



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 06:18 AM UTC

PDB ID : 5HAI / pdb_00005hai
Title : P99 beta-lactamase mutant - S64G
Authors : Stojanoski, V.; Adamski, C.J.; Hu, L.; Mehta, S.C.; Sankaran, B.; Prasad, B.V.V.; Palzkill, T.G.
Deposited on : 2015-12-30
Resolution : 2.74 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

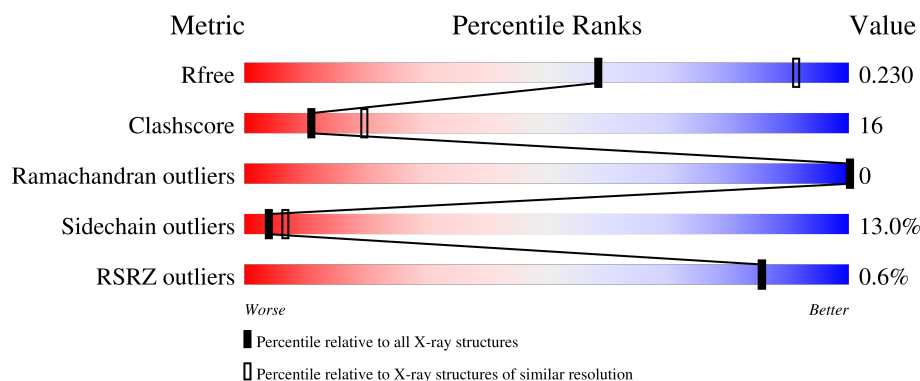
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.74 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	1819 (2.76-2.72)
Clashscore	190562	1866 (2.76-2.72)
Ramachandran outliers	187476	1830 (2.76-2.72)
Sidechain outliers	187428	1831 (2.76-2.72)
RSRZ outliers	180081	1819 (2.76-2.72)

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	361	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 2799 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.

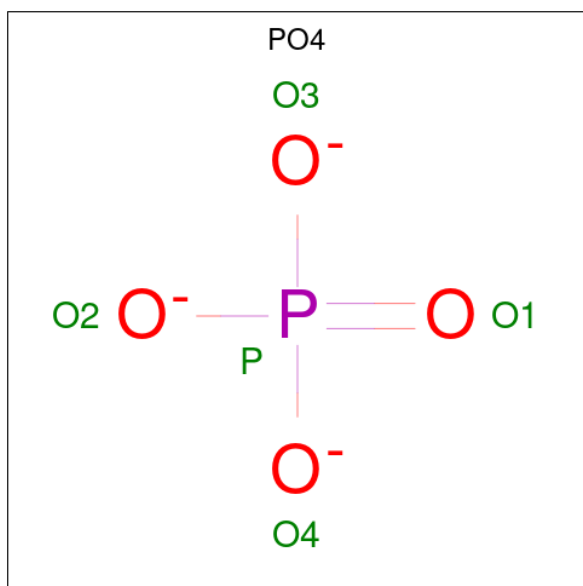
- Molecule 1 is a protein called Beta-lactamase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	359	2749	1767	465	505	12	0	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	64	GLY	SER	engineered mutation	UNP P05364

- Molecule 2 is PHOSPHATE ION (CCD ID: PO4) (formula: O_4P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	P		
2	A	1	5	4	1	0	0

