



Full wwPDB EM Validation Report ⓘ

Jun 15, 2026 – 01:16 PM EDT

PDB ID : 9ZZM / pdb_00009zzm
EMDB ID : EMD-75010
Title : Two Lmod2s and incoming actin at the pointed end of F-actin
Authors : Brotzman, S.B.; Palmer, N.J.; Dominguez, R.
Deposited on : 2026-01-07
Resolution : 3.56 Å(reported)
Based on initial model : 8F8S

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:

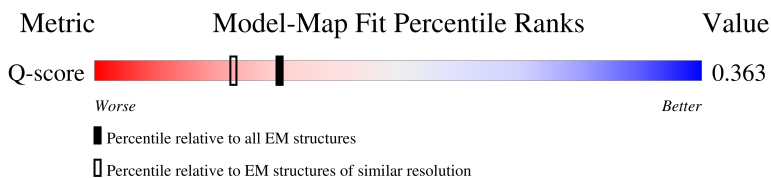
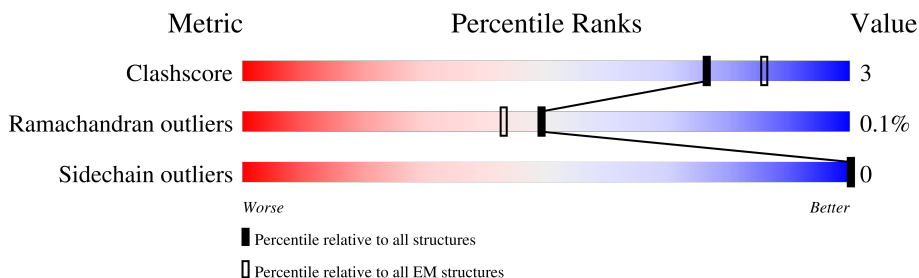
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMD 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 3.56 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	12750 (3.06 - 4.06)

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	375	 87% 12% .
1	B	375	 90% 9% .
1	C	375	 90% 9% .
1	D	375	 93% 6% .

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Mol	Chain	Length	Quality of chain
1	E	375	<div><div></div><div>93%</div><div>6%</div><div></div></div>
1	O	375	<div><div>5%</div><div></div><div>87%</div><div>9%</div><div></div></div>
2	L	556	<div><div></div><div>26%</div><div>5%</div><div></div><div>69%</div></div>
2	M	556	<div><div></div><div>27%</div><div></div><div></div><div>69%</div></div>

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 20218 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 Actin, alpha skeletal muscle.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	371	Total	C	N	O	S	0	0
			2900	1837	489	553	21		
1	B	371	Total	C	N	O	S	0	0
			2900	1837	489	553	21		
1	C	371	Total	C	N	O	S	0	0
			2900	1837	489	553	21		
1	D	371	Total	C	N	O	S	0	0
			2900	1837	489	553	21		
1	E	371	Total	C	N	O	S	0	0
			2900	1837	489	553	21		
1	O	360	Total	C	N	O	S	0	0
			2818	1786	474	539	19		

- Molecule 2 is a protein called Leiomodin-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	L	172	Total	C	N	O	S	0	0
			1359	841	245	264	9		
2	M	173	Total	C	N	O	S	0	0
			1369	847	248	265	9		

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
L	-8	MET	-	initiating methionine	UNP Q6P5Q4
L	-7	HIS	-	expression tag	UNP Q6P5Q4
L	-6	HIS	-	expression tag	UNP Q6P5Q4
L	-5	HIS	-	expression tag	UNP Q6P5Q4
L	-4	HIS	-	expression tag	UNP Q6P5Q4
L	-3	HIS	-	expression tag	UNP Q6P5Q4
L	-2	HIS	-	expression tag	UNP Q6P5Q4
L	-1	SER	-	expression tag	UNP Q6P5Q4
L	0	GLY	-	expression tag	UNP Q6P5Q4

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Chain	Residue	Modelled	Actual	Comment	Reference
M	-8	MET	-	initiating methionine	UNP Q6P5Q4
M	-7	HIS	-	expression tag	UNP Q6P5Q4
M	-6	HIS	-	expression tag	UNP Q6P5Q4
M	-5	HIS	-	expression tag	UNP Q6P5Q4
M	-4	HIS	-	expression tag	UNP Q6P5Q4
M	-3	HIS	-	expression tag	UNP Q6P5Q4
M	-2	HIS	-	expression tag	UNP Q6P5Q4
M	-1	SER	-	expression tag	UNP Q6P5Q4
M	0	GLY	-	expression tag	UNP Q6P5Q4

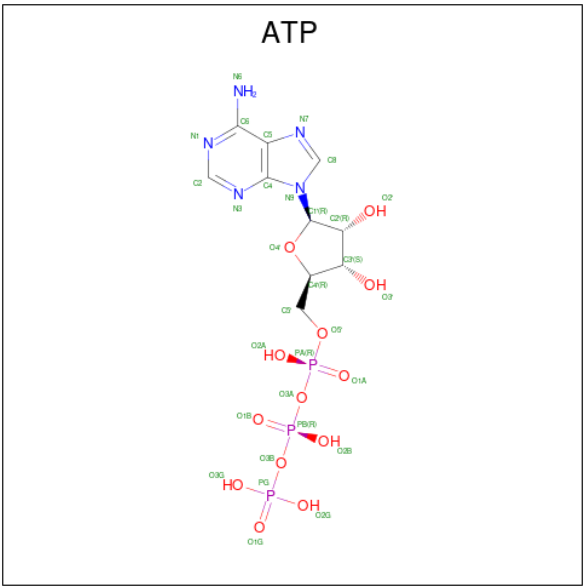
- # ADP

Mol	Chain	Residues	Atoms					AltConf
3	A	1	Total 27	C 10	N 5	O 10	P 2	0
3	B	1	Total 27	C 10	N 5	O 10	P 2	0
3	C	1	Total 27	C 10	N 5	O 10	P 2	0
3	D	1	Total 27	C 10	N 5	O 10	P 2	0
3	E	1	Total 27	C 10	N 5	O 10	P 2	0

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Mol	Chain	Residues	Atoms		AltConf
4	A	1	Total	Mg	0
			1	1	
4	B	1	Total	Mg	0
			1	1	
4	C	1	Total	Mg	0
			1	1	
4	D	1	Total	Mg	0
			1	1	
4	E	1	Total	Mg	0
			1	1	
4	O	1	Total	Mg	0
			1	1	

- Molecule 5 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: C₁₀H₁₆N₅O₁₃P₃).

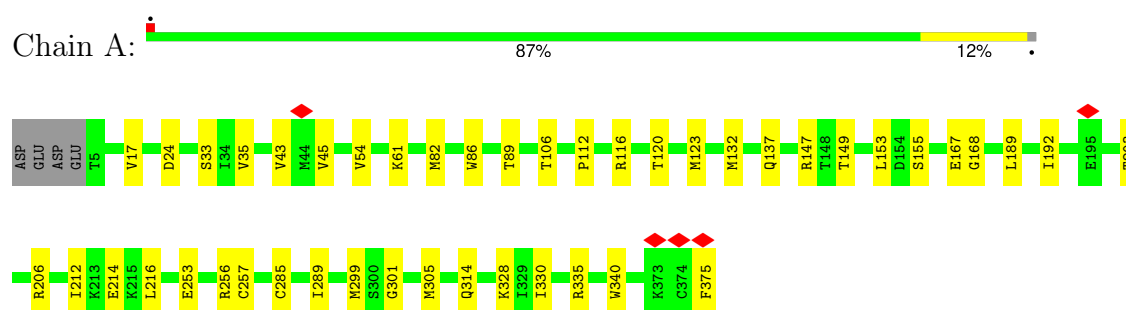


Mol	Chain	Residues	Atoms					AltConf
5	O	1	Total	C	N	O	P	0
			31	10	5	13	3	

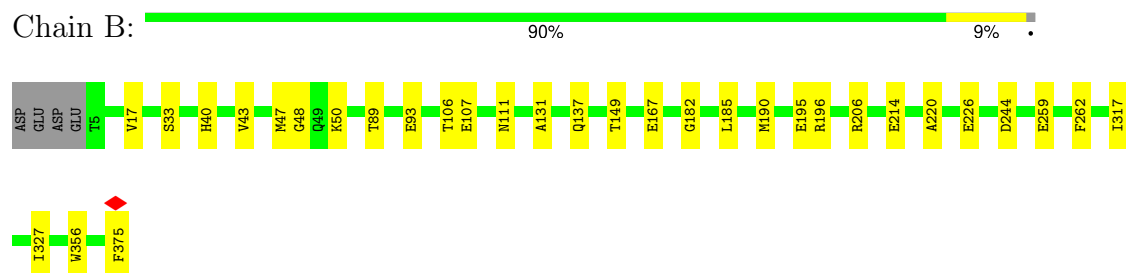
3 Residue-property plots

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.

