

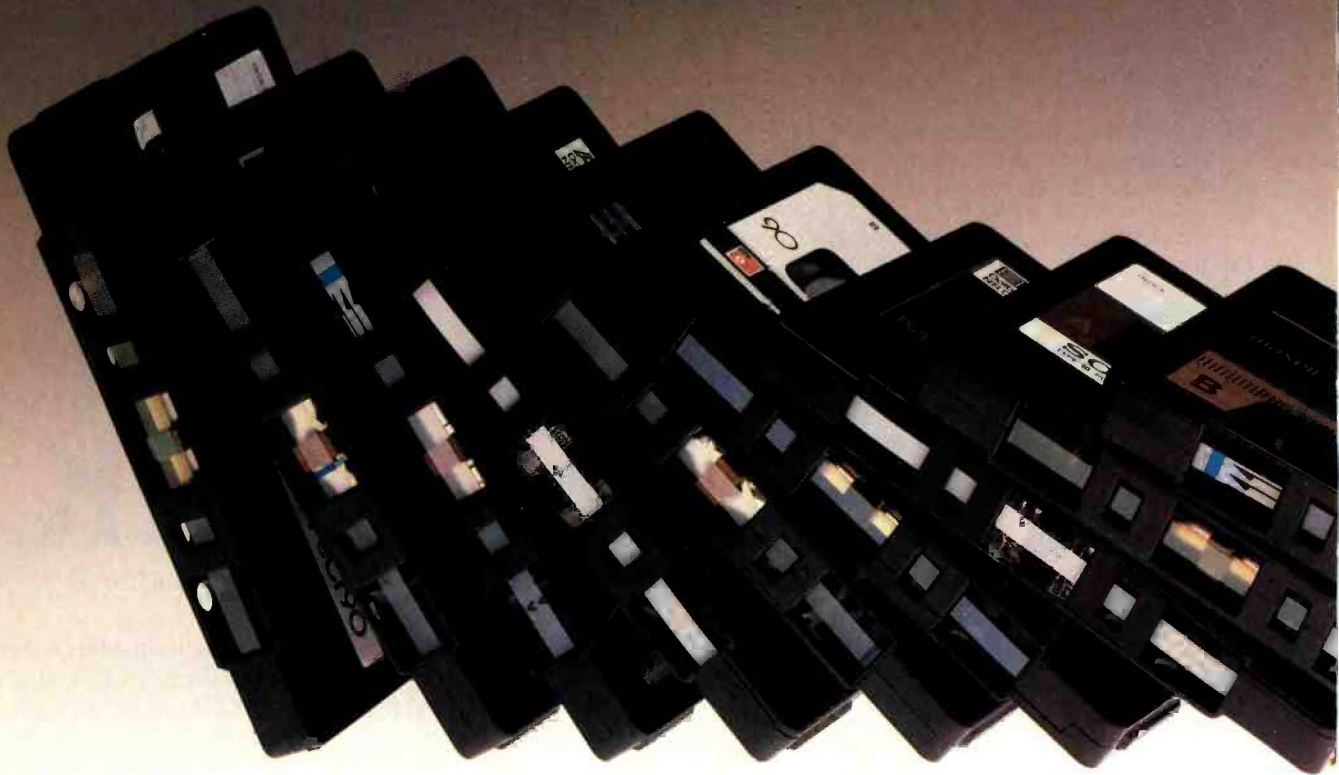
MASS TAPE TEST

HOWARD A. ROBERSON

This year our tape survey covers 77 different formulations: 37 Type I (ferric/normal), 24 Type II (chrome-type/high bias), one Type III (ferrichrome type), and 15 Type IV (metal particle). About 50 manufacturers were contacted and asked to supply three C-90s of each of their tapes for the testing. The majority of them made some response, though some declined to supply samples, so the reader may find that a tape of interest is not covered. A few supplied C-60s as well, and those were subjected to some brief tests. The data reported, however, are primarily on the C-90s, with the

exception of Magnex's metal Studio 4 which was available only in C-60s.

In general, the coverage is only on new or updated formulations; it is possible that some of those tested had only new shells or labels. New manufacturers not covered in any past surveys are DLK Acoustical Products, Irish, Magnex, MIS (Magnetic Information Systems), PD Magnetics, Swire, and Yamaha. Tapes not covered this time but in a previous survey and still in the manufacturers' lines are Denon DX1, DX3, DX7 and DXM; Memorex MRX-1; RKO XD, Broadcast I and Ultrachrome, and Sony FeCr. Speaking



77 CASSETTES

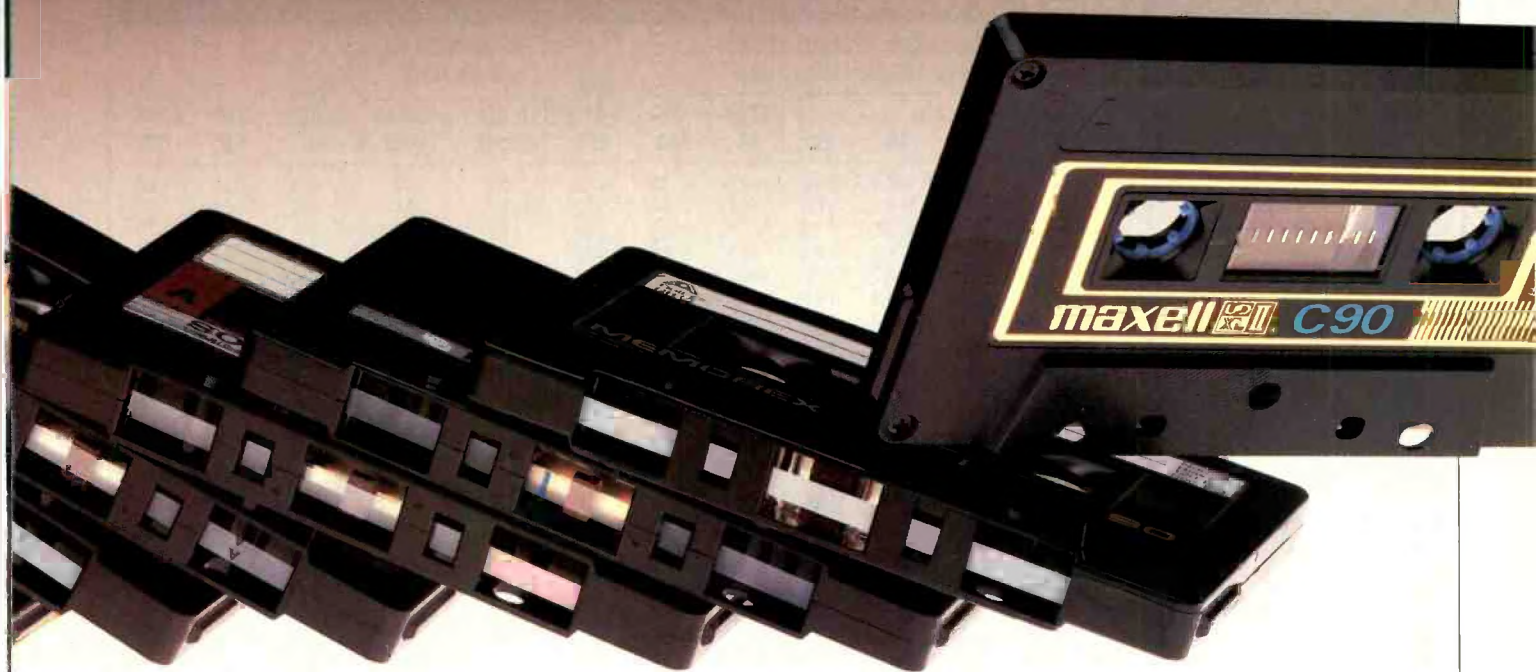
of Memorex tapes, they are from what is now Memtek Products, a division of Tandy Corporation. I feel certain that most of our readers know that Realistic is a Radio Shack brand name and that Scotch comes from the 3M Company. From now on, all references will be to brand name in these three cases.

A fair amount of good technical background information was received. Because of the large number of tapes covered, however, the specifications will not be listed and discussed, thereby saving space for more essential things. I will make a few comments, however, basically relaying what some

of the manufacturers have said about their new offerings.

