



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 04:42 PM UTC

PDB ID : 8CYN / pdb_00008cyn
Title : [2T7+20bp Linker] Self-Assembled 3D DNA Hexagonal Tensegrity Triangle with 20 bp Sticky-End Linker
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Deposited on : 2022-05-24
Resolution : 9.45 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)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

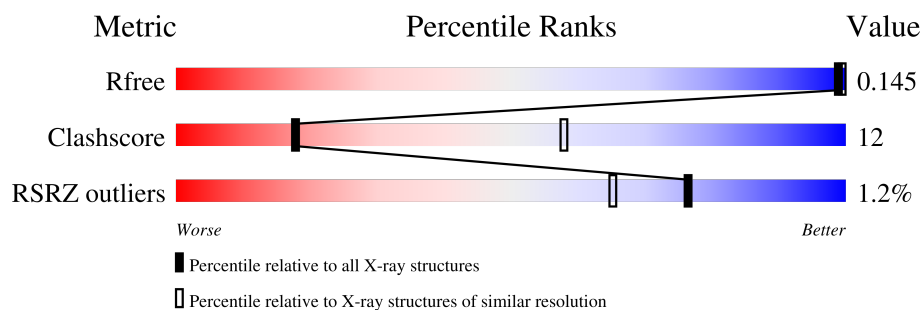
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 9.45 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}	180053	1168 (11.50-4.00)
Clashscore	190562	1001 (11.50-4.06)
RSRZ outliers	180081	1162 (11.50-4.00)

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	19% 81%
2	B	7	57% 43%
3	C	6	17% 83%
4	D	8	75% 25%
5	X	20	5% 90% 10%
6	Y	20	65% 35%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 1675 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*CP*GP*CP*AP*GP*CP*CP*TP*GP*TP*AP*CP*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
			427	203	82	122	20			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	7	Total	C	N	O	P	0	0	0
			141	67	26	41	7			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	6	Total	C	N	O	P	0	0	0
			124	58	23	37	6			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	8	Total	C	N	O	P	0	0	0
			161	79	26	49	7			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	X	20	Total	C	N	O	P	0	0	0
			417	197	82	118	20			

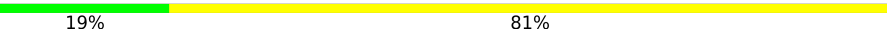
- Molecule 6 is a DNA chain called DNA (5'-D(P*GP*CP*TP*CP*TP*GP*CP*TP*AP*CP*TP*AP*CP*GP*TP*CP*AP*GP*CP*A)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
6	Y	20	Total 405	C 193	N 71	O 121	P 20	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*CP*GP*CP*AP*GP*CP*CP*TP*GP*TP*AP*CP*GP*GP*AP*CP*AP*TP*CP*A)-3')

Chain A: 

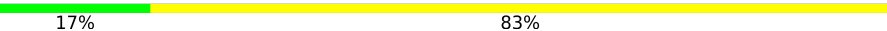


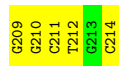
- Molecule 2: DNA (5'-D(P*CP*CP*GP*TP*AP*CP*A)-3')

Chain B: 



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

Chain C: 



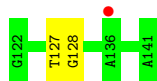
- Molecule 4: DNA (5'-D(*TP*CP*TP*GP*AP*TP*GP*T)-3')

Chain D: 



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

Chain X: 



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

Chain Y: 

G102	C103	G108	T109	A110	A113	C114	A121
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4 Data and refinement statistics

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, α , β , γ	231.03Å 231.03Å 100.85Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	50.02 – 9.45 50.02 – 9.45	Depositor EDS
% Data completeness (in resolution range)	63.2 (50.02-9.45) 58.5 (50.02-9.45)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$	-	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.096 , 0.144 0.098 , 0.145	Depositor DCC
R_{free} test set	69 reflections (3.33%)	wwPDB-VP
Wilson B-factor (Å ²)	(Not available)	Xtriage
Anisotropy	(Not available)	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.23 , 999.0	EDS
L-test for twinning ¹	$\langle L \rangle =$ (Not available), $\langle L^2 \rangle =$ (Not available)	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	1675	wwPDB-VP
Average B, all atoms (Å ²)	977.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *(Not available)*

¹Theoretical 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	0.26	0/479	0.54	0/737
2	B	0.21	0/157	0.45	0/239
3	C	0.25	0/138	0.55	0/211
4	D	0.21	0/179	0.47	0/275
5	X	0.18	0/469	0.35	0/723
6	Y	0.24	0/452	0.45	0/694
All	All	0.23	0/1874	0.46	0/2879

There are no bond length outliers.

