



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 11:42 PM UTC

PDB ID : 5RSA / pdb_00005rsa
Title : COMPARISON OF TWO INDEPENDENTLY REFINED MODELS OF RIBONUCLEASE-A
Authors : Wlodawer, A.
Deposited on : 1985-04-29
Resolution : 2.00 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
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	FAILED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

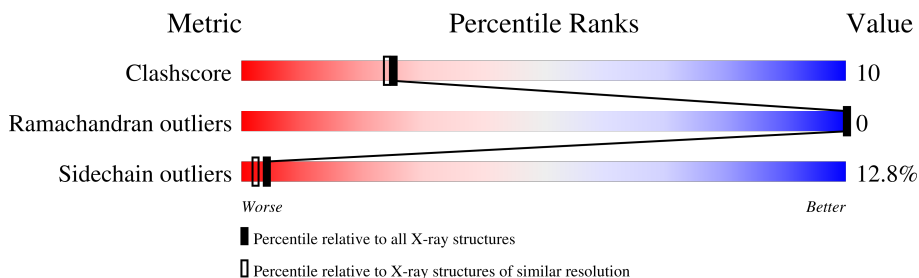
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION, NEUTRON DIFFRACTION

The reported resolution of this entry is 2.00 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))
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)

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 $\leq 5\%$

Note EDS failed to run properly.

Mol	Chain	Length	Quality of chain
1	A	124	45% 42% 10% .

2 Entry composition [i](#)

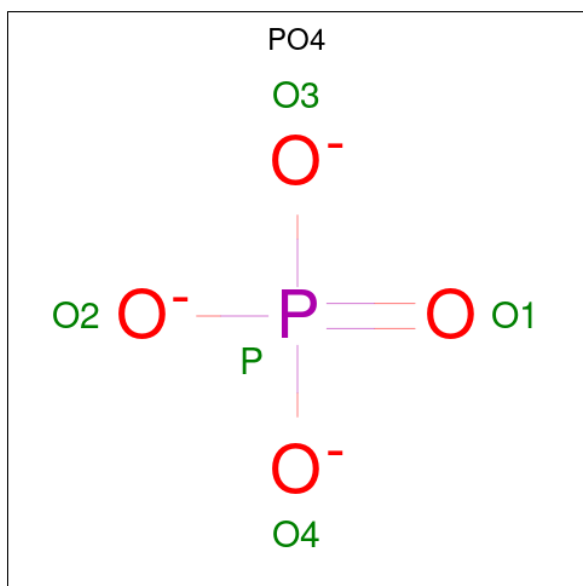
There are 3 unique types of molecules in this entry. The entry contains 2249 atoms, of which 693 are hydrogens and 472 are deuteriums.

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 RIBONUCLEASE A.

Mol	Chain	Residues	Atoms								ZeroOcc	AltConf	Trace
1	A	124	Total	C	D	H	N	O	S		0	0	0
			1860	575	216	693	171	193	12				

- Molecule 2 is PHOSPHATE ION (CCD ID: PO4) (formula: O₄P).



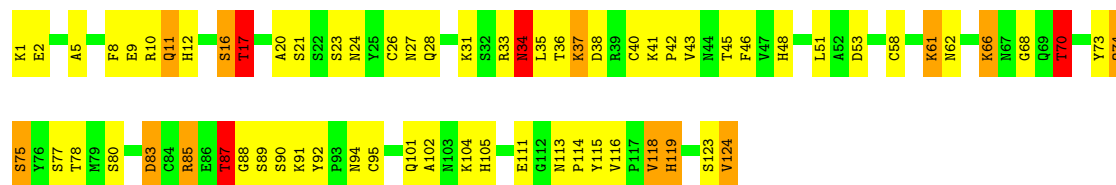
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	P	0	0
			5	4	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	128	Total	D	O	0	0
			384	256	128		

Note EDS failed to run properly.

Chain A: 45% 42% 10% 3%



4 Data and refinement statistics

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	30.18Å 38.40Å 53.32Å 90.00° 105.85° 90.00°	Depositor
Resolution (Å)	10.00 – 2.00	Depositor
% Data completeness (in resolution range)	95.6 (10.00-2.00)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$	-	Xtriage
Refinement program	unknown	Depositor
R, R_{free}	0.159 , (Not available)	Depositor
Wilson B-factor (Å ²)	12.8	Xtriage
Anisotropy	0.214	Xtriage
L-test for twinning ¹	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	0.045 for h,-k,-h-l	Xtriage
Total number of atoms	2249	wwPDB-VP
Average B, all atoms (Å ²)	14.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 13.42% of the height of the origin peak. No significant pseudotranslation is detected.*

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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: PO4, DOD

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	1.51	3/967 (0.3%)	2.77	86/1304 (6.6%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	20	ALA	C-N	-5.29	1.26	1.33
1	A	119	HIS	C-N	-5.14	1.26	1.33
1	A	101	GLN	C-O	5.13	1.30	1.24

