



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 05:06 PM UTC

PDB ID : 9AY8 / pdb_00009ay8
Title : Structure of the A type blood alpha-D-galactosamine galactosaminidase from
Flavonifractor plautii
Authors : Worrall, L.J.; Strynadka, N.C.J.
Deposited on : 2024-03-07
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	:	4-5-2 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

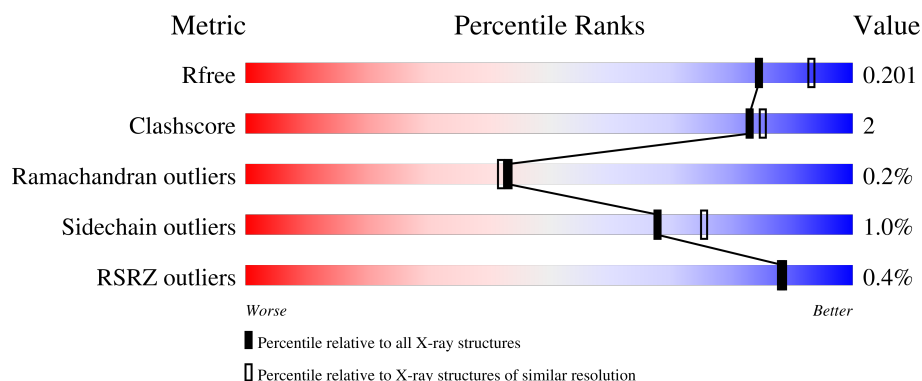
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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}	180053	10052 (2.00-2.00)
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)
RSRZ outliers	180081	10067 (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	672	92% 5% .
1	B	672	90% 7% .
1	C	672	92% 5% .
1	D	672	% 92% 5% .
1	E	672	% 92% 5% .

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 28727 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 A type blood alpha-D-galactosamine galactosaminidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	654	Total	C	N	O	S	0	0	0
			5067	3200	832	1011	24			
1	B	654	Total	C	N	O	S	0	0	0
			5067	3200	832	1011	24			
1	C	654	Total	C	N	O	S	0	0	0
			5067	3200	832	1011	24			
1	D	654	Total	C	N	O	S	0	0	0
			5067	3200	832	1011	24			
1	E	654	Total	C	N	O	S	0	1	0
			5072	3204	832	1011	25			

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	624	ALA	GLU	conflict	UNP P0DTR5
A	625	ALA	LYS	conflict	UNP P0DTR5
B	624	ALA	GLU	conflict	UNP P0DTR5
B	625	ALA	LYS	conflict	UNP P0DTR5
C	624	ALA	GLU	conflict	UNP P0DTR5
C	625	ALA	LYS	conflict	UNP P0DTR5
D	624	ALA	GLU	conflict	UNP P0DTR5
D	625	ALA	LYS	conflict	UNP P0DTR5
E	624	ALA	GLU	conflict	UNP P0DTR5
E	625	ALA	LYS	conflict	UNP P0DTR5

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Zn	0	0
			1	1		
2	B	1	Total	Zn	0	0
			1	1		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	C	1	Total 1	Zn 1	0	0
2	D	1	Total 1	Zn 1	0	0
2	E	1	Total 1	Zn 1	0	0

- Molecule 3 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total 1	Cl 1	0	0
3	B	1	Total 1	Cl 1	0	0
3	C	1	Total 1	Cl 1	0	0
3	D	1	Total 1	Cl 1	0	0
3	E	1	Total 1	Cl 1	0	0

- Molecule 4 is COBALT (II) ION (CCD ID: CO) (formula: Co).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total 1	Co 1	0	0
4	B	1	Total 1	Co 1	0	0
4	C	1	Total 1	Co 1	0	0
4	D	1	Total 1	Co 1	0	0
4	E	1	Total 1	Co 1	0	0

- Molecule 5 is MANGANESE (II) ION (CCD ID: MN) (formula: Mn).

