Skandionkliniken: Physical and technical update

Håkan Nyström
PhD, Uppsala, Sweden

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Radiological Use of Fast Protons

ROBERT R. WILSON

Research Laboratory of Physics, Harvard University

Cambridge, Massachusetts

EXCEPT FOR electrons, the particles which have been accelerated to high energies by machines such as cyclotrons or Van de Graaff generators have not been directly used therapeutically. Rather, the neutrons, gamma rays, or artificial

per centimeter of path, or specific ionization, and this varies almost inversely with the energy of the proton. Thus the specific ionization or dose is many times less where the proton enters the tissue at high energy than it is in the last centimeter of the path

Wilson R. *Radiology 1946 (47) 487-491*

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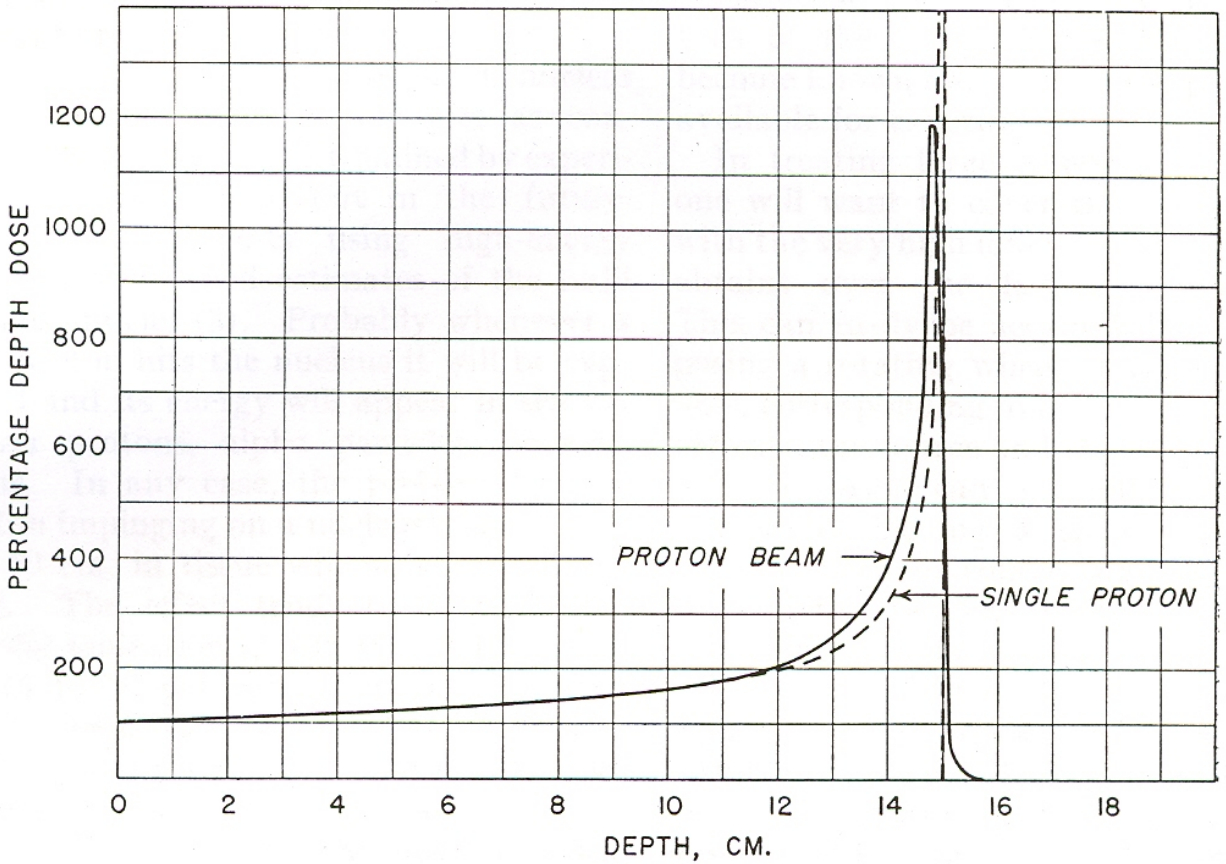

Fig. 2. The dotted curve shows the relative dose due to a single 140 Mev proton. The full curve shows qualitatively the depth dose curve for a beam of 140 Mev protons in tissue.

Wilson R. *Radiology 1946 (47) 487-491*

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”Proton therapy is more precise than standard radiation treatment.”

http://www.procure.com/ForMedicalProfessionals/FAQs.aspx

”…proton therapy delivers a more precise dose…”

http://www.iba-worldwide.com/iba-solutions/proton-therapy

”The accuracy of proton therapy for treatment delivery is within approximately one millimeter.”

http://www.mdanderson.org

”Compared to radiation, proton therapy is more precise …”

http://prostablog.wordpress.com/category/treatment/proton-therapy/

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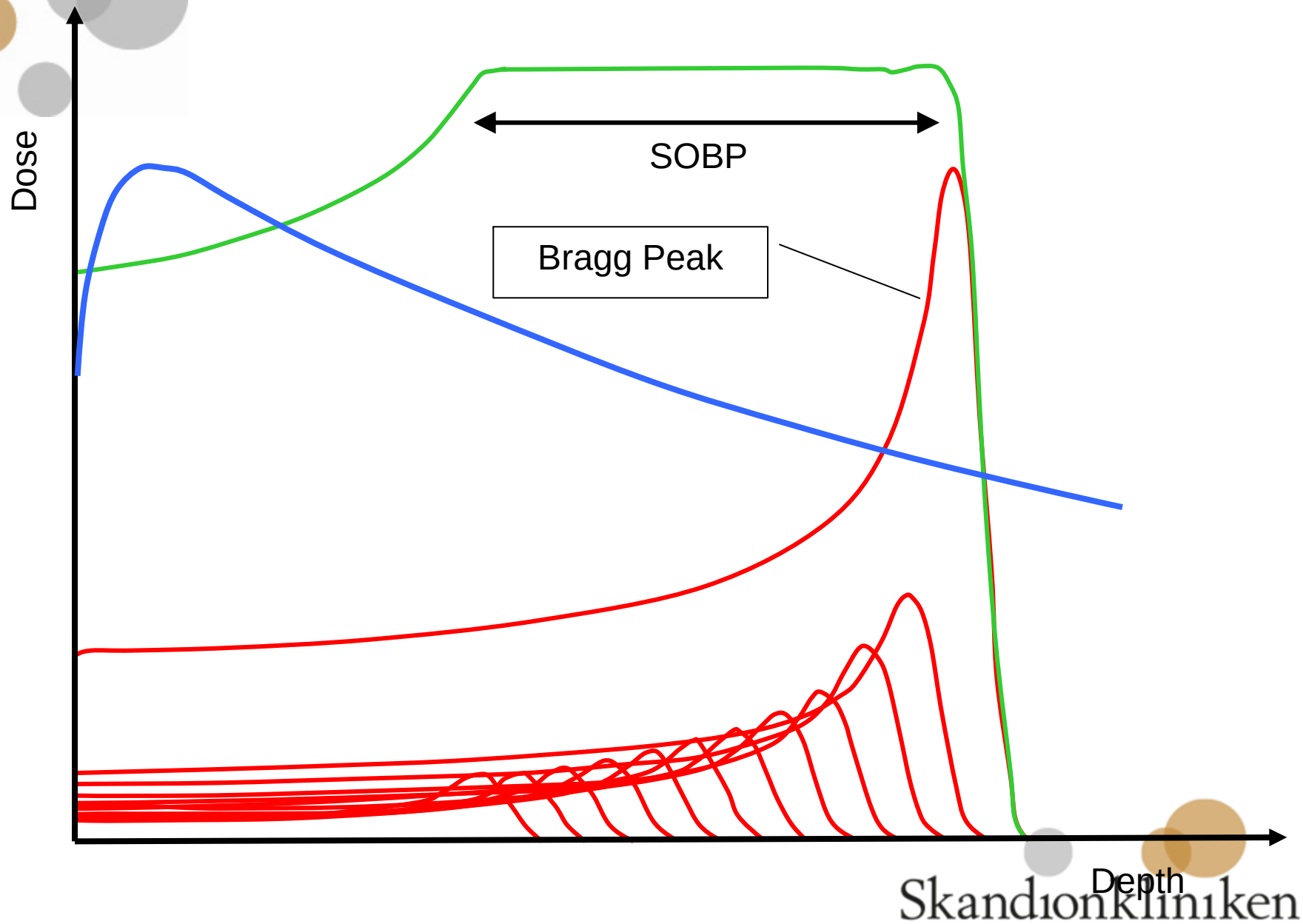

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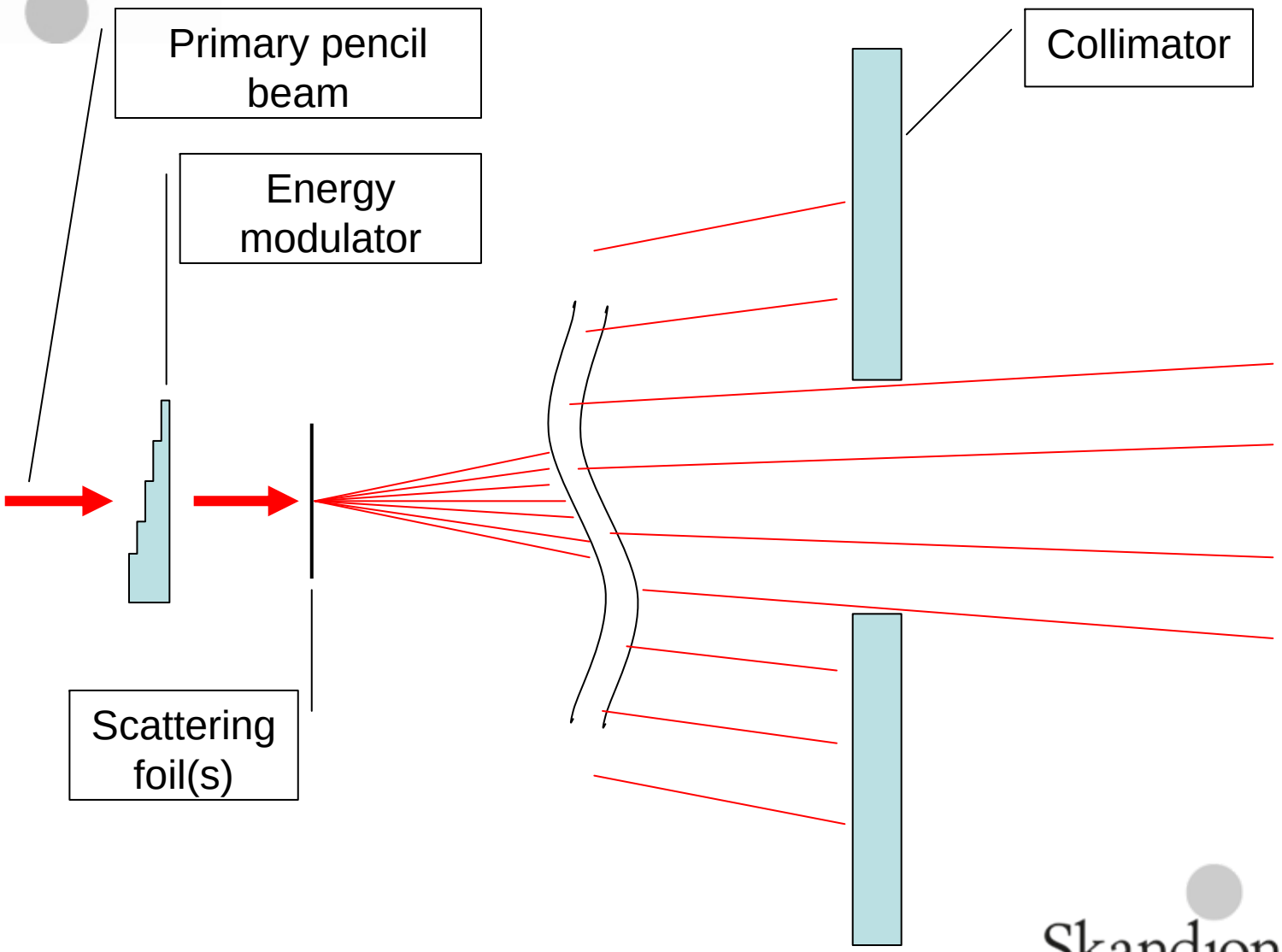
Passive Scattering