BASF emphasized improved Type I formulations with refined shells. There are also new names and packaging. Denon stated that the new DX4 has "extremely low static distortion" and is also free from "dynamic distortion." Fuji's new line first appeared about a year ago, and includes the benefits of "mono particle dispersion," "micro integrated orientation" and "high absorption polymer." JVC introduced the Dynarec line of cassettes, two Type I's and one Type II and one Type IV. Their F1 is the Type I tape in the popular series.

Loian announced new Type I and II formulations to "match or beat the best selling tapes." Maxell announced improvements in magnetic particles, binder system chemistry and mechanical construction, and the new "XL S, UD-XL and IX tapes incorporate major technological breakthroughs." The Memorex brand was expanded with the introduction of the dB Series, "an economical alternative to America's favorite audio tape." Sony has added UCX, a lower cost version "of the revolutionary UCX-S tape with the same micro-fine magnetic particles." In a sense, it replaces EHF, and the new BHF and



TAPES RATED

"Bias and sensitivity differences of a dB or less from standard aren't detrimental—but greater ones cause Dolby mistracking on some decks."

AHF replace HFX and SHF, respectively. The performance of TDK's improved line benefits from increased remanence and coercivity for most tapes, reduced print-through for a number of them, and "making the Laboratory Standard Mechanism standard for all cassettes, except MA-R and D."

The Test Program

Each cassette was first tested by being fast wound and played for its entire length. There were no failures, though some chattered quite a bit. With both standard level tapes and the new IEC reference tapes, the Nakamichi 582's meters, output levels and

bias current were calibrated for each of the tape types. The reference tapes for IEC Types I and II were provided by BASF, the tape for Type III came from Sony, and TDK supplied the Type IV reference tape. With the bias figure determined and the 400-Hz output voltage measured with a standard test tone with each IEC tape, every cassette was checked for bias requirements and sensitivity, both expressed in dB relative to the IEC tape. Differences of a dB or less from the reference should not be considered detrimental, but greater deviations could cause Dolby mistracking—if the deck is set up to match the IEC tapes.

Each and every tape was also checked on both sides using a pink-noise source and a 1/3-octave RTA. This is an excellent way to see the effect of bias differences and to observe changes in skew with time or from turning the cassette over. High-frequency response variations shown by the RTA require checking to pinpoint whether the cause is skew- or bias-related. Based upon these checks and the earlier ones on bias and sensitivity, one C-90 was selected as typical from each group of three. Bias was adjusted for the best response at 20 dB below Dolby level, but the response was not actually taken,

TABLE II—TEST RESULTS

BRAND	DESIGNATION	TYPE	MAXIMUM RECORD LEVEL dB re 400-Hz Dolby Level						S/N RATIO dBA	RESPONSE AT -3 db (kHz)		MOD NOISE dB	BIAS dB	SENS dB
			HDL ₃ = 3%				TTIM = 3%			0 dB Level	-20 dB Level			
			100	400	1k	2k	5k	10k						
BASF	Performance I	I	+ 5.0	+ 6.4	+ 7.4	+3.6	-1.3	- 7.6	57.2	10.2	23.0	-45.6	-0.8	+0.2
BASF	Pro I Super	I	+ 6.2	+ 7.6	+ 8.6	+8.3	-0.2	- 6.4	57.2	10.7	22.7	-49.2	+0.5	+0.7
Certron	HE	I	+ 0.4	+ 1.0	+ 2.5	+1.9	-4.2	-10.5	52.1	8.7	23.3	-42.2	-5.1	-0.6
Certron	FRXI	I	+ 5.6	+ 6.3	+ 6.3	+4.3	-2.5	- 8.7	58.8	10.0	23.0	-46.8	-0.7	+0.9
Denon	DX4	I	+ 6.6	+ 7.7	+ 8.2	+7.2	+0.3	- 5.5	58.1	11.4	23.2	-48.3	0.0	+1.9
DLK	PRO-FI 1	I	+ 4.4	+ 5.0	+ 5.3	+4.6	-2.5	- 8.3	57.4	8.8	23.1	-41.0	-2.2	+0.4
Fuji	DR	I	+ 3.0	+ 4.4	+ 5.9	+3.6	-1.5	- 7.8	55.9	9.9	22.7	-49.8	+0.2	-0.9
Fuji	ER	I	+ 6.3	+ 7.2	+ 7.8	+5.4	-1.2	- 7.8	59.4	10.2	23.2	-49.3	0.0	+0.3
Fuji	FR-I	I	+ 7.0	+ 8.1	+ 8.5	+5.2	-0.6	- 7.5	60.2	10.9	23.5	-49.7	+0.2	+0.2
Irish	2000	I	+ 1.3	+ 2.3	+ 3.3	+1.8	-4.5	-10.7	53.4	9.0	20.9	-47.2	-0.3	-1.4
Irish	7000	I	+ 0.5	+ 1.8	+ 3.7	+3.9	-2.1	- 8.5	52.0	9.5	21.3	-46.7	-1.2	-1.1
JVC	F1	I	+ 2.9	+ 4.2	+ 5.9	+3.4	-3.5	-10.3	54.2	9.2	22.9	-46.8	-1.2	-0.3
JVC	DA1	I	+ 4.0	+ 5.5	+ 7.3	+5.8	-1.8	- 7.9	56.0	10.0	21.7	-50.0	-0.5	-0.4
JVC	DA3	I	+ 4.2	+ 5.5	+ 6.2	+3.4	-2.5	- 9.0	58.2	10.1	22.3	-47.8	0.0	+0.1
Loran	Normal	I	+ 3.1	+ 4.2	+ 5.3	+3.4	-2.3	- 8.8	56.9	9.7	22.5	-49.2	0.0	-1.1
Magnex	Studio LH	I	+ 3.7	+ 4.2	+ 4.1	+3.0	-2.5	- 8.5	56.1	9.8	23.7	-40.8	-1.8	+0.6
Magnex	Studio I	I	+ 3.4	+ 5.1	+ 6.6	+5.4	-1.5	- 7.5	56.8	10.2	23.1	-42.0	0.0	+0.3
Maxell	LN	I	+ 2.1	+ 2.9	+ 3.6	+1.8	-4.0	- 9.5	53.2	9.3	22.0	-49.2	-1.1	-1.5
Maxell	UD	I	+ 5.8	+ 7.0	+ 7.4	+4.9	-1.0	- 7.3	59.0	10.7	22.8	-47.5	-0.2	+0.4
Maxell	UD-XL I	I	+ 6.7	+ 8.2	+ 9.4	+7.0	-0.3	- 6.6	59.4	11.1	23.9	-50.1	+0.2	+0.5
Maxell	XL I-S	I	+ 7.3	+ 8.6	+ 7.9	+3.6	-2.5	- 8.8	61.0	10.8	22.6	-51.3	+0.3	+1.3
Memorex	dB	I	+ 3.6	+ 5.4	+ 7.6	+7.3	-2.5	- 9.1	57.6	9.2	23.4	-45.9	-1.4	+0.4
MIS	XR	I	+ 3.8	+ 5.5	+ 7.7	+7.1	-2.0	- 9.1	56.5	9.5	24.3	-47.6	-1.3	+3.7
Nakamichi	EXII	I	+ 5.4	+ 6.8	+ 7.9	+4.2	-1.6	- 8.4	58.1	10.2	23.5	-47.5	0.0	+0.2
PD Magnetics	Tri-Oxide Ferro	I	+ 5.5	+ 6.6	+ 7.1	+5.7	-2.2	- 8.6	56.9	10.4	22.6	-47.4	-1.2	+0.5
Realistic	Supertape Gold	I	+ 4.6	+ 5.7	+ 6.5	+3.0	-2.6	- 8.9	55.7	10.3	22.8	-44.2	-1.1	+0.4
Scotch	XSI	I	+ 4.4	+ 5.7	+ 6.2	+4.2	-2.8	- 9.1	57.7	9.9	23.2	-48.0	-0.7	0.0
Sony	LNK	I	+ 3.1	+ 4.4	+ 5.6	+2.9	-3.4	- 9.3	53.7	10.2	22.6	-48.0	-0.6	-0.9
Sony	BHF	I	+ 6.4	+ 8.1	+ 9.5	+5.3	0.0	- 7.0	58.3	10.9	23.3	-46.9	+0.1	+0.6
Sony	AHF	I	+ 6.4	+ 7.9	+ 9.1	+5.2	+0.2	- 6.5	60.3	11.1	23.3	-50.2	+0.6	-0.1
Swire	Laser XL	I	- 2.8	- 1.5	- 0.1	-2.6	-3.2	- 9.5	49.7	9.3	21.8	-46.0	-1.5	-2.5
Swire	Laser UHDI	I	+ 2.7	+ 3.3	+ 3.6	+1.0	-2.4	- 9.2	54.6	10.0	23.6	-47.8	-0.3	-0.7
TDK	D	I	+ 3.9	+ 5.3	+ 6.7	+3.6	-2.4	- 9.0	55.7	9.5	22.9	-49.3	-1.0	-0.4
TDK	AD	I	+ 4.8	+ 6.3	+ 7.9	+4.7	-1.0	- 7.2	58.8	10.6	23.2	-47.4	+0.4	-0.4
TDK	AD-X	I	+ 7.8	+ 9.3	+10.0	+6.0	+0.3	- 6.5	60.4	10.9	24.1	-48.0	+0.4	+0.6
Yamaha	NR	I	+ 4.9	+ 6.3	+ 7.6	+4.8	-1.0	- 7.4	58.8	10.6	23.4	-45.0	+0.2	-0.1
Yamaha	NR-X	I	+ 7.9	+ 9.5	+10.1	+8.1	+0.3	- 6.3	60.8	11.1	24.7	-47.9	+0.6	+0.3
BASF	Pro II Chrome	II	+ 4.1	+ 5.9	+ 6.6	+2.9	-4.5	- 9.6	61.5	9.1	21.9	-52.3	0.0	-0.2
Certron	FRXII	II	- 0.9	+ 0.7	+ 0.8	-0.1	-6.2	-10.7	56.8	8.3	23.1	-41.8	+0.1	-0.1

