



wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 21, 2023 – 06:06 PM EDT

PDB ID : 2Q4F
Title : Ensemble refinement of the crystal structure of putative histidine-containing phosphotransfer protein from rice, Ak104879
Authors : Levin, E.J.; Kondrashov, D.A.; Wesenberg, G.E.; Phillips Jr., G.N.; Center for Eukaryotic Structural Genomics (CESG)
Deposited on : 2007-05-31
Resolution : 2.00 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 : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.35
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) : 2.35

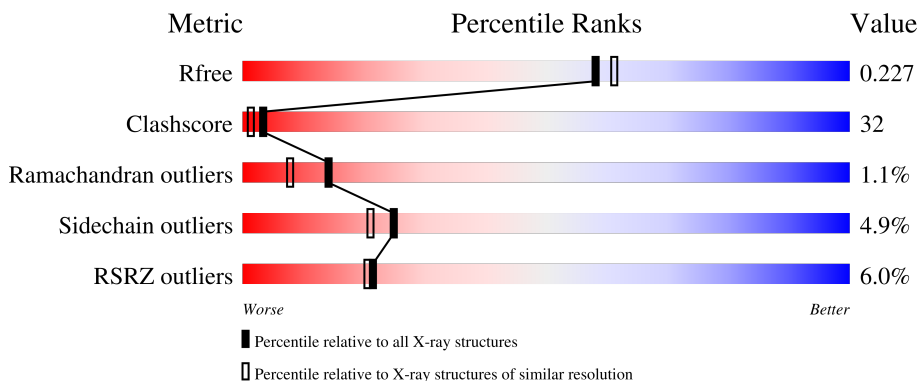
1 Overall quality at a glance

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))
R_{free}	130704	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (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 $\leq 5\%$. 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	1-A	149	
1	1-B	149	
1	2-A	149	
1	2-B	149	
1	3-A	149	

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Mol	Chain	Length	Quality of chain
1	3-B	149	
1	4-A	149	
1	4-B	149	
1	5-A	149	
1	5-B	149	
1	6-A	149	
1	6-B	149	
1	7-A	149	
1	7-B	149	
1	8-A	149	
1	8-B	149	

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 20000 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 Histidine-containing phosphotransfer protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	1-A	140	1102	692	188	213	9	0	0	0
1	2-A	140	1102	692	188	213	9	0	0	0
1	3-A	140	1102	692	188	213	9	0	0	0
1	4-A	140	1102	692	188	213	9	0	0	0
1	5-A	140	1102	692	188	213	9	0	0	0
1	6-A	140	1102	692	188	213	9	0	0	0
1	7-A	140	1102	692	188	213	9	0	0	0
1	8-A	140	1102	692	188	213	9	0	0	0
1	1-B	136	1079	679	184	207	9	0	0	0
1	2-B	136	1079	679	184	207	9	0	0	0
1	3-B	136	1079	679	184	207	9	0	0	0
1	4-B	136	1079	679	184	207	9	0	0	0
1	5-B	136	1079	679	184	207	9	0	0	0
1	6-B	136	1079	679	184	207	9	0	0	0
1	7-B	136	1079	679	184	207	9	0	0	0
1	8-B	136	1079	679	184	207	9	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	SER	-	expression tag	UNP Q6VAK4
B	1	SER	-	expression tag	UNP Q6VAK4