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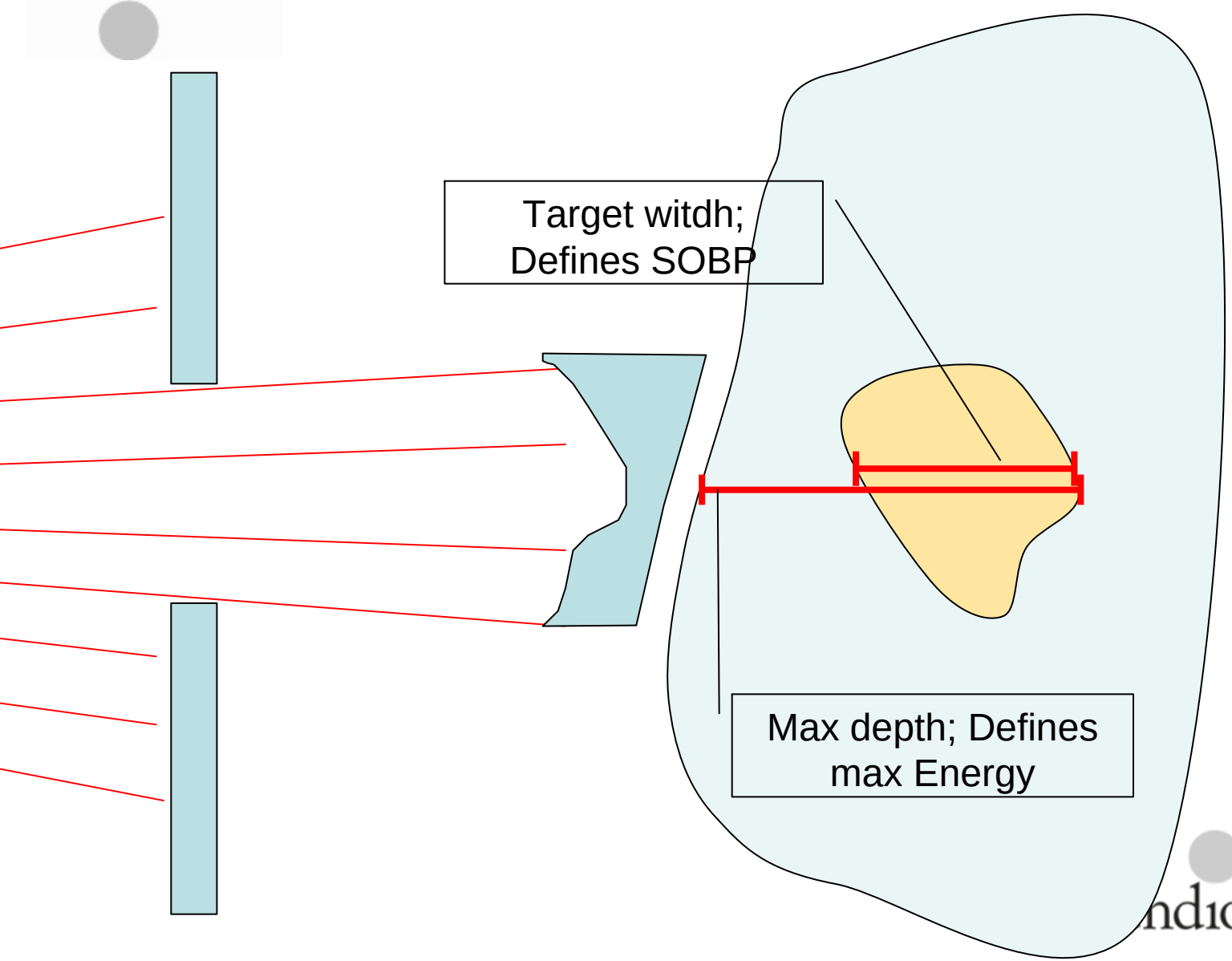
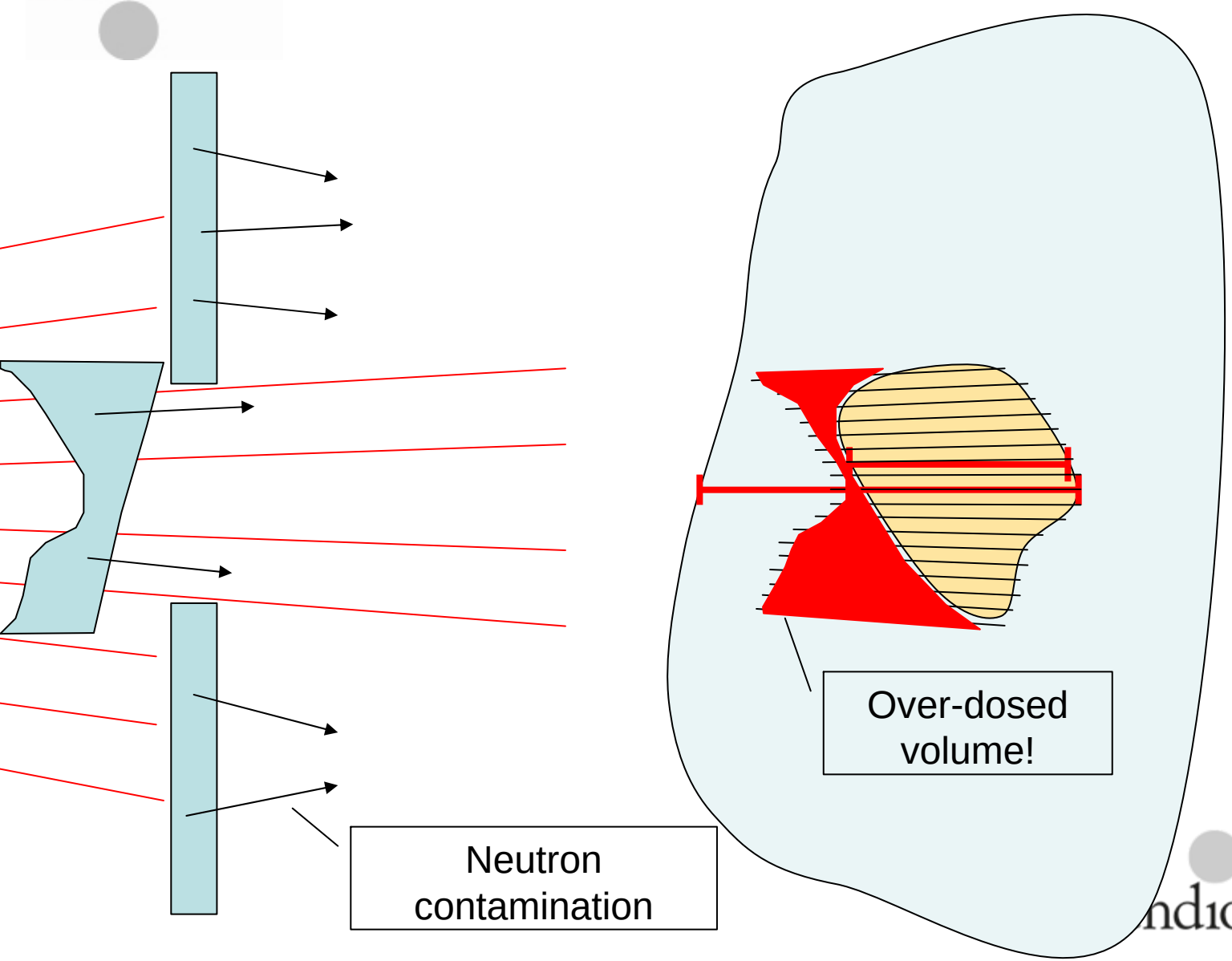
Passive Scattering



ndionkliniken

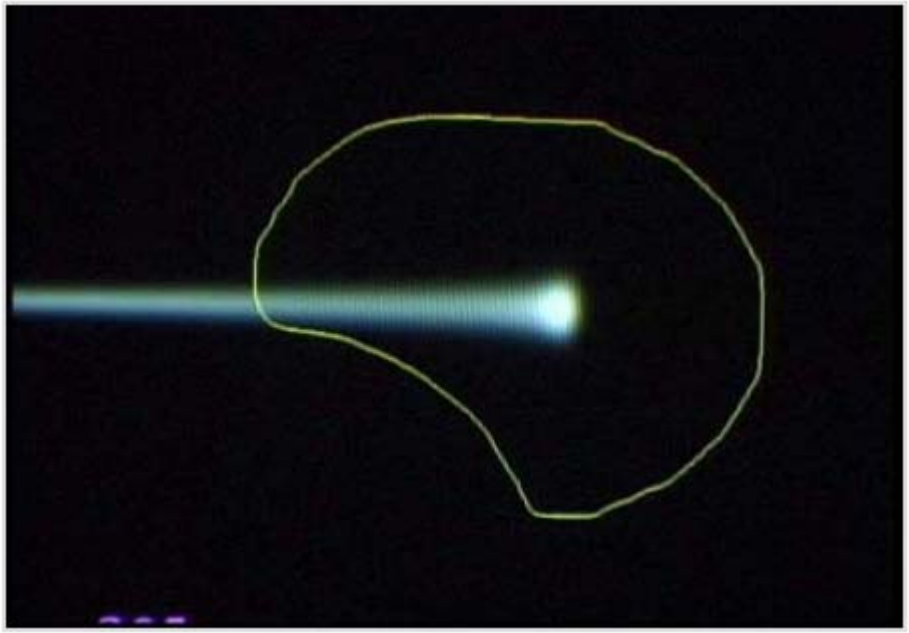
Passive Scattering



ndionkliniken

ActiveVolume Scanning

One single dose spot

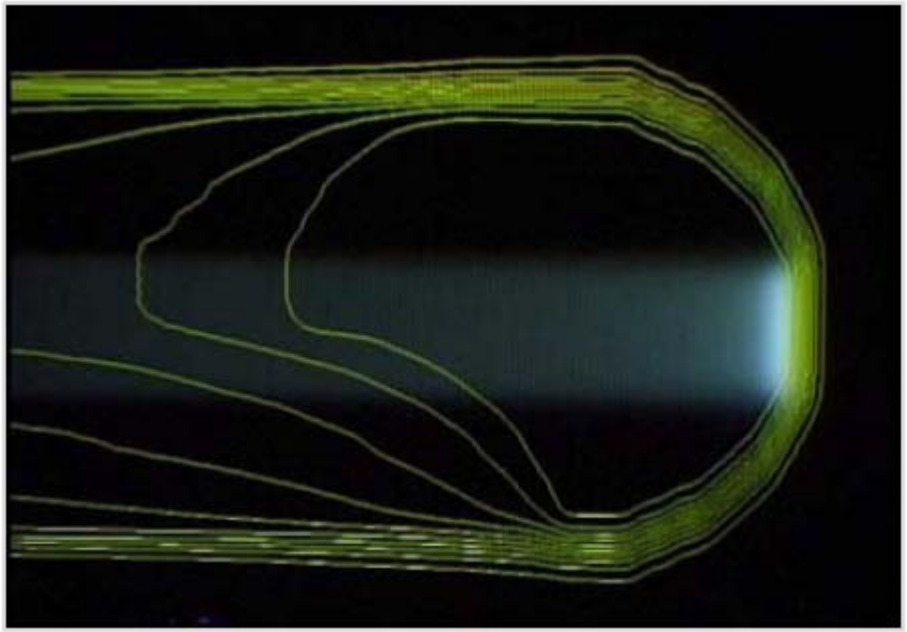


Courtesy of A Lomax, PSI

Skandionkliniken

ActiveVolume Scanning

One layer of dose ”painted”



