



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 7, 2026 – 03:57 AM UTC

PDB ID : 5X7S / pdb_00005x7s
Title : Crystal structure of Paenibacillus sp. 598K alpha-1,6-glucosyltransferase, terbium derivative
Authors : Fujimoto, Z.; Kishine, N.; Suzuki, N.; Momma, M.; Ichinose, H.; Kimura, A.; Funane, K.
Deposited on : 2017-02-27
Resolution : 2.40 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

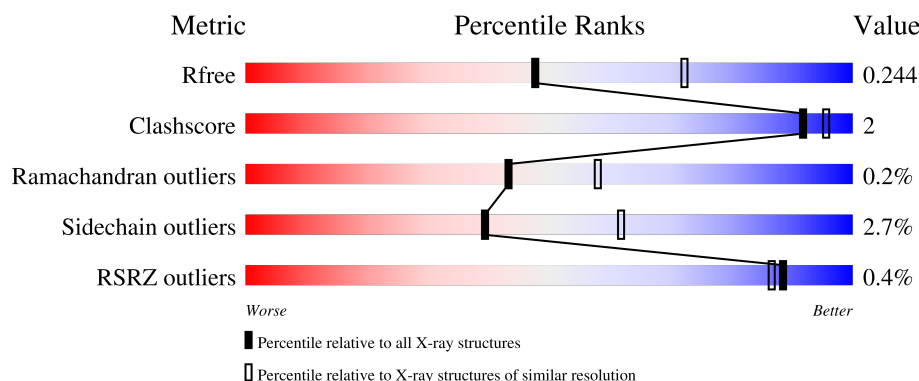
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

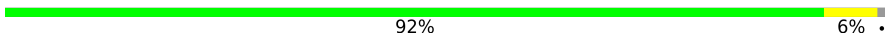
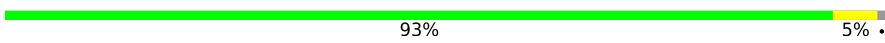
The reported resolution of this entry is 2.40 Å.

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	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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	1263	 92% 6% •
1	B	1263	 93% 5% •

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 20511 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 Glycoside hydrolase family 31 alpha-glucosidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	1247	Total	C	N	O	S	0	1	0
			9607	6027	1634	1924	22			
1	B	1247	Total	C	N	O	S	0	0	0
			9601	6023	1633	1923	22			

There are 34 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	19	HIS	-	expression tag	UNP A0A193PKW5
A	20	HIS	-	expression tag	UNP A0A193PKW5
A	21	HIS	-	expression tag	UNP A0A193PKW5
A	22	HIS	-	expression tag	UNP A0A193PKW5
A	23	HIS	-	expression tag	UNP A0A193PKW5
A	24	HIS	-	expression tag	UNP A0A193PKW5
A	25	SER	-	expression tag	UNP A0A193PKW5
A	26	SER	-	expression tag	UNP A0A193PKW5
A	27	GLY	-	expression tag	UNP A0A193PKW5
A	28	LEU	-	expression tag	UNP A0A193PKW5
A	29	VAL	-	expression tag	UNP A0A193PKW5
A	30	PRO	-	expression tag	UNP A0A193PKW5
A	31	ARG	-	expression tag	UNP A0A193PKW5
A	32	GLY	-	expression tag	UNP A0A193PKW5
A	33	SER	-	expression tag	UNP A0A193PKW5
A	34	HIS	-	expression tag	UNP A0A193PKW5
A	35	MET	-	expression tag	UNP A0A193PKW5
B	19	HIS	-	expression tag	UNP A0A193PKW5
B	20	HIS	-	expression tag	UNP A0A193PKW5
B	21	HIS	-	expression tag	UNP A0A193PKW5
B	22	HIS	-	expression tag	UNP A0A193PKW5
B	23	HIS	-	expression tag	UNP A0A193PKW5
B	24	HIS	-	expression tag	UNP A0A193PKW5
B	25	SER	-	expression tag	UNP A0A193PKW5
B	26	SER	-	expression tag	UNP A0A193PKW5

