



Full wwPDB X-ray Structure Validation Report ⓘ

May 15, 2020 – 02:37 am BST

PDB ID : 1OQF
Title : Crystal structure of the 2-methylisocitrate lyase
Authors : Liu, S.; Lu, Z.; Dunaway-Mariano, D.; Herzberg, O.; Structure 2 Function Project (S2F)
Deposited on : 2003-03-08
Resolution : 1.93 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

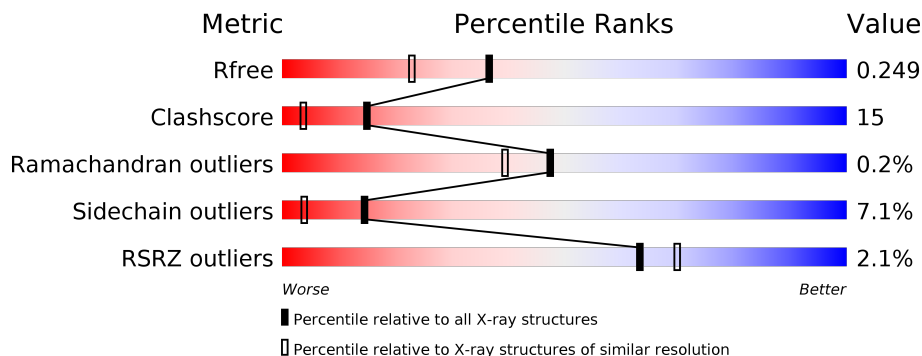
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION



The reported resolution of this entry is 1.93 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	4310 (1.96-1.92)
Clashscore	141614	1023 (1.94-1.94)
Ramachandran outliers	138981	1007 (1.94-1.94)
Sidechain outliers	138945	1007 (1.94-1.94)
RSRZ outliers	127900	4250 (1.96-1.92)

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	295	 3% 78% 17% . .
1	B	295	 % 73% 21% . .

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5059 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 2-methylisocitrate lyase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	290	2206	1387	385	424	10	0	0	0
1	B	290	2205	1387	385	423	10	0	0	0

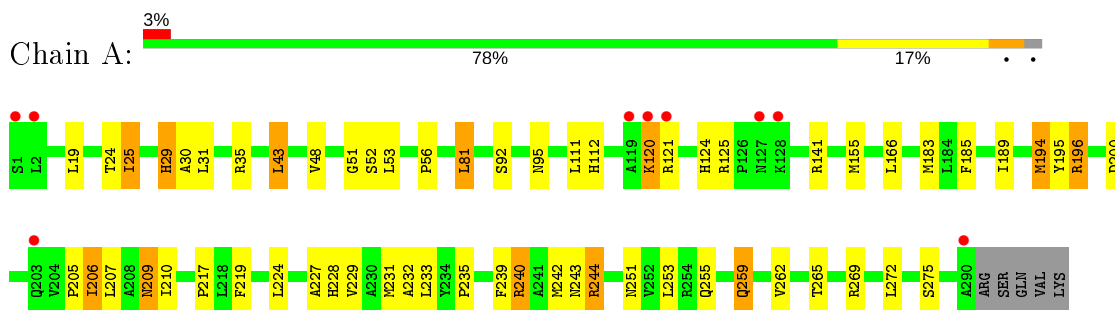
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	330	Total 330	O 330	0	0
2	B	318	Total 318	O 318	0	0

