

Out of Plane High Aspect Ratio Micro Wires as Suspension Elements in Inertial Sensors

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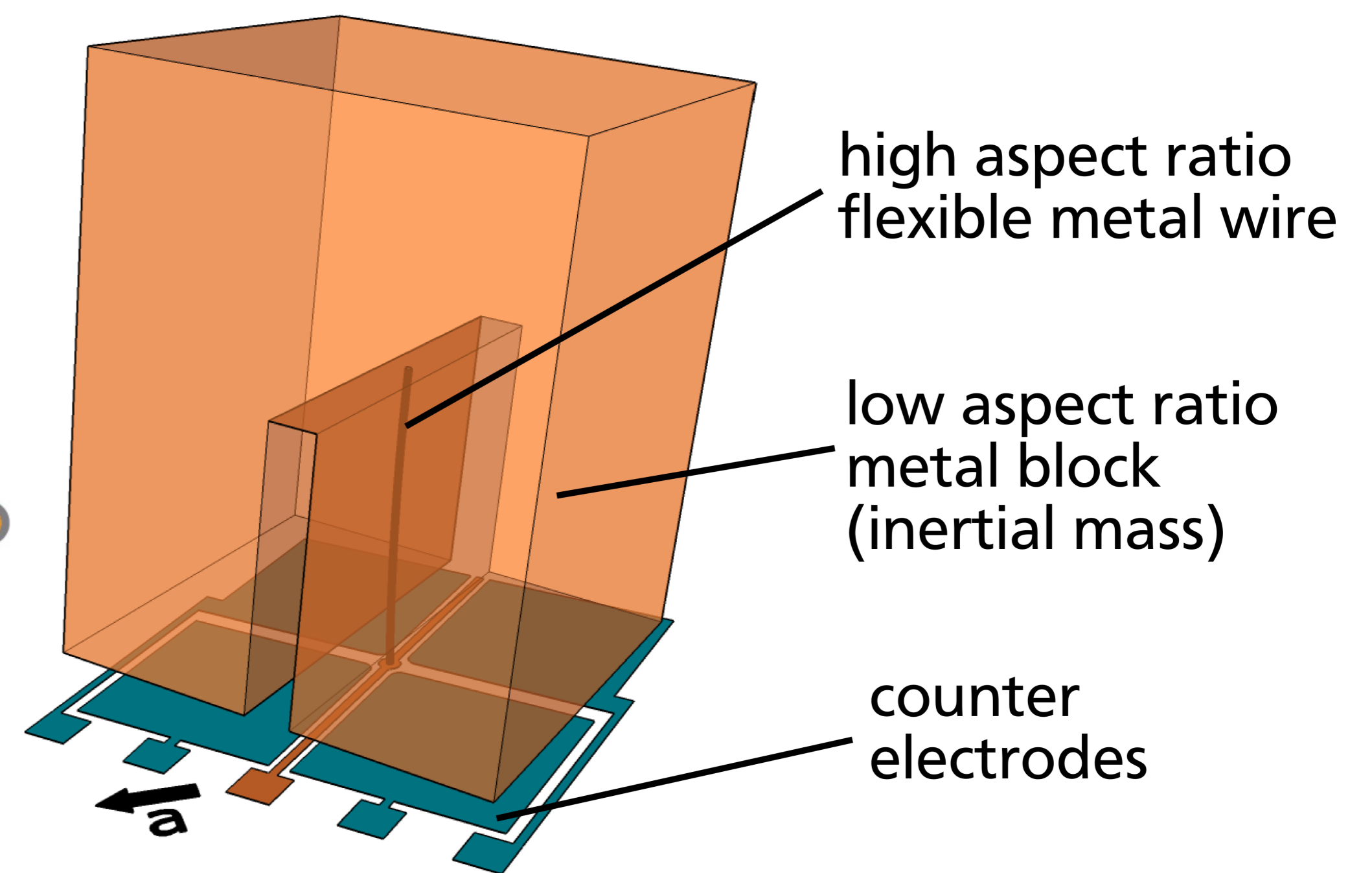
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Project goals

- 1st Fabrication of high aspect ratio out of plane metal wires next to low aspect ratio metal blocks
- 2nd Multilayer material link of these metal structures
- 3rd Realization and characterization of an acceleration sensor applying these structures.

