



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 4, 2026 – 10:12 PM UTC

PDB ID : 5W0W / pdb_00005w0w
Title : Crystal structure of Protein Phosphatase 2A bound to TIPRL
Authors : Wu, C.; Zheng, A.; Li, J.; Satyshur, K.; Xing, Y.
Deposited on : 2017-06-01
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 : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
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

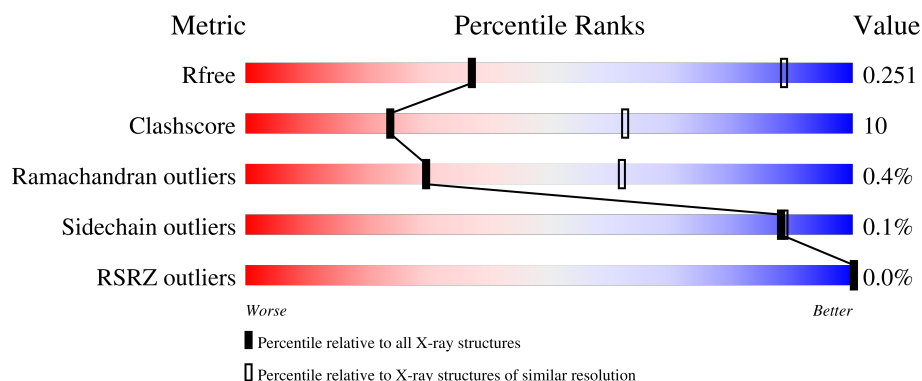
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.80 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	1065 (3.96-3.64)
Clashscore	190562	1012 (3.94-3.66)
Ramachandran outliers	187476	1048 (3.96-3.64)
Sidechain outliers	187428	1043 (3.96-3.64)
RSRZ outliers	180081	1064 (3.96-3.64)

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	A	585	 81% 19% .
1	D	585	 80% 20% .
1	G	585	 76% 23%
1	J	585	 74% 25% .
2	B	251	 69% 17% 14%

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Mol	Chain	Length	Quality of chain
2	E	251	 66% 20% 14%
2	H	251	 69% 16% 14%
2	K	251	 61% 24% 14%
3	C	311	 77% 19% •
3	F	311	 69% 24% • 5%
3	I	311	 70% 24% • 5%
3	L	311	 71% 24% 5%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 34732 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 Serine/threonine-protein phosphatase 2A 65 kDa regulatory subunit A alpha isoform.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	582	Total	C	N	O	S	Se	0	0	0
			4535	2882	764	861	14	14			
1	D	582	Total	C	N	O	S	Se	0	0	0
			4535	2882	764	861	14	14			
1	G	584	Total	C	N	O	S	Se	0	0	0
			4551	2891	768	864	14	14			
1	J	580	Total	C	N	O	S	Se	0	0	0
			4518	2870	762	858	14	14			

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	5	GLY	-	expression tag	UNP P30153
A	6	SER	-	expression tag	UNP P30153
A	7	HIS	-	expression tag	UNP P30153
A	8	MSE	-	expression tag	UNP P30153
D	5	GLY	-	expression tag	UNP P30153
D	6	SER	-	expression tag	UNP P30153
D	7	HIS	-	expression tag	UNP P30153
D	8	MSE	-	expression tag	UNP P30153
G	5	GLY	-	expression tag	UNP P30153
G	6	SER	-	expression tag	UNP P30153
G	7	HIS	-	expression tag	UNP P30153
G	8	MSE	-	expression tag	UNP P30153
J	5	GLY	-	expression tag	UNP P30153
J	6	SER	-	expression tag	UNP P30153
J	7	HIS	-	expression tag	UNP P30153
J	8	MSE	-	expression tag	UNP P30153

