



wwPDB X-ray Structure Validation Summary Report

Apr 7, 2022 – 04:58 PM EDT

PDB ID : 3QTD
Title : Crystal structure of putative modulator of gyrase (PmbA) from *Pseudomonas aeruginosa* PAO1
Authors : Tkaczuk, K.L.; Chruszcz, M.; Evdokimova, E.; Liu, F.; Savchenko, A.; Edwards, A.; Joachimiak, A.; Minor, W.; Midwest Center for Structural Genomics (MCSG)
Deposited on : 2011-02-22
Resolution : 2.70 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 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 : 2.27
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) : 2.27

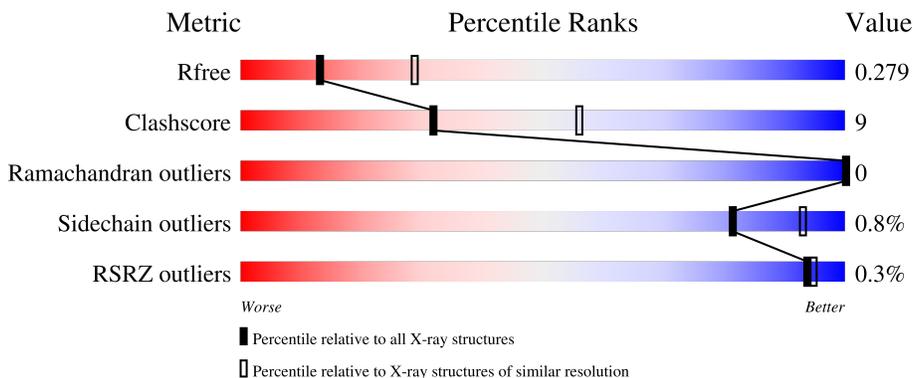
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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	2808 (2.70-2.70)
Clashscore	141614	3122 (2.70-2.70)
Ramachandran outliers	138981	3069 (2.70-2.70)
Sidechain outliers	138945	3069 (2.70-2.70)
RSRZ outliers	127900	2737 (2.70-2.70)

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 ≥ 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	449	
1	B	449	
1	C	449	
1	D	449	

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
2	GOL	D	451	-	-	X	-

2 Entry composition [i](#)

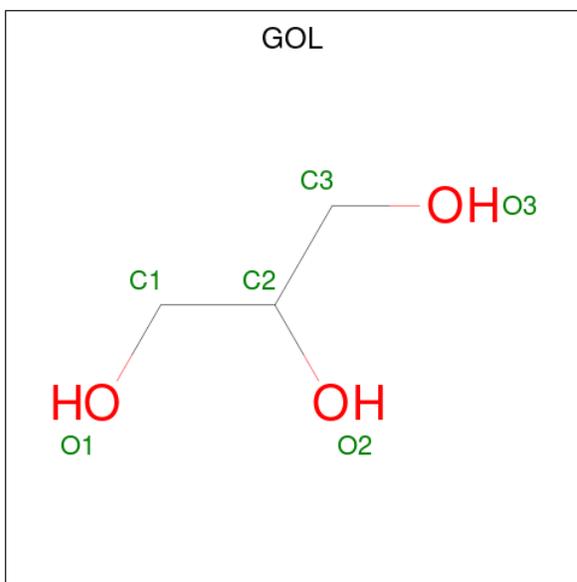
There are 3 unique types of molecules in this entry. The entry contains 13604 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 PmbA protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	N	O	S				Se
1	A	442	Total 3298	C 2048	N 597	O 641	S 5	Se 7	0	0	0
1	B	441	Total 3303	C 2050	N 600	O 641	S 5	Se 7	0	0	0
1	C	442	Total 3295	C 2047	N 599	O 637	S 5	Se 7	0	0	0
1	D	441	Total 3299	C 2048	N 600	O 639	S 5	Se 7	0	0	0

