

sunshine



UNCHAINED
LABS

Scale it up

Once you've found a rock-solid formulation, Sunshine helps you tune in your LNP's size and design the perfect process to scale them up. Scout ideal flow rates, explore different mixing options, then dial in the right dilution factor to keep them stable. When you've got everything just right, Sunshine can shift into continuous mode, making tens of liters in a day. Get process development and scale-up on one platform – who would have figured?

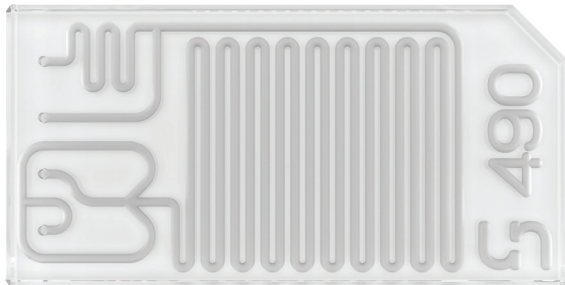
- 10 experiments in 15 minutes
- Fractional & total flow rates
- 1 mL to continuous flow
- 0.1–30 mL/min flow rates
- Reusable microfluidics
- Protocol transfer from Sunscreen



Find your flow

Fill one syringe with payloads, the other with lipids and you're ready to mix them up with a Sunny. For a simple, well-known T-mixing approach or to increase fluid contact area for particle formation with a cross-junction, grab a Sunny XT. To use Sunshine's full range of flow rates, ratios and integrated in-line dilution, choose a Sunny Trident. Sunnies can be subbed in and out of Sunshine, used over and over, and when you're ready to turn up the volume, they can run longer than you can.

Sunny Trident



- Reverse-angle mixing
- In-line dilution

Sunny XT



- Cross-type or T-mixing
- Multiple channel sizes

Fine-tune it fast

Tell Sunshine's Sunny Suite Software what's in your syringes, the lipid to payload ratios, the flow rates you want to mix at, how much diluent you want to add and you're ready to go. The software checks to make sure your experiments will work, so you don't need to worry about screwing things up. Create 10 different samples in 15 minutes or let Sunshine run for hours while it makes liters of LNPs.

The screenshot displays the Sunny Suite Version 1.0 software interface. The main window is titled "BK Timing Test Sunshine - 22-SEP-23-1". The interface is divided into several sections:

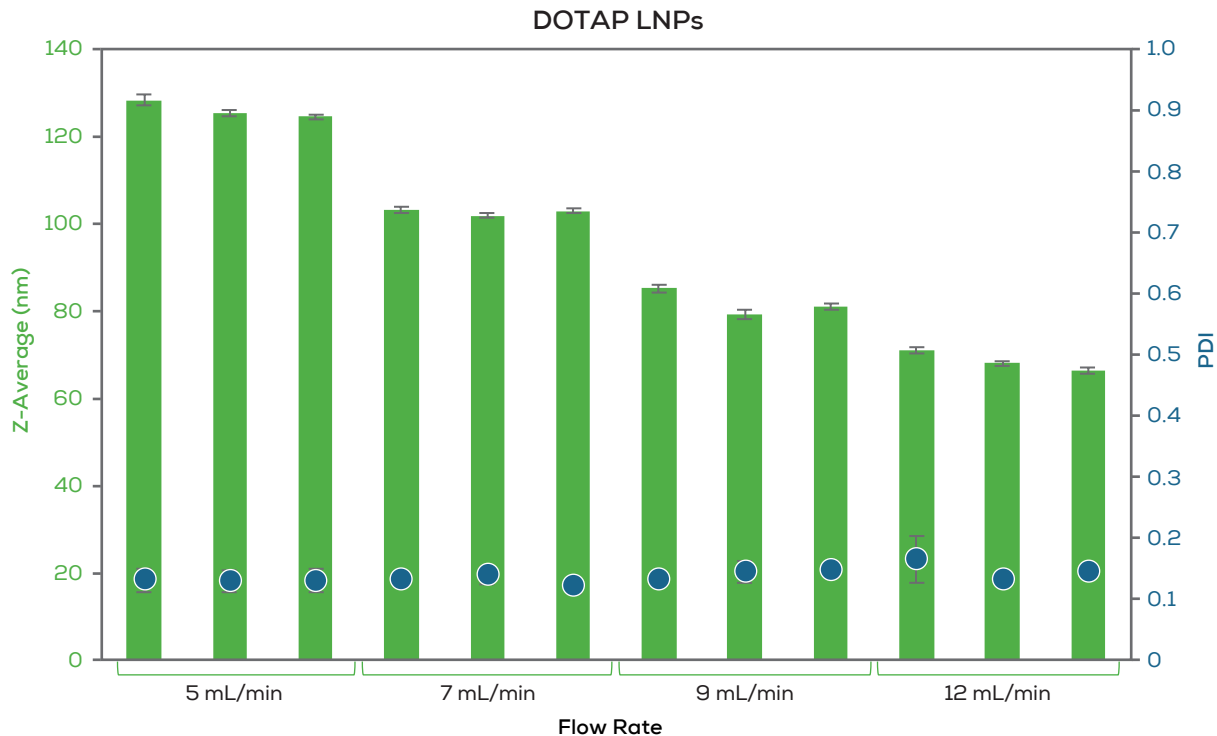
- Protocols:** A sidebar on the left lists protocol families, including "Sunshine Development", "Sunshine Prime", and "Sunshine System Initialize".
- Configuration:** A central panel shows the protocol description and apparatus. The apparatus table is as follows:

