



Full wwPDB/EMDataBank EM Map/Model Validation Report ⓘ

Jan 30, 2017 – 09:33 PM EST

PDB ID : 5TQQ
EMDB ID: : EMD-8435
Title : Cryo-electron microscopy structure of a bovine CLC-K chloride channel, main (class 1) conformation
Authors : Park, E.; MacKinnon, R.
Deposited on : 2016-10-24
Resolution : 3.76 Å(reported)

This is a Full wwPDB/EMDataBank EM Map/Model Validation Report
for a publicly released PDB/EMDB entry.

We welcome your comments at validation@mail.wwpdb.org
A user guide is available at
<http://wwpdb.org/validation/2016/EMValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

MolProbity : 4.02b-467
Mogul : unknown
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : rb-20028442

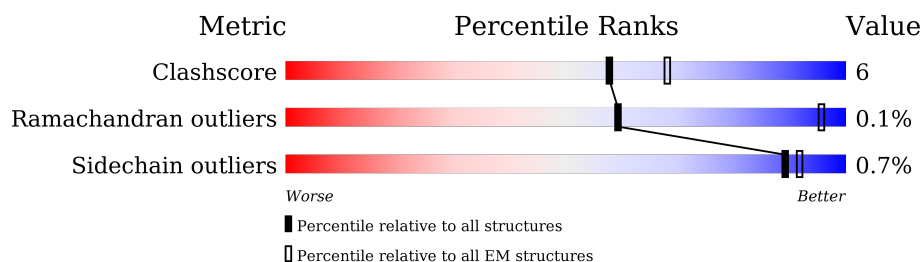
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.76 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)	EM structures (#Entries)
Clashscore	114402	924
Ramachandran outliers	111179	726
Sidechain outliers	111093	686

The table below summarises the geometric issues observed across the polymeric chains. The red, orange, yellow and green segments on the 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 $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	671	
1	B	671	
2	L	107	
2	M	107	
3	H	113	
3	I	113	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 12574 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Chloride channel protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	603	Total	C	N	O	S	0	0
			4594	3022	747	800	25		
1	B	603	Total	C	N	O	S	0	0
			4594	3022	747	800	25		

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	26	MET	-	initiating methionine	UNP E1B792
A	373	GLN	ASN	engineered mutation	UNP E1B792
A	688	SER	-	expression tag	UNP E1B792
A	689	ASN	-	expression tag	UNP E1B792
A	690	SER	-	expression tag	UNP E1B792
A	691	LEU	-	expression tag	UNP E1B792
A	692	GLU	-	expression tag	UNP E1B792
A	693	VAL	-	expression tag	UNP E1B792
A	694	LEU	-	expression tag	UNP E1B792
A	695	PHE	-	expression tag	UNP E1B792
A	696	GLN	-	expression tag	UNP E1B792
B	26	MET	-	initiating methionine	UNP E1B792
B	373	GLN	ASN	engineered mutation	UNP E1B792
B	688	SER	-	expression tag	UNP E1B792
B	689	ASN	-	expression tag	UNP E1B792
B	690	SER	-	expression tag	UNP E1B792
B	691	LEU	-	expression tag	UNP E1B792
B	692	GLU	-	expression tag	UNP E1B792
B	693	VAL	-	expression tag	UNP E1B792
B	694	LEU	-	expression tag	UNP E1B792
B	695	PHE	-	expression tag	UNP E1B792
B	696	GLN	-	expression tag	UNP E1B792

- Molecule 2 is a protein called Monoclonal antibody, Fab fragment, light chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	L	107	Total	C	N	O	S	0	0
			831	525	136	166	4		
2	M	107	Total	C	N	O	S	0	0
			831	525	136	166	4		

