Status of the primary target setup

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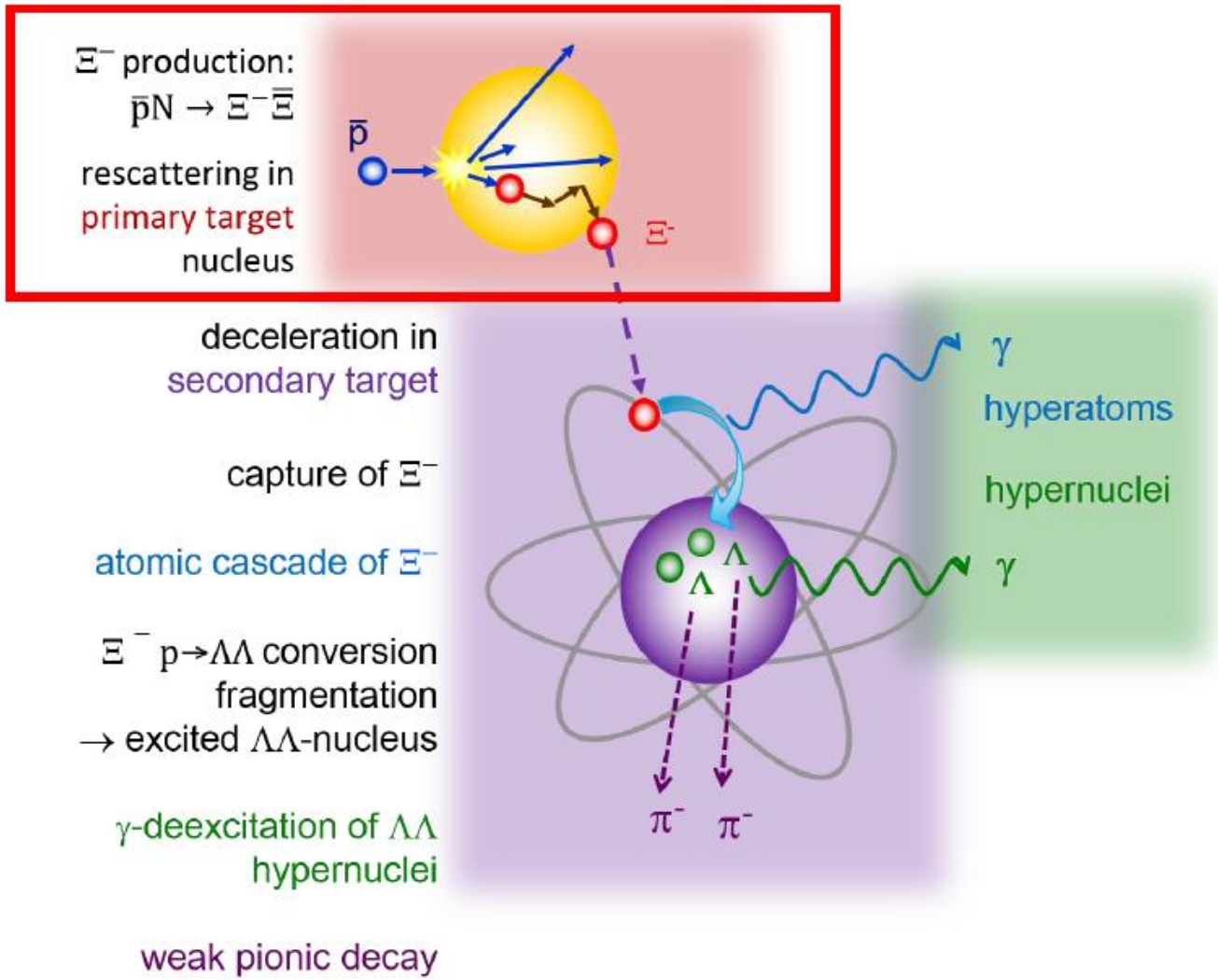
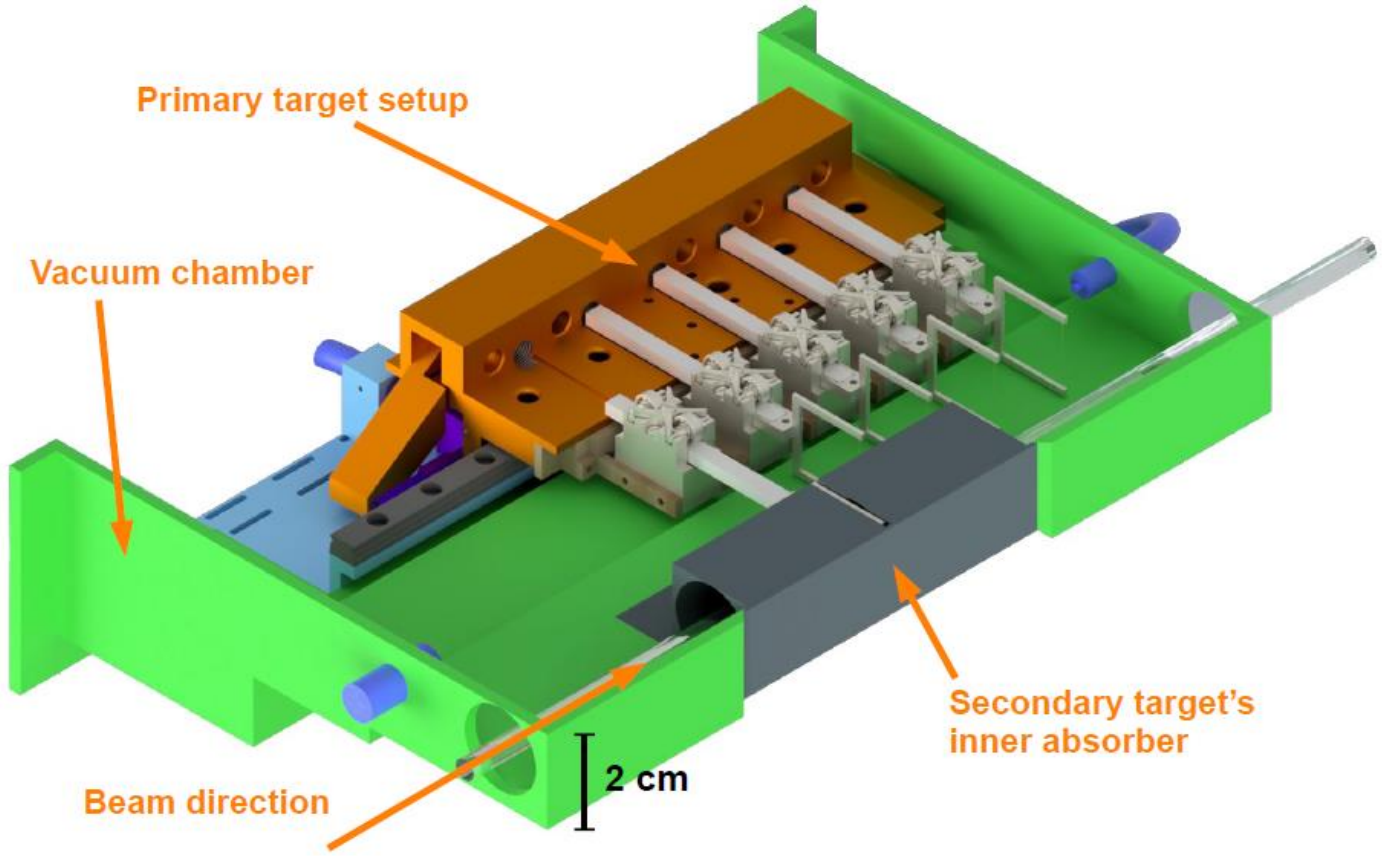
Production of hypernuclei

