



wwPDB X-ray Structure Validation Summary Report ⓘ

Sep 20, 2023 – 01:31 PM EDT

PDB ID : 5I6Q
Title : Crystal structure of color device state B
Authors : Hao, Y.; Birktoft, J.; Seeman, N.C.
Deposited on : 2016-02-16
Resolution : 4.91 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.35.1
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.35.1

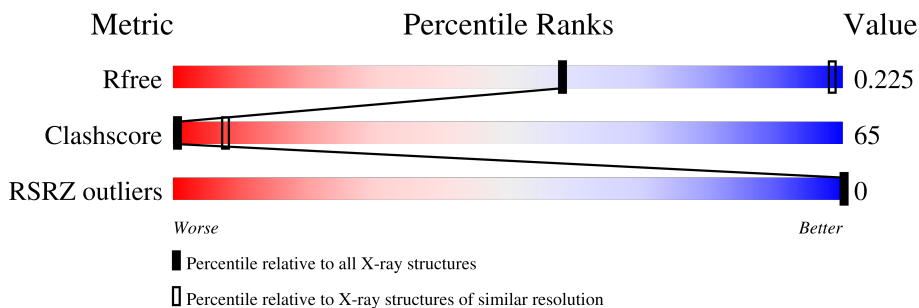
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 4.91 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}	130704	1135 (6.02-3.80)
Clashscore	141614	1210 (6.02-3.80)
RSRZ outliers	127900	1007 (6.10-3.72)

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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	21	
2	B	26	
3	C	14	
4	D	14	
5	E	14	
6	F	21	
7	G	21	

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Mol	Chain	Length	Quality of chain
8	H	5	 100%

2 Entry composition i

There are 8 unique types of molecules in this entry. The entry contains 2767 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*CP*TP*AP*CP*CP*TP*GP*GP*CP*AP*GP*GP*AP*CP*GP*AP*CP*T)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
1	A	21	426	203	79	124	20	0	0	0

- Molecule 2 is a DNA chain called DNA (26-MER).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	B	26	520	249	93	153	25	0	0	0

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
3	C	14	290	139	53	85	13	0	0	0

- Molecule 4 is a DNA chain called DNA (5'-D(*AP*CP*AP*GP*TP*CP*GP*TP*GP*GP*TP*AP*TP*C)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
4	D	14	285	137	52	83	13	0	0	0

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
5	E	14	287	137	52	85	13	0	0	0

- Molecule 6 is a DNA chain called DNA (5'-D(*CP*AP*GP*AP*TP*AP*CP*CP*TP*GP*

AP*TP*CP*GP*GP*AP*CP*TP*AP*CP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
6	F	21	427	204	81	122	20	0	0	0

- Molecule 7 is a DNA chain called DNA (5'-D(*GP*AP*GP*CP*GP*AP*CP*CP*TP*GP*TP*AP*CP*GP*GP*AP*CP*AP*TP*CP*A)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
7	G	21	429	204	84	121	20	0	0	0

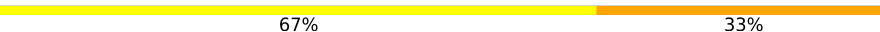
- Molecule 8 is a DNA chain called DNA (5'-D(P*TP*AP*GP*AP*C)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
8	H	5	103	49	20	29	5	0	0	0

3 Residue-property plots


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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). 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: DNA (5'-D(*GP*TP*CP*CP*TP*AP*CP*CP*TP*GP*GP*CP*AP*GP*GP*AP*CP*GP*AP*CP*T)-3')

Chain A:  67% 33%



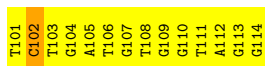
- Molecule 2: DNA (26-MER)

Chain B:  15% 58% 27%

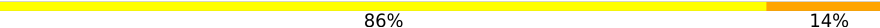


- Molecule 3: DNA (5'-D(*TP*CP*TP*GP*AP*TP*GP*TP*GP*GP*TP*AP*GP*G)-3')

Chain C:  93% 7%



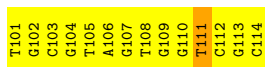
- Molecule 4: DNA (5'-D(*AP*CP*AP*GP*TP*CP*GP*TP*GP*GP*TP*AP*TP*C)-3')

Chain D:  86% 14%



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

Chain E:  93% 7%



- Molecule 6: DNA (5'-D(*CP*AP*GP*AP*TP*AP*CP*CP*TP*GP*AP*TP*CP*GP*GP*AP*CP*TP*AP*CP*G)-3')

Chain F:  5% 86% 10%

C201
A202
G203
A204
T205
A206
C207
C208
T209
G210
A211
T212
C213
G214
G215
A216
C217
T218
A219
C220
G221

- Molecule 7: DNA (5'-D(*GP*AP*GP*CP*GP*AP*CP*CP*TP*GP*TP*AP*CP*GP*GP*AP*CP*AP*TP*CP*A)-3')

Chain G:  5% 95%

G301
A302
G303
C304
G305
A306
C307
C308
T309
G310
T311
A312
C313
G314
G315
A316
C317
A318
T319
C320
A321

- Molecule 8: DNA (5'-D(P*TP*AP*GP*AP*C)-3')

Chain H:  100%

There are no outlier residues recorded for this chain.

