Full wwPDB X-ray Structure Validation Report ⓘ

Dec 2, 2024 – 05:46 PM EST

PDB ID	:	3KMI
Title	:	Crystal structure of putative membrane protein from Clostridium difficile 630
Authors	:	Chang, C.; Rakowski, E.; Bearden, J.; Joachimiak, A.; Midwest Center for Structural Genomics (MCSG)
Deposited on	:	2009-11-10
Resolution	:	1.96 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 types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references ⓘ) were used in the production of this report:

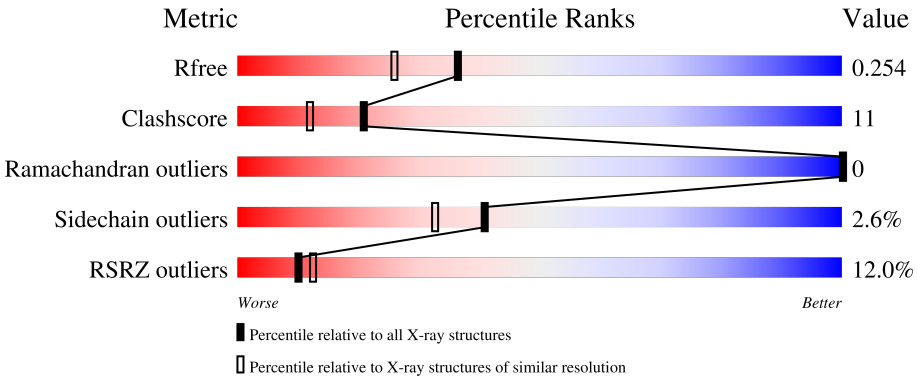
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.21
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

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 1.96 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}	164625	3187 (1.96-1.96)
Clashscore	180529	3412 (1.96-1.96)
Ramachandran outliers	177936	3390 (1.96-1.96)
Sidechain outliers	177891	3390 (1.96-1.96)
RSRZ outliers	164620	3186 (1.96-1.96)

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 <=5%

Mol	Chain	Length	Quality of chain
1	A	177	8% 77% 19%
1	B	177	14% 75% 19% 5%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 3362 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.

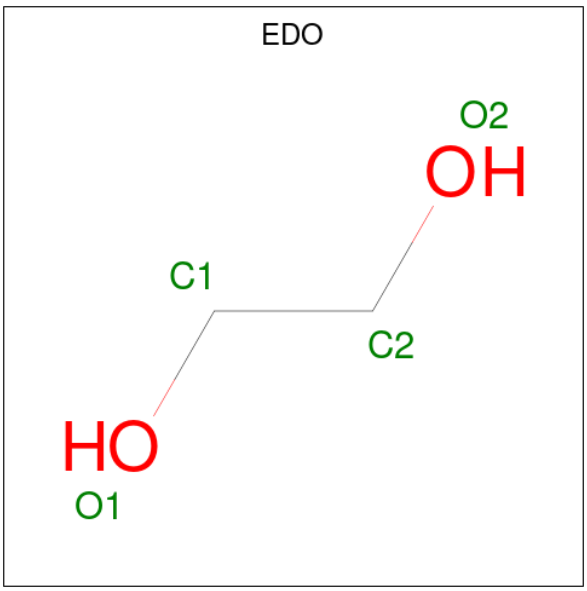
- Molecule 1 is a protein called Putative membrane protein COG4129.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	172	Total	C	N	O	S	Se	0	20	0
			1570	998	267	299	1	5			
1	B	168	Total	C	N	O	S	Se	0	18	0
			1488	934	252	293	1	8			

There are 6 discrepancies between the modelled and reference sequences:

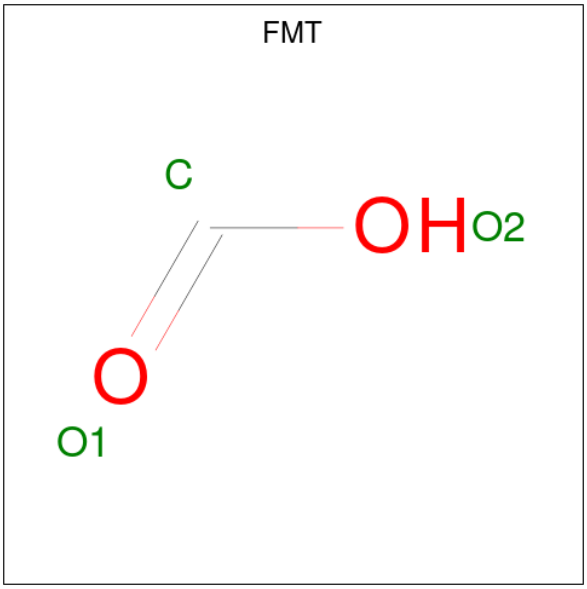
Chain	Residue	Modelled	Actual	Comment	Reference
A	141	SER	-	expression tag	UNP Q184N1
A	142	ASN	-	expression tag	UNP Q184N1
A	143	ALA	-	expression tag	UNP Q184N1
B	141	SER	-	expression tag	UNP Q184N1
B	142	ASN	-	expression tag	UNP Q184N1
B	143	ALA	-	expression tag	UNP Q184N1

