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DELIVERABLE REPORT

WP2 MGT2 - Pilot scheme for the management of a distributed research infrastructure offering harmonized, interoperable and integrated services

D2.7
Second assessment of access provision

Due date

M38

This initiative has received funding from the EU's H2020 framework program for research and innovation under grant agreement n. 101007417, NFFA-Europe Pilot Project

PROJECT DETAILS

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Analysis of the demand, of the use of the IDRIN and of new potential developments

DUE DATE	ACTUAL SUBMISSION DATE
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NATURE

☒ R - Report

☐ P - Prototype

☐ DEC - Websites, Patent filing, Press & media actions, Videos, etc

☐ O - Other

DISSEMINATION LEVEL

☒ P - Public

☐ PP - Restricted to other programme participants & EC: (Specify)

☐ RE - Restricted to a group (Specify)

☐ CO - Confidential, only for members of the consortium

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Contents

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1. EXECUTIVE SUMMARY

[The figures related to the previous reporting period are consigned in parentheses for reference throughout the document]

After **ten** (four) **quarterly calls**, NEP has received **about 355** (151) **proposals** from institutions from **46** (35) **different countries**.

61% (58%)[1] of those proposals have been **retained for access** involving **100%** (80%) of NEP beneficiaries and making use of **about two thirds** (half) of the techniques offered in the NEP catalogue. The evaluation of proposals in terms of eligibility, feasibility and scientific merit has followed the already well-oiled procedure of former NFFA with TLNet and ARP as main actors.

The granted access amounts to **3111** (1282) **Units of Access (UoA)**, which represents **63%** of the committed NEP offer. Since about sixteen calls are foreseen during the action lifetime, it can be considered that the demand received and the success rate associated to the evaluation procedure after the first ten calls is adequate for the capacity mobilized by NEP (10/16=62.5%).

The NEP catalogue is arranged around **six different installations** (**all have received demand**) collectively covering up to **43 different families of techniques, 98%** of which have received demand. NEP capacity has been pre-distributed with a tentative split of UoA among the six installations and among the different beneficiaries/providers; however, no pre-arrangement has been defined neither for the relative weight of the different families of techniques, nor the different techniques therein. Details on installations, families of techniques and providers are given in section 2. Quantitative access data of the first four calls, and the assessment of how these installations, families of techniques and providers have fared in terms of access (demand, success rates…) is covered in section 3.

NEP contemplates a couple of capacity redistribution exercises at installation and provider levels. The first has taken place close during the second reporting period. Section 4 covers further insights about this process on the re-steering of NEP original provisions about access capacity to the demand that was being obtained. It also opened a window of opportunity to extend the catalogue to newer directions. In this respect, the first call for new providers was also contemplated in this reported period of NEP, and as a result **four** new providers (and a new site for one of the current beneficiaries) have started the process of being enrolled to NEP. Nevertheless, they have not been active in the first ten calls since the amendment contemplating their inclusion was signed after the reported period. In any case, the aforementioned UoA redistribution exercise already considered the provisions for the selected new providers.

In terms of technical outreach, NEP has already increased its presence in the engineering, chemical and biological domains, as intended, but there are technical possiblities in the catalogue related to those areas that remain untapped. At this stage, it is considered better to consolidate the access to those communities to better exploit the current catalogue before attempting to reach any other new ones.

Virtual Access (VA) is a novel service offered in NEP. It comprises innovative online simulation services, databases, machine learning services, data and metadata services (listed in Section 2.1), seamlessly integrated into the NEP infrastructure from Month 31 (September 2023). The services

[1] 11 (10) extra proposals were approved and initially granted access, leading to slightly larger success rates, 64.5% (65%). However, those proposals were at some point discarded by different reasons.

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are provided to authenticated users via the Keycloack single-sign-on with the NFFA credentials and their usage is monitored according to the individual definitions of the UoA as specified in the Grant Agreement and reported in Section 4. The details of the services are described in D16.2 and 16.4, while their deployment and integration into the offer as VA is described in D9.2, D9.3, MS27, and MS30.

2. PREMISE

WP2 aims at optimizing the implementation of all access-related activities leading to integration and interoperability of a single Interoperable Distributed Research Infrastructure for Nanoscience (IDRIN). Optimization of user access experience, effectiveness of usage of the infrastructure and scientific output are the ultimate goals. To this effect, a continuous monitoring scheme for a smooth and harmonized operation is being put in place. Careful monitoring of the user proposals wallow identifying the scientific trends in user needs. Scientific outcomes are monitored and analyzed, both in terms of scientific publication and scientific data made available. To this effect one of its tasks is the technical and operational continuous upgrade of the IDRIN to better serve an expanding user community and to set the basis of an evolutionary model for an advanced and sustainable distributed research infrastructure.

Particularly, this deliverable originates from task 2.5 (*Technical and scientific evolution of the IDRIN*). It foresees the analysis of the use of the TA-VA infrastructure and its scientific outcome as a whole, identifying new user communities to be targeted and preparing the calls for additional providers. The collective effort of TA-VA WP leaders, as well as the TLNet, contributes to the evaluation the scientific use of the distributed installations, identifying capacity criticalities if any, and/or capturing new science opportunities to be supported by the offer to the nanoscience users. As a result, it is foreseen that the NEP catalogue undergoes periodical revisions giving an answer to both (i) identified unmet qualitative needs of users and (ii) quantitative needs resulting from oversubscription of the current capacity.

2.1 List of Techniques

As of today (month 22), the NEP TA catalogue is arranged in six installations, each one comprising several families of techniques totaling up to 178 individual techniques:

- 1: Lithography and Nano-patterning installation, **L&P** (18 techniques):
  - scanning probe lithography
  - patterning, replication, and sample navigation
  - electron and ion beam lithography
  - synchrotron-based lithography
  - photon-based lithography
- 2: Growth and Synthesis installation, **G&S** (20):
  - Chemical deposition of thin films.
  - Physical deposition of thin films.
  - Soft matter synthesis.
  - Synthesis of nanoparticles.
  - Thermal treatments.

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- 3: Structural and Morphological Characterization installation, **SM Charact**. (40):
  - Dispersed-phases characterisation
  - Scanning probe microscopy
  - Electron and ion beam technologies
  - Light and acoustic microscopy
  - Neutron characterisation
  - HF magnetic field imaging
  - Surface/overlayer/interface characterisation
  - X-ray analysis
- 4: Electronic, Chemical and Magnetic Characterization installation, **ECM Charact.** (40):
  - Magnetic characterization
  - Neutron magnetic characterization
  - X-ray/soft-X-ray spectroscopy
  - Spectro-microscopy
  - Chemical analysis
  - Luminescence spectroscopy
  - Electron spectroscopy
  - Optical spectroscopy
- 5: Nano to micro/macro installation, **Ntmm** (54):
  - Microfabrication
  - 3D shaping
  - Thick films and coatings
  - Synthesis of dispersed phases
  - 2D/3D bioprinting
  - In vitro assays and cell analysis
  - Biomolecules and biomaterials analysis
  - Rheology analysis
  - Mechanical analysis
  - Thermal analysis
  - Electrical analysis
- 6: Theory and Simulation installation, **T&S** (6):
  - Structural and ground state electronic properties (SGSEP)
  - Magnetic properties (MP)
  - Excited state properties (ESP)
  - Multiscale modeling of materials under extreme irradiation (MMMEI)
  - Atoms and molecules in motion (AMM)
  - Transport properties (TP)

Further information can be consulted at https://www.nffa.eu/offer/

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In addition to TA, VA is offered as follows:

- 7: Virtual Access (VA)
  - Metadata Repository (MetaRepo)
  - Trieste Advanced Data Services (TriDAS)
    - STM Explorer
    - SEM Explorer
    - STM Similarity
    - SEM similarity
    - SEM Classifier
  - Machine Learning (ML): predictive service for nanostructures
  - Materials Modeling (MM): damage threshold evaluation
  - Materials Cloud for computational simulations
  - Nuclear Magnetic Resonance (NMR) Spectra Graph
  - Magnetic Resonance Imaging (MRI) Prediction Service
  - Mapping Service

Further information can be consulted at https://www.nffa.eu/

2.2 List of Providers

Table 1.a lists all the providers involved in NEP and the techniques offered at their sites, Table 1.b lists the providers hosting the VA services. A given beneficiary may participate with different provider's sites (those in italics correspond to associated *Third Parties Against Payment*).

Table 1.a: List of providers

ACCESS PROVIDER	SHORT NAME OF INFRASTRUCTURE	OFFERED TECHNIQUES
CNR	IOM (TS) + (PG)	1: ICP, RIE, NIL, EBL, FIB, UV-IL 2: CVD, MBE, PLD, SSR 3: SEM, TEM / AFM, STM / XRD 4: MT, MOKE / IOS, XAS lsf, XMCD/XMLD / XPS, XPS lsf, ARPES, RESPED/RESPES, UPS / Pump-Probe - IPES, MOKE, BLS, RS 5: ECD, Standard depos., Standard etching, UVL, UV-SL / CCF, DH / OM 6: SGSEP, MP, ESP, AMM, TP (Quantum ESPRESSO package)
	ISM	4: ML, PL, Pump-Probe, OS 6: SGSEP, MP, ESP, MMMEI (YAMBO package)
	DSCTM	2: ALS, CVD, GM, MS, PVDS, TE, TP 3: SEM, TEM / AFM, STM / NMR / XRD, SAXS* / CM /DLS, ζ-potential, UAC / ITCAM, BET, PA 4: HPLC, FTIR, XPS 5: FDM, Slip Casting, SLS / ARC, Ink-jet, SALbL, SS&RP, Tape Casting / DNP, EoC, FF / 3DBP / MM, Thixotropy, Viscosity / MP, TDA, TMP / DSC, HTM, STG-DSC-DTA, TC/D, TGA / (HTEC), TP

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	ELETTRA	3: EXAFS-XAFS 4: DIPROI-FEL, XAS lsf / XPEEM/KPEEM/SPEM / FTIR
	UNI NAMUR	3: IBA, SIMS 4: XPS
CEA	LETI	3: SEM, TEM, FIB sample preparation for TEM, SIM, APT / AFM / XRD 4: AES/SAM, XPEEM/KPEEM/SPEM, CL, PL, XPS, UPS, Ellipsometry, RS, FTIR
CNRS	C2N	1: ICP, RIE, NIL, HE-FIB, EBL, FIB, TWL 2: ALD, CVD, EBE, MS, MBE, TE, TP 3: SEM, TEM / AFM / XRD 4: CL, ML, PL, Ellipsometry, RS, FTIR 5: ECD, Standard depos., Standard etching, UVL
	SOLEIL	3: XRT, XRM, XRI, XRD, SAXS 4: IXS, IOS, XAS, XMCD/XMLD / XPEEM/KPEEM/SPEM, SPELEEM / ARPES, XPS lsf
CSIC	CNM	1: AFML, ICP, NIL, BCL, EBL, FIB 2: ALD, CVD, GBM, SMP, TP 3: SEM, FIB preparation for TEM/ AFM / CM, OTFM 4: Ellipsometry, RS, FTIR 5: CD&P, DWL, ECD, I&GLS, II, SOTP, Standard depos., Standard etching, UVL / Ink-jet / MET, RF-VNAC
	ICMAB	1: RIE, EBL, SM-DWL 2: ALD, CSD, MS, MBE, PLD, TE, SMP, GIN, SP, TP 3: XRD / FM / DLS, WAS, NPTA, ζ-potential / ITCAM, BET 4: MFDC, EPR, SQUID, Magnetometry, MT, MOKE, Ellipsometry, RS, FTIR, OS 5: DWL, Standard depos., Standard etching, UVL / CCF, INA / Viscosity / DSC, TGA 6: AMM (LAMMPS package)
	ICMM	2: MICS 4: UPS, UHV-RAIRS, FTIR, XPS
	ALBA	3: XRM, XRD, SAXS, XRR, EXAS-XAFS 4: IOS, XAS, XMCD/XMLD / XPEEM/KPEEM/SPEM / UHV-RAIRS, FTIR / ARPES, XPS lsf
	CIC-BIOMAGUNE	3: AFM / TEM / NMR / LSCM 4: XPS, ICP-MS, FCS, FS, RS 5: CCF, FC / QCMB / IC
	IREC	2: ALD 4: Ellipsometry, RS
DESY	NanoLab (+ PETRA III)	1: NOT&P 3: SEM / AFM, STM / XRD, SAXS 4: IXS, XAS / UHV-RAIRS/ XPS, XPS lsf
EPFL	EPFL	6: SGSEP, MP, ESP, AMM, TP (Quantum ESPRESSO and AIIDA packages)

