Status of ECAL-P mechanics: 1.2 mm spacing for TB-2025

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Outline

- **mechanical body:** 1.2 **mm spacing**
- **further plans towards TB-2025:**
- new ECAL-P bottom plate
- transportation plate
- more T-frames
- support for old tungsten plates 18 $\times$ 18 cm
- radiators
- packages for FLAME chips
- scafolding for racks, PS, ...
- light protection
- grounding / insulating
- rotary table ?
- mechanical/assembly test in Warsaw before shipping to Kraków
  $\rightarrow$ with 10 tungsten plates
- packaging/wrapping (tungsten in separate wooden boxes ?)
  T-frames (?) (plus Si sensors ? $\rightarrow$ to DESY transport)

New look of ECAL-P mechanics

- 1.2 mm spacing

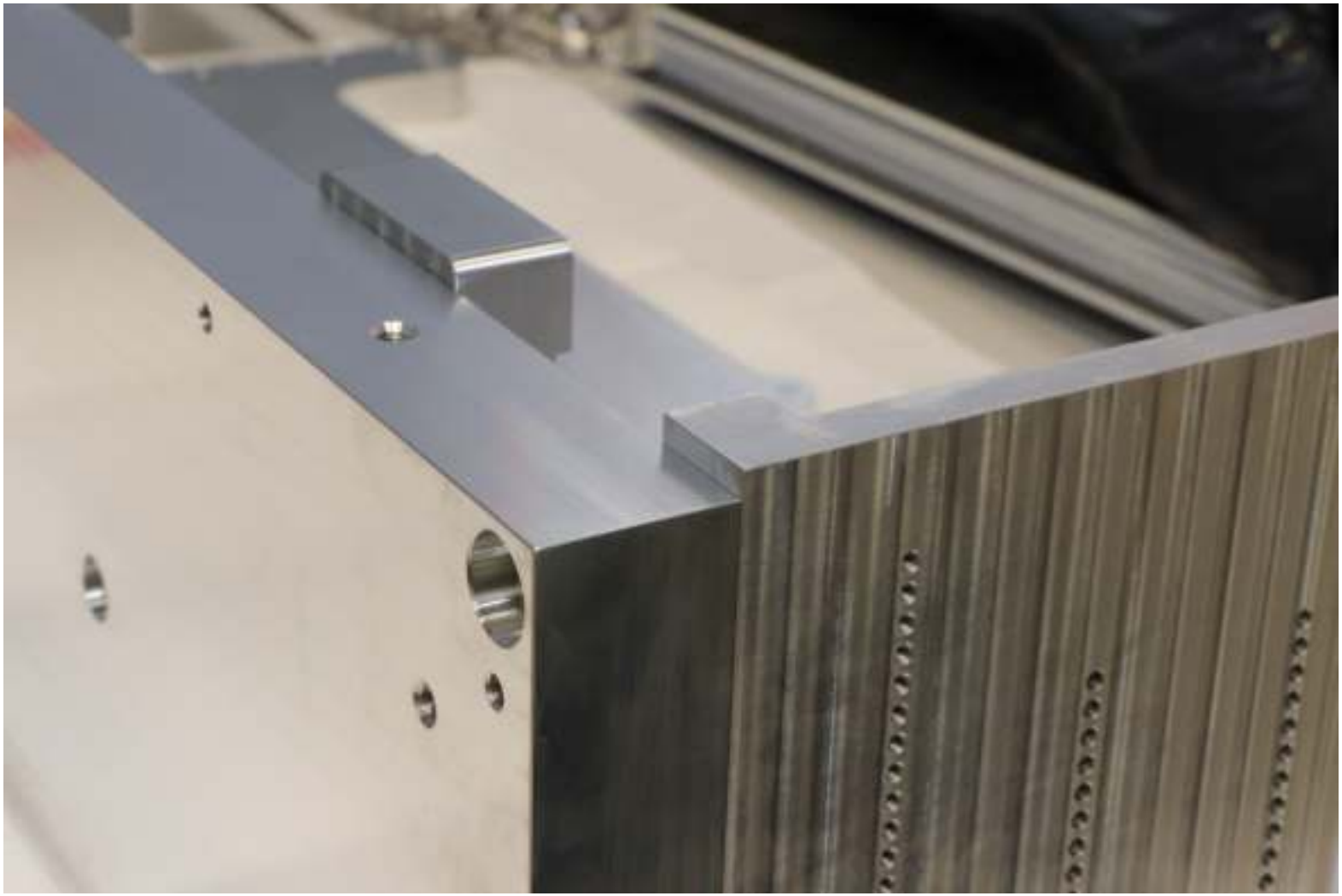
New bottom combs

- Bottom comb with 1.0 mm gap spacing compared to new 1.2 mm combs.
- Tungsten slot clearance increased from 50 μm to 80 μm (thickness: 3.5$\rightarrow$3.55mm)

New combs: problem with CAD scaling

- Bottom and side combs with 1.2 mm spacing mounted
- PROBLEM: mismatch... (on pin holes) $\rightarrow$ new bottom plate needed as well...

