



Full wwPDB EM Validation Report ⓘ

Oct 10, 2024 – 06:31 pm BST

PDB ID : 9FNN
EMDB ID : EMD-50599
Title : Cryo-EM structure of the c-di-GMP-saturated 'crown'less Bcs macrocomplex for cellulose secretion in *E. coli*
Authors : Anso, I.; Krasteva, P.V.
Deposited on : 2024-06-10
Resolution : 2.85 Å (reported)
Based on initial models : 6ybb, 6yb5, ., 6ybu

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.dev113
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.39

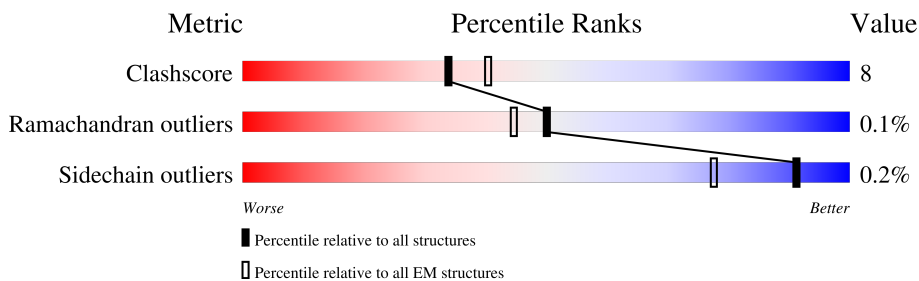
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 2.85 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

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	A	908	
2	B	779	
2	X	779	
2	Y	779	
2	Z	779	
3	E	536	
3	U	536	
4	F	63	

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Mol	Chain	Length	Quality of chain
4	S	63	
5	Q	250	
5	W	250	
6	R	77	
6	V	77	
7	D	536	
7	G	536	

2 Entry composition [i](#)

There are 10 unique types of molecules in this entry. The entry contains 23714 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 Cellulose synthase catalytic subunit [UDP-forming].

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	793	6403	4196	1098	1076	33	0	0

- Molecule 2 is a protein called Cyclic di-GMP-binding protein.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
2	B	45	385	262	71	52	0	0
2	X	42	358	246	64	48	0	0
2	Y	42	358	246	64	48	0	0
2	Z	42	358	246	64	48	0	0

- Molecule 3 is a protein called Cyclic di-GMP binding protein BcsE.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	E	485	3874	2455	696	699	24	0	0
3	U	511	4082	2582	734	742	24	0	0

- Molecule 4 is a protein called Cellulose biosynthesis protein BcsF.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	F	47	390	261	72	56	1	0	0
4	S	50	412	274	75	62	1	0	0

- Molecule 5 is a protein called Cell division protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	Q	240	Total 1891	C 1187	N 342	O 352	S 10	0	0
5	W	240	Total 1891	C 1187	N 342	O 352	S 10	0	0

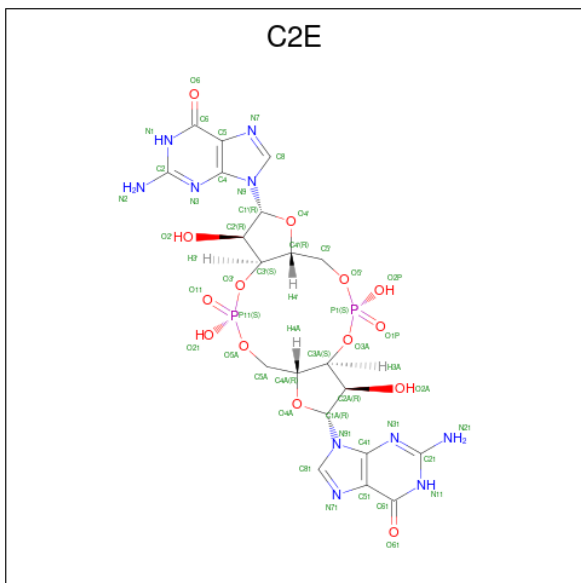
- Molecule 6 is a protein called Protein YhjR.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
6	R	29	Total 235	C 151	N 40	O 44	0	0
6	V	41	Total 327	C 211	N 55	O 61	0	0

- Molecule 7 is a protein called Cellulose biosynthesis protein BcsG.

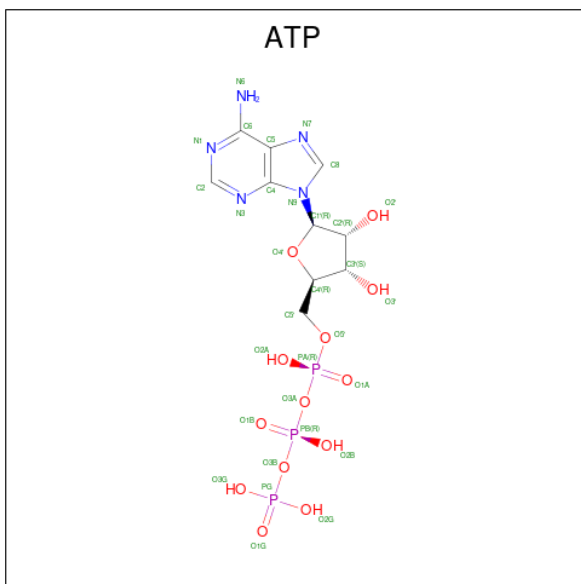
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	G	144	Total 1205	C 829	N 192	O 181	S 3	0	0
7	D	144	Total 1205	C 829	N 192	O 181	S 3	0	0

- Molecule 8 is 9,9'-[(2R,3R,3aS,5S,7aR,9R,10R,10aS,12S,14aR)-3,5,10,12-tetrahydroxy-5,12-dioxidoctahydro-2H,7H-difuro[3,2-d:3',2'-j][1,3,7,9,2,8]tetraoxadiphosphacyclododecine-2,9-diy]bis(2-amino-1,9-dihydro-6H-purin-6-one) (three-letter code: C2E) (formula: C₂₀H₂₄N₁₀O₁₄P₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				AltConf	
8	A	1	Total	C	N	O	P	0
			46	20	10	14	2	
8	A	1	Total	C	N	O	P	0
			46	20	10	14	2	
8	E	1	Total	C	N	O	P	0
			46	20	10	14	2	
8	E	1	Total	C	N	O	P	0
			46	20	10	14	2	
8	U	1	Total	C	N	O	P	0
			46	20	10	14	2	
8	U	1	Total	C	N	O	P	0
			46	20	10	14	2	

- Molecule 9 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				AltConf	
9	Q	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	W	1	Total	C	N	O	P	0
			31	10	5	13	3	

- Molecule 10 is MAGNESIUM ION (three-letter code: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
10	Q	1	Total	Mg	0
			1	1	

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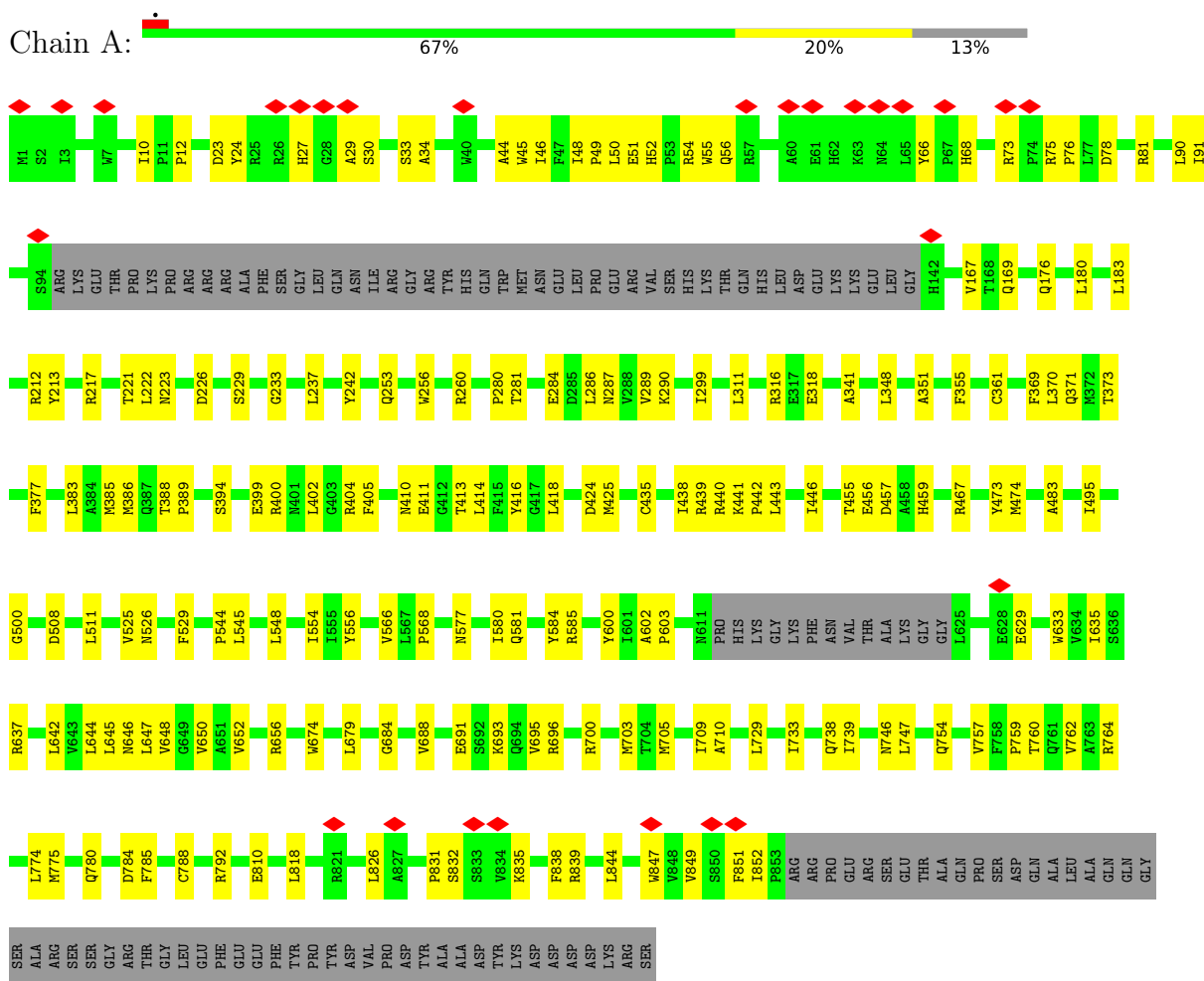
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Mol	Chain	Residues	Atoms		AltConf
			Total	Mg	
10	W	1	1	1	0

3 Residue-property plots [i](#)

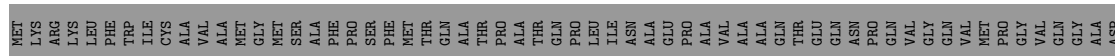
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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.

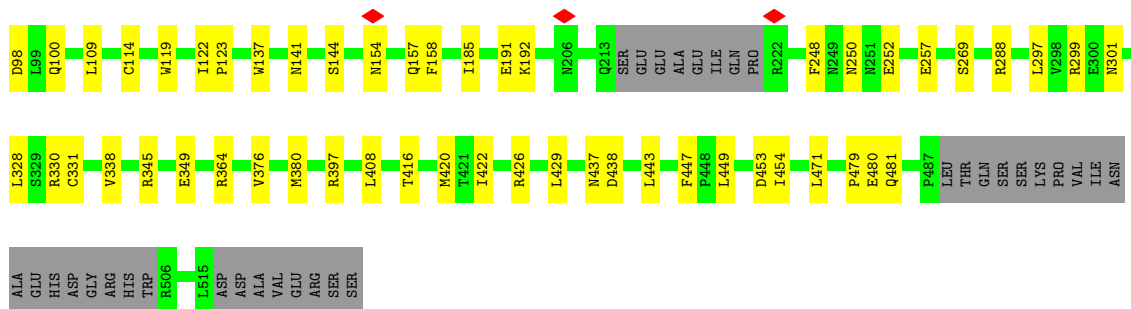
- Molecule 1: Cellulose synthase catalytic subunit [UDP-forming]



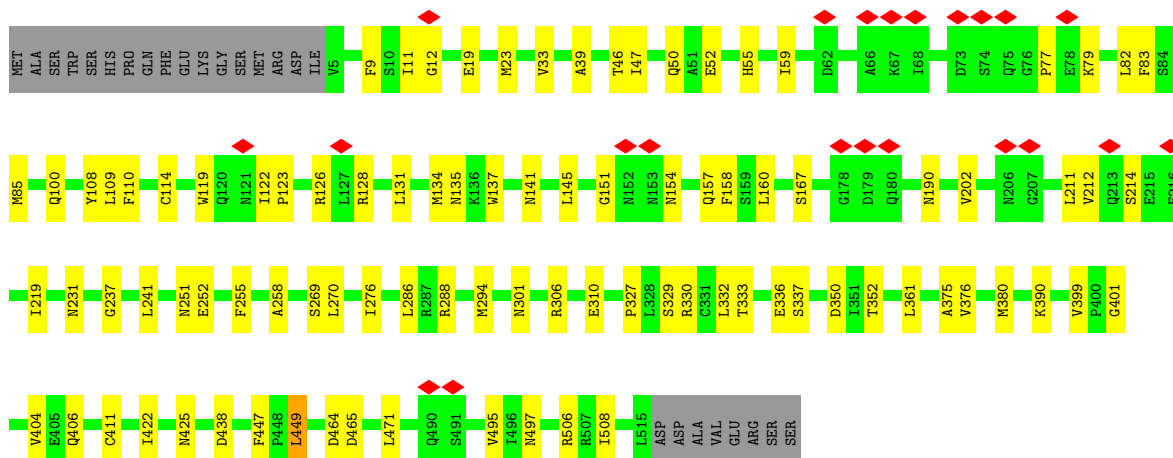
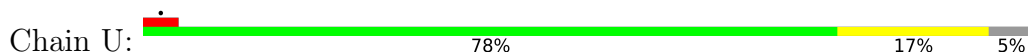
- Molecule 2: Cyclic di-GMP-binding protein

Chain B:  5% . 94%

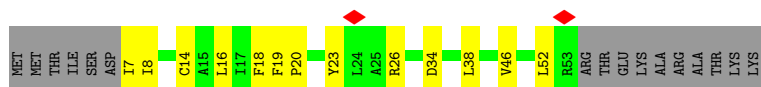




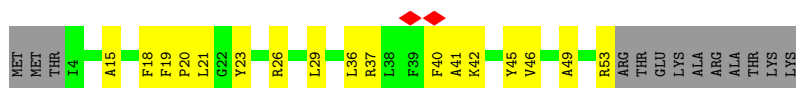
• Molecule 3: Cyclic di-GMP binding protein BcsE



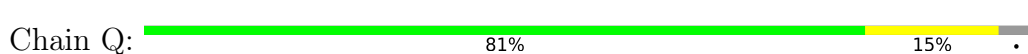
• Molecule 4: Cellulose biosynthesis protein BcsF



• Molecule 4: Cellulose biosynthesis protein BcsF



• Molecule 5: Cell division protein



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	260501	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 ($e^-/\text{\AA}^2$)	49.35	Depositor
Minimum defocus (nm)	300	Depositor
Maximum defocus (nm)	2100	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	1.932	Depositor
Minimum map value	-0.002	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.017	Depositor
Recommended contour level	0.03	Depositor
Map size (Å)	419.5, 419.5, 419.5	wwPDB
Map dimensions	500, 500, 500	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.839, 0.839, 0.839	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: C2E, MG, ATP

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	0.28	0/6588	0.48	0/8971
2	B	0.24	0/397	0.47	0/543
2	X	0.21	0/370	0.43	0/507
2	Y	0.21	0/370	0.42	0/507
2	Z	0.22	0/370	0.44	0/507
3	E	0.26	0/3959	0.48	0/5376
3	U	0.28	0/4175	0.50	0/5674
4	F	0.55	0/399	0.65	0/538
4	S	0.60	0/421	0.62	0/568
5	Q	0.26	0/1928	0.47	0/2623
5	W	0.28	0/1928	0.47	0/2623
6	R	0.26	0/240	0.44	0/325
6	V	0.26	0/333	0.43	0/452
7	D	0.26	0/1254	0.41	0/1720
7	G	0.23	0/1254	0.39	0/1720
All	All	0.28	0/23986	0.48	0/32654

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	6403	0	6488	141	0
2	B	385	0	418	4	0
2	X	358	0	388	0	0
2	Y	358	0	388	2	0
2	Z	358	0	388	1	0
3	E	3874	0	3870	44	0
3	U	4082	0	4063	65	0
4	F	390	0	428	28	0
4	S	412	0	448	33	0
5	Q	1891	0	1861	26	0
5	W	1891	0	1861	26	0
6	R	235	0	230	5	0
6	V	327	0	326	7	0
7	D	1205	0	1212	32	0
7	G	1205	0	1212	15	0
8	A	92	0	44	4	0
8	E	92	0	44	0	0
8	U	92	0	44	2	0
9	Q	31	0	12	2	0
9	W	31	0	12	2	0
10	Q	1	0	0	0	0
10	W	1	0	0	0	0
All	All	23714	0	23737	381	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 8.

