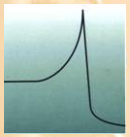
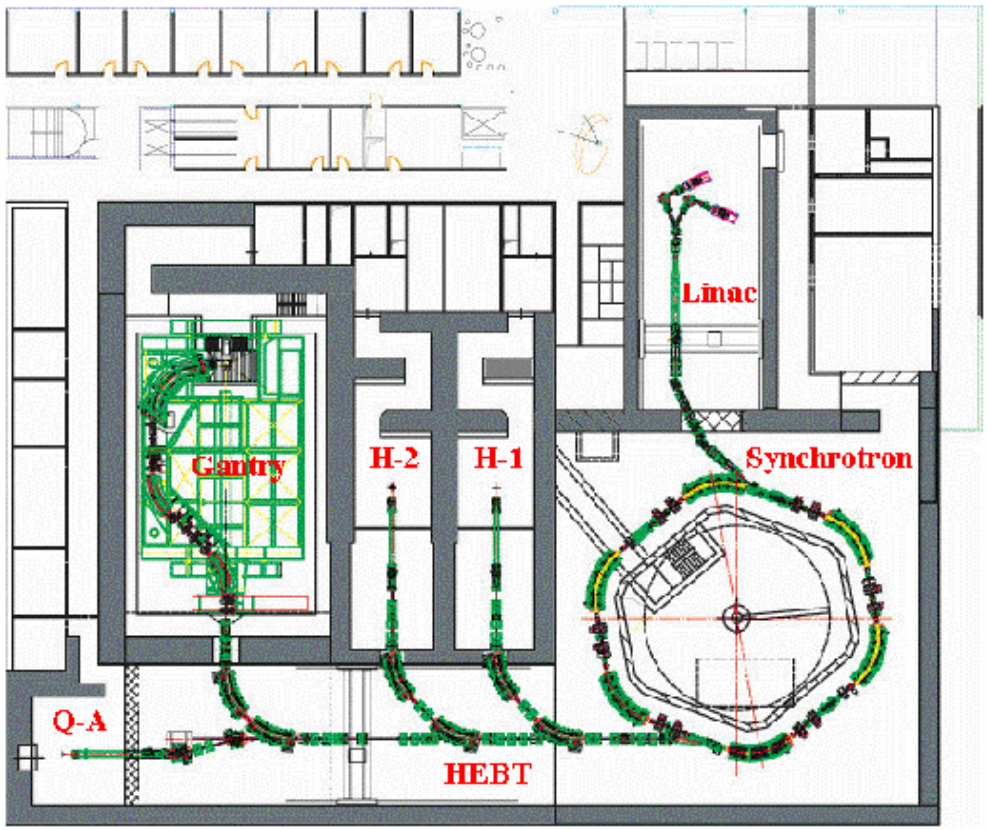


