



Full wwPDB EM Validation Report ⓘ

Aug 14, 2021 – 12:39 PM EDT

PDB ID : 7L5X
EMDB ID : EMD-23192
Title : p97-R155H mutant dodecamer II
Authors : Nandi, P.; Li, S.; Coulmbres, R.C.A.; Wang, F.; Williams, D.R.; Malyutin, A.G.; Poh, Y.-P.; Chou, T.-F.; Chiu, P.-L.
Deposited on : 2020-12-23
Resolution : 6.10 Å(reported)
Based on initial model : 5FTK

This is a Full wwPDB EM 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/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

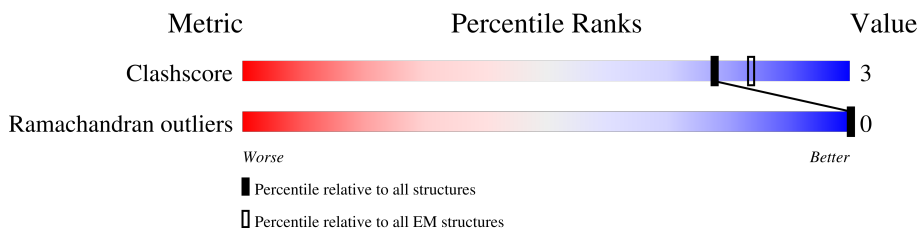
EMDB validation analysis : **FAILED**
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.23.1

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 6.10 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)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	A	806	63% 34%
1	B	806	63% 34%
1	C	806	64% 34%
1	D	806	63% 34%
1	E	806	63% 34%
1	F	806	63% 34%
1	G	806	63% 34%
1	H	806	63% 34%
1	I	806	63% 34%
1	J	806	63% 34%

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Mol	Chain	Length	Quality of chain	
1	K	806	 63%	34%
1	L	806	 64%	34%

2 Entry composition [i](#)

There is only 1 type of molecule in this entry. The entry contains 31512 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Transitional endoplasmic reticulum ATPase.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
1	A	532	2626	1562	532	532	0	0
1	B	532	2626	1562	532	532	0	0
1	C	532	2626	1562	532	532	0	0
1	D	532	2626	1562	532	532	0	0
1	E	532	2626	1562	532	532	0	0
1	F	532	2626	1562	532	532	0	0
1	G	532	2626	1562	532	532	0	0
1	H	532	2626	1562	532	532	0	0
1	I	532	2626	1562	532	532	0	0
1	J	532	2626	1562	532	532	0	0
1	K	532	2626	1562	532	532	0	0
1	L	532	2626	1562	532	532	0	0

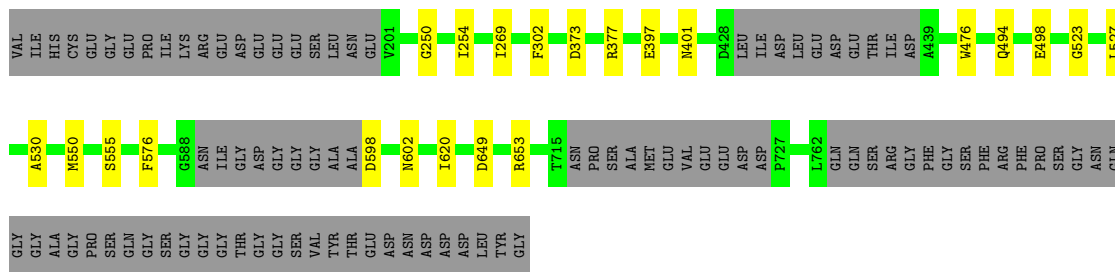
There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	155	HIS	ARG	engineered mutation	UNP P55072
B	155	HIS	ARG	engineered mutation	UNP P55072
C	155	HIS	ARG	engineered mutation	UNP P55072
D	155	HIS	ARG	engineered mutation	UNP P55072
E	155	HIS	ARG	engineered mutation	UNP P55072
F	155	HIS	ARG	engineered mutation	UNP P55072