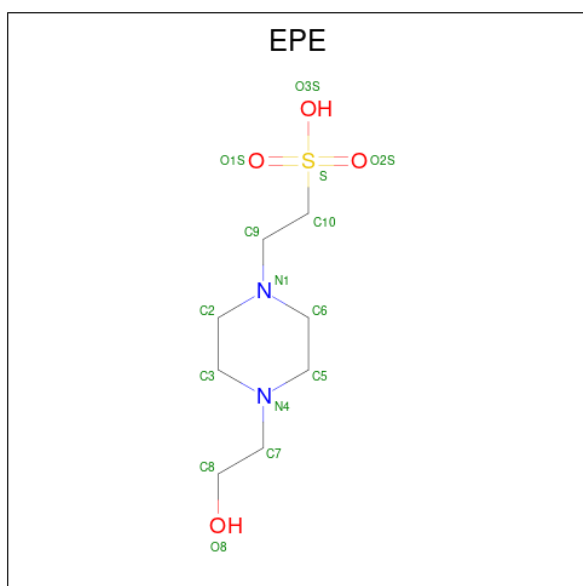
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total 1	Mn 1	0	0
5	B	1	Total 1	Mn 1	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	C	1	Total	Mn	0	0
			1	1		
5	D	1	Total	Mn	0	0
			1	1		
5	E	1	Total	Mn	0	0
			1	1		

- Molecule 6 is 4-(2-HYDROXYETHYL)-1-PIPERAZINE ETHANESULFONIC ACID (CCD ID: EPE) (formula: $C_8H_{18}N_2O_4S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	A	1	Total	C	N	O	S	0	0
			15	8	2	4	1		
6	B	1	Total	C	N	O	S	0	0
			15	8	2	4	1		

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	763	Total	O	0	0
			763	763		
7	B	776	Total	O	0	0
			776	776		
7	C	536	Total	O	0	0
			536	536		
7	D	621	Total	O	0	0
			621	621		

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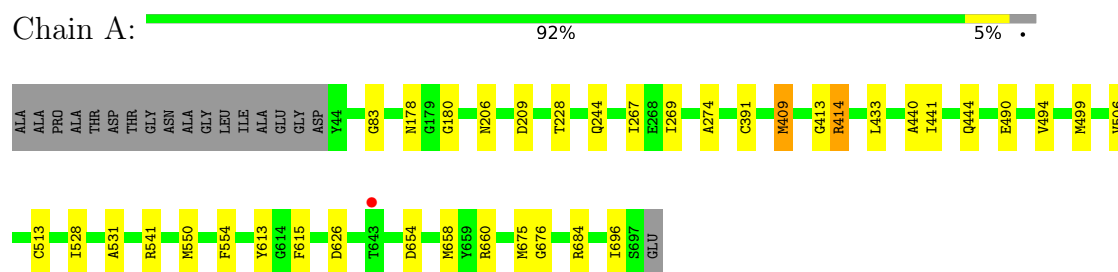
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	E	641	Total 641	O 641	0	0

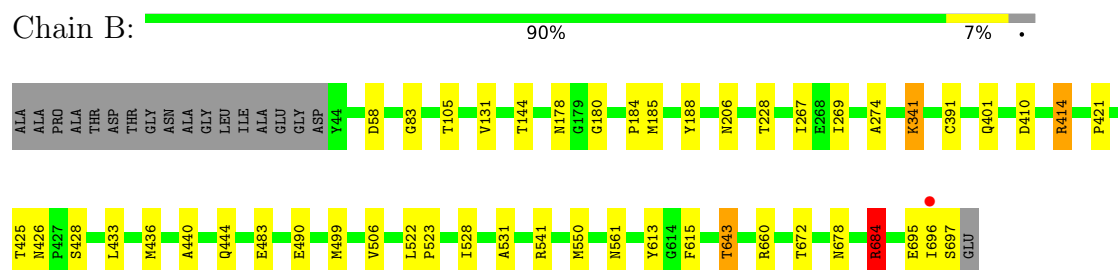
3 Residue-property plots [i](#)

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.

