



Full wwPDB X-ray Structure Validation Report

Jul 14, 2014 – 11:27 PM EDT

PDB ID : 4QB5
Title : Crystal structure of a glyoxalase/bleomycin resistance protein from *Albidiferax ferrireducens* T118
Authors : Kumaran, D.; Chamala, S.; Evans, B.; Foti, R.; Gizzi, A.; Hillerich, B.; Kar, A.; Lafleur, J.; Seidel, R.; Villigas, G.; Zencheck, W.; Al Obaidi, N.; Almo, S.C.; Swaminathan, S.; New York Structural Genomics Research Consortium (NYSGRG)
Deposited on : 2014-05-06
Resolution : 2.05 Å(reported)

This is a full wwPDB validation report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

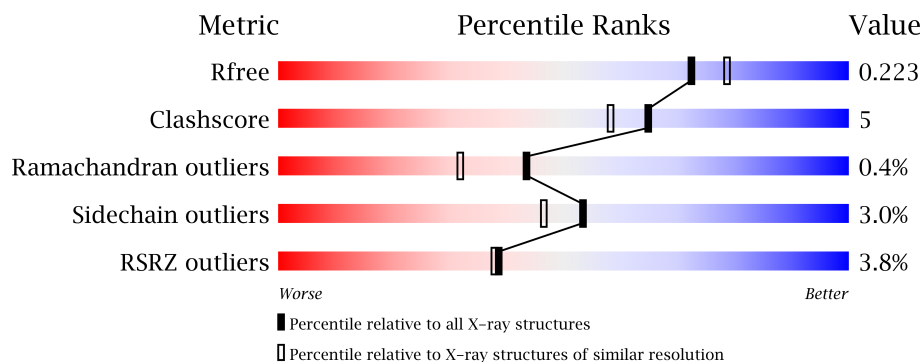
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	FAILED
Xtriage (Phenix)	:	dev-1439
EDS	:	stable23161
Percentile statistics	:	21963
Refmac	:	5.8.0049
CCP4	:	6.3.0 (Settle)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP)	:	stable23161

1 Overall quality at a glance

The reported resolution of this entry is 2.05 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}	66092	1380 (2.06-2.02)
Clashscore	79885	1577 (2.06-2.02)
Ramachandran outliers	78287	1565 (2.06-2.02)
Sidechain outliers	78261	1565 (2.06-2.02)
RSRZ outliers	66119	1381 (2.06-2.02)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	148	
1	B	148	
1	C	148	
1	D	148	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 3897 atoms, of which 0 are hydrogen and 0 are deuterium.

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.

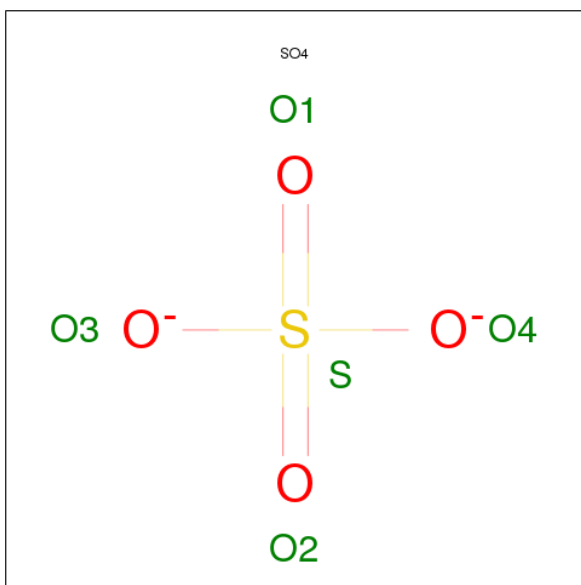
- Molecule 1 is a protein called Glyoxalase/bleomycin resistance protein/dioxygenase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	120	Total	C	N	O	S	Se	0	0	0
			893	563	156	169	3	2			
1	B	124	Total	C	N	O	S	Se	0	0	0
			915	576	161	173	3	2			
1	C	121	Total	C	N	O	S	Se	0	0	0
			902	569	158	170	3	2			
1	D	125	Total	C	N	O	S	Se	0	0	0
			922	581	162	174	3	2			

There are 4 discrepancies between the modelled and reference sequences:

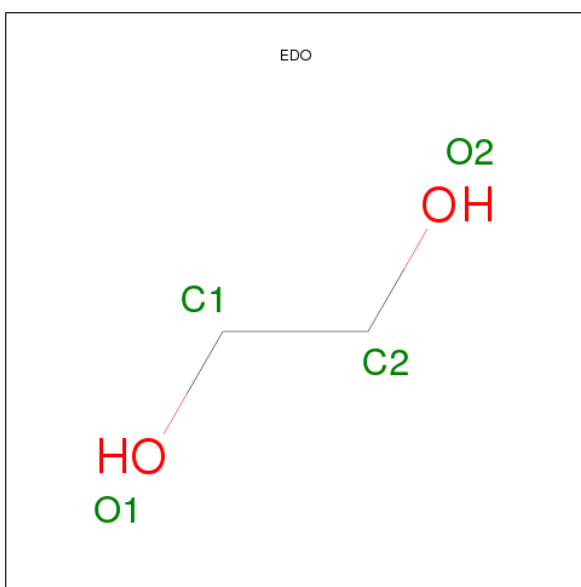
Chain	Residue	Modelled	Actual	Comment	Reference
A	0	SER	-	EXPRESSION TAG	UNP Q21R90
B	0	SER	-	EXPRESSION TAG	UNP Q21R90
C	0	SER	-	EXPRESSION TAG	UNP Q21R90
D	0	SER	-	EXPRESSION TAG	UNP Q21R90

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	B	1	Total	O	S	0	0
			5	4	1		
2	D	1	Total	O	S	0	0
			5	4	1		
2	D	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	D	1	Total	C	O	0	0
			4	2	2		

- Molecule 4 is water.

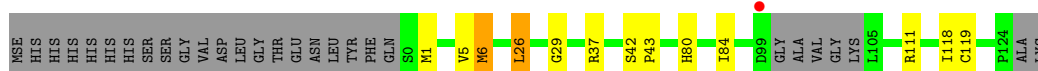
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	72	Total 72	O 72	0	0
4	B	45	Total 45	O 45	0	0
4	C	49	Total 49	O 49	0	0
4	D	80	Total 80	O 80	0	0

3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

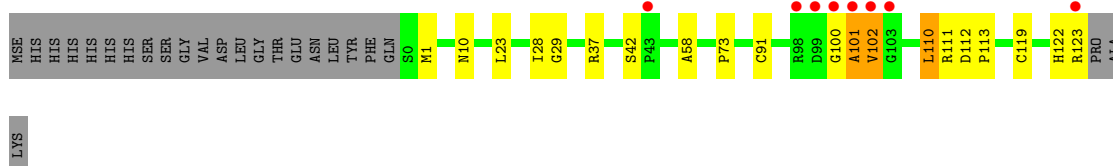
- Molecule 1: Glyoxalase/bleomycin resistance protein/dioxygenase

Chain A: 



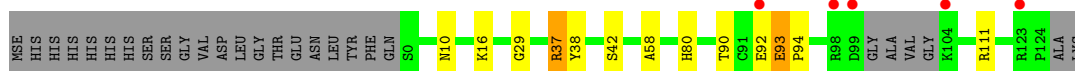
- Molecule 1: Glyoxalase/bleomycin resistance protein/dioxygenase

Chain B: 



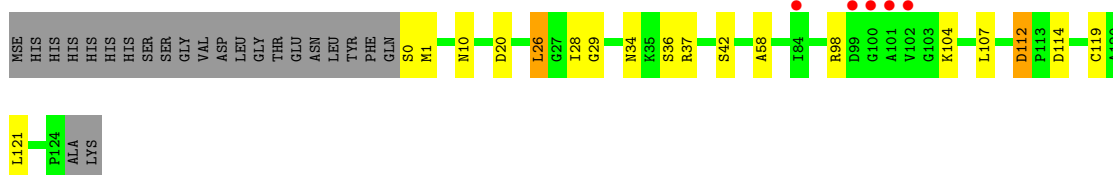
- Molecule 1: Glyoxalase/bleomycin resistance protein/dioxygenase

Chain C: 



- Molecule 1: Glyoxalase/bleomycin resistance protein/dioxygenase

Chain D: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	46.95Å 89.90Å 131.86Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.72 – 2.05 39.69 – 2.05	Depositor EDS
% Data completeness (in resolution range)	96.8 (39.72-2.05) 96.9 (39.69-2.05)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	15.57 (at 2.05Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.172 , 0.211 0.187 , 0.223	Depositor DCC
R_{free} test set	1734 reflections (5.26%)	DCC
Wilson B-factor (Å ²)	21.5	Xtriage
Anisotropy	0.538	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 35.0	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 34686 reflections	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	3897	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.21% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: SO4, EDO

