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Title: Open-source Release of CGMF and Integration into the MCNP6.3 Code

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Los Alamos NATIONAL LABORATORY

Open-source Release of CGMF and Integration into the MCNP6.3 Code

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Overview

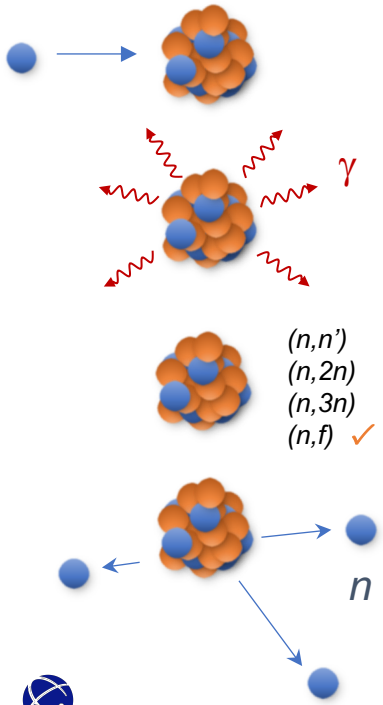
- Motivation for CGMF in the MCNP6.2 release

- CGMF on GitHub
  - Source code and Python toolkit
  - ReadTheDocs documentation
  - Computer Physics Communications publication

- Updates for the MCNP6.3 release
  - CGMF updates
  - New CGMF-MCNP integration
  - Verification

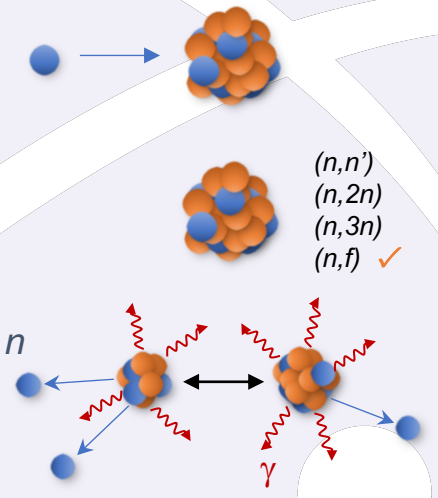
Motivation for CGMF in the MCNP6.2 release

Default MCNP Calculations



- Limitations
  - OK on average → criticality safety, shielding, reactor physics applications, etc.
  - Wrong order for selection of reaction channels and reaction output
  - Cannot perform correlated simulations or time-coincident detector response calculations
- Previous workarounds:
  - Sampling P(ν) in MCNP
  - LLNL fission library
  - Detector response simulations in MCNPX-PoliMi

