ACCEL Instruments GmbH

Advanced Technology Equipment and Turn-Key System Supplier for Research, Industry and Medical worldwide

Business Units

- RF Components and Systems
- Linear Accelerators
- Specialized Manufacturing Projects
- Superconducting Magnet Systems
- Circular Accelerators
- Proton/Ion Therapy
- Synchrotron-Beamlines
- X-Ray Systems
- Special UHV Equipment

ACCEL-Site in the Technologiepark Bergisch Gladbach (BAB A4)
ACCEL Sites

Bergisch Gladbach (9000 m²)
Administration,
Marketing/Sales,
Management, Engineering,
Manufacturing, Assembly,
Testing,

Troisdorf (5500 m²)
Series Production of the Superconducting Main Quad Magnets

Glarus/Schweiz (300 m²)
Mechanical Machining, Sales
ACCEL Instruments GmbH

1980 - 1993 Siemens AG/Interatom GmbH in Bergisch Gladbach

„Accelerator and Magnet Technology“

1993/94 Foundation of ACCEL Instruments GmbH, Management Buyout Contract with Siemens AG

Production Facilities, Rights, Documentation, Regulation Transfer, Guarantees, etc.
Transfer of about 30 existing Key People

End of 2004 Staff of 270 People
Physicists, Engineers, Manufacturing Specialists, Commercial, Controlling, Administration

More than 2000 Person Years of accumulated KnowHow and above 400 Mio € of Business Volume since 1980
ACCEL Personnel

An Advanced Technology Engineering and Manufacturing Company
ACCEL – Core Competences and Markets

**Technologies**
- RF
- Magnets
- Superconductivity / Cryogenics
- Vacuum
- Optics
- Specialized Manufacturing
- Integr. System Control

**Products / Services**
- Lin. & Circ. Accelerators
- RF Cavities / SRF Modules
- S.C. Magnet Systems
- Beamlines, Insertion Devices
- Vacuum & Cryog. Systems
- International Project and Quality Management

**Markets**
- Fundamental & Applied Research
- Medical/ Particle Therapy
- Energy/ Nuclear
- Advanced Technology Industry

Certified by DIN EN ISO 9001:2000, DIN EN 13485:2003, KTA and further norms

World Map of Customers and Partners in Fundamental and Applied Research (not complete)
Engineering <> Manufacturing <> Series Production <> System Integration

ACCEL Instruments GmbH, Focus on SRF and ILC – Visit JLAB    Jan. 27, 2005
Engineering <> **Manufacturing** <> Series Production <> System Integration
Engineering <> Manufacturing <> **Series Production** <> System Integration
Engineering <> Manufacturing <> Series Production <> System Integration
Production of Superconducting Niobium Cavities

ACCEL manufactured e.g. 360 CEBAF, 109 SNS and about 50 TESLA Cavities as a Special Equipment Supplier (Technology Transfer DESY, JLAB, Cornell, Wpt. Univ.)
2 TESLA Cavities with guaranteed Performance for BESSY

<table>
<thead>
<tr>
<th>Preparation steps</th>
<th>Done at</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>ACCEL</td>
</tr>
<tr>
<td>100 µm BCP (closed loop)</td>
<td>ACCEL</td>
</tr>
<tr>
<td>Heat treatment 800 °C</td>
<td>DESY</td>
</tr>
<tr>
<td>20 µm BCP (closed loop)</td>
<td>ACCEL</td>
</tr>
<tr>
<td>High pressure rinsing (HPR)</td>
<td>ACCEL</td>
</tr>
<tr>
<td>Assembly in cleanroom</td>
<td>ACCEL</td>
</tr>
<tr>
<td>Transport under vacuum</td>
<td>ACCEL</td>
</tr>
<tr>
<td>Vertical test</td>
<td>DESY</td>
</tr>
</tbody>
</table>

For Future Projects:

All steps under responsibility of ACCEL with using existing DESY inspection, furnace and test infrastructure

HPR at ACCEL

Test at DESY
AC cavities for DESY (prepared by DESY): heat treated at 800 C and 1400 C (except AC63)
BE cavities for BESSY (prepared by ACCEL): only heat treated at 800 C

* reference TESLA TDR, DESY 2001
Superconducting RF Accelerator Modules (Examples)

