



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 06:32 AM UTC

PDB ID : 2XD5 / pdb_00002xd5
Title : Structural insights into the catalytic mechanism and the role of Streptococcus pneumoniae PBP1b
Authors : Macheboeuf, P.; Lemaire, D.; Jamin, M.; Dideberg, O.; Dessen, A.
Deposited on : 2010-04-29
Resolution : 2.50 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

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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

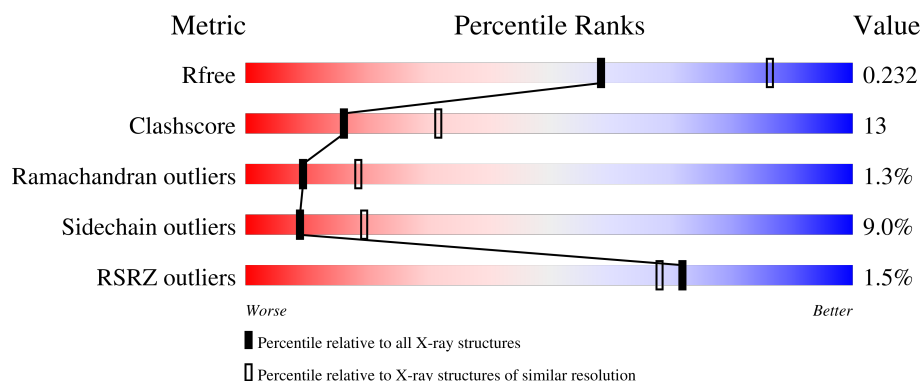
1 Overall quality at a glance

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	494	0% 66% 24% • • 5%
1	B	494	2% 69% 20% • • 5%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 7547 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 PENICILLIN-BINDING PROTEIN 1B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	469	Total	C	N	O	S	4	5	0
			3657	2285	621	736	15			
1	B	468	Total	C	N	O	S	2	2	0
			3610	2256	609	729	16			

There are 56 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	101	ASP	-	expression tag	UNP Q7CRA4
A	102	ILE	-	expression tag	UNP Q7CRA4
A	103	SER	-	expression tag	UNP Q7CRA4
A	104	SER	-	expression tag	UNP Q7CRA4
A	105	ILE	-	expression tag	UNP Q7CRA4
A	106	SER	-	expression tag	UNP Q7CRA4
A	107	GLU	-	expression tag	UNP Q7CRA4
A	108	ILE	-	expression tag	UNP Q7CRA4
A	109	THR	-	expression tag	UNP Q7CRA4
A	110	TYR	-	expression tag	UNP Q7CRA4
A	111	SER	-	expression tag	UNP Q7CRA4
A	112	ASP	-	expression tag	UNP Q7CRA4
A	113	GLY	-	expression tag	UNP Q7CRA4
A	114	THR	-	expression tag	UNP Q7CRA4
A	115	VAL	-	expression tag	UNP Q7CRA4
A	116	ILE	-	expression tag	UNP Q7CRA4
A	117	ALA	-	expression tag	UNP Q7CRA4
A	118	SER	-	expression tag	UNP Q7CRA4
A	119	ILE	-	expression tag	UNP Q7CRA4
A	120	GLU	-	expression tag	UNP Q7CRA4
A	121	SER	-	expression tag	UNP Q7CRA4
A	122	ASP	-	expression tag	UNP Q7CRA4
A	123	MET	-	expression tag	UNP Q7CRA4
A	124	LEU	-	expression tag	UNP Q7CRA4
A	125	ARG	-	expression tag	UNP Q7CRA4

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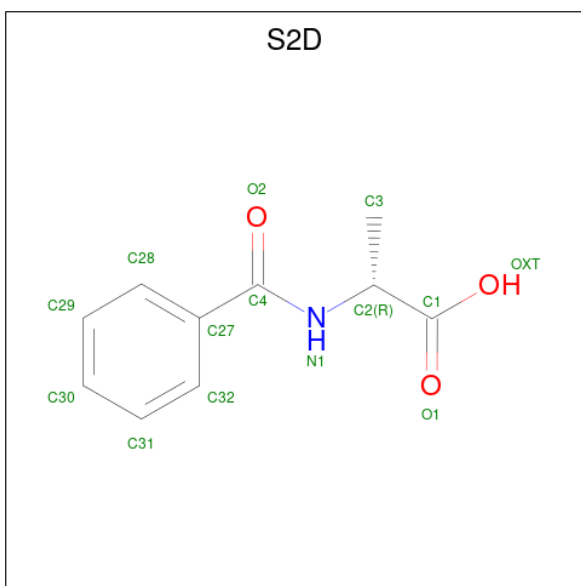
Chain	Residue	Modelled	Actual	Comment	Reference
A	336	GLN	ARG	engineered mutation	UNP Q7CRA4
A	686	GLN	ARG	engineered mutation	UNP Q7CRA4
A	687	GLN	ARG	engineered mutation	UNP Q7CRA4
B	101	ASP	-	expression tag	UNP Q7CRA4
B	102	ILE	-	expression tag	UNP Q7CRA4
B	103	SER	-	expression tag	UNP Q7CRA4
B	104	SER	-	expression tag	UNP Q7CRA4
B	105	ILE	-	expression tag	UNP Q7CRA4
B	106	SER	-	expression tag	UNP Q7CRA4
B	107	GLU	-	expression tag	UNP Q7CRA4
B	108	ILE	-	expression tag	UNP Q7CRA4
B	109	THR	-	expression tag	UNP Q7CRA4
B	110	TYR	-	expression tag	UNP Q7CRA4
B	111	SER	-	expression tag	UNP Q7CRA4
B	112	ASP	-	expression tag	UNP Q7CRA4
B	113	GLY	-	expression tag	UNP Q7CRA4
B	114	THR	-	expression tag	UNP Q7CRA4
B	115	VAL	-	expression tag	UNP Q7CRA4
B	116	ILE	-	expression tag	UNP Q7CRA4
B	117	ALA	-	expression tag	UNP Q7CRA4
B	118	SER	-	expression tag	UNP Q7CRA4
B	119	ILE	-	expression tag	UNP Q7CRA4
B	120	GLU	-	expression tag	UNP Q7CRA4
B	121	SER	-	expression tag	UNP Q7CRA4
B	122	ASP	-	expression tag	UNP Q7CRA4
B	123	MET	-	expression tag	UNP Q7CRA4
B	124	LEU	-	expression tag	UNP Q7CRA4
B	125	ARG	-	expression tag	UNP Q7CRA4
B	336	GLN	ARG	engineered mutation	UNP Q7CRA4
B	686	GLN	ARG	engineered mutation	UNP Q7CRA4
B	687	GLN	ARG	engineered mutation	UNP Q7CRA4

