

SUMMARY 2023

ISIS@MACH ITALIA (IM@IT¹), the Italian Multidisciplinary Research Infrastructure for Complex Materials and Interfaces

Name of Research Infrastructure	ISIS@MACH ITALIA (IM@IT) – the Italian Multidisciplinary Research Infrastructure (RI) for Complex Materials and Interfaces, Hub of ISIS - Facility (UK)
Type of Research infrastructure	The Hybrid RI combines “distributed Small Research Facilities (SRFs)”, single-sited “Medium Range Facilities (MRFs)”, with user @ hub to single-sited Large Scale Facilities (LSFs)”
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Stage of development	Phase 2: Operation Phase– <i>ad interim</i> ²

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¹ IM@IT is the short acronym for ISIS@MACH ITALIA.

² The Executive Summary (ExS) is a ‘living document’ which is updated yearly on regular basis as new ideas come along and others become lower priorities. The present document is the 2023 update of the ExS sent to the Ministry for University and Research (MUR) in December 2021 and 2022.

IM@IT Summary 2023

1. Introduction

IM@IT is a multidisciplinary project linking a wide range of scientific facilities of different scales, bringing together research teams across Italy, Europe, and the world. It was initiated in 2019 with the ISIS@MACH project and the earlier 'seed' of the ISIS collaboration³. Launched in 2020, IM@IT has already attracted well over a hundred users, with participants doubling in the last year. With sustainable funding, IM@IT has the potential to develop a new generation of collaborative researchers from both academia and industry, and to be a game-changer in transforming the research ecosystem in Italy and beyond.

2. Vision

The multidisciplinary IM@IT has catalysed the creation of a multi-site collaboration of twenty-eight Medium Range Facilities - which are more specialised collections of equipment - (see document Annex - MRFs) and one hundred and thirty Small Research Facilities - of which many universities will have some, but not all - (see document Annex - SRFs). Without IM@IT, these would not have been realised.

Through synergistic research activities among MRFs, SRFs, and Large Scale Facilities - highly specialised infrastructures operated nationally or internationally (see at link [LSFs](#)), IM@IT operates a multi-level Transnational Access (TA) program for users from both academia and industry. The TA program enables the multidisciplinary community – from life sciences to engineering – to take full advantage of the very significant investments made by European Countries in LSFs, which are not always fully geared to support national priorities (see document Annex - MRFs Proposals - Direct Access I and II Round 2023).

A key point is the recognition of a natural hierarchy of need/productivity in which users become familiar with different techniques at SRFs/MRFs, before progressing to more complex RIs and becoming LSFs expert users. This hierarchy applies not only to a given research question, but also to training and education of novice users in accessing the more advanced and more expensive methods. Research carried out at the European RIs needs

³ ISIS@MACH, the first Hub of ISIS Facility (UK), was funded in 2019, following an independent scientific and technical review panel, for with 4.83 M € within the programme POR FESR 2014-2020 (with 75% shares by Region Lazio and 25% by Univ Rome Tor Vergata).

to be constantly nourished with new users and new research and innovative ideas. However, for users having little or no experience in the use of the analytical tools required to exploit MRFs and LSFs there is a steep learning curve to develop proficiency in their use. Many researchers, if they do not have prior experience, find that the highly competitive access to LSFs is a high barrier. IM@IT is contributing to reduce this barrier, which benefits the research but also enables Italy to get better value from those LSF that it contributes to financially such as ISIS, the ILL (Institute Laue Langevin), and ESS (Lund).

In this context a particularly unique feature of IM@IT is that it provides users with a research pipeline from SRFs to MRFs and then to LSFs, and greatly enhances the deployment of user's multi-disciplinary research ideas, which will then have better access to the European LSFs and in turn enrich their impact.

3. Mission (how do we get there?)

MRFs (and SRFs) are usually located at universities or research centres, used by few small groups, and not necessarily operating for user TA programs. Most of the SRFs and MRFs are based at universities and at research centres. In most cases instruments are financed by universities and research institutions through projects, and the operation costs are financed either by the same project or by other projects. These loans do not generally include provisions for external users access to unused machine time, which would require funding for external user support and training. Therefore, **two significant opportunities are missed under the current system**: 1) to exploit the initial capital investment to the fullest by maximising high-payoff machine usage and 2) to allow a wider section of the scientific community to make a qualitative leap, moving from SRFs to MRFs and to LSFs.

