



Full wwPDB EM Validation Report ⓘ

Mar 3, 2025 – 12:42 pm GMT

PDB ID : 9HBU
EMDB ID : EMD-52030
Title : TiLV-NP tetramer (pseudo-C2) (local refinement around 2 TiLV-NPs)
Authors : Arragain, B.; Cusack, S.
Deposited on : 2024-11-08
Resolution : 3.51 Å (reported)

This is a Full wwPDB EM 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/EMValidationReportHelp>

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:

EMDB validation analysis : **FAILED**
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.41

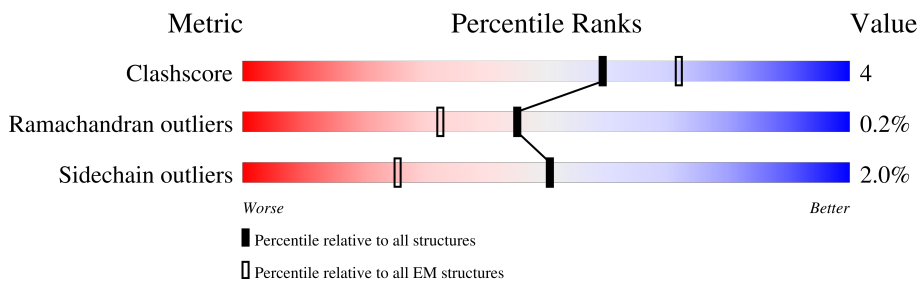
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.51 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)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	C	354	
1	D	354	
1	E	354	
2	H	37	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5530 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Tilapia Lake Virus nucleoprotein (segment 4).

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	C	291	2244	1413	407	408	16	0	0
1	D	317	2422	1521	439	445	17	0	0
1	E	21	147	92	26	28	1	0	0


- Molecule 2 is a DNA chain called 40-mer vRNA loop.

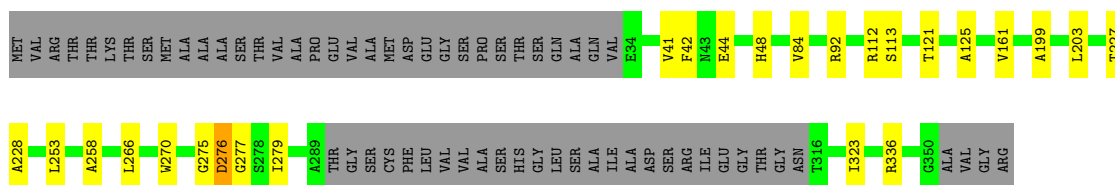
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
2	H	37	717	350	108	222	37	0	0

3 Residue-property plots [i](#)


These plots are drawn for all protein, RNA, DNA and oligosaccharide 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. 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. 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.

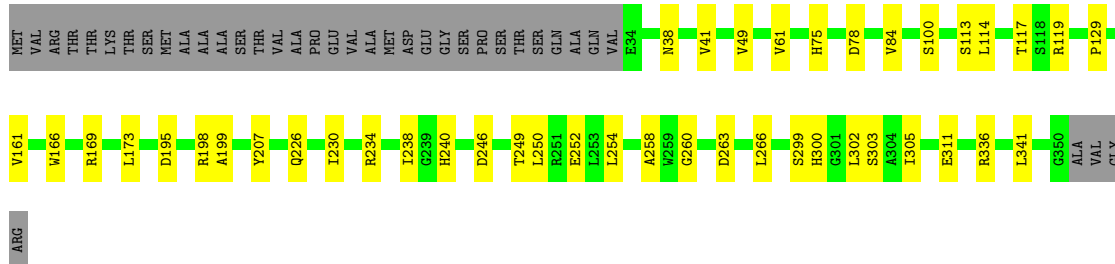
- Molecule 1: Tilapia Lake Virus nucleoprotein (segment 4)

Chain C: 



- Molecule 1: Tilapia Lake Virus nucleoprotein (segment 4)

Chain D: 




- Molecule 1: Tilapia Lake Virus nucleoprotein (segment 4)

Chain E: 



LEU
GLU
GLU
CYS
ILE
ALA
ILE
GLN
LYS
GLN
ASP
GLY
VAL
ILE
LYS
CYS
LYS
ARG
SER
GLY
LYS
SER
LEU
TYR
HIS
CYS
LEU
LYS
GLU
THR
ALA
GLY
ALA
VAL
GLY
ARG

