



Full wwPDB EM Validation Report ⓘ

Mar 10, 2026 – 10:22 AM UTC

PDB ID : 8TO6 / pdb_00008to6
EMDB ID : EMD-41437
Title : Escherichia coli RNA polymerase unwinding intermediate (I1d) at the lambda PR promoter
Authors : Darst, S.A.; Saecker, R.M.; Mueller, A.U.
Deposited on : 2023-08-02
Resolution : 2.90 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 ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

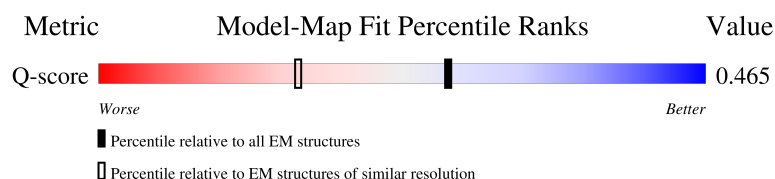
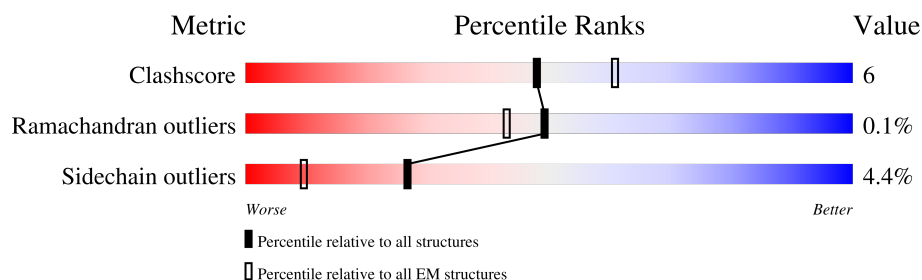
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data 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) : 2.49

1 Overall quality at a glance

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

The reported resolution of this entry is 2.90 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	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	13054 (2.40 - 3.40)

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 $\leq 5\%$. 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	G	329	
1	H	329	
1	M	329	
2	I	1342	

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Mol	Chain	Length	Quality of chain
3	J	1407	5% 79% 14% • 5%
4	K	91	70% 10% 20%
5	L	613	6% 62% 13% • 23%
6	O	105	44% 10% 47%
7	P	105	37% • 60%

2 Entry composition

There are 10 unique types of molecules in this entry. The entry contains 31406 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 DNA-directed RNA polymerase subunit alpha.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	G	230	Total	C	N	O	S	0	0
			1755	1097	310	342	6		
1	H	221	Total	C	N	O	S	0	0
			1699	1061	299	333	6		
1	M	73	Total	C	N	O	S	0	0
			572	362	100	108	2		

- Molecule 2 is a protein called DNA-directed RNA polymerase subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	I	1336	Total	C	N	O	S	0	0
			10530	6612	1833	2042	43		

- Molecule 3 is a protein called DNA-directed RNA polymerase subunit beta'.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	J	1335	Total	C	N	O	S	0	0
			10373	6518	1848	1958	49		

- Molecule 4 is a protein called DNA-directed RNA polymerase subunit omega.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	K	73	Total	C	N	O	S	0	0
			582	355	111	115	1		

- Molecule 5 is a protein called RNA polymerase sigma factor RpoD.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	L	470	Total	C	N	O	S	0	0
			3799	2383	679	714	23		

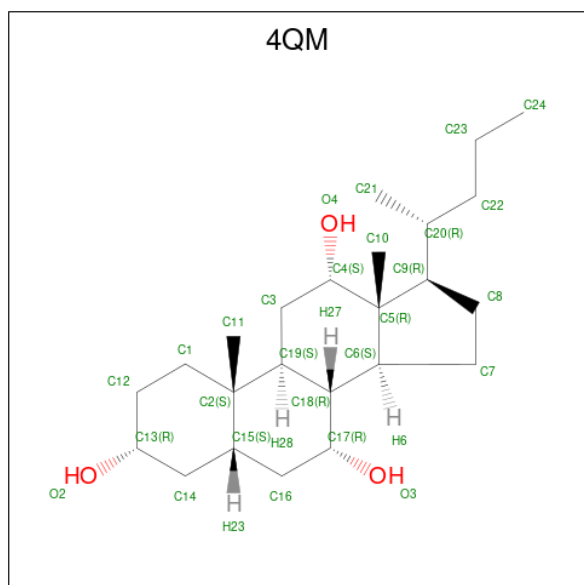
- Molecule 6 is a DNA chain called Nontemplate strand of lambda PR promoter DNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	O	56	Total	C	N	O	P	0	0
			1150	549	201	344	56		

- Molecule 7 is a DNA chain called Template strand of lamdba PR promoter DNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	P	42	Total	C	N	O	P	0	0
			863	409	167	245	42		

- Molecule 8 is (3R,5S,7R,8R,9S,10S,12S,13R,14S,17R)-10,13-dimethyl-17-[(2R)-pentan-2-yl]-2,3,4,5,6,7,8,9,11,12,14,15,16,17-tetradecahydro-1H-cyclopenta[a]phenanthrene-3,7,12-triol (CCD ID: 4QM) (formula: C₂₄H₄₂O₃).



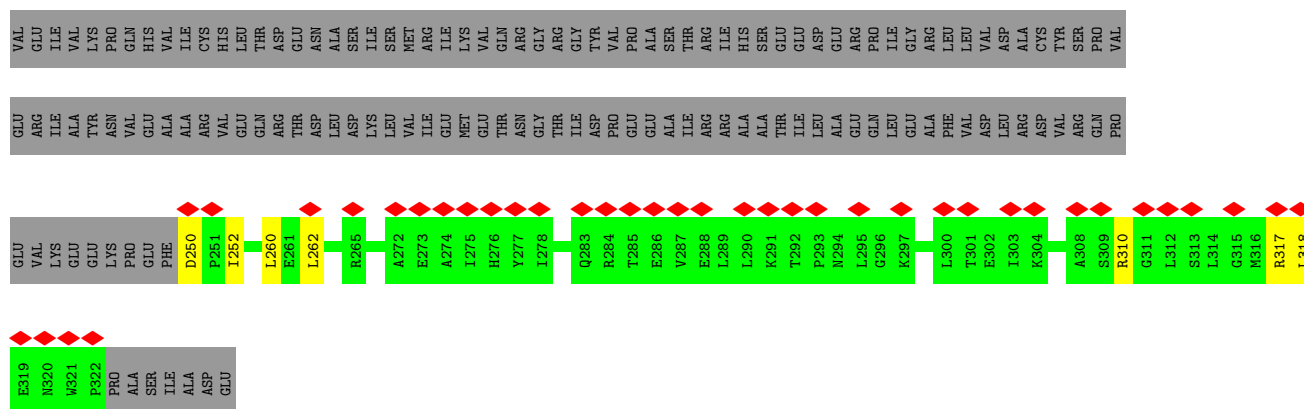
Mol	Chain	Residues	Atoms			AltConf
8	I	1	Total	C	O	0
			26	23	3	
8	J	1	Total	C	O	0
			27	24	3	
8	L	1	Total	C	O	0
			27	24	3	

- Molecule 9 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

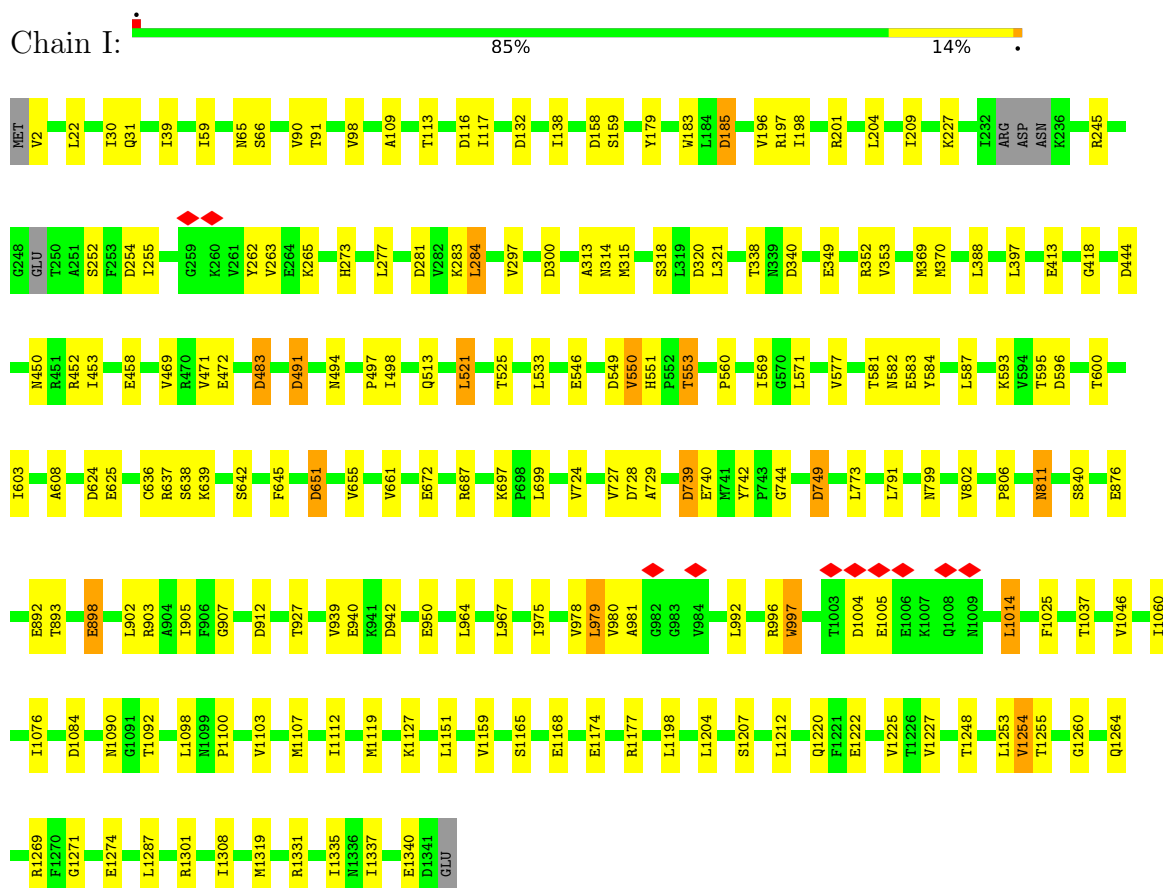
Mol	Chain	Residues	Atoms		AltConf
9	J	1	Total	Mg	0
			1	1	

- Molecule 10 is ZINC ION (CCD ID: ZN) (formula: Zn).

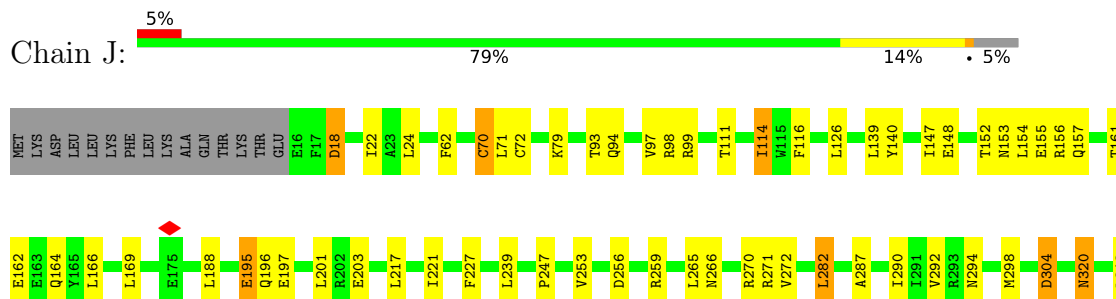
Mol	Chain	Residues	Atoms		AltConf
10	J	2	Total	Zn	0
			2	2	

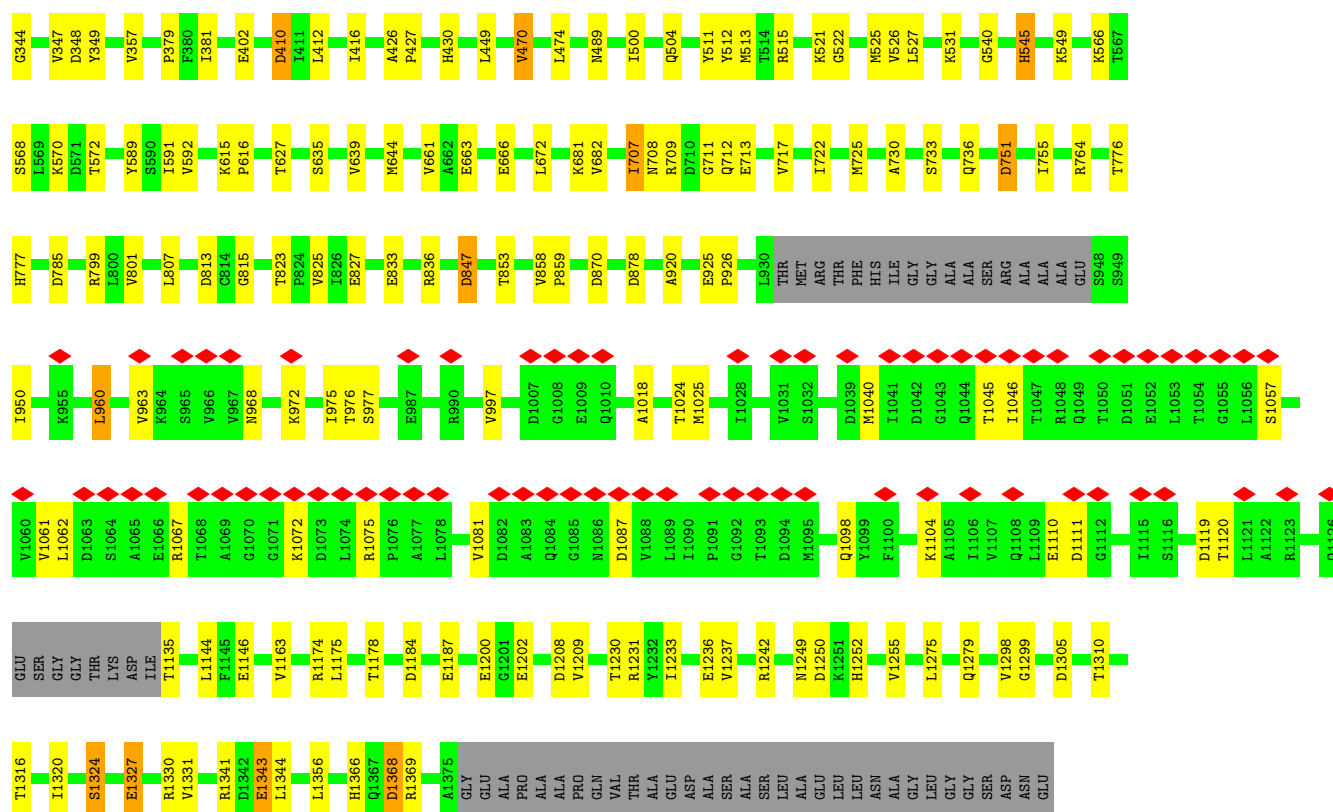


• Molecule 2: DNA-directed RNA polymerase subunit beta

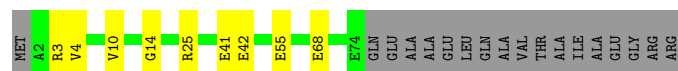


• Molecule 3: DNA-directed RNA polymerase subunit beta'