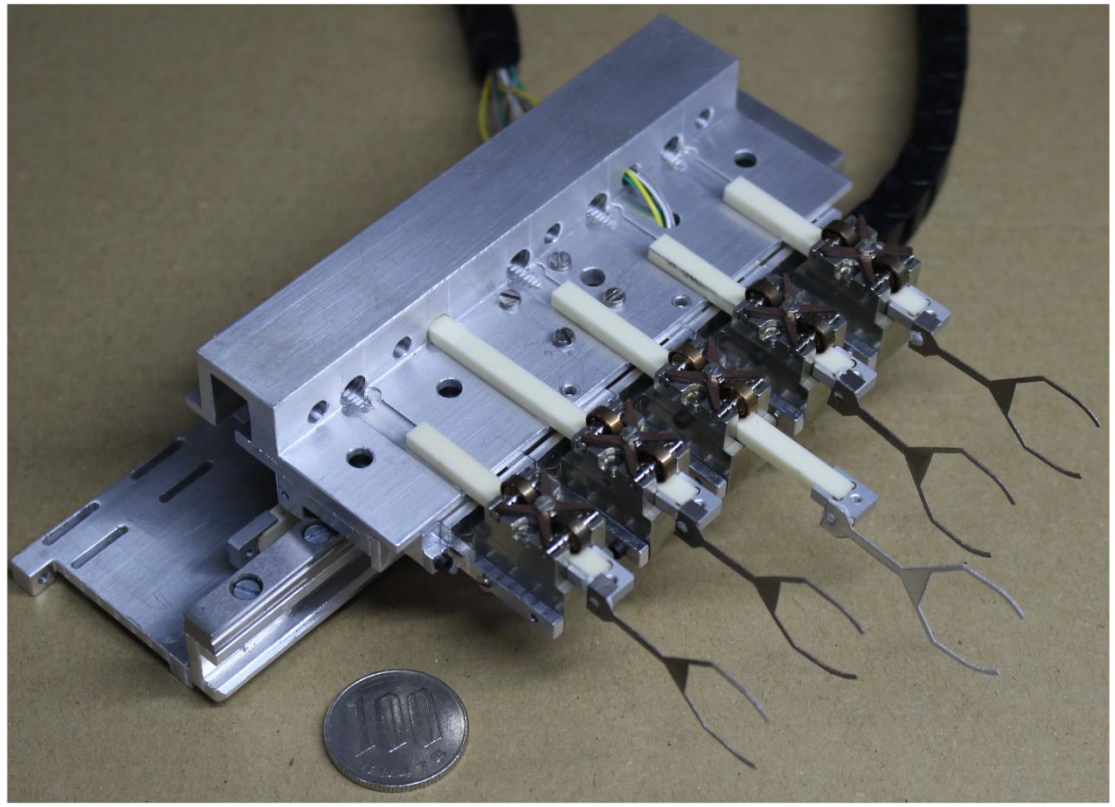


The primary target setup

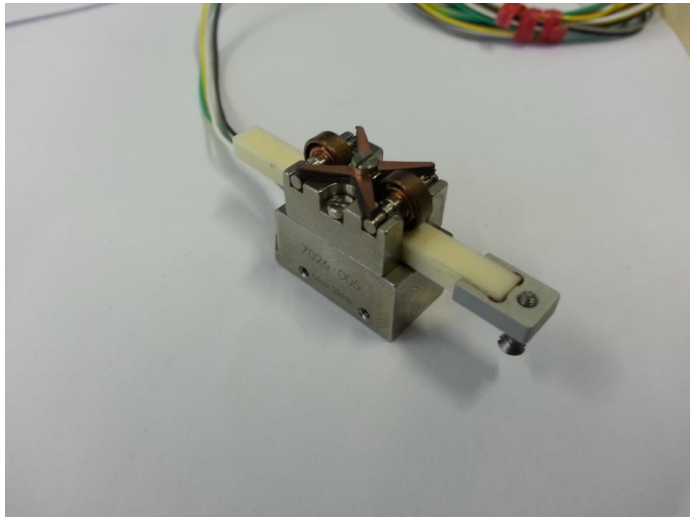
- Stores up to 5 targets
- Replacement of damaged targets during beam time
- Resistant to radiation, magnetic fields and vacuum
- Limited size due to placement inside MVD cavitity
- Compact design required



