Green laser babies

The query came in from a teacher on maternity leave. She had her baby at a sensory class and had been so concerned at one of the activities for the wee ones, she feigned having to change a nappy. The class leader was waving a green laser pointer around as babies crawled around on the floor, chasing the dot.

Leaving aside fictional examples such as the "Do you expect me to talk?" "No, Mr Bond, I expect you to die," scene in *Goldfinger*, it is difficult to think of a more striking example of **What Not to Do With a Laser**. Here is a brief summary of SSERC's guidance on the use of lasers in schools:

- Use only Class 1 or 2 lasers (and not 1M, 2M, etc).
- Lasers should be stable. In the case of laser diode modules, clamp them in a boss head or similar.
- Do not stare into the beam.
- Do not point the laser at anybody.
- Use a beam stop - some sort of shield to terminate the beam (a photocopy paper box is ideal).
- Beware of stray reflections. Use beam stops if necessary.

We say "no" to laser pointers for experiments and pupil use because they are not stable and often wrongly-labelled. It is too easy to pick them up and wave them around. In our considerable experience they are, more often than not, wrongly classified, especially green laser pointers. Class 2 means:

- Visible light only.
- Less than 1 mW output.

If these criteria are fulfilled, the human aversion response - blinking or turning from a bright light - should be enough to protect from permanent eye damage. A time of 0.25 for the response to kick in is assumed. That is for an adult. It would be wrong to assume that it is the same for a baby.

All but one of the half dozen or so green laser pointers we have tested have been significantly above 1 mW. We have heard of a green laser pointer with an output of 35 mW. It was still labelled as Class 2.

Now have a look at Figure 1. It is a graph obtained when a spectrophotometer was used to examine the output of one of the green laser pointers we tested.

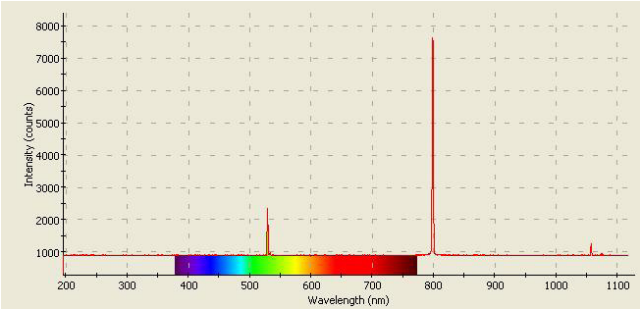

Figure 1 - Green laser output.

As you might expect, there is a peak of laser radiation at 532 nm. This is green light. That is all there should be, but there are also peaks at 808 nm and 1064 nm. To understand what is happening, we need to know how a green laser diode module works. Unlike red laser diodes, green ones use a multi-stage process.

- An infrared laser diode produces light at 808 nm.
- This is used to cause fluorescence at 1064 nm in a neodymium crystal.
- A frequency-doubling crystal then creates light at 532 nm.

We see that infrared radiation is produced at two stages in this process. Reputable manufacturers of laser diode modules ensure that any residual infrared radiation is filtered out. They also use automatic power control circuitry that continuously monitors the output power of the laser, reducing it if it creeps above the 1 mW limit.

The eye's response is not uniform over the visible spectrum. A 1 mW green laser diode module would be perceived as being as bright as an 8 mW red. You can see why green laser pointers are popular as presentation aids. Nevertheless, for the above reasons, we recommend using red rather than green for a presentation aid.

And we wouldn't shine either near a baby, even if we had a cast-iron guarantee that the lasers had been tested to prove they were Class 2. <<