

## DPBI

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Manufacturers brought out videodiscs not just to improve prerecorded video images but also to prevent bootlegging of programs, since expensive equipment is necessary to replicate them, unlike the videocassette. The demise of the disc was due to lack of standardization. Three systems appeared on the scene simultaneously, so none could survive splitting up a small market. Audio discs seem to be doing much better, since all discs work in all players. Sources of audio discs, also known as Compact Discs, herein referred to as CD's, smugly assert that their products deliver better sound reproduction, and charge about twice as much for a CD as for a record or cassette. They must feel that they are invulnerable to the pirating that occurs with the audio cassette.

Or are they? Certainly producers of embossed security holograms thought that they were counterfeitproof, but Jeff Blythe has blown that ship out of the water.<sup>1</sup> Could it be possible to duplicate the CD holographically?

This is not such a silly idea. The CD works optically, and as readers of this magazine we all believe that a

hologram is the optical equivalent of the object holographed. In principle then the hologram of the CD should work just as well as the original!

The problems in attempting to prove that this works are not insurmountable. A Denisyuk recording scheme would be the logical way to start, simply contact copying the disc should suffice. The major obstacle is to get the hologram to replay at the wavelength of the laser in the disc player. CD units use near IR laser diodes, so if the disc were copied using He-Ne there would not be good Bragg diffraction at the longer wavelength. Swelling with triethanolamine could work, but trying to fine tune the reconstruction color in the infrared could be painstaking.

What I propose is to simply place the holographic film next to the disc and expose it as it plays! Our research at Northwestern University has shown that Agfa 10E75 has some sensitivity at nm as we have made holograms on it using a Diolite. I assume that 8E75HD has a similar spectral sensitizing dye or perhaps a more suitable recording medium could become available in the future.

Exposure could be accomplished while the unit is running as then the

reference angle will be exactly duplicated. A possible problem is that the thickness of the film may not let the information be read properly. The test would be to listen if the disc is being played while exposing. Good fringes will be formed regardless of the spinning motion, as it is the relative phase of the incoming beam and the one returned from the disc's surface that count. So the film must be stuck to the CD rather well. Because the beam interrogating the disc is focused well, there is the slight possibility of over exposing the film on a single playing/exposure, but what is more likely is that many passes are necessary or to run at a slower speed to suitably darken the film. A non-shrinking develop-rehalogenating bleach processing scheme like CWC2 is a must.

This magazine is prepared to give a *Lloyd Cross Award* to anyone who can make this work. It would certainly be fun if holographers could have their own exclusive disc-swapping network!

### References

- 1 Jeff Blythe, *Security Display Hologram to Foil Counterfeiters*, Proceedings SPIE Volume 615, (1985) p. 18.
- 2 D. Cooke, A. Ward, *Reflection-hologram Processing for High Efficiency in Silver-halide Emulsions*, Applied Optics, Volume 23, No. 6, 15 March 1984, p. 934.

