SoM-CAM: status and roadmap

Mariusz Sapinski

SoM-CAM meeting
PSI, November 10th, 2026

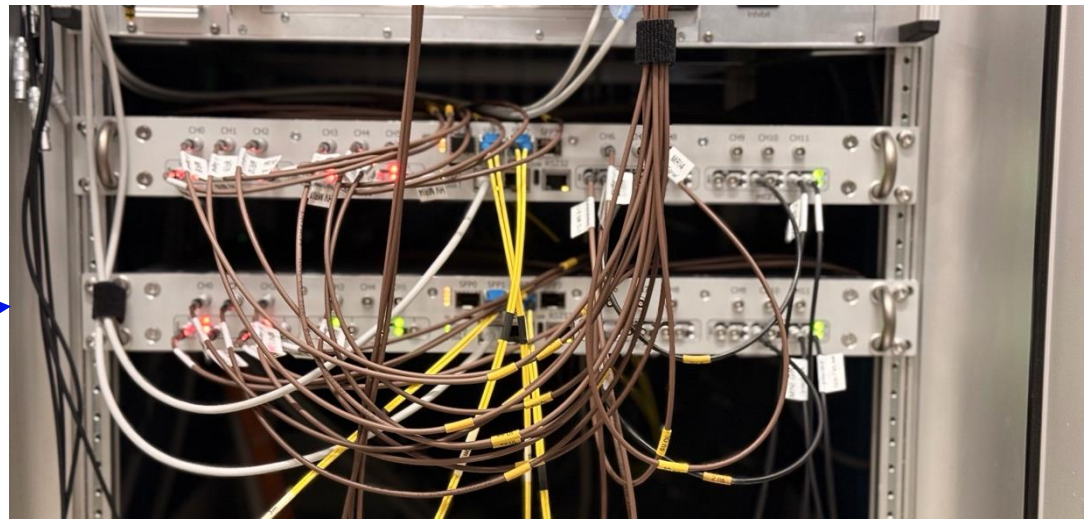
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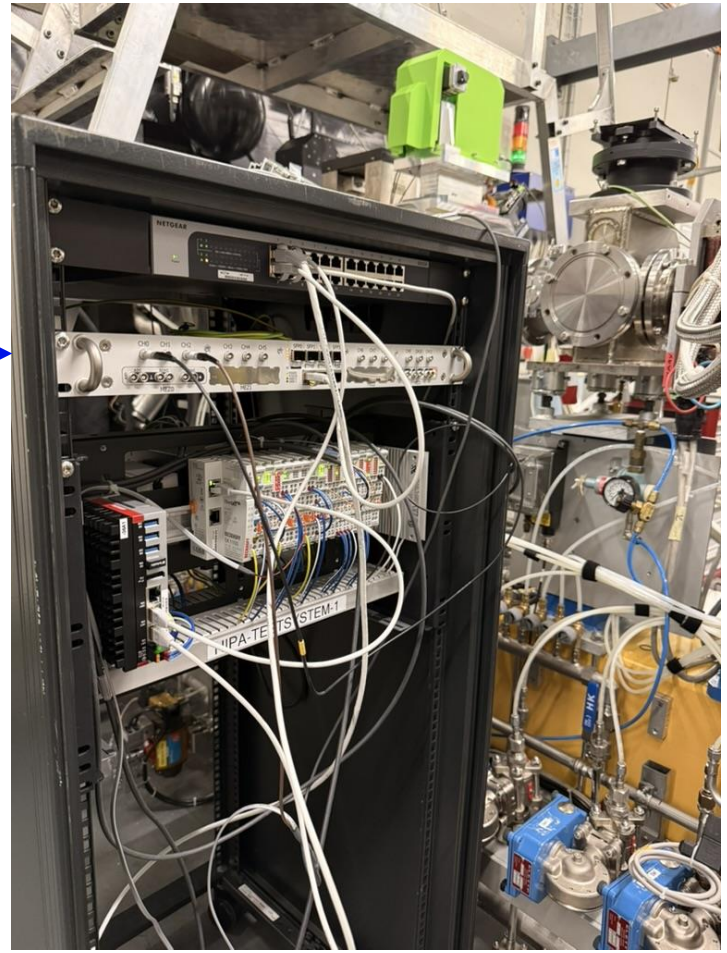
1. Present situation
   - Deployment on selected MRI and MNI channels.
   - Test setup with fast wire scanner (OAWM).
   - Issue with loss spikes.
2. Plans for the last service days of 2026.
3. Plans for 2027 CAMAC conversion.
4. Long Shutdown 2028.
5. Final perspective (2029+)

