



Full wwPDB NMR Structure Validation Report ⓘ

Dec 17, 2023 – 02:15 PM EST

PDB ID : 1NEM
Title : Saccharide-RNA recognition in the neomycin B / RNA aptamer complex
Authors : Jiang, L.; Majumdar, A.; Hu, W.; Jaishree, T.J.; Xu, W.; Patel, D.J.
Deposited on : 1999-03-15

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 ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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
Mogul : 1.8.5 (274361), CSD as541be (2020)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
wwPDB-RCI : v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV : Wang et al. (2010)
wwPDB-ShiftChecker : v1.2
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

2 Ensemble composition and analysis

This entry contains 9 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 are 4 unique types of molecules in this entry. The entry contains 837 atoms, of which 301 are hydrogens and 0 are deuteriums.

- Molecule 1 is a RNA chain called 5'-R(*GP*GP*AP*CP*UP*GP*GP*GP*CP*GP*AP*GP*AP*AP*GP*UP*UP*UP*AP*GP*UP*CP*C)-3'.

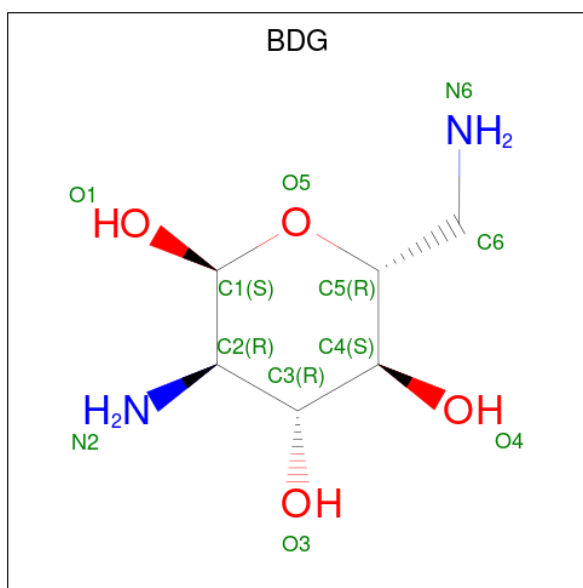
Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	P	
1	A	23	744	221	250	92	159	22	0

- Molecule 2 is an oligosaccharide called 2,6-diamino-2,6-dideoxy-beta-L-idopyranose-(1-3)-beta-D-ribofuranose.



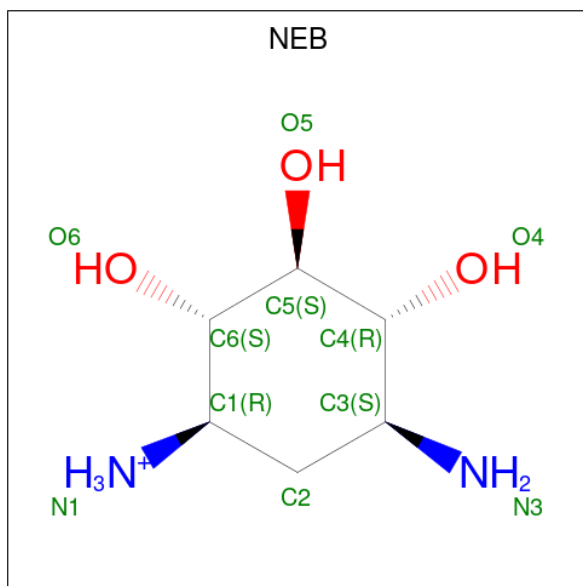
Mol	Chain	Residues	Atoms					Trace
			Total	C	H	N	O	
2	B	2	43	11	23	2	7	0

- Molecule 3 is 2,6-diamino-2,6-dideoxy-alpha-D-glucopyranose (three-letter code: BDG) (formula: C₆H₁₄N₂O₄).



Mol	Chain	Residues	Atoms				
			Total	C	H	N	O
3	A	1	26	6	15	2	3

- Molecule 4 is 2-DEOXY-D-STREPTAMINE (three-letter code: NEB) (formula: $C_6H_{15}N_2O_3$).