The creation of IM@IT in 2020 represents a significant step change in that it carried out a coordination action which joined five distinct laboratories (located at three universities and two research centres) into the IM@IT nodes, which started to operate synergically to provide user TA in a coordinated way. IM@IT is a partner in doing research with our users, not just a community doing research.

What is the IM@IT added value compared to what is already financed?

The IM@IT added value consists in selecting research centers with state-of-the-art instrumentation and providing targeted funds to make machine time available for external groups (industrial or other Italian university departments and research centers) that do not

have such instrumentation at their own institutions. This would allow *significant leveraging of public investment in small- and medium-scale instrumentation*: a realistic goal is 80% usage, up from a typical 50% under the current model. Moreover, the research community that uses diagnostic tools – such as optical, X-Ray, and particle probes – will be able to progress and climb the pipeline from SRFs to MRFs and to LSFs more rapidly, thus ensuring *significant leveraging of public investment in national and international facilities*.

IM@IT already operates in “transversal” science areas from Life Science to Engineering, for multidisciplinary research in complex materials & Interfaces, and provides user TA to its suite of national MRFs [and SRFs] and to European LSFs through a single digital User@Hub (see document Annex – User@Hub), while consolidating a network of alliances within the LENS initiative ([League of Advances European Neutron Source](#)).

3.1 The need to finance IM@IT as a single entity

What is the alternative? Individual institutions could be for example funded to provide access, either as part of regular projects or with ad-hoc calls. However, 1) individual institutions do not have experience and tools for user access, whereas IM@IT in four-year-of operation has ‘accumulated significant expertise in promoting industrial access, thus responding to the growing need of the Italian production system, mainly consisting of SMEs. Unlike large corporations, SMEs usually have limited resources and skills to access and exploit the most advanced tools, which are nonetheless essential for understanding, developing, and improving their “productive fabric”. 2) There is a benefit in providing a single access costing model, which can be both transparent and uniform, and a single approach to peer-review. IM@IT panels are of very high calibre (something that would be difficult to achieve at small institutions) and evaluate a broad range of science, including ‘transversal’ science. 3) IM@IT can be used by the funders as a tool to target specific science areas of high societal value, without distorting the general spirit of open peer review.

3.2 IM@IT – a tool for target specific science areas

One innovative aspect is represented by the development of new approaches to access LSFs, including the deployment of targeted funding for specific types of access to LSFs. In this context, IM@IT has developed several Case Studies in specific areas of societal challenges, within the Italian national science priorities, in thematic areas shaped together with IM@IT stakeholders (academic & industrials user) (see document Annex –

Case Studies). New access approaches to LSFs are linked to target-specific Case Studies and envisage the deployment of specific funding for targeted Case Studies (see document Annex – TA for target-specific Case Studies). These have been designed precisely to provide successful exemplars of this journey in the LSFs international landscape. The industrial and academic users who are not LSFs experts are accompanied by IM@IT' pool of expertise (PE) and led to become independent and able to propose their own experiments or, in the case of industry, to buy machine time for 'proprietary research', thus favouring the transition 'from research to business', foreseen by the National Plan for Recovery and Resilience (PNRR, Next Generation EU).

4. 2023 Activities and Strategic Actions

Since 2020, IM@IT has operated continuously to provide TA to academic and industrial users. Currently, we are mainly funded, through in-kind contributions, provided by the three universities and two research institutions constituting the IM@IT Joint Research Unit⁴. In 2023, the Ministry of University and Research (MUR) has granted IM@IT some core funds under the FOE 2022 program.

The IM@IT infrastructure is ramping up its services (through SRFs) and “*peer reviewed TA*” access (MRFs, International MRFs and LSFs) to new users (academic and industrial). The number and range of multidisciplinary users accessing IM@IT is significant and continues to grow.

4.1 Transnational access (TA)

IM@IT operates TA tailored to the needs of new users (academic & Industrial) for service to SRFs, experimental and training access to MRFs and to International LSFs, through a single-point digital access – the digital User@Hub.

In 2023, IM@IT issued two calls for Direct Access to MRFs (see document Annex - MRFs), International MRFs, to international neutron LSFs (including ISIS (UK), ILL (F), the ANSTO Reactor_(Sidney Australia), and the DIAMOND Light Source (UK)]. Calls open yearly in mid-January and mid-June. A total of 93 proposals was submitted to MRFs (and International MRFs) in 2023.

