



wwPDB EM Validation Summary Report ⓘ

Aug 15, 2026 – 04:22 pm BST

PDB ID : 9QK1 / pdb_00009qk1
EMDB ID : EMD-53216
Title : GABA-A receptor a2b3 (1:4) + a2NB06(silent) + b3Mb125 + GABA
Authors : Miller, P.S.; Gonzalez-Prada, J.E.
Deposited on : 2025-03-19
Resolution : 3.05 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:

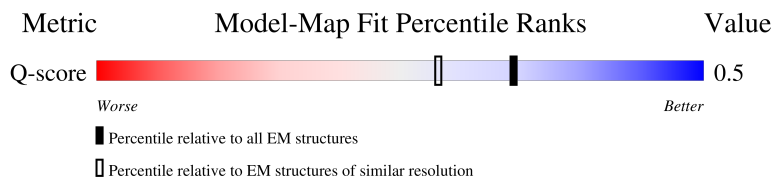
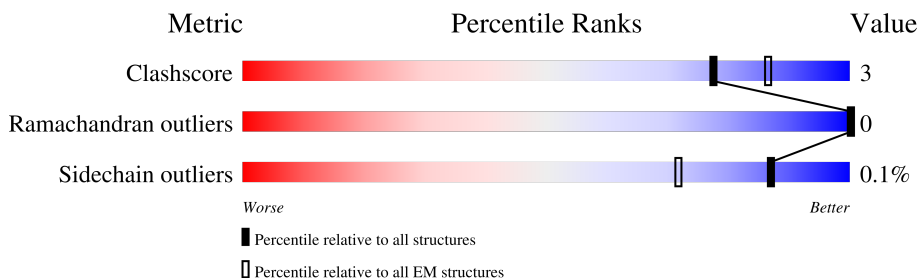
EMDB validation analysis : 0.0.1.dev133
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data 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) : 2.50

1 Overall quality at a glance

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

The reported resolution of this entry is 3.05 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	13971 (2.55 - 3.55)

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	365	13% 84% 7% 8%
2	B	451	7% 69% 6% 26%
2	C	451	6% 69% 5% 26%
2	D	451	5% 67% 7% 26%

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Mol	Chain	Length	Quality of chain
2	E	451	
3	F	133	
4	G	133	
4	H	133	
4	I	133	
5	L	2	
5	N	2	
5	P	2	
5	R	2	
6	M	4	
6	O	4	
6	Q	4	
6	S	4	

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 34976 atoms, of which 17341 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 Gamma-aminobutyric acid receptor subunit alpha-2.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	A	335	Total	C	H	N	O	S	0	0
			5385	1749	2686	444	489	17		

There are 54 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	312	SER	-	expression tag	UNP P47869
A	313	GLN	-	expression tag	UNP P47869
A	314	PRO	-	expression tag	UNP P47869
A	315	ALA	-	expression tag	UNP P47869
A	316	ARG	-	expression tag	UNP P47869
A	317	ALA	-	expression tag	UNP P47869
A	318	ALA	-	expression tag	UNP P47869
A	388	LYS	-	expression tag	UNP P47869
A	389	ILE	-	expression tag	UNP P47869
A	390	ASP	-	expression tag	UNP P47869
A	391	ARG	-	expression tag	UNP P47869
A	392	MET	-	expression tag	UNP P47869
A	393	SER	-	expression tag	UNP P47869
A	394	ARG	-	expression tag	UNP P47869
A	395	ILE	-	expression tag	UNP P47869
A	396	VAL	-	expression tag	UNP P47869
A	397	PHE	-	expression tag	UNP P47869
A	398	PRO	-	expression tag	UNP P47869
A	399	VAL	-	expression tag	UNP P47869
A	400	LEU	-	expression tag	UNP P47869
A	401	PHE	-	expression tag	UNP P47869
A	402	GLY	-	expression tag	UNP P47869
A	403	THR	-	expression tag	UNP P47869
A	404	PHE	-	expression tag	UNP P47869
A	405	ASN	-	expression tag	UNP P47869
A	406	LEU	-	expression tag	UNP P47869
A	407	VAL	-	expression tag	UNP P47869
A	408	TYR	-	expression tag	UNP P47869

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Chain	Residue	Modelled	Actual	Comment	Reference
A	409	TRP	-	expression tag	UNP P47869
A	410	ALA	-	expression tag	UNP P47869
A	411	THR	-	expression tag	UNP P47869
A	412	TYR	-	expression tag	UNP P47869
A	413	LEU	-	expression tag	UNP P47869
A	414	ASN	-	expression tag	UNP P47869
A	415	ARG	-	expression tag	UNP P47869
A	416	GLU	-	expression tag	UNP P47869
A	417	PRO	-	expression tag	UNP P47869
A	418	VAL	-	expression tag	UNP P47869
A	419	LEU	-	expression tag	UNP P47869
A	420	GLY	-	expression tag	UNP P47869
A	421	VAL	-	expression tag	UNP P47869
A	422	SER	-	expression tag	UNP P47869
A	423	PRO	-	expression tag	UNP P47869
A	424	GLY	-	expression tag	UNP P47869
A	425	THR	-	expression tag	UNP P47869
A	426	THR	-	expression tag	UNP P47869
A	427	GLU	-	expression tag	UNP P47869
A	428	THR	-	expression tag	UNP P47869
A	429	SER	-	expression tag	UNP P47869
A	430	GLN	-	expression tag	UNP P47869
A	431	VAL	-	expression tag	UNP P47869
A	432	ALA	-	expression tag	UNP P47869
A	433	PRO	-	expression tag	UNP P47869
A	434	ALA	-	expression tag	UNP P47869

- Molecule 2 is a protein called Gamma-aminobutyric acid receptor subunit beta-3,Soluble cytochrome b562.

Mol	Chain	Residues	Atoms						AltConf	Trace
2	B	335	Total	C	H	N	O	S	0	0
			5482	1798	2738	447	483	16		
2	C	333	Total	C	H	N	O	S	0	0
			5441	1783	2717	445	480	16		
2	D	333	Total	C	H	N	O	S	0	0
			5439	1783	2715	445	480	16		
2	E	333	Total	C	H	N	O	S	0	0
			5441	1783	2717	445	480	16		

There are 56 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	308	SER	-	linker	UNP P28472
B	308A	GLN	-	linker	UNP P28472
B	308B	PRO	-	linker	UNP P28472
B	308C	ALA	-	linker	UNP P28472
B	308D	GLY	-	linker	UNP P28472
B	308E	THR	-	linker	UNP P28472
B	308L	TRP	MET	conflict	UNP P0ABE7
B	312C	ILE	HIS	conflict	UNP P0ABE7
B	416	LEU	-	linker	UNP P0ABE7
B	417	THR	-	linker	UNP P0ABE7
B	418	GLY	-	linker	UNP P0ABE7
B	419	ARG	-	linker	UNP P0ABE7
B	420	ALA	-	linker	UNP P0ABE7
B	421	ALA	-	linker	UNP P0ABE7
C	308	SER	-	linker	UNP P28472
C	308A	GLN	-	linker	UNP P28472
C	308B	PRO	-	linker	UNP P28472
C	308C	ALA	-	linker	UNP P28472
C	308D	GLY	-	linker	UNP P28472
C	308E	THR	-	linker	UNP P28472
C	308L	TRP	MET	conflict	UNP P0ABE7
C	312C	ILE	HIS	conflict	UNP P0ABE7
C	312G	LEU	-	linker	UNP P0ABE7
C	417	THR	-	linker	UNP P0ABE7
C	418	GLY	-	linker	UNP P0ABE7
C	419	ARG	-	linker	UNP P0ABE7
C	420	ALA	-	linker	UNP P0ABE7
C	421	ALA	-	linker	UNP P0ABE7
D	308	SER	-	linker	UNP P28472
D	308A	GLN	-	linker	UNP P28472
D	308B	PRO	-	linker	UNP P28472
D	308C	ALA	-	linker	UNP P28472
D	308D	GLY	-	linker	UNP P28472
D	308E	THR	-	linker	UNP P28472
D	308L	TRP	MET	conflict	UNP P0ABE7
D	312C	ILE	HIS	conflict	UNP P0ABE7
D	312G	LEU	-	linker	UNP P0ABE7
D	417	THR	-	linker	UNP P0ABE7
D	418	GLY	-	linker	UNP P0ABE7
D	419	ARG	-	linker	UNP P0ABE7
D	420	ALA	-	linker	UNP P0ABE7
D	421	ALA	-	linker	UNP P0ABE7
E	308	SER	-	linker	UNP P28472

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Chain	Residue	Modelled	Actual	Comment	Reference
E	308A	GLN	-	linker	UNP P28472
E	308B	PRO	-	linker	UNP P28472
E	308C	ALA	-	linker	UNP P28472
E	308D	GLY	-	linker	UNP P28472
E	308E	THR	-	linker	UNP P28472
E	308L	TRP	MET	conflict	UNP P0ABE7
E	312C	ILE	HIS	conflict	UNP P0ABE7
E	312G	LEU	-	linker	UNP P0ABE7
E	417	THR	-	linker	UNP P0ABE7
E	418	GLY	-	linker	UNP P0ABE7
E	419	ARG	-	linker	UNP P0ABE7
E	420	ALA	-	linker	UNP P0ABE7
E	421	ALA	-	linker	UNP P0ABE7

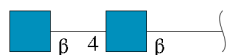
- Molecule 3 is a protein called a2NB06.