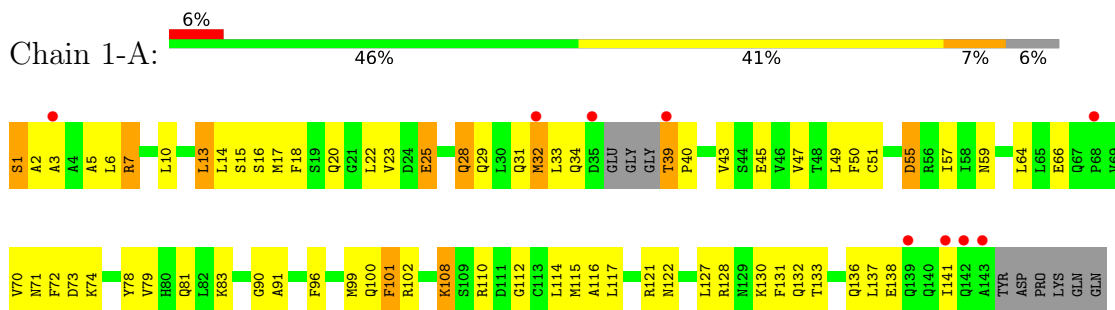
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	1-A	172	Total O 172 172	0	0
2	2-A	169	Total O 169 169	0	0
2	3-A	172	Total O 172 172	0	0
2	4-A	172	Total O 172 172	0	0
2	5-A	172	Total O 172 172	0	0
2	6-A	171	Total O 171 171	0	0
2	7-A	172	Total O 172 172	0	0
2	8-A	173	Total O 173 173	0	0
2	1-B	147	Total O 147 147	0	0
2	2-B	150	Total O 150 150	0	0
2	3-B	147	Total O 147 147	0	0
2	4-B	147	Total O 147 147	0	0
2	5-B	147	Total O 147 147	0	0
2	6-B	148	Total O 148 148	0	0
2	7-B	147	Total O 147 147	0	0
2	8-B	146	Total O 146 146	0	0

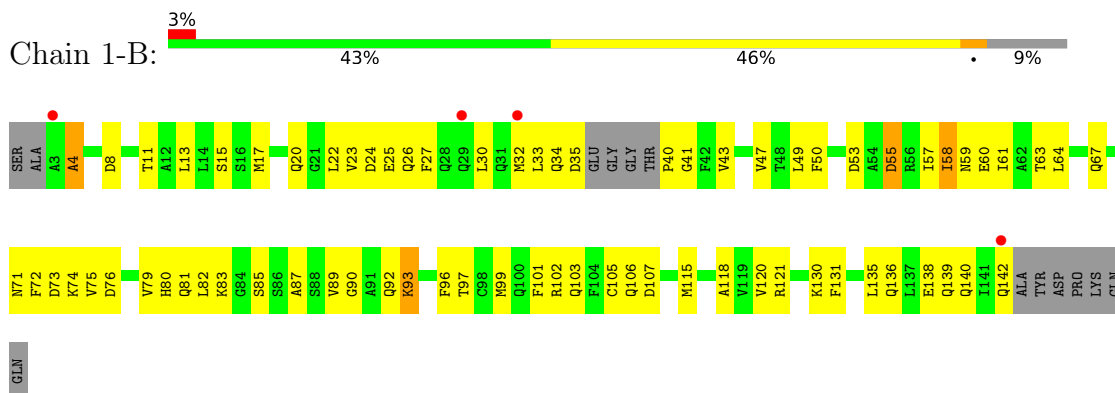
3 Residue-property plots [i](#)

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.

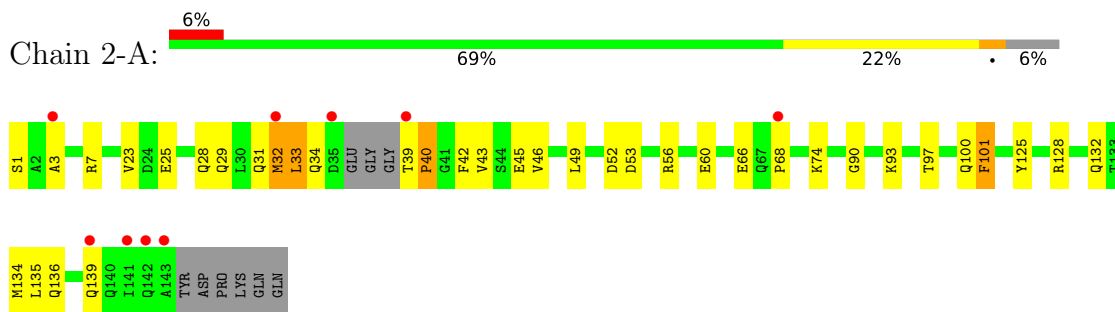
- Molecule 1: Histidine-containing phosphotransfer protein 1



