Full wwPDB EM Validation Report (i)

Dec 15, 2025 – 06:34 PM JST

PDB ID	:	9IMM / pdb_00009imm
EMDB ID	:	EMD-60693
Title	:	SARS-CoV-2 Replication-Transcription Complex has a dimer architecture (local dRTC) in post-capping state
Authors	:	Yan, L.M.; Rao, Z.H.; Lou, Z.Y.
Deposited on	:	2024-07-03
Resolution	:	3.22 Å(reported)

This is a Full wwPDB EM 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/EMValidationReportHelp
with specific help available everywhere you see the (i) 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 (1)) were used in the production of this report:

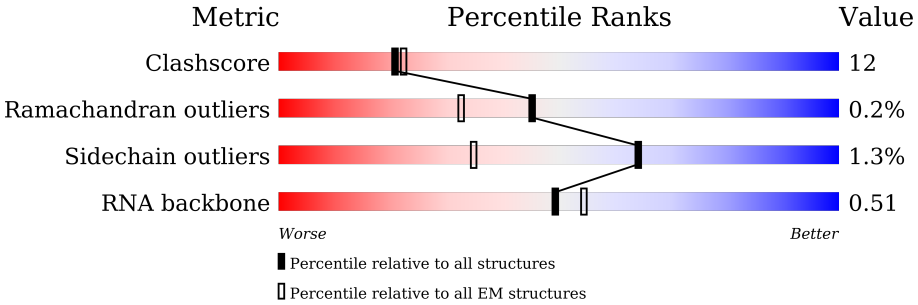
EMDB validation analysis	:	0.0.1.dev129
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.47

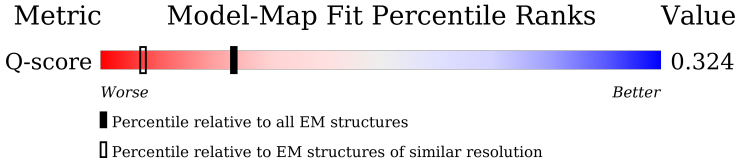
1 Overall quality at a glance (i)

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

The reported resolution of this entry is 3.22 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)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
RNA backbone	6643	2191	-
Q-score	-	25397	14612 (2.72 - 3.72)

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 >=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% 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	A	932	85% 13% ••
2	B	198	• 72% 22% • 6%
2	D	198	5% 58% 32% • • 6%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
3	C	83	58% 29% 13%
4	E	601	55% 70% 27% •
4	F	601	55% 73% 24% •
5	G	113	12% 62% 37% •
6	O	10	40% 60% 10% 20% 10%
7	P	40	10% 20% 70% 10%
8	Q	9	56% 11% 78% 11%
9	R	59	7% 29% 31% 17% 24%

2 Entry composition (i)

There are 11 unique types of molecules in this entry. The entry contains 22938 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 RNA-directed RNA polymerase nsp12.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	926	7473	4772	1256	1391	54	3	0

- Molecule 2 is a protein called Non-structural protein 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	187	1408	879	243	275	11	0	0
2	D	186	1418	892	243	272	11	0	0

- Molecule 3 is a protein called Non-structural protein 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	72	553	349	91	107	6	0	0

- Molecule 4 is a protein called Helicase nsp13.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	E	585	4500	2870	749	847	34	1	0
4	F	584	4488	2861	748	845	34	1	0

- Molecule 5 is a protein called Viral protein genome-linked nsp9.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	G	113	868	549	150	164	5	0	0

- Molecule 6 is a RNA chain called RNA (5'-D(*(ATP))-R(P*UP*UP*AP*AP*AP*GP*GP*UP*U)-3').

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
6	O	10	223	96	38	77	12	0	0

- Molecule 7 is a RNA chain called RNA (40-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
7	P	40	853	380	151	280	42	0	0

- Molecule 8 is a RNA chain called RNA (5'-R(P*AP*AP*CP*CP*UP*UP*CP*CP*C)-3').

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
8	Q	9	184	83	29	63	9	0	0

- Molecule 9 is a RNA chain called RNA (59-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
9	R	45	955	427	164	319	45	0	0

- Molecule 10 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
			Total	Zn	
10	A	2	2	2	0
10	E	3	3	3	0
10	F	3	3	3	0

- Molecule 11 is water.

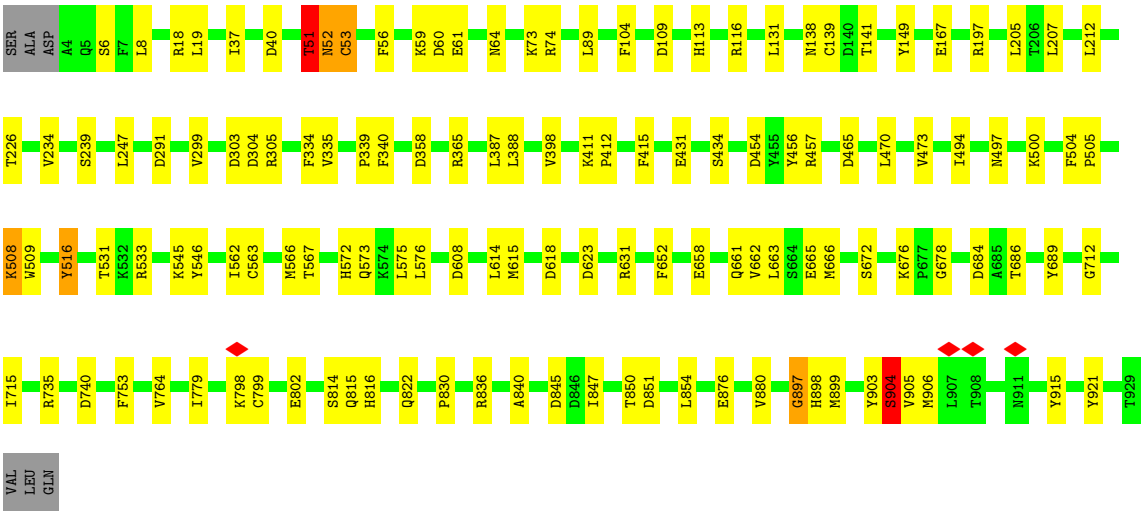
Mol	Chain	Residues	Atoms		AltConf
			Total	O	
11	A	5	5	5	0
11	G	1	1	1	0
11	O	1	1	1	0

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.

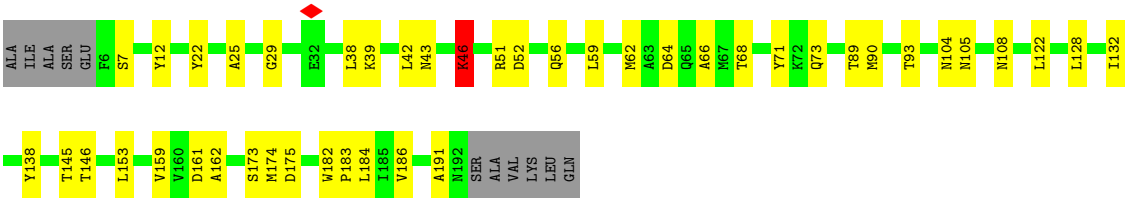
• Molecule 1: RNA-directed RNA polymerase nsp12

Chain A:



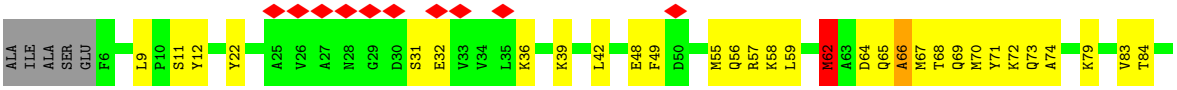
• Molecule 2: Non-structural protein 8

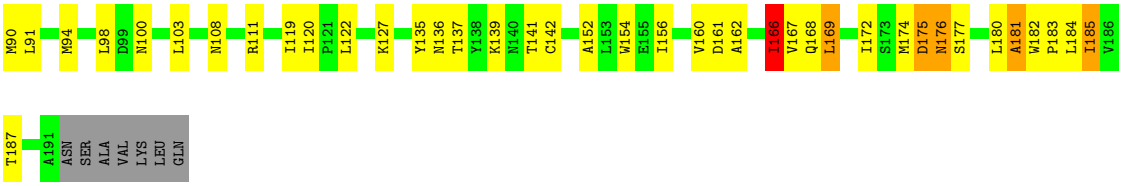
Chain B:



• Molecule 2: Non-structural protein 8

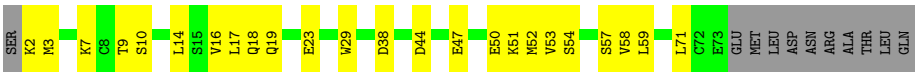
Chain D:





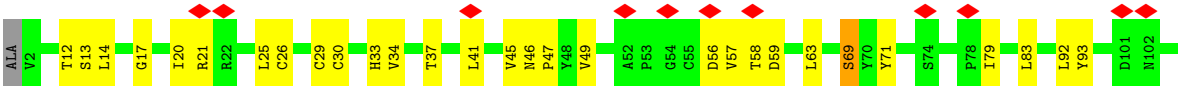
- Molecule 3: Non-structural protein 7

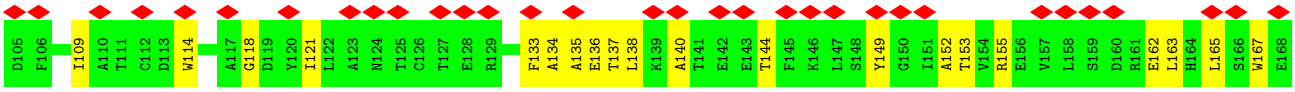
Chain C:

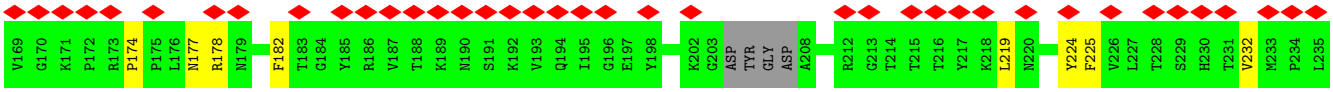


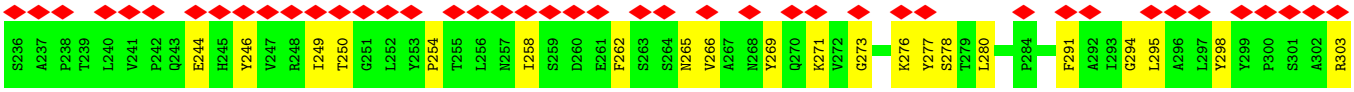
- Molecule 4: Helicase nsp13

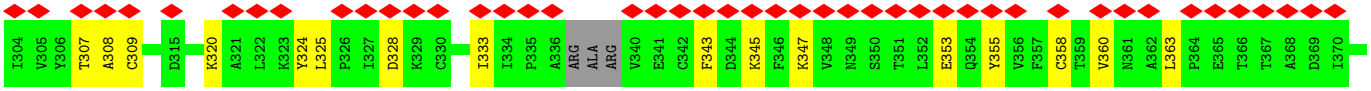
Chain E:

