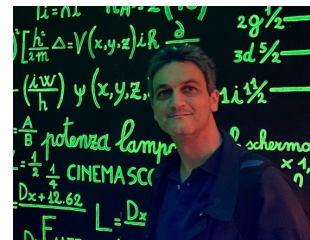


Europass Curriculum Vitae

Personal information

Name / Surname **MACCHI, Andrea**
 Personal Email andrea.macchi@ino.cnr.it
 Nationality Italian
 Date of birth September 05, 1970



Professional information

Present position **Senior research scientist**, permanent (*primo ricercatore, secondo livello, TI*),
 Consiglio Nazionale delle Ricerche, Istituto Nazionale di Ottica (CNR/INO), Pisa, Italy.

web page www.andreamacchi.eu
 ORCID 0000-0002-1835-2544
 Web of Science ResearcherID B-1900-2009
 Scopus ID 7006542747

Degrees

Degree **Habilitation**
 Qualification awarded National Scientific Habilitation ("*Abilitazione scientifica nazionale*") as 1st level Professor (*Professore di prima fascia*) in Italian Universities
 Awarding organization Italian Ministry for University and Research (MIUR)
 Attainment date May 2019

Degree **Habilitation**
 Qualification awarded National Scientific Habilitation ("*Abilitazione scientifica nazionale*") as 2nd level Professor (*Professore di seconda fascia*) in Italian Universities
 Awarding organization Italian Ministry for University and Research (MIUR)
 Attainment date December 2013

Degree **Ph.D. (Dottorato di Ricerca)**
 Qualification awarded Ph.D degree in **Physics** (*Diploma di Perfezionamento in Fisica*, equipollente al Dottorato di Ricerca, legge n. 308/1986)
 Awarding Organization Scuola Normale Superiore, Pisa, Italy
 Thesis "Superintense Laser-Solid Interaction" (in English)
 Classification With honors (70/70 *summa cum laude*)
 Attainment date November 05, 1999

Degree **M.Sc. (Laurea)**
 Qualification awarded M.Sc. degree in **Physics**

Awarding organization Università di Pisa, Pisa, Italy
Thesis “Spettroscopia di riga dell’emissione X dei plasmi prodotti da laser” (in Italian)
Classification With honors (110/110 *summa cum laude*)
Attainment date March 17, 1995

Positions held

01/11/2019– to date **Senior research staff scientist** (*primo ricercatore, livello II*)
Employer Consiglio Nazionale delle Ricerche, Istituto Nazionale di Ottica, (CNR/INO)

01/02/2010–31/10/2019 **Research staff scientist** (*ricercatore, livello III*)
Employer Consiglio Nazionale delle Ricerche, Istituto Nazionale di Ottica, (CNR/INO)

01/08/2003–31/01/2010 **Research staff scientist** (*ricercatore*)
Employer INFN (the National Institute for the Physics of Matter, part of CNR since 2005).
(Affiliated to the regional laboratory polyLAB of CNR/INFN at the Department of
Physics, University of Pisa, from 2005 to 2009)

01/06/2000–31/07/2003 **Postdoctoral Researcher**
Employer Department of Physics, University of Pisa, Italy (advisor: Prof. Fulvio Cornolti)

01/09/1998–31/05/2000 **Postdoctoral Researcher**
Employer Group of Theoretical Quantum Electronics, Institute for Advanced Physics, Darm-
stadt University of Technology, Darmstadt, Germany (advisor: Prof. Peter Mulser),
supported by the European TMR Network SILASI (No.ERBFMRX-CT96-0043)

01/01/1996–31/12/1998 **Ph.D. studentship**
Employer Scuola Normale Superiore, Pisa, Italy (advisors: Prof. Fulvio Cornolti, Prof.
Francesco Pegoraro)

Visiting positions

01/05/2008–31/08/2008 **International Research Fellow**
Host School of Mathematics and Physics, Queen’s University of Belfast, UK.

01/08/2015–31/08/2015 **Visiting Researcher**
Host Nuclear Engineering & Applied Physics Dept., Chalmers University of Technology,
Gothenburg, Sweden.

Several short visits to Universities and Research centers including: Max Planck Institute for Nuclear Physics, Heidelberg, Germany; Institute of Physics, Rostock University, Germany; Université Pierre et Marie Curie–La Sorbonne, Paris, France.