All (86) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	10	ARG	NE-CZ-NH1	16.41	137.91	121.50
1	A	118	VAL	CB-CA-C	14.36	124.13	110.63
1	A	118	VAL	N-CA-CB	-13.67	90.51	111.57
1	A	34	ASN	OD1-CG-ND2	11.61	134.21	122.60
1	A	10	ARG	NE-CZ-NH2	-10.45	109.80	119.20
1	A	12	HIS	CA-C-O	-10.38	106.92	119.18
1	A	70	THR	CA-CB-OG1	-9.85	94.82	109.60
1	A	17	THR	N-CA-CB	-9.80	93.31	111.53
1	A	70	THR	N-CA-CB	-9.68	95.72	110.73
1	A	70	THR	CA-CB-CG2	9.62	126.84	110.50
1	A	34	ASN	CA-CB-CG	-9.59	103.01	112.60
1	A	24	ASN	CA-CB-CG	-9.17	103.43	112.60
1	A	33	ARG	NE-CZ-NH1	9.15	130.65	121.50
1	A	119	HIS	CA-CB-CG	8.92	122.72	113.80
1	A	87	THR	CA-CB-OG1	-8.79	96.42	109.60
1	A	87	THR	N-CA-CB	-8.77	96.43	110.46
1	A	17	THR	OG1-CB-CG2	7.76	124.83	109.30
1	A	118	VAL	CG1-CB-CG2	7.76	127.86	110.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	34	ASN	CB-CG-OD1	-7.45	105.89	120.80
1	A	61	LYS	O-C-N	7.39	132.10	123.02
1	A	11	GLN	O-C-N	7.24	132.03	122.33
1	A	10	ARG	CD-NE-CZ	7.14	134.39	124.40
1	A	34	ASN	N-CA-CB	-7.05	101.58	112.30
1	A	17	THR	CA-CB-OG1	-7.02	99.08	109.60
1	A	73	TYR	O-C-N	6.89	131.67	123.33
1	A	34	ASN	CA-C-O	-6.85	112.31	120.81
1	A	61	LYS	CA-C-O	-6.64	112.79	120.49
1	A	5	ALA	CA-C-O	-6.61	113.89	120.70
1	A	70	THR	CA-C-O	-6.58	111.82	119.59
1	A	75	SER	N-CA-CB	6.55	119.71	109.69
1	A	53	ASP	O-C-N	6.54	130.31	122.27
1	A	90	SER	O-C-N	6.50	130.93	122.93
1	A	51	LEU	N-CA-CB	-6.50	100.57	110.12
1	A	78	THR	N-CA-CB	6.27	119.81	110.29
1	A	46	PHE	CA-CB-CG	-6.25	107.55	113.80
1	A	20	ALA	N-CA-C	-6.18	100.44	110.20
1	A	8	PHE	O-C-N	-6.16	115.68	122.09
1	A	41	LYS	CA-C-N	6.14	125.70	119.19
1	A	41	LYS	C-N-CA	6.14	125.70	119.19
1	A	88	GLY	N-CA-C	-6.12	106.76	114.16
1	A	36	THR	O-C-N	6.09	130.14	122.22
1	A	41	LYS	N-CA-C	-6.01	100.82	109.48
1	A	85	ARG	CB-CG-CD	-5.99	97.53	111.30
1	A	123	SER	N-CA-C	-5.97	99.66	109.40
1	A	20	ALA	N-CA-CB	-5.90	101.16	110.06
1	A	2	GLU	O-C-N	5.84	130.06	123.06
1	A	83	ASP	OD1-CG-OD2	5.78	136.77	122.90
1	A	68	GLY	CA-C-N	5.76	129.98	120.94
1	A	68	GLY	C-N-CA	5.76	129.98	120.94
1	A	45	THR	CA-C-O	5.75	126.91	120.70
1	A	91	LYS	O-C-N	5.75	130.51	123.14
1	A	51	LEU	CB-CA-C	5.74	120.32	110.79
1	A	116	VAL	CA-CB-CG1	5.71	120.11	110.40
1	A	74	GLN	CA-C-O	5.69	126.58	120.38
1	A	115	TYR	N-CA-CB	-5.68	102.00	110.24
1	A	11	GLN	OE1-CD-NE2	-5.68	116.92	122.60
1	A	1	LYS	CA-C-O	-5.65	111.20	120.80
1	A	11	GLN	CA-C-O	-5.62	113.16	119.79
1	A	53	ASP	CA-C-O	-5.54	113.60	119.97
1	A	21	SER	O-C-N	5.49	128.83	122.19

