

iDataLib: irenic Data Library Project

Maria Grazia Pia, Paolo Saracco

Preventivi INFN 2021

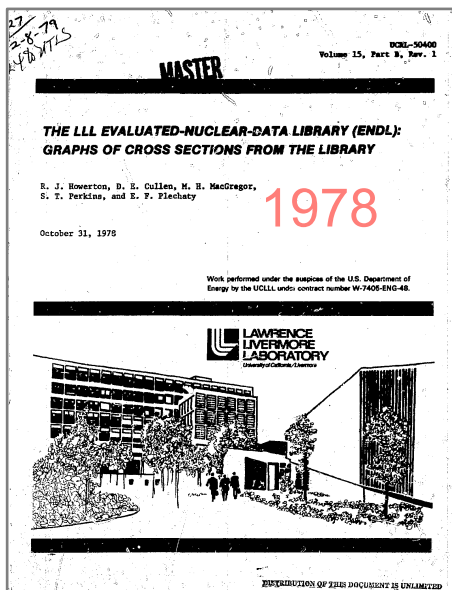
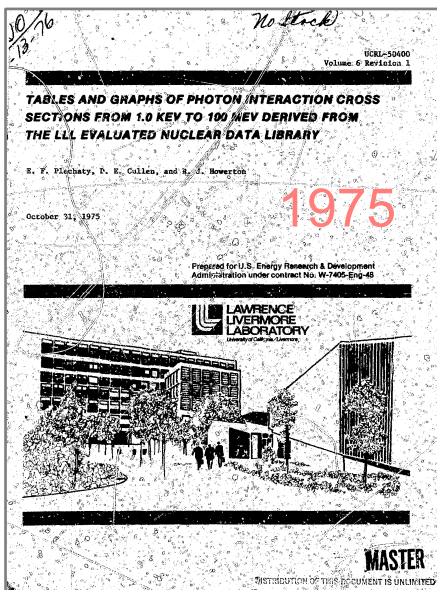
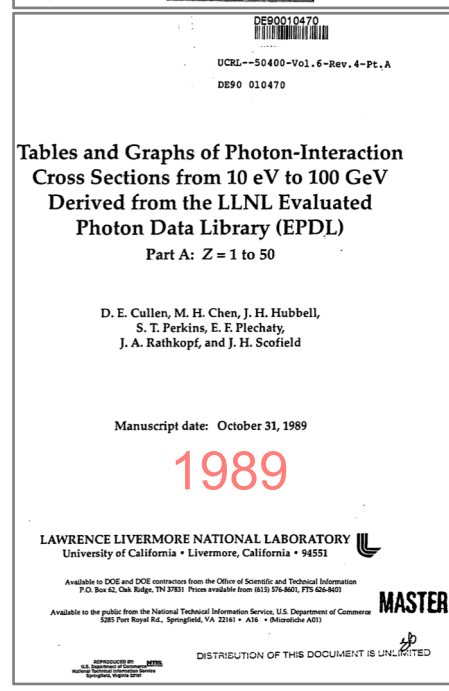
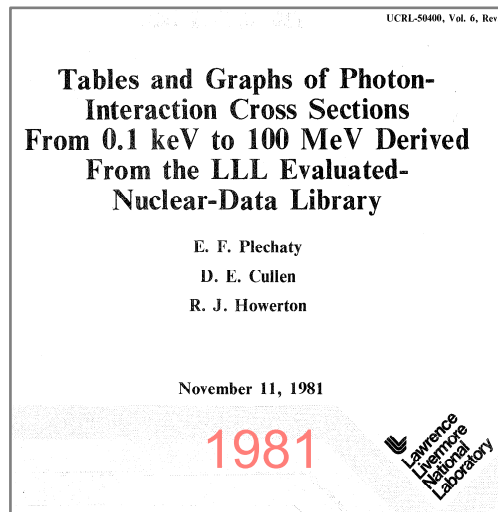
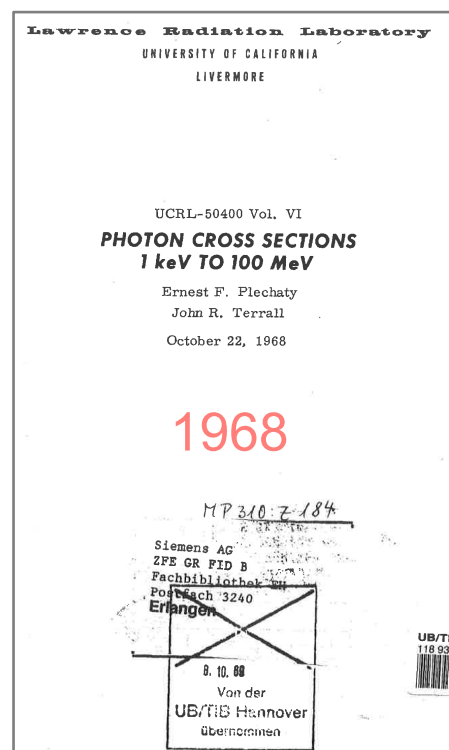
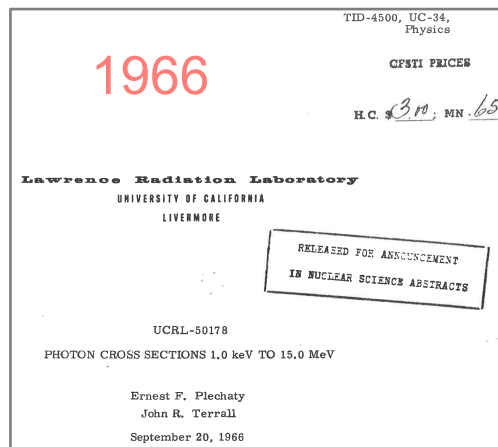
Genova, 16 luglio 2020

