Commissioning of the Jyväskylä MCC30/15 Cyclotron

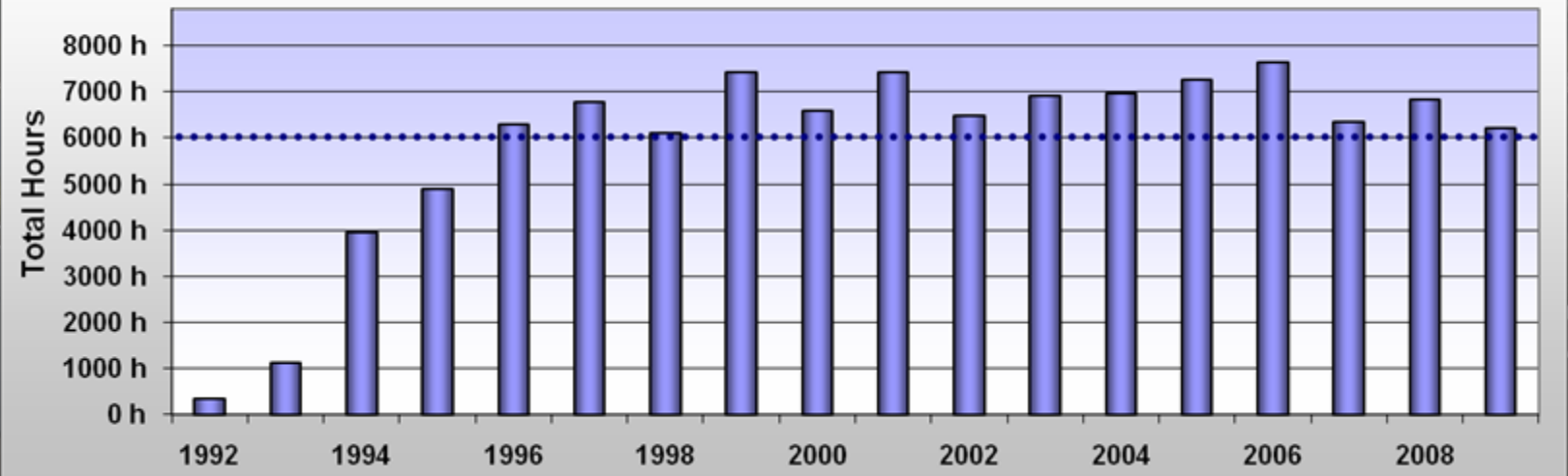
P. Heikkinen
JYFL, Finland

Cyclotrons'10, Lanzhou, China
September 7, 2010

UNIVERSITY OF JYVÄSKYLÄ

Operation of the Jyväskylä Cyclotron

JYFL



- **Very little time for maintenance**
- **Practically no time for machine development**
- **1/3 of the beams could be accelerated with a 30 MeV H^- cyclotron**

- 30 different isotopes (p, …, Xe)
- 20 – 30 % protons
  - mainly for proton induced fission and 123-I production

New cyclotron

- First negotiations in 2004 with NIIEFA and Machinoimport
- Two years of negotioations and waiting…
- 30 MeV H^- cyclotron MCC30/15
  - from NIIEFA (Efremov Institute, St. Petersburg)
  - as a partial compensation of former Soviet Union debt to Finland (Inter-governmental agreement between Finland and Russia, August 15, 2006)
  - Full system with two beam lines

Contract, February 20th, 2007

University of Jyväskylä:

Rector Aino Sallinen

Adm. Director Erkki Tuunanen

Alexey Lyutik, Machinoimport

Mikhail Vorogushin, NIIEFA

(Valery Shlyamin, Russian Trade Representative)

MACHINOIMPORT

JOINT STOCK COMPANY
FOREIGN ECONOMIC ASSOCIATION
RF,119330, Moscow, Mosfilmovskaya str. 35

Tel. +7 (495) 981-99-64, 143-87-97 Fax +7 (495) 143-87-39
e-mail: msm@machim.ru

20.06.2007. Our Ref № 50-0705/081

To Your Ref. № _____ Dt. _____

University of Jyvaskyla, Finland
Department of Physics
Attn.: Mr. Pauli Heikkinen
e-mail: Pauli.Heikkinen@phys.jyu.fi

Dear Mr. Heikkinen,

We are pleased to inform you that our mutual Contract No 50-0701/052174 dated 20.02.2007. for the delivery of Cyclotron was finally approved by the Russian Authorities on 19th of June 2007. So, this date could be the date of coming the Contract into force if you have already received the approval of the Ministry of Trade and Industry of Finland. Please kindly confirm that as soon as possible order we could give official notification the Contract (invoice with TAP P will be forwarded for you

