Full wwPDB X-ray Structure Validation Report ⓘ

May 15, 2020 – 10:27 pm BST

PDB ID	:	3VEM
Title	:	Structural basis of transcriptional gene silencing mediated by Arabidopsis MOM1
Authors	:	Nishikura, T.; Petty, T.J.; Halazonetis, T.; Paszkowski, J.; Thore, S.
Deposited on	:	2012-01-09
Resolution	:	3.20 Å(reported)

This is a Full wwPDB X-ray Structure 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/XrayValidationReportHelp
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:

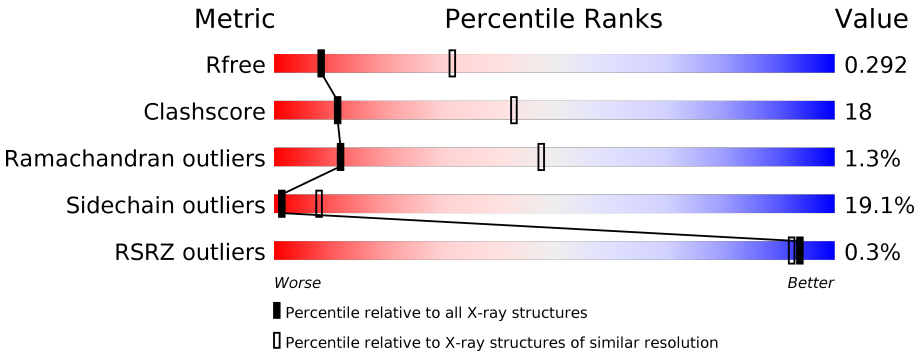
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 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	1133 (3.20-3.20)
Clashscore	141614	1253 (3.20-3.20)
Ramachandran outliers	138981	1234 (3.20-3.20)
Sidechain outliers	138945	1233 (3.20-3.20)
RSRZ outliers	127900	1095 (3.20-3.20)

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 on 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 <=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	115	42% 23% 7% 29%
1	B	115	36% 28% 8% 29%
1	C	115	% 33% 35% • 28%
1	D	115	51% 14% • 30%

2 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 2761 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 Helicase protein MOM1.

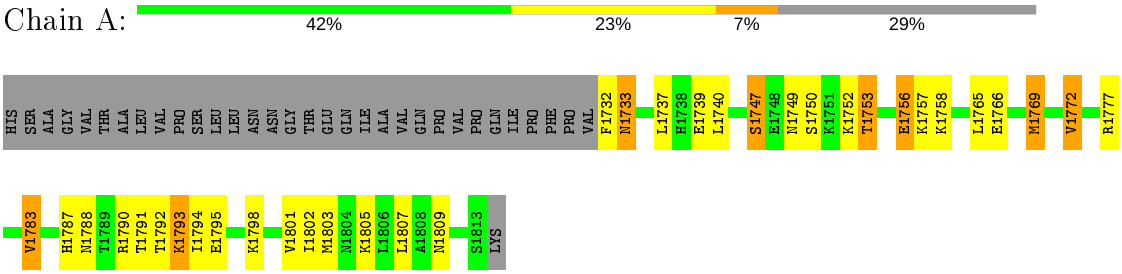
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	82	Total	C	N	O	S	0	0	0
			691	435	125	129	2			
1	B	82	Total	C	N	O	S	0	0	0
			691	435	125	129	2			
1	C	83	Total	C	N	O	S	0	0	0
			702	445	126	129	2			
1	D	80	Total	C	N	O	S	0	0	0
			677	426	123	126	2			

3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA 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.

