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**ISO/IEC JTC 1/SC 29/WG 11**
**CODING OF MOVING PICTURES AND AUDIO**

**ISO/IEC JTC 1/SC 29/WG 11 N7701**

**October 2005, Nice, France**

**Source:** **Audio Subgroup**
**Title:** **Performance of MPEG Surround Technology**
**Status:** **Approved**

## Introduction

In order to provide highest flexibility and cover all conceivable application areas, the MPEG Surround RM0 technology can operate at various points of the Rate/Distortion curve. It permits to flexibly select the operating point for the trade-off between side information rate and multi-channel audio quality without any change in its generic structure. This concept is illustrated in Figure 1.

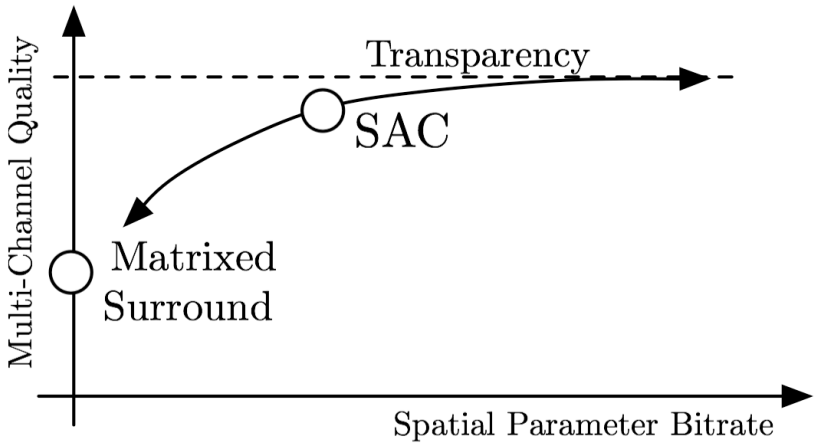


**Figure 1 - Rate/Distortion Scalability.**

In addition, RM0 provides for configurations that provide additional functionality, such as matrix compatibility. The MPEG Surround work plan outlines a schedule for subjective evaluation of such configurations.

It is the objective of this document to serve as a living document collecting all the subjective test results on MPEG Surround technology following its initial verification (N7138).

**Input documents in MPEG Surround to the 73rd MPEG meeting:**

M12226 *Additional subjective test results on high quality operation modes of spatial audio coding RM0*

Contents: The document gives test data for the MPEG Surround system operated at higher bitrates

Conclusions:

- Demonstrates R/D upward scalability using residual coding up to 320 kbit/s total including coded stereo downmix at 128 kbit/s
- Sound quality approaches quality of fully discrete coding system