# Status of the 7 MeV/u, 217 MHz Injector Linac for the Heidelberg Cancer Therapy Facility

B. Schlitt, G. Hutter, F. Klos, C. Muehle, W. Vinzenz,
GSI, Darmstadt, Germany

A. Bechtold, Y.R. Lu, U. Ratzinger, A. Schempp,
IAP, Johann Wolfgang Goethe University,
Frankfurt am Main, Germany

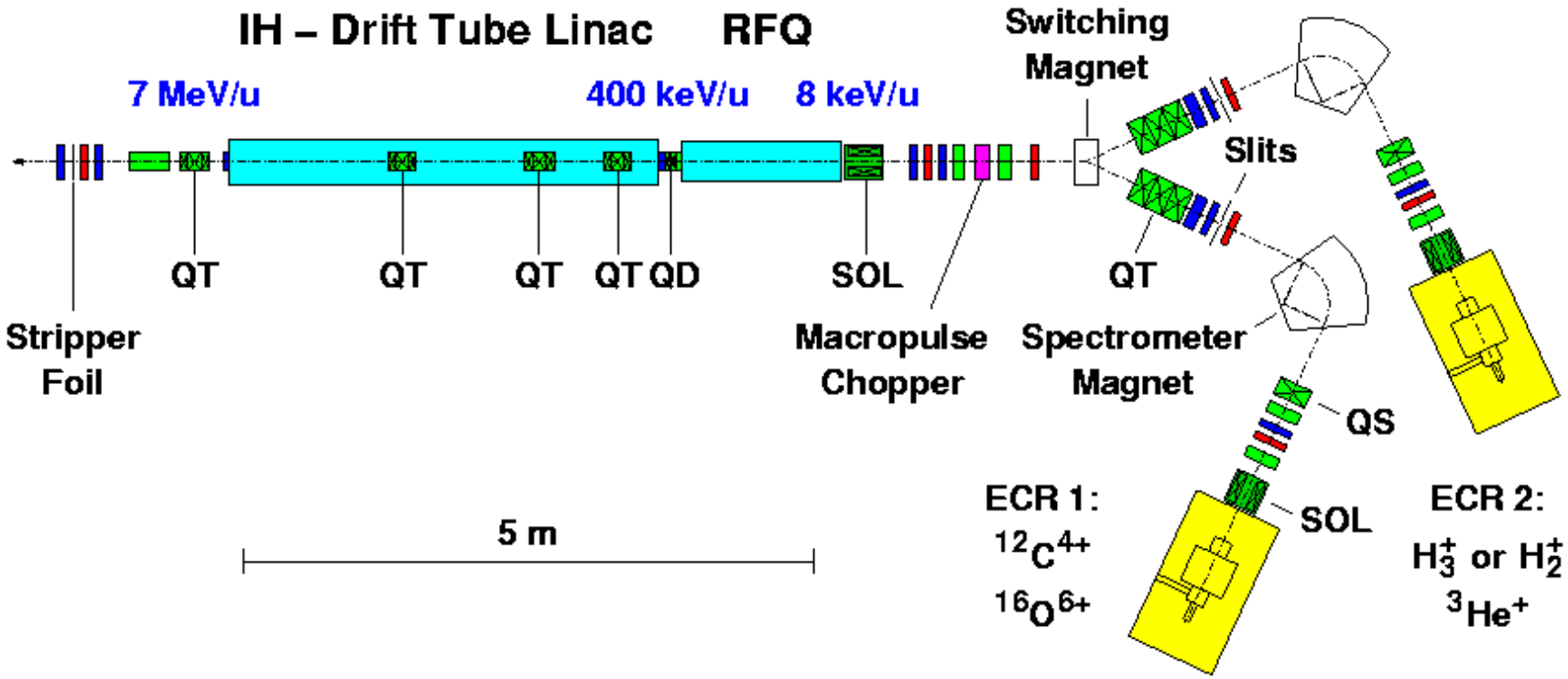
# HICAT – The Heavy Ion Cancer Therapy Facility for the University Hospital in Heidelberg




- Particles: p, $^{3}He^{2+}$, $^{12}C^{6+}$, $^{16}O^{8+}$
- Two ECR ion sources
  7 MeV/u injector linac
  6.5 Tm synchrotron
- Final beam energy:
  48 - 430 MeV/u
- 3 treatment stations with rasterscan systems:
  2 × fixed horizontal beam lines
  1 × isocentric ion gantry
- 1 × quality assurance place for R&D activities
- Building area ≈ 70 × 60 m²
- 1000 patients / year

H. Eickhoff et al., Proc. PAC 2003, p. 694

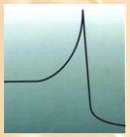
# 217 MHz, 7 MeV/u Injector Linac




| | |
|---|---|
| Operating frequency | 216.816 MHz |
| RF pulse length | ≤ 500 μs @ PRF ≤ 10 Hz |
| Ion mass-to-charge ratio | $A/q \leq 3$ |