KNMF: Aligned X-ray lithography:

- Vertical cylindrical holes
 - Diameter: 3..6 μm
 - Length: 100 μm
- Cuboid cavities
 - 53..450 μm x 206..1000 μm



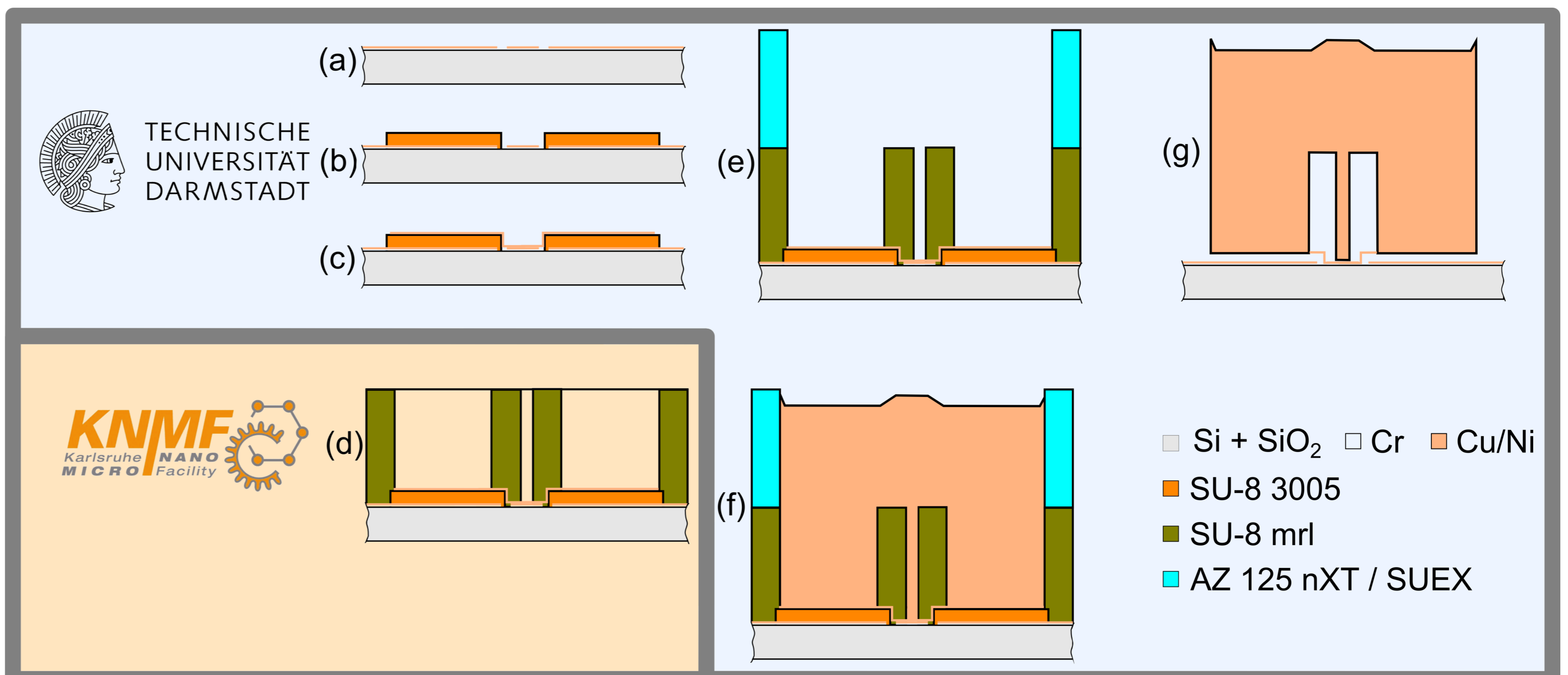
Technology approach

Process flow:

- (a) - (c) UV lithography at TUD
- (d) Aligned X-ray lithography at KNMF
- (e) UV lithography at TUD
- (f) Electroforming at TUD
- (g) Photoresist removal at TUD

Variations in proposal 2012-008-000970:

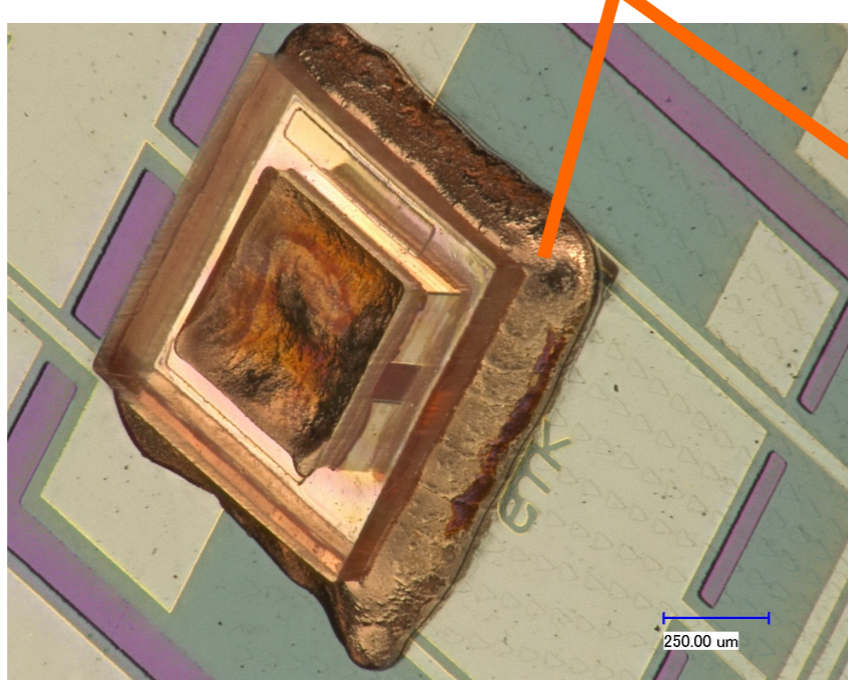
- 2nd thick photoresist
 - AZ125nXT: fluid
 - SUEX: epoxy dry film
- Electroplating
 - Cu (Atotech Everplate @ TUD)
 - Ni (Ni Sulfamate @ KIT)



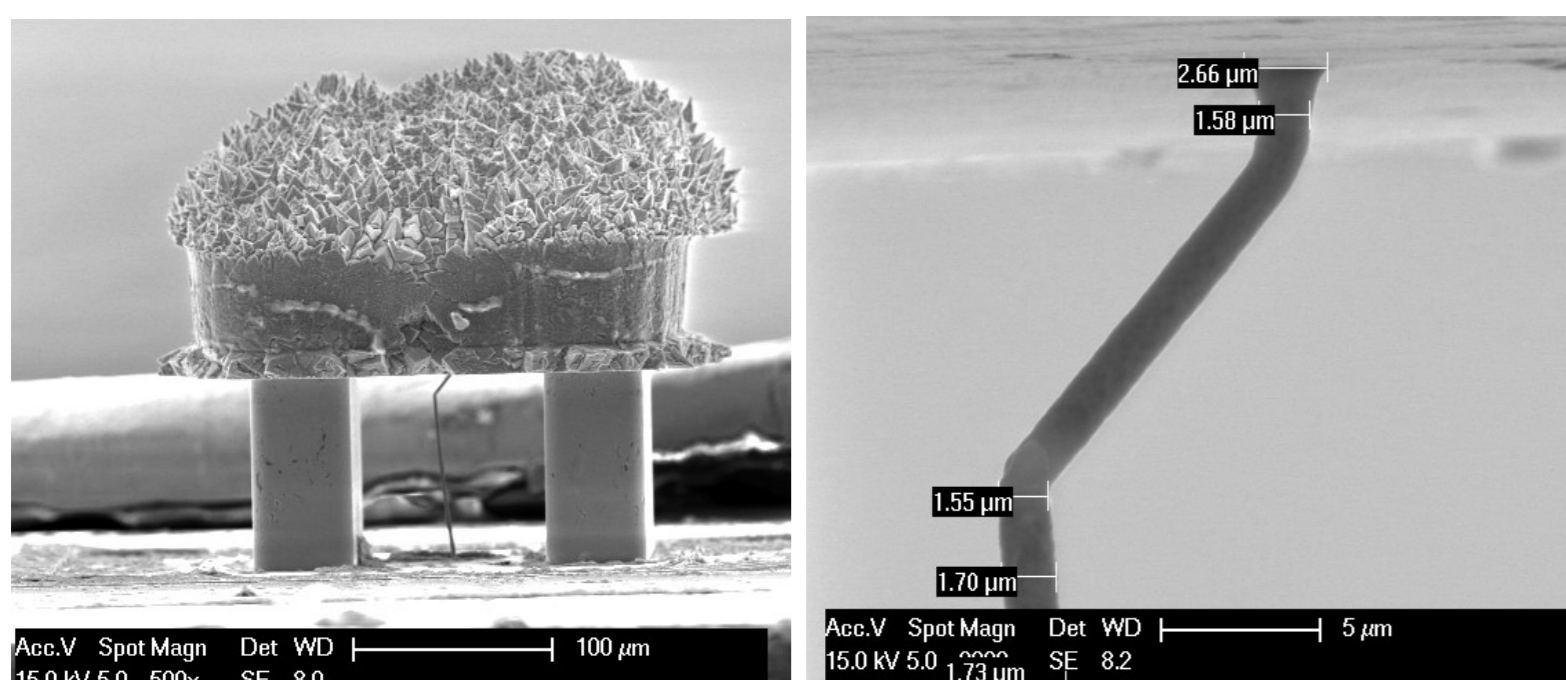
Issues in proposal 2010-004-000365:

- Low adhesion of SU-8 mrl on seed layer design cause parasitic metal growth.

