W O R L D W I D E

wwPDB

P R O T E I N   D A T A   B A N K

wwPDB X-ray Structure Validation Summary Report (i)

Nov 14, 2023 – 04:32 PM JST

PDB ID	:	5ZUU
Title	:	Crystal structure of AtCPSF30 YTH domain in complex with 10mer m6A-modified RNA
Authors	:	Wu, B.; Nie, H.; Li, S.; Patel, D.J.
Deposited on	:	2018-05-08
Resolution	:	1.95 Å(reported)

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

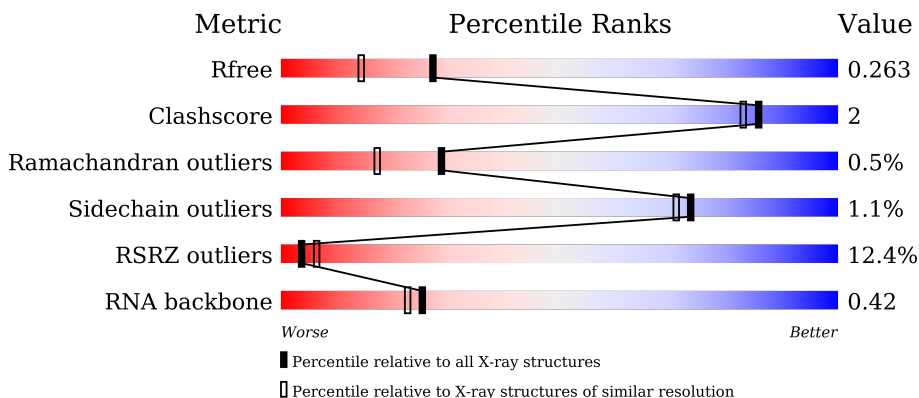|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 1.95 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.
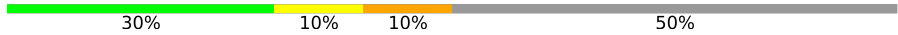
Metric	Percentile Ranks	Value
Rfree		0.263
Clashscore		2
Ramachandran outliers		0.5%
Sidechain outliers		1.1%
RSRZ outliers		12.4%
RNA backbone		0.42

Worse   *Better*

▌ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	2580 (1.96-1.96)
Clashscore	141614	2705 (1.96-1.96)
Ramachandran outliers	138981	2678 (1.96-1.96)
Sidechain outliers	138945	2678 (1.96-1.96)
RSRZ outliers	127900	2539 (1.96-1.96)
RNA backbone	3102	1124 (2.50-1.42)

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 <=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	180	8% / 83% / 7% / 10%
1	B	180	6% / 77% / 6% · 17%
1	C	180	9% / 91% / 6% · ·
1	D	180	19% / 75% / 7% / 18%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	E	10	30% 10% 10% 50%
2	F	10	30% 10% 10% 50%
2	G	10	10% 10% 30% 60%
2	I	10	20% 30% 10% 60%

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 5701 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 30-kDa cleavage and polyadenylation specificity factor 30.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	C	174	Total	C	N	O	S	0	1	0
			1405	874	258	268	5			
1	A	162	Total	C	N	O	S	0	0	0
			1294	811	235	243	5			
1	B	149	Total	C	N	O	S	0	0	0
			1209	760	219	225	5			
1	D	147	Total	C	N	O	S	0	0	0
			1181	739	213	224	5			

- Molecule 2 is a RNA chain called RNA (5'-R(*(6MZ)P*CP*UP*AP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	5	Total	C	N	O	P	0	0	0
			105	49	20	32	4			
2	F	5	Total	C	N	O	P	0	0	0
			105	49	20	32	4			
2	G	4	Total	C	N	O	P	0	0	0
			82	39	15	25	3			
2	I	4	Total	C	N	O	P	0	0	0
			82	39	15	25	3			

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).

GOL

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		

- Molecule 4 is 4-(2-HYDROXYETHYL)-1-PIPERAZINE ETHANESULFONIC ACID (three-letter code: EPE) (formula: $C_8H_{18}N_2O_4S$).