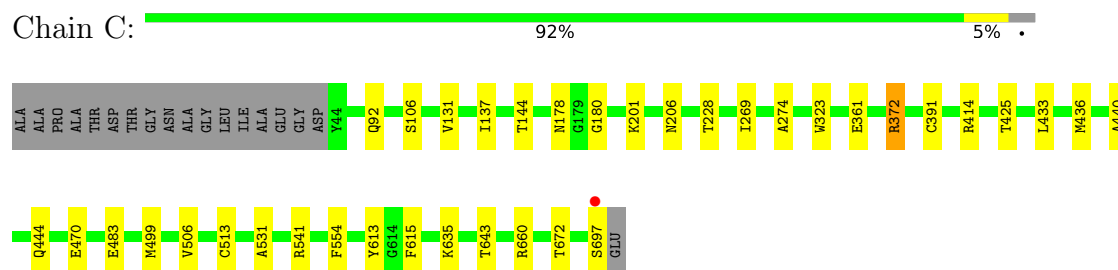
- Molecule 1: A type blood alpha-D-galactosamine galactosaminidase



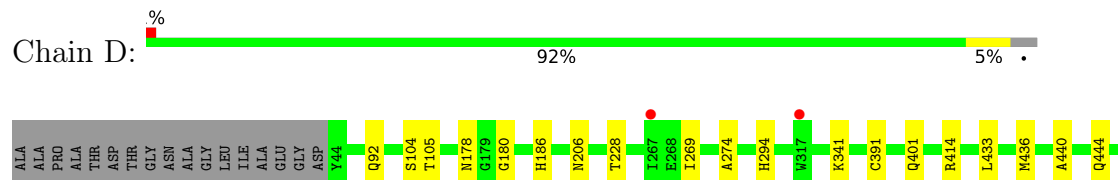
- Molecule 1: A type blood alpha-D-galactosamine galactosaminidase



- Molecule 1: A type blood alpha-D-galactosamine galactosaminidase

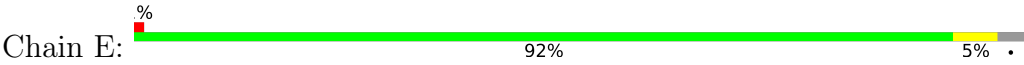


- Molecule 1: A type blood alpha-D-galactosamine galactosaminidase





● Molecule 1: A type blood alpha-D-galactosamine galactosaminidase



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	102.69Å 164.57Å 131.65Å 90.00° 90.30° 90.00°	Depositor
Resolution (Å)	39.44 – 2.00 39.44 – 2.00	Depositor EDS
% Data completeness (in resolution range)	98.7 (39.44-2.00) 98.7 (39.44-2.00)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.42 (at 2.00Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.168 , 0.193 0.176 , 0.201	Depositor DCC
R_{free} test set	14518 reflections (4.93%)	wwPDB-VP
Wilson B-factor (Å ²)	35.1	Xtriage
Anisotropy	0.229	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 42.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.014 for h,-k,-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	28727	wwPDB-VP
Average B, all atoms (Å ²)	39.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.62% 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: MN, CO, CL, EPE, ZN

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	0.62	0/5200	0.95	5/7087 (0.1%)
1	B	0.64	0/5200	0.96	7/7087 (0.1%)
1	C	0.59	0/5200	0.93	6/7087 (0.1%)
1	D	0.60	0/5200	0.93	4/7087 (0.1%)
1	E	0.62	0/5208	0.95	4/7097 (0.1%)
All	All	0.61	0/26008	0.94	26/35445 (0.1%)

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	0	2
1	B	0	3
1	C	0	3
1	D	0	3
All	All	0	11

There are no bond length outliers.

