Appendix B. PMAXS and XSEC format (version 2.0, revision-01)

Last revised 9/15/02

PMAXS file contains XS for one set, which may have one or more history cases and burnup points. XSEC file contains XS for one or more sets. There are 3 cards, i.e. Burnup Information, History case identification and Burnup point identification, are needed in PMAXS file only. The NSET in XS Control Information means number of history cases in PMAXS and means number of XS sets. Everything else is common.

		Existence
1	XS Control Information	NSET>1
2	Branches Information	Optional
3	Burnup Information	PMAXS
XS Set/(History case) wise data		Always
4	XS Set identification	Always
5	Dimension data	Always
6	History case identification	PMAXS
	Reference state data	Always
7	State identification	Always
	XS Data Block (repeat for each burnup point)	Always
8	Burnup point identification	PMAXS
9	Principal cross sections	Always
10	Scattering cross sections	Always
11	ADF	Optional
12	CDF	Optional
13	Local Power Peaking Factors	Optional
14	Power form function	Optional
15	Group-wise form function	Optional
16	Detector information	Optional
17	Xe/Sm cross sections	Optional
18	Beta of Delayed neutron	Optional
19	Lambda of Delayed neutron	Optional
20	Spectrum of Delayed neutron	Optional
21	Decay heat data	Optional
22	End Label of XS Block	Always
	Control rod branch cases (same structure with Ref. state case)	IBCR>0
	Moderator density branch cases (same structure)	IBMD>0
	Soluble Boron branch cases (same structure)	IBSB > 0
	Fuel temperature branch cases (same structure)	IBTF>0
	Moderator temperature branch cases (same structure)	IBTM >0

*The data in XS Block are original data for reference state, and partials for other branches

1) XS Control Information

If this card is default, all variable will be set to their default values.

```
Title,NSET,LADF,LCDF,LLPP,LPFF,LGFF,LDET,LXES,LBET,LAMB,LSPD,LDEC
Format      : (A8, I8,11L)
Title       =’XS_CONT’
NSET        number of history cases in PMAXS.
            number of XS sets in XESC.
            default=1.
LADF        T/F:  Read/not ADF, default=T
LCDF        T/F:  Read/not CDF, default=T
LLPP        T/F:  Read/not Local Power Peaking Factors, default=F
LPFF        T/F:  Read/not Power form function, default=F
LGFF        T/F:  Read/not Group form function, default=F
LDET        T/F:  Read/not Detector information, default=F
LXES        T/F:  Read/not Xe/Sm cross sections, default=T
LBET        T/F:  Read/not Beta of Delayed neutron, default=F
LAMB        T/F:  Read/not Lambda of Delayed neutron, default=F
LSPD        T/F:  Read/not Spectrum of Delayed neutron, default=F
LDEC        T/F:  Read/not Decay heat data, default=F
```

* PARCS will use these logic variables value in XSEC, but Depletor will use the value in user input file instead these value in PMAXS.

2) Branches information

```
Title,IST,IBCR,IBMD,IBSB,IBTF,IBTM
(name,ind,CR(i), MD(i), SB(i), TF(i),TM(i), i=1,NBRA)
Format      : (A8,6I4/(2x,A8,2I4,4F10.5)
```

If this block is default, then IBCR=IBMD=IBSB=IBTF=IBTM=0

```
Title       =’BRANCHES’
IST         Branches structure index
IBCR        number of control rod branch cases.
IBMD        number of moderator density branch cases.
IBSB        number of soluble boron branch cases.
IBTF        number of fuel temperature branch cases.
```

```
  IBTM        number of moderator temperature branch cases.
  NBRA=1+IBCR+IBMD+IBSB+IBTF+IBTM
If NBRA=1, the late part of this block can be defaulted.
  Name        ='REFE'/'CRBR'/'MDBR'/'SBBR'/'TFBR'/'TMBR'/
  ind         index of branches
  CR          control rod state.
  MD          Moderator density (g/cc).
  SB          Soluble boron concentration (ppm).
  TF          Fuel Temperature (K).
  TM          Moderator Temperature (K).
```