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Chain	Residue	Modelled	Actual	Comment	Reference
B	27	GLY	-	expression tag	UNP A0A193PKW5
B	28	LEU	-	expression tag	UNP A0A193PKW5
B	29	VAL	-	expression tag	UNP A0A193PKW5
B	30	PRO	-	expression tag	UNP A0A193PKW5
B	31	ARG	-	expression tag	UNP A0A193PKW5
B	32	GLY	-	expression tag	UNP A0A193PKW5
B	33	SER	-	expression tag	UNP A0A193PKW5
B	34	HIS	-	expression tag	UNP A0A193PKW5
B	35	MET	-	expression tag	UNP A0A193PKW5

- Molecule 2 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	3	Total Ca 3 3	0	0
2	B	3	Total Ca 3 3	0	0

- Molecule 3 is NICKEL (II) ION (CCD ID: NI) (formula: Ni).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Ni 1 1	0	0
3	B	1	Total Ni 1 1	0	0

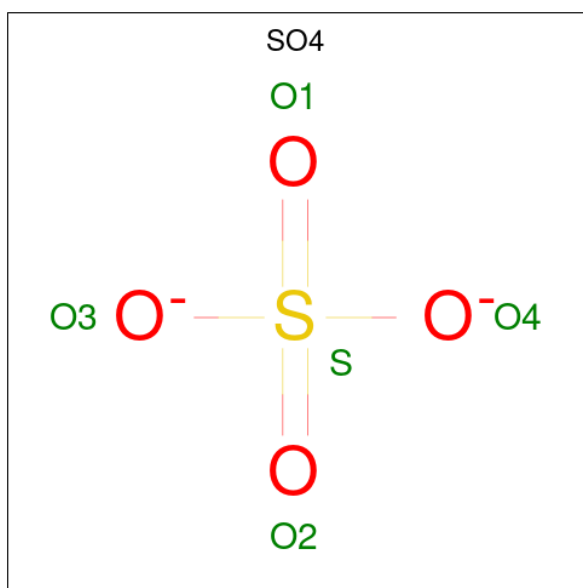
- Molecule 4 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	4	Total Mg 4 4	0	0
4	B	3	Total Mg 3 3	0	0

- Molecule 5 is TERBIUM(III) ION (CCD ID: TB) (formula: Tb).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	4	Total Tb 4 4	0	0
5	B	3	Total Tb 3 3	0	0

- Molecule 6 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



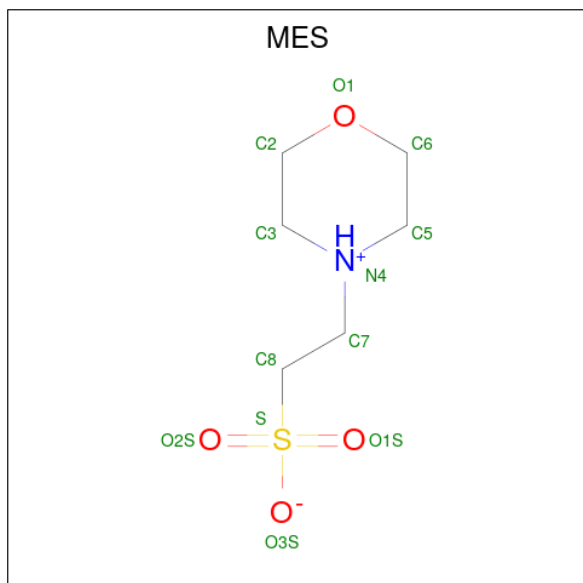
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	O	S	0	0
			5	4	1		
6	A	1	Total	O	S	0	0
			5	4	1		
6	A	1	Total	O	S	0	0
			5	4	1		
6	A	1	Total	O	S	0	0
			5	4	1		
6	A	1	Total	O	S	0	0
			5	4	1		
6	B	1	Total	O	S	0	0
			5	4	1		
6	B	1	Total	O	S	0	0
			5	4	1		
6	B	1	Total	O	S	0	0
			5	4	1		
6	B	1	Total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

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

- Molecule 7 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: $C_6H_{13}NO_4S$).