- Molecule 1: Histidine-containing phosphotransfer protein 1

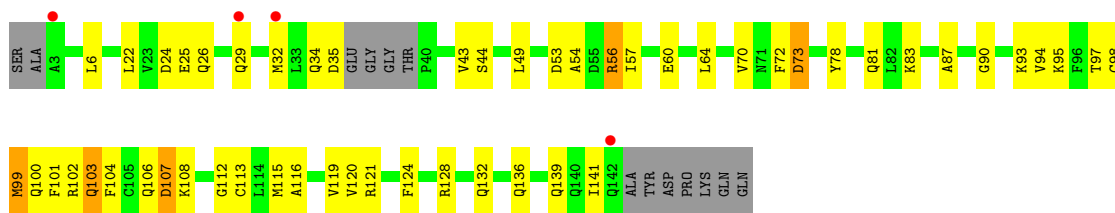


- Molecule 1: Histidine-containing phosphotransfer protein 1

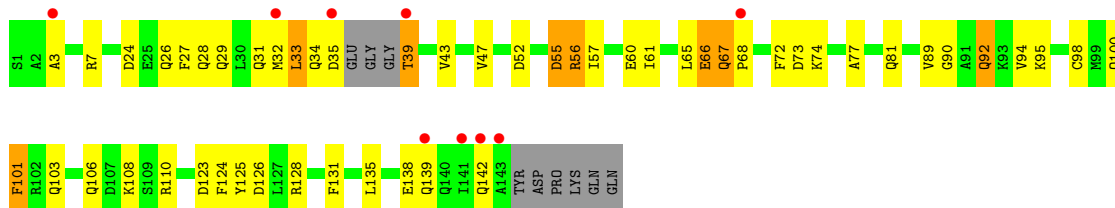


- Molecule 1: Histidine-containing phosphotransfer protein 1

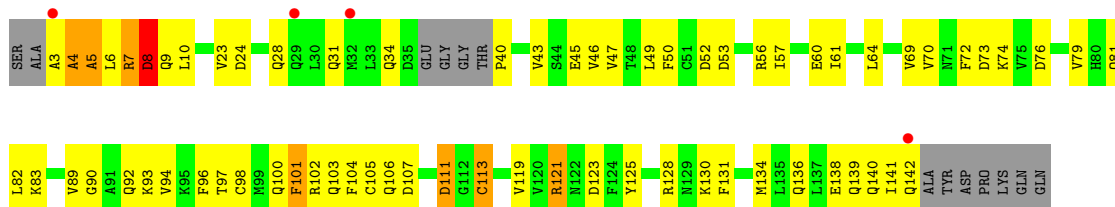




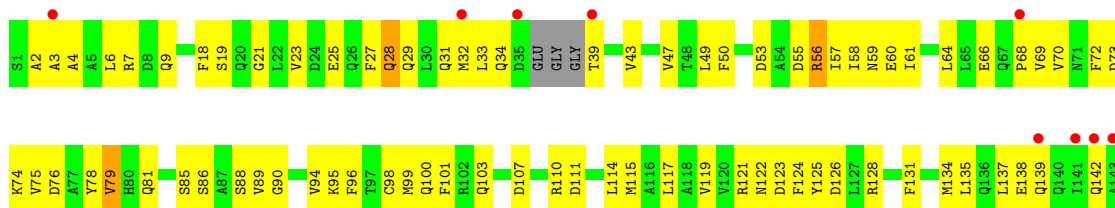
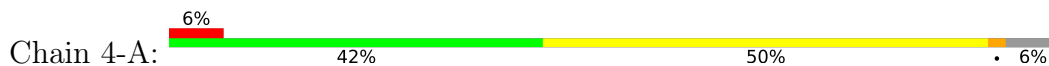
● Molecule 1: Histidine-containing phosphotransfer protein 1



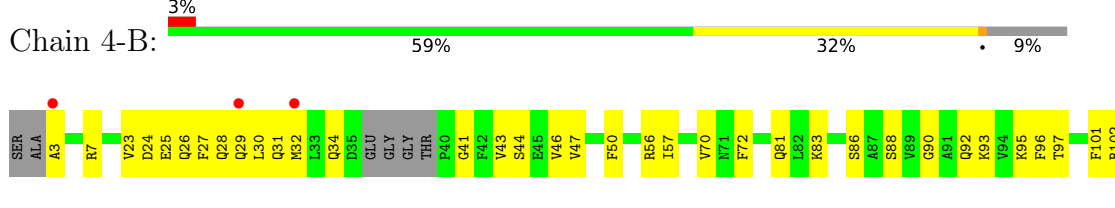
● Molecule 1: Histidine-containing phosphotransfer protein 1