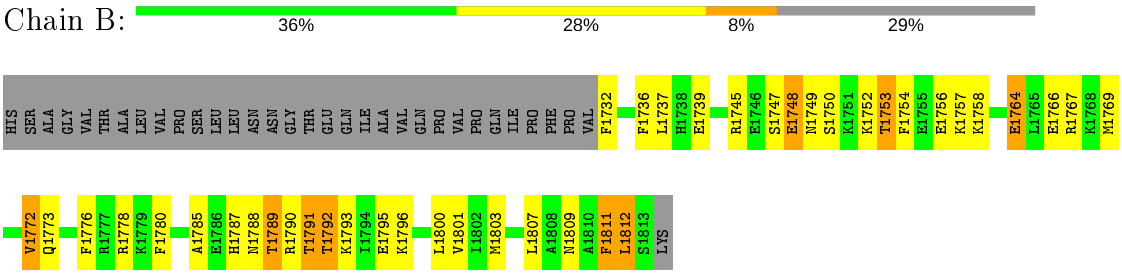
- Molecule 1: Helicase protein MOM1

Chain A:



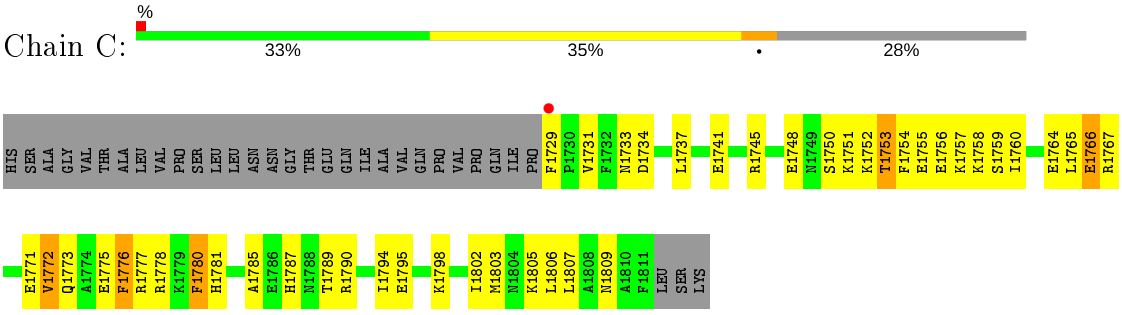
- Molecule 1: Helicase protein MOM1

Chain B:



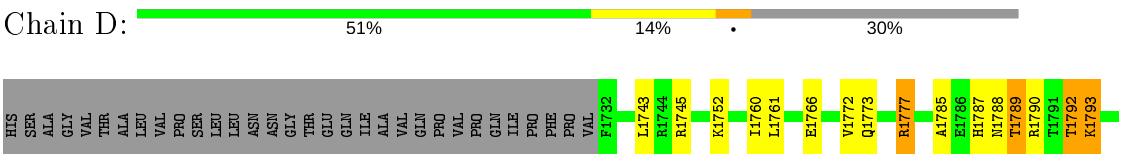
- Molecule 1: Helicase protein MOM1

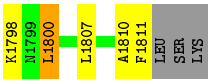
Chain C:



- Molecule 1: Helicase protein MOM1

Chain D:




K1798
N1799
L1800
L1807
A1810
F1811
LEU
SER
LYS

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α, β, γ	85.64Å 85.64Å 292.74Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	14.96 – 3.20 45.95 – 3.20	Depositor EDS
% Data completeness (in resolution range)	99.6 (14.96-3.20) 99.5 (45.95-3.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.69 (at 3.19Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.6.1_353)	Depositor
R, R_{free}	0.258 , 0.293 0.259 , 0.292	Depositor DCC
R_{free} test set	1068 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	113.1	Xtriage
Anisotropy	0.380	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 86.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.034 for -h,-k,l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	2761	wwPDB-VP
Average B, all atoms (Å^2)	130.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.32% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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	A	0.51	0/700	0.61	0/930
1	B	0.57	0/700	0.71	0/930
1	C	0.45	0/713	0.55	0/949
1	D	0.51	0/686	0.62	0/911
All	All	0.51	0/2799	0.62	0/3720

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

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	691	0	706	27	0
1	B	691	0	706	35	0
1	C	702	0	715	30	0
1	D	677	0	690	26	0
All	All	2761	0	2817	99	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 18.

