



wwPDB X-ray Structure Validation Summary Report ⓘ

May 16, 2020 – 10:42 am BST

PDB ID : 3R85
Title : Crystal structure of human SOUL BH3 domain in complex with Bcl-xL
Authors : Ambrosi, E.K.; Capaldi, S.; Bovi, M.; Saccomani, G.; Perduca, M.; Monaco, H.L.
Deposited on : 2011-03-23
Resolution : 1.95 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:

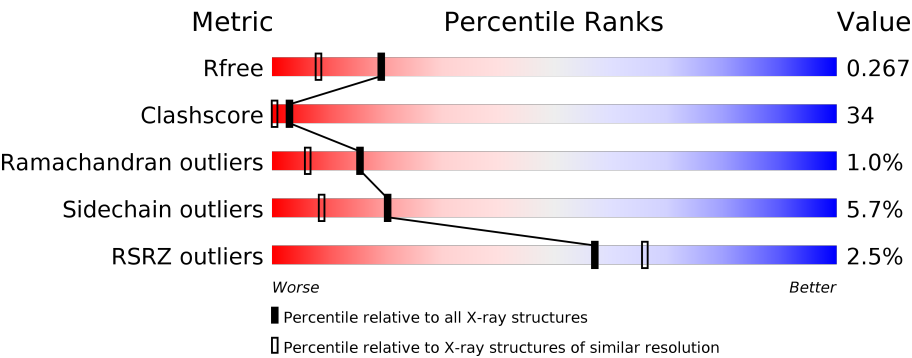
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, 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 1.95 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	2580 (1.96-1.96)
Clashscore	141614	2705 (1.96-1.96)
Ramachandran outliers	138981	2678 (1.96-1.96)
Sidechain outliers	138945	2678 (1.96-1.96)
RSRZ outliers	127900	2539 (1.96-1.96)

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 $\leq 5\%$. 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	156	<div><div>%</div><div><div></div><div>40%</div><div>44%</div><div>•</div><div>12%</div></div></div>
1	B	156	<div><div>%</div><div><div></div><div>38%</div><div>47%</div><div>•</div><div>12%</div></div></div>
1	C	156	<div><div>3%</div><div><div></div><div>46%</div><div>42%</div><div>•</div><div>11%</div></div></div>
1	D	156	<div><div>3%</div><div><div></div><div>40%</div><div>46%</div><div>•</div><div>11%</div></div></div>
2	E	26	<div><div>8%</div><div><div></div><div>42%</div><div>31%</div><div>•</div><div>23%</div></div></div>
2	F	26	<div><div></div><div><div></div><div>27%</div><div>50%</div><div>•</div><div>19%</div></div></div>

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Mol	Chain	Length	Quality of chain
2	G	26	<p>12% 15% 50% 8% 27%</p>
2	H	26	<p>42% 23% 8% 27%</p>

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 5309 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 Bcl-2-like protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	138	Total	C	N	O	S	0	0	0
			1120	717	189	210	4			
1	B	138	Total	C	N	O	S	0	0	0
			1120	717	189	210	4			
1	C	139	Total	C	N	O	S	0	0	0
			1129	722	191	212	4			
1	D	139	Total	C	N	O	S	0	0	0
			1129	722	191	212	4			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	EXPRESSION TAG	UNP Q07817
A	-1	SER	-	EXPRESSION TAG	UNP Q07817
A	0	HIS	-	EXPRESSION TAG	UNP Q07817
B	-2	GLY	-	EXPRESSION TAG	UNP Q07817
B	-1	SER	-	EXPRESSION TAG	UNP Q07817
B	0	HIS	-	EXPRESSION TAG	UNP Q07817
C	-2	GLY	-	EXPRESSION TAG	UNP Q07817
C	-1	SER	-	EXPRESSION TAG	UNP Q07817
C	0	HIS	-	EXPRESSION TAG	UNP Q07817
D	-2	GLY	-	EXPRESSION TAG	UNP Q07817
D	-1	SER	-	EXPRESSION TAG	UNP Q07817
D	0	HIS	-	EXPRESSION TAG	UNP Q07817

- Molecule 2 is a protein called Heme-binding protein 2.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	E	20	Total	C	N	O	0	0	0
			161	102	26	33			
2	F	21	Total	C	N	O	0	0	0
			169	106	29	34			

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	G	19	Total	C	N	O	0	0	0
			152	96	24	32			
2	H	19	Total	C	N	O	0	0	0
			152	96	25	31			