Present situation – SoM-CAM version 1

We have 5 SoM-CAM version 1 devices:

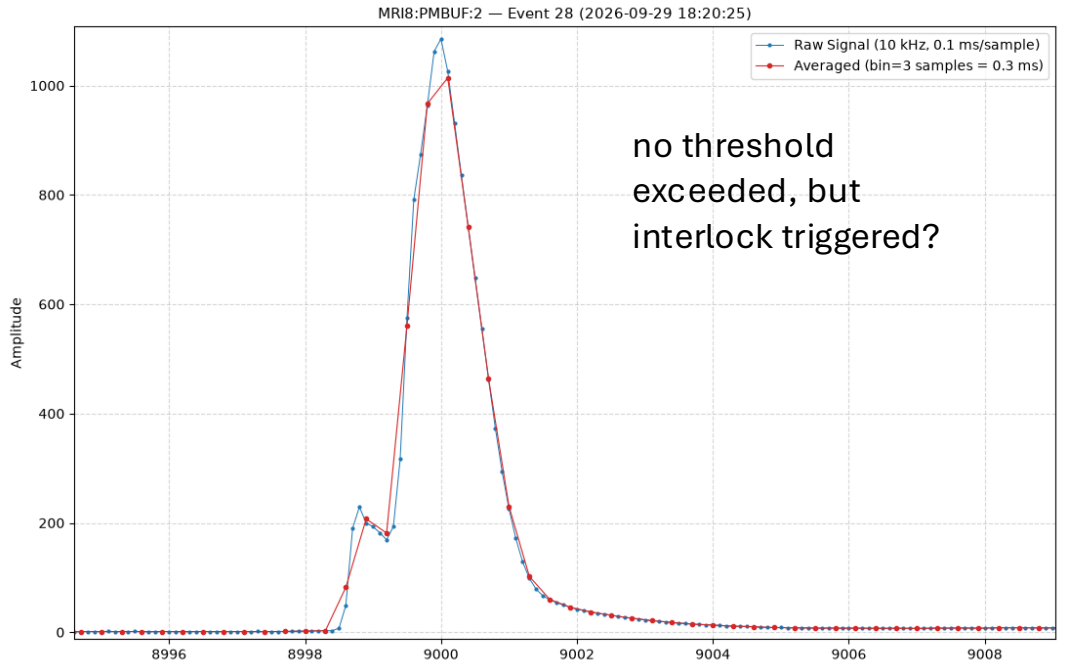
- 2 SoM-CAM version 1 are in operation, currently 12 channels.
  - Rack WSGA/S10.7, crate ZPSAF06
  - MRI GR.1, MRI GR.2 and MNI GR.2 - all LogCAM3, no filters
- 1 SoM-CAM version 1 used for test of fast wire scanner in CW
- Other 2 in the labs.





SoM-CAM signal spike

- Operation reports fast spikes in the signals which lead to increased number of interlocks.
- The consensus: SoM-CAM is faster (interlock loop 10 kHz, analog low-pass filter 16 kHz) than LogCAM (4 kHz) so the observed spikes are higher. Is this true?
- Example: Tue Sep 29 2026 20:20:18.489,Tue Sep 29 2026 20:20:19.889,AVKI DEFLECT,MNTR transmission low,CR5V (PS NOK),CR5 PHASE,CR5 AMPL.,MNTR DPL,MRI GR.2 (MRI8>HARD-MAX)
- HARD-MAX threshold already raised:
  300 nA ➞ 5000 nA.
- Interlocks are still coming.
- Investigation ongoing. Case-by-case analysis.