EPE
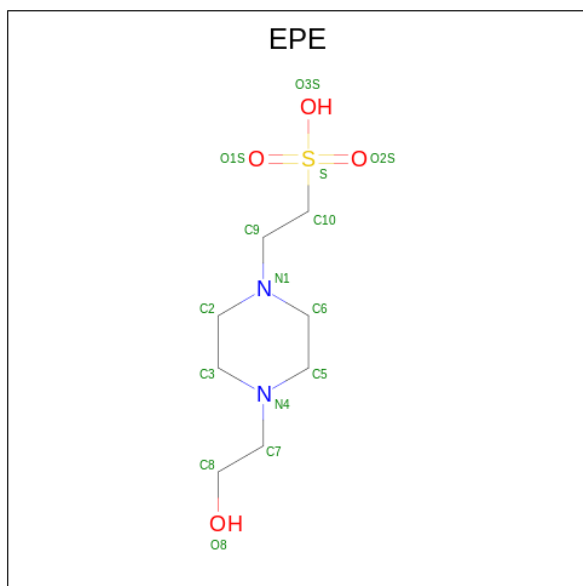
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	B	1	Total	C	N	O	S	0	0
			15	8	2	4	1		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	C	78	Total 78	O 78	0	0
5	A	48	Total 48	O 48	0	0
5	B	48	Total 48	O 48	0	0
5	D	24	Total 24	O 24	0	0
5	E	7	Total 7	O 7	0	0
5	F	10	Total 10	O 10	0	0
5	I	2	Total 2	O 2	0	0

3 Residue-property plots ⓘ

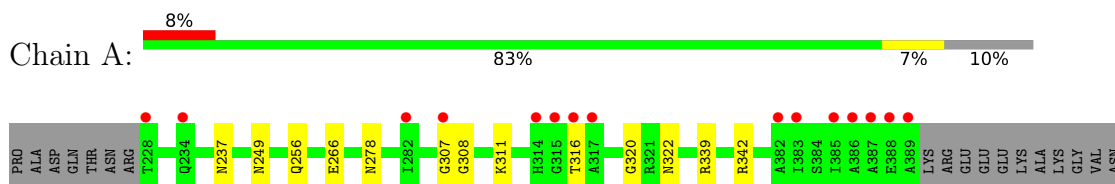These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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.

• Molecule 1: 30-kDa cleavage and polyadenylation specificity factor 30
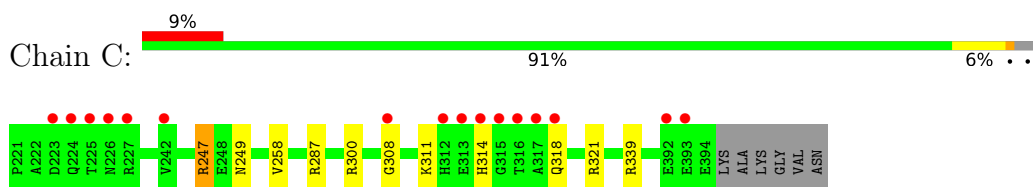
Chain C:

• Molecule 1: 30-kDa cleavage and polyadenylation specificity factor 30

Chain A:

• Molecule 1: 30-kDa cleavage and polyadenylation specificity factor 30

Chain B:

• Molecule 1: 30-kDa cleavage and polyadenylation specificity factor 30

Chain D:

• Molecule 2: RNA (5'-R(*(6MZ)P*CP*UP*AP*G)-3')

Chain E:

30% 10% 10% 50%

A A G G 6MD1 A4 G5 C

• Molecule 2: RNA (5'-R(*(6MZ)P*CP*UP*AP*G)-3')

Chain F:

30% 10% 10% 50%

A A G G 6MD1 A4 G5 C

• Molecule 2: RNA (5'-R(*(6MZ)P*CP*UP*AP*G)-3')

10%

Chain G:

10% 30% 60%

A A G G 6MD1 C2 U3 A4 G C

• Molecule 2: RNA (5'-R(*(6MZ)P*CP*UP*AP*G)-3')

20%

Chain I:

30% 10% 60%

A A G G 6MD1 C2 U3 A4 G C
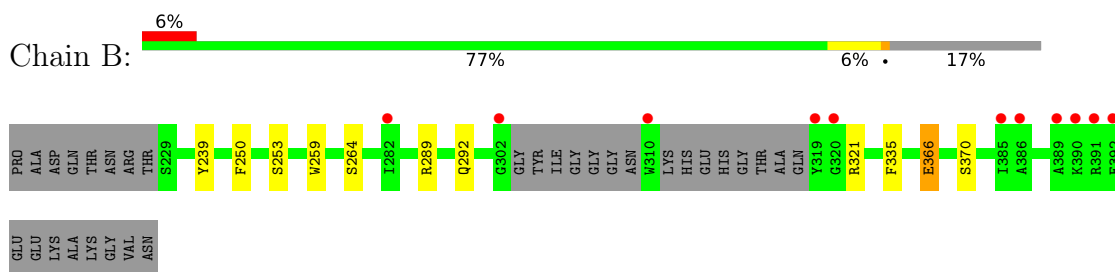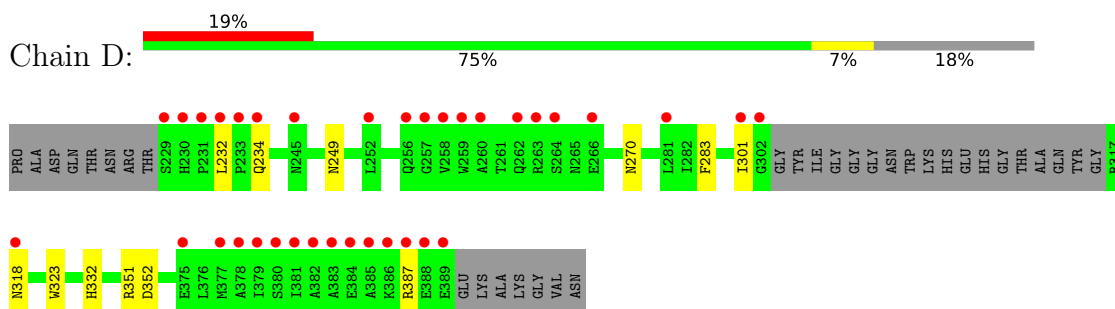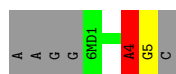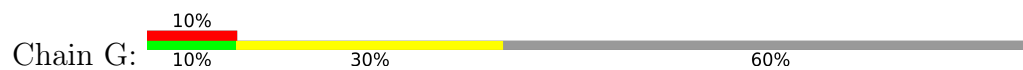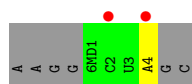
4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	69.11Å 74.29Å 151.14Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 1.95 29.90 – 1.95	Depositor EDS
% Data completeness (in resolution range)	86.3 (30.00-1.95) 86.3 (29.90-1.95)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.52 (at 1.95Å)	Xtriage
Refinement program	REFMAC 5.8.0189	Depositor
R, R_{free}	0.199 , 0.256 0.208 , 0.263	Depositor DCC
R_{free} test set	2513 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å^2)	18.5	Xtriage
Anisotropy	0.109	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 48.5	EDS
L-test for twinning [2]	$< |L| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	5701	wwPDB-VP
Average B, all atoms (Å^2)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.66% of the height of the origin peak. No significant pseudotranslation is detected.*

---

[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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 ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: 6MD, GOL, EPE

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	0.84	0/1322	0.95	2/1787 (0.1%)
1	B	0.92	1/1232 (0.1%)	0.93	0/1661
1	C	0.93	0/1434	1.00	5/1936 (0.3%)
1	D	0.73	0/1202	0.86	2/1621 (0.1%)
2	E	0.78	0/94	1.00	0/144
2	F	1.11	0/94	1.53	3/144 (2.1%)
2	G	0.61	0/68	0.82	0/103
2	I	0.59	0/68	0.70	0/103
All	All	0.86	1/5514 (0.0%)	0.95	12/7499 (0.2%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	366	GLU	CD-OE1	10.13	1.36	1.25

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	F	4	A	O5'-P-OP1	-8.27	98.26	105.70
2	F	4	A	O5'-P-OP2	6.88	118.95	110.70
1	C	339	ARG	NE-CZ-NH1	6.55	123.57	120.30
1	D	387	ARG	NE-CZ-NH2	5.74	123.17	120.30
1	D	352	ASP	CB-CG-OD1	5.73	123.46	118.30

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	1294	0	1261	7	0
1	B	1209	0	1190	4	0
1	C	1405	0	1363	2	0
1	D	1181	0	1163	7	0
2	E	105	0	58	1	0
2	F	105	0	58	2	0
2	G	82	0	47	2	0
2	I	82	0	47	0	0
3	A	6	0	8	0	0
4	B	15	0	18	0	0
5	A	48	0	0	0	0
5	B	48	0	0	0	0
5	C	78	0	0	1	0
5	D	24	0	0	1	0
5	E	7	0	0	0	0
5	F	10	0	0	0	0
5	I	2	0	0	0	0
All	All	5701	0	5213	23	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 2.

