



wwPDB EM Validation Summary Report ⓘ

Jan 20, 2026 – 02:38 PM EST

PDB ID : 9YNG / pdb_00009yng
EMDB ID : EMD-73178
Title : Dynactin and dynein-1 tail region of dynein-dynactin complex on microtubule in the presence of LIS1
Authors : Yang, J.; Rao, Q.; Chai, P.; Zhang, K.
Deposited on : 2025-10-10
Resolution : 4.07 Å(reported)

This is a wwPDB EM Validation Summary 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.dev129
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.47

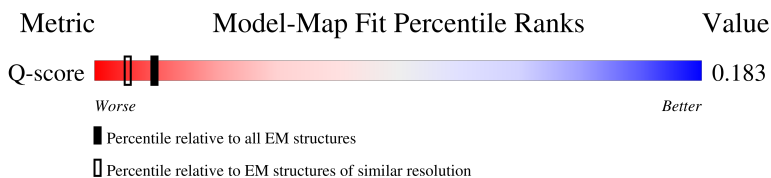
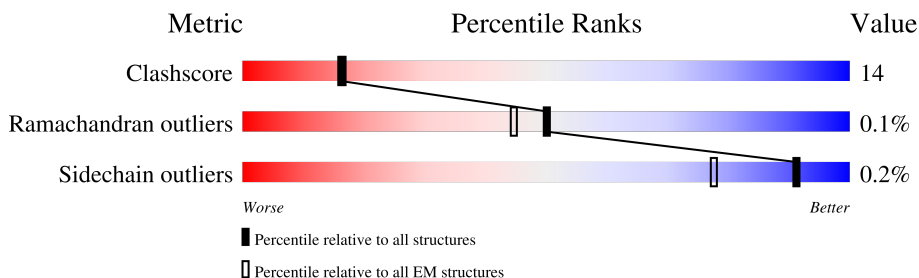
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 4.07 Å.

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



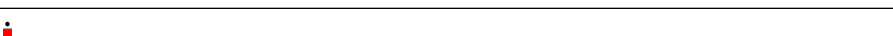
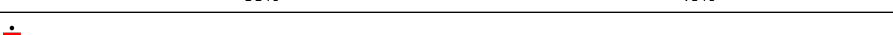
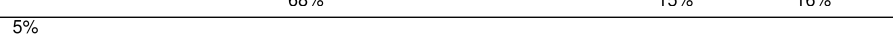
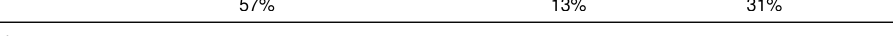
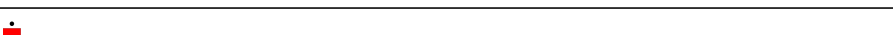
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
Q-score	-	25397	6427 (3.58 - 4.57)

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	376	 68% 31% .
1	B	376	 63% 35% .
1	C	376	 70% 30%
1	D	376	 68% 30% .

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
1	E	376	
1	F	376	
1	G	376	
1	I	376	
2	H	375	
3	J	417	
4	K	286	
5	L	272	
6	M	405	
6	N	405	
6	P	405	
6	Q	405	
7	O	186	
7	R	186	
8	U	190	
9	V	182	
10	W	1281	
10	Z	1281	
11	Y	467	
12	e	4646	
12	f	4646	
12	m	4646	
12	n	4646	
13	g	638	
13	h	638	

Continued on next page...

Mol	Chain	Length	Quality of chain
13	o	638	
13	p	638	

2 Entry composition

There are 16 unique types of molecules in this entry. The entry contains 83396 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 Alpha-centractin.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	370	Total	C	N	O	S	0	0
			2944	1886	509	539	10		
1	B	370	Total	C	N	O	S	0	0
			2956	1892	509	545	10		
1	C	375	Total	C	N	O	S	0	0
			2998	1918	514	556	10		
1	D	370	Total	C	N	O	S	0	0
			2956	1892	509	545	10		
1	E	370	Total	C	N	O	S	0	0
			2956	1892	509	545	10		
1	F	370	Total	C	N	O	S	0	0
			2956	1892	509	545	10		
1	G	370	Total	C	N	O	S	0	0
			2956	1892	509	545	10		
1	I	370	Total	C	N	O	S	0	0
			2941	1885	509	537	10		

- Molecule 2 is a protein called Actin, cytoplasmic 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	H	370	Total	C	N	O	S	0	0
			2885	1827	486	550	22		

- Molecule 3 is a protein called Actin-related protein 10.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	J	379	Total	C	N	O	S	0	0
			2932	1888	496	532	16		

- Molecule 4 is a protein called F-actin-capping protein subunit alpha-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	K	278	Total	C	N	O	S	0	0
			2258	1425	393	434	6		

- Molecule 5 is a protein called F-actin-capping protein subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	L	269	Total	C	N	O	S	0	0
			2122	1323	370	418	11		

- Molecule 6 is a protein called Dynactin subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	M	340	Total	C	N	O	S	0	0
			2238	1382	408	443	5		
6	N	280	Total	C	N	O	S	0	0
			1767	1089	327	346	5		
6	P	325	Total	C	N	O	S	0	0
			2262	1413	397	446	6		
6	Q	343	Total	C	N	O	S	0	0
			2349	1471	423	451	4		

- Molecule 7 is a protein called Dynactin subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	O	179	Total	C	N	O	S	0	0
			1183	736	210	233	4		
7	R	170	Total	C	N	O	S	0	0
			1082	679	208	194	1		

- Molecule 8 is a protein called Dynactin subunit 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	U	167	Total	C	N	O	S	0	0
			1224	771	212	231	10		

- Molecule 9 is a protein called Dynactin subunit 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	V	179	Total	C	N	O	S	0	0
			1260	818	222	211	9		

- Molecule 10 is a protein called Dynactin subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	W	152	Total	C	N	O	S	0	0
			937	574	186	174	3		
10	Z	192	Total	C	N	O	S	0	0
			1444	904	262	275	3		

- Molecule 11 is a protein called Dynactin subunit 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	Y	410	Total	C	N	O	S	0	0
			2960	1868	543	529	20		

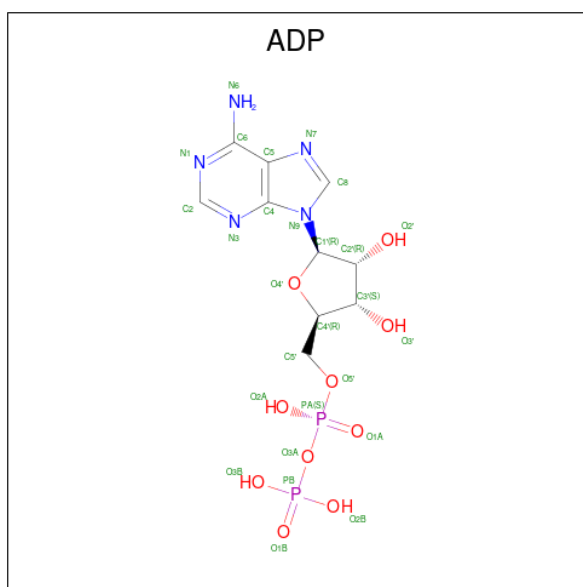
- Molecule 12 is a protein called Cytoplasmic dynein 1 heavy chain 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	e	798	Total	C	N	O	S	0	0
			4505	2742	871	889	3		
12	f	808	Total	C	N	O	S	0	0
			5969	3757	1096	1101	15		
12	m	792	Total	C	N	O	S	0	0
			5875	3688	1084	1088	15		
12	n	755	Total	C	N	O	S	0	0
			5082	3145	961	965	11		

- Molecule 13 is a protein called Cytoplasmic dynein 1 intermediate chain 2.

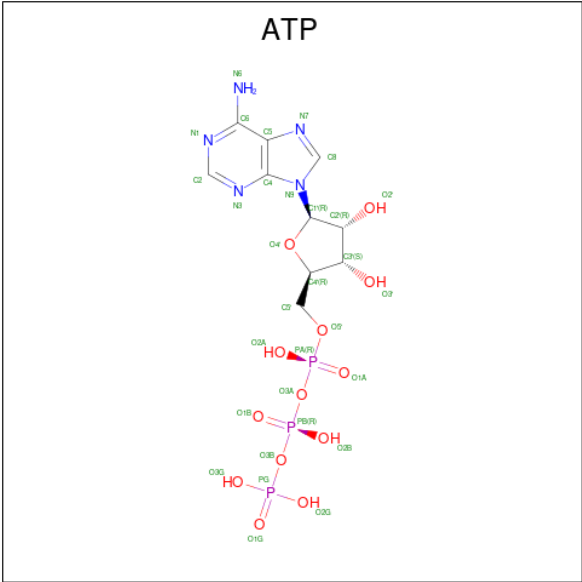
Mol	Chain	Residues	Atoms					AltConf	Trace
13	g	358	Total	C	N	O		0	0
			1767	1051	358	358			
13	h	358	Total	C	N	O	S	0	0
			2788	1759	487	527	15		
13	o	358	Total	C	N	O	S	0	0
			2800	1766	488	531	15		
13	p	358	Total	C	N	O		0	0
			1767	1051	358	358			

- Molecule 14 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: C₁₀H₁₅N₅O₁₀P₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
14	A	1	Total	C	N	O	P	0
			27	10	5	10	2	
14	B	1	Total	C	N	O	P	0
			27	10	5	10	2	
14	C	1	Total	C	N	O	P	0
			27	10	5	10	2	
14	D	1	Total	C	N	O	P	0
			27	10	5	10	2	
14	E	1	Total	C	N	O	P	0
			27	10	5	10	2	
14	F	1	Total	C	N	O	P	0
			27	10	5	10	2	
14	G	1	Total	C	N	O	P	0
			27	10	5	10	2	
14	I	1	Total	C	N	O	P	0
			27	10	5	10	2	
14	J	1	Total	C	N	O	P	0
			27	10	5	10	2	

- Molecule 15 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: C₁₀H₁₆N₅O₁₃P₃) (labeled as "Ligand of Interest" by depositor).



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

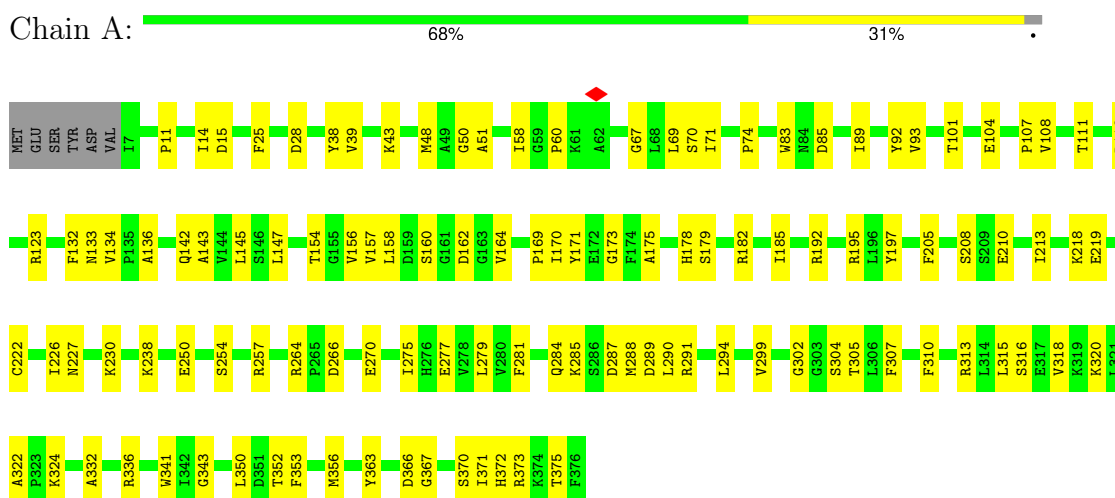
- Molecule 16 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
16	Y	3	Total	Zn	0
			3	3	

