

Working Group 3

The dielectric wakefield accelerator (~~DWA~~) =
= beam driven wakefields in a dielectric tube

WG3 coordinators:

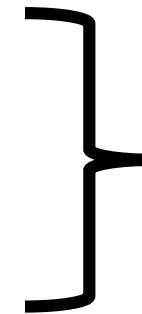
Paolo Craievich (PSI), Philippe Piot (FNAL/NIU), John Power (ANL)

Expanding WG3 topic

- Dielectric Wakefield Accelerator → Structure-based Wakefield Accelerator
- Structure = metallic or dielectric
- Acceleration Classification: Power Source & Medium

- Conventional Accelerator: Klystron & metallic structure

1. LWFA: → Laser & plasma (WG1)
2. PWFA: → Beam & plasma (WG2)
3. SWA: → Beam & structure (WG3)
4. DLA: → Laser & structure (WG4)



Advanced
And
Novel
Accelerators

Outline for six sessions of WG3.

Title + Contributors (a few slides to the discussion, there are no formal talks)

1. **S2a TUE (2pm-4pm)** : Straw man design effort, challenges and roadmap.
Contributors: John Power, Jamie Rosenzweig
2. **S2b TUE (4:30pm-6pm):** Novel wakefield **structures**.
Contributors: Jay Hirshfield, Alexei Kanareykin

Example for S2b

*There is still time to add contributors to the sessions but please email us quickly.

novel wakefield structures (and survey of structures)

S2b TUE (16:30pm - 18:00pm)

Example for S2b

Survey of experiments (current state-of-the-art structures)

- GHz vs THz; Two-beam Accelerator (TBA) vs Collinear Wakefield Accelerator (CWA); Dielectric vs metallic; cylindrical vs planar
- GHz cylindrical metallic loaded structures
 - Short pulse TBA with demonstration of 300MW rf power generation and 150MeV/m acceleration
 - TBA Staging experiment with demonstration of ~ 100 MV/m per stage
- GHz cylindrical dielectric loaded structures
 - Demonstration of the 1st 26GHz full dielectric TBA with ~ 160 MW rf generation and 50MeV/m acceleration
- GHz cylindrical coaxial dielectric loaded structures requiring an annular drive beam;
- THz metallic planar structure
 - Massimo Dal Forno et al., “rf breakdown measurements in electron beam driven 200 GHz copper and copper-silver accelerating structures”, PRAB, **19**, 111301 (2016)
 - Result: 200 GHz copper: 500 MV/m and a rf pulse length of 0.3 ns
- THz dielectric cylindrical structures
 - B. O’Shea et al., Nature Communications 2016
 - Result: 422 GHz, Peak field 1.3 GV/m; Mean acceleration gradient ~ 300 MV/m
- GHz PBG (MIT 17 GHz and LANL 11.7 GHz)
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Example for S2b

Survey of future directions

- S.V. Kuzikov et al., “Asymmetric bimodal accelerator cavity for raising RF breakdown thresholds,” Phys. Rev. Lett. 104, 214801 (2010).
- Cylindrical dielectric loaded structures with plasma filling;
- Cylindrical coaxial dielectric loaded structures requiring an annular drive beam;
- Dielectric resonators;
- Detuned cavity structures for collinear two-beam high transformer ratio high-beta acceleration (leptons);
- Multi-beam structure for high-power low-energy acceleration that requires no external RF;
- GHz MTM (MIT wagon wheel structure)
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Example for S2b

What structure issues should we be working on ?

- High gradient demonstration?
- Short pulse sources development?
- Multipactor in dielectric structures?
- BBU studies in THz structures?
- TBA: PETS/decelerator & main/accelerator structures
- CWA:
 - 0
 - 0
 - 0

Example for S2b

Outline for six sessions of WG3.

Title + Contributors (a few slides to the discussion, there are no formal talks)

3. **S3a WED (9am-10:30am):** Drive and witness **beam dynamics**
Contributors: Yuri Saveliev, Sergey Kuzikov, Francois Lemery, Alexey Petrenko, John Power, Levi Schachter
4. **S3b WED (11am-12:30am):** Parameter table for structure-based wakefield acceleration
 - GHz vs THz; Two-beam Accelerator (TBA) vs Collinear Wakefield Accelerator (CWA); Dielectric vs metallic; cylindrical vs planar
 - Contributors: Group effort
5. **S3c WED (2pm-4pm):** Survey of test facilities and Opportunities for collaborations
 1. Possible facilities: ATF (BNL); ATHOS beamline (PSI); AWA (ANL); CLEAR (CERN); FACET (SLAC); FAST (FNAL); PITZ(DESY); SINBAD (DESY) , SPARC (INFN), etc?
 2. Contributors: Group effort
6. **S3d WED (4:30pm-6pm):** write "scientific roadmap slide" and WG3 report
Contributors: Group effort

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