WORLDWIDE PDB

PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 30, 2025 – 04:04 PM EDT

PDB ID	:	9NFG / pdb_00009nfg
Title	:	[4,8,8-1] Shifted tensegrity triangle with an (arm,center,arm) distribution of (4,8,8) base pairs and 1 nt sticky ends
Authors	:	Abi Rizk, J.; Horvath, A.; Vecchioni, S.; Woloszyn, K.; Ohayon, Y.P.; Sha, R.
Deposited on	:	2025-02-21
Resolution	:	5.77 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:

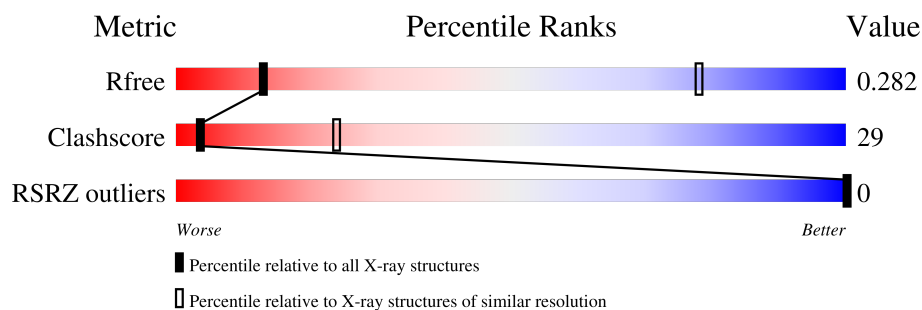|		
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.006 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.42

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 5.77 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	Percentile Ranks	Value
Rfree		0.282
Clashscore		29
RSRZ outliers		0

Worse   *Better*

▌Percentile relative to all X-ray structures

▯Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	164625	1063 (7.56-4.00)
Clashscore	180529	1104 (7.56-4.00)
RSRZ outliers	164620	1058 (7.56-4.00)

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 <=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	12	8% 92%
2	B	8	38% 62%
3	D	13	8% 92%
4	X	9	33% 67%

2 Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 855 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(P*AP*CP*GP*GP*AP*CP*AP*CP*GP*TP*CP*A)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	12	Total	C	N	O	P	0	0	0
			246	116	49	69	12			

- Molecule 2 is a DNA chain called DNA (5'-D(P*CP*AP*CP*AP*CP*CP*GP*T)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	8	Total	C	N	O	P	0	0	0
			160	76	29	47	8			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	D	13	Total	C	N	O	P	0	0	0
			262	126	45	79	12			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	X	9	Total	C	N	O	P	0	0	0
			187	89	37	53	8			

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.
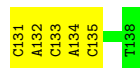
• Molecule 1: DNA (5'-D(P*AP*CP*GP*GP*AP*CP*AP*CP*GP*TP*CP*A)-3')

Chain A:　8%　　　　　　　　　92%

A112 C113 G114 G115 A116 C117 A118 C119 G120 T121 C122 A123
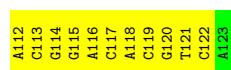
• Molecule 2: DNA (5'-D(P*CP*AP*CP*AP*CP*CP*GP*T)-3')

Chain B:　　　38%　　　　　62%

C131 A132 C133 A134 C135 T138

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

Chain D:　8%　　　　　　　　　92%

C200 T201 G202 A203 C204 G205 T206 G207 T208 G209 C210 T211 C212

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

Chain X:　　　33%　　　　　67%

G103 G104 A105 T108 G109 T110 G111
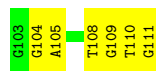
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, α, β, γ	135.13Å 135.13Å 42.84Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	39.01 – 5.77 39.01 – 5.77	Depositor EDS
% Data completeness (in resolution range)	70.1 (39.01-5.77) 63.0 (39.01-5.77)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.33 (at 5.75Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.187 , 0.287 0.185 , 0.282	Depositor DCC
R_{free} test set	70 reflections (5.81%)	wwPDB-VP
Wilson B-factor (Å^2)	198.6	Xtriage
Anisotropy	1.565	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.11 , 324.1	EDS
L-test for twinning[2]	$< |L| > = 0.46, < L^2 > = 0.29$	Xtriage
Estimated twinning fraction	0.126 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.98	EDS
Total number of atoms	855	wwPDB-VP
Average B, all atoms (Å^2)	440.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 18.43% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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	0.77	0/276	1.08	0/423
2	B	0.67	0/178	0.95	0/271
3	D	0.74	0/292	1.10	0/449
4	X	0.66	0/210	0.96	0/324
All	All	0.72	0/956	1.04	0/1467

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 ⓘ

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	246	0	134	16	0
2	B	160	0	90	7	0
3	D	262	0	149	14	0
4	X	187	0	103	3	0
All	All	855	0	476	38	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 29.

The worst 5 of 38 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)
2:B:134:DA:OP1	2:B:135:DC:N4	2.13	0.77
3:D:207:DG:H2'	3:D:208:DT:C6	2.33	0.64
1:A:112:DA:H4'	1:A:113:DC:OP1	1.99	0.62
1:A:119:DC:H1'	1:A:120:DG:C8	2.34	0.62
3:D:208:DT:H4'	3:D:209:DG:OP2	1.99	0.61

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

There are no protein molecules in this entry.

5.3.2 Protein sidechains ⓘ

There are no protein molecules in this entry.

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

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 ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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(Å²)	Q<0.9
1	A	12/12 (100%)	0.32	0	100	100	386, 421, 445, 460	0
2	B	8/8 (100%)	0.09	0	100	100	415, 442, 467, 469	0
3	D	13/13 (100%)	0.01	0	100	100	367, 425, 482, 491	0
4	X	9/9 (100%)	0.17	0	100	100	428, 457, 508, 511	0
All	All	42/42 (100%)	0.15	0	100	100	367, 437, 495, 511	0

There are no RSRZ outliers to report.

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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

6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

There are no ligands in this entry.

6.5 Other polymers ⓘ

There are no such residues in this entry.