Full wwPDB X-ray Structure Validation Report ⓘ

Oct 30, 2025 – 02:05 PM EDT

PDB ID	:	9Q3W / pdb_00009q3w
Title	:	[22-7B C|A] 22 bp tensegrity triangle that propagates via blunt-end stacking with C stacking on A at the interface
Authors	:	Horvath, A.; Woloszyn, K.; Vecchioni, S.; Ohayon, Y.P.; Sha, R.
Deposited on	:	2025-08-19
Resolution	:	6.08 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:

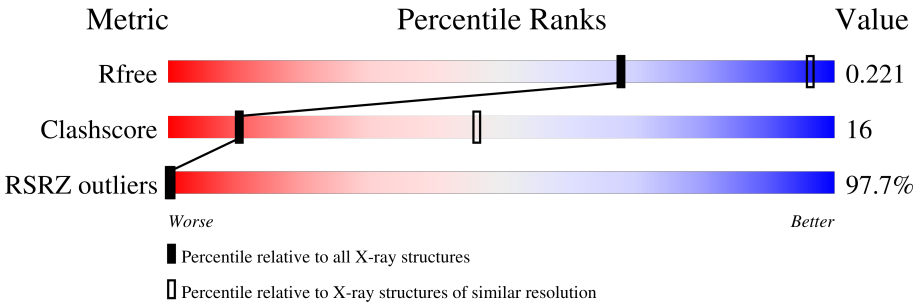
MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.46

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 6.08 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}	164625	1084 (8.06-4.00)
Clashscore	180529	1125 (8.06-4.00)
RSRZ outliers	164620	1079 (8.06-4.00)

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	22	100%, 27%, 73%
2	B	7	100%, 43%, 57%
3	C	7	100%, 57%, 43%
4	D	8	88%, 50%, 50%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 896 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*AP*TP*GP*CP*CP*TP*GP*TP*AP*CP*GP*GP*AP*CP*AP*GP*AP*TP*CP*A)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
1	A	22	449	214	86	128	21	0	0	0

- 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
			Total	C	N	O	P			
2	B	7	141	67	26	41	7	0	0	0

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
3	C	7	145	68	28	42	7	0	0	0

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

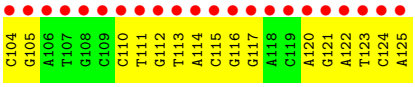
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
4	D	8	161	79	26	49	7	0	0	0

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.

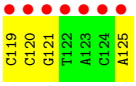
• Molecule 1: DNA (5'-D(*CP*GP*AP*TP*GP*CP*CP*TP*GP*TP*AP*CP*GP*GP*AP*CP *AP*GP*AP*TP*CP*A)-3')

Chain A:



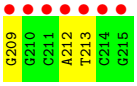
• Molecule 2: DNA (5'-D(P*CP*CP*GP*TP*AP*CP*A)-3')

Chain B:



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

Chain C:



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

Chain D:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	I 41 3 2	Depositor
Cell constants a, b, c, α, β, γ	178.63Å 178.63Å 178.63Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	72.93 – 6.08 72.93 – 6.08	Depositor EDS
% Data completeness (in resolution range)	89.9 (72.93-6.08) 86.1 (72.93-6.08)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	7.75 (at 6.18Å)	Xtriage
Refinement program	PHENIX 1.21.2_5419	Depositor
R, R_{free}	0.202 , 0.226 0.203 , 0.221	Depositor DCC
R_{free} test set	43 reflections (2.28%)	wwPDB-VP
Wilson B-factor (Å^2)	148.9	Xtriage
Anisotropy	0.000	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 999.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.41$, $< L^2 > = 0.24$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.87	EDS
Total number of atoms	896	wwPDB-VP
Average B, all atoms (Å^2)	226.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.96% of the height of the origin peak. No significant pseudotranslation is detected.*

[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	0.25	0/504	0.50	0/776
2	B	0.25	0/157	0.55	0/239
3	C	0.24	0/162	0.46	0/248
4	D	0.33	0/179	0.60	0/275
All	All	0.26	0/1002	0.52	0/1538

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	449	0	248	16	0
2	B	141	0	79	4	0
3	C	145	0	79	2	0
4	D	161	0	94	2	0
All	All	896	0	500	23	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 16.

