

RASTA: RADIATION SOURCE TERM ANALYSIS CODE

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ABSTRACT

1. Program Name and Title:

RASTA: RAdiation Source Term Analysis Code

2. Computer for Which Program is Designed and Other Machine Versions Available:

IBM PC compatible computers

3. Problem Solved:

RASTA computes neutron and photon source terms arising from (α,n) events, spontaneous fission, bremsstrahlung, and radioactive decay. The code was written to consolidate existing capabilities into a single, easy-to-use code with flexible, extensive output edits, while also adding new capabilities.

Calculated neutron and photon spectra can be presented in a variety of energy group structures: BUGLE (47 groups), SCALE (27 groups), or User Defined structure with up to 1000 groups for neutrons; and BUGLE (20 groups), SCALE (18 groups), VITAMIN-E (39 groups), ORIGEN (18 groups), or User Defined structure with up to 1000 groups for photons.

4. Method of Solution:

Neutron and photon sources from (α,n) events and spontaneous fission are calculated using a routine based on the SOURCES code. The (α,n) neutrons are calculated based on a method derived from first principles, and photons from radioactive (α,n) daughters are determined based on a library generated from the Table of Isotopes. Spontaneous fission neutron calculation is based on the energy spectrum given by Watt's equation; spontaneous fission photons are calculated based on information built from experimental data.

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The gamma decay routine is based on the GAMSRC code, which generates a photon source term based on data in the ICRP38 point-energy data library. Bremsstrahlung contribution from beta emitters to the source term is based on the BREMRAD code (CCC-031), which incorporates bremsstrahlung theory developed by Bethe and Heitler as extended by Elwert for external bremsstrahlung and the Knipp-Uhlenbeck formula for internal bremsstrahlung.

5. Restrictions on the Complexity of the Problem:

No restrictions noted.

6. Typical Running Time:

Typical run times vary from a few seconds to a minute or more, depending on the number of source isotopes and target isotopes given.

7. Unusual Features of the Program:

RASTA combines the calculation of all neutron and photon source terms into a single program with simple user input.

8. Related and Auxiliary Programs:

None.

9. Status:

Verification of RASTA by comparison with other computer programs and hand calculations was completed in July 1999.

10. References:

Frost, R.L. "RASTA: A Generalized Tool For Radiation Source Term Analysis." *Trans. of the Am. Nucl. Soc., Vol. 77*. November 1997.

11. Hardware Requirements:

RASTA has been tested on IBM PC compatible computers. There are no other specific hardware requirements known.

12. Programming Language(s):

RASTA was compiled using Digital Visual Fortran 5.0 under Microsoft Windows NT.

13. Operating System:

Compiled under Microsoft Windows NT but should be compatible with any DOS based operating system (though recompilation may be necessary).

14. Other Programming or Operating Information or Restrictions:

None.

15. Name and Affiliation of Author or Contributor:

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16. Material Available:

Summary information on the code basis, performance, and output verification. Source and executable code not yet available for public release.

17. Category:

Radiological Safety, Hazard, and Accident Analysis (G)

Keywords: source term, alpha-n, spontaneous fission, gamma decay, bremsstrahlung

18. Sponsor:

Westinghouse Savannah River Company (WSRC)

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