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	66	ARG	N-CA-CB	-6.89	99.30	111.08
1	A	414	ARG	NE-CZ-NH2	6.59	125.13	119.20
1	B	643	THR	CA-CB-OG1	-6.49	99.87	109.60
1	B	672	THR	CA-CB-OG1	-6.22	100.27	109.60
1	A	414	ARG	CD-NE-CZ	6.00	132.80	124.40
1	A	409	MET	CG-SD-CE	-5.92	87.88	100.90
1	D	615	PHE	CA-CB-CG	-5.79	108.01	113.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	672	THR	CA-CB-OG1	-5.74	101.00	109.60
1	A	554	PHE	CA-CB-CG	-5.68	108.12	113.80
1	C	425	THR	OG1-CB-CG2	5.64	120.58	109.30
1	E	554	PHE	CA-CB-CG	-5.60	108.20	113.80
1	C	672	THR	CA-CB-OG1	-5.55	101.27	109.60
1	D	554	PHE	CA-CB-CG	-5.52	108.28	113.80
1	C	372	ARG	CB-CA-C	-5.52	101.63	110.79
1	E	643	THR	CA-CB-OG1	-5.48	101.38	109.60
1	C	554	PHE	CA-CB-CG	-5.30	108.50	113.80
1	B	425	THR	OG1-CB-CG2	5.26	119.82	109.30
1	C	615	PHE	CA-CB-CG	-5.26	108.54	113.80
1	A	615	PHE	CA-CB-CG	-5.24	108.56	113.80
1	B	410	ASP	CA-CB-CG	5.19	117.79	112.60
1	B	341	LYS	CB-CG-CD	5.15	123.14	111.30
1	C	643	THR	CA-CB-OG1	-5.14	101.89	109.60
1	B	105	THR	CA-CB-OG1	-5.11	101.93	109.60
1	E	426	ASN	CB-CA-C	5.11	116.86	109.45
1	B	615	PHE	CA-CB-CG	-5.07	108.73	113.80
1	D	105	THR	CA-CB-OG1	-5.02	102.08	109.60

There are no chirality outliers.

All (11) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	660	ARG	Sidechain
1	A	684	ARG	Sidechain
1	B	414	ARG	Sidechain
1	B	660	ARG	Sidechain
1	B	684	ARG	Sidechain
1	C	372	ARG	Sidechain
1	C	414	ARG	Sidechain
1	C	660	ARG	Sidechain
1	D	414	ARG	Sidechain
1	D	668	ARG	Sidechain
1	D	684	ARG	Sidechain

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	5067	0	4765	22	0
1	B	5067	0	4765	29	0
1	C	5067	0	4765	17	0
1	D	5067	0	4764	20	0
1	E	5072	0	4773	27	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
2	E	1	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
3	E	1	0	0	0	0
4	A	1	0	0	1	0
4	B	1	0	0	0	0
4	C	1	0	0	1	0
4	D	1	0	0	0	0
4	E	1	0	0	0	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
5	C	1	0	0	0	0
5	D	1	0	0	0	0
5	E	1	0	0	0	0
6	A	15	0	17	1	0
6	B	15	0	17	1	0
7	A	763	0	0	8	0
7	B	776	0	0	11	0
7	C	536	0	0	5	1
7	D	621	0	0	5	0
7	E	641	0	0	8	1
All	All	28727	0	23866	117	1

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 2.