All (381) 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)
7:D:127:VAL:CG1	7:D:131:PHE:HE2	1.42	1.32
4:S:18:PHE:CD2	4:S:21:LEU:HD23	1.71	1.25
7:D:137:ARG:HH22	7:D:140:VAL:CG2	1.52	1.20
7:D:127:VAL:HG12	7:D:131:PHE:CE2	1.76	1.19
4:F:23:TYR:OH	4:S:29:LEU:HD22	1.44	1.12
7:D:127:VAL:CG1	7:D:131:PHE:CE2	2.33	1.10
4:F:7:ILE:HG22	4:F:8:ILE:H	0.98	1.09
5:W:35:VAL:CG1	5:W:44:LEU:HD21	1.82	1.09
4:S:18:PHE:CE2	4:S:21:LEU:HD23	1.89	1.08
7:D:127:VAL:HG12	7:D:131:PHE:HE2	0.91	1.07
5:W:35:VAL:HG11	5:W:44:LEU:HD21	1.34	1.06
4:S:18:PHE:CE2	4:S:21:LEU:CD2	2.40	1.05

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:647:LEU:HD13	1:A:838:PHE:HZ	1.23	1.02
7:D:137:ARG:NH2	7:D:140:VAL:CG2	2.21	1.00
4:F:7:ILE:HG22	4:F:8:ILE:N	1.72	1.00
7:D:137:ARG:HH22	7:D:140:VAL:HG21	1.29	0.96
1:A:647:LEU:HD21	1:A:679:LEU:HD13	1.52	0.92
7:D:137:ARG:NH2	7:D:140:VAL:HG23	1.83	0.92
4:F:26:ARG:HD3	4:S:23:TYR:CE1	2.04	0.92
4:F:7:ILE:CG2	4:F:8:ILE:H	1.83	0.91
1:A:738:GLN:O	1:A:739:ILE:HG13	1.73	0.88
1:A:647:LEU:HD13	1:A:838:PHE:CZ	2.09	0.87
4:F:19:PHE:HE1	4:S:21:LEU:HG	1.40	0.87
4:F:7:ILE:HG22	4:F:8:ILE:HG12	1.55	0.86
7:D:127:VAL:O	7:D:131:PHE:CD2	2.28	0.85
1:A:647:LEU:HD21	1:A:679:LEU:CD1	2.06	0.85
7:D:137:ARG:CZ	7:D:140:VAL:HG23	2.08	0.84
1:A:10:ILE:HG22	1:A:12:PRO:HD2	1.61	0.83
4:F:23:TYR:OH	4:S:29:LEU:CD2	2.27	0.82
1:A:709:ILE:HD12	1:A:739:ILE:HD11	1.61	0.81
7:D:137:ARG:NH1	7:D:140:VAL:HG23	1.97	0.80
7:D:127:VAL:O	7:D:131:PHE:HD2	1.64	0.79
1:A:647:LEU:HD23	1:A:679:LEU:HD11	1.65	0.79
1:A:647:LEU:CD2	1:A:679:LEU:HD11	2.13	0.78
7:D:137:ARG:NH2	7:D:140:VAL:HG21	1.92	0.78
3:U:404:VAL:HG21	3:U:425:ASN:HA	1.66	0.76
7:D:127:VAL:HG13	7:D:131:PHE:CE2	2.20	0.76
4:S:41:ALA:O	4:S:42:LYS:HG3	1.84	0.76
4:S:26:ARG:NH1	4:S:29:LEU:HD23	2.00	0.76
1:A:402:LEU:HD22	1:A:818:LEU:HD11	1.66	0.75
4:F:19:PHE:CE1	4:S:21:LEU:HG	2.20	0.75
4:F:34:ASP:O	4:F:38:LEU:HD13	1.85	0.75
5:W:35:VAL:HG12	5:W:44:LEU:HD21	1.68	0.73
1:A:46:ILE:HB	7:G:140:VAL:HG21	1.69	0.73
4:F:7:ILE:CG2	4:F:8:ILE:N	2.48	0.73
1:A:647:LEU:CD2	1:A:679:LEU:CD1	2.66	0.72
5:Q:69:ARG:HH21	5:Q:111:GLN:HE22	1.36	0.72
4:S:49:ALA:HB3	3:U:82:LEU:HB2	1.72	0.71
1:A:76:PRO:O	1:A:81:ARG:NH2	2.24	0.70
4:S:18:PHE:CE2	4:S:21:LEU:HD21	2.24	0.70
3:U:100:GLN:HE21	3:U:137:TRP:HE1	1.39	0.70
4:F:19:PHE:HB3	4:F:20:PRO:HD3	1.74	0.69
1:A:348:LEU:O	1:A:440:ARG:NH2	2.26	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:D:137:ARG:HH11	7:D:139:THR:HB	1.58	0.69
1:A:710:ALA:HB3	1:A:746:ASN:HB2	1.74	0.68
1:A:233:GLY:HA2	1:A:554:ILE:HG23	1.76	0.68
1:A:511:LEU:HG	1:A:525:VAL:HG11	1.75	0.68
4:S:18:PHE:CZ	4:S:21:LEU:CD2	2.77	0.67
1:A:45:TRP:HZ3	1:A:51:GLU:HG3	1.58	0.67
4:F:26:ARG:NH1	4:F:26:ARG:O	2.28	0.67
5:W:35:VAL:CG1	5:W:44:LEU:CD2	2.67	0.66
1:A:373:THR:HG23	1:A:386:MET:HG2	1.77	0.66
1:A:253:GLN:OE1	1:A:526:ASN:ND2	2.28	0.66
7:G:56:MET:O	7:G:67:ARG:NH1	2.29	0.66
3:U:33:VAL:HG21	3:U:39:ALA:HB2	1.77	0.65
3:E:25:ALA:HA	3:E:144:SER:HB3	1.79	0.65
1:A:394:SER:HB3	1:A:483:ALA:H	1.61	0.65
4:S:18:PHE:CD2	4:S:21:LEU:CD2	2.61	0.65
7:D:56:MET:O	7:D:67:ARG:NH1	2.30	0.65
7:D:137:ARG:NH1	7:D:139:THR:HB	2.11	0.65
7:D:137:ARG:HH12	7:D:140:VAL:HG23	1.61	0.65
1:A:849:VAL:HA	1:A:852:ILE:HG12	1.79	0.65
1:A:739:ILE:HG23	1:A:762:VAL:HG21	1.79	0.64
5:Q:167:HIS:ND1	5:Q:239:TYR:OH	2.30	0.64
1:A:50:LEU:O	1:A:56:GLN:NE2	2.30	0.64
1:A:647:LEU:CD1	1:A:838:PHE:HZ	2.04	0.64
1:A:709:ILE:CD1	1:A:739:ILE:HD11	2.28	0.64
1:A:400:ARG:NH2	1:A:691:GLU:OE1	2.32	0.63
1:A:81:ARG:HD3	1:A:852:ILE:HG22	1.79	0.63
5:W:35:VAL:HG12	5:W:44:LEU:CD2	2.28	0.63
1:A:545:LEU:HD21	1:A:646:ASN:HA	1.80	0.63
1:A:705:MET:SD	1:A:792:ARG:NH1	2.72	0.62
4:S:20:PRO:HA	4:S:23:TYR:HB3	1.81	0.62
5:W:69:ARG:NH2	5:W:111:GLN:OE1	2.33	0.62
3:U:212:VAL:HG13	3:U:214:SER:H	1.64	0.62
3:E:449:LEU:HB2	3:E:454:ILE:HD11	1.81	0.61
4:S:26:ARG:HH11	4:S:29:LEU:CD2	2.14	0.61
3:U:404:VAL:HG12	3:U:422:ILE:HD12	1.82	0.60
1:A:757:VAL:HG21	5:Q:175:ILE:HG23	1.82	0.60
3:E:330:ARG:NH1	3:U:310:GLU:OE2	2.34	0.60
1:A:91:ILE:HG23	7:D:136:ILE:HG23	1.82	0.59
4:S:36:LEU:HD23	4:S:37:ARG:HH21	1.67	0.59
1:A:180:LEU:HG	1:A:568:PRO:HG3	1.84	0.59
1:A:383:LEU:HD23	1:A:385:MET:H	1.67	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:Q:211:ALA:HA	6:R:53:PRO:HD2	1.85	0.59
1:A:222:LEU:HD21	1:A:237:LEU:HD22	1.85	0.59
3:U:350:ASP:OD2	3:U:352:THR:OG1	2.20	0.59
4:S:26:ARG:HH11	4:S:29:LEU:HD23	1.65	0.59
7:D:43:HIS:ND1	7:D:82:ASP:OD1	2.35	0.58
1:A:256:TRP:HB2	2:B:61:LEU:HD13	1.85	0.58
7:D:132:LEU:O	7:D:136:ILE:N	2.36	0.58
4:F:26:ARG:HB3	4:S:26:ARG:HG2	1.86	0.58
4:S:37:ARG:HA	4:S:41:ALA:HB2	1.86	0.58
3:U:52:GLU:HA	3:U:77:PRO:HA	1.85	0.58
3:U:506:ARG:NH1	5:W:211:ALA:O	2.36	0.58
3:E:299:ARG:NH1	3:E:331:CYS:SG	2.77	0.58
4:F:26:ARG:HD3	4:S:23:TYR:HE1	1.67	0.57
3:U:19:GLU:O	3:U:190:ASN:ND2	2.36	0.57
7:D:44:PRO:HG2	7:D:153:THR:HG21	1.86	0.57
3:E:114:CYS:SG	3:E:119:TRP:NE1	2.76	0.57
1:A:24:TYR:HB3	1:A:29:ALA:HB3	1.86	0.57
5:W:174:ARG:HG2	5:W:175:ILE:N	2.18	0.57
1:A:223:ASN:HB2	1:A:556:TYR:HB2	1.85	0.57
3:E:154:ASN:HB3	3:E:157:GLN:HB3	1.87	0.57
1:A:733:ILE:CD1	1:A:739:ILE:HD12	2.35	0.57
3:U:119:TRP:HB3	3:U:157:GLN:HE22	1.69	0.57
4:S:19:PHE:HB3	4:S:20:PRO:HD3	1.86	0.57
7:G:44:PRO:HG2	7:G:153:THR:HG21	1.87	0.56
3:U:231:ASN:ND2	3:U:251:ASN:OD1	2.39	0.56
5:W:106:CYS:SG	5:W:135:GLN:NE2	2.78	0.56
1:A:91:ILE:O	7:D:137:ARG:N	2.38	0.56
1:A:299:ILE:HG21	1:A:370:LEU:HD23	1.86	0.56
1:A:416:TYR:O	1:A:473:TYR:OH	2.23	0.56
4:S:41:ALA:O	4:S:42:LYS:CG	2.53	0.56
1:A:647:LEU:CD1	1:A:838:PHE:CZ	2.83	0.56
7:D:132:LEU:HB3	7:D:138:ILE:HD11	1.87	0.56
5:Q:41:ASP:OD2	5:W:156:ARG:NH2	2.36	0.56
3:E:364:ARG:HG2	3:E:416:THR:HA	1.88	0.55
1:A:495:ILE:HD11	1:A:600:TYR:HB3	1.88	0.55
5:Q:185:GLN:NE2	6:V:44:GLN:OE1	2.34	0.55
1:A:217:ARG:O	1:A:221:THR:OG1	2.22	0.55
3:E:438:ASP:OD2	3:U:329:SER:OG	2.23	0.55
1:A:30:SER:O	1:A:33:SER:OG	2.22	0.55
1:A:633:TRP:CZ3	1:A:831:PRO:HD3	2.42	0.55
3:E:443:LEU:HD22	3:E:447:PHE:HE2	1.71	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:U:269:SER:OG	3:U:301:ASN:OD1	2.21	0.55
3:U:390:LYS:NZ	3:U:464:ASP:OD2	2.39	0.55
4:F:16:LEU:O	4:F:20:PRO:HD2	2.06	0.55
1:A:284:GLU:O	1:A:316:ARG:NH1	2.39	0.55
1:A:844:LEU:HA	1:A:847:TRP:CD1	2.42	0.55
1:A:213:TYR:HE1	1:A:566:VAL:HG22	1.72	0.54
3:E:297:LEU:HD21	3:E:338:VAL:HG11	1.89	0.54
2:Y:735:ARG:HH21	2:Y:738:TYR:HD2	1.55	0.54
3:E:345:ARG:NH2	3:U:337:SER:O	2.40	0.54
3:E:122:ILE:HD12	3:E:123:PRO:HD2	1.89	0.54
4:S:18:PHE:HA	4:S:21:LEU:HB3	1.89	0.54
1:A:44:ALA:O	1:A:48:ILE:N	2.39	0.54
1:A:738:GLN:O	1:A:739:ILE:CG1	2.51	0.54
1:A:738:GLN:C	1:A:739:ILE:HG13	2.27	0.54
1:A:457:ASP:OD1	1:A:457:ASP:N	2.41	0.54
1:A:764:ARG:NH2	8:A:1001:C2E:O61	2.38	0.54
3:U:122:ILE:HD12	3:U:123:PRO:HD2	1.90	0.54
1:A:78:ASP:OD1	1:A:81:ARG:NH2	2.31	0.54
3:U:9:PHE:O	3:U:23:MET:N	2.38	0.54
4:S:46:VAL:HG22	3:U:85:MET:HB2	1.90	0.54
3:U:449:LEU:HD22	5:W:217:GLU:HA	1.90	0.54
1:A:213:TYR:CE1	1:A:566:VAL:HG22	2.43	0.53
7:D:25:ASN:HB2	7:D:129:TRP:HE1	1.73	0.53
1:A:371:GLN:NE2	6:V:37:ALA:O	2.39	0.53
1:A:577:ASN:O	1:A:581:GLN:HG2	2.08	0.53
3:E:288:ARG:NH2	3:E:349:GLU:OE1	2.41	0.53
1:A:446:ILE:HG22	1:A:467:ARG:HD2	1.89	0.53
4:F:14:CYS:O	4:F:18:PHE:HD2	1.92	0.53
1:A:399:GLU:HB3	1:A:405:PHE:HA	1.90	0.53
1:A:642:LEU:O	1:A:646:ASN:ND2	2.30	0.53
3:U:114:CYS:SG	3:U:119:TRP:NE1	2.79	0.53
1:A:754:GLN:OE1	6:V:41:GLN:NE2	2.33	0.53
1:A:760:THR:HG22	1:A:774:LEU:HD12	1.91	0.53
2:Z:731:PRO:HB2	2:Z:735:ARG:HH21	1.74	0.53
7:D:21:LEU:HG	7:D:139:THR:HG23	1.91	0.53
4:S:26:ARG:NH1	4:S:29:LEU:CD2	2.71	0.53
1:A:644:LEU:HD11	1:A:835:LYS:HE2	1.91	0.52
7:G:58:LEU:HD23	7:G:63:LEU:HB3	1.91	0.52
3:U:306:ARG:NH2	8:U:601:C2E:O6	2.28	0.52
1:A:647:LEU:O	1:A:650:VAL:HG12	2.10	0.52
5:W:117:ARG:O	5:W:117:ARG:NH1	2.43	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:242:TYR:OH	1:A:529:PHE:O	2.26	0.52
3:E:20:LEU:HD22	3:E:185:ILE:HG21	1.90	0.52
1:A:287:ASN:OD1	1:A:290:LYS:NZ	2.43	0.52
1:A:369:PHE:HD2	1:A:370:LEU:HD22	1.75	0.52
1:A:425:MET:HE1	2:B:65:SER:HB3	1.92	0.52
3:E:18:ASP:OD2	3:E:192:LYS:NZ	2.36	0.51
5:Q:137:LEU:HD21	5:Q:163:PRO:HG3	1.93	0.51
1:A:351:ALA:O	1:A:440:ARG:NH1	2.43	0.51
3:U:47:ILE:O	3:U:77:PRO:HD2	2.09	0.51
6:V:31:LEU:HG	6:V:34:ILE:HD13	1.91	0.51
4:F:26:ARG:HG2	4:S:23:TYR:HD1	1.75	0.51
5:Q:15:THR:N	9:Q:301:ATP:O2B	2.44	0.51
5:W:24:TRP:O	5:W:27:GLN:HG3	2.10	0.51
3:U:241:LEU:HD21	3:U:332:LEU:HD13	1.93	0.51
3:U:361:LEU:HD11	3:U:375:ALA:HB1	1.93	0.51
1:A:738:GLN:OE1	5:Q:219:ARG:NH2	2.44	0.51
5:Q:106:CYS:SG	5:Q:135:GLN:NE2	2.84	0.51
5:W:10:ARG:NH2	5:W:150:ASP:OD2	2.44	0.51
7:D:35:LEU:HD13	7:D:42:PHE:HB2	1.93	0.51
5:Q:46:LEU:HD12	5:W:155:ILE:HD13	1.94	0.50
3:E:479:PRO:O	3:E:480:GLU:HB3	2.12	0.50
1:A:383:LEU:O	1:A:439:ARG:HD3	2.11	0.50