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FORTH	FORTH	1: ICP, RIE, EBL, TWL 2: ALD, CVD, MBE, PLD, SMP, GIN, SP, SSR 3: SEM / AFM / CM, LSCM, FM, NLM, OAM, OTFM DLS, WAS, ζ-potential / ITCAM / XRD, XRR 4: MFDC, SQUID, Magnetometry, HSI, MSI, ML, PL, Pump-Probe, UHV-RAIRS, RS, FTIR, OS 5: Standard depos., Standard etching, UV-SL / LSIVP / DNP, EoC, FF / CCF, LCI / Elisa- PR / DSC, TGA / MET, RF-VNAC 6: MMMEI
FZJ	MLZ	2: MBE 3: TEM, Cryo-TEM / AFM / Neutron diffraction, Neutron imaging, Neutron reflectivity, SANS 4: DNS, M-SANS, MNREFL 6: SGSEP, MP, ESP, AMM, TP (Fleur package)
ICN2	ICN2	1: ICP, RIE, EBL 2: EBE, PLD 3: SEM, TEM / XRD 4: ARPES, PS, FTIR, OS, XPS 5: Standard depos., Standard etching, UVL 6: SGSEP, MP, ESP, AMM, TP (SIESTA package)
INL	INL	1: ICP, RIE, NIL, EBL, FIB, SM-DWL 2: CVD, GBM, MS, PVDS 3: SEM, TEM, Cryo-TEM, FIB sample preparation for TEM 4: UPS, XPS
	INESC-MN	1: RIE, IBE, EBL, UV-IL 2: CVD, GBM, MS, PVED SMP FLA, TP 3: SEM / AFM / XRD / FM / SDI 4: Magnetometry, MT, Ellipsometry 5: D&P, DWL, ECD, Standard depos., Standard etching, UVL
JRC	ISPRA	3: SEM, TEM, SIMS / AFM / DLS, DCS, UAC, MALS, AFFF / BET / XRD 4: HPLC, ICP-MS, TR-XRF, FS, RS, FTIR, XPS 5: MS / (MHCACC), FC, INA, MHCACC / CD, DNAMS, Elisa-PR, QCMB, RT PCR, SPRB
KIT	KIT	1: DPN, RIE, HE-FIB, EBL, FIB, DXRL, SM-DWL 2: ALD 3: TEM, APT, SIMS / AFM, STM / XRI, XRD 4: XAS, XMCD/XMLD / XPEEM/KPEEM/SPEM /XPS lsf
LU	LNL (+Nchrem)	1: ICP, RIE, NIL, EBL, FIB, SM-DWL, DTL 2: ALD, CVD, MS, TE, AD, FLA 3: SEM, TEM / AFM / XRD 5: 3DMP
	MAX IV	4: SPELEEM, Ellipsometry
PSI	LMN/SYN	1: ICP, RIE, NIL, EBL, SM-DWL, DTL, TWL, EUV-IL 2: ALD, EBE, TE 3: SEM / AFM, STM / OTFM / XRM / XRD

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		4: IXS, XAS, XMCD/XMLD / XPEEM/KPEEM/SPEM / RESPED/RESPES, ARPES, XPS, XPS lsf / OS 5: DWL, ECD, Standard depos., Standard etching, UVL
TUG	TUG	1: DXRL 3: DLS, WAS / SAXS 4: UHV-RAIRS, FTIR, OS
UAB	UAB	3: SEM / TEM / Cryo-TEM / CM, LSCM
UMIL	LFM	2: CBD, FSP 3: AFM
UNG	UNG	4: ARPES, Pump-Probe, XPS 6: SGSEP, MP, ESP, AMM, TP (YAMBO, Octupus, LAMMPS, LODIS, SAPPHIRE, Transiesta packages)
ENL nodes	IMM, NANOTEC + FEMTO-ST, IEMN, LTM, LAAS + *POLIFAB, FBK, IMT, UT, CEITEC, MMI*	1: AFML, T-SPL, ICP, RIE, IBE, NIL, EBL, FIB, SM-DWL, UV-IL, TWL 2: ALD, CSD, CVD, GBM, EBE, MS, MBE, PLD, TE, MICS, SP, FLA, TP 3: SEM, TEM, FIB sample preparation for TEM, SIMS / AFM, STM / CM, FM, OTFM / ITCAM, PTRMS / XRD, XRR 4: MFDC, EPR, Magnetometry, MT, MOKE, XAS, AES/SAM, HPLC, AT, ICP-MS, TR-XRF, FS, CL, PL, IPES, RESPED/RESPES, XPS, UPS, Pump-Probe, UHV-RAIRS, Ellipsometry, RS, OS 5: CD&P, DWL, ECD, I&GLS, II, SOP, Standard depos., Standard etching, UVL / (IM), LSIVP / ARC, Ink-jet, SS&RP / (LCA), MP / DSC / EC, (HTEC), MET, MPET, RF-VNSAC

Table 1.b: List of VA providers

ACCESS PROVIDER	SHORT NAME OF INFRASTRUCTURE	OFFERED VA SERVICES
CNR	IOM (TS)	TriDAS
EPFL	EPFL	Materials Cloud
FORTH	FORTH	Machine Learning
	FORTH	Materials Modeling
KIT	KIT/SCC	MetaRepo
	KIT/SCC	NMR Spectra Graph
	KIT/SCC	MRI Prediction Service
	KIT/SCC	Mapping Service

2.3 Access Procedure

NEP offers free-of-charge combined access to a wide portfolio of services to users. It offers the possibility to carry out comprehensive projects for multidisciplinary research at the nanoscale. TA activities are performed in any of the aforementioned six different types of Installations (1-6 in Section 2.1). NFFA-Europe proposals must generally include access to more than one type of Installation and should not be restricted to LSF-based fine analysis only. Whenever possible, access is granted to a single NFFA-Europe site for all research steps. Access to more than one site for a given proposal is considered only when technically or scientifically justified. Multiple access to the same facility (facilities) under the same proposal cannot be supported beyond standard reimbursement limits.

The Single Entry Point (SEP) on this portal provides the overall list of tools and methods available and is the portal to submit a proposal. Proposals can be submitted at any time but are periodically collected for scientific evaluation. These periodic collections are taking place on 1 March, 1 June, 1 September and 1 December each year. After submission, each proposal firstly undergoes a feasibility check by the NFFA facilities staff, coordinated by the Technical Liaison Network (TLNet), and if positively assessed, its scientific merit is, then, evaluated by an independent Access Review Panel (ARP). The best ranked proposals are assigned to the most appropriate NFFA-Europe site(s). Before submission, users can contact the TLNet for clarifying any technical doubts they might have and for refining the proposal.

The access to the VA services (listed at point 7 in Section 2.1) is provided by the facilities hosting them. Each Access Provider operates its own infrastructure, made of one or more installations, which offers identified User Access to the VA services under its own scheme based on institutional policies. The user authentication is performed via login to the NEP Single Sign-On (SSO).

3. TA ACCESS

3.1 Access Data

Calls and proposals

To date, **ten** (four) **calls** have been open (with deadlines on Sep 21, Dec 21, Mar 22, Jun 22, Sep 22, Dec 22, Mar 23, Jun 23, Sep 23, Dec 23) with an average of **36** (38) **proposals per call**, 355 in total, and fully processed through the technical feasibility and scientific evaluation stages, and so they are be the basis for the analysis of demand. Details can be seen in Table 2.

96% (97%) of the proposals received were **eligible**. Roughly, **90%** (95%) **of the eligible** ones have been deemed **feasible** and **74%** (71%) **of these** have been deemed **scientifically apt** yielding an overall **64.5% success rate - 67% excluding the non-eligible –** (65% - 677%).

From the **229** (98) **approved projects** in the first ten calls, **eleven** (ten) **have been cancelled**, one for user declining interest, one from a Russian user, and the rest due to provider overbooking.

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Table 2: Requested and accepted (and still assigned) proposals and units of access

	PROPOSALS		UNITS OF ACCESS	
CALL	REQUESTED	ACCEPTED / ASSIGNED	REQUESTED	ACCEPTED / ASSIGNED
1	51	33 / 32	882	519 / 482
2	38	22 / 21	542	324 / 322
3	33	24 / *19*	429	333 / 258
4	29	19 / 16	377	258 / 207
5	31	19 / 19	379	283 / 283
6	30	19 / 18	373	271 / 241
7	36	22 / 22	518	299 / 299
8	46	31 / 31	694	483 / 483
9	35	21 / 21	505	303 / 303
10	26	18 / 18	307	227 / 227
Total	**355**	**229/218**	**5018**	**3302 /3111**

Users

In terms of users, the **355** (151) proposals **received** in the first ten calls involved up to **895** (356) **users**. **601** (245) of them composed the user teams connected with the **229** (98) **approved** proposals.

Countries

In terms of country coverage, proposals from **46** (35) **countries** have been received in the first ten (four) calls open during the reported period:

- 22 from Member States (totalling 242 proposals)
- 7 from Associated Countries (totalling 30 proposals)
- 17 non-European countries (totalling 62 proposals – Argentina, Australia, Brazil, Canada, China, Egypt, India, Iran, Mongolia, Peru, Russia, Senegal, South Korea, Sri Lanka, UAE, USA).
- UK (as special case, 21 proposals)

Italy, Spain, France, UK, and Germany are the five countries requesting more proposals, approximately 40% of the total (approximately half of the total in the first four calls).

In the previous NFFA project up to 56 countries showed interest in the catalog offer.

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UoA and installations usage distribution

With regard to user demand and installations offer coverage, a first UoA distribution analysis has been performed. In terms of demand, **5018** (2242) **UoA have been requested**, of which **3302** (1436) **have been assigned** after the evaluation procedure with the distribuiton per call shown in Table 2. This represents a **66%** (64%) **success rate**, which is similar to the success rate at proposal level. The assigned UoA subtracting the ones of the cancelled projects are **3111** (1269), which is the value that is used for the capacity coverage analysis.

In order to have a more comprehensive image of overall user demand, this analysis has been done per installation. The six installations have been requested and afforded in some sort of agreement with the distribution of the capacity per installation originally defined in the Grant Agreement as can be appreciated in Table 3 in relative terms (after the first four calls and after the first ten).

Table 3: Access performance at installation level

INSTALLATION	SUCCESS RATE (AV. 64%)	RELATIVE DEMAND	RELATIVE ASSIGNMENT	RELATIVE CAPACITY IN GA
Litho & Pattern	68 → **63%**	11.8 → **9.8%**	12.6 →**9.9%**	16% → **10%**
Growth & Synthesis	57 → **66%**	12.0 →**12.0%**	10.7 → **12.7%**	16% → **13%**
SM Characterization	70 → **65%**	33.2 →**35.2%**	36.3 → **37.1%**	30% → **37%**
ECM Characterization	66 → **62%**	28.6 →**28.3%**	29.4 → **28.3%**	26% → **29%**
Nano to micro/macro	49 → **53%**	13.3 →**12.9%**	10.1 → **11.0%**	11% → **11%**
Theory & Simulation	60 → ***69%***	1.1 →**1.1%**	1.0 →**0.9%**	1% → **1%**
		100%	*100%*	*100%*

In orange colour, those values diverging by more -20% of the expected average in relative terms; in blue, those diverging by more than +20%. In this report and after the redistribution exercise among installations, no colors are present in the table, while in the previous one, which covered four calls, assignment figures of both L&P and G&S were orange and assignment of SM was blue. Arrows show the evolution from the first four calls to the first ten calls, and the evolution of the original capacity split to the amended one after the redistribution exercise

The difference between the relative demand and assignment for every installation obeys to their different success rates in the evaluation procedure that after ten calls ranges from 66% for Growth and Synthesis to 53% for Nano to micro/macro.

In any case, the characterization block (SM and ECM installations) is the most demanded, 63.5% (62%) and assigned, 65.4% (65.7%), while Lithography and Patterning is the one lagging behind more significantly in assignment (it was Growth & Synthesis in the previous period).

