



# Full wwPDB X-ray Structure Validation Report ⓘ

Nov 6, 2023 – 07:26 PM EST

PDB ID : 6NFP  
Title : 1.7 Angstrom Resolution Crystal Structure of Arginase from Bacillus subtilis subsp. subtilis str. 168  
Authors : Minasov, G.; Wawrzak, Z.; Evdokimova, E.; Grimshaw, S.; Kwon, K.; Savchenko, A.; Satchell, K.J.F.; Joachimiak, A.; Center for Structural Genomics of Infectious Diseases (CSGID)  
Deposited on : 2018-12-20  
Resolution : 1.70 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](mailto: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>.

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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

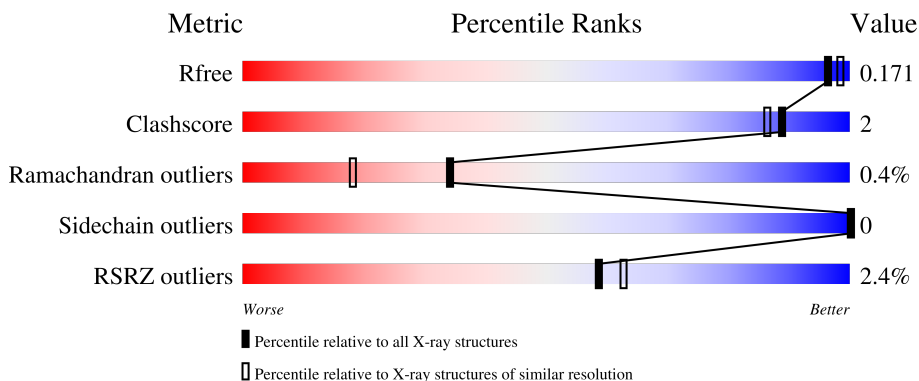
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.70 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.



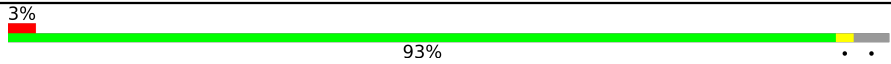
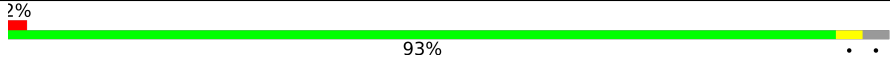
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	4298 (1.70-1.70)
Clashscore	141614	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)
RSRZ outliers	127900	4222 (1.70-1.70)

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  $\geq 3$ , 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	299	 2% 93%
1	B	299	 3% 95%
1	C	299	 2% 93%
1	D	299	 1% 91% 5%

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Mol	Chain	Length	Quality of chain
1	E	299	 3% 93% • •
1	F	299	 2% 93% • •

## 2 Entry composition i

There are 11 unique types of molecules in this entry. The entry contains 15539 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 Arginase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	292	Total 2310	C 1454	N 391	O 454	S 11	0	11	0
1	B	290	Total 2231	C 1402	N 377	O 440	S 12	0	4	0
1	C	290	Total 2260	C 1420	N 380	O 449	S 11	0	7	0
1	D	289	Total 2257	C 1420	N 378	O 447	S 12	0	8	0
1	E	287	Total 2229	C 1404	N 373	O 441	S 11	0	6	0
1	F	289	Total 2237	C 1406	N 377	O 443	S 11	0	5	0

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	SER	-	expression tag	UNP P39138
A	-1	ASN	-	expression tag	UNP P39138
A	0	ALA	-	expression tag	UNP P39138
B	-2	SER	-	expression tag	UNP P39138
B	-1	ASN	-	expression tag	UNP P39138
B	0	ALA	-	expression tag	UNP P39138
C	-2	SER	-	expression tag	UNP P39138
C	-1	ASN	-	expression tag	UNP P39138
C	0	ALA	-	expression tag	UNP P39138
D	-2	SER	-	expression tag	UNP P39138
D	-1	ASN	-	expression tag	UNP P39138
D	0	ALA	-	expression tag	UNP P39138
E	-2	SER	-	expression tag	UNP P39138
E	-1	ASN	-	expression tag	UNP P39138
E	0	ALA	-	expression tag	UNP P39138
F	-2	SER	-	expression tag	UNP P39138
F	-1	ASN	-	expression tag	UNP P39138

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Chain	Residue	Modelled	Actual	Comment	Reference
F	0	ALA	-	expression tag	UNP P39138

- Molecule 2 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	4	Total Cl 4 4	0	0
2	B	1	Total Cl 1 1	0	0
2	C	3	Total Cl 3 3	0	0
2	D	1	Total Cl 1 1	0	0
2	E	1	Total Cl 1 1	0	0

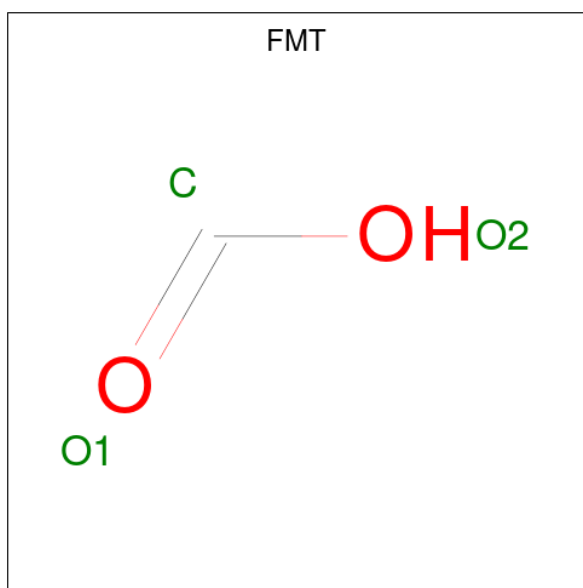
- Molecule 3 is SODIUM ION (three-letter code: NA) (formula: Na).