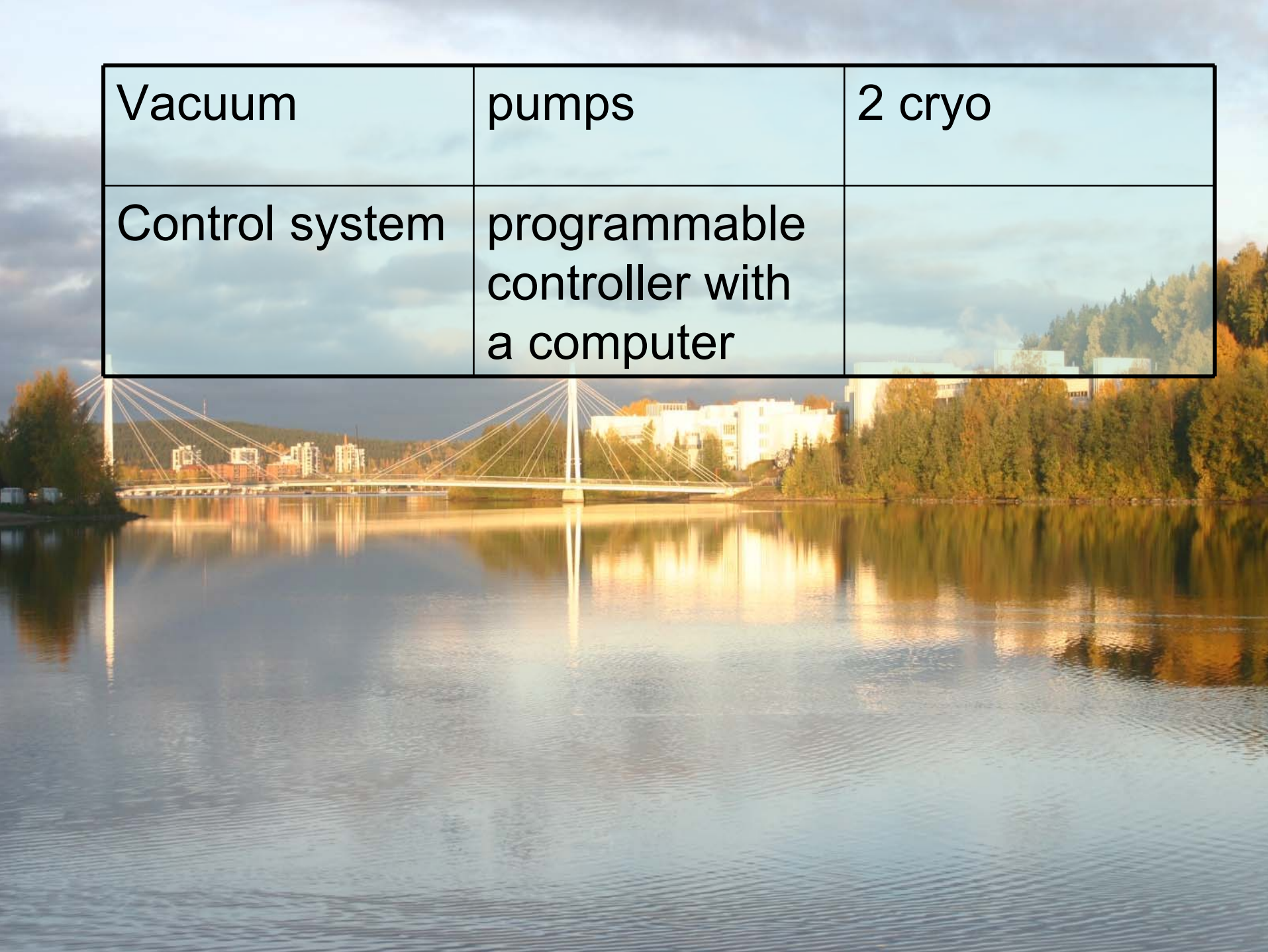
Looking f

Order placed 19th of June, 2007

Specifications

Beam	H^-	18 – 30 MeV
	d^-	9 – 15 MeV
	beam current	100/50 μA
Power consumption	Stand by	< 15 kW
	Beam on	<120 kW
Magnetic structure	pole diameter	140 cm
	sectors	4
	<B>	1.365 T
	coil power	14 kW
	weight	46 t

RF-system	number of dees	2
	dee angle	42 deg
	frequency	40.68 MHz
	Max dee voltage	40 kV
	dissipated RF power/dee	<8 kW
	RF-gen output power	25 kW
Ion source	type	Multi-cusp
	location	external
	max power from the mains	20 kW
	current	1.5/0.75 mA



Vacuum	pumps	2 cryo
Control system	programmable controller with a computer	


Building
Summer 2008


2008-08-28


2009-03-23


2009-04-28
TIKKANOSTOT
0400-244331
NOSTAA ASENTAA


2009-06-30

Installation of the MCC-30/15 Cyclotron

- The arrival delayed to August
- Finishing of the building (cooling, etc.) delayed as well
- First trucks arrived on August 7
  - Everything except the magnet
- Magnet arrived on August 10
- First beam tests in November 2009
- Final Acceptance Tests in April 2010


2009-08-07
LOKOMO


2009-08-10


9:20 pm


АТ 9532 76
RUS


FAYMONVILLE
TRAILERS TO THE MAX


What do we do now?


The distance to load is now bigger. Can the P-hall roof stand the extra counter weight?
NOSTOKONEPALVELU