The last column of table 3 show both the capacity split among installations before and after the aforementioned redistribuition exercise (done on data obtained after the first eight calls). Thanks to it the deviances apparent after the first calls have been corrected in the full period (e.g. Litho and Patters as well as Growth and Synthesis were underperforming and SM Characterization overperforming).

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UoA and installations capacity coverage

It must be noted that the total capacity of the NEP consortium after the redistribution exercise and the inclusion of the allotment for the new providers is **5020** (4925) UoA, so the currently assigned UoA represent **63% of the foreseen total offer**, which is virtually matching the UoA consumption rate expectation since 16 total calls are foreseen, 62.5%. The corrections introduced to the UoA capacity of each installation in the redistribution exercise obey to the relative demand observations of the previous sub-section (Litho & Pattern and Growth & Synthesis below initial expectations, while SM Characterization and ECM above). Once corrected the capacity coverage of each installation is well aligned with the expected averaged one.

(For Theory & Simulation, 1 UoA means one full project, while for the experimental installations 1 UoA stands for an 8h-shift of work)

Table 4: Capacity coverage at installation level

INSTALLATION	CAPACITY IN GA	CAPACITY COVERAGE	EXPECTED COVERAGE
Lithography & Patterning	809 → **482**	64%	62.5%
Growth & Synthesis	770 → **652**	61%	
SM Characterization	1498 → **1854**	62%	
ECM Characterization	1257 → **1418**	62%	
Nano to micro/macro	546 → **573**	60%	
Theory & Simulation	45 → **41**	71%	
All installations	**5020**[2]	**63%**	

In orange colour, those values diverging by more than -20% of the expected average in relative terms; in blue, those diverging by more than+20%. In this report and after the redistribution exercise among installations, no colors are present in the table, while in the previous one, which covered four calls, capacity coverage of G&S was orange and the one of SM was blue. Arrows show the evolution from the original capacity values per installation to the amended ones after the redistribution exercise

UoA balance (requested/assigned/provided)

In terms of demand, **5018** (2242) **UoA have been requested**, of which **3302** (1436) **have been approved** after the evaluation procedure. This represents a 66% (64%) success rate, which is similar to the success rate at proposal level. The **assigned UoA**, subtracting the ones of the cancelled projects, are **3111** (1269), which is the value that is used for the capacity coverage analysis. **1896** of those UoA have been already **provided** (1459 in the second reporting period), 61% (34%).

The assigned UoA to the 667 (260) steps retained for access to date represent 101.6% (98.5%) of the UoA requested for those steps. This is not because the TLNet and the ARP did not correct much the initial guesses of the users, but because the corrections upwards and downwards were very similar: the UoA of 16% (20%) of those steps were reduced by an overall amount of 233 (125),

[2] This figure includes the allotment for the new providers, which have had no implication in the first ten calls – the amendment sanctioning their incorporation has only recently been signed. The UoA capacity without them is 4810 after the redistribution and the corresponding coverage after ten calls is 65% overall

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while the UoA of 18% (18%) of those steps were increased by an overall amount of 281 (106), so about one third (40%) of the requested steps were modified although the net difference was only of 1.6% (1.5%) of the UoA finally assigned.

Special cases: large scale facilities demand

94 (39) out of the 355 (151) received proposals included techniques to be performed at LSF, what it is in accordance to the spirit of NFFA. They represent **26.5%** (26%). In terms of approved proposals, this percentage increases to **30%**, 69 out of 229 proposals (29.5%, 29 out of 98 proposals) since the **success rate** of this type of proposals is **73%** (74%), which is higher than the average for all proposals, **64.5%** (65%).

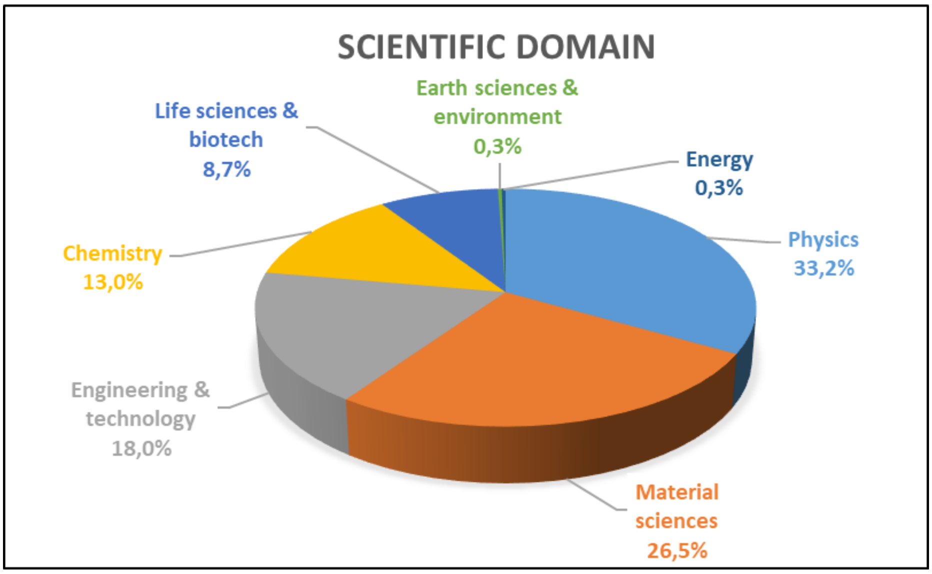
Special cases: industry interest

40 (21) of the 355 (151) received proposals were submitted by industrial organizations or proxies. They represent **11.3%** (14%). In terms of approved proposals this percentage decreases to 10.5%, 24 of 229 proposals (12.2%, 12 out of 98 proposals) because this type of proposals exhibit a **success rate of 60%** (57%), which is lower than the average for all proposals, **64.5%** (65%). In any case, although the relative number of submitted and approved proposals related to industry has slightly decreased, the difference between submitted and approved ones has reduced because the success rate of such proposals has recovered.

Proposals with **industry interest** and *asking for LSF techniques* have had a **better success rate 67%** (60%) and represent **2.5%** (3.3%) of the received proposals and **2,6%** (3.3%) of the approved ones.

Scientific domain

The analysis of the scientific distribution of the proposals is shown in the next figure according to the scientific domain the users identified when submitting them.



For comparison, in the previous NFFA project the declaration of the activity domain was as follows:

- Physics: 38%; Material Sciences: 35%; Engineering & technology:11%; Chemistry: 6.5%; Life sciences & biotech: 5%; Other: 4.5%

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This means that apparently the engineering, chemical and biological domains are getting more attention in NEP as initially intended (**39.7%** vs **22.5%**). This difference has even increased almost 7 points when compared to the first four calls.

3.2 Demanded Techniques

Table 5 summarizes the number of techniques offered at the different families of all installations, as well as the number of techniques demanded and assigned after the first four calls.

Out of the **43** families of techniques offered, only **one** (four) have received not demand at all:

- 2D/3D bioprinting from Ntmm

while **another one** (two others), despite receiving demand, were not successful in terms of assignment:

- Electrical analysis from Ntmm.

In addition, **four** (seven) **other families** received demand for less than half of the techniques offered, namely:

- Photon-based lithography from L&P
- Thick films and coatings from Ntmm
- 3D shaping from Ntmm
- Biomolecules and biomaterials analysis from Ntmm

In terms of individual techniques, **132** (97) techniques out of the **178** offered have received demand, **74%** (55%), and **114** (80) of them have been assigned, **64%** (45%).

All installations have received demand for at least 65% of their techniques with the exception of the Nano to micro/macro installation that has received demand for about half of the offered techniques, 46%.

More specific information at installation level can be found in deliverables D3.2, D4.2, D5.2, D6.2, D7.2, D8.2.

(For the Theory & Simulation installation, 'family of techniques' equals 'techniques')

Table 5. Requested and assigned demand per technique and family of techniques

INSTALLATION FAMILIES OF TECHNIQUES	# TECHS OFFERED	# TECHS DEMANDED	# TECHS ASSIGNED
L&P			
Scanning probe lithography	3	1	1
Patterning, replication, and sample navigation	6	6	6
Electron and ion beam lithography	3	3	3
Synchrotron-based lithography	2	2	2
Photon-based lithography	4	2	2
Total	**18**	**14**	**14**

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G&S			
Chemical deposition of thin films	4	3	3
Physical deposition of thin films	6	5	5
Soft matter preparation	1	1	1
Synthesis of nanoparticles	5	3	3
Thermal Treatments	4	3	2
Total	**20**	**15**	**14**
SM Charact			
Scanning probe microscopy	2	2	2
Electron and ion beam technologies	7	7	7
HF magnetic field imaging	1	1	1
Dispersed-phases characterisation	8	5	4
Light and acoustic microscopy	6	3	3
Surface/overlayer/interface characterisation	5	3	3
Neutron characterisation (Methods currently unavailable)	4	2	2
X-ray analysis	7	7	4
Total	**40**	**30**	**26**
ECM Charact			
Magnetic Characterization	6	6	4
Neutron Magnetic characterisation	3	2	1
X-ray/soft-X-ray spectroscopy	5	4	4
Spectro-microscopy techniques	5	3	3
Chemical analysis	3	3	1
Luminescence spectroscopy	6	6	5
Electron spectroscopy	5	5	4
Optical spectroscopy	7	7	7
Total	**40**	**36**	**29**
Ntmm			
Microfabrication	10	7	7
Thick films and coatings	5	2	1
3D Shaping	5	2	1
Synthesis of dispersed phases	3	3	3

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2D/3D bioprinting	2	0	0
In vitro assays and cell analysis	5	4	5
Biomolecules and biomaterials analysis	7	3	3
Rheology analysis	3	2	2
Mechanical analysis	3	2	1
Thermal analysis	6	4	2
Electrical analysis	5	2	0
Total	**54**	**31**	**25**
T&S			
Structural and ground state electronic properties	1	1	1
Magnetic properties	1	1	1
Excited state properties	1	1	1
Multiscale modeling of materials under extreme irradiation	1	1	1
Atoms and molecules in motion	1	1	1
Transport properties	1	1	1
Total	**6**	**6**	**6**

In orange colour, those families for which *less than half* of the offered techniques have received demand; in darker grey, those cases with *zero demand* or *zero assignment*.

3.3 Provider Involvement

The involvement of beneficiaries (and related internal providers) has been varying in intensity in the first ten calls depending on how well the demand matched the particular offers and the criteria that were followed for ascribing assignment in cases of multiple matching offers. Indeed, much of those variations were alleviated by reconfiguring the capacity for the different providers as a result of the redistribution exercise.

Table 6, which already uses the new capacity values for calculating the actual capacity coverage, summarizes such results when all installations are considered globally. Particular results per installation can be consulted in D3.2, D4.2, D5.2, D6.2, D7.2, D8.2.

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Table 6. Requested and assigned units of access, total capacity and % capacity coverage for all providers

ACCESS PROVIDER SHORT NAME	SHORT NAME OF INFRASTRUCTURE	UNIT OF ACCESS ASSIGNED	UNIT OF ACCESS CAPACITY	% COVERAGE
CNR	IOM (TS) + (PG) + (ISM)	565	620 → **883**	64
	DSCTM	73	160 → **135**	54
	Elettra	24	80 → **38**	63
	Uni-Namur	23	60 → **46**	50
CEA	LETI	97	240 → **161**	60
CNRS	C2N	61	227 → **149**	41
	Soleil	72	76 → **151**	48
CSIC	CNM	69	110 → **91**	76
	ICMAB	163	241 → **224**	73
	ICMM	105	70 → **185**	57
	CIC-biomaGUNE	85	100 → **120**	71
	Alba	117	44 → **105**	111
	IREC	5	80 → **20**	25
DESY	NanoLab+Petra III	87	145 → **155**	56
EPFL	EPFL	2	4 → **3**	67
ESRF	ESRF	0	36 → **10**	0
FORTH	FORTH	475	505 → **731**	65
FZJ	MLZ	73	177 → **140**	52
ICN2	ICN2	240	228 → **280**	86
INL	INL	65	135 → **65**	100
	INESC-MN	8	140 → **35**	23
JRC	ISPRA	83	210 → **115**	72
KIT	KIT	91	155 → **160**	57
LU	LNL+nCHREM+ MAX iV	34	131 → **85**	40
PSI	LMN + SYN	304	329 → **391**	78
TUG	TUG	48	117 → **75**	64
UAB	UAB	8	21 → **12**	67
UMIL	LGM	26	121 → **55**	47
UNG	UNG	23	45 → **20**	115
ENL nodes	IMM, NANOTEC + FEMTO-ST, IEMN, LTM, LAAS + POLIFAB, FBK, IMT, UT, CEITEC, MMI	85	318 → **170**	50

In orange colour, those values diverging by more than -30% (absolute) of the expected average; in blue, those diverging by more than +30%, roughly corresponding to half of the expected coverage (62.5%) after ten calls. In darker grey, beneficiaries/providers with zero offer so far.

