Table 1a. Summary of Simulation Capabilities of the IFE Liquid Wall Mechanisms by the 1-D ABLATOR Computer Model

Time	**<~10 ns**	**~10 ns-100 ns**	**~0.1 μs-1 μs**	**~1 μs-30 μs**	**30 μs - 3 ms**	**3-100's ms**
I. Energy Deposition	*Photon energy deposition in liquid wall*	*Neutron energy deposition*	*Ion energy deposition*			
Model simulation	**Yes**					
II. Liquid wall	*Explosive boiling*	*Shock propagation through liquid wall*	*Surface evaporation*	*Spallation*		*Jet reformation*
Model simulation	**Yes**	**Yes**	**Yes**	**Yes**		
	Impulse generation in liquid wall			*Liquid jet break-up due to isochoric heating*		*Film condensation*
Model simulation	**Yes**					
				Surface evaporation		*Aerosol coagulation*
Model simulation				**Yes**		
						Hydrodynamic droplets source term
Model simulation						
III. Chamber	*Ionization of ablated material*	*Expansion of ablated mass in chamber*	*Further ionization of ablated mass*	*Ablated vapor propagation through chamber*	*Shock wave traverse through chamber*	*Aerosol evolution*
Model simulation		**Yes**				
			High re-radiation to liquid wall	*Radiation cooling*	*Expansion and compression (cooling down through radiation*	*Cooling through condensation*
Model simulation						
					In-flight condensation & aerosol formation	*Vacuum pumping dynamics*
Model simulation						

Table 1b. Summary of Simulation Capabilities of the IFE Liquid Wall Mechanisms by the 1-D BUCKY Computer Model

Time	**<~10 ns**	**~10 ns-100 ns**	**~0.1 μs-1 μs**	**~1 μs-30 μs**	**30 μs - 3 ms**	**3-100's ms**
I. Energy Deposition	*Photon energy deposition in liquid wall*	*Neutron energy deposition*	*Ion energy deposition*			
Model simulation	**Yes**	**Yes**	**Yes**			
II. Liquid wall	*Explosive boiling*	*Shock propagation through liquid wall*	*Surface evaporation*	*Spallation*		*Jet reformation*
Model simulation	**Yes (partially)***	**Yes**	**Yes**			
	Impulse generation in liquid wall			*Liquid jet break-up due to isochoric heating*		*Film condensation*
Model simulation	**Yes**					
				Surface evaporation		*Aerosol coagulation*
Model simulation				**Yes**		
						Hydrodynamic droplets source term
Model simulation						
III. Chamber	*Ionization of ablated material*	*Expansion of ablated mass in chamber*	*Further ionization of ablated mass*	*Ablated vapor propagation through chamber*	*Shock wave traverse through chamber*	*Aerosol evolution*
Model simulation	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
			High re-radiation to liquid wall	*Radiation cooling*	*Expansion and compression (cooling down through radiation)*	*Cooling through condensation*
Model simulation			**Yes**	**Yes**	**Yes**	
					In-flight condensation & aerosol formation	*Vacuum pumping dynamics*
Model simulation						

*Energy is balanced, but liquid splash is not treated

Table 1c. Summary of Simulation Capabilities of the IFE Liquid Wall Mechanisms by the 2-D SPARTAN Computer Model

Time	**<~10 ns**	**~10 ns-100 ns**	**~0.1 μs-1 μs**	**~1 μs-30 μs**	**30 μs - 3 ms**	**3-100's ms**
I. Energy Deposition	*Photon energy deposition in liquid wall*	*Neutron energy deposition*	*Ion energy deposition*			
Model simulation						
II. Liquid wall	*Explosive boiling*	*Shock propagation through liquid wall*	*Surface evaporation*	*Spallation*		*Jet reformation*
Model simulation						
	Impulse generation in liquid wall			*Liquid jet break-up due to isochoric heating*		*Film condensation*
Model simulation						
				Surface evaporation		*Aerosol coagulation*
Model simulation						
						Hydrodynamic droplets source term
Model simulation						
III. Chamber	*Ionization of ablated material*	*Expansion of ablated mass in chamber*	*Further ionization of ablated mass*	*Ablated vapor propagation through chamber*	*Shock wave traverse through chamber*	*Aerosol evolution*
Model simulation		**Yes**		**Yes**	**Yes**	
			High re-radiation to liquid wall	*Radiation cooling*	*Expansion and compression (cooling down through radiation)*	*Cooling through condensation*
Model simulation						
					In-flight condensation & aerosol formation	*Vacuum pumping dynamics*
Model simulation						

