



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 1, 2026 – 04:11 AM UTC

PDB ID : 1CHK / pdb_00001chk
Title : STREPTOMYCES N174 CHITOSANASE PH5.5 298K
Authors : Marcotte, E.M.; Robertus, J.D.
Deposited on : 1995-06-12
Resolution : 2.40 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

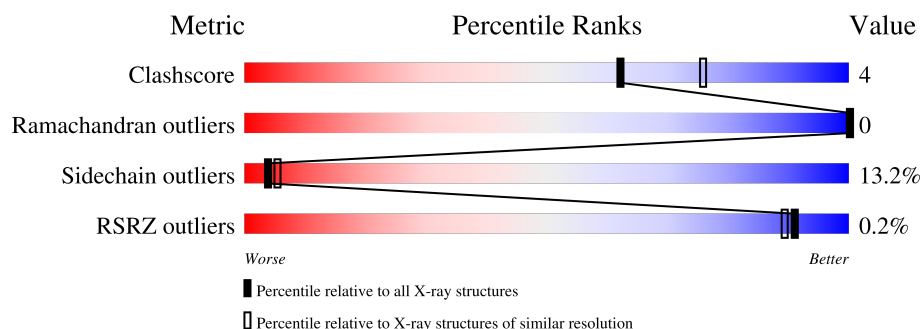
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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))
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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	238	
1	B	238	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3691 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 CHITOSANASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	238	Total	C	N	O	S	0	0	0
			1820	1141	313	360	6			
1	B	238	Total	C	N	O	S	0	0	0
			1820	1141	313	360	6			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	185	GLY	ALA	conflict	UNP P33665
B	185	GLY	ALA	conflict	UNP P33665

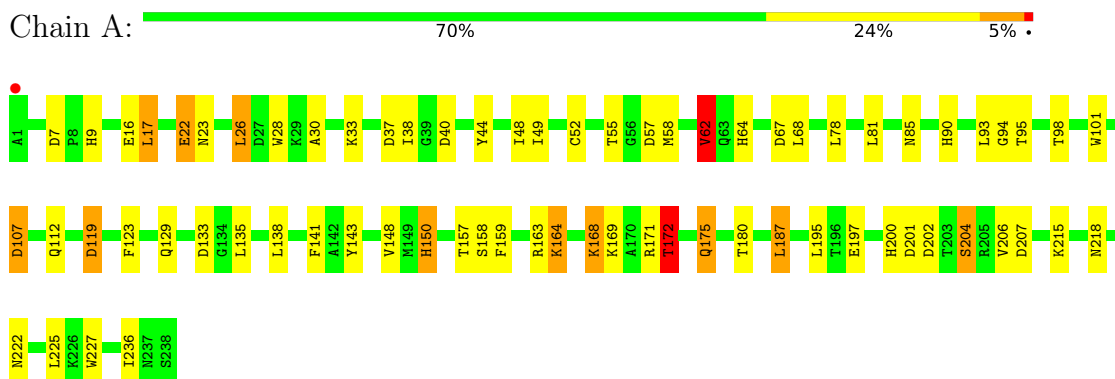
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	27	Total	O	0	0
			27	27		
2	B	24	Total	O	0	0
			24	24		

