



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 04:55 AM UTC

PDB ID : 5WQL / pdb_00005wql
Title : Structure of a PDZ-protease bound to a substrate-binding adaptor
Authors : Su, M.Y.; Chang, C.I.
Deposited on : 2016-11-27
Resolution : 2.30 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

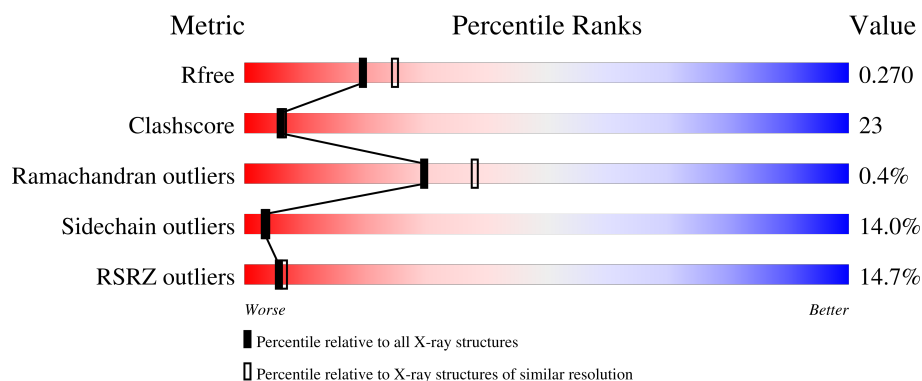
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 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	278	38% 53% 6% •
1	B	278	36% 55% 5% •
2	C	682	20% 52% 31% 11% 5%
2	D	682	17% 47% 33% 13% • 5%
3	F	6	67% 67% 17% 17%

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Mol	Chain	Length	Quality of chain
3	H	6	 67% 33%
4	E	4	 75% 25%
5	G	4	 25% 50% 50%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 15704 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 Lipoprotein NlpI.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	268	Total	C	N	O	S	0	0	0
			2176	1387	362	424	3			
1	A	270	Total	C	N	O	S	0	0	0
			2190	1395	364	427	4			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	17	GLY	-	expression tag	UNP P0AFB1
B	18	HIS	-	expression tag	UNP P0AFB1
B	19	MET	-	expression tag	UNP P0AFB1
A	17	GLY	-	expression tag	UNP P0AFB1
A	18	HIS	-	expression tag	UNP P0AFB1
A	19	MET	-	expression tag	UNP P0AFB1

- Molecule 2 is a protein called Tail-specific protease.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	648	Total	C	N	O	S	0	0	0
			5140	3233	897	998	12			
2	D	647	Total	C	N	O	S	0	0	0
			5139	3233	899	995	12			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	477	ALA	LYS	engineered mutation	UNP P23865
D	477	ALA	LYS	engineered mutation	UNP P23865

- Molecule 3 is a protein called ALA-ALA-ALA-ALA-ALA-ALA.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	F	6	Total	C	N	O	0	0	0
			30	18	6	6			
3	H	6	Total	C	N	O	0	0	0
			30	18	6	6			

- Molecule 4 is a protein called ALA-ALA-ALA-ALA.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	E	4	Total	C	N	O	0	0	0
			21	12	4	5			

- Molecule 5 is a protein called LEU-SER-ARG-SER.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	G	4	Total	C	N	O	0	0	0
			32	18	7	7			

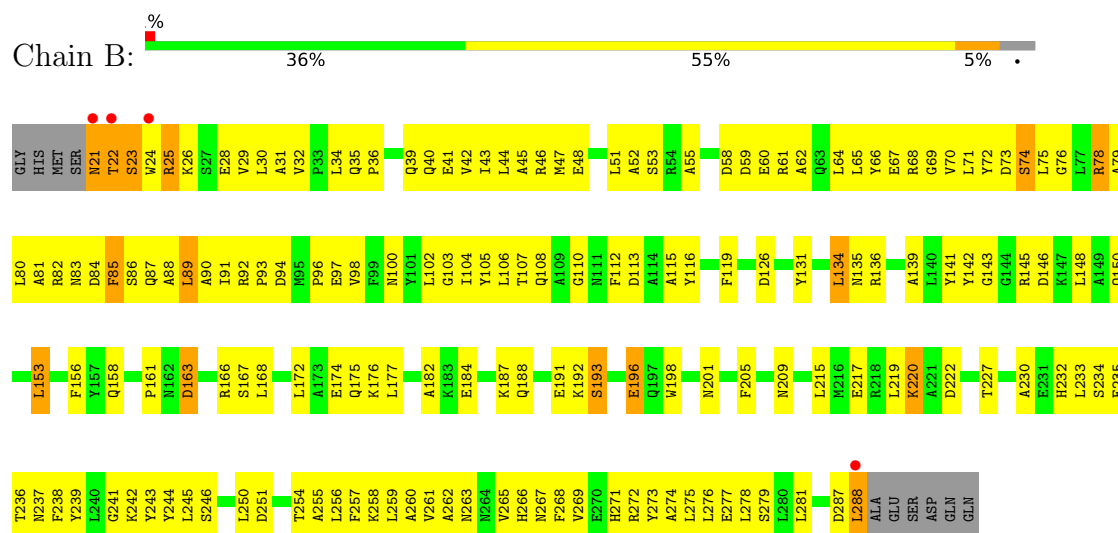
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	251	Total	O	0	0
			251	251		
6	A	250	Total	O	0	0
			250	250		
6	C	203	Total	O	0	0
			203	203		
6	D	241	Total	O	0	0
			241	241		
6	F	1	Total	O	0	0
			1	1		