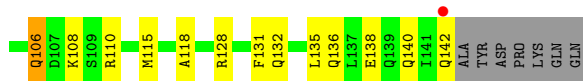


● Molecule 1: Histidine-containing phosphotransfer protein 1

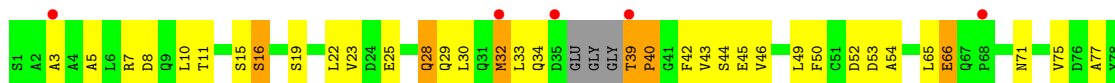


● Molecule 1: Histidine-containing phosphotransfer protein 1

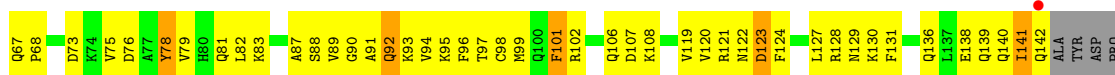
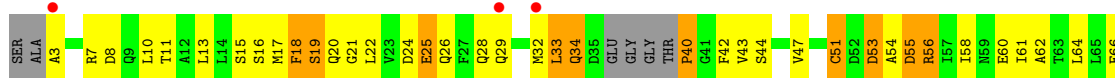




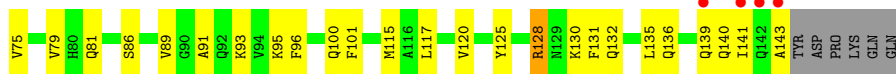
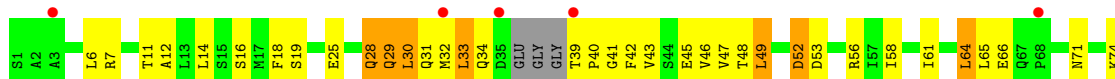
• Molecule 1: Histidine-containing phosphotransfer protein 1



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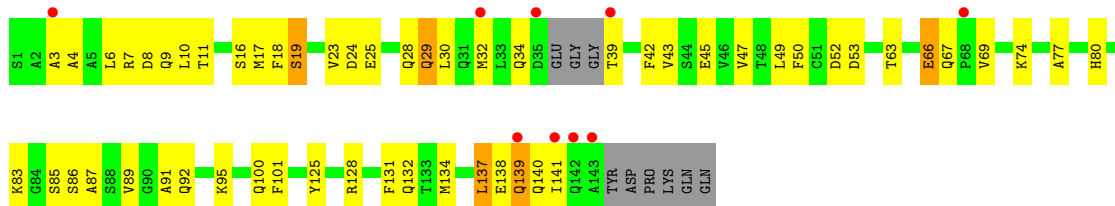


• Molecule 1: Histidine-containing phosphotransfer protein 1



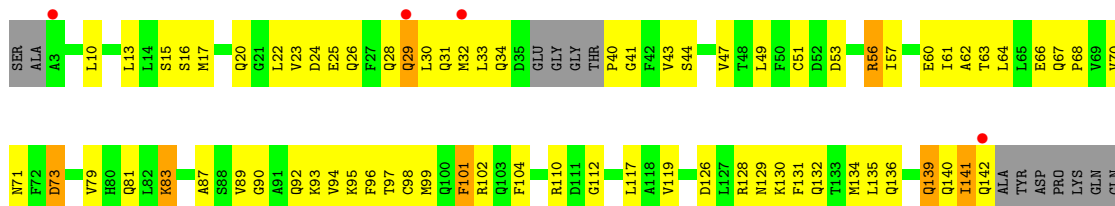
- Molecule 1: Histidine-containing phosphotransfer protein 1

