



wwPDB X-ray Structure Validation Summary Report

Feb 28, 2014 – 11:25 AM GMT

PDB ID : 2HT2
Title : Structure of the Escherichia coli ClC chloride channel Y445H mutant and Fab complex
Authors : Accardi, A.; Lobet, S.; Williams, C.; Miller, C.; Dutzler, R.
Deposited on : 2006-07-25
Resolution : 3.32 Å(reported)

This is a wwPDB validation summary 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/ValidationPDFNotes.html>

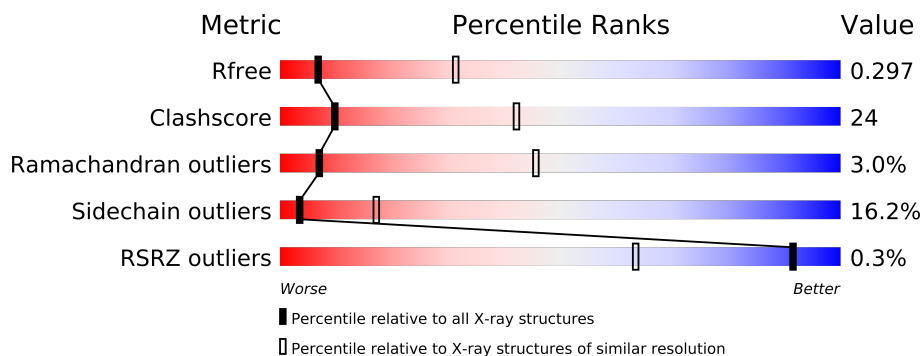
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.15 2013
Xtriage (Phenix)	:	dev-1323
EDS	:	stable22639
Percentile statistics	:	21963
Refmac	:	5.8.0049
CCP4	:	6.3.0 (Settle)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP)	:	stable22683

1 Overall quality at a glance

The reported resolution of this entry is 3.32 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))
R_{free}	66092	1372 (3.44-3.20)
Clashscore	79885	1016 (3.42-3.22)
Ramachandran outliers	78287	1699 (3.44-3.20)
Sidechain outliers	78261	1697 (3.44-3.20)
RSRZ outliers	66119	1373 (3.44-3.20)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	473	
1	B	473	
2	C	221	
2	E	221	
3	D	211	
3	F	211	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
4	BR	A	474	-	X
4	BR	B	474	-	X

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 13221 atoms, of which 0 are hydrogen and 0 are deuterium.

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 protein called H(+)/Cl(-) exchange transporter clcA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	444	Total	C	N	O	S	0	0	0
			3331	2187	562	562	20			
1	B	441	Total	C	N	O	S	0	0	0
			3302	2171	555	556	20			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	445	HIS	TYR	ENGINEERED	UNP P37019
B	445	HIS	TYR	ENGINEERED	UNP P37019

- Molecule 2 is a protein called Fab fragment, heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	221	Total	C	N	O	S	0	0	0
			1672	1077	274	315	6			
2	E	221	Total	C	N	O	S	0	0	0
			1672	1077	274	315	6			

- Molecule 3 is a protein called Fab fragment, light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	D	211	Total	C	N	O	S	0	0	0
			1621	1008	271	334	8			
3	F	211	Total	C	N	O	S	0	0	0
			1621	1008	271	334	8			

- Molecule 4 is BROMIDE ION (three-letter code: BR) (formula: Br).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	1	Total	Br	0	0
			1	1		