Mol	Chain	Residues	Atoms						AltConf	Trace
3	F	123	Total	C	H	N	O	S	0	0
			1798	577	873	159	185	4		

- Molecule 4 is a protein called Mb125.

Mol	Chain	Residues	Atoms						AltConf	Trace
4	G	116	Total	C	H	N	O	S	0	0
			1761	573	853	155	176	4		
4	H	116	Total	C	H	N	O	S	0	0
			1761	573	853	155	176	4		
4	I	116	Total	C	H	N	O	S	0	0
			1761	573	853	155	176	4		

- Molecule 5 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms						AltConf	Trace
5	L	2	Total	C	H	N	O		0	0
			53	16	25	2	10			
5	N	2	Total	C	H	N	O		0	0
			53	16	25	2	10			

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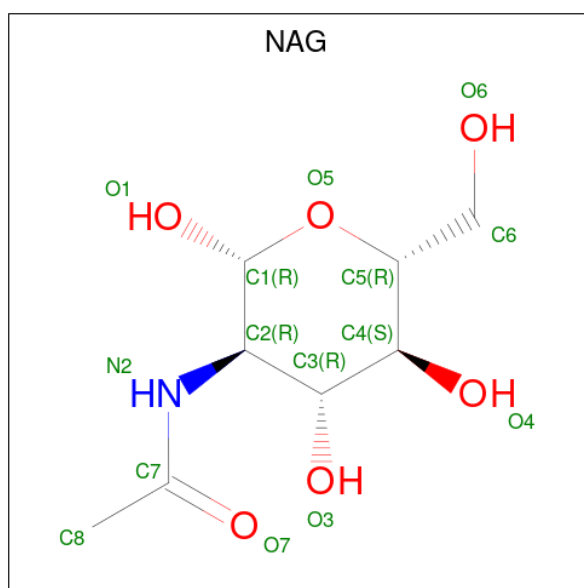
Mol	Chain	Residues	Atoms					AltConf	Trace
5	P	2	Total	C	H	N	O	0	0
			53	16	25	2	10		
5	R	2	Total	C	H	N	O	0	0
			53	16	25	2	10		

- Molecule 6 is an oligosaccharide called alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



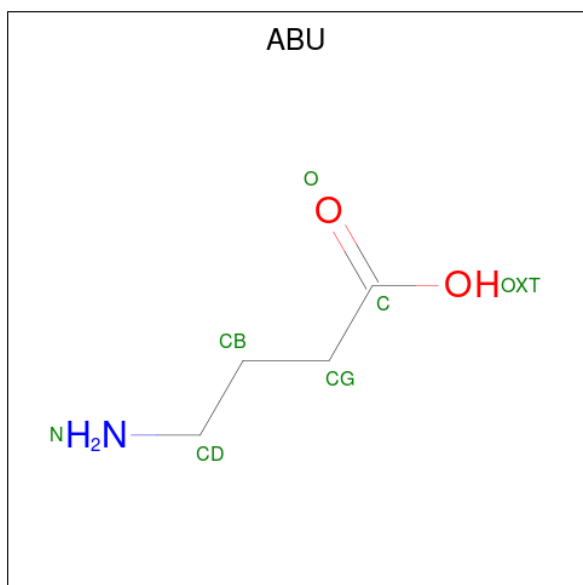
Mol	Chain	Residues	Atoms					AltConf	Trace
6	M	4	Total	C	H	N	O	0	0
			93	28	43	2	20		
6	O	4	Total	C	H	N	O	0	0
			93	28	43	2	20		
6	Q	4	Total	C	H	N	O	0	0
			92	28	42	2	20		
6	S	4	Total	C	H	N	O	0	0
			93	28	43	2	20		

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



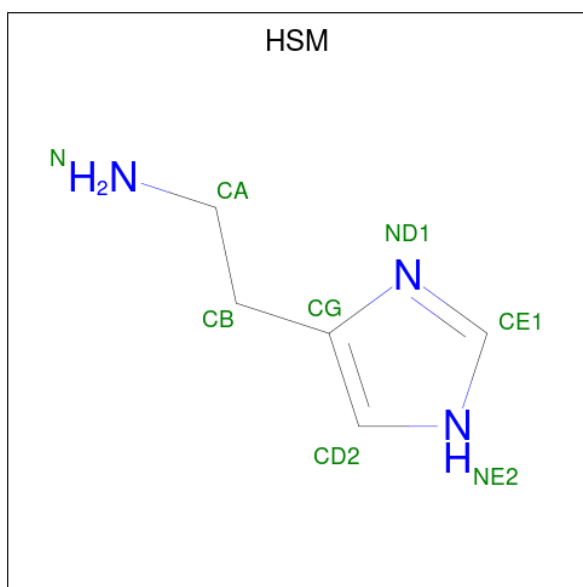
Mol	Chain	Residues	Atoms					AltConf
7	A	1	Total	C	H	N	O	0
			27	8	13	1	5	
7	A	1	Total	C	H	N	O	0
			27	8	13	1	5	

- Molecule 8 is GAMMA-AMINO-BUTANOIC ACID (CCD ID: ABU) (formula: $C_4H_9NO_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
8	B	1	Total	C	H	N	O	0
			16	4	9	1	2	

- Molecule 9 is HISTAMINE (CCD ID: HSM) (formula: $C_5H_9N_3$).

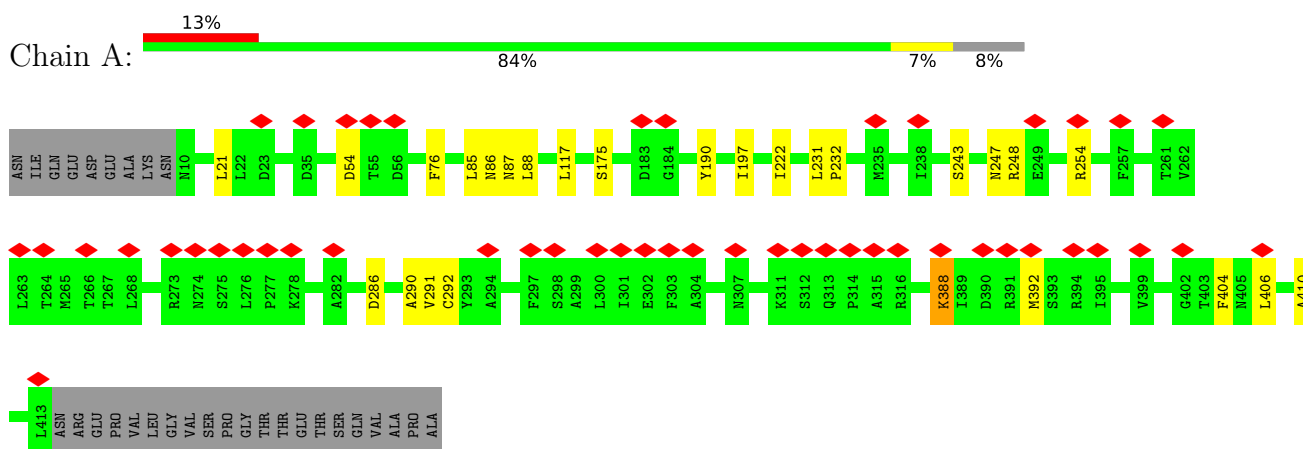


Mol	Chain	Residues	Atoms				AltConf
9	C	1	Total	C	H	N	0
			18	5	10	3	
9	D	1	Total	C	H	N	0
			18	5	10	3	
9	E	1	Total	C	H	N	0
			18	5	10	3	

