



Full wwPDB NMR Structure Validation Report ⓘ

Feb 12, 2017 – 08:51 pm GMT

PDB ID : 1Z2J
Title : Solution structure of the HIV-1 frameshift inducing element
Authors : Staple, D.W.; Butcher, S.E.
Deposited on : 2005-03-08

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

Cyrange : Kirchner and Güntert (2011)
NmrClust : Kelley et al. (1996)
MolProbity : 4.02b-467
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)
RCI : v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV : Wang et al. (2010)
ShiftChecker : trunk28760
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : recalc28949

2 Ensemble composition and analysis ⓘ

This entry contains 20 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 1451 atoms, of which 490 are hydrogens and 0 are deuteriums.

- Molecule 1 is a RNA chain called HIV-1 frameshift site RNA.

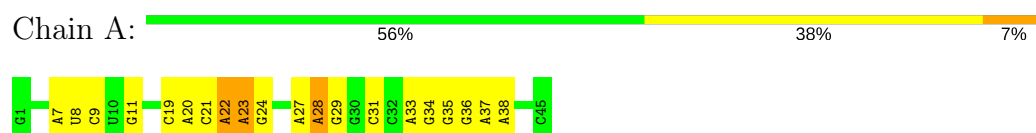
Mol	Chain	Residues	Atoms						Trace
1	A	45	Total	C	H	N	O	P	0
			1451	430	490	178	309	44	

4 Residue-property plots [i](#)

4.1 Average score per residue in the NMR ensemble

These plots are provided for all protein, RNA and DNA 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: HIV-1 frameshift site RNA

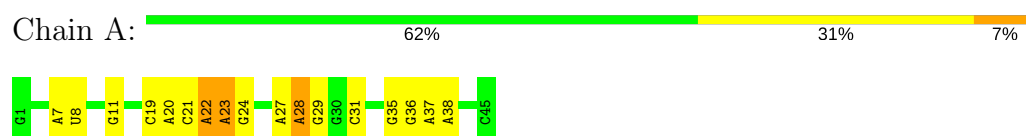


4.2 Scores per residue for each member of the ensemble

Colouring as in section [4.1](#) above.