1:A:23:ASP:O	1:A:27:HIS:ND1	2.31	0.50
1:A:90:LEU:HB3	7:D:140:VAL:HG21	1.92	0.50
5:Q:42:ASN:O	5:Q:45:ARG:NH1	2.44	0.50
1:A:167:VAL:HG13	1:A:212:ARG:HA	1.94	0.50
3:U:50:GLN:HE22	3:U:109:LEU:HD22	1.76	0.50
3:U:59:ILE:HG13	3:U:83:PHE:HB2	1.93	0.50
6:V:35:ASP:OD1	6:V:35:ASP:N	2.45	0.50
1:A:402:LEU:HD13	1:A:818:LEU:HD21	1.92	0.50
5:W:174:ARG:N	5:W:180:GLN:OE1	2.46	0.49
1:A:389:PRO:HD3	1:A:474:MET:O	2.12	0.49
1:A:418:LEU:HD21	1:A:580:ILE:HG22	1.93	0.49
1:A:629:GLU:HG3	1:A:693:LYS:HG3	1.95	0.49
1:A:700:ARG:NH2	8:A:1002:C2E:O61	2.27	0.49
4:F:7:ILE:CG2	4:F:8:ILE:HG12	2.35	0.49
5:W:45:ARG:HH12	5:W:52:PHE:HA	1.78	0.49
7:G:121:ALA:O	7:G:125:LEU:HG	2.13	0.49
1:A:633:TRP:HZ3	1:A:826:LEU:HD11	1.77	0.49
3:E:12:GLY:H	3:E:46:THR:HG22	1.78	0.49
4:F:26:ARG:HD3	4:S:23:TYR:CD1	2.45	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:U:154:ASN:O	3:U:158:PHE:N	2.39	0.48
3:U:376:VAL:HG12	3:U:471:LEU:HD11	1.94	0.48
3:E:154:ASN:O	3:E:158:PHE:N	2.37	0.48
5:Q:75:TYR:OH	5:Q:217:GLU:OE1	2.24	0.48
5:W:136:LEU:HD23	5:W:139:LEU:HD21	1.96	0.48
3:E:248:PHE:CE1	3:E:257:GLU:HG3	2.49	0.48
3:U:12:GLY:H	3:U:46:THR:HG22	1.79	0.48
1:A:438:ILE:HG21	1:A:443:LEU:HD13	1.96	0.48
1:A:341:ALA:HB2	1:A:456:GLU:HG2	1.96	0.47
5:W:45:ARG:NH1	5:W:51:ASP:O	2.47	0.47
1:A:260:ARG:NH1	1:A:424:ASP:OD1	2.48	0.47
1:A:55:TRP:CZ2	7:G:134:GLN:HB3	2.50	0.47
3:E:33:VAL:HG21	3:E:39:ALA:HB2	1.97	0.47
1:A:280:PRO:HA	1:A:311:LEU:HB2	1.95	0.47
5:Q:60:ARG:HH21	5:Q:87:LEU:HA	1.79	0.47
4:S:18:PHE:CG	4:S:21:LEU:HD23	2.38	0.47
1:A:826:LEU:HD12	1:A:826:LEU:HA	1.69	0.47
1:A:75:ARG:HD2	1:A:851:PHE:CE2	2.50	0.47
1:A:780:GLN:NE2	1:A:784:ASP:OD1	2.48	0.47
3:E:437:ASN:OD1	3:E:438:ASP:N	2.48	0.47
5:Q:108:GLY:O	5:Q:111:GLN:HG2	2.14	0.47
1:A:404:ARG:HH12	1:A:818:LEU:HD13	1.80	0.46
3:E:397:ARG:HH22	3:E:426:ARG:HE	1.63	0.46
3:E:376:VAL:HG12	3:E:471:LEU:HD11	1.96	0.46
5:Q:45:ARG:HA	5:Q:81:LEU:HD21	1.98	0.46
5:Q:212:LYS:NZ	6:R:57:GLU:OE1	2.48	0.46
7:D:17:TYR:CZ	7:D:59:PRO:HA	2.51	0.46
3:E:9:PHE:CE2	3:E:109:LEU:HB2	2.51	0.46
3:E:420:MET:HB3	3:E:429:LEU:HD23	1.97	0.46
7:G:21:LEU:HG	7:G:139:THR:HG23	1.98	0.46
7:G:117:GLN:HA	7:D:45:LEU:HD21	1.97	0.46
3:U:333:THR:O	3:U:336:GLU:HG2	2.16	0.46
1:A:49:PRO:HG3	7:G:137:ARG:HA	1.98	0.46
1:A:810:GLU:OE1	1:A:810:GLU:N	2.47	0.46
3:U:202:VAL:HG12	3:U:211:LEU:HA	1.98	0.45
7:D:46:LEU:HB3	7:D:78:LEU:HD11	1.98	0.45
3:E:250:ASN:ND2	3:E:252:GLU:OE1	2.49	0.45
5:W:174:ARG:HG2	5:W:175:ILE:H	1.81	0.45
1:A:91:ILE:HG12	7:D:141:PHE:CE2	2.51	0.45
6:R:56:ALA:O	6:R:60:GLN:HG2	2.16	0.45
1:A:729:LEU:HD22	1:A:747:LEU:HD21	1.99	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:548:LEU:HD23	1:A:548:LEU:HA	1.86	0.45
3:U:55:HIS:HB3	3:U:108:TYR:CZ	2.52	0.45
1:A:652:VAL:HG12	1:A:656:ARG:HH12	1.80	0.45
4:F:19:PHE:HB3	4:F:20:PRO:CD	2.46	0.45
1:A:602:ALA:HB3	1:A:603:PRO:HD3	1.98	0.44
3:U:258:ALA:HB1	3:U:294:MET:HE1	1.98	0.44
5:W:181:ASP:O	5:W:185:GLN:HG2	2.17	0.44
3:E:59:ILE:HG13	3:E:83:PHE:HB2	1.99	0.44
5:Q:35:VAL:HG22	5:Q:44:LEU:HD21	1.99	0.44
3:U:406:GLN:HB3	3:U:495:VAL:HG11	2.00	0.44
3:U:497:ASN:HB2	3:U:508:ILE:O	2.17	0.44
1:A:388:THR:HB	1:A:435:CYS:HB3	1.98	0.44
3:E:52:GLU:HA	3:E:77:PRO:HA	1.99	0.44
3:U:128:ARG:HD3	3:U:160:LEU:HD11	1.99	0.44
1:A:411:GLU:O	1:A:585:ARG:NH2	2.50	0.44
1:A:645:LEU:O	1:A:648:VAL:HG12	2.18	0.44
1:A:695:VAL:HG22	8:A:1002:C2E:O6	2.17	0.44
1:A:600:TYR:OH	1:A:635:ILE:O	2.32	0.43
3:E:16:LEU:HB3	3:E:21:ARG:HD2	1.99	0.43
3:U:327:PRO:HG2	3:U:330:ARG:HG2	2.00	0.43
1:A:355:PHE:HE2	1:A:377:PHE:CD1	2.36	0.43
1:A:402:LEU:HD11	1:A:688:VAL:HG22	2.00	0.43
5:Q:166:ALA:O	5:Q:193:ARG:HD3	2.18	0.43
5:Q:221:ASP:OD1	5:Q:221:ASP:N	2.46	0.43
3:U:12:GLY:N	3:U:46:THR:HG22	2.32	0.43
3:U:154:ASN:HB3	3:U:157:GLN:HB3	2.00	0.43
1:A:183:LEU:HD23	1:A:183:LEU:HA	1.83	0.43
1:A:287:ASN:HA	1:A:290:LYS:NZ	2.33	0.43
1:A:441:LYS:HB3	1:A:442:PRO:HD3	1.99	0.43
5:Q:201:ARG:NH1	9:Q:301:ATP:H2	2.15	0.43
1:A:459:HIS:NE2	1:A:508:ASP:OD2	2.52	0.43
5:Q:24:TRP:O	5:Q:27:GLN:HG3	2.18	0.43
3:U:361:LEU:HD12	3:U:361:LEU:HA	1.83	0.43
1:A:443:LEU:HD12	1:A:446:ILE:HD11	2.01	0.43
3:E:85:MET:HB3	4:F:46:VAL:HG22	2.01	0.43
3:U:123:PRO:HG2	3:U:126:ARG:HB2	2.01	0.43
3:U:134:MET:HE2	3:U:145:LEU:HD22	1.99	0.43
1:A:66:TYR:HD1	1:A:68:HIS:HE1	1.66	0.43
1:A:410:ASN:O	1:A:413:THR:HG22	2.18	0.43
3:U:137:TRP:NE1	3:U:141:ASN:OD1	2.52	0.43
3:U:465:ASP:OD1	3:U:465:ASP:N	2.50	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:W:17:THR:HG22	9:W:301:ATP:O2A	2.19	0.42
3:E:50:GLN:HB2	3:E:77:PRO:HD3	2.00	0.42
3:U:376:VAL:O	3:U:380:MET:HG2	2.18	0.42
7:G:129:TRP:HD1	7:G:138:ILE:HG13	1.83	0.42
6:R:42:ARG:HH21	6:R:45:LEU:HG	1.84	0.42
1:A:289:VAL:HG22	1:A:361:CYS:HB3	2.00	0.42
3:U:411:CYS:HB2	3:U:447:PHE:CE1	2.54	0.42
1:A:52:HIS:CD2	1:A:54:ARG:H	2.38	0.42
6:V:25:LEU:HD23	6:V:25:LEU:HA	1.89	0.42
1:A:684:GLY:O	1:A:688:VAL:HG23	2.19	0.42
1:A:696:ARG:NH2	8:A:1001:C2E:O6	2.47	0.42
1:A:775:MET:SD	3:U:237:GLY:HA3	2.60	0.42
1:A:788:CYS:O	1:A:792:ARG:HD2	2.20	0.42
2:B:59:ARG:O	2:B:63:ILE:HG12	2.19	0.42
4:F:26:ARG:HG2	4:S:23:TYR:CD1	2.53	0.42
4:F:34:ASP:O	4:F:38:LEU:CD1	2.60	0.42
1:A:318:GLU:HA	3:U:252:GLU:HG3	2.01	0.42
3:E:479:PRO:C	3:E:481:GLN:H	2.23	0.42
1:A:49:PRO:HG2	7:G:133:SER:C	2.40	0.42
1:A:414:LEU:HA	1:A:584:TYR:HB3	2.01	0.42
1:A:633:TRP:O	1:A:637:ARG:HG3	2.20	0.42
1:A:839:ARG:HA	1:A:839:ARG:HD3	1.94	0.42
3:E:9:PHE:CD2	3:E:109:LEU:HB2	2.55	0.42
3:U:114:CYS:HG	3:U:119:TRP:HE1	1.52	0.42
1:A:49:PRO:HG2	7:G:133:SER:O	2.20	0.41
1:A:226:ASP:HB2	1:A:229:SER:HB3	2.02	0.41
3:E:376:VAL:O	3:E:380:MET:HG2	2.19	0.41
3:U:255:PHE:CE1	3:U:286:LEU:HG	2.55	0.41
3:U:399:VAL:HG12	3:U:401:GLY:H	1.84	0.41
4:S:41:ALA:C	4:S:42:LYS:HG3	2.40	0.41
3:U:270:LEU:HD21	3:U:276:ILE:HG12	2.02	0.41
3:E:100:GLN:HE21	3:E:137:TRP:HE1	1.68	0.41
3:U:288:ARG:HA	3:U:288:ARG:HD2	1.87	0.41
1:A:169:GLN:HE22	2:B:32:TRP:HA	1.86	0.41
3:E:82:LEU:HD11	4:F:52:LEU:HD22	2.02	0.41
5:Q:22:LEU:HD13	5:Q:231:LEU:HD23	2.03	0.41
1:A:176:GLN:O	1:A:180:LEU:HD13	2.20	0.41
1:A:544:PRO:HD3	1:A:674:TRP:CE2	2.55	0.41
4:F:18:PHE:CZ	4:S:15:ALA:CB	3.04	0.41
3:U:11:ILE:HD12	3:U:11:ILE:HA	1.95	0.41
3:U:110:PHE:HE2	3:U:137:TRP:HH2	1.68	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:W:167:HIS:CE1	5:W:239:TYR:HH	2.39	0.41
1:A:281:THR:HG22	1:A:361:CYS:SG	2.61	0.41
3:E:191:GLU:HG2	3:E:192:LYS:HG3	2.02	0.41
1:A:832:SER:HB3	1:A:835:LYS:HE3	2.02	0.41
3:E:98:ASP:HB3	4:F:46:VAL:HB	2.03	0.41
3:E:137:TRP:HE1	3:E:141:ASN:HD22	1.68	0.41
3:E:408:LEU:HD22	3:E:422:ILE:HD13	2.01	0.41
3:U:135:ASN:ND2	3:U:167:SER:HA	2.36	0.41
5:W:4:LEU:HD11	5:W:144:LEU:HD13	2.03	0.41
1:A:223:ASN:HB2	1:A:556:TYR:CB	2.50	0.41
1:A:286:LEU:O	1:A:290:LYS:HG3	2.21	0.41
4:S:53:ARG:HG2	3:U:79:LYS:HB3	2.03	0.41
5:W:17:THR:HG21	9:W:301:ATP:C8	2.55	0.41
5:Q:37:ASP:HB2	5:Q:44:LEU:HD23	2.03	0.41
5:Q:149:VAL:HB	5:Q:180:GLN:HG3	2.03	0.41
6:R:39:ILE:HD12	6:R:42:ARG:HH22	1.86	0.41
3:U:119:TRP:HE3	3:U:122:ILE:HG21	1.85	0.41
1:A:24:TYR:HD2	1:A:34:ALA:HB2	1.86	0.41
1:A:73:ARG:HD3	1:A:75:ARG:HH21	1.86	0.41
1:A:729:LEU:HD11	1:A:785:PHE:HE1	1.85	0.41
3:E:16:LEU:HD12	3:E:17:TRP:H	1.85	0.41
1:A:55:TRP:HZ2	7:G:134:GLN:HB3	1.86	0.40
1:A:759:PRO:HB2	1:A:775:MET:HG3	2.02	0.40
3:U:425:ASN:ND2	3:U:425:ASN:O	2.54	0.40
1:A:404:ARG:HH22	1:A:818:LEU:HB2	1.85	0.40
3:E:12:GLY:N	3:E:46:THR:HG22	2.36	0.40
3:U:19:GLU:HG3	3:U:219:ILE:HG13	2.03	0.40
3:U:131:LEU:HD23	3:U:131:LEU:HA	1.91	0.40
3:U:151:GLY:HA3	3:U:154:ASN:OD1	2.21	0.40
5:W:89:ILE:O	5:W:93:GLU:HG2	2.21	0.40
7:G:80:TRP:O	7:G:83:THR:OG1	2.38	0.40
7:G:146:LEU:HD12	7:G:146:LEU:HA	1.87	0.40
1:A:545:LEU:HD13	1:A:645:LEU:HG	2.03	0.40
1:A:633:TRP:CZ3	1:A:826:LEU:HD11	2.55	0.40
1:A:455:THR:HG23	1:A:500:GLY:HA3	2.03	0.40
3:E:154:ASN:HB3	3:E:157:GLN:HE21	1.86	0.40
4:F:14:CYS:O	4:F:18:PHE:CD2	2.72	0.40
3:U:438:ASP:OD2	8:U:601:C2E:H4A	2.21	0.40
2:Y:764:ARG:HD3	2:Y:764:ARG:HA	1.93	0.40
3:E:269:SER:OG	3:E:301:ASN:OD1	2.28	0.40
5:Q:182:ASP:OD2	6:V:52:TRP:NE1	2.47	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	787/908 (87%)	754 (96%)	33 (4%)	0	100	100
2	B	43/779 (6%)	42 (98%)	1 (2%)	0	100	100
2	X	40/779 (5%)	40 (100%)	0	0	100	100
2	Y	40/779 (5%)	39 (98%)	1 (2%)	0	100	100
2	Z	40/779 (5%)	39 (98%)	1 (2%)	0	100	100
3	E	479/536 (89%)	459 (96%)	20 (4%)	0	100	100
3	U	509/536 (95%)	485 (95%)	24 (5%)	0	100	100
4	F	45/63 (71%)	37 (82%)	8 (18%)	0	100	100
4	S	48/63 (76%)	40 (83%)	6 (12%)	2 (4%)	2	4
5	Q	238/250 (95%)	237 (100%)	1 (0%)	0	100	100
5	W	238/250 (95%)	233 (98%)	5 (2%)	0	100	100
6	R	27/77 (35%)	27 (100%)	0	0	100	100
6	V	39/77 (51%)	37 (95%)	2 (5%)	0	100	100
7	D	142/536 (26%)	140 (99%)	2 (1%)	0	100	100
7	G	142/536 (26%)	141 (99%)	1 (1%)	0	100	100
All	All	2857/6948 (41%)	2750 (96%)	105 (4%)	2 (0%)	50	69