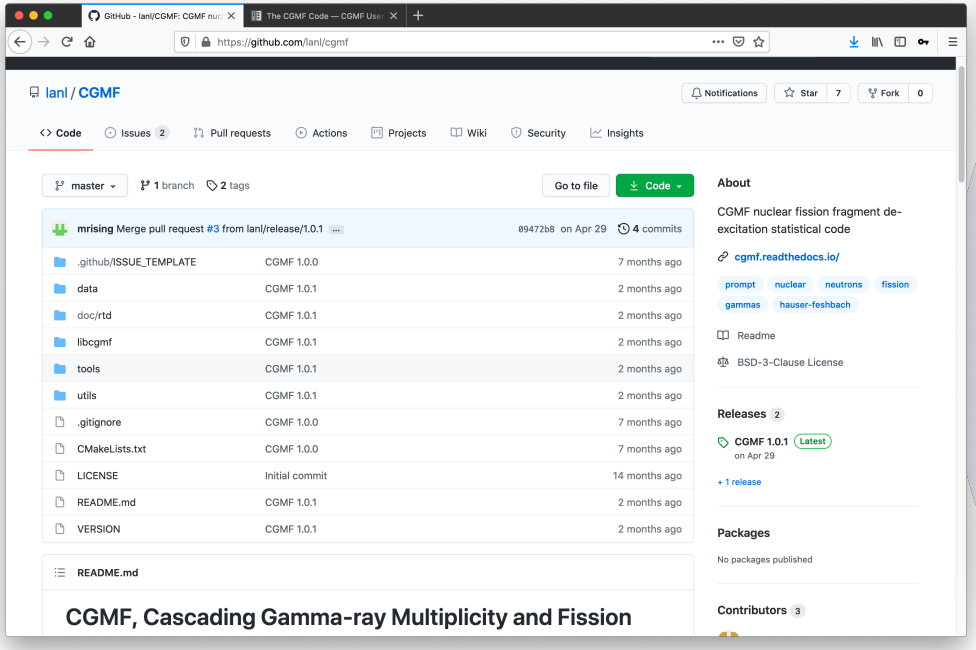
MCNP with CGMF Calculations

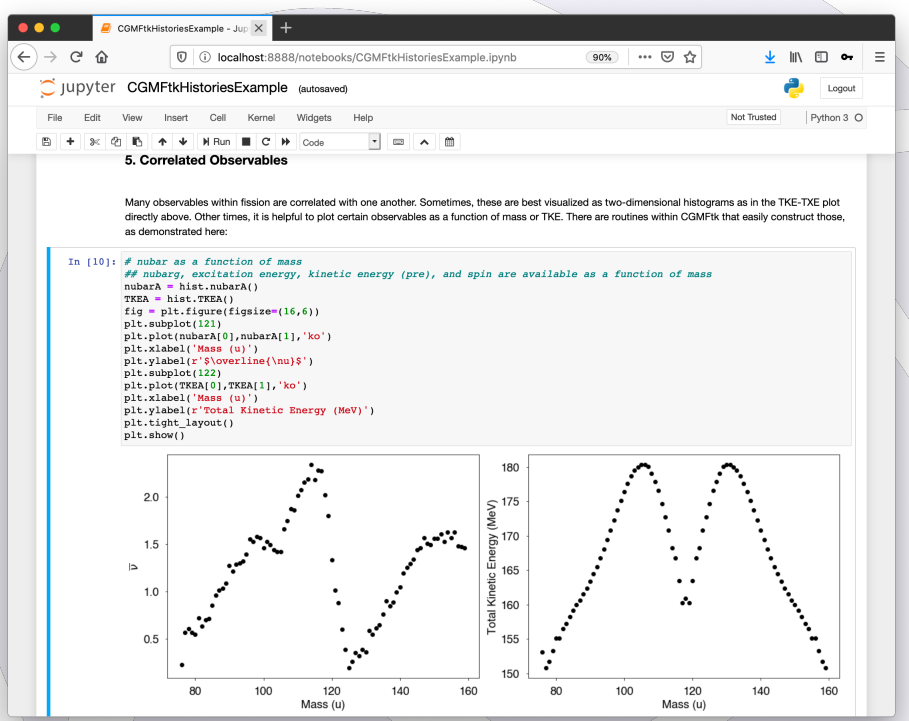


Developed a new paradigm to simulate nuclear reactions on an event-by-event basis for "low-energy" fission physics applications

