



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 06:19 AM UTC

PDB ID : 1B8I / pdb_00001b8i
Title : STRUCTURE OF THE HOMEOTIC UBX/EXD/DNA TERNARY COMPLEX
Authors : Passner, J.M.; Ryoo, H.-D.; Shen, L.; Mann, R.S.; Aggarwal, A.K.
Deposited on : 1999-02-01
Resolution : 2.40 Å(reported)

This is a Full wwPDB X-ray 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/XrayValidationReportHelp>

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:

MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

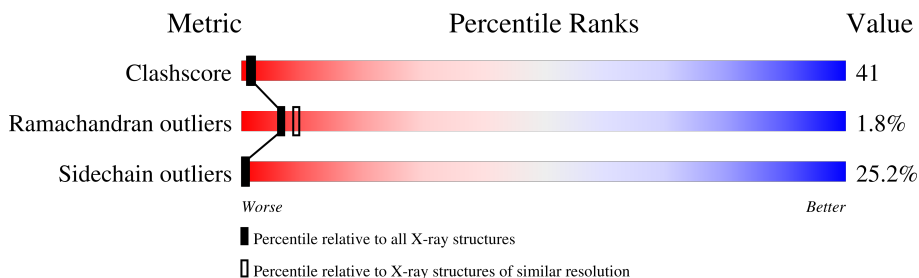
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)

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

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	C	15	
2	D	15	
3	A	81	
4	B	63	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 1747 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, 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 DNA chain called DNA (5'-D(*GP*TP*CP*GP*CP*CP*AP*TP*AP*AP*AP*TP*CP*AP*C)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	C	15	Total	C	N	O	P	0	0	0
			301	145	56	86	14			

- Molecule 2 is a DNA chain called DNA (5'-D(*AP*CP*GP*TP*GP*AP*TP*TP*TP*AP*TP*GP*GP*CP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	D	15	Total	C	N	O	P	0	0	0
			308	148	56	90	14			

- Molecule 3 is a protein called PROTEIN (ULTRABITHORAX HOMEOTIC PROTEIN IV).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	A	62	Total	C	N	O	S	0	0	0
			557	358	105	91	3			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	139	SER	CYS	engineered mutation	UNP P83949

- Molecule 4 is a protein called PROTEIN (HOMEBOX PROTEIN EXTRADENTICLE).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	B	58	Total	C	N	O	S	0	0	0
			471	298	85	87	1			

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	C	29	Total 29	O 29	0	0
5	D	34	Total 34	O 34	0	0
5	A	28	Total 28	O 28	0	0
5	B	19	Total 19	O 19	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.

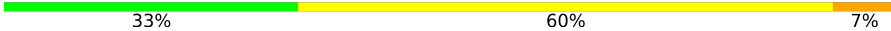
Note EDS was not executed.

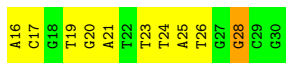
- Molecule 1: DNA (5'-D(*GP*TP*CP*GP*CP*CP*AP*TP*AP*AP*AP*TP*CP*AP*C)-3')

Chain C: 

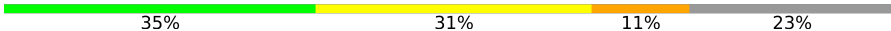


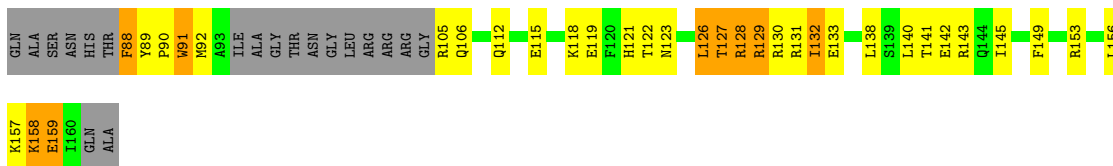
- Molecule 2: DNA (5'-D(*AP*CP*GP*TP*GP*AP*TP*TP*TP*AP*TP*GP*GP*CP*G)-3')

Chain D: 

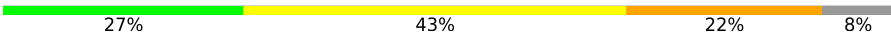


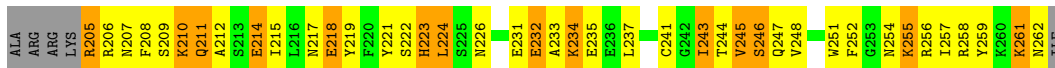
- Molecule 3: PROTEIN (ULTRABITHORAX HOMEOTIC PROTEIN IV)

