Full wwPDB X-ray Structure Validation Report (i)

Jun 17, 2024 – 05:23 AM EDT

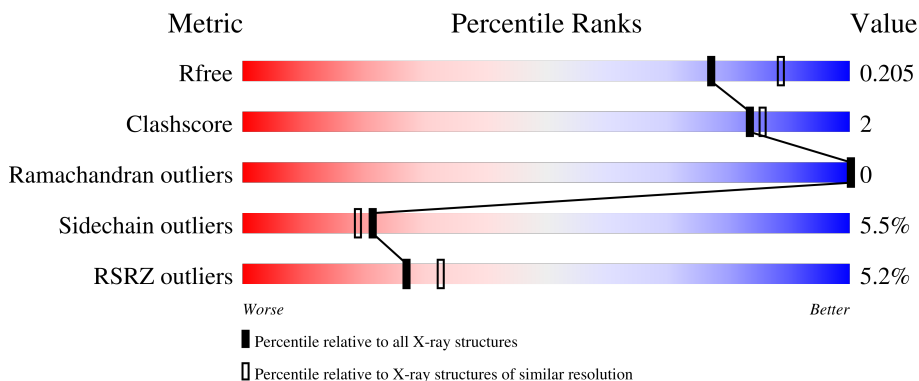|		
PDB ID	:	3Q7V
Title	:	Beta-Lactam-Sensor Domain of BlaR1 (Apo) from Staphylococcus Aureus with Carboxylated Lys392
Authors	:	Borbulevych, O.Y.; Mobashery, S.; Baker, B.M.
Deposited on	:	2011-01-05
Resolution	:	2.10 Å(reported)

1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:
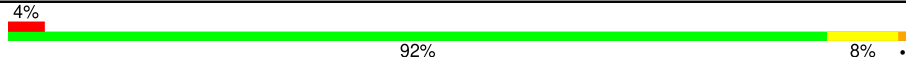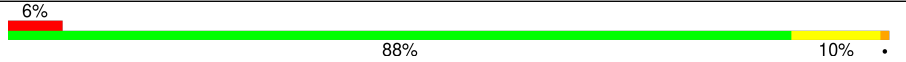*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.10 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	Percentile Ranks	Value
Rfree		0.205
Clashscore		2
Ramachandran outliers		0
Sidechain outliers		5.5%
RSRZ outliers		5.2%

Worse ... *Better*

▌ Percentile relative to all X-ray structures
▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (2.10-2.10)

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 <=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	252	4% / 92% / 8% ·
2	B	252	6% / 88% / 10% ·

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 4548 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 Beta-lactamase regulatory protein BlaR1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	252	Total	C	N	O	S	0	7	0
			2123	1352	358	403	10			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	39	ALA	LYS	engineered mutation	UNP Q7WU28
A	40	ALA	LYS	engineered mutation	UNP Q7WU28
A	42	ALA	LYS	engineered mutation	UNP Q7WU28

- Molecule 2 is a protein called Beta-lactamase regulatory protein BlaR1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	252	Total	C	N	O	S	0	3	0
			2107	1344	354	400	9			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	39	ALA	LYS	engineered mutation	UNP Q7WU28
B	40	ALA	LYS	engineered mutation	UNP Q7WU28
B	42	ALA	LYS	engineered mutation	UNP Q7WU28

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O_4S).

SO4

O1

O

O3 O⁻ — S — O⁻ O4

S

O

O2

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

• Molecule 4 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).

GOL

C3

OH O3

C1 C2

HO

O1

OH

O2

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

• Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	159	Total 159	O 159	0	0
5	B	115	Total 115	O 115	0	0

3 Residue-property plots ⓘ

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.
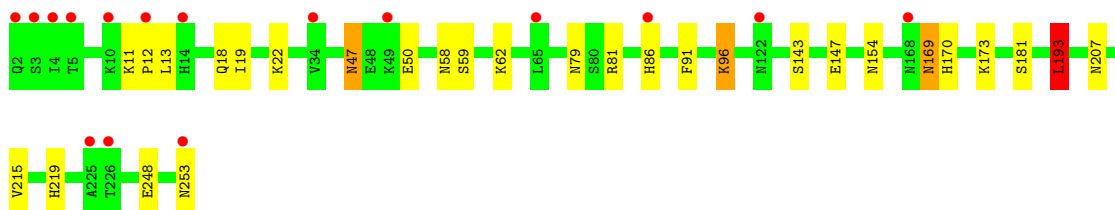
• Molecule 1: Beta-lactamase regulatory protein BlaR1

