Full wwPDB NMR Structure Validation Report (i)

Feb 15, 2022 – 08:49 AM EST

PDB ID	:	1LDZ
Title	:	SOLUTION STRUCTURE OF THE LEAD-DEPENDENT RIBOZYME, NMR, 25 STRUCTURES
Authors	:	Hoogstraten, C.G.; Legault, P.; Pardi, A.
Deposited on	:	1998-08-18

This is a Full wwPDB NMR 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/NMRValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The following versions of software and data (see references (i)) were used in the production of this report:

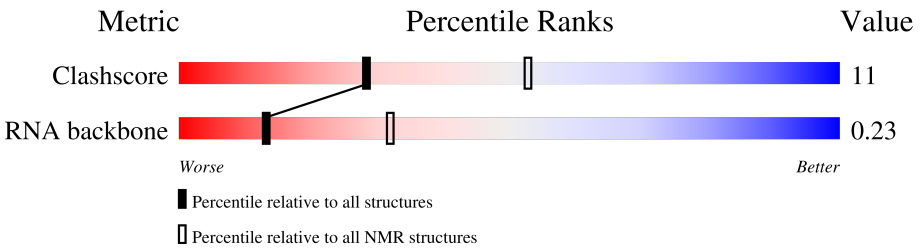
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	2.26
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.26

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
SOLUTION NMR

The overall completeness of chemical shifts assignment was not calculated.

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)	NMR archive (#Entries)
Clashscore	158937	12864
RNA backbone	4643	676

The table below summarises the geometric issues observed across the polymeric chains and their fit to the experimental data. The red, orange, yellow and green segments indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria. A cyan segment indicates the fraction of residues that are not part of the well-defined cores, and 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%

Mol	Chain	Length	Quality of chain
1	A	30	23% 27% 40% 10%

2 Ensemble composition and analysis (i)

This entry contains 25 models. This entry does not contain polypeptide chains, therefore identification of well-defined residues and clustering analysis are not possible. All residues are included in the validation scores.

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 977 atoms, of which 330 are hydrogens and 0 are deuteriums.

- Molecule 1 is a RNA chain called LEAD-DEPENDENT RIBOZYME.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	P	
1	A	30	977	289	330	125	204	29	0

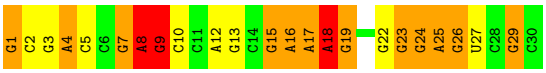
4 Residue-property plots (i)

4.1 Average score per residue in the NMR ensemble

These plots are provided for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic is the same as shown in the summary in section 1 of this report. The second graphic shows the sequence where residues are colour-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. Stretches of 2 or more consecutive residues without any outliers are shown as green connectors. Residues which are classified as ill-defined in the NMR ensemble, are shown in cyan with an underline colour-coded according to the previous scheme. Residues which were present in the experimental sample, but not modelled in the final structure are shown in grey.

• Molecule 1: LEAD-DEPENDENT RIBOZYME

Chain A: 23% 27% 40% 10%



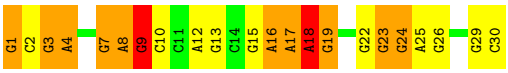
4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