- Molecule 2: 40-mer vRNA loop

Chain H:  11% 62% 27%

A2
A3
A4
Y5P5
Y5P6
Y5P7
Y5P8
Y5P9
Y5P10
Y5P11
Y5P12
Y5P13
Y5P14
A15
Y5P16
A17
Y5P18
Y5P19
Y5P20
A24
A25
Y5P26
A27
Y5P28
A29
A30
A31
A32
A36
Y5P37
Y5P38
Y5P39
Y5P40
A41

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	176605	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor

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: Y5P, P5P

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	C	0.24	0/2283	0.46	0/3073
1	D	0.25	0/2464	0.47	0/3320
1	E	0.26	0/148	0.44	0/199
All	All	0.25	0/4895	0.47	0/6592

There are no bond length outliers.

There are no bond angle outliers.

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	C	2244	0	2283	15	0
1	D	2422	0	2457	22	0
1	E	147	0	143	0	0
2	H	717	0	412	13	0
All	All	5530	0	5295	48	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.

All (48) 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:161:VAL:HG21	1:D:199:ALA:HB3	1.75	0.69
1:C:275:GLY:O	1:C:277:GLY:N	2.27	0.67
1:C:112:ARG:NH2	2:H:20:Y5P:OP1	2.27	0.67
1:C:161:VAL:HG21	1:C:199:ALA:HB3	1.84	0.60
1:D:263:ASP:OD2	1:D:336:ARG:NE	2.35	0.60
1:D:84:VAL:HG12	1:D:84:VAL:O	2.04	0.58
1:C:113:SER:OG	1:C:113:SER:O	2.20	0.57
1:D:195:ASP:OD1	1:D:198:ARG:NH2	2.37	0.57
1:D:254:LEU:HD13	1:D:341:LEU:HD22	1.86	0.56
1:D:254:LEU:HD22	1:D:341:LEU:HD11	1.88	0.54
1:D:305:ILE:HG23	1:D:311:GLU:HG3	1.89	0.54
2:H:12:Y5P:H2'	2:H:13:Y5P:H6	1.91	0.53
1:C:84:VAL:HG12	1:C:84:VAL:O	2.08	0.53
1:D:61:VAL:HG13	1:D:114:LEU:HD21	1.90	0.53
1:D:113:SER:OG	1:D:113:SER:O	2.24	0.52
1:C:44:GLU:O	1:C:48:HIS:ND1	2.42	0.52
2:H:36:P5P:OP2	2:H:36:P5P:H8	2.10	0.52
1:C:277:GLY:O	1:C:279:ILE:HD12	2.10	0.51
1:C:258:ALA:HB2	1:C:266:LEU:HD13	1.92	0.51
1:C:84:VAL:HG13	1:C:92:ARG:HG3	1.91	0.51
2:H:14:Y5P:H2'	2:H:15:P5P:H8	1.94	0.50
2:H:8:Y5P:H6	2:H:8:Y5P:O5'	2.12	0.50
1:D:173:LEU:HD23	1:D:260:GLY:HA2	1.94	0.49
1:C:253:LEU:HD23	1:C:270:TRP:HB2	1.95	0.48
2:H:15:P5P:H2'	2:H:16:Y5P:H6	1.95	0.48
2:H:11:Y5P:H2'	2:H:12:Y5P:H6	1.96	0.48
1:D:249:THR:HG22	1:D:250:LEU:N	2.30	0.46
1:D:166:TRP:HB2	1:D:230:ILE:HG21	1.98	0.46
1:D:38:ASN:O	1:D:41:VAL:HG12	2.16	0.46
1:D:75:HIS:NE2	1:D:129:PRO:O	2.48	0.45
1:D:258:ALA:HB2	1:D:266:LEU:HD13	1.99	0.44
2:H:13:Y5P:H2'	2:H:14:Y5P:H6	1.98	0.44
2:H:24:P5P:H2'	2:H:25:P5P:H8	2.00	0.44
1:C:323:ILE:CG2	1:D:302:LEU:HD11	2.47	0.43
1:C:203:LEU:HD22	1:C:228:ALA:HB3	2.01	0.42
1:D:49:VAL:O	1:D:117:THR:HG22	2.19	0.42
2:H:2:P5P:H2'	2:H:3:P5P:H8	2.01	0.42
2:H:5:Y5P:OP2	2:H:5:Y5P:H6	2.19	0.42
2:H:12:Y5P:H4	2:H:32:P5P:N1	2.35	0.42
1:C:41:VAL:HG13	1:C:42:PHE:N	2.35	0.42
1:D:234:ARG:O	1:D:238:ILE:HD12	2.20	0.42
1:D:258:ALA:CB	1:D:266:LEU:HD13	2.50	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:121:THR:O	1:C:125:ALA:N	2.52	0.42
1:C:227:THR:HG22	1:C:227:THR:O	2.20	0.42
1:D:238:ILE:HG22	1:D:238:ILE:O	2.18	0.41
2:H:4:P5P:H8	2:H:4:P5P:O5'	2.20	0.41
1:D:299:SER:HG	1:D:300:HIS:CE1	2.33	0.41
1:D:169:ARG:NH2	1:D:226:GLN:O	2.53	0.41