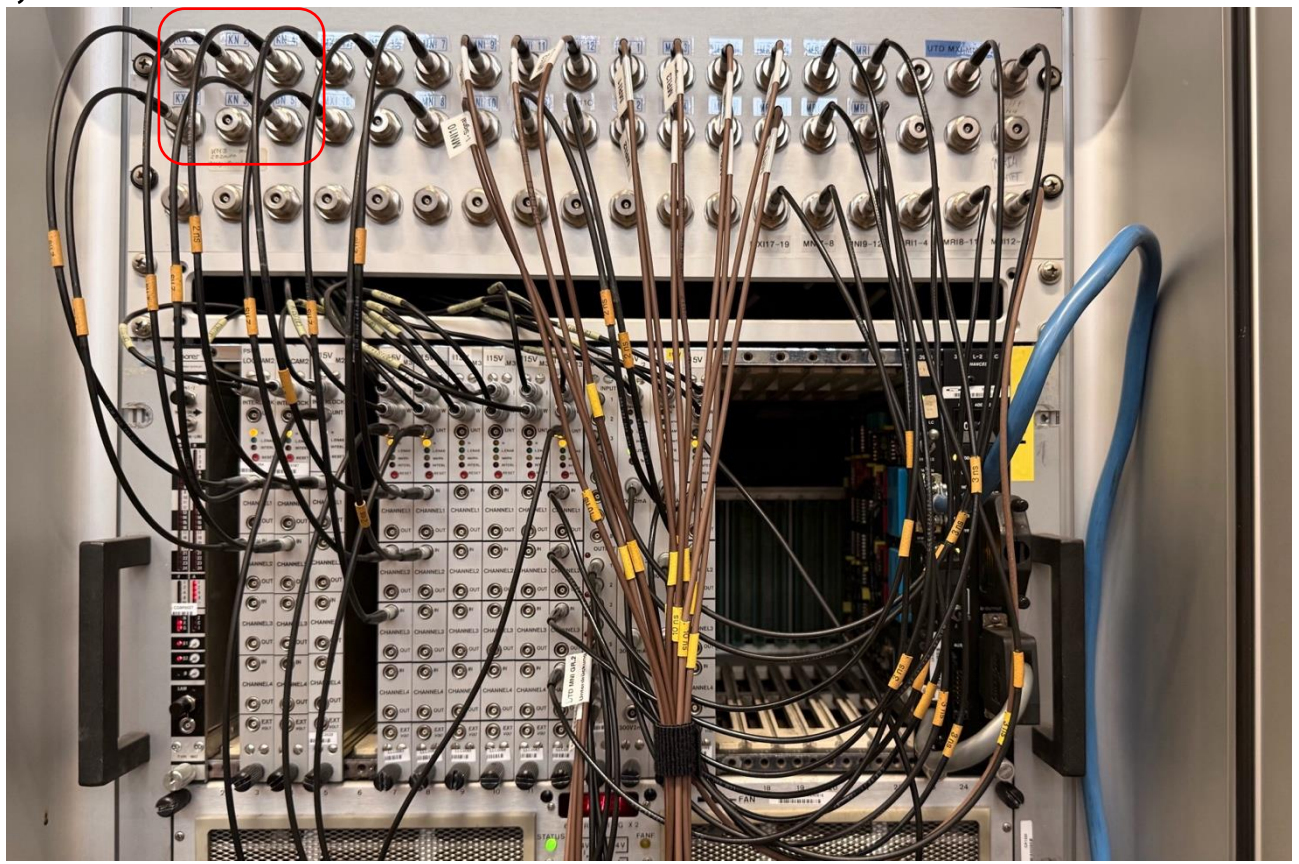


Present situation – SoM-CAM version 2

- 15 SoM-CAM version 2 are produced, waiting for assembly, tests, calibrations etc.
- Difference with respect to version 1: improvements at the analog input.
- Expected to perform the same way or better.
- Rather no time to test with the beam this year.

Immediate next steps: last service/test days of 2026

- Migrate 5 more channels from LogCAM2s (WSGA/S10.7, ZPSAF06) to SoM-CAM.
- Specific monitors: KX18, KX19, KN2, KN3, BN5
- Significance: First deployment of collimator signals onto SoM-CAM.
- Date: November 24th.



Beam Test Session (November 25th):

- Test OAWM with AVKI signal.