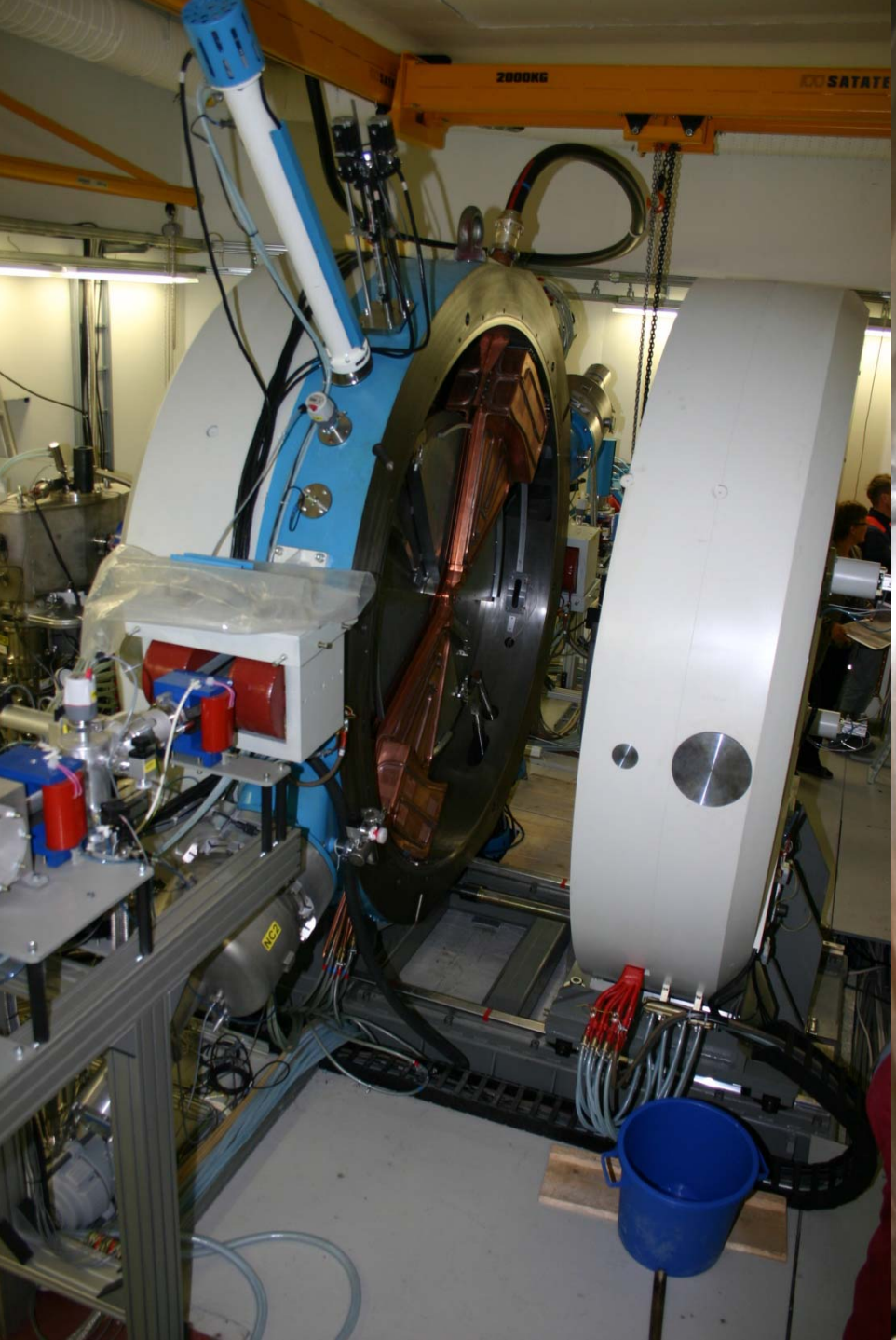

Yes!

