



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:45 PM UTC

PDB ID : 2ZU7 / pdb_00002zu7
Title : Crystal structure of mannosyl-3-phosphoglycerate synthase from *Pyrococcus horikoshii*
Authors : Kawamura, T.; Watanabe, N.; Tanaka, I.
Deposited on : 2008-10-14
Resolution : 2.50 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

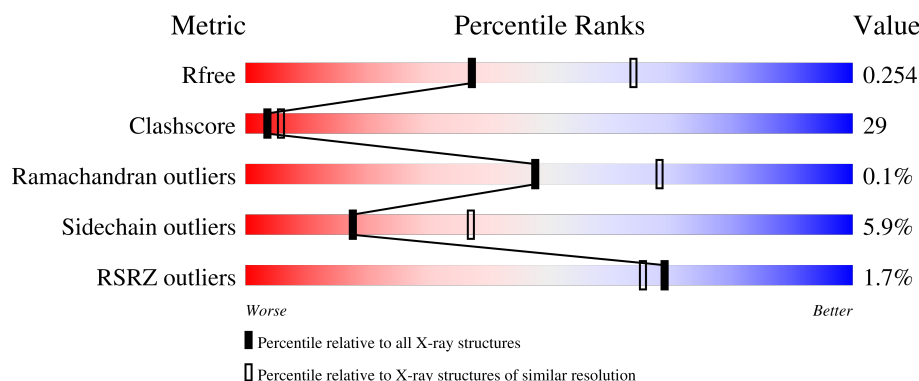
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (2.50-2.50)

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	394	
1	B	394	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5880 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 Mannosyl-3-phosphoglycerate synthase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	369	Total	C	N	O	S	Se	0	0	0
			2968	1915	490	547	1	15			
1	B	357	Total	C	N	O	S	Se	0	0	0
			2877	1861	471	529	1	15			

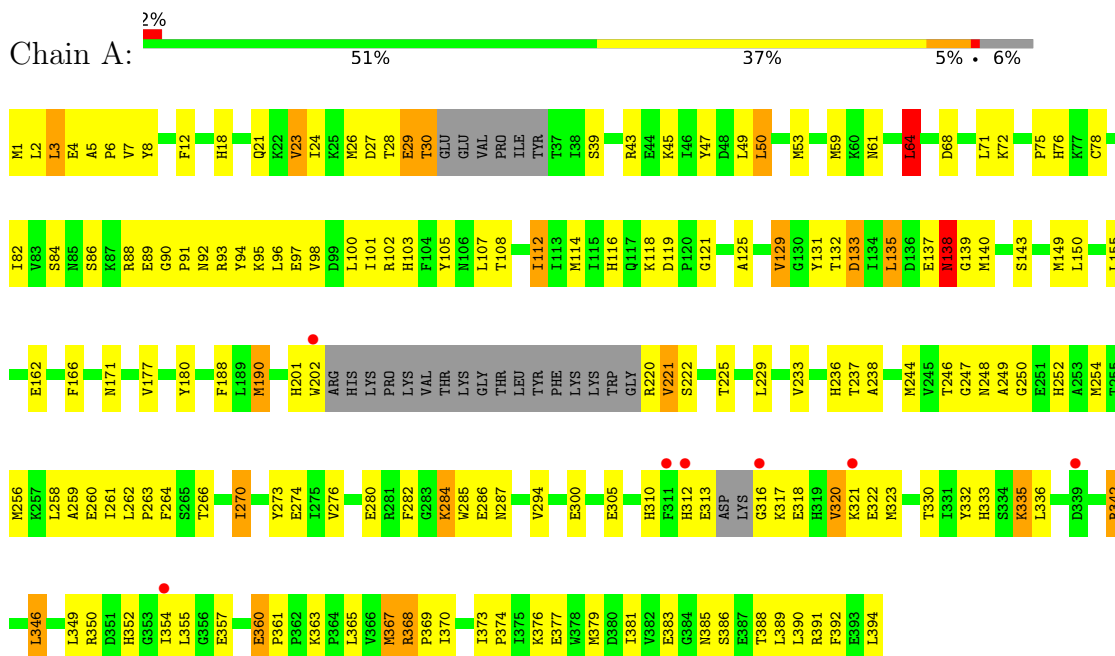
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	20	Total	O	0	0
			20	20		
2	B	15	Total	O	0	0
			15	15		