Chain A: 



- Molecule 4: PROTEIN (HOMEBOX PROTEIN EXTRADENTICLE)

Chain B: 



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	69.43 Å 69.43 Å 100.70 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 2.40	Depositor
% Data completeness (in resolution range)	96.7 (8.00-2.40)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	7.40	Depositor
Refinement program	X-PLOR 3.851	Depositor
R, R_{free}	0.224 , 0.304	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1747	wwPDB-VP
Average B, all atoms (Å ²)	42.0	wwPDB-VP

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	$\# Z > 5$	RMSZ	$\# Z > 5$
1	C	0.31	0/337	0.64	0/517
2	D	0.31	0/345	0.70	0/532
3	A	0.37	0/570	0.84	0/762
4	B	0.36	0/482	1.06	3/648 (0.5%)
All	All	0.34	0/1734	0.84	3/2459 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
2	D	0	1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
4	B	214	GLU	N-CA-C	-6.11	104.55	111.14
4	B	209	SER	N-CA-C	-5.67	102.89	110.55
4	B	245	VAL	N-CA-C	-5.35	105.16	110.62

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	D	28	DG	Sidechain

5.2 Too-close contacts ⓘ

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	301	0	170	15	1
2	D	308	0	172	13	1
3	A	557	0	559	39	0
4	B	471	0	446	64	0
5	A	28	0	0	2	0
5	B	19	0	0	3	0
5	C	29	0	0	5	0
5	D	34	0	0	3	0
All	All	1747	0	1347	121	1

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 41.

All (121) 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)
3:A:89:TYR:HB2	3:A:92:MET:HE2	1.28	1.12
3:A:128:ARG:HG3	3:A:128:ARG:HH11	1.02	1.09
1:C:9:DA:H2''	1:C:10:DA:H5'	1.46	0.97
3:A:158:LYS:HE3	5:B:793:HOH:O	1.64	0.96
3:A:128:ARG:HH11	3:A:128:ARG:CG	1.82	0.91
4:B:217:ASN:HD22	4:B:221:TYR:HE2	1.17	0.90
3:A:128:ARG:HG3	3:A:128:ARG:NH1	1.84	0.87
2:D:24:DT:H2''	2:D:25:DA:H5'	1.53	0.87
3:A:89:TYR:HB2	3:A:92:MET:CE	2.07	0.84
2:D:21:DA:H62	4:B:254:ASN:HD21	1.26	0.83
4:B:210:LYS:NZ	4:B:214:GLU:HG3	1.94	0.83
4:B:218:GLU:HG3	4:B:219:TYR:N	1.95	0.81
4:B:243:ILE:HD11	4:B:248:VAL:HG22	1.65	0.78
4:B:207:ASN:O	4:B:208:PHE:HB2	1.82	0.78
4:B:206:ARG:HG2	4:B:208:PHE:H	1.51	0.76
2:D:16:DA:H5'	5:D:745:HOH:O	1.84	0.75
3:A:88:PHE:CD1	3:A:88:PHE:N	2.52	0.75
1:C:7:DA:H2''	1:C:8:DT:C5'	2.17	0.75
4:B:252:PHE:O	4:B:256:ARG:HB2	1.86	0.74

