

Addendum to the Executive Summary ISIS@MACH ITALIA 2024

This document contains additional notes to the Executive Summary relative to the sections below indicated.

2. Vision

The multidisciplinary IM@IT facility promotes, enables and supports new and innovative multidisciplinary research to address emerging scientific problems and key societal challenges, particularly in the areas of materials, energy storage, environment, ICT, and health. To address complex materials problems, the infrastructure brings together hubs of expertise located at universities and national laboratories. Together they provide a highly transversal portfolio of capabilities not currently covered by a single national laboratory or university

IM@IT is strongly challenge driven, providing researchers with open and free access to expertise and advanced analytical techniques. Researchers are thus enabled to incorporate advanced methodologies into their work—many of which they may not have used before—without incurring significant costs for purchasing or maintaining specialized MRF. By leveraging the advanced instrumentation available at MRF, IM@IT maximizes the utilization of existing resources. It also provides a trained pipeline of researchers who can go on to further exploit the large-scale facilities within Europe. This unique approach allows researchers to focus on their projects while leveraging high-quality tools tailored to their needs.

The IM@IT program provides a unique and valuable solution to the challenges researchers face when accessing specialized equipment for their work. Through its model, users can utilize the instruments they need for their research by paying only for the hours of instrument use, eliminating the need for costly purchases. This approach addresses a key issue in research infrastructures, where expensive equipment often remains underutilized due to the lack of trained personnel or insufficient demand. For instance, sometimes institutions acquired expensive high-end tools, which ultimately are left unused because of lack of personnel, or no one had the expertise to operate them. IM@IT solves this problem by centralizing resources, offering not only access to cutting-edge instruments but also providing the necessary technical support and training.

Access to Advanced Technology

Researchers can utilize state-of-the-art instruments that might otherwise be beyond their financial reach. This ensures a broader and more equitable access to cutting-edge facilities.

Optimized Resource Utilization

Instruments are managed and maintained by dedicated staff, ensuring they remain in optimal condition. This centralized approach prevents underutilization, which often occurs when institutions individually acquire equipment they may use infrequently.

Skill Development

Users gain hands-on experience with advanced technology under the guidance of trained experts. This fosters skill development and allows researchers to better understand the capabilities and limitations of the tools, thereby enhancing the quality of their work.

Collaborative Opportunities

IM@IT creates a collaborative environment where researchers from various disciplines and institutions converge. This stimulates interdisciplinary projects and strengthens research networks.

Cost Efficiency and Sustainability

Instead of duplicating resources across multiple institutions, the shared infrastructure model ensures a sustainable and cost-effective approach. Researchers only pay for the time and services they need, maximizing financial efficiency.

Flexibility for Specialized Needs

The IM@IT infrastructure accommodates researchers who require occasional access to specialized techniques. For example, a scientist needing a specific tool for a one-time project can access it through the program without committing to long-term maintenance or operational costs. By addressing these critical needs, IM@IT not only supports current research but also lays the groundwork for a more innovative and collaborative scientific landscape.

Expanded Benefits to the Research Infrastructure

One of the key strengths of the IM@IT program lies in addressing the accessibility challenges faced by researchers who require advanced instruments sporadically rather than consistently for their projects. This flexibility offers significant advantages to the research community, enabling a more efficient and equitable use of resources.

Key Benefits

Access for Occasional Use:

Many research techniques, especially those requiring specialized instruments, may only be necessary at specific stages of a research project. For example, a researcher might need an advanced imaging technique or analytical method once during a study and not again for several years. IM@IT makes this possible by allowing researchers to access these tools on a pay-per-use basis. This eliminates the need for institutions or individuals to invest in equipment they won't use regularly, ensuring resources are not wasted.

Optimal Utilization of Instruments:

High-end scientific equipment often requires substantial investment and can become underutilized in traditional settings due to limited demand within a single institution. IM@IT's shared infrastructure model ensures these instruments are fully utilized, serving a broader community of researchers across disciplines and institutions.

Eliminating Redundancy in Equipment Purchase

The program avoids the inefficiency of multiple institutions purchasing the same instruments, which may then sit idle due to infrequent use or lack of expertise. Instead, IM@IT consolidates resources, allowing institutions to focus their budgets on other priorities while still providing researchers access to state-of-the-art facilities.