Given the number of total calls foreseen in NEP, the average involvement in terms of capacity coverage would be 62.5% after ten calls.

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After ten calls and the redistribution exercise **only one beneficiary** out of 19 **is showing an excess of coverage of more than 50% of the expected one**, UNG; its offer, though, represents less than 1%. In the first four calls, three were the beneficiaries in this situation (CNR, FORTH, PSI) and they represented 36% of overall NEP capacity.

Similarly, **only one beneficiary, EPFL (representing less than 0.5% of the overall offer), shows currently a coverage below the average by at least a similar (negative) percentage**. In fact, ESREF has not been able to habilitate yet the offer of the beamline it was supposed to. In the first four calls up to seven of beneficiaries, representing 14% of the overall capacity, were below the expected coverage by more than 50% (INL, JRC, LUND, EPFL, ESRF, UAB, UNG) – the last four of them having not offered any access at that time.

Several beneficiaries are multi-site. If the same analysis is done at provider (site) level, **only three of the 30 sites show a relevant excess** (ALBA, INL and UNG) **and three more a relevant defect of coverage** (INESC, IREC and ESRF) after the first ten calls, while those figures after the first four were, respectively, six and eleven. Those should be cases of especial attention when stirring and steering access and one of the focus of possible future redistributions.

The situation of the neutron techniques offer deserves a special mention. Although they were regularly offered in previous NFFA, access to them has been discontinued throughout NEP and it is not foreseen to be resumed until early 2025. The reason is that the research neutron source FRM II is currently undergoing an extended maintenance break because the so-called central channel has to be newly manufactured and replaced, and the work required to normalize the systems, recurring tests, and special commissioning tests following the replacement is expected to occur by the end of 2024.

Lastly, new providers will join the NEP offer as a result of the first call for new providers in the calls to come. Although the call was resolved time ago, the administrative procedure for approving the corresponding grant amendment has prevented their earlier contribution. Such new providers are the **Synchrotron ASTRID 2** linked to the Aarhus University in Denmark, **Centres Científics i Tecnològics Universitat de Barcelona** (CCiTUB) linked to the University of Barcelona in Spain, the Greek **National Centre for Scientific Research** (NCSRD), and the SME **Koral Tecnologies**. They will contribute with additional capacity to techniques already available in the NEP catalogue, as well as with new ones. With the exception of the Growth and Synthesis and Theory and Simulation installations the rest has been reinforces with those additions.

4. VA ACCESS

UoA definitions and usage distribution

The nature of the Unit of Access (UoA) has been individually defined for each VA service: for Machine Learning and Materials Modeling is defined as "168 hours (equivalent to one week) of computing power employed by logged-in users"; for Materials Cloud is "the number of authenticated users accessing the service"; for MetaRepo is "every single call or action (e.g. upload, query, retrieve) performed on the service by an authenticated user"; for TriDAS is "every single action made by a logged-in user on one of the sub-services"; for NMR Spectra Graph, MRI Prediction Service; and for Mapping Service is "every single action made by a logged-in user on the service".

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Table 7 summarises the usage of each of the VA services in terms of UoA and of number of users during the monitoring period, from the individual release (which varies according to the schedule) up to date (M38). For comparison, the minimum amount of UoA to be provided and the estimated number of users over the foreseen full period of offer, from the release up to the end of the project at M60 (February 2026), are also reported. It must be noted that the Mapping Service is an additional VA service, developed as output of the Task 16.4 "Scouting activities for further data services" of WP16.

Table 7. Statistics about the VA usage

ACCESS PROVIDER	VA SERVICE	MONITORING PERIOD	ACTUAL NUMBER OF USERS	ESTIMATED NUMBER OF USERS	ACTUAL UoA	MINUMUM UoA TO BE PROVIDED
CNR	TriDAS	M24-M38	10	30	123	90
EPFL	Materials Cloud	M31-M38	15	30	15	30
FORTH	Machine Learning	M31-M38	1	35	1	35
	Materials Modeling	M31-M38	0	35	0	35
KIT	MetaRepo	M25-M38	27	120	1983	360
	NMR Spectra Graph	M37-M38	0	50	0	100
	MRI Prediction Service	M37-M38	0	20	0	60
	Mapping Service	M37-M38	1	n/a	1	n/a

User Gender Distribution

In Table 8, the Gender distribution of the users for each VA service is reported.

Table 8. VA user gender distribution

ACCESS PROVIDER	VA SERVICE	TOTAL NUMBER OF USERS	NUMBER OF FEMALES	NUMBER OF MALES
CNR	TriDAS	10	2	8
EPFL	Materials Cloud	15	2	13
FORTH	Machine Learning	1	0	1
	Materials Modeling	0	0	0
KIT	MetaRepo	27	8	19
	NMR Spectra Graph	0	0	0
	MRI Prediction Service	0	0	0
	Mapping Service	1	0	1

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User Geographical Distribution

Table 9 summarizes the geographical distribution of the users accessing each of the VA services.

Table 9. VA user geographical distribution

TriDAS		Materials Cloud		Machine Learning		MetaRepo		Mapping Service	
Country	Number of users	Country	Number of users	Country	Number of users	Country	Number of users	Country	Number of users
Italy	6	Italy	4	Greece	1	Italy	15	Italy	1
Germany	2	India	3			Germany	7		
Estonia	1	Switzerland	2			China	1		
Poland	1	Germany	2			Belgium	1		
		Spain	1			Portugal	1		
		Finnland	1						
		Tunisia	1						
		Bangladesh	1						

5. ANALYSIS OF ACCESS PROVISION

5.1 TA Access

Similar to what D2.3 described after the first four calls, the coverage of NEP access capacity after the first ten is matching expectations, 63% vs 62.5%, so the amount and rate with which proposals are being received and approved continues to be adequate. Nevertheless, attention shall be paid to the slight decreasing trend in received proposals which is apparent from Table 2. However, this is mostly an artifact due to the very successful first call (probably explained by the latency time between NFFA and NEP): if call 1 is not considered, the graphical plot of the submitted and approved proposals in the remaining nine calls exhibits a flat line centered at **34 average submitted proposals** and **22 average approved ones**. The number of users per proposal, either submitted or approved, continues to be around 2.5.

All six installations of NEP have received demand. Up to **98%** (93%) **of all families of techniques** included in our catalogue **have received demand** as well, although with different intensities. Similarly, **95%** (80%) **of the beneficiaries have received demand** at this stage, again with different intensities, although deviances have been certainly leveled off after the first redistribution exercise.

Regarding demand, the **characterization block (SM and ECM characterization) has continued to overperform**, representing a combined 65.4% of the assignment, if compared to initial provisions, 56%. On the other hand, Litho and Patterning and Growth & Synthesis have continued to underperform, a combined 22.6% assignment in front of an initially foreseen 32%, although in the second period those two installations have reversed their evolution (G&S going up,

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L&P going down – see Table 3); this is because G&S has kept its demand and has improved its success rate, which was rather low in the first period, while the opposite has happened with L&P (experiencing lower demand and decreased success rate). In terms of success rate, though, the Nano to micro/macro installation is still the one with the lowest[3], although it has lately improved and the overall assigned access has not suffered because of its demand has remained above its initial expectations. This evidence has led to the redistribution exercise after which the capacity dedicated to the overperforming installations has been increased in detriment of the ones underperforming as shown in Table 3.

In terms of families of techniques, just one of them did not received demand to date (2D/3D bioprinting) while two are the ones not being assigned (+ Electrical analysis). Both belong to the Nano to micro/macro installation and appeal to domains not traditionally targeted by NFFA (bio-community and device-making community) so still some additional awareness may be needed; moreover, a device reaching the status of being electrically measured may require a lengthy fabrication process that usually goes beyond what NFFA offers. When speaking of individual techniques, there is still a relevant number of them not yet demanded although the catalogue coverage has grown from 55% in the first period to 74% to date. There are two ways to react to this fact: to *adapt* the offer to the demand, decreasing the number of offered techniques by eliminating non-demanded techniques, or to *spur* the demand of techniques less successful so far. Since keeping the offer of non-demanded techniques is not a problem in itself, it seems wiser to increase the dissemination activities with active involvement of the providers of those techniques, especially in those cases where such techniques appeal to the newer communities considered at NEP as commented before.

At this point, and in prevision of a second call for new providers, **there is no clear indication of a pressing need to include new techniques in the NEP catalogue**. The number of unfeasible proposals, which could point to some unmet needs from the users, is low (10% of the eligible ones). On the other hand, it is difficult to identify lacks from within the catalogue, since we do not get demand for what is missing. A direct consultation to our user base to gather intelligence about what they may find missing is the only way around.

Additional comments follow on the impact and corrective measures regarding both extremes of demand: heavily demanded techniques and techniques attracting little attention.

Very demanded techniques

This particular set of techniques puts under certain stress the system with implications in the capacity offered by the involved providers and the offer split among them, which should be kept balanced if possible. If the demand for certain techniques exceeds the capacity collectively mobilized within the consortium, there may be need of additional extra capacity that could be serviced by new providers. This can be especially true for those techniques for which there is currently a single provider.

In the **L&P installation**, *TWL* and *EUV-IL* are the most demanded techniques followed by *EBL* and *RIE*. *EUV-IL* has been assigned exclusively to PSI, which is an oversubscribed provider for lsf lithography, since it is the only provider of EUV-IL in the consortium. Due to the temporary shutdown of PSI synchrotron that will extend for most of the remaining NEP, this oversubscription will correct itself. Unfortunately, no other provider inside or outside the consortium (in Europe) can offer *EUV-*

[3] A joint exercise with the ARP took place to analyse the possible causes of the low success rate of particular types of proposals, as for instance those related to the Nano to micro/macro installations or those labelled as of industrial interest, but no unnoticed bias or lack of background within the ARP could be identified.

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IL, so being a very demanded technique, its unavoidable absence may press down L&P overall figures. Regarding *TWL*, a large number of UoA has been kept being assigned to 2 of the 4 providers, namely PSI and FORTH. Since one is no longer available and the other exhibits an oversubscription trend, eligible proposals asking for *TWL* in the next calls should be spread to the other providers that offer it as well (C2N and ENL). *EBL* poses no risk at the moment, as it is a technique offered at a large number of providers. The same can be said of *RIE*. Incidentally, *BCL*, a technique developed through the joint research activities of the previous NFFA, that was at risk in the first period is no longer in this situation.

The comparatively three more demanded techniques in the **G&S installation** are *PLD*, *MBE*, followed by *MICS*. They are the most assigned as well, although *MICS* overcame *MBE* in assignment. For the first two techniques there are available several providers (from five to six) so a huge demand can be accommodated, especially given the fact that half of them are still underexploited. The general issue in this installation, even with highly demanded and widely offered techniques, is if the particular material systems of users' interest are available at the sites providing such techniques. *MICS*, on the other hand, is only provided by CSIC-ICMM. It is a rather novel and special technique, so alternative partners may be hard to find. In this case, the only solution is to modulate the internal distribution of NEP offer increasing the global share of this partner within the restriction of its own capability of delivering access.

For SM Characterization, *SEM*, *TEM*, *XRD* and *AFM* are the more demanded techniques, although in terms of assignment *STM* overcame *AFM*. The offer base of these techniques is large enough to not lead to criticalities and several providers have also extra capacity from less used techniques that they can offer. However, in the case of *STM*, it is important to observe the demand, since it is offered by less providers (CNR-TS & DSTCM, DESY, KIT, PSI and also ENL) than the rest and some of them have an oversubscription trend (CNR-TS) or are temporary shutdown (PSI).

