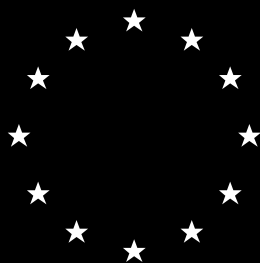

FixData nuclides, near range nuclides, and far range nuclides, in RODOS PV6final

RODOS migration contract

D R A F T
V e r s i o n 2 . 0



RODOS

REPORT

DECISION SUPPORT FOR NUCLEAR EMERGENCIES

**FixData nuclides, near range nuclides, and far range nuclides, in
RODOS PV6final
RODOS(RA1)-TN(02)-04**

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Management Summary¹

The report at hand describes the spelling rules, the nuclide information for the RODOS atmospheric dispersion and deposition models, the default settings, the RODOS internal nuclide data files, and the Shared Memory, of the RODOS FixData nuclides, near range nuclides, and far range nuclides. It is part of the RODOS system documentation.

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Contents

1	FIXDATA NUCLIDES, NEAR RANGE NUCLIDES, AND FAR RANGE NUCLIDES, IN RODOS PV6FINAL	3
1	General information	7
1.1	Overview	7
1.2	FixData nuclides currently implemented	7
1.3	Spelling rules for RODOS FixData nuclides or nuclide compounds	9
2	Nuclide information for the RODOS ADMs	10
2.1	Near range nuclides	10
2.2	Far range nuclides	11
3	Default near/far range nuclide files for NPP-type accidents	13
3.1	Near range nuclides	13
3.2	File <in.FarRangeNuclides> with the default far range nuclides	14
4	RODOS-internal FixData nuclide information	16
4.1	Fixdata nuclide information in the RODOS Shared Memory	16
4.2	Cross-referencing FixData and near range nuclides	17
4.3	File <in.FixDataNuclides>	17
4.4	File <in.NuclideData>	19
5	RODOS-internal near and far range nuclide information in the RODOS Shared Memory	22
5.1	Near range nuclides	22
5.2	Far range nuclides	23
6	Subroutines in program package SETNUK	24
7	References	25

List of Tables

Table 1: Radionuclides and radionuclide compounds in RODOS	8
Table 2: Spelling rules for RODOS FixData nuclides or nuclide compounds	9
Table 3: Near range nuclide data for the RODOS ADMs	10
Table 4: Arrangement of the 1 to NNUKL near range nuclides	11
Table 5: Far range nuclide data for the RODOS ADMs	11
Table 6: Current file <in.NearRangeNuclides_25>	13
Table 7: Current file <in.FarRangeNuclides>	14
Table 8: RODOS-internal FixData nuclide information	16
Table 9: Part of current file <in.FixDataNuclides>	17
Table 10: Top part of current file file <in.NuclideData>	19
Table 11: Near range nuclide information used internally in RODOS	22
Table 12: Far range nuclide information used internally in RODOS	23
Table 13: Subroutine inventory of program package SETNUK	24

1 General information

1.1 Overview

RODOS PV6final contains names, radioactive half-lives and other nuclide-specific data for 79 radionuclides that are referred to as "FixData nuclides".

In all near range Atmospheric Dispersion and Deposition (ADM) calculations with RODOS, only a subset containing between 1 and 25 "near range nuclides" of all available FixData nuclides can be taken into account. However,

- For accident scenarios for nuclear power plants (nuclear accidents) RODOS provides a representative default selection of 25 near range nuclides.

If a RODOS calculation for an NPP shall be carried out with different near range nuclides, the user may define an own nuclide subset.

- For accident scenarios for radiological emergencies², there is no default selection of near range nuclides.

In such a case, the up to 25 near range nuclides are entirely defined by the user via the source term input.

For far range ADM calculations basing on a particular near range ADM calculation, a subset of up to 7 "far range nuclides" of the near range nuclides from the particular near range ADM calculation can be taken into account. By default a representative selection of 7 far range nuclides is pre-set in RODOS. If a particular calculation shall be carried out with other far range nuclides, the user can select an own nuclide subset from the current near range nuclides; however, this has to be done already on the level of the near range calculation.