- Molecule 2 is a protein called TIP41-like protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	216	Total	C	N	O	S	0	0	0
			1754	1127	292	325	10			
2	E	215	Total	C	N	O	S	0	0	0
			1746	1123	290	323	10			
2	H	215	Total	C	N	O	S	0	0	0
			1743	1121	288	324	10			
2	K	215	Total	C	N	O	S	0	0	0
			1747	1123	288	326	10			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	9	GLY	-	expression tag	UNP Q8BH58
B	10	SER	-	expression tag	UNP Q8BH58
B	11	MET	-	expression tag	UNP Q8BH58
E	9	GLY	-	expression tag	UNP Q8BH58
E	10	SER	-	expression tag	UNP Q8BH58
E	11	MET	-	expression tag	UNP Q8BH58
H	9	GLY	-	expression tag	UNP Q8BH58
H	10	SER	-	expression tag	UNP Q8BH58
H	11	MET	-	expression tag	UNP Q8BH58
K	9	GLY	-	expression tag	UNP Q8BH58
K	10	SER	-	expression tag	UNP Q8BH58
K	11	MET	-	expression tag	UNP Q8BH58

- Molecule 3 is a protein called Serine/threonine-protein phosphatase 2A catalytic subunit alpha isoform.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	298	Total	C	N	O	S	0	1	0
			2424	1537	416	456	15			
3	F	296	Total	C	N	O	S	0	0	0
			2387	1513	407	452	15			
3	I	296	Total	C	N	O	S	0	0	0
			2394	1519	407	453	15			
3	L	296	Total	C	N	O	S	0	0	0
			2394	1519	407	453	15			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-1	GLY	-	expression tag	UNP P67775
C	0	SER	-	expression tag	UNP P67775

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Chain	Residue	Modelled	Actual	Comment	Reference
F	-1	GLY	-	expression tag	UNP P67775
F	0	SER	-	expression tag	UNP P67775
I	-1	GLY	-	expression tag	UNP P67775
I	0	SER	-	expression tag	UNP P67775
L	-1	GLY	-	expression tag	UNP P67775
L	0	SER	-	expression tag	UNP P67775

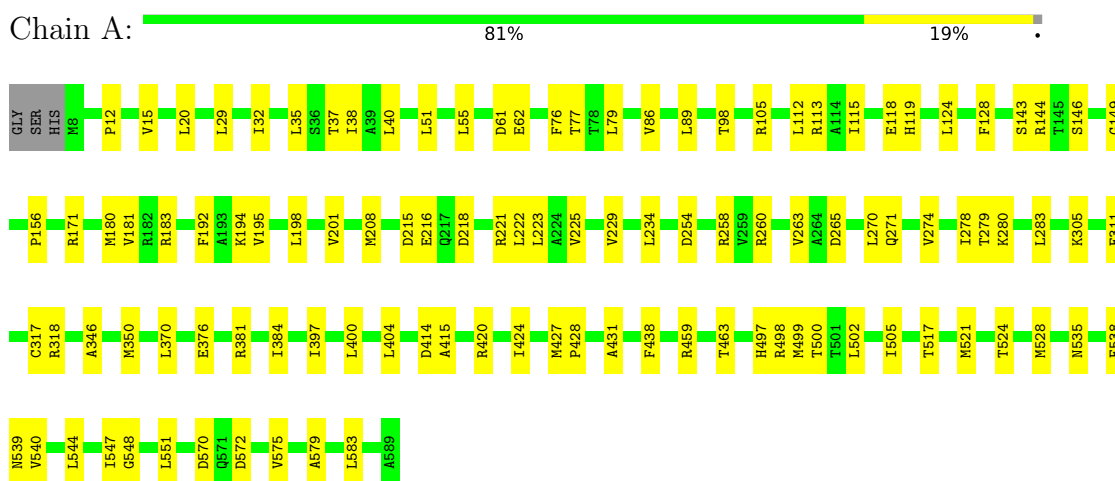
- Molecule 4 is MANGANESE (II) ION (CCD ID: MN) (formula: Mn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	C	1	Total Mn 1 1	0	0
4	F	1	Total Mn 1 1	0	0
4	I	1	Total Mn 1 1	0	0
4	L	1	Total Mn 1 1	0	0

