



Full wwPDB/EMDatabank EM Map/Model Validation Report ⓘ

Jul 24, 2017 – 05:44 AM EDT

PDB ID : 5O3L
EMDB ID: : EMD-3741
Title : Paired helical filament in Alzheimer's disease brain
Authors : Fitzpatrick, A.W.P.; Falcon, B.; He, S.; Murzin, A.G.; Murshudov, G.; Gar-
ringer, H.G.; Crowther, R.A.; Ghatti, B.; Goedert, M.; Scheres, S.H.W.
Deposited on : unknown
Resolution : 3.40 Å(reported)
Based on PDB ID : 2RNM

This is a Full wwPDB/EMDatabank EM Map/Model Validation Report
for a publicly released PDB/EMDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<http://wwpdb.org/validation/2016/EMValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

MolProbity : 4.02b-467
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : rb-20029824

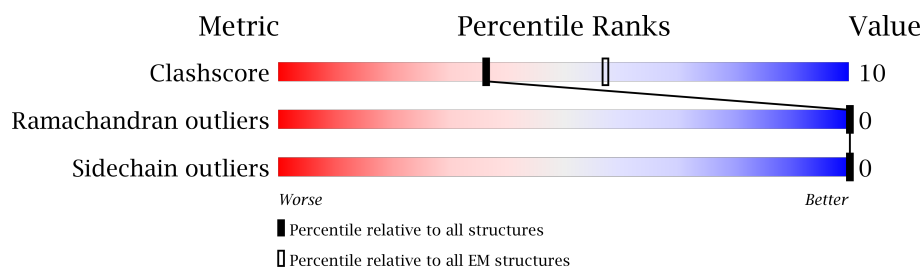
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.40 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	125131	1336
Ramachandran outliers	121729	1120
Sidechain outliers	121581	1026

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

Mol	Chain	Length	Quality of chain
1	A	73	86% 14%
1	B	73	86% 14%
1	C	73	79% 21%
1	D	73	84% 16%
1	E	73	79% 21%
1	F	73	85% 15%
1	G	73	79% 21%
1	H	73	85% 15%
1	I	73	82% 18%

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Mol	Chain	Length	Quality of chain
1	J	73	 85%15%

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 11360 atoms, of which 5790 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.

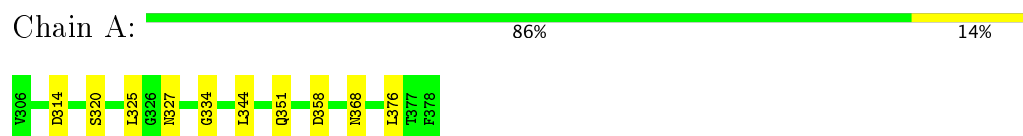
- Molecule 1 is a protein called Microtubule-associated protein tau.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	A	73	Total	C	H	N	O	S	0	0
			1136	351	579	101	104	1		
1	B	73	Total	C	H	N	O	S	0	0
			1136	351	579	101	104	1		
1	C	73	Total	C	H	N	O	S	0	0
			1136	351	579	101	104	1		
1	D	73	Total	C	H	N	O	S	0	0
			1136	351	579	101	104	1		
1	E	73	Total	C	H	N	O	S	0	0
			1136	351	579	101	104	1		
1	F	73	Total	C	H	N	O	S	0	0
			1136	351	579	101	104	1		
1	G	73	Total	C	H	N	O	S	0	0
			1136	351	579	101	104	1		
1	H	73	Total	C	H	N	O	S	0	0
			1136	351	579	101	104	1		
1	I	73	Total	C	H	N	O	S	0	0
			1136	351	579	101	104	1		
1	J	73	Total	C	H	N	O	S	0	0
			1136	351	579	101	104	1		

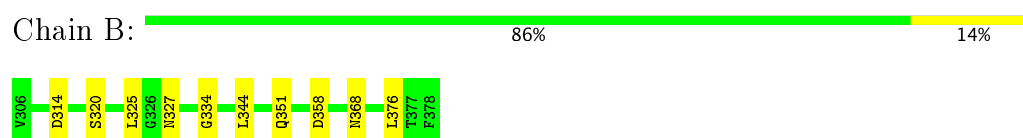
3 Residue-property plots

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. 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.

