



wwPDB EM Validation Summary Report ⓘ

Mar 9, 2026 – 06:00 PM UTC

PDB ID : 7X3J / pdb_00007x3j
EMDB ID : EMD-32989
Title : Cryo-EM structure of human TRiC-tubulin-S2
Authors : Cong, Y.; Liu, C.X.
Deposited on : 2022-03-01
Resolution : 4.20 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:

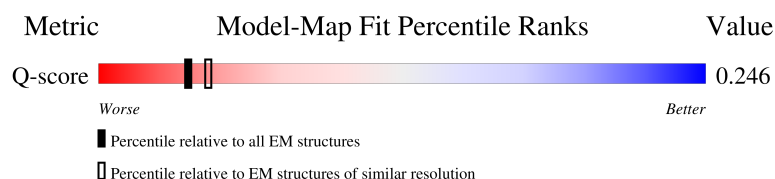
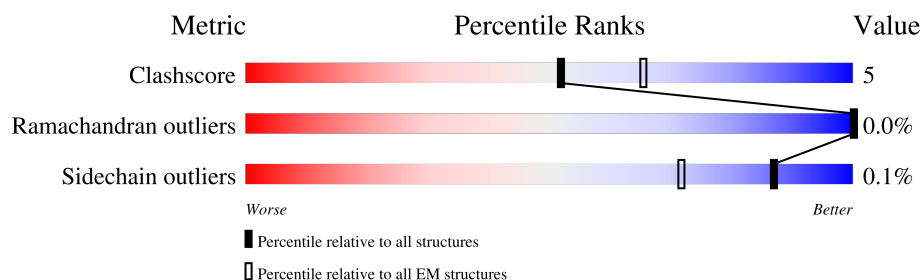
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

1 Overall quality at a glance

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

The reported resolution of this entry is 4.20 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	5410 (3.70 - 4.70)

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	556	28% 83% 11% • 5%
1	a	556	35% 80% 15% • 5%
2	B	535	31% 83% 11% 6%
2	b	535	20% 87% 10% •

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Mol	Chain	Length	Quality of chain
3	D	539	
3	d	539	
4	E	539	
4	e	539	
5	G	545	
5	g	545	
6	H	543	
6	h	543	
7	Q	548	
7	q	548	
8	Z	531	
8	z	531	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
9	ATP	Q	601	-	-	X	-

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 63188 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 T-complex protein 1 subunit alpha.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	529	Total	C	N	O	S	0	0
			4017	2517	702	775	23		
1	a	529	Total	C	N	O	S	0	0
			4017	2517	702	775	23		

- Molecule 2 is a protein called T-complex protein 1 subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	504	Total	C	N	O	S	0	0
			3796	2374	668	735	19		
2	b	517	Total	C	N	O	S	0	0
			3891	2433	686	753	19		

- Molecule 3 is a protein called T-complex protein 1 subunit delta.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	D	469	Total	C	N	O	S	0	0
			3513	2202	607	683	21		
3	d	516	Total	C	N	O	S	0	0
			3902	2440	678	761	23		

- Molecule 4 is a protein called T-complex protein 1 subunit epsilon.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	E	509	Total	C	N	O	S	0	0
			3914	2449	683	752	30		
4	e	520	Total	C	N	O	S	0	0
			4000	2498	700	772	30		

- Molecule 5 is a protein called T-complex protein 1 subunit gamma.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	G	512	Total	C	N	O	S	0	0
			3979	2479	703	767	30		
5	g	512	Total	C	N	O	S	0	0
			3979	2479	703	767	30		

- Molecule 6 is a protein called T-complex protein 1 subunit eta.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	H	509	Total	C	N	O	S	0	0
			3913	2471	679	740	23		
6	h	519	Total	C	N	O	S	0	0
			3987	2518	690	756	23		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
H	290	SER	LEU	engineered mutation	UNP Q99832
h	290	SER	LEU	engineered mutation	UNP Q99832

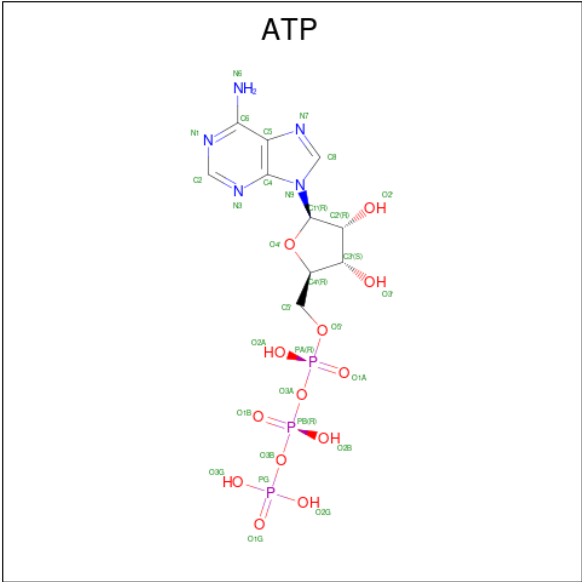
- Molecule 7 is a protein called T-complex protein 1 subunit theta.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	Q	506	Total	C	N	O	S	0	0
			3858	2431	654	747	26		
7	q	523	Total	C	N	O	S	0	0
			3987	2515	677	768	27		

- Molecule 8 is a protein called T-complex protein 1 subunit zeta.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	Z	514	Total	C	N	O	S	0	0
			3943	2478	690	754	21		
8	z	521	Total	C	N	O	S	0	0
			3996	2511	699	765	21		

- Molecule 9 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: C₁₀H₁₆N₅O₁₃P₃) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
9	A	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	B	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	D	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	E	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	G	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	H	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	Q	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	Z	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	b	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	d	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	e	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	g	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	h	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	q	1	Total	C	N	O	P	0
			31	10	5	13	3	

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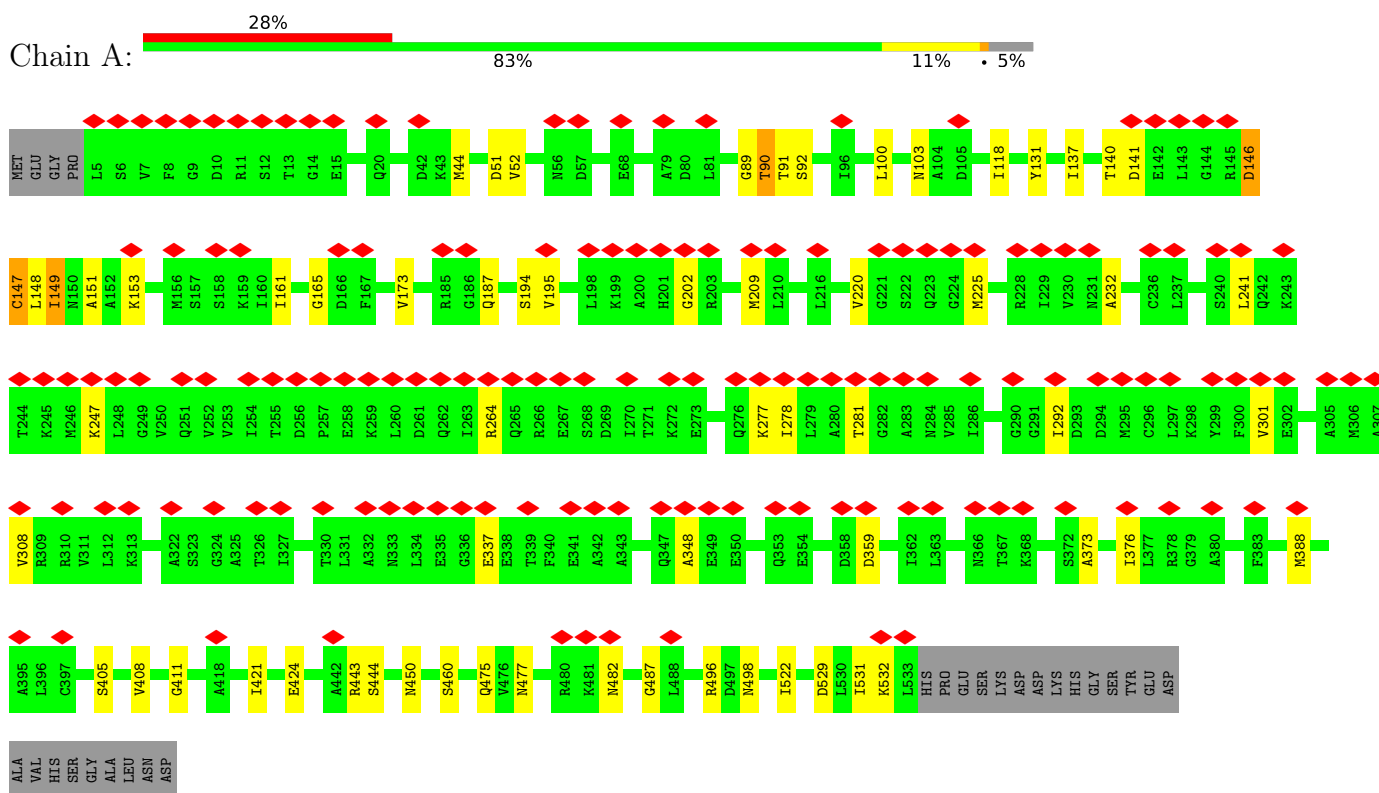
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Mol	Chain	Residues	Atoms					AltConf
9	z	1	Total	C	N	O	P	0
			31	10	5	13	3	
9	a	1	Total	C	N	O	P	0
			31	10	5	13	3	

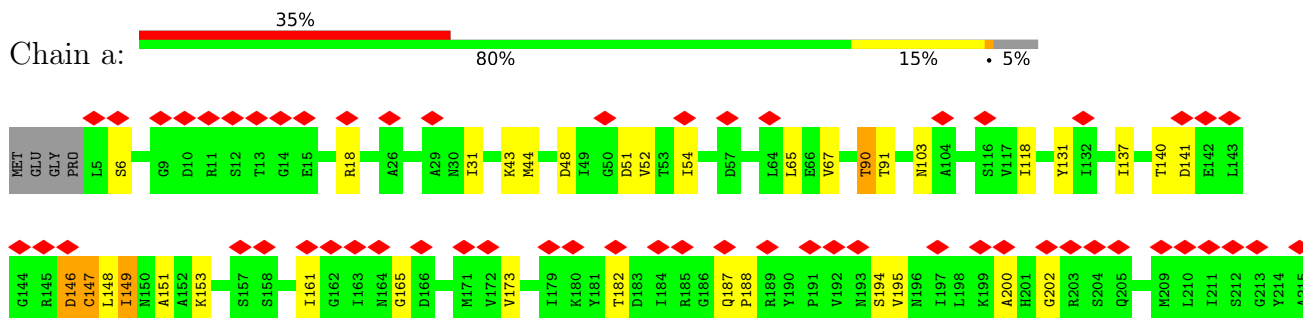
3 Residue-property plots

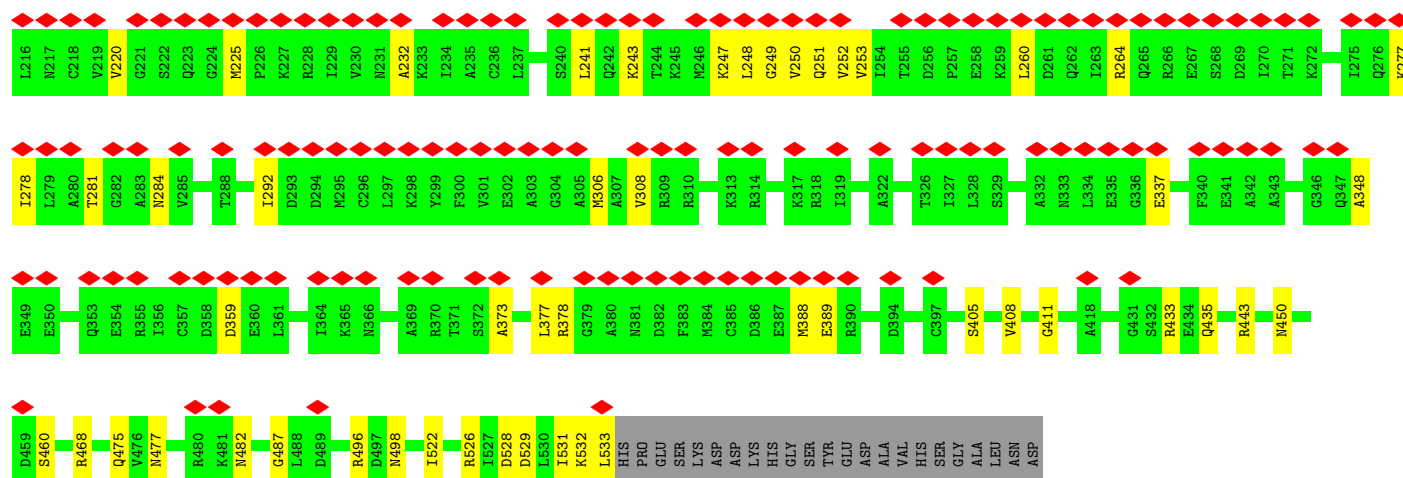
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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: T-complex protein 1 subunit alpha

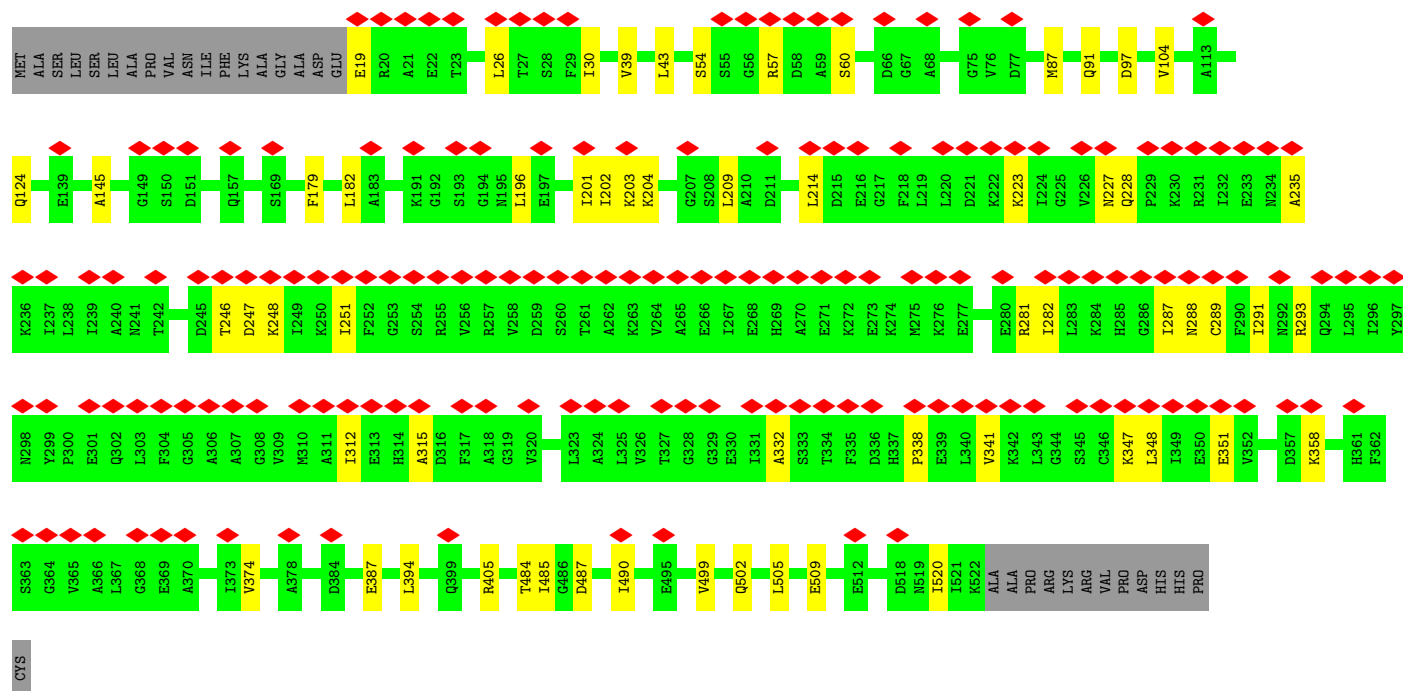
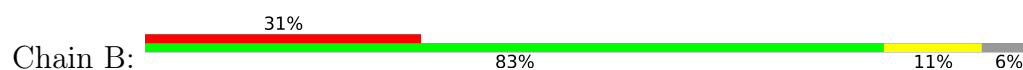


• Molecule 1: T-complex protein 1 subunit alpha

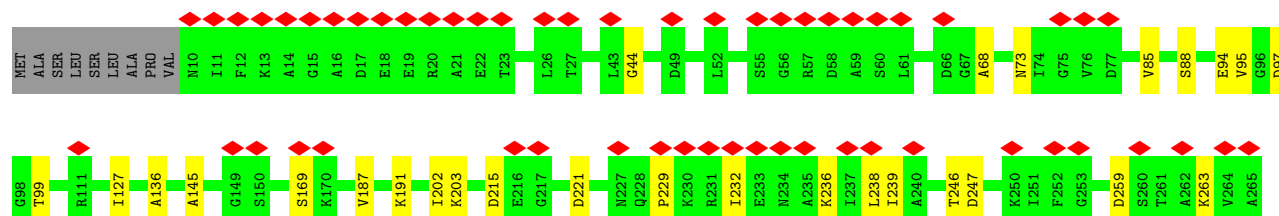
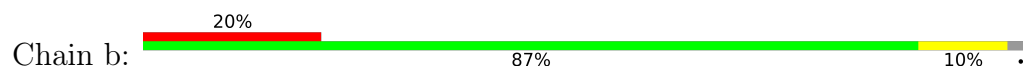


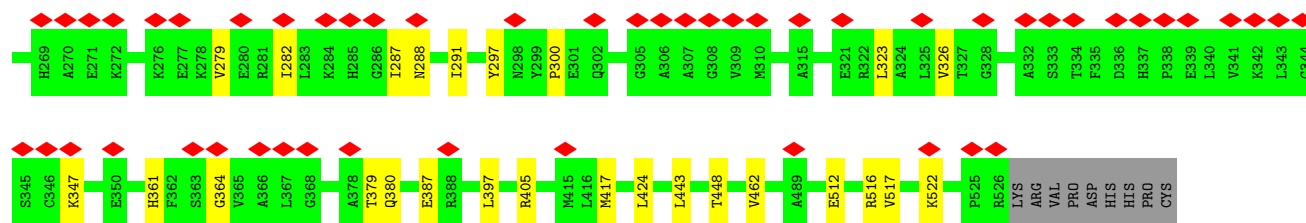


• Molecule 2: T-complex protein 1 subunit beta

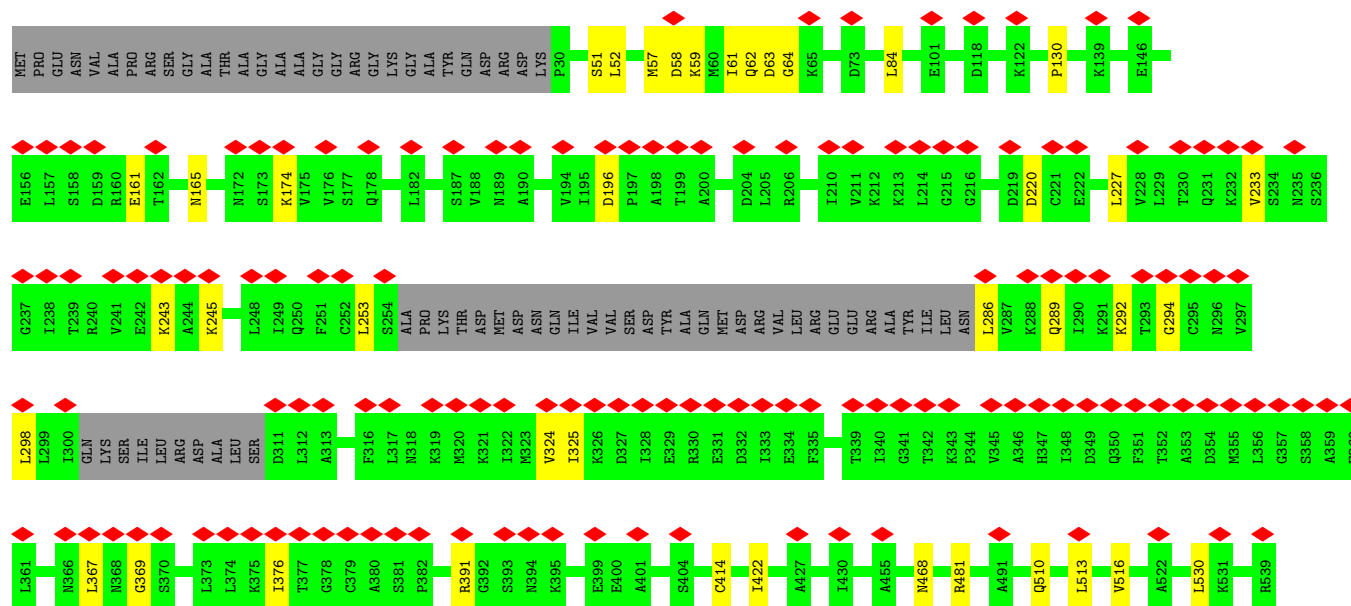
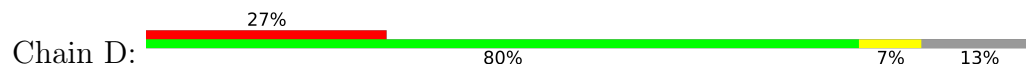