although the -3 dB upper limit was. Many tests have shown that there is substantially no difference in -20 dB responses among almost all tapes of all types, when bias is set for best response with each tape. The responses were plotted at Dolby level (with the same bias setting) to show how the tapes compared in high-frequency headroom. Differences here are indicative of how well a formulation will do in recording music with high levels of high-frequency energy.

As stated above, the higher level response checks were made at Dolby level, with a reference flux level of 200 nWb/m at 400 Hz. The IEC (and the

forthcoming EIA) level reference is 250 nWb/m (at 315 Hz), which is just about 2 dB higher. I would find it appealing to be able to say that the reference level I use follows international standards, but unfortunately there are very few cassette decks which give the user the slightest indication where 250 nWb/m might be. Almost every deck does have that little Dolby double-D symbol, however, and a number of decks, including Nakamichi, have meter zero at Dolby level. So the response tests discussed above and the checks for MRLs (maximum record levels) all refer to Dolby level. In the case of the MRLs, the figures given are for the change in

input recording level relative to that producing Dolby level on the tape. The actual record/playback values that would be obtained on a particular deck would be lowered by the usual compression or saturation effects.

The MRLs are very important: Good tapes have high MRLs, and poor tapes have low ones. High MRLs let the user record at a higher level for the same distortion limit, and higher MRLs usually go with higher signal-to-noise ratios—in other words, greater dynamic range.

MRLs were measured at 100, 400, 1000 and 2000 Hz with a single tone, and with twin tones at 5 and 6 kHz, 7

BRAND	DESIGNATION	TYPE	MAXIMUM RECORD LEVEL dB re 400-Hz Dolby Level						S/N RATIO dBA	RESPONSE AT -3 db (kHz)		MOD NOISE dB	BIAS dB	SENS dB
			HDL ₃ = 3%				TTIM = 3%			0 dB Level	-20 dB Level			
			100	400	1k	2k	5k	10k						
Denon	DX7	II	+ 4.7	+ 6.1	+ 6.2	+2.9	-6.1	-11.2	59.6	9.2	23.3	-49.4	-0.1	+1.3
DLK	PRO-FI 2	II	+ 1.2	+ 2.5	+ 2.8	+1.4	-5.8	-10.4	56.5	8.2	22.6	-46.2	-0.1	-0.5
DLK	PRO-FI 3	II	+ 1.2	+ 2.7	+ 3.1	+1.4	-7.0	-12.3	56.0	9.4	22.5	-51.3	+0.5	-0.5
Fuji	FR-II	II	+ 4.8	+ 6.4	+ 7.2	+4.4	-4.8	-10.3	60.0	10.1	22.3	-51.4	-0.5	+1.2
JVC	DA7	II	+ 2.9	+ 4.7	+ 5.4	+2.2	-7.7	-12.3	59.4	8.9	24.1	-50.0	0.0	+1.1
Loran	High Bias	II	+ 6.3	+ 7.6	+ 8.4	+4.3	-2.2	- 7.6	60.9	10.8	23.1	-48.6	-1.1	+1.7
Magnex	Studio 2	II	+ 3.5	+ 4.6	+ 4.5	+2.9	-5.5	- 7.6	59.4	9.6	24.4	-44.2	0.0	-0.1
Maxell	UD-XL II	II	+ 4.9	+ 6.3	+ 7.0	+4.0	-4.8	-10.2	60.6	10.0	22.1	-50.1	+0.2	+0.8
Maxell	XL II-S	II	+ 7.0	+ 8.6	+ 7.7	+3.8	-6.0	-11.3	63.4	10.3	25.1	-50.7	+0.2	+2.7
Memorex	HBII	II	+ 2.3	+ 3.7	+ 4.0	+2.1	-5.7	-10.9	59.0	9.7	23.5	-45.7	+0.5	0.0
Nakamichi	SX	II	+ 4.6	+ 6.2	+ 7.3	+4.2	-4.6	- 9.9	59.5	9.9	21.7	-48.4	-0.4	+1.3
Nakamichi	SXII	II	+ 4.9	+ 6.7	+ 7.7	+5.1	-4.7	- 9.9	60.5	11.2	23.9	-50.6	+0.1	+2.5
PD Magnetics	500 Crolyn	II	+ 2.9	+ 4.5	+ 4.3	+1.1	-7.6	-12.6	60.1	8.6	22.0	-46.4	-0.6	0.0
Realistic	Supertape Hi-Bias	II	+ 1.5	+ 2.7	+ 2.8	+0.5	-5.8	-10.9	57.1	9.3	21.8	-45.3	-0.4	+1.1
Scotch	XSII	II	+ 3.9	+ 5.5	+ 6.1	+2.7	-5.9	-11.2	58.6	9.6	24.1	-50.5	0.0	+1.4
Sony	UCX	II	+ 6.7	+ 8.2	+ 8.8	+4.5	-4.6	-10.0	62.2	10.1	22.6	-49.8	-0.5	+2.3
Sony	UCX-S	II	+ 6.1	+ 7.8	+ 8.7	+4.2	-4.3	- 9.9	62.5	10.3	21.9	-48.5	-0.1	+2.0
Swire	Laser UHDI	II	+ 1.8	+ 3.5	+ 3.0	-0.2	-8.9	-13.8	59.8	8.0	21.5	-46.4	-0.2	-0.9
TDK	SA	II	+ 5.9	+ 7.6	+ 8.5	+3.7	-4.0	- 9.9	61.6	9.9	20.3	-50.3	-0.1	+1.3
TDK	SA-X	II	+ 5.1	+ 7.0	+ 8.1	+5.2	-4.6	-10.3	61.9	11.1	23.8	-50.7	0.0	+2.8
Yamaha	CR	II	+ 4.8	+ 6.2	+ 6.7	+4.4	-5.5	-10.8	60.2	9.4	22.2	-49.3	-0.5	+0.9
Yamaha	CR-X	II	+ 6.4	+ 8.1	+ 9.1	+5.2	-4.1	- 9.7	61.1	11.3	22.7	-49.9	+0.3	+2.7
BASF	Ferrochrom III	III	+ 6.4	+ 9.2	+ 7.9	+3.6	-7.6	-13.1	64.2	9.4	23.8	-50.8	+1.5	-0.4
BASF	Metal IV	IV	+ 6.5	+ 8.1	+ 8.8	+5.5	-2.2	- 7.3	60.3	12.5	25.5	-50.5	0.0	-0.5
Fuji	FR Metal	IV	+ 8.6	+11.0	+12.6	+7.4	-0.3	- 5.9	63.3	12.7	23.9	-47.7	+0.7	+0.2
JVC	ME-PII	IV	+ 7.3	+ 9.0	+10.0	+6.6	-0.5	- 6.5	60.6	12.2	23.1	-51.6	+0.4	-0.7
Loran	Metal	IV	+ 8.7	+ 9.9	+ 9.6	+6.1	-1.7	- 6.8	62.1	12.7	25.4	-47.1	-0.2	+0.3
Magnex	Studio 4	IV	+ 7.2	+ 9.1	+ 9.8	+5.7	-1.6	- 6.8	60.9	12.9	25.4	-49.0	-0.1	0.0
Maxell	MX	IV	+ 8.7	+10.7	+11.9	+7.6	-0.3	- 5.8	64.0	13.0	25.0	-52.6	0.0	+0.6
Memorex	Metal IV	IV	+ 7.7	+ 9.8	+10.9	+5.9	-0.6	- 6.1	62.3	13.1	25.5	-48.3	+0.6	+0.2
Nakamichi	ZX	IV	+ 7.1	+ 9.2	+10.6	+6.6	-1.3	- 6.6	62.2	12.7	25.3	-50.2	0.0	0.0
PD Magnetics	1100 Metal	IV	+ 7.8	+10.1	+11.2	+6.4	-1.0	- 6.3	62.7	13.3	25.4	-49.7	+0.5	+0.1
Realistic	Supertape Metal	IV	+ 7.3	+ 9.2	+ 9.6	+5.5	-2.1	- 7.6	62.3	12.7	25.5	-48.9	-0.5	-0.1
Scotch	XSM	IV	+ 6.2	+ 7.9	+ 8.5	+4.9	-2.6	- 7.5	60.1	12.8	25.6	-48.0	-0.6	-0.3
Sony	Metallic	IV	+ 9.7	+11.7	+12.8	+7.7	+0.6	- 4.8	64.0	13.5	25.1	-49.4	+0.6	+0.7
TDK	MA	IV	+10.3	+12.5	+13.3	+8.2	+0.7	- 5.3	65.3	13.0	24.5	-49.2	+0.7	+0.9
TDK	MA-R	IV	+ 8.1	+10.2	+10.9	+6.2	-1.5	- 6.9	62.1	13.0	25.7	-50.8	-0.6	+0.2
Yamaha	MR	IV	+ 7.2	+ 9.4	+10.7	+6.5	-1.4	- 7.2	62.0	13.1	25.4	-50.2	+0.2	-0.6