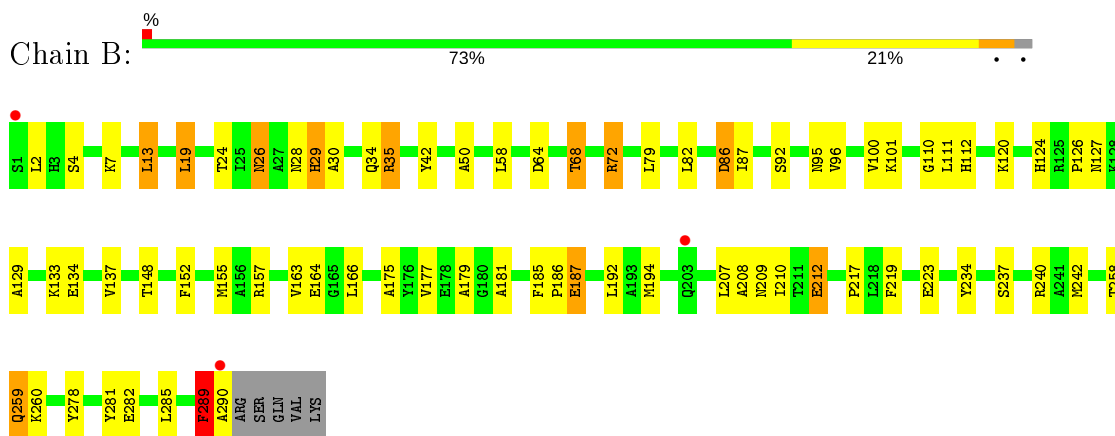
3 Residue-property plots [i](#)

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: 2-methylisocitrate lyase



- Molecule 1: 2-methylisocitrate lyase



4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	83.04Å 83.04Å 166.87Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	50.00 – 1.93 20.14 – 1.86	Depositor EDS
% Data completeness (in resolution range)	91.9 (50.00-1.93) 93.3 (20.14-1.86)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.29 (at 1.86Å)	Xtrriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.191 , 0.247 0.195 , 0.249	Depositor DCC
R_{free} test set	3200 reflections (6.06%)	wwPDB-VP
Wilson B-factor (Å ²)	23.7	Xtrriage
Anisotropy	0.251	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 47.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtrriage
Estimated twinning fraction	0.043 for -h,-k,l	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	5059	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.90% 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	0.54	0/2241	0.71	1/3039 (0.0%)
1	B	0.50	0/2240	0.72	2/3038 (0.1%)
All	All	0.52	0/4481	0.72	3/6077 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	72	ARG	NE-CZ-NH1	5.80	123.20	120.30
1	B	212	GLU	N-CA-C	5.55	126.00	111.00
1	A	240	ARG	NE-CZ-NH1	-5.45	117.58	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	A	2206	0	2206	72	0
1	B	2205	0	2203	70	0
2	A	330	0	0	8	0
2	B	318	0	0	10	0
All	All	5059	0	4409	133	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 15.

