



## Full wwPDB EM Validation Report ⓘ

Dec 19, 2022 – 09:59 am GMT

PDB ID : 7NYV  
EMDB ID : EMD-12655  
Title : Respiratory complex I from Escherichia coli - conformation 3  
Authors : Kolata, P.; Efremov, R.G.  
Deposited on : 2021-03-23  
Resolution : 3.70 Å(reported)  
Based on initial models : 4HEA, 3RKO

This is a Full wwPDB EM Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

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>.

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

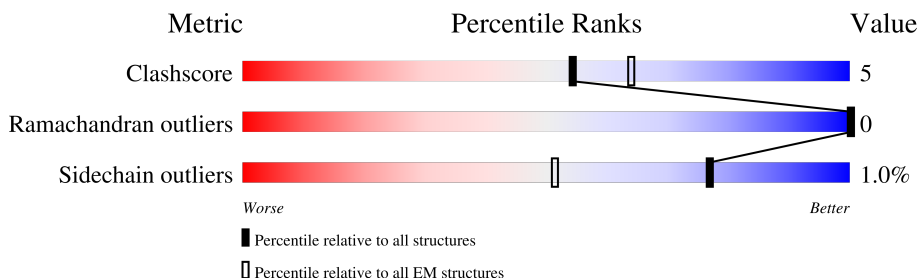
EMDB validation analysis : 0.0.1.dev43  
Mogul : 1.8.4, CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.9  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.31.3

# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:  
*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.70 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.



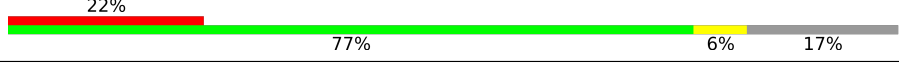
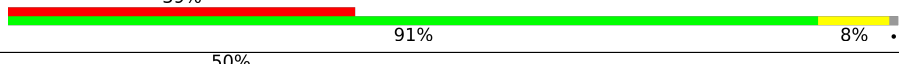

Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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 EM map (all-atom inclusion  $< 40\%$ ). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	B	220	
2	D	596	
3	E	166	
4	F	445	
5	G	908	
6	I	180	
7	K	100	
8	J	184	

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Mol	Chain	Length	Quality of chain
9	A	147	
10	H	325	
11	M	509	
12	L	613	
13	N	485	

## 2 Entry composition [i](#)

There are 17 unique types of molecules in this entry. The entry contains 35228 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 NADH-quinone oxidoreductase subunit B.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	B	159	Total	C	N	O	S	0	0
			1222	769	218	222	13		

- Molecule 2 is a protein called NADH-quinone oxidoreductase subunit C/D.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	D	588	Total	C	N	O	S	0	0
			4725	3027	825	852	21		

- Molecule 3 is a protein called NADH-quinone oxidoreductase subunit E.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	E	156	Total	C	N	O	S	0	0
			1220	768	215	229	8		

- Molecule 4 is a protein called NADH-quinone oxidoreductase subunit F.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	F	441	Total	C	N	O	S	0	0
			3424	2171	599	633	21		

- Molecule 5 is a protein called NADH-quinone oxidoreductase subunit G.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	G	907	Total	C	N	O	S	0	0
			7044	4402	1272	1332	38		

- Molecule 6 is a protein called NADH-quinone oxidoreductase subunit I.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	I	158	Total	C	N	O	S	0	0
			1220	771	205	232	12		

- Molecule 7 is a protein called NADH-quinone oxidoreductase subunit K.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	K	100	760	494	132	129	5	0	0

- Molecule 8 is a protein called NADH-quinone oxidoreductase subunit J.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
8	J	164	1242	833	193	209	7	0	0

- Molecule 9 is a protein called NADH-quinone oxidoreductase subunit A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	A	92	668	448	108	111	1	0	0

- Molecule 10 is a protein called NADH-quinone oxidoreductase subunit H.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
10	H	270	1985	1317	317	337	14	0	0

- Molecule 11 is a protein called NADH-quinone oxidoreductase subunit M.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
11	M	504	3953	2661	617	646	29	0	0

- Molecule 12 is a protein called NADH-quinone oxidoreductase subunit L.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
12	L	612	4126	2671	698	733	24	0	0

- Molecule 13 is a protein called NADH-quinone oxidoreductase subunit N.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
13	N	467	3543	2370	559	596	18	0	0

- Molecule 14 is IRON/SULFUR CLUSTER (three-letter code: SF4) (formula: Fe<sub>4</sub>S<sub>4</sub>).



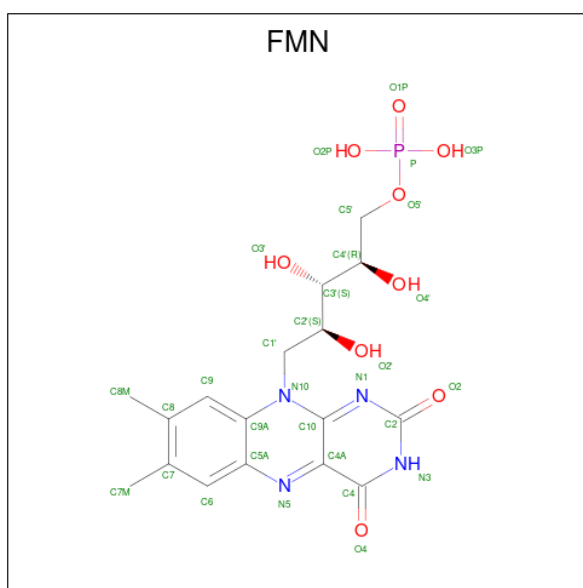
Mol	Chain	Residues	Atoms			AltConf
			Total	Fe	S	
14	B	1	8	4	4	0
14	F	1	8	4	4	0
14	G	1	24	12	12	0
14	G	1	24	12	12	0
14	G	1	24	12	12	0
14	I	1	16	8	8	0
14	I	1	16	8	8	0

- Molecule 15 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe<sub>2</sub>S<sub>2</sub>).



Mol	Chain	Residues	Atoms			AltConf
15	E	1	Total	Fe	S	0
			4	2	2	
15	G	1	Total	Fe	S	0
			4	2	2	

- Molecule 16 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: C<sub>17</sub>H<sub>21</sub>N<sub>4</sub>O<sub>9</sub>P).



Mol	Chain	Residues	Atoms				AltConf	
16	F	1	Total	C	N	O	P	0
			31	17	4	9	1	

- Molecule 17 is CALCIUM ION (three-letter code: CA) (formula: Ca).

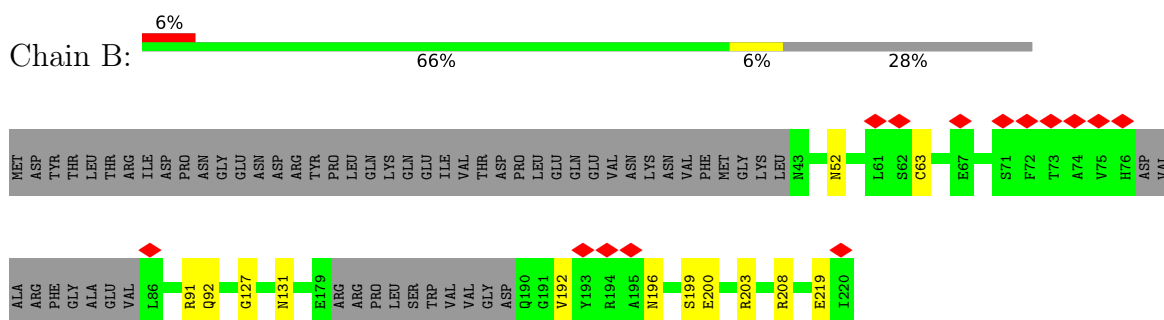
<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>AltConf</b>
17	G	1	Total 1	Ca 1	0



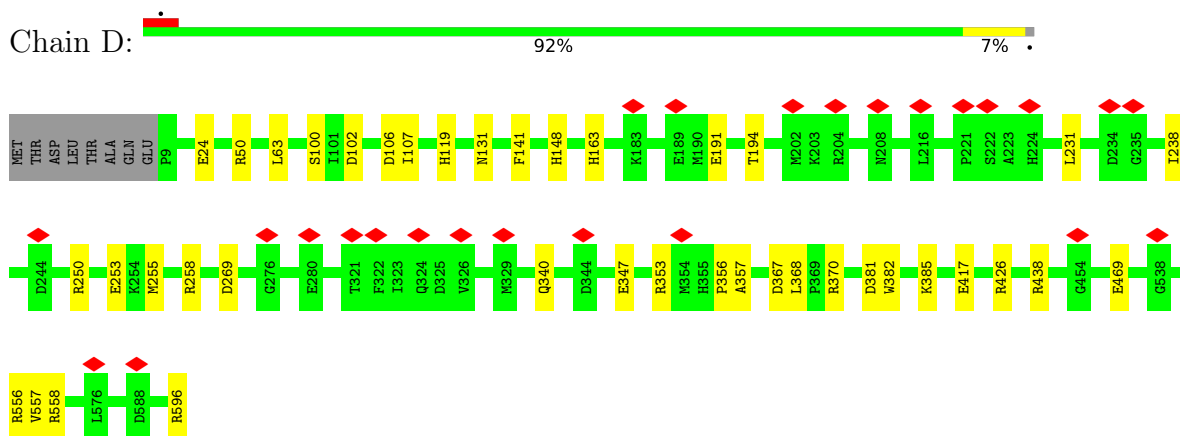
### 3 Residue-property plots [i](#)

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 and atom inclusion in map 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 diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). 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.

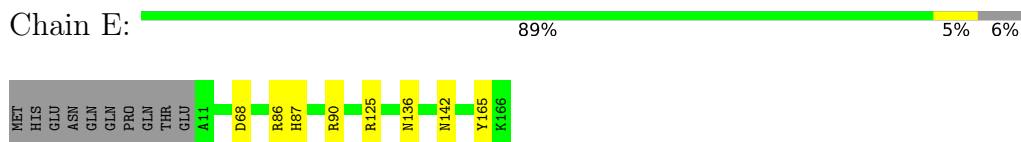
- Molecule 1: NADH-quinone oxidoreductase subunit B



- Molecule 2: NADH-quinone oxidoreductase subunit C/D

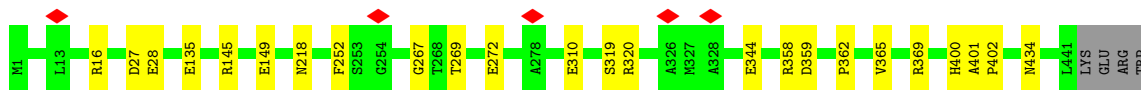


- Molecule 3: NADH-quinone oxidoreductase subunit E

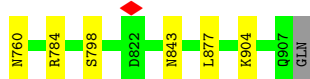
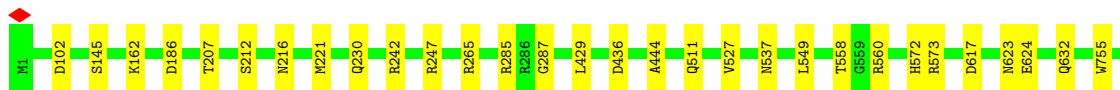


- Molecule 4: NADH-quinone oxidoreductase subunit F

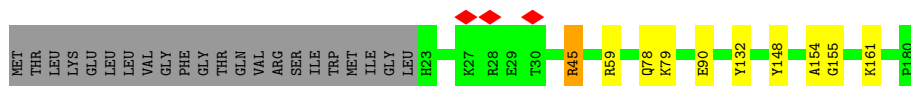
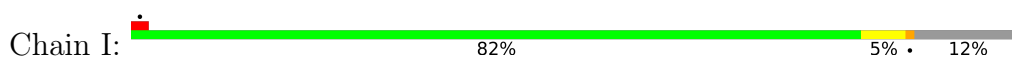




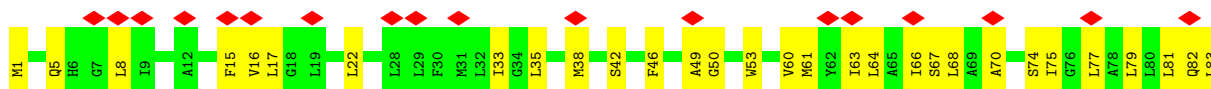
• Molecule 5: NADH-quinone oxidoreductase subunit G



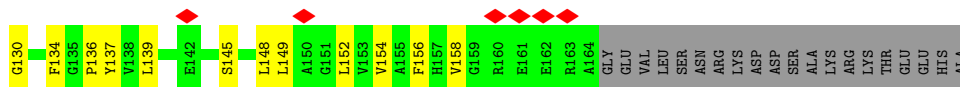
• Molecule 6: NADH-quinone oxidoreductase subunit I



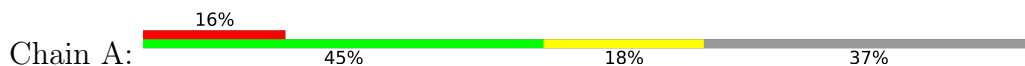
• Molecule 7: NADH-quinone oxidoreductase subunit K

