

Repeatability and/or Resolution in Hardness
MAC Advisory Subcommittee
Summary of Results

The subcommittee was formed to address the action item arising from the 2008 A2LA Conclave. Specifically, *ACTION ITEM 2 – Create a task group to review the consensus for inclusion of both repeatability and resolution for hardness in laboratory uncertainty budgets to determine whether both are needed or whether the laboratory would be allowed to include one or the other. Volunteers for the sub-committee are: Ray Gil, Ted Doiron, Jim Salsbury with Vincent Pugh as the staff contact. Report of findings/proposal due January 1, 2009.* The current A2LA consensus document on resolution and repeatability is Reference 1 by Moody and Ellis given below.

The subcommittee discussed the need for resolution and repeatability within measurement uncertainty hardness budgets as related to hardness calibrations. All technical members of the committee stated that there are cases where only repeatability or resolution would be needed, not both. No consensus was achieved in the subcommittee for when repeatability, resolution, or both should be included in budgets.

Additional documents that implied that both are required or that only one was required in uncertainty calculations were reviewed. In the interest of consistency, a brief search for how other accrediting bodies handle this issue was conducted. The references that implied a position supporting the need for both to be included and references that imply that only one needs to be included are given separately in the references section.

References:

References implying both resolution and repeatability are required.

- (1) "*What should be Included In An Uncertainty Calculation For Hardness*", (by Harry Moody & Robert A. Ellis) presented at the 2008 A2LA conclave in April, and references therein.
- (2) GUM:1995, Appendix H.6 named "Measurements on a Reference Scale: hardness"
- (3) ASTM E10-07a, "*Standard Test Method for Brinell Hardness of Metallic Materials*", Appendix X2.
- (4) ASTM E18-07, "*Standard Test Methods for Rockwell Hardness of Metallic Materials*", Appendix X2.
- (5) "*Guide for Evaluation of Uncertainty in Calibration*", (by the International Accreditation Service), September 22, 2008.

References implying only one needs to be taken into account:

- (1) EA-10/16 "*EA Guidelines on the Estimation of Uncertainty in Hardness Measurements*", May 2002, Section 4.2.4.2 and other sections,