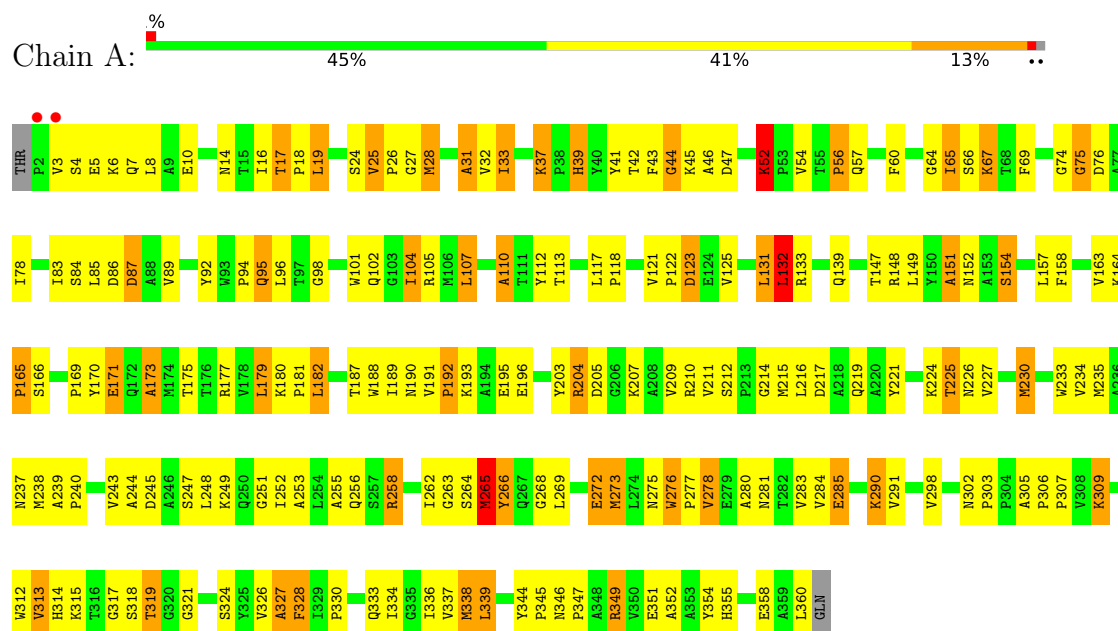
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	45	Total	O	0	0
			45	45		

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: Beta-lactamase



4 Data and refinement statistics

Property	Value	Source
Space group	P 2 ₁ 2 ₁ 2 ₁	Depositor
Cell constants a, b, c, α , β , γ	61.86Å 69.43Å 78.14Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	61.86 – 2.74 61.86 – 2.74	Depositor EDS
% Data completeness (in resolution range)	99.2 (61.86-2.74) 99.4 (61.86-2.74)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.26 (at 2.73Å)	Xtriage
Refinement program	PHENIX 1.10.1_2155	Depositor
R, R_{free}	0.206 , 0.243 0.214 , 0.230	Depositor DCC
R_{free} test set	479 reflections (5.15%)	wwPDB-VP
Wilson B-factor (Å ²)	30.5	Xtriage
Anisotropy	0.510	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 42.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	2799	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.82% 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

Bond lengths and bond angles in the following residue types are not validated in this section: PO4

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	94/2825 (3.3%)	1.36	24/3860 (0.6%)

