



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 17, 2022 – 06:26 AM JST

PDB ID : 4XOH
Title : Mechanistic insights into anchorage of the contractile ring from yeast to humans
Authors : Chen, Z.; Wu, J.-Q.; Wang, J.; Guan, R.; Sun, L.; Lee, I.-J.; Liu, Y.; Chen, M.
Deposited on : 2015-01-16
Resolution : 2.80 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 : 2.27
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) : 2.27

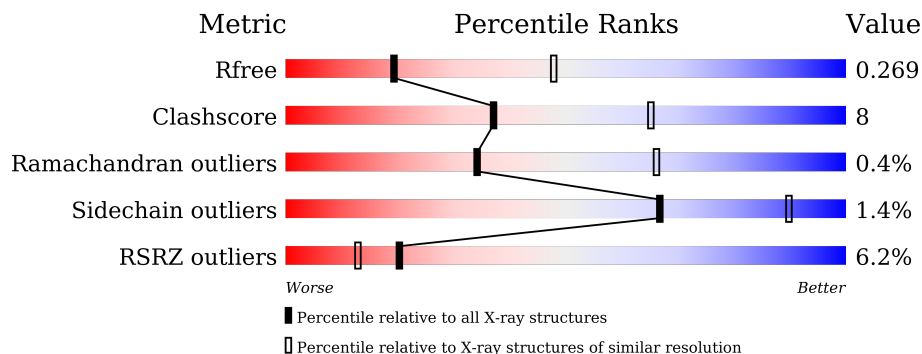
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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}	130704	3140 (2.80-2.80)
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)
RSRZ outliers	127900	3078 (2.80-2.80)

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	325	
1	B	325	
1	C	325	

2 Entry composition i

There is only 1 type of molecule in this entry. The entry contains 6483 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 Division mal foutue 1 protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	C	268	2171	1398	377	386	10	0	1	0
1	A	266	2147	1379	367	392	9	0	0	0
1	B	268	2165	1390	372	394	9	0	0	0

There are 36 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	1	GLY	-	expression tag	UNP P78953
C	2	HIS	-	expression tag	UNP P78953
C	3	MET	-	expression tag	UNP P78953
C	106	GLY	-	linker	UNP P78953
C	107	GLY	-	linker	UNP P78953
C	108	SER	-	linker	UNP P78953
C	109	THR	-	linker	UNP P78953
C	110	GLY	-	linker	UNP P78953
C	111	SER	-	linker	UNP P78953
C	112	SER	-	linker	UNP P78953
C	113	GLY	-	linker	UNP P78953
C	114	GLY	-	linker	UNP P78953
A	1	GLY	-	expression tag	UNP P78953
A	2	HIS	-	expression tag	UNP P78953
A	3	MET	-	expression tag	UNP P78953
A	106	GLY	-	linker	UNP P78953
A	107	GLY	-	linker	UNP P78953
A	108	SER	-	linker	UNP P78953
A	109	THR	-	linker	UNP P78953
A	110	GLY	-	linker	UNP P78953
A	111	SER	-	linker	UNP P78953
A	112	SER	-	linker	UNP P78953
A	113	GLY	-	linker	UNP P78953

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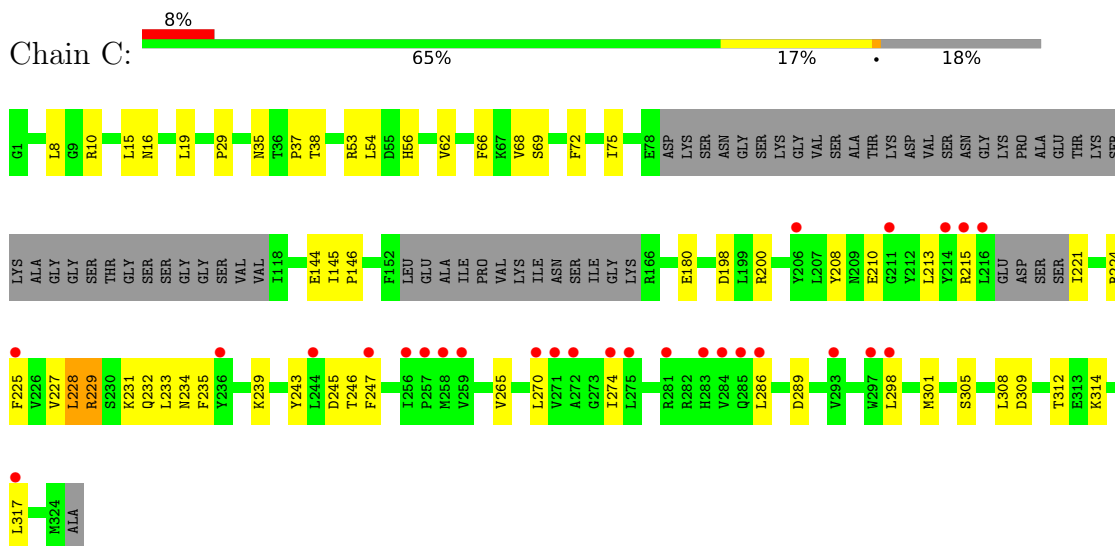
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Chain	Residue	Modelled	Actual	Comment	Reference
A	114	GLY	-	linker	UNP P78953
B	1	GLY	-	expression tag	UNP P78953
B	2	HIS	-	expression tag	UNP P78953
B	3	MET	-	expression tag	UNP P78953
B	106	GLY	-	linker	UNP P78953
B	107	GLY	-	linker	UNP P78953
B	108	SER	-	linker	UNP P78953
B	109	THR	-	linker	UNP P78953
B	110	GLY	-	linker	UNP P78953
B	111	SER	-	linker	UNP P78953
B	112	SER	-	linker	UNP P78953
B	113	GLY	-	linker	UNP P78953
B	114	GLY	-	linker	UNP P78953