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

- Molecule 8 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	A	1	Total	C	O	0	0
			4	2	2		
8	A	1	Total	C	O	0	0
			4	2	2		
8	A	1	Total	C	O	0	0
			4	2	2		
8	A	1	Total	C	O	0	0
			4	2	2		
8	B	1	Total	C	O	0	0
			4	2	2		
8	B	1	Total	C	O	0	0
			4	2	2		
8	B	1	Total	C	O	0	0
			4	2	2		

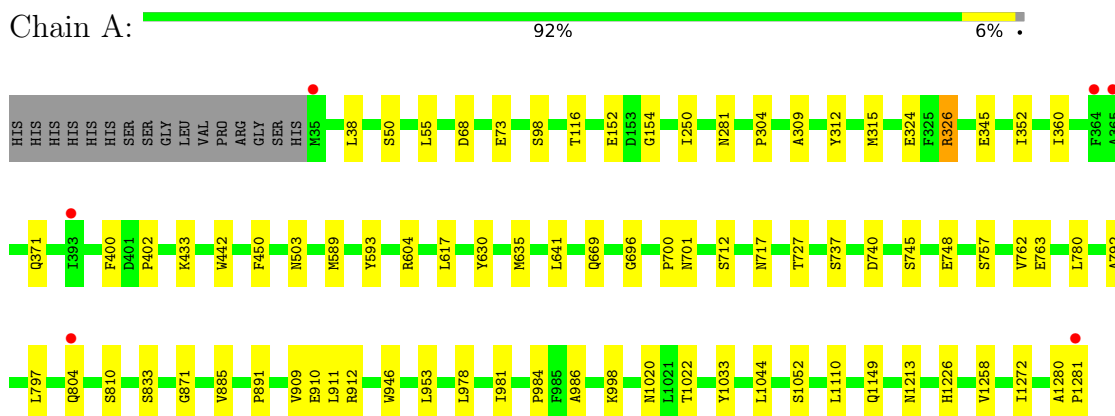
- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	553	Total	O	0	0
			553	553		
9	B	577	Total	O	0	0
			577	577		

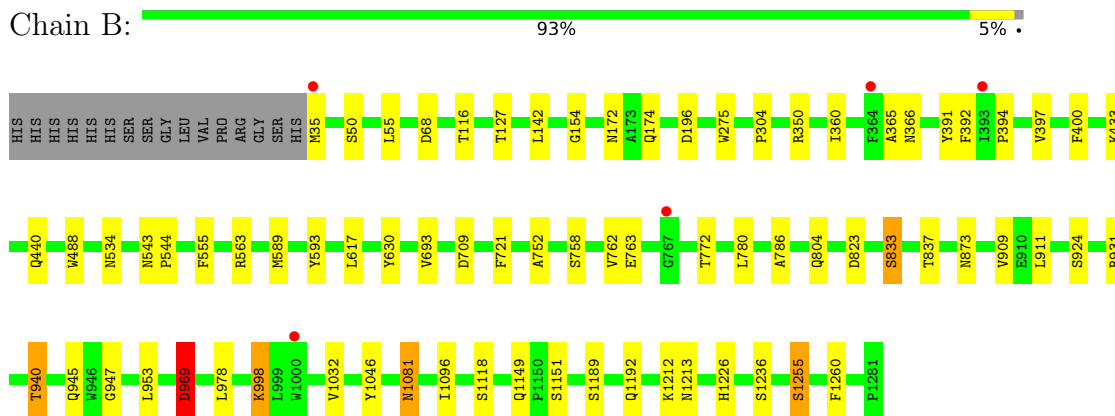
3 Residue-property plots

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: Glycoside hydrolase family 31 alpha-glucosidase



