

Plasma Based Accelerators (Brainstorming Session I)

Coordinator: W. Leemans

Talks/Slides: will be available in website

Leemans: laser driven accelerators

Hyper spectral radiation: THz to gamma rays

Betatron source: laser beam on gas jet creates a plasma; incoherent; on cover of PRL; bunch diagnostic; bio imaging apps; phase contrast imaging; $1e7$ X-rays/shot; much brighter than older sources by 7 orders of magnitude

LPWA: visible spontaneous radiation; tuning techniques; 0.2 microns emittance; FEL is next

Harmonic emission: solid target; up to $n=500$ is possible

Plasma shocks: gas jet targets; XUV combs generated

7.7 GeV beam for a 1 nm FEL; BELLA is related

Laser tech: up to PW class at 1 Hz; how to get high average power; ICFA WORKSHOP

Possible testbed

ELI in Hungary and Czech Rep

Colby: beam driven plasma acc

50 GeV/m was done

Focusing grad $1e6$ T/m

Afterburner FELs: example from FERMI for soft xrays by M. Hogan; extend wavelength by a factor of 4

Ion channel laser

Rad generation from Offset Witness Beam: could be done at FACET

HEP funded acc is relevant for BES

Yakimenko:

10 keV x-rays: effects of short period undulators on ebeam energy and facility length

78 MeV ebeam with CO₂ as the undulator

LWFA with CO₂ laser (only facilities developing this laser)

Accelerated charge scales with wavelength; gradient scales inversely

Open Discussion:

IBZ: lasers are enormous, can the size be reduced?

WL: comments on front end of BELLA; says size has shrunk tremendously; pump lasers need to be shrunk; laser could be small for 500 MeV; he advocates R&D to make "everything to be small"

CP: how well can you control the pulse length and charge?

WL: this should be good now; no control of pulse length now; 10-15% for charge; excited to see XUV light

EL: what is the timescale for an LPWA FEL?

WL: depends on the funding level

GH: what is the rep rate?

WL: 10 Hz now; progress on combining fiber CW lasers; TiSaph will have trouble with pump lasers, not TiSaph crystal itself; TiSaph may get to 30 Hz

FW: how long can you use a capillary structure?

WL: 100,000s of shots is possible; have gone for 3 weeks with same one