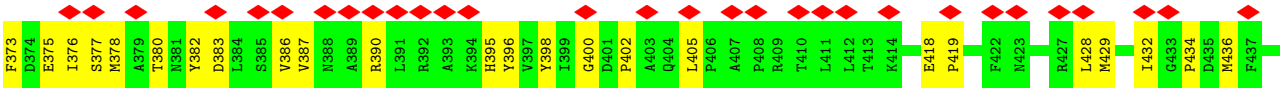


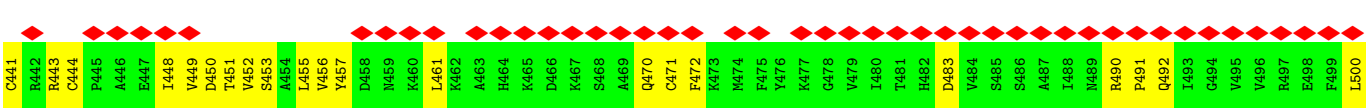


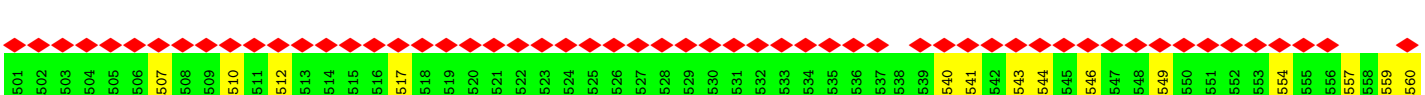






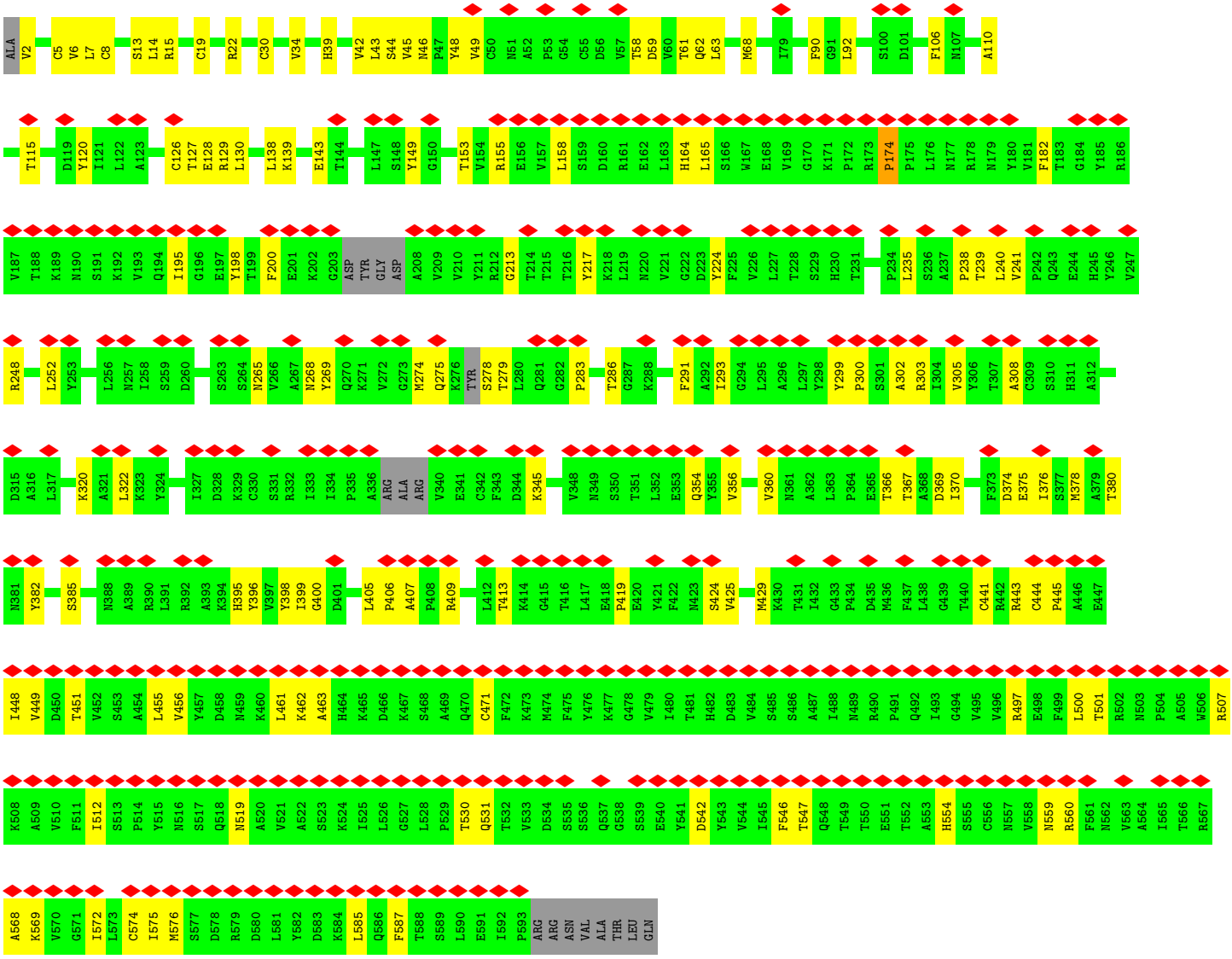






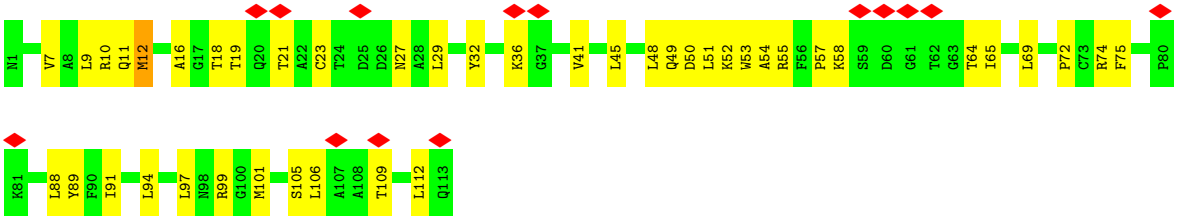
- Molecule 4: Helicase nsp13

Chain F: 55% 73% 24%



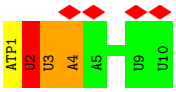
- Molecule 5: Viral protein genome-linked nsp9

Chain G: 12% 62% 37%



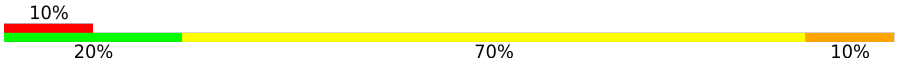
- Molecule 6: RNA (5'-D(*(ATP))-R(P*UP*UP*AP*AP*AP*GP*GP*UP*U)-3')

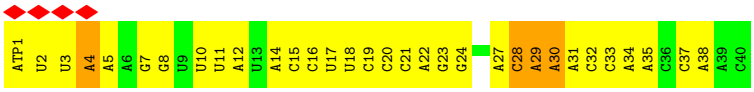
Chain O:



• Molecule 7: RNA (40-MER)

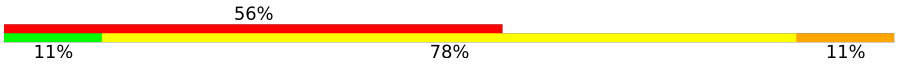
Chain P:





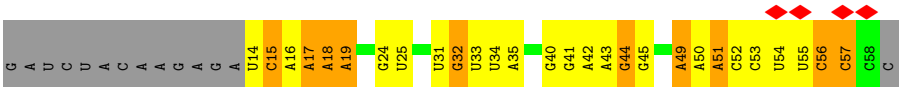
• Molecule 8: RNA (5'-R(P*AP*AP*CP*CP*UP*UP*CP*CP*C)-3')

Chain Q:



• Molecule 9: RNA (59-MER)

Chain R:



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	268970	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS TALOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	20	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor
Maximum map value	1.964	Depositor
Minimum map value	-1.234	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.043	Depositor
Recommended contour level	0.2	Depositor
Map size (Å)	360.8, 360.8, 360.8	wwPDB
Map dimensions	440, 440, 440	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.82, 0.82, 0.82	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: ATP, ZN

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	0.26	0/7662	0.50	10/10397 (0.1%)
2	B	0.33	0/1426	0.52	1/1935 (0.1%)
2	D	0.60	1/1437 (0.1%)	0.93	14/1948 (0.7%)
3	C	0.20	0/556	0.48	0/749
4	E	0.21	0/4602	0.44	4/6273 (0.1%)
4	F	0.17	0/4588	0.40	1/6252 (0.0%)
5	G	0.18	0/884	0.50	0/1200
6	O	0.26	0/214	0.63	1/331 (0.3%)
7	P	0.13	0/918	0.31	0/1425
8	Q	0.12	0/203	0.30	0/312
9	R	0.12	0/1066	0.33	0/1658
All	All	0.26	1/23556 (0.0%)	0.49	31/32480 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
2	B	0	1
2	D	0	1
All	All	0	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	74	ALA	CA-C	-6.73	1.43	1.52

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	504	PHE	CA-C-N	-12.09	108.46	120.31
1	A	504	PHE	C-N-CA	-12.09	108.46	120.31
2	D	74	ALA	N-CA-C	-12.01	97.89	112.54
2	D	176	ASN	N-CA-C	-9.80	101.50	112.57
1	A	505	PRO	N-CA-C	-9.47	97.17	111.57
2	D	67	MET	N-CA-C	-8.95	102.38	113.20
4	E	46	ASN	CA-C-N	-8.32	112.16	120.31
4	E	46	ASN	C-N-CA	-8.32	112.16	120.31
2	D	66	ALA	N-CA-C	-8.13	102.25	112.90
2	D	62	MET	N-CA-C	-7.57	103.11	111.36
2	D	177	SER	CA-C-N	-7.39	111.95	120.89
2	D	177	SER	C-N-CA	-7.39	111.95	120.89
1	A	897	GLY	O-C-N	-7.32	115.16	122.18
1	A	52	ASN	CB-CA-C	-7.24	101.09	111.95
4	E	46	ASN	N-CA-C	-6.77	97.01	109.06
2	D	182	TRP	N-CA-C	6.71	124.64	109.81
2	D	181	ALA	N-CA-C	-6.40	101.01	110.48
4	E	69	SER	N-CA-C	6.27	116.85	108.38
4	F	174	PRO	N-CA-C	6.26	118.34	110.70
2	B	46	LYS	N-CA-C	-6.18	105.70	113.18
2	D	166	ILE	N-CA-C	5.97	116.96	110.21
1	A	516	TYR	N-CA-C	-5.81	106.16	113.72
1	A	504	PHE	N-CA-CB	5.78	120.66	110.37
1	A	52	ASN	N-CA-C	5.73	119.09	111.30
2	D	185	ILE	N-CA-C	-5.68	100.10	108.85
1	A	904	SER	N-CA-C	5.58	122.68	110.80
2	D	175	ASP	N-CA-C	-5.40	106.86	113.50
6	O	2	U	O5'-P-OP2	5.19	123.57	108.00
1	A	53	CYS	N-CA-C	5.17	116.27	108.46
2	D	169	LEU	N-CA-C	5.10	118.64	112.93
2	D	73	GLN	N-CA-C	-5.08	99.99	110.80

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	182	TRP	Peptide
2	D	69	GLN	Mainchain

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	7473	0	7213	102	0
2	B	1408	0	1394	34	0
2	D	1418	0	1427	47	0
3	C	553	0	585	26	0
4	E	4500	0	4414	126	0
4	F	4488	0	4404	113	0
5	G	868	0	880	44	0
6	O	223	0	107	4	0
7	P	853	0	432	29	0
8	Q	184	0	98	6	0
9	R	955	0	481	28	0
10	A	2	0	0	0	0
10	E	3	0	0	0	0
10	F	3	0	0	0	0
11	A	5	0	0	0	0
11	G	1	0	0	0	0
11	O	1	0	0	0	0
All	All	22938	0	21435	524	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 12.

All (524) 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)
4:E:373:PHE:HE2	4:E:396:TYR:CE1	1.56	1.22
1:A:138:ASN:OD1	1:A:138:ASN:O	1.62	1.15
4:E:373:PHE:CE2	4:E:396:TYR:HE1	1.71	1.08
4:E:373:PHE:CE2	4:E:396:TYR:CE1	2.42	1.07
4:F:158:LEU:HD11	4:F:164:HIS:CD2	1.87	1.07
5:G:52:LYS:HB2	5:G:53:TRP:CE3	1.91	1.04
4:E:262:PHE:CE1	4:E:294:GLY:HA2	1.95	1.02
5:G:52:LYS:HB2	5:G:53:TRP:CZ3	1.99	0.97
4:F:252:LEU:HD22	4:F:299:TYR:CG	2.00	0.96
2:B:66:ALA:HA	4:F:68:MET:HE1	1.50	0.92

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:19:GLN:HE22	2:D:84:THR:HA	1.40	0.87
4:F:252:LEU:HD22	4:F:299:TYR:CD1	2.09	0.87
4:E:373:PHE:HE2	4:E:396:TYR:HE1	0.91	0.86
4:F:127:THR:HG22	4:F:130:LEU:HG	1.60	0.83
1:A:226:THR:HG21	5:G:75:PHE:HB3	1.59	0.83
4:F:542:ASP:HA	4:F:569:LYS:HB2	1.61	0.82
4:F:375:GLU:HB3	4:F:378:MET:HE2	1.62	0.82
5:G:18:THR:O	5:G:53:TRP:CE3	2.33	0.82
2:B:71:TYR:CE2	4:F:92:LEU:HD22	2.14	0.82
5:G:10:ARG:NH2	5:G:11:GLN:HG3	1.95	0.82
4:F:374:ASP:HA	4:F:399:ILE:HG23	1.62	0.81
3:C:19:GLN:NE2	2:D:84:THR:HA	1.96	0.81
4:E:419:PRO:HG3	4:E:559:ASN:HD21	1.44	0.80
5:G:10:ARG:HH22	5:G:11:GLN:HG3	1.47	0.79
4:E:376:ILE:HG22	4:E:400:GLY:HA3	1.63	0.79
4:F:19:CYS:SG	4:F:39:HIS:HE1	2.07	0.78
4:F:7:LEU:HD21	4:F:106:PHE:HD2	1.48	0.78
1:A:779:ILE:HD11	1:A:799:CYS:SG	2.25	0.77
4:E:280:LEU:HG	4:E:436:MET:CE	2.15	0.75
7:P:30:A:H2'	7:P:31:A:H8	1.51	0.75
4:F:248:ARG:HA	4:F:274:MET:HE1	1.68	0.75
7:P:29:A:H2'	7:P:30:A:H8	1.52	0.74
2:D:160:VAL:HG12	2:D:166:ILE:HA	1.68	0.74
1:A:335:VAL:HG11	1:A:340:PHE:CE1	2.24	0.73
1:A:509:TRP:HH2	2:B:90:MET:HE3	1.54	0.72
4:E:12:THR:HG22	4:E:14:LEU:H	1.55	0.72
4:F:7:LEU:HD21	4:F:106:PHE:CD2	2.25	0.71
4:E:92:LEU:HD13	4:E:93:TYR:CE1	2.25	0.71
2:D:90:MET:O	2:D:94:MET:HG3	1.91	0.70
2:B:71:TYR:CD2	4:F:92:LEU:HD22	2.25	0.70
3:C:71:LEU:HD23	2:D:111:ARG:HE	1.55	0.70
5:G:12:MET:HE3	5:G:12:MET:HA	1.74	0.70
4:E:20:ILE:HD12	4:E:20:ILE:H	1.55	0.69
4:F:158:LEU:HD11	4:F:164:HIS:NE2	2.07	0.69
1:A:138:ASN:O	1:A:138:ASN:CG	2.35	0.69
5:G:91:ILE:HD12	5:G:91:ILE:H	1.57	0.69
4:E:250:THR:O	4:E:395:HIS:NE2	2.20	0.68
4:E:402:PRO:O	4:E:559:ASN:ND2	2.27	0.68
1:A:454:ASP:O	1:A:457:ARG:NH1	2.27	0.68
4:E:441:CYS:HB2	4:E:461:LEU:HD11	1.75	0.68
1:A:494:ILE:O	1:A:573:GLN:NE2	2.27	0.67

