



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2018 – 11:27 pm GMT

PDB ID : 3DAD
Title : Crystal structure of the N-terminal regulatory domains of the formin FHOD1
Authors : Schulte, A.; Stolp, B.; Schonichen, A.; Pylypenko, O.; Rak, A.; Fackler, O.T.; Geyer, M.
Deposited on : 2008-05-29
Resolution : 2.30 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 : trunk30967
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
Refmac : 5.8.0158
CCP4 : 7.0 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk30967

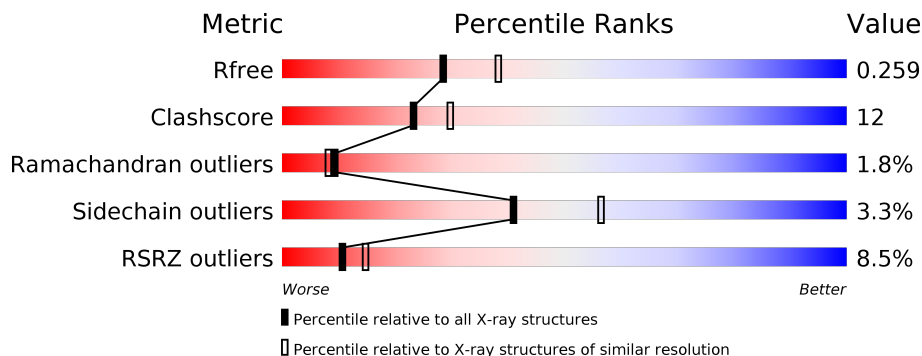
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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}	111664	4477 (2.30-2.30)
Clashscore	122126	5072 (2.30-2.30)
Ramachandran outliers	120053	5022 (2.30-2.30)
Sidechain outliers	120020	5021 (2.30-2.30)
RSRZ outliers	108989	4374 (2.30-2.30)

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. 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	339	
1	B	339	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5072 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 FH1/FH2 domain-containing protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	324	2478	1577	412	482	7	0	0	0
1	B	311	2356	1501	388	461	6	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	31	SER	CYS	ENGINEERED	UNP Q9Y613
A	71	SER	CYS	ENGINEERED	UNP Q9Y613
B	31	SER	CYS	ENGINEERED	UNP Q9Y613
B	71	SER	CYS	ENGINEERED	UNP Q9Y613

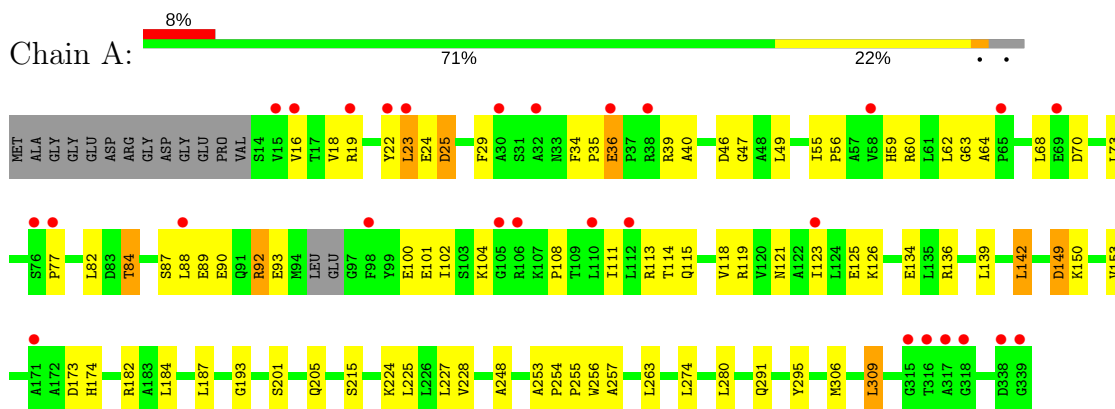
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	118	Total 118	O 118	0	0
2	B	120	Total 120	O 120	0	0