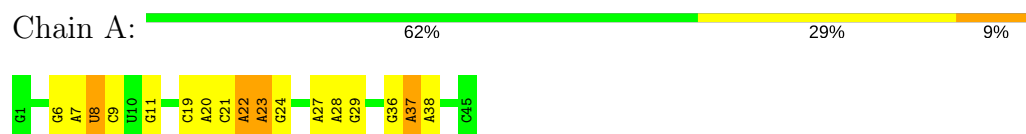
4.2.1 Score per residue for model 1

- Molecule 1: HIV-1 frameshift site RNA



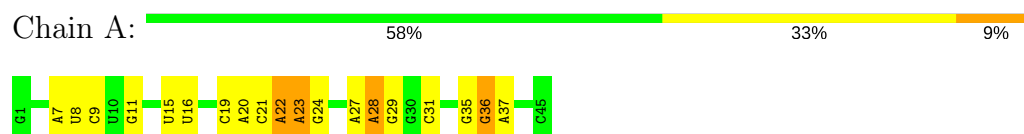
4.2.2 Score per residue for model 2

- Molecule 1: HIV-1 frameshift site RNA



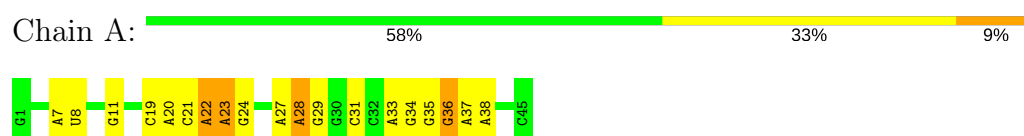
4.2.3 Score per residue for model 3

- Molecule 1: HIV-1 frameshift site RNA



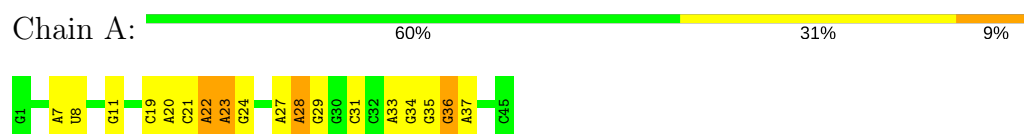
4.2.4 Score per residue for model 4

- Molecule 1: HIV-1 frameshift site RNA



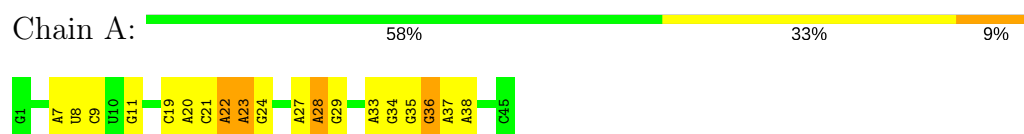
4.2.5 Score per residue for model 5

- Molecule 1: HIV-1 frameshift site RNA



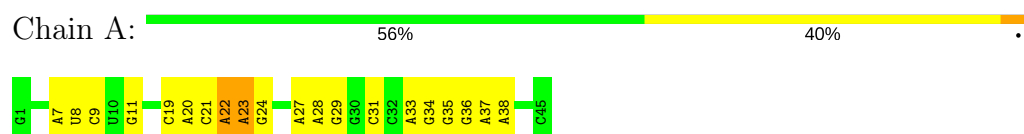
4.2.6 Score per residue for model 6

- Molecule 1: HIV-1 frameshift site RNA



4.2.7 Score per residue for model 7

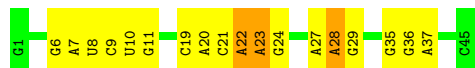
- Molecule 1: HIV-1 frameshift site RNA



4.2.8 Score per residue for model 8

- Molecule 1: HIV-1 frameshift site RNA

Chain A:  60% 33% 7%



4.2.9 Score per residue for model 9

- Molecule 1: HIV-1 frameshift site RNA

Chain A:  60% 33% 7%



4.2.10 Score per residue for model 10

- Molecule 1: HIV-1 frameshift site RNA

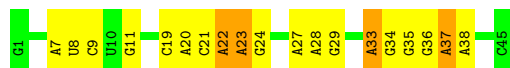
Chain A:  58% 33% 9%



4.2.11 Score per residue for model 11

- Molecule 1: HIV-1 frameshift site RNA

Chain A:  58% 33% 9%



4.2.12 Score per residue for model 12

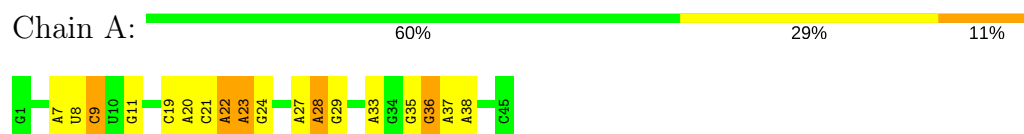
- Molecule 1: HIV-1 frameshift site RNA

Chain A:  56% 36% 9%



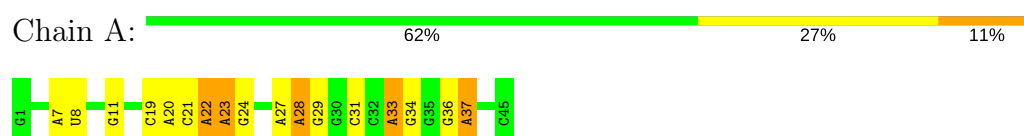
4.2.13 Score per residue for model 13

- Molecule 1: HIV-1 frameshift site RNA



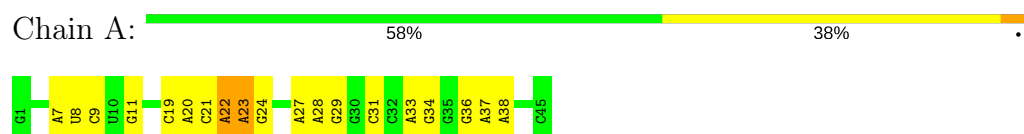
