



# NMX STAP

DetG Update

KEVIN FISSUM

2023-10-16

# NMX STAP

## DetG



Kevin Fissum, Detector Group Lead

NN1, Detector Technical Writer

Josef Eid, Detector Project Planner

Zsuzsa Szlanyina, Detector PA (50%)

John(Jack) Segal, Technical Section Lead

Fabio Dos Santos Alves, Detector FPGA Engineer  
Jan Hrivnak, Detector Mechanical Engineer  
Alexander Johansson, Detector Mechanical Technician  
Angel Monera Martinez, Detector Electronics Engineer  
Erlis Shahu, Detector Electronics Technician  
Per-Olof Svensson, Detector Production Technician  
Lisa Vergara, Detector Support Technician  
NN3, Detector Mechanical Engineer  
NN4, Detector Electronics Engineer

Alexander Backis, Detector Scientist  
NN2, Detector Scientist (MultiGrid)  
Nathaly De La Rosa Ramirez, Detector Scientist  
Farnaz Ghazi Moradi, Detector Researcher  
Ioannis Katsioulas, Detector Scientist  
Chung-Chuan Lai, Coatings Scientist  
Nicholai Mauritzson, Detector Scientist  
Francesco Piscitelli, Detector Scientist  
Jerome Samarati, Detector Scientist  
Ourania Sidiropoulou, Detector Scientist  
Irina Stefanescu, Detector Scientist



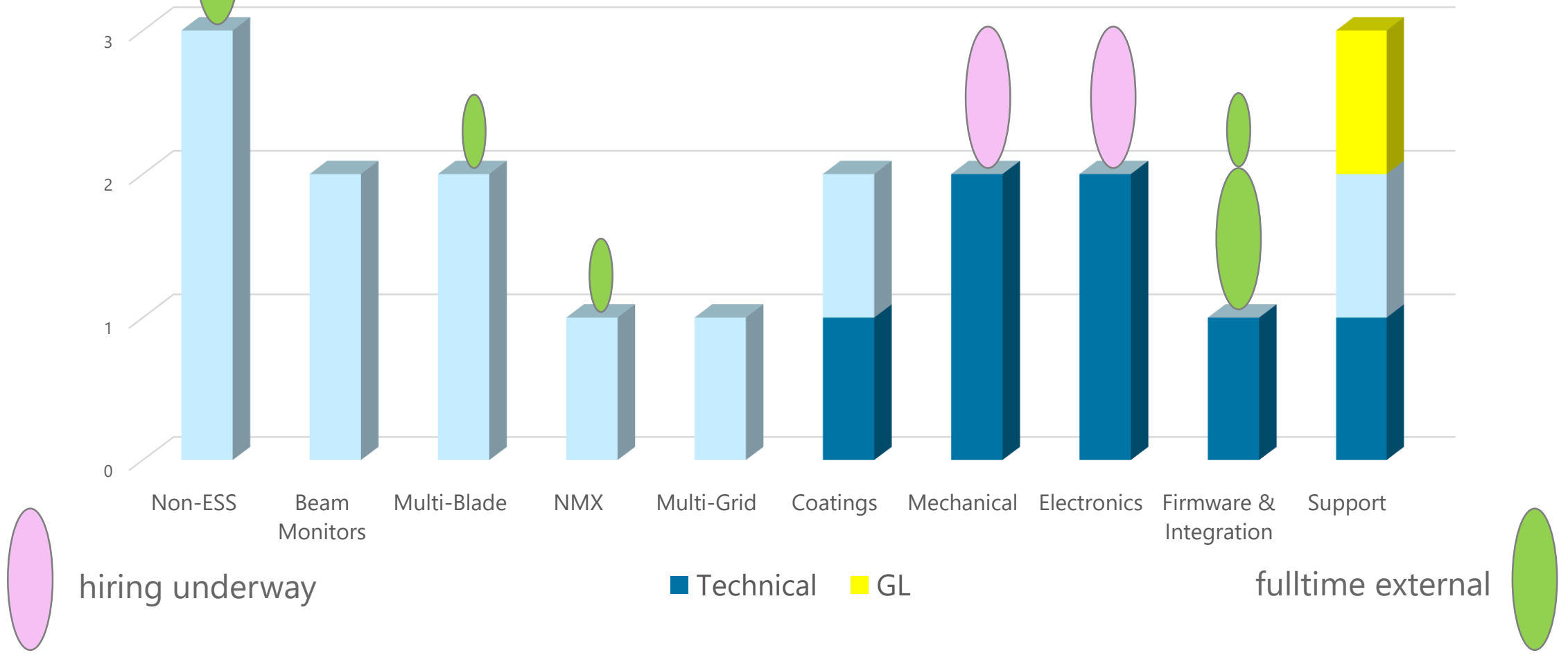
# NMX STAP

Does not illustrate:  
100% Project Planner, 100% Technical Writer, 50% PA



DetG

### Planned FTE Assignments



hiring underway

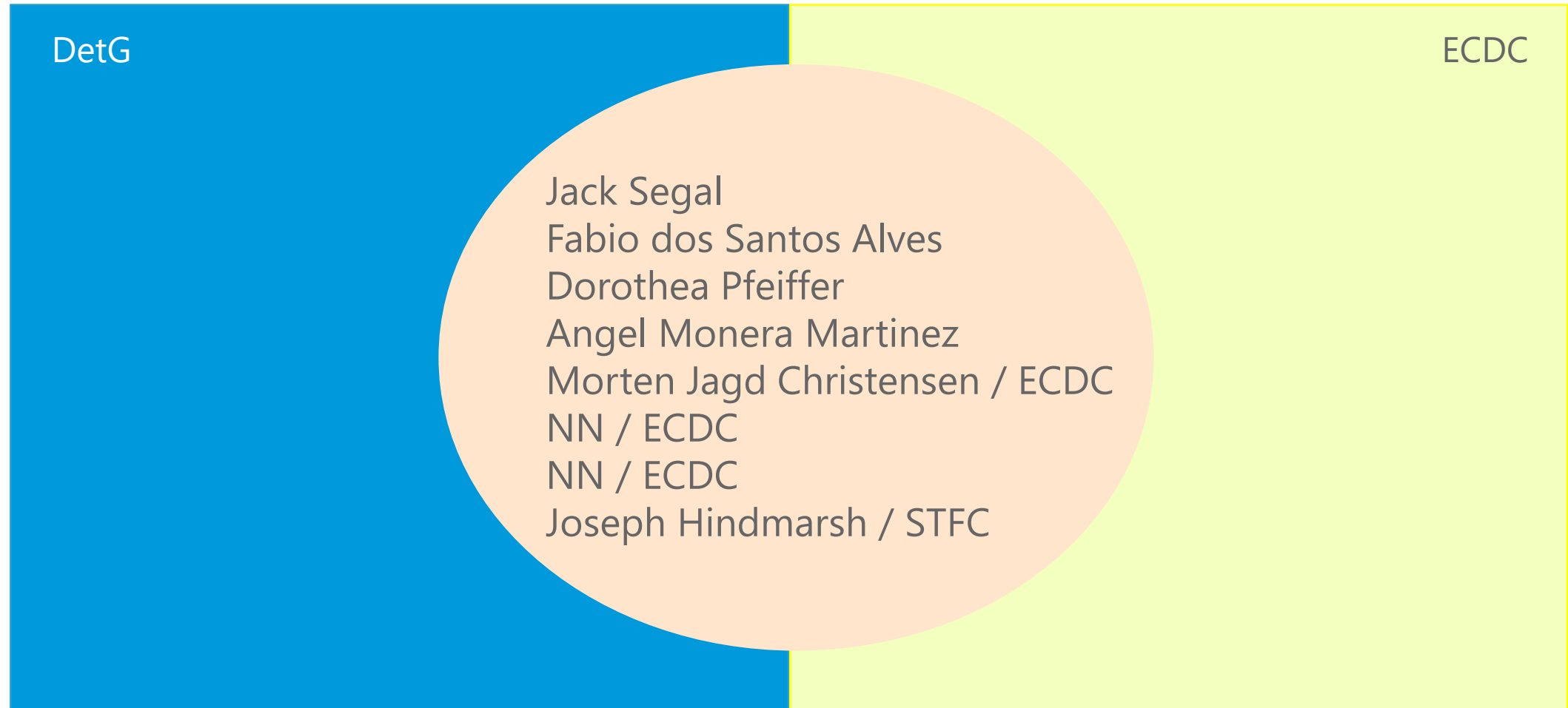
■ Technical ■ GL

fulltime external

# NMX STAP



Firmware, slow controls, and visualization







# NMX STAP

## Readout master module

RMM CE marked

	European Spallation Source ERIC Box 176 221 00 Lund, Sweden ess.eu info@ess.eu	 0640
Product:	Detector Readout Master Module	
Type:	Detector Data Acquisition System Backend	
Serial number:	DRMM22-01-01	
Manufact. Year:	2022	