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

- Molecule 3 is N-BENZOYL-D-ALANINE (CCD ID: S2D) (formula: C₁₀H₁₁NO₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			5	3	1	1		
3	B	1	Total	C	N	O	0	0
			13	10	1	2		

- Molecule 4 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	2	Total 2	Cl 2	0	0

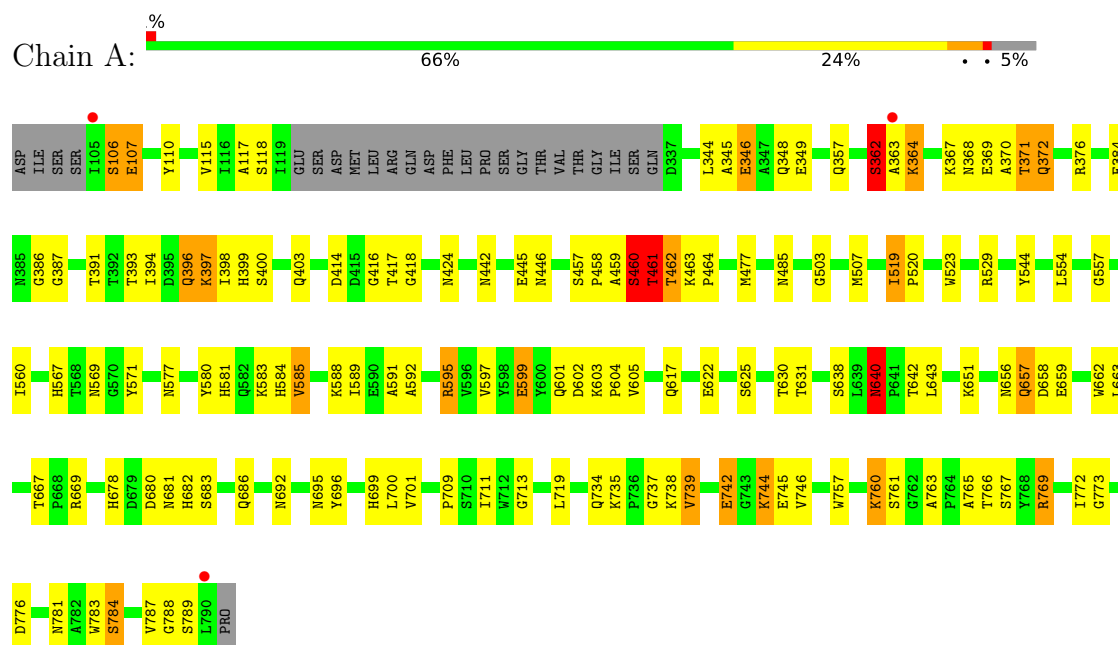
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	116	Total 116	O 116	0	0
5	B	134	Total 134	O 134	0	0