Evaluated data libraries

- Tabulations of physics quantities: cross sections, nuclear and atomic parameters, secondary particle spectra...
- Derive from the evaluation of the body of knowledge of **theoretical** computations, **experimental** measurements *or both*
- **Essential tool** for Monte Carlo particle transport, experimental physics and engineering applications
- Some of the most popular are:
 - BROND (*Russian Evaluated Neutron Data Library*): Russia
 - CENDL (*Chinese Evaluated Nuclear Data Library*): China
 - **ENDF** (*Evaluated Nuclear Data File*): USA
 - JEFF (*Joint Evaluated Fission and Fusion File*): France
 - JENDL (*Japanese Evaluated Nuclear Data Library*): Japan
 - TENDL (Talys): PSI
- Proprietary and personal compilations (*usually of specialized scope*)

Evaluated Atomic Libraries

- **EADL (atomic) 1991**
- **EEDL (electron) 1991**
- **EPDL (photon) 1997**



- **Originally released by LLL/LLNL**
- **Released in ENDF/B since version VI.8**
- **Currently in the hands of a LLNL retiree**

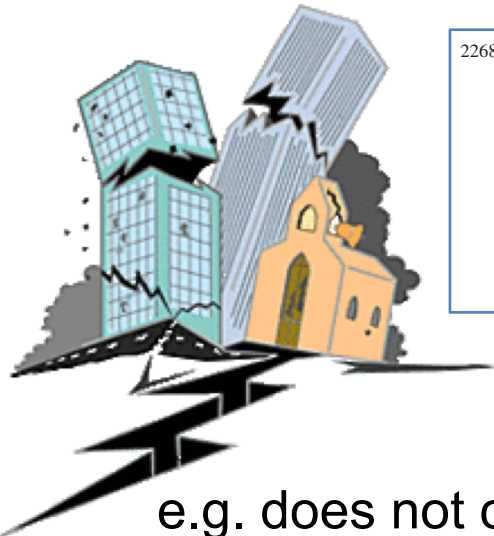
Formats:
ENDL
ENDF

The world changes... 1991/1997 → 2018

- Kissel's S-matrix calculations of photoelastic scattering
- Electron ionisation cross sections (Sch-Märk, Kim-Rudd, Bote-Salvat...)
- Scofield's Hartree-Fock calculations of atomic parameters
- Effects of theoretical/experimental atomic binding energies
- Salvat's electron elastic scattering calculations
- Photoelectric cross sections, relativistic scattering functions etc.

EPICS2017

Released in January 2018 by IAEA
Released in February 2018 in ENDF/B-VIII.0



2268

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First Assessment of ENDF/B-VIII and EPICS Atomic Data Libraries

Min Cheol Han, Maria Grazia Pia^{id}, Paolo Saracco^{id}, and Tullio Basaglia

Physics

e.g. does not conserve energy!