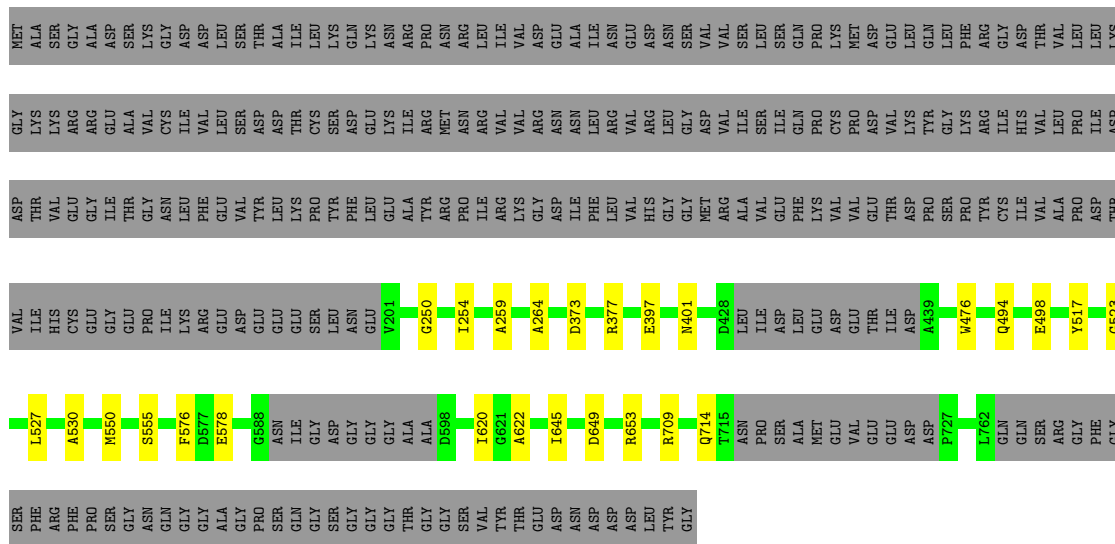
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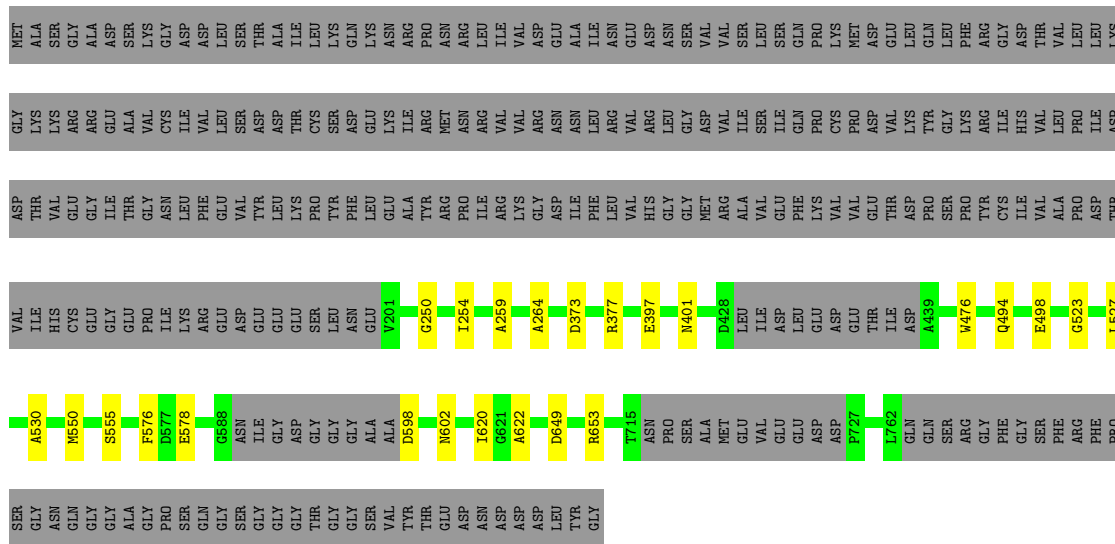
Chain	Residue	Modelled	Actual	Comment	Reference
G	155	HIS	ARG	engineered mutation	UNP P55072
H	155	HIS	ARG	engineered mutation	UNP P55072
I	155	HIS	ARG	engineered mutation	UNP P55072
J	155	HIS	ARG	engineered mutation	UNP P55072
K	155	HIS	ARG	engineered mutation	UNP P55072
L	155	HIS	ARG	engineered mutation	UNP P55072