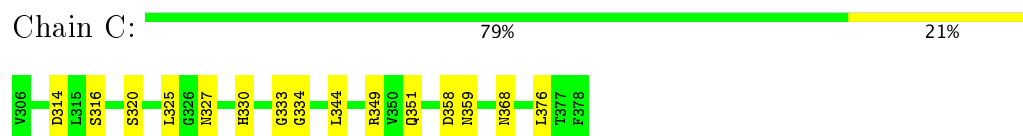
- Molecule 1: Microtubule-associated protein tau



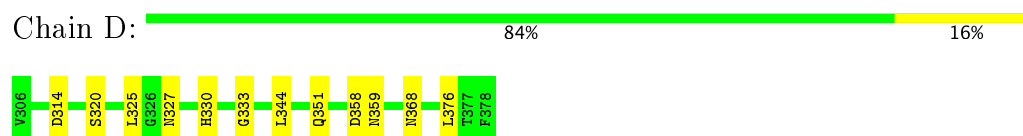
- Molecule 1: Microtubule-associated protein tau



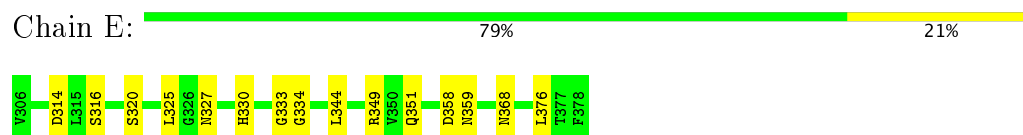
- Molecule 1: Microtubule-associated protein tau



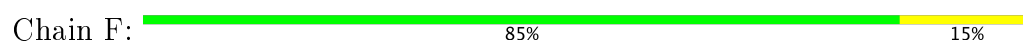
- Molecule 1: Microtubule-associated protein tau



- Molecule 1: Microtubule-associated protein tau

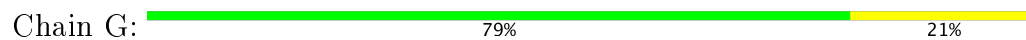


- Molecule 1: Microtubule-associated protein tau

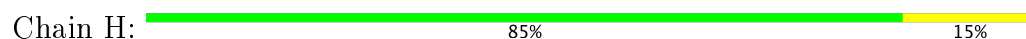




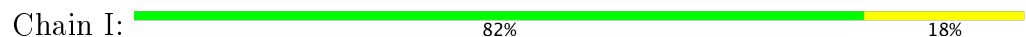
- Molecule 1: Microtubule-associated protein tau



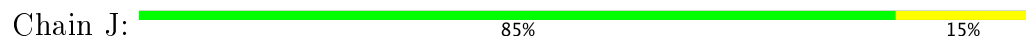
- Molecule 1: Microtubule-associated protein tau



- Molecule 1: Microtubule-associated protein tau



- Molecule 1: Microtubule-associated protein tau



4 Experimental information

Property	Value	Source
Reconstruction method	HELICAL	Depositor
Imposed symmetry	HELICAL, twist=179.4°, rise=2.36 Å, axial sym=C1	Depositor
Number of segments used	23086	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	1.2	Depositor
Minimum defocus (nm)	900	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	Not provided	Depositor
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor

5 Model quality [i](#)

5.1 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 root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >2	RMSZ	# Z >2
1	A	0.55	0/566	0.69	0/758
1	B	0.55	0/566	0.69	0/758
1	C	0.55	0/566	0.69	0/758
1	D	0.55	0/566	0.69	0/758
1	E	0.55	0/566	0.69	0/758
1	F	0.55	0/566	0.69	0/758
1	G	0.55	0/566	0.69	0/758
1	H	0.54	0/566	0.69	0/758
1	I	0.55	0/566	0.69	0/758
1	J	0.54	0/566	0.69	0/758
All	All	0.55	0/5660	0.69	0/7580

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	A	557	579	579	12	0
1	B	557	579	579	12	0
1	C	557	579	579	25	0
1	D	557	579	579	22	0
1	E	557	579	579	26	0
1	F	557	579	579	21	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	G	557	579	579	25	0
1	H	557	579	579	21	0
1	I	557	579	579	14	0
1	J	557	579	579	12	0
All	All	5570	5790	5790	109	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 10.