B. Schlitt et al., Proc. LINAC 2002, p. 781

# Time Schedule and General Status

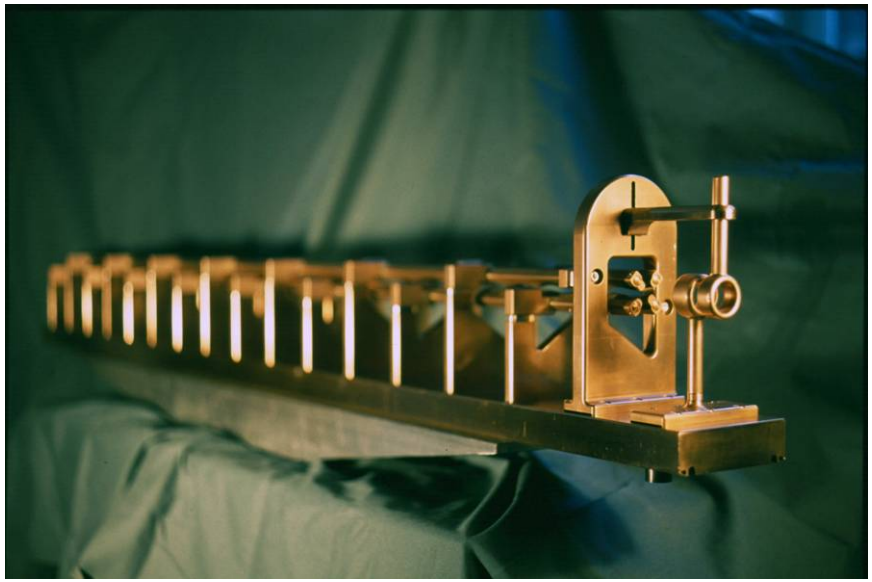


| | |
|---|---|
| 1997 | First patient treatment at GSI |
| 1998 | Proposal published |
| 2000 | Technical description |
| 2002 | Call for tenders |
| 2003 | Components ordered from industry |
| November 2003 | Beginning of excavation activities for the building in Heidelberg |
| At present | Production of components in progress,<br>first devices already delivered (to GSI) |
| First half of 2005 | Beginning of step-by-step installation and commissioning of the accelerator facility in Heidelberg |
| 2006 / 2007 | First patient treatment |

# 400 keV/u 4-Rod Type RFQ

Designed, assembled and tuned at the IAP,

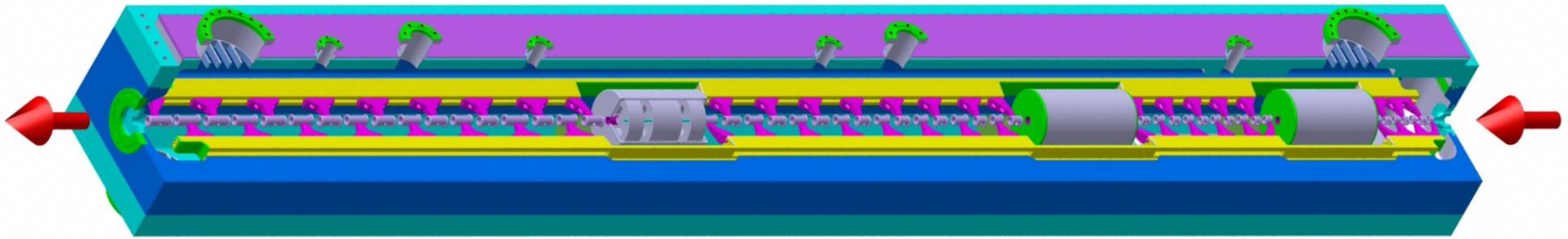
RFQ beam test stand is presently beeing set up at the IAP



| | |
|---|---|
| Energy range | 8 – 400 keV/u |
| Electrode length | 1.28 m |
| Tank diameter | 0.25 m |
| Electrode voltage | 70 kV |
| RF power loss (pulse) | ≈ 165 kW |

