



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 17, 2024 – 11:04 PM EST

PDB ID : 4D8Y  
Title : Crystal structure of the hexameric purine nucleoside phosphorylase from *Bacillus subtilis* in space group P212121 at pH 5.6  
Authors : Santos, C.R.; Meza, A.N.; Martins, N.H.; Giuseppe, P.O.; Murakami, M.T.  
Deposited on : 2012-01-11  
Resolution : 1.61 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

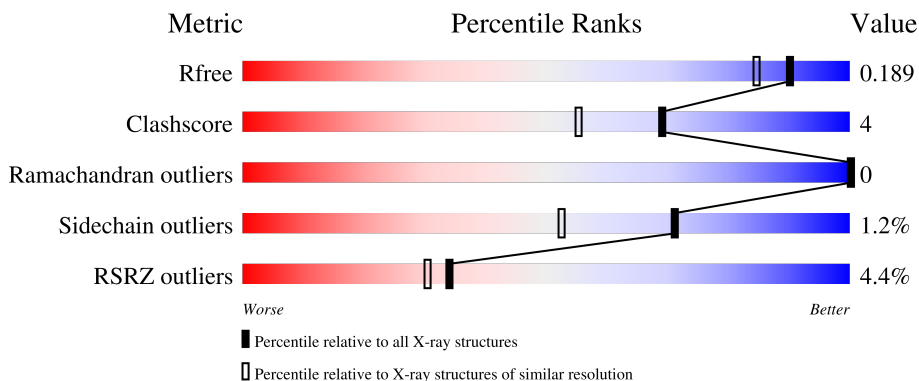
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.61 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	4693 (1.64-1.60)
Clashscore	141614	5002 (1.64-1.60)
Ramachandran outliers	138981	4888 (1.64-1.60)
Sidechain outliers	138945	4887 (1.64-1.60)
RSRZ outliers	127900	4609 (1.64-1.60)

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	253	 5% 85% 10% 5%
1	B	253	 3% 87% 8% 5%
1	C	253	 4% 85% 9% 5%
1	D	253	 5% 90% 5% 5%
1	E	253	 5% 87% 7% 5%

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Mol	Chain	Length	Quality of chain
1	F	253	<p>4% 89% 6% 5%</p>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	GOL	F	305	-	-	X	-

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 12418 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 Purine nucleoside phosphorylase deoD-type.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	240	1907	1204	318	374	11	0	17	0
1	B	240	1887	1192	312	372	11	0	14	0
1	C	240	1886	1189	313	373	11	0	13	0
1	D	240	1872	1180	310	372	10	0	11	0
1	E	240	1903	1203	314	375	11	0	17	0
1	F	240	1861	1172	311	368	10	0	9	0

There are 126 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	expression tag	UNP O34925
A	-18	GLY	-	expression tag	UNP O34925
A	-17	SER	-	expression tag	UNP O34925
A	-16	SER	-	expression tag	UNP O34925
A	-15	HIS	-	expression tag	UNP O34925
A	-14	HIS	-	expression tag	UNP O34925
A	-13	HIS	-	expression tag	UNP O34925
A	-12	HIS	-	expression tag	UNP O34925
A	-11	HIS	-	expression tag	UNP O34925
A	-10	HIS	-	expression tag	UNP O34925
A	-9	SER	-	expression tag	UNP O34925
A	-8	SER	-	expression tag	UNP O34925
A	-7	GLY	-	expression tag	UNP O34925
A	-6	LEU	-	expression tag	UNP O34925
A	-5	VAL	-	expression tag	UNP O34925
A	-4	PRO	-	expression tag	UNP O34925
A	-3	ARG	-	expression tag	UNP O34925

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	expression tag	UNP O34925
A	-1	SER	-	expression tag	UNP O34925
A	0	HIS	-	expression tag	UNP O34925
A	225	ASP	GLU	SEE REMARK 999	UNP O34925
B	-19	MET	-	expression tag	UNP O34925
B	-18	GLY	-	expression tag	UNP O34925
B	-17	SER	-	expression tag	UNP O34925
B	-16	SER	-	expression tag	UNP O34925
B	-15	HIS	-	expression tag	UNP O34925
B	-14	HIS	-	expression tag	UNP O34925
B	-13	HIS	-	expression tag	UNP O34925
B	-12	HIS	-	expression tag	UNP O34925
B	-11	HIS	-	expression tag	UNP O34925
B	-10	HIS	-	expression tag	UNP O34925
B	-9	SER	-	expression tag	UNP O34925
B	-8	SER	-	expression tag	UNP O34925
B	-7	GLY	-	expression tag	UNP O34925
B	-6	LEU	-	expression tag	UNP O34925
B	-5	VAL	-	expression tag	UNP O34925
B	-4	PRO	-	expression tag	UNP O34925
B	-3	ARG	-	expression tag	UNP O34925
B	-2	GLY	-	expression tag	UNP O34925
B	-1	SER	-	expression tag	UNP O34925
B	0	HIS	-	expression tag	UNP O34925
B	225	ASP	GLU	SEE REMARK 999	UNP O34925
C	-19	MET	-	expression tag	UNP O34925
C	-18	GLY	-	expression tag	UNP O34925
C	-17	SER	-	expression tag	UNP O34925
C	-16	SER	-	expression tag	UNP O34925
C	-15	HIS	-	expression tag	UNP O34925
C	-14	HIS	-	expression tag	UNP O34925
C	-13	HIS	-	expression tag	UNP O34925
C	-12	HIS	-	expression tag	UNP O34925
C	-11	HIS	-	expression tag	UNP O34925
C	-10	HIS	-	expression tag	UNP O34925
C	-9	SER	-	expression tag	UNP O34925
C	-8	SER	-	expression tag	UNP O34925
C	-7	GLY	-	expression tag	UNP O34925
C	-6	LEU	-	expression tag	UNP O34925
C	-5	VAL	-	expression tag	UNP O34925
C	-4	PRO	-	expression tag	UNP O34925
C	-3	ARG	-	expression tag	UNP O34925