“Most tapes have low skew, consistent bias and sensitivity needs, stable output levels without audible dropouts, and pretty equal flutter.”

and 8 kHz, and 10 and 11 kHz. The defined limit was 3% for the third-order products of distortion. The twin-tone tests required use of a spectrum analyzer to examine the relevant distortion products. The noise level from each tape, both with A and CCIR/ARM weightings, was measured while in record mode but with no input signal.

The reported signal-to-noise ratio (in dBA) is the total of the 400-Hz MRL figure and that for the measured ratio between Dolby level and tape noise. (CCIR/ARM figures were 2.6 dB lower than dBA figures.) Modulation noise was measured by recording a 1-kHz tone at +3 dB, notching out the tone in playback and passing the result through a 500- to 1500-Hz filter. The residual is made up of tape noise and sidebands of energy from modulation caused by the high-level tone. High modulation noise can give a rather buzzy quality to a high-level recording, particularly with something like an isolated trumpet.

A 3000-Hz tone was recorded, and the playback was checked for output-level stability, dropouts, and flutter. A wandering output level can be quite detrimental, particularly if it is rapid. Dropouts, of course, can be very obvious if they are deep and of some duration. Flutter is important, but in most cases, not that much will show up in tests on one deck. If the figures are extreme, then they have some significance. Some fast checks of 15-kHz play loss were made of Type I tapes, but no data are reported in this survey as the problem appeared to be considerably lessened with some of the new formulations.

Test Results

Most numerical data from the tests are listed in Table I. Note that the tapes are in alphabetical order for each of the IEC types. The exact 3-dB down points for both levels are given in the table, and, of course, they appear for Dolby level in the plots of the swept responses. Overlaid on each of those are dashed lines showing the MRLs from the table. An interesting facet (with a couple of exceptions) is that the signal-to-noise ratio for Type I tapes is usually just about 50 dB higher than the 1-kHz MRL. A similar relationship exists for the other tape types, albeit

with a different base number. There is a great deal of data shown, but if you are looking for the “best” tape, let me suggest this approach: Scan the 1-kHz MRLs to find the tapes with the highest values, also checking the 10-kHz MRL figure. Then, look at the signal-to-noise ratio and the high-frequency limit (-3 dB) at the 0-dB record level. Finally, make certain the modulation noise is low. If you cannot adjust bias and record sensitivity on your deck, any selection made should match what your recorder was set up for.

Since our last survey, many characteristics of cassette tapes have improved, all to the benefit of the user. To help save space and minimize repetition, general statements will be made here and not repeated for the comments on the individual tapes: (1) The majority of tapes have very low tape skew, and are also consistent in sensitivity and bias needs; (2) the great majority of tapes have output levels that are stable within 0.3 dB and do *not* have dropouts that even approach audibility, and (3) most tapes had pretty much the same amount of flutter in the tests.

Type I Tapes

Two of the tapes reported on here had 1-kHz MRLs of at least 10 dB above Dolby level. With the exception of 0 dB high-frequency headroom, these tapes matched some of the metal tapes. With the use of Dolby C or dbx NR, the Type I tapes and their low distortion on most recorders become quite appealing.

BASF Performance I: Certainly a good Type I tape and very consistent in all of its characteristics. A great improvement over the previous version. (C-90, \$4.19)

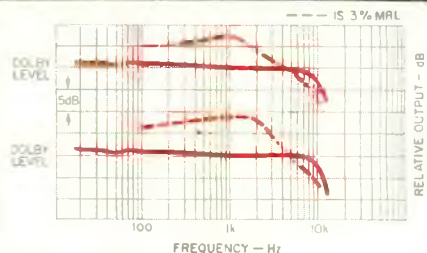
BASF Pro I Super: One of the best Type I tapes with very high MRLs across the band. This was very consistent throughout the testing. (C-90, \$5.99)

Certron HE: This is a limited-use tape with very low bias needs, delivering but small MRLs with high tape and modulation noise. (C-90, \$2.59)

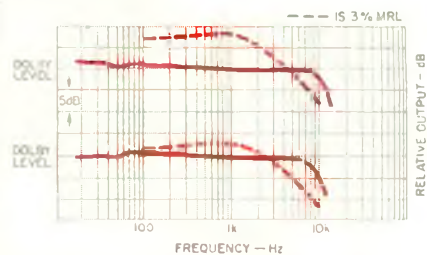
Certron FRX1: This is a great improvement over the HE formulation. FRX1 has good MRLs and lower noise than most other Type I tapes. (C-90, \$3.99)

Denon DX4: Denon is correct about

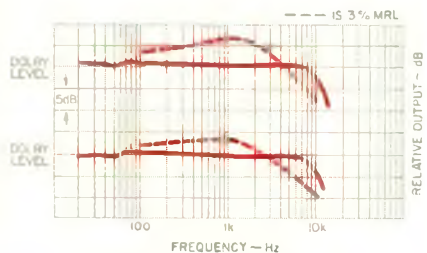
TYPE I



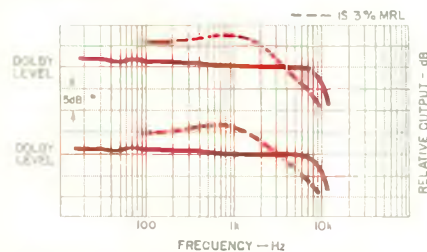
BASF Performance I (top) and Pro I Super



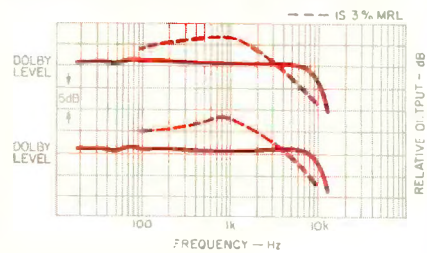
Fuji FR-I (top) and Irish 2000



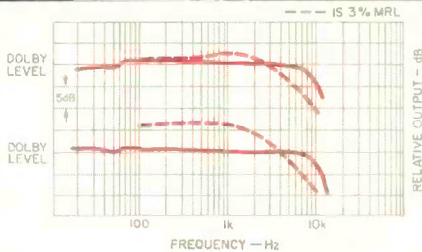
Magnex Studio 1 (top) and Maxell LN



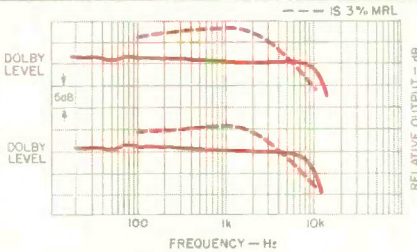
PD Magnetics Tri-Oxide Ferro (top), Realistic Supertape Gold