⁴ Joint Research Unit (JRU) ISIS@MACH ITALIA first established and registered at MUR [official registry U. 0008642.28-05-2020 - 16th April 2020].

A first critical issue to highlight here is that, with the present core funding (FOE 2022), IM@IT had the ability to give access to a maximum of twenty-eight MRFs. Without more core funding IM@IT will not be able to operate more MRFs. Starting from next year there would be significant room to expand IM@IT operation if more core funds were allocated to IM@IT: in particular the RI could give access to: ten more MRFs based at the Italian universities [Milano Bicocca (three) and Rome Tor Vergata (four)], three based at the CNR Institutes (CNR Institutes in Bologna [one] and Lecce [two]), to two MRFs of Polytechnic of Milan.

4.2 The digital User@Hub

The digital User@Hub serves to:

- manage our users (and referees panels);
- manage access to SRFs, to MRFs and to LSFs (see diagram 1)
- coordinate and schedule experimental time access routes;
- organise the referees MAP meetings;
- monitor the required safety trainings;

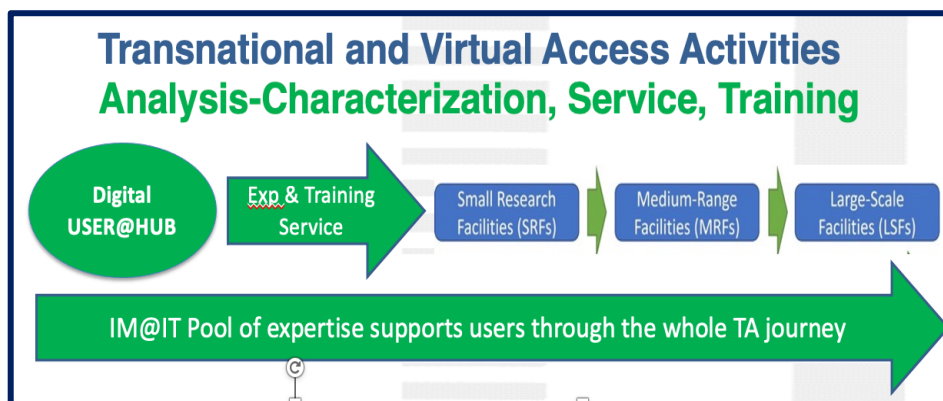
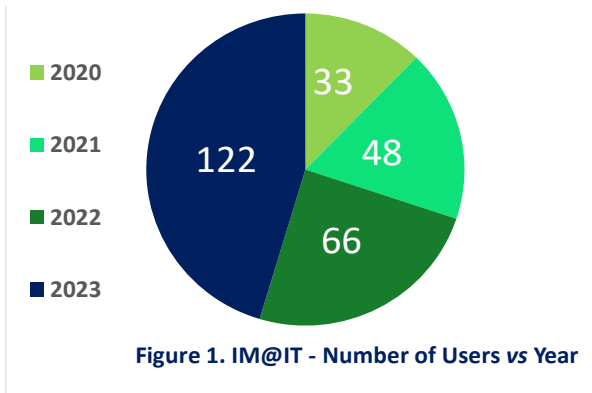


Diagram 1

MRFs are free at the point of use for researchers, provided the results from experiments are published in the public domain. IM@IT operates one MRFs Access Panel (MAP) to peer review all MRFs proposals, including both original science and training. MAP is an external independent peer review panel responsible for the selection and scientific evaluation of the proposals submitted by all potential users. It is composed of 9 to 13 independent experts with a collective scientific knowledge of complex materials and

interphases and atomic-to-micro analysis, covering the science areas supported by the IM@IT Research Infrastructure.



The total submitted experimental and training proposals to IM@IT in 2023 are listed in the document Annex - MRFs Proposals - Direct Access I and II Round 2023.

Figure 1 summarizes the number of IM@IT users registered on the digital User@Hub in the year 2020, 2021, 2022, 2023, a total number of ~270 users (226 from Italy) from nine countries. The number of users attracted in 2023 almost doubles the 2022 figure.