In the **EMC Characterization** installation, *XPS* (both lsf-based and lab-based), *BLS*, *XAS* and *PL* are the most demanded techniques, although *XAS* advanced *BLS* in terms of assignment. *BLS* is offered by a single provider (CNR-IOM/PG) so an additional reinforcement may be advisable. The situation of the other three techniques is non-critical since they are offered by several providers. Lsf-based *XAS* and *XPS* are currently serviced in NEP by various synchrotrons, although the main provider has been CNR-IOM/ELETTRA. When is no longer available due to temporary shutdown, demand could be redistributed without problem. *PL* should be watched since two of their five providers are currently in an oversubscription path and its main provider to date (FORTH) is one of them. The situation of oversubscription of some providers has been alleviated after the NEP internal redistribution exercise, but in general terms it may be advisable diversifying the assignment when possible.

In the **Ntmm installation**, *LSIVP*, *CCF*, *Standard etching* and *LCI* are the most demanded techniques. *LSIVP* and *LCI* are only offered by FORTH, and *CCF* has also been assigned to it although is part of other three providers offer. Since FORTH is a provider with a trend for oversubscription, *CCF* demand should be redistributed to non-oversubscribed providers when possible (e.g. ICMAB, CIC-bioMAGUNE). If extra capacity would be needed for *LSIVP* beyond current capabilities of FORTH, a possible new external provider may be considered but this may prove difficult since it was a technique developed in a joint research activity of previous NFFA. *Standard etching* capacity is well spread, but it has been mainly assigned to PSI. Since PSI participation is temporary down, demand should be redistributed, what should pose no problem.

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In the **T&S installation**, *SGSEP* and *AMM* are still being the most demanded techniques but are virtually offered by all T&S providers, so the situation is controlled from a provider point of view and redistribution in case of oversubscription can be handled. No necessity of extra capacity is appreciated.

Families of techniques receiving 'little' attention

Those families of techniques receiving none or very little demand are summarized in section 3.2. Reaction to this situation would take a specific dissemination effort and the mobilization of the involved providers. With the exception of the G&S installation, the rest of them have some example of such families.

In **L&P** all five families have received demand and assignment, while two of them have only received it for half or less than half of their available techniques. In the first period, those two families also exhibit poor demand; in fact, one of them received none. In the case of Scanning probe lithography, most probably our user base is not well acquainted with such techniques. Since the unused techniques therein are offered by single or very few providers: *DPN* (KIT) and *AFML* (CNM and ENL), they should try to mobilize demand on their own, and NEP should consider them specifically in any dissemination effort. On the other hand, *UV-IL* and *SM-DWL* are the unsuccessful techniques of the Photon-based lithography. They are provided in more than one site (IOM, INESC, ENL, PSI, LUND) but have got no demand. The first one is a technique based in interference of light and may be competing with the very successful *EUV-IL* technique. The third is similar to *DWL* from the Ntmm (they involved the same machines). In both cases, it would be advisable to clarify the differences among those techniques in dissemination activities.

In **G&M** all families got demand and assignment as it was also the case in the first period although the number of unused techniques has decreased from 10 to 6: *AD*, *FSP*, *GBM*, *PVD*, *SSR* and *TP* (the first two being offered by single providers, LUND and UMIL, respectively)

Within **SM Charact.**, all families of techniques received demand and assignment and no family has received assignment for less than half of their available techniques. In the previous period, one family, HF magnetic field imaging, did not received demand, and other three families got assignment for less than half of their techniques. Nevertheless, the families Dispersed-phases Characterization and Light and Acoustic Microscopy are being much less popular, in the sense that just half of their techniques have received assignment and concentrate seven of the twelve techniques of this installation unused to date (excluding neutron-based ones). If there is continued lack of demand, providers of these techniques should hold discussions regarding possible reasons and solutions. When targeting dissemination activities to stimulate interest in them, it is important to also consider how they may be combined with techniques in another installations (which is imperative in NEP). Special mobilization is required for those unused techniques that have single providers: ISPRA (*DCS* & *AFFF*), ICMAB (*NPTA*), FORTH (*OAM*), SOLEIL (*XRT*), ENL (*PTMRS*) and INESC (*SDI*). The rest of unused techniques are *XRI*, *XRR*, WAS, *FM*, *OTFM*.

In **ECM Charact**., all eight families have received demand and assignment and only two families have received assignment for less than half of their available techniques. One of them is the neutron-based one, being the other one the Chemical Analysis family. In the first period, the situation was not much different: three were the families in that condition (being Electron spectroscopy the additional one), but the overall unused techniques have decreased from 17 to 12: Magnetrometry, EPR, IXS, HSI, MSI, AT, HPLC, TR-XRF, UPS, RESPED-RESPES (excluding the two neutron-based). HSI, MSI and AT (FORTH, ENL) while two are the providers of HPLC (DSTMC, ISPRA) and TR-XRF (ISPRA, ENL), so those partners need to be mobilized.

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The **Ntmm installation** hosts only family that has got no demand and the two only families that have got no assignment (2D/3D bioprinting and Electrical analysis). Five other families have got assignment for less than half of their available techniques (Thick films and coatings, 3D shaping, Biomolecules and biomaterials analysis, Mechanical analysis, and Thermal analysis). In the first period, four were the families that got no assignment and six other the ones that got assignment for less than half of their techniques. The unused techniques have decreased from 42 to 30. Nineteen of those techniques are offered by single providers: DSCTM (*Tape casting*, *SLS*, *FDM*, *Slip casting*, *3DBP*, *MM*, *TDA*, *TMP*, *TC/D*, *STG-DSC-DTA*, *HTM*, *TP*), IOM-TS (*DH*, *OM*), ISPRA (*DNAMS*, *RT-PCR*), CIC-bomaGUNE (*IC*), ENL (*EC*, *MPET*) which should be mobilized in further dissemination efforts.

For **T&S**, all families (that in this case equal techniques) have been demanded and assigned, although Transport properties is the one less mobilized, together with Magnetic properties

Further information can be found in Annex I.

Provider involvement

The disparity of provider involvement was increasing as calls were progressing. This situation triggered the first of the redistribution exercises envisaged in NEP. This process followed a mixed approach between *adapting* and *correcting* such disparity. Thus, some capacity rearrangement among providers took place after call 8 to rebalance their offer and demand. This rearrangement had two dimensions, one *intra-partner*, readjusting the internal weights of the different installation's capacity in response to their relative success, and one *inter-partner* by enabling partial transfer of capacity from those partners less successful to those more successful. As a result, the relative UoA capacity for the different installations has changed as well. The outcome of the first redistribution exercise can be appreciated in Tables 3 and 4 at installation level and in table 6 at beneficiary/provider level, and has had as a consequence the levelling of the observed disparities and an alignment of the associated capacity with the provider performance.

This bold movement follow a milder approach by which the overconcentration of access in some partners is analysed call by call, and access assignment protocols takes it into consideration the result. Indeed, access to some of such providers is to be decreased or even suspended in some calls to avoid major disruptions that may hinder the redistribution exercises. Corrective measures to foster the balanced involvement of alternative providers already present in the consortium contemplate

(i) reconsidering the assignments when different providers have a common offer in favour of the underused
(ii) encouraging the latter to stimulate the demand for their own portfolio, especially for those techniques they may be specialty providers.

Extended communities

One of the objectives of NEP is to overcome the boundaries of material aspects of nanoscience and nanotechnology and increase the appeal to users in the bio-domain, in the chemistry domain and in the device-making domain. For this reason, the catalogue has been populated with many techniques (especially, but not only, in the Nano to micro/macro installation) that could be interesting for those communities. A first order analysis of the scientific domains of the received proposals already points in a good direction when compared with previous NFFA (see section 3.1). However, many of the less demanded families of techniques identified in section 3.3, and discussed in the previous paragraphs, correspond to those fields, so much is still to be gained if demand is attracted by:

(i) a better concerted dissemination to stress NEP potential in those domains (starting by a friendlier introduction to those items in our website)

(ii) the activation of the networks of the beneficiaries providing such techniques (word of mouth was in fact very important for consolidating the original offer of NFFA)

Many of the relevant providers in these domains are new to NEP, so it is normal that it may take some time for them to align with access granting procedures. However, their mobilization is a must to succeed in generating demand. DSCTM in the chemical field and JRC-ISPRA in the biochemical / biological field are centric to this effort given their allotted capacity.

Another way to spur proposals looking for activities extending materials systems into tests structures and devices is to advantageously exploit those techniques labelled as 'standard' and that can be accessed remotely, which could ease the demand by attracting local user communities. Also, a temporary or permanent waiving of the two-installations internal rule for the Nano to micro/macro installation (as it has been done in the past for some special cases – theory proposals, and SMEs) may be considered, provided enough internal diversity is present in the proposals, which should not be a problem for an installation that already contains subsets of lithography and patterning, growth and synthesis and various characterization of techniques. However, this waver has not been enforced because the share of this installation has been quite stable to date.

5.2 VA Access

All the VA services foreseen in the Grant Agreement were gradually integrated into the offer following the schedule. An additional one, the Mapping Service, was included. Other services which might be developed will be eventually included to the offer.

Looking at the statistics reported in Table 7, if a linear evolution is assumed, the current number users is low with respect to the estimated ones. However, it must be considered that the VA services are still new and little known: to enhance their dissemination, we already scheduled a Summer School on Data Management and Virtual Access services which will take place at FORTH from 12 to 14 June 2024. Moreover, we plan to provide tutorials for the services as video or text.

On the other hand, looking at the actual UoA, the usage of Materials Cloud is beyond the linear evolution of the minimum expectation, while the usage of MetaRepo and TriDAS has already reached and well exceeded the minimum target. In addition, the last two services have already been useful for the publication of scientific outcomes ([1] Blumenröhr, N., MacKinnon, N., Aversa, R., FAIR Data Management Workflow for MRI Data, Proceedings of the 3rd Workshop on Metadata and Research (objects) Management for Linked Open Science (DaMaLOS 2023). DOI: 10.4126/FRL01-006444992; [2] Blumenröhr, N., Aversa, R., From implementation to application: FAIR digital objects for training data composition. Research Ideas and Outcomes 9: e108706. DOI: 10.3897/rio.9.e108706; [3] Rodani, T., Osmenaj, E., Cazzaniga, A., Panighel, M., Africh, C., Cozzini, S., Towards the FAIRification of Scanning Tunneling Microscopy Images. Data Intelligence 5 (1), 27–42 (2023). DOI: 10.1162/dint_a_00164).

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ANNEX I – DEMAND & ACCESS AT TECHNIQUE LEVEL

Details are provided in the following table, whose information is arranged in the following way:

- 1st column (FAMILY) depicts the different families of techniques for the different installations.
- 2nd column (#TECHS) gives an indication of the coverage of techniques at each family by showing the number of techniques that has been requested / assigned (granted access) / and the total number of offered techniques in that family.
- 3rd column (#PROVIDERS) gives an indication of the overall coverage of the providers involved at each family, technique by technique, by showing the number of providers that have received a request for a given technique / that have been assigned an access to do so / and the total of involved providers for each technique.
- 4th column (#PROPOSALS) gives an indication of the interest of a given technique at proposal level, by showing the number of proposals that requested a given technique / and the number of them that were finally assigned.
- 5th column (#UNITS OF ACCESS) gives an indication of the interest of a given technique at units of access level, by showing the number of UoA that have been requested for a given technique / and the number of them that were finally assigned.