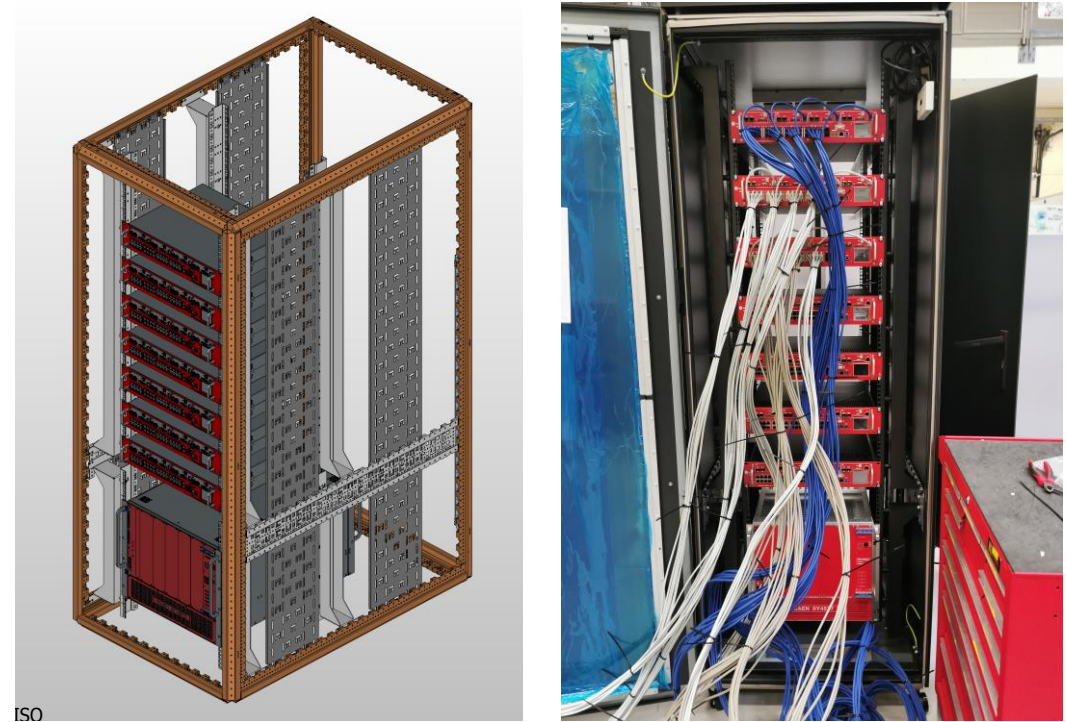


# NMX STAP

## Racks e t c

- Order placed:
  - 15 Master racks
  - 15 Slave racks
  - 15 UPS
  - 30 batteries
  - 15 switching panels
- Significant eplanning experience obtained
- CEP dialog in place

This was not the first attempt



Iterations are necessary

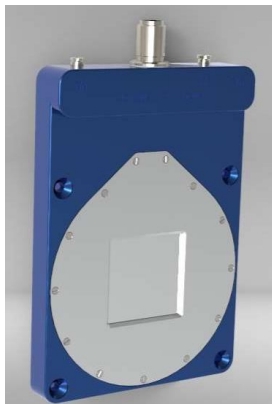
# NMX STAP

## Beam-monitor overview



#BM	Zone	Purpose	PSD	Beam profile (y×z, × mm <sup>2</sup> )	Placement	Technology
1	Bunker	NBOA Diagnostics		30 x 45	Air	I-BM
2	Cave	End of Guide/Diagnostics	2D	30 x 30	Air	CASCADE GEM
3	Cave	Pre-Sample/After slit Collimation stage/Diagnostics		5 x 5	Air	ESS-FLUX

### CDT I-BM



- Ionization chamber with  **$\gamma$ -discrimination**
- ESS-driven development
- No in-bunker electronics
- Current mode operation
- Large dynamic range
- Low beam attenuation

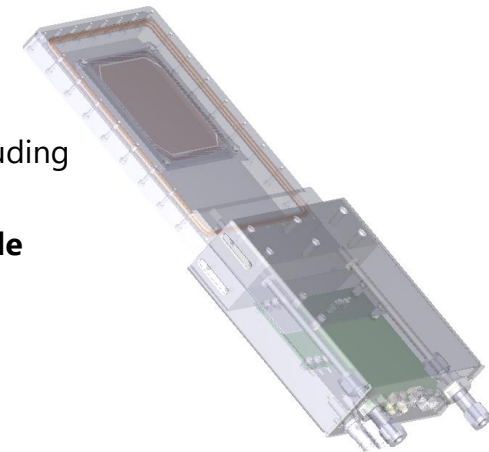
### CDT CASCADE GEM



- High rate capabilities
- **Good 2D spatial resolution**
- Beam profiling
- Pulse mode operation

