Chaired by J-L Biarrotte and A. Lombardi

Secretaries G. Bellodi and F. Bouly

Administrative secretary J. Double

- 42 registred participants
- 30 contributions
- Projects
    - Myrrha
    - Linac4/SPL
    - ESS
    - Saraf
    - SPIRAL2/IPHI

From J-P Revol

Accelerator requirements

- In principle, it does not matter how the external neutron source is provided. In practice, for industrial applications, there are a number of well-defined requirements for the accelerator.
  - **Beam particle: protons** [electrons (low spallation neutron yield), deuterons (neutron background)];
  - **Beam power**: **a few to 10-15 MW** depending of choice of ks value, and desired unit power output;
  - **Beam Energy**: **E_{beam} ≥ 800-900 MeV**
  - **Beam spot size (footprint):** large on impact on window, but perhaps some limitation due to beam transport issues (studies at JAEA: ≤ 0.1-0.2 mA/cm^2 ?), MYRRHA has 0.07mA/cm^2;
  - **Beam losses**: minimize irradiation of the accelerator and of the environment; impact on the maintenance and repair (main issue for any high power beam, not only for ADS);

Accelerator requirements

- **Reliability**, minimize beam trips (have multiple sources); the limitation comes mainly from thermal stress in fuel structure. For instance, for MYRRHA (F. Bouly, J.-L. Biarrotte @ ThEC13)
  - Trip < 0.1 s no limit
  - 0.1 s < Trip < 3 s not more than 100 per day
  - Trip > 3 s 10 in three months
  - Administrative limit if SCRAM event

  However these may evolve with time, with the development of new materials
- **Beam power stability and control**: 1% fluctuation on beam intensity is 1% fluctuation on the thermal power;
- **Large operational range of beam intensity**: to follow demand; factor 10?
- **Energy efficiency**: maximize fraction of electric grid power stored in the beam. Relevant to overall energy efficiency of system
- **Size of accelerator**: for waste elimination, people might want to fit it on the site o a standard nuclear power plant
- **Cost:** This is very important. One main criticism of ADS is that "the accelerator does not exist and will be too expensive"

- In the end, the solution chosen among LINAC, Cyclotron or FFAG will be the one best fulfilling all these requirements

From L Medeiros

From JL Biarrotte

- **Prepare a possible follow-up within Euratom H2020**
  - First H2020 Euratom FISSION call (deadline date: 17 Sept. 2014)
  - Output of the preliminary discussions between MAX and SCK*CEN are:
    - ✓ **Only 1 integrated project** with 3 big WPs
      (reactor safety, liquid LBE R&D, accelerator R&D)
    - ✓ **Main goal of the accelerator WP**: focus efforts to build a full-scale injector demonstrator
      while trying to sustain/pursue the generic R&D developed so far during Eurotrans and MAX

Possible H2020 prospects

- **Possible topics for a future accelerator WP** (6M€ total budget oom) **- tb further discussed !!**
  - WP.1: construction of a full RFQ demonstrator (IAP, Univ Darmsdat…?)
  - WP.2: 176 MHz RF power amplifier development (SCK?, …?)
  - WP.3: Digital LLRF development (IPNO?, …?)
  - WP.4: Beam diagnostics (CEA?, IPNO?, SCK? …?)
  - WP.5: Controls (SCK?, CosyLab?, ADEX?…?)
  - WP.6: Beam simulation code development (CEA?, LPSC?, IPNO? …?)
  - WP.7: LEBT space-charge experiments (LPSC?, CEA?, SCK?, CERN?, …?)
  - WP.8: Injector commissioning (SCK?, IAP?, IPNO?, LPSC?, CERN? …?)
  - *WP.9: Detailed injector reliability analysis (EA?, SCK?, CERN? …?)*
  - *WP.10: SRF spoke R&D – prototyping, multipacting (IPNO?, LPSC?, …?)*
  - *WP.11: SRF CH demonstration with beam (IAP?, …?)*

- **Additional/new ideas and partners are obviously very welcome !**

Main common themes

- RELIABILITY
- LEBT dynamics and neutralisation effects
- Virtual Accelerator
- Possibility to use framework of EUCARD2/H2020 as a catalyst for organising mini-workshop on a very specific topic

Reliability

- Catalogue of faults from existing linacs
- Identify what can be addressed
    - Make the system more reliable
    - Mitigation measures
    - Automated reaction
- Use LINAC4 in 2016 as test bed for the above ?
    - And for benchmarking/improving reliability models?
    - (+ use obvioulsy the RFQ@UCL test stand)
- Prepare a proposal to the next EC infrastructure call (sept. 2014) on “accelerator reliability” (???)
    - Tb further explored within the next weeks. Obvious parners would be SCK, CNRS, CERN, CEA, ESS…

LEBT dynamics & SC compensation

- Better understand the SC compensation phenomenon in magnetic LEBT
  - Compensation level
  - Transient time
  - Explore effect of pressure & gas nature
- Use the MYRRHA@UCL (@LPSC) for experiments
  - In collaboration with interested partners (CEA, CERN, GSI?)
  - Share & exchange results with other similar activities in CEA and in CERN
  - Benchmark/improve simulation codes

Beam simulation developments

- Keep on developing the Virtual machine concept
  - Complete the CEA tools (Auto-pilot mode & control tower modes at least)
  - Include it in the Myrrha injector in close relation with control system dvlpmt (& test)
- Improve longitudinal dynamics simulations
  - Include more close-to-reality models for the V/fi tuning method to better assess possible related losses
  - Develop dedicated algorithms for automatic set-points reconfiguration (fault cases)

Other possible common topics ?

- Multipacting?
- Beam diagnostics?
- Controls?
- RF (SSPA? DLLRF?)?