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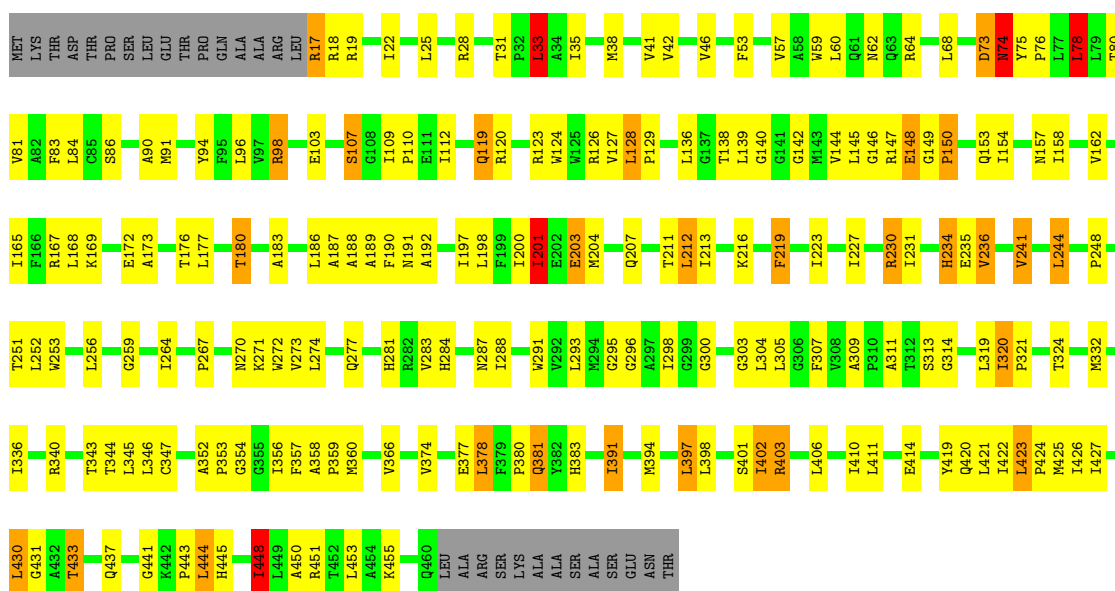
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Br	0	0
			1	1		

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.

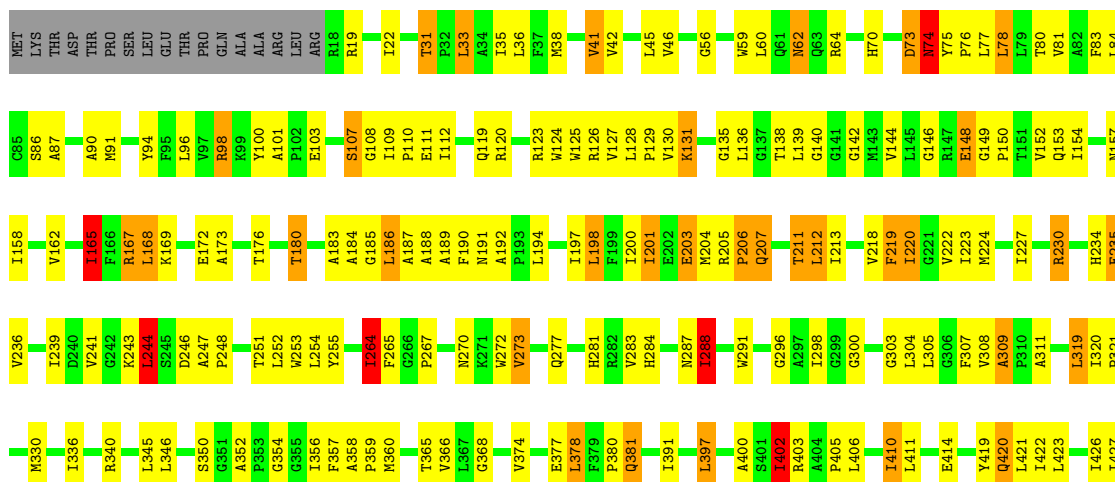
- Molecule 1: H(+)/Cl(-) exchange transporter clcA

Chain A:



- Molecule 1: H(+)/Cl(-) exchange transporter clcA

Chain B:





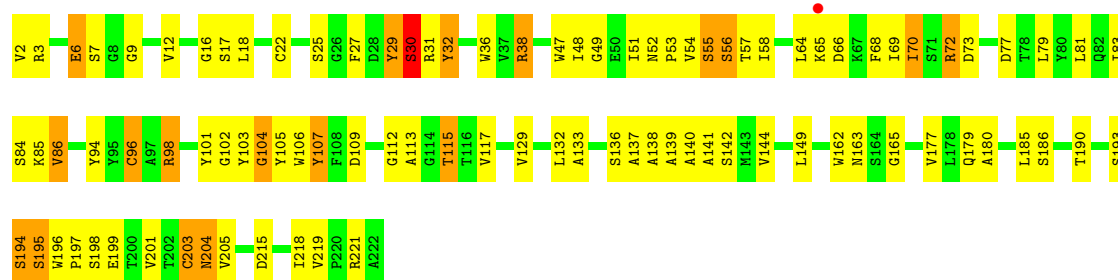
• Molecule 2: Fab fragment, heavy chain

Chain C:



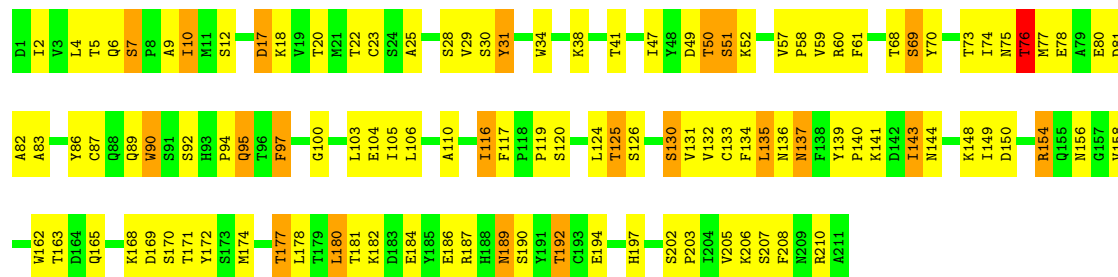
• Molecule 2: Fab fragment, heavy chain

Chain E:



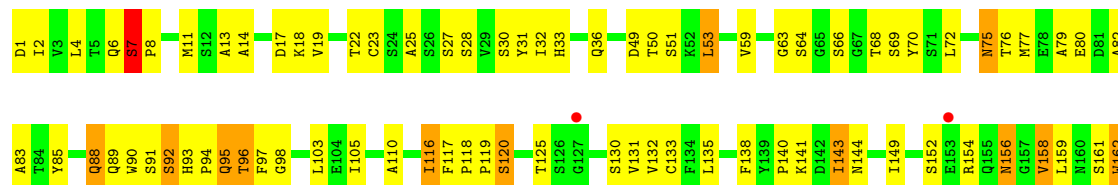
• Molecule 3: Fab fragment, light chain

Chain D:



• Molecule 3: Fab fragment, light chain

Chain F:





4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	232.29Å 96.58Å 170.56Å 90.00° 131.43° 90.00°	Depositor
Resolution (Å)	40.00 – 3.32 20.04 – 3.30	Depositor EDS
% Data completeness (in resolution range)	93.8 (40.00-3.32) 93.3 (20.04-3.30)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.57 (at 3.29Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.270 , 0.305 0.258 , 0.297	Depositor DCC
R_{free} test set	1932 reflections (5.16%)	DCC
Wilson B-factor (Å ²)	104.8	Xtriage
Anisotropy	0.451	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.23 , 16.8	EDS
Estimated twinning fraction	0.000 for h,-k,-h-l	Xtriage
L-test for twinning	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Outliers	0 of 42057 reflections	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	13221	wwPDB-VP
Average B, all atoms (Å ²)	86.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.43% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality

5.1 Standard geometry

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

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	A	0.95	6/3403 (0.2%)	1.06	10/4618 (0.2%)
1	B	0.92	7/3374 (0.2%)	1.11	13/4580 (0.3%)
2	C	0.90	0/1721	0.86	0/2355
2	E	0.86	0/1721	0.81	0/2355
3	D	0.85	1/1660 (0.1%)	0.81	0/2257
3	F	0.81	0/1660	0.84	0/2257
All	All	0.90	14/13539 (0.1%)	0.97	23/18422 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
2	C	0	1
2	E	0	2
3	F	0	1
All	All	0	4

The worst 5 of 14 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	41	VAL	CB-CG1	-14.24	1.23	1.52
1	A	41	VAL	CB-CG2	-9.85	1.32	1.52
1	B	41	VAL	CB-CG1	-9.28	1.33	1.52
1	B	41	VAL	CB-CG2	-8.78	1.34	1.52
1	B	458	ALA	C-O	7.20	1.37	1.23

The worst 5 of 23 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	402	ILE	CG1-CB-CG2	-15.19	77.97	111.40
1	B	41	VAL	CG1-CB-CG2	-14.21	88.16	110.90
1	A	41	VAL	CG1-CB-CG2	-12.76	90.49	110.90
1	A	201	ILE	CG1-CB-CG2	-8.82	91.98	111.40
1	B	288	ILE	CG1-CB-CG2	-8.80	92.05	111.40