### ESS-Flux Monitor (MicroMegas)

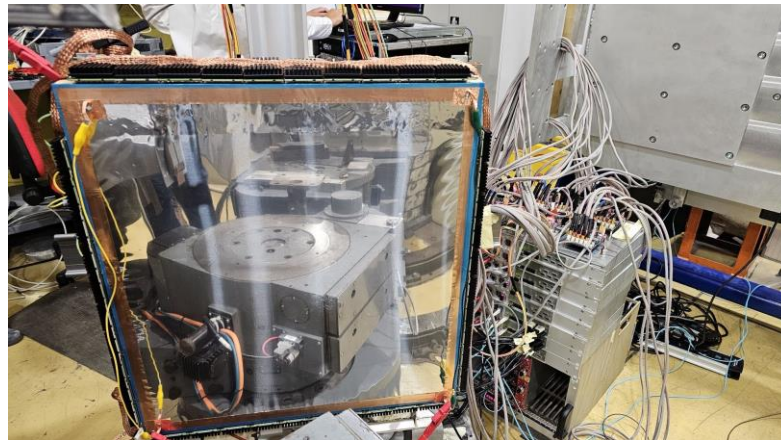
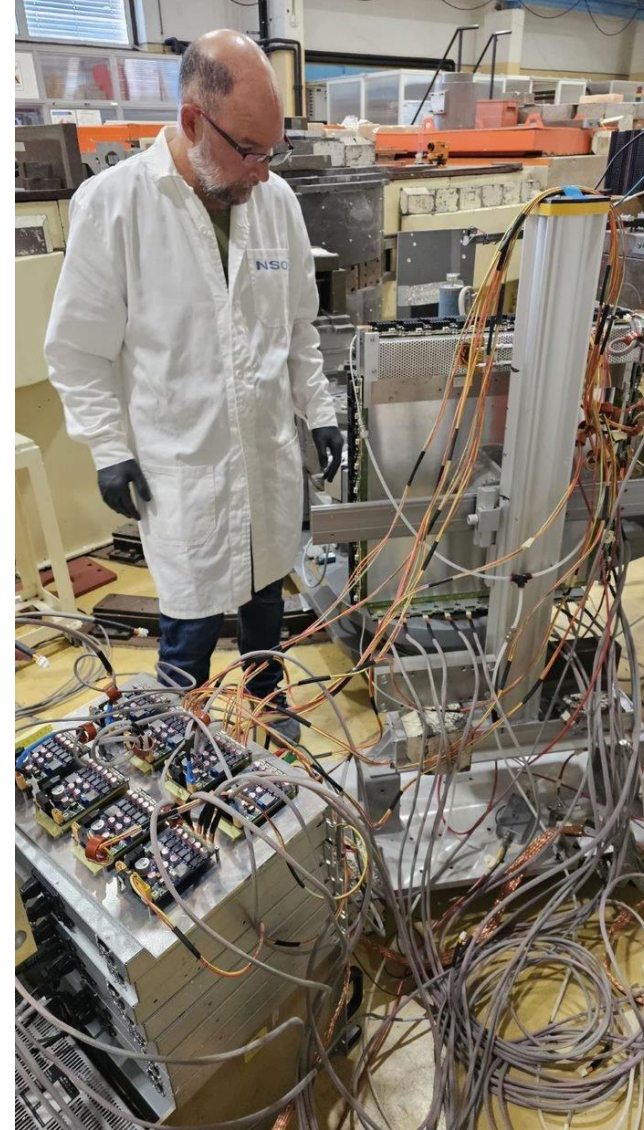
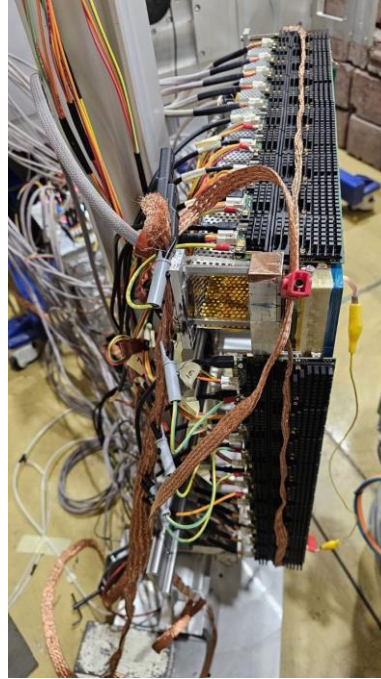
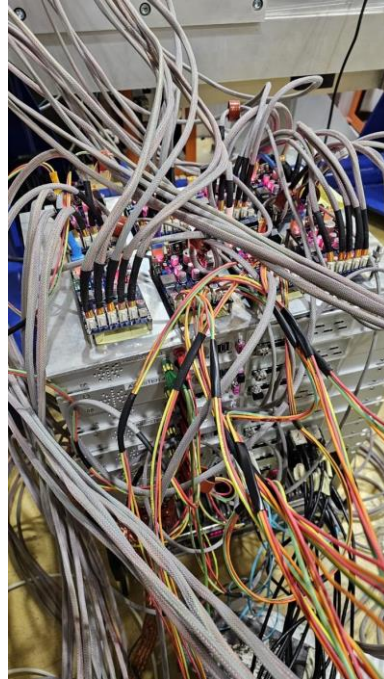
- High rate capabilities
- One to few channels
- **Large dynamic range** including single neutron detection
- **Dual pulse & current mode operation**
- Low beam attenuation