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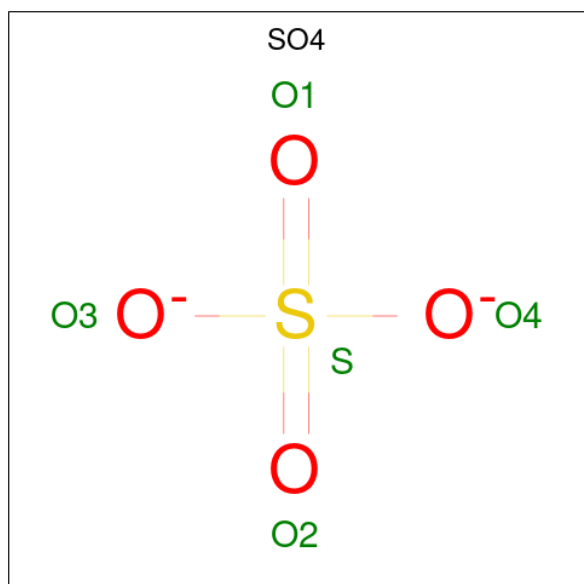
Chain	Residue	Modelled	Actual	Comment	Reference
C	-2	GLY	-	expression tag	UNP O34925
C	-1	SER	-	expression tag	UNP O34925
C	0	HIS	-	expression tag	UNP O34925
C	225	ASP	GLU	SEE REMARK 999	UNP O34925
D	-19	MET	-	expression tag	UNP O34925
D	-18	GLY	-	expression tag	UNP O34925
D	-17	SER	-	expression tag	UNP O34925
D	-16	SER	-	expression tag	UNP O34925
D	-15	HIS	-	expression tag	UNP O34925
D	-14	HIS	-	expression tag	UNP O34925
D	-13	HIS	-	expression tag	UNP O34925
D	-12	HIS	-	expression tag	UNP O34925
D	-11	HIS	-	expression tag	UNP O34925
D	-10	HIS	-	expression tag	UNP O34925
D	-9	SER	-	expression tag	UNP O34925
D	-8	SER	-	expression tag	UNP O34925
D	-7	GLY	-	expression tag	UNP O34925
D	-6	LEU	-	expression tag	UNP O34925
D	-5	VAL	-	expression tag	UNP O34925
D	-4	PRO	-	expression tag	UNP O34925
D	-3	ARG	-	expression tag	UNP O34925
D	-2	GLY	-	expression tag	UNP O34925
D	-1	SER	-	expression tag	UNP O34925
D	0	HIS	-	expression tag	UNP O34925
D	225	ASP	GLU	SEE REMARK 999	UNP O34925
E	-19	MET	-	expression tag	UNP O34925
E	-18	GLY	-	expression tag	UNP O34925
E	-17	SER	-	expression tag	UNP O34925
E	-16	SER	-	expression tag	UNP O34925
E	-15	HIS	-	expression tag	UNP O34925
E	-14	HIS	-	expression tag	UNP O34925
E	-13	HIS	-	expression tag	UNP O34925
E	-12	HIS	-	expression tag	UNP O34925
E	-11	HIS	-	expression tag	UNP O34925
E	-10	HIS	-	expression tag	UNP O34925
E	-9	SER	-	expression tag	UNP O34925
E	-8	SER	-	expression tag	UNP O34925
E	-7	GLY	-	expression tag	UNP O34925
E	-6	LEU	-	expression tag	UNP O34925
E	-5	VAL	-	expression tag	UNP O34925
E	-4	PRO	-	expression tag	UNP O34925
E	-3	ARG	-	expression tag	UNP O34925