Chain 7-A: 6% 56% 34% 6%



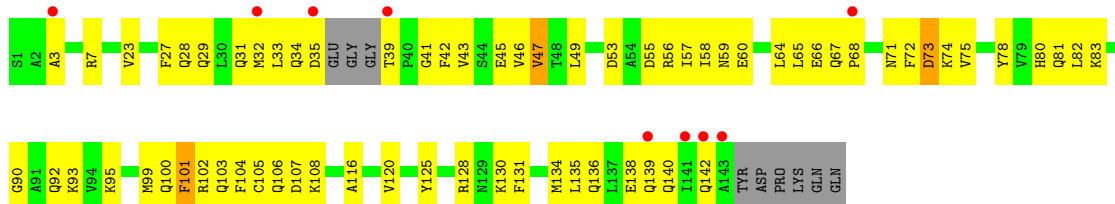
- Molecule 1: Histidine-containing phosphotransfer protein 1

Chain 7-B: 3% 42% 44% 5% 9%



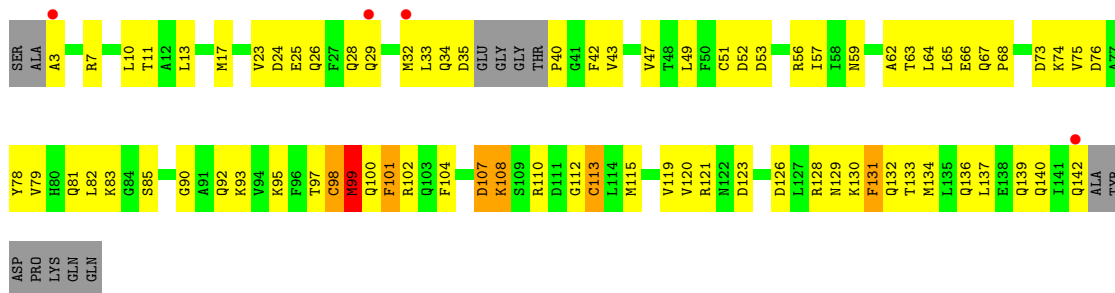
- Molecule 1: Histidine-containing phosphotransfer protein 1

Chain 8-A: 6% 48% 44% 6%



- Molecule 1: Histidine-containing phosphotransfer protein 1

Chain 8-B: 3% 39% 48% 9% 9%



4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	100.56Å 100.56Å 69.57Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	37.77 – 2.00 37.77 – 2.00	Depositor EDS
% Data completeness (in resolution range)	99.0 (37.77-2.00) 99.0 (37.77-2.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.22 (at 2.00Å)	Xtrriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.145 , 0.222 0.152 , 0.227	Depositor DCC
R_{free} test set	1249 reflections (5.11%)	wwPDB-VP
Wilson B-factor (Å ²)	19.5	Xtrriage
Anisotropy	0.094	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 63.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	20000	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.08% 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	1-A	1.03	0/1115	0.83	1/1501 (0.1%)
1	1-B	0.99	0/1092	0.89	3/1468 (0.2%)
1	2-A	1.01	2/1115 (0.2%)	0.77	0/1501
1	2-B	0.93	0/1092	0.86	2/1468 (0.1%)
1	3-A	1.04	3/1115 (0.3%)	0.83	1/1501 (0.1%)
1	3-B	1.03	1/1092 (0.1%)	0.92	2/1468 (0.1%)
1	4-A	1.02	0/1115	0.93	5/1501 (0.3%)
1	4-B	0.95	0/1092	0.86	0/1468
1	5-A	1.12	2/1115 (0.2%)	0.92	0/1501
1	5-B	1.11	2/1092 (0.2%)	1.01	4/1468 (0.3%)
1	6-A	1.13	3/1115 (0.3%)	0.90	3/1501 (0.2%)
1	6-B	1.06	0/1092	1.00	6/1468 (0.4%)
1	7-A	1.12	3/1115 (0.3%)	0.90	1/1501 (0.1%)
1	7-B	1.07	2/1092 (0.2%)	0.94	3/1468 (0.2%)
1	8-A	1.14	3/1115 (0.3%)	0.89	2/1501 (0.1%)
1	8-B	1.17	3/1092 (0.3%)	0.96	2/1468 (0.1%)
All	All	1.06	24/17656 (0.1%)	0.90	35/23752 (0.1%)

The worst 5 of 24 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	8-B	113	CYS	CB-SG	-8.95	1.67	1.82
1	8-B	98	CYS	CB-SG	-8.49	1.67	1.82
1	5-B	51	CYS	CB-SG	7.64	1.95	1.82
1	3-B	113	CYS	CB-SG	-7.42	1.69	1.82
1	7-A	125	TYR	CD2-CE2	7.00	1.49	1.39

