Full wwPDB X-ray Structure Validation Report ⓘ

May 15, 2020 – 03:44 pm BST

PDB ID	:	4PDX
Title	:	Crystal structure of Escherchia coli uncharacterized protein YjcS
Authors	:	Liang, Y.J.; Gao, Z.Q.; Liu, Q.S.; Dong, Y.H.
Deposited on	:	2014-04-22
Resolution	:	1.75 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*
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:

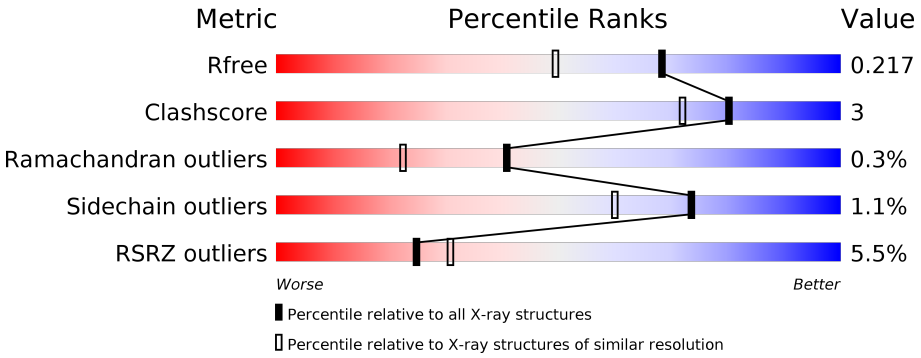
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

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 1.75 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	2340 (1.76-1.76)
Clashscore	141614	2466 (1.76-1.76)
Ramachandran outliers	138981	2437 (1.76-1.76)
Sidechain outliers	138945	2437 (1.76-1.76)
RSRZ outliers	127900	2298 (1.76-1.76)

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 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	640	5% 90% 8% .
1	B	640	6% 89% 7% .

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 10859 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.

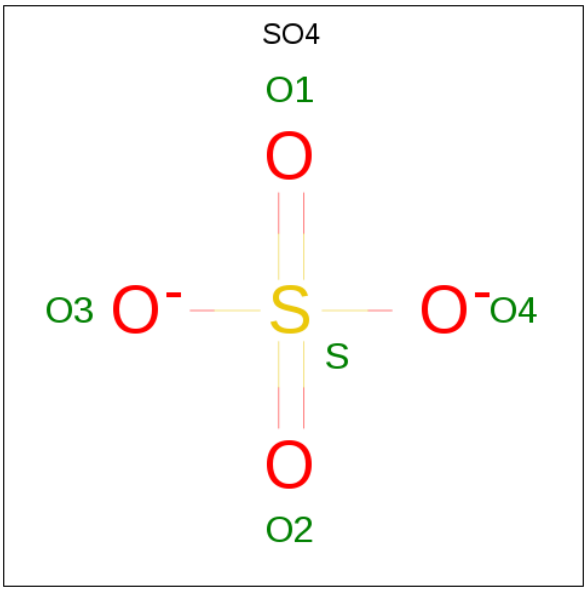
- Molecule 1 is a protein called Putative alkyl/aryl-sulfatase YjcS.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	622	Total	C	N	O	S	Se	0	0	0
			4886	3101	846	921	2	16			
1	B	619	Total	C	N	O	S	Se	0	0	0
			4865	3090	842	915	2	16			

There are 16 discrepancies between the modelled and reference sequences:

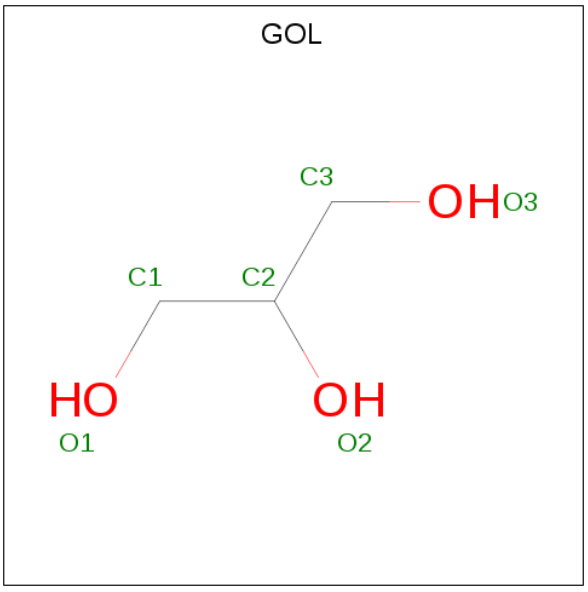
Chain	Residue	Modelled	Actual	Comment	Reference
A	662	LEU	-	expression tag	UNP P32717
A	663	GLU	-	expression tag	UNP P32717
A	664	HIS	-	expression tag	UNP P32717
A	665	HIS	-	expression tag	UNP P32717
A	666	HIS	-	expression tag	UNP P32717
A	667	HIS	-	expression tag	UNP P32717
A	668	HIS	-	expression tag	UNP P32717
A	669	HIS	-	expression tag	UNP P32717
B	662	LEU	-	expression tag	UNP P32717
B	663	GLU	-	expression tag	UNP P32717
B	664	HIS	-	expression tag	UNP P32717
B	665	HIS	-	expression tag	UNP P32717
B	666	HIS	-	expression tag	UNP P32717
B	667	HIS	-	expression tag	UNP P32717
B	668	HIS	-	expression tag	UNP P32717
B	669	HIS	-	expression tag	UNP P32717

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



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

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



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

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

- Molecule 4 is water.

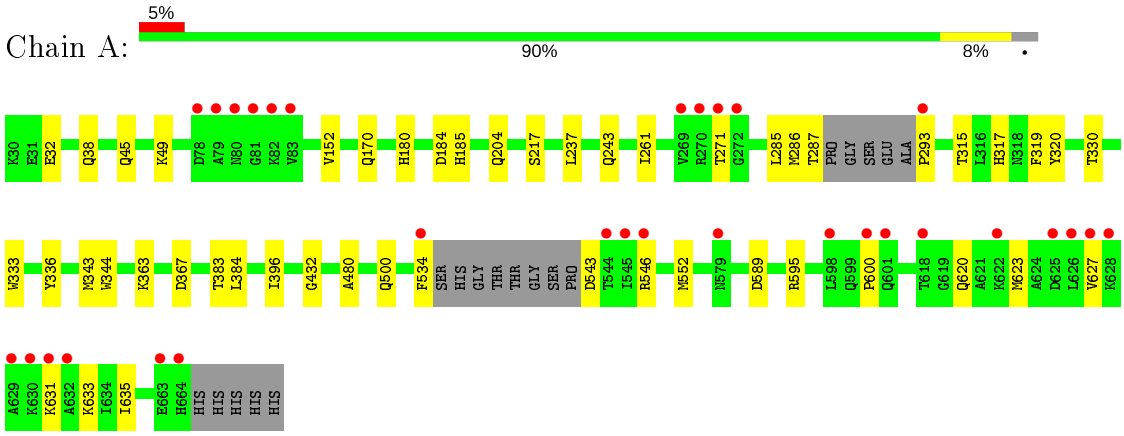
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	539	Total	O	0	0
			539	539		
4	B	542	Total	O	0	0
			542	542		

3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA 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.