All (23) 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:104:DC:H2'	1:A:105:DG:C8	2.26	0.70
4:D:107:DT:H2'	4:D:108:DG:C8	2.28	0.69
1:A:112:DG:H2"	1:A:113:DT:H5"	1.75	0.68
1:A:122:DA:H2"	1:A:123:DT:H5'	1.77	0.67
1:A:124:DC:H2"	1:A:125:DA:C8	2.30	0.67
1:A:116:DG:H2"	1:A:117:DG:N7	2.15	0.61
1:A:113:DT:H2"	1:A:114:DA:C8	2.37	0.59
1:A:111:DT:H2"	1:A:112:DG:C8	2.42	0.54
1:A:116:DG:H2"	1:A:117:DG:C8	2.44	0.52
4:D:105:DT:H4'	4:D:106:DC:OP1	2.11	0.50
2:B:120:DC:H4'	2:B:121:DG:OP1	2.12	0.49
2:B:125:DA:H1'	3:C:209:DG:H1'	1.95	0.48
2:B:120:DC:H1'	2:B:121:DG:C8	2.50	0.47
1:A:120:DA:H2"	1:A:121:DG:H8	1.80	0.46
1:A:110:DC:H5'	1:A:110:DC:H6	1.81	0.45
1:A:114:DA:H2"	1:A:115:DC:C6	2.52	0.44
3:C:212:DA:H2"	3:C:213:DT:O5'	2.17	0.44
1:A:121:DG:H2"	1:A:122:DA:C8	2.53	0.43
2:B:119:DC:H6	2:B:119:DC:OP1	2.03	0.42
1:A:104:DC:H2"	1:A:105:DG:OP1	2.20	0.41
1:A:120:DA:H2"	1:A:121:DG:C8	2.56	0.41
1:A:116:DG:H1'	1:A:117:DG:C4	2.55	0.41
1:A:122:DA:C2'	1:A:123:DT:H5'	2.47	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

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, 95^{th} 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	22/22 (100%)	7.85	22 (100%) 0 0	186, 221, 279, 290	0
2	B	7/7 (100%)	6.05	7 (100%) 0 0	183, 194, 246, 250	0
3	C	7/7 (100%)	13.19	7 (100%) 0 0	217, 241, 256, 276	0
4	D	8/8 (100%)	5.48	7 (87%) 0 0	202, 208, 235, 237	0
All	All	44/44 (100%)	7.98	43 (97%) 0 0	183, 223, 276, 290	0

All (43) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	C	210	DG	27.7
3	C	209	DG	27.0
1	A	117	DG	19.0
1	A	112	DG	16.0
1	A	113	DT	13.7
2	B	120	DC	13.5
1	A	105	DG	12.0
3	C	212	DA	11.5
4	D	104	DA	11.0
1	A	121	DG	10.4
2	B	123	DA	9.9
1	A	111	DT	8.7
4	D	108	DG	7.9
1	A	106	DA	7.8
1	A	116	DG	7.8
1	A	124	DC	7.7
3	C	211	DC	7.4
1	A	120	DA	7.4
1	A	122	DA	7.3
4	D	109	DT	7.3
3	C	214	DC	7.0

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Mol	Chain	Res	Type	RSRZ
1	A	123	DT	6.7
1	A	119	DC	6.5
3	C	213	DT	6.2
4	D	103	DG	6.1
1	A	104	DC	6.1
1	A	114	DA	5.9
3	C	215	DG	5.5
1	A	110	DC	5.1
1	A	125	DA	4.9
1	A	118	DA	4.8
2	B	122	DT	4.1
2	B	119	DC	4.1
4	D	107	DT	4.0
1	A	108	DG	4.0
1	A	109	DC	4.0
1	A	107	DT	3.9
2	B	121	DG	3.8
2	B	125	DA	3.5
2	B	124	DC	3.4
1	A	115	DC	3.2
4	D	105	DT	3.1
4	D	102	DT	3.0

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.