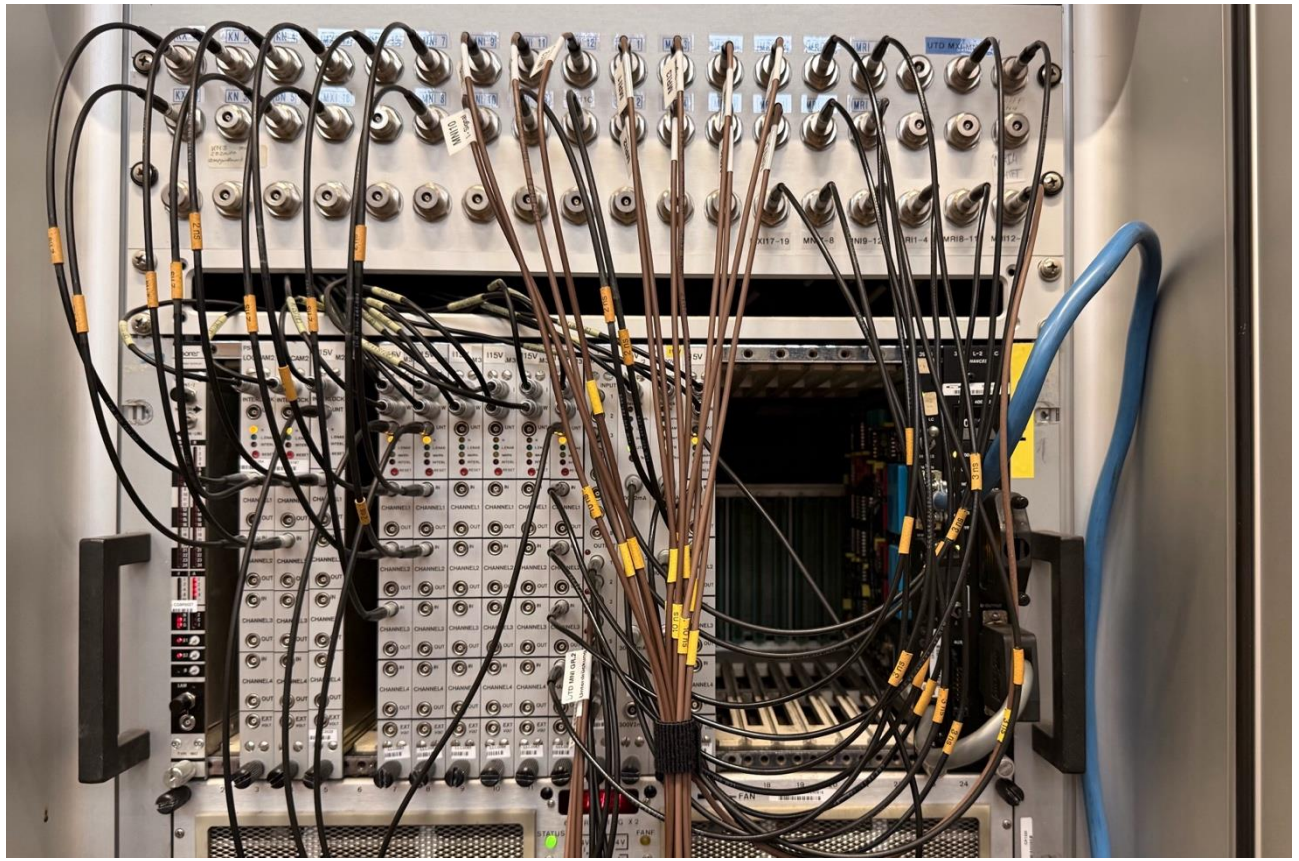
Plans for 2027 – Phased Rollout

- Extensive operational validation confirms SoM-CAM v1 reliably reads ionization chambers.

  (Grain of doubt: we have fully tested SoM-CAM version 1, but there is no reason to belive that version 2 is different).
- Therefore start operational deployment of SoM-CAMs for all ionization chambers in HIPA.
- But do it gradually because:
  - Only tested one type of firmware (i.e. one type of interlock).
  - Take time to set and test the interlock parameters. Machine safety!
- Separate hardware roles in 2027:
  - SoM-CAMs version 2 for ionization chambers/collimators.
  - SoM-CAMs version 1 for testing motion applications.

