



wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 2, 2023 – 04:39 AM EDT

PDB ID : 3K6K
Title : Crystal structure at 2.2 angstrom of HSL-homolog EstE7 from a metagenome library
Authors : Hwang, K.Y.; Nam, K.H.
Deposited on : 2009-10-09
Resolution : 2.20 Å (reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 1.8.5 (274361), 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

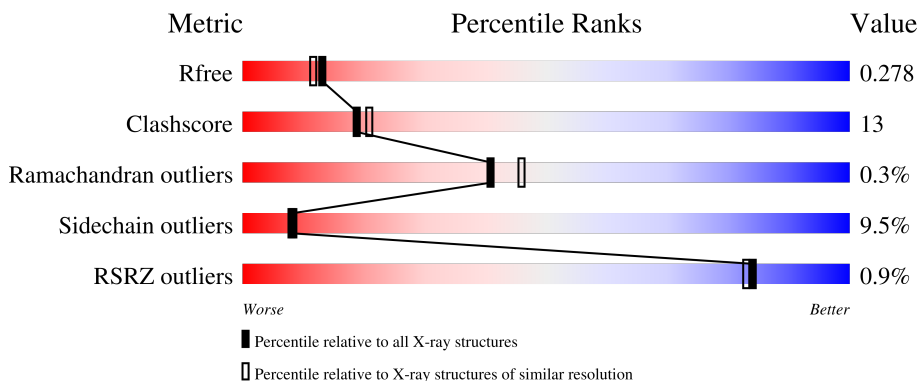
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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	322	
1	B	322	
1	C	322	
1	D	322	

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 9335 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 Esterase/lipase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	297	2235	1411	378	433	13	0	0	0
1	B	297	2235	1411	378	433	13	0	0	0
1	C	290	2178	1375	369	421	13	0	0	0
1	D	293	2205	1394	373	425	13	0	0	0

There are 52 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	310	LYS	-	expression tag	UNP Q0GMU1
A	311	LEU	-	expression tag	UNP Q0GMU1
A	312	ALA	-	expression tag	UNP Q0GMU1
A	313	ALA	-	expression tag	UNP Q0GMU1
A	314	ALA	-	expression tag	UNP Q0GMU1
A	315	LEU	-	expression tag	UNP Q0GMU1
A	316	GLU	-	expression tag	UNP Q0GMU1
A	317	HIS	-	expression tag	UNP Q0GMU1
A	318	HIS	-	expression tag	UNP Q0GMU1
A	319	HIS	-	expression tag	UNP Q0GMU1
A	320	HIS	-	expression tag	UNP Q0GMU1
A	321	HIS	-	expression tag	UNP Q0GMU1
A	322	HIS	-	expression tag	UNP Q0GMU1
B	310	LYS	-	expression tag	UNP Q0GMU1
B	311	LEU	-	expression tag	UNP Q0GMU1
B	312	ALA	-	expression tag	UNP Q0GMU1
B	313	ALA	-	expression tag	UNP Q0GMU1
B	314	ALA	-	expression tag	UNP Q0GMU1
B	315	LEU	-	expression tag	UNP Q0GMU1
B	316	GLU	-	expression tag	UNP Q0GMU1
B	317	HIS	-	expression tag	UNP Q0GMU1

