



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 04:47 PM UTC

PDB ID : 2RHE / pdb_00002rhe
Title : STRUCTURE OF A NOVEL BENICE-JONES PROTEIN (RHE) FRAGMENT AT 1.6 ANGSTROMS RESOLUTION
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Deposited on : 1983-06-13
Resolution : 1.60 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) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
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

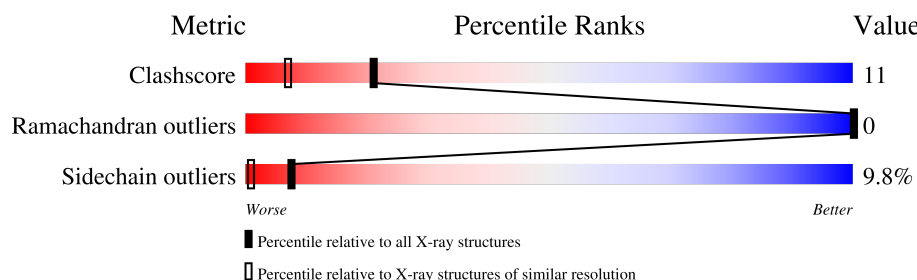
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.60 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	4931 (1.60-1.60)
Ramachandran outliers	187476	4831 (1.60-1.60)
Sidechain outliers	187428	4830 (1.60-1.60)

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 was not executed.

Mol	Chain	Length	Quality of chain
1	A	114	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 1019 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 BENICE-JONES PROTEIN RHE (LIGHT CHAIN).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	114	Total	C	N	O	S	0	0	0
			833	519	135	177	2			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	23	THR	SER	conflict	PIR S25752
A	26	ALA	SER	conflict	PIR S25752
A	27	THR	SER	conflict	PIR S25752
A	28	ASP	ASN	conflict	PIR S25752
A	33	SER	THR	conflict	PIR S25752
A	35	ILE	ASN	conflict	PIR S25752
A	40	VAL	LEU	conflict	PIR S25752
A	43	LYS	THR	conflict	PIR S25752
A	51	TYR	ARG	conflict	PIR S25752
A	53	ASP	ASN	conflict	PIR S25752
A	54	LEU	GLN	conflict	PIR S25752
A	55	LEU	ARG	conflict	PIR S25752
A	60	SER	PRO	conflict	PIR S25752
A	65	ALA	GLY	conflict	PIR S25752
A	80	GLU	GLN	conflict	PIR S25752
A	93	ASN	ASP	conflict	PIR S25752
A	97	ASP	ASN	conflict	PIR S25752
A	98	GLU	GLY	conflict	PIR S25752
A	99	PRO	VAL	conflict	PIR S25752
A	100	GLY	VAL	conflict	PIR S25752

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	186	Total	O	0	0
			186	186		

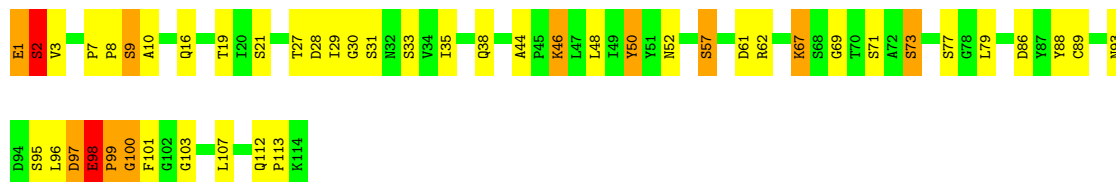
3 Residue-property plots [i](#)

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. 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.

Note EDS was not executed.

• Molecule 1: BENICE-JONES PROTEIN RHE (LIGHT CHAIN)

Chain A: 



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	54.63Å 52.22Å 42.62Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 1.60	Depositor
% Data completeness (in resolution range)	(Not available) (10.00-1.60)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	PROLSQ	Depositor
R, R_{free}	0.149 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1019	wwPDB-VP
Average B, all atoms (Å ²)	16.0	wwPDB-VP

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	1.59	5/851 (0.6%)	2.65	54/1159 (4.7%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	1	0

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	57	SER	CA-CB	6.69	1.64	1.53
1	A	7	PRO	CA-C	-6.32	1.48	1.52
1	A	50	TYR	CA-C	-5.72	1.45	1.52
1	A	88	TYR	C-N	-5.55	1.25	1.33
1	A	101	PHE	C-O	-5.04	1.17	1.23