4.2.1 Score per residue for model 1

• Molecule 1: LEAD-DEPENDENT RIBOZYME

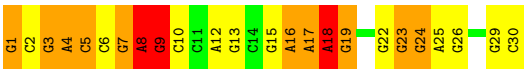
Chain A: 27% 33% 33% 7%



4.2.2 Score per residue for model 2

• Molecule 1: LEAD-DEPENDENT RIBOZYME

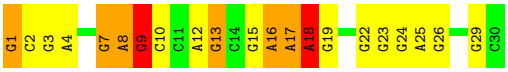
Chain A: 20% 37% 33% 10%



4.2.3 Score per residue for model 3

- Molecule 1: LEAD-DEPENDENT RIBOZYME

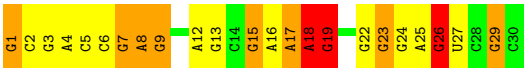
Chain A: 30% 43% 20% 7%



4.2.4 Score per residue for model 4

- Molecule 1: LEAD-DEPENDENT RIBOZYME

Chain A: 23% 40% 27% 10%



4.2.5 Score per residue for model 5

- Molecule 1: LEAD-DEPENDENT RIBOZYME

Chain A: 23% 33% 33% 10%

4.2.6 Score per residue for model 6

- Molecule 1: LEAD-DEPENDENT RIBOZYME

Chain A: 27% 30% 30% 13%

4.2.7 Score per residue for model 7

- Molecule 1: LEAD-DEPENDENT RIBOZYME

Chain A: 17% 40% 27% 17%

4.2.8 Score per residue for model 8

- Molecule 1: LEAD-DEPENDENT RIBOZYME

Chain A: 23% 27% 30% 20%

4.2.9 Score per residue for model 9

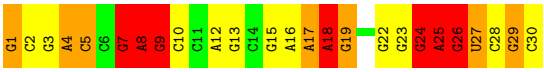
- Molecule 1: LEAD-DEPENDENT RIBOZYME

Chain A: 23% 43% 17% 17%

4.2.10 Score per residue for model 10

- Molecule 1: LEAD-DEPENDENT RIBOZYME

Chain A: 17% 37% 23% 23%



4.2.11 Score per residue for model 11

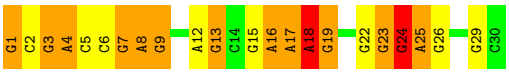
- Molecule 1: LEAD-DEPENDENT RIBOZYME

Chain A: 17% 40% 30% 13%

4.2.12 Score per residue for model 12

- Molecule 1: LEAD-DEPENDENT RIBOZYME

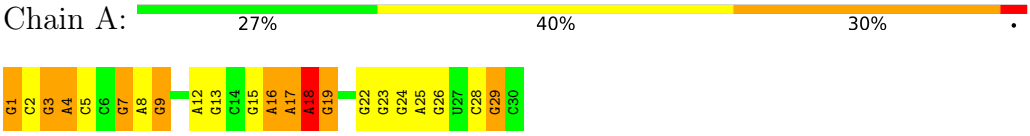
Chain A: 27% 27% 40% 7%



4.2.13 Score per residue for model 13

- Molecule 1: LEAD-DEPENDENT RIBOZYME

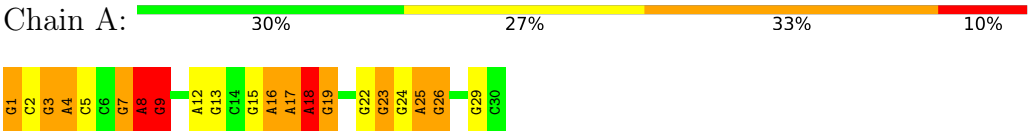
Chain A:



4.2.14 Score per residue for model 14

- Molecule 1: LEAD-DEPENDENT RIBOZYME

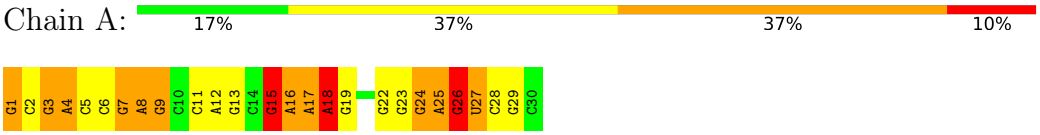
Chain A:



4.2.15 Score per residue for model 15

- Molecule 1: LEAD-DEPENDENT RIBOZYME

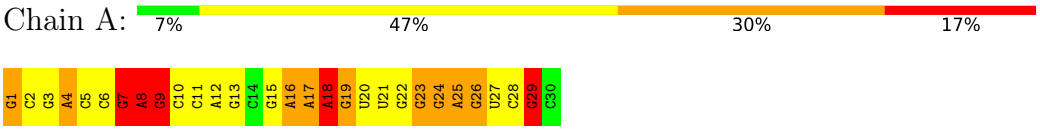
Chain A:



