

TEST factory



DAT-P-095/99-10

Leuschnerstrasse 1 70174 Stuttgart

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Listening Test Report

for

**Ingenieurbüro Peter Bengel
(IPB)**

Turnhallestraße 7A, 70565 Stuttgart

Sony Europe BV

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1, Table of delivery and performance

All data in this report is only valid for the product types specified below.

Product: Codec

Manufacturer: Sony

Type: ATRAC3plus and ATRAC3 comparison type 1 to type 4

Date of delivery: 17.02.2003

- Type 1:** Sony ATRAC3plus 48kbps as used by Sony compared with MP3 48kbps, (Fraunhofer-Type as included in Cool Edit Pro 2.0) and WMA 48kbps, (MS-WMEncoder version 9.0).
- Type 2:** Sony ATRAC3plus 64kbps as used by Sony compared with MP3 64kbps and WMA 64kbps.
- Type 3:** Sony ATRAC3 132kbps as used by Sony compared with MP3 128kbps and WMA 128kbps.
- Type 4:** Sony ATRAC3plus 64kbps as used by Sony compared with MP3 128kbps.

For preparing the listening test the comparison Types 1 to 4 were done in separate sessions 1 to 4.

1.1 Delivery Table:

Quantity	Type
10	Music samples, 8 to 15 sec. Duration, originals in MS-WAVE-File format
10	Music samples as above, encoded and decoded by Sony using ATRAC3plus at 48kbps
10	Music samples as above, encoded and decoded by Sony using ATRAC3plus at 64kbps
10	Music samples as above, encoded and decoded by Sony using ATRAC3 at 132kbps
9	Headphones Sony MDR-CD3000, supplied by Sony
1	Headphones Sony MDR-CD3000, supplied by IPB

1.2 Table of performance:

Kind of performance	Purpose
Encoding	10 Music samples at 3 different bitrates with two codecs
Decoding	60 music samples back to WAVE-format
Randomise	Make a random track list
Cutting	Put 3 samples together to one track, tracks to CD
Listening test	Relative A-B (RAB-) Test, specified by Sony, in 4 Sessions
Evaluation	Record all judgements, calculate the results

1.3 Description of Encoding and Decoding:

10 Music samples of following type were chosen, 7 supplied by Sony, 3 supplied by "IPB".

- English POPs X 4
- Harpsichord X 1
- percussion instrument X 1
- English female speech X 1
- Piano X 1
- Jazz X 2

The music samples were encoded and decoded back to WAVE-format using ATRAC3plus at 48kbps and 64kbps and ATRAC3 at 132kbps by Sony engineers.

The WMA encoding was done using the MS-WMEncoder V9.0 and the MP3 encoding was done using CoolEdit Pro 2.0 (where the Fraunhofer codec algorithm is used) at bitrates of 48kbps, 64kbps and 128kbps by "IPB".

The decoding of the WMA and MP3 format back to WAVE-format was done using CoolEdit Pro 2.0 by "IPB".

1.4 Description of Randomising:

For each session the sequence of the tracks was created by the randomising tool "random.exe" supplied by Sony, using a different "seed"-value. Each track consisted of the original sample (always first) the WMA or MP3 coded sample and the ATRAC3 or ATRAC3plus coded sample.

1.5 Description of Cutting:

For each session a CDDA with 45 tracks (session 4: 25 tracks) was prepared. Except the 5 starters, the sequence of all tracks was randomised.

Session 1:

ATRAC3plus 48kbps MP3 48kbps or WMA 48kbps (45 tracks)

- 5 starters for training, explanations and orientation
- Original (CDDA) => ATRAC3plus 48kbps (A) => MP3 48kbps (B) X 10 tracks
- Original (CDDA) => MP3 48kbps (A) => ATRAC3plus 48kbps (B) X 10 tracks
- Original (CDDA) => ATRAC3plus (A) 48kbps => WMA 48kbps (B) X 10 tracks
- Original (CDDA) => WMA 48kbps (A) => ATRAC3plus 48kbps (B) X 10 tracks

The participants judged 45 different tracks, 40 judgements were evaluated.

Session 2:

ATRAC3plus 64kbps MP3 64kbps or WMA 64kbps (45 tracks)

- 5 starters for training, explanations and orientation
- Original (CDDA) => ATRAC3plus 64kbps (A) => MP3 64kbps (B) X 10 tracks
- Original (CDDA) => MP3 64kbps (A) => ATRAC3plus 64kbps (B) X 10 tracks
- Original (CDDA) => ATRAC3plus 64kbps (A) => WMA 64kbps (B) X 10 tracks
- Original (CDDA) => WMA 64kbps (A) => ATRAC3plus 64kbps (B) X 10 tracks

The participants judged 45 different tracks, 40 judgements were evaluated.