Function	Device
Automated sample valve	ASV
Input 1 pump	Aqueous
Input 2 pump	Ethanol
Dilution pump	Dilution
Automated collector	Automated Collector
- Execution Time:** A large digital display shows "00:04:14".
- Image:** A 3D schematic of the laboratory equipment is shown, labeled "Configuration A".
- Status:** The status is "Sunshine protocol: System Preparation".
- Execution Control:** A section with "Experiment is running" and buttons for "Start" and "Stop". Below are radio buttons for "Run all Experiments" and "Run from Experiment".
- Output:** A log of system events and descriptions, including timestamps and protocol steps.
- Manual Control:** A bottom row of six panels, each representing a component: Automated Collector (Idle), ASV (Idle), Aqueous (Idle), Ethanol (Idle), Dilution (Idle), and V Quad Pump 4 (Not initialized). Each panel includes a "Stop" button and "Current Readings" for Valve, Pressure, and other parameters.

The bottom right corner of the interface shows system information: "RAM: 352MB CPU: 4%".

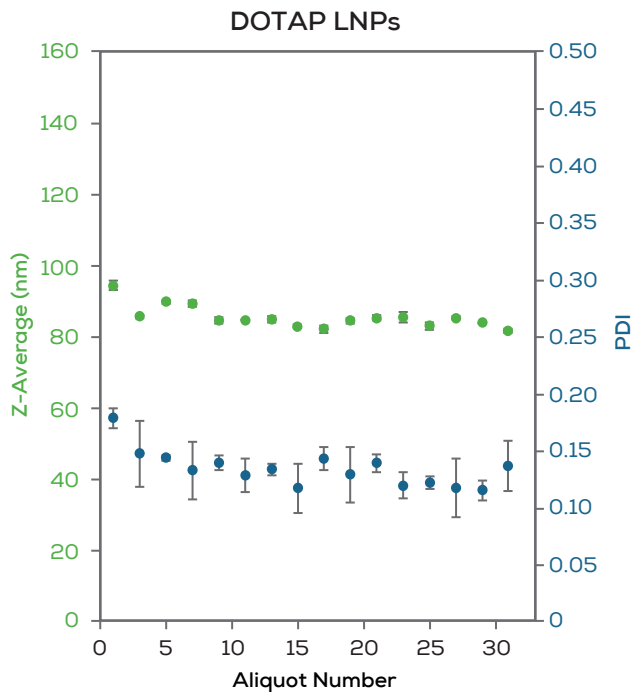
Dial it in

From their ability to get inside of cells, to releasing their payload, size really does matter when it comes to LNPs. Sunshine fully automates the fractional flow rate, total flow rate and dilution experiments that help you size them down and keep them stable, with spot on repeatability. Tinker with up to 10 parameters per run and let Sunshine take it from there.



