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Introduction of SRAC for Reactor Physics Analyses

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Contents

History of SRAC

1978~ Development of SRAC as a Standard thermal Reactor Analysis Code system at JAERI

1983 First Report (JAERI 1285) by K. Tsuchihashi *et al*.

1986 Revised SRAC (JAERI 1302) by K. Tsuchihashi *et al.*

1995 SRAC95 (Potable system on Unix OS)

1996 Published in Japan (JAERI-Data/Code 96-015) by K. Okumura *et al.*

JAEA established (Oct. 2005)

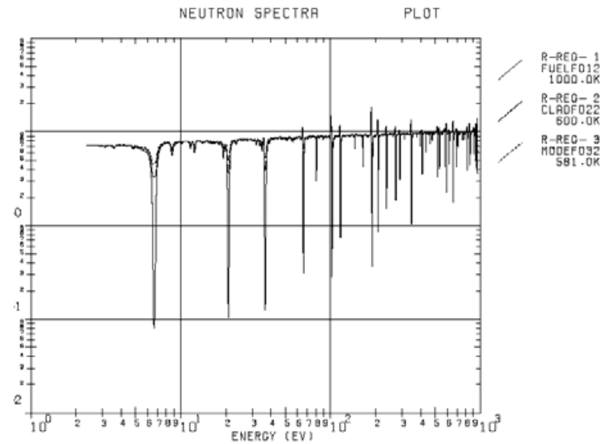
2006 SRAC2006 (final version)

2007 Published with English manuals:

- **JAEA-Data/Code 2007-4 (SRAC body code)**
- **JAEA-Data/Code 2007-3 (COREBN)**

SRAC : A comprehensive neutronics calculation code system for various types of thermal reactors

- **Production of effective microscopic and macroscopic group cross sections**
- **Static cell and core calculations including burn-up analyses**



Features

- **Collision probability calculation (PIJ) applicable to 16 types of lattice geometries**
- **PEACO option which solves a multi-region cell problem by PIJ using hyper-fine lethargy mesh in resonance energy range**
- **SN transport codes ANISN(1D), TWOTRAN(2D) and multi-dimensional diffusion code CITATION are integrated into the system to enable many choices of calculation flow depending on problem**

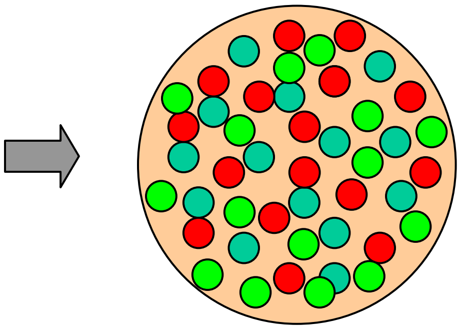
MVP : general purpose Monte Carlo code based on the continuous-energy model

- Time-dependent neutron and photon transport problems
- External-source and fission-source (keff) problems

Features

(MVP have been used to give reference solutions for SRAC)

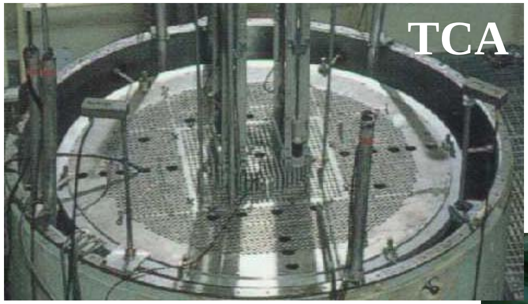
- Fast computation algorism for vector and/or parallel computers
- Arbitrary temperature calculation
  (Internal production of temperature dependent libraries)
- Burn-up calculation (MVP-BURN)
- Statistical geometry model
  for randomly distributed lots of particles
  (analyses of HTGR, plutonium spots etc.)
- Accurate perturbation calculation
- Noise analysis (Feynman-α)
- Production of group constants for
  deterministic code (scattering matrix tally)



Location and type of particles are sampled along a flight path of each neutron

Applications of SRAC and MVP in Japan

Experimental Analyses of Critical Assemblies (CA) and Testing Reactors



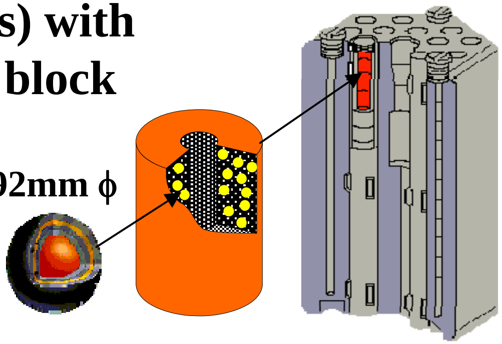
*TCA [JAEA]: Tank type critical assembly
Pin type fuels (low enriched UO_2/MOX),
H_2O moderator

*FCA [JAEA]: Fast Critical Assembly
Many kinds of plate type fuels
and structural materials;
uranium, plutonium, sodium,
stainless steel, polyethylene, etc.

*HTTR [JAEA]: High Temperature engineering Test Reactor
TRISO coated fuel particles (CFPs) with
UO_2 kernel in hexagonal graphite block
fuel assembly

0.92mm ϕ

about 1 billion CFPs
in HTTR



*JMTRC [JAEA] :CA for JAEA Material Testing Reactor
UAl$_x$-Al plate type fuel,
H_2O moderator
*STACY [JAEA]: CA of Nucl. Fuel Cycle Safety
Engineering Research Facility (NUCEF)
10% enriched uranil nitrate solution fuel
*KUCA [Kyoto Univ.]
High enriched U-Al alloy plate type fuel,
polyethylene moderator

*EOLE [Cadarash]: Programs by CEA(France) and NUPEC, JNES
MOX-LWR mockup experiments ; MISTRAL, BASALA and FUBILA

Core Management and Upgrading of Research Reactor

*JRR-2 [JAEA]: research reactor (decommissioned)
45% enriched UAl$_x$-Al cylindrical plate type fuel,
D_2O moderator
*JRR-3M [JAEA]: research reactor
20% enriched UAl$_x$-Al plate type fuel,
H_2O moderator

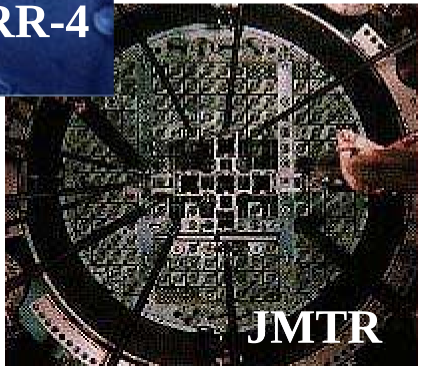
*JRR-4 [JAEA]: research reactor

93% enriched U, U-Al alloy fuel, (~1996)

20% enriched U, U_3Si_2-Al dispersed alloy fuel (1998~), H_2O moderator

*JMTR [JAEA]: materials testing reactor

20% enriched U_3Si_2-Al dispersed alloy fuel, H_2O moderator



Analyses of Post Irradiation Experiments

*PWR (Mihama NPP/Unit-3, Takahama NPP/Unit-3) by JAEA

*BWR (Fukushima NPP/Unit-1/3) by NUPEC

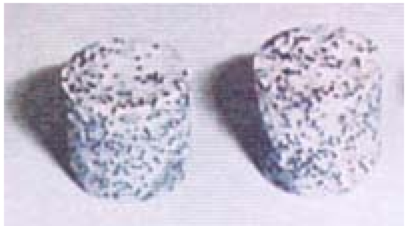
*REBUS program analyses by JNES

Conceptual Nuclear Design Study of Future Reactors

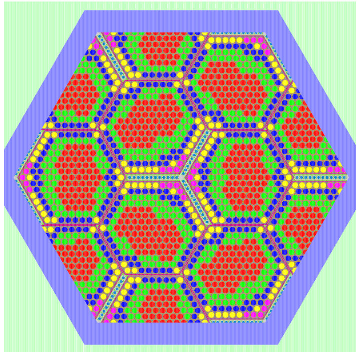
*Reduced-Moderation Water Reactors

*Space Power Reactor

*Rock-like oxide (ROX) fueled Reactor



ROX fuel pellets



Fuel lattice of RMWR

Integral Testing of JENDL

*Benchmark calculation data with MVP for more than 1000 experimental data in the ICSBEP benchmark handbook

System Structure

(Ref. Section 1.2)

SRAC Body Code

PIJ (Collision Probability Method)
ANISN (1-D S_N transport)
TWOTRAN (2-D S_N transport)
TUD (1-D Diffusion)
CITATION (Multi-D Diffusion)

SRAC Public Libraries

JENDL-3.2, -3.3
JEF-2.2, -3.0, -3.1
ENDF/B-VI.5, -VI.8, -VII.0

For more than 300 nuclides

Resonance absorption Calculation
Cell Burn-up Calculation
Reaction Rate Calculation

Macroscopic Cross-section Table

Auxiliary Burn-up Calculation Module

HIST : Management of Burn-up History
COREBN : CITATION + Interpolation of Macroscopic Cross-section Table

