



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2026 – 04:29 PM UTC

PDB ID : 1G4B / pdb_00001g4b
Title : CRYSTAL STRUCTURES OF THE HSLVU PEPTIDASE-ATPASE COMPLEX REVEAL AN ATP-DEPENDENT PROTEOLYSIS MECHANISM
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Deposited on : 2000-10-26
Resolution : 7.00 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 ⓘ 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)	:	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

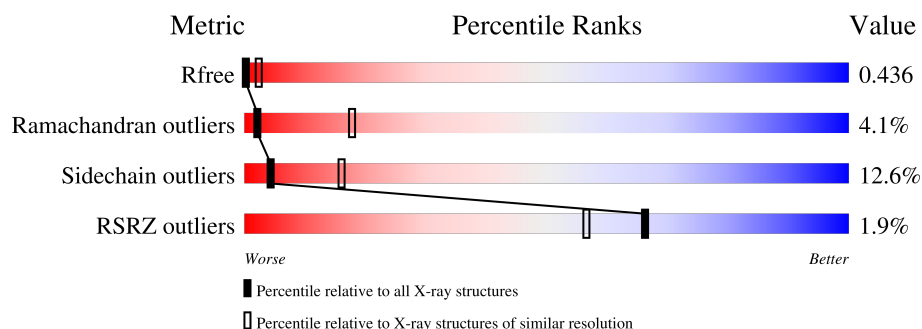
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 7.00 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))
R_{free}	180053	1167 (10.00-4.00)
Ramachandran outliers	187476	1054 (10.00-4.00)
Sidechain outliers	187428	1017 (10.00-4.00)
RSRZ outliers	180081	1161 (10.00-4.00)

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 $\leq 5\%$. 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	E	443	0% 34% 44% 9% 11%
1	F	443	2% 31% 44% 12% 11%
1	K	443	2% 33% 44% 10% 11%
1	L	443	0% 33% 42% 13% 11%
2	M	175	2% 38% 52% 9%
2	N	175	2% 37% 54% 9%
2	O	175	0% 41% 47% 10%

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Mol	Chain	Length	Quality of chain
2	P	175	2% 33% 57% 9%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 17660 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 ATP-DEPENDENT HSL PROTEASE ATP-BINDING SUB-UNIT HSLU.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	E	393	Total	C	N	O	S	0	0	0
			3096	1935	551	600	10			
1	F	393	Total	C	N	O	S	0	0	0
			3096	1935	551	600	10			
1	K	393	Total	C	N	O	S	0	0	0
			3096	1935	551	600	10			
1	L	393	Total	C	N	O	S	0	0	0
			3096	1935	551	600	10			