All (99) 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:1796:LYS:NZ	1:D:1793:LYS:HE2	1.88	0.89
1:B:1800:LEU:HD13	1:D:1800:LEU:HD13	1.56	0.86
1:A:1787:HIS:HD2	1:A:1790:ARG:HH22	1.23	0.83
1:D:1773:GLN:HE21	1:D:1777:ARG:HH12	1.25	0.82
1:B:1800:LEU:CD1	1:D:1800:LEU:HD13	2.10	0.81
1:B:1796:LYS:HZ2	1:D:1793:LYS:HE2	1.46	0.81
1:C:1750:SER:OG	1:D:1790:ARG:HD2	1.84	0.78
1:A:1798:LYS:O	1:A:1802:ILE:HG13	1.88	0.73
1:A:1787:HIS:CD2	1:A:1790:ARG:HH22	2.05	0.73
1:B:1788:ASN:O	1:B:1792:THR:HG23	1.90	0.71
1:D:1785:ALA:O	1:D:1789:THR:HG23	1.90	0.71
1:A:1733:ASN:N	1:A:1733:ASN:HD22	1.88	0.70
1:D:1760:ILE:HG22	1:D:1761:LEU:HD23	1.73	0.70
1:C:1803:MET:O	1:C:1807:LEU:HG	1.92	0.69
1:B:1812:LEU:H	1:B:1812:LEU:HD12	1.55	0.69
1:A:1787:HIS:HD2	1:A:1790:ARG:NH2	1.90	0.69
1:D:1793:LYS:HE3	1:D:1793:LYS:HA	1.74	0.68
1:B:1749:ASN:O	1:B:1753:THR:HG23	1.93	0.68
1:C:1785:ALA:O	1:C:1789:THR:HG23	1.95	0.67
1:A:1787:HIS:CD2	1:A:1790:ARG:NH2	2.63	0.66
1:A:1749:ASN:O	1:A:1753:THR:HG23	1.95	0.66
1:D:1773:GLN:HE21	1:D:1777:ARG:NH1	1.94	0.65
1:C:1751:LYS:O	1:C:1755:GLU:HG2	1.97	0.65
1:B:1787:HIS:O	1:B:1791:THR:HG23	1.99	0.63
1:D:1773:GLN:NE2	1:D:1777:ARG:HH12	1.96	0.63
1:B:1787:HIS:HD2	1:B:1790:ARG:NH2	1.97	0.62
1:D:1788:ASN:O	1:D:1792:THR:HG23	1.99	0.62
1:B:1748:GLU:HA	1:B:1748:GLU:OE1	2.00	0.61
1:B:1796:LYS:HZ3	1:D:1793:LYS:HE2	1.65	0.61
1:B:1796:LYS:O	1:B:1800:LEU:HB2	2.02	0.60
1:B:1812:LEU:N	1:B:1812:LEU:HD12	2.19	0.58
1:C:1778:ARG:HB3	1:C:1778:ARG:NH1	2.19	0.57
1:C:1780:PHE:C	1:C:1780:PHE:CD2	2.78	0.57
1:B:1811:PHE:HD2	1:B:1811:PHE:C	2.09	0.56
1:B:1773:GLN:O	1:B:1773:GLN:HG2	2.06	0.55
1:A:1793:LYS:HA	1:A:1793:LYS:HE3	1.87	0.55
1:C:1780:PHE:HD2	1:C:1781:HIS:N	2.04	0.54
1:C:1765:LEU:HD23	1:C:1766:GLU:OE1	2.07	0.54
1:C:1734:ASP:HB3	1:C:1737:LEU:HB2	1.88	0.54
1:B:1811:PHE:C	1:B:1811:PHE:CD2	2.79	0.54
1:B:1764:GLU:HG3	1:B:1767:ARG:HH21	1.73	0.53
1:A:1791:THR:O	1:A:1795:GLU:HB2	2.09	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1750:SER:OG	1:B:1790:ARG:HD2	2.08	0.53
1:A:1733:ASN:N	1:A:1733:ASN:ND2	2.57	0.52
1:C:1805:LYS:HG3	1:C:1805:LYS:O	2.08	0.52
1:A:1783:VAL:HG22	1:B:1757:LYS:HD3	1.92	0.52
1:D:1810:ALA:O	1:D:1811:PHE:CD2	2.63	0.52
1:C:1756:GLU:O	1:C:1760:ILE:HG13	2.11	0.50
1:A:1750:SER:CB	1:B:1790:ARG:HD2	2.40	0.50
1:D:1787:HIS:HD2	1:D:1790:ARG:NH2	2.09	0.50
1:B:1803:MET:HG2	1:D:1807:LEU:HD12	1.94	0.50
1:D:1810:ALA:C	1:D:1811:PHE:CG	2.84	0.49