All (133) 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:239:PHE:HA	1:A:242:MET:HE2	1.39	1.03
1:A:259:GLN:H	1:A:259:GLN:HE21	1.02	1.01
1:A:120:LYS:HD2	1:A:124:HIS:HB2	1.45	0.99
1:B:259:GLN:H	1:B:259:GLN:HE21	1.04	0.97
1:A:125:ARG:HH21	1:B:290:ALA:HB3	1.33	0.92
1:A:240:ARG:HG3	1:A:240:ARG:HH11	1.35	0.88
1:A:92:SER:H	1:A:95:ASN:HD22	1.20	0.88
1:A:224:LEU:HB3	1:A:229:VAL:CG2	2.07	0.84
1:A:224:LEU:HB3	1:A:229:VAL:HG21	1.60	0.82
1:A:239:PHE:HD1	1:A:242:MET:HE3	1.45	0.82
1:A:120:LYS:HD3	1:A:121:ARG:HG3	1.61	0.82
1:A:120:LYS:HE3	1:A:124:HIS:HD2	1.45	0.81
1:A:259:GLN:N	1:A:259:GLN:HE21	1.79	0.81
1:A:239:PHE:HA	1:A:242:MET:CE	2.11	0.80
1:B:127:ASN:HD22	1:B:129:ALA:H	1.28	0.80
1:B:212:GLU:CG	1:B:240:ARG:HE	1.97	0.78
1:A:262:VAL:O	1:A:265:THR:HG22	1.83	0.78
1:B:68:THR:HG21	2:B:304:HOH:O	1.85	0.76
1:B:217:PRO:HG2	1:B:219:PHE:CZ	2.22	0.75
1:B:13:LEU:HD22	1:B:19:LEU:HD12	1.70	0.74
1:A:125:ARG:NH2	1:B:290:ALA:HB3	2.03	0.73
1:B:120:LYS:H	1:B:124:HIS:HD2	1.34	0.73
1:B:259:GLN:NE2	1:B:259:GLN:H	1.83	0.73
1:A:183:MET:HG2	1:A:205:PRO:HG2	1.69	0.72
1:B:120:LYS:H	1:B:124:HIS:CD2	2.06	0.72
1:A:240:ARG:HG3	1:A:240:ARG:NH1	1.98	0.72
1:B:68:THR:HG22	2:B:340:HOH:O	1.90	0.72
2:A:323:HOH:O	1:B:72:ARG:HD2	1.88	0.72
1:A:120:LYS:HE3	1:A:124:HIS:CD2	2.25	0.71
1:A:120:LYS:HD2	1:A:121:ARG:H	1.56	0.69
1:B:212:GLU:HB2	1:B:240:ARG:HE	1.58	0.69
1:A:92:SER:H	1:A:95:ASN:ND2	1.88	0.69
1:B:212:GLU:CB	1:B:240:ARG:HE	2.06	0.69
1:B:212:GLU:HB2	1:B:240:ARG:NE	2.10	0.67
1:A:210:ILE:HD11	1:A:224:LEU:HD11	1.77	0.66
1:A:224:LEU:O	1:A:229:VAL:HG22	1.96	0.65
1:B:166:LEU:HD13	1:B:194:MET:HE3	1.78	0.65
1:A:120:LYS:CD	1:A:121:ARG:H	2.10	0.64
1:A:217:PRO:HG2	1:A:219:PHE:CZ	2.33	0.64
1:A:259:GLN:NE2	1:A:259:GLN:H	1.86	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:212:GLU:HG3	1:B:240:ARG:HE	1.63	0.63
1:A:31:LEU:O	1:A:35:ARG:HG3	1.97	0.63
1:A:43:LEU:HB2	1:A:81:LEU:HD21	1.82	0.61
1:B:166:LEU:HD13	1:B:194:MET:CE	2.31	0.60
1:B:137:VAL:HG13	1:B:179:ALA:HB2	1.84	0.60
1:B:111:LEU:HD12	1:B:111:LEU:C	2.24	0.59
1:A:239:PHE:CD1	1:A:242:MET:HE3	2.34	0.58
1:A:196:ARG:HH11	1:A:196:ARG:HG3	1.68	0.58
1:A:269:ARG:HD2	2:B:504:HOH:O	2.04	0.58
1:A:196:ARG:HD2	1:A:200:ASP:OD2	2.04	0.58
1:B:64:ASP:O	1:B:68:THR:HG23	2.03	0.58
1:A:255:GLN:HG2	2:A:597:HOH:O	2.04	0.58
1:A:112:HIS:HD2	2:A:301:HOH:O	1.88	0.56
1:A:53:LEU:HD23	1:B:72:ARG:HG2	1.86	0.56
1:B:58:LEU:HD22	1:B:126:PRO:HB3	1.87	0.56
1:A:120:LYS:NZ	1:A:124:HIS:HA	2.21	0.56
1:A:275:SER:HB3	2:A:603:HOH:O	2.06	0.56
1:A:120:LYS:CD	1:A:124:HIS:HB2	2.27	0.55
1:A:195:TYR:HD1	1:A:206:ILE:HD11	1.71	0.55
1:A:227:ALA:O	1:A:228:HIS:HB2	2.06	0.54
1:A:210:ILE:HD11	1:A:224:LEU:CD1	2.38	0.54
1:B:282:GLU:HG2	2:B:608:HOH:O	2.08	0.54
1:A:210:ILE:CD1	1:A:232:ALA:HB1	2.38	0.54
1:A:244:ARG:HD3	2:B:345:HOH:O	2.07	0.54
1:A:141:ARG:HD3	2:A:594:HOH:O	2.09	0.53
1:A:189:ILE:HD12	1:A:195:TYR:CE1	2.42	0.53
1:A:251:ASN:O	1:A:255:GLN:HG3	2.09	0.52
1:B:112:HIS:HD2	2:B:316:HOH:O	1.92	0.52