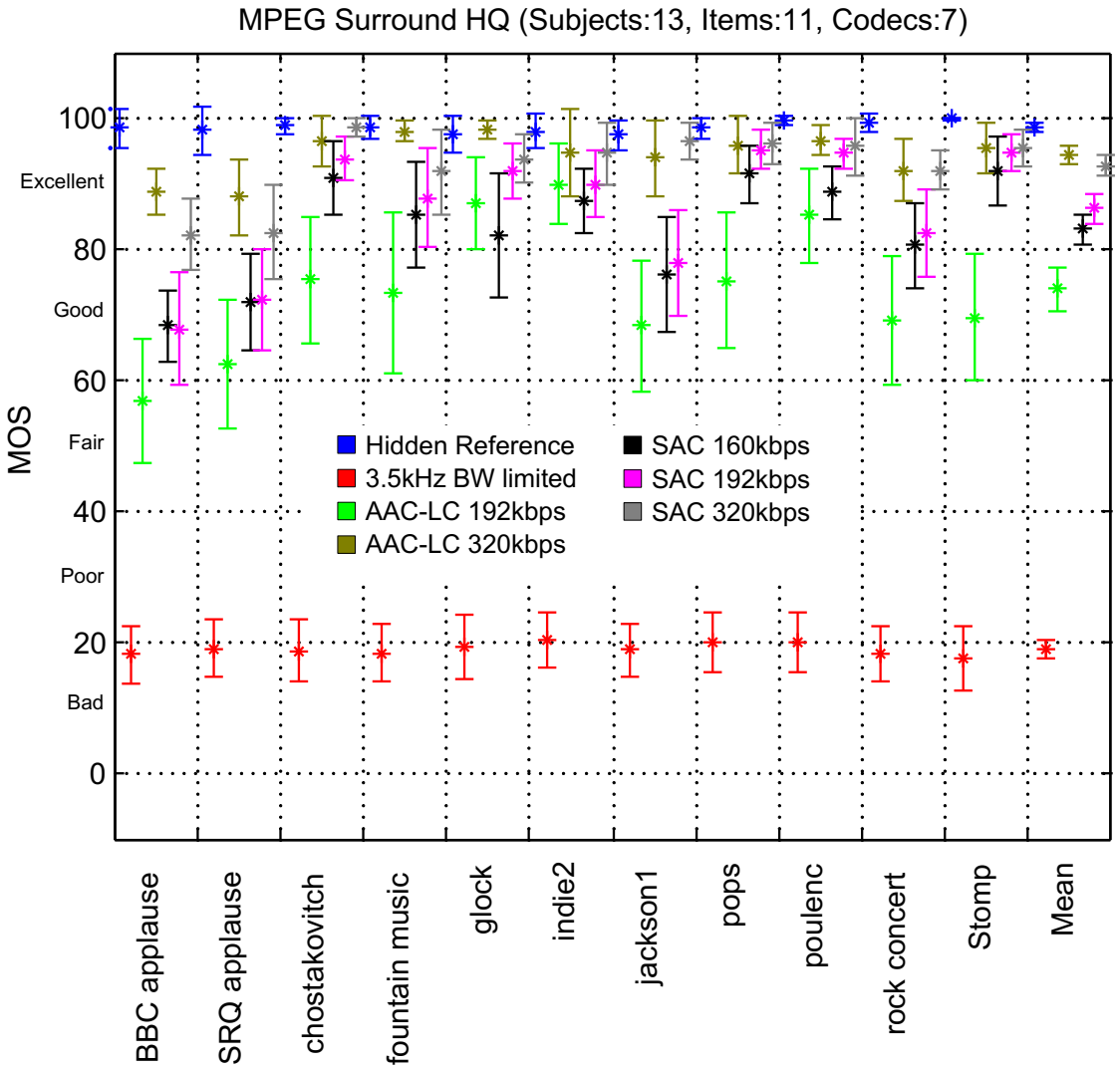


**Figure 2 – Subjective test results for MPEG Surround in high quality configurations.**

M12368 *Additional subjective test results on R/D scalability of Spatial Audio Coding RM0*

Contents: The input document presents additional data on the MPEG Surround system operated at lower bitrates than previously tested.

Conclusions:

- Demonstrates R/D Scalability down to below 2kbit/s
- Still meaningful results w.r.t. subjective sound quality (better than matrixed surround)

