Commissioning of the Jyväskylä MCC30/15 Cyclotron
P. Heikkinen
JYFL, Finland

Cyclotrons'10, Lanzhou, China
September 7, 2010
• 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 negotiations 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)
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 the as soon as possible. Order we could give official notification of the Can be for Invoice with TAP P will be forwarded for very special attention.

Looking for

Order placed 19th of June, 2007
## Specifications

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


<p>| <strong>RF-system</strong> | <strong>number of dees</strong> | 2 |
|               | <strong>dee angle</strong>     | 42 deg |
|               | <strong>frequency</strong>    | 40.68 MHz |
|               | <strong>Max dee voltage</strong> | 40 kV |
|               | <strong>dissipated RF power/ dee</strong> | &lt;8 kW |
|               | <strong>RF-gen output power</strong> | 25 kW |
| <strong>Ion source</strong> | <strong>type</strong>          | Multi-cusp |
|               | <strong>location</strong>     | external |
|               | <strong>max power from the mains</strong> | 20 kW |
|               | <strong>current</strong>      | 1.5/0.75 mA |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum pumps</td>
<td>programmable</td>
<td>2 cryo</td>
</tr>
<tr>
<td>Control system</td>
<td>controller with</td>
<td>a computer</td>
</tr>
</tbody>
</table>


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
What do we do now?
The distance to load is now bigger. Can the P-hall roof stand the extra counter weight?
Magnet design

- Azimuthal shimming
- Field re-configured by movable (rotating) shim placed in two of 4 «valleys»
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
Power supplies
RF and control
Training of local users
Ion source
Old lay-out
New lay-out including plans
New IGISOL cave
Thank you!