4.2.16 Score per residue for model 16

- Molecule 1: LEAD-DEPENDENT RIBOZYME

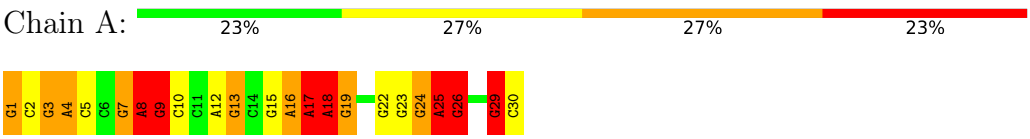
Chain A:



4.2.17 Score per residue for model 17

- Molecule 1: LEAD-DEPENDENT RIBOZYME

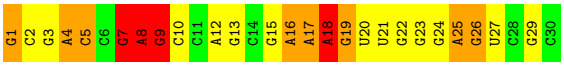
Chain A:



4.2.18 Score per residue for model 18

- Molecule 1: LEAD-DEPENDENT RIBOZYME

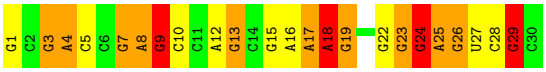
Chain A: 17% 43% 27% 13%



4.2.19 Score per residue for model 19

- Molecule 1: LEAD-DEPENDENT RIBOZYME

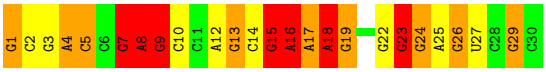
Chain A: 23% 30% 33% 13%



4.2.20 Score per residue for model 20

- Molecule 1: LEAD-DEPENDENT RIBOZYME

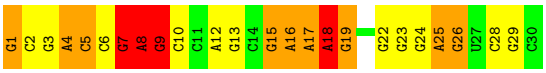
Chain A: 20% 27% 30% 23%



4.2.21 Score per residue for model 21

- Molecule 1: LEAD-DEPENDENT RIBOZYME

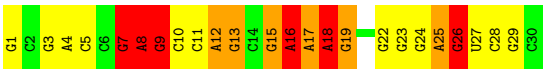
Chain A: 20% 37% 30% 13%



4.2.22 Score per residue for model 22

- Molecule 1: LEAD-DEPENDENT RIBOZYME

Chain A: 20% 40% 20% 20%



4.2.23 Score per residue for model 23

- Molecule 1: LEAD-DEPENDENT RIBOZYME

Chain A: 23% 37% 23% 17%

4.2.24 Score per residue for model 24

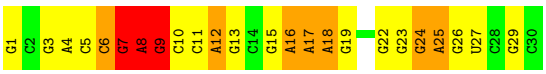
- Molecule 1: LEAD-DEPENDENT RIBOZYME

Chain A: 20% 30% 30% 20%

4.2.25 Score per residue for model 25

- Molecule 1: LEAD-DEPENDENT RIBOZYME

Chain A: 20% 47% 23% 10%



5 Refinement protocol and experimental data overview (i)

The models were refined using the following method: *SIMULATED ANNEALING FROM RANDOM TORSION ANGLES.*

Of the 25 calculated structures, 25 were deposited, based on the following criterion: *NO NOE VIOLATIONS GREATER THAN 0.3 A, NO DIHEDRAL VIOLATIONS GREATER THAN 3 DEGREES, GOOD STEREOCHEMICAL QUALITY, TOTAL ENERGY LESS THAN -120 KCAL/MOL, NOE PSEUDOENERGY LESS THAN 4 KCAL/ MOL.*

The following table shows the software used for structure solution, optimisation and refinement.

Software name	Classification	Version
X-PLOR	refinement	3.1
X-PLOR	structure solution	3.1

No chemical shift data was provided.

6 Model quality (i)

6.1 Standard geometry (i)

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 (average) 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	1.11±0.00	0±0/725 (0.0± 0.0%)	2.03±0.01	47±2/1131 (4.1± 0.1%)
All	All	1.11	0/18125 (0.0%)	2.03	1170/28275 (4.1%)

There are no bond-length outliers.