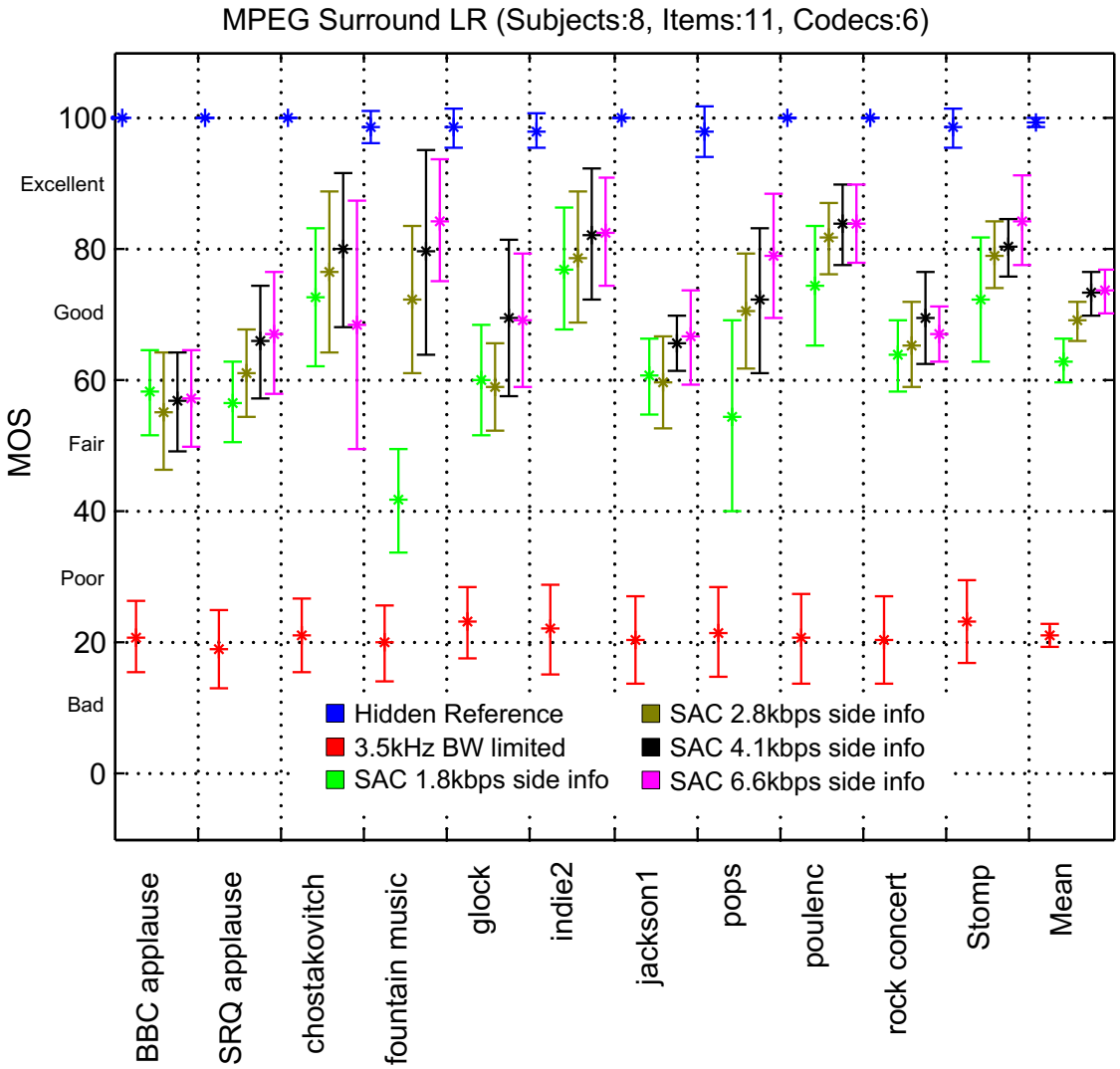


**Figure 3 – Subjective test results for MPEG Surround in low spatial bit-rate configurations.**

M12566 *Verification of MPEG Surround artistic stereo down-mix*

Contents: The input document presents verification data on the MPEG Surround ability to handle external or artistic downmixes.

Conclusions:

The subjective test results show that the artistic stereo down-mix capability of RM0 spatial audio coding, offers a performance that is statistically significantly better than the non-precautionary artistic stereo down-mix mode.

