Trevor de Clercq
October 13th, 1998

Digital Audio Processing
E85.2600, Prof. K. Peacock

Research Status Report #5

Since the arrival of a 24-bit version of the 2-track DAT machine heralds the probable continued use of the R-DAT format in professional applications, it is also interesting to look into other areas in which the R-DAT can be used. Although standard DAT tapes use a similar tape width to analog cassettes, i.e. 1/8th of an inch, it is possible to create recorders which use thicker tape, similar to the availability of wider tape analog recorders. The most common application of wider tape uses 1/4 inch tape with the rotary head. This machine became known as the NAGRA D. As well as offering possibilities for traditionally spliced tape, the NAGRA model offers up to 20 bit wordlength and timecode facilities. Moreover, new versions of the NAGRA use a sampling rate of 96 kHz, two times the professional standard of 48 kHz. This increased sampling rate helps to avoid the use of analog anti-aliasing filters and thus more accurately represent the sampled waveform. In listening tests, engineers were said to have admired the 96 kHz NAGRA's high end smoothness and likened it to that of an analog machine. Perhaps the supposed coldness of digital recorders, therefore, lies not in the digital nature of the medium but just within the limited sampling bandwidth that is currently in use. One of the drawbacks with the NAGRA recorders, though, is that since wider tape is being used, the possibility of storing the tape in cassettes becomes unfeasible. Therefore, open-reel recorders are the only solution. With open-reel R-DAT's, however, the possibility for contamination exists, thus restricting the format to low-density recording only.

The tape width possibilities do not end with a mere 1/4 inch. Half-inch and 8mm rotary formats are now on the market. These recorders are based on the VHS or Video 8 rotary-head cassette decks and employ the same tape cartridge format, thus making convenient the purchase of cartridges from any video cartridge supplier. Typically, these recorders offer eight channels of audio. Consumer examples of this format include the Alesis ADAT and Tascam DA-88 models. Although multitracking is limited to only eight channels with one recorder, manufacturers have made it possible to link machines with a master/slave relationship to mock the operation of 16- or 24-track recording. Usually a separate controlling device is required to operate all of the machines in tandem. The machines themselves are linked together by a shared timecode and include synchronizing functions built into each machine. The possibility of recording eight digital tracks onto videotape is made possible through the standard R-DAT practice of slant tape tracks and azimuth aligned heads to maximize information density per length of tape. According to John Watkinson, these digital multitrack machines, "represent the future of multitrack recording." The forecasted success of such recorders is due to their lower cost of manufacture than traditional analog stationary-head recorders. Also, since these digital machines use simple VHS or Video-8 cartridges, tape costs are extremely lower than their standard analog counterparts while also offering longer playing time. For example, a 2-hour Hi-8 cartridge costs less than ten dollars whereas a reel of one inch analog tape, which offers less than half and hour of recording time, costs over fifty dollars. Even if the impracticality of linking multiple digital

machines can be sighted as a drawback, it is certainly only a matter of time before 16- and 24-track digital multitracks will begin to appear on the consumer market. The versatility of the R-DAT format, therefore, hints at its future success and staying power within the world of high-end audio equipment.

Bibliography

Hitomi, A. and Taki, T. "Servo Technology of R-DAT." IEEE Trans. Consum. Electron. CE-32, pp. 425-432, 1986

Itoh, F., Shiba, H., Hayama, M. and Satoth, T. "Magnetic Tape and Cartridge of R-DAT." IEEE Trans. Consum. Electron. CE-32, pp. 442-452, 1986

Nakajima, H. and Odaka, K. "A Rotary-head High-Density Digital Audio Tape Recorder." IEEE Trans. Consum. Electron. CE-29, pp. 430-437, 1983

Strawn, John, Ed. Digital Audio Engineering. William-Kaufmann, Inc.: Los Altos, CA. 1985

Watkinson, John. The Art of Digital Audio. Focal Press: London. 1994