



wwPDB X-ray Structure Validation Summary Report ⓘ

Dec 8, 2023 – 01:21 am GMT

PDB ID : 2W5J
Title : Structure of the c14-rotor ring of the proton translocating chloroplast ATP synthase
Authors : Vollmar, M.; Schlieper, D.; Winn, M.; Buechner, C.; Groth, G.
Deposited on : 2008-12-10
Resolution : 3.80 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.


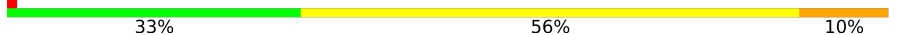

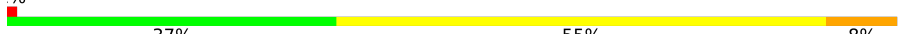
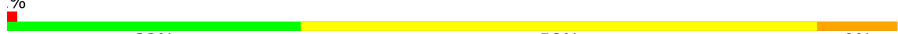

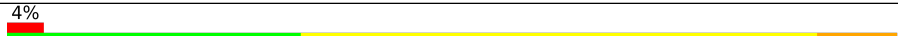
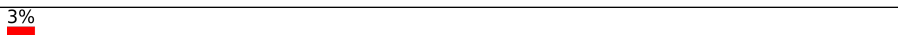
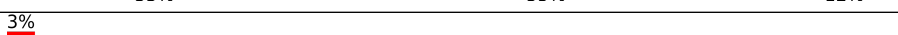
The types of validation reports are described at

<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 : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.36
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

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Mol	Chain	Length	Quality of chain
1	F	78	 32% 59% 9%
1	G	78	 33% 56% 10%
1	H	78	 33% 58% 9%
1	I	78	 37% 55% 8%
1	J	78	 33% 58% 9%
1	K	78	 4% 36% 54% 10%
1	L	78	 4% 33% 58% 9%
1	M	78	 3% 33% 55% 12%
1	V	78	 3% 36% 54% 10%

2 Entry composition [i](#)

There is only 1 type of molecule in this entry. The entry contains 6860 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.

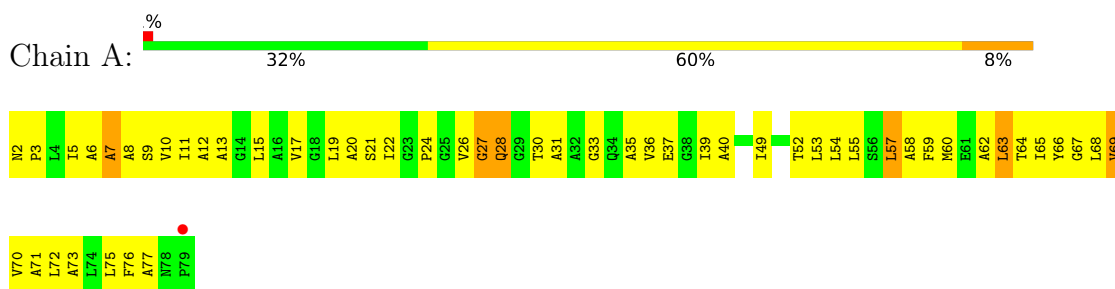
- Molecule 1 is a protein called ATP SYNTHASE C CHAIN, CHLOROPLASTIC.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
1	A	78	490	315	85	90	0	0	0
1	B	78	490	315	85	90	0	0	0
1	C	78	490	315	85	90	0	0	0
1	D	78	490	315	85	90	0	0	0
1	E	78	490	315	85	90	0	0	0
1	F	78	490	315	85	90	0	0	0
1	G	78	490	315	85	90	0	0	0
1	H	78	490	315	85	90	0	0	0
1	I	78	490	315	85	90	0	0	0
1	J	78	490	315	85	90	0	0	0
1	K	78	490	315	85	90	0	0	0
1	L	78	490	315	85	90	0	0	0
1	M	78	490	315	85	90	0	0	0
1	V	78	490	315	85	90	0	0	0