FG310 with structured SU-8 mrl (X-ray) and SUEX (UV) after copper electroforming

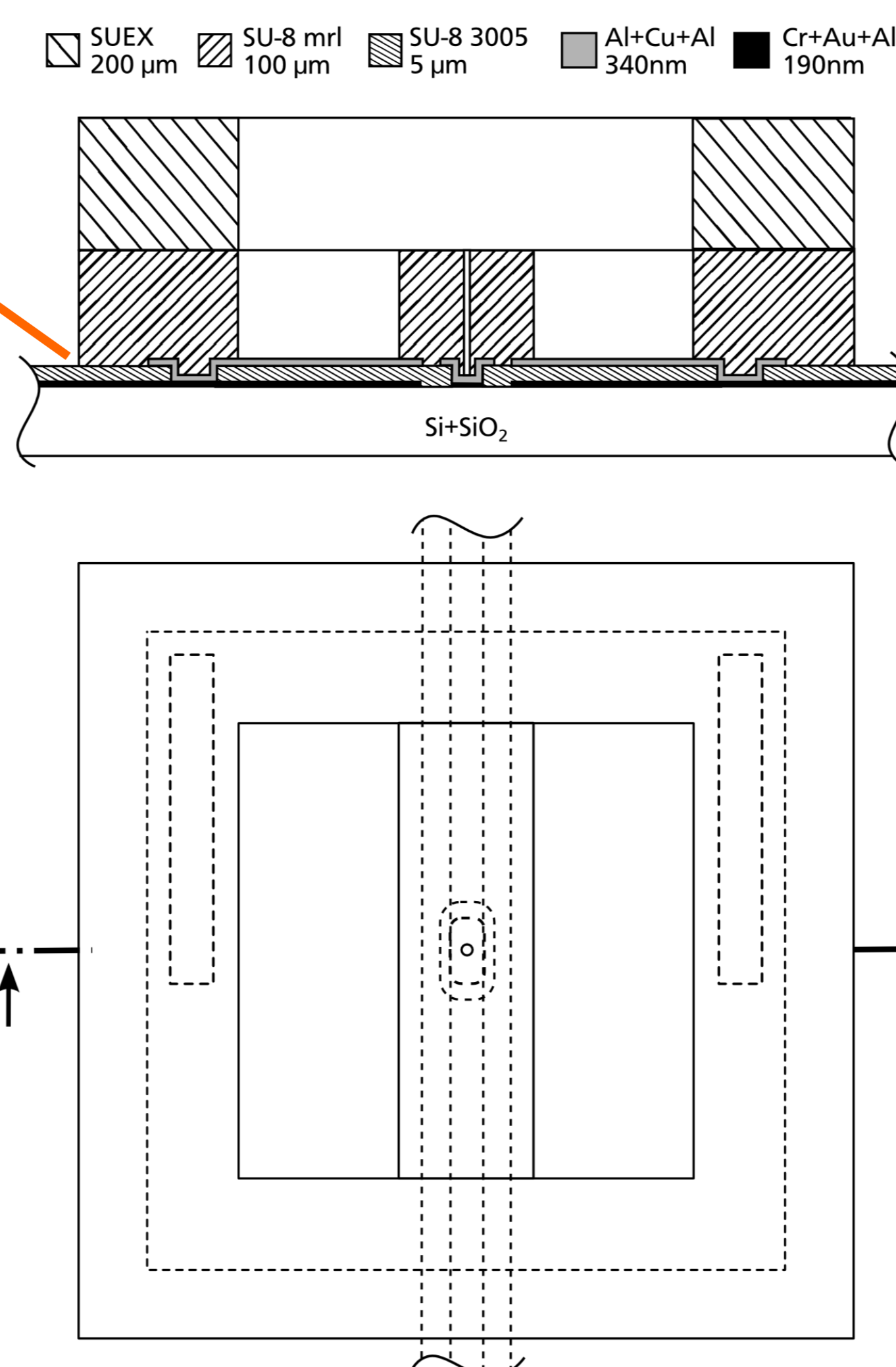


- Structures (columns) on the X-ray exposure mask approx. 1 μm smaller than designed \rightarrow the wire buckles



Copper structure of FG311 after final polymer removal in R3T at TUD and detail showing buckled wire (designed diameter: 3 μm)

Proposal # 2010-004-000365



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