All (117) 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:D:626:ASP:HB3	7:D:1186:HOH:O	1.35	1.27
1:A:626:ASP:HB3	7:A:1309:HOH:O	1.58	1.03
1:B:58:ASP:HB3	7:B:1452:HOH:O	1.68	0.92
1:A:513:CYS:HG	4:A:703:CO:CO	0.54	0.88
1:E:178:ASN:HD22	1:E:206:ASN:HD21	1.29	0.80
1:B:178:ASN:HD22	1:B:206:ASN:HD21	1.29	0.80
1:C:178:ASN:HD22	1:C:206:ASN:HD21	1.27	0.79
1:A:178:ASN:HD22	1:A:206:ASN:HD21	1.28	0.79
1:A:490:GLU:OE1	7:A:801:HOH:O	2.00	0.79
1:D:178:ASN:HD22	1:D:206:ASN:HD21	1.27	0.79
1:E:97:ILE:HD11	1:E:120:GLN:HB2	1.65	0.78
1:E:695:GLU:OE2	7:E:801:HOH:O	2.05	0.73
1:C:470:GLU:OE2	7:C:801:HOH:O	2.07	0.72
1:E:426:ASN:HD22	1:E:429:LEU:HG	1.55	0.71
1:B:678:ASN:ND2	7:B:803:HOH:O	2.23	0.70
1:B:695:GLU:OE2	7:B:801:HOH:O	2.12	0.67
1:E:261:ILE:HG12	1:E:267:ILE:HD11	1.78	0.66
1:E:138:GLU:OE2	7:E:802:HOH:O	2.14	0.66
1:E:402:GLN:HG2	7:E:1385:HOH:O	1.96	0.65
1:A:409:MET:HE3	1:A:413:GLY:HA2	1.79	0.65
1:C:513:CYS:SG	4:C:703:CO:CO	1.85	0.64
1:A:244:GLN:HB3	7:A:1333:HOH:O	1.96	0.64
1:B:490:GLU:OE1	7:B:802:HOH:O	2.15	0.64
1:C:391:CYS:H	1:C:444:GLN:HE22	1.46	0.63
1:B:341:LYS:HD3	7:B:969:HOH:O	2.00	0.61
1:B:528:ILE:CD1	1:B:550:MET:HG3	2.31	0.61
1:E:391:CYS:H	1:E:444:GLN:HE22	1.48	0.60
1:B:58:ASP:CB	7:B:1452:HOH:O	2.38	0.60
1:A:209:ASP:OD2	7:A:802:HOH:O	2.17	0.60
7:A:1240:HOH:O	1:D:186:HIS:HD2	1.85	0.60
1:A:391:CYS:H	1:A:444:GLN:HE22	1.49	0.59
1:B:267:ILE:HD12	7:B:990:HOH:O	2.01	0.59
1:B:414:ARG:NH1	7:B:806:HOH:O	2.33	0.59
1:E:436[B]:MET:SD	1:E:483:GLU:CD	2.85	0.59
1:D:391:CYS:H	1:D:444:GLN:HE22	1.48	0.59
1:E:436[B]:MET:SD	1:E:483:GLU:HG2	2.43	0.59
1:E:528:ILE:CD1	1:E:550:MET:HG3	2.33	0.59
1:A:528:ILE:CD1	1:A:550:MET:HG3	2.33	0.58
1:B:391:CYS:H	1:B:444:GLN:HE22	1.50	0.58
1:A:528:ILE:HD12	1:A:550:MET:HG3	1.85	0.58
6:A:705:EPE:H51	7:A:1426:HOH:O	2.04	0.57
1:E:426:ASN:HD21	1:E:428:SER:HB2	1.71	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:528:ILE:HD12	1:B:550:MET:HG3	1.88	0.54
1:B:185:MET:HE2	1:B:421:PRO:HD2	1.87	0.54
1:A:658:MET:HG2	1:A:675:MET:SD	2.48	0.54
1:E:150:ALA:O	7:E:803:HOH:O	2.18	0.53
1:D:436:MET:SD	1:D:483:GLU:HG2	2.48	0.53
1:E:97:ILE:HD11	1:E:120:GLN:CB	2.37	0.53
1:A:267:ILE:HD13	7:A:1160:HOH:O	2.08	0.53
1:E:528:ILE:HD12	1:E:550:MET:HG3	1.91	0.53
1:B:401:GLN:NE2	7:B:815:HOH:O	2.39	0.52
1:D:499:MET:HB3	1:D:506:VAL:HG21	1.92	0.51
1:E:541:ARG:HD3	1:E:613:TYR:CZ	2.46	0.51
1:B:499:MET:HB3	1:B:506:VAL:HG21	1.94	0.50
1:C:499:MET:HB3	1:C:506:VAL:HG21	1.93	0.50
1:A:541:ARG:HD3	1:A:613:TYR:CZ	2.47	0.50
1:A:499:MET:HB3	1:A:506:VAL:HG21	1.93	0.50