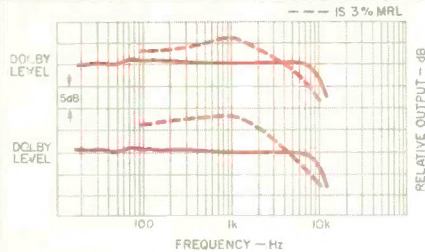
TDK D (top) and AD



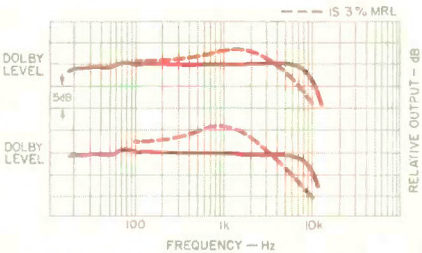
Certron HE (top) and FRXI



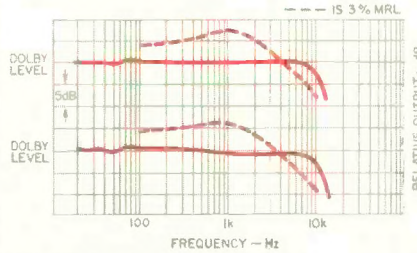
Denon DX4 (top) and DLK Pro-FI 1



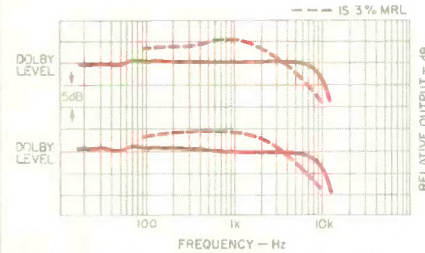
Fuji DR (top) and ER



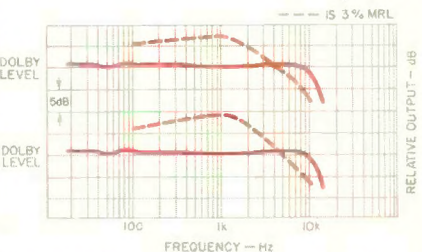
Irish 7000 (top) and JVC F1



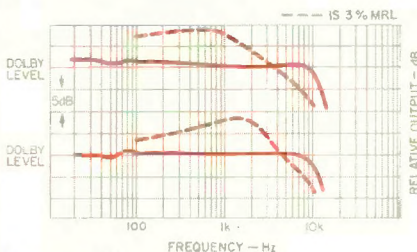
JVC DA1 (top) and DA3



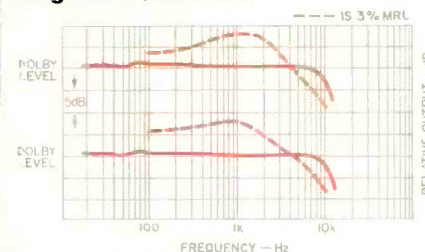
Loran Normal Bias (top) and Magnex Studio LH



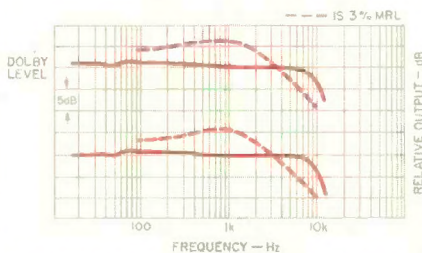
Maxell UD (top) and UD-XL I



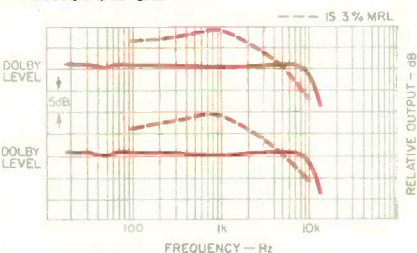
Maxell XL I-S (top) and Memorex dB



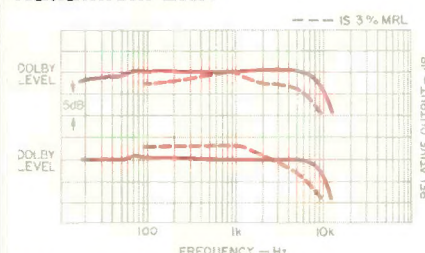
MIS XR (top) and Nakamichi EXII



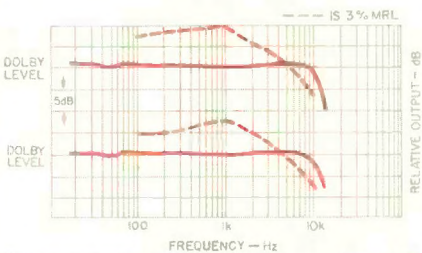
Scotch XSI (top) and Sony LNX



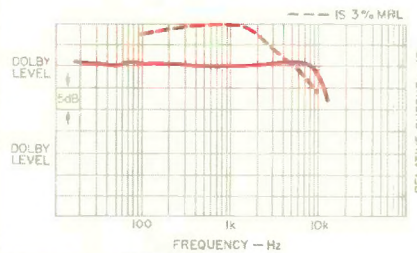
Sony BHF (top) and AHF



Swire Laser XL (top) and Laser UHDI



TDK AD-X (top) and Yamaha NR



Yamaha NR-X

“Type II tapes are improving. But quite a few still do not match the better Type I tapes in MRL or signal-to-noise ratios.”

this tape. It is an excellent addition to the Type I tape selections, with very high MRLs and low noise. Excellent consistency, one of the best in this regard. (C-90, \$5.99)

DLK PRO-FI 1: In most respects, this tape is quite good. The modulation noise was very high, perhaps related to the fact that the 3-kHz level varied rapidly over a range of almost 1 dB in playback. (C-90, \$2.79)

Fuji DR: This is a good Type I tape in all respects, and it had better output stability than most. (C-90, \$4.75)

Fuji ER: This is one of the better tapes, with high MRLs and very low noise. (C-90, \$5.75)

Fuji FR-I: This is one of the best tapes in this category, with very high MRLs and very low noise. (C-90, \$7.50)

Irish 2000: With low MRLs and so-so consistency, including occasional detectable dropouts, this is one of the poorer Type I tapes tested. (C-90, \$2.15)

Irish 7000: Overall, this tape is close in performance to the other Irish tape: Unimpressive MRLs and inconsistent performance, wandering skew. (C-90, \$2.70)

JVC F1: Not a bad tape for noncritical uses, with reasonable MRLs and excellent consistency. (C-90, \$3.95)

JVC DA1: This is quite a good tape with good MRLs and excellent amplitude stability. There was a 1 dB spread in bias needs. Flutter was slightly high. (C-90, \$5.25)

JVC DA3: This formulation was slightly different from DA1, perhaps somewhat better because of the lower noise. Consistency was among the best. (C-90, \$6.95)

Loran Normal: This has fairly good MRLs, though not up to the standard set by the best Type Is. Bias and sensitivity were completely consistent, but skew was not. (C-90, \$7.95)

Magnex Studio LH: This was the first Italian-manufactured tape to be tested, so there was great curiosity on what the results would be. This is their lowest quality Type I tape, and the MRLs were not that great and the noise a bit high. (C-90, \$3.99)

Magnex Studio 1: This formulation is certainly better than the LH from Magnex, as is shown in the higher MRLs, but there was little improvement in the noise performance. The C-60s were a

close match for the C-90s. (C-90, \$4.59)

Maxell LN: A nonpremium tape for not-too-demanding applications, due to its low MRLs. Excellent consistency.

Maxell UD: A tape of good performance with fairly high MRLs and good noise performance. Very consistent, with excellent output-level stability. Lower flutter than most.

Maxell UD-XL I: An excellent tape, with very high MRLs, good responses and low noise. Very consistent in all respects, with superior output-level smoothness and stability. Lower flutter than most.