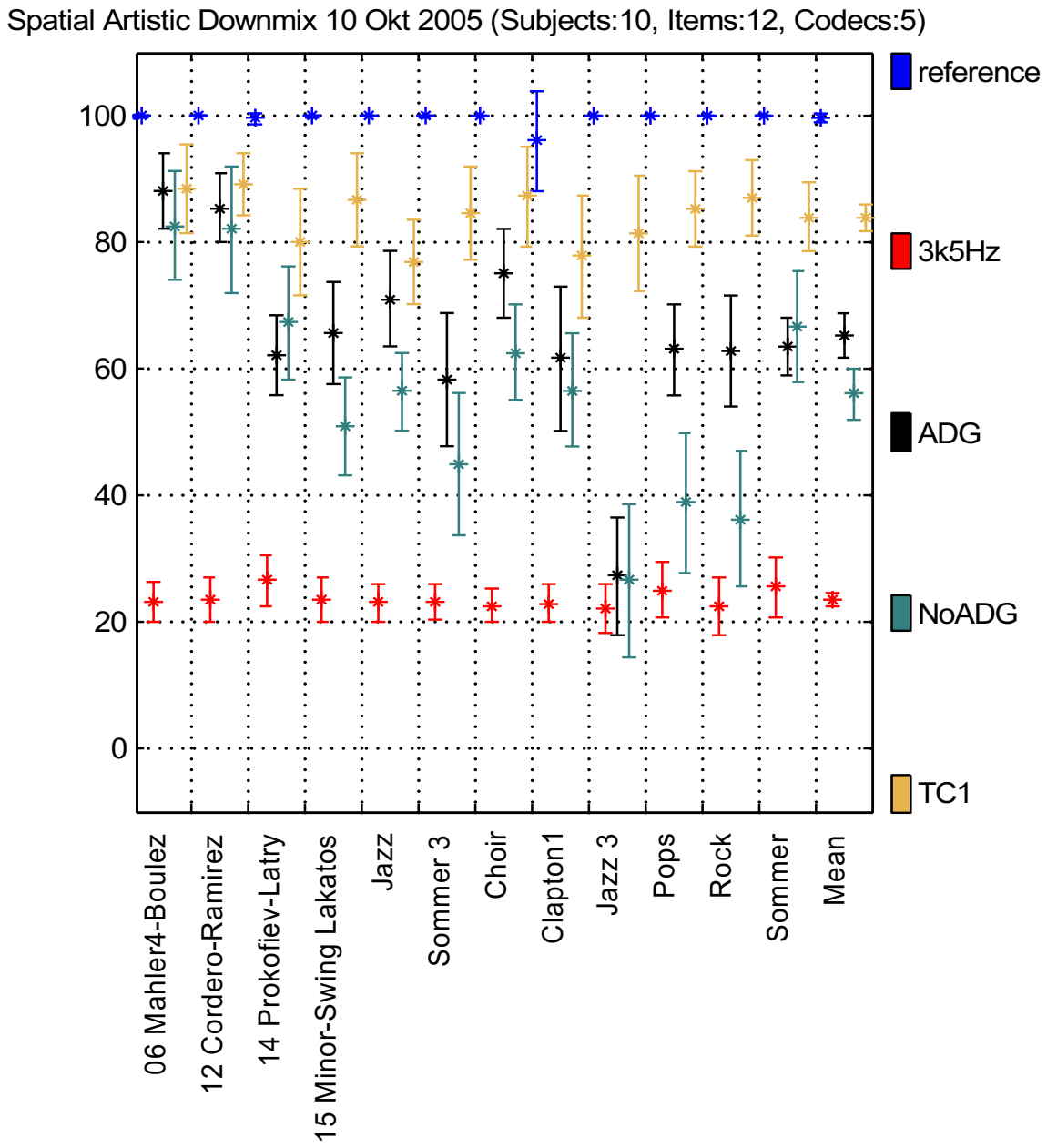


**Figure 4 - Artistic downmix overall results**

**Input documents in MPEG Surround to the 74th MPEG meeting:**

M12580 *MPEG Surround: Evidence of the Matrix Compatibility configuration*

Contents: The input document presents verification data on the MPEG Surround ability to interface to legacy surround decoders.

Conclusions:

The matrix compatible processing can be inverted in the MPEG Surround decoder without any statistically significant degradation in subjective quality. A down mix generated using matrix compatibility ($5252_{dm}$) provides for a statistical significantly higher subjective quality than a down mix generated without using matrix compatibility ($5251_{dm}$), in combination with Dolby Prologic II decoding. The merit of the matrix compatible configuration is most prominent for materials containing discrete sound sources (e.g. 'approaching tunnel 6', 'party talk 6ch' and '6 Channel ID' as an extreme example). For materials, which are more diffuse, the effect is still present though less pronounced.

