⑤ The Litiholo 3-D Holography Kit

Introduction

Liti Holo, offers holography related components and supplies for the DIY'er. Liti's main attraction appears to be their instant no developing required holography plates. These literally develop as they are exposed, so once the lights are turned back on, the hologram (or lack thereof) is (Liti Holo is a division of Liti Holographics, a company specializing in the production of holograms (including full color and motion) for marketing and advertising. At least, that's what I gather from their Web mention or links to Liti Holo.)

A single color holography kit using a red diode laser has been available for awhile for around $100.
See Litiholo Hologram Kit.

Now, a new version has been developed for making what they call full color holograms. (Link from the page above. Whether it is generally available – or ever will be – isn't entirely clear.) The kit consists of a set of 3 lasers (all under 5 mW) with battery packs, a holographic beam combiner, laser-cut plastic parts to mount everything, and two boxes of Liti's special instant no development 2x3″ holography plates (20 total). Now before you get excited, there are just The most significant is that for the $250 to $300 price tag, it does NOT include $10,000 laboratory single frequency lasers. What a surprise? ;-) Due to the limited coherence length of the only essentially 2-D objects (like the tops of the bottle caps that are provided) can be assured of being captured. This despite the spectacularly 3-D images shown on the Liti Holo Web site. So, if you thought this was going to make nice 3-D holograms, probably not. For that, you'll need lasers with decent coherence length. likely, you won't, or at least not very often. That's the bad news. The good news is that this kit will make real holograms and the way things are arranged, vibrations are less of an issue than with conventional holography. So there's an excellent chance that your first exposure will be successful. Taken together, these hooked. :-)

However, since the 3 color kit is a superset of the basic holography kit, it is possible to make 3-D (single color) holograms if the limited dimensionality becomes excessively boring. The red and blue lasers may have adequate coherence length, at least some of the time.

The Lasers

What the instructions call ″laser diodes″ or simply ″diodes″ are either actually diode lasers which have built in drivers (red and blue) or a Diode Pumped Solid State (DPSS) laser (green).

These are all typical laser pointer type modules. To provide a divergent beam, the collimating lenses must be removed. (This had already been done on all but the red laser.)

Red diode laser

This is the physically smallest of the three. If the output looks like a pointer beam, the front barrel must be unscrewed to remove the collimating lens and spring (save for something else). and screw the barrel back on to help secure it. Add the ″Special Clip″ (heat-sink) to the barrel once the laser is installed.

Once set up, carefully rotate the laser to maximize coverage of the spread out red beam on the Holographic Plate Holder.

- **Wavelength:** 638 nm.
- **Output power:** Approximately 6 mW.
- **Spatial mode:** Typical single mode diode.
- **Longitudinal modes:** Goes through periods of multimode but appears to settle more or less single mode after ~1/2 hour.
- **Useful coherence length:** May be the time.

Green DPSS laser

WARNING: There is NO IR-blocking filter. Thus high levels of both 808 nm and 1,064 nm are present in the output. To display anything on the SFPI or to accurately measure the output power,

On my sample, the laser starts out very weak and requires 2 or 3 minutes before it suddenly transitions to decent power. This appears to be related to the temperature of the crystal as a great deal pump light leakage is present initially, visible by eye.

The Special Clip (heat-sink) may be most important for the green laser.

The beam from the green laser is fairly symmetric so orientation doesn't matter. But it diverges slowly, so it will generally need to be positioned farther from the setup than the red laser.

