



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:03 AM UTC

PDB ID : 6JUF / pdb_00006juf
Title : SspB crystal structure
Authors : Liqiong, L.; Yubing, Z.
Deposited on : 2019-04-13
Resolution : 1.59 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

<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

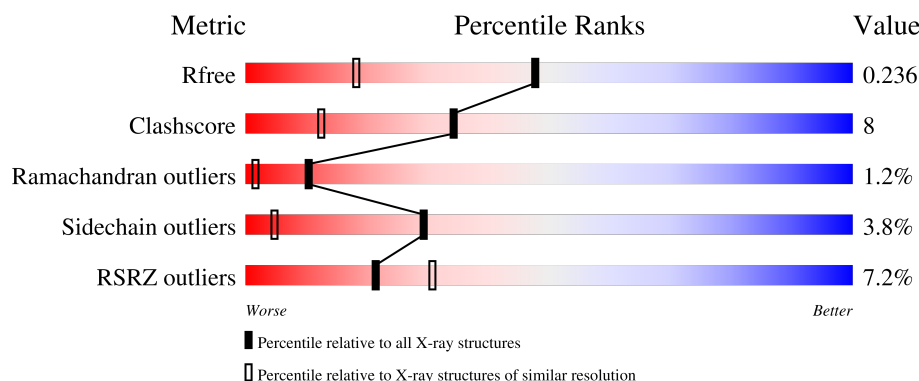
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.59 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	1094 (1.58-1.58)
Clashscore	190562	1105 (1.58-1.58)
Ramachandran outliers	187476	1082 (1.58-1.58)
Sidechain outliers	187428	1081 (1.58-1.58)
RSRZ outliers	180081	1094 (1.58-1.58)

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	365	6% 78% 13% •• 6%
1	B	365	7% 77% 14% • 7%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5920 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 SspB protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	340	Total	C	N	O	S	0	2	0
			2727	1736	482	500	9			
1	A	344	Total	C	N	O	S	0	1	0
			2746	1747	487	503	9			

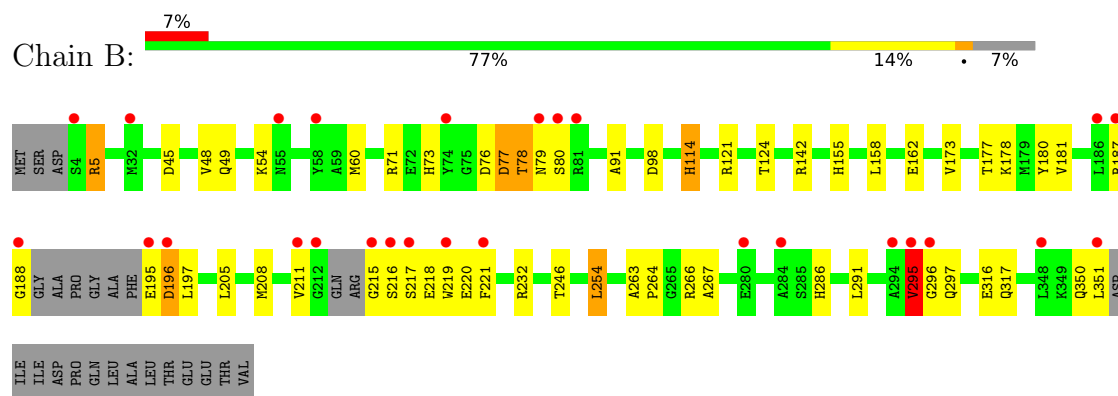
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	217	Total	O	0	0
			217	217		
2	A	230	Total	O	0	0
			230	230		

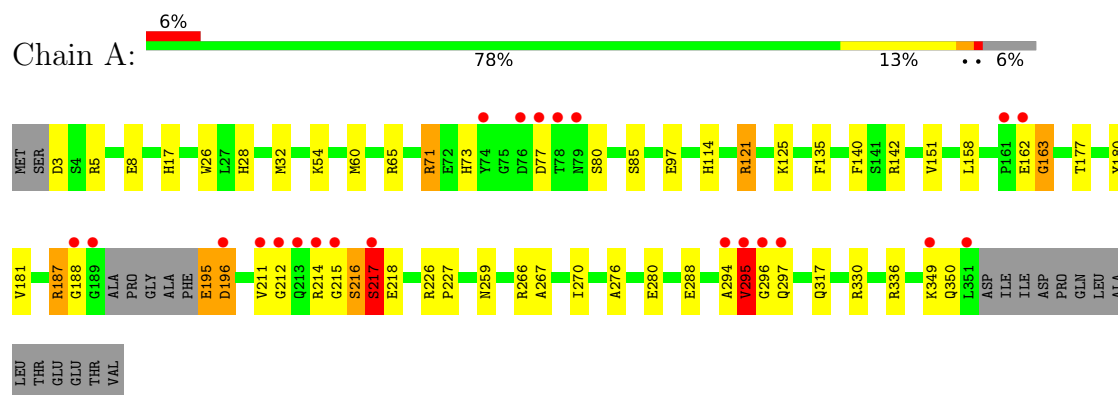
3 Residue-property plots [i](#)