Awards and recognitions

Award **Predhiman Kaw legacy award** for plasma physics and fusion studies
(www.predhimankaw.in), received on June 21, 2021

Award **CNR award** (“incentivazioni al personale anno 2005”) for the work (published in 2005)
on the use of circularly polarized laser pulses to accelerate ions (date awarded:
09/10/2009, prot. 0071013)

Services

Date June 2020–to date
Role Member of **Editorial Board**, New Journal of Physics: in charge for selecting reviewers
and provide recommendations on manuscripts.

Date	September 2018–to date
Role	Member of Editorial Board , The European Physical Journal Plus: in charge for selecting reviewers, taking final editorial decisions on manuscripts, promoting and managing special issues [see A. Macchi & O. M. Maragò, The European Physical Journal Plus 136 , 1-3 (2021)].
Date	2013–2016
Role	Member of Scientific Advisory Committee , CILEX-APOLLON project (France): participation to periodic meetings to monitor and report on the project development.
Date	2010-2013
Role	Elected member of the Council (<i>Consiglio d'Istituto</i>) of CNR/INO .
Date	2009-2015
Role	Participation to conference committees: Program committee (“beam plasma” section), 36th European Physical Society Conference in Plasma Physics, 2009; international advisory board , COULOMB09 workshop "Ions Acceleration with High Power Lasers: Physics and Applications" (Senigallia, Italy), June 2009; international advisory board for ALPA 2015 - Applications of Laser-driven Particle Acceleration international symposium, Venezia, Italy, November 19-21, 2015.
Date	2009-2020
Role	Reviewer/Panel member for the evaluation of research proposals/applications: <ul style="list-style-type: none"> - European Commission (EC): Horizon 2020 Research Infrastructure calls, proposal evaluation for H2020-INFRADEV-2019-3 (2019) & HORIZON-INFRA-2022-DEV-01 (2022), project reporting for H2020-INFRADEV-2019-2 (2022). - European Research Council (ERC) : ERCEA.B.4 Physical Sciences and Engineering, Consolidator Grant Call (2019); panel “Fundamental Constituents of Matter”; Starting Grant (2022). - Swiss National Science Foundation: proposal evaluation (2022). - Ministry of Education and Science of the Russian Federation (MESRF): Mega-grants Program (2019, 2020). - Multi-Organization Institute for Cancer (ITMO Cancer) of the French National Alliance for Life and Health Sciences (AVIESAN) & French National Cancer Institute (INCa) – France: Initiative “Plan Cancer” (2019, 2020). - Foundation for the Advancement of Theoretical Physics (BASIS), Russia: “Leader” & “Junior Leader” competitions (2017, 2019). - Czech Science Foundation (CSF), Czech Republic: Junior Research projects (2009, 2011), generic projects (2019) - Deutsche Forschungsgemeinschaft (DFG), Germany: generic projects (2018, 2021). - Italian Ministry of University and Research (MIUR), Italy: PRIN projects (2009,2011), FARE projects (2016), “Rita Levi Montalcini” projects (2017, 2018) - Agence Nationale de la Recherche (ANR), France: Appel à projet Retour Post-Doctorants (2011) & Appel à projets générique (2015, 2016) - Executive Agency for Higher Education, Research, Development and Innovation Funding – UEFISCDI, Romania: generic projects (2012, 2016, 2020, 2021); - Helmholtz Association, Germany: Helmholtz Young Investigator Groups (2013). - Shota Rustaveli National Science Foundation, Georgia: generic projects (2011). - U.S. Department Of Energy (DOE), USA: “High Energy Density Plasmas” program (2009)
Date	2012 & 2016
Role	Evaluator for the National Agency for the eValuation of University and Research (AN-VUR), Italy (2012 & 2016).

Date 1999–
 Role **Referee/Reviewer** for about 40 international peer reviewed journals, including Physical Review Letters, Physical Review (A, B, E, ST-AB, X, Applied), Nature Physics, Nature Communications, New Journal of Physics, Applied Physics Letters, Communications Physics, Journal of the Optical Society of America B, Journal of Physics (A, B, D), Medical Physics, Nuclear Fusion, Optics Express, Physics of Plasmas, Plasma Physics and Controlled Fusion, Proceedings of the Royal Society A, Scientific Reports.
 See the Web of Science profile for full list of journals and reviews
 Recognized as
 - **Top Reviewer in Physics** by Web of Science (2019)
 - **Outstanding Referee** of the American Physical Society (2015)
 plus several yearly recognitions by specific journals.

