



## wwPDB EM Validation Summary Report ⓘ

Mar 10, 2026 – 12:59 PM UTC

PDB ID : 4ATU / pdb\_00004atu  
EMDB ID : EMD-2095  
Title : Human doublecortin N-DC repeat plus linker, and tubulin (2XRP) docked into an 8Å cryo-EM map of doublecortin-stabilised microtubules reconstructed in absence of kinesin  
Authors : Liu, J.S.; Schubert, C.R.; Fu, X.; Fourniol, F.J.; Jaiswal, J.K.; Houdusse, A.; Stultz, C.M.; Moores, C.A.; Walsh, C.A.  
Deposited on : 2012-05-09  
Resolution : 8.30 Å (reported)  
Based on initial model : 2XRP

This is a wwPDB EM Validation Summary Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto: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>.

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

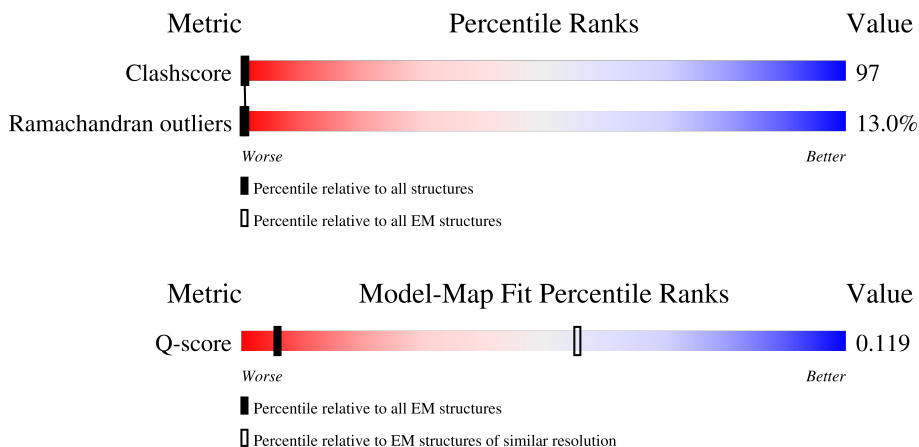
EMDB validation analysis : 0.0.1.dev132  
Mogul : 2022.3.0, CSD as543be (2022)  
MolProbity : 4-5-2 with Phenix2.0  
Buster-report : wwPDB partial adaption of 1.1.7 (2018)  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)

# 1 Overall quality at a glance i

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

The reported resolution of this entry is 8.30 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.



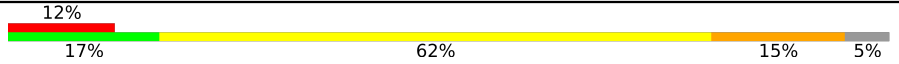
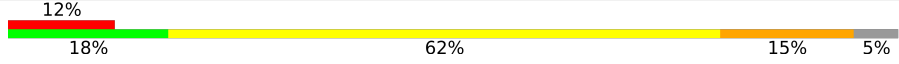
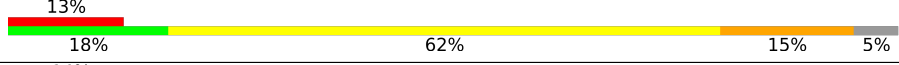
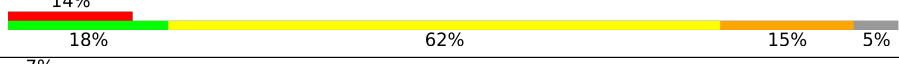

Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Q-score	-	25397	280 ( 7.82 - 8.80 )

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  $\geq 3$ , 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	445	<div style="display: flex; align-items: center;"> <div style="width: 11%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 18%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 64%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 14%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 1%; height: 10px; background: grey;"></div> </div> <p style="margin-left: 10px;">11% 18% 64% 14% .</p>
1	C	445	<div style="display: flex; align-items: center;"> <div style="width: 11%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 17%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 64%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 14%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 1%; height: 10px; background: grey;"></div> </div> <p style="margin-left: 10px;">11% 17% 64% 14% .</p>
1	E	445	<div style="display: flex; align-items: center;"> <div style="width: 11%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 18%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 63%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 14%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 1%; height: 10px; background: grey;"></div> </div> <p style="margin-left: 10px;">11% 18% 63% 14% .</p>
1	G	445	<div style="display: flex; align-items: center;"> <div style="width: 15%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 16%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 65%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 14%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, blue);"></div> <div style="width: 1%; height: 10px; background: grey;"></div> </div> <p style="margin-left: 10px;">15% 16% 65% 14% .</p>

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Mol	Chain	Length	Quality of chain
2	B	452	
2	D	452	
2	F	452	
2	H	452	
3	I	373	

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 27840 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 TUBULIN BETA-2B CHAIN.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	426	3351	2105	575	646	25	0	0
1	C	426	3351	2105	575	646	25	0	0
1	E	426	3351	2105	575	646	25	0	0
1	G	426	3351	2105	575	646	25	0	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	57	ALA	THR	conflict	UNP Q6B856
A	172	VAL	MET	conflict	UNP Q6B856
A	298	ALA	SER	conflict	UNP Q6B856
A	318	VAL	ILE	conflict	UNP Q6B856
C	57	ALA	THR	conflict	UNP Q6B856
C	172	VAL	MET	conflict	UNP Q6B856
C	298	ALA	SER	conflict	UNP Q6B856
C	318	VAL	ILE	conflict	UNP Q6B856
E	57	ALA	THR	conflict	UNP Q6B856
E	172	VAL	MET	conflict	UNP Q6B856
E	298	ALA	SER	conflict	UNP Q6B856
E	318	VAL	ILE	conflict	UNP Q6B856
G	57	ALA	THR	conflict	UNP Q6B856
G	172	VAL	MET	conflict	UNP Q6B856
G	298	ALA	SER	conflict	UNP Q6B856
G	318	VAL	ILE	conflict	UNP Q6B856

- Molecule 2 is a protein called TUBULIN ALPHA-1D CHAIN.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	429	Total 3334	C 2114	N 569	O 630	S 21	0	0
2	D	429	Total 3334	C 2114	N 569	O 630	S 21	0	0
2	F	429	Total 3334	C 2114	N 569	O 630	S 21	0	0
2	H	429	Total 3334	C 2114	N 569	O 630	S 21	0	0

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	450	GLU	ASP	conflict	UNP Q2HJ86
B	7	ILE	VAL	conflict	UNP Q2HJ86
B	114	ILE	LEU	conflict	UNP Q2HJ86
B	136	SER	LEU	conflict	UNP Q2HJ86
B	137	VAL	ILE	conflict	UNP Q2HJ86
B	265	GLY	ILE	conflict	UNP Q2HJ86
B	358	GLU	GLN	conflict	UNP Q2HJ86
B	437	VAL	MET	conflict	UNP Q2HJ86
D	450	GLU	ASP	conflict	UNP Q2HJ86
D	7	ILE	VAL	conflict	UNP Q2HJ86
D	114	ILE	LEU	conflict	UNP Q2HJ86
D	136	SER	LEU	conflict	UNP Q2HJ86
D	137	VAL	ILE	conflict	UNP Q2HJ86
D	265	GLY	ILE	conflict	UNP Q2HJ86
D	358	GLU	GLN	conflict	UNP Q2HJ86
D	437	VAL	MET	conflict	UNP Q2HJ86
F	450	GLU	ASP	conflict	UNP Q2HJ86
F	7	ILE	VAL	conflict	UNP Q2HJ86
F	114	ILE	LEU	conflict	UNP Q2HJ86
F	136	SER	LEU	conflict	UNP Q2HJ86
F	137	VAL	ILE	conflict	UNP Q2HJ86
F	265	GLY	ILE	conflict	UNP Q2HJ86
F	358	GLU	GLN	conflict	UNP Q2HJ86
F	437	VAL	MET	conflict	UNP Q2HJ86
H	450	GLU	ASP	conflict	UNP Q2HJ86
H	7	ILE	VAL	conflict	UNP Q2HJ86
H	114	ILE	LEU	conflict	UNP Q2HJ86
H	136	SER	LEU	conflict	UNP Q2HJ86
H	137	VAL	ILE	conflict	UNP Q2HJ86
H	265	GLY	ILE	conflict	UNP Q2HJ86
H	358	GLU	GLN	conflict	UNP Q2HJ86
H	437	VAL	MET	conflict	UNP Q2HJ86

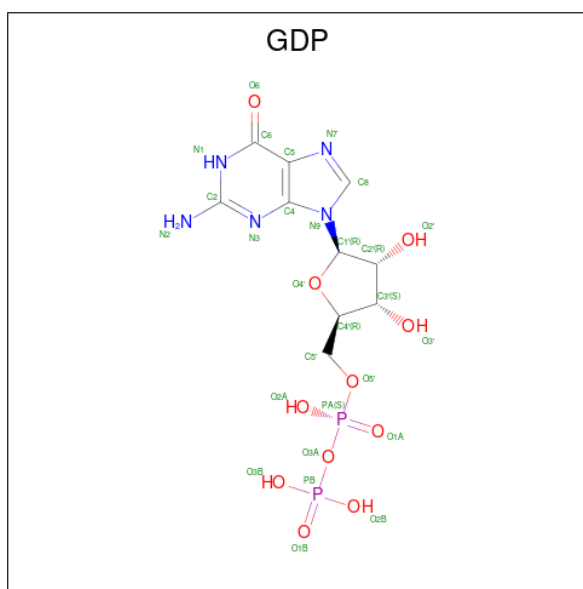
- Molecule 3 is a protein called NEURONAL MIGRATION PROTEIN DOUBLECORTIN.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	I	107	860	541	151	165	3	0	1

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	-12	GLY	-	expression tag	UNP O43602
I	-11	ALA	-	expression tag	UNP O43602
I	-10	MET	-	expression tag	UNP O43602
I	-9	ASP	-	expression tag	UNP O43602
I	-8	TYR	-	expression tag	UNP O43602
I	-7	LYS	-	expression tag	UNP O43602
I	-6	ASP	-	expression tag	UNP O43602
I	-5	ASP	-	expression tag	UNP O43602
I	-4	ASP	-	expression tag	UNP O43602
I	-3	ASP	-	expression tag	UNP O43602
I	-2	LYS	-	expression tag	UNP O43602
I	-1	ILE	-	expression tag	UNP O43602
I	0	CYS	-	expression tag	UNP O43602
I	1	ARG	-	expression tag	UNP O43602

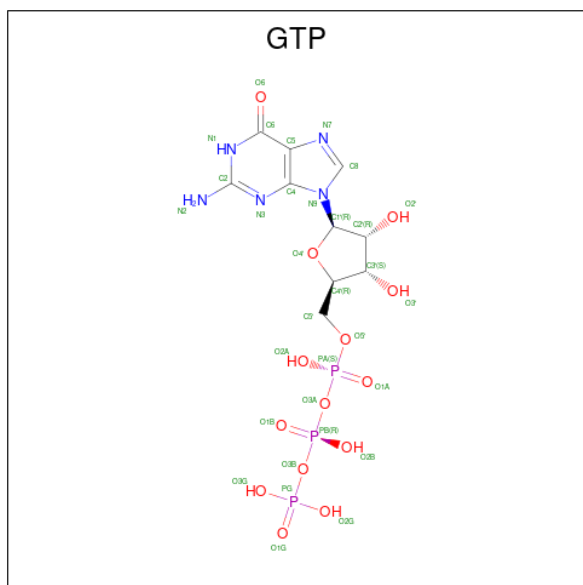
- Molecule 4 is GUANOSINE-5'-DIPHOSPHATE (CCD ID: GDP) (formula:  $C_{10}H_{15}N_5O_{11}P_2$ ).