Mol	Chain	Residues	Atoms				
			Total	C	H	N	O
4	A	1	24	6	13	2	3

4 Residue-property plots

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: 5'-R(*GP*GP*AP*CP*UP*GP*GP*GP*CP*GP*AP*GP*AP*AP*GP*UP*UP*UP*AP*GP*UP*CP*C)-3'

Chain A:  83% 17%



- Molecule 2: 2,6-diamino-2,6-dideoxy-beta-L-idopyranose-(1-3)-beta-D-ribofuranose

Chain B:  50% 50%

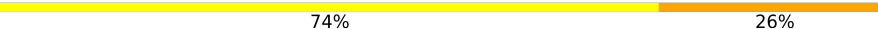


4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

4.2.1 Score per residue for model 1

- Molecule 1: 5'-R(*GP*GP*AP*CP*UP*GP*GP*GP*CP*GP*AP*GP*AP*AP*GP*UP*UP*UP*AP*GP*UP*CP*C)-3'

Chain A:  74% 26%



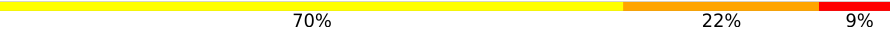
- Molecule 2: 2,6-diamino-2,6-dideoxy-beta-L-idopyranose-(1-3)-beta-D-ribofuranose

Chain B:  100%

BDR1
IDG2

4.2.2 Score per residue for model 2

- Molecule 1: 5'-R(*GP*GP*AP*CP*UP*GP*GP*GP*CP*GP*AP*GP*AP*AP*GP*UP*UP*UP*AP*GP*UP*CP*C)-3'

Chain A:  70% 22% 9%

G4	G5	A6	C7	U8	G9	G10	G11	C12	G13	A14	G15	A16	A17	G18	U19	U20	U21	A22	G23	U24	C25	C26
----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

- Molecule 2: 2,6-diamino-2,6-dideoxy-beta-L-idopyranose-(1-3)-beta-D-ribofuranose

Chain B:  50% 50%

BDR1
IDG2

4.2.3 Score per residue for model 3

- Molecule 1: 5'-R(*GP*GP*AP*CP*UP*GP*GP*GP*CP*GP*AP*GP*AP*AP*GP*UP*UP*UP*AP*GP*UP*CP*C)-3'

Chain A:  61% 30%

G4	G5	A6	C7	U8	G9	G10	G11	C12	G13	A14	G15	A16	A17	G18	U19	U20	U21	A22	G23	U24	C25	C26
----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

- Molecule 2: 2,6-diamino-2,6-dideoxy-beta-L-idopyranose-(1-3)-beta-D-ribofuranose

Chain B:  50% 50%

BDR1
IDG2

4.2.4 Score per residue for model 4

- Molecule 1: 5'-R(*GP*GP*AP*CP*UP*GP*GP*GP*CP*GP*AP*GP*AP*AP*GP*UP*UP*UP*AP*GP*UP*CP*C)-3'

Chain A:  61% 35%

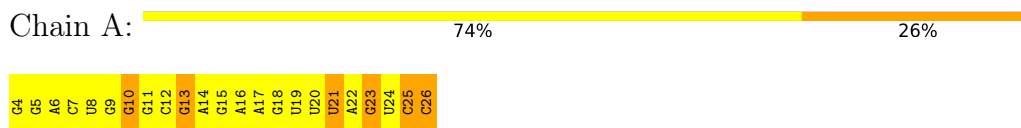
G4	G5	A6	C7	U8	G9	G10	G11	C12	G13	A14	G15	A16	A17	G18	U19	U20	U21	A22	G23	U24	C25	C26
----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

- Molecule 2: 2,6-diamino-2,6-dideoxy-beta-L-idopyranose-(1-3)-beta-D-ribofuranose



4.2.5 Score per residue for model 5

- Molecule 1: 5'-R(*GP*GP*AP*CP*UP*GP*GP*GP*CP*GP*AP*GP*AP*AP*GP*UP*UP*UP*AP*GP*UP*CP*C)-3'

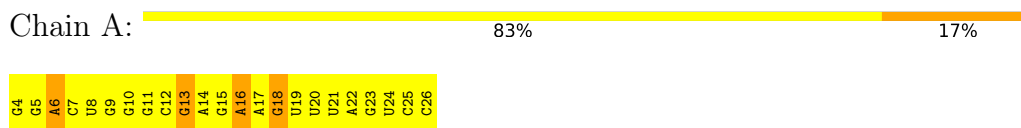


- Molecule 2: 2,6-diamino-2,6-dideoxy-beta-L-idopyranose-(1-3)-beta-D-ribofuranose