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:73[A]:LYS:HD3	1:A:116:ARG:HH21	1.59	0.67
1:A:847:ILE:HD13	2:D:83:VAL:HG12	1.76	0.67
4:F:6:VAL:HG22	4:F:129:ARG:HH21	1.59	0.67
1:A:497:ASN:HD22	1:A:500:LYS:HE2	1.60	0.67
7:P:29:A:H2'	7:P:30:A:C8	2.29	0.67
4:F:252:LEU:HB3	4:F:299:TYR:CZ	2.31	0.66
4:E:152:ALA:HB1	4:E:165:LEU:HD12	1.77	0.66
7:P:30:A:H2'	7:P:31:A:C8	2.28	0.66
1:A:662:VAL:CA	1:A:665:GLU:OE1	2.43	0.66
4:E:265:ASN:HB2	4:E:269:TYR:CE1	2.31	0.66
4:E:455:LEU:HG	4:E:456:VAL:HG13	1.78	0.66
9:R:53:C:H2'	9:R:54:U:C6	2.31	0.65
1:A:563:CYS:O	1:A:567:THR:HG23	1.96	0.65
2:D:11:SER:HG	2:D:49:PHE:HD2	1.43	0.65
9:R:40:G:H2'	9:R:41:G:H8	1.61	0.65
2:D:36:LYS:HA	2:D:39:LYS:HG2	1.79	0.65
7:P:5:A:N6	9:R:56:C:O2	2.29	0.65
1:A:661:GLN:C	1:A:665:GLU:OE1	2.40	0.65
5:G:10:ARG:NH2	5:G:11:GLN:O	2.31	0.64
4:F:239:THR:OG1	4:F:424:SER:HB2	1.98	0.64
1:A:851:ASP:HB2	2:D:79:LYS:HE2	1.78	0.64
4:F:451:THR:HG21	4:F:585:LEU:HD23	1.79	0.64
1:A:398:VAL:HG11	1:A:666:MET:HE2	1.80	0.63
4:E:277:TYR:HB2	4:E:398:TYR:HE1	1.64	0.63
4:F:15:ARG:HG2	4:F:43:LEU:HB2	1.80	0.63
4:F:68:MET:HE2	4:F:68:MET:HA	1.78	0.63
1:A:398:VAL:HG11	1:A:666:MET:CE	2.29	0.63
2:B:132:ILE:HD13	2:B:138:TYR:HD2	1.64	0.62
3:C:9:THR:HG21	2:D:98:LEU:HD11	1.81	0.62
2:D:108:ASN:O	2:D:111:ARG:HG2	1.99	0.62
7:P:7:G:H2'	7:P:8:G:H8	1.63	0.62
4:E:280:LEU:HD21	4:E:436:MET:HB2	1.82	0.62
4:F:429:MET:SD	4:F:429:MET:N	2.65	0.62
5:G:32:TYR:HA	5:G:41:VAL:HA	1.82	0.61
4:E:418:GLU:HG3	4:E:419:PRO:HD2	1.82	0.61
4:E:262:PHE:CZ	4:E:294:GLY:HA2	2.34	0.61
2:B:71:TYR:HE2	4:F:92:LEU:HD22	1.60	0.61
4:E:177:ASN:OD1	4:E:178:ARG:N	2.31	0.61
4:F:279:THR:HG22	4:F:398:TYR:HD2	1.65	0.61
4:F:376:ILE:HG22	4:F:400:GLY:HA3	1.82	0.61
3:C:71:LEU:CD2	2:D:111:ARG:HE	2.14	0.60

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
9:R:14:U:H2'	9:R:15:C:H4'	1.82	0.60
4:E:280:LEU:HG	4:E:436:MET:HE3	1.83	0.60
4:E:280:LEU:HG	4:E:436:MET:HE2	1.82	0.60
8:Q:135:C:H2'	8:Q:136:U:C6	2.37	0.60
2:B:73:GLN:HE22	4:F:46:ASN:HD21	1.47	0.60
4:E:500:LEU:HD22	4:E:507:ARG:HG3	1.83	0.60
4:F:19:CYS:O	4:F:22:ARG:NH1	2.33	0.60
9:R:54:U:H2'	9:R:55:U:C6	2.37	0.60
4:E:373:PHE:HE2	4:E:396:TYR:CZ	2.17	0.59
4:F:248:ARG:HA	4:F:274:MET:CE	2.31	0.59
4:F:568:ALA:HB2	4:F:572:ILE:HD12	1.83	0.59
4:E:444:CYS:HB3	4:E:448:ILE:HD12	1.83	0.59
4:F:158:LEU:CD1	4:F:164:HIS:CD2	2.76	0.59
4:E:360:VAL:HG13	4:E:387:VAL:HG23	1.83	0.59
4:E:453:SER:HA	4:E:457:TYR:HB2	1.83	0.59
4:E:278:SER:HB2	4:E:436:MET:HE1	1.85	0.59
2:D:58:LYS:HD2	4:E:79:ILE:HG21	1.84	0.59
4:F:182:PHE:N	4:F:198:TYR:O	2.35	0.59
7:P:11:U:H2'	7:P:12:A:H8	1.66	0.59
4:E:280:LEU:CD2	4:E:436:MET:HB2	2.34	0.58
1:A:576:LEU:HD11	1:A:686:THR:HG22	1.86	0.58
4:F:380:THR:HG23	4:F:382:TYR:H	1.69	0.58
7:P:28:C:H2'	7:P:29:A:C8	2.39	0.58
4:F:59:ASP:O	4:F:63:LEU:HD23	2.03	0.58
3:C:16:VAL:HG11	2:D:91:LEU:HD22	1.85	0.58
1:A:74:ARG:HD3	1:A:113:HIS:CD2	2.37	0.58
7:P:4:A:N6	9:R:56:C:O2'	2.37	0.57
4:E:363:LEU:HD12	4:E:387:VAL:HG22	1.85	0.57
4:E:443:ARG:HG3	4:E:569:LYS:HG2	1.85	0.57
4:F:376:ILE:HG12	4:F:425:VAL:HG11	1.87	0.57
2:B:22:TYR:HA	2:B:38:LEU:HD21	1.86	0.57
2:D:156:ILE:HD12	2:D:156:ILE:H	1.70	0.57
4:F:13:SER:HB2	4:F:92:LEU:HD12	1.87	0.57
4:F:252:LEU:HD13	4:F:299:TYR:CE2	2.40	0.57
1:A:531:THR:HG21	1:A:567:THR:HG21	1.86	0.57
4:E:554:HIS:O	4:E:560:ARG:NH1	2.37	0.56
5:G:48:LEU:HD13	5:G:51:LEU:HD11	1.88	0.56
9:R:43:A:H2'	9:R:44:G:C8	2.40	0.56
9:R:43:A:H2'	9:R:44:G:H8	1.70	0.56
4:E:219:LEU:HD12	4:E:219:LEU:H	1.70	0.56
9:R:17:A:H4'	9:R:18:A:OP1	2.05	0.56

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
9:R:41:G:H2'	9:R:42:A:H8	1.69	0.56
2:B:89:THR:O	2:B:93:THR:HG22	2.06	0.56
4:F:512:ILE:HG23	4:F:546:PHE:HD1	1.68	0.56
5:G:16:ALA:N	5:G:27:ASN:OD1	2.38	0.56
4:F:115:THR:HG23	4:F:413:THR:OG1	2.05	0.56
2:B:104:ASN:OD1	2:B:108:ASN:ND2	2.38	0.56
8:Q:136:U:H2'	8:Q:137:U:C6	2.41	0.56
2:D:137:THR:O	2:D:141:THR:HG23	2.06	0.56
5:G:19:THR:HA	5:G:53:TRP:CD2	2.41	0.55
5:G:16:ALA:HA	5:G:54:ALA:HA	1.87	0.55
4:E:12:THR:HG22	4:E:13:SER:N	2.21	0.55
4:F:61:THR:OG1	4:F:62:GLN:OE1	2.17	0.55
5:G:49:GLN:O	5:G:89:TYR:OH	2.22	0.55
1:A:73[A]:LYS:HD3	1:A:116:ARG:NH2	2.22	0.55
2:B:73:GLN:HE22	4:F:46:ASN:ND2	2.05	0.55
2:B:132:ILE:HG21	2:B:138:TYR:HB2	1.89	0.55
5:G:94:LEU:O	5:G:99:ARG:NH1	2.39	0.55
3:C:58:VAL:HG22	2:D:119:ILE:HG22	1.88	0.55
4:E:328:ASP:O	4:E:347:LYS:NZ	2.40	0.55
5:G:11:GLN:C	5:G:12:MET:SD	2.89	0.55
4:E:277:TYR:HB2	4:E:398:TYR:CE1	2.42	0.55
4:F:546:PHE:HE2	4:F:576:MET:HE1	1.71	0.55
9:R:50:A:H2'	9:R:51:A:C8	2.42	0.55
4:F:455:LEU:HG	4:F:456:VAL:HG13	1.89	0.55
4:F:252:LEU:HD22	4:F:299:TYR:CD2	2.42	0.54
3:C:10:SER:OG	3:C:52:MET:SD	2.60	0.54
4:E:47:PRO:HB2	4:E:49:VAL:HG12	1.89	0.54
4:F:120:TYR:HE2	4:F:138:LEU:HD22	1.72	0.54
4:E:26:CYS:SG	4:E:29:CYS:HB2	2.47	0.54
4:E:114:TRP:HZ2	4:E:137:THR:HG23	1.73	0.54
4:E:140:ALA:O	4:E:144:THR:HG23	2.07	0.54
4:E:443:ARG:CZ	4:E:540:GLU:HB3	2.38	0.54
4:E:471:CYS:O	4:E:472:PHE:HD2	1.89	0.54
1:A:431:GLU:OE2	1:A:431:GLU:N	2.27	0.54
1:A:662:VAL:N	1:A:665:GLU:OE1	2.41	0.54
7:P:28:C:H2'	7:P:29:A:H8	1.71	0.54
1:A:662:VAL:HA	1:A:665:GLU:OE1	2.06	0.54
2:D:55:MET:O	2:D:59:LEU:HG	2.08	0.54
4:F:406:PRO:HB2	4:F:409:ARG:HH12	1.71	0.54
2:D:9:LEU:O	2:D:12:TYR:HB3	2.08	0.54
8:Q:132:A:H2'	8:Q:133:A:C8	2.42	0.54

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:F:405:LEU:HD13	4:F:406:PRO:HD2	1.89	0.54
2:B:173:SER:OG	2:B:175:ASP:OD1	2.25	0.54
5:G:23:CYS:SG	5:G:55:ARG:HG2	2.48	0.54
7:P:11:U:H2'	7:P:12:A:C8	2.42	0.54
3:C:18:GLN:HB2	3:C:29:TRP:CH2	2.43	0.53
9:R:52:C:H2'	9:R:53:C:C6	2.43	0.53
1:A:365:ARG:HH11	1:A:365:ARG:HA	1.72	0.53
4:E:271:LYS:HD3	4:E:436:MET:SD	2.48	0.53
4:E:450:ASP:OD1	4:E:451:THR:N	2.41	0.53
1:A:676:LYS:NZ	1:A:678:GLY:O	2.34	0.53
2:D:135:TYR:O	2:D:139:LYS:HG3	2.08	0.53
8:Q:134:C:H2'	8:Q:135:C:C6	2.43	0.53
5:G:10:ARG:CZ	5:G:11:GLN:H	2.22	0.53
1:A:456:TYR:HE1	1:A:676:LYS:HD2	1.74	0.53
4:E:12:THR:HG21	4:E:25:LEU:O	2.08	0.53
1:A:618:ASP:HB3	1:A:798:LYS:HE2	1.91	0.53
2:B:145:THR:HG23	2:B:146:THR:HG23	1.91	0.53
2:D:100:ASN:HB3	2:D:103:LEU:HD12	1.91	0.53
4:F:13:SER:CB	4:F:92:LEU:HD12	2.38	0.53
4:F:139:LYS:O	4:F:143:GLU:HG2	2.09	0.53
2:B:59:LEU:O	2:B:62:MET:HG3	2.09	0.53
2:B:162:ALA:HB2	2:B:183:PRO:HD2	1.91	0.53
3:C:54:SER:HB2	2:D:122:LEU:HD21	1.90	0.53
2:D:22:TYR:HB2	2:D:42:LEU:HD13	1.90	0.53
4:E:378:MET:SD	4:E:378:MET:N	2.81	0.52
1:A:434:SER:OG	1:A:876:GLU:OE1	2.27	0.52
9:R:34:U:H2'	9:R:35:A:H8	1.75	0.52
4:E:557:ASN:HB3	4:E:560:ARG:HB3	1.91	0.52
1:A:291:ASP:OD1	1:A:291:ASP:N	2.42	0.52
1:A:335:VAL:CG1	1:A:340:PHE:CE1	2.92	0.52
3:C:50:GLU:CD	3:C:50:GLU:H	2.17	0.52
2:D:48:GLU:N	2:D:48:GLU:OE2	2.42	0.52
2:D:162:ALA:HB2	2:D:183:PRO:HB2	1.90	0.52
1:A:572:HIS:HA	1:A:575:LEU:HB3	1.92	0.52
9:R:51:A:H2'	9:R:52:C:O4'	2.10	0.52
1:A:897:GLY:O	1:A:898:HIS:C	2.49	0.52
1:A:365:ARG:HA	1:A:365:ARG:NH1	2.25	0.52
1:A:615:MET:HE3	1:A:764:VAL:HG11	1.91	0.52
5:G:10:ARG:CZ	5:G:11:GLN:HG3	2.39	0.52
1:A:545:LYS:HE2	9:R:19:A:H62	1.74	0.52
5:G:52:LYS:CB	5:G:53:TRP:CZ3	2.85	0.52