• Molecule 2: T-complex protein 1 subunit beta

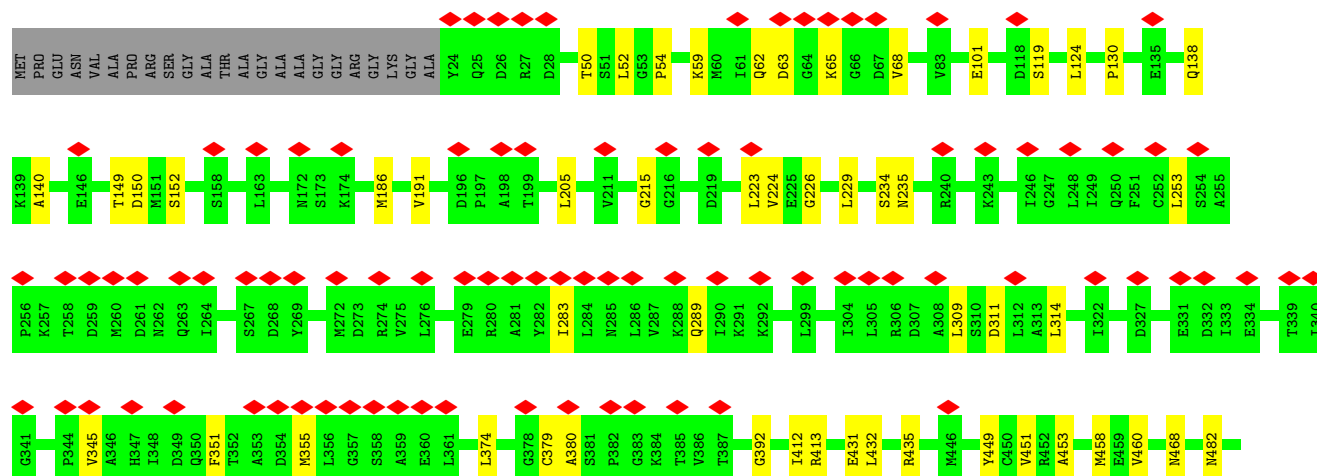
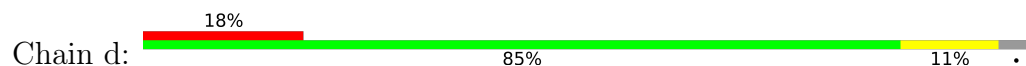


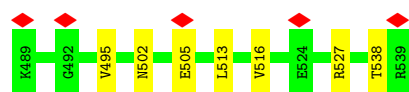


• Molecule 3: T-complex protein 1 subunit delta

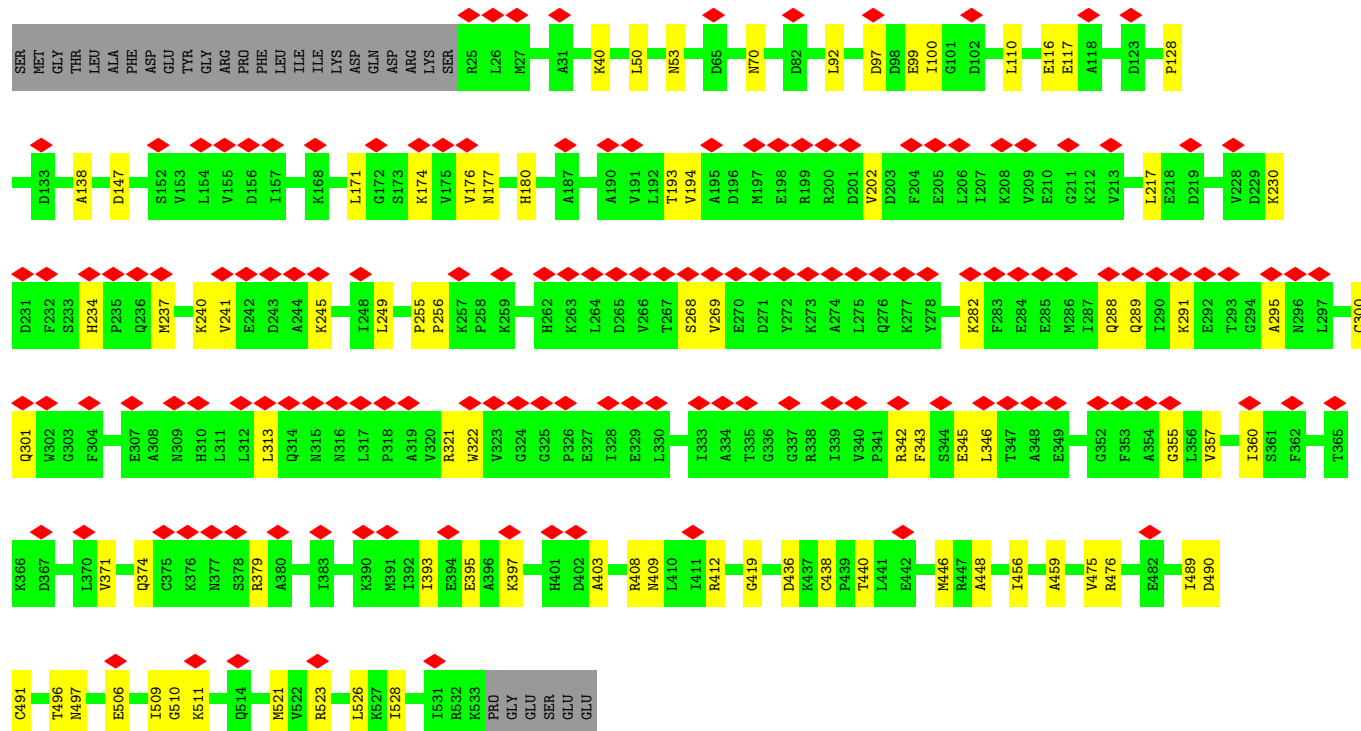
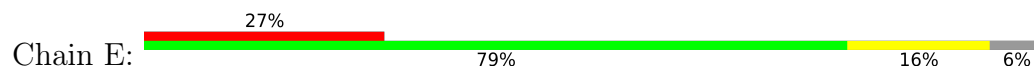


• Molecule 3: T-complex protein 1 subunit delta

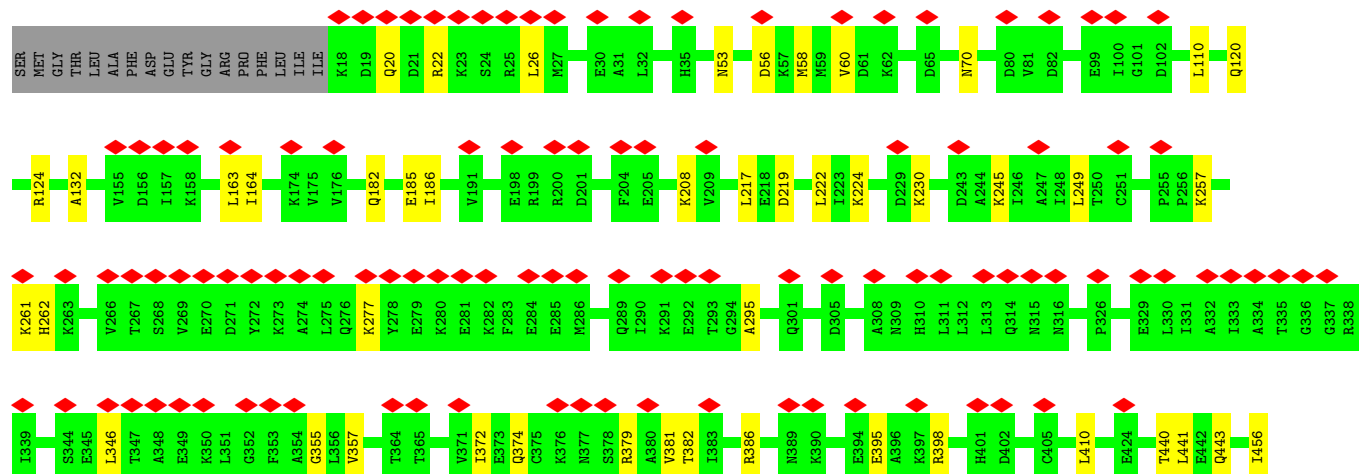
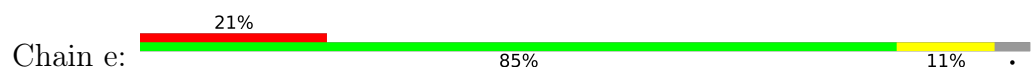


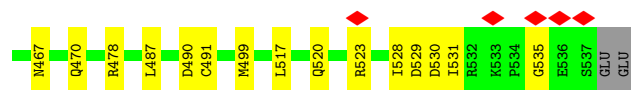


• Molecule 4: T-complex protein 1 subunit epsilon

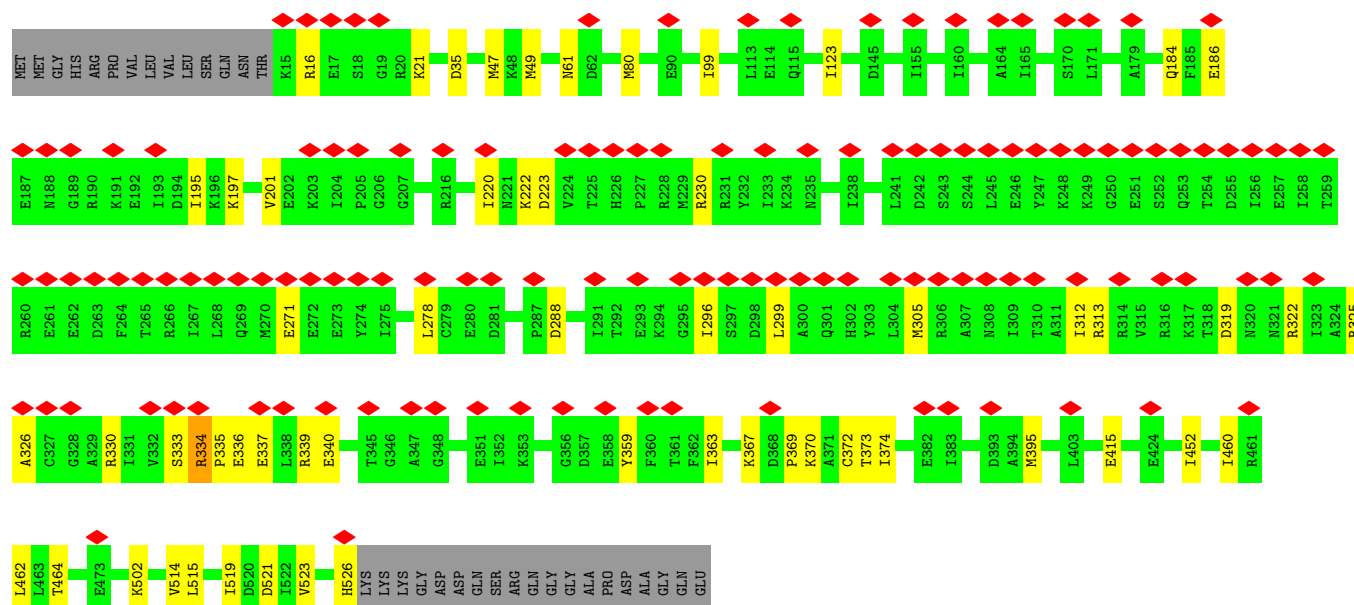
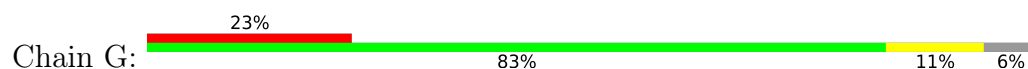


• Molecule 4: T-complex protein 1 subunit epsilon

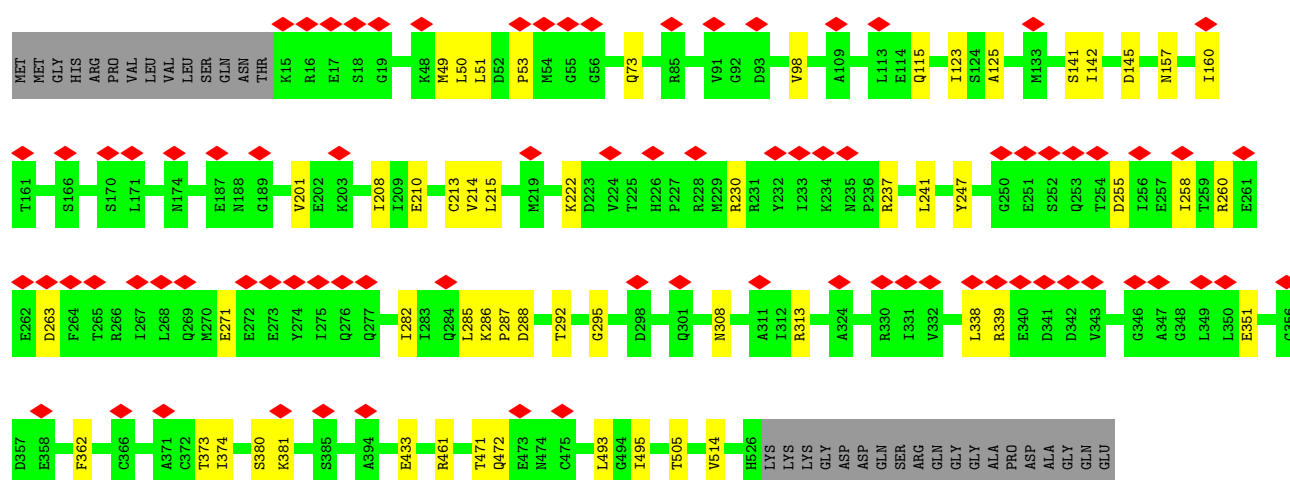
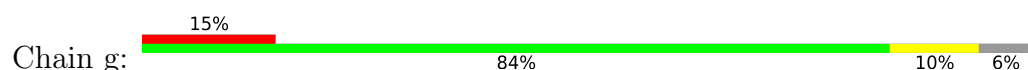




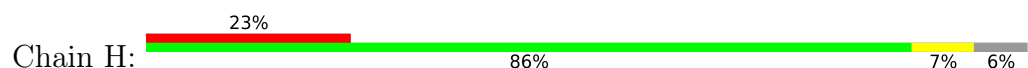
• Molecule 5: T-complex protein 1 subunit gamma

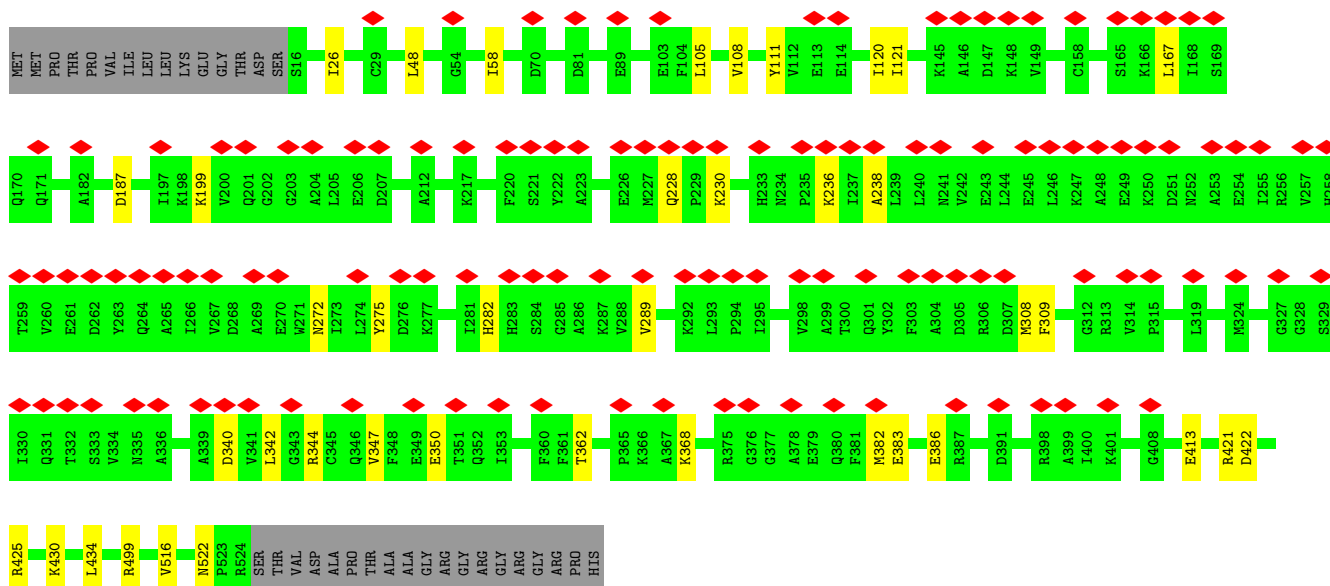


• Molecule 5: T-complex protein 1 subunit gamma

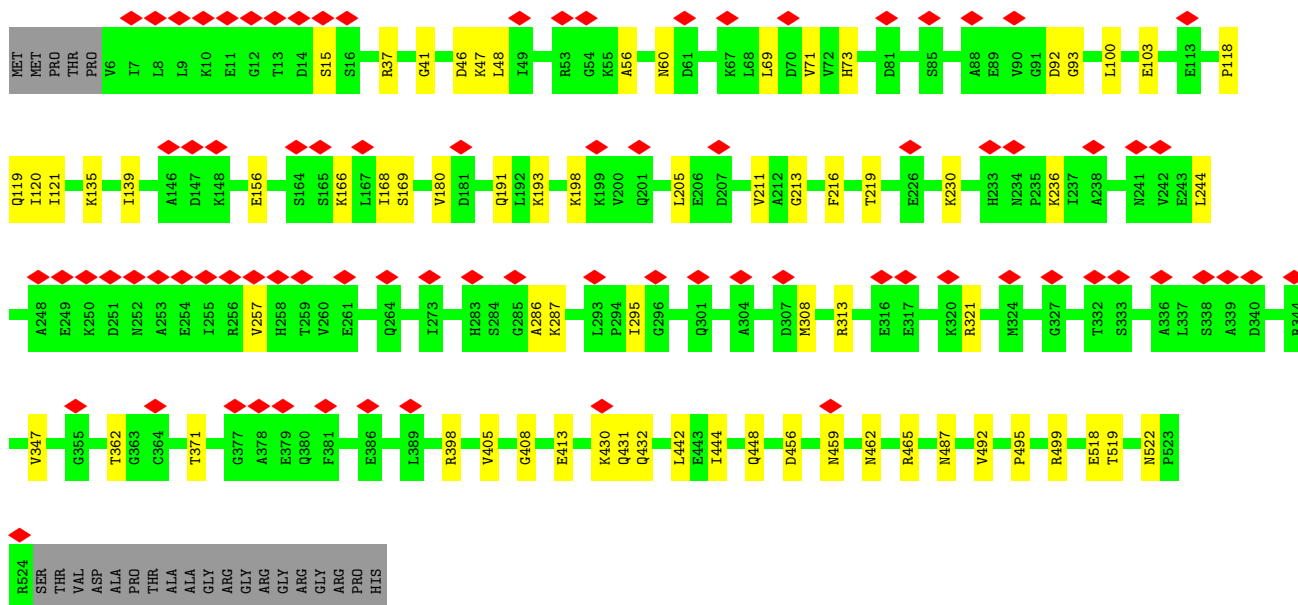
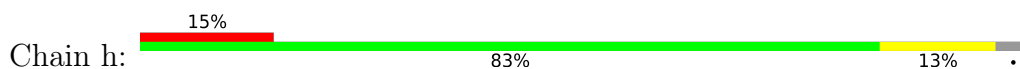