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Mol	Chain	Residues	Atoms				AltConf	
4	C	1	Total	C	N	O	P	0
			28	10	5	11	2	
4	E	1	Total	C	N	O	P	0
			28	10	5	11	2	
4	G	1	Total	C	N	O	P	0
			28	10	5	11	2	

- Molecule 5 is GUANOSINE-5'-TRIPHOSPHATE (CCD ID: GTP) (formula:  $C_{10}H_{16}N_5O_{14}P_3$ ).

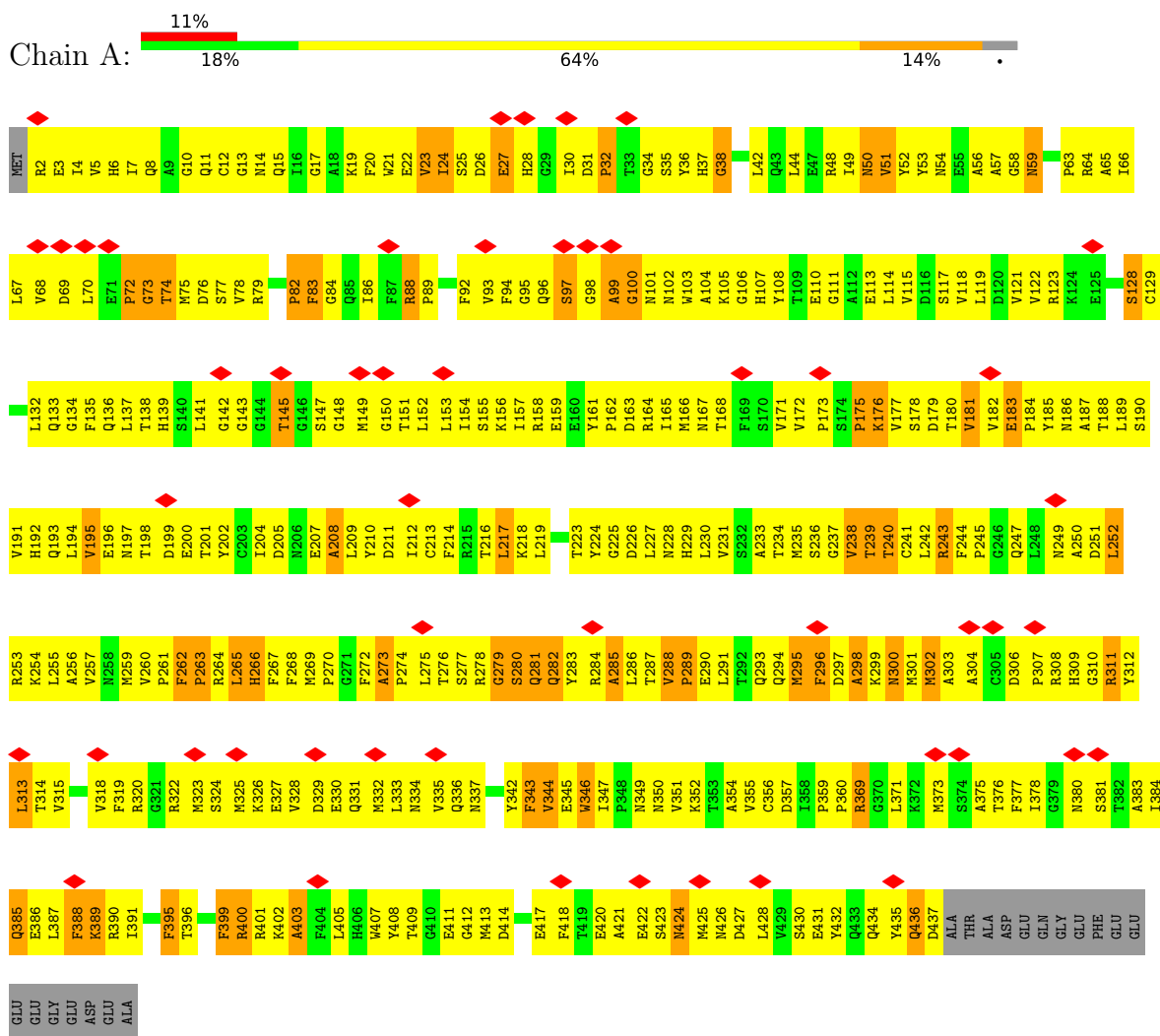


Mol	Chain	Residues	Atoms				AltConf	
5	B	1	Total	C	N	O	P	0
			32	10	5	14	3	
5	D	1	Total	C	N	O	P	0
			32	10	5	14	3	
5	F	1	Total	C	N	O	P	0
			32	10	5	14	3	
5	H	1	Total	C	N	O	P	0
			32	10	5	14	3	

### 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.

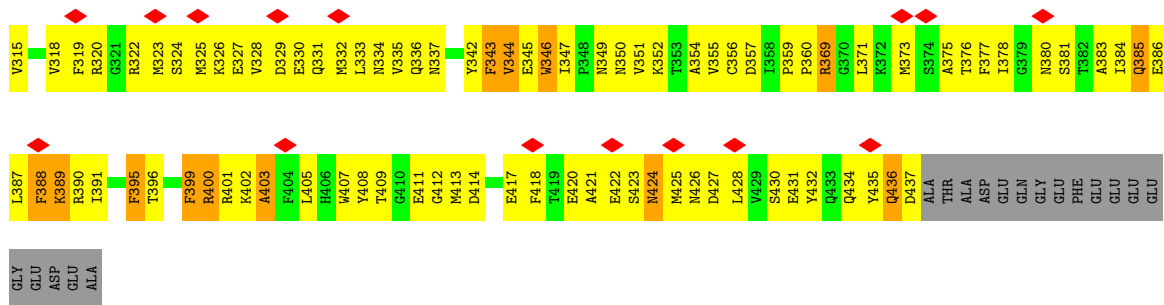
#### • Molecule 1: TUBULIN BETA-2B CHAIN



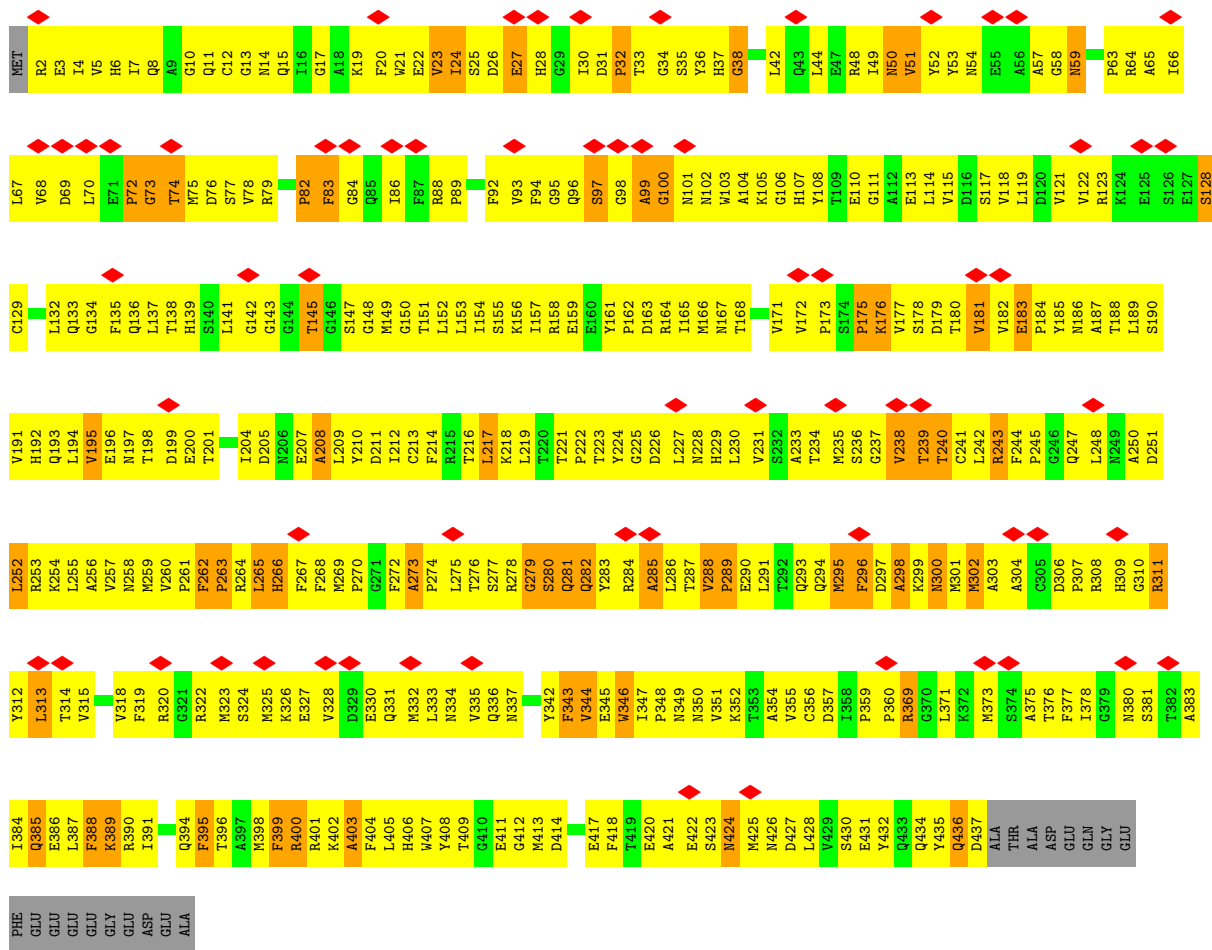
#### • Molecule 1: TUBULIN BETA-2B CHAIN



