

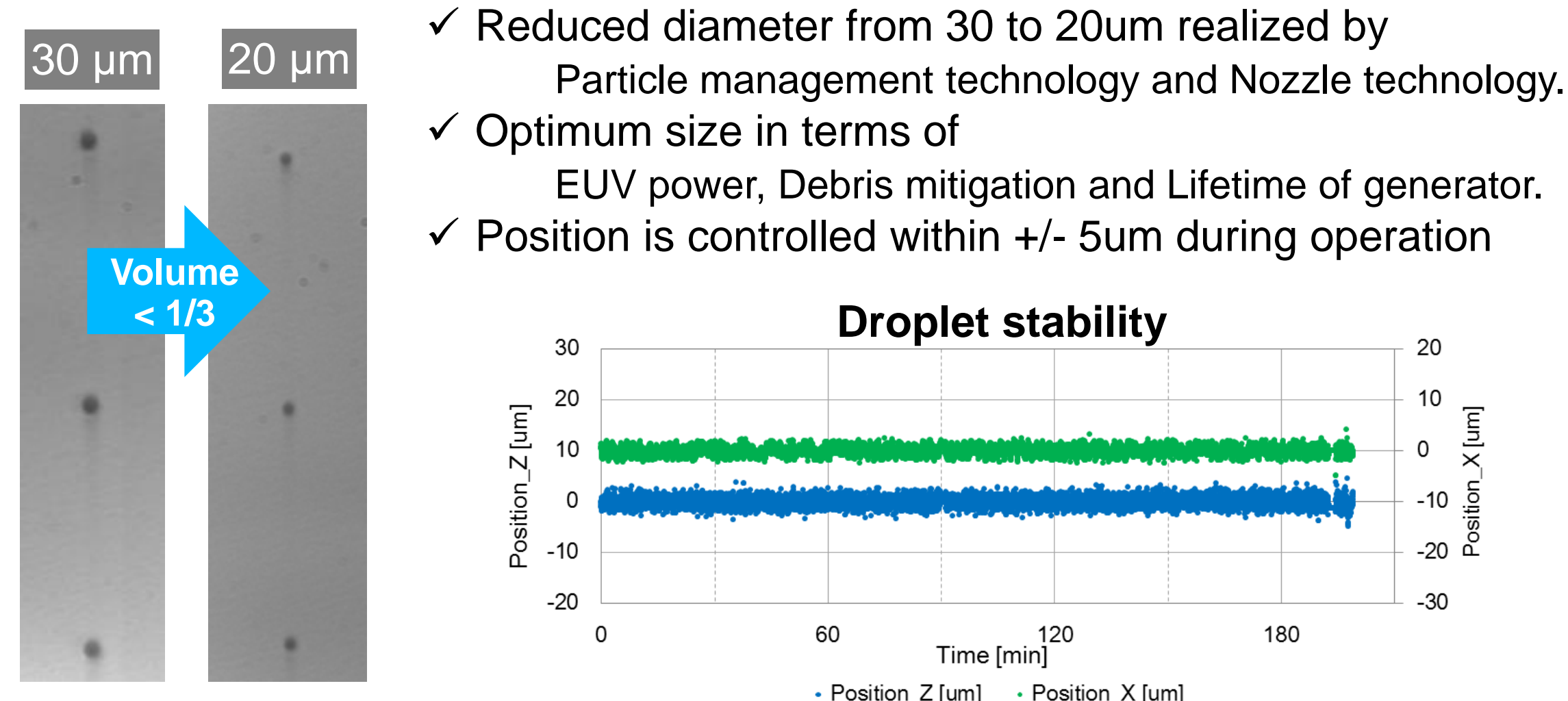
Key components technology update of 100W HVM EUV source