Table 10. Requested and assigned demand per technique and family of techniques in terms of proposals and units of access

FAMILY	#TECHS REQUEST. /ASSIGN. /OFFER.	# PROVIDER REQUEST. /ASSIGN. /OFFER.	# PROPOSALS REQUEST. /ASSIGN.	# UNITS OF ACCESS REQUEST. /ASSIGN.
L&P				
Scanning probe lithography	1/1/3	DPN 0/0/1 AFML 0/0/2 **T-SPL** 1/1/1	**T-SPL** 2/1	**T-SPL** 6/3
Patterning, replication, and sample navigation	6/6/6	**ICP** 2/0/9 **RIE** 5/5/12 **IBM** 0/2/2 **NIL** 4/2/7 **BCL** 1/1/1 **NOT&P** 1/1/1	**ICP** 5/0 **RIE** 12/6 **IBM** 2/2 **NIL** 6/3 **BCL** 3/2 **NOT&P** 3/3	**ICP** 13/0 **RIE** 45/29 **IBM** 3/8 **NIL** 40/26 **BCL** 24/16 **NOT&P** 6/7
Electron and ion beam lithography	3/3/3	**He-FIB** 2/0/2 **EBL** 6/5/12 **FIB** 5/5/7	**He-FIB** 3/0 **EBL** 19/9 **FIB** 10/6	**He-FIB** 9/0 **EBL** 83/59 **FIB** 36/27
Synchrotron-based lithography	2/2/2	**EUV-IL** 1/1/1 **DXRL** 1/1/2	**EUV-IL** 9/8 **DXRL** 3/1	**EUV-IL** 85/63 **DXRL** 30/12
Photon-based lithography	2/2/4	SM-DWL 0/0/6 UV-IL 0/0/3 **TWL** 2/2/4 **DTL** 1/1/2	**TWL** 8/5 **DTL** 2/2	**TWL** 101/49 **DTL** 10/10

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G&S				
Chemical deposition of thin films	3/3/4	**ALD 4/3/10** **CSD 1/1/2** **CVD 1/1/9** GBM 0/0/5	**ALD 5/5** **CSD 1/1** **CVD 7/1**	**ALD 11/10** **CSD 2/2** **CVD 25/2**
Physical deposition of thin films	5/5/6	**EBE 3/2/4** **MBE 2/2/6** **MS 2/2/7** **PLD 4/3/5** PVD 0/0/3 **TE 1/1/5**	**EBE 8/5** **MBE 8/4** **MS 4/3** **PLD 5/1** **TE 1/1**	**EBE 24/18** **MBE 117/51** **MS 25/21** **PLD 233/166** **TE 1/1**
Soft matter preparation	1/1/1	**SMP 2/2/5**	**SMP 3/2**	**SMP 17/12**
Synthesis of nanoparticles	3/3/5	AD 0/0/1 **CBD 1/1/1** FSP 0/0/1 **GIN 2/1/2** **MICS 1/1/2**	**CBD 4/3** **GIN 8/4** **MICS 6/6**	**CBD 21/17** **GIN 37/17** **MICS 75/75**
Thermal Treatments	3/2/4	**FLA 2/2/3** **SP 1/1/4** SSR 0/0/2 TP 2/0/6	**FLA 4/2** **SP 1/1** TP 2/0	**FLA 6/3** **SP 1/1** TP 5/0
SM Charact				
Scanning probe microscopy	2/2/2	**AFM** 13/8/18 **STM** 3/3/6	**AFM** 51/26 **STM** 19/14	**AFM** 158/83 **STM** 137/110
Electron and ion beam technologies	7/7/7	**SEM** 14/11/17 **TEM** 15/12/14 **Cryo TEM** 2/2/4 **FIB prep** 4/4/4 **APT** 1/1/2 **SIMS** 3/4/5 **IBA** 1/1/1	**SEM** 99/63 **TEM** 75/46 **Cryo TEM** 7/6 **FIB prep** 13/8 **APT** 3/2 **SIMS** 7/5 **IBA** 1/1	**SEM** 372/217 **TEM** 348/247 **Cryo TEM** 21/25 **FIB prep** 50/38 **APT** 24/28 **SIMS** 29/25 **IBA** 3/5
HF magnetic field imaging	1/1/1	**NMR** 1/1/3	**NMR** 1/1	**NMR** 6/6
Dispersed-phases characterisation	5/4/8	**DLS** 2/2/6 **ζ-potential** 1/1/3 WAS 0/0/3 **NPTA** 1/0/1 DCS 0/0/1 **UAC** 1/1/2 AFFF 0/0/1 **MALS** 1/1/1	**DLS** 8/2 **ζ-potential** 5/1 **NPTA** 1/0 **UAC** 2/1 **MALS** 2/2	**DLS** 34/5 **ζ-potential** 8/2 **NPTA** 2/0 **UAC** 6/3 **MALS** 3/4
Light and acoustic microscopy	3/3/6	**CM** 1/1/5 **LSCM** 2/2/3 **NLM** 1/1/1 FM 0/0/4 OAM 0/0/1 OTFM 0/0/3	**CM** 5/2 **LSCM** 5/3 **NLM** 14/10	**CM** 16/8 **LSCM** 24/14 **NLM** 91/54

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Surface/overlayer/interface characterisation	3/3/5	**ITCAM** 2/1/4 **BET** 2/1/3 **PA** 1/1/1 PTRMS 0/0/1 SDI 0/0/1	**ITCAM** 4/2 **BET** 4/3 **PA** 2/2	**ITCAM** 19/8 **BET** 11/5 **PA** 14/14
Neutron characterisation (Methods currently unavailable)	2/2/4	**Neut. Reflect.** 1/1/1 **SANS** 1/1/1 Neut. diffraction 0/0/1 Neut. imaging 0/0/1	**Neut. Reflect.** 1/1 **SANS** 2/2	**Neut. Reflect.** 3/6 **SANS** 8/16
X-ray analysis	7/4/7	**XRD*** 10/9/17 **SAXS*** 5/3/5 **XRT** 1/0/1 **XRM** 2/1/3 **X-ray imaging*** 1/0/2 **EXAFS/XAFS** 1/1/1 **X-ray Reflect*.** 1/0/3	**XRD lab** 52/37 **XRD lsf** 7/6 **SAXS lab** 5/2 **SAXS lsf** 17/9 **XRT** 3/0 **XRM*** 3/2 **X-ray imaging lab** 2/7 **X-ray imaging lsf** 1/0 **EXAFS/XAFS** 1/1 **X-ray Reflect lsf** 1/0	**XRD** lab 172/123 **XRD lsf** 37/36 **SAXS** 22/7 **SAXS lsf** 75/46 **XRT** lsf 9/0 **XRM** lsf 16/12 **X-ray imaging lab** 17/0 **X-ray imaging lsf** 14/0 **EXAFS/XAFS** 6/6 **X-ray Reflect lsf***. 10/0
ECM Charact				
Magnetic Characterization	6/4/6	**MFDC** 3/2/3 **SQUID** 2/1/2 **MT** 2/1/4 **MOKE** 2/1/4 Magnetometry 1/0/4 EPR 1/0/4	**MFDC** 4/4 **SQUID** 6/3 **MT** 8/5 **MOKE** 3/2 Magnetometry 1/0 EPR 2/0	**MFDC** 15/15 **SQUID** 40/25 **MT** 41/27 **MOKE** 17/13 Magnetometry 2/0 EPR 5/0
Neutron Magnetic characterisation	2/1/3	**M-SANS** 1/1/1 MNREFFL 1/0/1 *DNS 0/0/1*	**M-SANS** 1/1 MNREFFL 1/0	**M-SANS** 6/6 MNREFFL 6/0
X-ray/soft-X-ray spectroscopy	4/4/5	**XAS lsf** 6/3/8 **XMCD/XMLD** 6/5/5 **IOS** 2/2/ **DIPROI-FEL** 1/1/1 *IXS 0/0/3*	**XAS lsf** 21/19 **XMCD/XMLD** 15/10 **IOS** 2/2 **DIPROI-FEL** 2/2	**XAS lsf** 106/88 **XMCD/XMLD** 88/61 **IOS** 10/10 **DIROI-FEL** 24/18
Spectro-microscopy techniques	3/3/5	***XPEEM lsf** 5/4/6 **SPELEEM lsf** 4/2/2 **AES/SAM** 1/1/1 *HSI 0/0/1* *MSI 0/0/1*	***XPEEM lsf** 11/4 **SPELEEM lsf** 8/3 **AES/SAM** 3/1	***XPEEM lsf** 54/27 **SPELEEM lsf** 36/17 **AES/SAM** 11/4
Chemical analysis	3/1/3	**ICP-MS** 4/3/2 AT 1/0/1 HPLC 1/0/2	**ICP-MS** 9/5 AT 2/0 HPLC 1/0	**ICP-MS** 43/27 AT 2/0 HPLC 5/0

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Luminescence spectroscopy	6/5/6	**FS** 2/1/3 **ML** 1/1/3 **PL** 4/2/5 **CL** 1/1/3 **FCS** 2/1/1 TR-XRF 1/0/2	**FS** 2/1 **ML** 1/1 **PL** 15/9 **CL** 2/2 **FCS** 5/2 TR-XRF 1/0	**FS** 5/3 **ML** 14/10 **PL** 72/39 **CL** 5/12 **FCS** 39/15 TR-XRF 1/0
Electron spectroscopy	5/4/5	**XPS lab** 12/9/14 **-XPS lsf** 6/6/6 **ARPES lsf** 2/2/6 **-ARPES lab** 1/1/6 **IPES** 2/1/2 UPS 2/0/7 *RESPED-RESPES 0/0/3*	**XPS lab** 40/29 **-XPS lsf** 26/23 **ARPES lsf** 4/3 **-ARPES lab** 1/1 **IPES** 6/2 UPS 4/0	**XPS lab** 146/111 **-XPS lsf** 130/113 **ARPES lsf** 19/8 **A-RPES lab** 14/14 **IPES** 34/14 UPS 9/0
Optical spectroscopy	7/7/7	**Pump-Probe** 3/3/5 **Ellipsometry** 5/3/9 **RS** 9/10/11 **IRS Lab** 1/1/5 *-IRS lsf 0/0/1* **FTIR** 5/3/2 **-FTIR lab** 3/2/12 **OS** 5/3/8 **BLS** 1/1/1	**Pump-Probe** 6/3 **Ellipsometry** 8/4 **RS** 19/14 **IRS Lab** 1/1 *-IRS lsf 0/0* **FTIR** 11/5 **-FTIR lab** 4/2 **OS** 14/6 **BLS** 19/9	**Pump-Probe** 51/17 **Ellipsometry** 29/20 **RS** 72/48 **IRS Lab** 5/4 *-IRS lsf 0/0* **FTIR** 23/17 **-FTIR lab** 10/6 **OS** 47/19 **BLS** 183/73
Ntmm				
Microfabrication	7/7/10	**DWL 3/1/6** I&GLS 0/0/2 **UV-SL 1/1/2** **UVL 4/5/8** **SOTP 1/1/2** **II 1/1/2** CD&P 0/0/2 **STAND. ETCHING** *4/3/10* ECD 0/0/7 **STAND. DEPOS. 2/2/10**	DWL 8/2 **UV-SL 1/1** **UVL 6/5** **SOTP 2/1** **II 2/1** **STAND. ETCHING 7/6** **STAND. DEPOS 2/2**	**DWL 35/10** **UV-SL 6/6** **UVL 15/13** **SOTP 14/8** **II 12/7** **STAND. ETCHING 54/51** **STAND. DEPOS 5/5**
Thick films and coatings	2/1/5	SS&RP 0/0/2 TAPE CASTING 0/0/1 ARC 0/0/2 **SALBL 1/1/1** INK-JET 1/0/2	**SALBL 2/2** INK-JET 1/0	**SALBL 7/8** INK-JET 3/0
3D Shaping	2/1/5	3D MP 1/0/2 SLS 0/0/1 FDM 0/0/1 SLIP CASTING 0/0/1 **LSIVP 1/1/2**	3D MP 2/0 **LSIVP 25/11**	3D MP 5/0 **LSIVP 176/80**