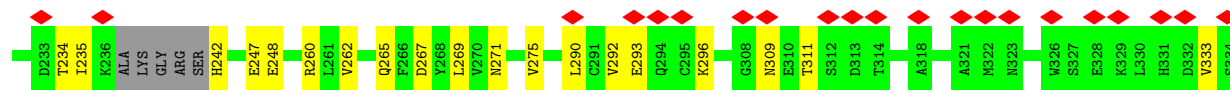
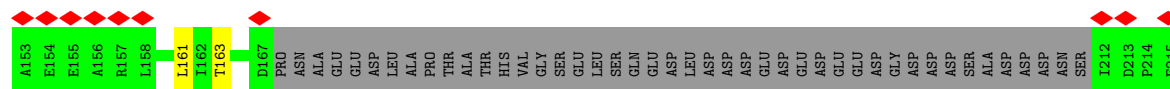
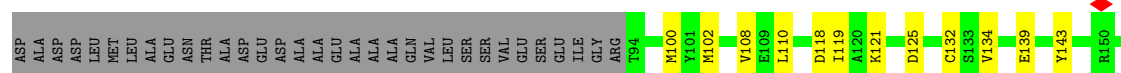
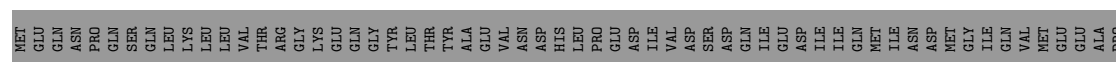


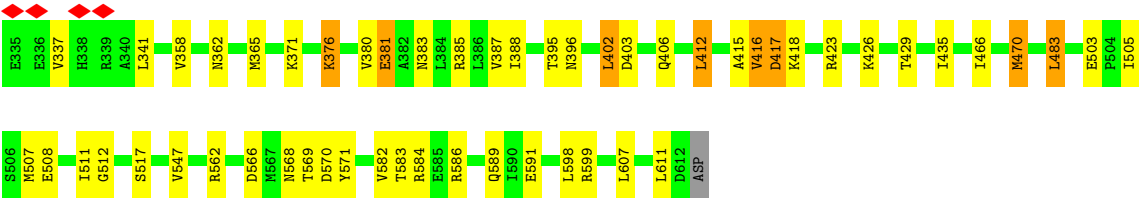


• Molecule 4: DNA-directed RNA polymerase subunit omega



• Molecule 5: RNA polymerase sigma factor RpoD

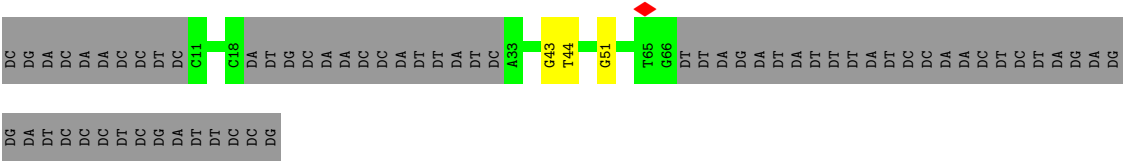




● Molecule 6: Nontemplate strand of lamdba PR promoter DNA



● Molecule 7: Template strand of lamdba PR promoter DNA



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	111510	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	60	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	3.366	Depositor
Minimum map value	-2.575	Depositor
Average map value	0.003	Depositor
Map value standard deviation	0.070	Depositor
Recommended contour level	0.12	Depositor
Map size ($\text{\AA}$)	324.096, 324.096, 324.096	wwPDB
Map dimensions	384, 384, 384	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	0.84400004, 0.84400004, 0.84400004	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 4QM, ZN, MG

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	G	0.27	0/1777	0.37	0/2412
1	H	0.23	0/1718	0.38	0/2328
1	M	0.09	0/579	0.25	0/784
2	I	0.28	0/10695	0.36	1/14426 (0.0%)
3	J	0.25	0/10530	0.37	2/14219 (0.0%)
4	K	0.20	0/584	0.34	0/786
5	L	0.24	0/3849	0.39	0/5175
6	O	0.25	0/1287	0.49	0/1986
7	P	0.19	0/969	0.38	0/1490
All	All	0.25	0/31988	0.37	3/43606 (0.0%)

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
5	L	0	1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	J	707	ILE	CA-C-N	7.08	134.45	121.70
3	J	707	ILE	C-N-CA	7.08	134.45	121.70
2	I	893	THR	N-CA-CB	-5.51	107.89	114.17

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
5	L	423	ARG	Sidechain

5.2 Too-close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	G	1755	0	1771	25	0
1	H	1699	0	1731	33	0
1	M	572	0	602	4	0
2	I	10530	0	10549	112	0
3	J	10373	0	10587	137	0
4	K	582	0	593	5	0
5	L	3799	0	3861	59	0
6	O	1150	0	636	7	0
7	P	863	0	471	3	0
8	I	26	0	0	3	0
8	J	27	0	0	4	0
8	L	27	0	0	4	0
9	J	1	0	0	0	0
10	J	2	0	0	0	0
All	All	31406	0	30801	367	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 6.

All (367) 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)
8:I:1401:4QM:C3	8:I:1401:4QM:C19	1.82	1.55
8:J:1504:4QM:C19	8:J:1504:4QM:C3	1.83	1.54
8:L:701:4QM:C3	8:L:701:4QM:C19	1.82	1.50
2:I:1269:ARG:NH1	3:J:344:GLY:O	2.02	0.93
2:I:452:ARG:NH1	2:I:584:TYR:O	2.07	0.87
5:L:234:THR:OG1	5:L:248:GLU:OE1	1.93	0.85
2:I:91:THR:OG1	2:I:138:ILE:O	1.96	0.82
2:I:281:ASP:OD1	2:I:283:LYS:NZ	2.14	0.80
2:I:413:GLU:OE1	2:I:413:GLU:N	2.15	0.80