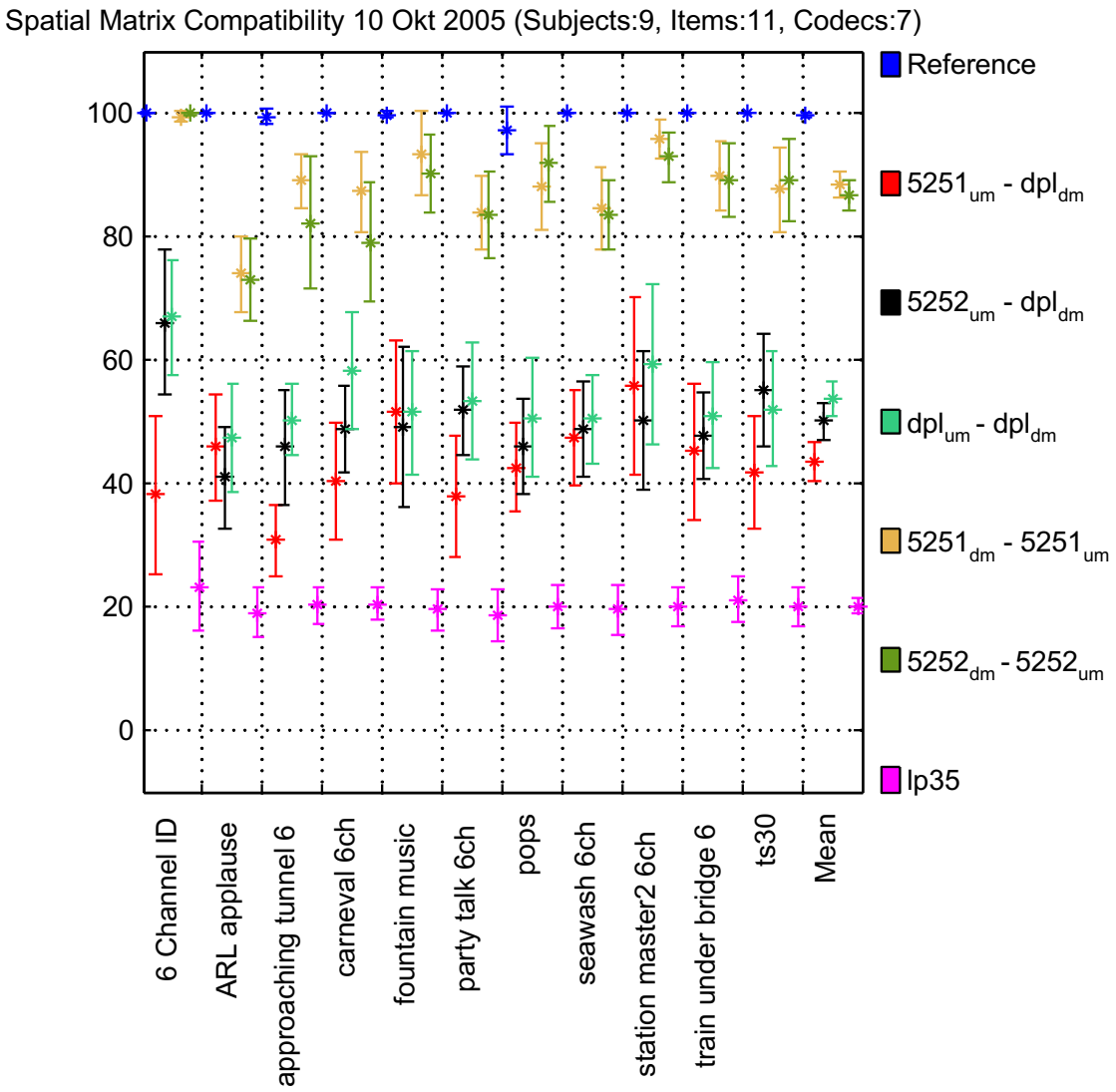


**Figure 5 - Results for the Matrix compatibility configuration test. 5251 and 5252 refer to MPEG Surround en/decoding with matrix compatibility disabled and enabled respectively. The subscripts um and dm denote upmix and downmix respectively.**

| | |
|---|---|
| M12227 | *Core experiment on non-guided spatial audio coding (73rd input)* |
| M12547 | *Report on Non-Guided MPEG Surround Verification Test* |
| M12582 | *Verification of the Non-Guided MPEG Surround CE* |
| M12608 | *Cross-check of the Core Experiment on non-guided MPEG Surround* |
| M12622 | *FhG listening test results for CE on non-guided mode of MPEG Surround* |
| Contents: | The input document present intial test and verification data on the MPEG Surround ability to generate a spatial upmix in the case no spatial side information is available, a so called non-guided spatial audio coding mode that enables the interface to legacy surround decoders. |
| Conclusions: | |