Courtesy of A Lomax, PSI

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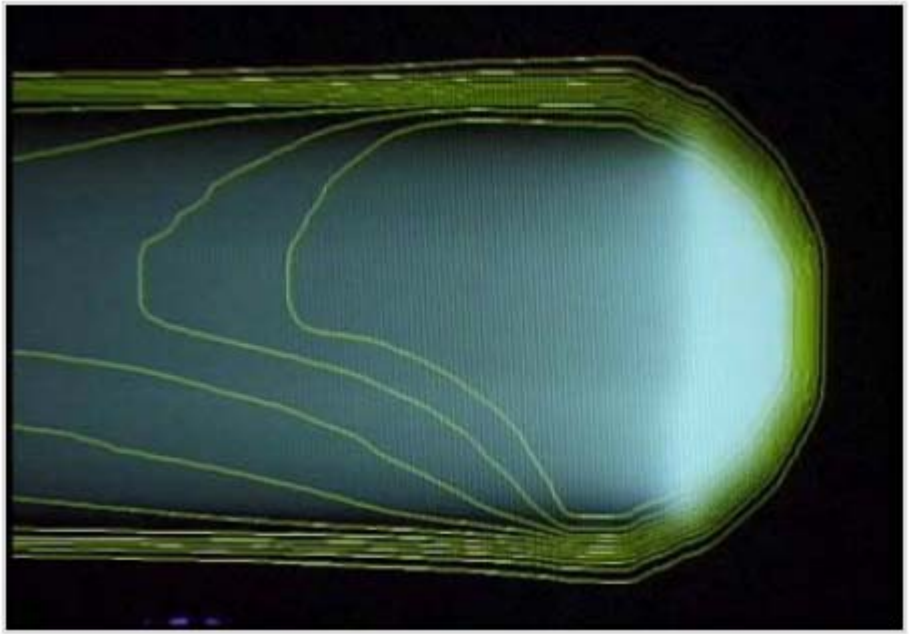
ActiveVolume Scanning

Several layers of dose ”painted”



Courtesy of A Lomax, PSI

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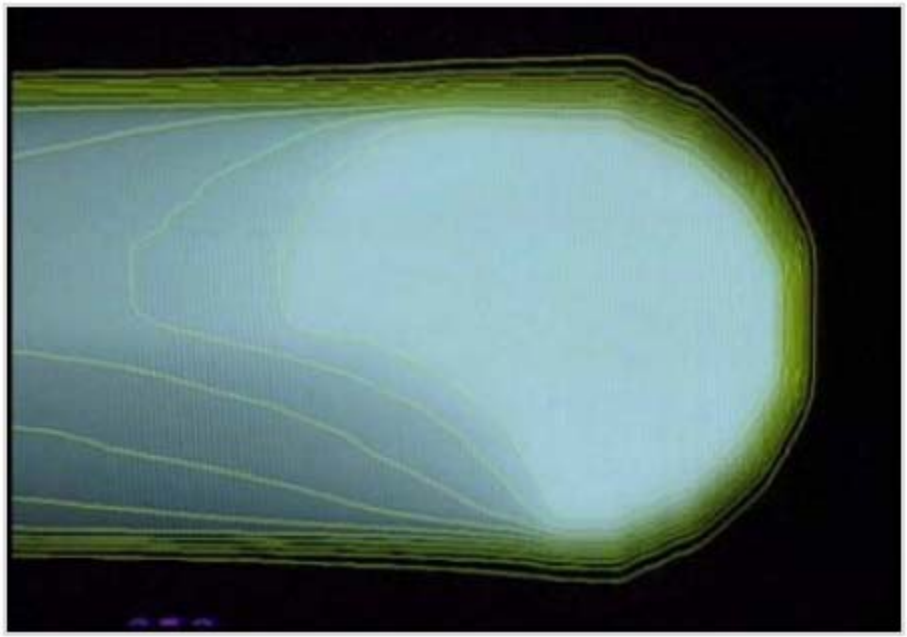
ActiveVolume Scanning

…and the full volume.



Courtesy of A Lomax, PSI

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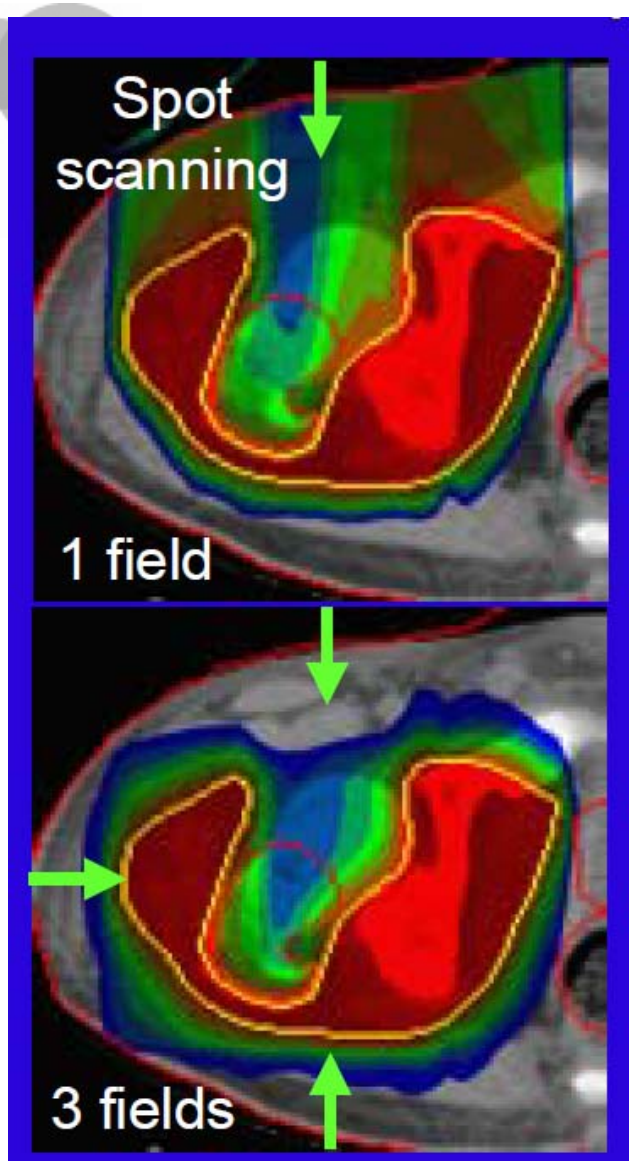

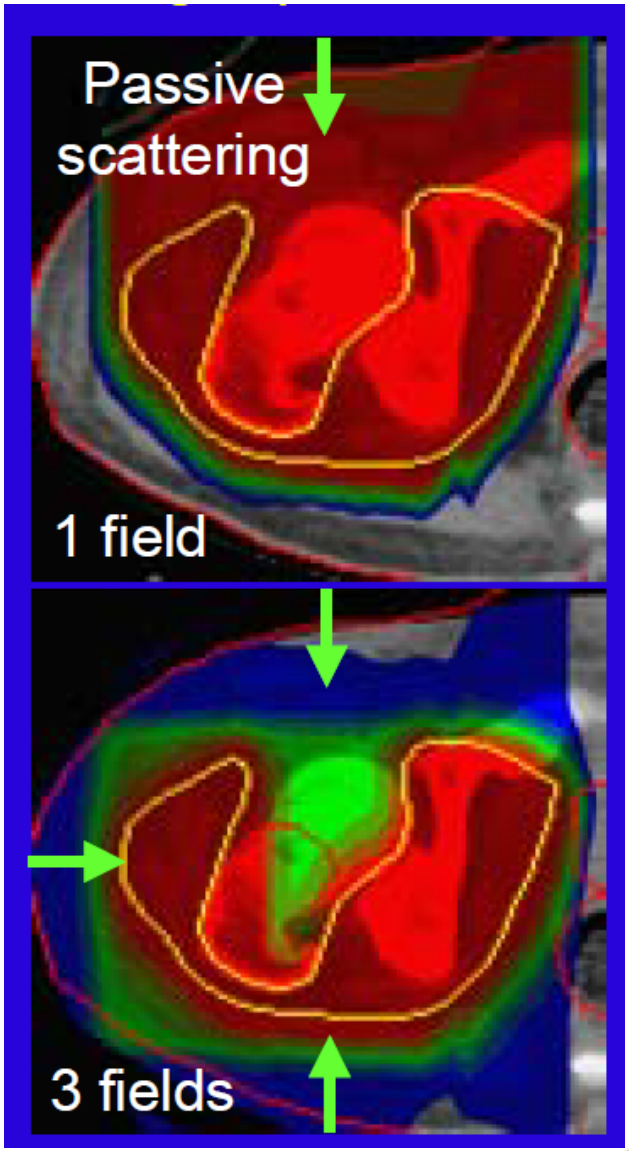

A Lomax, PSI Winter School

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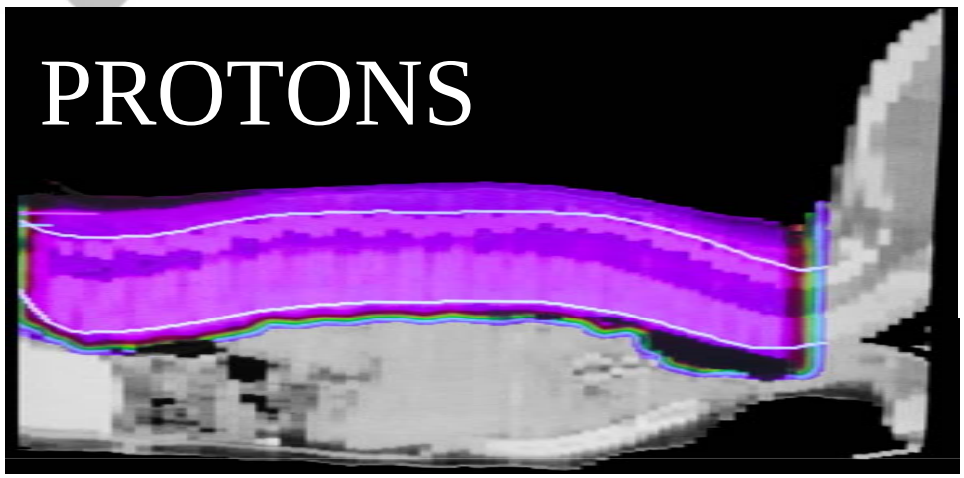
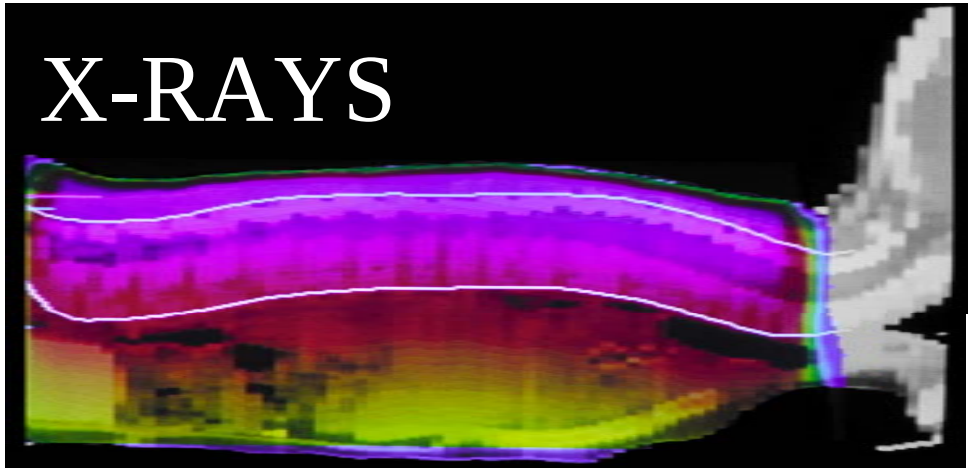
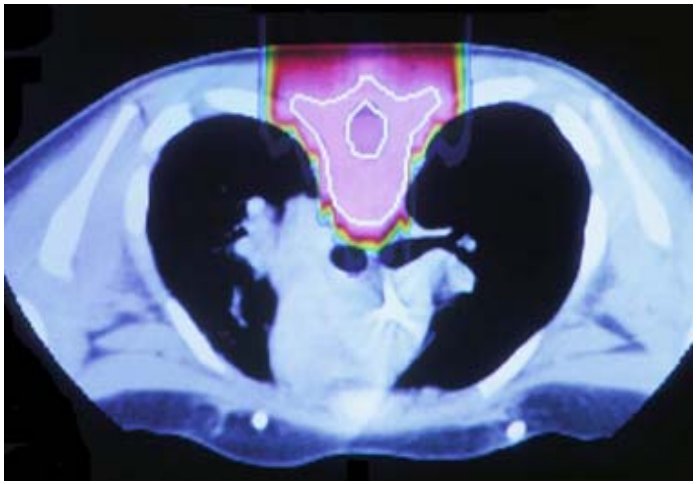
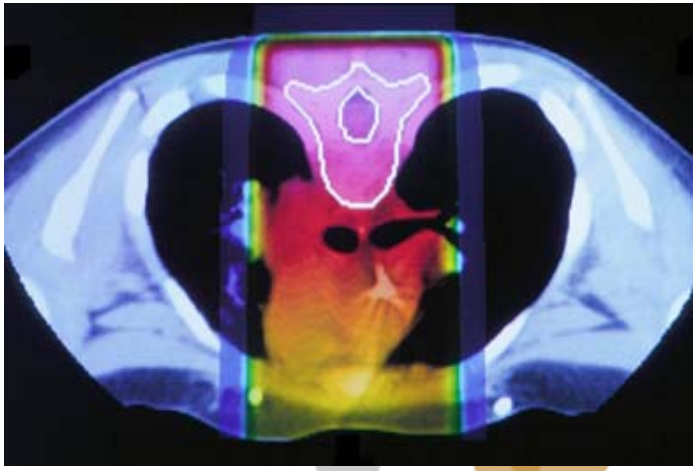
Medulloblastoma