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	0.96	1/914 (0.1%)	0.94	4/1236 (0.3%)
1	B	0.89	2/936 (0.2%)	0.96	4/1265 (0.3%)
1	C	0.93	1/923 (0.1%)	0.92	2/1247 (0.2%)
1	D	1.01	2/944 (0.2%)	1.00	5/1277 (0.4%)
All	All	0.95	6/3717 (0.2%)	0.96	15/5025 (0.3%)

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	119	CYS	CB-SG	-11.50	1.62	1.82
1	D	29	GLY	N-CA	7.77	1.57	1.46
1	A	119	CYS	CB-SG	-7.75	1.69	1.82
1	C	29	GLY	N-CA	6.69	1.56	1.46
1	B	29	GLY	N-CA	6.60	1.55	1.46
1	B	119	CYS	CB-SG	-6.25	1.71	1.82

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	6	MSE	CG-SE-CE	6.79	113.84	98.90
1	D	26	LEU	CB-CG-CD1	6.60	122.22	111.00
1	B	110	LEU	CA-CB-CG	6.10	129.34	115.30
1	C	111	ARG	NE-CZ-NH2	-6.00	117.30	120.30
1	D	29	GLY	N-CA-C	-5.97	98.18	113.10
1	A	26	LEU	CB-CG-CD1	5.86	120.96	111.00
1	D	112	ASP	CB-CG-OD2	-5.80	113.08	118.30
1	B	111	ARG	NE-CZ-NH2	-5.68	117.46	120.30
1	C	37	ARG	NE-CZ-NH1	5.62	123.11	120.30
1	A	29	GLY	N-CA-C	-5.53	99.28	113.10
1	B	119	CYS	N-CA-CB	-5.44	100.81	110.60

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	114	ASP	CB-CG-OD1	5.36	123.12	118.30
1	A	111	ARG	NE-CZ-NH1	5.19	122.90	120.30
1	D	20	ASP	CB-CG-OD1	5.18	122.96	118.30
1	B	29	GLY	N-CA-C	-5.17	100.17	113.10

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	893	0	856	7	0
1	B	915	0	883	18	0
1	C	902	0	869	9	0
1	D	922	0	890	14	0
2	B	5	0	0	1	0
2	D	10	0	0	0	0
3	D	4	0	6	0	0
4	A	72	0	0	0	0
4	B	45	0	0	1	0
4	C	49	0	0	0	0
4	D	80	0	0	3	0
All	All	3897	0	3504	38	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 5.

All (38) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:C:93:GLU:HG3	1:C:94:PRO:HD2	1.58	0.85
1:B:10:ASN:HD21	1:B:58:ALA:H	1.35	0.73
1:C:10:ASN:HD21	1:C:58:ALA:H	1.35	0.73
1:A:5:VAL:O	1:A:6:MSE:HE2	1.93	0.68
1:D:10:ASN:HD21	1:D:58:ALA:H	1.43	0.67

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:101:ALA:O	1:B:102:VAL:HG23	1.95	0.66
1:B:123:ARG:C	4:B:304:HOH:O	2.35	0.65
1:C:10:ASN:ND2	1:C:58:ALA:H	2.01	0.57
1:A:1:MSE:HE3	1:C:42:SER:HB3	1.87	0.56
1:B:10:ASN:ND2	1:B:58:ALA:H	2.04	0.56
1:D:37:ARG:HD3	4:D:367:HOH:O	2.06	0.55
1:B:101:ALA:HB3	1:D:34:ASN:HD21	1.70	0.55
1:A:1:MSE:HE3	1:C:42:SER:CB	2.38	0.54
1:B:91:CYS:HA	2:B:201:SO4:O1	2.08	0.53
1:D:36:SER:C	1:D:37:ARG:HG3	2.31	0.51
1:B:1:MSE:HE3	1:D:42:SER:HB3	1.91	0.50
1:D:10:ASN:ND2	1:D:58:ALA:H	2.07	0.49
1:B:23:LEU:HB3	1:B:28:ILE:HB	1.94	0.49
1:B:1:MSE:HE3	1:D:42:SER:CB	2.43	0.49
1:B:101:ALA:O	1:B:102:VAL:CG2	2.60	0.48
1:B:100:GLY:O	1:B:102:VAL:N	2.46	0.48
1:C:80:HIS:HE1	1:C:90:THR:OG1	1.97	0.47
1:B:42:SER:OG	1:D:1:MSE:HE3	2.14	0.47
1:A:1:MSE:CE	1:C:42:SER:HB3	2.45	0.46
1:D:107:LEU:HD21	1:D:121:LEU:HD12	1.97	0.46
1:B:101:ALA:C	1:B:102:VAL:HG23	2.36	0.45
1:A:80:HIS:O	1:A:84:ILE:HG12	2.16	0.45
1:B:112:ASP:HB2	1:B:113:PRO:CD	2.47	0.44
1:D:0:SER:N	4:D:378:HOH:O	2.51	0.43
1:D:10:ASN:HD21	1:D:58:ALA:N	2.13	0.43
1:D:98:ARG:NH1	4:D:377:HOH:O	2.51	0.43
1:A:1:MSE:HE3	1:C:42:SER:OG	2.19	0.43
1:A:42:SER:HB2	1:A:43:PRO:HD2	2.01	0.43
1:B:73:PRO:HD3	1:B:122:HIS:CD2	2.54	0.42
1:B:1:MSE:HE2	1:D:28:ILE:HD12	2.01	0.42
1:B:1:MSE:CE	1:D:42:SER:HB3	2.47	0.42
1:B:10:ASN:HD21	1:B:58:ALA:N	2.11	0.40
1:C:16:LYS:HD2	1:C:38:TYR:CZ	2.56	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries

