



Full wwPDB X-ray Structure Validation Report ⓘ

May 22, 2020 – 09:18 pm BST

PDB ID : 1ZMU
Title : Catalytic and ubiquitin-associated domains of MARK2/PAR-1: Wild type
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Deposited on : 2005-05-11
Resolution : 2.90 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

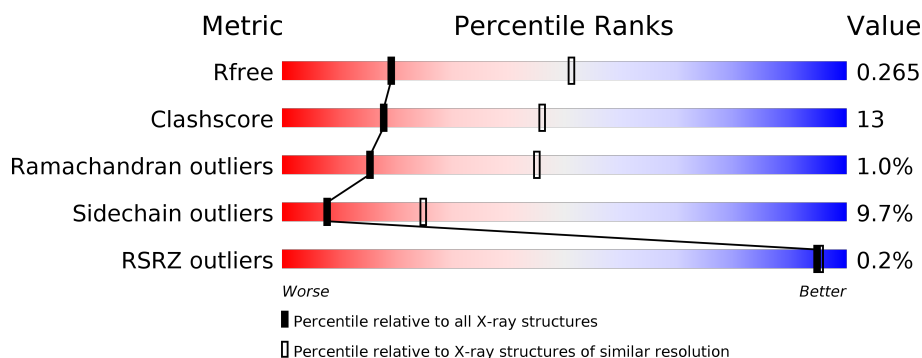
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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	1957 (2.90-2.90)
Clashscore	141614	2172 (2.90-2.90)
Ramachandran outliers	138981	2115 (2.90-2.90)
Sidechain outliers	138945	2117 (2.90-2.90)
RSRZ outliers	127900	1906 (2.90-2.90)

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 $\leq 5\%$. 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	327	
1	B	327	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 4664 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 MAP/Microtubule affinity regulating kinase 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	293	Total	C	N	O	S	0	0	0
			2314	1486	391	425	12			
1	B	296	Total	C	N	O	S	0	0	0
			2350	1512	399	427	12			

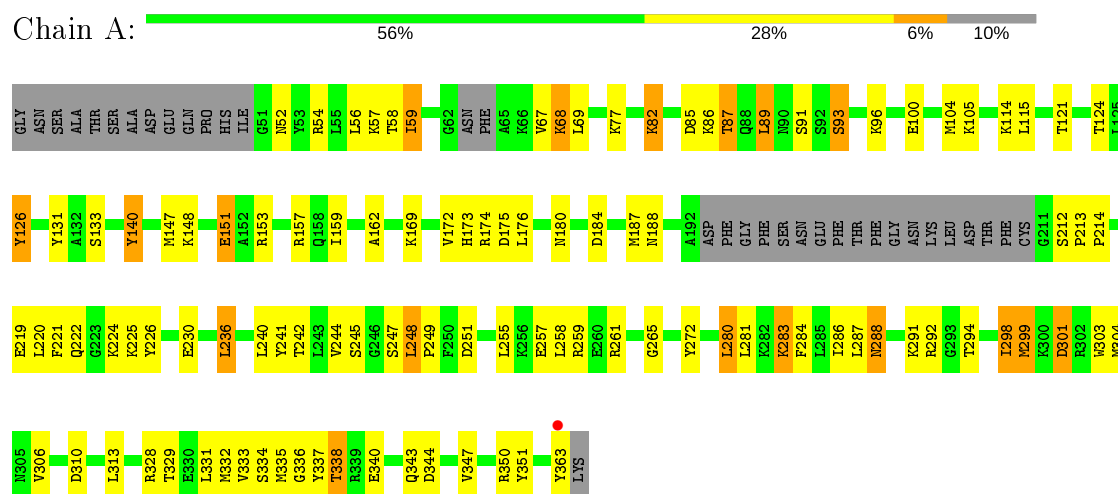
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	38	GLY	-	CLONING ARTIFACT	UNP O08679
B	38	GLY	-	CLONING ARTIFACT	UNP O08679