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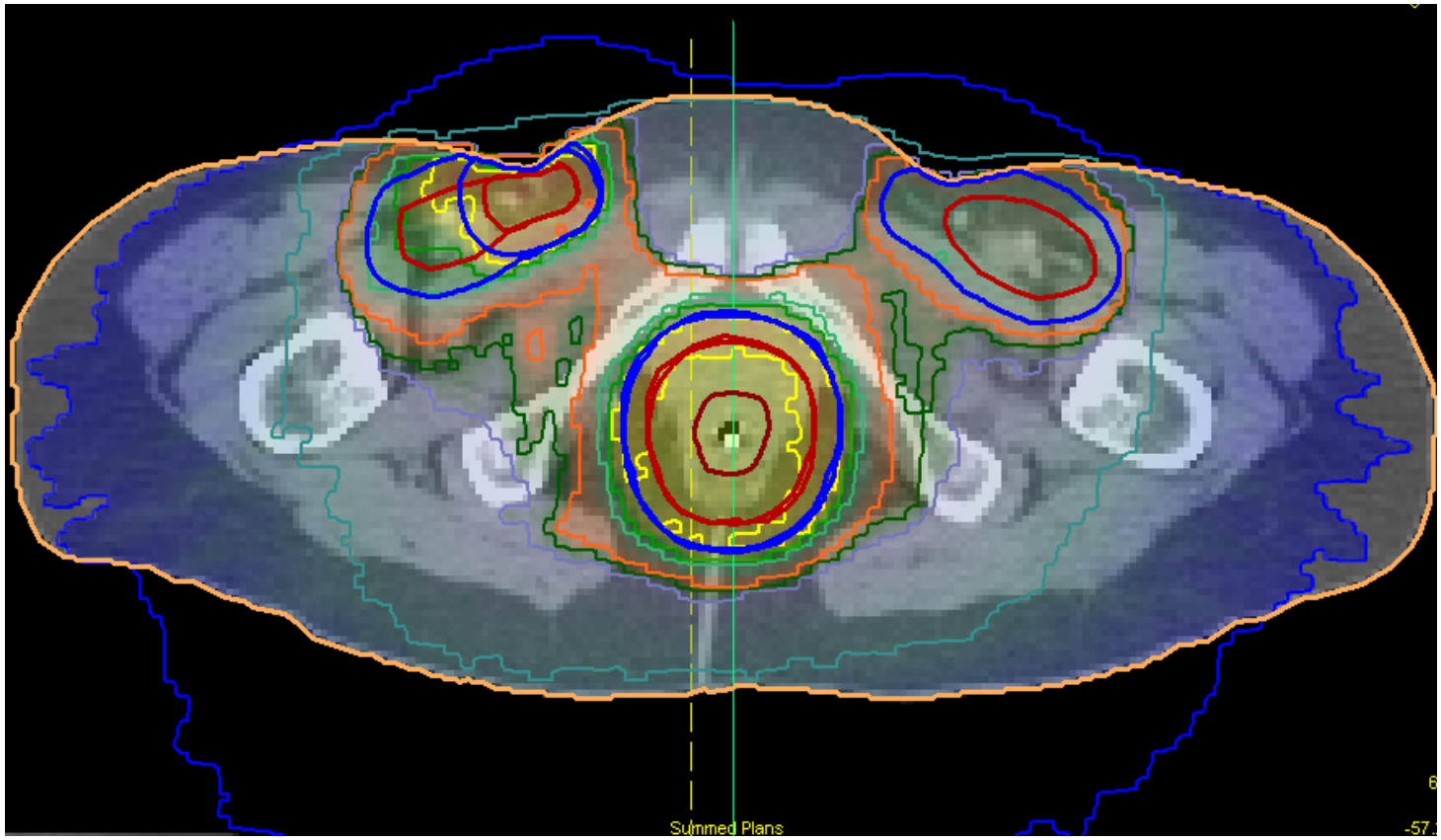
Anal cancer (T2N2), Female 61 y.
Prescription: 46 Gy to PTV1 and 60 Gy to PTV2

Plan 1: Tomotherapy



Nyström, Acta Oncol 2010

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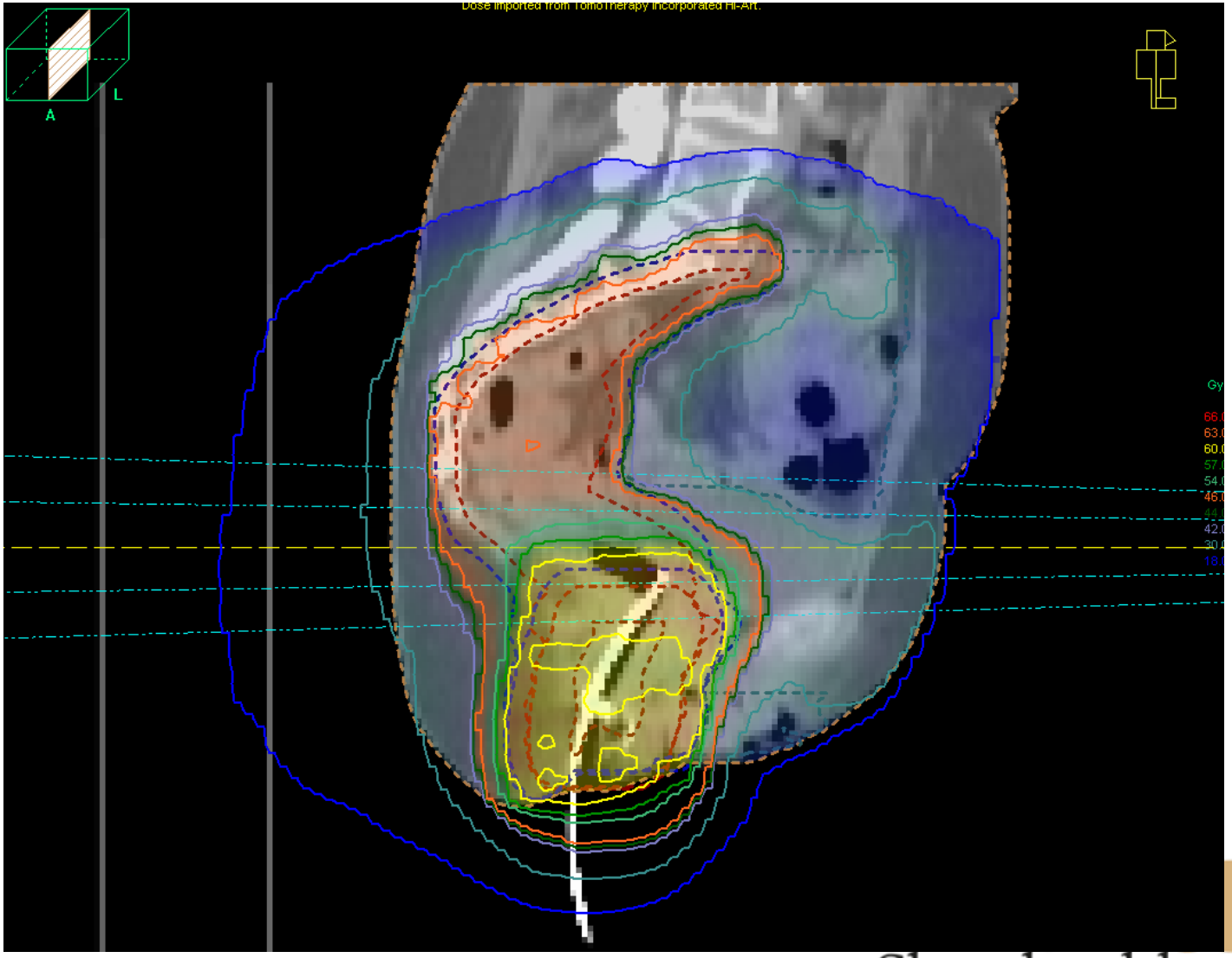
Plan 1: Tomotherapy



