Thursday Morning Session

Summary

Laser development crucial for success of field

- Key challenges for high peak/ultra-fast laser technology
  - Reliable turn-key operation: much progress in past 5 years but ways to go
  - Low cost systems:
    - Driver for GeV module: commercial 30 W (10 Hz), 100 TW system ~ $1.5 M (FY09)
    - High energy pump laser price has dropped from ~$75K/J in FY01 to ~ $30K/J in FY10 (factor 3 lower, accounting for inflation)
  - Average power:
    - Have 10-100 W systems, need 1-100 kW and even near MW-class high peak power lasers
    - Requires diodes, ceramics, fibers, etc…
- Many science communities need it (colliders, light sources, fusion) as well as medical and defense apps

Conclusion

- Requirements for lasers for future accelerators largely identified
  - Case specific, no one solution fits all
  - All need high average and peak power
- Laser technology candidates need further definition
  - Slab, disc, fiber lasers
  - Diode pumping
  - New materials
- Sustained, long range R&D needed with major investment into accelerator relevant lasers -- similar to klystron effort, decades ago
  - Help with advocating stewardship role for laser technology within funding agencies
- Long ranged collaborative/complementary relation between ICFA-ICUIL is essential
  - Science driver affects laser choice which affects science design
  - First report nearing completion -- publish as ICFA BD newsletter and ICUIL publication; next workshop being planned

G. Korn LEI-Brasov 17. 10. 09

Scientific Scope of the integrated Proposal

WP7A

Amplification chain
Scaled PFS technology

Oscillators

Attosecond facility
Upscaled PFS 0.1 PW/ 1 kHz
1 J / 5-10 fs; 20 PW

High-intensity development
200 PW
3 kJ/ 15fs
8-12 beams

?

Oscillators **Front end**

beamlines dedicated to e- and p+

OPCPA amplification chain
Ti:Sapphire backup option

1-10J / 10fs
≥100 Hz

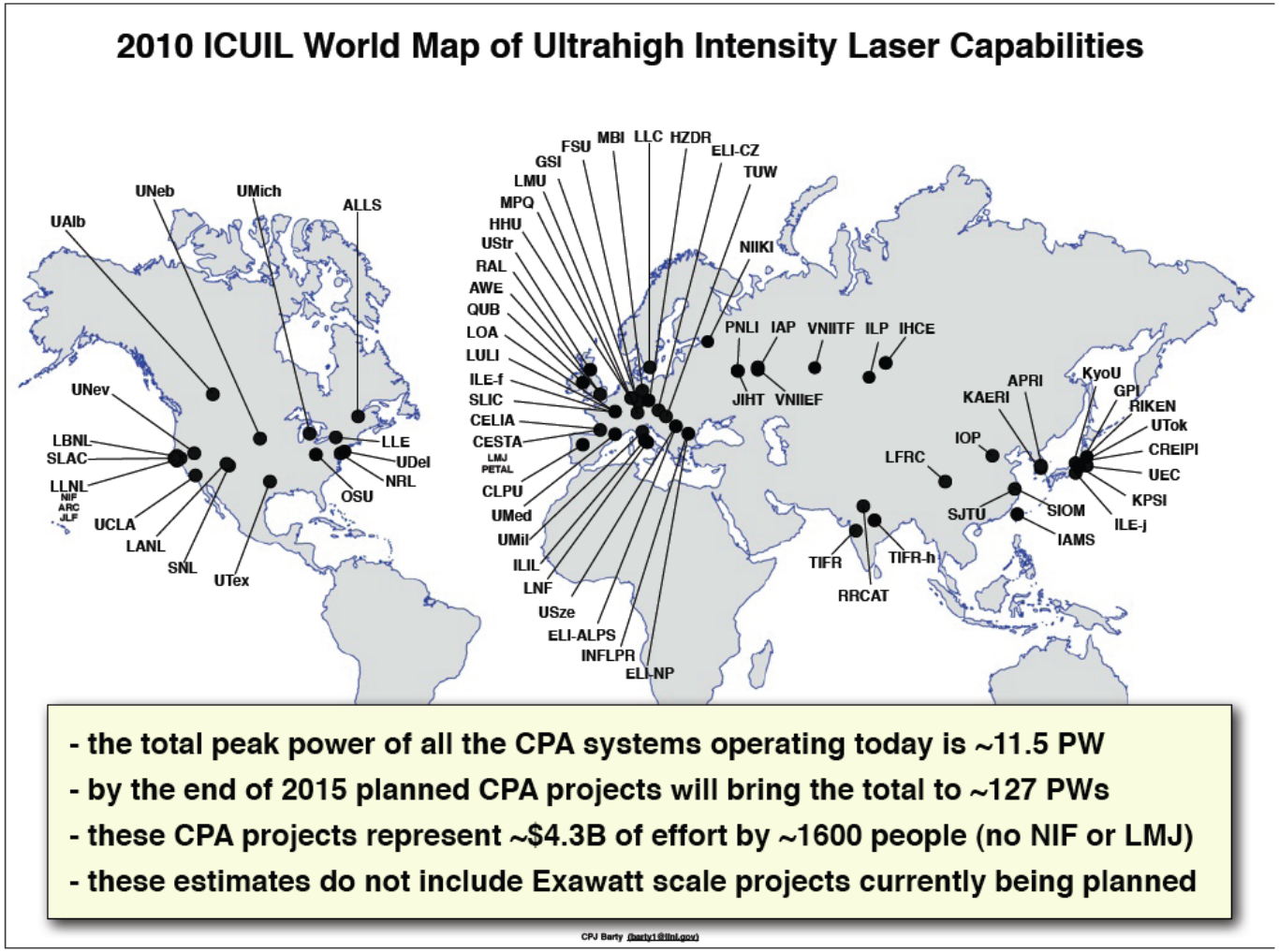
Beamlines facility
≥50J/ 15fs per beamline
at least two 10Hz DPSSL units