# NMX STAP

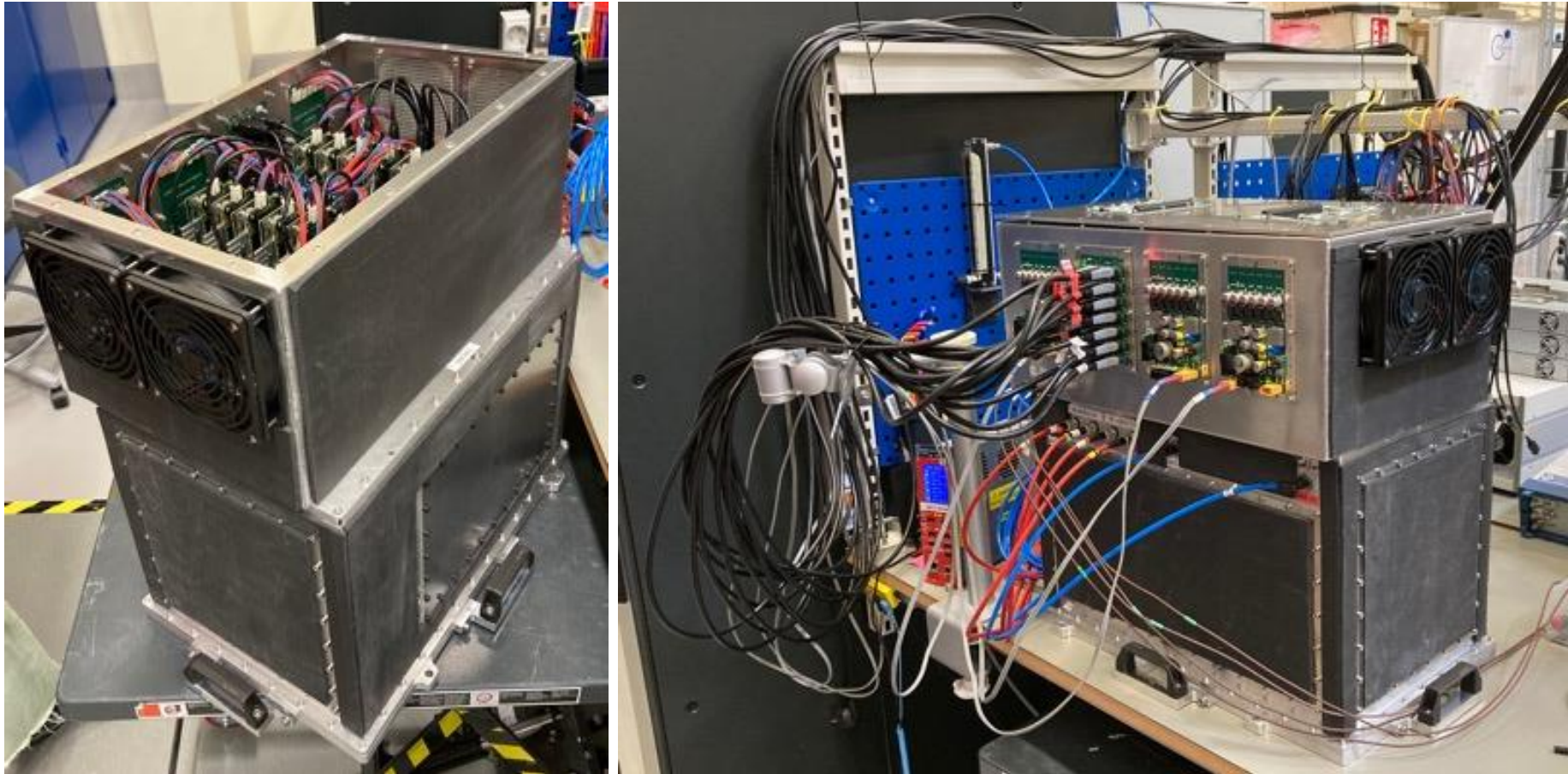
Status

BRR, Sep23



# NMX STAP

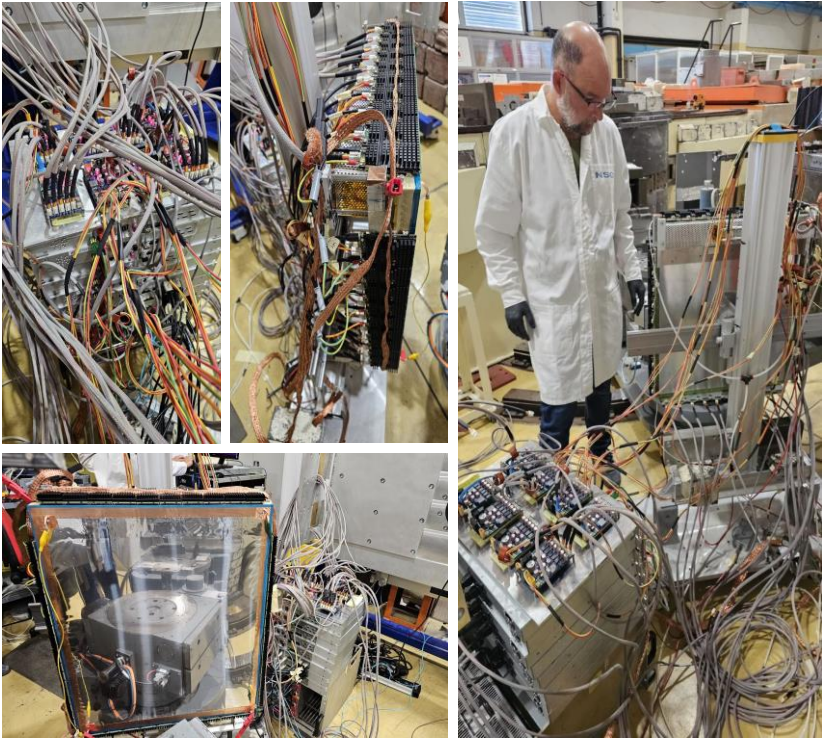
## Goal



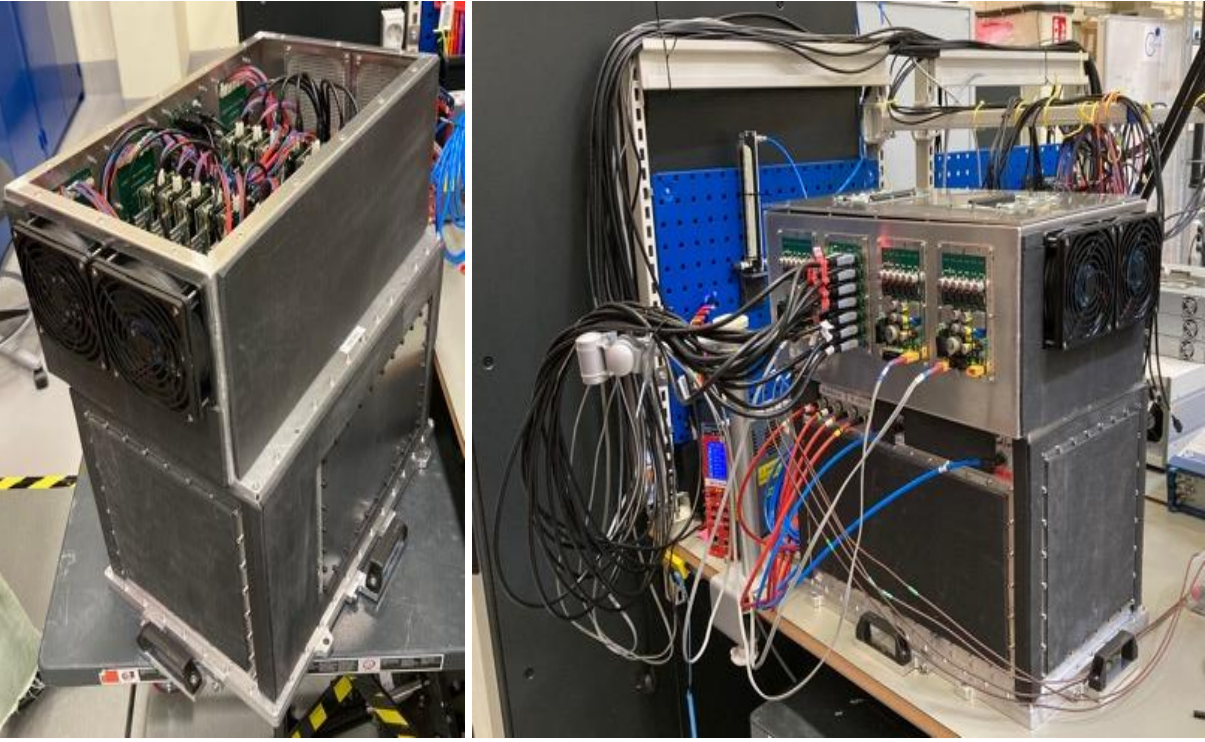
MB AMOR (TBL 1:1), Sep23

# NMX STAP

Significant mechatronics required



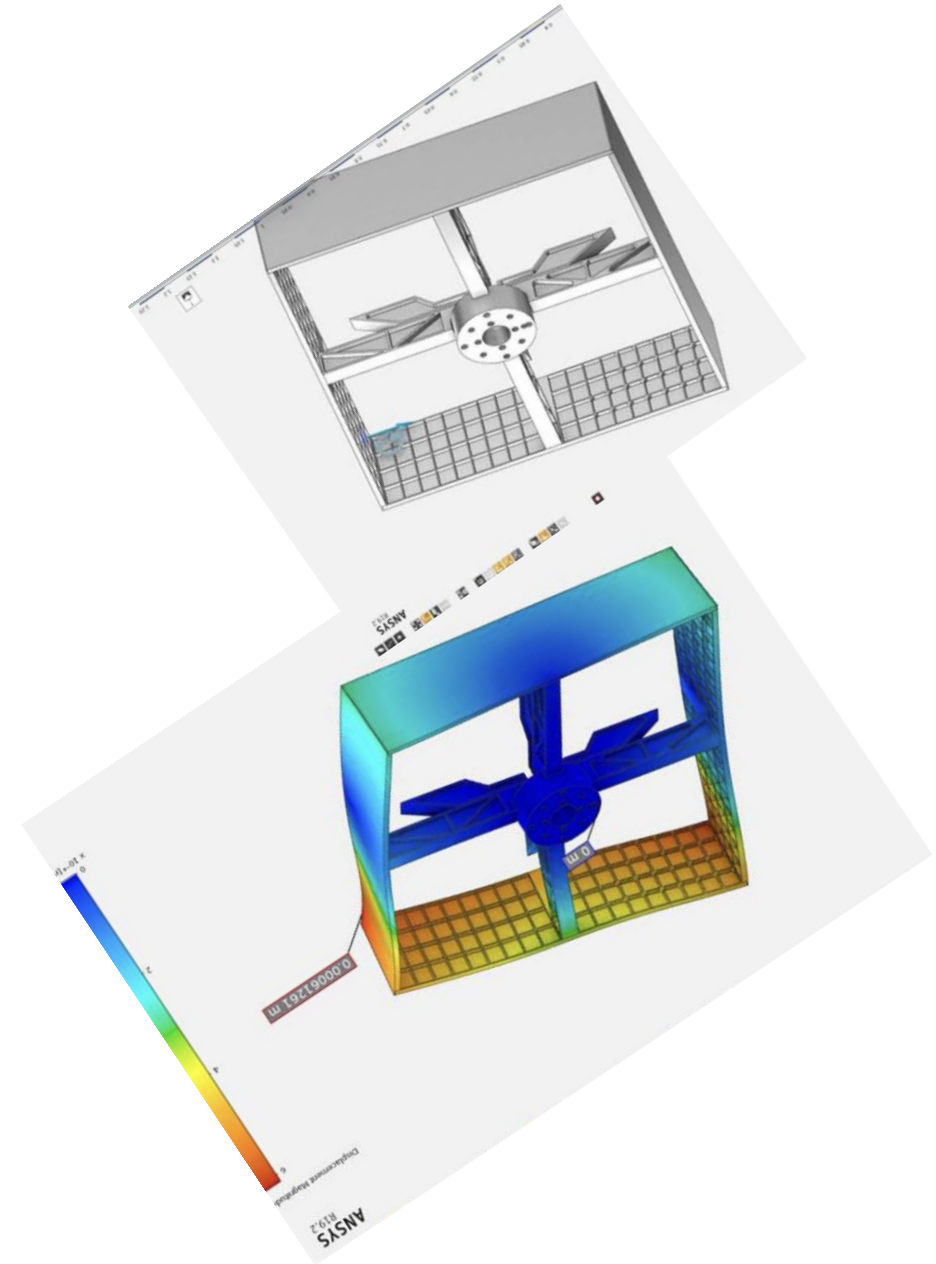
BRR, Sep23



MB AMOR (TBL 1:1), Sep23

# NMX STAP

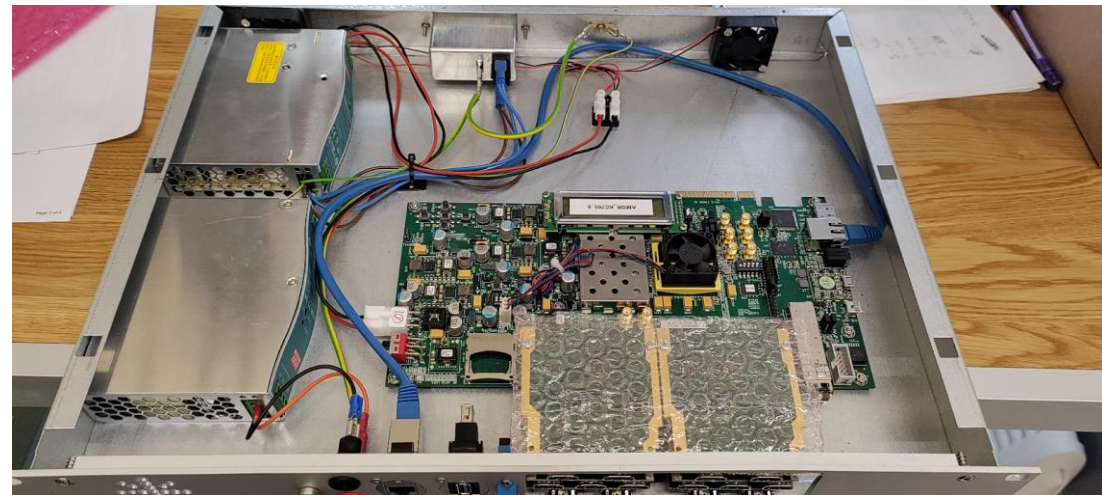
## Mechanics, detector box



# NMX STAP

## Electronics, assister box

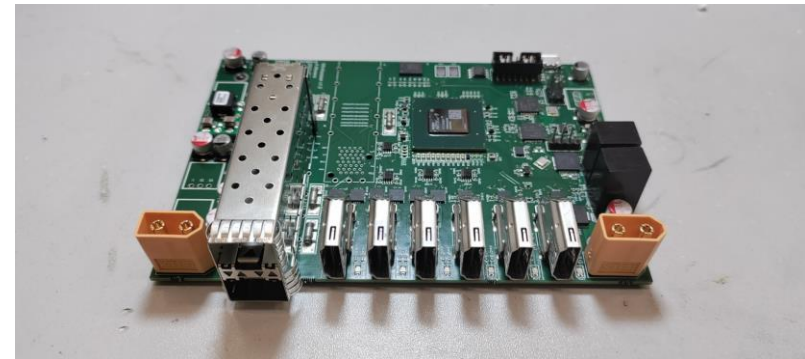
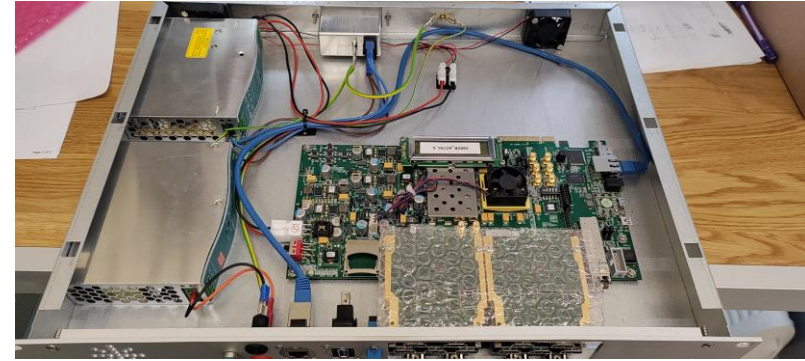