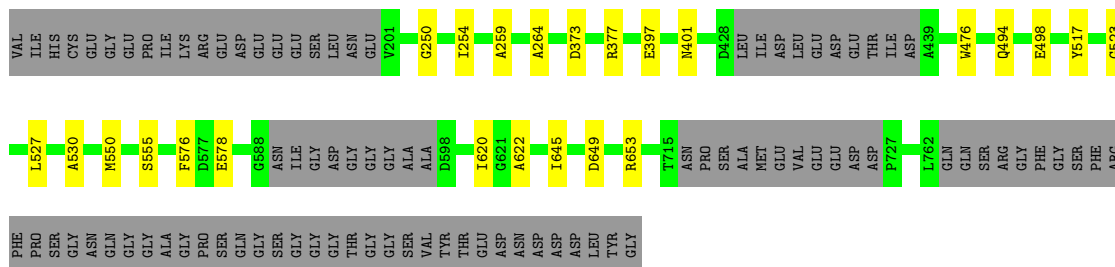
• Molecule 1: Transitional endoplasmic reticulum ATPase



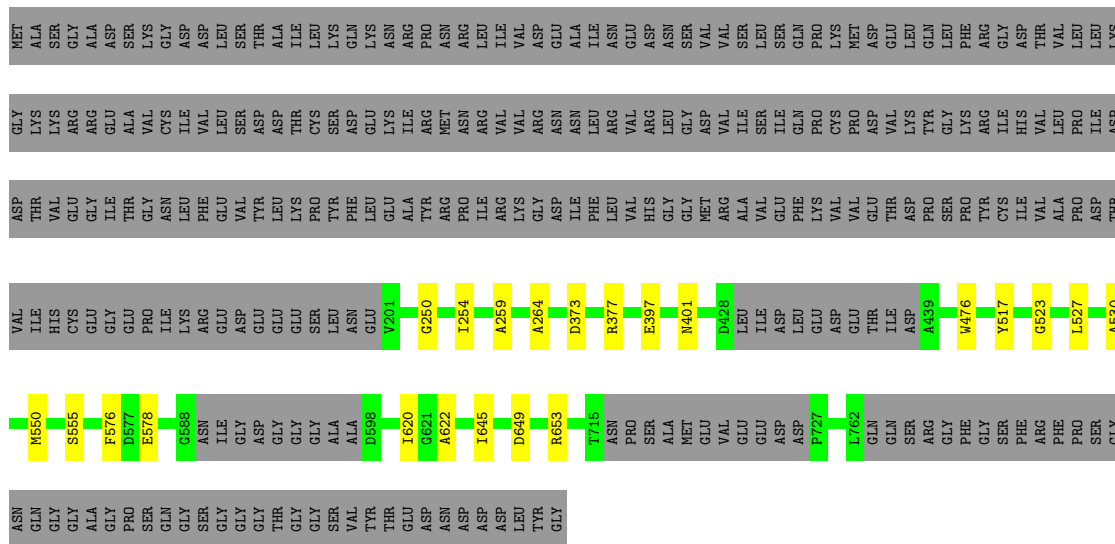
• Molecule 1: Transitional endoplasmic reticulum ATPase