- Molecule 2 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	B	1	Total C O 4 2 2	0	0

- Molecule 3 is FORMIC ACID (three-letter code: FMT) (formula: CH_2O_2).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	1	Total C O 3 1 2	0	0
3	B	1	Total C O 3 1 2	0	0

- Molecule 4 is water.

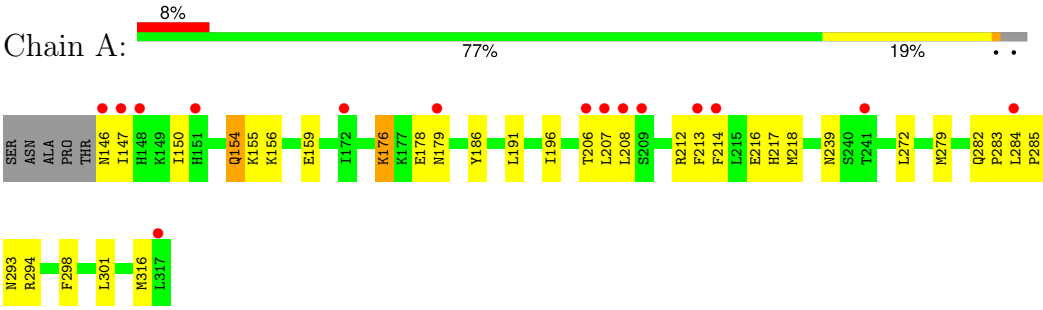
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	162	Total O 162 162	0	0
4	B	132	Total O 132 132	0	0

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. 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. 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.

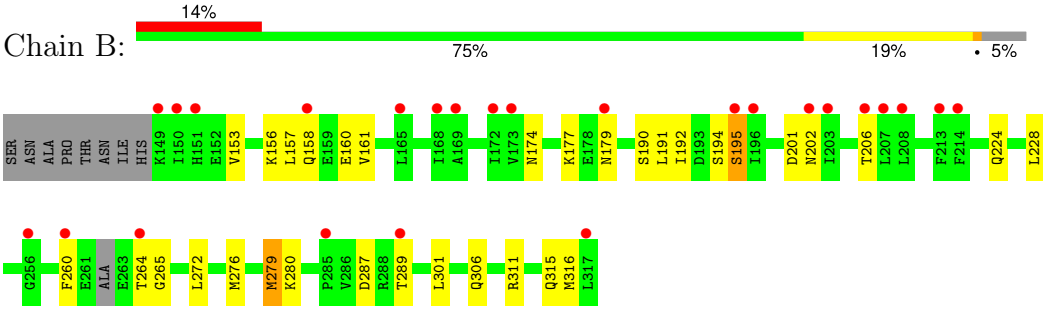
• Molecule 1: Putative membrane protein COG4129

Chain A:



• Molecule 1: Putative membrane protein COG4129

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	58.38Å 66.24Å 87.19Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 1.96 50.00 – 1.96	Depositor EDS
% Data completeness (in resolution range)	99.0 (50.00-1.96) 99.3 (50.00-1.96)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	8.13 (at 1.95Å)	Xtriage
Refinement program	REFMAC 5.5.0102	Depositor
R, R_{free}	0.191 , 0.235 0.216 , 0.254	Depositor DCC
R_{free} test set	1261 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å^2)	23.7	Xtriage
Anisotropy	0.343	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 40.1	EDS
L-test for twinning[2]	$< \|L\| > = 0.46$, $< L^2 > = 0.28$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.91	EDS
Total number of atoms	3362	wwPDB-VP
Average B, all atoms (Å^2)	16.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.62% 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

Bond lengths and bond angles in the following residue types are not validated in this section: EDO, FMT

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	0.63	0/1593	0.61	0/2146
1	B	0.65	0/1504	0.67	0/2020
All	All	0.64	0/3097	0.64	0/4166

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	1570	0	1554	33	0
1	B	1488	0	1444	36	0
2	B	4	0	6	3	0
3	B	6	0	2	1	0
4	A	162	0	0	5	0
4	B	132	0	0	5	0
All	All	3362	0	3006	67	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 11.