Public Data Libraries

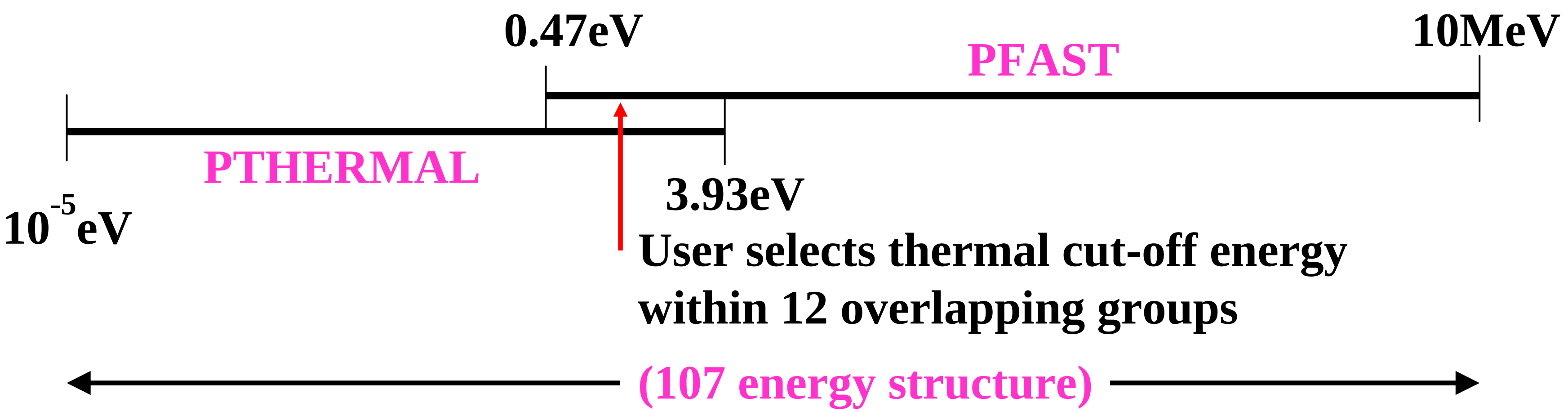
(Ref. Sections 1.3, 8.3)

(1) PFAST : Public Fast Library

Cross section data of all available nuclides for fast energy range (10MeV~0.47eV) in 74-group structure.

(2) PTHERMAL : Public Thermal Library

Cross section data of all available nuclides for thermal energy range (3.93eV~10^{-5}eV) in 48-group structure.

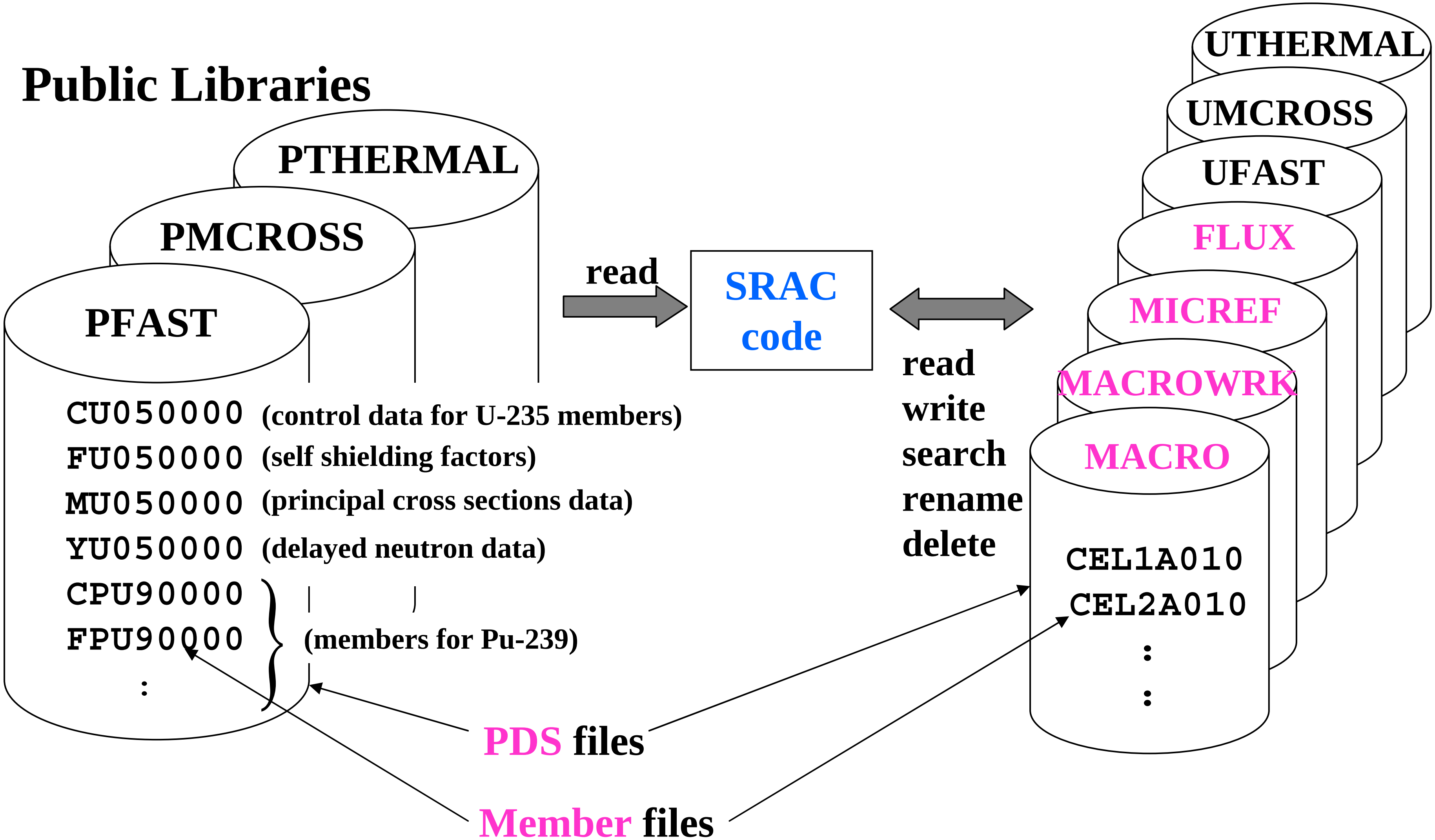


(3) PMCROSS : Public MCROSS Library (used by PEACO)

Point-wise cross section data of dominant resonant nuclides for the resolved resonant energy range (0.47eV~1keV)

Data Storage in PDS Files

(Ref. Section 1.4)



UFAST : User FAST Library

Fast energy cross section data of the nuclides necessary for user's calculation in his own energy group structure.

UTHERMAL : User Thermal Library

Thermal energy cross section data of the nuclides necessary for user's calculation in his own energy group structure.

UMCROSS: Users MCROSS Library

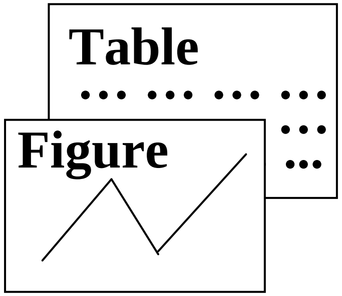
Hyperfine-group resonant cross section data for the nuclides produced from Public MCROSS library, which is Doppler broadened by the temperature of resonant mixture)

MICREF :	**Microscopic X-section data in fine group**
MACROWRK :	**Macroscopic X-section data in fine group**
MACRO :	**Macroscopic X-section data in collapsed (coarse) group**
FLUX :	**Flux data in fine and collapsed group.**

(Ref. Chapter 6)

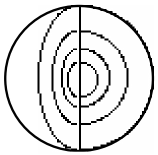
Utilities to edit members of PDS files

Users Edit

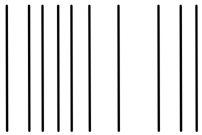


Geometrical Models of PIJ

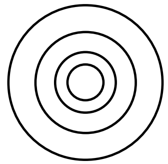
(Ref. Section 2.4)



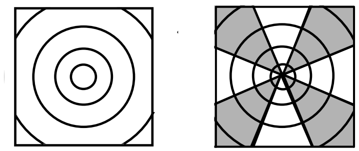
Sphere (Pebble, HTGR)



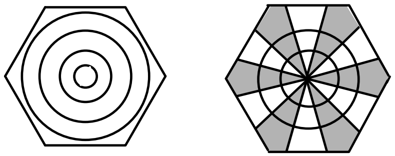
1D-Plate (JRR, JMTR)



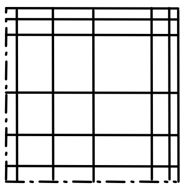
1D-Cylinder (any pin type fuel)



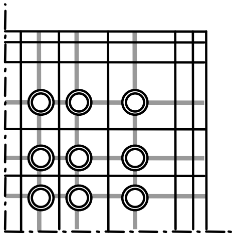
Square unit pin cell (PWR, BWR)