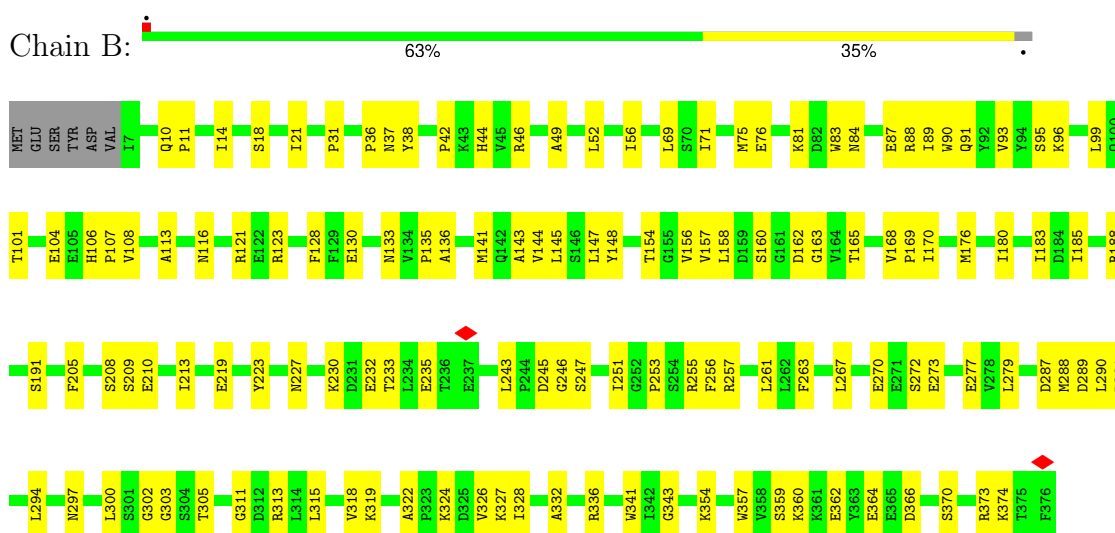
3 Residue-property plots

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: Alpha-centractin

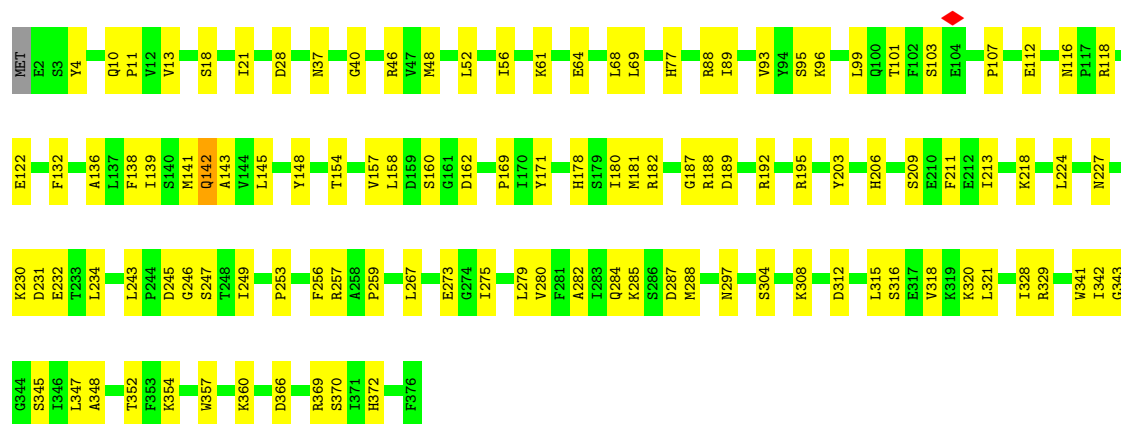


• Molecule 1: Alpha-centractin



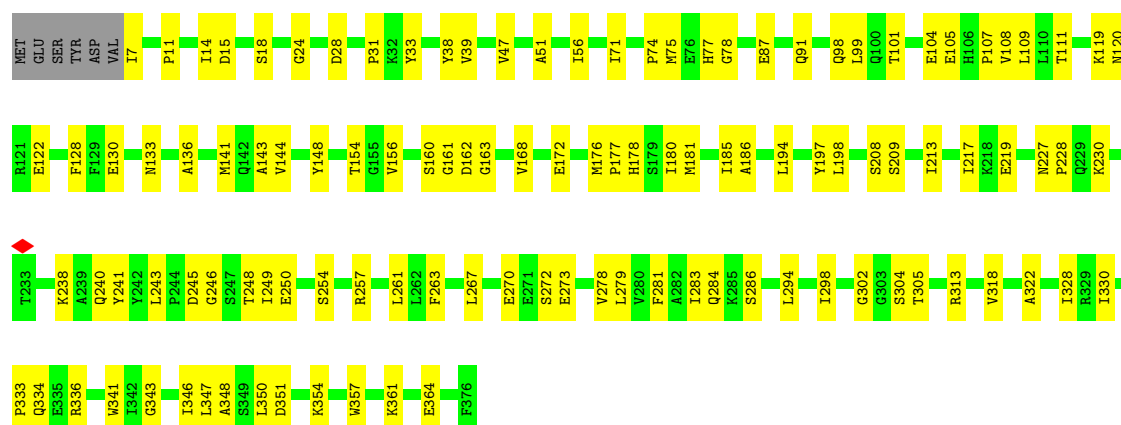
• Molecule 1: Alpha-centractin





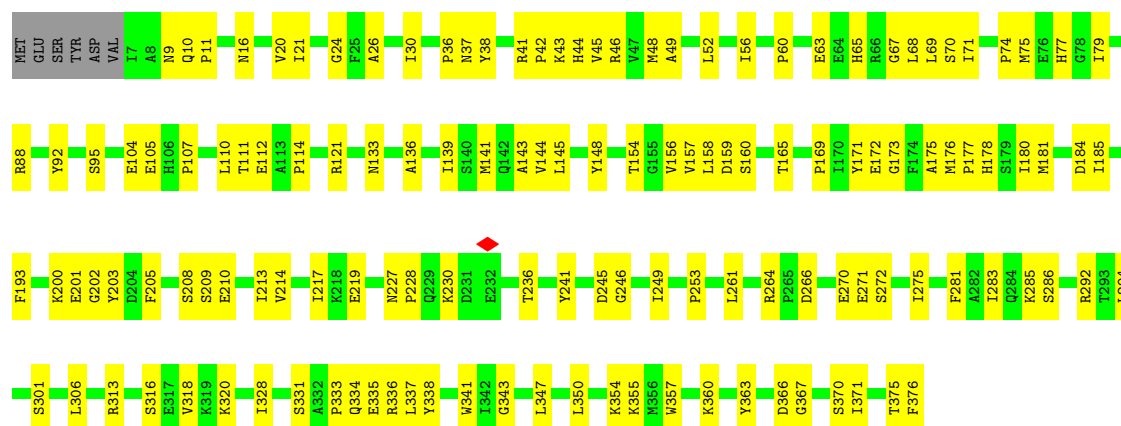
• Molecule 1: Alpha-centractin

Chain D: 68% 30%



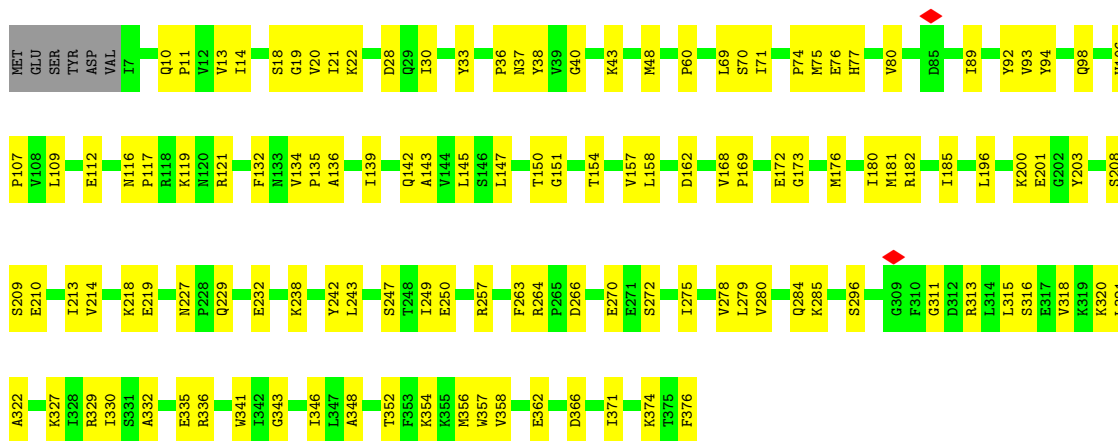
• Molecule 1: Alpha-centractin

Chain E: 62% 36%



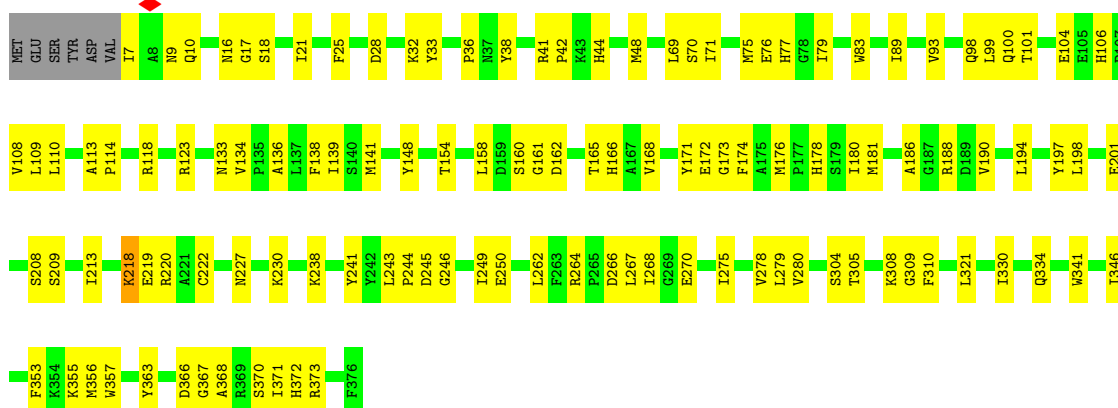
• Molecule 1: Alpha-centractin

Chain F: 65% 33%



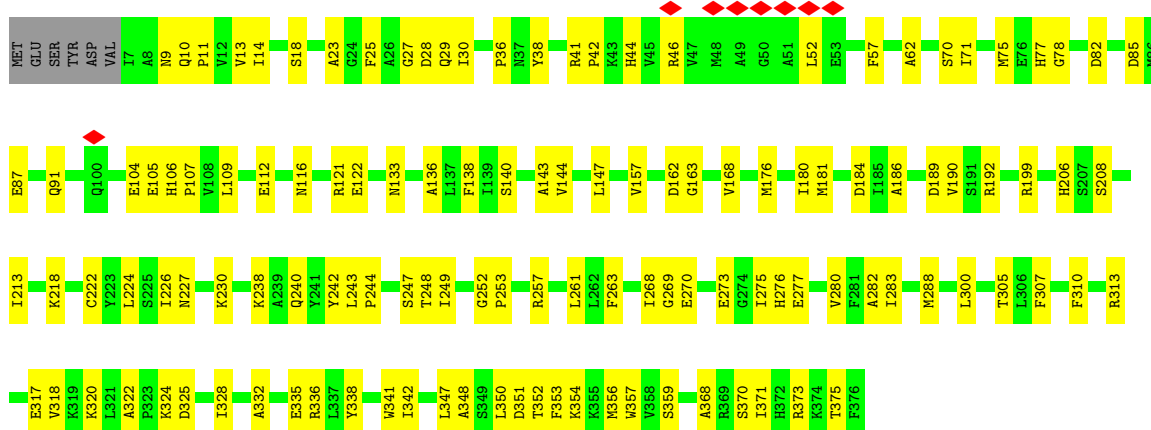
- Molecule 1: Alpha-centractin

Chain G: 67% 31%



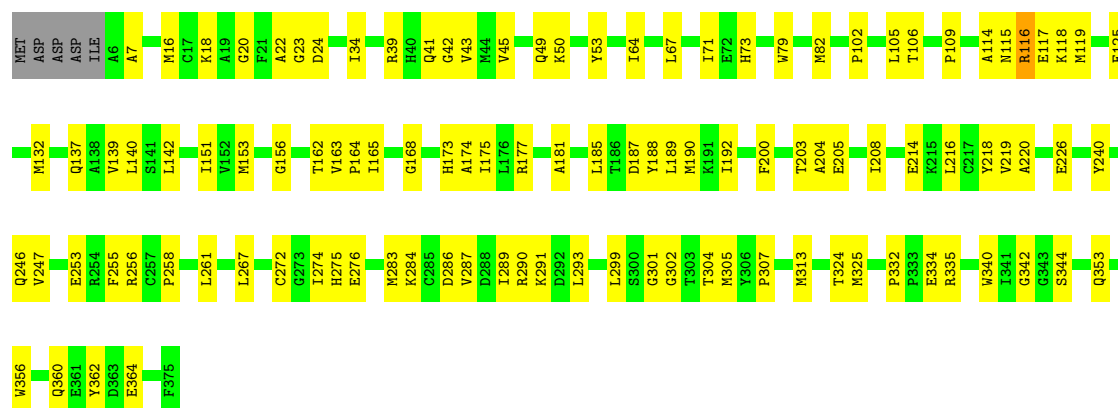
- Molecule 1: Alpha-centractin

Chain I: 65% 33%



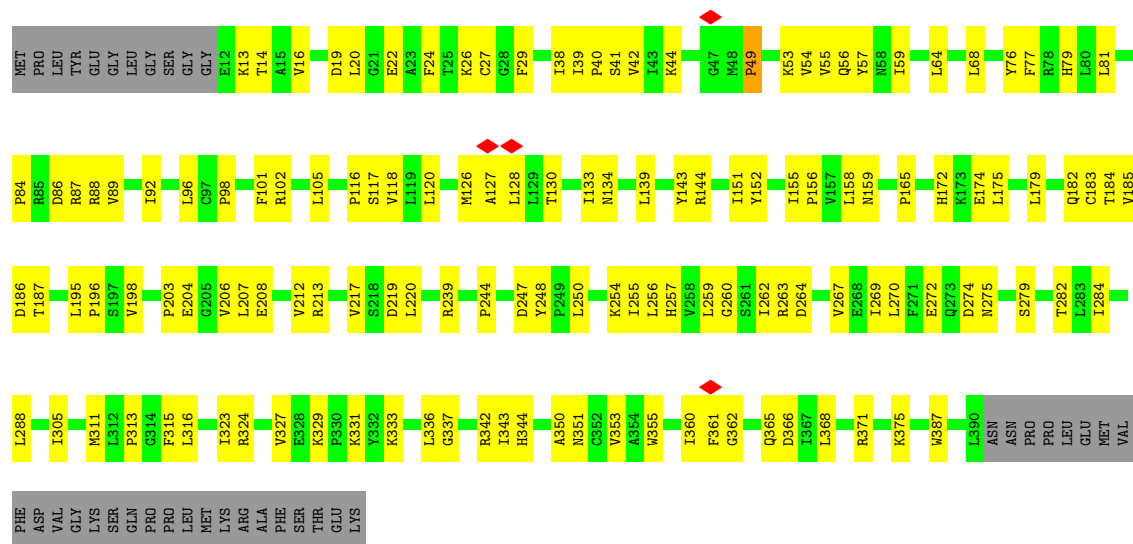
- Molecule 2: Actin, cytoplasmic 1

Chain H:  70% 29%



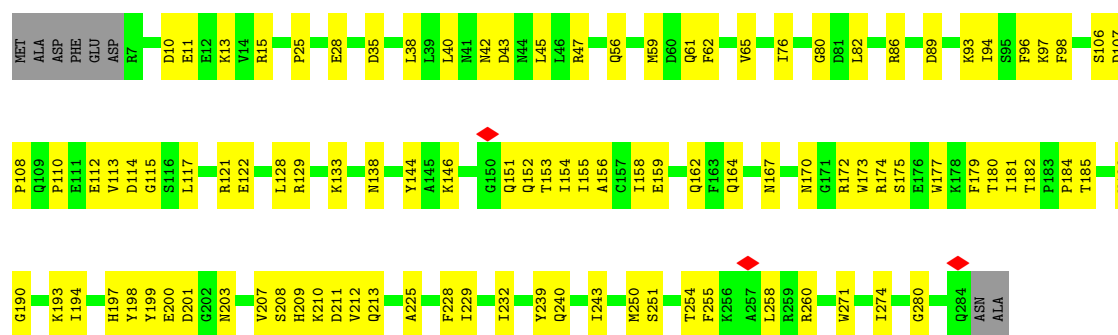
• Molecule 3: Actin-related protein 10

Chain J:  58% 32% 9%

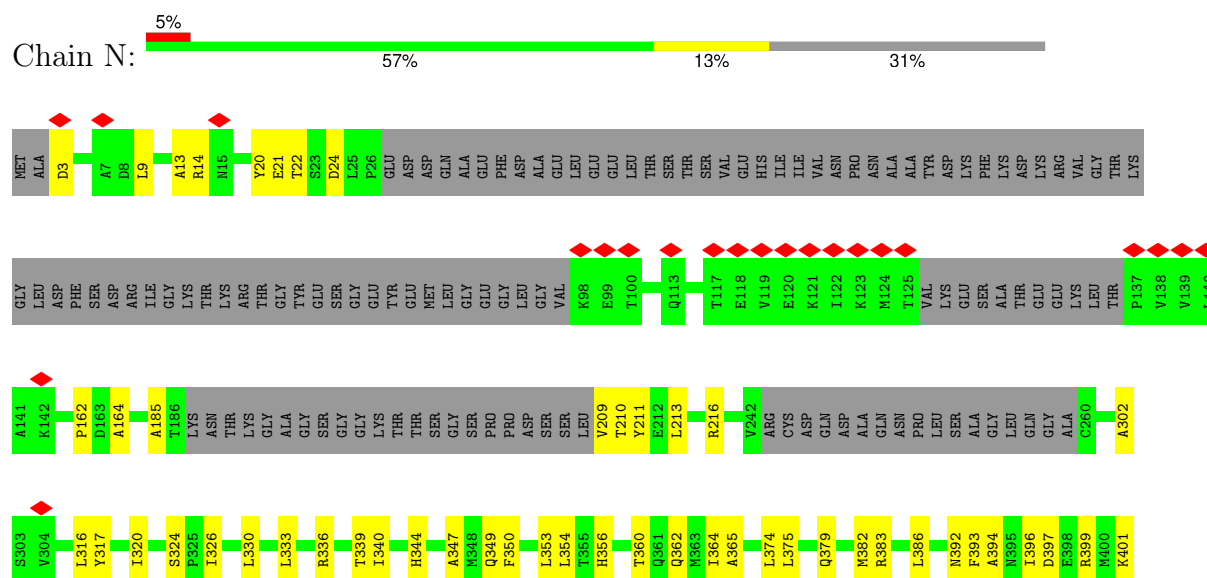


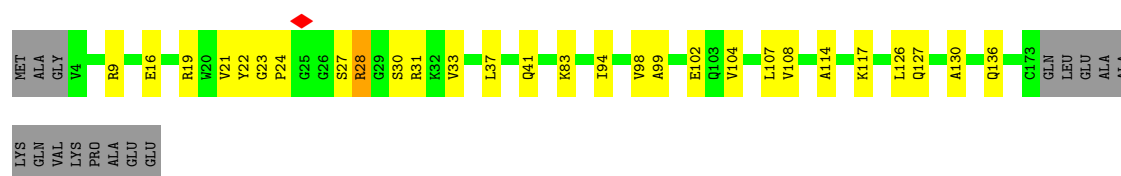
• Molecule 4: F-actin-capping protein subunit alpha-1

Chain K:  62% 35%



• Molecule 5: F-actin-capping protein subunit beta





Chain U:

Chain V:

65% 34%

M1 E2 L3 C4 E5 L6 L7 T8 N9 K10 Y13 I14 G19 N20 K21 V22 S23 R24 L28 C29 G30 N33 K39 T40 I41 I47 I48 R49 G50 A53 S54 V55 R56 V57 G58 R59 H60 K64 V68 P71 F72 F73 K74 A81 F82 I87 G88 S90

H90 E94 V99 H100 A101 I104 K112 M113 I116 L119 V121 L122 K123 P135 P136 V139 P142 L152 F153 P158 T161 Y173 Q174 K175 P178 L179 THR GLN VAL

Chain W: 9%

88%

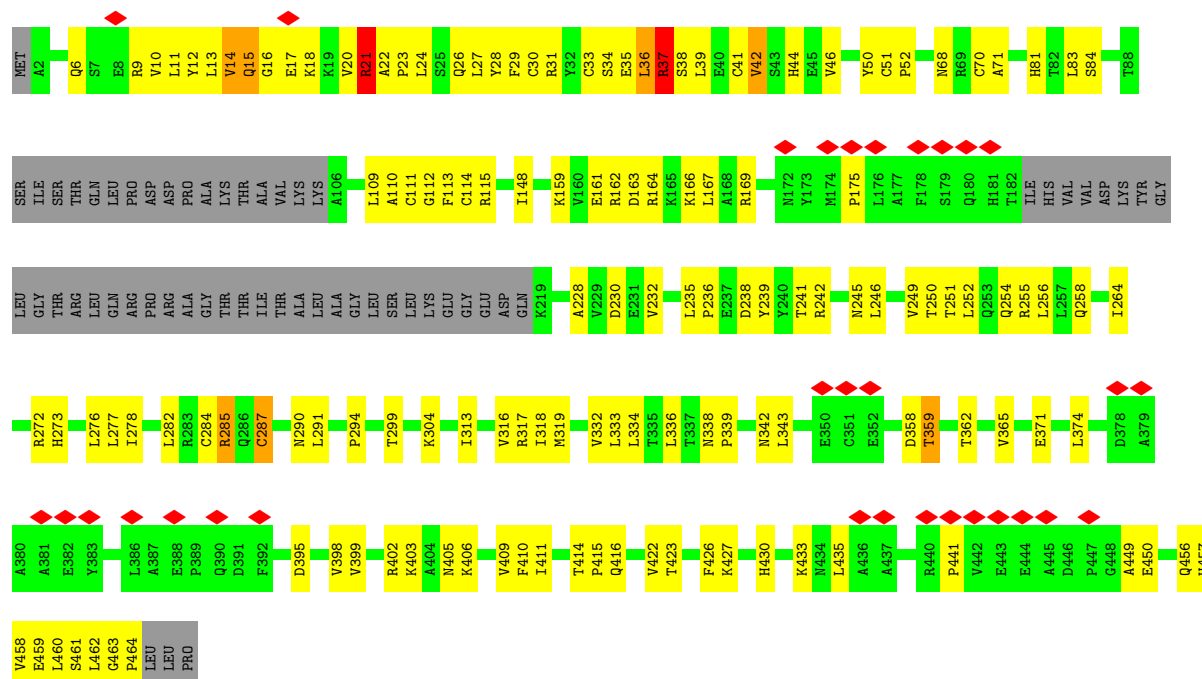
R1283	L1284	I1285	SER
-------	-------	-------	-----