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

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	2	Total Mg 2 2	0	0
4	B	2	Total Mg 2 2	0	0
4	C	2	Total Mg 2 2	0	0
4	D	2	Total Mg 2 2	0	0
4	E	2	Total Mg 2 2	0	0
4	F	2	Total Mg 2 2	0	0

- Molecule 5 is FORMIC ACID (three-letter code: FMT) (formula: CH<sub>2</sub>O<sub>2</sub>).



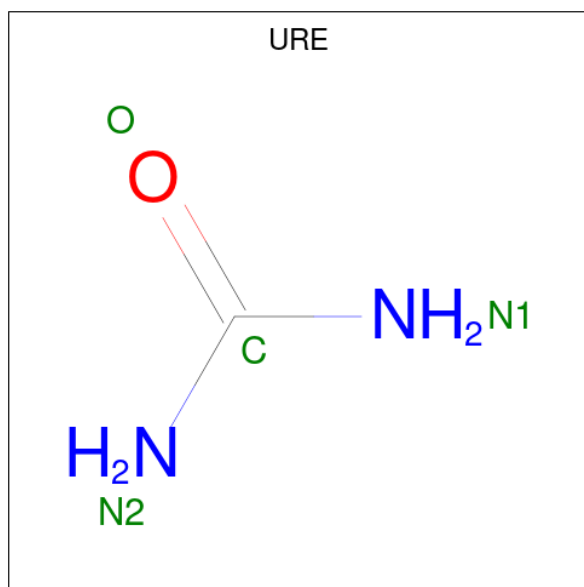
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C O 3 1 2	0	0
5	A	1	Total C O 3 1 2	0	0
5	B	1	Total C O 3 1 2	0	0
5	B	1	Total C O 3 1 2	0	0
5	B	1	Total C O 3 1 2	0	0
5	D	1	Total C O 3 1 2	0	0
5	D	1	Total C O 3 1 2	0	0
5	D	1	Total C O 3 1 2	0	0
5	D	1	Total C O 3 1 2	0	0
5	E	1	Total C O 3 1 2	0	0
5	E	1	Total C O 3 1 2	0	0
5	E	1	Total C O 3 1 2	0	1
5	E	1	Total C O 3 1 2	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	F	1	Total	C	O	0	0
			3	1	2		
5	F	1	Total	C	O	0	0
			3	1	2		

- Molecule 6 is UREA (three-letter code: URE) (formula: CH<sub>4</sub>N<sub>2</sub>O).



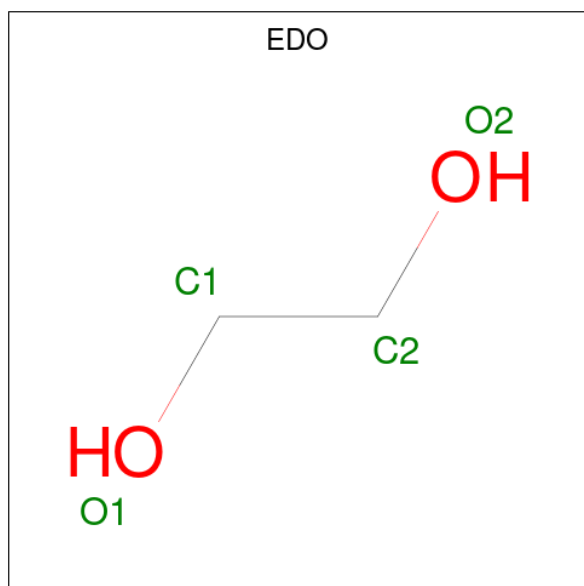
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	N	O	0	0
			4	1	2	1		
6	A	1	Total	C	N	O	0	0
			4	1	2	1		
6	A	1	Total	C	N	O	0	0
			4	1	2	1		
6	B	1	Total	C	N	O	0	0
			4	1	2	1		
6	B	1	Total	C	N	O	0	0
			4	1	2	1		
6	B	1	Total	C	N	O	0	0
			4	1	2	1		
6	C	1	Total	C	N	O	0	0
			4	1	2	1		
6	C	1	Total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

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	C	1	Total	C	N	O	0	0
			4	1	2	1		
6	C	1	Total	C	N	O	0	0
			4	1	2	1		
6	C	1	Total	C	N	O	0	0
			4	1	2	1		
6	E	1	Total	C	N	O	0	0
			4	1	2	1		
6	E	1	Total	C	N	O	0	0
			4	1	2	1		
6	F	1	Total	C	N	O	0	0
			4	1	2	1		
6	F	1	Total	C	N	O	0	0
			4	1	2	1		