- **Wavelength:** 532 nm.
- **Output power:** Approximately 10 mW at 532 nm but significant IR leakage!
- **Spatial mode:** TEM00.
- **Longitudinal modes:** Massively noisy multimode at first, then settles down to 3 or 4 dominant modes. Sometimes, there will be a single mode that may be 2 or 3 times higher than not a situation that will remain for long.
- **Useful coherence length:** The minimum is less than 1 mm but when there is a single dominant mode, it could

Blue diode laser

A switchmode boost driver provides the 4 to 6 V required by the blue laser diode. Once set up, carefully rotate the laser to maximize coverage of the spread out red beam on the

- **Wavelength:** 445 nm.
- **Output power:** Approximately 5 mW.
- **Spatial mode:**: Typical single mode diode.
- **Longitudinal modes:** Noisy multimode.
- **Useful coherence length:** May be

Unfortunately, without actually monitoring of these lasers continuously, it's a sort of crap shoot as to whether any given exposure will be capable of significant depth without artifacts.

These are not $25,000 lab-quality lasers.

Guidelines for Using the Litiholo 3-D Kit

The following were not mentioned in the instructions for this kit:

- Solder the battery boxes to the lead wires from the lasers, or add real connectors. Toss the clip leads into your electronics yet, substitute a **well regulated low noise (linear)** 3 VDC power supply capable of at least 1 A for all the lasers. However, note that it must be physically isolated from the holography table due to to need to avoid vibrations from its power transformer and
- The fit of the tabs that secure the individual pieces of the various assemblies is not very precise. If excessive force is required to push a tab through a hole, trim or file it a bit. If very loose, use some type of adhesive to stabilize assemblies like the "Laser Tower", "Color Combiner Mount", as well as the ones for the laser diodes (but not the piece that hold the actual diode laser since that has to be able to pivot to adjust the beam direction). Make sure the battery boxes can be removed to change batteries. (A slot may switch and/or wires to pass by the frame for the green one at least.) DO NOT glue the "Stilts" to the laser assemblies as the stilts are not used if making a single color hologram.

  I used dabs of two-part Epoxy but RTV Silicone would probably be adequate. DO NOT use stuff like Superglue (cyanoacrylate) or Duco Cement, which may eat the plastic. 5-Minute Epoxy can usually be removed if necessary without collateral damage.

- Put some rubber feet under the Laser Tower and Plate Holder so prevent them from moving around too easily.
- Take extreme care in handling the lasers as the PCBs attach directly to the leads of the laser diode and flexing can result in breakage. In addition, the "Green Diode Laser" is actually a Diode Pumped Solid State (DPSS) laser (not a simple diode), and flexing may loosen the mounting of the IR pump diode resulting in a loss of alignment and degraded performance – unstable or no output.
- The "Green Diode" (see above) has NO IR-blocking filter, so there is significant mostly invisible light at 808 diode. This may even be visible as a faint red glow. Do not stare into the front of the Green Diode even from an angle as the IR spreads much There is also some IR leakage at 1,064 nm green output), but this follows the green will also avoid the 1,064 nm IR.
- The Color Combiner (Holographic Optical Element, basically a pre-made speical hologram) is bonded to a piece of it off – damage will result.
- Use a spring clothes pin or something similar to secure the Blue diode assembly to the Laser Tower once the optimal position has been determined.
- When preparing to expose, remove the film plate from the box in total darkness to avoid fogging the unused plates, but use the dimmest safe light that will allow you to avoid knocking everything over to position the plate.

- While waiting for vibrations to die down, turn off the safe light.
- When ready to expose, remove the black possible to avoid introducing new vibrations. The laser light shining on the black paper may be enough to do this without a safe light.
- Stand perfectly still or sit perfectly some other way for the 5 to 10 minutes for the exposure.

My first hologram was of the top of a cell if you must know, found along the side of the road). While I would classify this as a success – sort of – there was almost no blue and the contrast was rather poor (or at least poorer than I had and showed enough depth to be able to clearly see the limited 3-D nature of the circuit board components.

The lack of blue was either due to the need for more blue and less red/green in the color balance mix, or bad luck on the blue laser not being very coherent (or changing coherence) during the exposure.

Unfortunately, while the instant plates make it easy to make holograms, that also makes it easy to expose plates and end up with nothing on them. And the plates are not inexpensive, $3 or more for each 2x3″ plate.