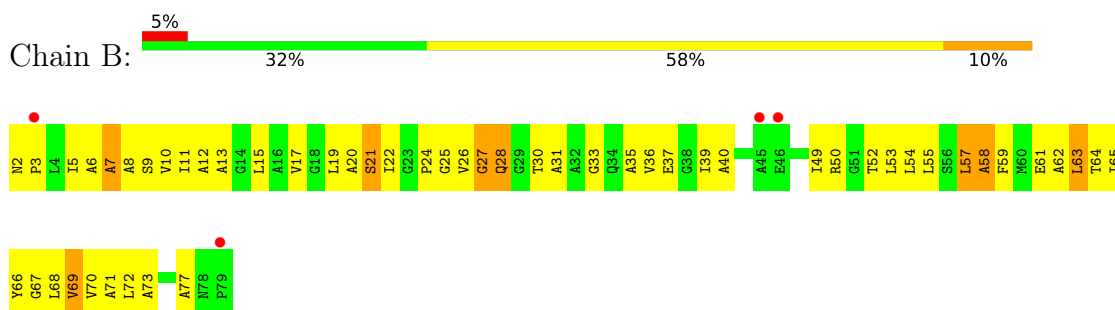
3 Residue-property plots [i](#)

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 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.

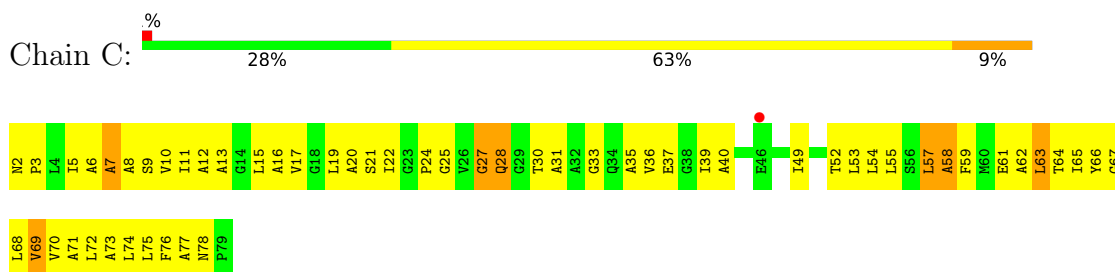
- Molecule 1: ATP SYNTHASE C CHAIN, CHLOROPLASTIC



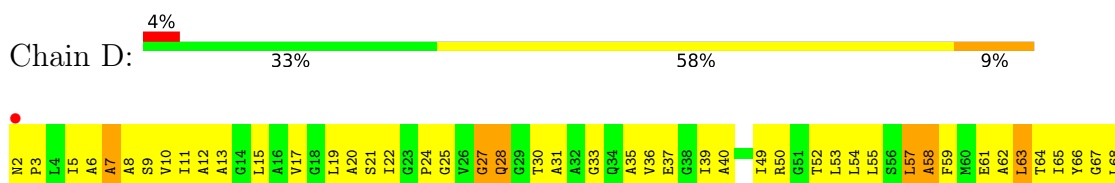
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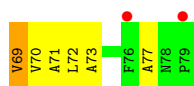


- Molecule 1: ATP SYNTHASE C CHAIN, CHLOROPLASTIC

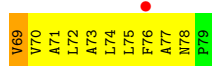
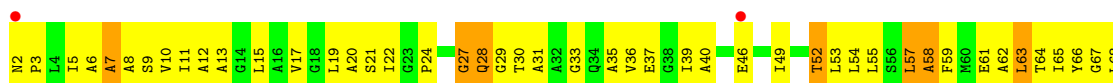


- Molecule 1: ATP SYNTHASE C CHAIN, CHLOROPLASTIC

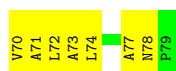
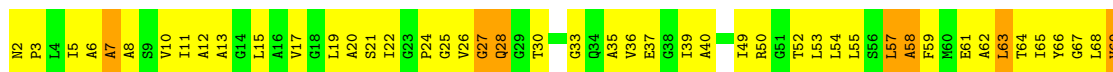




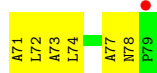
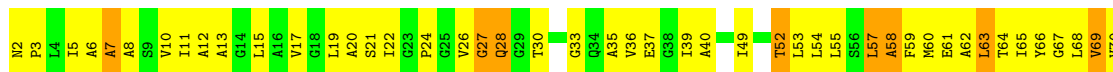
- Molecule 1: ATP SYNTHASE C CHAIN, CHLOROPLASTIC



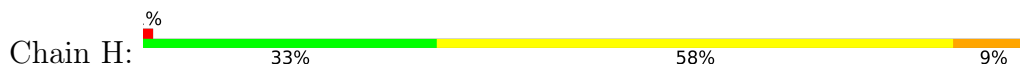
- Molecule 1: ATP SYNTHASE C CHAIN, CHLOROPLASTIC