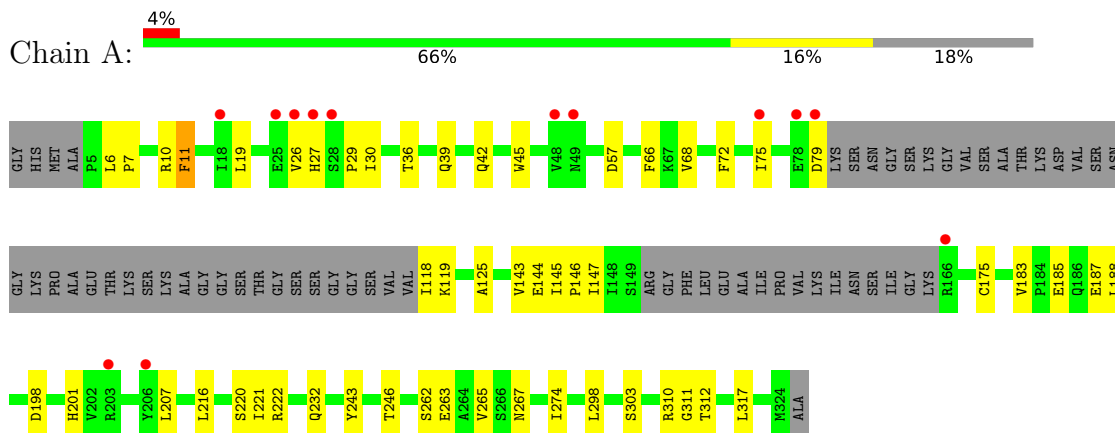
3 Residue-property plots [i](#)

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.

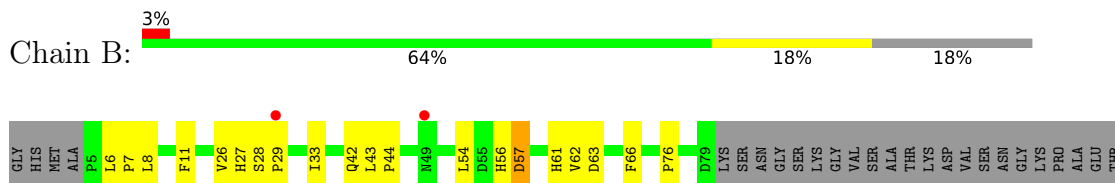
- Molecule 1: Division mal foutue 1 protein