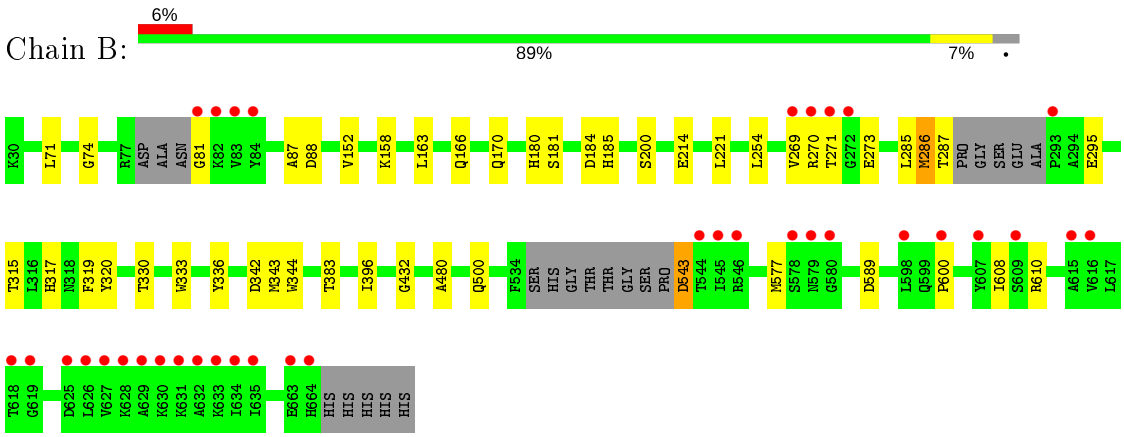
- Molecule 1: Putative alkyl/aryl-sulfatase YjcS

Chain A:



- Molecule 1: Putative alkyl/aryl-sulfatase YjcS

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	199.55Å 76.18Å 103.68Å 90.00° 115.26° 90.00°	Depositor
Resolution (Å)	45.12 – 1.75 45.12 – 1.75	Depositor EDS
% Data completeness (in resolution range)	92.2 (45.12-1.75) 92.2 (45.12-1.75)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.57 (at 1.75Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.2_1309)	Depositor
R, R_{free}	0.183 , 0.216 0.184 , 0.217	Depositor DCC
R_{free} test set	6592 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å^2)	15.5	Xtriage
Anisotropy	0.502	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 51.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	10859	wwPDB-VP
Average B, all atoms (Å^2)	19.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.67% of the height of the origin peak. No significant pseudotranslation is detected.*

[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

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	0.36	0/4979	0.53	0/6725
1	B	0.36	0/4957	0.53	0/6693
All	All	0.36	0/9936	0.53	0/13418

There are no bond length outliers.

There are no bond angle outliers.

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	4886	0	4785	29	1
1	B	4865	0	4769	28	1
2	A	10	0	0	0	0
2	B	5	0	0	0	0
3	A	6	0	8	0	0
3	B	6	0	8	0	0
4	A	539	0	0	4	0
4	B	542	0	0	8	0
All	All	10859	0	9570	53	1

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 3.