Chain A:

• Molecule 2: Beta-lactamase regulatory protein BlaR1

Chain B:

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	46.95Å　107.43Å　56.50Å 90.00°　108.75°　90.00°	Depositor
Resolution (Å)	20.00　–　2.10 19.94　–　2.10	Depositor EDS
% Data completeness (in resolution range)	97.4 (20.00-2.10) 97.4 (19.94-2.10)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.32 (at 2.09Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.173　,　0.237 0.188　,　0.205	Depositor DCC
R_{free} test set	1517 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å^2)	31.3	Xtriage
Anisotropy	0.032	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 46.0	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	4548	wwPDB-VP
Average B, all atoms (Å^2)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.86% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: GOL, SO4, KCX

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	0.75	0/2193	0.79	1/2951 (0.0%)
2	B	0.69	0/2156	0.76	1/2901 (0.0%)
All	All	0.72	0/4349	0.78	2/5852 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	99	ASP	CB-CG-OD1	5.30	123.07	118.30
2	B	193	LEU	CA-CB-CG	5.07	126.97	115.30

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	2123	0	2062	8	0
2	B	2107	0	2036	12	0
3	A	10	0	0	0	0
3	B	10	0	0	0	0
4	A	12	0	16	1	0
4	B	12	0	16	0	0
5	A	159	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	115	0	0	1	0
All	All	4548	0	4130	20	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 (20) 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)
2:B:219:HIS:ND1	5:B:290:HOH:O	2.29	0.64
1:A:2:GLN:N	5:A:273:HOH:O	2.33	0.61
2:B:79:ASN:HD21	2:B:81:ARG:HH11	1.53	0.56
2:B:193:LEU:HD23	2:B:215:VAL:HG22	1.90	0.53
2:B:18:GLN:NE2	2:B:19:ILE:O	2.38	0.52
1:A:58[A]:ASN:ND2	1:A:147:GLU:OE1	2.31	0.52
1:A:188:ASN:O	4:A:256:GOL:O1	2.26	0.51
2:B:58[B]:ASN:HD22	2:B:59:SER:H	1.60	0.49
1:A:193:LEU:HD23	1:A:215:VAL:HG22	1.94	0.48
2:B:96:LYS:HB2	2:B:96:LYS:HE2	1.51	0.46
1:A:8[A]:ASN:ND2	5:A:408:HOH:O	2.50	0.45
2:B:47:ASN:HB3	2:B:50:GLU:HB3	2.00	0.44
1:A:142:LYS:HB3	1:A:143:SER:H	1.65	0.43
2:B:169:ASN:HB2	2:B:170:HIS:H	1.73	0.43
2:B:22:LYS:HA	2:B:22:LYS:HD3	1.77	0.43
2:B:22:LYS:NZ	2:B:248:GLU:OE1	2.44	0.43
2:B:11:LYS:HA	2:B:12:PRO:HD3	1.85	0.41
2:B:58[A]:ASN:ND2	2:B:147:GLU:OE1	2.26	0.41
1:A:22:LYS:HA	1:A:22:LYS:HD3	1.89	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	257/252 (102%)	245 (95%)	12 (5%)	0	100	100
2	B	252/252 (100%)	237 (94%)	15 (6%)	0	100	100
All	All	509/504 (101%)	482 (95%)	27 (5%)	0	100	100

There are no Ramachandran outliers to report.

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	235/228 (103%)	223 (95%)	12 (5%)	24	22
2	B	230/227 (101%)	215 (94%)	15 (6%)	17	14
All	All	465/455 (102%)	438 (94%)	27 (6%)	21	17

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	4	ILE
1	A	10	LYS
1	A	30	SER
1	A	77	ASP
1	A	91	PHE
1	A	122	ASN
1	A	143	SER
1	A	169	ASN
1	A	189	GLU
1	A	193	LEU
1	A	244	LYS
1	A	253	ASN
2	B	13	LEU
2	B	47	ASN
2	B	86	HIS
2	B	91[A]	PHE
2	B	91[B]	PHE
2	B	96	LYS

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Mol	Chain	Res	Type
2	B	143	SER
2	B	154	ASN
2	B	169	ASN
2	B	173	LYS
2	B	181	SER
2	B	193	LEU
2	B	207[A]	ASN
2	B	207[B]	ASN
2	B	253	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	253	ASN
2	B	47	ASN
2	B	109	ASN
2	B	154	ASN
2	B	169	ASN
2	B	253	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

