



wwPDB X-ray Structure Validation Summary Report ⓘ

Oct 26, 2017 – 08:54 AM EDT

PDB ID : 5XJ2
Title : Structure of spRlmCD with U747 RNA
Authors : Jiang, Y.; Gong, Q.
Deposited on : unknown
Resolution : 2.84 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

<http://wwpdb.org/validation/2016/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:

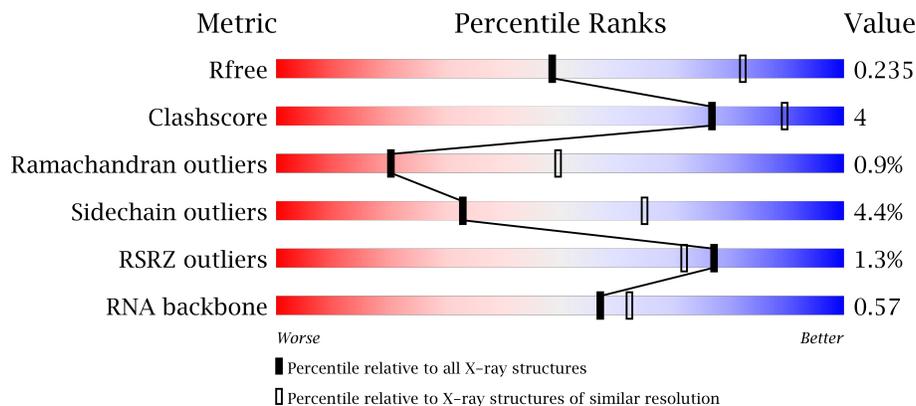
MolProbity : 4.02b-467
Mogul : 1.7.2 (RC1), CSD as538be (2017)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20030345
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : rb-20030345

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 2.84 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.



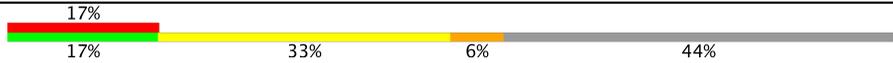
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	100719	3466 (2.88-2.80)
Clashscore	112137	3975 (2.88-2.80)
Ramachandran outliers	110173	3902 (2.88-2.80)
Sidechain outliers	110143	3905 (2.88-2.80)
RSRZ outliers	101464	3501 (2.88-2.80)
RNA backbone	2435	1054 (3.18-2.50)

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. 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	454	
1	B	454	
1	C	454	
1	D	454	

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Mol	Chain	Length	Quality of chain
2	G	18	 <p>A horizontal bar chart representing the quality of chain. The bar is divided into five segments: a red segment (17%), a green segment (17%), a yellow segment (33%), an orange segment (6%), and a grey segment (44%).</p>

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 14555 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 Uncharacterized RNA methyltransferase SP_1029.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	454	3568	2283	612	661	12	0	0	0
1	B	452	3524	2252	602	658	12	0	0	0
1	C	451	3559	2275	611	662	11	0	0	0
1	D	452	3570	2282	611	667	10	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	443	GLN	GLU	engineered mutation	UNP Q97R12
B	443	GLN	GLU	engineered mutation	UNP Q97R12
C	443	GLN	GLU	engineered mutation	UNP Q97R12
D	443	GLN	GLU	engineered mutation	UNP Q97R12

- Molecule 2 is a RNA chain called RNA (5'-R(*GP*GP*CP*AP*CP*GP*UP*GP*CP*U)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	G	10	211	95	38	69	9	0	0	0

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).

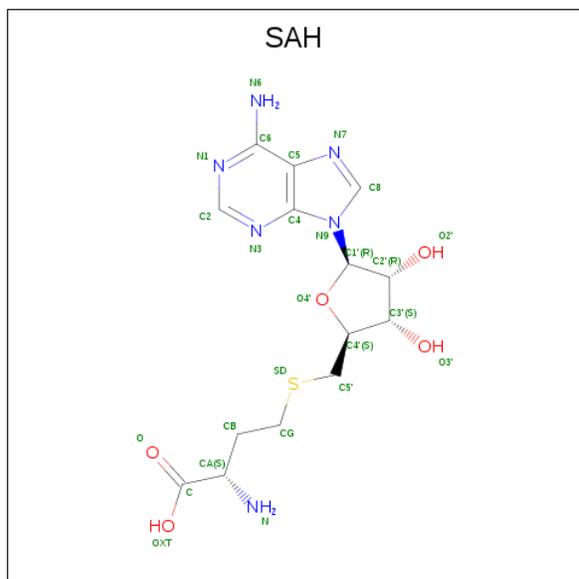
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	Zn	0	0
			1	1		
3	A	1	Total	Zn	0	0
			1	1		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	D	1	Total Zn 1 1	0	0
3	C	1	Total Zn 1 1	0	0