Chain Z: 11% . 85%



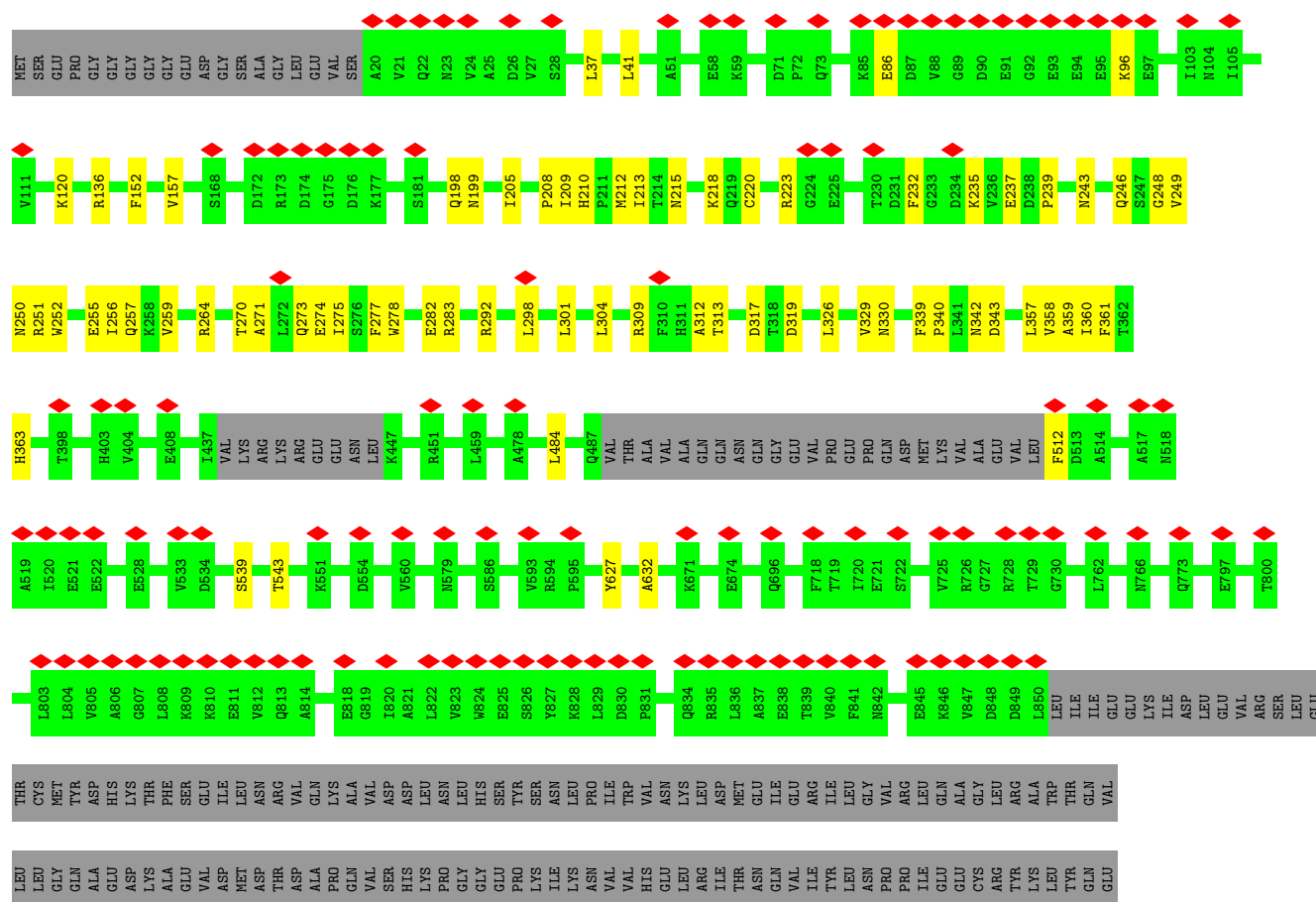
- Molecule 11: Dynactin subunit 4





• Molecule 12: Cytoplasmic dynein 1 heavy chain 1

Chain e: 16% 83%









- Molecule 12: Cytoplasmic dynein 1 heavy chain 1

[illegible]





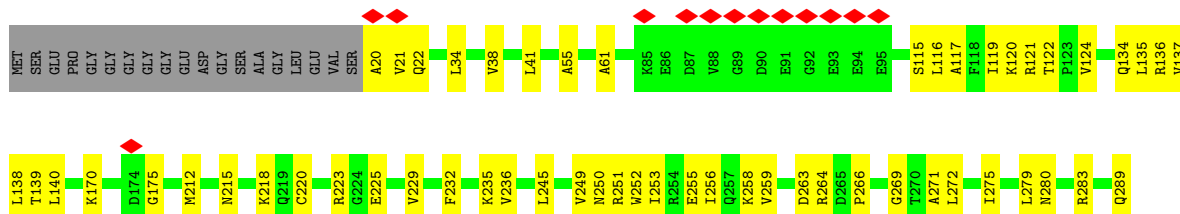
- Molecule 12: Cytoplasmic dynein 1 heavy chain 1







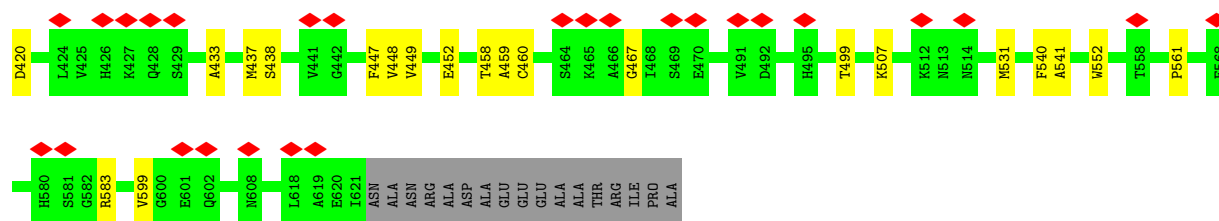
- Molecule 12: Cytoplasmic dynein 1 heavy chain 1





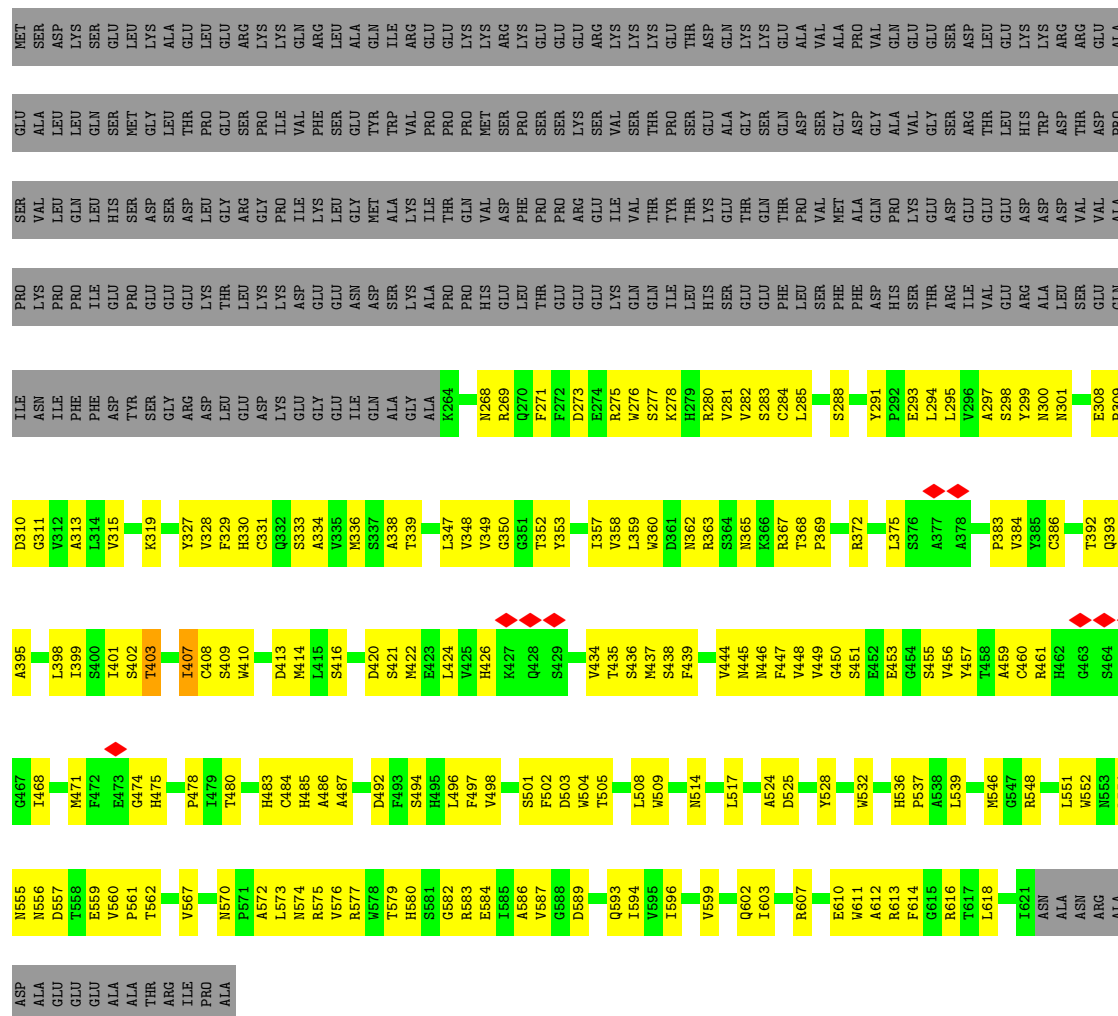






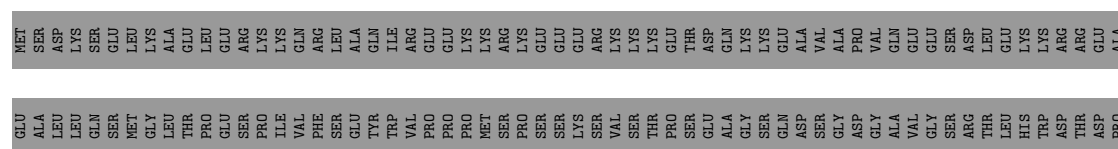
• Molecule 13: Cytoplasmic dynein 1 intermediate chain 2

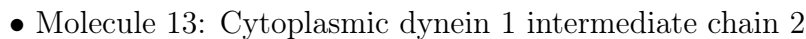
Chain h: 28% 28% 44%



• Molecule 13: Cytoplasmic dynein 1 intermediate chain 2

Chain o: 30% 26% 44%





P516	N388	ILE	PRO	SER	GLU	MET
L517	V389	ASN	LYS	VAL	ALA	SER
Y518	V390	ILE	PRO	GLN	LEU	LEU
S519	G391	PHE	PRO	ILE	GLN	SER
F520	G391	PHE	ILE	GLU	SER	GLU
Y526	H396	ASP	PRO	ASP	HIS	LEU
V527	H397	SER	GLU	SER	MET	LYS
L398	L398	GLY	GLU	GLY	GLY	ALA
L539	I399	ARG	GLU	ASP	THR	GLU
D544	T403	ASP	LYS	THR	PRO	LEU
G545	T408	GLU	LEU	GLY	GLU	LEU
R548	T408	ASP	LYS	ARG	SER	ARG
L551	S421	GLY	GLU	LYS	PHE	GLN
H552	H426	ILE	ASN	GLY	SER	LEU
N553	K427	GLN	ASP	MET	TYR	GLN
T558	Q428	ALA	SER	LYS	TRP	ILE
E559	S429	GLY	ALA	LYS	VAL	ARG
V560	S433	ALA	ALA	ILE	PRO	GLU
P611	A433	K264	PRO	THR	PRO	GLU
T562	L265	L265	PRO	GLN	PRO	LYS
S566	V448	S266	HIS	VAL	MET	LYS
V567	V449	L267	GLU	ASP	SER	ARG
E568	Q450	N268	LEU	PHE	PRO	LYS
G569	S451	N268	THR	PRO	SER	GLU
N570	E452	H279	GLU	PRO	SER	GLU
L573	V456	K280	GLU	ARG	LYS	GLU
A586	Y457	E303	GLU	GLY	SER	ARG
D589	T458	D304	LYS	ILE	VAL	LYS
I596	H462	A305	GLN	VAL	THR	LYS
Y597	G463	P306	ILE	TYR	PRO	GLU
D598	S464	H307	LEU	THR	SER	THR
T621	K465	D310	ASP	THR	GLY	ASP
ALA	A466	V315	PHE	GLN	SER	LYS
ASN	S469	E326	LEU	THR	GLN	GLU
ALA	E470	E326	LEU	PRO	ASP	ALA
ASN	M471	E326	SER	VAL	GLY	ALA
ARG	F472	G332	PHE	MET	GLY	ALA
ALA	E473	S333	ASP	ALA	GLY	VAL
ALA	I479	A394	HIS	PRO	ALA	GLN
ALA	V498	L347	THR	LYS	VAL	GLU
GLU	T499	V353	ARG	GLU	GLY	GLU
GLU	S500	V353	ILE	GLU	ARG	ASP
ALA	S501	D361	VAL	GLU	GLY	LEU
ALA	V506	K365	ARG	GLU	THR	ASP
THR	K507	V506	THR	LEU	GLU	SER
ARG	L508	L508	ALA	ASP	TRP	LYS
ILE			GLN	VAL	THR	ARG
			ALA	VAL	ASP	GLU

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	91824	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS GLACIOS	Depositor
Voltage (kV)	200	Depositor
Electron dose ($e^-/\text{\AA}^2$)	40	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2600	Depositor
Magnification	45000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.662	Depositor
Minimum map value	-0.309	Depositor
Average map value	-0.001	Depositor
Map value standard deviation	0.020	Depositor
Recommended contour level	0.1	Depositor
Map size (Å)	665.0, 665.0, 665.0	wwPDB
Map dimensions	500, 500, 500	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.33, 1.33, 1.33	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, ADP, 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	0.11	0/3013	0.29	0/4070
1	B	0.18	0/3025	0.36	0/4085
1	C	0.13	0/3068	0.30	0/4144
1	D	0.26	0/3025	0.43	0/4085
1	E	0.15	0/3025	0.32	0/4085
1	F	0.12	0/3025	0.31	0/4085
1	G	0.37	0/3025	0.54	0/4085
1	I	0.24	0/3010	0.41	0/4066
2	H	0.23	0/2948	0.36	0/3991
3	J	0.12	0/2994	0.31	0/4066
4	K	0.10	0/2310	0.28	0/3128
5	L	0.11	0/2156	0.26	0/2906
6	M	0.25	0/2259	0.42	0/3090
6	N	0.13	0/1783	0.32	0/2451
6	P	0.12	0/2287	0.32	0/3119
6	Q	0.11	0/2375	0.30	0/3246
7	O	0.12	0/1194	0.32	0/1631
7	R	0.29	0/1093	0.44	0/1498
8	U	0.10	0/1241	0.29	0/1691
9	V	0.09	0/1286	0.28	0/1757
10	W	0.10	0/940	0.28	0/1281
10	Z	0.13	0/1467	0.36	0/1992
11	Y	0.45	0/3020	0.56	1/4119 (0.0%)
12	e	0.10	0/4529	0.25	0/6256
12	f	0.13	0/6058	0.31	0/8220
12	m	0.11	0/5959	0.27	0/8072
12	n	0.19	0/5136	0.34	0/6997
13	g	0.08	0/1766	0.21	0/2457
13	h	0.25	0/2867	0.38	0/3915
13	o	0.31	0/2879	0.43	0/3929
13	p	0.08	0/1766	0.21	0/2457
All	All	0.20	0/84529	0.35	1/114974 (0.0%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
2	H	0	1
6	M	0	1
7	R	0	2
11	Y	0	2
12	n	0	1
13	o	0	1
All	All	0	8

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
11	Y	16	GLY	CA-C-O	-6.46	117.80	122.45

There are no chirality outliers.