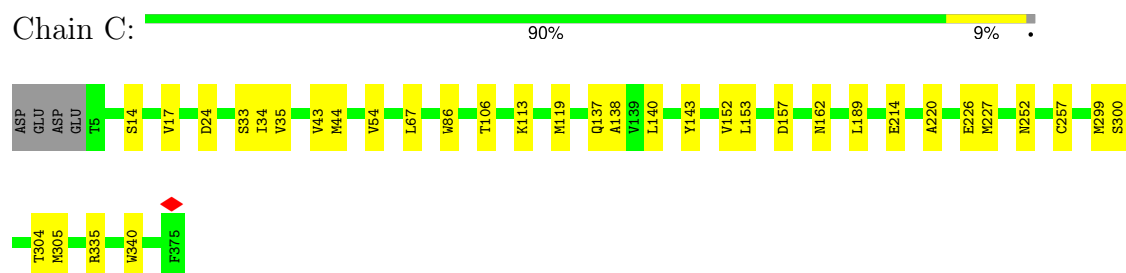
- Molecule 1: Actin, alpha skeletal muscle



- Molecule 1: Actin, alpha skeletal muscle

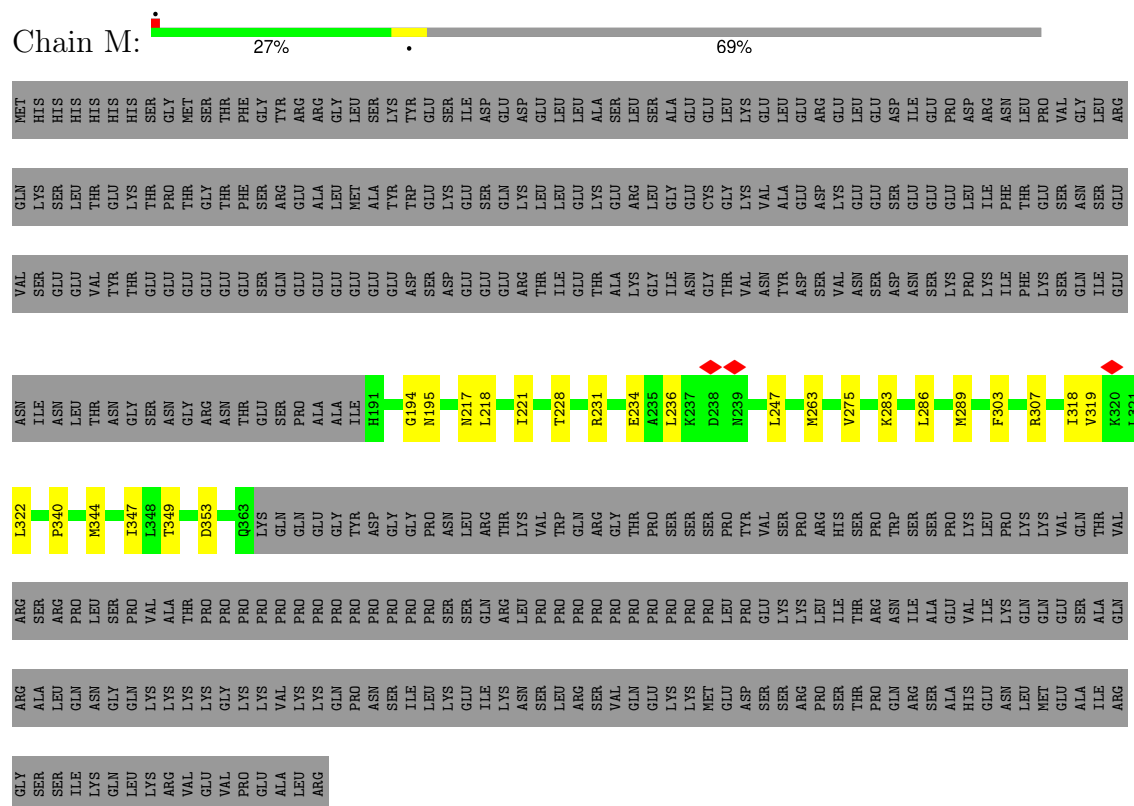


- Molecule 1: Actin, alpha skeletal muscle



- Molecule 1: Actin, alpha skeletal muscle





4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, POINT, POINT, POINT	Depositor
Number of particles used	25835, 25835, 25835, 25835	Depositor
Resolution determination method	FSC 0.143 CUT-OFF, FSC 0.143 CUT-OFF, FSC 0.143 CUT-OFF, FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE, NONE	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	49	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	81000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.708	Depositor
Minimum map value	0.000	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.017	Depositor
Recommended contour level	0.127	Depositor
Map size (Å)	439.712, 439.712, 439.712	wwPDB
Map dimensions	416, 416, 416	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.057, 1.057, 1.057	Depositor

5 Model quality

5.1 Standard geometry

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

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	0.30	0/2950	0.70	1/3994 (0.0%)
1	B	0.28	0/2950	0.67	2/3994 (0.1%)
1	C	0.26	0/2950	0.62	0/3994
1	D	0.25	0/2950	0.59	1/3994 (0.0%)
1	E	0.22	0/2950	0.52	0/3994
1	O	0.29	0/2865	0.69	2/3881 (0.1%)
2	L	0.36	0/1375	0.87	2/1857 (0.1%)
2	M	0.39	0/1386	0.96	3/1873 (0.2%)
All	All	0.28	0/20376	0.68	11/27581 (0.0%)

There are no bond length outliers.

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	47	MET	CA-C-N	6.43	127.26	119.99
1	B	47	MET	C-N-CA	6.43	127.26	119.99
2	M	247	LEU	CA-CB-CG	6.18	137.93	116.30
1	O	83	GLU	CA-CB-CG	6.06	126.22	114.10
1	O	83	GLU	N-CA-CB	5.72	119.15	110.28
1	A	61	LYS	CA-CB-CG	5.62	125.33	114.10
2	L	300	GLU	CA-CB-CG	5.55	125.19	114.10
2	M	289	MET	CA-CB-CG	5.38	124.85	114.10
2	L	354	LYS	CA-CB-CG	5.20	124.50	114.10
1	D	123	MET	CB-CG-SD	5.12	128.07	112.70
2	M	234	GLU	N-CA-CB	5.10	118.98	110.41

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	2900	0	2872	25	0
1	B	2900	0	2872	19	0
1	C	2900	0	2872	20	0
1	D	2900	0	2872	12	0
1	E	2900	0	2872	11	0
1	O	2818	0	2794	17	0
2	L	1359	0	1379	14	0
2	M	1369	0	1385	13	0
3	A	27	0	12	1	0
3	B	27	0	12	1	0
3	C	27	0	12	1	0
3	D	27	0	12	0	0
3	E	27	0	12	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
4	E	1	0	0	0	0
4	O	1	0	0	0	0
5	O	31	0	12	0	0
All	All	20218	0	19990	120	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 3.