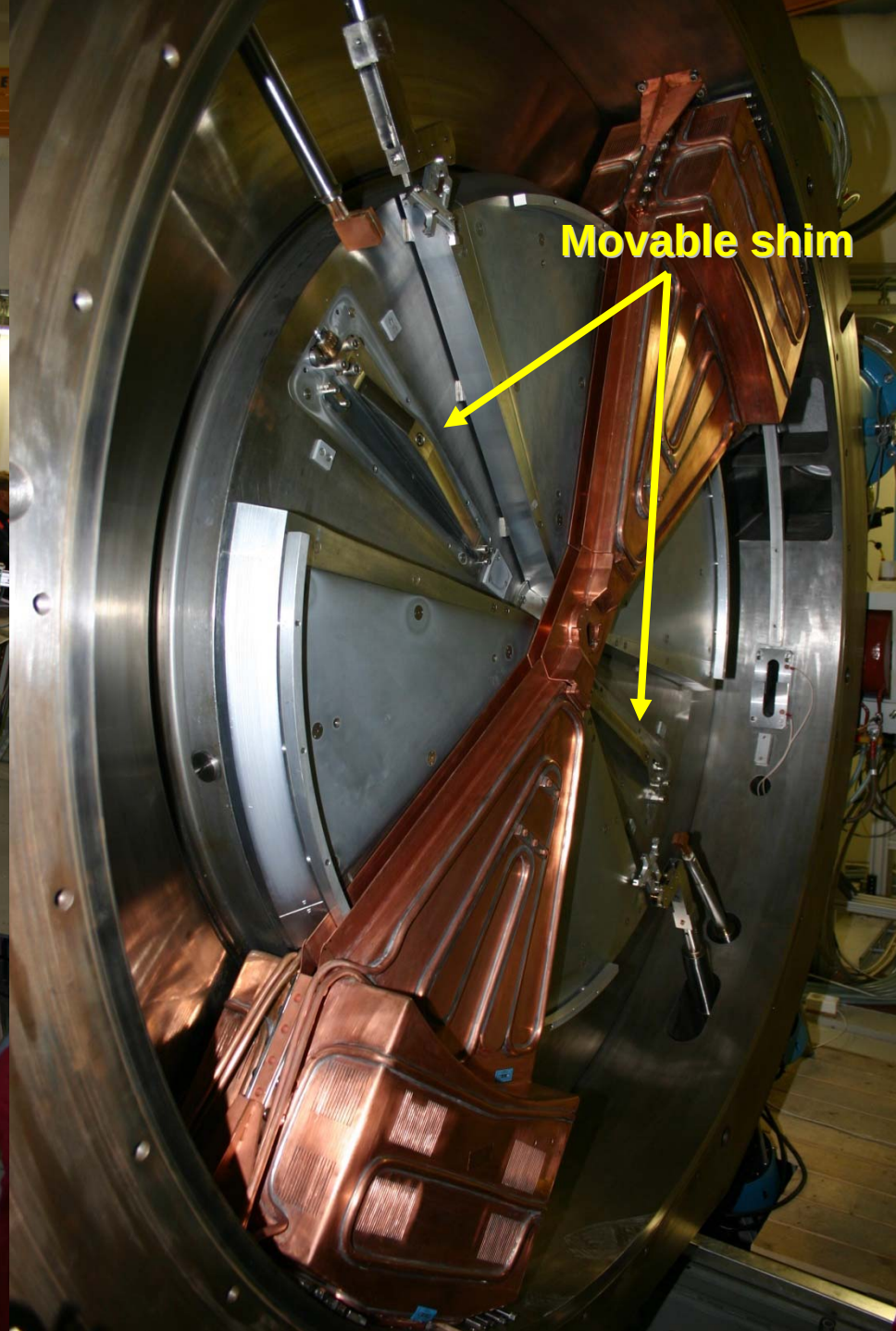

NOSTOKONEPALVELU

The New MCC30/15 Cyclotron / JYFL

2009 © Ari Lehtiö

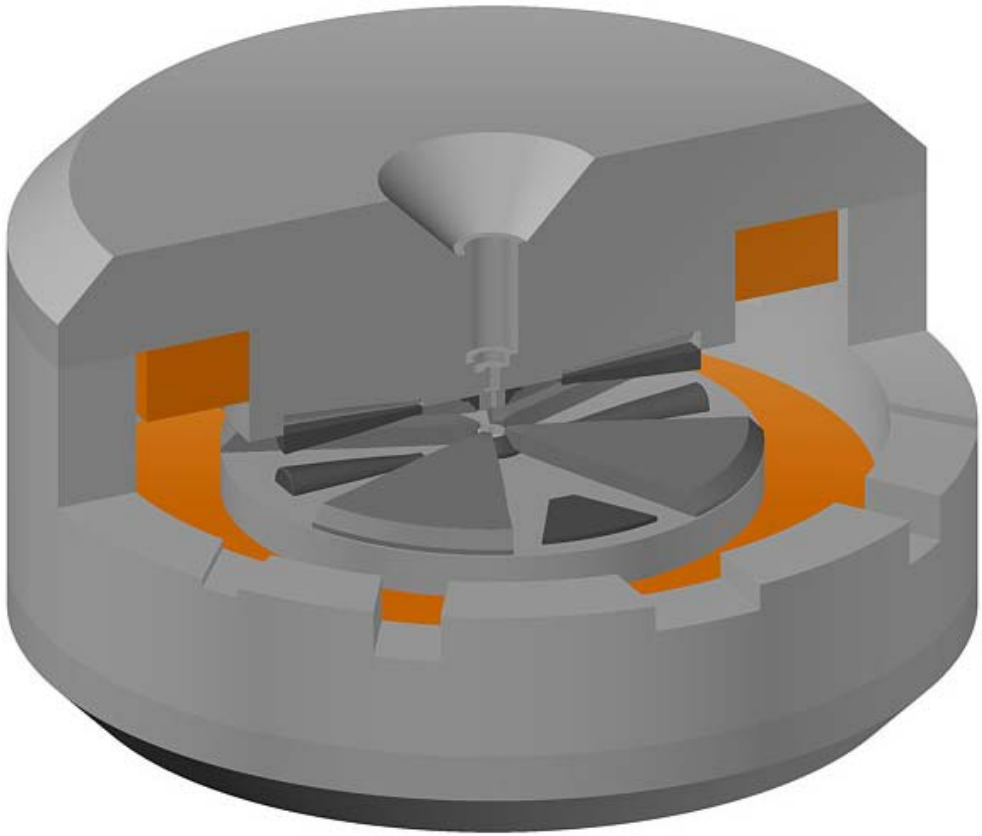

01:15 am

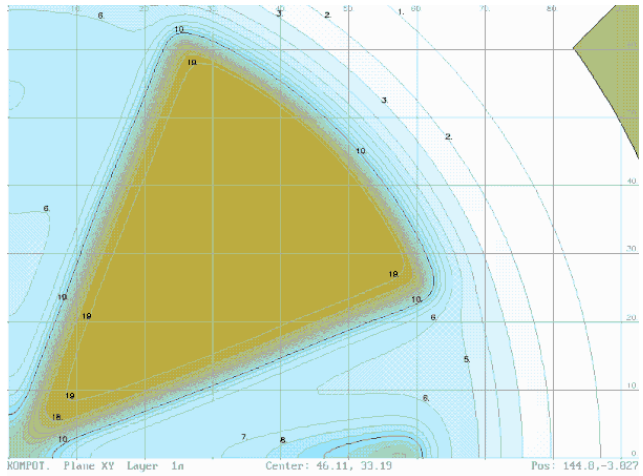

2000KG

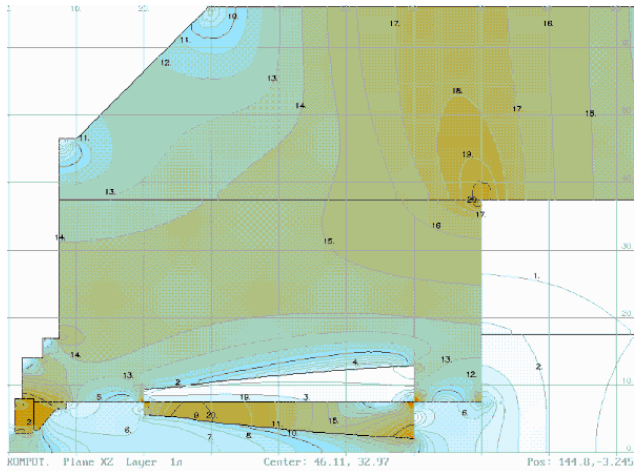

Movable shim

Magnet design

- Azimuthal shimming
- Field re-configured by movable (rotating) shim placed in two of 4 «valleys»