5 of 8 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	H	116	ARG	Sidechain
6	M	74	ARG	Sidechain
7	R	28	ARG	Sidechain
7	R	31	ARG	Sidechain
11	Y	21	ARG	Sidechain

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2944	0	2938	77	0
1	B	2956	0	2950	93	0
1	C	2998	0	2983	76	0
1	D	2956	0	2950	86	0
1	E	2956	0	2950	99	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	F	2956	0	2950	96	0
1	G	2956	0	2950	83	0
1	I	2941	0	2936	79	0
2	H	2885	0	2856	76	0
3	J	2932	0	3001	102	0
4	K	2258	0	2175	83	0
5	L	2122	0	2113	84	0
6	M	2238	0	1829	61	0
6	N	1767	0	1356	49	0
6	P	2262	0	2060	63	0
6	Q	2349	0	2069	62	0
7	O	1183	0	981	29	0
7	R	1082	0	881	24	0
8	U	1224	0	1215	40	0
9	V	1260	0	1213	41	0
10	W	937	0	707	32	0
10	Z	1444	0	1446	49	0
11	Y	2960	0	2711	128	0
12	e	4505	0	2831	54	0
12	f	5969	0	5526	217	0
12	m	5875	0	5449	163	0
12	n	5082	0	4173	136	0
13	g	1767	0	799	21	0
13	h	2788	0	2637	145	0
13	o	2800	0	2656	116	0
13	p	1767	0	799	29	0
14	A	27	0	12	3	0
14	B	27	0	12	2	0
14	C	27	0	12	0	0
14	D	27	0	12	2	0
14	E	27	0	12	1	0
14	F	27	0	12	4	0
14	G	27	0	12	2	0
14	I	27	0	12	1	0
14	J	27	0	12	1	0
15	H	31	0	12	6	0
16	Y	3	0	0	0	0
All	All	83396	0	75210	2215	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 14.

The worst 5 of 2215 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
11:Y:285:ARG:H	11:Y:285:ARG:HD3	1.15	1.08
11:Y:13:LEU:HA	11:Y:21:ARG:HA	1.37	1.05
11:Y:427:LYS:HA	11:Y:457:HIS:HA	1.47	0.96
1:G:18:SER:HA	1:G:75:MET:HE1	1.47	0.95
12:n:594:ARG:O	12:n:598:ARG:HB2	1.67	0.94

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	368/376 (98%)	352 (96%)	16 (4%)	0	100	100
1	B	368/376 (98%)	352 (96%)	16 (4%)	0	100	100
1	C	373/376 (99%)	351 (94%)	22 (6%)	0	100	100
1	D	368/376 (98%)	352 (96%)	16 (4%)	0	100	100
1	E	368/376 (98%)	353 (96%)	15 (4%)	0	100	100
1	F	368/376 (98%)	354 (96%)	14 (4%)	0	100	100
1	G	368/376 (98%)	351 (95%)	14 (4%)	3 (1%)	16	53
1	I	368/376 (98%)	347 (94%)	20 (5%)	1 (0%)	37	71
2	H	368/375 (98%)	354 (96%)	14 (4%)	0	100	100
3	J	377/417 (90%)	361 (96%)	15 (4%)	1 (0%)	37	71
4	K	276/286 (96%)	264 (96%)	12 (4%)	0	100	100
5	L	267/272 (98%)	262 (98%)	5 (2%)	0	100	100
6	M	330/405 (82%)	307 (93%)	21 (6%)	2 (1%)	22	59
6	N	270/405 (67%)	260 (96%)	10 (4%)	0	100	100
6	P	319/405 (79%)	308 (97%)	11 (3%)	0	100	100
6	Q	335/405 (83%)	317 (95%)	18 (5%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
7	O	177/186 (95%)	171 (97%)	6 (3%)	0	100	100
7	R	168/186 (90%)	160 (95%)	7 (4%)	1 (1%)	22	59
8	U	165/190 (87%)	152 (92%)	13 (8%)	0	100	100
9	V	177/182 (97%)	170 (96%)	7 (4%)	0	100	100
10	W	144/1281 (11%)	134 (93%)	9 (6%)	1 (1%)	19	56
10	Z	190/1281 (15%)	181 (95%)	9 (5%)	0	100	100
11	Y	404/467 (86%)	377 (93%)	24 (6%)	3 (1%)	19	56
12	e	792/4646 (17%)	765 (97%)	27 (3%)	0	100	100
12	f	804/4646 (17%)	775 (96%)	27 (3%)	2 (0%)	44	76
12	m	786/4646 (17%)	760 (97%)	26 (3%)	0	100	100
12	n	747/4646 (16%)	720 (96%)	26 (4%)	1 (0%)	48	81
13	g	356/638 (56%)	343 (96%)	13 (4%)	0	100	100
13	h	356/638 (56%)	340 (96%)	16 (4%)	0	100	100
13	o	356/638 (56%)	344 (97%)	12 (3%)	0	100	100
13	p	356/638 (56%)	347 (98%)	9 (2%)	0	100	100
All	All	11469/30887 (37%)	10984 (96%)	470 (4%)	15 (0%)	50	81

5 of 15 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
6	M	217	PRO
10	W	1142	PRO
11	Y	175	PRO
11	Y	441	PRO
12	f	38	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	315/324 (97%)	315 (100%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	318/324 (98%)	318 (100%)	0	100	100
1	C	323/324 (100%)	322 (100%)	1 (0%)	91	92
1	D	318/324 (98%)	318 (100%)	0	100	100
1	E	318/324 (98%)	318 (100%)	0	100	100
1	F	318/324 (98%)	318 (100%)	0	100	100
1	G	318/324 (98%)	318 (100%)	0	100	100
1	I	314/324 (97%)	314 (100%)	0	100	100
2	H	313/318 (98%)	313 (100%)	0	100	100
3	J	323/363 (89%)	323 (100%)	0	100	100
4	K	246/254 (97%)	246 (100%)	0	100	100
5	L	238/241 (99%)	238 (100%)	0	100	100
6	M	164/346 (47%)	163 (99%)	1 (1%)	84	88
6	N	112/346 (32%)	112 (100%)	0	100	100
6	P	197/346 (57%)	197 (100%)	0	100	100
6	Q	192/346 (56%)	192 (100%)	0	100	100
7	O	87/160 (54%)	87 (100%)	0	100	100
7	R	67/160 (42%)	67 (100%)	0	100	100
8	U	129/163 (79%)	129 (100%)	0	100	100
9	V	121/163 (74%)	121 (100%)	0	100	100
10	W	53/1078 (5%)	53 (100%)	0	100	100
10	Z	154/1078 (14%)	154 (100%)	0	100	100
11	Y	274/416 (66%)	264 (96%)	10 (4%)	30	53
12	e	158/4125 (4%)	158 (100%)	0	100	100
12	f	541/4125 (13%)	540 (100%)	1 (0%)	92	94
12	m	535/4125 (13%)	535 (100%)	0	100	100
12	n	364/4125 (9%)	364 (100%)	0	100	100
13	h	304/557 (55%)	302 (99%)	2 (1%)	81	87
13	o	307/557 (55%)	306 (100%)	1 (0%)	91	92
All	All	7421/25984 (29%)	7405 (100%)	16 (0%)	91	94

5 of 16 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
13	h	407	ILE
13	h	403	THR
11	Y	37	ARG
12	f	751	ARG
11	Y	36	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 66 such sidechains are listed below:

Mol	Chain	Res	Type
12	m	799	ASN
12	n	243	ASN
13	o	513	ASN
5	L	126	HIS
5	L	102	ASN

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 13 ligands modelled in this entry, 3 are monoatomic - leaving 10 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
14	ADP	I	800	-	24,29,29	0.91	0	29,45,45	1.28	3 (10%)
14	ADP	F	800	-	24,29,29	0.87	0	29,45,45	1.13	2 (6%)
14	ADP	G	800	-	24,29,29	0.73	0	29,45,45	0.74	1 (3%)
14	ADP	D	800	-	24,29,29	0.90	0	29,45,45	1.16	2 (6%)
14	ADP	E	800	-	24,29,29	0.86	0	29,45,45	1.14	2 (6%)
14	ADP	J	800	-	24,29,29	0.93	1 (4%)	29,45,45	1.24	3 (10%)
14	ADP	B	800	-	24,29,29	0.86	0	29,45,45	1.22	2 (6%)
14	ADP	C	800	-	24,29,29	0.88	0	29,45,45	1.16	2 (6%)
15	ATP	H	401	-	28,33,33	0.70	0	34,52,52	0.60	1 (2%)
14	ADP	A	800	-	24,29,29	0.93	1 (4%)	29,45,45	1.35	4 (13%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
14	ADP	I	800	-	-	3/12/32/32	0/3/3/3
14	ADP	F	800	-	-	0/12/32/32	0/3/3/3
14	ADP	G	800	-	-	0/12/32/32	0/3/3/3
14	ADP	D	800	-	-	5/12/32/32	0/3/3/3
14	ADP	E	800	-	-	1/12/32/32	0/3/3/3
14	ADP	J	800	-	-	5/12/32/32	0/3/3/3
14	ADP	B	800	-	-	3/12/32/32	0/3/3/3
14	ADP	C	800	-	-	2/12/32/32	0/3/3/3
15	ATP	H	401	-	-	8/18/38/38	0/3/3/3
14	ADP	A	800	-	-	0/12/32/32	0/3/3/3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
14	A	800	ADP	O4'-C1'	2.14	1.43	1.40
14	J	800	ADP	PA-O3A	2.05	1.61	1.59

The worst 5 of 22 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
14	A	800	ADP	N3-C2-N1	-3.74	123.59	128.67

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
14	B	800	ADP	N3-C2-N1	-3.72	123.62	128.67
14	J	800	ADP	N3-C2-N1	-3.66	123.71	128.67
14	I	800	ADP	N3-C2-N1	-3.60	123.79	128.67
14	C	800	ADP	N3-C2-N1	-3.56	123.84	128.67

There are no chirality outliers.

5 of 27 torsion outliers are listed below:

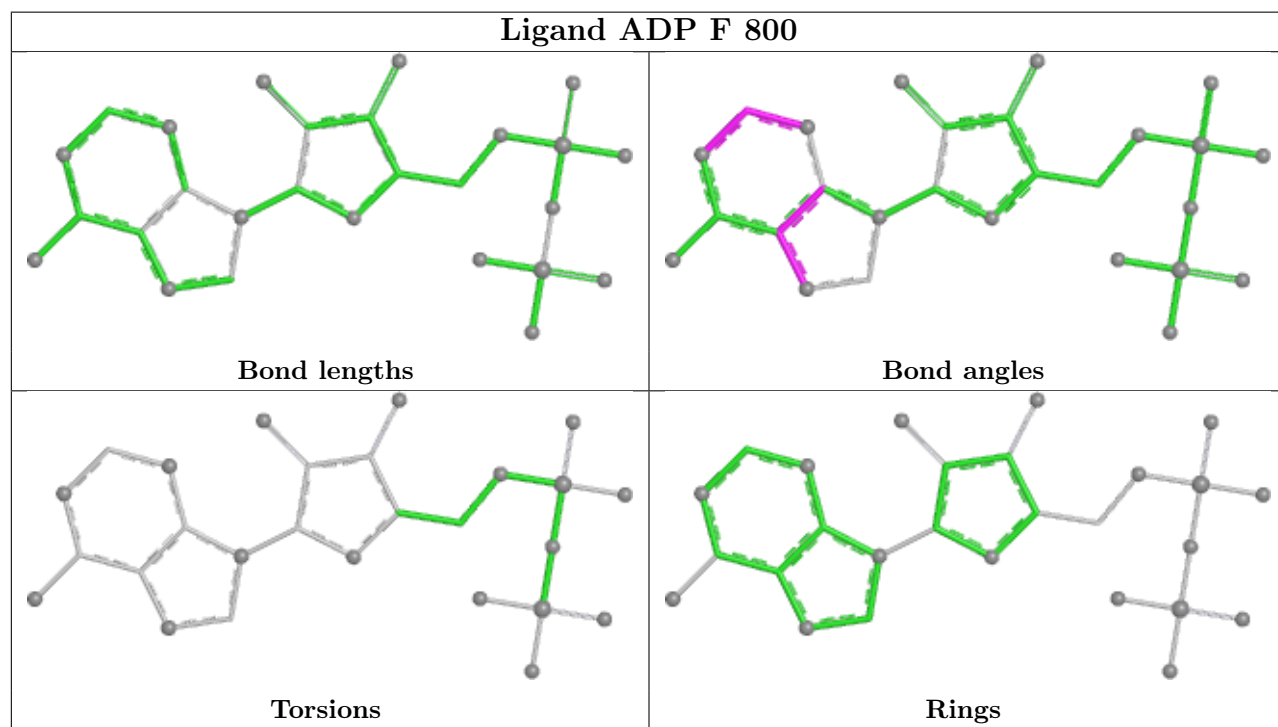
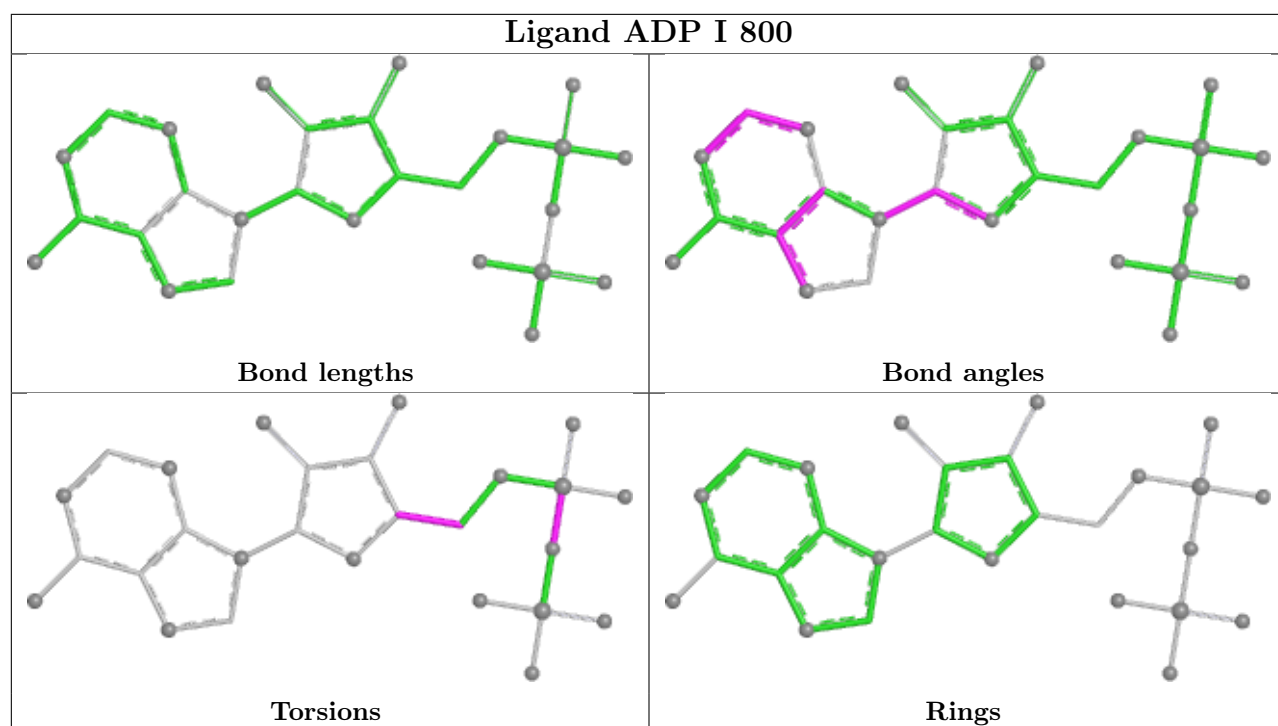
Mol	Chain	Res	Type	Atoms
14	B	800	ADP	C5'-O5'-PA-O2A
14	C	800	ADP	C5'-O5'-PA-O1A
14	D	800	ADP	PB-O3A-PA-O5'
14	D	800	ADP	C5'-O5'-PA-O2A
14	D	800	ADP	C5'-O5'-PA-O3A

