



# Full wwPDB X-ray Structure Validation Report ⓘ

May 14, 2020 – 05:14 am BST

PDB ID : 9BNA  
Title : RE-REFINEMENT OF THE B-DODECAMER D(CGCGAATTCGCG)  
WITH A COMPARATIVE ANALYSIS OF THE SOLVENT IN IT AND IN  
THE Z-HEXAMER D(5BRCG5BRCG5BRCG)  
Authors : Westhof, E.  
Deposited on : 1990-02-01  
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](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.

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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  
Xtrriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11



## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 549 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(\*CP\*GP\*CP\*GP\*AP\*AP\*TP\*TP\*CP\*GP\*CP\*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	12	Total	C	N	O	P	0	0	0
			243	116	46	70	11			
1	B	12	Total	C	N	O	P	0	0	0
			243	116	46	70	11			

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	37	Total	O	0	0
			37	37		
2	B	26	Total	O	0	0
			26	26		

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

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.

Note EDS was not executed.

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

Chain A: 



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

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 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	24.87Å 40.39Å 66.20Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	5.00 – 1.90	Depositor
% Data completeness (in resolution range)	(Not available) (5.00-1.90)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	NUCLSQ	Depositor
R, $R_{free}$	0.188 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	549	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	40.0	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	A	1.68	2/272 (0.7%)	2.72	29/418 (6.9%)
1	B	1.69	3/272 (1.1%)	2.62	34/418 (8.1%)
All	All	1.68	5/544 (0.9%)	2.67	63/836 (7.5%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	7	DT	C4'-O4'	-5.87	1.39	1.45
1	A	6	DA	N9-C4	5.54	1.41	1.37
1	B	23	DC	N3-C4	5.38	1.37	1.33
1	B	20	DT	C4'-O4'	-5.32	1.39	1.45
1	B	15	DC	C4'-O4'	-5.10	1.40	1.45