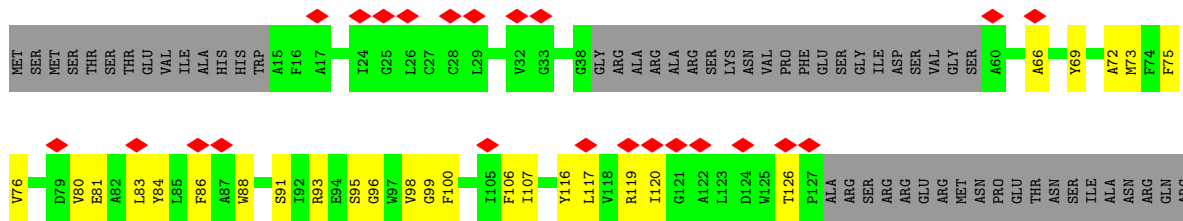


• Molecule 8: NADH-quinone oxidoreductase subunit J

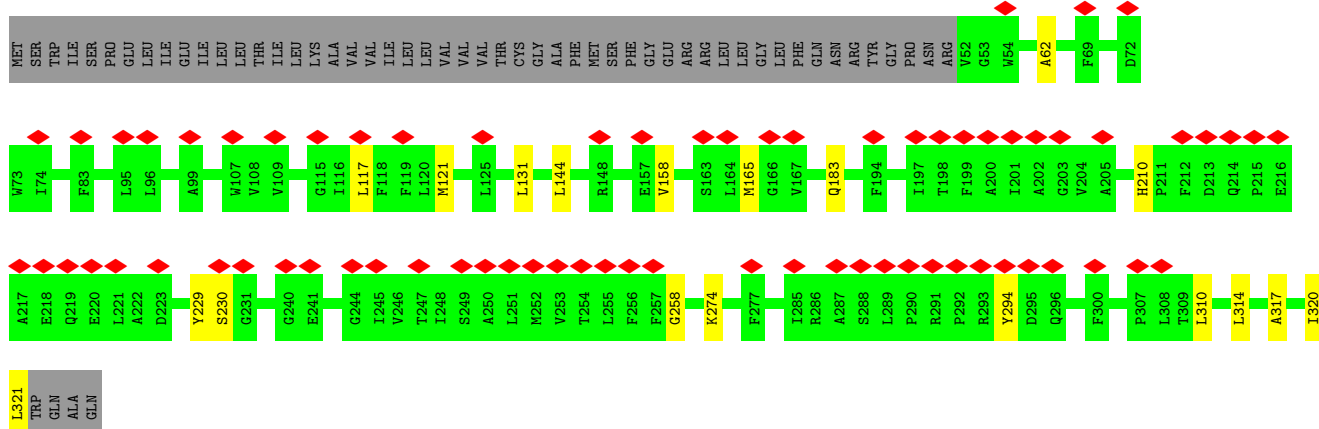
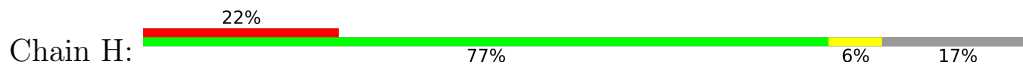


• Molecule 9: NADH-quinone oxidoreductase subunit A

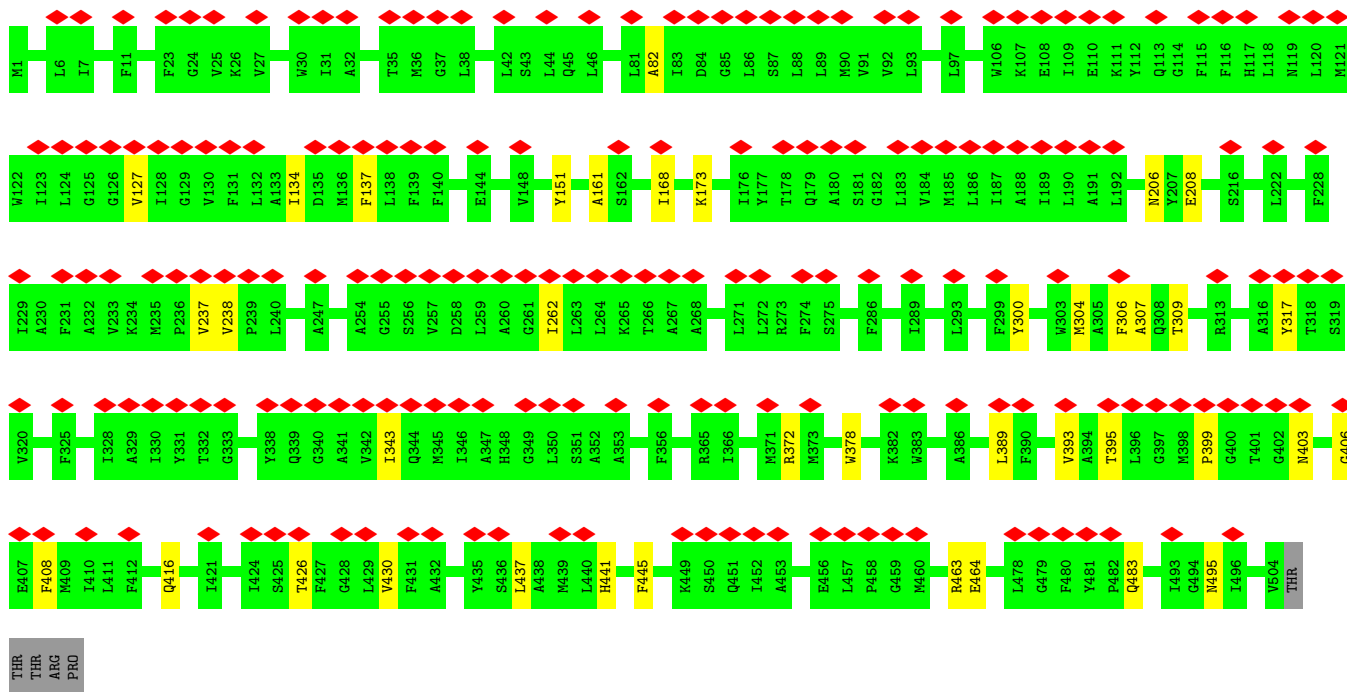
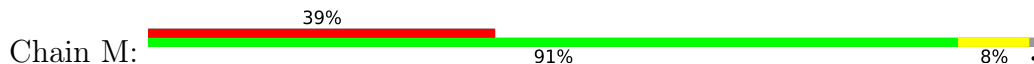




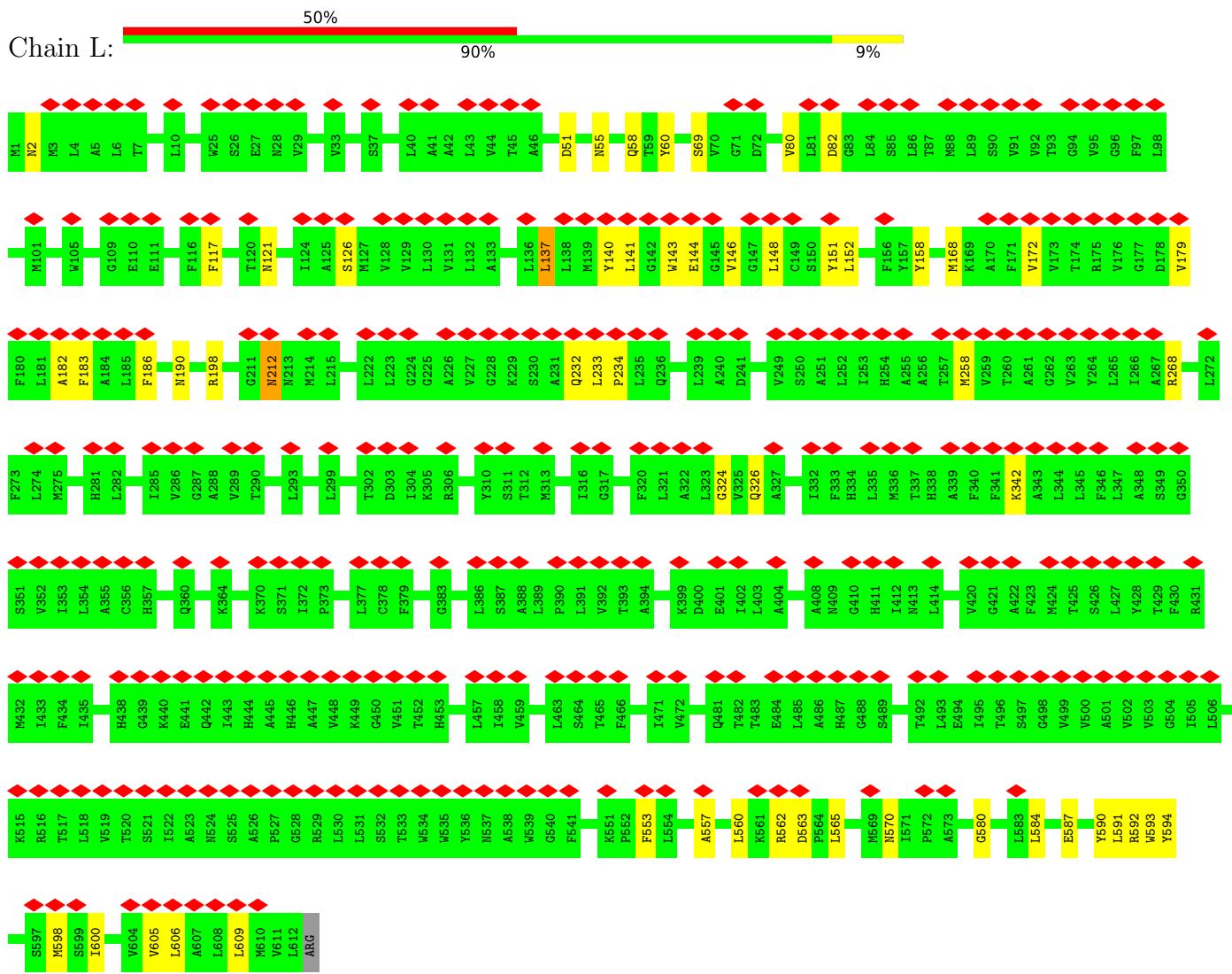
• Molecule 10: NADH-quinone oxidoreductase subunit H



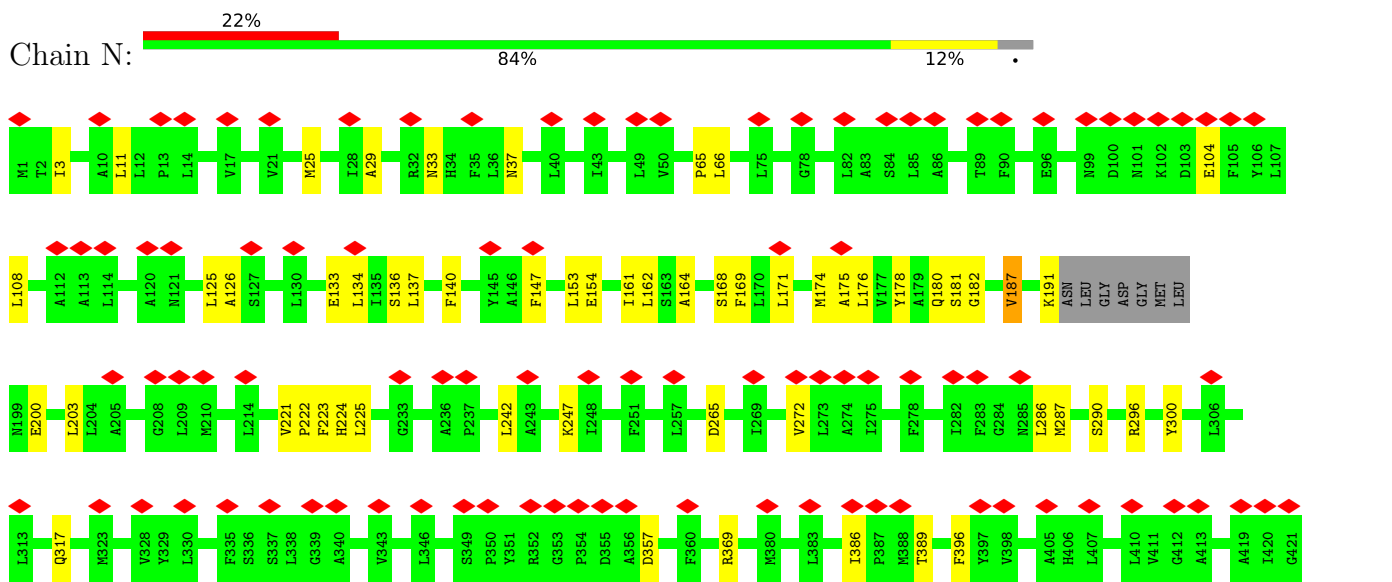
• Molecule 11: NADH-quinone oxidoreductase subunit M

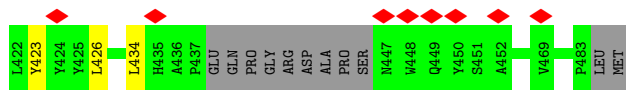


• Molecule 12: NADH-quinone oxidoreductase subunit L



• Molecule 13: NADH-quinone oxidoreductase subunit N





## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	21234	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	JEOL CRYO ARM 300	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	64.7	Depositor
Minimum defocus (nm)	900	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	60000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	167.778	Depositor
Minimum map value	-57.903	Depositor
Average map value	0.001	Depositor
Map value standard deviation	1.000	Depositor
Recommended contour level	1.6	Depositor
Map size ( $\text{\AA}$ )	385.5, 385.5, 385.5	wwPDB
Map dimensions	250, 250, 250	wwPDB
Map angles ( $^\circ$ )	90.0, 90.0, 90.0	wwPDB
Pixel spacing ( $\text{\AA}$ )	1.542, 1.542, 1.542	Depositor

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: SF4, CA, CSX, FMN, FES

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	B	0.29	0/1238	0.63	0/1674
2	D	0.28	0/4856	0.60	0/6593
3	E	0.28	0/1240	0.58	0/1680
4	F	0.28	0/3495	0.62	0/4723
5	G	0.27	0/7195	0.60	0/9755
6	I	0.28	0/1248	0.59	0/1691
7	K	0.28	0/769	0.64	0/1040
8	J	0.28	0/1268	0.55	0/1729
9	A	0.27	0/684	0.57	0/932
10	H	0.28	0/2037	0.56	0/2780
11	M	0.35	0/4074	0.61	0/5546
12	L	0.33	0/4205	0.58	0/5754
13	N	0.37	0/3630	0.61	0/4954
All	All	0.30	0/35939	0.60	0/48851

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	B	1222	0	1182	14	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	D	4725	0	4619	18	0
3	E	1220	0	1186	4	0
4	F	3424	0	3391	13	0
5	G	7044	0	6849	17	0
6	I	1220	0	1155	7	0
7	K	760	0	817	112	0
8	J	1242	0	1315	85	0
9	A	668	0	623	52	0
10	H	1985	0	1921	23	0
11	M	3953	0	4053	87	0
12	L	4126	0	3691	113	0
13	N	3543	0	3709	115	0
14	B	8	0	0	0	0
14	F	8	0	0	1	0
14	G	24	0	0	0	0
14	I	16	0	0	0	0
15	E	4	0	0	0	0
15	G	4	0	0	0	0
16	F	31	0	19	2	0
17	G	1	0	0	0	0
All	All	35228	0	34530	373	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 5.