4.2.14 Score per residue for model 14

- Molecule 1: HIV-1 frameshift site RNA



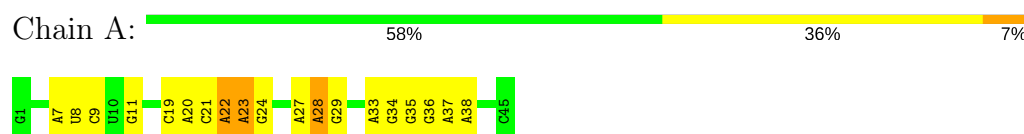
4.2.15 Score per residue for model 15

- Molecule 1: HIV-1 frameshift site RNA



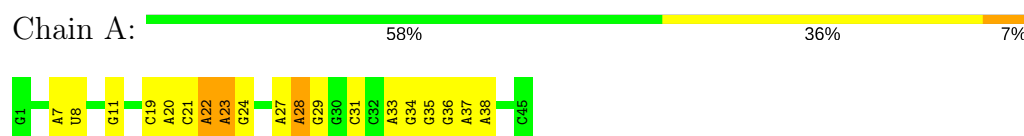
4.2.16 Score per residue for model 16

- Molecule 1: HIV-1 frameshift site RNA



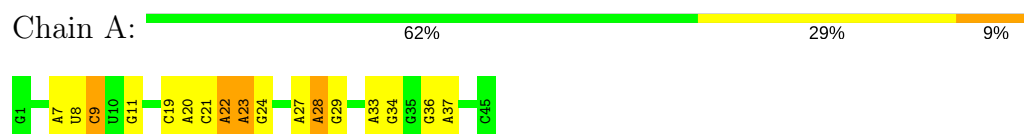
4.2.17 Score per residue for model 17

- Molecule 1: HIV-1 frameshift site RNA



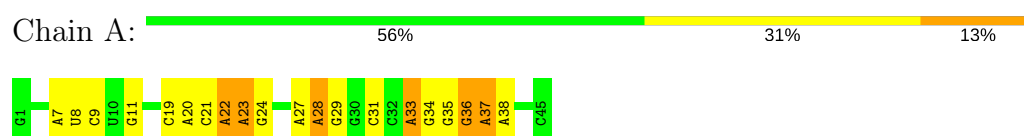
4.2.18 Score per residue for model 18

- Molecule 1: HIV-1 frameshift site RNA



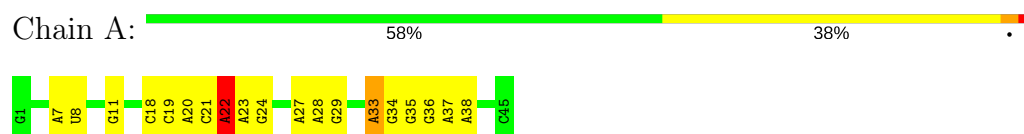
4.2.19 Score per residue for model 19

- Molecule 1: HIV-1 frameshift site RNA



4.2.20 Score per residue for model 20

- Molecule 1: HIV-1 frameshift site RNA



5 Refinement protocol and experimental data overview

Of the 100 calculated structures, 20 were deposited, based on the following criterion: *structures with the least restraint violations, structures with the lowest energy.*

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

Software name	Classification	Version
CNS	structure solution	
XPLOR-NIH	refinement	

The following table shows chemical shift validation statistics as aggregates over all chemical shift files. Detailed validation can be found in section 7 of this report.

Chemical shift file(s)	BMRB entry 6543
Number of chemical shift lists	1
Total number of shifts	423
Number of shifts mapped to atoms	423
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	47%

No validations of the models with respect to experimental NMR restraints is performed at this time.