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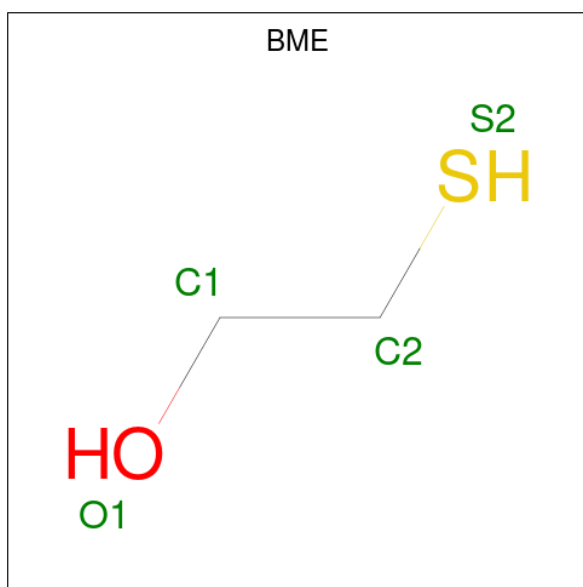
Chain	Residue	Modelled	Actual	Comment	Reference
B	318	HIS	-	expression tag	UNP Q0GMU1
B	319	HIS	-	expression tag	UNP Q0GMU1
B	320	HIS	-	expression tag	UNP Q0GMU1
B	321	HIS	-	expression tag	UNP Q0GMU1
B	322	HIS	-	expression tag	UNP Q0GMU1
C	310	LYS	-	expression tag	UNP Q0GMU1
C	311	LEU	-	expression tag	UNP Q0GMU1
C	312	ALA	-	expression tag	UNP Q0GMU1
C	313	ALA	-	expression tag	UNP Q0GMU1
C	314	ALA	-	expression tag	UNP Q0GMU1
C	315	LEU	-	expression tag	UNP Q0GMU1
C	316	GLU	-	expression tag	UNP Q0GMU1
C	317	HIS	-	expression tag	UNP Q0GMU1
C	318	HIS	-	expression tag	UNP Q0GMU1
C	319	HIS	-	expression tag	UNP Q0GMU1
C	320	HIS	-	expression tag	UNP Q0GMU1
C	321	HIS	-	expression tag	UNP Q0GMU1
C	322	HIS	-	expression tag	UNP Q0GMU1
D	310	LYS	-	expression tag	UNP Q0GMU1
D	311	LEU	-	expression tag	UNP Q0GMU1
D	312	ALA	-	expression tag	UNP Q0GMU1
D	313	ALA	-	expression tag	UNP Q0GMU1
D	314	ALA	-	expression tag	UNP Q0GMU1
D	315	LEU	-	expression tag	UNP Q0GMU1
D	316	GLU	-	expression tag	UNP Q0GMU1
D	317	HIS	-	expression tag	UNP Q0GMU1
D	318	HIS	-	expression tag	UNP Q0GMU1
D	319	HIS	-	expression tag	UNP Q0GMU1
D	320	HIS	-	expression tag	UNP Q0GMU1
D	321	HIS	-	expression tag	UNP Q0GMU1
D	322	HIS	-	expression tag	UNP Q0GMU1

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



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	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	D	1	Total O S 5 4 1	0	0
2	D	1	Total O S 5 4 1	0	0

- Molecule 3 is BETA-MERCAPTOETHANOL (three-letter code: BME) (formula: C₂H₆OS).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	O	S		
3	D	1	4	2	1	1	0	0

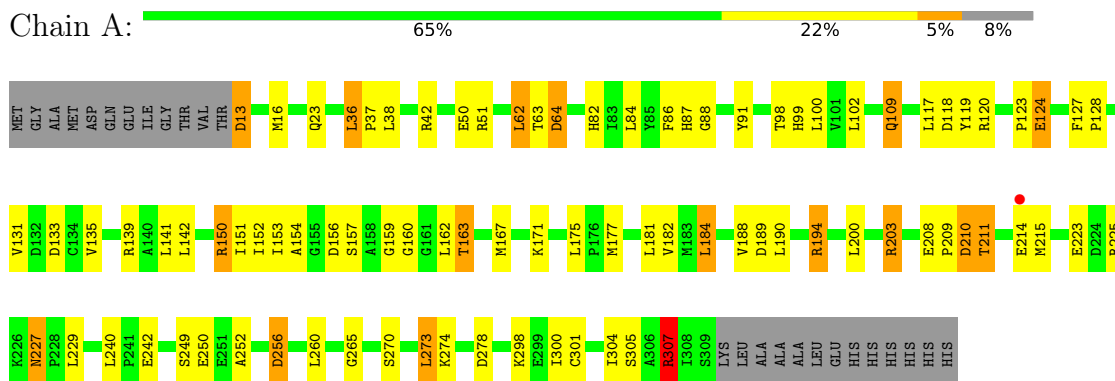
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	133	Total	O	0	0
			133	133		
4	B	111	Total	O	0	0
			111	111		
4	C	86	Total	O	0	0
			86	86		
4	D	103	Total	O	0	0
			103	103		