- Houses the KC705
- Upgrade to 5 HDMI ports completed
- 10 HDMI ports is the goal
  - Hardware prototypes exist
  - Testing with firmware is necessary
- 12 units assembled and tested
  - NMX
  - MB AMOR (TBL 1:1)



# NMX STAP

## Electronics, mini-assister

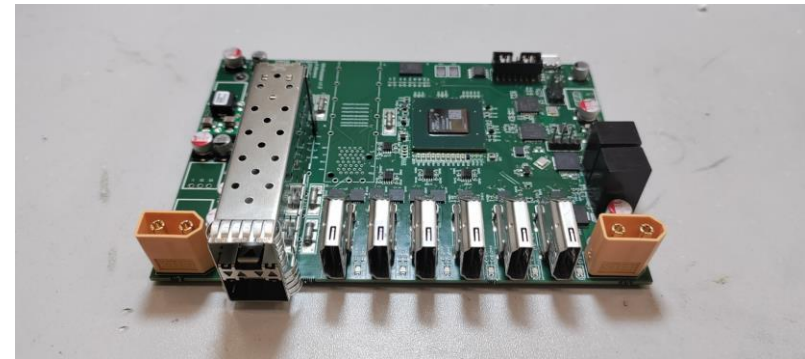
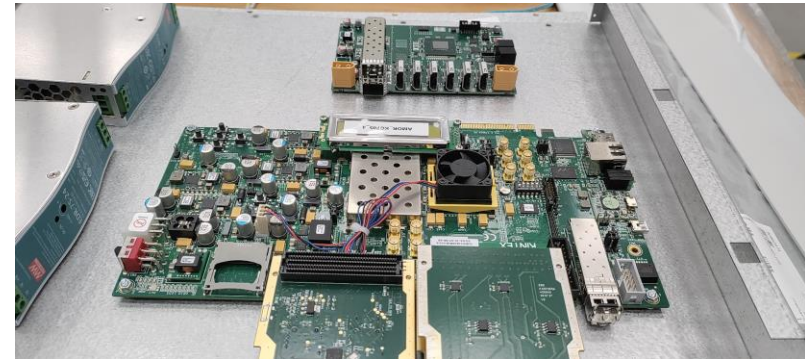
- Much smaller footprint than the KC705
- Power consumption: 55%
  - @12 V: 11 W instead of 20 W
- Adjustable packing options:
  - Single card (6 HDMI per box)
  - Double card (12 HDMI per box)