of similar resolution. The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	116/148 (78%)	113 (97%)	3 (3%)	0	100	100
1	B	122/148 (82%)	115 (94%)	5 (4%)	2 (2%)	14	4
1	C	117/148 (79%)	112 (96%)	5 (4%)	0	100	100
1	D	123/148 (83%)	117 (95%)	6 (5%)	0	100	100
All	All	478/592 (81%)	457 (96%)	19 (4%)	2 (0%)	43	32

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	101	ALA
1	B	102	VAL

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution. The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	92/111 (83%)	89 (97%)	3 (3%)	50	42
1	B	93/111 (84%)	91 (98%)	2 (2%)	64	60
1	C	93/111 (84%)	90 (97%)	3 (3%)	51	44
1	D	94/111 (85%)	91 (97%)	3 (3%)	51	44
All	All	372/444 (84%)	361 (97%)	11 (3%)	53	46

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	26	LEU
1	A	37	ARG
1	A	118	ILE
1	B	37	ARG
1	B	110	LEU
1	C	37	ARG
1	C	92	GLU

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	C	93	GLU
1	D	26	LEU
1	D	104	LYS
1	D	112	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	10	ASN
1	A	86	ASN
1	A	116	ASN
1	A	122	HIS
1	B	10	ASN
1	B	80	HIS
1	B	86	ASN
1	B	116	ASN
1	B	122	HIS
1	C	10	ASN
1	C	80	HIS
1	C	86	ASN
1	C	116	ASN
1	D	10	ASN
1	D	60	HIS

5.3.3 RNA ⓘ

There are no RNA chains in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

Mogul failed to run properly - this section will therefore be empty.

5.5 Carbohydrates ⓘ

Mogul failed to run properly - this section will therefore be empty.

5.6 Ligand geometry ⓘ

Mogul failed to run properly - this section will therefore be empty.

5.7 Other polymers ⓘ

Mogul failed to run properly - this section will therefore be empty.

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, 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	120/148 (81%)	-0.02	1 (0%) 83 86	12, 19, 42, 64	0
1	B	124/148 (83%)	0.12	8 (6%) 18 16	16, 24, 56, 108	0
1	C	121/148 (81%)	-0.14	5 (4%) 35 34	13, 19, 42, 69	0
1	D	125/148 (84%)	0.20	5 (4%) 36 36	11, 19, 50, 88	0
All	All	490/592 (82%)	0.04	19 (3%) 38 37	11, 20, 49, 108	0

All (19) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	101	ALA	8.8
1	B	100	GLY	8.0
1	B	99	ASP	6.4
1	D	100	GLY	5.7
1	D	102	VAL	5.5
1	D	101	ALA	5.5
1	C	99	ASP	5.0
1	B	102	VAL	3.6
1	B	43	PRO	3.4
1	C	98	ARG	3.3
1	A	99	ASP	3.1
1	D	99	ASP	2.9
1	B	123	ARG	2.8
1	C	92	GLU	2.7
1	B	98	ARG	2.5
1	C	123	ARG	2.5
1	C	104	LYS	2.4
1	D	84	ILE	2.3
1	B	103	GLY	2.3

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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

6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

6.4 Ligands ⓘ

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	RSR	LLDF	B-factors(Å ²)	Q<0.9
2	SO4	B	201	5/5	0.18	0.59	55,58,62,68	0
3	EDO	D	203	4/4	0.11	-1.11	22,22,23,26	0
2	SO4	D	201	5/5	0.08	-1.63	30,35,35,42	0
2	SO4	D	202	5/5	0.08	-2.84	30,31,34,35	0

6.5 Other polymers ⓘ

There are no such residues in this entry.