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	43	Total	O	0	0
			43	43		
4	B	56	Total	O	0	0
			56	56		
4	C	32	Total	O	0	0
			32	32		
4	D	30	Total	O	0	0
			30	30		
4	F	6	Total	O	0	0
			6	6		
4	G	2	Total	O	0	0
			2	2		

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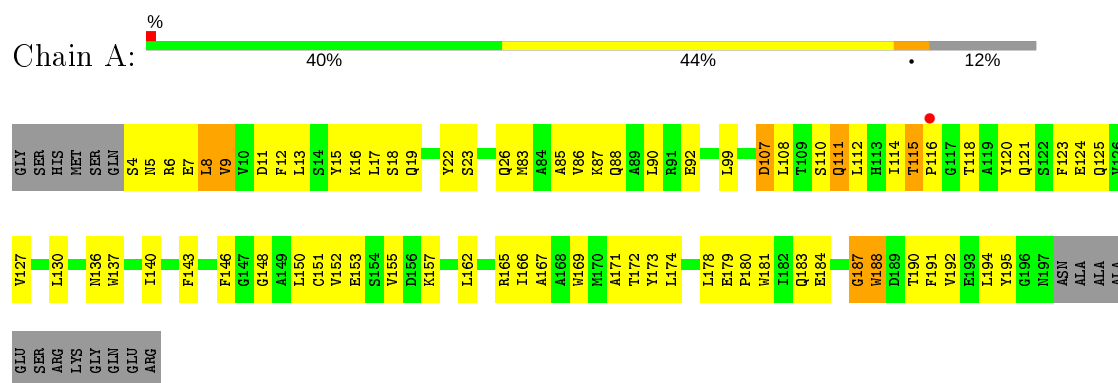
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	H	3	Total	O	0	0
			3	3		