1:B:684:ARG:HA	7:B:1048:HOH:O	2.10	0.50
1:B:426:ASN:ND2	1:B:428:SER:H	2.10	0.50
1:D:294:HIS:ND1	7:D:805:HOH:O	2.35	0.49
1:D:541:ARG:HD3	1:D:613:TYR:CZ	2.47	0.49
1:B:541:ARG:HD3	1:B:613:TYR:CZ	2.49	0.48
1:E:261:ILE:HG23	1:E:267:ILE:HG12	1.94	0.48
1:C:201:LYS:HE2	7:C:1203:HOH:O	2.12	0.48
1:C:391:CYS:H	1:C:444:GLN:NE2	2.12	0.47
1:C:541:ARG:HD3	1:C:613:TYR:CZ	2.49	0.47
1:D:684:ARG:HE	1:D:684:ARG:HB3	1.39	0.47
1:B:83:GLY:HA3	7:B:830:HOH:O	2.14	0.47
1:D:401:GLN:HG3	7:D:971:HOH:O	2.14	0.47
1:E:499:MET:HB3	1:E:506:VAL:HG21	1.97	0.47
1:D:683:THR:HG21	1:D:685:PHE:HD1	1.80	0.46
1:E:66:ARG:HG3	7:E:862:HOH:O	2.16	0.46
1:C:635:LYS:CE	7:C:1107:HOH:O	2.63	0.46
1:D:660:ARG:HD2	7:D:810:HOH:O	2.16	0.46
1:D:391:CYS:H	1:D:444:GLN:NE2	2.12	0.45
1:A:269:ILE:C	1:A:269:ILE:HD12	2.42	0.45
1:A:433:LEU:HB3	1:A:440:ALA:HB1	1.98	0.45
1:E:323:TRP:HB3	7:E:908:HOH:O	2.17	0.45
1:C:635:LYS:HE3	7:C:1107:HOH:O	2.16	0.44
1:B:391:CYS:H	1:B:444:GLN:NE2	2.15	0.44
1:C:323:TRP:HB3	7:C:976:HOH:O	2.17	0.44
1:A:391:CYS:H	1:A:444:GLN:NE2	2.14	0.44
1:B:269:ILE:HD12	1:B:269:ILE:C	2.43	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:433:LEU:HB3	1:C:440:ALA:HB1	2.00	0.44
1:D:269:ILE:C	1:D:269:ILE:HD12	2.43	0.44
1:D:433:LEU:HB3	1:D:440:ALA:HB1	1.99	0.44
1:D:228:THR:O	1:D:274:ALA:HA	2.18	0.44
1:B:131:VAL:O	1:B:144:THR:HA	2.18	0.43
1:E:180:GLY:HA3	1:E:206:ASN:HA	2.00	0.43
1:C:436:MET:SD	1:C:483:GLU:HG2	2.59	0.43
6:B:705:EPE:H101	6:B:705:EPE:H22	1.76	0.43
1:E:436[B]:MET:SD	1:E:483:GLU:CG	3.07	0.43
1:A:83:GLY:HA3	7:A:843:HOH:O	2.19	0.43
1:E:228:THR:O	1:E:274:ALA:HA	2.19	0.43
1:D:683:THR:CG2	1:D:685:PHE:HD1	2.32	0.43
1:B:180:GLY:HA3	1:B:206:ASN:HA	2.01	0.42
1:E:391:CYS:H	1:E:444:GLN:NE2	2.14	0.42
1:E:269:ILE:C	1:E:269:ILE:HD12	2.44	0.42
1:C:269:ILE:C	1:C:269:ILE:HD12	2.44	0.42
1:E:48:GLY:HA2	7:E:1321:HOH:O	2.19	0.42
1:B:433:LEU:HB3	1:B:440:ALA:HB1	2.01	0.42
1:B:228:THR:O	1:B:274:ALA:HA	2.19	0.42
1:D:341:LYS:HE2	7:D:1112:HOH:O	2.18	0.42
1:B:184:PRO:HD2	1:B:188:TYR:HB2	2.01	0.42
1:C:228:THR:O	1:C:274:ALA:HA	2.19	0.41
1:A:228:THR:O	1:A:274:ALA:HA	2.20	0.41
1:B:436:MET:SD	1:B:483:GLU:HG2	2.60	0.41
1:A:180:GLY:HA3	1:A:206:ASN:HA	2.02	0.41
1:B:522:LEU:N	1:B:523:PRO:CD	2.84	0.41
1:E:433:LEU:HB3	1:E:440:ALA:HB1	2.03	0.41
1:C:131:VAL:O	1:C:144:THR:HA	2.20	0.41
1:D:683:THR:HG23	1:D:685:PHE:H	1.85	0.41
1:B:561:ASN:HB3	7:E:1197:HOH:O	2.21	0.40
1:C:180:GLY:HA3	1:C:206:ASN:HA	2.02	0.40
1:A:654:ASP:O	1:A:676:GLY:HA3	2.21	0.40
1:A:441:ILE:CG2	1:A:494:VAL:HG11	2.52	0.40
1:D:180:GLY:HA3	1:D:206:ASN:HA	2.03	0.40

