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For more than 30 years, Eckert & Ziegler Analytics (EZA) has provided proficiency test (PT) samples on a quarterly basis through its Hot Cross-Check Program (designed for nuclear power plant effluents) and its Environmental Cross-Check Program. In 2017, EZA introduced a web based data reporting system for use by our customers in submitting results. The system generates a signed report immediately after submission. This application note outlines established PT evaluation criteria used in the reports as well as other options already built into the system.

Our Hot Cross-Check Program (HCC) uses evaluation(pass/fail) criteria established by the US Nuclear Regulatory Agency as referenced in the US NRC Inspection Procedure 84750. Our Environmental Cross-Check Program (ECC) provides participants with a comparison report, showing the ratio of EZA's result with the submitted result with no pass/fail indication. In both cases, the submitted result is compared to the EZA result which is traceable to national standards: The National Institute of Standards and Technology (USA) and/or the National Physical Laboratory (UK).

EZA participates in a Measurement Assurance Program with the National Institute of Standards and Technology conforming to the US NRC Regulatory Guide 4.15. Traceability of the sample is maintained by either; (1) gravimetric preparation from traceable solutions, or (2) direct counting on EZA's calibrated instrumentation.

Other PT type programs may compare participant's results to the average of all participants. Our program does not use this criterion, although results from other participants, without identification, are shown, if available, through the simple statistical analysis tools found in our web-based interface for participant's use.

Because our program is based on traceability to a national metrology institute, we have the flexibility to offer sample types based on your requirements, even if you are the first and only participant for that type. In some cases, we may market these new samples types, but this is not a given or necessary to be fully within our [ISO/IEC 17043:2010 Proficiency Test Provider accredited program](#).

For New Customers: We currently have two pass fail statistical approaches built into our web based system plus the comparison report option (no pass fail issued). A manual report would be issued for any other statistical handling of your results that you request, for the time being, until demand and time allows us to integrate that approach into our web-based system.

1) The HCC pass/fail style reporting using the US NRC referenced criteria is described as follows:

A ratio is calculated by dividing the participants result by the corresponding EZA assigned value. Sample resolution is calculated by taking the reciprocal of the EZA one sigma uncertainty. In most cases, we state our nominal one sigma uncertainty as 5% which translated to a resolution of 20 for use in the NRC table below. Reading from the table, we find that the passing ratio ranges from 0.75 to 1.33. If the calculated ratio falls in this range, the participant's result passes.

Resolution	Ratio
< 4	0.4 – 2.5
4 – 7	0.5 – 2.0
8 – 15	0.6 – 1.66
16 – 50	0.75 – 1.33
51 – 200	0.80 – 1.25
> 200	0.85 – 1.18

In the case of a new sample type, the EZA Nuclear Metrologist will determine the nominal uncertainty and resolution.

- 2) A second evaluation criterion is available for any sample type. While the NRC style evaluation criterion only considers a reasonable spread of data based on EZA’s nominal measurement uncertainty, this second approach takes the square root of the sum of the squares of both the EZA standard uncertainty and the participant’s standard uncertainty. As the participant’s uncertainty goes up, the allowed deviation from the EZA result goes up according the following formula/criterion referenced in ANSI Standard N42.22-1995:

$$|V_A - V_N| \leq 3\sqrt{\mu_A^2 + \mu_N^2}$$

Where V_A = EZA value

μ_A is the standard uncertainty of V_A

V_N = Participant value, and

μ_N is the standard uncertainty of V_N

The number 3 in the formula corresponds to the coverage factor. A passing report will be issued when the difference between the participant’s value and EZA’s value is less than the total propagated uncertainty with this coverage factor of 3 (99.7% confidence level) according to the above formula.

For compliance with the US DOE/DOD QSM 5.3, the user will enter the method used into our web interface and a pass-fail grade will be issued for each matrix, method and analyte submitted. The default criteria is a ratio of 0.75-1.33 as developed from the NRC approach above.

If you have any questions, please contact us at isotrakusa@ezag.com. www.ezag.com

Thank you,

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