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REVIEWER'S REPORT

Manuscript No.: IJAR-56004

Title: PRACTICAL APPROACH TO CALCULATING PROBABILITY OF FALSE ACCEPT FOR DECISION RULES IN CONFORMITY ASSESSMENT

Recommendation:
Accept as it is .....
Accept after minor revision.....
Accept after major revision .....
Do not accept (*Reasons below*) .....

Rating	Excel.	Good	Fair	Poor
Originality	....			
Techn. Quality	....			
Clarity	....			
Significance	....			

Reviewer Name: Dr. Ishrat Fatima

Detailed Reviewer's Report

The paper addresses an important and practically relevant issue in metrology and conformity assessment: the calculation and application of the Probability of False Accept (PFA) when decision rules are applied under ISO/IEC 17025. The topic is timely and significant, especially as laboratories are increasingly required to justify decision rules and explicitly communicate risk to customers. The authors clearly position the study within the framework of internationally recognized standards such as ISO/IEC 17025, ILAC-G8, and BIPM GUM, which strengthens the paper's relevance and credibility.

In the introductory section, the authors provide a clear conceptual explanation of decision rules and risk, distinguishing between false accept and false reject. The emphasis on false accept as the more critical risk from a safety, financial, and reputational perspective is well justified and supported by authoritative references, including NASA's metrology documentation. The discussion successfully establishes why merely stating tolerance limits is insufficient without defining acceptable risk levels, thereby setting a strong rationale for the study. The terminology section is particularly strong. By comparing different conformity-assessment guidance documents (ILAC, OIML, UKAS, Eurachem, ASME, etc.), the paper highlights a common problem in applied metrology conceptual consistency masked by terminological variation. Table 1 is effective in harmonizing these terms and helps reduce ambiguity for practitioners. This section adds pedagogical value and enhances the paper's usability as a reference document.

The explanation of the four conformity assessment scenarios using measurement uncertainty is logically structured and well illustrated. The use of Figure 1 to explain the four cases (clear pass, clear fail, and two indeterminate regions) aligns well with existing guidance and provides a strong conceptual bridge to the need for probabilistic evaluation. The transition from qualitative reasoning to quantitative PFA calculation is smooth and accessible, even for readers with limited statistical background. The statistical foundation of the paper is presented with clarity. The discussion of normal distribution, z-distribution, and t-distribution is accurate and appropriately contextualized for calibration practice. The justification for using z-scores (coverage factors) in typical metrology scenarios, despite small sample sizes, is consistent with EURAMET and DKD guidance. The explanation of coverage factors and confidence intervals is concise yet sufficiently rigorous, reinforcing the methodological soundness of the paper.

One of the strongest contributions of the paper lies in its treatment of guard bands. The authors clearly explain the relationship between guard band size, coverage factor, and maximum PFA, effectively linking abstract risk concepts to concrete numerical values. Table 2 is particularly valuable, as it provides practitioners with directly applicable coefficients for different PFA targets. The comparison between UKAS LAB 48 and ILAC-G8

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formulations is handled carefully and avoids conceptual confusion, which is a common weakness in similar papers. The Materials and Methods section is practical and well chosen. Using a thermometer calibration example makes the discussion tangible and directly relevant to routine laboratory work. The step-by-step derivation of acceptance limits from tolerance limits using guard bands is clearly explained, and Tables 3 and 4 effectively demonstrate how theoretical principles are implemented in real calibration scenarios. This section successfully bridges theory and practice.

The conformity assessment results are logically interpreted. The binary pass-fail decision rule is applied consistently, and the outcomes at each calibration point are clearly justified. The paper correctly emphasizes that conformity decisions depend not only on tolerance but also on the selected PFA target, a point that is often misunderstood in laboratory practice. The explanation that equality at acceptance limits corresponds exactly to the maximum PFA is both accurate and pedagogically useful. The inclusion of conformance probability (PC) calculations adds depth to the analysis.

Overall, the paper is technically sound, well structured, and highly practical. Its main strengths are clarity, strong alignment with international standards, and direct applicability to laboratory practice. Minor limitations include limited discussion of global risk and assumptions of normality, which could be addressed in future work. Nevertheless, the article makes a valuable contribution as both a technical reference and a training aid for laboratories implementing risk-based decision rules in conformity assessment.