- Molecule 1: Glycoside hydrolase family 31 alpha-glucosidase



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	182.81Å 270.92Å 133.34Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	151.54 – 2.40 151.54 – 2.40	Depositor EDS
% Data completeness (in resolution range)	92.4 (151.54-2.40) 92.4 (151.54-2.40)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.98 (at 2.39Å)	Xtriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.185 , 0.239 0.194 , 0.244	Depositor DCC
R_{free} test set	6423 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å ²)	40.6	Xtriage
Anisotropy	0.684	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 29.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.52$, $\langle L^2 \rangle = 0.36$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	20511	wwPDB-VP
Average B, all atoms (Å ²)	47.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.96% 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: NI, EDO, CA, MG, SO4, MES, TB

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	1.00	2/9872 (0.0%)	0.98	5/13485 (0.0%)
1	B	0.98	2/9863 (0.0%)	0.98	3/13473 (0.0%)
All	All	0.99	4/19735 (0.0%)	0.98	8/26958 (0.0%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	947	GLY	N-CA	5.70	1.49	1.44
1	A	1272	ILE	C-O	-5.30	1.18	1.24
1	A	737	SER	N-CA	5.27	1.52	1.46
1	B	391	TYR	CA-C	-5.17	1.46	1.52

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	154	GLY	N-CA-C	7.12	119.70	110.45
1	A	371	GLN	CB-CA-C	-6.32	100.70	110.81
1	B	154	GLY	N-CA-C	5.68	117.56	110.29
1	A	737	SER	CB-CA-C	-5.44	102.04	109.28
1	B	833	SER	N-CA-C	-5.32	103.87	110.41
1	A	810	SER	N-CA-C	-5.25	102.76	110.52
1	A	1226	HIS	N-CA-C	5.05	119.20	113.19
1	B	873	ASN	N-CA-C	5.05	115.97	108.60

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	9607	0	8962	30	0
1	B	9601	0	8954	31	0
2	A	3	0	0	0	0
2	B	3	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	4	0	0	0	0
4	B	3	0	0	0	0
5	A	4	0	0	0	0
5	B	3	0	0	0	0
6	A	30	0	0	0	0
6	B	45	0	0	0	0
7	A	24	0	26	0	0
7	B	24	0	26	0	0
8	A	16	0	24	0	0
8	B	12	0	18	0	0
9	A	553	0	0	2	0
9	B	577	0	0	2	0
All	All	20511	0	18010	58	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 2.

