



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 10, 2026 – 07:37 AM UTC

PDB ID : 3SIV / pdb_00003siv
Title : Structure of a hPrp31-15.5K-U4atac 5' stem loop complex, dimeric form
Authors : Liu, S.; Ghalei, H.; Luhrmann, R.; Wahl, M.C.
Deposited on : 2011-06-20
Resolution : 3.30 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

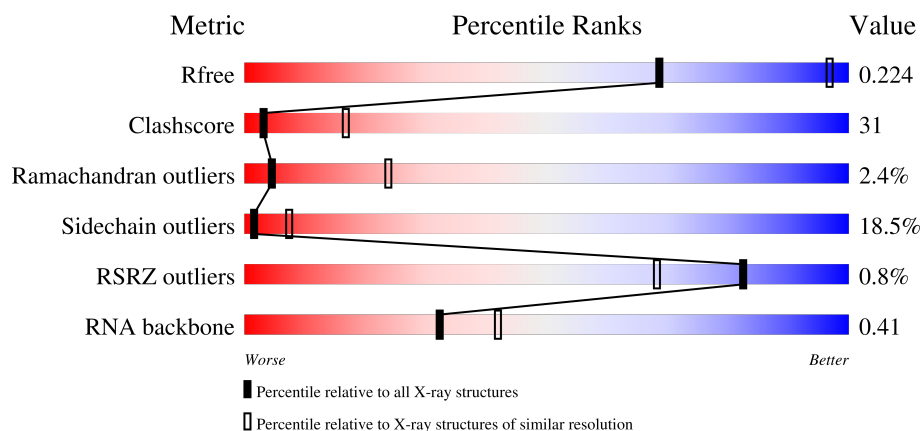
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.30 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}	180053	1169 (3.32-3.28)
Clashscore	190562	1209 (3.32-3.28)
Ramachandran outliers	187476	1188 (3.32-3.28)
Sidechain outliers	187428	1187 (3.32-3.28)
RSRZ outliers	180081	1169 (3.32-3.28)
RNA backbone	3983	1048 (3.60-3.00)

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 of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. 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	A	130	 38% 52% 9% .
1	D	130	 38% 42% 16% . .
1	G	130	 45% 41% 12% .
1	J	130	 42% 42% 12% . .

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Mol	Chain	Length	Quality of chain
2	B	254	% 33%45%15%7%
2	E	254	45%32%15%7%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 14114 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 protein called NHP2-like protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	128	Total	C	N	O	S	0	0	0
			991	625	175	185	6			
1	D	125	Total	C	N	O	S	0	0	0
			968	611	172	180	5			
1	G	128	Total	C	N	O	S	0	0	0
			992	625	175	186	6			
1	J	126	Total	C	N	O	S	0	0	0
			976	616	173	182	5			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP P55769
A	0	SER	-	expression tag	UNP P55769
D	-1	GLY	-	expression tag	UNP P55769
D	0	SER	-	expression tag	UNP P55769
G	-1	GLY	-	expression tag	UNP P55769
G	0	SER	-	expression tag	UNP P55769
J	-1	GLY	-	expression tag	UNP P55769
J	0	SER	-	expression tag	UNP P55769

- Molecule 2 is a protein called U4/U6 small nuclear ribonucleoprotein Prp31.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	237	Total	C	N	O	S	1	0	0
			1860	1168	321	361	10			
2	E	236	Total	C	N	O	S	0	0	0
			1851	1163	320	358	10			
2	H	235	Total	C	N	O	S	3	0	0
			1844	1158	319	357	10			
2	K	241	Total	C	N	O	S	0	0	0
			1892	1188	329	365	10			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	80	GLY	-	expression tag	UNP Q8WWY3
B	81	PRO	-	expression tag	UNP Q8WWY3
B	82	LEU	-	expression tag	UNP Q8WWY3
B	83	GLY	-	expression tag	UNP Q8WWY3
B	84	SER	-	expression tag	UNP Q8WWY3
E	80	GLY	-	expression tag	UNP Q8WWY3
E	81	PRO	-	expression tag	UNP Q8WWY3
E	82	LEU	-	expression tag	UNP Q8WWY3
E	83	GLY	-	expression tag	UNP Q8WWY3
E	84	SER	-	expression tag	UNP Q8WWY3
H	80	GLY	-	expression tag	UNP Q8WWY3
H	81	PRO	-	expression tag	UNP Q8WWY3
H	82	LEU	-	expression tag	UNP Q8WWY3
H	83	GLY	-	expression tag	UNP Q8WWY3
H	84	SER	-	expression tag	UNP Q8WWY3
K	80	GLY	-	expression tag	UNP Q8WWY3
K	81	PRO	-	expression tag	UNP Q8WWY3
K	82	LEU	-	expression tag	UNP Q8WWY3
K	83	GLY	-	expression tag	UNP Q8WWY3
K	84	SER	-	expression tag	UNP Q8WWY3

