



wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 2, 2024 – 04:50 pm GMT

PDB ID : 2WYL
Title : Apo structure of a metallo- β -lactamase
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Deposited on : 2009-11-16
Resolution : 2.59 Å (reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 3.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.003 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.39

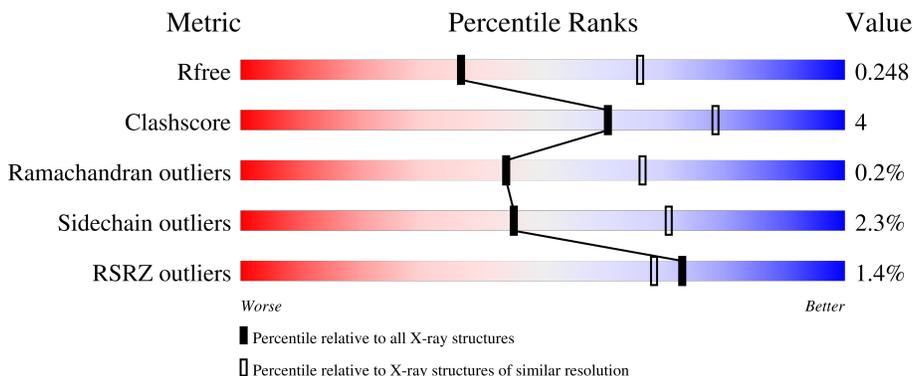
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.59 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}	164625	3775 (2.60-2.60)
Clashscore	180529	4181 (2.60-2.60)
Ramachandran outliers	177936	4129 (2.60-2.60)
Sidechain outliers	177891	4129 (2.60-2.60)
RSRZ outliers	164620	3775 (2.60-2.60)

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 ≥ 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	360	
1	B	360	
1	C	360	
1	D	360	
1	E	360	

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Mol	Chain	Length	Quality of chain
1	F	360	 <p>A horizontal bar chart representing the quality of chain. The bar is divided into three segments: a green segment on the left labeled '74%', a yellow segment in the middle labeled '10%', and a grey segment on the right labeled '16%'. A small red square is positioned at the beginning of the bar, and a '%' symbol is located above the bar.</p>

2 Entry composition [i](#)

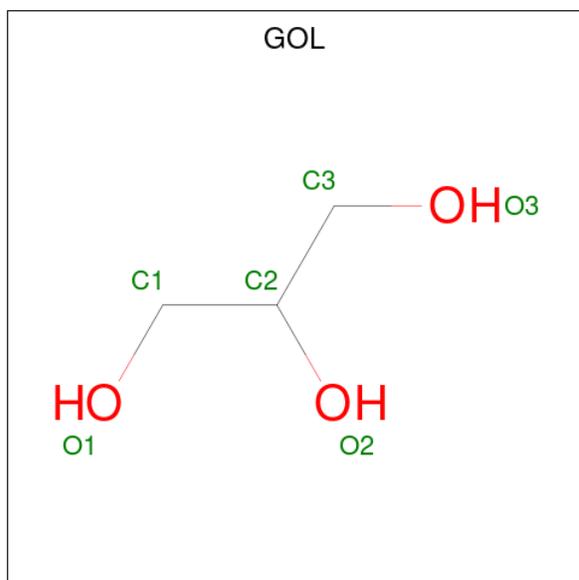
There are 4 unique types of molecules in this entry. The entry contains 15043 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 L-ASCORBATE-6-PHOSPHATE LACTONASE ULAG.