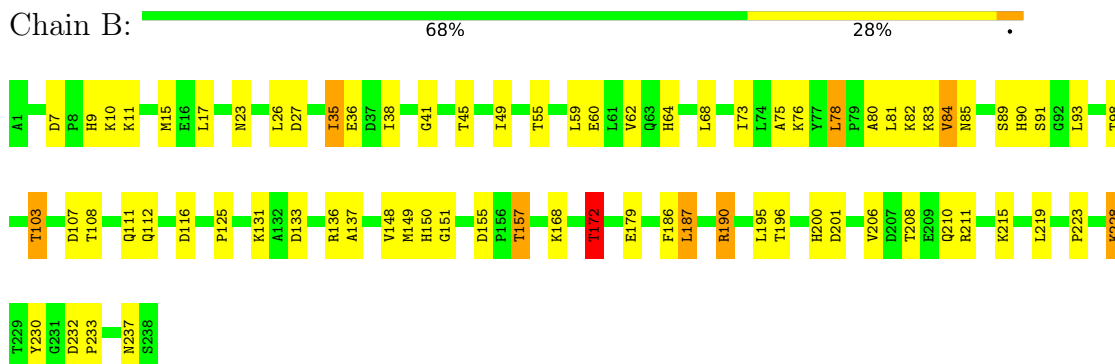
3 Residue-property plots

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: CHITOSANASE



• Molecule 1: CHITOSANASE



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	56.30Å 59.30Å 85.40Å 90.00° 96.20° 90.00°	Depositor
Resolution (Å)	5.00 – 2.40 5.00 – 2.40	Depositor EDS
% Data completeness (in resolution range)	98.7 (5.00-2.40) 87.3 (5.00-2.40)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.72 (at 2.41Å)	Xtriage
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.181 , 0.175 0.175 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	18.8	Xtriage
Anisotropy	0.446	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.52 , 92.3	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	0.94	EDS
Total number of atoms	3691	wwPDB-VP
Average B, all atoms (Å ²)	18.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.01% 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	1.07	6/1860 (0.3%)	1.85	46/2517 (1.8%)
1	B	1.10	8/1860 (0.4%)	1.88	43/2517 (1.7%)
All	All	1.08	14/3720 (0.4%)	1.86	89/5034 (1.8%)

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	B	0	1

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	90	HIS	CD2-NE2	-7.20	1.29	1.37
1	A	9	HIS	CD2-NE2	-6.79	1.30	1.37
1	A	62	VAL	CA-CB	6.66	1.62	1.54
1	A	200	HIS	CD2-NE2	-6.55	1.30	1.37
1	B	200	HIS	CD2-NE2	-6.45	1.30	1.37
1	B	9	HIS	CD2-NE2	-6.39	1.30	1.37
1	B	64	HIS	CD2-NE2	-6.28	1.30	1.37
1	B	107	ASP	N-CA	-6.00	1.39	1.46
1	A	150	HIS	CD2-NE2	-5.76	1.31	1.37
1	B	90	HIS	CD2-NE2	-5.62	1.31	1.37
1	A	64	HIS	CD2-NE2	-5.50	1.31	1.37
1	B	150	HIS	CD2-NE2	-5.50	1.31	1.37
1	B	103	THR	CA-CB	5.37	1.62	1.53
1	B	107	ASP	CA-CB	5.37	1.59	1.53