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:I:1165:SER:OG	2:I:1168:GLU:OE1	2.00	0.79
2:I:1260:GLY:O	2:I:1264:GLN:NE2	2.16	0.79
3:J:799:ARG:NH1	3:J:1146:GLU:OE2	2.15	0.79
3:J:1072:LYS:O	3:J:1075:ARG:NH1	2.15	0.78
3:J:294:ASN:OD1	5:L:406:GLN:NE2	2.17	0.77
1:G:45:ARG:NH2	2:I:1084:ASP:OD1	2.17	0.77
3:J:833:GLU:OE1	3:J:1242:ARG:NH1	2.18	0.76
2:I:314:ASN:OD1	2:I:352:ARG:NH1	2.19	0.75
5:L:267:ASP:OD1	5:L:271:ASN:ND2	2.20	0.75
2:I:185:ASP:N	2:I:185:ASP:OD1	2.19	0.75
3:J:1174:ARG:NH2	3:J:1187:GLU:OE1	2.20	0.75
2:I:593:LYS:O	2:I:600:THR:OG1	2.05	0.74
2:I:349:GLU:N	2:I:349:GLU:OE1	2.21	0.73
1:G:212:ASP:N	1:G:212:ASP:OD1	2.21	0.73
3:J:1341:ARG:NH1	3:J:1343:GLU:OE1	2.21	0.73
5:L:503:GLU:OE1	5:L:503:GLU:N	2.22	0.73
3:J:712:GLN:OE1	3:J:712:GLN:N	2.22	0.72
3:J:708:ASN:ND2	3:J:712:GLN:O	2.23	0.72
5:L:381:GLU:OE1	5:L:381:GLU:N	2.21	0.72
1:H:41:ASN:OD1	1:H:44:ARG:NH2	2.23	0.71
2:I:560:PRO:HB2	3:J:776:THR:HG21	1.73	0.71
3:J:155:GLU:OE1	3:J:155:GLU:N	2.24	0.71
3:J:1098:GLN:OE1	3:J:1098:GLN:N	2.24	0.71
8:L:701:4QM:C3	8:L:701:4QM:C2	2.67	0.71
8:I:1401:4QM:C3	8:I:1401:4QM:C18	2.69	0.70
2:I:749:ASP:N	2:I:749:ASP:OD1	2.24	0.70
2:I:300:ASP:OD1	2:I:313:ALA:N	2.24	0.69
3:J:572:THR:HG21	3:J:589:TYR:OH	1.91	0.69
3:J:195:GLU:OE1	3:J:196:GLN:N	2.25	0.69
2:I:227:LYS:O	2:I:245:ARG:NH1	2.25	0.69
5:L:108:VAL:HG21	5:L:381:GLU:HB3	1.73	0.69
1:H:191:ARG:NH1	1:H:193:GLU:O	2.26	0.69
8:I:1401:4QM:C3	8:I:1401:4QM:C2	2.69	0.69
8:J:1504:4QM:C3	8:J:1504:4QM:C2	2.67	0.69
2:I:252:SER:O	2:I:265:LYS:NZ	2.19	0.69
3:J:500:ILE:O	3:J:500:ILE:HG22	1.92	0.69
3:J:1057:SER:OG	3:J:1110:GLU:OE2	2.10	0.69
3:J:18:ASP:OD1	3:J:18:ASP:N	2.25	0.68
1:H:77:ASP:OD1	1:H:78:ILE:N	2.27	0.68
5:L:139:GLU:OE1	5:L:139:GLU:N	2.26	0.68
3:J:1200:GLU:OE1	3:J:1200:GLU:N	2.27	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:I:902:LEU:HD21	5:L:611:LEU:HB2	1.75	0.68
5:L:163:THR:O	5:L:260:ARG:NE	2.26	0.68
2:I:728:ASP:OD1	2:I:729:ALA:N	2.28	0.66
2:I:582:ASN:OD1	2:I:583:GLU:N	2.29	0.66
2:I:1254:VAL:O	3:J:99:ARG:NH2	2.28	0.66
3:J:70:CYS:SG	3:J:71:LEU:N	2.69	0.66
5:L:293:GLU:OE1	5:L:293:GLU:N	2.30	0.65
3:J:707:ILE:HD11	3:J:713:GLU:CD	2.22	0.65
5:L:429:THR:HG22	6:O:75:DA:H4'	1.78	0.65
2:I:1222:GLU:OE1	3:J:512:TYR:OH	2.13	0.64
3:J:1279:GLN:NE2	3:J:1305:ASP:OD2	2.30	0.64
3:J:1062:LEU:O	3:J:1067:ARG:NH2	2.29	0.64
2:I:560:PRO:CB	3:J:776:THR:HG21	2.28	0.64
2:I:491:ASP:N	2:I:491:ASP:OD1	2.29	0.63
1:G:228:LEU:O	1:G:232:VAL:HG23	1.99	0.63
5:L:247:GLU:OE1	5:L:247:GLU:N	2.32	0.63
8:J:1504:4QM:C3	8:J:1504:4QM:C18	2.72	0.63
1:G:137:ASN:N	1:G:137:ASN:OD1	2.31	0.63
2:I:577:VAL:HG23	2:I:661:VAL:O	1.98	0.63
2:I:975:ILE:HG12	2:I:1014:LEU:HD23	1.81	0.63
2:I:198:ILE:HG21	2:I:388:LEU:HD21	1.82	0.62
5:L:508:GLU:N	5:L:508:GLU:OE1	2.33	0.62
2:I:521:LEU:O	2:I:525:THR:HG22	1.99	0.62
5:L:161:LEU:O	5:L:265:GLN:NE2	2.33	0.62
1:G:118:ASP:N	1:G:118:ASP:OD1	2.32	0.62
2:I:444:ASP:O	2:I:450:ASN:ND2	2.32	0.61
3:J:156:ARG:NH1	3:J:157:GLN:OE1	2.34	0.61
3:J:950:ILE:HD12	3:J:1018:ALA:HB3	1.82	0.61
1:H:155:ALA:N	1:H:174:ASP:OD1	2.34	0.61
3:J:827:GLU:OE1	3:J:827:GLU:N	2.33	0.61
5:L:380:VAL:HG13	5:L:412:LEU:HD21	1.82	0.61
2:I:892:GLU:OE1	2:I:892:GLU:N	2.31	0.60
1:G:102:LEU:HD23	1:G:142:MET:HE2	1.82	0.60
1:H:206:GLU:OE2	3:J:531:LYS:NZ	2.22	0.60
3:J:147:ILE:HG22	3:J:188:LEU:HG	1.84	0.60
3:J:513:MET:HE1	3:J:627:THR:HG22	1.84	0.60
3:J:256:ASP:OD2	8:J:1504:4QM:O2	2.20	0.60
3:J:568:SER:OG	3:J:570:LYS:NZ	2.35	0.60
1:G:45:ARG:NH1	1:H:34:GLY:O	2.36	0.59
3:J:1327:GLU:OE1	3:J:1330:ARG:NH1	2.35	0.59
3:J:708:ASN:OD1	3:J:709:ARG:N	2.34	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:H:172:LEU:HD23	1:H:172:LEU:H	1.67	0.59
2:I:1271:GLY:N	2:I:1274:GLU:OE1	2.36	0.59
2:I:1174:GLU:OE2	2:I:1177:ARG:NH1	2.34	0.59
5:L:292:VAL:O	5:L:296:LYS:N	2.34	0.59
2:I:533:LEU:HD21	2:I:571:LEU:HD13	1.86	0.58
5:L:426:LYS:NZ	6:O:78:DA:OP1	2.34	0.58
5:L:358:VAL:O	5:L:362:ASN:ND2	2.36	0.58
1:H:202:VAL:HG12	1:H:202:VAL:O	2.04	0.58
8:L:701:4QM:C3	8:L:701:4QM:C18	2.72	0.58
2:I:996:ARG:O	2:I:997:TRP:N	2.37	0.58
1:G:207:THR:HG21	1:G:211:ILE:HG22	1.86	0.57
2:I:453:ILE:HD11	2:I:587:LEU:HD21	1.85	0.57
5:L:387:VAL:HG22	5:L:435:ILE:HD13	1.86	0.57
3:J:1368:ASP:OD1	3:J:1369:ARG:N	2.37	0.57
1:G:182:ARG:NH1	2:I:1090:ASN:O	2.37	0.57
3:J:572:THR:HG21	3:J:589:TYR:CE2	2.40	0.57
4:K:10:VAL:O	4:K:14:GLY:N	2.33	0.57
5:L:376:LYS:O	5:L:380:VAL:HG23	2.05	0.56
5:L:383:ASN:CB	5:L:412:LEU:HD13	2.34	0.56
7:P:43:DG:H2'	7:P:44:DT:H72	1.87	0.56
2:I:65:ASN:OD1	2:I:66:SER:N	2.38	0.56
2:I:551:HIS:ND1	2:I:553:THR:OG1	2.32	0.56
5:L:415:ALA:O	5:L:416:VAL:C	2.48	0.56
2:I:1335:ILE:HG21	3:J:22:ILE:HD11	1.87	0.56
3:J:426:ALA:HB3	3:J:427:PRO:HD3	1.89	0.55
3:J:1163:VAL:HG12	3:J:1202:GLU:O	2.06	0.55
3:J:282:LEU:HD23	3:J:287:ALA:HB3	1.89	0.55
5:L:125:ASP:OD2	5:L:371:LYS:NZ	2.40	0.55
3:J:1356:LEU:O	3:J:1366:HIS:NE2	2.37	0.55
1:G:58:GLU:HG2	1:G:172:LEU:HD23	1.89	0.55
2:I:196:VAL:HG21	2:I:209:ILE:CD1	2.37	0.55
2:I:806:PRO:O	2:I:811:ASN:ND2	2.39	0.55
3:J:661:VAL:HG23	3:J:682:VAL:HG22	1.88	0.55
3:J:1249:ASN:OD1	3:J:1250:ASP:N	2.39	0.55
3:J:347:VAL:HG12	3:J:348:ASP:O	2.07	0.55
3:J:513:MET:HE1	3:J:627:THR:CG2	2.36	0.55
3:J:960:LEU:HB2	3:J:963:VAL:HG11	1.89	0.54
2:I:525:THR:HG21	2:I:687:ARG:CD	2.37	0.54
1:H:207:THR:HG22	1:H:208:ASN:H	1.72	0.54
3:J:511:TYR:OH	3:J:515:ARG:NH1	2.40	0.54
3:J:960:LEU:O	3:J:960:LEU:HD12	2.07	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:I:158:ASP:OD1	2:I:159:SER:N	2.41	0.54
2:I:742:TYR:O	2:I:744:GLY:N	2.41	0.54
3:J:111:THR:O	3:J:239:LEU:N	2.41	0.54
3:J:1061:VAL:O	3:J:1104:LYS:N	2.37	0.54
5:L:309:ASN:OD1	5:L:311:THR:OG1	2.26	0.54
1:H:131:CYS:SG	1:H:132:HIS:N	2.81	0.54
3:J:320:ASN:OD1	3:J:320:ASN:N	2.39	0.54
3:J:521:LYS:NZ	3:J:540:GLY:O	2.35	0.53
1:H:89:ALA:HB3	1:H:124:VAL:HG22	1.90	0.53
3:J:707:ILE:HA	3:J:708:ASN:HB2	1.90	0.53
1:G:14:VAL:HG11	1:G:29:GLU:HB2	1.90	0.53
2:I:1004:ASP:OD1	2:I:1004:ASP:N	2.42	0.53
2:I:201:ARG:HB2	2:I:369:MET:HE2	1.90	0.53
5:L:583:THR:HG21	6:O:52:DT:OP2	2.08	0.53
2:I:980:VAL:HG12	2:I:980:VAL:O	2.09	0.53
3:J:152:THR:OG1	3:J:154:LEU:HD23	2.08	0.53
3:J:259:ARG:CZ	5:L:505:ILE:HD11	2.39	0.53
5:L:383:ASN:HB2	5:L:412:LEU:HD13	1.91	0.53
1:H:35:PHE:HA	1:H:38:THR:HG22	1.90	0.52
5:L:586:ARG:NH1	5:L:589:GLN:OE1	2.38	0.52
2:I:596:ASP:N	2:I:596:ASP:OD1	2.42	0.52
3:J:1144:LEU:HD21	3:J:1236:GLU:HB3	1.91	0.52
5:L:470:MET:HE1	5:L:483:LEU:HA	1.92	0.52
6:O:76:DT:H2"	6:O:77:DA:C8	2.44	0.52
1:G:27:THR:C	1:G:28:LEU:HD12	2.35	0.52
1:H:67:GLU:OE2	1:H:82:LEU:HD12	2.09	0.52
5:L:383:ASN:O	5:L:387:VAL:HG23	2.10	0.51
5:L:143:TYR:CD2	5:L:269:LEU:HD21	2.44	0.51
1:G:15:ASP:C	1:G:16:ILE:HD12	2.35	0.51
3:J:410:ASP:OD1	3:J:410:ASP:N	2.43	0.51
5:L:570:ASP:OD1	5:L:571:TYR:N	2.44	0.51
2:I:2:VAL:O	2:I:2:VAL:HG22	2.10	0.51
3:J:975:ILE:HG22	3:J:977:SER:H	1.76	0.51
2:I:1037:THR:HG22	2:I:1037:THR:O	2.11	0.51
3:J:153:ASN:C	3:J:154:LEU:HD22	2.36	0.51
5:L:562:ARG:NH2	7:P:51:DG:OP1	2.43	0.51
1:M:260:LEU:HD23	1:M:262:LEU:HD11	1.92	0.51
2:I:284:LEU:HD23	2:I:284:LEU:N	2.26	0.50
2:I:483:ASP:OD1	2:I:483:ASP:N	2.41	0.50
1:G:197:ASP:OD1	1:G:197:ASP:N	2.39	0.50
5:L:118:ASP:OD1	5:L:119:ILE:N	2.45	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:I:903:ARG:O	2:I:907:GLY:N	2.42	0.50
2:I:1255:THR:HG23	2:I:1255:THR:O	2.10	0.50
3:J:70:CYS:SG	3:J:72:CYS:N	2.85	0.50
3:J:416:ILE:HG22	3:J:416:ILE:O	2.12	0.50
3:J:925:GLU:HG3	3:J:926:PRO:HD3	1.93	0.50
3:J:148:GLU:OE2	3:J:156:ARG:NE	2.42	0.49
3:J:853:THR:HG22	3:J:853:THR:O	2.13	0.49
2:I:964:LEU:HD13	2:I:1025:PHE:CD2	2.48	0.49
3:J:644:MET:O	3:J:764:ARG:NE	2.45	0.49
2:I:340:ASP:OD1	2:I:340:ASP:N	2.44	0.49
2:I:525:THR:HG21	2:I:687:ARG:HD2	1.95	0.49
2:I:196:VAL:HG21	2:I:209:ILE:HD12	1.95	0.49
5:L:337:VAL:O	5:L:341:LEU:HD13	2.13	0.49
1:H:100:LEU:HD23	1:H:115:ILE:HG12	1.94	0.49
4:K:42:GLU:N	4:K:42:GLU:OE1	2.46	0.48
3:J:381:ILE:HD11	3:J:412:LEU:HD13	1.96	0.48
1:G:16:ILE:HD12	1:G:16:ILE:N	2.28	0.48
2:I:553:THR:CG2	2:I:608:ALA:HB1	2.43	0.48
2:I:1308:ILE:HG21	3:J:379:PRO:HB2	1.95	0.48
1:G:110:VAL:CG2	1:G:133:LEU:HD23	2.43	0.48
2:I:22:LEU:HD13	2:I:603:ILE:HD13	1.95	0.48
2:I:553:THR:HG21	2:I:608:ALA:HB1	1.96	0.48
3:J:572:THR:HG21	3:J:589:TYR:CZ	2.47	0.48
3:J:1024:THR:O	3:J:1025:MET:C	2.57	0.48
2:I:651:ASP:OD1	2:I:651:ASP:N	2.46	0.48
2:I:318:SER:OG	2:I:320:ASP:OD1	2.25	0.48
2:I:254:ASP:OD1	2:I:255:ILE:N	2.45	0.47
3:J:1146:GLU:OE1	3:J:1310:THR:HG22	2.13	0.47
2:I:1100:PRO:HB2	3:J:725:MET:HE1	1.96	0.47
3:J:197:GLU:O	3:J:201:LEU:HD23	2.14	0.47
5:L:395:THR:HG23	5:L:396:ASN:N	2.29	0.47
2:I:109:ALA:HB3	2:I:113:THR:CG2	2.45	0.47
3:J:751:ASP:OD1	3:J:751:ASP:N	2.45	0.47
3:J:801:VAL:HG12	3:J:920:ALA:CB	2.45	0.47
5:L:568:ASN:OD1	5:L:569:THR:N	2.48	0.47
1:G:29:GLU:HB3	1:G:30:PRO:HD3	1.97	0.47
2:I:397:LEU:N	2:I:418:GLY:O	2.47	0.47
3:J:836:ARG:NH1	3:J:870:ASP:OD1	2.46	0.47
1:H:58:GLU:OE1	1:H:170:ARG:NH2	2.48	0.47
2:I:320:ASP:OD1	2:I:321:LEU:N	2.49	0.47
4:K:41:GLU:OE1	4:K:41:GLU:N	2.40	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:L:118:ASP:O	5:L:121:LYS:HG2	2.15	0.46
1:H:9:LEU:HD21	1:H:12:ARG:NH2	2.30	0.46
2:I:624:ASP:OD1	2:I:625:GLU:N	2.44	0.46
3:J:976:THR:O	3:J:976:THR:HG22	2.16	0.46
3:J:1184:ASP:N	3:J:1184:ASP:OD1	2.49	0.46
3:J:1320:ILE:O	3:J:1324:SER:OG	2.33	0.46
2:I:739:ASP:OD1	2:I:739:ASP:N	2.49	0.46
3:J:24:LEU:HD21	3:J:116:PHE:CZ	2.51	0.46
1:H:93:GLN:NE2	1:H:122:GLU:OE1	2.49	0.46
2:I:1060:ILE:HD11	2:I:1076:ILE:HD11	1.97	0.46
2:I:939:VAL:HG12	2:I:940:GLU:N	2.31	0.46
3:J:290:ILE:N	3:J:290:ILE:HD12	2.31	0.46
5:L:376:LYS:HG3	5:L:416:VAL:HG11	1.98	0.46
8:L:701:4QM:C3	8:L:701:4QM:C11	2.94	0.46
3:J:1040:MET:HE3	3:J:1046:ILE:HG21	1.98	0.45
7:P:43:DG:C2'	7:P:44:DT:H72	2.45	0.45
3:J:1178:THR:HA	3:J:1184:ASP:HB3	1.98	0.45
5:L:163:THR:OG1	5:L:262:VAL:HG22	2.16	0.45
3:J:801:VAL:HG12	3:J:920:ALA:HB3	1.99	0.45
5:L:387:VAL:HG22	5:L:435:ILE:CD1	2.46	0.45
2:I:116:ASP:OD1	2:I:117:ILE:N	2.48	0.45
1:H:29:GLU:HB3	1:H:30:PRO:HD3	1.99	0.45
2:I:353:VAL:HG12	2:I:353:VAL:O	2.16	0.45
3:J:813:ASP:OD1	3:J:815:GLY:N	2.49	0.45
2:I:183:TRP:O	2:I:198:ILE:O	2.34	0.45
1:H:83:LEU:HD11	3:J:526:VAL:CG2	2.47	0.45
2:I:59:ILE:HD13	2:I:472:GLU:HA	1.98	0.45
2:I:255:ILE:HG21	2:I:262:TYR:HB2	1.99	0.45
2:I:876:GLU:HG2	2:I:927:THR:HG22	1.98	0.45
3:J:1111:ASP:N	3:J:1111:ASP:OD1	2.50	0.45
1:H:92:VAL:HG22	1:H:121:VAL:HG12	1.99	0.44
3:J:975:ILE:CD1	3:J:997:VAL:HG11	2.47	0.44
1:G:224:LEU:HD23	1:H:228:LEU:HD11	1.99	0.44
1:H:207:THR:HG22	1:H:208:ASN:N	2.32	0.44
1:M:252:ILE:HD11	1:M:310:ARG:HD3	1.98	0.44
2:I:981:ALA:HB1	2:I:1005:GLU:H	1.83	0.44
3:J:349:TYR:HB3	3:J:470:VAL:HG13	1.99	0.44
5:L:235:ILE:O	5:L:242:HIS:N	2.50	0.44
1:H:71:LYS:O	1:H:74:VAL:HG22	2.17	0.44
2:I:595:THR:O	2:I:596:ASP:C	2.60	0.44
5:L:412:LEU:O	5:L:416:VAL:HG23	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:H:114:ASP:OD1	1:H:114:ASP:N	2.49	0.44
2:I:132:ASP:OD1	2:I:132:ASP:N	2.48	0.44
2:I:254:ASP:HB2	2:I:263:VAL:HG13	1.99	0.44
2:I:550:VAL:HG13	3:J:777:HIS:CD2	2.53	0.44
3:J:1081:VAL:HG12	3:J:1087:ASP:OD1	2.17	0.44
4:K:25:ARG:NH2	4:K:68:GLU:OE1	2.51	0.44
1:G:233:ASP:N	1:G:233:ASP:OD1	2.50	0.44
2:I:283:LYS:HB2	2:I:284:LEU:HD23	1.99	0.44
2:I:453:ILE:CD1	2:I:587:LEU:HD21	2.46	0.44
2:I:1331:ARG:NH2	2:I:1337:ILE:O	2.51	0.44
3:J:270:ARG:O	3:J:271:ARG:C	2.61	0.44
1:H:14:VAL:O	1:H:14:VAL:HG13	2.18	0.43
5:L:403:ASP:OD1	5:L:403:ASP:N	2.50	0.43
1:M:250:ASP:OD1	1:M:252:ILE:HG22	2.17	0.43
3:J:807:LEU:CD2	3:J:1255:VAL:HG23	2.48	0.43
3:J:823:THR:HG22	3:J:878:ASP:O	2.18	0.43
6:O:85:DC:O2	6:O:85:DC:O4'	2.36	0.43
2:I:273:HIS:O	2:I:277:LEU:HD13	2.18	0.43
3:J:290:ILE:HD12	3:J:290:ILE:H	1.84	0.43
3:J:1298:VAL:HG22	3:J:1299:GLY:H	1.83	0.43
3:J:847:ASP:OD1	3:J:847:ASP:N	2.51	0.43
3:J:1233:ILE:O	3:J:1237:VAL:HG12	2.19	0.43
3:J:572:THR:HG21	3:J:589:TYR:HE2	1.84	0.43
1:G:174:ASP:OD1	1:G:174:ASP:N	2.49	0.43
1:H:198:LEU:N	1:H:198:LEU:HD22	2.33	0.43
3:J:140:TYR:CD2	5:L:100:MET:HE1	2.54	0.43
3:J:298:MET:SD	5:L:402:LEU:HB3	2.59	0.43
3:J:1208:ASP:OD1	3:J:1209:VAL:N	2.50	0.43
3:J:1327:GLU:OE2	3:J:1331:VAL:HG23	2.18	0.43
1:G:215:GLU:OE2	1:G:219:ARG:NH2	2.52	0.43
2:I:905:ILE:HD11	5:L:598:LEU:HD13	2.00	0.43
3:J:162:GLU:OE1	3:J:162:GLU:N	2.42	0.43
3:J:271:ARG:O	3:J:272:VAL:C	2.62	0.43
2:I:39:ILE:HG13	2:I:39:ILE:O	2.18	0.42
3:J:825:VAL:O	3:J:825:VAL:HG13	2.20	0.42
1:G:135:ASP:OD1	1:G:136:GLU:N	2.52	0.42
3:J:201:LEU:HB3	3:J:221:ILE:HD11	2.01	0.42
3:J:711:GLY:N	3:J:712:GLN:OE1	2.52	0.42
2:I:30:ILE:HG23	2:I:31:GLN:N	2.34	0.42
2:I:297:VAL:HG12	2:I:315:MET:O	2.19	0.42
5:L:271:ASN:O	5:L:275:VAL:HG23	2.18	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:L:290:LEU:HB3	5:L:333:VAL:HG21	2.00	0.42
5:L:415:ALA:O	5:L:418:LYS:N	2.37	0.42
5:L:547:VAL:CG1	5:L:598:LEU:HD22	2.49	0.42
2:I:204:LEU:HD11	2:I:369:MET:HE3	2.01	0.42
2:I:637:ARG:HA	2:I:642:SER:HA	2.01	0.42
3:J:147:ILE:HG13	3:J:147:ILE:O	2.19	0.42
3:J:515:ARG:O	3:J:545:HIS:HB3	2.20	0.42
5:L:134:VAL:CG1	5:L:365:MET:HE2	2.50	0.42
5:L:582:VAL:HG12	5:L:583:THR:N	2.34	0.42
2:I:979:LEU:O	2:I:979:LEU:HD22	2.20	0.42
2:I:981:ALA:HB1	2:I:1004:ASP:HA	2.01	0.42
3:J:504:GLN:O	3:J:730:ALA:HB1	2.19	0.42
3:J:707:ILE:HD11	3:J:713:GLU:OE2	2.19	0.42
3:J:62:PHE:O	3:J:98:ARG:HA	2.20	0.42
6:O:59:DT:H4'	6:O:60:DT:OP1	2.19	0.42
3:J:591:ILE:HG13	3:J:592:VAL:HG13	2.01	0.42
3:J:1275:LEU:N	3:J:1275:LEU:HD12	2.34	0.42
2:I:905:ILE:O	5:L:599:ARG:NE	2.53	0.41
2:I:942:ASP:OD1	2:I:942:ASP:N	2.53	0.41
2:I:1151:LEU:HD12	2:I:1198:LEU:HD13	2.02	0.41
5:L:385:ARG:O	5:L:388:ILE:HG22	2.20	0.41
6:O:83:DT:H2''	6:O:84:DG:N3	2.35	0.41
1:H:102:LEU:HB2	1:H:115:ILE:HD12	2.02	0.41
2:I:569:ILE:HG23	2:I:569:ILE:O	2.21	0.41
4:K:3:ARG:NH2	4:K:55:GLU:OE1	2.53	0.41
5:L:511:ILE:HG23	5:L:512:GLY:N	2.35	0.41
2:I:1103:VAL:HG11	2:I:1112:ILE:HD11	2.02	0.41
1:H:47:LEU:HD12	1:H:183:ILE:HD13	2.02	0.41
1:G:98:VAL:HG22	1:G:99:ILE:N	2.36	0.41
1:G:234:LEU:HB2	1:H:14:VAL:HG21	2.01	0.41
2:I:90:VAL:HG22	2:I:91:THR:N	2.35	0.41
3:J:265:LEU:O	3:J:266:ASN:C	2.62	0.41
2:I:494:ASN:O	2:I:497:PRO:HD2	2.21	0.41
3:J:522:GLY:HA3	3:J:525:MET:HE2	2.02	0.41
3:J:975:ILE:HD12	3:J:997:VAL:HG11	2.03	0.41
2:I:724:VAL:HG11	2:I:727:VAL:CG2	2.51	0.41
3:J:114:ILE:HD12	3:J:304:ASP:OD1	2.21	0.41
3:J:253:VAL:HG12	5:L:507:MET:CE	2.51	0.41
3:J:1230:THR:HG23	3:J:1231:ARG:N	2.35	0.41
1:H:20:SER:OG	1:H:21:SER:N	2.54	0.41
2:I:636:CYS:SG	2:I:645:PHE:CD1	3.14	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:J:357:VAL:O	3:J:449:LEU:O	2.39	0.41
3:J:639:VAL:HG23	3:J:722:ILE:HD11	2.03	0.41
3:J:663:GLU:O	3:J:666:GLU:HG3	2.21	0.41
3:J:672:LEU:N	3:J:672:LEU:HD12	2.36	0.41
3:J:733:SER:OG	3:J:736:GLN:OE1	2.37	0.41
5:L:417:ASP:OD1	5:L:417:ASP:N	2.52	0.41
1:M:317:ARG:C	1:M:318:LEU:HD12	2.46	0.41
2:I:494:ASN:OD1	2:I:494:ASN:N	2.53	0.41
2:I:1119:MET:HG3	2:I:1204:LEU:HD13	2.02	0.41
3:J:94:GLN:O	3:J:97:VAL:HG12	2.21	0.41
3:J:161:THR:HG23	3:J:164:GLN:H	1.86	0.41
3:J:615:LYS:HB2	3:J:616:PRO:HD3	2.03	0.41
3:J:1045:THR:O	3:J:1062:LEU:N	2.46	0.40
5:L:586:ARG:HD3	5:L:589:GLN:HB2	2.01	0.40
1:G:23:HIS:NE2	1:G:204:GLU:OE2	2.52	0.40
2:I:979:LEU:HD23	2:I:981:ALA:O	2.21	0.40
3:J:500:ILE:O	3:J:500:ILE:CG2	2.62	0.40
3:J:1119:ASP:OD1	3:J:1120:THR:N	2.54	0.40
1:H:212:ASP:OD1	1:H:212:ASP:N	2.54	0.40
2:I:179:TYR:OH	2:I:458:GLU:OE2	2.35	0.40
2:I:471:VAL:HG21	2:I:498:ILE:HD11	2.02	0.40
2:I:727:VAL:HG12	2:I:728:ASP:N	2.36	0.40
3:J:515:ARG:NH2	3:J:717:VAL:HG23	2.36	0.40
3:J:1252:HIS:HA	3:J:1255:VAL:HG12	2.02	0.40
1:H:59:VAL:HG23	1:H:144:ILE:HG22	2.03	0.40
2:I:638:SER:O	2:I:639:LYS:C	2.64	0.40
3:J:62:PHE:CD1	3:J:247:PRO:HD3	2.57	0.40
3:J:526:VAL:HG12	3:J:549:LYS:HB2	2.04	0.40
1:H:112:ALA:O	1:H:115:ILE:HG22	2.21	0.40
3:J:968:ASN:OD1	3:J:972:LYS:N	2.55	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	G	228/329 (69%)	210 (92%)	18 (8%)	0	100	100
1	H	217/329 (66%)	196 (90%)	21 (10%)	0	100	100
1	M	71/329 (22%)	69 (97%)	2 (3%)	0	100	100
2	I	1326/1342 (99%)	1237 (93%)	88 (7%)	1 (0%)	48	77
3	J	1329/1407 (94%)	1249 (94%)	79 (6%)	1 (0%)	48	77
4	K	71/91 (78%)	68 (96%)	3 (4%)	0	100	100
5	L	462/613 (75%)	440 (95%)	21 (4%)	1 (0%)	43	72
All	All	3704/4440 (83%)	3469 (94%)	232 (6%)	3 (0%)	49	77