- LEP 200 Nb/Cu, 352 MHz
- Cornell Type 500 MHz Single Cell SRF Module for Cornell, NSRRC, CLS, DLS
- 3rd harmonic, 1500 MHz Landau Module for BESSY (Inhouse Development)

Technology Transfer from CERN and Cornell
Superconducting Linear Accelerators for FEL/ERL Applications and the Future ILC

SRF Accelerator Module for the future 4GLS X-Ray Source in UK (License Agreement with FZ Rossendorf)

SRF Cavities and Modules for the future projects X-FEL/DESY (1000 Units) in Hamburg und ILC (20000 Units)

ACCEL is the World leading Company in SRF Technology
CCL Modules for SNS in Oak Ridge/USA

ACCEL manufactured, assembled, aligned and rf tuned 4 CCL Modules as a Special Equipment Supplier (Co-operation with LANL)
Turn-Key S-Band Electron Linear Accelerators for Synchrotron Light Sources and Medical Applications

Delivered:
- SLS/PSI, CH 100 MeV

In Production:
- DLS, UK 100 MeV
- ASP, Australia 100 MeV
- PTB, Germany 0.5-50 MeV

Technology Transfer from DESY (Dortmund Univ.)
License Agreement on S-Band Lin. Collider Components with DESY
Turn-Key 40 MeV Proton/Deuteron SRF Linac for SARAF/Israel

<table>
<thead>
<tr>
<th>Parameter for p / d</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy maximal</td>
<td>40</td>
<td>MeV</td>
</tr>
<tr>
<td>Energy minimal</td>
<td>5</td>
<td>MeV</td>
</tr>
<tr>
<td>Energy adjustment accuracy</td>
<td>200</td>
<td>keV/step</td>
</tr>
<tr>
<td>Current maximal (cw)</td>
<td>2 (4)</td>
<td>mA</td>
</tr>
<tr>
<td>Current minimal (cw)</td>
<td>40</td>
<td>µA</td>
</tr>
<tr>
<td>Transv. emittance (norm. rms)</td>
<td>&lt; 1</td>
<td>π<em>mm</em>mrad</td>
</tr>
<tr>
<td>Longit. emittance (rms)</td>
<td>&lt; 4</td>
<td>π<em>nsec</em>keV/n</td>
</tr>
<tr>
<td>Operation</td>
<td>6000</td>
<td>hours/year</td>
</tr>
<tr>
<td>Reliability</td>
<td>90</td>
<td>%</td>
</tr>
</tbody>
</table>

3 Phases:

- Assessment and Design Study (incl. Beam Dynamics Simul. and Error Analysis)
- Design-Build-Install. Linac Injector with Prototype SRF-HWR Module (incl. Infrastructure Requirements)
- Upgrade to 40 MeV

Intense Inhouse R&D, strong Interaction with World‘s leading Accelerator Labs (e.g., INFN LNL, ANL, MSU, Frankfurt Univ., FZJ, LANL, ORNL, PSI, AECL)
SARAF p/d Injection Linac
Prototype Superconducting HWR Module for SARAF

- Acceleration of protons and deuterons from 1.5 MeV/u on
- Cavity vacuum and insulation vacuum separated
X-Ray Beamline for Protein-Cristallography at the Canadian Synchrotron Light Source CLS
Precision Reflectometer for Characterisation of Optical Lens Systems for the EUV-Semiconductor Lithography (PTB/Berlin)

The Characterisation of Extreme Ultra Violett (EUV) Lens Systems is performed by this High Precision Reflectometer working under Ultra High Vacuum Conditions
Superconducting Magnet Systems

Superconducting Magnet
Energy Storage for the
Stabilisation of a Laboratory
Current Supply

Superconducting Magnets
are Key Components for
Nuclear Fusion Plants
(ITER/TFMC, Consortium AGAN
(ACCEL, Alstom, Ansaldo, Noell))
Proton Therapy Facilities

ACCEL is delivering the first European Clinical Proton Therapy Facility (RPTC/München) and is expecting to supply more such Facilities in the near Future.
ACCEL Instruments GmbH

- Advanced Technologies, Turnkey Systems
- Engineering and Manufacturing
- Integrated System Control, Software
- Highly motivated, qualified people
- Project oriented, integrative, flexibel
- Worldwide Business
- intensive, fruitful and multinational Cooperations

We would be happy to serve with all our Management, Engineering and Manufacturing Capabilities and Know-How for the most exciting Accelerator Projects worldwide… and for the Future International Linear Collider