TBM
mechanical test-bench
(TBM-MTB)

M. Aicheler

Module review 22.06.2015

Current situation with LabModule:

1. LabModule array is (almost) frozen design

2. Test programme is extensive and setup should not change severly during testing (next 18 months)

3. LabModule array is very complex and cramped object

4. After test campaign LabModule array could partially be salvaged or could stay as a showcase (decision to be taken yet)

5. Significant amount of spare parts of support system components are available

➔Need for a «simple» playground for trying out innovations as they come (no precise environmental control needed)

Spare parts (not used in LabModule)

- Girders
  - 1x Epucret (removable v-supports, can double for MB and DB)
  - 2x Boostec DB
  - 1x Boostec MB T0
  - 1x MB T1 no specs
- Actuators
  - 4x full sets (2x VLA-2 & 1x RLA-2 per set)
- Supporting system
  - 3x 'short' design
  - 1x 'long' design (different design, same interfaces)
- No extremity pieces
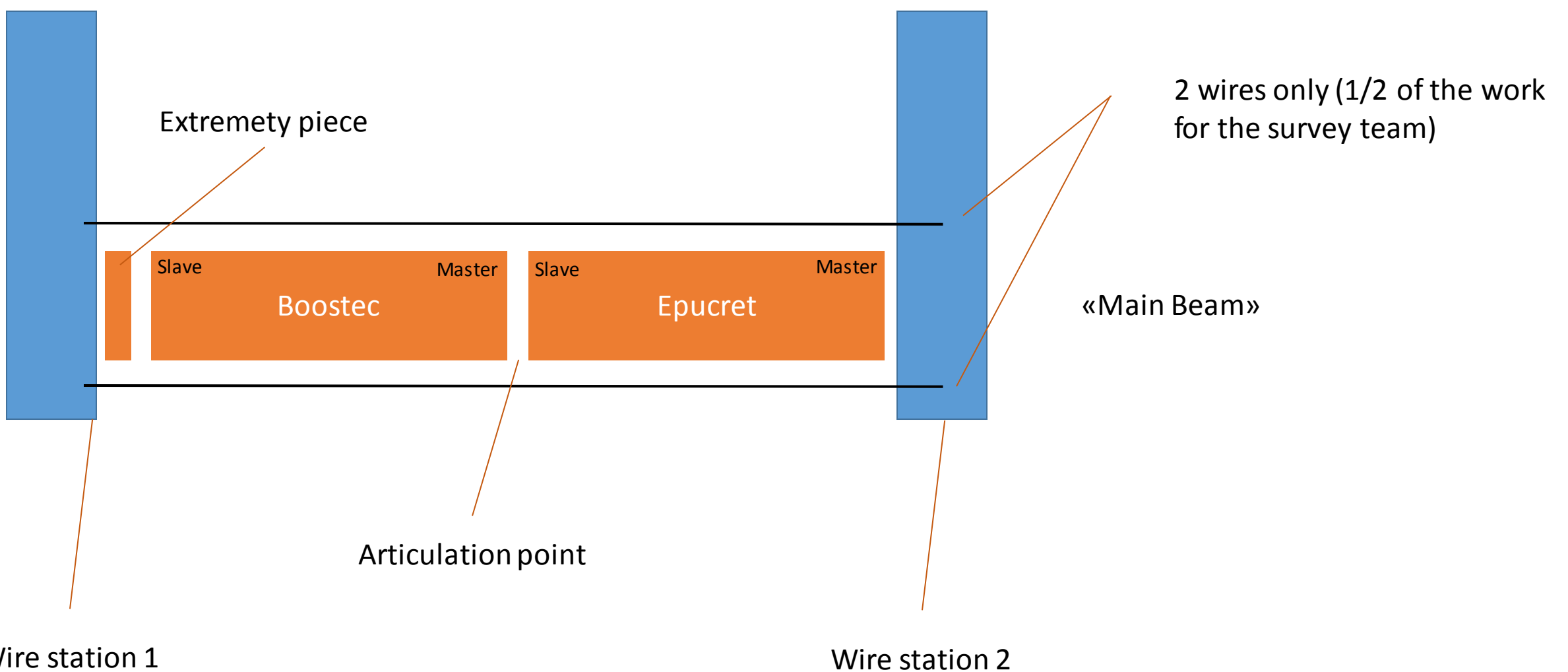
Thanks Alex!