Table 1d. Summary of Simulation Capabilities of the IFE Liquid Wall Mechanisms by the 1-D TOPGUN Computer Model

Time	**<~10 ns**	**~10 ns-100 ns**	**~0.1 μs-1 μs**	**~1 μs-30 μs**	**30 μs - 3 ms**	**3-100's ms**
I. Energy Deposition	*Photon energy deposition in liquid wall*	*Neutron energy deposition*	*Ion energy deposition*			
Model simulation						
II. Liquid wall	*Explosive boiling*	*Shock propagation through liquid wall*	*Surface evaporation*	*Spallation*		*Jet reformation*
Model simulation			**Yes**			
	Impulse generation in liquid wall			*Liquid jet break-up due to isochoric heating*		*Film condensation*
Model simulation						**Yes**
				Surface evaporation		*Aerosol coagulation*
Model simulation				**Yes**		**Yes**
						Hydrodynamic droplets source term
Model simulation						
III. Chamber	*Ionization of ablated material*	*Expansion of ablated mass in chamber*	*Further ionization of ablated mass*	*Ablated vapor propagation through chamber*	*Shock wave traverse through chamber*	*Aerosol evolution*
Model simulation					**Yes**	**Yes**
			High re-radiation to liquid wall	*Radiation cooling*	*Expansion and compression (cooling down through radiation)*	*Cooling through condensation*
Model simulation						**Yes**
					In-flight condensation & aerosol formation	*Vacuum pumping dynamics*
Model simulation					**Yes**	

Table 1e. Summary of Simulation Capabilities of the IFE Liquid Wall Mechanisms by the 2-D TSUNAMI Computer Model

Time	**<~10 ns**	**~10 ns-100 ns**	**~0.1 μs-1 μs**	**~1 μs-30 μs**	**30 μs - 3 ms**	**3-100's ms**
I. Energy Deposition	*Photon energy deposition in liquid wall*	*Neutron energy deposition*	*Ion energy deposition*			
Model simulation	**Yes**		*			
II. Liquid wall	*Explosive boiling*	*Shock propagation through liquid wall*	*Surface evaporation*	*Spallation*		*Jet reformation*
Model simulation	**Yes**		**Yes**			
	Impulse generation in liquid wall			*Liquid jet break-up due to isochoric heating*		*Film condensation*
Model simulation						
				Surface evaporation		*Aerosol coagulation*
Model simulation				**Yes**		
						Hydrodynamic droplets source term
Model simulation						
III. Chamber	*Ionization of ablated material*	*Expansion of ablated mass in chamber*	*Further ionization of ablated mass*	*Ablated vapor propagation through chamber*	*Shock wave traverse through chamber*	*Aerosol evolution*
Model simulation	**Yes**	**Yes**		**Yes**	**Yes**	
			High re-radiation to liquid wall	*Radiation cooling*	*Expansion and compression (cooling down through radiation)*	*Cooling through condensation*
Model simulation			**Yes**	**Yes**	**Yes**	
					In-flight condensation & aerosol formation	*Vacuum pumping dynamics*
Model simulation					*	

* (can be implemented)

Table 1f. Summary of Simulation Capabilities of the IFE Liquid Wall Mechanisms by the 2-D TSUNAMI Computer Model (+ 1-D Condensation Module)