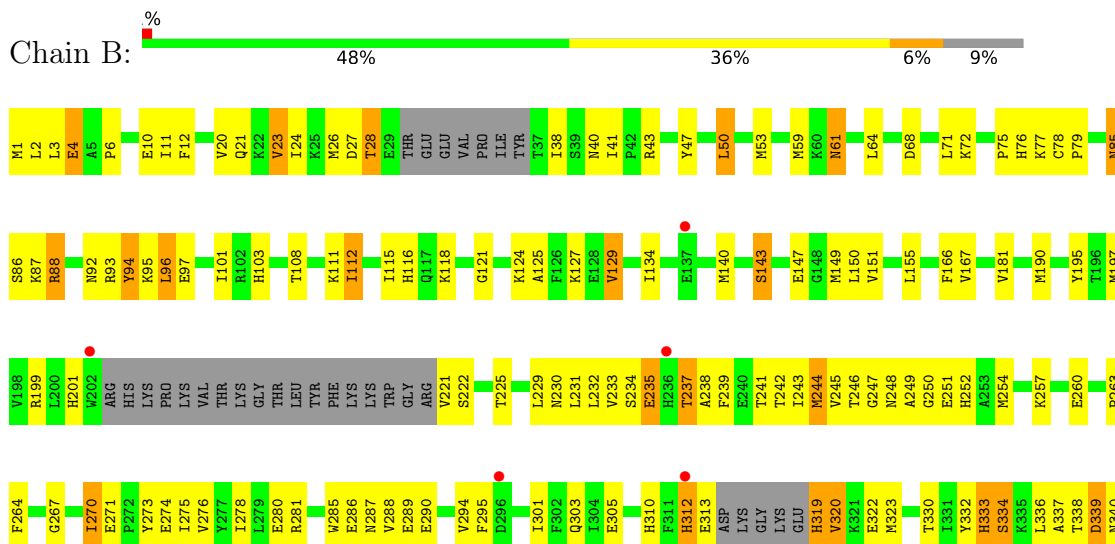
3 Residue-property plots

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: Mannosyl-3-phosphoglycerate synthase



- Molecule 1: Mannosyl-3-phosphoglycerate synthase



L341	R342	K343	R344	I345	L346	L349	R350	D351	HIS	GLY	ILE	LEU	GLY	GLU	ASN	E359	E360	P361	L365	V366	M367	I370	R371	E372	I373	P374	I375	K376	M379	D380	I381	V382	E383	G384	N385	T388	L389	L390	R391	F392	E393	L394
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4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	55.08Å 86.92Å 83.33Å 90.00° 101.78° 90.00°	Depositor
Resolution (Å)	29.93 – 2.50 29.93 – 2.50	Depositor EDS
% Data completeness (in resolution range)	94.4 (29.93-2.50) 94.4 (29.93-2.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	13.27 (at 2.51Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.210 , 0.256 0.211 , 0.254	Depositor DCC
R_{free} test set	1295 reflections (5.14%)	wwPDB-VP
Wilson B-factor (Å ²)	31.8	Xtriage
Anisotropy	1.296	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 34.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	5880	wwPDB-VP
Average B, all atoms (Å ²)	42.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.56% 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	0.65	1/3015 (0.0%)	1.20	24/4045 (0.6%)
1	B	0.69	5/2922 (0.2%)	1.21	22/3920 (0.6%)
All	All	0.67	6/5937 (0.1%)	1.21	46/7965 (0.6%)

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	320	VAL	N-CA	-8.16	1.38	1.46
1	B	320	VAL	CA-C	-8.06	1.42	1.52
1	B	320	VAL	C-O	-5.68	1.17	1.24
1	B	244	MSE	SE-CE	-5.18	1.79	1.95
1	A	190	MSE	SE-CE	-5.08	1.80	1.95
1	B	320	VAL	CA-CB	-5.02	1.48	1.54

All (46) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	320	VAL	N-CA-C	-24.71	88.51	113.47
1	A	322	GLU	N-CA-C	-15.53	94.46	113.41
1	B	237	THR	N-CA-C	-12.51	97.78	113.55
1	A	318	GLU	N-CA-C	-10.56	98.52	111.40
1	A	26	MSE	N-CA-C	9.59	121.68	111.03
1	A	363	LYS	CA-C-N	-9.11	111.38	120.31
1	A	363	LYS	C-N-CA	-9.11	111.38	120.31
1	A	94	TYR	N-CA-C	-8.98	101.57	111.36
1	B	26	MSE	N-CA-C	8.43	120.38	111.03
1	B	235	GLU	N-CA-C	7.30	121.10	112.93
1	B	382	VAL	N-CA-C	-7.14	103.89	110.82
1	B	320	VAL	CA-C-O	7.10	125.37	118.98
1	B	320	VAL	CA-C-N	-6.94	108.71	120.58
1	B	320	VAL	C-N-CA	-6.94	108.71	120.58
1	B	85	ASN	N-CA-C	-6.62	101.83	111.30
1	B	94	TYR	N-CA-C	-6.51	104.18	111.28

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	263	PRO	N-CA-C	-6.41	101.13	111.19
1	A	112	ILE	N-CA-C	6.37	116.75	108.35
1	A	29	GLU	N-CA-C	-6.36	104.48	112.93
1	A	23	VAL	N-CA-C	-6.31	100.56	108.89
1	B	23	VAL	N-CA-C	-6.19	100.72	108.89
1	A	367	MSE	N-CA-C	-6.08	100.99	110.42
1	A	360	GLU	CA-C-N	6.06	126.62	120.38
1	A	360	GLU	C-N-CA	6.06	126.62	120.38
1	B	263	PRO	N-CA-C	-6.03	101.72	111.19
1	A	342	ARG	N-CA-C	5.85	117.33	111.07
1	B	103	HIS	N-CA-C	-5.85	104.81	111.07
1	A	103	HIS	N-CA-C	-5.74	104.93	111.07
1	B	270	ILE	N-CA-C	5.68	116.13	110.23
1	A	4	GLU	N-CA-C	-5.57	102.03	110.28
1	B	333	HIS	N-CA-C	5.56	119.16	112.93
1	A	162	GLU	N-CA-C	-5.56	107.05	113.88
1	B	61	ASN	N-CA-C	5.52	119.31	112.24
1	A	270	ILE	N-CA-C	5.44	115.89	110.23
1	B	112	ILE	N-CA-C	5.40	115.48	108.35
1	A	259	ALA	CA-C-N	5.40	128.05	120.28
1	A	259	ALA	C-N-CA	5.40	128.05	120.28
1	B	78	CYS	N-CA-C	5.36	116.40	109.65
1	B	371	LYS	N-CA-C	5.35	117.11	111.28
1	A	64	LEU	N-CA-C	5.18	116.93	111.28
1	A	284	LYS	N-CA-C	5.17	116.27	108.46
1	B	4	GLU	N-CA-C	-5.14	102.67	110.28
1	B	121	GLY	N-CA-C	-5.11	109.05	114.67
1	A	121	GLY	N-CA-C	-5.09	108.65	115.32
1	A	61	ASN	N-CA-C	5.09	118.62	111.90
1	B	334	SER	N-CA-C	5.00	118.23	110.17

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	2968	0	3010	179	0
1	B	2877	0	2920	172	0
2	A	20	0	0	2	0
2	B	15	0	0	3	0
All	All	5880	0	5930	346	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 29.

