

QUALITY ASSURANCE AND QUALITY CONTROL OF NUCLEAR ANALYTICAL LABORATORIES IN ANKARA NUCLEAR RESEARCH AND TRAINING CENTER

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ABSTRACT

The objective of this project is to introduce quality assurance systems for validated analytical data in nuclear laboratories of Center. In trade, health, safety and environmental protection, the users of a laboratory's analytical results are increasingly requiring demonstrable proof of the reliability and credibility of the results using internationally accepted standards. Such demands are being imposed by the European Community. In addition to this, there is growing need for laboratories to operate efficiently and effectively to reduce internal waste to provide reliable and verifiable reports in a timely and economical manner.

International Atomic Energy Agency assist laboratories to improve their QA activities to a level of performance which satisfies the requirements of the immediate beneficiaries and ultimately to a level of certification. A comprehensive QA/QC programme is applied to NALs - ANAEM which the QA system is self-sustainable for official accreditation.

INTRODUCTION

A regional technical cooperation project (RER) entitled "QA / QC of nuclear analytical techniques" has been established by the IAEA for the countries of Central and Eastern Europe (CEE) and the Newly Independent States (NISs).

In trade, health and environmental protection, users of a laboratory's analytical results are increasingly requiring demonstrable proof of the reliability and credibility of the results using internationally accepted standards, since the economic, ecological, medical and legal decisions based on laboratory results need to be accepted nationally and internationally. Such demands are being imposed, for example, by the European Community and others on products for import, and can be a barrier to trade, especially for developing nations.

The Agency assist nuclear analytical laboratories to improve their quality assurance activities to a level of performance which satisfies the requirements of the immediate beneficiaries and clients and ultimately to a level of certification.

The requirements for each these steps are in accordance with the ISO 17025 for laboratory accreditation. Throughout the project, there is an active and continuous interaction between the Agency and the participating laboratories.[1-3]

A comprehensive Quality Assurance / Quality Control programme is applied to Nuclear Analytical Laboratories (NALs) in Nuclear Physics and Nuclear Chemistry Departments of Ankara Nuclear Research and Training Center (ANTRC) which the QA system is self-sustainable for official accreditation from TURKAK.

Basic rules for the quantification of criteria

Some of the characteristic quality assurance aspects, in the quality system of the nuclear analytical techniques (NATs) are: [2-3]

- Full documentation of all parts of the NAT procedures
- Database of previously analyzed materials and results
- Quantified criteria for decisions
- Requirement of training and qualifications for the various parts of the NATs procedure
- Full trackability of all operations
- Independent quadruple control of the analysis results.
- Internal audits
- Non-conformance evaluation
- Customer satisfaction evaluation

The facilities (α / β , γ and x-rays) are used in Center for scientific research programs in order to support governmental bodies, technological institutions, and to give a service to industry, private companies, etc.

It is always the laboratory's responsibility to use methods by trained staff which are appropriate for the required application.

In addition to management requirements of ISO 17025, many factors determine the correctness and reliability of the measurements performed by a laboratory. These factors include contributions from

- environmental conditions
- method validation
- equipment
- measurement traceability
- sampling
- handling of test, etc.

The laboratory staff regularly monitor, control and record environmental conditions as required in quality system for example control chart of temperature and humidity in XRF laboratory are given in Figs 1 and 2.