Prototyp used for first tests

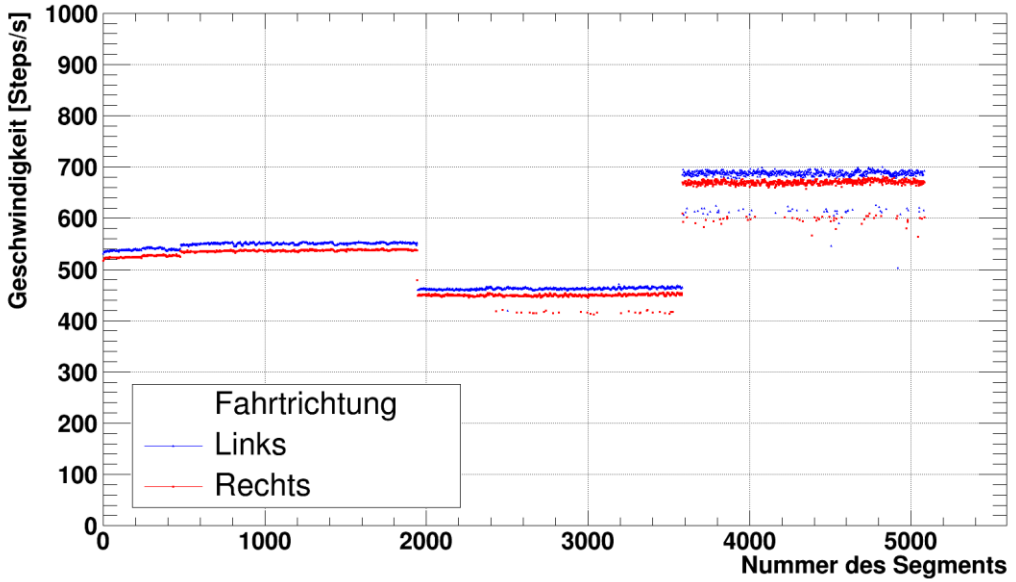


Uses PiezoLEGS motors



First test results

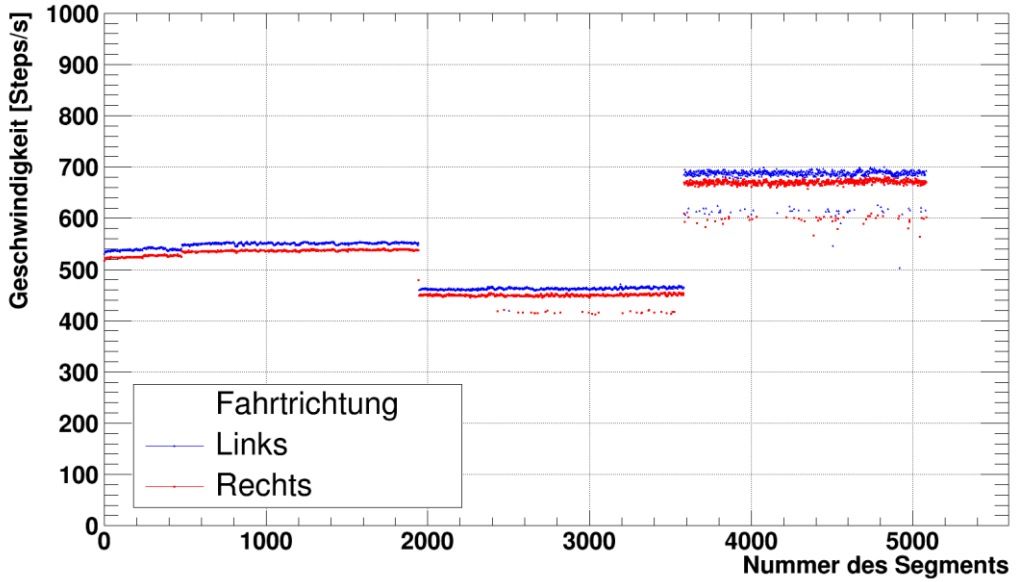
- Piezo motors are operated with constant speed settings
- Resulting speed varies
  - Speed varies with load
- Carriage and rail with insufficient stiffness