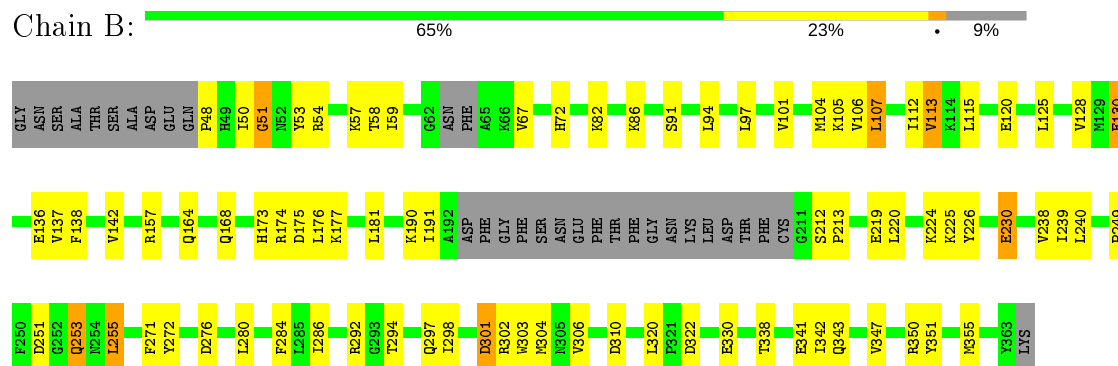
3 Residue-property plots

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: MAP/Microtubule affinity regulating kinase 2



- Molecule 1: MAP/Microtubule affinity regulating kinase 2



4 Data and refinement statistics

Property	Value	Source
Space group	P 61	Depositor
Cell constants a, b, c, α , β , γ	120.27 Å 120.27 Å 99.53 Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	46.14 – 2.90 46.14 – 2.90	Depositor EDS
% Data completeness (in resolution range)	99.9 (46.14-2.90) 99.9 (46.14-2.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.43 (at 2.91 Å)	Xtriage
Refinement program	REFMAC 5.2	Depositor
R, R_{free}	0.195 , 0.270 0.193 , 0.265	Depositor DCC
R_{free} test set	942 reflections (5.16%)	wwPDB-VP
Wilson B-factor (Å ²)	68.2	Xtriage
Anisotropy	0.076	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 64.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.044 for h,-h-k,-l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	4664	wwPDB-VP
Average B, all atoms (Å ²)	62.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.01% 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	0.99	4/2356 (0.2%)	0.99	1/3182 (0.0%)
1	B	0.95	1/2396 (0.0%)	0.95	3/3236 (0.1%)
All	All	0.97	5/4752 (0.1%)	0.97	4/6418 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	100	GLU	CB-CG	7.02	1.65	1.52
1	A	100	GLU	CG-CD	6.06	1.61	1.51
1	A	284	PHE	CE1-CZ	5.70	1.48	1.37
1	B	130	GLU	CB-CG	-5.49	1.41	1.52
1	A	82	LYS	CD-CE	5.34	1.64	1.51

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	176	LEU	CA-CB-CG	5.94	128.96	115.30
1	B	355	MET	CG-SD-CE	5.80	109.47	100.20
1	B	322	ASP	CB-CG-OD1	5.75	123.48	118.30
1	B	322	ASP	CB-CG-OD2	-5.18	113.64	118.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	310	ASP	Peptide

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	2314	0	2320	81	0
1	B	2350	0	2360	46	1
All	All	4664	0	4680	126	1

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 13.