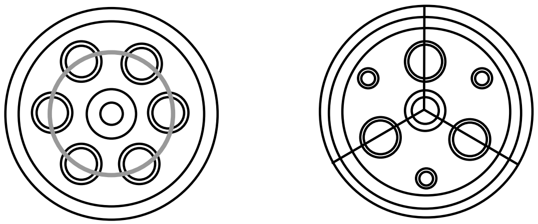
Hexagonal unit pin cell (FBR, VVER, HCLWR)



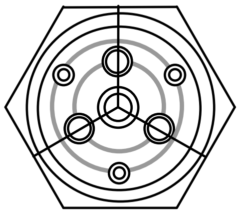
2D square plate fuel assembly (KUCA)



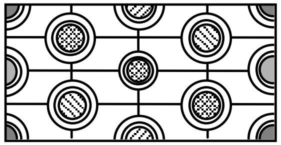
2D square assembly with pin rods (PWR)



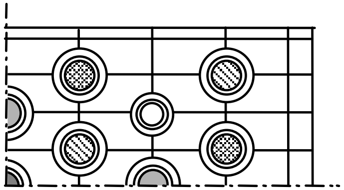
Annular assembly with annular arrays of pin rods (CANDU, ATR, RBMK)



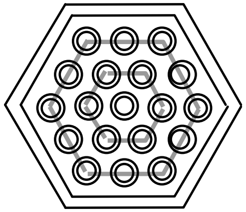
Hexagonal assembly with annular arrays of pin rods (HTTR, VHTRC)



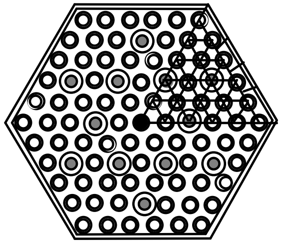
Periodic 2D X-Y array with different pin rods (PROTEUS-LWHCR)



Reflective 2D X-Y array with different pin rods(PWR, BWR,etc.)



Hexagonal fuel assembly with pin rods (FBR)



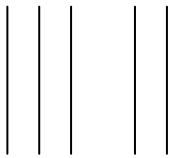
Hexagonal Assembly with different types of pin rods (VVER,HCLWR)

Geometrical Modes of Other Codes

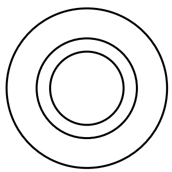
(Ref. Sect. 2.4~2.7)

S_N Transport

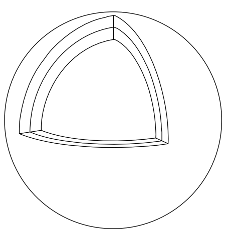
ANISN(3)



X (Slab)

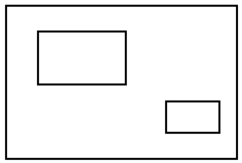


R (Cylinder)

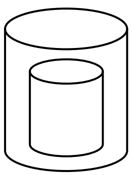


Rs (Sphere)

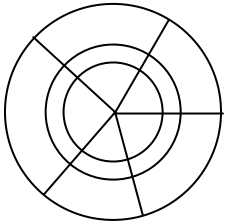
TWOTRAN(3)



X-Y (2D-Slab)



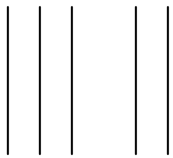
R-Z (2D-Cylinder)



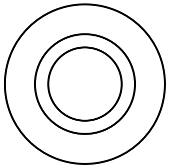
R-θ (2D-Circle)

Diffusion

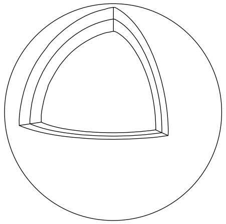
TUD(3)



X (Slab)



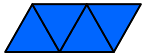
R (Cylinder)

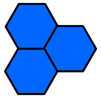


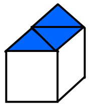
Rs (Sphere)

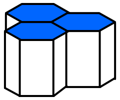
CITATION(12) / COREBN(12)

X	(1D-Slab)
R	(1D Cylinder)
Rs	(Sphere)
X-Y	(2D-Slab)
R-Z	(2D-Cylinder)
R-θ	(2D-Circle)
Tx-Ty	(2D-Triangular)
Hx-Hy	(2D-Hexagonal)
X-Y-Z	(3D-Slab)
Tx-Ty-Z	(3D-Triangular)
Hx-Hy-Z	(3D-Hexagonal)
R-θ-Z	(3D-Cylinder)









Resonance Absorption Calculation

(Ref. Sect. 1.6)

1) Table-look-up (NR approximation)

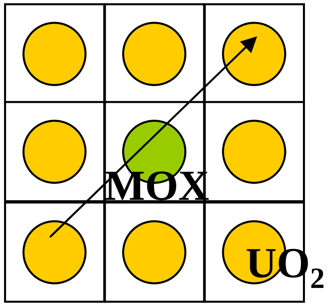
$$\sigma_{x,n}^{eff} = \sigma_{x,n}^{\infty} \times f_{x,n}(\sigma_{0,n}^{NR}, T)$$

$$\sigma_{0,n}^{NR} = \frac{1}{N_n}\sum_{m \neq n}\left(N_m \sigma_{t,n}\right) + \frac{a(1-C_n)}{1+(a-1)C_n}\frac{1}{N_n L}$$

Nuclide-wise Dancoff Correction Factor

- **Calculated by PIJ**
- **or**
- **Given by Input**

Nuclide-wise Dancoff factor is effective for cell including different kinds of resonant mixtures

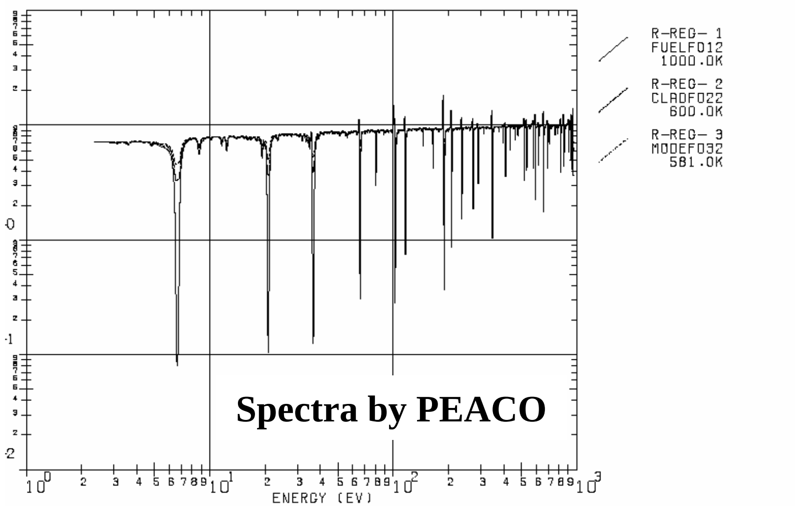


2) Table-look-up (IR approximation)

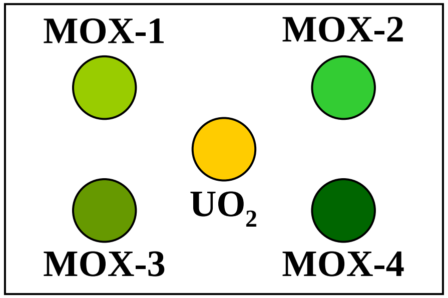
$$\sigma_{x,n}^{eff} = \sigma_{x,n}^{\infty} \times f_{x,n}(\sigma_{0,n}^{IR}, T)$$

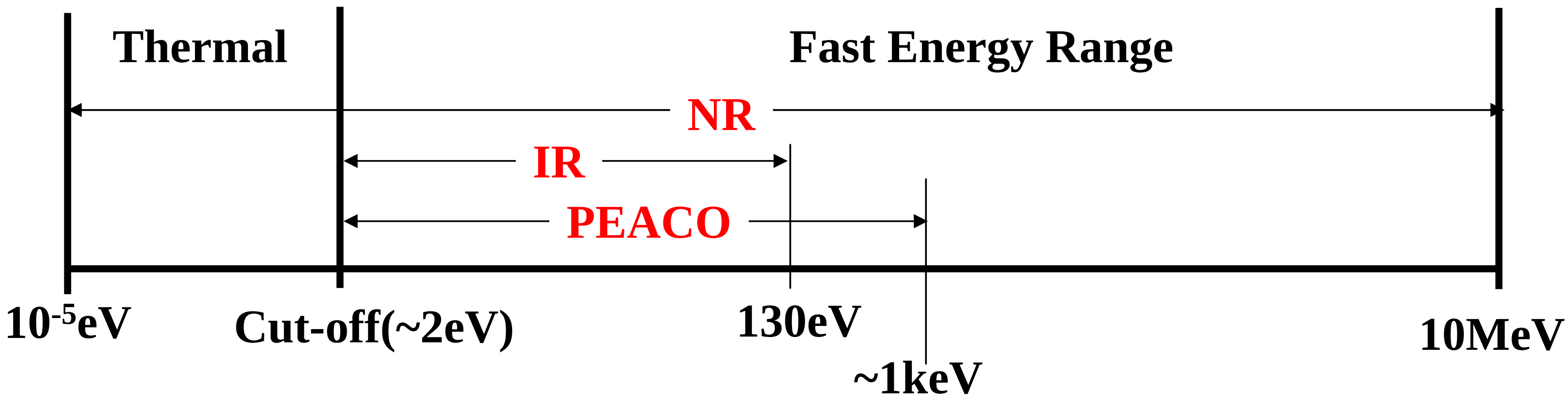
[Limited for one resonant mixture problem]

3) PEACO (Direct solution of slowing-down equation by PIJ with hyper-fine lethargy mesh of about 10^{-4}~10^{-3})



Applicable to any geometrical models and any temperatures but limited for two kinds of resonant mixtures.