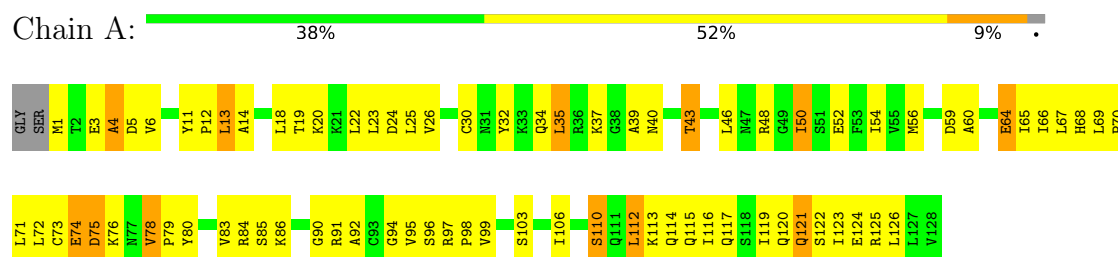
- Molecule 3 is a RNA chain called U4atac snRNA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	32	Total	C	N	O	P	0	0	0
			685	307	127	220	31			
3	F	32	Total	C	N	O	P	0	0	0
			685	307	127	220	31			
3	I	32	Total	C	N	O	P	0	0	0
			685	307	127	220	31			
3	L	32	Total	C	N	O	P	0	0	0
			685	307	127	220	31			

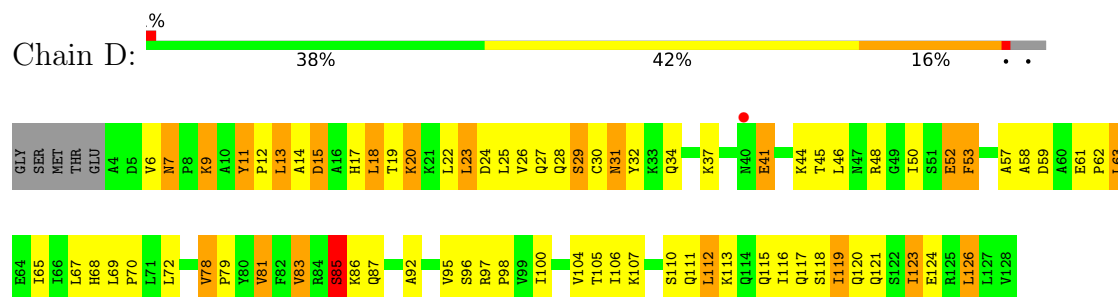
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes 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.

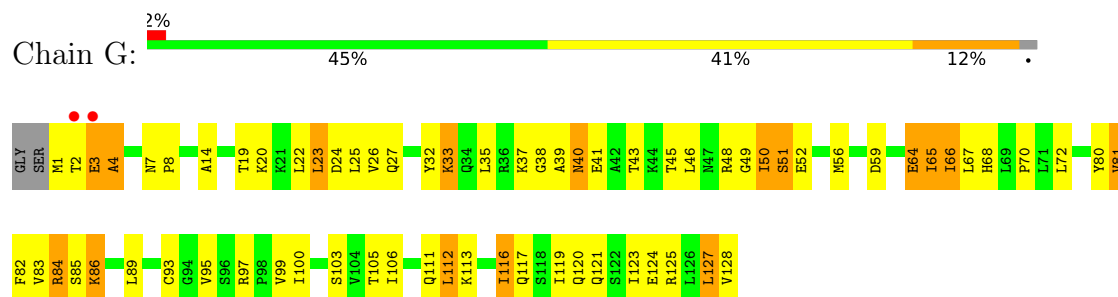
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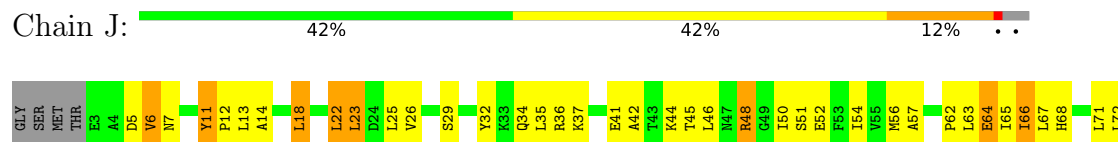
• Molecule 1: NHP2-like protein 1