All (373) 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)
11:M:441:HIS:CD2	12:L:168:MET:HE1	1.60	1.36
7:K:79:LEU:CD2	8:J:158:VAL:HG21	1.72	1.18
11:M:306:PHE:CG	12:L:553:PHE:CZ	2.32	1.17
8:J:149:LEU:HD11	13:N:25:MET:HE1	1.24	1.13
7:K:35:LEU:HD11	13:N:164:ALA:HB1	1.30	1.08
7:K:53:TRP:CE2	13:N:182:GLY:HA2	1.88	1.08
12:L:598:MET:HE1	13:N:223:PHE:HB3	1.35	1.07
11:M:151:TYR:CE2	13:N:426:LEU:HD13	1.90	1.07
11:M:441:HIS:CD2	12:L:168:MET:CE	2.38	1.05
7:K:79:LEU:HD23	8:J:158:VAL:HG21	1.35	1.04
7:K:53:TRP:CZ2	13:N:181:SER:C	2.31	1.04
7:K:75:ILE:HD12	8:J:154:VAL:CG2	1.89	1.02
7:K:79:LEU:HD23	8:J:158:VAL:CG2	1.90	1.02

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
11:M:307:ALA:HB2	12:L:557:ALA:HA	1.39	1.01
7:K:1:MET:HE3	8:J:118:GLY:HA3	1.43	1.00
11:M:304:MET:SD	12:L:560:LEU:HD12	2.01	1.00
12:L:584:LEU:HD22	13:N:290:SER:OG	1.62	0.99
7:K:50:GLY:HA2	13:N:178:TYR:HE2	1.26	0.98
7:K:70:ALA:CB	9:A:80:VAL:HG21	1.94	0.96
11:M:441:HIS:HD2	12:L:168:MET:HE1	1.27	0.96
11:M:389:LEU:HD21	12:L:152:LEU:HD21	1.49	0.93
11:M:307:ALA:HB1	12:L:557:ALA:O	1.68	0.93
8:J:149:LEU:CD1	13:N:25:MET:HE1	1.99	0.93
11:M:300:TYR:HE2	12:L:565:LEU:HD12	1.35	0.92
7:K:53:TRP:CD2	13:N:182:GLY:HA2	2.05	0.92
8:J:149:LEU:HD11	13:N:25:MET:CE	1.99	0.91
11:M:306:PHE:CZ	12:L:553:PHE:CE2	2.58	0.91
11:M:306:PHE:CD2	12:L:553:PHE:CZ	2.58	0.91
7:K:79:LEU:HD21	8:J:158:VAL:HG21	1.49	0.91
11:M:300:TYR:CE2	12:L:565:LEU:HD12	2.06	0.91
11:M:306:PHE:CG	12:L:553:PHE:HZ	1.84	0.91
11:M:306:PHE:CE2	12:L:553:PHE:CE2	2.60	0.89
7:K:67:SER:HA	9:A:80:VAL:HG11	1.52	0.87
7:K:5:GLN:HG3	8:J:111:ILE:HG13	1.57	0.87
7:K:50:GLY:HA2	13:N:178:TYR:CE2	2.09	0.87
7:K:70:ALA:HB2	9:A:80:VAL:HG21	1.56	0.86
7:K:22:LEU:HD11	13:N:161:ILE:HG23	1.56	0.86
8:J:106:VAL:CG1	12:L:606:LEU:HD13	2.06	0.86
7:K:84:HIS:CD2	8:J:74:LEU:HD22	2.10	0.85
7:K:77:LEU:HD23	8:J:66:LEU:HG	1.58	0.85
7:K:53:TRP:CZ2	13:N:182:GLY:HA2	2.11	0.84
11:M:168:ILE:HD11	13:N:423:TYR:OH	1.76	0.84
7:K:99:ARG:CZ	12:L:590:TYR:OH	2.26	0.84
11:M:307:ALA:HB2	12:L:557:ALA:CA	2.07	0.84
7:K:75:ILE:HD12	8:J:154:VAL:HG21	1.58	0.83
11:M:306:PHE:CE1	12:L:553:PHE:HE2	1.96	0.83
11:M:306:PHE:CD1	12:L:553:PHE:CZ	2.66	0.83
11:M:173:LYS:CE	12:L:570:ASN:OD1	2.26	0.82
7:K:53:TRP:CZ2	13:N:182:GLY:N	2.47	0.82
9:A:116:TYR:HA	13:N:29:ALA:HB2	1.61	0.82
8:J:136:PRO:HB3	13:N:65:PRO:HD2	1.62	0.82
7:K:53:TRP:CZ2	13:N:181:SER:O	2.34	0.80
7:K:77:LEU:HD22	8:J:66:LEU:HD23	1.64	0.80
11:M:306:PHE:CZ	12:L:553:PHE:HE2	1.97	0.80