A. Bechtold et al., Proc. PAC 2003, p. 1062, and Proc. EPAC 2004, in print

# 20 MV IH-Type Drift Tube Cavity

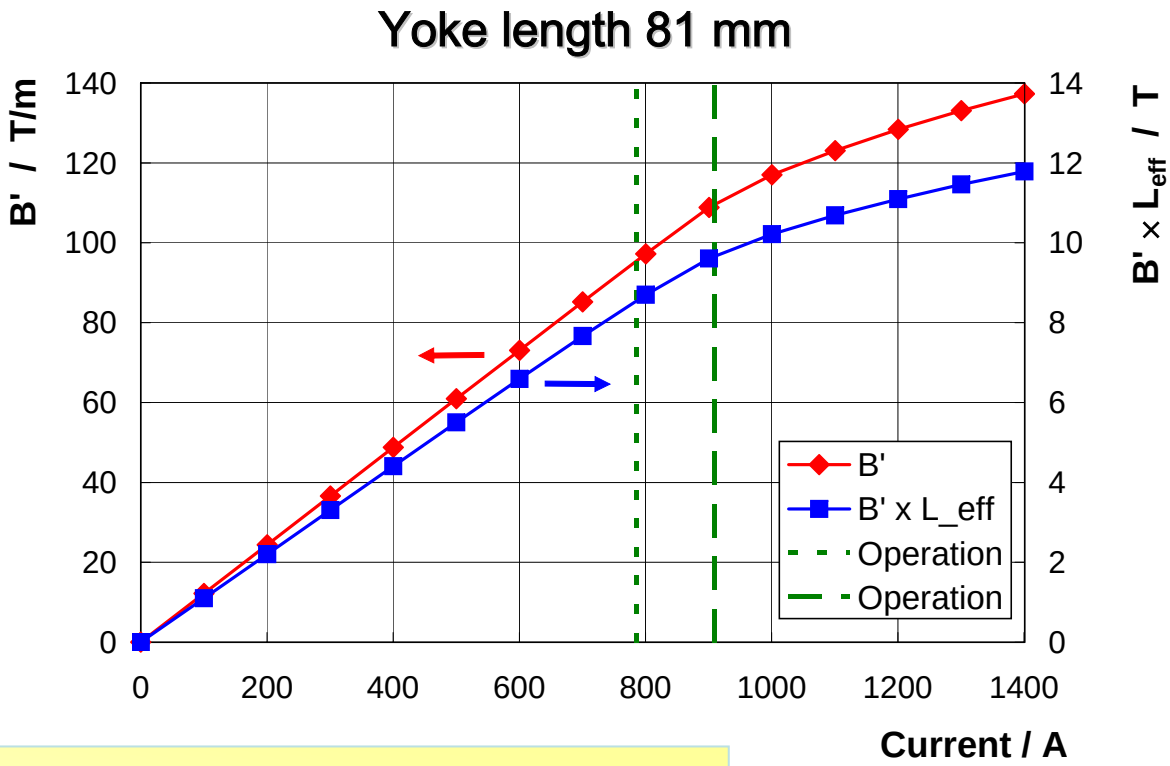


3 Integrated magnetic triplet lenses
56 Accelerating gaps

| | |
|---|---|
| Energy range | 0.4 – 7 MeV/u |
| Tank length | 3.77 m |
| Inner tank height | 0.34 m |
| Inner tank width | 0.26 m |
| Drift tube aperture diam. | 12 – 16 mm |
| RF power loss (pulse) | ≈ 1 MW |
| Averaged eff. volt. gain | 5.3 MV/m |

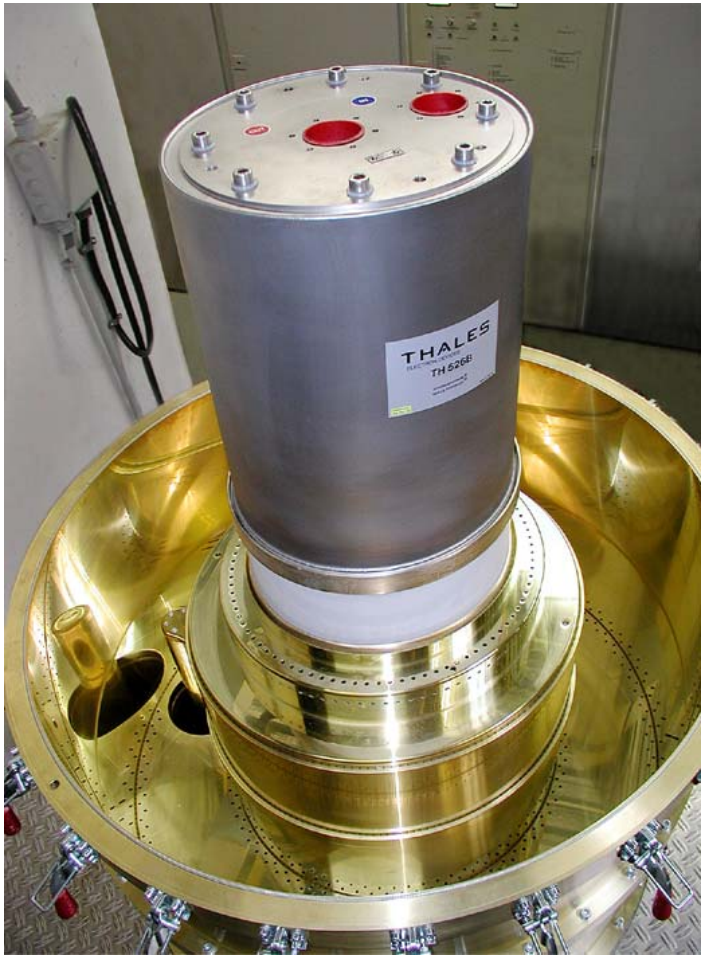
See also Y.R. Lu et al., MOP11, this conference

# Linac Quadrupole Magnets




| | |
|---|---|
| Yoke outer diameter | 130 mm |
| Yoke length | 42 / 49 / 67 / 81 / 97 mm |
| Yoke material | VACOFLUX 50 |
| Magnet aperture diameter | 20 mm |
| Number of turns per pole | 5 |