4.2.6 Score per residue for model 6

- Molecule 1: 5'-R(*GP*GP*AP*CP*UP*GP*GP*GP*CP*GP*AP*GP*AP*AP*GP*UP*UP*UP*AP*GP*UP*CP*C)-3'

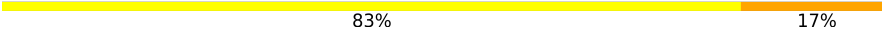


- Molecule 2: 2,6-diamino-2,6-dideoxy-beta-L-idopyranose-(1-3)-beta-D-ribofuranose



4.2.7 Score per residue for model 7

- Molecule 1: 5'-R(*GP*GP*AP*CP*UP*GP*GP*GP*CP*GP*AP*GP*AP*AP*GP*UP*UP*UP*AP*GP*UP*CP*C)-3'

Chain A:  83% 17%



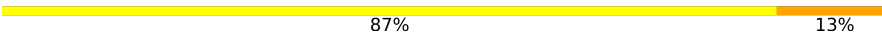
- Molecule 2: 2,6-diamino-2,6-dideoxy-beta-L-idopyranose-(1-3)-beta-D-ribofuranose

Chain B:  100%



4.2.8 Score per residue for model 8

- Molecule 1: 5'-R(*GP*GP*AP*CP*UP*GP*GP*GP*CP*GP*AP*GP*AP*AP*GP*UP*UP*UP*AP*GP*UP*CP*C)-3'

Chain A:  87% 13%



- Molecule 2: 2,6-diamino-2,6-dideoxy-beta-L-idopyranose-(1-3)-beta-D-ribofuranose

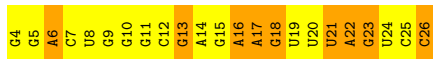
Chain B:  50% 50%



4.2.9 Score per residue for model 9

- Molecule 1: 5'-R(*GP*GP*AP*CP*UP*GP*GP*GP*CP*GP*AP*GP*AP*AP*GP*UP*UP*UP*AP*GP*UP*CP*C)-3'

Chain A:  61% 39%



- Molecule 2: 2,6-diamino-2,6-dideoxy-beta-L-idopyranose-(1-3)-beta-D-ribofuranose

Chain B:  50% 50%



5 Refinement protocol and experimental data overview

The models were refined using the following method: *DISTANCE RESTRAINED MOLECULAR DYNAMICS*.

Of the 100 calculated structures, 9 were deposited, based on the following criterion: *LEAST RESTRAINT VIOLATION*.

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

Software name	Classification	Version
X-PLOR	refinement	3.1

No chemical shift data was provided.

6 Model quality i

6.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: BDG, IDG, NEB, BDR

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	2.08±0.01	17±2/553 (3.1± 0.4%)	2.51±0.06	44±5/862 (5.1± 0.6%)
All	All	2.08	152/4977 (3.1%)	2.51	394/7758 (5.1%)

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	6	A	N9-C4	7.99	1.42	1.37	2	9
1	A	17	A	N9-C4	7.65	1.42	1.37	6	9
1	A	24	U	N1-C2	7.06	1.45	1.38	5	9
1	A	14	A	N9-C4	6.93	1.42	1.37	1	9
1	A	20	U	N1-C2	6.88	1.44	1.38	6	9
1	A	19	U	N1-C2	6.80	1.44	1.38	8	9
1	A	21	U	N1-C2	6.51	1.44	1.38	4	8
1	A	12	C	N1-C2	6.41	1.46	1.40	4	9
1	A	16	A	N9-C4	6.30	1.41	1.37	5	4
1	A	8	U	N1-C2	6.14	1.44	1.38	3	9
1	A	22	A	N9-C4	5.95	1.41	1.37	6	5
1	A	23	G	N9-C4	5.92	1.42	1.38	5	1
1	A	7	C	N1-C6	5.79	1.40	1.37	1	7
1	A	25	C	N1-C2	5.67	1.45	1.40	5	8
1	A	19	U	C2-N3	5.66	1.41	1.37	4	8
1	A	13	G	N9-C4	5.58	1.42	1.38	9	3
1	A	7	C	N1-C2	5.48	1.45	1.40	1	4
1	A	25	C	N1-C6	5.47	1.40	1.37	6	8
1	A	10	G	N9-C4	5.43	1.42	1.38	4	2
1	A	24	U	C2-N3	5.43	1.41	1.37	5	6
1	A	21	U	C2-N3	5.42	1.41	1.37	1	2
1	A	9	G	N9-C4	5.41	1.42	1.38	2	2
1	A	11	G	N9-C4	5.36	1.42	1.38	3	1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)	Models	
								Worst	Total
1	A	26	C	N1-C2	5.31	1.45	1.40	7	2
1	A	20	U	C2-N3	5.18	1.41	1.37	6	2
1	A	12	C	N1-C6	5.10	1.40	1.37	4	1
1	A	4	G	N9-C4	5.09	1.42	1.38	4	3
1	A	18	G	N7-C5	-5.09	1.36	1.39	6	1
1	A	18	G	N9-C4	5.04	1.42	1.38	6	2

