



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 12, 2022 – 02:03 PM EDT

PDB ID : 7SGB  
Title : [C-C] DNA mismatch in a self-assembling rhombohedral lattice at pH 5.5  
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Deposited on : 2021-10-05  
Resolution : 5.20 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](mailto: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>.

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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	:	2.31.2
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)	:	2.31.2

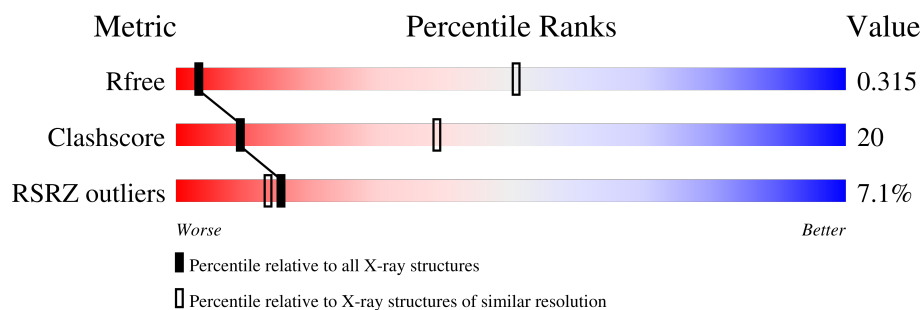
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 5.20 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	1167 (6.60-3.80)
Clashscore	141614	1006 (6.56-3.84)
RSRZ outliers	127900	1008 (6.64-3.74)

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  $\geq 3$ , 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	<div> <div>14%</div> <div>19%</div> <div>71%</div> <div>10%</div> </div>
2	B	7	<div> <div>43%</div> <div>57%</div> </div>
3	C	7	<div> <div>71%</div> <div>29%</div> </div>
4	D	7	<div> <div>14%</div> <div>71%</div> <div>14%</div> </div>

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 856 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\*AP\*GP\*CP\*AP\*GP\*CP\*CP\*TP\*GP\*TP\*CP\*TP\*GP\*GP\*AP\*CP\*AP\*TP\*CP\*A)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	21	Total	C	N	O	P	0	0	0
			428	204	81	123	20			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	7	Total	C	N	O	P	0	0	0
			139	66	27	39	7			

- Molecule 3 is a DNA chain called DNA (5'-D(P\*GP\*GP\*CP\*TP\*GP\*CP\*T)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	7	Total	C	N	O	P	0	0	0
			144	68	25	44	7			

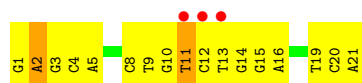
- Molecule 4 is a DNA chain called DNA (5'-D(P\*CP\*TP\*GP\*AP\*TP\*GP\*T)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	7	Total	C	N	O	P	0	0	0
			145	69	24	45	7			

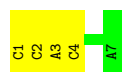
### 3 Residue-property plots [i](#)

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 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\*AP\*GP\*CP\*AP\*GP\*CP\*CP\*TP\*GP\*TP\*CP\*TP\*GP\*GP\*AP\*CP\*AP\*TP\*CP\*A)-3')



- Molecule 2: DNA (5'-D(P\*CP\*CP\*AP\*CP\*AP\*CP\*A)-3')



- Molecule 3: DNA (5'-D(P\*GP\*GP\*CP\*TP\*GP\*CP\*T)-3')



- Molecule 4: DNA (5'-D(P\*CP\*TP\*GP\*AP\*TP\*GP\*T)-3')