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	I	898	GLU
5	L	416	VAL
3	J	859	PRO

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	G	191/286 (67%)	176 (92%)	15 (8%)	11	34
1	H	188/286 (66%)	180 (96%)	8 (4%)	26	60
1	M	65/286 (23%)	65 (100%)	0	100	100
2	I	1150/1157 (99%)	1093 (95%)	57 (5%)	22	53
3	J	1117/1168 (96%)	1074 (96%)	43 (4%)	29	64
4	K	63/75 (84%)	62 (98%)	1 (2%)	55	83
5	L	412/540 (76%)	396 (96%)	16 (4%)	28	63
All	All	3186/3798 (84%)	3046 (96%)	140 (4%)	27	59

All (140) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	26	VAL
1	G	50	SER
1	G	56	VAL
1	G	74	VAL
1	G	92	VAL
1	G	100	LEU
1	G	118	ASP
1	G	137	ASN
1	G	160	HIS
1	G	173	VAL
1	G	177	TYR
1	G	187	VAL
1	G	211	ILE
1	G	212	ASP
1	G	229	GLU
1	H	9	LEU
1	H	15	ASP
1	H	27	THR
1	H	107	ILE
1	H	114	ASP
1	H	127	GLN
1	H	173	VAL
1	H	214	GLU
2	I	98	VAL
2	I	185	ASP
2	I	197	ARG
2	I	284	LEU
2	I	338	THR
2	I	370	MET
2	I	469	VAL
2	I	483	ASP
2	I	491	ASP
2	I	513	GLN
2	I	521	LEU
2	I	546	GLU
2	I	549	ASP
2	I	550	VAL
2	I	553	THR
2	I	581	THR
2	I	651	ASP
2	I	655	VAL
2	I	672	GLU

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Mol	Chain	Res	Type
2	I	697	LYS
2	I	699	LEU
2	I	739	ASP
2	I	740	GLU
2	I	749	ASP
2	I	773	LEU
2	I	791	LEU
2	I	799	ASN
2	I	802	VAL
2	I	811	ASN
2	I	840	SER
2	I	898	GLU
2	I	912	ASP
2	I	950	GLU
2	I	967	LEU
2	I	978	VAL
2	I	979	LEU
2	I	992	LEU
2	I	997	TRP
2	I	1014	LEU
2	I	1046	VAL
2	I	1092	THR
2	I	1098	LEU
2	I	1107	MET
2	I	1127	LYS
2	I	1159	VAL
2	I	1207	SER
2	I	1212	LEU
2	I	1220	GLN
2	I	1225	VAL
2	I	1227	VAL
2	I	1248	THR
2	I	1253	LEU
2	I	1254	VAL
2	I	1287	LEU
2	I	1301	ARG
2	I	1319	MET
2	I	1340	GLU
3	J	18	ASP
3	J	70	CYS
3	J	79	LYS
3	J	93	THR

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Mol	Chain	Res	Type
3	J	114	ILE
3	J	126	LEU
3	J	139	LEU
3	J	166	LEU
3	J	169	LEU
3	J	195	GLU
3	J	203	GLU
3	J	217	LEU
3	J	227	PHE
3	J	282	LEU
3	J	292	VAL
3	J	304	ASP
3	J	320	ASN
3	J	343	LEU
3	J	402	GLU
3	J	410	ASP
3	J	430	HIS
3	J	470	VAL
3	J	474	LEU
3	J	489	ASN
3	J	527	LEU
3	J	545	HIS
3	J	566	LYS
3	J	635	SER
3	J	681	LYS
3	J	751	ASP
3	J	755	ILE
3	J	785	ASP
3	J	847	ASP
3	J	858	VAL
3	J	960	LEU
3	J	1135	THR
3	J	1175	LEU
3	J	1316	THR
3	J	1324	SER
3	J	1327	GLU
3	J	1343	GLU
3	J	1344	LEU
3	J	1368	ASP
4	K	4	VAL
5	L	102	MET
5	L	110	LEU

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Mol	Chain	Res	Type
5	L	132	CYS
5	L	376	LYS
5	L	381	GLU
5	L	402	LEU
5	L	412	LEU
5	L	417	ASP
5	L	466	ILE
5	L	470	MET
5	L	483	LEU
5	L	517	SER
5	L	566	ASP
5	L	584	ARG
5	L	591	GLU
5	L	607	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	G	41	ASN
1	G	66	HIS
1	H	37	HIS
1	H	117	HIS
2	I	165	HIS
2	I	357	ASN
2	I	737	ASN
2	I	760	ASN
2	I	1023	HIS
2	I	1209	GLN
3	J	209	ASN
3	J	875	ASN
3	J	921	GLN
3	J	1010	GLN
3	J	1279	GLN
4	K	7	GLN
5	L	301	ASN
5	L	357	GLN
5	L	362	ASN
5	L	383	ASN
5	L	455	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 6 ligands modelled in this entry, 3 are monoatomic - leaving 3 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$
8	4QM	J	1504	-	30,30,30	5.20	16 (53%)	47,48,48	2.36	14 (29%)
8	4QM	L	701	-	30,30,30	5.15	15 (50%)	47,48,48	2.30	10 (21%)
8	4QM	I	1401	-	29,29,30	5.24	16 (55%)	47,47,48	1.99	11 (23%)