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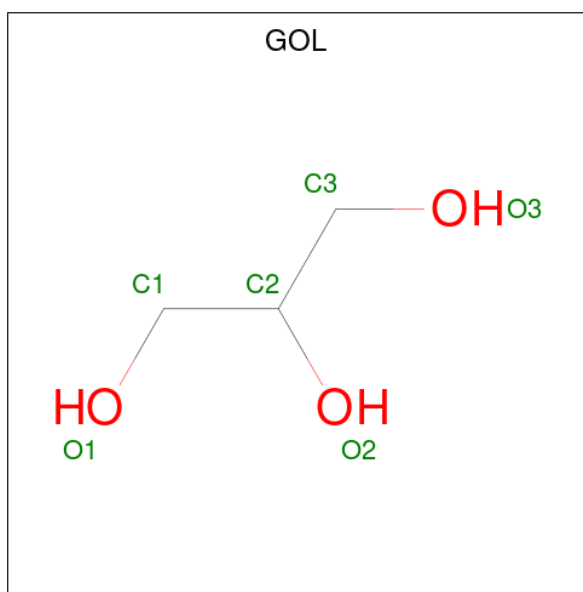
Chain	Residue	Modelled	Actual	Comment	Reference
E	-2	GLY	-	expression tag	UNP O34925
E	-1	SER	-	expression tag	UNP O34925
E	0	HIS	-	expression tag	UNP O34925
E	225	ASP	GLU	SEE REMARK 999	UNP O34925
F	-19	MET	-	expression tag	UNP O34925
F	-18	GLY	-	expression tag	UNP O34925
F	-17	SER	-	expression tag	UNP O34925
F	-16	SER	-	expression tag	UNP O34925
F	-15	HIS	-	expression tag	UNP O34925
F	-14	HIS	-	expression tag	UNP O34925
F	-13	HIS	-	expression tag	UNP O34925
F	-12	HIS	-	expression tag	UNP O34925
F	-11	HIS	-	expression tag	UNP O34925
F	-10	HIS	-	expression tag	UNP O34925
F	-9	SER	-	expression tag	UNP O34925
F	-8	SER	-	expression tag	UNP O34925
F	-7	GLY	-	expression tag	UNP O34925
F	-6	LEU	-	expression tag	UNP O34925
F	-5	VAL	-	expression tag	UNP O34925
F	-4	PRO	-	expression tag	UNP O34925
F	-3	ARG	-	expression tag	UNP O34925
F	-2	GLY	-	expression tag	UNP O34925
F	-1	SER	-	expression tag	UNP O34925
F	0	HIS	-	expression tag	UNP O34925
F	225	ASP	GLU	SEE REMARK 999	UNP O34925

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



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	C	1	Total O S 5 4 1	0	0
2	C	1	Total O S 5 4 1	0	0
2	D	1	Total O S 5 4 1	0	0
2	D	1	Total O S 5 4 1	0	0
2	E	1	Total O S 5 4 1	0	0
2	E	1	Total O S 5 4 1	0	0
2	F	1	Total O S 5 4 1	0	0
2	F	1	Total O S 5 4 1	0	0

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).





Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 6 3 3	0	0
3	A	1	Total C O 6 3 3	0	0
3	B	1	Total C O 6 3 3	0	0
3	C	1	Total C O 6 3 3	0	0
3	C	1	Total C O 6 3 3	0	0
3	C	1	Total C O 6 3 3	0	0
3	C	1	Total C O 6 3 3	0	0
3	D	1	Total C O 6 3 3	0	0
3	E	1	Total C O 6 3 3	0	0
3	E	1	Total C O 6 3 3	0	0
3	F	1	Total C O 6 3 3	0	0
3	F	1	Total C O 6 3 3	0	0
3	F	1	Total C O 6 3 3	0	0

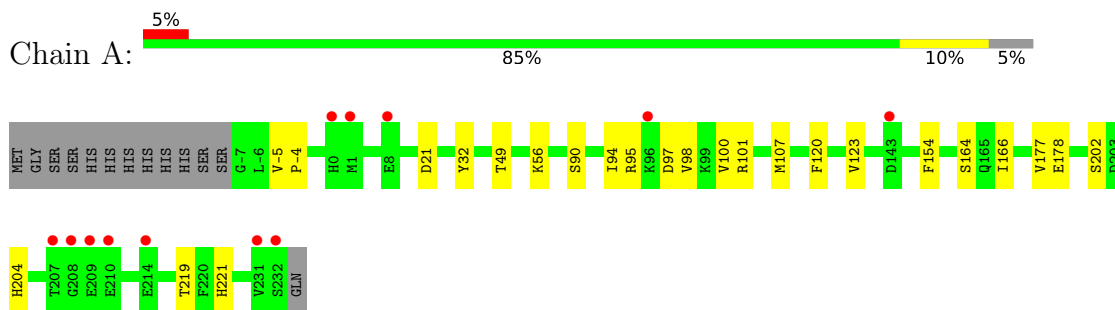
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	135	Total O 135 135	0	0
4	B	163	Total O 163 163	0	0
4	C	173	Total O 173 173	0	0
4	D	170	Total O 170 170	0	0
4	E	163	Total O 163 163	0	0
4	F	160	Total O 160 160	0	0