- Molecule 1: ATP SYNTHASE C CHAIN, CHLOROPLASTIC

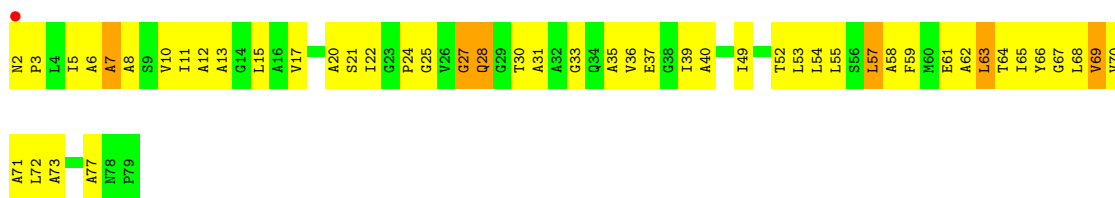


- Molecule 1: ATP SYNTHASE C CHAIN, CHLOROPLASTIC

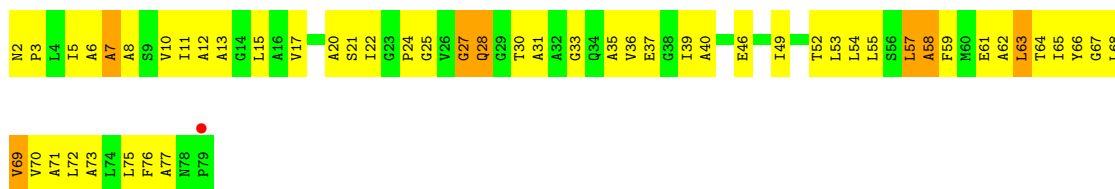


- Molecule 1: ATP SYNTHASE C CHAIN, CHLOROPLASTIC

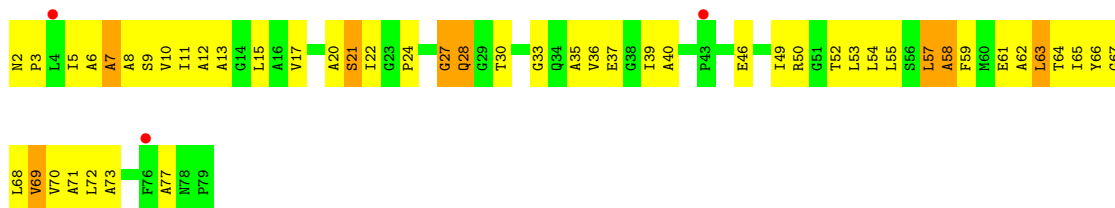




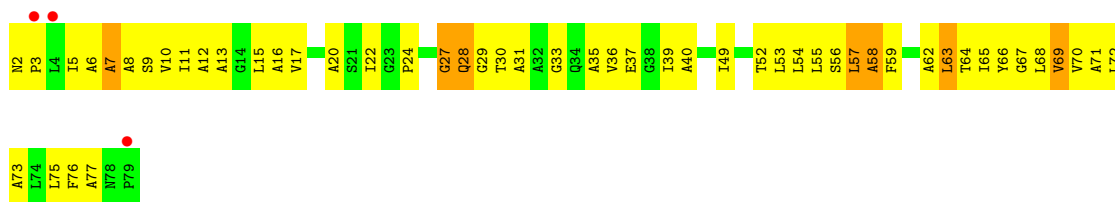
- Molecule 1: ATP SYNTHASE C CHAIN, CHLOROPLASTIC



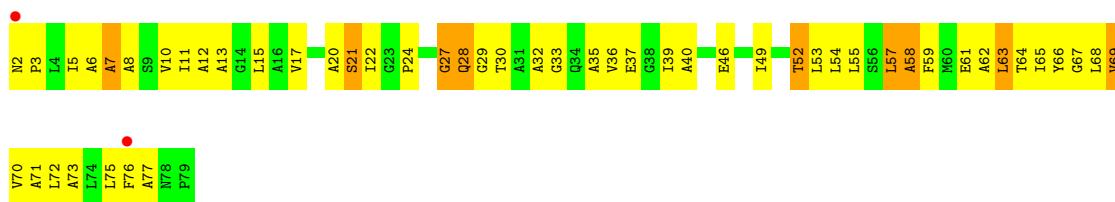
- Molecule 1: ATP SYNTHASE C CHAIN, CHLOROPLASTIC