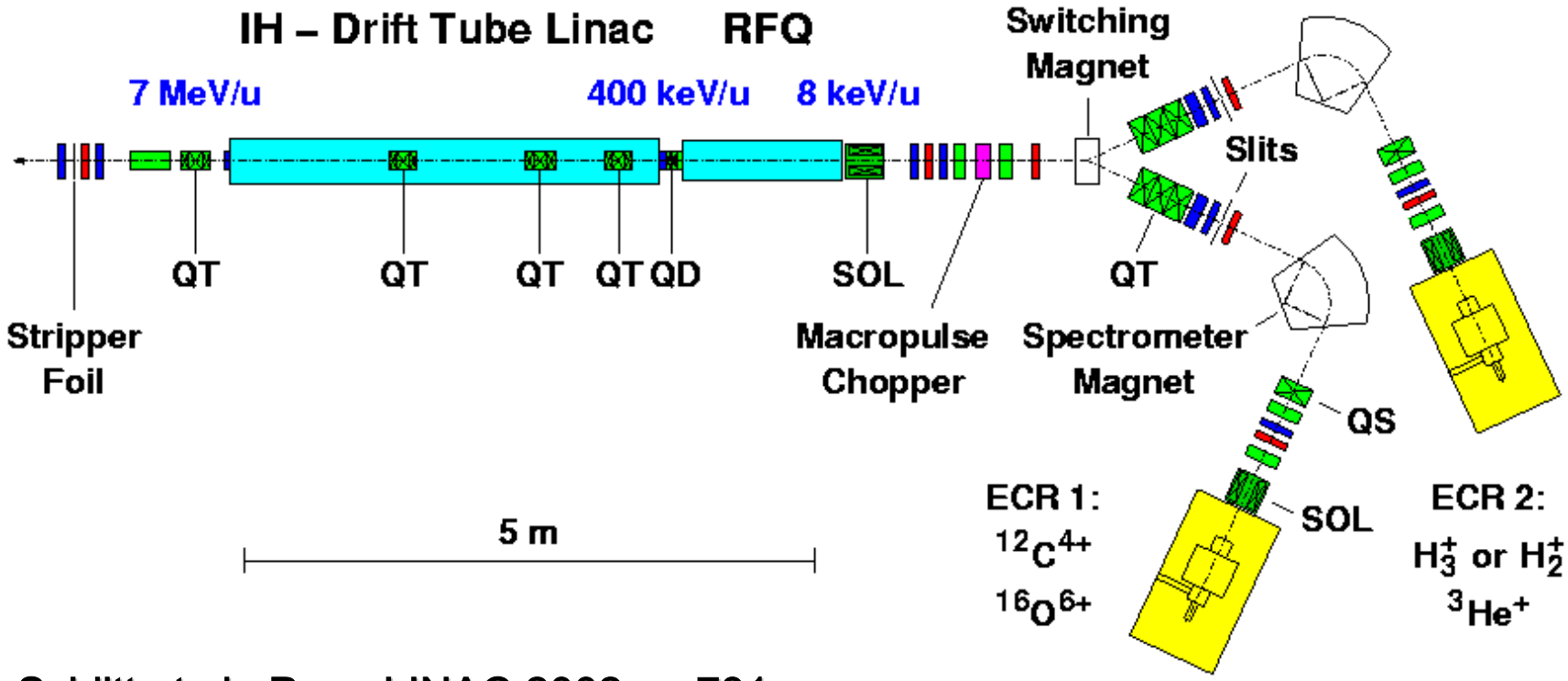
# 1.4 MW Final Stage Cavity Amplifier




**Built by BERTRONIX Electronic GmbH, Munich, Germany**

# 217 MHz, 7 MeV/u Injector Linac

| | |
|---|---|
| Operating frequency | 216.816 MHz |
| RF pulse length | ≤ 500 μs @ PRF ≤ 10 Hz |
| Ion mass-to-charge ratio | $A/q \leq 3$ |




B. Schlitt et al., Proc. LINAC 2002, p. 781

# 20 MV IH-type Drift Tube Cavity



| | |
|---|---|
| 3 | Integrated magnetic triplet lenses |
| 56 | Accelerating gaps |
| Tank length | 3.77 m |
| Inner tank height | 0.34 m |
| Drift tube aperture diam. | 12 – 16 mm |
| RF power loss (pulse) | ≈ 1 MW |
| Averaged eff. volt. Gain | 5.7 MV/m |

See also Y.R. Lu et al., MOP11, this conference