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	S	40	PHE
4	S	45	TYR

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	685/783 (88%)	684 (100%)	1 (0%)	92	97
2	B	39/669 (6%)	39 (100%)	0	100	100
2	X	36/669 (5%)	36 (100%)	0	100	100
2	Y	36/669 (5%)	36 (100%)	0	100	100
2	Z	36/669 (5%)	36 (100%)	0	100	100
3	E	427/472 (90%)	425 (100%)	2 (0%)	86	94
3	U	450/472 (95%)	449 (100%)	1 (0%)	92	97
4	F	41/55 (74%)	41 (100%)	0	100	100
4	S	44/55 (80%)	44 (100%)	0	100	100
5	Q	202/211 (96%)	202 (100%)	0	100	100
5	W	202/211 (96%)	202 (100%)	0	100	100
6	R	23/63 (36%)	23 (100%)	0	100	100
6	V	33/63 (52%)	33 (100%)	0	100	100
7	D	125/453 (28%)	124 (99%)	1 (1%)	79	90
7	G	125/453 (28%)	125 (100%)	0	100	100
All	All	2504/5967 (42%)	2499 (100%)	5 (0%)	91	97

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	703	MET
3	E	328	LEU
3	E	453	ASP
3	U	449	LEU
7	D	109	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (18) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	52	HIS
1	A	68	HIS
1	A	172	ASN
1	A	261	GLN
1	A	743	GLN
3	E	36	HIS
3	E	135	ASN
5	Q	111	GLN
5	Q	135	GLN
3	U	50	GLN
3	U	100	GLN
3	U	141	ASN
3	U	271	GLN
3	U	359	GLN
5	W	135	GLN
5	W	178	GLN
5	W	213	GLN
7	D	64	HIS

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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 10 ligands modelled in this entry, 2 are monoatomic - leaving 8 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	C2E	E	602	-	44,52,52	0.93	4 (9%)	52,82,82	0.78	2 (3%)
8	C2E	U	601	-	44,52,52	0.97	4 (9%)	52,82,82	0.75	0
8	C2E	A	1001	-	44,52,52	0.95	4 (9%)	52,82,82	0.79	3 (5%)
8	C2E	U	602	-	44,52,52	0.93	4 (9%)	52,82,82	0.77	2 (3%)
8	C2E	E	601	-	44,52,52	0.94	4 (9%)	52,82,82	0.78	1 (1%)
8	C2E	A	1002	-	44,52,52	0.95	4 (9%)	52,82,82	0.80	3 (5%)
9	ATP	W	301	10	26,33,33	0.73	0	31,52,52	0.76	1 (3%)
9	ATP	Q	301	10	26,33,33	0.73	0	31,52,52	0.77	1 (3%)

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	C2E	E	602	-	-	0/22/62/62	0/6/7/7
8	C2E	U	601	-	-	4/22/62/62	0/6/7/7
8	C2E	A	1001	-	-	2/22/62/62	0/6/7/7
8	C2E	U	602	-	-	6/22/62/62	0/6/7/7
8	C2E	E	601	-	-	6/22/62/62	0/6/7/7
8	C2E	A	1002	-	-	3/22/62/62	0/6/7/7
9	ATP	W	301	10	-	4/18/38/38	0/3/3/3
9	ATP	Q	301	10	-	0/18/38/38	0/3/3/3

All (24) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	U	601	C2E	C51-C61	-2.75	1.41	1.47
8	A	1002	C2E	C5-C6	-2.67	1.42	1.47
8	A	1001	C2E	C5-C6	-2.67	1.42	1.47
8	A	1001	C2E	C51-C61	-2.67	1.42	1.47
8	U	601	C2E	C5-C6	-2.67	1.42	1.47
8	A	1002	C2E	C51-C61	-2.65	1.42	1.47
8	U	602	C2E	C51-C61	-2.65	1.42	1.47
8	E	601	C2E	C5-C6	-2.63	1.42	1.47
8	E	602	C2E	C51-C61	-2.62	1.42	1.47
8	E	601	C2E	C51-C61	-2.61	1.42	1.47
8	E	602	C2E	C5-C6	-2.58	1.42	1.47
8	U	602	C2E	C5-C6	-2.56	1.42	1.47

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	U	601	C2E	C81-N71	-2.21	1.31	1.35
8	A	1002	C2E	C8-N7	-2.17	1.31	1.35
8	U	601	C2E	C8-N7	-2.15	1.31	1.35
8	E	601	C2E	C8-N7	-2.14	1.31	1.35
8	A	1001	C2E	C81-N71	-2.13	1.31	1.35
8	A	1001	C2E	C8-N7	-2.12	1.31	1.35
8	E	601	C2E	C81-N71	-2.11	1.31	1.35
8	E	602	C2E	C81-N71	-2.10	1.31	1.35
8	E	602	C2E	C8-N7	-2.06	1.31	1.35
8	U	602	C2E	C8-N7	-2.06	1.31	1.35
8	U	602	C2E	C81-N71	-2.05	1.31	1.35
8	A	1002	C2E	C81-N71	-2.04	1.31	1.35

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	A	1001	C2E	P1-O3A-C3A	-2.56	110.09	119.41
8	A	1002	C2E	P11-O3'-C3'	-2.53	110.21	119.41
9	Q	301	ATP	C5-C6-N6	2.39	123.98	120.35
9	W	301	ATP	C5-C6-N6	2.26	123.78	120.35
8	E	602	C2E	O61-C61-C51	2.18	128.62	124.37
8	U	602	C2E	O61-C61-C51	2.15	128.57	124.37
8	A	1002	C2E	P1-O3A-C3A	-2.10	111.75	119.41
8	E	601	C2E	O6-C6-C5	2.09	128.45	124.37
8	A	1001	C2E	O6-C6-C5	2.04	128.35	124.37
8	A	1002	C2E	O61-C61-C51	2.02	128.32	124.37
8	A	1001	C2E	O61-C61-C51	2.02	128.31	124.37
8	E	602	C2E	O6-C6-C5	2.01	128.30	124.37
8	U	602	C2E	O6-C6-C5	2.01	128.29	124.37

There are no chirality outliers.

All (25) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
8	A	1001	C2E	C5A-O5A-P11-O11
8	A	1002	C2E	C5A-O5A-P11-O11
8	E	601	C2E	C5'-O5'-P1-O1P
8	E	601	C2E	C5A-O5A-P11-O11
8	U	601	C2E	C5A-O5A-P11-O11
8	U	602	C2E	C5'-O5'-P1-O1P
8	U	602	C2E	C5A-O5A-P11-O11
8	A	1002	C2E	C5A-O5A-P11-O3'

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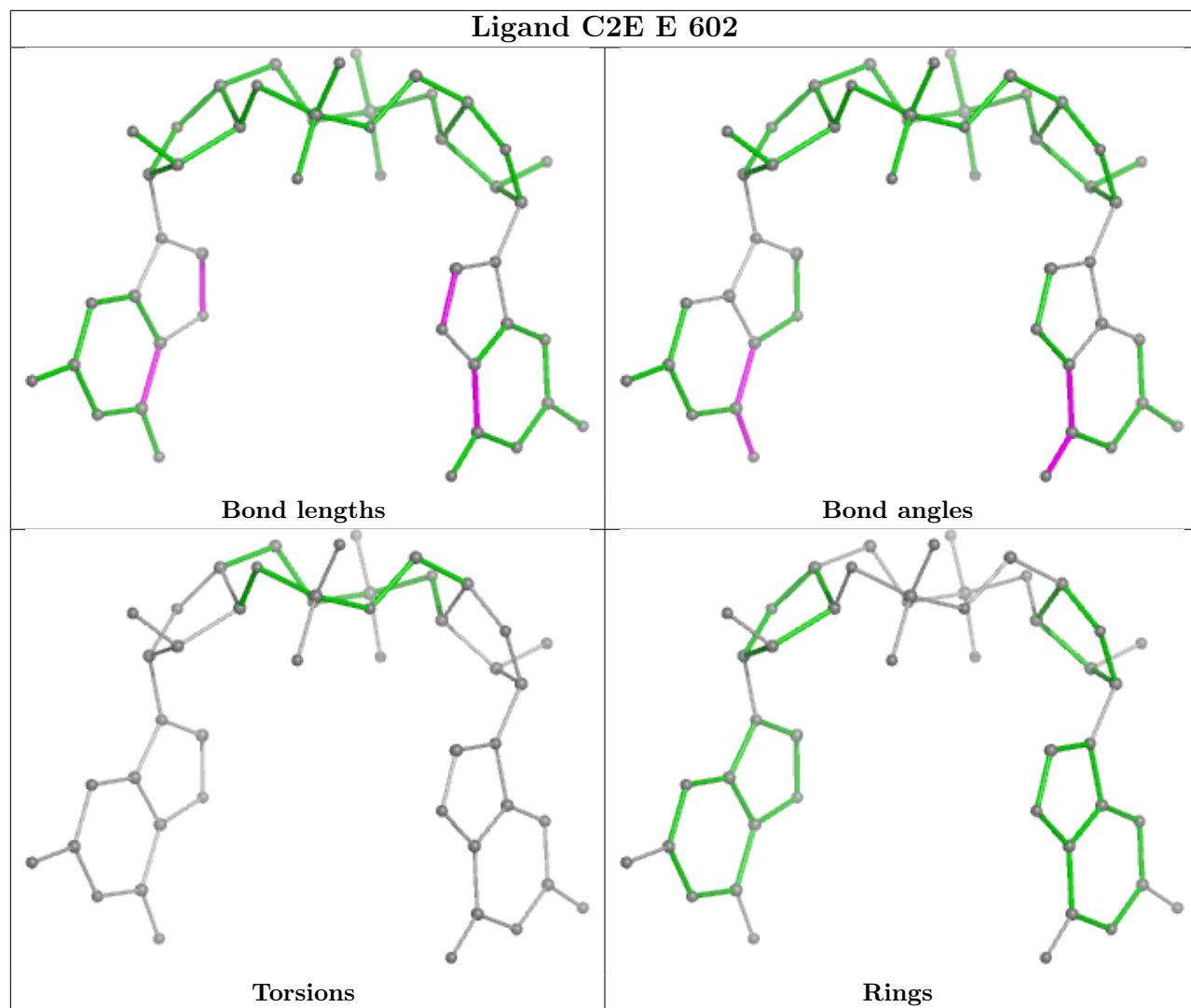
Mol	Chain	Res	Type	Atoms
8	U	602	C2E	C5A-O5A-P11-O3'
9	W	301	ATP	PB-O3B-PG-O1G
9	W	301	ATP	PB-O3B-PG-O3G
8	U	601	C2E	C5A-O5A-P11-O3'
8	A	1002	C2E	C5A-O5A-P11-O21
8	E	601	C2E	C5'-O5'-P1-O2P
8	E	601	C2E	C5A-O5A-P11-O21
8	U	601	C2E	C5'-O5'-P1-O1P
8	U	601	C2E	C5A-O5A-P11-O21
8	U	602	C2E	C5A-O5A-P11-O21
8	E	601	C2E	C5'-O5'-P1-O3A
8	E	601	C2E	C5A-O5A-P11-O3'
9	W	301	ATP	PA-O3A-PB-O1B
9	W	301	ATP	PA-O3A-PB-O2B
8	U	602	C2E	C5'-O5'-P1-O3A
8	A	1001	C2E	C5A-O5A-P11-O21
8	U	602	C2E	C5'-O5'-P1-O2P

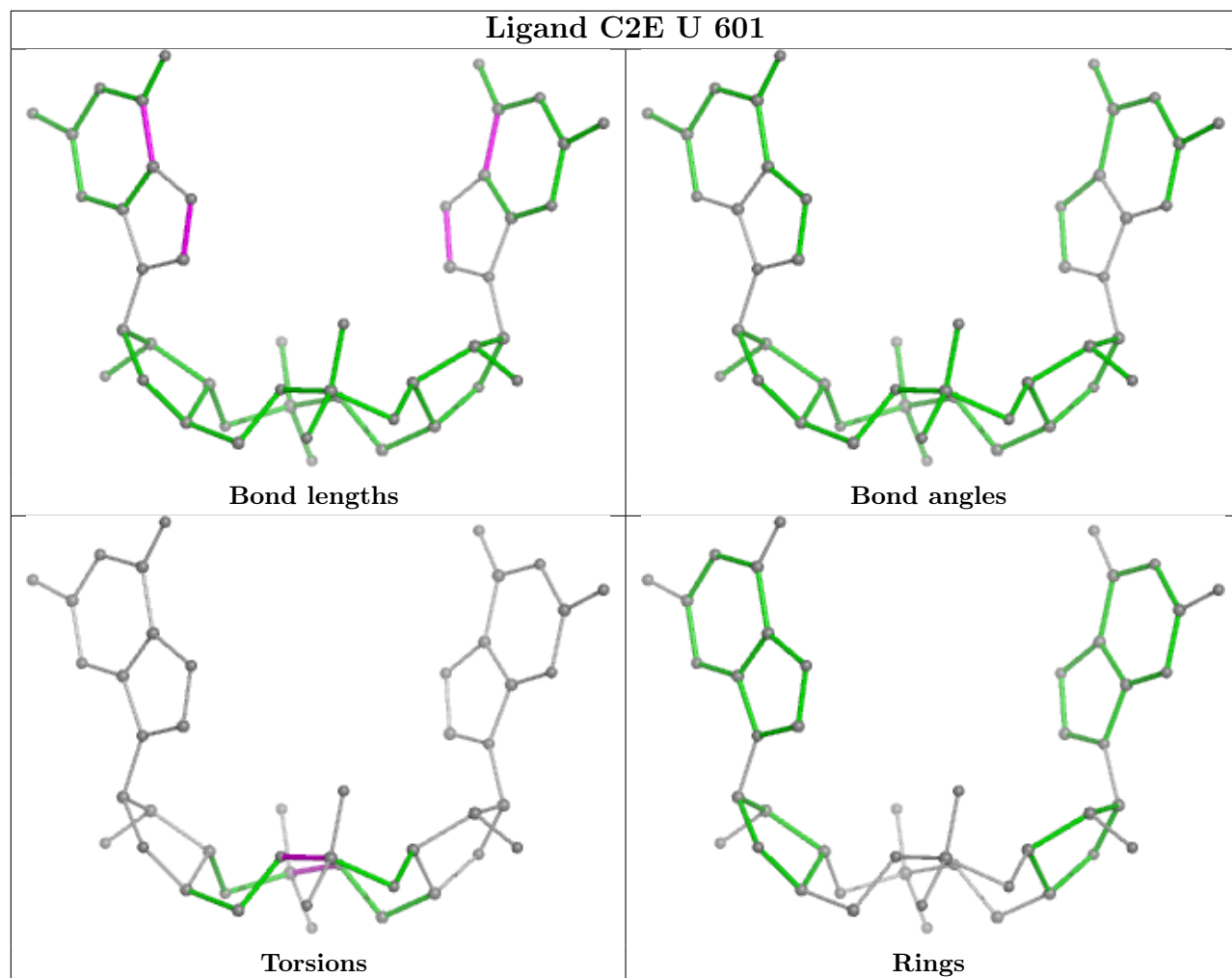
There are no ring outliers.