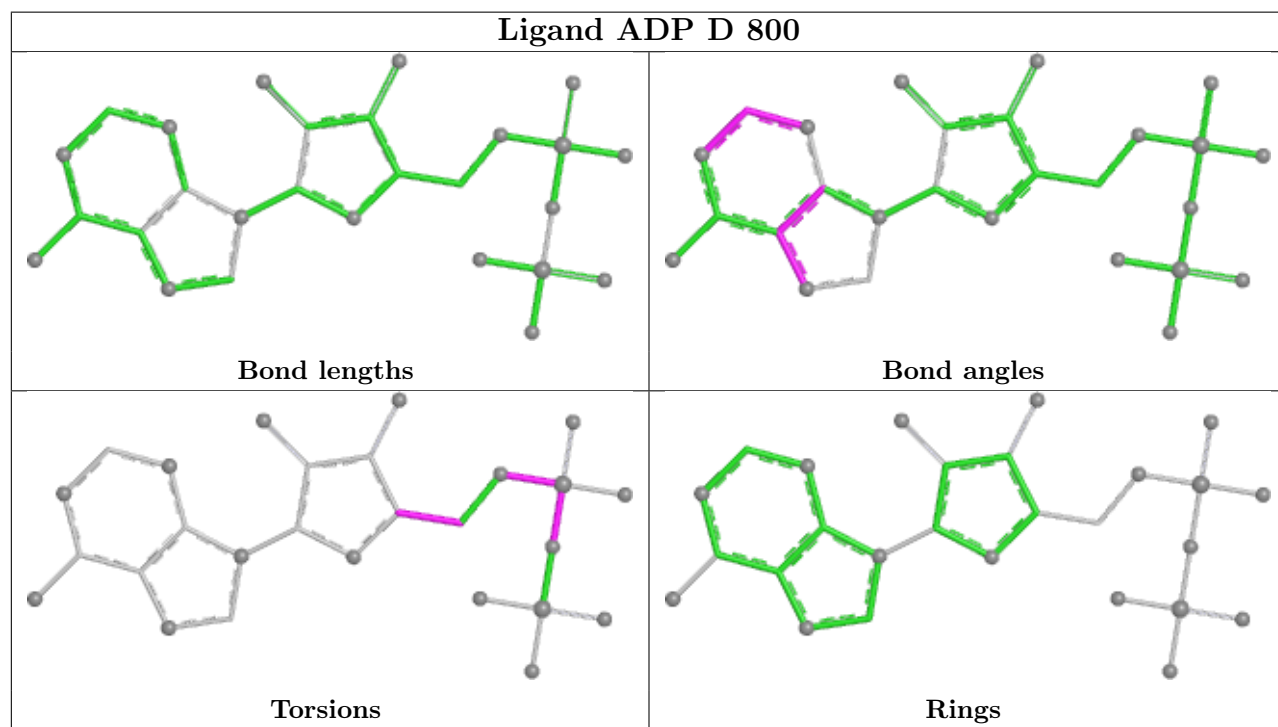
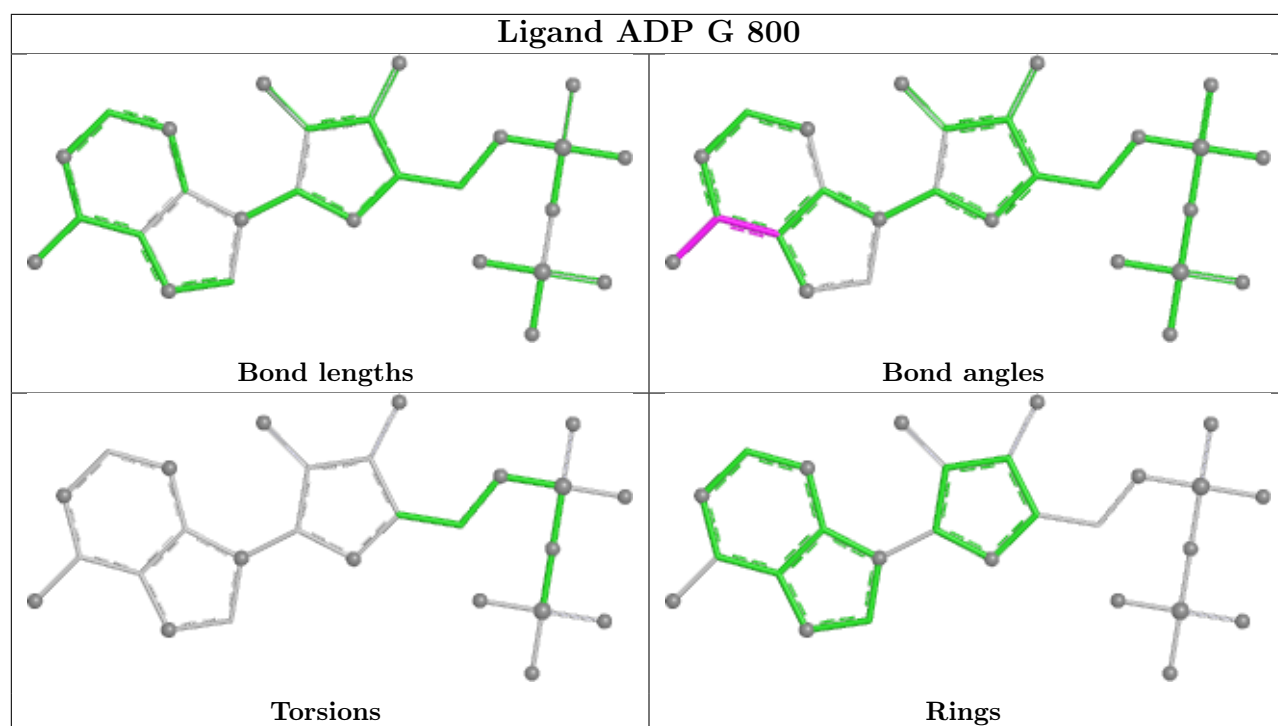
There are no ring outliers.

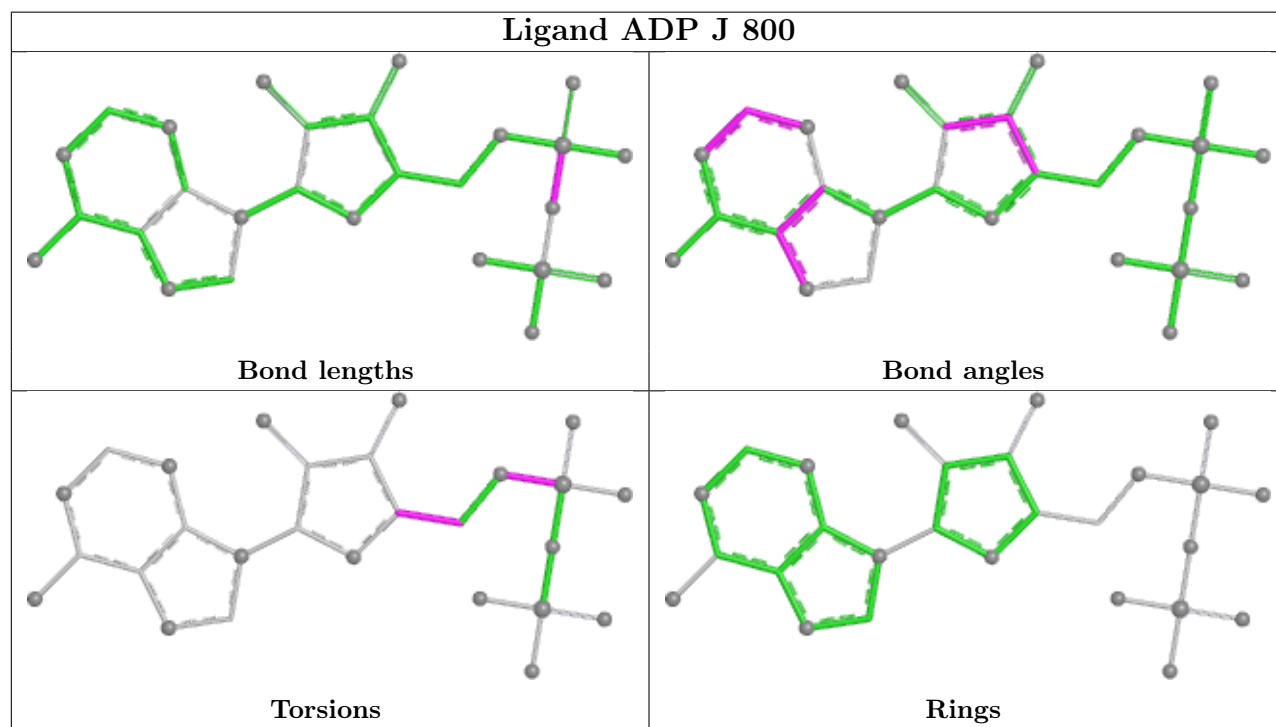
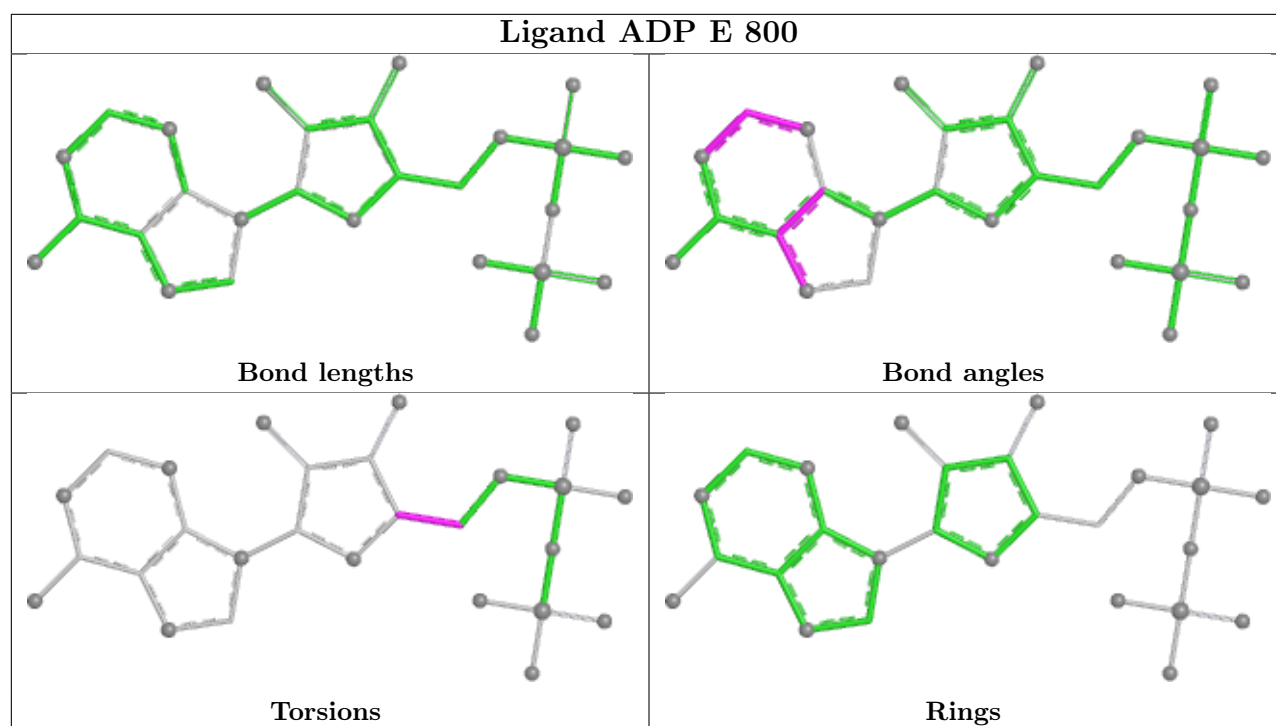
9 monomers are involved in 22 short contacts:

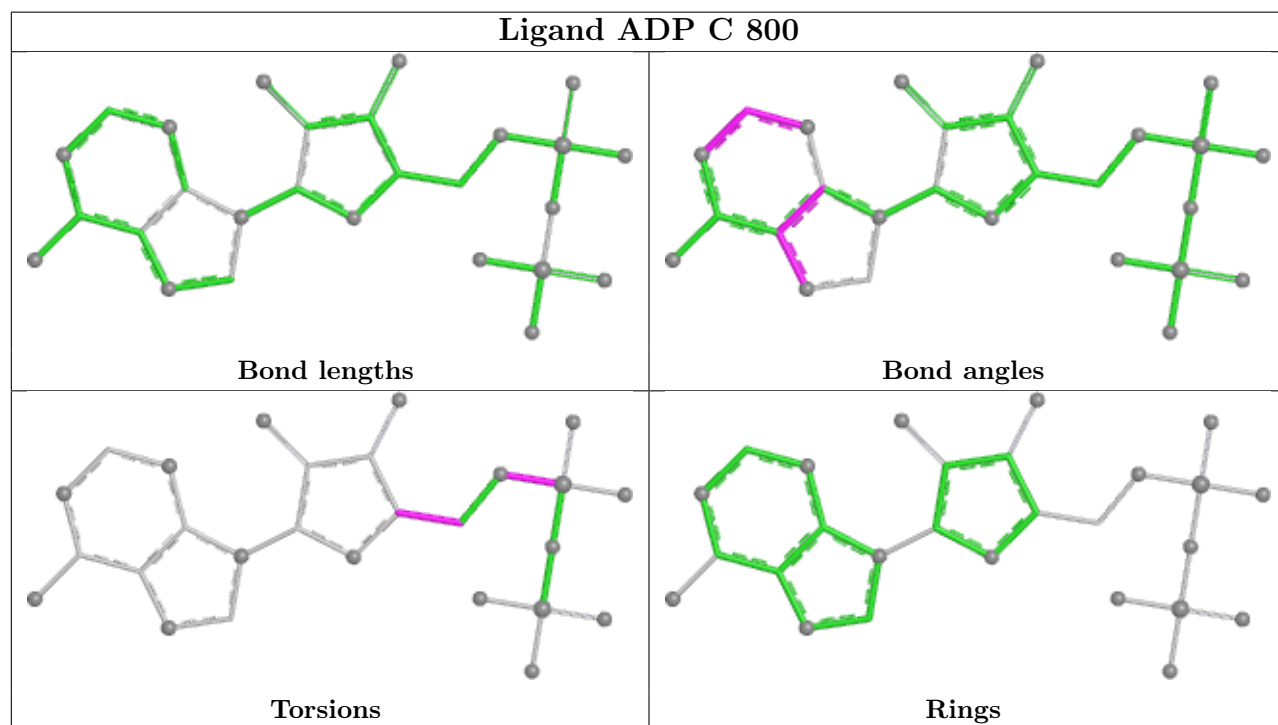
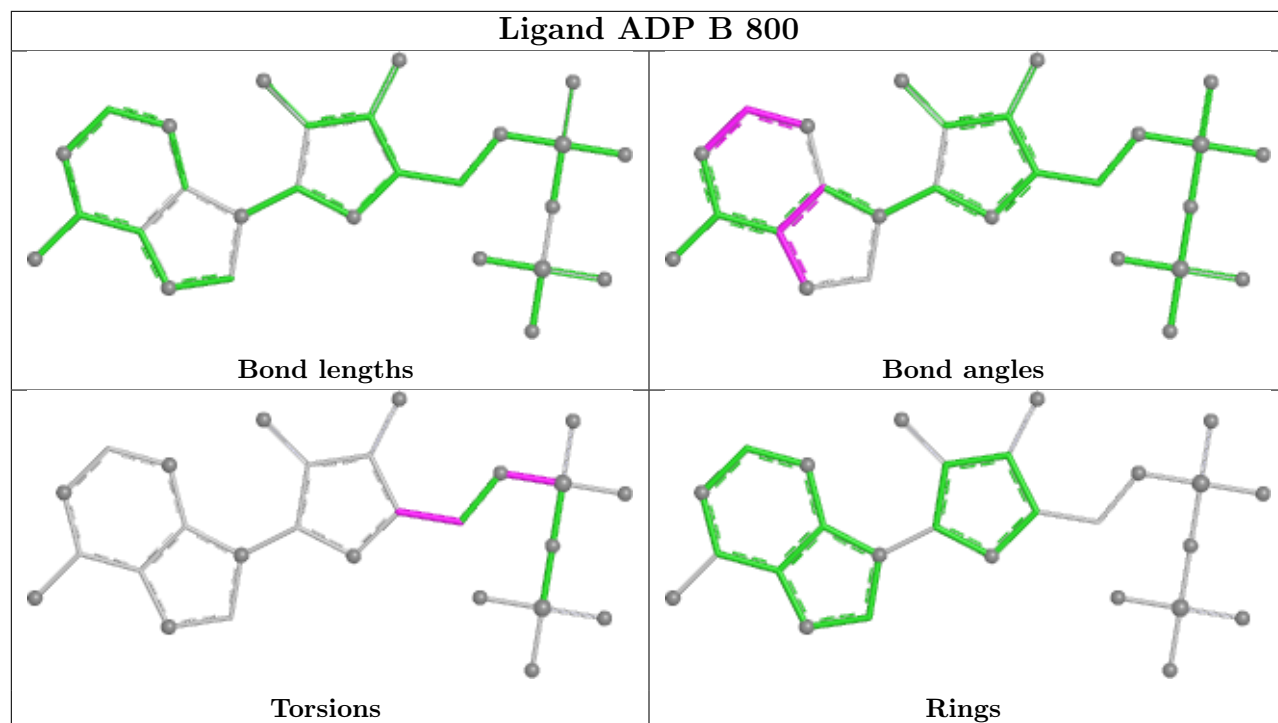
Mol	Chain	Res	Type	Clashes	Symm-Clashes
14	I	800	ADP	1	0
14	F	800	ADP	4	0
14	G	800	ADP	2	0
14	D	800	ADP	2	0
14	E	800	ADP	1	0
14	J	800	ADP	1	0
14	B	800	ADP	2	0
15	H	401	ATP	6	0
14	A	800	ADP	3	0