All unique angle outliers are listed below. They are sorted according to the Z-score of the worst occurrence in the ensemble.

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})	Models	
								Worst	Total
1	A	7	G	N7-C8-N9	9.50	117.85	113.10	17	25
1	A	9	G	N7-C8-N9	9.43	117.82	113.10	15	25
1	A	15	G	N7-C8-N9	9.39	117.80	113.10	4	25
1	A	24	G	N7-C8-N9	9.36	117.78	113.10	4	25
1	A	3	G	N7-C8-N9	9.30	117.75	113.10	19	25
1	A	22	G	N7-C8-N9	9.30	117.75	113.10	17	25
1	A	13	G	N7-C8-N9	9.29	117.75	113.10	16	25
1	A	19	G	N7-C8-N9	9.26	117.73	113.10	21	25
1	A	26	G	N7-C8-N9	9.26	117.73	113.10	2	25
1	A	23	G	N7-C8-N9	9.19	117.69	113.10	13	25
1	A	29	G	N7-C8-N9	9.18	117.69	113.10	12	25
1	A	1	G	N7-C8-N9	9.17	117.68	113.10	21	25
1	A	25	A	N7-C8-N9	7.98	117.79	113.80	6	25
1	A	16	A	N7-C8-N9	7.69	117.65	113.80	4	25
1	A	8	A	N7-C8-N9	7.66	117.63	113.80	13	25
1	A	17	A	N7-C8-N9	7.64	117.62	113.80	20	25
1	A	4	A	N7-C8-N9	7.63	117.62	113.80	14	25
1	A	18	A	N7-C8-N9	7.62	117.61	113.80	4	25
1	A	12	A	N7-C8-N9	7.57	117.59	113.80	17	25
1	A	7	G	C8-N9-C4	-7.30	103.48	106.40	16	25
1	A	26	G	C8-N9-C4	-7.18	103.53	106.40	11	25
1	A	24	G	C8-N9-C4	-7.16	103.54	106.40	19	25
1	A	9	G	C8-N9-C4	-7.15	103.54	106.40	15	25
1	A	13	G	C8-N9-C4	-7.03	103.59	106.40	16	25

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)	Models	
								Worst	Total
1	A	15	G	C8-N9-C4	-7.00	103.60	106.40	4	25
1	A	3	G	C8-N9-C4	-6.99	103.61	106.40	10	25
1	A	23	G	C8-N9-C4	-6.95	103.62	106.40	19	25
1	A	22	G	C8-N9-C4	-6.92	103.63	106.40	24	25
1	A	19	G	C8-N9-C4	-6.91	103.64	106.40	23	25
1	A	1	G	C8-N9-C4	-6.83	103.67	106.40	11	25
1	A	29	G	C8-N9-C4	-6.83	103.67	106.40	11	25
1	A	25	A	N1-C2-N3	-6.39	126.11	129.30	25	25
1	A	17	A	C8-N9-C4	-5.92	103.43	105.80	20	25
1	A	16	A	C8-N9-C4	-5.92	103.43	105.80	14	25
1	A	8	A	C8-N9-C4	-5.81	103.48	105.80	3	25
1	A	18	A	C8-N9-C4	-5.80	103.48	105.80	14	25
1	A	12	A	C8-N9-C4	-5.75	103.50	105.80	11	25
1	A	4	A	C8-N9-C4	-5.69	103.52	105.80	7	25
1	A	25	A	C8-N9-C4	-5.69	103.52	105.80	21	25
1	A	26	G	C5-N7-C8	-5.32	101.64	104.30	24	23
1	A	29	G	C5-N7-C8	-5.28	101.66	104.30	9	19
1	A	3	G	C5-N7-C8	-5.28	101.66	104.30	2	19
1	A	1	G	C5-N7-C8	-5.25	101.67	104.30	2	19
1	A	22	G	C5-N7-C8	-5.24	101.68	104.30	8	23
1	A	23	G	C5-N7-C8	-5.20	101.70	104.30	20	20
1	A	19	G	C5-N7-C8	-5.19	101.70	104.30	21	14
1	A	7	G	C5-N7-C8	-5.18	101.71	104.30	9	8
1	A	15	G	C5-N7-C8	-5.15	101.72	104.30	11	11
1	A	13	G	C5-N7-C8	-5.14	101.73	104.30	24	17
1	A	24	G	C5-N7-C8	-5.13	101.74	104.30	15	11
1	A	9	G	C5-N7-C8	-5.09	101.75	104.30	2	11

There are no chirality outliers.