New combs: problem with CAD scaling

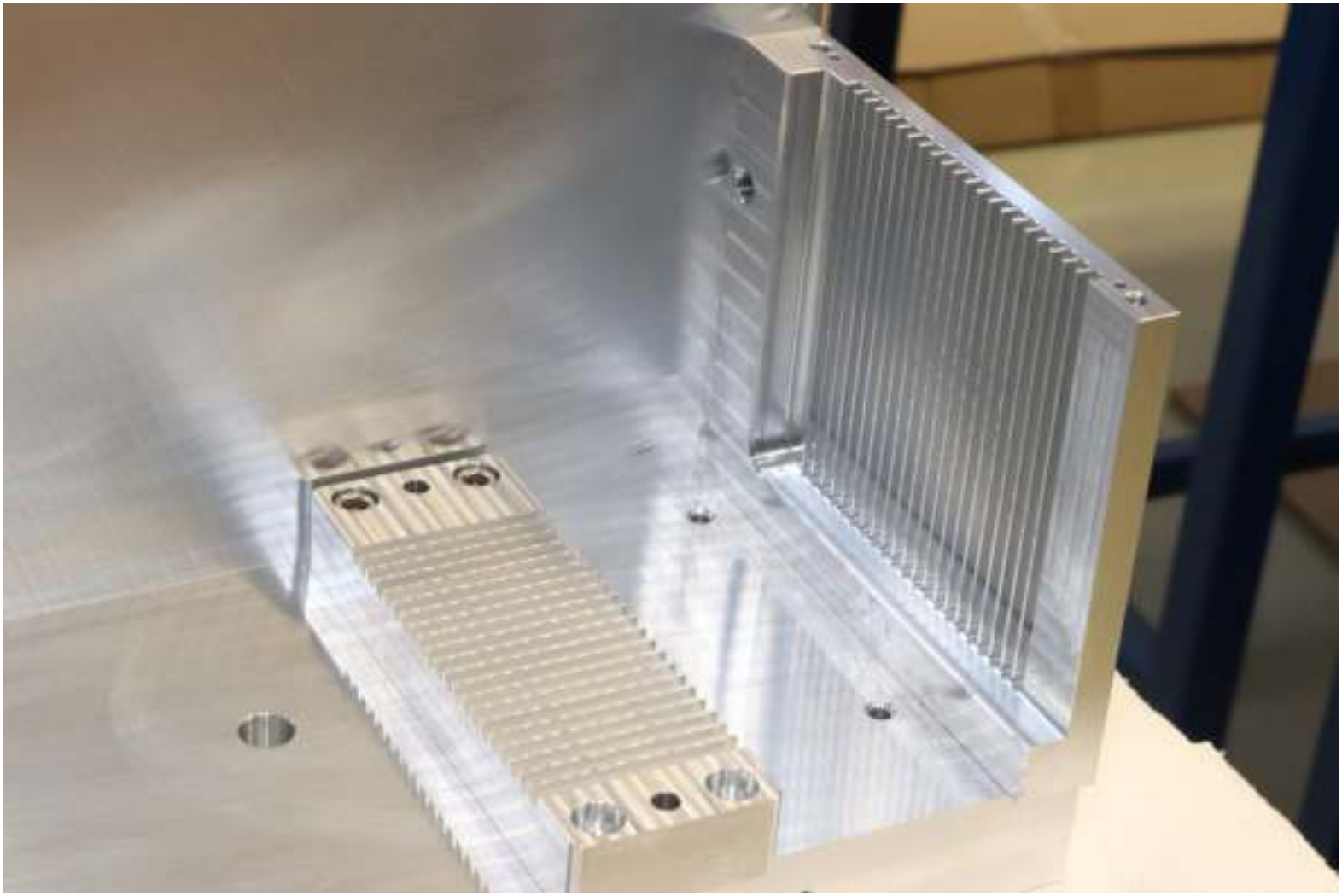


- Bottom and side combs with 1.2 mm spacing mounted
- PROBLEM: mismatch... (on pin holes) $\rightarrow$ new bottom plate needed as well...

New combs: problem with CAD scaling

- **will be corrected in February** $\rightarrow$ T-frames interface not affected
- temporary montage using only one pin and corresponding hole(s)

New combs, zoom on right corner (beam side)



- temporary montage using only one pin and corresponding hole(s)

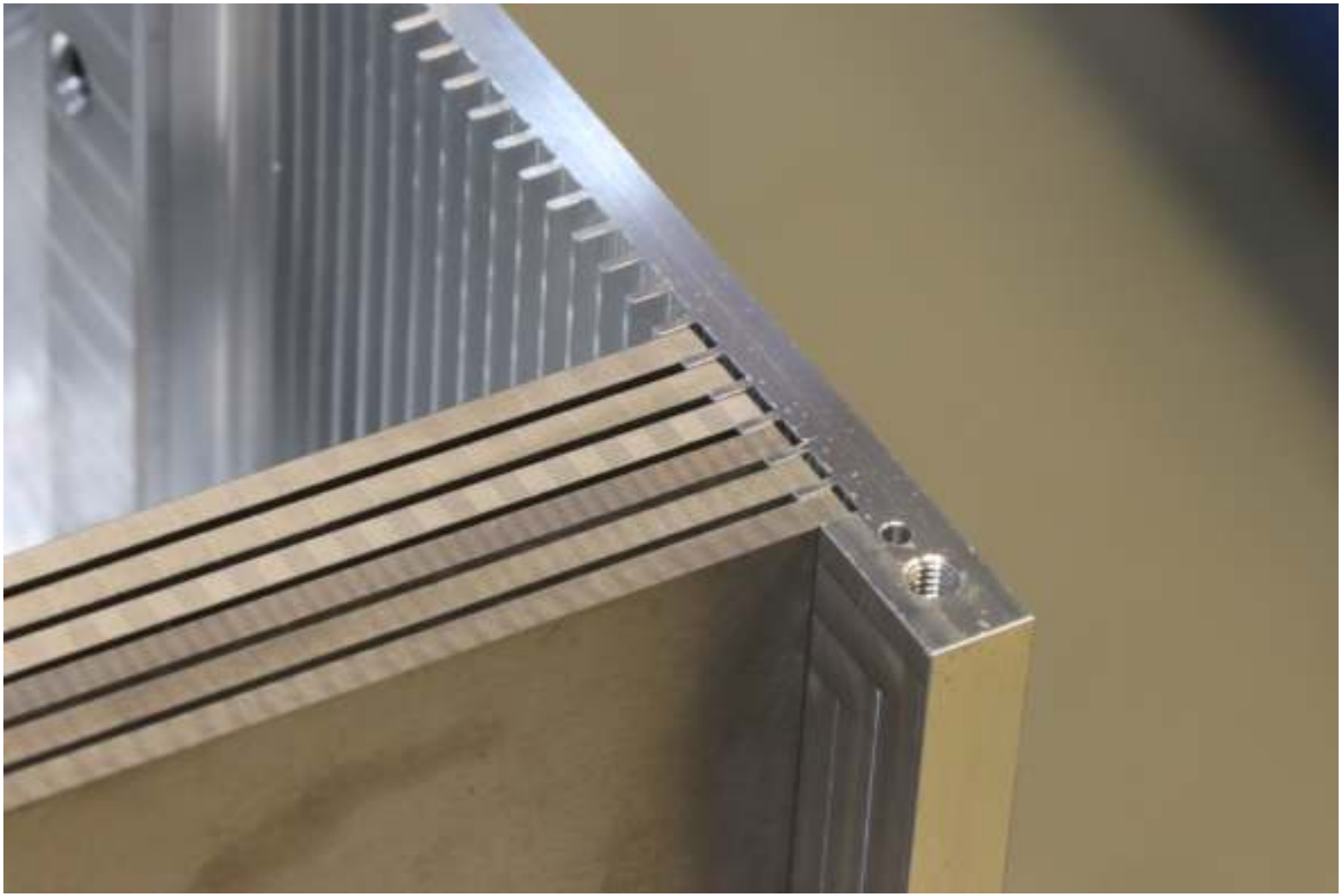
New combs, zoom on left corner (outer side)