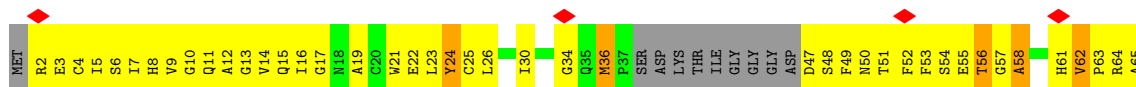


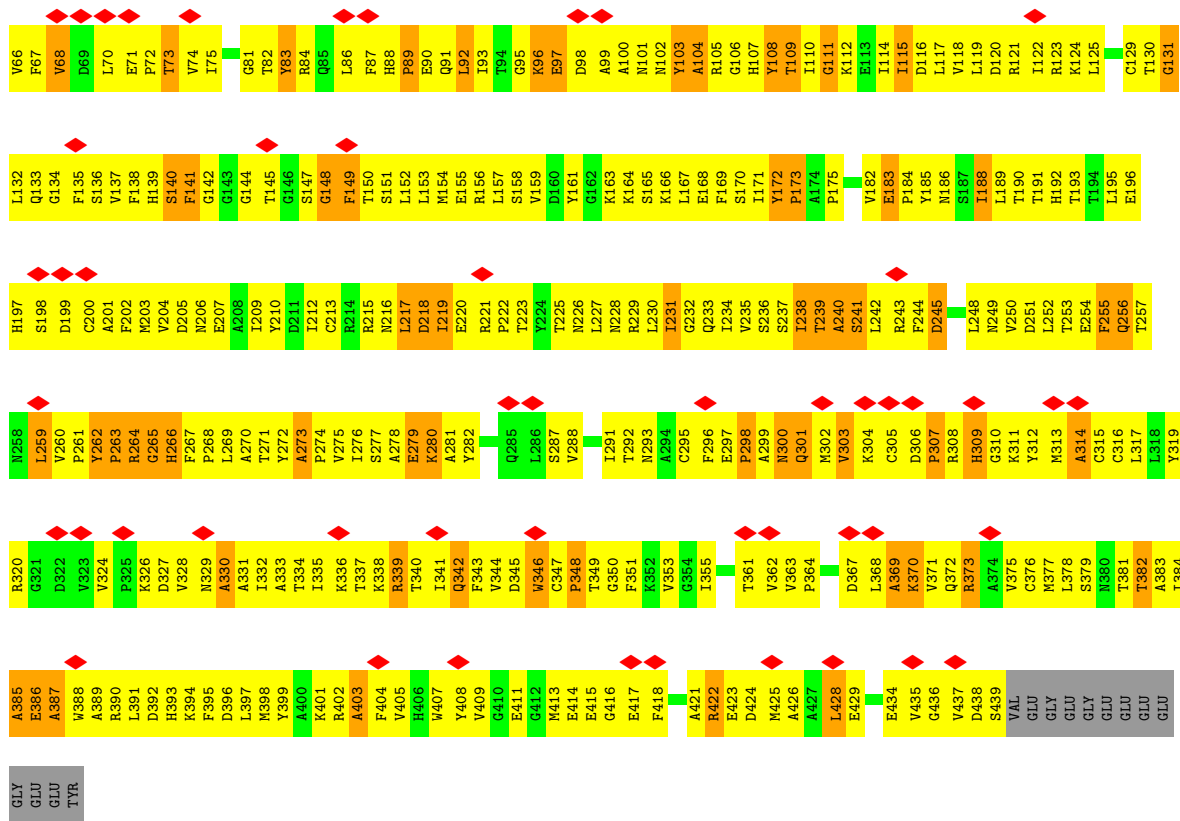


• Molecule 1: TUBULIN BETA-2B CHAIN

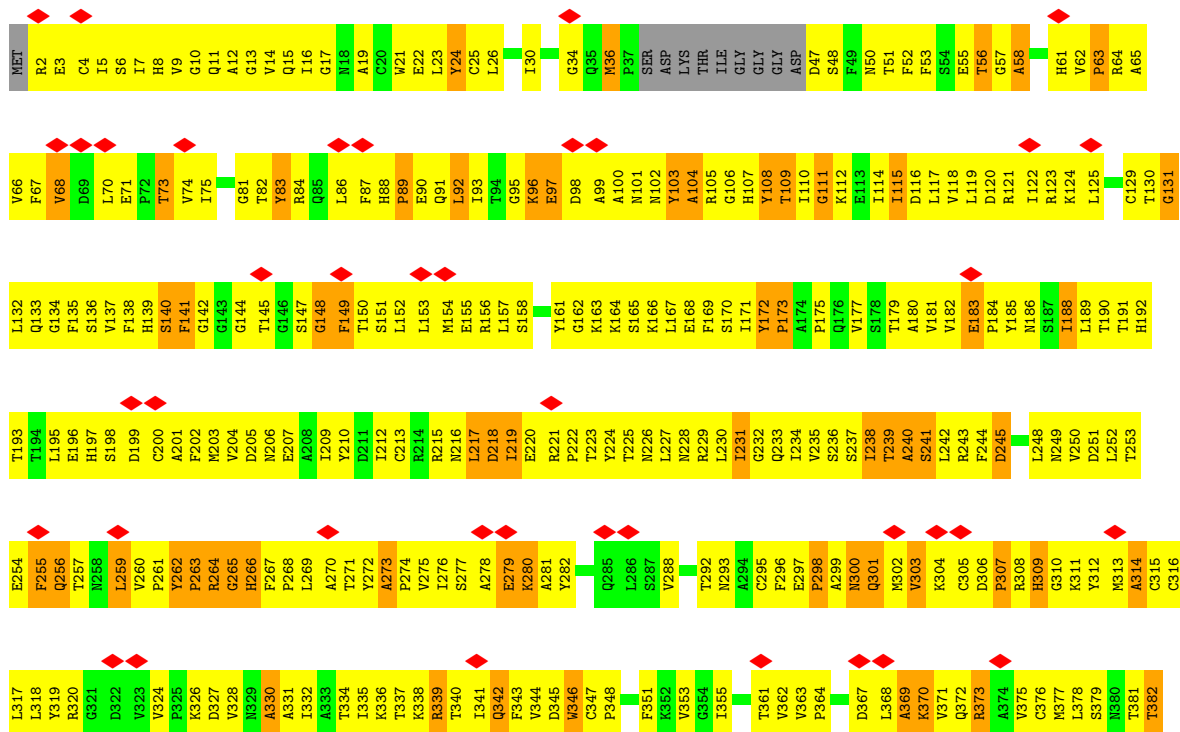


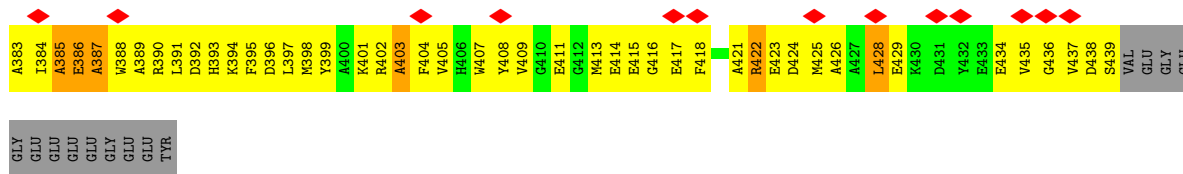
• Molecule 2: TUBULIN ALPHA-1D CHAIN



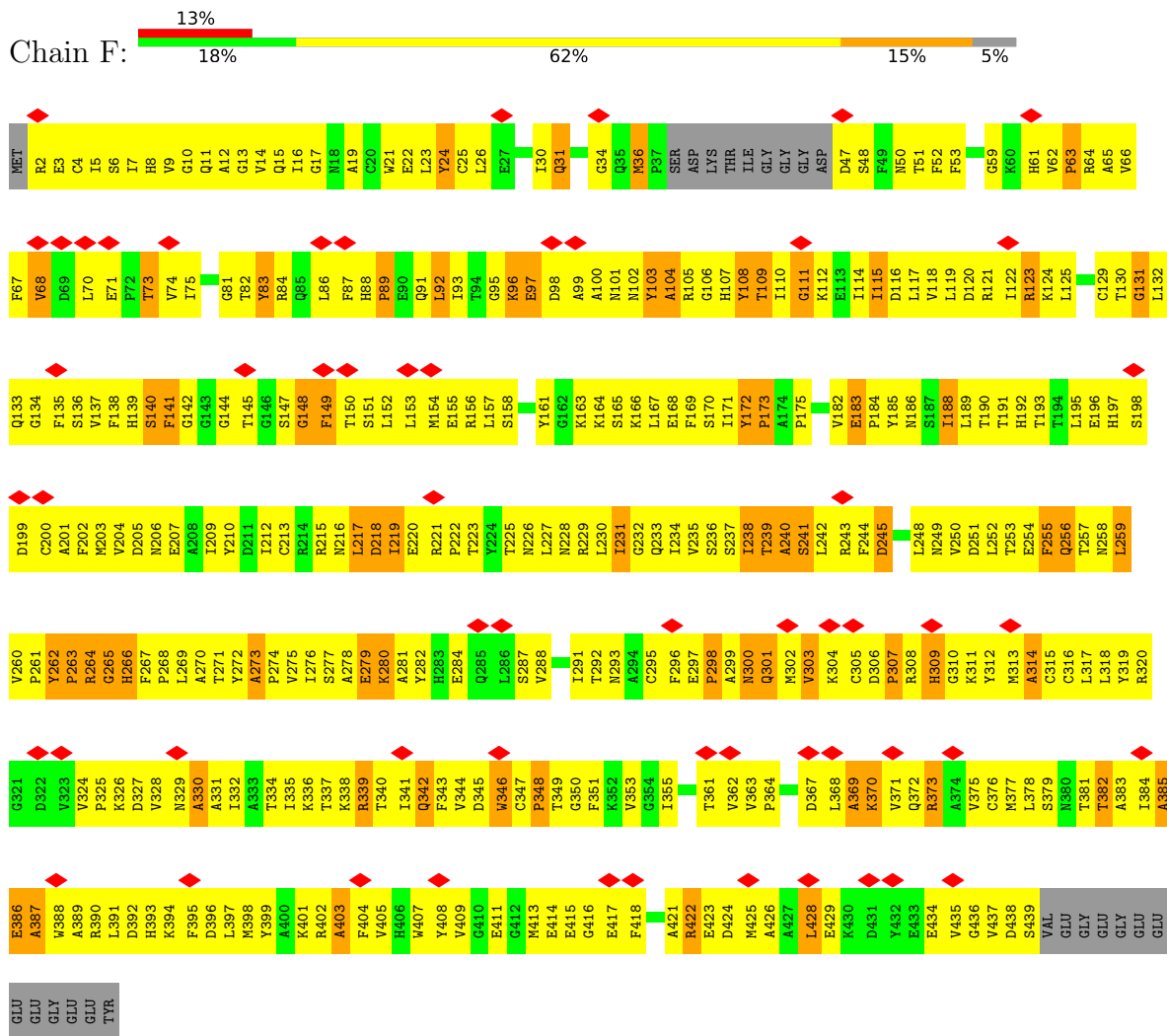


• Molecule 2: TUBULIN ALPHA-1D CHAIN

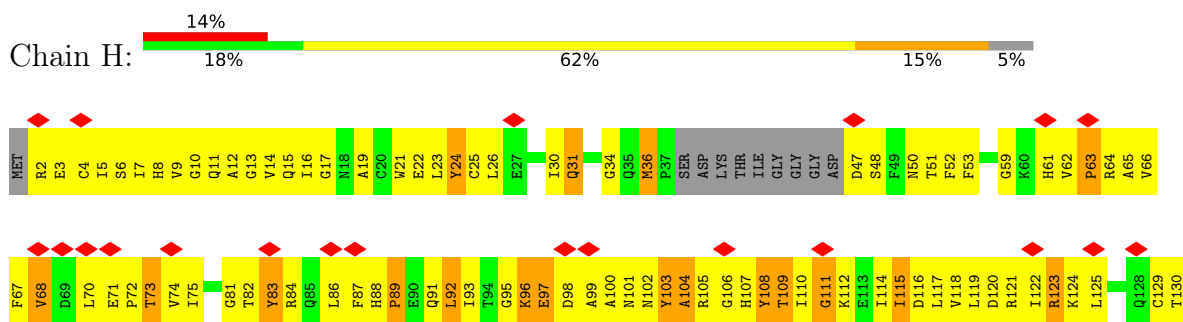


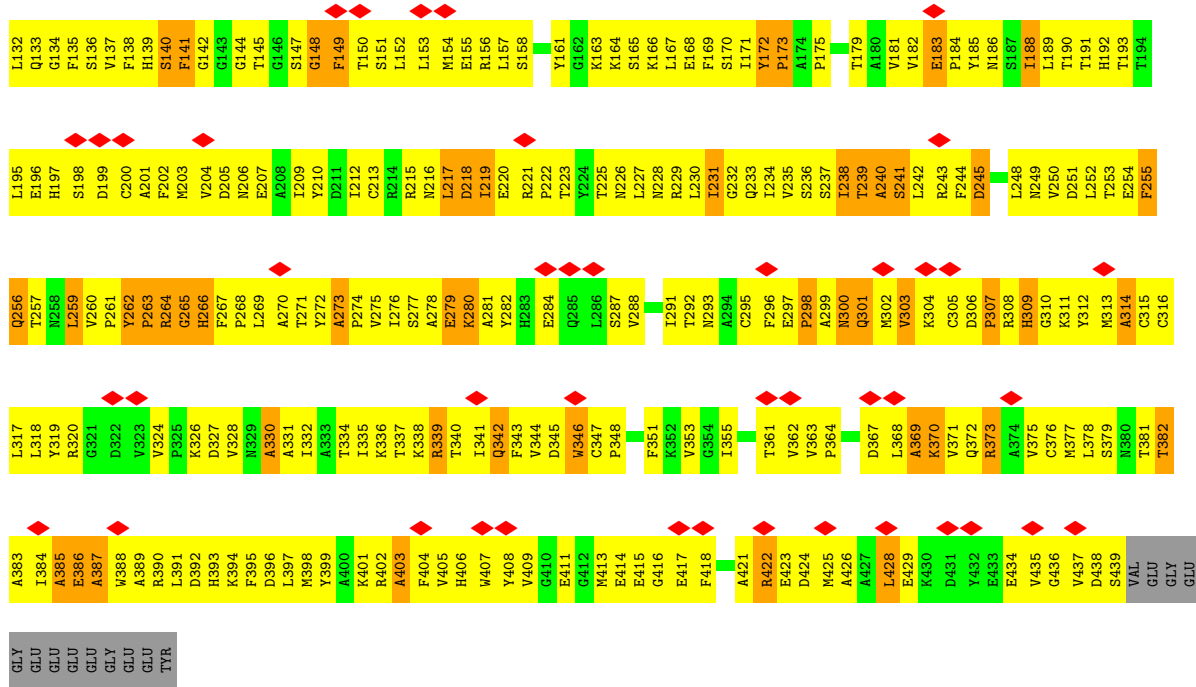


• Molecule 2: TUBULIN ALPHA-1D CHAIN

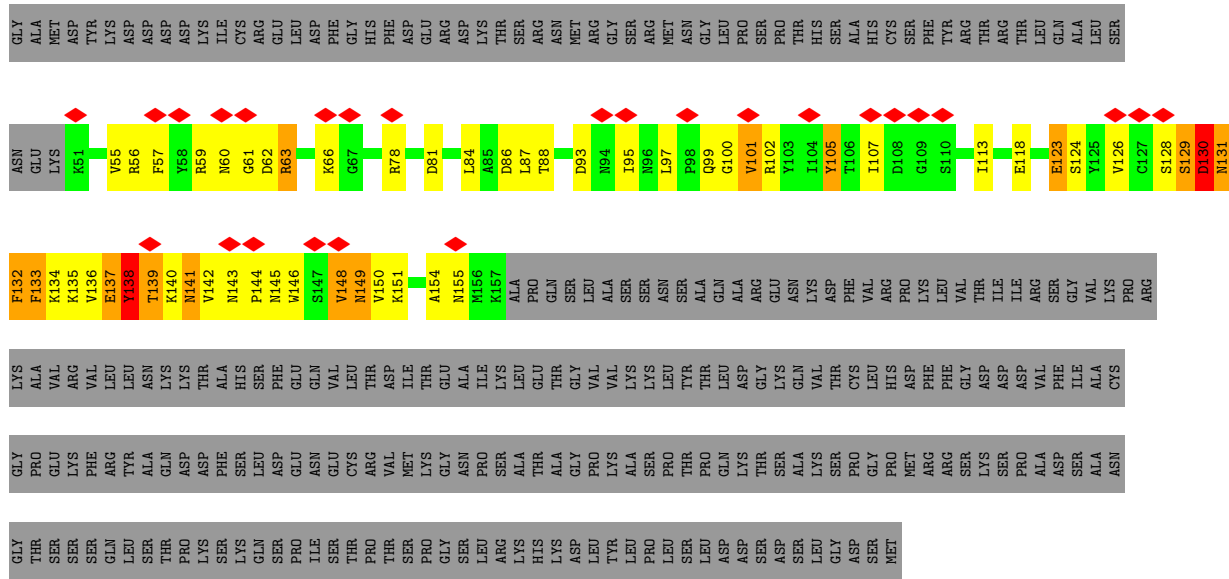


• Molecule 2: TUBULIN ALPHA-1D CHAIN





● Molecule 3: NEURONAL MIGRATION PROTEIN DOUBLECORTIN



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	HELICAL, twist=Not provided°, rise=Not provided Å, axial sym=Not provided	Depositor
Number of particles used	146000	Depositor
Resolution determination method	Not provided	
CTF correction method	DONE WITH FREALIGN	Depositor
Microscope	FEI TECNAI F20	Depositor
Voltage (kV)	200	Depositor
Electron dose ( $e^-/\text{Å}^2$ )	17	Depositor
Minimum defocus (nm)	900	Depositor
Maximum defocus (nm)	3600	Depositor
Magnification	50000	Depositor
Image detector	KODAK SO-163 FILM	Depositor
Maximum map value	12.476	Depositor
Minimum map value	-8.861	Depositor
Average map value	0.573	Depositor
Map value standard deviation	2.008	Depositor
Recommended contour level	1.6	Depositor
Map size (Å)	238.0, 114.799995, 282.8	wwPDB
Map dimensions	85, 41, 101	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	2.8, 2.8, 2.8	Depositor

## 5 Model quality i

### 5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: GDP, GTP

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	0.63	0/3426	1.11	22/4642 (0.5%)
1	C	0.63	0/3426	1.11	22/4642 (0.5%)
1	E	0.63	0/3426	1.11	22/4642 (0.5%)
1	G	0.63	0/3426	1.11	23/4642 (0.5%)
2	B	1.33	4/3410 (0.1%)	1.12	23/4629 (0.5%)
2	D	1.33	4/3410 (0.1%)	1.12	23/4629 (0.5%)
2	F	1.33	4/3410 (0.1%)	1.13	23/4629 (0.5%)
2	H	1.33	4/3410 (0.1%)	1.13	23/4629 (0.5%)
3	I	1.01	0/876	1.57	21/1178 (1.8%)
All	All	1.04	16/28220 (0.1%)	1.13	202/38262 (0.5%)

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
3	I	0	8

The worst 5 of 16 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	92	LEU	C-N	52.09	1.98	1.33
2	F	92	LEU	C-N	52.06	1.98	1.33
2	H	92	LEU	C-N	52.04	1.98	1.33
2	B	92	LEU	C-N	52.01	1.98	1.33
2	B	298	PRO	C-N	35.96	1.73	1.33

The worst 5 of 202 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	68	VAL	O-C-N	-10.96	111.26	122.99
2	F	68	VAL	O-C-N	-10.89	111.33	122.99
2	B	68	VAL	O-C-N	-10.89	111.34	122.99
2	H	68	VAL	O-C-N	-10.86	111.37	122.99
2	H	172	TYR	CA-C-N	10.78	133.31	119.84

There are no chirality outliers.

5 of 8 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	I	105	TYR	Sidechain
3	I	123	GLU	Sidechain
3	I	129	SER	Peptide
3	I	81	ASP	Sidechain
3	I	93	ASP	Sidechain

## 5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3351	0	3229	580	0
1	C	3351	0	3229	658	0
1	E	3351	0	3229	589	0
1	G	3351	0	3229	791	0
