



Full wwPDB X-ray Structure Validation Report ⓘ

Dec 16, 2023 – 08:46 am GMT

PDB ID : 3ZVW
Title : Unexpected tricovalent binding mode of boronic acids within the active site of a penicillin binding protein
Authors : Sauvage, E.; Zervosen, A.; Herman, R.; Kerff, F.; Rocaboy, M.; Charlier, P.
Deposited on : 2011-07-28
Resolution : 2.00 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 : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

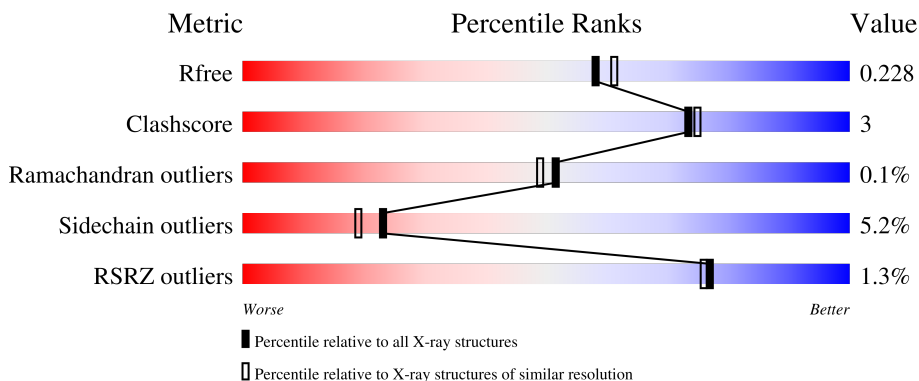
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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}	130704	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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	466	 2% 92% 7% .
1	B	466	 % 92% 7% .
1	C	466	 % 92% 7% .
1	D	466	 % 91% 8% .

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
6	33D	B	620	-	-	X	-

2 Entry composition [i](#)

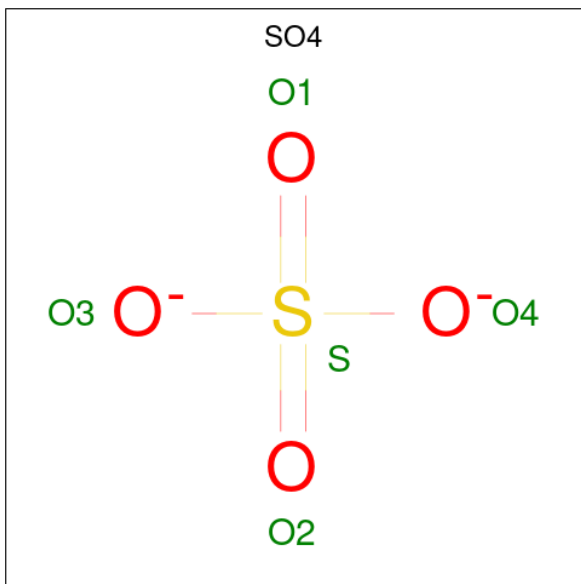
There are 8 unique types of molecules in this entry. The entry contains 15510 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	466	Total 3353	C 2076	N 564	O 707	S 6	0	0	0
1	B	466	Total 3344	C 2071	N 564	O 703	S 6	0	0	1
1	C	466	Total 3344	C 2071	N 564	O 703	S 6	0	0	1
1	D	466	Total 3353	C 2076	N 564	O 707	S 6	0	0	0

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



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

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

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

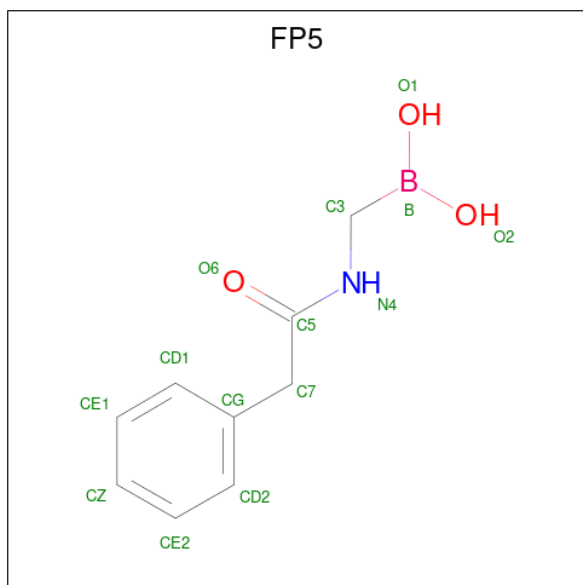
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	3	Total Mg 3 3	0	0
3	B	3	Total Mg 3 3	0	0
3	C	5	Total Mg 5 5	0	0