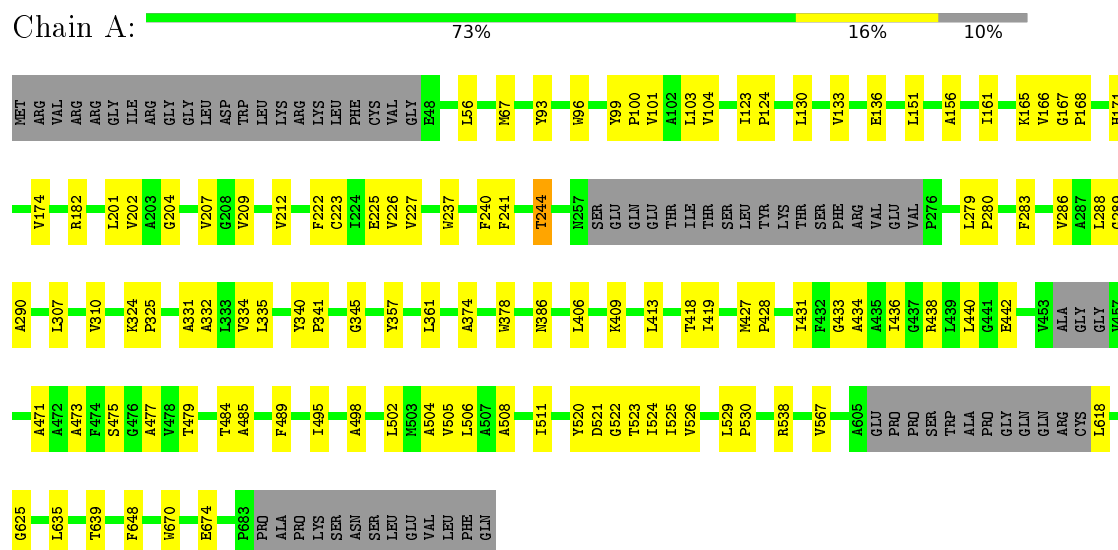
- Molecule 3 is a protein called Monoclonal antibody, Fab fragment, heavy chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	H	111	Total	C	N	O	S	0	0
			862	548	141	170	3		
3	I	111	Total	C	N	O	S	0	0
			862	548	141	170	3		

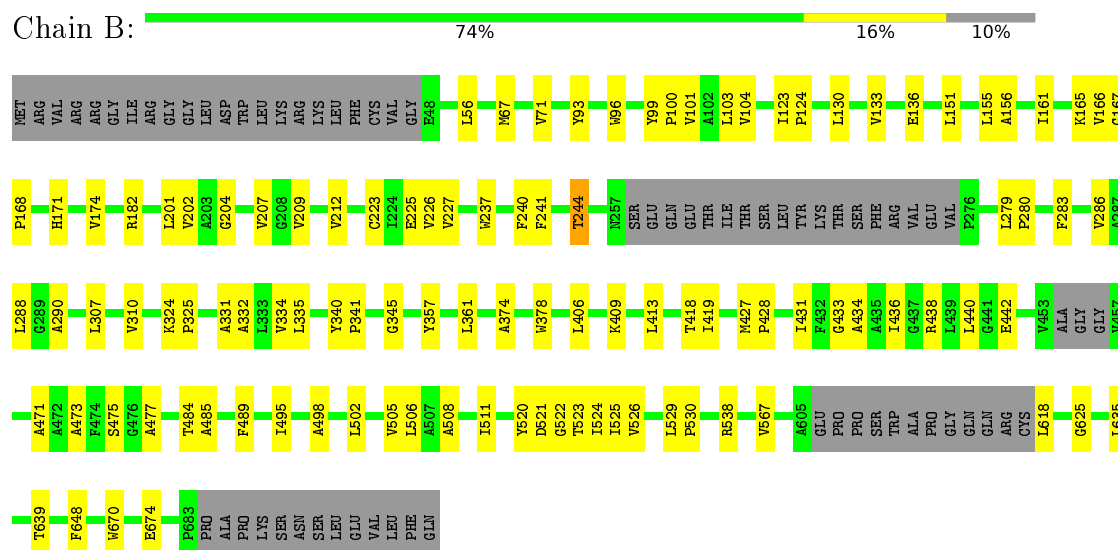
3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: Chloride channel protein



- Molecule 1: Chloride channel protein



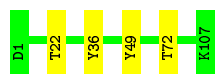
- Molecule 2: Monoclonal antibody, Fab fragment, light chain

Chain L:  97% .