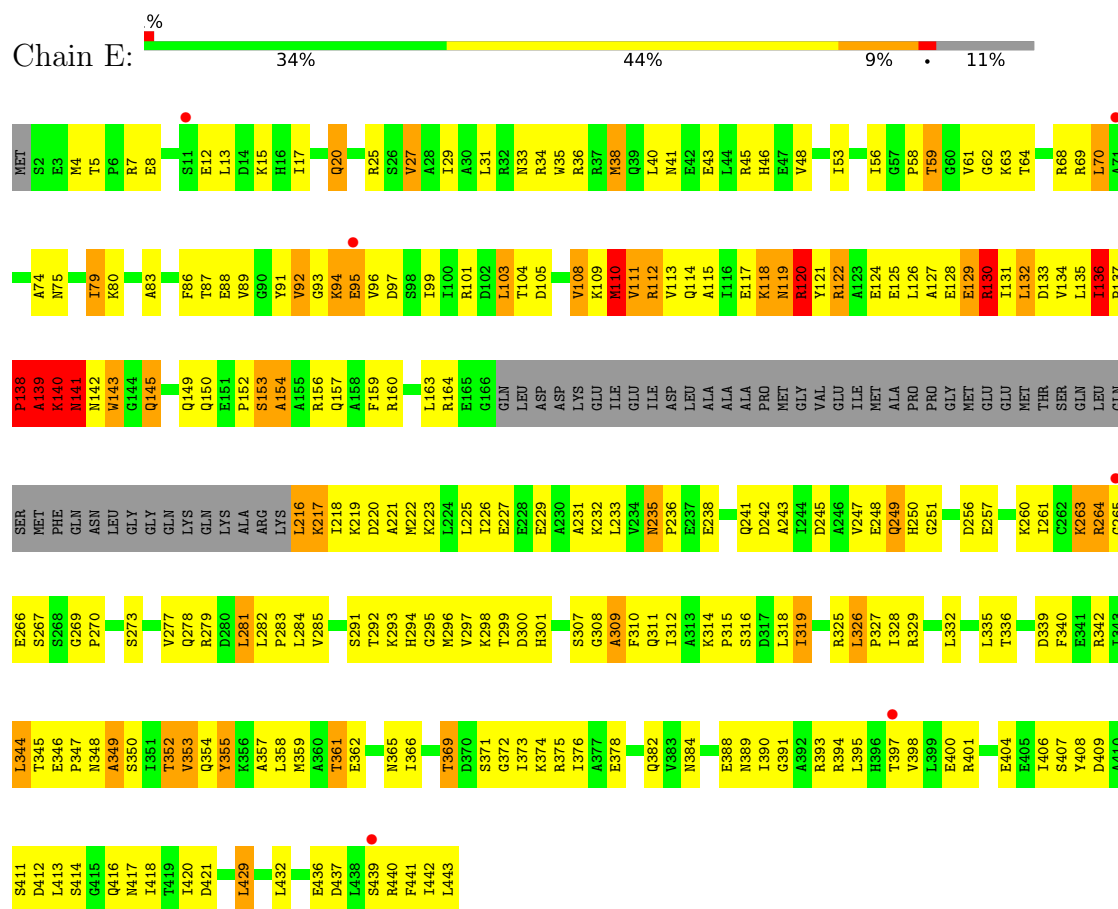
- Molecule 2 is a protein called ATP-DEPENDENT PROTEASE HSLV.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	M	173	Total	C	N	O	S	0	0	0
			1319	828	235	252	4			
2	N	173	Total	C	N	O	S	0	0	0
			1319	828	235	252	4			
2	O	173	Total	C	N	O	S	0	0	0
			1319	828	235	252	4			
2	P	173	Total	C	N	O	S	0	0	0
			1319	828	235	252	4			