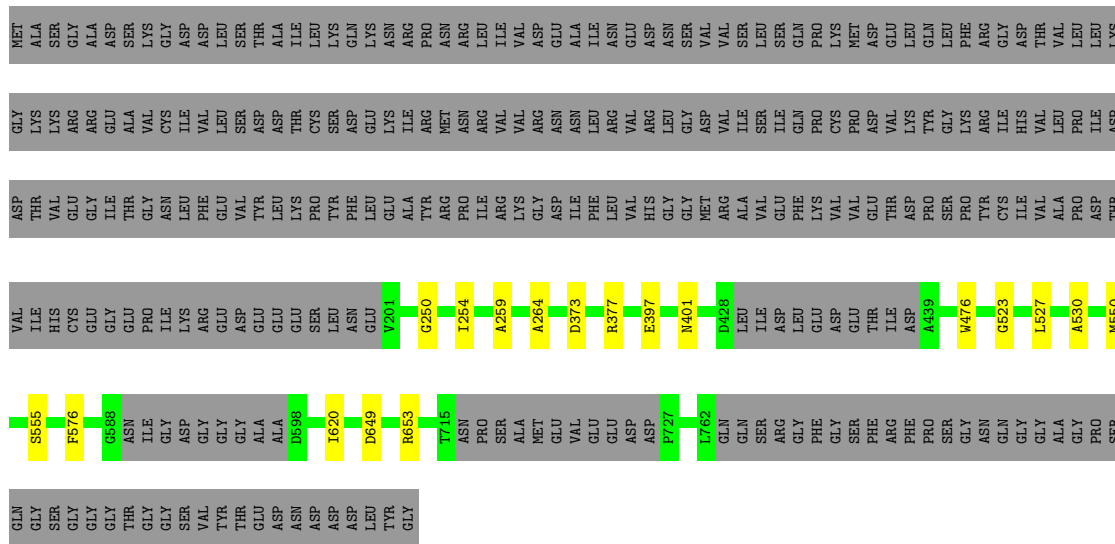
• Molecule 1: Transitional endoplasmic reticulum ATPase



• Molecule 1: Transitional endoplasmic reticulum ATPase



• Molecule 1: Transitional endoplasmic reticulum ATPase



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, D6	Depositor
Number of particles used	2219	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	44.4	Depositor
Minimum defocus (nm)	-800	Depositor
Maximum defocus (nm)	-2500	Depositor
Magnification	48077	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor

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	0.28	0/2622	0.43	0/3644
1	B	0.28	0/2622	0.43	0/3644
1	C	0.28	0/2622	0.43	0/3644
1	D	0.28	0/2622	0.43	0/3644
1	E	0.28	0/2622	0.43	0/3644
1	F	0.28	0/2622	0.43	0/3644
1	G	0.28	0/2622	0.43	0/3644
1	H	0.28	0/2622	0.43	0/3644
1	I	0.28	0/2622	0.43	0/3644
1	J	0.28	0/2622	0.43	0/3644
1	K	0.28	0/2622	0.43	0/3644
1	L	0.28	0/2622	0.43	0/3644
All	All	0.28	0/31464	0.43	0/43728