- Molecule 7 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



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

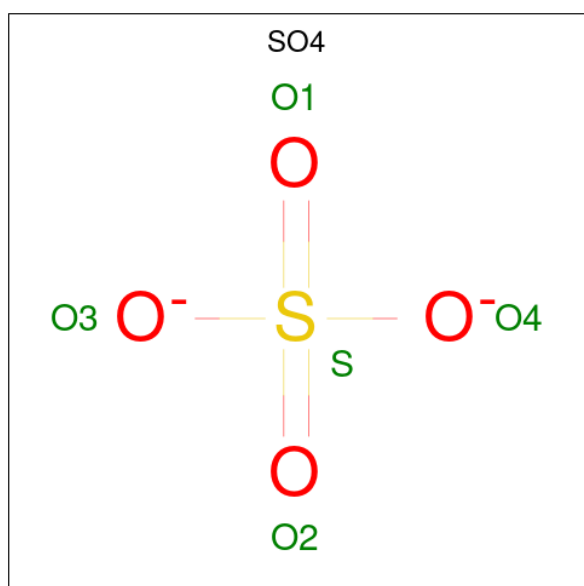
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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total	C	O	0	0
			4	2	2		
7	B	1	Total	C	O	0	0
			4	2	2		
7	B	1	Total	C	O	0	0
			4	2	2		
7	C	1	Total	C	O	0	0
			4	2	2		
7	C	1	Total	C	O	0	0
			4	2	2		
7	C	1	Total	C	O	0	0
			4	2	2		
7	D	1	Total	C	O	0	0
			4	2	2		
7	E	1	Total	C	O	0	0
			4	2	2		
7	F	1	Total	C	O	0	0
			4	2	2		
7	F	1	Total	C	O	0	0
			4	2	2		

- Molecule 8 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



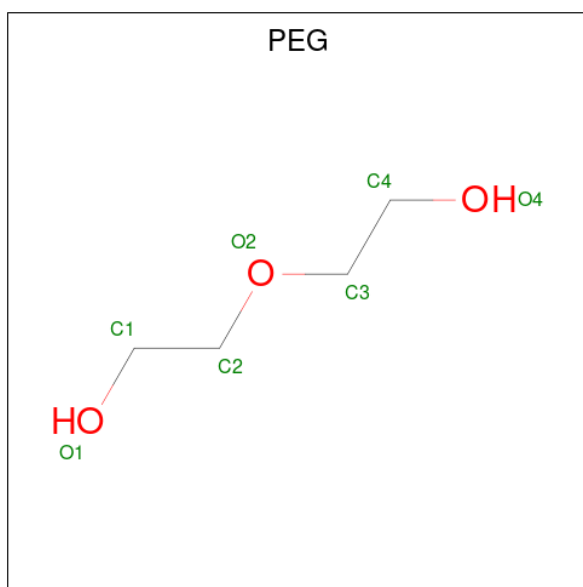
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	A	1	Total	O	S	0	0
			5	4	1		

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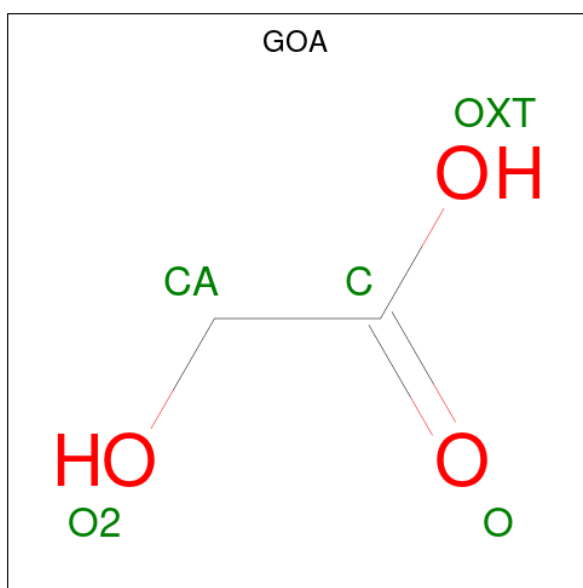
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	A	1	Total	O	S	0	0
			5	4	1		
8	B	1	Total	O	S	0	0
			5	4	1		
8	B	1	Total	O	S	0	0
			5	4	1		
8	B	1	Total	O	S	0	0
			5	4	1		
8	B	1	Total	O	S	0	0
			5	4	1		
8	C	1	Total	O	S	0	0
			5	4	1		
8	C	1	Total	O	S	0	0
			5	4	1		
8	C	1	Total	O	S	0	0
			5	4	1		
8	D	1	Total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

- Molecule 9 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C<sub>4</sub>H<sub>10</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	B	1	Total	C	O	0	0
			7	4	3		
9	B	1	Total	C	O	0	0
			7	4	3		

- Molecule 10 is GLYCOLIC ACID (three-letter code: GOA) (formula:  $C_2H_4O_3$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
10	C	1	Total	C	O	0	0
			5	2	3		
10	C	1	Total	C	O	0	0
			5	2	3		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
10	D	1	Total	C	O	0	0
			5	2	3		
10	F	1	Total	C	O	0	0
			5	2	3		

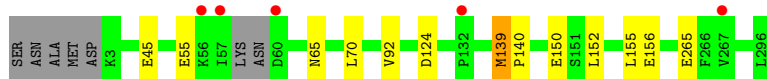
- Molecule 11 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	A	294	Total	O	0	23
			311	311		
11	B	273	Total	O	0	21
			291	291		
11	C	291	Total	O	0	12
			301	301		
11	D	275	Total	O	0	15
			287	287		
11	E	243	Total	O	0	11
			253	253		
11	F	247	Total	O	0	13
			258	258		

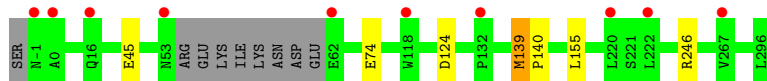
### 3 Residue-property plots [i](#)