Nyström, Acta Oncol 2010

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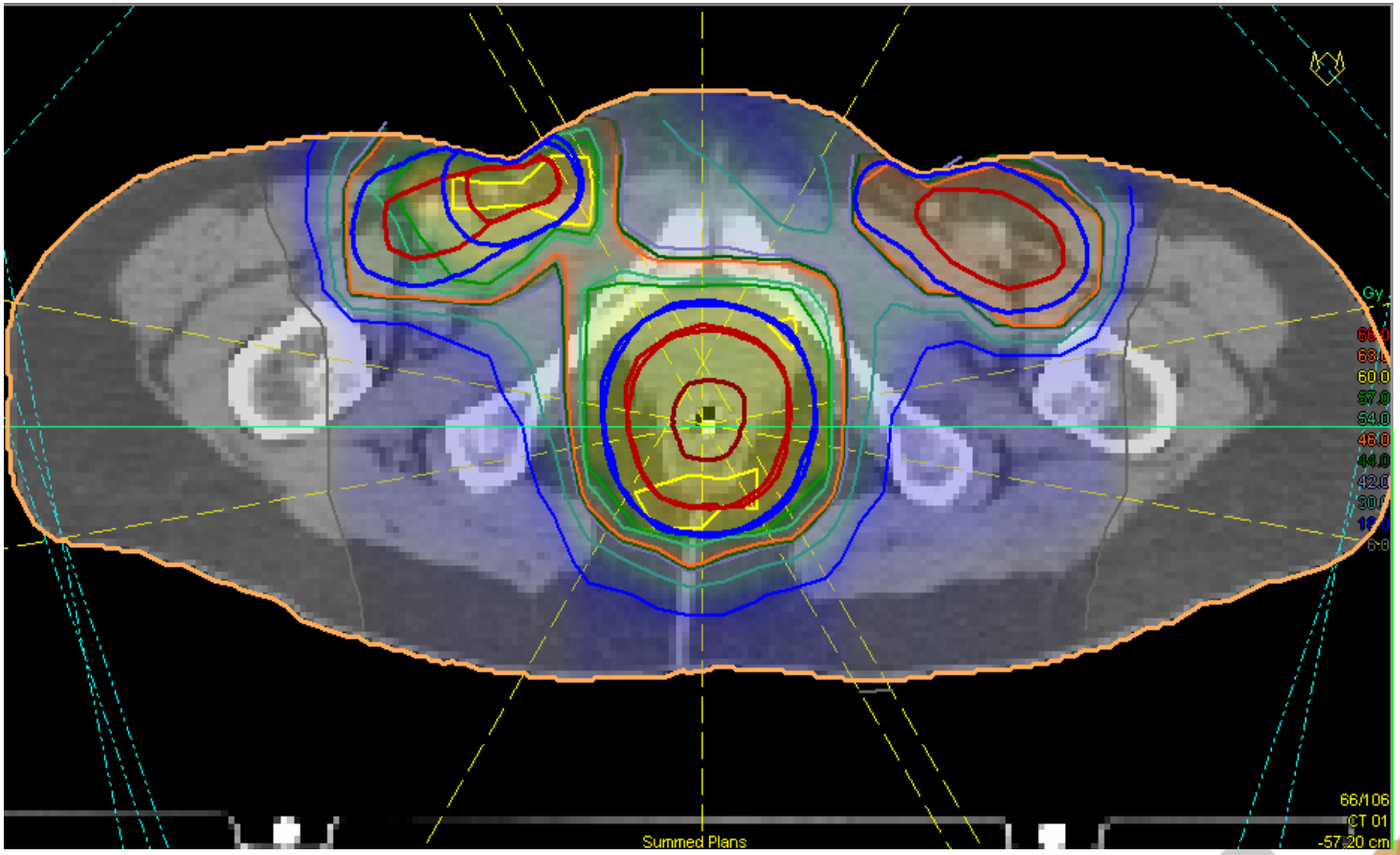
Plan 2: Protons



Nyström, Acta Oncol 2010

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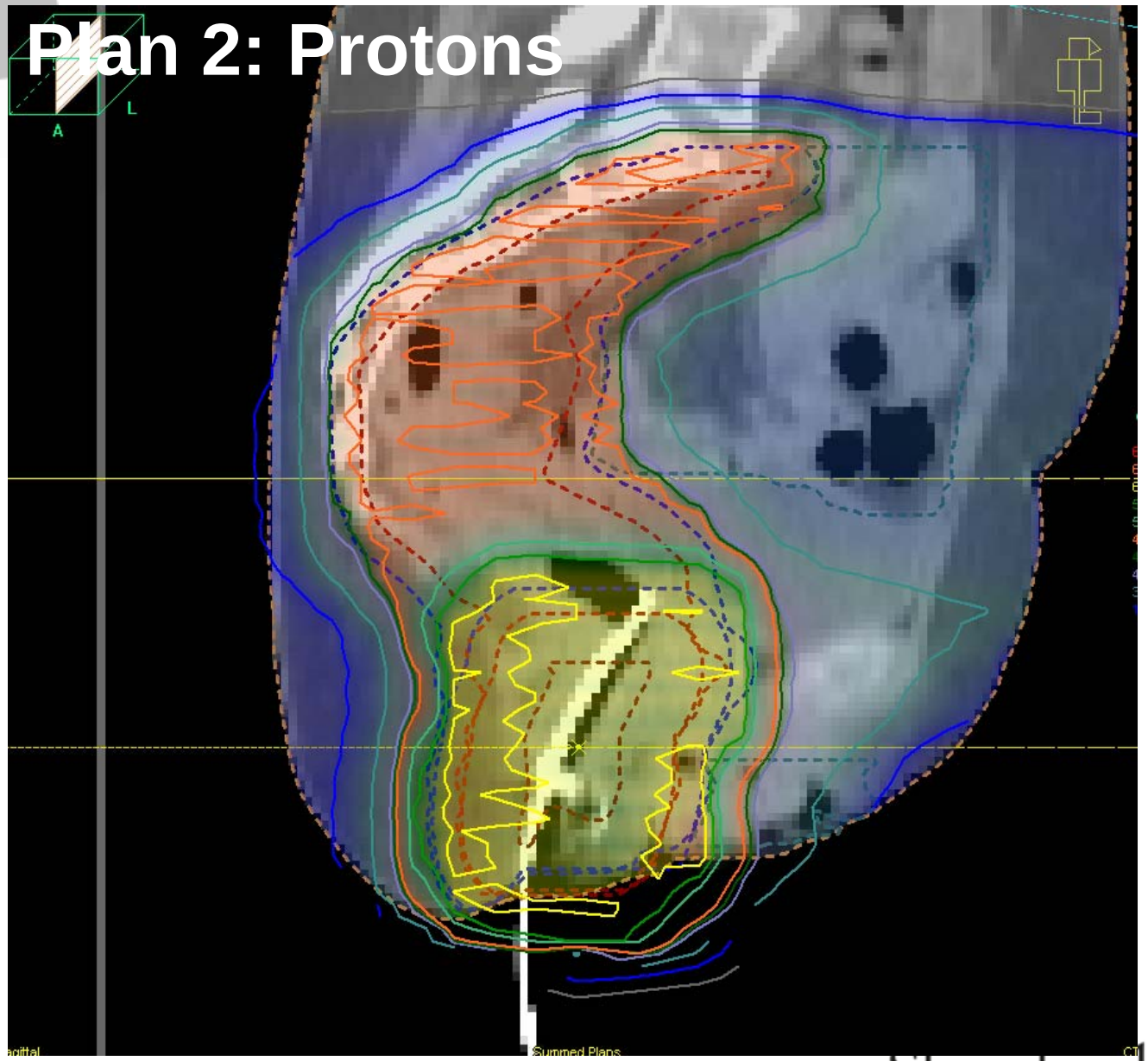
Plan 2: Protons



Nyström, Acta Oncol 2010

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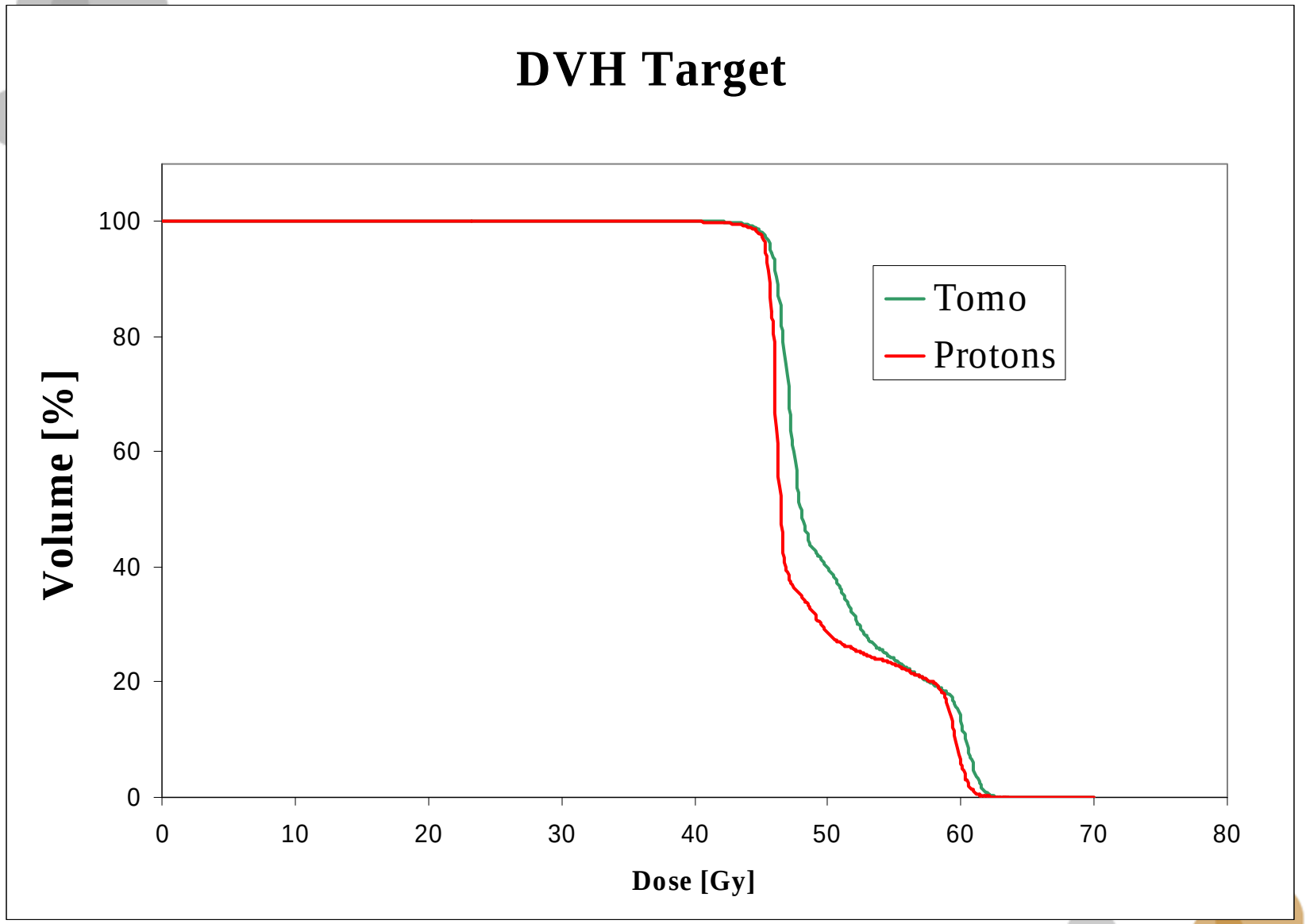