All (346) 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:197:MSE:HE3	1:B:199:ARG:HD2	1.27	1.16
1:B:12:PHE:CE1	1:B:233:VAL:HG11	1.97	0.99
1:A:244:MSE:HE1	1:A:246:THR:C	1.88	0.99
1:B:244:MSE:HE1	1:B:246:THR:C	1.89	0.97
1:B:124:LYS:HE2	1:B:385:ASN:ND2	1.81	0.96
1:A:317:LYS:HA	1:A:320:VAL:HG12	1.49	0.94
1:A:64:LEU:HD23	1:A:100:LEU:HD22	1.48	0.94
1:A:349:LEU:HD23	1:A:355:LEU:HD22	1.50	0.93
1:B:245:VAL:H	1:B:303:GLN:HE22	1.12	0.92
1:A:244:MSE:CE	1:A:246:THR:H	1.81	0.91
1:B:332:TYR:CE1	1:B:342:ARG:HB3	2.07	0.90
1:A:244:MSE:HE3	1:A:246:THR:H	1.37	0.89
1:B:53:MSE:HE3	1:B:181:VAL:HG13	1.52	0.89
1:B:61:ASN:HD21	1:B:87:LYS:H	1.21	0.88
1:B:221:VAL:HG13	1:B:222:SER:H	1.36	0.88
1:A:6:PRO:HG3	1:A:190:MSE:HE2	1.54	0.87
1:A:116:HIS:HD2	1:A:118:LYS:H	1.23	0.86
1:A:332:TYR:CE1	1:A:342:ARG:HG3	2.10	0.86
1:A:317:LYS:HA	1:A:320:VAL:CG1	2.05	0.86
1:B:21:GLN:OE1	1:B:190:MSE:HE1	1.76	0.85
1:A:244:MSE:CE	1:A:247:GLY:N	2.39	0.85
1:A:116:HIS:CD2	1:A:118:LYS:H	1.95	0.85
1:B:379:MSE:HE3	1:B:383:GLU:HG3	1.58	0.84
1:A:76:HIS:HE1	1:A:108:THR:O	1.62	0.82
1:B:244:MSE:CE	1:B:247:GLY:N	2.42	0.82
1:A:6:PRO:HG3	1:A:190:MSE:CE	2.09	0.82
1:A:21:GLN:HE22	1:A:190:MSE:HE1	1.44	0.82
1:A:287:ASN:HB2	2:A:406:HOH:O	1.81	0.81
1:B:6:PRO:HD3	1:B:190:MSE:HE3	1.62	0.81
1:B:245:VAL:H	1:B:303:GLN:NE2	1.78	0.81