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Synthesis of dispersed phases	3/3/3	**DNP 1/1/2** **EOC 1/1/2** **FF 1/1/2**	**DNP 2/1** **EOC 4/2** **FF 2/1**	**DNP 6/3** **EOC 21/11** **FF 4/6**
2D/3D bioprinting	0/0/2	*3DBP 0/0/1* MS 0/0/2		
In vitro assays and cell analysis	5/4/5	DH 1/0/1 FC 1/1/2 **INA 2/1/2** **CCF 3/1/4** **LCI 1/1/1**	DH 1/0 **FC 2/1** **INA 2/1** **CCF 13/7** **LCI 12/6**	DH 3/0 FC 8/5 **INA 6/5** **CCF 92/54** **LCI 48/21**
Biomolecules and biomaterials analysis	3/3/7	**CD 1/1/1** ELISA-PR 0/0/2 OM 0/0/1 DNAMS 0/0/1 **SPRB 1/1/1** RT PCR 0/0/1 **QCMB 2/1/2**	**CD 1/1** **SPRB 2/1** **QCMB 2/1**	**CD 4/4** **SPRB 7/4** **QCMB 7/4**
Rheology analysis	2/2/3	MM 0/0/1 **THIXOTROPY 1/1/1** **VISCOSITY 1/1/2**	**THIXOTROPY 2/1** **VISCOSITY 2/2**	**THIXOTROPY 2/3** **VISCOSITY 5/5**
Mechanical analysis	2/1/3	**MP 2/1/2** TMP 1/0/1 TDA 0/0/1	**MP 7/2** TMP 1/0	**MP 22/7** TMP 1/0
Thermal analysis	4/2/6	**DSC 1/1/4** **TGA 3/3/3** TC/D 1/0/1 STG-DSC-DTA 0/0/1 HTM 0/0/1 IC 1/0/1	**DSC 2/1** **TGA 7/4** TC/D 2/0 IC 2/0	**DSC 5/3** **TGA 22/20** TC/D 8/0 IC 14/0
Electrical analysis	2/0/5	TP 1/0/1 RF-VNAC 0/0/3 EC 1/0/1 MET 0/0/3 MPET 0/0/1	TP 3/0 EC 2/0	TP 17/0 EC 6/0
T&S				
Structural and ground state electronic properties	1/1/1	**5/6/6**	**20/17**	**11.67/10.5**
Magnetic properties	1/1/1	**2/2/6**	**5/3**	**3.83/1.83**
Excited state properties	1/1/1	**2/2/6**	**10/6**	**8/5**
Multiscale modeling of materials under	1/1/1	**1/1/2**	**8/4**	**8/4**

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extreme irradiation				
Atoms and molecules in motion	1/1/1	**5/3/6**	**14/11**	**8.33/6.67**
Transport properties	1/1/1	**3/2/5**	**4/3**	**2.17/1**

In **bold** those techniques that received requests and were granted access at some provider site

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ANNEX II- TA REDISTRIBUTION

The procedure uses as main parameter the **Access Rate** (AR), which can be defined as the number of UoA per Call. The Access rate value, and in case mitigated values, allows for estimating future access amount, just multiplying the AR by the remaining numbers of Calls. In the full cycle of the project made of 15 Calls for proposals, and at the half period of the 8th Call concluded and evaluated, it is possible to consider and compare the following Access Rate values:

- Grant Agreement AR = total capacity/15 Calls; if a percentage of the capacity is considered, then the Grant Agreement AR is 100%/15 or Grant Agreement AR=1/15
- Achieved Access Rate so far; if X is the amount (%) of access provided up to the 7th Call, it is achieved AR=X/7; the expected value for X after 8 Calls is 8/15
- AR corrected for the Grant Agreement capacity: is the AR to achieve in order to conclude in the remaining 15-8=7 Calls the remaining of the Grant Agreement capacity 1-X: AR to achieve ideally (1-X)/7.

In the frame of the redistribution of the Access and of the request to the provider to "mitigate" the AR (increase for undersubscribed ones and decrease for oversubscribed ones) it is useful to define an **Acceleration Factor** (Facc) as the change in AR from the value X/8 so far achieved to the requested value. The Acceleration Factor is more useful with respect to absolute values, as it provides a change of pace the providers have to implement. Facc is assigned on an analytical basis.

One possibility is to ask to each provider to accelerate (decelerate) the AR in order to spend in the remaining 15-8=7 Calls the remaining of the Grant Agreement capacity 1-X; that is to change the AR from X/8 to (1-X)/7, that is Facc=8/7*(1-X)/X. But such a solution has extreme corrections for extreme performances: for X close to 1 or even bigger than 1 Facc goes to zero or even to negative values; in the former case it practically stops the activity of "good providers" while in the latter case it would ask access "back", which makes no sense. For X close to zero Facc diverges to great values (red curve of the graph)

A second possibility is to ask to each provider to reach the AR 1/15 expected in the Grant Agreement, that is changing AT from X/8 to 1/15, that is Facc=8/15/X. For X close to one Facc ask to "good providers" to drop down the AR more than a factor of two, and still diverges for X close to zero (blue curve of the graph)

Finally. A more relaxed curve can be drawn in the form of Fa = cost + A*exp(-X*b), where the constant cost, A and b are found to get reasonable values of AR in the extreme cases, that is a maximum value of about 2 and a minimum value of about 0.8. This means that for the most undersubscribed providers is asked to double the actual performance, while for the most oversubscribed ones is asked to reduce their performance by a 20% (green curve of the graph).

The total redistribution, in terms of a new capacity for the providers found accordingly to the green curve, is equal to the actual provided access (assigned) plus the access to be provided in the next 7 calls with the new AR corrected by Facc:

Total Capacity= X + X/8*Facc*7 = X/8*8 + X/8*Facc*7 = X/8 * (8+ Facc*7)

The last expression highlights the fact that in the first 8 Calls the AR has been X/8 and that it has to be changed to Facc*X/8 in the next 7 calls.

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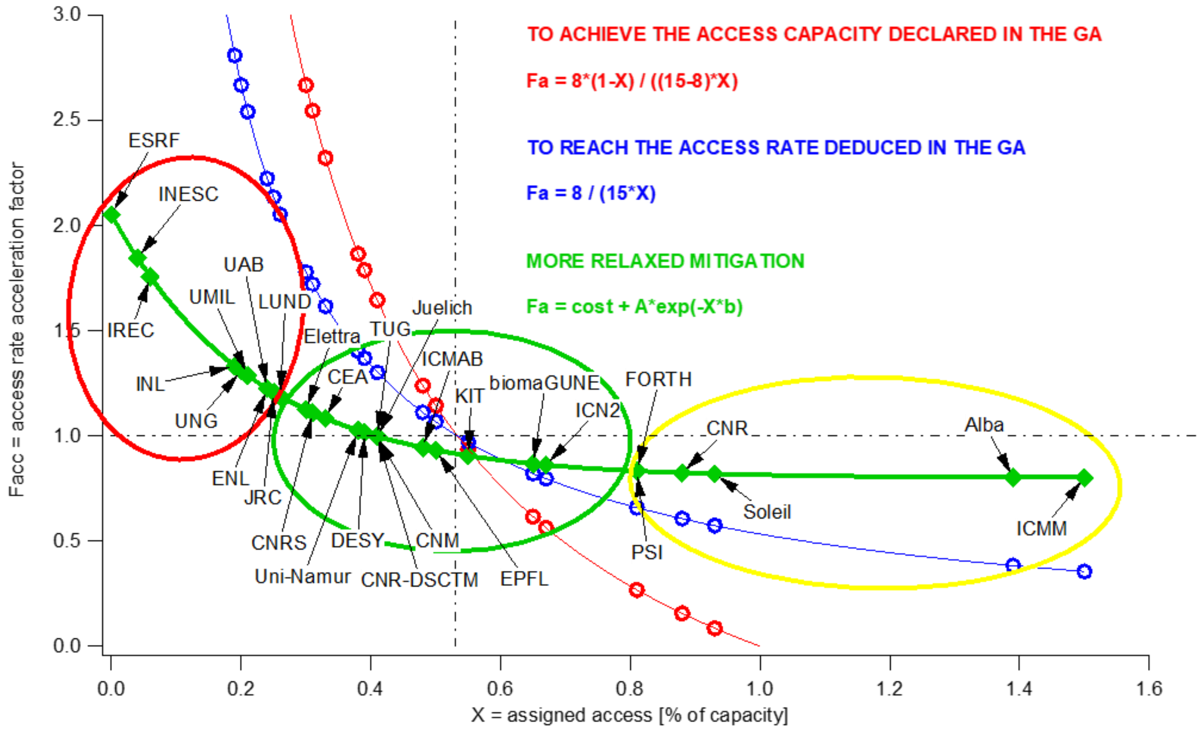
It is worth to note that if no Facc is applied (Facc=1), the total capacity projected with the so far achieved AR (X/8) is found: Projected Total Capacity PrjTotCap= X/8 (8 + 7) = X/8 * 15; only for X=8/15 the Projected Total Capacity is equal to one, which means that everything is in line with the Grant Agreement.



In summary for each installation of each provider the following operations are made:

- Assigned UoA at 8th call X, is used to calculate the actual access rate AR=X/8
- The projected capacity (projected assigned UoA up to the 15th call) is calculated PrjTotCap=X/8*15
- The future access is found by subtracting the actual assigned access X/8*15 – X = X*(15/8- 1) = X/8*7
- For LSF that will shut down, the future access is used as an estimation of access to LSF which will be not available and therefore will be subtracted from these LSF provider and assigned to other providers or new providers providing access to LSF;
- The Acceleration factor is then applied to the future access Facc*X/8*7
- The gran total project capacity is calculated and a normalisation is made to each provider capacity in order to get a total amount of Transnational Access of about 5000 UoA
- The total cost is calculated and compared with the total available budget
- The total TA budget is increased by an amount equal to 2/3 of the available budget of 150.000 for new providers (2/3*150.000=100.000) and the total TA capacity is increased form 4925 UoA to about 5000 UoA
- If the total cost exceeds the available total budget, small rounds down are made to “expensive” providers and small round up to “cheep” providers, in order to get the best compromise between total capacity and total budget.

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ANNEX III- SCIENTIFIC GOALS OF THE USERS PROJECTS

The objectives of the user projects approved after ten calls cover a very wide range of materials and applications.

The *materials systems* considered (not necessarily obtained at NFFA premises – often provided by the users themselves) encompass different types of formats: inorganic (and inorganic-organic composites) films, 2D materials, and different types of nanostructures or nanoobjects, e.g. nanowires, nanoparticles:

- Films, composites: Silicon carbide, 4H-Silicon Carbide membranes, Diamond Like Carbon coatings, nanocolumnar TaZrN coatings, Co based nano-hetero-structured thin films, cobalt oxide - cerium oxide, Thin photoresist materials for Extreme Ultraviolet Lithography, Carbon-silica thin-film modified with metal (Cu, Ag) nanoparticles, silver nanoparticles stabilized with organic molecules, CaMnO3/BaTiO3/LaNiO3 and CaMnO3 thin films, CaxTayO3+δ/SrTiO3 heterostructures, Ge-based halide perovskites, Metal halide perovskite nanostructured films, Fully inorganic perovskite thin films, Block copolymer hyperbolic metamaterials, thin film Nd1-xCox, Ni80Fe20, Co magnets, [Co/Pd]N super-lattice on flexible polyimide substrate, Tantalum Sulfide Selenide (1T-TaS1.2Se0.8), 1T-TaS2, NiO/coumarin films, High Entropy Alloys, novel materials for 4D liquid crystals, topological metal (Cu3Sn), La0.67Sr0.33MnO3 /La0.2Sr0.8MnO3 heterostructures, LSMO thin films, Lanthanium Strontium based perovskite oxides, functional oxides (BiFeO3, ZnO, La0.7Sr0.3MnO3) in polymers matrices (PDMS, PET), covalent organic frameworks of boron-containing molecules, conducting porous scaffolds, biomimetic polymer constructs, PEDOT:PSS/Carbon composites, PEDOT:PSS 3D microstructures, nano-SiC coated CNT/Mg composites, ZPO / TPO (chemical) composite materials, Organic molecules on SiO2 microstructures, BODIPY-phenol thin film, Gd-DLC Coatings and Ionic Liquids, ferroelectric oxides, Ag/ZnO/Al2O3 composites, TBCo/Pt/Co multilayers on Si, Fe2O3 (photoanodes), La:HfO2 (chemical) thin films, SrVO3 thin films, SrIrO3 thin films, Ni-TCNB network on Ag(100), YIG (Yttrium Iron Garnet) thin films, Pt3Te4 metamaterial, Mercaptobenzothiazolate-intercalated Mg-Al layered hydroxide, black phosphorus, Pyrochlore Iridate thin films, ZnTe-zincblende semiconductor
- 2D materials: WS2, MoS2, MoSSe, PtSe2, hexagonal, Two-dimensional porphyrin network, graphene, Fe-TCNB/Gr/Co/Pt(111) on graphene, graphene oxide modified/doped with ZnO or TiO2, graphene oxide membranes, molecule assemblies on graphene superlattices, graphene-hydroxyapatite scaffolds, Ni nanotubes, Ni nanoparticles, Ni-, Fe-, and Co-TCNQ MOF, 2D Fe(x)TaS2 Nanomagnets, N-heterocyclic Olefins (NHOs) monolayers on Au(111), porphyrin molecules deposited on 2 monolayers of MgO atop Fe(100)
- Nanostructures / nanoobjects: SiC nanowhiskers, SiC and FeC nanoparticles, Zn3P2 nanowires, GaAs/AlGaAs heterostructures and nanowires, InAs/GaAs two-dimensional electron gas, Co nanowires, layered magnetic (Ni80Fe20 /Ru(tRu)/ Ni80Fe2) nanowires, ZnO/porous Si nanowires, WOx nanostructured assemblies, hybrid Au-Si nanostructures, self-assembled Co3O4/CoTe2 heterostructures, GaN QW, halide perovskite nanoparticles, silicon oxide nanoparticles, functional oxides nanoparticles (CeO2, ZnO, Fe3O4), oxide nanocomposites (Sr3Al2O6, BiFeO3, CoFe2O4), tin oxyhydroxide, modified carbon nanomaterials, Si & C nanoparticles, Cu and Cu oxide nanoparticles, Cu3N and Cu3N-CNT