All (120) 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)
2:M:349:THR:O	2:M:353:ASP:HB2	1.94	0.67
1:A:314:GLN:HE22	1:A:328:LYS:HA	1.61	0.65
1:A:149:THR:HG22	1:A:167:GLU:H	1.65	0.62
1:B:317:ILE:HG22	1:B:327:ILE:HD13	1.83	0.61
1:B:149:THR:HG22	1:B:167:GLU:H	1.64	0.61
1:C:14:SER:HB2	1:C:157:ASP:HB3	1.83	0.59
1:O:215:LYS:HG3	1:O:216:LEU:HG	1.86	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:212:ILE:HG23	1:A:216:LEU:HD12	1.86	0.56
1:O:349:LEU:HB2	1:O:352:PHE:HB2	1.87	0.56
1:D:149:THR:HG22	1:D:167:GLU:H	1.69	0.56
2:L:329:LEU:HD12	2:L:352:MET:HG2	1.88	0.55
1:O:102:PRO:HB3	1:O:131:ALA:HB3	1.89	0.55
1:B:48:GLY:HA2	2:M:194:GLY:HA2	1.89	0.54
1:A:253:GLU:HA	1:A:256:ARG:HB2	1.89	0.54
1:O:53:TYR:HB3	1:O:57:GLU:HG3	1.90	0.54
1:A:203:THR:HA	1:A:206:ARG:HG2	1.91	0.53
1:C:106:THR:HB	1:C:137:GLN:HG2	1.90	0.53
1:B:106:THR:HB	1:B:137:GLN:HG2	1.92	0.52
1:D:8:LEU:HD11	1:D:96:VAL:HG11	1.90	0.52
1:C:305:MET:HA	1:C:335:ARG:HH21	1.74	0.52
1:B:107:GLU:HG3	1:B:111:ASN:HD22	1.75	0.51
2:M:218:LEU:HA	2:M:221:ILE:HD12	1.91	0.51
2:L:237:LYS:HD3	2:L:263:MET:HA	1.93	0.51
2:L:338:PRO:HA	2:L:341:ARG:HG2	1.93	0.51
1:A:35:VAL:HG22	1:A:54:VAL:HG22	1.94	0.50
1:A:45:VAL:HG11	2:L:222:GLU:HG2	1.94	0.50
1:O:335:ARG:HA	1:O:338:SER:HB3	1.94	0.50
1:D:220:ALA:HB1	1:D:226:GLU:HG3	1.94	0.50
2:L:234:GLU:HA	2:L:237:LYS:HG2	1.94	0.49
1:C:34:ILE:HD11	1:C:67:LEU:HB3	1.93	0.49
1:C:86:TRP:HH2	1:C:119:MET:HG2	1.77	0.49
1:A:285:CYS:HB3	1:A:289:ILE:HD11	1.93	0.49
1:B:220:ALA:HB1	1:B:226:GLU:HG3	1.94	0.49
1:E:153:LEU:HD22	1:E:299:MET:HE2	1.94	0.49
1:B:182:GLY:HA2	1:B:185:LEU:HD12	1.94	0.49
2:L:320:LYS:HA	2:L:323:LYS:HE2	1.95	0.48
1:D:106:THR:HB	1:D:137:GLN:HG2	1.94	0.48
1:O:32:PRO:HG2	1:O:59:GLN:HE21	1.78	0.48
1:O:185:LEU:HD11	1:O:261:LEU:HD23	1.95	0.48
1:E:203:THR:HG22	1:E:206:ARG:HH21	1.79	0.48
1:A:305:MET:HE1	1:A:335:ARG:HG3	1.96	0.48
1:C:227:MET:HE1	1:C:252:ASN:HD22	1.79	0.48
2:L:244:THR:HG23	2:L:272:ASN:HD22	1.78	0.47
1:A:106:THR:HB	1:A:137:GLN:HG2	1.96	0.47
2:L:331:LEU:HD22	2:L:344:MET:HE2	1.96	0.47
2:L:255:SER:HA	2:L:258:MET:HE2	1.96	0.47
2:M:275:VAL:HG23	2:M:303:PHE:HB3	1.97	0.47
2:M:283:LYS:HA	2:M:286:LEU:HB2	1.96	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:L:289:MET:HG3	2:L:318:ILE:HG13	1.97	0.46
1:A:155:SER:H	1:A:301:GLY:HA3	1.80	0.46
2:L:287:ALA:HA	2:L:290:ARG:HE	1.80	0.46
1:E:76:ILE:HD13	1:E:82:MET:HG2	1.98	0.46
1:C:113:LYS:HG2	1:D:195:GLU:HB2	1.98	0.45
1:E:24:ASP:HB2	1:E:340:TRP:HH2	1.81	0.45
2:M:195:ASN:HD22	2:M:217:ASN:HD21	1.64	0.45
1:A:153:LEU:HD23	1:A:299:MET:HE1	1.98	0.45
1:A:375:PHE:HB2	1:C:43:VAL:HG12	1.98	0.45
1:E:285:CYS:HB3	1:E:289:ILE:HD11	1.97	0.45
1:B:190:MET:HE1	1:B:206:ARG:HA	1.97	0.45
1:O:18:LYS:HG3	1:O:30:VAL:HG22	1.98	0.45
1:C:220:ALA:HB1	1:C:226:GLU:HG3	1.98	0.45
1:C:299:MET:HE2	1:C:304:THR:HB	1.99	0.45
1:E:317:ILE:HG22	1:E:327:ILE:HG12	1.99	0.45
2:M:318:ILE:O	2:M:322:LEU:HB2	2.16	0.45
1:A:17:VAL:HG23	1:A:33:SER:HB2	1.98	0.45
2:M:228:THR:HA	2:M:231:ARG:HG2	1.99	0.45
1:B:17:VAL:HG23	1:B:33:SER:HB2	1.98	0.44
1:A:112:PRO:HB3	1:B:195:GLU:HA	2.00	0.44
1:B:50:LYS:HA	2:M:195:ASN:HD21	1.83	0.44
1:A:214:GLU:HG2	3:A:401:ADP:C5	2.52	0.44
1:C:35:VAL:HG22	1:C:54:VAL:HG12	2.00	0.44
1:B:131:ALA:HB1	1:B:356:TRP:HB3	1.99	0.44
1:C:189:LEU:HD13	1:C:257:CYS:HB2	2.00	0.44
2:M:344:MET:HA	2:M:347:ILE:HG12	2.00	0.44
1:B:196:ARG:HA	2:L:342:MET:HE3	1.99	0.43
1:D:317:ILE:HG22	1:D:327:ILE:HG12	2.00	0.43
1:O:188:TYR:HB2	1:O:267:ILE:HD11	2.00	0.43
1:O:299:MET:HE1	1:O:309:ILE:HG23	2.00	0.43
1:A:24:ASP:HB2	1:A:340:TRP:HH2	1.83	0.43
1:B:244:ASP:HB3	1:O:287:ILE:HG13	2.01	0.43
1:O:291:LYS:HG3	1:O:325:MET:HG3	2.00	0.43
1:E:220:ALA:HB1	1:E:226:GLU:HG3	2.00	0.43
1:O:24:ASP:HB2	1:O:340:TRP:HH2	1.83	0.43
1:B:375:PHE:HB2	1:D:43:VAL:HG12	2.01	0.43
1:C:300:SER:HA	1:C:335:ARG:HB2	2.01	0.43
1:D:86:TRP:HA	1:D:89:THR:HG22	2.01	0.43
1:A:86:TRP:HA	1:A:89:THR:HG22	2.02	0.42
2:M:236:LEU:HD13	2:M:263:MET:HE2	1.99	0.42
1:O:369:ILE:HA	1:O:372:ARG:HB2	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:189:LEU:HD13	1:A:257:CYS:HB2	2.00	0.42
1:O:189:LEU:HD23	1:O:192:ILE:HD11	2.01	0.42
1:B:40:HIS:CE1	2:M:307:ARG:HB2	2.55	0.42
2:M:319:VAL:HG11	2:M:340:PRO:HA	2.02	0.42
1:D:17:VAL:HG23	1:D:33:SER:HB2	2.02	0.42
1:C:214:GLU:HG2	3:C:401:ADP:C4	2.55	0.41
1:O:259:GLU:HA	1:O:262:PHE:HD2	1.84	0.41
1:C:138:ALA:HB1	1:C:152:VAL:HB	2.02	0.41
1:D:139:VAL:HG22	1:D:165:ILE:HD11	2.03	0.41
1:O:163:VAL:HG22	1:O:175:ILE:HG12	2.03	0.41
1:E:97:ALA:HA	1:E:98:PRO:HD3	1.94	0.41
1:A:147:ARG:HH12	1:A:330:ILE:HG21	1.85	0.41
1:A:189:LEU:HA	1:A:192:ILE:HG12	2.02	0.41
1:C:17:VAL:HG23	1:C:33:SER:HB2	2.01	0.41
1:E:131:ALA:HB1	1:E:356:TRP:HB3	2.02	0.41
1:A:82:MET:HE2	1:A:82:MET:HB2	1.80	0.41
2:L:263:MET:HE1	2:L:270:ILE:HG21	2.02	0.41
1:E:142:LEU:HD12	1:E:142:LEU:HA	1.93	0.41
1:C:140:LEU:HA	1:C:143:TYR:HD2	1.86	0.41
1:D:332:PRO:HA	1:D:333:PRO:HD3	1.98	0.41
1:B:214:GLU:HG2	3:B:401:ADP:C4	2.56	0.41
1:B:259:GLU:HA	1:B:262:PHE:HD2	1.86	0.41
1:A:168:GLY:HA2	1:C:44:MET:HG3	2.02	0.40
2:L:203:LEU:HA	2:L:206:ILE:HG22	2.03	0.40
1:A:123:MET:HG3	1:A:132:MET:HG3	2.04	0.40
1:A:116:ARG:O	1:A:120:THR:HG23	2.21	0.40
1:B:89:THR:HA	1:B:93:GLU:HB2	2.03	0.40
1:E:275:HIS:HA	1:E:313:MET:HE1	2.03	0.40
1:C:153:LEU:HD12	1:C:162:ASN:HD21	1.86	0.40
1:D:176:MET:HE2	1:D:176:MET:HB3	1.91	0.40
1:C:24:ASP:HB2	1:C:340:TRP:HH2	1.86	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	368/375 (98%)	352 (96%)	15 (4%)	1 (0%)	36	65
1	B	368/375 (98%)	350 (95%)	17 (5%)	1 (0%)	36	65
1	C	368/375 (98%)	357 (97%)	11 (3%)	0	100	100
1	D	368/375 (98%)	355 (96%)	13 (4%)	0	100	100
1	E	368/375 (98%)	356 (97%)	12 (3%)	0	100	100
1	O	355/375 (95%)	350 (99%)	5 (1%)	0	100	100
2	L	170/556 (31%)	160 (94%)	10 (6%)	0	100	100
2	M	171/556 (31%)	156 (91%)	15 (9%)	0	100	100
All	All	2536/3362 (75%)	2436 (96%)	98 (4%)	2 (0%)	49	79

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	43	VAL
1	B	43	VAL

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	313/317 (99%)	313 (100%)	0	100	100
1	B	313/317 (99%)	313 (100%)	0	100	100
1	C	313/317 (99%)	313 (100%)	0	100	100
1	D	313/317 (99%)	313 (100%)	0	100	100
1	E	313/317 (99%)	313 (100%)	0	100	100
1	O	305/317 (96%)	305 (100%)	0	100	100
2	L	155/506 (31%)	155 (100%)	0	100	100
2	M	156/506 (31%)	156 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
All	All	2181/2914 (75%)	2181 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (31) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	40	HIS
1	A	41	GLN
1	A	161	HIS
1	A	173	HIS
1	A	314	GLN
1	B	88	HIS
1	B	371	HIS
1	C	162	ASN
1	C	296	ASN
1	C	297	ASN
1	D	40	HIS
1	D	41	GLN
1	D	115	ASN
1	D	297	ASN
1	E	40	HIS
1	E	115	ASN
1	E	297	ASN
2	L	239	ASN
2	L	249	ASN
2	L	269	HIS
2	L	304	HIS
2	L	334	HIS
2	L	357	GLN
2	M	195	ASN
2	M	209	ASN
2	M	220	ASN
2	M	294	HIS
2	M	355	GLN
2	M	357	GLN
1	O	59	GLN
1	O	252	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

6 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
1	HIC	B	73	1	10,11,12	0.47	0	9,14,16	0.63	0
1	HIC	E	73	1	10,11,12	0.46	0	9,14,16	0.57	0
1	HIC	C	73	1	10,11,12	0.46	0	9,14,16	0.63	0
1	HIC	D	73	1	10,11,12	0.46	0	9,14,16	0.85	0
1	HIC	O	73	1	10,11,12	0.46	0	9,14,16	0.54	0
1	HIC	A	73	1	10,11,12	0.45	0	9,14,16	0.69	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	HIC	B	73	1	-	3/5/6/8	0/1/1/1
1	HIC	E	73	1	-	2/5/6/8	0/1/1/1
1	HIC	C	73	1	-	0/5/6/8	0/1/1/1
1	HIC	D	73	1	-	1/5/6/8	0/1/1/1
1	HIC	O	73	1	-	1/5/6/8	0/1/1/1
1	HIC	A	73	1	-	1/5/6/8	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	73	HIC	N-CA-CB-CG
1	B	73	HIC	CA-CB-CG-ND1
1	E	73	HIC	CA-CB-CG-ND1
1	B	73	HIC	N-CA-CB-CG
1	O	73	HIC	N-CA-CB-CG
1	D	73	HIC	N-CA-CB-CG
1	B	73	HIC	CA-CB-CG-CD2
1	E	73	HIC	CA-CB-CG-CD2

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 6 are monoatomic - leaving 6 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	$\# Z > 2$
3	ADP	C	401	4	28,29,29	1.39	4 (14%)	43,45,45	1.82	10 (23%)
3	ADP	D	401	4	28,29,29	1.39	5 (17%)	43,45,45	1.82	9 (20%)
5	ATP	O	401	4	32,33,33	0.32	0	48,52,52	0.38	0
3	ADP	A	401	4	28,29,29	1.38	4 (14%)	43,45,45	1.84	9 (20%)
3	ADP	B	401	4	28,29,29	1.41	4 (14%)	43,45,45	1.84	9 (20%)
3	ADP	E	401	4	28,29,29	1.39	4 (14%)	43,45,45	1.80	8 (18%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	ADP	C	401	4	-	1/16/32/32	0/3/3/3
3	ADP	D	401	4	-	3/16/32/32	0/3/3/3
5	ATP	O	401	4	-	1/22/38/38	0/3/3/3
3	ADP	A	401	4	-	1/16/32/32	0/3/3/3
3	ADP	B	401	4	-	4/16/32/32	0/3/3/3
3	ADP	E	401	4	-	4/16/32/32	0/3/3/3