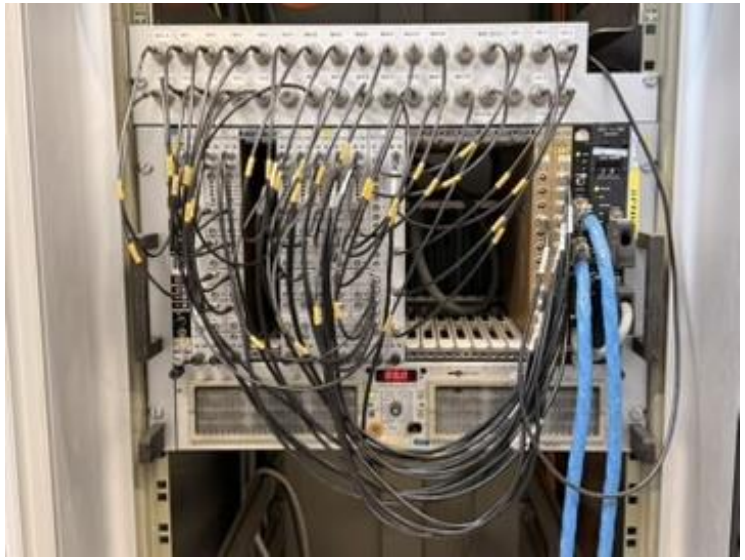
Plans for 2027
1) complete crate ZPSAF06

1. To be done during the shutdown.
2. Require 3 SoM-CAMs version 2.
3. Total 27 channels, 22 HV connections.
4. Remaining for SD 2027: 9 channels, 9 HV connections.
5. The final location of these channels is in new rack (WSGA/S10.3). When to install this rack?



Plans for 2027
2) convert all in crate ZPSAF02

1. It contains 21 channels MII and MXI.
2. Ample rack space available (WIHA/G66.5).
3. Will require 3 SoM-CAMs version 2.
4. 21 HV connections.
5. To be done during shutdown.





WIHA

Plans for 2027
3) OAWM crate(s)

1. New racks in CW ground floor required because OAWM need shorter cables.
2. Serve test OAWM and replacement for MWP11/12.
3. 1x SoM-CAM v1 and ECMC for 4 axes.
4. To be done during shutdown.
5. Need to pull cables (working on the list).
6. Will also be used for tests of next generation Light Profile Monitors.
7. Is the enough space there?



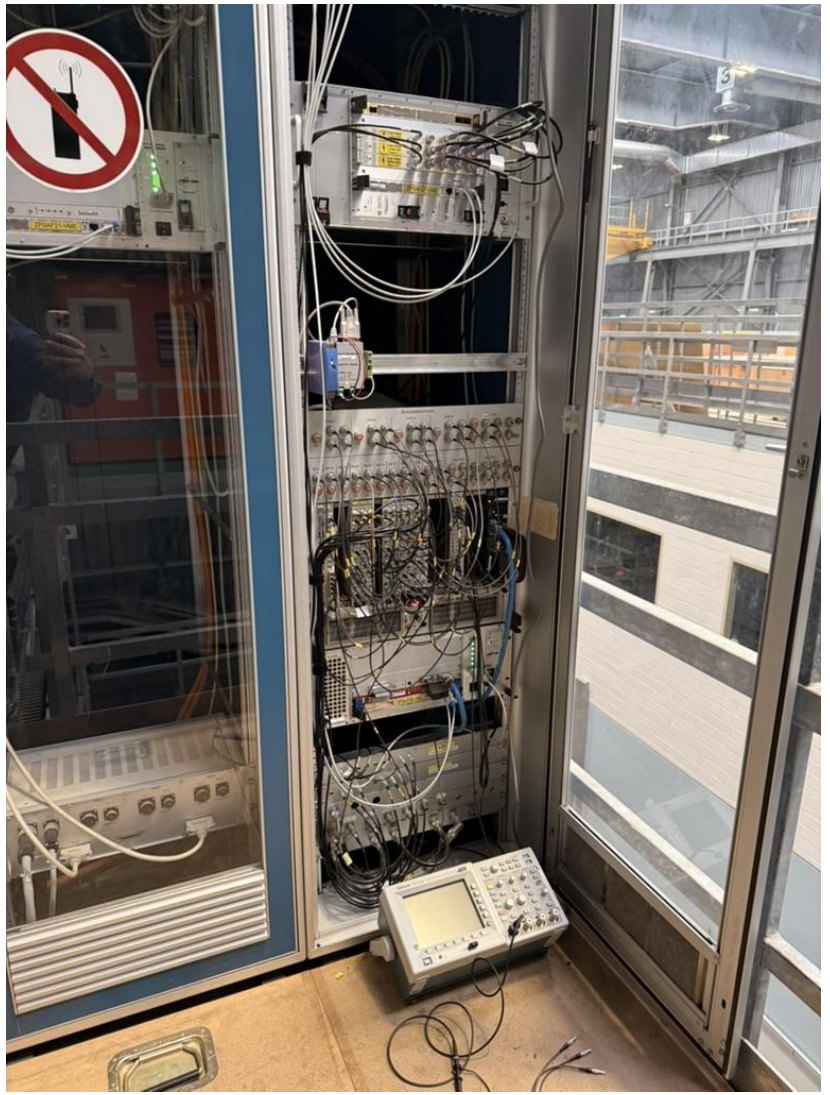
Plans for 2027
4) WIPAM replacement test

