



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 12:08 AM GMT

PDB ID : 1ZTT
Title : Netropsin bound to d(CTTAATTCGAATTAAG) in complex with MMLV RT catalytic fragment
Authors : Goodwin, K.D.; Long, E.C.; Georgiadis, M.M.
Deposited on : 2005-05-27
Resolution : 1.85 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

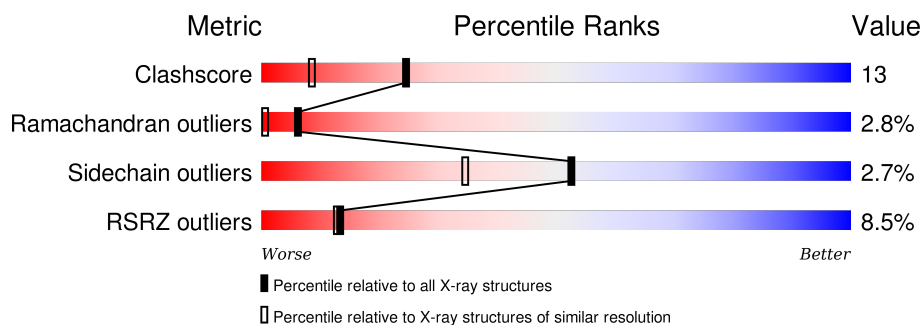
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.85 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	102246	1898 (1.86-1.86)
Ramachandran outliers	100387	1875 (1.86-1.86)
Sidechain outliers	100360	1875 (1.86-1.86)
RSRZ outliers	91569	1747 (1.86-1.86)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	B	8	
2	G	8	
3	A	255	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	NT	G	301	-	-	-	X

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 2679 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a DNA chain called 5'-D(*CP*TP*TP*AP*AP*TP*TP*C)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	8	Total	C	N	O	P	0	0	0
			157	78	24	48	7			

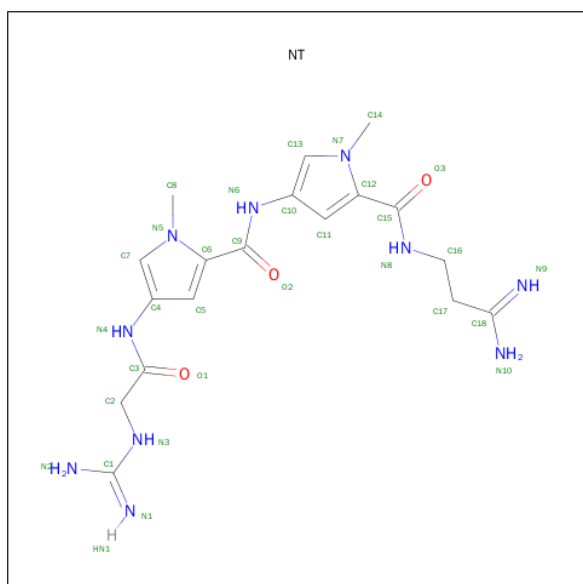
- Molecule 2 is a DNA chain called 5'-D(P*GP*AP*AP*TP*TP*AP*AP*G)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	G	8	Total	C	N	O	P	0	0	0
			168	80	34	46	8			

- Molecule 3 is a protein called Reverse transcriptase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	A	255	Total	C	N	O	S	0	0	0
			2041	1311	356	367	7			

- Molecule 4 is NETROPSIN (three-letter code: NT) (formula: C₁₈H₂₆N₁₀O₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	G	1	Total	C	N	O	0	0
			31	18	10	3		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	262	Total	O	0	0
			262	262		
5	B	7	Total	O	0	0
			7	7		
5	G	13	Total	O	0	0
			13	13		

3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: 5'-D(*CP*TP*TP*AP*AP*TP*TP*C)-3'

Chain B:  100%


C1
T2
T3
A4
A5
T6
T7
C8

- Molecule 2: 5'-D(P*GP*AP*AP*TP*TP*AP*AP*G)-3'

Chain G:  38% 63%

G9
A10
A11
T12
T13
A14
A15
G16

- Molecule 3: Reverse transcriptase

Chain A:  9% 79% 18%

T24
T61
Y64
Q68
E69
A70
R71
L72
G73
I74
K75
P76
L99
P100
V101
K102
K103
P104
G105
T106
M107
D108
Y109
R110
P111
V112
E117
P132
L136
S137
G138
L139
P140
V148
H161
P162
T163
S164
Q165
W172
R173
D174
P175
E176
M177
G178
I179
S180
G181
Q182
L183
T184
W185
D206
D209
Q213
V223
L227
Q237
R241
L250
L272
L273
K274
E275
G276
Q277
R278