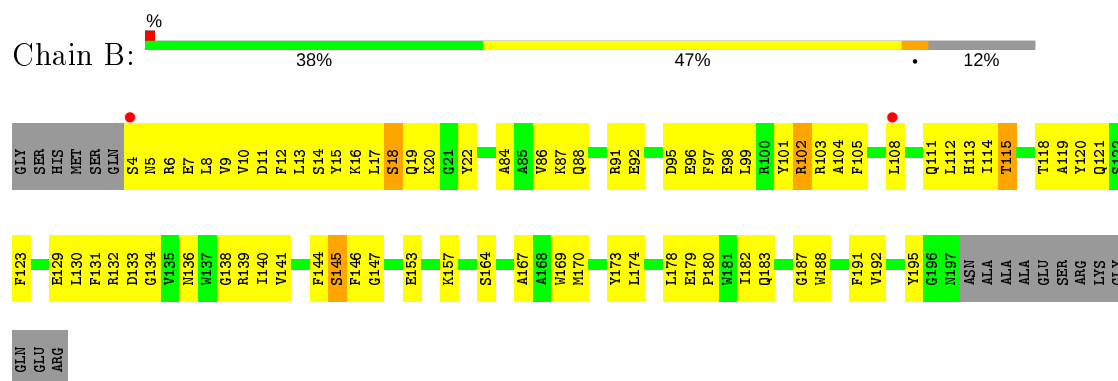
3 Residue-property plots

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

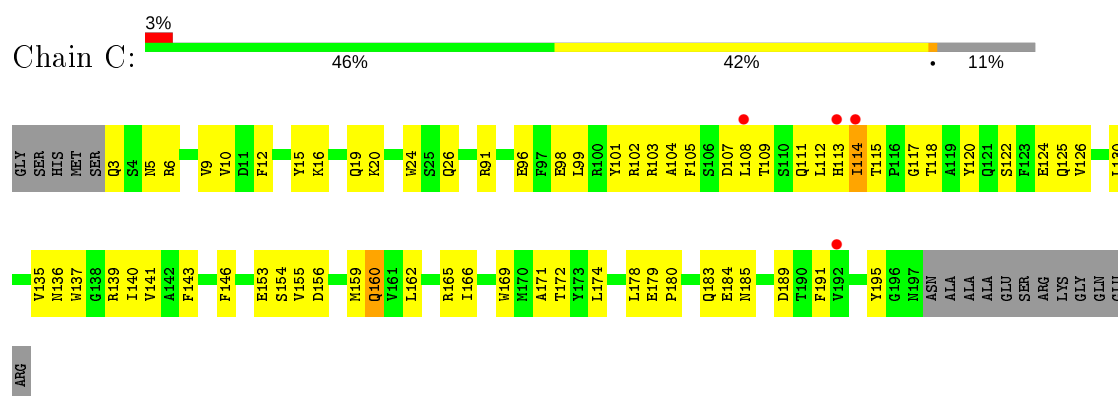
• Molecule 1: Bcl-2-like protein 1



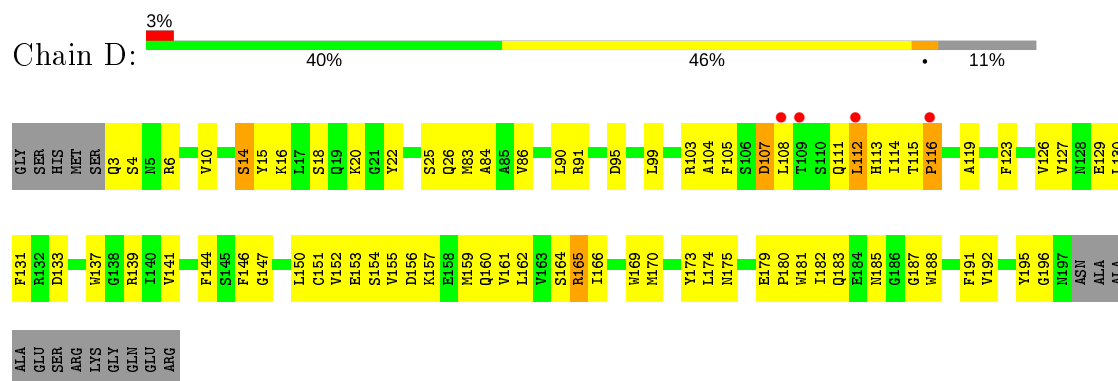
• Molecule 1: Bcl-2-like protein 1



• Molecule 1: Bcl-2-like protein 1



- Molecule 1: Bcl-2-like protein 1



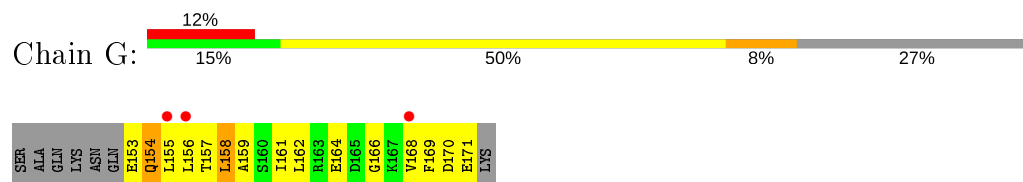
- Molecule 2: Heme-binding protein 2



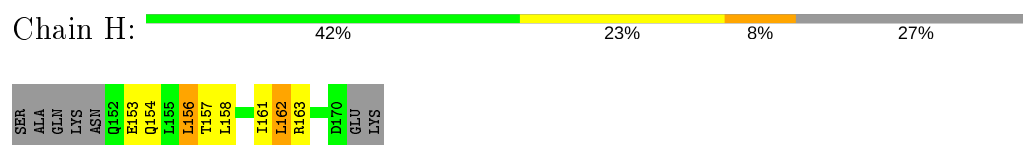
- Molecule 2: Heme-binding protein 2



- Molecule 2: Heme-binding protein 2



- Molecule 2: Heme-binding protein 2



4 Data and refinement statistics

Property	Value	Source
Space group	P 43	Depositor
Cell constants a, b, c, α , β , γ	66.83Å 66.83Å 175.22Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	36.74 – 1.95 36.74 – 1.95	Depositor EDS
% Data completeness (in resolution range)	98.0 (36.74-1.95) 98.0 (36.74-1.95)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.83 (at 1.95Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.6.4_486)	Depositor
R, R_{free}	0.211 , 0.263 0.213 , 0.267	Depositor DCC
R_{free} test set	2788 reflections (5.10%)	wwPDB-VP
Wilson B-factor (Å ²)	25.9	Xtriage
Anisotropy	0.430	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 61.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	0.469 for h,-k,-l	Xtriage
Reported twinning fraction	0.503 for h,-k,-l	Depositor
Outliers	0 of 54700 reflections	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	5309	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 24.48 % 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 3.8014e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹ Intensities estimated from amplitudes.