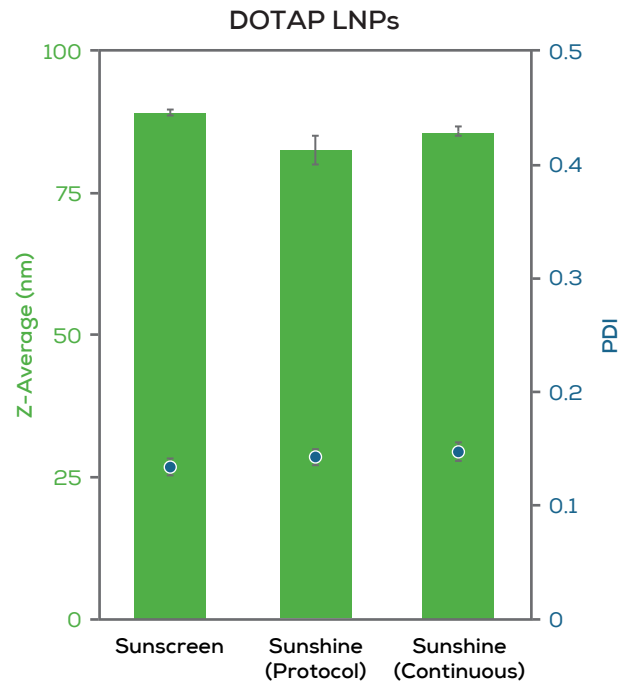
Bulk it up

Sunshine is ready when you are to start making large volumes of LNPs. Whether you're making milliliters or liters, your sizes and PDIs will stay consistent – no matter how much you decide to make.



Trust the process

From screening to development to scale up, **Sunscreen** and Sunshine have your LNPs covered. The methods and Sunnies can be handed off from platform to platform, so you can trust you'll get high quality LNPs every step of the way.



Specifications

Application			
Throughput	10 samples in 15 minutes		
Total flow rate range	0.1–30 mL/min (chip dependent)		
Flow rate ratio (aqueous to organic) range	1:1 to 10:1		
Typical sample volume range (at a 3:1 FRR)	1–6.5 mL		
Minimum input volume (including dead volume)	320 µL		
Continuous mode volume range	20 mL to ∞ in continuous mode		
In-line dilution	Yes		
Typical particle size range	40–200 nm*		
PDI	<0.2*		
Encapsulation efficiency	>90%*		
Instrument			
Physical			
Weight and dimensions (required space)	31 kg, 53 cm H x 60 cm W x 65 cm D		
Operating pressure	0–10 bar		
Electrical			
Voltage input	100 V–240 V AC, 50–60 Hz		
Communications	USB via Sunny Suite Software		
Other information			
Fluidic port sizes	¼"–28 and 10–32 and Luer fittings		
Sample loop size	1, 5 and 10 mL		
Fluid store volumes	4 x 250 mL pressurizable bottles		
Waste storage volume	1 L		
Wetted materials	PTFE, PCTFE, FEP, ETFE, PEEK, Polypropylene, FFKM, FKM, Hastelloy C276, Stainless Steel T316, Glass, Tygon (waste tubes), PET (waste bottle)		
Computer	Separate computer with Win 11, monitor, keyboard and mouse		
Consumable			
Sunnies	Glass microfluidic mixing devices of various geometries and channel sizes		
Available types	Sunny 490 Trident T Sunny 100 XT	Sunny 190 XT Sunny 275 XT	Sunny 150 5-input Sunny 50 Micromixer (edge connected)

* Formulation dependent

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Rev A