There are no planarity outliers.

6.2 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 each 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 averaged over the ensemble.

Mol	Chain	Non-H	H(model)	H(added)	Clashes
1	A	647	330	329	10±2

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Mol	Chain	Non-H	H(model)	H(added)	Clashes
All	All	16175	8250	8225	257

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 11.

All unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:7:G:N3	1:A:7:G:H2'	0.74	1.98	2	17
1:A:28:C:H2'	1:A:29:G:O4'	0.68	1.89	19	2
1:A:17:A:H2'	1:A:18:A:O4'	0.67	1.89	15	14
1:A:9:G:H4'	1:A:10:C:O4'	0.64	1.92	20	19
1:A:15:G:H2'	1:A:17:A:OP2	0.63	1.92	20	3
1:A:24:G:H2'	1:A:24:G:N3	0.63	2.07	19	7
1:A:29:G:H2'	1:A:30:C:O4'	0.62	1.94	5	3
1:A:16:A:O2'	1:A:17:A:H5'	0.61	1.96	8	7
1:A:18:A:H2'	1:A:19:G:O4'	0.61	1.95	20	8
1:A:7:G:H5"	1:A:9:G:O6	0.60	1.97	22	1
1:A:7:G:H3'	1:A:9:G:N7	0.59	2.12	9	1
1:A:8:A:H2'	1:A:9:G:O4'	0.58	1.99	18	4
1:A:7:G:H1'	1:A:8:A:N7	0.58	2.13	14	2
1:A:7:G:N3	1:A:7:G:C2'	0.57	2.67	25	9
1:A:15:G:H1'	1:A:17:A:N7	0.56	2.15	21	3
1:A:7:G:H1'	1:A:8:A:OP1	0.56	1.99	21	6
1:A:24:G:N3	1:A:24:G:C2'	0.55	2.70	19	3
1:A:4:A:H2'	1:A:5:C:O4'	0.54	2.02	10	14
1:A:16:A:C6	1:A:17:A:C2	0.54	2.96	20	9
1:A:1:G:O2'	1:A:2:C:H5'	0.53	2.03	14	18
1:A:17:A:H2'	1:A:18:A:C1'	0.53	2.33	19	20
1:A:7:G:H4'	1:A:8:A:OP2	0.53	2.04	22	5
1:A:24:G:O2'	1:A:25:A:H8	0.52	1.87	6	1
1:A:24:G:O2'	1:A:25:A:C8	0.51	2.63	6	2
1:A:3:G:O2'	1:A:4:A:H5'	0.50	2.07	17	2
1:A:7:G:O6	1:A:25:A:H2'	0.48	2.08	25	1
1:A:23:G:O2'	1:A:24:G:H5'	0.48	2.08	1	3
1:A:26:G:C6	1:A:27:U:C4	0.48	3.02	9	6
1:A:8:A:H8	1:A:8:A:O5'	0.47	1.91	20	2
1:A:9:G:N3	1:A:9:G:C2'	0.47	2.77	17	1
1:A:17:A:C6	1:A:18:A:N1	0.47	2.83	19	10
1:A:5:C:H2'	1:A:6:C:O4'	0.47	2.10	4	2
1:A:7:G:O2'	1:A:8:A:H5'	0.47	2.10	25	1
1:A:18:A:C8	1:A:19:G:C8	0.46	3.03	7	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:8:A:C2	1:A:10:C:C2	0.46	3.03	11	4
1:A:5:C:N4	1:A:6:C:C4	0.45	2.84	25	1
1:A:7:G:O2'	1:A:9:G:C5	0.45	2.68	14	1
1:A:17:A:C6	1:A:18:A:C6	0.45	3.05	16	8
1:A:8:A:C6	1:A:24:G:C2	0.44	3.05	7	1
1:A:2:C:O2'	1:A:3:G:H5'	0.44	2.12	14	1
1:A:16:A:H2'	1:A:17:A:O4'	0.44	2.12	18	1
1:A:22:G:O2'	1:A:23:G:H5'	0.44	2.12	24	1
1:A:25:A:N3	1:A:25:A:H2'	0.44	2.28	6	1
1:A:25:A:C2	1:A:26:G:C4	0.43	3.06	17	2
1:A:12:A:C6	1:A:13:G:N7	0.43	2.87	22	1
1:A:28:C:N3	1:A:29:G:C5	0.42	2.87	16	1
1:A:14:C:C4	1:A:15:G:N7	0.42	2.87	9	3
1:A:6:C:C4	1:A:7:G:N7	0.42	2.87	15	1
1:A:13:G:C6	1:A:14:C:C4	0.42	3.08	24	2
1:A:17:A:C2	1:A:18:A:C2	0.42	3.07	16	3
1:A:17:A:O5'	1:A:17:A:H8	0.42	1.98	20	1
1:A:3:G:C6	1:A:4:A:C6	0.42	3.08	15	1
1:A:7:G:C6	1:A:25:A:N3	0.41	2.88	25	1
1:A:5:C:C4	1:A:6:C:C4	0.41	3.09	25	3
1:A:26:G:OP2	1:A:26:G:H8	0.41	1.98	17	1
1:A:7:G:C4'	1:A:8:A:OP2	0.41	2.68	22	3
1:A:8:A:O5'	1:A:8:A:H8	0.41	1.98	10	1
1:A:28:C:O2'	1:A:29:G:H5'	0.41	2.16	10	1
1:A:19:G:H2'	1:A:20:U:O4'	0.41	2.15	16	1
1:A:23:G:C2	1:A:24:G:C8	0.41	3.09	20	1
1:A:20:U:H2'	1:A:21:U:C6	0.40	2.50	16	2
1:A:27:U:C4	1:A:28:C:N4	0.40	2.90	9	1
1:A:11:C:C2	1:A:23:G:C2	0.40	3.09	16	1