First test results

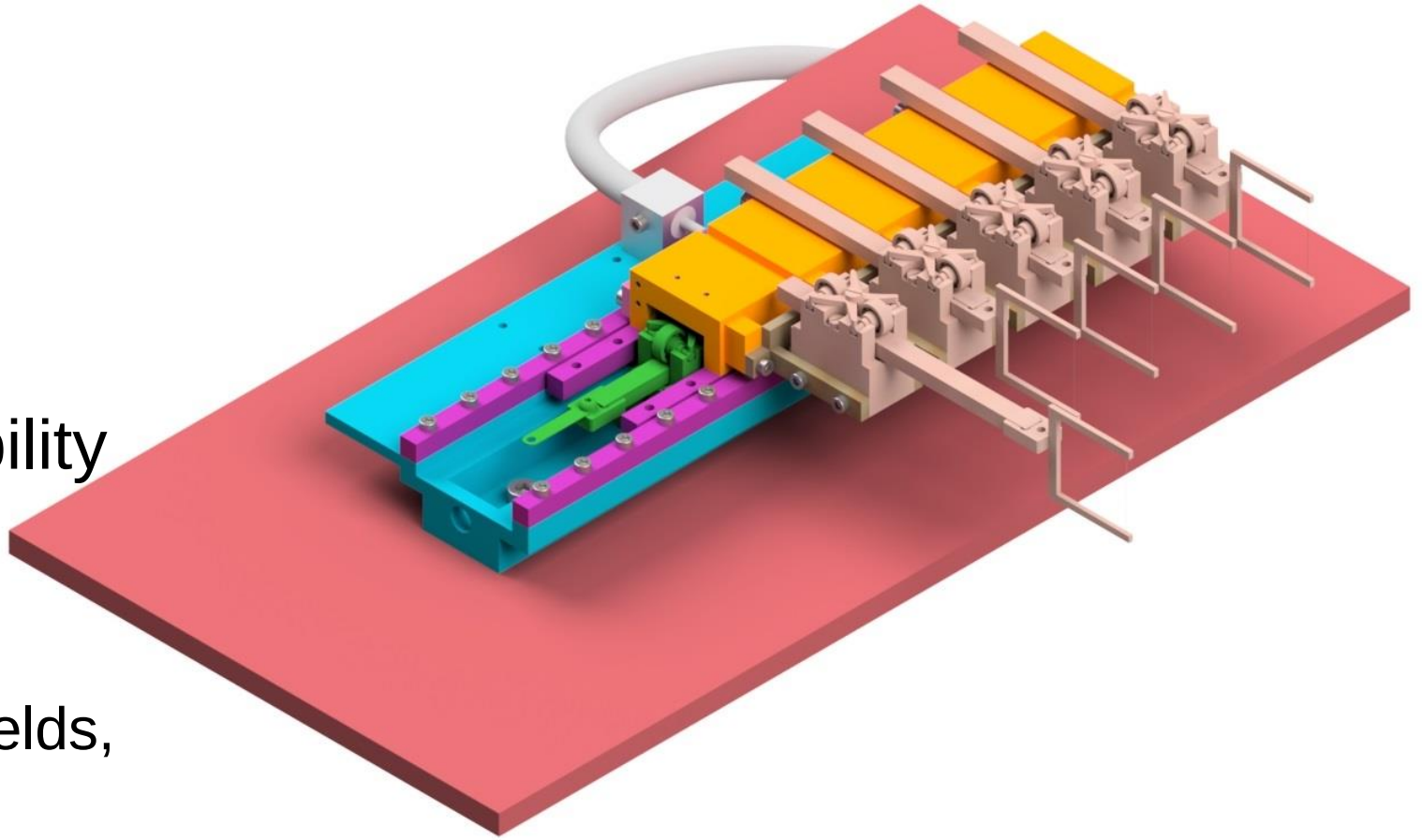
- Piezo motors are sensitive to misalignment of axis of motion

- Motors were damaged in tests
  - After extended drive range (several km)
  - In experiment lifetime is no problem (drive range <1m)