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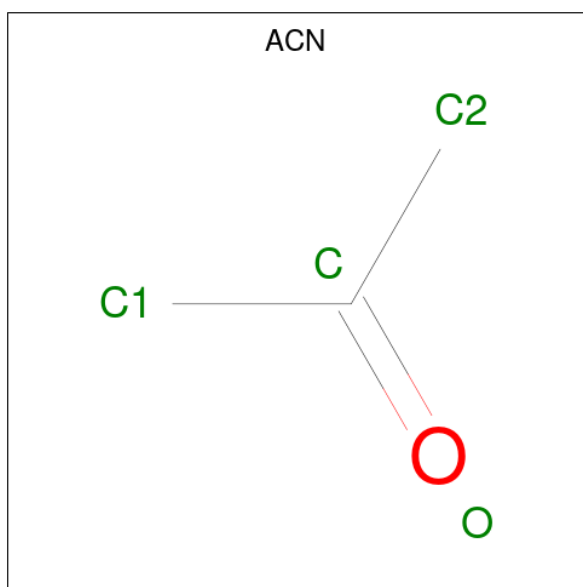
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	D	3	Total Mg 3 3	0	0

- Molecule 4 is PHENYLACETAMIDOMETHYL BORONIC ACID (three-letter code: FP5) (formula: $C_9H_{12}BNO_3$).



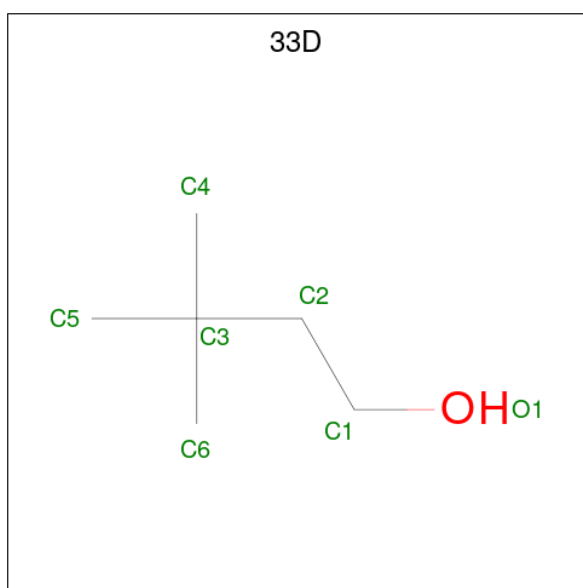
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total B C N O 12 1 9 1 1	0	0
4	C	1	Total B C N O 12 1 9 1 1	0	0

- Molecule 5 is ACETONE (three-letter code: ACN) (formula: C_3H_6O).



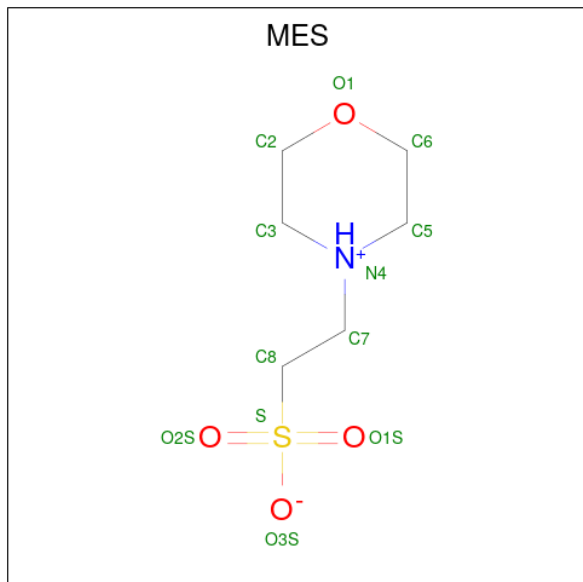
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total	C	O	0	0
			4	3	1		
5	C	1	Total	C	O	0	0
			4	3	1		

- Molecule 6 is 3,3-DIMETHYLBUTAN-1-OL (three-letter code: 33D) (formula: $C_6H_{14}O$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	B	1	Total	C	O	0	0
			7	6	1		
6	C	1	Total	C	O	0	0
			7	6	1		

- Molecule 7 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula: C₆H₁₃NO₄S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
7	D	1	12	6	1	4	1	0	0