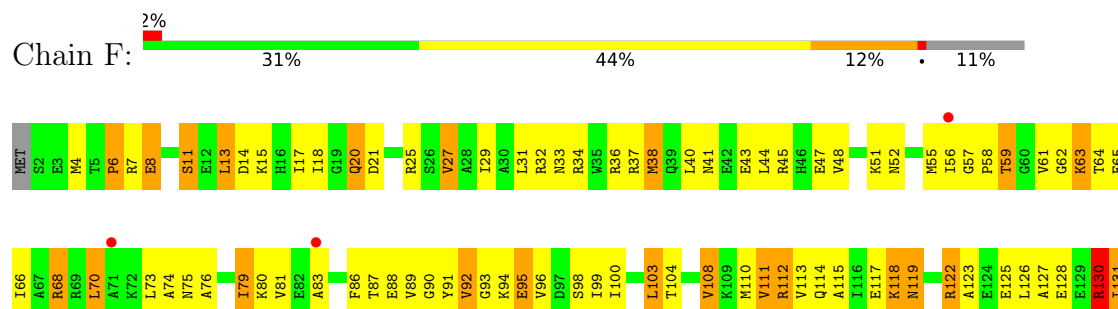
3 Residue-property plots

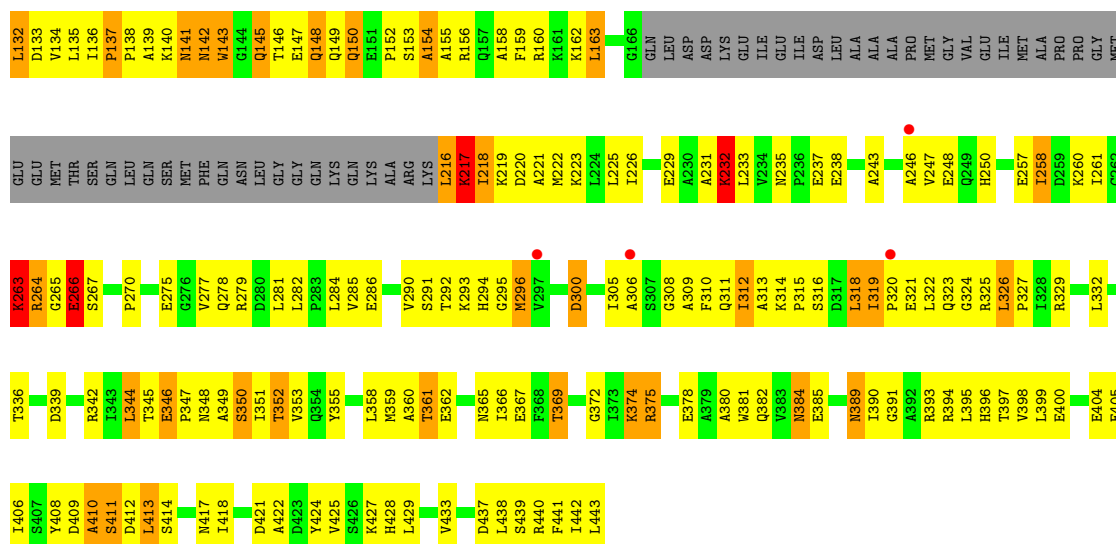
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: ATP-DEPENDENT HSL PROTEASE ATP-BINDING SUBUNIT HSLU