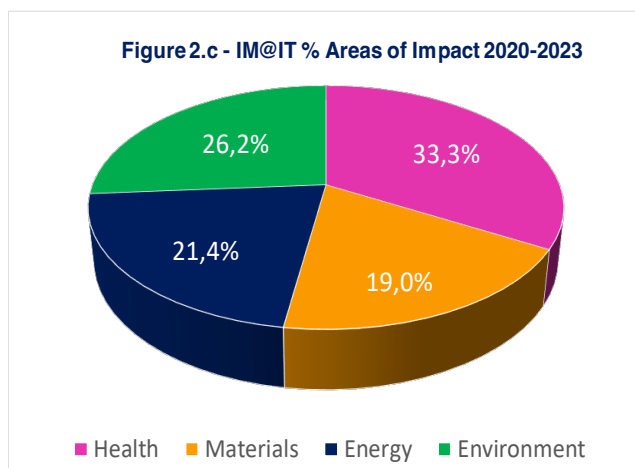
Category	Submitted proposals	Average users per proposal	Proposals reviewed & allocated	Experimental days allocated
8 Rounds TA to IM@IT	627	3	380	over 1100
TA to LSFs (through IM@IT)	220	3	92	over 270

Figure 2.a reports the statistics of the TA in 2020-2023: proposals submitted, proposals reviewed & allocated, total experimental days allocated to SRFs/MRFs and to LSFs); figure 2.b reports the statistics of TA, Direct Access (DA), to MRFs only in 2023.

9 Countries	90 submitted proposals DA 2023	over 20% with industry	21,4% Energy	33,3% Health
			26,2% Environment	19,0% Materials

4.3 Case studies: toward targeted access to tackle societal challenges

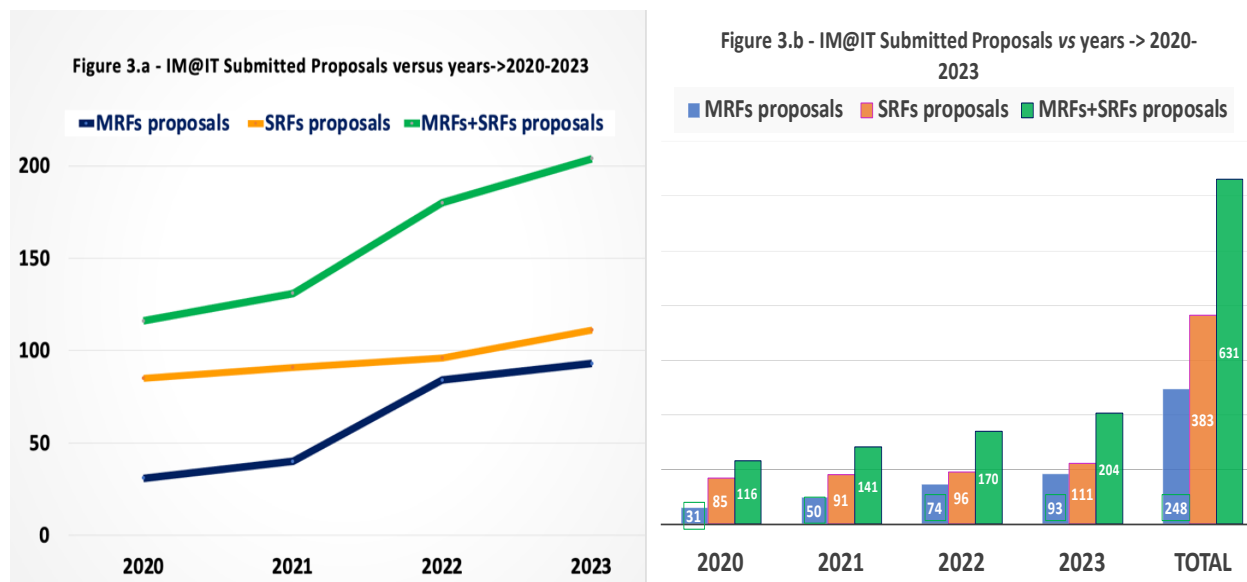
The Areas of impact 2020- 2023 (%) are shown in figure 2.c. Figures 3a and 3b show the yearly trend of the number of proposals submitted to the different facilities between 2020 and 2023.



In addition to 'generic TA', IM@IT offers to its users an innovative approach for TA to MRFs and to LSFs via the IM@IT User@Hub for target-specific Case Studies (see document Annex – TA for target-specific Case Studies), which were tailored for specific areas of societal challenges and thematic areas (see document Annex – Case Studies).