• Molecule 6: T-complex protein 1 subunit eta

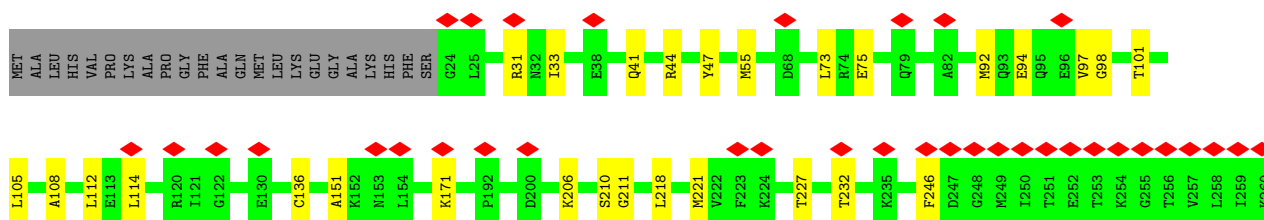
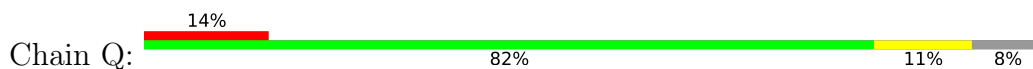


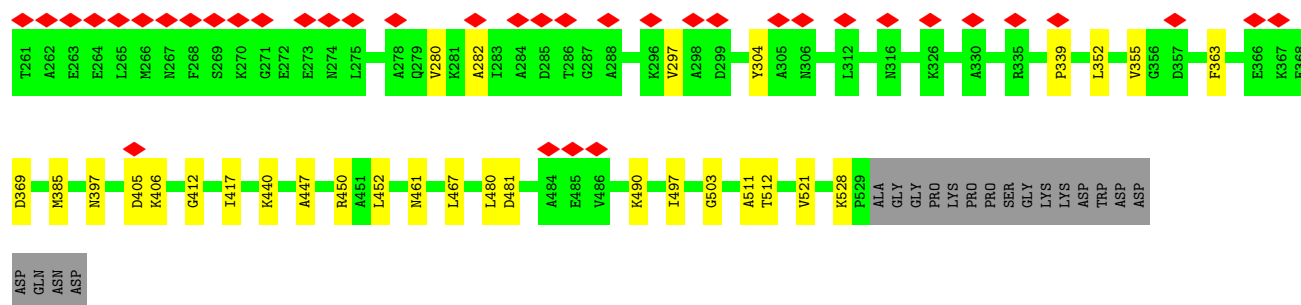


• Molecule 6: T-complex protein 1 subunit eta

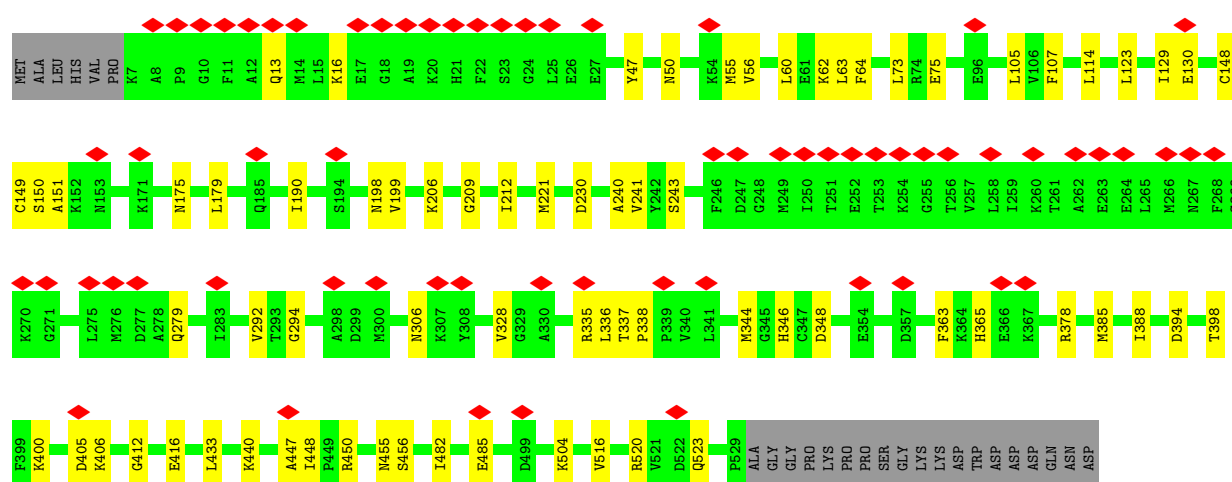
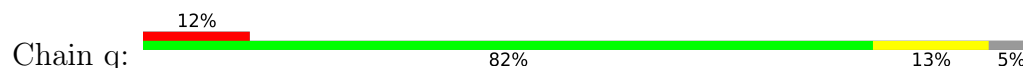


• Molecule 7: T-complex protein 1 subunit theta

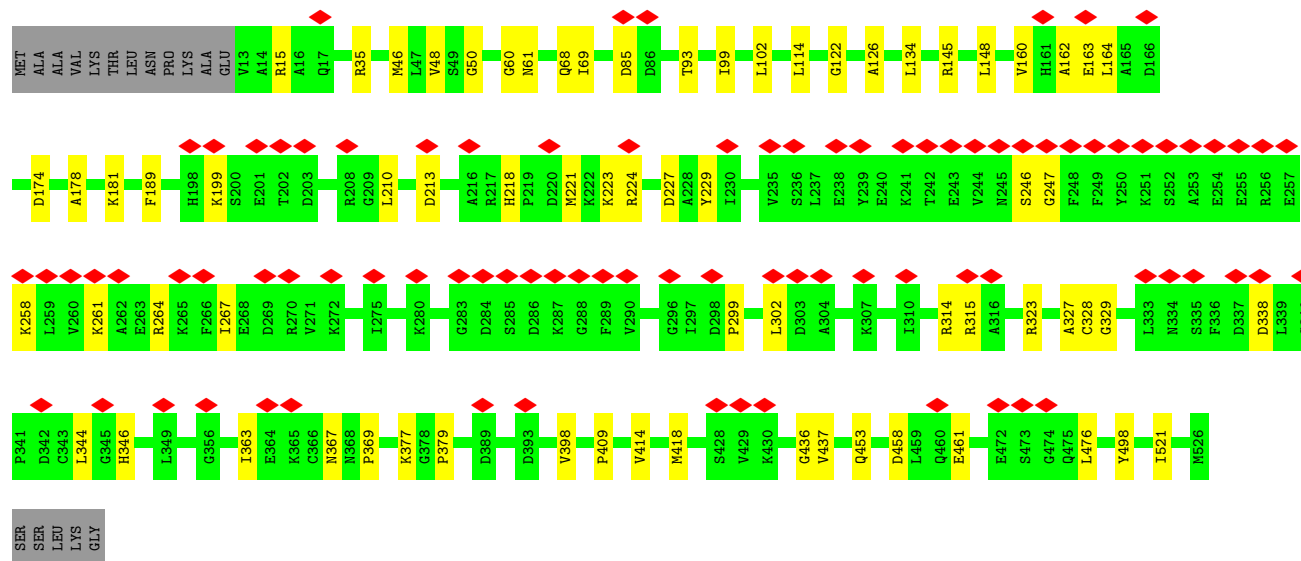
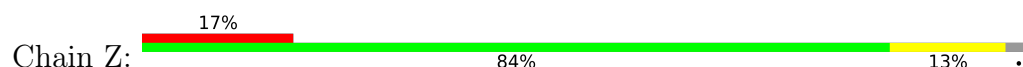




• Molecule 7: T-complex protein 1 subunit theta



• Molecule 8: T-complex protein 1 subunit zeta



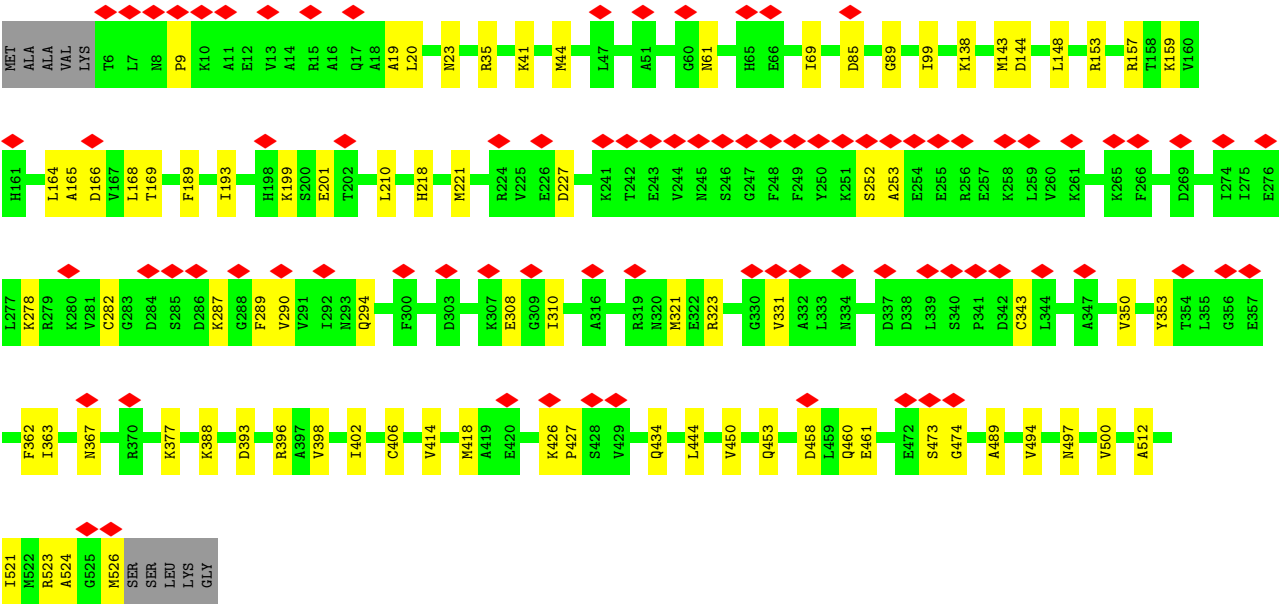
• Molecule 8: T-complex protein 1 subunit zeta

Chain z:

16%

83%

15%



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	87764	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	38	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	3.891	Depositor
Minimum map value	-2.150	Depositor
Average map value	0.020	Depositor
Map value standard deviation	0.166	Depositor
Recommended contour level	0.65	Depositor
Map size ($\text{\AA}$)	337.408, 337.408, 337.408	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	1.318, 1.318, 1.318	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

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	0.17	0/4054	0.50	3/5472 (0.1%)
1	a	0.18	0/4054	0.50	3/5472 (0.1%)
2	B	0.16	0/3836	0.44	0/5170
2	b	0.16	0/3933	0.43	0/5301
3	D	0.17	0/3539	0.47	0/4774
3	d	0.16	0/3934	0.44	2/5310 (0.0%)
4	E	0.17	0/3959	0.45	0/5334
4	e	0.16	0/4046	0.43	0/5449
5	G	0.16	0/4024	0.42	0/5428
5	g	0.16	0/4024	0.44	0/5428
6	H	0.16	0/3968	0.44	0/5354
6	h	0.16	0/4042	0.41	0/5454
7	Q	0.16	0/3910	0.43	0/5287
7	q	0.16	0/4043	0.45	1/5463 (0.0%)
8	Z	0.16	0/3989	0.44	0/5377
8	z	0.15	0/4043	0.42	0/5451
All	All	0.16	0/63398	0.44	9/85524 (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
1	A	0	3
1	a	0	3
All	All	0	6

There are no bond length outliers.

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	a	90	THR	N-CA-C	5.75	123.04	110.80
1	A	90	THR	N-CA-C	5.74	123.02	110.80
3	d	460	VAL	CA-C-N	5.71	123.84	120.24
3	d	460	VAL	C-N-CA	5.71	123.84	120.24
1	A	202	GLY	CA-C-N	5.38	131.82	121.54

There are no chirality outliers.

5 of 6 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	146	ASP	Peptide
1	A	187	GLN	Peptide
1	A	405	SER	Peptide
1	a	146	ASP	Peptide
1	a	187	GLN	Peptide

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	4017	0	4183	40	0
1	a	4017	0	4180	164	0
2	B	3796	0	3907	34	0
2	b	3891	0	3999	30	0
3	D	3513	0	3719	66	0
3	d	3902	0	4106	36	0
4	E	3914	0	4033	52	0
4	e	4000	0	4113	38	0
5	G	3979	0	4099	105	0
5	g	3979	0	4099	36	0
6	H	3913	0	4007	26	0
6	h	3987	0	4087	49	0
7	Q	3858	0	3924	49	0
7	q	3987	0	4053	44	0
8	Z	3943	0	4070	43	0
8	z	3996	0	4126	50	0
9	A	31	0	12	1	0
9	B	31	0	12	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
9	D	31	0	12	1	0
9	E	31	0	12	0	0
9	G	31	0	12	0	0
9	H	31	0	12	0	0
9	Q	31	0	12	17	0
9	Z	31	0	10	1	0
9	a	31	0	12	1	0
9	b	31	0	12	0	0
9	d	31	0	12	0	0
9	e	31	0	11	0	0
9	g	31	0	11	0	0
9	h	31	0	12	2	0
9	q	31	0	11	1	0
9	z	31	0	10	0	0
All	All	63188	0	64890	689	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 5.

The worst 5 of 689 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)
5:G:330:ARG:HH12	1:a:243:LYS:CE	1.20	1.45
3:D:64:GLY:HA2	1:a:533:LEU:C	1.45	1.38
3:D:64:GLY:HA2	1:a:533:LEU:O	1.22	1.36
3:D:63:ASP:CA	1:a:533:LEU:HB2	1.55	1.34
5:G:334:ARG:CB	1:a:251:GLN:HB3	1.61	1.29

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	527/556 (95%)	498 (94%)	27 (5%)	2 (0%)	30	66
1	a	527/556 (95%)	498 (94%)	27 (5%)	2 (0%)	30	66
2	B	502/535 (94%)	489 (97%)	13 (3%)	0	100	100
2	b	515/535 (96%)	502 (98%)	13 (2%)	0	100	100
3	D	463/539 (86%)	453 (98%)	10 (2%)	0	100	100
3	d	514/539 (95%)	502 (98%)	12 (2%)	0	100	100
4	E	507/539 (94%)	487 (96%)	20 (4%)	0	100	100
4	e	518/539 (96%)	501 (97%)	17 (3%)	0	100	100
5	G	510/545 (94%)	490 (96%)	20 (4%)	0	100	100
5	g	510/545 (94%)	493 (97%)	17 (3%)	0	100	100
6	H	507/543 (93%)	493 (97%)	14 (3%)	0	100	100
6	h	517/543 (95%)	500 (97%)	17 (3%)	0	100	100
7	Q	504/548 (92%)	491 (97%)	13 (3%)	0	100	100
7	q	521/548 (95%)	507 (97%)	14 (3%)	0	100	100
8	Z	512/531 (96%)	499 (98%)	13 (2%)	0	100	100
8	z	519/531 (98%)	507 (98%)	12 (2%)	0	100	100
All	All	8173/8672 (94%)	7910 (97%)	259 (3%)	4 (0%)	100	100

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	90	THR
1	a	90	THR
1	A	149	ILE
1	a	149	ILE

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	441/463 (95%)	440 (100%)	1 (0%)	87	85

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	a	441/463 (95%)	440 (100%)	1 (0%)	87	85
2	B	403/427 (94%)	402 (100%)	1 (0%)	87	85
2	b	411/427 (96%)	411 (100%)	0	100	100
3	D	398/452 (88%)	398 (100%)	0	100	100
3	d	441/452 (98%)	441 (100%)	0	100	100
4	E	429/455 (94%)	428 (100%)	1 (0%)	87	85
4	e	439/455 (96%)	439 (100%)	0	100	100
5	G	443/469 (94%)	441 (100%)	2 (0%)	81	81
5	g	443/469 (94%)	443 (100%)	0	100	100
6	H	417/443 (94%)	417 (100%)	0	100	100
6	h	426/443 (96%)	425 (100%)	1 (0%)	87	85
7	Q	420/452 (93%)	420 (100%)	0	100	100
7	q	432/452 (96%)	432 (100%)	0	100	100
8	Z	429/442 (97%)	429 (100%)	0	100	100
8	z	435/442 (98%)	435 (100%)	0	100	100
All	All	6848/7206 (95%)	6841 (100%)	7 (0%)	87	88

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
5	G	334	ARG
5	G	363	ILE
1	a	147	CYS
6	h	257	VAL
4	E	193	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 88 such sidechains are listed below:

Mol	Chain	Res	Type
4	e	120	GLN
6	h	462	ASN
4	e	315	ASN
5	g	420	HIS
7	q	172	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

16 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$
9	ATP	g	601	-	32,33,33	1.38	4 (12%)	48,52,52	1.98	12 (25%)
9	ATP	G	601	-	32,33,33	1.38	4 (12%)	48,52,52	1.75	10 (20%)
9	ATP	H	601	-	32,33,33	1.48	7 (21%)	48,52,52	1.78	9 (18%)
9	ATP	b	601	-	32,33,33	1.43	5 (15%)	48,52,52	1.77	9 (18%)
9	ATP	Q	601	-	32,33,33	1.40	4 (12%)	48,52,52	1.85	10 (20%)
9	ATP	B	601	-	32,33,33	1.42	4 (12%)	48,52,52	1.77	9 (18%)
9	ATP	d	601	-	32,33,33	1.47	7 (21%)	48,52,52	1.76	9 (18%)
9	ATP	E	601	-	32,33,33	1.41	4 (12%)	48,52,52	1.77	9 (18%)
9	ATP	A	601	-	32,33,33	1.42	5 (15%)	48,52,52	1.87	12 (25%)
9	ATP	Z	601	-	32,33,33	1.38	4 (12%)	48,52,52	1.76	9 (18%)
9	ATP	e	601	-	32,33,33	1.39	4 (12%)	48,52,52	1.77	9 (18%)
9	ATP	a	601	-	32,33,33	1.44	5 (15%)	48,52,52	1.87	12 (25%)
9	ATP	D	601	-	32,33,33	1.40	4 (12%)	48,52,52	1.76	9 (18%)
9	ATP	z	601	-	32,33,33	1.37	4 (12%)	48,52,52	1.76	9 (18%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
9	ATP	q	601	-	32,33,33	1.40	4 (12%)	48,52,52	1.86	10 (20%)
9	ATP	h	601	-	32,33,33	1.38	4 (12%)	48,52,52	1.76	9 (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
9	ATP	g	601	-	-	2/22/38/38	0/3/3/3
9	ATP	G	601	-	-	5/22/38/38	0/3/3/3
9	ATP	H	601	-	-	4/22/38/38	0/3/3/3
9	ATP	b	601	-	-	2/22/38/38	0/3/3/3
9	ATP	Q	601	-	-	5/22/38/38	0/3/3/3
9	ATP	B	601	-	-	2/22/38/38	0/3/3/3
9	ATP	d	601	-	-	6/22/38/38	0/3/3/3
9	ATP	E	601	-	-	2/22/38/38	0/3/3/3
9	ATP	A	601	-	-	2/22/38/38	0/3/3/3
9	ATP	Z	601	-	-	2/22/38/38	0/3/3/3
9	ATP	e	601	-	-	2/22/38/38	0/3/3/3
9	ATP	a	601	-	-	2/22/38/38	0/3/3/3
9	ATP	D	601	-	-	2/22/38/38	0/3/3/3
9	ATP	z	601	-	-	2/22/38/38	0/3/3/3
9	ATP	q	601	-	-	5/22/38/38	0/3/3/3
9	ATP	h	601	-	-	4/22/38/38	0/3/3/3

The worst 5 of 73 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
9	q	601	ATP	C5-C4	4.89	1.47	1.39
9	Q	601	ATP	C5-C4	4.86	1.47	1.39
9	D	601	ATP	C5-C4	4.77	1.47	1.39
9	a	601	ATP	C5-C4	4.76	1.47	1.39
9	B	601	ATP	C5-C4	4.76	1.47	1.39

The worst 5 of 156 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	g	601	ATP	O3G-PG-O3B	6.27	125.68	104.64
9	q	601	ATP	C5-C4-N3	-6.09	118.33	126.72
9	Q	601	ATP	C5-C4-N3	-6.08	118.35	126.72
9	z	601	ATP	C5-C4-N3	-5.92	118.57	126.72
9	G	601	ATP	C5-C4-N3	-5.90	118.59	126.72

There are no chirality outliers.