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	0.97±0.01	0±1/1075 (0.0±0.1%)	1.40±0.01	3±1/1675 (0.2±0.0%)
All	All	0.97	8/21500 (0.0%)	1.40	69/33500 (0.2%)

All unique bond 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(Å)	Ideal(Å)	Models	
								Worst	Total
1	A	33	A	C4'-C3'	-6.99	1.45	1.53	20	7
1	A	22	A	C4'-O4'	-5.80	1.38	1.45	20	1

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(°)	Ideal(°)	Models	
								Worst	Total
1	A	22	A	C1'-O4'-C4'	-6.48	104.72	109.90	20	1
1	A	11	G	C1'-O4'-C4'	-6.41	104.78	109.90	4	20
1	A	11	G	C4'-C3'-C2'	-5.98	96.62	102.60	4	20
1	A	28	A	C1'-O4'-C4'	-5.88	105.20	109.90	18	15
1	A	31	C	C1'-O4'-C4'	-5.69	105.34	109.90	9	12
1	A	8	U	C1'-O4'-C4'	-5.27	105.69	109.90	2	1

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	961	490	490	36±4
All	All	19220	9800	9800	729

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 25.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:8:U:O2'	1:A:9:C:H5'	1.01	1.56	12	8
1:A:21:C:H1'	1:A:22:A:OP2	0.95	1.61	20	1
1:A:36:G:HO2'	1:A:37:A:H8	0.86	0.94	19	5
1:A:7:A:O2'	1:A:8:U:H5'	0.84	1.72	9	20
1:A:36:G:O2'	1:A:37:A:H8	0.83	1.55	2	10
1:A:22:A:O2'	1:A:23:A:O5'	0.80	1.99	12	19
1:A:22:A:O2'	1:A:23:A:C8	0.78	2.37	5	18
1:A:36:G:N3	1:A:36:G:H2'	0.78	1.92	11	10
1:A:19:C:N4	1:A:20:A:N6	0.77	2.32	20	17
1:A:33:A:O2'	1:A:34:G:H5'	0.75	1.80	18	15
1:A:36:G:H2'	1:A:36:G:N3	0.75	1.97	2	10
1:A:20:A:O2'	1:A:21:C:H5'	0.73	1.83	7	20
1:A:36:G:O2'	1:A:37:A:OP2	0.72	2.07	14	2
1:A:21:C:C1'	1:A:22:A:OP2	0.72	2.37	20	1
1:A:22:A:N6	1:A:23:A:N1	0.71	2.38	20	1
1:A:35:G:C2	1:A:36:G:N7	0.70	2.59	1	3
1:A:21:C:O2'	1:A:22:A:P	0.69	2.51	14	18
1:A:22:A:O2'	1:A:23:A:P	0.69	2.51	18	18
1:A:20:A:C6	1:A:21:C:N3	0.68	2.62	7	20
1:A:36:G:O2'	1:A:37:A:C8	0.68	2.46	11	8
1:A:20:A:C5	1:A:21:C:C4	0.68	2.82	9	20
1:A:19:C:N4	1:A:20:A:C6	0.67	2.63	17	20
1:A:21:C:O2'	1:A:22:A:OP2	0.66	2.11	5	19
1:A:22:A:O2'	1:A:23:A:H8	0.66	1.73	12	15
1:A:36:G:O2'	1:A:37:A:P	0.65	2.54	19	2
1:A:20:A:C6	1:A:21:C:C4	0.65	2.85	17	17
1:A:36:G:N2	1:A:37:A:C5	0.65	2.65	17	5
1:A:37:A:C6	1:A:38:A:C6	0.64	2.85	20	10
1:A:22:A:O2'	1:A:23:A:O4'	0.64	2.14	5	15
1:A:36:G:O2'	1:A:37:A:O5'	0.64	2.16	2	3
1:A:36:G:N2	1:A:37:A:N7	0.64	2.46	8	4
1:A:19:C:C5	1:A:20:A:N7	0.64	2.66	20	4
1:A:37:A:C2	1:A:38:A:C4	0.63	2.86	13	9
1:A:20:A:N7	1:A:21:C:C4	0.63	2.66	20	2

