



wwPDB X-ray Structure Validation Summary Report ⓘ

May 25, 2020 – 05:08 am BST

PDB ID : 3SIU
Title : Structure of a hPrp31-15.5K-U4atac 5' stem loop complex, monomeric form
Authors : Liu, S.; Ghalei, H.; Luhrmann, R.; Wahl, M.C.
Deposited on : 2011-06-20
Resolution : 2.63 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

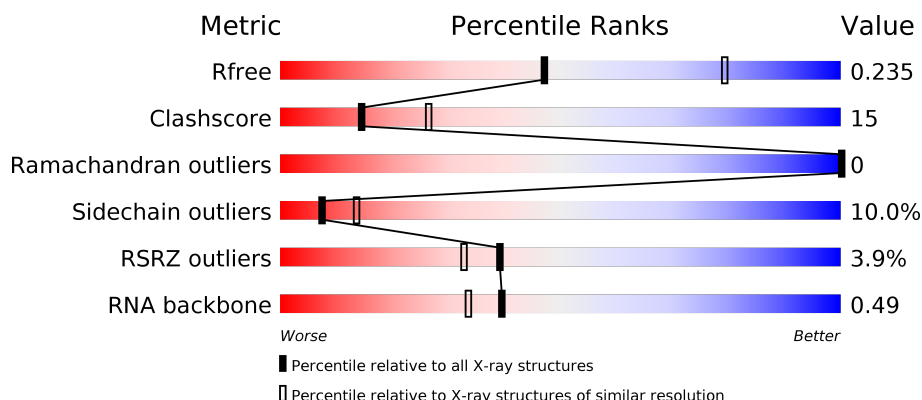
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.63 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	3797 (2.64-2.60)
Clashscore	141614	4168 (2.64-2.60)
Ramachandran outliers	138981	4093 (2.64-2.60)
Sidechain outliers	138945	4093 (2.64-2.60)
RSRZ outliers	127900	3731 (2.64-2.60)
RNA backbone	3102	1062 (2.94-2.30)

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	130	<div> <div>2%</div> <div>70%</div> <div>24%</div> <div>• •</div> </div>
1	D	130	<div> <div>4%</div> <div>64%</div> <div>28%</div> <div>• •</div> </div>
2	B	254	<div> <div>4%</div> <div>59%</div> <div>27%</div> <div>6%</div> <div>7%</div> </div>
2	E	254	<div> <div>3%</div> <div>67%</div> <div>22%</div> <div>•</div> <div>7%</div> </div>

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Mol	Chain	Length	Quality of chain
3	C	28	<div><div></div><div>11%</div><div>50%</div><div>29%</div><div>21%</div></div>
3	F	28	<div><div></div><div>7%</div><div>39%</div><div>46%</div><div>14%</div></div>

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 6896 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 NHP2-like protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	125	Total	C	N	O	S	0	0	0
			967	611	172	179	5			
1	D	125	Total	C	N	O	S	0	0	0
			968	611	172	180	5			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	EXPRESSION TAG	UNP P55769
A	0	SER	-	EXPRESSION TAG	UNP P55769
D	-1	GLY	-	EXPRESSION TAG	UNP P55769
D	0	SER	-	EXPRESSION TAG	UNP P55769

- Molecule 2 is a protein called U4/U6 small nuclear ribonucleoprotein Prp31.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	235	Total	C	N	O	S	0	0	0
			1844	1158	319	357	10			
2	E	236	Total	C	N	O	S	0	0	0
			1848	1161	319	358	10			

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	80	GLY	-	EXPRESSION TAG	UNP Q8WWY3
B	81	PRO	-	EXPRESSION TAG	UNP Q8WWY3
B	82	LEU	-	EXPRESSION TAG	UNP Q8WWY3
B	83	GLY	-	EXPRESSION TAG	UNP Q8WWY3
B	84	SER	-	EXPRESSION TAG	UNP Q8WWY3
E	80	GLY	-	EXPRESSION TAG	UNP Q8WWY3
E	81	PRO	-	EXPRESSION TAG	UNP Q8WWY3
E	82	LEU	-	EXPRESSION TAG	UNP Q8WWY3