All (53) 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:546:ARG:CZ	1:A:620:GLN:OE1	2.14	0.96
1:A:546:ARG:NE	1:A:620:GLN:OE1	2.18	0.76
1:B:271:THR:HG22	1:B:286:MSE:H	1.54	0.73
1:B:589:ASP:OD2	4:B:1073:HOH:O	2.06	0.71
1:A:589:ASP:OD2	4:A:1167:HOH:O	2.14	0.66
1:B:81:GLY:N	4:B:1228:HOH:O	2.30	0.65
1:B:166:GLN:NE2	4:B:1341:HOH:O	2.27	0.63
1:B:269:VAL:HG13	1:B:270:ARG:HG3	1.83	0.61
1:B:158:LYS:NZ	4:B:1069:HOH:O	2.23	0.60
1:A:546:ARG:NH2	1:A:620:GLN:OE1	2.35	0.60
1:A:633:LYS:HE3	1:A:635:ILE:HD11	1.86	0.58
1:B:543:ASP:N	4:B:1302:HOH:O	2.37	0.57
1:B:343:MSE:HG2	1:B:344:TRP:CE2	2.44	0.53
1:B:271:THR:HB	1:B:285:LEU:HD12	1.90	0.53
1:B:88:ASP:OD2	4:B:1296:HOH:O	2.19	0.52
1:A:343:MSE:HG2	1:A:344:TRP:CE2	2.45	0.51
1:A:317:HIS:HB3	1:A:333:TRP:HH2	1.74	0.51
1:A:432:GLY:HA3	1:B:320:TYR:CE1	2.47	0.49
1:B:480:ALA:HA	1:B:500:GLN:OE1	2.12	0.49
1:B:295:GLU:OE2	4:B:1074:HOH:O	2.19	0.49
1:A:287:THR:HB	1:A:293:PRO:HB3	1.94	0.49
1:A:45:GLN:O	1:A:49:LYS:HG2	2.14	0.48
1:A:480:ALA:HA	1:A:500:GLN:OE1	2.14	0.48
1:A:595:ARG:NH2	4:A:1001:HOH:O	2.48	0.47
1:B:180:HIS:HB3	1:B:185:HIS:CG	2.50	0.47
1:A:384:LEU:HD13	1:B:221:LEU:HB3	1.96	0.47
1:A:631:LYS:NZ	4:A:1192:HOH:O	2.48	0.46
1:A:383:THR:HG23	1:A:396:ILE:HG21	1.97	0.46
1:B:383:THR:HG23	1:B:396:ILE:HG21	1.96	0.45
1:B:270:ARG:O	1:B:273:GLU:HB2	2.16	0.45
1:A:237:LEU:HD22	1:A:534:PHE:CD2	2.51	0.45
1:A:363:LYS:HE3	1:A:367:ASP:OD2	2.16	0.45
1:A:261:ILE:HG22	1:A:543:ASP:HB3	1.97	0.45
1:B:71:LEU:HG	1:B:163:LEU:HD13	1.98	0.45
1:A:152:VAL:HG22	1:A:184:ASP:HA	1.99	0.44
1:B:271:THR:HG21	4:B:1233:HOH:O	2.17	0.44
1:B:577:MSE:CE	1:B:610:ARG:HA	2.47	0.44
1:B:74:GLY:HA3	1:B:87:ALA:HB3	1.98	0.44
1:B:319:PHE:CD2	1:B:330:THR:HG21	2.52	0.44
1:A:180:HIS:HB3	1:A:185:HIS:CG	2.53	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:320:TYR:CE1	1:B:432:GLY:HA3	2.53	0.44
1:A:32:GLU:OE2	4:A:1181:HOH:O	2.20	0.44
1:A:546:ARG:NE	1:A:620:GLN:CD	2.73	0.42
1:A:319:PHE:CD2	1:A:330:THR:HG21	2.54	0.42
1:B:181:SER:OG	1:B:214:GLU:HG2	2.19	0.42
1:A:595:ARG:HD2	1:B:342:ASP:OD1	2.19	0.42
1:A:623:MSE:O	1:A:627:VAL:HG23	2.20	0.42
1:A:217:SER:HB3	1:A:552:MSE:HE2	2.02	0.41
1:A:180:HIS:HB3	1:A:185:HIS:CD2	2.55	0.41
1:B:317:HIS:HB3	1:B:333:TRP:HH2	1.86	0.41
1:B:577:MSE:HA	1:B:608:ILE:O	2.20	0.41
1:A:271:THR:OG1	1:A:285:LEU:HD12	2.20	0.41
1:B:152:VAL:HG21	1:B:254:LEU:HD12	2.04	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:204:GLN:NE2	1:B:200:SER:O[2_555]	2.14	0.06

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	616/640 (96%)	597 (97%)	17 (3%)	2 (0%)	41 22
1	B	611/640 (96%)	591 (97%)	18 (3%)	2 (0%)	41 22
All	All	1227/1280 (96%)	1188 (97%)	35 (3%)	4 (0%)	41 22

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	315	THR
1	B	315	THR
1	A	600	PRO
1	B	600	PRO

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	510/508 (100%)	505 (99%)	5 (1%)	76	63
1	B	508/508 (100%)	502 (99%)	6 (1%)	71	56
All	All	1018/1016 (100%)	1007 (99%)	11 (1%)	73	60

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

Mol	Chain	Res	Type
1	A	38	GLN
1	A	170	GLN
1	A	243	GLN
1	A	286	MSE
1	A	336	TYR
1	B	170	GLN
1	B	184	ASP
1	B	286	MSE
1	B	287	THR
1	B	336	TYR
1	B	543	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	38	GLN
1	B	170	GLN

5.3.3 RNA

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates

There are no carbohydrates in this entry.