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	11	G	P-O3'-C3'	14.00	136.50	119.70	2	2
1	A	21	U	P-O3'-C3'	13.27	135.63	119.70	9	2
1	A	11	G	O4'-C1'-N9	13.16	118.73	108.20	8	2
1	A	22	A	P-O3'-C3'	12.76	135.01	119.70	9	1
1	A	9	G	P-O3'-C3'	10.94	132.83	119.70	4	1
1	A	6	A	N1-C6-N6	10.93	125.16	118.60	7	9
1	A	22	A	N1-C6-N6	10.71	125.03	118.60	8	9
1	A	13	G	N3-C2-N2	10.36	127.16	119.90	9	9
1	A	11	G	N3-C2-N2	10.10	126.97	119.90	8	9
1	A	10	G	N3-C2-N2	10.09	126.96	119.90	5	9
1	A	18	G	N3-C2-N2	10.06	126.94	119.90	4	9
1	A	23	G	N3-C2-N2	10.05	126.93	119.90	2	9
1	A	14	A	N1-C6-N6	9.89	124.54	118.60	5	9
1	A	4	G	N3-C2-N2	9.68	126.67	119.90	6	9
1	A	9	G	N3-C2-N2	9.41	126.49	119.90	6	9
1	A	16	A	N1-C6-N6	9.39	124.24	118.60	7	9
1	A	5	G	P-O3'-C3'	9.36	130.93	119.70	6	2
1	A	15	G	N3-C2-N2	9.07	126.25	119.90	3	9
1	A	5	G	N3-C2-N2	8.85	126.09	119.90	1	9
1	A	17	A	N1-C6-N6	8.69	123.81	118.60	5	9
1	A	12	C	N1-C2-O2	7.92	123.65	118.90	4	9
1	A	18	G	N1-C6-O6	7.59	124.46	119.90	6	8
1	A	9	G	C5-C6-O6	-7.51	124.10	128.60	5	5
1	A	18	G	C5-C6-O6	-7.49	124.11	128.60	6	8
1	A	11	G	C5-C6-O6	-7.09	124.34	128.60	7	3
1	A	25	C	N1-C2-O2	7.08	123.15	118.90	5	9
1	A	15	G	P-O3'-C3'	6.95	128.03	119.70	5	1
1	A	11	G	C2-N3-C4	6.91	115.36	111.90	3	9
1	A	9	G	N1-C6-O6	6.88	124.03	119.90	5	4
1	A	24	U	P-O3'-C3'	6.77	127.82	119.70	8	1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)	Models	
								Worst	Total
1	A	12	C	O4'-C1'-N1	6.75	113.60	108.20	1	6
1	A	10	G	N1-C2-N3	-6.60	119.94	123.90	5	8
1	A	5	G	O4'-C1'-N9	6.59	113.47	108.20	6	3
1	A	25	C	C6-N1-C2	-6.54	117.68	120.30	5	9
1	A	16	A	N9-C1'-C2'	6.49	122.44	114.00	7	1
1	A	10	G	C5-C6-O6	-6.47	124.72	128.60	3	7
1	A	11	G	C1'-O4'-C4'	-6.42	104.77	109.90	8	1
1	A	7	C	N1-C2-O2	6.40	122.74	118.90	8	9
1	A	7	C	C6-N1-C2	-6.40	117.74	120.30	2	8
1	A	10	G	C2-N3-C4	6.37	115.09	111.90	4	8
1	A	26	C	N1-C2-O2	6.31	122.69	118.90	7	9
1	A	18	G	C8-N9-C4	-6.24	103.91	106.40	3	5
1	A	11	G	N1-C6-O6	6.24	123.64	119.90	7	2
1	A	11	G	P-O5'-C5'	6.23	130.86	120.90	2	1
1	A	12	C	C6-N1-C2	-6.15	117.84	120.30	2	7
1	A	23	G	N1-C6-O6	6.14	123.59	119.90	6	6