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 PDB entries followed by that with respect to all EM entries.

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	C	287/354 (81%)	278 (97%)	8 (3%)	1 (0%)	37	68
1	D	315/354 (89%)	304 (96%)	11 (4%)	0	100	100
1	E	19/354 (5%)	18 (95%)	1 (5%)	0	100	100
All	All	621/1062 (58%)	600 (97%)	20 (3%)	1 (0%)	45	75

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	276	ASP

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 PDB entries followed by that with respect to all EM entries.

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	C	237/285 (83%)	235 (99%)	2 (1%)	79	87
1	D	256/285 (90%)	248 (97%)	8 (3%)	35	62
1	E	15/285 (5%)	15 (100%)	0	100	100
All	All	508/855 (59%)	498 (98%)	10 (2%)	50	71

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	276	ASP
1	C	336	ARG
1	D	78	ASP
1	D	100	SER
1	D	119	ARG
1	D	207	TYR
1	D	240	HIS
1	D	246	ASP
1	D	252	GLU
1	D	303	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

37 non-standard protein/DNA/RNA residues 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	$\# Z > 2$
2	Y5P	H	14	2	14,19,20	3.70	1 (7%)	18,26,29	0.78	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	Y5P	H	39	2	14,19,20	2.33	1 (7%)	18,26,29	1.00	1 (5%)
2	P5P	H	3	2	16,23,24	0.76	0	14,33,36	0.77	0
2	Y5P	H	20	2	14,19,20	3.68	1 (7%)	18,26,29	0.79	1 (5%)
2	Y5P	H	10	2	14,19,20	2.33	1 (7%)	18,26,29	0.98	1 (5%)
2	Y5P	H	40	2	14,19,20	3.66	1 (7%)	18,26,29	0.79	1 (5%)
2	Y5P	H	16	2	14,19,20	3.66	1 (7%)	18,26,29	0.76	1 (5%)
2	Y5P	H	9	2	14,19,20	2.32	1 (7%)	18,26,29	1.00	1 (5%)
2	P5P	H	24	2	16,23,24	1.34	3 (18%)	14,33,36	1.89	2 (14%)
2	Y5P	H	8	2	14,19,20	2.31	1 (7%)	18,26,29	1.00	1 (5%)
2	P5P	H	27	2	16,23,24	1.34	3 (18%)	14,33,36	1.82	2 (14%)
2	P5P	H	17	2	16,23,24	1.34	3 (18%)	14,33,36	1.88	2 (14%)
2	P5P	H	32	2	16,23,24	0.77	0	14,33,36	0.74	0
2	P5P	H	34	2	16,23,24	0.77	0	14,33,36	0.86	0
2	Y5P	H	28	2	14,19,20	2.27	1 (7%)	18,26,29	0.99	1 (5%)
2	P5P	H	33	2	16,23,24	0.78	0	14,33,36	0.75	0
2	Y5P	H	19	2	14,19,20	3.69	1 (7%)	18,26,29	0.82	0
2	P5P	H	35	2	16,23,24	0.76	0	14,33,36	0.76	0
2	Y5P	H	11	2	14,19,20	2.32	1 (7%)	18,26,29	0.99	1 (5%)