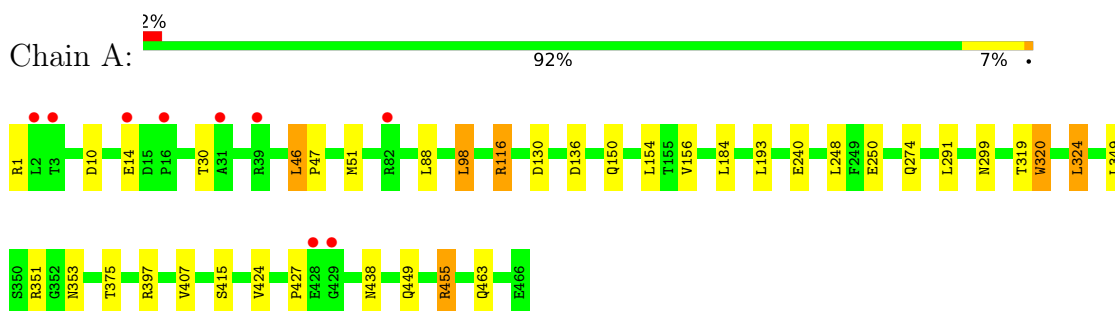
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	479	Total	O	0	0
			479	479		
8	B	481	Total	O	0	0
			481	481		
8	C	531	Total	O	0	0
			531	531		
8	D	463	Total	O	0	0
			463	463		

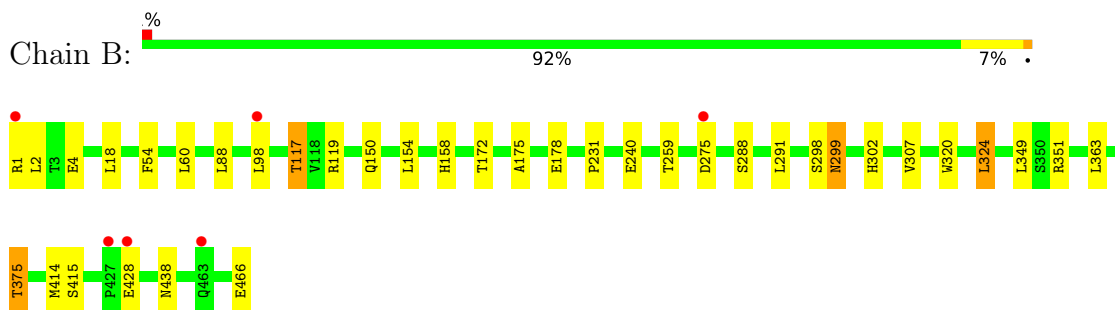
3 Residue-property plots

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.

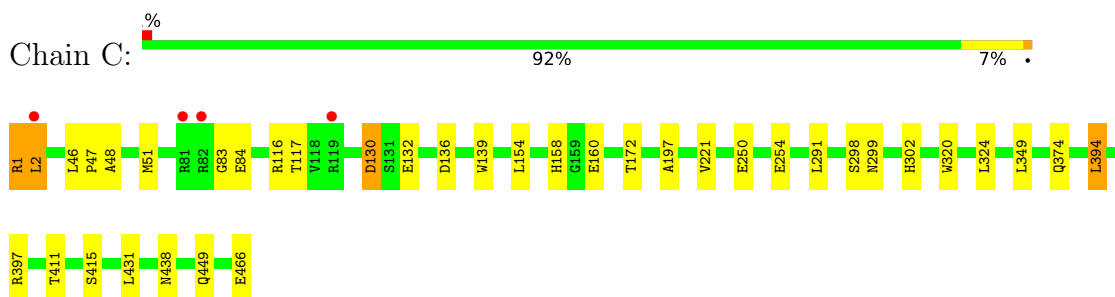
- Molecule 1: D-ALANYL-D-ALANINE CARBOXYPEPTIDASE



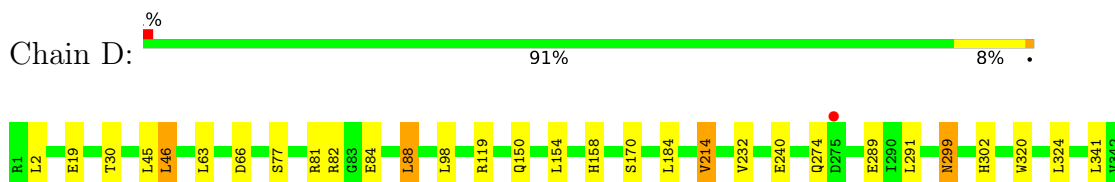
- Molecule 1: D-ALANYL-D-ALANINE CARBOXYPEPTIDASE