The non-guided mode on RM0 spatial audio coding, offers a performance that is statistically significantly better than state-of-the art matrixing technologies

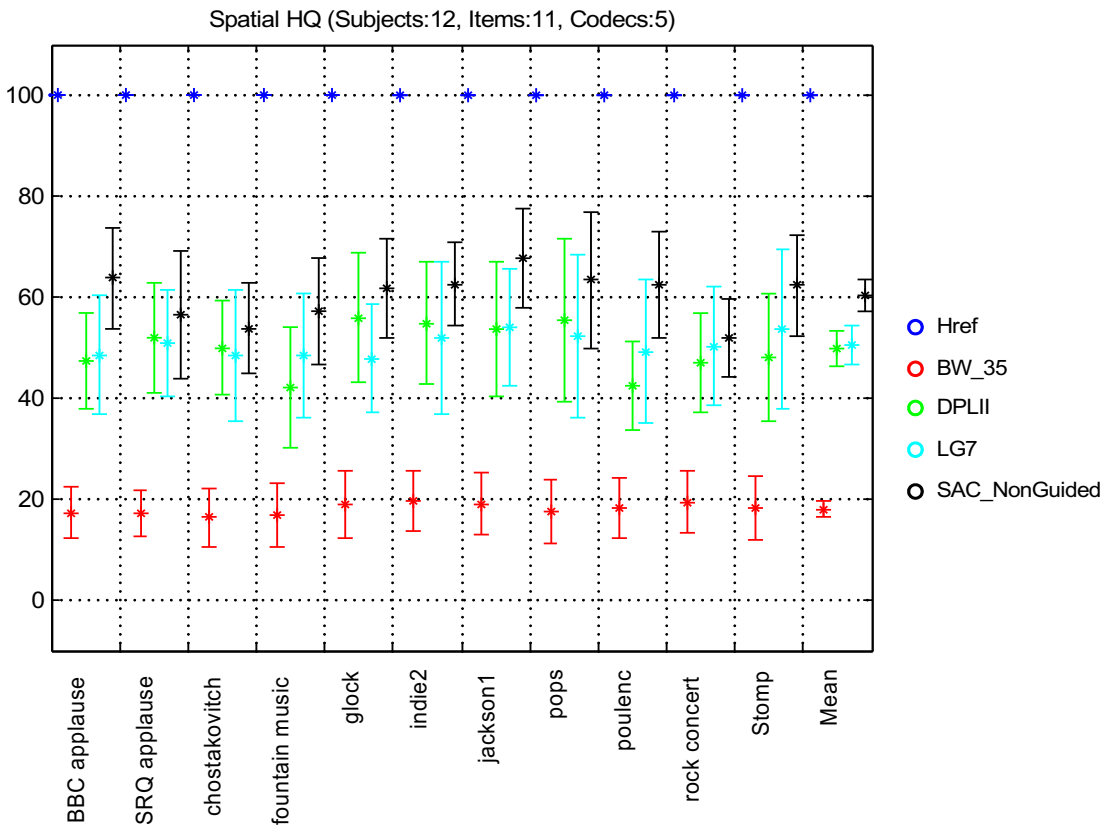


**Figure 6 – MPEG Surround non-guided configuration subjective test results.**

M12626 *Evidence for the Low Complexity Mode of MPEG Surround*

Contents: The input document presents verification data on the MPEG Surround low complexity decoding mode (decType 0) with respect to normal decoding (decType 1)

Conclusions:

For both the overall results as well as for all individual items in all test cases, the 95% confidence intervals overlap between the decType 0 and decType 1 decoding modes. For the 2 critical items, applse and ARL_applause, the TP tool tends to produce a slight increase in perceived quality for decType 1.