All (58) 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:360:ILE:HD13	1:B:397:VAL:HG12	1.48	0.94
1:B:911:LEU:HD11	1:B:978:LEU:HD22	1.66	0.76
1:A:617:LEU:HD12	1:A:630:TYR:HD2	1.59	0.66
1:A:617:LEU:HD12	1:A:630:TYR:CD2	2.32	0.65
1:A:909:VAL:HG21	1:A:953:LEU:HD12	1.80	0.63
1:B:940:THR:CG2	1:B:945:GLN:O	2.48	0.61
1:B:909:VAL:HG21	1:B:953:LEU:HD12	1.86	0.58
1:A:792:ALA:HB3	1:A:797:LEU:HD11	1.86	0.56
1:B:940:THR:HG21	1:B:945:GLN:O	2.06	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:593:TYR:CE1	1:B:304:PRO:HB2	2.42	0.55
1:A:998:LYS:NZ	9:A:2011:HOH:O	2.40	0.53
1:A:700:PRO:HA	1:A:717:ASN:O	2.09	0.52
1:A:38:LEU:O	9:A:2001:HOH:O	2.18	0.51
1:A:911:LEU:HD11	1:A:978:LEU:HD22	1.93	0.51
1:B:940:THR:HG23	1:B:945:GLN:O	2.10	0.50
1:A:1280:ALA:O	1:A:1281:PRO:C	2.53	0.50
1:B:433:LYS:NZ	1:B:440:GLN:HE21	2.09	0.49
1:A:304:PRO:HB2	1:B:593:TYR:CE1	2.49	0.48
1:B:786:ALA:HB2	1:B:823:ASP:HB3	1.96	0.47
1:A:740:ASP:HB3	1:A:745:SER:HB3	1.96	0.46
1:B:392:PHE:O	1:B:394:PRO:HD3	2.15	0.46
1:B:617:LEU:HD12	1:B:630:TYR:HD2	1.81	0.46
1:A:1044:LEU:HD21	1:A:1110:LEU:HD22	1.98	0.46
1:B:969:ASP:OD1	1:B:969:ASP:N	2.49	0.46
1:B:752:ALA:HB3	1:B:763:GLU:HB2	1.97	0.46
1:B:172:ASN:HB3	1:B:196:ASP:HB2	1.98	0.45
1:B:275:TRP:CE2	1:B:350:ARG:HG3	2.51	0.45
1:B:142:LEU:HD23	1:B:142:LEU:N	2.32	0.45
1:B:1046:TYR:CE1	1:B:1081:ASN:HB2	2.52	0.45
1:B:693:VAL:HG11	1:B:721:PHE:CD1	2.52	0.44
1:A:641:LEU:C	1:A:641:LEU:HD23	2.42	0.44
1:A:589:MET:HB2	1:A:589:MET:HE2	1.81	0.44
1:A:669:GLN:HG2	1:A:1033:TYR:CE2	2.53	0.44
1:A:871:GLY:O	1:A:885:VAL:HA	2.18	0.44
1:B:543:ASN:HB3	1:B:544:PRO:HD2	2.00	0.43
1:B:360:ILE:HD12	1:B:360:ILE:N	2.34	0.43
1:A:912:ARG:NH2	1:A:946:TRP:HB2	2.34	0.43
1:B:1032:VAL:HG21	1:B:1096:ILE:HD12	2.01	0.42
1:A:309:ALA:HA	1:A:352:ILE:HB	2.00	0.42
1:A:315:MET:HA	1:A:326:ARG:O	2.19	0.42
1:A:696:GLY:HA3	1:A:727:THR:HG21	2.00	0.42
1:B:762:VAL:HG11	1:B:780:LEU:HD13	2.01	0.42
1:A:402:PRO:HB2	1:A:450:PHE:HB3	2.01	0.42
1:A:910:GLU:O	1:A:981:ILE:HA	2.20	0.41
1:B:365:ALA:O	1:B:366:ASN:CB	2.68	0.41
1:B:924:SER:OG	1:B:931:ARG:NH2	2.50	0.41
1:B:1226:HIS:HA	1:B:1255:SER:O	2.20	0.41
1:B:709:ASP:OD1	1:B:709:ASP:N	2.52	0.41
1:A:433:LYS:HD2	1:A:442:TRP:CE2	2.56	0.41
1:A:617:LEU:HD23	1:A:635:MET:HG2	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:804:GLN:HG3	9:B:2032:HOH:O	2.21	0.41
1:A:909:VAL:CG2	1:A:953:LEU:HD12	2.49	0.41
1:A:604:ARG:NH2	1:A:748:GLU:OE1	2.50	0.40
1:A:762:VAL:HG11	1:A:780:LEU:HD13	2.02	0.40
1:A:984:PRO:HB2	1:A:986:ALA:O	2.20	0.40
1:B:174:GLN:NE2	9:B:2030:HOH:O	2.45	0.40
1:B:998:LYS:HA	1:B:998:LYS:HD3	1.89	0.40
1:B:1189:SER:HA	1:B:1260:PHE: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	1246/1263 (99%)	1203 (96%)	41 (3%)	2 (0%)	43	58
1	B	1245/1263 (99%)	1205 (97%)	38 (3%)	2 (0%)	43	58
All	All	2491/2526 (99%)	2408 (97%)	79 (3%)	4 (0%)	43	58

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	969	ASP
1	B	1213	ASN
1	A	312	TYR
1	A	1213	ASN