- Molecule 2: Monoclonal antibody, Fab fragment, light chain

Chain M:  96% .



- Molecule 3: Monoclonal antibody, Fab fragment, heavy chain

Chain H:  94% . .



- Molecule 3: Monoclonal antibody, Fab fragment, heavy chain

Chain I:  96% . .



4 Experimental information

Property	Value	Source
Reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	Depositor
Number of particles used	82167	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	Not provided	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	Not provided	Depositor
Minimum defocus (nm)	Not provided	Depositor
Maximum defocus (nm)	Not provided	Depositor
Magnification	Not provided	Depositor
Image detector	Not provided	Depositor

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	$\# Z > 2$	RMSZ	$\# Z > 2$
1	A	0.46	0/4719	0.77	0/6437
1	B	0.46	0/4719	0.78	0/6437
2	L	0.36	0/851	0.55	0/1155
2	M	0.36	0/851	0.55	0/1155
3	H	0.36	0/883	0.56	0/1204
3	I	0.36	0/883	0.56	0/1204
All	All	0.44	0/12906	0.72	0/17592

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	4594	0	4622	79	0
1	B	4594	0	4622	79	0
2	L	831	0	797	2	0
2	M	831	0	797	2	0
3	H	862	0	826	5	0
3	I	862	0	826	4	0
All	All	12574	0	12490	154	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 6.

All (154) 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:130:LEU:HD21	1:B:202:VAL:HG22	1.52	0.90
1:A:130:LEU:HD21	1:A:202:VAL:HG22	1.52	0.89
1:B:104:VAL:HG11	1:B:332:ALA:HB2	1.72	0.70
1:A:104:VAL:HG11	1:A:332:ALA:HB2	1.73	0.70
1:B:521:ASP:O	1:B:524:ILE:HG22	1.93	0.69
1:A:521:ASP:O	1:A:524:ILE:HG22	1.93	0.68
1:A:130:LEU:HD22	1:A:227:VAL:HG12	1.74	0.68
1:B:130:LEU:HD22	1:B:227:VAL:HG12	1.74	0.68
1:B:485:ALA:HB2	1:B:505:VAL:HG21	1.78	0.66
1:A:485:ALA:HB2	1:A:505:VAL:HG21	1.78	0.65
1:B:471:ALA:O	1:B:475:SER:OG	2.14	0.63
1:A:171:HIS:O	1:A:174:VAL:HG12	2.00	0.62
1:B:283:PHE:O	1:B:286:VAL:HG12	2.00	0.62
1:B:209:VAL:HG11	1:B:223:CYS:HB2	1.81	0.62
1:A:209:VAL:HG11	1:A:223:CYS:HB2	1.81	0.62
1:B:171:HIS:O	1:B:174:VAL:HG12	2.00	0.62
1:A:283:PHE:O	1:A:286:VAL:HG12	2.00	0.62
1:B:427:MET:N	1:B:428:PRO:HD2	2.16	0.61
1:A:427:MET:N	1:A:428:PRO:HD2	2.16	0.61
1:B:130:LEU:HD22	1:B:227:VAL:CG1	2.31	0.60
1:A:506:LEU:CD1	1:B:244:THR:HG21	2.31	0.60
1:A:130:LEU:HD22	1:A:227:VAL:CG1	2.31	0.60
1:B:635:LEU:HD22	1:B:639:THR:HG21	1.83	0.60
1:A:244:THR:HG21	1:B:506:LEU:CD1	2.31	0.60
1:A:241:PHE:O	1:A:244:THR:HG22	2.02	0.60
1:B:241:PHE:O	1:B:244:THR:HG22	2.02	0.59
1:A:635:LEU:HD22	1:A:639:THR:HG21	1.83	0.58
1:B:56:LEU:HD21	1:B:204:GLY:HA2	1.88	0.56
1:A:56:LEU:HD21	1:A:204:GLY:HA2	1.88	0.55
1:B:204:GLY:O	1:B:207:VAL:HG12	2.07	0.54
1:A:204:GLY:O	1:A:207:VAL:HG12	2.07	0.54
1:B:96:TRP:O	1:B:100:PRO:CD	2.57	0.53
1:A:123:ILE:N	1:A:124:PRO:HD2	2.24	0.53
1:B:123:ILE:N	1:B:124:PRO:HD2	2.24	0.53
1:A:101:VAL:O	1:A:104:VAL:HG12	2.09	0.53
1:B:101:VAL:O	1:B:104:VAL:HG12	2.09	0.53
1:A:96:TRP:O	1:A:100:PRO:CD	2.57	0.53
2:M:36:TYR:OH	3:I:100:VAL:HG23	2.09	0.53
1:A:288:LEU:HB2	1:A:440:LEU:CD2	2.39	0.52
1:B:433:GLY:O	1:B:436:ILE:HG12	2.10	0.52

