

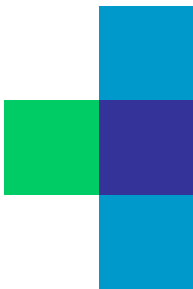
# Multibeam Tomotherapy

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# Structure

- 1 Medical linacs for photon therapy
- 2 Multibeam Tomotherapy-the TOM`5 system
- 3 Image-guided and Adaptive RT
- 4 Chances with Multibeam Tomotherapy



# Linac designs

- traditional L-shaped gantry linacs
  - fixed beam IMRT
  - volumetric-modulated arc therapy
- helical tomotherapy
- robotic manipulator with linac
- same dose distributions



# Time Considerations

$$t_{\text{case}} = t_{\text{prepare}} + t_{\text{image}} + t_{\text{treat}}$$

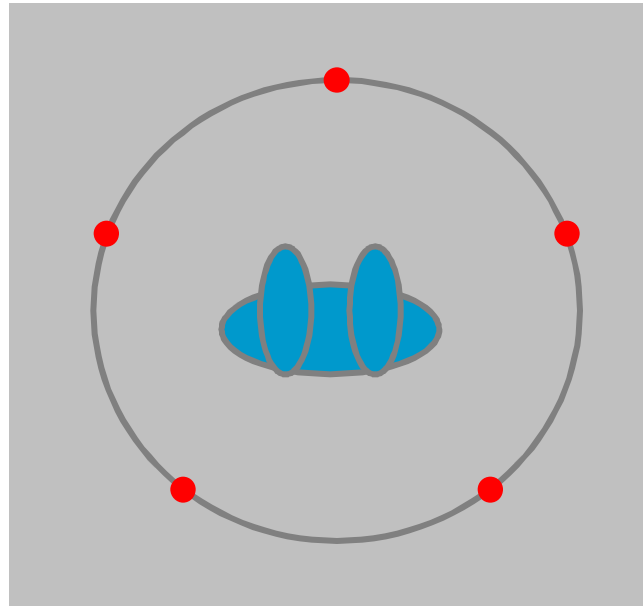
- every summand as short as reasonable achievable
- time efficiency:
  - patient comfort
  - treatment quality
  - the next patient on waiting list

# Multibeam Tomotherapy

- conception of an universal IMRT unit
- integrated system (field generation, application, verification)
- modular set-up in terms of parts as well as technologies
- new design „easy“ to realize
- fast accurate and automated treatments