2	B	3334	0	3223	722	0
2	D	3334	0	3223	698	0
2	F	3334	0	3223	766	0
2	H	3334	0	3223	752	0
3	I	860	0	841	99	0
4	A	28	0	12	1	0
4	C	28	0	12	1	0
4	E	28	0	12	1	0
4	G	28	0	12	4	0
5	B	32	0	12	5	0
5	D	32	0	12	4	0
5	F	32	0	12	4	0
5	H	32	0	12	5	0
All	All	27840	0	26745	5295	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 97.

The worst 5 of 5295 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)
1:G:257:VAL:HG21	2:H:407:TRP:CG	1.28	1.64
2:B:296:PHE:CE2	2:B:341:ILE:HD11	1.32	1.62
2:H:296:PHE:CE2	2:H:341:ILE:HD11	1.32	1.62
2:D:296:PHE:CE2	2:D:341:ILE:HD11	1.32	1.62
2:F:296:PHE:CE2	2:F:341:ILE:HD11	1.32	1.62

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	424/445 (95%)	274 (65%)	94 (22%)	56 (13%)	0	4
1	C	424/445 (95%)	273 (64%)	95 (22%)	56 (13%)	0	4
1	E	424/445 (95%)	273 (64%)	95 (22%)	56 (13%)	0	4
1	G	424/445 (95%)	273 (64%)	95 (22%)	56 (13%)	0	4
2	B	423/452 (94%)	279 (66%)	87 (21%)	57 (14%)	0	4
2	D	423/452 (94%)	281 (66%)	85 (20%)	57 (14%)	0	4
2	F	423/452 (94%)	279 (66%)	87 (21%)	57 (14%)	0	4
2	H	423/452 (94%)	278 (66%)	88 (21%)	57 (14%)	0	4
3	I	105/373 (28%)	88 (84%)	15 (14%)	2 (2%)	6	32
All	All	3493/3961 (88%)	2298 (66%)	741 (21%)	454 (13%)	0	4

5 of 454 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	23	VAL
1	A	24	ILE
1	A	32	PRO
1	A	50	ASN
1	A	82	PRO

### 5.3.2 Protein sidechains [i](#)

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

### 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](#)

8 ligands 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	$\# Z  > 2$
5	GTP	D	500	-	33,34,34	1.89	3 (9%)	50,54,54	0.91	3 (6%)
4	GDP	C	600	-	29,30,30	2.95	11 (37%)	45,47,47	3.48	18 (40%)
4	GDP	E	600	-	29,30,30	2.94	11 (37%)	45,47,47	3.48	18 (40%)
4	GDP	A	600	-	29,30,30	2.95	11 (37%)	45,47,47	3.48	17 (37%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	GDP	G	600	-	29,30,30	2.95	11 (37%)	45,47,47	3.48	17 (37%)
5	GTP	F	500	-	33,34,34	1.89	3 (9%)	50,54,54	0.91	3 (6%)
5	GTP	H	500	-	33,34,34	1.90	3 (9%)	50,54,54	0.91	3 (6%)
5	GTP	B	500	-	33,34,34	2.02	4 (12%)	50,54,54	1.20	3 (6%)

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
5	GTP	D	500	-	-	4/22/38/38	0/3/3/3
4	GDP	C	600	-	-	4/16/32/32	0/3/3/3
4	GDP	E	600	-	-	4/16/32/32	0/3/3/3
4	GDP	A	600	-	-	4/16/32/32	0/3/3/3
4	GDP	G	600	-	-	4/16/32/32	0/3/3/3
5	GTP	F	500	-	-	4/22/38/38	0/3/3/3
5	GTP	H	500	-	-	4/22/38/38	0/3/3/3
5	GTP	B	500	-	-	5/22/38/38	0/3/3/3

The worst 5 of 57 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	600	GDP	PA-O3A	7.56	1.67	1.59
4	C	600	GDP	PA-O3A	7.51	1.67	1.59
4	G	600	GDP	PA-O3A	7.48	1.67	1.59
4	E	600	GDP	PA-O3A	7.43	1.67	1.59
5	B	500	GTP	PA-O3A	-5.99	1.53	1.59

The worst 5 of 82 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	600	GDP	N9-C8-N7	-10.79	93.40	113.40
4	G	600	GDP	N9-C8-N7	-10.76	93.44	113.40
4	E	600	GDP	N9-C8-N7	-10.75	93.46	113.40
4	C	600	GDP	N9-C8-N7	-10.74	93.48	113.40
4	A	600	GDP	C8-N7-C5	9.25	120.73	104.26

There are no chirality outliers.