All (89) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	215	LYS	CB-CG-CD	-8.40	91.97	111.30
1	B	172	THR	N-CA-CB	-8.40	97.35	110.03
1	A	172	THR	N-CA-CB	-8.25	97.58	110.03
1	A	112	GLN	OE1-CD-NE2	-8.18	114.42	122.60
1	B	201	ASP	N-CA-C	8.12	121.15	111.33
1	B	107	ASP	N-CA-CB	-7.95	97.23	109.94
1	B	155	ASP	N-CA-C	-7.84	100.20	109.93
1	B	107	ASP	CB-CA-C	7.83	123.84	110.77
1	B	200	HIS	CB-CG-CD2	-7.57	121.36	131.20
1	A	200	HIS	CB-CG-CD2	-7.47	121.49	131.20
1	B	112	GLN	OE1-CD-NE2	-7.45	115.16	122.60
1	A	200	HIS	N-CA-C	7.44	120.46	110.35
1	B	136	ARG	CA-CB-CG	-7.43	99.24	114.10
1	A	202	ASP	CA-CB-CG	7.38	119.98	112.60
1	A	207	ASP	N-CA-C	7.32	119.26	111.28
1	B	237	ASN	CA-CB-CG	-6.95	105.65	112.60
1	A	222	ASN	OD1-CG-ND2	-6.76	115.84	122.60
1	A	57	ASP	CA-CB-CG	6.74	119.34	112.60
1	B	60	GLU	CA-CB-CG	6.68	127.46	114.10
1	B	210	GLN	OE1-CD-NE2	-6.68	115.92	122.60
1	A	200	HIS	CA-C-O	6.61	128.56	121.55
1	A	171	ARG	CA-C-O	6.57	128.48	120.92
1	B	186	PHE	CA-CB-CG	-6.49	107.31	113.80
1	A	37	ASP	N-CA-C	-6.47	98.00	108.41
1	B	172	THR	CB-CA-C	6.38	119.92	109.46
1	A	107	ASP	CA-CB-CG	6.38	118.97	112.60
1	B	64	HIS	CB-CG-CD2	-6.33	122.97	131.20
1	B	179	GLU	CA-C-O	-6.32	114.19	120.82
1	B	111	GLN	OE1-CD-NE2	-6.31	116.29	122.60
1	A	7	ASP	CA-CB-CG	6.29	118.89	112.60
1	A	119	ASP	N-CA-C	6.29	117.80	111.07
1	A	85	ASN	OD1-CG-ND2	-6.29	116.31	122.60
1	B	27	ASP	CA-CB-CG	6.24	118.84	112.60
1	A	55	THR	N-CA-C	6.18	120.08	112.54
1	A	204	SER	CA-C-O	-6.17	113.96	120.63
1	B	150	HIS	CB-CG-CD2	-5.98	123.43	131.20
1	A	172	THR	CB-CA-C	5.96	119.23	109.46
1	A	9	HIS	CB-CG-CD2	-5.92	123.51	131.20
1	A	112	GLN	CG-CD-NE2	5.87	125.21	116.40
1	B	157	THR	N-CA-C	5.83	120.55	113.38
1	B	200	HIS	CB-CG-ND1	5.80	131.41	122.70
1	B	223	PRO	O-C-N	-5.80	118.64	121.31
1	A	200	HIS	CB-CG-ND1	5.79	131.38	122.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	23	ASN	CA-CB-CG	5.74	118.34	112.60
1	A	129	GLN	OE1-CD-NE2	-5.73	116.87	122.60
1	B	91	SER	N-CA-C	5.68	118.82	110.30
1	A	163	ARG	N-CA-C	-5.68	105.17	111.36
1	A	201	ASP	CA-CB-CG	5.65	118.25	112.60
1	B	151	GLY	CA-C-N	5.63	125.94	119.92
1	B	151	GLY	C-N-CA	5.63	125.94	119.92
1	A	48	ILE	N-CA-C	5.60	118.09	111.09
1	A	98	THR	N-CA-CB	-5.59	101.62	110.28
1	B	38	ILE	O-C-N	-5.57	115.31	122.17
1	B	223	PRO	CA-C-O	-5.55	116.91	120.90
1	A	204	SER	CA-CB-OG	5.54	122.17	111.10
1	A	67	ASP	CA-CB-CG	5.53	118.13	112.60
1	B	73	ILE	O-C-N	-5.52	114.82	122.05
1	B	78	LEU	CA-C-O	-5.48	113.03	118.34
1	B	41	GLY	O-C-N	-5.45	115.60	122.41
1	A	175	GLN	OE1-CD-NE2	-5.42	117.18	122.60
1	B	83	LYS	CA-CB-CG	5.41	124.92	114.10
1	B	85	ASN	OD1-CG-ND2	-5.36	117.24	122.60
1	A	62	VAL	CG1-CB-CG2	5.34	122.56	110.80
1	A	175	GLN	CG-CD-NE2	5.34	124.42	116.40
1	A	101	TRP	N-CA-C	-5.33	105.37	111.07
1	B	75	ALA	N-CA-C	5.31	118.86	112.38
1	B	150	HIS	CA-CB-CG	-5.31	108.49	113.80
1	A	236	ILE	N-CA-C	-5.29	100.13	107.80
1	A	218	ASN	OD1-CG-ND2	-5.28	117.32	122.60
1	B	190	ARG	CG-CD-NE	-5.25	100.44	112.00
1	B	116	ASP	CA-CB-CG	5.25	117.85	112.60
1	A	64	HIS	CA-CB-CG	-5.24	108.56	113.80
1	A	40	ASP	CA-CB-CG	5.23	117.83	112.60
1	A	23	ASN	OD1-CG-ND2	-5.22	117.38	122.60
1	A	85	ASN	CB-CG-ND2	5.22	124.23	116.40
1	B	131	LYS	CA-CB-CG	-5.22	103.66	114.10
1	B	137	ALA	CA-C-O	-5.21	115.03	120.55
1	B	23	ASN	OD1-CG-ND2	-5.18	117.42	122.60
1	A	28	TRP	N-CA-C	5.18	117.67	111.71
1	A	22	GLU	CB-CG-CD	5.17	121.39	112.60
1	A	30	ALA	O-C-N	-5.16	115.33	122.46
1	B	9	HIS	CB-CG-CD2	-5.15	124.50	131.20
1	A	168	LYS	N-CA-C	-5.15	105.74	112.23
1	A	148	VAL	N-CA-C	-5.14	105.70	110.53
1	B	211	ARG	N-CA-C	-5.14	105.80	111.71

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	227	TRP	CE2-CD2-CG	-5.12	101.05	107.20
1	B	55	THR	N-CA-C	5.12	119.67	113.38
1	A	90	HIS	CB-CG-CD2	-5.08	124.59	131.20
1	B	45	THR	CA-CB-OG1	-5.06	102.01	109.60

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	230	TYR	Sidechain

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	1820	0	1757	17	0
1	B	1820	0	1757	13	0
2	A	27	0	0	1	0
2	B	24	0	0	0	0
All	All	3691	0	3514	29	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 4.