- Molecule 4 is S-ADENOSYL-L-HOMOCYSTEINE (three-letter code: SAH) (formula: $C_{14}H_{20}N_6O_5S$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N O S 26 14 6 5 1	0	0
4	B	1	Total C N O S 26 14 6 5 1	0	0
4	C	1	Total C N O S 26 14 6 5 1	0	0
4	D	1	Total C N O S 26 14 6 5 1	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	8	Total O 8 8	0	0
5	B	1	Total O 1 1	0	0
5	C	3	Total O 3 3	0	0

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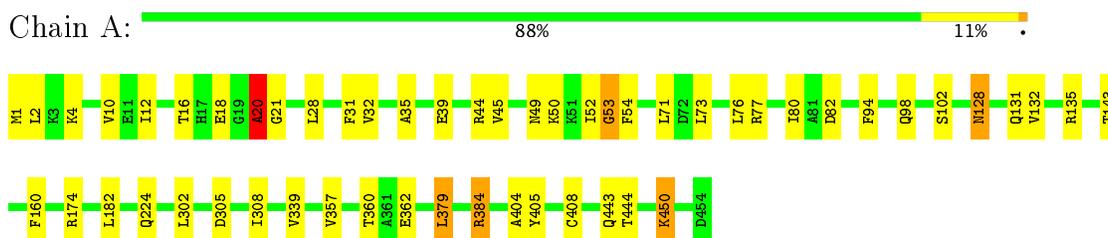
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	D	3	Total	O	0	0
			3	3		

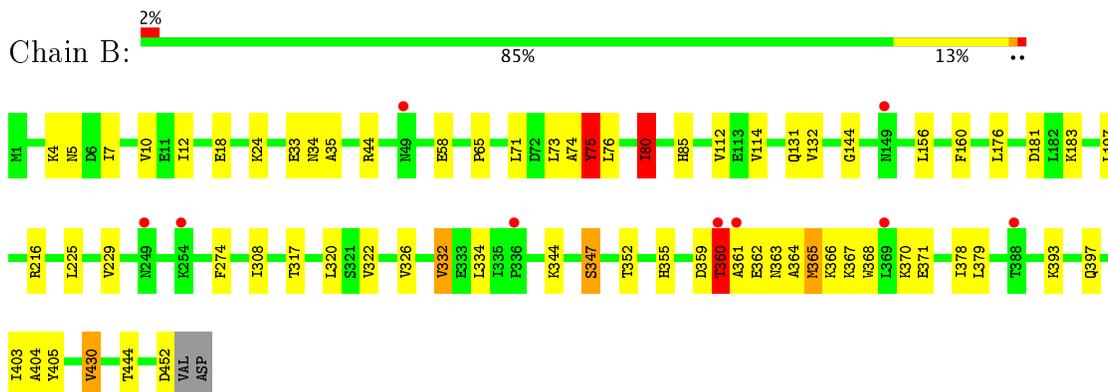
3 Residue-property plots [i](#)

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.

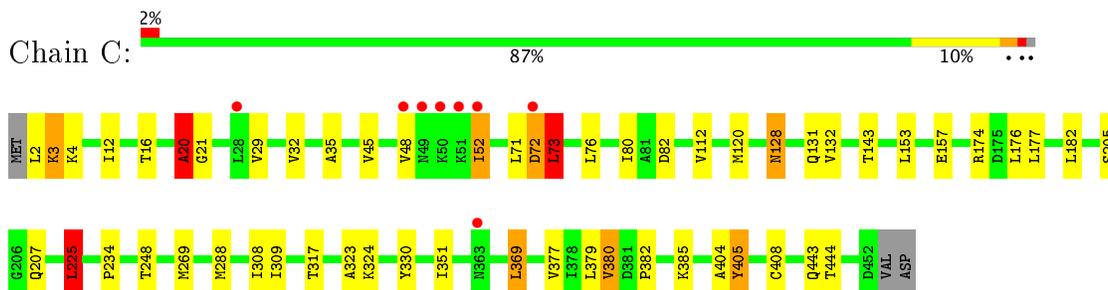
- Molecule 1: Uncharacterized RNA methyltransferase SP_1029



