

LISST-HOLO

Submersible Digital Holographic Particle Imaging System

• Particle Images

The LISST-HOLO from Sequoia is the world's first commercially available fully autonomous submersible Digital Holographic Particle Imaging System. The system was developed by Dr. Alex Nimmo Smith at the Marine Institute of University of Plymouth (UK) and Sequoia holds a world-wide exclusive license for manufacture. The LISST-HOLO stores in-situ holograms of particles, using in-line digital holography. This overcomes the depth of field limitation of traditional particle imaging systems. Numerical reconstruction of the digitally recorded

• Particle Size and Volume Concentration

holograms gives in-focus, high resolution images of all particles from 25 μm to 2.5 mm equivalent spherical diameter throughout the entire sample volume (~2 ml). Features as small as 4 μm can often be resolved. The LISST-HOLO is particularly well suited to the measurement of large, complex flocs and biological particles. The processing software, available in MATLAB as well as compiled format for non-MATLAB users, performs the automatic focusing of particle images and the extraction of size distributions. From the images, shape parameters

can be computed and particles may be manually identified, e.g. as plankton or flocculated sediment grains. The LISST-HOLO is equipped with an external memory module on the connector endcap, capable of holding 15,000 holograms. The external memory makes for fast and easy offloading of holograms. The sampling frequency is adjustable, with a maximum sampling frequency of 0.5 Hz. Power is provided externally, either from an optional external battery pack or from another instrument, e.g. a CTD.



SEQUOIA

LISST-HOLO Submersible Holographic Particle Imaging System

FEATURES

- In-situ digital in-line holographic technology
- Self-contained with internal datalogger
- Ethernet connection to PC for programmable data collection—no software is needed for programming or offloading data
- Power via external battery pack (Optional, not included) or external power source (cable provided)
- Programmable data collection including Burst and Fixed Rate modes. Programmable Start and Stop conditions.
- Optical path length: 50 mm standard; Path Reduction Modules (PRM) available for high-concentration environments
- Sample volume: 1.86 cm³
- Data processing yields in-focus particle images and volume distribution
- Automated firmware updates possible when instrument is connected to the Internet

SPECIFICATIONS (subject to change without notice)

Parameters measured

- Particle images for observation and classification
- Particle volume distribution
- Temperature
- Depth

Size and concentration range

- 25-2500 μm equivalent spherical diameter, features down to 4 μm
- Beam - C of 0-4 m⁻¹; ~0-50 mg/l (grain-size dependent)

Technology

- Solid state diode laser @ 658 nm
- 4.4 μm pixel size digital camera; 1600 \times 1200 pixels

Mechanical and electrical

- Dimensions 13.3 cm (5.25") \varnothing \times 75 cm (29.5") L
- Weight: 9.5/3.6 kg (21/8 lbs) in air/water
- 300 m depth rating
- 32 GB internal solid state drive
- 32 GB external USB flash drive (included)
- Battery life (optional external battery pack): 15,000 holograms for standard 15V, 42Ah battery
- External power input: 15VDC nominal, 12-16VDC
- Sampling frequency up to 0.2 Hz; 0.5 Hz in short bursts
- Power drain: 500 mA measuring



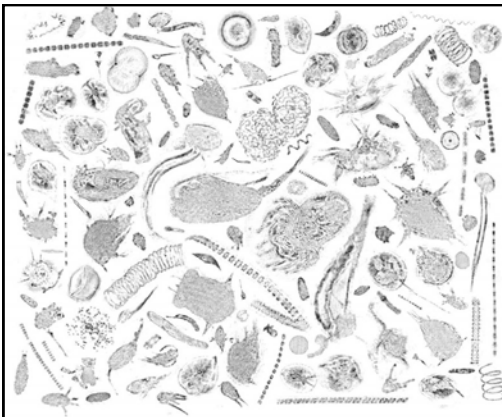
The open LISST-HOLO optics design permits measurement of undisturbed fragile particles.



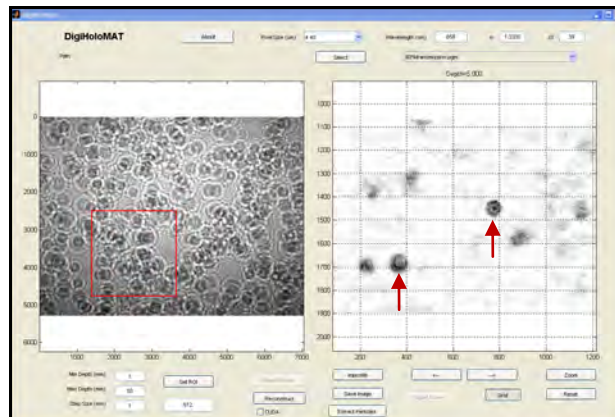
Connector endcap with external memory module for easy offloading of holograms.



LISST-HOLO external memory module and USB offload cable (1 set included).



Composite of particle images from Monterey Bay. See the full details on the LISST-Holo web page.



Detail of hologram reconstruction. Two particles, 75-90 μm in size are in focus at this image plane. Grid size is 200 μm .



LISST-HOLO optional accessories: External battery pack (top) and Path Reduction Module (bottom)