A Compact ENDF (ACE) Format Specification

Jeremy Lloyd Conlin (editor)[1], Forrest B. Brown[2], and Brian K. Kiedrowski[2,3]

[1]Los Alamos National Laboratory, Nuclear Data Team
[2]Los Alamos National Laboratory, MCNP Team
[3]University of Michigan, Department of Nuclear Engineering and Radiological Sciences

1 Introduction

The ACE format consists of two *types* and nine *classes* of data. The data are kept in an ACE Table. The term ACE Table and ACE file are often used interchangeably.

1.1 Types of ACE-Formatted Data

There are two types of ACE-formatted data; simply called Type 1 and Type 2.

Type 1 Standard formatted tables. These tables contain ASCII text and are machine independent; they are readable on every machine.

Type 2 Standard unformatted tables. These tables are binary and can be generated from the Type 1 files. They are more compact and faster to read than the Type 1 ACE Tables but are machine/platform dependent; they are not readable on every machine.

Traditionally Type 2 ACE files were more commonly used because they were smaller in size and faster to read. However due to the fact that they are not portable across machines and platforms they have fallen out of fashion.

1.2 Classes of ACE-Formatted Data

There are nine classes of ACE-formatted data:
1. continuous-energy neutron (see Section 3),
2. discrete-reaction neutron,
3. continuous-energy photoatomic interaction,
4. continuous-energy electron interaction,
5. continuous-energy photonuclear interaction,
6. neutron dosimetry,
7. $S(\alpha, \beta)$thermal,
8. neutron multigroup, and
9. photoatomic multigroup.

Each of these classes of data are described later in this document.

An ACE Table is an entity that contains evaluation-dependent data about one of the nine classes of data for a specific material—an target isotope, isomer, or element. For a given ZAID, the data contained on a Type 1 and Type 2 tables are identical. Simulations run with one type of data should produce identical results as those run with the other type of data.

1.3 ACE Libraries

A collection of ACE data tables that derive from a single set of evaluation files are typically grouped together in a "library"—not to be confused from the evaluation library from which they derive. Multiple ACE data tables can concatenated into the same logical file on the computer, although this has fallen somewhat out of fashion due to the large amount of data on each ACE table derived from modern evaluation files. Applications

that use ACE-formatted data should produce the same results regardless of whether the tables are contained in one logical file on the computer or spread across many.

2 ACE Tables

An ACE Table consists of a header followed by an array (`XSS`) containing the actual data. The header and `XSS` array are the same regardless of whether the ACE Table is Type 1 or Type 2. All data in the `XSS` array can be read using the Fortran format: `4E20.0`.

2.1 ACE Header

The ACE Header contains metadata[1] about the ACE Table.

Following the opening of the Header are three arrays, `IZAW`, `NXS`, and `JXS` respectively. They are each described below. Immediately following the `JXS` array is the `XSS`array.

2.1.1 `IZAW` Array

2.1.2 `NXS` Array

2.1.3 `JXS` Array

2.2 Locating Data on a Type 1 Table

2.3 Locating Data on a Type 2 Table

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[1]data about the data

Element	Name	Description
1	—	Length of second block of data (XSS array)
2	ZA	$1000 * Z + A$
3	NES	Number of energies
4	NTR	Number of reactions excluding elastic scattering
5	NR	Number of reactions having secondary neutrons excluding elastic scattering
6	NTRP	Number of photon production reactions
7	...	
8	NPCR	Number of delayed neutron precurser families
	...	
15	NT	
16	—	0=normal photon production
	—	-1=do not produce photons

Table 1: NXS array element definitions for continuous-energy neutron ACE Table.

3 Continuous Energy Neutron

3.1 NXS Array

3.2 JXS Array

Element	Name	Location Description
1	ESZ	Energy table
2	NU	Fission ν data
3	MTR	MT array
4	LQR	Q-calue array
5	TYR	Reaction type array
6	LSIG	Table of cross section locators
7	SIG	Cross sections
8	LAND	Table of angular distribution locators
9	AND	Angular distributions
10	LDLW	Table of energy distribution locators
11	DLW	Energy distributions
12	GPD	Photon production data
13	MTRP	Photon production MT array
14	LSIGP	Table of photon production cross section locators
15	SIGP	Photon production cross sections
16	LANDP	Table of photon production angular distribution locators
17	ANDP	Photon production angular distributions
18	LDLWP	Table of photon production energy distribution locators
19	DLWP	Photon production energy distributions
20	YP	Table of yield multipliers
21	FIS	Total fission cross section
22	END	Last word of this table
23	LUNR	Probability tables
24	DNU	Delayed $\bar{\nu}$ data
25	BDD	Basic delayed data (λ's, probabilities)
26	DNEDL	Table of energy distribution locators
27	DNED	Energy distributions
	...	
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Table 2: JXS array element definitions for continuous-energy neutron ACE Table.