The worst 5 of 35 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	4-A	121	ARG	NE-CZ-NH1	9.77	125.19	120.30
1	6-B	52	ASP	CB-CG-OD1	8.35	125.81	118.30
1	5-B	123	ASP	CB-CG-OD2	-7.91	111.18	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	7-A	137	LEU	CA-CB-CG	7.76	133.15	115.30
1	5-B	121	ARG	NE-CZ-NH2	-7.68	116.46	120.30

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	1-A	1102	0	1092	87	0
1	1-B	1079	0	1068	85	0
1	2-A	1102	0	1092	36	0
1	2-B	1079	0	1068	68	0
1	3-A	1102	0	1092	50	0
1	3-B	1079	0	1068	83	0
1	4-A	1102	0	1092	72	0
1	4-B	1079	0	1068	48	0
1	5-A	1102	0	1092	78	0
1	5-B	1079	0	1068	107	0
1	6-A	1102	0	1092	74	0
1	6-B	1079	0	1068	73	0
1	7-A	1102	0	1092	58	0
1	7-B	1079	0	1068	100	0
1	8-A	1102	0	1092	69	0
1	8-B	1079	0	1068	73	0
2	1-A	172	0	0	23	0
2	1-B	147	0	0	17	0
2	2-A	169	0	0	12	0
2	2-B	150	0	0	14	0
2	3-A	172	0	0	17	0
2	3-B	147	0	0	15	0
2	4-A	172	0	0	18	0
2	4-B	147	0	0	15	0
2	5-A	172	0	0	17	0
2	5-B	147	0	0	28	0
2	6-A	171	0	0	15	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	6-B	148	0	0	17	0
2	7-A	172	0	0	18	0
2	7-B	147	0	0	21	0
2	8-A	173	0	0	17	0
2	8-B	146	0	0	18	0
All	All	20000	0	17280	1128	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 32.

The worst 5 of 1128 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:B:97:THR:HG23	2:B:185:HOH:O	1.34	1.23
1:B:57:ILE:HG21	1:B:82:LEU:HB2	1.34	1.10
1:B:97:THR:HG23	2:B:186:HOH:O	1.52	1.10
1:A:57:ILE:HD13	1:A:82:LEU:HD13	1.33	1.08
1:A:43:VAL:O	1:A:47:VAL:HG23	1.53	1.08

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	1-A	136/149 (91%)	129 (95%)	7 (5%)	0	100 100
1	1-B	132/149 (89%)	123 (93%)	7 (5%)	2 (2%)	10 4
1	2-A	136/149 (91%)	133 (98%)	2 (2%)	1 (1%)	22 16
1	2-B	132/149 (89%)	125 (95%)	7 (5%)	0	100 100
1	3-A	136/149 (91%)	128 (94%)	5 (4%)	3 (2%)	6 2

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	3-B	132/149 (89%)	120 (91%)	8 (6%)	4 (3%)	4	1
1	4-A	136/149 (91%)	133 (98%)	2 (2%)	1 (1%)	22	16
1	4-B	132/149 (89%)	126 (96%)	6 (4%)	0	100	100
1	5-A	136/149 (91%)	122 (90%)	13 (10%)	1 (1%)	22	16
1	5-B	132/149 (89%)	117 (89%)	10 (8%)	5 (4%)	3	1
1	6-A	136/149 (91%)	128 (94%)	6 (4%)	2 (2%)	10	4
1	6-B	132/149 (89%)	124 (94%)	7 (5%)	1 (1%)	19	13
1	7-A	136/149 (91%)	132 (97%)	4 (3%)	0	100	100
1	7-B	132/149 (89%)	126 (96%)	5 (4%)	1 (1%)	19	13
1	8-A	136/149 (91%)	125 (92%)	10 (7%)	1 (1%)	22	16
1	8-B	132/149 (89%)	127 (96%)	4 (3%)	1 (1%)	19	13
All	All	2144/2384 (90%)	2018 (94%)	103 (5%)	23 (1%)	14	8

5 of 23 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	3-B	4	ALA
1	3-B	5	ALA
1	5-B	19	SER
1	6-A	65	LEU
1	1-B	4	ALA