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: Arginase



- Molecule 1: Arginase



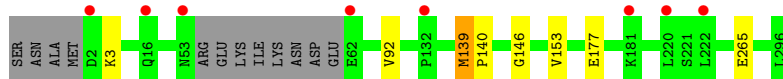
- Molecule 1: Arginase



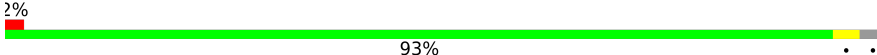
- Molecule 1: Arginase

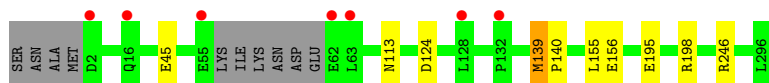


- Molecule 1: Arginase



- Molecule 1: Arginase

Chain F:  2% 93%



## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	81.41Å 143.99Å 85.52Å 90.00° 109.35° 90.00°	Depositor
Resolution (Å)	29.99 – 1.70 29.99 – 1.70	Depositor EDS
% Data completeness (in resolution range)	94.3 (29.99-1.70) 94.4 (29.99-1.70)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.96 (at 1.70Å)	Xtrriage
Refinement program	REFMAC 5.8.0238	Depositor
R, $R_{free}$	0.139 , 0.166 0.148 , 0.171	Depositor DCC
$R_{free}$ test set	9706 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	26.1	Xtrriage
Anisotropy	0.249	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 55.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	0.024 for l,-k,h	Xtrriage
$F_o, F_c$ correlation	0.98	EDS
Total number of atoms	15539	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	31.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.72% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: GOA, MG, FMT, PEG, SO4, EDO, NA, CL, URE

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	0.68	0/2344	0.74	0/3162
1	B	0.70	0/2266	0.75	0/3063
1	C	0.69	0/2294	0.73	0/3100
1	D	0.70	0/2291	0.75	0/3096
1	E	0.68	0/2264	0.75	0/3061
1	F	0.69	0/2271	0.73	0/3069
All	All	0.69	0/13730	0.74	0/18551

There are no bond length outliers.

There are no bond angle outliers.

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	2310	0	2334	8	0
1	B	2231	0	2237	6	0
1	C	2260	0	2263	10	0
1	D	2257	0	2264	10	0
1	E	2229	0	2233	7	0
1	F	2237	0	2242	9	0
2	A	4	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	1	0	0	0	0
2	C	3	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	E	1	0	0	0	0
4	A	2	0	0	0	0
4	B	2	0	0	0	0
4	C	2	0	0	0	0
4	D	2	0	0	0	0
4	E	2	0	0	0	0
4	F	2	0	0	0	0
5	A	6	0	2	0	0
5	B	9	0	3	0	0
5	D	12	0	4	0	0
5	E	12	0	4	0	0
5	F	6	0	2	0	0
6	A	12	0	12	1	0
6	B	12	0	12	0	0
6	C	24	0	24	2	0
6	E	8	0	8	0	0
6	F	8	0	8	0	0
7	A	20	0	30	0	0
7	B	8	0	12	0	0
7	C	12	0	18	1	0
7	D	4	0	6	0	0
7	E	4	0	6	1	0
7	F	8	0	12	0	0
8	A	10	0	0	1	0
8	B	20	0	0	0	0
8	C	15	0	0	0	0
8	D	20	0	0	0	0
8	E	15	0	0	0	0
8	F	10	0	0	0	0
9	B	14	0	20	0	0
10	C	10	0	0	0	0
10	D	5	0	0	0	0
10	F	5	0	0	0	0
11	A	311	0	0	3	0
11	B	291	0	0	0	0
11	C	301	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
11	D	287	0	0	1	0
11	E	253	0	0	1	0
11	F	258	0	0	1	0
All	All	15539	0	13756	52	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 (52) 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:E:177:GLU:H	1:E:177:GLU:CD	1.94	0.70
1:F:113[B]:ASN:ND2	11:F:401:HOH:O	2.24	0.70
1:C:203:LYS:HE3	1:C:207:GLU:OE2	1.96	0.65
8:A:319:SO4:O3	11:A:401[B]:HOH:O	2.15	0.61
1:B:124:ASP:HB3	1:B:140:PRO:HD2	1.83	0.60
1:A:55[B]:GLU:OE2	1:A:65:ASN:HA	2.01	0.59
1:F:139:MET:N	1:F:140:PRO:CD	2.65	0.59
7:C:313:EDO:H11	1:F:246:ARG:HG2	1.83	0.58
1:C:124:ASP:HB3	1:C:140:PRO:HD2	1.87	0.55
1:C:139:MET:N	1:C:140:PRO:CD	2.70	0.55
1:F:139:MET:N	1:F:140:PRO:HD2	2.22	0.54
1:E:177:GLU:CD	1:E:177:GLU:N	2.60	0.54
1:C:5[B]:ILE:HD13	1:C:291[B]:LEU:HD13	1.88	0.54
1:A:70[B]:LEU:CD2	1:A:152:LEU:HD23	2.37	0.54
1:D:124:ASP:HB3	1:D:140:PRO:HD2	1.90	0.54
1:D:150:GLU:H	1:D:150:GLU:CD	2.12	0.53
1:E:139:MET:N	1:E:140:PRO:CD	2.73	0.52
1:B:139:MET:N	1:B:140:PRO:CD	2.72	0.52
1:C:155:LEU:HG	1:C:156:GLU:HG2	1.91	0.52
1:A:139:MET:N	1:A:140:PRO:CD	2.73	0.51
1:D:139:MET:N	1:D:140:PRO:CD	2.73	0.51
1:F:139:MET:H	1:F:140:PRO:CD	2.23	0.51
1:A:124:ASP:HB3	1:A:140:PRO:HD2	1.93	0.50
1:A:155:LEU:HG	1:A:156:GLU:HG2	1.92	0.50
1:C:288:GLU:OE1	6:C:307:URE:N2	2.45	0.50
1:F:45[B]:GLU:O	1:F:45[B]:GLU:HG3	2.14	0.48
6:A:312:URE:N2	11:A:403:HOH:O	2.35	0.48
1:B:246:ARG:HG2	7:E:311:EDO:H22	1.96	0.48
1:B:74:GLU:HG2	1:B:155:LEU:HD11	1.96	0.47
1:E:139:MET:N	1:E:140:PRO:HD2	2.30	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:124:ASP:HB3	1:F:140:PRO:HD2	1.98	0.45
1:D:1:MET:CE	1:D:5:ILE:HD11	2.47	0.44
1:D:203:LYS:O	1:D:207:GLU:HG3	2.18	0.44
1:F:155:LEU:HG	1:F:156:GLU:HG2	1.99	0.44
1:A:45[B]:GLU:O	1:A:45[B]:GLU:HG3	2.17	0.43
1:D:74[A]:GLU:HG2	1:D:155:LEU:HD11	2.00	0.43
1:D:10:MET:HG3	1:D:76:LEU:HD22	1.99	0.43
1:F:195:GLU:OE1	1:F:198:ARG:NH2	2.51	0.43
1:A:150:GLU:HG2	11:A:610:HOH:O	2.19	0.42
1:B:45[A]:GLU:O	1:B:45[A]:GLU:HG3	2.18	0.42
1:E:3:LYS:HD2	11:E:631:HOH:O	2.20	0.42
1:A:92:VAL:O	1:A:265:GLU:HA	2.20	0.42
1:D:92:VAL:O	1:D:265:GLU:HA	2.19	0.41
1:C:86:GLU:OE1	6:C:311:URE:N1	2.53	0.41
1:D:206:GLU:OE1	11:D:401:HOH:O	2.22	0.41
1:E:146:GLY:HA2	1:E:153:VAL:HG13	2.00	0.41
1:C:203:LYS:NZ	11:C:402:HOH:O	2.38	0.41
1:D:146:GLY:HA2	1:D:153:VAL:HG13	2.01	0.41
1:E:92:VAL:O	1:E:265:GLU:HA	2.20	0.40
1:B:74:GLU:CG	1:B:155:LEU:HD11	2.52	0.40
1:C:74:GLU:HG2	1:C:155:LEU:HD11	2.04	0.40
1:C:129[B]:GLU:CD	11:C:416:HOH:O	2.60	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	298/299 (100%)	288 (97%)	9 (3%)	1 (0%)	41 24
1	B	290/299 (97%)	282 (97%)	7 (2%)	1 (0%)	41 24
1	C	293/299 (98%)	286 (98%)	6 (2%)	1 (0%)	41 24

