iDataLib: irenic Data Library Project

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INFN-CNAF 13.7.2020

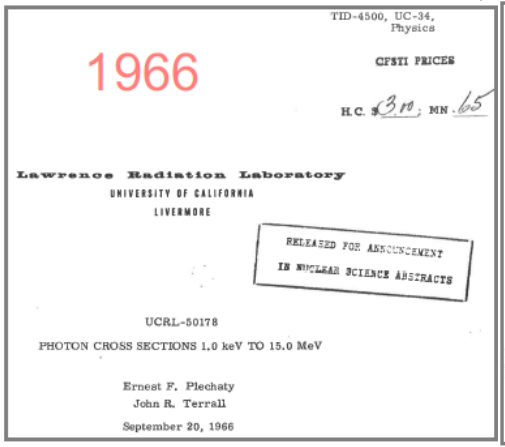
Evaluated data libraries

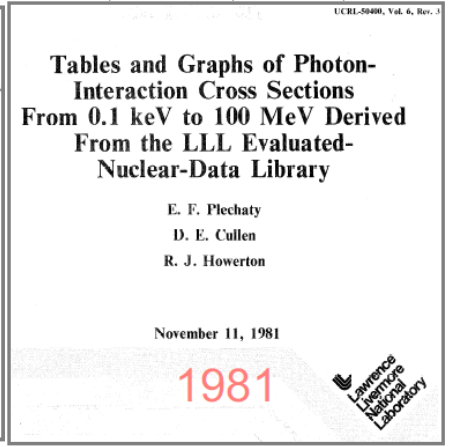
- Tabulations of physics quantities: cross sections, nuclear
- and atomic parameters, secondary particle spectra…
- Derive from the evaluation of the body of knowledge of **theoretical** computations, **experimental** measurements *or both*
- **Essential tool** for Monte Carlo particle transport, experimental 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)*

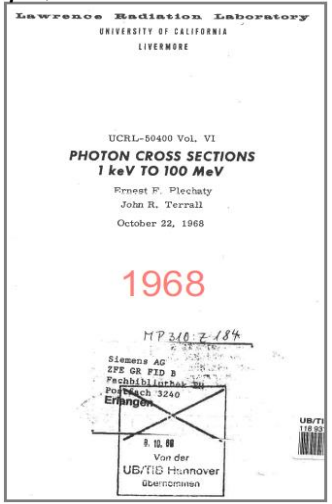
Evaluated Atomic Libraries *EGS, FLUKA, Geant4, MCNP, Penelope, PHITS…*

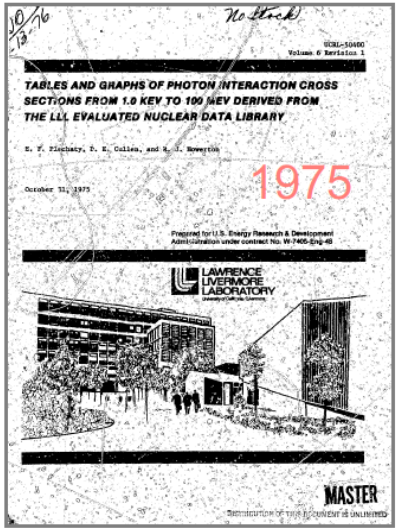
- **EADL** (atomic) 1991
- **EEDL** (electron) 1991
- **EPDL** (photon) 1997
- **Originally released by LLL/LLNL** 1989
- Released in **ENDF/B** since version **VI.8**
- *Currently in the hands of a LLNL retiree*