All (21) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	401	ADP	C5-C4	4.77	1.47	1.39
3	E	401	ADP	C5-C4	4.63	1.47	1.39
3	C	401	ADP	C5-C4	4.61	1.47	1.39
3	A	401	ADP	C5-C4	4.60	1.47	1.39
3	D	401	ADP	C5-C4	4.59	1.47	1.39
3	C	401	ADP	C5-C6	2.71	1.48	1.41
3	B	401	ADP	C5-C6	2.67	1.48	1.41
3	D	401	ADP	C5-C6	2.66	1.48	1.41
3	E	401	ADP	C5-C6	2.65	1.48	1.41
3	A	401	ADP	C5-C6	2.61	1.48	1.41
3	E	401	ADP	C5-N7	-2.42	1.34	1.39
3	A	401	ADP	C5-N7	-2.40	1.34	1.39
3	D	401	ADP	C5-N7	-2.39	1.34	1.39
3	C	401	ADP	C8-N7	2.37	1.36	1.31
3	B	401	ADP	C8-N7	2.31	1.36	1.31
3	C	401	ADP	C5-N7	-2.30	1.34	1.39
3	B	401	ADP	C5-N7	-2.29	1.34	1.39
3	D	401	ADP	C8-N7	2.24	1.36	1.31
3	E	401	ADP	C8-N7	2.24	1.36	1.31
3	A	401	ADP	C8-N7	2.20	1.35	1.31
3	D	401	ADP	C4-N9	-2.02	1.33	1.37

All (45) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	401	ADP	C5-C4-N3	-5.86	118.65	126.72
3	D	401	ADP	C5-C4-N3	-5.79	118.74	126.72
3	E	401	ADP	C5-C4-N3	-5.77	118.77	126.72
3	C	401	ADP	C5-C4-N3	-5.76	118.78	126.72
3	A	401	ADP	C5-C4-N3	-5.75	118.80	126.72
3	A	401	ADP	N3-C4-N9	4.69	135.15	127.17
3	B	401	ADP	N3-C4-N9	4.63	135.04	127.17

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	E	401	ADP	N3-C4-N9	4.55	134.90	127.17
3	D	401	ADP	N3-C4-N9	4.52	134.85	127.17
3	C	401	ADP	N3-C4-N9	4.50	134.83	127.17
3	B	401	ADP	C2-N3-C4	3.76	121.01	111.83
3	A	401	ADP	C2-N3-C4	3.74	120.97	111.83
3	C	401	ADP	C2-N3-C4	3.70	120.88	111.83
3	E	401	ADP	C2-N3-C4	3.63	120.70	111.83
3	D	401	ADP	C2-N3-C4	3.63	120.69	111.83
3	D	401	ADP	C4-C5-N7	-3.52	106.56	110.58
3	B	401	ADP	C4-C5-N7	-3.46	106.62	110.58
3	C	401	ADP	C4-C5-N7	-3.41	106.68	110.58
3	A	401	ADP	N3-C2-N1	-3.40	123.44	128.58
3	B	401	ADP	N3-C2-N1	-3.35	123.52	128.58
3	E	401	ADP	C4-C5-N7	-3.33	106.78	110.58
3	C	401	ADP	N3-C2-N1	-3.24	123.68	128.58
3	A	401	ADP	C4-C5-N7	-3.19	106.94	110.58
3	E	401	ADP	N3-C2-N1	-3.11	123.87	128.58
3	D	401	ADP	N3-C2-N1	-3.05	123.97	128.58
3	A	401	ADP	C4-N9-C8	2.72	108.59	105.74
3	B	401	ADP	C4-N9-C8	2.60	108.47	105.74
3	D	401	ADP	C4-N9-C8	2.58	108.45	105.74
3	C	401	ADP	C4-N9-C8	2.55	108.42	105.74
3	D	401	ADP	C5-N7-C8	2.51	107.39	103.45
3	D	401	ADP	C3'-C2'-C1'	2.51	106.20	101.46
3	B	401	ADP	C5-N7-C8	2.51	107.39	103.45
3	C	401	ADP	C5-N7-C8	2.45	107.30	103.45
3	E	401	ADP	C4-N9-C8	2.45	108.31	105.74
3	E	401	ADP	C3'-C2'-C1'	2.41	106.03	101.46
3	A	401	ADP	C5-N7-C8	2.40	107.22	103.45
3	E	401	ADP	C5-N7-C8	2.38	107.19	103.45
3	A	401	ADP	C3'-C2'-C1'	2.32	105.85	101.46
3	B	401	ADP	C3'-C2'-C1'	2.30	105.82	101.46
3	C	401	ADP	C3'-C2'-C1'	2.30	105.82	101.46
3	D	401	ADP	C6-C5-N7	2.16	136.26	132.09
3	B	401	ADP	C6-C5-N7	2.11	136.17	132.09
3	C	401	ADP	C6-C5-N7	2.10	136.15	132.09
3	C	401	ADP	O2A-PA-O1A	2.02	121.85	112.44
3	A	401	ADP	O2A-PA-O1A	2.01	121.81	112.44

There are no chirality outliers.

All (14) torsion outliers are listed below:

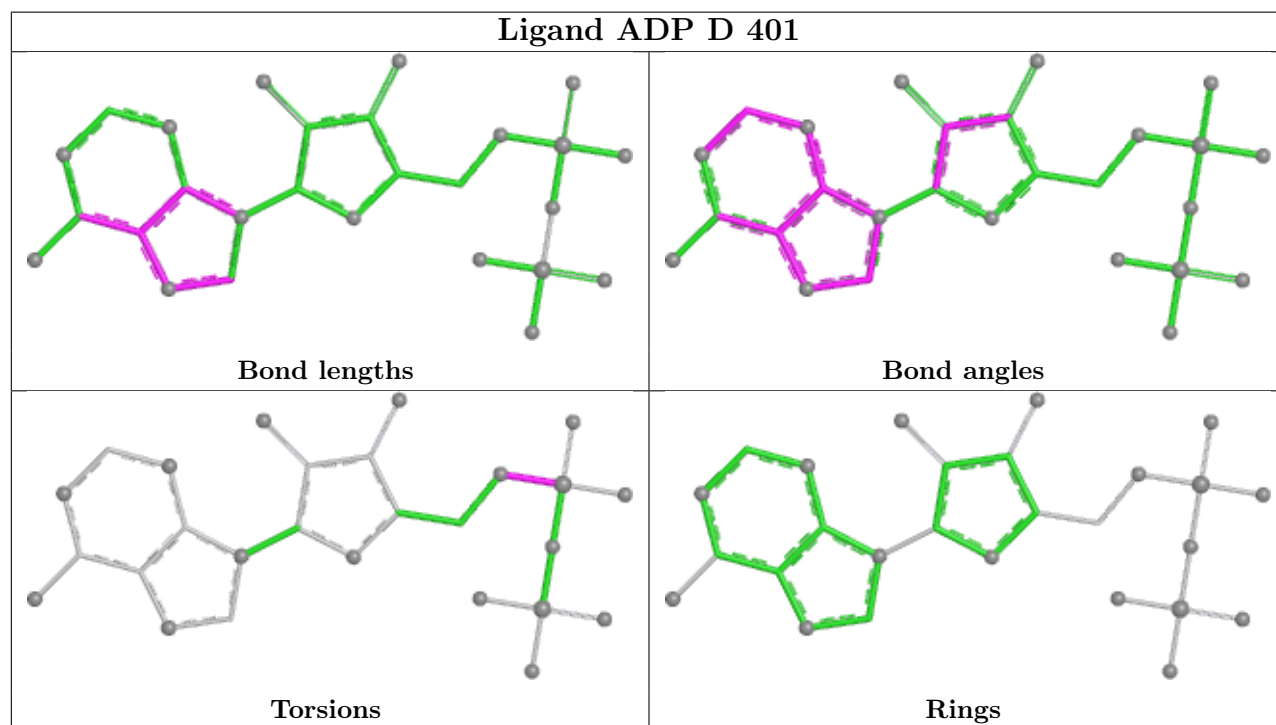
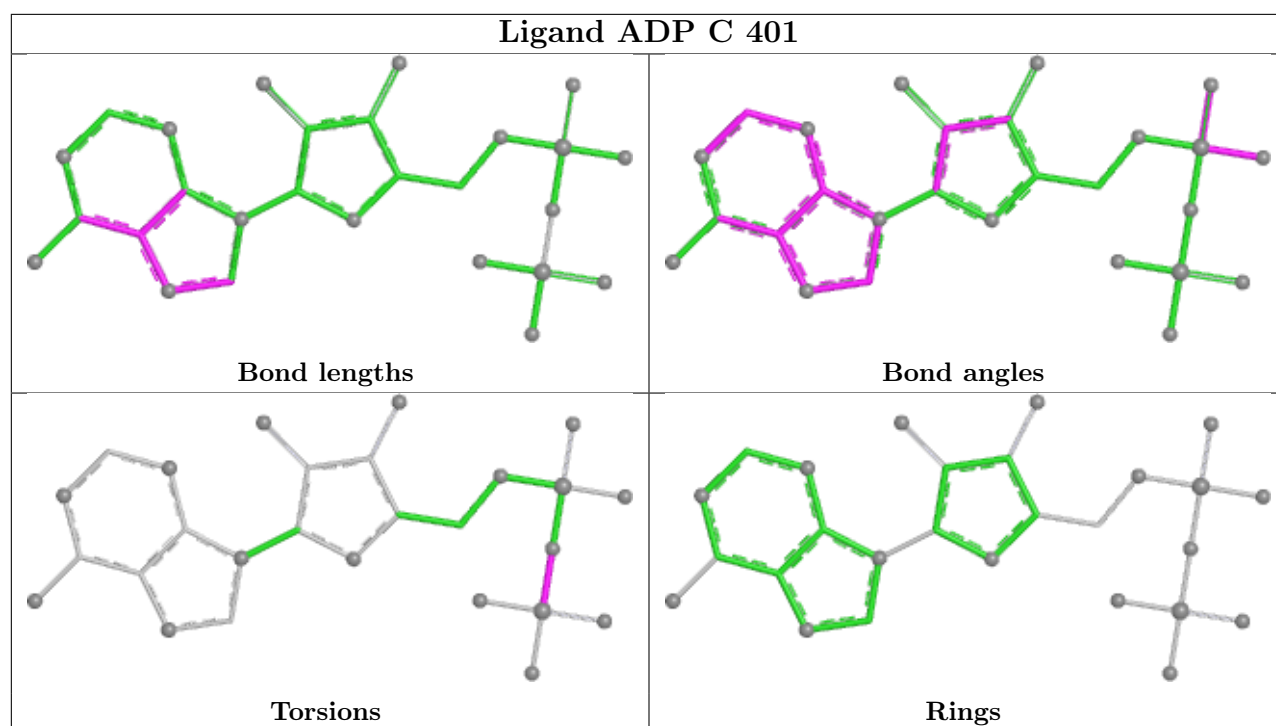
Mol	Chain	Res	Type	Atoms
3	A	401	ADP	C5'-O5'-PA-O2A
3	B	401	ADP	C5'-O5'-PA-O1A
3	B	401	ADP	C5'-O5'-PA-O2A
3	B	401	ADP	C5'-O5'-PA-O3A
3	D	401	ADP	C5'-O5'-PA-O1A
3	D	401	ADP	C5'-O5'-PA-O2A
3	D	401	ADP	C5'-O5'-PA-O3A
3	E	401	ADP	C5'-O5'-PA-O1A
3	E	401	ADP	C5'-O5'-PA-O2A
3	E	401	ADP	C5'-O5'-PA-O3A
5	O	401	ATP	PG-O3B-PB-O2B
3	C	401	ADP	PA-O3A-PB-O3B
3	B	401	ADP	C3'-C4'-C5'-O5'
3	E	401	ADP	C3'-C4'-C5'-O5'