Redesign of primary target setup

- Using new type of linear guide rails

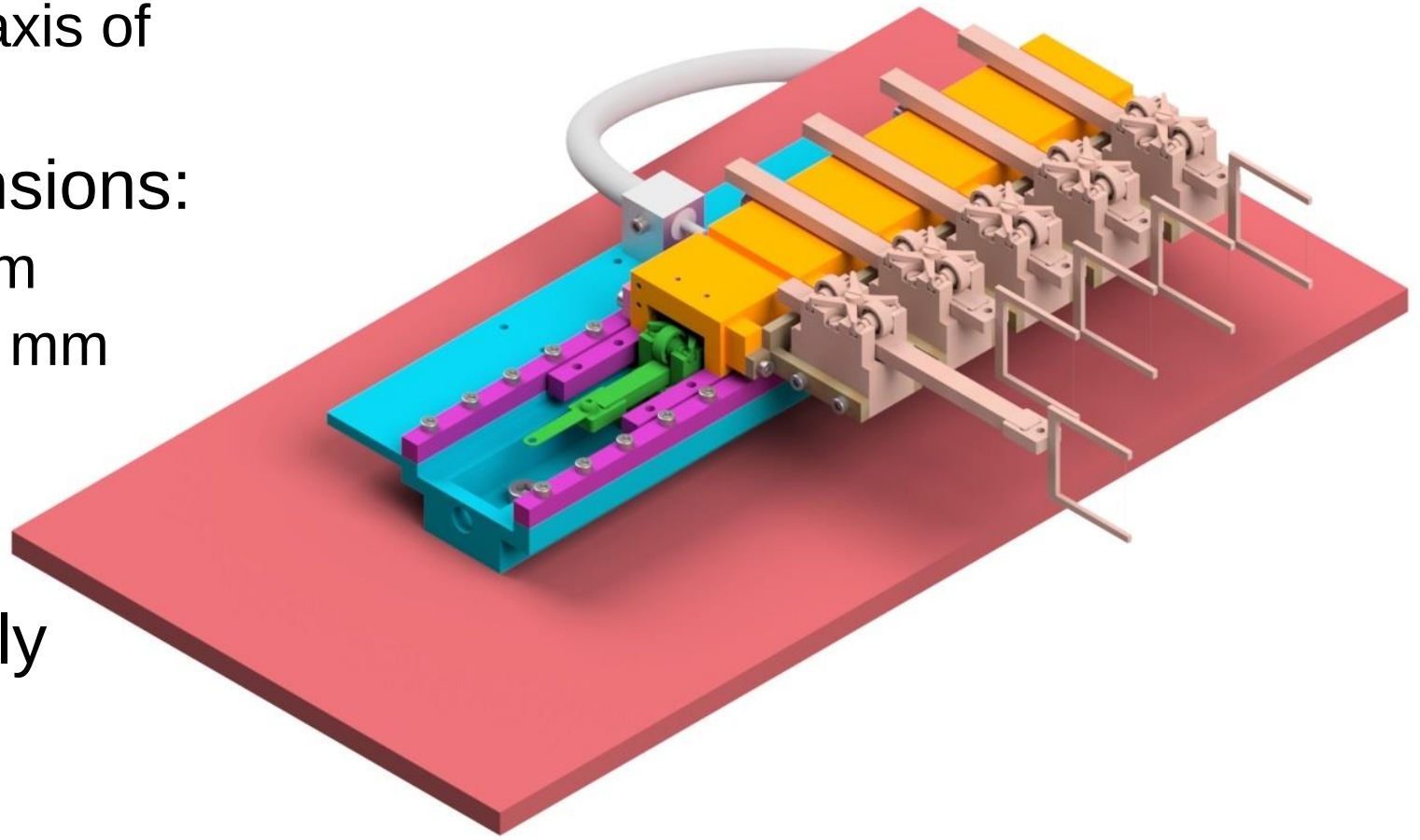


- Improved mechanical stability

- Ceramic rails possible
  - No problems in magnetic fields, vacuum or radiation

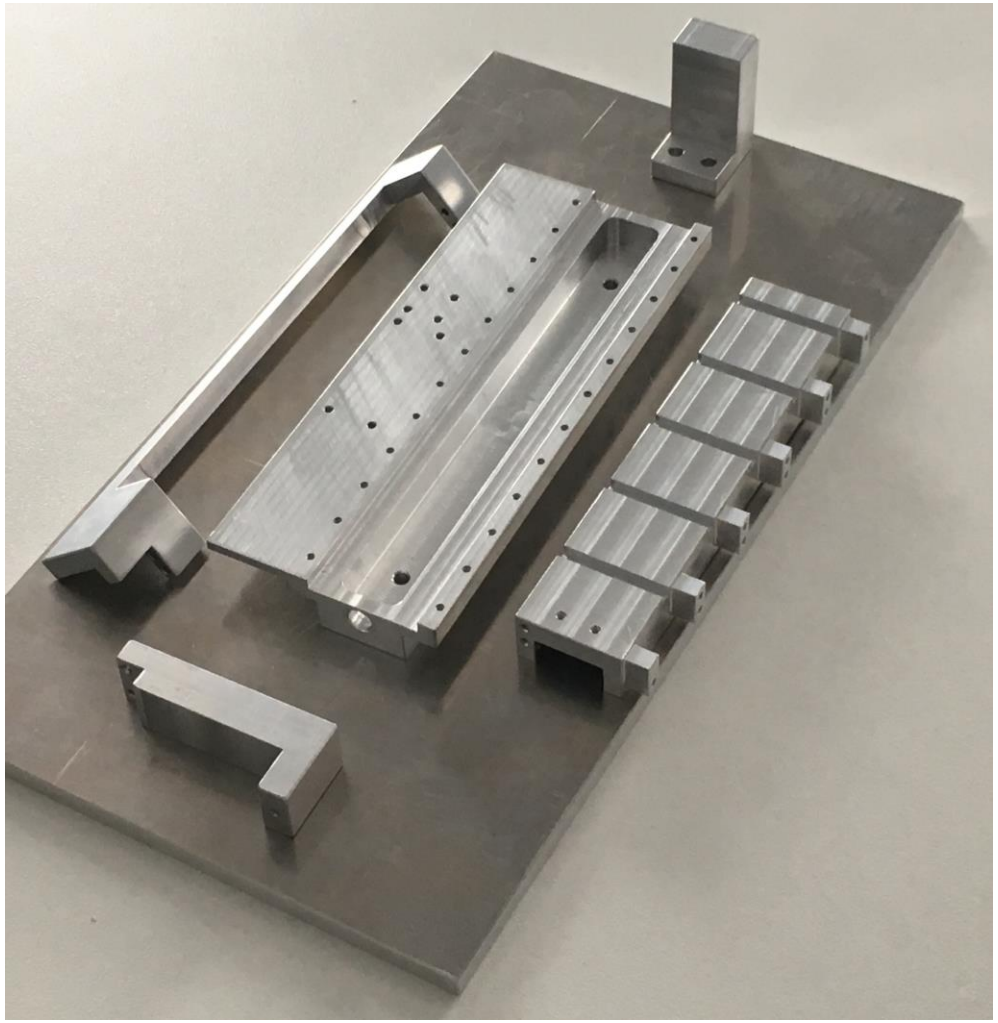
Redesign of primary target setup

- Placing motor inbetween rails
  - Better alignment between axis of motion and motor
- Further reduction in dimensions:
  - Heigth: 39,5 mm to 38,5 mm
  - Length: 131,7 mm to 110,6 mm



- Less complicated assembly
- Reduced material budget

Redesigned prototype



- All parts manufactured
- Missing components
  - Linear guide rail
  - Piezo motor
- Further tests when all components are delivered