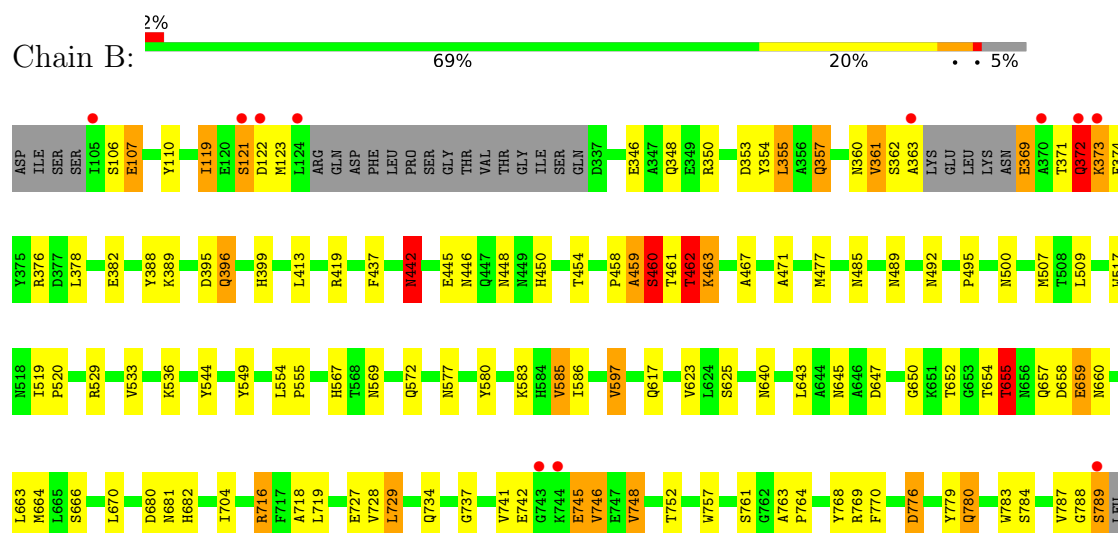
3 Residue-property plots

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: PENICILLIN-BINDING PROTEIN 1B



• Molecule 1: PENICILLIN-BINDING PROTEIN 1B



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4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	96.80Å 101.10Å 145.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	83.05 – 2.50 82.93 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.9 (83.05-2.50) 99.9 (82.93-2.50)	Depositor EDS
R_{merge}	0.22	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	7.24 (at 2.51Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.181 , 0.233 0.181 , 0.232	Depositor DCC
R_{free} test set	2481 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	33.2	Xtriage
Anisotropy	0.248	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 40.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.43$, $\langle L^2 \rangle = 0.26$	Xtriage
Estimated twinning fraction	0.038 for k,h,-l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	7547	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.28% 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: S2D, CL, SO4

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	1.45	13/3730 (0.3%)	1.40	35/5063 (0.7%)
1	B	1.59	16/3682 (0.4%)	1.58	31/5001 (0.6%)
All	All	1.52	29/7412 (0.4%)	1.49	66/10064 (0.7%)

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	A	1	3
1	B	1	5
All	All	2	8

All (29) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	445	GLU	CD-OE1	36.58	1.94	1.25
1	A	742	GLU	CD-OE2	22.36	1.67	1.25
1	A	460	SER	C-O	16.54	1.43	1.24
1	B	729	LEU	CB-CG	14.24	1.81	1.53
1	B	460	SER	C-O	13.81	1.41	1.24
1	A	397	LYS	CD-CE	-12.67	1.14	1.52
1	B	729	LEU	CG-CD2	-10.99	1.16	1.52
1	A	460	SER	C-N	-9.10	1.21	1.33
1	B	122	ASP	N-CA	7.75	1.56	1.46
1	B	467	ALA	N-CA	-6.74	1.40	1.46
1	B	121	SER	N-CA	6.71	1.54	1.46
1	A	346	GLU	CB-CG	6.55	1.72	1.52
1	B	459	ALA	C-O	-5.95	1.18	1.24
1	A	519	ILE	CA-CB	-5.85	1.51	1.54

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	586	ILE	CA-CB	5.85	1.61	1.54
1	A	418	GLY	C-O	5.71	1.29	1.24
1	A	651	LYS	C-O	5.63	1.30	1.23
1	B	396	GLN	CA-C	5.62	1.60	1.52
1	B	718	ALA	CA-CB	5.54	1.63	1.53
1	A	106	SER	N-CA	5.50	1.52	1.46
1	A	398	ILE	CA-C	5.47	1.59	1.52
1	A	346	GLU	CG-CD	5.42	1.65	1.52
1	B	625	SER	CA-C	-5.21	1.45	1.52
1	B	346	GLU	N-CA	5.21	1.52	1.46
1	A	667	THR	C-O	-5.19	1.19	1.24
1	B	647	ASP	CA-C	5.18	1.59	1.53
1	B	471	ALA	CA-CB	-5.03	1.45	1.53
1	B	460	SER	N-CA	-5.03	1.39	1.46
1	A	625	SER	C-O	-5.01	1.17	1.24