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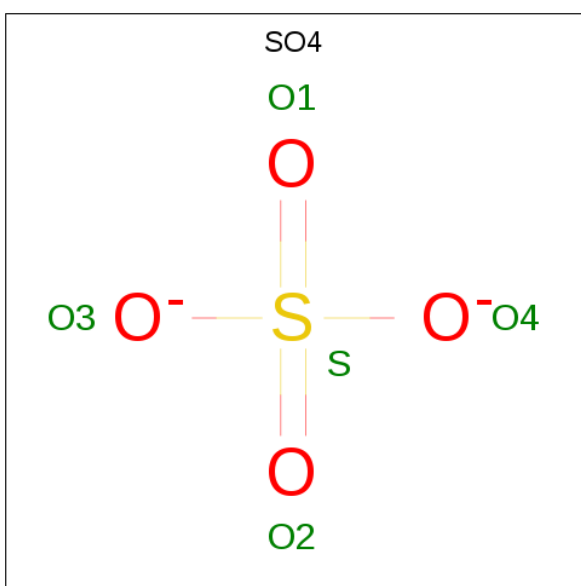
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Chain	Residue	Modelled	Actual	Comment	Reference
E	83	GLY	-	EXPRESSION TAG	UNP Q8WWY3
E	84	SER	-	EXPRESSION TAG	UNP Q8WWY3

- Molecule 3 is a RNA chain called U4atac snRNA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	28	Total	C	N	O	P	0	0	0
			601	269	113	192	27			
3	F	28	Total	C	N	O	P	0	0	0
			601	269	113	192	27			

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



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

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	4	Total	O	0	0
			4	4		
5	B	11	Total	O	0	0
			11	11		

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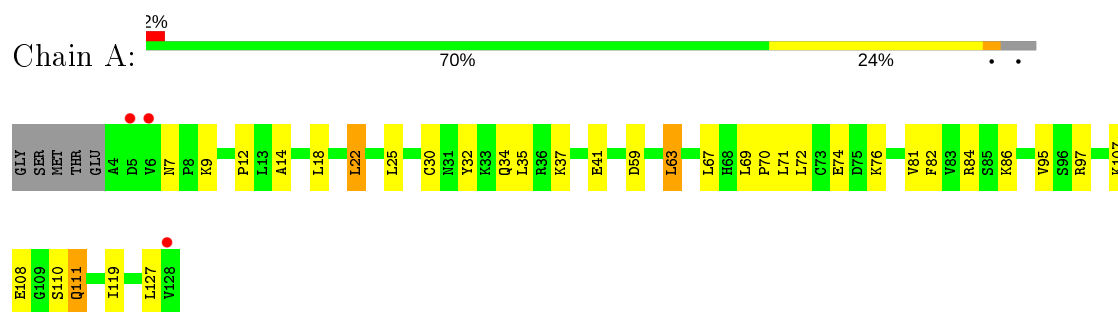
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	C	9	Total 9	O 9	0	0
5	D	9	Total 9	O 9	0	0
5	E	10	Total 10	O 10	0	0
5	F	14	Total 14	O 14	0	0

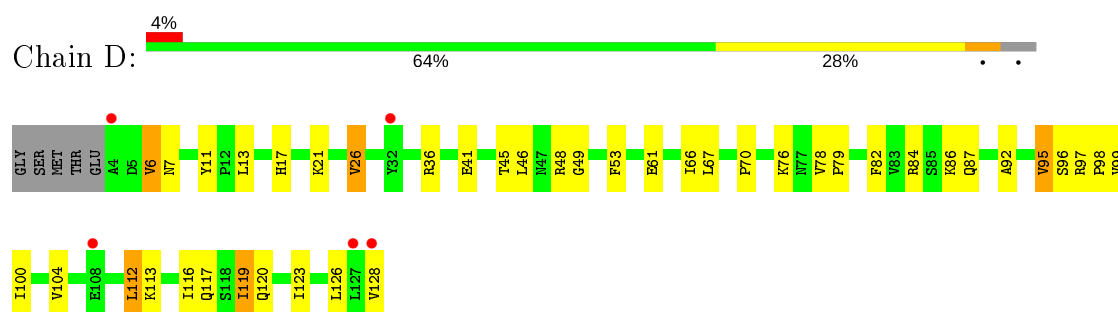
3 Residue-property plots [i](#)

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.