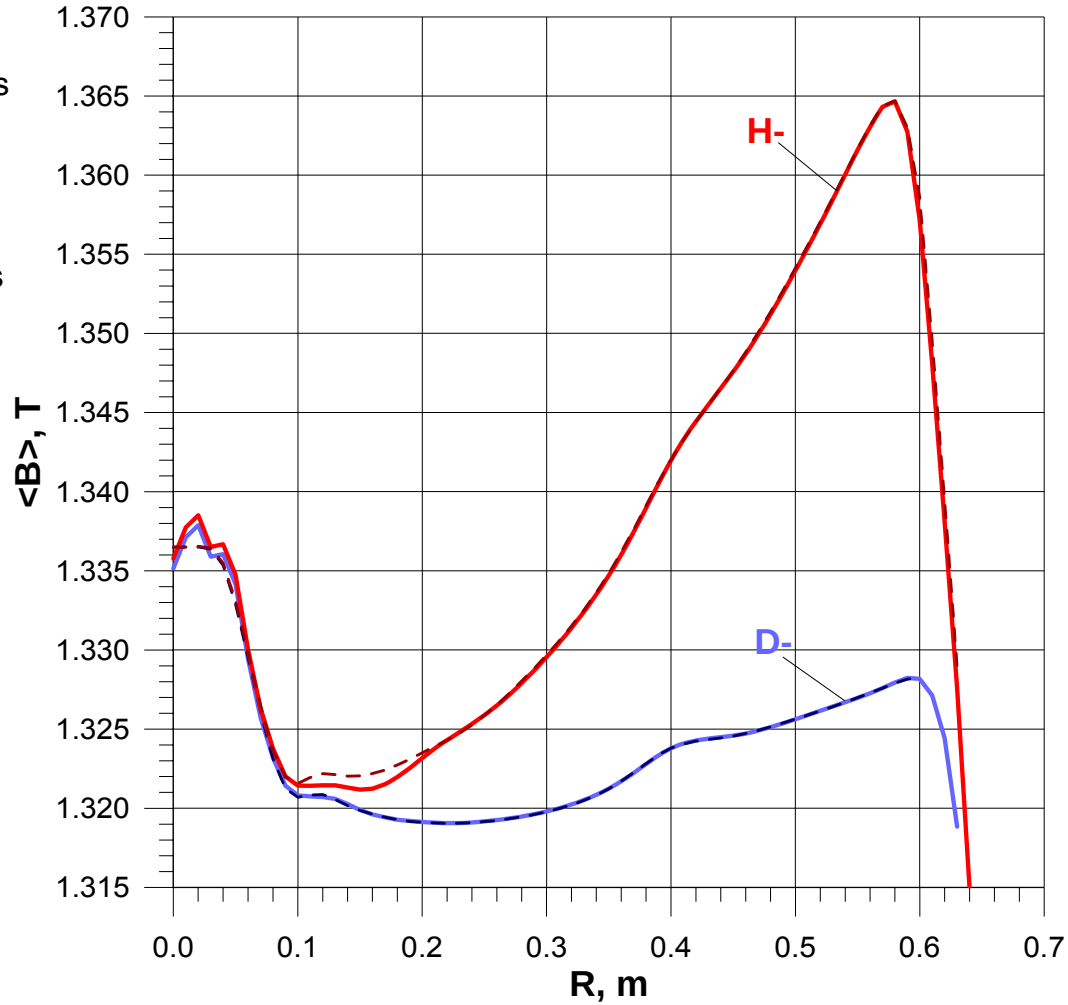


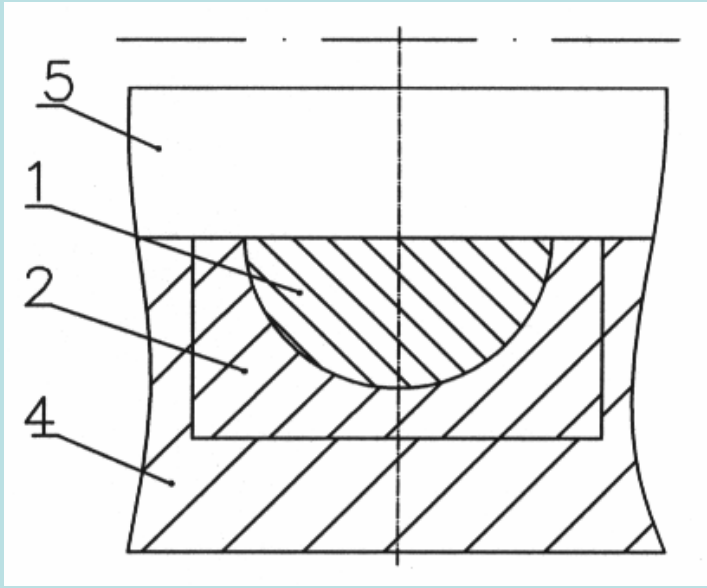
Cyclotron CC-30/15

Efremov Scientific Research Institute, St.Petersburg for Jyväskylä, Finland

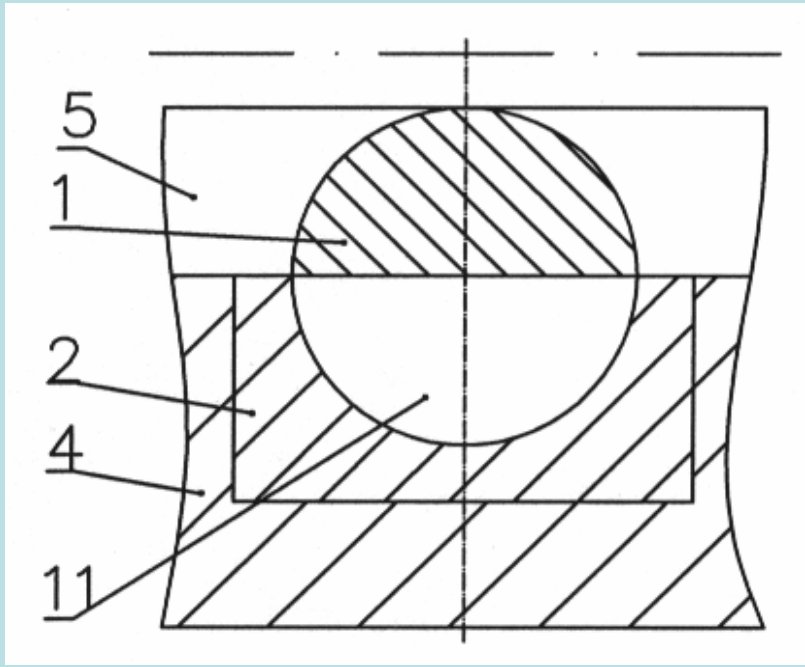
Comparison of field distribution:
- desired isochronous field (for protons and deuterons)
- optimized field

Relative error for acceleration region is 10^{-3}-10^{-4}.