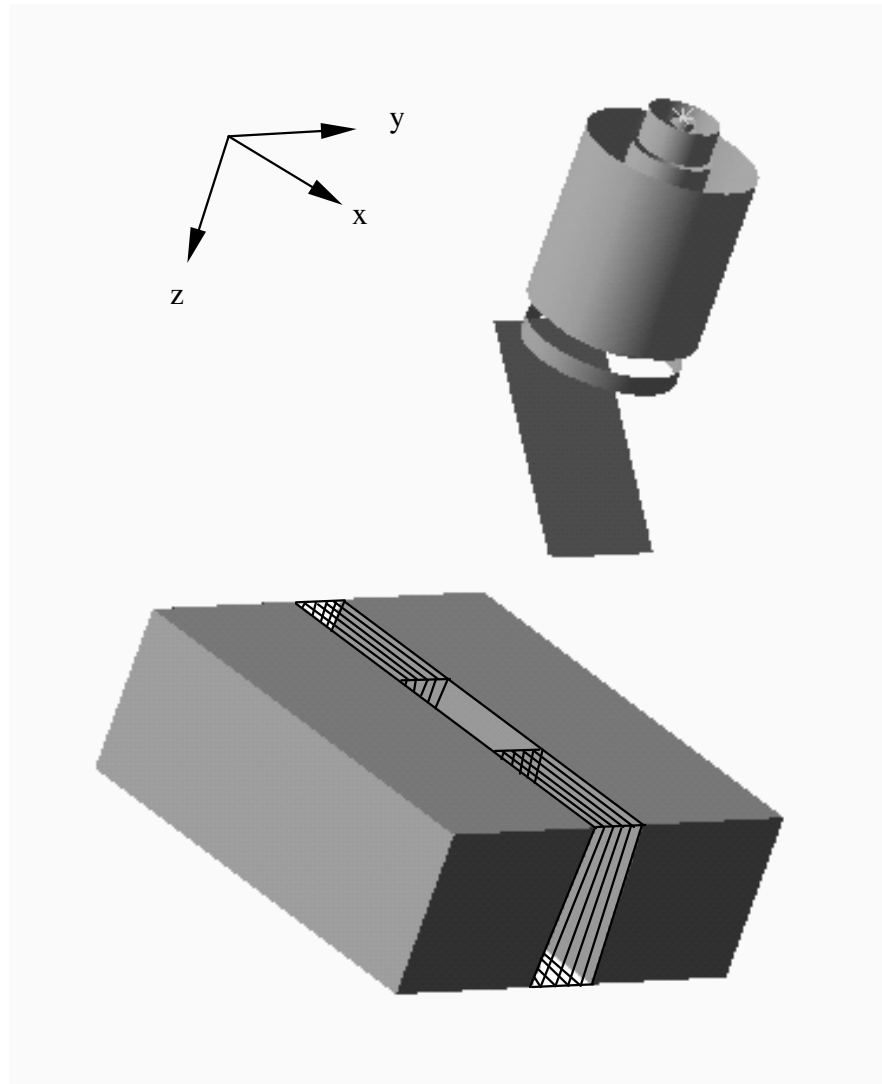
# Rigid five-head design



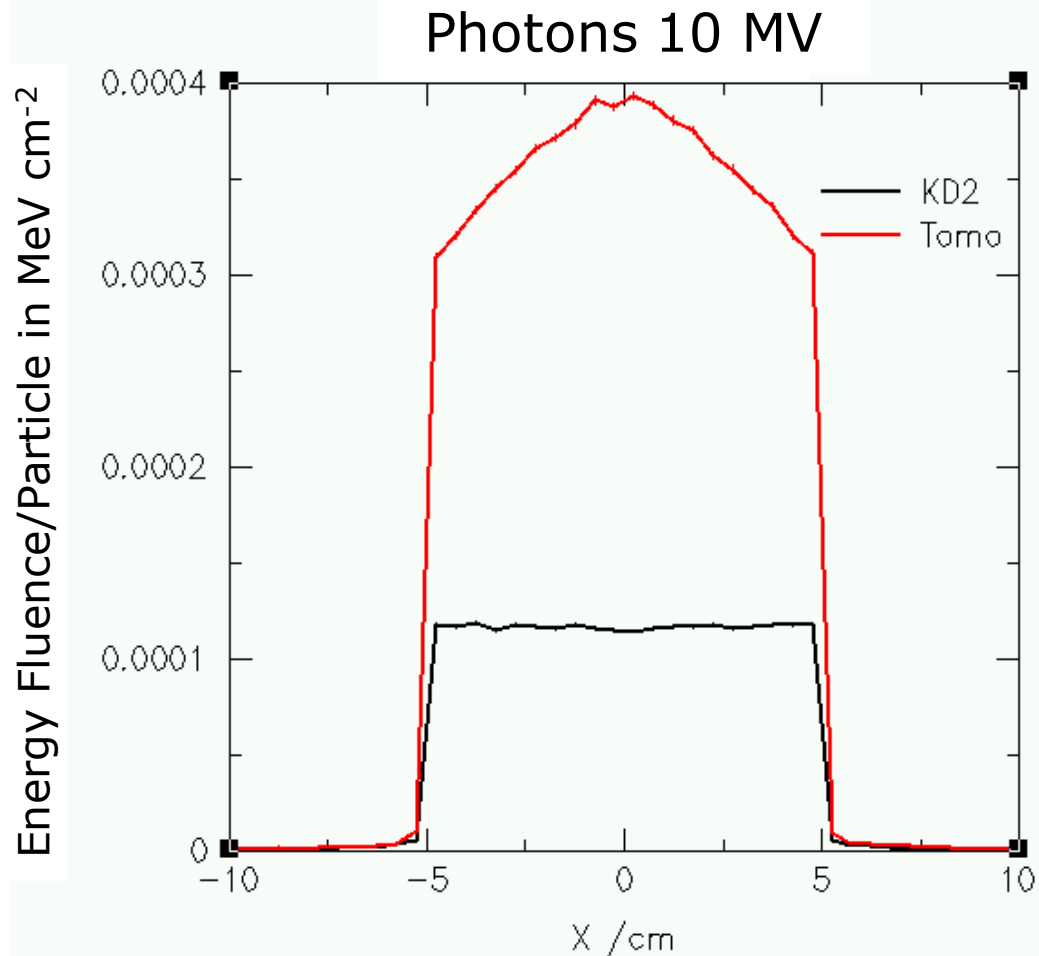
- small angle rotation of the gantry as a whole
- „step and shoot“ turns into „shoot and shoot“