- temporary montage using only one pin and corresponding hole(s)

New combs with 6 tungsten plates

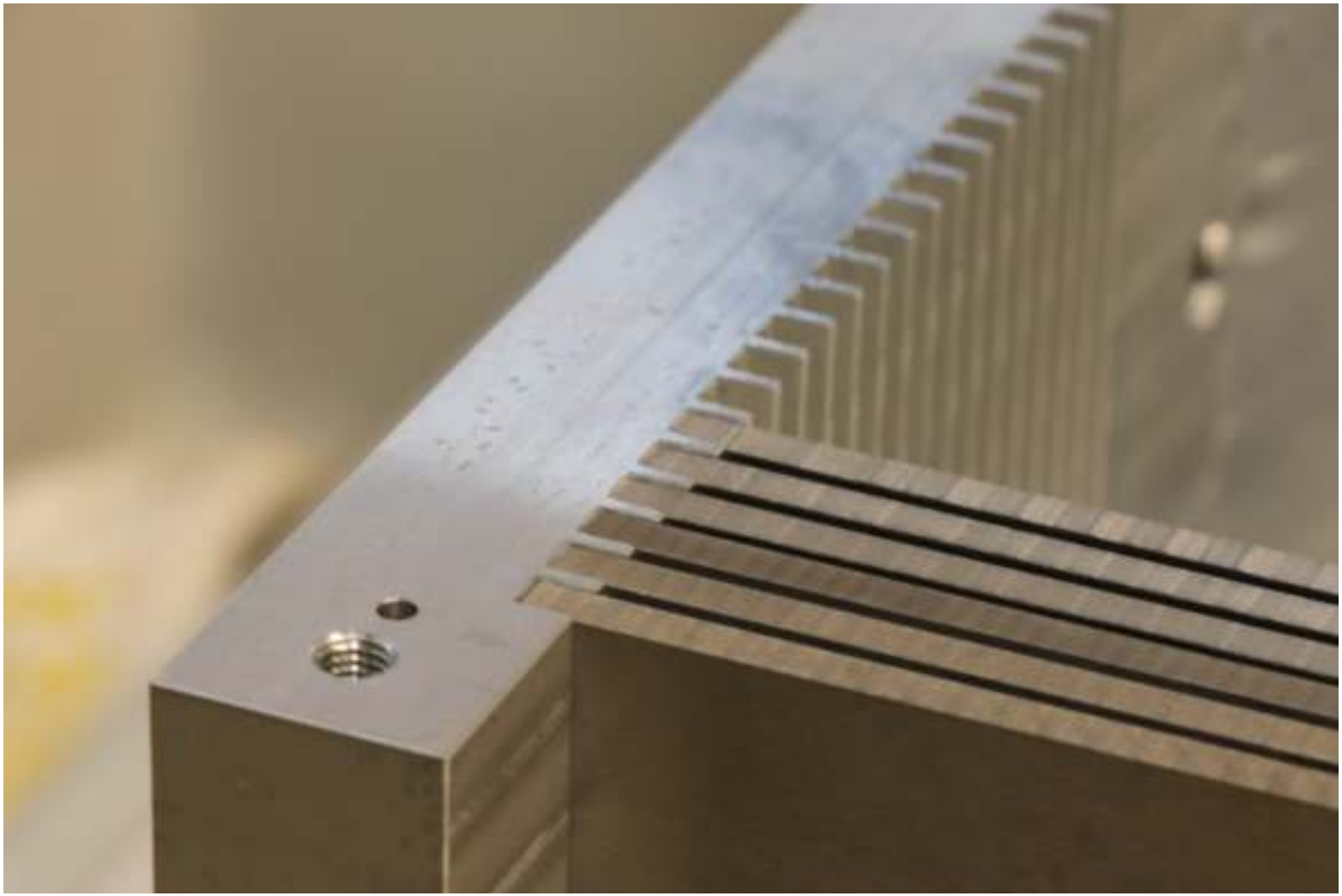
- All tungsten plates fits w/o any problems

New combs with 6 tungsten plates, right corner (beam side)



- All tungsten plates fits w/o any problems
- no one plate “sticks out” (clearance increased from 50 to 80 μm)

New combs with 6 tungsten plates, left corner (outer side)