1:B:1800:LEU:HD12	1:D:1800:LEU:HD13	1.91	0.49
1:C:1767:ARG:O	1:C:1771:GLU:HB3	2.13	0.49
1:A:1795:GLU:OE1	1:A:1795:GLU:HA	2.12	0.49
1:C:1809:ASN:O	1:C:1809:ASN:ND2	2.46	0.49
1:A:1805:LYS:HD3	1:B:1736:PHE:CG	2.48	0.48
1:C:1754:PHE:O	1:C:1758:LYS:HB2	2.15	0.47
1:C:1790:ARG:O	1:C:1794:ILE:HG13	2.14	0.47
1:D:1788:ASN:O	1:D:1792:THR:CG2	2.63	0.47
1:A:1769:MET:HG2	1:B:1772:VAL:HG11	1.97	0.47
1:C:1741:GLU:OE1	1:C:1741:GLU:HA	2.15	0.47
1:B:1764:GLU:O	1:B:1764:GLU:HG2	2.15	0.47
1:C:1787:HIS:HD2	1:C:1790:ARG:HH21	1.62	0.46
1:B:1807:LEU:C	1:B:1809:ASN:H	2.18	0.46
1:A:1772:VAL:HG11	1:B:1769:MET:HG3	1.99	0.45
1:C:1733:ASN:ND2	1:C:1733:ASN:N	2.64	0.45
1:C:1780:PHE:CD2	1:C:1781:HIS:N	2.84	0.45
1:D:1810:ALA:O	1:D:1811:PHE:CG	2.70	0.45
1:C:1802:ILE:O	1:C:1806:LEU:HG	2.16	0.45
1:D:1773:GLN:HG2	1:D:1773:GLN:O	2.17	0.45
1:C:1764:GLU:HG2	1:C:1764:GLU:O	2.16	0.44
1:D:1810:ALA:O	1:D:1811:PHE:CB	2.64	0.44
1:A:1802:ILE:HG22	1:A:1802:ILE:O	2.18	0.44
1:C:1753:THR:O	1:C:1757:LYS:HB2	2.17	0.44
1:A:1752:LYS:HB2	1:A:1752:LYS:HE3	1.81	0.44
1:D:1807:LEU:HA	1:D:1807:LEU:HD23	1.81	0.44
1:A:1756:GLU:HG2	1:A:1757:LYS:N	2.32	0.44
1:A:1739:GLU:OE1	1:A:1739:GLU:HA	2.18	0.44
1:B:1787:HIS:CD2	1:B:1790:ARG:NH2	2.83	0.43
1:A:1787:HIS:CD2	1:B:1754:PHE:HB2	2.53	0.43
1:B:1812:LEU:N	1:B:1812:LEU:CD1	2.77	0.43
1:A:1801:VAL:HG12	1:B:1736:PHE:CE2	2.54	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:1734:ASP:OD2	1:C:1737:LEU:HD23	2.19	0.43
1:B:1785:ALA:O	1:B:1789:THR:CG2	2.67	0.43
1:B:1780:PHE:CD2	1:B:1780:PHE:C	2.92	0.42
1:C:1776:PHE:CD2	1:C:1777:ARG:N	2.88	0.42
1:C:1794:ILE:O	1:C:1794:ILE:HG22	2.19	0.42
1:C:1752:LYS:HE3	1:C:1752:LYS:HB2	1.84	0.42
1:C:1772:VAL:CG1	1:C:1773:GLN:N	2.83	0.42
1:A:1747:SER:O	1:A:1747:SER:OG	2.37	0.41
1:A:1788:ASN:O	1:A:1792:THR:HG23	2.20	0.41
1:C:1798:LYS:HA	1:D:1743:LEU:CD1	2.51	0.41
1:C:1754:PHE:HB2	1:D:1787:HIS:CD2	2.55	0.41
1:A:1787:HIS:O	1:A:1791:THR:HG23	2.20	0.41
1:A:1807:LEU:C	1:A:1809:ASN:H	2.24	0.41
1:B:1807:LEU:CD2	1:D:1807:LEU:HG	2.50	0.41
1:B:1793:LYS:HA	1:B:1793:LYS:HE3	2.02	0.40
1:C:1778:ARG:HH11	1:C:1778:ARG:HB3	1.85	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 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	80/115 (70%)	61 (76%)	17 (21%)	2 (2%)	5 32
1	B	80/115 (70%)	67 (84%)	12 (15%)	1 (1%)	12 47
1	C	81/115 (70%)	78 (96%)	2 (2%)	1 (1%)	13 49
1	D	78/115 (68%)	73 (94%)	5 (6%)	0	100 100
All	All	319/460 (69%)	279 (88%)	36 (11%)	4 (1%)	12 47