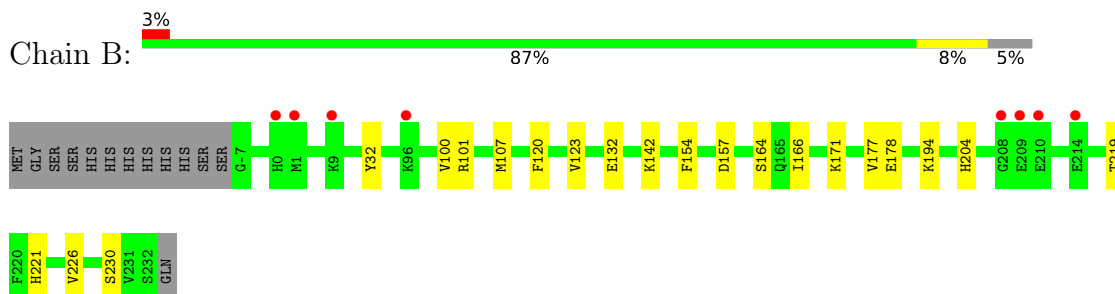
### 3 Residue-property plots [i](#)

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.

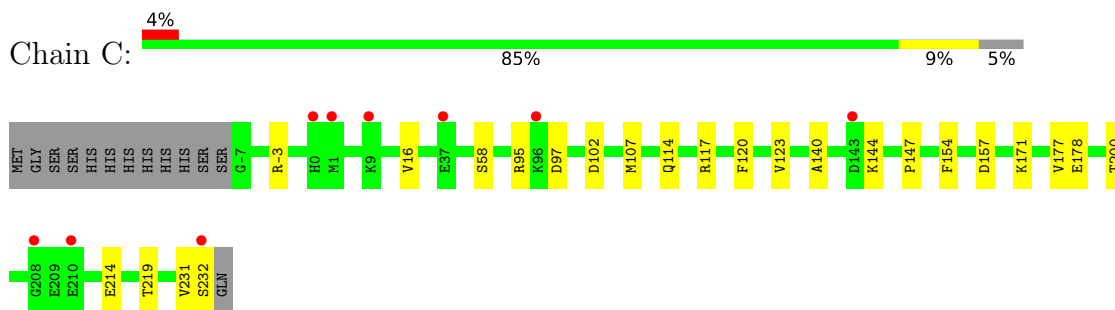
- Molecule 1: Purine nucleoside phosphorylase deoD-type



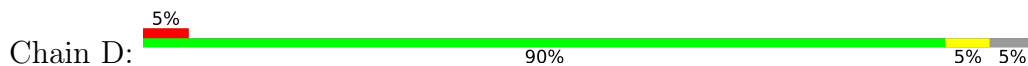
- Molecule 1: Purine nucleoside phosphorylase deoD-type

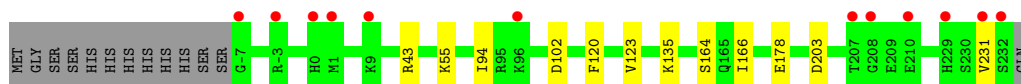


- Molecule 1: Purine nucleoside phosphorylase deoD-type

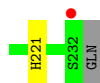
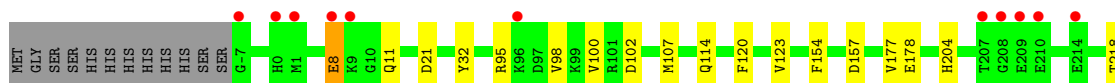
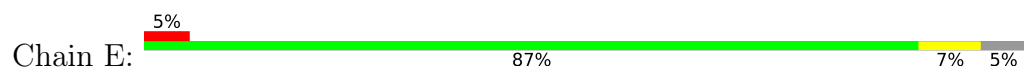


- Molecule 1: Purine nucleoside phosphorylase deoD-type

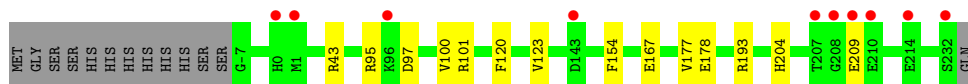
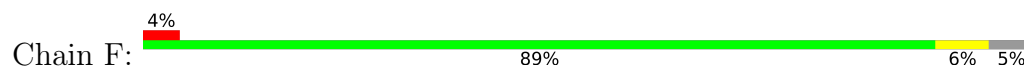