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



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	C O		
2	A	1	Total 6	C O 3 3	0	0
2	A	1	Total 6	C O 3 3	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
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	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

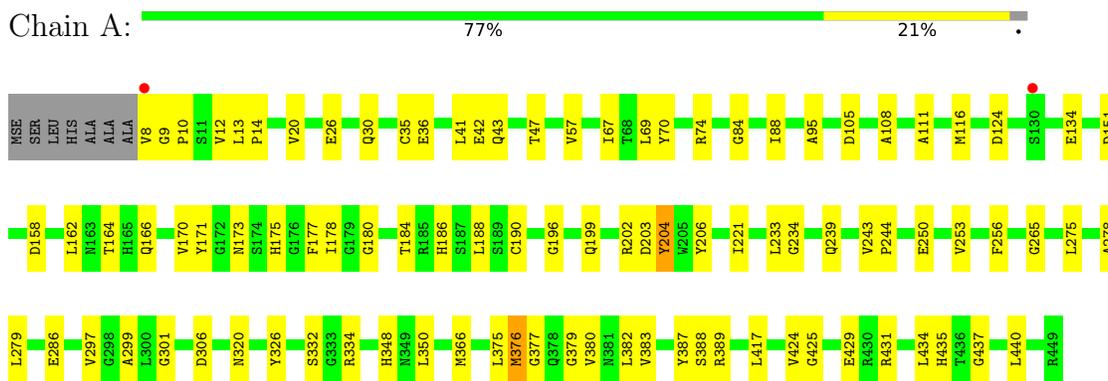
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	86	Total O 86 86	0	0
3	B	112	Total O 112 112	0	0
3	C	98	Total O 98 98	0	0
3	D	59	Total O 59 59	0	0

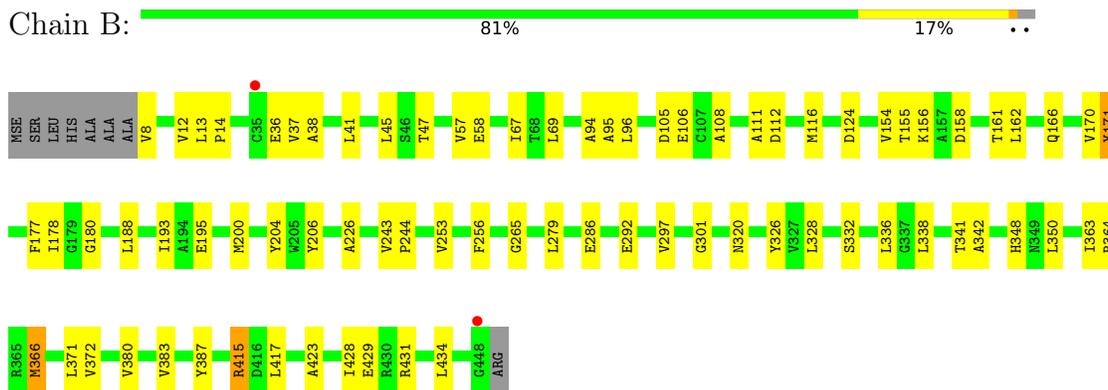
3 Residue-property plots [i](#)

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.