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:244:MSE:HE3	1:B:246:THR:H	1.48	0.79
1:B:125:ALA:HA	1:B:381:ILE:CD1	2.14	0.77
1:A:244:MSE:HE1	1:A:247:GLY:N	1.98	0.77
1:A:129:VAL:HG11	1:A:373:ILE:HG23	1.66	0.76
1:A:244:MSE:CE	1:A:246:THR:N	2.48	0.76
1:B:197:MSE:CE	1:B:199:ARG:HD2	2.11	0.76
1:B:116:HIS:CD2	1:B:118:LYS:H	2.04	0.75
1:A:244:MSE:HE3	1:A:246:THR:N	2.01	0.74
1:B:332:TYR:HE1	1:B:342:ARG:HB3	1.49	0.74
1:A:321:LYS:HB3	1:A:354:ILE:CD1	2.18	0.74
1:B:244:MSE:CE	1:B:246:THR:H	2.00	0.73
1:B:221:VAL:HG13	1:B:222:SER:N	2.03	0.73
1:A:93:ARG:HA	1:A:96:LEU:HD12	1.68	0.73
1:B:116:HIS:HD2	1:B:118:LYS:H	1.37	0.73
1:B:254:MSE:HE1	1:B:264:PHE:HZ	1.53	0.72
1:B:125:ALA:HA	1:B:381:ILE:HD11	1.70	0.72
1:A:12:PHE:CE1	1:A:233:VAL:HG11	2.23	0.72
1:A:222:SER:HA	1:A:248:ASN:HD22	1.56	0.71
1:B:76:HIS:HE1	1:B:108:THR:O	1.72	0.71
1:B:280:GLU:OE2	1:B:334:SER:HB2	1.89	0.71
1:A:332:TYR:CE1	1:A:346:LEU:HD13	2.26	0.70
1:B:334:SER:C	1:B:336:LEU:H	2.00	0.69
1:A:276:VAL:HG21	1:A:330:THR:HG22	1.75	0.69
1:A:285:TRP:H	1:A:285:TRP:CD1	2.11	0.69
1:B:244:MSE:HE3	1:B:246:THR:N	2.07	0.68
1:B:197:MSE:HE3	1:B:199:ARG:CD	2.16	0.68
1:A:379:MSE:O	1:A:383:GLU:HG3	1.93	0.67
1:B:61:ASN:HD22	1:B:93:ARG:HD3	1.59	0.67
1:B:244:MSE:HE1	1:B:247:GLY:N	2.09	0.67
1:B:53:MSE:CE	1:B:181:VAL:HG13	2.24	0.67
1:B:43:ARG:O	1:B:47:TYR:HD2	1.77	0.67
1:B:61:ASN:ND2	1:B:93:ARG:HD3	2.11	0.66
1:A:7:VAL:HG23	1:A:8:TYR:N	2.11	0.66
1:B:312:HIS:N	1:B:312:HIS:CD2	2.64	0.65
1:B:1:MSE:N	1:B:28:THR:HB	2.11	0.65
1:B:276:VAL:HG21	1:B:330:THR:HG22	1.77	0.65
1:B:365:LEU:C	1:B:365:LEU:HD23	2.21	0.65
1:B:197:MSE:HE2	1:B:301:ILE:HG12	1.78	0.65
1:A:321:LYS:HB3	1:A:354:ILE:HD13	1.78	0.64
1:B:124:LYS:HE2	1:B:385:ASN:HD21	1.63	0.64
1:B:43:ARG:HG3	1:B:47:TYR:CE2	2.32	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:7:VAL:HG23	1:A:8:TYR:H	1.62	0.64
1:A:171:ASN:HA	1:A:312:HIS:CD2	2.32	0.64
1:A:2:LEU:C	1:A:3:LEU:HD22	2.23	0.63
1:A:391:ARG:HH21	1:A:394:LEU:C	2.06	0.63
1:B:6:PRO:HD3	1:B:190:MSE:CE	2.28	0.63
1:B:1:MSE:H1	1:B:28:THR:HB	1.64	0.62
1:B:61:ASN:ND2	1:B:87:LYS:H	1.96	0.62
1:A:244:MSE:HE2	1:A:247:GLY:N	2.13	0.62
1:B:235:GLU:OE1	1:B:338:THR:OG1	2.17	0.62
1:B:225:THR:CB	1:B:248:ASN:HD21	2.13	0.61
1:A:18:HIS:HE1	1:A:300:GLU:OE1	1.83	0.61
1:A:59:MSE:HE2	1:A:114:MSE:HE1	1.81	0.61
1:A:222:SER:HA	1:A:248:ASN:ND2	2.15	0.61
1:B:285:TRP:C	1:B:286:GLU:HG3	2.24	0.61
1:A:43:ARG:O	1:A:47:TYR:HD2	1.84	0.61
1:B:244:MSE:CE	1:B:246:THR:C	2.66	0.61
1:A:84:SER:HB2	1:A:114:MSE:HE2	1.81	0.61
1:B:115:ILE:HD12	1:B:389:LEU:HD13	1.82	0.61
1:B:273:TYR:HA	1:B:330:THR:HG21	1.83	0.61
1:A:84:SER:HB2	1:A:114:MSE:CE	2.30	0.61
1:B:68:ASP:OD2	1:B:72:LYS:HE3	2.01	0.61
1:A:389:LEU:HD13	1:A:389:LEU:C	2.25	0.61
1:B:53:MSE:O	1:B:79:PRO:HD2	2.00	0.60
1:B:244:MSE:CE	1:B:246:THR:N	2.64	0.60
1:A:244:MSE:HE1	1:A:246:THR:CA	2.32	0.59
1:B:232:LEU:HA	1:B:341:LEU:CD2	2.31	0.59
1:B:3:LEU:HD23	1:B:23:VAL:HA	1.85	0.59
1:B:43:ARG:HG3	1:B:47:TYR:HE2	1.67	0.59
1:B:86:SER:O	1:B:116:HIS:HE1	1.85	0.59
1:A:244:MSE:HE1	1:A:246:THR:H	1.63	0.59
1:A:90:GLY:N	1:A:91:PRO:HA	2.16	0.59
1:B:12:PHE:HE1	1:B:233:VAL:HG11	1.63	0.59
1:A:244:MSE:HE1	1:A:246:THR:N	2.16	0.58
1:A:97:GLU:O	1:A:101:ILE:HG12	2.03	0.58
1:B:260:GLU:O	1:B:371:LYS:HB2	2.03	0.58
1:A:237:THR:O	1:A:238:ALA:HB3	2.03	0.58
1:B:12:PHE:CE1	1:B:233:VAL:CG1	2.82	0.58
1:B:85:ASN:HD21	1:B:143:SER:HB3	1.68	0.58
1:A:53:MSE:HE2	1:A:188:PHE:HE2	1.68	0.58