All (67) 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:260:PHE:HB3	1:B:315:GLN:NE2	1.24	1.44
1:B:260:PHE:CB	1:B:315:GLN:NE2	2.21	1.01
1:B:265:GLY:HA2	4:B:370:HOH:O	1.60	1.01
1:B:260:PHE:HB3	1:B:315:GLN:HE21	1.17	0.97
1:B:260:PHE:CE2	1:B:311:ARG:HD3	2.13	0.82
1:B:260:PHE:HB3	1:B:315:GLN:HE22	1.43	0.82
1:B:244[B]:GLN:HB3	1:B:279[B]:MSE:HE2	1.68	0.75
1:A:292:GLU:OE2	1:B:280:LYS:HE2	1.87	0.74
1:A:212:ARG:NH1	1:B:201:ASP:OD1	2.28	0.67
1:B:260:PHE:CB	1:B:315:GLN:HE21	1.98	0.65
1:B:190[B]:SER:O	1:B:194[B]:SER:OG	2.10	0.63
1:B:260:PHE:CD2	1:B:311:ARG:HD3	2.34	0.62
1:B:191:LEU:O	1:B:195:SER:HB3	1.98	0.62
1:B:260:PHE:CE2	1:B:311:ARG:CD	2.81	0.62
4:A:358:HOH:O	1:B:306:GLN:HG2	1.99	0.60
1:A:146:ASN:O	1:A:150:ILE:HG22	2.00	0.60
1:A:208[A]:LEU:HD23	1:A:208[A]:LEU:O	2.02	0.60
1:B:161:VAL:HG13	1:B:228:LEU:HD11	1.83	0.60
1:B:224:GLN:HG3	2:B:401:EDO:H21	1.85	0.58
1:B:279[A]:MSE:SE	1:B:301:LEU:HD12	2.54	0.58
1:B:260:PHE:HE1	4:B:370:HOH:O	1.85	0.57
1:B:265:GLY:CA	4:B:370:HOH:O	2.31	0.57
1:A:155:LYS:O	1:A:159:GLU:HG3	2.06	0.56
1:A:154[B]:GLN:HE22	1:A:213[B]:PHE:HE2	1.52	0.56
1:B:276[B]:MSE:HG2	1:B:301:LEU:HD13	1.87	0.55
1:A:239:ASN:HB2	1:A:293[A]:ASN:HD21	1.72	0.55
1:A:186:TYR:HB2	4:A:81:HOH:O	2.07	0.54
1:A:272:LEU:CD1	1:A:301:LEU:HD22	2.38	0.54
1:A:196:ILE:CG1	1:A:218[B]:MSE:HG2	2.39	0.52
1:A:147:ILE:HA	1:A:150:ILE:HG22	1.92	0.52
1:A:154[A]:GLN:HB2	1:A:217:HIS:CE1	2.45	0.52
1:B:156:LYS:O	1:B:160:GLU:HG3	2.10	0.52
1:A:196:ILE:HD11	1:A:218[B]:MSE:HG2	1.92	0.50
1:B:306:GLN:HG2	4:B:371:HOH:O	2.11	0.50
1:A:154[B]:GLN:NE2	1:A:213[B]:PHE:HE2	2.10	0.50
1:A:284[B]:LEU:O	1:A:284[B]:LEU:HD12	2.12	0.49
1:A:284[B]:LEU:HD12	1:A:284[B]:LEU:C	2.33	0.49
1:A:290:GLU:O	1:A:294[B]:ARG:HG2	2.13	0.49
1:A:196:ILE:HD11	1:A:218[B]:MSE:CG	2.43	0.49
1:B:158[A]:GLN:HG2	2:B:401:EDO:C1	2.43	0.48
1:A:279:MSE:HE2	1:A:298[B]:PHE:CE1	2.49	0.48