Software engineering

e.g. changes w/o version control

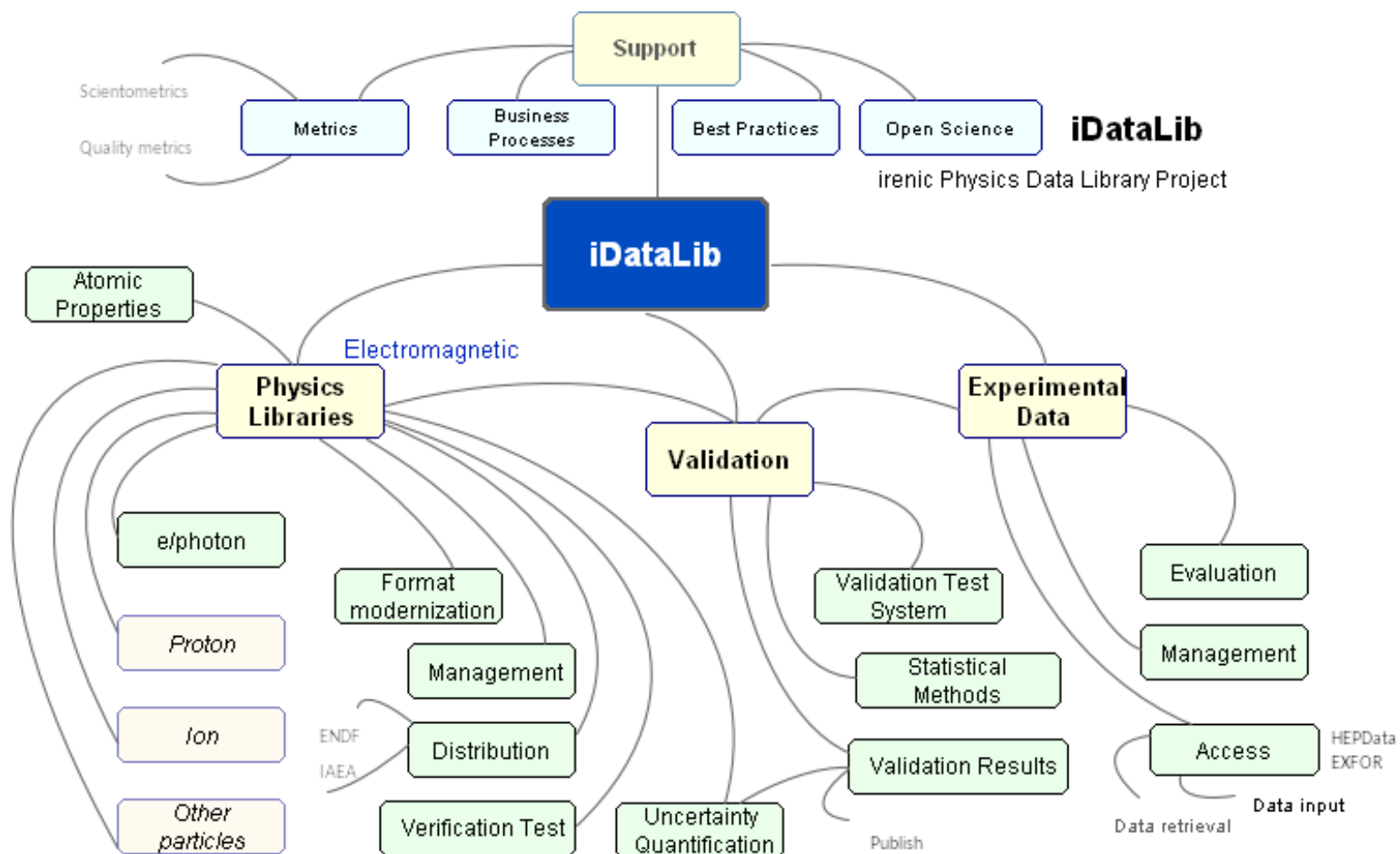
Bibliografia

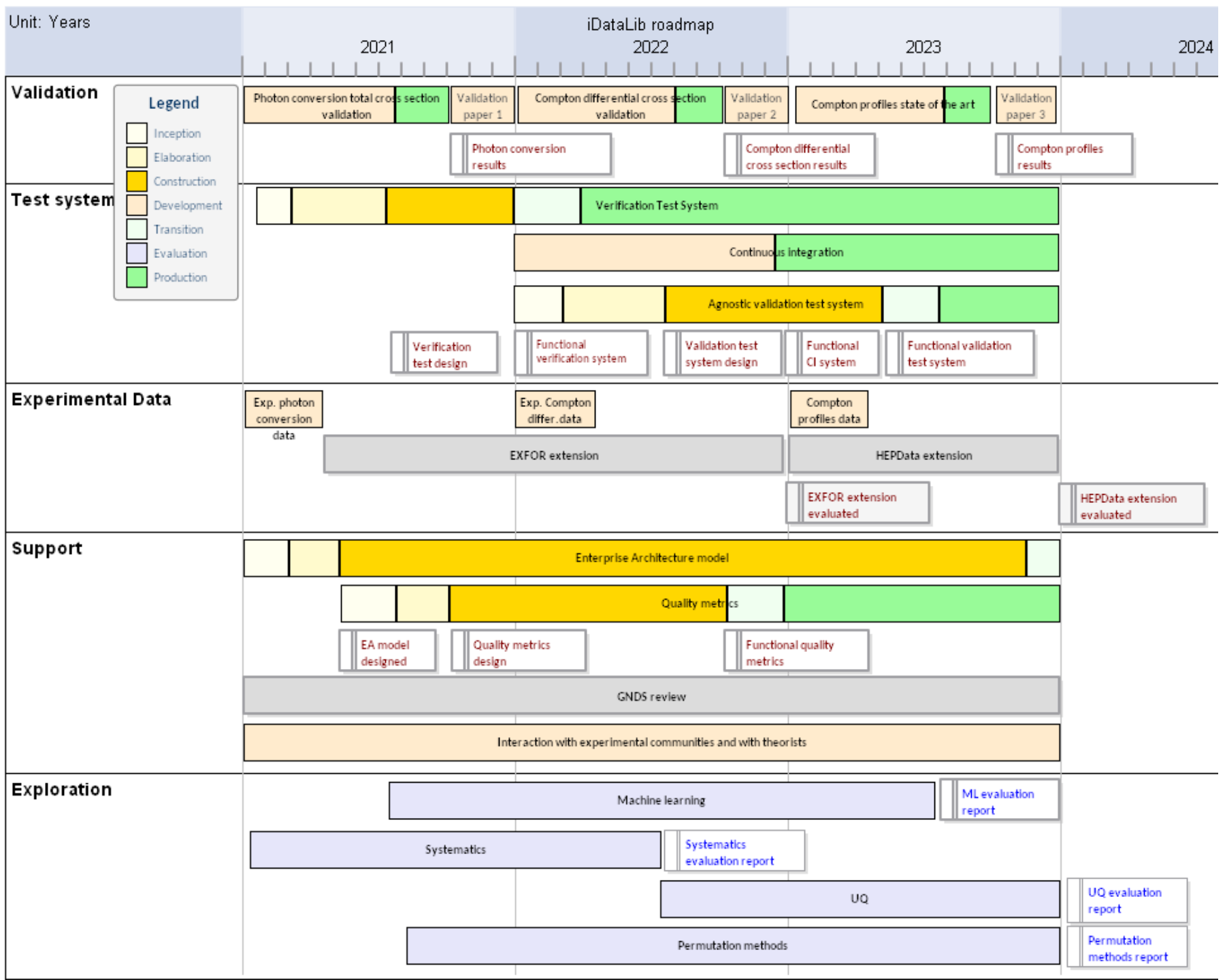
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etc.

Continuazione di quello che facciamo da > 20 anni

iDataLib





Temi di lavoro

Tests di validazione

- Sezione d'urto totale di conversione di fotoni
- Sezioni d'urto differenziali di scattering Compton
 - Calcoli relativistici di scattering functions?
- Profili Compton
 - Alternative a Biggs: stato dell'arte?

Sviluppo di strumenti

- Generalizzazione e automazione di strumenti di test, che hanno raggiunto adeguato livello di maturità
- Libera risorse per R&D su temi di ricerca di punta (trattamento di sistematica, UQ, machine learning, tests di permutazione)

Manifesto for Physics Data Libraries

Alphabetical Order, Tullio Basaglia, Mária Begalli, John D. Bess, David A. Brown, Jeremy Lloyd Conlin, Marie-Anne Descalle, Doina Cristina Duma, Michael Fleming, Christian Hill, Ian Hill, Ivan A. Kodeli, Arjan Koning, Caleb M. Mattoon, Elizabeth A. McCutchan, Hugo Palmans, Sandra Parlati, Maria Grazia Pia, Boris Pritychenko, Lina Quintieri, Brian J. Quiter, Yuri Ralchenko, Elisabetta Ronchieri, Paolo Saracco, Hendrik Schatz, Michael Spannowsky, Kenichi Tada, Reid W. Townson, Andrej Trkov, Dorothea Wiarda and Other Authors please add yourself

Abstract—The abstract goes here.