Nyström, Acta Oncol 2010

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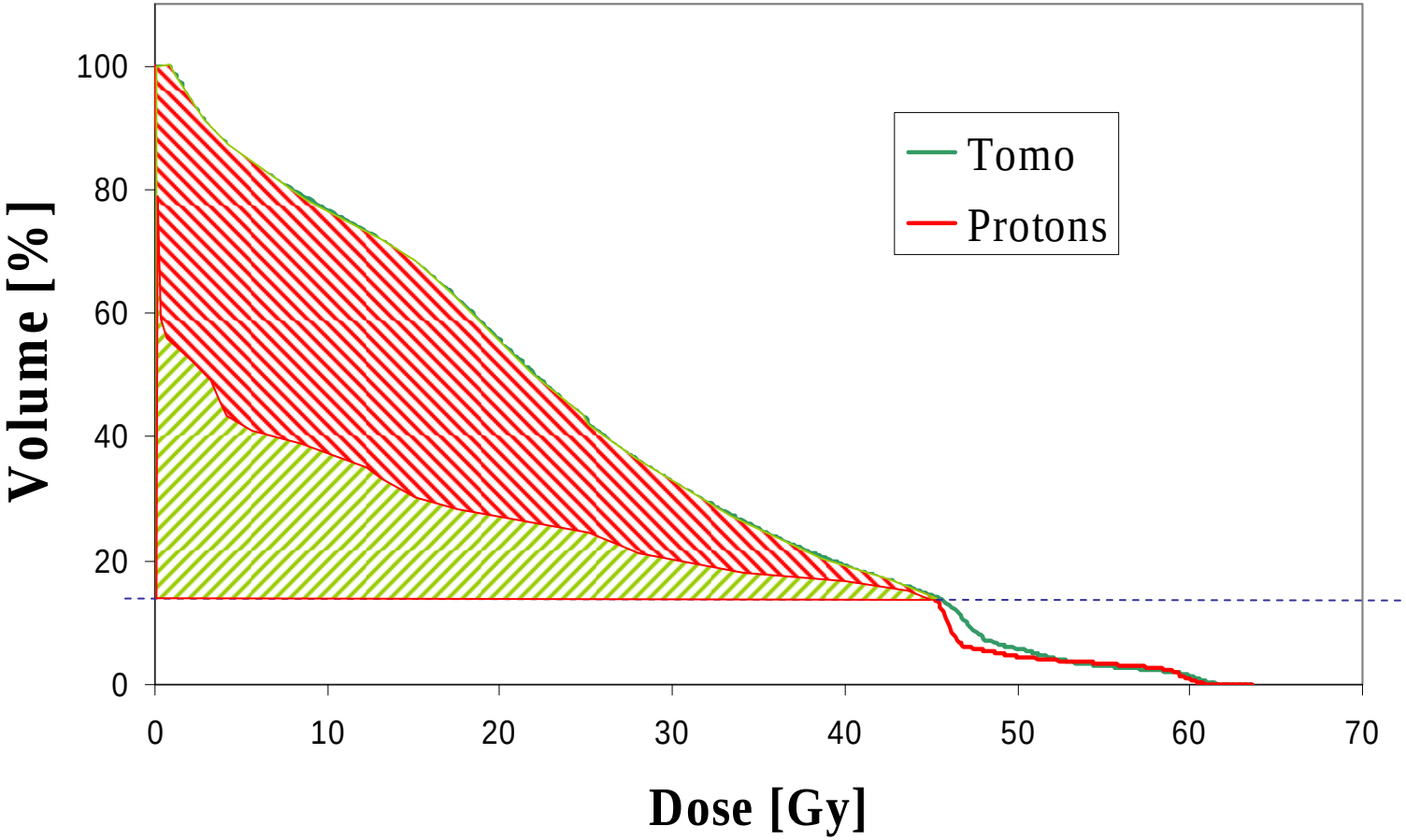
DVH External contour



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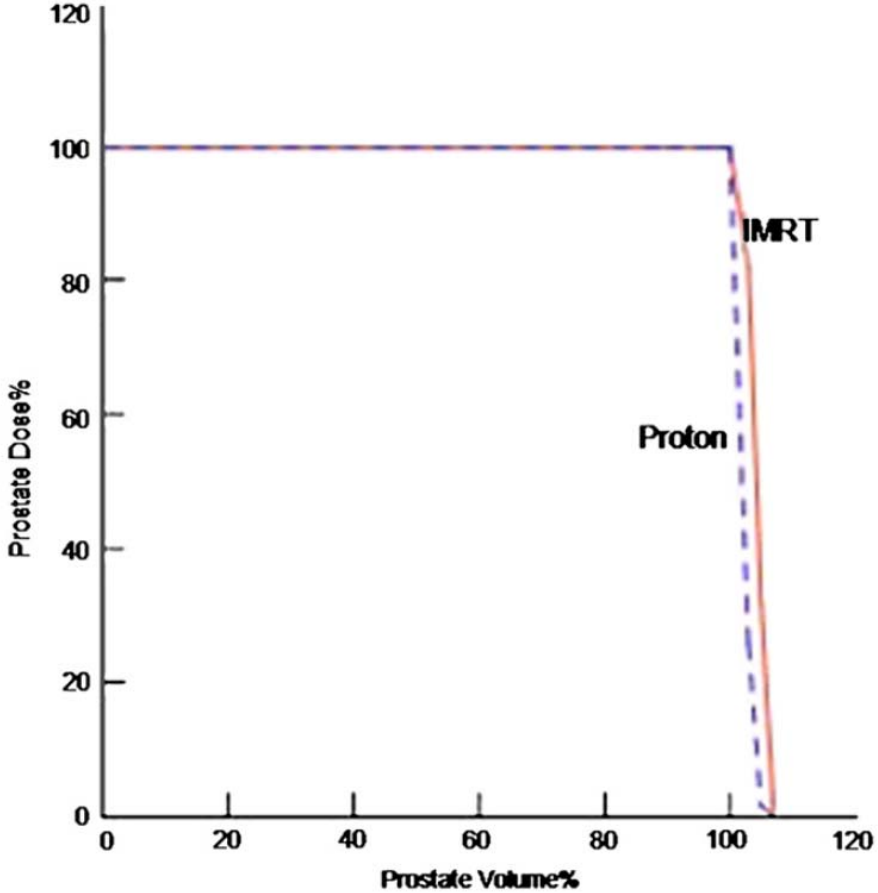

Fig. 1. Combined prostate dose–volume curve for proton therapy and intensity-modulated radiotherapy (IMRT) (n = 20 plans).

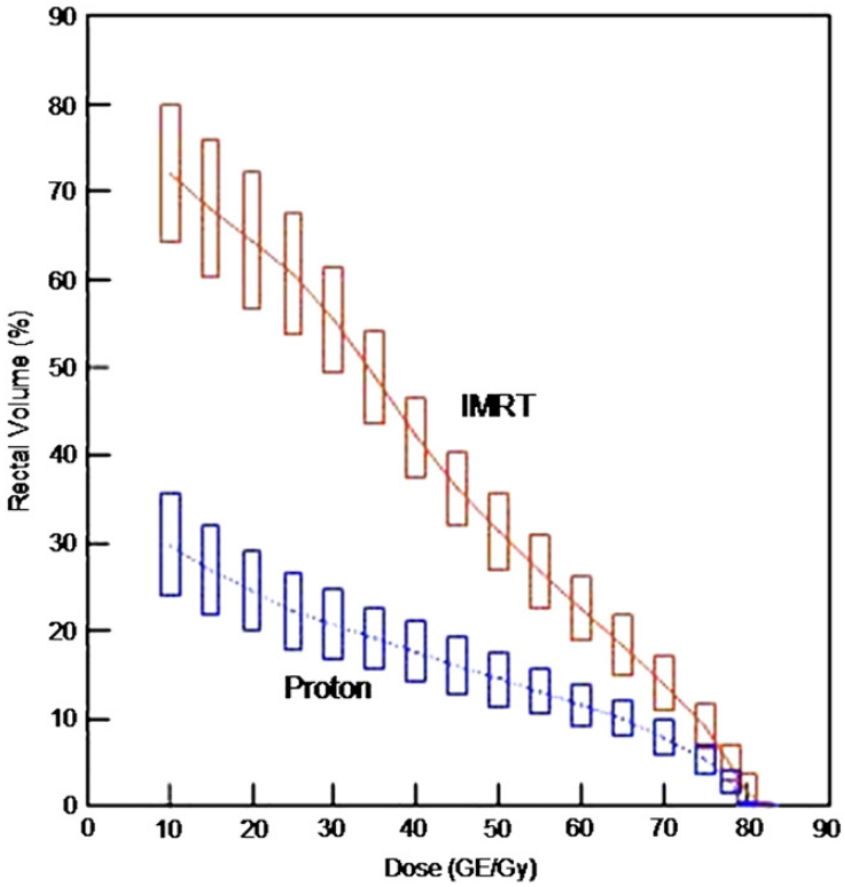

Fig. 3. Combined rectal dose–volume curves for proton therapy and intensity-modulated radiotherapy (IMRT) (n = 20 plans); error box shows 95% standard error.

Vargas *et al*, IJROBP 2008

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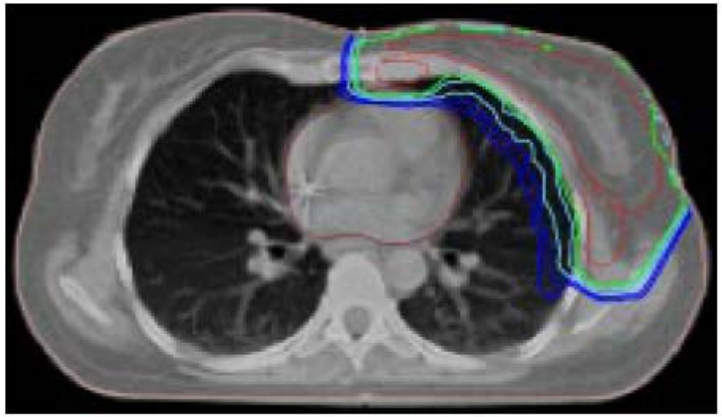
SPTC Svenskt protonterapicentrum

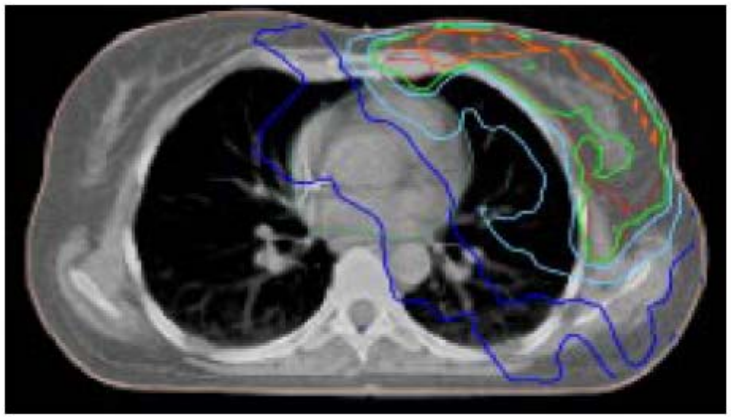
Huvudrapport 2003-10-15 från en utredning om ett

NATIONELLT PROTONTERAPICENTRUM

FÖR CANCERPATIENTER



Bröstcancertumör/protoner
(förklaring på insidan)



Bröstcancertumör/*IMRT-fotoner*
(förklaring på insidan)

Rapporten har tagits fram inom projektet Svenskt protonterapicentrum med deltagande och stöd från
Norrlands universitetssjukhus, Umeå • Universitetssjukhuset i Örebro • Akademiska sjukhuset, Uppsala
Huddinge universitetssjukhus, Stockholm • Universitetssjukhuset i Linköping • Sahlgrenska universitets-
sjukhuset, Göteborg • Universitetssjukhuset i Lund • Universitetssjukhuset MAS i Malmö
Landstinget i Uppsala län • Uppsala universitet