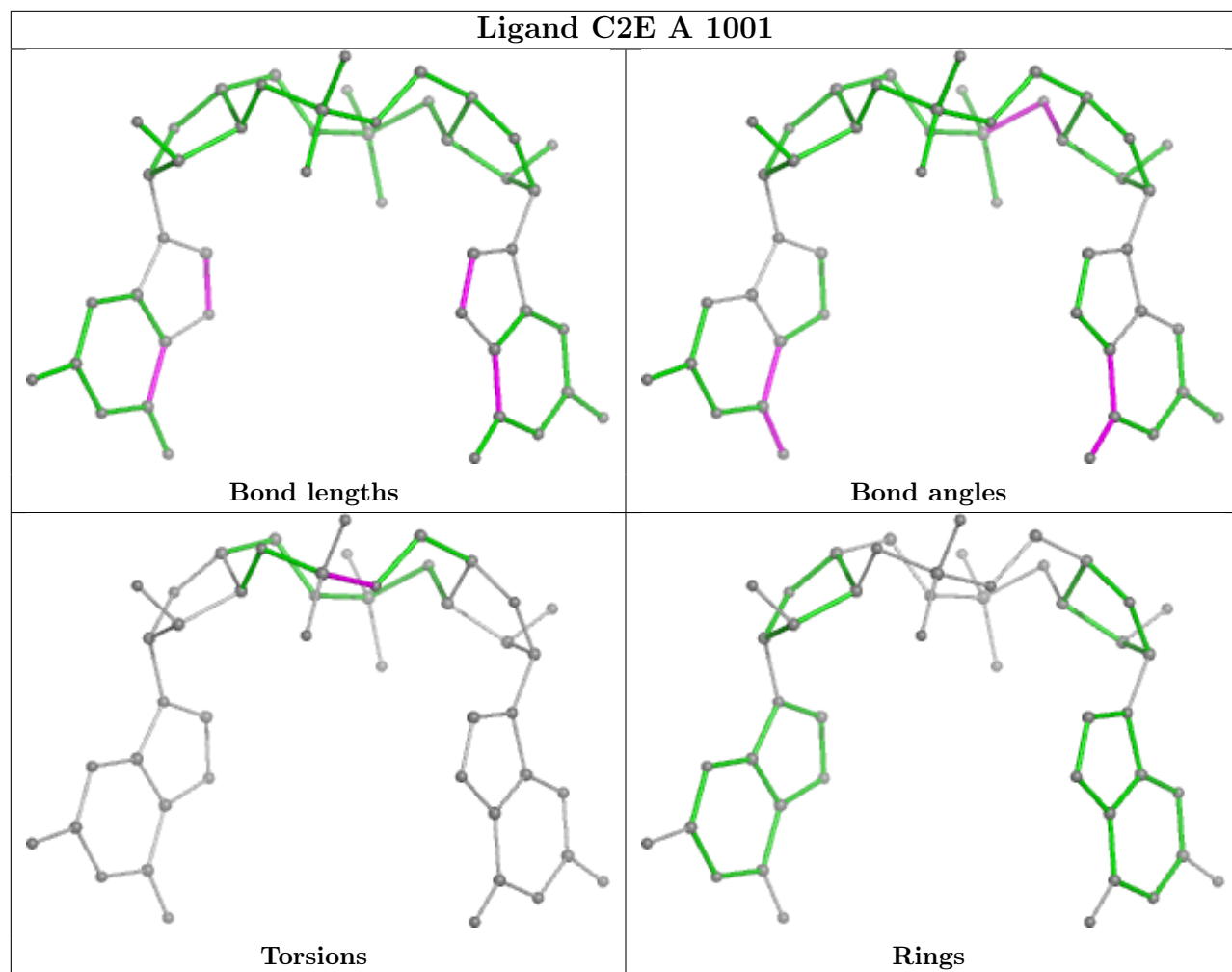
5 monomers are involved in 10 short contacts:

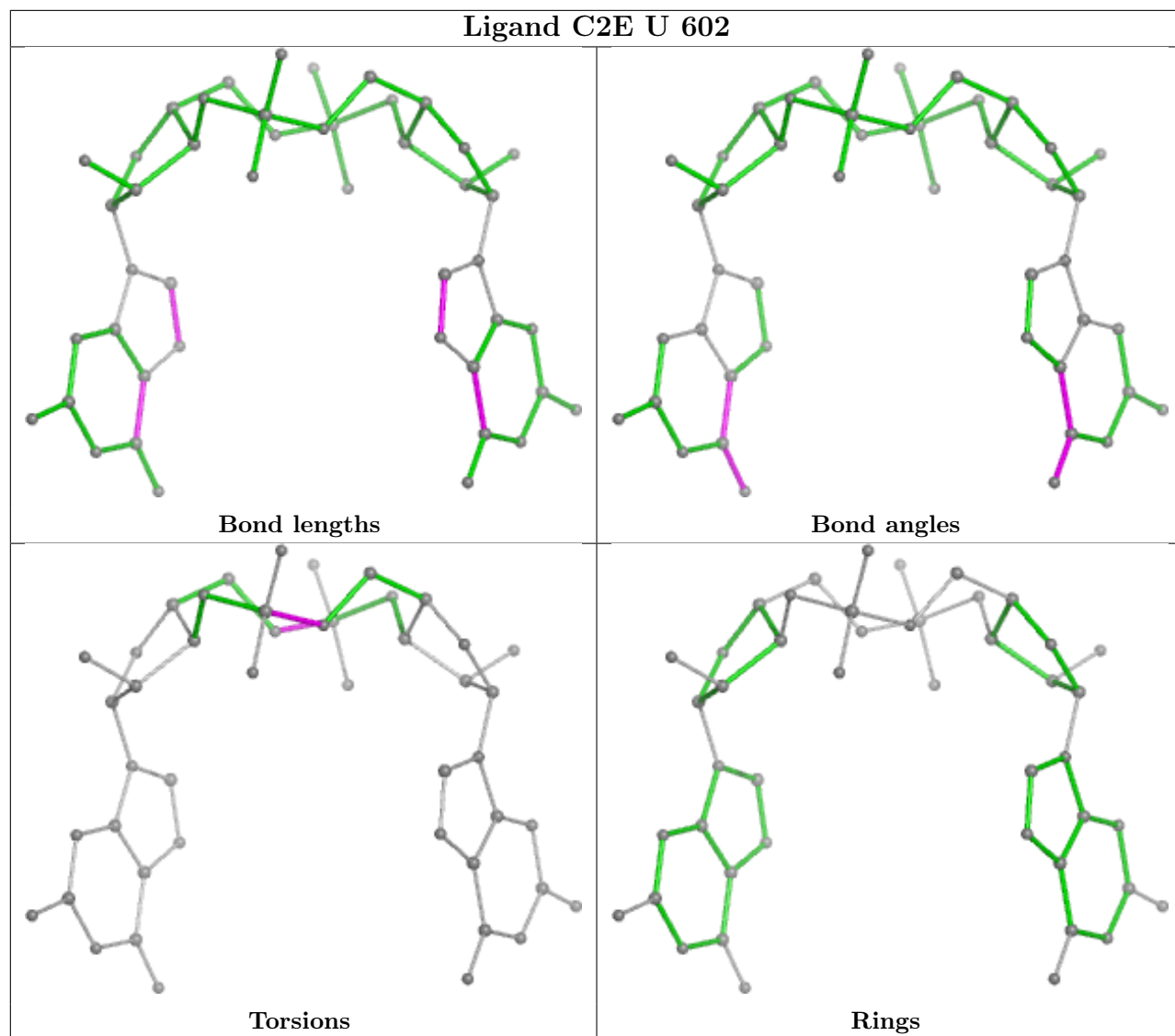
Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	U	601	C2E	2	0
8	A	1001	C2E	2	0
8	A	1002	C2E	2	0
9	W	301	ATP	2	0
9	Q	301	ATP	2	0

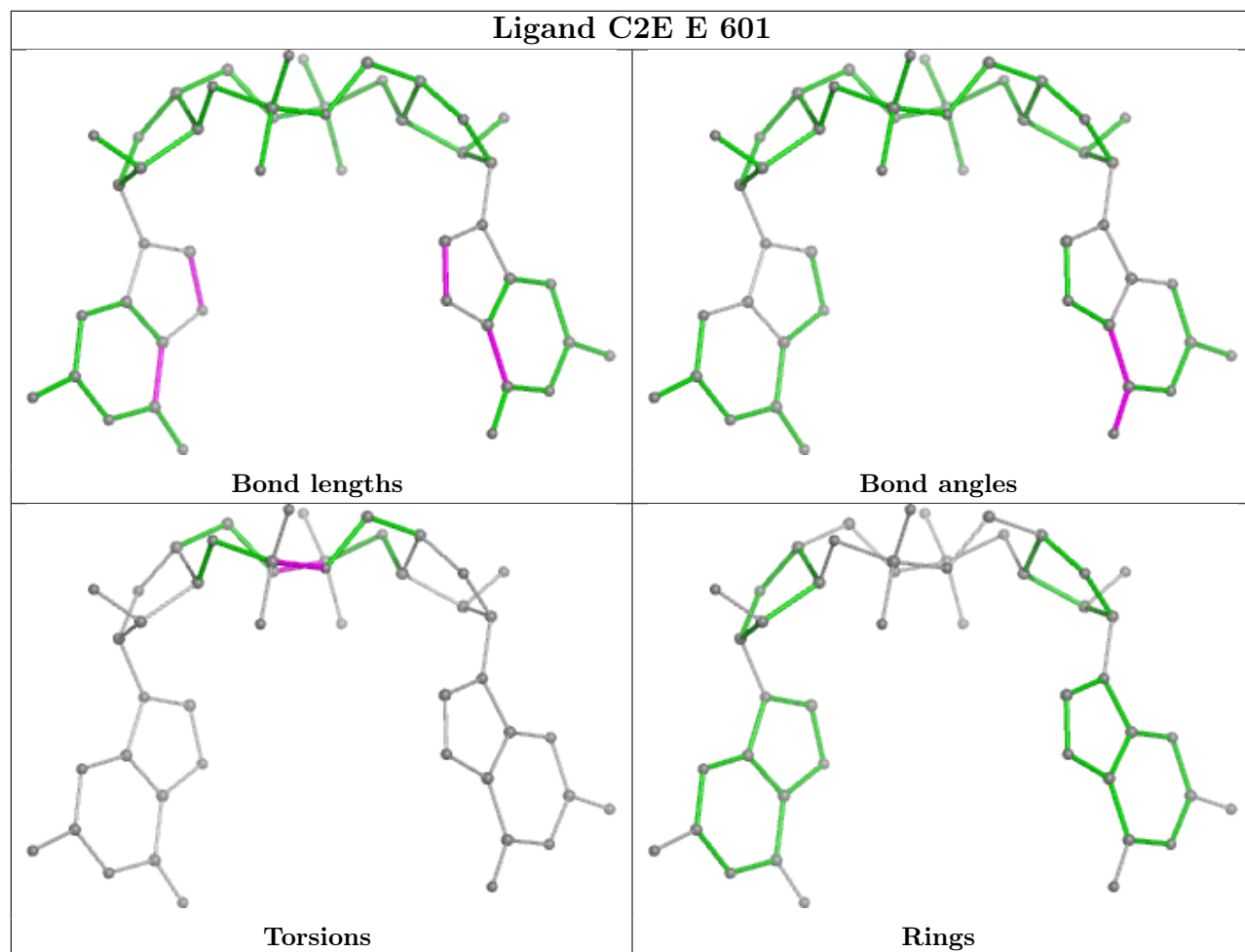
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

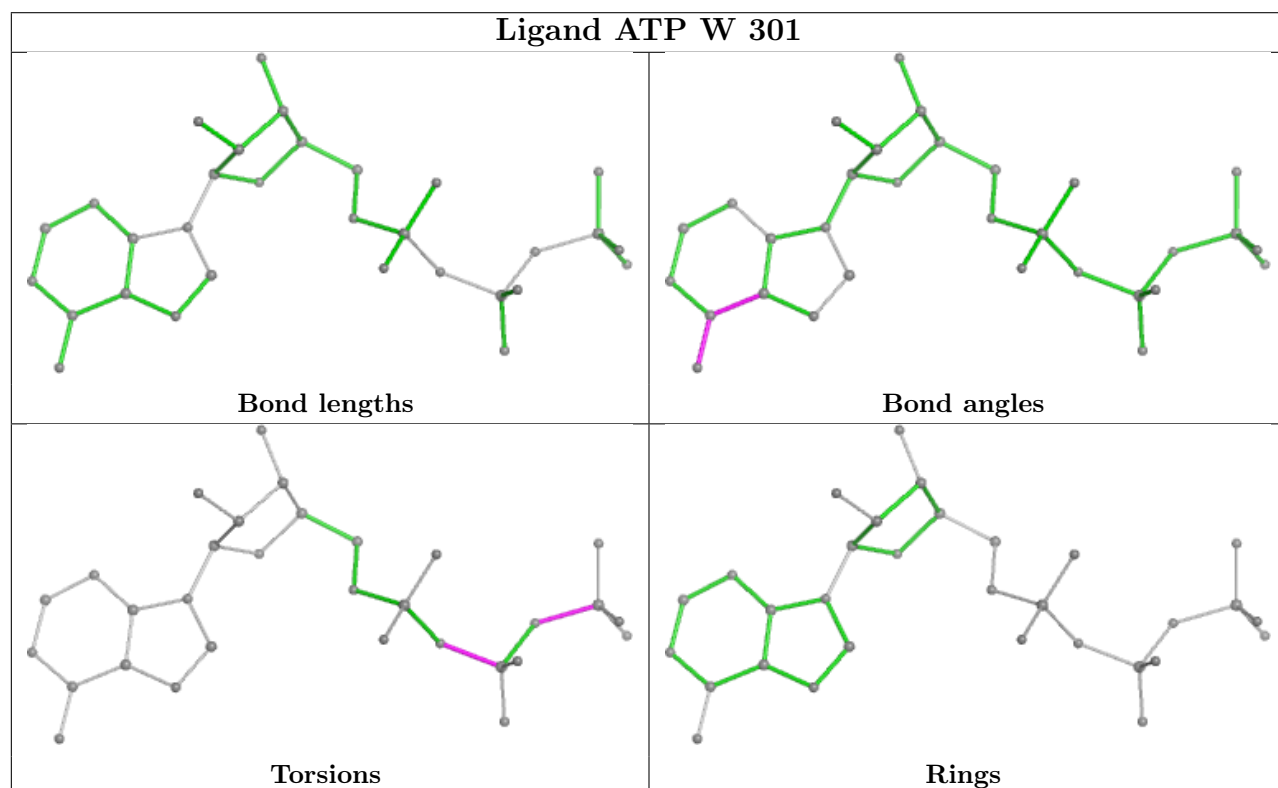
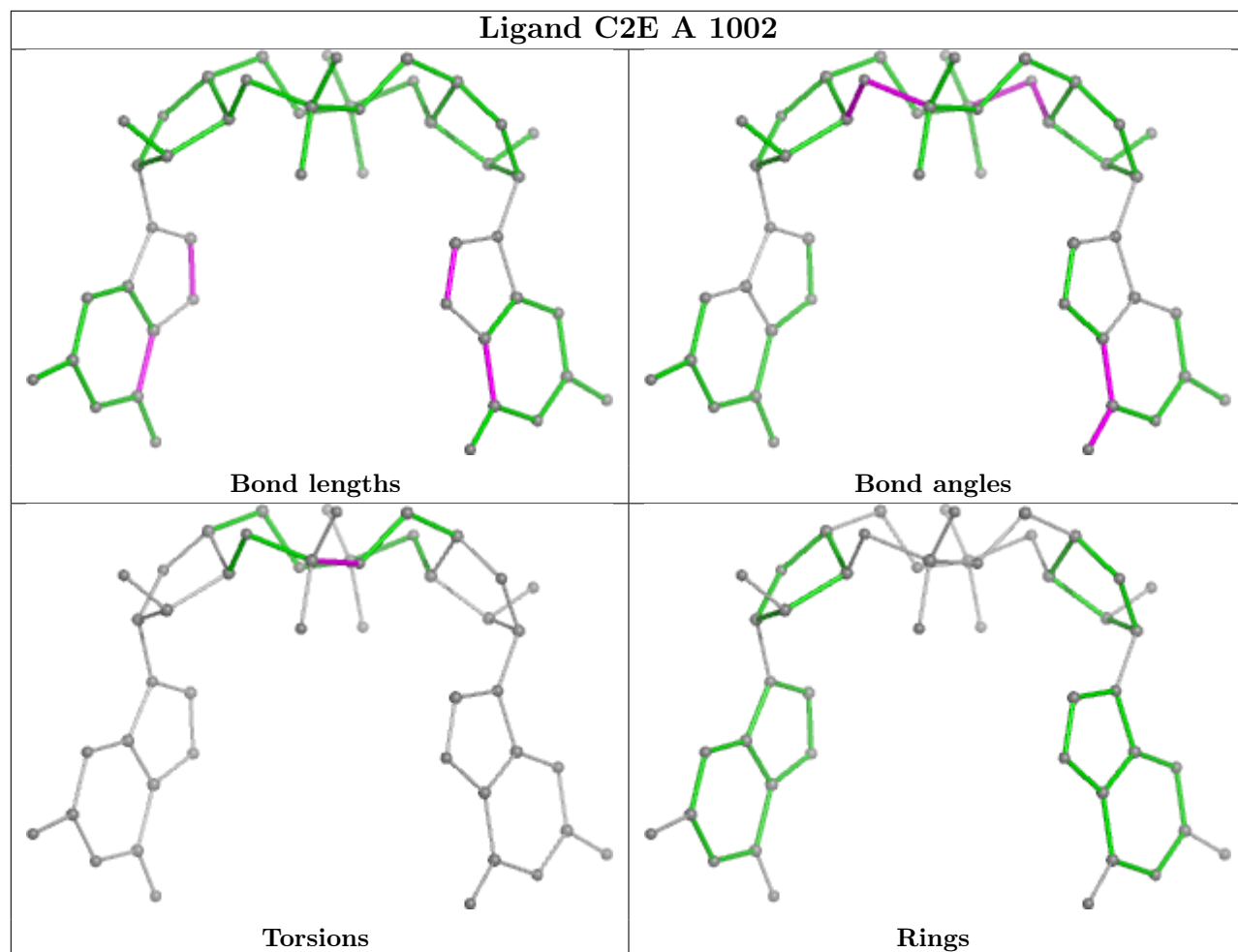


