Proposal for Microstation Prototype

Jaak Lippmaa
CERN 2005

Microstation Advantage

- Lightweight design
- Directly mounted on beam pipe
- Detectors can be positioned close to beam
- Dynamic alignment of detector planes
- Redundancy provided by clustering
- No heat dissipation

Design Constraints (ATLAS)

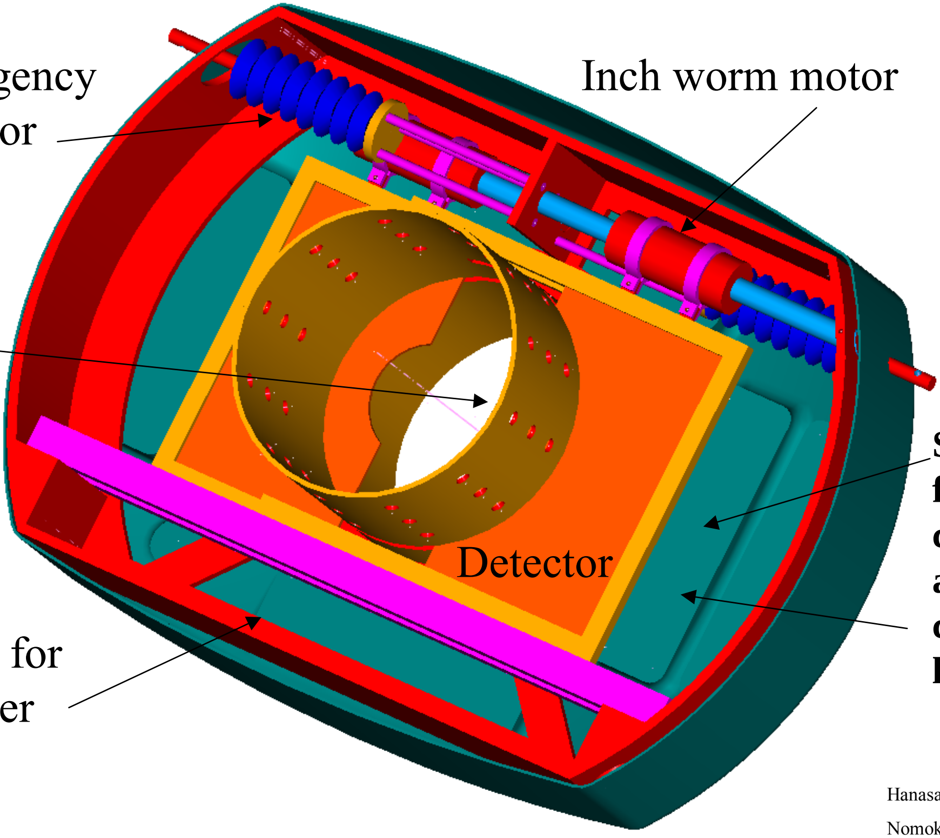
• Outer dimensions	max. diam. 190 mm
• Weight	M < 1 200 g
• Transparency to particles	materials selected for minimum radiation/absorption
• Magnetic field	0.2 T < B < 0.4 T
• Vacuum:	10-11 atm, dynamic vacuum preservation
• RF-impedance	< 30 mΩ/microstation
• Max. temp during bake-out	μS chamber 200^{o}C, detector 150^{o}C
• Radiation environment	< 10 Mrad/year

Microstation State of Play

- Vacuum chamber development completed
- Heat exchanger development completed
  - Three modes of operation
- Detector positioning mechanics design
- Position feedback monitor not completed
- Detector & readout not completed
- R&D stopped (lack of funding)