# NMX STAP

## Electronics, mini-assister

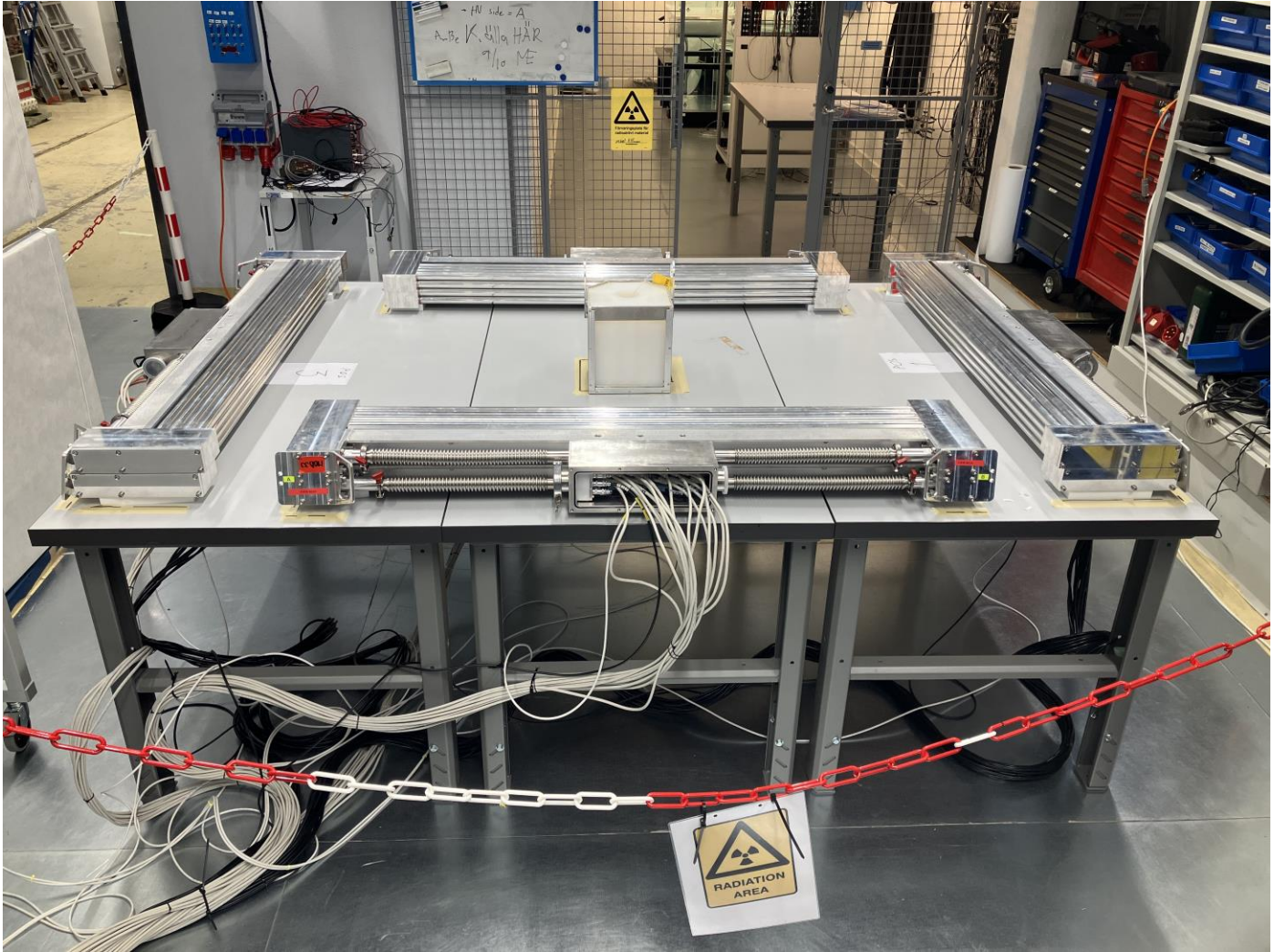
- Prototype cost: 1 k€ per card
  - Unit cost will decrease in production mode
- Cost-effective solution
  - Single (6 HDMI per box): 67% cost of the 5-port Assister box
  - Double (12 HDMI per box): 50% cost of the 10-port Assister box
- Status:
  - Hardware prototypes exist
  - Testing with firmware is necessary



# NMX STAP

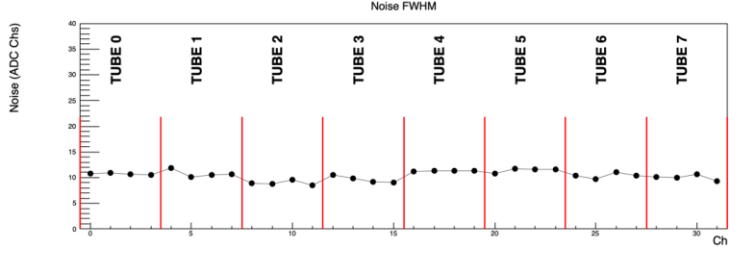
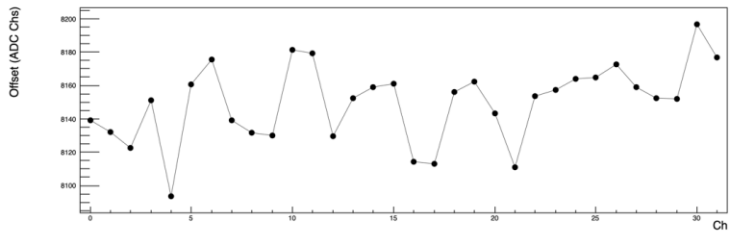
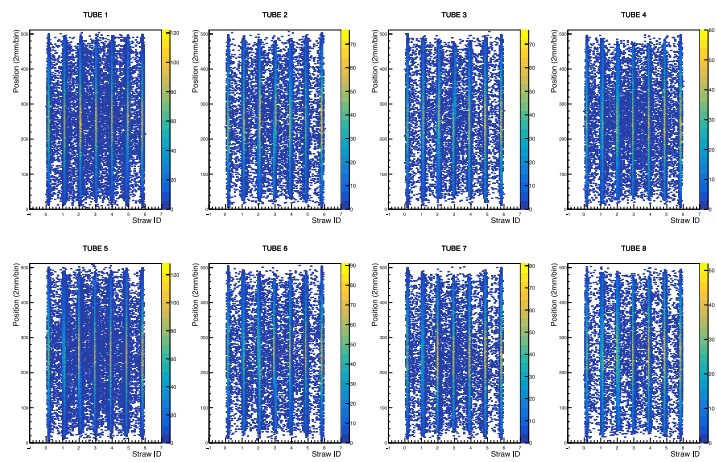
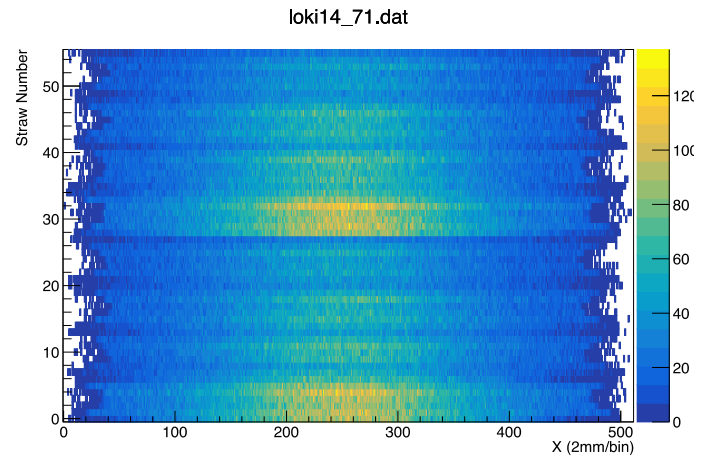
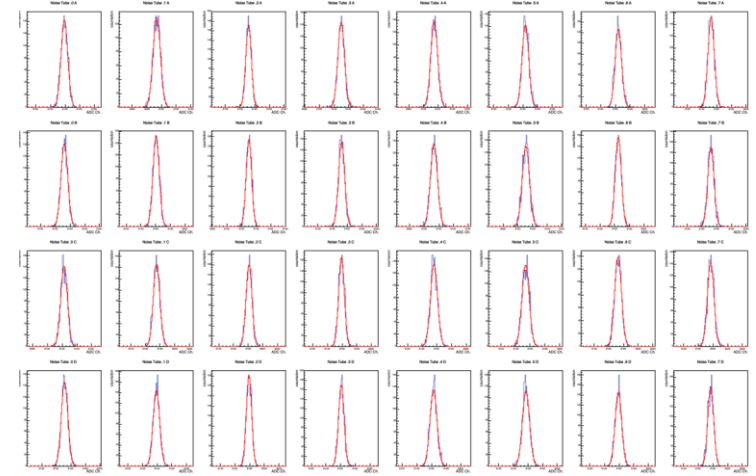
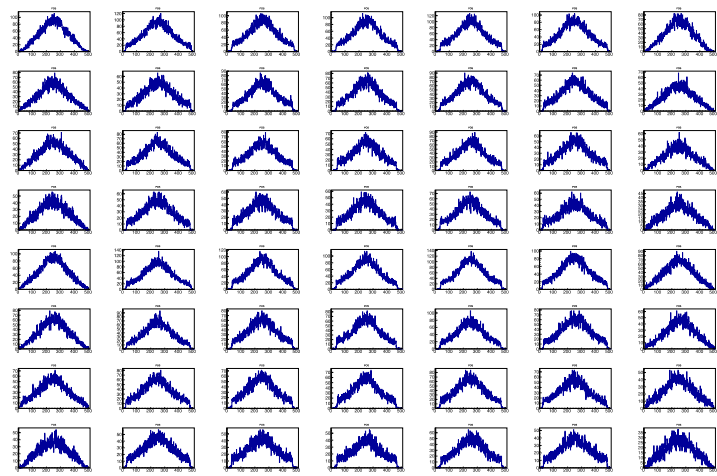
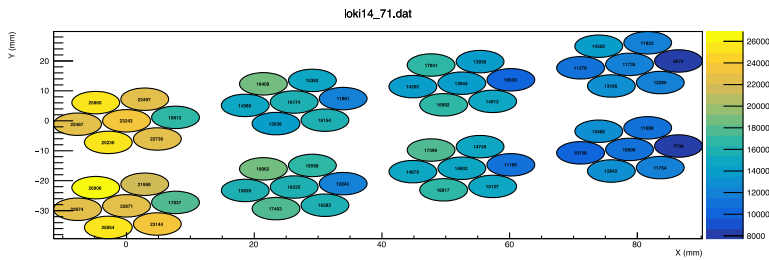
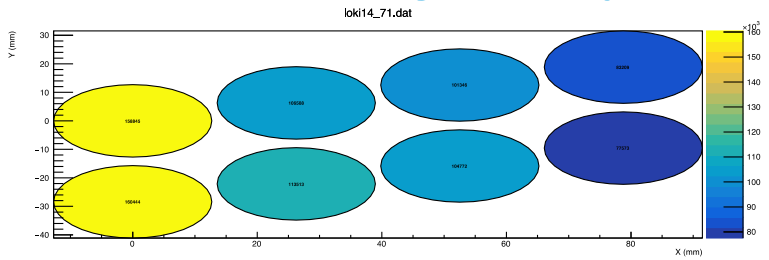
## Source-Testing Facility, LU