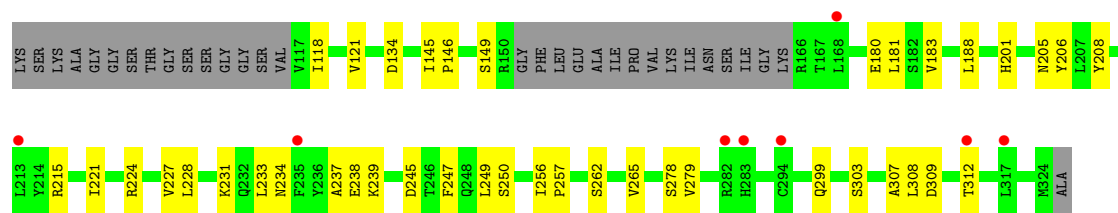


- Molecule 1: Division mal foutue 1 protein



- Molecule 1: Division mal foutue 1 protein





4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	80.94Å 80.94Å 314.44Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	68.40 – 2.80 70.10 – 2.80	Depositor EDS
% Data completeness (in resolution range)	86.7 (68.40-2.80) 86.8 (70.10-2.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.84 (at 2.81Å)	Xtrriage
Refinement program	PHENIX (phenix.refine: 1.7.3_928)	Depositor
R, R_{free}	0.235 , 0.269 0.232 , 0.269	Depositor DCC
R_{free} test set	1319 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	74.4	Xtrriage
Anisotropy	0.616	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 76.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	0.047 for -h,-k,l	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	6483	wwPDB-VP
Average B, all atoms (Å ²)	125.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.82% 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	0.24	0/2192	0.39	0/2968
1	B	0.23	0/2210	0.40	0/2992
1	C	0.23	0/2220	0.40	0/3002
All	All	0.23	0/6622	0.40	0/8962

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 [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	2147	0	2156	34	0
1	B	2165	0	2178	37	0
1	C	2171	0	2195	40	0
All	All	6483	0	6529	102	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 8.

All (102) 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:C:213:LEU:HD21	1:C:286:LEU:HB3	1.59	0.83

