Status of the FP7 Integrating Activity

"Novel Acceleration Systems"

- *Trans-national Access*
  - to the CTF3 facility
  - to MICE
- *Network*

  to coordinate the activities mentioned below and to disseminate information
- *Joint Research Activities* (JRA's) :
  - High Gradient RF Structures (estimate: 5.5 M€*),
  - EURODrive (estimate: 5.0 M€, tendency: ↘)
  - LED (estimate: 5.4 M€ , tendency: ↗)
  - GADGET (estimate: 5.9 M€)
  - EURO FFAG (estimate: 5.0 M€)
  - POSIPOL (estimate: 6.0 M€)
  - High Power RF Sources (estimate: 8.0 M€)
  - LAPTECH (estimate: 6.0 M€)

*) Estimates concern total cost, i.e. expected EU funding plus matching funds from collaborators.

High Gradient RF Structures (Walter Wuensch): Fundamental Research, development, test with power and beam, for CLIC and ν-factory (estimate: 5.5 M€)

Supported existing infrastructures: CTF3: Mid-linac power station, (planned) X-band Klystron Test-Stand and Two-beam test stand (2BTS), plus facilities at Lancaster U:

- Structure tests under high power RF (200 MHz and 12 GHz)
- Surface topology/chemistry alteration (Auger & AFM)
- Breakdown modelling
- DC spark tests
- RF pulsed heating tests (also involved: BINP Dubna)
- Laser & ultrasonic fatigue tests
- Structure design & optimization
- High power RF interaction with beam
- Module testing

EURODrive – Handling of the high current drive beam (Daniel Schulte): Simulations and experiments on alignment and tuning (estimate: 5.0 M€)

Supported existing infrastructures: CTF3 Test Beam Line (TBL), Combiner Ring (CR) and 2BTS:

- Develop beam based alignment and tuning methods adapted to the drive beam decelerator
- Develop a conceptual machine protection system
- Develop a method to correct the drive beam phase jitter (synergy with X-FEL's)
  - Study the drive beam phase jitter
  - Develop the pickups (BW 100 MHz, 20 fs resolution) and correctors
  - Develop a longitudinal feedback to reduce drive beam phase jitter
- Benchmarking of simulation codes with CTF3 experiments including TBL, CR & 2BTS

LED – Luminosity Ensuring Design (Daniel Schulte): Handling, measurement and conservation of ultra-small beams for future LC's (ILC, CLIC, …), feasibility of final focus components and stability in sub-nm range (estimate: 5.4 M€)

Supported existing infrastructures: CTF3

- Stabilization of final focus magnets, located inside the detector, to 0.2 nm @ 4 Hz. Develop elements that allow this stabilization
  - Develop sensors to the required resolution and stability
  - Develop a support that can be integrated into the detector
  - Develop the correctors (conceptually)
- To allow beam-beam scans within a single pulse: Develop intra-pulse tuning concept (kickers)
  - Study the feasibility of kickers (10 ps) and their integration
  - Assess detector technologies and required improvements
  - Integration of instrumentation into the post-collision line

GADGET – Generation and Diagnostic Gear for tiny Emittance (Hans Braun): Develop elements and diagnostics necessary to create and control ultra-small emittance, for future HEP colliders (ILC, CLIC, …), synergy with SR facilities (estimate: 5.9 M€)

Supported existing infrastructures: SLS and new low-emittance injector for FEL at PSI, magnet-measurement facility at BINP, ANKA ring at Karlsruhe, CTF3

- Development and test of high field SC wigglers
- Development of necessary instrumentation to measure, control and tune low emittance beams
- Improve IBS theory, test on existing SR facilities
- Develop damping ring ejection kickers with low ripple

EuroFFAG – Design and prototyping work (François Méot):

Study challenges and potentials of the FFAG method, design concepts and best methods

Supported existing infrastructures: EMMA (assumed existing 2009)

- ***Lattice design, beam dynamics studies*** – proton acceleration, fast acceleration of muons, electron model (one could focus on the two latter points)
- ***Component design studies*** – non-linear and linear magnets; modulated RF systems; fixed frequency RF systems; injection and extraction kicker systems; beam diagnostics; vacuum
- ***Prototyping and experimental tests*** - linear and non-linear magnets; broad band modulated RF systems; injection and extraction kicker systems
- ***Comparison of the FFAG methods*** – scaling, semi-scaling and non-scaling: undertake costing studies and assess advantages and drawbacks

POSIPOL – Compton-back-scattering polarized positron generation: Alternative positron generation scheme for the ILC and main scheme for CLIC (estimate: 6.0 M€)

Supported existing infrastructures: DAΦNE and ATF

- Design Study (Parameters, Compton ring, collection system) with focus on polarized photon generation
- Laser & laser cavity development (LASCA): high-power and high rep frequency lasers, cavity in pulsed regime, polarimetry
- Test facility experiments (DAΦNE at INFN, and ATF at KEK)

High Power RF sources (estimate: 8.0 M€)

Supported existing infrastructures: CERN SPS, …

- Develop, build and test high efficiency L-band power source, (CLIC drive beam and ILC)
  - High power (50 MW), high efficiency (70 %) multi-beam amplifier
- Develop scalable High power source for 200 MHz (SPS upgrade, muon cooling)
  - 5 MW level modern technology based amplifiers, scalable to large quantities as needed for muon cooling and for upgrade of existing synchrotrons.

LAPTECH – Develop laser plasma technology for staged accelerators that will constitute the basis for future high energy accelerators:

Aiming at stable, reproducible e- beam of a few GeV

Supported existing infrastructures: ?

- Laser development increase stability, reproducibility. Reliability and efficiency (mainly concerns the FEL and SR community as ELI – not available before 2015)
- Injector development (based on EuroLEAP results – 3 years starting mid-2006)
- Electron beam dynamics, beam transport and shaping between stages
- Plasma target studies, optimization of plasma parameters, stability and reliability (L)
- Beam-beam interaction studies for ultra-short bunches, polarisation studies, positron generation (modelling)

Problem 1 — Resources (total EU funding):

- The estimate of the total cost is now at 47.8 M€, we will have to cut it back to < 30 M€ — how?
- Waiting for guidelines from ESGARD, we could assume scenarios :
  - Everything reduced proportionally (to around 60%)
    - Risk: rather than a consistent R&D program, we might end up with a much less efficient patch-work of activities, each of which will be under-funded!
  - Use the Lisbon document and cut out lower priorities
    - Risk: Some activities will drop out completely – that will make part of the community very unhappy
  - Reduce to maximize coherence and focus of the R&D programme.
  - A "reasonable" combination of the above …

Problem 2 —Resources: additional request for ILC related activities

- Phil Burrows (Oxford) has requested for the ILC GDE that some of our planned JRA's be not reduced, but increased!
- Luckily, we had anticipated synergy with the ILC already, and some JRA's are already fully exploiting this.
- Concerned areas:
  - Beam delivery (→ LED)
  - Positron source (→ Posipol)
  - Collimation (→ JRA in IA on HIHEP)
  - Beam Instrumentation (→ GADGET)
  - Beam stabilisation (→ LED)
  - L-band power (→ HP RF)

Phil has contacted the concerned coordinators of JRA's – I have not yet received feedback on the impact.

Next steps:

- Preparatory working group meeting:
  - prepare for September "Open Meeting"
  - discuss strategy to get to a coherent programme, consistent with priorities and resources