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	D	293/299 (98%)	284 (97%)	8 (3%)	1 (0%)	41	24
1	E	289/299 (97%)	284 (98%)	4 (1%)	1 (0%)	41	24
1	F	290/299 (97%)	283 (98%)	6 (2%)	1 (0%)	41	24
All	All	1753/1794 (98%)	1707 (97%)	40 (2%)	6 (0%)	34	24

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	139	MET
1	F	139	MET
1	A	139	MET
1	C	139	MET
1	D	139	MET
1	E	139	MET

### 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	254/249 (102%)	254 (100%)	0	100	100
1	B	244/249 (98%)	244 (100%)	0	100	100
1	C	248/249 (100%)	248 (100%)	0	100	100
1	D	247/249 (99%)	247 (100%)	0	100	100
1	E	244/249 (98%)	244 (100%)	0	100	100
1	F	245/249 (98%)	245 (100%)	0	100	100
All	All	1482/1494 (99%)	1482 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	E	32	HIS

### 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 94 ligands modelled in this entry, 25 are monoatomic - leaving 69 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	$\# Z  > 2$
5	FMT	E	308	-	2,2,2	0.26	0	1,1,1	0.16	0
8	SO4	E	312	4	4,4,4	0.37	0	6,6,6	0.05	0
5	FMT	D	305	-	2,2,2	0.33	0	1,1,1	0.15	0
7	EDO	F	308	-	3,3,3	0.06	0	2,2,2	0.24	0
10	GOA	C	316	-	4,4,4	0.93	0	4,4,4	1.00	0
7	EDO	E	311	-	3,3,3	0.10	0	2,2,2	0.31	0
6	URE	C	309	-	3,3,3	0.18	0	3,3,3	0.03	0
5	FMT	E	307[A]	-	2,2,2	0.32	0	1,1,1	0.15	0
7	EDO	A	317	-	3,3,3	0.11	0	2,2,2	0.30	0
5	FMT	D	304	-	2,2,2	0.36	0	1,1,1	0.17	0
8	SO4	B	315	-	4,4,4	0.40	0	6,6,6	0.06	0
8	SO4	D	310	4	4,4,4	0.36	0	6,6,6	0.07	0
8	SO4	C	317	-	4,4,4	0.41	0	6,6,6	0.06	0
6	URE	E	310	-	3,3,3	0.22	0	3,3,3	0.04	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
8	SO4	F	310	4	4,4,4	0.37	0	6,6,6	0.06	0
6	URE	C	306	-	3,3,3	0.18	0	3,3,3	0.11	0
6	URE	B	309	-	3,3,3	0.14	0	3,3,3	0.03	0
8	SO4	C	318	4	4,4,4	0.38	0	6,6,6	0.06	0
8	SO4	D	311	-	4,4,4	0.40	0	6,6,6	0.05	0
5	FMT	E	305	-	2,2,2	0.46	0	1,1,1	0.14	0
10	GOA	D	309	-	4,4,4	1.00	0	4,4,4	0.99	0
8	SO4	D	313	-	4,4,4	0.39	0	6,6,6	0.07	0
7	EDO	C	312	-	3,3,3	0.10	0	2,2,2	0.13	0
8	SO4	A	319	-	4,4,4	0.39	0	6,6,6	0.05	0
7	EDO	A	314	-	3,3,3	0.08	0	2,2,2	0.18	0
7	EDO	C	314	-	3,3,3	0.15	0	2,2,2	0.19	0
8	SO4	B	313	4	4,4,4	0.38	0	6,6,6	0.05	0
10	GOA	F	309	-	4,4,4	1.09	0	4,4,4	0.94	0
6	URE	A	311	-	3,3,3	0.13	0	3,3,3	0.03	0
5	FMT	F	303	-	2,2,2	0.29	0	1,1,1	0.17	0
5	FMT	D	306	-	2,2,2	0.29	0	1,1,1	0.17	0
6	URE	B	308	-	3,3,3	0.17	0	3,3,3	0.03	0
7	EDO	A	313	-	3,3,3	0.13	0	2,2,2	0.32	0
10	GOA	C	315	-	4,4,4	0.97	0	4,4,4	1.29	0
9	PEG	B	318	-	6,6,6	0.14	0	5,5,5	0.10	0
7	EDO	F	307	-	3,3,3	0.07	0	2,2,2	0.21	0
5	FMT	F	304	-	2,2,2	0.31	0	1,1,1	0.14	0