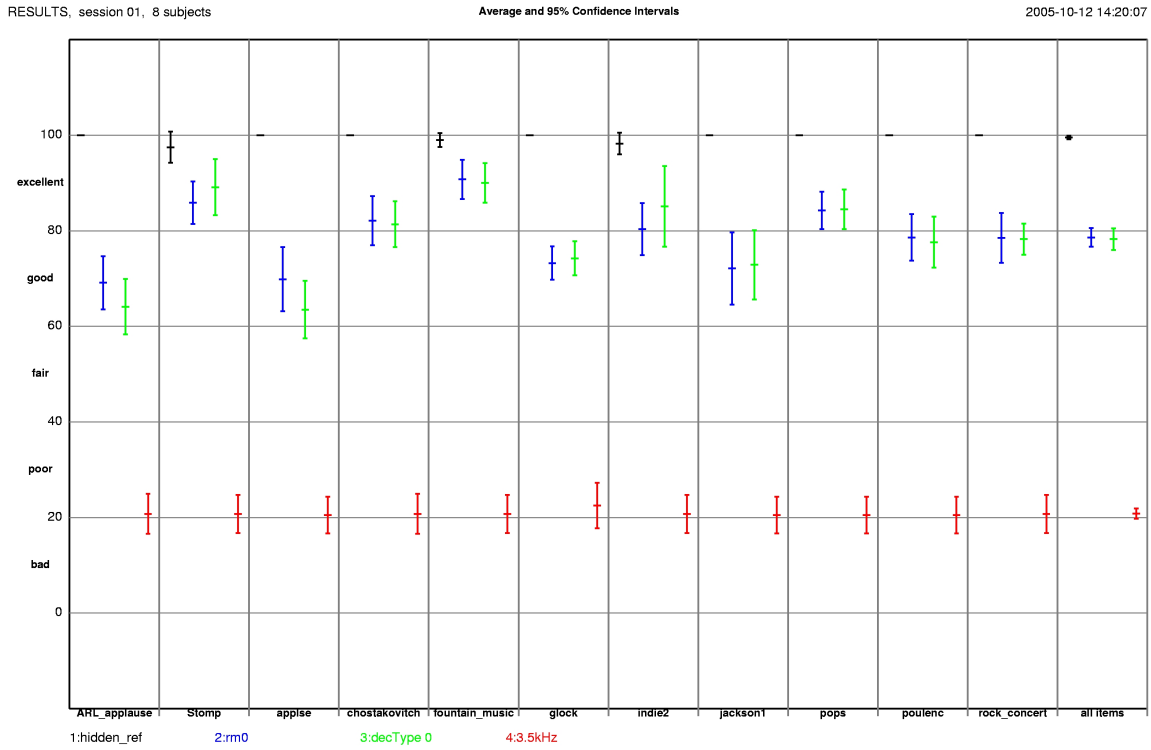


**Figure 7 - decType 0 results for testcase 1a**

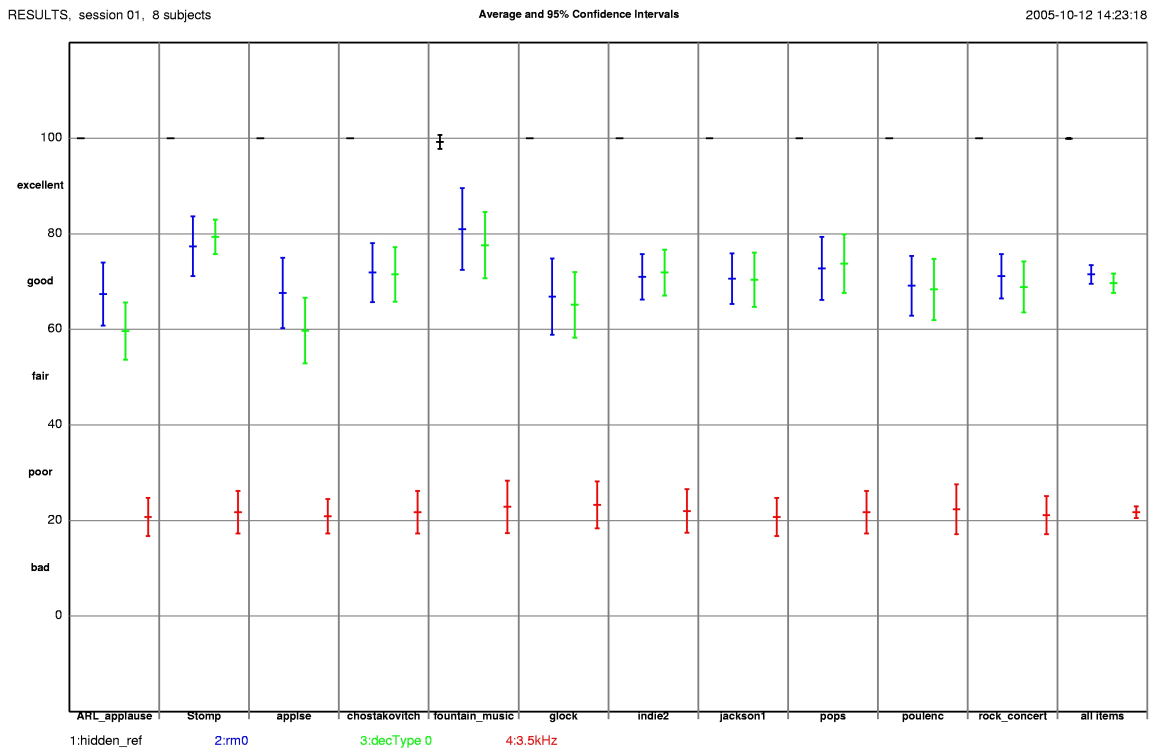