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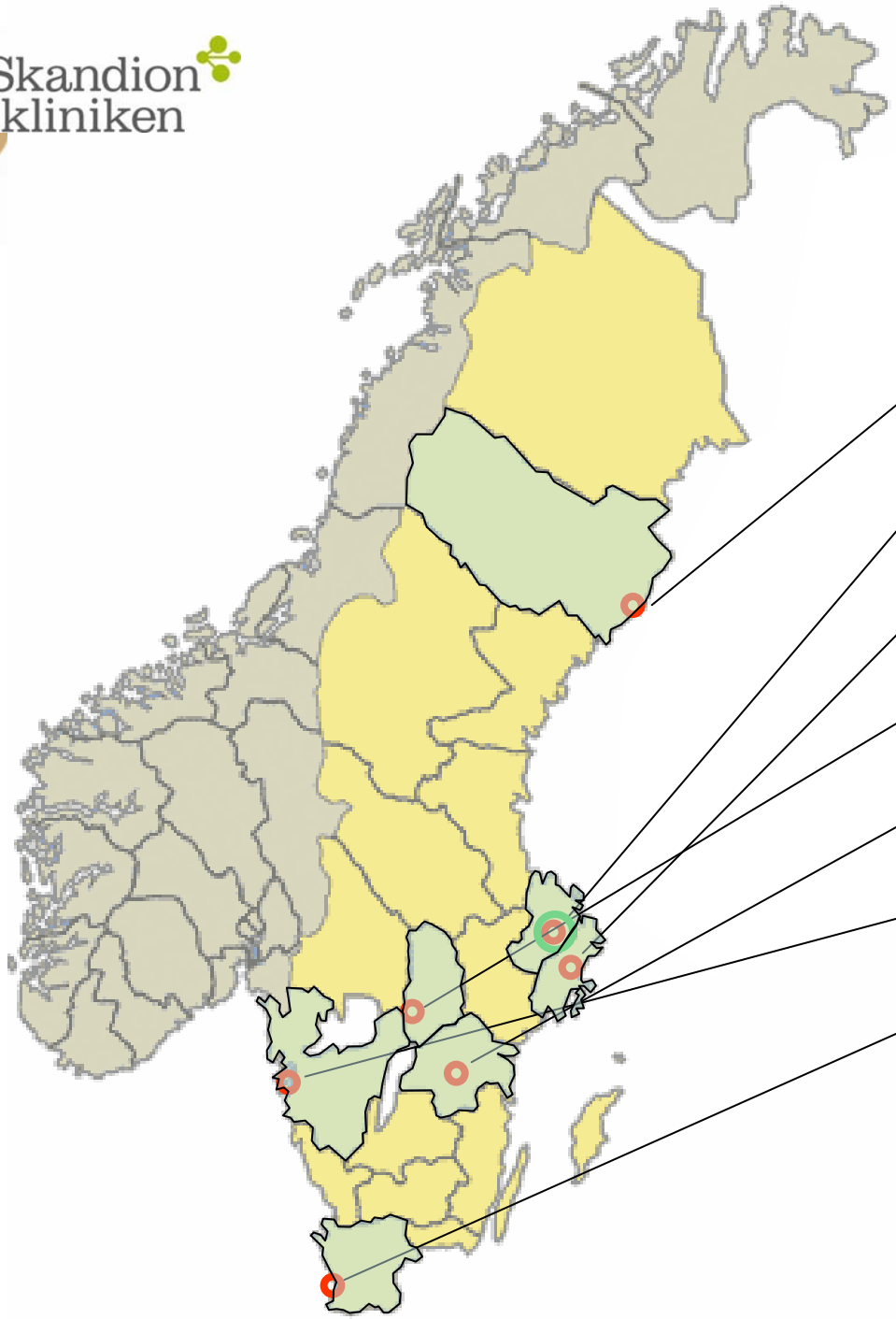

Umeå

Uppsala

Stockholm

Örebro

Linköping

Göteborg

Skåne

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Acta Oncologica, 2006; 45: 1094–1101

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

"Distributed proton radiation therapy"-A new concept for advanced competence support

MIKAEL KARLSSON[1], THOMAS BJÖRK-ERIKSSON[2], OLOF MATTSSON[3], SÖREN MATTSSON[4], ANDERS MONTELIUS[5], PER NILSSON[6] & BJÖRN ZACKRISSON[7]

[1]*Radiation Physics, Department of Radiation Sciences, Umeå University, Umeå, Sweden,* [2]*Department of Oncology, Sahlgrenska University Hospital, Gothenburg, Sweden,* [3]*Department of Medical Physics and Biomedical Engineering, Sahlgrenska University Hospital, Göteborg, Sweden,* [4]*Department of Radiation Physics, Malmö University Hospital, Malmö, Sweden,* [5]*Department of Radiation Physics, Academic Hospital, Uppsala, Sweden,* [6]*Department of Radiation Physics, Lund University Hospital, Lund, Sweden, and* [7]*Oncology, Department of Radiation Sciences, Umeå University, Umeå, Sweden*

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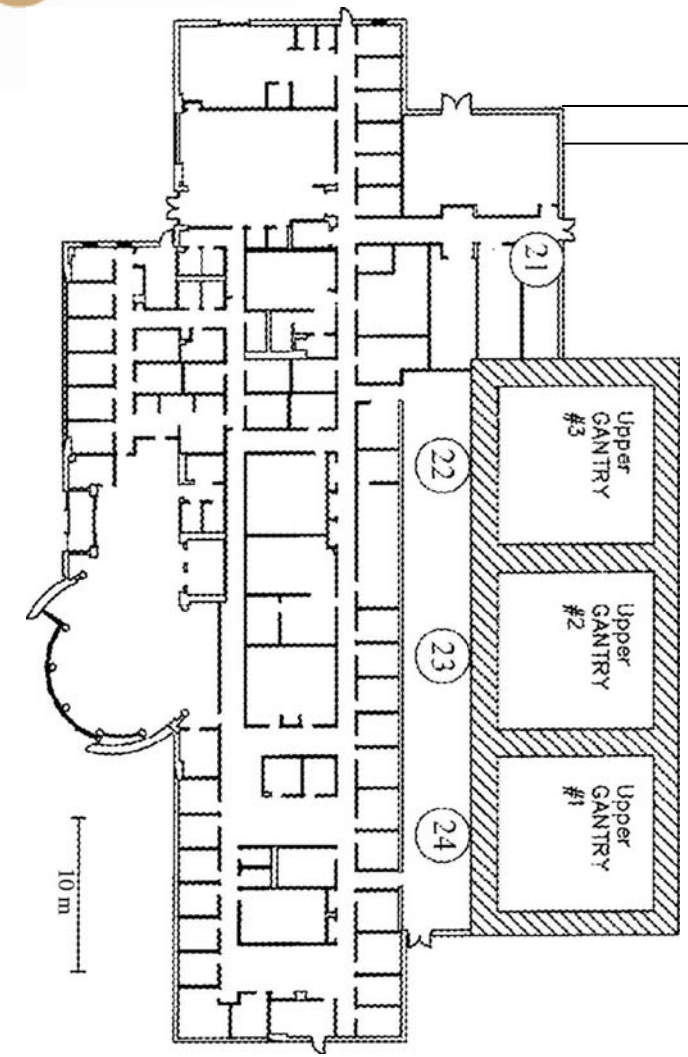

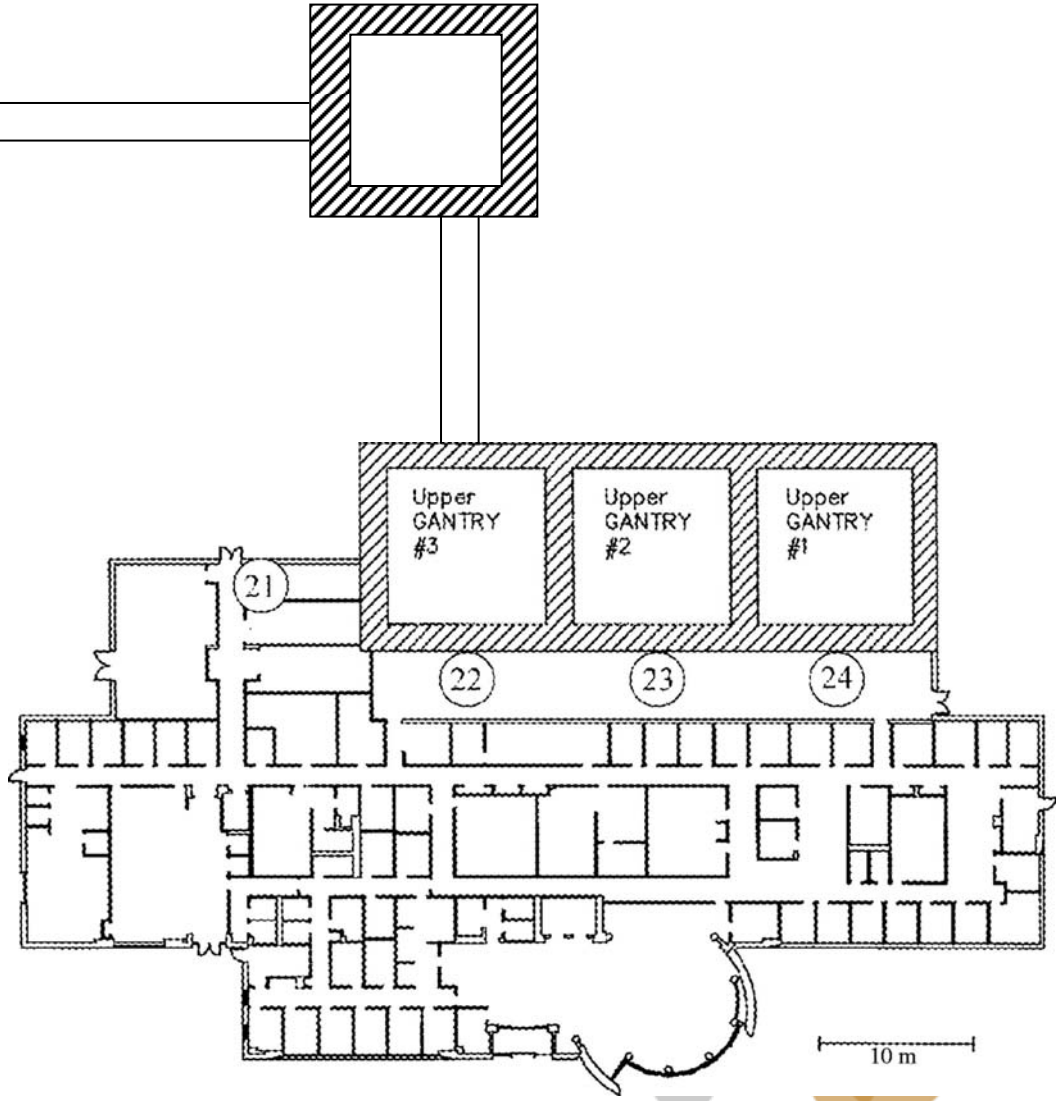

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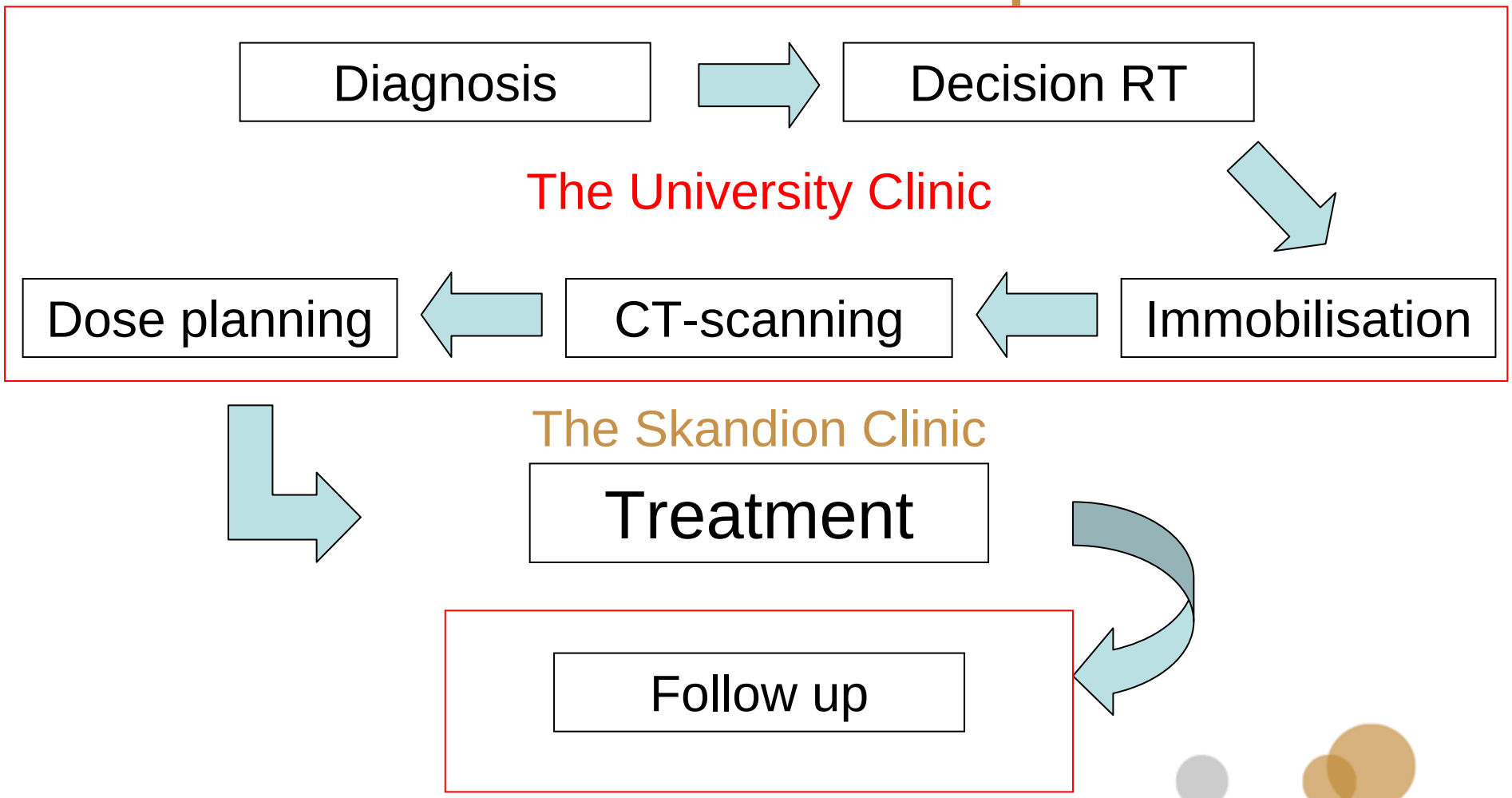
The distributed competence