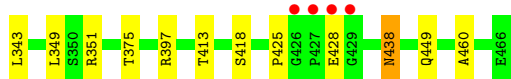


- Molecule 1: D-ALANYL-D-ALANINE CARBOXYPEPTIDASE



- Molecule 1: D-ALANYL-D-ALANINE CARBOXYPEPTIDASE





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	103.75Å 91.36Å 107.33Å 90.00° 94.63° 90.00°	Depositor
Resolution (Å)	34.59 – 2.00 34.58 – 2.00	Depositor EDS
% Data completeness (in resolution range)	99.4 (34.59-2.00) 99.4 (34.58-2.00)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.24 (at 2.00Å)	Xtrriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.179 , 0.227 0.181 , 0.228	Depositor DCC
R_{free} test set	6744 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	23.4	Xtrriage
Anisotropy	0.152	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 48.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.017 for l,-k,h	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	15510	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.81% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MG, 33D, SO4, FP5, MES, ACN

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	0.48	0/3412	0.61	2/4666 (0.0%)
1	B	0.49	0/3403	0.61	1/4656 (0.0%)
1	C	0.52	0/3403	0.62	0/4656
1	D	0.52	0/3412	0.64	3/4666 (0.1%)
All	All	0.50	0/13630	0.62	6/18644 (0.0%)

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	46	LEU	CA-CB-CG	5.75	128.53	115.30
1	D	351	ARG	NE-CZ-NH2	-5.67	117.47	120.30
1	A	98	LEU	CA-CB-CG	5.43	127.78	115.30
1	D	88	LEU	CA-CB-CG	5.23	127.33	115.30
1	B	351	ARG	NE-CZ-NH2	-5.11	117.75	120.30
1	A	46	LEU	CA-CB-CG	5.04	126.89	115.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	3353	0	3201	21	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	3344	0	3193	25	0
1	C	3344	0	3193	27	0
1	D	3353	0	3201	13	0
2	A	25	0	0	0	0
2	B	20	0	0	0	0
2	C	20	0	0	1	0
2	D	25	0	0	0	0
3	A	3	0	0	0	0
3	B	3	0	0	0	0
3	C	5	0	0	0	0
3	D	3	0	0	0	0
4	B	12	0	10	1	0
4	C	12	0	10	4	0
5	B	4	0	6	0	0
5	C	4	0	6	0	0
6	B	7	0	14	7	0
6	C	7	0	14	5	0
7	D	12	0	12	0	0
8	A	479	0	0	6	0
8	B	481	0	0	4	0
8	C	531	0	0	7	0
8	D	463	0	0	3	0
All	All	15510	0	12860	88	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 3.

All (88) 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:319:THR:HB	8:A:2385:HOH:O	0.97	1.14
1:C:1:ARG:HG2	1:C:2:LEU:H	1.27	0.99
6:B:620:33D:H41	1:C:415:SER:H	1.29	0.94
1:B:415:SER:H	6:C:620:33D:H41	1.35	0.92
1:A:319:THR:HG22	8:A:2386:HOH:O	1.78	0.84
1:D:413:THR:HG23	8:D:2434:HOH:O	1.81	0.79
1:B:288:SER:HB2	1:B:375:THR:HG21	1.66	0.77
1:A:136:ASP:OD2	8:A:2192:HOH:O	2.02	0.77
1:D:341:LEU:HD13	1:D:343:LEU:HD21	1.71	0.72
6:B:620:33D:HC4	1:C:415:SER:OG	1.89	0.72
1:A:150:GLN:HE22	1:A:240:GLU:H	1.38	0.70