All (109) 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:B:320:SER:OG	1:B:368:ASN:OD1	2.11	0.67
1:D:320:SER:OG	1:D:368:ASN:OD1	2.11	0.67
1:F:320:SER:OG	1:F:368:ASN:OD1	2.11	0.66
1:J:320:SER:OG	1:J:368:ASN:OD1	2.11	0.66
1:H:320:SER:OG	1:H:368:ASN:OD1	2.11	0.65
1:A:320:SER:OG	1:A:368:ASN:OD1	2.11	0.65
1:A:344:LEU:HB2	1:C:344:LEU:HD22	1.79	0.65
1:C:320:SER:OG	1:C:368:ASN:OD1	2.11	0.65
1:C:344:LEU:HB2	1:E:344:LEU:HD22	1.79	0.64
1:E:344:LEU:HB2	1:G:344:LEU:HD22	1.79	0.64
1:G:344:LEU:HB2	1:I:344:LEU:HD22	1.79	0.64
1:I:320:SER:OG	1:I:368:ASN:OD1	2.11	0.64
1:E:320:SER:OG	1:E:368:ASN:OD1	2.11	0.64
1:G:320:SER:OG	1:G:368:ASN:OD1	2.11	0.64
1:H:344:LEU:HB2	1:J:344:LEU:HD22	1.79	0.63
1:B:344:LEU:HB2	1:D:344:LEU:HD22	1.79	0.63
1:B:314:ASP:OD1	1:B:314:ASP:N	2.32	0.63
1:F:344:LEU:HB2	1:H:344:LEU:HD22	1.79	0.63
1:D:344:LEU:HB2	1:F:344:LEU:HD22	1.79	0.62
1:C:314:ASP:OD1	1:C:314:ASP:N	2.32	0.62
1:A:314:ASP:OD1	1:A:314:ASP:N	2.32	0.61
1:D:314:ASP:N	1:D:314:ASP:OD1	2.32	0.61
1:J:314:ASP:OD1	1:J:314:ASP:N	2.32	0.61
1:F:314:ASP:OD1	1:F:314:ASP:N	2.32	0.61
1:H:314:ASP:N	1:H:314:ASP:OD1	2.32	0.61
1:E:314:ASP:N	1:E:314:ASP:OD1	2.32	0.59
1:G:314:ASP:N	1:G:314:ASP:OD1	2.32	0.59
1:I:314:ASP:N	1:I:314:ASP:OD1	2.32	0.59
1:A:358:ASP:HB3	1:C:358:ASP:OD1	2.07	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:325:LEU:HD11	1:D:325:LEU:HD22	1.89	0.55
1:F:325:LEU:HD11	1:H:325:LEU:HD22	1.89	0.55
1:H:325:LEU:HD11	1:J:325:LEU:HD22	1.89	0.55
1:C:358:ASP:HB3	1:E:358:ASP:OD1	2.07	0.54
1:D:325:LEU:HD11	1:F:325:LEU:HD22	1.89	0.54
1:E:358:ASP:HB3	1:G:358:ASP:OD1	2.07	0.54
1:G:358:ASP:HB3	1:I:358:ASP:OD1	2.07	0.54
1:B:358:ASP:HB3	1:D:358:ASP:OD1	2.07	0.54
1:E:325:LEU:HD11	1:G:325:LEU:HD22	1.89	0.54
1:D:358:ASP:HB3	1:F:358:ASP:OD1	2.07	0.54
1:A:325:LEU:HD11	1:C:325:LEU:HD22	1.89	0.54
1:G:325:LEU:HD11	1:I:325:LEU:HD22	1.89	0.54
1:C:325:LEU:HD11	1:E:325:LEU:HD22	1.89	0.54
1:F:358:ASP:HB3	1:H:358:ASP:OD1	2.07	0.54
1:B:325:LEU:CD1	1:D:325:LEU:HD22	2.39	0.53
1:H:358:ASP:HB3	1:J:358:ASP:OD1	2.07	0.53
1:D:325:LEU:CD1	1:F:325:LEU:HD22	2.39	0.53
1:F:325:LEU:CD1	1:H:325:LEU:HD22	2.39	0.53