1	A	16	A	P-O3'-C3'	6.07	126.98	119.70	8	4
1	A	23	G	C5-C6-O6	-5.87	125.08	128.60	6	4
1	A	10	G	N1-C6-O6	5.86	123.42	119.90	3	5
1	A	11	G	O4'-C1'-C2'	-5.82	99.98	105.80	8	1
1	A	9	G	N1-C2-N3	-5.78	120.43	123.90	2	6
1	A	6	A	N9-C1'-C2'	5.77	121.50	114.00	7	1
1	A	11	G	N1-C2-N3	-5.76	120.45	123.90	3	6
1	A	9	G	C2-N3-C4	5.72	114.76	111.90	2	6
1	A	20	U	N1-C1'-C2'	5.69	121.39	114.00	7	1
1	A	25	C	O4'-C1'-N1	5.68	112.74	108.20	7	1
1	A	6	A	C5-C6-N6	-5.66	119.17	123.70	7	3
1	A	23	G	N1-C2-N3	-5.65	120.51	123.90	6	8
1	A	12	C	N3-C4-N4	5.63	121.94	118.00	9	1
1	A	11	G	N9-C1'-C2'	5.58	121.26	114.00	6	2
1	A	23	G	C2-N3-C4	5.56	114.68	111.90	5	8
1	A	18	G	N7-C8-N9	5.52	115.86	113.10	9	2
1	A	21	U	O4'-C1'-N1	5.51	112.61	108.20	7	1
1	A	5	G	C8-N9-C4	-5.49	104.20	106.40	7	1
1	A	23	G	C8-N9-C4	-5.45	104.22	106.40	5	1
1	A	12	C	N3-C2-O2	-5.43	118.10	121.90	4	4
1	A	7	C	O4'-C1'-N1	5.40	112.52	108.20	7	2
1	A	5	G	C5-C6-O6	-5.39	125.37	128.60	1	2
1	A	7	C	N3-C4-N4	5.35	121.75	118.00	5	2
1	A	24	U	O4'-C1'-N1	5.35	112.48	108.20	6	1
1	A	9	G	C8-N9-C4	-5.35	104.26	106.40	8	2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)	Models	
								Worst	Total
1	A	15	G	C8-N9-C4	-5.34	104.26	106.40	9	2
1	A	5	G	N1-C6-O6	5.30	123.08	119.90	8	4
1	A	4	G	C8-N9-C4	-5.28	104.29	106.40	4	4
1	A	15	G	C2-N3-C4	5.25	114.53	111.90	3	1
1	A	7	C	C2-N3-C4	5.25	122.52	119.90	6	1
1	A	22	A	C5-C6-N1	-5.24	115.08	117.70	7	2
1	A	26	C	N3-C4-N4	5.24	121.67	118.00	3	1
1	A	13	G	N1-C6-O6	5.19	123.02	119.90	3	3
1	A	5	G	C2-N3-C4	5.18	114.49	111.90	7	1
1	A	13	G	N1-C2-N2	-5.18	111.54	116.20	5	2
1	A	22	A	C5-C6-N6	-5.17	119.57	123.70	8	1
1	A	25	C	N3-C2-O2	-5.15	118.30	121.90	5	1
1	A	19	U	O4'-C1'-N1	5.08	112.27	108.20	9	1
1	A	25	C	N3-C4-N4	5.08	121.56	118.00	5	1
1	A	4	G	C5-C6-O6	-5.08	125.55	128.60	7	2
1	A	18	G	N1-C2-N2	-5.08	111.63	116.20	4	1
1	A	4	G	N1-C2-N3	-5.06	120.86	123.90	9	4
1	A	12	C	N1-C1'-C2'	5.05	120.56	114.00	9	1
1	A	20	U	N1-C2-O2	5.04	126.33	122.80	7	1
1	A	25	C	N1-C1'-C2'	5.02	120.52	114.00	5	1
1	A	17	A	C8-N9-C4	-5.01	103.80	105.80	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	494	250	250	1±1
All	All	4824	2709	2637	7