1:A:21:GLN:NE2	1:A:190:MSE:HE1	2.18	0.57
1:A:86:SER:O	1:A:116:HIS:HE1	1.87	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:59:MSE:HE2	1:A:114:MSE:CE	2.35	0.56
1:B:237:THR:O	1:B:238:ALA:HB3	2.05	0.56
1:A:6:PRO:CG	1:A:190:MSE:CE	2.83	0.56
1:A:105:TYR:CD1	1:A:392:PHE:HB3	2.40	0.56
1:A:149:MSE:HG2	1:A:166:PHE:CE1	2.41	0.56
1:A:320:VAL:HG22	1:A:321:LYS:HG2	1.88	0.56
1:A:105:TYR:CE1	1:A:392:PHE:HB3	2.40	0.56
1:A:270:ILE:O	1:A:274:GLU:HG3	2.05	0.56
1:A:6:PRO:CG	1:A:190:MSE:HE2	2.32	0.56
1:B:221:VAL:CG1	1:B:222:SER:H	2.13	0.56
1:B:93:ARG:O	1:B:97:GLU:HG3	2.04	0.56
1:A:252:HIS:HE1	1:A:274:GLU:OE2	1.87	0.56
1:A:349:LEU:HG	1:A:355:LEU:HB2	1.87	0.56
1:B:231:LEU:HD12	1:B:234:SER:OG	2.06	0.56
1:B:339:ASP:O	1:B:343:LYS:HG3	2.05	0.56
1:A:53:MSE:HE2	1:A:188:PHE:CE2	2.40	0.55
1:A:98:VAL:O	1:A:102:ARG:HG3	2.05	0.55
1:B:245:VAL:N	1:B:303:GLN:HE22	1.94	0.55
1:B:254:MSE:HE1	1:B:264:PHE:CZ	2.37	0.55
1:B:345:ILE:HG22	1:B:349:LEU:HD22	1.89	0.55
1:B:285:TRP:C	1:B:286:GLU:CG	2.79	0.55
1:B:312:HIS:O	1:B:313:GLU:HG3	2.07	0.55
1:A:137:GLU:H	1:A:137:GLU:CD	2.14	0.55
1:B:6:PRO:CD	1:B:190:MSE:HE3	2.34	0.55
1:A:116:HIS:HD2	1:A:118:LYS:N	1.99	0.55
1:A:93:ARG:CB	1:A:96:LEU:HD12	2.38	0.54
1:A:82:ILE:HG21	1:A:114:MSE:HE3	1.88	0.54
1:A:332:TYR:CE1	1:A:346:LEU:CD1	2.91	0.54
1:B:244:MSE:HE2	1:B:247:GLY:CA	2.37	0.54
1:B:92:ASN:O	1:B:95:LYS:HB3	2.08	0.54
1:B:340:ASN:HA	1:B:343:LYS:HD2	1.88	0.54
1:A:82:ILE:CG2	1:A:114:MSE:HE3	2.37	0.54
1:A:254:MSE:HE1	1:A:264:PHE:HZ	1.72	0.54
1:A:391:ARG:NE	1:A:394:LEU:OXT	2.35	0.54
1:B:150:LEU:HD22	1:B:370:ILE:HG21	1.90	0.54
1:A:29:GLU:O	1:A:30:THR:C	2.51	0.54
1:A:250:GLY:O	1:A:252:HIS:HD2	1.91	0.53
1:B:341:LEU:O	1:B:341:LEU:HD12	2.08	0.53
1:B:274:GLU:O	1:B:278:ILE:HG13	2.09	0.53
1:A:285:TRP:O	1:A:286:GLU:HB3	2.08	0.53
1:B:201:HIS:O	1:B:305:GLU:HA	2.07	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:310:HIS:CE1	1:A:312:HIS:ND1	2.76	0.53
1:A:202:TRP:CD2	1:A:310:HIS:HB2	2.44	0.53
1:A:389:LEU:O	1:A:390:LEU:HD12	2.09	0.53
1:B:231:LEU:HD21	1:B:344:ARG:NH1	2.23	0.53
1:A:21:GLN:HE22	1:A:190:MSE:CE	2.19	0.53
1:A:84:SER:CB	1:A:114:MSE:HE2	2.39	0.53
1:A:90:GLY:N	1:A:91:PRO:CA	2.71	0.53
1:B:97:GLU:O	1:B:101:ILE:HG12	2.08	0.53
1:A:252:HIS:CE1	1:A:274:GLU:OE2	2.61	0.53
1:A:93:ARG:CA	1:A:96:LEU:HD12	2.37	0.53
1:A:75:PRO:HA	1:B:27:ASP:HB2	1.91	0.52
1:B:250:GLY:O	1:B:252:HIS:HD2	1.92	0.52
1:B:332:TYR:CD1	1:B:342:ARG:HB3	2.44	0.52
1:B:285:TRP:N	1:B:285:TRP:CD1	2.78	0.52
1:A:27:ASP:O	1:B:76:HIS:HB2	2.10	0.52
1:A:133:ASP:OD1	1:A:367:MSE:HA	2.09	0.52
1:A:282:PHE:CE1	1:A:294:VAL:HG11	2.45	0.52
1:A:333:HIS:HE1	1:A:361:PRO:O	1.93	0.52
1:A:236:HIS:HE1	1:A:336:LEU:O	1.93	0.52
1:B:50:LEU:HD12	1:B:53:MSE:HE2	1.92	0.51
1:B:280:GLU:OE2	1:B:334:SER:CB	2.56	0.51
1:A:310:HIS:CE1	1:A:312:HIS:CE1	2.98	0.51
1:A:221:VAL:HG21	1:A:320:VAL:HG23	1.93	0.51
1:B:270:ILE:O	1:B:274:GLU:HG3	2.11	0.51
1:A:256:MSE:O	1:A:260:GLU:HB2	2.11	0.51
1:A:317:LYS:O	1:A:320:VAL:HG13	2.11	0.51
1:B:222:SER:HA	1:B:248:ASN:HD22	1.75	0.51
1:A:391:ARG:NH2	1:A:394:LEU:O	2.44	0.51
1:B:281:ARG:NH2	1:B:287:ASN:HB2	2.26	0.51
1:B:372:GLU:HA	1:B:372:GLU:OE1	2.11	0.51
1:B:222:SER:HA	1:B:248:ASN:ND2	2.26	0.50
1:A:59:MSE:HE3	1:A:97:GLU:CD	2.36	0.50
1:A:119:ASP:OD2	1:A:386:SER:HB2	2.12	0.50
1:B:59:MSE:HE3	1:B:97:GLU:CD	2.36	0.50
1:A:261:ILE:HA	1:A:369:PRO:HB3	1.94	0.50
1:A:321:LYS:HB3	1:A:354:ILE:HD11	1.90	0.50
1:B:244:MSE:HE2	1:B:247:GLY:N	2.24	0.49