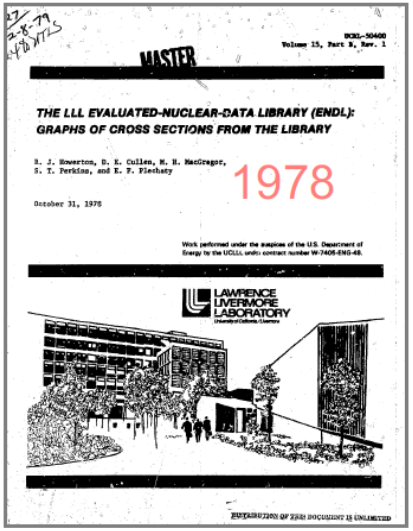
Formats:
ENDL
ENDF

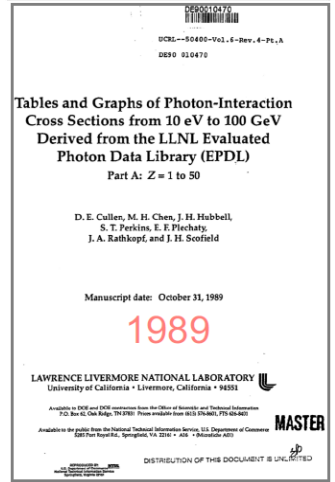












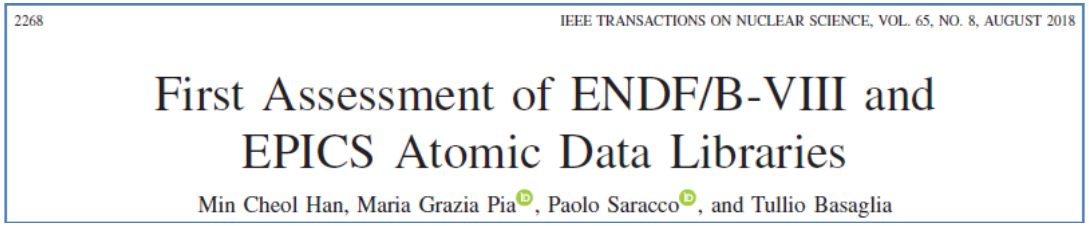
The world changes 1991/1997-> 2018

- Kissel's S-matrix calculations of photon elastic scattering
- Electron ionisation cross sections *(Deutsch-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.

EPICS 2017 released in

January 2018 by IAEA

February 2018 in ENDF/B-VIII.0


2268 IEEE TRANSACTIONS ON NUCLEAR SCIENCE, VOL. 65, NO. 8, AUGUST 2018

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

Min Cheol Han, Maria Grazia Pia, Paolo Saracco, and Tullio Basaglia

- **Physics**
- e.g. does not conserve energy!

Software engineering

e.g. changes w/o version control

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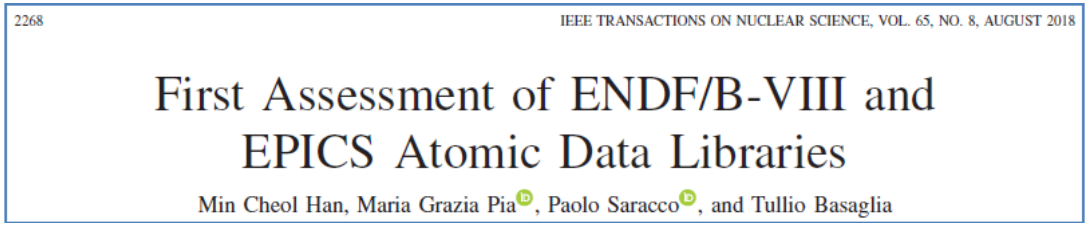
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Bibliografia

