



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 1, 2026 – 06:56 AM UTC

PDB ID : 3FVW / pdb_00003fvw
Title : Crystal structure of the Q8DWD8_STRMU protein from Streptococcus mutans. Northeast Structural Genomics Consortium target SmR99.
Authors : Vorobiev, S.M.; Abashidze, M.; Belote, R.L.; Foote, E.L.; Ciccocanti, C.; Janjua, H.; Xiao, R.; Acton, T.; Montelione, G.T.; Hunt, J.F.; Tong, L.; Northeast Structural Genomics Consortium (NESG)
Deposited on : 2009-01-16
Resolution : 2.30 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
Mogul	:	2022.3.0, CSD as543be (2022)
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

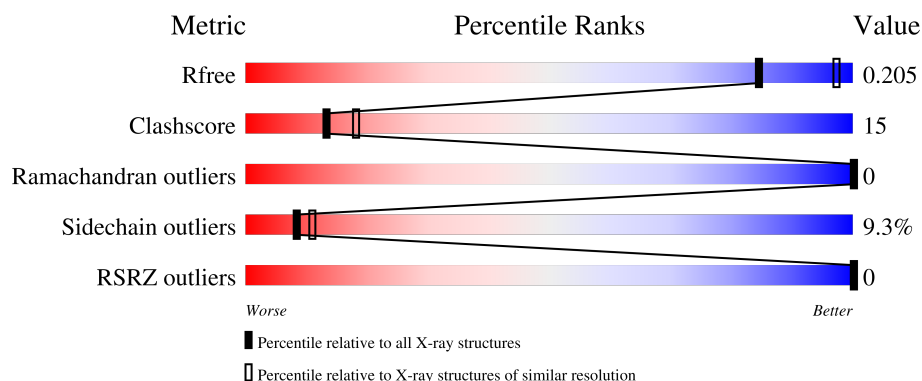
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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	6319 (2.30-2.30)
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)
RSRZ outliers	180081	6325 (2.30-2.30)

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	192	
1	B	192	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 2899 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 Putative NAD(P)H-dependent FMN reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	179	Total	C	N	O	Se	0	0	0
			1384	886	231	266	1			
1	B	182	Total	C	N	O	Se	0	0	0
			1403	898	235	269	1			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	182	ILE	VAL	engineered mutation	UNP Q8DWD8
A	185	LEU	-	expression tag	UNP Q8DWD8
A	186	GLU	-	expression tag	UNP Q8DWD8
A	187	HIS	-	expression tag	UNP Q8DWD8
A	188	HIS	-	expression tag	UNP Q8DWD8
A	189	HIS	-	expression tag	UNP Q8DWD8
A	190	HIS	-	expression tag	UNP Q8DWD8
A	191	HIS	-	expression tag	UNP Q8DWD8
A	192	HIS	-	expression tag	UNP Q8DWD8
B	182	ILE	VAL	engineered mutation	UNP Q8DWD8
B	185	LEU	-	expression tag	UNP Q8DWD8
B	186	GLU	-	expression tag	UNP Q8DWD8
B	187	HIS	-	expression tag	UNP Q8DWD8
B	188	HIS	-	expression tag	UNP Q8DWD8
B	189	HIS	-	expression tag	UNP Q8DWD8
B	190	HIS	-	expression tag	UNP Q8DWD8
B	191	HIS	-	expression tag	UNP Q8DWD8
B	192	HIS	-	expression tag	UNP Q8DWD8

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	54	Total	O	0	0
			54	54		

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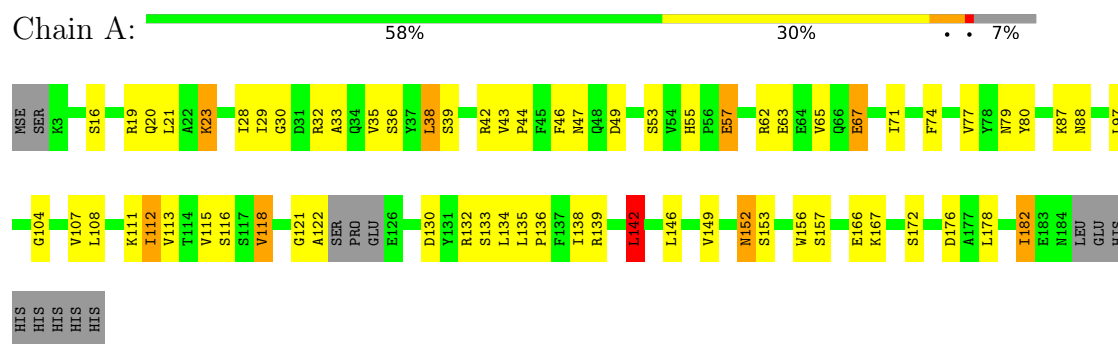
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	58	Total	O	0	0
			58	58		