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:6:SER:HB3	1:A:104:PHE:HZ	1.75	0.51
4:F:574:CYS:HB3	4:F:576:MET:SD	2.50	0.51
5:G:18:THR:O	5:G:53:TRP:CZ3	2.63	0.51
4:E:262:PHE:CE1	4:E:294:GLY:CA	2.84	0.51
4:F:19:CYS:SG	4:F:110:ALA:HB1	2.50	0.51
2:B:66:ALA:CA	4:F:68:MET:HE1	2.33	0.51
1:A:470:LEU:O	1:A:473:VAL:HG12	2.10	0.51
1:A:623:ASP:OD1	1:A:623:ASP:N	2.44	0.51
4:E:360:VAL:HG11	4:E:383:ASP:HB3	1.92	0.51
1:A:576:LEU:HD22	1:A:689:TYR:CG	2.45	0.51
3:C:47:GLU:HA	3:C:50:GLU:OE2	2.11	0.51
1:A:545:LYS:HG3	1:A:546:TYR:H	1.74	0.51
7:P:23:G:H2'	7:P:24:G:C8	2.45	0.51
7:P:31:A:H2'	7:P:32:C:C6	2.45	0.51
2:D:11:SER:OG	2:D:49:PHE:HD2	1.94	0.51
2:B:56:GLN:O	2:B:59:LEU:HG	2.11	0.51
4:E:136:GLU:HA	4:E:382:TYR:CE2	2.46	0.51
4:F:322:LEU:HD13	4:F:345:LYS:HD3	1.93	0.51
4:E:471:CYS:C	4:E:472:PHE:HD2	2.19	0.50
7:P:23:G:H2'	7:P:24:G:H8	1.76	0.50
9:R:31:U:H2'	9:R:32:G:C8	2.46	0.50
9:R:34:U:H2'	9:R:35:A:C8	2.46	0.50
1:A:207:LEU:H	1:A:207:LEU:HD23	1.76	0.50
4:F:126:CYS:HB2	4:F:130:LEU:HD12	1.93	0.50
4:E:405:LEU:HD21	4:E:560:ARG:HB2	1.94	0.50
9:R:53:C:H2'	9:R:54:U:H6	1.75	0.50
3:C:38:ASP:OD1	3:C:51:LYS:CD	2.59	0.50
5:G:58:LYS:HE3	5:G:65:ILE:HG23	1.93	0.50
8:Q:135:C:H2'	8:Q:136:U:H6	1.76	0.50
4:F:44:SER:OG	4:F:45:VAL:N	2.44	0.50
9:R:41:G:H2'	9:R:42:A:C8	2.46	0.50
4:E:59:ASP:O	4:E:63:LEU:HD23	2.12	0.50
4:F:278:SER:N	4:F:396:TYR:O	2.44	0.49
9:R:49:A:H2'	9:R:50:A:H8	1.76	0.49
1:A:18:ARG:HB2	1:A:59:LYS:HB2	1.94	0.49
4:F:283:PRO:HG2	4:F:461:LEU:HD13	1.94	0.49
4:E:33:HIS:O	4:E:37:THR:OG1	2.28	0.49
4:F:443:ARG:HG3	4:F:569:LYS:HZ2	1.77	0.49
5:G:72:PRO:HB3	5:G:89:TYR:CZ	2.47	0.49
2:D:39:LYS:HA	2:D:42:LEU:HB3	1.94	0.49
4:E:380:THR:OG1	4:E:383:ASP:OD2	2.28	0.49

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:E:167:TRP:CZ3	4:E:174:PRO:HD2	2.48	0.49
4:E:449:VAL:HG13	4:E:461:LEU:HG	1.95	0.49
4:F:153:THR:HA	4:F:224:TYR:HA	1.95	0.48
7:P:18:U:H2'	7:P:19:C:C6	2.48	0.48
2:B:64:ASP:O	2:B:68:THR:HG23	2.13	0.48
3:C:3:MET:HE3	3:C:7:LYS:HE3	1.96	0.48
4:F:546:PHE:CE2	4:F:576:MET:HE1	2.49	0.48
1:A:658:GLU:O	1:A:662:VAL:HG22	2.14	0.48
4:F:30:CYS:O	4:F:34:VAL:HG22	2.13	0.48
4:F:407:ALA:O	4:F:409:ARG:NH1	2.40	0.48
5:G:75:PHE:CZ	5:G:88:LEU:HB2	2.48	0.48
7:P:27:A:O2'	7:P:28:C:H5'	2.13	0.48
3:C:18:GLN:OE1	3:C:19:GLN:N	2.47	0.48
4:F:265:ASN:HB3	4:F:269:TYR:CE2	2.49	0.48
1:A:753:PHE:CZ	1:A:764:VAL:HG21	2.49	0.48
1:A:876:GLU:O	1:A:880:VAL:HG23	2.13	0.48
4:F:128:GLU:HG3	4:F:238:PRO:HB3	1.94	0.48
9:R:40:G:H2'	9:R:41:G:C8	2.45	0.48
3:C:57:SER:OG	2:D:120:ILE:HG13	2.14	0.48
4:E:303:ARG:NH1	4:E:353:GLU:O	2.47	0.48
4:E:428:LEU:O	4:E:432:ILE:N	2.43	0.48
4:E:471:CYS:HA	4:E:572:ILE:HG22	1.96	0.48
3:C:23:GLU:HA	3:C:29:TRP:HB2	1.94	0.48
4:E:483:ASP:OD2	4:E:517:SER:OG	2.24	0.48
7:P:27:A:H2'	7:P:28:C:C6	2.49	0.48
2:B:39:LYS:HD2	2:B:42:LEU:HD11	1.94	0.48
4:E:309:CYS:HA	4:E:360:VAL:HG23	1.95	0.48
4:E:492:GLN:HE22	4:E:549:THR:H	1.62	0.48
4:E:557:ASN:OD1	4:E:560:ARG:N	2.41	0.48
1:A:614:LEU:HB2	1:A:802:GLU:HB3	1.96	0.48
5:G:19:THR:HA	5:G:53:TRP:CE3	2.48	0.47
7:P:14:A:H2'	7:P:15:C:C6	2.49	0.47
1:A:8:LEU:HD11	1:A:19:LEU:HB2	1.96	0.47
2:B:73:GLN:OE1	4:F:46:ASN:OD1	2.32	0.47
4:E:436:MET:SD	4:E:436:MET:N	2.87	0.47
4:F:2:VAL:HG22	4:F:13:SER:HB2	1.95	0.47
4:F:239:THR:HG1	4:F:424:SER:HB2	1.79	0.47
2:B:159:VAL:HG22	2:B:186:VAL:HG22	1.96	0.47
4:E:155:ARG:HD2	4:E:155:ARG:C	2.39	0.47
1:A:415:PHE:HE2	2:D:94:MET:HE1	1.80	0.47
3:C:50:GLU:HA	3:C:53:VAL:HG12	1.95	0.47

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:62:MET:HE2	2:D:62:MET:HB2	1.68	0.47
4:F:239:THR:HG21	4:F:424:SER:OG	2.15	0.47
2:B:7:SER:HA	2:B:12:TYR:HD2	1.80	0.47
2:B:25:ALA:O	2:B:29:GLY:N	2.43	0.47
2:B:42:LEU:HD12	2:B:43:ASN:N	2.29	0.47
4:E:182:PHE:HB3	4:E:225:PHE:HB3	1.97	0.47
4:E:320:LYS:HD2	4:E:324:TYR:HE2	1.78	0.47
4:F:554:HIS:O	4:F:560:ARG:HD2	2.14	0.47
9:R:56:C:H2'	9:R:57:C:C5	2.50	0.47
1:A:358:ASP:OD1	1:A:533:ARG:NH1	2.48	0.47
1:A:415:PHE:CE2	2:D:94:MET:HE1	2.49	0.47
4:E:280:LEU:HD11	4:E:291:PHE:CZ	2.50	0.47
4:F:286:THR:HG22	4:F:441:CYS:HA	1.97	0.47
1:A:387:LEU:HD23	2:B:128:LEU:HD13	1.96	0.47
4:E:118:GLY:O	4:E:121:ILE:HG22	2.14	0.47
4:E:244:GLU:HB2	4:E:276:LYS:HB2	1.96	0.47
4:E:429:MET:HG3	4:E:434:PRO:HB3	1.96	0.47
9:R:49:A:H2'	9:R:50:A:C8	2.50	0.47
1:A:74:ARG:HD3	1:A:113:HIS:HD2	1.80	0.46
1:A:299:VAL:HG23	1:A:652:PHE:CE2	2.51	0.46
4:E:56:ASP:O	4:E:58:THR:HG23	2.15	0.46
1:A:608:ASP:OD2	1:A:608:ASP:C	2.57	0.46
1:A:740:ASP:OD1	1:A:740:ASP:C	2.57	0.46
2:B:174:MET:HE3	2:B:174:MET:O	2.16	0.46
4:E:12:THR:HG22	4:E:13:SER:H	1.81	0.46
4:F:48:TYR:OH	4:F:90:PHE:O	2.25	0.46
1:A:104:PHE:HB3	1:A:113:HIS:HE1	1.81	0.46
1:A:205:LEU:HB2	1:A:234:VAL:HG12	1.98	0.46
1:A:291:ASP:OD2	1:A:735:ARG:NH2	2.49	0.46
2:D:136:ASN:HA	2:D:139:LYS:HD3	1.97	0.46
6:O:4:A:N6	8:Q:138:C:O2'	2.49	0.46
4:E:512:ILE:HG23	4:E:546:PHE:HD1	1.80	0.46
4:F:449:VAL:HG11	4:F:463:ALA:HB2	1.97	0.46
7:P:34:A:H2'	7:P:35:A:C8	2.51	0.46
3:C:50:GLU:O	3:C:53:VAL:HG12	2.16	0.46
4:E:273:GLY:HA2	4:E:395:HIS:CE1	2.51	0.46
9:R:24:G:H2'	9:R:25:U:C6	2.51	0.46
4:E:428:LEU:O	4:E:432:ILE:HG12	2.16	0.46
2:B:153:LEU:HD23	2:B:191:ALA:HB3	1.97	0.46
4:E:140:ALA:HA	4:E:232:VAL:HG21	1.98	0.46
4:F:303:ARG:NH2	4:F:366:THR:OG1	2.48	0.46

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:E:266:VAL:HA	4:E:269:TYR:HD1	1.81	0.46
4:E:455:LEU:HD13	4:E:584:LYS:HD3	1.97	0.46
5:G:21:THR:O	5:G:21:THR:OG1	2.29	0.46
2:D:161:ASP:HB3	2:D:181:ALA:HB3	1.97	0.46
4:E:133:PHE:O	4:E:137:THR:HG22	2.16	0.46
7:P:18:U:H2'	7:P:19:C:H6	1.80	0.46
1:A:847:ILE:O	1:A:850:THR:HB	2.16	0.45
2:B:132:ILE:HD13	2:B:138:TYR:CD2	2.48	0.45
4:F:14:LEU:HD23	4:F:14:LEU:HA	1.75	0.45
2:B:46:LYS:HB2	2:B:46:LYS:HE2	1.39	0.45
2:B:64:ASP:C	2:B:64:ASP:OD1	2.59	0.45
4:F:300:PRO:O	4:F:354:GLN:NE2	2.48	0.45
1:A:845:ASP:C	1:A:845:ASP:OD2	2.58	0.45
4:E:269:TYR:OH	4:E:294:GLY:HA3	2.16	0.45
7:P:10:U:H2'	7:P:11:U:C6	2.52	0.45
1:A:454:ASP:HB3	1:A:457:ARG:HH11	1.82	0.45
4:E:265:ASN:O	4:E:269:TYR:CD1	2.69	0.45
5:G:29:LEU:HB2	5:G:45:LEU:HB3	1.99	0.45
7:P:29:A:O2'	7:P:30:A:OP1	2.35	0.45
9:R:32:G:H2'	9:R:33:U:C6	2.52	0.45
2:D:39:LYS:HE3	2:D:39:LYS:HB2	1.75	0.45
4:F:195:ILE:HG12	4:F:217:TYR:CE2	2.51	0.45
4:F:241:VAL:HG21	4:F:396:TYR:CE2	2.52	0.45
4:F:471:CYS:HB3	4:F:587:PHE:CE2	2.52	0.45
5:G:57:PRO:HA	5:G:64:THR:HA	1.99	0.45
3:C:17:LEU:HD21	3:C:59:LEU:HB2	1.98	0.45
4:F:444:CYS:HB3	4:F:448:ILE:HB	1.99	0.45
4:F:500:LEU:HD22	4:F:507:ARG:HG3	1.99	0.45
5:G:50:ASP:HA	5:G:89:TYR:OH	2.17	0.45
4:F:158:LEU:HD11	4:F:164:HIS:HD2	1.67	0.44
4:F:275:GLN:O	4:F:395:HIS:ND1	2.41	0.44
1:A:19:LEU:HB3	1:A:56:PHE:HB3	1.99	0.44
4:F:129:ARG:HD2	4:F:129:ARG:HA	1.78	0.44
1:A:138:ASN:OD1	1:A:138:ASN:C	2.45	0.44
1:A:508:LYS:H	1:A:508:LYS:HG2	1.41	0.44
1:A:562:ILE:O	1:A:566:MET:HG3	2.17	0.44
1:A:814:SER:C	1:A:815:GLN:HE21	2.25	0.44
4:E:585:LEU:HD11	4:E:587:PHE:CE2	2.52	0.44
6:O:2:U:O2'	6:O:3:U:H5"	2.17	0.44
4:E:30:CYS:O	4:E:34:VAL:HG12	2.18	0.44
4:E:377:SER:OG	4:E:378:MET:SD	2.72	0.44