6.3 Torsion angles (i)

6.3.1 Protein backbone (i)

There are no protein molecules in this entry.

6.3.2 Protein sidechains (i)

There are no protein molecules in this entry.

6.3.3 RNA (i)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers	Suiteness
1	A	29/30 (97%)	9±2 (31±8%)	1±1 (2±2%)	0.23±0.03
All	All	725/750 (97%)	227 (31%)	15 (2%)	0.23

The overall RNA backbone suiteness is 0.23.

All unique RNA backbone outliers are listed below:

Mol	Chain	Res	Type	Models (Total)
1	A	9	G	25
1	A	18	A	25
1	A	8	A	24
1	A	19	G	15
1	A	26	G	15
1	A	25	A	14
1	A	16	A	11
1	A	23	G	10
1	A	29	G	10
1	A	5	C	9
1	A	27	U	8
1	A	24	G	8
1	A	30	C	7
1	A	13	G	7
1	A	28	C	7
1	A	3	G	6
1	A	7	G	6
1	A	17	A	5
1	A	15	G	4
1	A	11	C	4
1	A	6	C	4
1	A	14	C	2
1	A	12	A	1

All unique RNA pucker outliers are listed below:

Mol	Chain	Res	Type	Models (Total)
1	A	7	G	8
1	A	24	G	5
1	A	17	A	1
1	A	16	A	1

6.4 Non-standard residues in protein, DNA, RNA chains (i)

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

6.5 Carbohydrates (i)

There are no monosaccharides in this entry.

6.6 Ligand geometry (i)

There are no ligands in this entry.

6.7 Other polymers (i)

There are no such molecules in this entry.

6.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

7 Chemical shift validation (i)

No chemical shift data were provided