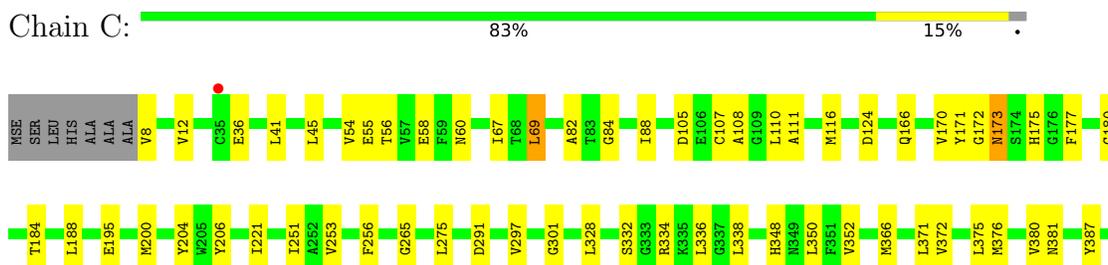
- Molecule 1: PmbA protein



- Molecule 1: PmbA protein



- Molecule 1: PmbA protein





- Molecule 1: PmbA protein

Chain D: 80% 18%



4 Data and refinement statistics i

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	69.39Å 116.20Å 253.97Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.70 35.22 – 2.70	Depositor EDS
% Data completeness (in resolution range)	97.5 (50.00-2.70) 97.3 (35.22-2.70)	Depositor EDS
R_{merge}	0.17	Depositor
R_{sym}	0.17	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.29 (at 2.68Å)	Xtrriage
Refinement program	REFMAC 5.6.0070	Depositor
R, R_{free}	0.225 , 0.279 0.227 , 0.279	Depositor DCC
R_{free} test set	2831 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å ²)	33.3	Xtrriage
Anisotropy	0.808	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 37.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	13604	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 49.74 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 7.1420e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: 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	1.22	6/3347 (0.2%)	0.90	3/4522 (0.1%)
1	B	1.25	5/3352 (0.1%)	0.93	3/4527 (0.1%)
1	C	1.07	6/3344 (0.2%)	0.87	3/4517 (0.1%)
1	D	1.07	2/3348 (0.1%)	0.86	3/4522 (0.1%)
All	All	1.16	19/13391 (0.1%)	0.89	12/18088 (0.1%)

The worst 5 of 19 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	204	TYR	CB-CG	-5.94	1.42	1.51
1	C	171	TYR	CD1-CE1	-5.91	1.30	1.39
1	C	429	GLU	CG-CD	-5.87	1.43	1.51
1	B	106	GLU	CB-CG	5.67	1.62	1.52
1	D	70	TYR	CD1-CE1	-5.60	1.30	1.39

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	12	VAL	CG1-CB-CG2	5.90	120.34	110.90
1	A	306	ASP	CB-CG-OD1	-5.88	113.01	118.30
1	C	291	ASP	CB-CG-OD2	-5.49	113.36	118.30
1	D	334	ARG	NE-CZ-NH1	5.37	122.98	120.30
1	B	415	ARG	NE-CZ-NH2	-5.36	117.62	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	3298	0	3210	67	0
1	B	3303	0	3225	65	0
1	C	3295	0	3211	46	0
1	D	3299	0	3221	65	0
2	A	12	0	15	0	0
2	B	12	0	16	3	0
2	C	12	0	16	1	0
2	D	18	0	24	5	0
3	A	86	0	0	1	0
3	B	112	0	0	2	0
3	C	98	0	0	2	0
3	D	59	0	0	2	0
All	All	13604	0	12938	233	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 9.

The worst 5 of 233 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:C:375:LEU:C	1:C:376:MSE:HG3	1.59	1.15
1:A:8:VAL:HG13	1:A:41:LEU:HD23	1.39	1.00
1:C:375:LEU:O	1:C:376:MSE:HG3	1.62	0.98
1:D:278:ALA:O	1:D:281:GLN:HG3	1.68	0.93
1:B:350:LEU:HD23	1:B:434:LEU:CD1	2.06	0.85

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	440/449 (98%)	434 (99%)	6 (1%)	0	100	100
1	B	439/449 (98%)	434 (99%)	5 (1%)	0	100	100
1	C	440/449 (98%)	437 (99%)	3 (1%)	0	100	100
1	D	439/449 (98%)	434 (99%)	5 (1%)	0	100	100
All	All	1758/1796 (98%)	1739 (99%)	19 (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	330/331 (100%)	327 (99%)	3 (1%)	78	92
1	B	332/331 (100%)	330 (99%)	2 (1%)	86	95
1	C	329/331 (99%)	326 (99%)	3 (1%)	78	92
1	D	331/331 (100%)	329 (99%)	2 (1%)	86	95
All	All	1322/1324 (100%)	1312 (99%)	10 (1%)	81	93