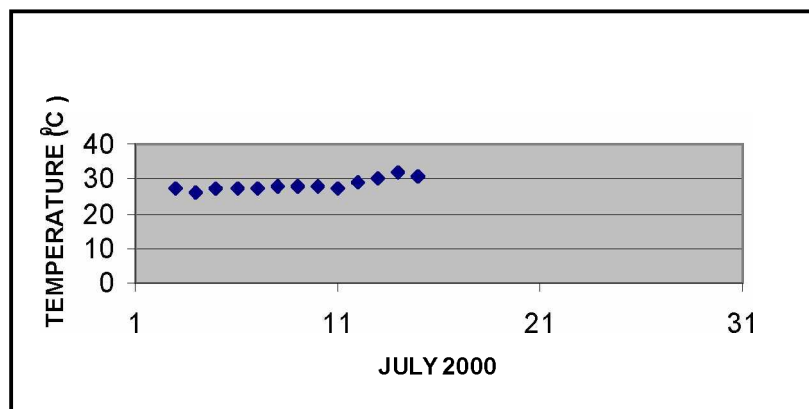


Figure 1. Control chart of temperature

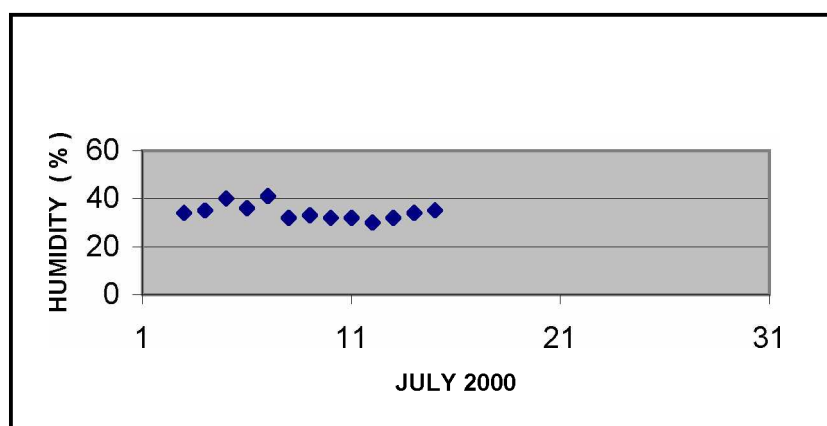


Figure 2. Control chart of humidity

The NALs validate laboratory designed, developed methods or standard methods used their intended scope. The method validation is necessary to meet the needs in the given application or field of application by using the uncertainty of the results, detection limit, repeatability etc. It is seen in Table 1 the uncertainty budget for XRF lab.

Uncertainty source	Origin	Contributions
Repeatability of XRF Spec.	$u_1 = \%1.46$	
Peak area	Statistical (u_2), $\%1.98$ Peak analysis (u_3), $\%0.10$	All sample peaks deconvolution by AXIL software programme
Sample properties	Nonhomogeneity (u_4), $\%1.68$ Mass (u_5); $\%0.10$	
Source (Cd-109, Fe-55, ...)	Intensity (u_6), $\%2.00$	Standard source

Table 1. Uncertainty budget for XRF lab.

Repeatability chart is also given in Fig. 3. for the evaluation of XRF methods

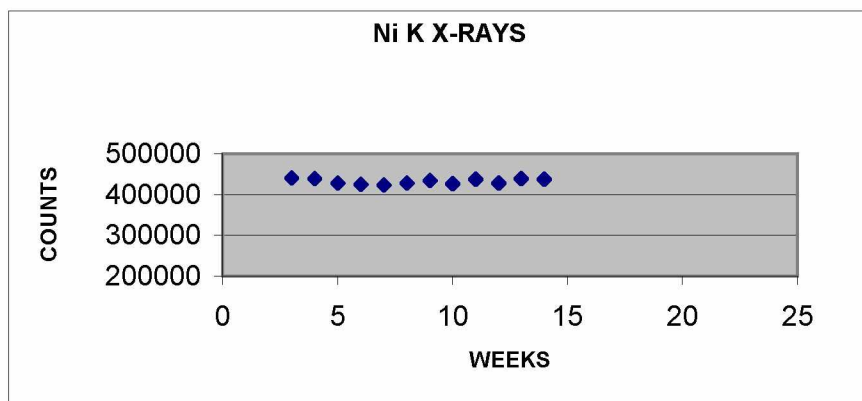


Fig.3 Performance check for XRF method

RESULTS AND DISCUSSIONS

Sufficient results were obtained from a collaborative study under the IAEA's initiative and coordination between the member countries of project.

Most of the characteristic quality assurance aspects in the quality system of the nuclear analytical laboratories of Center for applied methods were discussed in details. All quality indicators related to NALs performance and activity were quantified, registered and reported by [4-5]

As a results, nuclear analytical laboratories in Center will benefit from having the opportunity to improve their credibility and demonstrate their reliability using ISO 17025 general requirements for the competence of testing and calibration laboratories. This will have an economic impact on trade health safety and environmental protection.

REFERENCES

1. ISO 17025- General requirements for the competence of testing and calibration laboratories.
2. Lecture notes Training workshop of IAEA on QA/QC of nuclear analytical techniques 12-16 July 1999 Vienna-Austria
3. Lecture notes Advanced Training workshop of IAEA on QA/QC of nuclear analytical techniques 29 May-2 June 2000 Riga Latvia
4. Progress report of NALs-1
5. Progress report of NALs-2