Supporting Diverse Research Needs:

Researchers in fields ranging from materials science to biology can leverage IM@IT's infrastructure to meet the unique requirements of their projects, regardless of how niche or infrequent those needs might be. This accessibility encourages innovation and exploration in areas that might otherwise be constrained by lack of resources.

Encouraging Interdisciplinary Collaboration:

By centralizing access, the program fosters a collaborative environment where researchers from various disciplines share the same tools and expertise, promoting cross-pollination of ideas and methodologies.

Skill Development and Knowledge Sharing:

IM@IT not only provides access but also training and support for users, enabling them to gain experience with techniques and instruments they might otherwise never encounter. This enhances the overall skill set of the research community.

4.1 Transnational access (TA)

IM@IT operates two annual Direct Access (DA) Calls, tailored to the needs of new users (academic & industrial) for services to SRF and for user access to both MRF and to International LSF through a single-point digital access – the digital User - Hub.

The Direct Access (DA) Calls are open from the beginning of January until mid-March and from the beginning of June until end of September. The proposals are peer reviewed by a Medium Range Facility Access Panel (MAP) composed by external independent members selected from academia and industry, which meets twice a year, in April and October. Users may request access for experiment or for training (in presence or virtually) to a single analytical instrument for the analysis of materials at the atomic scale or to a suite of multiple instruments with complementary capabilities. Allocation of experimental and training proposals is based on the scientific merit of the proposals submitted and they are ranked on a scale from 10 (world class) to 1 (unsatisfactory). More information on the MAP process, including the Panel Guidelines, is available in the MAP PACK (see Annex MAP PACK DA 24-2), made available to all MAP members before each DA Call.

Following the MAP peer review, the program manager communicates to the Principal Investigators (PI) the outcome of the evaluation process and the User Office communicates the selection outcomes and the allocated proposals to the Board of Directors. Then the instrument scientists schedule the machine time in coordination with the PI, across the IM@IT Units. The Instrument Scientists together with users schedule the days to perform for experiments/trainings (in presence or remotely). These are usually programmed in two periods during the year: from late April to late September and from late November to the beginning of April. In these periods the “Board of Directors” meets

every two weeks to discuss access strategies and any technical or logistic issue that may emerge during the uses access to MRF.

The DA Call lifetime is completed when all Principal Investigators (PI) have performed all allocated experimental/training proposals, and all “experimental reports” are uploaded on the User-Hub.

7. Core Funding and Sustainability

MUR public funding should remain the ‘bedrock’ upon which IM@IT is built and sustained. Each year the MUR FOE fundings are assigned, through CNR, to the Centre NAST-University of Rome Tor Vergata (IM@IT Coordinator), which manages all allocations of resources to IM@IT Units: for personnel [Instrument Scientists, technical-administration positions, communication officer), travel expenses (MAP, SAC, Roadshows), services [User-Hub, webpage, Transnational Access (TA)].

Resources are allocated to the Units and to ISIS Facility in the framework of agreements signed with: CNR Institutes, University Milano Bicocca, CSGI-University of Florence, Venice International University, and ISIS Facility.

So far, an unvaluable additional source of income for IM@IT comes from the in-kind contribution provided by personnel of universities and research centres who operated the complex and multilevel IM@IT facility. Such personnel in kind contribution can be evaluated as 2 years of a full-time personnel unit (ca. 150.000 €).

Core Funding Allocated to IM@IT Units

Each year IM@IT assigns MUR public funding to Units to support user TA to MRF. A total of 240.000 € were allocated in 2024 (core funding FOE 2023). Each Unit can use these resources accordingly to their operational needs, e.g purchase of new equipment ancillary to MRF, instrumentation maintenance, consumables, staff incentives, travel. In 2024, additional resources to core funding, coming from the HiCHIP project (Daughter Project) were allocated for TA to all Units. In 2025, additional resources to core funding will come from the CHARMANT project (Daughter Project) and will be allocated for TA to all Units. The model for transnational access remains the same.

IM@IT operates according to a model that involves a team of instrument scientists, technicians, and user office members based at the IM@IT Units, functioning in a manner like how instrument scientists operate at large-scale facilities (LSFs).