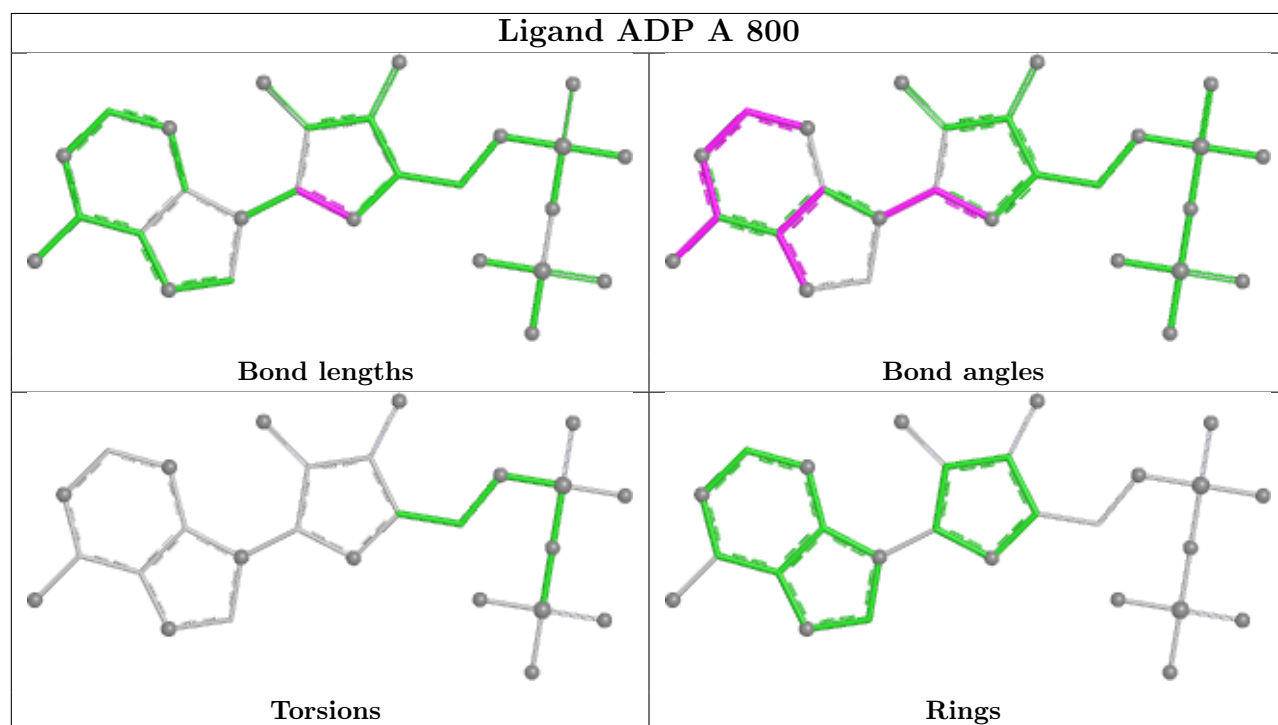
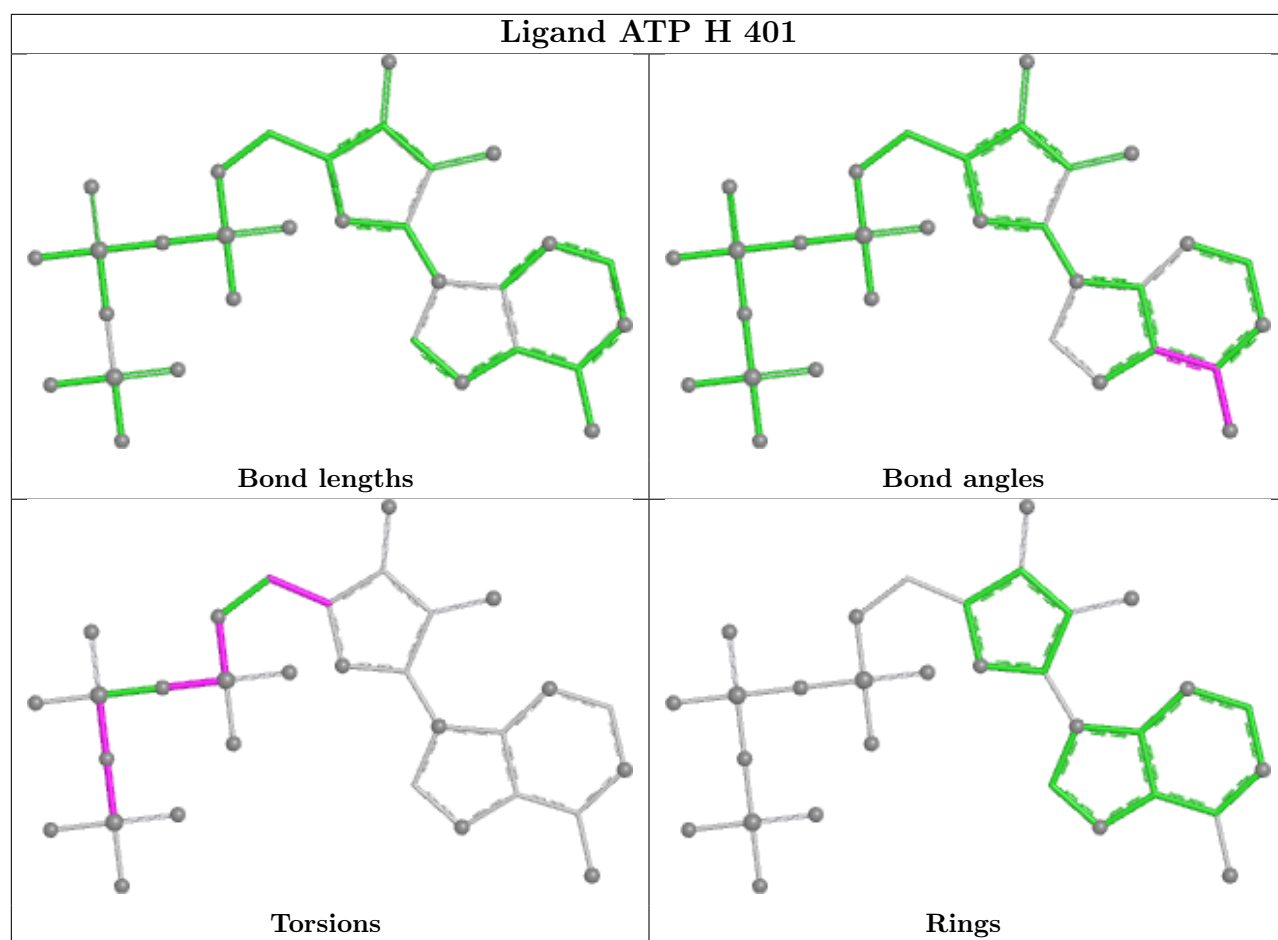
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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











5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

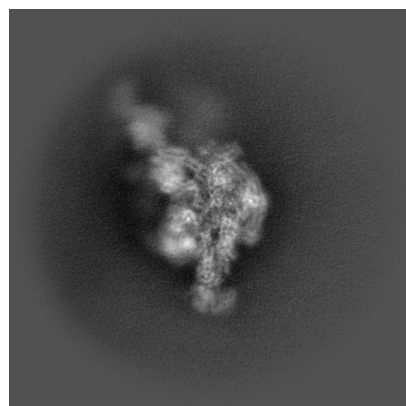
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-73178. These allow visual inspection of the internal detail of the map and identification of artifacts.

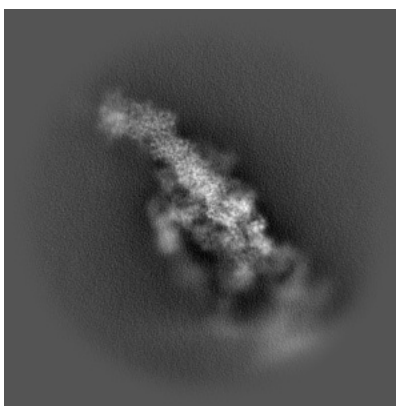
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

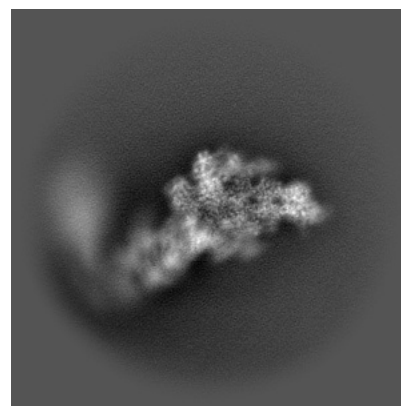
6.1.1 Primary map



X

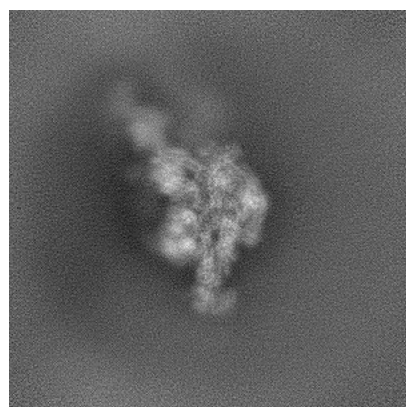


Y

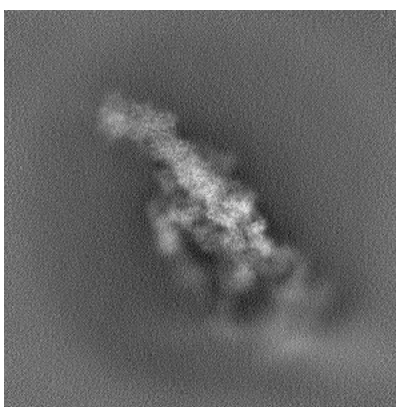


Z

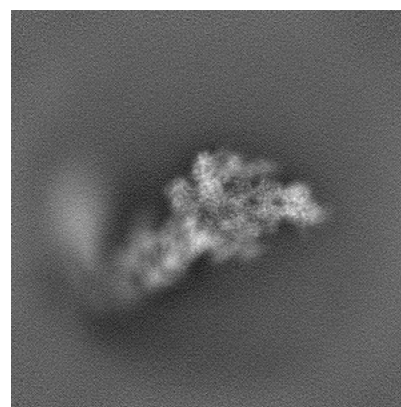
6.1.2 Raw map



X



Y

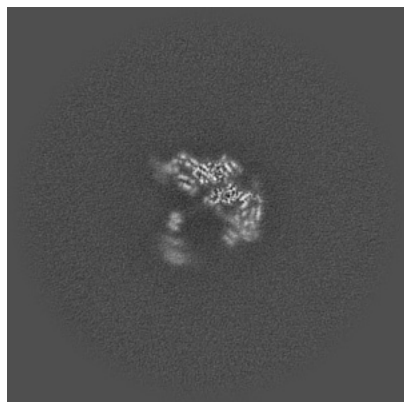


Z

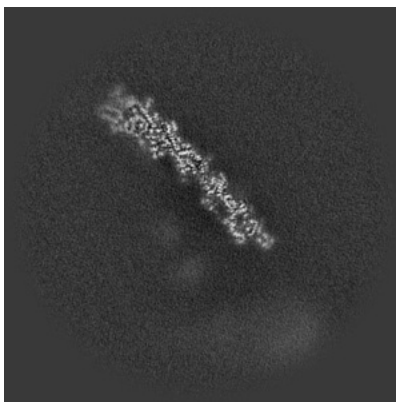
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

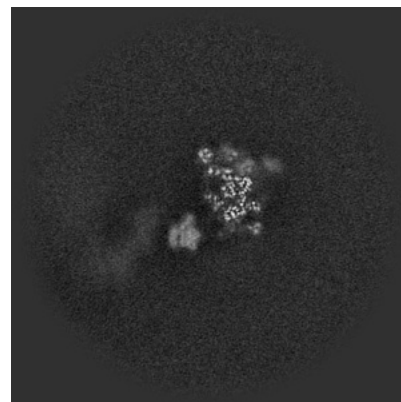
6.2.1 Primary map



X Index: 250



Y Index: 250

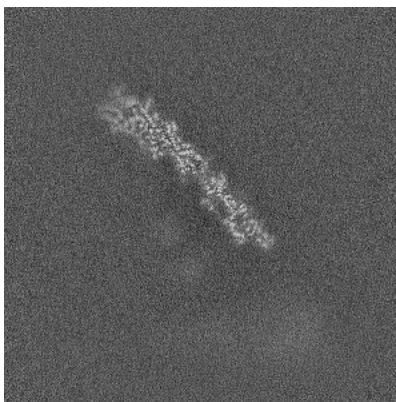


Z Index: 250

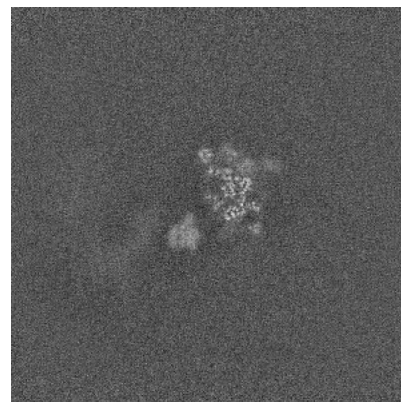
6.2.2 Raw map



X Index: 250



Y Index: 250

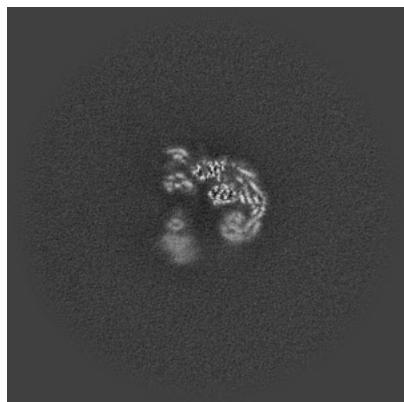


Z Index: 250

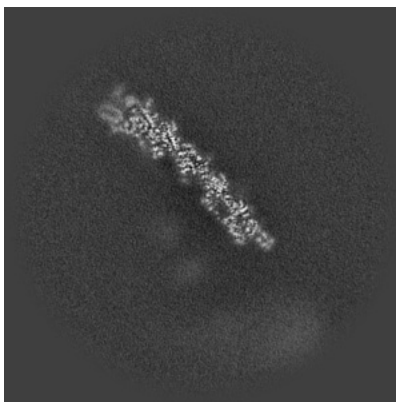
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

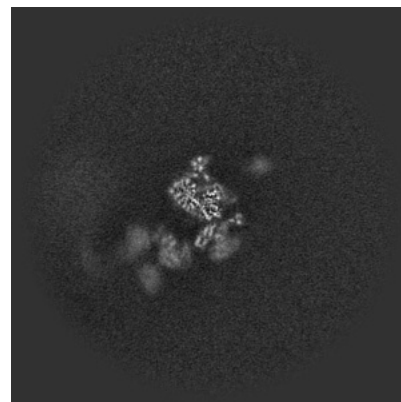
6.3.1 Primary map



X Index: 241

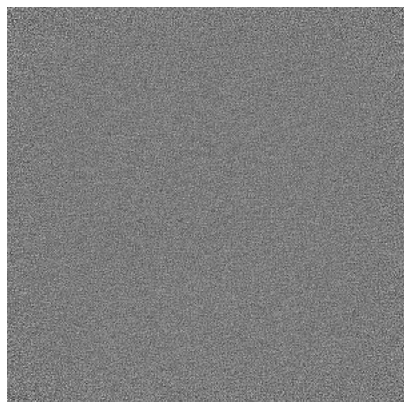


Y Index: 251

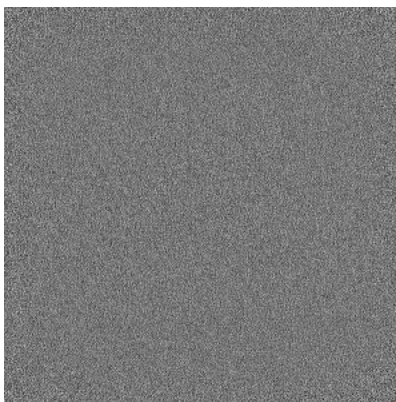


Z Index: 287

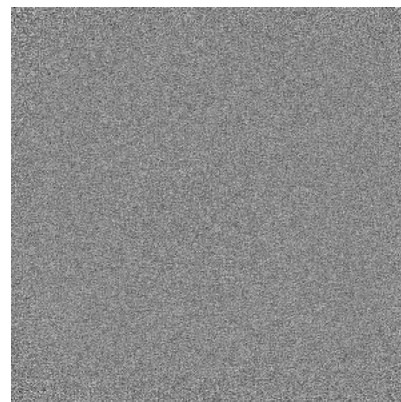
6.3.2 Raw map



X Index: 0



Y Index: 0

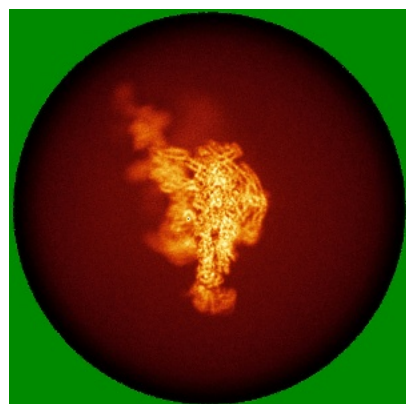


Z Index: 0

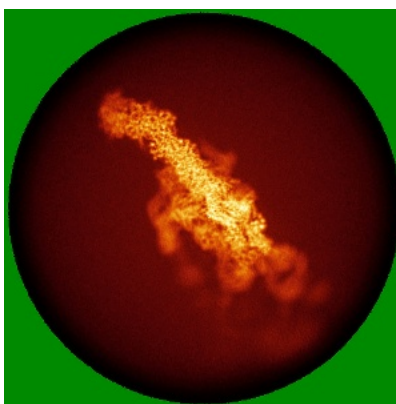
The images above show the largest variance slices of the map in three orthogonal directions.