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:L:36:TYR:OH	3:H:100:VAL:HG23	2.09	0.52
1:B:288:LEU:HB2	1:B:440:LEU:CD2	2.39	0.52
1:A:374:ALA:HB2	3:H:100:VAL:CG1	2.40	0.52
1:A:433:GLY:O	1:A:436:ILE:HG12	2.09	0.52
1:A:524:ILE:HG13	1:A:529:LEU:HD12	1.92	0.51
1:B:475:SER:OG	1:B:484:THR:HG21	2.10	0.51
1:B:489:PHE:CZ	1:B:498:ALA:HA	2.46	0.51
1:A:67:MET:SD	1:A:151:LEU:HD22	2.51	0.51
1:B:374:ALA:HB2	3:I:100:VAL:CG1	2.40	0.51
1:B:96:TRP:O	1:B:100:PRO:HD2	2.11	0.51
1:B:524:ILE:HG13	1:B:529:LEU:HD12	1.91	0.51
1:A:96:TRP:O	1:A:100:PRO:HD2	2.11	0.51
1:A:489:PHE:CZ	1:A:498:ALA:HA	2.45	0.51
1:A:361:LEU:O	1:A:438:ARG:NE	2.41	0.51
1:B:226:VAL:HG13	1:B:227:VAL:HG23	1.92	0.50
1:A:434:ALA:HB2	1:A:471:ALA:HB2	1.94	0.50
1:A:475:SER:OG	1:A:484:THR:HG21	2.10	0.50
1:B:434:ALA:HB2	1:B:471:ALA:HB2	1.93	0.50
1:A:226:VAL:HG13	1:A:227:VAL:HG23	1.92	0.50
1:B:67:MET:SD	1:B:151:LEU:HD22	2.51	0.49
1:A:161:ILE:HD11	1:A:419:ILE:HD11	1.95	0.49
1:A:471:ALA:O	1:A:475:SER:OG	2.14	0.49
1:A:279:LEU:N	1:A:280:PRO:CD	2.76	0.49
1:B:161:ILE:HD11	1:B:419:ILE:HD11	1.95	0.49
1:B:428:PRO:O	1:B:431:ILE:HG22	2.13	0.49
1:A:428:PRO:O	1:A:431:ILE:HG22	2.13	0.48
1:B:279:LEU:N	1:B:280:PRO:CD	2.76	0.48
1:A:290:ALA:O	1:A:511:ILE:HD11	2.14	0.47
1:A:324:LYS:N	1:A:325:PRO:CD	2.77	0.47
1:B:290:ALA:O	1:B:511:ILE:HD11	2.14	0.47
1:A:477:ALA:HB2	1:A:508:ALA:HB1	1.96	0.47
1:B:167:GLY:N	1:B:168:PRO:CD	2.78	0.47
1:B:307:LEU:HG	1:B:526:VAL:HG11	1.97	0.47
1:B:374:ALA:HB2	3:I:100:VAL:HG12	1.97	0.47
1:A:307:LEU:HG	1:A:526:VAL:HG11	1.97	0.47
1:B:223:CYS:O	1:B:227:VAL:HB	2.15	0.47
3:H:52:ILE:HD11	3:H:70:ILE:HG22	1.96	0.47
1:B:324:LYS:N	1:B:325:PRO:CD	2.77	0.47
1:A:167:GLY:N	1:A:168:PRO:CD	2.77	0.46
1:B:477:ALA:HB2	1:B:508:ALA:HB1	1.96	0.46
1:A:223:CYS:O	1:A:227:VAL:HB	2.15	0.46