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1758	LYS
1	A	1794	ILE
1	B	1795	GLU
1	C	1731	VAL

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	76/104 (73%)	61 (80%)	15 (20%)	1 7
1	B	76/104 (73%)	54 (71%)	22 (29%)	0 1
1	C	77/104 (74%)	66 (86%)	11 (14%)	3 15
1	D	74/104 (71%)	64 (86%)	10 (14%)	4 18
All	All	303/416 (73%)	245 (81%)	58 (19%)	1 8

All (58) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1732	PHE
1	A	1733	ASN
1	A	1737	LEU
1	A	1740	LEU
1	A	1747	SER
1	A	1753	THR
1	A	1756	GLU
1	A	1765	LEU
1	A	1766	GLU
1	A	1769	MET
1	A	1772	VAL
1	A	1777	ARG
1	A	1783	VAL
1	A	1793	LYS
1	A	1803	MET
1	B	1732	PHE
1	B	1737	LEU
1	B	1739	GLU

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Mol	Chain	Res	Type
1	B	1745	ARG
1	B	1747	SER
1	B	1748	GLU
1	B	1750	SER
1	B	1752	LYS
1	B	1753	THR
1	B	1756	GLU
1	B	1758	LYS
1	B	1764	GLU
1	B	1766	GLU
1	B	1772	VAL
1	B	1776	PHE
1	B	1778	ARG
1	B	1789	THR
1	B	1791	THR
1	B	1792	THR
1	B	1801	VAL
1	B	1811	PHE
1	B	1812	LEU
1	C	1729	PHE
1	C	1745	ARG
1	C	1748	GLU
1	C	1753	THR
1	C	1759	SER
1	C	1766	GLU
1	C	1772	VAL
1	C	1775	GLU
1	C	1776	PHE
1	C	1780	PHE
1	C	1795	GLU
1	D	1745	ARG
1	D	1752	LYS
1	D	1766	GLU
1	D	1772	VAL
1	D	1777	ARG
1	D	1789	THR
1	D	1792	THR
1	D	1793	LYS
1	D	1798	LYS
1	D	1800	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	1733	ASN
1	A	1787	HIS
1	A	1809	ASN
1	B	1787	HIS
1	C	1733	ASN
1	C	1787	HIS
1	C	1809	ASN
1	D	1733	ASN
1	D	1773	GLN
1	D	1787	HIS
1	D	1804	ASN

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 carbohydrates in this entry.

5.6 Ligand geometry

There are no ligands in this entry.

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

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, 95^{th} 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	82/115 (71%)	0.17	0 100 100	105, 124, 144, 173	0
1	B	82/115 (71%)	0.31	0 100 100	90, 113, 128, 140	0
1	C	83/115 (72%)	0.23	1 (1%) 79 67	114, 147, 170, 172	0
1	D	80/115 (69%)	0.38	0 100 100	99, 133, 158, 167	0
All	All	327/460 (71%)	0.27	1 (0%) 94 92	90, 127, 164, 173	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	1729	PHE	2.9

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 carbohydrates 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.