The "Guidance on adaptation of RODOS to national conditions" [1] describes the possibility to change the default near and far range nuclide setting on installation of the RODOS system. The "User Guide for the Prognosis Models of RODOS" [2] describes the selection of near range and far range nuclides by the user.

RODOS-internal information concerning the near and far range nuclides is set up in the RODOS Shared Memory (SHM) by program package "SETNUK" (SETup of NUKlides)³.

1.2 FixData nuclides currently implemented

Table 1 on the next page shows the names of the currently implemented radionuclides or nuclide compounds in RODOS⁴. Explanations follow after the Table!

² Since RODOS Version PV6.0 Patch 07.

³ Formerly termed "NucInfo".

⁴ The list may become extended whenever need arises in further releases of RODOS.

The radioactive half-life data of the radionuclides contained in the database were taken from the "Karlsruhe Chart of the Nuclides" [6].

Table 1: Radionuclides and radionuclide compounds in RODOS

T -3x (HT) ⁵	TO-3x (HTO) ⁵				
Na-24					
Mn-54					
Co-58	Co-60				
Se-75					
Kr-85m	Kr-85	Kr-87	Kr-88		
Rb-86	Rb-88				
Sr-89	Sr-90	Sr-91	Sr-92		
Y -90	Y -91				
Zr-95	Zr-97				
Nb-95					
Mo-99					
Tc-99m					
Ru-103	Ru-105	Ru-106			
Rh-105					
Ag-110m					
Sb-127	Sb-129				
Te-127m	Te-127	Te-129m	Te-129	Te-131m	Te-131
Te-132	Te-133m	Te-133	Te-134		
I -129	I -131	I -132	I -133	I -134	I -135
Xe-133	Xe-135	Xe-138			
Cs-134	Cs-136	Cs-137	Cs-138		
Ba-140					
La-140					
Ce-141	Ce-143	Ce-144			
Pr-143					
Nd-147					
Yb-169					
W -185	W-187				
Ir-192					
Po-210					
Ra-226					
U -234	U -235	U -238			
Np-239					
Pu-238	Pu-239	Pu-240	Pu-241		

⁵ Due to the RODOS naming rules, HT is coded as "T^{-3x}", and HTO as "TO-3x".

Am-241					
Cm-242	Cm-244				
Cf-252					

The RODOS nuclides comprise:

- All radionuclides considered for LWR accidents in the German Risk Study Phase A [3, p. 17] and the German Leitfaden [4, p. 8, 9].
- Additional radionuclides for complementation of some potentially important radioactive decay chains.
- Some activation products or other radionuclides that may be of relevance for LWR reactors in normal operation mode, for Fast Breeder Reactors, or for fusion reactors. They were put into the database on request of RODOS users.
- The radionuclide compounds HT and HTO for fusion reactors.
- Nuclides identified as potentially relevant for RODOS calculations involving radiological emergencies [5], plus Po-210 (due to the Po-210 incident in England in 2006).

1.3 Spelling rules for RODOS FixData nuclides or nuclide compounds

The names of FixData nuclides or nuclide compounds in RODOS consist of seven characters that must obey the strict rules listed in Table 2.

Table 2: Spelling rules for RODOS FixData nuclides or nuclide compounds

char.	content	spelling rules
1,2	chemical elements: names as in periodic tables ----- chemical compounds, or any other type	chemical element: 2-character element : 1st char. upper case, 2nd char. lower case char. 1-character element : 1st char. upper case, 2nd char. blank character. ----- symbolic name: no constraint on upper/lower case characters; however, for 1-character names the 2nd character must be the blank character.
3	hyphen	the minus-sign "-"
4,5,6	nucleon number of radionuclide	Right-adjusted. Missing figures to the left must be filled with the blank character.
7	additional information	no restriction; for instance - the blank character; - the lower case "m" for metastable states; - the lower case "x" for unclassifiable entries.