All (66) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	445	GLU	OE1-CD-OE2	-50.18	2.46	122.90
1	A	742	GLU	CG-CD-OE2	-15.87	81.89	118.40
1	B	460	SER	O-C-N	-13.95	104.03	122.59
1	A	460	SER	O-C-N	-13.43	106.67	122.11
1	A	460	SER	CA-C-N	11.29	143.09	121.54
1	A	460	SER	C-N-CA	11.29	143.09	121.54
1	B	460	SER	CB-CA-C	9.39	129.10	110.42
1	B	374	PHE	N-CA-C	-8.68	101.94	112.62
1	A	503	GLY	N-CA-C	8.23	122.23	111.70
1	B	460	SER	CA-C-N	7.97	135.81	120.99
1	B	460	SER	C-N-CA	7.97	135.81	120.99
1	B	123	MET	N-CA-C	7.60	121.21	108.13
1	A	107	GLU	N-CA-C	7.28	120.52	109.23
1	A	683	SER	N-CA-C	7.25	120.47	110.24
1	A	692	ASN	N-CA-C	7.22	119.83	111.02
1	B	459	ALA	CB-CA-C	-7.18	108.28	116.54
1	A	640	ASN	CA-C-N	7.02	126.85	119.05
1	A	640	ASN	C-N-CA	7.02	126.85	119.05
1	A	460	SER	N-CA-CB	6.91	121.04	109.78
1	B	463	LYS	CA-C-N	-6.85	111.93	119.19
1	B	463	LYS	C-N-CA	-6.85	111.93	119.19
1	A	711	ILE	N-CA-C	6.84	117.63	110.72
1	B	372	GLN	N-CA-CB	6.80	122.06	110.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	500	ASN	N-CA-C	6.75	121.12	113.02
1	B	704	ILE	N-CA-C	-6.70	103.95	110.72
1	A	117	ALA	N-CA-C	6.21	116.64	107.88
1	B	107	GLU	N-CA-C	6.16	119.17	108.76
1	A	700	LEU	N-CA-C	-6.10	104.71	111.36
1	B	776	ASP	N-CA-C	6.09	118.70	111.33
1	B	746	VAL	N-CA-C	6.07	117.10	108.42
1	B	462	THR	N-CA-C	6.06	118.85	111.82
1	B	780	GLN	CB-CA-C	6.00	120.29	110.88
1	A	761	SER	N-CA-C	5.99	120.28	112.92
1	A	346	GLU	N-CA-CB	5.97	118.67	110.01
1	B	348	GLN	N-CA-C	5.95	117.77	111.28
1	A	362	SER	N-CA-C	5.93	123.43	110.80
1	B	396	GLN	N-CA-C	5.77	118.31	111.33
1	A	739	VAL	N-CA-C	5.69	116.32	108.12
1	A	394	ILE	N-CA-C	5.69	116.42	109.30
1	B	623	VAL	N-CA-C	-5.69	104.82	110.62
1	A	554	LEU	CA-C-N	-5.67	113.98	119.87
1	A	554	LEU	C-N-CA	-5.67	113.98	119.87
1	A	387	GLY	N-CA-C	-5.64	99.81	113.18
1	B	745	GLU	N-CA-C	5.52	117.82	110.53
1	B	652	THR	CB-CA-C	-5.48	100.96	110.45
1	A	638	SER	N-CA-C	5.47	118.17	111.82
1	A	460	SER	N-CA-C	5.46	120.38	111.37
1	A	416	GLY	N-CA-C	-5.45	107.25	115.32
1	B	533	VAL	N-CA-C	5.39	116.64	109.37
1	B	670	LEU	N-CA-C	5.31	118.23	109.85
1	A	580	TYR	N-CA-C	5.29	118.56	110.20
1	B	119	ILE	N-CA-C	5.27	115.54	108.17
1	B	655	THR	N-CA-CB	-5.27	102.83	110.36
1	A	737	GLY	N-CA-C	5.22	117.89	110.74
1	A	414	ASP	N-CA-C	-5.20	103.17	110.50
1	A	709	PRO	CA-C-N	-5.17	111.49	121.58
1	A	709	PRO	C-N-CA	-5.17	111.49	121.58
1	A	783	TRP	N-CA-C	5.12	116.87	111.28
1	A	605	VAL	N-CA-C	5.12	115.27	108.11
1	A	631	THR	N-CA-C	-5.10	106.65	112.92
1	A	776	ASP	N-CA-C	-5.09	105.81	111.36
1	A	418	GLY	N-CA-C	-5.07	105.08	112.17
1	B	372	GLN	CA-C-O	-5.05	112.22	120.80
1	B	477	MET	CA-C-N	5.03	126.05	121.82
1	B	477	MET	C-N-CA	5.03	126.05	121.82

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	585	VAL	N-CA-CB	-5.02	105.42	112.35

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	A	460	SER	CA
1	B	460	SER	CA

All (8) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	362	SER	Peptide
1	A	460	SER	Mainchain
1	A	742	GLU	Sidechain
1	B	361	VAL	Peptide
1	B	372	GLN	Peptide
1	B	460	SER	Mainchain
1	B	666	SER	Peptide

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	3657	0	3505	95	0
1	B	3610	0	3448	91	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
3	A	5	0	4	1	0
3	B	13	0	10	1	0
4	A	2	0	0	0	0
5	A	116	0	0	2	0
5	B	134	0	0	3	0
All	All	7547	0	6967	186	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 13.