**Figure 8 - decType 0 results for testcase 2a**

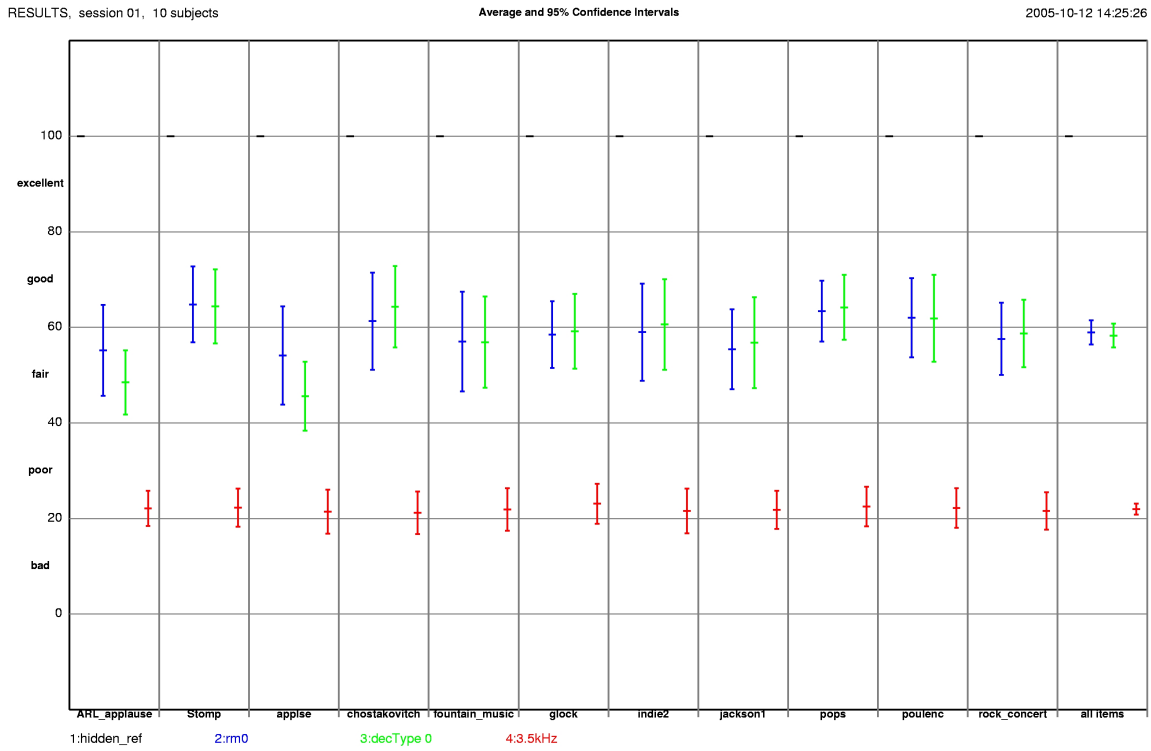


**Figure 9 – decType 0 results for testcase 3**