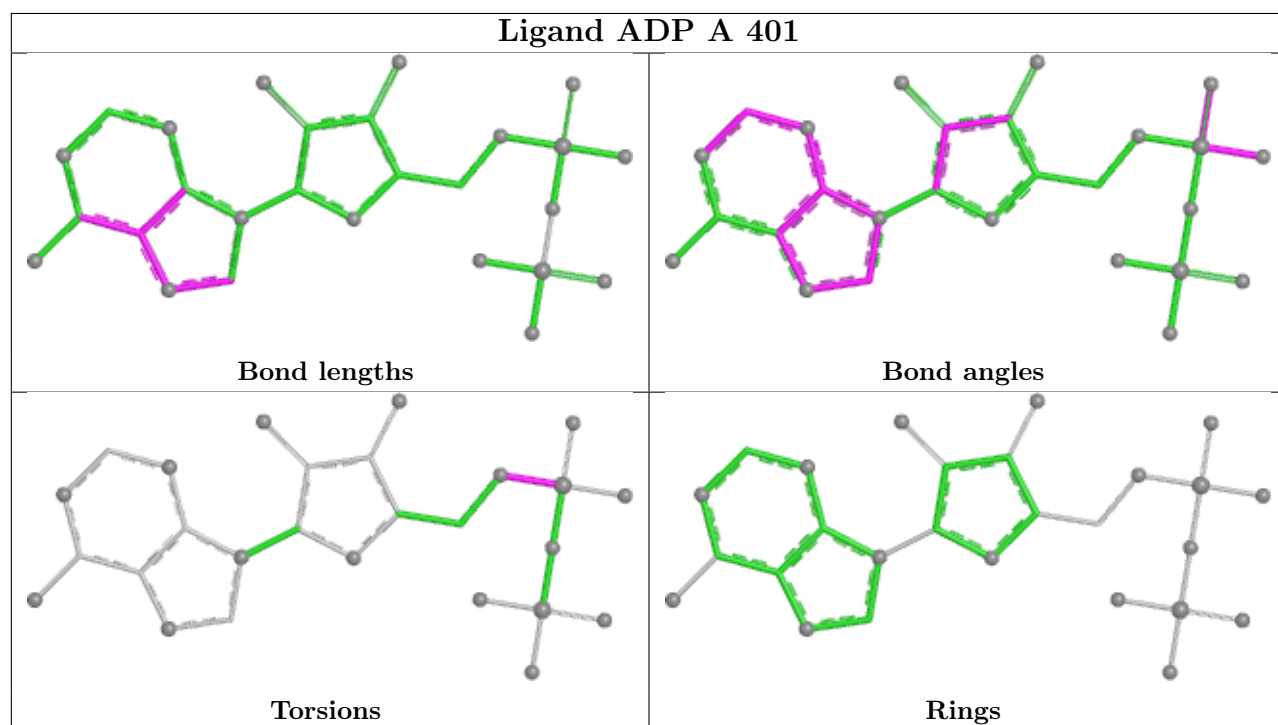
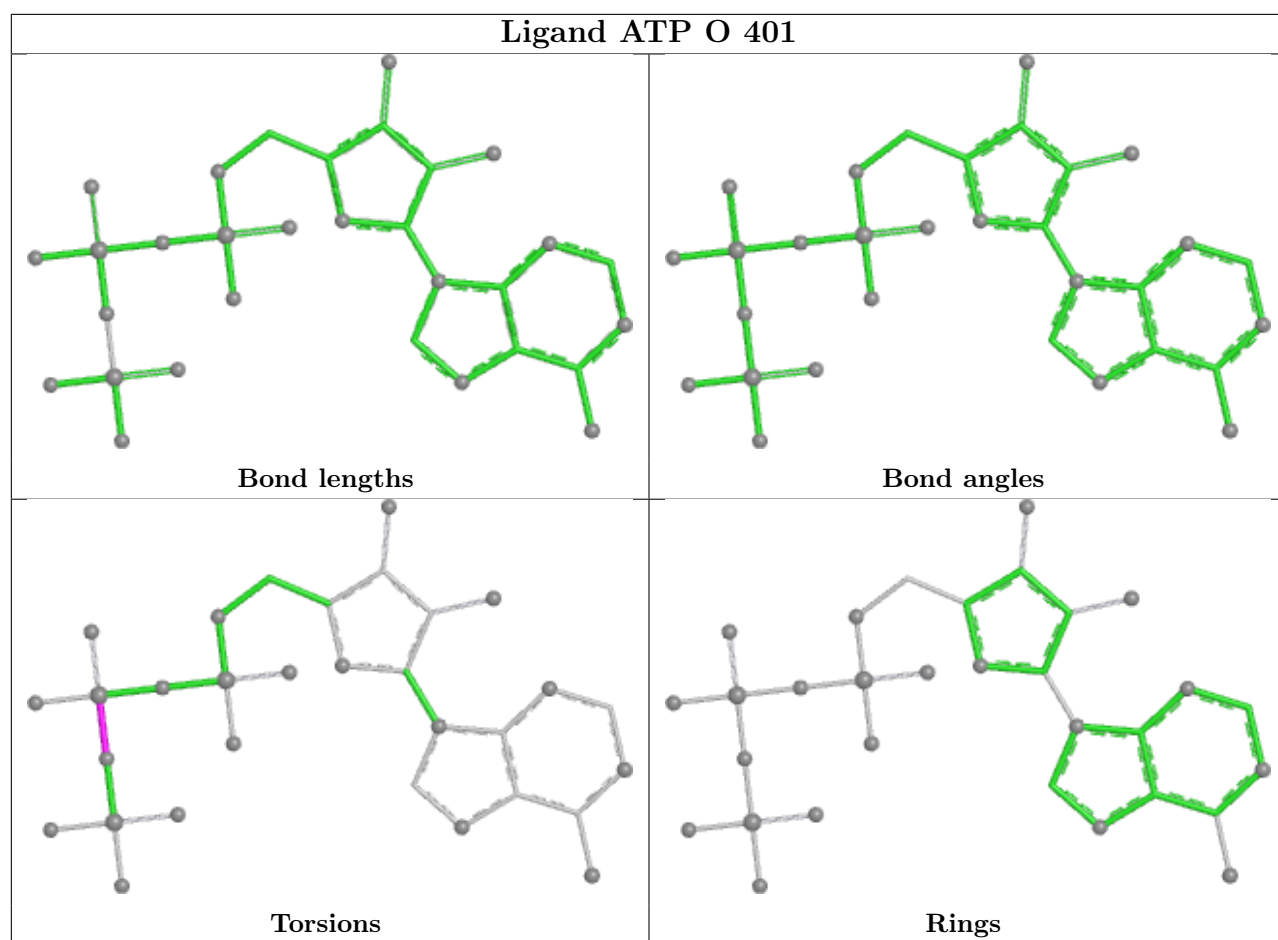
There are no ring outliers.

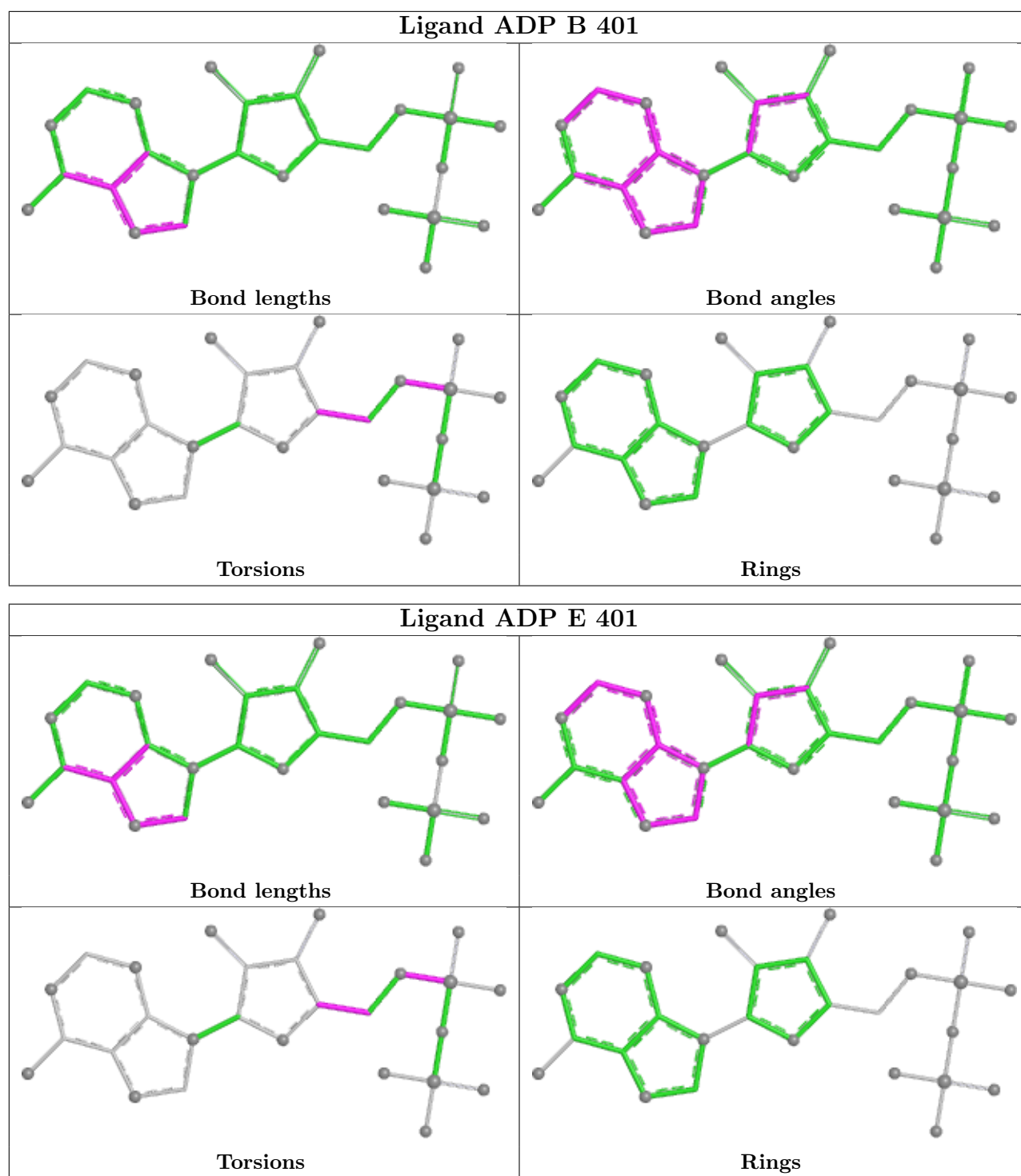
3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	401	ADP	1	0
3	A	401	ADP	1	0
3	B	401	ADP	1	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 ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