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

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:C:842:HOH:O	7:E:1305:HOH:O[1_556]	1.79	0.41

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	652/672 (97%)	629 (96%)	22 (3%)	1 (0%)	43	42
1	B	652/672 (97%)	630 (97%)	21 (3%)	1 (0%)	43	42
1	C	652/672 (97%)	631 (97%)	20 (3%)	1 (0%)	43	42
1	D	652/672 (97%)	629 (96%)	22 (3%)	1 (0%)	43	42
1	E	653/672 (97%)	631 (97%)	21 (3%)	1 (0%)	43	42
All	All	3261/3360 (97%)	3150 (97%)	106 (3%)	5 (0%)	43	42

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	531	ALA
1	B	531	ALA
1	C	531	ALA
1	D	531	ALA
1	E	531	ALA

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	536/546 (98%)	534 (100%)	2 (0%)	84	89
1	B	536/546 (98%)	532 (99%)	4 (1%)	76	82
1	C	536/546 (98%)	531 (99%)	5 (1%)	70	78
1	D	536/546 (98%)	528 (98%)	8 (2%)	57	64

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	E	537/546 (98%)	530 (99%)	7 (1%)	61	68
All	All	2681/2730 (98%)	2655 (99%)	26 (1%)	68	75

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	414	ARG
1	A	696	ILE
1	B	643	THR
1	B	684	ARG
1	B	696	ILE
1	B	697	SER
1	C	92	GLN
1	C	106	SER
1	C	137	ILE
1	C	361	GLU
1	C	697	SER
1	D	92	GLN
1	D	104	SER
1	D	513	CYS
1	D	643	THR
1	D	668	ARG
1	D	682	ASN
1	D	683	THR
1	D	684	ARG
1	E	66	ARG
1	E	92	GLN
1	E	104	SER
1	E	137	ILE
1	E	361	GLU
1	E	426	ASN
1	E	643	THR

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	178	ASN
1	A	186	HIS
1	A	444	GLN
1	B	60	GLN
1	B	178	ASN

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Mol	Chain	Res	Type
1	B	186	HIS
1	B	426	ASN
1	B	444	GLN
1	B	600	GLN
1	C	178	ASN
1	C	186	HIS
1	C	444	GLN
1	C	477	ASN
1	C	673	ASN
1	D	178	ASN
1	D	186	HIS
1	D	444	GLN
1	E	120	GLN
1	E	178	ASN
1	E	426	ASN
1	E	444	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 22 ligands modelled in this entry, 20 are monoatomic - leaving 2 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	EPE	A	705	-	15,15,15	1.09	1 (6%)	19,20,20	1.06	2 (10%)
6	EPE	B	705	-	15,15,15	1.29	1 (6%)	19,20,20	1.13	2 (10%)