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	998/1011 (99%)	972 (97%)	26 (3%)	40	63
1	B	997/1011 (99%)	970 (97%)	27 (3%)	39	62
All	All	1995/2022 (99%)	1942 (97%)	53 (3%)	39	62

All (53) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	50	SER
1	A	55	LEU
1	A	68	ASP
1	A	73	GLU
1	A	98	SER
1	A	116	THR
1	A	152	GLU
1	A	250	ILE
1	A	281	ASN
1	A	324	GLU
1	A	326	ARG
1	A	345	GLU
1	A	400	PHE
1	A	503	ASN
1	A	701	ASN
1	A	712	SER
1	A	757	SER
1	A	763	GLU
1	A	804	GLN
1	A	833	SER
1	A	891	PRO
1	A	1020	ASN
1	A	1022	THR
1	A	1052	SER
1	A	1149	GLN
1	A	1258	VAL
1	B	35	MET
1	B	50	SER
1	B	55	LEU
1	B	68	ASP
1	B	116	THR
1	B	127	THR
1	B	400	PHE

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Mol	Chain	Res	Type
1	B	488	TRP
1	B	534	ASN
1	B	555	PHE
1	B	563	ARG
1	B	589	MET
1	B	758	SER
1	B	772	THR
1	B	833	SER
1	B	837	THR
1	B	940	THR
1	B	969	ASP
1	B	998	LYS
1	B	1081	ASN
1	B	1118	SER
1	B	1149	GLN
1	B	1151	SER
1	B	1192	GLN
1	B	1212	LYS
1	B	1236	SER
1	B	1255	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	405	GLN
1	A	414	HIS
1	A	701	ASN
1	A	703	GLN
1	A	875	ASN
1	A	945	GLN
1	A	977	ASN
1	A	1104	ASN
1	A	1107	ASN
1	A	1109	ASN
1	A	1200	ASN
1	A	1226	HIS
1	A	1237	ASN
1	B	370	GLN
1	B	414	HIS
1	B	440	GLN
1	B	503	ASN
1	B	807	GLN

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Mol	Chain	Res	Type
1	B	876	HIS
1	B	1144	ASN
1	B	1248	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 48 ligands modelled in this entry, 22 are monoatomic - leaving 26 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
6	SO4	B	1708	-	4,4,4	0.67	0	6,6,6	0.78	0
6	SO4	A	1704	-	4,4,4	0.45	0	6,6,6	0.31	0
6	SO4	A	1708	-	4,4,4	0.79	0	6,6,6	0.59	0
8	EDO	A	1801	-	3,3,3	0.58	0	2,2,2	0.27	0
8	EDO	B	1803	-	3,3,3	0.70	0	2,2,2	0.08	0
6	SO4	B	1710	-	4,4,4	0.56	0	6,6,6	0.25	0
8	EDO	B	1801	-	3,3,3	0.71	0	2,2,2	0.57	0
7	MES	B	1709	-	12,12,12	2.51	1 (8%)	15,16,16	1.09	1 (6%)
6	SO4	B	1701	-	4,4,4	0.66	0	6,6,6	0.54	0
6	SO4	B	1705	-	4,4,4	0.54	0	6,6,6	0.35	0
6	SO4	B	1702	-	4,4,4	0.52	0	6,6,6	0.40	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
7	MES	A	1707	-	12,12,12	2.37	2 (16%)	15,16,16	1.62	3 (20%)
6	SO4	A	1701	-	4,4,4	0.62	0	6,6,6	0.49	0
6	SO4	A	1705	-	4,4,4	0.58	0	6,6,6	0.58	0
6	SO4	B	1711	-	4,4,4	0.49	0	6,6,6	0.20	0
7	MES	B	1703	-	12,12,12	2.00	1 (8%)	15,16,16	1.50	3 (20%)
6	SO4	B	1706	-	4,4,4	0.50	0	6,6,6	0.53	0
6	SO4	B	1704	-	4,4,4	0.54	0	6,6,6	0.32	0
6	SO4	B	1707	-	4,4,4	0.44	0	6,6,6	0.83	0
6	SO4	A	1703	-	4,4,4	0.53	0	6,6,6	0.76	0
8	EDO	B	1802	-	3,3,3	0.50	0	2,2,2	0.24	0
8	EDO	A	1803	-	3,3,3	0.54	0	2,2,2	0.63	0
7	MES	A	1706	-	12,12,12	2.23	2 (16%)	15,16,16	1.50	3 (20%)
8	EDO	A	1802	-	3,3,3	0.33	0	2,2,2	0.73	0
8	EDO	A	1804	-	3,3,3	0.72	0	2,2,2	0.36	0
6	SO4	A	1702	-	4,4,4	0.59	0	6,6,6	0.46	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	A	1706	-	-	0/6/14/14	0/1/1/1
7	MES	B	1709	-	-	0/6/14/14	0/1/1/1
8	EDO	A	1802	-	-	1/1/1/1	-
8	EDO	A	1803	-	-	1/1/1/1	-
8	EDO	A	1804	-	-	0/1/1/1	-
8	EDO	B	1801	-	-	0/1/1/1	-
7	MES	A	1707	-	-	3/6/14/14	0/1/1/1
8	EDO	B	1803	-	-	1/1/1/1	-
7	MES	B	1703	-	-	3/6/14/14	0/1/1/1
8	EDO	B	1802	-	-	0/1/1/1	-
8	EDO	A	1801	-	-	0/1/1/1	-