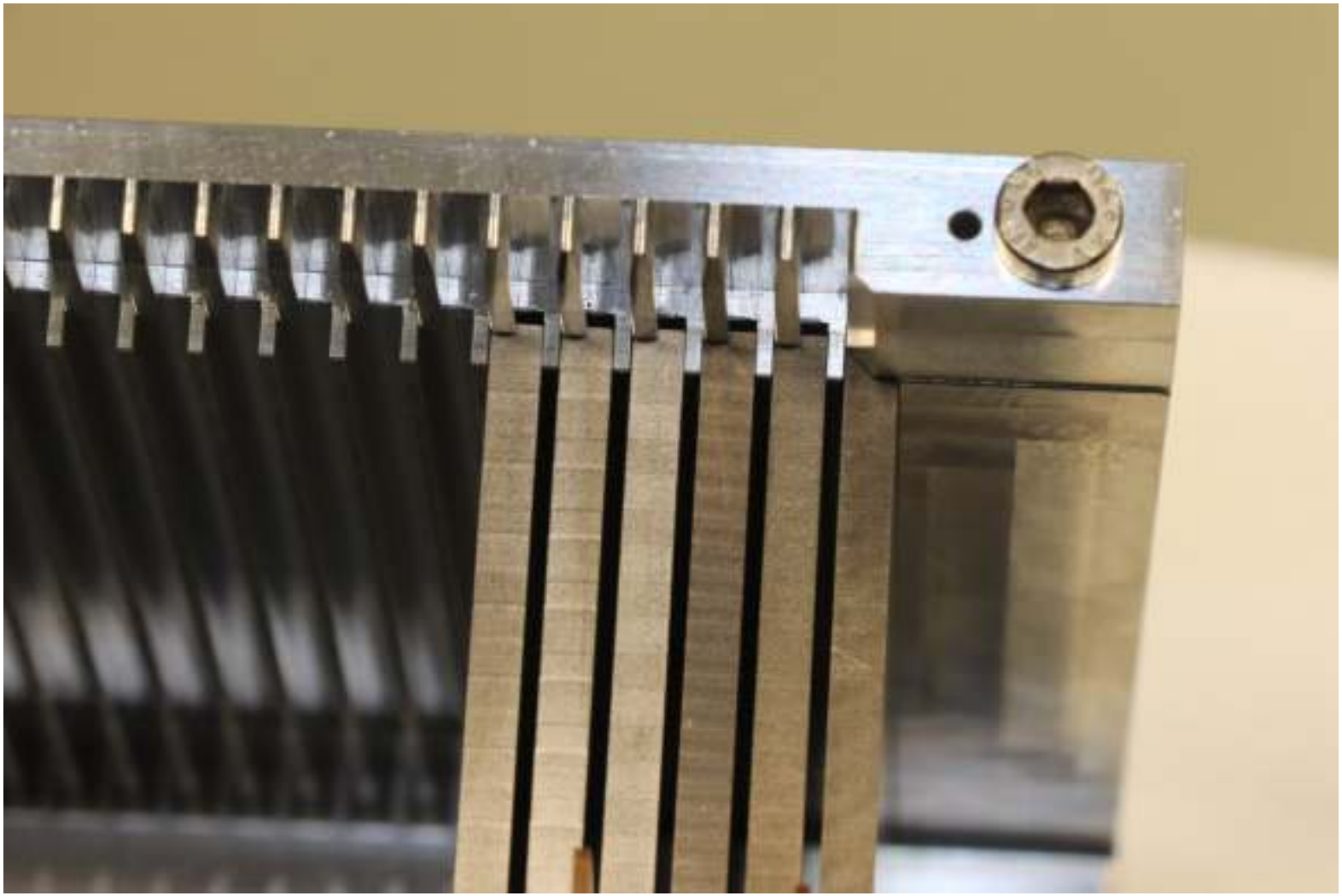


- All tungsten plates fits w/o any problems
- no one plate “sticks out” (clearance increased from 50 to 80 μm)

Middle combs for T-frame positioning

- left and right version

Middle comb mounted above side comb

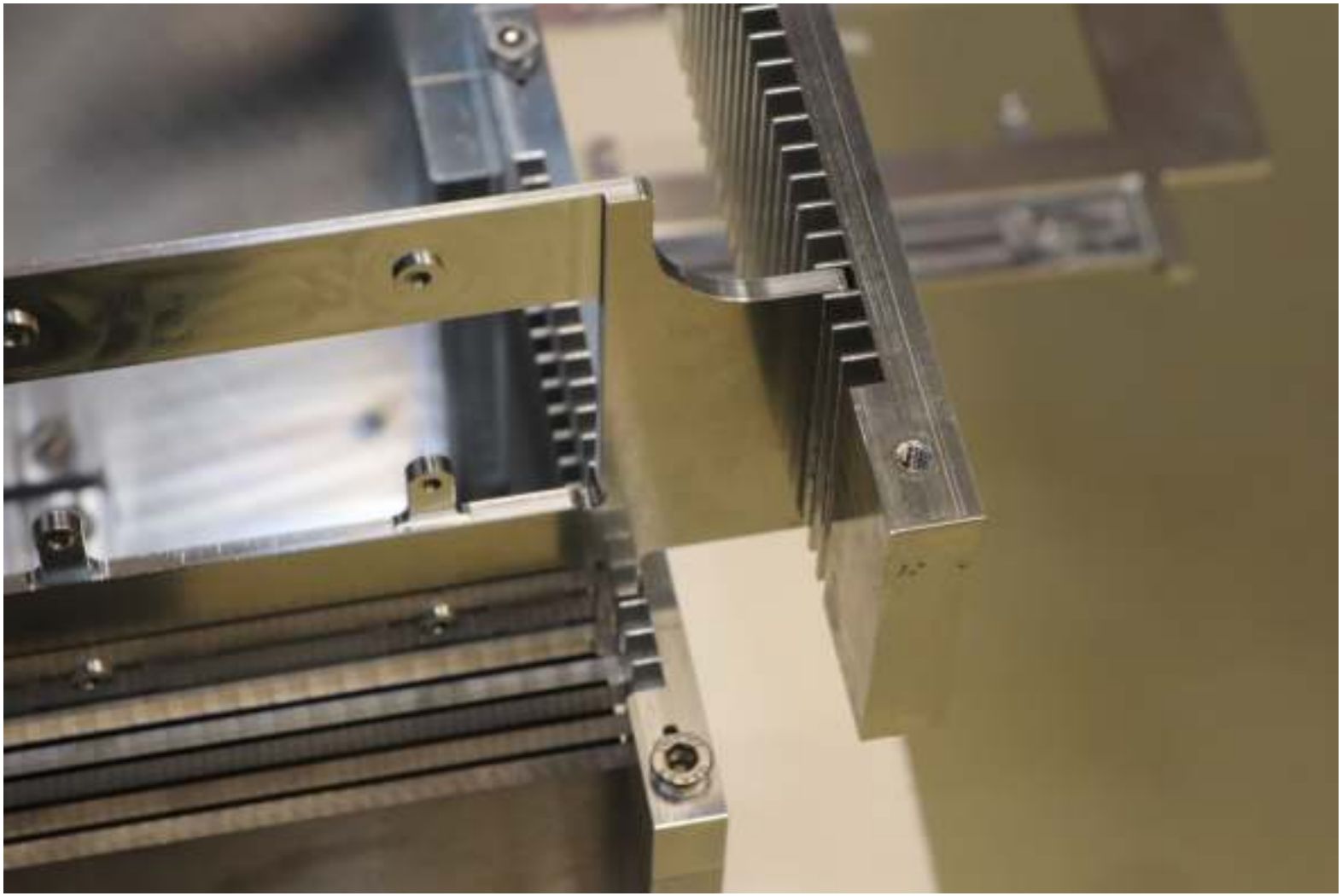


- NOTE: “phase difference” wrt. the side combs
- $\rightarrow$ centering of Si sandwich inside tungsten gap