- Contract, routines for operation established and measurements underway
- Networks (LU, ESS) and ESS timing signals next



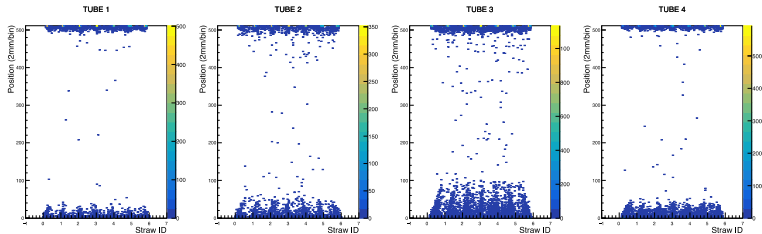
# NMX STAP

## Source-Testing Facility, LU

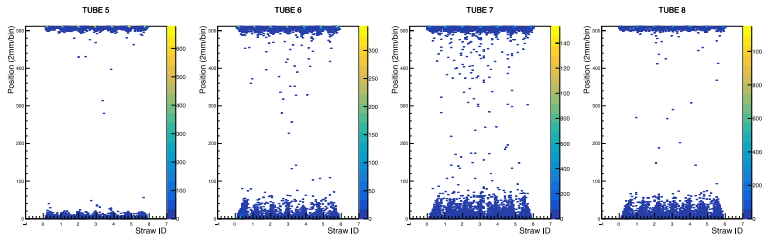


# NMX STAP

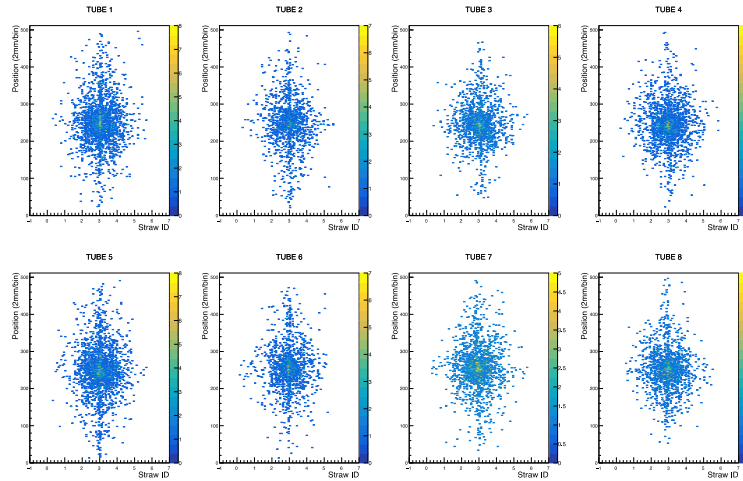
## Source-Testing Facility, LU



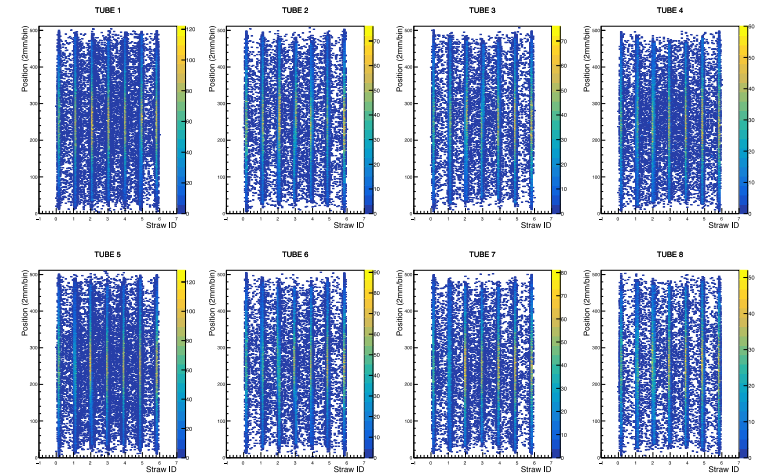
This is what happens when the firmware is wrong but the cabling is correct