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:F:126:CYS:SG	4:F:130:LEU:HB2	2.58	0.44
1:A:712:GLY:HA2	1:A:715:ILE:HD12	1.99	0.44
1:A:822:GLN:O	1:A:822:GLN:HG3	2.17	0.44
4:E:17:GLY:HA3	4:E:41:LEU:HB3	1.98	0.44
4:E:114:TRP:CZ2	4:E:137:THR:HG23	2.51	0.44
6:O:2:U:H4'	6:O:3:U:OP1	2.18	0.44
5:G:74:ARG:HD2	5:G:75:PHE:N	2.32	0.44
7:P:17:U:H2'	7:P:18:U:C6	2.52	0.44
2:D:56:GLN:HE22	2:D:57:ARG:HH21	1.65	0.44
7:P:31:A:H2'	7:P:32:C:H6	1.82	0.44
1:A:139:CYS:O	1:A:141:THR:HG22	2.18	0.44
1:A:139:CYS:O	1:A:141:THR:N	2.50	0.44
2:D:56:GLN:HA	2:D:59:LEU:HD12	1.99	0.44
1:A:411:LYS:HB3	1:A:411:LYS:NZ	2.32	0.44
4:E:149:TYR:HB3	4:E:174:PRO:HD3	2.00	0.44
4:E:325:LEU:HD13	4:E:355:TYR:CD2	2.53	0.44
1:A:836:ARG:NH1	1:A:840:ALA:HB2	2.33	0.43
2:D:31:SER:OG	2:D:32:GLU:N	2.51	0.43
4:F:252:LEU:HD21	4:F:302:ALA:HB2	1.99	0.43
5:G:75:PHE:HZ	5:G:88:LEU:HB2	1.83	0.43
4:E:109:ILE:HD13	4:E:134:ALA:HB2	2.00	0.43
4:F:5:CYS:SG	4:F:8:CYS:HB2	2.57	0.43
4:E:63:LEU:HD13	4:E:71:TYR:O	2.19	0.43
5:G:105:SER:O	5:G:109:THR:HG22	2.17	0.43
7:P:20:C:H2'	7:P:21:C:C6	2.54	0.43
2:D:152:ALA:HB3	2:D:154:TRP:HE1	1.82	0.43
4:E:333:ILE:HB	4:E:358:CYS:HB2	2.00	0.43
7:P:32:C:H2'	7:P:33:C:C6	2.53	0.43
2:B:105:ASN:OD1	2:B:105:ASN:C	2.61	0.43
2:B:161:ASP:HA	2:B:184:LEU:HD23	2.00	0.43
4:F:293:ILE:HG13	4:F:320:LYS:HB3	2.00	0.43
4:F:369:ASP:OD2	4:F:370:ILE:HG13	2.18	0.43
1:A:816:HIS:O	1:A:830:PRO:HA	2.19	0.43
4:E:63:LEU:HB3	4:E:83:LEU:HD12	2.00	0.43
4:E:307:THR:HA	4:E:358:CYS:O	2.19	0.43
4:F:443:ARG:HA	4:F:569:LYS:NZ	2.33	0.43
4:F:497:ARG:O	4:F:501:THR:HG23	2.18	0.43
5:G:11:GLN:O	5:G:12:MET:SD	2.77	0.43
5:G:69:LEU:HB3	5:G:89:TYR:HB3	2.01	0.43
2:D:108:ASN:HA	2:D:111:ARG:CD	2.49	0.43
4:E:254:PRO:HB3	4:E:298:TYR:CE2	2.54	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:G:32:TYR:C	5:G:32:TYR:CD2	2.96	0.43
7:P:37:C:H2'	7:P:38:A:H8	1.84	0.43
4:F:376:ILE:H	4:F:400:GLY:HA3	1.84	0.43
1:A:139:CYS:C	1:A:141:THR:H	2.26	0.43
2:D:65:GLN:O	2:D:68:THR:HG22	2.19	0.43
4:E:443:ARG:HH12	4:E:567:ARG:NH1	2.17	0.43
4:F:240:LEU:HD21	4:F:425:VAL:HG22	2.00	0.43
1:A:197:ARG:HG2	1:A:197:ARG:HH11	1.84	0.42
4:E:153:THR:HA	4:E:224:TYR:HA	2.00	0.42
1:A:51:THR:OG1	1:A:52:ASN:N	2.51	0.42
3:C:71:LEU:HG	3:C:71:LEU:O	2.19	0.42
4:F:252:LEU:CD2	4:F:299:TYR:CG	2.89	0.42
9:R:44:G:H2'	9:R:45:G:C8	2.54	0.42
1:A:387:LEU:HD11	2:B:122:LEU:HD12	2.01	0.42
4:F:149:TYR:HB3	4:F:174:PRO:HD3	2.01	0.42
4:F:303:ARG:NE	4:F:367:THR:O	2.49	0.42
5:G:52:LYS:HB2	5:G:53:TRP:HE3	1.68	0.42
1:A:545:LYS:HG3	1:A:546:TYR:N	2.33	0.42
4:E:280:LEU:HD11	4:E:291:PHE:CE1	2.55	0.42
4:E:308:ALA:HB1	4:E:375:GLU:OE2	2.20	0.42
4:F:305:VAL:HG22	4:F:356:VAL:HB	2.00	0.42
1:A:398:VAL:HG11	1:A:666:MET:HE1	2.01	0.42
2:D:108:ASN:HA	2:D:111:ARG:HG2	2.01	0.42
4:E:452:VAL:HB	4:E:562:ASN:OD1	2.19	0.42
7:P:17:U:H2'	7:P:18:U:H6	1.84	0.42
4:E:155:ARG:HD2	4:E:155:ARG:O	2.20	0.42
4:E:269:TYR:HD2	4:E:295:LEU:HD13	1.85	0.42
4:E:510:VAL:HG21	4:E:541:TYR:CD1	2.55	0.42
4:F:7:LEU:CD2	4:F:106:PHE:CD2	3.00	0.42
4:F:512:ILE:HG13	4:F:531:GLN:O	2.20	0.42
5:G:18:THR:O	5:G:53:TRP:HE3	1.96	0.42
5:G:97:LEU:O	5:G:101:MET:HG3	2.20	0.42
2:D:66:ALA:C	2:D:68:THR:N	2.74	0.42
4:E:92:LEU:HB3	4:E:93:TYR:CD1	2.54	0.42
4:E:373:PHE:CD2	4:E:396:TYR:CE1	3.04	0.42
1:A:684:ASP:OD2	1:A:684:ASP:C	2.62	0.42
3:C:2:LYS:HE3	3:C:2:LYS:HB2	1.76	0.42
1:A:37:ILE:CD1	6:O:2:U:H5'	2.50	0.42
3:C:58:VAL:HG22	2:D:119:ILE:CG2	2.50	0.42
2:D:141:THR:OG1	2:D:142:CYS:N	2.53	0.42
4:E:375:GLU:HB2	4:E:378:MET:CE	2.49	0.42

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:F:165:LEU:HD11	4:F:200:PHE:CZ	2.55	0.42
1:A:303:ASP:OD2	1:A:303:ASP:C	2.63	0.42
1:A:854:LEU:HD22	2:D:72:LYS:HB3	2.02	0.42
4:E:470:GLN:NE2	4:E:543:TYR:OH	2.52	0.42
4:F:519:ASN:HB3	4:F:530:THR:HB	2.00	0.42
1:A:303:ASP:OD2	1:A:305:ARG:N	2.52	0.41
2:D:127:LYS:HG3	2:D:187:THR:HG23	2.02	0.41
4:F:155:ARG:HE	4:F:164:HIS:HB3	1.85	0.41
4:F:308:ALA:C	4:F:360:VAL:HG23	2.45	0.41
7:P:15:C:H2'	7:P:16:C:C6	2.54	0.41
1:A:60:ASP:N	1:A:64:ASN:O	2.54	0.41
4:E:21:ARG:HA	4:E:21:ARG:HD2	1.81	0.41
1:A:40:ASP:OD1	1:A:40:ASP:N	2.46	0.41
3:C:38:ASP:OD2	3:C:38:ASP:C	2.62	0.41
4:E:152:ALA:HB2	4:E:167:TRP:CZ3	2.55	0.41
4:F:443:ARG:HA	4:F:569:LYS:HZ1	1.85	0.41
4:E:258:ILE:HD12	4:E:258:ILE:HA	1.93	0.41
4:E:510:VAL:O	4:E:544:VAL:HG13	2.21	0.41
4:F:49:VAL:HG22	4:F:58:THR:HG22	2.01	0.41
1:A:304:ASP:N	1:A:304:ASP:OD1	2.53	0.41
3:C:44:ASP:OD2	3:C:44:ASP:C	2.62	0.41
4:F:14:LEU:HD22	4:F:42:VAL:HG12	2.03	0.41
4:F:380:THR:HG23	4:F:382:TYR:N	2.35	0.41
4:F:445:PRO:O	4:F:449:VAL:HG12	2.20	0.41
4:F:235:LEU:HD13	4:F:385:SER:HB3	2.02	0.41
1:A:109:ASP:OD1	1:A:109:ASP:N	2.54	0.41
1:A:412:PRO:HB3	3:C:14:LEU:HD23	2.03	0.41
5:G:36:LYS:HD3	5:G:36:LYS:HA	1.83	0.41
1:A:131:LEU:HD22	1:A:247:LEU:HD21	2.02	0.41
1:A:149:TYR:CE2	1:A:212:LEU:HD13	2.55	0.41
1:A:234:VAL:HG23	1:A:234:VAL:O	2.20	0.41
1:A:334:PHE:CE1	1:A:339:PRO:HG3	2.56	0.41
2:D:58:LYS:HD2	4:E:79:ILE:HD13	2.02	0.41
4:E:162:GLU:O	4:E:163:LEU:HD23	2.20	0.41
4:E:167:TRP:HZ3	4:E:174:PRO:HD2	1.86	0.41
4:F:265:ASN:HA	4:F:268:ASN:ND2	2.36	0.41
4:F:419:PRO:HG3	4:F:559:ASN:HD21	1.86	0.41
5:G:12:MET:SD	5:G:12:MET:N	2.94	0.41
1:A:89:LEU:HD23	1:A:89:LEU:HA	1.92	0.41
1:A:576:LEU:HD22	1:A:689:TYR:CD1	2.56	0.41
1:A:906:MET:HB2	1:A:906:MET:HE2	1.77	0.41

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:E:249:ILE:HG23	4:E:273:GLY:HA3	2.03	0.41
5:G:9:LEU:HD13	5:G:9:LEU:HA	1.95	0.41
9:R:33:U:H2'	9:R:34:U:H6	1.86	0.41
4:E:343:PHE:CZ	4:E:345:LYS:HB2	2.56	0.40
9:R:33:U:H2'	9:R:34:U:C6	2.57	0.40
4:E:592:ILE:HA	4:E:593:PRO:HD3	1.93	0.40
4:F:547:THR:HG22	4:F:575:ILE:HD13	2.03	0.40
4:E:135:ALA:HA	4:E:138:LEU:HG	2.04	0.40
4:E:244:GLU:OE1	4:E:246:TYR:OH	2.28	0.40
4:F:198:TYR:HA	4:F:213:GLY:HA2	2.03	0.40
4:F:265:ASN:HD21	4:F:291:PHE:HD2	1.69	0.40
5:G:50:ASP:HB2	5:G:52:LYS:HZ1	1.85	0.40
5:G:106:LEU:HD23	5:G:112:LEU:HD11	2.03	0.40
1:A:104:PHE:HB3	1:A:113:HIS:CE1	2.57	0.40
1:A:239:SER:OG	1:A:465:ASP:OD1	2.23	0.40
1:A:388:LEU:HD22	1:A:672:SER:HB3	2.03	0.40
1:A:915:TYR:O	1:A:921:TYR:OH	2.21	0.40
4:E:57:VAL:HG12	4:E:63:LEU:HD21	2.03	0.40
4:F:462:LYS:HG2	4:F:463:ALA:N	2.36	0.40
1:A:631:ARG:HG2	1:A:663:LEU:HD13	2.03	0.40
4:E:386:VAL:O	4:E:390:ARG:HG2	2.22	0.40
4:E:490:ARG:HH21	4:E:491:PRO:HG3	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	A	925/932 (99%)	875 (95%)	47 (5%)	3 (0%)	37 68
2	B	185/198 (93%)	176 (95%)	9 (5%)	0	100 100
2	D	184/198 (93%)	171 (93%)	13 (7%)	0	100 100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	C	70/83 (84%)	68 (97%)	2 (3%)	0	100	100
4	E	579/601 (96%)	561 (97%)	18 (3%)	0	100	100
4	F	576/601 (96%)	565 (98%)	11 (2%)	0	100	100
5	G	111/113 (98%)	104 (94%)	6 (5%)	1 (1%)	14	48
All	All	2630/2726 (96%)	2520 (96%)	106 (4%)	4 (0%)	45	74

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	61	GLU
1	A	904	SER
5	G	7	VAL
1	A	51	THR

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	A	819/823 (100%)	810 (99%)	9 (1%)	70	84
2	B	148/167 (89%)	145 (98%)	3 (2%)	50	73
2	D	150/167 (90%)	135 (90%)	15 (10%)	6	25
3	C	67/77 (87%)	67 (100%)	0	100	100
4	E	497/523 (95%)	495 (100%)	2 (0%)	89	93
4	F	496/523 (95%)	496 (100%)	0	100	100
5	G	94/94 (100%)	93 (99%)	1 (1%)	70	84
All	All	2271/2374 (96%)	2241 (99%)	30 (1%)	64	81

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	51	THR
1	A	53	CYS

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	167	GLU
1	A	508	LYS
1	A	516	TYR
1	A	899	MET
1	A	903	TYR
1	A	904	SER
1	A	905	VAL
2	B	46	LYS
2	B	51	ARG
2	B	52	ASP
2	D	62	MET
2	D	64	ASP
2	D	70	MET
2	D	71	TYR
2	D	166	ILE
2	D	167	VAL
2	D	168	GLN
2	D	169	LEU
2	D	172	ILE
2	D	174	MET
2	D	175	ASP
2	D	176	ASN
2	D	180	LEU
2	D	184	LEU
2	D	185	ILE
4	E	45	VAL
4	E	69	SER
5	G	12	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (27) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	79	ASN
1	A	113	HIS
1	A	414	ASN
1	A	459	ASN
1	A	468	GLN
1	A	497	ASN
1	A	611	ASN
1	A	790	ASN
1	A	886	GLN
2	B	73	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	B	157	GLN
3	C	19	GLN
2	D	140	ASN
2	D	157	GLN
4	E	265	ASN
4	E	404	GLN
4	E	470	GLN
4	E	482	HIS
4	E	492	GLN
4	E	559	ASN
4	F	164	HIS
4	F	245	HIS
4	F	265	ASN
4	F	268	ASN
4	F	404	GLN
4	F	470	GLN
5	G	98	ASN

5.3.3 RNA (i)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
6	O	10/10 (100%)	2 (20%)	3 (30%)
7	P	40/40 (100%)	5 (12%)	4 (10%)
8	Q	8/9 (88%)	2 (25%)	0
9	R	44/59 (74%)	10 (22%)	2 (4%)
All	All	102/118 (86%)	19 (18%)	9 (8%)

All (19) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
6	O	3	U
6	O	4	A
7	P	3	U
7	P	4	A
7	P	22	A
7	P	28	C
7	P	30	A
8	Q	138	C
8	Q	139	C
9	R	15	C
9	R	16	A

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
9	R	18	A
9	R	19	A
9	R	32	G
9	R	44	G
9	R	49	A
9	R	51	A
9	R	56	C
9	R	57	C

All (9) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
6	O	1	ATP
6	O	2	U
6	O	3	U
7	P	1	ATP
7	P	2	U
7	P	3	U
7	P	29	A
9	R	17	A
9	R	18	A

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)

Of 8 ligands modelled in this entry, 8 are monoatomic - leaving 0 for Mogul analysis.