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	C	196	TRP	Peptide
2	E	29	TYR	Peptide
2	E	32	TYR	Peptide
3	F	75	ASN	Peptide

5.2 Close contacts ⓘ

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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3331	0	3482	162	0
1	B	3302	0	3455	193	0
2	C	1672	0	1654	73	0
2	E	1672	0	1654	66	0
3	D	1621	0	1546	99	0
3	F	1621	0	1546	96	0
4	A	1	0	0	1	0
4	B	1	0	0	3	0
All	All	13221	0	13337	643	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 24.

The worst 5 of 643 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:112:ILE:HD11	1:B:153:GLN:HA	1.25	1.18
3:D:95:GLN:H	3:D:95:GLN:CD	1.48	1.12

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:398:LEU:O	1:A:402:ILE:HG22	1.48	1.10
2:C:163:ASN:HD22	2:C:167:LEU:HD23	1.14	1.10
3:F:7:SER:HB3	3:F:8:PRO:CD	1.78	1.09

There are no symmetry-related clashes.

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	
1	A	442/473 (93%)	391 (88%)	42 (10%)	9 (2%)	11	58
1	B	439/473 (93%)	379 (86%)	52 (12%)	8 (2%)	13	61
2	C	219/221 (99%)	191 (87%)	18 (8%)	10 (5%)	4	31
2	E	219/221 (99%)	182 (83%)	25 (11%)	12 (6%)	3	25
3	D	209/211 (99%)	173 (83%)	26 (12%)	10 (5%)	4	30
3	F	209/211 (99%)	181 (87%)	25 (12%)	3 (1%)	16	66
All	All	1737/1810 (96%)	1497 (86%)	188 (11%)	52 (3%)	7	45

5 of 52 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	167	ARG
1	B	188	ALA
1	B	309	ALA
2	C	62	PRO
2	C	65	LYS

5.3.2 Protein sidechains ⓘ

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	
1	A	335/358 (94%)	284 (85%)	51 (15%)	4	20
1	B	332/358 (93%)	284 (86%)	48 (14%)	5	23
2	C	181/181 (100%)	153 (84%)	28 (16%)	4	19
2	E	181/181 (100%)	148 (82%)	33 (18%)	2	12
3	D	185/185 (100%)	151 (82%)	34 (18%)	2	11
3	F	185/185 (100%)	153 (83%)	32 (17%)	3	14
All	All	1399/1448 (97%)	1173 (84%)	226 (16%)	3	17

5 of 226 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	C	35	SER
2	C	218	ILE
3	F	135	LEU
2	C	64	LEU
2	C	125	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 40 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	270	ASN
1	B	381	GLN
3	F	88	GLN
1	B	284	HIS
1	B	420	GLN

5.3.3 RNA ⓘ

There are no RNA chains 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 ⓘ

Of 2 ligands modelled in this entry, 2 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues

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(Å ²)	Q<0.9
1	A	444/473 (93%)	-0.24	0	100 100	37, 84, 144, 185	0
1	B	441/473 (93%)	-0.22	0	100 100	35, 82, 139, 194	0
2	C	221/221 (100%)	-0.13	2 (0%)	81 37	38, 77, 144, 191	0
2	E	221/221 (100%)	-0.13	1 (0%)	88 51	32, 81, 137, 193	0
3	D	211/211 (100%)	-0.10	0	100 100	44, 93, 133, 149	0
3	F	211/211 (100%)	-0.06	3 (1%)	72 25	26, 76, 133, 199	0
All	All	1749/1810 (96%)	-0.17	6 (0%)	91 63	26, 83, 139, 199	0

The worst 5 of 6 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	F	153	GLU	3.0
2	C	137	ALA	2.7
2	C	136	SER	2.7
3	F	127	GLY	2.6
2	E	65	LYS	2.2

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

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

6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

6.4 Ligands ⓘ

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	RSR	LLDF	B-factors(Å ²)	Q<0.9
4	BR	B	474	1/1	0.56	6.21	88,88,88,88	0
4	BR	A	474	1/1	0.47	5.89	88,88,88,88	0

6.5 Other polymers ⓘ

There are no such residues in this entry.