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:39:GLN:HG2	1:B:61:HIS:H	1.51	0.76
1:C:53:ARG:NH1	1:C:54:LEU:O	2.20	0.74
1:C:274:ILE:HB	1:C:286:LEU:HB2	1.70	0.72
1:C:215:ARG:O	1:C:221:ILE:N	2.23	0.71
1:A:57:ASP:HB2	1:B:42:GLN:HB2	1.75	0.68
1:A:220:SER:OG	1:A:222:ARG:NH1	2.27	0.67
1:C:144:GLU:HB2	1:A:19:LEU:HD13	1.78	0.66
1:C:215:ARG:HH22	1:C:224:ARG:HB2	1.61	0.66
1:B:228:LEU:HD13	1:B:233:LEU:HD13	1.76	0.65
1:C:10[A]:ARG:NH1	1:C:180:GLU:OE2	2.31	0.62
1:B:249:LEU:HA	1:B:278:SER:HA	1.82	0.61
1:B:221:ILE:HD11	1:B:265:VAL:HG12	1.81	0.61
1:A:198:ASP:HB3	1:A:317:LEU:HD11	1.84	0.60
1:B:250:SER:HA	1:B:279:VAL:HG22	1.83	0.60
1:C:233:LEU:HD11	1:C:247:PHE:HB3	1.84	0.59
1:B:8:LEU:HB2	1:B:180:GLU:HG3	1.84	0.58
1:A:183:VAL:HG13	1:A:188:LEU:HD11	1.84	0.58
1:A:30:ILE:O	1:A:45:TRP:N	2.32	0.57
1:C:229:ARG:HB3	1:A:27:HIS:CD2	2.39	0.57
1:B:54:LEU:HB3	1:B:56:HIS:HD2	1.72	0.55
1:B:145:ILE:HD12	1:B:146:PRO:HD2	1.89	0.55
1:C:145:ILE:HD12	1:C:146:PRO:HD2	1.88	0.54
1:A:72:PHE:HB3	1:A:75:ILE:HD11	1.89	0.54
1:B:43:LEU:HD12	1:B:44:PRO:HD2	1.90	0.54
1:A:42:GLN:HB2	1:B:57:ASP:HB2	1.88	0.54
1:A:79:ASP:H	1:A:118:ILE:HD12	1.72	0.54
1:C:232:GLN:NE2	1:C:234:ASN:HD21	2.05	0.54
1:C:8:LEU:HB2	1:C:180:GLU:HG3	1.89	0.53
1:A:216:LEU:HD13	1:A:221:ILE:HG12	1.91	0.52
1:B:205:ASN:HD21	1:B:307:ALA:HB2	1.74	0.52
1:C:228:LEU:HD12	1:C:233:LEU:HB3	1.92	0.52
1:C:309:ASP:OD2	1:B:26:VAL:HG13	2.09	0.51
1:B:224:ARG:HH11	1:B:237:ALA:HB2	1.76	0.51
1:C:37:PRO:O	1:C:38:THR:OG1	2.28	0.51
1:C:200:ARG:NH1	1:B:29:PRO:HG3	2.25	0.51
1:C:19:LEU:HD13	1:A:144:GLU:HB2	1.91	0.51
1:A:262:SER:HB3	1:A:265:VAL:HG13	1.91	0.51
1:B:299:GLN:O	1:B:303:SER:OG	2.23	0.51
1:A:232:GLN:NE2	1:A:246:THR:OG1	2.38	0.51
1:C:72:PHE:HB3	1:C:75:ILE:HD11	1.94	0.50
1:B:262:SER:HB3	1:B:265:VAL:HG13	1.93	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:26:VAL:HG12	1:A:27:HIS:HD2	1.78	0.49
1:A:66:PHE:CZ	1:A:68:VAL:HB	2.47	0.49
1:C:298:LEU:HA	1:C:301:MET:HG2	1.95	0.49
1:B:215:ARG:NH2	1:B:245:ASP:OD1	2.32	0.48
1:C:15:LEU:HD12	1:C:56:HIS:HB2	1.96	0.48
1:A:310:ARG:HA	1:A:311:GLY:HA2	1.59	0.48
1:C:208:TYR:HE1	1:C:227:VAL:HG13	1.79	0.48
1:A:145:ILE:HD12	1:A:146:PRO:HD2	1.95	0.48
1:C:312:THR:HG22	1:C:314:LYS:HB2	1.95	0.47
1:C:234:ASN:HB3	1:C:243:TYR:HD1	1.80	0.47
1:C:231:LYS:HE3	1:C:305:SER:HB3	1.96	0.47
1:A:26:VAL:CG1	1:A:27:HIS:HD2	2.27	0.47
1:A:125:ALA:HB2	1:A:147:ILE:HG12	1.95	0.47
1:B:231:LYS:NZ	1:B:303:SER:O	2.47	0.46
1:C:35:ASN:HB3	1:C:69:SER:HB3	1.97	0.46
1:A:11:PHE:CE1	1:A:175:CYS:HB2	2.51	0.46
1:A:10:ARG:HH22	1:A:185:GLU:HG2	1.81	0.46
1:A:207:LEU:HD21	1:A:303:SER:HB2	1.97	0.46
1:A:118:ILE:HG22	1:A:119:LYS:HG3	1.98	0.45
1:C:265:VAL:HB	1:C:270:LEU:HD12	1.98	0.45
1:A:10:ARG:NH1	1:A:188:LEU:HD22	2.31	0.45
1:B:181:LEU:HB2	1:B:183:VAL:HG12	1.99	0.45
1:A:201:HIS:HB3	1:A:312:THR:HG21	1.99	0.45
1:B:183:VAL:HG13	1:B:188:LEU:HD11	1.99	0.44
1:B:201:HIS:HB3	1:B:312:THR:HG22	1.99	0.44
1:C:66:PHE:CE2	1:C:68:VAL:HB	2.52	0.44
1:C:210:GLU:HB2	1:C:225:PHE:CE2	2.52	0.44
1:C:274:ILE:HG23	1:C:298:LEU:HD21	2.00	0.44
1:B:62:VAL:HG23	1:B:66:PHE:CD1	2.53	0.43
1:C:270:LEU:HA	1:C:289:ASP:HA	2.00	0.43
1:C:308:LEU:HD11	1:C:317:LEU:HB3	2.00	0.43
1:C:234:ASN:HB3	1:C:243:TYR:CD1	2.54	0.43
1:B:206:TYR:CE2	1:B:208:TYR:HB3	2.53	0.43
1:B:8:LEU:HA	1:B:63:ASP:HA	2.01	0.42
1:B:26:VAL:HG21	1:B:118:ILE:HD11	2.01	0.42
1:A:187:GLU:N	1:A:187:GLU:OE1	2.53	0.42
1:C:245:ASP:OD1	1:C:246:THR:N	2.53	0.42
1:A:6:LEU:HA	1:A:7:PRO:HD3	1.90	0.42
1:C:16:ASN:O	1:C:53:ARG:HD2	2.20	0.42
1:C:198:ASP:HB3	1:C:317:LEU:HD11	2.02	0.42
1:C:274:ILE:N	1:C:286:LEU:O	2.38	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:256:ILE:HD12	1:B:257:PRO:HD2	2.02	0.42
1:B:62:VAL:HG22	1:B:63:ASP:O	2.21	0.41
1:B:308:LEU:HG	1:B:312:THR:HG21	2.02	0.41
1:C:235:PHE:CD1	1:C:245:ASP:HB3	2.55	0.41
1:B:309:ASP:O	1:B:312:THR:HG23	2.20	0.41
1:B:6:LEU:HA	1:B:7:PRO:HD3	1.86	0.41
1:B:233:LEU:HD12	1:B:233:LEU:HA	1.87	0.41
1:C:233:LEU:CD1	1:C:247:PHE:HB3	2.48	0.41
1:A:243:TYR:OH	1:A:246:THR:HB	2.20	0.41
1:B:28:SER:HB3	1:B:76:PRO:HG3	2.01	0.41
1:B:227:VAL:HG12	1:B:234:ASN:HB2	2.02	0.41
1:B:247:PHE:CZ	1:B:278:SER:HB3	2.56	0.41
1:A:274:ILE:HG23	1:A:298:LEU:HD21	2.03	0.41
1:C:225:PHE:HB2	1:C:239:LYS:HA	2.02	0.41
1:A:36:THR:HB	1:A:66:PHE:HE1	1.87	0.40
1:C:232:GLN:OE1	1:A:26:VAL:HB	2.22	0.40
1:A:263:GLU:O	1:A:267:ASN:HB2	2.21	0.40
1:B:33:ILE:HG23	1:B:42:GLN:HG2	2.03	0.40
1:B:238:GLU:O	1:B:239:LYS:HB3	2.22	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	260/325 (80%)	241 (93%)	18 (7%)	1 (0%)	34	66
1	B	262/325 (81%)	246 (94%)	15 (6%)	1 (0%)	34	66
1	C	261/325 (80%)	245 (94%)	15 (6%)	1 (0%)	34	66
All	All	783/975 (80%)	732 (94%)	48 (6%)	3 (0%)	34	66