Upper combs mounted plus T-frame inserted

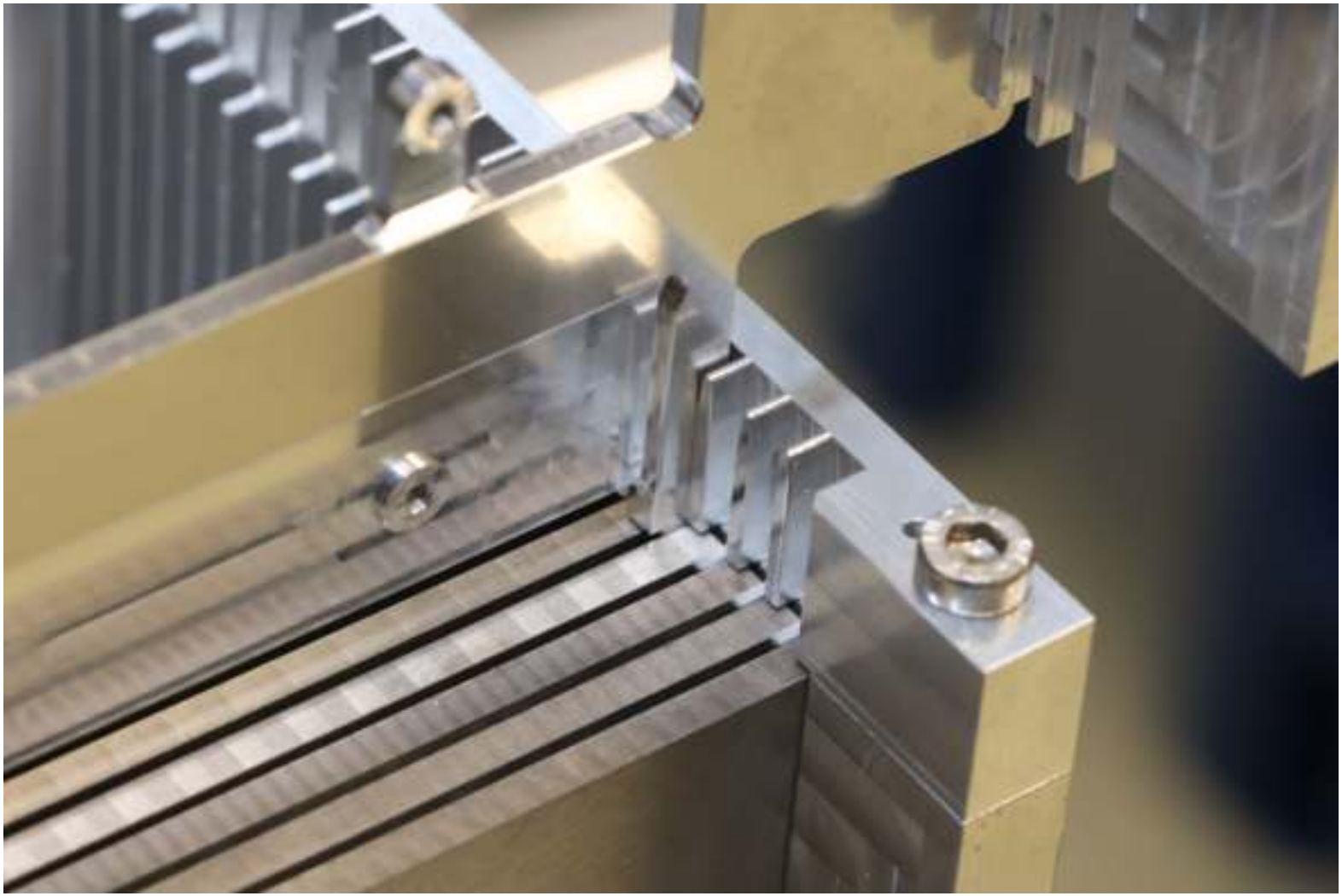
- Upper combs mounted plus T-frame inserted
- (Almost) no obstacles → see next 2 pages

Upper combs mounted plus T-frame inserted



- No obstacles on upper combs
- NOTE: longitudinal clerance for T-frames insertion