All (54) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	98	GLU	CA-CB-CG	22.60	159.31	114.10
1	A	46	LYS	CB-CG-CD	13.01	141.22	111.30
1	A	9	SER	CA-CB-OG	-12.24	86.62	111.10
1	A	7	PRO	O-C-N	-11.88	115.57	121.15
1	A	57	SER	CA-CB-OG	-11.11	88.89	111.10
1	A	62	ARG	CD-NE-CZ	10.99	139.78	124.40
1	A	57	SER	N-CA-CB	10.81	126.15	109.83
1	A	69	GLY	CA-C-O	-10.58	106.85	121.46
1	A	67	LYS	CG-CD-CE	10.51	135.47	111.30
1	A	35	ILE	CA-CB-CG2	10.24	127.91	110.50
1	A	98	GLU	CB-CG-CD	9.32	128.44	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	2	SER	CA-CB-OG	8.51	128.12	111.10
1	A	2	SER	N-CA-CB	8.49	124.84	110.49
1	A	1	GLU	CA-C-N	8.24	137.27	121.54
1	A	1	GLU	C-N-CA	8.24	137.27	121.54
1	A	2	SER	CA-C-O	-7.32	110.05	120.51
1	A	97	ASP	CA-CB-CG	-7.23	105.37	112.60
1	A	2	SER	CA-C-N	-7.15	110.51	120.74
1	A	2	SER	C-N-CA	-7.15	110.51	120.74
1	A	99	PRO	CA-C-N	7.08	129.60	122.66
1	A	99	PRO	C-N-CA	7.08	129.60	122.66
1	A	1	GLU	CA-C-O	6.96	132.63	120.80
1	A	3	VAL	CB-CA-C	6.85	121.01	112.04
1	A	16	GLN	O-C-N	6.70	130.43	122.79
1	A	112	GLN	OE1-CD-NE2	-6.50	116.10	122.60
1	A	31	SER	N-CA-CB	-6.48	102.28	110.90
1	A	71	SER	CA-CB-OG	-6.30	98.50	111.10
1	A	30	GLY	O-C-N	-6.28	115.73	122.19
1	A	2	SER	O-C-N	6.26	130.91	122.59
1	A	21	SER	O-C-N	6.16	129.84	122.94
1	A	73	SER	N-CA-CB	-6.12	100.18	111.13
1	A	44	ALA	O-C-N	6.07	128.23	121.43
1	A	100	GLY	CA-C-O	-5.86	115.20	120.94
1	A	29	ILE	O-C-N	5.78	127.55	121.89
1	A	61	ASP	CA-CB-CG	-5.78	106.82	112.60
1	A	77	SER	N-CA-C	-5.72	102.06	110.52
1	A	57	SER	CB-CA-C	-5.70	100.26	109.72
1	A	86	ASP	CA-C-N	5.62	130.75	123.00
1	A	86	ASP	C-N-CA	5.62	130.75	123.00
1	A	16	GLN	CA-C-O	-5.60	115.37	121.87
1	A	113	PRO	CA-C-O	5.54	127.66	121.34
1	A	95	SER	CB-CA-C	5.51	120.79	110.70
1	A	69	GLY	O-C-N	5.48	131.19	122.36
1	A	9	SER	O-C-N	5.47	129.62	123.27
1	A	98	GLU	CB-CA-C	5.42	120.86	110.17
1	A	3	VAL	CA-CB-CG1	5.37	119.52	110.40
1	A	61	ASP	CB-CG-OD2	-5.35	106.09	118.40
1	A	97	ASP	CB-CG-OD1	-5.33	106.13	118.40
1	A	52	ASN	CB-CG-OD1	-5.28	110.24	120.80
1	A	28	ASP	CA-CB-CG	5.21	117.81	112.60
1	A	28	ASP	O-C-N	5.15	126.40	120.58
1	A	8	PRO	N-CD-CG	-5.14	95.49	103.20
1	A	89	CYS	N-CA-CB	5.11	119.02	110.85

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	10	ALA	O-C-N	-5.03	117.64	123.33

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	A	35	ILE	CB

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	833	0	800	18	0
2	A	186	0	0	7	0
All	All	1019	0	800	18	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 11.

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:96:LEU:HD12	2:A:273:HOH:O	1.76	0.86
1:A:1:GLU:HG2	1:A:2:SER:H	1.56	0.70
1:A:1:GLU:HB2	1:A:103:GLY:HA2	1.78	0.64
1:A:93:ASN:HB3	2:A:273:HOH:O	2.00	0.61
1:A:98:GLU:HB3	2:A:150:HOH:O	2.00	0.60
1:A:1:GLU:CG	1:A:2:SER:H	2.15	0.57
1:A:27:THR:HG23	2:A:247:HOH:O	2.07	0.55
1:A:99:PRO:C	2:A:273:HOH:O	2.49	0.55
1:A:1:GLU:CG	1:A:2:SER:N	2.69	0.55
1:A:38:GLN:HG3	1:A:48:LEU:HD11	1.88	0.54
1:A:1:GLU:HG3	2:A:251:HOH:O	2.10	0.52
1:A:100:GLY:N	2:A:273:HOH:O	2.47	0.48
1:A:98:GLU:HB2	1:A:99:PRO:HD2	1.94	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1:GLU:OE1	1:A:2:SER:HB3	2.13	0.47
1:A:1:GLU:CD	1:A:2:SER:HB3	2.44	0.43
1:A:19:THR:CG2	1:A:73:SER:OG	2.68	0.42
1:A:79:LEU:HD11	1:A:107:LEU:HD21	2.02	0.41
1:A:98:GLU:HB2	1:A:99:PRO:CD	2.51	0.40

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	112/114 (98%)	106 (95%)	6 (5%)	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	92/92 (100%)	83 (90%)	9 (10%)	7	1

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	SER

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Mol	Chain	Res	Type
1	A	9	SER
1	A	33	SER
1	A	46	LYS
1	A	50	TYR
1	A	57	SER
1	A	67	LYS
1	A	97	ASP
1	A	98	GLU

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](#)

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 ⓘ

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates ⓘ

EDS was not executed - this section is therefore empty.

6.4 Ligands ⓘ

EDS was not executed - this section is therefore empty.

6.5 Other polymers ⓘ

EDS was not executed - this section is therefore empty.