

















- A multi-disciplinary group of leading researchers in plasma science, lasers, beam physics, modeling and conventional accelerator technology
- A shared set of broad physical and intellectual resources in a stable research environment





Critical Issues

- Bunch Length Scaling Law
- Bunch Shaping & Beam Loading
- Transverse Beam Dynamics – Betatron, hosing, lensing
- Positron Acceleration
- Plasma Source Development
- Modeling

Critical Issues
are addressed at ORION• Bunch Length Scaling LawMRC 1• Bunch Shaping & Beam LoadingMRC 3,5• Transverse Beam Dynamics
– Betatron, hosing, lensingMRC 1, 5• Positron AccelerationMRC 1• Plasma Source DevelopmentMRC 1, 5• ModelingMRC 6

•	Bunch Length Scaling Law	MRC 1
•	Bunch Shaping & Beam Loading	MRC 3,5
•	Transverse Beam Dynamics – Betatron, hosing, lensing	MRC 1, 5
•	Positron Acceleration	MRC 1
•	Plasma Source Development	MRC 1, 5
•	Modeling	MRC 6



Critical Issues are addressed at ORION		
Bunch Length Scaling Law	MRC 1	
Bunch Shaping & Beam Loading	MRC 3,5	
 Transverse Beam Dynamics Betatron, hosing, lensing 	MRC 1, 5	
Positron Acceleration	MRC 1	
Plasma Source Development	MRC 1, 5	
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Critical Issues are addressed at ORION			
Bunch Length Scaling Law	MRC 1		
Bunch Shaping & Beam Loading	MRC 5		
 Transverse Beam Dynamics Betatron, hosing, lensing 	MRC 1, 5		
Positron Acceleration	MRC 1		
Plasma Source Development	MRC 1, 5 RC		
Modeling	MRC 6		
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Experiment	Physics
Ion Channel Laser (ICL)	Short plasma cell replaces a long undulator magnet in an FEL. Could be demonstrated in visible (50 MeV beam)and ultraviolet (300 MeV)
Coherent Plasma	Magnetic field outcouples multi kW of microwave power at 100+
Cherenkov Rad iation	GHz.
Laser Guiding	Laser Guided over 100 Rayleigh Lengths. Extended interaction for Laser Wakefield Accelerator.
E-Beam Steering	Deflected e-beam. Fast switching via laser plasma.
E-Beam Slicing	Energy modulation on intra-bunch timescale + bend = slicer
Bunch Shaping–High Transformer Ratio	Chicane optimized drive bunch shap e gives large wake amplitudes (1.5 GeV)
Electron Hose Instability	Parametric study of the onset and saturation. Blowup of beam.
Hi De-magnification Plasma Lens	4μ spot with M=1/100 to test geometric and chromatic aberrations.
Energy Compensation	Use linear part of wake to remove correlated energy spread. A 10% spread can be reduced to 1%.
Self-Modulated Plasma	Beam driven instability bunches beam and excites large acceleratin
Wakefield Acceleration	wakes.