Upper combs mounted plus T-frame inserted

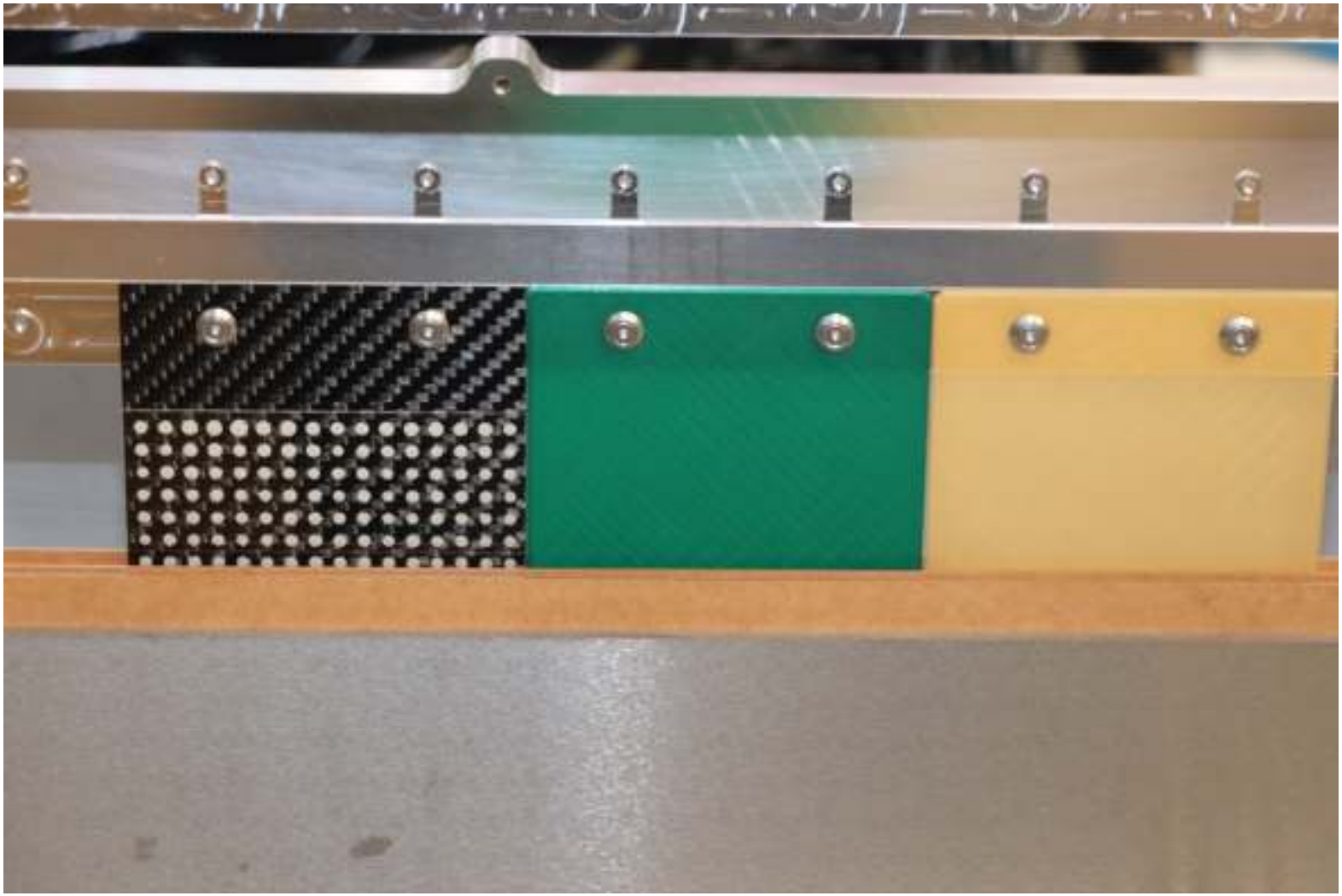


- Some friction on middle combs observed: $\rightarrow$ **free gravity fall desired**
- Clearance will be increased from 50 to 80 μm $\rightarrow$ better control of sensor insertion

Test with dummy sensors on T-frame (up position)

- No obstacles, pressboards 0.9 mm thick filling other gaps
- glass dummy sensor 0.95 mm thick

Test with dummy sensors on T-frame (up position)



- mounting with screws to the T-frame works OK

Test with dummy sensors on T-frame (down position)

- No obstacles, pressboards 0.9 mm thick filling other gaps
- glass dummy sensor 0.95 mm thick

T-frame + dummy sensors insertion

- $\rightarrow$ movie

Test with 2 T-frames

- 2 T-frames inserted
- No obstacles, dummy PCB needed for further tests

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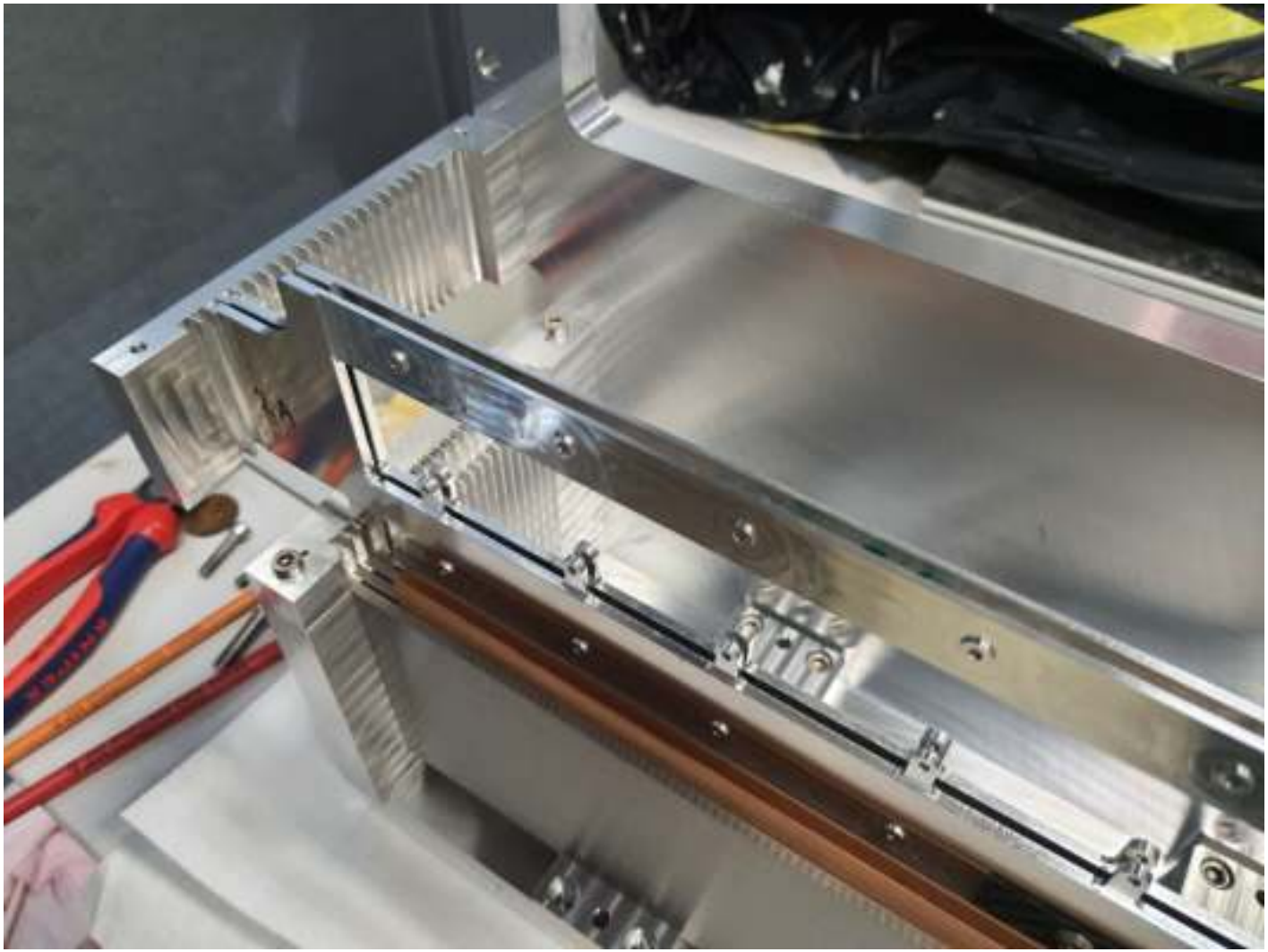
Test with 2 T-frames