1:B:288:VAL:HA	1:B:295:PHE:CD2	2.47	0.49
1:B:285:TRP:O	1:B:286:GLU:CG	2.60	0.49
1:A:137:GLU:O	1:A:139:GLY:N	2.45	0.49
1:A:12:PHE:CE1	1:A:233:VAL:CG1	2.94	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:388:THR:O	1:A:390:LEU:HD13	2.13	0.49
1:A:137:GLU:CD	1:A:137:GLU:N	2.71	0.49
1:B:319:HIS:ND1	1:B:319:HIS:N	2.58	0.49
1:A:1:MSE:N	1:A:28:THR:HB	2.27	0.49
1:B:334:SER:C	1:B:336:LEU:N	2.64	0.49
1:B:150:LEU:HD22	1:B:370:ILE:CG2	2.43	0.49
1:A:24:ILE:HG22	1:B:108:THR:HG22	1.94	0.49
1:A:137:GLU:C	1:A:139:GLY:N	2.69	0.49
1:A:254:MSE:HE1	1:A:264:PHE:CZ	2.46	0.49
1:B:285:TRP:O	1:B:286:GLU:HG2	2.12	0.49
1:A:119:ASP:CG	1:A:386:SER:HB2	2.38	0.49
1:A:201:HIS:O	1:A:305:GLU:HA	2.13	0.48
1:B:201:HIS:HB2	1:B:246:THR:HG22	1.94	0.48
1:B:338:THR:O	1:B:342:ARG:HG3	2.12	0.48
1:A:6:PRO:HG3	1:A:190:MSE:HE1	1.94	0.48
1:A:386:SER:OG	1:A:389:LEU:HB2	2.13	0.48
1:B:10:GLU:C	1:B:11:ILE:HD12	2.39	0.48
1:B:64:LEU:HD11	1:B:96:LEU:HB3	1.94	0.48
1:A:72:LYS:HG2	1:B:24:ILE:O	2.13	0.48
1:A:3:LEU:HD13	1:A:23:VAL:HA	1.95	0.48
1:A:389:LEU:CD1	1:A:391:ARG:HG3	2.43	0.48
1:B:286:GLU:C	1:B:288:VAL:N	2.71	0.48
1:B:3:LEU:HD12	1:B:190:MSE:SE	2.64	0.47
1:A:125:ALA:HA	1:A:381:ILE:HG21	1.96	0.47
1:A:316:GLY:C	1:A:317:LYS:HG3	2.38	0.47
1:B:260:GLU:CD	1:B:371:LYS:HD3	2.40	0.47
1:B:124:LYS:HE2	1:B:385:ASN:CG	2.37	0.47
1:A:389:LEU:HD11	1:A:391:ARG:HG3	1.96	0.47
1:B:341:LEU:O	1:B:345:ILE:HG13	2.14	0.47
1:B:360:GLU:HB3	1:B:361:PRO:CD	2.44	0.47
1:B:365:LEU:HD23	1:B:366:VAL:N	2.30	0.47
1:A:258:LEU:O	1:A:262:LEU:HG	2.15	0.47
1:A:332:TYR:CE1	1:A:342:ARG:CG	2.90	0.47
1:A:76:HIS:CE1	1:A:108:THR:O	2.54	0.47
1:B:41:ILE:HD11	1:B:190:MSE:HG3	1.95	0.47
1:B:112:ILE:HG22	1:B:392:PHE:HB2	1.97	0.47
1:A:244:MSE:HE2	1:A:247:GLY:CA	2.44	0.47
1:B:197:MSE:SE	1:B:199:ARG:HH11	2.48	0.47
1:A:357:GLU:HG3	1:A:357:GLU:O	2.15	0.46
1:A:389:LEU:C	1:A:390:LEU:HD12	2.40	0.46
1:B:237:THR:O	1:B:238:ALA:CB	2.62	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:252:HIS:HE1	1:B:274:GLU:OE2	1.98	0.46
1:A:222:SER:HB2	2:A:402:HOH:O	2.15	0.46
1:A:64:LEU:CD2	1:A:100:LEU:HD22	2.32	0.46
1:B:76:HIS:CE1	1:B:108:THR:O	2.59	0.46
1:B:310:HIS:HA	2:B:399:HOH:O	2.15	0.46
1:B:2:LEU:HD23	1:B:40:ASN:HA	1.97	0.46
1:B:229:LEU:O	1:B:232:LEU:HB3	2.16	0.46
1:B:195:TYR:CZ	1:B:294:VAL:HG22	2.50	0.46
1:A:133:ASP:CG	1:A:367:MSE:HA	2.40	0.46
1:A:273:TYR:HA	1:A:330:THR:HG21	1.98	0.46
1:B:244:MSE:HE1	1:B:246:THR:CA	2.46	0.46
1:A:27:ASP:HB2	1:B:75:PRO:HA	1.98	0.46
1:A:82:ILE:HB	1:A:114:MSE:HG3	1.98	0.46
1:A:93:ARG:HB3	1:A:96:LEU:HD12	1.98	0.45
1:B:287:ASN:C	1:B:289:GLU:N	2.73	0.45
1:A:6:PRO:HD3	1:A:190:MSE:CE	2.45	0.45
1:A:131:TYR:CG	1:A:373:ILE:HD11	2.52	0.45
1:B:134:ILE:HG12	1:B:134:ILE:O	2.15	0.45
1:B:225:THR:HB	1:B:248:ASN:HD21	1.79	0.45
1:B:333:HIS:HE1	1:B:361:PRO:O	2.00	0.45
1:A:280:GLU:OE2	1:A:335:LYS:HE2	2.17	0.45
1:B:271:GLU:CD	1:B:271:GLU:H	2.24	0.45
1:B:375:ILE:HG23	1:B:376:LYS:N	2.31	0.45
1:A:5:ALA:HA	1:A:39:SER:OG	2.16	0.45
1:B:235:GLU:HB3	1:B:338:THR:HG21	1.97	0.45
1:A:132:THR:HG22	1:A:132:THR:O	2.16	0.44
1:A:202:TRP:CZ2	1:A:310:HIS:CE1	3.06	0.44
1:A:282:PHE:C	1:A:284:LYS:H	2.26	0.44
1:B:64:LEU:HD23	1:B:64:LEU:HA	1.82	0.44
1:A:68:ASP:OD1	1:A:72:LYS:HE3	2.17	0.44
1:A:201:HIS:HB2	1:A:246:THR:HG22	2.00	0.44
1:A:376:LYS:HD2	1:A:376:LYS:HA	1.75	0.44
1:A:82:ILE:HD12	1:A:112:ILE:HD11	1.98	0.44
1:B:197:MSE:HE1	1:B:275:ILE:CD1	2.48	0.44
1:A:285:TRP:CD1	1:A:285:TRP:N	2.84	0.44