2 Nuclide information for the RODOS ADMs

Note: The descriptions in Chapter 2 hold for both accidental releases from a nuclear power plant and for radiological emergencies.

2.1 Near range nuclides

Table 3 shows the near range nuclide information designated for the RODOS ADMs. More details about the near range nuclide numbers follow after the Table.

The data are contained in the RODOS Shared Memory and are distributed over several data classes representing FORTRAN common blocks. The Table displays the statements for the RODOS DefineEditor that consists of two lines:

The first line contains the name of the variable transporting the information, the dimension and type of the variable⁶, the upper and lower limit for the values of the variable⁷, and the physical unit.

The second line contains a description of the variable.

Table 3: Near range nuclide data for the RODOS ADMs

NNUKL [] Integer (0:0) --- 'Total number of near range nuclides';
NNOBL [] Integer (0:0) --- 'Number of noble gas nuclides in NNUKL';
NIODS [] Integer (0:0) --- 'Number of iodine nuclides in NNUKL';
NAERO [] Integer (0:0) --- 'Number of aerosol nuclides in NNUKL';
NSPCL [] Integer (0:0) --- 'Number of special nuclides in NNUKL';
CNUKL ⁸ [1:7][1:25] Char (0:0) --- 'Names of the 1 ... NNUKL near range nuclides';
RADEC ⁸ [1:25][1:5] Real (0:0) 1/(s,m,h,d,a) Radioactive decay constants (ln2/rad.half-life) of the 1 ... NNUKL nuclides';
RHALF ⁸ [1:25][1:5] Real (0:0) (s,m,h,d,a) 'Radioactive half-lives of the 1 ... NNUKL near range nuclides';

Variable NNUKL tells how many nuclides are present in the run; the current maximum number is 25. Variable CNUKL gives the names of the 1 ... NNUKL nuclides.

⁶ A scalar variable in FORTRAN is characterised by dimension indicator [].

⁷ Range indicator (0:0) means that no boundaries are defined.

⁸ Example for near range nuclide with current number 8: CNUKL(8) gives the 7-Character nuclide name, RADEC(8,1) the radioactive decay constant in [1/seconds], RHALF(8,3) the radioactive half-life in [hours] (s,m,h,d,a stand for seconds, minutes, hours, days, years).

NNOBL, NIODS, NAERO, NSPCL count the number of noble gas, iodine, aerosol and special nuclides among the near range nuclides, respectively; the sum (NNOBL+NIODS+NAERO+NSPCL) equals NNUKL. The noble gas, iodine, aerosol and special nuclides appear one after the other in the 1...NNUKL near range nuclides;

Table 4 illustrates the arrangement.

Table 4: Arrangement of the 1 to NNUKL near range nuclides

type	array element
noble gases	1 to NNOBL
iodine isotopes	NNOBL+1 to NNOBL+NIODS
aerosols	NNOBL+NIODS+1 to. NNOBL+NIODS+NAERO
specials	NNOBL+NIODS+NAERO+1 to NNOBL+NIODS+NAERO+NSPCL=NNUKL

NOTE: One, two, or three of the counters NNOBL, NIODS, NAERO, NSPCL can be zero, but not all four, that is, NNUKL is never zero.

2.2 Far range nuclides

Table 5 shows the far range nuclide information designated for the RODOS ADMs. More details follow after the Table.

The data are contained in the RODOS Shared Memory and are distributed over several data classes representing FORTRAN common blocks. The Table displays the statements for the RODOS DefineEditor that consist of two lines:

The first line contains the name of the variable transporting the information, the dimension and type of the variable⁹, the upper and lower limit for the values of the variable¹⁰, and the physical unit.

The second line contains a description of the variable.