TA Access will be either through a special grant agreement with IM@IT- ISIS (Agreement 2023-2027), or through the normal open access proposal system (Agreement

CNR-SFTC 2021-2027). In the former case priority will be given to proposals within “long term projects” and exploiting the instrumentation available at IM@IT to fully prepare and support the need for neutron and muon beamtimes and the implementation of ISIS. These ‘long term projects’, will prioritise the participation of pools of industry, including SME as details in document Annex – TA for target-specific Case Studies.



Proposal applications of TA for target specific Case Studies will continue to be assessed scientifically and technically within the framework of the IM@IT MAP and ISIS Facility Access Panels (FAPs): users can open access to the national MRFs facilities for which the individual or long term experimental proposals would then be assessed (peer-reviewed): proposals submitted to MRFs are first checked for technical feasibility; those assessed as feasible will be then sent for evaluation of scientific merit by an independent, external ISIS FAP’s which if the response is positive determine the assignment of experimental time and neutron beamtime to the applicant team. Where access to ISIS or other LSFs is needed this could either be through the digital User @ Hub, but with IM@IT staff providing support and the proposal success rate being much improved because of the previous work using other IM@IT instrumentation.

In 2023, several proposals for “TA for target-specific Case Studies” in areas of societal challenges and thematic areas have been allocated. Priority has been given to proposals that have exploited the suite of MRFs available at IM@IT to fully prepare and support the need for ISIS beamlines. Science highlights resulting from TA for target specific Case Studies include (see Table 1 and document Annex - MRFs Proposals - Direct Access I and II Round 2023):

Table 1. TA for target-specific Case Studies

GP Number	MRFs (ISIS beamlines)	Days	Proposal Title	Institution	Case Study / societal challenges
2023044	XRD TOMOGRAPHY (ChipIR and Nile)	4	<i>Characterisation of the degree of damage by neutron induced single-event burnout failure in SiC MOSFET by means of X-Ray tomography</i>	STMicroelectronics	CS 3 / Digital, Industry, Space, Security, chip irradiation
2023045	SEM with correlative AFM (ChipIR and Nile)	2	<i>Characterisation of the degree of damage by neutron induced single-event burnout failure in SiC MOSFET by SEM measurements</i>	STMicroelectronics	CS 3 /Digital, Industry, Space, Security, chip irradiation
2023046	X-Ray diffractometer (ChipIR and Nile)	4	<i>Characterisation of the stress field in SiC MOSFET by means of X-Ray diffraction</i>	STMicroelectronics	CS 3 /Digital, Industry, Space, Security, chip irradiation
2023047	AFM Raman (ChipIR and Nile)	3	<i>Characterisation of the stress field in SiC MOSFET by means of Raman spectroscopy</i>	STMicroelectronics	CS 3 /Digital, Industry, Space, Security, chip irradiation
2022009	SAXS Xenocs Xeuss (TOSCA)	3	<i>SAXS characterisation of artificial skin samples for application in skincare products</i>	Arterra Bioscience SpA	CS 1 / Health, wellness, biomaterials
2023021	SEM ZEISS SIGMA	4	<i>SEM-based investigations of powdered-formulated ingredients for functional make-up</i>	Arterra Bioscience SpA	CS 1 / Health, wellness, biomaterials
2023030	Confocal Microscope 2 (TOSCA)	4	<i>Confocal based analysis of mechanosensation in an ex vivo model of re- innervated human skin.</i>	Arterra Bioscience SpA	CS 1 / Health, wellness, biomaterials
2023048	SEM with correlative AFM	2	Characterisation of surgically removed vitreous humor samples by SEM measurements	IRCCS Fondazione G.B. Bietti	CS 1 / Health, wellness, biomaterials
2023049	TEM FEI	2	Characterisation of surgically removed human vitreous samples by TEM measurements	IRCCS Fondazione G.B. Bietti	CS 1 / Health, wellness, biomaterials
2023050	XRD - TOMOGRAPHY (IMAT)	3	Characterisation of surgically removed human vitreous samples by X-Ray tomography	IRCCS Fondazione G.B. Bietti	CS 1 / Health, wellness, biomaterials
2023070	SEM with correlative AFM (INES)	3	Analysis of nails provided by different antique shipwrecks in the Mediterranean using SEM-EDS	Université de Genève	CS 2 / Cultural, and Education
2023071	SAXS GISAXS (INES)	3	Analysis of nails provided by different antique shipwrecks in the Mediterranean using SAXS	Université de Genève	CS 2 / Cultural, and Education
2023052	SAXS GISAXS	2	Characterization of collagen and both tanning and colouring materials on leather artefacts from Museo Egizio by WAXS /SAXS /USAXS measurements	Fondazione Museo Antichità Egizie	CS 2 / Cultural, and Education
2023053	FT-IR Nexus (TOSCA)	1	Characterization of collagen and both tanning and colouring materials on leather artefacts from Museo Egizio by FT-IR measurements	Fondazione Museo Antichità Egizie	CS 2 / Cultural, and Education