All (94) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	346	ASN	C-O	-8.02	1.17	1.24
1	A	32	VAL	C-O	-7.92	1.15	1.24
1	A	251	GLY	C-O	-7.40	1.15	1.24
1	A	147	THR	C-O	-7.17	1.15	1.23
1	A	173	ALA	C-O	-6.96	1.16	1.24
1	A	31	ALA	C-O	-6.94	1.16	1.24
1	A	312	TRP	C-O	-6.92	1.15	1.23
1	A	121	VAL	CA-C	-6.85	1.47	1.52
1	A	76	ASP	C-O	-6.84	1.16	1.24
1	A	96	LEU	C-O	-6.65	1.16	1.23
1	A	139	GLN	C-O	-6.64	1.16	1.24
1	A	309	LYS	C-O	-6.64	1.16	1.24
1	A	327	ALA	C-O	-6.64	1.15	1.23
1	A	298	VAL	C-O	-6.54	1.17	1.24
1	A	28	MET	C-O	-6.53	1.16	1.23
1	A	321	GLY	C-O	-6.51	1.15	1.23
1	A	328	PHE	C-O	-6.44	1.16	1.23
1	A	258	ARG	C-O	-6.41	1.16	1.24
1	A	240	PRO	C-O	-6.36	1.15	1.24
1	A	43	PHE	C-O	-6.33	1.16	1.23
1	A	262	ILE	C-O	-6.25	1.16	1.24
1	A	39	HIS	C-O	-6.24	1.17	1.24
1	A	47	ASP	C-O	-6.22	1.17	1.23
1	A	217	ASP	C-O	-6.18	1.16	1.24
1	A	26	PRO	C-O	-6.15	1.16	1.24
1	A	169	PRO	C-O	-6.12	1.16	1.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	233	TRP	C-O	-6.12	1.16	1.24
1	A	225	THR	C-O	-6.11	1.17	1.23
1	A	349	ARG	C-O	-6.10	1.16	1.24
1	A	237	ASN	C-O	-6.07	1.16	1.24
1	A	275	ASN	C-O	-5.94	1.16	1.23
1	A	266	TYR	C-O	-5.92	1.17	1.24
1	A	117	LEU	CA-C	-5.91	1.46	1.53
1	A	276	TRP	C-O	-5.91	1.16	1.24
1	A	75	GLY	C-O	-5.91	1.16	1.23
1	A	65	ILE	C-O	-5.91	1.16	1.24
1	A	148	ARG	C-O	-5.91	1.16	1.24
1	A	154	SER	C-O	-5.88	1.17	1.24
1	A	84	SER	C-O	-5.87	1.16	1.23
1	A	214	GLY	C-O	-5.86	1.16	1.23
1	A	337	VAL	C-O	-5.84	1.18	1.24
1	A	336	ILE	C-O	-5.73	1.17	1.23
1	A	149	LEU	C-O	-5.72	1.17	1.24
1	A	122	PRO	C-O	-5.70	1.17	1.23
1	A	268	GLY	C-O	-5.66	1.19	1.24
1	A	41	TYR	C-O	-5.65	1.17	1.23
1	A	262	ILE	CA-C	-5.63	1.45	1.52
1	A	324	SER	C-O	-5.61	1.16	1.23
1	A	192	PRO	C-O	-5.60	1.17	1.23
1	A	54	VAL	C-O	-5.58	1.17	1.24
1	A	249	LYS	C-O	-5.54	1.17	1.24
1	A	226	ASN	C-O	-5.52	1.16	1.23
1	A	98	GLY	C-O	-5.51	1.18	1.23
1	A	56	PRO	C-O	-5.50	1.18	1.23
1	A	60	PHE	C-O	-5.48	1.17	1.23
1	A	133	ARG	C-O	-5.46	1.17	1.24
1	A	326	VAL	C-O	-5.46	1.17	1.23
1	A	263	GLY	C-O	-5.46	1.16	1.23
1	A	19	LEU	C-O	-5.45	1.17	1.24
1	A	330	PRO	C-O	-5.42	1.17	1.24
1	A	64	GLY	C-O	-5.38	1.17	1.23
1	A	157	LEU	C-O	-5.33	1.17	1.24
1	A	25	VAL	CA-C	-5.33	1.48	1.52
1	A	347	PRO	C-O	-5.33	1.17	1.24
1	A	243	VAL	C-O	-5.32	1.18	1.24
1	A	151	ALA	C-O	-5.31	1.17	1.23
1	A	171	GLU	C-O	-5.31	1.18	1.24
1	A	224	LYS	C-O	-5.31	1.17	1.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	334	ILE	C-O	-5.30	1.18	1.24
1	A	182	LEU	C-O	-5.29	1.17	1.24
1	A	89	VAL	C-O	-5.28	1.17	1.24
1	A	345	PRO	C-O	-5.27	1.17	1.23
1	A	256	GLN	C-O	-5.24	1.17	1.24
1	A	339	LEU	C-O	-5.24	1.17	1.24
1	A	67	LYS	C-O	-5.24	1.17	1.24
1	A	74	GLY	C-O	-5.21	1.17	1.23
1	A	104	ILE	C-O	-5.21	1.17	1.24
1	A	45	LYS	C-O	-5.20	1.17	1.23
1	A	132	LEU	C-O	-5.20	1.17	1.24
1	A	355	HIS	C-O	-5.19	1.18	1.24
1	A	204	ARG	C-O	-5.17	1.18	1.24
1	A	121	VAL	C-O	-5.16	1.18	1.24
1	A	266	TYR	CA-C	-5.14	1.46	1.52
1	A	216	LEU	C-O	-5.12	1.16	1.23
1	A	210	ARG	C-O	-5.10	1.17	1.23
1	A	47	ASP	CA-C	-5.09	1.46	1.52
1	A	44	GLY	C-O	-5.06	1.18	1.24
1	A	131	LEU	C-O	-5.06	1.17	1.24
1	A	190	ASN	C-O	-5.05	1.18	1.24
1	A	272	GLU	C-O	-5.05	1.17	1.23
1	A	57	GLN	C-O	-5.01	1.17	1.24
1	A	317	GLY	C-O	-5.01	1.17	1.23
1	A	221	TYR	C-O	-5.00	1.18	1.24
1	A	265	MET	C-O	-5.00	1.18	1.23