Table 5: Far range nuclide data for the RODOS ADMs

MXXRED [] Integer (0:0) --- 'Maximum number of far range nuclides';
NNURED [] Integer (0:0) --- 'Current number of far range nuclides in run';
CNURED [1:7][1:25] Char (0:0) --- 'Names of the 1 ... NNURED far range nuclides';

Variable NNURED gives the number of far range nuclides that are present in a run; the current maximum number MXXRED is 7¹¹. **Note:** NNURED can be zero.

⁹ A scalar variable in FORTRAN is characterised by dimension indicator [].

¹⁰ Range indicator (0:0) means that no boundaries are defined.

Variable CNURED gives the names of the 1 ... NNURED nuclides. There is no fixed arrangement of the far range nuclides: If NNURED is greater than 1, array CNURED simply contains the names of the 1...NNURED nuclides as they come in.

¹¹ The code allows for up to 15 far range nuclides. The current limitation to 7 (contained in variable MXXRED) stems from one of the models for the far range atmospheric dispersion.

3 Default near/far range nuclide files for NPP-type accidents

For accident scenarios for nuclear power plants, a representative default selection of near and far range nuclides is provided with the RODOS system¹². Number and names of the default nuclides are contained in files that are described in this Chapter. The default selection can be adapted to national preferences, see [1].

3.1 Near range nuclides

There are three files with the number and names of the default near range nuclides:

- File <~rodos/roextern/data/sourceterm/setup/in.NearRangeNuclides_25>
This file contains the current default setting for all RODOS installations with the maximum number of near range nuclides being 25.
- File <~rodos/roextern/data/sourceterm/setup/in.NearRangeNuclides_15>
This file contains the current default setting for all RODOS installations with the maximum number of near range nuclides being 15.
- File <~rodos/roextern/data/sourceterm/setup/in.CalculaNuclides>
This file was precursor of the file "NearRangeNuclides". This file will be used as a backup when - by some reason - there is neither a file <in.NearRangeNuclides_25> or in <NearRangeNuclides_15>.

Table 6 shows the current file <in.NearRangeNuclides_25> in RODOS_PV6final. The first line gives the number of radionuclides or radionuclide compounds contained in the file (integer number with 2 digits, right adjusted, value between 1 and 25). All following lines give the names of the radionuclides.

Table 6: Current file <in.NearRangeNuclides_25>

25
Kr- 85m
Kr- 85
Kr- 88
Rb- 88
Sr- 89
Sr- 90
Zr- 95
Ru-103
Ru-106
Te-131m
Te-132
I -131

¹² For RODOS calculations for radiological emergencies, there is no default selection of near range nuclides. In that case, the up to 25 near range nuclides are entirely defined by the user via the source term input.

I -132
I -133
I -135
Xe-133
Xe-135
Cs-134
Cs-136
Cs-137
Ba-140
Pu-238
Pu-241
Cm-242
Cm-244

ATTENTION:

- The nuclides must appear in the order they have in file <~rodos/roextern/data/sourceterm/setup/in.FixDataNuclides>. This is a vital condition for the RODOS -(B)HTML user interface and is checked at run time. Violation of the constraint is considered to be a RODOS installation error and leads to a program stop with a corresponding message.

3.2 File <in.FarRangeNuclides> with the default far range nuclides

The number and names of the default far range nuclides is contained in file <in.FarRangeNuclides>. The file resides in RODOS directory <~rodos/roextern/data/sourceterm/setup/>.

Table 7 shows the current file <in.FarRangeNuclides> in RODOS_PV6final. The first line gives the number of radionuclides or radionuclide compounds contained in the file (integer number with 2 digits, right adjusted, value between 1 and 7). All following lines give the names of the radionuclides.

Table 7: Current file <in.FarRangeNuclides>

5
Zr- 95
Te-132
I -131
Xe-133
I -133
Cs-137

ATTENTION:

- The nuclides must appear in the order they have in file <~rodos/roextern/data/sourceterm/setup/in.FixDataNuclides>. This is a vital condition for the RODOS -(B)HTML user interface.

- For the far range nuclides, no more than one iodine nuclide can be specified¹³.