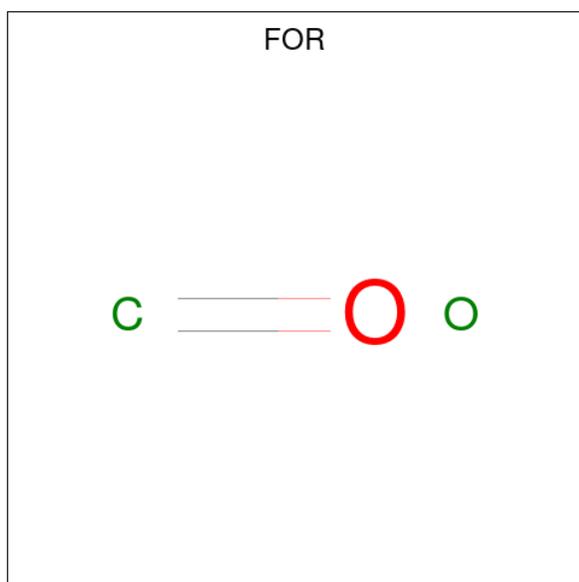
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	304	Total 2438	C 1564	N 417	O 443	S 6	Se 8	0	0	0
1	B	302	Total 2425	C 1555	N 414	O 442	S 6	Se 8	0	1	0
1	C	299	Total 2403	C 1541	N 411	O 437	S 6	Se 8	0	1	0
1	D	300	Total 2406	C 1545	N 409	O 438	S 6	Se 8	0	0	0
1	E	302	Total 2435	C 1566	N 415	O 440	S 6	Se 8	0	1	0
1	F	302	Total 2430	C 1561	N 415	O 440	S 6	Se 8	0	0	0

- Molecule 2 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



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

- Molecule 3 is FORMYL GROUP (three-letter code: FOR) (formula: CH₂O).



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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	71	Total	O	0	0
			71	71		
4	B	59	Total	O	0	0
			59	59		
4	C	72	Total	O	0	0
			72	72		
4	D	86	Total	O	0	0
			86	86		
4	E	49	Total	O	0	0
			49	49		
4	F	45	Total	O	0	0
			45	45		

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	103.61Å 178.56Å 112.42Å 90.00° 103.82° 90.00°	Depositor
Resolution (Å)	14.94 – 2.59 14.94 – 2.59	Depositor EDS
% Data completeness (in resolution range)	98.5 (14.94-2.59) 97.9 (14.94-2.59)	Depositor EDS
R_{merge}	0.16	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	12.57 (at 2.58Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.198 , 0.248 0.200 , 0.248	Depositor DCC
R_{free} test set	3037 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	31.1	Xtrriage
Anisotropy	0.154	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 45.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.44$, $\langle L^2 \rangle = 0.27$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	15043	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.56% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: FOR, GOL

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	0.40	0/2506	0.47	0/3393
1	B	0.33	0/2495	0.46	0/3380
1	C	0.38	1/2473 (0.0%)	0.46	0/3348
1	D	0.38	0/2474	0.47	0/3350
1	E	0.33	0/2507	0.45	0/3395
1	F	0.35	0/2499	0.45	0/3384
All	All	0.36	1/14954 (0.0%)	0.46	0/20250

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	161	CYS	CB-SG	-5.55	1.72	1.81

There are no bond angle outliers.

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	2438	0	2325	27	0
1	B	2425	0	2322	7	0
1	C	2403	0	2297	28	0
1	D	2406	0	2293	18	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	E	2435	0	2338	22	0
1	F	2430	0	2327	23	0
2	A	18	0	24	2	0
2	B	12	0	16	0	0
2	C	24	0	32	1	0
2	D	24	0	32	0	0
2	E	24	0	32	0	0
2	F	18	0	24	1	0
3	C	2	0	0	0	0
3	F	2	0	0	0	0
4	A	71	0	0	0	0
4	B	59	0	0	0	0
4	C	72	0	0	0	0
4	D	86	0	0	0	0
4	E	49	0	0	0	0
4	F	45	0	0	0	0
All	All	15043	0	14062	119	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.