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
8	4QM	J	1504	-	-	4/7/72/72	0/4/4/4
8	4QM	L	701	-	-	5/7/72/72	0/4/4/4
8	4QM	I	1401	-	-	0/6/71/72	0/4/4/4

All (47) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	J	1504	4QM	C3-C19	18.24	1.83	1.53
8	L	701	4QM	C3-C19	18.02	1.82	1.53
8	I	1401	4QM	C3-C19	18.01	1.82	1.53
8	J	1504	4QM	C3-C4	12.19	1.73	1.53
8	I	1401	4QM	C3-C4	12.05	1.72	1.53
8	L	701	4QM	C3-C4	11.94	1.72	1.53
8	L	701	4QM	C5-C4	-9.53	1.39	1.54
8	I	1401	4QM	C5-C4	-9.47	1.40	1.54
8	J	1504	4QM	C5-C4	-9.38	1.40	1.54
8	J	1504	4QM	C2-C19	-8.64	1.41	1.56
8	I	1401	4QM	C2-C19	-8.34	1.41	1.56
8	L	701	4QM	C2-C19	-8.32	1.41	1.56
8	J	1504	4QM	C8-C7	6.21	1.71	1.54
8	L	701	4QM	C8-C7	6.14	1.70	1.54
8	I	1401	4QM	C8-C7	6.10	1.70	1.54
8	I	1401	4QM	C5-C6	-4.24	1.48	1.55
8	J	1504	4QM	C5-C6	-4.23	1.48	1.55
8	I	1401	4QM	O4-C4	-4.17	1.36	1.43
8	L	701	4QM	C5-C6	-4.17	1.48	1.55
8	L	701	4QM	O4-C4	-4.13	1.36	1.43
8	J	1504	4QM	C18-C6	-4.11	1.46	1.53
8	J	1504	4QM	O4-C4	-4.10	1.36	1.43
8	I	1401	4QM	C18-C6	-4.03	1.46	1.53
8	L	701	4QM	C18-C6	-3.85	1.46	1.53
8	J	1504	4QM	C7-C6	3.56	1.61	1.54
8	L	701	4QM	C7-C6	3.50	1.61	1.54
8	I	1401	4QM	C7-C6	3.29	1.61	1.54
8	I	1401	4QM	C5-C9	3.26	1.61	1.55
8	I	1401	4QM	C14-C15	-3.17	1.48	1.53
8	L	701	4QM	C2-C15	3.12	1.60	1.55
8	L	701	4QM	C5-C9	3.12	1.60	1.55
8	J	1504	4QM	C14-C15	-3.03	1.49	1.53
8	J	1504	4QM	C5-C9	3.03	1.60	1.55
8	I	1401	4QM	C2-C15	3.02	1.60	1.55
8	J	1504	4QM	C2-C15	2.94	1.60	1.55
8	L	701	4QM	C14-C15	-2.93	1.49	1.53
8	L	701	4QM	C14-C13	2.77	1.56	1.52
8	J	1504	4QM	C14-C13	2.56	1.56	1.52
8	I	1401	4QM	O2-C13	-2.33	1.36	1.43
8	L	701	4QM	O2-C13	-2.26	1.36	1.43
8	J	1504	4QM	O2-C13	-2.24	1.36	1.43
8	I	1401	4QM	C14-C13	2.23	1.55	1.52
8	L	701	4QM	C10-C5	2.18	1.57	1.54

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	I	1401	4QM	C20-C9	-2.09	1.50	1.54
8	J	1504	4QM	C16-C15	2.07	1.57	1.53
8	J	1504	4QM	C12-C13	2.03	1.56	1.51
8	I	1401	4QM	C1-C2	2.00	1.57	1.54

All (35) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	L	701	4QM	C9-C5-C4	-7.56	110.86	117.67
8	J	1504	4QM	C9-C5-C4	-7.23	111.17	117.67
8	L	701	4QM	C6-C5-C4	6.96	113.78	107.42
8	I	1401	4QM	C9-C5-C4	-6.64	111.70	117.67
8	L	701	4QM	C7-C6-C18	-5.75	110.47	118.36
8	I	1401	4QM	C7-C6-C18	-5.64	110.62	118.36
8	J	1504	4QM	C6-C5-C4	5.33	112.29	107.42
8	J	1504	4QM	C7-C6-C18	-5.31	111.08	118.36
8	J	1504	4QM	C5-C9-C20	-4.90	113.55	119.48
8	I	1401	4QM	C6-C5-C4	4.43	111.47	107.42
8	J	1504	4QM	C19-C3-C4	-4.40	108.54	114.29
8	I	1401	4QM	C19-C3-C4	-4.32	108.64	114.29
8	L	701	4QM	C19-C3-C4	-4.29	108.67	114.29
8	J	1504	4QM	C21-C20-C9	-3.87	107.07	112.88
8	L	701	4QM	C15-C16-C17	-3.59	110.14	114.40
8	J	1504	4QM	C19-C18-C17	-3.45	107.51	111.86
8	L	701	4QM	C3-C19-C2	-3.32	110.34	113.70
8	L	701	4QM	C5-C9-C20	-3.10	115.73	119.48
8	I	1401	4QM	C3-C19-C18	-2.75	106.82	110.89
8	J	1504	4QM	C3-C19-C2	-2.71	110.96	113.70
8	J	1504	4QM	C14-C15-C2	-2.55	109.94	112.66
8	I	1401	4QM	C9-C5-C6	2.55	102.67	100.11
8	I	1401	4QM	C5-C9-C20	-2.39	116.59	119.48
8	J	1504	4QM	C22-C20-C9	2.37	115.23	110.33
8	J	1504	4QM	C1-C2-C19	-2.36	107.67	111.34
8	J	1504	4QM	C15-C14-C13	-2.29	109.25	112.71
8	L	701	4QM	C16-C15-C2	-2.24	110.27	112.66
8	J	1504	4QM	C9-C5-C6	2.12	102.23	100.11
8	I	1401	4QM	C21-C20-C9	-2.11	109.72	112.88
8	L	701	4QM	C5-C6-C18	2.10	117.38	114.72
8	I	1401	4QM	C16-C15-C2	-2.07	110.45	112.66
8	L	701	4QM	C21-C20-C9	-2.06	109.80	112.88
8	I	1401	4QM	C16-C15-C14	-2.04	108.90	111.23
8	J	1504	4QM	C7-C6-C5	2.02	105.50	103.54

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	I	1401	4QM	C19-C18-C17	-2.01	109.33	111.86

There are no chirality outliers.

All (9) torsion outliers are listed below:

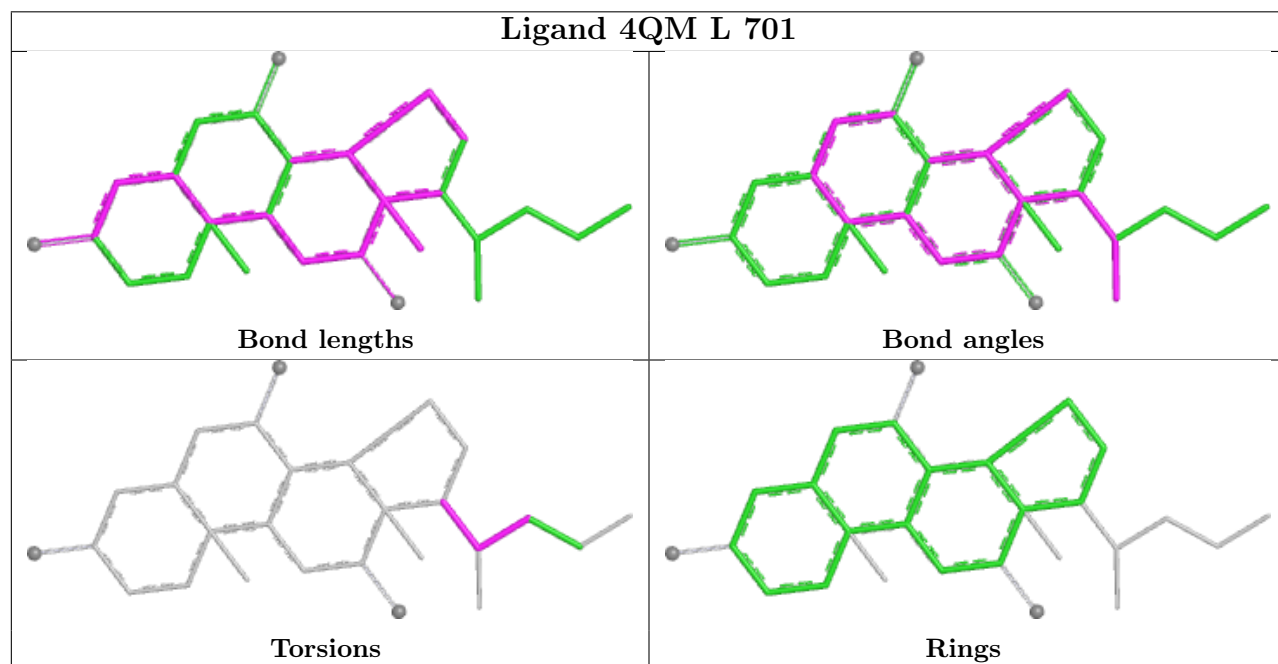
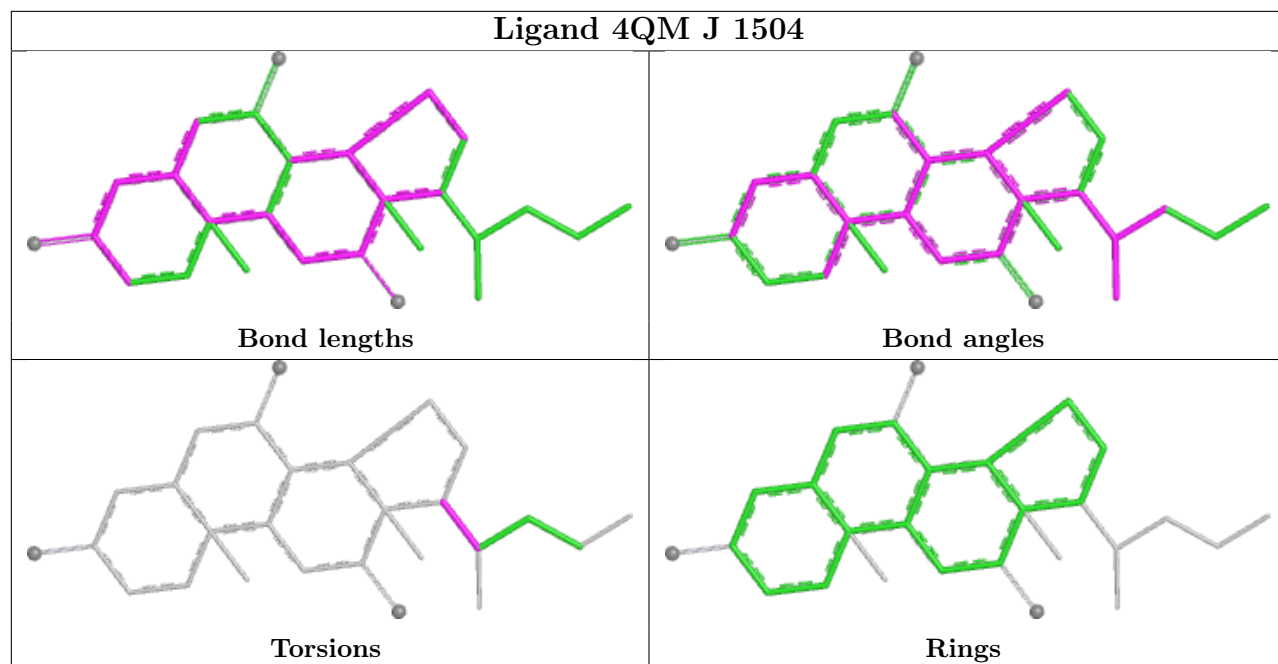
Mol	Chain	Res	Type	Atoms
8	J	1504	4QM	C22-C20-C9-C5
8	J	1504	4QM	C21-C20-C9-C8
8	J	1504	4QM	C22-C20-C9-C8
8	J	1504	4QM	C21-C20-C9-C5
8	L	701	4QM	C21-C20-C9-C5
8	L	701	4QM	C9-C20-C22-C23
8	L	701	4QM	C22-C20-C9-C5
8	L	701	4QM	C21-C20-C9-C8
8	L	701	4QM	C22-C20-C9-C8

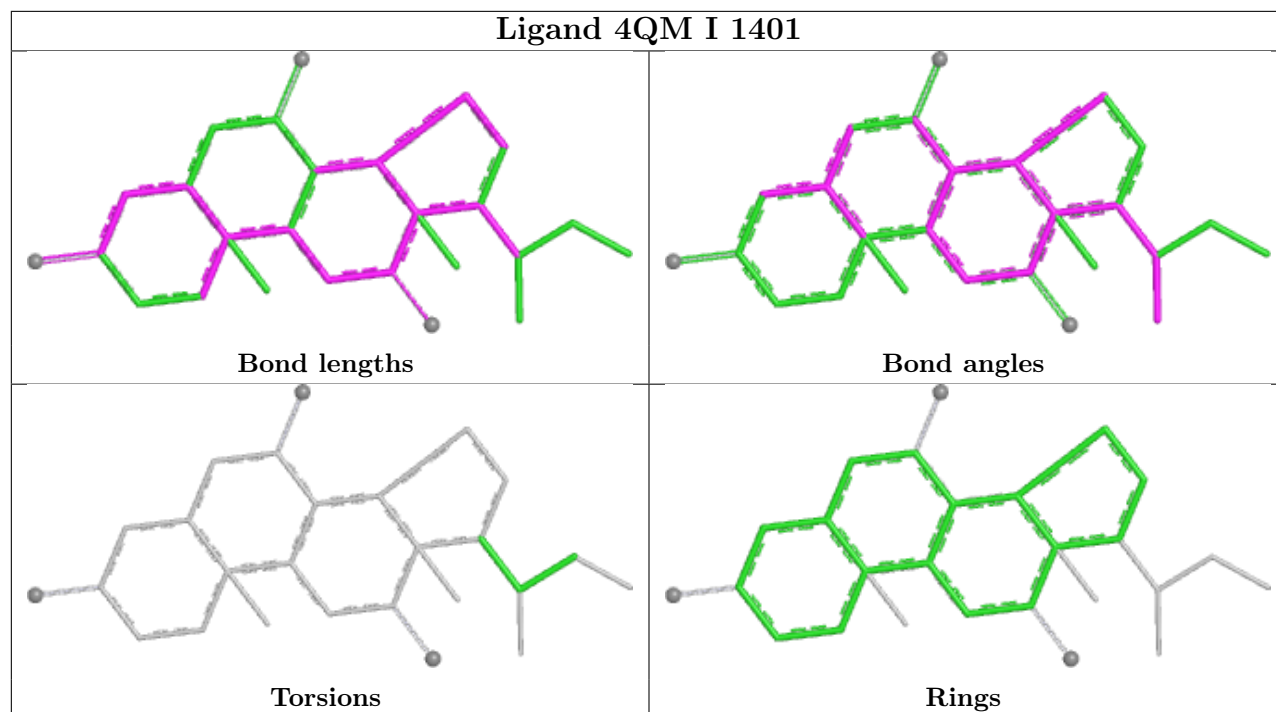
There are no ring outliers.