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
12:L:598:MET:CE	13:N:223:PHE:HB3	2.12	0.80
7:K:35:LEU:HD11	13:N:164:ALA:CB	2.09	0.79
7:K:66:ILE:HD11	9:A:83:LEU:CD2	2.12	0.79
7:K:50:GLY:CA	13:N:178:TYR:HE2	1.97	0.78
11:M:306:PHE:CE1	12:L:553:PHE:CE2	2.71	0.78
7:K:1:MET:CE	8:J:118:GLY:HA3	2.13	0.78
12:L:587:GLU:OE2	13:N:287:MET:HE1	1.83	0.78
7:K:84:HIS:HD2	8:J:74:LEU:HD22	1.46	0.78
11:M:408:PHE:CE1	12:L:186:PHE:CE1	2.72	0.77
11:M:408:PHE:CZ	12:L:186:PHE:HE1	2.02	0.77
7:K:81:LEU:HD21	9:A:69:TYR:HE1	1.47	0.77
8:J:106:VAL:HG12	12:L:606:LEU:HD13	1.67	0.76
7:K:53:TRP:CZ2	13:N:182:GLY:CA	2.68	0.76
9:A:98:VAL:HG21	13:N:3:ILE:HD12	1.68	0.76
7:K:61:MET:SD	13:N:126:ALA:HB1	2.27	0.75
11:M:408:PHE:CZ	12:L:186:PHE:CE1	2.75	0.75
12:L:594:TYR:CE2	13:N:225:LEU:HB3	2.22	0.75
11:M:378:TRP:HB3	12:L:158:TYR:CE2	2.21	0.74
12:L:594:TYR:CE1	13:N:225:LEU:HD12	2.22	0.74
11:M:399:PRO:HD3	12:L:144:GLU:CG	2.16	0.74
7:K:84:HIS:CD2	8:J:74:LEU:CD2	2.71	0.73
11:M:378:TRP:HB3	12:L:158:TYR:CD2	2.23	0.73
11:M:306:PHE:CD2	12:L:553:PHE:CE2	2.74	0.73
11:M:399:PRO:CD	12:L:144:GLU:CG	2.66	0.73
5:G:624:GLU:OE2	5:G:784:ARG:NH2	2.21	0.73
7:K:22:LEU:HD11	13:N:161:ILE:CG2	2.19	0.73
7:K:64:LEU:CD2	9:A:84:TYR:HE1	2.02	0.72
8:J:134:PHE:HE1	9:A:99:GLY:HA2	1.54	0.72
13:N:265:ASP:OD1	13:N:317:GLN:NE2	2.22	0.72
11:M:395:THR:O	11:M:403:ASN:ND2	2.23	0.72
2:D:131:ASN:OD1	2:D:148:HIS:NE2	2.24	0.71
7:K:53:TRP:CH2	13:N:182:GLY:CA	2.74	0.70
7:K:53:TRP:CH2	13:N:182:GLY:N	2.60	0.70
7:K:35:LEU:CD1	13:N:164:ALA:HB1	2.15	0.70
13:N:136:SER:O	13:N:140:PHE:N	2.25	0.70
12:L:594:TYR:CZ	13:N:225:LEU:HB3	2.26	0.70
11:M:399:PRO:HD3	12:L:144:GLU:HG3	1.72	0.70
5:G:242:ARG:O	5:G:247:ARG:NH1	2.24	0.69
11:M:389:LEU:HD21	12:L:152:LEU:CD2	2.23	0.69
11:M:306:PHE:CD1	12:L:553:PHE:HZ	2.05	0.69
2:D:356:PRO:O	6:I:45:ARG:NH2	2.25	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:K:38:MET:HE2	13:N:168:SER:HB3	1.73	0.69
7:K:77:LEU:CD2	8:J:66:LEU:HG	2.21	0.69
8:J:106:VAL:HG11	12:L:606:LEU:CD1	2.22	0.69
11:M:408:PHE:CE1	12:L:186:PHE:HE1	2.11	0.69
4:F:145:ARG:NH1	4:F:149:GLU:OE2	2.26	0.68
7:K:64:LEU:HD23	9:A:84:TYR:HE1	1.59	0.68
9:A:100:PHE:CD1	10:H:317:ALA:HB1	2.28	0.68
7:K:46:PHE:HA	13:N:175:ALA:HB2	1.74	0.68
3:E:125:ARG:NH2	3:E:165:TYR:O	2.28	0.67
11:M:307:ALA:HA	12:L:557:ALA:HB1	1.76	0.67
7:K:53:TRP:CZ2	13:N:180:GLN:O	2.47	0.67
10:H:258:GLY:O	10:H:274:LYS:NZ	2.27	0.67
8:J:106:VAL:HG11	12:L:606:LEU:HD13	1.74	0.67
7:K:53:TRP:HZ2	13:N:181:SER:C	1.94	0.67
7:K:75:ILE:HD12	8:J:154:VAL:CB	2.23	0.67
8:J:134:PHE:CE2	9:A:95:SER:HA	2.29	0.67
7:K:53:TRP:HZ2	13:N:180:GLN:O	1.79	0.66
11:M:399:PRO:CD	12:L:144:GLU:HG2	2.25	0.66
8:J:137:TYR:CD1	13:N:66:LEU:HD11	2.30	0.66
12:L:55:ASN:ND2	12:L:58:GLN:O	2.29	0.66
7:K:79:LEU:HD23	8:J:158:VAL:HG22	1.77	0.65
8:J:134:PHE:CE1	9:A:99:GLY:HA2	2.31	0.65
1:B:200:GLU:OE2	1:B:203:ARG:NH2	2.29	0.65
12:L:591:LEU:HD11	13:N:162:LEU:HG	1.77	0.65
7:K:46:PHE:HA	13:N:175:ALA:CB	2.26	0.65
12:L:584:LEU:HD22	13:N:290:SER:HG	1.62	0.65
7:K:8:LEU:HD22	13:N:176:LEU:CD2	2.27	0.65
9:A:107:ILE:CG2	10:H:310:LEU:HD22	2.27	0.65
7:K:64:LEU:CD2	9:A:84:TYR:CE1	2.80	0.64
11:M:483:GLN:OE1	12:L:69:SER:N	2.30	0.64
8:J:106:VAL:CG1	12:L:606:LEU:CD1	2.76	0.64
11:M:304:MET:SD	12:L:560:LEU:CD1	2.84	0.64
11:M:306:PHE:CD1	12:L:553:PHE:CE2	2.85	0.64
5:G:212:SER:O	6:I:79:LYS:NZ	2.30	0.64
7:K:5:GLN:CG	8:J:111:ILE:HG13	2.27	0.64
8:J:134:PHE:CE1	9:A:99:GLY:CA	2.82	0.63
7:K:75:ILE:HD12	8:J:154:VAL:HB	1.80	0.63
7:K:97:GLU:N	13:N:154:GLU:OE2	2.31	0.62
11:M:426:THR:OG1	12:L:183:PHE:CZ	2.51	0.62
12:L:82:ASP:OD2	12:L:268:ARG:NH1	2.32	0.62
5:G:285:ARG:NH1	5:G:287:GLY:O	2.32	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:91:ARG:O	10:H:230:SER:HB3	1.99	0.62
7:K:33:ILE:HG12	8:J:67:PHE:CE2	2.35	0.62
7:K:97:GLU:HB3	13:N:154:GLU:OE1	2.01	0.61
11:M:306:PHE:CG	12:L:553:PHE:CE2	2.87	0.61
7:K:53:TRP:CE2	13:N:181:SER:O	2.53	0.61
7:K:67:SER:HA	9:A:80:VAL:CG1	2.28	0.61
11:M:151:TYR:CZ	13:N:426:LEU:HD13	2.34	0.61
11:M:445:PHE:HE2	12:L:151:TYR:OH	1.83	0.61
3:E:68:ASP:OD1	5:G:162:LYS:NZ	2.34	0.61
7:K:77:LEU:HD22	8:J:66:LEU:CD2	2.29	0.61
8:J:107:ILE:HD11	13:N:176:LEU:HD13	1.82	0.61
7:K:33:ILE:CG1	8:J:67:PHE:CE2	2.84	0.61
12:L:587:GLU:CD	13:N:287:MET:CE	2.69	0.61
8:J:107:ILE:HD11	13:N:176:LEU:CD1	2.30	0.60
11:M:206:ASN:ND2	11:M:208:GLU:OE1	2.34	0.60
7:K:53:TRP:CE3	13:N:182:GLY:HA2	2.37	0.60
7:K:81:LEU:HD21	9:A:69:TYR:CE1	2.34	0.60
11:M:399:PRO:HG3	12:L:144:GLU:OE2	2.01	0.60
7:K:35:LEU:CD1	13:N:164:ALA:CB	2.78	0.60
2:D:106:ASP:OD2	2:D:438:ARG:NH1	2.35	0.59
7:K:35:LEU:HD21	13:N:164:ALA:CB	2.32	0.59
7:K:79:LEU:HG	8:J:158:VAL:HG11	1.85	0.59
11:M:161:ALA:HB1	13:N:434:LEU:HD22	1.85	0.59
7:K:16:VAL:HG13	8:J:100:SER:HB3	1.84	0.59
5:G:617:ASP:OD1	5:G:632:GLN:N	2.35	0.59
8:J:148:LEU:HB3	9:A:81:GLU:OE2	2.02	0.59
7:K:68:LEU:HD22	13:N:133:GLU:HG3	1.85	0.58
7:K:15:PHE:HZ	13:N:169:PHE:CD1	2.20	0.58
8:J:156:PHE:CE2	13:N:104:GLU:OE2	2.56	0.58
11:M:161:ALA:HB1	13:N:434:LEU:CD2	2.33	0.58
11:M:307:ALA:CB	12:L:557:ALA:O	2.47	0.58
12:L:587:GLU:OE2	13:N:287:MET:CE	2.51	0.58
4:F:344:GLU:OE2	4:F:369:ARG:NH1	2.37	0.57
13:N:386:ILE:O	13:N:389:THR:OG1	2.22	0.57
13:N:187:VAL:O	13:N:191:LYS:NZ	2.38	0.57
7:K:64:LEU:HD23	9:A:84:TYR:CE1	2.39	0.57
13:N:296:ARG:NH1	13:N:300:TYR:OH	2.37	0.57
1:B:192:VAL:HG13	1:B:196:ASN:HB2	1.86	0.57
8:J:54:LEU:HG	9:A:83:LEU:HD11	1.87	0.57
11:M:173:LYS:NZ	12:L:570:ASN:OD1	2.38	0.57
1:B:63:CYS:SG	2:D:250:ARG:NH2	2.77	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:269:ASP:OD2	2:D:357:ALA:N	2.37	0.56
5:G:230:GLN:O	5:G:265:ARG:NH2	2.37	0.56
7:K:53:TRP:CH2	13:N:182:GLY:HA2	2.39	0.56
5:G:145:SER:OG	5:G:207:THR:OG1	2.23	0.56
11:M:408:PHE:CE1	12:L:182:ALA:HB1	2.41	0.56
12:L:594:TYR:CD2	13:N:225:LEU:HB3	2.40	0.56
1:B:91:ARG:O	10:H:230:SER:CB	2.54	0.56
7:K:77:LEU:HG	8:J:70:VAL:HG11	1.88	0.55
9:A:98:VAL:CG2	13:N:3:ILE:HD12	2.34	0.55
4:F:358:ARG:NH1	4:F:359:ASP:OD1	2.39	0.55
7:K:92:ILE:CG2	12:L:592:ARG:HH22	2.19	0.55
12:L:580:GLY:HA2	13:N:286:LEU:HB3	1.89	0.55
8:J:154:VAL:CG1	13:N:108:LEU:HD21	2.36	0.55
9:A:86:PHE:HA	10:H:165:MET:SD	2.47	0.55
11:M:437:LEU:HD21	12:L:172:VAL:CG2	2.36	0.55
12:L:587:GLU:CD	13:N:287:MET:HE3	2.26	0.55
2:D:367:ASP:OD1	2:D:368:LEU:N	2.39	0.55
11:M:445:PHE:HE2	12:L:151:TYR:HH	1.51	0.55
5:G:755:TRP:NE1	5:G:760:ASN:OD1	2.39	0.55
11:M:307:ALA:CB	12:L:557:ALA:CA	2.84	0.55
7:K:33:ILE:HG12	8:J:67:PHE:HE2	1.72	0.54
11:M:399:PRO:HD2	12:L:144:GLU:HG2	1.88	0.54
7:K:17:LEU:HD22	8:J:20:ILE:HD13	1.90	0.54
11:M:173:LYS:HE2	12:L:570:ASN:OD1	2.06	0.54
11:M:408:PHE:CE1	12:L:186:PHE:CZ	2.95	0.54
11:M:441:HIS:HD2	12:L:168:MET:CE	2.02	0.54
12:L:609:LEU:HG	13:N:272:VAL:HG21	1.90	0.53
4:F:267:GLY:N	4:F:310:GLU:OE2	2.41	0.53
7:K:53:TRP:CZ3	13:N:182:GLY:CA	2.92	0.53
2:D:50:ARG:NH1	2:D:119:HIS:O	2.38	0.53
4:F:400:HIS:HB3	14:F:501:SF4:S2	2.49	0.52
4:F:401:ALA:HB3	4:F:402:PRO:HD3	1.89	0.52
7:K:33:ILE:HG13	8:J:67:PHE:CE2	2.44	0.52
7:K:38:MET:CE	13:N:168:SER:HB3	2.38	0.52
7:K:42:SER:HB2	13:N:171:LEU:HB3	1.91	0.52
11:M:137:PHE:HE1	13:N:396:PHE:CE1	2.27	0.52
11:M:430:VAL:HG23	12:L:179:VAL:HG21	1.91	0.52
12:L:587:GLU:CD	13:N:287:MET:HE1	2.29	0.52
2:D:347:GLU:OE2	2:D:353:ARG:NH1	2.42	0.52
9:A:107:ILE:HD11	10:H:314:LEU:HD11	1.92	0.52
12:L:117:PHE:O	12:L:121:ASN:ND2	2.43	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:F:319:SER:OG	4:F:320:ARG:N	2.43	0.52
1:B:92:GLN:NE2	10:H:229:TYR:O	2.43	0.52
2:D:253:GLU:OE2	2:D:596:ARG:NH1	2.42	0.52
11:M:306:PHE:CB	12:L:553:PHE:CZ	2.93	0.51
11:M:343:ILE:HG23	11:M:406:GLY:HA2	1.92	0.51
11:M:309:THR:OG1	11:M:372:ARG:NH1	2.41	0.51
5:G:102:ASP:OD1	6:I:155:GLY:N	2.42	0.51
8:J:148:LEU:CB	9:A:81:GLU:OE2	2.59	0.51
8:J:149:LEU:HD21	13:N:25:MET:CE	2.41	0.51
12:L:137:LEU:O	12:L:140:TYR:N	2.44	0.51
7:K:77:LEU:CD2	8:J:66:LEU:CG	2.89	0.51
8:J:136:PRO:HB3	13:N:65:PRO:CD	2.36	0.51
12:L:594:TYR:CD1	13:N:225:LEU:HG	2.46	0.51
4:F:27:ASP:OD1	4:F:28:GLU:N	2.43	0.51
7:K:74:SER:OG	9:A:73:MET:SD	2.69	0.51
11:M:307:ALA:CB	12:L:557:ALA:HA	2.27	0.50
7:K:82:GLN:NE2	13:N:147:PHE:CD1	2.80	0.50
7:K:75:ILE:HD12	8:J:154:VAL:HG23	1.88	0.50
8:J:120:ASP:OD1	8:J:121:GLY:N	2.43	0.50
11:M:445:PHE:CE2	12:L:151:TYR:OH	2.63	0.50
7:K:17:LEU:HD13	8:J:16:THR:HG22	1.93	0.50
11:M:416:GLN:OE1	12:L:190:ASN:OD1	2.29	0.50
2:D:426:ARG:NH2	2:D:469:GLU:OE2	2.45	0.50
8:J:66:LEU:HB2	9:A:76:VAL:HG21	1.93	0.50
11:M:137:PHE:CE1	13:N:396:PHE:CE1	2.99	0.50
9:A:93:ARG:HE	10:H:320:ILE:HD11	1.77	0.49
2:D:556:ARG:NH1	2:D:557:VAL:O	2.45	0.49
11:M:173:LYS:HE3	12:L:570:ASN:OD1	2.10	0.49
2:D:100:SER:OG	2:D:102:ASP:OD1	2.30	0.49
8:J:54:LEU:HD21	9:A:83:LEU:HD21	1.94	0.49
8:J:136:PRO:CB	13:N:65:PRO:HD2	2.39	0.49
7:K:79:LEU:CD2	8:J:158:VAL:CG2	2.56	0.49
9:A:116:TYR:HA	13:N:29:ALA:CB	2.36	0.49
7:K:60:VAL:HB	8:J:137:TYR:CD2	2.48	0.49
8:J:145:SER:HB3	9:A:106:PHE:CE2	2.48	0.49
7:K:8:LEU:HD22	13:N:176:LEU:HD23	1.93	0.49
8:J:134:PHE:CD1	9:A:88:TRP:HH2	2.31	0.49
8:J:134:PHE:CE2	9:A:95:SER:CA	2.95	0.49
8:J:69:PHE:HE2	9:A:72:ALA:HB1	1.78	0.48
8:J:149:LEU:HD11	13:N:25:MET:SD	2.53	0.48
7:K:81:LEU:O	7:K:85:ARG:HG3	2.14	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
11:M:441:HIS:CD2	12:L:168:MET:HE3	2.42	0.48
8:J:154:VAL:HG13	13:N:108:LEU:HD21	1.95	0.48
9:A:75:PHE:CD1	10:H:158:VAL:HG22	2.48	0.48
12:L:594:TYR:CE1	13:N:225:LEU:HB3	2.48	0.48
11:M:463:ARG:NH2	11:M:464:GLU:OE2	2.47	0.48
1:B:127:GLY:O	1:B:131:ASN:ND2	2.47	0.48
7:K:92:ILE:HG22	12:L:592:ARG:HH22	1.77	0.48
12:L:598:MET:HE1	13:N:223:PHE:CB	2.25	0.48
7:K:33:ILE:CG1	8:J:67:PHE:HE2	2.23	0.47
8:J:149:LEU:HD21	13:N:25:MET:HE3	1.96	0.47
2:D:191:GLU:O	2:D:194:THR:OG1	2.33	0.47
7:K:53:TRP:CE2	13:N:182:GLY:CA	2.78	0.47
8:J:56:ILE:HG21	10:H:121:MET:HG3	1.96	0.47
11:M:393:VAL:HG21	12:L:148:LEU:HD11	1.96	0.47
12:L:593:TRP:HZ3	13:N:225:LEU:HD11	1.78	0.47
1:B:92:GLN:OE1	10:H:229:TYR:O	2.32	0.47
6:I:59:ARG:NH2	6:I:148:TYR:O	2.48	0.47
6:I:154:ALA:O	6:I:161:LYS:NZ	2.26	0.47
7:K:49:ALA:HB1	13:N:178:TYR:CD2	2.50	0.47
8:J:134:PHE:CD1	9:A:88:TRP:CH2	3.02	0.47
8:J:148:LEU:HD12	9:A:81:GLU:OE1	2.14	0.47
5:G:843:ASN:ND2	5:G:877:LEU:O	2.44	0.47
7:K:75:ILE:CD1	8:J:154:VAL:HB	2.43	0.47
2:D:381:ASP:OD1	2:D:382:TRP:N	2.47	0.47
12:L:233:LEU:HB3	12:L:234:PRO:HD3	1.97	0.47
8:J:130:GLY:C	9:A:91:SER:HB2	2.36	0.46
1:B:199:SER:O	1:B:203:ARG:N	2.43	0.46
7:K:63:ILE:HG22	9:A:84:TYR:CE1	2.50	0.46
11:M:307:ALA:CA	12:L:557:ALA:HB1	2.42	0.46
5:G:511:GLN:OE1	5:G:798:SER:OG	2.33	0.46
7:K:92:ILE:CG2	12:L:592:ARG:NH2	2.78	0.46
7:K:53:TRP:CZ3	13:N:182:GLY:HA2	2.51	0.46
7:K:83:LEU:HD12	13:N:153:LEU:HD21	1.96	0.46
9:A:100:PHE:CE1	10:H:317:ALA:HB1	2.51	0.46
11:M:399:PRO:HD3	12:L:144:GLU:OE2	2.16	0.46
7:K:66:ILE:HD11	9:A:83:LEU:HD21	1.94	0.46
12:L:324:GLY:O	12:L:326:GLN:NE2	2.48	0.46
11:M:317:TYR:OH	12:L:563:ASP:HB2	2.15	0.45
3:E:90:ARG:NH2	4:F:135:GLU:OE1	2.45	0.45
12:L:212:ASN:O	12:L:212:ASN:ND2	2.39	0.45
12:L:605:VAL:HG13	13:N:272:VAL:HG11	1.97	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:I:78:GLN:O	6:I:90:GLU:N	2.45	0.45
7:K:49:ALA:O	13:N:178:TYR:CE2	2.70	0.45
12:L:126:SER:OG	12:L:146:VAL:N	2.49	0.45
11:M:168:ILE:CD1	13:N:423:TYR:OH	2.59	0.45
7:K:15:PHE:CZ	13:N:169:PHE:CE1	3.05	0.45
9:A:69:TYR:O	9:A:72:ALA:N	2.46	0.44
8:J:149:LEU:HD21	13:N:25:MET:SD	2.57	0.44
9:A:126:THR:O	10:H:294:TYR:HE2	2.01	0.44
11:M:393:VAL:CG2	12:L:148:LEU:HD11	2.47	0.44
1:B:52:ASN:OD1	10:H:62:ALA:CB	2.66	0.44
7:K:49:ALA:C	13:N:178:TYR:CE2	2.91	0.44
3:E:136:ASN:O	3:E:142:ASN:ND2	2.50	0.44
7:K:46:PHE:CA	13:N:175:ALA:HB2	2.46	0.43
7:K:84:HIS:CD2	8:J:74:LEU:HD21	2.53	0.43
2:D:231:LEU:CD1	2:D:238:ILE:HG23	2.49	0.43
11:M:437:LEU:CD2	12:L:172:VAL:CG2	2.96	0.43
11:M:151:TYR:CZ	13:N:426:LEU:CD1	3.01	0.43
11:M:307:ALA:HB2	12:L:557:ALA:CB	2.47	0.43
4:F:269:THR:N	4:F:272:GLU:OE2	2.52	0.43
5:G:623:ASN:OD1	5:G:624:GLU:N	2.51	0.43
7:K:15:PHE:HZ	13:N:169:PHE:CE1	2.36	0.43
11:M:408:PHE:HE1	12:L:182:ALA:HB1	1.82	0.43
5:G:216:ASN:ND2	5:G:221:MET:SD	2.88	0.43
7:K:1:MET:CE	8:J:118:GLY:CA	2.90	0.43
11:M:237:VAL:HG12	11:M:238:VAL:H	1.83	0.43
4:F:218:ASN:ND2	16:F:502:FMN:O2	2.47	0.43
5:G:429:LEU:O	5:G:444:ALA:N	2.51	0.43
7:K:75:ILE:HB	8:J:154:VAL:HG23	2.01	0.43
9:A:75:PHE:CE1	10:H:158:VAL:HG22	2.54	0.43
9:A:96:GLY:HA2	10:H:321:LEU:CD2	2.49	0.43
4:F:362:PRO:HA	4:F:365:VAL:HG12	2.00	0.42
11:M:306:PHE:HD2	12:L:557:ALA:HB2	1.84	0.42
13:N:33:ASN:O	13:N:37:ASN:ND2	2.52	0.42
13:N:242:LEU:O	13:N:247:LYS:NZ	2.53	0.42
8:J:53:ALA:HB1	10:H:117:LEU:HB3	2.00	0.42
8:J:152:LEU:HD11	9:A:117:LEU:HD11	2.01	0.42
11:M:82:ALA:HB3	11:M:134:ILE:HG13	2.01	0.42
13:N:357:ASP:OD1	13:N:357:ASP:N	2.46	0.42
5:G:436:ASP:N	5:G:436:ASP:OD1	2.53	0.42
7:K:35:LEU:CD2	13:N:164:ALA:CB	2.98	0.42
8:J:156:PHE:CZ	9:A:120:ILE:HD12	2.55	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:K:46:PHE:HA	13:N:175:ALA:HB1	2.01	0.41
9:A:66:ALA:HB2	10:H:144:LEU:HD11	2.00	0.41
11:M:300:TYR:CE2	12:L:565:LEU:CD1	2.92	0.41
9:A:119:ARG:HB3	13:N:29:ALA:O	2.21	0.41
2:D:141:PHE:O	2:D:163:HIS:ND1	2.53	0.41
7:K:50:GLY:N	13:N:178:TYR:HE2	2.18	0.41
9:A:107:ILE:HG22	10:H:310:LEU:HD22	2.03	0.41
13:N:200:GLU:OE2	13:N:203:LEU:N	2.51	0.41
12:L:2:ASN:OD1	12:L:60:TYR:OH	2.35	0.41
7:K:99:ARG:NH1	12:L:590:TYR:OH	2.52	0.41
8:J:139:LEU:HD11	13:N:11:LEU:HD11	2.03	0.41
4:F:400:HIS:HB2	16:F:502:FMN:HM71	2.01	0.41
8:J:134:PHE:HE1	9:A:99:GLY:CA	2.22	0.41
11:M:127:VAL:HG11	11:M:262:ILE:HG13	2.03	0.41
11:M:437:LEU:HB2	12:L:168:MET:HG2	2.03	0.41
13:N:221:VAL:O	13:N:224:HIS:ND1	2.54	0.41
1:B:52:ASN:OD1	10:H:62:ALA:HB2	2.21	0.41
7:K:67:SER:CB	9:A:84:TYR:HH	2.18	0.41
12:L:51:ASP:O	12:L:55:ASN:N	2.53	0.41
2:D:255:MET:SD	2:D:258:ARG:NH2	2.94	0.41
8:J:69:PHE:HE1	10:H:131:LEU:HD21	1.86	0.41
5:G:558:THR:OG1	5:G:560:ARG:NH2	2.53	0.40
7:K:60:VAL:HG21	8:J:137:TYR:CE2	2.55	0.40
1:B:92:GLN:OE1	10:H:230:SER:HA	2.21	0.40
12:L:232:GLN:HG3	12:L:233:LEU:H	1.86	0.40
1:B:208:ARG:NH2	6:I:132:TYR:OH	2.54	0.40
1:B:219:GLU:OE1	2:D:370:ARG:NH2	2.49	0.40
11:M:399:PRO:HG3	12:L:141:LEU:HA	2.04	0.40
13:N:221:VAL:CG1	13:N:222:PRO:HD3	2.51	0.40
7:K:60:VAL:HG21	8:J:137:TYR:HE2	1.87	0.40
12:L:140:TYR:HA	12:L:143:TRP:HD1	1.86	0.40
13:N:137:LEU:HA	13:N:140:PHE:HD2	1.86	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	B	152/220 (69%)	143 (94%)	9 (6%)	0	100	100
2	D	586/596 (98%)	568 (97%)	18 (3%)	0	100	100
3	E	153/166 (92%)	150 (98%)	3 (2%)	0	100	100
4	F	438/445 (98%)	430 (98%)	8 (2%)	0	100	100
5	G	905/908 (100%)	887 (98%)	18 (2%)	0	100	100
6	I	156/180 (87%)	154 (99%)	2 (1%)	0	100	100
7	K	98/100 (98%)	96 (98%)	2 (2%)	0	100	100
8	J	162/184 (88%)	154 (95%)	8 (5%)	0	100	100
9	A	88/147 (60%)	84 (96%)	4 (4%)	0	100	100
10	H	268/325 (82%)	254 (95%)	14 (5%)	0	100	100
11	M	502/509 (99%)	485 (97%)	17 (3%)	0	100	100
12	L	610/613 (100%)	575 (94%)	35 (6%)	0	100	100
13	N	461/485 (95%)	447 (97%)	14 (3%)	0	100	100
All	All	4579/4878 (94%)	4427 (97%)	152 (3%)	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 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	B	126/191 (66%)	126 (100%)	0	100	100
2	D	500/515 (97%)	493 (99%)	7 (1%)	67	82
3	E	128/138 (93%)	126 (98%)	2 (2%)	62	80
4	F	354/358 (99%)	351 (99%)	3 (1%)	81	89
5	G	735/736 (100%)	728 (99%)	7 (1%)	76	86