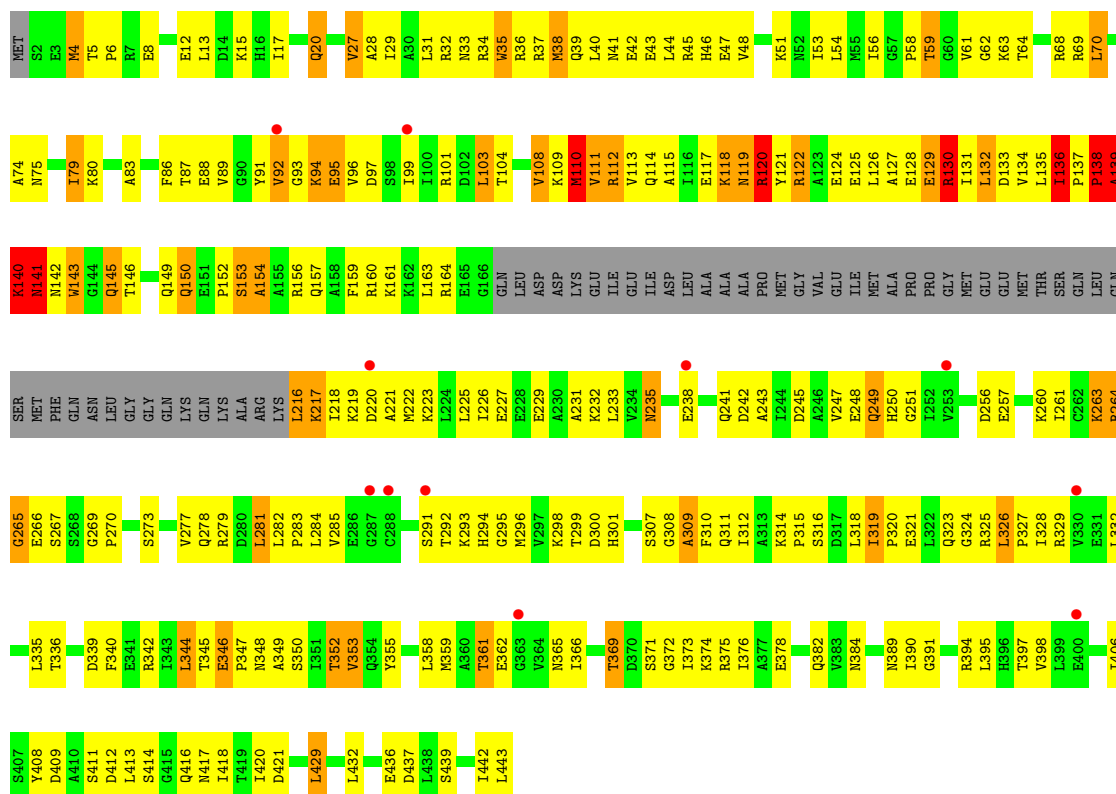


• Molecule 1: ATP-DEPENDENT HSL PROTEASE ATP-BINDING SUBUNIT HSLU



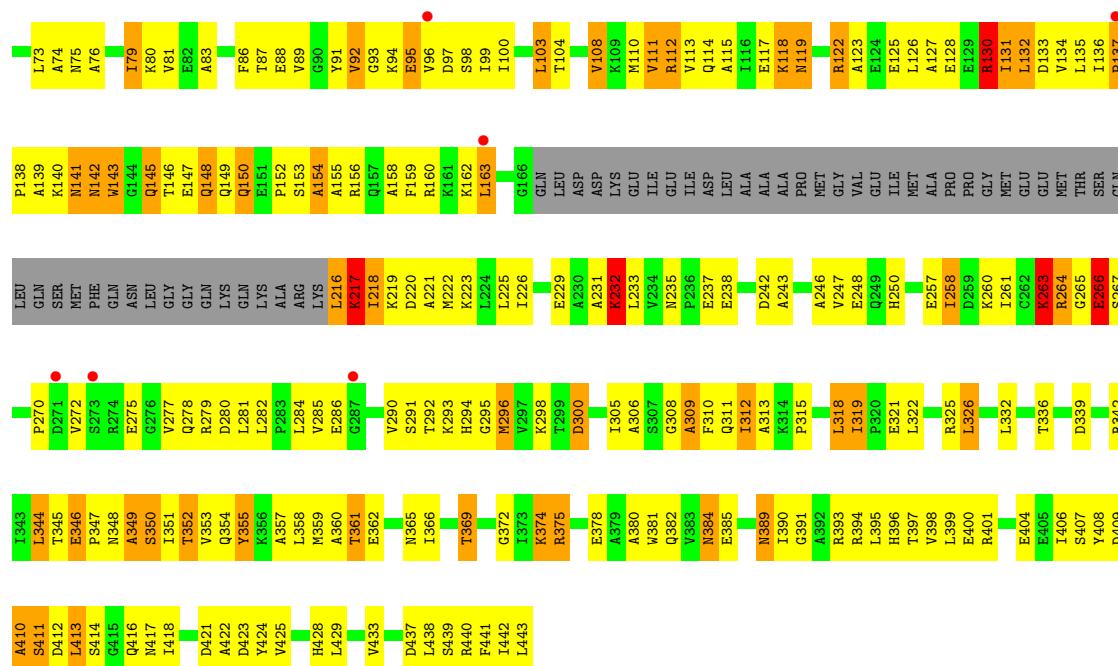


• Molecule 1: ATP-DEPENDENT HSL PROTEASE ATP-BINDING SUBUNIT HSLU

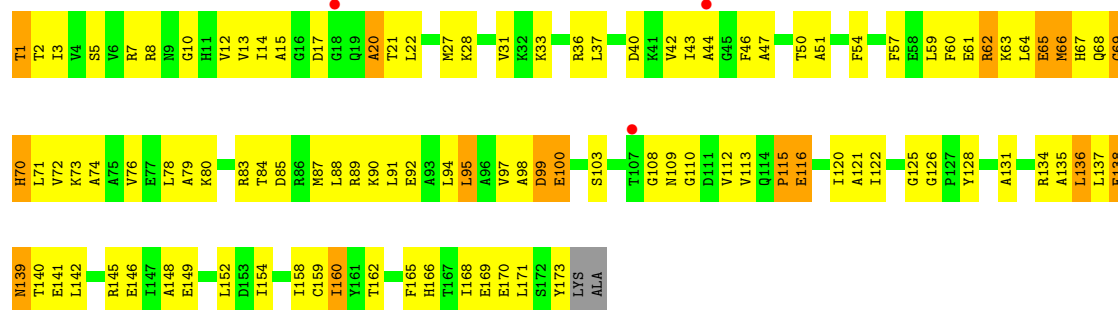