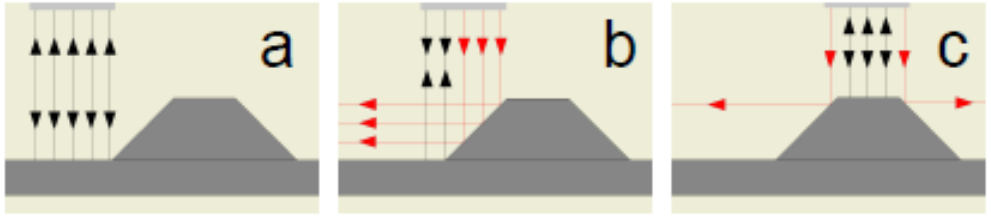
Light-based position sensors

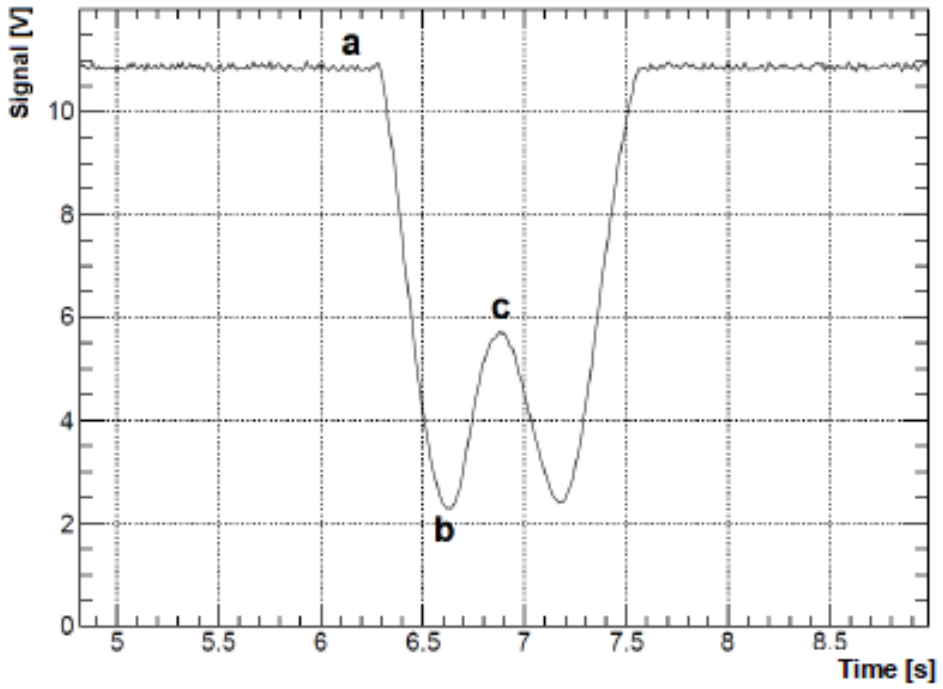
- Light-based sensors
- Sensors from company Tippkember
- IR light is routed with optical fiber
- Maximum distance between electronics and sensor head: 15m

Light-based position sensors

- Vacuum-rated system can be purchased
- Application as lightbarrier is also possible