Time	**<~10 ns**	**~10 ns-100 ns**	**~0.1 µs-1 µs**	**~1 µs-30 µs**	**30 µs - 3 ms**	**3-100's ms**
I. Energy Deposition	*Photon energy deposition in liquid wall*	*Neutron energy deposition*	*Ion energy deposition*			
Model simulation						
II. Liquid wall	*Explosive boiling*	*Shock propagation through liquid wall*	*Surface evaporation*	*Spallation*		*Jet reformation*
Model simulation			**Yes**			
	Impulse generation in liquid wall			*Liquid jet break-up due to isochoric heating*		*Film condensation*
Model simulation						**Yes**
				Surface evaporation		*Aerosol coagulation*
Model simulation				**Yes**		
						Hydrodynamic droplets source term
Model simulation						
III. Chamber	*Ionization of ablated material*	*Expansion of ablated mass in chamber*	*Further ionization of ablated mass*	*Ablated vapor propagation through chamber*	*Shock wave traverse through chamber*	*Aerosol evolution*
Model simulation		**Yes**		**Yes**	**Yes**	
			High re-radiation to liquid wall	*Radiation cooling*	*Expansion and compression (cooling down through radiation)*	*Cooling through condensation*
Model simulation						**Yes**
					In-flight condensation & aerosol formation	*Vacuum pumping dynamics*
Model simulation						

Table 2a. Summary of Simulation and Measurement Capabilities in the UCLA Plasma Gun Facility

Time		**<~10 ns**		**~10 ns-100 ns**		**~0.1 μs-1 μs**		**~1 μs-30 μs**		**30 μs - 3 ms**		**3-100's ms**	
I. Energy Deposition		*Photon energy deposition in liquid wall*		*Neutron energy deposition*		*Ion energy deposition*							
Experimental simulation	Experimental measurement					**Yes**							
II. Liquid wall		*Explosive boiling*		*Shock propagation through liquid wall*		*Surface evaporation*		*Spallation*				*Jet reformation*	
Experimental simulation	Experimental measurement			**Yes**		**Yes**							
		Impulse generation in liquid wall						*Liquid jet break-up due to isochoric heating*				*Film condensation*	
Experimental simulation	Experimental measurement	**Yes**										**Yes**	**Yes***
								Surface evaporation				*Aerosol coagulation*	
Experimental simulation	Experimental measurement							**Yes**				**Yes**	**Yes***
												Hydrodynamic droplets source term	
Experimental simulation	Experimental measurement												
III. Chamber		*Ionization of ablated material*		*Expansion of ablated mass in chamber*		*Further ionization of ablated mass*		*Ablated vapor propagation through chamber*		*Shock wave traverse through chamber*		*Aerosol evolution*	
Experimental simulation	Experimental measurement			**Yes**				**Yes**	**Yes**	**Yes**		**Yes**	**Yes***
						High re-radiation to liquid wall		*Radiation cooling*		*Expansion and compression (cooling down through radiation)*		*Cooling through condensation*	
Experimental simulation	Experimental measurement							**Yes**		**Yes**		**Yes**	**Yes**
										In-flight condensation & aerosol formation		*Vacuum pumping dynamics*	
Experimental simulation	Experimental measurement									**Yes**	**Yes***		

*(in progress)

Table 2b. Summary of Simulation and Measurement Capabilities in the UCSD Laser Plasma and Laser-Matter Interactions Laboratory

Time		**<~10 ns**		**~10 ns-100 ns**		**~0.1 μs-1 μs**		**~1 μs-30 μs**		**30 μs - 3 ms**		**3-100's ms**	
I. Energy Deposition		*Photon energy deposition in liquid wall*		*Neutron energy deposition*		*Ion energy deposition*							
simulation	measurement	**Yes**											
II. Liquid wall		*Explosive boiling*		*Shock propagation through liquid wall*		*Surface evaporation*		*Spallation*				*Jet reformation*	
simulation	measurement	**Yes**	**Yes***	**Yes**		**Yes**		**Yes**					
		Impulse generation in liquid wall						*Liquid jet break-up due to isochoric heating*				*Film condensation*	
simulation	measurement	**Yes**										**Yes**	
								Surface evaporation				*Aerosol coagulation*	
simulation	measurement							**Yes**	**Yes**			**Yes**	**Yes***
												Hydrodynamic droplets source term	
simulation	measurement												
III. Chamber		*Ionization of ablated material*		*Expansion of ablated mass in chamber*		*Further ionization of ablated mass*		*Ablated vapor propagation through chamber*		*Shock wave traverse through chamber*		*Aerosol evolution*	
simulation	measurement	**Yes**	**Yes**	**Yes**	**Yes**			**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes***
						High re-radiation to liquid wall		*Radiation cooling*		*Expansion and compression (cooling down through radiation)*		*Cooling through condensation*	
simulation	measurement							**Yes**				**Yes**	**Yes***
										In-flight condensation & aerosol formation		*Vacuum pumping dynamics*	
simulation	measurement												