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: SspB protein



• Molecule 1: SspB protein



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	57.40Å 81.64Å 148.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 1.59 50.00 – 1.59	Depositor EDS
% Data completeness (in resolution range)	96.0 (50.00-1.59) 97.3 (50.00-1.59)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.82 (at 1.58Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.193 , 0.238 0.191 , 0.236	Depositor DCC
R_{free} test set	4616 reflections (4.87%)	wwPDB-VP
Wilson B-factor (Å ²)	13.5	Xtriage
Anisotropy	0.108	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 35.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	5920	wwPDB-VP
Average B, all atoms (Å ²)	17.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.27% 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	1.15	4/2826 (0.1%)	1.13	11/3842 (0.3%)
1	B	1.17	3/2806 (0.1%)	1.09	5/3815 (0.1%)
All	All	1.16	7/5632 (0.1%)	1.11	16/7657 (0.2%)

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
1	A	0	3

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	17	HIS	ND1-CE1	6.74	1.39	1.32
1	B	114	HIS	ND1-CE1	6.24	1.38	1.32
1	B	91	ALA	N-CA	5.66	1.53	1.46
1	A	71	ARG	CD-NE	-5.56	1.38	1.46
1	A	28	HIS	ND1-CE1	5.43	1.38	1.32
1	B	286	HIS	CA-C	-5.29	1.46	1.52
1	A	85	SER	N-CA	5.05	1.52	1.46

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	78	THR	N-CA-C	-9.31	99.93	111.11
1	B	77	ASP	N-CA-C	8.46	123.39	112.89
1	A	188	GLY	N-CA-C	-8.31	103.18	112.33
1	A	77	ASP	N-CA-C	8.01	123.17	113.23
1	A	217	SER	N-CA-C	7.56	126.91	110.80
1	A	163	GLY	N-CA-C	7.37	127.37	112.34
1	B	197	LEU	N-CA-C	6.81	119.67	109.25

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	295	VAL	N-CA-C	6.01	121.84	109.34
1	A	294	ALA	CA-C-N	-5.98	111.21	121.97
1	A	294	ALA	C-N-CA	-5.98	111.21	121.97
1	A	218	GLU	N-CA-C	5.64	118.92	109.95
1	A	211	VAL	CB-CA-C	5.61	119.14	110.50
1	A	296	GLY	N-CA-C	-5.41	97.61	113.30
1	A	330	ARG	NE-CZ-NH2	-5.33	114.41	119.20
1	B	79	ASN	N-CA-C	5.22	119.21	113.21
1	B	246	THR	N-CA-C	5.08	117.70	109.06

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	195	GLU	Peptide
1	A	216	SER	Peptide
1	A	295	VAL	Peptide

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	2746	0	2645	45	0
1	B	2727	0	2624	44	1
2	A	230	0	0	19	1
2	B	217	0	0	10	0
All	All	5920	0	5269	82	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 8.

All (82) 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:195:GLU:N	2:A:401:HOH:O	1.81	1.11