All (186) 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:461:THR:CG2	1:A:567:HIS:HE1	1.41	1.32
1:B:460:SER:CB	1:B:463:LYS:HE3	1.78	1.13
1:A:461:THR:CG2	1:A:567:HIS:CE1	2.32	1.12
1:A:461:THR:HG23	1:A:567:HIS:HE1	1.16	1.04
1:B:373[A]:LYS:HD3	1:B:376:ARG:HH11	1.25	1.01
1:B:372:GLN:HB3	1:B:373[A]:LYS:HB2	1.44	0.98
1:B:460:SER:HB2	1:B:463:LYS:HE3	1.40	0.98
1:A:461:THR:HG23	1:A:567:HIS:CE1	1.98	0.96
1:B:460:SER:HB3	1:B:463:LYS:HE3	1.49	0.91
1:B:729:LEU:CD1	1:B:729:LEU:CB	2.50	0.90
1:A:769:ARG:HG3	1:A:769:ARG:HH11	1.36	0.88
1:A:459:ALA:O	1:A:462:THR:HG23	1.76	0.86
1:B:459:ALA:O	1:B:462:THR:HG23	1.79	0.82
1:B:373[A]:LYS:HD3	1:B:376:ARG:NH1	1.95	0.81
1:A:659:GLU:HG3	1:A:681[B]:ASN:HD21	1.46	0.81
1:A:680:ASP:OD1	1:A:682:HIS:HD2	1.61	0.81
1:A:461:THR:HG22	1:A:567:HIS:HE1	1.43	0.80
1:A:659:GLU:HG3	1:A:681[B]:ASN:ND2	1.98	0.78
1:A:760:LYS:HD3	1:A:760:LYS:H	1.48	0.78
1:B:659:GLU:OE1	1:B:659:GLU:N	2.17	0.76
1:A:656[A]:ASN:O	1:A:659:GLU:OE2	2.03	0.75
1:A:110:TYR:CE2	1:A:396:GLN:HG3	2.22	0.75
1:A:458:PRO:HB2	1:A:461:THR:HG22	1.68	0.75
1:B:372:GLN:HB3	1:B:373[A]:LYS:CB	2.17	0.75
1:A:368:ASN:HD22	1:A:371:THR:H	1.33	0.74
1:B:729:LEU:CB	1:B:729:LEU:CD2	2.66	0.74
1:A:345:ALA:O	1:A:349[B]:GLU:HG2	1.89	0.72
1:B:485:ASN:HD22	1:B:520:PRO:HD3	1.53	0.72
1:A:460:SER:HB3	1:A:463:LYS:HE3	1.71	0.71
1:A:458:PRO:HG2	1:A:462:THR:HG22	1.71	0.70
1:A:734:GLN:HE21	1:A:766:THR:HA	1.56	0.69
1:B:460:SER:HB2	1:B:463:LYS:CE	2.19	0.69
1:A:110:TYR:CZ	1:A:396:GLN:HG3	2.27	0.69
1:B:371:THR:HA	1:B:373[B]:LYS:HB3	1.74	0.69
1:A:640:ASN:C	1:A:640:ASN:HD22	2.02	0.68
1:B:369:GLU:O	1:B:372:GLN:HB2	1.93	0.68
1:B:787:VAL:O	1:B:789:SER:N	2.22	0.67
1:B:461:THR:OG1	1:B:567:HIS:HE1	1.78	0.67
1:B:373[A]:LYS:CD	1:B:376:ARG:HH11	2.04	0.66
1:A:458:PRO:O	1:A:461:THR:HB	1.96	0.66
1:A:460:SER:CB	3:A:1792:S2D:C1	2.72	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:640:ASN:ND2	1:A:643:LEU:H	1.95	0.65
1:A:485:ASN:HB3	1:A:507:MET:HE3	1.78	0.64
1:A:529:ARG:NH2	5:A:2042:HOH:O	2.30	0.64
1:A:417:THR:OG1	1:A:678:HIS:HE1	1.79	0.64
1:B:654:THR:OG1	3:B:1791:S2D:C32	2.46	0.64
1:B:680:ASP:OD1	1:B:682:HIS:HD2	1.80	0.64
1:B:544:TYR:OH	1:B:567:HIS:HD2	1.81	0.63
1:A:485:ASN:HD22	1:A:519:ILE:HB	1.63	0.63
1:B:787:VAL:C	1:B:789:SER:H	2.06	0.63
1:B:371:THR:HG23	1:B:373[B]:LYS:HG3	1.79	0.63
1:A:659:GLU:OE2	1:A:659:GLU:N	2.31	0.62
1:B:459:ALA:O	1:B:462:THR:CG2	2.47	0.62
1:A:577:ASN:ND2	1:A:617:GLN:HE22	1.98	0.62
1:A:417:THR:O	1:A:682:HIS:HE1	1.83	0.61
1:A:372:GLN:HE21	1:A:376:ARG:HH22	1.47	0.61
1:B:372:GLN:HB3	1:B:373[B]:LYS:HB3	1.83	0.61
1:A:588:LYS:HG3	1:A:599:GLU:HB2	1.82	0.61
1:B:657:GLN:C	1:B:659:GLU:OE1	2.44	0.61
1:B:372:GLN:CB	1:B:373[A]:LYS:HB2	2.26	0.61
1:A:680:ASP:OD1	1:A:682:HIS:CD2	2.50	0.60
1:B:645:ASN:O	1:B:716:ARG:NH2	2.34	0.60
1:B:734:GLN:HG2	1:B:764:PRO:HG2	1.83	0.60
1:B:577:ASN:HD22	1:B:617:GLN:HE22	1.51	0.59
1:B:399:HIS:CD2	1:B:437:PHE:H	2.21	0.58
1:A:656[A]:ASN:O	1:A:657:GLN:HB2	2.02	0.58
1:A:459:ALA:O	1:A:462:THR:CG2	2.50	0.58
1:A:544:TYR:OH	1:A:567:HIS:HD2	1.86	0.58
1:B:529:ARG:NH2	5:B:2044:HOH:O	2.35	0.58
1:B:768:TYR:CE2	1:B:783:TRP:CD1	2.92	0.57
1:A:458:PRO:HG2	1:A:462:THR:CG2	2.35	0.57
1:A:744:LYS:HD3	1:A:744:LYS:H	1.69	0.57
1:A:460:SER:HB3	1:A:463:LYS:CE	2.34	0.57
1:B:655:THR:HG22	1:B:659:GLU:OE1	2.05	0.57
1:A:769:ARG:HH11	1:A:769:ARG:CG	2.13	0.57
1:A:368:ASN:ND2	1:A:371:THR:HG23	2.20	0.56
1:A:577:ASN:HD22	1:A:617:GLN:HE22	1.51	0.56
1:A:744:LYS:H	1:A:744:LYS:CD	2.18	0.56
1:B:569:ASN:ND2	1:B:583:LYS:H	2.03	0.56
1:B:650:GLY:HA2	1:B:664:MET:O	2.06	0.56
1:A:461:THR:HG22	1:A:567:HIS:CE1	2.23	0.56
1:B:657:GLN:HB2	1:B:659:GLU:CD	2.30	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:507:MET:HE1	1:B:517:TRP:NE1	2.22	0.55
1:B:577:ASN:ND2	1:B:617:GLN:HE22	2.05	0.55
1:A:346:GLU:HB2	5:A:2003:HOH:O	2.05	0.55
1:B:458:PRO:HG2	1:B:462:THR:HG22	1.88	0.55
1:B:787:VAL:C	1:B:789:SER:N	2.64	0.54
1:B:741:VAL:HG12	1:B:742:GLU:HG2	1.88	0.54
1:B:507:MET:HE1	1:B:517:TRP:CD1	2.43	0.54
1:A:461:THR:HG21	1:A:567:HIS:CE1	2.37	0.54
1:A:368:ASN:ND2	1:A:371:THR:H	2.05	0.53
1:A:393:THR:OG1	1:A:585:VAL:HA	2.08	0.53
1:B:399:HIS:HD2	1:B:437:PHE:H	1.56	0.53
