MRI scanner development in Russia

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Lebedev Physical Institute of the RAS, Moscow, Russia
Lebedev Physical Institute Russian Academy of Sciences:

Lebedev is the largest Russian Institute in physics:
1600 staff altogether;
800 researchers,
7 Nobel prize winners,
Highest Russian citation indexes
Laser invention (Basov, Prokhorov)
Superconducting Magnet:

Field Strength: 1.5 T
RT Bore Diameter: 900 mm
Rough field homogeneity in 450 mm DSV: 700 ppm (peak to peak)
Active Shielding:
0.5 mT Line Distance from Center: 2.6 radial /4.6 м axial
Field Stability: 0.2 ppm/h or better
Zero Boil-off Helium Cryostat: Sumitomo RDK-408D2
Coldhead: Sumitomo RDK-408D2
Dimensions (WxDxH): 1980x1700x2440 mm
MRI scanner development in Russia

Testing of head coil

On a laboratory stand In a gradient module
MRI scanner development in Russia

Knee coil  Shoulder coil  Neck coil

Body coil  Spine coil  Head coil
MRI scanner development in Russia

Software includes PACS, image improvement and processing system
MRI scanner development in Russia

Brain (FLAIR)  Brain (T2 FSE)  Neck (FSE)

Shoulder (SE)  Spine (FSE)
MRI scanner development in Russia

Full body MRI 1.5T

- ready for production
- own software, magnet and Russian components 60% now (in future up to 85%)
- medical registration in progress
- site for production is being chosen
- search for investors in progress
Helium-free MRI for extremities
<table>
<thead>
<tr>
<th>Main parameters of magnet</th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Superconducting magnet 1.5T</strong></td>
<td></td>
</tr>
<tr>
<td>Diameter of tunnel</td>
<td>325 mm</td>
</tr>
<tr>
<td>Length of tunnel</td>
<td>600 mm</td>
</tr>
<tr>
<td>Shielding</td>
<td>Active</td>
</tr>
<tr>
<td>0.5 mT line from centre distance</td>
<td>2.5 x 1.7 m (Z x R)</td>
</tr>
<tr>
<td><strong>Gradient system:</strong></td>
<td></td>
</tr>
<tr>
<td>Patient access diameter</td>
<td>220 mm</td>
</tr>
<tr>
<td>Gradient coils X, Y, Z</td>
<td>Passive shielded</td>
</tr>
<tr>
<td>Gradient strength</td>
<td>30 mT/m</td>
</tr>
<tr>
<td>Gradient system cooling</td>
<td>Water-cooled</td>
</tr>
<tr>
<td>Field correction</td>
<td>System of passive shimming</td>
</tr>
</tbody>
</table>
MRI scanner development in Russia

Design of magnet

1 – cryocooler
2 – heat exchange camera
3 – radiation screen
4 – vacuum casing
5 – superconducting switch
6 – frame
7 – superconducting coils
8 – HTSC current leads
MRI scanner development in Russia

Current state

• Basic MRI technology including Software for MRI device is developed;

• Prototype Production Line with production capacity of 5 MRI scanners/year is developed and installed;
  • Several prototypes built;
  • Qualified team of 60 engineers and workers;

• Readiness to start serial production, safety, pre-clinical and clinical tests, registration of medical device procedures
  • Helium-free MRI technology is being developed
Goals and future plans

• Further research and development works are in progress on projects of:
  • 1.5T helium-free full scale MRI;
  • 3T full scale MRI
  • production set-up for current 1.5T MRI

THANKS FOR YOUR ATTENTION!

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