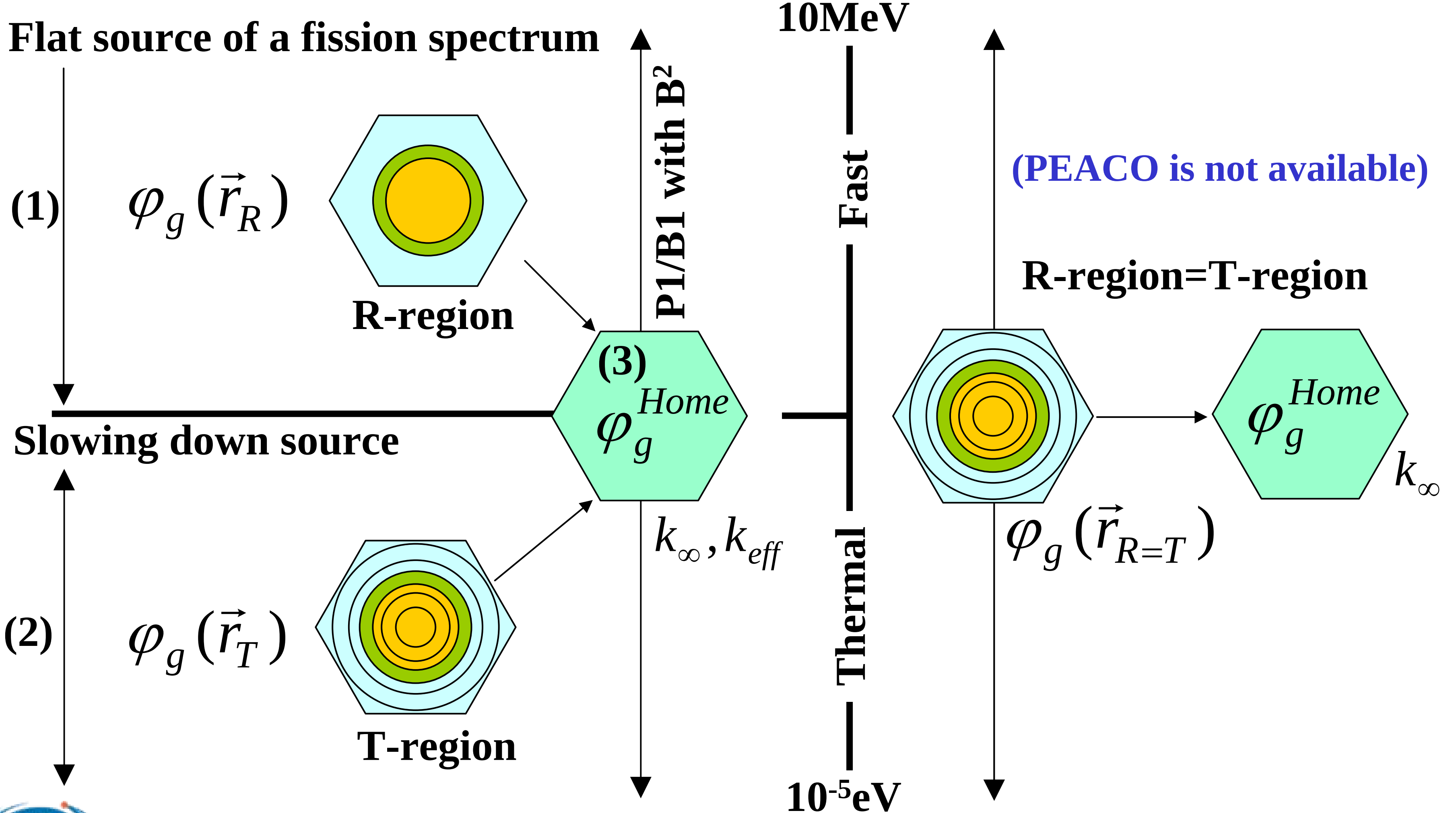


Fixed Source Mode and Eigenvalue Mode

(Ref. Sect. 1. 7)

Fixed Source Mode
(Separated Energy Calculation)

Eigenvalue Mode
(Whole Energy Calculation)



Definition of Spatial Divisions in PIJ

(Ref. Sect. 1.8)

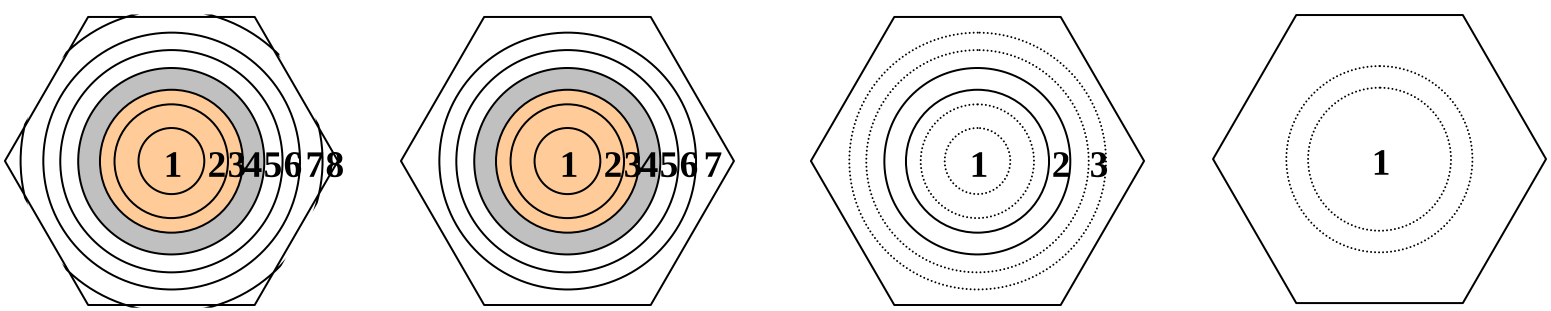
S-region: **geometrical sub-divisions**

T-region: **mesh divisions for thermal flux calculation in the fixed source mode (composed of S-regions)**

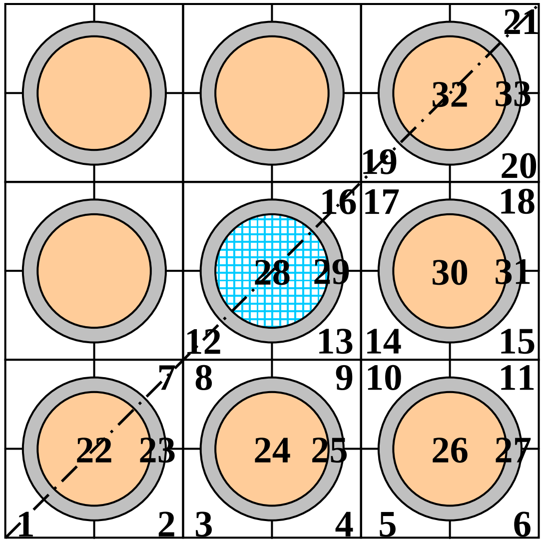
R-region: **mesh divisions for fast flux calculation in the fixed source mode (composed of T-regions)**