1:B:554:LEU:N	1:B:555:PRO:HD2	2.24	0.53
1:A:372:GLN:NE2	1:A:376:ARG:HH22	2.06	0.52
1:B:729:LEU:CD1	1:B:729:LEU:HB2	2.39	0.52
1:A:458:PRO:HA	1:A:662:TRP:NE1	2.25	0.52
1:A:569:ASN:ND2	1:A:583:LYS:H	2.07	0.52
1:B:363:ALA:C	1:B:369:GLU:HG3	2.35	0.52
1:A:372:GLN:HE21	1:A:376:ARG:NH2	2.07	0.51
1:A:757:TRP:NE1	1:A:763:ALA:HB2	2.25	0.51
1:B:680:ASP:OD1	1:B:682:HIS:CD2	2.64	0.51
1:A:460:SER:CB	1:A:463:LYS:HE3	2.37	0.51
1:B:363:ALA:C	1:B:369:GLU:CG	2.84	0.50
1:A:368:ASN:HD21	1:A:370:ALA:HB3	1.76	0.50
1:A:591:ALA:HB3	1:A:595:ARG:HD3	1.92	0.50
1:A:734:GLN:NE2	1:A:766:THR:HA	2.25	0.50
1:B:569:ASN:HD21	1:B:583:LYS:H	1.57	0.50
1:B:372:GLN:HB3	1:B:373[B]:LYS:CB	2.41	0.50
1:A:760:LYS:H	1:A:760:LYS:CD	2.19	0.50
1:B:657:GLN:O	1:B:658:ASP:HB2	2.11	0.49
1:A:372:GLN:NE2	1:A:376:ARG:NH2	2.61	0.49
1:A:781:ASN:O	1:A:784:SER:HB2	2.13	0.49
1:B:655:THR:HG21	1:B:660:ASN:HD22	1.78	0.49
1:A:544:TYR:OH	1:A:567:HIS:CD2	2.65	0.49
1:B:544:TYR:OH	1:B:567:HIS:CD2	2.64	0.49
1:A:739:VAL:HG21	1:A:766:THR:HG22	1.94	0.49
1:B:734:GLN:NE2	1:B:770:PHE:HB2	2.27	0.49
1:B:737:GLY:O	1:B:748:VAL:HG23	2.12	0.49
1:A:364:LYS:HA	1:A:367:LYS:HG3	1.94	0.48
1:A:589:ILE:HB	1:A:597:VAL:HG23	1.95	0.48
1:B:485:ASN:ND2	1:B:520:PRO:HD3	2.25	0.48
1:B:536:LYS:HD3	1:B:549:TYR:CE1	2.48	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:757:TRP:NE1	1:B:763:ALA:HB2	2.29	0.48
1:B:779:TYR:O	1:B:783:TRP:HB2	2.14	0.48
1:A:485:ASN:HD22	1:A:520:PRO:HD3	1.77	0.47
1:A:735:LYS:HB2	1:A:765:ALA:HA	1.96	0.47
1:A:460:SER:CB	1:A:463:LYS:CE	2.93	0.47
1:A:602:ASP:OD2	1:A:604:PRO:HD3	2.15	0.47
1:A:417:THR:OG1	1:A:678:HIS:CE1	2.64	0.47
1:B:460:SER:CB	1:B:463:LYS:CE	2.71	0.47
1:B:450:HIS:HA	1:B:454:THR:OG1	2.14	0.47
1:A:787:VAL:C	1:A:789:SER:H	2.23	0.46
1:B:640:ASN:C	1:B:640:ASN:HD22	2.24	0.46
1:A:669:ARG:HD2	1:A:713:GLY:HA3	1.97	0.46
1:A:569:ASN:HD21	1:A:583:LYS:H	1.64	0.46
1:B:655:THR:HG22	1:B:659:GLU:H	1.80	0.46
1:A:446:ASN:C	1:A:446:ASN:OD1	2.59	0.46
1:A:640:ASN:C	1:A:640:ASN:ND2	2.70	0.45
1:A:583:LYS:O	1:A:584:HIS:HB3	2.17	0.45
1:B:110:TYR:CG	1:B:396:GLN:HB2	2.52	0.45
1:A:462:THR:HG21	1:A:557:GLY:HA2	1.99	0.45
1:A:399:HIS:O	1:A:403:GLN:HG2	2.17	0.44
1:B:110:TYR:CD1	1:B:396:GLN:HB2	2.53	0.44
1:B:519:ILE:HG13	5:B:2026:HOH:O	2.17	0.44
1:B:680:ASP:O	1:B:681:ASN:HB2	2.17	0.44
1:B:716:ARG:HD3	5:B:2116:HOH:O	2.18	0.43
1:B:382:GLU:HG3	1:B:388:TYR:CE2	2.53	0.43
1:B:458:PRO:HG2	1:B:462:THR:CG2	2.49	0.43
1:B:354:TYR:CZ	1:B:597:VAL:HG22	2.53	0.43
1:A:463:LYS:HB2	1:A:464:PRO:HD3	1.99	0.43
1:B:372:GLN:HB3	1:B:373[A]:LYS:CG	2.48	0.43
1:A:523:TRP:CG	1:A:773:GLY:HA3	2.53	0.43
1:A:369:GLU:HA	1:A:372:GLN:HB2	2.01	0.42
1:B:355:LEU:HD12	1:B:355:LEU:HA	1.88	0.42
1:A:477:MET:HE2	1:A:772:ILE:HG13	2.01	0.42
1:A:485:ASN:ND2	1:A:519:ILE:HB	2.32	0.42
1:B:399:HIS:HD2	1:B:437:PHE:N	2.17	0.42
1:B:446:ASN:OD1	1:B:448:ASN:N	2.49	0.42
1:A:769:ARG:HG3	1:A:769:ARG:NH1	2.16	0.42
1:A:442:ASN:HD22	1:A:442:ASN:C	2.28	0.42
1:A:457:SER:HA	1:A:560:ILE:O	2.20	0.42
1:A:371:THR:O	1:A:372:GLN:C	2.63	0.41
1:B:769:ARG:NH2	1:B:776:ASP:OD1	2.53	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:581:HIS:CE1	1:A:604:PRO:HB3	2.55	0.41
1:B:372:GLN:HB3	1:B:373[A]:LYS:HG2	2.01	0.41
1:A:640:ASN:HD21	1:A:642:THR:HB	1.84	0.41
1:B:769:ARG:HA	1:B:779:TYR:CE1	2.55	0.41
1:A:657:GLN:O	1:A:658:ASP:HB2	2.19	0.41
1:B:442:ASN:C	1:B:442:ASN:HD22	2.28	0.41
1:A:424:ASN:ND2	1:A:696:TYR:OH	2.53	0.41
1:B:640:ASN:ND2	1:B:643:LEU:H	2.19	0.41
1:B:350:ARG:HA	1:B:350:ARG:HD3	1.89	0.41
1:B:519:ILE:HB	1:B:520:PRO:HD3	2.03	0.41
1:B:728:VAL:O	1:B:752:THR:HB	2.21	0.41
1:A:344:LEU:O	1:A:348:GLN:HG3	2.20	0.41
1:B:572:GLN:HE22	1:B:580:TYR:HA	1.86	0.41
1:A:464:PRO:HG2	1:A:571:TYR:OH	2.21	0.40
1:A:460:SER:C	1:A:462:THR:N	2.80	0.40
1:A:695:ASN:O	1:A:699:HIS:HD2	2.04	0.40
1:B:363:ALA:C	1:B:369:GLU:CD	2.89	0.40
1:B:492:ASN:C	1:B:492:ASN:OD1	2.64	0.40
1:B:353:ASP:O	1:B:357:GLN:HB2	2.21	0.40
1:B:650:GLY:CA	1:B:664:MET:O	2.69	0.40
1:B:489:ASN:OD1	1:B:495:PRO:HA	2.21	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	470/494 (95%)	438 (93%)	25 (5%)	7 (2%)	8	16
1	B	464/494 (94%)	433 (93%)	26 (6%)	5 (1%)	11	22
All	All	934/988 (94%)	871 (93%)	51 (6%)	12 (1%)	9	18