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

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	2626	0	1225	12	0
1	B	2626	0	1225	11	0
1	C	2626	0	1225	9	0
1	D	2626	0	1225	11	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	E	2626	0	1225	11	0
1	F	2626	0	1225	13	0
1	G	2626	0	1225	12	0
1	H	2626	0	1225	11	0
1	I	2626	0	1225	12	0
1	J	2626	0	1225	12	0
1	K	2626	0	1225	11	0
1	L	2626	0	1225	9	0
All	All	31512	0	14700	134	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 (134) 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:D:476:TRP:H	1:D:530:ALA:HB1	1.70	0.56
1:G:476:TRP:H	1:G:530:ALA:HB1	1.70	0.56
1:C:476:TRP:H	1:C:530:ALA:HB1	1.70	0.56
1:H:476:TRP:H	1:H:530:ALA:HB1	1.70	0.56
1:L:476:TRP:H	1:L:530:ALA:HB1	1.70	0.56
1:E:476:TRP:H	1:E:530:ALA:HB1	1.70	0.55
1:J:476:TRP:H	1:J:530:ALA:HB1	1.70	0.55
1:K:476:TRP:H	1:K:530:ALA:HB1	1.71	0.55
1:B:476:TRP:H	1:B:530:ALA:HB1	1.70	0.55
1:A:476:TRP:H	1:A:530:ALA:HB1	1.70	0.55
1:I:476:TRP:H	1:I:530:ALA:HB1	1.70	0.55
1:F:476:TRP:H	1:F:530:ALA:HB1	1.70	0.54
1:D:550:MET:HA	1:D:555:SER:H	1.73	0.54
1:G:550:MET:HA	1:G:555:SER:H	1.73	0.54
1:E:550:MET:HA	1:E:555:SER:H	1.73	0.54
1:F:550:MET:HA	1:F:555:SER:H	1.73	0.54
1:A:550:MET:HA	1:A:555:SER:H	1.73	0.54
1:H:550:MET:HA	1:H:555:SER:H	1.73	0.54
1:I:550:MET:HA	1:I:555:SER:H	1.73	0.54
1:K:550:MET:HA	1:K:555:SER:H	1.73	0.54
1:B:550:MET:HA	1:B:555:SER:H	1.73	0.53
1:J:550:MET:HA	1:J:555:SER:H	1.73	0.53
1:C:550:MET:HA	1:C:555:SER:H	1.73	0.52
1:A:523:GLY:O	1:A:527:LEU:N	2.42	0.52
1:F:523:GLY:O	1:F:527:LEU:N	2.42	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:I:523:GLY:O	1:I:527:LEU:N	2.42	0.52
1:J:523:GLY:O	1:J:527:LEU:N	2.42	0.52
1:L:550:MET:HA	1:L:555:SER:H	1.73	0.52
1:D:523:GLY:O	1:D:527:LEU:N	2.42	0.52
1:G:523:GLY:O	1:G:527:LEU:N	2.42	0.52
1:E:523:GLY:O	1:E:527:LEU:N	2.42	0.52
1:L:523:GLY:O	1:L:527:LEU:N	2.42	0.52
1:B:523:GLY:O	1:B:527:LEU:N	2.42	0.51
1:C:523:GLY:O	1:C:527:LEU:N	2.42	0.51
1:H:523:GLY:O	1:H:527:LEU:N	2.42	0.51
1:K:523:GLY:O	1:K:527:LEU:N	2.42	0.51
1:A:649:ASP:O	1:A:653:ARG:N	2.42	0.50
1:K:649:ASP:O	1:K:653:ARG:N	2.42	0.49
1:B:649:ASP:O	1:B:653:ARG:N	2.42	0.49
1:B:397:GLU:O	1:B:401:ASN:N	2.46	0.49
1:H:397:GLU:O	1:H:401:ASN:N	2.46	0.49
1:E:397:GLU:O	1:E:401:ASN:N	2.46	0.49
1:H:649:ASP:O	1:H:653:ARG:N	2.42	0.48