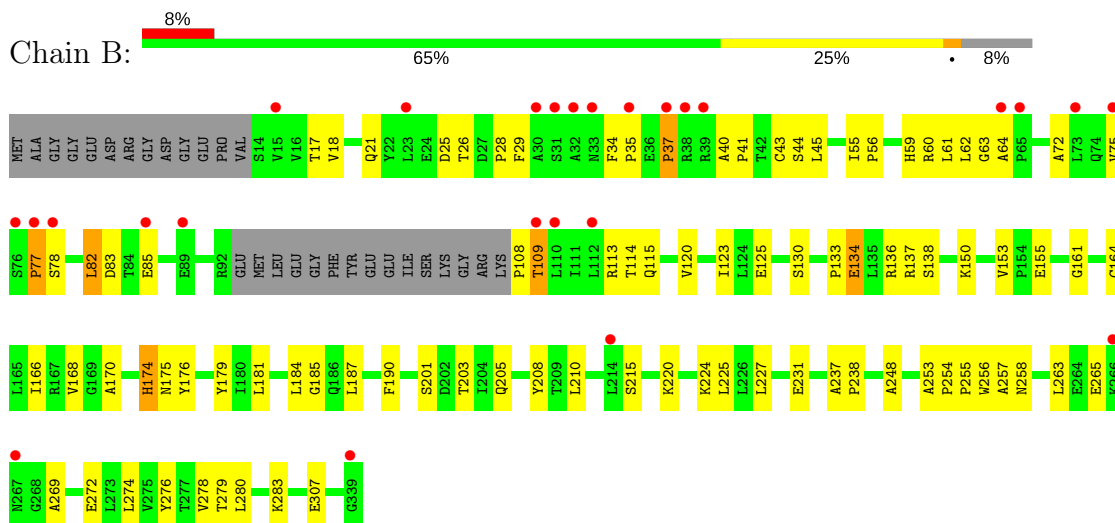
3 Residue-property plots [i](#)

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: FH1/FH2 domain-containing protein 1



- Molecule 1: FH1/FH2 domain-containing protein 1



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	35.44Å 73.93Å 78.67Å 78.24° 86.17° 89.67°	Depositor
Resolution (Å)	19.60 – 2.30 19.69 – 2.30	Depositor EDS
% Data completeness (in resolution range)	94.8 (19.60-2.30) 95.0 (19.69-2.30)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.30 (at 2.30Å)	Xtrriage
Refinement program	CNS	Depositor
R, R_{free}	0.219 , 0.259 0.218 , 0.259	Depositor DCC
R_{free} test set	1646 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	31.6	Xtrriage
Anisotropy	0.465	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 53.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	5072	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.83% 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	0.35	0/2520	0.58	2/3430 (0.1%)
1	B	0.36	0/2397	0.56	0/3271
All	All	0.36	0/4917	0.57	2/6701 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	35	PRO	N-CA-CB	6.10	110.62	103.30
1	A	77	PRO	N-CA-CB	5.48	109.88	103.30

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	A	2478	0	2446	58	0
1	B	2356	0	2332	59	0
2	A	118	0	0	3	0
2	B	120	0	0	1	0
All	All	5072	0	4778	117	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 12.