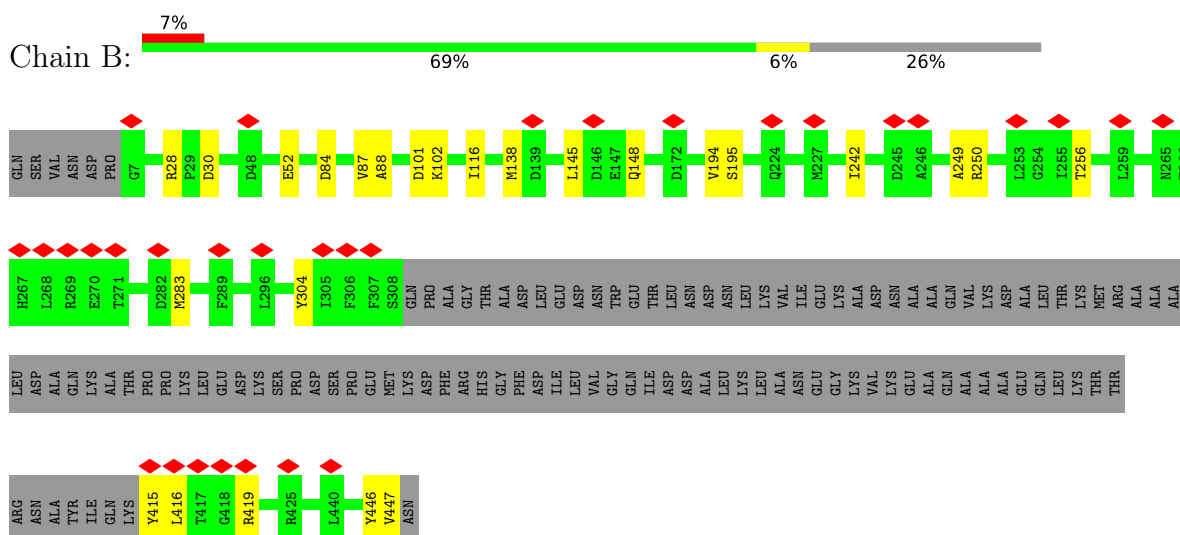
3 Residue-property plots

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: Gamma-aminobutyric acid receptor subunit alpha-2

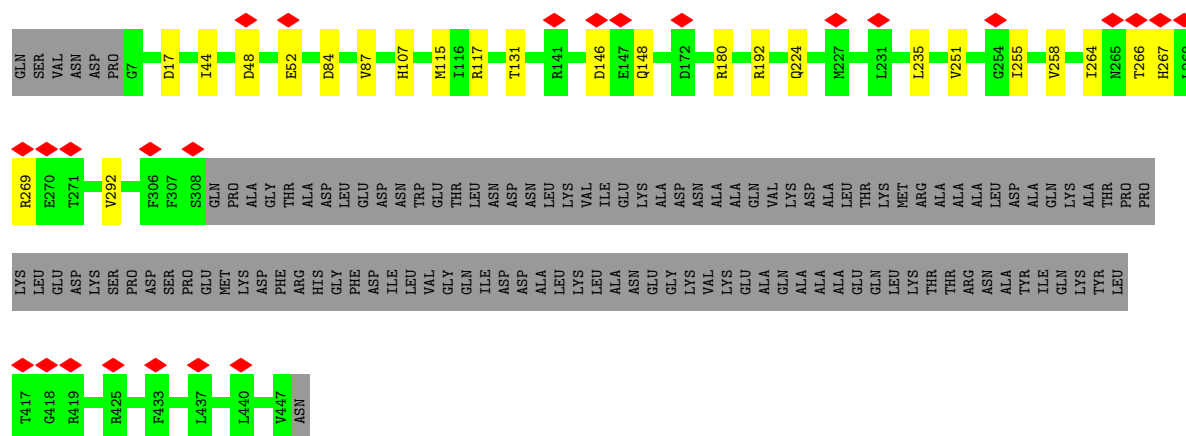


- Molecule 2: Gamma-aminobutyric acid receptor subunit beta-3, Soluble cytochrome b562

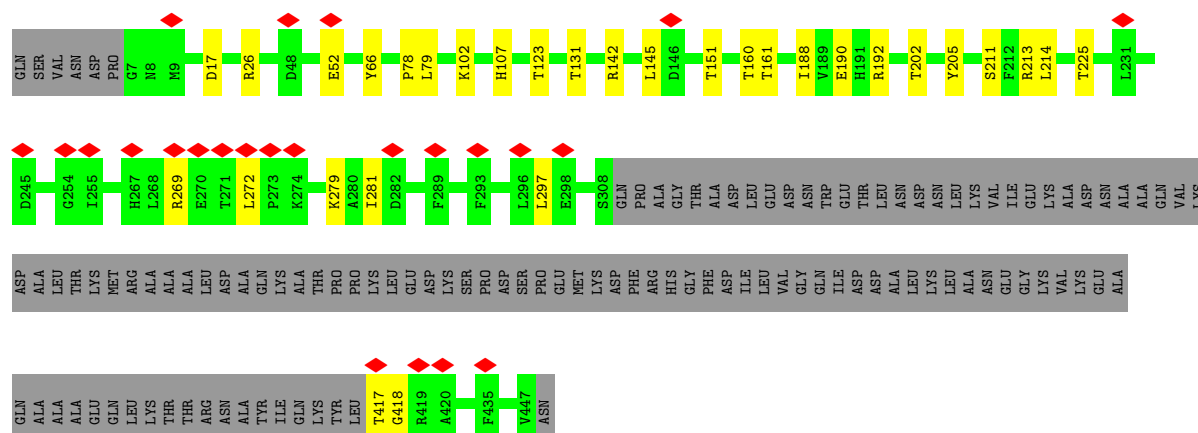


- Molecule 2: Gamma-aminobutyric acid receptor subunit beta-3, Soluble cytochrome b562

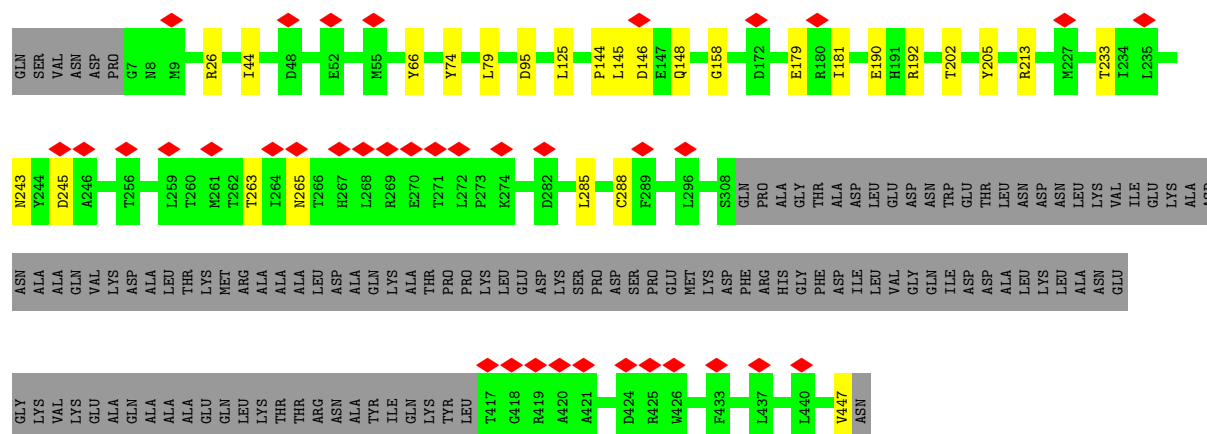




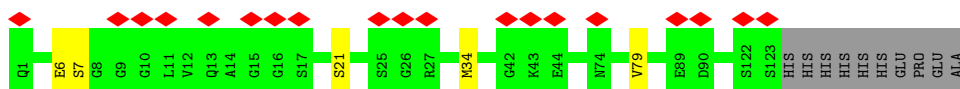
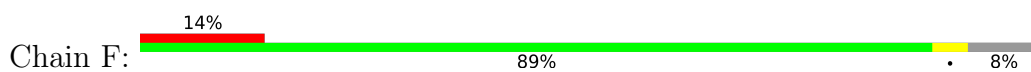
- Molecule 2: Gamma-aminobutyric acid receptor subunit beta-3, Soluble cytochrome b562