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nanoparticles, vanadate and phosphate-molybdate) nanoparticles, metal nanoparticles (Au, Ag, Cu, Pd) and others ($CsPbBr_3$, Cu_2SnS_3), $CsPbBr_3$ and $CsPbI_3$ perovskite nanocrystals, highly P-doped Si nanodots, Glyco-Gold nanoparticles, gold nanoparticles and nanoantennas, gold nanoneedles, gold nanorods, doxorubicin nanogels, Ag nanoparticles, FeRh nanoparticles, V_2O_5 nanorods/nanowires, $ZrSe_3$, FeP nanomaterials, hybrid-plasmonic nanocrystals superlattices, azafullerene C59N, Large area plasmonic nanohole arrays, GaGeTe-nanosheets, LAO and LSMO nanolayers on STO

- Others: liposomes coated MOF, polymeric PLA, PCL, CA / 2.5D (replicas) & 3D scaffolds, epileptic brain tissue, extracellular vesicle, human enamel, "true-to-life" micro- and nanoplastics, 316 stainless steel micro-components, light aluminium alloys, polymer composites, clinoptilolite zeolite

This huge variety of material systems has been studied in relation to several applications such as fundamental phenomena, advanced processing, energy related applications, medical/biotechnology applications, among others:

- Molecular dynamics;
- Wear resistant coatings, corrosion protection, materials welding, lightweight structure metal composites or alloys for aeronautics, automotive or construction; microforming of metallic part for aerospace;
- Electrocatalysis / photocatalysis / thermocatalysis;
- 3D printing, advanced EUV lithography (micro-nanoelectronics);
- Light emitting diodes, lasers, Optoelectronics, nonlinear optical systems, single photon sources, light responsive microactuators;
- Spintronics, nanomagnetism, magnonic-based logic architectures; magnetoelectricity; High-speed electronics, future electronic devices, oxide electronics, topological materials, data storage devices and transistors, memory devices;
- Quantum technologies (spin qubits and quantum memories, quantum light sources for quantum information processing, Valleytronics devices);
- Neuromorphic computing;
- Power electronics (e.g. electric vehicles);
- Energy devices (e.g batteries, supercapacitors, solid oxide fuel cells, photovoltaics, thermoelectrics, water electrolysis/hydrogen generation);
- Ultrasensitive gas sensing, responsive surfaces and sensors, sensors for pollutant analysis in water, radiation sensors, eco-friendly processing of advanced materials for applications in the agri-food industry and desalination, harsh environment sensors, interstellar icy dust grain studies, heavy metal separation, Optical biosensing and biomedical applications (e.g. 3D tissue engineering models and organ/membranes-on-chip for in vitro toxicology), biosensing for healthcare and food safety, drug delivery, theragnostic applications, bioelectronic interfacing, neural interfaces, dentistry, artificial joint replacement, pathophysiology of epilepsy

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ANNEX IV – TECHNIQUE GLOSSARY

	ACRONYM	FULL NAME
L&P		
Scanning probe lithography	DPN AFML T-SPL	Dip Pen Nanolithography Atomic Force Microscopy Lithography Thermal-Scanning Probe Lithography
Patterning, replication, and sample navigation	RIE ICP IBM NIL BCL NOT&P	Reactive Ion Etching Inductively Coupled Plasma Etching Ion Beam Milling NanoImprint Lithography Block Copolymer Lithography Nano Object Transfer and Positioning
Electron and ion beam lithography	He-FIB EBL FIB	He-Focused Ion Beam & He Microscopy Electron Beam Lithography Focused Ion Beam
Synchrotron-based lithography	EUV-IL DXRL	Extreme Ultra Violet – Interference Lithography Deep X-ray Lithography
Photon-based lithography	TWL SM-DWL UV-IL DTL	Two Photon Lithography Sub-micron Direct Writing Lithography Ultra Violet – Interference Lithography Displacement Talbot Lithography
G&S		
Chemical deposition of thin films	ALD CSD CVD GBM	Atomic Layer Deposition Chemical Solution Deposition Chemical Vapor Deposition Graphene-based materials
Physical deposition of thin films	TE EBE MBE PLD MS PVDS	Thermal Evaporation e-beam evaporation Molecular Beam Epitaxy Pulsed Laser Deposition Magnetron Sputtering Physical Vapor Deposition by Sputtering
Soft matter preparation	SMP	Soft Matter Preparation
Synthesis of nanoparticles	CBD GIN MICS AD FSP	Cluster Beam Deposition Growth of Inorganic Nanocrystals Multiple Ion Cluster Source Aerosol Deposition Flame Spray Pyrolysis
Thermal Treatments	FLA TP SP SSR	Flash Lamp Annealing Thermal Processes Sintering Processes Solid State Reaction

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SM Charact		
Scanning probe microscopy	AFM STM	Atomic Force Microscopy Scanning Tunnelling Microscopy
Electron and ion beam technologies	SEM TEM Cryo TEM FIB prep APT SIMS IBA	Scanning Electron Microscopy Transmission Electron Microscopy Cryo-TEM Focused Ion Beam preparation Atomic Probe Tomography Secondary Ion Mass Spectroscopy Ion Beam Analysis
HF magnetic field imaging	NMR	Nuclear Magnetic Resonance
Dispersed-phases characterisation	DLS ζ-potential WAS NPTA DCS UAC AFFF MALS	Dynamic Light Scattering ζ-potential Wide Angle Static and Laser Diffraction Nanoparticle Tracking Analysis Disk Centrifuge Sedimentation Analytical Ultra centrifuge Asymmetric Field Flow Fractionation Multiangle Light Scattering
Light and acoustic microscopy	CM LSCM NLM FM OAM OTFM	Confocal Microscopy LSCM Laser Scanning Confocal Microscopy NLM Non-linear microscopy Fluorescence microscopy Optoacoustic microscopy Optical Thin Film Metrology
Surface/overlayer /interface characterisation	ITCAM BET PA PTRMS SDI	Interfacial Tension and Contact Angle Measurement Brunnaer-Emmett-Teller method Permeability Analysis Proton Transfer Reaction Mass Spectrometry Surface Direct Inspection
Neutron characterisation	NR SANS ND NI	Neutron Reflectivity Small Angle Neutron Scattering Neutron Diffraction Neutron Imaging
X-ray analysis	XRD SAXS XRT XRM XRI EXAFS/XAFS XRR	X-ray Diffraction Small Angel X-ray Scattering X-ray Tomography X-ray Microscopy X-ray imaging Extended X-ray Absorption Fine Structure X-ray Reflectivity
ECM Charact		
Magnetic Characterization	MFDC SQUID MT Magnetometry MOKE EPR	Magnetic/Ferroelectric/Dielectric Characterization Superconducting Quantum Interference Device Magneto-Transport Magnetometry Magneto-Optic Kerr Effect Electron Paramagnetic Resonance

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Neutron Magnetic characterisation	M-SANS MNREFL DNS	Magnetic-Small Angle Neutron Scattering MNREFFL Magnetic Neutron Reflectivity Diffuse Neutron Scattering
X-ray/soft-X-ray spectroscopy	XAS lsf XMCD/XMLD IOS IXS DIPROI-FEL	X-ray Absorption Spectroscopy X-ray Magnetic Circular/Linear Dichroism In-Operando Spectroscopy Inelastic X-ray Scattering Coherent Diffraction Imaging @ Free Electron Laser
Spectro-microscopy techniques	AES/SAM HSI MSI XPEEM lsf SPELEEM lsf	Scanning Auger Microscopy Hyperspectral Imaging Multispectral Imaging X-ray Photoemission Electron Microscopy Spectroscopy Photoemission & Low Energy Electron Microscopy
Chemical analysis	ICP-MS AT HPLC	ICP-Mass Spectroscopy Automated Titration High Performance Liquid Chromatography
Luminescence spectroscopy	FS ML PL CL FCS TR-XRF	Fluorescence Spectroscopy Microluminescence Photoluminiscence Cathodoluminescence Fluorescence Correlation Spectroscopy Total Reflection X-ray Fluorescence Spectrometer
Electron spectroscopy	XPS ARPES lsf UPS IPES RESPED-RESPES	X-ray Photoemission Spectroscopy Angle Resolved Photoemission Spectroscopy Ultraviolet Photoemission Spectroscopy Inverse Photoemission Spectroscopy Resonant Photoemission Spectroscopy/Diffraction
Optical spectroscopy	Pump-Probe Ellipsometry RS FTIR OS BLS UHV-RAIRS	Pump-Probe Spectroscopy Ellipsometry Raman Spectroscopy Fourier Transform Infrared Spectroscopy Optical Spectroscopy BLS 13/6 UHV-Reflection Absorption Infrared Spectroscopy
Ntmm		
Microfabrication	DWL I&GLS UV-SL UVL SOTP II CD&P STAND. ETCHING ECD STAND. DEPOS.	Direct Writing Lithography I & g-line Steppers Ultraviolet Soft Lithography Ultraviolet Lithography Silicon Oxidation and Thermal Processes Ionic Implantation Chip Dicing and Packaging Standard Etching Electrochemical Deposition Standard Deposition
Thick films and coatings	SS&RP TAPE CASTING ARC SALB	Screen Stencil & Roller Printer Tape Casting Automated Rod Coater Spray Assisted Layer by Layer

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	INK-JET	Ink-Jet Printing
3D Shaping	3D MP SLS FDM SLIP CASTING LSIVP	3D Microprinting Selective Laser Sintering Fused Deposition Modeling Slip Casting Laser Surface and in-Volume Patterning
Synthesis of dispersed phases	DNP EOC FF	Dispersion of Nanoparticles Engineering of Colloids Formulation of Fluids
2D/3D bioprinting	3DBP MS	3D Bioprinting Microspotter
In vitro assays and cell analysis	DH FC INA CCF LCI	Digital Holography Flow Cytometry In-vitro Assays Cell Culture Facilities Live Cell Imaging
Biomolecules and biomaterials analysis	CD OM DNAMS SPRB RT PCR QCMB ELISA-PR	Circular Dichroism Optical Manipulation DNA Microarray Scanner Surface Plasmon Resonance Biosensor Real-Time Polymerase Chain Reaction Quartz Crystal Microbalance Enzyme-Linked Immunosorbent Assay Plate Reading
Rheology analysis	MM THIXOTROPY VISCOSITY	Mechanical Moduli THIXOTROPY Viscosity
Mechanical analysis	MP TMP TDA	Mechanical Properties Thermo-mechanical Properties Thermo-Dilatometric Analysis
Thermal analysis	HTM IC DSC TGA TC/D STG-DSC-DTA	High Temperature Microscopy Isothermal Calorimetry Differential Scanning Calorimetry Thermo-gravimetric Analysis Thermal Conductivity/Diffusivity Simultaneous Thermogravimetric/differential calorimetry
Electrical analysis	TP RF-VNAC EC MET MPET	Thermoelectric Properties Radio Frequency Vector Network Analysis Electrochemical Characterization Microprobe Electrical Testing Mercury Probe Electrical Testing
T&S		
Structural and ground state electronic properties	SGSEP	Structural and ground state electronic properties
Magnetic properties	MP	Magnetic properties
Excited state properties	ESP	Excited state properties
Multiscale modeling of	MMMEI	Multiscale modeling of materials under extreme irradiation

materials under extreme irradiation		
Atoms and molecules in motion	AMM	Atoms and molecules in motion
Transport properties	TP	Transport properties

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