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:351:ARG:NH2	1:A:415:SER:O	2.24	0.68
1:A:319:THR:HG21	8:A:2390:HOH:O	1.92	0.67
1:A:319:THR:CG2	8:A:2386:HOH:O	2.39	0.67
1:C:1:ARG:HG2	1:C:2:LEU:N	2.06	0.66
1:C:136:ASP:OD2	8:C:2227:HOH:O	2.14	0.64
1:C:83:GLY:HA3	1:C:116:ARG:HG3	1.79	0.64
1:C:172:THR:HG23	8:C:2294:HOH:O	1.99	0.62
1:D:84:GLU:OE2	1:D:119:ARG:HD2	2.00	0.61
1:D:150:GLN:HE22	1:D:240:GLU:H	1.46	0.60
1:A:150:GLN:NE2	1:A:240:GLU:H	2.01	0.59
1:B:117:THR:HG23	1:B:259:THR:HB	1.84	0.59
1:B:150:GLN:HE22	1:B:240:GLU:H	1.50	0.59
1:B:415:SER:HB3	6:C:620:33D:HC4	1.84	0.59
1:C:130:ASP:HB3	1:C:132:GLU:H	1.68	0.59
1:A:1:ARG:HH22	1:A:455:ARG:HH22	1.52	0.57
1:D:158:HIS:HD2	8:D:2237:HOH:O	1.87	0.56
1:D:150:GLN:NE2	1:D:240:GLU:H	2.04	0.56
1:B:466:GLU:N	8:B:2472:HOH:O	2.39	0.55
1:B:415:SER:CB	6:C:620:33D:HC4	2.37	0.55
6:B:620:33D:HC4	1:C:415:SER:CB	2.37	0.54
1:A:130:ASP:OD2	1:A:319:THR:HG23	2.08	0.54
1:C:84:GLU:HG2	1:C:117:THR:HB	1.90	0.54
1:A:320:TRP:O	1:A:324:LEU:HB2	2.08	0.53
1:B:299:ASN:ND2	1:B:302:HIS:H	2.06	0.53
1:C:1:ARG:CG	1:C:2:LEU:H	2.09	0.53
1:C:48:ALA:HB1	4:C:500:FP5:HE2	1.92	0.52
1:C:394:LEU:HD13	1:C:411:THR:CG2	2.40	0.52
1:B:1:ARG:HG2	1:B:4:GLU:HB2	1.93	0.51
1:D:45:LEU:HD22	1:D:438:ASN:HB2	1.93	0.51
6:B:620:33D:HC2	8:B:2480:HOH:O	2.11	0.51
1:C:397:ARG:HH22	1:C:449:GLN:HE21	1.57	0.51
1:A:1:ARG:HH22	1:A:455:ARG:NH2	2.09	0.50
1:C:47:PRO:HG3	1:C:51:MET:HE1	1.93	0.50
1:C:160:GLU:HG2	2:C:604:SO4:O2	2.13	0.49
1:D:428:GLU:HG3	1:D:460:ALA:C	2.33	0.49
1:B:299:ASN:HD22	1:B:302:HIS:H	1.60	0.48
1:B:298:SER:CB	4:B:500:FP5:C3	2.91	0.48
1:B:175:ALA:HB3	1:B:178:GLU:HG3	1.96	0.47
1:B:150:GLN:NE2	1:B:240:GLU:H	2.12	0.46
1:A:51:MET:CE	1:A:353:ASN:HB3	2.46	0.46
1:D:397:ARG:HH22	1:D:449:GLN:HE21	1.64	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:307:VAL:HG11	1:B:324:LEU:HD13	1.98	0.46
1:D:299:ASN:ND2	1:D:302:HIS:H	2.14	0.46
1:A:397:ARG:HH22	1:A:449:GLN:HE21	1.63	0.46
1:B:415:SER:OG	6:C:620:33D:HC4	2.16	0.46
1:D:413:THR:HG22	1:D:418:SER:OG	2.16	0.45
1:C:158:HIS:HD2	8:C:2270:HOH:O	1.99	0.45
1:C:158:HIS:HE1	8:C:2291:HOH:O	1.99	0.45
1:A:407:VAL:HG22	1:A:424:VAL:HG22	1.99	0.45
1:B:60:LEU:HD11	1:B:291:LEU:HD11	1.98	0.45
1:A:116:ARG:HD2	8:A:2039:HOH:O	2.17	0.45
1:B:158:HIS:HD2	8:B:2262:HOH:O	2.01	0.44
1:B:1:ARG:CG	1:B:4:GLU:H	2.31	0.44
1:A:51:MET:HE2	1:A:353:ASN:HB3	1.98	0.43
1:C:48:ALA:HB1	4:C:500:FP5:CE2	2.47	0.43
6:B:620:33D:HC3	1:C:139:TRP:HZ3	1.82	0.43
1:B:1:ARG:HG2	1:B:4:GLU:CB	2.48	0.43
1:B:414:MET:HB2	6:C:620:33D:C4	2.48	0.43
1:B:119:ARG:HD2	8:B:2135:HOH:O	2.18	0.43
1:C:47:PRO:HG3	1:C:51:MET:CE	2.49	0.43
1:A:47:PRO:HG3	1:A:51:MET:HE2	2.01	0.43
6:B:620:33D:HC4	1:C:415:SER:HB3	2.01	0.42
1:C:466:GLU:N	8:C:2520:HOH:O	2.53	0.42
1:D:214:VAL:HG13	8:D:2205:HOH:O	2.19	0.42
1:A:156:VAL:HG21	1:A:248:LEU:HD12	2.02	0.42
1:D:170:SER:HA	1:D:232:VAL:O	2.20	0.42
1:C:298:SER:CB	4:C:500:FP5:C3	2.97	0.41
1:A:184:LEU:HD11	1:A:193:LEU:HB2	2.02	0.41
1:B:54:PHE:CD1	1:B:363:LEU:HD22	2.55	0.41
1:B:172:THR:HG22	1:B:231:PRO:HB3	2.02	0.41
1:C:197:ALA:HB2	1:C:221:VAL:HG12	2.03	0.41
1:B:1:ARG:HG2	1:B:4:GLU:H	1.86	0.41
1:C:172:THR:HG21	8:C:2044:HOH:O	2.20	0.40
1:A:10:ASP:O	1:A:14:GLU:HG2	2.22	0.40
6:B:620:33D:HC3	1:C:139:TRP:CZ3	2.56	0.40
1:B:98:LEU:HD23	1:B:98:LEU:C	2.41	0.40
4:C:500:FP5:H72C	8:C:2486:HOH:O	2.21	0.40