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.

No monomer is involved in short contacts.

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.

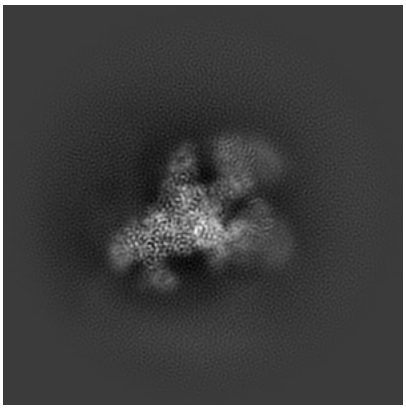
6 Map visualisation (i)

This section contains visualisations of the EMDB entry EMD-60693. These allow visual inspection of the internal detail of the map and identification of artifacts.

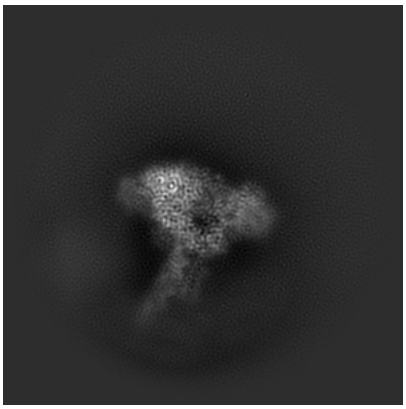
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections (i)

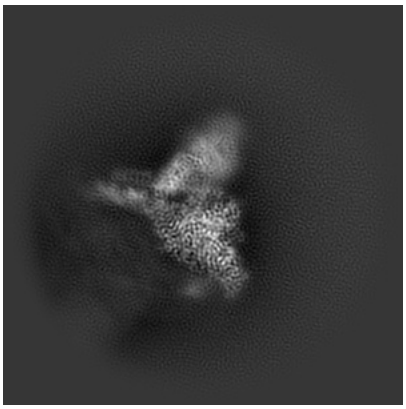
6.1.1 Primary map



X

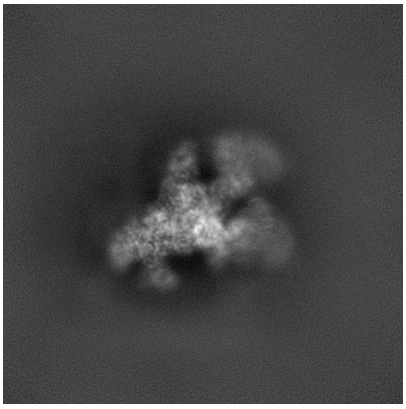


Y

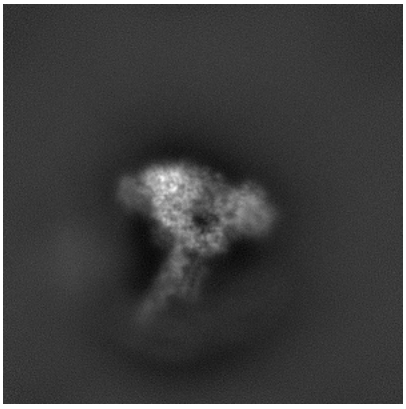


Z

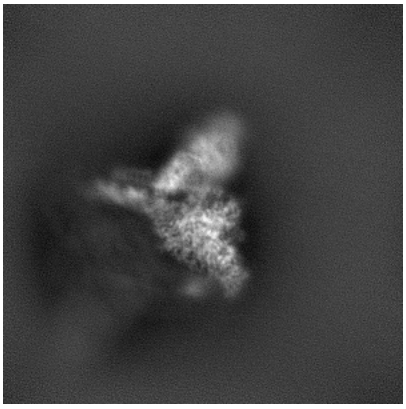
6.1.2 Raw map



X



Y

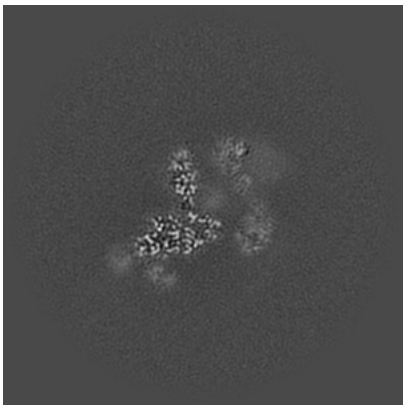


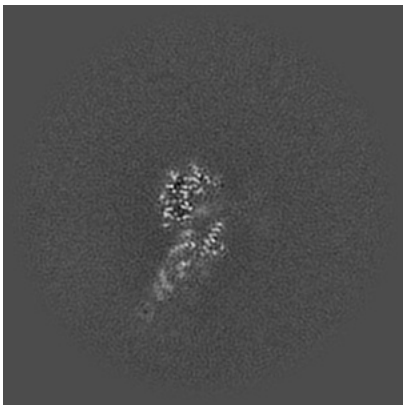
Z

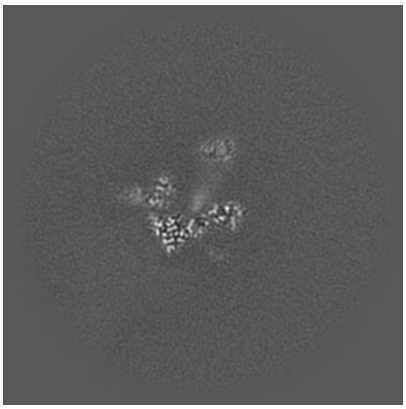
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

6.2.1 Primary map

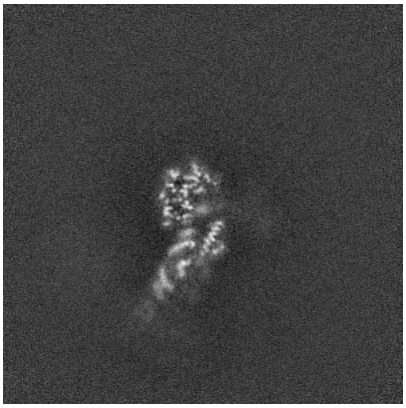

X Index: 220

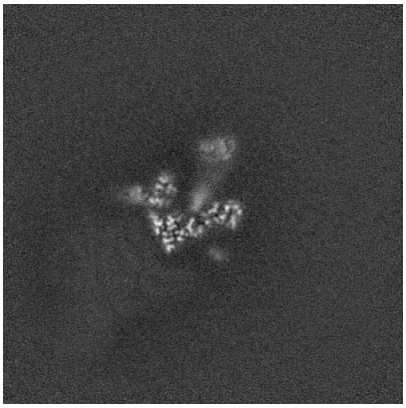

Y Index: 220


Z Index: 220

6.2.2 Raw map

X Index: 220

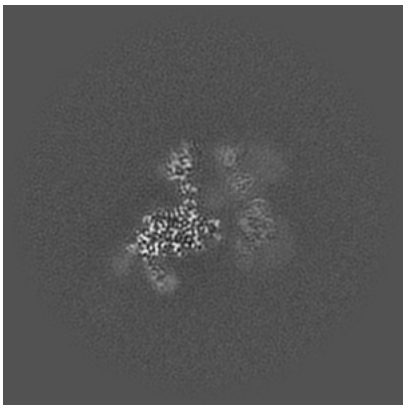

Y Index: 220

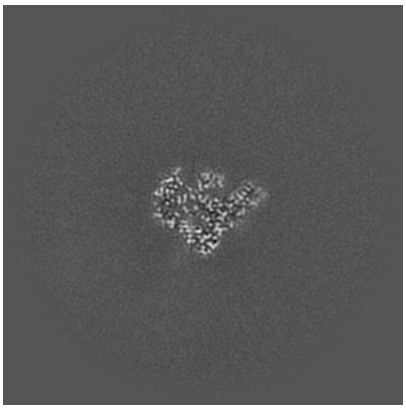

Z Index: 220

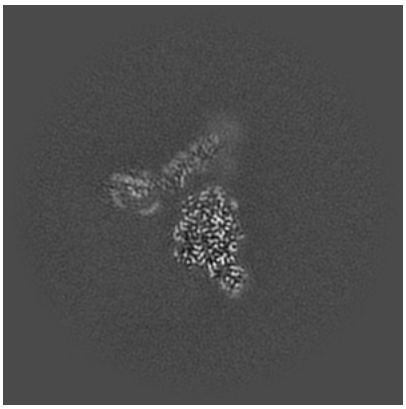
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

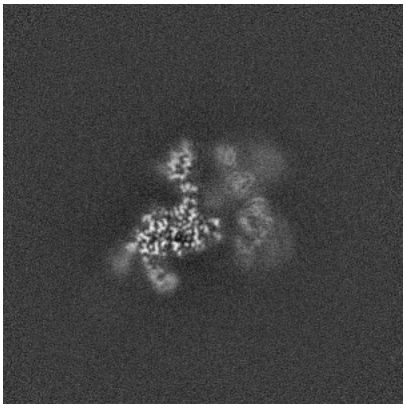
6.3.1 Primary map

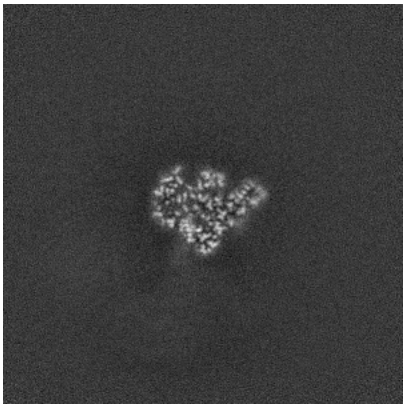

X Index: 226

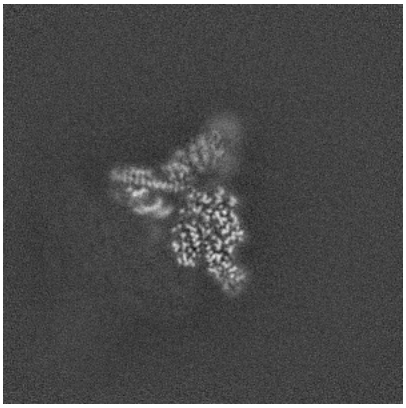

Y Index: 199


Z Index: 185

6.3.2 Raw map


X Index: 226

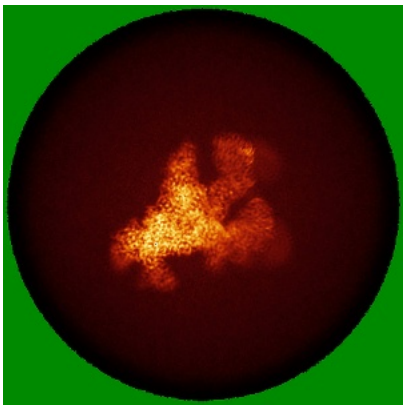

Y Index: 199

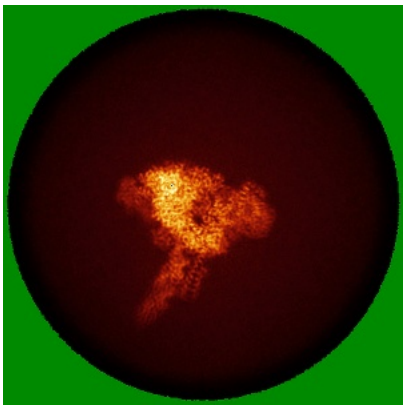

Z Index: 190

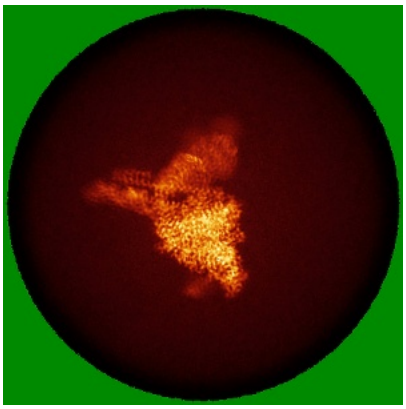
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) (i)