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

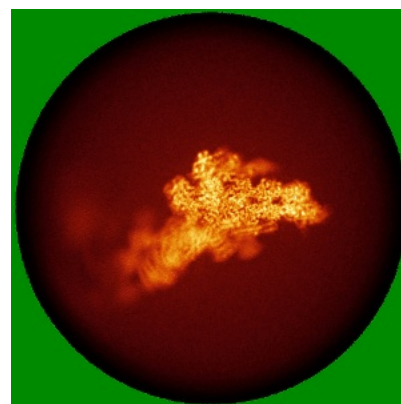
6.4.1 Primary map



X

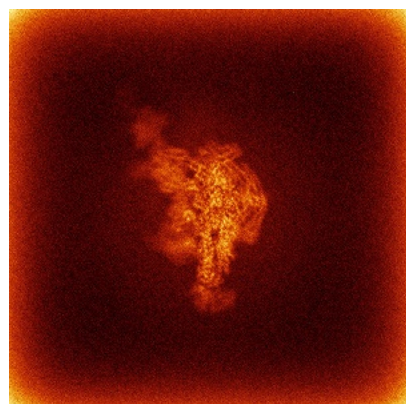


Y

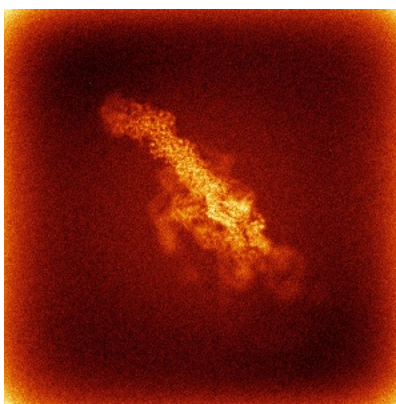


Z

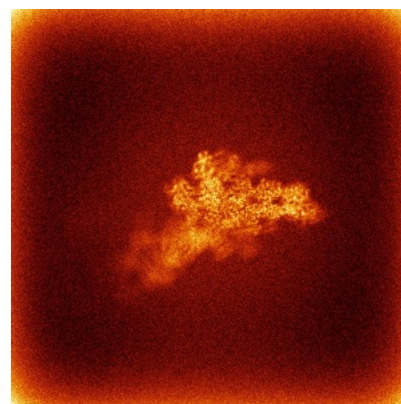
6.4.2 Raw map



X



Y

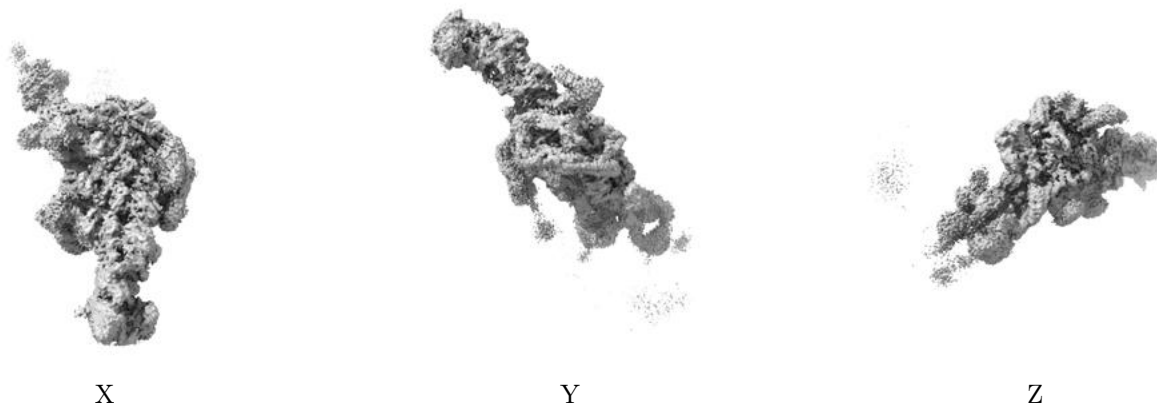


Z

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.

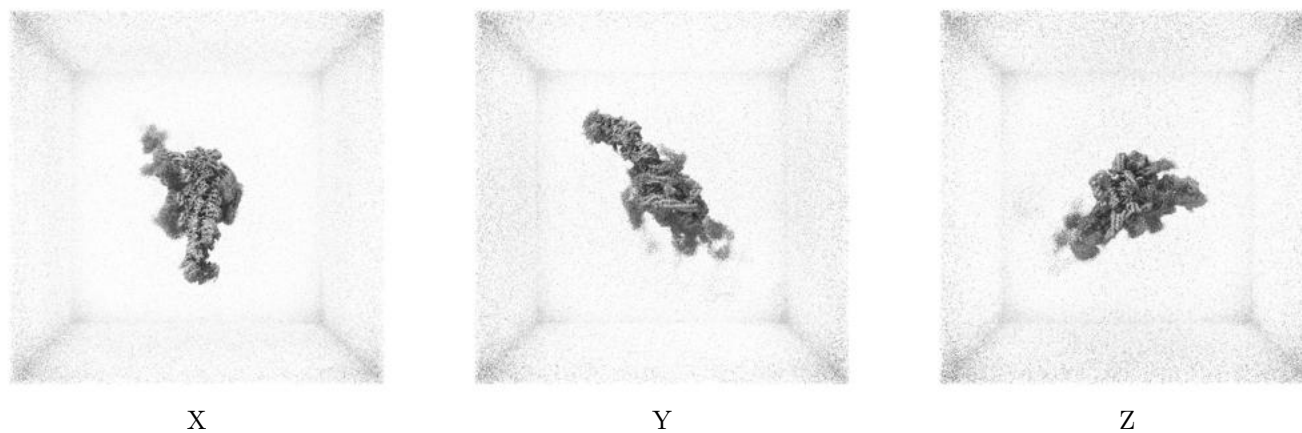
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.1. 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.

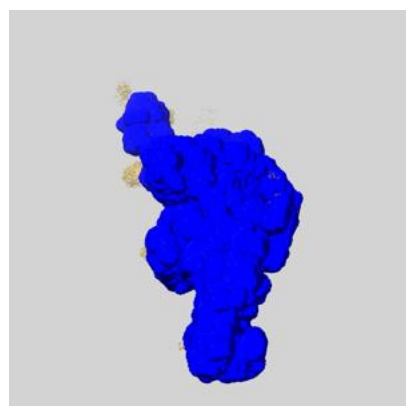
6.6 Mask visualisation [i](#)

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

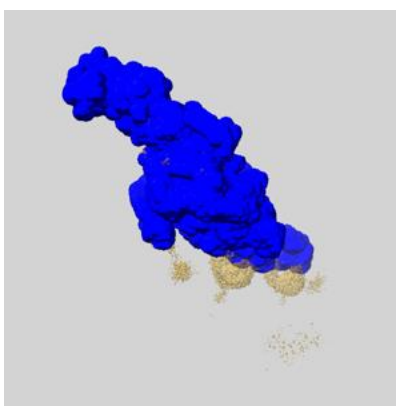
A mask typically either:

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

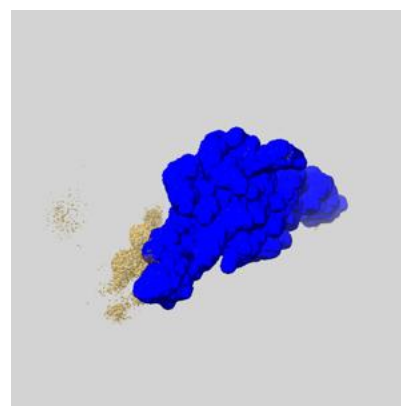
6.6.1 emd_73178_msk_1.map [i](#)



X



Y

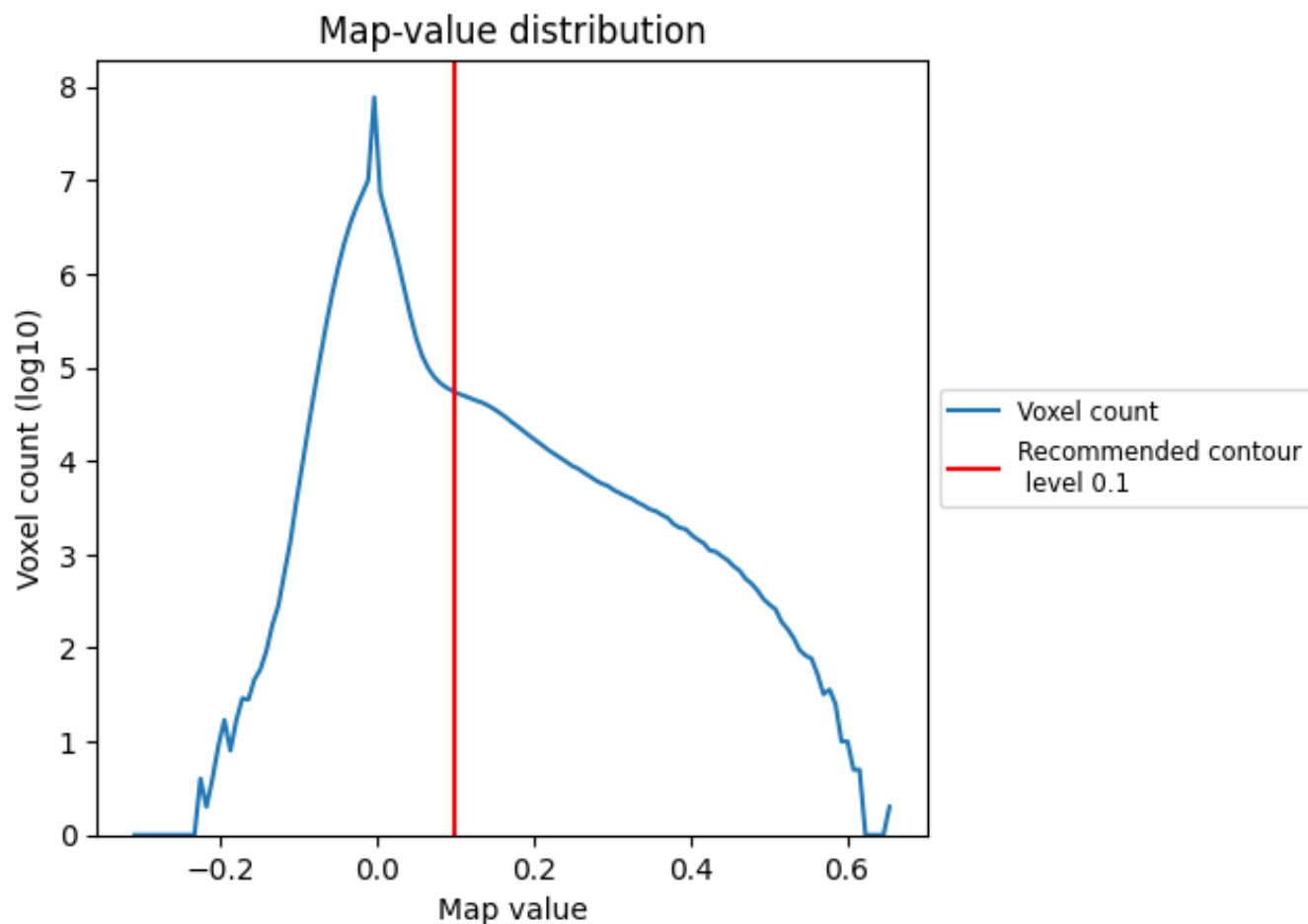


Z

7 Map analysis [i](#)

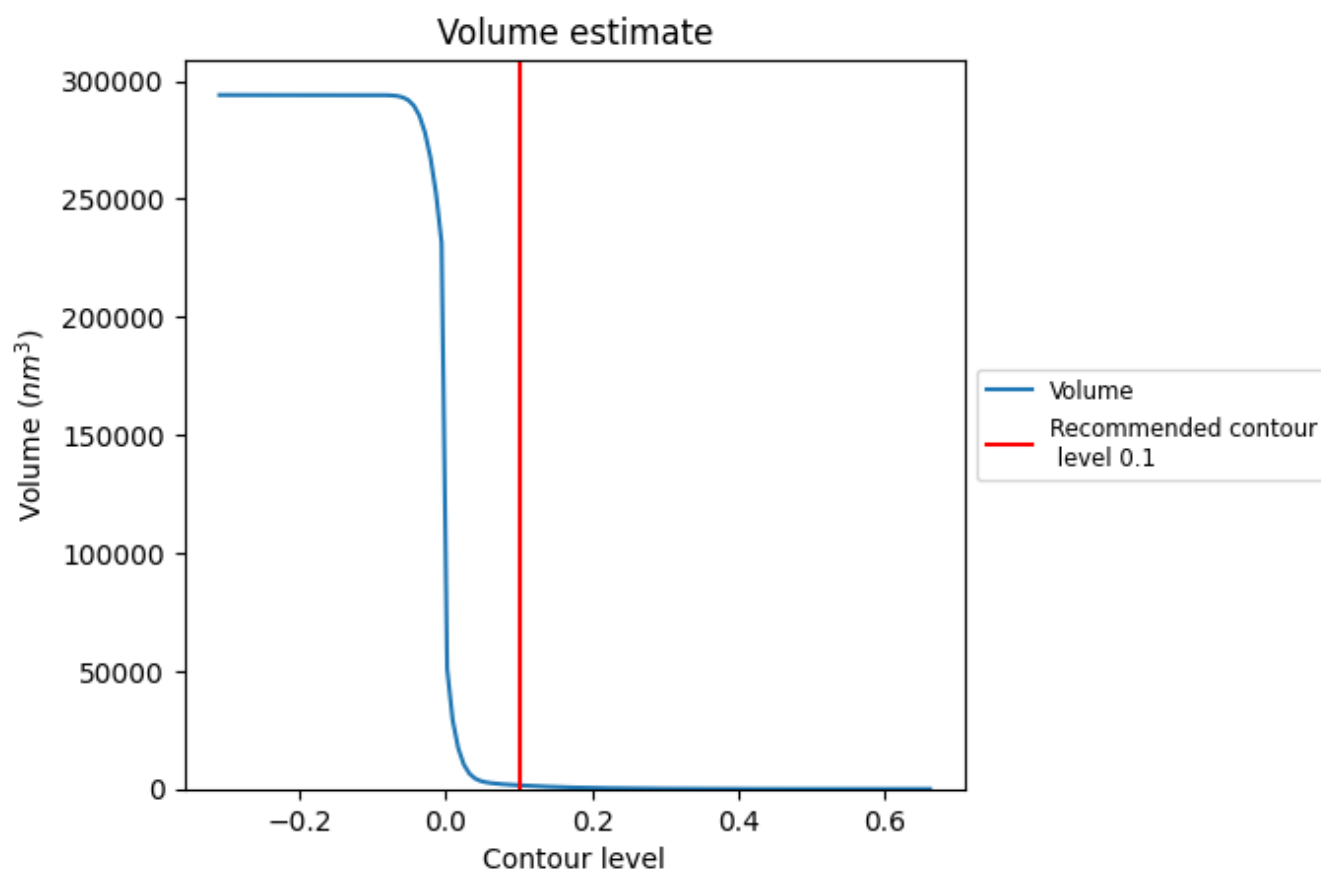
This section contains the results of statistical analysis of the map.

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.