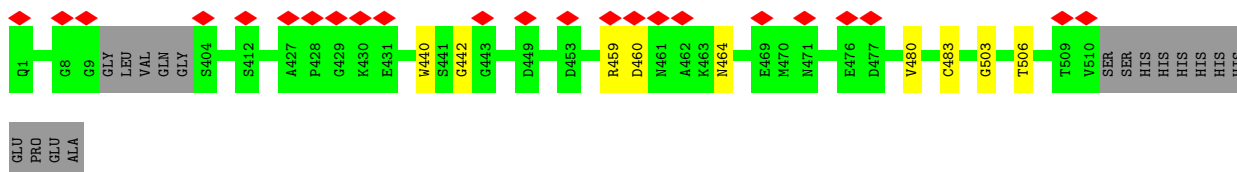
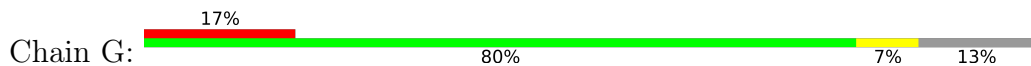
- Molecule 2: Gamma-aminobutyric acid receptor subunit beta-3, Soluble cytochrome b562



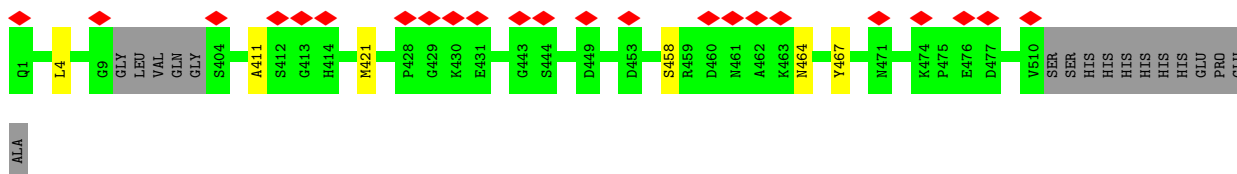
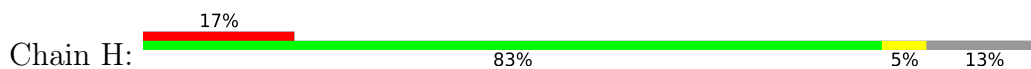
- Molecule 3: a2NB06



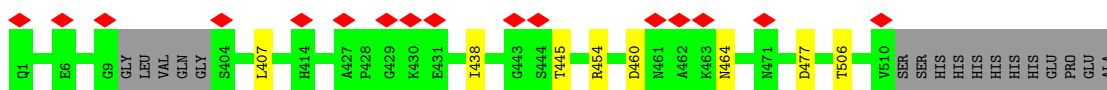
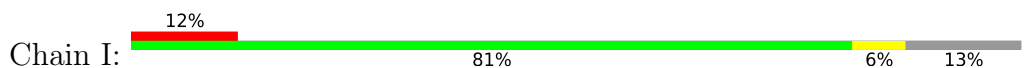
- Molecule 4: Mb125



- Molecule 4: Mb125



- Molecule 4: Mb125



- Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain P:  50% 100%

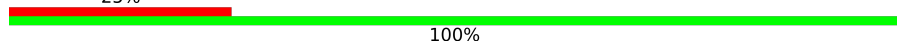


- Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain R:  50% 100%



- Molecule 6: alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain M:  25% 100%



- Molecule 6: alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain O:  75% 25%



- Molecule 6: alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain Q:  50% 25% 25%



- Molecule 6: alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain S:  75% 25%



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	142272	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	51.5	Depositor
Minimum defocus (nm)	900	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.954	Depositor
Minimum map value	-0.295	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.020	Depositor
Recommended contour level	0.225	Depositor
Map size (Å)	395.90002, 395.90002, 395.90002	wwPDB
Map dimensions	370, 370, 370	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.07, 1.07, 1.07	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: HSM, ABU, NAG, BMA, MAN

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	0.13	0/2769	0.25	0/3765
2	B	0.10	0/2817	0.22	0/3832
2	C	0.11	0/2796	0.22	0/3803
2	D	0.10	0/2796	0.22	0/3803
2	E	0.11	0/2796	0.22	0/3803
3	F	0.09	0/946	0.20	0/1282
4	G	0.09	0/931	0.21	0/1261
4	H	0.09	0/931	0.22	0/1261
4	I	0.10	0/931	0.21	0/1261
All	All	0.11	0/17713	0.22	0/24071

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [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	2699	2686	2686	16	0
2	B	2744	2738	2737	20	0
2	C	2724	2717	2717	16	0
2	D	2724	2715	2715	22	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	E	2724	2717	2717	17	0
3	F	925	873	873	3	0
4	G	908	853	853	5	0
4	H	908	853	853	3	0
4	I	908	853	853	4	0
5	L	28	25	25	0	0
5	N	28	25	25	0	0
5	P	28	25	25	0	0
5	R	28	25	25	0	0
6	M	50	43	43	0	0
6	O	50	43	43	1	0
6	Q	50	42	42	2	0
6	S	50	43	43	2	0
7	A	28	26	26	0	0
8	B	7	9	0	0	0
9	C	8	10	9	0	0
9	D	8	10	9	0	0
9	E	8	10	9	0	0
All	All	17635	17341	17328	100	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.

The worst 5 of 100 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:192:ARG:NH1	6:O:1:NAG:O7	2.06	0.87
2:B:242:ILE:O	2:B:250:ARG:NH2	2.13	0.81
4:H:411:ALA:O	4:H:464:ASN:ND2	2.15	0.80
6:Q:1:NAG:O3	6:Q:2:NAG:O6	2.01	0.79
2:E:179:GLU:N	2:E:179:GLU:OE1	2.18	0.77

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	333/365 (91%)	324 (97%)	9 (3%)	0	100	100
2	B	331/451 (73%)	326 (98%)	5 (2%)	0	100	100
2	C	329/451 (73%)	324 (98%)	5 (2%)	0	100	100
2	D	329/451 (73%)	327 (99%)	2 (1%)	0	100	100
2	E	329/451 (73%)	325 (99%)	4 (1%)	0	100	100
3	F	121/133 (91%)	117 (97%)	4 (3%)	0	100	100
4	G	112/133 (84%)	111 (99%)	1 (1%)	0	100	100
4	H	112/133 (84%)	106 (95%)	6 (5%)	0	100	100
4	I	112/133 (84%)	110 (98%)	2 (2%)	0	100	100
All	All	2108/2701 (78%)	2070 (98%)	38 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	299/324 (92%)	297 (99%)	2 (1%)	76	80
2	B	299/393 (76%)	299 (100%)	0	100	100
2	C	297/393 (76%)	297 (100%)	0	100	100
2	D	297/393 (76%)	297 (100%)	0	100	100
2	E	297/393 (76%)	297 (100%)	0	100	100
3	F	95/104 (91%)	95 (100%)	0	100	100
4	G	94/108 (87%)	94 (100%)	0	100	100
4	H	94/108 (87%)	94 (100%)	0	100	100
4	I	94/108 (87%)	94 (100%)	0	100	100
All	All	1866/2324 (80%)	1864 (100%)	2 (0%)	87	89

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	292	CYS
1	A	388	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	197	ASN
2	E	54	ASN
2	E	224	GLN
2	C	65	GLN
2	D	65	GLN

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](#)

