Coding of covariance data for all EXFOR Entries having authors' covariances

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2013: ***A70*** *V.Zerkin (Continuing Action) Prepare coding of covariance data for all EXFOR Entries having authors' covariances, and offer them to compilers according to Areas for finalizing and submitting to the database*

EXFOR contains 67 Entries (212 Subentries) with keyword COVARIANCE. Some of them have only comments or description without data values, some refer to possibility to obtain values from the author, etc. Cases with given correlation matrix (or covariance) is already present in Entry were considered in this work.

#	ENTRY	Status	#	ENTRY	Status	#	ENTRY	Status
1	10047	N/A	*26*	22411		*51*	31448	
2	10887	done	*27*	22412		*52*	31722	
3	12833	done	*28*	22666		*53*	32591	
4	12834	done	*29*	22733		*54*	32593	
5	12972	done	*30*	22741		*55*	40660	
6	13113	done	*31*	22806		*56*	40664	done
7	13134	done	*32*	22870		*57*	40665	
8	13176	N/A	*33*	22875		*58*	40666	
9	21643	done	*34*	22961		*59*	40915	done
10	21772		*35*	22962		*60*	40960	done
11	21817		*36*	22973		*61*	41112	done
12	21968	done	*37*	22974		*62*	41322	done
13	22044		*38*	22975		*63*	41438	done
14	22140		*39*	22976		*64*	41439	done
15	22148		*40*	22988		*65*	41508	done
16	22211		*41*	22993		*66*	V0042	done
17	22214		*42*	23039		*67*	V0043	done
18	22216		*43*	23069				
19	22282		*44*	23077				
20	22403	Problem?	*45*	23114				
21	22404		*46*	23156				
22	22407		*47*	30660				
23	22408		*48*	30811				
24	22409		*49*	30812				
25	22410		*50*	31447				

Sequence of operations for coding covariance data in EXFOR was the following:

1) If maximum width of one line in correlation/covariance matrix was longer than 55 symbols, matrix was sent to “MyPlot” Uploading system, plotted by Web-ZVView, and output data - draft for EXFOR coding it was used as input to EXFOR file
2) EXFOR file was modified by including coding of covariance data
3) EXFOR Entry/Subentry was sent to Uploading system and matrix was plotted and visually checked on the plot and html-output.

Additional purpose of this work was to find out problems, i.e. whether proposed codding of covariance data is sufficient to present covariance data already existing in EXFOR files. One (probably, typical) problem was discovered: covariance matrix can be given together with standard deviations column. Probably coding of covariance data should be extended to include such cases. Example (SUBENT 22403005) is given below:

```
SUBENT        22403005   19980820
BIB                 4        296
REACTION    (26-FE-0(N,EL)26-FE-0,,DA,,LEG/RSL)
ANALYSIS     .A(0) = ANGLE-INTEGRATED CROSS SECTION,
              A(L) - L=1 TO MAX - COEFF. AS IN ENDF
STATUS      (DEP,22403002)
COVARIANCE .Correlations of the Legendre coefficients
               EN = 9.41 MEV
             l RSD(%)           correlation matrix
             0   2.10 100
             1   0.13  35 100
             2   0.20  20  65 100
             3   0.33   8  59  91 100
             4   0.58   0  33  87  94 100
             5   0.97   2  42  87  97  98 100
             6   1.58   1  30  86  91  99  97 100
             7   2.30   1  34  83  92  97  98  98 100
             8   4.00   4  26  82  84  93  92  97  96 100
             9   6.29   6  36  79  84  88  90  92  94  95 100
            10  13.84   6   9  65  57  72  67  79  76  87  83 100
             ----------------------------------------
DATA                 5        143
EN          EN-RSL-FW  NUMBER     DATA-CM    ERR-T
MEV         MEV        NO-DIM     NO-DIM     PER-CENT
 9.4100E+00 1.2400E-01 1.0000E+00 8.4557E-01 1.3000E-01
 9.4100E+00 1.2400E-01 2.0000E+00 7.1911E-01 2.0000E-01
 9.4100E+00 1.2400E-01 3.0000E+00 5.5711E-01 3.3000E-01
 9.4100E+00 1.2400E-01 4.0000E+00 4.0569E-01 5.8000E-01
 9.4100E+00 1.2400E-01 5.0000E+00 2.4550E-01 9.7000E-01
 9.4100E+00 1.2400E-01 6.0000E+00 1.4083E-01 1.5800E+00
 9.4100E+00 1.2400E-01 7.0000E+00 6.9570E-02 2.3000E+00
 9.4100E+00 1.2400E-01 8.0000E+00 2.8640E-02 4.0000E+00
 9.4100E+00 1.2400E-01 9.0000E+00 9.4700E-03 6.2900E+00
 9.4100E+00 1.2400E-01 1.0000E+01 2.4800E-03 1.3840E+01
```


Coding of COVARIANCE data includes Legendre coefficient numbers (“iLeg”) and correlation matrix:

```
(XY,11,NO-DIM,iLeg)
 0 1 2 3 4 5 6 7 8 9 10
(Z,66,PER-CENT,COR:EN=9.41MeV)
 100
  35 100
  20  65 100
   8  59  91 100
   0  33  87  94 100
   2  42  87  97  98 100
   1  30  86  91  99  97 100
   1  34  83  92  97  98  98 100
   4  26  82  84  93  92  97  96 100
   6  36  79  84  88  90  92  94  95 100
   6   9  65  57  72  67  79  76  87  83 100
```

Column with uncertainties of coefficients (RSD,%) is not coded, assuming that if user needs it – s/he can take it from the DATA section (ERR-T column). Additional complication for user would be obtaining uncertainties for 0-coefficient – they can be found in Subentry 22403006. Probably, it would be useful to allow coding of standard deviation column as well under COVARIANCE. It could be done in two ways: (a) in additional 1-dimentional array, and (b) in extended correlation matrix having additional left column - so, we'll have matrix (n+1)×n. Option (a) – easy to implement, but not convenient to observe. Option (b) – better for users if matrix is not large; requires more complex implementation in plotting and checking.

Results are available as draft for compilers for finalizing or further work:
https://www-nds.iaea.org/exfor-master/working/Zerkin2NRDC2014/A70/.

18 Entries were completed (from total 67). The work is not finished. The options can be discussed on NRDC meeting.