1:A:24:THR:HG21	1:A:30:ALA:HA	1.91	0.52
1:B:163:VAL:HG23	1:B:164:GLU:HG3	1.91	0.52
1:A:125:ARG:HD3	1:B:285:LEU:HD13	1.92	0.52
1:B:2:LEU:N	1:B:2:LEU:HD12	2.24	0.52
1:A:111:LEU:HD12	1:A:111:LEU:C	2.30	0.52
1:A:243:ASN:OD1	1:B:29:HIS:HE1	1.94	0.51
1:B:42:TYR:OH	1:B:112:HIS:HE1	1.93	0.51
1:A:196:ARG:HG3	2:A:564:HOH:O	2.12	0.50
1:A:25:ILE:O	1:A:25:ILE:HD13	2.12	0.50
1:B:112:HIS:HA	1:B:155:MET:O	2.12	0.50
1:B:92:SER:H	1:B:95:ASN:HD22	1.59	0.50
1:B:4:SER:HB3	1:B:7:LYS:HB2	1.94	0.50
1:A:217:PRO:HG2	1:A:219:PHE:CE2	2.48	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:207:LEU:HD23	1:A:207:LEU:C	2.34	0.48
1:A:253:LEU:HD21	1:B:234:TYR:CG	2.48	0.48
1:A:92:SER:N	1:A:95:ASN:HD22	2.01	0.48
1:B:210:ILE:O	1:B:210:ILE:HG22	2.14	0.48
1:B:35:ARG:HD3	1:B:35:ARG:O	2.13	0.48
1:A:196:ARG:NH1	1:A:196:ARG:HG3	2.29	0.47
1:A:112:HIS:HA	1:A:155:MET:O	2.14	0.47
1:B:212:GLU:HG3	1:B:240:ARG:NE	2.29	0.47
1:B:157:ARG:NH2	1:B:187:GLU:HG3	2.29	0.47
1:B:26:ASN:HD22	1:B:26:ASN:C	2.18	0.46
1:B:175:ALA:HA	2:B:543:HOH:O	2.15	0.46
1:B:258:THR:OG1	1:B:260:LYS:HG3	2.15	0.46
1:B:192:LEU:HD11	1:B:223:GLU:HB3	1.96	0.46
1:B:137:VAL:HG13	1:B:179:ALA:CB	2.44	0.46
1:B:86:ASP:HB3	1:B:87:ILE:H	1.59	0.46
1:A:196:ARG:NH2	1:A:228:HIS:CE1	2.84	0.45
1:B:2:LEU:HD12	1:B:2:LEU:H	1.81	0.45
1:B:110:GLY:HA2	1:B:152:PHE:CE1	2.52	0.45
1:B:95:ASN:ND2	2:B:581:HOH:O	2.39	0.45
1:A:48:VAL:O	1:A:52:SER:HB2	2.17	0.45
1:B:259:GLN:NE2	2:B:311:HOH:O	2.48	0.45
1:A:240:ARG:NH1	1:A:240:ARG:CG	2.69	0.45
1:B:217:PRO:HG2	1:B:219:PHE:CE1	2.52	0.43
1:A:224:LEU:C	1:A:229:VAL:HG22	2.38	0.43
1:B:24:THR:HG21	1:B:30:ALA:HA	2.00	0.43
1:A:29:HIS:HD2	2:A:304:HOH:O	2.01	0.43
1:B:278:TYR:C	1:B:278:TYR:CD1	2.92	0.43
1:A:209:ASN:HD21	1:A:235:PRO:HG3	1.82	0.43
1:B:217:PRO:CG	1:B:219:PHE:CZ	2.98	0.43
1:B:111:LEU:HD12	1:B:111:LEU:O	2.19	0.42
1:B:96:VAL:O	1:B:100:VAL:HG23	2.19	0.42
1:A:120:LYS:HZ1	1:A:124:HIS:HA	1.85	0.42
1:B:133:LYS:HD2	1:B:175:ALA:CB	2.50	0.42
1:B:289:PHE:N	1:B:289:PHE:CD1	2.88	0.42
1:B:207:LEU:HD23	1:B:208:ALA:N	2.35	0.42
1:A:265:THR:HG21	2:A:341:HOH:O	2.19	0.41
1:A:56:PRO:HG3	1:B:281:TYR:CD1	2.56	0.41
1:B:186:PRO:HD2	1:B:207:LEU:O	2.21	0.41
1:B:101:LYS:HG2	1:B:148:THR:HG23	2.02	0.41
1:B:50:ALA:HB2	2:B:451:HOH:O	2.20	0.41
1:B:34:GLN:HA	1:B:79:LEU:HD11	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:177:VAL:HA	1:B:181:ALA:HB3	2.03	0.41
1:B:212:GLU:CB	1:B:240:ARG:NE	2.73	0.41
1:B:289:PHE:HB2	1:B:290:ALA:H	1.39	0.41
1:B:134:GLU:H	1:B:134:GLU:CD	2.23	0.41
1:B:26:ASN:ND2	1:B:29:HIS:H	2.19	0.41
1:A:120:LYS:HZ2	1:A:124:HIS:HA	1.85	0.41
1:A:25:ILE:HG13	1:A:239:PHE:CD1	2.56	0.40
1:A:125:ARG:CD	1:B:285:LEU:HD13	2.50	0.40
1:A:189:ILE:HG23	1:A:194:MET:HB3	2.03	0.40
1:A:51:GLY:HA2	1:B:28:ASN:HB2	2.03	0.40
1:A:210:ILE:CD1	1:A:224:LEU:HD11	2.49	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	288/295 (98%)	279 (97%)	9 (3%)	0	100	100
1	B	288/295 (98%)	281 (98%)	6 (2%)	1 (0%)	41	32
All	All	576/590 (98%)	560 (97%)	15 (3%)	1 (0%)	47	39