5 of 10 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	195	GLU
1	D	33	SER
1	D	442	GLU
1	B	158	ASP
1	B	366	MSE

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

Mol	Chain	Res	Type
1	C	175	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](#)

9 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	GOL	B	450	-	5,5,5	1.10	1 (20%)	5,5,5	1.00	0
2	GOL	A	451	-	5,5,5	0.89	0	5,5,5	0.55	0
2	GOL	D	452	-	5,5,5	0.70	0	5,5,5	0.43	0
2	GOL	A	450	-	5,5,5	1.12	1 (20%)	5,5,5	1.10	1 (20%)
2	GOL	B	451	-	5,5,5	0.41	0	5,5,5	1.53	1 (20%)
2	GOL	D	450	-	5,5,5	0.22	0	5,5,5	0.92	0
2	GOL	C	451	-	5,5,5	0.69	0	5,5,5	0.21	0
2	GOL	C	450	-	5,5,5	0.63	0	5,5,5	0.27	0
2	GOL	D	451	-	5,5,5	0.85	0	5,5,5	1.16	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	B	450	-	-	4/4/4/4	-
2	GOL	A	451	-	-	4/4/4/4	-
2	GOL	D	452	-	-	1/4/4/4	-
2	GOL	A	450	-	-	3/4/4/4	-
2	GOL	B	451	-	-	0/4/4/4	-
2	GOL	D	450	-	-	2/4/4/4	-
2	GOL	C	451	-	-	2/4/4/4	-
2	GOL	C	450	-	-	0/4/4/4	-
2	GOL	D	451	-	-	4/4/4/4	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	450	GOL	O2-C2	-2.25	1.36	1.43
2	B	450	GOL	O2-C2	-2.16	1.36	1.43

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	451	GOL	O3-C3-C2	2.41	121.77	110.20
2	A	450	GOL	O2-C2-C1	-2.29	99.03	109.12

There are no chirality outliers.

5 of 20 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	451	GOL	C1-C2-C3-O3
2	A	451	GOL	O2-C2-C3-O3
2	B	450	GOL	O1-C1-C2-C3
2	C	451	GOL	O1-C1-C2-C3
2	D	451	GOL	C1-C2-C3-O3

There are no ring outliers.

3 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	451	GOL	3	0
2	C	451	GOL	1	0
2	D	451	GOL	5	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	435/449 (96%)	-0.32	2 (0%) 91 92	13, 27, 50, 80	0
1	B	434/449 (96%)	-0.34	2 (0%) 91 92	12, 26, 49, 61	0
1	C	435/449 (96%)	-0.24	1 (0%) 95 96	17, 32, 53, 74	0
1	D	434/449 (96%)	-0.20	0 100 100	18, 33, 54, 71	0
All	All	1738/1796 (96%)	-0.27	5 (0%) 94 95	12, 29, 52, 80	0

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	130	SER	3.2
1	B	35	CYS	3.2
1	C	35	CYS	2.1
1	A	8	VAL	2.0
1	B	448	GLY	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, 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	D	451	6/6	0.72	0.36	53,56,60,61	0
2	GOL	D	452	6/6	0.75	0.27	40,55,57,60	0
2	GOL	C	451	6/6	0.81	0.31	44,58,69,70	0
2	GOL	C	450	6/6	0.82	0.19	29,39,44,47	0
2	GOL	A	450	6/6	0.85	0.21	33,40,45,52	0
2	GOL	B	451	6/6	0.87	0.29	39,43,50,60	0
2	GOL	D	450	6/6	0.88	0.28	34,40,48,58	0
2	GOL	A	451	6/6	0.89	0.26	33,44,47,59	0
2	GOL	B	450	6/6	0.95	0.18	34,41,50,51	0

6.5 Other polymers [i](#)

There are no such residues in this entry.