Date 2014–to date
 Role **Ph.D. Thesis Referee**
 - Ph.D. Dissertation Award Selection Committee member, American Physical Society, Division of Physics of Beams (APS-DPB), 2019.
 - referee of Ph.D theses (either anonymous or not) for the Chalmers University of Technology, Gothenburg (2022), Homi Bhabha National Institute, Mumbai (2022), Hebrew University of Jerusalem (2019), Université de Bordeaux(2018), Università di Roma 1 La Sapienza (2018), Université Paris-Sud (2014).

Research activity

Theme **Radiation pressure acceleration**
 With my group in Pisa I have shown in 2005 that the use of circularly polarized pulses may lead to a laser-plasma interaction regime dominated by radiation pressure acceleration (RPA), characterized by high conversion efficiency in multi-MeV ions; this highly cited paper [A. Macchi et al, Phys. Rev. Lett. **94**, 165003 (2005); recognized by CNR with a research award in 2009] has stimulated much theoretical and experimental work (on my side I proposed a scheme for a sub-femtosecond source of fusion neutrons based on RPA [A. Macchi, Appl. Phys. B: Laser & Optics **82**, 337 (2006)]). When using ultrathin foil targets (“light sail” scheme), RPA has the potential to drive ions up to hundreds of MeV energy as required for advanced applications, e.g. in ion beam therapy; I have contributed to this topic by another highly cited paper unfolding key aspect of the physics of the light sail at ultra-high intensities [A. Macchi et al, Phys. Rev. Lett. **103**, 085003 (2009)]. I have also participated to the design, modeling and interpretation of experiments on RPA [S. Kar et al, Phys. Rev. Lett. **100**, 225004 (2008); **109**, 185006 (2012); C Scullion et al, Phys. Rev. Lett. **119**, 054801 (2017)]. The most recent work which I contributed to [A. McIlvenny et al, Phys. Rev. Lett. **127**, 194801 (2021)] was covered in Physics Today, Physics (APS magazine), Physics World and mentioned on several newspapers for its possible relevance to FLASH therapy.

Theme **High field and ultrafast plasmonics**
 I have coordinated two experiments (sponsored by LASERLAB-EUROPE) at the CEA/SLIC facility in Saclay (France) which provided experimental evidence of laser excitation of relativistic surface plasmons (SP) at optical frequencies in grating targets via related enhanced absorption [T. Ceccotti et al, Phys. Rev. Lett. **111**, 185001 (2013)] and electron acceleration [L. Fedeli et al, Phys. Rev. Lett. **116**, 015001 (2016)]. More recently we showed that high harmonic emission in the XUV region can be also enhanced by SPs [G. Cantono et al, Phys. Rev. Lett. **120**, 264803 (2018)]. This pioneering work suggests that concept and schemes of plasmonics may be extended in a nonlinear regime of ultrahigh laser fields and relativistic electron dynamics. Stimulated by the above described work on SP driven by femtosecond laser pulses, we proposed a concept to obtain surface polaritons with near-single cycle duration [F. Pisani et al, ACS Photonics **5**, 1068 (2018)] which was recently extended to the high field regime [S. Marini et al, Phys. Rev. E **103**, L021201 (2021)].