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	9	GLU	OE1-CD-OE2	5.46	136.01	122.90
1	A	10	ARG	NH1-CZ-NH2	-5.43	112.24	119.30
1	A	95	CYS	N-CA-C	-5.42	101.63	110.20
1	A	87	THR	OG1-CB-CG2	5.41	120.12	109.30
1	A	101	GLN	OE1-CD-NE2	5.37	127.97	122.60
1	A	61	LYS	CG-CD-CE	5.35	123.59	111.30
1	A	102	ALA	O-C-N	-5.32	116.99	123.10
1	A	27	ASN	OD1-CG-ND2	5.25	127.85	122.60
1	A	92	TYR	CA-C-O	-5.23	115.31	119.71
1	A	23	SER	CA-CB-OG	-5.23	100.63	111.10
1	A	16	SER	CB-CA-C	5.23	118.82	110.09
1	A	26	CYS	N-CA-CB	5.23	117.59	110.01
1	A	111	GLU	O-C-N	5.18	128.97	123.42
1	A	124	VAL	N-CA-CB	-5.17	102.71	111.50
1	A	105	HIS	CA-C-N	-5.13	115.06	122.45
1	A	105	HIS	C-N-CA	-5.13	115.06	122.45
1	A	33	ARG	O-C-N	5.12	129.00	122.39
1	A	62	ASN	CA-CB-CG	5.12	117.72	112.60
1	A	66	LYS	N-CA-CB	-5.12	102.05	110.14
1	A	104	LYS	CB-CA-C	-5.12	99.78	111.95
1	A	27	ASN	CB-CG-ND2	-5.10	108.75	116.40
1	A	95	CYS	CA-C-O	-5.09	115.25	121.05
1	A	87	THR	CA-C-O	-5.06	115.75	121.72
1	A	53	ASP	N-CA-CB	5.03	118.07	110.28
1	A	17	THR	CB-CA-C	5.03	120.72	109.56
1	A	80	SER	CA-CB-OG	-5.01	101.08	111.10

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	1167	693	905	18	1
2	A	5	0	0	1	0
3	A	384	0	0	4	1

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	1556	693	905	18	2

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 10.

All (18) 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:87:THR:HG23	1:A:89:SER:H	1.37	0.80
1:A:119:HIS:HB2	3:A:205:DOD:O	1.87	0.70
1:A:40:CYS:O	3:A:260:DOD:O	2.12	0.67
1:A:17:THR:HG22	1:A:48:HIS:ND1	2.08	0.62
1:A:58:CYS:O	3:A:185:DOD:O	2.19	0.60
1:A:94:ASN:ND2	3:A:191:DOD:O	2.24	0.59
1:A:119:HIS:ND1	2:A:125:PO4:O1	2.36	0.56
1:A:42:PRO:C	1:A:43:VAL:HG23	2.27	0.54
1:A:34:ASN:CG	1:A:37:LYS:HD3	2.29	0.52
1:A:17:THR:CG2	1:A:48:HIS:CE1	2.93	0.51
1:A:42:PRO:O	1:A:43:VAL:HG23	2.06	0.51
1:A:87:THR:CG2	1:A:89:SER:H	2.14	0.50
1:A:43:VAL:HG22	1:A:85:ARG:HD3	1.84	0.49
1:A:17:THR:CG2	1:A:48:HIS:ND1	2.77	0.47
1:A:113:ASN:HA	1:A:114:PRO:C	2.37	0.43
1:A:11:GLN:HG2	1:A:35:LEU:HD21	1.91	0.43
1:A:74:GLN:HG2	1:A:75:SER:N	2.29	0.43
1:A:87:THR:HG23	1:A:89:SER:N	2.19	0.41

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:188:DOD:O	3:A:306:DOD:O[1_655]	1.98	0.22
1:A:38:ASP:OD2	1:A:70:THR:CG2[2_745]	2.14	0.06

5.3 Torsion angles

5.3.1 Protein backbone

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	122/124 (98%)	118 (97%)	4 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains

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	109/109 (100%)	95 (87%)	14 (13%)	4	2

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	16	SER
1	A	17	THR
1	A	28	GLN
1	A	31	LYS
1	A	34	ASN
1	A	37	LYS
1	A	61	LYS
1	A	66	LYS
1	A	70	THR
1	A	77	SER
1	A	83	ASP
1	A	87	THR
1	A	118	VAL

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Mol	Chain	Res	Type
1	A	124	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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](#)

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	PO4	A	125	-	4,4,4	1.33	0	6,6,6	1.22	1 (16%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	125	PO4	O3-P-O1	-2.45	102.30	110.95

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	125	PO4	1	0

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](#)

EDS failed to run properly - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

EDS failed to run properly - this section is therefore empty.

6.3 Carbohydrates [i](#)

EDS failed to run properly - this section is therefore empty.

6.4 Ligands [i](#)

EDS failed to run properly - this section is therefore empty.

6.5 Other polymers [i](#)

EDS failed to run properly - this section is therefore empty.