EXECUTIVE SUMMARY

The NFFA-Research Infrastructure, being an open access distributed facility addressed to a wide basis of customers (the users) and aiming to create a common metrology and protocols platform, will deal with the "quality" and "standard" concepts.

The issue of "**quality**" management system (QMS) is mainly treated by the well known ISO 9000 family, essentially based on the concepts of continual improvement of the system and of assurance of conformity to customer and applicable statutory and regulatory requirements. The key rules are:

- to apply the operating PDCA principle that is to **P**lan (establish objectives) – to **D**o (implement them) – to **C**heck (measure results) – to **A**ct(correct and improve),
- the managing structure must be clear,
- the organization should invite its clients to audit.

In this framework, the users policy plays a fundamental role, and quality rules will need to be implemented mainly for the following three objectives:

- a more flexible access with respect to existing infrastructures, including a strategic access to the analytical LSFs,
- actions to foster access of new users communities,
- implementation of a more effective data management.

Among these, the main quality aspects concerning the newest concept of data management are:

- the data format and the metadata composition,
- IPR issues,
- the effects on users and meta-users (users only accessing the Data Repository).

If the Data consist of all the information that the user requested access for, the Metadata is instead the set of "additional" information making the data more widely "useful", beyond the user and beyond the time window of the facility operations. In order to achieve the best compromise between a completely free Metadata composition, associated with a semantic search criterion (which is more flexible but less inclined to smart application forms and analysis), and a set of keywords (very effective for widespread software applications but more affected by versioning problems), an hybrid system will be adopted.

IPR issues will be mainly based on a user request strategy associated with an *ex-post* evaluation, in order to avoid stringent fixed rules which may act as a bottleneck. Every time a specific deadline for Non Disclosure Agreement will be approached a possible extension request will be evaluated.

Whenever an access request to download data or protocols from the NFFA data repository will take place, the external user will be asked to accept copy right conditions.

Beyond the adoption of national safety issues by each NFFA center, a knowledge-based solution on risk management in a research environment is well suited for framing the NFFA safety purposes. As an example, the Delft University of Technology developed a management tool consisting of an on-line safety report system enabling researchers to make their own safety assessment for the experimental set-ups under their control. The overall concept of the method is to delegate safety issues to the researcher that has the deepest knowledge on the research process.

As a first institutional step toward regulation and safe research and development activities, the NFFA-DS adopts the contents of the EC Code of Conduct for responsible nanosciences and nanotechnologies research.[1]

A "**standard**" provides rules and/or characteristics for activities or for ensuing results aiming at common and repeated use. At present, mainly the technical committee ISO TC229 is steering the activity on nanotechnology standards. As the nanoscience competence core is mainly shared among scientific institutions which have not an adequate involvement/interest in the normative activity as manufactures and entrepreneurs typically have, any effort towards establishing more common practices and round robin activities that aim at comparing processes and results at the atomic scale among scientific research groups, will push forward the implementation of more effective standardization assets.

New phenomena have emerged at LSFs by exploiting extreme conditions of sources and sample environment and advanced programmes (e.g. in materials science, which are tributary of systematic work, where advanced and well established probes are applied on materials grown in systematically modified

[1] See http://www.nffa.eu/NewsData.aspx?IdNews=12&ViewType=Actual&IdType=104

conditions, or subject to thermal, pressure, field treatments, and possibly with in-situ and in-operando conditions) are strongly dependent on the availability of advanced and reliable metrology. Measurements must be compared with each other and this requires that absolute values of key parameters are known, within well established and routinely verified error bars.

Also the sample preparation, characterization and the parameters of the sample environment must be certified by an appropriate reliable metrology.

Metrology and data management are the two actions that can upgrade the very valuable arsenal of European Large Scale Radiation Facilities for Fine Analysis.

There is a need at LSFs to overcome waste of time in reproducing time-consuming sample preparations, difficulties in comparing quantitatively complementary techniques available at different sites, and the critical level in performing in-situ or in-operando measurements. This need can be overcome by two actions of "common" practice.

First, an internal common standard of protocols which can be facilitated by technical solutions that physically link, in the same or a nearby site, time-consuming sample preparation to analytical beamlines: for instance by implementing sample transfer under UHV controlled conditions or by directly connecting synthesis chambers to the beamlines, where appropriate, or by implementing EM-field manipulators for cells or macromolecular assemblies, with known applied pressure.

Second, an internal common standard of metrology, aiming at exploiting the link between fine analysis and atomic scale manufacturing/characterization at different complementary sites, and where all the physical, chemical and morphological parameters are under full control and quantified with the proper uncertainty. The implementation of a common metrology will require technical as well as organizational solutions like the correct estimate of duty cycles in the equipment time or personnel and data-metadata management meeting specific requests concerning metrology and protocols (e.g. the reference to calibration operations).

For such a purpose, the **NFFA Technical Liaison (TL)** – defined as a kernel structure made of personnel first, but also of rules, procedures and data setting, second - aims at managing the technical competences in the following areas in a self consistent way:

- Users access (including ILO activity and promotion of collaborations),
- Common metrology and protocols,
- Data Repository management,
- Local Desk Service (like short time characterization by microscopy and spectroscopy),
- Characterization of associated LSF methods and development of technical solutions to link nanoscience instrumentation at the NFFA centers with analytical methods at the associated LSFs.

The TL personnel is not involved on a voluntary and extemporaneous participation basis but is a structural part of the employment/agreement. The TL team must develop an interdisciplinary background which will not replace or overlap with high level competences of the scientific heads, responsible of specific areas or facilities. An editorial-like approach will be the connection between the two and a peer review-like method will account for the technical evaluation.

Finally, there can be specific needs of formal certification at some of the NFFA centers (in response to local requirements of nearby institutions) or at the distributed level as well, that have to be dealt with at the proper time. Two examples are provided by (a) the ISO 9001 certification for the QMS, potentially addressed to the ILO, whose activity is connected to private industries which are more sensitive to quality guarantees; and (b) by some other technical certifications such as the ISO/IEC 17025 which is the main standard used by testing and calibration laboratories.

A particular recommendation concerns the effective implementation of this common platform, which is upfront mandatory in order to maximize the success of the NFFA initiative. This means to include:

- a kernel of instruments specifically adapted for common metrology and protocols (possibly new instruments, i.e. the same ones at the different sites, furnished with the proper customization for satisfying the needs for the Data Repository link and for the calibration operations),
- a kernel of personnel for the Technical Liaison objective (people employed or specifically in charge, at least at 60-70 % of their working time),
- virtuous and well defined (internal) standardization, technical development and data management activities linking the two.

On the other side, widespread facilities and personnel shared with the participant institutions are well suited for conducting users and in-house experiments and carrying out a massive part of the NFFA scientific programme.