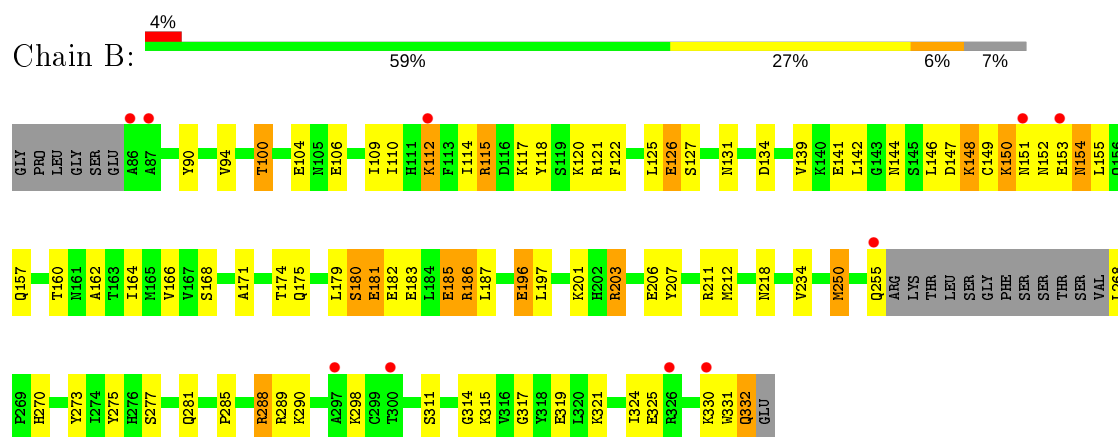
- Molecule 1: NHP2-like protein 1



- Molecule 1: NHP2-like protein 1

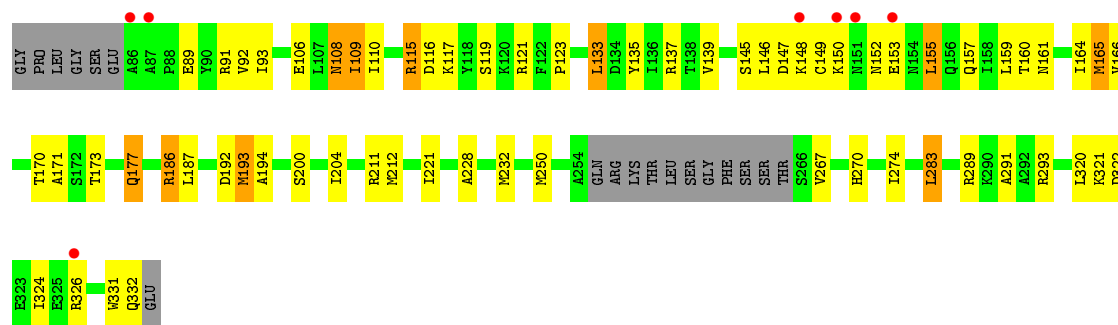


- Molecule 2: U4/U6 small nuclear ribonucleoprotein Prp31



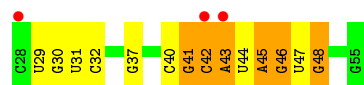
- Molecule 2: U4/U6 small nuclear ribonucleoprotein Prp31

Chain E: 



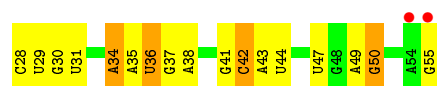
• Molecule 3: U4atac snRNA

Chain C: 



• Molecule 3: U4atac snRNA

Chain F: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	49.50 Å 111.26 Å 110.86 Å 90.00° 101.81° 90.00°	Depositor
Resolution (Å)	29.45 – 2.63 30.32 – 2.63	Depositor EDS
% Data completeness (in resolution range)	98.8 (29.45-2.63) 98.9 (30.32-2.63)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.63 (at 2.64 Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.6.4 _486)	Depositor
R, R_{free}	0.198 , 0.241 0.187 , 0.235	Depositor DCC
R_{free} test set	1750 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	67.0	Xtriage
Anisotropy	0.575	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 50.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.028 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	6896	wwPDB-VP
Average B, all atoms (Å ²)	82.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.89% of the height of the origin peak. No significant pseudotranslation is detected.*

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: 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	0.45	0/979	0.62	0/1323
1	D	0.40	0/980	0.58	0/1323
2	B	0.42	0/1870	0.56	0/2526
2	E	0.45	0/1874	0.56	0/2532
3	C	0.47	0/673	0.97	3/1049 (0.3%)
3	F	0.58	0/673	1.19	5/1049 (0.5%)
All	All	0.45	0/7049	0.71	8/9802 (0.1%)

There are no bond length outliers.