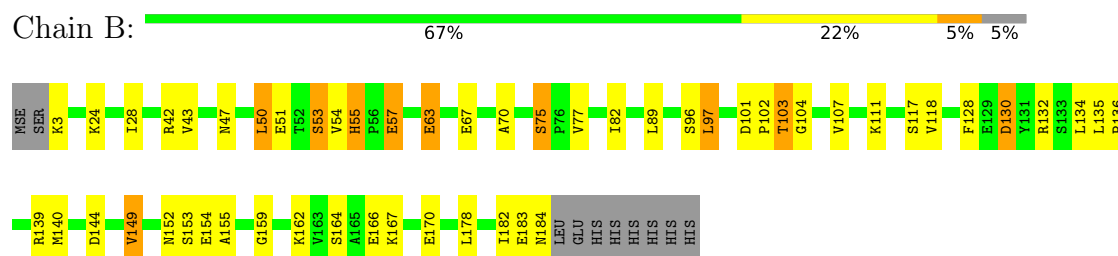
3 Residue-property plots [i](#)

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: Putative NAD(P)H-dependent FMN reductase



- Molecule 1: Putative NAD(P)H-dependent FMN reductase



4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	99.30Å 99.30Å 90.11Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	50.00 – 2.30 50.00 – 2.30	Depositor EDS
% Data completeness (in resolution range)	95.6 (50.00-2.30) 97.8 (50.00-2.30)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.56 (at 2.29Å)	Xtriage
Refinement program	CNS 1.2 (using xtal_twin utilities)	Depositor
R, R_{free}	0.188 , 0.217 0.184 , 0.205	Depositor DCC
R_{free} test set	2048 reflections (4.64%)	wwPDB-VP
Wilson B-factor (Å ²)	30.6	Xtriage
Anisotropy	0.595	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 21.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.40$, $\langle L^2 \rangle = 0.22$	Xtriage
Estimated twinning fraction	0.255 for -h,-k,l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	2899	wwPDB-VP
Average B, all atoms (Å ²)	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.07% 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	0.54	2/1412 (0.1%)	0.99	6/1922 (0.3%)
1	B	0.51	0/1433	1.03	10/1952 (0.5%)
All	All	0.53	2/2845 (0.1%)	1.01	16/3874 (0.4%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	182	ILE	CA-CB	-8.41	1.42	1.54
1	A	182	ILE	N-CA	-5.06	1.39	1.46

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	139	ARG	N-CA-C	6.89	120.98	112.58
1	B	144	ASP	N-CA-C	6.34	119.48	109.39
1	B	134	LEU	N-CA-C	6.14	117.85	111.03
1	B	139	ARG	N-CA-C	5.95	119.84	112.58
1	A	104	GLY	CA-C-N	5.84	125.60	119.76
1	A	104	GLY	C-N-CA	5.84	125.60	119.76
1	B	55	HIS	CA-C-N	5.55	125.01	119.24
1	B	55	HIS	C-N-CA	5.55	125.01	119.24
1	A	134	LEU	N-CA-C	5.53	118.14	111.40
1	B	149	VAL	N-CA-C	5.41	114.05	107.61
1	B	117	SER	N-CA-C	5.20	117.84	108.48
1	B	55	HIS	N-CA-C	-5.17	103.65	109.60
1	B	47	ASN	N-CA-C	5.13	120.18	112.94
1	A	142	LEU	N-CA-C	5.03	116.47	108.67
1	A	118	VAL	N-CA-C	5.02	113.61	106.53
1	B	75	SER	N-CA-C	5.02	117.31	108.82

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	1384	0	1361	46	0
1	B	1403	0	1380	40	0
2	A	54	0	0	0	0
2	B	58	0	0	1	0
All	All	2899	0	2741	82	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 15.

