wwPDB X-ray Structure Validation Summary Report (i)

Mar 23, 2026 – 11:43 AM UTC

PDB ID	:	2BMF / pdb_00002bmf
Title	:	Dengue virus RNA helicase at 2.4A
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Deposited on	:	2005-03-14
Resolution	:	2.41 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 (i) 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 (1)) were used in the production of this report:

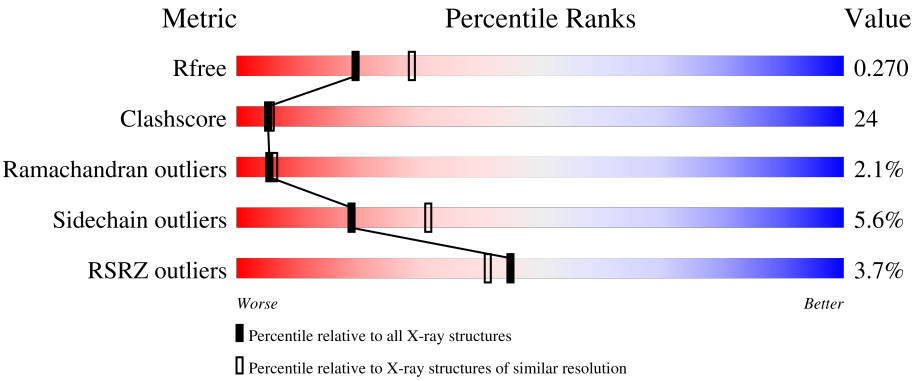
MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.41 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	6062 (2.44-2.40)
Clashscore	190562	6562 (2.44-2.40)
Ramachandran outliers	187476	6481 (2.44-2.40)
Sidechain outliers	187428	6482 (2.44-2.40)
RSRZ outliers	180081	6066 (2.44-2.40)

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	451	6% 52% 40% 6%
1	B	451	2% 62% 32%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 7360 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 protein called RNA HELICASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	442	Total	C	N	O	S	0	0	0
			3531	2224	629	657	21			
1	B	443	Total	C	N	O	S	0	0	0
			3556	2237	639	659	21			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	168	ALA	-	expression tag	UNP Q91H74
A	169	MET	-	expression tag	UNP Q91H74
A	170	ALA	-	expression tag	UNP Q91H74
B	168	ALA	-	expression tag	UNP Q91H74
B	169	MET	-	expression tag	UNP Q91H74
B	170	ALA	-	expression tag	UNP Q91H74

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	121	Total	O	0	0
			121	121		
2	B	152	Total	O	0	0
			152	152		

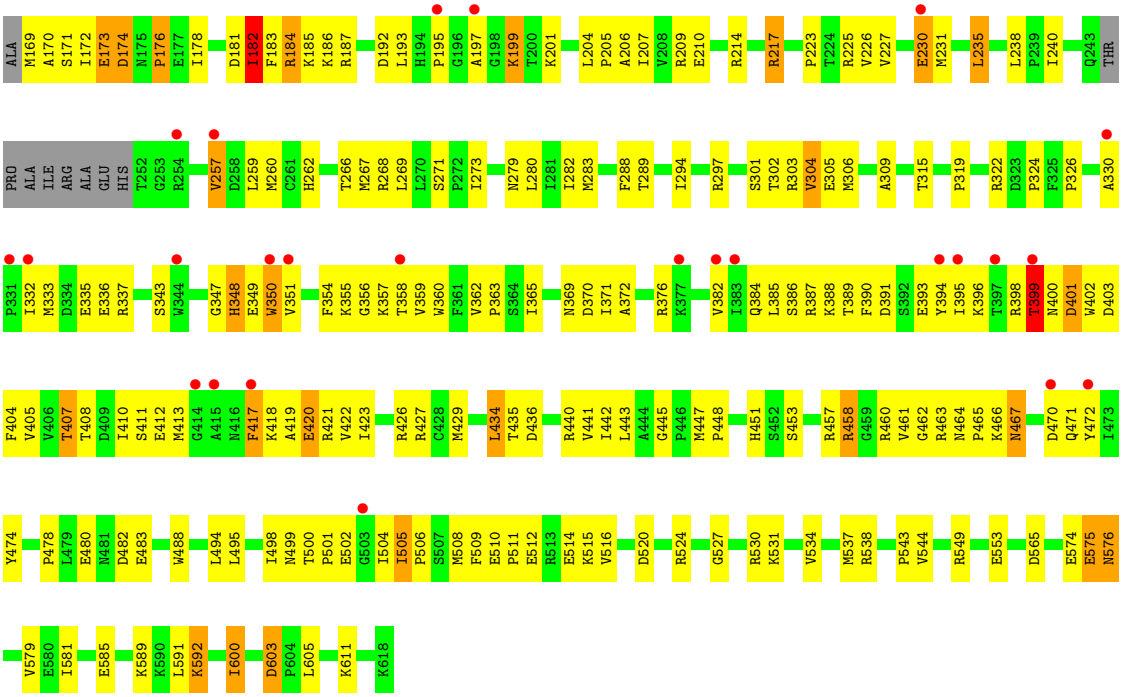
3 Residue-property plots (i)

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: RNA HELICASE

Chain A:

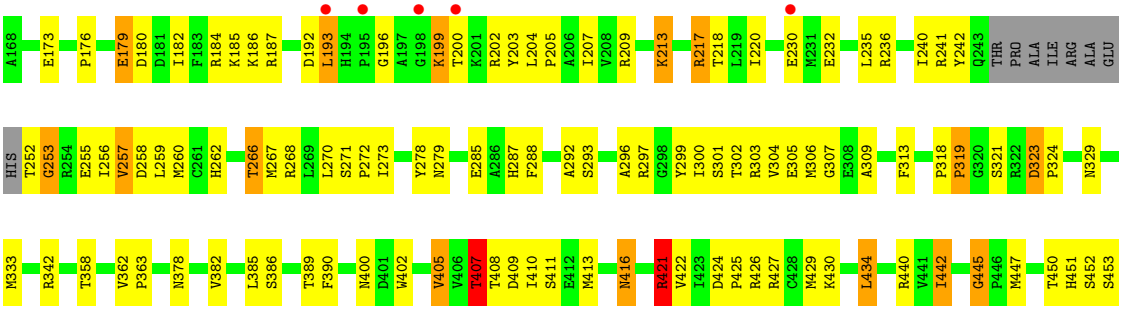


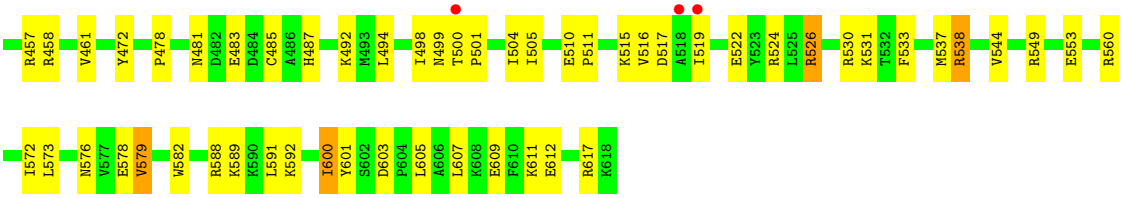


• Molecule 1: RNA HELICASE

Chain B:






R457 R458 V461 Y472 P478 N481 D482 E483 D484 C485 A486 H487 K492 M493 L494 I498 N499 T500 P501 I504 I505 E510 P511 K515 V516 D517 A518 I519 E522 Y523 R524 L525 R526 R530 K531 T532 F533 M537 R538 V544 R549 E553 R560

I572 L573 N576 V577 E578 V579 W582 R588 K589 K590 L591 K592 I600 Y601 S602 D603 P604 L605 A606 L607 K608 E609 F610 K611 E612 R617 K618

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	54.90Å 178.10Å 55.40Å 90.00° 101.30° 90.00°	Depositor
Resolution (Å)	20.00 – 2.41 20.00 – 2.41	Depositor EDS
% Data completeness (in resolution range)	93.8 (20.00-2.41) 93.9 (20.00-2.41)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	4.40 (at 2.42Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.222 , 0.270 0.222 , 0.270	Depositor DCC
R_{free} test set	1885 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å^2)	43.9	Xtriage
Anisotropy	0.099	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 59.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.29$	Xtriage
Estimated twinning fraction	0.039 for l,-k,h	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	7360	wwPDB-VP
Average B, all atoms (Å^2)	50.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.50% 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	0.42	0/3606	0.94	8/4873 (0.2%)
1	B	0.49	0/3631	0.96	15/4904 (0.3%)
All	All	0.46	0/7237	0.95	23/9777 (0.2%)

There are no bond length outliers.

The worst 5 of 23 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	182	ILE	N-CA-C	-7.95	103.66	112.80
1	A	505	ILE	N-CA-C	6.98	115.79	108.95
1	B	409	ASP	N-CA-C	6.49	120.79	113.01
1	B	405	VAL	N-CA-C	-6.43	98.36	107.75
1	B	390	PHE	N-CA-C	6.17	118.80	111.33

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	3531	0	3499	210	0
1	B	3556	0	3542	136	0
2	A	121	0	0	31	0
2	B	152	0	0	23	0
All	All	7360	0	7041	346	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 24.

The worst 5 of 346 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:388:LYS:HD2	1:A:605:LEU:HD12	1.37	1.06
1:B:385:LEU:HB2	1:B:407:THR:HG23	1.35	1.05
1:A:382:VAL:HG11	1:A:404:PHE:HB2	1.52	0.92
1:A:537:MET:HE3	1:A:544:VAL:HG22	1.49	0.92
1:A:458:ARG:HH11	1:A:458:ARG:HB3	1.38	0.89

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	438/451 (97%)	373 (85%)	49 (11%)	16 (4%)	2 2
1	B	439/451 (97%)	400 (91%)	37 (8%)	2 (0%)	24 35
All	All	877/902 (97%)	773 (88%)	86 (10%)	18 (2%)	5 6

5 of 18 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	348	HIS
1	A	436	ASP
1	A	465	PRO
1	A	576	ASN
1	A	176	PRO

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	373/384 (97%)	355 (95%)	18 (5%)	23 38
1	B	377/384 (98%)	353 (94%)	24 (6%)	16 26
All	All	750/768 (98%)	708 (94%)	42 (6%)	19 31

5 of 42 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	378	ASN
1	B	526	ARG
1	B	407	THR
1	B	421	ARG
1	B	549	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 19 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	400	ASN
1	B	487	HIS
1	B	569	ASN
1	B	456	GLN
1	A	499	ASN

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, 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	442/451 (98%)	0.41	25 (5%)	29	25	24, 57, 96, 99	1 (0%)
1	B	443/451 (98%)	-0.17	8 (1%)	67	64	19, 40, 64, 82	1 (0%)
All	All	885/902 (98%)	0.12	33 (3%)	45	41	19, 47, 91, 99	2 (0%)

The worst 5 of 33 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	331	PRO	4.4
1	A	417	PHE	3.3
1	A	472	TYR	3.2
1	A	330	ALA	3.0
1	B	518	ALA	3.0

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 oligosaccharides 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.