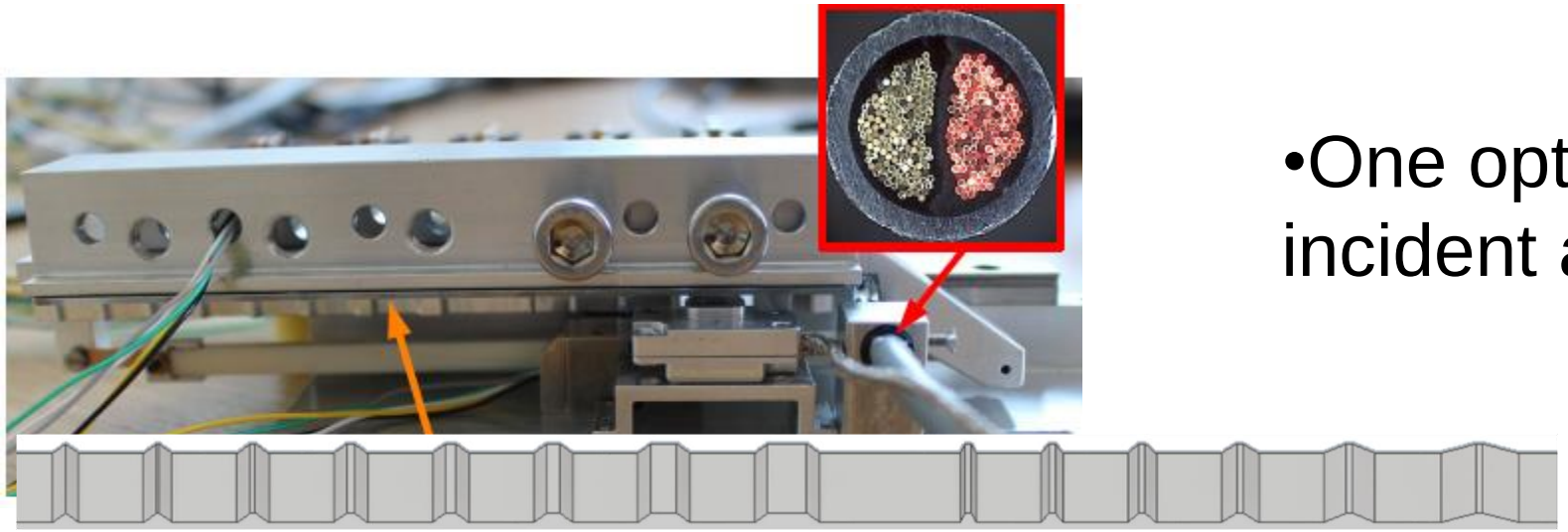
Principle of operation



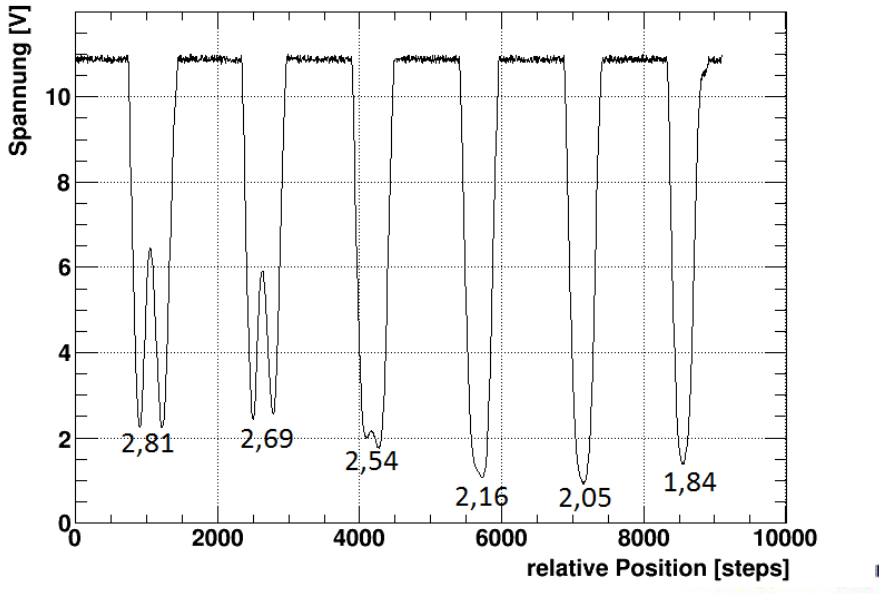


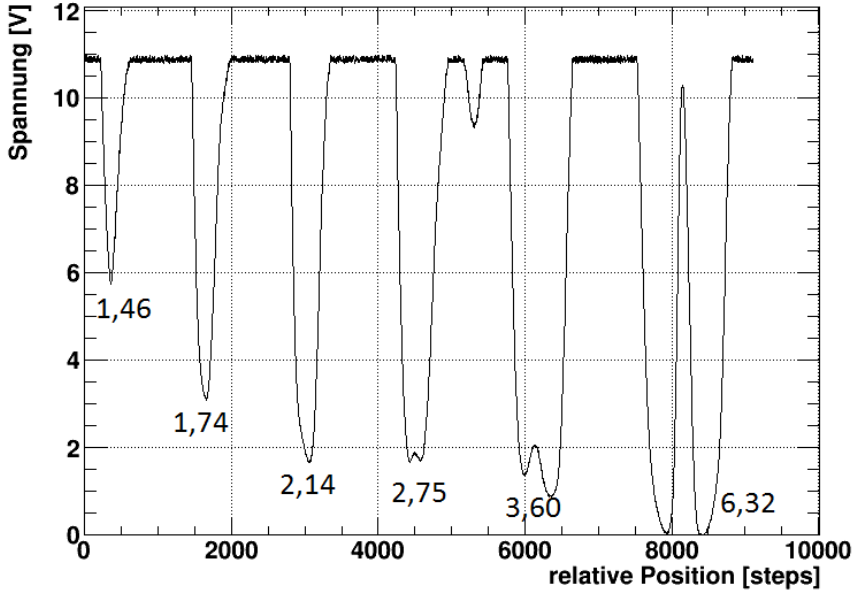
- Based on the reflection of infrared light on structured surfaces
- Surface geometry can be used for position detection
- Signal can also be used to identify geometry
  - Position encoding possible