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:27:A:C2	1:A:28:A:C5	0.63	2.86	9	20
1:A:22:A:C6	1:A:23:A:N1	0.63	2.66	20	1
1:A:37:A:N1	1:A:38:A:C6	0.63	2.66	7	4
1:A:36:G:H1'	1:A:37:A:OP2	0.62	1.94	14	1
1:A:37:A:N6	1:A:38:A:C6	0.62	2.67	12	5
1:A:35:G:O2'	1:A:36:G:C2	0.62	2.52	11	7
1:A:35:G:O2'	1:A:36:G:C4	0.61	2.52	19	3
1:A:20:A:C2	1:A:24:G:O6	0.61	2.54	3	19
1:A:21:C:O2'	1:A:22:A:H5''	0.61	1.95	17	2
1:A:37:A:N6	1:A:38:A:N1	0.60	2.48	1	2
1:A:19:C:C4	1:A:20:A:C5	0.60	2.90	12	20
1:A:36:G:N3	1:A:36:G:C2'	0.59	2.64	11	11
1:A:37:A:N1	1:A:38:A:C2	0.59	2.70	16	4
1:A:35:G:O2'	1:A:36:G:C6	0.59	2.55	11	2
1:A:21:C:O2'	1:A:22:A:C5'	0.58	2.50	5	2
1:A:35:G:O2'	1:A:36:G:C5	0.58	2.57	11	2
1:A:34:G:C6	1:A:35:G:C6	0.58	2.91	19	1
1:A:28:A:O2'	1:A:29:G:H5'	0.57	1.99	13	20
1:A:8:U:O2'	1:A:9:C:C5'	0.57	2.53	6	5
1:A:20:A:O2'	1:A:22:A:N7	0.57	2.34	20	1
1:A:37:A:C6	1:A:38:A:C2	0.57	2.93	1	1
1:A:21:C:O3'	1:A:22:A:H8	0.56	1.83	7	13
1:A:35:G:H2'	1:A:36:G:OP2	0.56	2.01	13	1
1:A:8:U:HO2'	1:A:9:C:H5'	0.56	1.56	12	1
1:A:35:G:C2	1:A:36:G:O6	0.56	2.59	10	4
1:A:36:G:C2'	1:A:36:G:N3	0.56	2.69	18	8
1:A:23:A:H2'	1:A:24:G:O4'	0.56	2.01	20	2
1:A:21:C:O3'	1:A:22:A:C8	0.55	2.59	14	16
1:A:21:C:C2'	1:A:22:A:OP2	0.55	2.54	20	1
1:A:35:G:C2'	1:A:36:G:OP2	0.55	2.54	13	1
1:A:36:G:O4'	1:A:37:A:C8	0.55	2.59	14	3
1:A:37:A:N6	1:A:38:A:N6	0.55	2.54	19	4
1:A:9:C:H6	1:A:9:C:O5'	0.55	1.84	8	2
1:A:19:C:H41	1:A:20:A:N6	0.55	1.98	20	2
1:A:8:U:O2'	1:A:9:C:O5'	0.55	2.25	13	3
1:A:37:A:H8	1:A:37:A:O5'	0.55	1.85	14	1
1:A:35:G:N1	1:A:36:G:O6	0.54	2.40	12	4
1:A:37:A:C2	1:A:38:A:C5	0.54	2.95	7	2
1:A:8:U:O2'	1:A:9:C:C6	0.54	2.61	11	2
1:A:19:C:C4	1:A:20:A:N7	0.54	2.75	20	1
1:A:20:A:N1	1:A:24:G:O6	0.53	2.41	5	11