• Molecule 1: ATP-DEPENDENT HSL PROTEASE ATP-BINDING SUBUNIT HSLU

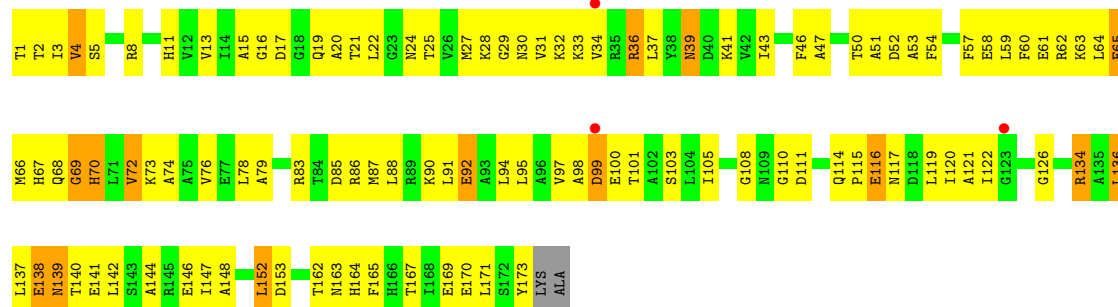




• Molecule 2: ATP-DEPENDENT PROTEASE HSLV

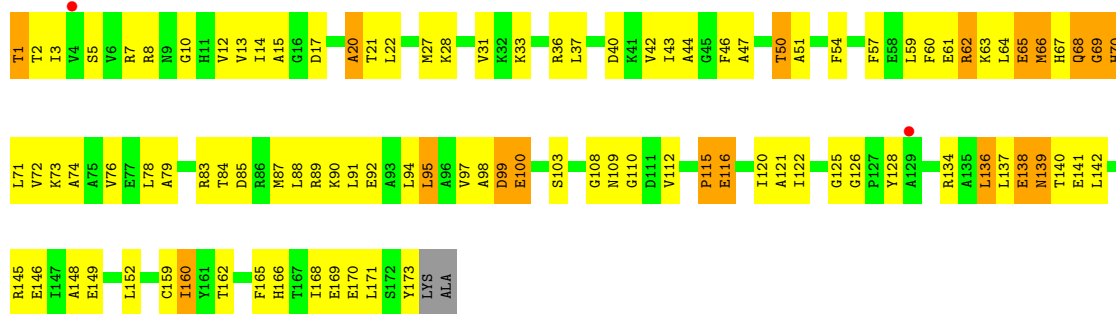


• Molecule 2: ATP-DEPENDENT PROTEASE HSLV



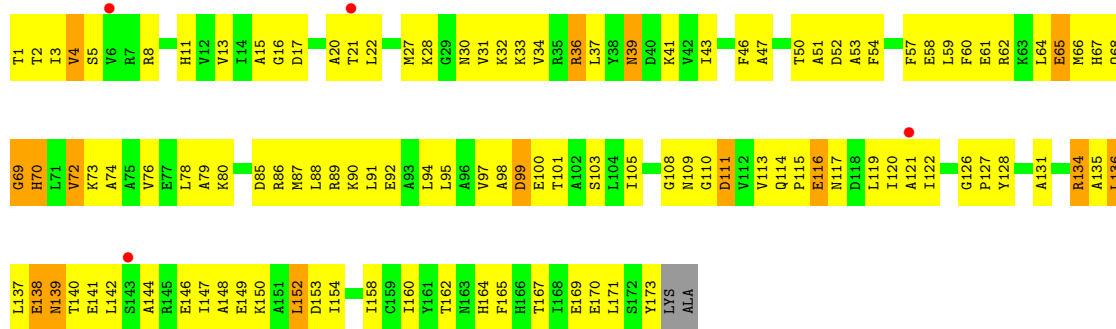
• Molecule 2: ATP-DEPENDENT PROTEASE HSLV

