

## POYNTON'S VECTOR 16 What's "home theater calibration"?

POYNTON, CHARLES (2003), *Digital video and HDTV algorithms and interfaces* (San Francisco: Morgan Kaufmann).

I have written at length in previous issues – and in my book – about highly technical aspects of video signal processing, display, and calibration. Most of my writing is directed to people having background in math, physics, and electronics. In this note I seek to address everyday issues associated with obtaining high quality video at home.

I've always had trouble with the word "reproduction" applied to presentation, in the home, of professionally created audiovisual content. Taken literally, "reproduction" suggests "production again." However, viewers don't want to do the production again, they simply wish to display it. We seek proper *presentation* of recorded (and in today's world, streamed) media.

High-quality viewing (and listening) is satisfying for many sources of programming, including sports, home video, and even YouTube clips. However, the most demanding video content available to consumers is represented by movies delivered on Blu-ray. Movies delivered by cable or satellite are promising, but these sources are liable to have impairments introduced by severe compression in the transmission channel, so for our purposes we'll take our source to be Blu-ray.

To many people involved in home theater, the main goal is to recreate the filmmaker's vision in your home. Some people phrase the goal as "preserving the creative intent"; however, it seems to me that truly determining the director's artistic intent would be a deep philosophical (or perhaps even legal!) quest. It is sufficient for our purposes to establish the director's *experience* upon mastering the content: Audio and video enthusiasts seek to recreate, in their living rooms, dens, or home theaters, the *experience* of the director when the movie was created. The nub is this: What was the state of the display used to master the content, and what environment was it in?

Home theatre enthusiasts traditionally use motion picture film as their reference point for quality. It is implicit that display standards are in place when film is projected in a theater. Theaters have technical standards concerning presentation; however, consumer electronics (CE) equipment does not. It is a goal of home theater calibrators to bring home equipment into conformance with presentation standards.

Movies transferred to Blu-ray are mastered on studio-grade reference displays. They used to be called "broadcast video monitors," but that term is falling out of fashion as "broadcast" becomes less important in content creation, and as mastering displays are used not just for video but also for film. (See Issue 5.)

A studio-grade reference display has BT.709 primary chromaticities, CIE  $D_{65}$  white reference, a 2.4-power electro-optical function (EOCF), and  $100 \text{ cd} \cdot \text{m}^{-2}$  reference white luminance. If that all sound technical, it is. For faithful presentation, you'd like to mimic the technical parameters of the studio. A good home theater calibrator needs the technical knowledge and skill to understand these parameters and instruments suitable to measure them.

CE manufacturers do not necessarily – or even usually – have the goal of approximating a studio display. Instead, they seek “good-looking pictures,” whatever that means to any particular company. Most companies seek to sell receivers and displays; they do not generally seek to recreate the movie maker’s experience. CE equipment diverges from studio standards for several reasons. One reason is that consumer equipment is sold in showrooms, not in living rooms: CE displays are optimized for over-bright viewing environments. Another reason is product differentiation: If all CE displays approximated studio displays, all CE displays would look alike, and the image displayed on a Sony would then appear the same as the image on a Samsung! CE vendors seek to “enhance” or “improve” the picture with technologies such as Sony’s *X-Reality PRO Engine* or Samsung’s *HyperReal Engine*. Such processing can be advantageous on really poor video sources – think 1980s vintage VHS tapes – but when as a consumer you have access to the exact bitstream that the movie-maker placed on a Blu-ray disc, at least as far as the movie-maker is concerned, “improvement” is not possible. It is a sad fact of calibration that half or two-thirds of the job involves “dialing-out” poorly chosen factory presets. You rely upon your calibrator’s knowledge of particular manufacturers, makes, and models to accomplish that task.

I have been describing what you could call the scientific aspects of calibration. If you are running a small business producing computer-generated imagery (CGI) or visual effects (VFX) serving the movie business, then your own viewing preferences aren’t relevant; what matters is bringing your equipment into conformance with the appropriate standards, and straight science and engineering suffices.

However, in a typical consumer home theatre, there are aspects that require judgement. Movies transferred to Blu-ray are mastered in very dark conditions (around 1 lux) that are almost certainly darker than your viewing preference. Your family members and guests would run the risk of tripping! If you prefer a somewhat brighter viewing environment, subtle changes in the technical parameters are necessary to achieve the intended appearance. You rely upon your calibrator to understand the issues, to assess your viewing environment, and to make the correct technical choices. If a calibrator has experience in post-production, that’s a plus: A good understanding of the mastering environment helps to establish the home viewing environment. ■■