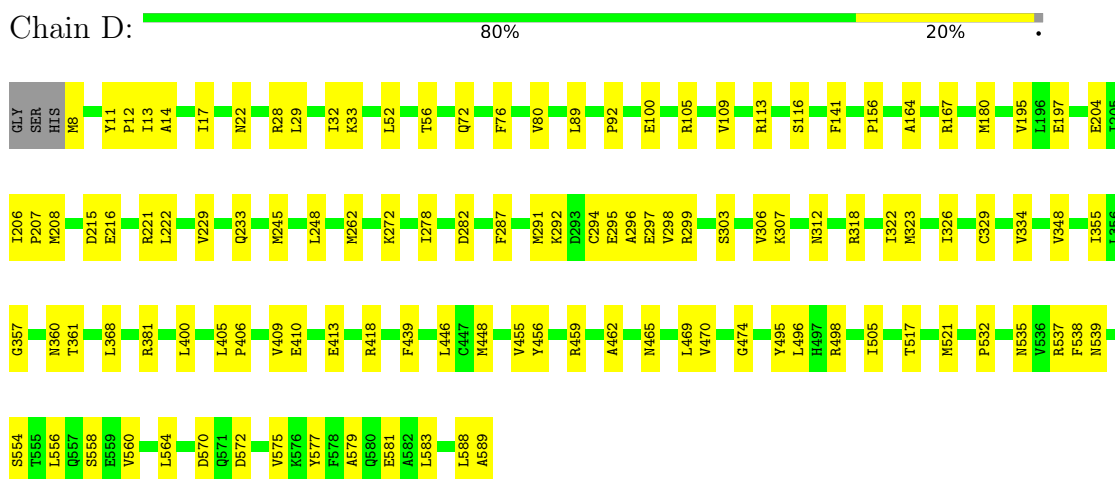
3 Residue-property plots

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.

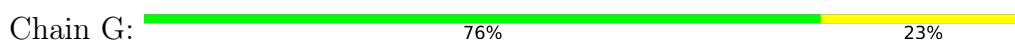
- Molecule 1: Serine/threonine-protein phosphatase 2A 65 kDa regulatory subunit A alpha isoform

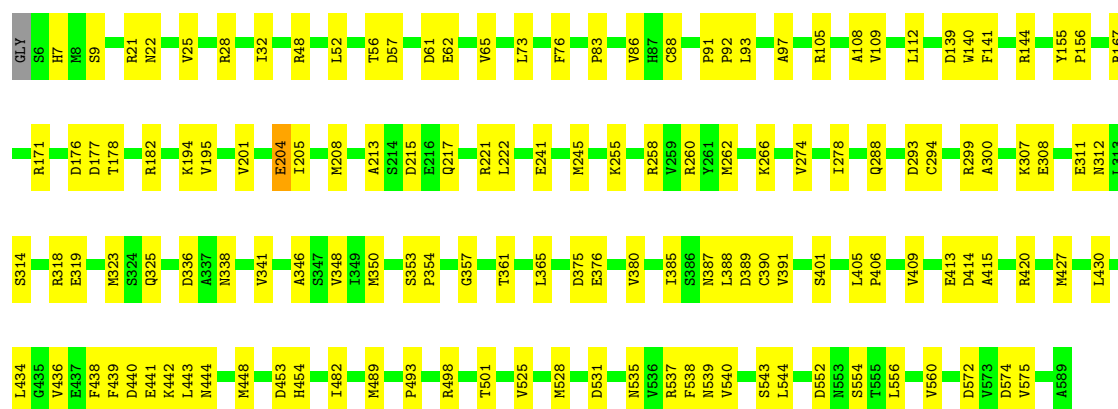


- Molecule 1: Serine/threonine-protein phosphatase 2A 65 kDa regulatory subunit A alpha isoform