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
6	I	126/154 (82%)	125 (99%)	1 (1%)	81	89
7	K	79/79 (100%)	79 (100%)	0	100	100
8	J	129/146 (88%)	129 (100%)	0	100	100
9	A	55/119 (46%)	55 (100%)	0	100	100
10	H	190/269 (71%)	188 (99%)	2 (1%)	73	85
11	M	413/418 (99%)	412 (100%)	1 (0%)	93	97
12	L	322/486 (66%)	314 (98%)	8 (2%)	47	70
13	N	371/385 (96%)	366 (99%)	5 (1%)	69	83
All	All	3528/3994 (88%)	3492 (99%)	36 (1%)	77	86

All (36) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	D	24	GLU
2	D	63	LEU
2	D	107	ILE
2	D	340	GLN
2	D	385	LYS
2	D	417	GLU
2	D	558	ARG
3	E	86	ARG
3	E	87	HIS
4	F	16	ARG
4	F	252	PHE
4	F	434	ASN
5	G	186	ASP
5	G	527	VAL
5	G	537	ASN
5	G	549	LEU
5	G	572	HIS
5	G	573	ARG
5	G	904	LYS
6	I	45	ARG
10	H	183	GLN
10	H	210	HIS
11	M	495	ASN
12	L	80	VAL
12	L	137	LEU
12	L	198	ARG

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Mol	Chain	Res	Type
12	L	212	ASN
12	L	258	MET
12	L	342	LYS
12	L	562	ARG
12	L	600	ILE
13	N	125	LEU
13	N	134	LEU
13	N	174	MET
13	N	187	VAL
13	N	369	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
7	K	84	HIS
11	M	206	ASN
11	M	441	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](#)

3 non-standard protein/DNA/RNA residues 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	$\# Z  > 2$
3	CSX	E	132	3	3,6,7	0.85	0	1,6,8	0.08	0
1	CSX	B	102	1	3,6,7	0.86	0	1,6,8	0.98	0
4	CSX	F	215	4	3,6,7	0.68	0	1,6,8	0.23	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
3	CSX	E	132	3	-	1/1/5/7	-
1	CSX	B	102	1	-	0/1/5/7	-
4	CSX	F	215	4	-	1/1/5/7	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	E	132	CSX	N-CA-CB-SG
4	F	215	CSX	N-CA-CB-SG

There are no ring outliers.

No monomer is involved in short contacts.

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 11 ligands modelled in this entry, 1 is monoatomic - leaving 10 for Mogul analysis.

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	$\# Z  > 2$
14	SF4	G	1003	5	0,12,12	-	-	-		
14	SF4	G	1002	5	0,12,12	-	-	-		
15	FES	E	201	3	0,4,4	-	-	-		

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
14	SF4	B	301	1	0,12,12	-	-	-		
14	SF4	G	1004	5	0,12,12	-	-	-		
14	SF4	I	201	6	0,12,12	-	-	-		
14	SF4	I	202	6	0,12,12	-	-	-		
15	FES	G	1001	5	0,4,4	-	-	-		
14	SF4	F	501	4	0,12,12	-	-	-		
16	FMN	F	502	-	33,33,33	1.04	2 (6%)	48,50,50	1.33	8 (16%)

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
14	SF4	G	1003	5	-	-	0/6/5/5
14	SF4	G	1002	5	-	-	0/6/5/5
15	FES	E	201	3	-	-	0/1/1/1
14	SF4	B	301	1	-	-	0/6/5/5
14	SF4	G	1004	5	-	-	0/6/5/5
14	SF4	I	201	6	-	-	0/6/5/5
14	SF4	I	202	6	-	-	0/6/5/5
15	FES	G	1001	5	-	-	0/1/1/1
14	SF4	F	501	4	-	-	0/6/5/5
16	FMN	F	502	-	-	1/18/18/18	0/3/3/3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
16	F	502	FMN	C4A-N5	3.51	1.37	1.30
16	F	502	FMN	C10-N1	2.53	1.38	1.33

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
16	F	502	FMN	C4-N3-C2	-3.30	119.55	125.64
16	F	502	FMN	C4A-C10-N10	2.80	120.57	116.48
16	F	502	FMN	C4A-C10-N1	-2.73	118.39	124.73
16	F	502	FMN	C4A-C4-N3	2.66	119.95	113.19
16	F	502	FMN	O4-C4-C4A	-2.47	120.05	126.60
16	F	502	FMN	C4-C4A-C10	2.37	120.77	116.79
16	F	502	FMN	C10-C4A-N5	-2.16	120.27	124.86
16	F	502	FMN	C10-N1-C2	2.00	120.91	116.90

There are no chirality outliers.