There are no bond angle outliers.

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	427	0	236	19	0
2	B	141	0	79	2	0
3	C	124	0	68	5	0
4	D	161	0	94	1	0
5	X	417	0	225	1	0
6	Y	405	0	226	5	0
All	All	1675	0	928	32	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 12.

All (32) 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:112:DA:H2'	1:A:113:DC:C6	2.28	0.69
1:A:111:DT:H2''	1:A:112:DA:C8	2.35	0.61
1:A:120:DC:H2'	1:A:121:DA:C8	2.36	0.60
1:A:118:DA:C4	1:A:119:DT:H72	2.37	0.59
6:Y:113:DA:H2'	6:Y:114:DC:C6	2.40	0.56
2:B:121:DG:H2'	2:B:122:DT:H71	1.87	0.56
1:A:103:DG:H22	3:C:214:DC:H42	1.53	0.55
1:A:104:DC:H1'	1:A:105:DA:C5	2.42	0.55
3:C:209:DG:H2'	3:C:210:DG:C8	2.42	0.54
1:A:113:DC:H2''	1:A:114:DG:C5	2.45	0.51
1:A:115:DG:N3	1:A:116:DA:N7	2.59	0.51
2:B:120:DC:H2''	2:B:121:DG:N7	2.24	0.51
1:A:103:DG:H2''	1:A:104:DC:H2'	1.93	0.51
3:C:211:DC:H2''	3:C:212:DT:O5'	2.14	0.48
6:Y:102:DG:H2''	6:Y:103:DC:OP2	2.12	0.48
6:Y:102:DG:H1'	6:Y:103:DC:H4'	1.95	0.48
1:A:107:DC:H2''	1:A:108:DC:H5'	1.95	0.47
5:X:127:DT:H2''	5:X:128:DG:C8	2.49	0.47
1:A:114:DG:H2''	1:A:115:DG:C8	2.51	0.46
3:C:211:DC:H2'	3:C:212:DT:H72	1.98	0.46
1:A:101:DG:H2'	1:A:102:DC:C6	2.50	0.46
1:A:113:DC:H2''	1:A:114:DG:N7	2.31	0.45
6:Y:108:DC:H2''	6:Y:109:DT:C5	2.50	0.45
3:C:211:DC:H4'	3:C:212:DT:OP1	2.17	0.45
1:A:103:DG:H1'	1:A:104:DC:H5'	1.99	0.44
6:Y:109:DT:H2''	6:Y:110:DA:H5''	1.99	0.44
1:A:112:DA:H2''	1:A:113:DC:O5'	2.18	0.43
4:D:206:DT:H2''	4:D:207:DG:N7	2.33	0.43
1:A:112:DA:H2''	1:A:113:DC:C5'	2.48	0.43
1:A:114:DG:H2''	1:A:115:DG:OP2	2.19	0.43
1:A:115:DG:H1'	1:A:116:DA:C8	2.55	0.41
1:A:111:DT:H2''	1:A:112:DA:H8	1.82	0.41

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 oligosaccharides 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%)	0.08	0 100 100	586, 813, 1196, 1695	0
2	B	7/7 (100%)	-0.08	0 100 100	643, 657, 955, 1024	0
3	C	6/6 (100%)	0.33	0 100 100	627, 792, 915, 1218	0
4	D	8/8 (100%)	-0.31	0 100 100	394, 875, 1108, 1188	0
5	X	20/20 (100%)	0.12	1 (5%) 34 35	682, 1073, 1459, 1549	0
6	Y	20/20 (100%)	0.09	0 100 100	668, 1083, 1454, 1661	0
All	All	82/82 (100%)	0.06	1 (1%) 76 65	394, 957, 1365, 1695	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
5	X	136	DA	2.0

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 oligosaccharides 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.