6	URE	F	305	-	3,3,3	0.11	0	3,3,3	0.03	0
8	SO4	E	314	-	4,4,4	0.39	0	6,6,6	0.04	0
6	URE	B	310	-	3,3,3	0.14	0	3,3,3	0.03	0
7	EDO	B	312	-	3,3,3	0.07	0	2,2,2	0.14	0
6	URE	A	312	-	3,3,3	0.20	0	3,3,3	0.07	0
6	URE	C	308	-	3,3,3	0.14	0	3,3,3	0.04	0
8	SO4	B	316	-	4,4,4	0.39	0	6,6,6	0.07	0
7	EDO	B	311	-	3,3,3	0.10	0	2,2,2	0.27	0
7	EDO	A	315	-	3,3,3	0.08	0	2,2,2	0.21	0
5	FMT	E	306	-	2,2,2	0.24	0	1,1,1	0.18	0
6	URE	A	310	-	3,3,3	0.29	0	3,3,3	0.13	0
5	FMT	B	306	-	2,2,2	0.26	0	1,1,1	0.16	0
6	URE	F	306	-	3,3,3	0.13	0	3,3,3	0.03	0
7	EDO	D	308	-	3,3,3	0.11	0	2,2,2	0.30	0
8	SO4	D	312	-	4,4,4	0.40	0	6,6,6	0.05	0
8	SO4	C	319	-	4,4,4	0.38	0	6,6,6	0.07	0
5	FMT	A	309	-	2,2,2	0.36	0	1,1,1	0.14	0
8	SO4	F	311	-	4,4,4	0.38	0	6,6,6	0.06	0
7	EDO	A	316	-	3,3,3	0.12	0	2,2,2	0.31	0
7	EDO	C	313	-	3,3,3	0.07	0	2,2,2	0.29	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
5	FMT	B	307	-	2,2,2	0.28	0	1,1,1	0.17	0
6	URE	C	310	-	3,3,3	0.16	0	3,3,3	0.05	0
6	URE	C	307	-	3,3,3	0.11	0	3,3,3	0.13	0
6	URE	C	311	-	3,3,3	0.12	0	3,3,3	0.06	0
9	PEG	B	317	-	6,6,6	0.16	0	5,5,5	0.08	0
5	FMT	D	307	-	2,2,2	0.30	0	1,1,1	0.15	0
8	SO4	B	314	-	4,4,4	0.40	0	6,6,6	0.05	0
6	URE	E	309	-	3,3,3	0.21	0	3,3,3	0.07	0
8	SO4	E	313	-	4,4,4	0.38	0	6,6,6	0.06	0
5	FMT	A	308	-	2,2,2	0.45	0	1,1,1	0.12	0
5	FMT	B	305	-	2,2,2	0.43	0	1,1,1	0.16	0
8	SO4	A	318	4	4,4,4	0.33	0	6,6,6	0.06	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	EDO	F	308	-	-	1/1/1/1	-
10	GOA	C	316	-	-	2/2/2/2	-
7	EDO	E	311	-	-	1/1/1/1	-
7	EDO	A	317	-	-	1/1/1/1	-
10	GOA	D	309	-	-	2/2/2/2	-
7	EDO	A	314	-	-	1/1/1/1	-
7	EDO	C	314	-	-	1/1/1/1	-
10	GOA	F	309	-	-	0/2/2/2	-
10	GOA	C	315	-	-	2/2/2/2	-
7	EDO	A	313	-	-	1/1/1/1	-
9	PEG	B	318	-	-	1/4/4/4	-
7	EDO	F	307	-	-	0/1/1/1	-
7	EDO	B	312	-	-	0/1/1/1	-
7	EDO	B	311	-	-	1/1/1/1	-
7	EDO	A	315	-	-	1/1/1/1	-
7	EDO	D	308	-	-	1/1/1/1	-
7	EDO	A	316	-	-	1/1/1/1	-
7	EDO	C	313	-	-	1/1/1/1	-
9	PEG	B	317	-	-	2/4/4/4	-
7	EDO	C	312	-	-	0/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (20) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
10	C	315	GOA	O-C-CA-O2
10	C	315	GOA	OXT-C-CA-O2
10	C	316	GOA	O-C-CA-O2
10	C	316	GOA	OXT-C-CA-O2
10	D	309	GOA	O-C-CA-O2
10	D	309	GOA	OXT-C-CA-O2
9	B	317	PEG	O1-C1-C2-O2
9	B	318	PEG	O2-C3-C4-O4
7	A	313	EDO	O1-C1-C2-O2
7	A	315	EDO	O1-C1-C2-O2
7	A	317	EDO	O1-C1-C2-O2
7	B	311	EDO	O1-C1-C2-O2
7	C	313	EDO	O1-C1-C2-O2
7	E	311	EDO	O1-C1-C2-O2
7	A	314	EDO	O1-C1-C2-O2
7	D	308	EDO	O1-C1-C2-O2
7	F	308	EDO	O1-C1-C2-O2
7	A	316	EDO	O1-C1-C2-O2
9	B	317	PEG	C1-C2-O2-C3
7	C	314	EDO	O1-C1-C2-O2