*(in progress)

Table 2c. Summary of Simulation and Measurement Capabilities in the UW Shock Tube Facility

Time		**<~10 ns**		**~10 ns-100 ns**		**~0.1 μs-1 μs**		**~1 μs-30 μs**		**30 μs - 3 ms**		**3-100's ms**	
I. Energy Deposition		*Photon energy deposition in liquid wall*		*Neutron energy deposition*		*Ion energy deposition*							
Experimental simulation	Experimental measurement												
II. Liquid wall		*Explosive boiling*		*Shock propagation through liquid wall*		*Surface evaporation*		*Spallation*				*Jet reformation*	
Experimental simulation	Experimental measurement												
		Impulse generation in liquid wall						*Liquid jet break-up due to isochoric heating*				*Film condensation*	
Experimental simulation	Experimental measurement												
								Surface evaporation				*Aerosol coagulation*	
Experimental simulation	Experimental measurement												
												Hydrodynamic droplets source term	
Experimental simulation	Experimental measurement												
III. Chamber		*Ionization of ablated material*		*Expansion of ablated mass in chamber*		*Further ionization of ablated mass*		*Ablated vapor propagation through chamber*		*Shock wave traverse through chamber*		*Aerosol evolution*	
Experimental simulation	Experimental measurement									**Yes**			
						High re-radiation to liquid wall		*Radiation cooling*		*Expansion and compression (cooling down through radiation)*		*Cooling through condensation*	
Experimental simulation	Experimental measurement												
										In-flight condensation & aerosol formation		*Vacuum pumping dynamics*	
Experimental simulation	Experimental measurement												

Table 2d. Summary of Simulation and Measurement Capabilities in the XAPPER Facility

Time		**<~10 ns**		**~10 ns-100 ns**		**~0.1 μs-1 μs**		**~1 μs-30 μs**		**30 μs - 3 ms**		**3-100's ms**	
I. Energy Deposition		*Photon energy deposition in liquid wall*		*Neutron energy deposition*		*Ion energy deposition*							
Experimental simulation	Experimental measurement	**Yes**											
II. Liquid wall		*Explosive boiling*		*Shock propagation through liquid wall*		*Surface evaporation*		*Spallation*				*Jet reformation*	
Experimental simulation	Experimental measurement	**Yes**		**Yes**				**Yes**					
		Impulse generation in liquid wall						*Liquid jet break-up due to isochoric heating*				*Film condensation*	
Experimental simulation	Experimental measurement	**Yes**											
								Surface evaporation				*Aerosol coagulation*	
Experimental simulation	Experimental measurement												
												Hydrodynamic droplets source term	
Experimental simulation	Experimental measurement												
III. Chamber		*Ionization of ablated material*		*Expansion of ablated mass in chamber*		*Further ionization of ablated mass*		*Ablated vapor propagation through chamber*		*Shock wave traverse through chamber*		*Aerosol evolution*	
Experimental simulation	Experimental measurement	**Yes**		**Yes**				**Yes**					
						High re-radiation to liquid wall		*Radiation cooling*		*Expansion and compression (cooling down through radiation)*		*Cooling through condensation*	
Experimental simulation	Experimental measurement							**Yes**					
										In-flight condensation & aerosol formation		*Vacuum pumping dynamics*	
Experimental simulation	Experimental measurement												

*(in progress)