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:7:DA:H2''	1:C:8:DT:H5''	1.71	0.73
4:B:244:THR:O	4:B:248:VAL:HG23	1.89	0.72
4:B:221:TYR:HA	4:B:224:LEU:HD12	1.72	0.71
4:B:223:HIS:ND1	4:B:223:HIS:N	2.36	0.70
3:A:129:ARG:O	3:A:133:GLU:HG3	1.92	0.69
3:A:88:PHE:CD1	3:A:92:MET:HE1	2.26	0.69
4:B:210:LYS:HZ1	4:B:214:GLU:HG3	1.55	0.67
1:C:11:DA:H2''	1:C:12:DT:H5''	1.77	0.66
1:C:7:DA:C2'	1:C:8:DT:H5''	2.26	0.66
4:B:217:ASN:O	4:B:221:TYR:HD2	1.80	0.65
1:C:11:DA:H2''	1:C:12:DT:C5'	2.27	0.65
3:A:89:TYR:CB	3:A:92:MET:HE2	2.17	0.64
2:D:26:DT:OP2	3:A:143:ARG:CZ	2.45	0.64
3:A:88:PHE:N	3:A:88:PHE:HD1	1.94	0.64
4:B:215:ILE:CG2	4:B:237:LEU:HD23	2.28	0.63
1:C:9:DA:H2''	1:C:10:DA:C5'	2.26	0.63
4:B:211:GLN:O	4:B:214:GLU:HB2	1.97	0.63
4:B:208:PHE:HE1	4:B:247:GLN:NE2	1.97	0.63
2:D:19:DT:H4'	4:B:207:ASN:OD1	1.99	0.62
3:A:106:GLN:HB2	5:A:765:HOH:O	2.00	0.62
2:D:24:DT:H2''	2:D:25:DA:C5'	2.28	0.62
4:B:215:ILE:HB	4:B:241:CYS:SG	2.39	0.62
2:D:19:DT:O2	4:B:205:ARG:NH2	2.29	0.60
4:B:215:ILE:HG22	4:B:237:LEU:HD23	1.84	0.60
2:D:24:DT:H4'	3:A:106:GLN:O	2.03	0.59
1:C:3:DC:H2''	1:C:4:DG:OP2	2.03	0.59
4:B:208:PHE:CE1	4:B:247:GLN:NE2	2.71	0.58
3:A:112:GLN:NE2	3:A:140:LEU:HG	2.19	0.58
3:A:131:ARG:NE	3:A:142:GLU:OE2	2.33	0.58
2:D:23:DT:H5''	5:D:740:HOH:O	2.04	0.57
4:B:206:ARG:HG2	4:B:207:ASN:N	2.19	0.57
4:B:210:LYS:HZ3	4:B:214:GLU:HG3	1.65	0.57
4:B:232:GLU:HG3	4:B:233:ALA:N	2.19	0.57
3:A:115:GLU:HA	3:A:115:GLU:OE1	2.03	0.57
1:C:11:DA:C2'	1:C:12:DT:H5''	2.34	0.56
1:C:8:DT:H2'	5:C:727:HOH:O	2.04	0.56
1:C:12:DT:H1'	1:C:13:DC:H5'	1.86	0.56
5:C:778:HOH:O	4:B:257:ILE:HD11	2.05	0.56
3:A:126:LEU:HD23	3:A:131:ARG:HG2	1.88	0.56
2:D:21:DA:N6	4:B:254:ASN:HD21	2.02	0.55
4:B:233:ALA:O	4:B:237:LEU:HD12	2.07	0.55

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:1:DG:H2'	1:C:2:DT:H72	1.90	0.54
1:C:7:DA:H2''	1:C:8:DT:H5'	1.90	0.54
4:B:211:GLN:HG2	4:B:212:ALA:N	2.22	0.53
1:C:5:DC:OP2	3:A:153:ARG:NH1	2.42	0.53
4:B:243:ILE:HG13	4:B:244:THR:N	2.23	0.53
4:B:261:LYS:O	4:B:262:ASN:CB	2.57	0.53
5:C:778:HOH:O	4:B:257:ILE:CG1	2.57	0.52
4:B:219:TYR:CD2	4:B:237:LEU:HD11	2.45	0.52
4:B:214:GLU:HB3	5:B:772:HOH:O	2.08	0.52
3:A:156:LEU:O	3:A:159:GLU:HB2	2.10	0.52
1:C:1:DG:H2'	1:C:2:DT:C7	2.40	0.52
4:B:218:GLU:HG3	4:B:219:TYR:H	1.74	0.52
4:B:259:TYR:C	4:B:259:TYR:CD1	2.87	0.52
3:A:88:PHE:CE1	3:A:92:MET:HE1	2.45	0.51
3:A:90:PRO:O	3:A:92:MET:N	2.44	0.51
4:B:261:LYS:NZ	4:B:261:LYS:HB3	2.24	0.50
3:A:118:LYS:O	3:A:121:HIS:HB3	2.11	0.50
3:A:88:PHE:HD1	3:A:92:MET:HE1	1.74	0.50
4:B:206:ARG:CG	4:B:207:ASN:N	2.73	0.50
4:B:226:ASN:ND2	5:B:728:HOH:O	2.43	0.50
4:B:217:ASN:O	4:B:221:TYR:CD2	2.63	0.50
4:B:251:TRP:CH2	4:B:255:LYS:HE3	2.47	0.49
3:A:90:PRO:C	3:A:92:MET:N	2.68	0.49
3:A:128:ARG:CG	3:A:128:ARG:NH1	2.51	0.49
4:B:222:SER:HB2	4:B:223:HIS:ND1	2.28	0.49
3:A:127:THR:O	3:A:131:ARG:HG3	2.13	0.48
4:B:219:TYR:C	4:B:219:TYR:CD1	2.91	0.48
4:B:232:GLU:C	4:B:234:LYS:H	2.23	0.47
4:B:208:PHE:HE1	4:B:247:GLN:HE22	1.63	0.47
4:B:210:LYS:HA	4:B:210:LYS:HD2	1.37	0.46
3:A:89:TYR:CB	3:A:92:MET:CE	2.88	0.46
4:B:211:GLN:HA	4:B:214:GLU:HB2	1.98	0.46
2:D:26:DT:OP2	3:A:143:ARG:NH2	2.49	0.46
3:A:153:ARG:NH2	5:A:709:HOH:O	2.49	0.46
4:B:211:GLN:HA	4:B:214:GLU:CD	2.41	0.46
3:A:90:PRO:C	3:A:92:MET:H	2.24	0.45
3:A:141:THR:O	3:A:145:ILE:HG12	2.17	0.45
5:C:778:HOH:O	4:B:257:ILE:HG12	2.17	0.45
3:A:128:ARG:NH1	3:A:132:ILE:HD11	2.32	0.45
4:B:211:GLN:C	4:B:214:GLU:HB2	2.42	0.44
3:A:91:TRP:CZ3	4:B:256:ARG:HG2	2.53	0.44