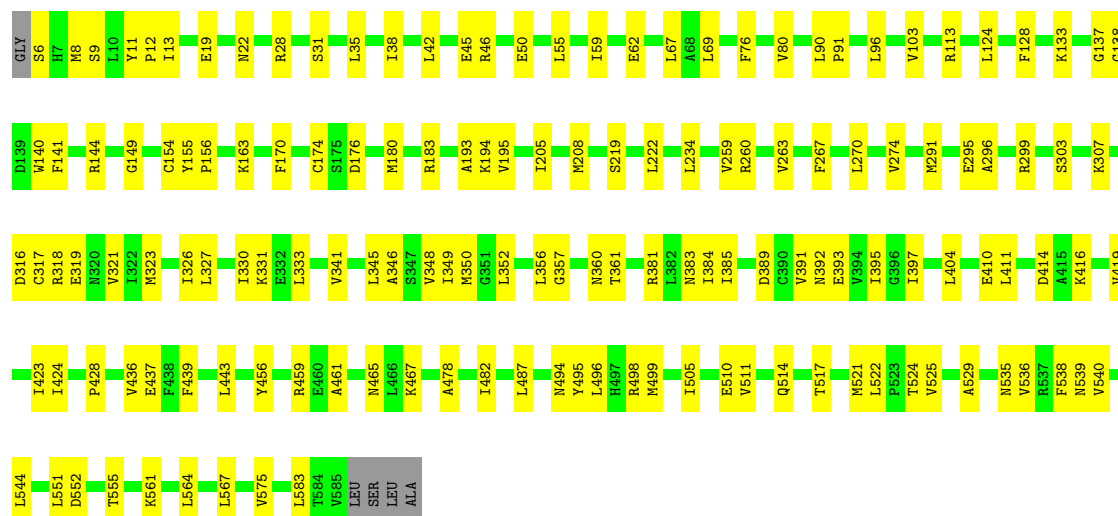
- Molecule 1: Serine/threonine-protein phosphatase 2A 65 kDa regulatory subunit A alpha isoform





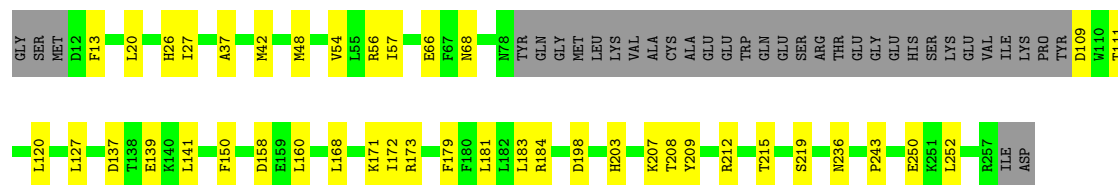
- Molecule 1: Serine/threonine-protein phosphatase 2A 65 kDa regulatory subunit A alpha isoform