- 2 T-frames inserted
- No obstacles, dummy PCB needed for further tests

Test with 2 T-frames: zoom on structure

- relative alignment of 2 T-frames looks OK (visual inspection)

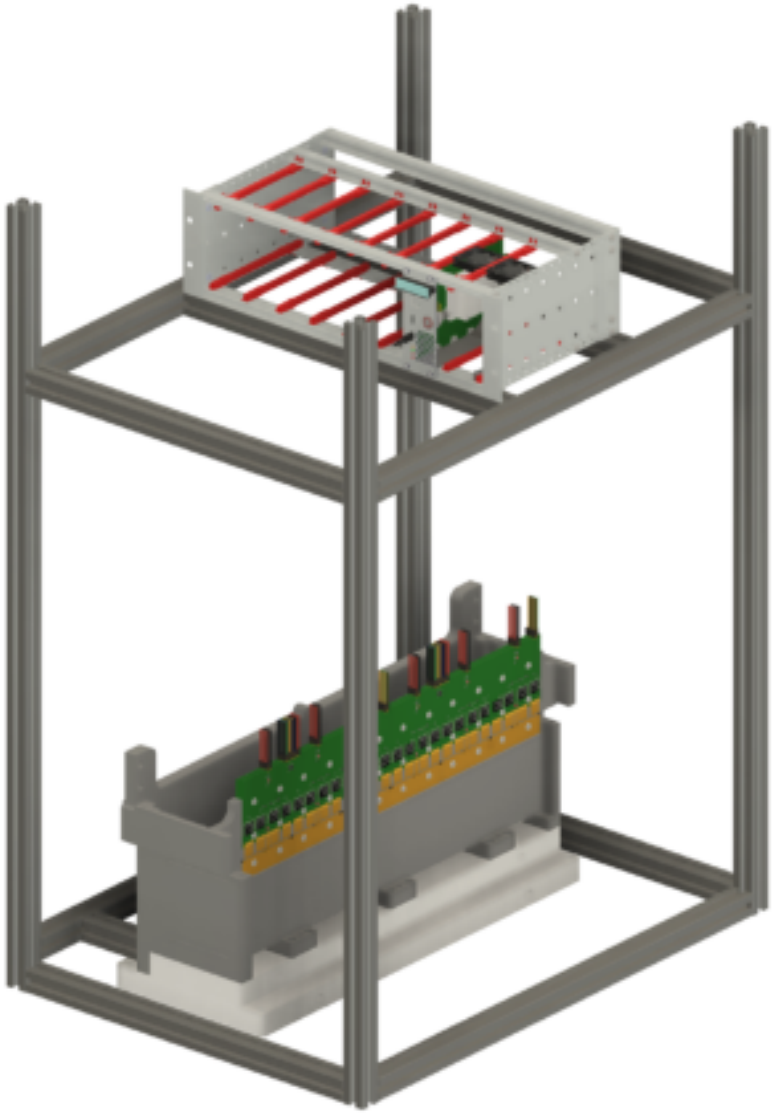
Further plans

- new ECAL-P bottom plate: to fix the “CAD scaling” mistake: **February**
- transportation plate: **March**
- more T-frames: **January + February** (sandblasting)
- support for old tungsten plates 18 $\times$ 18 cm: **March**
- radiators: **March**
- packages for FLAME chips: (tech. spec. needed ! how many pieces ?)
- scafolding for racks, PS, ... : **TBD...**
- light protection: **TBD...**
- grounding / insulating: **TBD...**
- rotary table: **possible to borrow** (compatible with transportation plate)
- CMM metrology of 4 tungsten plates (ISS order): **May**
- mechanical/assembly test in Warsaw before shipping to Kraków
  $\rightarrow$ with 10 tungsten plates **May**
- packaging/wrapping (tungsten in separate wooden boxes ?)
  T-frames (?) (plus Si sensors ? $\rightarrow$ to DESY transport) **May**