5 of 49 torsion outliers are listed below:

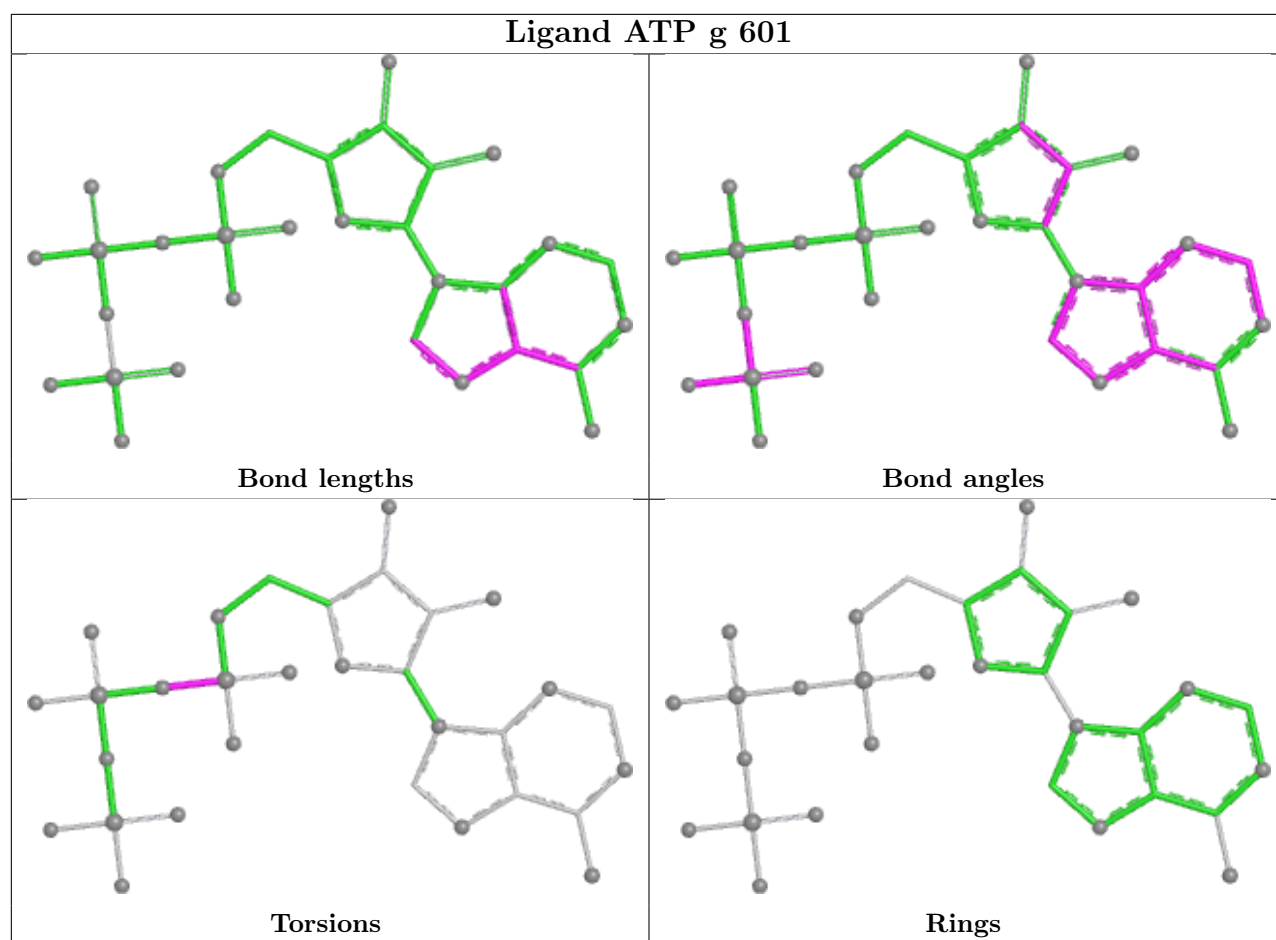
Mol	Chain	Res	Type	Atoms
9	Q	601	ATP	C5'-O5'-PA-O2A
9	Q	601	ATP	O4'-C4'-C5'-O5'
9	d	601	ATP	C5'-O5'-PA-O1A
9	d	601	ATP	C5'-O5'-PA-O2A
9	q	601	ATP	C5'-O5'-PA-O2A

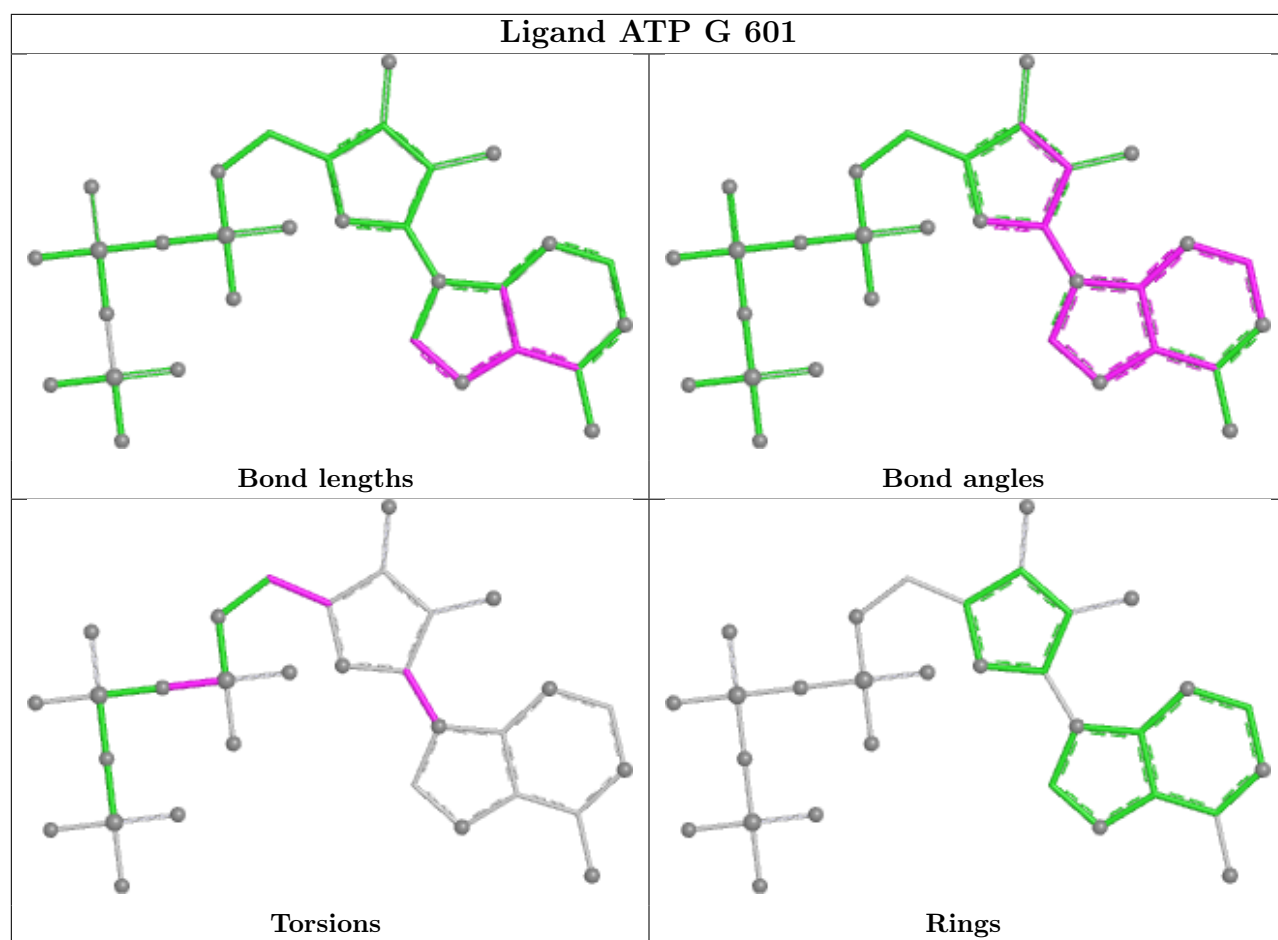
There are no ring outliers.

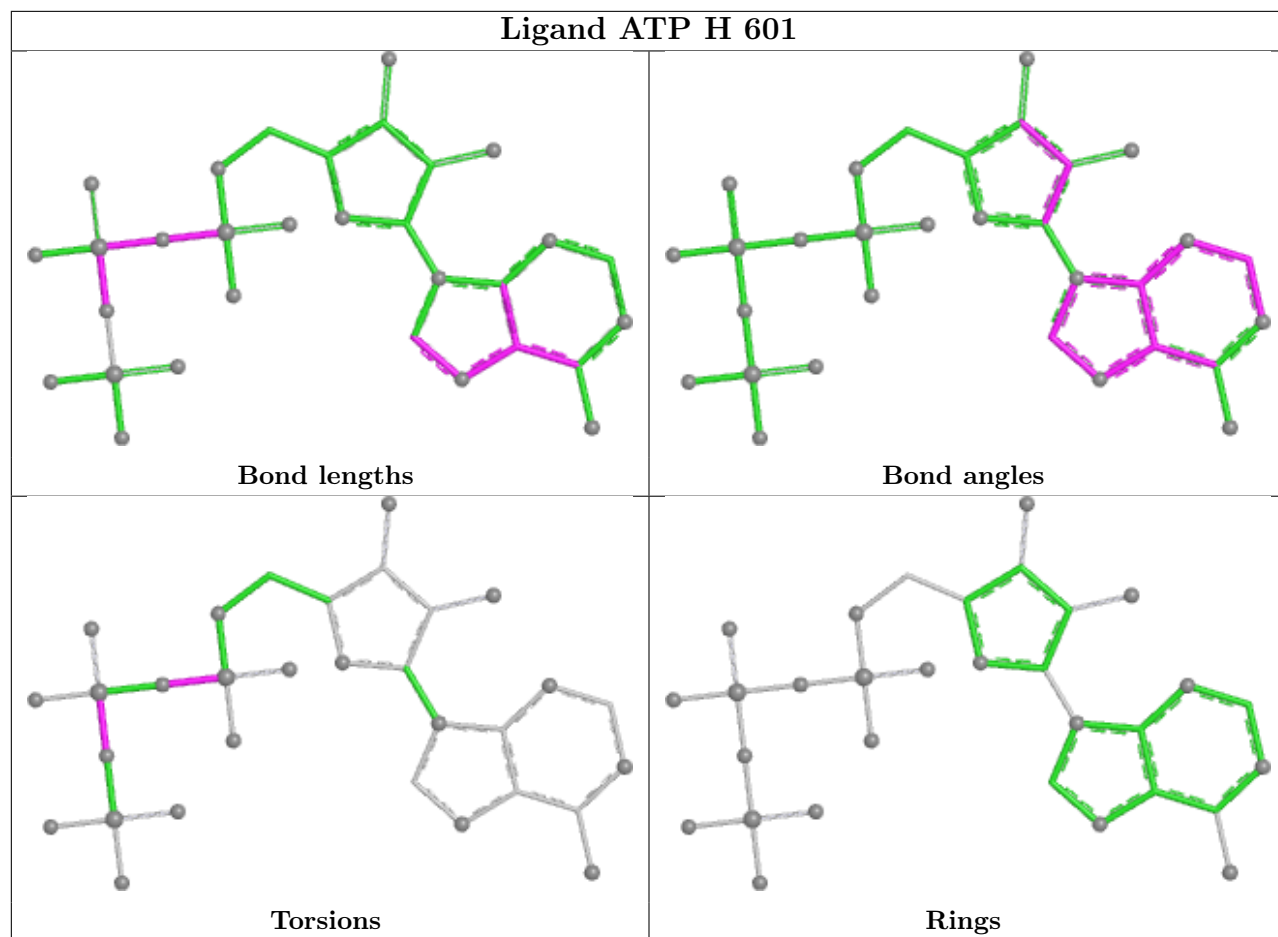
7 monomers are involved in 24 short contacts:

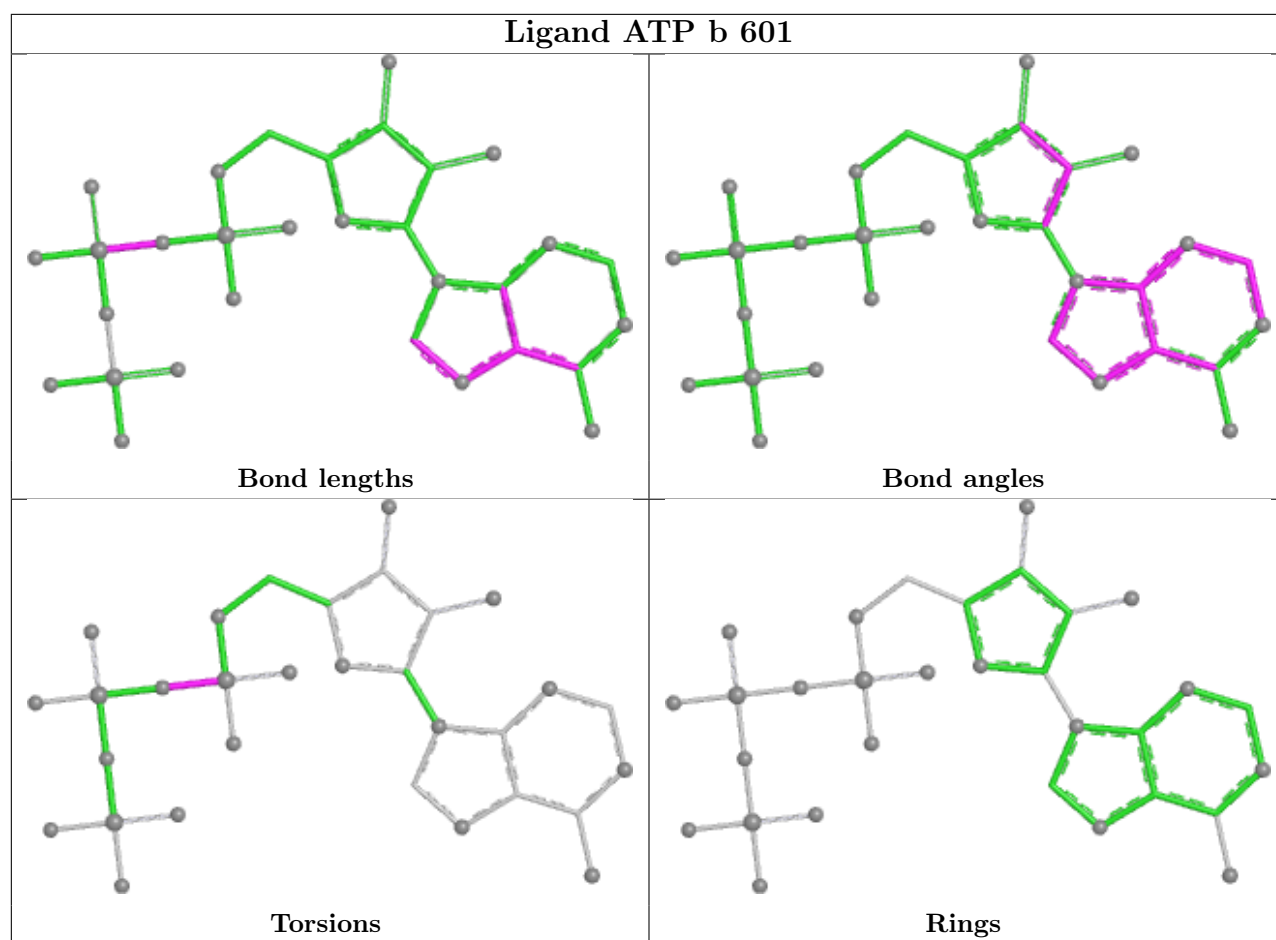
Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	Q	601	ATP	17	0
9	A	601	ATP	1	0
9	Z	601	ATP	1	0
9	a	601	ATP	1	0
9	D	601	ATP	1	0
9	q	601	ATP	1	0
9	h	601	ATP	2	0

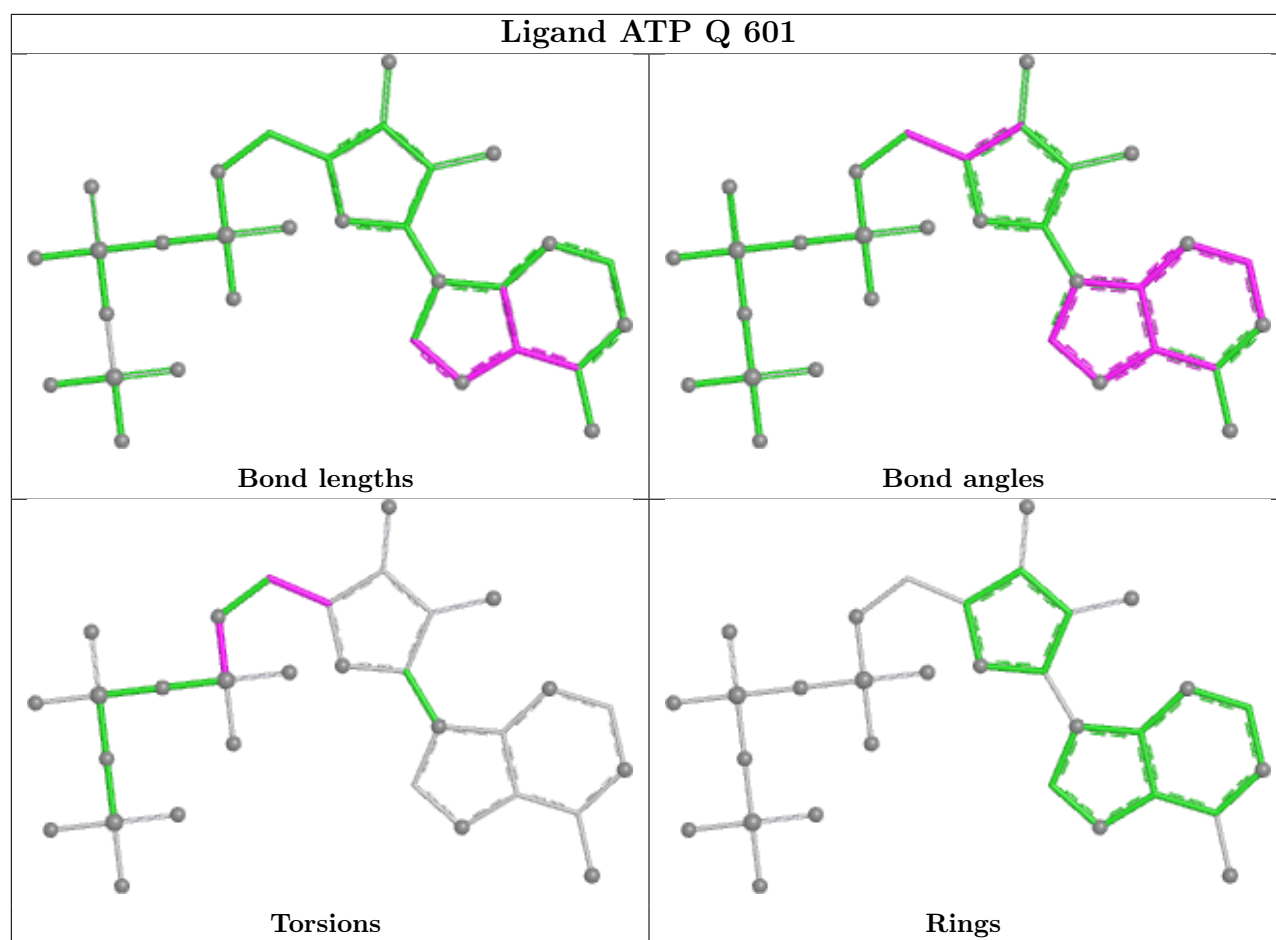
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