Session 3:

ATRAC3 132kbps MP3 128kbps or WMA 128kbps (45 tracks)

- 5 starters for training, explanations and orientation
- Original (CDDA) => ATRAC3 132kbps (A) => MP3 128kbps (B) X 10 tracks
- Original (CDDA) => MP3 128kbps (A) => ATRAC3 132kbps (B) X 10 tracks
- Original (CDDA) => ATRAC3 132kbps (A) => WMA 128kbps (B) X 10 tracks
- Original (CDDA) => WMA 128kbps (A) => ATRAC3 132kbps (B) X 10 tracks

The participants judged 45 different tracks, 40 judgements were evaluated.

Session 4:

ATRAC3plus 64kbps MP3 128kbps (25 tracks)

- 5 starters for training, explanations and orientation
- Original (CDDA) => ATRAC3plus 64kbps (A) => MP3 128kbps (B) X 10 tracks
- Original (CDDA) => MP3 128kbps (A) => ATRAC3plus 64kbps (B) X 10 tracks

The participants judged 25 different tracks, 20 judgements were evaluated.

2, Listening Test

2.1 Used Equipment for listening test:

Equipment	Manufacturer	Type	Serial number	Purpose
Test CD	IPB	-	-	-
Amplifier	Sony	VA333ES	5501145	-
DVD-Player	T&A	DVD 1230	1245500260	-
Headphones	Sony	MDR-CD3000	-	-

2.2 Participating persons:

Name	Given Name	Allocation	Member TESTfactory	Freelancer
Barth	Horst	Engineer	yes	-
Bauer	Christian	Student	yes	-
Bengel	Peter	Leading test engineer	-	yes
Born	Dietmar	Engineer	yes	-
Ertl	Harald	Student	-	yes
Göttling	Silke	Student	-	yes
Jaschke	Dominik	Student	yes	-
Lemke	Heinz	Second Manager of the lab	yes	-
Messerschmidt	Claudia	Student	yes	-
Roy	Sabine	Secretary	yes	-
Stumpf	Tobias	Student	-	Yes
Zarrabi	Navid	Student	-	Yes

2.3 Description of the listening test:

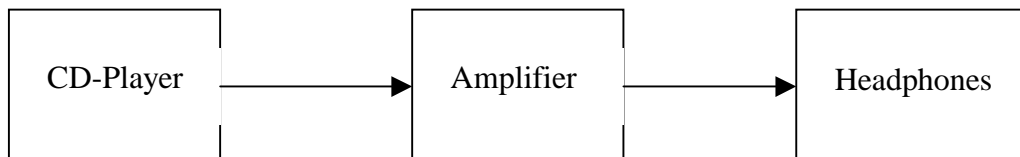
The whole listening test was prepared in a modified listening room by using Sony headphones. The 11 participating persons were listening in 4 sessions, separated by breaks of at least half an hour. 10 are evaluated with the Sony headphones and 1 additional person for crosscheck. Depends at the small deviation there is no influence to the result by the 11th person.



The participating persons judged the comparison RAB for each track.

Comparison Result	Table of Judgement
A is much better than B	+2
A is better than B	+1
A and B are equal	0
A is worse than B	-1
A is much worse than B	-2