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The distributed competence: Pros

- All the national competence gathered
- Increased consensus for treatment strategies

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Video conferences

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The distributed competence: Pros

- All the national competence gathered
- Increased consensus for treatment strategies
- Synergy effects for RT as a whole
- Excellent basis for clinical studies
- Ensures patient recruitment

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The distributed competence: Cons

- Competence has to be built everywhere
- Consensus may be difficult to reach
- QA may be quite complicated…
- Sharing and defining responsibilities…
- “Someone-else-ism”

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The distributed competence - A big challenge!

- Prior to clinical start we need to:
  - Agree on clinical protocols
  - Design clinical trials
  - Tune our logistics and co-operation
  - Design, install and tune our IT-systems
  - Educate and train ourselves

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The distributed competence:
What have we done to make it work?

- A special model for billing has been developed
- The Skandion Treatment School has started
- Collaboration with Trento
- National and international courses
- Working parties on a variety of topics

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Billing

- The construction of the billing system shall ensure that patient refferals based on medical need
- 50 % paid as a subscription and 50 % per treatment fraction

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Expected annual cost:

Ca 19,5 M€

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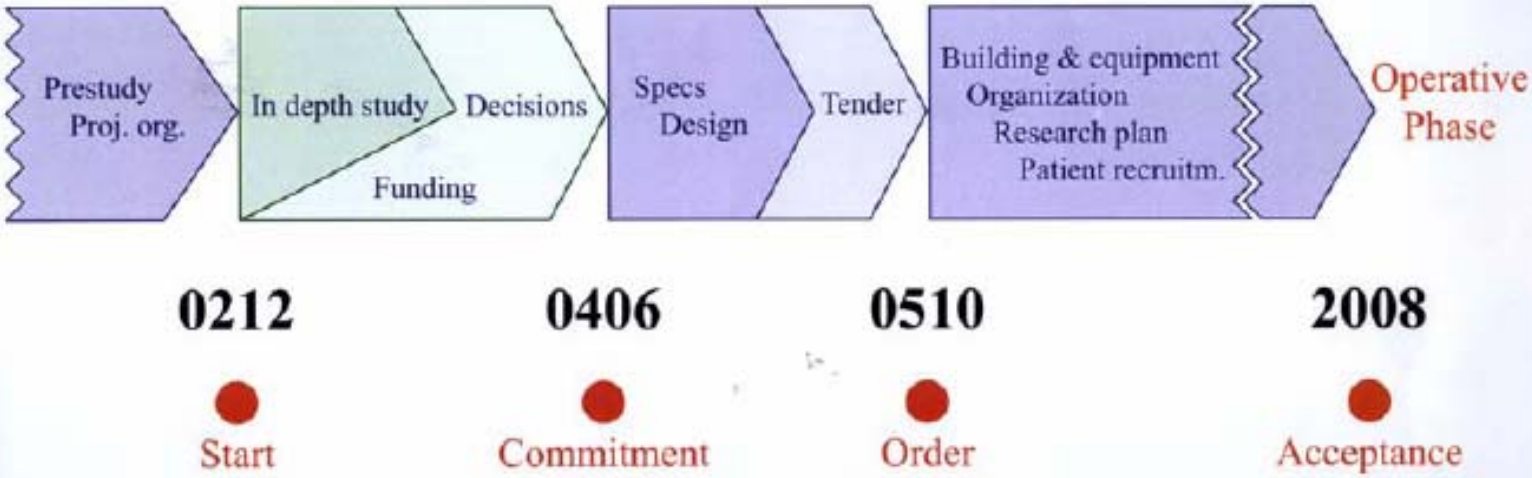
Project time schedule



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9:e Juni 2011

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webbkameror.se
NCC
6:e Feb 2012
2012-02-06 CET 12:04:03


webbkameror.se
NCC
4:e Feb 2013
2013-02-04 CET 08:20:04

webbkameror.se

NCC

8:e Jul 2013

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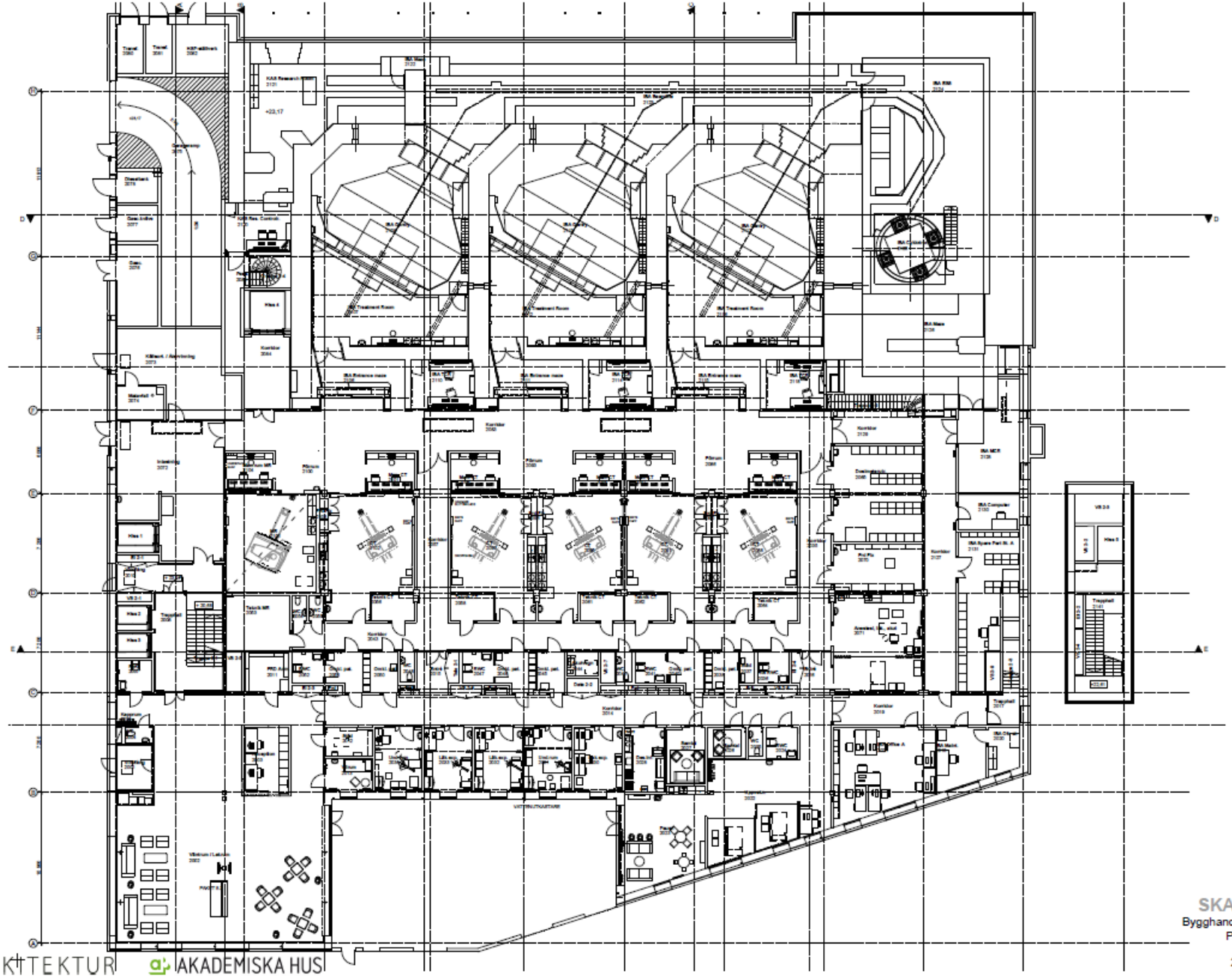

SKANDION
Bygghandlingsskede
Plan 0 Entré
1:250
2012-07-04

LINK ARKITEKTUR AKADEMISKA HUS

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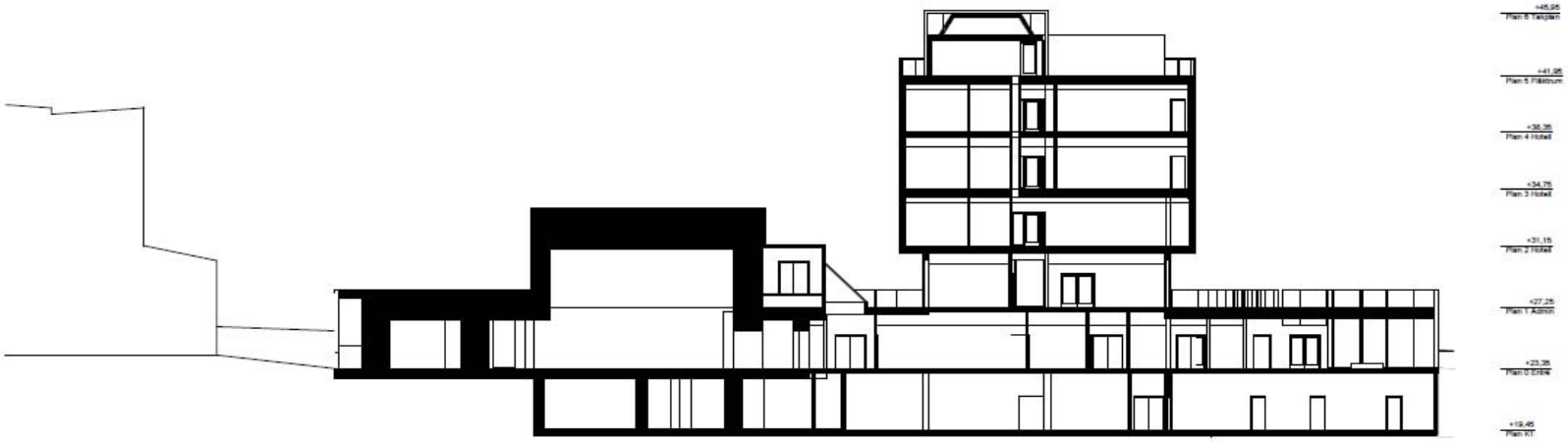

LINK ARKITEKTUR AKADEMISKA HUS

SKANDIONKLINIKEN
Preliminär Programhandling
Sektion A-A
1:250
2010-12-22

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Thank You!

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