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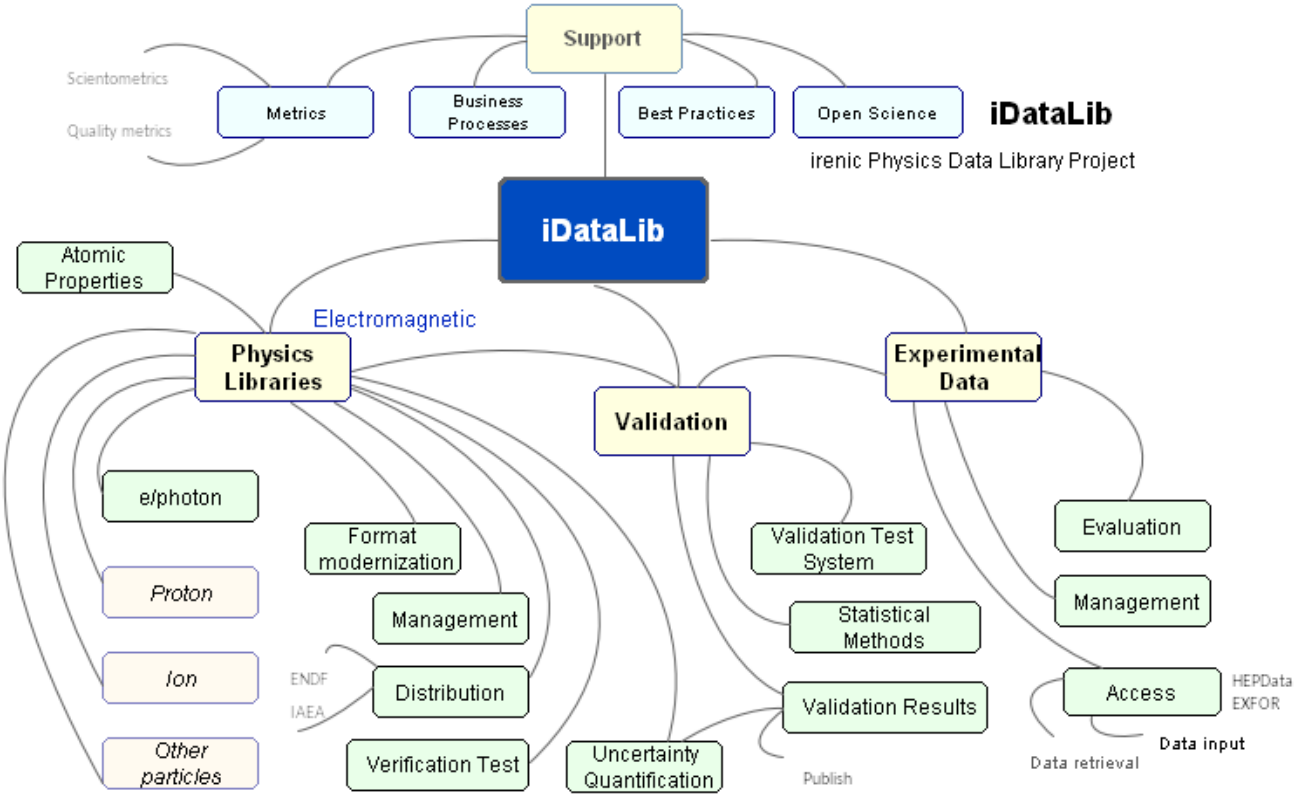
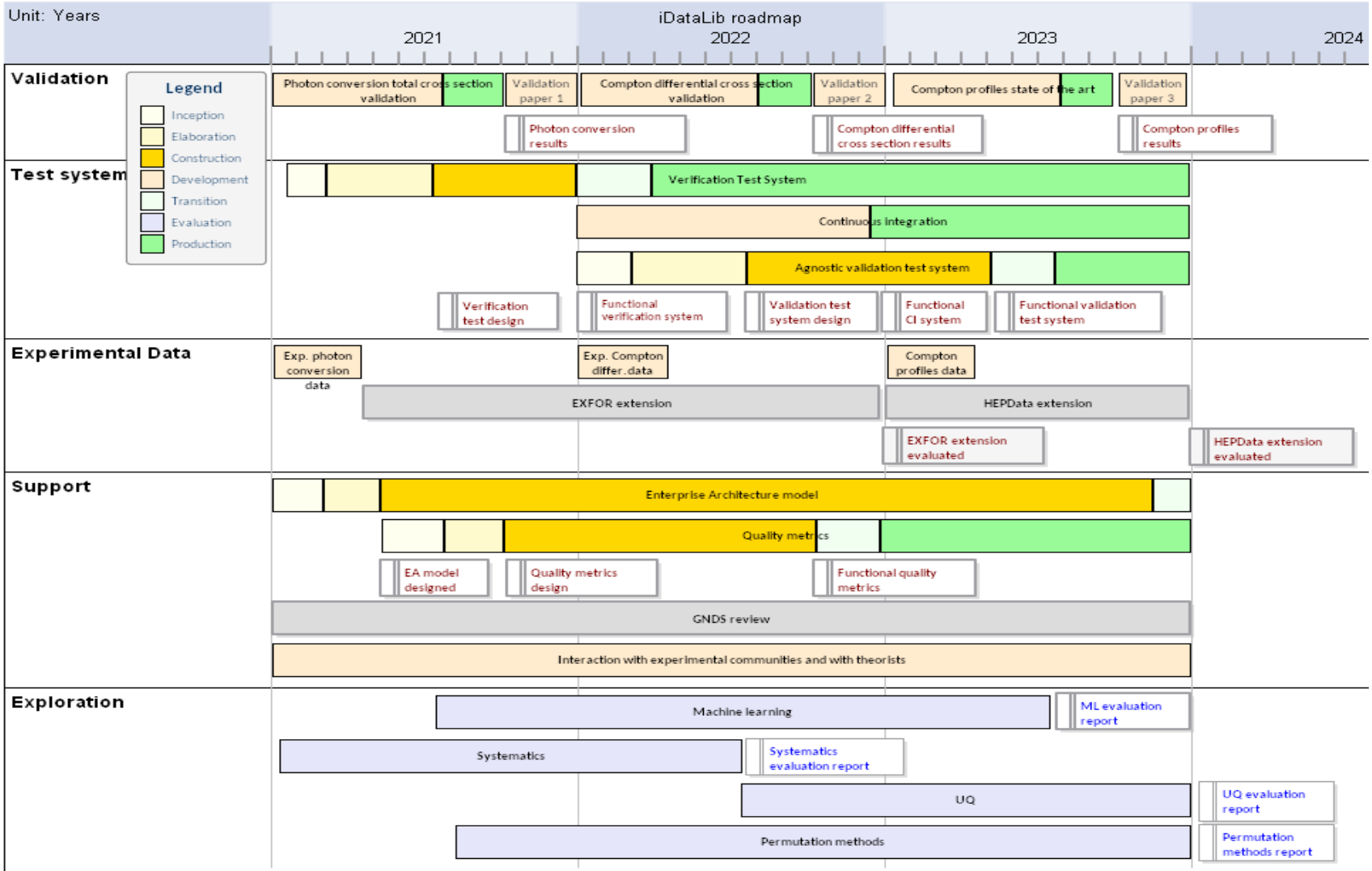
etc