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	289	PHE

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	227/232 (98%)	210 (92%)	17 (8%)	13	3
1	B	226/232 (97%)	211 (93%)	15 (7%)	16	5
All	All	453/464 (98%)	421 (93%)	32 (7%)	14	4

All (32) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	19	LEU
1	A	25	ILE
1	A	29	HIS
1	A	43	LEU
1	A	81	LEU
1	A	120	LYS
1	A	166	LEU
1	A	185	PHE
1	A	194	MET
1	A	196	ARG
1	A	206	ILE
1	A	209	ASN
1	A	231	MET
1	A	233	LEU
1	A	244	ARG
1	A	259	GLN
1	A	272	LEU
1	B	13	LEU
1	B	19	LEU
1	B	26	ASN
1	B	29	HIS
1	B	35	ARG
1	B	68	THR
1	B	82	LEU
1	B	86	ASP
1	B	185	PHE
1	B	187	GLU
1	B	209	ASN
1	B	237	SER
1	B	242	MET
1	B	259	GLN
1	B	289	PHE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	3	HIS
1	A	29	HIS
1	A	39	GLN
1	A	95	ASN
1	A	112	HIS
1	A	124	HIS
1	A	203	GLN
1	A	209	ASN
1	A	259	GLN
1	B	26	ASN
1	B	29	HIS
1	B	95	ASN
1	B	112	HIS
1	B	124	HIS
1	B	127	ASN
1	B	209	ASN
1	B	259	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

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	290/295 (98%)	-0.25	9 (3%) 49 56	16, 25, 43, 58	0
1	B	290/295 (98%)	-0.23	3 (1%) 82 86	17, 27, 45, 54	0
All	All	580/590 (98%)	-0.24	12 (2%) 63 70	16, 26, 44, 58	0

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	290	ALA	5.5
1	A	128	LYS	4.3
1	A	1	SER	3.4
1	A	119	ALA	3.1
1	B	1	SER	3.1
1	A	121	ARG	2.8
1	A	203	GLN	2.7
1	A	127	ASN	2.7
1	B	290	ALA	2.3
1	B	203	GLN	2.2
1	A	2	LEU	2.1
1	A	120	LYS	2.1

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.