- Molecule 1: Purine nucleoside phosphorylase deoD-type



- Molecule 1: Purine nucleoside phosphorylase deoD-type



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	56.79Å 135.98Å 236.61Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 1.61 19.90 – 1.61	Depositor EDS
% Data completeness (in resolution range)	98.7 (20.00-1.61) 98.7 (19.90-1.61)	Depositor EDS
$R_{merge}$	0.05	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.95 (at 1.61Å)	Xtrriage
Refinement program	REFMAC	Depositor
R, $R_{free}$	0.166 , 0.190 0.166 , 0.189	Depositor DCC
$R_{free}$ test set	11788 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	20.4	Xtrriage
Anisotropy	0.050	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.42 , 52.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	12418	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	22.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.79% 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 [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, 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	0.68	0/1986	0.79	0/2685
1	B	0.71	0/1960	0.80	1/2653 (0.0%)
1	C	0.71	0/1955	0.82	2/2645 (0.1%)
1	D	0.72	0/1935	0.79	0/2620
1	E	0.72	0/1984	0.78	1/2683 (0.0%)
1	F	0.70	0/1917	0.80	1/2593 (0.0%)
All	All	0.71	0/11737	0.80	5/15879 (0.0%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	157	ASP	CB-CG-OD1	6.68	124.31	118.30
1	C	157	ASP	CB-CG-OD1	5.72	123.44	118.30
1	E	157	ASP	CB-CG-OD1	5.66	123.39	118.30
1	C	117	ARG	NE-CZ-NH2	-5.22	117.69	120.30
1	F	193	ARG	NE-CZ-NH2	-5.18	117.71	120.30

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1907	0	1934	19	0
1	B	1887	0	1904	16	0
1	C	1886	0	1900	25	0
1	D	1872	0	1881	7	0
1	E	1903	0	1934	25	0
1	F	1861	0	1875	10	0
2	A	10	0	0	0	0
2	B	10	0	0	1	0
2	C	10	0	0	0	0
2	D	10	0	0	0	0
2	E	10	0	0	0	0
2	F	10	0	0	0	0
3	A	12	0	16	0	0
3	B	6	0	8	0	0
3	C	24	0	32	0	0
3	D	6	0	8	0	0
3	E	12	0	16	0	0
3	F	18	0	24	4	0
4	A	135	0	0	1	0
4	B	163	0	0	1	0
4	C	173	0	0	2	0
4	D	170	0	0	2	0
4	E	163	0	0	6	0
4	F	160	0	0	0	0
All	All	12418	0	11532	84	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 4.

All (84) 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:107[B]:MET:SD	1:B:107[B]:MET:SD	2.32	1.27
1:C:107[B]:MET:SD	1:E:107[B]:MET:SD	2.35	1.24
1:C:107[B]:MET:CG	1:E:107[B]:MET:CG	2.28	1.11
1:D:102:ASP:HB2	4:D:567:HOH:O	1.54	1.07
1:C:107[B]:MET:HG3	1:E:107[B]:MET:SD	2.01	1.00
1:C:107[B]:MET:CG	1:E:107[B]:MET:SD	2.53	0.97
1:C:107[B]:MET:SD	1:E:107[B]:MET:HG3	2.08	0.93
1:C:107[B]:MET:SD	1:E:107[B]:MET:CG	2.58	0.91
1:D:135:LYS:HE2	4:D:566:HOH:O	1.72	0.88
1:F:167:GLU:HG3	3:F:305:GOL:H12	1.54	0.86

