



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 22, 2018 – 12:00 PM EDT

PDB ID : 6B1Q
Title : Hydrogen Bonding Complementary, not size complementarity is key in the formation of the double helix
Authors : Singh, I.; Georgiadis, M.M.
Deposited on : 2017-09-18
Resolution : 1.90 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : **FAILED**
Mogul : 1.7.3 (157068), CSD as539be (2018)
Xtrriage (Phenix) : 1.13
EDS : rb-20031172
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
Refmac : 5.8.0158
CCP4 : 7.0 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : rb-20031172

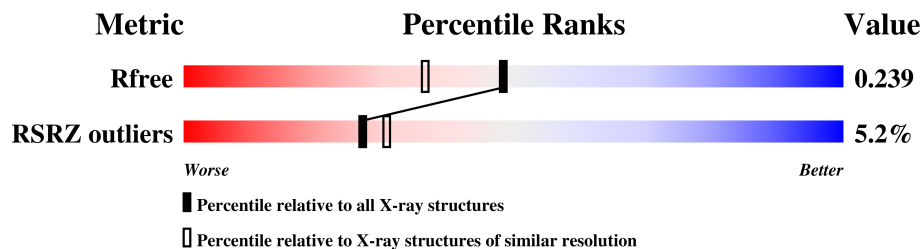
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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))
R_{free}	111664	5502 (1.90-1.90)
RSRZ outliers	108989	5379 (1.90-1.90)

MolProbity failed to run properly - the sequence quality summary graphics cannot be shown.

2 Entry composition i

There are 4 unique types of molecules in this entry. The entry contains 2583 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 protein called Reverse transcriptase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	242	1975	1269	350	350	6	0	3	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	20	GLY	-	expression tag	UNP P03355
A	21	SER	-	expression tag	UNP P03355
A	22	HIS	-	expression tag	UNP P03355
A	23	MET	-	expression tag	UNP P03355

- Molecule 2 is a DNA chain called DNA (5'-D(*CP*TP*TP*AP*TP*(CJ1)P*(CJ1)P*(CJ1))-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	B	8	163	82	23	51	7	0	0	0

- Molecule 3 is a DNA chain called DNA (5'-D(P*(1AP)P*(1AP)P*(1AP)P*AP*TP*AP*AP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
3	G	8	171	80	40	43	8	0	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	260	Total	O	0	0
			260	260		
4	B	7	Total	O	0	0
			7	7		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	G	7	Total	O	0	0
			7	7		

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3 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	55.28Å 146.28Å 46.94Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	44.70 – 1.90 46.94 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.7 (44.70-1.90) 99.7 (46.94-1.90)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.15 (at 1.90Å)	Xtrriage
Refinement program	PHENIX 1.10.1_2155	Depositor
R, R_{free}	0.204 , 0.237 0.206 , 0.239	Depositor DCC
R_{free} test set	1535 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å ²)	21.9	Xtrriage
Anisotropy	0.236	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 52.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	2583	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.60% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

4 Model quality [i](#)

4.1 Standard geometry [i](#)

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4.2 Too-close contacts [i](#)

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4.3 Torsion angles [i](#)

4.3.1 Protein backbone [i](#)

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4.3.2 Protein sidechains [i](#)

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4.3.3 RNA [i](#)

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

6 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	CJ1	B	6	2	16,24,25	0.94	1 (6%)	21,35,38	2.48	6 (28%)
2	CJ1	B	7	2	16,24,25	0.93	1 (6%)	21,35,38	2.15	4 (19%)
2	CJ1	B	8	2	16,24,25	0.97	1 (6%)	21,35,38	2.22	5 (23%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	1AP	G	10	3	19,24,25	1.16	3 (15%)	20,35,38	2.04	8 (40%)
3	1AP	G	11	3	19,24,25	1.16	3 (15%)	20,35,38	2.24	6 (30%)
3	1AP	G	9	3	19,24,25	1.14	3 (15%)	20,35,38	2.15	7 (35%)

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	CJ1	B	6	2	-	0/3/21/22	0/3/3/3
2	CJ1	B	7	2	-	0/3/21/22	0/3/3/3
2	CJ1	B	8	2	-	0/3/21/22	0/3/3/3
3	1AP	G	10	3	-	0/3/21/22	0/3/3/3
3	1AP	G	11	3	-	0/3/21/22	0/3/3/3
3	1AP	G	9	3	-	0/3/21/22	0/3/3/3

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	G	10	1AP	C6-N6	-2.62	1.23	1.34
3	G	11	1AP	C6-N6	-2.57	1.23	1.34
3	G	9	1AP	C6-N6	-2.51	1.23	1.34
3	G	9	1AP	C8-N7	-2.46	1.30	1.34
3	G	11	1AP	C8-N7	-2.42	1.30	1.34
3	G	10	1AP	C8-N7	-2.37	1.30	1.34
3	G	11	1AP	C6-N1	2.20	1.38	1.33
3	G	10	1AP	C6-N1	2.41	1.38	1.33
2	B	7	CJ1	O2-C2	2.46	1.34	1.24
3	G	9	1AP	C6-N1	2.46	1.38	1.33
2	B	6	CJ1	O2-C2	2.55	1.34	1.24
2	B	8	CJ1	O2-C2	2.60	1.34	1.24