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
6	EPE	A	705	-	-	5/9/19/19	0/1/1/1
6	EPE	B	705	-	-	5/9/19/19	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	B	705	EPE	O1S-S	4.61	1.58	1.45
6	A	705	EPE	O1S-S	4.02	1.56	1.45

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	705	EPE	O1S-S-C10	-3.03	102.15	106.73
6	A	705	EPE	O3S-S-O2S	2.53	117.72	111.40
6	B	705	EPE	O3S-S-O2S	2.22	116.97	111.40
6	B	705	EPE	O1S-S-C10	-2.22	103.37	106.73

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	705	EPE	C10-C9-N1-C2
6	A	705	EPE	C9-C10-S-O2S
6	A	705	EPE	C9-C10-S-O3S
6	B	705	EPE	C10-C9-N1-C2
6	B	705	EPE	C10-C9-N1-C6
6	A	705	EPE	C10-C9-N1-C6
6	B	705	EPE	C9-C10-S-O3S
6	A	705	EPE	C9-C10-S-O1S
6	B	705	EPE	C9-C10-S-O1S
6	B	705	EPE	C9-C10-S-O2S

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	705	EPE	1	0
6	B	705	EPE	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	654/672 (97%)	-0.47	1 (0%) 91 90	22, 32, 56, 74	0
1	B	654/672 (97%)	-0.49	1 (0%) 91 90	21, 30, 52, 68	0
1	C	654/672 (97%)	-0.25	1 (0%) 91 90	26, 39, 68, 89	0
1	D	654/672 (97%)	-0.23	5 (0%) 82 82	26, 40, 66, 95	0
1	E	654/672 (97%)	-0.23	5 (0%) 82 82	23, 36, 65, 89	1 (0%)
All	All	3270/3360 (97%)	-0.33	13 (0%) 88 88	21, 35, 63, 95	1 (0%)

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	697	SER	2.8
1	D	683	THR	2.6
1	E	153	SER	2.6
1	E	267	ILE	2.6
1	E	137	ILE	2.6
1	E	697	SER	2.5
1	D	267	ILE	2.4
1	D	685	PHE	2.3
1	D	697	SER	2.2
1	D	317	TRP	2.2
1	A	643	THR	2.2
1	E	683	THR	2.2
1	B	696	ILE	2.1

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
6	EPE	A	705	15/15	0.77	0.19	67,91,117,142	0
6	EPE	B	705	15/15	0.89	0.14	53,65,74,83	0
4	CO	C	703	1/1	0.98	0.13	58,58,58,58	0
4	CO	E	703	1/1	0.98	0.11	52,52,52,52	0
4	CO	A	703	1/1	0.98	0.14	55,55,55,55	0
4	CO	B	703	1/1	0.98	0.15	52,52,52,52	0
2	ZN	D	701	1/1	0.99	0.02	31,31,31,31	0
2	ZN	E	701	1/1	0.99	0.03	33,33,33,33	0
4	CO	D	703	1/1	0.99	0.13	59,59,59,59	0
3	CL	C	702	1/1	0.99	0.06	30,30,30,30	0
5	MN	A	704	1/1	0.99	0.07	36,36,36,36	0
5	MN	B	704	1/1	0.99	0.06	41,41,41,41	0
5	MN	C	704	1/1	0.99	0.10	45,45,45,45	0
5	MN	D	704	1/1	0.99	0.06	43,43,43,43	0
5	MN	E	704	1/1	0.99	0.05	44,44,44,44	0
3	CL	D	702	1/1	0.99	0.04	29,29,29,29	0
2	ZN	C	701	1/1	0.99	0.03	32,32,32,32	0
2	ZN	B	701	1/1	1.00	0.01	28,28,28,28	0
2	ZN	A	701	1/1	1.00	0.01	31,31,31,31	0
3	CL	E	702	1/1	1.00	0.04	26,26,26,26	0
3	CL	A	702	1/1	1.00	0.03	25,25,25,25	0
3	CL	B	702	1/1	1.00	0.03	26,26,26,26	0

6.5 Other polymers [i](#)

There are no such residues in this entry.