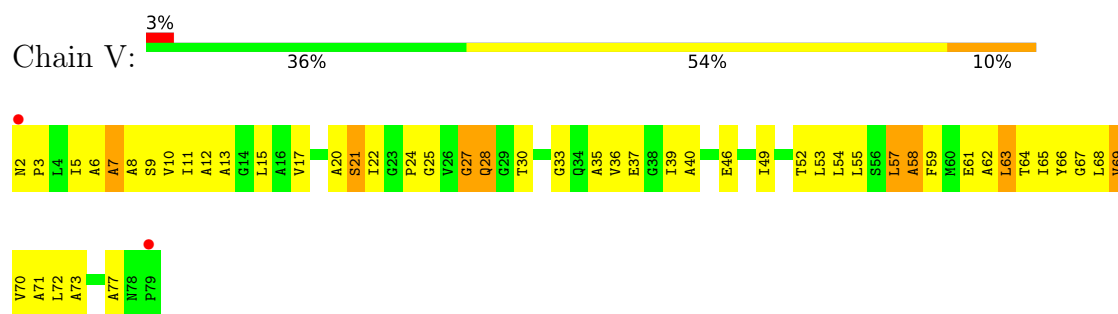
- Molecule 1: ATP SYNTHASE C CHAIN, CHLOROPLASTIC



- Molecule 1: ATP SYNTHASE C CHAIN, CHLOROPLASTIC



- Molecule 1: ATP SYNTHASE C CHAIN, CHLOROPLASTIC



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	128.60Å 90.00Å 124.89Å 90.00° 104.70° 90.00°	Depositor
Resolution (Å)	19.75 – 3.80 19.75 – 3.80	Depositor EDS
% Data completeness (in resolution range)	92.5 (19.75-3.80) 92.5 (19.75-3.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.78 (at 3.82Å)	Xtrriage
Refinement program	REFMAC 5.5.0063	Depositor
R, R_{free}	0.317 , 0.335 0.323 , 0.336	Depositor DCC
R_{free} test set	628 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å ²)	140.7	Xtrriage
Anisotropy	0.186	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 211.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.54$, $\langle L^2 \rangle = 0.37$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	6860	wwPDB-VP
Average B, all atoms (Å ²)	69.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 13.93% 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 [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	0.62	0/496	0.64	0/681
1	B	0.68	0/496	0.66	0/681
1	C	0.68	0/496	0.65	0/681
1	D	0.67	0/496	0.65	0/681
1	E	0.69	0/496	0.65	0/681
1	F	0.63	0/496	0.65	0/681
1	G	0.60	0/496	0.63	0/681
1	H	0.57	0/496	0.63	0/681
1	I	0.62	0/496	0.64	0/681
1	J	0.62	0/496	0.64	0/681
1	K	0.63	0/496	0.64	0/681
1	L	0.64	0/496	0.64	0/681
1	M	0.63	0/496	0.65	0/681
1	V	0.63	0/496	0.65	0/681
All	All	0.64	0/6944	0.65	0/9534

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	490	0	477	123	0
1	B	490	0	477	126	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	490	0	477	121	0
1	D	490	0	477	129	0
1	E	490	0	477	124	0
1	F	490	0	477	116	0
1	G	490	0	477	101	0
1	H	490	0	477	105	0
1	I	490	0	477	111	0
1	J	490	0	477	122	0
1	K	490	0	477	118	0
1	L	490	0	477	129	0
1	M	490	0	477	127	0
1	V	490	0	477	105	0
All	All	6860	0	6678	1122	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 83.

The worst 5 of 1122 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:70:VAL:HG22	1:E:72:LEU:HD21	1.33	1.09
1:A:70:VAL:HG22	1:B:72:LEU:HD21	1.35	1.08
1:A:5:ILE:HG22	1:B:8:ALA:HB2	1.34	1.07
1:K:5:ILE:HG22	1:L:8:ALA:HB2	1.34	1.06
1:K:70:VAL:HG22	1:L:72:LEU:HD21	1.43	1.00