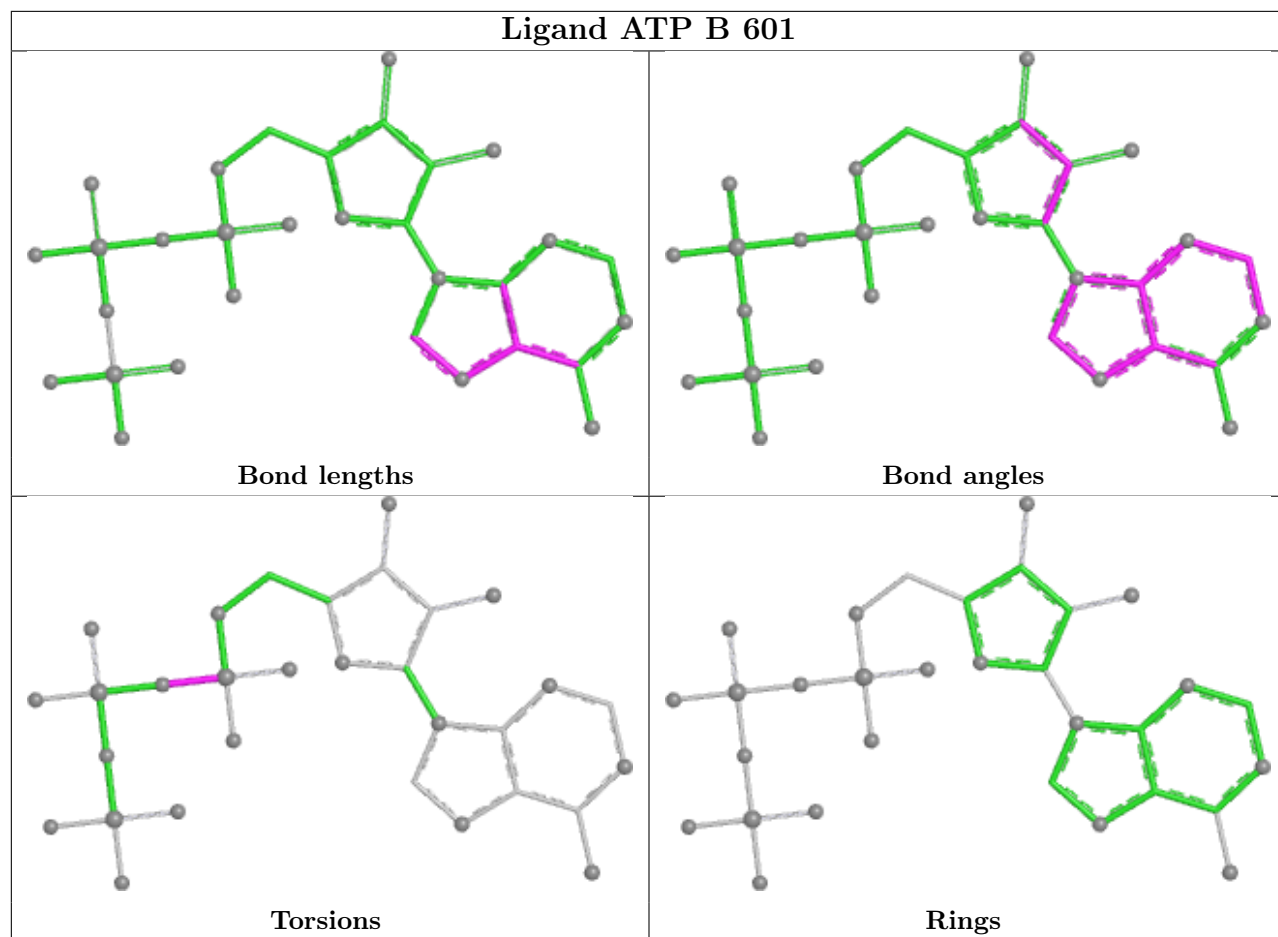


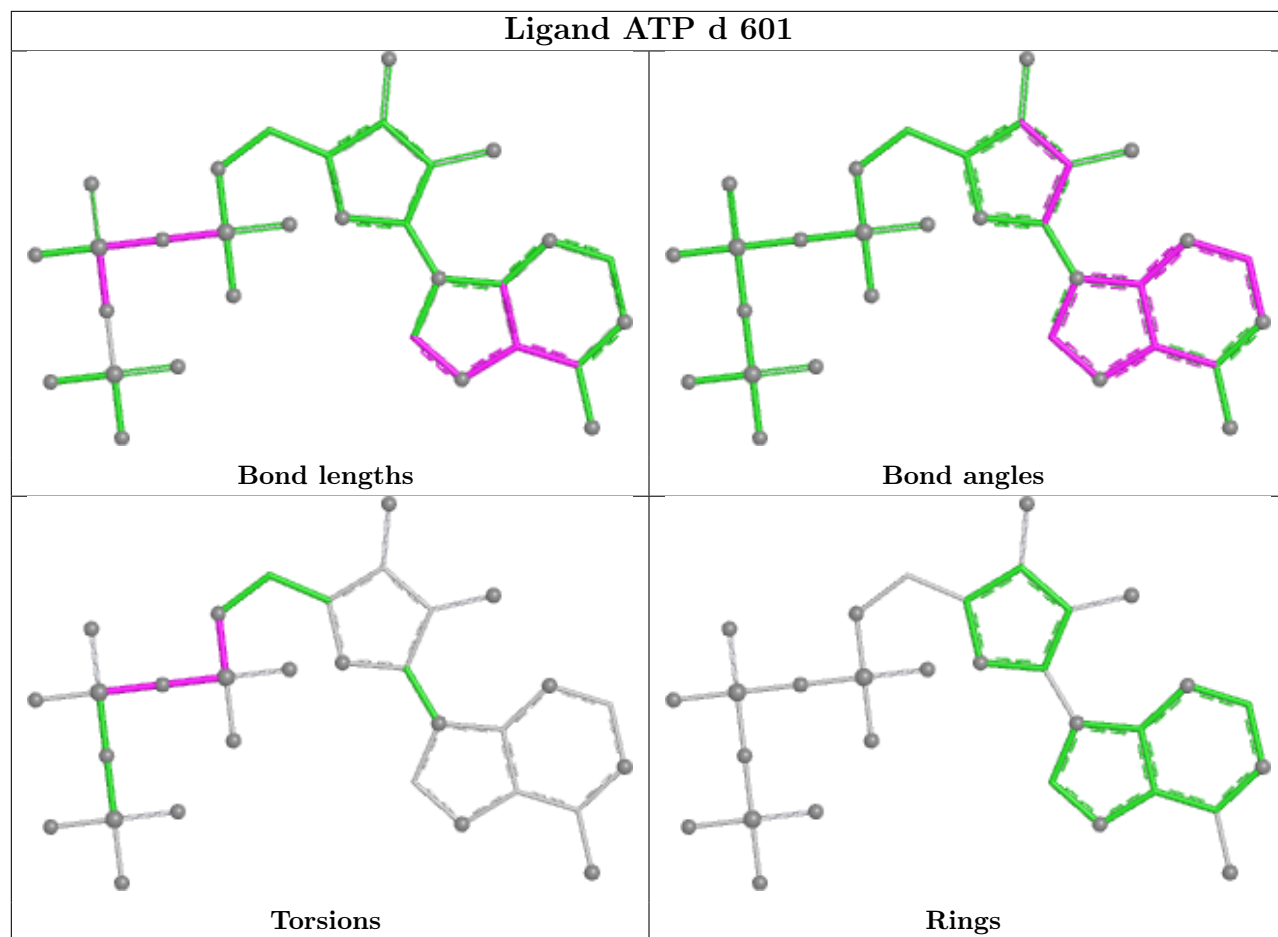


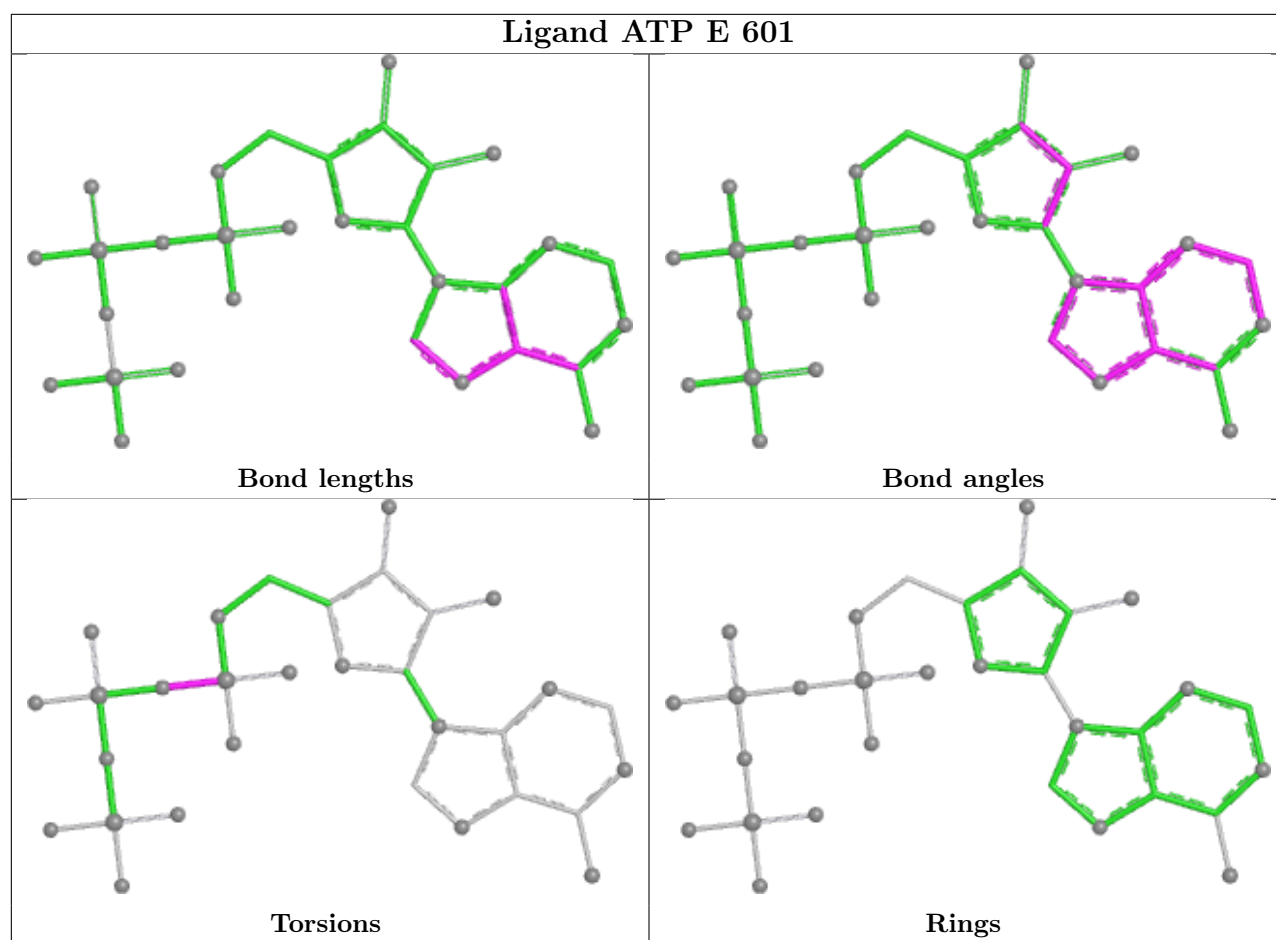


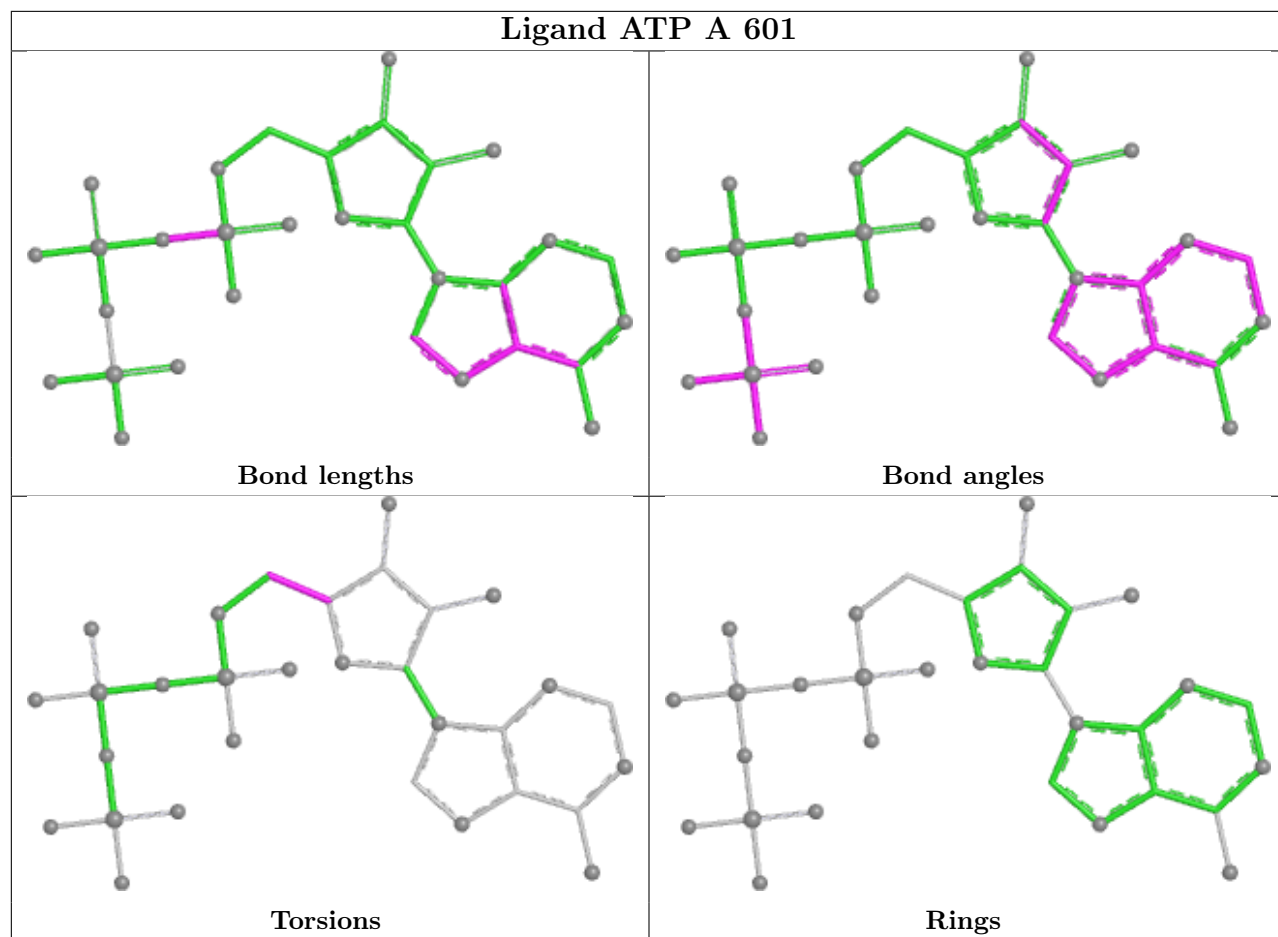


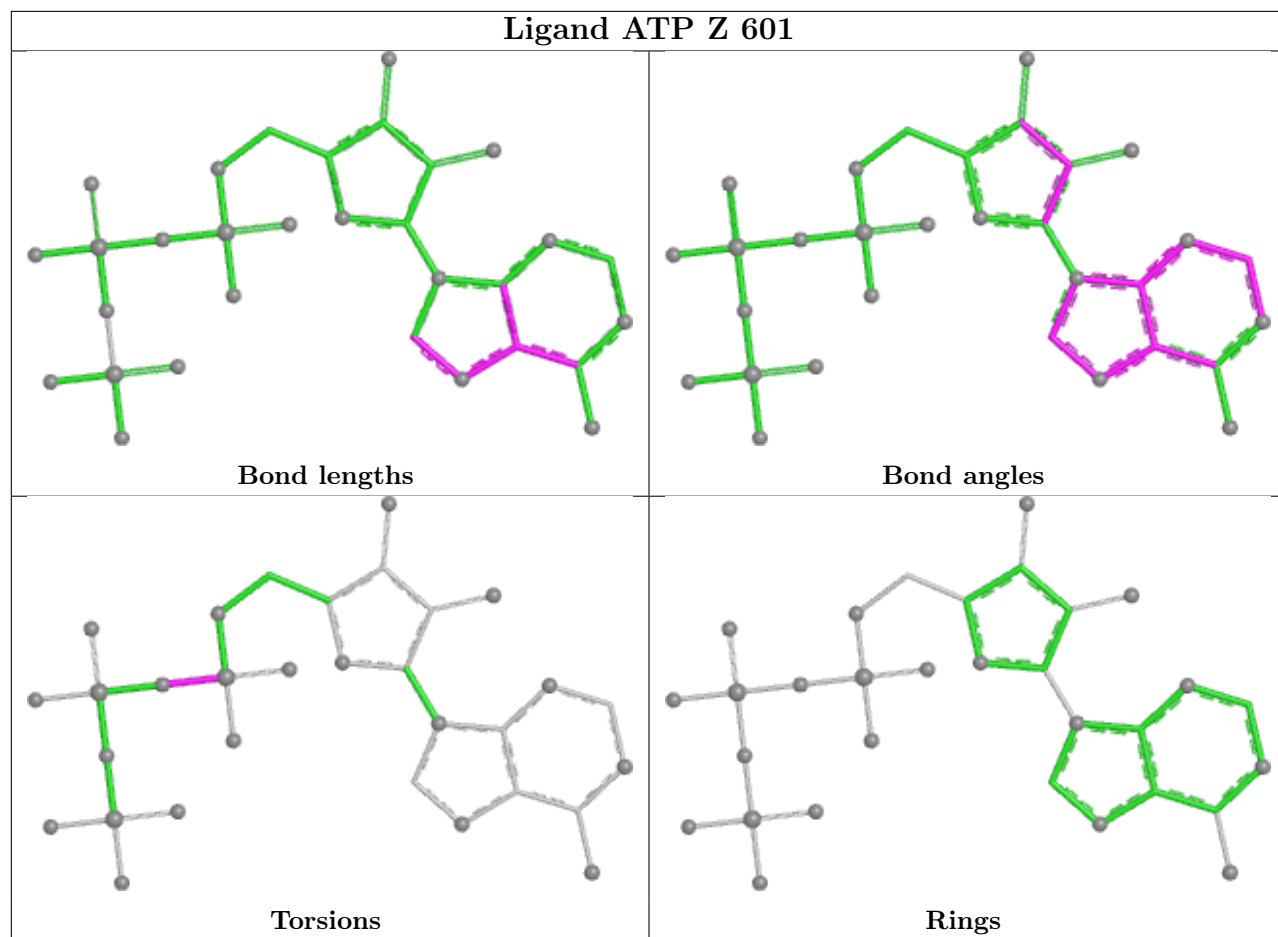


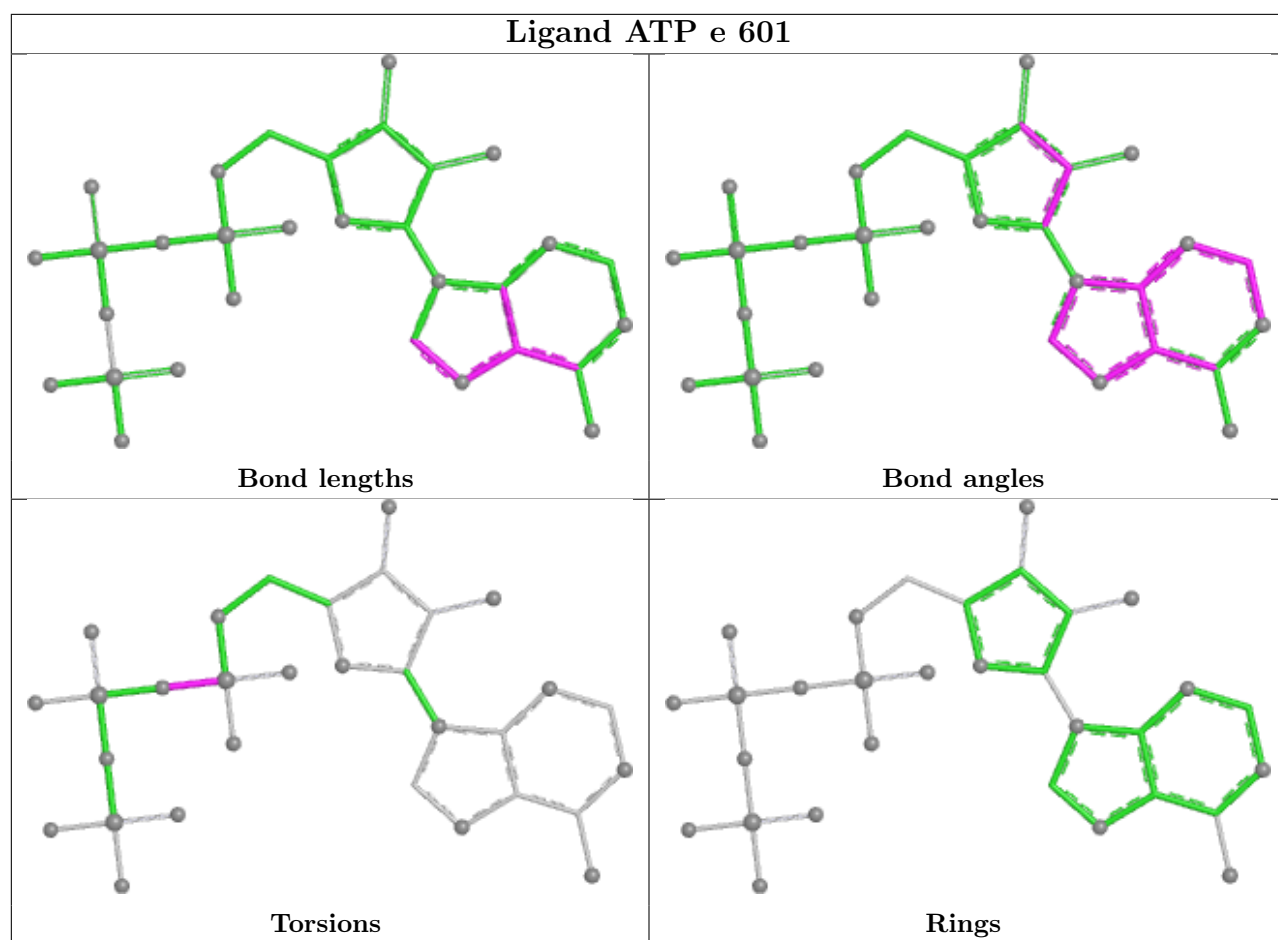


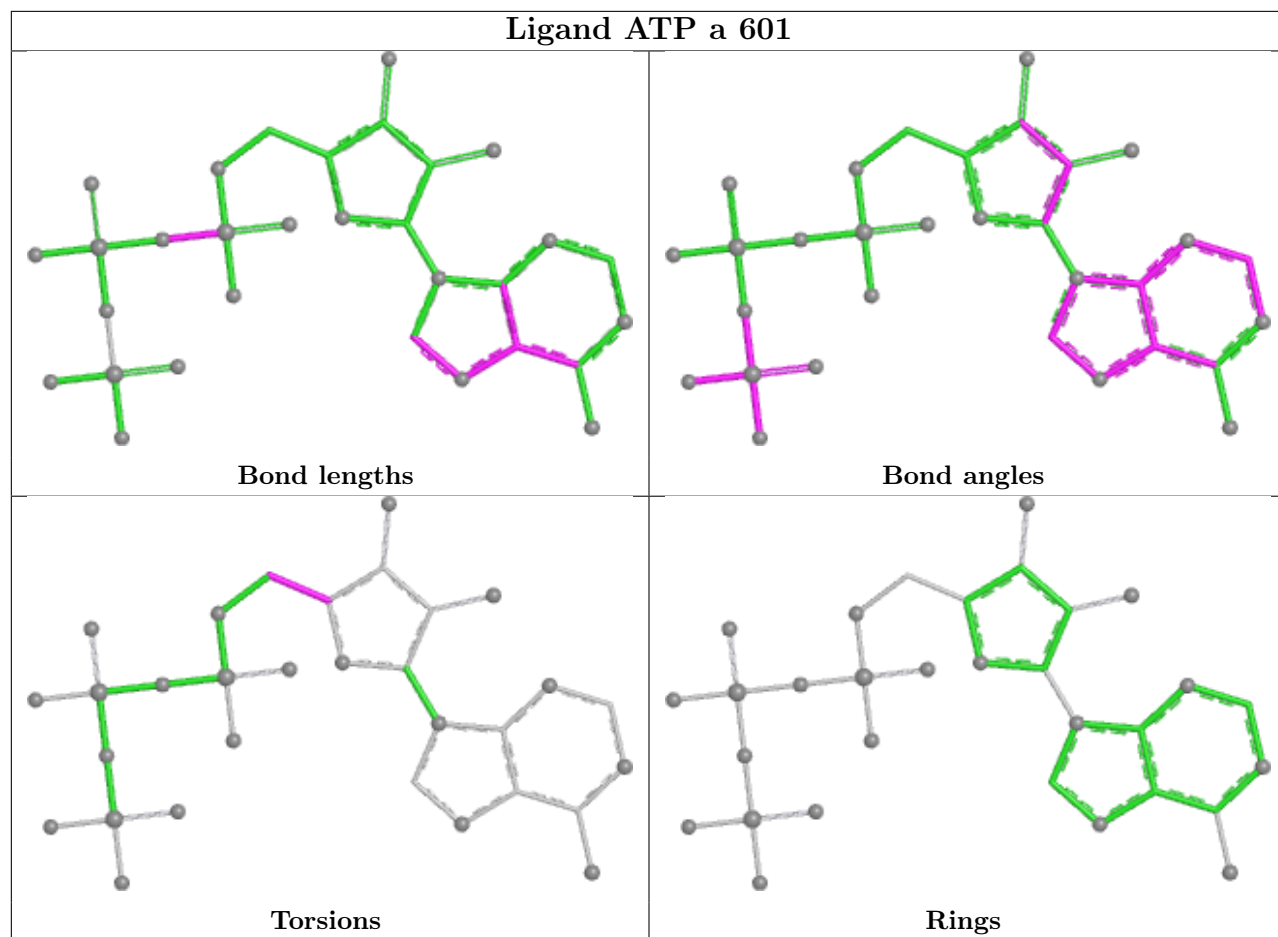


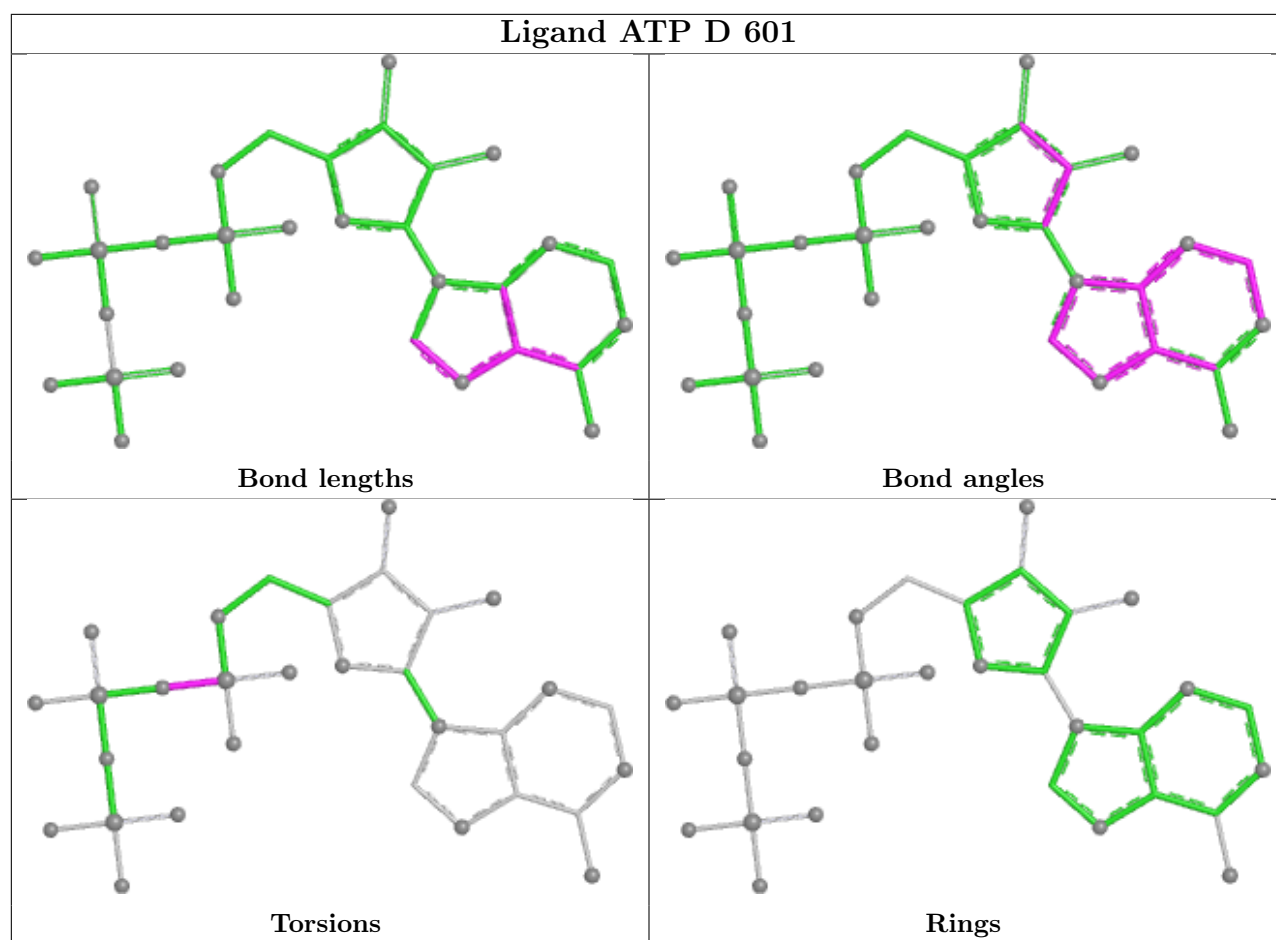


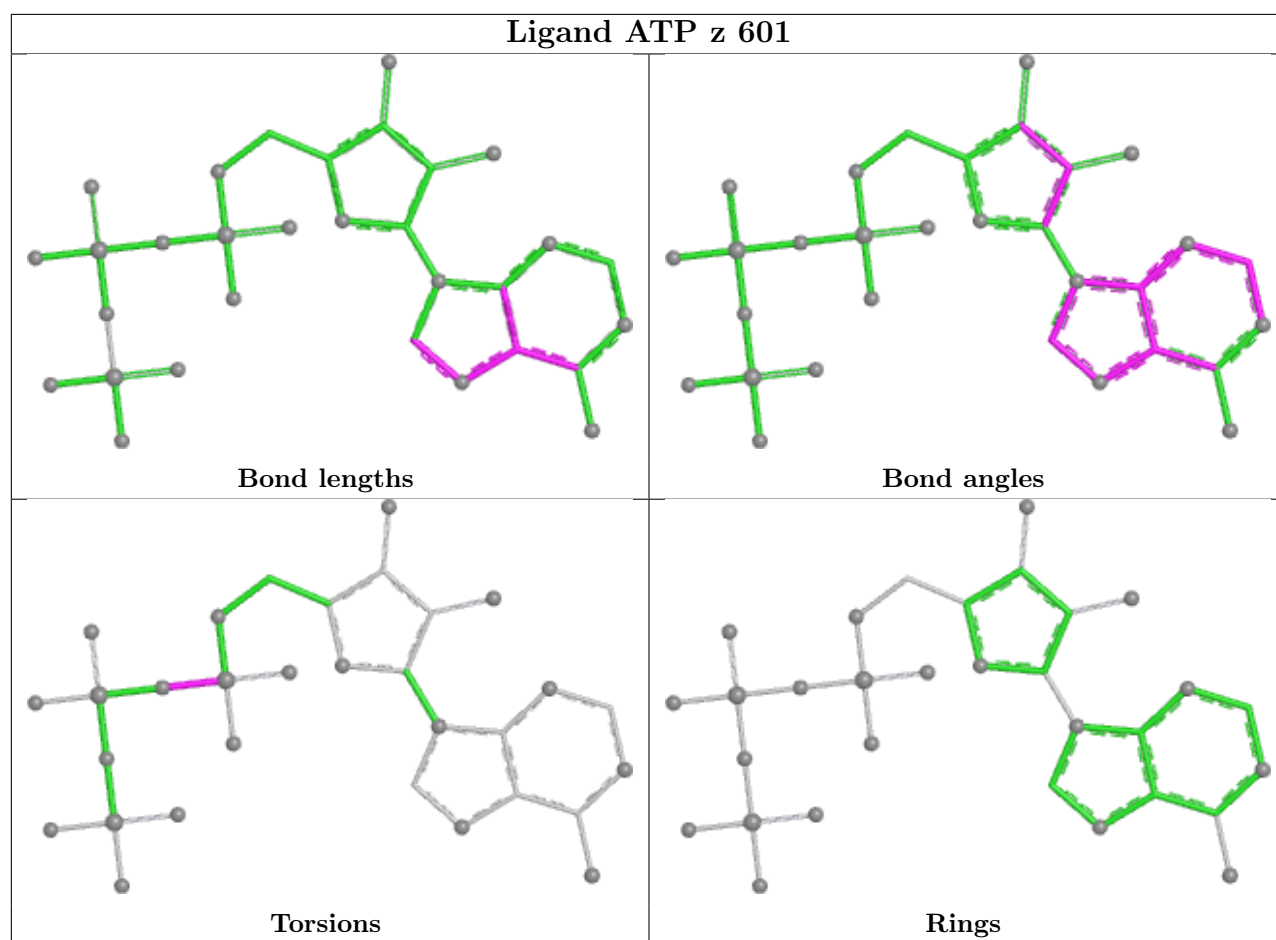