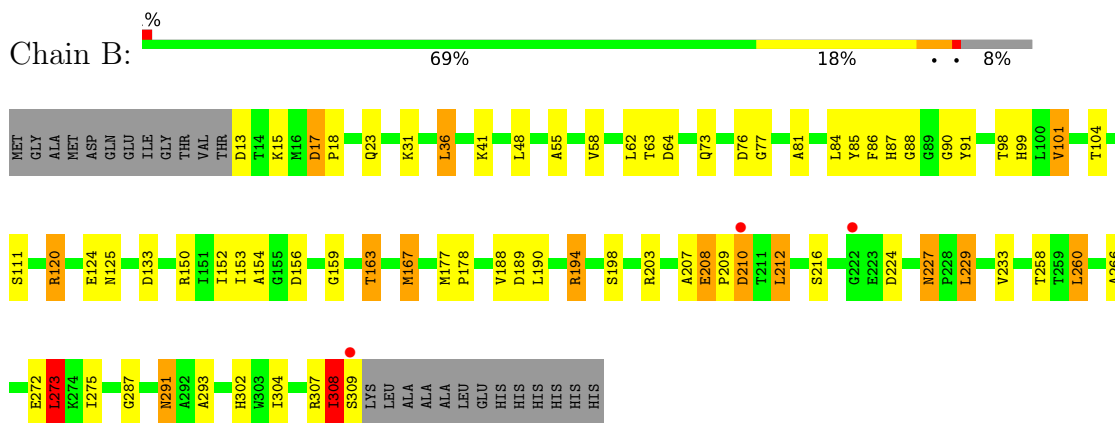
3 Residue-property plots [i](#)

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.

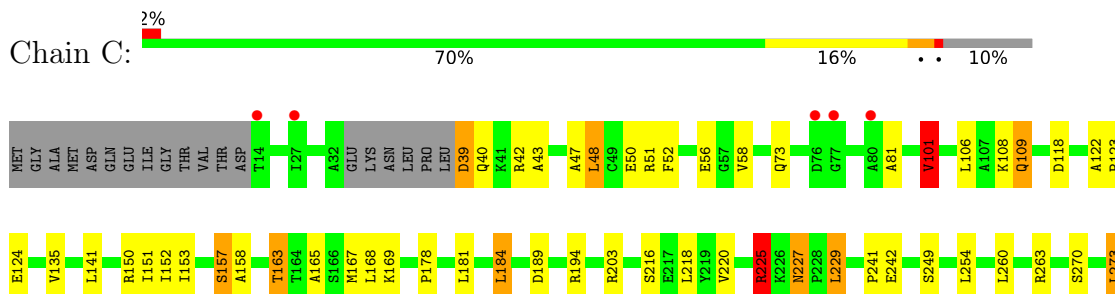
- Molecule 1: Esterase/lipase



- Molecule 1: Esterase/lipase

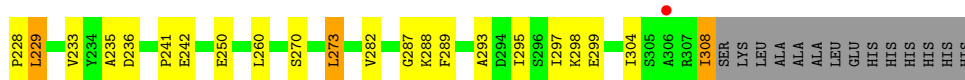
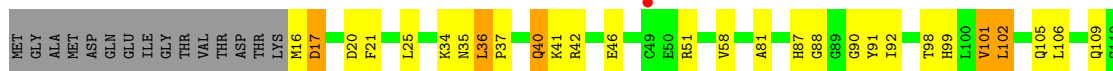


- Molecule 1: Esterase/lipase





- Molecule 1: Esterase/lipase



4 Data and refinement statistics

Property	Value	Source
Space group	I 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	117.16Å 127.70Å 232.87Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.27 – 2.20 48.27 – 2.20	Depositor EDS
% Data completeness (in resolution range)	95.7 (48.27-2.20) 95.6 (48.27-2.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.92 (at 2.20Å)	Xtrriage
Refinement program	REFMAC 5.5.0072	Depositor
R, R_{free}	0.223 , 0.282 0.220 , 0.278	Depositor DCC
R_{free} test set	4253 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	25.4	Xtrriage
Anisotropy	0.058	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 43.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	9335	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 41.79 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 2.2421e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: BME, 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	0.96	0/2280	1.03	12/3096 (0.4%)
1	B	0.95	0/2280	1.02	10/3096 (0.3%)
1	C	0.94	1/2221 (0.0%)	0.96	6/3014 (0.2%)
1	D	0.91	0/2250	0.95	7/3056 (0.2%)
All	All	0.94	1/9031 (0.0%)	0.99	35/12262 (0.3%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	1	0

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	43	ALA	CA-CB	-5.38	1.41	1.52

The worst 5 of 35 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	194	ARG	NE-CZ-NH2	-10.82	114.89	120.30
1	B	203	ARG	NE-CZ-NH2	-7.71	116.44	120.30
1	B	120	ARG	NE-CZ-NH2	-7.52	116.54	120.30
1	A	203	ARG	NE-CZ-NH1	7.27	123.94	120.30
1	C	101	VAL	CB-CA-C	-6.58	98.89	111.40

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	B	291	ASN	CA

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	2235	0	2224	69	0
1	B	2235	0	2224	62	0
1	C	2178	0	2165	41	0
1	D	2205	0	2195	63	0
2	A	10	0	0	0	0
2	B	15	0	0	0	0
2	C	10	0	0	1	0
2	D	10	0	0	0	0
3	D	4	0	6	0	0
4	A	133	0	0	4	0
4	B	111	0	0	8	0
4	C	86	0	0	0	0
4	D	103	0	0	4	0
All	All	9335	0	8814	232	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.