All (29) 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:B:35:ILE:HG12	1:B:98:THR:HG22	1.65	0.79
1:A:172:THR:HG21	2:A:802:HOH:O	1.96	0.65
1:B:187:LEU:HG	1:B:206:VAL:HG13	1.83	0.61
1:A:164:LYS:HD3	1:A:168:LYS:HE3	1.83	0.60
1:B:7:ASP:HB3	1:B:10:LYS:HB2	1.92	0.52
1:B:80:ALA:O	1:B:84:VAL:HB	2.10	0.51
1:A:58:MET:O	1:A:62:VAL:HG13	2.11	0.51
1:B:78:LEU:O	1:B:82:LYS:HG3	2.11	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:164:LYS:HZ3	1:A:168:LYS:HG3	1.76	0.50
1:A:44:TYR:OH	1:A:94:GLY:HA2	2.13	0.48
1:A:107:ASP:HA	1:B:108:THR:HG21	1.95	0.48
1:B:84:VAL:HG22	1:B:89:SER:HB3	1.94	0.48
1:A:44:TYR:O	1:A:52:CYS:HA	2.14	0.47
1:A:164:LYS:HA	1:A:164:LYS:HE2	1.96	0.47
1:A:164:LYS:NZ	1:A:168:LYS:HG3	2.29	0.47
1:A:150:HIS:HB3	1:A:157:THR:O	2.16	0.45
1:B:149:MET:O	1:B:149:MET:HG2	2.15	0.45
1:A:17:LEU:HB3	1:A:141:PHE:CZ	2.51	0.45
1:B:215:LYS:HA	1:B:215:LYS:HD3	1.77	0.44
1:A:187:LEU:HG	1:A:206:VAL:HG13	1.99	0.44
1:A:16:GLU:HB3	1:A:26:LEU:HG	2.00	0.44
1:A:133:ASP:O	1:A:172:THR:HG23	2.20	0.42
1:B:228:LYS:HA	1:B:232:ASP:O	2.19	0.42
1:B:11:LYS:O	1:B:15:MET:HG2	2.20	0.42
1:B:133:ASP:O	1:B:172:THR:HG23	2.20	0.42
1:A:172:THR:HG22	1:A:175:GLN:H	1.84	0.42
1:A:143:TYR:CD2	1:A:159:PHE:HZ	2.38	0.41
1:A:119:ASP:HA	1:A:123:PHE:HB3	2.02	0.41
1:B:232:ASP:HA	1:B:233:PRO:HD2	1.94	0.41

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	236/238 (99%)	227 (96%)	9 (4%)	0	100	100
1	B	236/238 (99%)	224 (95%)	12 (5%)	0	100	100
All	All	472/476 (99%)	451 (96%)	21 (4%)	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	186/186 (100%)	162 (87%)	24 (13%)	4	6
1	B	186/186 (100%)	161 (87%)	25 (13%)	4	5
All	All	372/372 (100%)	323 (87%)	49 (13%)	4	5

All (49) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	17	LEU
1	A	22	GLU
1	A	26	LEU
1	A	33	LYS
1	A	38	ILE
1	A	49	ILE
1	A	62	VAL
1	A	68	LEU
1	A	78	LEU
1	A	81	LEU
1	A	93	LEU
1	A	95	THR
1	A	135	LEU
1	A	138	LEU
1	A	158	SER
1	A	164	LYS
1	A	169	LYS
1	A	172	THR
1	A	180	THR
1	A	187	LEU
1	A	195	LEU
1	A	197	GLU
1	A	204	SER
1	A	225	LEU
1	B	17	LEU

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Mol	Chain	Res	Type
1	B	26	LEU
1	B	35	ILE
1	B	36	GLU
1	B	49	ILE
1	B	59	LEU
1	B	62	VAL
1	B	68	LEU
1	B	76	LYS
1	B	81	LEU
1	B	84	VAL
1	B	93	LEU
1	B	103	THR
1	B	125	PRO
1	B	148	VAL
1	B	157	THR
1	B	168	LYS
1	B	172	THR
1	B	187	LEU
1	B	190	ARG
1	B	195	LEU
1	B	196	THR
1	B	208	THR
1	B	219	LEU
1	B	228	LYS

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	23	ASN
1	A	150	HIS
1	A	210	GLN
1	A	237	ASN
1	B	31	GLN
1	B	63	GLN
1	B	115	ASN
1	B	200	HIS

5.3.3 RNA ⓘ

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	238/238 (100%)	-0.99	1 (0%) 88 86	5, 17, 35, 57	0
1	B	238/238 (100%)	-0.97	0 100 100	5, 17, 36, 65	0
All	All	476/476 (100%)	-0.98	1 (0%) 91 89	5, 17, 35, 65	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1	ALA	2.9

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.