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:I:52:ILE:HD11	3:I:70:ILE:HG22	1.96	0.46
1:B:331:ALA:O	1:B:334:VAL:HG12	2.16	0.46
1:A:331:ALA:O	1:A:334:VAL:HG12	2.16	0.45
1:B:310:VAL:HG21	1:B:418:THR:HG21	1.98	0.45
1:B:648:PHE:HB3	1:B:670:TRP:CZ2	2.51	0.45
1:A:648:PHE:HB3	1:A:670:TRP:CZ2	2.51	0.45
1:A:310:VAL:HG21	1:A:418:THR:HG21	1.98	0.45
1:A:567:VAL:HG21	1:A:618:LEU:HG	1.99	0.45
1:A:502:LEU:HD22	1:B:244:THR:OG1	2.15	0.45
1:A:409:LYS:O	1:A:413:LEU:N	2.48	0.45
1:B:567:VAL:HG21	1:B:618:LEU:HG	1.99	0.45
1:A:244:THR:OG1	1:B:502:LEU:HD22	2.15	0.45
1:A:428:PRO:HA	1:A:431:ILE:HG22	1.98	0.45
1:A:520:TYR:O	1:A:523:THR:HG22	2.16	0.45
1:B:428:PRO:HA	1:B:431:ILE:HG22	1.98	0.45
1:B:133:VAL:HG13	1:B:674:GLU:HG2	1.99	0.45
1:B:93:TYR:HA	1:B:340:TYR:CE1	2.52	0.45
1:B:409:LYS:O	1:B:413:LEU:N	2.48	0.45
1:A:374:ALA:HB2	3:H:100:VAL:HG12	1.97	0.45
1:A:93:TYR:HA	1:A:340:TYR:CE1	2.52	0.44
1:B:520:TYR:O	1:B:523:THR:HG22	2.16	0.44
1:A:133:VAL:HG11	1:A:530:PRO:CG	2.48	0.44
1:A:133:VAL:HG13	1:A:674:GLU:HG2	1.99	0.44
1:B:361:LEU:O	1:B:438:ARG:NE	2.41	0.44
1:B:174:VAL:HG22	1:B:201:LEU:HD22	1.99	0.44
1:A:406:LEU:HD21	1:A:436:ILE:HG22	2.00	0.43
1:A:244:THR:HG21	1:B:506:LEU:HD12	2.00	0.43
1:A:506:LEU:HD12	1:B:244:THR:HG21	2.00	0.43
1:A:427:MET:N	1:A:428:PRO:CD	2.81	0.43
1:B:99:TYR:HB3	1:B:100:PRO:HD3	2.00	0.43
1:A:174:VAL:HG22	1:A:201:LEU:HD22	1.99	0.43
1:A:136:GLU:OE1	1:A:182:ARG:NH2	2.51	0.43
1:A:341:PRO:HA	1:A:345:GLY:HA3	2.00	0.43
1:B:136:GLU:OE1	1:B:182:ARG:NH2	2.51	0.43
1:B:406:LEU:HD21	1:B:436:ILE:HG22	2.00	0.43
1:B:525:ILE:HD12	1:B:538:ARG:HB2	2.01	0.43
1:A:240:PHE:CE2	1:B:502:LEU:HD21	2.54	0.42
1:A:473:ALA:HA	1:A:505:VAL:HG22	2.00	0.42
1:A:525:ILE:HD12	1:A:538:ARG:HB2	2.01	0.42
1:B:473:ALA:HA	1:B:505:VAL:HG22	2.00	0.42
1:B:495:ILE:HG22	1:B:495:ILE:O	2.19	0.42