1:H:325:LEU:CD1	1:J:325:LEU:HD22	2.39	0.53
1:A:325:LEU:CD1	1:C:325:LEU:HD22	2.39	0.53
1:E:325:LEU:CD1	1:G:325:LEU:HD22	2.39	0.53
1:C:325:LEU:CD1	1:E:325:LEU:HD22	2.39	0.52
1:G:325:LEU:CD1	1:I:325:LEU:HD22	2.39	0.52
1:G:327:ASN:HA	1:I:327:ASN:OD1	2.13	0.49
1:C:327:ASN:HA	1:E:327:ASN:OD1	2.13	0.49
1:A:327:ASN:HA	1:C:327:ASN:OD1	2.13	0.49
1:E:327:ASN:HA	1:G:327:ASN:OD1	2.13	0.49
1:D:376:LEU:HB3	1:F:376:LEU:HD13	1.95	0.49
1:F:376:LEU:HB3	1:H:376:LEU:HD13	1.95	0.49
1:H:376:LEU:HB3	1:J:376:LEU:HD13	1.95	0.49
1:B:376:LEU:HB3	1:D:376:LEU:HD13	1.95	0.48
1:G:376:LEU:HB3	1:I:376:LEU:HD13	1.95	0.48
1:H:327:ASN:HA	1:J:327:ASN:OD1	2.13	0.48
1:E:376:LEU:HB3	1:G:376:LEU:HD13	1.95	0.48
1:F:327:ASN:HA	1:H:327:ASN:OD1	2.13	0.48
1:C:376:LEU:HB3	1:E:376:LEU:HD13	1.95	0.48
1:D:327:ASN:HA	1:F:327:ASN:OD1	2.13	0.48
1:B:327:ASN:HA	1:D:327:ASN:OD1	2.13	0.48
1:A:376:LEU:HB3	1:C:376:LEU:HD13	1.95	0.48
1:E:316:SER:O	1:G:316:SER:OG	2.23	0.46
1:C:316:SER:O	1:E:316:SER:OG	2.23	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:334:GLY:N	1:C:333:GLY:O	2.48	0.46
1:C:334:GLY:N	1:E:333:GLY:O	2.48	0.45
1:E:334:GLY:N	1:G:333:GLY:O	2.48	0.45
1:G:334:GLY:N	1:I:333:GLY:O	2.48	0.45
1:F:330:HIS:HE2	1:F:359:ASN:HB3	1.82	0.45
1:H:330:HIS:HE2	1:H:359:ASN:HB3	1.82	0.45
1:J:330:HIS:HE2	1:J:359:ASN:HB3	1.82	0.45
1:C:330:HIS:HE2	1:C:359:ASN:HB3	1.82	0.45
1:E:330:HIS:HE2	1:E:359:ASN:HB3	1.82	0.45
1:D:330:HIS:HE2	1:D:359:ASN:HB3	1.82	0.45
1:G:330:HIS:HE2	1:G:359:ASN:HB3	1.82	0.45
1:I:330:HIS:HE2	1:I:359:ASN:HB3	1.82	0.44
1:B:334:GLY:N	1:D:333:GLY:O	2.48	0.44
1:G:351:GLN:OE1	1:I:351:GLN:NE2	2.51	0.43
1:A:351:GLN:OE1	1:C:351:GLN:NE2	2.51	0.43
1:E:351:GLN:OE1	1:G:351:GLN:NE2	2.51	0.43
1:C:351:GLN:OE1	1:E:351:GLN:NE2	2.51	0.43
1:B:351:GLN:OE1	1:D:351:GLN:NE2	2.52	0.42
1:D:351:GLN:OE1	1:F:351:GLN:NE2	2.52	0.42
1:F:351:GLN:OE1	1:H:351:GLN:NE2	2.52	0.42
1:H:351:GLN:OE1	1:J:351:GLN:NE2	2.52	0.42
1:C:368:ASN:O	1:E:368:ASN:HA	2.21	0.41
1:A:368:ASN:O	1:C:368:ASN:HA	2.21	0.41
1:E:368:ASN:O	1:G:368:ASN:HA	2.21	0.41
1:B:327:ASN:HB3	1:D:327:ASN:OD1	2.20	0.41