Radiators for FPGA readout boards

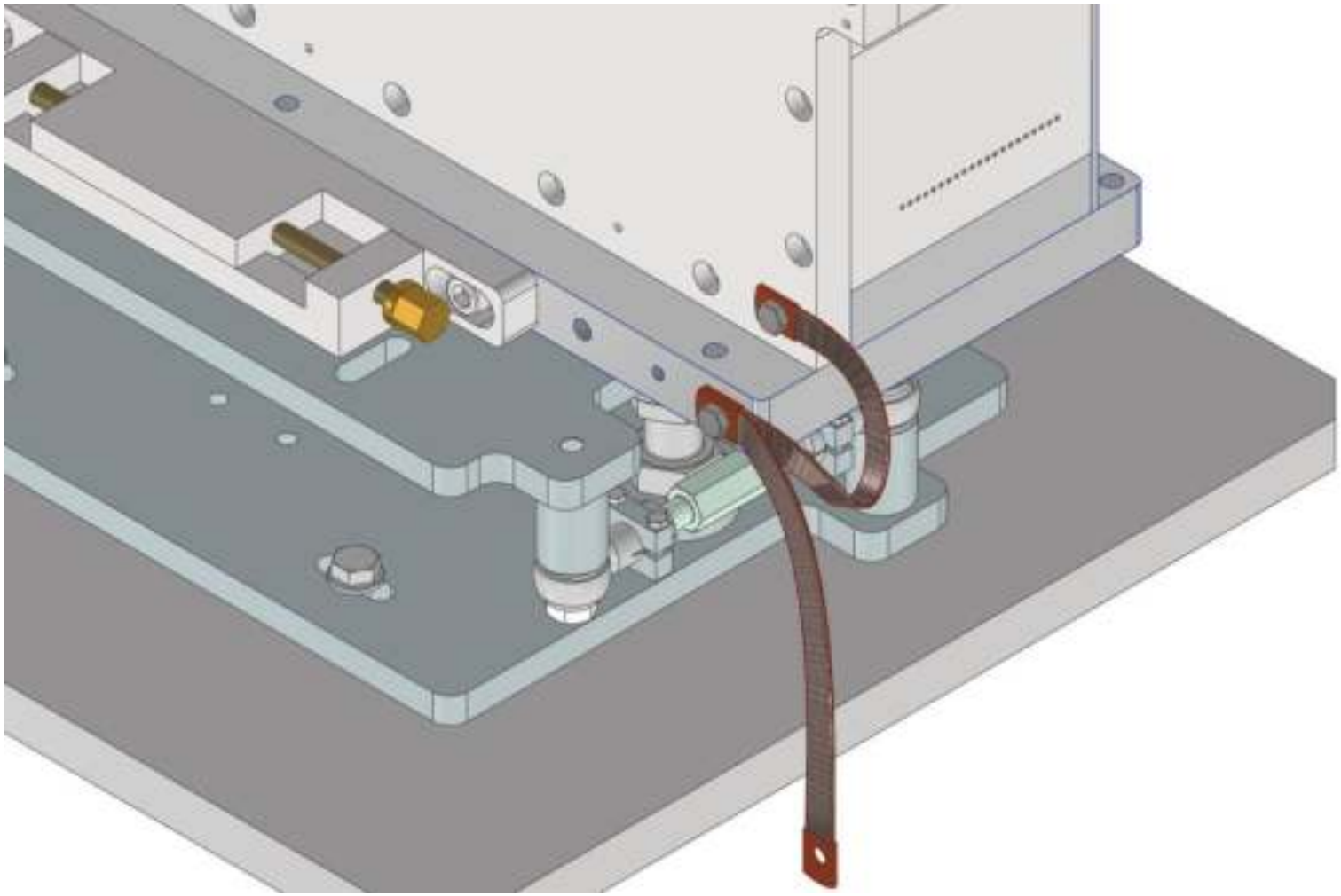
- OK, got full techical spec. incl. .STEP file: how many ? material ?
- delivery time: March

Scaffolding for racks, PS, routing of cables, etc...



- final design after defining support for old tungsten
- incorporate also light protection, grounding, ...

ECAL-P: electrical grounding



- one point at the outer rear corner to avoid current loops
- attached to the ECAL-P main body and to the transportation plate
- also to the scafolding and racks ? (common ground with PS ?)

Earthing braids: bare or tinned copper

EARTHING BRAIDS

ERR ERT ETT

Single wire Cu-ETP UNI EN 13602 - Ø 0,20 mm (special wire on demand)
Bare or Tinned copper braid
Terminals in bare or tinned copper
Standard cross section from 6 mm² up to 75 mm²
Customized solutions on demand
Current loads following IEC 439

Build your own earthing braid following the drawing here below and the examples in the table

Type	Cross-Sect.	Wire	L	W	X	Y	d Ø	t	Ordering Code
	mm²	Ø mm	dimensions in mm						
ERR	16	0,20	150	17	23	13	9	2,5	ERR 16-17/150-9
ERT	25	0,20	300	23	23	13,5	9	3,2	ERT 25-23/300-9
ETT	50	0,20	550	30	30	15	11	4,5	ETT 50-30/550-11
BUILD YOUR EARTHING BRAID									

EARTHING BRAIDS - standard

Code	Cross-Sect.	Single wire	L	W	X	Y	d Ø	t	Current load
	mm²	Ø mm	dimension in mm						ΔT 50°C
ERR									
ERR 6-11/ L- 7	6	0,2	75-100-150	11	13	7	7	2	90 A
ERR 10-17/ L- 9	10	0,2	100-150-200-250-300	17	23	13	9	2	130 A
ERR 16-17/ L - 9	16	0,2	100-150-200-250-300	17	23	13	9	2,5	160 A
ERR 25-23/ L - 9	25	0,2	100-150-200-250-300	23	23	13,5	9	3,2	220 A
ERR 35-23/ L - 9	35	0,2	100-150-200-250-300	23	23	13,5	9	3,4	260 A
ERR 50-30/ L - 11	50	0,2	100-150-200-250-300	30	30	15	11	4,5	340 A
ERR 75-30/ L - 11	75	0,2	100-150-200-250-300	30	30	15	11	5	420 A
ERT									
ERT 6-11/ L- 7	6	0,2	75-100-150	11	13	7	7	2	90 A
ERT 10-17/ L- 9	10	0,2	100-150-200-250-300	17	23	13	9	2	130 A
ERT 16-17/ L – 9	16	0,2	100-150-200-250-300	17	23	13	9	2,5	160 A
ERT 25-23/ L – 9	25	0,2	100-150-200-250-300	23	23	13,5	9	3,2	220 A
ERT 35-23/ L – 9	35	0,2	100-150-200-250-300	23	23	13,5	9	3,4	260 A
ERT 50-30/ L – 11	50	0,2	100-150-200-250-300	30	30	15	11	4,5	340 A
ERT 75-30/ L – 11	75	0,2	100-150-200-250-300	30	30	15	11	5	420 A
ETT									
ETT 6-11/ L- 7	6	0,2	75-100-150	11	13	7	7	2	90 A
ETT 10-17/ L- 9	10	0,2	100-150-200-250-300	17	23	13	9	2	130 A
ETT 16-17/ L – 9	16	0,2	100-150-200-250-300	17	23	13	9	2,5	160 A
ETT 25-23/ L – 9	25	0,2	100-150-200-250-300	23	23	13,5	9	3,2	220 A
ETT 35-23/ L – 9	35	0,2	100-150-200-250-300	23	23	13,5	9	3,4	260 A
ETT 50-30/ L – 11	50	0,2	100-150-200-250-300	30	30	15	11	4,5	340 A
ETT 75-30/ L – 11	75	0,2	100-150-200-250-300	30	30	15	11	5	420 A

- differs by cross-section and current load