All (126) 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:A:338:THR:OG1	1:A:340:GLU:HB2	1.62	0.97
1:A:343:GLN:O	1:A:347:VAL:HG23	1.78	0.83
1:B:343:GLN:O	1:B:347:VAL:HG23	1.84	0.78
1:B:230:GLU:CD	1:B:230:GLU:H	1.95	0.70
1:A:283:LYS:NZ	1:A:301:ASP:HB2	2.05	0.70
1:A:328:ARG:O	1:A:332:MET:HG3	1.92	0.69
1:B:286:ILE:O	1:B:292:ARG:NH1	2.26	0.68
1:B:338:THR:OG1	1:B:341:GLU:HG2	1.94	0.68
1:A:288:ASN:C	1:A:288:ASN:HD22	1.98	0.67
1:A:220:LEU:HB2	1:A:226:TYR:CE2	2.32	0.65
1:B:220:LEU:HB2	1:B:226:TYR:CE1	2.33	0.64
1:A:294:THR:O	1:A:298:ILE:HG13	1.98	0.63
1:B:301:ASP:OD1	1:B:303:TRP:N	2.31	0.63
1:A:212:SER:N	1:A:213:PRO:HD3	2.14	0.62
1:A:184:ASP:OD2	1:A:188:ASN:HB2	2.00	0.62
1:B:219:GLU:HB2	1:B:224:LYS:HB2	1.82	0.61
1:B:338:THR:O	1:B:342:ILE:HG13	2.01	0.61
1:A:242:THR:HG22	1:A:248:LEU:HA	1.83	0.60
1:B:225:LYS:H	1:B:225:LYS:NZ	2.00	0.59
1:A:299:MET:HG2	1:A:313:LEU:HG	1.84	0.59
1:B:104:MET:HB3	1:B:115:LEU:HD22	1.83	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:85:ASP:OD1	1:A:87:THR:HG23	2.02	0.59
1:A:283:LYS:HZ3	1:A:301:ASP:HB2	1.66	0.59
1:A:104:MET:HG2	1:A:115:LEU:HD13	1.85	0.59
1:A:338:THR:HG1	1:A:340:GLU:HB2	1.66	0.58
1:B:105:LYS:HG2	1:B:351:TYR:CE2	2.38	0.58
1:A:89:LEU:HD13	1:A:93:SER:HB2	1.86	0.58
1:A:58:THR:HG22	1:A:59:ILE:N	2.19	0.58
1:A:213:PRO:HD2	1:A:214:PRO:HD3	1.86	0.58
1:A:173:HIS:O	1:A:175:ASP:N	2.37	0.57
1:B:225:LYS:H	1:B:225:LYS:HZ3	1.52	0.57
1:A:58:THR:CG2	1:A:59:ILE:N	2.68	0.56
1:A:242:THR:HG22	1:A:247:SER:O	2.07	0.55
1:A:265:GLY:HA3	1:A:287:LEU:HD21	1.89	0.55
1:A:58:THR:O	1:A:59:ILE:HG23	2.08	0.54
1:A:230:GLU:N	1:A:230:GLU:OE1	2.35	0.54
1:A:77:LYS:CE	1:A:363:TYR:HB2	2.38	0.54
1:A:126:TYR:CD1	1:A:126:TYR:N	2.76	0.54
1:B:107:LEU:HD13	1:B:112:ILE:HG21	1.91	0.53
1:B:120:GLU:HG2	1:B:125:LEU:CD1	2.39	0.53
1:A:77:LYS:HE3	1:A:363:TYR:HB2	1.92	0.52
1:A:221:PHE:CG	1:A:259:ARG:HG3	2.46	0.51
1:A:140:TYR:CD1	1:A:140:TYR:O	2.63	0.51
1:B:177:LYS:HE2	1:B:212:SER:HB3	1.93	0.51
1:B:48:PRO:HD2	1:B:54:ARG:NE	2.27	0.50
1:B:58:THR:HG22	1:B:59:ILE:N	2.26	0.50
1:B:238:VAL:HG13	1:B:249:PRO:HD2	1.94	0.49
1:A:288:ASN:C	1:A:288:ASN:ND2	2.65	0.49
1:B:53:TYR:CE1	1:B:72:HIS:HD2	2.30	0.49
1:B:53:TYR:CE2	1:B:128:VAL:HG21	2.47	0.49
1:A:222:GLN:C	1:A:224:LYS:N	2.65	0.49
1:A:54:ARG:HH11	1:A:54:ARG:HA	1.78	0.48
1:A:131:TYR:CE2	1:A:133:SER:HB3	2.48	0.48
1:A:329:THR:O	1:A:333:VAL:HG23	2.12	0.48
1:A:140:TYR:C	1:A:140:TYR:CD1	2.87	0.48
1:A:140:TYR:HD1	1:A:140:TYR:O	1.97	0.48
1:B:271:PHE:CD1	1:B:271:PHE:C	2.87	0.48
1:A:147:MET:HE2	1:A:151:GLU:HB3	1.96	0.48
1:A:283:LYS:HZ1	1:A:301:ASP:HB2	1.76	0.47
1:A:157:ARG:NH1	1:A:304:MET:O	2.43	0.47
1:B:113:VAL:HG12	1:B:190:LYS:HB3	1.95	0.47
1:B:113:VAL:HG13	1:B:191:ILE:O	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:105:LYS:HG2	1:B:351:TYR:CD2	2.49	0.47