Table 2e. Summary of Simulation and Measurement Capabilities in the Z Facility

Time		<~10 ns		~10 ns-100 ns		~0.1 μs-1 μs		~1 μs-30 μs		30 μs - 3 ms		3-100's ms	
I. Energy Deposition		*Photon energy deposition in liquid wall*		*Neutron energy deposition*		*Ion energy deposition*							
Experimental simulation	Experimental measurement	**Yes**											
II. Liquid wall		*Explosive boiling*		*Shock propagation through liquid wall*		*Surface evaporation*		*Spallation*				*Jet reformation*	
Experimental simulation	Experimental measurement	**Yes**		**Yes**									
		Impulse generation in liquid wall						*Liquid jet break-up due to isochoric heating*				*Film condensation*	
Experimental simulation	Experimental measurement	**Yes**											
								Surface evaporation				*Aerosol coagulation*	
Experimental simulation	Experimental measurement												
												Hydrodynamic droplets source term	
Experimental simulation	Experimental measurement												
III. Chamber		*Ionization of ablated material*		*Expansion of ablated mass in chamber*		*Further ionization of ablated mass*		*Ablated vapor propagation through chamber*		*Shock wave traverse through chamber*		*Aerosol evolution*	
Experimental simulation	Experimental measurement	**Yes**		**Yes**									
						High re-radiation to liquid wall		*Radiation cooling*		*Expansion and compression (cooling down through radiation)*		*Cooling through condensation*	
Experimental simulation	Experimental measurement												
										In-flight condensation & aerosol formation		*Vacuum pumping dynamics*	
Experimental simulation	Experimental measurement												

*(in progress)

Table 2f. Summary of Simulation and Measurement Capabilities in the Georgia Institute of Tech. Hydraulic Facility

Time		**<~10 ns**		**~10 ns-100 ns**		**~0.1 μs-1 μs**		**~1 μs-30 μs**		**30 μs - 3 ms**		**3-100's ms**	
I. Energy Deposition		*Photon energy deposition in liquid wall*		*Neutron energy deposition*		*Ion energy deposition*							
Experimental simulation	Experimental measurement												
II. Liquid wall		*Explosive boiling*		*Shock propagation through liquid wall*		*Surface evaporation*		*Spallation*				*Jet reformation*	
Experimental simulation	Experimental measurement											**Yes**	**Yes**
		Impulse generation in liquid wall						*Liquid jet break-up due to isochoric heating*				*Film condensation*	
Experimental simulation	Experimental measurement												
								Surface evaporation				*Aerosol coagulation*	
Experimental simulation	Experimental measurement												
												Hydrodynamic droplets source term	
Experimental simulation	Experimental measurement											**Yes**	**Yes**
III. Chamber		*Ionization of ablated material*		*Expansion of ablated mass in chamber*		*Further ionization of ablated mass*		*Ablated vapor propagation through chamber*		*Shock wave traverse through chamber*		*Aerosol evolution*	
Experimental simulation	Experimental measurement											**Yes***	
						High re-radiation to liquid wall		*Radiation cooling*		*Expansion and compression (cooling down through radiation)*		*Cooling through condensation*	
Experimental simulation	Experimental measurement											**Yes***	
										In-flight condensation & aerosol formation		*Vacuum pumping dynamics*	
Experimental simulation	Experimental measurement												

*(in progress)

Table 2g. Summary of Simulation and Measurement Capabilities in the UCB Hydraulic Experimental Facility

Time		**<~10 ns**		**~10 ns-100 ns**		**~0.1 μs-1 μs**		**~1 μs-30 μs**		**30 μs - 3 ms**		**3-100's ms**	
I. Energy Deposition		*Photon energy deposition in liquid wall*		*Neutron energy deposition*		*Ion energy deposition*							
Experimental simulation	Experimental measurement												
II. Liquid wall		*Explosive boiling*		*Shock propagation through liquid wall*		*Surface evaporation*		*Spallation*				*Jet reformation*	
Experimental simulation	Experimental measurement											**Yes**	
		Impulse generation in liquid wall						*Liquid jet break-up due to isochoric heating*				*Film condensation*	
Experimental simulation	Experimental measurement												
								Surface evaporation				*Aerosol coagulation*	
Experimental simulation	Experimental measurement												
												Hydrodynamic droplets source term	
Experimental simulation	Experimental measurement											**Yes**	
III. Chamber		*Ionization of ablated material*		*Expansion of ablated mass in chamber*		*Further ionization of ablated mass*		*Ablated vapor propagation through chamber*		*Shock wave traverse through chamber*		*Aerosol evolution*	
Experimental simulation	Experimental measurement												
						High re-radiation to liquid wall		*Radiation cooling*		*Expansion and compression (cooling down through radiation)*		*Cooling through condensation*	
Experimental simulation	Experimental measurement												
										In-flight condensation & aerosol formation		*Vacuum pumping dynamics*	
Experimental simulation	Experimental measurement												