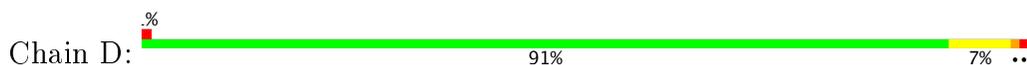
- Molecule 1: Uncharacterized RNA methyltransferase SP_1029



- Molecule 1: Uncharacterized RNA methyltransferase SP_1029



- Molecule 1: Uncharacterized RNA methyltransferase SP_1029





- Molecule 2: RNA (5'-R(*GP*GP*CP*AP*CP*GP*UP*GP*CP*U)-3')



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	63.38Å 94.92Å 164.16Å 90.00° 95.93° 90.00°	Depositor
Resolution (Å)	39.53 – 2.84 39.53 – 2.84	Depositor EDS
% Data completeness (in resolution range)	99.5 (39.53-2.84) 99.5 (39.53-2.84)	Depositor EDS
R_{merge}	0.37	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.39 (at 2.86Å)	Xtrriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.195 , 0.236 0.197 , 0.235	Depositor DCC
R_{free} test set	1999 reflections (4.57%)	DCC
Wilson B-factor (Å ²)	31.7	Xtrriage
Anisotropy	0.069	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 36.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	14555	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.37% 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: ZN, SAH

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	0.60	0/3632	0.85	13/4923 (0.3%)
1	B	0.57	0/3587	0.86	5/4868 (0.1%)
1	C	0.58	0/3623	0.82	5/4907 (0.1%)
1	D	0.60	0/3634	0.84	4/4924 (0.1%)
2	G	0.44	0/234	0.87	0/361
All	All	0.58	0/14710	0.84	27/19983 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	2
1	B	0	2
1	C	0	3
1	D	0	5
All	All	0	12

There are no bond length outliers.

The worst 5 of 27 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	181	ASP	CB-CG-OD1	9.71	127.03	118.30
1	A	31	PHE	CB-CG-CD1	9.16	127.21	120.80
1	A	31	PHE	CB-CG-CD2	-8.70	114.71	120.80
1	A	305	ASP	CB-CG-OD1	8.33	125.80	118.30
1	B	80	ILE	N-CA-C	6.11	127.51	111.00

There are no chirality outliers.

5 of 12 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	20	ALA	Peptide
1	A	52	ILE	Peptide
1	B	33	GLU	Peptide
1	B	360	THR	Peptide
1	C	20	ALA	Peptide

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	3568	0	3606	19	0
1	B	3524	0	3524	38	0
1	C	3559	0	3597	32	0
1	D	3570	0	3605	17	0
2	G	211	0	111	4	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	26	0	19	1	0
4	B	26	0	19	0	0
4	C	26	0	19	0	0
4	D	26	0	19	4	0
5	A	8	0	0	0	0
5	B	1	0	0	0	0
5	C	3	0	0	0	0
5	D	3	0	0	0	0
All	All	14555	0	14519	103	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 4.

The worst 5 of 103 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:D:120:MET:HE2	1:D:437:PRO:HG2	1.59	0.85

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:176:LEU:HD13	1:B:229:VAL:HG22	1.59	0.84
1:A:2:LEU:HD11	1:A:45:VAL:HG21	1.61	0.82
1:D:73:LEU:HD21	1:D:160:PHE:CE2	2.18	0.78
1:B:332:VAL:HG22	1:B:368:TRP:CH2	2.21	0.75

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	452/454 (100%)	433 (96%)	18 (4%)	1 (0%)	51	81
1	B	450/454 (99%)	428 (95%)	16 (4%)	6 (1%)	14	39
1	C	449/454 (99%)	423 (94%)	23 (5%)	3 (1%)	25	56
1	D	450/454 (99%)	420 (93%)	24 (5%)	6 (1%)	14	39
All	All	1801/1816 (99%)	1704 (95%)	81 (4%)	16 (1%)	20	49