3) Burnup information

If this card is default, then NBset=1, `NBP(1)=1,BURN(1,1)=0`

```
  Title,NBset/
  (i,NBP(i),(Burn(j,i),j=1, NBP(i)))
  Format      : (A8,I4/(2I4,10F8.3/(8x,10F8.3/)))
  Title       ='BURNUPS'
  NBset       number of Burnups sets, default=1
  i           index for Burnups set
  NBP(i)      Burnup points in Burnups set i
  Burns(j,i)  Burnup values.
```

4) XS Set identification

```
  Title, Series, IHMD, Dsat,ARWatR,ARByPa,ARConR, CMNT
  Format      : (A8,I4,5F8.5,A12)
  Title       ='XS_SET'
  Series      XS set series number
  IHMD        initial heavy metal density (g/cc)
  Dsat        the saturated moderator density
  ARByPa      the area ration of bypass to coolant
  ARWatR      the area ration of water rods to coolant
  ARConR      the area ration of control rods to coolant
  CMNT        comments for this fuel assembly
```

5) Dimension Data

```
 Title,IST,NGROUP,NDLAY,NDCAY,NADF,NCDF,NCOL,NPIN
Format      : (A8,14I4)
Title       =’DIMENSN’
IST         Branches structure index
NGROUP      Number of energy groups.
NDLAY       Number of delay neutron groups.
NDCAY       Number of decay Heat groups.
NADF        Number of ADF in each group.
NCDF        Number of CDF in each group.
NCOL        Maximum rods in each row.
NPIN        Number of pins, including fuel, guide tubes.
```

6) History case identification

Only needed in PMAXS when NSET>1

```
Title, HCR, HMD, HSB, HTF, HTM
Formatted   : (A8,I4,4F10.5)
Title       =’HST_CASE’
HCR         =Control rod history
HMD         =Moderator density history (g/cc)
HSB         Soluble boron History(ppm).
HTF         Fuel Temperature History (K).
HTM         Moderator Temperature History(K).
```

7) State identification

```
Title, index, IBSET
Format      : (A8, 2I4)
Title       ='REFERENC'/'CRBRANCH'/'MDBRANCH'/'SBBRANCH'
            /'TFBRANCH'/'TMBRANCH'/
index       Branch case index
IBSET       Burnups Set index
```

8) Burnup Point Identification

Only needed in PMAXS when NBPI>1

```
Title, BURN
Format      : (A8,F8.3)
Title       ='BURNPNT'
BURN        Burnup of this point
```

9) Principal cross sections

```
Title,
(STR(g),SAB(g),SNF(g),SKF(g),CHI(g),INV(g),g=1,NGROUP),
Format :    (A8/(1p6E12.5/))
Title       ='PRI'
STR         Transport cross section
SAB         Absorption cross sections.
SNF         Nu-fission cross section
SKF         Kappa-fission cross section
CHI         Fission spectrum
INV         Inverse Neutron velocity (cm/sec)
```

10) Scattering cross sections

```
Title,
((SCT(j,i),j=1,NGROUP),i=l,NGROUP)
Format      : (A8/(1p10E12.5/))
Title       =’SCA’
SCT(j,i)    scattering xs from group j to group i.
```

11) ADF

```
Title,
((ADF(n,g),j=1,NADF),g=1,NGROUP)
Format      : (A8/(1p6E12.5/))
Title       =’ADF’
ADF         Assembly discontinuity factor.
            For Cartesian:
            If NADF=5: j=1/2/3/4/5= W/S/E/N/average
            If NADF=4: j=1/2/3/4  = W/S/E/N
            If NADF=3: j=1/2/3    = W/S/average
            If NADF=2: j=1/2      = W/S
            If NADF=1: j=1        = average
```