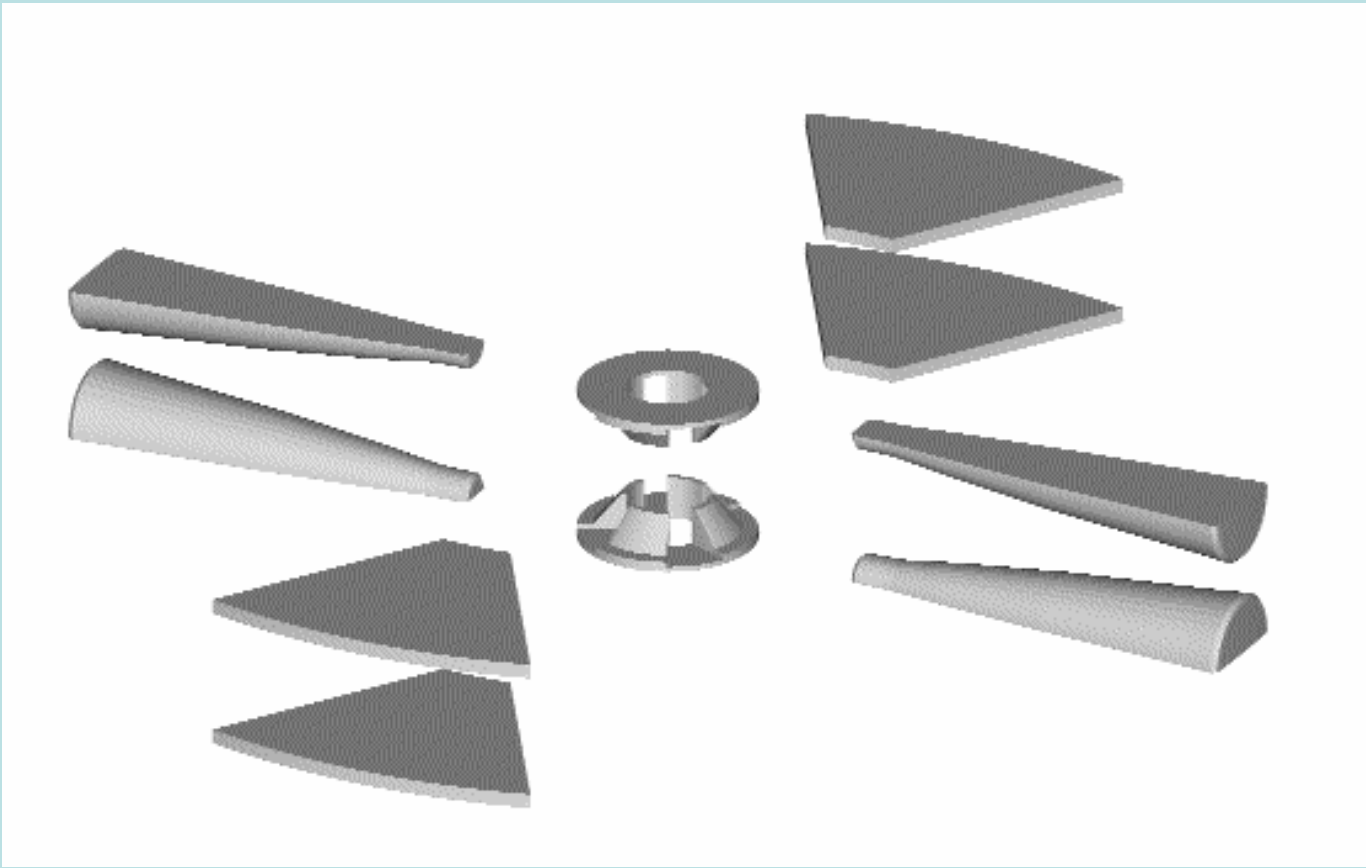




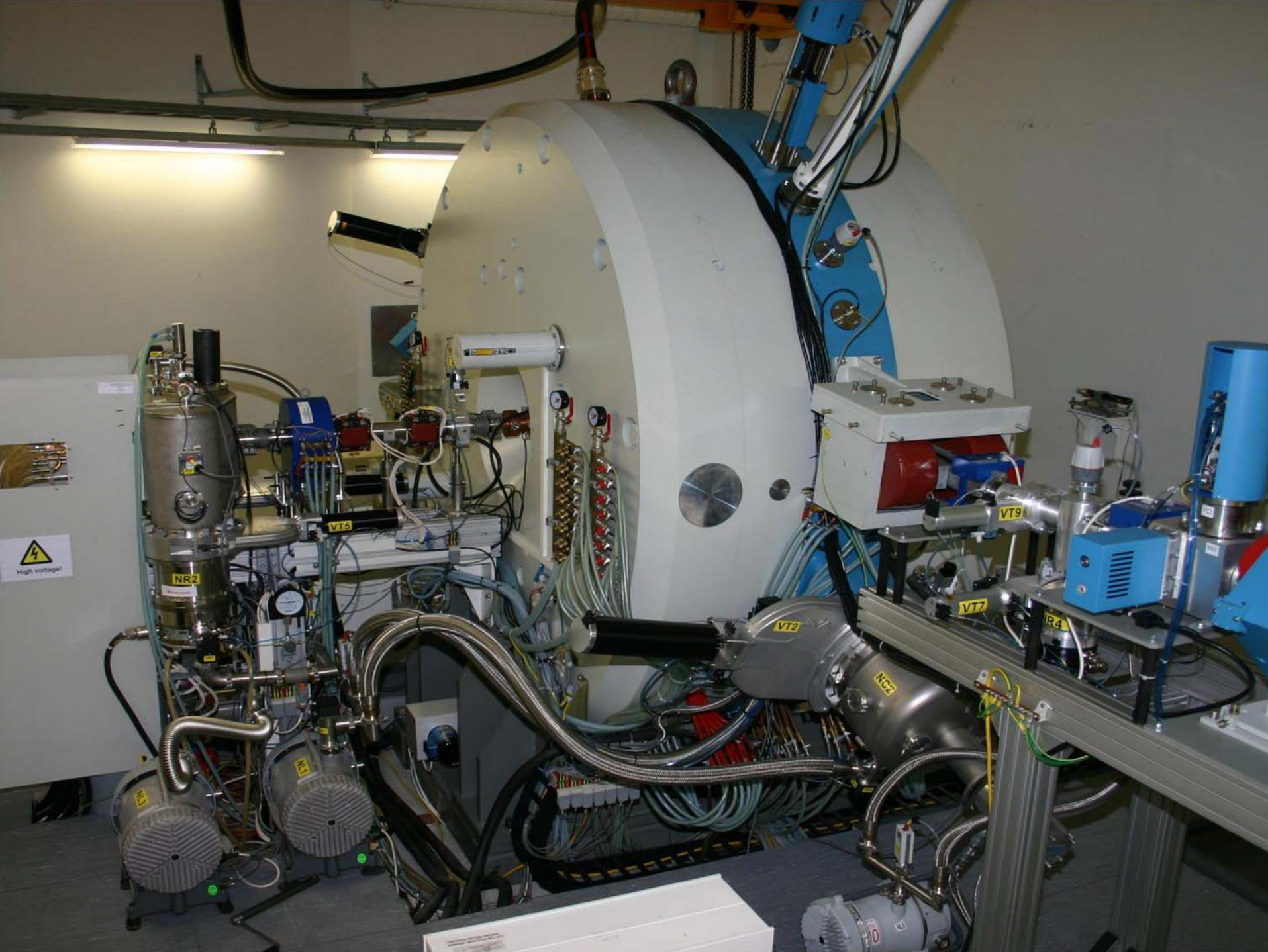
Movable(rotating) shim in position for deuteron acceleration
1- shim moved inside its groove, 2 – insert, 4 - pole piece, 5 - sector.
Median plane is marked with dashed line.



Movable(rotating) shim in position for proton acceleration
1 – shim rotated by 180° and moved outside its groove (11) closer to median plane (dashed line), 2 – insert, 4 – pole piece, 5 - sector.