All (1) torsion outliers are listed below:

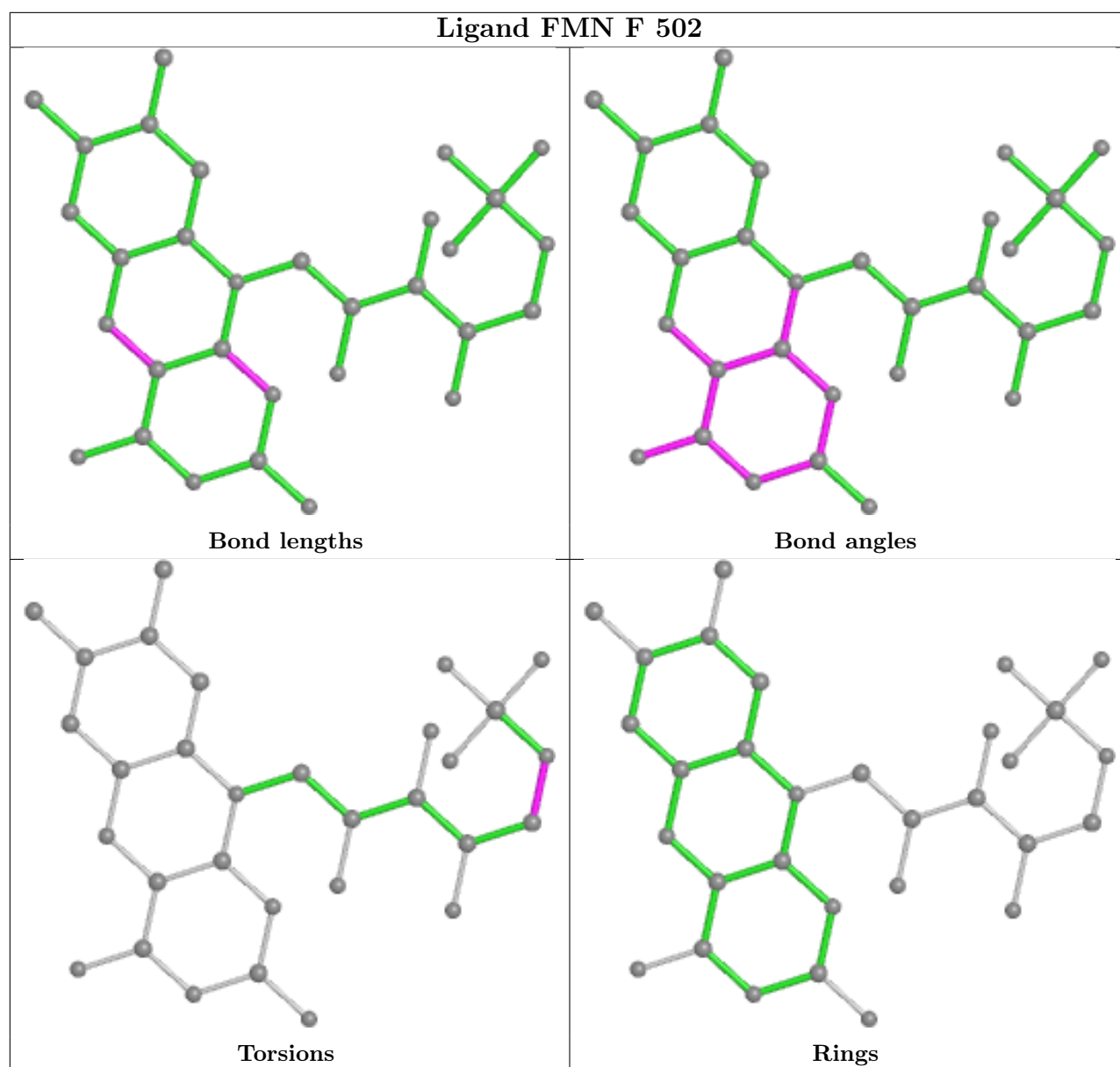
Mol	Chain	Res	Type	Atoms
16	F	502	FMN	C4'-C5'-O5'-P

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
14	F	501	SF4	1	0
16	F	502	FMN	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



## 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.



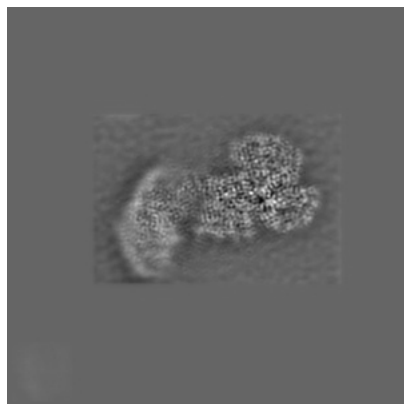
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-12655. These allow visual inspection of the internal detail of the map and identification of artifacts.

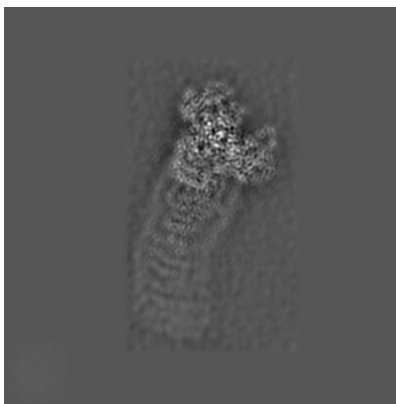
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

### 6.1 Orthogonal projections [i](#)

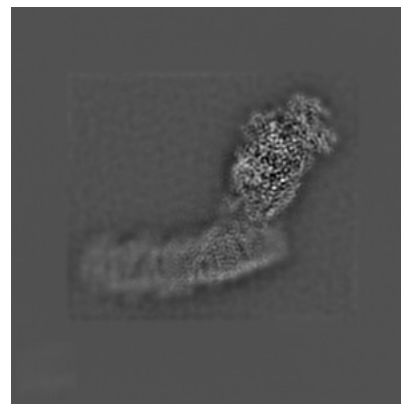
#### 6.1.1 Primary map



X

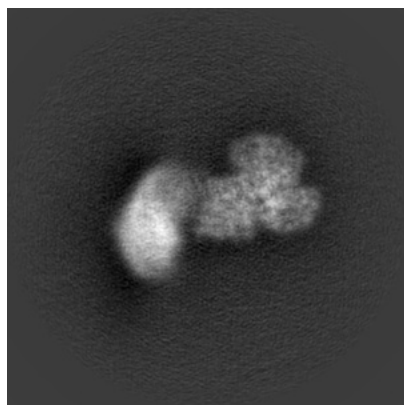


Y

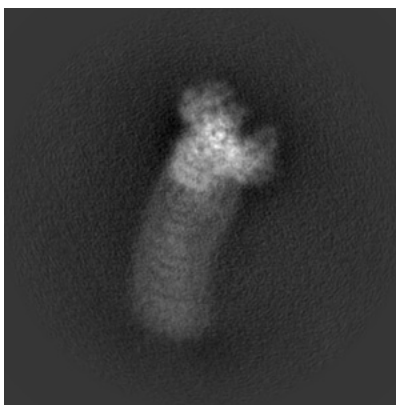


Z

#### 6.1.2 Raw map



X



Y

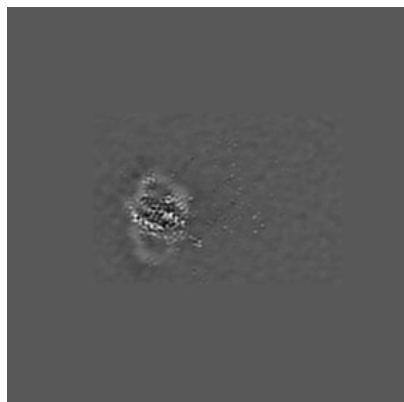


Z

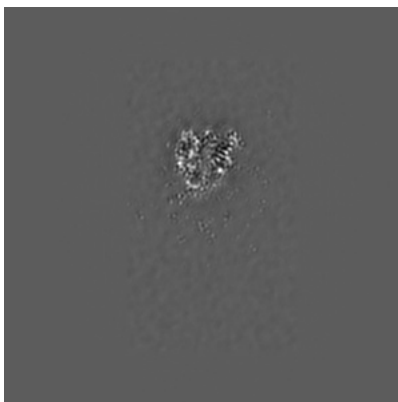
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

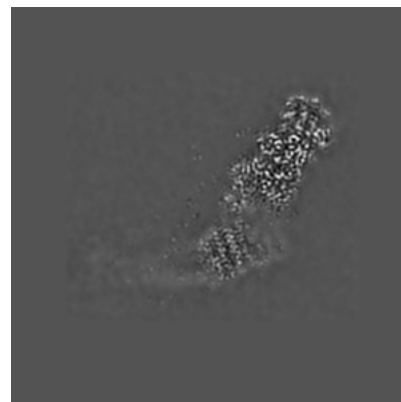
### 6.2.1 Primary map



X Index: 125

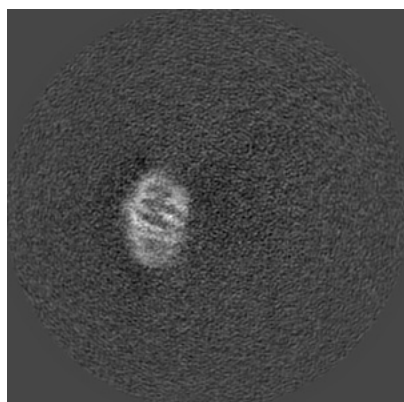


Y Index: 125

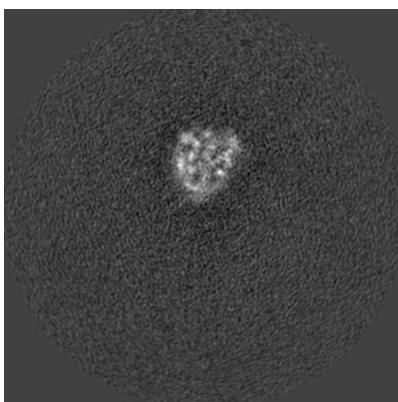


Z Index: 125

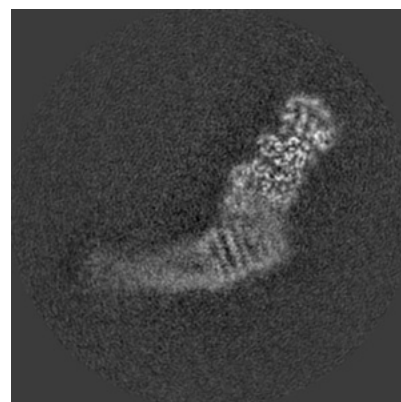
### 6.2.2 Raw map



X Index: 125



Y Index: 125

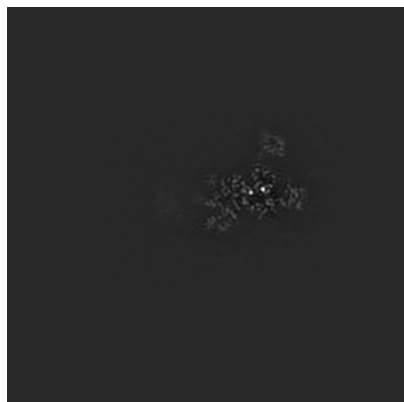


Z Index: 125

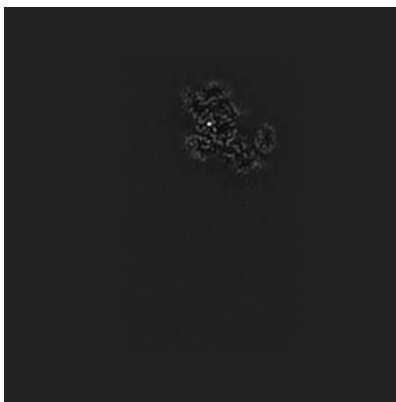
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices [i](#)

### 6.3.1 Primary map



X Index: 171

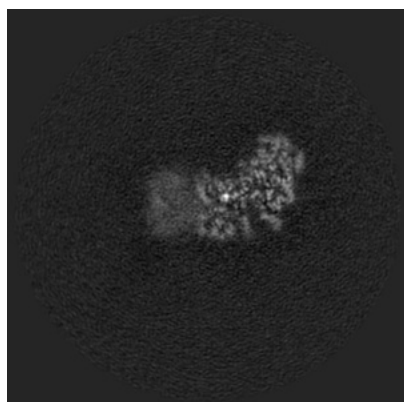


Y Index: 166

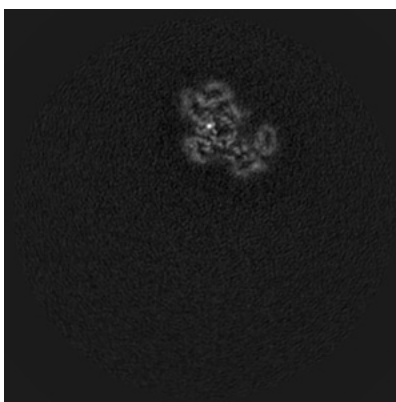


Z Index: 135

### 6.3.2 Raw map



X Index: 163



Y Index: 166

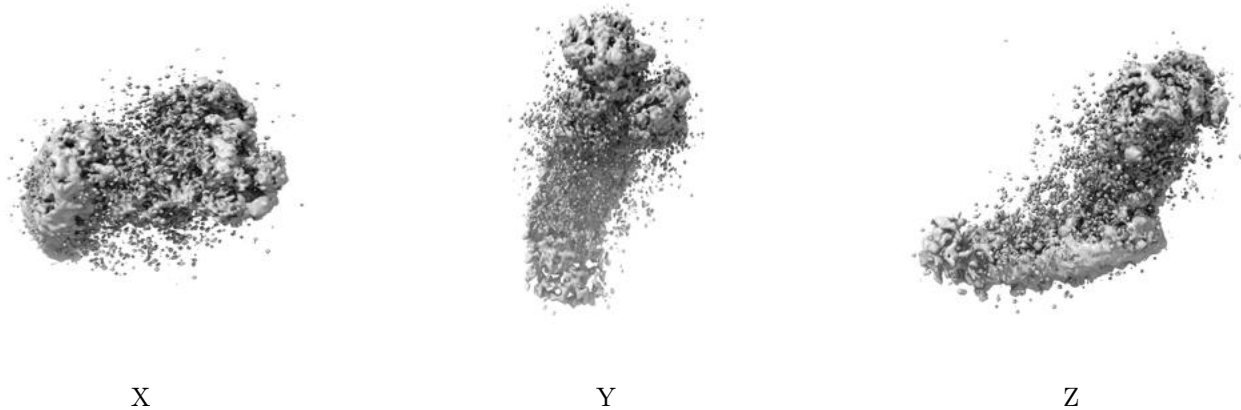


Z Index: 126

The images above show the largest variance slices of the map in three orthogonal directions.