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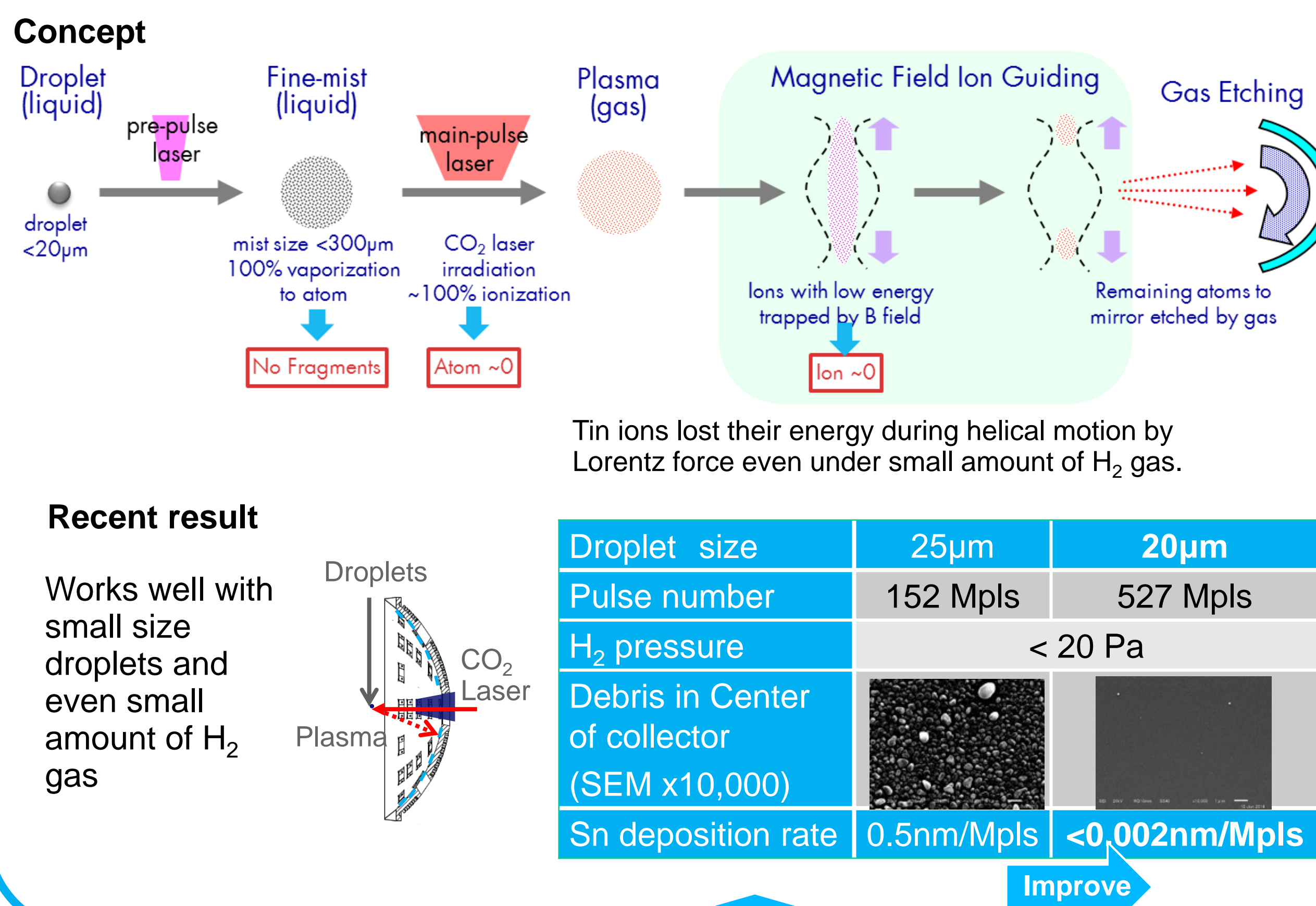
This paper introduces key components technology update of 100W HVM LPP-EUV (laser produced plasma extreme ultraviolet) source which enable sub-10nm critical layer patterning. This light source system is composed of several key components and each has its innovating, key and original technology. They are perfectly controlled and work harmoniously to produce stable plasma and provide high power EUV light in long term to the photolithography equipment. This paper describes the latest results obtained from our proto systems and test stand which support one 100 watt HVM LPP-EUV light source. Key components performance with experimental data and measurements are reported, such as high power short pulse CO₂ drive laser, unique pre-pulse laser technology, very small droplet generation, magnetic debris mitigation, laser-droplet shooting control and etc.