1:B:212:SER:N	1:B:213:PRO:CD	2.78	0.47
1:A:332:MET:O	1:A:337:TYR:HB2	2.14	0.47
1:A:344:ASP:HB3	1:A:350:ARG:NH2	2.29	0.47
1:B:173:HIS:O	1:B:175:ASP:N	2.48	0.47
1:A:212:SER:N	1:A:213:PRO:CD	2.78	0.46
1:A:86:LYS:NZ	1:A:121:THR:O	2.39	0.46
1:A:334:SER:C	1:A:336:GLY:N	2.68	0.46
1:A:222:GLN:C	1:A:224:LYS:H	2.19	0.46
1:B:255:LEU:HD12	1:B:255:LEU:HA	1.78	0.46
1:B:67:VAL:HG22	1:B:82:LYS:HG2	1.97	0.46
1:B:164:GLN:OE1	1:B:168:GLN:NE2	2.45	0.46
1:A:288:ASN:OD1	1:A:291:LYS:HE3	2.17	0.45
1:A:230:GLU:CD	1:A:230:GLU:H	2.16	0.45
1:B:280:LEU:HD12	1:B:280:LEU:O	2.17	0.45
1:A:212:SER:H	1:A:213:PRO:HD3	1.82	0.44
1:A:153:ARG:O	1:A:157:ARG:HG3	2.16	0.44
1:A:334:SER:C	1:A:336:GLY:H	2.21	0.44
1:A:67:VAL:HG22	1:A:82:LYS:HG2	1.99	0.44
1:A:58:THR:HA	1:A:68:LYS:HG3	1.99	0.44
1:B:50:ILE:O	1:B:51:GLY:C	2.55	0.43
1:A:172:VAL:O	1:A:172:VAL:HG23	2.18	0.43
1:A:334:SER:O	1:A:336:GLY:N	2.51	0.43
1:B:284:PHE:CZ	1:B:298:ILE:HG21	2.54	0.43
1:A:280:LEU:HG	1:A:301:ASP:OD1	2.18	0.43
1:B:48:PRO:HD2	1:B:54:ARG:CZ	2.49	0.43
1:A:242:THR:CG2	1:A:248:LEU:HA	2.47	0.43
1:A:56:LEU:O	1:A:57:LYS:C	2.57	0.43
1:B:294:THR:O	1:B:298:ILE:HG13	2.19	0.43
1:A:105:LYS:HG3	1:A:351:TYR:CD2	2.53	0.43
1:A:77:LYS:HE2	1:A:363:TYR:HB2	2.01	0.43
1:B:157:ARG:NH1	1:B:304:MET:O	2.52	0.43
1:A:333:VAL:HA	1:A:337:TYR:O	2.19	0.43
1:B:181:LEU:HD11	1:B:239:ILE:HD13	2.01	0.43
1:B:97:LEU:O	1:B:101:VAL:HG23	2.19	0.42
1:A:140:TYR:C	1:A:140:TYR:HD1	2.23	0.42
1:A:219:GLU:OE2	1:A:292:ARG:NH2	2.53	0.42
1:A:153:ARG:NE	1:A:303:TRP:O	2.43	0.42
1:A:331:LEU:O	1:A:335:MET:HG3	2.19	0.42
1:A:58:THR:OG1	1:A:68:LYS:HE2	2.20	0.42
1:A:286:ILE:O	1:A:292:ARG:NH1	2.50	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:230:GLU:CD	1:B:230:GLU:N	2.67	0.42
1:A:173:HIS:C	1:A:175:ASP:H	2.23	0.42
1:B:137:VAL:O	1:B:138:PHE:C	2.58	0.41
1:B:271:PHE:CD1	1:B:272:TYR:N	2.88	0.41
1:A:173:HIS:O	1:A:173:HIS:ND1	2.54	0.41
1:A:96:LYS:HD3	1:B:253:GLN:HG3	2.01	0.41
1:B:253:GLN:HG2	1:B:253:GLN:H	1.64	0.41
1:A:159:ILE:O	1:A:162:ALA:HB3	2.20	0.41
1:A:148:LYS:HD2	1:A:148:LYS:HA	1.91	0.41
1:A:241:TYR:CG	1:A:249:PRO:HG3	2.55	0.41
1:B:104:MET:CB	1:B:115:LEU:HD22	2.49	0.41
1:A:299:MET:HE2	1:A:313:LEU:HG	2.03	0.41
1:A:299:MET:HG2	1:A:313:LEU:CG	2.51	0.41
1:A:54:ARG:HG3	1:A:56:LEU:HD23	2.02	0.41
1:A:281:LEU:HD23	1:A:281:LEU:HA	1.71	0.40
1:A:242:THR:HG22	1:A:247:SER:C	2.41	0.40
1:A:251:ASP:H	1:A:261:ARG:NH1	2.19	0.40
1:A:245:SER:HA	1:A:272:TYR:OH	2.22	0.40
1:B:276:ASP:HB3	1:B:303:TRP:HB2	2.02	0.40
1:A:153:ARG:CZ	1:A:306:VAL:HB	2.52	0.40
1:B:302:ARG:O	1:B:306:VAL:HG23	2.21	0.40
1:B:94:LEU:HA	1:B:94:LEU:HD23	1.89	0.40
1:A:236:LEU:HD12	1:A:236:LEU:HA	2.00	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:86:LYS:NZ	1:B:271:PHE:O[5_554]	2.19	0.01

