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As the glut of 24-bit products enters the professional audio marketplace, the question arises as to how the end consumer can benefit also from this new technology. Certainly the recording engineers benefit by having the advantage of processing and hearing recordings with sonic detail that rivals analog tape, but if these high resolution recordings are merely going to end up being transferred to 16-bit compact discs in the long run, how does the consumer appreciate the engineers use of 24-bit systems? Is there a way, in other words, to capture the detail an increased signal to noise ratio of a 24-bit system in a 16-bit format? The answer, of course, is yes and exists in a number of mastering tools to help engineers transfer 24-bit recordings into the 16-bit world. Sony's Super Bit Mapping and Phillips' HDCD systems are two example of these processes. Another method developed by Apogee, called UV22, seems however to emerge as the foremost means of encoding high resolution onto the standard compact disc, and it is therefore on this system that I concentrated this week.

Popular opinion among mastering engineers seems to favor the Apogee UV22 in general as a high resolution encoder for compact discs. Ted Jensen of Sterling Sound comments that, "UV22 kept the 24-bit signal perfectly clean...all the way down to -120 dB." I remark that mastering engineers prefer this system in general because the encoding method often depends on the needs of the project. Much in the way that a recording engineer may pass over the favored Neumann U87 microphone to use an AKG 414 to record vocals in a certain situation, many mastering engineers find other encoding means better suited for particular recordings. In general, however, the UV22 system is preferred. Another benefit to engineers of the Apogee system is its general ease of use. The UV22 encoder merely needs to be placed in the signal path between the source and the 16-bit target.

The reason for this preference is that the UV22 method preserves the sound stage and tonal balance of the original high resolution recording. In order to do this, UV22 places "the algorithmically generated 'clump' of energy around 22 kHz" (product literature). This high frequency emphasis is similar to the bias of a magnetic tape recorder. In fact, this analog modeling is used as a selling point by Apogee. The UV22 supposedly adds white noise similar to that of analog tape. This use of analog modeled noise differs from noise shaping and the Super Bit Mapping method which trade a reduced noise floor for a large noise boost at high frequencies. The UV22 system places this boost outside of the audible range. As opposed to dither which adds noise to a digital system, UV22 keeps the audible noise floor (20 Hz-20 kHz) solidly at the theoretical minimum of -96 dB for 16 bits (remember 6 dB of signal to noise ratio per digital audio bit). In order to facilitate this completely flat noise floor, UV22 does not modify the noise floor, but merely makes it transparent, up to 30 dB into it. For example, a 1 kHz tone at -108 dB will distort if truncated at 16 bit information, but will be audible without distortion up to 20 kHz using Apogee's system.

The benefit to the average consumer of such a mastering system is immediately apparent. The high resolution information translates directly to compact disc and can supposedly be recognized on even the cheapest CD players and boom boxes. More detail can thus be appreciated on any system. If 24-bit technology can be realized on a 16-bit mastered format, it would seem that the release of 24-bit compact discs will not be as necessary as was previously expected. Since consumers are so hesitant to change

recording formats, the possibility of 24-bit sound quality on standard compact discs seems to point to their continued success in the marketplace.

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