3 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	J	1504	4QM	4	0
8	L	701	4QM	4	0
8	I	1401	4QM	3	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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
2	I	2
5	L	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	I	1009:ASN	C	1010:GLN	N	4.89
1	L	586:ARG	C	587:ILE	N	4.05
1	I	996:ARG	C	997:TRP	N	3.59

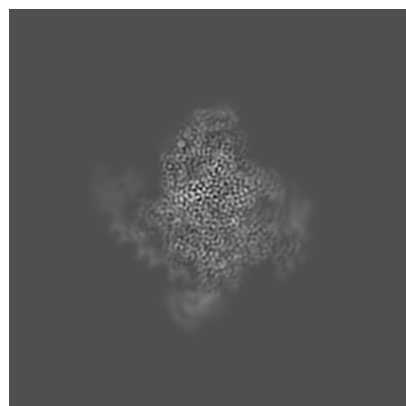
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-41437. These allow visual inspection of the internal detail of the map and identification of artifacts.

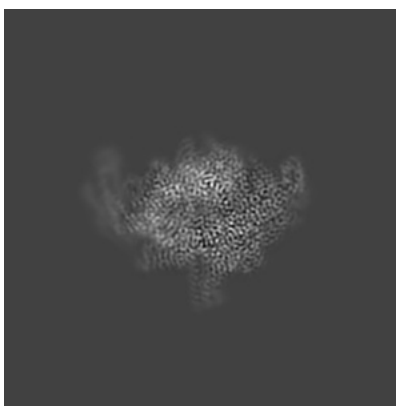
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

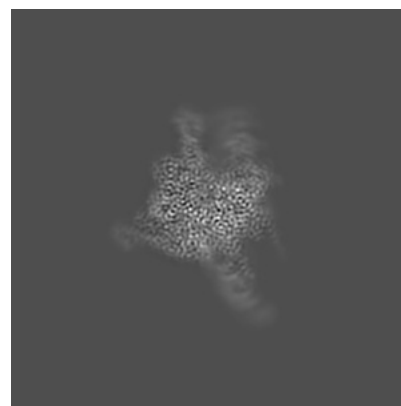
6.1.1 Primary map



X

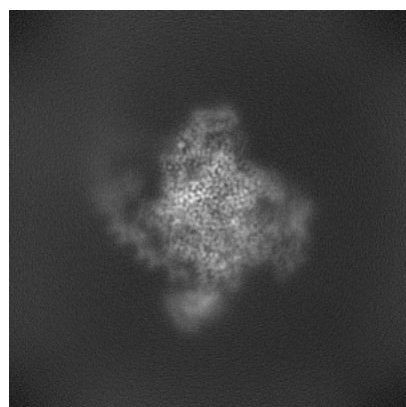


Y

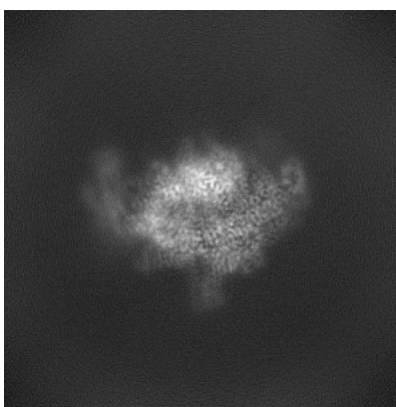


Z

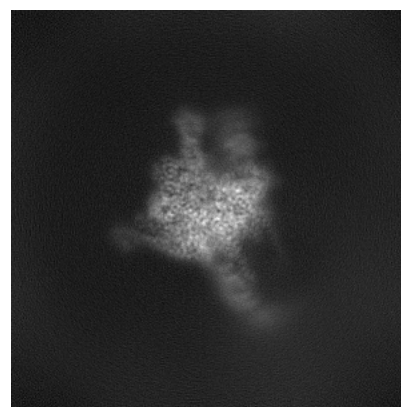
6.1.2 Raw map



X



Y

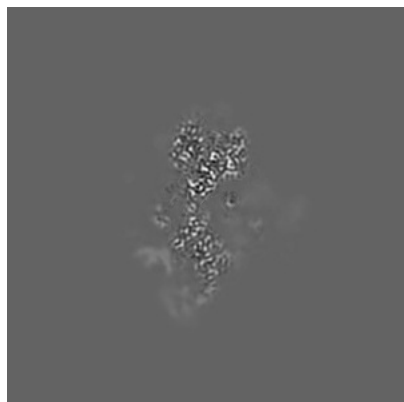


Z

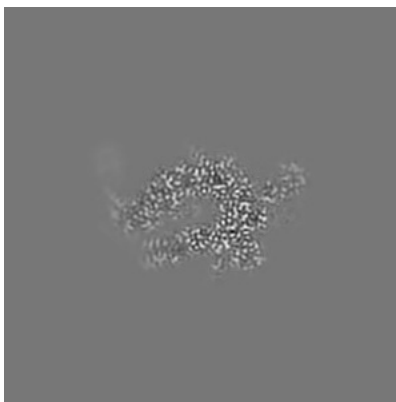
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

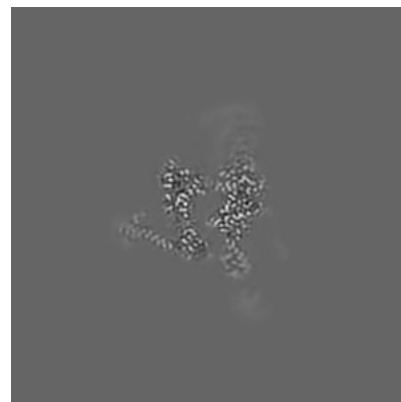
6.2.1 Primary map



X Index: 192

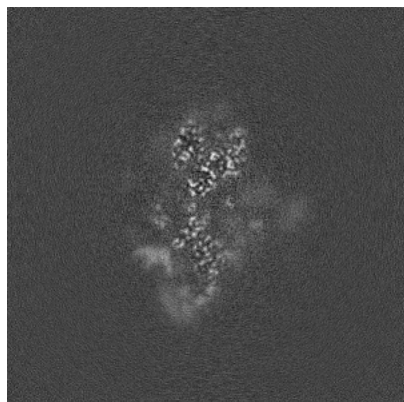


Y Index: 192

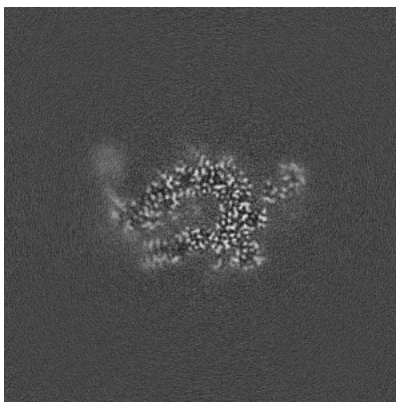


Z Index: 192

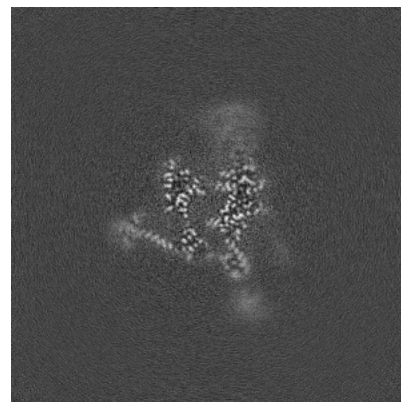
6.2.2 Raw map



X Index: 192



Y Index: 192



Z Index: 192

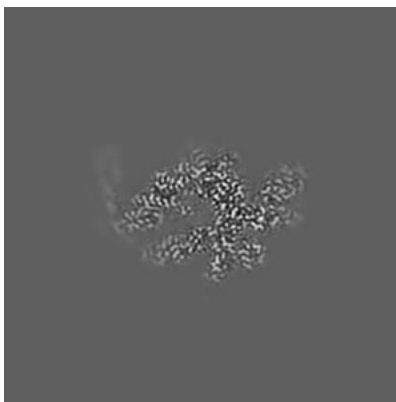
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

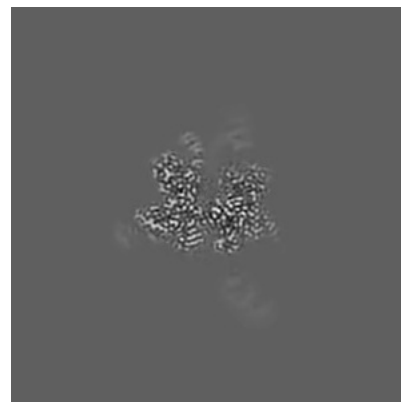
6.3.1 Primary map



X Index: 171

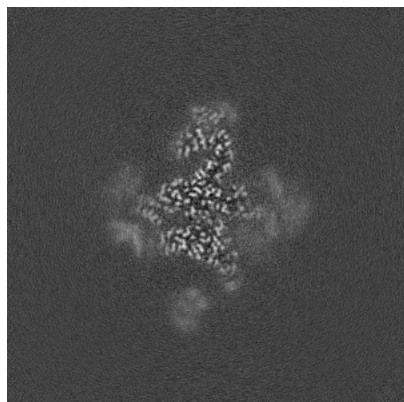


Y Index: 186

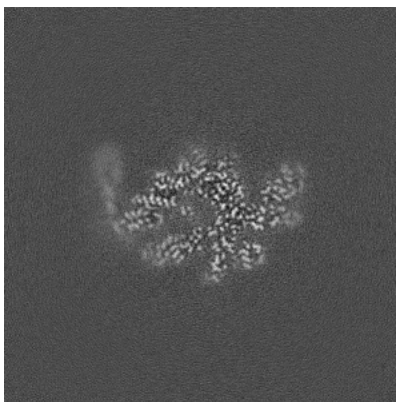


Z Index: 206

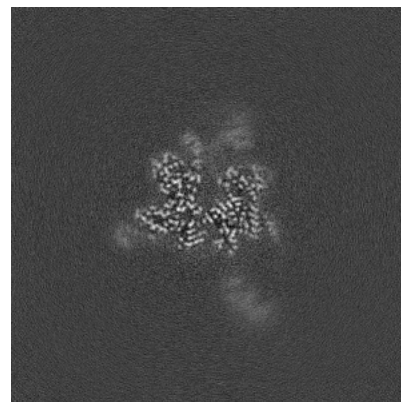
6.3.2 Raw map



X Index: 210



Y Index: 186

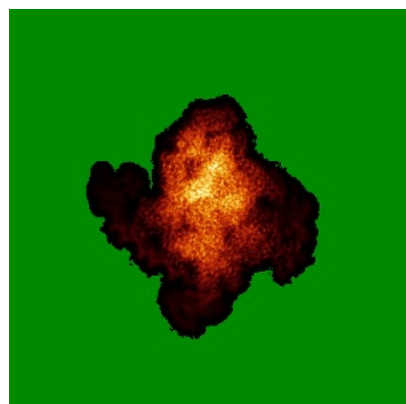


Z Index: 205

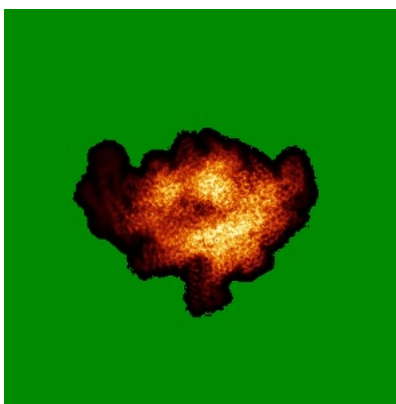
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) [i](#)

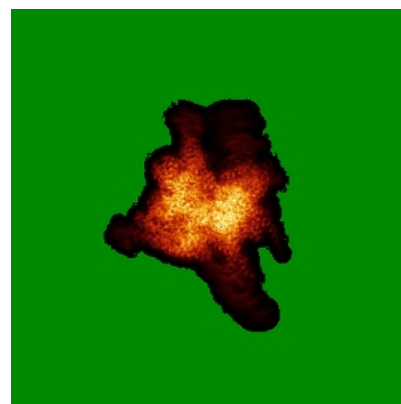
6.4.1 Primary map



X

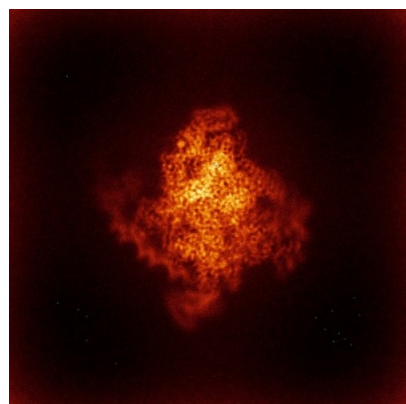


Y

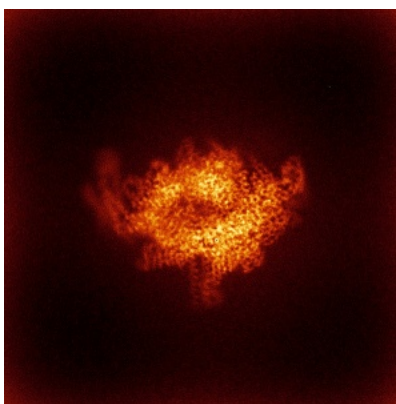


Z

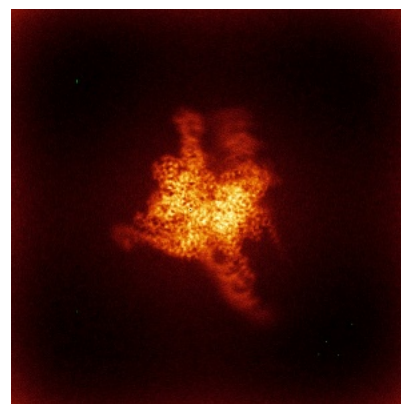
6.4.2 Raw map



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.