5 of 33 torsion outliers are listed below:

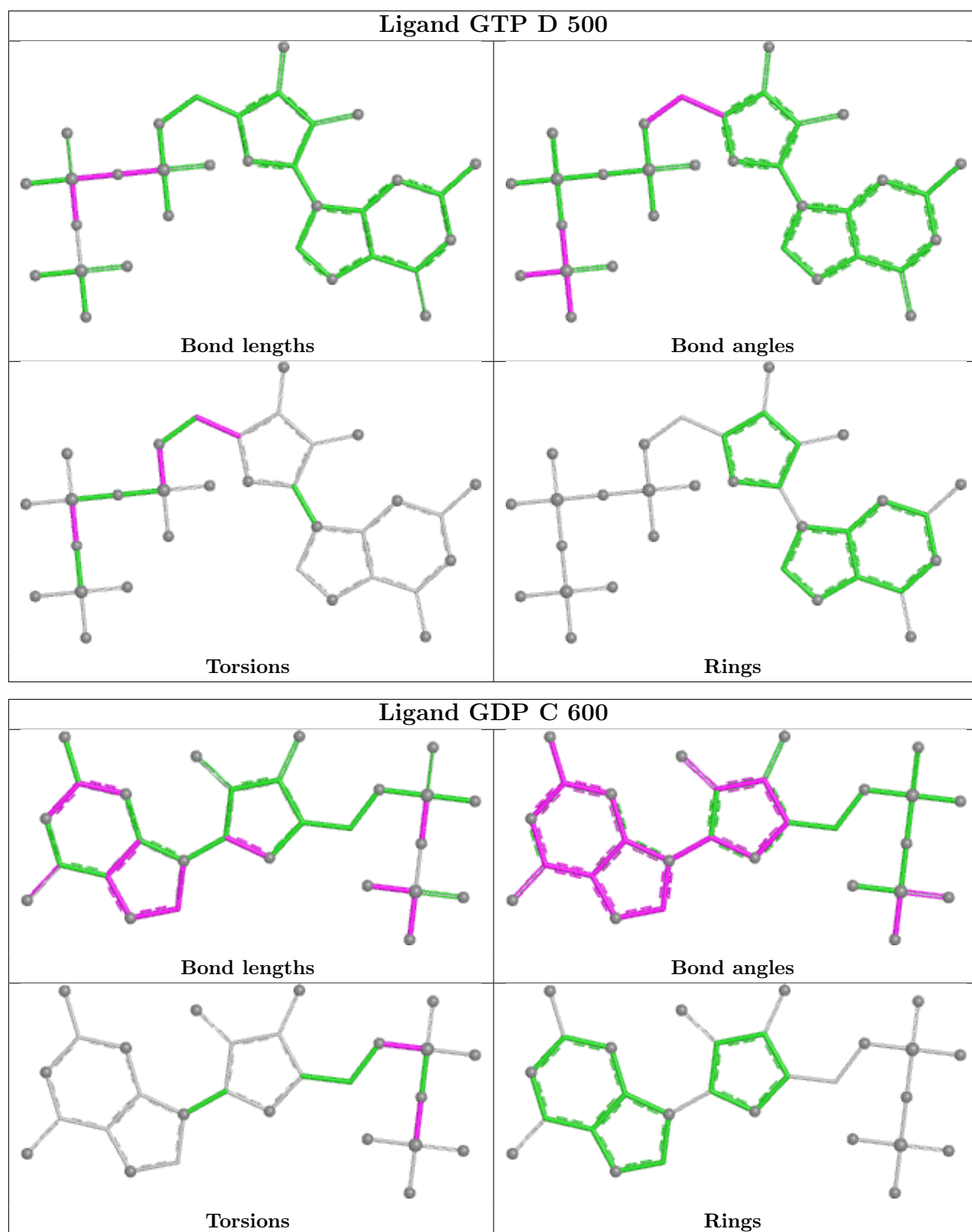
Mol	Chain	Res	Type	Atoms
4	A	600	GDP	PA-O3A-PB-O2B
4	A	600	GDP	C5'-O5'-PA-O3A
4	A	600	GDP	C5'-O5'-PA-O2A
4	C	600	GDP	PA-O3A-PB-O2B
4	C	600	GDP	C5'-O5'-PA-O3A

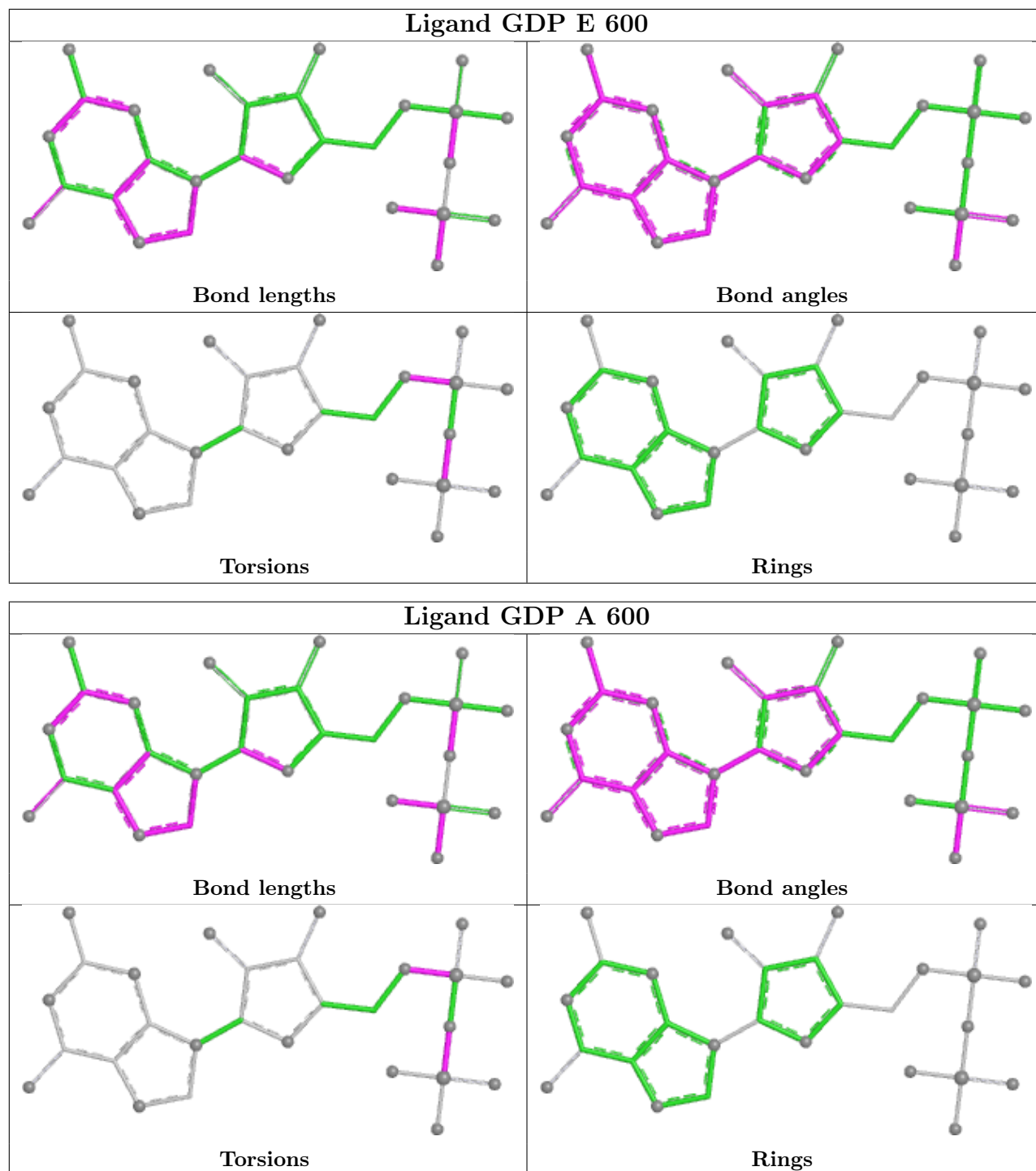
There are no ring outliers.