2.4 Signal path for listening test:



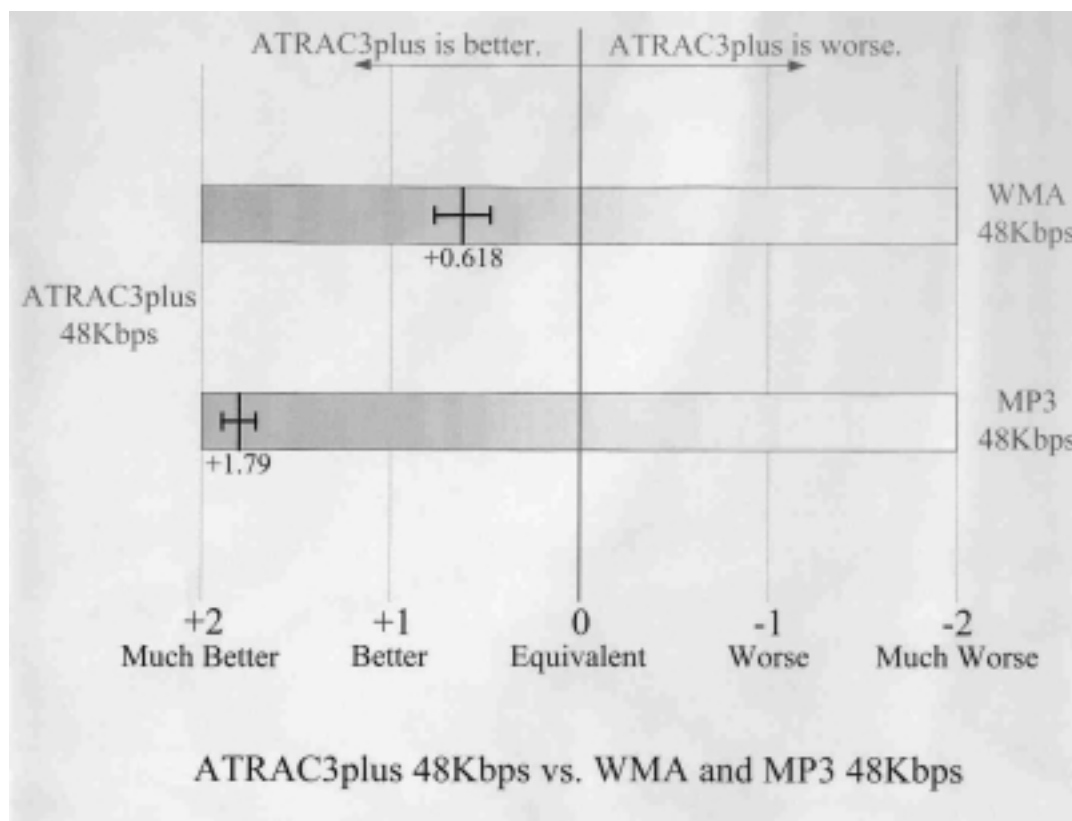
3, Evaluation of the listening test:

The judgements were recorded to an especially prepared table for evaluation with the tool “anasfr.exe” supplied by Sony.

3.1. Type 1

ATRAC3plus relative to WMA			
	rating	95% confidence interval	standard deviation
Bitrate			
48kbps	0.6182	0.7528 ... 0.4835	0.9602

ATRAC3plus relative to MP3			
	rating	95% confidence interval	standard deviation
Bitrate			
48kbps	1.7864	1.8716 ... 1.7011	0.6080



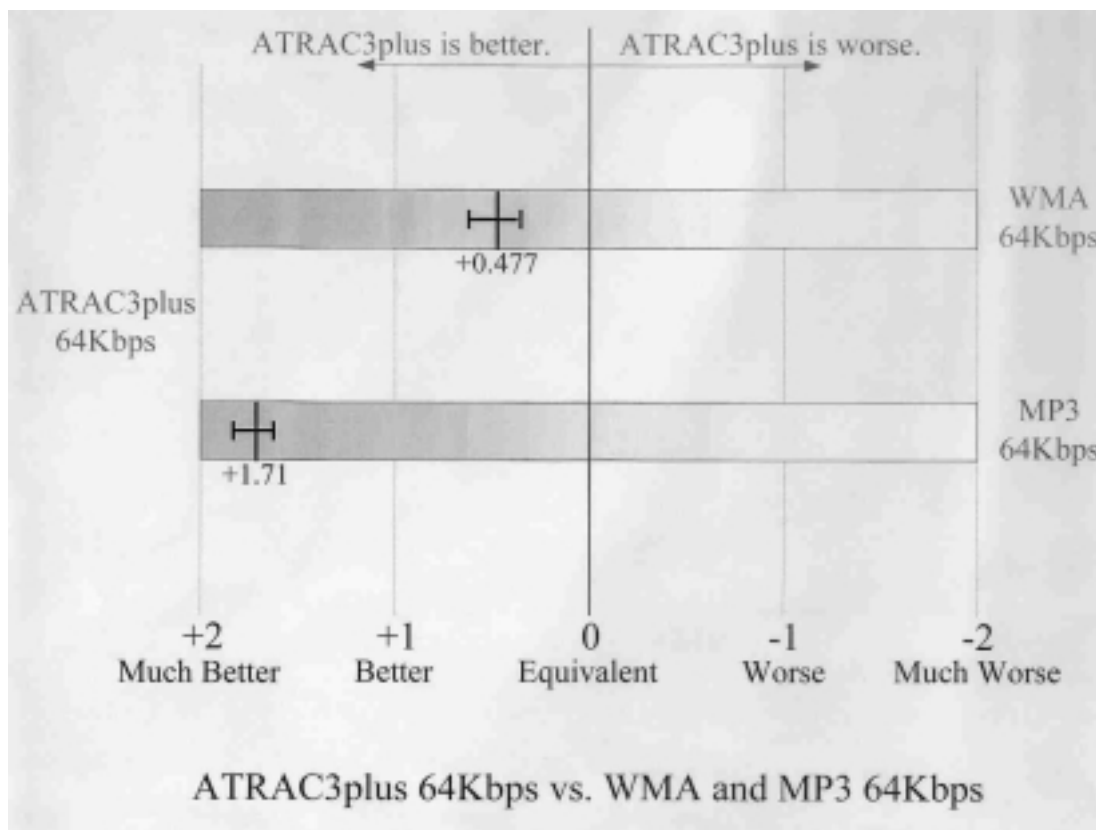
ATRAC3plus shows clearly a better rating (+0.6) compared to WMA, with a small confidence interval, which means the rating is reliable and an acceptable standard deviation, which means that the opinions of the participants show in the same direction.