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:63:GLU:O	1:A:67:GLU:HG2	1.75	0.87
1:A:46:PHE:H	1:A:88:ASN:HD21	1.20	0.87
1:A:152:ASN:HD22	1:A:152:ASN:H	1.22	0.83
1:B:50:LEU:O	1:B:53:SER:HB2	1.81	0.80
1:B:152:ASN:HD21	1:B:162:LYS:H	1.27	0.79
1:A:49:ASP:OD1	1:B:50:LEU:HD22	1.89	0.73
1:A:29:ILE:HD11	1:A:35:VAL:HG23	1.72	0.72
1:B:97:LEU:HD11	1:B:107:VAL:HG13	1.72	0.70
1:A:21:LEU:HD22	1:A:118:VAL:HG23	1.75	0.68
1:B:63:GLU:O	1:B:67:GLU:HG2	1.94	0.67
1:A:29:ILE:HA	1:A:32:ARG:HH21	1.60	0.66
1:B:43:VAL:HG23	1:B:57:GLU:HG2	1.76	0.66
1:B:55:HIS:CD2	1:B:57:GLU:H	2.14	0.65
1:B:152:ASN:ND2	1:B:162:LYS:H	1.93	0.65
1:A:112:ILE:HD12	1:A:182:ILE:HG12	1.79	0.65
1:A:62:ARG:HG3	1:A:107:VAL:HG11	1.81	0.63
1:B:97:LEU:HD11	1:B:107:VAL:CG1	2.29	0.62
1:A:152:ASN:HD22	1:A:152:ASN:N	1.97	0.61
1:A:178:LEU:O	1:A:182:ILE:HG13	2.00	0.61
1:B:3:LYS:HZ2	1:B:183:GLU:HG3	1.68	0.58
1:A:79:ASN:O	1:A:80:TYR:HB2	2.03	0.58
1:B:164:SER:OG	1:B:166:GLU:HG2	2.04	0.57
1:A:152:ASN:H	1:A:152:ASN:ND2	1.98	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:182:ILE:O	1:A:182:ILE:HG22	2.03	0.57
1:B:111:LYS:HB2	1:B:140:MSE:HE3	1.88	0.56
1:B:70:ALA:CB	1:B:182:ILE:HD11	2.36	0.56
1:A:28:ILE:HD12	1:A:172:SER:HA	1.88	0.55
1:A:153:SER:HA	1:A:156:TRP:CD1	2.42	0.55
1:A:46:PHE:CE2	1:B:102:PRO:HG3	2.43	0.54
1:B:152:ASN:ND2	1:B:152:ASN:H	2.05	0.54
1:A:21:LEU:HD22	1:A:118:VAL:CG2	2.38	0.53
1:A:166:GLU:HG3	1:A:167:LYS:N	2.23	0.53
1:A:29:ILE:HD12	1:A:33:ALA:HB3	1.90	0.53
1:B:24:LYS:O	1:B:28:ILE:HG13	2.09	0.52
1:A:87:LYS:HE2	1:B:103:THR:HG21	1.90	0.52
1:B:70:ALA:HB3	1:B:182:ILE:HD11	1.91	0.52
1:A:115:VAL:H	1:A:146:LEU:HD22	1.75	0.52
1:A:49:ASP:CG	1:B:50:LEU:HD22	2.35	0.52
1:A:29:ILE:HG13	1:A:30:GLY:N	2.21	0.51
1:B:166:GLU:CG	1:B:167:LYS:N	2.74	0.51
1:A:97:LEU:HD21	1:A:107:VAL:HG13	1.92	0.51
1:B:135:LEU:HB2	1:B:136:PRO:HD3	1.93	0.50
1:A:43:VAL:HG13	1:A:44:PRO:HD2	1.92	0.50
1:B:128:PHE:O	1:B:132:ARG:HG3	2.12	0.48
1:A:43:VAL:HA	1:A:57:GLU:HG3	1.96	0.48
1:A:118:VAL:HG22	1:A:149:VAL:HB	1.96	0.47
1:B:101:ASP:OD1	1:B:103:THR:HG22	2.14	0.47
1:A:108:LEU:HD13	1:A:138:ILE:HD12	1.97	0.47
1:A:132:ARG:O	1:A:136:PRO:HG2	2.16	0.46
1:B:3:LYS:NZ	1:B:183:GLU:HG3	2.29	0.46
1:A:32:ARG:NH1	1:A:176:ASP:OD1	2.48	0.46
1:B:111:LYS:HB2	1:B:140:MSE:CE	2.46	0.46
1:A:19:ARG:HG2	1:A:23:LYS:HE2	1.99	0.45
1:B:42:ARG:HB2	1:B:57:GLU:CD	2.41	0.45
1:B:154:GLU:H	1:B:154:GLU:CD	2.21	0.44
1:A:118:VAL:O	1:A:118:VAL:HG12	2.17	0.44
1:B:152:ASN:H	1:B:152:ASN:HD22	1.64	0.44
1:A:65:VAL:HG13	1:A:71:ILE:HD11	2.00	0.43
1:B:51:GLU:C	1:B:53:SER:N	2.77	0.43
1:B:155:ALA:O	1:B:159:GLY:HA2	2.19	0.43
1:B:43:VAL:CG2	1:B:57:GLU:HG2	2.46	0.42
1:B:96:SER:HB2	1:B:104:GLY:O	2.18	0.42
1:A:113:VAL:HG13	1:A:142:LEU:HD23	2.00	0.42
1:B:178:LEU:O	1:B:182:ILE:HG13	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:74:PHE:HA	1:A:116:SER:O	2.19	0.42
1:A:38:LEU:HD22	1:A:39:SER:N	2.35	0.42
1:B:55:HIS:CD2	1:B:57:GLU:N	2.85	0.42
1:A:152:ASN:N	1:A:152:ASN:ND2	2.61	0.42
1:A:16:SER:O	1:A:20:GLN:HG3	2.20	0.41
1:A:57:GLU:H	1:A:57:GLU:CD	2.27	0.41
1:B:118:VAL:HA	1:B:149:VAL:O	2.20	0.41
1:A:121:GLY:O	1:A:122:ALA:C	2.63	0.41
1:B:55:HIS:HD2	1:B:57:GLU:N	2.19	0.41
1:A:118:VAL:HA	1:A:149:VAL:O	2.20	0.41
1:B:82:ILE:HG13	1:B:130:ASP:HB3	2.02	0.41
1:B:166:GLU:HB3	2:B:241:HOH:O	2.19	0.41
1:A:53:SER:HB2	1:A:55:HIS:CE1	2.56	0.41
1:A:111:LYS:HA	1:A:111:LYS:HD2	1.84	0.40
1:A:135:LEU:HB2	1:A:136:PRO:HD3	2.03	0.40
1:B:50:LEU:HD23	1:B:51:GLU:N	2.36	0.40
1:B:154:GLU:OE1	1:B:154:GLU:N	2.33	0.40
1:A:135:LEU:N	1:A:136:PRO:CD	2.84	0.40