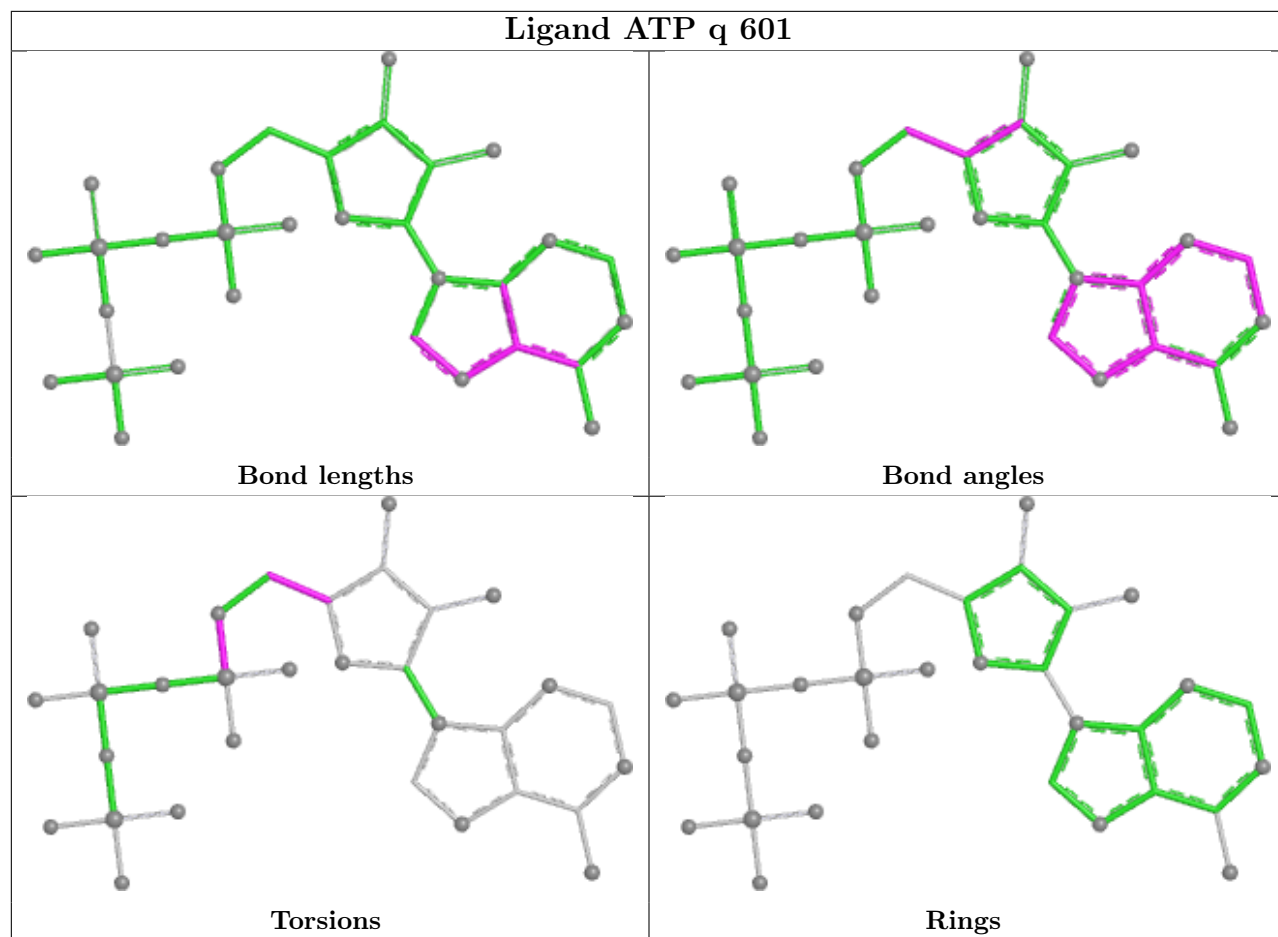


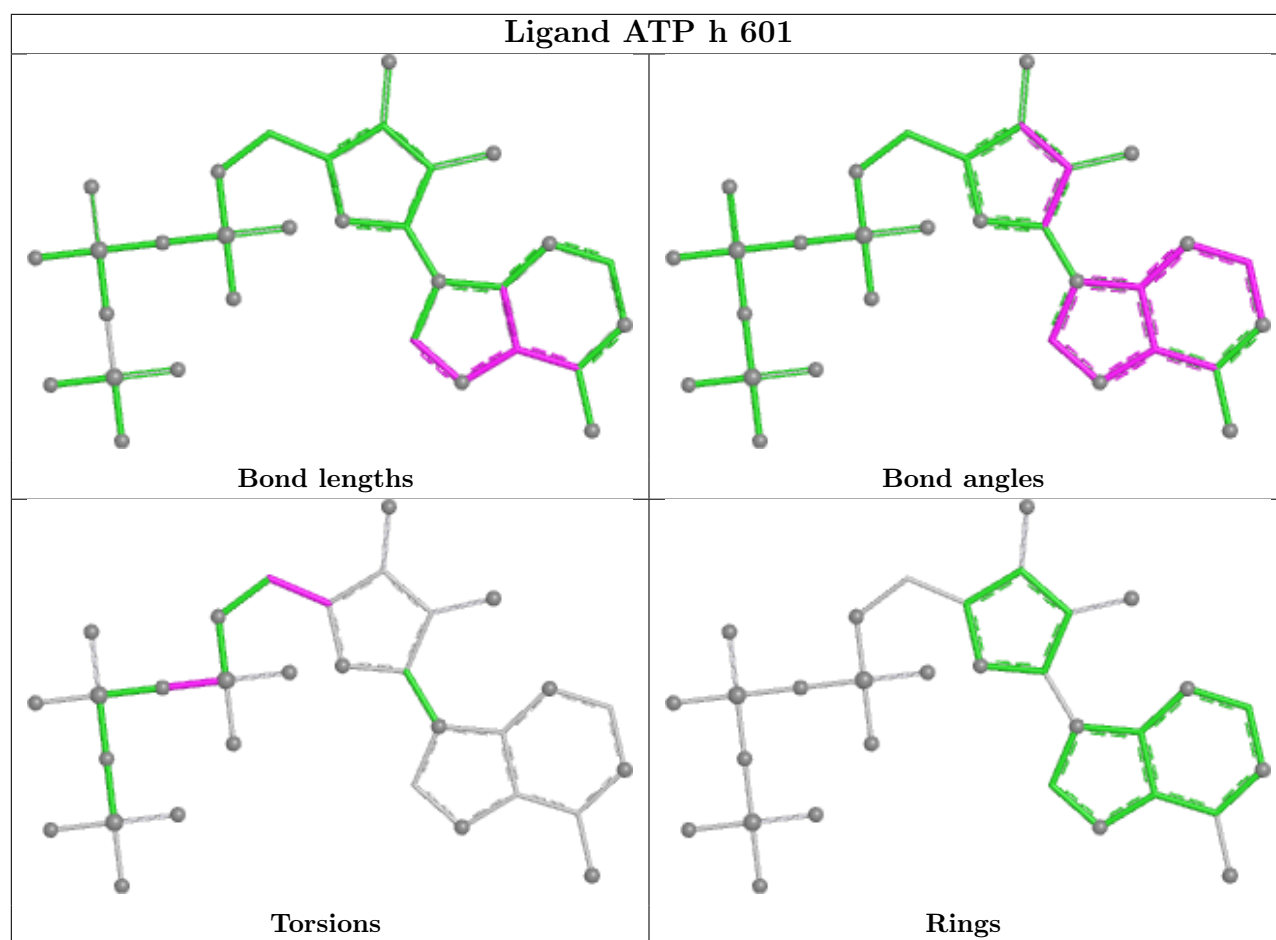












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

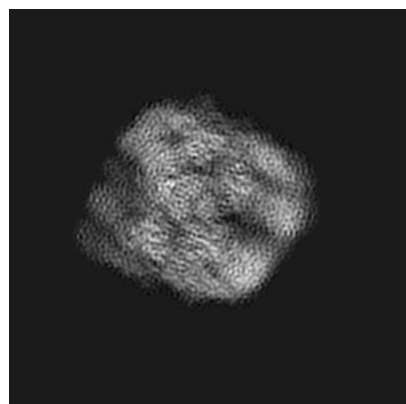
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-32989. These allow visual inspection of the internal detail of the map and identification of artifacts.