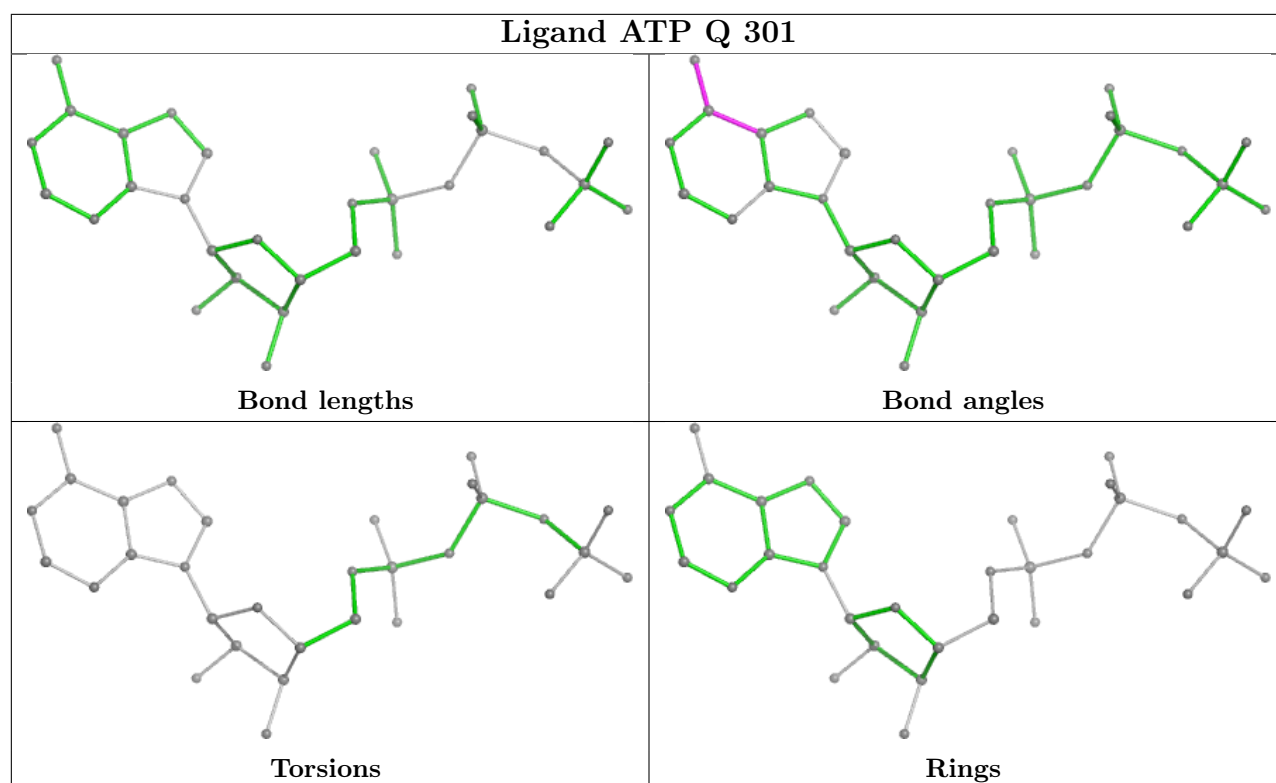












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

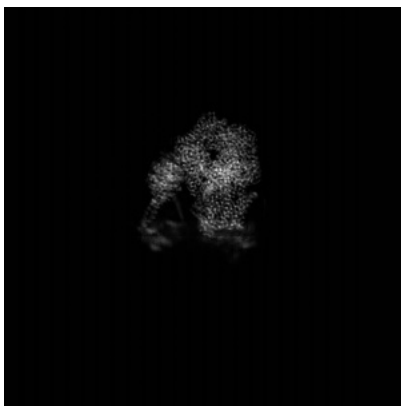
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-50599. These allow visual inspection of the internal detail of the map and identification of artifacts.

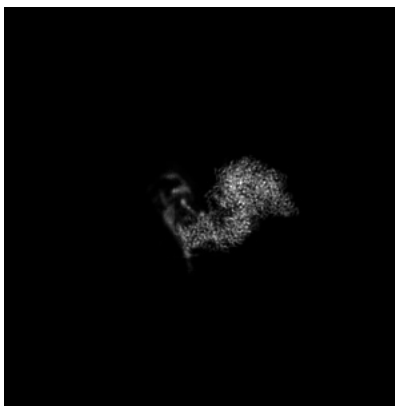
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

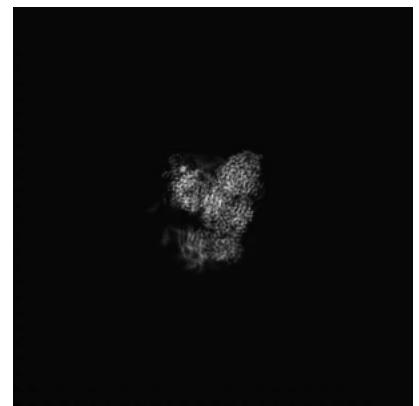
6.1.1 Primary map



X

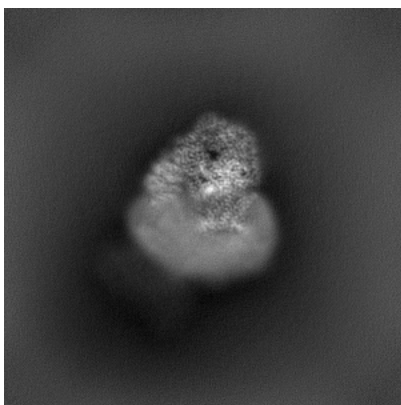


Y

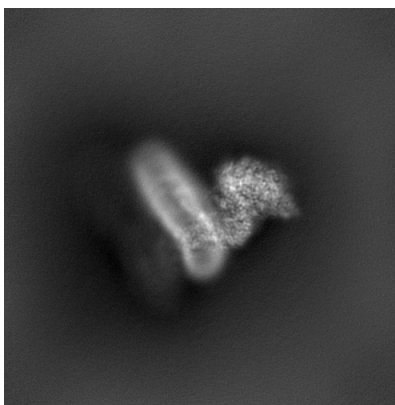


Z

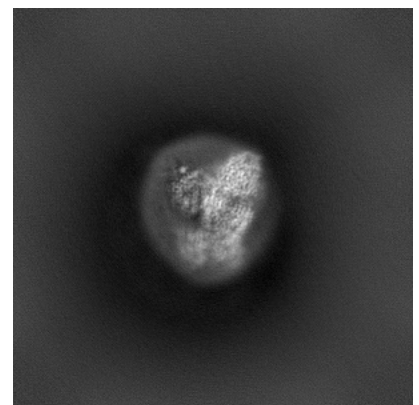
6.1.2 Raw map



X



Y



Z

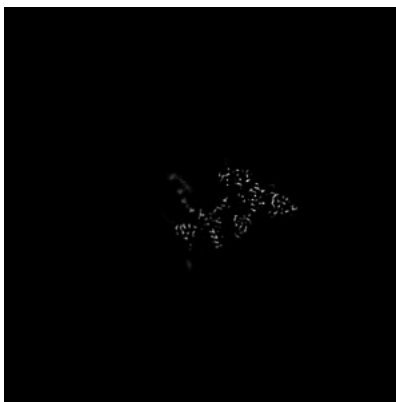
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

6.2.1 Primary map



X Index: 250



Y Index: 250

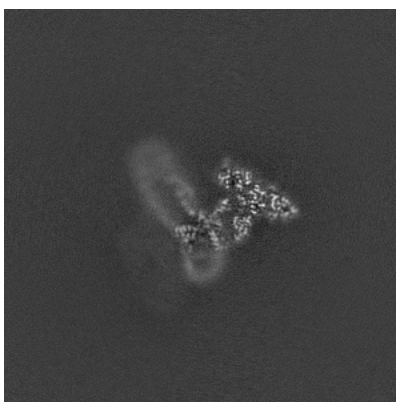


Z Index: 250

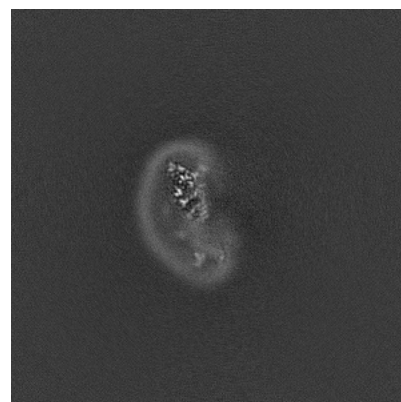
6.2.2 Raw map



X Index: 250



Y Index: 250



Z Index: 250

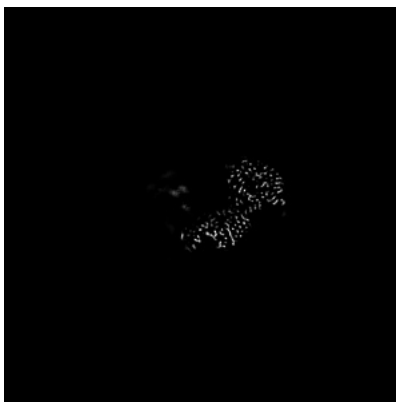
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

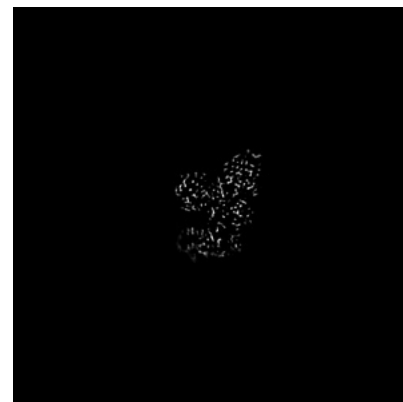
6.3.1 Primary map



X Index: 254

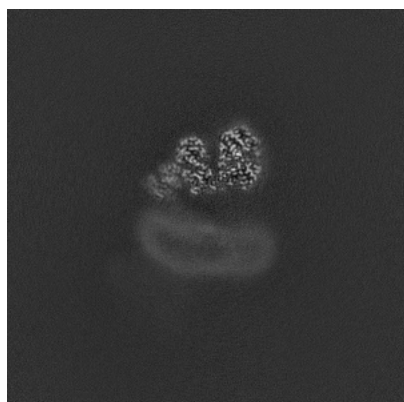


Y Index: 281

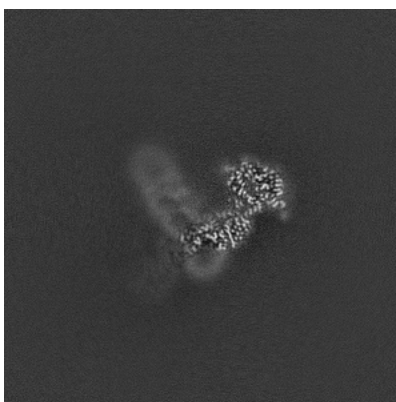


Z Index: 295

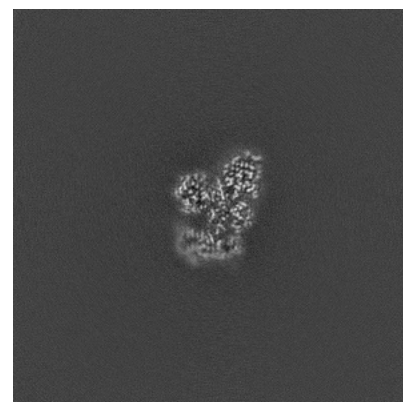
6.3.2 Raw map



X Index: 280



Y Index: 281

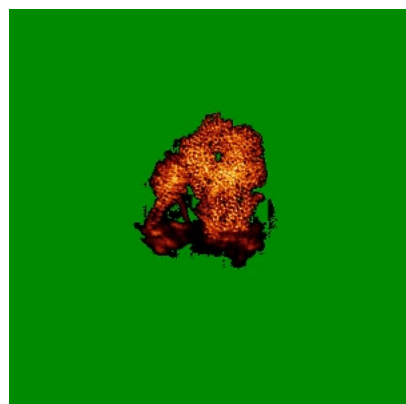


Z Index: 295

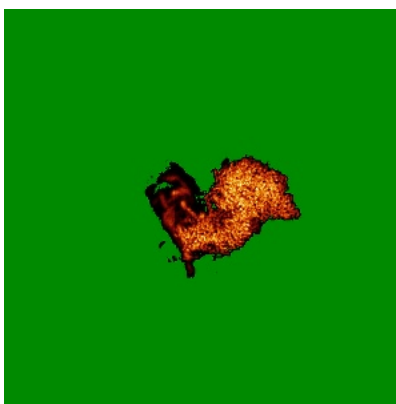
The images above show the largest variance slices of the map in three orthogonal directions.