Chain O:  41% 47% 10%



• Molecule 2: ATP-DEPENDENT PROTEASE HSLV

Chain P:  33% 57% 9%



4 Data and refinement statistics

Property	Value	Source
Space group	P 3 2 1	Depositor
Cell constants a, b, c, α , β , γ	173.38Å 173.38Å 254.41Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	10.00 – 7.00 10.00 – 7.00	Depositor EDS
% Data completeness (in resolution range)	66.0 (10.00-7.00) 80.2 (10.00-7.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.68 (at 6.72Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.401 , 0.432 0.449 , 0.436	Depositor DCC
R_{free} test set	607 reflections (9.48%)	wwPDB-VP
Wilson B-factor (Å ²)	101.1	Xtriage
Anisotropy	0.402	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 0.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.42$, $\langle L^2 \rangle = 0.25$	Xtriage
Estimated twinning fraction	0.350 for -h,-k,l	Xtriage
F_o, F_c correlation	0.49	EDS
Total number of atoms	17660	wwPDB-VP
Average B, all atoms (Å ²)	60.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.82% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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

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	E	0.82	4/3135 (0.1%)	1.29	34/4228 (0.8%)
1	F	0.58	2/3135 (0.1%)	1.04	16/4228 (0.4%)
1	K	0.82	4/3135 (0.1%)	1.29	35/4228 (0.8%)
1	L	0.58	1/3135 (0.0%)	1.05	16/4228 (0.4%)
2	M	0.45	0/1336	0.93	2/1806 (0.1%)
2	N	0.42	0/1336	0.98	2/1806 (0.1%)
2	O	0.45	0/1336	0.93	2/1806 (0.1%)
2	P	0.42	0/1336	0.98	2/1806 (0.1%)
All	All	0.64	11/17884 (0.1%)	1.11	109/24136 (0.5%)

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	E	0	2
1	K	0	2
All	All	0	4

The worst 5 of 11 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	139	ALA	C-N	-29.05	0.93	1.33
1	K	139	ALA	C-N	-29.05	0.93	1.33
1	E	122	ARG	CB-CG	9.32	1.80	1.52
1	K	122	ARG	CB-CG	9.28	1.80	1.52
1	E	145	GLN	CA-CB	-8.03	1.40	1.53

The worst 5 of 109 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	122	ARG	CA-CB-CG	-20.16	73.78	114.10

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	K	122	ARG	CA-CB-CG	-20.15	73.80	114.10
1	K	140	LYS	CG-CD-CE	15.09	146.01	111.30
1	E	140	LYS	CG-CD-CE	15.08	145.98	111.30
1	E	138	PRO	CA-C-N	13.76	147.83	121.54

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	E	139	ALA	Mainchain
1	E	141	ASN	Mainchain
1	K	139	ALA	Mainchain
1	K	141	ASN	Mainchain

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	E	3096	0	3151	589	49
1	F	3096	0	3155	609	54
1	K	3096	0	3150	333	220
1	L	3096	0	3152	405	225
2	M	1319	0	1335	175	12
2	N	1319	0	1335	148	15
2	O	1319	0	1330	203	14
2	P	1319	0	1327	181	19
All	All	17660	0	17935	2121	305

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). Clashscore could not be calculated for this entry.

