Full wwPDB X-ray Structure Validation Report ⓘ

Nov 25, 2024 – 03:36 PM EST

PDB ID : 1RGF
Title : HYDROLASE, GUANYLORIBONUCLEASE
Authors : Sevcik, J.; Dauter, Z.; Lamzin, V.S.; Wilson, K.S.
Deposited on : 1995-06-05
Resolution : 1.20 Å(reported)

The following versions of software and data (see references ⓘ) were used in the production of this report:

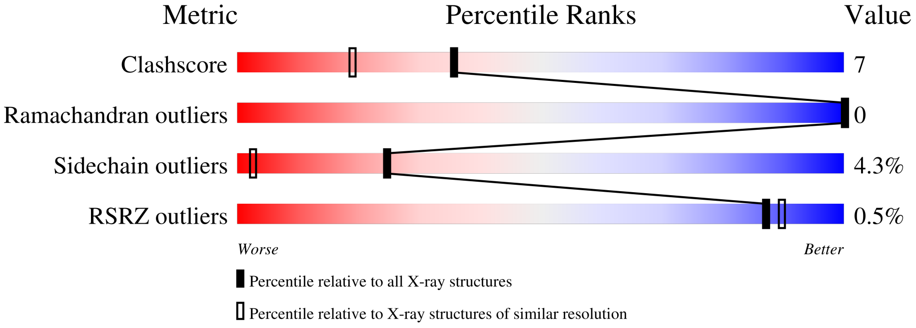
MolProbity : 4.02b-467
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 1.21
EDS : 3.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.004 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.40

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 1.20 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	180529	1183 (1.20-1.20)
Ramachandran outliers	177936	1146 (1.20-1.20)
Sidechain outliers	177891	1146 (1.20-1.20)
RSRZ outliers	164620	1078 (1.20-1.20)

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%

Mol	Chain	Length	Quality of chain
1	A	96	
1	B	96	

2 Entry composition ⓘ

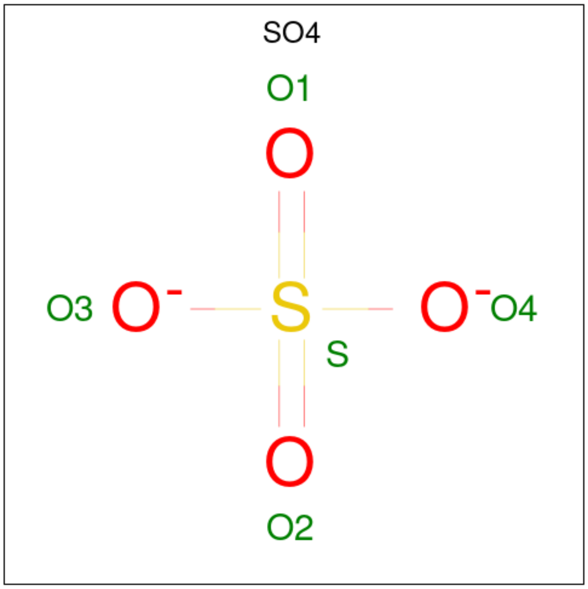
There are 3 unique types of molecules in this entry. The entry contains 3269 atoms, of which 1371 are hydrogens and 0 are deuteriums.

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 RIBONUCLEASE.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	96	Total 1435	C 469	H 683	N 122	O 159	S 2	0	3	0
1	B	96	Total 1439	C 468	H 688	N 122	O 159	S 2	10	2	0

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



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

- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	191	Total O 191 191	0	0
3	B	194	Total O 194 194	0	0

3 Residue-property plots

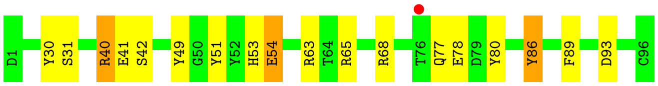
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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. 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: RIBONUCLEASE

Chain A:

- Molecule 1: RIBONUCLEASE

Chain B:



4 Data and refinement statistics ⓘ

Property	**Value**	**Source**
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	64.82Å 78.56Å 39.05Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 1.20 10.00 – 1.20	Depositor EDS
% Data completeness (in resolution range)	95.0 (10.00-1.20) 91.2 (10.00-1.20)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.92 (at 1.20Å)	Xtriage
Refinement program	SHELXL-93	Depositor
R, R_{free}	(Not available) , (Not available) 0.152 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å^2)	10.8	Xtriage
Anisotropy	0.283	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 71.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.98	EDS
Total number of atoms	3269	wwPDB-VP
Average B, all atoms (Å^2)	18.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.12% 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

Bond lengths and bond angles in the following residue types are not validated in this section: SO4

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	1.16	1/786 (0.1%)	1.67	10/1075 (0.9%)
1	B	1.94	2/779 (0.3%)	3.40	25/1065 (2.3%)
All	All	1.59	3/1565 (0.2%)	2.67	35/2140 (1.6%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	41	GLU	CG-CD	44.31	2.18	1.51
1	A	78	GLU	CD-OE1	-6.30	1.18	1.25
1	B	31	SER	CB-OG	-6.22	1.34	1.42

All (35) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	40	ARG	NE-CZ-NH2	-70.48	85.06	120.30
1	B	40	ARG	NE-CZ-NH1	55.56	148.08	120.30
1	B	40	ARG	CD-NE-CZ	-20.30	95.18	123.60
1	B	41	GLU	CG-CD-OE1	14.57	147.45	118.30
1	B	63	ARG	NE-CZ-NH2	-12.79	113.90	120.30
1	B	41	GLU	CG-CD-OE2	-12.55	93.19	118.30
1	A	40	ARG	CD-NE-CZ	12.09	140.53	123.60
1	B	41	GLU	CB-CG-CD	-10.91	84.73	114.20
1	A	68	ARG	NE-CZ-NH2	-10.65	114.97	120.30
1	B	63	ARG	CD-NE-CZ	10.33	138.06	123.60
1	A	65	ARG	NE-CZ-NH1	-9.61	115.50	120.30
1	A	63	ARG	NE-CZ-NH2	-8.49	116.06	120.30
1	B	63	ARG	NE-CZ-NH1	8.28	124.44	120.30
1	A	63	ARG	NE-CZ-NH1	7.73	124.16	120.30
1	B	68	ARG	NE-CZ-NH2	-7.73	116.44	120.30
1	B	30	TYR	CB-CG-CD1	-7.19	116.69	121.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	78	GLU	OE1-CD-OE2	6.94	131.63	123.30
1	B	65	ARG	NE-CZ-NH2	-6.87	116.87	120.30
1	B	49	TYR	CB-CG-CD1	-6.73	116.96	121.00
1	B	40	ARG	NH1-CZ-NH2	6.72	126.79	119.40
1	B	86	TYR	CB-CG-CD1	6.59	124.96	121.00
1	A	17	ASP	CB-CG-OD1	-6.42	112.52	118.30
1	B	93	ASP	CB-CG-OD2	-6.27	112.65	118.30
1	A	30	TYR	CB-CG-CD1	-6.26	117.24	121.00
1	B	77	GLN	CA-CB-CG	6.16	126.96	113.40
1	B	86	TYR	CG-CD1-CE1	6.10	126.18	121.30
1	B	54[A]	GLU	CG-CD-OE2	-5.73	106.84	118.30
1	B	54[B]	GLU	CG-CD-OE2	-5.73	106.84	118.30
1	B	30	TYR	CB-CG-CD2	5.67	124.41	121.00
1	B	80	TYR	CB-CG-CD2	-5.42	117.75	121.00
1	A	84	ASP	CB-CG-OD2	-5.41	113.43	118.30
1	B	89	PHE	CD1-CE1-CZ	-5.32	113.72	120.10
1	A	5	THR	CA-CB-CG2	5.27	119.77	112.40
1	A	61	GLY	O-C-N	-5.07	114.59	122.70
1	B	51	TYR	O-C-N	5.02	130.74	122.70

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	752	683	699	19	0
1	B	751	688	698	2	0
2	A	10	0	0	0	0
3	A	191	0	0	16	0
3	B	194	0	0	1	0
All	All	1898	1371	1397	21	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 7.