Both conditions are checked at run time. Violation of either constraint is considered to be a RODOS installation error and leads to a program stop with a corresponding message.

¹³ This limitation stems from one of the models for the far range atmospheric dispersion.

4 RODOS-internal FixData nuclide information

4.1 Fixdata nuclide information in the RODOS Shared Memory

Table 8 shows the FixData nuclide information that is used internally in RODOS e.g. by the source term codes. More details follow after the Table.

The data are contained in the RODOS Shared Memory and are distributed over several data classes representing FORTRAN common blocks. The Table displays the statements for the RODOS DefineEditor. Each statement consists of two lines:

The first line contains the name of the variable transporting the information, the dimension and type of the variable¹⁴, the upper and lower limit for the values of the variable¹⁵, and the physical unit.

The second line contains a description of the variable.

Table 8: RODOS-internal FixData nuclide information

<pre> CNUKSD: CISOTOP [1:7][1:100] Char (0:0) --- 'Nuclide names (FixData/StammDaten nuclides)'; CISOTYP [1:4][1:100] Char (0:0) --- 'Deposition type (noble gas/iodine/aerosol/special)'; CRHLISO [1:1][1:100] Char (0:0) --- 'Phys. unit for RHLISO in DNUKSD'; END CLASS </pre>
<pre> DNUKSD: ISONUK [1:100] Integer (0:0) --- 'Cross-reference between FixData and calc. nuclides'; ISOYES [1:100] Integer (0:0) --- 'Flag to select calc. nuclides from FixData nuclides'; NISOT [] Integer (0:0) --- 'Total number of nuclides (FixData/StammDaten)'; RHLISO [1:100] Real (0:0) CRHLISO 'Radioactive half-lives'; ZzDNUKS [] Real (0:0) --- 'Alignment-Correction'; END CLASS </pre>

Variable NISOT gives the total number of FixData nuclides. The 1...NISOT radionuclides or radionuclide compounds appear in the sequence defined by the arrangement of the nuclides in the FixData nuclide definition file <in.FixDataNuclides>.

¹⁴ A scalar variable in FORTRAN is characterised by dimension indicator [].

¹⁵ Range indicator (0:0) means that no boundaries are defined.

4.2 Cross-referencing FixData and near range nuclides

The array ISOYES contains a selection flag that tells for each FixData nuclide if it is selected as a near range nuclide. If this is so, the cross-reference array ISONUK gives the address of the FixData nuclide in the near range nuclides arrays, if not, ISONUK is zero.

In FORTRAN for instance, this information can be utilised with the following construction:

```
DO ## ISO=1,NISOT {"Loop over all NISOT FixData nuclides"}
  IF(ISOYES(ISO).GT.0) THEN
    INU=ISONUK(ISO)
    {"The current FixData nuclide ISO is near range number INU among the
    1...NNUKL16 near range nuclides"}
  ELSE
    {"The current FixData nuclide ISO is not a near range nuclide"}
  END IF
## CONTINUE
```

4.3 File <in.FixDataNuclides>

The number and names of the FixData nuclides is contained in file <in.FixDataNuclides>. The file resides in RODOS directory <~rodos/roextern/data/sourceterm/setup/>.

The file is read internally when the RODOS system sets up the corresponding information for the FixData nuclides in the RODOS Shared Memory.

Table 9 shows the top and bottom part of the current file <in.FixDataNuclides> in RODOS_PV6final.

The first line contains the number of radionuclides or radionuclide compounds contained in the file (integer number with 3 digits, right adjusted, value between 1 and 100).

Each of the following lines contains the number of the nuclide's position in the file (integer with 3 digits, right adjusted)¹⁷, followed by a colon¹⁷, followed by the name of the FixData nuclide(-compound).

Table 9: Part of current file <in.FixDataNuclides>

79
1:T - 3x
2:TO- 3x
3:Na- 24

¹⁶ For NNUKL see Chapter 2.1.