Chain J: 74% 25%



- Molecule 2: TIP41-like protein

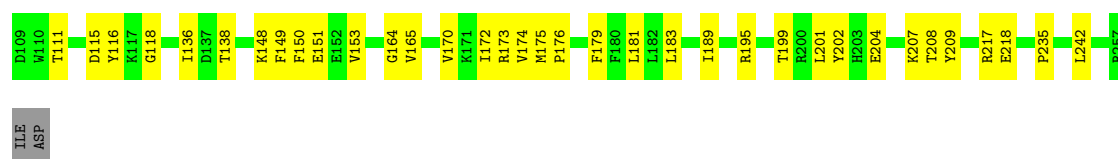
Chain B: 69% 17% 14%



- Molecule 2: TIP41-like protein

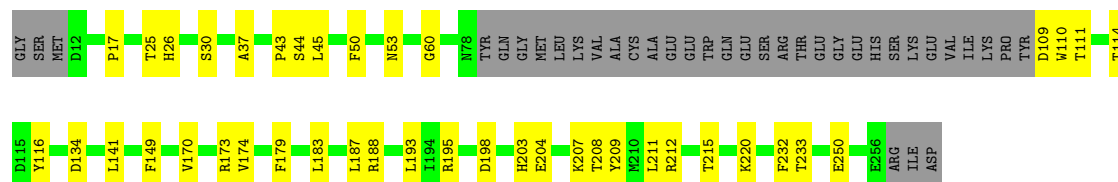
Chain E: 66% 20% 14%





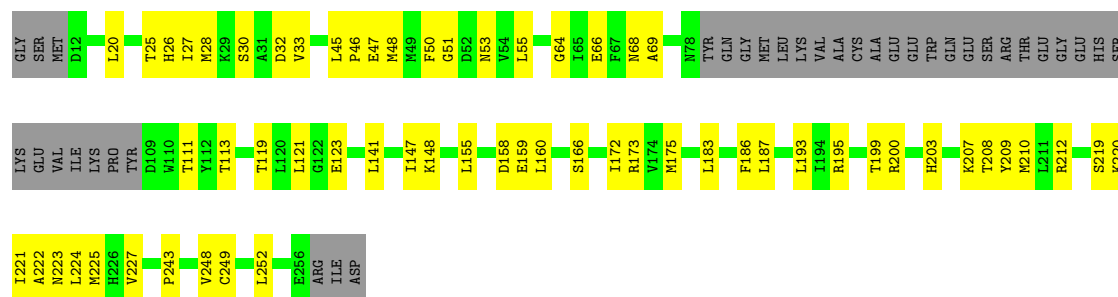
- Molecule 2: TIP41-like protein

Chain H: 69% 16% 14%



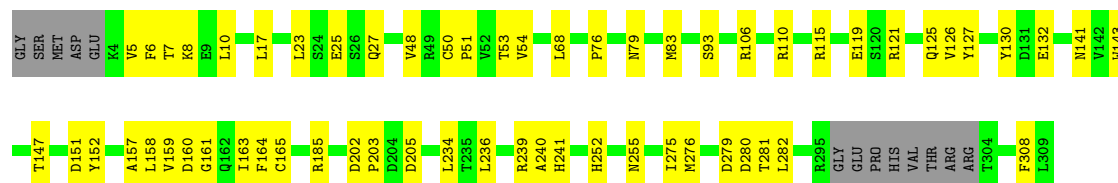
- Molecule 2: TIP41-like protein

Chain K: 61% 24% 14%



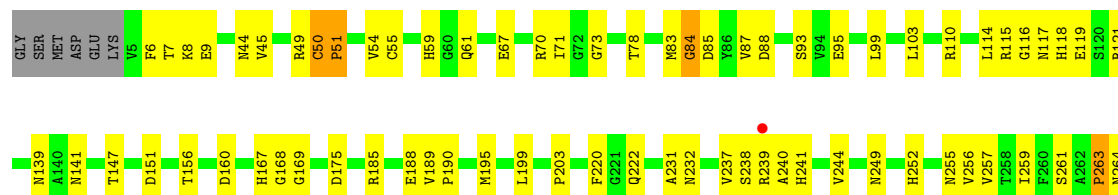
- Molecule 3: Serine/threonine-protein phosphatase 2A catalytic subunit alpha isoform

Chain C: 77% 19% 4%



- Molecule 3: Serine/threonine-protein phosphatase 2A catalytic subunit alpha isoform

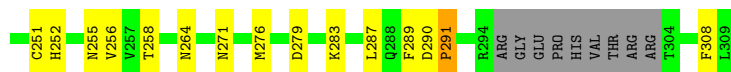
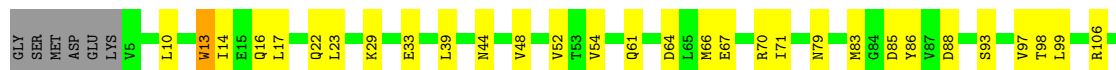
Chain F: 69% 24% 5%