There are no symmetry-related clashes.

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	464/466 (100%)	451 (97%)	13 (3%)	0	100	100
1	B	464/466 (100%)	452 (97%)	12 (3%)	0	100	100
1	C	464/466 (100%)	453 (98%)	10 (2%)	1 (0%)	47	44
1	D	464/466 (100%)	451 (97%)	12 (3%)	1 (0%)	47	44
All	All	1856/1864 (100%)	1807 (97%)	47 (2%)	2 (0%)	51	49

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	130	ASP
1	D	425	PRO

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	339/339 (100%)	321 (95%)	18 (5%)	22	18
1	B	338/339 (100%)	325 (96%)	13 (4%)	33	31
1	C	338/339 (100%)	322 (95%)	16 (5%)	26	22
1	D	339/339 (100%)	316 (93%)	23 (7%)	16	11
All	All	1354/1356 (100%)	1284 (95%)	70 (5%)	23	19

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

Mol	Chain	Res	Type
1	A	30	THR
1	A	46	LEU
1	A	88	LEU
1	A	98	LEU
1	A	116	ARG
1	A	154	LEU
1	A	250	GLU
1	A	274	GLN
1	A	291	LEU
1	A	299	ASN
1	A	320	TRP
1	A	324	LEU
1	A	349	LEU
1	A	375	THR
1	A	427	PRO
1	A	438	ASN
1	A	455	ARG
1	A	463	GLN
1	B	2	LEU
1	B	18	LEU
1	B	88	LEU
1	B	117	THR
1	B	154	LEU
1	B	275	ASP
1	B	299	ASN
1	B	320	TRP
1	B	324	LEU
1	B	349	LEU
1	B	375	THR
1	B	428	GLU
1	B	438	ASN
1	C	1	ARG
1	C	2	LEU
1	C	46	LEU
1	C	154	LEU
1	C	250	GLU
1	C	254	GLU
1	C	291	LEU
1	C	299	ASN
1	C	302	HIS
1	C	320	TRP
1	C	324	LEU
1	C	349	LEU

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Mol	Chain	Res	Type
1	C	374	GLN
1	C	394	LEU
1	C	431	LEU
1	C	438	ASN
1	D	2	LEU
1	D	19	GLU
1	D	30	THR
1	D	46	LEU
1	D	63	LEU
1	D	66	ASP
1	D	77	SER
1	D	81	ARG
1	D	82	ARG
1	D	88	LEU
1	D	98	LEU
1	D	154	LEU
1	D	184	LEU
1	D	214	VAL
1	D	274	GLN
1	D	289	GLU
1	D	291	LEU
1	D	299	ASN
1	D	320	TRP
1	D	324	LEU
1	D	349	LEU
1	D	375	THR
1	D	438	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (30) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	50	ASN
1	A	150	GLN
1	A	158	HIS
1	A	299	ASN
1	A	312	GLN
1	A	437	ASN
1	A	449	GLN
1	A	463	GLN
1	B	50	ASN
1	B	150	GLN
1	B	158	HIS