All (117) 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:82:LEU:HD12	1:B:82:LEU:H	1.36	0.87
1:B:29:PHE:HE1	1:B:123:ILE:HA	1.41	0.85
1:B:237:ALA:HB3	1:B:238:PRO:HD3	1.59	0.84
1:B:75:VAL:HG12	1:B:77:PRO:HD2	1.61	0.83
1:A:121:ASN:O	1:A:125:GLU:HG3	1.85	0.77
1:A:100:GLU:HG2	1:A:101:GLU:N	1.99	0.76
1:A:22:TYR:CE2	1:A:24:GLU:HG2	2.25	0.71
1:B:133:PRO:O	1:B:137:ARG:HG3	1.90	0.69
1:B:130:SER:HB3	1:B:134:GLU:HG2	1.74	0.69
1:B:59:HIS:HD2	1:B:64:ALA:HB3	1.59	0.67
1:B:29:PHE:CE1	1:B:123:ILE:HA	2.29	0.65
1:B:166:ILE:HD11	1:B:203:THR:HA	1.81	0.63
1:A:174:HIS:ND1	1:A:215:SER:HB2	2.14	0.63
1:B:77:PRO:HG2	1:B:78:SER:H	1.64	0.63
1:B:120:VAL:HG21	1:B:155:GLU:HB3	1.81	0.61
1:B:82:LEU:HD12	1:B:82:LEU:N	2.14	0.61
1:B:220:LYS:HE2	1:B:224:LYS:NZ	2.16	0.60
1:A:263:LEU:HA	1:A:274:LEU:CD2	2.31	0.60
1:A:29:PHE:HE1	1:A:123:ILE:HA	1.66	0.59
1:A:263:LEU:HA	1:A:274:LEU:HD22	1.85	0.59
1:B:72:ALA:HB2	1:B:115:GLN:HG2	1.82	0.59
1:A:227:LEU:HD13	1:A:280:LEU:HB2	1.84	0.57
1:B:82:LEU:H	1:B:82:LEU:CD1	2.11	0.57
1:B:272:GLU:HG2	1:B:276:TYR:CE1	2.38	0.57
1:B:136:ARG:HH11	1:B:136:ARG:HG2	1.68	0.57
1:B:208:TYR:CE1	1:B:258:ASN:HB2	2.40	0.56
1:B:43:CYS:SG	1:B:61:LEU:HD23	2.45	0.56
1:A:119:ARG:NH1	1:A:149:ASP:OD1	2.29	0.56
1:B:263:LEU:HA	1:B:274:LEU:HD22	1.86	0.56
1:A:25:ASP:OD2	1:A:113:ARG:NE	2.39	0.56
1:A:101:GLU:OE1	1:A:108:PRO:HA	2.06	0.56
1:A:34:PHE:O	1:A:36:GLU:N	2.37	0.56
1:A:89:GLU:HB3	1:A:92:ARG:CZ	2.37	0.55
1:A:18:VAL:HG12	1:A:108:PRO:HG2	1.89	0.55
1:A:73:LEU:HB3	1:A:82:LEU:HD12	1.88	0.54
1:B:59:HIS:CD2	1:B:64:ALA:HB3	2.39	0.54
1:B:55:ILE:N	1:B:56:PRO:CD	2.71	0.53
1:B:108:PRO:O	1:B:109:THR:HG23	2.07	0.53
1:B:56:PRO:O	1:B:60:ARG:HB2	2.08	0.53
1:B:26:THR:O	1:B:28:PRO:HD3	2.09	0.53
1:A:136:ARG:HG2	1:A:136:ARG:HH11	1.74	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:29:PHE:CE1	1:A:123:ILE:HA	2.44	0.52
1:A:224:LYS:O	1:A:228:VAL:HG23	2.10	0.51
1:A:291:GLN:HG2	1:A:295:TYR:CE2	2.46	0.51
1:B:227:LEU:O	1:B:231:GLU:HG3	2.11	0.51
1:B:265:GLU:OE2	1:B:269:ALA:HA	2.12	0.50
1:A:47:GLY:O	1:A:87:SER:HB2	2.11	0.49
1:B:279:THR:O	1:B:283:LYS:HG2	2.11	0.49
1:A:23:LEU:HB2	1:A:111:ILE:CG2	2.42	0.49
1:A:174:HIS:CG	1:A:215:SER:HB2	2.47	0.49
1:B:208:TYR:CZ	1:B:258:ASN:HB2	2.48	0.49
1:B:130:SER:HB3	1:B:134:GLU:CG	2.42	0.49
1:B:136:ARG:HG3	1:B:179:TYR:HE1	1.77	0.49
1:A:70:ASP:O	1:A:115:GLN:HG3	2.12	0.49
1:B:174:HIS:ND1	1:B:215:SER:HB2	2.28	0.48
1:A:62:LEU:C	1:A:64:ALA:N	2.65	0.48
1:B:29:PHE:CE2	1:B:138:SER:HB3	2.49	0.48
1:A:55:ILE:N	1:A:56:PRO:CD	2.76	0.48
1:B:227:LEU:HD22	1:B:280:LEU:HD13	1.95	0.48
1:A:263:LEU:HD23	1:A:274:LEU:HD22	1.95	0.47