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	27	HIS
1	A	29	PRO
1	C	29	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	243/285 (85%)	241 (99%)	2 (1%)	81	94
1	B	245/285 (86%)	240 (98%)	5 (2%)	55	84
1	C	243/285 (85%)	240 (99%)	3 (1%)	71	92
All	All	731/855 (86%)	721 (99%)	10 (1%)	67	90

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	62	VAL
1	C	228	LEU
1	C	229	ARG
1	A	11	PHE
1	A	143	VAL
1	B	11	PHE
1	B	57	ASP
1	B	121	VAL
1	B	134	ASP
1	B	149	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	27	HIS
1	C	234	ASN
1	A	27	HIS
1	A	39	GLN
1	A	46	GLN

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Mol	Chain	Res	Type
1	A	56	HIS
1	B	56	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 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	A	266/325 (81%)	0.49	13 (4%) 29 20	78, 112, 162, 204	0
1	B	268/325 (82%)	0.39	10 (3%) 41 31	74, 124, 177, 218	0
1	C	268/325 (82%)	0.75	27 (10%) 7 4	67, 117, 212, 232	0
All	All	802/975 (82%)	0.54	50 (6%) 20 13	67, 118, 194, 232	0

All (50) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	27	HIS	9.8
1	C	258	MET	8.8
1	C	256	ILE	6.4
1	C	259	VAL	6.2
1	C	215	ARG	5.1
1	C	270	LEU	4.8
1	A	49	ASN	4.4
1	C	275	LEU	4.0
1	C	272	ALA	4.0
1	C	285	GLN	4.0
1	A	28	SER	3.9
1	C	216	LEU	3.9
1	C	284	VAL	3.8
1	C	283	HIS	3.7
1	C	257	PRO	3.7
1	C	286	LEU	3.6
1	C	297	TRP	3.6
1	A	25	GLU	3.5
1	C	293	VAL	3.3
1	C	214	TYR	3.1
1	C	271	VAL	3.0
1	B	282	ARG	2.9
1	A	26	VAL	2.8

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Mol	Chain	Res	Type	RSRZ
1	C	247	PHE	2.8
1	A	78	GLU	2.7
1	A	48	VAL	2.7
1	B	312	THR	2.7
1	C	281	ARG	2.6
1	B	294	CYS	2.6
1	C	244	LEU	2.6
1	B	283	HIS	2.6
1	C	211	GLY	2.5
1	A	206	TYR	2.5
1	B	29	PRO	2.4
1	B	317	LEU	2.4
1	A	203	ARG	2.4
1	C	274	ILE	2.3
1	C	206	TYR	2.3
1	A	166	ARG	2.3
1	C	236	TYR	2.2
1	B	49	ASN	2.2
1	B	168	LEU	2.2
1	A	75	ILE	2.1
1	B	213	LEU	2.1
1	C	317	LEU	2.1
1	C	298	LEU	2.1
1	A	79	ASP	2.1
1	C	225	PHE	2.0
1	B	235	PHE	2.0
1	A	18	ILE	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 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.