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:90[A]:SER:HB2	1:A:202[A]:SER:OG	1.75	0.86
1:C:107[B]:MET:CG	1:E:107[B]:MET:HG2	2.06	0.85
1:B:164[A]:SER:OG	1:B:166:ILE:HG12	1.77	0.85
1:F:167:GLU:H	3:F:305:GOL:H11	1.41	0.84
1:C:107[B]:MET:HG3	1:E:107[B]:MET:CG	2.07	0.82
1:C:107[B]:MET:HG2	1:E:107[B]:MET:CG	2.10	0.81
1:A:107[B]:MET:CG	1:B:107[B]:MET:SD	2.71	0.79
1:F:95[B]:ARG:HD2	1:F:97:ASP:OD2	1.83	0.78
1:C:107[B]:MET:CG	1:E:107[B]:MET:HG3	2.11	0.78
1:B:32:TYR:HH	1:B:221:HIS:HD1	1.30	0.76
1:A:107[B]:MET:HG3	1:B:107[B]:MET:SD	2.27	0.75
1:A:164[A]:SER:OG	1:A:166:ILE:HG12	1.91	0.70
1:C:107[B]:MET:HG2	1:E:107[B]:MET:HG2	1.71	0.68
1:C:102:ASP:HB2	4:C:551:HOH:O	1.95	0.65
1:C:107[B]:MET:HG3	1:E:107[B]:MET:HG2	1.73	0.64
1:E:218:THR:HG22	4:E:556:HOH:O	1.98	0.62
2:B:302:SO4:O1	1:C:-3:ARG:HD3	2.00	0.62
1:E:102:ASP:HB2	4:E:536:HOH:O	2.01	0.60
1:A:100:VAL:HG12	1:A:204[B]:HIS:CE1	2.36	0.60
1:C:140:ALA:O	1:C:144:LYS:HD2	2.03	0.58
1:D:120:PHE:HB3	1:D:123:VAL:HB	1.85	0.58
1:B:32:TYR:OH	1:B:221:HIS:ND1	2.24	0.57
1:A:95[B]:ARG:HD2	1:A:97:ASP:OD2	2.04	0.57
1:D:55:LYS:HE3	1:D:231:VAL:O	2.05	0.57
1:E:32:TYR:OH	1:E:221[B]:HIS:ND1	2.29	0.57
1:C:95[B]:ARG:HD2	1:C:97:ASP:OD2	2.05	0.57
1:E:95[B]:ARG:HB2	1:E:98:VAL:HG23	1.85	0.57
1:E:8:GLU:HG2	1:E:11:GLN:OE1	2.06	0.56
1:C:171:LYS:CG	4:E:559:HOH:O	2.54	0.56
1:C:171:LYS:HG2	4:E:559:HOH:O	2.06	0.56
1:B:120:PHE:HB3	1:B:123:VAL:HB	1.87	0.55
1:C:120:PHE:HB3	1:C:123:VAL:HB	1.88	0.55
1:E:120:PHE:HB3	1:E:123:VAL:HB	1.87	0.55
1:C:107[B]:MET:HG2	1:E:107[B]:MET:HG3	1.81	0.55
1:F:120:PHE:HB3	1:F:123:VAL:HB	1.89	0.54
1:E:100[B]:VAL:CG2	1:E:204:HIS:NE2	2.71	0.54
1:D:164:SER:OG	1:D:166:ILE:HG12	2.08	0.53
1:E:154:PHE:HB3	1:E:177[B]:VAL:HG12	1.90	0.52
1:F:167:GLU:CG	3:F:305:GOL:H12	2.33	0.52
1:B:132:GLU:OE1	1:B:194:LYS:NZ	2.35	0.51
1:B:101:ARG:HA	1:B:219[B]:THR:HG21	1.93	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:154:PHE:HB3	1:B:177[B]:VAL:HG12	1.93	0.50
1:B:100[B]:VAL:HG22	1:B:204[B]:HIS:NE2	2.27	0.49
1:F:167:GLU:H	3:F:305:GOL:C1	2.21	0.49
1:B:101:ARG:HA	1:B:219[B]:THR:CG2	2.42	0.49
1:C:214:GLU:H	1:C:214:GLU:CD	2.15	0.49
1:C:154:PHE:HB3	1:C:177[B]:VAL:HG12	1.95	0.49
1:A:100:VAL:HG23	1:A:101:ARG:HG2	1.95	0.48
1:A:95[B]:ARG:HB2	1:A:98:VAL:HG23	1.96	0.48
1:A:100:VAL:HG12	1:A:204[B]:HIS:NE2	2.30	0.47
1:A:120:PHE:HB3	1:A:123:VAL:HB	1.96	0.47
1:E:100[B]:VAL:HG23	1:E:204:HIS:NE2	2.31	0.46
1:E:21:ASP:OD1	1:F:43:ARG:HA	2.18	0.44
1:B:171:LYS:HG3	4:B:530:HOH:O	2.18	0.43
1:F:100:VAL:HG23	1:F:101:ARG:HG2	2.00	0.42
1:B:226:VAL:O	1:B:230:SER:HB3	2.19	0.42
1:E:218:THR:CG2	4:E:556:HOH:O	2.64	0.42
1:B:166:ILE:HD12	1:B:177[B]:VAL:HG11	2.01	0.42
1:B:142:LYS:HD2	1:B:142:LYS:HA	1.81	0.42
1:D:94:ILE:HG21	1:D:166:ILE:HG23	2.01	0.42
1:A:21:ASP:OD1	1:D:43:ARG:HA	2.19	0.42
1:C:214:GLU:HG2	4:C:508:HOH:O	2.19	0.42
1:A:219[A]:THR:HG21	4:A:446:HOH:O	2.20	0.41
1:A:49:THR:HG21	1:A:56:LYS:HE2	2.01	0.41
1:A:94:ILE:HG21	1:A:166:ILE:HG23	2.03	0.41
1:C:16:VAL:HG22	1:C:58:SER:HB2	2.03	0.41
1:E:98:VAL:HG13	4:E:536:HOH:O	2.20	0.41
1:F:154:PHE:HB3	1:F:177[B]:VAL:HG12	2.03	0.41
1:A:32:TYR:HH	1:A:221[B]:HIS:HD1	1.63	0.40
1:A:154:PHE:HB3	1:A:177[B]:VAL:HG12	2.03	0.40
1:A:100:VAL:CG1	1:A:204[B]:HIS:CE1	3.03	0.40
1:A:-5:VAL:HB	1:A:-4:PRO:HD2	2.03	0.40
1:C:200:THR:CG2	1:C:219:THR:HG22	2.51	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	255/253 (101%)	252 (99%)	3 (1%)	0	100	100
1	B	252/253 (100%)	251 (100%)	1 (0%)	0	100	100
1	C	251/253 (99%)	249 (99%)	2 (1%)	0	100	100
1	D	249/253 (98%)	246 (99%)	3 (1%)	0	100	100
1	E	255/253 (101%)	253 (99%)	2 (1%)	0	100	100
1	F	247/253 (98%)	246 (100%)	1 (0%)	0	100	100
All	All	1509/1518 (99%)	1497 (99%)	12 (1%)	0	100	100

There are no Ramachandran outliers to report.