1:B:248:ALA:HB1	1:B:253:ALA:O	2.15	0.47
1:B:201:SER:HB3	1:B:205:GLN:HE21	1.78	0.47
1:A:114:THR:HG22	1:A:118:VAL:HB	1.95	0.47
1:A:153:VAL:HG13	1:A:187:LEU:HG	1.95	0.47
1:B:274:LEU:O	1:B:278:VAL:HG23	2.14	0.46
1:A:100:GLU:CG	1:A:101:GLU:N	2.74	0.46
1:A:56:PRO:HA	1:A:68:LEU:HD11	1.97	0.46
1:A:254:PRO:HG2	1:A:257:ALA:HB2	1.98	0.46
1:B:17:THR:HA	1:B:44:SER:HA	1.96	0.46
1:A:187:LEU:O	1:A:193:GLY:HA3	2.16	0.46
1:B:150:LYS:HE3	1:B:190:PHE:CD2	2.51	0.46
1:A:201:SER:OG	1:A:205:GLN:NE2	2.48	0.46
1:B:181:LEU:HD11	1:B:210:LEU:HD13	1.97	0.46
1:B:21:GLN:NE2	1:B:37:PRO:O	2.48	0.46
1:A:59:HIS:HD2	1:A:64:ALA:HB3	1.81	0.46
1:A:255:PRO:O	1:A:256:TRP:HB2	2.16	0.45
1:A:126:LYS:NZ	1:A:134:GLU:HG2	2.31	0.45
1:B:62:LEU:O	1:B:63:GLY:C	2.55	0.45
1:B:18:VAL:HG12	1:B:108:PRO:HG2	1.98	0.45
1:A:126:LYS:HZ3	1:A:134:GLU:HG2	1.82	0.44
1:A:59:HIS:CD2	1:A:64:ALA:HB3	2.52	0.44
1:A:25:ASP:OD2	1:A:113:ARG:HB2	2.18	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:153:VAL:HG13	1:B:187:LEU:CD2	2.48	0.44
1:A:68:LEU:HD23	1:A:68:LEU:O	2.18	0.44
1:B:254:PRO:HG2	1:B:257:ALA:HB2	1.99	0.44
1:B:255:PRO:O	1:B:256:TRP:HB2	2.18	0.43
1:B:43:CYS:SG	1:B:61:LEU:CD2	3.05	0.43
1:A:182:ARG:HG2	2:A:3011:HOH:O	2.17	0.43
1:A:46:ASP:OD2	1:A:49:LEU:HG	2.19	0.43
1:B:25:ASP:OD1	1:B:113:ARG:HB2	2.18	0.43
1:B:237:ALA:CB	1:B:238:PRO:HD3	2.40	0.43
1:B:83:ASP:C	1:B:85:GLU:H	2.21	0.43
1:B:136:ARG:HB2	1:B:176:TYR:CE1	2.53	0.43
1:A:56:PRO:O	1:A:60:ARG:HB2	2.18	0.42
1:B:307:GLU:HB3	2:B:1071:HOH:O	2.19	0.42
1:A:248:ALA:HB1	1:A:253:ALA:O	2.19	0.42
1:A:22:TYR:O	1:A:36:GLU:CB	2.68	0.42
1:B:161:GLY:O	1:B:164:CYS:HB3	2.20	0.42
1:B:220:LYS:HE3	1:B:272:GLU:OE1	2.20	0.42
1:A:136:ARG:HG2	1:A:136:ARG:NH1	2.34	0.42
1:B:220:LYS:HG2	1:B:224:LYS:HE2	2.02	0.42
1:A:55:ILE:HD11	1:A:84:THR:HG22	2.01	0.41
1:B:34:PHE:O	1:B:35:PRO:C	2.57	0.41
1:B:185:GLY:HA2	1:B:225:LEU:HD11	2.02	0.41
1:A:19:ARG:NH2	2:A:2009:HOH:O	2.42	0.41
1:A:87:SER:OG	1:A:90:GLU:HG3	2.20	0.41
1:A:62:LEU:O	1:A:63:GLY:C	2.58	0.41
1:B:114:THR:HG22	1:B:115:GLN:N	2.35	0.41
1:A:142:LEU:HA	1:A:142:LEU:HD12	1.78	0.41
1:A:119:ARG:HD2	2:A:1057:HOH:O	2.20	0.41
1:A:139:LEU:O	1:A:142:LEU:HB2	2.21	0.41
1:A:16:VAL:HG21	1:A:88:LEU:CD1	2.51	0.40
1:A:306:MET:O	1:A:309:LEU:HB2	2.21	0.40
1:A:102:ILE:C	1:A:104:LYS:H	2.25	0.40
1:B:164:CYS:O	1:B:168:VAL:HG23	2.21	0.40
1:A:29:PHE:HZ	1:A:123:ILE:HG23	1.85	0.40
1:A:89:GLU:HB3	1:A:92:ARG:NH1	2.36	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	320/339 (94%)	303 (95%)	12 (4%)	5 (2%)	11	10
1	B	307/339 (91%)	286 (93%)	15 (5%)	6 (2%)	8	7
All	All	627/678 (92%)	589 (94%)	27 (4%)	11 (2%)	9	8