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	G	11	1AP	O3'-C3'-C2'	-4.92	93.01	110.86
3	G	9	1AP	O3'-C3'-C2'	-4.87	93.22	110.86
2	B	7	CJ1	C5-C6-N1	-4.53	111.03	123.72
2	B	6	CJ1	C5-C6-N1	-4.36	111.50	123.72
2	B	8	CJ1	C5-C6-N1	-4.21	111.93	123.72

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	G	10	1AP	C2-N3-C4	-3.76	110.77	115.16
3	G	11	1AP	C2-N3-C4	-3.69	110.85	115.16
3	G	9	1AP	C2-N3-C4	-3.58	110.97	115.16
3	G	10	1AP	O3'-C3'-C2'	-3.03	99.88	110.86
3	G	11	1AP	C2'-C1'-N9	-2.95	107.39	114.27
3	G	10	1AP	C2'-C1'-N9	-2.84	107.65	114.27
3	G	9	1AP	C2'-C1'-N9	-2.84	107.66	114.27
2	B	8	CJ1	N3-C2-N1	-2.73	123.62	127.73
3	G	11	1AP	N3-C2-N1	-2.48	123.77	127.41
3	G	9	1AP	N3-C2-N1	-2.43	123.85	127.41
2	B	6	CJ1	N3-C2-N1	-2.42	124.08	127.73
2	B	7	CJ1	N3-C2-N1	-2.33	124.22	127.73
3	G	10	1AP	N3-C2-N1	-2.22	124.16	127.41
3	G	10	1AP	C4'-O4'-C1'	-2.07	104.40	109.43
3	G	10	1AP	C4-C5-N7	2.12	111.46	109.41
3	G	9	1AP	O3'-C3'-C4'	2.39	119.50	110.14
2	B	6	CJ1	C2'-C1'-N9	2.50	120.09	114.27
3	G	10	1AP	C2-N1-C6	2.87	125.62	116.73
3	G	9	1AP	C2-N1-C6	2.91	125.74	116.73
3	G	11	1AP	C2-N1-C6	3.04	126.15	116.73
3	G	9	1AP	C5-C6-N6	3.40	127.39	120.47
3	G	10	1AP	C5-C6-N6	3.77	128.16	120.47
3	G	11	1AP	C5-C6-N6	4.05	128.72	120.47
2	B	8	CJ1	C8-N9-C1'	4.22	129.57	125.40
2	B	8	CJ1	C2-N1-C6	4.54	125.23	115.50
2	B	7	CJ1	C2-N1-C6	4.61	125.39	115.50
2	B	6	CJ1	C2-N1-C6	4.63	125.43	115.50
2	B	6	CJ1	C8-N9-C1'	5.39	130.72	125.40
2	B	7	CJ1	O6-C6-C5	5.50	128.78	116.64
2	B	8	CJ1	O6-C6-C5	5.60	128.99	116.64
2	B	6	CJ1	O6-C6-C5	6.08	130.04	116.64

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	8	CJ1	0	3
3	G	9	1AP	0	3

4.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

4.6 Ligand geometry [i](#)

There are no ligands in this entry.

4.7 Other polymers [i](#)

There are no such residues in this entry.

4.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

5 Fit of model and data [i](#)

5.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	242/259 (93%)	0.24	13 (5%) 26 29	11, 24, 53, 69	0
2	B	5/8 (62%)	0.12	0 100 100	39, 42, 46, 56	0
3	G	5/8 (62%)	0.64	0 100 100	32, 47, 63, 63	0
All	All	252/275 (91%)	0.25	13 (5%) 27 31	11, 25, 54, 69	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	173	ARG	4.7
1	A	234	LEU	3.4
1	A	26	LEU	3.2
1	A	64	TYR	2.9
1	A	109	TYR	2.9
1	A	99	LEU	2.8
1	A	180	SER	2.6
1	A	145	TRP	2.6
1	A	100	PRO	2.4
1	A	101	VAL	2.2
1	A	25	TRP	2.2
1	A	238	GLN	2.1
1	A	272	LEU	2.1

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

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	CJ1	B	7	22/23	0.76	0.22	41,64,79,84	0
2	CJ1	B	6	22/23	0.83	0.24	48,59,81,83	0
2	CJ1	B	8	22/23	0.84	0.20	36,52,73,89	0
3	1AP	G	10	22/23	0.89	0.15	39,49,69,73	0
3	1AP	G	9	22/23	0.89	0.17	37,49,65,74	0
3	1AP	G	11	22/23	0.91	0.15	42,51,71,73	0

5.3 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.4 Ligands [i](#)

There are no ligands in this entry.

5.5 Other polymers [i](#)

There are no such residues in this entry.