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Mol	Chain	Res	Type
1	B	299	ASN
1	B	302	HIS
1	B	396	ASN
1	B	437	ASN
1	B	449	GLN
1	B	463	GLN
1	C	50	ASN
1	C	158	HIS
1	C	299	ASN
1	C	366	GLN
1	C	437	ASN
1	C	449	GLN
1	D	44	GLN
1	D	50	ASN
1	D	150	GLN
1	D	158	HIS
1	D	299	ASN
1	D	437	ASN
1	D	449	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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 39 ligands modelled in this entry, 14 are monoatomic - leaving 25 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$
2	SO4	C	601	-	4,4,4	0.13	0	6,6,6	0.27	0
5	ACN	C	610	-	3,3,3	0.34	0	3,3,3	0.77	0
2	SO4	C	602	-	4,4,4	0.13	0	6,6,6	0.08	0
2	SO4	D	600	-	4,4,4	0.16	0	6,6,6	0.16	0
2	SO4	D	603	-	4,4,4	0.18	0	6,6,6	0.41	0
4	FP5	B	500	1	11,12,14	0.79	0	13,14,17	1.05	1 (7%)
7	MES	D	1469	-	12,12,12	2.00	1 (8%)	14,16,16	2.83	6 (42%)
2	SO4	A	600	-	4,4,4	0.21	0	6,6,6	0.25	0
2	SO4	A	604	-	4,4,4	0.16	0	6,6,6	0.24	0
2	SO4	B	604	-	4,4,4	0.16	0	6,6,6	0.15	0
4	FP5	C	500	1	11,12,14	0.65	0	13,14,17	1.32	2 (15%)
2	SO4	B	601	-	4,4,4	0.15	0	6,6,6	0.11	0
2	SO4	A	601	-	4,4,4	0.10	0	6,6,6	0.26	0
5	ACN	B	610	-	3,3,3	0.41	0	3,3,3	0.68	0
6	33D	B	620	-	6,6,6	0.54	0	8,8,8	1.31	1 (12%)
2	SO4	A	602	-	4,4,4	0.14	0	6,6,6	0.09	0
6	33D	C	620	-	6,6,6	0.52	0	8,8,8	1.16	1 (12%)
2	SO4	B	602	-	4,4,4	0.13	0	6,6,6	0.09	0
2	SO4	C	603	-	4,4,4	0.15	0	6,6,6	0.29	0
2	SO4	D	604	-	4,4,4	0.24	0	6,6,6	0.16	0
2	SO4	D	601	-	4,4,4	0.20	0	6,6,6	0.25	0
2	SO4	D	602	-	4,4,4	0.13	0	6,6,6	0.19	0
2	SO4	A	603	-	4,4,4	0.23	0	6,6,6	0.12	0
2	SO4	B	603	-	4,4,4	0.31	0	6,6,6	0.17	0
2	SO4	C	604	-	4,4,4	0.24	0	6,6,6	0.22	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
7	MES	D	1469	-	-	1/6/14/14	0/1/1/1
6	33D	C	620	-	-	2/4/4/4	-
4	FP5	B	500	1	-	0/6/7/9	0/1/1/1
4	FP5	C	500	1	-	0/6/7/9	0/1/1/1
6	33D	B	620	-	-	1/4/4/4	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	D	1469	MES	C8-S	-6.62	1.68	1.77

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	D	1469	MES	C5-N4-C3	6.53	123.53	108.83
7	D	1469	MES	O1S-S-C8	5.65	113.72	106.92
4	C	500	FP5	C3-N4-C5	3.62	129.36	123.11
6	B	620	33D	C1-C2-C3	3.15	123.92	117.45
7	D	1469	MES	O3S-S-C8	3.09	110.76	105.77
7	D	1469	MES	C7-N4-C3	2.91	118.67	111.23
4	B	500	FP5	C3-N4-C5	2.83	128.00	123.11
6	C	620	33D	C1-C2-C3	2.79	123.18	117.45
7	D	1469	MES	C7-N4-C5	2.56	117.78	111.23
4	C	500	FP5	CG-C7-C5	-2.38	105.51	112.57
7	D	1469	MES	O2S-S-C8	-2.04	104.45	106.92

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	B	620	33D	O1-C1-C2-C3
7	D	1469	MES	C8-C7-N4-C3
6	C	620	33D	C1-C2-C3-C4
6	C	620	33D	C1-C2-C3-C6

There are no ring outliers.