• Molecule 1: NHP2-like protein 1

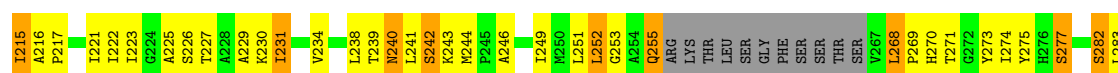
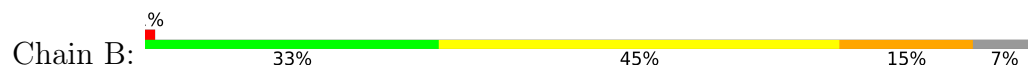


• Molecule 1: NHP2-like protein 1

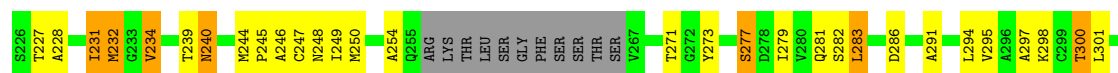




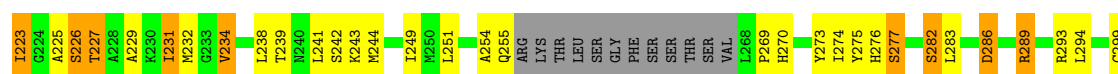
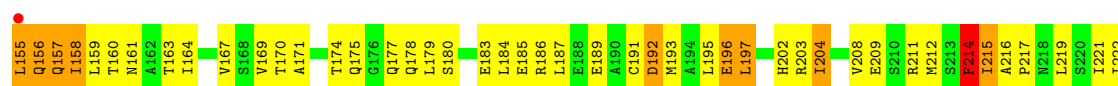
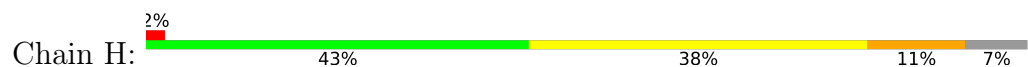
• Molecule 2: U4/U6 small nuclear ribonucleoprotein Prp31



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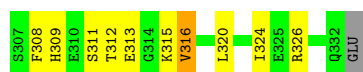
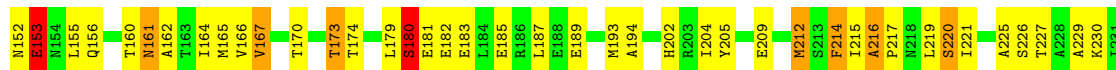
• Molecule 2: U4/U6 small nuclear ribonucleoprotein Prp31





- Molecule 2: U4/U6 small nuclear ribonucleoprotein Prp31

Chain K: %



- Molecule 3: U4atac snRNA

Chain C: %



- Molecule 3: U4atac snRNA

Chain F: %



- Molecule 3: U4atac snRNA

Chain I: %



- Molecule 3: U4atac snRNA

Chain L: %



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	255.41 Å 105.33 Å 188.64 Å 90.00° 127.52° 90.00°	Depositor
Resolution (Å)	29.92 – 3.30 29.92 – 3.30	Depositor EDS
% Data completeness (in resolution range)	99.3 (29.92-3.30) 99.1 (29.92-3.30)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	0.11	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.61 (at 3.31 Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.6.4_486)	Depositor
R, R_{free}	0.198 , 0.239 0.178 , 0.224	Depositor DCC
R_{free} test set	2991 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å ²)	119.0	Xtriage
Anisotropy	0.146	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 96.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	14114	wwPDB-VP
Average B, all atoms (Å ²)	137.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.07% 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, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

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	0.66	0/1003	1.02	2/1355 (0.1%)
1	D	0.55	0/980	1.00	5/1323 (0.4%)
1	G	0.66	0/1004	1.00	3/1355 (0.2%)
1	J	0.56	0/988	1.00	4/1335 (0.3%)
2	B	0.62	0/1886	0.99	6/2548 (0.2%)
2	E	0.63	0/1877	1.01	10/2536 (0.4%)
2	H	0.61	0/1870	1.03	10/2526 (0.4%)
2	K	0.57	0/1918	1.00	8/2590 (0.3%)
3	C	0.43	0/767	0.46	0/1195
3	F	0.48	0/767	0.54	0/1195
3	I	0.44	0/767	0.49	0/1195
3	L	0.43	0/767	0.49	0/1195
All	All	0.58	0/14594	0.91	48/20348 (0.2%)

There are no bond length outliers.

The worst 5 of 48 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	216	ALA	CA-C-N	10.07	129.72	119.24
2	H	216	ALA	C-N-CA	10.07	129.72	119.24
2	B	216	ALA	CA-C-N	8.17	127.75	118.85
2	B	216	ALA	C-N-CA	8.17	127.75	118.85
2	H	214	PHE	N-CA-C	-7.68	104.41	114.31

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-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 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	A	991	0	1042	86	0
1	D	968	0	1017	70	0
1	G	992	0	1042	68	0
1	J	976	0	1023	62	0
2	B	1860	0	1879	153	0
2	E	1851	0	1873	120	0
2	H	1844	0	1864	135	0
2	K	1892	0	1922	102	0
3	C	685	0	347	19	0
3	F	685	0	347	23	0
3	I	685	0	347	19	0
3	L	685	0	347	24	0
All	All	14114	0	13050	846	0

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 31.