The worst 5 of 119 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:40:MSE:HE1	1:A:246:LEU:HD11	1.64	0.80
1:A:247:GLY:HA3	1:A:265:MSE:HE1	1.62	0.80
1:C:23:TRP:HE1	2:C:1339:GOL:H12	1.48	0.78
1:C:265:MSE:HA	1:C:265:MSE:HE2	1.66	0.77
1:A:40:MSE:CE	1:A:246:LEU:HD11	2.17	0.74

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	298/360 (83%)	289 (97%)	8 (3%)	1 (0%)	37	59
1	B	297/360 (82%)	289 (97%)	8 (3%)	0	100	100
1	C	294/360 (82%)	284 (97%)	10 (3%)	0	100	100
1	D	294/360 (82%)	284 (97%)	9 (3%)	1 (0%)	37	59
1	E	297/360 (82%)	284 (96%)	13 (4%)	0	100	100
1	F	296/360 (82%)	288 (97%)	7 (2%)	1 (0%)	37	59
All	All	1776/2160 (82%)	1718 (97%)	55 (3%)	3 (0%)	44	66

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	173	LYS
1	D	137	ASP
1	F	91	LEU

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	259/297 (87%)	258 (100%)	1 (0%)	89	96
1	B	259/297 (87%)	254 (98%)	5 (2%)	52	75
1	C	256/297 (86%)	249 (97%)	7 (3%)	40	66
1	D	256/297 (86%)	246 (96%)	10 (4%)	27	53
1	E	260/297 (88%)	251 (96%)	9 (4%)	31	57
1	F	259/297 (87%)	255 (98%)	4 (2%)	60	81
All	All	1549/1782 (87%)	1513 (98%)	36 (2%)	45	71

5 of 36 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	259	LYS
1	F	280	PHE
1	E	260	MSE
1	F	10	GLU
1	C	303	LYS

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

Mol	Chain	Res	Type
1	A	117	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

22 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	$\# Z > 2$
3	FOR	F	1338	-	0,1,1	-	-	-		
2	GOL	C	1338	-	5,5,5	0.37	0	5,5,5	0.34	0
2	GOL	E	1339	-	5,5,5	0.36	0	5,5,5	0.39	0
2	GOL	B	1338	-	5,5,5	0.37	0	5,5,5	0.29	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	GOL	A	1340	-	5,5,5	0.39	0	5,5,5	0.25	0
2	GOL	C	1339	-	5,5,5	0.37	0	5,5,5	0.21	0
2	GOL	E	1342	-	5,5,5	0.38	0	5,5,5	0.20	0
2	GOL	F	1341	-	5,5,5	0.37	0	5,5,5	0.27	0
3	FOR	C	1337	-	0,1,1	-	-	-	-	-
2	GOL	F	1340	-	5,5,5	0.38	0	5,5,5	0.27	0
2	GOL	D	1343	-	5,5,5	0.42	0	5,5,5	0.25	0
2	GOL	D	1342	-	5,5,5	0.39	0	5,5,5	0.32	0
2	GOL	F	1339	-	5,5,5	0.38	0	5,5,5	0.23	0
2	GOL	E	1340	-	5,5,5	0.35	0	5,5,5	0.31	0
2	GOL	C	1341	-	5,5,5	0.37	0	5,5,5	0.26	0
2	GOL	D	1340	-	5,5,5	0.36	0	5,5,5	0.27	0
2	GOL	A	1339	-	5,5,5	0.38	0	5,5,5	0.24	0
2	GOL	A	1341	-	5,5,5	0.36	0	5,5,5	0.29	0
2	GOL	D	1341	-	5,5,5	0.37	0	5,5,5	0.32	0
2	GOL	B	1339	-	5,5,5	0.38	0	5,5,5	0.27	0
2	GOL	C	1340	-	5,5,5	0.40	0	5,5,5	0.28	0
2	GOL	E	1341	-	5,5,5	0.35	0	5,5,5	0.32	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
2	GOL	C	1338	-	-	2/4/4/4	-
2	GOL	E	1339	-	-	3/4/4/4	-
2	GOL	B	1338	-	-	0/4/4/4	-
2	GOL	A	1340	-	-	0/4/4/4	-
2	GOL	C	1339	-	-	2/4/4/4	-
2	GOL	E	1342	-	-	0/4/4/4	-
2	GOL	F	1341	-	-	2/4/4/4	-
2	GOL	F	1340	-	-	2/4/4/4	-
2	GOL	D	1343	-	-	2/4/4/4	-
2	GOL	D	1342	-	-	3/4/4/4	-
2	GOL	F	1339	-	-	4/4/4/4	-
2	GOL	E	1340	-	-	0/4/4/4	-
2	GOL	C	1341	-	-	3/4/4/4	-
2	GOL	D	1340	-	-	1/4/4/4	-
2	GOL	A	1339	-	-	2/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	GOL	A	1341	-	-	1/4/4/4	-
2	GOL	D	1341	-	-	4/4/4/4	-
2	GOL	B	1339	-	-	2/4/4/4	-
2	GOL	C	1340	-	-	0/4/4/4	-
2	GOL	E	1341	-	-	0/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 33 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1339	GOL	O1-C1-C2-C3
2	C	1338	GOL	O1-C1-C2-C3
2	C	1339	GOL	C1-C2-C3-O3
2	D	1341	GOL	C1-C2-C3-O3
2	D	1342	GOL	C1-C2-C3-O3