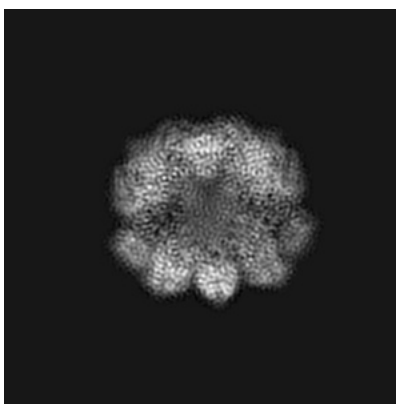
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

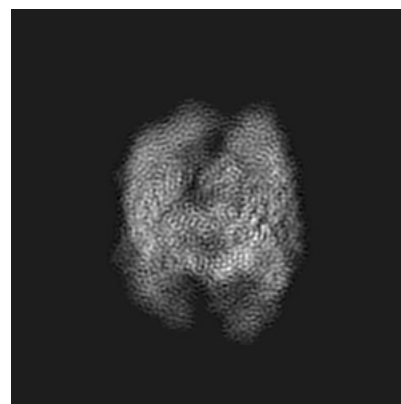
6.1.1 Primary map



X

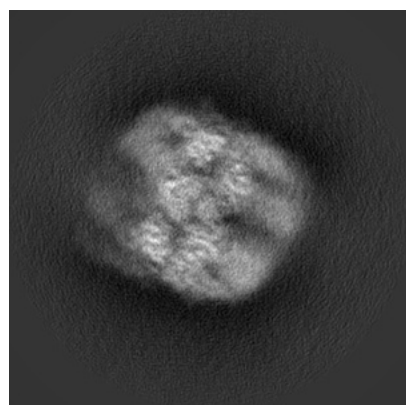


Y

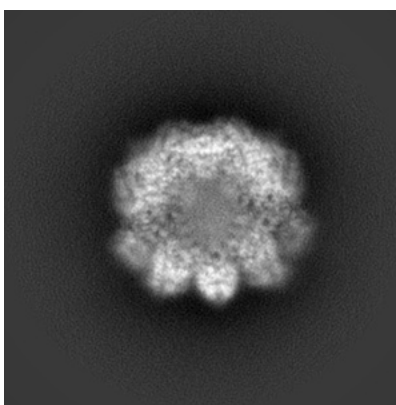


Z

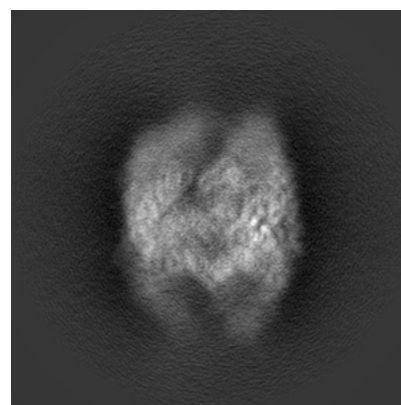
6.1.2 Raw map



X



Y

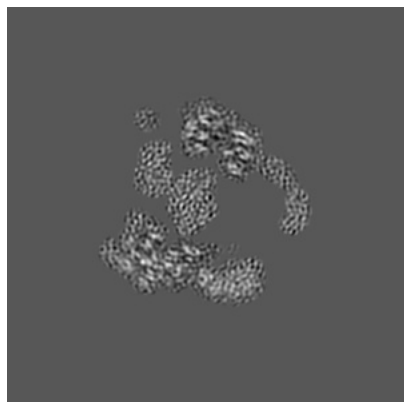


Z

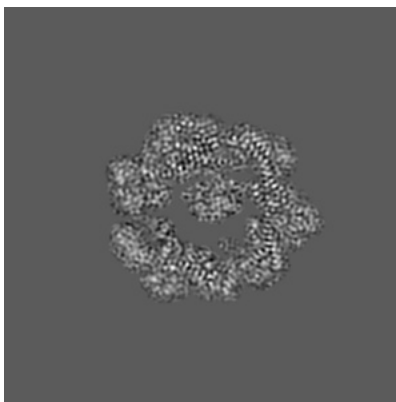
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

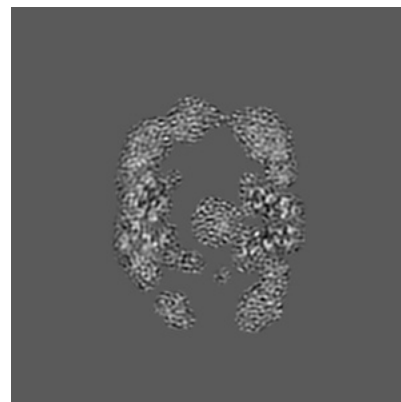
6.2.1 Primary map



X Index: 128

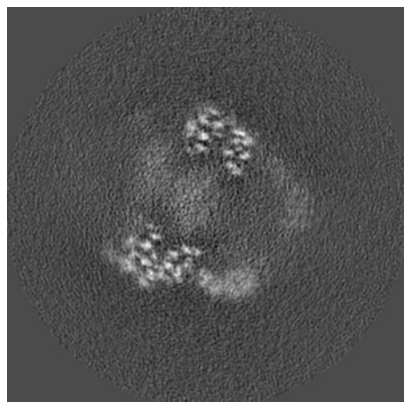


Y Index: 128

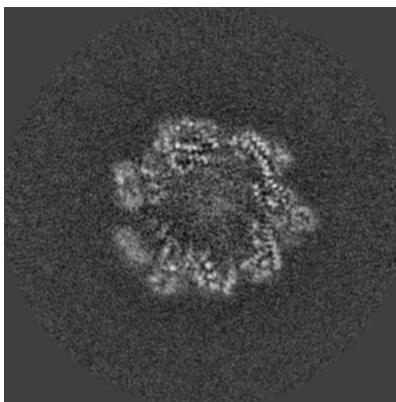


Z Index: 128

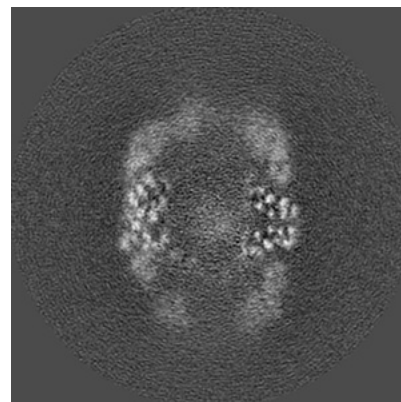
6.2.2 Raw map



X Index: 128



Y Index: 128

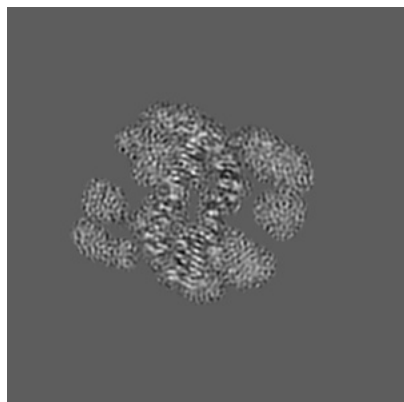


Z Index: 128

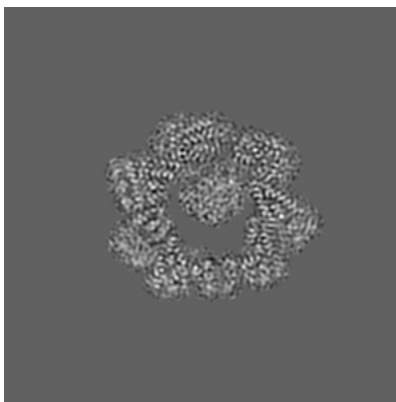
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

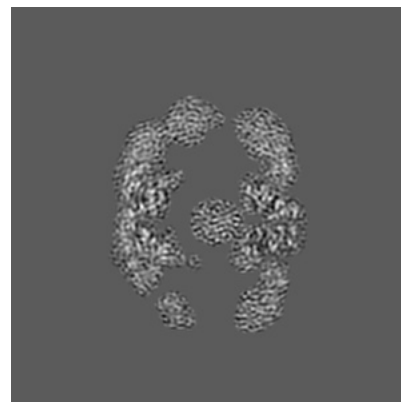
6.3.1 Primary map



X Index: 154

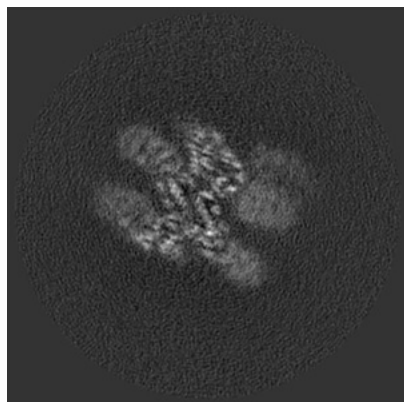


Y Index: 124

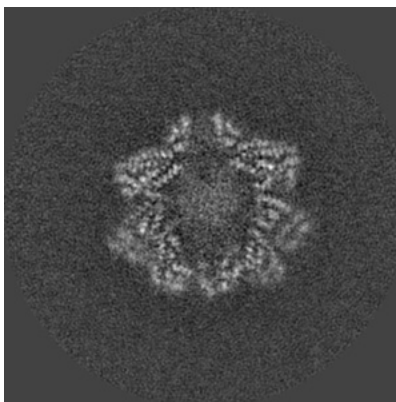


Z Index: 131

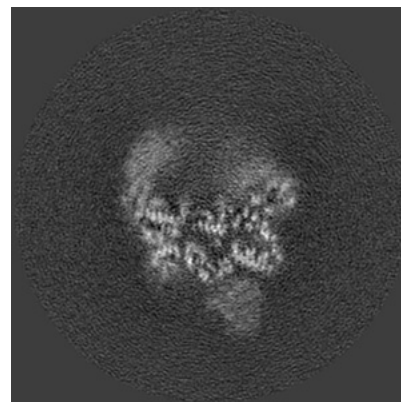
6.3.2 Raw map



X Index: 167



Y Index: 118

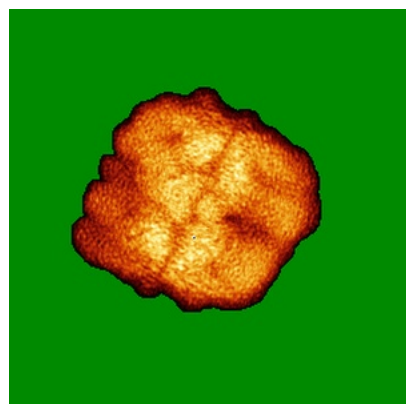


Z Index: 100

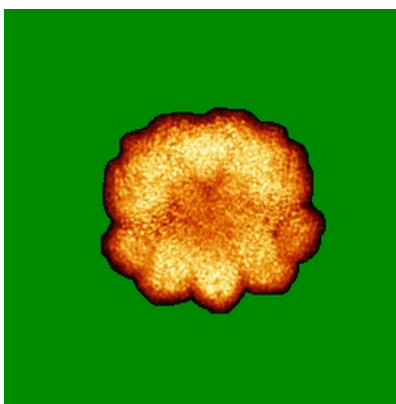
The images above show the largest variance slices of the map in three orthogonal directions.

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

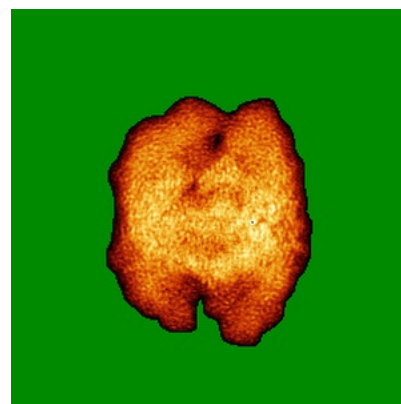
6.4.1 Primary map



X

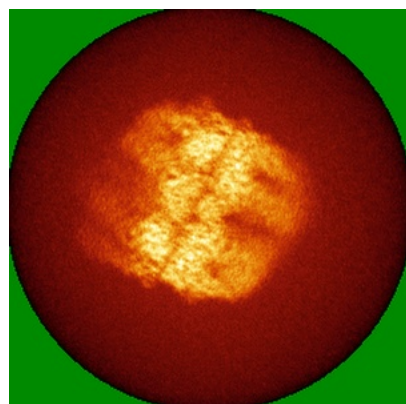


Y

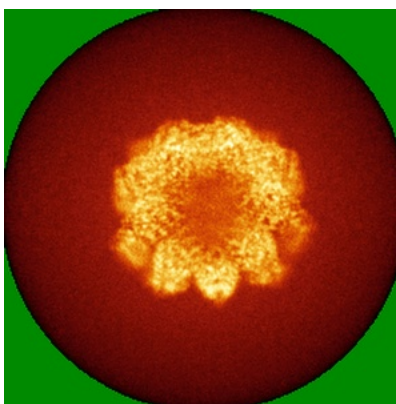


Z

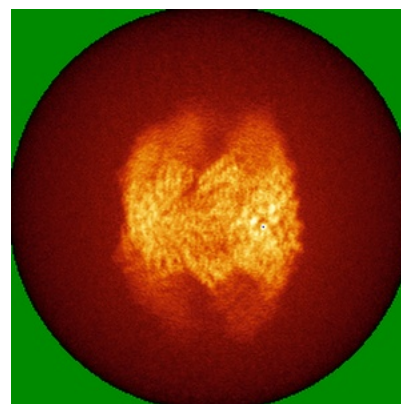
6.4.2 Raw map



X



Y

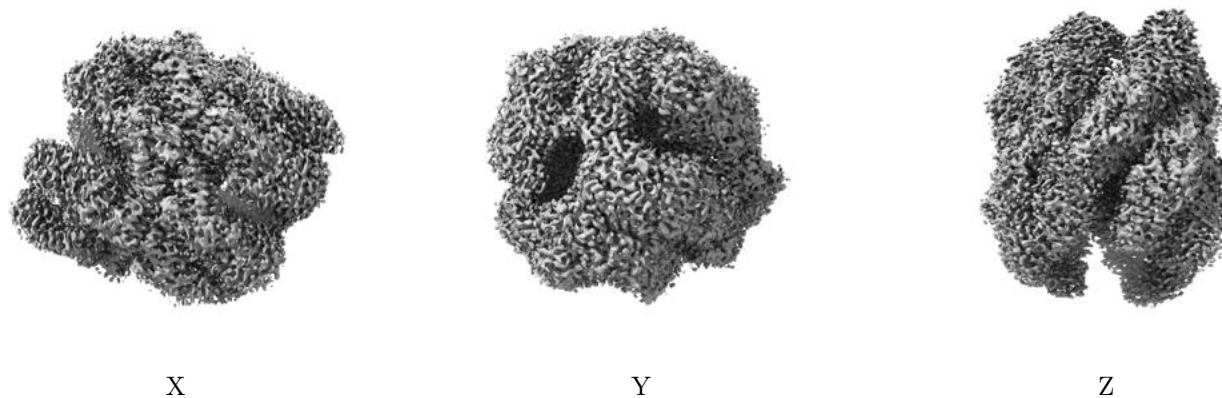


Z

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.

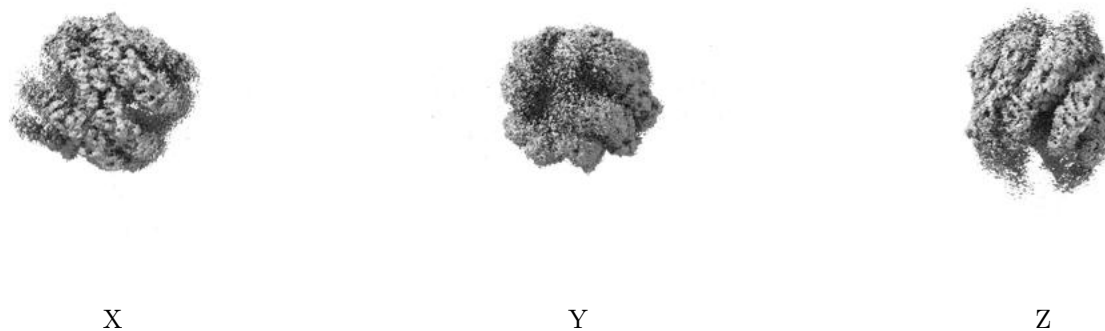
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.65. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

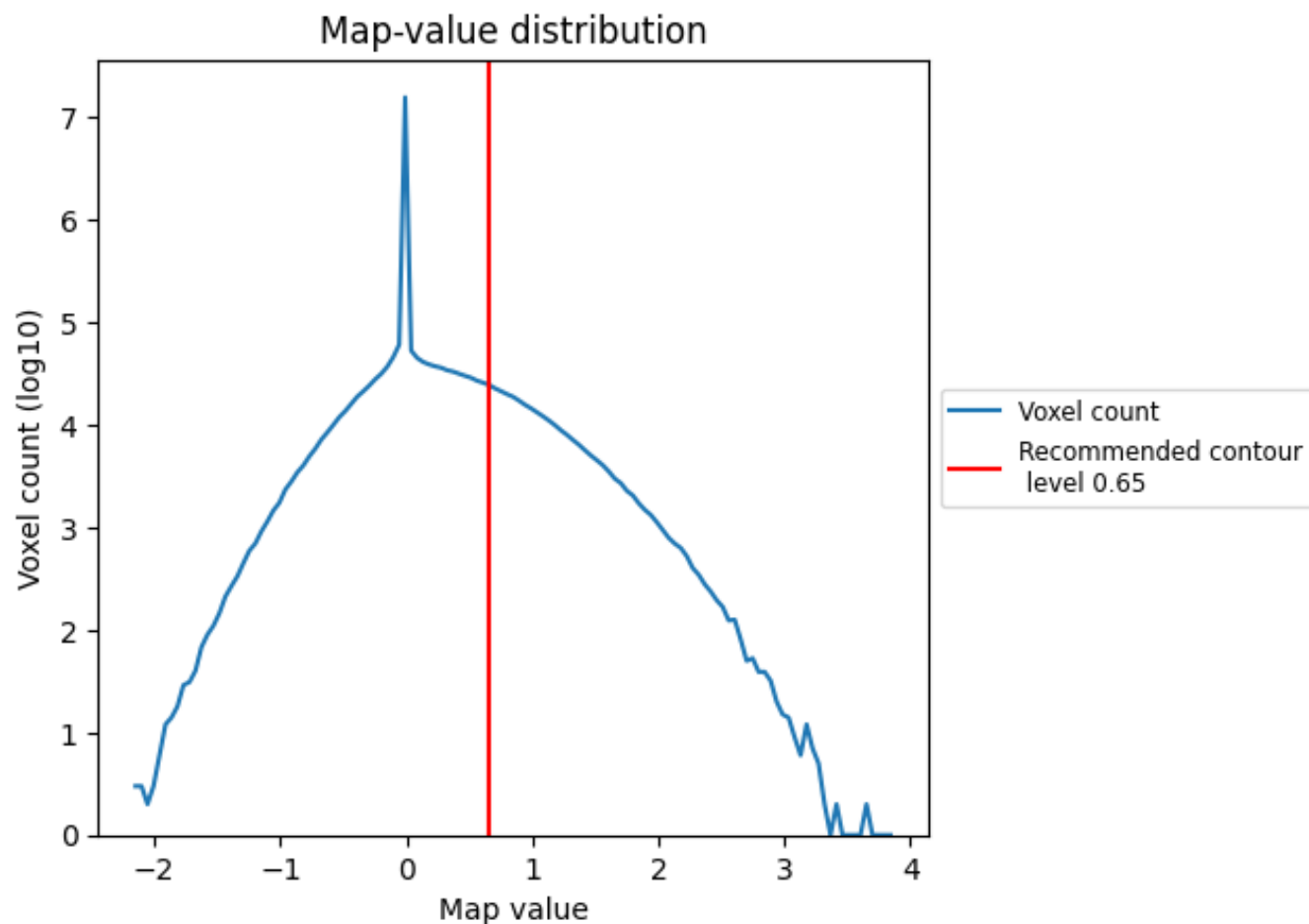
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