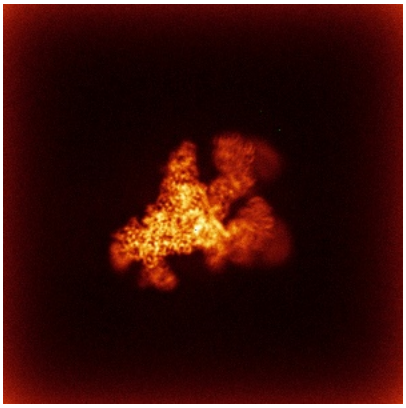
6.4.1 Primary map

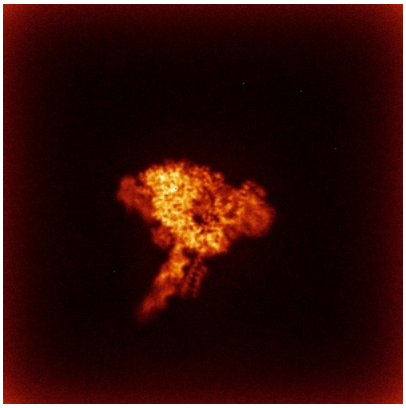

X

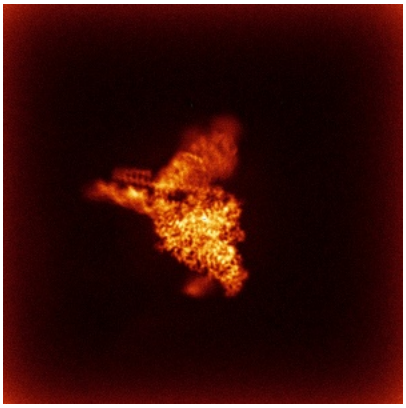

Y


Z

6.4.2 Raw map


X

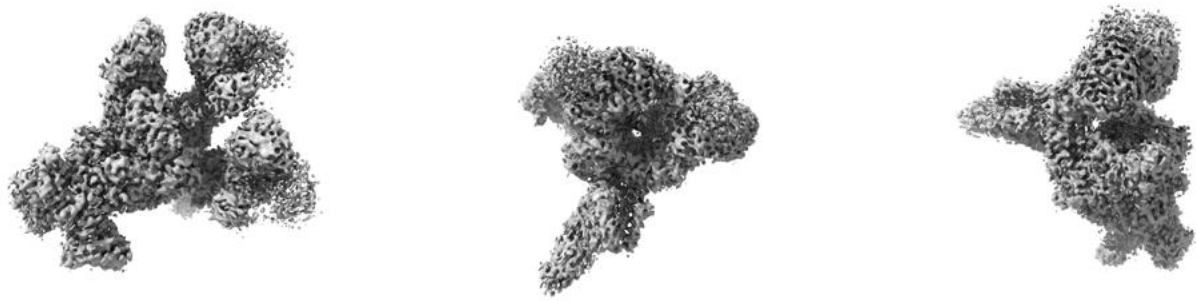

Y


Z

The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views (i)

6.5.1 Primary map



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.2. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map

X Y Z

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.

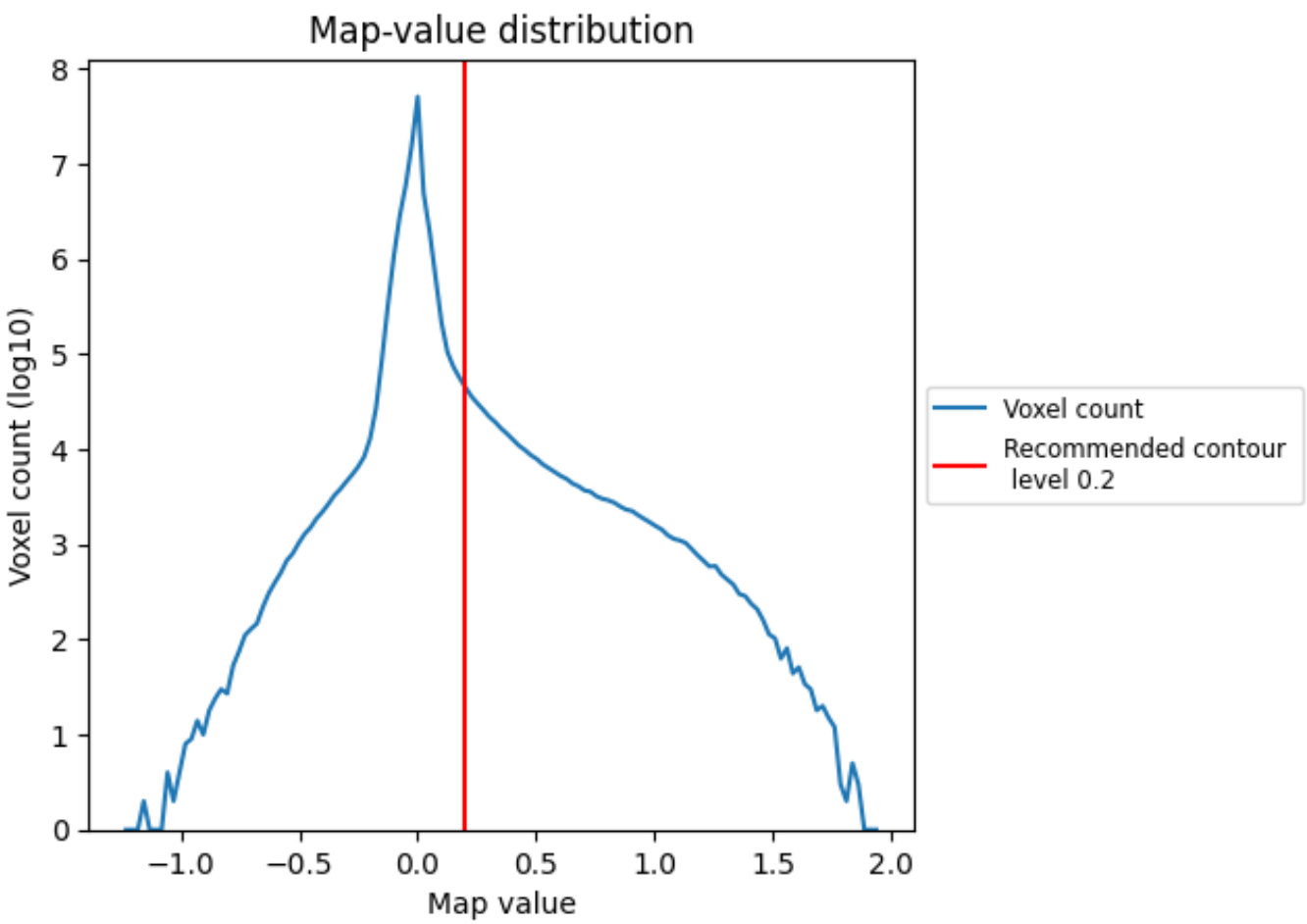
6.6 Mask visualisation (i)

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

7 Map analysis (i)

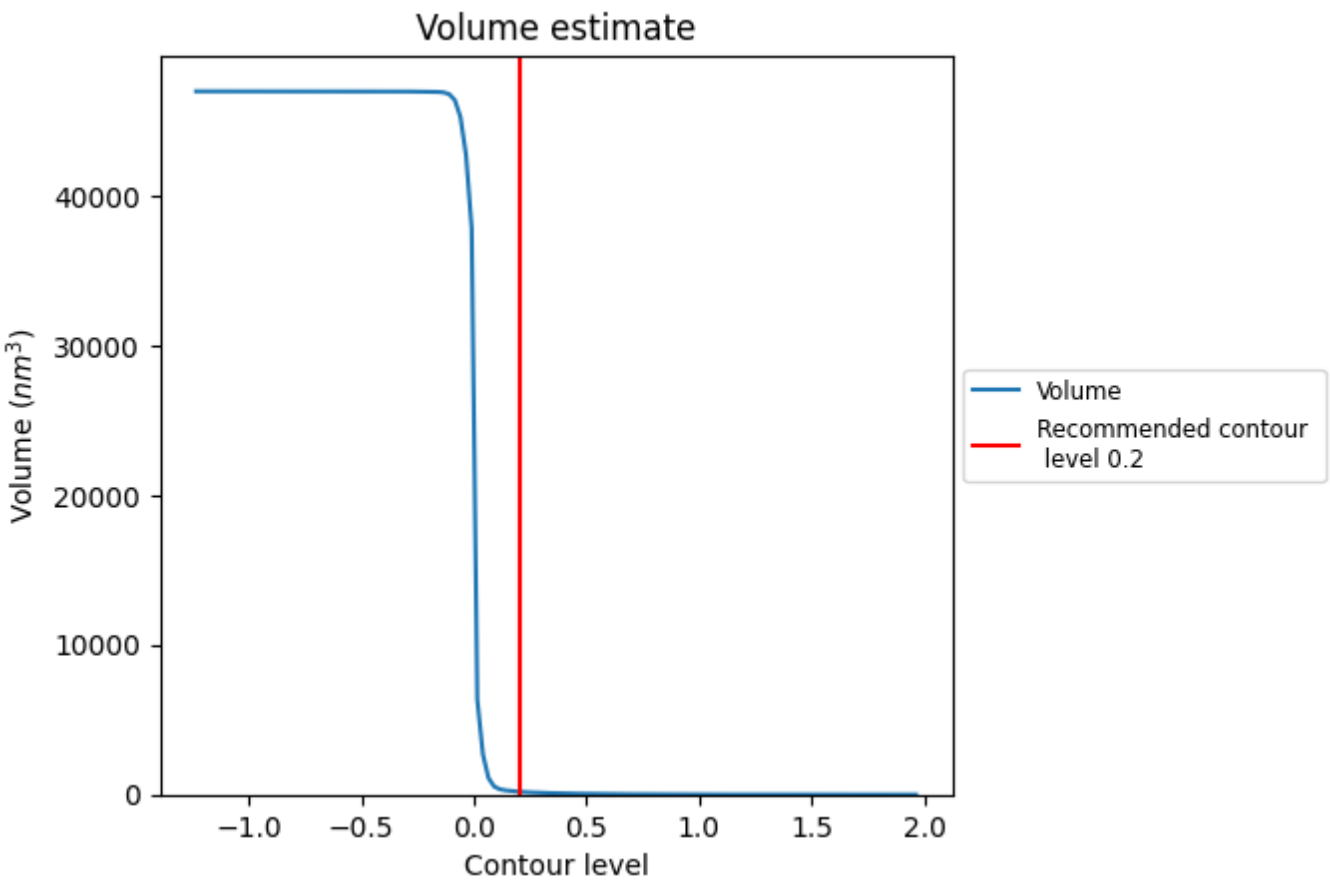
This section contains the results of statistical analysis of the map.

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.

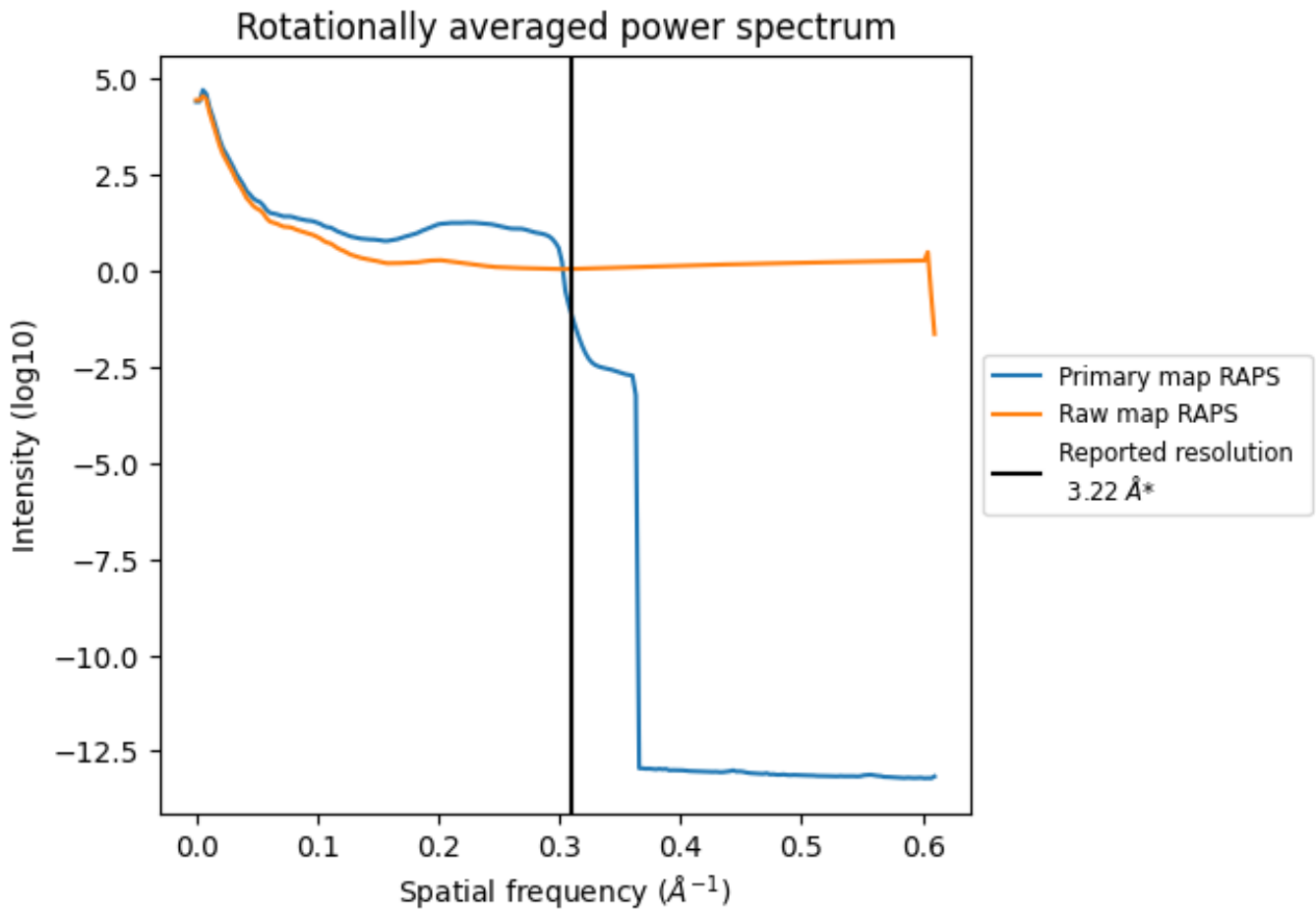
7.2 Volume estimate (i)



The volume at the recommended contour level is 191 nm^3; this corresponds to an approximate mass of 173 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)