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:34:G:O6	1:A:35:G:C6	0.53	2.62	19	1
1:A:22:A:O2'	1:A:23:A:C5'	0.53	2.56	18	5
1:A:35:G:N2	1:A:36:G:N7	0.53	2.57	12	1
1:A:37:A:C6	1:A:38:A:C5	0.53	2.97	19	7
1:A:19:C:H2'	1:A:20:A:O4'	0.52	2.03	12	3
1:A:36:G:H1'	1:A:37:A:N7	0.52	2.20	9	2
1:A:35:G:C2	1:A:36:G:C6	0.52	2.97	12	2
1:A:36:G:O2'	1:A:37:A:O4'	0.52	2.27	6	5
1:A:34:G:C8	1:A:35:G:N7	0.52	2.78	19	1
1:A:35:G:N2	1:A:36:G:O6	0.51	2.43	16	2
1:A:34:G:C5	1:A:35:G:C5	0.51	2.99	19	1
1:A:8:U:O2'	1:A:9:C:H6	0.51	1.88	11	3
1:A:22:A:C6	1:A:23:A:C2	0.51	2.99	20	1
1:A:23:A:O2'	1:A:24:G:H5'	0.50	2.07	3	4
1:A:33:A:O2'	1:A:34:G:C5'	0.50	2.57	18	2
1:A:9:C:O5'	1:A:9:C:H6	0.49	1.89	12	3
1:A:20:A:N6	1:A:21:C:N4	0.49	2.60	3	8
1:A:20:A:C2	1:A:24:G:C6	0.49	3.01	13	10
1:A:37:A:H2'	1:A:38:A:O4'	0.49	2.06	1	1
1:A:35:G:O2'	1:A:36:G:N3	0.49	2.45	6	2
1:A:36:G:H4'	1:A:37:A:O4'	0.48	2.07	15	1
1:A:21:C:O2'	1:A:22:A:O5'	0.48	2.31	10	6
1:A:27:A:N1	1:A:28:A:C6	0.48	2.82	11	15
1:A:27:A:N1	1:A:28:A:C5	0.48	2.81	11	13
1:A:36:G:C1'	1:A:37:A:OP2	0.48	2.62	14	1
1:A:35:G:C6	1:A:36:G:O6	0.48	2.67	7	1
1:A:36:G:C2'	1:A:37:A:OP2	0.48	2.61	14	1
1:A:9:C:C2	1:A:35:G:N2	0.47	2.83	3	1
1:A:34:G:N7	1:A:35:G:N7	0.47	2.63	19	1
1:A:20:A:C2	1:A:21:C:C2	0.47	3.03	17	1
1:A:20:A:C6	1:A:21:C:N4	0.47	2.83	17	2
1:A:18:C:N4	1:A:19:C:H41	0.46	2.08	20	1
1:A:35:G:C2	1:A:36:G:C8	0.46	3.03	9	1
1:A:20:A:N7	1:A:21:C:N4	0.46	2.63	20	1
1:A:22:A:O2'	1:A:23:A:OP2	0.46	2.33	18	1
1:A:35:G:O2'	1:A:36:G:N1	0.46	2.45	8	2
1:A:6:G:O2'	1:A:7:A:H5'	0.46	2.11	8	2
1:A:9:C:C6	1:A:9:C:O5'	0.45	2.69	8	1
1:A:19:C:C4	1:A:20:A:C6	0.45	3.05	9	3
1:A:36:G:O3'	1:A:37:A:H8	0.45	1.95	9	1
1:A:35:G:N1	1:A:36:G:N7	0.45	2.63	1	2