Theme	<p>Giant unipolar pulses on metal surfaces</p> <p>Within my collaboration since 2005 with the Queen's University of Belfast (QUB), I have contributed to the interpretation and modelization of giant current pulses, of k-Ampere intensity and picosecond duration, observed after the high-intensity irradiation of metal targets. We showed that such pulses are generated due to the rapid escape of a large amount of charge in vacuum [K. Quinn et al, Phys. Rev. Lett. 102, 194801 (2009); highlighted as Editor's suggestion]. Within the same collaboration, recently such unipolar pulses have been exploited to develop a novel concept of a compact, all-optical scheme for the manipulation of a laser-accelerated proton pulse [S. Kar et al, Nature Communications 7, 10792 (2016)]. Other groups are exploiting the concept for the generation of intense pulses in the THz domain.</p>
Theme	<p>Radiation friction</p> <p>Within a collaboration with the Max-Planck Institute of Nuclear Physics, my group has been amongst the first to explore radiation friction (RF) effects in ultraintense laser-plasma interactions, in particular proposing a simple method to implement RF in laser-plasma simulations [M. Tamburini et al, New J. Phys. 12, 123005 (2010)] which has been later used by several groups, including some active in plasma astrophysics. More recently I have shown how RF may lead to a peculiar form of the Inverse Faraday Effect [T. Liseykina et al, New J. Phys. 18, 072001 (2016); fast track communication highlighted as news on Physics World and other scientific magazines online] providing both a test bed of RF physics and a way to generate ultra-intense (Gigagauss) magnetic fields in forthcoming experiments on laser facilities such as the Extreme Light Infrastructure (ELI), APOLLON, XCELS or VULCAN-10 PW, all in an advanced development stage.</p>
Theme	<p>Ion acceleration and proton probing investigations</p> <p>In addition to my work on RPA, I have promoted and participated to several theoretical and experimental investigations on laser-driven acceleration of ions: my leading role in this field has been recognized by an invited review paper on Review of Modern Physics [A. Macchi et al, Rev. Mod. Phys. 85, 751-793 (2013)], other short reviews in journals and books, and several invited overview talks and lectures. In addition, within my collaboration with QUB I have contributed to the modelization and interpretation of several laser-plasma phenomena (e.g. laser beam self-channeling, magnetic field generation, coherent electromagnetic structures) observed thanks to the use of laser-driven proton beams as a time- and space resolved probe of EM fields [L. Romagnani et al, Phys. Rev. Lett. 95, 195001 (2005); 105, 175002 (2010); S. Kar et al, New J. Phys. 9, 402 (2007); K. Quinn et al, Phys. Rev. Lett. 108, 135001 (2012); G. Sarri et al, Phys. Rev. Lett. 109, 205002 (2012)].</p>
Theme	<p>Ultrafast ionization</p> <p>During my Ph.D. and post-doctoral period I have been interested in the modeling of phenomena related to ultrafast field ionization of many-electron systems (from heavy atoms to macromolecules, clusters and plasmas). Examples from this activity are the study of the generation of steady magnetic fields as the result of transient ionization [A. Macchi et al, Phys. Rev. E 59 (R) 36 (1999)] and the unfolding of the collective mechanism of "ionization ignition" in clusters [D. Bauer & A. Macchi, Phys. Rev. A 68, 033201 (2003)].</p>
Theme	<p>Absorption and fast electron generation in laser-solid interactions</p> <p>The other main activity of my Ph.D. and post-doctoral period has been devoted to the study of the mechanism of laser absorption and generation of "fast" relativistic electrons in the interaction with solid-density targets. Using for the first time in this context Vlasov-Euler simulations, we evidenced the effect of large scale surface deformations [H. Ruhl, A. Macchi et al, Phys. Rev. Lett. 82, 2095 (1999)]; later, using PIC simulations we showed that small scale deformations appear as the result of a parametric process involving surface waves [A. Macchi et al, Phys. Rev. Lett. 87, 205004 (2001); Phys. Plasmas 9, 1704 (2002)]. This work was also relevant to the "fast ignition" concept in inertial confinement fusion and was presented by myself, along with an overview of the Italian activity in this field in an invited talk and paper at the IAEA conference [A. Macchi et al, Nucl. Fusion 43, 362 (2003)].</p>

Research grants

This list includes projects for which I received substantial funding and I was either the (principal investigator (PI) or the local coordinator of a research unit within collaborative project. Not included are several other projects as PI awarding access to experimental and supercomputing facilities, providing e.g. beamtime, computing time, and support fundings for participants.