All (21) 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:91:LEU:HB3	3:A:193:HOH:O	1.71	0.89
1:A:91:LEU:CB	3:A:193:HOH:O	2.27	0.81
1:A:41:GLU:HG3	3:A:188:HOH:O	1.84	0.77
1:A:91:LEU:CD2	3:A:258:HOH:O	2.32	0.76
1:A:91:LEU:HD22	3:A:258:HOH:O	1.89	0.72
1:A:74:GLU:OE2	3:A:160:HOH:O	2.07	0.70
1:A:91:LEU:HD13	3:A:193:HOH:O	1.96	0.64
1:A:74:GLU:CD	3:A:160:HOH:O	2.35	0.63
1:A:76:THR:HG22	1:A:77:GLN:HG2	1.79	0.63
1:A:74:GLU:HG2	3:A:261:HOH:O	2.01	0.61
1:A:31:SER:HB2	3:A:278:HOH:O	2.04	0.57
1:A:91:LEU:CG	3:A:193:HOH:O	2.50	0.55
1:A:53:HIS:HE1	3:A:181:HOH:O	1.91	0.54
1:A:74:GLU:CG	3:A:261:HOH:O	2.55	0.54
1:A:53:HIS:HD2	3:A:102:HOH:O	1.94	0.51
1:B:53:HIS:HD2	3:B:103:HOH:O	1.92	0.51
1:A:91:LEU:HD23	3:A:258:HOH:O	2.04	0.45
1:A:54[A]:GLU:OE1	1:A:86:TYR:OH	2.31	0.44
1:B:54[B]:GLU:CD	1:B:86:TYR:HH	2.20	0.43
1:A:91:LEU:HD22	3:A:193:HOH:O	2.18	0.42
1:A:80:TYR:CE1	1:A:91:LEU:HG	2.54	0.42

There are no symmetry-related clashes.

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	97/96 (101%)	97 (100%)	0	0	100	100
1	B	96/96 (100%)	96 (100%)	0	0	100	100
All	All	193/192 (100%)	193 (100%)	0	0	100	100

There are no Ramachandran outliers to report.

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	85/82 (104%)	80 (94%)	5 (6%)	16	1
1	B	84/82 (102%)	82 (98%)	2 (2%)	44	9
All	All	169/164 (103%)	162 (96%)	7 (4%)	25	3

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	PRO
1	A	25	ASP
1	A	40	ARG
1	A	74	GLU
1	A	91	LEU
1	B	40	ARG
1	B	42	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	53	HIS
1	B	53	HIS

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 ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

2 ligands are 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	SO4	A	97	-	4,4,4	0.63	0	6,6,6	0.33	0
2	SO4	A	98	-	4,4,4	0.76	0	6,6,6	0.88	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

Warning: The R factor obtained from EDS is 0.1544, which does not match the depositor's R factor of 0.0. Please interpret the results in this section carefully.

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	96/96 (100%)	-0.54	0	100	100	6, 11, 31, 46	3 (3%)
1	B	96/96 (100%)	-0.42	1 (1%)	79	81	6, 12, 35, 49	4 (4%)
All	All	192/192 (100%)	-0.48	1 (0%)	87	90	6, 12, 32, 49	7 (3%)

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	76	THR	2.2

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 ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
2	SO4	A	98	5/5	0.90	0.11	36,39,43,43	5

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\AA^2$)	Q<0.9
2	SO4	A	97	5/5	0.99	0.04	12,12,14,16	0

6.5 Other polymers ⓘ

There are no such residues in this entry.