1:E:649:ASP:O	1:E:653:ARG:N	2.42	0.48
1:L:649:ASP:O	1:L:653:ARG:N	2.42	0.48
1:L:397:GLU:O	1:L:401:ASN:N	2.46	0.47
1:G:649:ASP:O	1:G:653:ARG:N	2.42	0.47
1:I:397:GLU:O	1:I:401:ASN:N	2.46	0.47
1:C:397:GLU:O	1:C:401:ASN:N	2.46	0.47
1:C:649:ASP:O	1:C:653:ARG:N	2.42	0.47
1:F:397:GLU:O	1:F:401:ASN:N	2.46	0.47
1:D:649:ASP:O	1:D:653:ARG:N	2.42	0.47
1:I:578:GLU:N	1:I:622:ALA:O	2.48	0.46
1:D:397:GLU:O	1:D:401:ASN:N	2.46	0.46
1:F:578:GLU:N	1:F:622:ALA:O	2.48	0.46
1:I:649:ASP:O	1:I:653:ARG:N	2.42	0.46
1:G:397:GLU:O	1:G:401:ASN:N	2.46	0.46
1:F:649:ASP:O	1:F:653:ARG:N	2.42	0.46
1:I:250:GLY:O	1:I:254:ILE:N	2.49	0.45
1:F:250:GLY:O	1:F:254:ILE:N	2.49	0.45
1:J:397:GLU:O	1:J:401:ASN:N	2.46	0.45
1:C:250:GLY:O	1:C:254:ILE:N	2.49	0.44
1:J:649:ASP:O	1:J:653:ARG:N	2.42	0.44
1:L:250:GLY:O	1:L:254:ILE:N	2.49	0.44
1:F:373:ASP:O	1:F:377:ARG:N	2.49	0.44
1:A:397:GLU:O	1:A:401:ASN:N	2.46	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:373:ASP:O	1:E:377:ARG:N	2.48	0.44
1:H:373:ASP:O	1:H:377:ARG:N	2.48	0.44
1:I:373:ASP:O	1:I:377:ARG:N	2.49	0.44
1:J:578:GLU:N	1:J:622:ALA:O	2.48	0.44
1:K:250:GLY:O	1:K:254:ILE:N	2.49	0.44
1:B:250:GLY:O	1:B:254:ILE:N	2.49	0.44
1:J:250:GLY:O	1:J:254:ILE:N	2.49	0.44
1:A:250:GLY:O	1:A:254:ILE:N	2.49	0.43
1:A:578:GLU:N	1:A:622:ALA:O	2.48	0.43
1:J:373:ASP:O	1:J:377:ARG:N	2.48	0.43
1:H:250:GLY:O	1:H:254:ILE:N	2.49	0.43
1:A:373:ASP:O	1:A:377:ARG:N	2.48	0.43
1:G:494:GLN:O	1:G:498:GLU:N	2.50	0.43
1:E:250:GLY:O	1:E:254:ILE:N	2.49	0.43
1:J:494:GLN:O	1:J:498:GLU:N	2.50	0.43
1:D:494:GLN:O	1:D:498:GLU:N	2.50	0.43
1:A:494:GLN:O	1:A:498:GLU:N	2.50	0.43
1:K:397:GLU:O	1:K:401:ASN:N	2.46	0.43
1:I:517:TYR:O	1:I:645:ILE:N	2.46	0.43
1:K:517:TYR:O	1:K:645:ILE:N	2.46	0.43
1:B:517:TYR:O	1:B:645:ILE:N	2.46	0.43
1:F:517:TYR:O	1:F:645:ILE:N	2.46	0.43
1:K:578:GLU:N	1:K:622:ALA:O	2.48	0.42
1:B:578:GLU:N	1:B:622:ALA:O	2.48	0.42
1:D:373:ASP:O	1:D:377:ARG:N	2.49	0.42
1:D:578:GLU:N	1:D:622:ALA:O	2.48	0.42
1:G:578:GLU:N	1:G:622:ALA:O	2.48	0.42
1:G:373:ASP:O	1:G:377:ARG:N	2.49	0.42
1:I:494:GLN:O	1:I:498:GLU:N	2.50	0.42
1:E:494:GLN:O	1:E:498:GLU:N	2.50	0.42
1:F:494:GLN:O	1:F:498:GLU:N	2.50	0.42
1:H:269:ILE:N	1:H:302:PHE:O	2.46	0.42
1:H:494:GLN:O	1:H:498:GLU:N	2.50	0.42
1:K:373:ASP:O	1:K:377:ARG:N	2.48	0.42
1:B:373:ASP:O	1:B:377:ARG:N	2.48	0.41
1:E:269:ILE:N	1:E:302:PHE:O	2.46	0.41