There are no ring outliers.

6 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	E	311	EDO	1	0
8	A	319	SO4	1	0
6	A	312	URE	1	0
7	C	313	EDO	1	0
6	C	307	URE	1	0
6	C	311	URE	1	0

## 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

### 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	292/299 (97%)	-0.40	5 (1%) 70 74	20, 26, 39, 96	0
1	B	290/299 (96%)	-0.31	10 (3%) 45 50	21, 26, 42, 72	0
1	C	290/299 (96%)	-0.33	7 (2%) 59 63	21, 27, 40, 83	0
1	D	289/299 (96%)	-0.40	4 (1%) 75 79	21, 28, 42, 68	0
1	E	287/299 (95%)	-0.30	8 (2%) 53 57	22, 29, 44, 84	0
1	F	289/299 (96%)	-0.28	7 (2%) 59 63	23, 30, 46, 97	0
All	All	1737/1794 (96%)	-0.34	41 (2%) 59 63	20, 28, 43, 97	0

All (41) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	57	ILE	12.7
1	C	60	ASP	5.5
1	E	2	ASP	4.9
1	F	62	GLU	4.6
1	A	56	LYS	4.4
1	F	2	ASP	4.4
1	C	132	PRO	4.3
1	F	132	PRO	4.2
1	B	132	PRO	3.9
1	E	53	ASN	3.8
1	A	132	PRO	3.6
1	B	-1	ASN	3.5
1	E	62	GLU	3.5
1	D	62	GLU	3.5
1	A	60	ASP	3.5
1	B	62	GLU	3.4
1	F	63	LEU	3.3
1	F	128	LEU	3.1
1	D	132	PRO	3.1

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Mol	Chain	Res	Type	RSRZ
1	F	16	GLN	3.0
1	E	132	PRO	2.9
1	C	99	ILE	2.9
1	E	222	LEU	2.6
1	B	222	LEU	2.6
1	A	267	VAL	2.6
1	B	0	ALA	2.6
1	B	267	VAL	2.5
1	B	118	TRP	2.5
1	E	220	LEU	2.4
1	B	220	LEU	2.3
1	C	222	LEU	2.3
1	F	55	GLU	2.3
1	E	16	GLN	2.3
1	B	16	GLN	2.3
1	D	118	TRP	2.2
1	C	118	TRP	2.2
1	C	266	PHE	2.2
1	B	53	ASN	2.1
1	E	181	LYS	2.1
1	D	16[A]	GLN	2.1
1	C	220	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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
8	SO4	D	310	5/5	0.61	0.37	43,50,57,64	5