Project Acronym	LaShoWa
Project name	“Laser-Driven Shock Waves”
Project type	PRIN (“research program of national interest”) – collaborative project between Italian research institutions
Time period	04/02/2014-03/02/2017
Awarding organization	Italian Ministry of University and Research (MIUR)
Project ID	MIUR 2012AY5LEL
Role	Local coordinator of one of the two research units
Budget	total 214.884 Euros, local 107.441 Euros
Project Acronym	SULDIS
Project name	“Superintense Laser-Driven Ion Sources”
Project type	FIRB “Futuro in Ricerca” – collaborative project between Italian research institutions, reserved to early stage researchers
Time period	01/12/2010-01/12/2014
Awarding organization	Italian Ministry of University and Research (MIUR)
Project ID	FIRB_RBFR08T5UN_003
Role	Local coordinator of one of the two research units
Budget	total 439.000 Euros, local 67.200 Euros
Project Acronym	SWILAP
Project name	“Surface Wave Induced Laser Absorption in Plasmas”
Project type	CNR-CNRS bilateral project for scientific collaboration and exchange of researchers
Time period	01/01/2010-01/01/2012
Awarding organization	CNR (Italy) and CNRS (France)
Project ID	MD.P03.034/MD.P03.034.001 (CNR identifier)
Role	Italian partner unit coordinator
Budget	total 8000 Euros, local 5.904,65 Euros
Project Acronym	SION
Project name	“Laser-driven pulsed sources of ions and neutrons”
Project type	CNR “Ricerca Spontanea a Tema Libero” project for “curiosity-driven” research
Awarding organization	CNR (Italy)
Project ID	535
Date awarded	29/11/2007
Role	Principal Investigator
Budget	9000 Euros

Publications

Metrics	Complete lists of peer reviewed publications and citation data available at: https://www.webofscience.com/wos/author/record/172255 (Web of Science) , http://www.scopus.com/authid/detail.url?authorId=7006542747 (SCOPUS), http://scholar.google.it/citations?user=P5RtCW4AAAAJ (Google Scholar). (at 17/01/2023)
ISI Web of Science	H-index=34, Hc-index=18, G-index=67, total publications=120, total citations=4743
SCOPUS	H-index=35, total publications=132, total citations=5000 (without self-citations: H-index=34, total citations=4612)
Google Scholar	H-index=40, i10-index=75, total citations=6919 (since 2018: H-index=24, i10-index=51, total citations=2840)

Six most cited publications

ISI-Wos data with **total citations** (the second number excludes **self-citations** defined as citations from papers of which I am a coauthor) including the **Impact Factor** (IF) of the journal. The asterisk (*) indicates an **Highly Cited Paper** according to ISI-Wos (“top 1% of the academic field of Physics”).

961* (934): Andrea Macchi, Marco Borghesi, Matteo Passoni, *Ion acceleration by superintense laser-plasma interaction*, *Reviews of Modern Physics* **85**, 751-793 (2013). IF=**42.860**

461 (418): A. Macchi, F. Cattani, T. V. Liseikina, F. Cornolti, *Laser acceleration of ion bunches at the front surface of overdense plasmas*, *Physical Review Letters* **94**, 165003 (2005). IF=**7.489**

269(254): Andrea Macchi, Silvia Veghini, Francesco Pegoraro, *Light Sail Acceleration Reexamined*, *Physical Review Letters* **103**, 085003 (2009). IF=**7.328**

236 (225): L. Romagnani, J. Fuchs, M. Borghesi, P. Antici, P. Audebert, F. Ceccherini, T. Cowan, T. Grismayer, S. Kar, A. Macchi, P. Mora, G. Pretzler, A. Schiavi, T. Toncian, O. Willi, *Dynamics of electric fields driving laser acceleration of multi-MeV protons*, *Physical Review Letters* **95**, 195001 (2005). IF=**7.489**

224* (212): S. Kar, K. F. Kakolee, B. Qiao, A. Macchi, M. Cerchez, D. Doria, M. Geissler, P. McKenna, D. Neely, J. Osterholz, R. Prasad, K. Quinn, B. Ramakrishna, G. Sarri, O. Willi, X. Y. Yuan, M. Zepf, M. Borghesi, *Ion acceleration in multispecies targets driven by intense laser radiation pressure*, *Physical Review Letters* **109**, 185006 (2012). IF=**7.943**

186 (179): M. Tamburini, F. Pegoraro, A. Di Piazza, C. H. Keitel, A. Macchi, *Radiation Reaction Effects on Radiation Pressure Acceleration*, *New Journal of Physics* **12**, 123005 (2010). IF=**3.849**

Books

This list only includes books of I am author or co-author of the whole content: it does not include chapters in books or collections.

A. Macchi, G. Moruzzi, F. Pegoraro, *Problems in Classical Electromagnetism* (Springer, 2017), ISBN 978-3-319-63132-5 (hardcopy), ISBN 978-3-319-63133-2 (e-book).