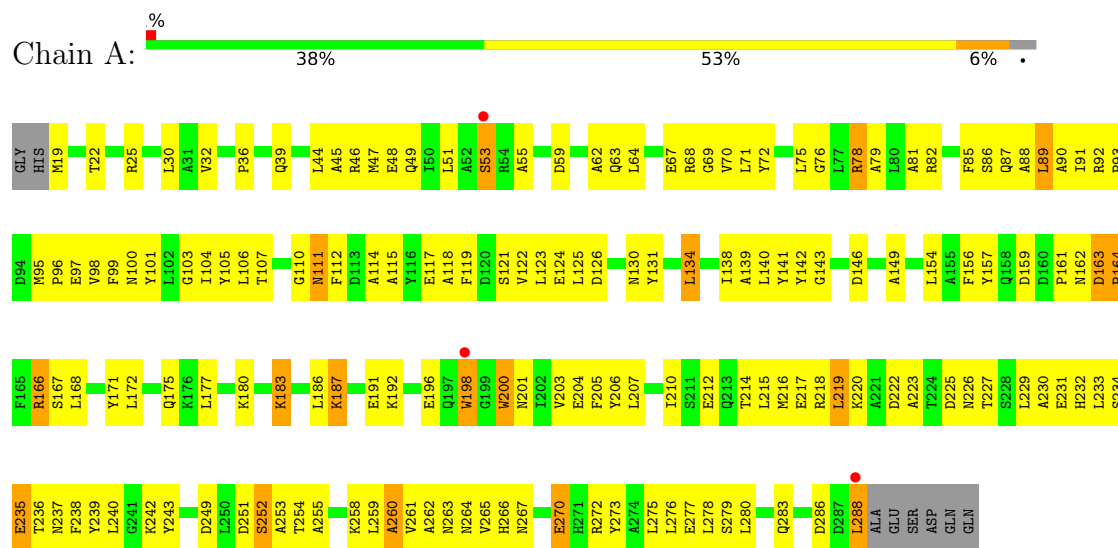
3 Residue-property plots

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: Lipoprotein NlpI

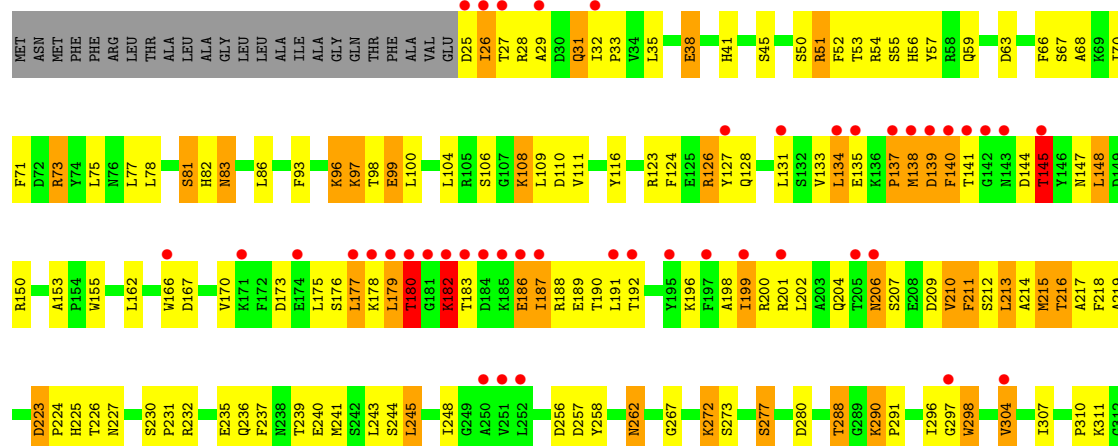


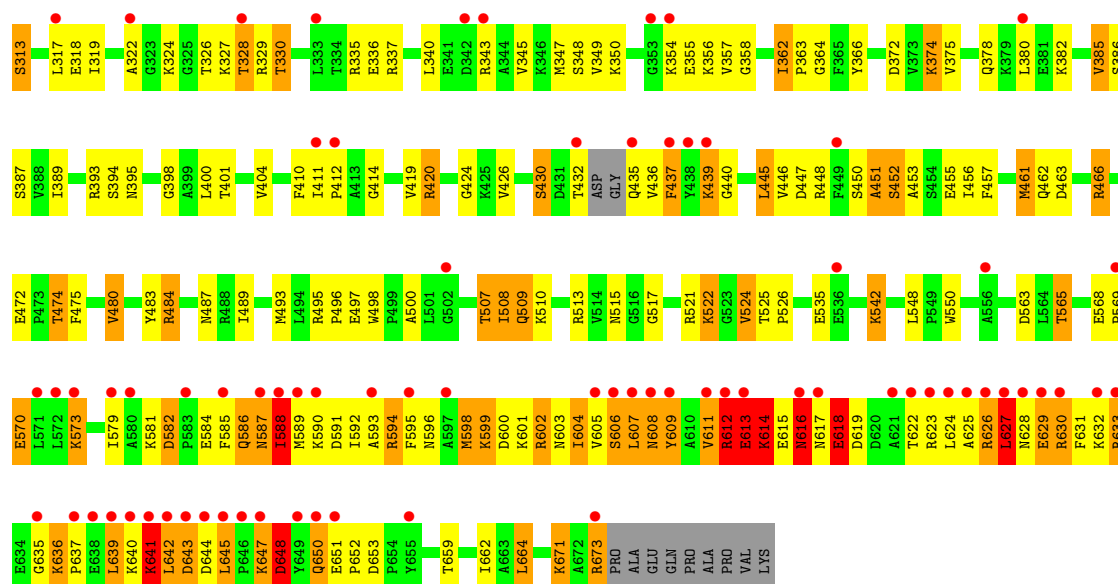
• Molecule 1: Lipoprotein NlpI



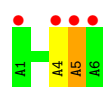
• Molecule 2: Tail-specific protease



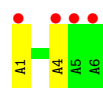




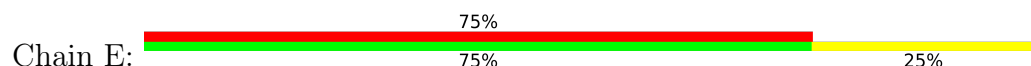
• Molecule 3: ALA-ALA-ALA-ALA-ALA-ALA



• Molecule 3: ALA-ALA-ALA-ALA-ALA-ALA



• Molecule 4: ALA-ALA-ALA-ALA



• Molecule 5: LEU-SER-ARG-SER



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	120.59Å 146.73Å 148.43Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	104.35 – 2.30 104.35 – 2.30	Depositor EDS
% Data completeness (in resolution range)	90.3 (104.35-2.30) 90.3 (104.35-2.30)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.17 (at 2.31Å)	Xtriage
Refinement program	REFMAC 5.8.0155	Depositor
R, R_{free}	0.217 , 0.271 0.220 , 0.270	Depositor DCC
R_{free} test set	5472 reflections (4.66%)	wwPDB-VP
Wilson B-factor (Å ²)	28.8	Xtriage
Anisotropy	0.157	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 48.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.000 for -h,l,k	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	15704	wwPDB-VP
Average B, all atoms (Å ²)	44.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 23.96 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 4.2069e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹ Intensities estimated from amplitudes.

² Theoretical 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 [i](#)

5.1 Standard geometry [i](#)

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	2.30	137/2236 (6.1%)	1.26	14/3034 (0.5%)
1	B	2.25	134/2222 (6.0%)	1.22	7/3016 (0.2%)
2	C	1.67	43/5227 (0.8%)	1.18	34/7059 (0.5%)
2	D	1.69	46/5225 (0.9%)	1.33	65/7054 (0.9%)
3	F	1.85	0/29	1.64	1/39 (2.6%)
3	H	1.46	0/29	1.57	0/39
4	E	1.23	0/20	0.91	0/25
5	G	1.11	0/31	1.26	1/38 (2.6%)
All	All	1.87	360/15019 (2.4%)	1.25	122/20304 (0.6%)