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	54.57Å 145.61Å 46.81Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	35.50 – 1.85 43.67 – 1.85	Depositor EDS
% Data completeness (in resolution range)	(Not available) (35.50-1.85) 94.9 (43.67-1.85)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.72 (at 1.86Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.220 , 0.246 0.230 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	DCC
Wilson B-factor (Å ²)	22.5	Xtriage
Anisotropy	0.153	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 45.6	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 32107 reflections	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	2679	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.25% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: NT

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	B	0.26	0/174	0.68	0/266
2	G	0.25	0/189	0.68	0/290
3	A	0.30	0/2097	0.60	0/2858
All	All	0.30	0/2460	0.62	0/3414

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	157	0	94	9	1
2	G	168	0	91	5	1
3	A	2041	0	2056	46	0
4	G	31	0	25	0	0
5	A	262	0	0	1	0
5	B	7	0	0	0	0
5	G	13	0	0	0	0
All	All	2679	0	2266	60	1

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 13.

All (60) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:6:DT:H2''	1:B:7:DT:H5''	1.39	1.02
3:A:173:ARG:HH11	3:A:173:ARG:HB2	1.28	0.97
1:B:7:DT:H2''	1:B:8:DC:H5'	1.45	0.95
3:A:103:LYS:HZ3	3:A:103:LYS:H	1.17	0.89
3:A:74:ILE:HG23	3:A:111:PRO:HG3	1.51	0.89
3:A:103:LYS:HB2	3:A:104:PRO:HD3	1.54	0.88
1:B:6:DT:H2''	1:B:7:DT:C5'	2.07	0.84
1:B:6:DT:C2'	1:B:7:DT:H5''	2.08	0.82
3:A:174:ASP:H	3:A:178:GLY:HA3	1.45	0.80
1:B:3:DT:H2''	1:B:4:DA:H5'	1.72	0.72
3:A:68:GLN:O	3:A:72:LEU:HD13	1.91	0.70
2:G:13:DT:H2''	2:G:14:DA:H5'	1.72	0.69
3:A:173:ARG:NH1	3:A:173:ARG:HB2	2.05	0.69
2:G:9:DG:H2''	2:G:10:DA:C8	2.29	0.67
3:A:61:ILE:HD11	3:A:117:GLU:HG3	1.74	0.66
3:A:161:HIS:CD2	3:A:163:THR:H	2.15	0.65
3:A:103:LYS:N	3:A:103:LYS:HZ3	1.94	0.60
1:B:7:DT:H2''	1:B:8:DC:C5'	2.27	0.59
3:A:206:ASP:HB3	3:A:250:LEU:HD13	1.86	0.58
3:A:103:LYS:NZ	3:A:103:LYS:H	1.97	0.56
3:A:104:PRO:HD2	3:A:108:ASP:OD2	2.05	0.56
3:A:272:LEU:H	3:A:278:ARG:HH11	1.52	0.56
2:G:12:DT:H2''	2:G:13:DT:H5'	1.87	0.56
3:A:179:ILE:HG21	3:A:183:LEU:HD21	1.87	0.56
3:A:161:HIS:HD2	3:A:163:THR:H	1.53	0.55
2:G:12:DT:H2''	2:G:13:DT:C5'	2.37	0.55
3:A:138:GLY:O	3:A:140:PRO:HD3	2.07	0.54
3:A:101:VAL:HG12	3:A:103:LYS:NZ	2.24	0.53
3:A:227:LEU:C	3:A:227:LEU:HD13	2.30	0.52
3:A:173:ARG:HG3	3:A:174:ASP:N	2.24	0.51
3:A:209:ASP:O	3:A:213:GLN:HG2	2.11	0.51
3:A:148:VAL:HG22	3:A:227:LEU:HD23	1.91	0.51
3:A:277:GLN:O	3:A:278:ARG:HB2	2.12	0.49
3:A:174:ASP:N	3:A:178:GLY:HA3	2.22	0.48
3:A:173:ARG:HH11	3:A:173:ARG:CB	2.14	0.48
3:A:274:LYS:HG2	3:A:275:GLU:HG3	1.96	0.48
3:A:75:LYS:HB3	3:A:76:PRO:HD3	1.95	0.47
3:A:237:GLN:O	3:A:241:ARG:HG3	2.14	0.47
3:A:174:ASP:O	3:A:176:GLU:N	2.48	0.47
3:A:139:LEU:HD22	5:A:516:HOH:O	2.12	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:103:LYS:HB2	3:A:104:PRO:CD	2.34	0.46
2:G:13:DT:H2''	2:G:14:DA:C5'	2.43	0.46
3:A:213:GLN:HA	3:A:213:GLN:NE2	2.30	0.46
3:A:179:ILE:N	3:A:179:ILE:HD12	2.31	0.45
1:B:1:DC:H2'	1:B:2:DT:H72	1.99	0.45
1:B:7:DT:C2'	1:B:8:DC:H5'	2.31	0.44
3:A:101:VAL:HG21	3:A:112:VAL:HG21	2.00	0.44
3:A:172:TRP:CD1	3:A:179:ILE:HD13	2.53	0.44
3:A:179:ILE:HD12	3:A:179:ILE:H	1.81	0.43
3:A:132:PRO:O	3:A:136:LEU:HD23	2.19	0.43
3:A:165:GLN:HG2	3:A:185:TRP:O	2.20	0.42
3:A:102:LYS:O	3:A:103:LYS:C	2.57	0.42
3:A:176:GLU:HB2	3:A:177:MET:H	1.57	0.42
3:A:103:LYS:HD3	3:A:110:ARG:CZ	2.51	0.41
3:A:101:VAL:HG12	3:A:102:LYS:N	2.36	0.41
3:A:70:ALA:HA	3:A:109:TYR:CE2	2.56	0.40
3:A:213:GLN:HA	3:A:213:GLN:HE21	1.85	0.40
1:B:5:DA:H2''	1:B:6:DT:H5'	2.02	0.40
3:A:179:ILE:CG2	3:A:180:SER:N	2.85	0.40
3:A:179:ILE:H	3:A:179:ILE:CD1	2.34	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:8:DC:O3'	2:G:9:DG:P[2_765]	1.60	0.60