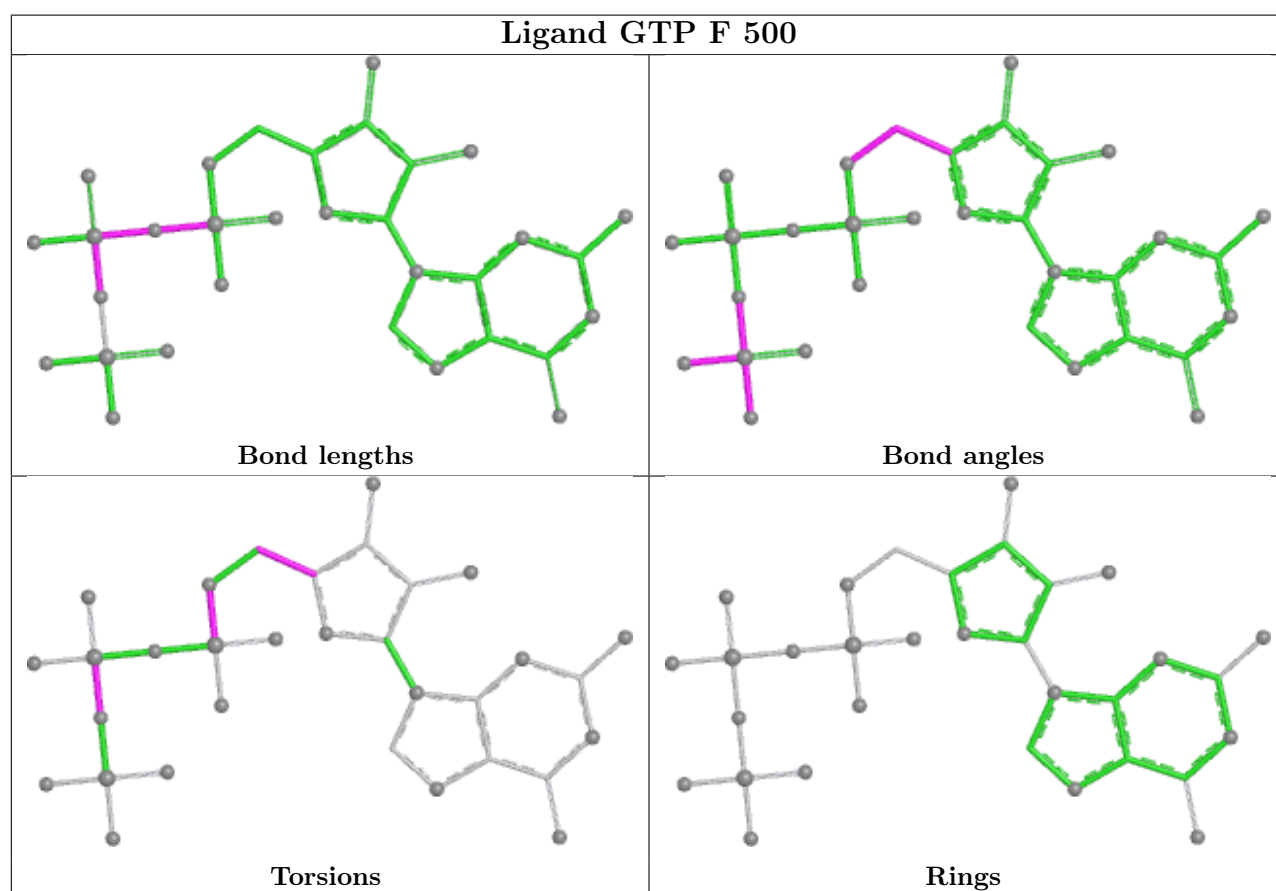
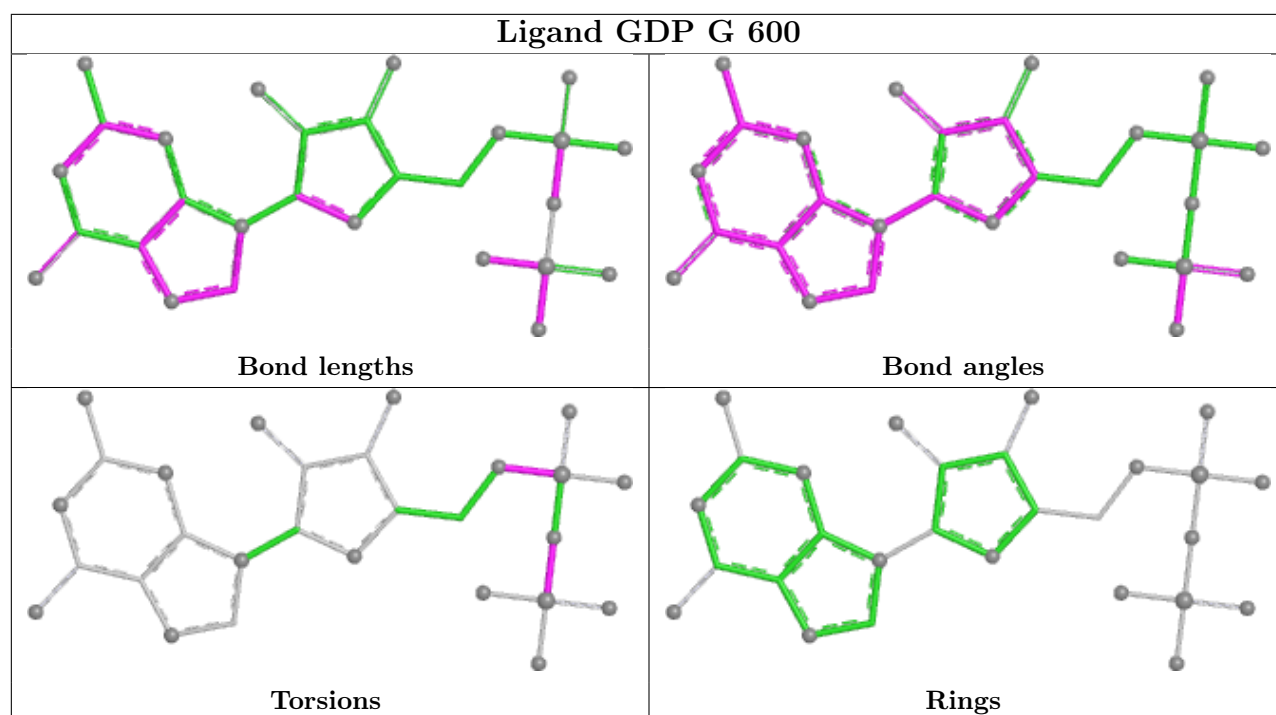
8 monomers are involved in 25 short contacts:

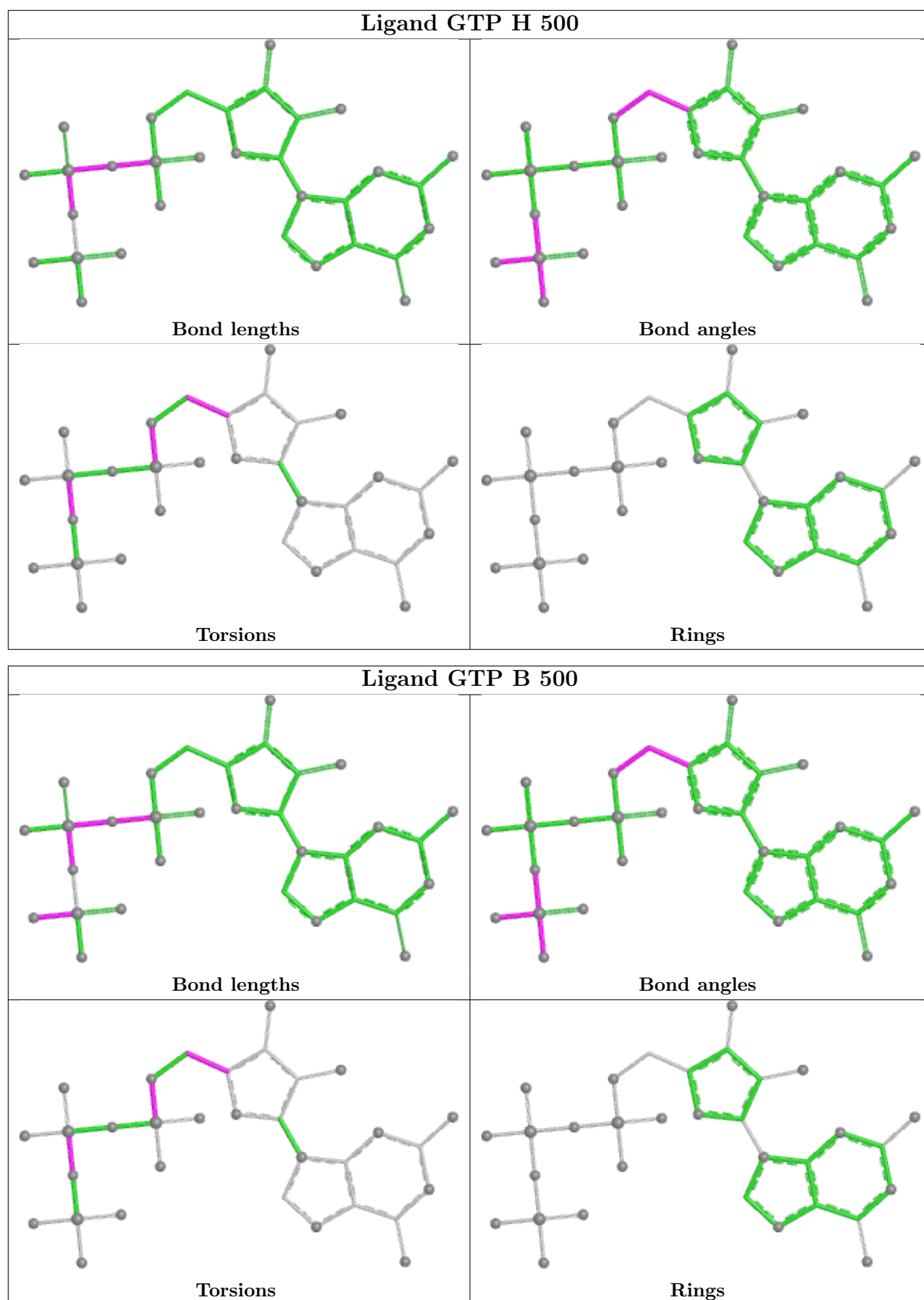
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	500	GTP	4	0
4	C	600	GDP	1	0
4	E	600	GDP	1	0
4	A	600	GDP	1	0
4	G	600	GDP	4	0
5	F	500	GTP	4	0
5	H	500	GTP	5	0
5	B	500	GTP	5	0

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









## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
2	B	4
2	D	4
2	F	4
2	H	4

The worst 5 of 16 chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	B	274:PRO	C	275:VAL	N	2.09
1	D	274:PRO	C	275:VAL	N	2.09
1	F	274:PRO	C	275:VAL	N	2.09
1	H	274:PRO	C	275:VAL	N	2.09
1	B	92:LEU	C	93:ILE	N	1.98

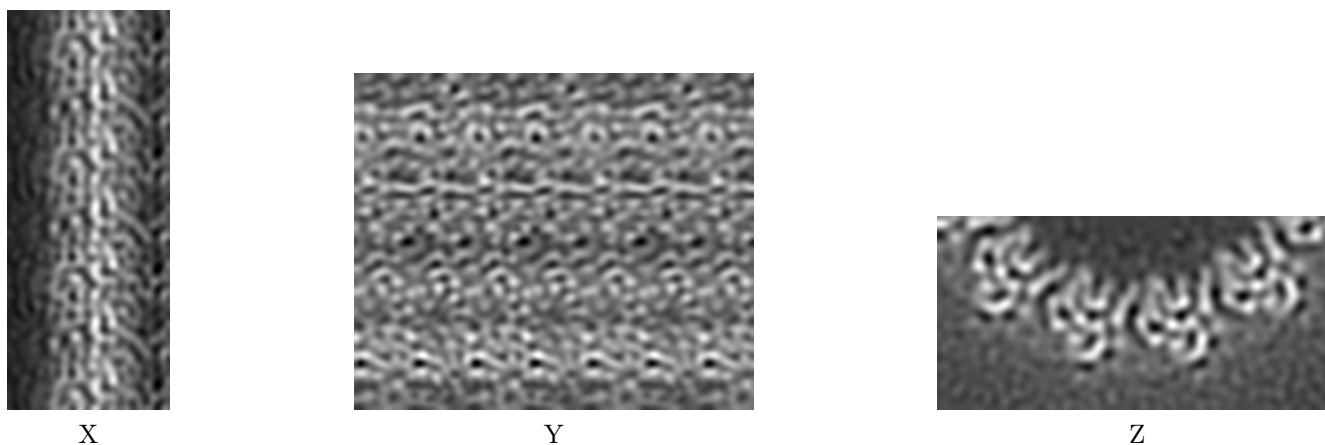
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-2095. 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](#)