5.6 Ligand geometry

5 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	GOL	A	703	-	5,5,5	0.34	0	5,5,5	0.24	0
2	SO4	A	701	-	4,4,4	0.20	0	6,6,6	0.21	0
2	SO4	B	701	-	4,4,4	0.15	0	6,6,6	0.21	0
3	GOL	B	702	-	5,5,5	0.37	0	5,5,5	0.16	0
2	SO4	A	702	-	4,4,4	0.15	0	6,6,6	0.26	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
3	GOL	A	703	-	-	0/4/4/4	-
3	GOL	B	702	-	-	0/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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

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, 95^{th} 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	606/640 (94%)	0.29	31 (5%)	28	34	8, 16, 34, 58	2 (0%)
1	B	603/640 (94%)	0.29	36 (5%)	21	27	8, 16, 35, 55	0
All	All	1209/1280 (94%)	0.29	67 (5%)	25	31	8, 16, 35, 58	2 (0%)

All (67) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	79	ALA	11.5
1	A	545	ILE	9.2
1	A	81	GLY	8.0
1	B	545	ILE	6.8
1	A	80	ASN	6.2
1	A	270	ARG	5.8
1	B	579	ASN	5.7
1	B	270	ARG	5.6
1	B	628	LYS	5.5
1	A	630	LYS	5.4
1	B	546	ARG	5.1
1	A	629	ALA	5.0
1	A	546	ARG	4.8
1	B	82	LYS	4.7
1	A	83	VAL	4.5
1	B	271	THR	4.4
1	B	630	LYS	4.4
1	A	82	LYS	4.3
1	A	601	GLN	4.2
1	B	629	ALA	4.1
1	A	293	PRO	4.0
1	B	627	VAL	3.9
1	B	578	SER	3.6
1	A	600	PRO	3.5

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Mol	Chain	Res	Type	RSRZ
1	A	628	LYS	3.5
1	A	78	ASP	3.5
1	B	272	GLY	3.4
1	B	544	THR	3.4
1	A	271	THR	3.4
1	B	626	LEU	3.4
1	B	600	PRO	3.3
1	B	632	ALA	3.3
1	A	272	GLY	3.3
1	A	627	VAL	3.3
1	A	544	THR	3.1
1	A	663	GLU	3.1
1	B	664	HIS	3.0
1	B	81	GLY	3.0
1	A	632	ALA	3.0
1	A	664	HIS	2.9
1	A	622	LYS	2.9
1	B	635	ILE	2.9
1	B	293	PRO	2.9
1	B	83	VAL	2.8
1	A	631	LYS	2.8
1	A	626	LEU	2.8
1	A	269	VAL	2.8
1	B	625	ASP	2.7
1	B	634	ILE	2.6
1	B	618	THR	2.5
1	A	534	PHE	2.5
1	B	580	GLY	2.5
1	B	598	LEU	2.5
1	B	84	TYR	2.4
1	A	625	ASP	2.4
1	B	269	VAL	2.3
1	B	616	VAL	2.3
1	B	607	TYR	2.3
1	B	631	LYS	2.3
1	A	579	ASN	2.2
1	B	619	GLY	2.2
1	B	633	LYS	2.2
1	B	609	SER	2.1
1	A	618	THR	2.1
1	B	615	ALA	2.1
1	A	598	LEU	2.0

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Mol	Chain	Res	Type	RSRZ
1	B	663	GLU	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 carbohydrates 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^{th} 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
3	GOL	B	702	6/6	0.94	0.09	15,16,17,18	0
2	SO4	A	702	5/5	0.94	0.14	25,29,35,38	0
3	GOL	A	703	6/6	0.96	0.08	14,15,16,17	0
2	SO4	A	701	5/5	0.98	0.09	11,12,13,14	0
2	SO4	B	701	5/5	0.98	0.11	11,11,13,14	0

6.5 Other polymers (i)

There are no such residues in this entry.