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Article Summary:

"Microphones for DSD Recordings" by Tetsuo Baba
(Audio Engineering Society; UK Conference, 16-17 March 1998, pgs. 40-44)

As we all know, the data rate of digital audio is continuously being pushed upwards by audio manufacturers. 16 bit capabilities are being replaced by 20- and 24-bit resolutions, whereas the 44.1 kHz sampling frequency is being supplanted by 96 kHz, 192 kHz, and up. Also common knowledge is that the Sony Corporation has developed a recording method called Direct Stream Digital (DSD) which avoids the bit-depth/sampling rate parameters in favor of a single bit delta-sigma modulation technique. With this method of recording, frequencies up to 100 kHz can be captured, giving DSD a practical sampling frequency of over 200 kHz! While it may be arguable whether or not humans can indeed perceive frequencies of this ultra-high energy, the question also remains as to whether recording engineers have equipment capable of capturing these higher frequencies with any accuracy. Microphone technology is basically a mature industry with many of the most cherished microphones dating from before the 1960's. Almost all modern microphones only have a usable bandwidth up to 20 kHz, above which the microphones' responses drop off considerably. With the advent of microphones such as David Blackmer's Earthworks product line, engineers are seeing transducer technology which is starting to catch up with the capabilities of modern recorder technology. Earthworks microphones, while still better approaching the possibilities of DSD technology, are only rated linear up to 40 kHz. Considering that DSD recordings can capture all the way up to 100 kHz, a discrepancy still exists. Sony Advanced Audio Laboratory, however, has made an experimental wide frequency range microphone which has a frequency response rated all the way up to 100 kHz to take advantage of DSD technology. This microphone is called the C-2 and is a three way condenser microphone built in two bodies.

The C-2 microphone employs three diaphragms to cover such a large spectrum of sound. The first two diaphragms are housed in one capsule having a frequency response up to 40 kHz with a crossover frequency of 16 kHz for the two diaphragms. The third very small diaphragm is housed in a second microphone casing and covers a frequency response of 40 kHz to 100 kHz. In all of the technical diagrams for this article, the ultra-small diaphragm microphone is referred to as the C2+, whereas the dual diaphragm microphone with frequency response up to 40 kHz is simply called the C2. It seems fascinating to me that the capsule for the C2+ has to housed in a completely separate microphone casing. Presumably the larger casing needed for the diaphragms of the C2 microphone would be enough of an impediment to degrade the response to those ultra-high frequencies. Although this point is not mentioned in the article, since the C2+ is housed in a separate body, I cannot see any reason why it necessarily has to be paired with a C2 microphone. Perhaps a C2+ and an Earthworks 40 kHz omni might be an acceptable match. If frequencies above 20 kHz or 40 kHz are in fact proven to be vital to one's perception of sonic fidelity, a market niche may exist for the C2+ alone or perhaps a similarly designed microphone with frequency response of 20 kHz to 100 kHz.

The rest of this article focuses on two applications in which the extended frequency response C2 microphones were put to practical tests. The first recording project was that of a jazz trio (piano, bass, and drums). The C2 microphones were used for drum overheads whereas standard studio mics (SM57, 421, U87) were used for the other instruments. This session was recorded in a standard jazz/pop studio setting. The second recording was done in a large hall, typical of classical recording situations. The ensemble was a quartet of

marimbas and percussion. In this recording, five C2 microphones were employed at a near-field distance with two B&K 4003 mics used as far-fields.

Although much detail was given for the setup of these recording sessions, the author did not give much information as to the results of his experiences with these high quality microphones. The only follow-up to the recordings, in fact, was these two lines: "The musicians were very satisfied with the high quality recorded sound. Many reviewers were present, and they were also very impressed with the sound." Unfortunately, the recording experiment was not conducted to compare the C2 system with other standard, limited frequency response microphones. The reader, therefore, cannot conclude whether the reviewers were impressed by the high sound quality of the recordings just because these C2 microphones are good pieces of equipment (no better than most other studio gear), or whether indeed there truly was a perceivable increase in fidelity gained by using this microphone set-up. I would say the recording sessions need to be redone with a standard of comparison.