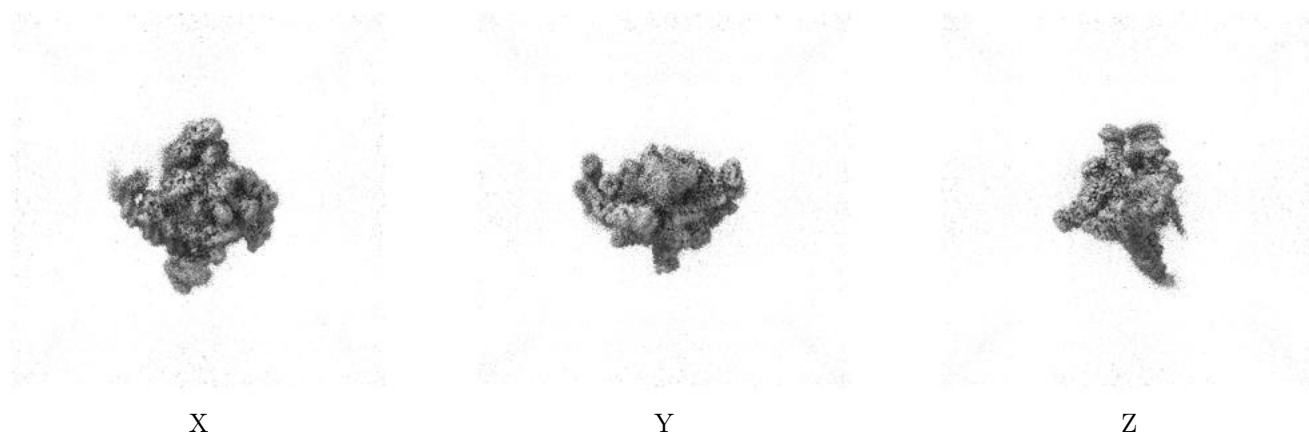
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.12. 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



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.

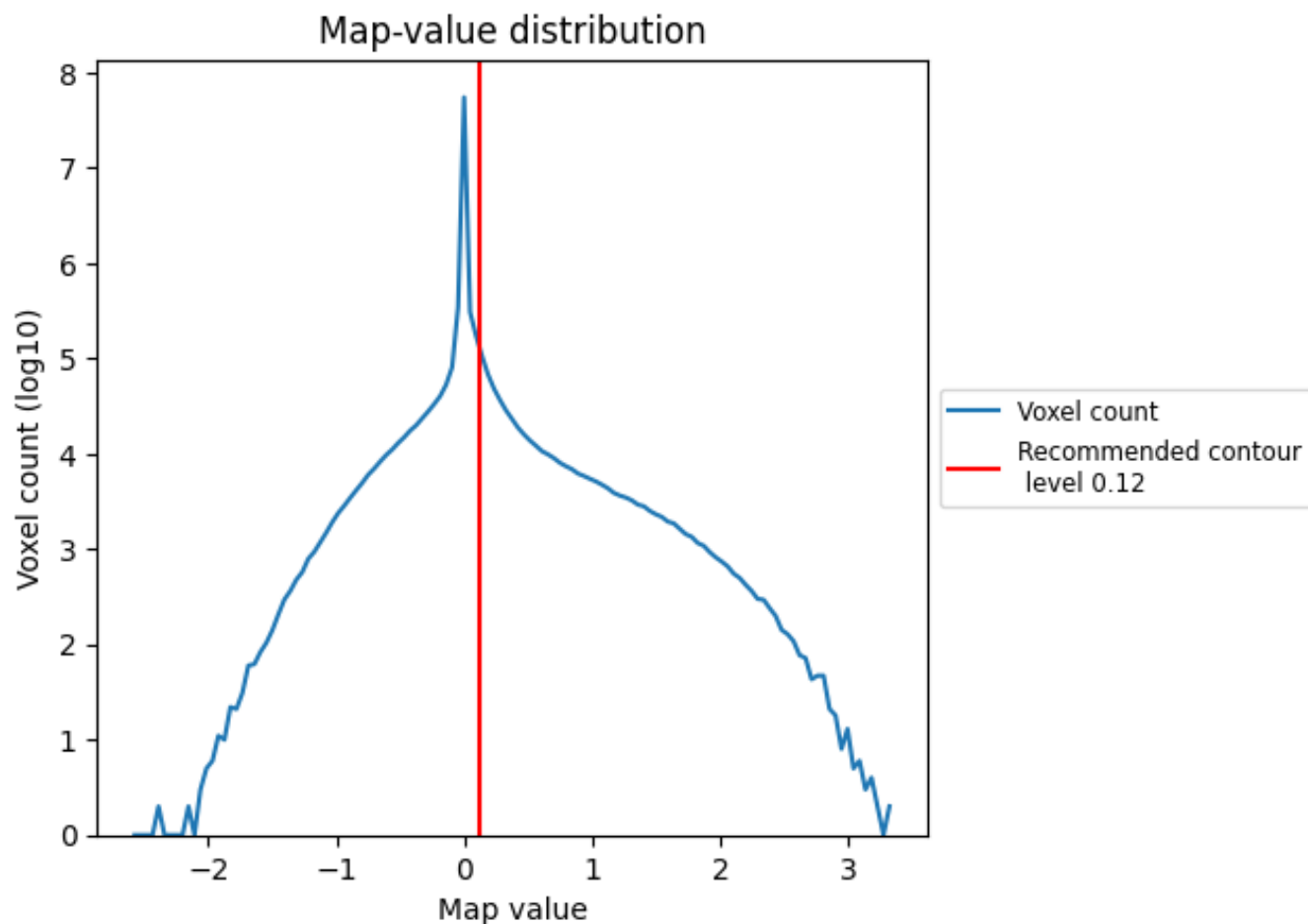
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

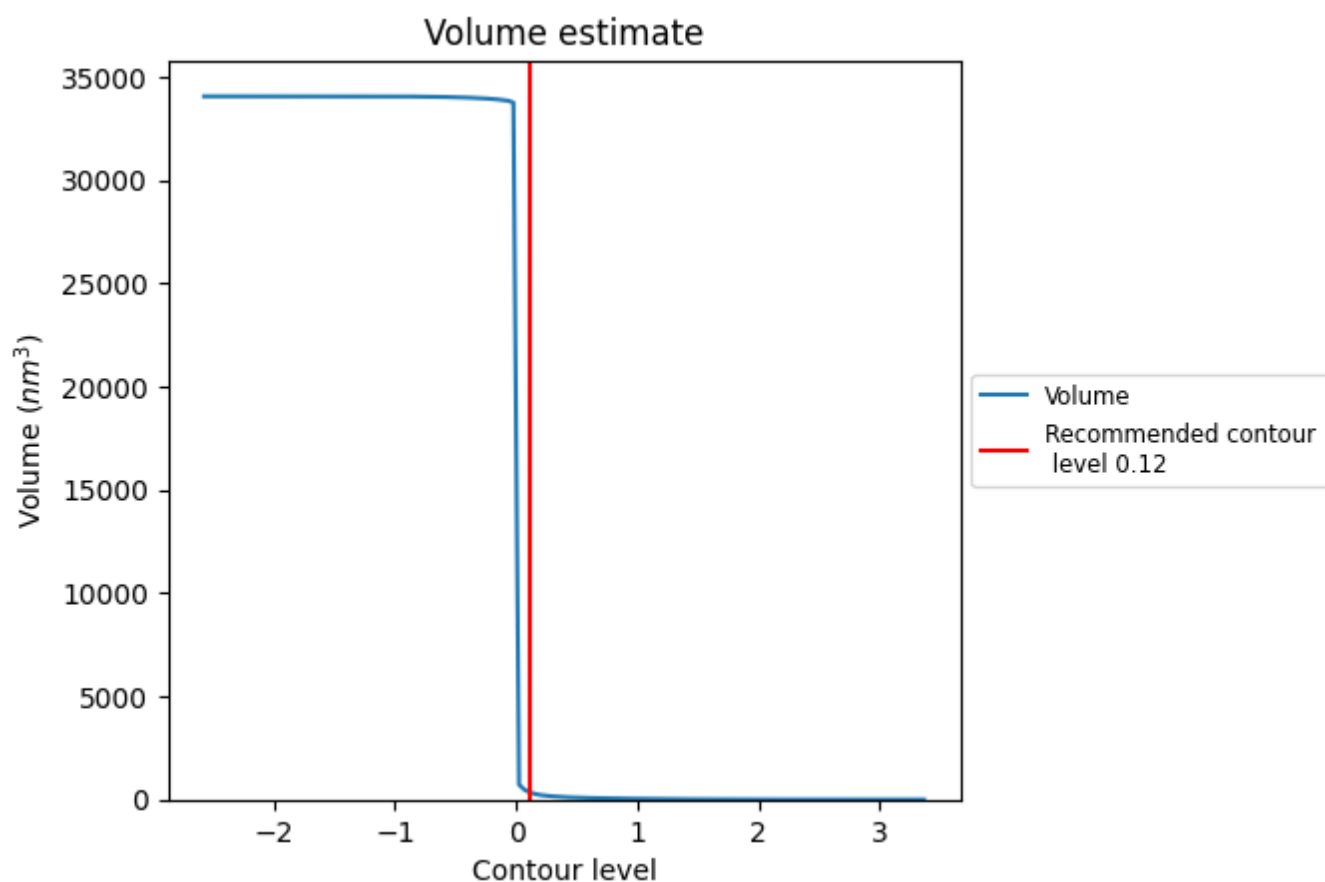
This section contains the results of statistical analysis of the map.

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.

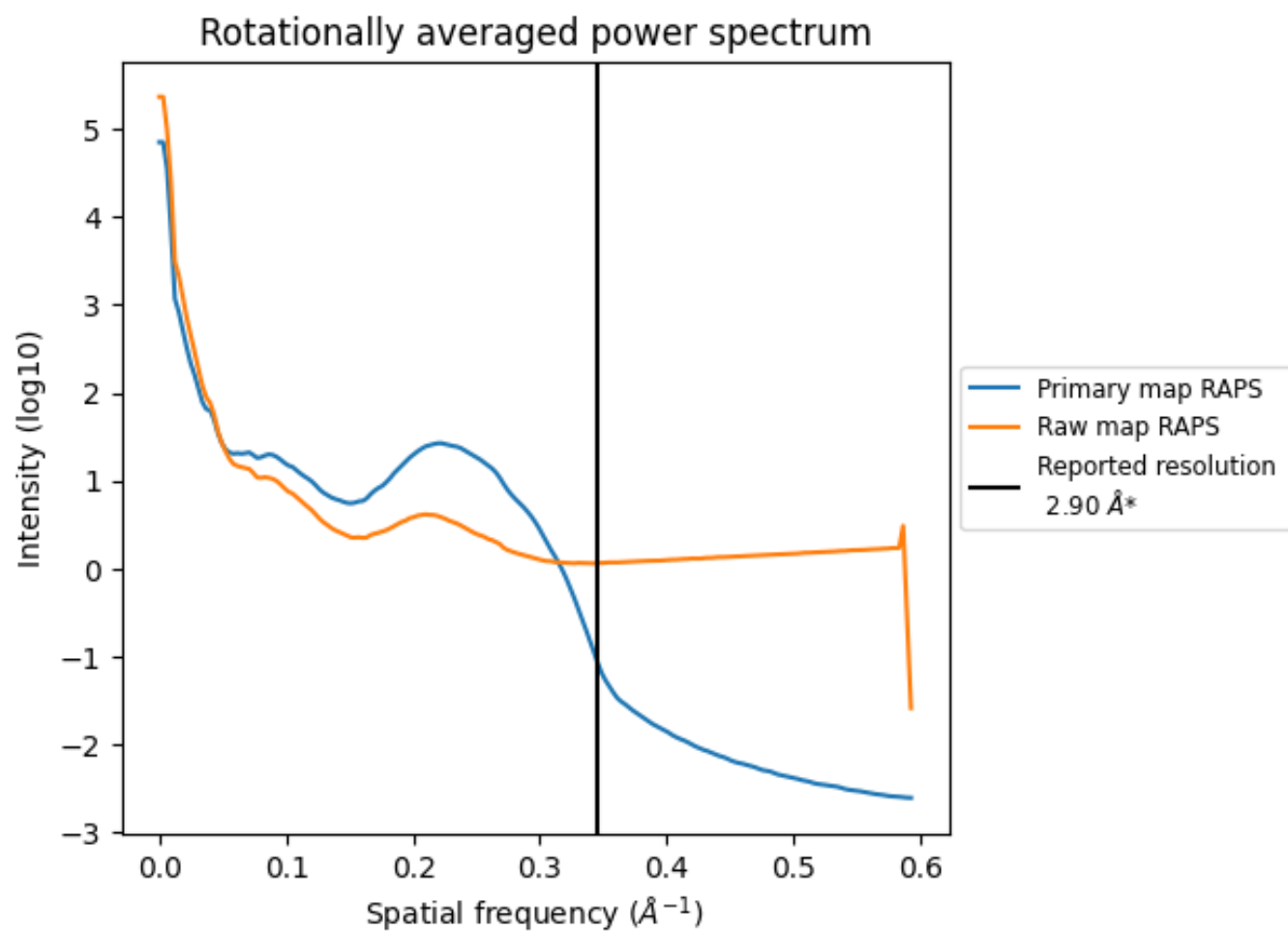
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 336 nm^3 ; this corresponds to an approximate mass of 303 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 ⓘ