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
3	A	253/255 (99%)	236 (93%)	10 (4%)	7 (3%)	6 0

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	A	102	LYS
3	A	104	PRO
3	A	108	ASP
3	A	223	VAL
3	A	103	LYS
3	A	181	GLY
3	A	175	PRO

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	A	224/224 (100%)	218 (97%)	6 (3%)	52	34

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	A	64	TYR
3	A	99	LEU
3	A	139	LEU
3	A	173	ARG
3	A	176	GLU
3	A	177	MET

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
3	A	68	GLN
3	A	84	GLN
3	A	144	GLN
3	A	161	HIS
3	A	213	GLN
3	A	237	GLN
3	A	245	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
4	NT	G	301	-	26,32,32	2.02	9 (34%)	24,44,44	1.30	3 (12%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NT	G	301	-	-	0/14/27/27	0/2/2/2

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	G	301	NT	C13-C10	2.01	1.41	1.37
4	G	301	NT	C5-C6	2.20	1.41	1.39
4	G	301	NT	C3-N4	2.59	1.41	1.35
4	G	301	NT	C5-C4	2.87	1.42	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	G	301	NT	C7-C4	3.22	1.43	1.37
4	G	301	NT	C15-N8	3.43	1.41	1.33
4	G	301	NT	C11-C12	3.53	1.43	1.39
4	G	301	NT	C17-C18	3.75	1.54	1.51
4	G	301	NT	C9-N6	4.02	1.46	1.35

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	G	301	NT	C13-N7-C12	-2.24	105.97	108.72
4	G	301	NT	O3-C15-N8	-2.22	117.92	122.58
4	G	301	NT	O1-C3-C2	2.43	125.60	120.66

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2		OWAB(Å²)	Q<0.9
1	B	8/8 (100%)	0.18	0	100 100	37, 42, 47, 51	0
2	G	8/8 (100%)	0.16	0	100 100	23, 37, 44, 49	0
3	A	255/255 (100%)	0.67	23 (9%)	12 11	12, 22, 63, 87	0
All	All	271/271 (100%)	0.64	23 (8%)	13 13	12, 22, 61, 87	0

All (23) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	A	105	GLY	11.4
3	A	179	ILE	10.7
3	A	177	MET	9.8
3	A	178	GLY	9.1
3	A	107	ASN	8.6
3	A	103	LYS	8.1
3	A	104	PRO	7.7
3	A	180	SER	7.3
3	A	102	LYS	6.2
3	A	175	PRO	6.1
3	A	101	VAL	5.8
3	A	106	THR	5.6
3	A	108	ASP	5.6
3	A	174	ASP	4.3
3	A	100	PRO	4.3
3	A	176	GLU	3.4
3	A	173	ARG	3.4
3	A	64	TYR	3.3
3	A	109	TYR	3.1
3	A	110	ARG	3.1
3	A	278	ARG	3.0
3	A	99	LEU	2.7
3	A	24	THR	2.6

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no carbohydrates in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	LLDF	B-factors(\AA^2)	Q<0.9
4	NT	G	301	31/31	0.79	0.22	3.16	53,57,63,64	0

6.5 Other polymers [i](#)

There are no such residues in this entry.