All (12) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	461	THR
1	B	121	SER
1	B	372	GLN
1	B	788	GLY
1	A	363	ALA
1	A	657	GLN
1	B	442	ASN
1	A	362	SER
1	A	592	ALA
1	A	386	GLY
1	B	362	SER
1	A	788	GLY

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	389/409 (95%)	353 (91%)	36 (9%)	8	18
1	B	384/409 (94%)	350 (91%)	34 (9%)	9	20
All	All	773/818 (94%)	703 (91%)	70 (9%)	9	19

All (70) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	106	SER
1	A	107	GLU
1	A	115	VAL
1	A	118	SER
1	A	357	GLN
1	A	364	LYS
1	A	371	THR
1	A	372	GLN
1	A	384	GLU
1	A	391	THR
1	A	396	GLN

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Mol	Chain	Res	Type
1	A	397	LYS
1	A	400	SER
1	A	445	GLU
1	A	461	THR
1	A	462	THR
1	A	585	VAL
1	A	595	ARG
1	A	599	GLU
1	A	601	GLN
1	A	603	LYS
1	A	622	GLU
1	A	630	THR
1	A	640	ASN
1	A	663	LEU
1	A	686	GLN
1	A	701	VAL
1	A	719	LEU
1	A	738	LYS
1	A	744	LYS
1	A	745	GLU
1	A	746	VAL
1	A	760	LYS
1	A	767	SER
1	A	769	ARG
1	A	784	SER
1	B	106	SER
1	B	107	GLU
1	B	119	ILE
1	B	355	LEU
1	B	357	GLN
1	B	360	ASN
1	B	361	VAL
1	B	369	GLU
1	B	372	GLN
1	B	373[A]	LYS
1	B	373[B]	LYS
1	B	378	LEU
1	B	389	LYS
1	B	395	ASP
1	B	413	LEU
1	B	419	ARG
1	B	442	ASN