Index Terms—keyword, keyword, keyword, keyword.

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T. Basaglia is with CERN Scientific Information Service, Geneva, Switzerland, email: tullio.basaglia@cern.ch

J. Bess is with INL, MS 3855, PO BOX 1625, Idaho Falls, ID 83415, email: john.bess@inl.gov

D. A. Brown is with BNL, address, e-mail: dbrown@bnl.gov

Jeremy Lloyd Conlin, is with LANL, MS F663, PO BOX 1663, Los Alamos NM 87545, jlconlin@lanl.gov

M.-A. Descalle is with LLNL, 7000 East Avenue, Livermore, CA 94550, USA, email: mades@llnl.gov

D. C. Duma and E. Ronchieri are with INFN CNF, Viale Bert Pichat 6/2, 40123 Bologna, Italy, email: cristina.aiftimici@cnf.infn.it, elisabetta.ronchieri@cnf.infn.it

M. Fleming is with the OECD Nuclear Energy Agency, 2, rue André Pascal, 57016 Paris, France, email: michael.fleming@oecd-nea.org

C. Hill and A. Koning are with the Nuclear Data Section, International Atomic Energy Agency, Vienna International Center, PO Box 100, A-1400 Vienna, Austria, email: ch.hill@iaea.org

I. Hill is with the OECD Nuclear Energy Agency, address, email: ian.hill@oecd-nea.org

I. Kodeli is with the UKAEA, CCFE, Culham Science Center, Abingdon, UK, email: ivan.kodeli@ukaea.uk

C. M. Mattoon is with Lawrence Livermore National Laboratory, 7000 East Avenue, Livermore, CA 94550, USA, email: mattoon1@llnl.gov

E. A. McCutchan is with National Nuclear Data Center, Brookhaven National Laboratory, Upton, NY USA, email: mccutchan@bnl.gov

H. Palmans is with the National Physics Laboratory, Hampton Road, Teddington TW11 0LW, UK and MedAustron, Marie Curiestrasse 5, 2700 Wiener Neustadt, Austria, email: hugo.palmans@npl.co.uk

S. Parlati is with INFN Laboratori Nazionali del Gran Sasso, via Acitelli 22, 67100 L'Aquila, Italy, email: sandra.parlati@lngs.infn.it

M. G. Pia and P. Saracco are with INFN Sezione di Genova, Via Dodecaneso 33, 16146 Genova, Italy, email: maria Grazia.pia@ge.infn.it, paolo.saracco@ge.infn.it

B. Pritychenko is with BNL, address, e-mail: pritychenko@bnl.gov

L. Quintieri is with ISIS Neutron and Muon Source, STFC, Rutherford Appleton Laboratory, Didcot OX11 0QX, United Kingdom, email: lina.quintieri@stfc.ac.uk

B. J. Quiter is with Lawrence Berkeley National Laboratory, 1 Cyclotron Road Berkeley, CA 94720, USA, email: bquiter@lbl.gov

Yu. Ralchenko is with the National Institute of Standards and Technology, 100 Bureau Dr, Gaithersburg, MD 20899, USA, email: yuri.ralchenko@nist.gov

M. Spannowsky is with the Institute for Particle Physics Phenomenology, Durham University, Durham DH1 3LE, United Kingdom, email: michael.spannowsky@durham.ac.uk

K. Tada is with Japan Atomic Energy Agency, Shirakata 2-4, Tokai-mura, Ibaraki-pref., Japan, email: tada.kenichi@jaea.go.jp

R. W. Townson is with National Research Council Canada, 1200 Montreal Rd., Ottawa, Ontario, Canada, K1A 0R6, email: reid.townson@nrc-cnrc.ca

H. Schatz is with National Superconducting Cyclotron Laboratory, Department of Physics and Astronomy, and Joint Institute for Nuclear Astrophysics Center for the Evolution of the Elements, Michigan State University, South Shaw Lane, East Lansing MI 48824, USA, email: schatz@nsl.msu.edu

A. Trkov is with the Jozef Stefan Institute, Jamova cesta 39, 1000 Ljubljana, Slovenia

Other Author is with Affiliation, Address, email: author@email.xxx.