MP3 performs really bad compared to ATRAC3plus. The rating of +1.8 for ATRAC3plus is an impressive judgement against MP3-quality and with a very small confidence interval and also a small standard deviation value, this judgement is very reliable.

3.2. Type 2

ATRAC3plus relative to WMA			
	rating	95% confidence interval	standard deviation
Bitrate			
64kbps	0.4773	0.6054 ... 0.3491	0.9138

ATRAC3plus relative to MP3			
	rating	95% confidence interval	standard deviation
Bitrate			
64kbps	1.7091	1.8045 ... 1.6137	0.6804



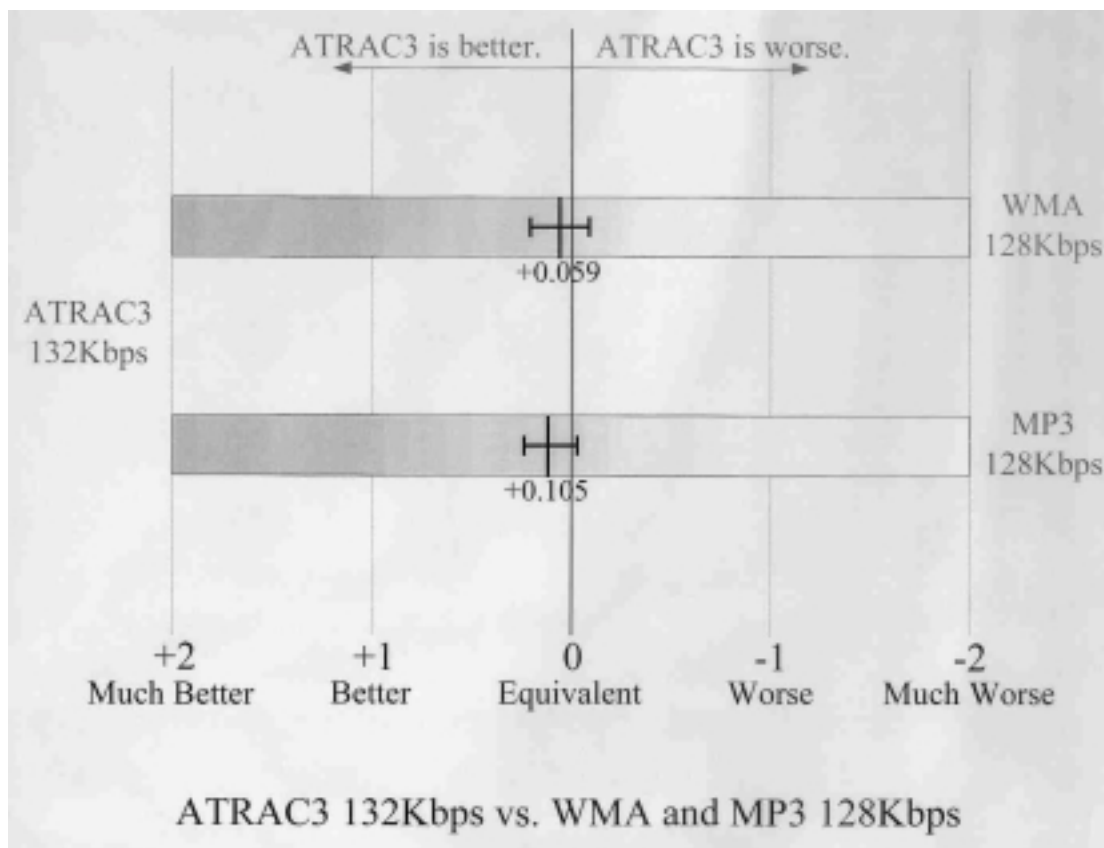
ATRAC3plus again shows clearly a better rating (+0.5) compared to WMA with a small confidence interval and an acceptable standard deviation.