24 monosaccharides 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	NAG	L	1	2,5	14,14,15	0.24	0	17,19,21	0.44	0
5	NAG	L	2	5	14,14,15	0.23	0	17,19,21	0.45	0
6	NAG	M	1	2,6	14,14,15	0.27	0	17,19,21	0.37	0
6	NAG	M	2	6	14,14,15	0.25	0	17,19,21	0.44	0
6	BMA	M	3	6	11,11,12	0.20	0	15,15,17	0.42	0
6	MAN	M	4	6	11,11,12	0.20	0	15,15,17	0.30	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	NAG	N	1	2,5	14,14,15	0.26	0	17,19,21	0.42	0
5	NAG	N	2	5	14,14,15	0.24	0	17,19,21	0.43	0
6	NAG	O	1	2,6	14,14,15	0.27	0	17,19,21	0.38	0
6	NAG	O	2	6	14,14,15	0.25	0	17,19,21	0.48	0
6	BMA	O	3	6	11,11,12	0.21	0	15,15,17	0.40	0
6	MAN	O	4	6	11,11,12	0.19	0	15,15,17	0.31	0
5	NAG	P	1	2,5	14,14,15	0.26	0	17,19,21	0.44	0
5	NAG	P	2	5	14,14,15	0.23	0	17,19,21	0.44	0
6	NAG	Q	1	2,6	14,14,15	0.25	0	17,19,21	0.54	0
6	NAG	Q	2	6	14,14,15	0.28	0	17,19,21	0.95	1 (5%)
6	BMA	Q	3	6	11,11,12	0.22	0	15,15,17	0.45	0
6	MAN	Q	4	6	11,11,12	0.20	0	15,15,17	0.33	0
5	NAG	R	1	2,5	14,14,15	0.26	0	17,19,21	0.43	0
5	NAG	R	2	5	14,14,15	0.24	0	17,19,21	0.44	0
6	NAG	S	1	2,6	14,14,15	0.26	0	17,19,21	0.41	0
6	NAG	S	2	6	14,14,15	0.22	0	17,19,21	0.55	0
6	BMA	S	3	6	11,11,12	0.22	0	15,15,17	0.39	0
6	MAN	S	4	6	11,11,12	0.20	0	15,15,17	0.31	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	L	1	2,5	-	0/6/23/26	0/1/1/1
5	NAG	L	2	5	-	0/6/23/26	0/1/1/1
6	NAG	M	1	2,6	-	0/6/23/26	0/1/1/1
6	NAG	M	2	6	-	0/6/23/26	0/1/1/1
6	BMA	M	3	6	-	0/2/19/22	0/1/1/1
6	MAN	M	4	6	-	0/2/19/22	0/1/1/1
5	NAG	N	1	2,5	-	0/6/23/26	0/1/1/1
5	NAG	N	2	5	-	0/6/23/26	0/1/1/1
6	NAG	O	1	2,6	-	1/6/23/26	0/1/1/1
6	NAG	O	2	6	-	0/6/23/26	0/1/1/1
6	BMA	O	3	6	-	0/2/19/22	0/1/1/1
6	MAN	O	4	6	-	0/2/19/22	0/1/1/1
5	NAG	P	1	2,5	-	0/6/23/26	0/1/1/1
5	NAG	P	2	5	-	0/6/23/26	0/1/1/1
6	NAG	Q	1	2,6	-	2/6/23/26	0/1/1/1
6	NAG	Q	2	6	-	0/6/23/26	0/1/1/1
6	BMA	Q	3	6	-	0/2/19/22	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	MAN	Q	4	6	-	1/2/19/22	0/1/1/1
5	NAG	R	1	2,5	-	0/6/23/26	0/1/1/1
5	NAG	R	2	5	-	0/6/23/26	0/1/1/1
6	NAG	S	1	2,6	-	0/6/23/26	0/1/1/1
6	NAG	S	2	6	-	0/6/23/26	0/1/1/1
6	BMA	S	3	6	-	0/2/19/22	0/1/1/1
6	MAN	S	4	6	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	Q	2	NAG	C1-O5-C5	3.48	116.91	112.19

There are no chirality outliers.

All (4) torsion outliers are listed below:

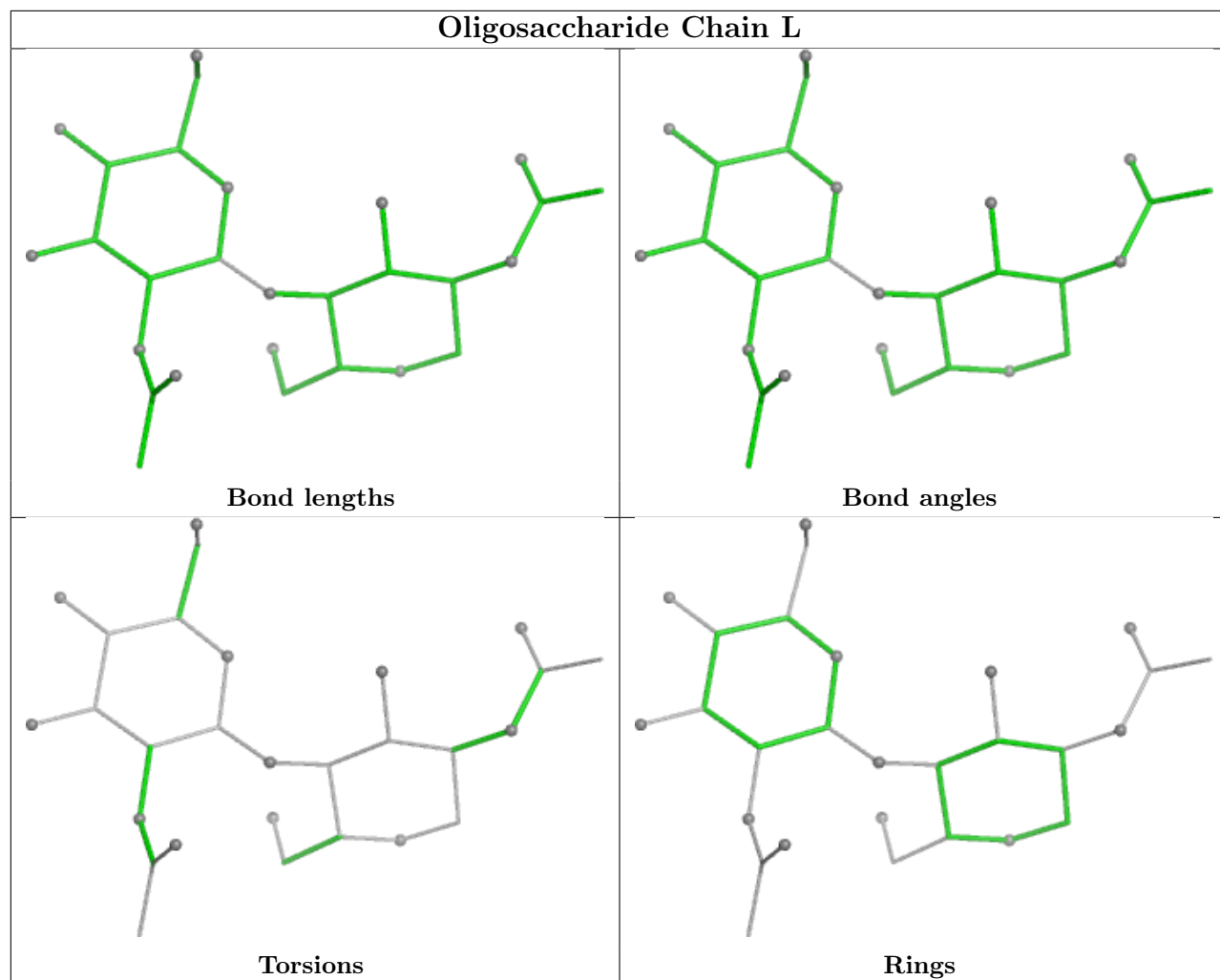
Mol	Chain	Res	Type	Atoms
6	Q	4	MAN	O5-C5-C6-O6
6	Q	1	NAG	O5-C5-C6-O6
6	Q	1	NAG	C4-C5-C6-O6
6	O	1	NAG	C1-C2-N2-C7

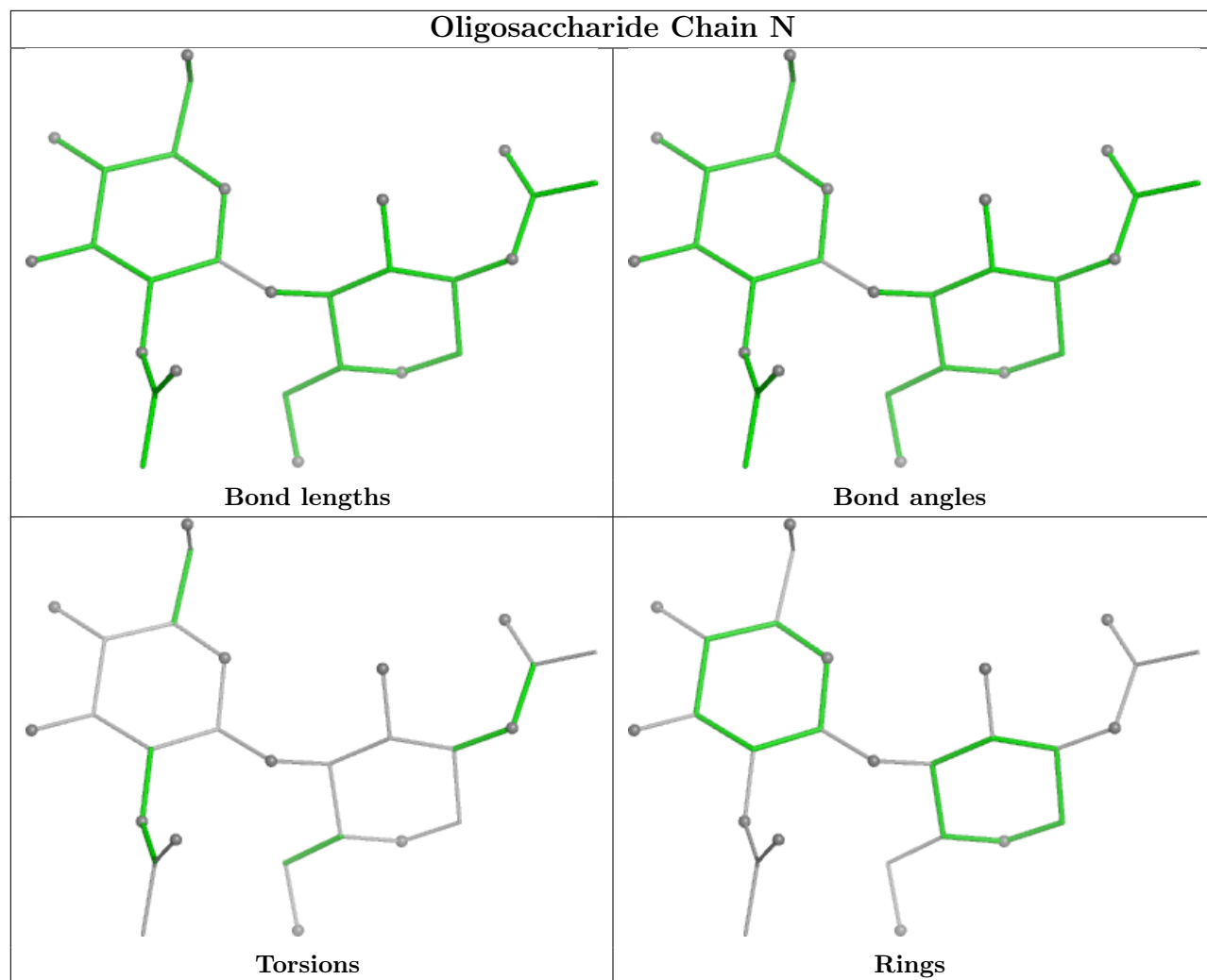
There are no ring outliers.