1 non-standard protein/DNA/RNA residue is 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	KCX	B	62	2	10,11,12	1.61	2 (20%)	6,12,14	3.12	1 (16%)

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	KCX	B	62	2	-	1/9/10/12	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	62	KCX	CE-NZ	3.46	1.53	1.46
2	B	62	KCX	CB-CA	2.01	1.56	1.53

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	62	KCX	CE-NZ-CX	7.21	134.22	121.98

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	62	KCX	CG-CD-CE-NZ

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

8 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	SO4	B	1	-	4,4,4	0.31	0	6,6,6	0.38	0
3	SO4	A	254	-	4,4,4	0.20	0	6,6,6	0.62	0
3	SO4	A	255	-	4,4,4	0.30	0	6,6,6	0.21	0
3	SO4	B	254	-	4,4,4	0.28	0	6,6,6	0.30	0
4	GOL	A	256	-	5,5,5	0.28	0	5,5,5	0.61	0
4	GOL	A	1	-	5,5,5	0.28	0	5,5,5	0.63	0
4	GOL	B	256	-	5,5,5	0.32	0	5,5,5	1.16	0
4	GOL	B	255	-	5,5,5	0.46	0	5,5,5	0.20	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
4	GOL	B	256	-	-	2/4/4/4	-
4	GOL	A	256	-	-	4/4/4/4	-
4	GOL	B	255	-	-	3/4/4/4	-
4	GOL	A	1	-	-	3/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1	GOL	O1-C1-C2-C3
4	A	256	GOL	O1-C1-C2-O2
4	A	256	GOL	O1-C1-C2-C3
4	A	256	GOL	C1-C2-C3-O3
4	B	255	GOL	O1-C1-C2-C3
4	B	256	GOL	C1-C2-C3-O3
4	A	256	GOL	O2-C2-C3-O3
4	A	1	GOL	C1-C2-C3-O3
4	B	255	GOL	O1-C1-C2-O2
4	A	1	GOL	O1-C1-C2-O2
4	B	256	GOL	O2-C2-C3-O3
4	B	255	GOL	O2-C2-C3-O3

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	256	GOL	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 (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	252/252 (100%)	0.08	10 (3%)	38	44	21, 32, 49, 65	0
2	B	251/252 (99%)	0.20	16 (6%)	19	24	25, 37, 57, 90	0
All	All	503/504 (99%)	0.14	26 (5%)	27	32	21, 35, 53, 90	0

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	2	GLN	6.0
2	B	253	ASN	5.9
2	B	168	ASN	4.4
2	B	14	HIS	3.8
1	A	14	HIS	3.7
1	A	2	GLN	3.4
2	B	122	ASN	3.2
1	A	168	ASN	3.1
1	A	86	HIS	3.1
2	B	65	LEU	2.7
2	B	4	ILE	2.7
1	A	91	PHE	2.7
1	A	253	ASN	2.5
1	A	77	ASP	2.4
2	B	86	HIS	2.4
2	B	49	LYS	2.4
2	B	225	ALA	2.4
2	B	12	PRO	2.3
1	A	67[A]	MET	2.3
2	B	3	SER	2.3
2	B	34	VAL	2.2
2	B	10	LYS	2.2
1	A	65	LEU	2.1
2	B	5	THR	2.0

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Mol	Chain	Res	Type	RSRZ
1	A	225	ALA	2.0
2	B	226	THR	2.0

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

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	KCX	B	62	12/13	0.87	0.20	26,33,49,50	0

6.3 Carbohydrates ⓘ

There are no monosaccharides 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. 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
4	GOL	A	1	6/6	0.62	0.34	78,79,80,80	0
4	GOL	B	255	6/6	0.73	0.22	65,66,66,66	0
4	GOL	A	256	6/6	0.83	0.25	57,59,59,60	0
4	GOL	B	256	6/6	0.84	0.15	47,49,49,49	0
3	SO4	B	254	5/5	0.89	0.29	91,91,91,91	0
3	SO4	A	255	5/5	0.90	0.34	104,104,104,104	0
3	SO4	B	1	5/5	0.96	0.18	48,50,50,51	0
3	SO4	A	254	5/5	0.98	0.09	45,46,47,48	0

6.5 Other polymers ⓘ

There are no such residues in this entry.