¹⁷ The RODOS HTML user interface needs that information.

4:Mn- 54
5:Co- 58
6:Co- 60
7:Se- 75
8:Kr- 85m
9:Kr- 85
10:Kr- 87
.....
.....
.....
65:Ir-192
66:Po-210
67:Ra-226
68:U -234
69:U -235
70:U -238
71:Np-239
72:Pu-238
73:Pu-239
74:Pu-240
75:Pu-241
76:Am-241
77:Cm-242
78:Cm-244
79:Cf-252
80:

NOTE:

The last line " 80: "turned out to be necessary due to some RODOS HTML-(B)User interface problems. It has no other inherent meaning.

ATTENTION:

The order of nuclides in the file determines

- The readability of the file by humans.
- The appearance of the FixData nuclides in the RODOS ADM (A)Initialisation Windows
- The appearance of the FixData nuclides in the RODOS HTML-(B)User interface, and due to that also the sequence of nuclides in the files for the default near and far range nuclides.

Therefore, new nuclides should be placed at appropriate positions in the file and not just dumped at the end. A stand-alone-program (FORTRAN program called "FixNuks") exists that will update the overall nuclide number and renumber the nuclides in the file, so that work needs not to be done by hand.

4.4 File <in.NuclideData>

The file <in.NuclideData> contains the radioactive half-life and a type flag for a large number of radionuclides or radionuclide compounds¹⁸. The file resides in RODOS directory <~rodos/roextern/data/sourceterm/setup/>.

The file is read internally when the RODOS system sets up the corresponding information for the FixData nuclides in the RODOS Shared Memory.

Table 10 shows the top part of the current file <in.NuclideData> in RODOS_PV6final. Explanations follow after the Table.

Table 10: Top part of current file file <in.NuclideData>

```

=====
NCOMM = 17 ***** number of comment lines to follow *****
-----
C. Landman/FZK ***** File in.NuclideData ***** Version 25.09.2002
C. Landman/FZK ***** Plus Se Yb Ir Cf ***** Update 17.08.2006
C. Landman/FZK ***** Activated Po-210 ***** Update 11.01.2007
=====
Rad. half-life from [Karlsruher Nuklidkarte. Hrsg: Forschungszentrum
Karlsruhe, Technik und Umwelt (November 1995)].
-----
Naturerl. Nuklide p=primordial | k=kosmisch_erzeugt | z=Zerfallsreihe
-----
The deposition types of T-3x and TO-3x are set to AERO, because the
current ADMS need this so. It should be SPCL, though.
=====
-----
pro. Name rad. half- depo Comments
num. life & unit code
-----
001 H - 3 1.2323E+01 a XXXX k beta-
001 T - 3x 1.2323E+01 a AERO
001 TO- 3x 1.2323E+01 a AERO
004 Be- 7 5.3290E+01 d XXXX k
004 Be- 10 1.6000E+06 a XXXX beta-(no_gamm)
006 C - 14 5.7300E+03 a XXXX k beta-(no_gamm)
011 Na- 22 2.6030E+00 a AERO
011 Na- 24 1.4960E+01 h AERO
014 Si- 32 1.7200E+02 a XXXX beta-(no_gamm)
015 P - 33 2.5340E+01 d XXXX beta-(no_gamm)
018 Ar- 41 1.8300E+00 h XXXX
019 K - 40 1.2800E+09 a XXXX p beta- el.capt beta+
020 Ca- 47 4.5400E+00 d XXXX
021 Sc- 44m 2.4400E+00 d XXXX
021 Sc- 44 3.9200E+00 h XXXX
021 Sc- 46 8.3820E+01 d XXXX

```

¹⁸ There are data for more nuclides than the FixData nuclides in the file!