The worst 5 of 232 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:C:307:ARG:HH11	1:C:307:ARG:HG2	1.28	0.99
1:A:208:GLU:HG2	1:A:211:THR:OG1	1.63	0.98
1:B:58:VAL:HG11	1:B:104:THR:HB	1.43	0.97
1:B:167:MET:HE2	1:B:178:PRO:HG3	1.45	0.94
1:B:167:MET:HE3	1:B:178:PRO:HD3	1.50	0.91

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	295/322 (92%)	273 (92%)	22 (8%)	0	100	100
1	B	295/322 (92%)	274 (93%)	19 (6%)	2 (1%)	22	22
1	C	286/322 (89%)	267 (93%)	19 (7%)	0	100	100
1	D	291/322 (90%)	270 (93%)	20 (7%)	1 (0%)	41	46
All	All	1167/1288 (91%)	1084 (93%)	80 (7%)	3 (0%)	41	46

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	51	ARG
1	B	308	ILE
1	B	77	GLY

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	237/256 (93%)	215 (91%)	22 (9%)	9	8
1	B	237/256 (93%)	215 (91%)	22 (9%)	9	8
1	C	230/256 (90%)	208 (90%)	22 (10%)	8	8
1	D	233/256 (91%)	210 (90%)	23 (10%)	8	7
All	All	937/1024 (92%)	848 (90%)	89 (10%)	8	8

5 of 89 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	225	ARG
1	D	102	LEU
1	C	229	LEU
1	C	307	ARG
1	D	163	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 29 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	125	ASN
1	D	197	ASN
1	C	28	ASN
1	D	99	HIS
1	B	227	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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

10 ligands are 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	SO4	B	325	-	4,4,4	0.18	0	6,6,6	0.56	0
2	SO4	C	324	-	4,4,4	0.23	0	6,6,6	0.83	0
3	BME	D	325	-	3,3,3	0.37	0	1,2,2	1.08	0
2	SO4	A	324	-	4,4,4	0.28	0	6,6,6	0.72	0
2	SO4	D	324	-	4,4,4	0.30	0	6,6,6	0.65	0
2	SO4	B	324	-	4,4,4	0.21	0	6,6,6	0.22	0
2	SO4	B	323	-	4,4,4	0.17	0	6,6,6	0.75	0
2	SO4	A	323	-	4,4,4	0.24	0	6,6,6	0.75	0
2	SO4	C	323	-	4,4,4	0.12	0	6,6,6	0.27	0
2	SO4	D	323	-	4,4,4	0.23	0	6,6,6	0.43	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	BME	D	325	-	-	0/1/1/1	-

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.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	324	SO4	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	297/322 (92%)	-0.47	1 (0%) 94 93	9, 22, 44, 56	1 (0%)
1	B	297/322 (92%)	-0.53	3 (1%) 82 81	9, 23, 45, 52	1 (0%)
1	C	290/322 (90%)	-0.39	5 (1%) 70 68	13, 26, 51, 65	1 (0%)
1	D	293/322 (90%)	-0.39	2 (0%) 87 86	13, 26, 60, 75	1 (0%)
All	All	1177/1288 (91%)	-0.45	11 (0%) 84 83	9, 24, 50, 75	4 (0%)

The worst 5 of 11 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	76	ASP	3.9
1	C	14	THR	2.6
1	D	306	ALA	2.5
1	C	80	ALA	2.4
1	A	214	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 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	B	324	5/5	0.82	0.22	86,87,88,89	0
2	SO4	B	325	5/5	0.88	0.14	83,84,85,85	0
3	BME	D	325	4/4	0.90	0.15	40,44,48,55	0
2	SO4	D	324	5/5	0.92	0.17	51,52,54,56	0
2	SO4	C	324	5/5	0.93	0.16	54,55,58,59	0
2	SO4	A	324	5/5	0.94	0.11	52,54,55,57	0
2	SO4	C	323	5/5	0.95	0.19	53,56,57,58	0
2	SO4	B	323	5/5	0.97	0.11	39,43,44,44	0
2	SO4	A	323	5/5	0.99	0.11	37,37,38,38	0
2	SO4	D	323	5/5	0.99	0.16	44,44,45,46	0

6.5 Other polymers [\(i\)](#)

There are no such residues in this entry.