ABSTRACT

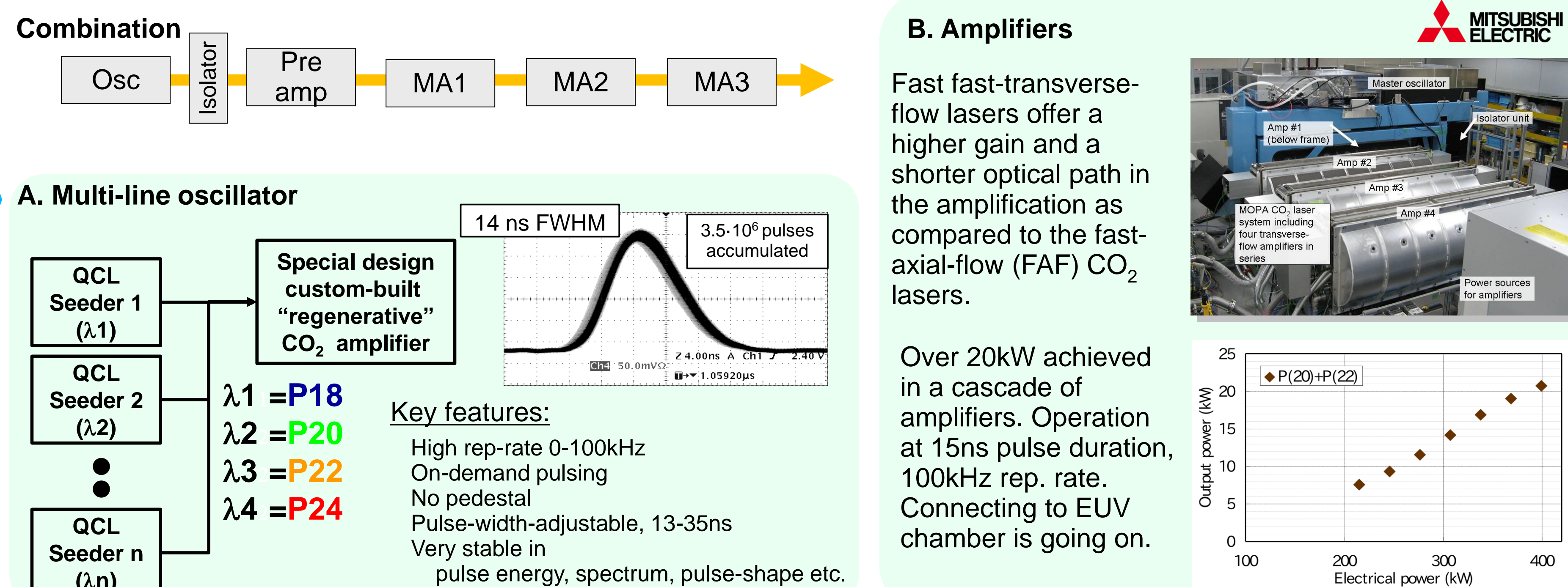
1. Droplet generation and Control



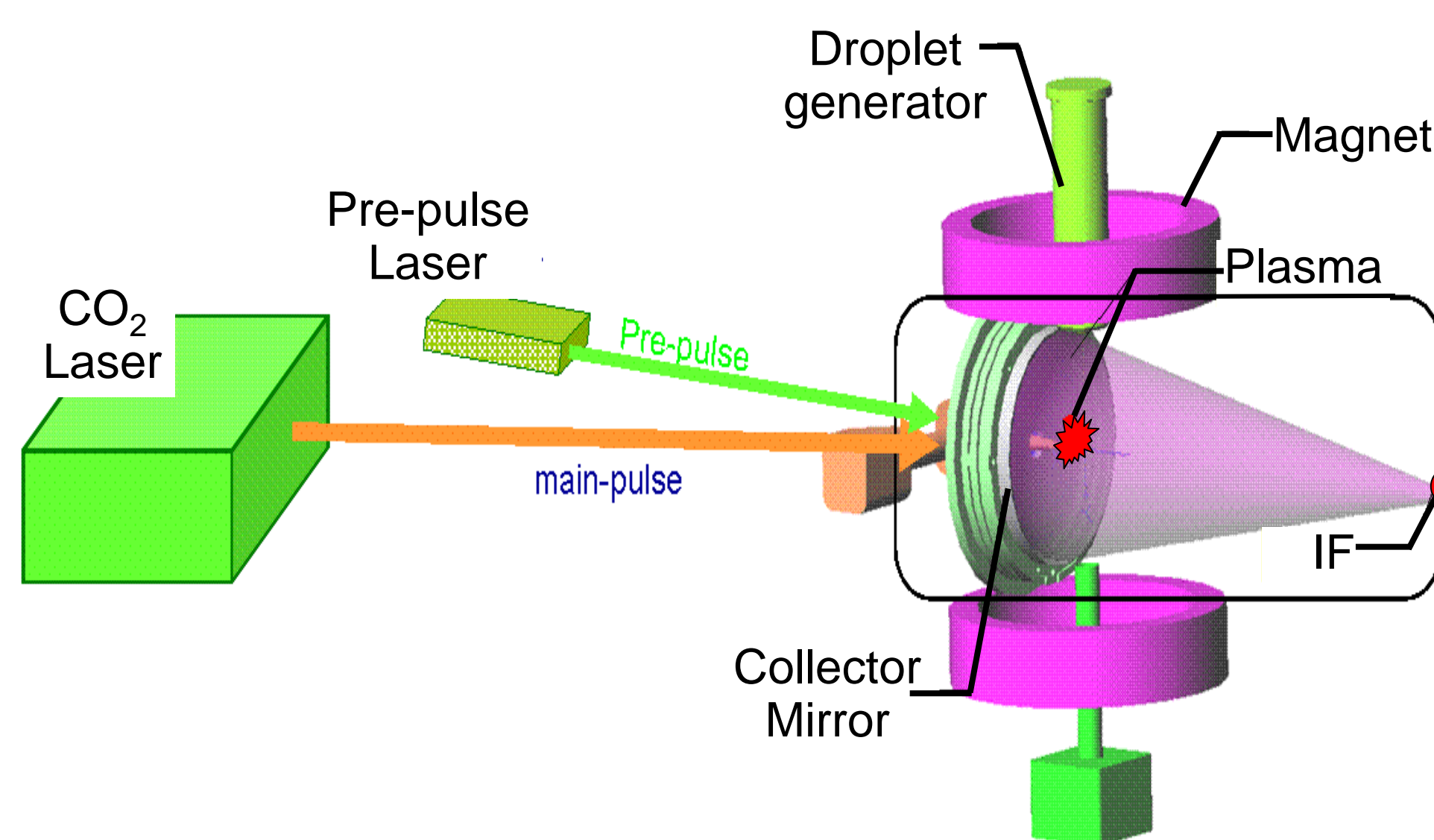
5. Tin debris mitigation with a super conductive magnet