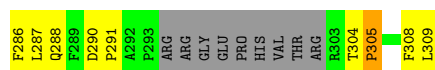
- Molecule 3: Serine/threonine-protein phosphatase 2A catalytic subunit alpha isoform

Chain I: 70% 24% 5%



- Molecule 3: Serine/threonine-protein phosphatase 2A catalytic subunit alpha isoform

Chain L: 71% 24% 5%



4 Data and refinement statistics

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, α , β , γ	150.98Å 150.98Å 285.50Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	49.42 – 3.80 49.42 – 3.80	Depositor EDS
% Data completeness (in resolution range)	100.0 (49.42-3.80) 100.0 (49.42-3.80)	Depositor EDS
R_{merge}	0.88	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.30 (at 3.57Å)	Xtriage
Refinement program	PHENIX (1.11.1_2575: ???)	Depositor
R, R_{free}	0.197 , 0.246 0.205 , 0.251	Depositor DCC
R_{free} test set	5923 reflections (7.02%)	wwPDB-VP
Wilson B-factor (Å ²)	131.7	Xtriage
Anisotropy	0.294	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 142.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.44$, $\langle L^2 \rangle = 0.27$	Xtriage
Estimated twinning fraction	0.054 for -h,-k,l 0.067 for h,-h-k,-l 0.058 for -k,-h,-l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	34732	wwPDB-VP
Average B, all atoms (Å ²)	167.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.46% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MN

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	0.16	0/4596	0.36	0/6217
1	D	0.16	0/4596	0.37	0/6217
1	G	0.15	0/4612	0.37	0/6237
1	J	0.19	0/4576	0.42	0/6186
2	B	0.12	0/1794	0.34	0/2422
2	E	0.14	0/1786	0.40	0/2411
2	H	0.12	0/1783	0.36	0/2408
2	K	0.16	0/1787	0.43	1/2413 (0.0%)
3	C	0.14	0/2484	0.36	0/3366
3	F	0.18	0/2445	0.43	0/3315
3	I	0.15	0/2453	0.38	0/3326
3	L	0.16	0/2453	0.42	0/3326
All	All	0.16	0/35365	0.39	1/47844 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	K	51	GLY	N-CA-C	5.36	115.09	110.21

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	4535	0	4642	75	0
1	D	4535	0	4642	86	0
1	G	4551	0	4652	99	0
1	J	4518	0	4615	113	0
2	B	1754	0	1745	24	0
2	E	1746	0	1739	37	0
2	H	1743	0	1732	28	0
2	K	1747	0	1736	43	0
3	C	2424	0	2324	46	0
3	F	2387	0	2285	67	0
3	I	2394	0	2292	54	0
3	L	2394	0	2292	61	0
4	C	1	0	0	0	0
4	F	1	0	0	0	0
4	I	1	0	0	0	0
4	L	1	0	0	0	0
All	All	34732	0	34696	700	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 10.

The worst 5 of 700 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:G:319:GLU:O	1:G:323:MSE:CE	1.94	1.15
3:I:54:VAL:HG12	3:I:276:MET:HG2	1.41	1.00
1:A:570:ASP:HB3	1:A:575:VAL:HG21	1.47	0.95
1:J:22:ASN:O	1:J:28:ARG:NH2	2.01	0.93
3:C:48:VAL:CG1	3:C:159:VAL:HG12	2.03	0.89