# Head and MLC design

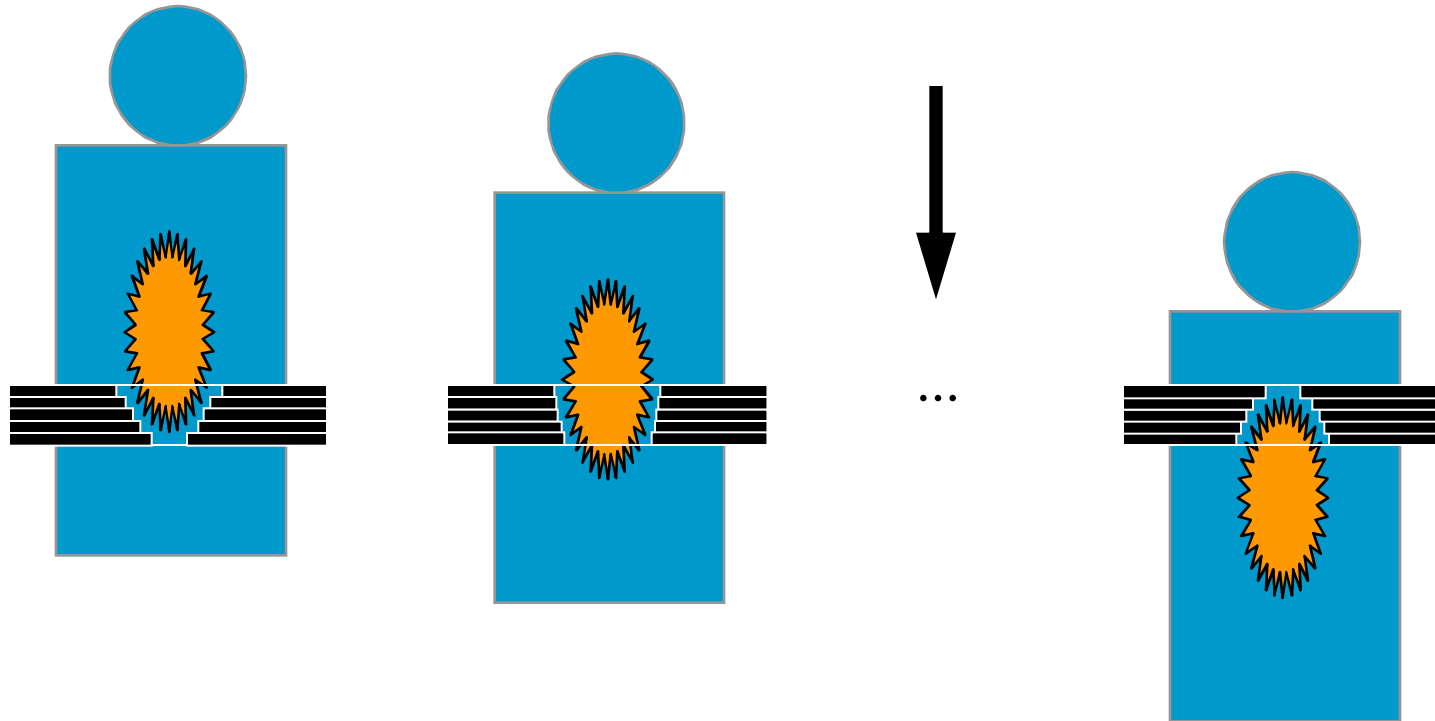


# Fluence Output



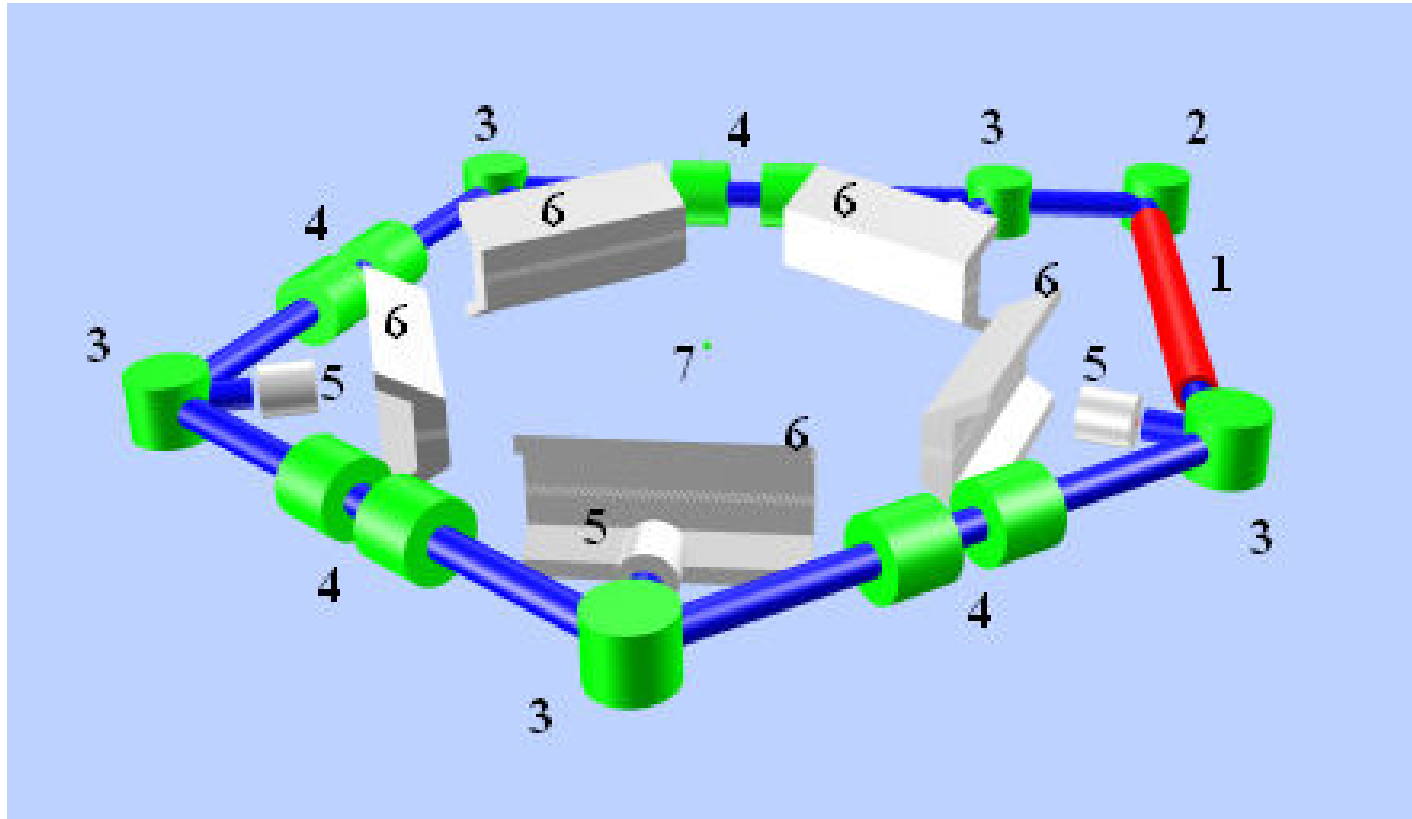


# Couch Movement



- discrete table steps
- field-overlap strategy

# Electron Beam Line

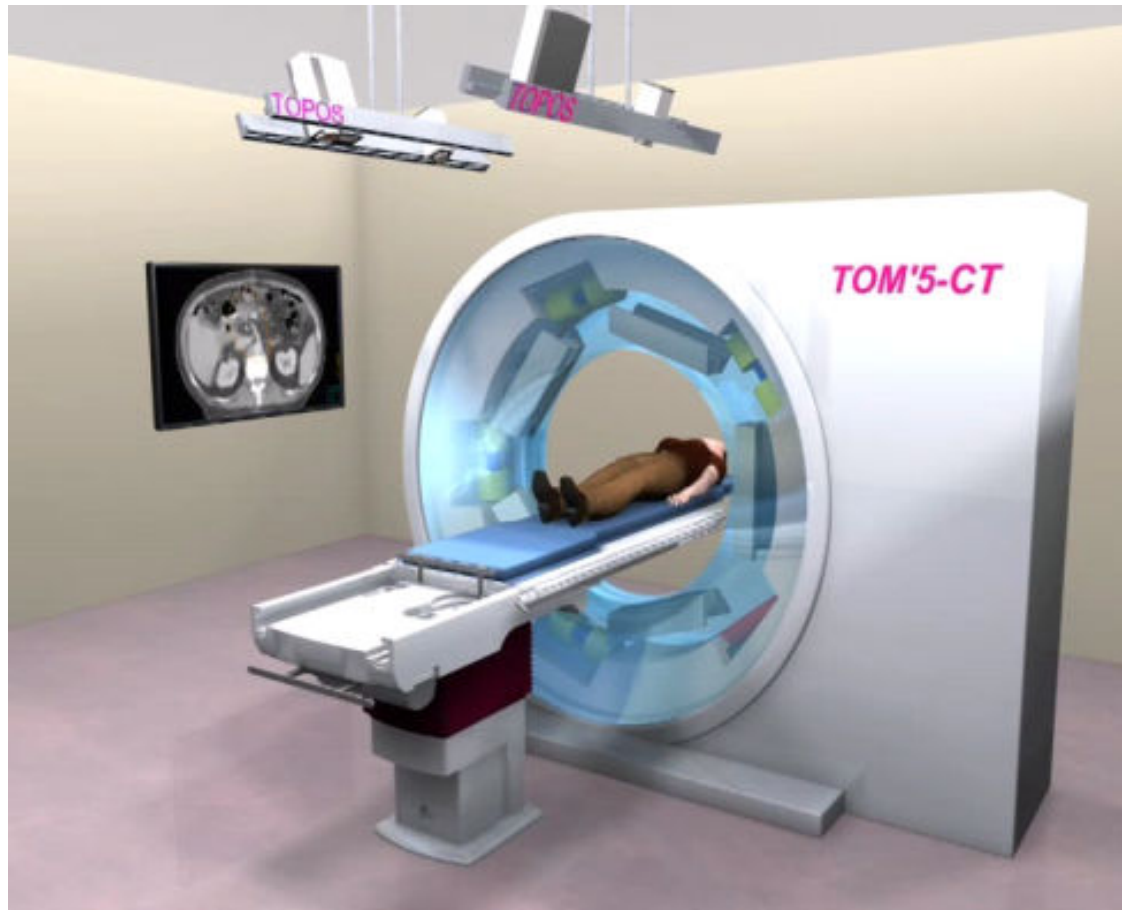


# Simulations

- hardware
- electron beam line
- x-ray beam
- treatment procedure (electron beam delivery, time optimization)
- treatment planning