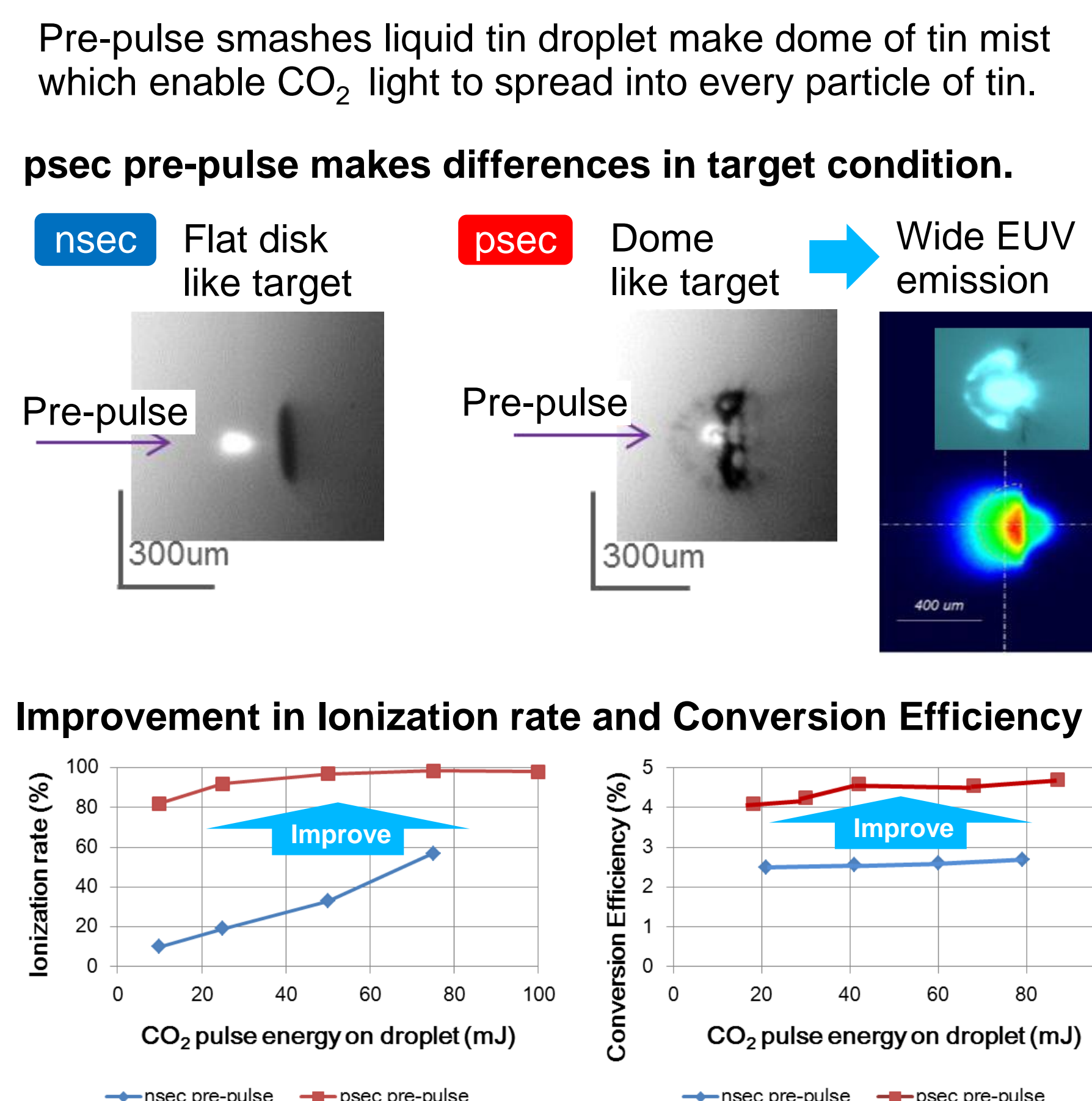
2. Hybrid CO₂ Laser System with short pulse high rep. rate Oscillator and FTF Amplifiers