1. Reminder: In addition to lab tests we have already tested movement of MYP20 using ECMC in April 2026. This monitor was chosen because it has the longest cable (~120 m).
2. Next step:
   - Integrate ECMC and SoM-CAM.
   - Develop software.
   - Operational test of two WIPAM monitors MYP13/14.
   - Rack location WIHA/G66.4
3. Installation during winter shutdown.
4. Ample rack space.



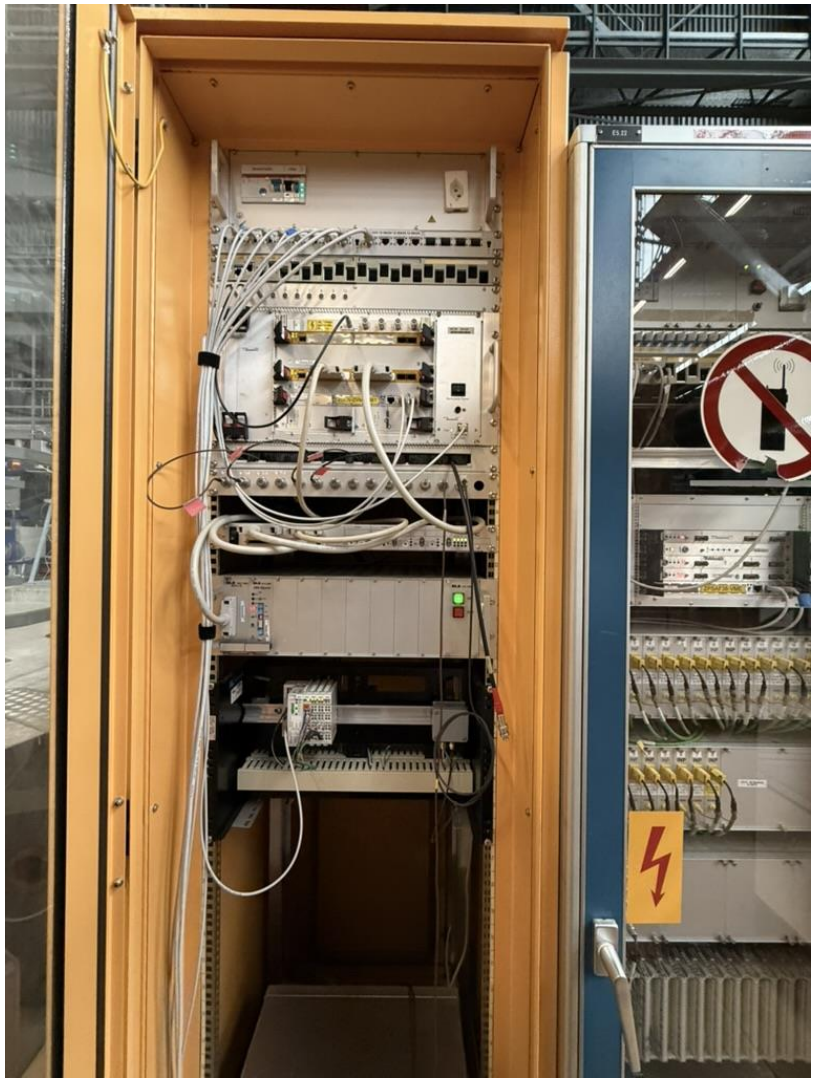
Plans for 2027
5) SINQ ionization chambers