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	121	VAL	N-CA-C	-13.70	91.88	108.05
1	A	189	ILE	N-CA-C	-11.20	102.18	111.81
1	A	179	LEU	N-CA-C	9.12	120.83	111.07
1	A	319	THR	N-CA-C	-7.81	97.84	108.86
1	A	244	ALA	N-CA-C	7.61	119.57	111.28
1	A	44	GLY	N-CA-C	7.15	122.17	112.17
1	A	117	LEU	N-CA-C	-6.65	101.39	109.83
1	A	87	ASP	N-CA-C	-6.52	99.67	110.17
1	A	314	HIS	N-CA-C	6.15	117.58	108.60
1	A	54	VAL	N-CA-C	-5.77	101.36	109.21
1	A	324	SER	N-CA-C	5.54	118.28	109.81
1	A	188	TRP	N-CA-C	5.51	118.21	109.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	69	PHE	CA-C-N	5.49	127.63	120.28
1	A	69	PHE	C-N-CA	5.49	127.63	120.28
1	A	110	ALA	N-CA-C	5.40	118.09	111.82
1	A	165	PRO	CA-C-N	5.39	128.04	120.28
1	A	165	PRO	C-N-CA	5.39	128.04	120.28
1	A	211	VAL	N-CA-C	5.36	117.34	109.63
1	A	16	ILE	N-CA-C	5.33	116.81	111.00
1	A	17	THR	CA-C-O	5.25	123.43	118.34
1	A	52	LYS	CA-C-N	-5.22	114.86	120.03
1	A	52	LYS	C-N-CA	-5.22	114.86	120.03
1	A	209	VAL	N-CA-C	5.17	116.14	108.65
1	A	252	ILE	N-CA-C	-5.15	105.52	110.72

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	2749	0	2736	90	1
2	A	5	0	0	0	0
3	A	45	0	0	1	0
All	All	2799	0	2736	90	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 16.

All (90) 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:4:SER:HB2	1:A:7:GLN:HG2	1.17	1.14
1:A:17:THR:HB	1:A:18:PRO:HD3	1.16	1.12
1:A:4:SER:HB2	1:A:7:GLN:CG	1.92	0.98
1:A:17:THR:HB	1:A:18:PRO:CD	1.94	0.96
1:A:4:SER:CB	1:A:7:GLN:HG2	2.01	0.90