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	580/585 (99%)	555 (96%)	25 (4%)	0	100	100
1	D	580/585 (99%)	552 (95%)	27 (5%)	1 (0%)	43	73
1	G	582/585 (100%)	554 (95%)	28 (5%)	0	100	100
1	J	574/585 (98%)	532 (93%)	42 (7%)	0	100	100
2	B	212/251 (84%)	198 (93%)	13 (6%)	1 (0%)	24	57
2	E	211/251 (84%)	192 (91%)	17 (8%)	2 (1%)	14	45
2	H	211/251 (84%)	191 (90%)	18 (8%)	2 (1%)	14	45
2	K	211/251 (84%)	193 (92%)	16 (8%)	2 (1%)	14	45
3	C	295/311 (95%)	269 (91%)	25 (8%)	1 (0%)	36	67
3	F	292/311 (94%)	256 (88%)	30 (10%)	6 (2%)	5	31
3	I	292/311 (94%)	261 (89%)	29 (10%)	2 (1%)	18	51
3	L	292/311 (94%)	258 (88%)	32 (11%)	2 (1%)	18	51
All	All	4332/4588 (94%)	4011 (93%)	302 (7%)	19 (0%)	30	62

5 of 19 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	208	THR
2	E	208	THR
3	F	7	THR
2	H	208	THR
3	C	6	PHE

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	509/497 (102%)	509 (100%)	0	100	100
1	D	509/497 (102%)	509 (100%)	0	100	100
1	G	511/497 (103%)	510 (100%)	1 (0%)	87	87
1	J	507/497 (102%)	507 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	B	197/228 (86%)	197 (100%)	0	100	100
2	E	196/228 (86%)	196 (100%)	0	100	100
2	H	196/228 (86%)	196 (100%)	0	100	100
2	K	197/228 (86%)	197 (100%)	0	100	100
3	C	265/275 (96%)	265 (100%)	0	100	100
3	F	261/275 (95%)	261 (100%)	0	100	100
3	I	262/275 (95%)	261 (100%)	1 (0%)	84	83
3	L	262/275 (95%)	262 (100%)	0	100	100
All	All	3872/4000 (97%)	3870 (100%)	2 (0%)	88	89

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	204	GLU
3	I	66	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 47 such sidechains are listed below:

Mol	Chain	Res	Type
1	G	399	GLN
3	I	139	ASN
1	G	433	GLN
2	H	53	ASN
1	J	304	HIS

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 ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

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.

No monomer is involved in short contacts.

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	J	2

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	J	552:ASP	C	553:ASN	N	5.66
1	J	337:ALA	C	338:ASN	N	4.02

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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(Å²)	Q<0.9
1	A	568/585 (97%)	-0.72	0	100	100	101, 163, 207, 237	0
1	D	568/585 (97%)	-0.70	0	100	100	113, 161, 197, 232	0
1	G	570/585 (97%)	-0.73	0	100	100	115, 179, 228, 250	0
1	J	566/585 (96%)	-0.64	0	100	100	104, 214, 308, 366	0
2	B	216/251 (86%)	-0.73	0	100	100	119, 165, 210, 228	0
2	E	215/251 (85%)	-0.60	0	100	100	108, 159, 224, 271	0
2	H	215/251 (85%)	-0.66	0	100	100	104, 148, 208, 259	0
2	K	215/251 (85%)	-0.63	0	100	100	108, 158, 208, 226	0
3	C	298/311 (95%)	-0.68	0	100	100	63, 121, 163, 232	1 (0%)
3	F	296/311 (95%)	-0.56	1 (0%)	90	78	107, 150, 192, 236	0
3	I	296/311 (95%)	-0.68	0	100	100	77, 120, 165, 203	0
3	L	296/311 (95%)	-0.65	0	100	100	157, 203, 241, 276	0
All	All	4319/4588 (94%)	-0.67	1 (0%)	100	100	63, 161, 248, 366	1 (0%)

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	F	239	ARG	3.8

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

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

6.3 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q<0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	MN	C	501	1/1	0.47	0.13	204,204,204,204	0
4	MN	L	501	1/1	0.64	0.13	225,225,225,225	0
4	MN	I	501	1/1	0.78	0.10	157,157,157,157	0
4	MN	F	501	1/1	0.81	0.10	181,181,181,181	0

6.5 Other polymers [i](#)

There are no such residues in this entry.