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
6	URE	C	307	4/4	0.63	0.23	40,47,55,58	0
4	MG	D	303	1/1	0.66	0.28	35,35,35,35	1
6	URE	C	308	4/4	0.71	0.39	67,68,69,70	0
4	MG	C	305	1/1	0.72	0.24	33,33,33,33	1
5	FMT	B	307	3/3	0.73	0.09	68,68,69,69	0
9	PEG	B	317	7/7	0.73	0.28	60,67,74,75	0
4	MG	F	301	1/1	0.74	0.17	32,32,32,32	1
6	URE	C	310	4/4	0.74	0.28	71,75,77,78	0
8	SO4	C	318	5/5	0.75	0.35	40,52,55,59	5
4	MG	F	302	1/1	0.76	0.30	37,37,37,37	1
7	EDO	A	313	4/4	0.78	0.14	51,52,56,60	0
8	SO4	B	313	5/5	0.79	0.26	37,44,49,56	5
5	FMT	E	305	3/3	0.79	0.13	38,38,44,45	0
2	CL	A	304	1/1	0.81	0.06	80,80,80,80	0
8	SO4	F	310	5/5	0.82	0.33	44,51,53,59	5
6	URE	F	305	4/4	0.83	0.26	68,69,71,72	0
6	URE	A	312	4/4	0.83	0.11	52,55,61,63	0
7	EDO	A	316	4/4	0.83	0.13	47,54,60,61	0
8	SO4	E	314	5/5	0.83	0.28	81,89,92,93	0
7	EDO	C	313	4/4	0.83	0.12	38,49,49,51	0
7	EDO	E	311	4/4	0.83	0.15	39,46,48,51	0
6	URE	B	309	4/4	0.84	0.24	68,69,73,74	0
5	FMT	A	308	3/3	0.84	0.10	36,36,42,45	0
5	FMT	F	304	3/3	0.84	0.21	62,62,63,66	0
5	FMT	D	307	3/3	0.84	0.12	64,64,67,69	0
6	URE	C	311	4/4	0.84	0.26	64,66,68,69	0
8	SO4	A	318	5/5	0.84	0.17	48,66,80,92	0
4	MG	B	304	1/1	0.86	0.12	32,32,32,32	1
6	URE	E	310	4/4	0.86	0.26	61,62,64,66	0
10	GOA	D	309	5/5	0.86	0.11	54,55,61,62	0
7	EDO	D	308	4/4	0.87	0.15	53,55,57,58	0
4	MG	E	304	1/1	0.87	0.14	35,35,35,35	1
8	SO4	C	317	5/5	0.87	0.20	51,56,57,57	5
2	CL	C	303	1/1	0.88	0.08	83,83,83,83	0
6	URE	B	310	4/4	0.88	0.37	64,67,68,68	0
8	SO4	E	312	5/5	0.88	0.30	41,48,52,57	5
7	EDO	A	315	4/4	0.88	0.34	62,69,70,71	0
6	URE	C	309	4/4	0.88	0.16	68,70,70,71	0
7	EDO	A	317	4/4	0.88	0.23	56,61,62,63	0
7	EDO	B	311	4/4	0.88	0.12	49,56,58,58	0
8	SO4	A	319	5/5	0.89	0.14	53,55,56,58	5
6	URE	A	311	4/4	0.89	0.15	55,61,66,71	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
5	FMT	E	307[A]	3/3	0.89	0.07	45,45,48,50	3
6	URE	F	306	4/4	0.89	0.27	58,58,60,65	0
2	CL	E	301	1/1	0.89	0.17	80,80,80,80	0
4	MG	E	303	1/1	0.90	0.08	34,34,34,34	1
7	EDO	B	312	4/4	0.90	0.13	45,53,54,64	0
8	SO4	B	315	5/5	0.91	0.17	49,50,55,56	5
7	EDO	C	312	4/4	0.91	0.10	39,39,41,44	0
7	EDO	A	314	4/4	0.91	0.14	53,55,57,58	0
4	MG	A	306	1/1	0.91	0.07	30,30,30,30	1
5	FMT	D	304	3/3	0.91	0.07	38,38,47,54	0
7	EDO	F	308	4/4	0.91	0.15	49,53,54,56	0
5	FMT	D	305	3/3	0.91	0.10	41,41,55,56	0
4	MG	D	302	1/1	0.91	0.12	31,31,31,31	1
9	PEG	B	318	7/7	0.91	0.12	49,55,59,60	0
5	FMT	B	305	3/3	0.91	0.11	33,33,43,47	0
6	URE	E	309	4/4	0.92	0.10	65,68,69,72	0
8	SO4	D	312	5/5	0.92	0.15	52,56,57,59	5
2	CL	A	303	1/1	0.93	0.12	76,76,76,76	0
5	FMT	A	309	3/3	0.93	0.16	40,40,47,49	0
8	SO4	D	311	5/5	0.93	0.12	60,63,64,66	5
4	MG	B	303	1/1	0.93	0.13	30,30,30,30	1
10	GOA	C	316	5/5	0.93	0.12	59,61,64,66	0
6	URE	B	308	4/4	0.93	0.16	56,59,63,67	0
6	URE	C	306	4/4	0.94	0.09	42,48,53,53	0
8	SO4	B	314	5/5	0.94	0.27	51,51,54,56	5
5	FMT	E	306	3/3	0.94	0.07	45,45,51,60	0
2	CL	C	302	1/1	0.94	0.07	74,74,74,74	0
5	FMT	F	303	3/3	0.94	0.05	65,65,66,69	0
5	FMT	D	306	3/3	0.95	0.05	42,42,56,62	0
10	GOA	C	315	5/5	0.95	0.18	33,38,40,49	0
8	SO4	D	313	5/5	0.95	0.22	63,64,68,76	0
7	EDO	F	307	4/4	0.95	0.07	36,40,40,43	0
8	SO4	F	311	5/5	0.96	0.19	60,62,68,74	0
5	FMT	B	306	3/3	0.96	0.15	42,42,52,59	0
6	URE	A	310	4/4	0.96	0.10	34,39,41,44	0
8	SO4	C	319	5/5	0.96	0.14	58,60,64,74	0
7	EDO	C	314	4/4	0.96	0.09	35,38,40,42	0
4	MG	A	307	1/1	0.96	0.12	34,34,34,34	1
10	GOA	F	309	5/5	0.96	0.09	37,40,49,56	0
8	SO4	E	313	5/5	0.97	0.17	61,64,71,73	0
8	SO4	B	316	5/5	0.97	0.13	55,60,63,73	0
2	CL	A	302	1/1	0.98	0.06	45,45,45,45	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	NA	A	305	1/1	0.98	0.03	24,24,24,24	0
3	NA	B	302	1/1	0.98	0.03	24,24,24,24	0
5	FMT	E	308	3/3	0.98	0.03	47,47,52,58	0
4	MG	C	304	1/1	0.98	0.14	29,29,29,29	1
2	CL	B	301	1/1	0.98	0.14	43,43,43,43	0
2	CL	C	301	1/1	0.99	0.10	42,42,42,42	0
2	CL	D	301	1/1	0.99	0.12	43,43,43,43	0
3	NA	E	302	1/1	0.99	0.05	26,26,26,26	0
2	CL	A	301	1/1	0.99	0.09	38,38,38,38	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.