12) CDF

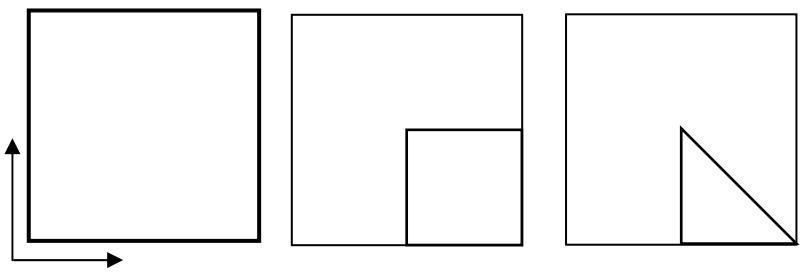
```
Title,(CDF(n),j=1,NCDF)
Format      : (A8/(1p6E12.5/))
Title       =’CDF’
CDF         Corner discontinuity factor.
            For Cartesian:
            For Cartesian:
            If NCDF=8: j=1/2/3/4  = NW/SW/SE/NE
                        /5/6/7/8   /W /S /E /N
            If NCDF=4: j=1/2/3/4  = NW/SW/SE/NE
            If NCDF=3: j=1/2/3    = NW/SW/SE
            If NCDF=2: j=1/2      = corner/mid
            If NCDF=1: j=1        = corner
```

13) Local Power Peaking Factors

```
Title,
LPF(i),i=1,8
Format      : (A8/8F10.5)
Title       ='LPF'
LPF(1)      Local Power Peaking Factor.
LPF(2)      Inner  J1 factor (for Critical Power Ratio)
LPF(3)      Side   J1 factor (for Critical Power Ratio)
LPF(3)      Corner J1 factor (for Critical Power Ratio)
LPF(5)      the ratio of DED fraction in coolant and its density
LPF(6)      the ratio of DED fraction in water rod and its density
LPF(7)      the ratio of DED fraction in bypass and its density
LPF(8)      DED fraction in control rod.
```

14) Power form function

```
Title,
(PFF(j),j=1,NPINS)
Format      : (A8/(10F10.5/))
Title       ='PFF'
PFF(j)      Power form function from left to right, from bottom to
            top.
```



15) Group-wise form function

```
Title,
((GFF(j,g),j=1,NPINS),g=1,NGROUP)
Format      : (A8/(10F10.5/))
Title       =’GFF’
GFF(j,g)    group-wise form function from left to right, from
            bottom to top.
```

16) Detector information

```
Title,
(DFORM(g),DMIC(g),g=1,NGROUP)
Format      : (A8/(1p2E12.5/))
Title       =’DET’
DFORM       Detector Form function
DMIC        detector microscopic XS
```

17) Xe/Sm cross sections

```
Title,
YLDXE,YLDID,YLDPM,YLDSM
(XENG(g),SMNG(g),SFI(g),g=NGROUP)
Format      : (A8/(1p3E12.5/))
Title       =’XESM’
YLDXE       Effective Xenon Yield
YLDID       Effective Iodine Yield
YLDPM       Effective Promethium Yield
YLDSM       Effective Samarium Yield
XENG        Microscopic capture cross section of Xenon
SMNG        Microscopic capture cross section of Samarium
SFI         Fission cross section
```

18) Beta of Delayed neutron

```
 Title, (BETA(n), n=1,NDLAY),
Format      : (A8,(1p6E12.5/))
```

```
Title       ='BETA'
BETA        Effective delayed neutron fraction in the base
            condition of base
```

19) Lambda of Delayed neutron

```
 Title, (LAMBDA(n),n=1,NDLAY)
Format      : (A8,(1p6E12.5/))
Title       ='LAMB'
LAMBDA      Decay constant of delayed neutron in the base condition
            of base (/sec).
```

20) Spectrum of Delayed neutron

```
 Title,
((CHID(n,g),n=1,NDLAY),g=1,NGROUP)
Format      : (A8/(1p6E12.5/))
Title       ='CHID'
CHID        Fission spectrum of delay neutron
```

21) Decay heat data

```
 Title,
(DCBS(n),n=1,NDCAY)
(DHBS(n),n=1,NDCAY),
Format      : (A8/(1p6E12.5/))
Title       ='DEC'
DCBS        Decay constant of decay heat group i. [/sec]
DHBS        Fraction of the total fission energy appearing as decay
            heat for decay group i.
```

22) Ending Label of XS block

```
Title
Format      : (A3)
Title       ='END'
```