CGMF on GitHub - https://github.com/lanl/cgmf

Source code, data, and Python tools



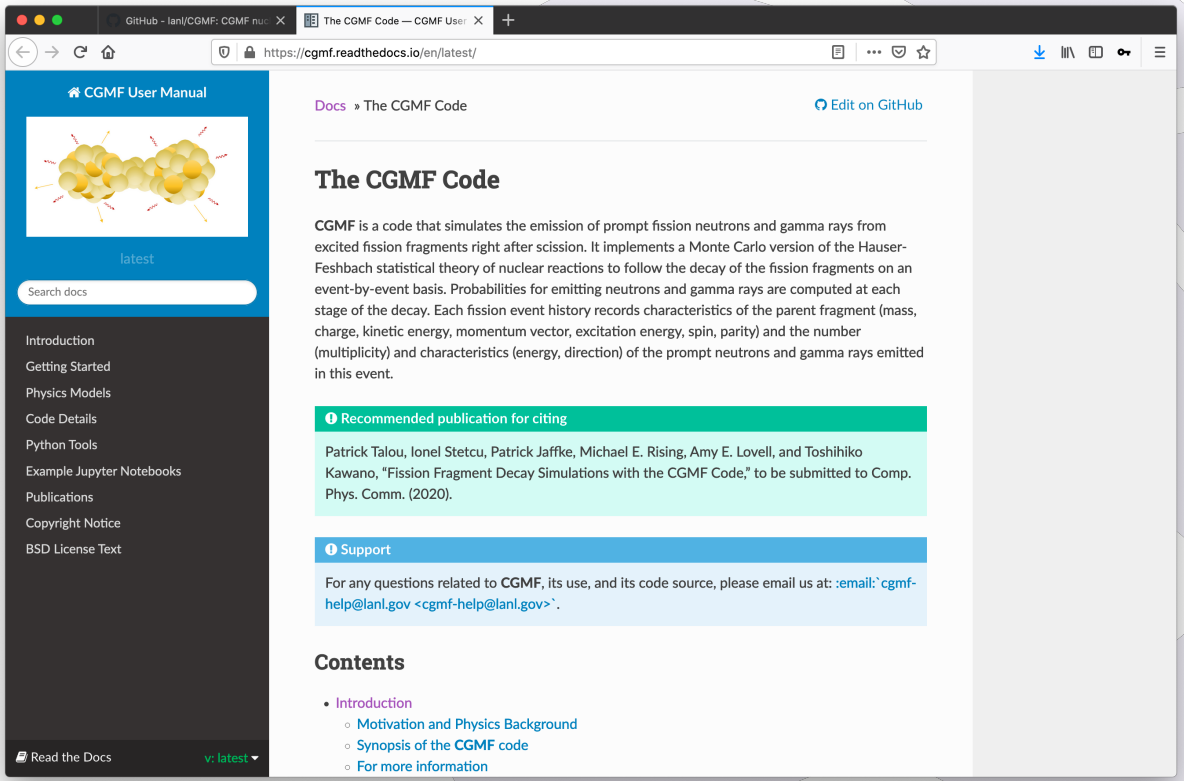


Python Jupyter notebooks distributed

CGMF on GitHub - https://cgmf.readthedocs.io/en/latest/index.html

- ReadTheDocs documentation
- Computer Physics Communications publication coming out soon

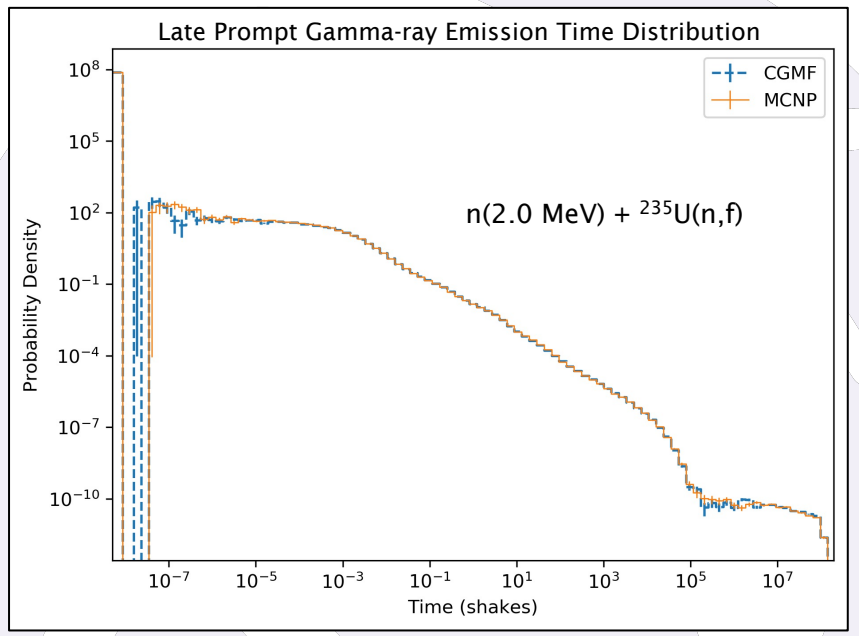
Patrick Talou, Ionel Stetcu, Patrick Jaffke, Michael E. Rising, Amy E. Lovell, and Toshihiko Kawano, “Fission Fragment Decay Simulations with the CGMF Code,” accepted in Comp. Phys. Comm. (2021).