021	Sc-	47	3.3500E+00	d	XXXX	
021	Sc-	48	4.3670E+01	h	XXXX	
023	V	- 48	1.5970E+01	d	XXXX	
023	V	- 49	3.3000E+02	d	XXXX	no_gamm
024	Cr-	51	2.7700E+01	d	XXXX	
025	Mn-	52m	2.1000E+01	m	AERO	
025	Mn-	52	5.6000E+00	d	AERO	
025	Mn-	53	3.7000E+06	a	AERO	no_gamm
025	Mn-	54	3.1220E+02	d	AERO	
025	Mn-	56	2.5800E+00	h	AERO	
026	Fe-	52	8.2700E+00	h	XXXX	
026	Fe-	55	2.7300E+00	a	XXXX	no_gamm
...	
...	
...	

The first line in the file is a comment line that can contain arbitrary characters.

The second line contains the number of comment lines to follow in the file header (8 arbitrary characters, integer number with 5 digits (right adjusted), followed by arbitrary comment characters).

Then follow NCOMM comment lines with information about the file.

Then follows for each nuclide one line with data:

- The proton number of the pure radionuclide or of the radionuclide in a compound.
- The name of the radionuclide(-compound). If the name is contained in file <in.FixDataNuclides>, the name from the file must be used. If the name is not contained in the file, a name according to the RODOS spelling rules must be made up. In the latter case, this name is cogent if the nuclide will later be added to the FixData nuclides.
- The radioactive half-life and the physical unit for the radioactive half-life (exactly in the format shown in the Table; allowed notations for the physical unit are "s", "m", "h", "d", "a" for second, minute, hour, day, year, this is checked by the program that reads the file!).
- A code for the deposition property for the Atmospheric Dispersion and Deposition models:
 - If the radionuclide(-compound) is not contained in file <in.FixDataNuclides>, the code is meaningless (represented by XXXX in the Table).
 - If the radionuclide(-compound) is contained in file <in.FixDataNuclides>, only four values are allowed: "AERO" for aerosol¹⁹ - type deposition property, "IOD " for all iodine nuclides(-compounds)²⁰, "NOBL" for noble gas - type

¹⁹ "Aerosol" means here fission products released to the atmosphere as solid or liquid suspensions in air via a carrier (e.g. CsI, NaOH etc.).

²⁰ The distinction between elementary iodine, organically bound iodine and iodine in aerosol form is made elsewhere in RODOS.

deposition property (in other words, no deposition), "SPECL" for a deposition type not fitting into the above scheme.

- An arbitrary comment, e.g. about the decay mode(s).

The number radionuclides or radionuclide compounds in the file and their order is completely arbitrary. However, to maintain good readability of the file by humans, new nuclides should be placed at appropriate positions in the file and not just dumped at the end.

5 RODOS-internal near and far range nuclide information in the RODOS Shared Memory

5.1 Near range nuclides

Apart from the near range nuclide information designated for the ADMs, the RODOS Shared Memory contains further data concerning the near range nuclides that is used internally, see Table 11.

The data are contained in the RODOS Shared Memory and are distributed over several data classes representing FORTRAN common blocks. The Table displays the statements for the RODOS DefineEditor that consist of two lines:

The first line contains the name of the variable transporting the information, the dimension and type of the variable²¹, the upper and lower limit for the values of the variable²², and the physical unit.

The second line contains a description of the variable.

Table 11: Near range nuclide information used internally in RODOS

<pre> For ADM user interfaces and source term routines CNUKPD: CNUDFL [1:7][1:25] Char (0:0) --- 'Default near range nuclides'; CRHALFX [1:1][1:25] Char (0:0) --- 'Phys. unit for RHALFX in DNUKPD'; END CLASS DNUKPD: INUDFL [1:2] Integer (0:0) --- 'Run with default (1 0) or user (0 1) near range nu.'; RHALFX [1:25] Real (0:0) CRHALFX half-lives (nice format for printout for user)'; END CLASS </pre>
<pre> For RODOS graphics manager²³ CNUKGO: CNUGRF [1:8][1:25] Char (0:0) --- 'Near range nuclides names for graphics'; END CLASS </pre>

²¹ A scalar variable in FORTRAN is characterised by dimension indicator [].