### 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	216/211 (102%)	215 (100%)	1 (0%)	88	80
1	B	213/211 (101%)	212 (100%)	1 (0%)	88	80
1	C	212/211 (100%)	207 (98%)	5 (2%)	49	22
1	D	210/211 (100%)	207 (99%)	3 (1%)	67	46
1	E	216/211 (102%)	213 (99%)	3 (1%)	67	46
1	F	208/211 (99%)	206 (99%)	2 (1%)	76	60
All	All	1275/1266 (101%)	1260 (99%)	15 (1%)	71	52

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	178	GLU
1	B	178	GLU
1	C	114	GLN

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Mol	Chain	Res	Type
1	C	147	PRO
1	C	178	GLU
1	C	231	VAL
1	C	232	SER
1	D	178	GLU
1	D	203[A]	ASP
1	D	203[B]	ASP
1	E	8	GLU
1	E	114	GLN
1	E	178	GLU
1	F	178	GLU
1	F	209	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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](#)

25 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	E	302	-	4,4,4	0.23	0	6,6,6	0.46	0
3	GOL	A	304	-	5,5,5	0.24	0	5,5,5	0.59	0
2	SO4	D	302	-	4,4,4	0.39	0	6,6,6	0.54	0
2	SO4	B	301	-	4,4,4	0.43	0	6,6,6	0.38	0
3	GOL	B	303	-	5,5,5	0.45	0	5,5,5	0.42	0
3	GOL	E	303	-	5,5,5	0.53	0	5,5,5	0.44	0
2	SO4	A	301	-	4,4,4	0.18	0	6,6,6	0.29	0
3	GOL	F	305	-	5,5,5	0.59	0	5,5,5	0.62	0
2	SO4	D	301	-	4,4,4	0.08	0	6,6,6	0.38	0
3	GOL	E	304	-	5,5,5	0.23	0	5,5,5	0.68	0
2	SO4	C	301	-	4,4,4	0.24	0	6,6,6	0.19	0
3	GOL	C	305	-	5,5,5	0.57	0	5,5,5	0.55	0
3	GOL	F	304	-	5,5,5	0.19	0	5,5,5	0.54	0
2	SO4	F	301	-	4,4,4	0.19	0	6,6,6	0.23	0
3	GOL	F	303	-	5,5,5	0.65	0	5,5,5	0.46	0
2	SO4	A	302	-	4,4,4	0.16	0	6,6,6	0.24	0
3	GOL	C	303	-	5,5,5	0.55	0	5,5,5	0.60	0
3	GOL	C	304	-	5,5,5	0.24	0	5,5,5	0.48	0
2	SO4	B	302	-	4,4,4	0.30	0	6,6,6	0.40	0
2	SO4	F	302	-	4,4,4	0.14	0	6,6,6	0.36	0
3	GOL	A	303	-	5,5,5	0.13	0	5,5,5	0.55	0
2	SO4	C	302	-	4,4,4	0.29	0	6,6,6	0.34	0
3	GOL	D	303	-	5,5,5	0.51	0	5,5,5	0.50	0
3	GOL	C	306	-	5,5,5	0.29	0	5,5,5	0.78	0
2	SO4	E	301	-	4,4,4	0.25	0	6,6,6	0.44	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. <sup>1,2</sup> means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	GOL	F	304	-	-	0/4/4/4	-
3	GOL	A	304	-	-	0/4/4/4	-
3	GOL	C	304	-	-	0/4/4/4	-
3	GOL	E	303	-	-	0/4/4/4	-
3	GOL	B	303	-	-	0/4/4/4	-
3	GOL	F	303	-	-	0/4/4/4	-
3	GOL	D	303	-	-	0/4/4/4	-
3	GOL	F	305	-	-	4/4/4/4	-
3	GOL	C	306	-	-	0/4/4/4	-
3	GOL	E	304	-	-	0/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	GOL	C	303	-	-	0/4/4/4	-
3	GOL	A	303	-	-	0/4/4/4	-
3	GOL	C	305	-	-	2/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	C	305	GOL	C1-C2-C3-O3
3	C	305	GOL	O2-C2-C3-O3
3	F	305	GOL	O1-C1-C2-C3
3	F	305	GOL	O1-C1-C2-O2
3	F	305	GOL	C1-C2-C3-O3
3	F	305	GOL	O2-C2-C3-O3

There are no ring outliers.