Set of shims for MCC30/15


High voltage!
NR2
VT5
VT2
NCF
VT9
VT7
NR4

Power supplies

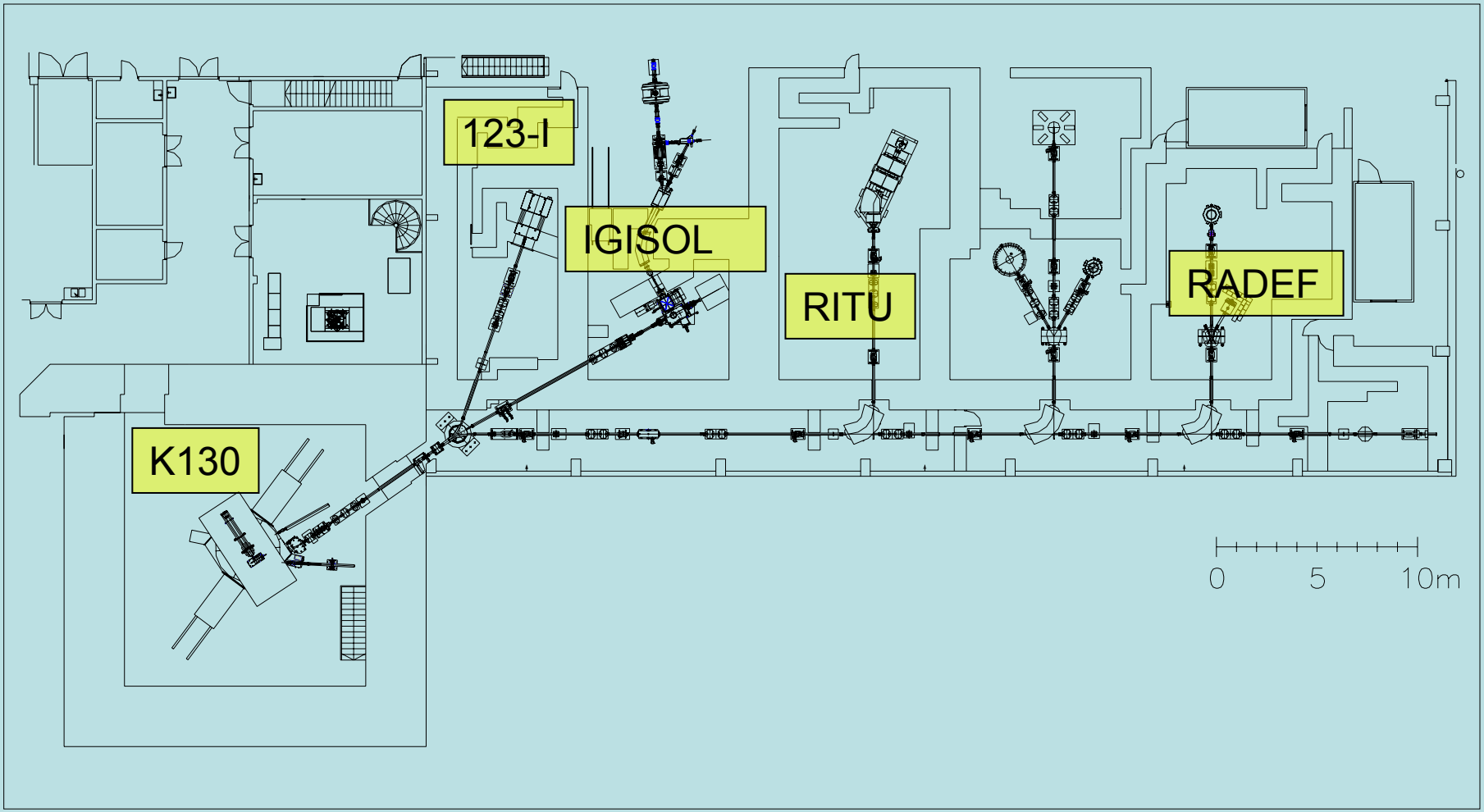

RF and control
DISCONNECT PRIMARY POWER
BEFORE OPENING THIS PANEL
High voltage!

Training of local users

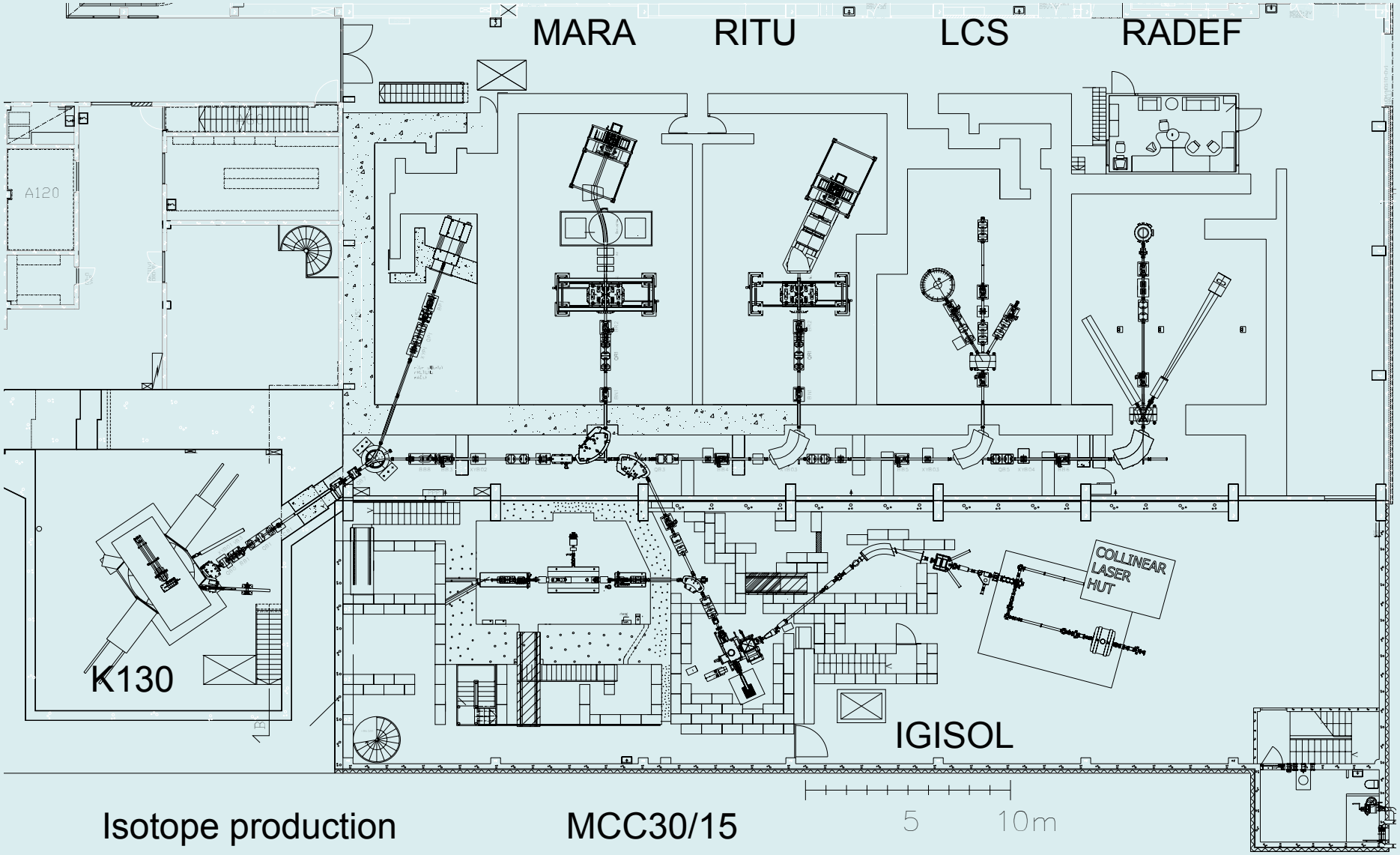
Ion source


Now

Old lay-out



New lay-out including plans



Isotope production

MCC30/15


New IGISOL cave

Thank you!

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