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:175:THR:HG22	1:A:180:LYS:HE3	1.56	0.85
1:A:278:VAL:O	1:A:354:TYR:OH	1.98	0.81
1:A:87:ASP:OD2	1:A:92:TYR:OH	1.99	0.80
1:A:17:THR:CB	1:A:18:PRO:HD3	2.07	0.80
1:A:175:THR:HG22	1:A:180:LYS:CE	2.11	0.80
1:A:302:ASN:HA	1:A:303:PRO:C	2.10	0.73
1:A:265:MET:HE3	1:A:272:GLU:HG2	1.70	0.73
1:A:95:GLN:HE21	1:A:95:GLN:H	1.35	0.71
1:A:258:ARG:HB2	1:A:305:ALA:HB3	1.75	0.69
1:A:253:ALA:O	1:A:307:PRO:HG3	1.93	0.69
1:A:101:TRP:HA	1:A:104:ILE:HD12	1.76	0.67
1:A:95:GLN:H	1:A:95:GLN:NE2	1.94	0.66
1:A:10:GLU:O	1:A:14:ASN:HB2	1.97	0.64
1:A:175:THR:HA	1:A:179:LEU:HB2	1.80	0.63
1:A:225:THR:CG2	1:A:230:MET:HG2	2.28	0.63
1:A:25:VAL:HG11	1:A:28:MET:HE2	1.82	0.62
1:A:163:VAL:O	1:A:166:SER:HB3	2.01	0.61
1:A:281:ASN:HA	1:A:284:VAL:HG22	1.82	0.61
1:A:42:THR:HG21	1:A:56:PRO:HD3	1.83	0.60
1:A:27:GLY:HA2	1:A:44:GLY:HA3	1.83	0.59
1:A:173:ALA:O	1:A:177:ARG:HB2	2.02	0.59
1:A:94:PRO:HD2	1:A:95:GLN:HE22	1.68	0.58
1:A:187:THR:HG23	1:A:225:THR:HB	1.86	0.57
1:A:25:VAL:HG11	1:A:28:MET:CE	2.35	0.56
1:A:225:THR:HG21	1:A:230:MET:HG2	1.86	0.56
1:A:280:ALA:O	1:A:284:VAL:HG13	2.06	0.56
1:A:37:LYS:HE3	1:A:39:HIS:CE1	2.41	0.56
1:A:180:LYS:N	1:A:181:PRO:HD2	2.22	0.55
1:A:10:GLU:O	1:A:14:ASN:N	2.36	0.54
1:A:31:ALA:HB2	1:A:227:VAL:HG22	1.90	0.54
1:A:175:THR:CG2	1:A:180:LYS:HE2	2.38	0.54
1:A:230:MET:HA	1:A:230:MET:HE2	1.90	0.54
1:A:170:TYR:CE2	1:A:219:GLN:HG3	2.44	0.53
1:A:344:TYR:O	1:A:349:ARG:NH2	2.42	0.53
1:A:175:THR:HG22	1:A:180:LYS:HE2	1.88	0.52
1:A:46:ALA:N	1:A:52:LYS:O	2.31	0.52
1:A:125:VAL:HG12	1:A:215:MET:HG3	1.90	0.52
1:A:95:GLN:NE2	1:A:95:GLN:N	2.59	0.51
1:A:180:LYS:HB2	1:A:181:PRO:HD3	1.93	0.51
1:A:4:SER:HB2	1:A:7:GLN:CD	2.37	0.50
1:A:123:ASP:OD1	1:A:123:ASP:N	2.31	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:166:SER:HB2	3:A:517:HOH:O	2.12	0.49
1:A:83:ILE:HG22	1:A:92:TYR:CE2	2.48	0.48
1:A:276:TRP:CD2	1:A:277:PRO:HA	2.49	0.48
1:A:313:VAL:O	1:A:327:ALA:HA	2.14	0.48
1:A:95:GLN:HB3	1:A:132:LEU:HD21	1.95	0.47
1:A:118:PRO:O	1:A:151:ALA:HB1	2.14	0.47
1:A:234:VAL:O	1:A:238:MET:HB2	2.13	0.47
1:A:344:TYR:CE2	1:A:349:ARG:HG2	2.49	0.47
1:A:65:ILE:O	1:A:65:ILE:HG22	2.13	0.47
1:A:180:LYS:N	1:A:181:PRO:CD	2.78	0.47
1:A:238:MET:HG3	1:A:328:PHE:CD2	2.49	0.47
1:A:255:ALA:HA	1:A:269:LEU:HB2	1.97	0.46
1:A:265:MET:HG2	1:A:266:TYR:N	2.29	0.46
1:A:10:GLU:O	1:A:14:ASN:CB	2.63	0.46
1:A:203:TYR:HA	1:A:207:LYS:O	2.16	0.46
1:A:276:TRP:CZ3	1:A:278:VAL:HG23	2.51	0.45
1:A:85:LEU:O	1:A:107:LEU:HB2	2.16	0.45
1:A:338:MET:HE1	1:A:352:ALA:HB3	1.99	0.44
1:A:75:GLY:HA2	1:A:78:ILE:HD12	1.98	0.44
1:A:302:ASN:CA	1:A:303:PRO:C	2.87	0.44
1:A:238:MET:HE3	1:A:333:GLN:NE2	2.33	0.43
1:A:192:PRO:HG2	1:A:195:GLU:CG	2.48	0.43
1:A:17:THR:N	1:A:18:PRO:CD	2.81	0.43
1:A:94:PRO:HD2	1:A:95:GLN:NE2	2.33	0.43
1:A:164:LYS:HB2	1:A:165:PRO:HD3	2.01	0.43
1:A:192:PRO:HG2	1:A:195:GLU:HG2	2.01	0.43
1:A:204:ARG:O	1:A:205:ASP:HB2	2.19	0.43
1:A:8:LEU:HD13	1:A:360:LEU:HD21	2.01	0.42
1:A:110:ALA:HB2	1:A:158:PHE:CG	2.55	0.42
1:A:273:MET:HG3	1:A:313:VAL:HG13	2.01	0.42
1:A:67:LYS:NZ	1:A:152:ASN:OD1	2.48	0.42
1:A:315:LYS:HD2	1:A:315:LYS:HA	1.86	0.42
1:A:235:MET:HA	1:A:238:MET:HE2	2.01	0.41
1:A:245:ASP:HB3	1:A:248:LEU:HB3	2.02	0.41
1:A:239:ALA:HB2	1:A:333:GLN:HE22	1.86	0.41
1:A:281:ASN:O	1:A:285:GLU:HB3	2.21	0.41
1:A:33:ILE:HG21	1:A:238:MET:HE1	2.02	0.41
1:A:131:LEU:HD22	1:A:215:MET:HE3	2.02	0.41
1:A:354:TYR:O	1:A:358:GLU:HB2	2.21	0.41
1:A:290:LYS:HG3	1:A:291:VAL:HG23	2.03	0.41
1:A:191:VAL:HA	1:A:192:PRO:HD2	1.86	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:86:ASP:N	1:A:86:ASP:OD1	2.51	0.40
1:A:17:THR:N	1:A:18:PRO:HD2	2.36	0.40
1:A:28:MET:HA	1:A:339:LEU:O	2.22	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:5:GLU:OE1	1:A:102:GLN:NE2[1_455]	1.93	0.27