5 of 16 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	75	TYR
1	B	365	MET
1	D	373	ILE
1	D	374	GLN
1	A	4	LYS

5.3.2 Protein sidechains [i](#)

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	386/398 (97%)	367 (95%)	19 (5%)	29	60
1	B	377/398 (95%)	358 (95%)	19 (5%)	28	59
1	C	386/398 (97%)	371 (96%)	15 (4%)	37	69
1	D	388/398 (98%)	374 (96%)	14 (4%)	40	72
All	All	1537/1592 (96%)	1470 (96%)	67 (4%)	33	65

5 of 67 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	344	LYS
1	B	452	ASP
1	D	195	ARG
1	B	347	SER
1	B	405	TYR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 11 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	190	GLN
1	B	275	GLN
1	D	98	GLN
1	B	98	GLN
1	C	128	ASN

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	G	9/18 (50%)	3 (33%)	1 (11%)

All (3) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
2	G	744	C
2	G	754	U
2	G	755	G

All (1) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
2	G	753	G

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](#)

Of 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 for Mogul analysis.

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	SAH	A	502	-	20,28,28	1.09	2 (10%)	20,40,40	2.77	7 (35%)
4	SAH	B	502	-	20,28,28	1.25	2 (10%)	20,40,40	2.07	5 (25%)
4	SAH	C	502	-	20,28,28	1.16	2 (10%)	20,40,40	2.27	5 (25%)
4	SAH	D	502	-	20,28,28	1.17	2 (10%)	20,40,40	2.05	3 (15%)

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	SAH	A	502	-	-	0/7/31/31	0/3/3/3
4	SAH	B	502	-	-	0/7/31/31	0/3/3/3
4	SAH	C	502	-	-	0/7/31/31	0/3/3/3
4	SAH	D	502	-	-	0/7/31/31	0/3/3/3

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	502	SAH	O4'-C1'	2.11	1.44	1.41
4	C	502	SAH	O4'-C1'	2.22	1.44	1.41
4	A	502	SAH	C5-C4	2.38	1.45	1.40
4	B	502	SAH	C2-N3	2.42	1.36	1.32
4	A	502	SAH	C2-N3	2.44	1.36	1.32

The worst 5 of 20 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	502	SAH	N3-C2-N1	-10.11	120.05	128.86
4	C	502	SAH	N3-C2-N1	-7.54	122.29	128.86
4	D	502	SAH	N3-C2-N1	-7.49	122.33	128.86
4	B	502	SAH	N3-C2-N1	-6.72	123.00	128.86
4	C	502	SAH	C1'-N9-C4	-4.38	119.06	126.64

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	502	SAH	1	0
4	D	502	SAH	4	0

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	454/454 (100%)	-0.42	0 100 100	12, 20, 39, 63	0
1	B	452/454 (99%)	-0.09	9 (1%) 65 57	16, 34, 57, 87	0
1	C	451/454 (99%)	-0.25	8 (1%) 69 61	17, 29, 50, 75	0
1	D	452/454 (99%)	-0.30	4 (0%) 84 80	16, 29, 50, 75	0
2	G	10/18 (55%)	1.71	3 (30%) 1 0	53, 56, 106, 127	0
All	All	1819/1834 (99%)	-0.25	24 (1%) 77 72	12, 28, 52, 127	0

The worst 5 of 24 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	G	753	G	6.3
1	B	360	THR	5.4
1	C	49	ASN	4.1
1	C	50	LYS	4.0
1	D	363	ASN	3.2

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. 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	RSCC	RSR	LLDF	B-factors(Å ²)	Q<0.9
4	SAH	B	502	26/26	0.85	0.24	0.35	58,65,76,78	0
4	SAH	D	502	26/26	0.93	0.19	0.32	38,46,73,83	0
4	SAH	C	502	26/26	0.92	0.19	0.23	28,36,56,62	0
4	SAH	A	502	26/26	0.96	0.14	-0.66	22,25,34,38	0
3	ZN	C	501	1/1	0.99	0.08	-2.41	43,43,43,43	0
3	ZN	D	501	1/1	0.96	0.06	-2.64	42,42,42,42	0
3	ZN	A	501	1/1	0.98	0.10	-4.74	33,33,33,33	0
3	ZN	B	501	1/1	0.98	0.07	-	45,45,45,45	0

6.5 Other polymers

There are no such residues in this entry.