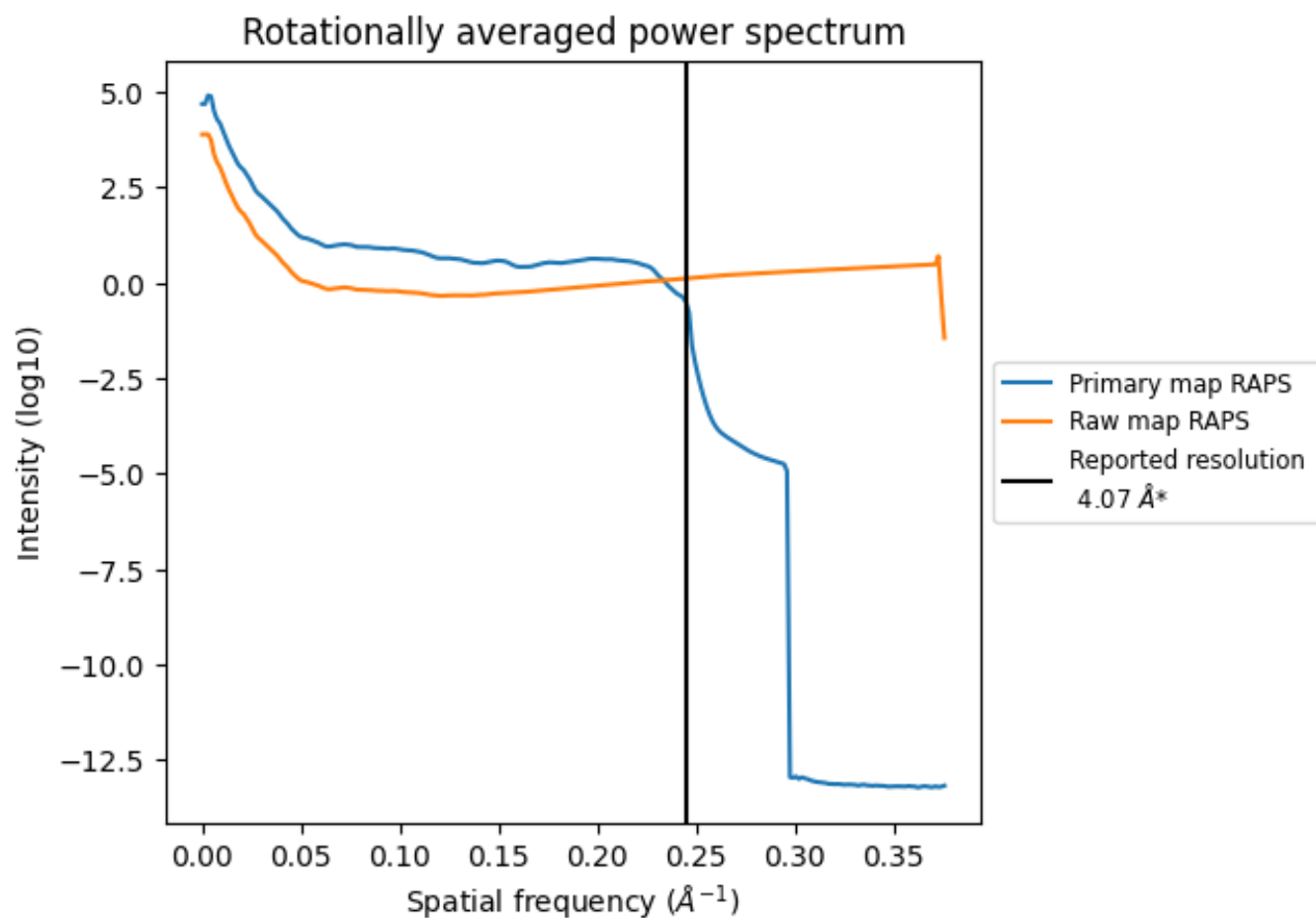
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 1565 nm³; this corresponds to an approximate mass of 1414 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 ⓘ

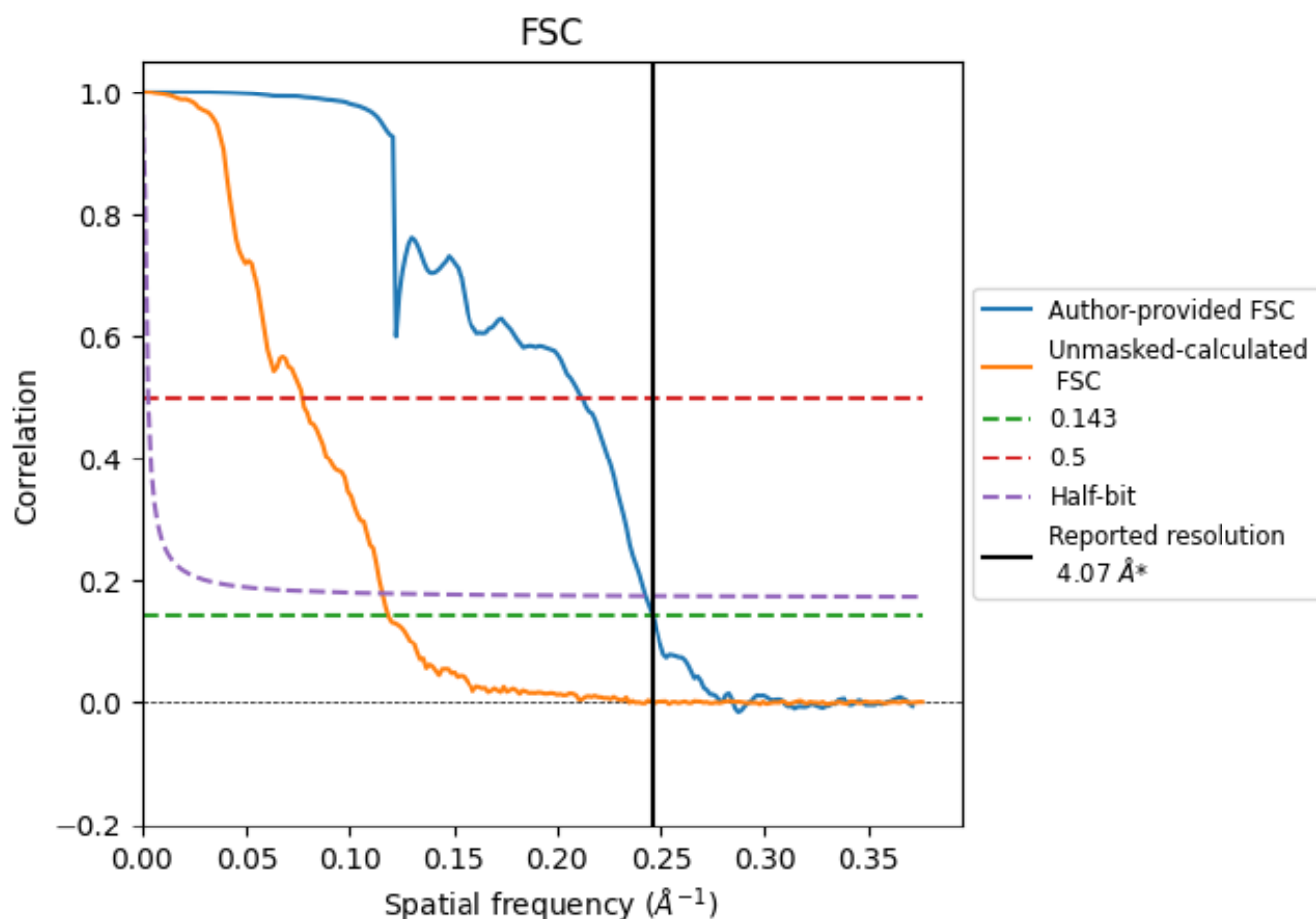


*Reported resolution corresponds to spatial frequency of 0.246 Å⁻¹

8 Fourier-Shell correlation [i](#)

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

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.246 $\text{\AA}^{-1}$

8.2 Resolution estimates [i](#)

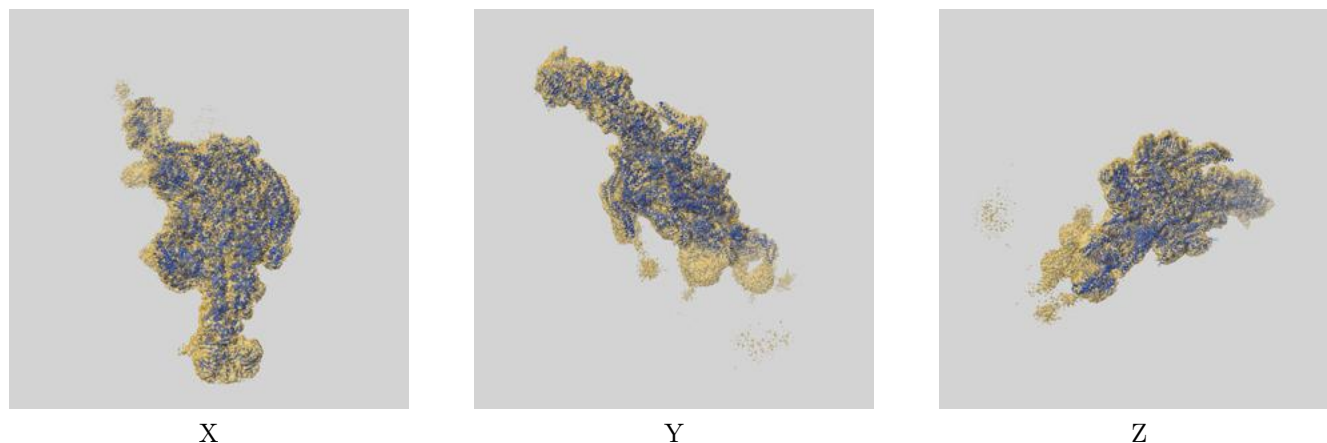
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.07	-	-
Author-provided FSC curve	4.07	4.72	4.13
Unmasked-calculated*	8.43	12.94	8.64

*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 8.43 differs from the reported value 4.07 by more than 10 %

9 Map-model fit [i](#)

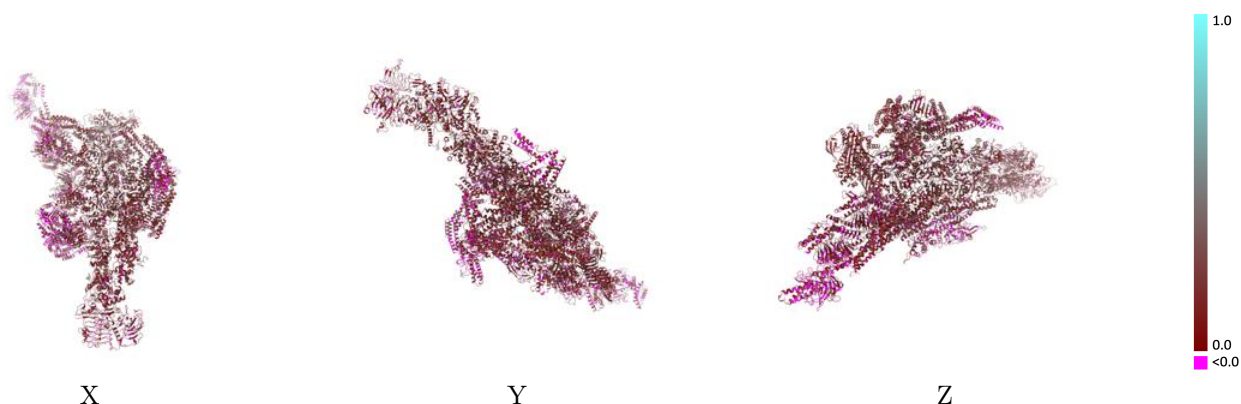
This section contains information regarding the fit between EMDB map EMD-73178 and PDB model 9YNG. Per-residue inclusion information can be found in [section 3](#) on [page 10](#).

9.1 Map-model overlay [i](#)



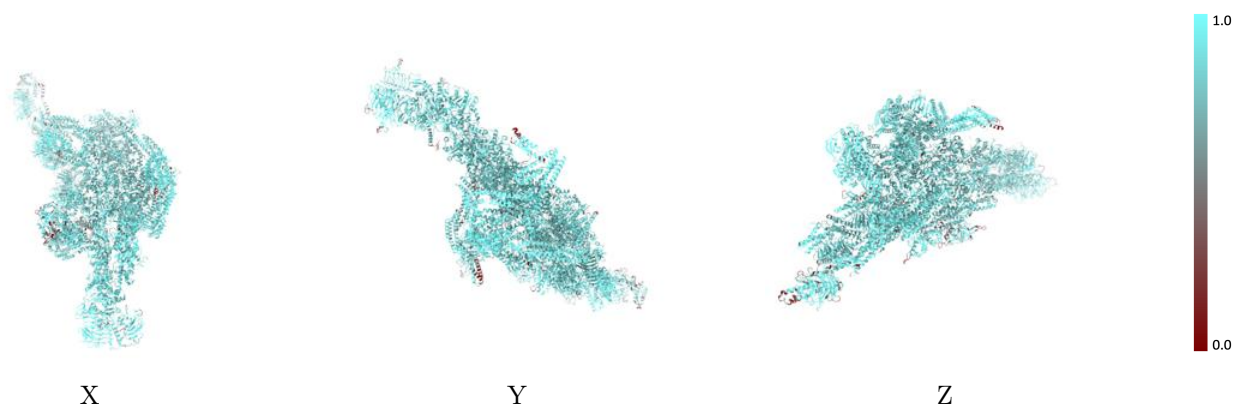
The images above show the 3D surface view of the map at the recommended contour level 0.1 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



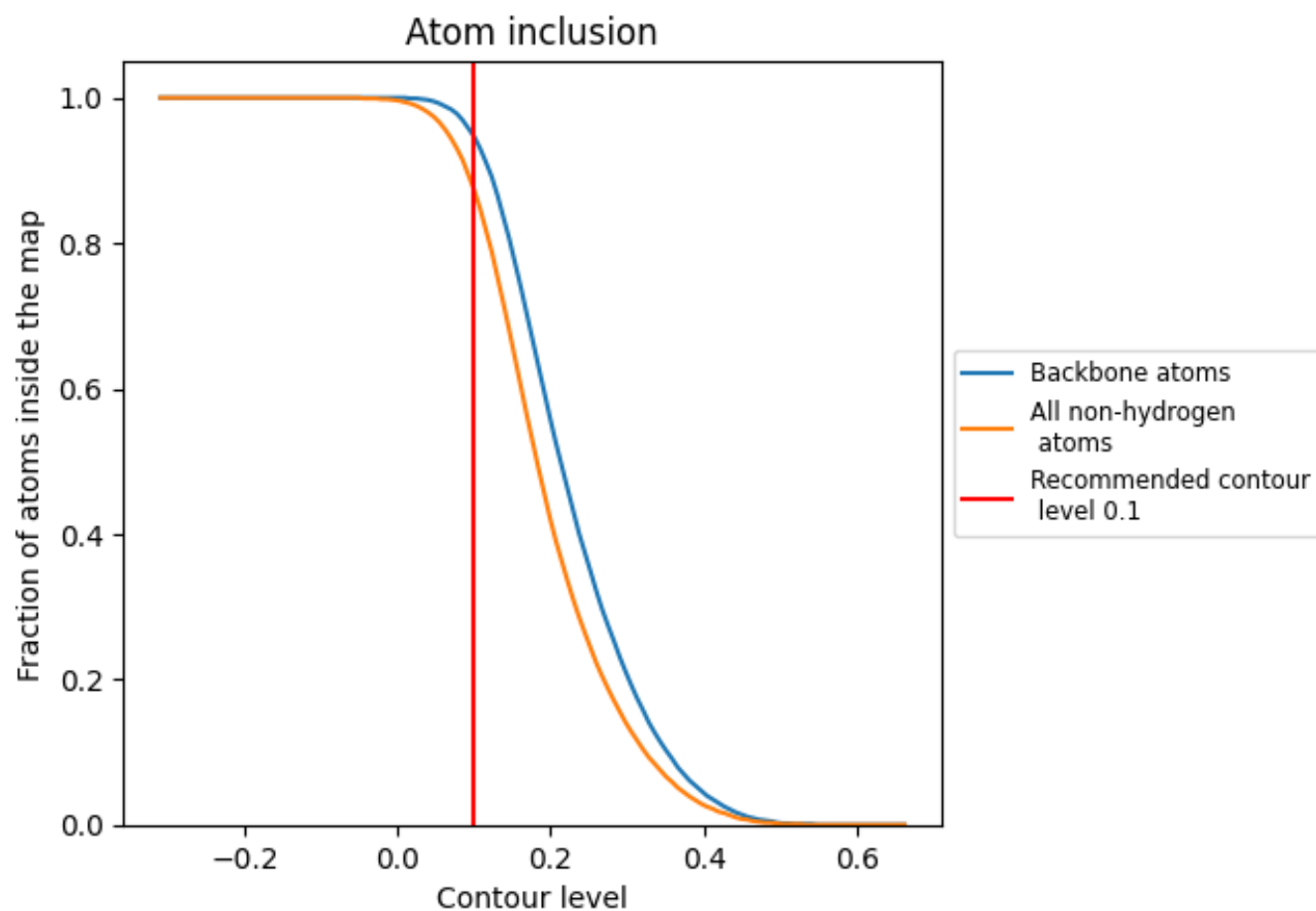
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.1).

9.4 Atom inclusion [i](#)



At the recommended contour level, 95% of all backbone atoms, 87% 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 (0.1) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8730	 0.1830
A	 0.8780	 0.2270
B	 0.8730	 0.2300
C	 0.8480	 0.2310
D	 0.8790	 0.2370
E	 0.8570	 0.2340
F	 0.8700	 0.2300
G	 0.8640	 0.2150
H	 0.8580	 0.2220
I	 0.8870	 0.1890
J	 0.8850	 0.2080
K	 0.9060	 0.2120
L	 0.8910	 0.2280
M	 0.8970	 0.1840
N	 0.8810	 0.1570
O	 0.9220	 0.1770
P	 0.8880	 0.1980
Q	 0.8580	 0.2010
R	 0.9330	 0.1660
U	 0.8900	 0.1590
V	 0.9040	 0.1770
W	 0.9030	 0.1660
Y	 0.8850	 0.1840
Z	 0.9120	 0.2060
e	 0.8050	 0.1130
f	 0.8490	 0.1490
g	 0.8840	 0.1250
h	 0.9410	 0.1320
m	 0.8640	 0.1740
n	 0.8410	 0.1570
o	 0.9060	 0.1210
p	 0.8830	 0.0880