The worst 5 of 23 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:A:249:ASN:HD21	1:A:311:LYS:H	1.24	0.85
1:D:332:HIS:HD2	5:D:404:HOH:O	1.72	0.71
1:C:249:ASN:HD21	1:C:311:LYS:H	1.39	0.70
1:D:270:ASN:HD21	1:D:301:ILE:HB	1.57	0.69
1:B:239:TYR:OH	1:B:366:GLU:HG3	2.02	0.59

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	160/180 (89%)	154 (96%)	5 (3%)	1 (1%)	25	14
1	B	144/180 (80%)	140 (97%)	4 (3%)	0	100	100
1	C	173/180 (96%)	166 (96%)	5 (3%)	2 (1%)	13	4
1	D	143/180 (79%)	137 (96%)	6 (4%)	0	100	100
All	All	620/720 (86%)	597 (96%)	20 (3%)	3 (0%)	29	17

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	316	THR
1	C	314	HIS
1	C	308	GLY

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	141/156 (90%)	141 (100%)	0	100	100
1	B	134/156 (86%)	131 (98%)	3 (2%)	52	44
1	C	153/156 (98%)	151 (99%)	2 (1%)	69	65
1	D	132/156 (85%)	131 (99%)	1 (1%)	81	80
All	All	560/624 (90%)	554 (99%)	6 (1%)	73	71

5 of 6 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	321	ARG
1	B	370	SER
1	D	318	ASN
1	C	318	GLN
1	C	258	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 11 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	234	GLN
1	D	249	ASN
1	D	332	HIS
1	D	318	ASN
1	B	249	ASN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	E	3/10 (30%)	1 (33%)	0
2	F	3/10 (30%)	1 (33%)	0
2	G	2/10 (20%)	1 (50%)	0
2	I	2/10 (20%)	1 (50%)	0
All	All	10/40 (25%)	4 (40%)	0

All (4) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
2	E	5	G
2	F	4	A
2	G	4	A
2	I	4	A

There are no RNA pucker outliers to report.

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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

2 ligands are 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	#$|Z| > 2$
3	GOL	A	501	-	5,5,5	0.49	0	5,5,5	0.70	0
4	EPE	B	501	-	15,15,15	1.69	1 (6%)	18,20,20	1.60	4 (22%)

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
3	GOL	A	501	-	-	4/4/4/4	-
4	EPE	B	501	-	-	4/9/19/19	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	501	EPE	C10-S	-6.10	1.68	1.77

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	501	EPE	O2S-S-C10	3.51	111.14	106.92
4	B	501	EPE	O2S-S-O1S	-3.34	102.39	113.95
4	B	501	EPE	O3S-S-C10	2.93	110.51	105.77
4	B	501	EPE	O1S-S-C10	2.18	109.55	106.92

There are no chirality outliers.

5 of 8 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	501	GOL	O1-C1-C2-C3
4	B	501	EPE	C9-C10-S-O1S
4	B	501	EPE	C9-C10-S-O3S
3	A	501	GOL	C1-C2-C3-O3
3	A	501	GOL	O1-C1-C2-O2

There are no ring outliers.

No monomer is involved in short contacts.

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	162/180 (90%)	0.33	15 (9%)	8	14	13, 22, 62, 78	0
1	B	149/180 (82%)	0.26	11 (7%)	14	22	12, 23, 62, 88	0
1	C	174/180 (96%)	0.26	16 (9%)	9	14	11, 16, 67, 107	0
1	D	147/180 (81%)	1.13	35 (23%)	0	0	18, 45, 85, 97	0
2	E	4/10 (40%)	-0.72	0	100	100	15, 17, 24, 29	0
2	F	4/10 (40%)	-0.45	0	100	100	14, 16, 26, 31	0
2	G	3/10 (30%)	2.22	1 (33%)	0	0	66, 66, 70, 101	0
2	I	3/10 (30%)	2.53	2 (66%)	0	0	49, 49, 51, 91	0
All	All	646/760 (85%)	0.49	80 (12%)	4	6	11, 25, 74, 107	0

The worst 5 of 80 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	381	ILE	8.4
1	C	314	HIS	8.3
1	D	385	ALA	7.3
1	D	232	LEU	6.9
1	D	263	ARG	5.7

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 monosaccharides in this entry.

WORLDWIDE
wwPDB
PROTEIN DATA BANK

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. 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	B-factors(Å^2)	Q<0.9
3	GOL	A	501	6/6	0.88	0.20	36,43,47,47	0
4	EPE	B	501	15/15	0.88	0.29	56,66,80,84	0

6.5 Other polymers ⓘ

There are no such residues in this entry.