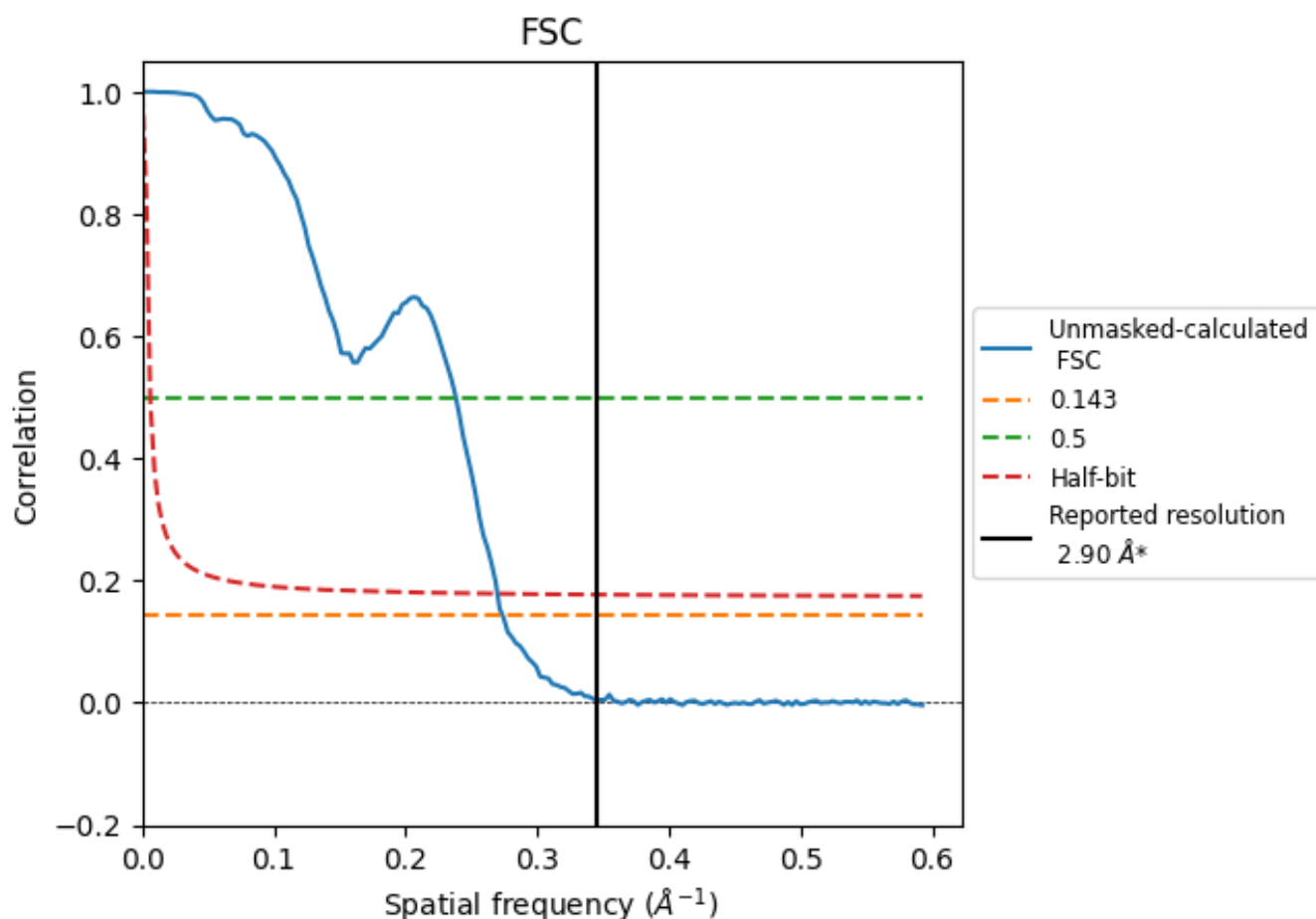


*Reported resolution corresponds to spatial frequency of $0.345 \text{ \AA}^{-1}$

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 0.345 $\text{\AA}^{-1}$

8.2 Resolution estimates [i](#)

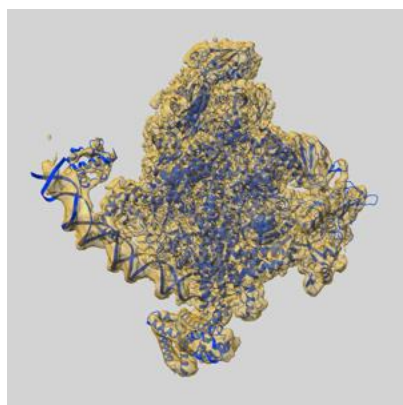
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.90	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.65	4.20	3.71

*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 3.65 differs from the reported value 2.9 by more than 10 %

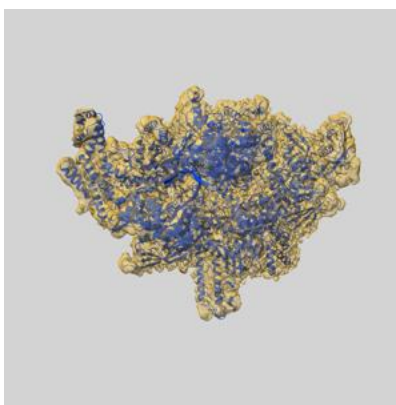
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-41437 and PDB model 8TO6. Per-residue inclusion information can be found in section [3](#) on page [7](#).

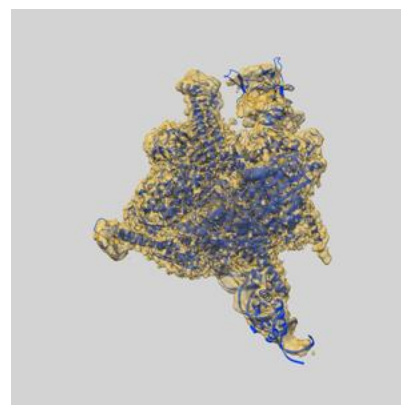
9.1 Map-model overlay [i](#)



X



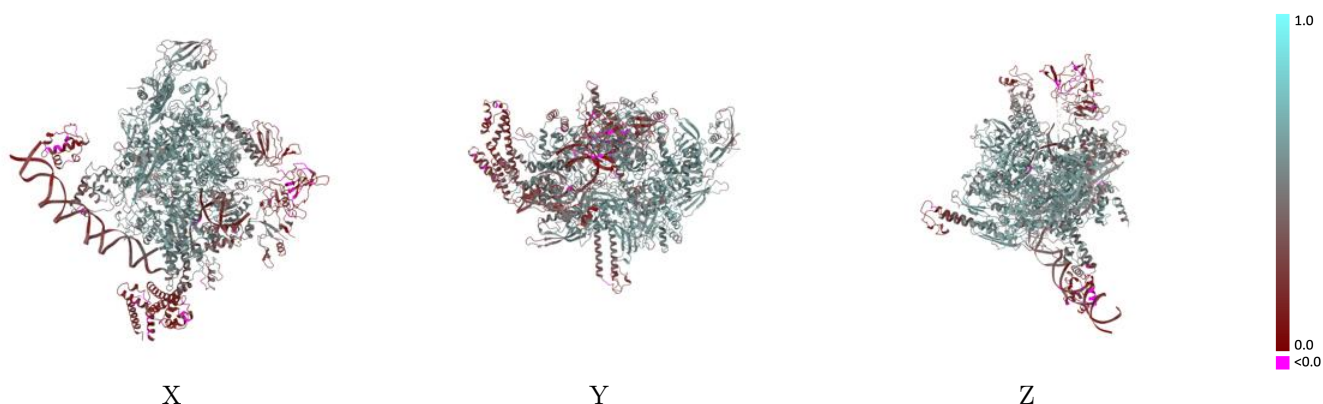
Y



Z

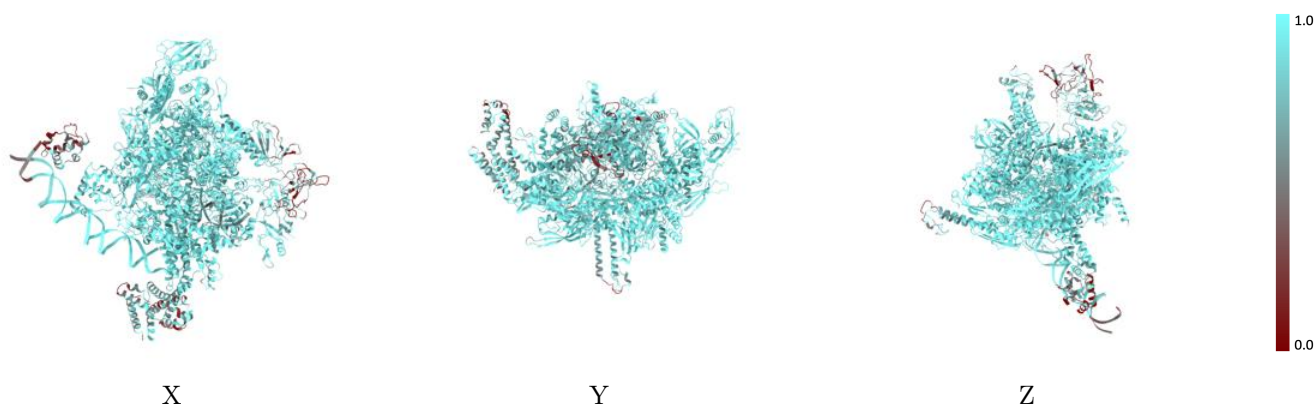
The images above show the 3D surface view of the map at the recommended contour level 0.12 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



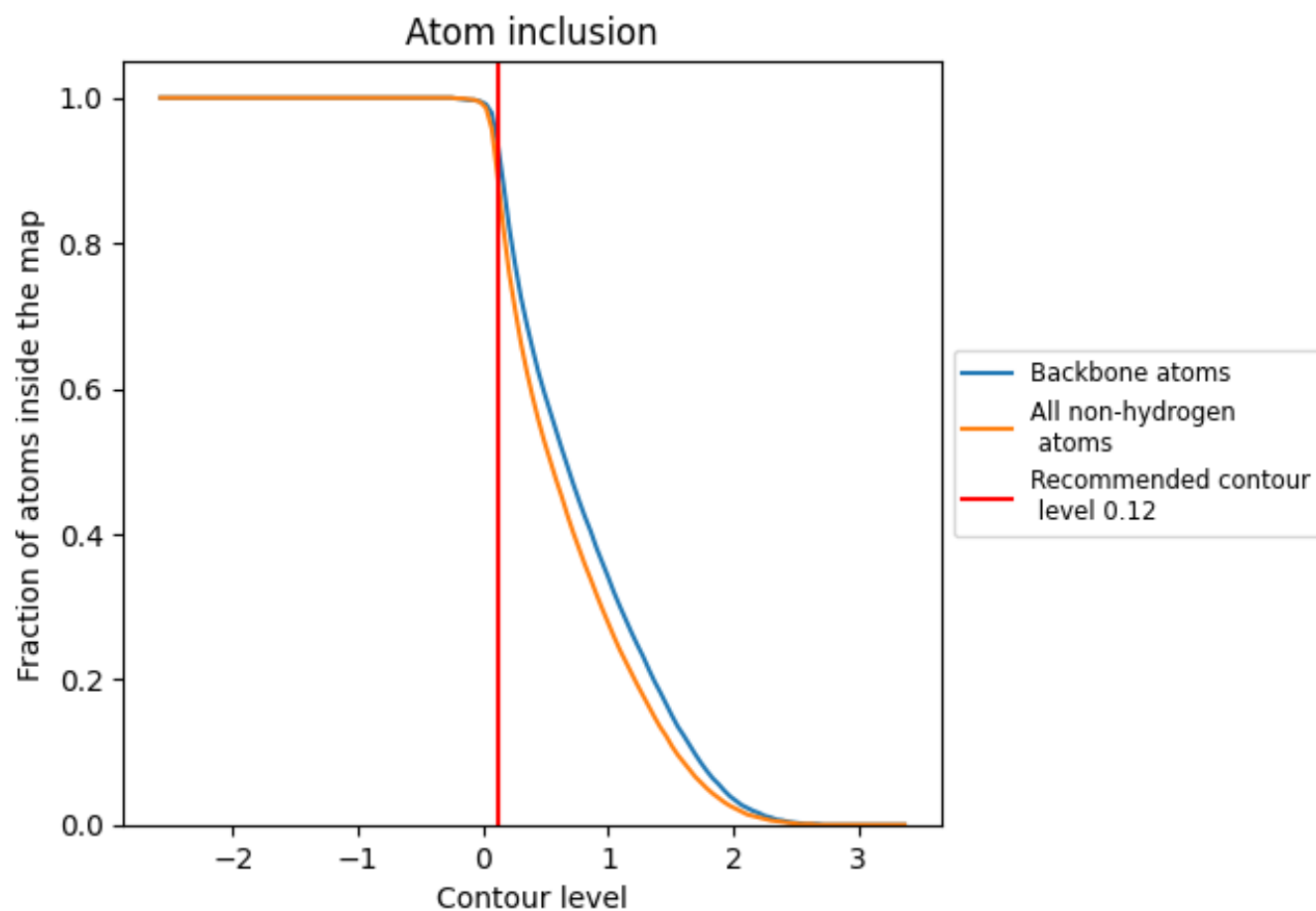
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.12).

9.4 Atom inclusion [i](#)



At the recommended contour level, 93% of all backbone atoms, 89% 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 (0.12) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8880	0.4650
G	0.9630	0.5610
H	0.9380	0.5150
I	0.9350	0.5240
J	0.8840	0.4790
K	0.9360	0.5380
L	0.8100	0.3460
M	0.3860	0.1280
O	0.8000	0.2610
P	0.8590	0.2480

1.0

0.0

<0.0