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

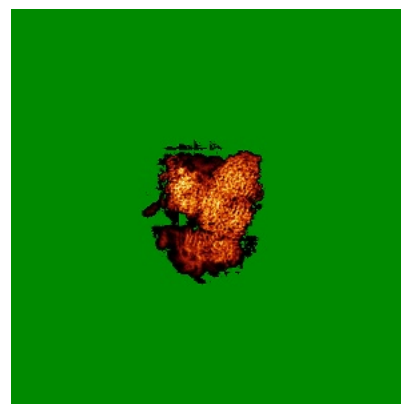
6.4.1 Primary map



X

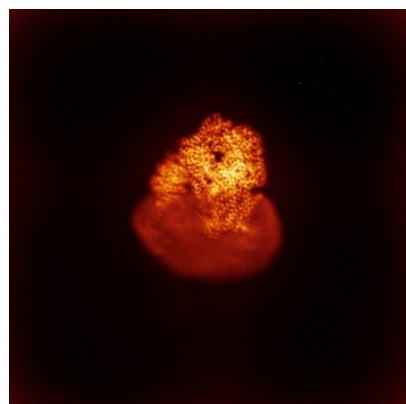


Y

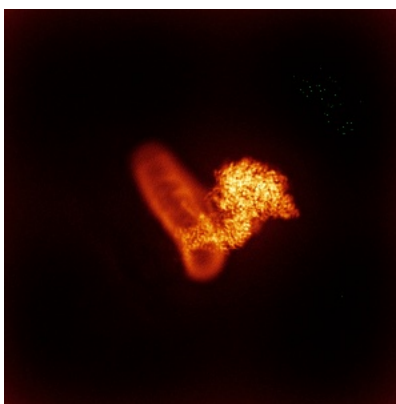


Z

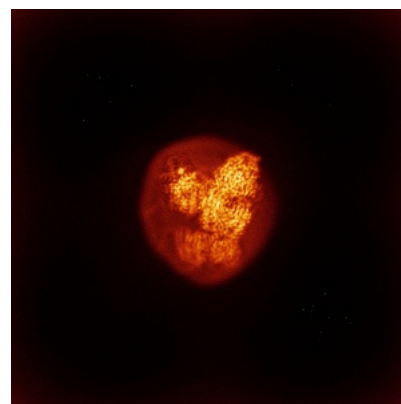
6.4.2 Raw map



X



Y

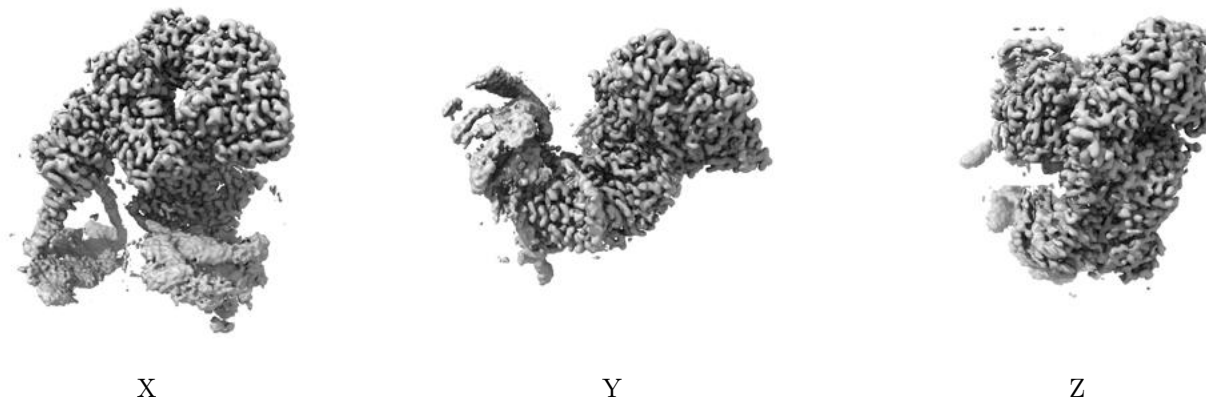


Z

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.

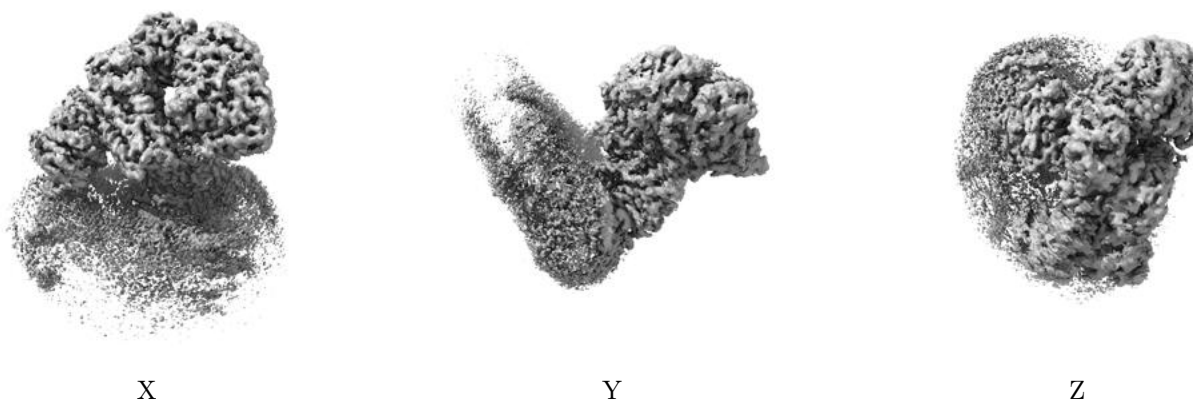
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.03. 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.

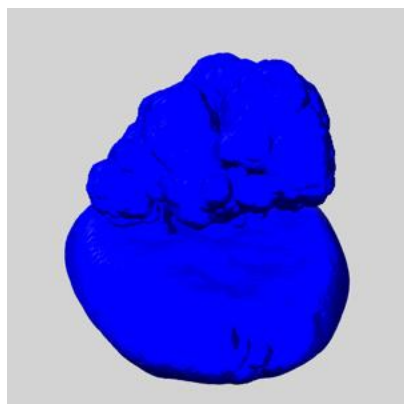
6.6 Mask visualisation [i](#)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

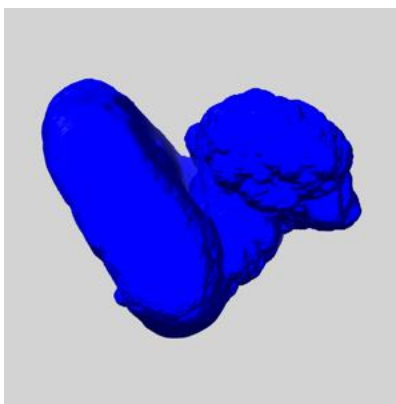
A mask typically either:

- Encompasses the whole structure
- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

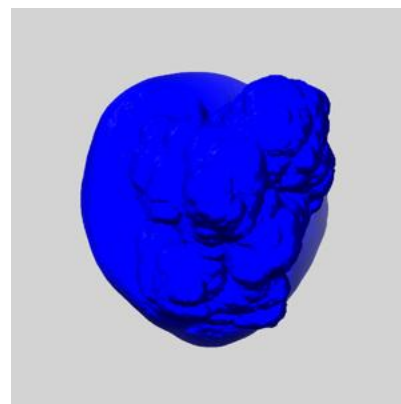
6.6.1 emd_50599_msk_1.map [i](#)



X



Y

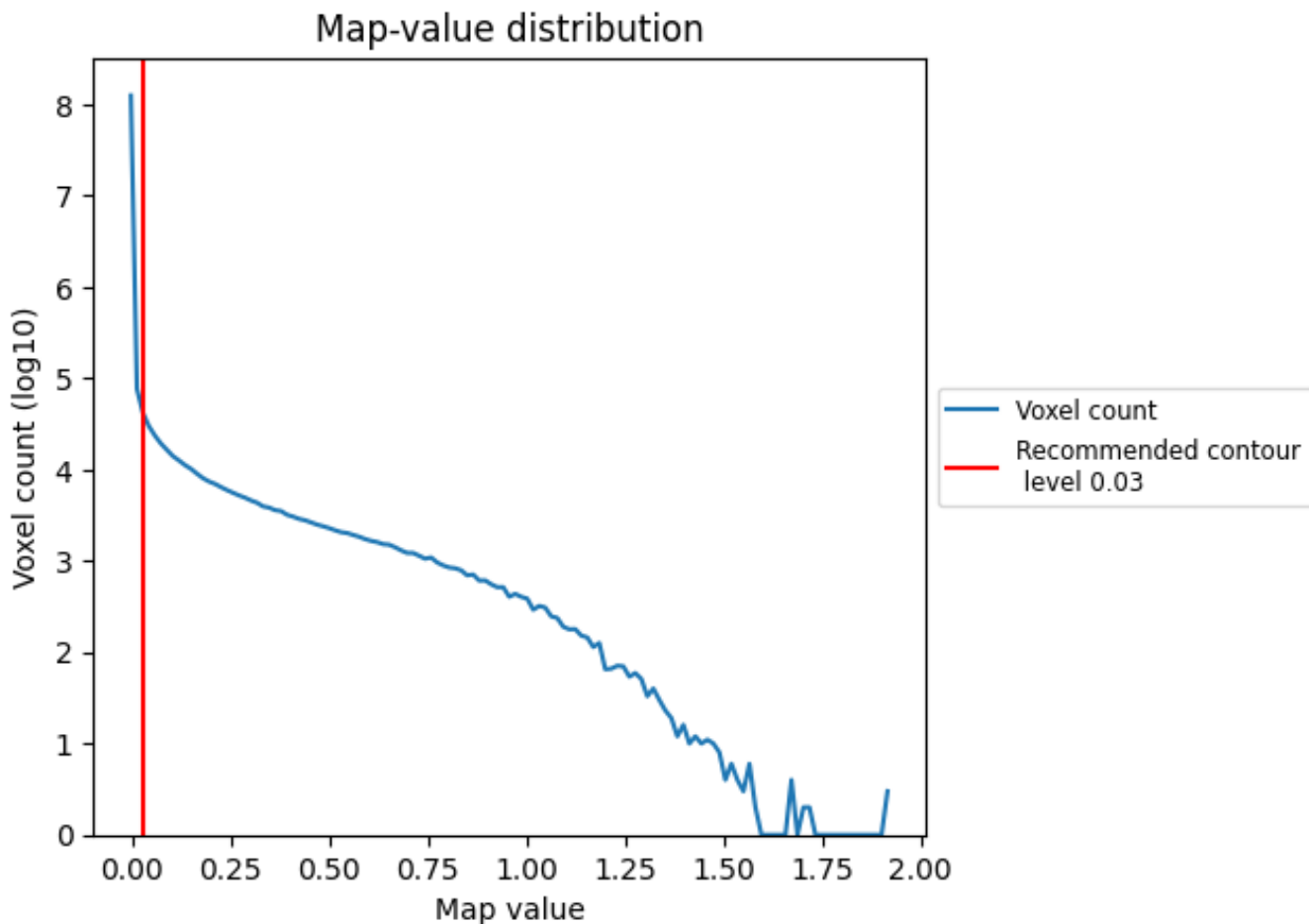


Z

7 Map analysis [i](#)

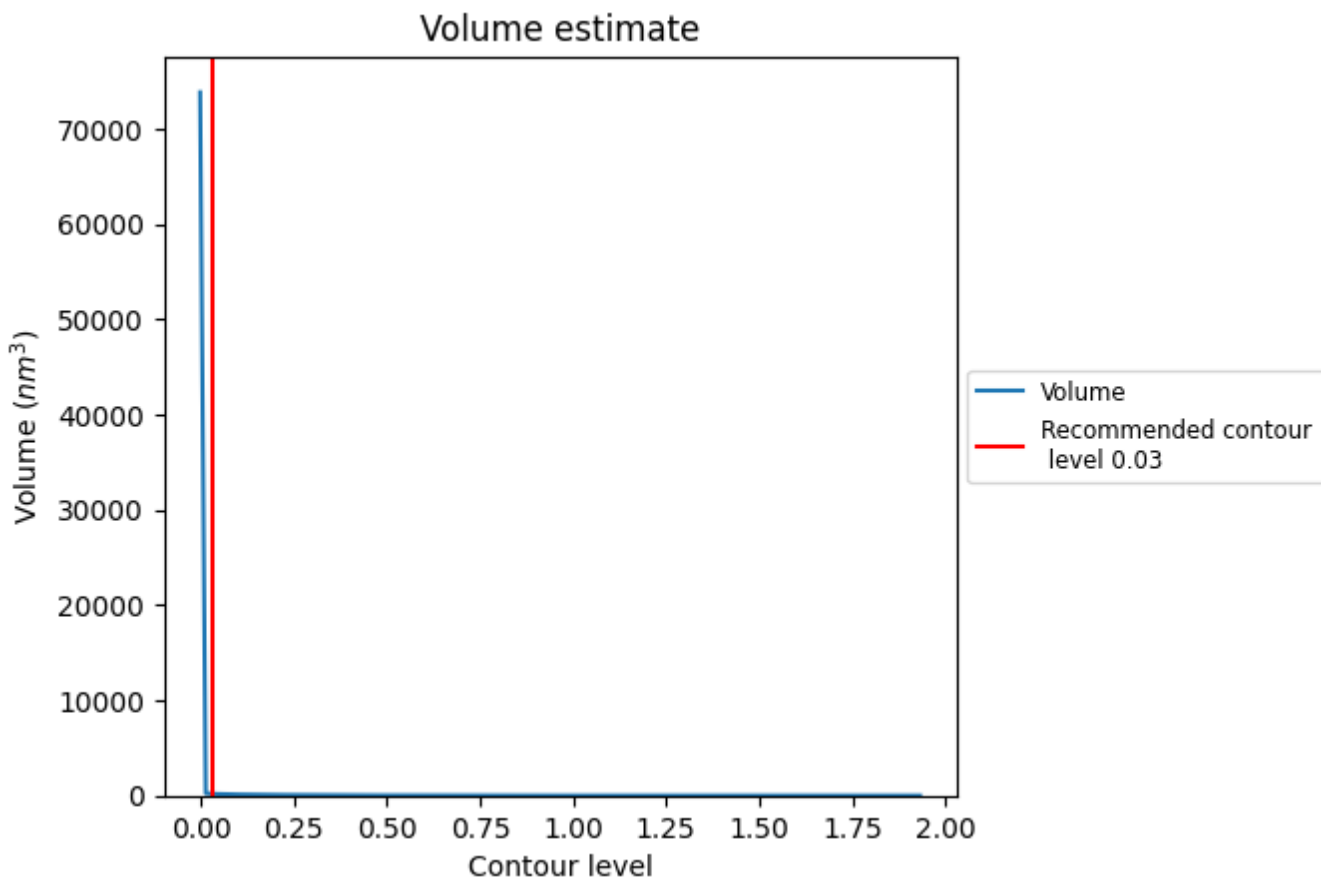
This section contains the results of statistical analysis of the map.

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.