Signal for various geometries



•One optical fiber for both incident and reflected light



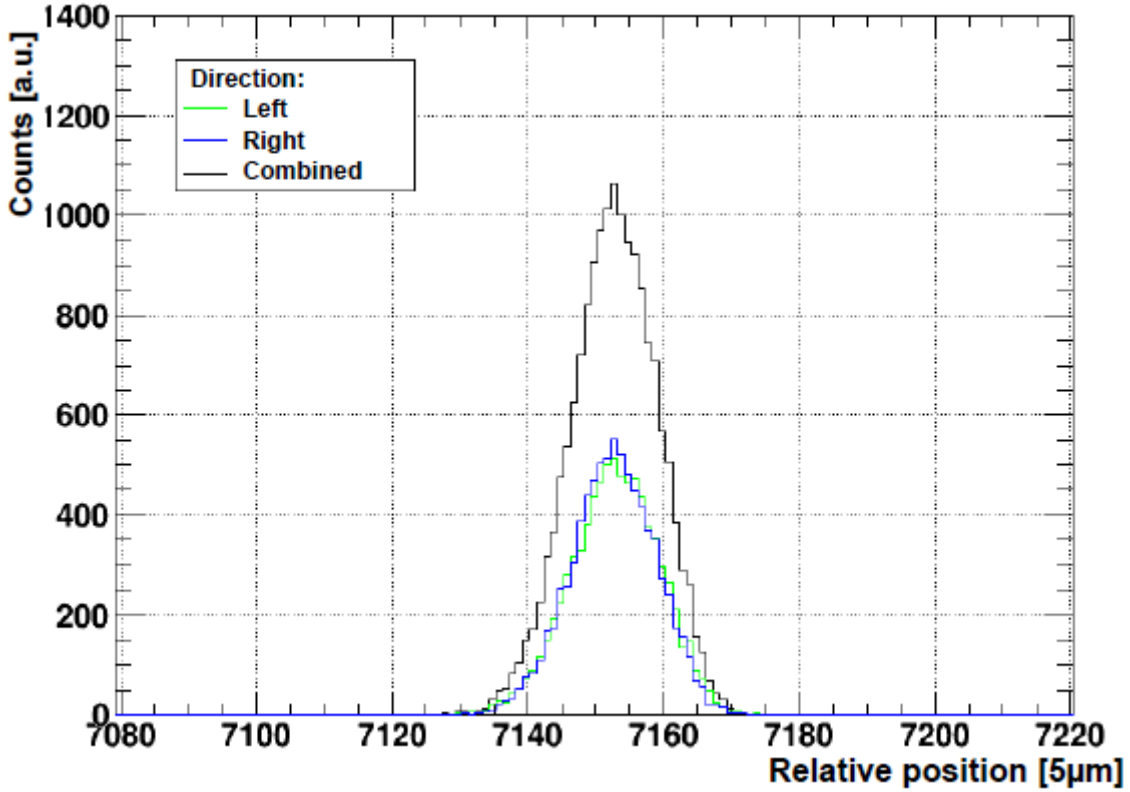


•Width of a geometry = Width of the signal

•Width of crest = Signal form

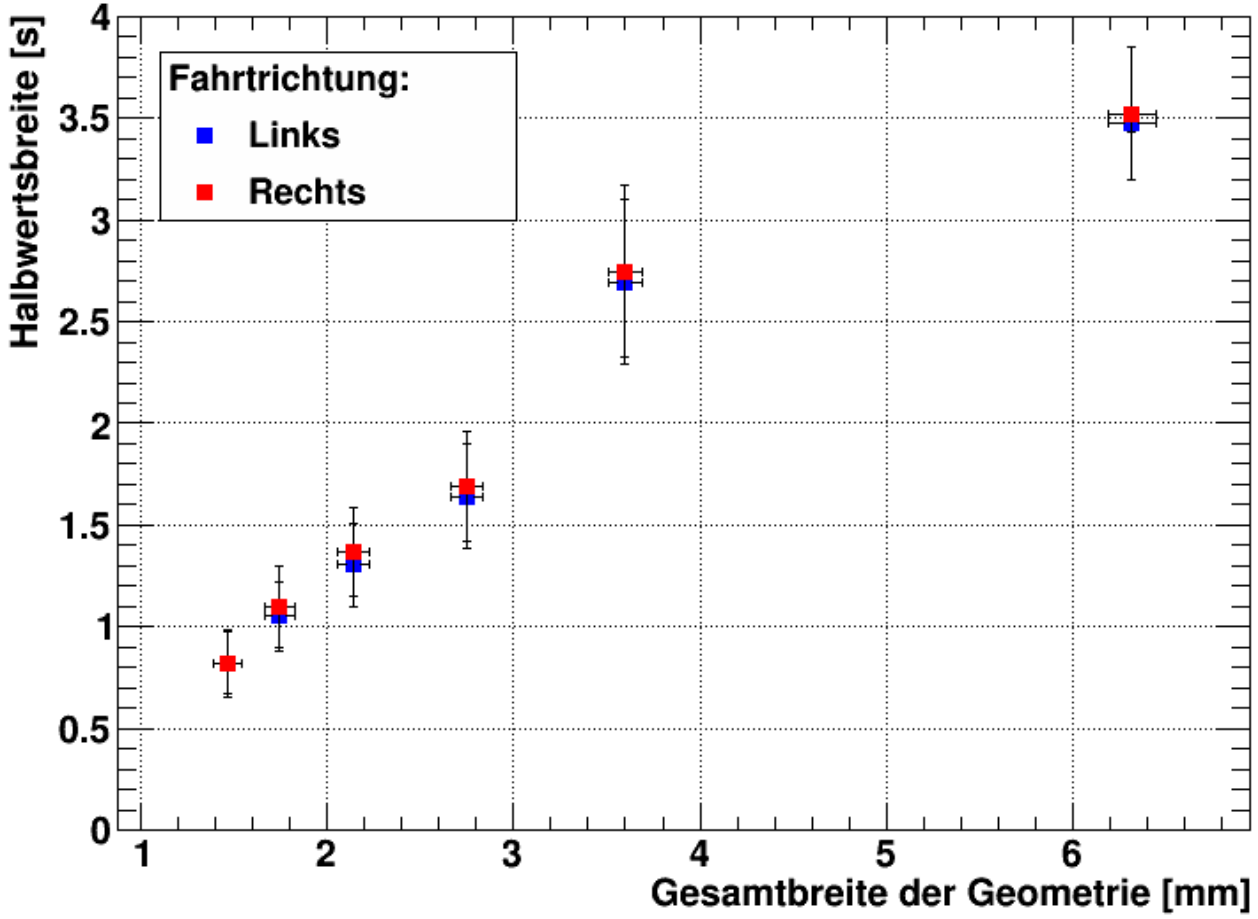
Position resolution

- Required position by primary target setup: 100 µm
- Current precision: 62 µm
- Further improvments might be possible
  - polished reflector
  - Silver or Gold instead of Aluminium (better IR reflectifity)



Position encoding

- Sensors can only give relative position
- Need to insure that the correct target is positioned
  - Otherwise a target might be destroyed
- However: depended on constant speeds



Summary

- The primary target setup was redesigned
  - New setup requires less space
  - Better motor placement should further improve motor lifetime
  - Improved mechanical stability

- A new light-based positioning sensor was developed
  - Offers sufficient precision
  - Allows position encoding
  - Resistant to radiation, vacuum and magnetic fields