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 1.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:6:A:C4	1:A:7:C:C5	0.57	2.92	4	1
1:A:11:G:C5	1:A:12:C:C5	0.47	3.01	2	2
1:A:11:G:C4	1:A:12:C:C6	0.46	3.04	2	1
1:A:10:G:C5	1:A:11:G:C8	0.44	3.05	3	1
1:A:9:G:C5	1:A:22:A:C2	0.41	3.08	2	1
1:A:4:G:H2'	1:A:5:G:C8	0.40	2.51	4	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	22/23 (96%)	5±2 (21±8%)	1±1 (4±4%)	0.37±0.05
All	All	198/207 (96%)	42 (21%)	8 (4%)	0.37

The overall RNA backbone suiteness is 0.37.

All unique RNA backbone outliers are listed below:

Mol	Chain	Res	Type	Models (Total)
1	A	16	A	8
1	A	13	G	6
1	A	18	G	4
1	A	10	G	3
1	A	6	A	3
1	A	22	A	2
1	A	12	C	2
1	A	7	C	2
1	A	21	U	2
1	A	23	G	2
1	A	26	C	2
1	A	5	G	1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Models (Total)
1	A	9	G	1
1	A	11	G	1
1	A	17	A	1
1	A	20	U	1
1	A	25	C	1

All unique RNA pucker outliers are listed below:

Mol	Chain	Res	Type	Models (Total)
1	A	21	U	2
1	A	11	G	1
1	A	9	G	1
1	A	25	C	1
1	A	6	A	1
1	A	17	A	1
1	A	22	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](#)

2 monosaccharides are modelled in this entry.

In the following table, the Counts columns list the number of bonds for which Mogul statistics could be retrieved, the number of bonds that are observed in the model and the number of bonds 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 is the number of standard deviations the observed value is removed from the expected value. A bond length with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of the bond lengths.

Mol	Type	Chain	Res	Link	Bond lengths		
					Counts	RMSZ	#Z>2
2	BDR	B	1	4,2	9,9,10	0.64±0.11	0±0 (0±0%)
2	IDG	B	2	2	11,11,12	0.47±0.04	0±0 (0±0%)

In the following table, the Counts columns list the number of angles for which Mogul statistics could be retrieved, the number of angles that are observed in the model and the number of 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 angle is the number of standard

deviations the observed value is removed from the expected value. A bond angle with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of the bond angles.

Mol	Type	Chain	Res	Link	Bond angles		
					Counts	RMSZ	#Z>2
2	BDR	B	1	4,2	10,12,14	1.23±0.17	1±1 (13±10%)
2	IDG	B	2	2	11,15,17	0.49±0.02	0±0 (0±0%)

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
2	BDR	B	1	4,2	-	0±0,2,15,18	0±0,1,1,1
2	IDG	B	2	2	-	0±0,2,19,22	0±0,1,1,1

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.