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:214:PHE:CE2	1:A:218[A]:MSE:CG	2.97	0.47
1:A:156:LYS:HE3	1:A:191:LEU:CD2	2.44	0.47
1:A:282:GLN:HG2	1:A:283:PRO:HD2	1.97	0.47
1:A:212:ARG:HD2	4:A:352:HOH:O	2.14	0.46
1:A:214:PHE:CE2	1:A:218[A]:MSE:HG3	2.50	0.46
1:A:176:LYS:HE3	1:A:176:LYS:HB2	1.56	0.45
1:A:272:LEU:HD11	1:A:301:LEU:HD22	1.99	0.44
1:A:154[B]:GLN:NE2	1:A:213[B]:PHE:CE2	2.73	0.43
1:A:316:MSE:HG3	4:A:341:HOH:O	2.17	0.43
1:B:244[A]:GLN:H	1:B:244[A]:GLN:CD	2.21	0.43
1:B:311:ARG:O	1:B:315:GLN:HG3	2.18	0.43
1:B:202:ASN:O	1:B:206:THR:HG22	2.18	0.43
1:B:157:LEU:HD22	1:B:192[B]:ILE:HG22	2.00	0.43
1:A:212:ARG:NH2	1:A:216:GLU:OE2	2.52	0.43
1:A:285:PRO:HG3	1:A:294[B]:ARG:HG3	2.01	0.42
1:B:246:HIS:HB3	3:B:402:FMT:H	2.01	0.42
1:B:272:LEU:CD1	1:B:301:LEU:HD22	2.49	0.42
1:A:208[A]:LEU:HD23	1:A:208[A]:LEU:C	2.40	0.42
1:B:287:ASP:CG	1:B:289:THR:HG22	2.40	0.42
1:A:156:LYS:HE3	1:A:191:LEU:HD22	2.02	0.41
4:A:318:HOH:O	1:B:280:LYS:HG3	2.20	0.41
1:B:158[A]:GLN:HA	2:B:401:EDO:H11	2.03	0.41
1:B:177:LYS:O	1:B:179[A]:ASN:ND2	2.54	0.41
1:A:206:THR:HG22	1:A:207:LEU:O	2.21	0.40
1:B:174:ASN:ND2	4:B:126:HOH:O	2.37	0.40
1:B:316[B]:MSE:O	1:B:316[B]:MSE:HG2	2.21	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	190/177 (107%)	187 (98%)	3 (2%)	0	100	100
1	B	182/177 (103%)	176 (97%)	6 (3%)	0	100	100
All	All	372/354 (105%)	363 (98%)	9 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	180/163 (110%)	175 (97%)	5 (3%)	38	29
1	B	169/163 (104%)	164 (97%)	5 (3%)	36	27
All	All	349/326 (107%)	339 (97%)	10 (3%)	41	28

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

Mol	Chain	Res	Type
1	A	154[A]	GLN
1	A	154[B]	GLN
1	A	176	LYS
1	A	178	GLU
1	A	179	ASN
1	B	153	VAL
1	B	195	SER
1	B	264	THR
1	B	279[A]	MSE
1	B	279[B]	MSE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	237	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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

3 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	EDO	B	401	-	3,3,3	0.41	0	2,2,2	0.65	0
3	FMT	B	402	-	2,2,2	0.64	0	1,1,1	0.05	0
3	FMT	B	403	-	2,2,2	0.75	0	1,1,1	0.21	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	EDO	B	401	-	-	0/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	401	EDO	3	0
3	B	402	FMT	1	0

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

Warning: The R factor obtained from EDS is 0.2554, which does not match the depositor's R factor of 0.19055. Please interpret the results in this section carefully.

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	168/177 (94%)	0.36	15 (8%) 17 21	3, 13, 32, 60	19 (11%)
1	B	164/177 (92%)	0.79	25 (15%) 6 8	3, 12, 28, 50	14 (8%)
All	All	332/354 (93%)	0.58	40 (12%) 10 12	3, 12, 31, 60	33 (9%)

All (40) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	213	PHE	4.0
1	B	317	LEU	3.7
1	A	148	HIS	3.3
1	B	151	HIS	3.2
1	A	208[A]	LEU	3.2
1	B	207	LEU	3.2
1	B	203	ILE	3.0
1	B	149	LYS	2.9
1	B	150	ILE	2.9
1	B	206	THR	2.8
1	B	165	LEU	2.8
1	A	284[A]	LEU	2.7
1	B	168	ILE	2.7
1	B	158[A]	GLN	2.7
1	A	179	ASN	2.6
1	B	173[A]	VAL	2.6
1	A	146	ASN	2.5
1	A	147	ILE	2.5
1	A	209	SER	2.5
1	B	169	ALA	2.5
1	A	206	THR	2.4
1	B	172	ILE	2.4

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	151[A]	HIS	2.4
1	B	195	SER	2.4
1	B	289	THR	2.4
1	A	172	ILE	2.3
1	B	285	PRO	2.3
1	A	241	THR	2.3
1	B	260	PHE	2.3
1	A	207	LEU	2.3
1	B	264	THR	2.3
1	A	317	LEU	2.2
1	B	179[A]	ASN	2.2
1	A	214	PHE	2.2
1	B	202	ASN	2.2
1	B	214	PHE	2.2
1	B	256	GLY	2.2
1	B	208	LEU	2.1
1	A	213[A]	PHE	2.0
1	B	196	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)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	FMT	B	403	3/3	0.69	0.15	62,62,62,62	0
2	EDO	B	401	4/4	0.84	0.11	42,42,45,49	0
3	FMT	B	402	3/3	0.90	0.11	34,34,35,35	0

6.5 Other polymers (i)

There are no such residues in this entry.