CLEX girder pre-assembly room

Rudimentary climate control

Wire station 1

Support station

Bore holes

Wire station 2 (not visible)

M. Aicheler

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Extremety piece

2 wires only (1/2 of the work for the survey team)

«Main Beam»

| Slave | Master | Slave | Master |
| Boostec | | Epucret | |

Articulation point

Wire station 1

Wire station 2

- Existing wire stations
- Existing boreholes for fixing on the ground
- Existing crates for actuator control hardware
- Rudimentary climate control

Validation of the pre-alignment strategy on short range

Helen's presentation
**"ALIGNMENT TESTS
for the Two Beam Test Module"**

Case of the supports:

- ✓ Girder:
  - Straightness of the V-shaped supports:
    - Boostec: radius of the cylinder containing the center of the V-shaped support : 6µm and 4µm
    - Micro-Contrôle: radius of the cylinder containing the center of the V-shaped support: 7.5 µm and 5.5 µm

- ✓ Girder + cradle:
  - Total length above 2 m
  - Measurements out of the range of the CMM: accuracy ~ 15 µm, some faults detected.
  - Different types of fiducials implied different types of measuring devices sometimes outside the range of measurement.
  - Position of the cradle w.r.t. girder not stable along time

- ✓ Articulation point:
  - Function ok
  - Stability along time ??
    - Shocks, loads, constraints
    - T°

TBM-MBT could offer a possibility to validate a new design

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Vacuum tests and other constraints

✓ Displacement of cradles versus girders

✓ Non repeatability

✓ Consequences:
  • Fiducialisation between cradle and girder lost: no possibility to perform again absolute measurements ZTS vvu Kosice has copied this solution for CLEX ➔ same problem for CLEX ➔ no possibility to align the components in an absolute way
 • Link girder/cradle lost

✓ Independence of girders

TBM-MBT could offer a possibility to validate a new design

	Linac	Sans contrainte	Connexion TANK	Connexion Waveguide	Connexion Vacuum Network	Vide	TOTAL
Déplacement Radial	DB	-	-	3 µrad	-	3 µrad	6 µrad
	MB	-	-	10 µrad	-	10 µrad	20 µrad
Déplacement Vertical	DB	-	1 µrad	-	-	-	1 µrad
	MB	-	3 µrad	-		9 µrad	12 µrad
Roulis	DB	-	1 µrad	14 µrad	-	1 µrad	15 µrad
	MB	-	-	15 µrad	-	???	???

Helen's presentation
ALIGNMENT TESTS
for the Two Beam Test Module

Inter-comparison between alignment systems

Need to develop an inclinometer that is absolute:

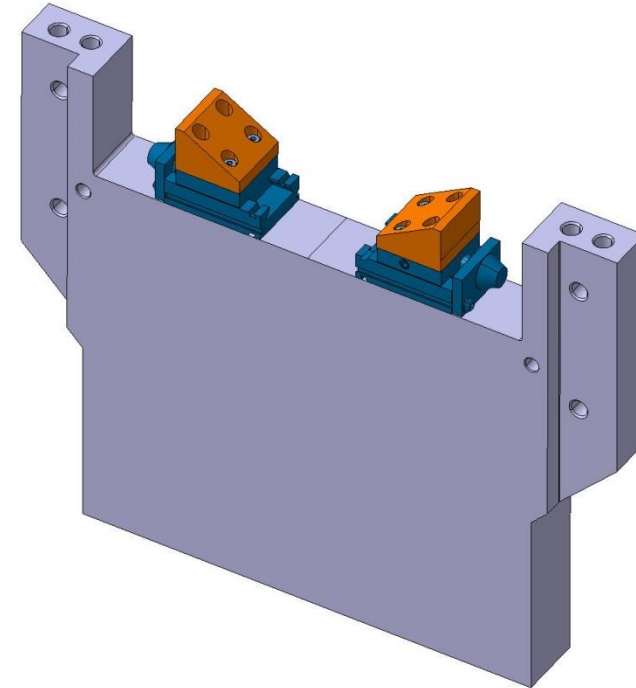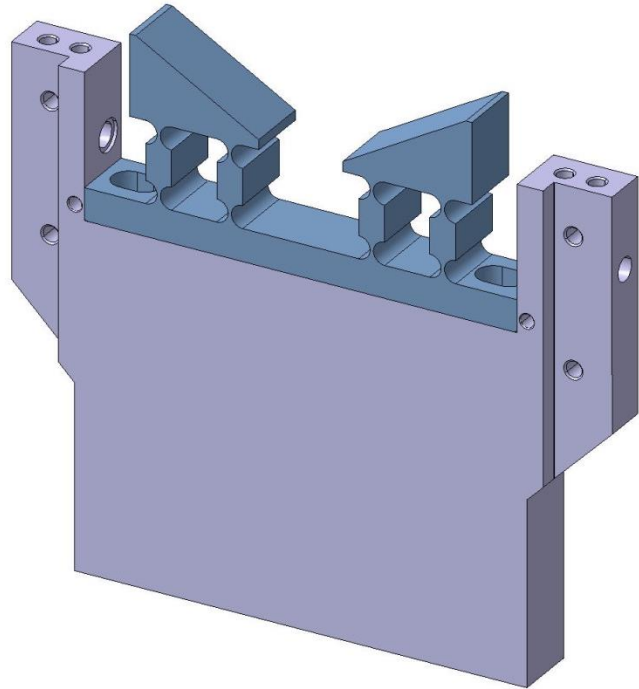TBM-MBT could offer a validation on a simple model with real dimensions and sensor setup