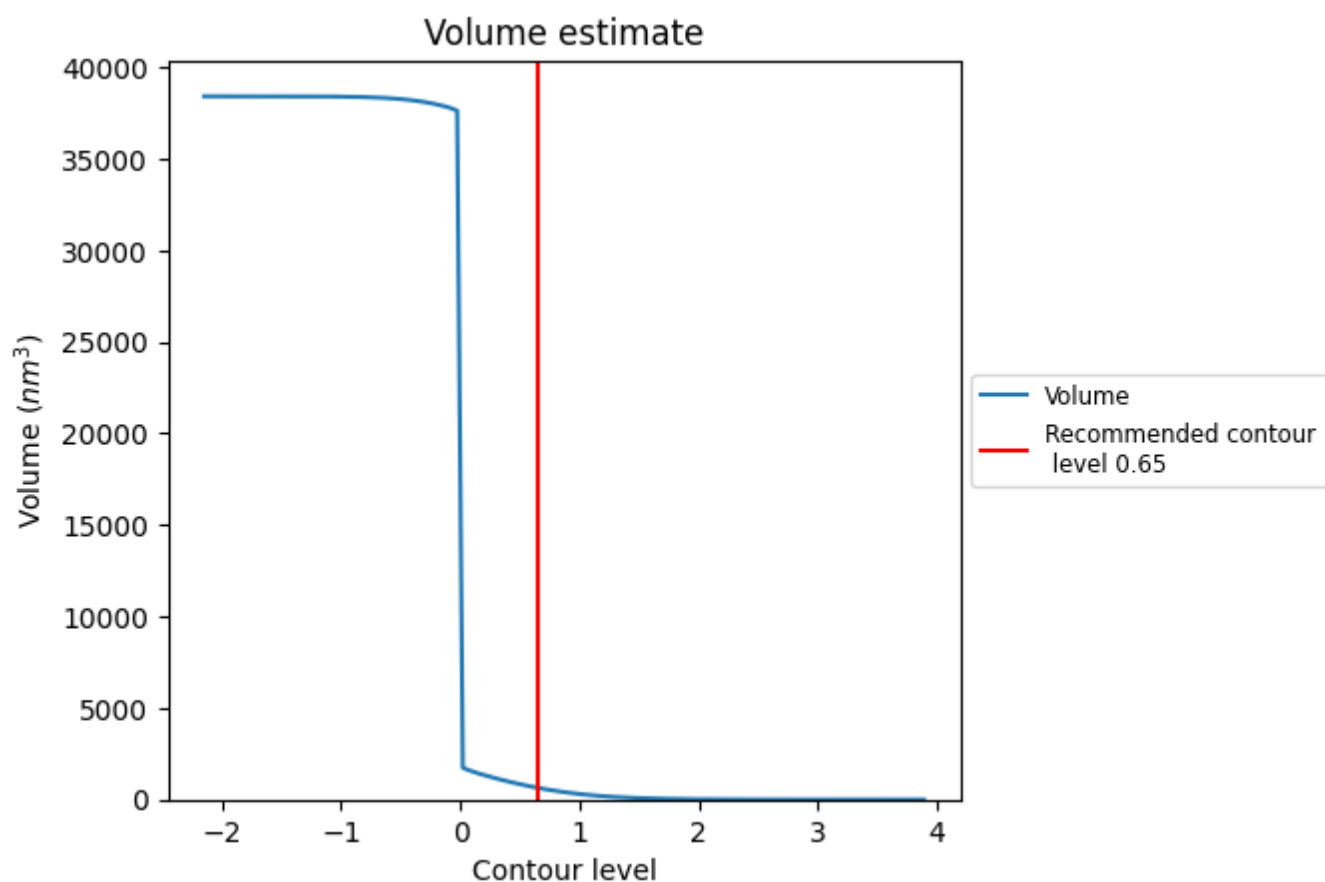
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

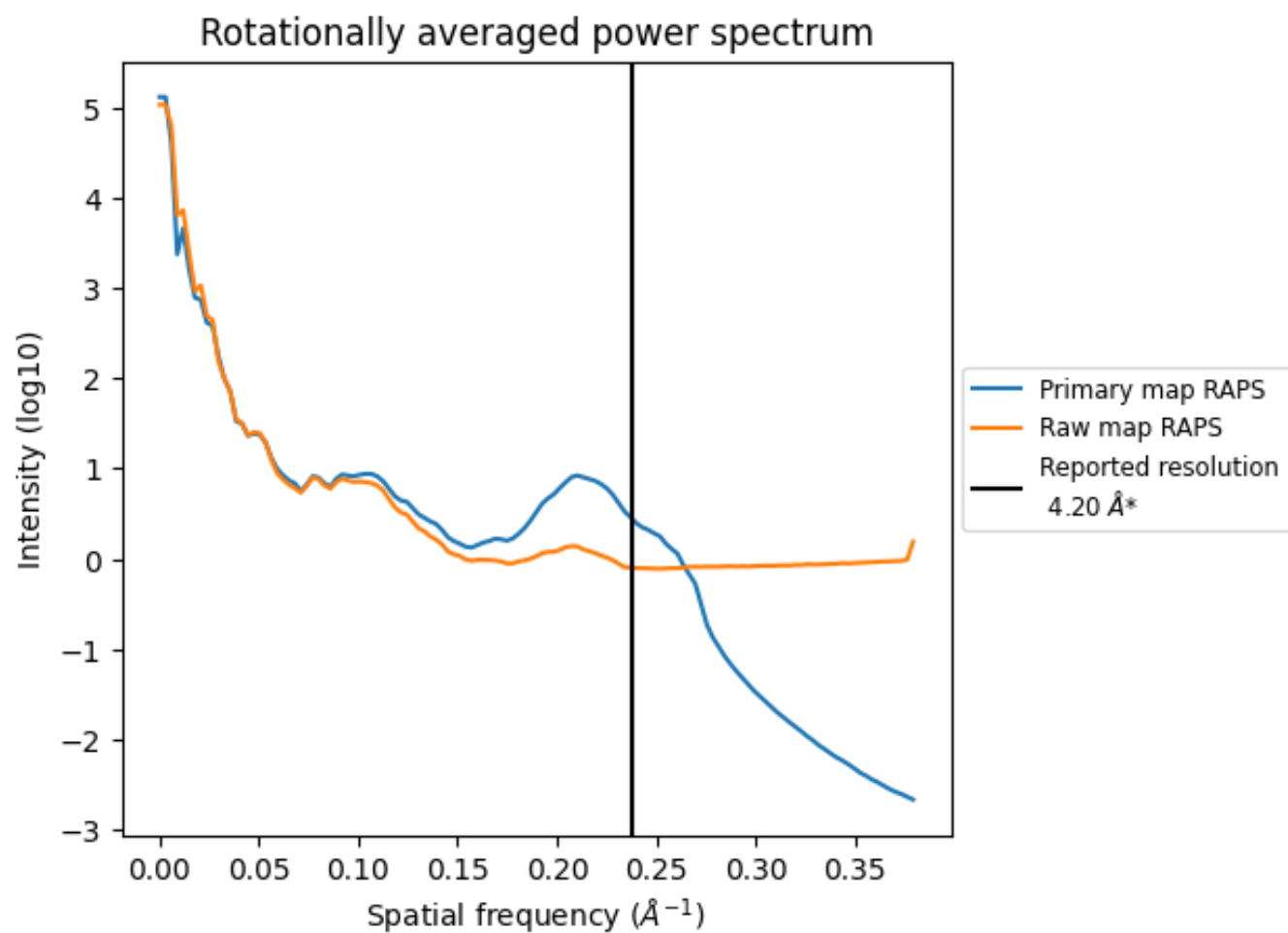
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 640 nm³; this corresponds to an approximate mass of 578 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 ⓘ

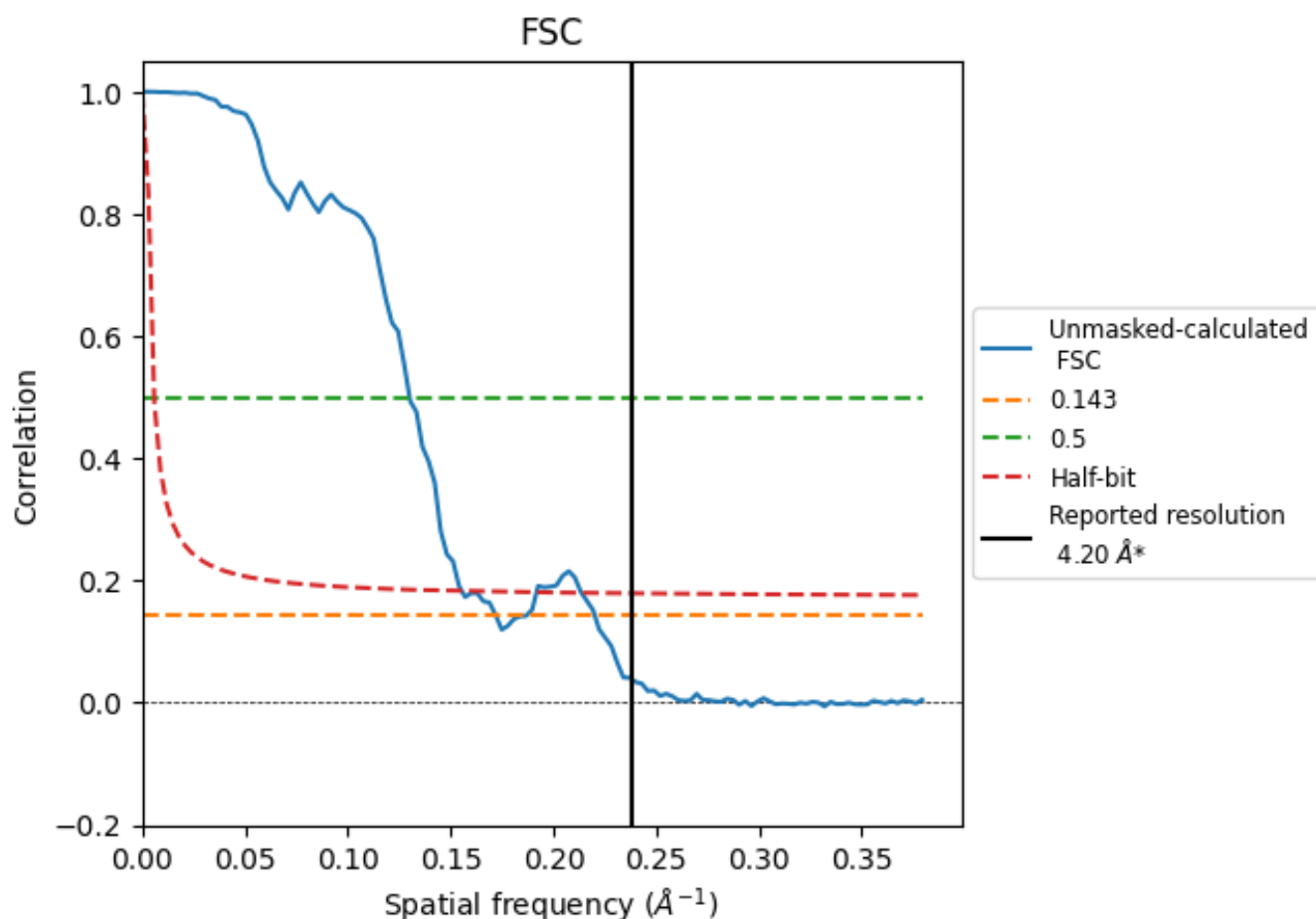


*Reported resolution corresponds to spatial frequency of 0.238 Å⁻¹

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 0.238 Å⁻¹

8.2 Resolution estimates [i](#)

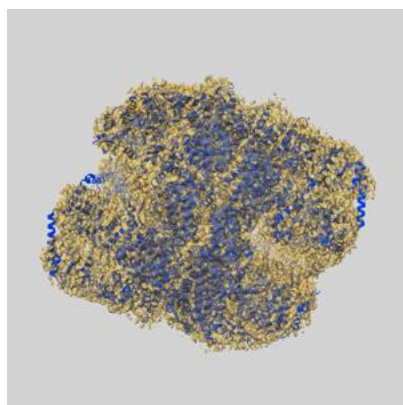
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.20	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	5.81	7.69	6.43

*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 5.81 differs from the reported value 4.2 by more than 10 %

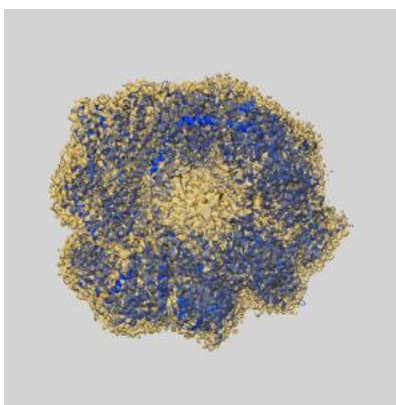
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-32989 and PDB model 7X3J. Per-residue inclusion information can be found in section [3](#) on page [8](#).

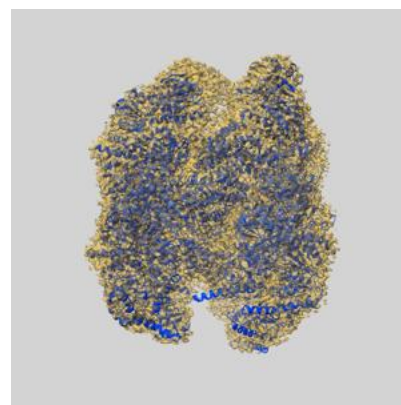
9.1 Map-model overlay [i](#)



X



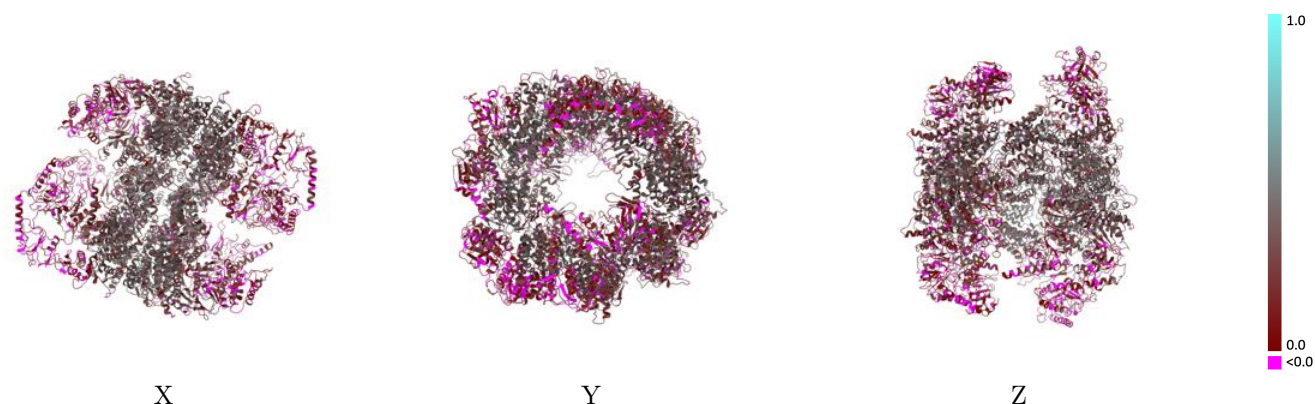
Y



Z

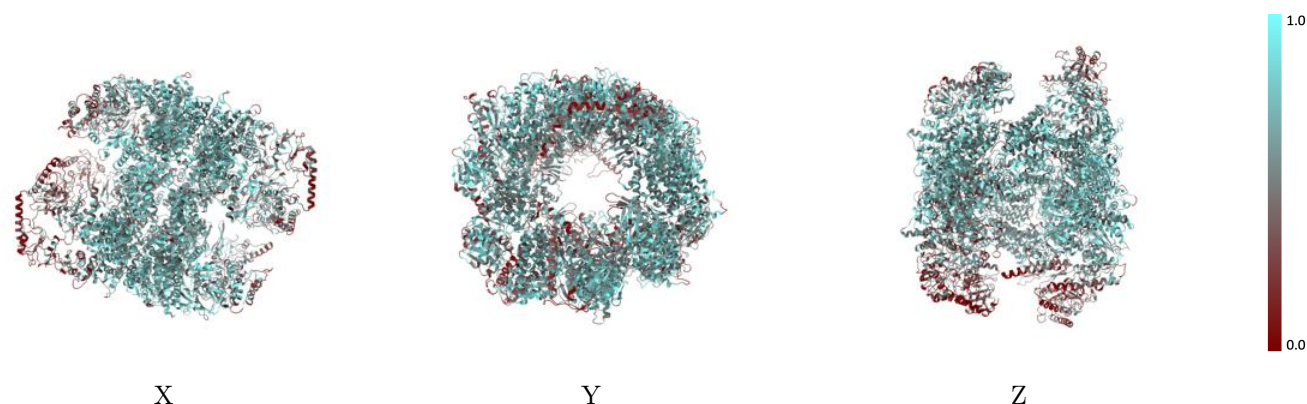
The images above show the 3D surface view of the map at the recommended contour level 0.65 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



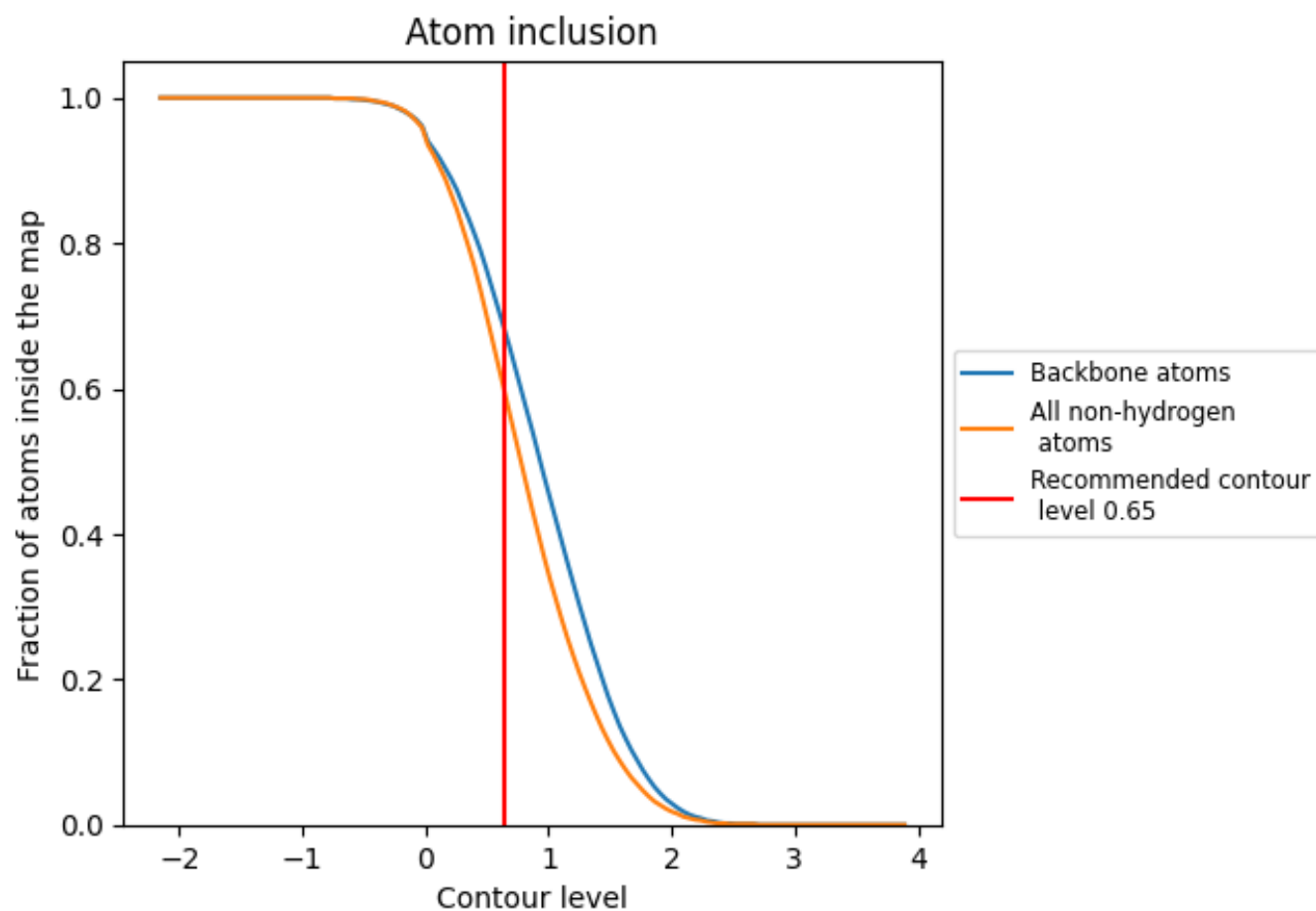
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.65).

9.4 Atom inclusion [i](#)



At the recommended contour level, 68% of all backbone atoms, 59% 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 (0.65) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.5920	 0.2460
A	 0.5480	 0.2390
B	 0.5330	 0.2280
D	 0.5580	 0.2490
E	 0.5420	 0.2190
G	 0.5520	 0.2480
H	 0.5770	 0.2550
Q	 0.6540	 0.2930
Z	 0.6240	 0.2810
a	 0.4910	 0.1850
b	 0.6090	 0.2350
d	 0.6030	 0.2280
e	 0.5980	 0.2000
g	 0.6270	 0.2510
h	 0.6500	 0.2590
q	 0.6620	 0.2870
z	 0.6330	 0.2720