X-region: **Homogenized region (composed of R-regions)**

M-region: **Material region (composed of R-regions)**

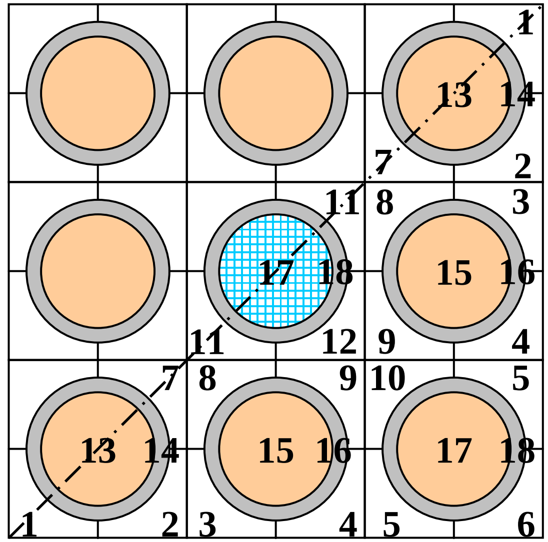


S-regions (IGT=6) **T-regions** **R-regions = M-regions** **X-regions**



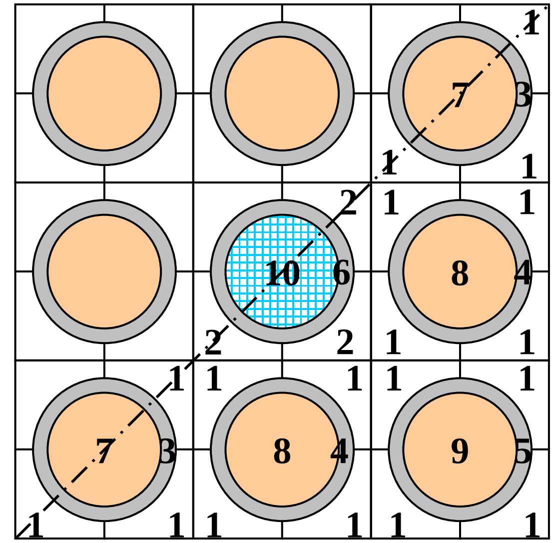
S-regions (33)

IGT=9



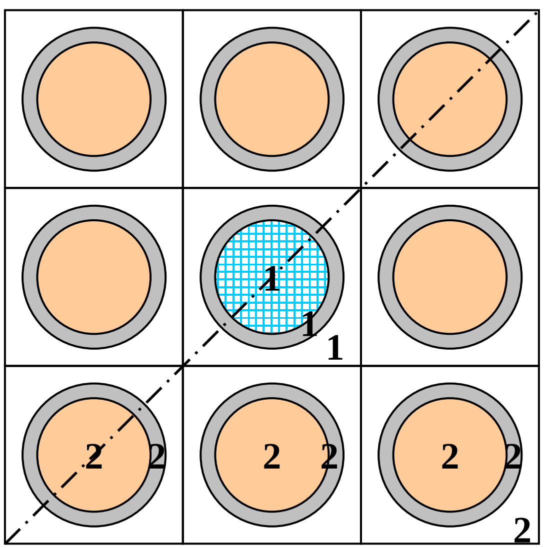
T-regions (18),

T-region No. for each S-region



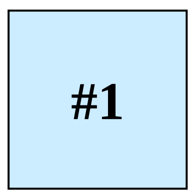
R-regions (10),

R-region No. for each T-region

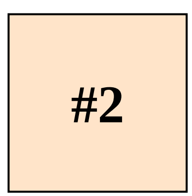


X-regions (2)

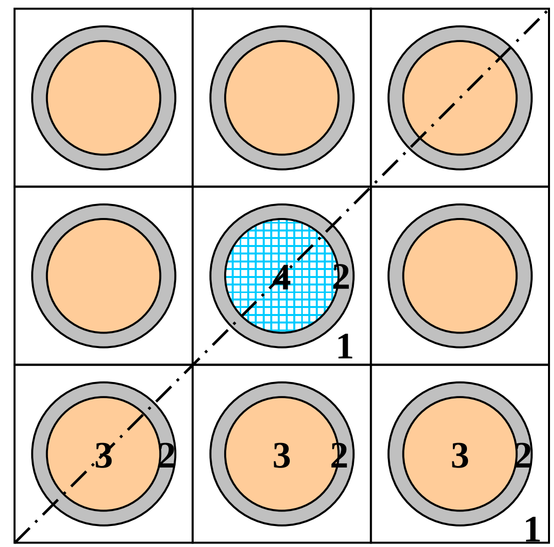
X-region No. for each R-region



Homogenized Σ of central cell



Homogenized Σ of surrounding cell



M-regions (4)