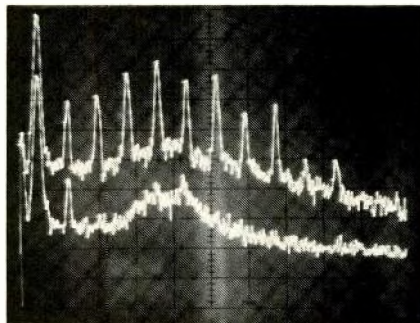


Fig. 1—Spectrum of playback of 2-kHz tone recorded at 3 dB above Dolby level for Swire Laser UHD I (top) and Swire Laser XL (bottom); see text. Vertical scale, 10 dB/division; horizontal, 2 kHz/division.

Maxell XL I-S: This is also an excellent tape, but I expected to find its high-frequency MRLs higher than those for UD-XL I, not lower. A very consistent tape, albeit not as smooth as UD-XL I. (C-90, \$7.29)

Memorex dB: This is quite good for a nonpremium tape, with fairly high MRLs and good consistency. (C-90, \$3.79)

MIS XR: The cassettes received were identified as high bias, but standard high bias reduced the 400-Hz level by 4 dB! With Type I bias, there was still some high-end roll-off, but lowering the bias 1.3 dB below the IEC tape's level got the results in the table. Actually, quite good in all respects, with nice MRLs and good consistency. The flutter was higher than most cassettes. (C-90, \$2.04)

Nakamichi EXII: This is a very good tape, with fairly good MRLs, low noise and excellent consistency, even be-

tween C-60s and C-90s. (C-90, \$5.40)

PD Magnetics Tri-Oxide Ferro: This new entry into our tape testing performed quite well, bringing good MRLs, very good consistency, and low flutter. (C-90, \$4.99)

Realistic Supertape Gold: This is another good Type 1 tape with fairly high MRLs. Consistency was good, though output-level stability was just fair. (C-90, \$3.99)

Scotch XSI: This is a good tape that is superior to a number of others with the same MRLs because of its lower noise. Flutter was much lower than most.

Sony LNX: This nonpremium tape shows some limitations with so-so MRLs and noise. The consistency was excellent in general, and the output level was very stable. The flutter was one of the lowest measured of all tapes. (C-90, \$3.15)

Sony BHF: This is an excellent tape, with very high MRLs, low noise, excellent consistency, and low flutter. A very worthwhile improvement over HFX. (C-90, \$4.25)

Sony AHF: This is an excellent tape, quite close to BHF, although with even lower noise and flutter. (C-90, \$5.20)

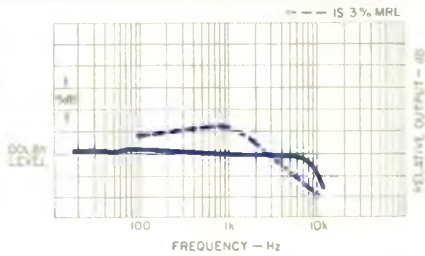
Swire Laser XL: The MRLs are so low for this tape that it would be quite limited for recording most music for any purpose. Bias and sensitivity also very low, not matching most decks. (C-90, \$1.89)

Swire Laser UHD I: The data listed in Table I indicates a considerable improvement in basic performance, although not at an impressive level. Of more significance, however, was the fact that the tape output evidenced what appeared to be a high-frequency oscillation. A spectrum-analyzer scan (Fig. 1) showed that with the test tones, there were harmonics up to the 17th (!) at high level. The cause was not determined, but the tape certainly has a limitation, to say the least. In the same figure, a sweep of the Laser XL tape (displaced downward for clarity) shows that it is not standard with the brand. (C-90, \$2.59)

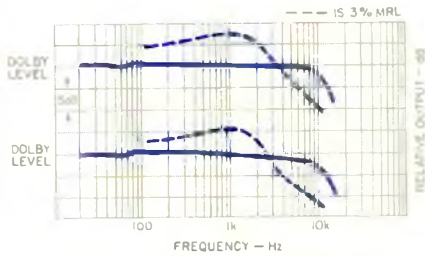
TDK D: Not bad at all for a nonpremium tape, with reasonable MRLs and excellent consistency including the match of C-60s to C-90s. (C-90, \$3.39)

TDK AD: With improvements gained substantially in every category, this is certainly one of the better Type I tapes.

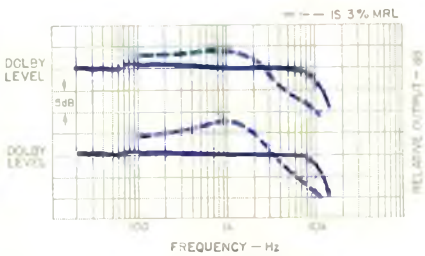
TYPE II



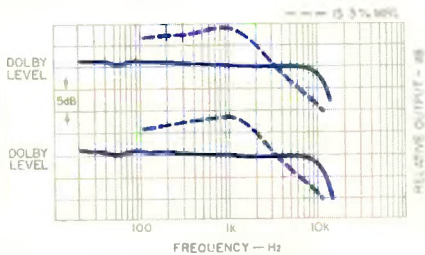
BASF Pro II Chrome



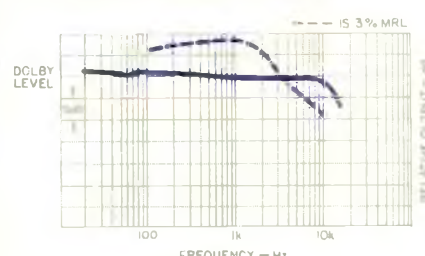
Fuji FR-II (top) and JVC DA7



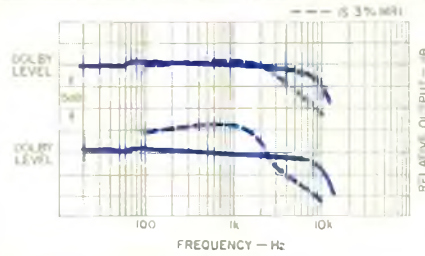
Memorex HBII (top) and Nakamichi SX



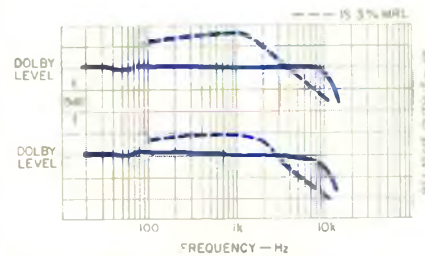
Sony UCX (top) and UCX-S



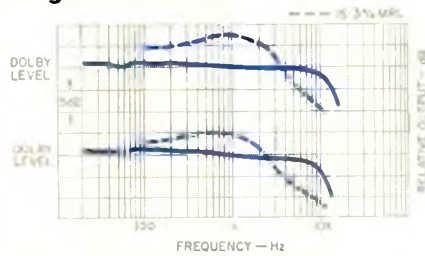
Yamaha CR-X



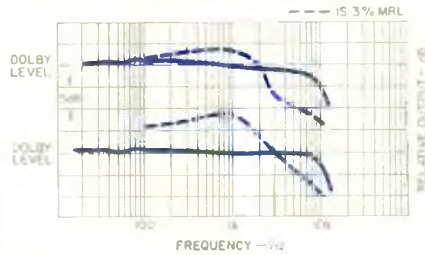
Certron FRXII (top) and Denon DX7



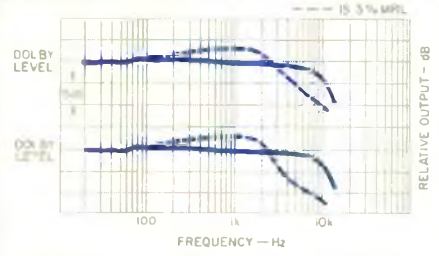
Loran High Bias (top) and Magnex Studio 2



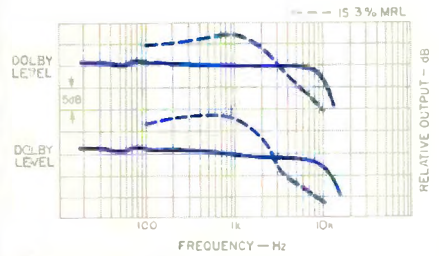
Nakamichi SXII (top) and PD Magnetics 500 Crolyn



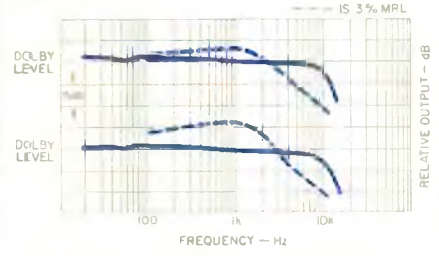
Swire Laser UHDII (top) and TDK SA



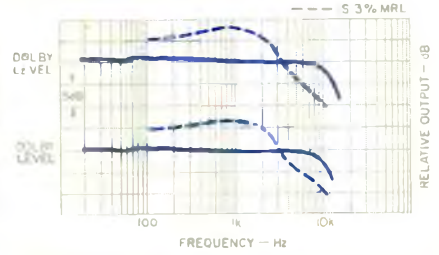
DLK Pro-FI 2 (top) and Pro-FI 3



Maxell UD-XL II (top) and XL II-S



Realistic Supertape Hi-Bias (top) and Scotch XSII



TDK SA-X (top) and Yamaha CR

“For Types I and II, the distortion limit changes greatly from tape to tape. With Type IV tapes, the effect of a particular choice is less obvious.”