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	287/327 (88%)	262 (91%)	21 (7%)	4 (1%)	11	36
1	B	290/327 (89%)	260 (90%)	28 (10%)	2 (1%)	22	54
All	All	577/654 (88%)	522 (90%)	49 (8%)	6 (1%)	15	45

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	52	ASN
1	A	174	ARG
1	A	59	ILE
1	B	174	ARG
1	A	258	LEU
1	B	51	GLY

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	246/289 (85%)	218 (89%)	28 (11%)	5	17
1	B	251/289 (87%)	231 (92%)	20 (8%)	12	33
All	All	497/578 (86%)	449 (90%)	48 (10%)	8	25

All (48) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	68	LYS
1	A	69	LEU
1	A	87	THR
1	A	89	LEU
1	A	91	SER
1	A	93	SER
1	A	114	LYS
1	A	124	THR
1	A	126	TYR
1	A	140	TYR

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Mol	Chain	Res	Type
1	A	151	GLU
1	A	169	LYS
1	A	180	ASN
1	A	187	MET
1	A	225	LYS
1	A	236	LEU
1	A	240	LEU
1	A	244	VAL
1	A	248	LEU
1	A	255	LEU
1	A	257	GLU
1	A	280	LEU
1	A	283	LYS
1	A	288	ASN
1	A	298	ILE
1	A	299	MET
1	A	301	ASP
1	A	338	THR
1	B	57	LYS
1	B	91	SER
1	B	106	VAL
1	B	107	LEU
1	B	113	VAL
1	B	130	GLU
1	B	136	GLU
1	B	142	VAL
1	B	176	LEU
1	B	230	GLU
1	B	240	LEU
1	B	251	ASP
1	B	253	GLN
1	B	255	LEU
1	B	297	GLN
1	B	301	ASP
1	B	310	ASP
1	B	320	LEU
1	B	330	GLU
1	B	350	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	90	ASN
1	A	288	ASN
1	B	49	HIS
1	B	254	ASN
1	B	288	ASN
1	B	297	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 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 [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	293/327 (89%)	-0.21	1 (0%) 94 94	35, 58, 93, 117	0
1	B	296/327 (90%)	-0.30	0 100 100	35, 59, 95, 113	0
All	All	589/654 (90%)	-0.25	1 (0%) 95 95	35, 59, 94, 117	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	363	TYR	2.5

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 [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.