All (63) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	22	DG	O4'-C1'-N9	10.18	115.13	108.00
1	A	7	DT	P-O3'-C3'	10.16	131.90	119.70
1	A	5	DA	P-O3'-C3'	9.78	131.43	119.70
1	B	24	DG	O4'-C1'-N9	9.38	114.57	108.00
1	A	9	DC	N1-C2-O2	9.01	124.31	118.90
1	B	19	DT	C2-N3-C4	-8.55	122.07	127.20
1	A	8	DT	C2-N3-C4	-8.40	122.16	127.20
1	A	10	DG	O4'-C1'-N9	8.29	113.80	108.00
1	B	20	DT	C2-N3-C4	-8.18	122.29	127.20
1	B	13	DC	O4'-C1'-N1	8.10	113.67	108.00
1	A	6	DA	O4'-C1'-N9	7.84	113.49	108.00
1	A	1	DC	N3-C4-C5	-7.80	118.78	121.90
1	A	2	DG	C5-C6-N1	7.65	115.33	111.50
1	B	17	DA	N1-C2-N3	-7.31	125.64	129.30
1	A	6	DA	N1-C2-N3	-7.21	125.69	129.30
1	B	18	DA	C5-C6-N1	-7.21	114.09	117.70
1	B	19	DT	C6-C5-C7	-6.98	118.71	122.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	7	DT	C2-N3-C4	-6.93	123.04	127.20
1	A	2	DG	C6-N1-C2	-6.80	121.02	125.10
1	A	8	DT	N3-C4-C5	6.69	119.22	115.20
1	B	18	DA	C6-N1-C2	6.66	122.59	118.60
1	B	22	DG	C5-C6-N1	6.64	114.82	111.50
1	A	5	DA	O4'-C1'-N9	6.56	112.59	108.00
1	A	3	DC	OP1-P-OP2	-6.42	109.97	119.60
1	B	16	DG	N1-C6-O6	-6.32	116.11	119.90
1	B	15	DC	N3-C4-C5	-6.27	119.39	121.90
1	B	15	DC	C2-N3-C4	6.23	123.01	119.90
1	B	19	DT	C4-C5-C7	6.20	122.72	119.00
1	B	22	DG	C6-N1-C2	-6.07	121.46	125.10
1	A	8	DT	N1-C2-N3	6.04	118.22	114.60
1	A	8	DT	P-O3'-C3'	6.01	126.91	119.70
1	A	9	DC	C5-C4-N4	6.01	124.41	120.20
1	A	6	DA	P-O5'-C5'	-6.00	111.30	120.90
1	A	7	DT	O4'-C1'-N1	6.00	112.20	108.00
1	B	13	DC	N3-C4-C5	-5.92	119.53	121.90
1	B	19	DT	P-O5'-C5'	-5.81	111.60	120.90
1	B	23	DC	O4'-C1'-N1	5.76	112.03	108.00
1	B	19	DT	N1-C2-N3	5.72	118.03	114.60
1	B	19	DT	N3-C4-C5	5.67	118.60	115.20
1	A	12	DG	C5-C6-N1	5.66	114.33	111.50
1	A	7	DT	N3-C4-C5	5.66	118.59	115.20
1	A	10	DG	C5-C6-N1	5.64	114.32	111.50
1	B	21	DC	N3-C4-C5	-5.64	119.64	121.90
1	A	2	DG	C5-C6-O6	-5.57	125.25	128.60
1	B	17	DA	P-O3'-C3'	5.56	126.37	119.70
1	B	20	DT	N1-C2-N3	5.43	117.86	114.60
1	A	10	DG	O5'-P-OP1	5.41	117.20	110.70
1	A	11	DC	O4'-C1'-N1	5.41	111.78	108.00
1	B	23	DC	N1-C2-O2	5.36	122.12	118.90
1	B	20	DT	C5-C4-O4	-5.35	121.15	124.90
1	B	20	DT	N3-C4-C5	5.33	118.40	115.20
1	B	19	DT	C5-C4-O4	-5.32	121.17	124.90
1	B	20	DT	P-O5'-C5'	-5.31	112.41	120.90
1	B	21	DC	C2-N3-C4	5.30	122.55	119.90
1	A	5	DA	C5-C6-N1	-5.29	115.06	117.70
1	B	16	DG	C6-N1-C2	-5.28	121.93	125.10
1	B	19	DT	N1-C2-O2	-5.18	118.95	123.10
1	A	9	DC	N3-C2-O2	-5.11	118.32	121.90
1	B	16	DG	O4'-C1'-N9	5.08	111.56	108.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	4	DG	C5-C6-N1	5.05	114.03	111.50
1	B	13	DC	N1-C2-O2	5.03	121.92	118.90
1	B	14	DG	N1-C6-O6	-5.03	116.88	119.90
1	A	2	DG	P-O3'-C3'	5.02	125.72	119.70

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	243	0	136	5	0
1	B	243	0	136	10	0
2	A	37	0	0	4	0
2	B	26	0	0	1	0
All	All	549	0	272	15	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 (15) 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:1:DC:H5'	2:A:37:HOH:O	1.55	1.03
1:B:13:DC:H2''	1:B:14:DG:C8	2.30	0.67
1:B:17:DA:N6	2:B:43:HOH:O	2.30	0.64
1:A:6:DA:H5''	2:A:47:HOH:O	1.97	0.62
1:A:4:DG:H2'	2:A:80:HOH:O	2.04	0.56
1:B:18:DA:H2''	1:B:19:DT:O5'	2.05	0.55
1:A:10:DG:H1'	1:A:11:DC:C5	2.43	0.53
1:B:22:DG:H2''	1:B:23:DC:C5	2.44	0.53
1:B:23:DC:H2''	1:B:24:DG:C8	2.46	0.50
1:B:20:DT:H2''	1:B:21:DC:O5'	2.14	0.47
1:A:9:DC:H5	2:A:31:HOH:O	1.99	0.44
1:B:16:DG:H2''	1:B:17:DA:OP2	2.19	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:13:DC:H5''	1:B:13:DC:H6	1.84	0.43
1:B:15:DC:H2''	1:B:16:DG:C8	2.54	0.42
1:B:13:DC:H2''	1:B:14:DG:H8	1.83	0.42

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 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

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.