1. Location: WNHA Galerie 4 rack NH2.13.49, crate ZPSAF27.
2. Crate failed twice in the last 2 years, every time multiple LogCAM cards needed replacement.
3. SINQ ICs have very special firmware/interlock (LogC2E53). Use beam current signal from MHC4.
4. Preparation and deployment during the 2027 run.
5. Phase one: MHI31, MHI32, MHI33 and MHI33B (the same LogCAM card).
6. Potential space issue: OK for 3 SoM-CAMs?



Plans for 2027
6) MESON replacement

1. We need it operational in 2029 for HIMB.
2. Test on MBPT1 wire scanner, UCN branch.
3. Rack WEHA/E5.23, crate ZUCN-CVME-MBT.
4. Enough space for ECMC and SoM-CAM.



Plans for 2027
7) Successive deployment of other crates

1. We have 62 LLCam channels, 46 LogCAM, 84 LogCAM2 and 104 LogCAM3 and 21 LinCAM channels. Total is 317 channels (excluding wire scanners), about 40 SoM-CAMs.
2. Up to this point we planned 45 channels, 7 SoM-CAMs.
3. During the 2027 run we should test and complete deployment for more channels. Decisions will depend on the manpower, test time, potential issues.
4. I belive we can replace 3-5 CAMAC crates (60-100 channels) (9-15 operational SoM-CAMs).
5. We will need at least 3 spare SoM-CAMs v.2, replacement procedures, piquett application, training.
6. Freeze SoM-CAM deployment, document, have a stable situation for the last 2 months of run, so there will be less problems when beam comes back in 2029.
   (or maybe we continue in Injector 2 as we should have beam there)
7. Q3 2027: produce the next batch of SoM-CAMs.

Summary 2027

Crate to be replaced	Devices	Number of SoM-CAMs	Number of channels
ZPSAF06	MRI, MNI	3	27
ZPSAF02	MII, MXI	3	21
ZPSAF27	MHI/SINQ	1(+2)	27
ZUCN-CMVE-MBT (test)	MBPT1	1 (v1)	2
OAWM test	OAWM, MWP11/12	1 (v1)	4
ZPSAF04 (?)	MYP	1 (v1)	2

Long Shutdown 2028

1. PK1 will be rearranged, new cables, new racks, opportunity to deploy SoM-CAMs.
2. For HIMB:
   - 2 SoM-CAMs for aperture monitors and ionization chambers (MHI11, MHBEI, MHB0, MHB1, MHB2).
   - 1 SoM-CAM + ECMC for wire scanners (4 axes, MESON replacement, MHP23/24, MHP23B,24B).
3. Replace all MWPs on horizontal beamline with OAWMs:
   - 8-10 boxes assemblies (2 scanners/box).
   - 2-4 SoM-CAMs (AVKI signal treatment).
4. If we have time and resources continue to deploy SoM-CAM in Injector 2.

Final Perspective (2029+)

Preliminary plan:

1. SD 2030: replace all remaining WIPAM electronics.
2. SD 2031: replace all remaining LogCAMs, LLCams etc.
3. SD 2032: replace MESONs for wire scanners.
4. SD 2033: replace MESONs for radial probes, final cleanup of CAMAC.
5. This plan must be coodrinated with replacement of racks in frame of HIPA Reneval.
6. Other related tasks: Proscan electronics, TATTOOS… I hope this plan is not too optimistic.

Summary

1. SoM-CAM deployment for ionization chambers, slits, collimators started this year.
2. Hardware needed in 2027: minimum 10 SoM-CAMs v2.
3. Motion in 2027 still in test phase (fast wire scanner, WIPAM and MESON)
   3x SoM-CAMs v 1 needed.
4. New batch of SoM-CAMs (40+) should be produced in Q3 2027.
5. Many open questions concerning rack space.
6. Ambitious preliminary plan with completion of CAMAC decommissioning in 2033.