The staff role is to support user programs, to assist, guide, and, if necessary, conduct experiments together with expert users or, for first-time users, enabling these users to eventually operate the equipment independently. The direct interaction with users is highly beneficial but is outweighed by the challenges of training individuals unfamiliar with the MRF equipment. To this end, during the DA Calls 2022-2024, to address the challenge of conducting experiments with users unfamiliar with the MRF equipment, IM@IT has undertaken two actions: a) CNR-ICCOM, CNR-IPCB, CNR-ICMATE, CSGI-University of Florence, Universities of Rome Tor Vergata, Milano Bicocca Units and Venice International Universities have provided additional personnel in-kind contributions, i.e. a total of four Instrument Scientists have completed experimental/training proposals; b) some core funding (in FOE 2022 and FOE 2023) have been allocated to Units in the form of two temporary instrument scientists (12 months).

It is noteworthy that the request for TA has almost doubled from 2023 to 2024 when 170 proposals were submitted by several new users, most of which first-time users. In 2023, each MFR offered user access for a maximum of 5 days, with a small degree of oversubscription. In 2024, for most MRF there was oversubscription of a factor 2-3 and this value increased to a factor 4-5 for a couple of MRF. This led the IM@IT Governance to the decision of decreasing the TA resource allocation per day to all Units not to discourage potential new users and widen the spam of collaborations: the total number of proposals allocated was 126 (experimental/training) for a total of 338 instrument days.

Core Funding and Sustainability

Research infrastructures of this type require a significant proportion of steady core funding and, although IM@IT has successfully obtained separate funding, cannot operate sustainably only based on short-term funding for specific research projects ('daughter projects'¹)

A key aspect of sustainability is that IM@IT has the ambition to provide expertise, not only in the technical use of equipment but also in how the equipment can be best used to tackle specific research problems. This level of expertise cannot be delivered only by junior staff on short term contracts, so IM@IT must be able to support (and develop) a pool of IM@IT expertise employed on a longer-term basis. From 2028, IM@IT will need

¹ Here, 'daughter projects' are defined as funded projects that obtained funding specifically to access facilities or services provided by IM@IT.

to operate in sustainable way and core funding to TA will include all the cost of the staff at the IM@IT units; this cost is not included in TA for the period 2024-2027 where the personnel provided by the universities and research centres is an in-kind source of income for by IM@IT. From 2028, IM@IT direct staff cost will only include core staffs such as the project coordinator, project manager, user office, IT.

IM@IT was first funded by MUR through the 2022 FOE (0,550 M€), the 2023 FOE (0,600 M€) and the 2024 FOE (1,15 M€). The increasing funding from MUR has enabled the growth of IM@IT, with the success described above, but this now needs to be further increased and then sustained, otherwise the benefits of the investment made so far will be lost (see Table 2). IM@IT will then not be sustainable for the long term and Italy will lose a valuable opportunity to host this unique RI and exploit it for the benefit of its research community and economy.

In the early stages, IM@IT operated with limited staffing capabilities provided locally by the staff of the universities and research centres, approximately half the instrument scientists and technicians needed to function optimally in the support of those external users not self-sufficient. IM@IT did not have enough financial resource to hire staff on 2/3-year contracts.

Starting with FOE 2024 and into 2025, 2026, and 2027, IM@IT will begin enrolling staff directly for those Units which demonstrated increasing capability in expanding the science program and attract users.

In 2027 we will then have a transition to a model where we will change the nature of contribution to the different Units going from TA to employee staff.

Table 2. – Level of core funding required to maintain small & constant grow of IM@IT operation with detailed budget for TA and personnel deriving from FOE and Daughter Projects

Source of funding	2022 (€)	2023 (€)	2024 (€)	2025 (€)	2026 (€)	2027 (€)
FOE MUR	550.000	600.000	1.150.000	1.500.000	1.500.000	1.500.000
Personnel*	30.000	100.000	530.000	650.000	700.000	700.000
TA	100.000	240.000	340.000			
Daughter Projects						
Personnel		150.000	200.000			
TA		150.000	150.000			
FOE MUR -euMATERIA**						1.800.000

*Including Executive Director, Science Director, Program Manager, Instrument Scientists, Technicians, members of User Offices and Administrative staff

** In 2028 there is the potential transition with the ESFRI project – euMATERIA, to be additionally supported by MUR core funding for ten years. In figure 7 going beyond 2028 there would be another similar set of bars, and a similar total.