Results from TTF linac operation since last meeting

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Proposed Schedule for TTF1
CSR experiments

• focus on longitudinal phase space
  \( \delta E, \sigma_z \) versus compression factor and bunch charge
• installation of new flat 8 mm vacuum chamber
  some transverse emittance measurements
• diagnostic development, especially for \( \sigma_z \)
  streak camera
  interferometric techniques
  electro-optical sampling
  bolometer
Energy break-up observed with larger chamber height (12 mm)

Now the energy break-up seems to be reduced; details -> P.Piot
SASE studies (presentation: Kryzwinski)
  ablation experiments, cluster experiments
SASE development
  RAFEL, photon diagnostics, BC1 studies
other
  diagnostics (including BTM and BBA)
  variable energy (tunable 80-120 nm)
  tuning efficiency (procedures and orbit control)
preparation of TESLA-like beams
  rf power distribution (imbalance of)
  repetition frequency, rf pulse lengths
  dosimetry
  beam protection systems (collimation, toroids)
  cathode testing
  dark current measurements
high gradient tests (presentation: Schreiber)
Overview of TTF Operation since August 2001

( Shutdown from 28.10.01 until 26.11.01 )

<table>
<thead>
<tr>
<th></th>
<th>total hours of operation</th>
<th>downtime</th>
<th>tuning time</th>
<th>off time</th>
</tr>
</thead>
<tbody>
<tr>
<td>before shutdown</td>
<td>1510</td>
<td>320</td>
<td>345</td>
<td>135</td>
</tr>
<tr>
<td>after shutdown</td>
<td>2570</td>
<td>270</td>
<td>780</td>
<td>220</td>
</tr>
<tr>
<td>total</td>
<td>4080</td>
<td>590</td>
<td>1125</td>
<td>355</td>
</tr>
</tbody>
</table>

**Beam Uptime** – defined as beam hours allocated to the users, accelerator studies, and overall tuning

- **before shutdown** 77%
- **after shutdown** 89%

w/o tuning

- **before shutdown** 52%
- **after shutdown** 55%
14.01.02 - 20.01.02

- Users: 63%
- Studies: 4%
- Tuning: 19%
- Down: 8%
- Off: 6%

11.02.02 - 17.02.02

- Users: 0%
- Studies: 61%
- Tuning: 25%
- Down: 8%
- Off: 0%
DOWNTIME SUMMARY SINCE SHUTDOWN (26.11.02-24.3.02)

Sum downtime 270 hours, i.e. 11% of total operation
cryogenics (60 hours, 24%) - 2 incidents

laser (45 hours, 18%) - predominantly due to laser hut temperature and improper cooling

capture cavity (35 hours, 14%) - regulation problems ~70%, waveguide interlock ~30%

other (27 hours, 11 %)
  4 instances
    linac beam dump water
    1EXP1 dipole water
    bad fan used in timing system
    power outage

vacuum (15 hours, 6%) - isolated instance of disconnected cable in vacuum controls which disallowed opening valves

gun and gun vacuum (24 hours, 10%)
gun: low SF6 and instance of improper DSP regulation, instance of improper cooling regulation
gun vacuum: predominantly at high gradient (40 MV/m) during SASE run
dark current measurements at ACC1 - setup
Accelerator development – Dark Current

Dark Current Measurements at ACC1, high gradient correlation with cavity database not possible but...
Accelerator development - Dark Current

![Graph showing the relationship between gradient (MV/m) and current (nA). The graph includes data points for different injection and beamlines. The key highlights the average gradient of 21.0 MV/m.](image)
Accelerator development – Diagnostics

- EOS Electro-Optical Sampling
- Last tests of BPMs
- Toroids
- Beam Loss measurements
  - Photomultiplier
  - Fiber (OTDR)
  - both online available in DOOCS
- Online TTF Linac Logbook