# TOM'5



# Image-guided and Adaptive RT

- surface: Topometrical Positioning (TOPOS)
- 3D: Tomographic Imager (TOM'AGE)
  - electron beam CT
  - (alternative: carbon nanotubes?)
  - at first: ordinary CT
- efficient inter-/intra-fraction patient/organ motion management and dose reconstruction

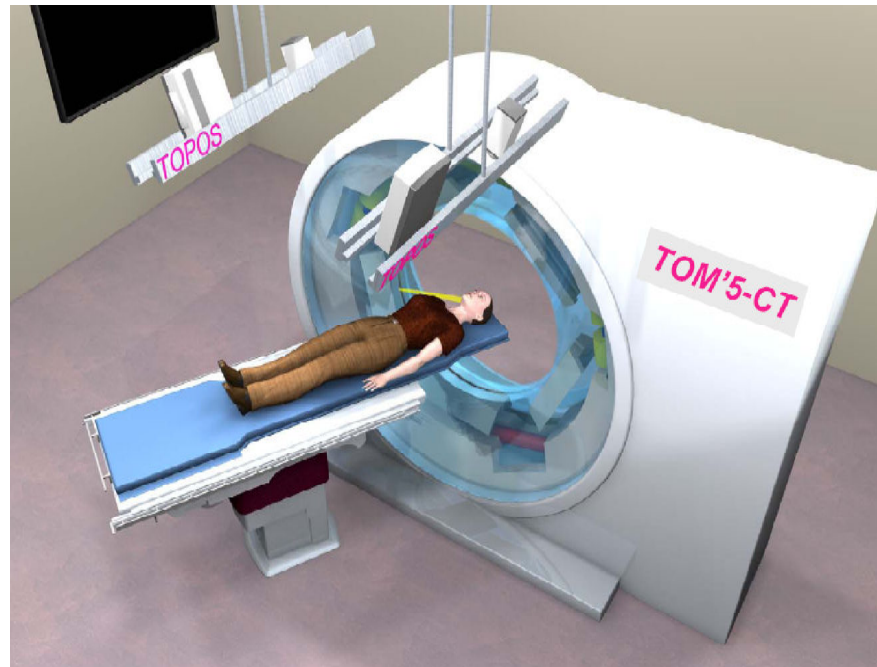


# Conclusions

- chances in:
  - Imaging (surface, 3D)
  - Planning (fast forward and re-planning)
  - Delivery (MU-efficiency, technical reliability)
  - Verification (inter-fraction, intra-fraction)
- ample space/five beam ports
- whole RT chain integration to:  
„image-plan-deliver-verify“



# Literature



N. Achterberg, R. G. Müller: Multibeam Tomotherapy: A new treatment unit devised for multileaf collimation, intensity-modulated radiation therapy, *Med. Phys.* **34** (2007) 3926-3942