All (11) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	36	GLU
1	A	39	ARG
1	A	149	ASP
1	B	77	PRO
1	B	174	HIS
1	A	40	ALA
1	B	37	PRO
1	B	40	ALA
1	B	170	ALA
1	A	84	THR
1	B	41	PRO

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	266/288 (92%)	256 (96%)	10 (4%)	36	50
1	B	255/288 (88%)	248 (97%)	7 (3%)	48	65

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	521/576 (90%)	504 (97%)	17 (3%)	41 56

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	23	LEU
1	A	25	ASP
1	A	92	ARG
1	A	93	GLU
1	A	142	LEU
1	A	150	LYS
1	A	173	ASP
1	A	184	LEU
1	A	225	LEU
1	A	309	LEU
1	B	45	LEU
1	B	82	LEU
1	B	109	THR
1	B	125	GLU
1	B	134	GLU
1	B	175	ASN
1	B	184	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	186	GLN
1	A	205	GLN
1	A	267	ASN
1	A	311	GLN
1	A	313	HIS
1	B	59	HIS
1	B	91	GLN
1	B	205	GLN
1	B	313	HIS

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 carbohydrates 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	A	324/339 (95%)	0.43	28 (8%) 10 14	16, 40, 74, 84	0
1	B	311/339 (91%)	0.45	26 (8%) 11 15	19, 39, 74, 86	0
All	All	635/678 (93%)	0.44	54 (8%) 11 15	16, 40, 74, 86	0

All (54) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	317	ALA	6.3
1	B	32	ALA	5.1
1	B	267	ASN	4.6
1	A	105	GLY	4.4
1	B	266	LYS	4.4
1	B	78	SER	4.1
1	B	77	PRO	4.0
1	A	77	PRO	4.0
1	B	76	SER	4.0
1	B	38	ARG	3.7
1	B	64	ALA	3.6
1	A	318	GLY	3.5
1	A	316	THR	3.4
1	A	339	GLY	3.3
1	B	339	GLY	3.3
1	A	110	LEU	3.2
1	B	65	PRO	3.1
1	A	65	PRO	3.0
1	A	22	TYR	3.0
1	B	30	ALA	3.0
1	A	106	ARG	2.9
1	B	39	ARG	2.9
1	B	110	LEU	2.9
1	A	88	LEU	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	15	VAL	2.8
1	A	30	ALA	2.8
1	A	315	GLY	2.7
1	A	98	PHE	2.7
1	B	15	VAL	2.7
1	B	75	VAL	2.7
1	A	38	ARG	2.7
1	B	109	THR	2.7
1	A	338	ASP	2.6
1	A	69	GLU	2.6
1	B	23	LEU	2.6
1	A	171	ALA	2.6
1	B	37	PRO	2.5
1	A	36	GLU	2.5
1	B	33	ASN	2.5
1	B	35	PRO	2.4
1	A	32	ALA	2.3
1	B	85	GLU	2.3
1	B	31	SER	2.2
1	B	73	LEU	2.2
1	B	112	LEU	2.2
1	A	19	ARG	2.2
1	A	58	VAL	2.2
1	A	112	LEU	2.1
1	B	89	GLU	2.1
1	A	16	VAL	2.1
1	A	123	ILE	2.0
1	A	76	SER	2.0
1	A	23	LEU	2.0
1	B	214	LEU	2.0

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 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.