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	B	1709	MES	C8-S	-8.03	1.66	1.77
7	A	1707	MES	C8-S	-7.73	1.66	1.77
7	A	1706	MES	C8-S	-7.07	1.67	1.77
7	B	1703	MES	C8-S	-6.47	1.68	1.77

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	1706	MES	O1S-S	2.07	1.50	1.45
7	A	1707	MES	O2S-S	2.00	1.50	1.45

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	1706	MES	O3S-S-C8	3.75	113.33	106.00
7	A	1707	MES	O2S-S-C8	3.21	111.57	106.73
7	B	1703	MES	O2S-S-C8	3.11	111.43	106.73
7	A	1707	MES	O1-C6-C5	-2.84	105.65	111.77
7	A	1706	MES	O3S-S-O2S	-2.61	104.86	111.40
7	B	1709	MES	O3S-S-C8	2.42	110.74	106.00
7	A	1706	MES	C6-C5-N4	-2.41	106.46	110.12
7	B	1703	MES	O3S-S-C8	2.38	110.66	106.00
7	A	1707	MES	C7-N4-C5	-2.26	105.23	111.24
7	B	1703	MES	O2S-S-O1S	-2.04	107.19	113.82

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	A	1707	MES	C7-C8-S-O1S
7	B	1703	MES	N4-C7-C8-S
7	A	1707	MES	C7-C8-S-O3S
8	B	1803	EDO	O1-C1-C2-O2
7	B	1703	MES	C8-C7-N4-C3
7	A	1707	MES	N4-C7-C8-S
7	B	1703	MES	C8-C7-N4-C5
8	A	1802	EDO	O1-C1-C2-O2
8	A	1803	EDO	O1-C1-C2-O2

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers ⓘ

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 [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	1247/1263 (98%)	-0.10	6 (0%) 87 85	24, 47, 64, 97	1 (0%)
1	B	1247/1263 (98%)	-0.22	5 (0%) 88 86	29, 44, 62, 90	0
All	All	2494/2526 (98%)	-0.16	11 (0%) 88 86	24, 46, 63, 97	1 (0%)

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	364	PHE	4.6
1	A	35	MET	3.6
1	B	364	PHE	3.6
1	B	35	MET	3.2
1	A	393	ILE	3.2
1	B	1000	TRP	3.0
1	A	365	ALA	2.7
1	B	767	GLY	2.5
1	A	1281	PRO	2.4
1	A	804	GLN	2.3
1	B	393	ILE	2.2