2023054	AFM Raman (INES)	1	Characterization of collagen and both tanning and colouring materials on leather artefacts from Museo Egizio by AFM-Raman measurements	Fondazione Museo Antichità Egizie	CS 2 / Cultural, and Education
2023002	SAXS Xenocs Xeuss (TOSCA)	2	SAXS characterization of leather artefacts from Museo Egizio	Fondazione Museo Antichità Egizie	CS 2 / Cultural, and Education

A second critical issue to highlight here with regards to TA is the mismatch between the constantly increasing user demand for both "generic TA" and "TA for target-specific Case Studies" and the limited core funding presently available to operate an expanding IM@IT suite of MRFs instrumentation. Expanding the IM@IT user programme necessarily requires additional FOE core funding. For example, with more core funding allocated to IM@IT for both personnel and TA, the RI could open expand its TA - for both user 'generic TA' and for 'TA for target-specific Case Studies'- to suite the MRFs and to new ones (see Section 8). New MRFs would include the following:

- **Recognition of Elements and Tomographic Imaging for Non-destructive Analysis (RETINA)** for non-destructive material analysis of various medium-sized samples by combining X-ray Fluorescence (XRF) spectroscopy and 2D/3D X-ray imaging techniques.
- A facility tailored for research on new radioisotopes and new radiopharmaceuticals, biomedical materials, on human tissues.
- Facilities for conducting brightfield and fluorescence time-lapse microscopy for lab-on-chip and organ-on-chip experiments. The system includes a seamlessly integrated cell incubator with an inverted microscope, a system for administering drugs and culture media, and a server for storing captured images.
- Two scanning probe microscopies (AFM-Raman, AFM-Bio) versus specifically designed for the examination of biological samples.
- Facilities dedicated to the simulation and development of Deep and Machine Learning algorithms. An Optically Induced Dielectrophoresis (ODEP) platform facilitating:
 - Manipulation of microparticles and objects.
 - Identification and characterization of various cell types, exemplified by the application of Circulating Tumor Cell analysis.
- Multimodality imaging of materials and training (i.e. SPECT/CT and PET/CT or PET/MRI), to allows the integration of the functional data with the information obtained by CT and MR resulting in an integrated mapping for precision medicine to diagnose, prognostication, deliver targeted therapy, guide treatment and monitoring the effects.

New research lines are foreseen in thematic areas such as:

Energy storage Fuel cell membranes & batteries Polymer membranes for fuel cells
Circular economy associated with batteries Elemental analysis on electrochemical devices
Cardiovascular disease Oncology Neurodegeneration Obesity and metabolic syndromes
Infectiology Rheumatological disease Prediction of treatment response Healthy aging

5. 2023 Research Projects

So far MUR has allocated to IM@IT: 550.000 € on FOE 2022 and 600.000 € on FOE 2023.

In 2023, in addition to the core funding FOE 2022, IM@IT has operated and pursued various strategies, adopting a flexible approach to construct a collection of ‘Daughter’ projects (DP), with corresponding fundings. Each of these DP is related to one or more IM@IT Case Studies (CSs) in specific areas of societal challenges within the national’s science priorities and identified in thematic areas shaped together with stakeholders (public & industrials user). The projects were submitted in response to public and/or private calls (see document Annex – IM@IT ‘Daughter’ projects).

6. Core funding and Daughter projects

6.1 *Core funding*

1. FOE 2022 (MUR) (550.000 € transferred to IM@IT)

FOE 2023 (MUR) (600.000 € to be transferred to IM@IT)

6.2 *‘Daughter’ funding projects*

2. HARDEST (2023, Submitted to Ministry of Defence – “HANE HARDENING FOR SATELLITE *SYSTEMS*” –Piano Nazionale di Ricerca Militare (PNRM) 2023 – ‘Daughter’ project (TA for target-specific Case Study 3).