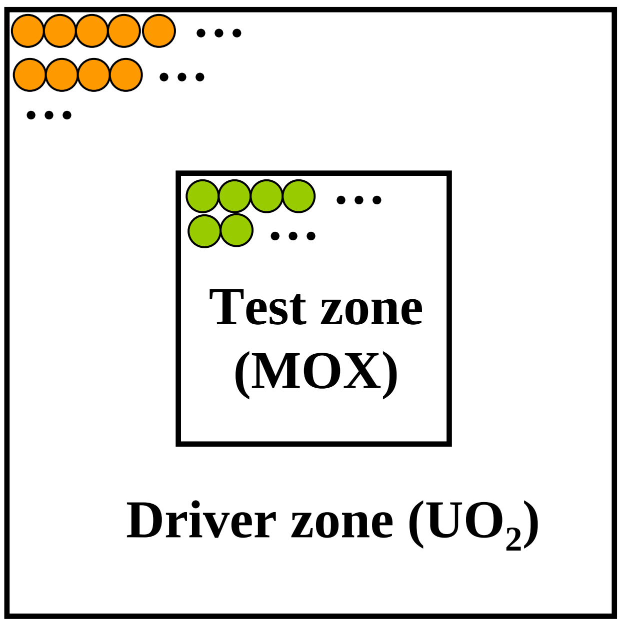
M-region No. for each R-regions

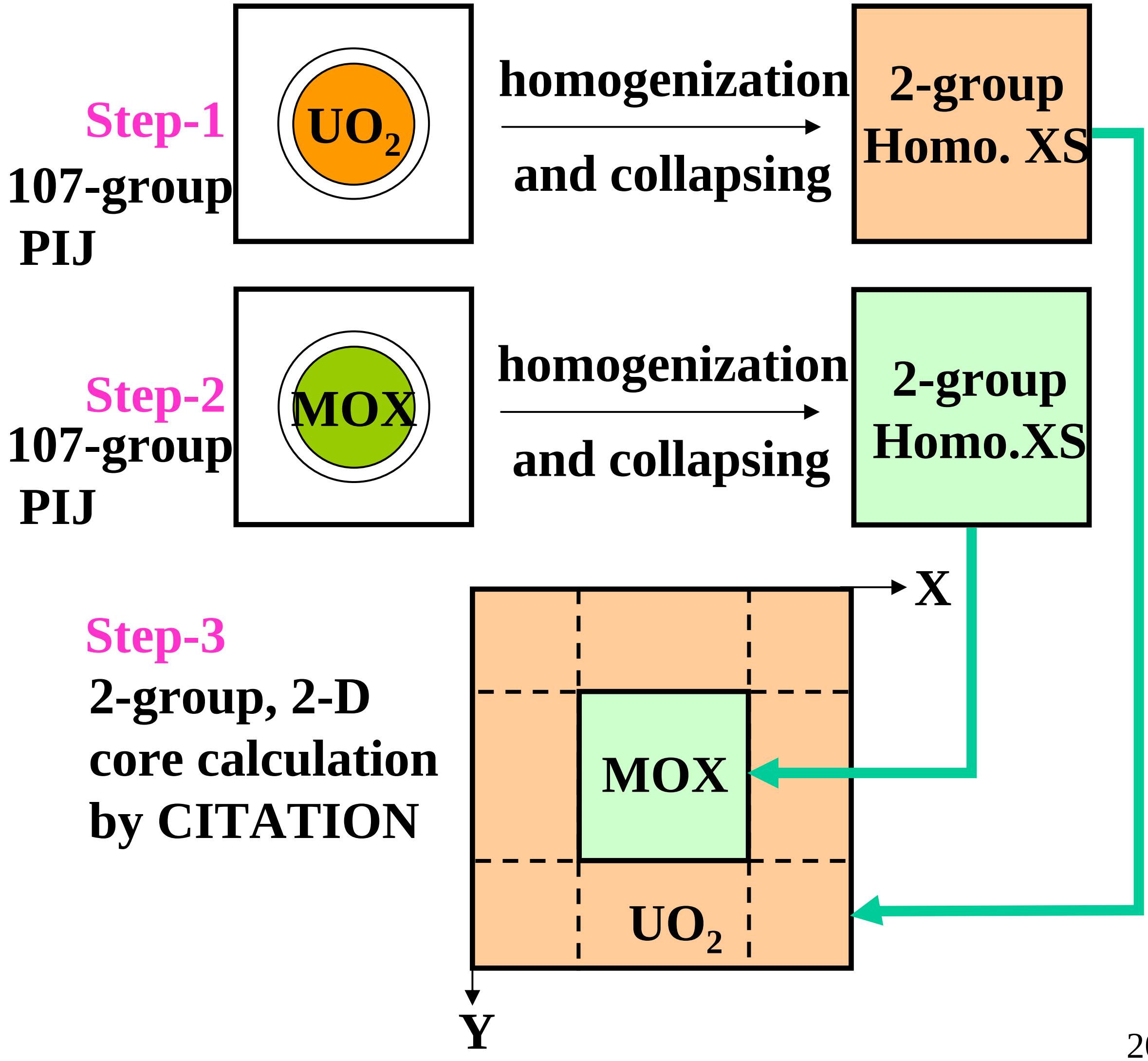
Calculation Scheme

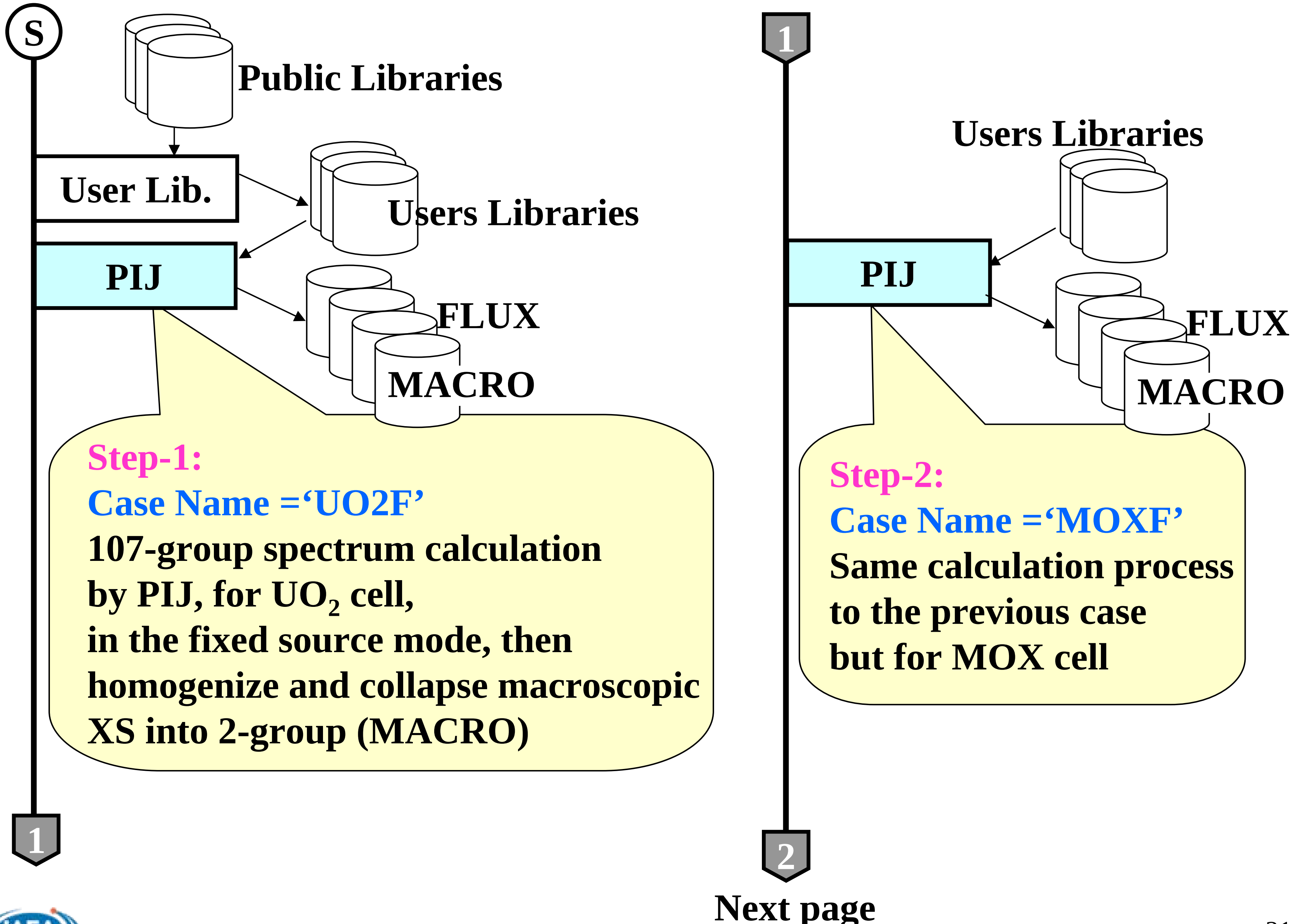
(Ref. Sect. 1.10)

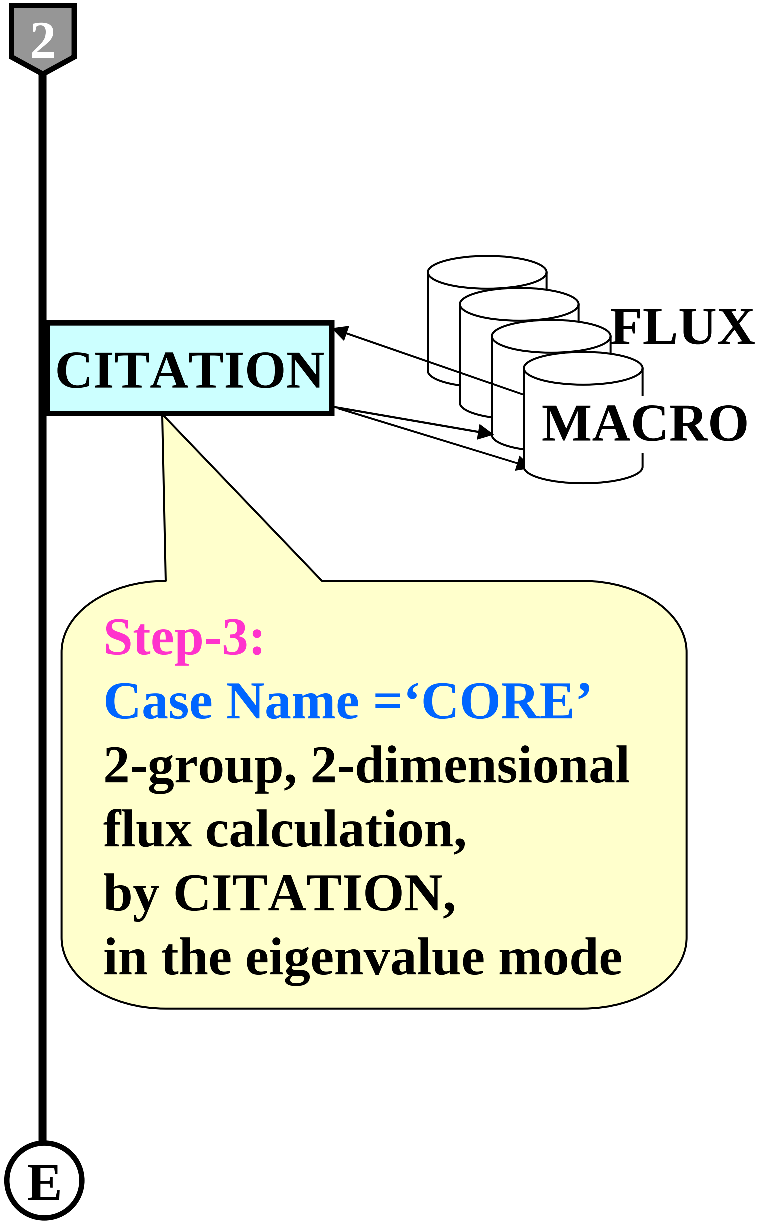
User defines method and calculation flow.

[Sample Problem]






S
Public Libraries
User Lib.
Users Libraries
PIJ
FLUX
MACRO
Step-1:
Case Name ='UO2F'
107-group spectrum calculation
by PIJ, for UO_2 cell,
in the fixed source mode, then
homogenize and collapse macroscopic
XS into 2-group (MACRO)
1
1
Users Libraries
PIJ
FLUX
MACRO
Step-2:
Case Name ='MOXF'
Same calculation process
to the previous case
but for MOX cell
2
Next page



Print-out Information

(Ref. Sect. 1.11)

6th output file — Status of calculation progress, PDS file access information, Error messages, if any

===== END OF SRAC CALCULATION ====

99th output file — Major calculated results

===== END OF SRAC CALCULATION ====

89th output file — Plot data (PostScript file) if plot option is used.

98th output file — Burn-up summary table if cell burn-up option is used.