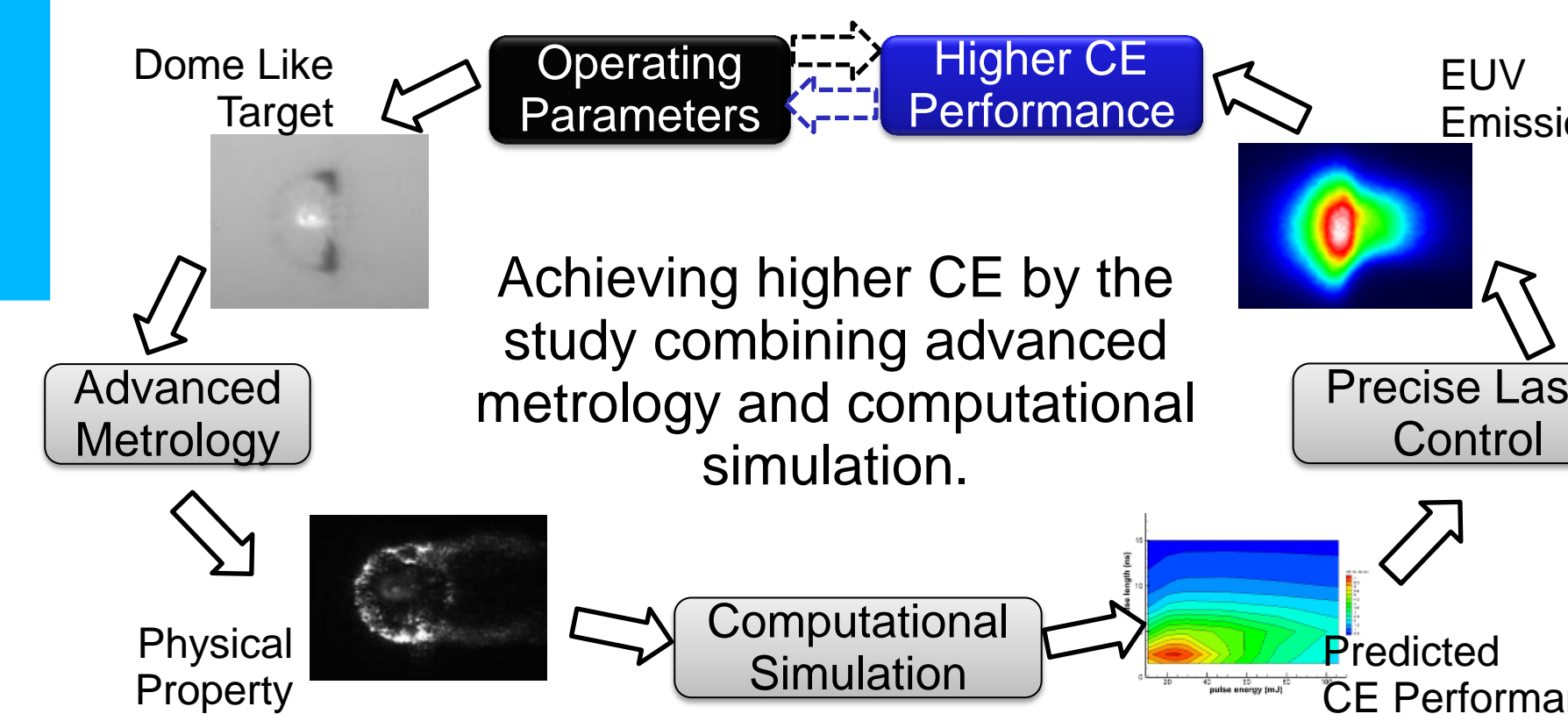
Gigaphoton's Concept



3. Pre-pulse Technology for High CE and Ionization Rate