4 Data and refinement statistics i

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	67.64Å 69.01Å 69.27Å 99.02° 96.63° 100.28°	Depositor
Resolution (Å)	33.39 – 4.91 33.39 – 4.91	Depositor EDS
% Data completeness (in resolution range)	86.1 (33.39-4.91) 86.4 (33.39-4.91)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.03 (at 4.83Å)	Xtriage
Refinement program	PHENIX (1.10_2152)	Depositor
R, R_{free}	0.148 , 0.226 0.148 , 0.225	Depositor DCC
R_{free} test set	479 reflections (10.14%)	wwPDB-VP
Wilson B-factor (Å ²)	262.2	Xtriage
Anisotropy	0.104	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.06 , 121.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.27$	Xtriage
Estimated twinning fraction	0.087 for k,l,h 0.087 for l,h,k 0.045 for -k,-h,-l 0.049 for -l,-k,-h 0.056 for -h,-l,-k	Xtriage
F_o, F_c correlation	0.99	EDS
Total number of atoms	2767	wwPDB-VP
Average B, all atoms (Å ²)	313.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.80% 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.

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	A	1.56	7/477 (1.5%)	1.17	1/734 (0.1%)
2	B	1.27	4/581 (0.7%)	1.14	4/892 (0.4%)
3	C	1.21	0/325	1.27	1/502 (0.2%)
4	D	1.25	0/319	1.23	3/491 (0.6%)
5	E	1.07	0/321	1.10	1/495 (0.2%)
6	F	1.21	1/479 (0.2%)	1.10	2/737 (0.3%)
7	G	1.16	0/482	1.03	0/742
8	H	0.80	0/115	0.85	0/175
All	All	1.25	12/3099 (0.4%)	1.13	12/4768 (0.3%)

The worst 5 of 12 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	113	DA	N9-C4	-7.75	1.33	1.37
1	A	104	DC	C3'-O3'	-6.83	1.35	1.44
2	B	111	DC	N1-C6	-6.22	1.33	1.37
1	A	112	DC	C1'-N1	6.13	1.57	1.49
6	F	202	DA	N9-C4	-6.12	1.34	1.37

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	108	DT	O4'-C4'-C3'	-9.09	100.55	106.00
2	B	117	DA	O4'-C1'-N9	6.51	112.56	108.00
2	B	110	DA	O4'-C1'-N9	5.88	112.11	108.00
2	B	110	DA	C1'-O4'-C4'	-5.85	104.25	110.10
2	B	101	DA	O4'-C4'-C3'	-5.72	102.21	104.50

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	426	0	237	54	0
2	B	520	0	293	54	0
3	C	290	0	161	30	1
4	D	285	0	160	39	0
5	E	287	0	160	33	0
6	F	427	0	237	44	0
7	G	429	0	236	43	1
8	H	103	0	57	0	0
All	All	2767	0	1541	245	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 65.

The worst 5 of 245 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)
4:D:113:DT:O4	6:F:204:DA:N6	1.94	0.98
3:C:106:DT:O4	7:G:318:DA:N6	1.97	0.97
1:A:113:DA:N1	2:B:113:DT:N3	2.14	0.94
1:A:111:DG:N2	2:B:115:DC:O2	2.03	0.91
1:A:110:DG:H3'	1:A:111:DG:C8	2.08	0.89

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)
3:C:102:DC:N4	7:G:301:DG:O6[1_556]	2.12	0.08

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

There are no protein molecules in this entry.

5.3.2 Protein sidechains [i](#)

There are no protein molecules in this entry.

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 monosaccharides 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.

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

6.1 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	21/21 (100%)	-1.44	0 100 100	206, 268, 316, 331	0
2	B	26/26 (100%)	-1.15	0 100 100	227, 247, 613, 697	0
3	C	14/14 (100%)	-1.54	0 100 100	246, 316, 405, 410	0
4	D	14/14 (100%)	-1.53	0 100 100	272, 326, 342, 346	0
5	E	14/14 (100%)	-1.55	0 100 100	255, 284, 340, 353	0
6	F	21/21 (100%)	-1.50	0 100 100	233, 274, 325, 345	0
7	G	21/21 (100%)	-1.46	0 100 100	260, 285, 328, 335	0
8	H	5/5 (100%)	0.21	0 100 100	636, 718, 727, 742	0
All	All	136/136 (100%)	-1.37	0 100 100	206, 285, 613, 742	0

There are no RSRZ outliers to report.

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

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

6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.