1:B:576:PHE:N	1:B:620:ILE:O	2.54	0.41
1:K:576:PHE:N	1:K:620:ILE:O	2.54	0.41
1:B:259:ALA:O	1:B:264:ALA:N	2.54	0.41
1:K:259:ALA:O	1:K:264:ALA:N	2.54	0.41
1:C:259:ALA:O	1:C:264:ALA:N	2.54	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:J:259:ALA:O	1:J:264:ALA:N	2.54	0.41
1:J:576:PHE:N	1:J:620:ILE:O	2.54	0.41
1:L:259:ALA:O	1:L:264:ALA:N	2.54	0.41
1:A:259:ALA:O	1:A:264:ALA:N	2.54	0.41
1:A:576:PHE:N	1:A:620:ILE:O	2.54	0.41
1:L:576:PHE:N	1:L:620:ILE:O	2.54	0.41
1:A:517:TYR:O	1:A:645:ILE:N	2.46	0.41
1:E:576:PHE:N	1:E:620:ILE:O	2.54	0.41
1:F:576:PHE:N	1:F:620:ILE:O	2.54	0.41
1:H:576:PHE:N	1:H:620:ILE:O	2.54	0.41
1:I:576:PHE:N	1:I:620:ILE:O	2.54	0.41
1:C:576:PHE:N	1:C:620:ILE:O	2.54	0.41
1:D:576:PHE:N	1:D:620:ILE:O	2.54	0.41
1:G:576:PHE:N	1:G:620:ILE:O	2.54	0.41
1:J:517:TYR:O	1:J:645:ILE:N	2.46	0.41
1:E:598:ASP:O	1:E:602:ASN:N	2.54	0.40
1:G:598:ASP:O	1:G:602:ASN:N	2.54	0.40
1:H:598:ASP:O	1:H:602:ASN:N	2.54	0.40
1:D:259:ALA:O	1:D:264:ALA:N	2.54	0.40
1:D:598:ASP:O	1:D:602:ASN:N	2.54	0.40
1:G:259:ALA:O	1:G:264:ALA:N	2.54	0.40
1:C:373:ASP:O	1:C:377:ARG:N	2.49	0.40
1:G:250:GLY:O	1:G:254:ILE:N	2.49	0.40
1:F:259:ALA:O	1:F:264:ALA:N	2.54	0.40
1:I:259:ALA:O	1:I:264:ALA:N	2.54	0.40
1:L:373:ASP:O	1:L:377:ARG:N	2.49	0.40
1:F:709:ARG:O	1:F:714:GLN:N	2.42	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 PDB entries followed by that with respect to all EM entries.

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	524/806 (65%)	490 (94%)	34 (6%)	0	100	100
1	B	524/806 (65%)	490 (94%)	34 (6%)	0	100	100
1	C	524/806 (65%)	490 (94%)	34 (6%)	0	100	100
1	D	524/806 (65%)	491 (94%)	33 (6%)	0	100	100
1	E	524/806 (65%)	490 (94%)	34 (6%)	0	100	100
1	F	524/806 (65%)	490 (94%)	34 (6%)	0	100	100
1	G	524/806 (65%)	490 (94%)	34 (6%)	0	100	100
1	H	524/806 (65%)	490 (94%)	34 (6%)	0	100	100
1	I	524/806 (65%)	490 (94%)	34 (6%)	0	100	100
1	J	524/806 (65%)	491 (94%)	33 (6%)	0	100	100
1	K	524/806 (65%)	490 (94%)	34 (6%)	0	100	100
1	L	524/806 (65%)	490 (94%)	34 (6%)	0	100	100
All	All	6288/9672 (65%)	5882 (94%)	406 (6%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

There are no protein residues with a non-rotameric sidechain to report in this entry.

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 monosaccharides 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.