²² Range indicator (0:0) means that no boundaries are defined.

²³ This re-assignment of the near range nuclide names must be done because the graphics system requires the nuclide names as 8 character variables and not as the 7 character variables used elsewhere.

5.2 Far range nuclides

Apart from the far range nuclide information designated for the ADMs, the RODOS Shared Memory contains further data concerning the far range nuclides that is used internally, see Table 12.

The data are contained in the RODOS Shared Memory and are distributed over several data classes representing FORTRAN common blocks. The Table displays the statement for the RODOS DefineEditor that consists of two lines:

The first line contains the name of the variable transporting the information, the dimensions and types of the variable²⁴, the upper and lower limit for the values of the variable²⁵, and the physical unit.

The second line contains a description of the variable.

Table 12: Far range nuclide information used internally in RODOS

```

For ADM user interfaces and nuclide setup routines
CNUKRE:
.....
CREDFL [1:7][1:25] Char (0:0) ---
'Default far range nuclides';
.....
END CLASS
DNUKRE:
.....
IREDFL [1:2] Integer (0:0) ---
'Run with default (1 0) or user (0 1) far range nuclides';
IREDFL [1:25] Integer (0:0) ---
'Flag array for far range nuclides';
.....
END CLASS
    
```

²⁴ A scalar variable in FORTRAN is characterised by dimension indicator [].

²⁵ Range indicator (0:0) means that no boundaries are defined.

6 Subroutines in program package SETNUK

Program package "SETNUK" (SETUp of NUKlides)²⁶ consists of the FORTRAN 77 subroutines listed in **Note**: In RODOS PV6final, the Native Language Support (NLS) via external files was introduced, and former ".ff"-files became normal "FORTRAN .f"-files.

Table 13 by means of the corresponding statements in the STERM comment library, member "Programs".

Note: In RODOS PV6final, the Native Language Support (NLS) via external files was introduced, and former ".ff"-files became normal "FORTRAN .f"-files.

Table 13: Subroutine inventory of program package SETNUK

C	=====	C
C	PACKAGE -> STERM AUXILIARY PROGRAM PACKAGE SETNUK	C
C	FILE -> [setnuk.f]	C
C	TASKS -> SETUP OF ADM-NUCLIDES	C
C	=====	C
C	-----	C
C	FOR NEAR RANGE ADMs	C
C	-----	C
C	SETNUK -> ENTRY ROUTINE	C
C	SETNUK_DFLNUK -> READ DEFAULT NEAR RANGE NUCLIDES	C
C	SETNUK_FIXNUK -> READ RODOS FIXDATA NUCLIDES	C
C	!! MUST BE CALLED FIRST BY CALLER OF SETNUK	C
C	SETNUK_PRINT -> PRINT NEAR RANGE NUCLIDES	C
C	!! MUST BE CALLED LAST BY CALLER OF SETNUK	C
C	+ ICHECK_NEANUK -> CHECK NEAR RANGE NUCLIDES - ON ERROR STOP!	C
C	IF A STOP SHALL BE AVOIDED, E.G. DURING "DYNAMIC WINDOW INPUT"	C
C	THE CALLER MUST PERFORM THE TESTING WITH ICHECK_NEANUK AND	C
C	INITIATE CORRECTIVE ACTIONS BEFORE CALLING SETNUK.	C
C	-----	C
C	FOR FAR RANGE ADMs	C
C	-----	C
C	SETRED -> ENTRY ROUTINE	C
C	SETRED_DFLNUK -> READ DEFAULT SETTING FOR RODOS FAR RANGE NUCLS	C
C	SETRED_PRINT -> PRINT FAR RANGE NUCLIDES	C
C	!! MUST BE CALLED LAST BY CALLER OF SETRED	C
C	SETRED_WINDOW -> DYNAMIC INITIALISATION WINDOWS	C
C	=====	C

²⁶ Formerly termed "NucInfo".

7 References

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