There are no ring outliers.

4 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1340	GOL	1	0
2	C	1339	GOL	1	0
2	F	1339	GOL	1	0
2	A	1339	GOL	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	296/360 (82%)	-0.27	3 (1%) 79 75	16, 30, 41, 59	0
1	B	294/360 (81%)	-0.21	4 (1%) 73 68	18, 31, 44, 58	1 (0%)
1	C	291/360 (80%)	-0.34	3 (1%) 79 75	13, 26, 40, 54	1 (0%)
1	D	292/360 (81%)	-0.41	5 (1%) 69 64	14, 25, 37, 56	0
1	E	294/360 (81%)	-0.10	7 (2%) 59 54	16, 35, 49, 54	1 (0%)
1	F	294/360 (81%)	-0.18	2 (0%) 84 81	19, 31, 45, 54	0
All	All	1761/2160 (81%)	-0.25	24 (1%) 73 68	13, 30, 46, 59	3 (0%)

The worst 5 of 24 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	338	PHE	4.2
1	D	338	PHE	3.7
1	B	159	GLU	3.6
1	A	72	GLY	3.5
1	E	159	GLU	3.3

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

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

6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	GOL	E	1342	6/6	0.75	0.15	58,58,58,58	0
2	GOL	A	1341	6/6	0.77	0.14	44,44,44,45	0
2	GOL	C	1339	6/6	0.80	0.14	46,46,46,46	0
2	GOL	F	1341	6/6	0.80	0.17	68,68,68,68	0
2	GOL	C	1341	6/6	0.81	0.13	46,46,46,46	0
2	GOL	E	1340	6/6	0.82	0.11	45,46,46,46	0
2	GOL	F	1340	6/6	0.84	0.10	52,53,53,53	0
3	FOR	C	1337	2/2	0.84	0.16	35,35,35,35	0
2	GOL	E	1339	6/6	0.85	0.14	53,53,53,53	0
2	GOL	C	1338	6/6	0.85	0.13	40,41,41,42	0
2	GOL	E	1341	6/6	0.86	0.12	40,40,41,41	0
2	GOL	D	1342	6/6	0.86	0.11	34,34,34,34	0
2	GOL	F	1339	6/6	0.86	0.12	36,37,37,37	0
3	FOR	F	1338	2/2	0.88	0.17	34,34,34,34	0
2	GOL	D	1340	6/6	0.89	0.11	33,33,34,34	0
2	GOL	D	1343	6/6	0.90	0.09	26,27,27,27	0
2	GOL	A	1340	6/6	0.90	0.11	31,32,32,32	0
2	GOL	D	1341	6/6	0.91	0.07	38,38,38,38	0
2	GOL	B	1339	6/6	0.91	0.09	40,41,41,41	0
2	GOL	A	1339	6/6	0.92	0.09	34,34,34,34	0
2	GOL	B	1338	6/6	0.95	0.07	33,34,34,34	0
2	GOL	C	1340	6/6	0.96	0.07	34,34,34,34	0

6.5 Other polymers [i](#)

There are no such residues in this entry.