5 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	500	FP5	1	0
4	C	500	FP5	4	0
6	B	620	33D	7	0
6	C	620	33D	5	0
2	C	604	SO4	1	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	466/466 (100%)	-0.31	9 (1%) 66 65	15, 25, 49, 75	0
1	B	466/466 (100%)	-0.36	6 (1%) 77 76	15, 26, 45, 104	0
1	C	466/466 (100%)	-0.42	4 (0%) 84 83	15, 22, 38, 75	0
1	D	466/466 (100%)	-0.44	5 (1%) 80 79	14, 23, 43, 60	0
All	All	1864/1864 (100%)	-0.38	24 (1%) 77 76	14, 24, 45, 104	0

All (24) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	427	PRO	6.1
1	D	429	GLY	5.7
1	D	428	GLU	5.5
1	A	429	GLY	5.0
1	C	81	ARG	4.9
1	C	2	LEU	4.4
1	B	275	ASP	4.1
1	B	428	GLU	4.1
1	A	2	LEU	3.8
1	B	427	PRO	3.7
1	C	82	ARG	3.7
1	D	426	GLY	3.1
1	B	1	ARG	2.8
1	A	31	ALA	2.6
1	A	39	ARG	2.5
1	A	16	PRO	2.5
1	B	463	GLN	2.4
1	A	3	THR	2.3
1	A	428	GLU	2.3
1	A	14	GLU	2.2
1	A	82	ARG	2.1

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Mol	Chain	Res	Type	RSRZ
1	D	275	ASP	2.1
1	C	119	ARG	2.0
1	B	98	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 monosaccharides 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(\AA^2)	Q<0.9
2	SO4	A	604	5/5	0.50	0.28	86,86,87,87	0
5	ACN	B	610	4/4	0.67	0.29	45,45,45,45	0
2	SO4	D	604	5/5	0.77	0.22	60,61,62,62	0
3	MG	A	1469	1/1	0.81	0.10	37,37,37,37	0
2	SO4	B	604	5/5	0.81	0.23	61,62,63,63	0
5	ACN	C	610	4/4	0.83	0.21	48,49,49,49	0
3	MG	D	3001	1/1	0.84	0.11	36,36,36,36	0
4	FP5	C	500	12/14	0.84	0.23	14,23,25,25	0
3	MG	A	610	1/1	0.86	0.15	52,52,52,52	0
3	MG	C	1467	1/1	0.87	0.11	54,54,54,54	0
3	MG	B	1467	1/1	0.88	0.09	40,40,40,40	0
6	33D	C	620	7/7	0.88	0.13	17,20,23,23	0
6	33D	B	620	7/7	0.91	0.13	20,24,26,26	0
4	FP5	B	500	12/14	0.91	0.11	18,23,24,24	0
3	MG	C	1468	1/1	0.92	0.10	40,40,40,40	0
3	MG	C	1469	1/1	0.94	0.07	38,38,38,38	0
3	MG	C	3001	1/1	0.94	0.21	37,37,37,37	0
3	MG	C	3002	1/1	0.94	0.24	45,45,45,45	0
2	SO4	A	602	5/5	0.94	0.13	64,64,65,65	0
2	SO4	C	604	5/5	0.94	0.15	33,33,35,37	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	SO4	D	601	5/5	0.95	0.10	36,36,38,38	0
7	MES	D	1469	12/12	0.95	0.13	26,29,32,32	0
3	MG	B	3002	1/1	0.96	0.27	38,38,38,38	0
3	MG	D	610	1/1	0.96	0.06	41,41,41,41	0
3	MG	B	3001	1/1	0.97	0.09	48,48,48,48	0
2	SO4	C	601	5/5	0.98	0.07	26,26,27,27	0
2	SO4	C	602	5/5	0.98	0.11	46,46,47,47	0
2	SO4	A	601	5/5	0.98	0.15	24,26,27,27	0
2	SO4	A	603	5/5	0.98	0.14	29,30,32,33	0
2	SO4	D	602	5/5	0.98	0.09	45,45,46,46	0
3	MG	D	611	1/1	0.99	0.07	19,19,19,19	0
2	SO4	A	600	5/5	0.99	0.07	26,26,27,28	0
2	SO4	B	601	5/5	0.99	0.08	33,33,34,34	0
2	SO4	D	603	5/5	0.99	0.09	21,22,24,24	0
2	SO4	B	602	5/5	0.99	0.13	46,47,48,48	0
2	SO4	C	603	5/5	0.99	0.07	20,23,24,24	0
3	MG	A	611	1/1	0.99	0.04	37,37,37,37	0
2	SO4	B	603	5/5	0.99	0.08	19,22,23,24	0
2	SO4	D	600	5/5	0.99	0.04	21,23,23,25	0

6.5 Other polymers [i](#)

There are no such residues in this entry.