A. Macchi, *A Superintense Laser-Plasma Interaction Primer* (Springer, 2013), ISBN 978-94-007-6124-7 (print), 978-94-007-6125-4 (e-book).

A. Macchi, G. Moruzzi, F. Pegoraro, *Problemi di Elettromagnetismo Classico* (Pisa University Press, 2012) ISBN 88-8492-414-6 [in Italian].

Other publications

This list includes “overview” or commentary papers upon invitation, usually reviewed by the Editors. Not included are several tens of conference proceedings.

- Andrea Macchi and Francesco Pegoraro, *Instability yields bright gamma emission*, *Nature Photonics* **12**, 314-315 (2018)

- Andrea Macchi, *Viewpoint: Intense Laser Sheds Light on Radiation Reaction*, *Physics* **11**, 13 (2018).

- D. Giulietti, A. Macchi, *Laser superintensi per tutti*, *Il Nuovo Saggiatore* **23**, n.3-4, 76-84 (2007).

Invited Talks & Seminars

This list only includes a selection of **invited talks** to international conferences and scientific events, **lectures** in schools, and **seminars** in research institutions **in the last two years**. In total, I have given **24 invited talks/lectures** and **>50 contributed talks and seminars** in several universities and research institutions worldwide. Full list available at <http://www.df.unipi.it/~macchi/talks.html>

Date	29/12/2022
Title	<i>Surfin' the Surface Wave: a New Approach to Plasma-based Acceleration</i>
Conference	International Conference on Plasma Science and Applications (ICPSA22) E-conference
Date	11/10/2022
Title	<i>Coherent Laser-Plasma Acceleration: Examples and Recent Results</i>
Conference	AAPPS-DPP2022 E-conference
Date	05/10/2022
Title	<i>Laser-Plasma Ion Acceleration</i>

School	ELI-NP Autumn School 2022, Extreme Light Infrastructure - Nuclear Physics, Magurele, Romania.
Date	20/06/2022
Title	<i>Advanced Concepts of Laser-Driven Ion Acceleration & Basic Phenomena of Superintense Laser-Plasma Optics</i>
School	47th International Nathiagali Summer College, Islamabad, Pakistan.
Date	21/06/2021
Title	<i>Laser-Plasma Acceleration in a Skin Layer</i>
Seminar	Indian Institute of Technology, Delhi, India, in the occasion of the 2020 Predhiman Kaw Legacy Award in plasma physics.
Date	18/06/2021
Title	<i>Plasma Waves in a Different Frame: a Tutorial for Plasma-based Electron Accelerators</i>
Seminar	LPA online seminar (https://indico.physik.uni-muenchen.de/event/46/)

Supervisions

Post-doctoral	3 supervisions completed since 2012
Ph.D. (<i>Dottorato</i>)	5 supervisions/co-supervisions completed since 2010
M.Sc. (<i>Laurea Magistrale</i>)	18 supervisions completed since 2002, all at the Department of Physics, University of Pisa.

Teaching

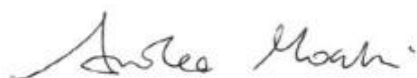
Date	2011
Institution	University of Salamanca, Spain
Program	Master Program in “Laser Physics and Technology”
Course(s)	“An Introduction to Ultraintense Laser-Plasma Interactions”, 10 hours
Date	2009–
Institution	Department of Physics Enrico Fermi, University of Pisa
Program	graduate (<i>Laurea specialistica/magistrale</i>) and Ph.D. programs in Physics
Course(s)	Electrodynamics of continuum media (36 hours, 2019–); Plasma Physics C (36 hours, 2013-2019); Low-Temperature Plasmas (24 hours, 2009-2012); Relativistic Plasmas (36 hours, 2009-2013)
Date	2002–
Institution	Department of Physics Enrico Fermi, University of Pisa
Program	undergraduate (<i>Laurea/laurea triennale</i>) program in Physics
Course(s)	Physics 2 – introductory classical electrodynamics, theory classes (40 hours)

Outreach

Since 2015 I have presented a dozen of **talks** in popularization events in Italy, including those in an international framework (*Night of the Researchers*, *Pint of Science*) and specific initiatives oriented to high school students. I have also authored several popularization **papers** in Italian magazines. Full list available at <http://www.df.unipi.it/~macchi/outreach.html>

Date and Signature

January 17, 2023



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