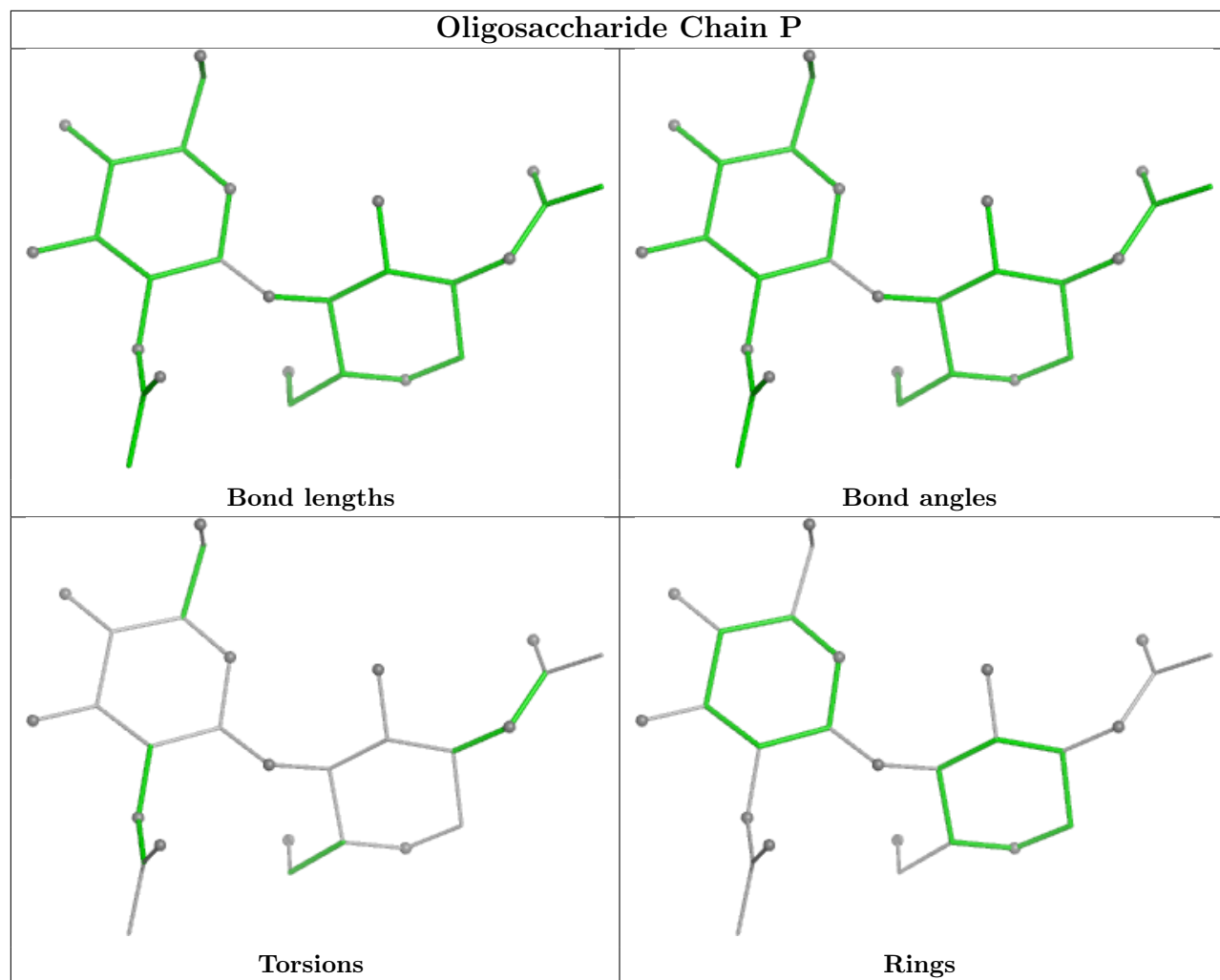
4 monomers are involved in 5 short contacts:

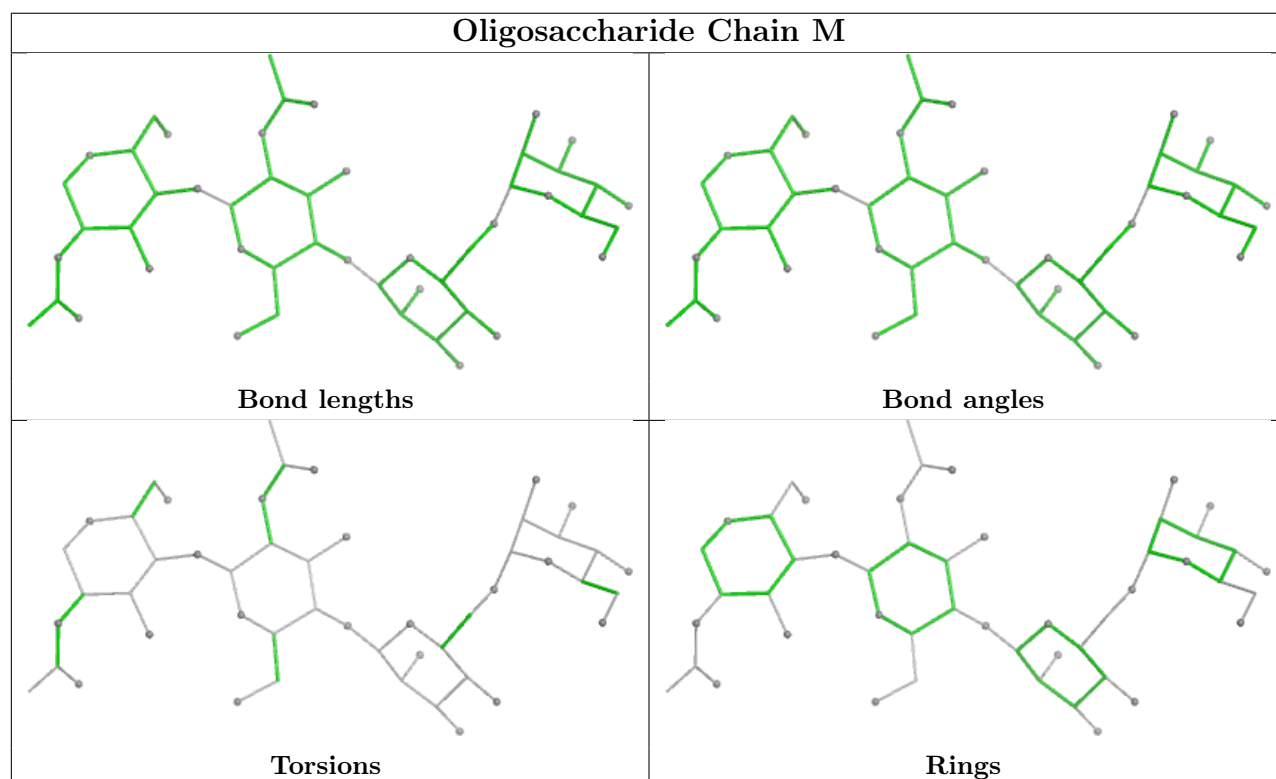
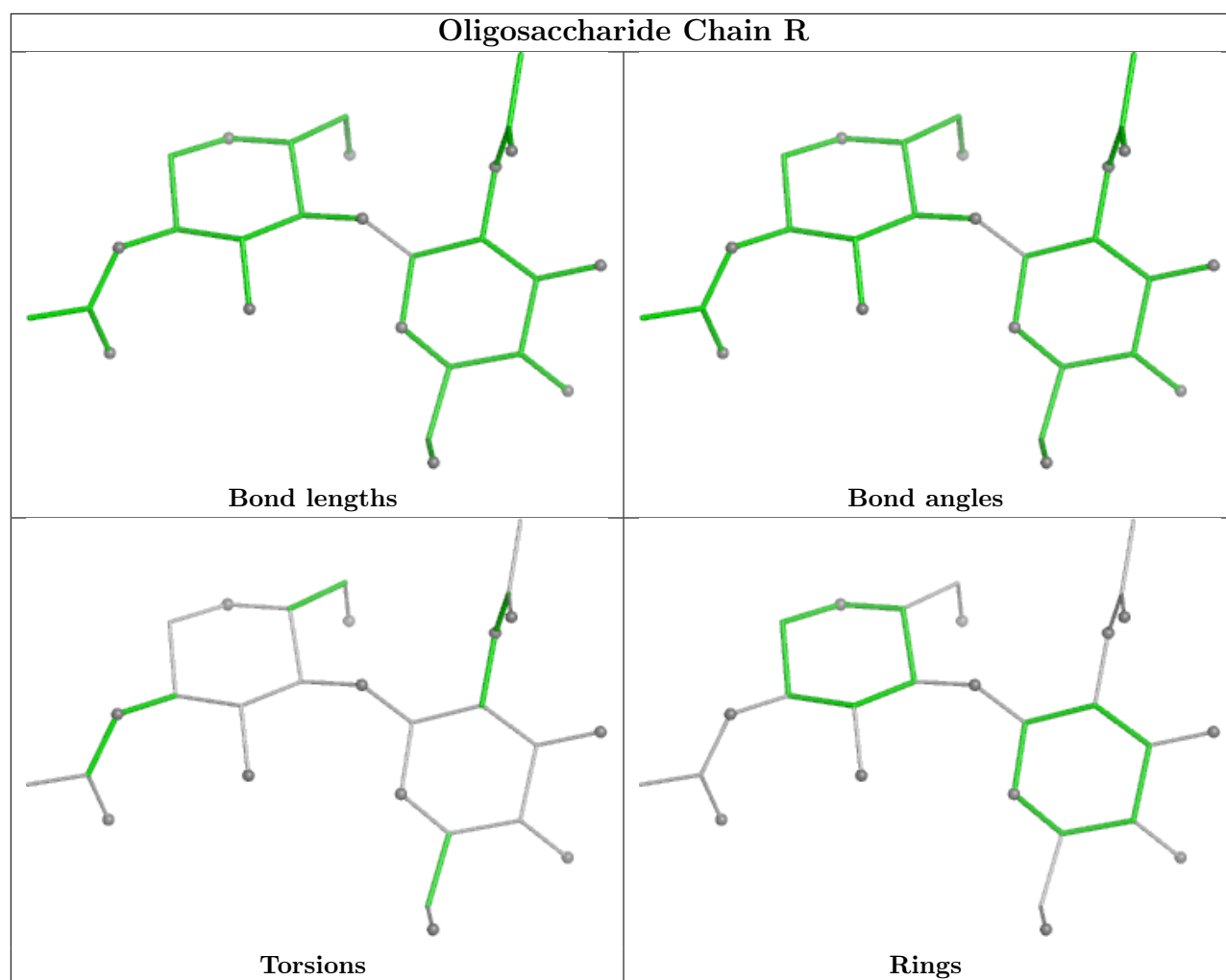
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	Q	1	NAG	1	0
6	S	1	NAG	2	0
6	O	1	NAG	1	0
6	Q	2	NAG	2	0

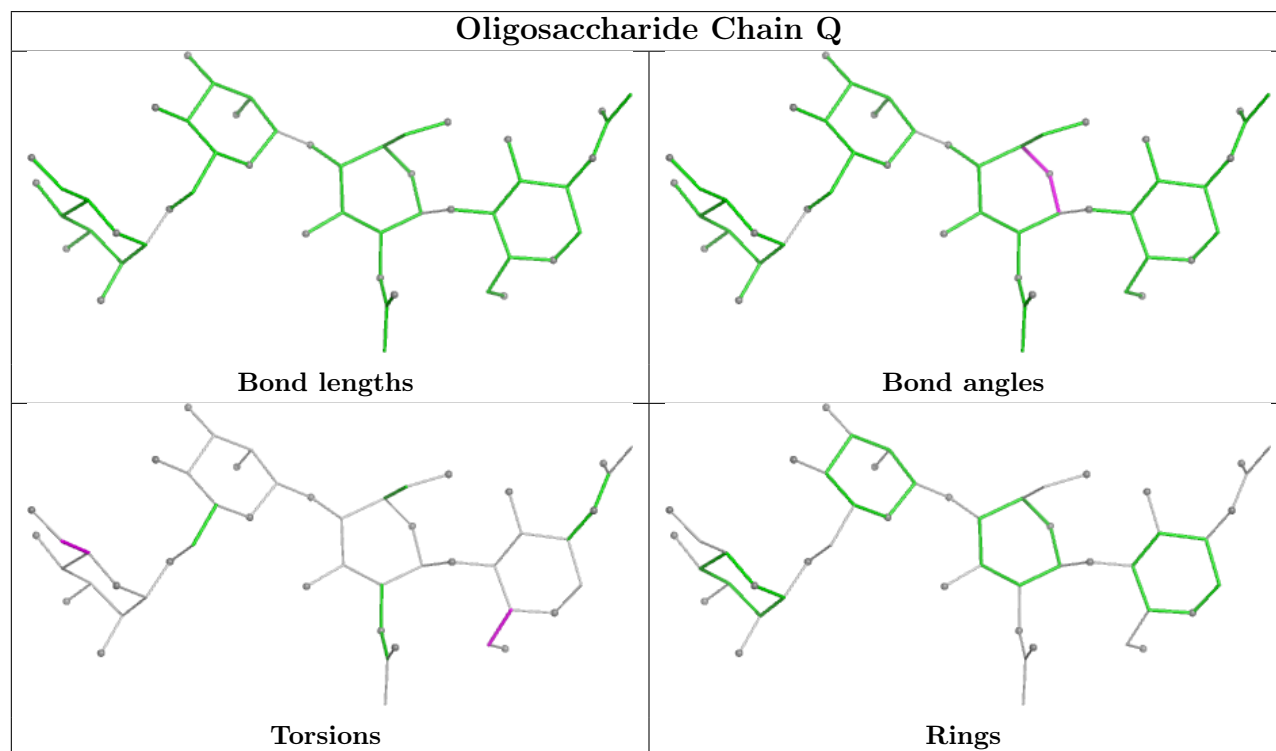
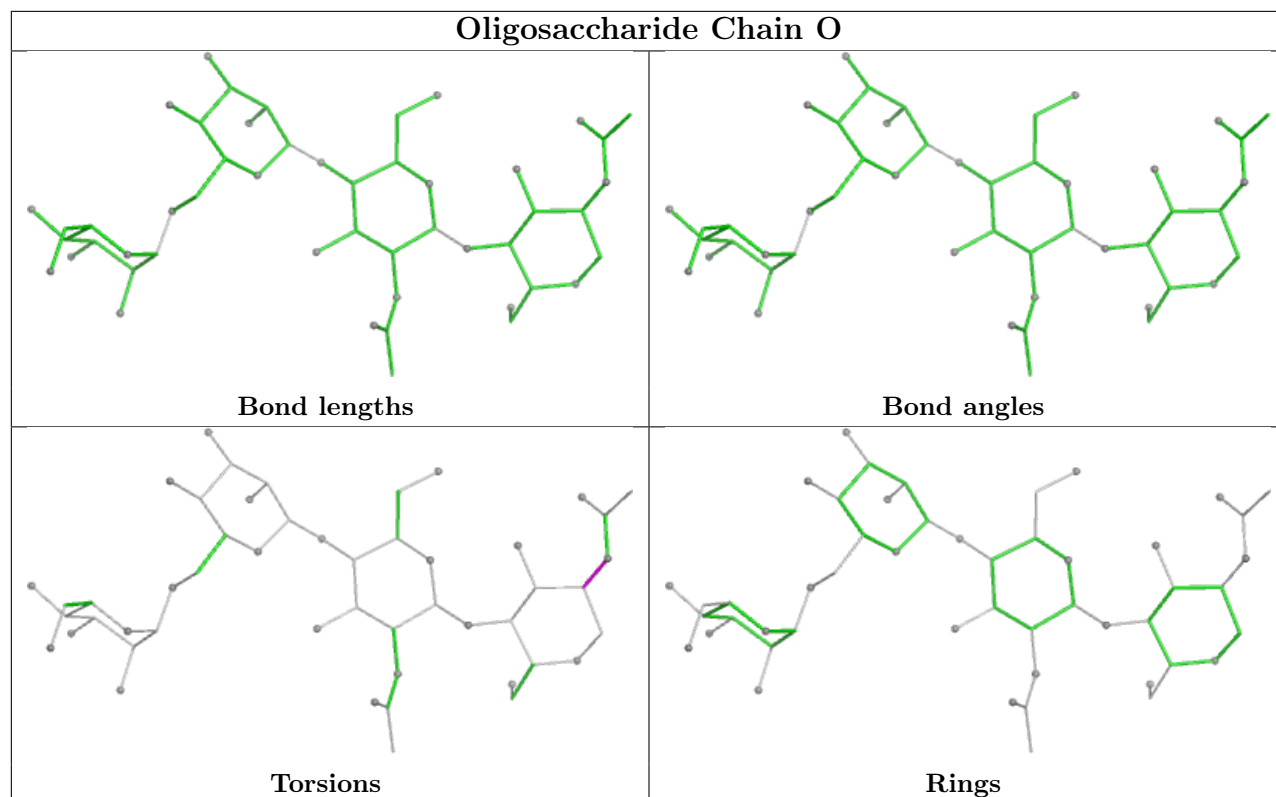
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