3. HiCHIP (2023, approved to Ministry of Defence) – “*Radiation hardness tests of hard Si/SiC/GaAs/GaN based chips and chip components of pacing-based devices for biomedical applications*”. Financed by the Ministry of Defense within the “Agreement between the Ministry of Defense General Secretariat and the University of Rome Tor Vergata Unit IM@IT – ‘Daughter’ project (TA for target-specific Case Study 3).

4. **EU-SEE Forum for intercultural exchange on Sustainable Management of Cultural Heritage - SMACH Forum** (Submitted to Central Europe Initiative Know-how Exchange Programme – CEI-KEP CALL KEP 2023) – ‘daughter’ project (TA for target-specific Case Study 2).
5. **CHARMANT** (2023 submitted to MUR) – Extreme space weather events and their impact on the ageing of human body, biological systems, and electronic systems. Submitted to MUR October 2023 – Program strengthening RI’ (civil building for MRF1, MRF2 for target-specific Case Study 1, Case Study 3).
6. IM@IT is currently working in constructing an ESFRI project jointly with a European consortium to respond to the next ESFRI Call (expected in early 2024). If successful, from the year 2028 onwards we envisage that the ESFRI project will represent the main DP of IM@IT with resources gradually increasing, while correspondingly the MUR-FOE funding will gradually decrease.

More details on ‘Daughter’ projects are in document Annex – ‘Daughter’ projects.

7. Recruitment of personnel

Following the SAC 2022 recommendations, we are now in the process of recruiting a project lead (‘Champion’) and a project manager, by then end of 2023 – beginning of 2024, respectively. Both positions will be funded from within the core funding FOE 2022 - FOE 2023 core-funding resources. A Communication Officer has also been recruited from within core funding FOE 2022 and FOE 2023.

To carry out “TA for target-specific Case Studies” it is necessary to hire scientific/technical staff with competences/expertise in specific areas relating to the societal challenges, including those on which IM@IT has developed the present case studies and those currently under development, such as:

- Multimodality imaging of materials (i.e. SPECT/CT and PET/CT or PET/MRI)
- structure/dynamics/function relationship in macromolecules/complexes connected to molecular signaling and recognition/aggregation mediated diseases.
- Neurodegeneration, healthy aging
- Investigation and remedial conservation ancient and modern artefact
- Energy storage (fuel cell membranes & batteries, polymer membranes for fuel cells, circular economy associated with batteries)

- Safeguarding water- Tracing novel entities by advanced analytical tool
- Chip irradiation in modern devices Si/Sic/GaAs/GaN and pacing systems artificial (e.g., artificial heart and pacemaker)
- Extreme space weather, new neutron monitors, impact on the aging of human body and terrestrial electronic infrastructures

8. Core funding and Sustainability

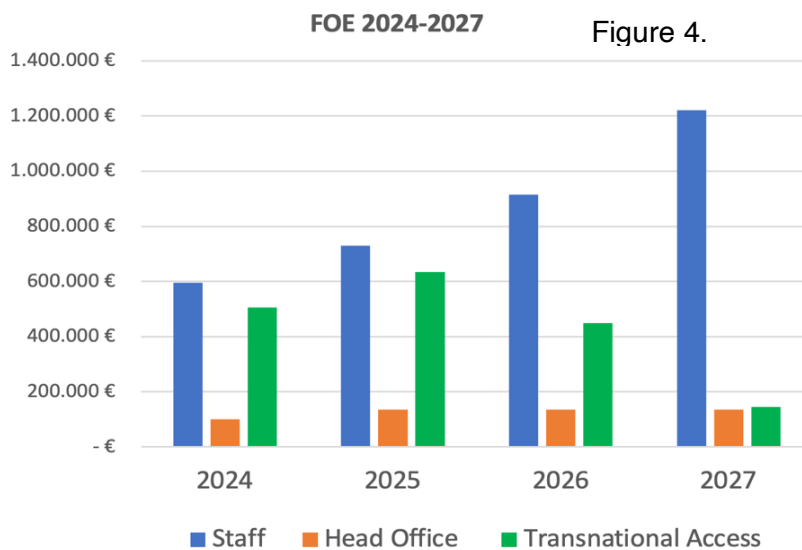
MUR public funding should remain the ‘bedrock’ upon which IM@IT is built and sustained. A RI such as IM@IT, which provides TA and services to many and varied external users, cannot operate sustainably based only on short-term DP for specific research projects, or contract services for industry, though such funding can complement and enhance the services offered by IM@IT.