1:A:389:LEU:HD13	1:A:390:LEU:N	2.33	0.44
1:A:335:LYS:H	1:A:335:LYS:HG2	1.50	0.44
1:A:49:LEU:C	1:A:49:LEU:HD23	2.43	0.44
1:B:252:HIS:CE1	1:B:274:GLU:OE2	2.71	0.44
1:A:368:ARG:O	1:A:369:PRO:C	2.60	0.44
1:B:373:ILE:O	1:B:375:ILE:N	2.51	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:137:GLU:C	1:A:139:GLY:H	2.26	0.44
1:B:246:THR:HB	1:B:249:ALA:HB2	2.00	0.44
1:B:312:HIS:N	1:B:312:HIS:HD2	2.13	0.44
1:B:111:LYS:HG2	1:B:393:GLU:O	2.17	0.43
1:B:116:HIS:HD2	1:B:118:LYS:N	2.10	0.43
1:B:129:VAL:O	1:B:129:VAL:CG1	2.65	0.43
1:B:149:MSE:HG2	1:B:166:PHE:CE1	2.53	0.43
1:B:147:GLU:HG3	1:B:367:MSE:SE	2.68	0.43
1:B:221:VAL:CG1	1:B:222:SER:N	2.73	0.43
1:A:246:THR:HB	1:A:249:ALA:HB2	2.00	0.43
1:A:350:ARG:C	1:A:352:HIS:N	2.74	0.43
1:A:368:ARG:CB	1:A:369:PRO:CD	2.96	0.43
1:A:266:THR:CG2	1:A:365:LEU:HD23	2.48	0.43
1:A:282:PHE:C	1:A:284:LYS:N	2.75	0.43
1:B:312:HIS:O	1:B:313:GLU:CB	2.66	0.43
1:A:88:ARG:O	1:A:89:GLU:HB3	2.18	0.43
1:A:320:VAL:O	1:A:323:MSE:HB3	2.19	0.43
1:B:273:TYR:HD1	1:B:330:THR:HG23	1.84	0.43
1:B:243:ILE:HG23	1:B:244:MSE:N	2.34	0.43
1:B:365:LEU:C	1:B:365:LEU:CD2	2.91	0.43
1:A:131:TYR:CD1	1:A:373:ILE:HD11	2.54	0.43
1:B:50:LEU:HB3	1:B:77:LYS:HG2	2.00	0.43
1:B:53:MSE:HE3	1:B:181:VAL:CG1	2.38	0.43
1:B:94:TYR:CE2	1:B:388:THR:HB	2.54	0.43
1:B:127:LYS:C	1:B:129:VAL:N	2.77	0.43
1:A:43:ARG:O	1:A:47:TYR:CD2	2.70	0.43
1:A:92:ASN:O	1:A:95:LYS:HB3	2.19	0.43
1:A:286:GLU:O	1:A:287:ASN:C	2.62	0.43
1:A:389:LEU:HD11	1:A:391:ARG:CD	2.49	0.43
1:A:317:LYS:CA	1:A:320:VAL:HG12	2.35	0.42
1:B:267:GLY:HA2	2:B:397:HOH:O	2.19	0.42
1:B:337:ALA:HB3	1:B:342:ARG:HE	1.83	0.42
1:B:50:LEU:HD12	1:B:50:LEU:HA	1.76	0.42
1:A:82:ILE:CD1	1:A:112:ILE:HD11	2.49	0.42
1:B:287:ASN:O	1:B:290:GLU:N	2.51	0.42
1:B:140:MSE:HE2	2:B:402:HOH:O	2.19	0.42
1:B:41:ILE:HD11	1:B:190:MSE:CG	2.50	0.42
1:A:150:LEU:HD23	1:A:150:LEU:HA	1.82	0.42
1:A:248:ASN:HB3	1:A:323:MSE:HE2	2.02	0.42
1:B:20:VAL:HA	1:B:303:GLN:O	2.19	0.42
1:B:195:TYR:CE1	1:B:257:LYS:HB3	2.55	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:88:ARG:C	1:B:92:ASN:HA	2.45	0.41
1:B:147:GLU:O	1:B:151:VAL:HG23	2.20	0.41
1:B:230:ASN:OD1	1:B:241:THR:HG23	2.19	0.41
1:B:111:LYS:HB2	1:B:111:LYS:HE3	1.62	0.41
1:A:237:THR:O	1:A:238:ALA:CB	2.67	0.41
1:B:4:GLU:HA	1:B:38:ILE:HD13	2.02	0.41
1:B:239:PHE:CD2	1:B:239:PHE:N	2.88	0.41
1:A:50:LEU:HG	1:A:78:CYS:SG	2.61	0.41
1:A:135:LEU:HA	1:A:140:MSE:O	2.21	0.41
1:A:138:ASN:OD1	1:A:138:ASN:N	2.54	0.41
1:A:18:HIS:CE1	1:A:300:GLU:OE1	2.70	0.41
1:A:202:TRP:CG	1:A:310:HIS:HB2	2.56	0.41
1:A:389:LEU:C	1:A:389:LEU:CD1	2.93	0.41
1:A:43:ARG:HG3	1:A:47:TYR:HE2	1.85	0.41
1:B:286:GLU:C	1:B:288:VAL:H	2.29	0.41
1:A:381:ILE:O	1:A:385:ASN:HB2	2.19	0.41
1:A:225:THR:O	1:A:229:LEU:HG	2.21	0.40
1:A:370:ILE:C	1:A:370:ILE:HD12	2.47	0.40
1:A:374:PRO:HB2	1:A:377:GLU:OE1	2.21	0.40
1:B:1:MSE:SE	1:B:3:LEU:HD21	2.72	0.40
1:B:125:ALA:HB2	1:B:381:ILE:HG13	2.03	0.40
1:A:7:VAL:CG2	1:A:8:TYR:N	2.79	0.40
1:A:177:VAL:HA	1:A:180:TYR:CD2	2.56	0.40
1:A:3:LEU:HD22	1:A:3:LEU:N	2.36	0.40
1:A:266:THR:HG21	1:A:365:LEU:HD23	2.03	0.40
1:A:332:TYR:HE1	1:A:346:LEU:HD13	1.82	0.40
1:A:360:GLU:HA	1:A:361:PRO:HD3	1.93	0.40
1:B:127:LYS:C	1:B:129:VAL:H	2.30	0.40
1:B:322:GLU:O	1:B:323:MSE:C	2.63	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	361/394 (92%)	339 (94%)	21 (6%)	1 (0%)	36	55
1	B	347/394 (88%)	323 (93%)	24 (7%)	0	100	100
All	All	708/788 (90%)	662 (94%)	45 (6%)	1 (0%)	48	68