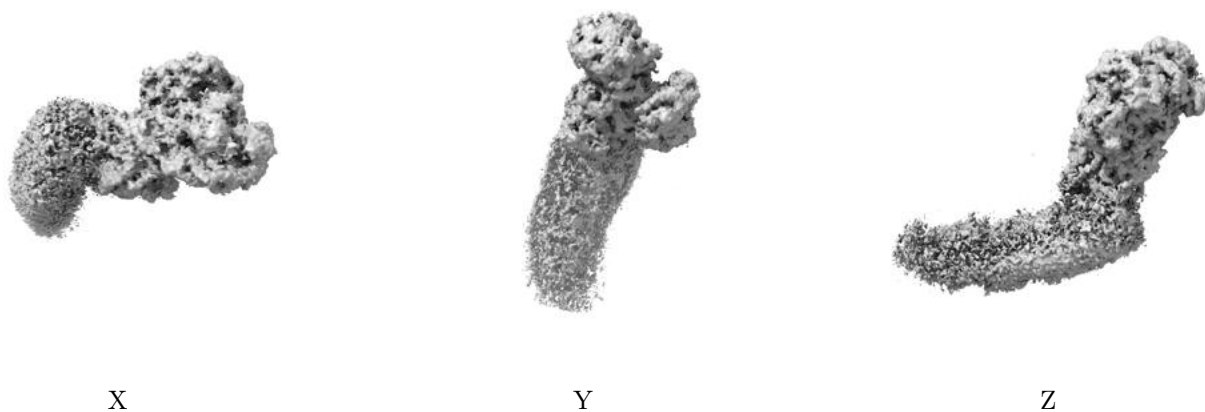
## 6.4 Orthogonal surface views [i](#)

### 6.4.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 1.6. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

### 6.4.2 Raw map



These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

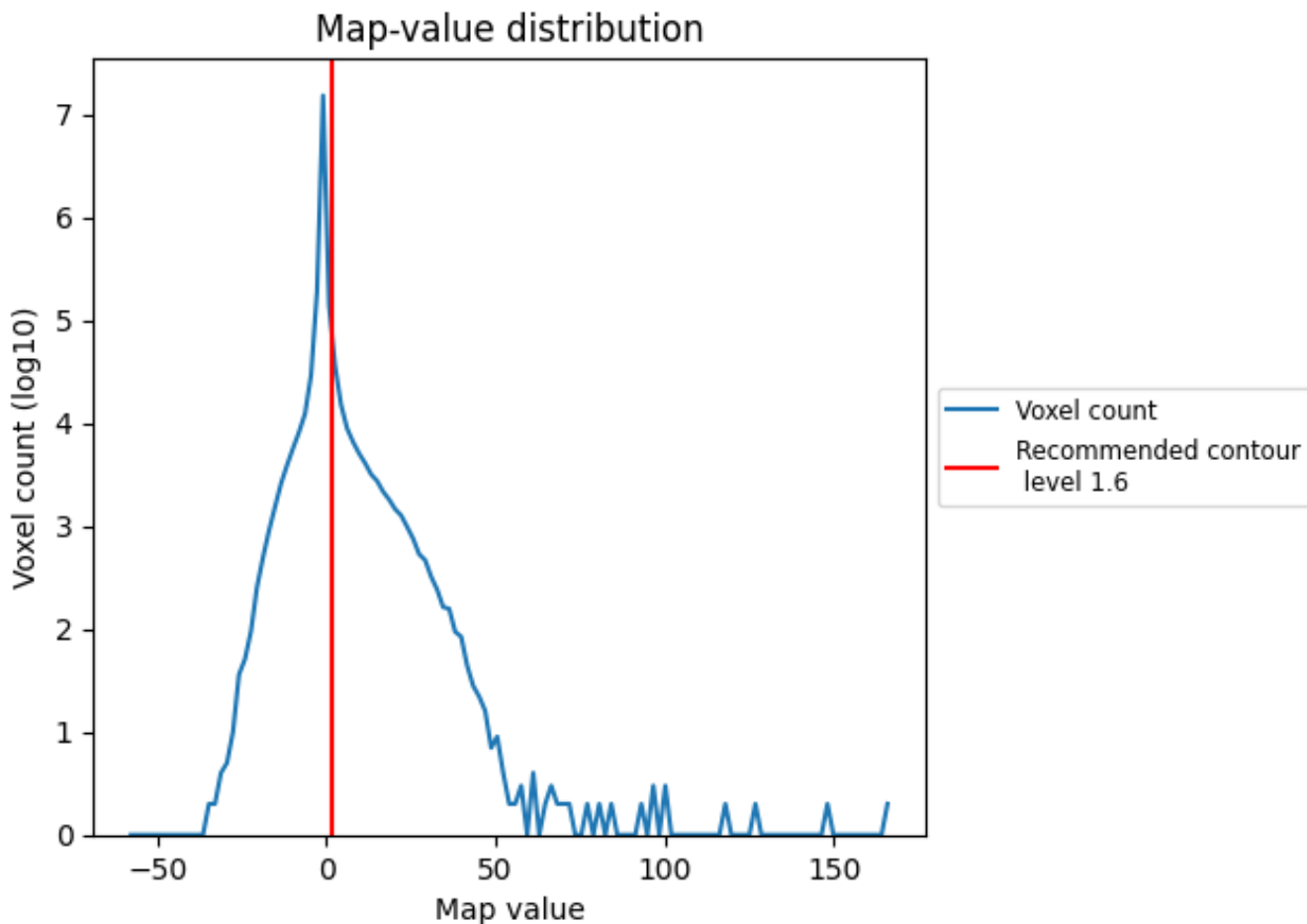
## 6.5 Mask visualisation [i](#)

This section was not generated. No masks/segmentation were deposited.

## 7 Map analysis [i](#)

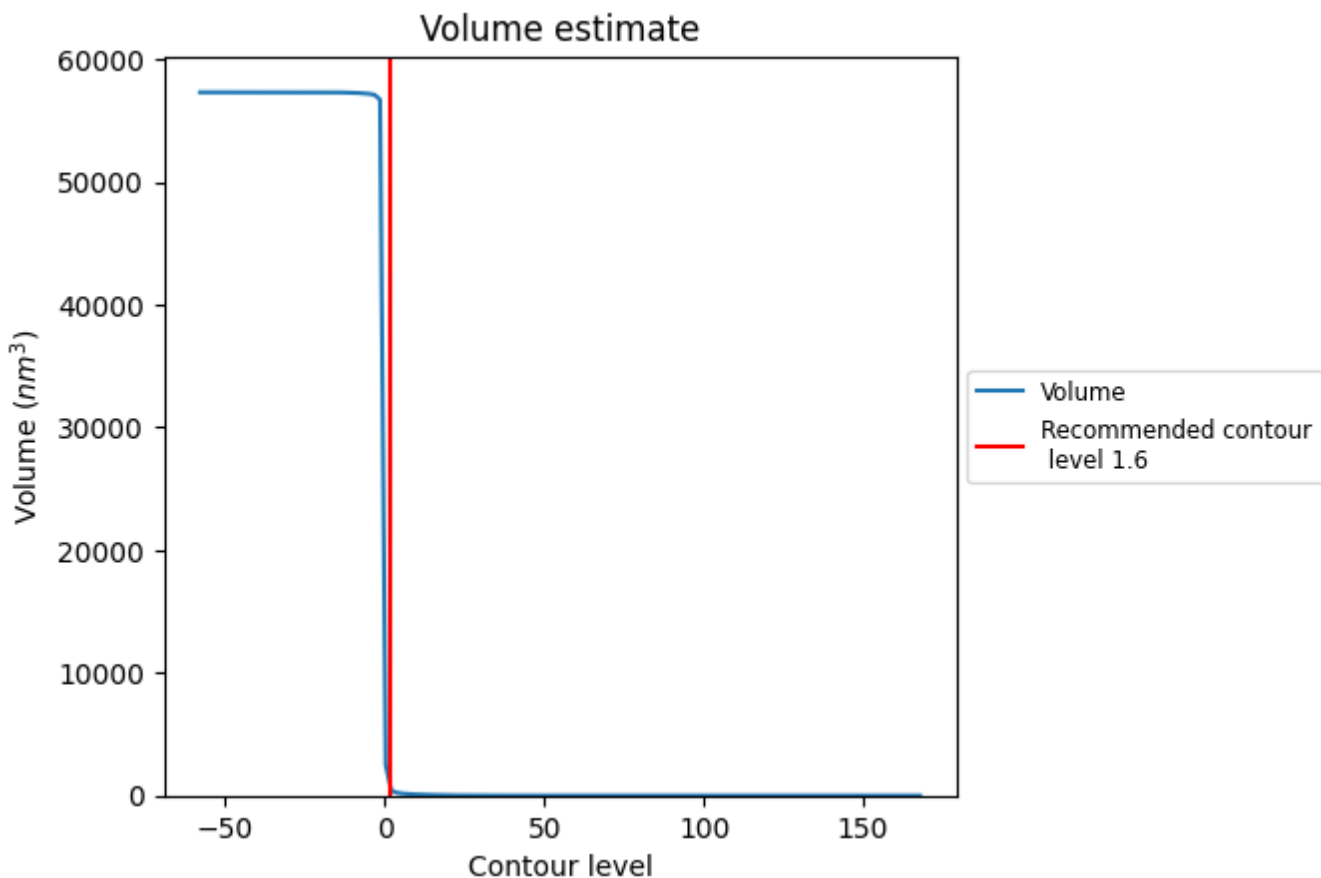
This section contains the results of statistical analysis of the map.

### 7.1 Map-value distribution [i](#)



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

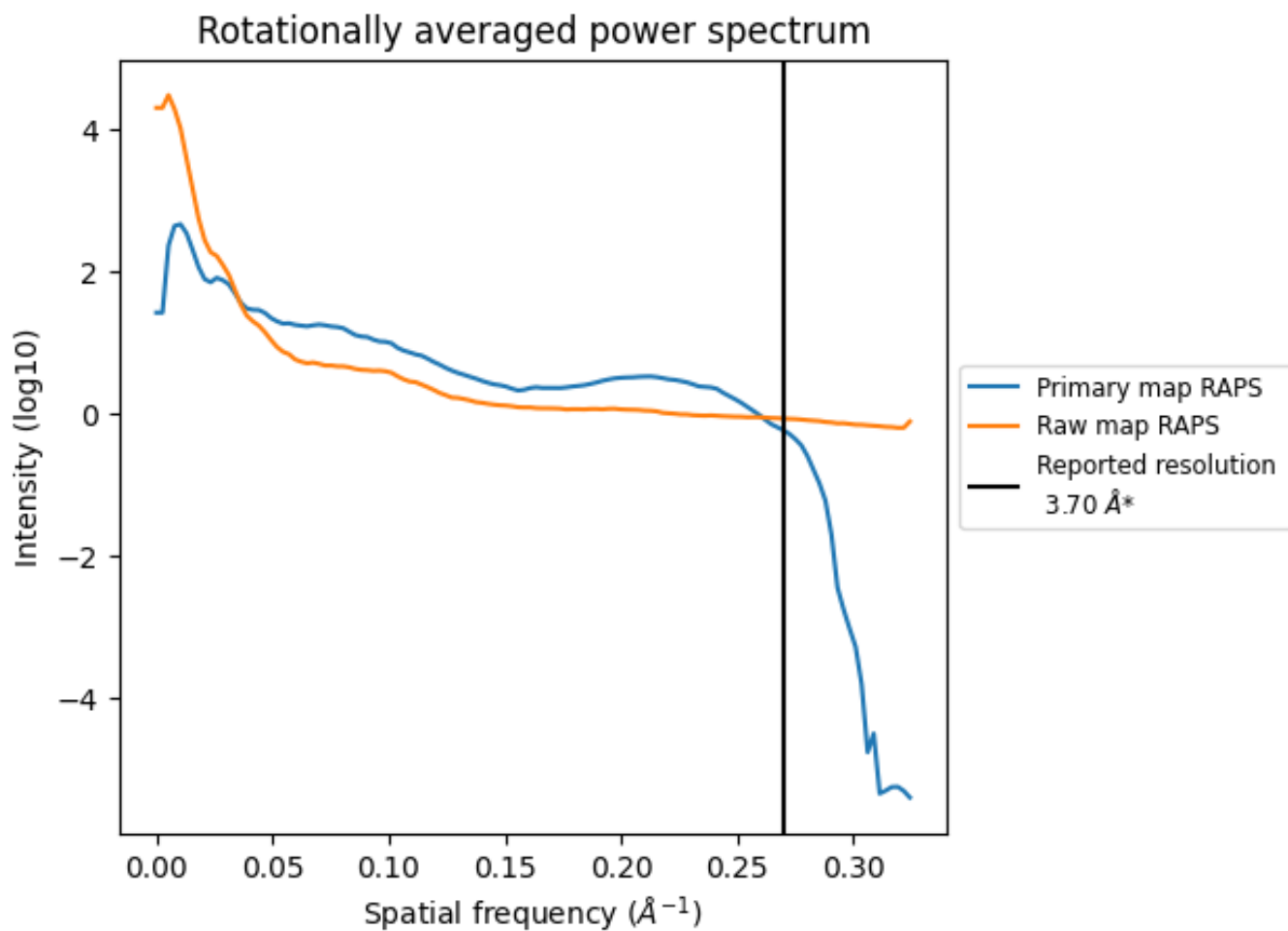
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 930 nm<sup>3</sup>; this corresponds to an approximate mass of 840 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