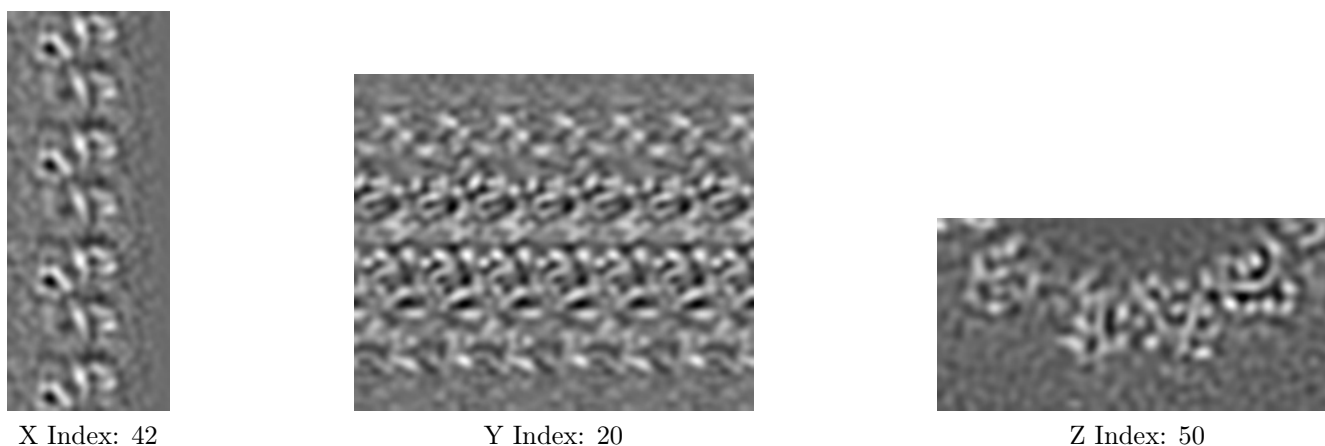
#### 6.1.1 Primary map



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

### 6.2 Central slices [i](#)

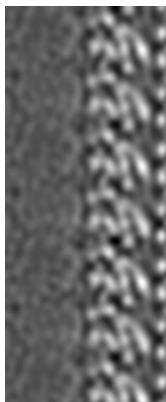
#### 6.2.1 Primary map



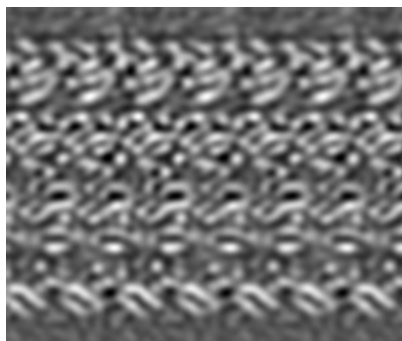
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices [i](#)

### 6.3.1 Primary map



X Index: 9



Y Index: 22

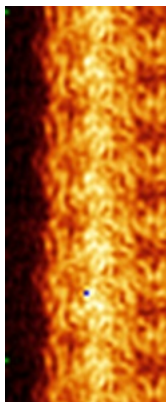


Z Index: 28

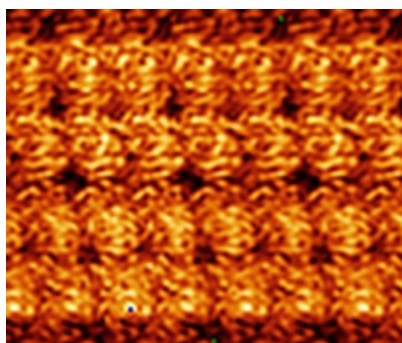
The images above show the largest variance slices of the map in three orthogonal directions.

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

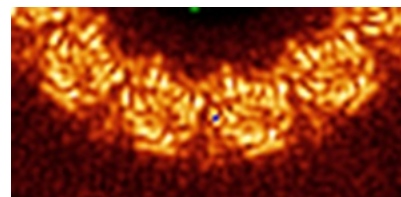
### 6.4.1 Primary map



X



Y

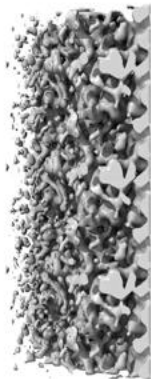


Z

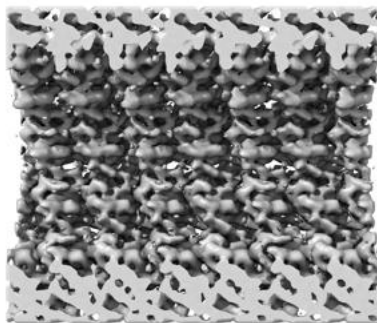
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

## 6.5 Orthogonal surface views [i](#)

### 6.5.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 1.6. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

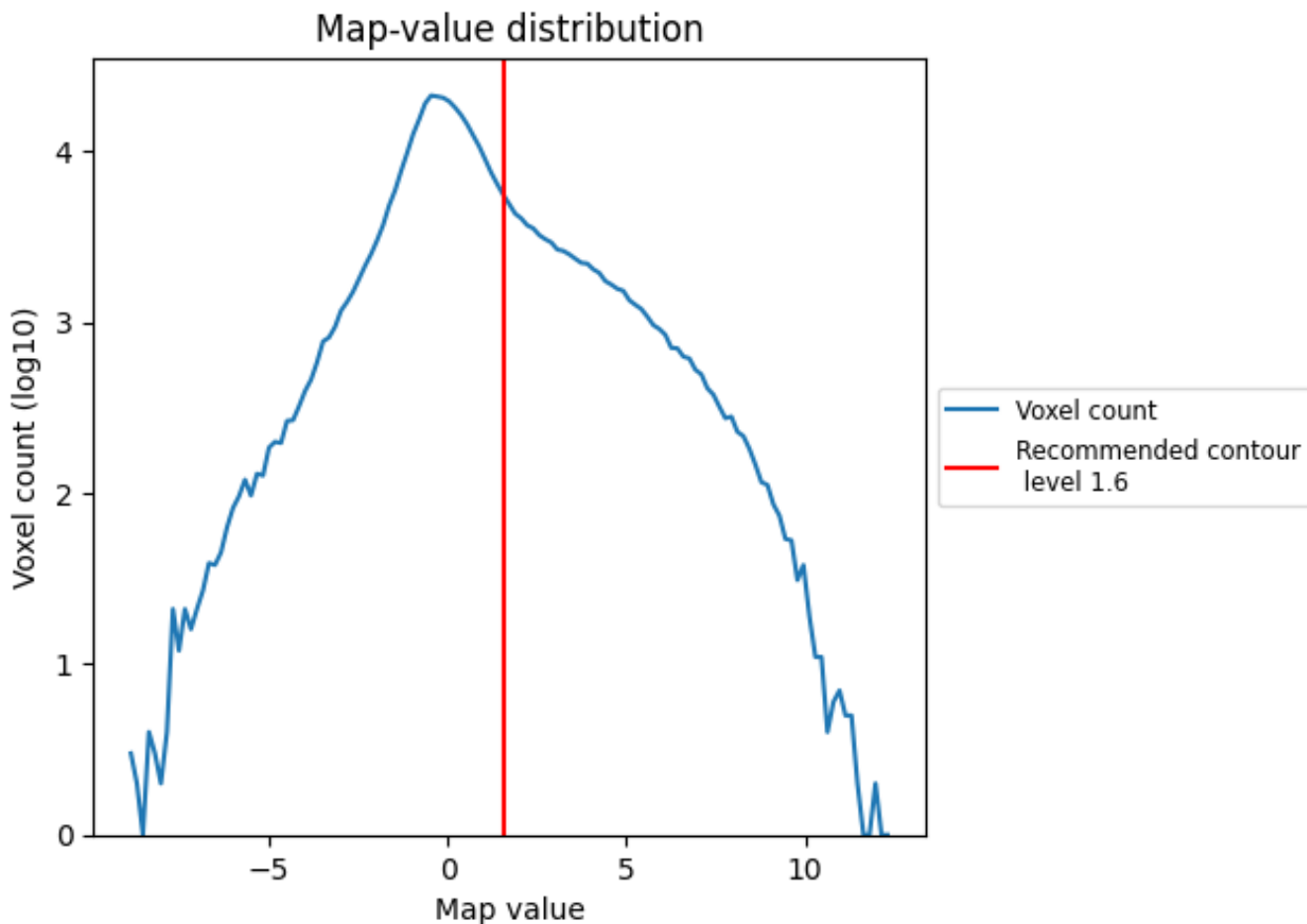
## 6.6 Mask visualisation [i](#)

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

## 7 Map analysis [i](#)

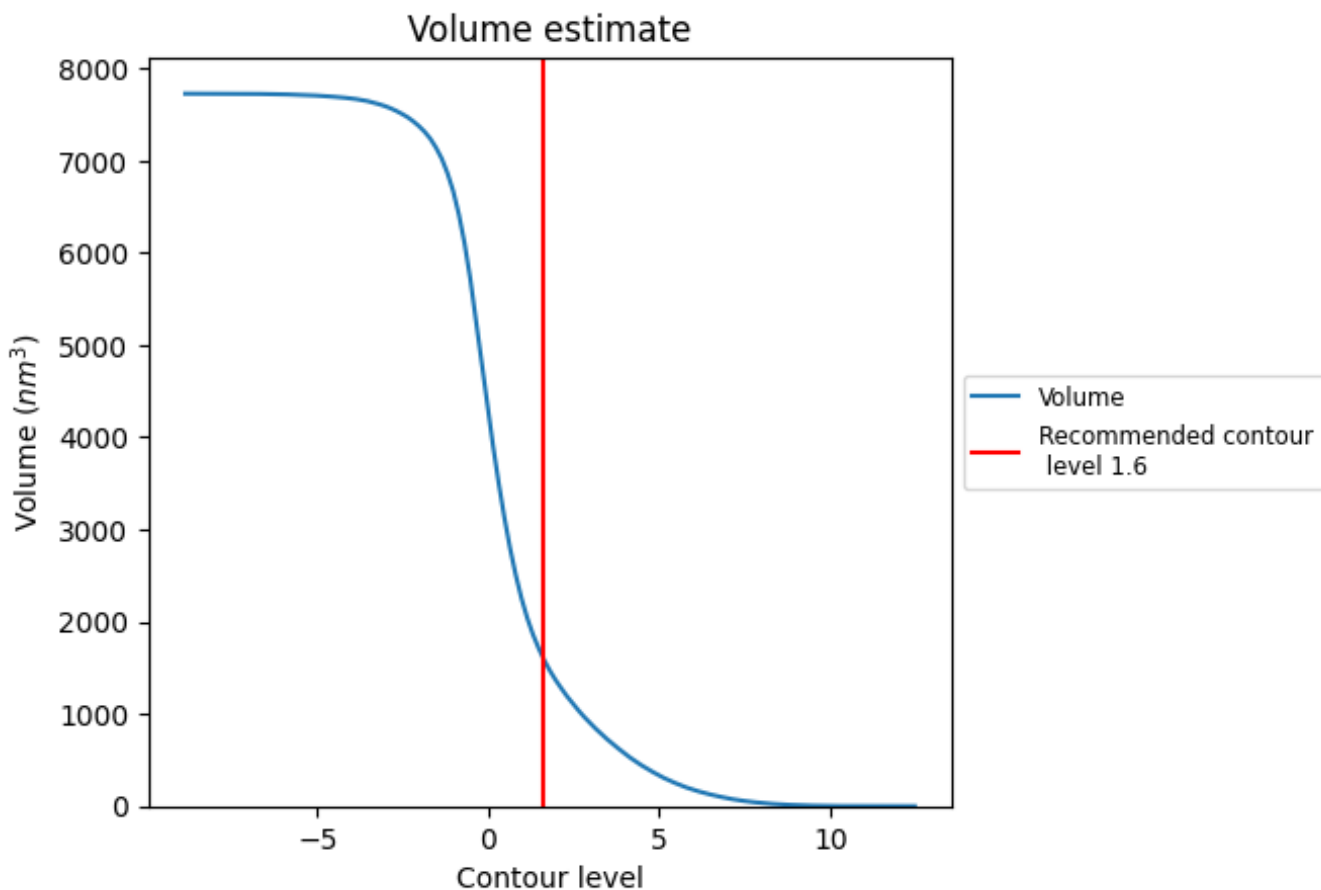
This section contains the results of statistical analysis of the map.