This is what happens when the cabling is wrong but the firmware is correct

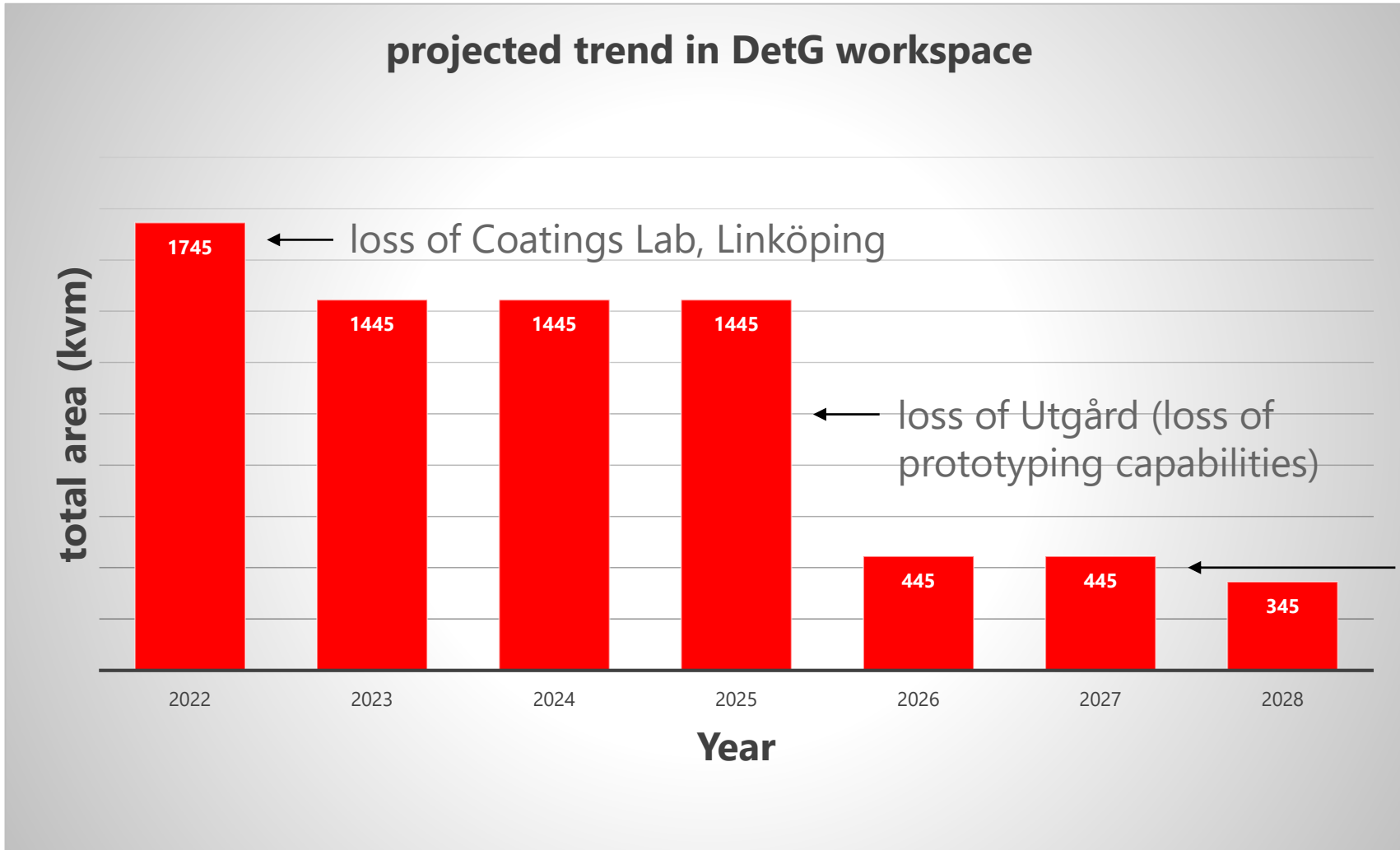


This is what happens when both the cabling and the firmware are correct



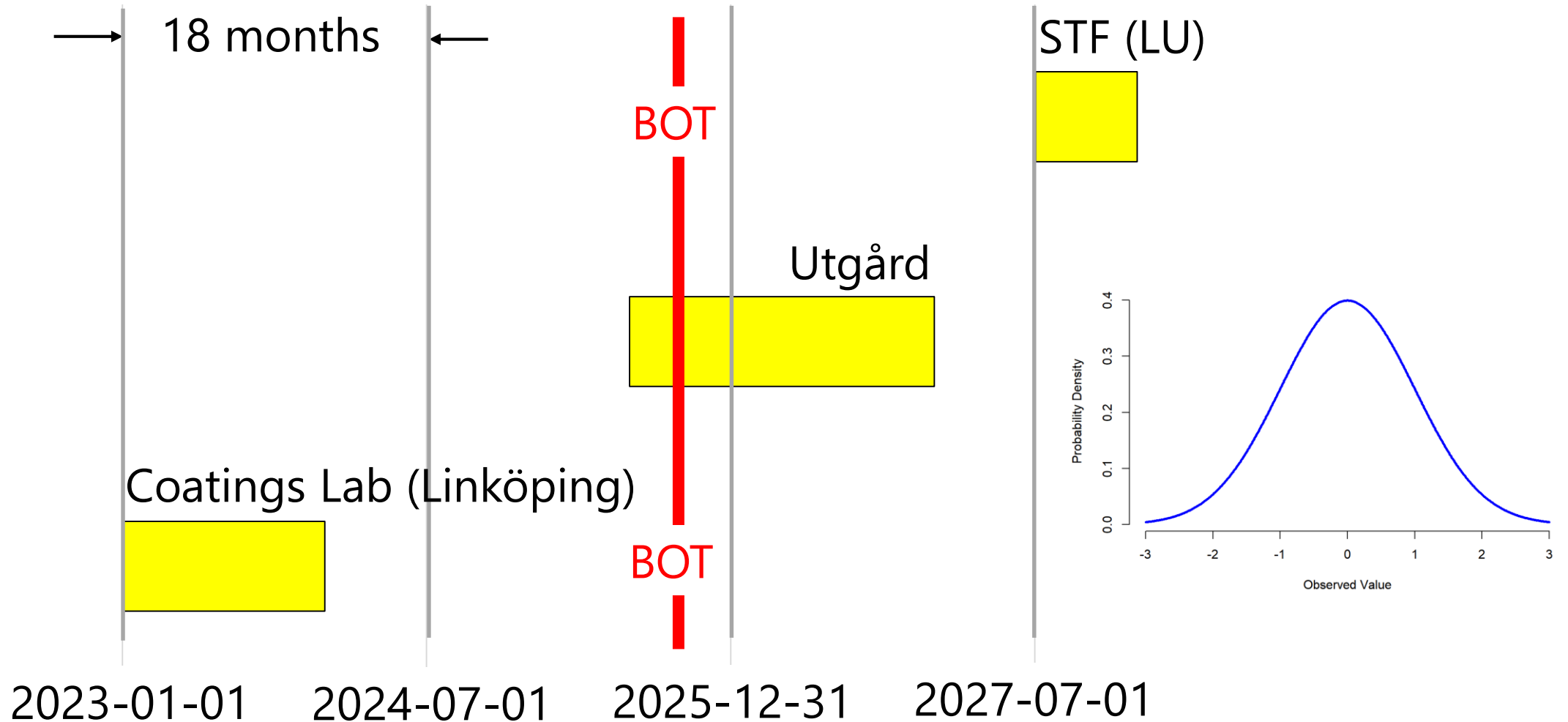
# NMX STAP

## DetG workspace



# NMX STAP

DetG workspace



# NMX STAP



## Status, risks, mitigations, and thoughts

- Jerome to site Aug24
  - Necessary for the build, but jeopardizes the detector-development team
  - Doro under contract, team travel envisioned
- Mechanics
  - Rapidly gaining valuable production experience, preferred partner database underway
  - Documentation overburden cannot be underestimated, expert Technical Writer hired
- Electronics
  - Mini-assister is highly desirable, particularly the double (12 HDMI per box) solution
  - Motivation is high – many instruments are very interested
- Firmware and slow controls
  - Playing catchup on the VMM and making progress, both MB and MG need it
  - Expert-level integration hire underway
- Trend in projected workspace
  - Presently unmitigated, but the situation has now been recognized

A large, dark blue stylized letter 'G' that forms a partial circle on the left and has a horizontal bar at the bottom. The top of the 'G' is curved and ends in an arrowhead pointing to the right.

# ESSDetector

roup