### 7.3 Rotationally averaged power spectrum i

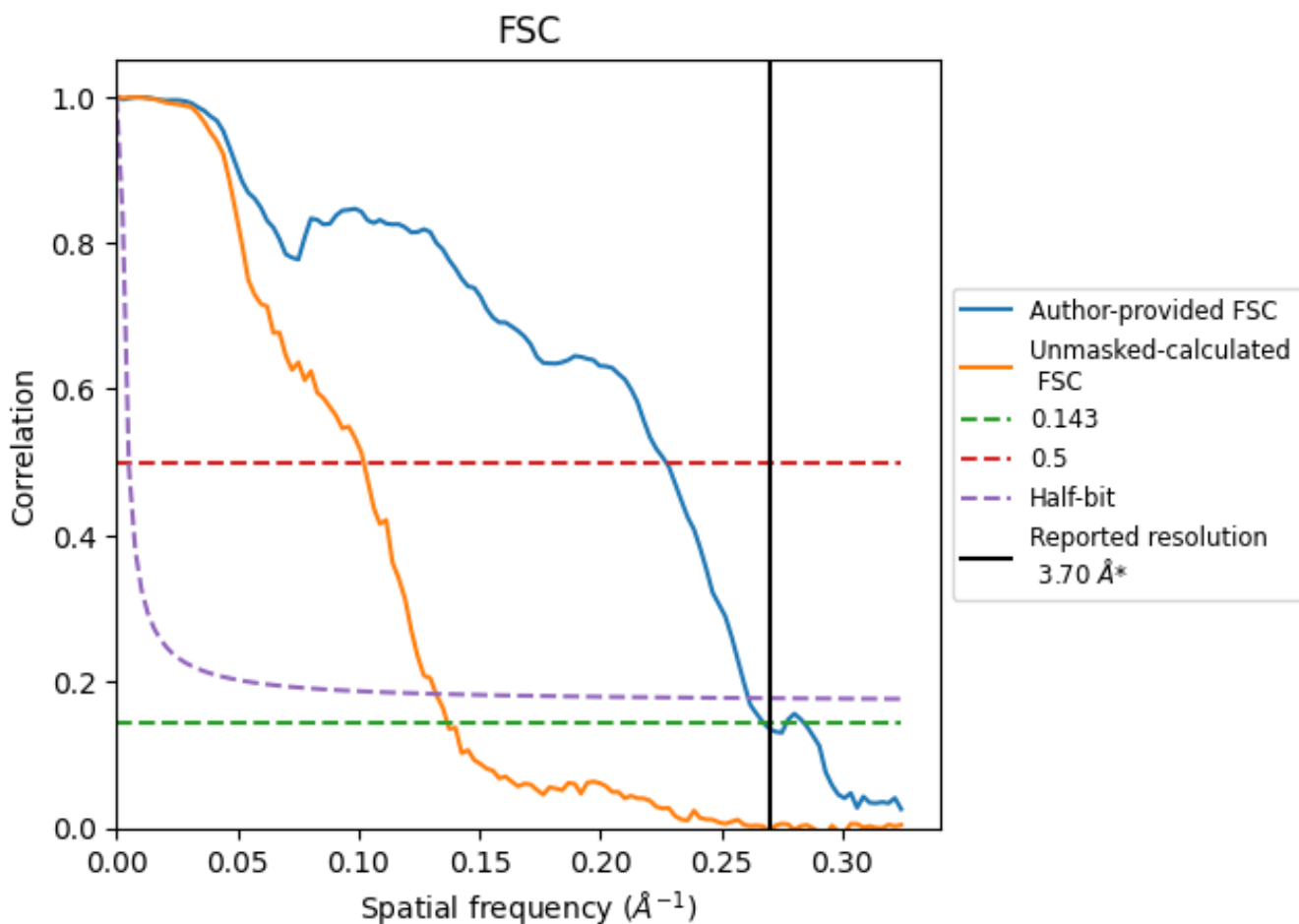


\*Reported resolution corresponds to spatial frequency of 0.270 Å<sup>-1</sup>

## 8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

### 8.1 FSC [i](#)



\*Reported resolution corresponds to spatial frequency of 0.270 Å<sup>-1</sup>



## 8.2 Resolution estimates [i](#)

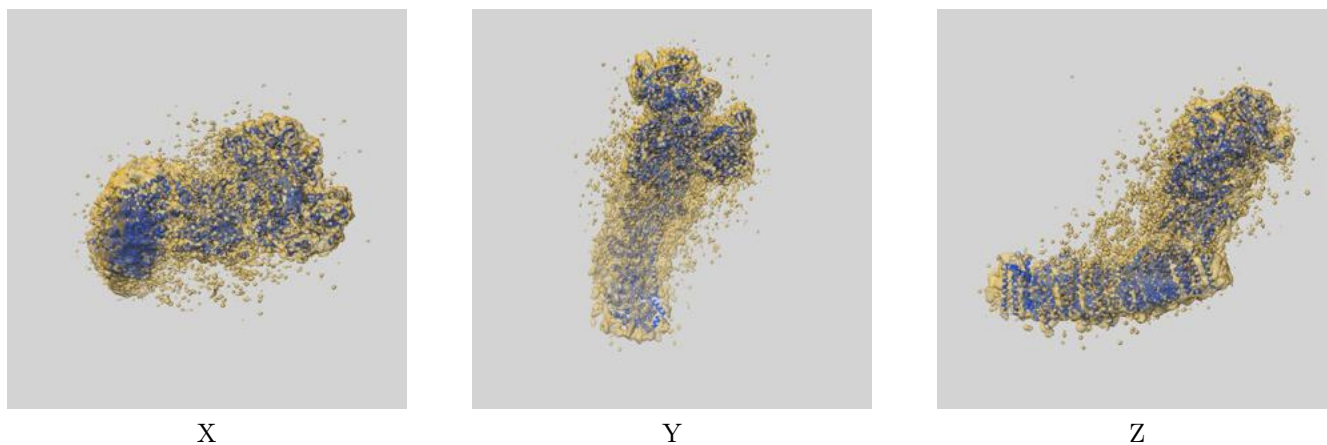
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.70	-	-
Author-provided FSC curve	3.74	4.40	3.83
Unmasked-calculated*	7.31	9.79	7.57

\*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 7.31 differs from the reported value 3.7 by more than 10 %

## 9 Map-model fit [i](#)

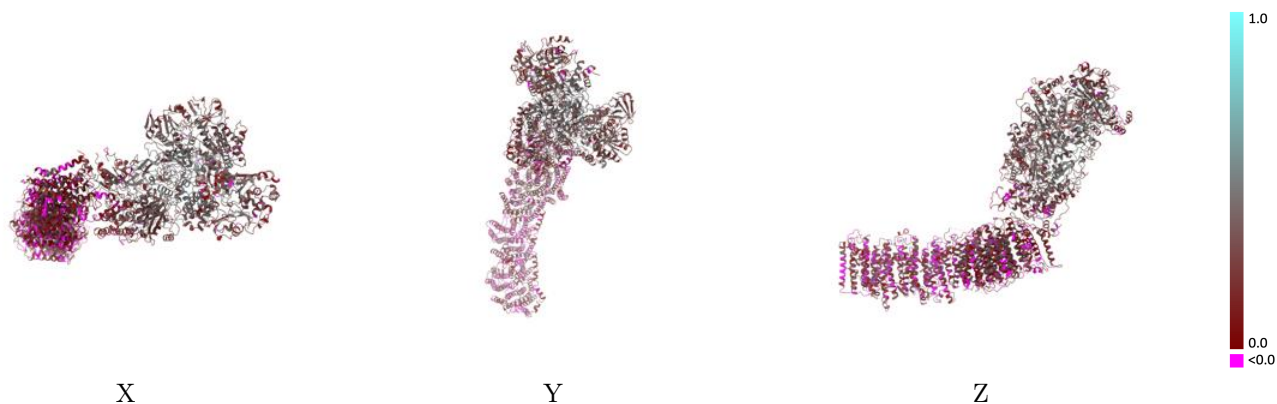
This section contains information regarding the fit between EMDB map EMD-12655 and PDB model 7NYV. Per-residue inclusion information can be found in section [3](#) on page [9](#).

### 9.1 Map-model overlay [i](#)



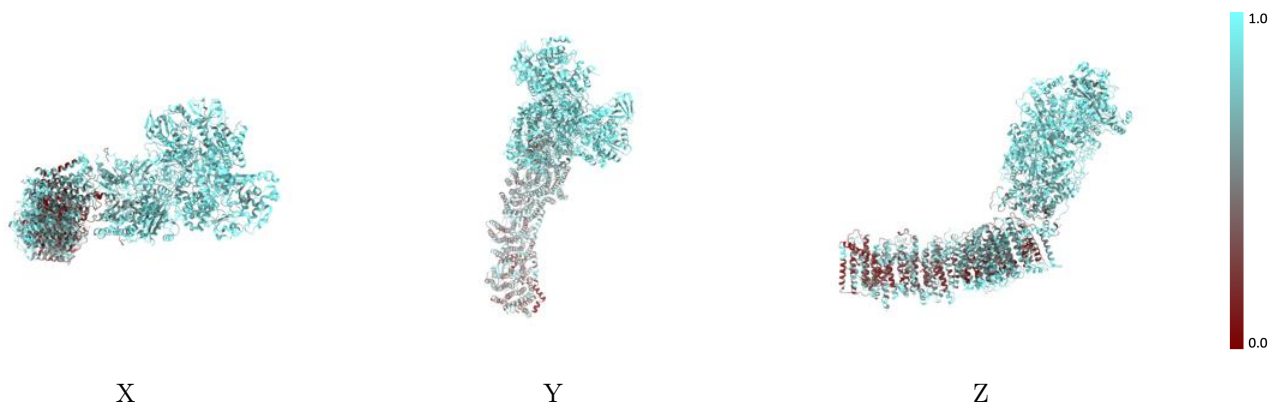
The images above show the 3D surface view of the map at the recommended contour level 1.6 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

## 9.2 Q-score mapped to coordinate model [\(i\)](#)



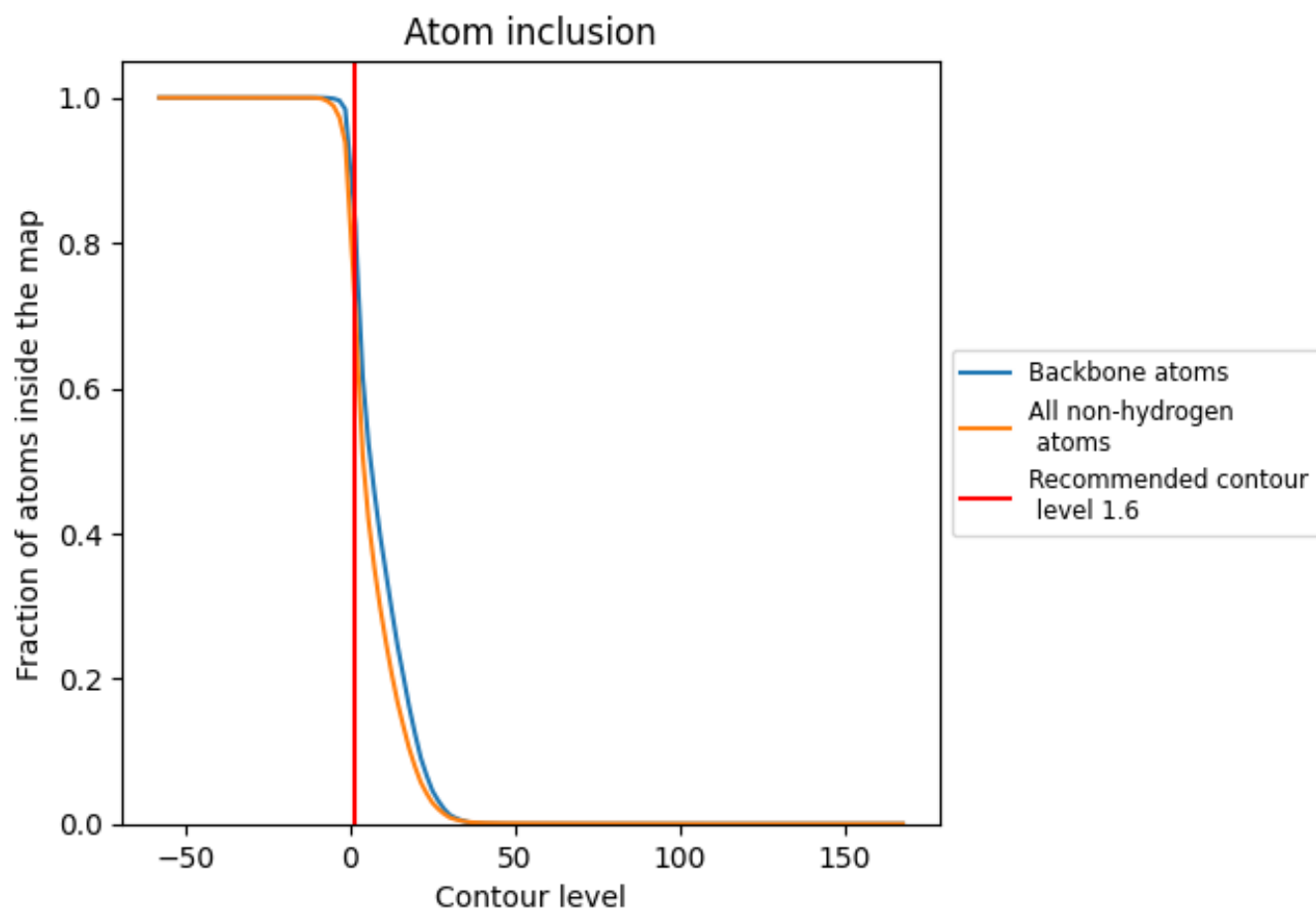
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

## 9.3 Atom inclusion mapped to coordinate model [\(i\)](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (1.6).





























## 9.4 Atom inclusion [i](#)



At the recommended contour level, 82% of all backbone atoms, 71% of all non-hydrogen atoms, are inside the map.

## 9.5 Map-model fit summary

The table lists the average atom inclusion at the recommended contour level (1.6) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7069	 0.2370
A	 0.6208	 0.1670
B	 0.7623	 0.2840
D	 0.7955	 0.2870
E	 0.8677	 0.3220
F	 0.8616	 0.3340
G	 0.8724	 0.3860
H	 0.5906	 0.1350
I	 0.8616	 0.3970
J	 0.6493	 0.1490
K	 0.6671	 0.1870
L	 0.4521	 0.0880
M	 0.5113	 0.0790
N	 0.6111	 0.1380

