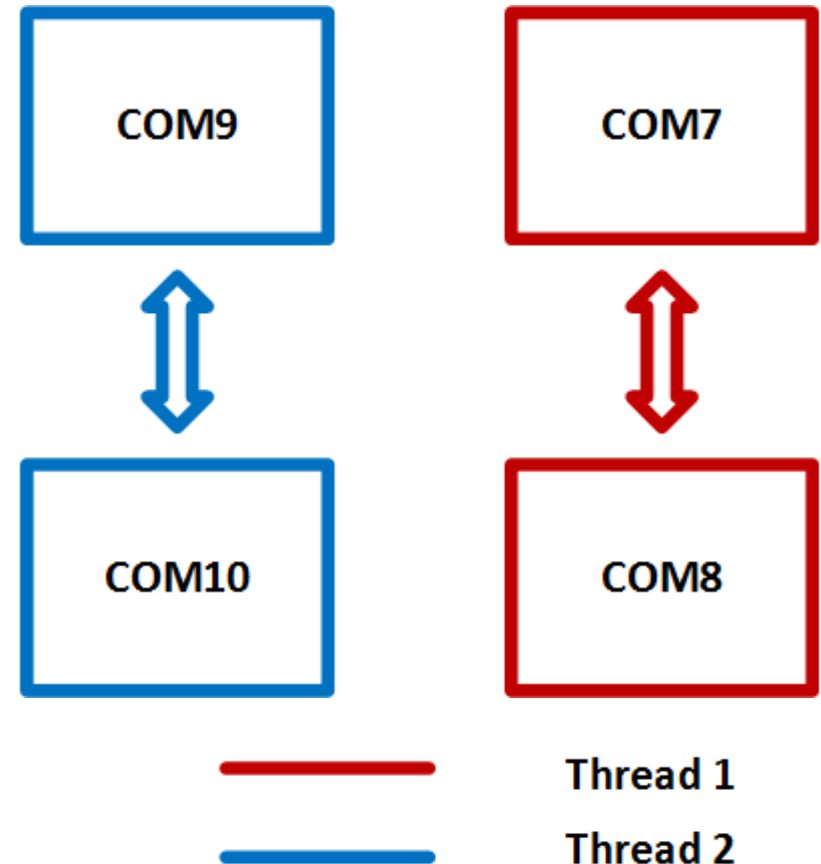


# Test of multi threads

## Single Thread program



## Multi Thread program







# Test of multi threads

## Single Thread program

```
Output  
  
Message 1  
Message 1  
Message 1  
Message 1  
Message 1  
Message 2  
Message 2  
Message 2  
Message 2
```

Transmission goes step by step

## Multi Thread program

```
Output  
  
Message 1  
Message 2  
Message 1  
Message 2  
Message 1  
Message 2  
Message 1  
Message 2  
Message 1  
Message 2  
Message 1  
Message 2
```

Parallel transmission



# Test on real devices

All three devices were connected to laptop to check efficiency of new software.

Test	Result
Calibration of the MCL table	<b>Working</b>
Sending device to new position	<b>Working</b>
Read current position of the device	<b>Working</b>
Read state of degrader plates	<b>Working</b>
Controlling degrader plates	<b>Working</b>
Read data from the UNIDOS	<b>Working</b>
Scan Beam Profile	<b>Working</b>
Beam monitoring	<b>Working with bugs</b>
Quality of performance	<b>Without freezes, constantly updating on UI</b>



# Conclusion

---

## Results from 20 March – 28 April

- Was learned new framework QT
- Multi threads driver was created.
- New software has successfully passed through following tests:
  - Multi thread testing
  - Device connection test

## Future plans:

- Add final parts to the program (fitting of the beam profile, flux calculation) ~ 5 May

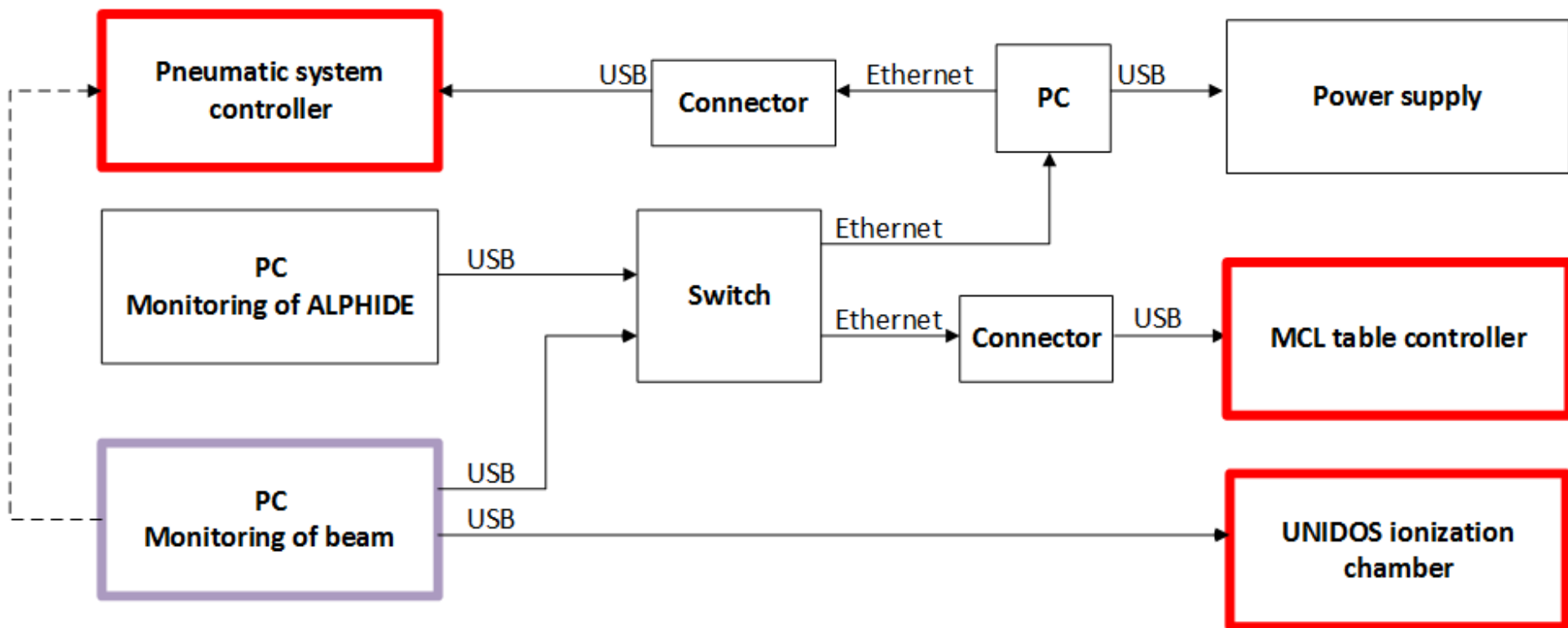


# Additional slides

---



# Functional diagram of the installation





# List of used sources

---

1. - Tomas Vanat – «Physical Fault Injection», Prague, February 2017