History of nanotube wakefield acceleration

Tajima and Dawson, PRL, 1979: wakefields
Tajima, M. Cavenago, PRL, 1987: crystal acceleration
S. Iijima, Nature 1991: CNT
Tajima workshop invited Iijima, 1992
.....

Mourou, 2014: Thin Film Compression
Tajima, 2014: nanotube acceleration with X-ray
Zhang, 2016: self-focusing in nanotube
Shiltsev, Tajima, 2019: Fermilab workshop

flat snow half pipe snow

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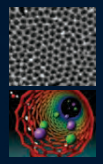
Shiltsev • Tajima



BEAM ACCELERATION IN CRYSTALS AND NANOSTRUCTURES

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Edited by

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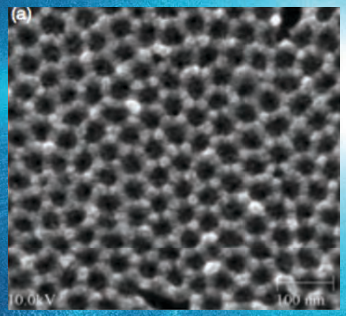
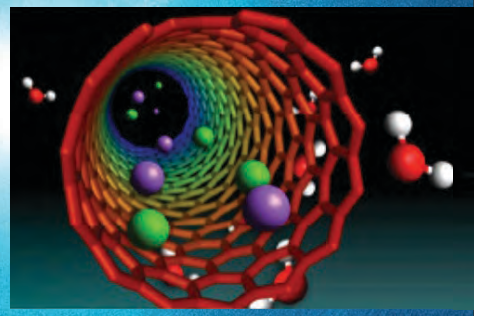




Many nanoholes Single nanohole

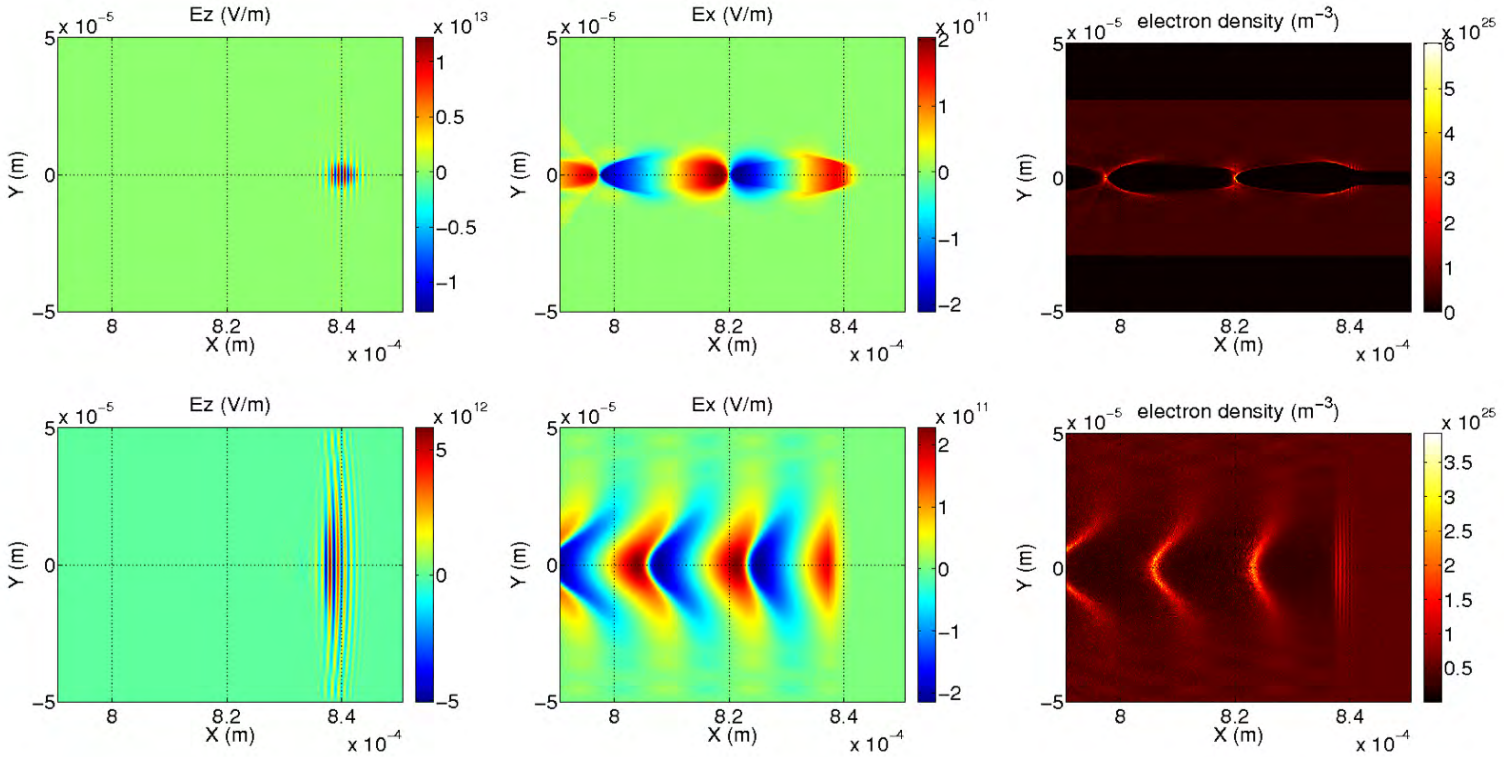
World Scientific

Book published (2020)

Gathered for **nanotube wakefield acceleration** (Fermilab, 2019)

E.g., X-ray LWFA in nanotube vs. uniform

X. Zhang (PRAB 19, 101004 , 2016)



in nanotube

in uniform solid

A few-cycled 1keV X-ray pulse (a_0 ~ O(1)), causing 10TeV/m wakefield in the tube

more strongly confined in the tube cf: uniform solid

Project: proof-of-principle experiments, augmented with theory, modeling and diagnostics development

CNT diameter: 10s-100s nm, singular or bundle of nanotubes

drivers: lasers (higher harmonic, TFC X-ray) or ultra-dense *e*- bunch

Goals: studies, PoP demo, modeling confirmation → 1 GeV over < 1 cm in 4-6 years

Collaborators: Mourou, Geddes, Shiltsev, P. Chen, Corde, Taborek, Dollar, Hakimi, Sahai, Zhang, Bulanov, ELI-ALPS, Kawachi (QST), Sone (JST), Iijima, …. (open armed, see following speakers, too)