*(in progress)

Table 3. Summary of Simulation Capabilities of Different Models and of Simulation and Measurement Capabilities of Different Experimental Facilities in Addressing IFE Liquid Wall Mechanisms

Time		**<~10 ns**		**~10 ns-100 ns**		**~0.1 µs-1 µs**		**~1 µs-30 µs**		**30 µs - 3 ms**		**3-100's ms**	
I. Energy Deposition		*Photon energy deposition in liquid wall*		*Neutron energy deposition*		*Ion energy deposition*							
Model simulation		ABLATOR BUCKY TSUNAMI		BUCKY		BUCKY							
Experimental simulation	Experimental measurement	UCSD XAPPER Z				UCLA							
II. Liquid wall		*Explosive boiling*		*Shock propagation through liquid wall*		*Surface evaporation*		*Spallation*				*Jet reformation*	
Model simulation		ABLATOR BUCKY TSUNAMI		ABLATOR BUCKY		ABLATOR BUCKY TOPGUN TSUNAMI TSUNAMI(+COND.)		ABLATOR					
Experimental simulation	Experimental measurement	UCSD XAPPER Z	UCSD*	UCLA UCSD XAPPER Z		UCLA UCSD		UCSD XAPPER				GATech UCB	GATech
		Impulse generation in liquid wall						*Liquid jet break-up due to isochoric heating*				*Film condensation*	
Model simulation		ABLATOR BUCKY										TOPGUN TSUNAMI(+COND.)	
Experimental simulation	Experimental measurement	UCLA UCSD XAPPER Z										UCLA UCSD	UCLA
								Surface evaporation				*Aerosol coagulation*	
Model simulation								ABLATOR BUCKY TOPGUN TSUNAMI TSUNAMI(+COND.)				TOPGUN	

Experimental simulation	Experimental measurement							UCLA UCSD	UCSD			UCLA UCSD	UCLA* UCSD*
												Hydrodynamic droplets source term	
Model simulation													
Experimental simulation	Experimental measurement											GATech UCB	GATech
III. Chamber		*Ionization of ablated material*		*Expansion of ablated mass in chamber*		*Further ionization of ablated mass*		*Ablated vapor propagation through chamber*		*Shock wave traverse through chamber*		*Aerosol evolution*	
Model simulation		BUCKY TSUNAMI		ABLATOR BUCKY SPARTAN TSUNAMI TSUNAMI(+COND.)		BUCKY		BUCKY SPARTAN TSUNAMI TSUNAMI(+COND.)		BUCKY TOPGUN SPARTAN TSUNAMI TSUNAMI(+COND.)		TOPGUN	
Experimental simulation	Experimental measurement	UCSD XAPPER Z	UCSD	UCLA UCSD XAPPER Z	UCSD			UCLA UCSD XAPPER	UCLA UCSD	UCLA UCSD UW(shock)	UCSD	UCLA UCSD GATech*	UCLA* UCSD*
						High re-radiation to liquid wall		*Radiation cooling*		*Expansion and compression (cooling down through radiation)*		*Cooling through condensation*	
Model simulation						BUCKY TSUNAMI		BUCKY TSUNAMI		BUCKY TSUNAMI		TOPGUN TSUNAMI(+COND.)	
Experimental simulation	Experimental measurement							UCLA UCSD XAPPER		UCLA		UCLA UCSD GATech*	UCLA UCSD*
										In-flight condensation & aerosol formation		*Vacuum pumping dynamics*	
Model simulation										TOPGUN			
Experimental simulation	Experimental measurement									UCLA	UCLA*		

*(in progress)