



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 05:10 AM UTC

PDB ID : 1FJO / pdb_00001fjo
Title : THERMOLYSIN (60% ACETONE SOAKED CRYSTALS)
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Deposited on : 2000-08-08
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)	:	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

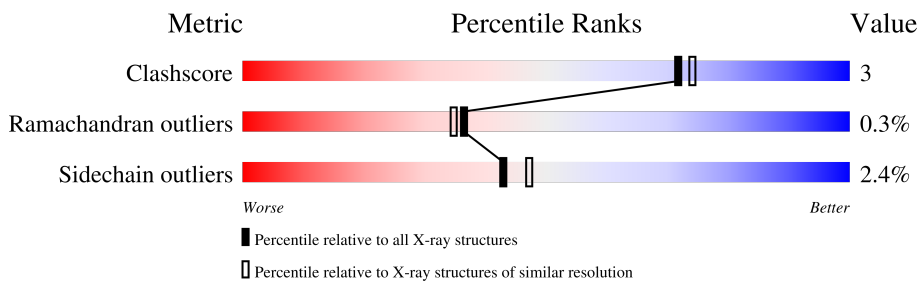
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 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 was not executed.

Mol	Chain	Length	Quality of chain
1	A	316	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
5	ACN	A	507	-	-	X	-

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 2620 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 THERMOLYSIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	316	Total	C	N	O	S	0	6	0
			2457	1541	415	499	2			

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Zn	0	0
			1	1		

- Molecule 3 is CALCIUM ION (CCD ID: CA) (formula: Ca).

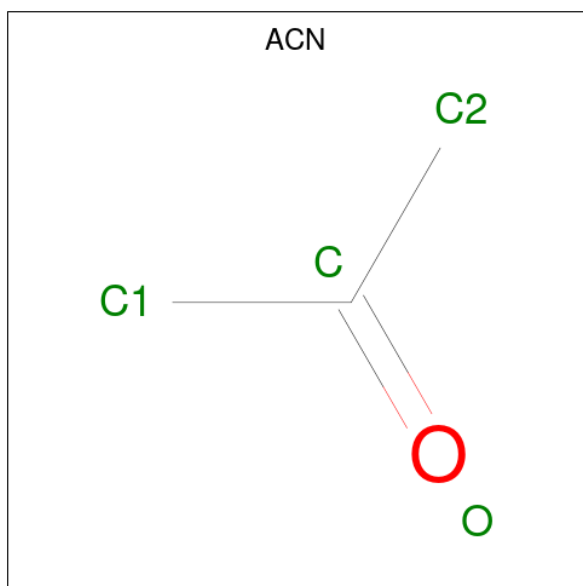
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	4	Total	Ca	0	0
			4	4		

- Molecule 4 is DIMETHYL SULFOXIDE (CCD ID: DMS) (formula: C₂H₆OS).



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

- Molecule 5 is ACETONE (CCD ID: ACN) (formula: C_3H_6O).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			4	3	1		
5	A	1	Total	C	O	0	0
			4	3	1		
5	A	1	Total	C	O	0	0
			4	3	1		
5	A	1	Total	C	O	0	0
			4	3	1		
5	A	1	Total	C	O	0	0
			4	3	1		

- Molecule 6 is water.

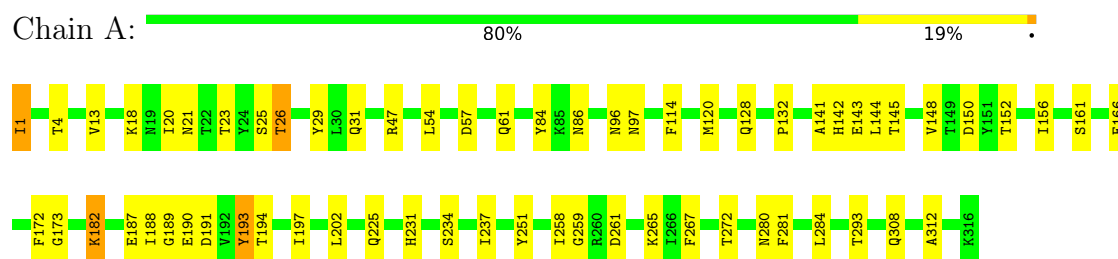
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	134	Total	O	0	0
			134	134		

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.

Note EDS was not executed.

• Molecule 1: THERMOLYSIN



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, α , β , γ	94.08Å 94.08Å 131.24Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	15.00 – 2.00	Depositor
% Data completeness (in resolution range)	96.0 (15.00-2.00)	Depositor
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	REFMAC	Depositor
R, R_{free}	0.156 , 0.207	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2620	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, ACN, CA, DMS

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	0.85	0/2548	1.77	43/3467 (1.2%)

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	0	4

There are no bond length outliers.