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:65:ARG:HD2	2:A:595:HOH:O	1.49	1.10
1:B:208:MET:HE2	1:B:221:PHE:CE1	1.86	1.09
1:B:317:GLN:HE22	1:A:195:GLU:HA	1.13	1.07
1:A:259:ASN:ND2	2:A:404:HOH:O	1.95	1.00
1:B:178:LYS:HE2	2:B:405:HOH:O	1.67	0.93
1:B:208:MET:CE	1:B:221:PHE:CE1	2.52	0.92
1:B:178:LYS:CE	2:B:405:HOH:O	2.19	0.89
1:A:217:SER:O	2:A:402:HOH:O	1.93	0.86
1:B:208:MET:CE	1:B:221:PHE:HE1	1.89	0.85
1:A:297:GLN:OE1	2:A:403:HOH:O	1.94	0.85
1:B:121:ARG:HD3	2:B:568:HOH:O	1.76	0.84
1:B:211:VAL:HG21	1:B:218:GLU:HB2	1.59	0.83
1:A:187:ARG:HH11	1:A:187:ARG:HG2	1.42	0.83
1:B:317:GLN:NE2	1:A:195:GLU:HA	1.95	0.81
1:B:211:VAL:CG2	1:B:218:GLU:HB2	2.10	0.81
1:A:121:ARG:NH2	2:A:405:HOH:O	2.13	0.79
1:B:216:SER:N	1:B:217:SER:HA	1.98	0.79
1:B:317:GLN:HE22	1:A:195:GLU:CA	1.93	0.76
1:A:336:ARG:HD3	2:A:607:HOH:O	1.87	0.74
1:B:215:GLY:C	1:B:217:SER:HA	2.15	0.71
1:B:45:ASP:O	1:B:49:GLN:HG2	1.90	0.71
1:A:217:SER:HA	2:A:606:HOH:O	1.92	0.70
1:A:187:ARG:HH11	1:A:187:ARG:CG	2.04	0.69
1:B:155:HIS:HE1	2:B:512:HOH:O	1.75	0.69
1:A:214:ARG:CB	1:A:215:GLY:HA3	2.25	0.66
1:A:65:ARG:HD2	2:A:431:HOH:O	1.97	0.64
1:A:121:ARG:NH1	2:A:405:HOH:O	2.31	0.63
1:A:121:ARG:CZ	2:A:405:HOH:O	2.45	0.62
1:B:114:HIS:HE1	1:B:267:ALA:O	1.83	0.61
1:A:214:ARG:CB	1:A:215:GLY:CA	2.79	0.60
1:A:3:ASP:OD1	1:A:5:ARG:HD3	2.01	0.59
1:B:142:ARG:HD3	1:B:218:GLU:OE2	2.01	0.59
1:B:195:GLU:CA	1:A:317:GLN:HE22	2.17	0.58
1:A:187:ARG:HG2	1:A:187:ARG:NH1	2.16	0.56
1:B:71:ARG:NH2	1:B:124:THR:OG1	2.39	0.56
1:A:65:ARG:NH2	2:A:406:HOH:O	2.18	0.55
1:B:188:GLY:HA2	1:A:227:PRO:HB3	1.88	0.55
1:A:114:HIS:HE1	1:A:267:ALA:O	1.91	0.53
1:A:195:GLU:O	1:A:196:ASP:HB2	2.09	0.53
1:B:351:LEU:HD21	2:B:408:HOH:O	2.08	0.52
1:B:211:VAL:HG22	1:B:218:GLU:HB2	1.88	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:181:VAL:HG11	1:B:219:TRP:HZ3	1.75	0.51
1:B:195:GLU:HA	1:A:317:GLN:HE22	1.75	0.50
1:B:232:ARG:CZ	1:B:316:GLU:HG2	2.42	0.50
1:B:48:VAL:HG23	2:B:584:HOH:O	2.12	0.49
1:A:135:PHE:O	1:A:266:ARG:HD2	2.13	0.49
1:A:276:ALA:O	1:A:280:GLU:HG3	2.13	0.48
1:B:76:ASP:OD1	1:B:78:THR:OG1	2.30	0.48
1:B:114:HIS:HD2	1:B:180:TYR:OH	1.97	0.48
1:A:187:ARG:HD3	1:A:187:ARG:HA	1.72	0.47
1:B:73:HIS:HD2	2:B:491:HOH:O	1.96	0.47
1:B:195:GLU:O	1:B:196:ASP:HB2	2.13	0.47
1:A:65:ARG:CG	2:A:595:HOH:O	2.62	0.47
1:A:114:HIS:HD2	1:A:180:TYR:OH	1.98	0.46
1:A:73:HIS:HD2	2:A:409:HOH:O	1.98	0.46
1:B:211:VAL:O	1:B:211:VAL:HG23	2.14	0.46
1:B:266:ARG:HD3	2:B:513:HOH:O	2.16	0.46
1:B:77:ASP:O	1:B:78:THR:C	2.53	0.46
1:A:71:ARG:HD3	2:A:591:HOH:O	2.16	0.46
1:A:295:VAL:O	1:A:295:VAL:HG23	2.16	0.46
1:B:208:MET:HE3	1:B:208:MET:HB2	1.71	0.45
1:A:140:PHE:CZ	1:A:151:VAL:HG21	2.51	0.45
1:B:195:GLU:N	1:A:317:GLN:HE22	2.16	0.44
1:B:295:VAL:HA	1:B:296:GLY:HA2	1.55	0.44
1:A:32:MET:HE3	2:A:541:HOH:O	2.18	0.44
1:A:26:TRP:HA	1:A:60:MET:HE3	2.00	0.44
1:B:208:MET:HE2	1:B:221:PHE:CD1	2.47	0.43
1:A:226:ARG:HG3	1:A:270:ILE:HG22	2.00	0.43
1:A:288:GLU:OE1	2:A:407:HOH:O	2.21	0.43
1:B:173:VAL:O	1:B:177:THR:HG23	2.18	0.43
1:B:5:ARG:HD3	2:B:589:HOH:O	2.19	0.42
1:B:263:ALA:HB1	1:B:264:PRO:CD	2.50	0.41
1:B:291:LEU:HD12	1:B:291:LEU:HA	1.92	0.41
1:A:151:VAL:HG22	2:A:619:HOH:O	2.20	0.41
1:B:155:HIS:HD2	2:B:581:HOH:O	2.02	0.41
1:B:60:MET:HE3	1:B:60:MET:HB2	1.78	0.41
1:A:177:THR:O	1:A:181:VAL:HG22	2.21	0.41
1:B:254:LEU:HD21	1:B:291:LEU:HD11	2.01	0.41
1:A:8:GLU:O	1:A:125:LYS:HE2	2.21	0.40
1:A:114:HIS:CD2	1:A:180:TYR:OH	2.74	0.40
1:A:65:ARG:CD	2:A:595:HOH:O	2.32	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the sym-