The worst 5 of 2121 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:E:441:PHE:CD1	1:F:56:ILE:HD13	1.27	1.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:K:122:ARG:CB	1:K:122:ARG:CG	1.80	1.59
1:L:309:ALA:HB1	2:O:66:MET:CE	1.28	1.58
1:E:442:ILE:HA	1:F:329:ARG:CB	1.12	1.58
1:E:122:ARG:CG	1:E:122:ARG:CB	1.80	1.56

The worst 5 of 305 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)
1:K:51:LYS:CG	1:L:400:GLU:OE1[3_665]	0.41	1.79
1:K:35:TRP:CE3	1:L:362:GLU:OE2[3_665]	0.55	1.65
1:K:47:GLU:O	1:L:354:GLN:OE1[3_665]	0.59	1.61
1:E:316:SER:CB	1:F:440:ARG:O[2_655]	0.62	1.58
1:K:315:PRO:CA	1:L:440:ARG:O[3_665]	0.66	1.54

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	E	389/443 (88%)	335 (86%)	40 (10%)	14 (4%)	2	20
1	F	389/443 (88%)	329 (85%)	41 (10%)	19 (5%)	1	16
1	K	389/443 (88%)	335 (86%)	40 (10%)	14 (4%)	2	20
1	L	389/443 (88%)	329 (85%)	41 (10%)	19 (5%)	1	16
2	M	171/175 (98%)	145 (85%)	18 (10%)	8 (5%)	2	16
2	N	171/175 (98%)	143 (84%)	23 (14%)	5 (3%)	3	23
2	O	154/175 (88%)	132 (86%)	14 (9%)	8 (5%)	1	15
2	P	171/175 (98%)	143 (84%)	23 (14%)	5 (3%)	3	23
All	All	2223/2472 (90%)	1891 (85%)	240 (11%)	92 (4%)	2	18

5 of 92 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	92	VAL
1	E	140	LYS
1	E	154	ALA
1	E	300	ASP
1	F	92	VAL

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	E	336/377 (89%)	297 (88%)	39 (12%)	5	18
1	F	336/377 (89%)	282 (84%)	54 (16%)	2	11
1	K	336/377 (89%)	297 (88%)	39 (12%)	5	18
1	L	336/377 (89%)	282 (84%)	54 (16%)	2	11
2	M	135/136 (99%)	124 (92%)	11 (8%)	11	31
2	N	135/136 (99%)	120 (89%)	15 (11%)	6	19
2	O	135/136 (99%)	124 (92%)	11 (8%)	11	31
2	P	135/136 (99%)	120 (89%)	15 (11%)	6	19
All	All	1884/2052 (92%)	1646 (87%)	238 (13%)	4	16

5 of 238 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	K	141	ASN
2	O	146	GLU
1	L	79	ILE
2	O	138	GLU
2	P	146	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 90 such sidechains are listed below:

Mol	Chain	Res	Type
1	L	150	GLN
2	M	114	GLN
1	L	235	ASN
1	L	396	HIS
2	N	39	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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	E	1
1	K	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	E	139:ALA	C	140:LYS	N	0.93
1	K	139:ALA	C	140:LYS	N	0.93

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	E	393/443 (88%)	-0.04	6 (1%) 72 60	60, 60, 60, 60	0
1	F	393/443 (88%)	-0.00	7 (1%) 67 58	60, 60, 60, 60	0
1	K	393/443 (88%)	0.07	11 (2%) 55 48	60, 60, 60, 60	0
1	L	393/443 (88%)	0.00	6 (1%) 72 60	60, 60, 60, 60	0
2	M	173/175 (98%)	-0.07	3 (1%) 69 59	60, 60, 60, 60	0
2	N	173/175 (98%)	0.09	3 (1%) 69 59	60, 60, 60, 60	0
2	O	173/175 (98%)	0.14	2 (1%) 76 65	60, 60, 60, 60	0
2	P	173/175 (98%)	0.03	4 (2%) 61 53	60, 60, 60, 60	0
All	All	2264/2472 (91%)	0.02	42 (1%) 66 56	60, 60, 60, 60	0

The worst 5 of 42 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	K	363	GLY	5.7
2	M	107	THR	5.1
2	P	121	ALA	4.7
2	M	44	ALA	4.7
1	F	83	ALA	4.3

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

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

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.