MP3 again performs really bad compared to ATRAC3plus. The rating of +1.7 for ATRAC3plus is again an impressive judgement against MP3-quality and with a very small confidence interval and also a small standard deviation value, this judgement is very reliable.

3.3. Type 3

ATRAC3 relative to WMA			
	rating	95% confidence interval	standard deviation
Bitrate			
132/128kbps	0.0591	0.2016 ... -0.0834	1.0164

ATRAC3 relative to MP3			
	rating	95% confidence interval	standard deviation
Bitrate			
132/ 128kbps	0.1045	0.2434 ... -0.0343	0.9899

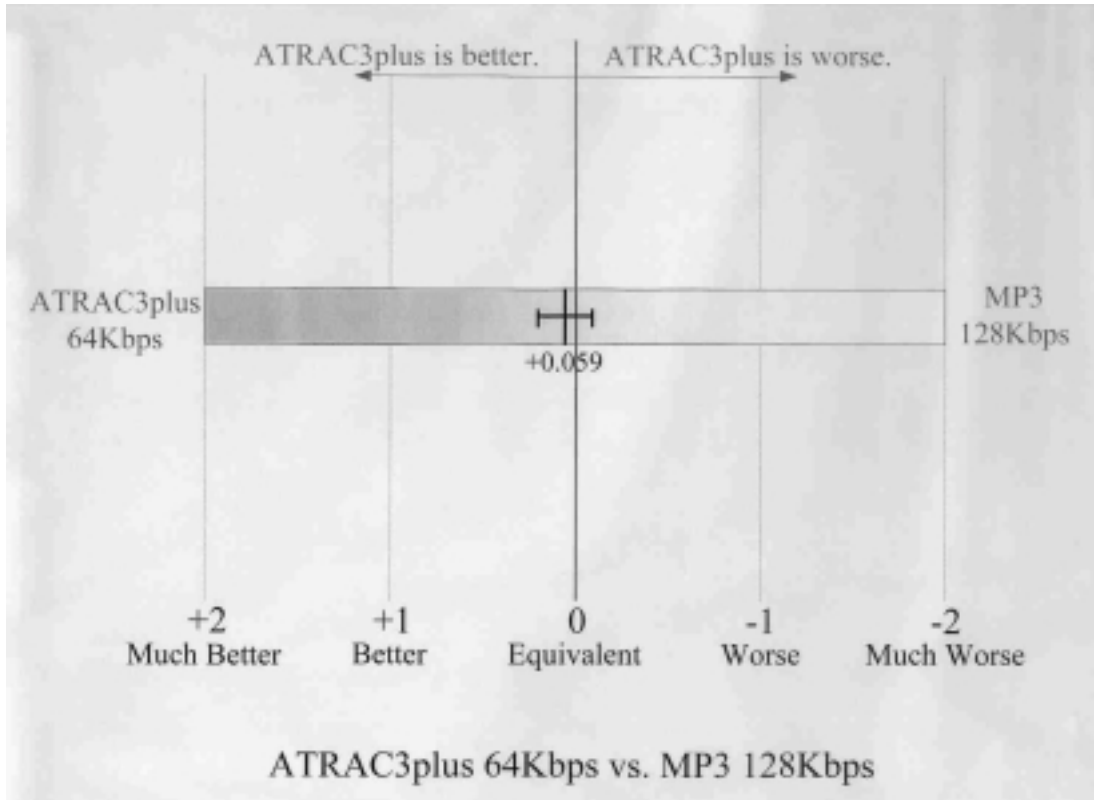


ATRAC3 shows only a slightly better rating (+0.06) compared to WMA. The confidence interval which reaches down to a small negative value and the acceptable standard deviation value support this result.

ATRAC3 shows a small advantage (+0.1) over MP3. Again, the confidence interval reaches down to a very small negative value and the acceptable standard deviation supports the result.

3.4. Type 4

ATRAC3plus relative to MP3			
	rating	95% confidence interval	standard deviation
Bitrate			
64/128kbps	0.0591	0.2004 ... -0.0822	1.0074



The ATRAC3plus-system used with 64 kbps shows almost equal quality of sound reproduction as the MP3-system used with 128 kbps, even with a small advantage for ATRAC3plus. Supported by a small confidence interval and the acceptable standard deviation, this result is reliable.

Stuttgart, 2003-02-27

Klaus Ludwig
(Manager of the lab)