A significant proportion of continuous core funding is required to guarantee IM@IT sustainability. An important aspect of sustainability is that IM@IT provides access to a pool of expertise, not only in the technical operation of equipment but also in its appropriate use for an individual research problem. Therefore, a significant proportion of steady core funding is required. Junior staff, recruited exclusively on short term contracts, would not be able to deliver this kind of expertise, whereas IM@IT must be able to support (and develop) it on a longer-term basis building on dedicated expert and senior staff, employed on open-ended contracts specifically for this activity. The current level of funding from MUR has enabled the growth of IM@IT, and the success are described above, but this now needs to be increased and sustained, otherwise the benefits of previous investments will be lost. For IM@IT to be sustainable in the long term, the level of core funding that should be allocated for IM@IT from FOE 2024 through FOE 2027 must include support for the recruitment of a) core staff for the RI head office (website responsible & developer and user office to deliver the TA); b) core staff based at the IM@IT universities or research centres, to operate the suite of MRFs1, i.e., beam/instrument senior researchers with expertise in the appropriate use for an individual research problem and technicians with adequate technical capacity for the use of equipment [see Table 2 and Figure 4 (blue and orange)]. Universities and research centres partnering with IM@IT have expressed interest in taking on permanent staff once the programme is well under way and has funding security for several years, and have agreed to sign a common agreement in 2024, which would commit them to reabsorb IM@IT staff financed by the MUR by the end of 2027; c) the delivery of TA [see Table 2 and Figure

4 (green)]. From 2025 one can note that the amount of TA requested to MUR decreases [Figure 4 (green)]. This is because as the staff allocated to IM@IT increases (blue) the more the RI will be able to support more TA. From 2028, IM@IT will operate in steady state; therefore, from FOE 2028, 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, because this staff will be employed directly by IM@IT. Therefore, from 2028, IM@IT direct staff cost will only include core staffs such as the project coordinator and project manager.

Table 2. – Level of core funding required for IM@IT to be sustainable on a longer

	2022 (€)	2023 (€)	2024 (€)	2025 (€)	2026 (€)	2027 (€)
FOE MUR	550.000	600.000	1.200.000	1.500.000	1.500.000	1.500.000



Once fully operational and sustainable, from 2028 IM@IT will become agile; beamline scientists will provide service to SRFs and TA to MRFs-LSFs, manage peer reviews and do jointly research with users. MUR could refer to IM@IT, for example, to finance TA in specific target areas to boost

research in certain thematic areas, related to societal challenges or other MUR strategic priorities. Our vision is for IM@IT to become a widespread tool for implementing and disseminating these initiatives.

9. ESFRI Call 2024 (project in preparation)

Currently, IM@IT is preparing a “Concept and Feasibility Document”, jointly with a European consortium with related capabilities (Table 3), to apply to the ESFRI’s call expected by March 2024, to operate as a European research infrastructure under the umbrella of the European Strategic Forum on Research Infrastructures (ESFRI).

If the ESFRI project were successful, it will provide core funding to Italian project through a different route and IM@IT will be self-sustaining after 2028.

Nevertheless, we would emphasise that this is an opportunity, not a necessity: IM@IT can continue to provide services to Italian researchers via the more conventional MUR-FOE funding route.

Table 3 – European consortium

Participants from	Country	MRF	LSF	Topics/research activities
Budapest Neutron Centre	Hungary	Yes	Yes	Neutron reflectometry, compact neutron sources
ISIS@MACH ITALIA	Italy	Yes	No	Health, Multimodality Human Imaging, Materials, Energy, Environment, Organ-on-chip
DIPC	Spain	Yes	No	Quantum, Cosmos, Nano, Life, Supercomputing
Politecnico Milano	Italy	Yes	No	Neutron, gamma, X-ray spectrometry
ISIS Facility	United Kingdom	Yes	Yes	Neutron, muons, X-rays
NPI	Czech Republic	Yes	No	Neutrons
PSI	Switzerland	Yes	Yes	Neutrons
Univ Strasbourg	France	Yes	No	Biology, quantum science, nano fabrication
Univ Poznan (CAT)	Poland	Yes	No	Material science, biology, chemistry