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	175/192 (91%)	168 (96%)	7 (4%)	0	100	100
1	B	180/192 (94%)	167 (93%)	13 (7%)	0	100	100
All	All	355/384 (92%)	335 (94%)	20 (6%)	0	100	100

There are no Ramachandran outliers to report.

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	150/165 (91%)	136 (91%)	14 (9%)	8	11
1	B	152/165 (92%)	138 (91%)	14 (9%)	8	11
All	All	302/330 (92%)	274 (91%)	28 (9%)	8	11

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	23	LYS
1	A	36	SER
1	A	38	LEU
1	A	42	ARG
1	A	47	ASN
1	A	57	GLU
1	A	67	GLU
1	A	77	VAL
1	A	112	ILE
1	A	130	ASP
1	A	133	SER
1	A	142	LEU
1	A	152	ASN
1	A	157	SER
1	B	50	LEU
1	B	53	SER
1	B	54	VAL
1	B	57	GLU
1	B	63	GLU
1	B	75	SER
1	B	77	VAL
1	B	89	LEU
1	B	97	LEU
1	B	103	THR
1	B	130	ASP
1	B	153	SER
1	B	170	GLU

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Mol	Chain	Res	Type
1	B	184	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	34	GLN
1	A	55	HIS
1	A	88	ASN
1	A	152	ASN
1	B	55	HIS
1	B	145	GLN
1	B	152	ASN
1	B	174	GLN

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	178/192 (92%)	-1.28	0 100 100	26, 45, 59, 77	0
1	B	181/192 (94%)	-1.42	0 100 100	20, 34, 53, 69	0
All	All	359/384 (93%)	-1.35	0 100 100	20, 39, 58, 77	0

There are no RSRZ outliers to report.

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.