2	Y5P	H	37	2	14,19,20	2.35	1 (7%)	18,26,29	1.01	1 (5%)
2	P5P	H	29	2	16,23,24	1.36	3 (18%)	14,33,36	1.91	2 (14%)
2	P5P	H	4	2	16,23,24	0.79	0	14,33,36	0.73	0
2	Y5P	H	6	2	14,19,20	2.33	1 (7%)	18,26,29	1.00	1 (5%)
2	Y5P	H	13	2	14,19,20	2.30	1 (7%)	18,26,29	1.00	1 (5%)
2	Y5P	H	38	2	14,19,20	2.31	1 (7%)	18,26,29	1.00	1 (5%)
2	P5P	H	2	2	16,23,24	0.78	0	14,33,36	0.73	0
2	P5P	H	25	2	16,23,24	0.80	0	14,33,36	0.71	0
2	Y5P	H	18	2	14,19,20	2.26	1 (7%)	18,26,29	1.00	1 (5%)
2	Y5P	H	5	2	14,19,20	2.32	1 (7%)	18,26,29	0.98	1 (5%)
2	P5P	H	41	2	16,23,24	1.31	3 (18%)	14,33,36	1.90	2 (14%)
2	Y5P	H	26	2	14,19,20	3.69	1 (7%)	18,26,29	0.75	1 (5%)
2	P5P	H	30	2	16,23,24	0.79	0	14,33,36	0.77	0
2	P5P	H	36	2	16,23,24	0.79	0	14,33,36	0.74	0
2	Y5P	H	7	2	14,19,20	2.34	1 (7%)	18,26,29	1.00	1 (5%)
2	P5P	H	31	2	16,23,24	1.34	3 (18%)	14,33,36	1.86	2 (14%)
2	Y5P	H	12	2	14,19,20	3.69	1 (7%)	18,26,29	0.79	1 (5%)
2	P5P	H	15	2	16,23,24	0.82	1 (6%)	14,33,36	0.78	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	Y5P	H	14	2	-	1/7/33/34	0/2/2/2
2	Y5P	H	39	2	-	1/7/33/34	0/2/2/2
2	P5P	H	3	2	-	0/3/25/26	0/3/3/3
2	Y5P	H	20	2	-	1/7/33/34	0/2/2/2
2	Y5P	H	10	2	-	2/7/33/34	0/2/2/2
2	Y5P	H	40	2	-	2/7/33/34	0/2/2/2
2	Y5P	H	16	2	-	1/7/33/34	0/2/2/2
2	Y5P	H	9	2	-	1/7/33/34	0/2/2/2
2	P5P	H	24	2	-	0/3/25/26	0/3/3/3
2	Y5P	H	8	2	-	3/7/33/34	0/2/2/2
2	P5P	H	27	2	-	0/3/25/26	0/3/3/3
2	P5P	H	17	2	-	0/3/25/26	0/3/3/3
2	P5P	H	32	2	-	1/3/25/26	0/3/3/3
2	P5P	H	34	2	-	2/3/25/26	0/3/3/3
2	Y5P	H	28	2	-	1/7/33/34	0/2/2/2
2	P5P	H	33	2	-	0/3/25/26	0/3/3/3
2	Y5P	H	19	2	-	3/7/33/34	0/2/2/2
2	P5P	H	35	2	-	0/3/25/26	0/3/3/3
2	Y5P	H	11	2	-	1/7/33/34	0/2/2/2
2	Y5P	H	37	2	-	2/7/33/34	0/2/2/2
2	P5P	H	29	2	-	0/3/25/26	0/3/3/3
2	P5P	H	4	2	-	0/3/25/26	0/3/3/3
2	Y5P	H	6	2	-	2/7/33/34	0/2/2/2
2	Y5P	H	13	2	-	1/7/33/34	0/2/2/2
2	Y5P	H	38	2	-	1/7/33/34	0/2/2/2
2	P5P	H	2	2	-	1/3/25/26	0/3/3/3
2	P5P	H	25	2	-	0/3/25/26	0/3/3/3
2	Y5P	H	18	2	-	1/7/33/34	0/2/2/2
2	Y5P	H	5	2	-	3/7/33/34	0/2/2/2
2	P5P	H	41	2	-	1/3/25/26	0/3/3/3
2	Y5P	H	26	2	-	1/7/33/34	0/2/2/2
2	P5P	H	30	2	-	2/3/25/26	0/3/3/3
2	P5P	H	36	2	-	2/3/25/26	0/3/3/3
2	Y5P	H	7	2	-	2/7/33/34	0/2/2/2
2	P5P	H	31	2	-	0/3/25/26	0/3/3/3
2	Y5P	H	12	2	-	1/7/33/34	0/2/2/2