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	357/361 (99%)	345 (97%)	12 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	284/286 (99%)	247 (87%)	37 (13%)	4	7

All (37) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3	VAL
1	A	6	LYS
1	A	19	LEU
1	A	24	SER
1	A	33	ILE
1	A	37	LYS
1	A	52	LYS
1	A	66	SER
1	A	95	GLN
1	A	105	ARG
1	A	107	LEU
1	A	112	TYR
1	A	113	THR
1	A	123	ASP
1	A	132	LEU
1	A	154	SER
1	A	171	GLU
1	A	182	LEU
1	A	193	LYS
1	A	196	GLU
1	A	212	SER
1	A	230	MET
1	A	247	SER
1	A	264	SER
1	A	265	MET
1	A	273	MET
1	A	278	VAL
1	A	283	VAL
1	A	285	GLU
1	A	290	LYS
1	A	306	PRO
1	A	309	LYS
1	A	313	VAL
1	A	318	SER
1	A	319	THR
1	A	338	MET
1	A	351	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	14	ASN
1	A	39	HIS

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Mol	Chain	Res	Type
1	A	95	GLN
1	A	186	HIS
1	A	190	ASN
1	A	333	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](#)

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	PO4	A	401	-	4,4,4	0.97	0	6,6,6	0.49	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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	359/361 (99%)	0.10	2 (0%) 85 85	12, 22, 35, 66	0

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	2	PRO	4.2
1	A	3	VAL	2.8

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](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	PO4	A	401	5/5	0.94	0.09	21,28,30,34	0

6.5 Other polymers [i](#)

There are no such residues in this entry.