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:B:215:ILE:HG22	4:B:237:LEU:CD2	2.48	0.44
4:B:255:LYS:HE3	4:B:255:LYS:HB2	1.75	0.43
2:D:28:DG:H3'	5:D:764:HOH:O	2.18	0.43
3:A:128:ARG:NH1	3:A:132:ILE:CD1	2.82	0.42
4:B:255:LYS:O	4:B:259:TYR:CB	2.67	0.42
4:B:218:GLU:CG	4:B:219:TYR:N	2.70	0.42
4:B:243:ILE:HG13	4:B:244:THR:O	2.19	0.42
3:A:119:GLU:OE2	3:A:126:LEU:HD11	2.19	0.41
4:B:247:GLN:HE21	4:B:247:GLN:HB3	1.60	0.41
3:A:119:GLU:CG	3:A:126:LEU:HD11	2.50	0.41
4:B:219:TYR:CD1	4:B:223:HIS:CE1	3.09	0.41
2:D:20:DG:O6	4:B:258:ARG:NH2	2.49	0.41
4:B:255:LYS:O	4:B:259:TYR:HB2	2.20	0.41
5:C:778:HOH:O	4:B:257:ILE:CD1	2.67	0.41
4:B:232:GLU:C	4:B:234:LYS:N	2.78	0.41
3:A:157:LYS:C	3:A:159:GLU:H	2.29	0.40
4:B:206:ARG:HG2	4:B:208:PHE:N	2.26	0.40
4:B:212:ALA:HB1	4:B:241:CYS:HB3	2.03	0.40
4:B:244:THR:HG22	4:B:246:SER:H	1.87	0.40
3:A:126:LEU:HD13	3:A:149:PHE:CE2	2.56	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:1:DG:N2	2:D:17:DC:O2[8_565]	2.18	0.02

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 X-ray entries followed by that with respect to entries of similar resolution.

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
3	A	58/81 (72%)	52 (90%)	5 (9%)	1 (2%)	7 10

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
4	B	56/63 (89%)	48 (86%)	7 (12%)	1 (2%)	6	9
All	All	114/144 (79%)	100 (88%)	12 (10%)	2 (2%)	6	9

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	A	91	TRP
4	B	243	ILE

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 X-ray entries followed by that with respect to entries of similar resolution.

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	
3	A	58/72 (81%)	45 (78%)	13 (22%)	1	1
4	B	49/57 (86%)	35 (71%)	14 (29%)	0	0
All	All	107/129 (83%)	80 (75%)	27 (25%)	0	1

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	A	88	PHE
3	A	105	ARG
3	A	122	THR
3	A	123	ASN
3	A	126	LEU
3	A	127	THR
3	A	128	ARG
3	A	129	ARG
3	A	130	ARG
3	A	132	ILE
3	A	138	LEU
3	A	158	LYS
3	A	159	GLU
4	B	205	ARG

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
4	B	210	LYS
4	B	211	GLN
4	B	218	GLU
4	B	223	HIS
4	B	224	LEU
4	B	231	GLU
4	B	232	GLU
4	B	234	LYS
4	B	235	GLU
4	B	245	VAL
4	B	246	SER
4	B	255	LYS
4	B	261	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
3	A	150	GLN
4	B	217	ASN
4	B	247	GLN
4	B	254	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

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

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.