Toward Higher CE for Higher Power in HVM

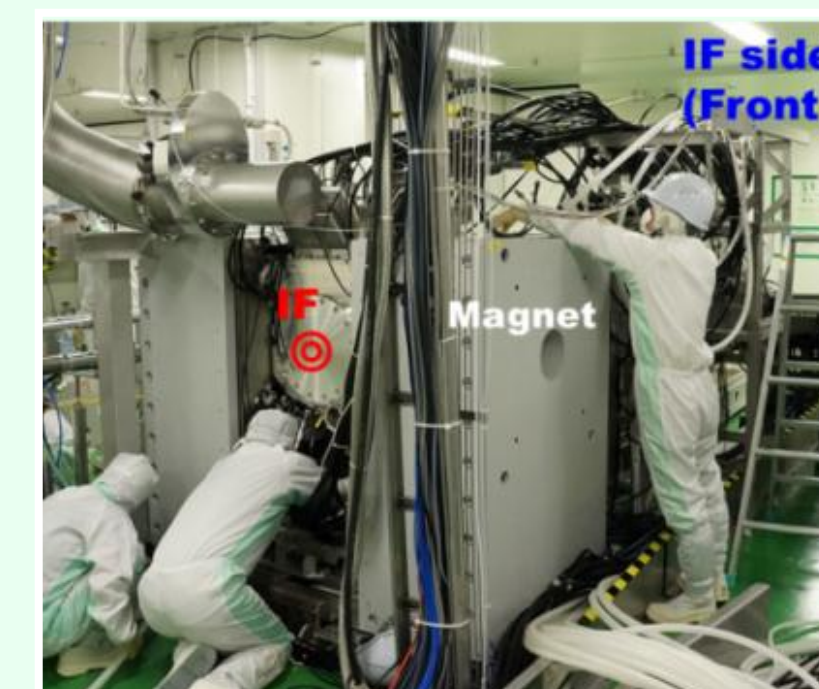
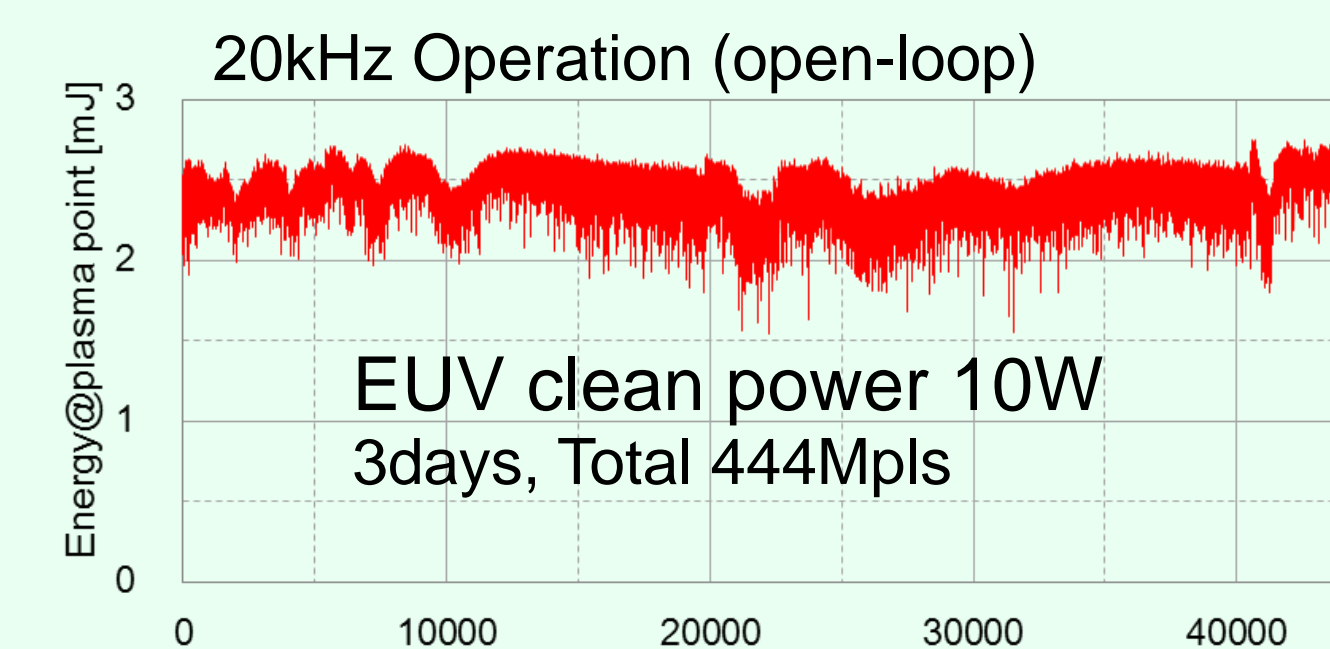