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Mol	Chain	Res	Type
1	B	462	THR
1	B	509	LEU
1	B	585	VAL
1	B	597	VAL
1	B	655	THR
1	B	659	GLU
1	B	663	LEU
1	B	716	ARG
1	B	719	LEU
1	B	727	GLU
1	B	745	GLU
1	B	746	VAL
1	B	748	VAL
1	B	761	SER
1	B	780	GLN
1	B	784	SER
1	B	789	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (44) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	348	GLN
1	A	368	ASN
1	A	372	GLN
1	A	399	HIS
1	A	403	GLN
1	A	424	ASN
1	A	442	ASN
1	A	485	ASN
1	A	494	ASN
1	A	531	ASN
1	A	567	HIS
1	A	569	ASN
1	A	572	GLN
1	A	577	ASN
1	A	606	GLN
1	A	640	ASN
1	A	657	GLN
1	A	678	HIS
1	A	682	HIS
1	A	686	GLN
1	A	695	ASN

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Mol	Chain	Res	Type
1	A	699	HIS
1	A	705	GLN
1	A	734	GLN
1	B	348	GLN
1	B	357	GLN
1	B	360	ASN
1	B	399	HIS
1	B	403	GLN
1	B	442	ASN
1	B	447	GLN
1	B	485	ASN
1	B	494	ASN
1	B	531	ASN
1	B	567	HIS
1	B	569	ASN
1	B	572	GLN
1	B	577	ASN
1	B	640	ASN
1	B	678	HIS
1	B	682	HIS
1	B	686	GLN
1	B	687	GLN
1	B	734	GLN

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 ⓘ

Of 6 ligands modelled in this entry, 2 are monoatomic - leaving 4 for Mogul analysis.

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	$\# Z > 2$
3	S2D	B	1791	1	12,13,14	2.47	6 (50%)	14,16,18	3.86	3 (21%)
2	SO4	B	1790	-	4,4,4	0.48	0	6,6,6	1.14	0
3	S2D	A	1792	1	3,4,14	1.69	1 (33%)	2,4,18	2.13	1 (50%)
2	SO4	A	1791	-	4,4,4	0.34	0	6,6,6	0.40	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	S2D	B	1791	1	-	4/9/10/12	0/1/1/1
3	S2D	A	1792	1	-	1/1/2/12	-

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	1791	S2D	C2-N1	5.40	1.52	1.46
3	B	1791	S2D	C4-N1	2.95	1.41	1.34
3	B	1791	S2D	C32-C27	2.73	1.43	1.39
3	B	1791	S2D	C3-C2	2.41	1.58	1.51
3	B	1791	S2D	C27-C4	2.21	1.55	1.50
3	B	1791	S2D	O1-C1	2.17	1.28	1.20
3	A	1792	S2D	O1-C1	2.16	1.28	1.20

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1791	S2D	C2-N1-C4	9.95	141.60	122.38
3	B	1791	S2D	C3-C2-N1	9.15	120.01	109.68
3	B	1791	S2D	O2-C4-C27	-3.48	114.01	120.90
3	A	1792	S2D	C3-C2-N1	2.88	120.02	110.02

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1792	S2D	O1-C1-C2-C3
3	B	1791	S2D	C27-C4-N1-C2
3	B	1791	S2D	C1-C2-N1-C4
3	B	1791	S2D	O1-C1-C2-C3
3	B	1791	S2D	O2-C4-N1-C2

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	1791	S2D	1	0
3	A	1792	S2D	1	0

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	469/494 (94%)	-0.48	3 (0%) 85 83	15, 30, 59, 74	9 (1%)
1	B	468/494 (94%)	-0.49	11 (2%) 59 55	11, 27, 61, 79	5 (1%)
All	All	937/988 (94%)	-0.48	14 (1%) 72 68	11, 29, 60, 79	14 (1%)

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	124	LEU	6.5
1	A	105	ILE	6.4
1	B	373[A]	LYS	4.7
1	B	363	ALA	4.3
1	B	105	ILE	3.8
1	B	121	SER	3.4
1	B	122	ASP	3.2
1	B	789	SER	3.2
1	B	370	ALA	3.0
1	B	743	GLY	2.4
1	B	744	LYS	2.3
1	B	372	GLN	2.1
1	A	363	ALA	2.1
1	A	790	LEU	2.0

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($\text{\AA}^2$)	Q<0.9
3	S2D	A	1792	5/14	0.61	0.27	33,39,45,47	0
3	S2D	B	1791	13/14	0.82	0.25	33,43,46,47	6
4	CL	A	1794	1/1	0.98	0.15	46,46,46,46	0
4	CL	A	1793	1/1	0.99	0.02	21,21,21,21	0
2	SO4	A	1791	5/5	0.99	0.03	26,28,31,31	0
2	SO4	B	1790	5/5	1.00	0.03	18,20,20,22	0

6.5 Other polymers [i](#)

There are no such residues in this entry.