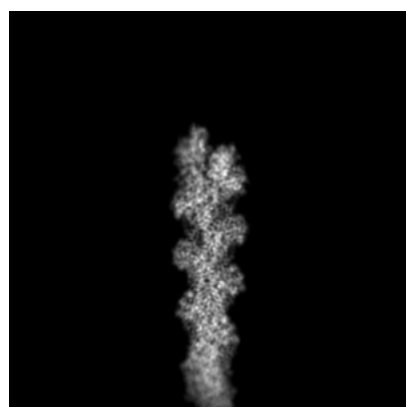
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-75010. These allow visual inspection of the internal detail of the map and identification of artifacts.

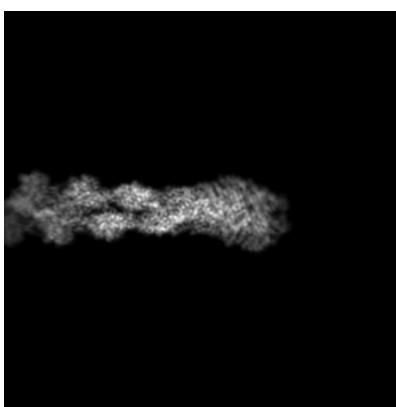
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

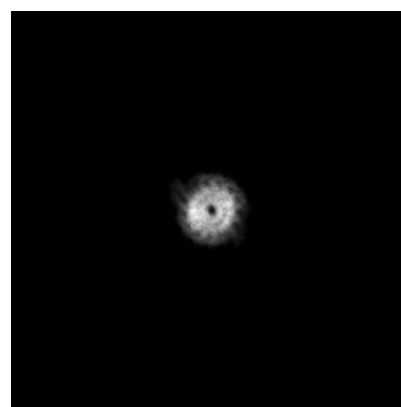
6.1.1 Primary map



X



Y

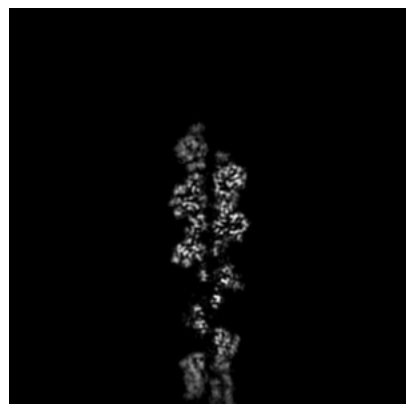


Z

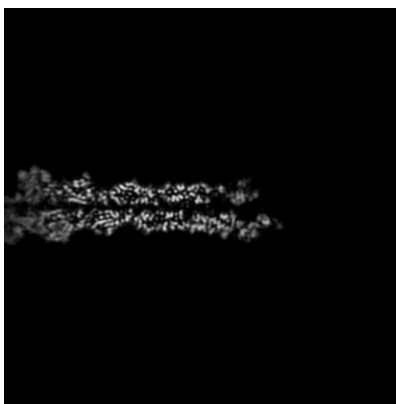
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

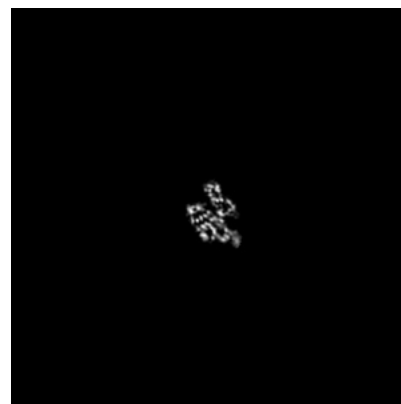
6.2.1 Primary map



X Index: 208



Y Index: 208

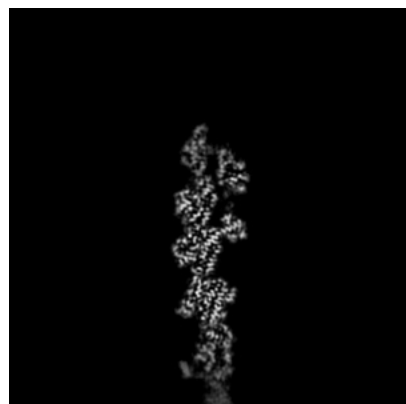


Z Index: 208

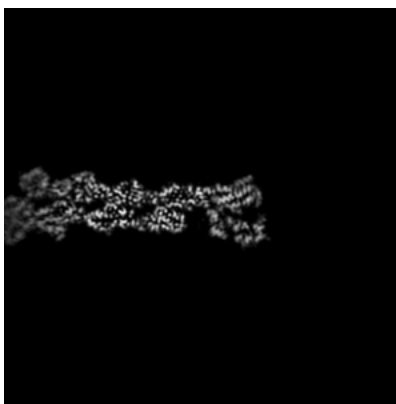
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

6.3.1 Primary map



X Index: 200



Y Index: 214

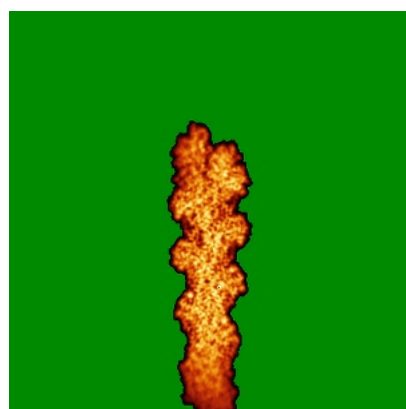


Z Index: 238

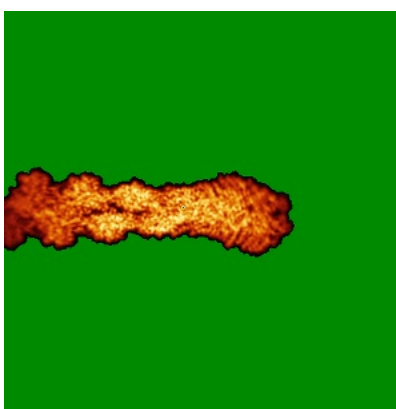
The images above show the largest variance slices of the map in three orthogonal directions.

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

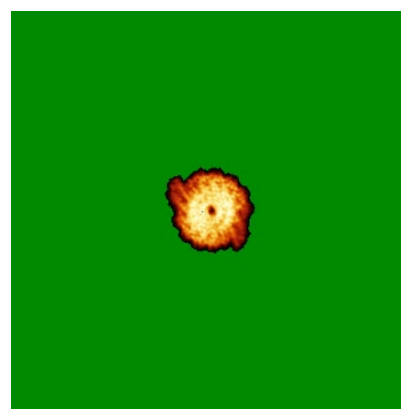
6.4.1 Primary map



X



Y

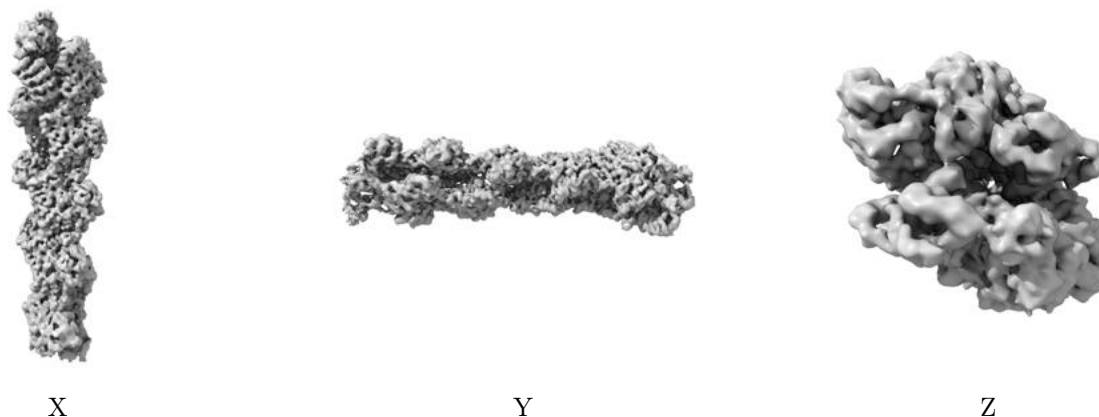


Z

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 0.127. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