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	138	ASN

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	326/334 (98%)	306 (94%)	20 (6%)	17	35
1	B	317/334 (95%)	299 (94%)	18 (6%)	18	39
All	All	643/668 (96%)	605 (94%)	38 (6%)	18	37

All (38) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3	LEU
1	A	30	THR
1	A	45	LYS
1	A	50	LEU
1	A	64	LEU
1	A	71	LEU
1	A	107	LEU
1	A	129	VAL
1	A	133	ASP
1	A	135	LEU
1	A	138	ASN
1	A	143	SER
1	A	155	LEU
1	A	220	ARG
1	A	221	VAL

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Mol	Chain	Res	Type
1	A	313	GLU
1	A	320	VAL
1	A	335	LYS
1	A	346	LEU
1	A	368	ARG
1	B	28	THR
1	B	50	LEU
1	B	71	LEU
1	B	88	ARG
1	B	96	LEU
1	B	129	VAL
1	B	143	SER
1	B	155	LEU
1	B	167	VAL
1	B	242	THR
1	B	251	GLU
1	B	312	HIS
1	B	319	HIS
1	B	320	VAL
1	B	339	ASP
1	B	346	LEU
1	B	349	LEU
1	B	390	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (26) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	18	HIS
1	A	21	GLN
1	A	76	HIS
1	A	109	HIS
1	A	116	HIS
1	A	227	HIS
1	A	236	HIS
1	A	248	ASN
1	A	252	HIS
1	A	310	HIS
1	A	333	HIS
1	A	340	ASN
1	B	61	ASN
1	B	65	HIS
1	B	76	HIS

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Mol	Chain	Res	Type
1	B	106	ASN
1	B	109	HIS
1	B	116	HIS
1	B	138	ASN
1	B	201	HIS
1	B	248	ASN
1	B	252	HIS
1	B	303	GLN
1	B	312	HIS
1	B	333	HIS
1	B	385	ASN

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	354/394 (89%)	-0.02	7 (1%) 65 61	21, 38, 65, 79	0
1	B	342/394 (86%)	0.06	5 (1%) 72 68	25, 41, 67, 76	0
All	All	696/788 (88%)	0.02	12 (1%) 69 65	21, 40, 66, 79	0

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	316	GLY	3.7
1	A	321	LYS	3.6
1	B	236	HIS	3.3
1	B	296	ASP	3.3
1	A	202	TRP	3.1
1	A	312	HIS	2.9
1	A	354	ILE	2.7
1	A	339	ASP	2.6
1	A	311	PHE	2.5
1	B	202	TRP	2.5
1	B	312	HIS	2.2
1	B	137	GLU	2.2

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.