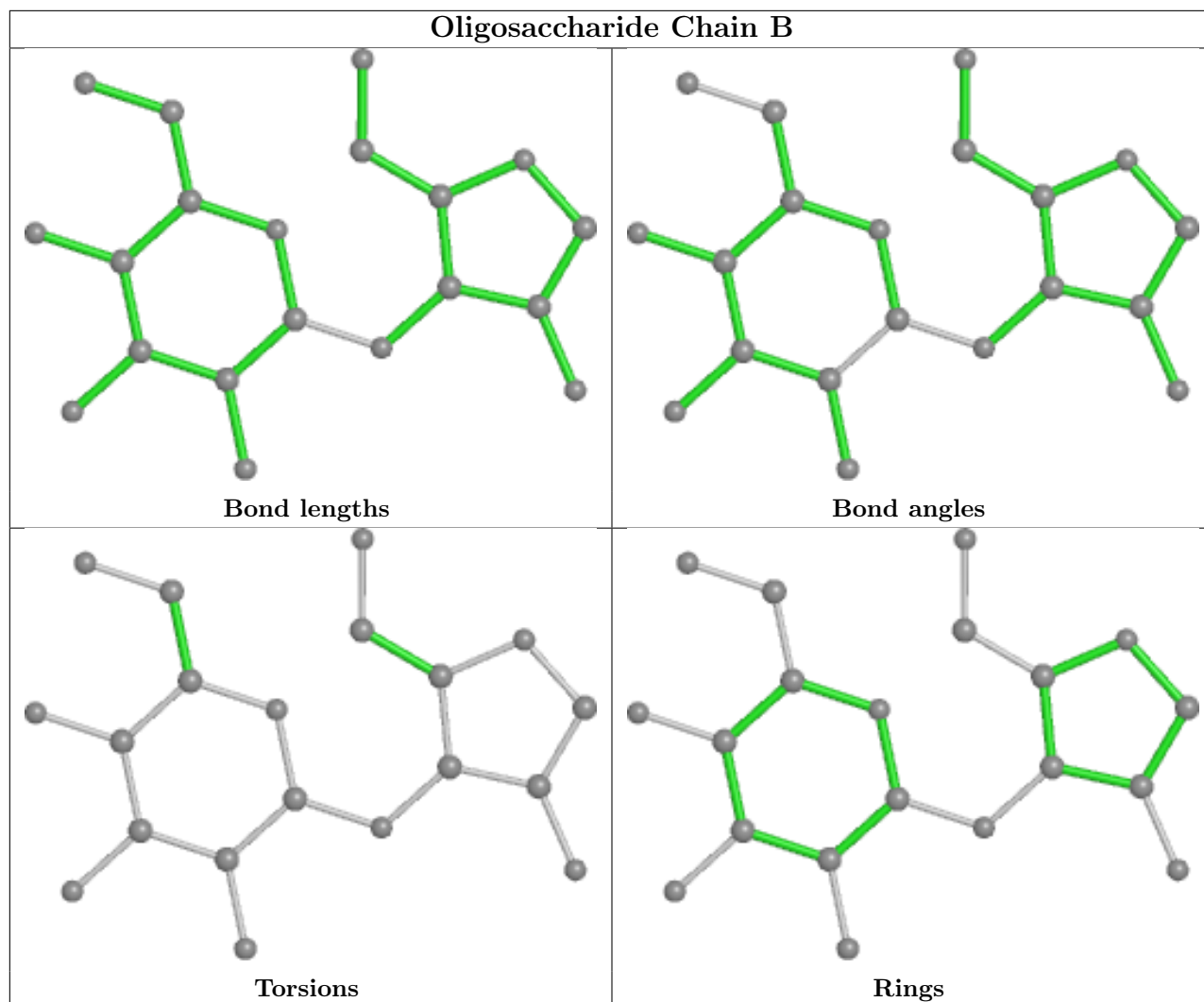
Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)	Models	
								Worst	Total
2	B	1	BDR	C1-C2-C3	3.25	96.68	101.63	4	3
2	B	1	BDR	O4-C4-C3	2.90	102.14	104.70	3	7
2	B	1	BDR	O3-C3-C4	2.58	118.50	111.05	3	1
2	B	1	BDR	O3-C3-C2	2.16	117.25	112.04	8	1

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.



6.6 Ligand geometry [i](#)

2 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds for which Mogul statistics could be retrieved, the number of bonds that are observed in the model and the number of bonds 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 is the number of standard deviations the observed value is removed from the expected value. A bond length with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of the bond lengths.

Mol	Type	Chain	Res	Link	Bond lengths		
					Counts	RMSZ	#Z>2
4	NEB	A	28	3,2	11,11,11	0.44±0.02	0±0 (0±0%)
3	BDG	A	27	4	11,11,12	0.43±0.03	0±0 (0±0%)

In the following table, the Counts columns list the number of angles for which Mogul statistics

could be retrieved, the number of angles that are observed in the model and the number of 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 angle is the number of standard deviations the observed value is removed from the expected value. A bond angle with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of the bond angles.

Mol	Type	Chain	Res	Link	Bond angles		
					Counts	RMSZ	#Z>2
4	NEB	A	28	3,2	16,16,16	0.47±0.05	0±0 (0±0%)
3	BDG	A	27	4	11,15,17	0.65±0.05	0±0 (0±0%)

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	NEB	A	28	3,2	-	-	0±0,1,1,1
3	BDG	A	27	4	-	0±0,2,19,22	0±0,1,1,1

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.

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

No chemical shift data were provided