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:20:A:N6	1:A:21:C:H42	0.45	2.10	17	2
1:A:36:G:O3'	1:A:37:A:C8	0.44	2.70	9	1
1:A:22:A:HO2'	1:A:23:A:C1'	0.44	2.26	5	1
1:A:20:A:N1	1:A:21:C:N3	0.44	2.66	17	1
1:A:18:C:N4	1:A:19:C:N4	0.43	2.67	20	1
1:A:9:C:O5'	1:A:9:C:C6	0.43	2.72	12	1
1:A:36:G:H1'	1:A:37:A:C8	0.42	2.49	20	1
1:A:28:A:O2'	1:A:29:G:C5'	0.42	2.68	13	1
1:A:10:U:O5'	1:A:10:U:H6	0.42	1.98	8	1
1:A:37:A:C2	1:A:38:A:N3	0.42	2.88	10	2
1:A:20:A:O2'	1:A:23:A:N6	0.42	2.52	13	1
1:A:37:A:N6	1:A:38:A:C2	0.41	2.88	1	1
1:A:20:A:HO2'	1:A:21:C:H5'	0.41	1.74	18	1
1:A:37:A:N1	1:A:38:A:N3	0.41	2.67	1	1
1:A:8:U:HO2'	1:A:9:C:C5'	0.41	2.27	16	1
1:A:15:U:O2'	1:A:16:U:H5'	0.41	2.16	3	1
1:A:34:G:C5	1:A:35:G:C6	0.41	3.09	19	1
1:A:37:A:C6	1:A:38:A:N1	0.41	2.88	16	1
1:A:37:A:C6	1:A:38:A:C4	0.41	3.08	1	1
1:A:20:A:C5	1:A:21:C:N3	0.40	2.90	12	1
1:A:34:G:O2'	1:A:35:G:H5'	0.40	2.17	6	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	44/45 (98%)	3±1 (6±2%)	0±0 (0±0%)	0.86±0.01
All	All	880/900 (98%)	51 (6%)	0 (0%)	0.86

The overall RNA backbone suiteness is 0.86.

All unique RNA backbone outliers are listed below:

Mol	Chain	Res	Type	Models (Total)
1	A	22	A	20
1	A	23	A	19
1	A	36	G	6
1	A	37	A	4
1	A	9	C	2

There are no RNA pucker outliers to report.

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 carbohydrates 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

The completeness of assignment taking into account all chemical shift lists is 47% for the well-defined parts and 47% for the entire structure.

7.1 Chemical shift list 1

File name: BMRB entry 6543

Chemical shift list name: *assigned_chem_shift_list_1*

7.1.1 Bookkeeping

The following table shows the results of parsing the chemical shift list and reports the number of nuclei with statistically unusual chemical shifts.

Total number of shifts	423
Number of shifts mapped to atoms	423
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	0

7.1.2 Chemical shift referencing

No chemical shift referencing corrections were calculated (not enough data).

7.1.3 Completeness of resonance assignments

The following table shows the completeness of the chemical shift assignments for the well-defined regions of the structure. The overall completeness is 47%, i.e. 409 atoms were assigned a chemical shift out of a possible 867. 0 out of 0 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	¹ H	¹³ C	¹⁵ N
Backbone	0/0 (—%)	0/0 (—%)	0/0 (—%)	0/0 (—%)
Sidechain	0/0 (—%)	0/0 (—%)	0/0 (—%)	0/0 (—%)
Aromatic	0/0 (—%)	0/0 (—%)	0/0 (—%)	0/0 (—%)
Overall	409/867 (47%)	301/495 (61%)	84/301 (28%)	24/71 (34%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 47%, i.e. 409 atoms were assigned a chemical shift out of a possible 867. 0 out of 0 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	¹H	¹³C	¹⁵N
Backbone	0/0 (—%)	0/0 (—%)	0/0 (—%)	0/0 (—%)
Sidechain	0/0 (—%)	0/0 (—%)	0/0 (—%)	0/0 (—%)
Aromatic	0/0 (—%)	0/0 (—%)	0/0 (—%)	0/0 (—%)
Overall	409/867 (47%)	301/495 (61%)	84/301 (28%)	24/71 (34%)

7.1.4 Statistically unusual chemical shifts ⓘ

There are no statistically unusual chemical shifts.

7.1.5 Random Coil Index (RCI) plots ⓘ

No *random coil index* (RCI) plot could be generated from the current chemical shift list (assigned_chem_shift_list_1). RCI is only applicable to proteins.