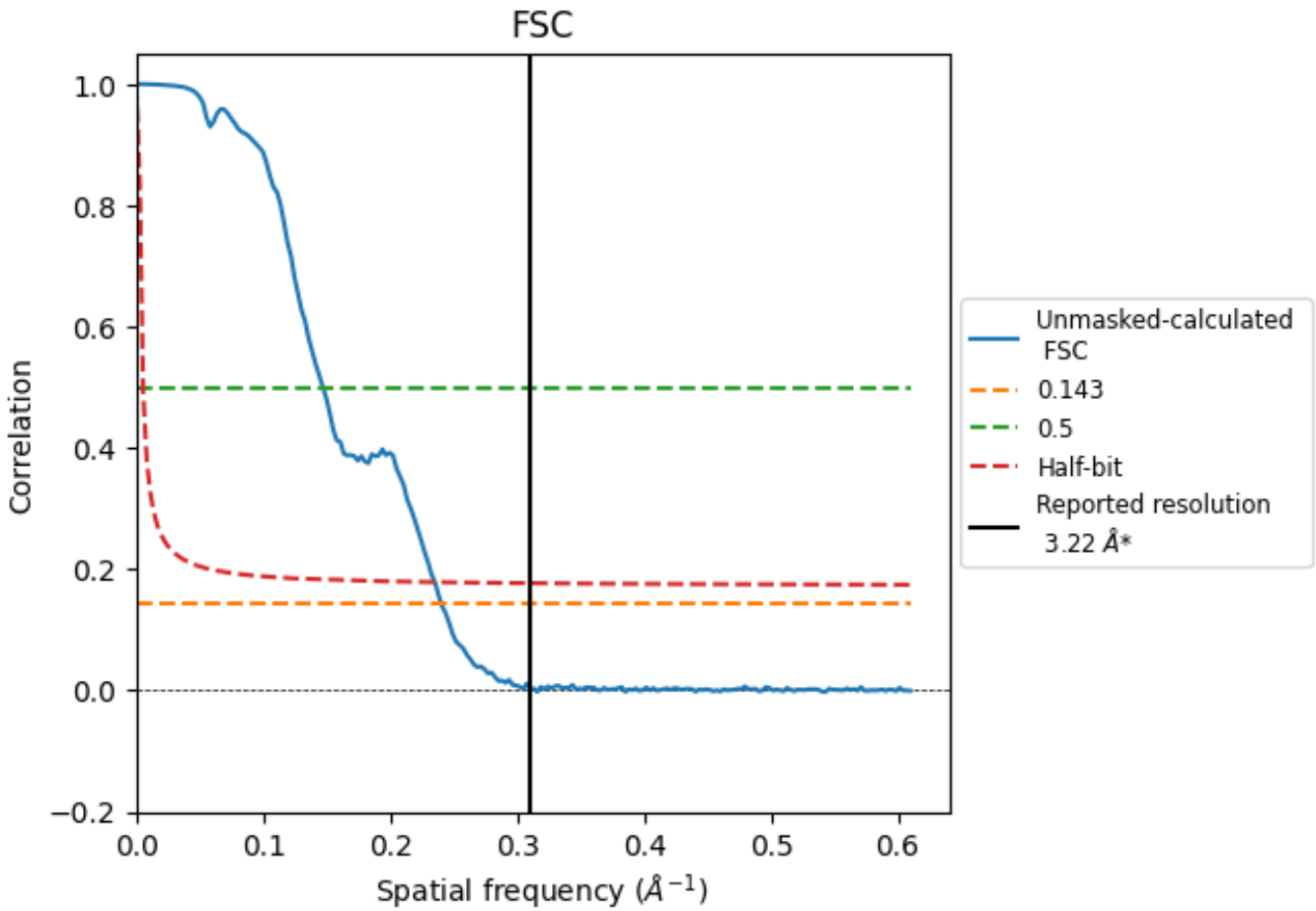


*Reported resolution corresponds to spatial frequency of 0.311 Å^{-1}

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 0.311 Å^{-1}

8.2 Resolution estimates (i)

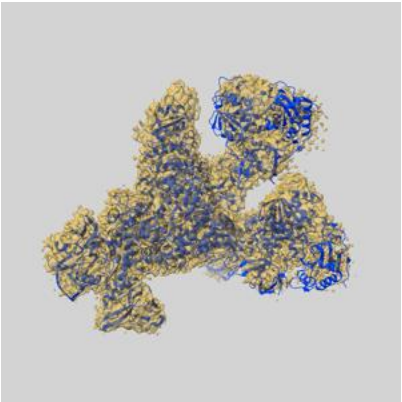
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.22	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	4.16	6.80	4.25

*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 4.16 differs from the reported value 3.22 by more than 10 %

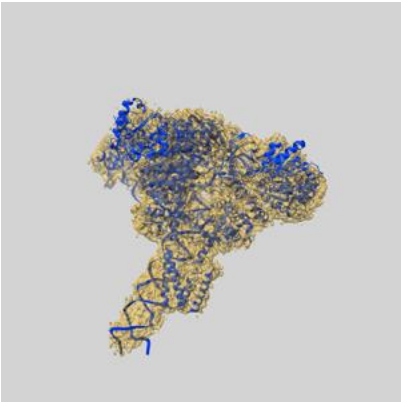
9 Map-model fit (i)

This section contains information regarding the fit between EMDB map EMD-60693 and PDB model 9IMM. Per-residue inclusion information can be found in section 3 on page 6.

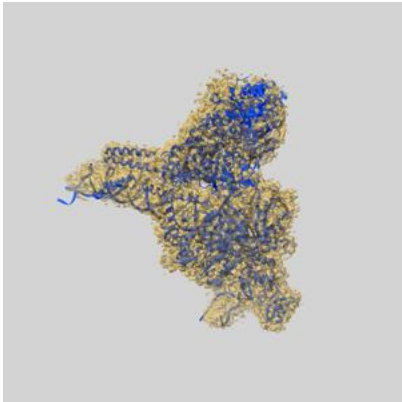
9.1 Map-model overlay (i)



X



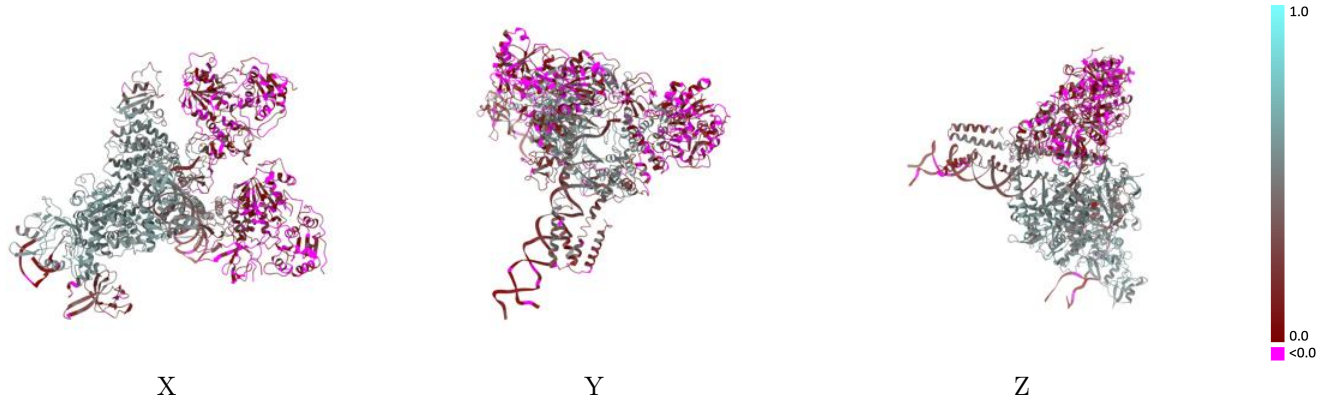
Y



Z

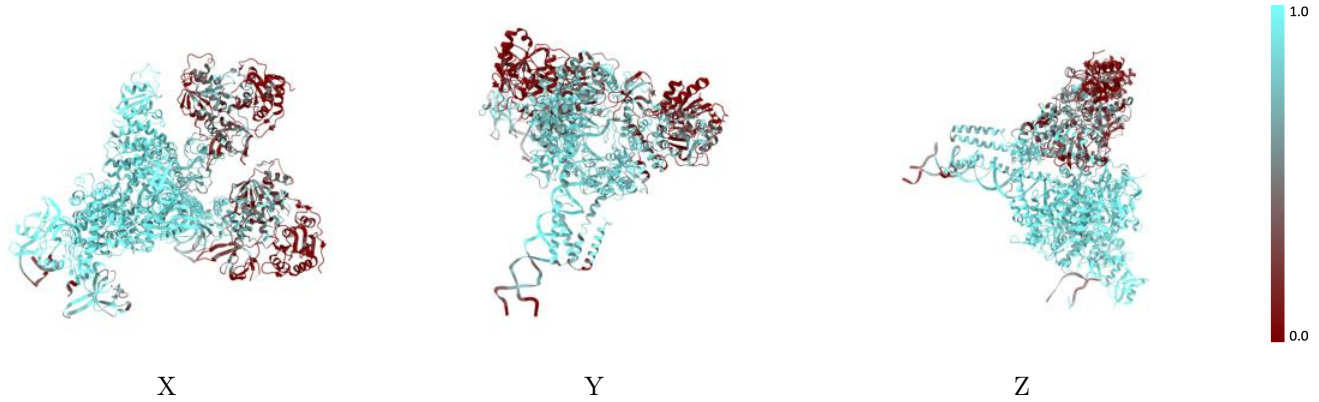
The images above show the 3D surface view of the map at the recommended contour level 0.2 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model (i)



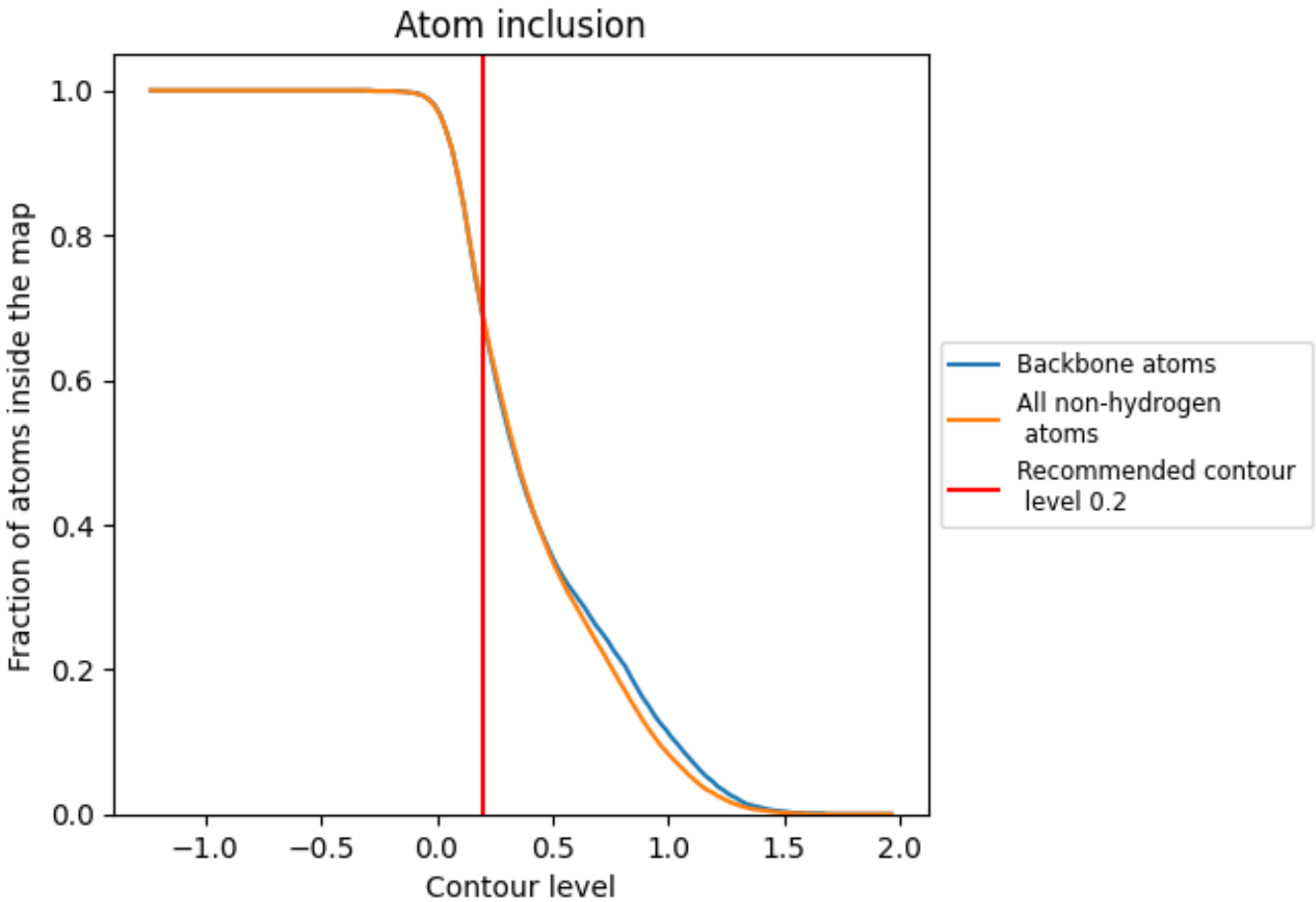
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.2).

9.4 Atom inclusion (i)



At the recommended contour level, 69% of all backbone atoms, 69% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary (i)

The table lists the average atom inclusion at the recommended contour level (0.2) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.6880	0.3240
A	0.9490	0.5490
B	0.8990	0.4630
C	0.9400	0.5050
D	0.8440	0.4030
E	0.3870	0.1120
F	0.3800	0.1160
G	0.7370	0.3070
O	0.5380	0.1780
P	0.7870	0.2540
Q	0.4670	0.0770
R	0.7990	0.2750