### 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 1613 nm<sup>3</sup>; this corresponds to an approximate mass of 1457 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](#)

This section was not generated. The rotationally averaged power spectrum is only generated for cubic maps.

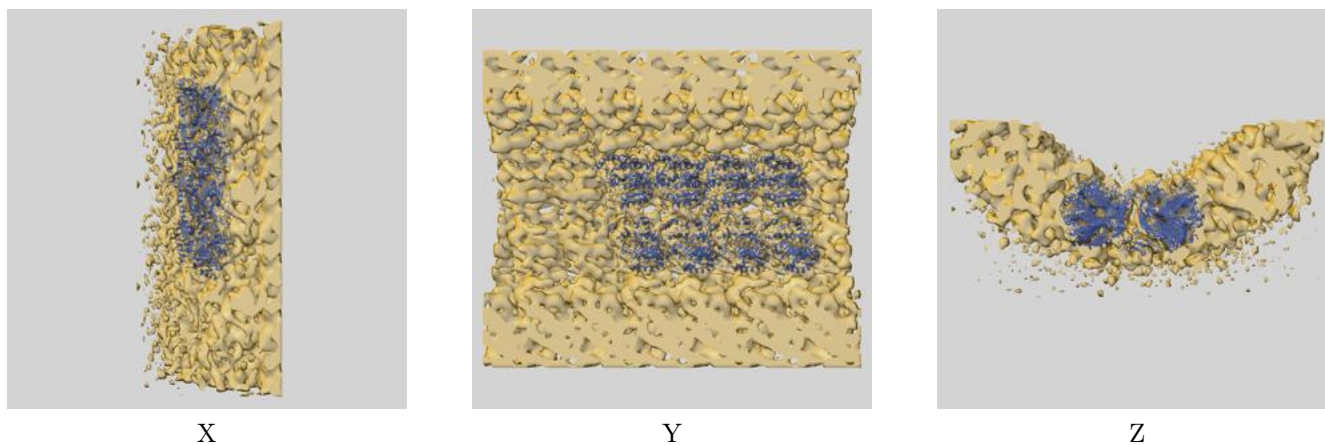
## 8 Fourier-Shell correlation

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

## 9 Map-model fit [i](#)

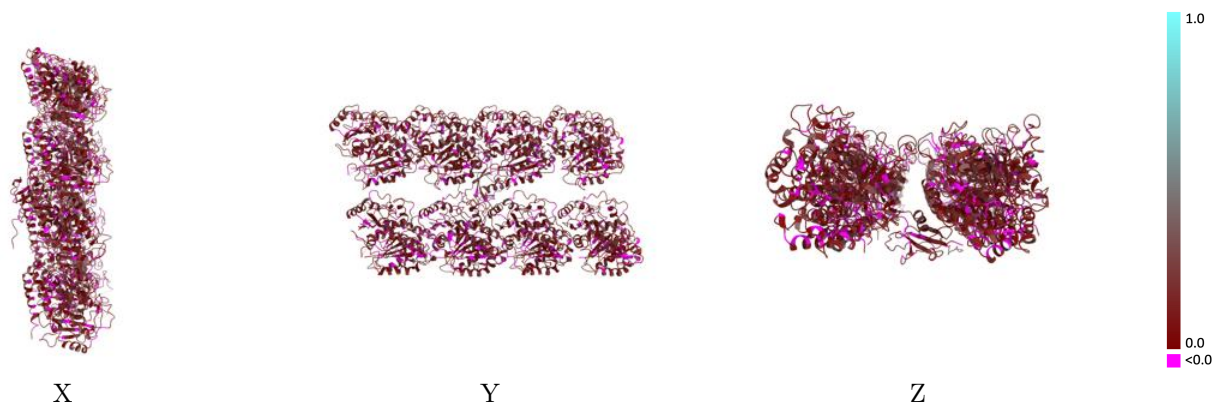
This section contains information regarding the fit between EMDB map EMD-2095 and PDB model 4ATU. Per-residue inclusion information can be found in section 3 on page 8.

### 9.1 Map-model overlay [i](#)



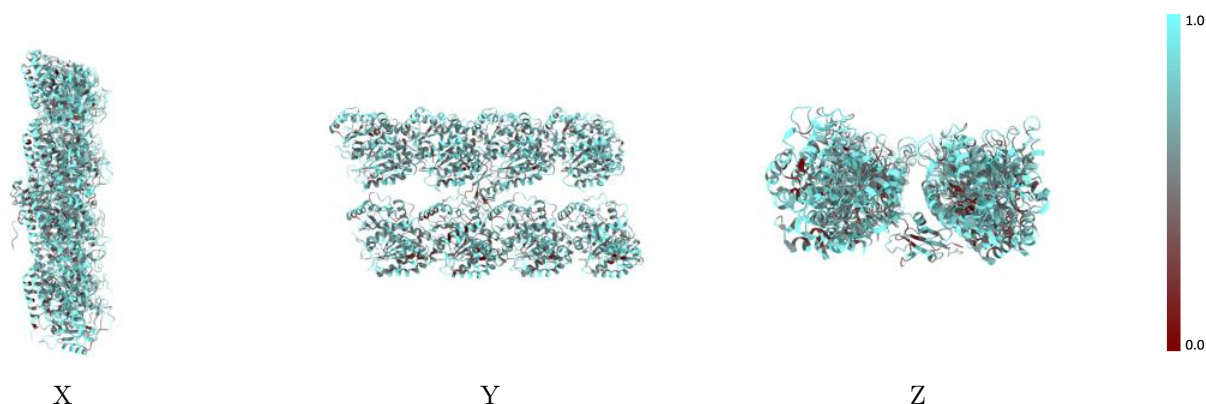
The images above show the 3D surface view of the map at the recommended contour level 1.6 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



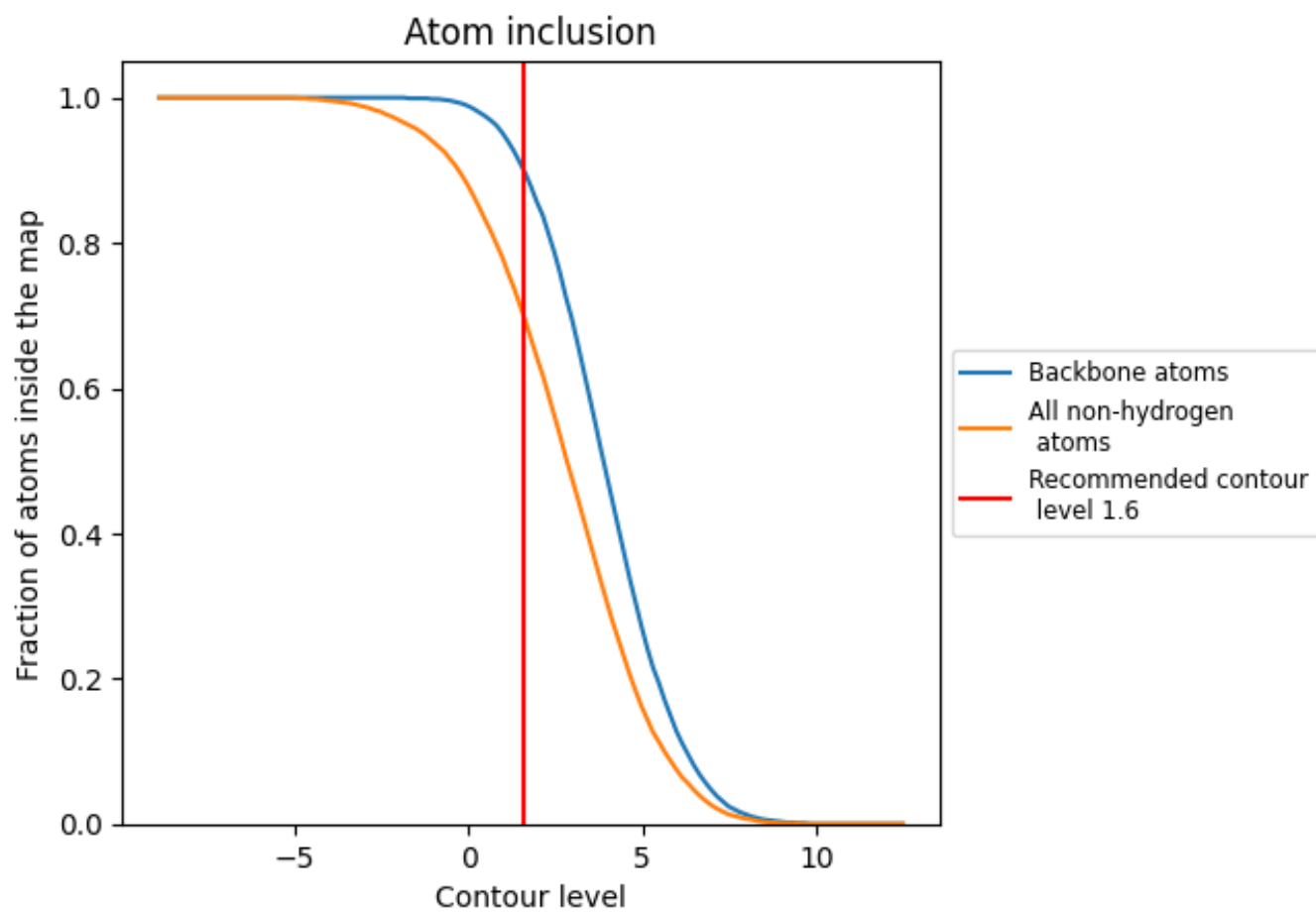
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (1.6).





















## 9.4 Atom inclusion [i](#)



At the recommended contour level, 90% of all backbone atoms, 70% 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 (1.6) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6990	 0.1190
A	 0.7150	 0.1260
B	 0.7000	 0.1170
C	 0.7130	 0.1200
D	 0.6960	 0.1200
E	 0.7120	 0.1220
F	 0.6980	 0.1220
G	 0.6890	 0.1070
H	 0.6920	 0.1180
I	 0.5990	 0.1110