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	P5P	H	15	2	-	0/3/25/26	0/3/3/3

All (39) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	14	Y5P	C4-N3	-13.66	1.33	1.46
2	H	19	Y5P	C4-N3	-13.64	1.33	1.46
2	H	26	Y5P	C4-N3	-13.62	1.33	1.46
2	H	12	Y5P	C4-N3	-13.62	1.33	1.46
2	H	20	Y5P	C4-N3	-13.60	1.33	1.46
2	H	40	Y5P	C4-N3	-13.52	1.33	1.46
2	H	16	Y5P	C4-N3	-13.51	1.33	1.46
2	H	37	Y5P	C4-N3	-8.64	1.38	1.46
2	H	7	Y5P	C4-N3	-8.61	1.38	1.46
2	H	39	Y5P	C4-N3	-8.59	1.38	1.46
2	H	10	Y5P	C4-N3	-8.56	1.38	1.46
2	H	6	Y5P	C4-N3	-8.56	1.38	1.46
2	H	5	Y5P	C4-N3	-8.53	1.38	1.46
2	H	9	Y5P	C4-N3	-8.52	1.38	1.46
2	H	38	Y5P	C4-N3	-8.52	1.38	1.46
2	H	11	Y5P	C4-N3	-8.51	1.38	1.46
2	H	8	Y5P	C4-N3	-8.49	1.38	1.46
2	H	13	Y5P	C4-N3	-8.43	1.38	1.46
2	H	28	Y5P	C4-N3	-8.33	1.38	1.46
2	H	18	Y5P	C4-N3	-8.28	1.38	1.46
2	H	29	P5P	C6-N1	4.14	1.39	1.32
2	H	27	P5P	C6-N1	4.13	1.39	1.32
2	H	24	P5P	C6-N1	4.10	1.39	1.32
2	H	17	P5P	C6-N1	4.10	1.39	1.32
2	H	31	P5P	C6-N1	4.08	1.39	1.32
2	H	41	P5P	C6-N1	3.95	1.39	1.32
2	H	24	P5P	C2-N1	2.21	1.37	1.33
2	H	17	P5P	C2-N1	2.15	1.37	1.33
2	H	27	P5P	C8-N7	-2.15	1.30	1.34
2	H	29	P5P	C2-N1	2.15	1.37	1.33
2	H	41	P5P	C8-N7	-2.14	1.30	1.34
2	H	17	P5P	C8-N7	-2.14	1.30	1.34
2	H	24	P5P	C8-N7	-2.13	1.30	1.34
2	H	31	P5P	C8-N7	-2.12	1.30	1.34
2	H	41	P5P	C2-N1	2.11	1.37	1.33
2	H	31	P5P	C2-N1	2.11	1.37	1.33
2	H	29	P5P	C8-N7	-2.11	1.30	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	27	P5P	C2-N1	2.07	1.37	1.33
2	H	15	P5P	C8-N7	-2.00	1.31	1.34

All (30) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	24	P5P	C6-N1-C2	6.32	124.89	115.84
2	H	41	P5P	C6-N1-C2	6.31	124.88	115.84
2	H	17	P5P	C6-N1-C2	6.29	124.85	115.84
2	H	29	P5P	C6-N1-C2	6.27	124.82	115.84
2	H	27	P5P	C6-N1-C2	6.15	124.66	115.84
2	H	31	P5P	C6-N1-C2	6.15	124.65	115.84
2	H	8	Y5P	N1-C2-N3	-3.61	114.75	125.33
2	H	6	Y5P	N1-C2-N3	-3.58	114.83	125.33
2	H	7	Y5P	N1-C2-N3	-3.58	114.83	125.33
2	H	39	Y5P	N1-C2-N3	-3.57	114.85	125.33
2	H	5	Y5P	N1-C2-N3	-3.57	114.86	125.33
2	H	37	Y5P	N1-C2-N3	-3.57	114.87	125.33
2	H	9	Y5P	N1-C2-N3	-3.57	114.88	125.33
2	H	38	Y5P	N1-C2-N3	-3.56	114.88	125.33
2	H	13	Y5P	N1-C2-N3	-3.52	115.00	125.33
2	H	18	Y5P	N1-C2-N3	-3.52	115.01	125.33
2	H	10	Y5P	N1-C2-N3	-3.49	115.10	125.33
2	H	28	Y5P	N1-C2-N3	-3.48	115.13	125.33
2	H	11	Y5P	N1-C2-N3	-3.44	115.24	125.33
2	H	41	P5P	N1-C2-N3	-2.87	123.98	127.65
2	H	29	P5P	N1-C2-N3	-2.85	124.01	127.65
2	H	17	P5P	N1-C2-N3	-2.80	124.07	127.65
2	H	31	P5P	N1-C2-N3	-2.79	124.08	127.65
2	H	24	P5P	N1-C2-N3	-2.77	124.11	127.65
2	H	27	P5P	N1-C2-N3	-2.56	124.38	127.65
2	H	20	Y5P	N1-C2-N3	-2.11	119.15	125.33
2	H	40	Y5P	N1-C2-N3	-2.08	119.22	125.33
2	H	12	Y5P	N1-C2-N3	-2.04	119.34	125.33
2	H	26	Y5P	N1-C2-N3	-2.04	119.36	125.33
2	H	16	Y5P	N1-C2-N3	-2.00	119.46	125.33

