

VII.E. COMPACT FORMAT FOR PARAMETER COVARIANCE INFORMATION

Existing formats for communication of covariance information are often inadequate. The sheer quantity of numbers in a typical covariance matrix prohibits storage of this information in ASCII format, and binary files are generally not transportable from one computer to another. This issue is discussed at greater length elsewhere [HD97]. SAMMY has an option for abbreviated formats for parameter covariance matrices, designated the “compact” format. This option is also available for use in the transmission of covariance information from one code to another via ENDF files; see Section IX for details.

When a binary covariance file from an earlier SAMMY run is specified as input for another run, then the inclusion of an appropriate command line will cause the creation of an output file SAMMY.CCV. (The characters CCV suggest Compact CoVariance.)

Important: It is the initial (prior) parameter covariance matrix that is written into this file. The final (posterior) parameter covariance matrix, if created by this run, is written in the usual binary format into file SAMMY.COV.

To create SAMMY.CCV in compact format, include any one of the following equivalent alphanumeric commands:

```
PUT COVARIANCES INTO compact format
PUT CORRELATIONS INTO compact format
WRITE CORRELATIONS INTO compact format
WRITE COVARIANCES INTO compact format
```

Within the CCV file, the covariance matrix is expressed as uncertainties plus correlation matrix. At the beginning of the CCV file, absolute uncertainties are listed for each varied parameter, in (6(1PG11.5)) format. The rest of the file specifies the non-negligible correlation matrix elements, converted to integer format.

The SAMMY compact format is directly analogous to the ENDF Compact Format (file 32, LRU=0, LCOMP=2; see Section IX). In this format, off-diagonal correlation coefficients C are mapped to integers M (which range from -99 to +99) as follows: Define *small* as IDROPP/100, where IDROPP is an input parameter (card set 2 of the INPUT file, Table VI A.1) with default value 2. Correlation coefficients in the range $-small < C < small$ are mapped to zero. Positive correlation coefficients in the range $M / 100 < C \leq (M + 1) / 100$ are mapped to M . Negative coefficients in the range $(M + 1) / 100 \leq C < M / 100$ are mapped to $-M$. Diagonal correlation coefficients always have the value +1, so they are not explicitly written in the file.

To reconstruct the (approximate) covariance matrix from the mapped values, all coefficients C mapped to positive integer M are assigned the value $c = (M + 1/2)/100$. All coefficients C mapped to negative integer $-M$ are assigned the value $c = -(M + 1/2)/100$. If $M = 0$, $c = 0$. A partial listing of values for this description is given in Table VII E.1.

Table VII E.1. Map from true correlation coefficient C to integer M and back to approximate coefficient c for compact format

C	M	c	C	M	c
$-1.00 \leq C < -0.99$	-99	-0.995	$0.99 < C \leq 1.00$	99	0.995
$-0.99 \leq C < -0.98$	-98	-0.985	$0.98 < C \leq 0.99$	98	0.985
$-0.98 \leq C < -0.97$	-97	-0.975	$0.97 < C \leq 0.98$	97	0.975
$-0.97 \leq C < -0.96$	-96	-0.965	$0.96 < C \leq 0.97$	96	0.965
...
$-0.04 \leq C < -0.03$	-3	-0.035	$0.03 < C \leq 0.04$	3	0.035
$-0.03 \leq C < -0.02$	-2	-0.025	$0.02 < C \leq 0.03$	2	0.025
$-0.02 \leq C < -0.01$	-1	-0.015	$0.01 < C \leq 0.02$	1	0.015
$-0.01 \leq C \leq 0.01$	0	0.000			

For example, a correlation coefficient whose exact value is $C = 0.7382$ is mapped to $M = 73$ and reconstructed as $c = 0.735$. The value $C = -0.2901$ is mapped to $M = -29$ and reconstructed as $c = -0.295$; if $C = -0.3000$, again $M = -29$ and $c = -0.295$.

Only the lower triangular half of the $n \times n$ correlation matrix C_{ij} is written into the SAMMY.CCV file. The first entry of a row is the row number i ; the second, the initial column number j ; and the following entries are the (M -style) correlation of parameter i with parameters j through k (where k is the lesser of $i - 1$ and $j + m - 1$, and m is the maximum number of such correlations that can fit on the line). If all entries on a line are zero, the line is omitted.

Several test cases contain SAMMY runs to produce the output SAMMY.CCV file and/or others that read and use the CCV file to re-generate the covariance matrix. Among them are test cases tr071, tr082, tr083, tr084, tr089, tr131, tr146, and tr149.

Use one of the following equivalent commands to read a compact format and reconstruct the parameter covariance matrix:

```

READ COMPACT COVARIAnces for prior parameters
READ COMPACT CORRELAtions for prior parameters
COMPACT COVARIANCES are to be read and used
COMPACT CORRELATIONS are to be read and used

```

SAMMY has the ability to use other than two digits (1, 2, 3, 4, 5, or 6 digits) for writing and reading the compact format; this is now also an approved ENDF format. To write SAMMY.CCV with a different number of digits, set NDIGIT in column 72 of card set 2 of the INPut file.