I. INTRODUCTION

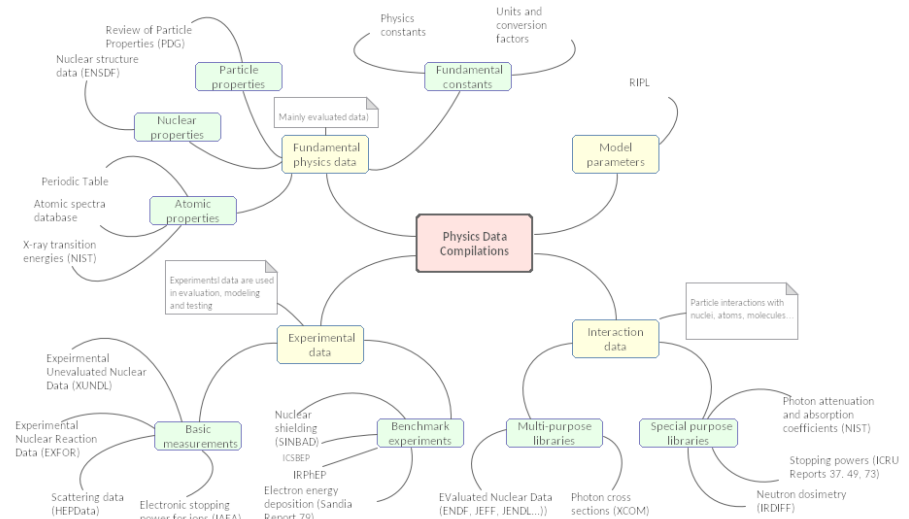
PHYSICS data libraries are collections of physics data that have been assembled for specific functions within computational systems. This paper concentrates on data libraries relevant to describe electromagnetic and hadronic interactions of particles with matter in computational physics environments. They are used in a variety of fundamental and applied research domains, such as high energy physics, nuclear physics, astroparticle physics and astrophysics, bio-medical physics, materials analysis, and in engineering applications. They play a fundamental role in the simulation of nuclear energy production and of various experimental scenarios, in detector design and development, in radiation oncology and medical imaging, in radiation protection and in the study of cultural heritage artifacts - just to mention a few use cases.

Physics data libraries can be considered as systems [1], since they are collections of components organized to accomplish a specific function or set of functions. Concepts and best practices have been developed for systems such as validation and verification [2], requirements engineering [3] and configuration management [4], and are generally included in the body of knowledge of systems engineering [5]. Some of these have already been applied to or tailored for various physics data libraries. With the wider lens of systems engineering, this paper discusses and develops best practices that can be applied to all physics data libraries.

Each data library fulfils one or more missions in its environment, and is in turn influenced by it. Due to their widespread use in diverse computational fields, the physics data libraries within the scope of this paper have several concerns of stakeholders, i.e. people who have key roles in, or concerns about, the system. Stakeholders include, for example developers, maintainers, content providers, data distribution centres, users, computational systems depending on their data research funding agencies, government program managers or organizations responsible for scientific policies. Stakeholders concerns are interests which pertain to physics data library development, use or any other aspects that are important to one or more of the parties involved. Different stakeholders will have different roles in the system, or more generally in the field may have different concerns. For example, developers may be concerned with requirements traceability through internal

Manifesto for Open Physics Data Libraries

Iniziativa da noi promossa (2019)
Grande successo nella comunità
Articolo di review in preparazione,
sarà pubblicato su TNS



Openness, transparency, traceability, reliability and validation, sustainability

Partecipazione, finanze e servizi

Partecipazione

ex CCR-UQ: M.G. Pia [1], P. Saracco [0.4] (Genova),

2 assegnisti SkinScan

E. Ronchieri, D. C. Duma (CNAF) (*possibile estensione?*)

Ripresa collaborazione con S. Parlati, LNGS

Nucleo inizialmente piccolo, in linea con l'ambiente di data libraries

Multidisciplinare: teorici, sperimentali, informatici



Richieste finanziarie “ordinarie“:

Workstations di sviluppo, Mac per analisi, storage di dati, missioni per contatti nazionali e internazionali, consumo informatico e metabolico

Nodi e storage di farm: sostituzione di materiale obsoleto

Risorse umane: assegnisti/borsisti/studenti

Richieste per i **servizi di sezione:** nessuna

Ringraziamo il Servizio Calcolo per l'ordinario supporto degli utenti e delle attività della sezione