Continuazione di quello che facciamo da > 20 anni IDataLib




Unit: Years
iDataLib roadmap
2021
2022
2023
2024
Validation
Legend
Inception
Elaboration
Construction
Development
Transition
Evaluation
Production
Photon conversion total cross section validation
Validation paper 1
Compton differential cross section validation
Validation paper 2
Compton profiles state of the art
Validation paper 3
Photon conversion results
Compton differential cross section results
Compton profiles results
Test system
Verification Test System
Continuous Integration
Agnostic validation test system
Verification test design
Functional verification system
Validation test system design
Functional CI system
Functional validation test system
Experimental Data
Exp. photon conversion data
Exp. Compton differ.data
Compton profiles data
EXFOR extension
HEPData extension
EXFOR extension evaluated
HEPData extension evaluated
Support
Enterprise Architecture model
Quality metrics
EA model designed
Quality metrics design
Functional quality metrics
GNDS review
Interaction with experimental communities and with theorists
Exploration
Machine learning
ML evaluation report
Systematics
Systematics evaluation report
UQ
UQ evaluation report
Permutation methods
Permutation methods report

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, Márcia 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.**

Manuscript received April 1, 2000; revised April 1, 2099.

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I. Introduction

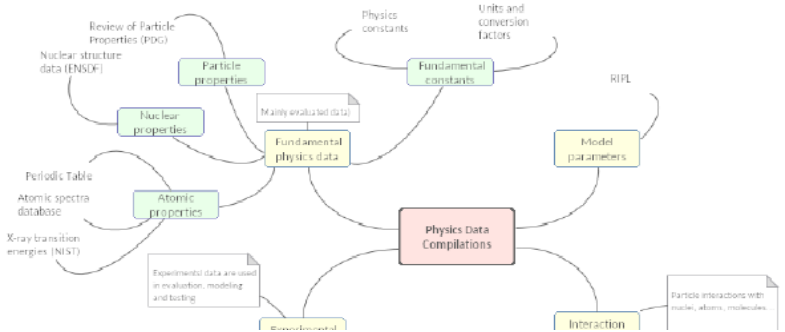
PHYSICS data libraries are collections of physics data that have been assembled for specific functions within computational systems. This paper concentrates on data libraries relevant to describe electromagnetic and hadronic interactions of particles with matter in computational physics environments. 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 kinds of stakeholders, i.e. people who have key roles in, o

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 [0.1], D. C. Duma [0.07] (CNAF)
- Ripresa collaborazione con S. Parlati, LNGS [0.1]
- 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