Overall description and objectives of the ELISA project

This integrating activity opens up a very large network of existing facilities to the entire European user community and is a bottom-up approach targeting a variety of different disciplines. The open access and the resulting exchanges will lead to a better integration of national facilities and avoid duplications and waste of resources. The joint research activities will bring together scientists from different facilities and countries with common objectives in instrumentation and method development; the results will benefit all network members and again contribute to their integration. The networking activities will improve documentation and communication, bringing in particular the opportunities offered by the consortium to the attention of new potential users and of the general public.

The concept of the project stems from some basic facts. First, there is an increasing demand for advanced photon (X-rays, ultraviolet, infrared etc.) sources in a variety of disciplines ranging from physics and chemistry to biomedical research, engineering and new domains such as the preservation of cultural heritage. Second, individual European nations responded to this need by funding the development of a variety of advanced synchrotrons and Free Electron Lasers (FELs). This resulted in the world's most advanced system in the field, but the facilities are geographically located in a subset of the European countries: Germany, France, the UK, Sweden, Italy, the Netherlands, Spain, Switzerland and Denmark. This could create a handicap for scientists from other countries. The European synchrotrons and FELs have a strong tradition in countering this risk by offering open access. However, the concrete implementation of this policy requires adequate resources for the support of the users and of the facilities.

Transnational access based on merit has a very strong impact on the integration of individual facilities in the system by bringing together users and facility scientists from different countries and facilitating the sharing of resources, ideas and results. The Europe-wide integration, however, requires additional actions. The effective exploitation of existing facilities, in particular for transnational users, necessitates the development of advanced instrumentation with a scope that often extends beyond individual facilities. We will conduct a set of Joint Research Activities (JRAs) targeting this issue in three crucial areas: FEL components, detectors and optics. In each area, the proposed JRAs will provide new instruments and techniques available to the consortium and therefore to the entire European user community.

A few quantitative facts can explain the magnitude of the challenges met by the present project. There are now 22 facilities operating or under development in Europe (besides Russia): 14 synchrotron laboratories (ESRF, SOLEIL, SLS, MAX-lab, DAFNE, ANKA, SRS, Diamond, DORIS, PETRA, BESSY, ISA, ALBA, Elettra) and 8 FELs (FLASH, FELBE, FELIX, CLIO, FERMI, SPARX, BESSY-FEL, MAX-IV). This capital constitutes almost 30% of the world resources in this domain; the estimated accumulated investments for construction, commissioning and operation exceed 7 billion Euros.

These efforts notwithstanding, the supply of synchrotron and FEL beamtime is far below the request. The oversubscription is high in most cases, reaching sometimes 1.000%. This results in strict quality control and rigorous merit selection: access is quite difficult and strongly competitive.

In addition to these standard difficulties, transnational users face the obstacle of the incremental cost of conducting experiments far from their home base: the objective of open access based on merit can thus become an illusion. The present project tackles this crucial problem by providing the necessary additional support both for transnational users and for facilities.

It must be stressed that the foreseen funding is a very small fraction of the aforementioned investments in European synchrotrons and FELs, not exceeding 0,15% for the whole project duration. Nevertheless, the impact is very important and strongly leverages the national investments, in line with the Lisbon framework for the construction of the European Research Area.

The first quantitative objective of the present project is to continue the transnational use of the consortium. The results will be easy to monitor, using as parameters the quantitative volume of access and the quality of the research results, i.e. high-impact publications. The milestones/deliverables are set by the planned quantity of access per year.

As far as the monitoring and milestones/deliverables for JRAs are concerned, a complete list is shown in Section 1.3. Overall, the objective for the JRAs is to develop innovative instrumentation and/or techniques within the time span of the present proposal and according to the technical parameters stated below. The milestones/deliverables in Section 1.3 should then be considered as significant (and often useful *per se*) steps towards the final results rather than just as partial results.

Finally, the overall objectives for the networking activities are better communication between the consortium members, new standards, optimized exploitation of novel and future sources, better documentation and better links with the general public. Specific milestones/deliverables are listed below. We note the financial contributions to professional schools and workshops for which the success criteria will be the realization of the events and the quality of teaching, as well as the networking activities on computing capacities and ultrafast experiments, the success being assessed in terms of the establishment of coordinated efforts in these two key areas.

Besides leveraging the national funding in this domain, the overall objective of this proposal is to further enhance the integration of the entire instrumentation infrastructure. The results of past efforts are already remarkable: for example, the network members volunteered in 2006 to reduce their own funding as a measure of solidarity for Soleil and Diamond that needed support for transnational access after their commissioning. Another example is the development of the present project: 33 JRAs were initially conceived and the network was able, through friendly and constructive discussions, to consensually reduce them to the present three.

This situation is an excellent starting point towards the higher levels of European integration targeted by the present proposal. We foresee, for example, the possibility of automatic transfer of beamline requests between facilities based on beamtime availability and a coordinated handling of peer review processes. The European systems of synchrotrons and FELs will thus not only be the largest and most advanced in the world, but also a shining example of Europe-wide collaboration and integration.