The worst 5 of 846 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:D:14:ALA:HB1	1:D:18:LEU:HB3	1.34	1.07
2:H:134:ASP:HA	2:H:137:ARG:NH2	1.75	1.00
2:E:240:ASN:HD22	2:E:240:ASN:H	1.10	0.99
2:K:276:HIS:HA	2:K:281:GLN:HE21	1.24	0.99
1:G:95:VAL:HG12	1:G:97:ARG:H	1.26	0.98

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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	126/130 (97%)	110 (87%)	13 (10%)	3 (2%)	4	24
1	D	123/130 (95%)	110 (89%)	11 (9%)	2 (2%)	7	31
1	G	126/130 (97%)	119 (94%)	4 (3%)	3 (2%)	4	24
1	J	124/130 (95%)	113 (91%)	10 (8%)	1 (1%)	16	45
2	B	233/254 (92%)	190 (82%)	36 (16%)	7 (3%)	3	20
2	E	232/254 (91%)	196 (84%)	32 (14%)	4 (2%)	7	30
2	H	231/254 (91%)	189 (82%)	37 (16%)	5 (2%)	5	26
2	K	237/254 (93%)	193 (81%)	34 (14%)	10 (4%)	2	14
All	All	1432/1536 (93%)	1220 (85%)	177 (12%)	35 (2%)	4	24

5 of 35 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	58	ALA
1	D	105	THR
2	K	87	ALA
2	K	128	LEU
2	B	119	SER

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	111/112 (99%)	94 (85%)	17 (15%)	3	13
1	D	108/112 (96%)	82 (76%)	26 (24%)	1	3
1	G	111/112 (99%)	95 (86%)	16 (14%)	3	14
1	J	109/112 (97%)	85 (78%)	24 (22%)	1	5
2	B	205/219 (94%)	162 (79%)	43 (21%)	1	5
2	E	204/219 (93%)	158 (78%)	46 (22%)	1	5
2	H	203/219 (93%)	173 (85%)	30 (15%)	3	13
2	K	209/219 (95%)	178 (85%)	31 (15%)	3	13

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	1260/1324 (95%)	1027 (82%)	233 (18%)	1 7

5 of 233 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	E	211	ARG
2	K	214	PHE
1	G	112	LEU
2	K	204	ILE
1	J	111	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 31 such sidechains are listed below:

Mol	Chain	Res	Type
2	E	202	HIS
2	K	178	GLN
2	E	281	GLN
2	K	202	HIS
2	K	98	ASN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
3	C	31/32 (96%)	4 (12%)	0
3	F	31/32 (96%)	6 (19%)	0
3	I	31/32 (96%)	3 (9%)	0
3	L	31/32 (96%)	8 (25%)	0
All	All	124/128 (96%)	21 (16%)	0

5 of 21 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
3	C	30	G
3	C	36	U
3	C	43	A
3	C	50	G
3	F	32	C

There are no RNA pucker outliers to report.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

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(Å ²)	Q<0.9
1	A	128/130 (98%)	-0.56	0 100 100	81, 109, 179, 224	0
1	D	125/130 (96%)	-0.26	1 (0%) 82 68	92, 142, 192, 239	0
1	G	128/130 (98%)	-0.55	2 (1%) 70 52	76, 114, 172, 220	0
1	J	126/130 (96%)	-0.42	0 100 100	86, 128, 195, 215	0
2	B	237/254 (93%)	-0.42	2 (0%) 82 68	72, 126, 220, 329	1 (0%)
2	E	236/254 (92%)	-0.45	0 100 100	86, 122, 171, 213	0
2	H	235/254 (92%)	-0.25	4 (1%) 69 50	80, 135, 271, 314	1 (0%)
2	K	241/254 (94%)	-0.33	3 (1%) 76 58	83, 135, 218, 318	0
3	C	32/32 (100%)	-0.75	0 100 100	106, 121, 163, 183	0
3	F	32/32 (100%)	-0.69	0 100 100	90, 128, 188, 211	0
3	I	32/32 (100%)	-0.70	0 100 100	105, 124, 172, 208	0
3	L	32/32 (100%)	-0.74	0 100 100	91, 128, 181, 247	0
All	All	1584/1664 (95%)	-0.42	12 (0%) 82 68	72, 126, 218, 329	2 (0%)

The worst 5 of 12 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	G	3	GLU	4.1
2	H	142	LEU	3.9
1	D	40	ASN	3.6
2	B	289	ARG	3.2
2	H	129	VAL	3.1

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 [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.