Structure of Input Data

(Ref. Fig.1.10-2 of Sect. 1.10 and Chapter 2)

```
UO2F  ← Case name for UO2 cell calculation
Macro-XS for UO2 CELL BY PIJ  ← Comment for this case
1 1 1 1 2   1 4 3 -2 1   0 0 0 0 2   0 1 0 0 0  ← Option control
1.0E-3  / Buckling for P1/B1
/home/Administrator/SRACLIB-JDL33/pds/pfast    Old      File  ⎫
/home/Administrator/SRACLIB-JDL33/pds/pthml    O        F     ⎪
/home/Administrator/SRACLIB-JDL33/pds/pmcrs    O        F     ⎪
/home/KSK/MyPDS/UFAST                          Scratch  Core  ⎪
/home/KSK/MyPDS/UTHERMAL                       S        C     ⎬ PDS file control
/home/KSK/MyPDS/UMCROSS                        S        C     ⎪ (first case only)
/home/KSK/MyPDS/MACROWRK                       S        C     ⎪
/home/KSK/MyPDS/MACRO                          New      C     ⎪
/home/KSK/MyPDS/FLUX                           New      C     ⎪
/home/KSK/MyPDS/MICREF                         S        C     ⎭
60 30   3 1 / Fast(60g)+Thermal(30g) => Fast(3G)+Thermal(1G)
   :
   :          { Energy Group Structure }
   :
   :          { Geometry for PIJ }
   :
```

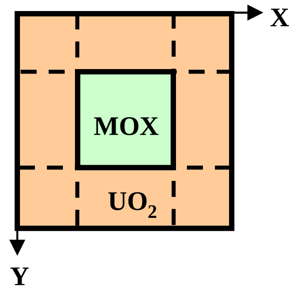
continued

```
      :
3   /  Number of Materials
FUE1X01X  0 3  300.  0.84  0.0  / 1 : UO2 FUEL
XU050001  2 0  6.086E-4
XU080001  2 0  2.255E-2
XO060001  0 0  4.725E-2
CLADX02X  0 1  300.  0.11  0.0  / 2 : CLADDING
XZRN0001  0 0  4.311E-2    /  ! Natural-Zirconium !
MODEX031  0 2  300.  0.00  0.0  / 3 : MODERATOR
XH01H001  0 0  6.676E-2    /  ! H of H2O is different from H of Free-atom !
XO060001  0 0  3.338E-2
      :
      :
MOXF   ← Case name for MOX cell calculation
Macro-XS for MOX CELL BY PIJ   ← Comment for this case
1 1 1 1 2   1 4 3 -2 1   0 0 0 0 2   0 1 0 0 0   ← Option control
1.0E-3 / Buckling for P1/B1
      :
      :          { Geometry for PIJ }
      :
      :          { Material specification for MOX fuel }
      :
```

Material specification (lines 3 / Number of Materials through XO060001 0 0 3.338E-2)

continued

CORE ← Case name for Core calculation
2-dimensional Core calculation by CITATION (4-group) ← Comment for this case
0 0 0 1 0   0 0 0 0 1   0 5 0 0 2   0 1 0 0 0 ← Option control
1.0E-20 / dummy Buckling (not effective)
:
: { Control and geometry data for CITATION }
:
005
1 1 1
1 2 1 ← Zone map
1 1 1
:
999



Input for CITATION

1 2 / Material No. by Zone
2 / Number of Materials   Material specification for CITATION
UO2FA010 0 0 0. 0. / Mat-1 ← Homogenized X-section provided by the first case
MOXFA010 0 0 0. 0. / Mat-2 ← Homogenized X-section provided by the second case
/ End job ← Blank case name (A4) to terminate job

First X-region

Nuclide Specification

(Ref. Sect.8.1)

X/zz/m/c/00t (general form by 8 characters)

zz-tag : Chemical symbol (Ref. Table 8.1-1 of Sect. 8.1)

Ex. U: U0, Pu: PU

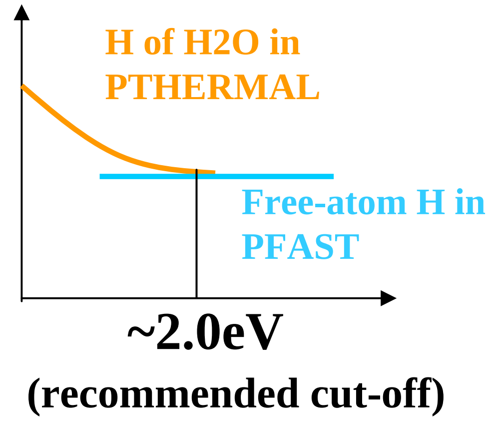
m-tag : Usually the last digit of mass number
but there are several exceptions (Ref. Sect.8.1)

Ex. U235: U05, Pu9: PU9, Zr-nat.: ZRN, Am-242^m : AMM

c-tag : Chemical bounding symbol (Ref. Table 8.1-3)
Give '0' for free-atom treatment

Ex. H_2O: H01H and O060, Graphite: C02C

t-tag : Temperature symbol (Ref. Table 8.1-3)
No practical meaning, now



Rule of Member Name (PDS)

(Ref. Sect.3.1)

In the case of MACRO file

case/e/b/x/p (general form by 8 characters)

case-tag : Case name defined by user in SRAC input (Ref. Sect. 2.2)
Ex. UO2F, MOXF, CORE

e-tag : Energy range (F:fast / T: thermal / A: All) (Ref. Sect. 3.1.6)
Usually e-tag =‘A’ in MACRO file

b-tag : Cell burn-up step (0,1,2,3,4,…..9,A,B,……,Z,a,b,……..z)
b-tag =‘0’ for no burned fuel

x-tag : X-region number to denote homogenized region
(0,1,2,3,4,…..9,A,B,……,Z)

p-tag : Cross-section type (=0 : P0 / =1: P1 if any / =N : (n,2n) if any

= 0	P0 cross-section
= 1	P1 cross-section, if any
=N	(n,2n) cross-section, if any
=Z	delayed neutron data, if any

Job Control Statements

(Ref. Chapter 4)

```
#!/bin/csh    ← C-shell (or TC-shell)
#
   set SRAC_DIR = /home/Administrator/SRAC ← Top derectory of installed SRAC
   set LMN      = SRAC.100m ← Load module name in ~SRAC/bin/
   set BRN      = u4cm6fp50bp16T ← Burn-up chain model (Ref. Sect.3.3)
   set ODR      = $HOME/Job/MyOutput ← existing directory for print-out files
   set CASE     = Test-1 ← Arbiturary name to identify job
   set PDSD     = $HOME/Job/Mypds ← existing directory for PDS files
#
#--------------------------------------- Not have to change --------------------------------
#  (( We assume my home directory $HOME = /home/KSK ))
#
 set PDS_DIR = $PDSD/$CASE
  mkdir $PDS_DIR
  mkdir $PDS_DIR/UFAST
  mkdir $PDS_DIR/UTHERMAL
  mkdir $PDS_DIR/UMCROSS
  mkdir $PDS_DIR/MACROWRK
  mkdir $PDS_DIR/MACRO
  mkdir $PDS_DIR/FLUX
  mkdir $PDS_DIR/MICREF
```

Empty Users PDS files are made in

/home/KSK/Job/Mypds/Test-1/UFAST

:

:

/MICREF

continued

```
  set LM      = $SRAC_DIR/bin/$LMN              ← Full path name of load module
  set DATE    = `date +%b%d.%H.%M.%S`           ← Current date (Dec25.11.22.33)
  set WKDR  = $HOME/SRACtmp.$CASE.$DATE ← Work directory for SRAC
#       ! Don’t remove the work directory during SRAC execution !
#        Ex.  /home/KSK/SRACtmp.Test-1/Dec25.11.22.33/
#------------------  File Allocation ---------------------------------
  setenv  fu50  $SRAC_DIR/lib/burnlibT/$BRN ← Burn-up chain data file
  setenv  fu85  $SRAC_ DIR/lib/kintab.dat       ← Bickley function table for PIJ
#                    ! Set fu89 active if plot option is used !
# setenv  fu89  $ODR/$CASE.SFT89.$DATE       ← Plot data (PostScript file)
#                    ! Set fu98 active if burn-up option is used !
# setenv  fu98  $ODR/$CASE.SFT98.$DATE       ← Burn-up summary table
  setenv  fu99  $ODR/$CASE.SFT99.$DATE       ← Major calculated results
  set OUTLST =  $ODR/$CASE.SFT06.$DATE ← Standard output (messages)
#  Output file  : /home/KSK/Job/MyOutput/Test-1.SFT??.Dec25.11.22.33
#---------------------------------------------------------------------
#
cd $WKDR
cat - << END_DATA | $LM >& $OUTLST         ← Start SRAC execution

     SRAC Input                    Input data is enclosed in shell-script

END_DATA
```

continued

```
TEST
SRAC INPUT for Cell Calculation by Pij
1 1 1 1 0   1 4 3 -2 1   0 0 0 0 2   0 1 0 0 0 / SRAC CONTROL
2.77396E-4   / Buckling for P1/B1
/home/Administrator/SRACLIB-JDL33/pds/pfast     Old     File
/home/Administrator/SRACLIB-JDL33/pds/pthml     O       F
/home/Administrator/SRACLIB-JDL33/pds/pmcrs     O       F
$PDS_DIR/UFAST              Scratch     Core
$PDS_DIR/UTHERMAL           S           C
   :
$PDS_DIR/MACRO              New         C
   :
   :
   :
END_DATA
#
  cd $HOME
  rm -r $WKDR
#
# rm -r $PDS_DIR
#
 rm -r $PDS_DIR/UFAST
 rm -r $PDS_DIR/UTHERMAL
 rm -r $PDS_DIR/UMCROSS
 rm -r $PDS_DIR/MACROWRK
#  rm -r $PDS_DIR/MACRO
 rm -r $PDS_DIR/FLUX
 rm -r $PDS_DIR/MICREF
```

Public Libraries (pfast, pthml, pmcrs lines)