## 4 Data and refinement statistics

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	107.06Å 107.06Å 90.29Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	32.67 – 5.20 64.68 – 5.20	Depositor EDS
% Data completeness (in resolution range)	82.3 (32.67-5.20) 71.7 (64.68-5.20)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	0.85 (at 5.11Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, $R_{free}$	0.233 , 0.321 0.233 , 0.315	Depositor DCC
$R_{free}$ test set	51 reflections (4.13%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	280.5	Xtriage
Anisotropy	0.668	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.17 , 405.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.048 for h,-h-k,-l	Xtriage
$F_o, F_c$ correlation	0.86	EDS
Total number of atoms	856	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	375.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.18% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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	0.76	0/480	1.11	2/739 (0.3%)
2	B	0.65	0/155	0.83	0/235
3	C	0.59	0/160	1.00	0/245
4	D	1.02	1/161 (0.6%)	1.15	1/245 (0.4%)
All	All	0.77	1/956 (0.1%)	1.06	3/1464 (0.2%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	1	DC	OP3-P	-9.81	1.49	1.61

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	A	2	DA	O4'-C1'-N9	6.27	112.39	108.00
1	A	11	DT	O4'-C1'-N1	5.34	111.74	108.00
4	D	1	DC	O4'-C1'-N1	5.04	111.53	108.00

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	428	0	237	16	0
2	B	139	0	78	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	144	0	80	1	0
4	D	145	0	81	7	0
All	All	856	0	476	26	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 20.

All (26) 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:A:20:DC:H2''	1:A:21:DA:H5''	1.72	0.70
2:B:1:DC:H1'	4:D:7:DT:H2'	1.78	0.65
1:A:9:DT:H2'	1:A:10:DG:C8	2.31	0.65
1:A:4:DC:H2'	1:A:5:DA:C8	2.33	0.63
4:D:2:DT:H2'	4:D:3:DG:C8	2.35	0.61
4:D:2:DT:H2'	4:D:3:DG:H8	1.67	0.59
4:D:6:DG:H2''	4:D:7:DT:H5''	1.83	0.59
1:A:3:DG:H2''	1:A:4:DC:O5'	2.04	0.57
1:A:10:DG:H2'	1:A:11:DT:C6	2.40	0.57
1:A:8:DC:H5''	1:A:8:DC:H6	1.71	0.56
1:A:12:DC:H2'	1:A:13:DT:H71	1.88	0.56
1:A:14:DG:H2''	1:A:15:DG:C8	2.43	0.53
4:D:2:DT:H2''	4:D:3:DG:O5'	2.11	0.50
4:D:5:DT:H6	4:D:5:DT:H5'	1.78	0.48
1:A:1:DG:H2'	1:A:2:DA:C8	2.50	0.46
3:C:11:DT:H2''	3:C:12:DG:OP1	2.17	0.45
4:D:1:DC:H1'	4:D:2:DT:OP2	2.17	0.44
2:B:1:DC:H2'	2:B:2:DC:C5	2.52	0.44
1:A:12:DC:H6	1:A:12:DC:OP1	2.02	0.43
1:A:2:DA:H1'	1:A:3:DG:OP2	2.19	0.42
1:A:10:DG:H2'	1:A:11:DT:C5	2.54	0.42
1:A:8:DC:H2'	1:A:9:DT:H72	2.01	0.42
1:A:19:DT:H2''	1:A:20:DC:O5'	2.19	0.42
2:B:3:DA:H2''	2:B:4:DC:OP2	2.21	0.41
1:A:15:DG:H4'	1:A:16:DA:OP1	2.20	0.40
1:A:11:DT:H1'	1:A:12:DC:OP2	2.21	0.40

There are no symmetry-related clashes.

## 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	21/21 (100%)	-0.10	3 (14%) 2 4	257, 387, 486, 567	0
2	B	7/7 (100%)	-0.58	0 100 100	227, 308, 379, 423	0
3	C	7/7 (100%)	-0.68	0 100 100	301, 355, 430, 537	0
4	D	7/7 (100%)	-0.68	0 100 100	219, 302, 421, 503	0
All	All	42/42 (100%)	-0.37	3 (7%) 16 14	219, 376, 501, 567	0

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	12	DC	2.8
1	A	11	DT	2.8
1	A	13	DT	2.3

### 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.