The worst 5 of 360 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	92	ARG	C-O	-10.00	1.16	1.25
1	A	232	HIS	C-O	-8.54	1.14	1.24
1	A	260	ALA	C-O	-7.91	1.15	1.24
1	B	241	GLY	C-O	-7.71	1.14	1.23
1	B	267	ASN	C-O	-7.29	1.14	1.24

The worst 5 of 122 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	139	ASP	N-CA-C	13.76	126.30	111.03
2	D	140	PHE	N-CA-C	12.64	130.01	109.40
2	D	635	GLY	N-CA-C	11.38	126.38	112.73
1	B	196	GLU	N-CA-C	10.04	122.30	111.36
2	D	606	SER	N-CA-C	9.68	121.43	111.07

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	2190	0	2114	25	0
1	B	2176	0	2100	25	0
2	C	5140	0	5151	273	0
2	D	5139	0	5156	347	0
3	F	30	0	32	2	0
3	H	30	0	32	5	0
4	E	21	0	22	1	0
5	G	32	0	36	2	0
6	A	250	0	0	2	0
6	B	251	0	0	4	0
6	C	203	0	0	5	0
6	D	241	0	0	5	0
6	F	1	0	0	0	0
All	All	15704	0	14643	669	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 23.

The worst 5 of 669 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)
2:D:640:LYS:HG3	2:D:643:ASP:CB	1.34	1.56
2:D:640:LYS:CG	2:D:643:ASP:HB2	1.29	1.53
2:D:393:ARG:HH11	2:D:445:LEU:CD1	1.55	1.19
2:D:175:LEU:CD2	2:D:179:LEU:HD11	1.73	1.17
2:C:264:MET:HE2	2:C:271:ALA:HA	1.27	1.15

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	268/278 (96%)	264 (98%)	4 (2%)	0	100	100
1	B	266/278 (96%)	261 (98%)	3 (1%)	2 (1%)	16	20
2	C	646/682 (95%)	631 (98%)	11 (2%)	4 (1%)	21	27
2	D	643/682 (94%)	621 (97%)	21 (3%)	1 (0%)	43	55
3	F	4/6 (67%)	3 (75%)	1 (25%)	0	100	100
3	H	4/6 (67%)	3 (75%)	1 (25%)	0	100	100
4	E	2/4 (50%)	2 (100%)	0	0	100	100
5	G	2/4 (50%)	2 (100%)	0	0	100	100
All	All	1835/1940 (95%)	1787 (97%)	41 (2%)	7 (0%)	30	38

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	C	82	HIS
2	C	257	ASP
1	B	25	ARG
2	D	613	GLU
1	B	287	ASP

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	231/237 (98%)	222 (96%)	9 (4%)	28	43
1	B	229/237 (97%)	215 (94%)	14 (6%)	17	24
2	C	558/583 (96%)	474 (85%)	84 (15%)	3	3
2	D	558/583 (96%)	447 (80%)	111 (20%)	1	1
5	G	4/4 (100%)	1 (25%)	3 (75%)	0	0

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	1580/1644 (96%)	1359 (86%)	221 (14%)	3 3

5 of 221 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	D	99	GLU
2	D	277	SER
5	G	3	ARG
2	D	615	GLU
2	D	123	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 16 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	586	GLN
2	D	435	GLN
1	A	197	GLN
2	D	59	GLN
1	A	135	ASN

5.3.3 RNA ⓘ

There are no RNA molecules 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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

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	270/278 (97%)	-0.17	3 (1%) 78 79	10, 20, 41, 90	0
1	B	268/278 (96%)	-0.07	4 (1%) 72 73	11, 21, 47, 113	0
2	C	648/682 (95%)	1.06	135 (20%) 2 3	18, 52, 96, 132	0
2	D	647/682 (94%)	1.04	118 (18%) 3 4	19, 45, 92, 117	0
3	F	6/6 (100%)	2.50	4 (66%) 0 0	35, 40, 59, 64	0
3	H	6/6 (100%)	3.05	4 (66%) 0 0	38, 42, 61, 70	0
4	E	4/4 (100%)	2.70	3 (75%) 0 0	38, 51, 59, 70	0
5	G	4/4 (100%)	1.43	1 (25%) 2 2	56, 64, 65, 69	0
All	All	1853/1940 (95%)	0.73	272 (14%) 6 6	10, 40, 91, 132	0

The worst 5 of 272 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	288	LEU	7.2
2	D	639	LEU	7.0
3	H	6	ALA	6.8
2	C	303	VAL	6.7
2	C	275	ALA	6.2

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 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.