Consistency was excellent, including the C-60/C-90 match. (C-90, \$4.79)

TDK AD-X: This is one of the best Type I tapes, with outstanding MRLs, superior noise performance, and excellent consistency, including an especially good match between C-90s and C-60s. The output-level stability was better than most, and the flutter was lower than average. (C-90, \$5.49)

Yamaha NR: This is another new entry into the testing of tapes, and a very good one it is, with high MRLs and low noise. There was some skewing, however, and some record-sensitivity differences from one side to the other. (C-90, \$4.90)

Yamaha NR-X: With the best MRLs at most frequencies and close to the best signal-to-noise ratio, this could be the best Type I at this time. The three samples were completely consistent.

Type II Tapes

In a similar fashion to the Type I tapes, the Type II formulations show general increases in MRLs and signal-to-noise ratios. Quite a few Type II tapes, however, do not match those of the better Type I tapes anywhere in the band, nor do they have better signal-to-noise ratios. In other words, a Type II tape *might* be better than a particular Type I tape—but make careful comparisons between formulations.

BASF Pro II Chrome: This tape shows very good performance, with high MRLs and very low noise. All of the samples were completely consistent, and the output-level stability was excellent. There were no perturbations that could even be called dropouts; one of the best tapes in this regard. (C-90, \$6.29)

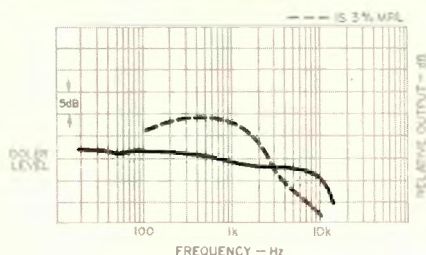
Certron FRXII: This was one of the poorer Type IIs in this survey, with low MRLs and high noise. (C-90, \$3.99)

Denon DX7: One of the good Type II tapes, with fairly high MRLs, low noise, and lower-than-average flutter. (C-90, \$7.00)

DLK PRO-FI 2: This is a so-so tape, with low MRLs and high noise. The samples also had varying skew, and the flutter was higher than most. (C-90, \$4.29)

DLK PRO-FI 3: Overall, this formulation was little different from the above, and it suffered from the same deficiencies. (C-90, \$5.49)

TYPE III



BASF Ferrochrom III

Fuji FR-II: This is one of the better Type II tapes, with good MRLs and low noise, along with excellent consistency. (C-90, \$7.50)

JVC DA7: The low-frequency MRLs are fairly good, but the high-frequency ones are on the low side. Excellent consistency doesn't help quite enough. (C-90, \$7.45)

Loran High Bias: With excellent MRLs, good responses and low noise, this is one of the best Type II tapes in most important respects. (C-90, \$7.95)

Magnex Studio 2: This tape is in the middle of the tested group with average MRLs, noise levels and responses. The C-90/C-60 match was very good. (C-90, \$5.09)

Maxell UD-XL II: Certainly one of the better Type II tapes, with high MRLs, low noise and flutter and outstanding consistency. The output-level stability was perhaps the best of all tapes, with no dropouts of any type observed.

Maxell XLII-S: This is one of the best of the Type II tapes: High MRLs, low noise, good responses, and excellent consistency, to say nothing of low flutter. (C-90, \$7.29)

Memorex HBII: With average MRLs and noise levels and some occasional inconsistencies, this tape gets a rating of average. (C-90, \$4.79)

Nakamichi SX: With its good MRLs and excellent consistency, including C-60s, this is one of the better tapes. Flutter was less than most. (C-90, \$6.30)

Nakamichi SXII: With its higher MRLs, lower noise and better responses, this tape is close to the best of the Type II tapes. (C-90, \$8.00)

PD Magnetics 500 Crolyn: With rather

low MRLs, unimpressive responses, and limited consistency, this tape does not rate well in comparison to most other tapes in this test group. (C-90, \$6.79)

Realistic Supertape Hi-Bias: This tape is one of the poorer entries, with low MRLs, high noise, and bad skewing for one side compared to the other. (C-90, \$4.99)

Scotch XSII: This is a fairly good Type II tape with good consistency, average MRLs.

Sony UCX: This is one of the best of the Type II tapes, certainly a most worthwhile addition to the offerings. Its MRLs are among the highest, with low noise to match. The consistency was excellent, as was the output-level stability, and no dropouts of any nature were observed. (C-90, \$6.15)

Sony UCX-S: This is one of the best of the Type II tapes, very close to UCX, in fact. The flutter was very low, one of the best. (C-90, \$7.00)

Swire UHDII: One of the poorer Type II formulations, with low MRLs, restricted responses, and miscellaneous inconsistencies. (C-90, \$2.59)

TDK SA: This is one of the best Type II tapes, with very high MRLs, low noise, excellent consistency and low flutter. Its output-level stability was one of the best, and there were no dropouts observed. (C-90, \$6.19)

TDK SA-X: In general, this was very close to SA in the tests, with a more extended frequency response. C-60s were also very consistent and a close match to the C-90s. Overall, one of the best. (C-90, \$6.99)

Yamaha CR: One of the better tapes, with high MRLs and low noise. Lower flutter than most. (C-90, \$6.20)

Yamaha CR-X: One of the best of the Type II tapes, and a worthwhile addition to what's available. High MRLs and low noise come along with good responses. (C-90, \$6.97)

Type III

BASF Ferrochrom III: There aren't many Type III tapes around, and the tilted frequency response at 0 dB is not to be applauded. The current BASF version does offer good MRLs, especially at the low end, and the noise performance is excellent. The consistency was excellent, including the output-level stability. (C-90, \$5.99)

Type IV

More manufacturers continue to join the once-small group making metal-particle tapes. There have been noticeable improvements in the performance of tapes in other type groups, but metal tapes are improving also, and they remain the tapes with superior MRLs, signal-to-noise ratios (sometimes), and frequency responses (all the time).

BASF Metal IV: The 0-dB response of this tape shows it to be metal type, but it is not exceptional in other respects. As shown in the plot figure, the C-120 response was actually peaked up and more extended than that for the C-90. The C-120's 400-Hz MRL was about +4 dB with the bias used, so it was limited in that respect, although it could be appealing for some uses. (C-90, \$11.49)

Fuji FR Metal: With very high MRLs and low noise, this is one of the best of the Type IV tapes. There was some spread in the bias needs among the three samples (0.8 dB). (C-90, \$10.75)

JVC ME-PII: This is basically a typical metal tape with generally very good performance, though not standing out from the group. (C-90, \$16.95)

Loran Metal: This is another typical metal tape, in the middle of the group. (C-90, \$15.75)

Magnex Studio 4: The results in the table were from the C-60s supplied (C-90s not available yet). Overall, the results fit in the middle of this high-performing group. Flutter was lower than most. (C-60, \$7.99)

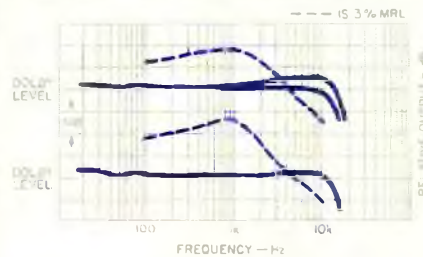
Maxell MX: The improvements announced have made this one of the best of the Type IV tapes, with very high MRLs and low noise. The flutter was very low, one of the best in that regard.