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

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
6	SO4	A	1708	5/5	0.60	0.14	73,77,95,98	0
6	SO4	B	1710	5/5	0.71	0.12	84,91,96,104	0
6	SO4	B	1706	5/5	0.78	0.12	79,84,93,95	0
6	SO4	B	1705	5/5	0.78	0.13	99,99,108,109	0
7	MES	B	1703	12/12	0.85	0.19	87,94,111,116	0
8	EDO	A	1803	4/4	0.85	0.16	52,59,61,64	0
8	EDO	A	1804	4/4	0.86	0.15	45,54,55,62	0
6	SO4	A	1704	5/5	0.88	0.08	86,88,97,97	0
6	SO4	B	1708	5/5	0.88	0.13	58,75,84,92	0
6	SO4	A	1703	5/5	0.89	0.14	66,68,83,89	0
6	SO4	B	1711	5/5	0.89	0.10	97,98,99,102	0
7	MES	A	1707	12/12	0.89	0.14	75,80,101,103	0
6	SO4	B	1702	5/5	0.91	0.13	61,67,76,77	0
8	EDO	A	1802	4/4	0.91	0.11	44,47,47,52	0
6	SO4	A	1701	5/5	0.92	0.08	48,55,67,67	0
8	EDO	B	1803	4/4	0.92	0.12	46,48,49,51	0
5	TB	A	1606	1/1	0.94	0.16	42,42,42,42	1
8	EDO	A	1801	4/4	0.94	0.09	45,50,50,52	0
8	EDO	B	1802	4/4	0.94	0.09	42,46,50,54	0
6	SO4	A	1702	5/5	0.94	0.17	62,64,67,75	0
6	SO4	B	1701	5/5	0.95	0.08	52,54,66,66	0
7	MES	B	1709	12/12	0.95	0.10	48,51,57,59	0
4	MG	A	1603	1/1	0.95	0.06	95,95,95,95	0
6	SO4	B	1704	5/5	0.95	0.10	69,70,74,82	0
6	SO4	A	1705	5/5	0.96	0.10	51,51,55,57	0
6	SO4	B	1707	5/5	0.96	0.08	45,47,49,52	0
8	EDO	B	1801	4/4	0.96	0.08	42,43,45,48	0
7	MES	A	1706	12/12	0.96	0.09	49,56,59,59	0
5	TB	B	1604	1/1	0.96	0.05	44,44,44,44	1
5	TB	A	1608	1/1	0.97	0.08	37,37,37,37	1
2	CA	B	1302	1/1	0.97	0.05	61,61,61,61	0
4	MG	B	1602	1/1	0.98	0.04	58,58,58,58	0
2	CA	A	1301	1/1	0.98	0.03	50,50,50,50	0
5	TB	A	1607	1/1	0.98	0.09	50,50,50,50	1
2	CA	B	1303	1/1	0.98	0.06	52,52,52,52	0
4	MG	A	1602	1/1	0.98	0.04	63,63,63,63	0
5	TB	B	1605	1/1	0.98	0.06	46,46,46,46	1

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	CA	A	1303	1/1	0.98	0.07	56,56,56,56	0
4	MG	B	1601	1/1	0.98	0.05	57,57,57,57	0
4	MG	A	1604	1/1	0.99	0.02	56,56,56,56	0
3	NI	B	1501	1/1	0.99	0.05	76,76,76,76	0
2	CA	A	1302	1/1	0.99	0.03	59,59,59,59	0
4	MG	B	1603	1/1	0.99	0.06	41,41,41,41	0
3	NI	A	1501	1/1	0.99	0.06	70,70,70,70	0
2	CA	B	1301	1/1	1.00	0.01	43,43,43,43	0
4	MG	A	1601	1/1	1.00	0.04	50,50,50,50	0
5	TB	A	1605	1/1	1.00	0.01	39,39,39,39	0
5	TB	B	1606	1/1	1.00	0.02	39,39,39,39	0

6.5 Other polymers [i](#)

There are no such residues in this entry.