Acknowledgements

Special thanks to you all!

Additional slides

In-Shielding Profile Monitors: MHP/S23/24 and MHP/S23B/24B

1 Measurement of beam profile (MHP) and beam position (MHS).

2 New, modular design, tested as MBPT (since 2022) and MHP/S45/46.

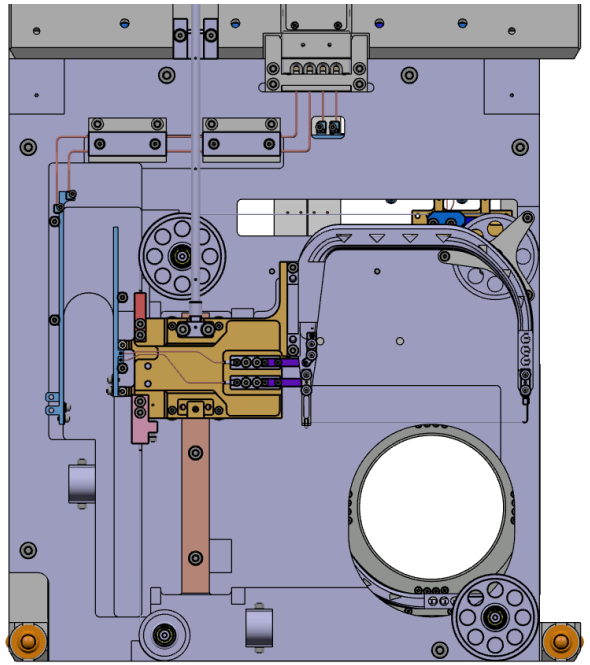
3 Electronics based on the SoM-CAM system, a new motor controller, and DBPM3-HIPA platform for MHS (Boris Keil: on time)
(MESON system as a fallback solution).

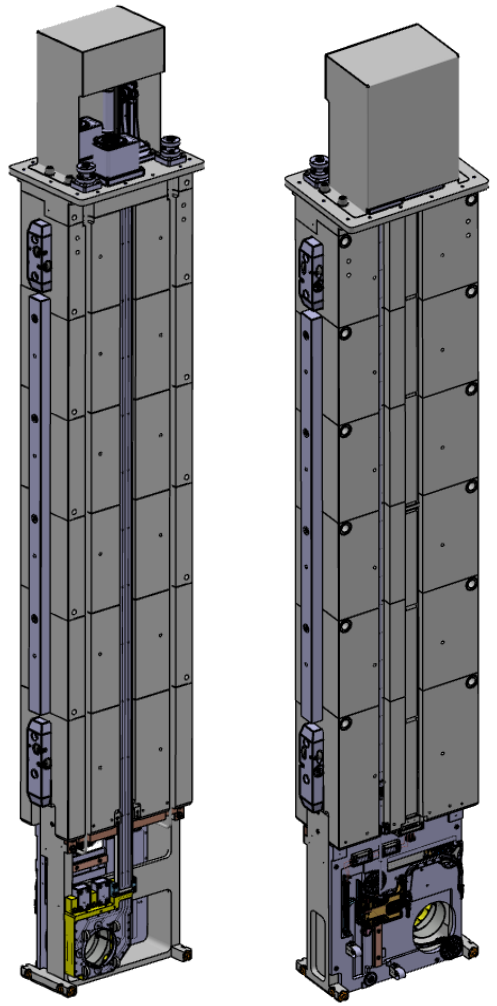
4 In production including spare parts.

5 Complex devices, 2 months for assembly and testing (each).

6 Final assembly in the Montagehalle
– monitors are long and heavy.

7 Movement calibration and testing
- in Experimentalhalle.





Oscillating Arm Wire Monitor (OAWM)
MDP1/2, MDP3/4 and HIPA 870 keV

1 Prototype tests successful in the lab, it can easily drive at 4 m/s.

2 Installation in CW for beam tests during Shutdown 2026. Initial results OK!

3 Design and testing: Martin Rohrer,
Rudolf Doeling, Simon Lindner