1:D:327:ASN:HB3	1:F:327:ASN:OD1	2.21	0.41
1:F:327:ASN:HB3	1:H:327:ASN:OD1	2.20	0.41
1:G:368:ASN:O	1:I:368:ASN:HA	2.21	0.41
1:H:327:ASN:HB3	1:J:327:ASN:OD1	2.21	0.41
1:H:368:ASN:O	1:J:368:ASN:HA	2.21	0.41
1:B:368:ASN:O	1:D:368:ASN:HA	2.21	0.40
1:E:349:ARG:CG	1:G:349:ARG:HE	2.34	0.40
1:G:349:ARG:CG	1:I:349:ARG:HE	2.34	0.40
1:G:327:ASN:HB3	1:I:327:ASN:OD1	2.20	0.40
1:A:327:ASN:HB3	1:C:327:ASN:OD1	2.20	0.40
1:D:368:ASN:O	1:F:368:ASN:HA	2.21	0.40
1:F:368:ASN:O	1:H:368:ASN:HA	2.21	0.40
1:C:349:ARG:CG	1:E:349:ARG:HE	2.34	0.40
1:C:327:ASN:HB3	1:E:327:ASN:OD1	2.20	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	A	71/73 (97%)	55 (78%)	16 (22%)	0	100	100
1	B	71/73 (97%)	55 (78%)	16 (22%)	0	100	100
1	C	71/73 (97%)	55 (78%)	16 (22%)	0	100	100
1	D	71/73 (97%)	56 (79%)	15 (21%)	0	100	100
1	E	71/73 (97%)	55 (78%)	16 (22%)	0	100	100
1	F	71/73 (97%)	55 (78%)	16 (22%)	0	100	100
1	G	71/73 (97%)	55 (78%)	16 (22%)	0	100	100
1	H	71/73 (97%)	56 (79%)	15 (21%)	0	100	100
1	I	71/73 (97%)	54 (76%)	17 (24%)	0	100	100
1	J	71/73 (97%)	55 (78%)	16 (22%)	0	100	100
All	All	710/730 (97%)	551 (78%)	159 (22%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains

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	A	64/64 (100%)	64 (100%)	0	100	100
1	B	64/64 (100%)	64 (100%)	0	100	100
1	C	64/64 (100%)	64 (100%)	0	100	100
1	D	64/64 (100%)	64 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	E	64/64 (100%)	64 (100%)	0	100	100
1	F	64/64 (100%)	64 (100%)	0	100	100
1	G	64/64 (100%)	64 (100%)	0	100	100
1	H	64/64 (100%)	64 (100%)	0	100	100
1	I	64/64 (100%)	64 (100%)	0	100	100
1	J	64/64 (100%)	64 (100%)	0	100	100
All	All	640/640 (100%)	640 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	351	GLN
1	C	351	GLN
1	C	368	ASN
1	D	368	ASN
1	D	374	HIS
1	E	351	GLN
1	E	368	ASN
1	F	368	ASN
1	G	351	GLN
1	G	368	ASN
1	H	368	ASN
1	H	374	HIS
1	I	351	GLN
1	I	368	ASN
1	J	368	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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](#)

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](#)

There are no chain breaks in this entry.