There are no chirality outliers.

All (40) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	H	5	Y5P	O4'-C4'-C5'-O5'

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Mol	Chain	Res	Type	Atoms
2	H	5	Y5P	C3'-C4'-C5'-O5'
2	H	5	Y5P	O4'-C1'-N1-C2
2	H	6	Y5P	C4'-C5'-O5'-P
2	H	9	Y5P	O4'-C1'-N1-C2
2	H	16	Y5P	O4'-C1'-N1-C2
2	H	18	Y5P	O4'-C1'-N1-C2
2	H	26	Y5P	O4'-C1'-N1-C2
2	H	28	Y5P	O4'-C1'-N1-C2
2	H	30	P5P	O4'-C4'-C5'-O5'
2	H	36	P5P	C3'-C4'-C5'-O5'
2	H	36	P5P	O4'-C4'-C5'-O5'
2	H	37	Y5P	C4'-C5'-O5'-P
2	H	37	Y5P	O4'-C1'-N1-C2
2	H	6	Y5P	O4'-C1'-N1-C2
2	H	8	Y5P	O4'-C1'-N1-C2
2	H	10	Y5P	O4'-C1'-N1-C2
2	H	11	Y5P	O4'-C1'-N1-C2
2	H	12	Y5P	O4'-C1'-N1-C2
2	H	13	Y5P	O4'-C1'-N1-C2
2	H	14	Y5P	O4'-C1'-N1-C2
2	H	19	Y5P	O4'-C1'-N1-C2
2	H	39	Y5P	O4'-C1'-N1-C2
2	H	19	Y5P	O4'-C4'-C5'-O5'
2	H	19	Y5P	C3'-C4'-C5'-O5'
2	H	30	P5P	C3'-C4'-C5'-O5'
2	H	20	Y5P	O4'-C1'-N1-C2
2	H	38	Y5P	O4'-C1'-N1-C2
2	H	8	Y5P	O4'-C4'-C5'-O5'
2	H	40	Y5P	C3'-C4'-C5'-O5'
2	H	40	Y5P	O4'-C1'-N1-C2
2	H	34	P5P	C3'-C4'-C5'-O5'
2	H	7	Y5P	O4'-C1'-N1-C2
2	H	2	P5P	C3'-C4'-C5'-O5'
2	H	41	P5P	O4'-C4'-C5'-O5'
2	H	10	Y5P	O4'-C4'-C5'-O5'
2	H	34	P5P	O4'-C4'-C5'-O5'
2	H	8	Y5P	C3'-C4'-C5'-O5'
2	H	7	Y5P	C3'-C4'-C5'-O5'
2	H	32	P5P	C3'-C4'-C5'-O5'

There are no ring outliers.

16 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	H	14	Y5P	2	0
2	H	3	P5P	1	0
2	H	20	Y5P	1	0
2	H	16	Y5P	1	0
2	H	24	P5P	1	0
2	H	8	Y5P	1	0
2	H	32	P5P	1	0
2	H	11	Y5P	1	0
2	H	4	P5P	1	0
2	H	13	Y5P	2	0
2	H	2	P5P	1	0
2	H	25	P5P	1	0
2	H	5	Y5P	1	0
2	H	36	P5P	1	0
2	H	12	Y5P	3	0
2	H	15	P5P	2	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
2	H	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	H	20:Y5P	O3'	24:P5P	P	10.28