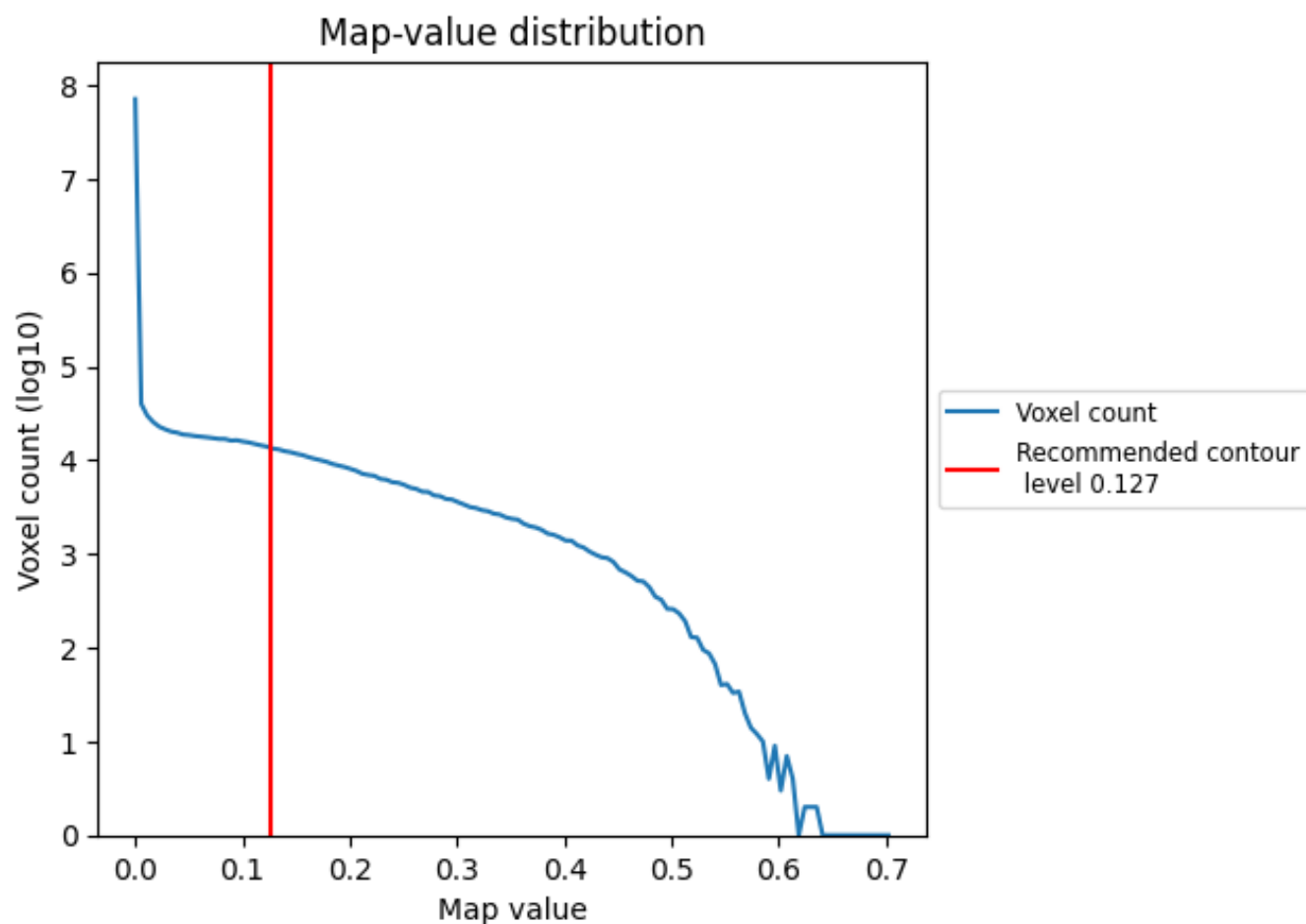
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

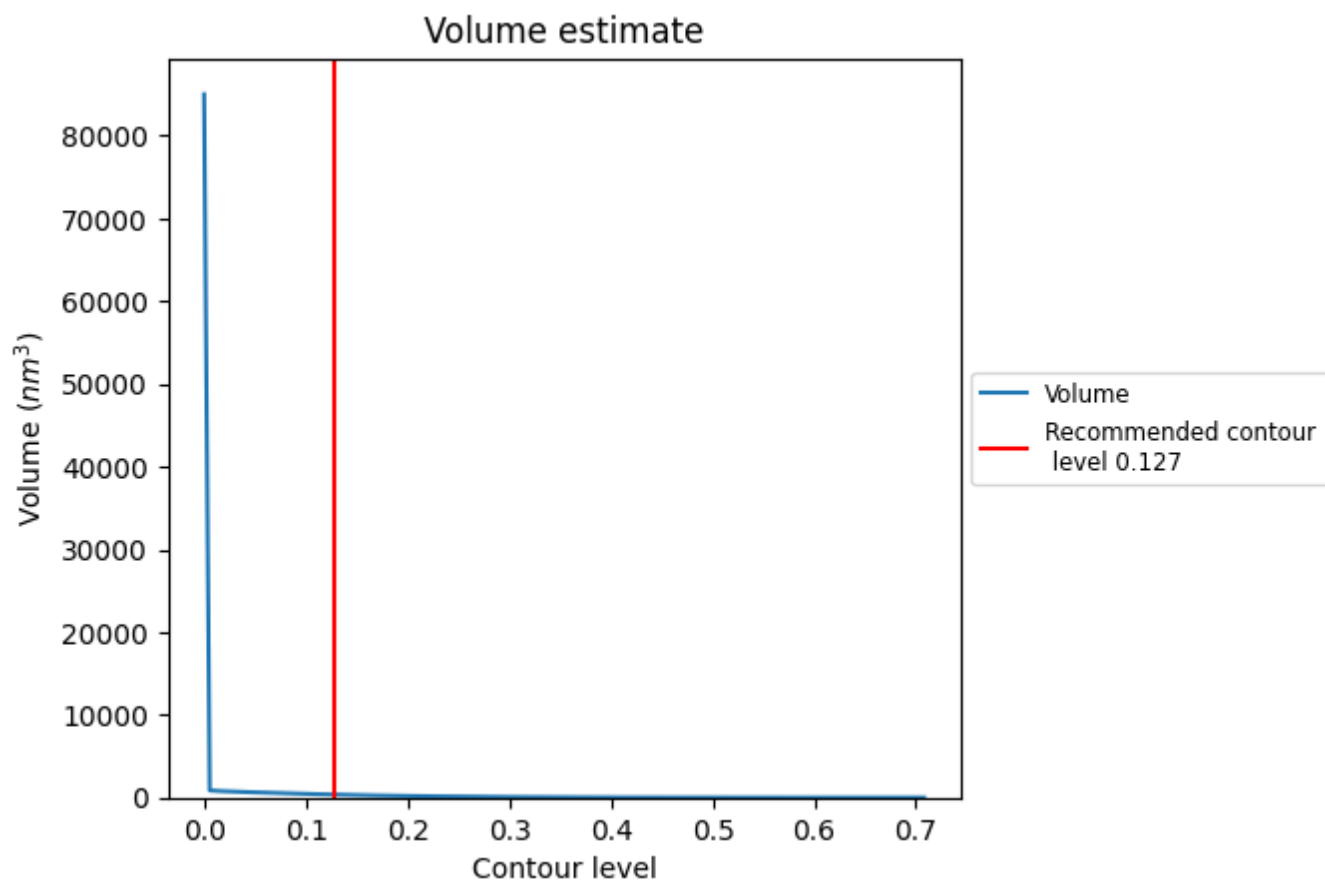
This section contains the results of statistical analysis of the map.

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.

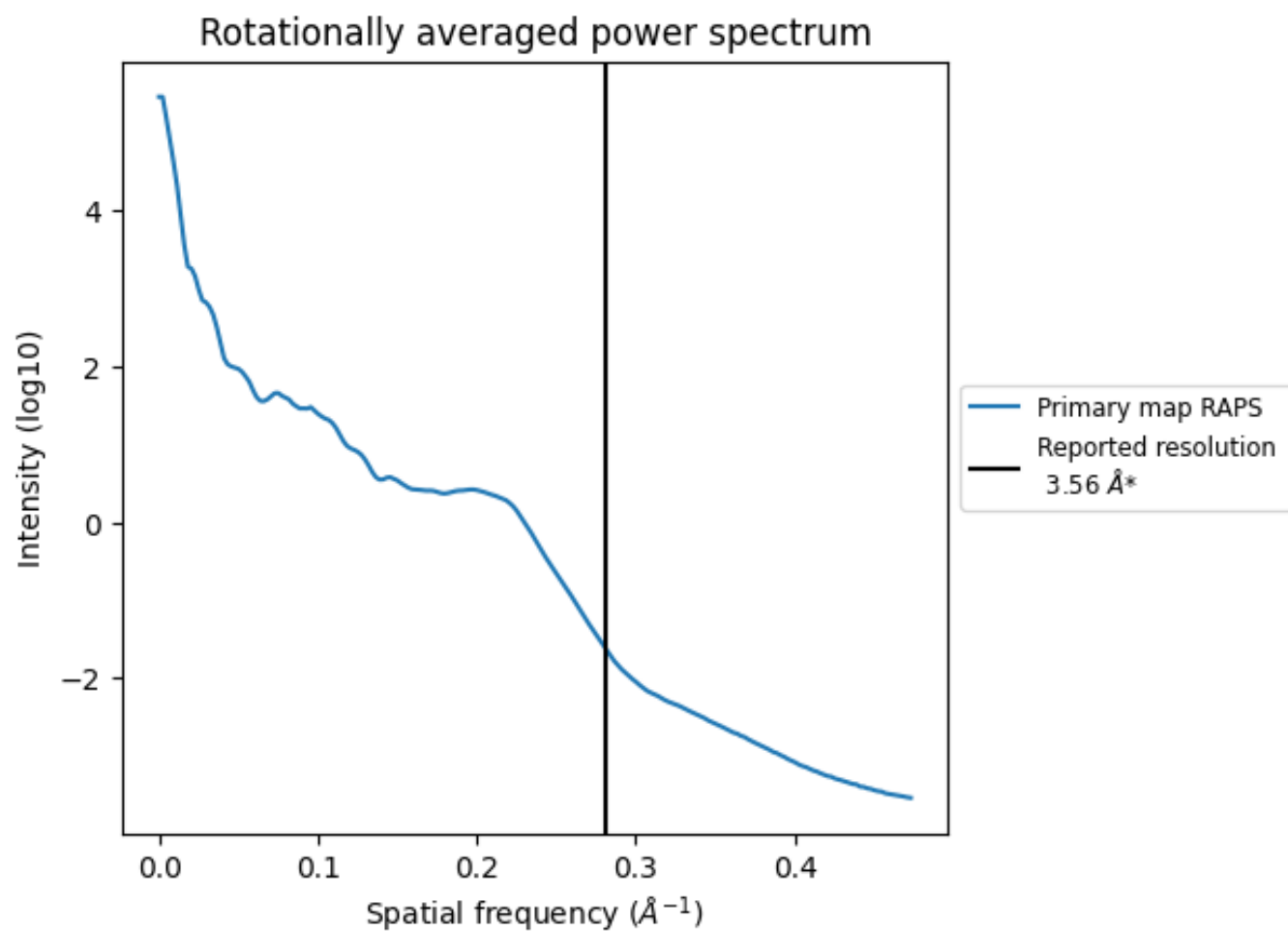
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 361 nm³; this corresponds to an approximate mass of 326 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 0.281 Å⁻¹