Ti:Sapphire amp chain

Oscillator + Front end

Photonuclear facility
10 PW, 0.02 - 0.1 Hz
Apollon technology

Resources challenge



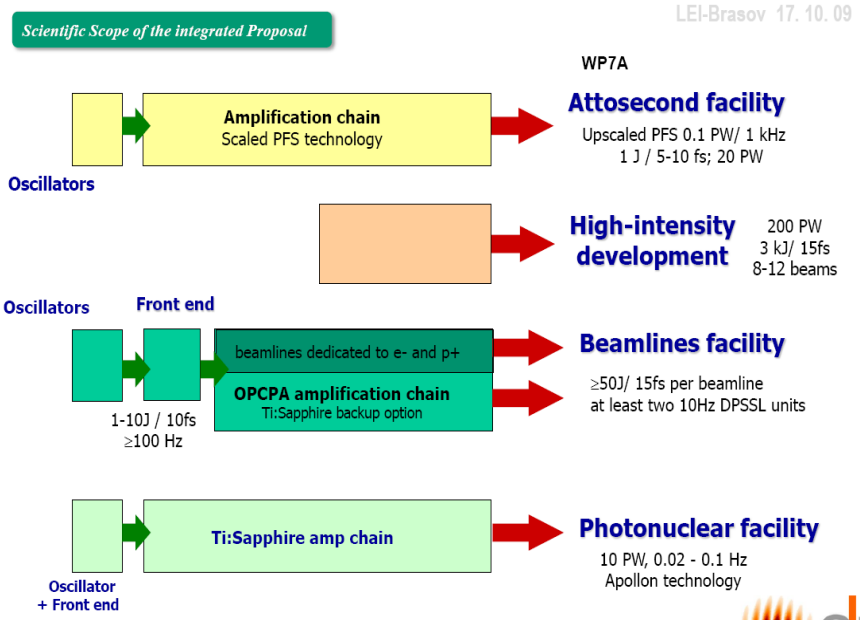
The real challenge

The real challenge is NOT to overcome the technological barriers towards multi-ten PW or even multi-hundred PW systems

Nor is it the challenge to achieve high repetition rates of such lasers for applications („*The next challenge after the PW is the kW*“ *)

Nor is it funding, due to an innovative ELI funding scheme

The real challenge is to build ELI under the temporal constraints of the Structural Funds within an environment that **has not kept up developing human resources at a rate which is needed**



EuroNNAc should integrate

with

- ICFA/ICUIL
- ELI
- Laserlab Europe

and be a bridge between “accelerator” and “laser-plasma” cultures

Discussion

- What are the top goals of the field (10y ahead)?
  - Demonstrate working plasma-based FEL at realistic frequencies
  - Reliable 24/7 operation of plasma-based accelerators at 1 GeV
  - Staging
  - High beam quality at 10 GeV from plasma accelerators
  - GV/m positron acceleration with plasma devices while preserving emittance
  - Demonstrate proton drivers for wake acceleration