² Theoretical 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: 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	0.44	0/1148	0.57	0/1555
1	B	0.46	0/1148	0.56	0/1555
1	C	0.47	0/1157	0.58	0/1567
1	D	0.47	0/1157	0.55	0/1567
2	E	0.45	0/161	0.63	0/214
2	F	0.38	0/169	0.65	0/225
2	G	0.36	0/152	0.56	0/203
2	H	0.46	0/152	0.58	0/203
All	All	0.45	0/5244	0.57	0/7089

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 [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	1120	0	1064	81	0
1	B	1120	0	1064	97	0
1	C	1129	0	1072	93	0
1	D	1129	0	1072	91	0
2	E	161	0	165	7	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	F	169	0	173	26	0
2	G	152	0	152	18	0
2	H	152	0	154	10	0
3	A	5	0	0	0	0
4	A	43	0	0	3	0
4	B	56	0	0	4	0
4	C	32	0	0	2	0
4	D	30	0	0	4	0
4	F	6	0	0	0	0
4	G	2	0	0	0	0
4	H	3	0	0	1	0
All	All	5309	0	4916	342	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 34.

The worst 5 of 342 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:B:112:LEU:HD12	2:F:155:LEU:HD21	1.51	0.93
1:B:108:LEU:HB2	2:F:158:LEU:HD21	1.51	0.91
1:C:109:THR:HA	1:C:112:LEU:HG	1.53	0.90
1:C:15:TYR:HB2	1:D:91:ARG:HE	1.37	0.90
2:G:153:GLU:N	2:G:156:LEU:HB2	1.87	0.89

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	136/156 (87%)	119 (88%)	14 (10%)	3 (2%)	6 1

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	136/156 (87%)	123 (90%)	12 (9%)	1 (1%)	22	11
1	C	137/156 (88%)	125 (91%)	12 (9%)	0	100	100
1	D	137/156 (88%)	123 (90%)	12 (9%)	2 (2%)	10	3
2	E	18/26 (69%)	18 (100%)	0	0	100	100
2	F	19/26 (73%)	17 (90%)	2 (10%)	0	100	100
2	G	17/26 (65%)	16 (94%)	1 (6%)	0	100	100
2	H	17/26 (65%)	17 (100%)	0	0	100	100
All	All	617/728 (85%)	558 (90%)	53 (9%)	6 (1%)	15	6

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	112	LEU
1	B	119	ALA
1	A	111	GLN
1	A	188	TRP
1	D	116	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	117/130 (90%)	109 (93%)	8 (7%)	16	5
1	B	117/130 (90%)	112 (96%)	5 (4%)	29	16
1	C	118/130 (91%)	112 (95%)	6 (5%)	24	11
1	D	118/130 (91%)	113 (96%)	5 (4%)	30	17
2	E	18/23 (78%)	16 (89%)	2 (11%)	6	1
2	F	19/23 (83%)	18 (95%)	1 (5%)	22	10
2	G	17/23 (74%)	15 (88%)	2 (12%)	5	1
2	H	17/23 (74%)	15 (88%)	2 (12%)	5	1
All	All	541/612 (88%)	510 (94%)	31 (6%)	20	9

5 of 31 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	103	ARG
1	C	160	GLN
2	G	158	LEU
1	C	114	ILE
1	C	185	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	113	HIS
1	B	19	GLN
1	B	111	GLN
1	C	113	HIS
1	C	183	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 ⓘ

1 ligand 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	$\# Z > 2$
3	SO4	A	500	-	4,4,4	0.10	0	6,6,6	0.29	0

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 [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 ⓘ

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	138/156 (88%)	0.04	1 (0%) 87 92	13, 33, 61, 103	0
1	B	138/156 (88%)	0.02	2 (1%) 75 82	17, 32, 57, 77	0
1	C	139/156 (89%)	0.11	4 (2%) 51 60	19, 32, 61, 80	0
1	D	139/156 (89%)	0.12	4 (2%) 51 60	18, 33, 66, 88	0
2	E	20/26 (76%)	0.23	2 (10%) 7 11	17, 36, 80, 88	0
2	F	21/26 (80%)	0.22	0 100 100	26, 41, 59, 71	0
2	G	19/26 (73%)	0.72	3 (15%) 2 2	22, 39, 67, 73	0
2	H	19/26 (73%)	0.01	0 100 100	26, 33, 63, 66	0
All	All	633/728 (86%)	0.10	16 (2%) 57 66	13, 33, 65, 103	0

The worst 5 of 16 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	116	PRO	3.9
2	G	155	LEU	3.8
2	E	155	LEU	3.7
1	D	109	THR	3.6
1	D	108	LEU	3.5

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. 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
3	SO4	A	500	5/5	0.96	0.11	32,47,51,64	0

6.5 Other polymers

There are no such residues in this entry.