- ✓ To avoid 2 wires per beam, 4 wires per module, as in lab and CLEX

- ✓ Difficulty: absolute measurement combined with kinematic interface

- ✓ Development of a special measurement bench and special tool, to be tested on TBTM, under validation in our metrological lab.
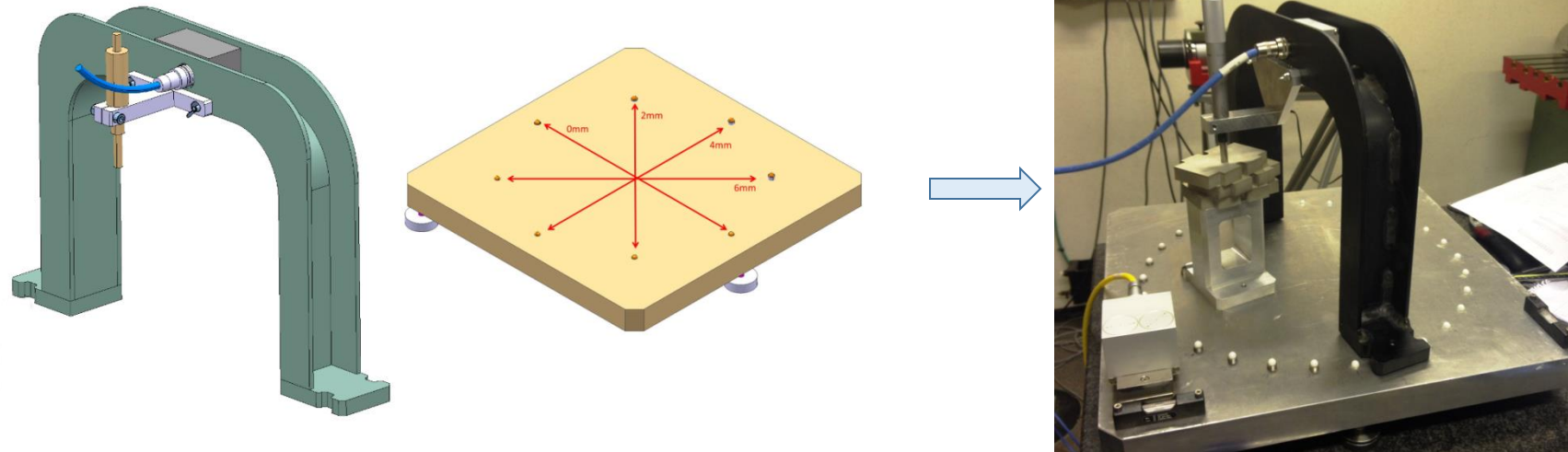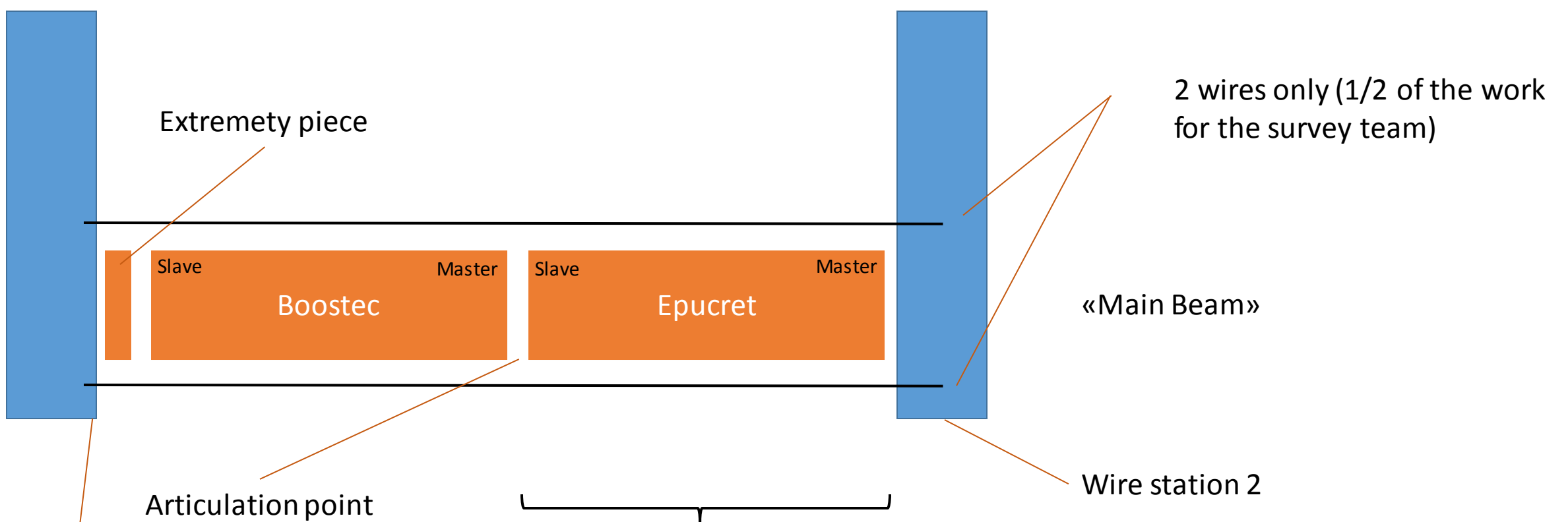

- ✓ Next step: development of a rad hard version (manufacturers are not interested to do this ➔ in-house development)

Adjustable V-Support Solutions and further evolution steps for MB can be tried out easily on the Epucret girders…

Courtesy of Vadim

… to be evaluated with simple precision copper cylinders (as AS mockups)

Extremety piece

Slave Boostec Master
Slave Epucret Master

2 wires only (1/2 of the work for the survey team)

«Main Beam»

Articulation point

Wire station 2

Wire station 1

Girder can be easily taken out for:
- Refidualisation in Metrology
- Transport test (e.g. to and from Metrology)
- Upgrading of support stations
- Upgrading of articulation point
- (Re-)Installation training

Summary:

Possible Tests:
1. Articulation point new design, implementation and longterm behaviour + robustness after transport and reinstallation
2. New craddle design and implemenation (goes together with 1.)
3. Absolute Inclinometer tests (potentially very crowded **lab module** for implementation)
4. Adjustable V-supports and further evolution steps in MB conditions
5. Transportation test, e.g. taking Epucret girder with Adj. V-supports to Metrology and back
6. Potentially any future girder / support system design evolution

Other:
1. Almost entire hardware already available and ready to be installed
2. Environment former CLEX assembly -> ready for installation
3. Minimal material budget for getting system up and running
4. Simple Benchmark for various systems also used in CLEX and LabModule

Thanks for your attention!

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