All (43) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	193	TYR	CA-C-O	-10.72	108.50	121.36
1	A	187	GLU	CA-C-O	-10.06	109.39	121.56
1	A	172	PHE	CA-CB-CG	-9.96	103.84	113.80
1	A	166	GLU	OE1-CD-OE2	-9.87	99.21	122.90
1	A	197	ILE	CA-C-O	-8.01	112.06	120.39
1	A	197	ILE	O-C-N	-7.95	114.77	123.20
1	A	280	ASN	OD1-CG-ND2	-7.58	115.02	122.60
1	A	225	GLN	CA-C-O	-7.54	113.58	121.87
1	A	166	GLU	CG-CD-OE1	7.39	135.40	118.40
1	A	61	GLN	CA-C-O	-7.21	112.59	120.30
1	A	259	GLY	CA-C-O	-6.88	117.48	122.23
1	A	281	PHE	CA-C-O	6.84	127.67	120.42
1	A	57	ASP	CA-CB-CG	-6.73	105.87	112.60
1	A	47	ARG	CD-NE-CZ	6.64	133.70	124.40
1	A	86	ASN	CA-CB-CG	-6.31	106.29	112.60
1	A	182	LYS	CA-C-O	-6.19	115.25	122.37

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	21	ASN	OD1-CG-ND2	-5.91	116.69	122.60
1	A	194	THR	OG1-CB-CG2	-5.85	97.59	109.30
1	A	312	ALA	CA-C-O	-5.74	113.62	120.10
1	A	96	ASN	OD1-CG-ND2	-5.71	116.89	122.60
1	A	293	THR	CA-C-O	-5.71	114.83	120.82
1	A	308	GLN	O-C-N	5.65	128.11	122.12
1	A	191	ASP	CA-C-N	-5.63	114.89	122.72
1	A	191	ASP	C-N-CA	-5.63	114.89	122.72
1	A	188	ILE	O-C-N	5.54	129.24	123.26
1	A	251	TYR	CA-C-O	5.51	127.93	121.54
1	A	231	HIS	CB-CG-CD2	-5.47	124.09	131.20
1	A	258	ILE	CA-C-O	-5.44	114.65	119.38
1	A	23	THR	CA-C-N	-5.44	115.50	123.00
1	A	23	THR	C-N-CA	-5.44	115.50	123.00
1	A	145	THR	CA-C-O	-5.36	113.80	119.97
1	A	18	LYS	CG-CD-CE	5.27	123.43	111.30
1	A	190	GLU	OE1-CD-OE2	-5.26	110.27	122.90
1	A	190	GLU	O-C-N	-5.25	115.39	122.43
1	A	26	THR	N-CA-CB	5.20	119.28	110.49
1	A	114	PHE	CA-CB-CG	5.18	118.98	113.80
1	A	4	THR	CA-CB-CG2	5.16	119.28	110.50
1	A	234	SER	N-CA-C	-5.14	106.28	112.54
1	A	267	PHE	CA-CB-CG	-5.12	108.68	113.80
1	A	13	VAL	CA-C-O	5.07	126.22	120.95
1	A	194	THR	O-C-N	-5.04	115.53	121.32
1	A	47	ARG	CA-CB-CG	-5.03	104.05	114.10
1	A	150	ASP	CA-CB-CG	5.02	117.62	112.60

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	189	GLY	Mainchain
1	A	193	TYR	Mainchain
1	A	202	LEU	Mainchain
1	A	25	SER	Mainchain

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	2457	0	2290	15	0
2	A	1	0	0	0	0
3	A	4	0	0	0	0
4	A	4	0	6	0	0
5	A	20	0	30	7	0
6	A	134	0	0	1	0
All	All	2620	0	2326	16	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 3.

All (16) 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:1:ILE:N	1:A:31:GLN:HE22	2.01	0.58
1:A:1:ILE:HD12	1:A:54:LEU:HD23	1.85	0.57
1:A:120:MET:SD	1:A:143:GLU:HB3	2.47	0.55
1:A:148:VAL:HG23	5:A:507:ACN:H23	1.90	0.54
1:A:142:HIS:CD2	5:A:506:ACN:H22	2.45	0.51
5:A:508:ACN:H21	6:A:643:HOH:O	2.12	0.50
1:A:84:TYR:CE2	5:A:507:ACN:H22	2.48	0.49
1:A:152:THR:HG21	1:A:272:THR:HG22	1.94	0.49
1:A:84:TYR:CD2	5:A:507:ACN:H22	2.48	0.48
1:A:261[B]:ASP:OD2	1:A:265:LYS:HE2	2.13	0.48
1:A:148:VAL:CG2	5:A:507:ACN:H23	2.43	0.48
1:A:141:ALA:HB3	1:A:173:GLY:HA2	2.02	0.42
1:A:156:ILE:HG13	1:A:161[A]:SER:OG	2.20	0.42
1:A:237:ILE:HD12	1:A:284:LEU:HD23	2.02	0.42
1:A:144:LEU:HB3	5:A:507:ACN:H21	2.02	0.41
1:A:1:ILE:HD13	1:A:29:TYR:CZ	2.55	0.41

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	320/316 (101%)	312 (98%)	7 (2%)	1 (0%)	36 35

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	26	THR

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	258/252 (102%)	252 (98%)	6 (2%)	44 49

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	ILE
1	A	20	ILE
1	A	97	ASN
1	A	128	GLN
1	A	132	PRO
1	A	182	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	31	GLN
1	A	33	ASN
1	A	97	ASN
1	A	246	GLN
1	A	301	GLN

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](#)

Of 11 ligands modelled in this entry, 5 are monoatomic - leaving 6 for Mogul analysis.

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	$\# Z > 2$
5	ACN	A	506	-	3,3,3	0.72	0	3,3,3	0.18	0
5	ACN	A	507	-	3,3,3	0.74	0	3,3,3	0.41	0
5	ACN	A	508	-	3,3,3	0.51	0	3,3,3	1.27	0
5	ACN	A	510	-	3,3,3	0.77	0	3,3,3	0.25	0
5	ACN	A	509	-	3,3,3	0.63	0	3,3,3	0.24	0
4	DMS	A	505	-	3,3,3	0.63	0	3,3,3	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.

3 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	506	ACN	1	0
5	A	507	ACN	5	0
5	A	508	ACN	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 ⓘ

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.