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	76/78 (97%)	53 (70%)	17 (22%)	6 (8%)	1	14
1	B	76/78 (97%)	51 (67%)	19 (25%)	6 (8%)	1	14
1	C	76/78 (97%)	51 (67%)	18 (24%)	7 (9%)	1	12
1	D	76/78 (97%)	52 (68%)	18 (24%)	6 (8%)	1	14
1	E	76/78 (97%)	51 (67%)	19 (25%)	6 (8%)	1	14
1	F	76/78 (97%)	51 (67%)	19 (25%)	6 (8%)	1	14
1	G	76/78 (97%)	53 (70%)	17 (22%)	6 (8%)	1	14
1	H	76/78 (97%)	51 (67%)	19 (25%)	6 (8%)	1	14
1	I	76/78 (97%)	53 (70%)	17 (22%)	6 (8%)	1	14
1	J	76/78 (97%)	50 (66%)	20 (26%)	6 (8%)	1	14
1	K	76/78 (97%)	52 (68%)	18 (24%)	6 (8%)	1	14
1	L	76/78 (97%)	51 (67%)	18 (24%)	7 (9%)	1	12
1	M	76/78 (97%)	52 (68%)	18 (24%)	6 (8%)	1	14
1	V	76/78 (97%)	51 (67%)	19 (25%)	6 (8%)	1	14
All	All	1064/1092 (97%)	722 (68%)	256 (24%)	86 (8%)	1	14

5 of 86 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	22	ILE
1	E	22	ILE
1	G	22	ILE
1	I	22	ILE
1	J	22	ILE

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	37/50 (74%)	34 (92%)	3 (8%)	11	41
1	B	37/50 (74%)	34 (92%)	3 (8%)	11	41

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	37/50 (74%)	34 (92%)	3 (8%)	11	41
1	D	37/50 (74%)	35 (95%)	2 (5%)	22	53
1	E	37/50 (74%)	33 (89%)	4 (11%)	6	30
1	F	37/50 (74%)	35 (95%)	2 (5%)	22	53
1	G	37/50 (74%)	34 (92%)	3 (8%)	11	41
1	H	37/50 (74%)	34 (92%)	3 (8%)	11	41
1	I	37/50 (74%)	34 (92%)	3 (8%)	11	41
1	J	37/50 (74%)	34 (92%)	3 (8%)	11	41
1	K	37/50 (74%)	34 (92%)	3 (8%)	11	41
1	L	37/50 (74%)	35 (95%)	2 (5%)	22	53
1	M	37/50 (74%)	33 (89%)	4 (11%)	6	30
1	V	37/50 (74%)	34 (92%)	3 (8%)	11	41
All	All	518/700 (74%)	477 (92%)	41 (8%)	12	42

5 of 41 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	J	69	VAL
1	M	52	THR
1	K	21	SER
1	L	63	LEU
1	M	69	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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.

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	A	78/78 (100%)	-0.36	1 (1%) 77 70	65, 69, 72, 72	0
1	B	78/78 (100%)	-0.25	4 (5%) 28 24	65, 69, 72, 72	0
1	C	78/78 (100%)	-0.36	1 (1%) 77 70	65, 69, 72, 72	0
1	D	78/78 (100%)	-0.40	3 (3%) 40 33	65, 69, 72, 72	0
1	E	78/78 (100%)	-0.33	3 (3%) 40 33	65, 69, 72, 72	0
1	F	78/78 (100%)	-0.43	0 100 100	65, 69, 72, 72	0
1	G	78/78 (100%)	-0.35	1 (1%) 77 70	65, 69, 72, 72	0
1	H	78/78 (100%)	-0.41	1 (1%) 77 70	65, 69, 72, 72	0
1	I	78/78 (100%)	-0.27	1 (1%) 77 70	65, 69, 72, 72	0
1	J	78/78 (100%)	-0.28	1 (1%) 77 70	65, 69, 72, 72	0
1	K	78/78 (100%)	-0.18	3 (3%) 40 33	65, 69, 72, 72	0
1	L	78/78 (100%)	-0.26	3 (3%) 40 33	65, 69, 72, 72	0
1	M	78/78 (100%)	-0.36	2 (2%) 56 47	65, 69, 72, 72	0
1	V	78/78 (100%)	-0.30	2 (2%) 56 47	65, 69, 72, 72	0
All	All	1092/1092 (100%)	-0.32	26 (2%) 59 50	65, 69, 72, 72	0

The worst 5 of 26 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	K	43	PRO	3.6
1	D	76	PHE	3.5
1	V	79	PRO	2.8
1	I	2	ASN	2.7
1	C	46	GLU	2.6

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 monosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.