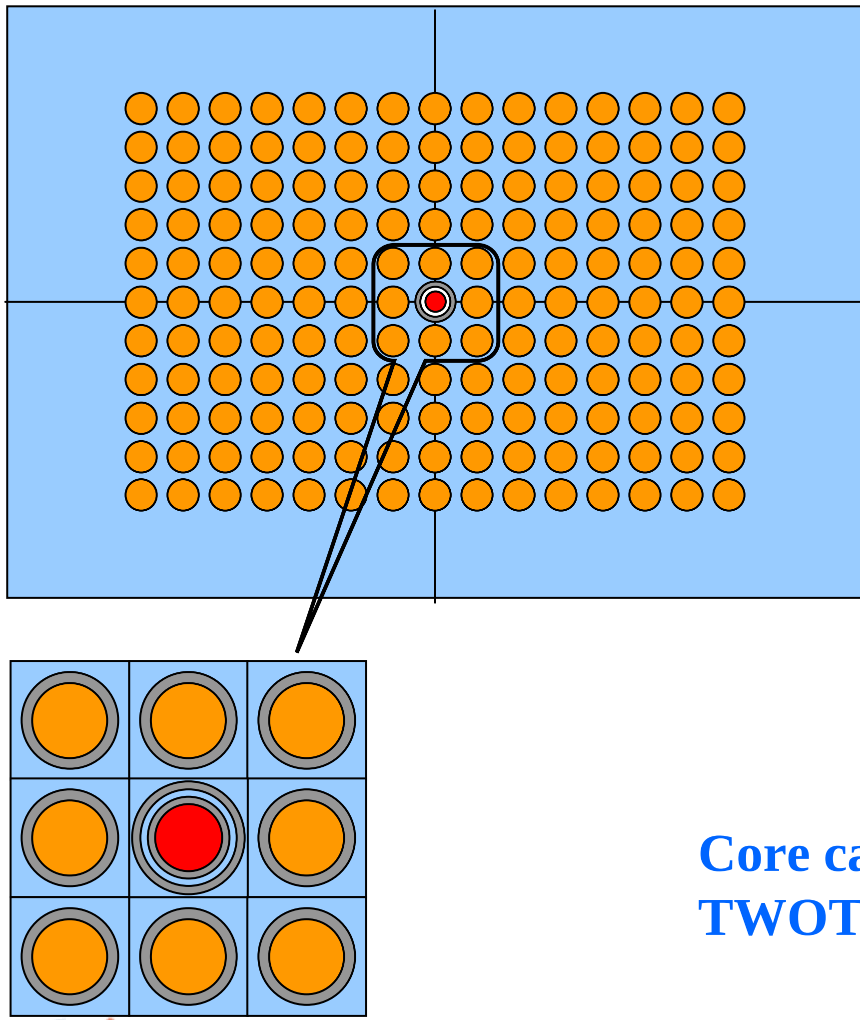
← Specify 'New' or 'Old' to keep PDS

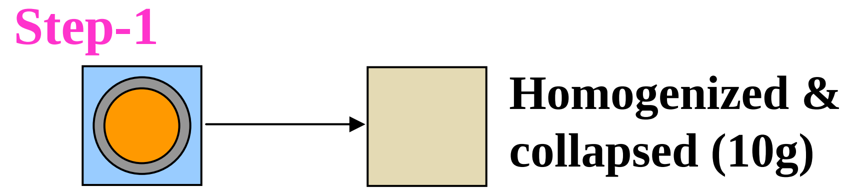
* Letters starting from '$' is taken as a shell environment variable.
* It should not be used even if comment line.
* Be careful that input data length doesn't exceed 72 columns, when $PDS_DIR is expanded.

Remove unnecessary PDS files (rm lines)

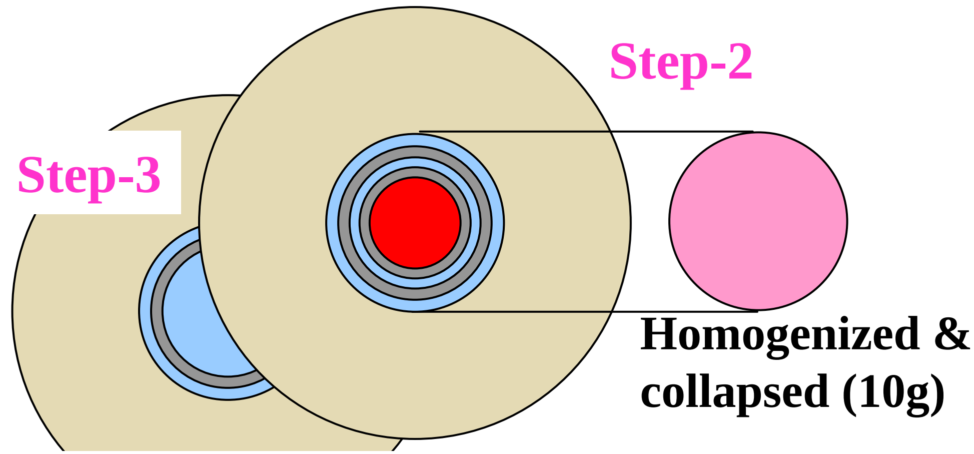
Application

[Central absorber rod worth]



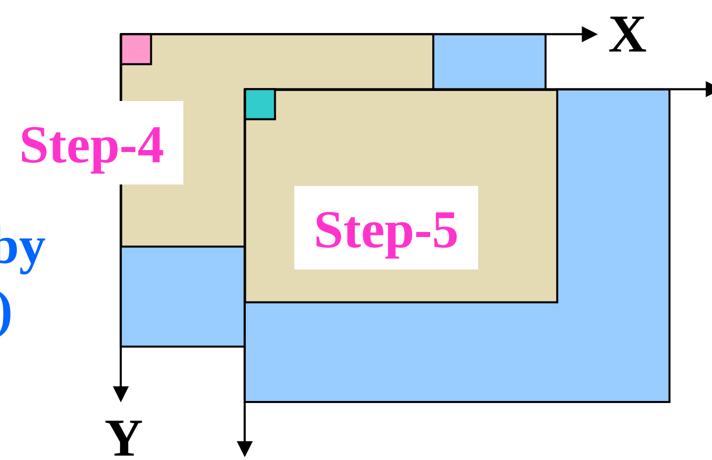


Unit cell calculation by PIJ (107g)



Super-cell calculation by ANISN (107g)

Core calculation by TWOTRAN (10g)



Distributions and Installation

No.	File name	Size(MB)	Contents
1	ReadMe.txt	–	Information
2	SRAC.tar.gz	1.5	SRAC body code (sources, utilities, samples, etc)
3	COREBN.tar.gz	0.2	Auxiliary code for core burn-up calculation
4	SRAC_manE_070104.pdf	3	Users manual of SRAC in English
5	COREBN_manE_070104.pdf	1.3	Users manual of COREBN in English
6	SRAC95_manJ_960213.pdf	26.8	SRAC95 users manual in Japanese (JAERI-Data/Code 96-015)
7	MOSRA-Light.tar.gz	0.2	Auxiliary code (3-D Nodal diffusion)
8	MOSRA-Light_manJ.980907.pdf	10.1	Users manual of MOSRA-Light in Japanese (JAERI-Data/Code 98-025)
9	SRACLIB-JDL33.tar	54.1	SRAC library based on JENDL-3.3
10	SRACLIB-JDL32.tar	38.4	SRAC library based on JENDL-3.2
11	SRACLIB-JEF31.tar	68	SRAC library based on JEFF-3.1
12	SRACLIB-JEF30.tar	46.8	SRAC library based on JEFF-3.0
13	SRACLIB-JEF22.tar	34.2	SRAC library based on JEF-2.2
14	SRACLIB-EDF70.tar	74.9	SRAC library based on ENDF/B-VII.0
15	SRACLIB-EDF68.tar	47	SRAC library based on ENDF/B-VI.8

Installation

(1) Set computer environment before installation

The installation conductor '@PunchMe' is a command by C-shell-script.
The C-shell (or TC-shell) should be available to install SRAC easily.

(2) Copy necessary files

(You can put them in any directory, but avoid too deep directory.)

(3) Extract the archived files

tar -zxvf SRAC.tar.gz

----> SRAC/ (You can rename this.)
----> Srac2K6/

tar -xvf SRACLIB-JDL33.tar

----> SRACLIB-JDL33/
----> LIBJ33/ (You can rename this.)

(4) Execute the installer (@PunchMe) equipped in each file.

cd SRAC
@PunchMe
(The command @PuncMe will guide you. Try any way !)

cd SRACLIB-JDL33
@PunchMe ! Install after the SRAC code !

What should I do in order to use SRAC ?

1) Read Section-1 of users manual (Vol.1) to understand outline of SRAC.

2) Install SRAC, any way (Read ReadMe file).

3) See the sample input file [~SRAC/smpl/shr/Test.sh], and
Understand the shell-script (See Chapter-4.) and input data (Chaper-2).

4) Execute SRAC for a sample problem.

5) Make an input data by yourself.

6) Apply to practical problems.

7) Learn the utilities of PDS files for well-use of SRAC
(See. Sect.3.1 and Chapter-6)