2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	F	305	GOL	4	0
2	B	302	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, 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	240/253 (94%)	-0.04	12 (5%) 28 26	13, 19, 37, 54	0
1	B	240/253 (94%)	-0.13	8 (3%) 46 42	13, 20, 35, 51	0
1	C	240/253 (94%)	-0.09	9 (3%) 40 37	12, 19, 34, 43	0
1	D	240/253 (94%)	-0.07	12 (5%) 28 26	13, 20, 35, 48	0
1	E	240/253 (94%)	-0.09	12 (5%) 28 26	13, 19, 36, 52	0
1	F	240/253 (94%)	-0.05	10 (4%) 36 32	13, 19, 37, 56	0
All	All	1440/1518 (94%)	-0.08	63 (4%) 34 30	12, 19, 36, 56	0

All (63) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	208	GLY	7.5
1	A	0	HIS	7.0
1	F	210	GLU	6.6
1	D	0	HIS	6.3
1	E	0	HIS	5.9
1	F	0	HIS	5.9
1	A	210	GLU	5.6
1	C	208	GLY	5.6
1	C	0	HIS	5.5
1	E	9	LYS	5.4
1	A	208	GLY	5.0
1	D	210	GLU	4.9
1	E	96	LYS	4.8
1	D	9	LYS	4.8
1	F	96	LYS	4.8
1	B	210	GLU	4.7
1	E	208	GLY	4.6
1	A	231	VAL	4.6
1	B	0[A]	HIS	4.6

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Mol	Chain	Res	Type	RSRZ
1	E	210[A]	GLU	4.5
1	A	1	MET	4.4
1	D	208	GLY	4.3
1	C	210	GLU	4.1
1	E	207	THR	4.1
1	C	96	LYS	4.1
1	D	1	MET	4.0
1	F	207	THR	3.7
1	F	208	GLY	3.6
1	C	9	LYS	3.5
1	E	232	SER	3.3
1	F	209	GLU	3.2
1	C	1	MET	3.2
1	F	143	ASP	3.1
1	A	96	LYS	3.1
1	E	209	GLU	3.0
1	B	9	LYS	3.0
1	E	1	MET	3.0
1	A	209	GLU	2.9
1	A	232	SER	2.8
1	D	232	SER	2.8
1	D	-7	GLY	2.8
1	C	232	SER	2.8
1	B	1	MET	2.7
1	B	96	LYS	2.7
1	B	209	GLU	2.5
1	D	96	LYS	2.5
1	F	1	MET	2.4
1	D	229	HIS	2.4
1	A	143[A]	ASP	2.3
1	F	232	SER	2.2
1	D	-3	ARG	2.2
1	A	214	GLU	2.2
1	B	214	GLU	2.2
1	C	143[A]	ASP	2.2
1	C	37	GLU	2.1
1	D	207	THR	2.1
1	A	8	GLU	2.1
1	E	-7	GLY	2.1
1	F	214	GLU	2.1
1	D	231	VAL	2.1
1	E	214	GLU	2.1

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Mol	Chain	Res	Type	RSRZ
1	E	8	GLU	2.1
1	A	207	THR	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
3	GOL	E	304	6/6	0.70	0.23	21,23,25,27	6
3	GOL	F	305	6/6	0.80	0.21	34,37,40,42	6
3	GOL	E	303	6/6	0.83	0.13	18,21,22,23	6
3	GOL	C	305	6/6	0.85	0.27	46,47,49,51	0
3	GOL	B	303	6/6	0.85	0.15	23,25,27,27	6
3	GOL	A	304	6/6	0.87	0.27	38,40,42,43	0
3	GOL	C	303	6/6	0.87	0.14	21,22,24,27	6
3	GOL	F	304	6/6	0.88	0.12	24,26,28,30	6
3	GOL	D	303	6/6	0.89	0.14	26,30,31,32	0
3	GOL	C	306	6/6	0.90	0.12	22,25,25,27	6
3	GOL	A	303	6/6	0.90	0.18	31,33,34,35	0
3	GOL	F	303	6/6	0.92	0.10	19,19,23,23	6
3	GOL	C	304	6/6	0.94	0.16	31,31,33,34	0
2	SO4	C	302	5/5	0.99	0.07	23,24,26,26	0
2	SO4	D	302	5/5	0.99	0.04	22,23,24,24	5
2	SO4	E	301	5/5	0.99	0.04	21,21,22,23	5
2	SO4	E	302	5/5	0.99	0.10	14,14,18,18	5
2	SO4	F	302	5/5	0.99	0.06	29,30,31,32	5
2	SO4	A	301	5/5	0.99	0.04	19,19,23,24	0
2	SO4	A	302	5/5	0.99	0.10	28,28,31,32	5
2	SO4	B	302	5/5	0.99	0.06	24,24,27,28	5

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	SO4	C	301	5/5	0.99	0.03	17,17,20,22	0
2	SO4	F	301	5/5	1.00	0.02	19,19,21,24	0
2	SO4	D	301	5/5	1.00	0.03	18,18,21,23	0
2	SO4	B	301	5/5	1.00	0.03	18,18,23,24	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.