6. System performance

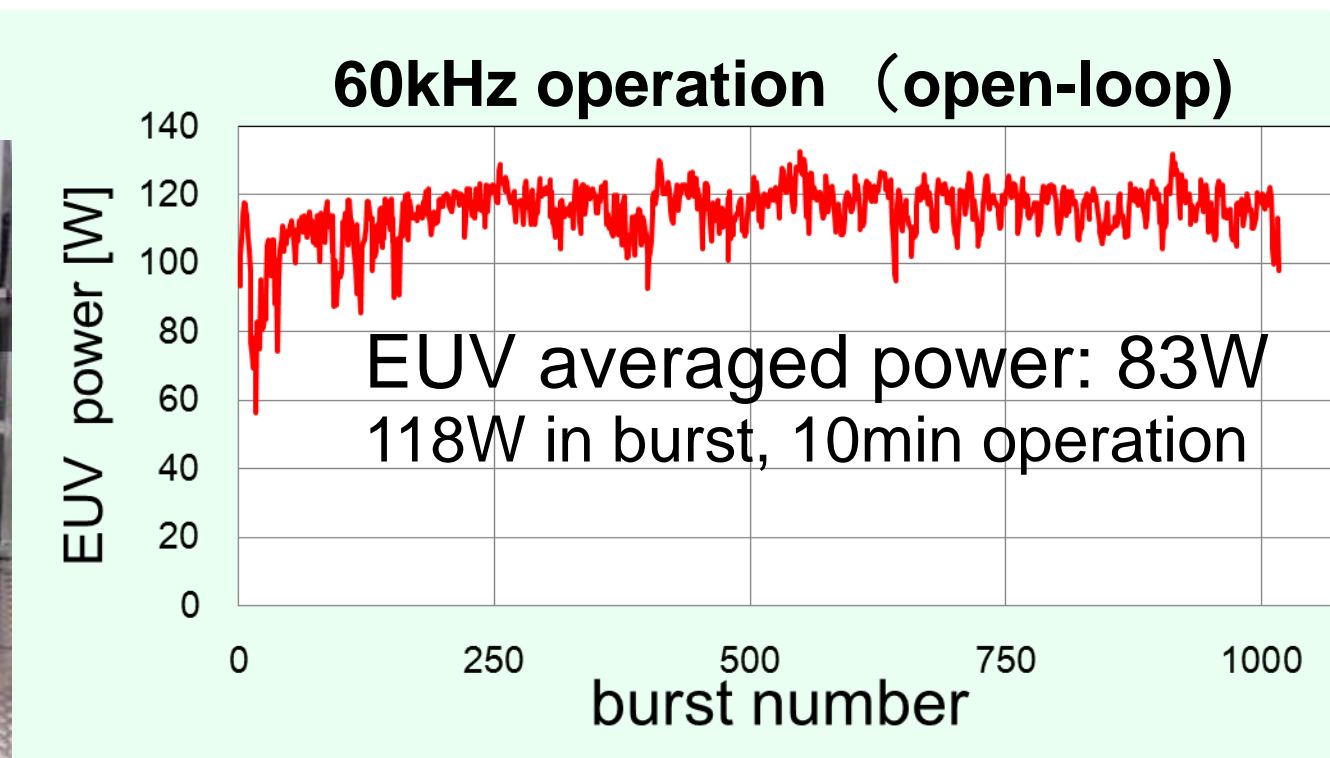
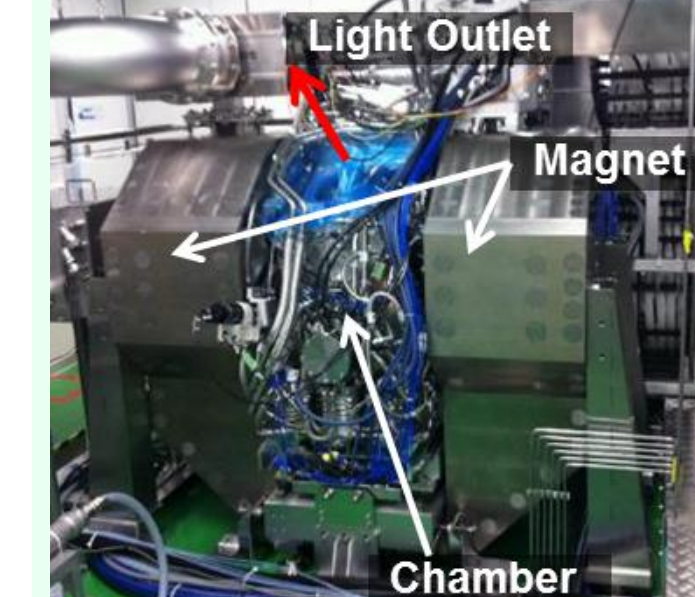
Operational Specification	Proto #1 at work	Proto #2 at work	Pilot under construction
Purpose	Magnetic Mitigation	High power and stable operation	Commercial beta system
Performance			
EUV Power	~25 W	~125 W	~250 W
CE	4%	4%	4%
Pulse rate	50 kHz	100 kHz	100 kHz
Output angle	Horizontal	62° upper (matched to NXE)	
Technology			
Droplet generator		20 μm	
CO ₂ laser	> 8 kW	> 12 kW	25 kW
Pre-pulse		Pico second	

Proto #1

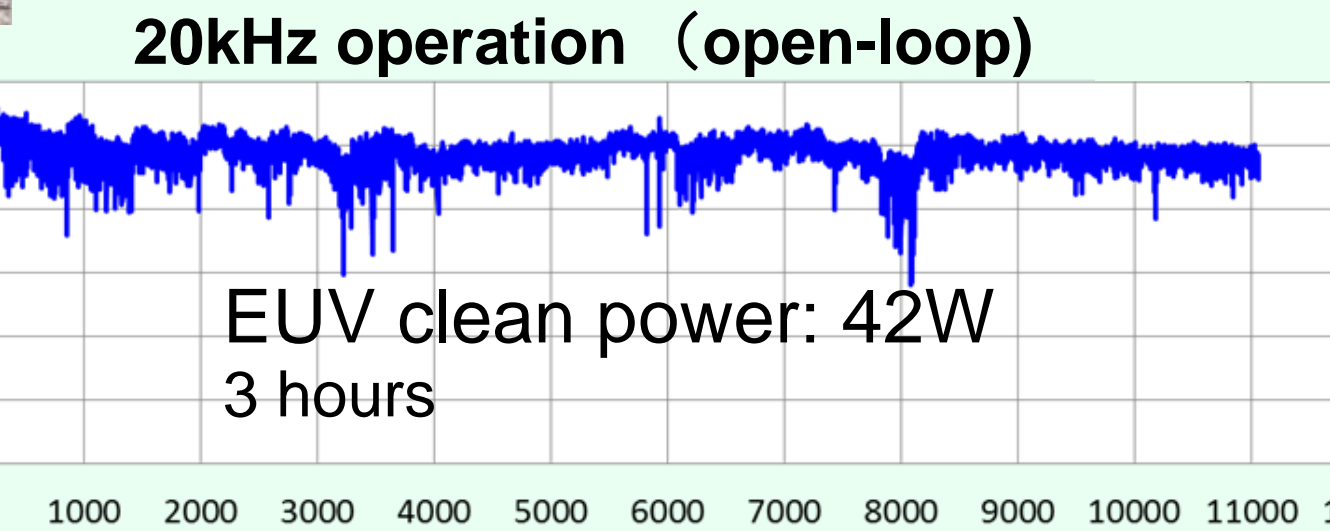
Good performance to confirm magnetic mitigation.