Memorex Metal IV: This is another tape in the middle of this well-performing group. It was generally very consistent, but there was some output-level wandering at times. The flutter was among the lowest. (C-90, \$6.29)

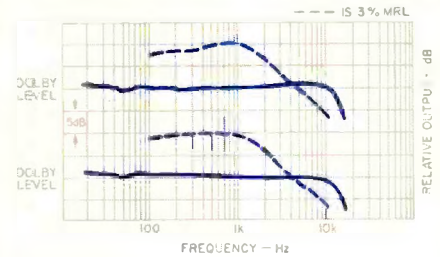
Nakamichi ZX: Yet another of the well-performing Type IV tapes. Consistency quite good, including the match between C-90s and C-60s. (C-90, \$9.00)

PD Magnetics 1100 Metal: This is quite impressive for a newcomer, for it is a bit above average in this well-performing group. (C-90, \$11.99)

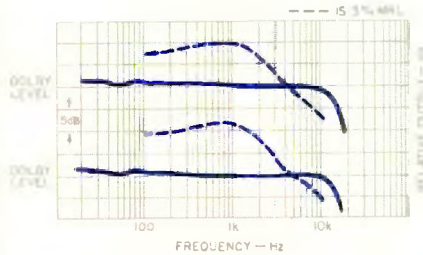
TYPE IV



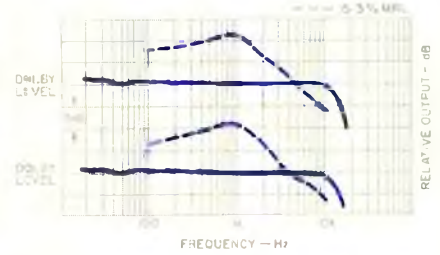
BASF Metal IV (top) C-120 (wider response) & C-90 and Fuji FR Metal



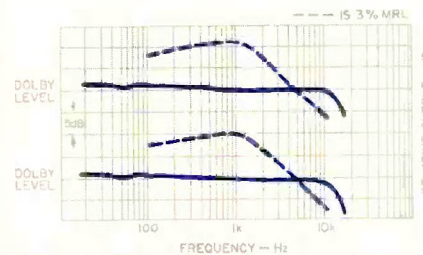
JVC ME-PII (top) and Loran Metal



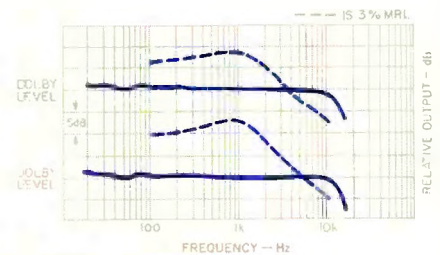
Magnex Studio 4 (top) and Maxell MX



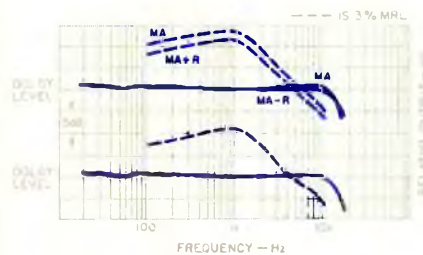
Memorex Metal IV (top) and Nakamichi ZX



PD Magnetics 1100 Metal (top) and Realistic Supertape Metal



Scotch XSM (top) and Sony Metallic



TDK MA and MA-R (top) and Yamaha MR

“Good tapes have high MRLs, letting the user record at higher levels for the same distortion—in other words, more dynamic range.”

Realistic Supertape Metal: Another tape in the pack of metal tapes, it was completely consistent, one of the best metal tapes in that respect. (C-90, \$6.99)

Scotch XSM: The MRLs are low for this tape in this Type IV grouping, and it is reflected in the relatively low signal-to-

noise ratio. This is perhaps the most consistent of all the tapes tested.

Sony Metallic: This is one of the best of the Type IV tapes, with very high MRLs, low noise, and good responses. The consistency was excellent, and the flutter was among the lowest of all cassettes tested. (C-90, \$11.50)

TDK MA: With the highest MRLs and the best signal-to-noise ratio of all Type IV tapes, it might well be the best of all 77 tapes tested in this survey. There were some slight inconsistencies among the samples, so I can't say it's best unreservedly. (C-90, \$8.99)

TDK MA-R: While this is one of the better Type IV tapes, it did not measure up to the results I obtained with the MA samples. (I rechecked mid-band MRLs for both formulations a couple of times.) I must say that it was one of the best tapes for consistency, and the flutter was among the lowest measured. (C-90, \$11.99)

Yamaha MR: This is a good entry into the Type IV metal tapes. The results were very consistent, but the flutter was on the high side. (C-90, \$9.03)

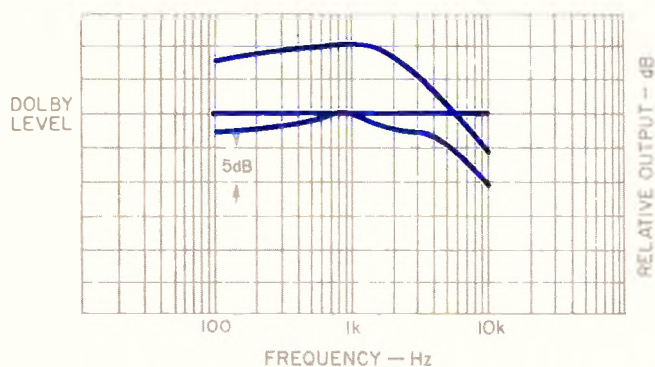


Fig. 2—Range of MRLs for Type I tapes.

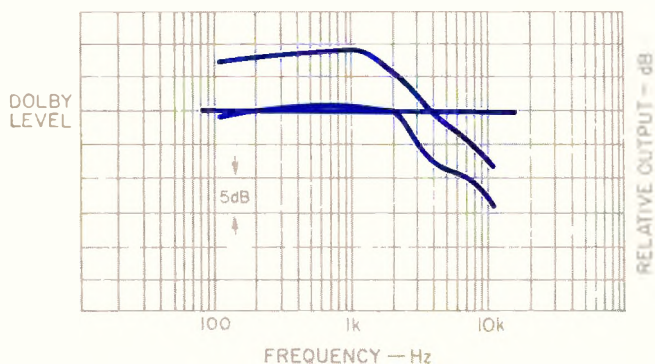


Fig. 3—Range of MRLs for Type II tapes.

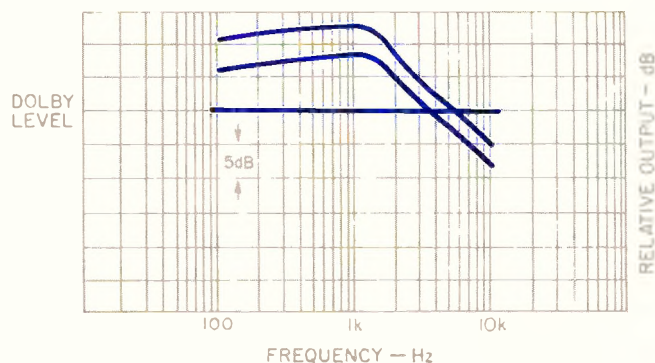


Fig. 4—Range of MRLs for Type IV tapes.

Summary

I'm certain that most readers got the message that I believe that high MRLs may be the most significant parameter for good tape performance. Figures 2 to 4 show the range of MRLs measured for the various tape types (except III, of course). For Types I and II, it is obvious that the distortion limit changes greatly from one tape to the other. With Type IV tapes, the effect of particular choices is less obvious. A review of the results in Table I will confirm that it is possible to select a tape or two from Type I or II that will match at least one of the metal tapes in most respects. Do remember, though, that the higher coercivity of the metal tapes makes them much more stable and less likely to change with time, or with such external influences as heat, stray magnetic fields or pressure. The metal tapes cover quite a wide price range, however, and that situation might also affect your choices.

As suggested in past reports, check such matters as labels, boxes and cassette shells. The low cost of budget tapes usually seems emphasized by their poor quality in these areas. Some wrappings were quite hard to remove—challenging my patience and strength. I did like those with the easy-pull tabs, such as Fuji, JVC, Nakamichi and TDK. Always remember: The best tape for you is the tape that works best with *your* deck and gives you the greatest listening pleasure. I hope this article helps you achieve that goal. **A**