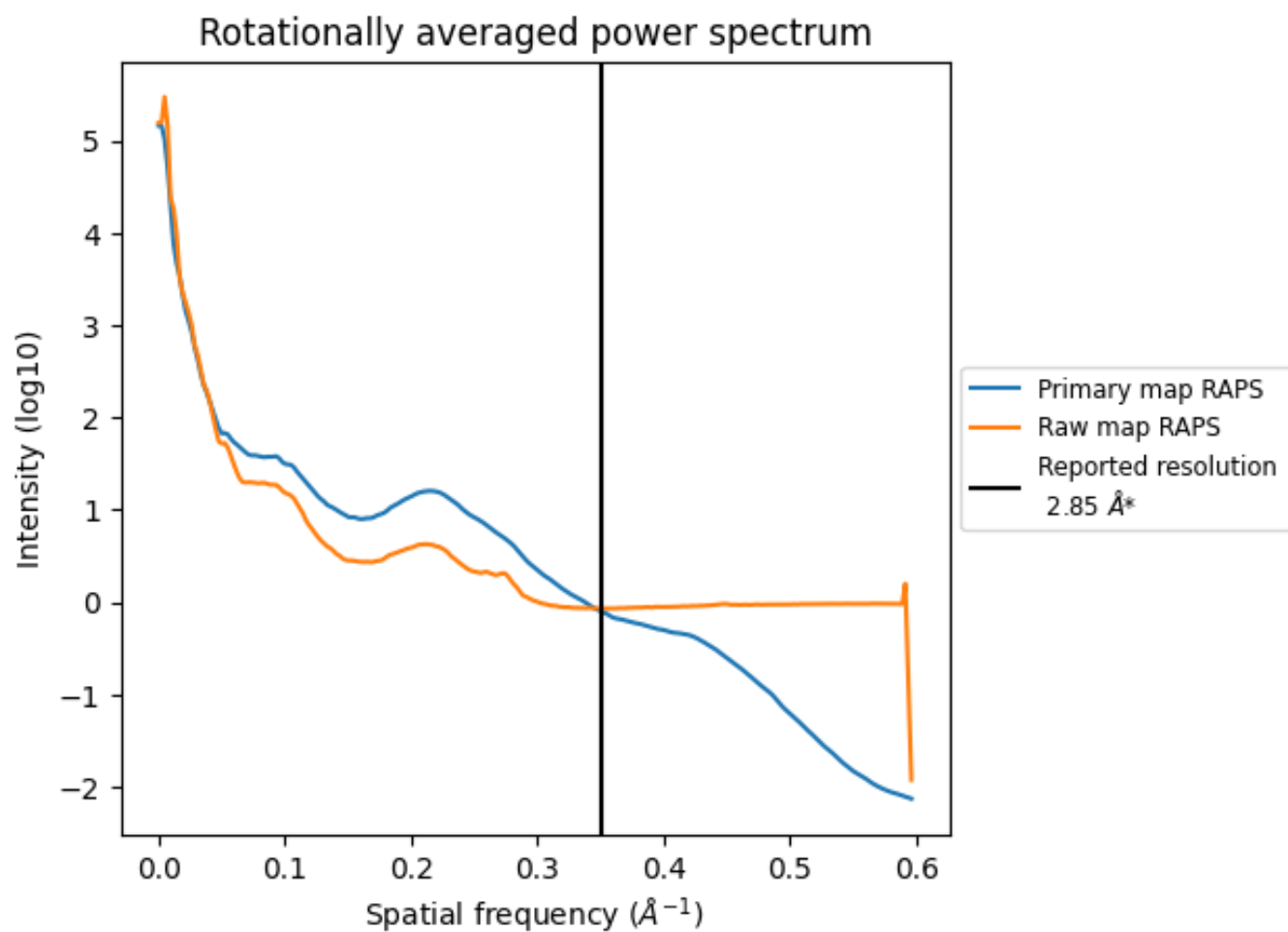
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 189 nm³; this corresponds to an approximate mass of 171 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

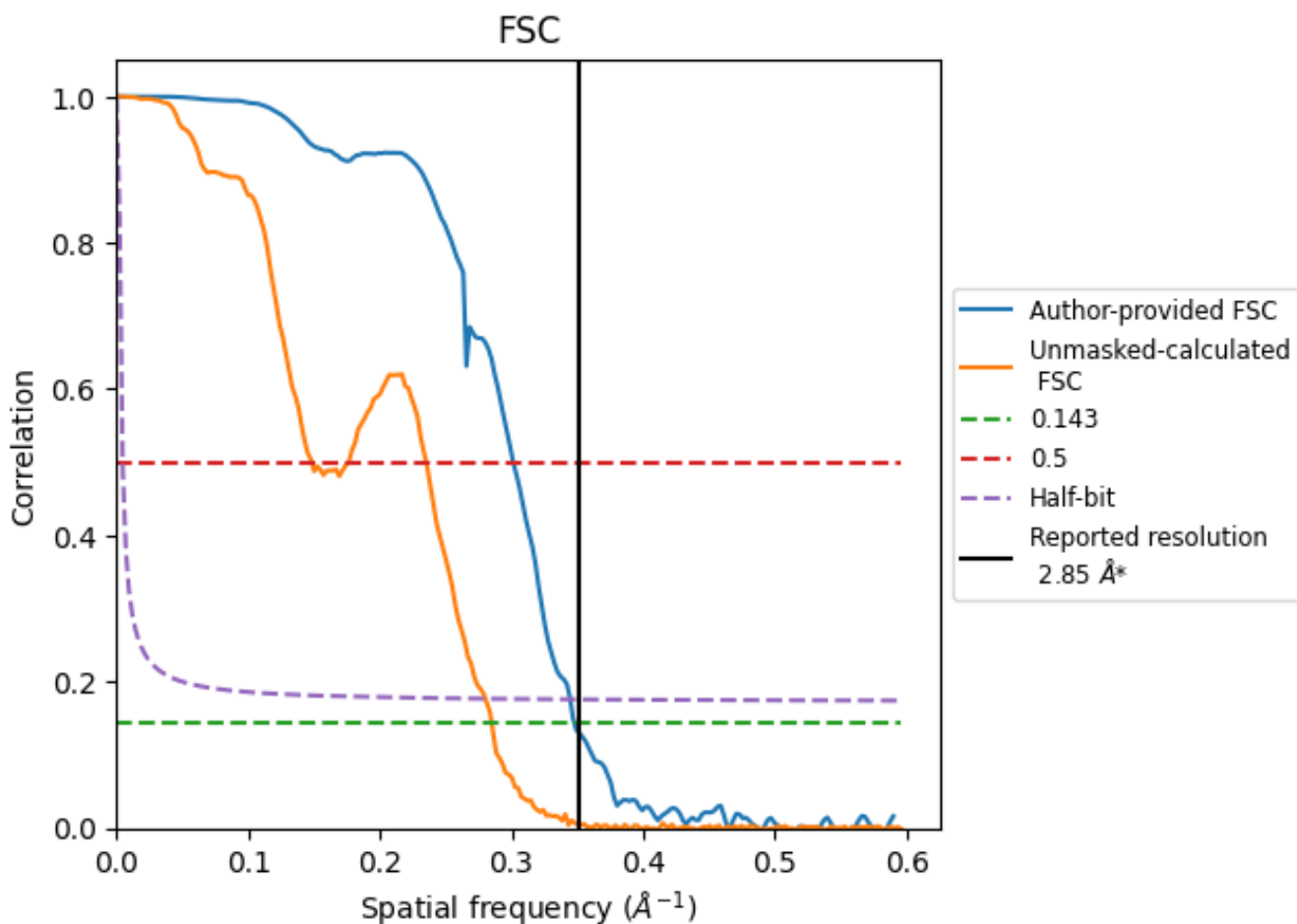


*Reported resolution corresponds to spatial frequency of 0.351 \AA^{-1}

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 0.351 Å⁻¹

8.2 Resolution estimates [i](#)

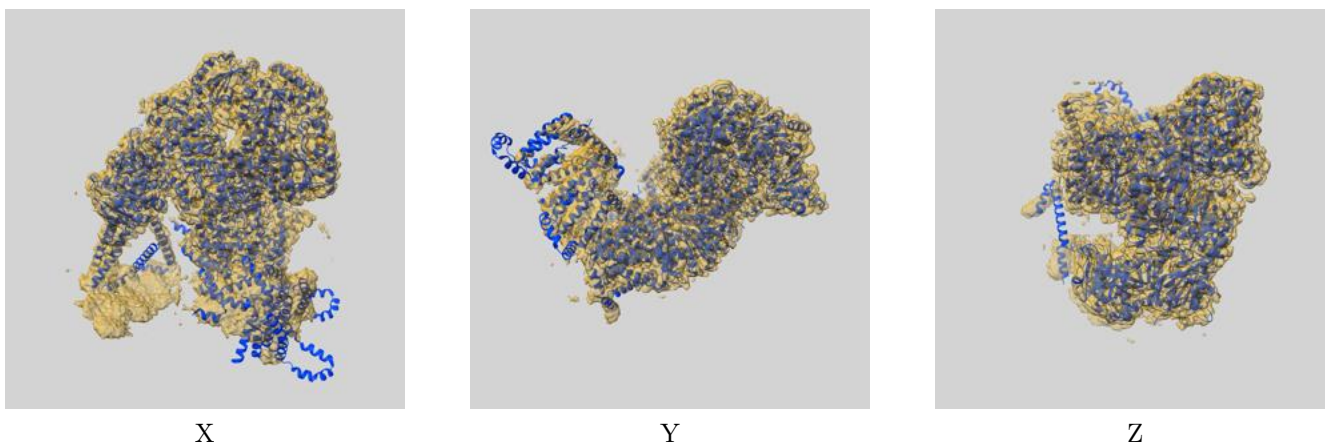
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.85	-	-
Author-provided FSC curve	2.88	3.32	2.90
Unmasked-calculated*	3.51	6.74	3.57

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.51 differs from the reported value 2.85 by more than 10 %

9 Map-model fit [i](#)

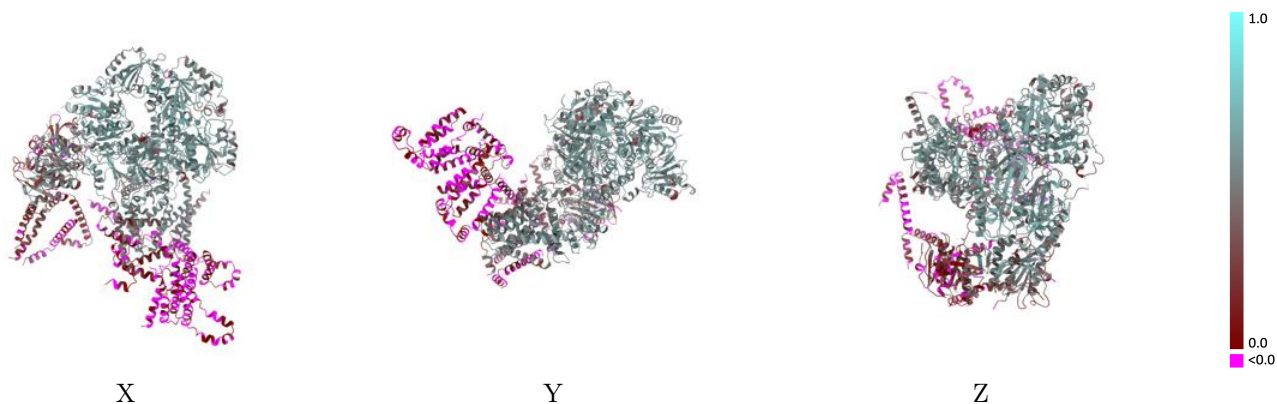
This section contains information regarding the fit between EMDB map EMD-50599 and PDB model 9FNN. Per-residue inclusion information can be found in section 3 on page 8.

9.1 Map-model overlay [i](#)



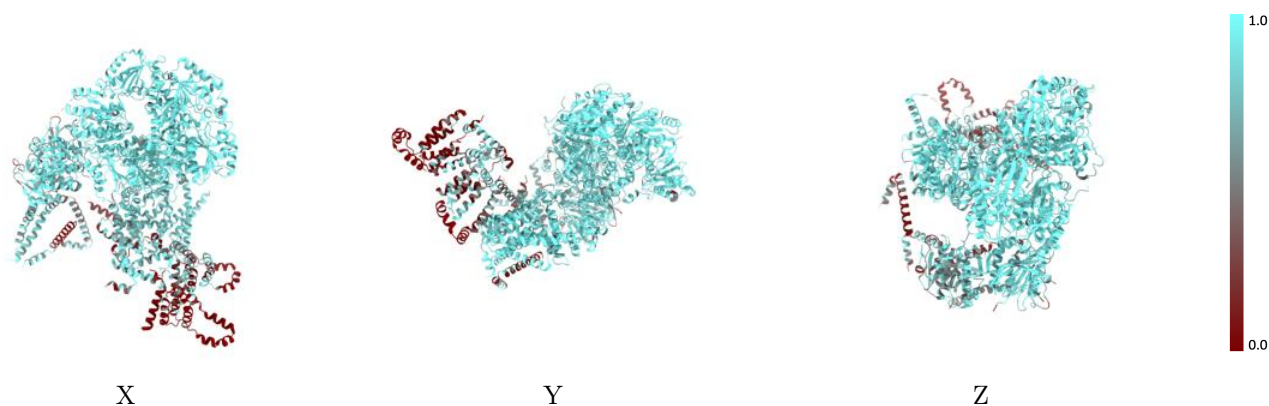
The images above show the 3D surface view of the map at the recommended contour level 0.03 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



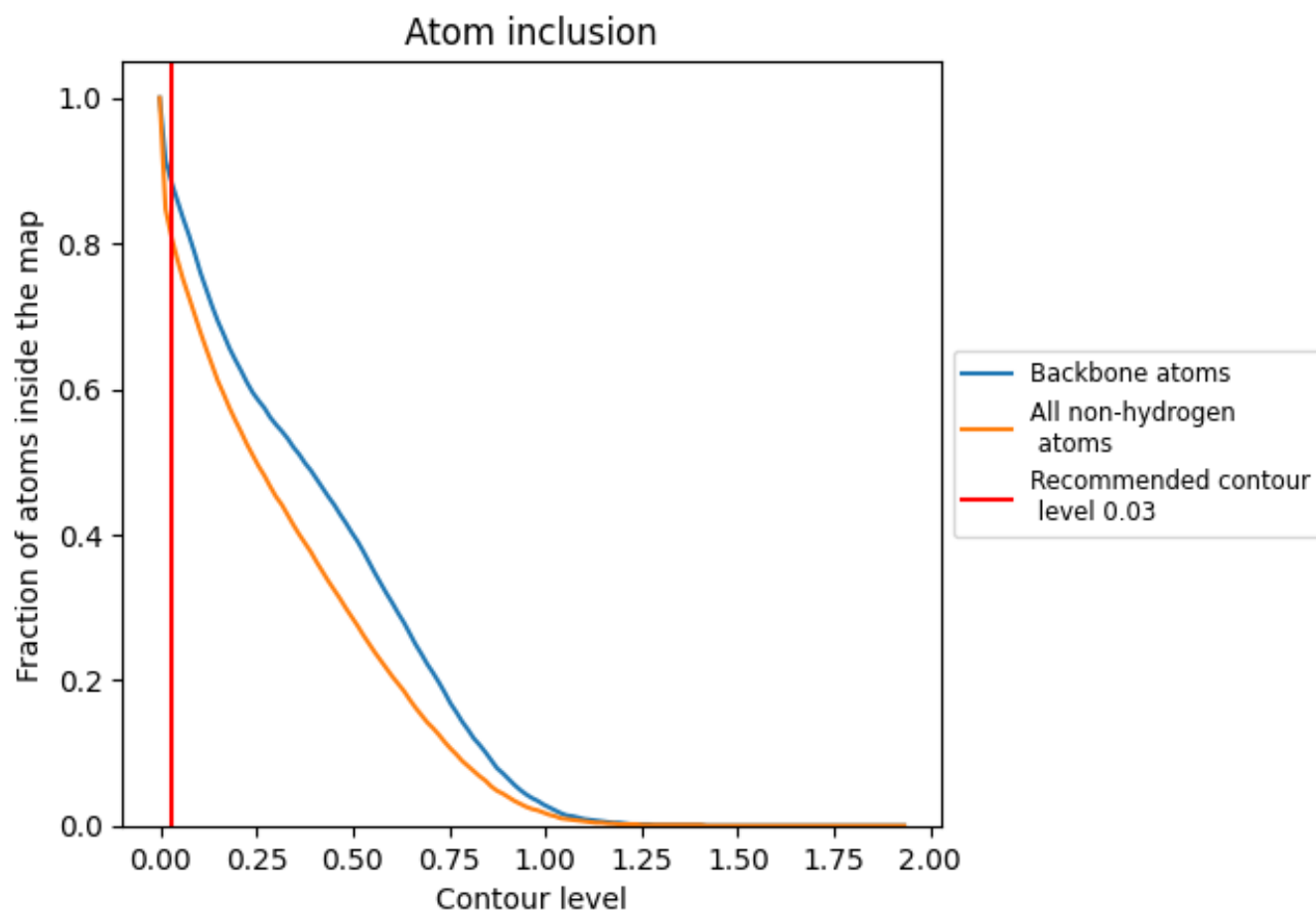
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.03).

































9.4 Atom inclusion [i](#)



At the recommended contour level, 88% of all backbone atoms, 81% 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 (0.03) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8060	 0.4020
A	 0.8810	 0.4530
B	 0.9210	 0.4660
D	 0.4200	 -0.0000
E	 0.9090	 0.5000
F	 0.7110	 0.2100
G	 0.1750	 -0.0280
Q	 0.9580	 0.5720
R	 0.8380	 0.4590
S	 0.7650	 0.1910
U	 0.8490	 0.4230
V	 0.7940	 0.4490
W	 0.9590	 0.5750
X	 0.3270	 0.0580
Y	 0.6090	 0.1180
Z	 0.2360	 0.0060