metry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:220:GLU:OE2	2:A:404:HOH:O[3_544]	2.05	0.15

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	341/365 (93%)	327 (96%)	9 (3%)	5 (2%)	8	1
1	B	336/365 (92%)	328 (98%)	5 (2%)	3 (1%)	14	3
All	All	677/730 (93%)	655 (97%)	14 (2%)	8 (1%)	10	1

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	196	ASP
1	A	163	GLY
1	A	196	ASP
1	A	216	SER
1	A	217	SER
1	B	295	VAL
1	A	212	GLY
1	B	187	ARG

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	
1	A	280/300 (93%)	270 (96%)	10 (4%)	31	5
1	B	279/300 (93%)	267 (96%)	12 (4%)	26	3
All	All	559/600 (93%)	537 (96%)	22 (4%)	29	4

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	5	ARG
1	B	54	LYS
1	B	80	SER
1	B	98[A]	ASP
1	B	98[B]	ASP
1	B	158	LEU
1	B	162	GLU
1	B	205	LEU
1	B	254	LEU
1	B	295	VAL
1	B	297	GLN
1	B	350	GLN
1	A	54	LYS
1	A	80	SER
1	A	97	GLU
1	A	121	ARG
1	A	142	ARG
1	A	158	LEU
1	A	162	GLU
1	A	187	ARG
1	A	349	LYS
1	A	350	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	37	ASN
1	B	49	GLN
1	B	73	HIS
1	B	114	HIS
1	B	155	HIS
1	B	317	GLN
1	B	320	ASN
1	A	37	ASN

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Mol	Chain	Res	Type
1	A	73	HIS
1	A	114	HIS
1	A	150	GLN
1	A	155	HIS

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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	344/365 (94%)	0.25	22 (6%)	25 34	7, 14, 40, 69	1 (0%)
1	B	340/365 (93%)	0.27	27 (7%)	18 27	8, 15, 40, 65	2 (0%)
All	All	684/730 (93%)	0.26	49 (7%)	21 31	7, 14, 40, 69	3 (0%)

All (49) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	189	GLY	8.7
1	B	188	GLY	5.9
1	A	215	GLY	5.7
1	B	216	SER	5.5
1	B	351	LEU	5.3
1	B	58	TYR	4.9
1	B	212	GLY	4.7
1	A	295	VAL	4.7
1	B	187	ARG	4.6
1	B	215	GLY	4.4
1	A	296	GLY	4.4
1	A	78	THR	4.2
1	A	76	ASP	3.9
1	A	294	ALA	3.9
1	A	77	ASP	3.8
1	A	214	ARG	3.6
1	B	74	TYR	3.5
1	A	161	PRO	3.4
1	A	213	GLN	3.3
1	B	295	VAL	3.3
1	A	211	VAL	3.2
1	A	188	GLY	3.1
1	B	4	SER	3.1
1	B	55	ASN	3.0

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Mol	Chain	Res	Type	RSRZ
1	A	349	LYS	2.9
1	A	351	LEU	2.9
1	B	280	GLU	2.8
1	B	32	MET	2.7
1	B	296	GLY	2.7
1	B	81	ARG	2.6
1	B	186	LEU	2.6
1	A	297	GLN	2.6
1	A	74	TYR	2.5
1	A	79	ASN	2.5
1	A	212	GLY	2.5
1	B	219	TRP	2.4
1	A	162	GLU	2.4
1	B	80	SER	2.4
1	B	211	VAL	2.4
1	B	195	GLU	2.4
1	B	217	SER	2.3
1	B	196	ASP	2.3
1	B	284	ALA	2.2
1	B	221	PHE	2.2
1	A	196	ASP	2.2
1	A	217	SER	2.2
1	B	294	ALA	2.1
1	B	348	LEU	2.1
1	B	79	ASN	2.0

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 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.