Microstation Concept

Some of the μS components - sketch

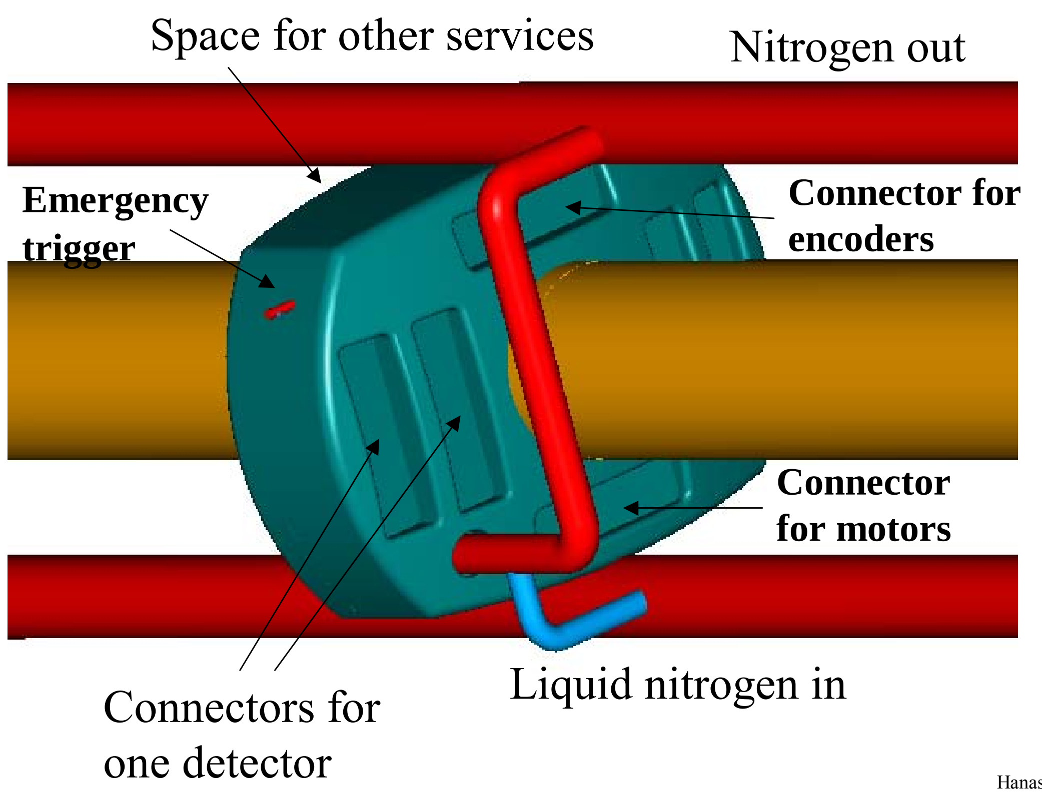


Hanasaari 031100

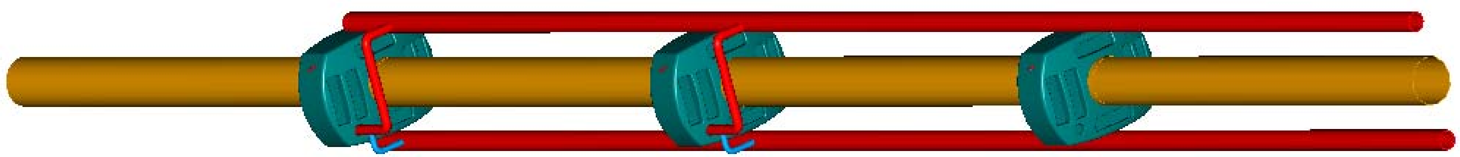
Nomokonow

Microstation Mounting

Services



Microstation cluster



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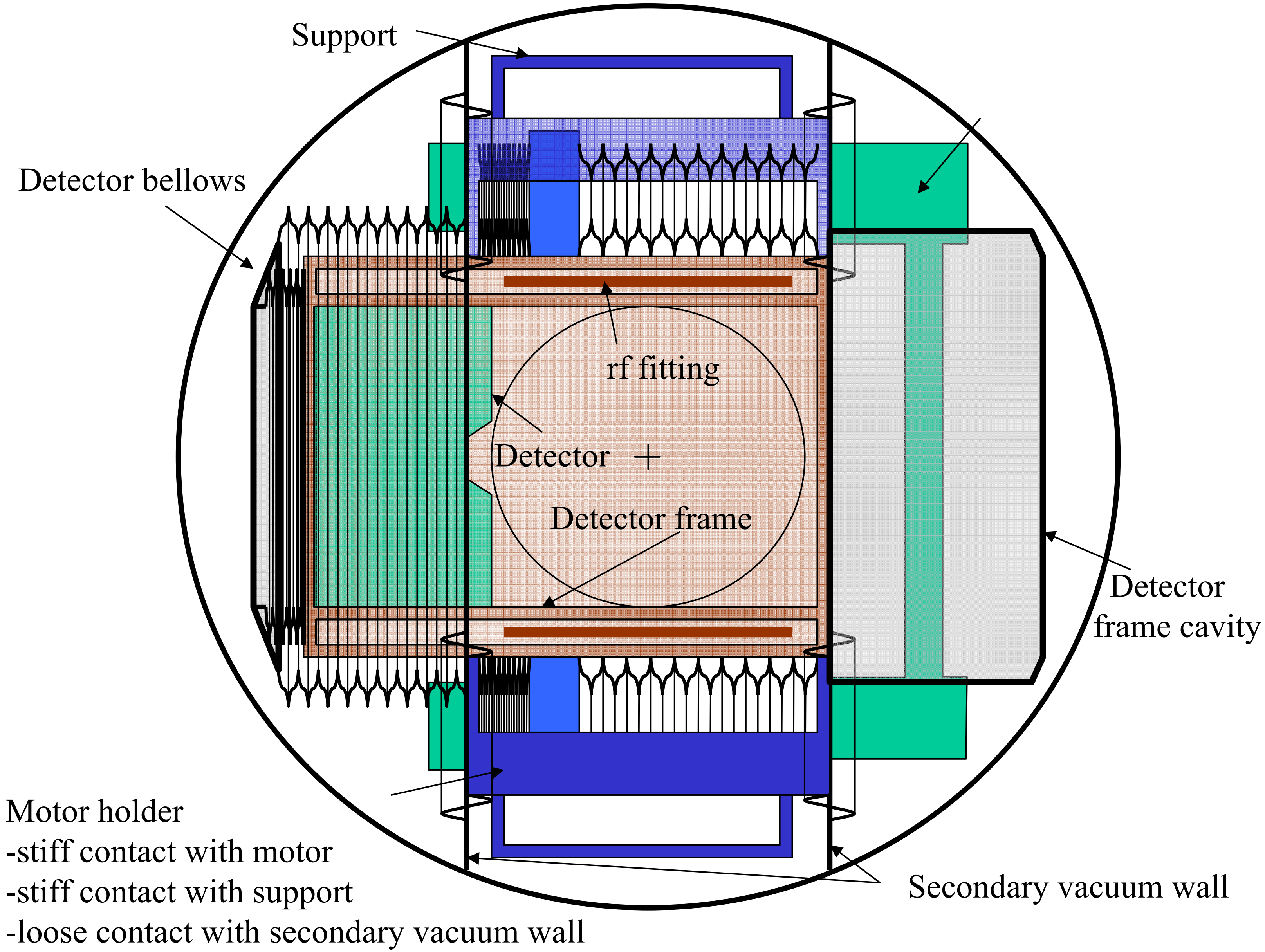
Microstation Mechanics

Microstation Secondary Vacuum Option



Microstation Deployment

- Proof of concept
- Assembly of working prototype
- Develop MS technology suitable for many environments
- Extend MS technology to general detection platform

To Do List

- Selection of testing environment for the prototype
- Selection of detectors
- Selection of readout electronics
- Selection of mounting
  - Free on beam pipe
  - Separate stand

Roadmap to Überstation

MSP Mark I

- Proof of concept at Fermilab
- Beam tests finished by May 2006

MSP Mark II

- Real detectors and readout integrated
- Beam tests Q1, 2007 (Fermilab/LHC)

MSP Final

- Assembled μS-s ready for FP420 deployment in 2008

Project Team Needs Expansion

- Finnish team (vacuum, cryo, positioning)
  - Jaak Lippmaa
  - Timo Luntama
  - Juha Kalliopuska
- Detectors
  - Open for partners...
- Readout
  - Machine specific (time constraint)

Project Steps

1. Fix the physical design of the working prototype according to machine parameters. Preparation of the technical drawings, etc. (FT)
2. Vacuum chamber with feed throughs and emergency actuator for vacuum tests (FT)
3. Study of thermal issues of the detector frame connections (FT)
4. Component subprojects (FT)
   - 4.1. Heat exchanger
   - 4.2. Position detector
   - 4.3. Rf-interference analysis (FP & machine)
   - 4.4. Radiation & vacuum hard insulator and support for detector power cables (FP & machine)
   - 4.5. Sensor assembly and testing
5. Assembly of a technically fully functioning prototype (FT)
6. Laboratory tests (FT, Kumpula and on test site)
   - 6.1 Outgassing
   - 6.2 Vacuum tests
   - 6.3. RF impedance and pick-up tests
7. Development of electronics (To Be Decided)
   - 7.1. Detector
   - 7.2. Hybrid
   - 7.3. E to light converter (According to Roman Pot design)
8. Development of internal NEG vacuum pump
9. Machine interface - beam tests
10. Microstation / cluster alignment vs beam position

Budget

• Personnel cost	???
• Travel	???
• Components	???
• Manufacturing items	???
• Laboratory costs	???
• On-site costs	???