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:130:LEU:CD2	1:A:227:VAL:HG12	2.46	0.42
1:B:133:VAL:HG11	1:B:530:PRO:CG	2.48	0.42
1:B:427:MET:N	1:B:428:PRO:CD	2.81	0.42
1:B:341:PRO:HA	1:B:345:GLY:HA3	2.00	0.42
1:A:103:LEU:HD23	1:A:156:ALA:HB3	2.02	0.42
1:A:502:LEU:HD21	1:B:240:PHE:CE2	2.54	0.42
1:A:386:ASN:ND2	2:L:31:THR:OG1	2.51	0.42
1:A:522:GLY:HA2	1:A:525:ILE:HG22	2.01	0.41
1:B:103:LEU:HD23	1:B:156:ALA:HB3	2.02	0.41
1:A:495:ILE:O	1:A:495:ILE:HG22	2.19	0.41
1:A:99:TYR:HB3	1:A:100:PRO:HD3	2.00	0.41
1:A:166:VAL:HG23	1:A:212:VAL:HG11	2.02	0.41
1:B:71:VAL:HG21	1:B:155:LEU:HB3	2.02	0.41
3:H:39:ARG:NH2	3:H:49:MET:SD	2.92	0.41
1:B:130:LEU:CD2	1:B:227:VAL:HG12	2.46	0.41
1:B:307:LEU:CG	1:B:526:VAL:HG11	2.50	0.41
1:B:166:VAL:HG23	1:B:212:VAL:HG11	2.02	0.41
1:B:409:LYS:HA	1:B:409:LYS:HD3	1.98	0.41
1:B:151:LEU:HD21	1:B:165:LYS:HB2	2.02	0.41
1:B:155:LEU:HD21	1:B:165:LYS:HD3	2.03	0.41
1:B:288:LEU:HB2	1:B:440:LEU:HD23	2.03	0.41
2:M:22:THR:HG22	2:M:72:THR:HG22	2.03	0.41
1:A:225:GLU:OE1	1:B:237:TRP:NE1	2.53	0.41
1:A:288:LEU:HB2	1:A:440:LEU:HD23	2.03	0.41
1:B:331:ALA:O	1:B:335:LEU:HD23	2.21	0.41
1:A:222:PHE:CE2	1:A:479:THR:HG21	2.56	0.41
1:A:237:TRP:NE1	1:B:225:GLU:OE1	2.54	0.41
1:A:151:LEU:HD21	1:A:165:LYS:HB2	2.02	0.40
1:A:289:GLY:HA3	1:A:504:ALA:HB1	2.04	0.40
1:A:307:LEU:CG	1:A:526:VAL:HG11	2.50	0.40
1:B:522:GLY:HA2	1:B:525:ILE:HG22	2.01	0.40
1:A:331:ALA:O	1:A:335:LEU:HD23	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 PDB entries followed by that with respect to all EM

entries.

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	595/671 (89%)	569 (96%)	25 (4%)	1 (0%)	52	87
1	B	595/671 (89%)	569 (96%)	25 (4%)	1 (0%)	52	87
2	L	105/107 (98%)	97 (92%)	8 (8%)	0	100	100
2	M	105/107 (98%)	97 (92%)	8 (8%)	0	100	100
3	H	109/113 (96%)	104 (95%)	5 (5%)	0	100	100
3	I	109/113 (96%)	104 (95%)	5 (5%)	0	100	100
All	All	1618/1782 (91%)	1540 (95%)	76 (5%)	2 (0%)	59	90

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	625	GLY
1	B	625	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 PDB entries followed by that with respect to all EM entries.

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	483/554 (87%)	479 (99%)	4 (1%)	86	95
1	B	483/554 (87%)	479 (99%)	4 (1%)	86	95
2	L	93/93 (100%)	92 (99%)	1 (1%)	80	92
2	M	93/93 (100%)	92 (99%)	1 (1%)	80	92
3	H	96/102 (94%)	96 (100%)	0	100	100
3	I	96/102 (94%)	96 (100%)	0	100	100
All	All	1344/1498 (90%)	1334 (99%)	10 (1%)	89	95

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

Mol	Chain	Res	Type
1	A	244	THR
1	A	357	TYR
1	A	378	TRP
1	A	442	GLU
2	L	49	TYR
1	B	244	THR
1	B	357	TYR
1	B	378	TRP
1	B	442	GLU
2	M	49	TYR

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	78	HIS
1	A	386	ASN
2	L	89	GLN
1	B	78	HIS
1	B	386	ASN
2	M	89	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

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.