Updates for the MCNP6.3 release

- CGMF updates
  - Spontaneous fission
    - 238, **240**, 242, **244**Pu
    - 252, **254**Cf
  - Neutron-induced fission
    - **233**, **234**, 235, 238U, **237Np**, and 239, **241**Pu
  - Late-time prompt fission gamma rays
  - Fission fragment angular distributions
  - Pre-equilibrium neutron emission

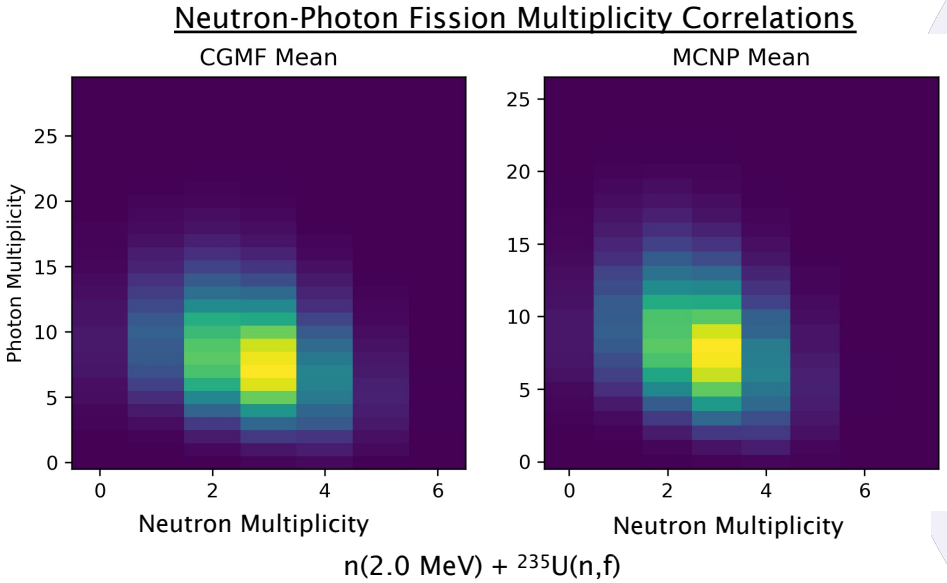
New Fissionable Systems Compared to MCNP6.2 Release

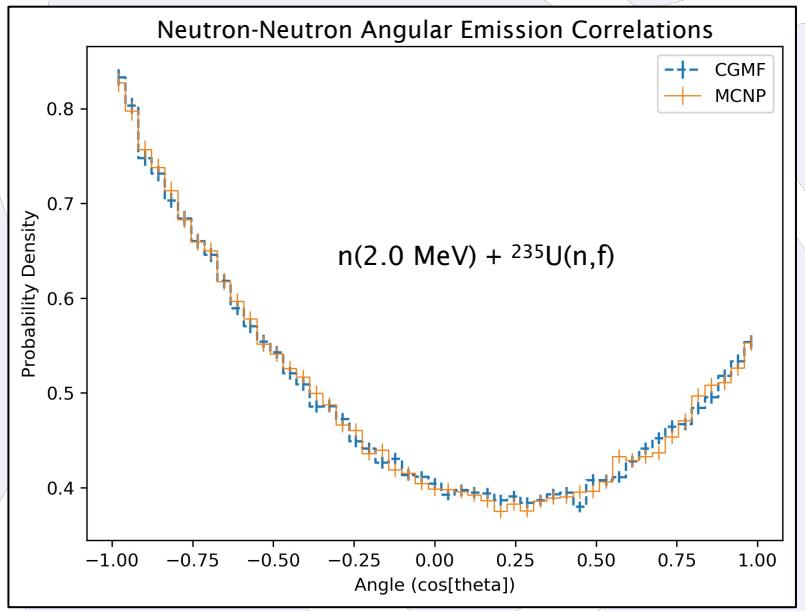


- New CGMF-MCNP integration
  - Through the new MCNP CMake build system (`find_package`)
  - Built as library, linked to MCNP executable
  - Same library can also be linked to CGMF executable

Updates for the MCNP6.3 release

- Verification of the integrated CGMF code and MCNP interface
  - Done with new HDF5 PTRAC and MPI





Note: No change to MCNP input options. To use CGMF → **`FMULT METHOD=7`**

Acknowledgements

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Questions?

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