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	1-A	122/129 (95%)	110 (90%)	12 (10%)	8	4
1	1-B	120/129 (93%)	117 (98%)	3 (2%)	47	49
1	2-A	122/129 (95%)	119 (98%)	3 (2%)	47	49
1	2-B	120/129 (93%)	114 (95%)	6 (5%)	24	20
1	3-A	122/129 (95%)	117 (96%)	5 (4%)	30	28

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	3-B	120/129 (93%)	116 (97%)	4 (3%)	38	37
1	4-A	122/129 (95%)	117 (96%)	5 (4%)	30	28
1	4-B	120/129 (93%)	118 (98%)	2 (2%)	60	65
1	5-A	122/129 (95%)	114 (93%)	8 (7%)	16	12
1	5-B	120/129 (93%)	110 (92%)	10 (8%)	11	7
1	6-A	122/129 (95%)	115 (94%)	7 (6%)	20	16
1	6-B	120/129 (93%)	110 (92%)	10 (8%)	11	7
1	7-A	122/129 (95%)	118 (97%)	4 (3%)	38	37
1	7-B	120/129 (93%)	114 (95%)	6 (5%)	24	20
1	8-A	122/129 (95%)	119 (98%)	3 (2%)	47	49
1	8-B	120/129 (93%)	114 (95%)	6 (5%)	24	20
All	All	1936/2064 (94%)	1842 (95%)	94 (5%)	25	21

5 of 94 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	5-B	101	PHE
1	6-B	88	SER
1	6-A	28	GLN
1	6-B	15	SER
1	7-A	19	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 74 such sidechains are listed below:

Mol	Chain	Res	Type
1	7-A	34	GLN
1	8-A	140	GLN
1	7-A	139	GLN
1	7-B	142	GLN
1	3-B	142	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 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

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(Å ²)	Q<0.9
1	1-A	140/149 (93%)	-0.15	9 (6%) 19 18	7, 14, 37, 55	140 (100%)
1	1-B	136/149 (91%)	-0.18	4 (2%) 51 50	5, 15, 38, 51	136 (100%)
1	2-A	140/149 (93%)	-0.15	9 (6%) 19 18	7, 14, 37, 55	140 (100%)
1	2-B	136/149 (91%)	-0.18	4 (2%) 51 50	5, 15, 38, 51	136 (100%)
1	3-A	140/149 (93%)	-0.15	9 (6%) 19 18	7, 14, 37, 55	140 (100%)
1	3-B	136/149 (91%)	-0.18	4 (2%) 51 50	5, 15, 38, 51	136 (100%)
1	4-A	140/149 (93%)	-0.15	9 (6%) 19 18	7, 14, 37, 55	140 (100%)
1	4-B	136/149 (91%)	-0.18	4 (2%) 51 50	5, 15, 38, 51	136 (100%)
1	5-A	140/149 (93%)	-0.15	9 (6%) 19 18	7, 14, 37, 55	140 (100%)
1	5-B	136/149 (91%)	-0.18	4 (2%) 51 50	5, 15, 38, 51	136 (100%)
1	6-A	140/149 (93%)	-0.15	9 (6%) 19 18	7, 14, 37, 55	140 (100%)
1	6-B	136/149 (91%)	-0.18	4 (2%) 51 50	5, 15, 38, 51	136 (100%)
1	7-A	140/149 (93%)	-0.15	9 (6%) 19 18	7, 14, 37, 55	140 (100%)
1	7-B	136/149 (91%)	-0.18	4 (2%) 51 50	5, 15, 38, 51	136 (100%)
1	8-A	140/149 (93%)	-0.15	9 (6%) 19 18	7, 14, 37, 55	140 (100%)
1	8-B	136/149 (91%)	-0.18	4 (2%) 51 50	5, 15, 38, 51	136 (100%)
All	All	2208/2384 (92%)	-0.17	104 (4%) 21 30	5, 15, 39, 55	2208 (100%)

The worst 5 of 104 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	1-A	35	ASP	4.4
1	2-A	35	ASP	4.4
1	3-A	35	ASP	4.4
1	4-A	35	ASP	4.4
1	5-A	35	ASP	4.4

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.