Proto #2

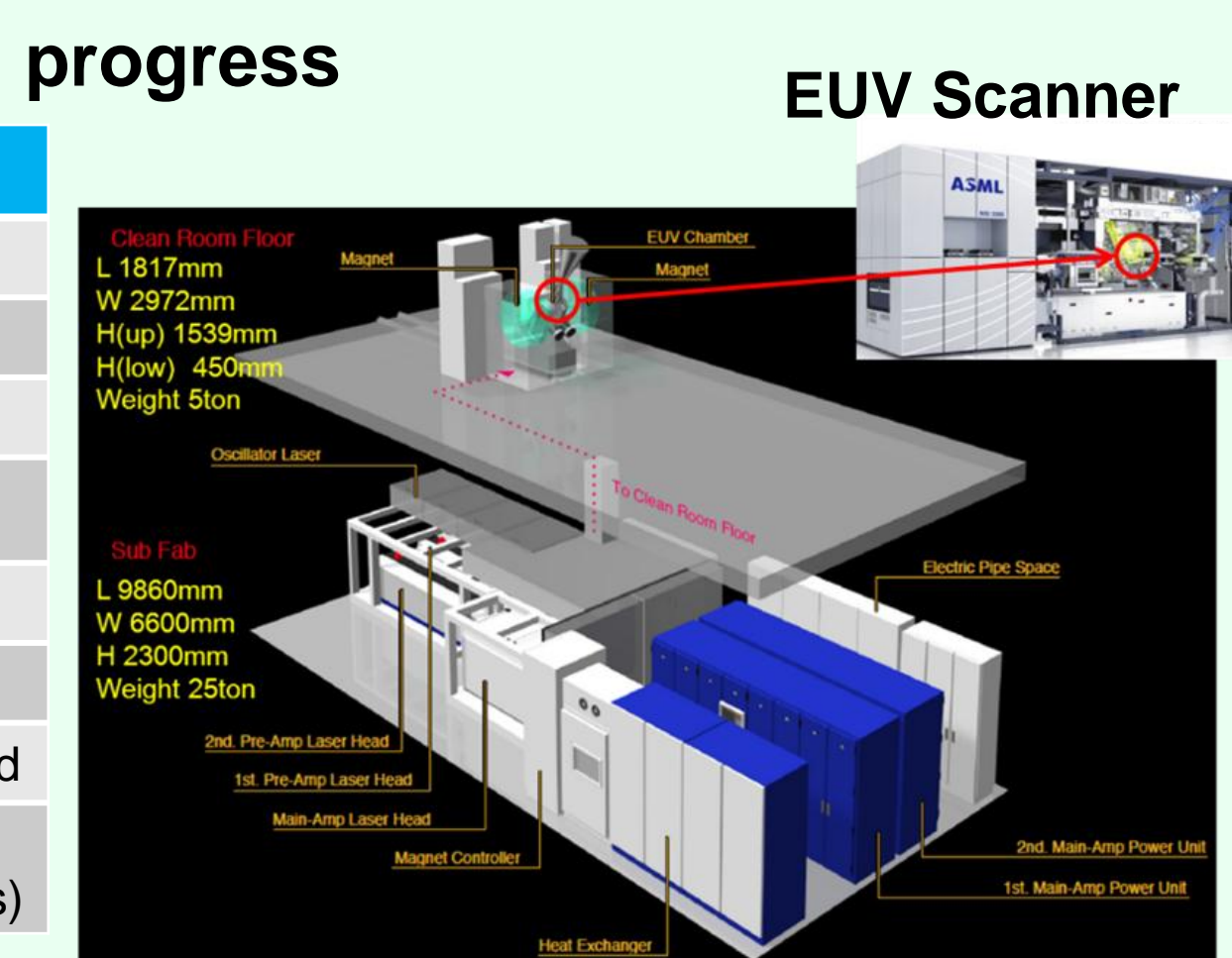


The current target is long-time-operation with high power.



Pilot: Construction in progress

Target Specification	
EUV Power	> 250 W
CE	> 4%
Pulse rate	100 kHz
Availability	> 75%
Droplet size	< 20μm
CO ₂ Laser Power	25 kW
Pre-pulse	Pico second
Debris Mitigation	> 15 days (>1500Mpls)



EUV Scanner