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
3	C	48	G	N9-C4-C5	-6.70	102.72	105.40
3	F	42	C	C2-N1-C1'	6.34	125.78	118.80
3	F	34	A	N1-C6-N6	6.33	122.40	118.60
3	F	34	A	C5-C6-N6	-5.57	119.25	123.70
3	C	48	G	N1-C6-O6	5.51	123.20	119.90

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	967	0	1017	30	0
1	D	968	0	1017	35	0
2	B	1844	0	1864	69	0
2	E	1848	0	1870	51	0
3	C	601	0	305	22	0
3	F	601	0	305	15	0
4	B	5	0	0	0	0
4	D	5	0	0	0	0
5	A	4	0	0	0	0
5	B	11	0	0	1	0
5	C	9	0	0	2	0
5	D	9	0	0	0	0
5	E	10	0	0	0	0
5	F	14	0	0	1	0
All	All	6896	0	6378	204	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 15.

The worst 5 of 204 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)
3:C:45:A:H4'	3:C:46:G:H5''	1.31	1.11
2:B:285:PRO:HA	2:B:288:ARG:HD2	1.40	1.03
1:A:32:TYR:CE1	1:A:111:GLN:HG3	1.95	1.00
1:A:32:TYR:HE1	1:A:111:GLN:HG3	1.18	1.00
2:B:218:ASN:HD22	2:B:317:GLY:H	1.07	1.00

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	123/130 (95%)	118 (96%)	5 (4%)	0	100	100
1	D	123/130 (95%)	121 (98%)	2 (2%)	0	100	100
2	B	231/254 (91%)	223 (96%)	8 (4%)	0	100	100
2	E	232/254 (91%)	228 (98%)	4 (2%)	0	100	100
All	All	709/768 (92%)	690 (97%)	19 (3%)	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	108/112 (96%)	104 (96%)	4 (4%)	34	58
1	D	108/112 (96%)	98 (91%)	10 (9%)	9	16
2	B	203/219 (93%)	174 (86%)	29 (14%)	3	5
2	E	204/219 (93%)	185 (91%)	19 (9%)	9	16
All	All	623/662 (94%)	561 (90%)	62 (10%)	7	13

5 of 62 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	250	MET
1	D	11	TYR
2	E	192	ASP
2	B	288	ARG
1	D	61	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
2	B	157	GLN
2	B	218	ASN
1	D	87	GLN

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Mol	Chain	Res	Type
2	B	154	ASN
2	B	332	GLN

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
3	C	27/28 (96%)	5 (18%)	1 (3%)
3	F	27/28 (96%)	2 (7%)	0
All	All	54/56 (96%)	7 (12%)	1 (1%)

5 of 7 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
3	C	41	G
3	C	42	C
3	C	43	A
3	C	45	A
3	C	46	G

All (1) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
3	C	45	A

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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

2 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	$\# Z > 2$
4	SO4	B	1	-	4,4,4	0.15	0	6,6,6	0.12	0
4	SO4	D	129	-	4,4,4	0.11	0	6,6,6	0.26	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 [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	125/130 (96%)	0.08	3 (2%) 59 53	52, 67, 110, 168	0
1	D	125/130 (96%)	0.17	5 (4%) 38 32	52, 75, 125, 177	0
2	B	235/254 (92%)	0.02	10 (4%) 35 29	49, 76, 122, 166	0
2	E	236/254 (92%)	-0.05	7 (2%) 50 44	54, 73, 126, 177	0
3	C	28/28 (100%)	0.34	3 (10%) 6 4	59, 94, 149, 185	0
3	F	28/28 (100%)	-0.25	2 (7%) 16 11	57, 75, 116, 139	0
All	All	777/824 (94%)	0.03	30 (3%) 39 33	49, 73, 125, 185	0

The worst 5 of 30 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	C	43	A	5.8
1	D	4	ALA	5.4
1	A	5	ASP	4.3
2	E	87	ALA	4.2
2	E	153	GLU	4.1

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, 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	SO4	B	1	5/5	0.91	0.15	127,128,141,147	0
4	SO4	D	129	5/5	0.95	0.20	100,101,108,117	0

6.5 Other polymers [i](#)

There are no such residues in this entry.