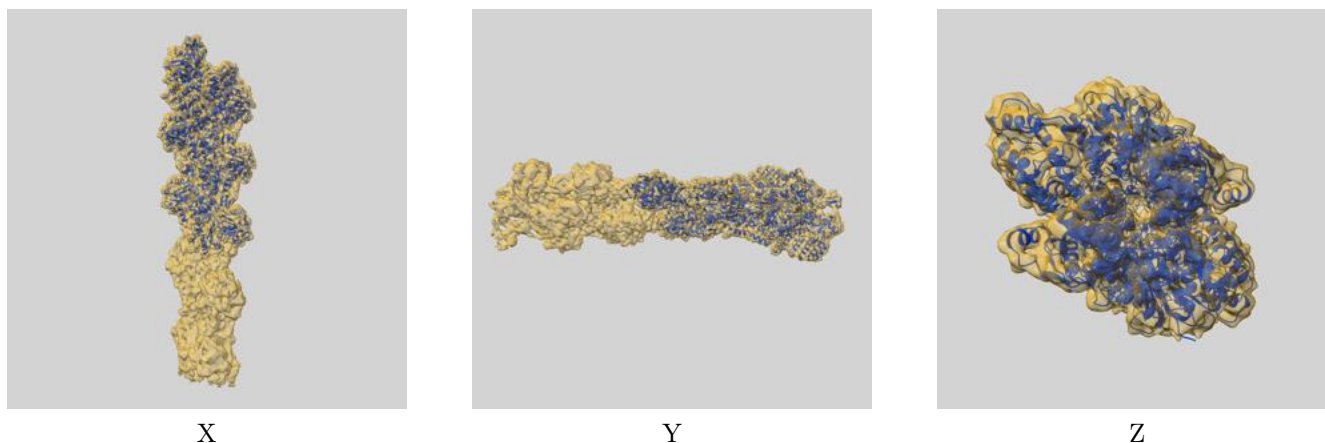
8 Fourier-Shell correlation

This section was not generated. No FSC curve or half-maps provided.

9 Map-model fit [i](#)

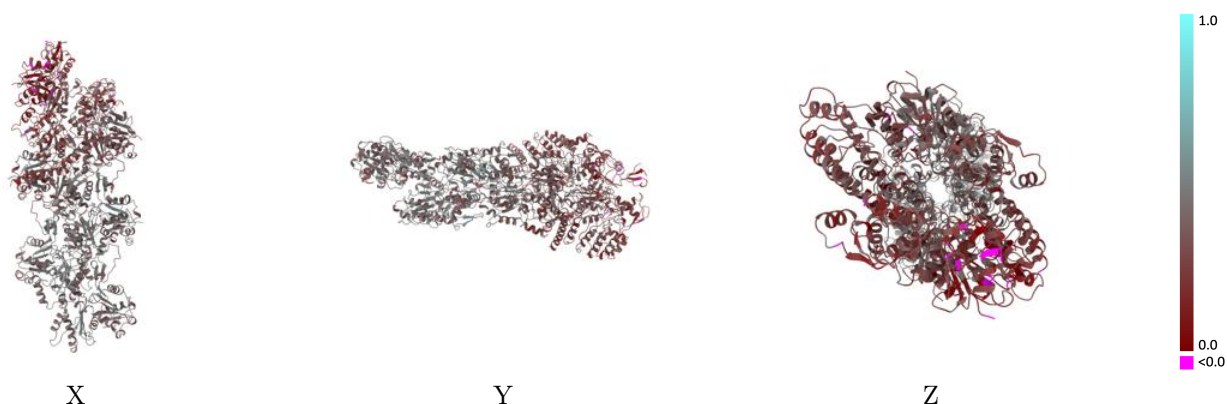
This section contains information regarding the fit between EMDB map EMD-75010 and PDB model 9ZZM. Per-residue inclusion information can be found in section [3](#) on page [7](#).

9.1 Map-model overlay [i](#)



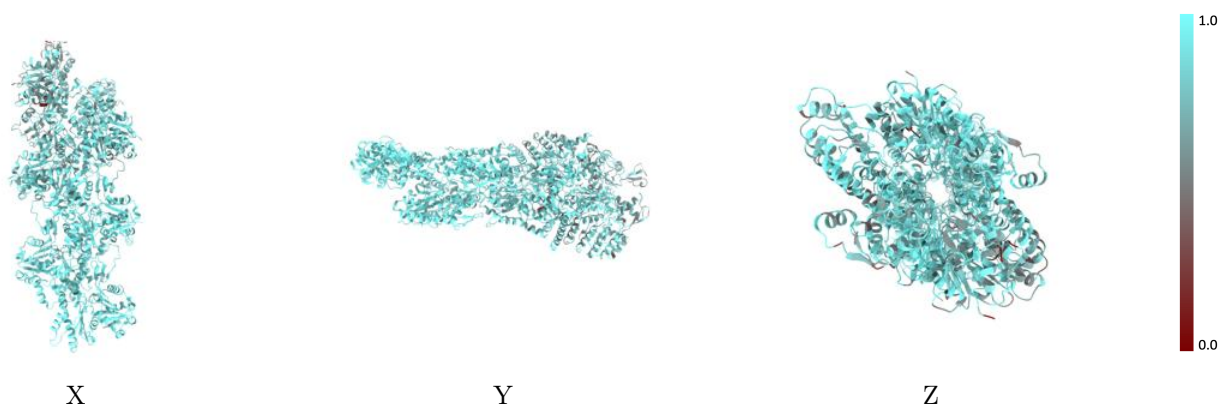
The images above show the 3D surface view of the map at the recommended contour level 0.127 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



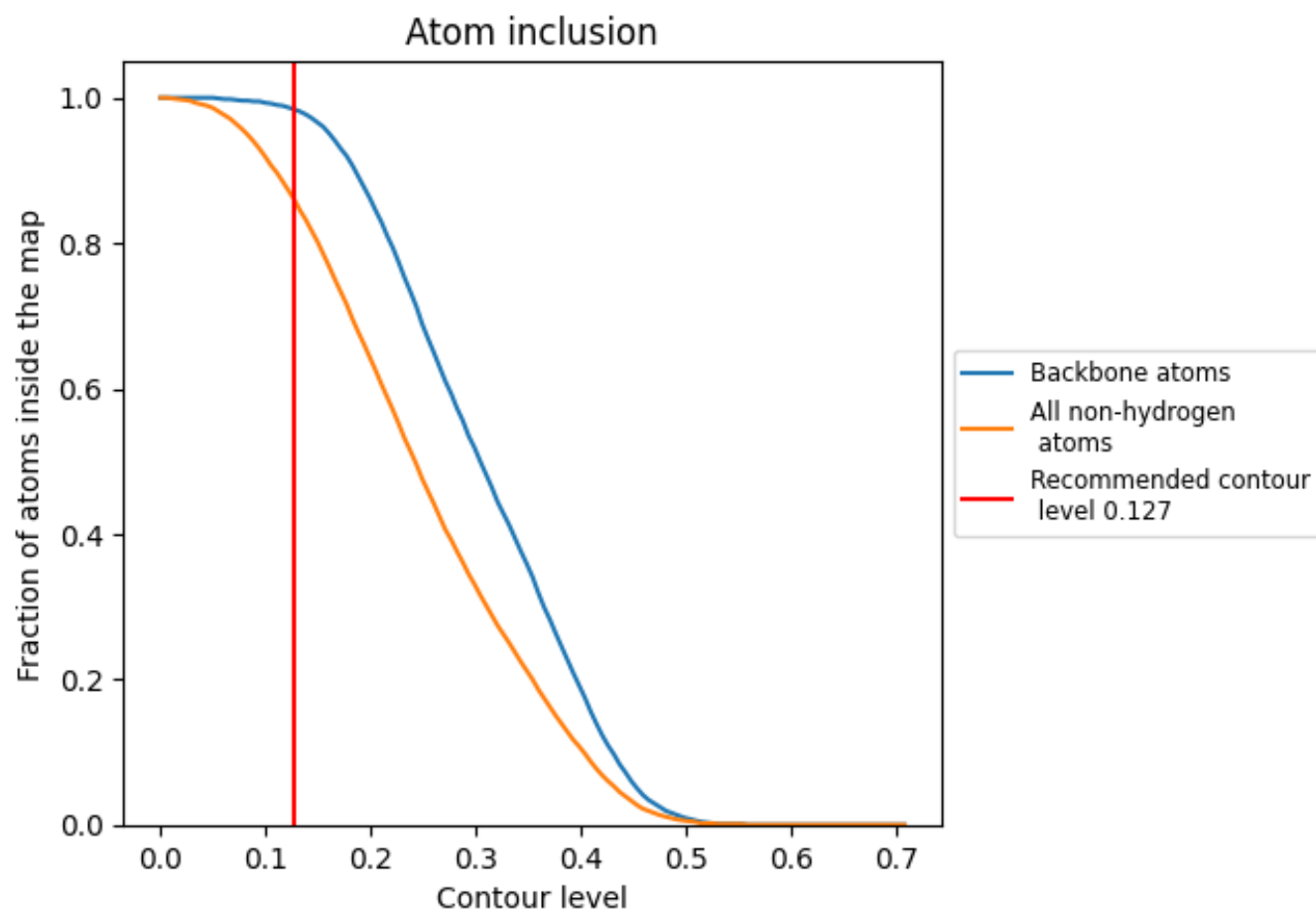
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.127).

9.4 Atom inclusion [i](#)



At the recommended contour level, 98% of all backbone atoms, 86% 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 (0.127) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div><div></div></div> 0.8600	<div><div></div></div> 0.3630
A	<div><div></div></div> 0.8410	<div><div></div></div> 0.3310
B	<div><div></div></div> 0.8800	<div><div></div></div> 0.3630
C	<div><div></div></div> 0.9200	<div><div></div></div> 0.4350
D	<div><div></div></div> 0.9340	<div><div></div></div> 0.4440
E	<div><div></div></div> 0.9200	<div><div></div></div> 0.4340
L	<div><div></div></div> 0.7870	<div><div></div></div> 0.2940
M	<div><div></div></div> 0.7510	<div><div></div></div> 0.2950
O	<div><div></div></div> 0.7500	<div><div></div></div> 0.2310

1.0

0.0

<0.0