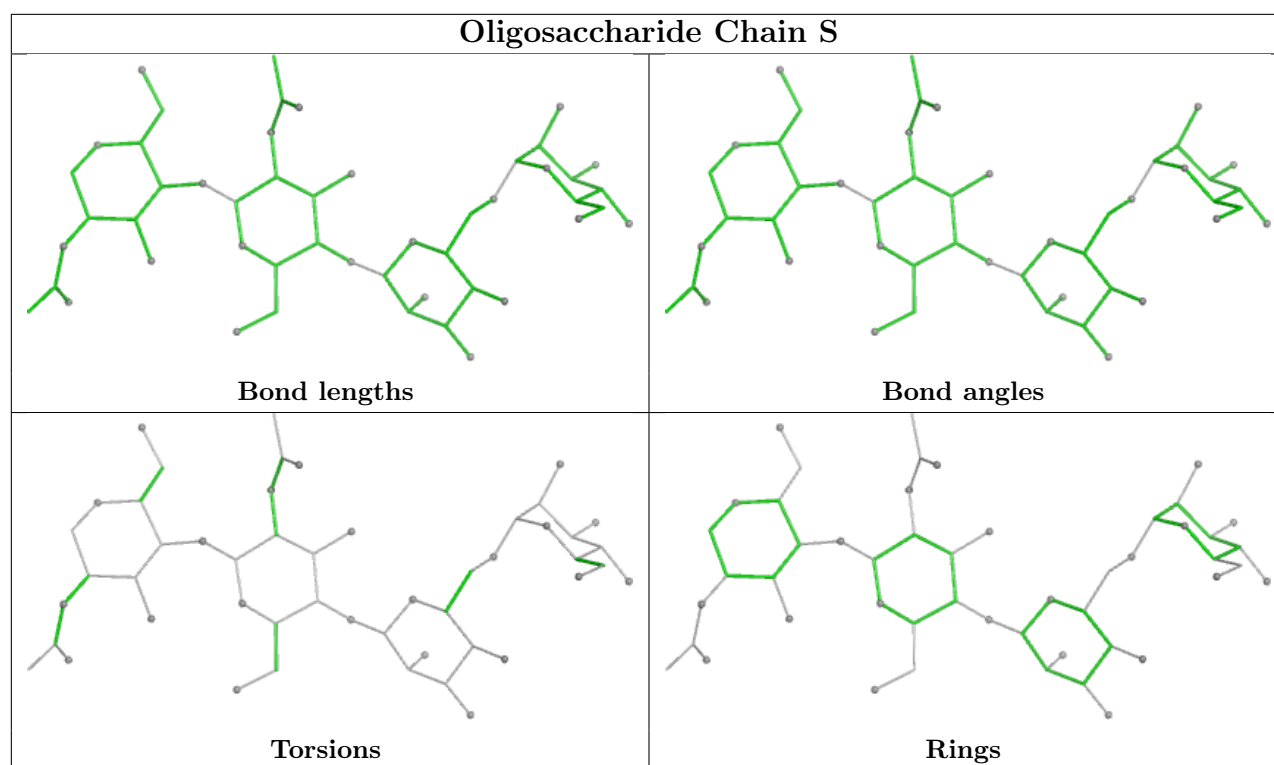












5.6 Ligand geometry [i](#)

6 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	$\# Z > 2$
8	ABU	B	501	-	6,6,6	0.89	0	6,6,6	0.42	0
9	HSM	E	501	-	8,8,8	0.20	0	9,9,9	0.30	0
9	HSM	C	501	-	8,8,8	0.20	0	9,9,9	0.30	0
7	NAG	A	501	1	14,14,15	0.25	0	17,19,21	0.44	0
7	NAG	A	502	1	14,14,15	0.28	0	17,19,21	0.41	0
9	HSM	D	501	-	8,8,8	0.21	0	9,9,9	0.31	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
8	ABU	B	501	-	-	0/4/4/4	-
9	HSM	E	501	-	-	2/3/3/3	0/1/1/1
9	HSM	C	501	-	-	2/3/3/3	0/1/1/1
7	NAG	A	501	1	-	0/6/23/26	0/1/1/1
7	NAG	A	502	1	-	1/6/23/26	0/1/1/1
9	HSM	D	501	-	-	1/3/3/3	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

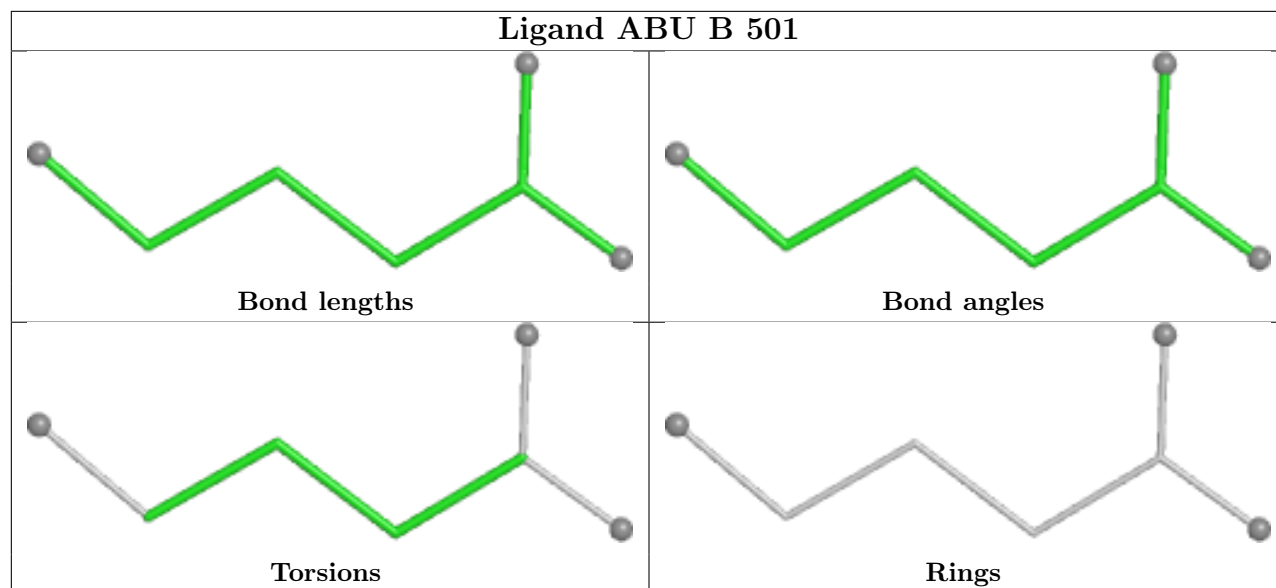
5 of 6 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	A	502	NAG	O5-C5-C6-O6
9	C	501	HSM	CA-CB-CG-CD2
9	E	501	HSM	CA-CB-CG-CD2
9	C	501	HSM	CA-CB-CG-ND1
9	E	501	HSM	CA-CB-CG-ND1

There are no ring outliers.

No monomer is involved in short contacts.

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.

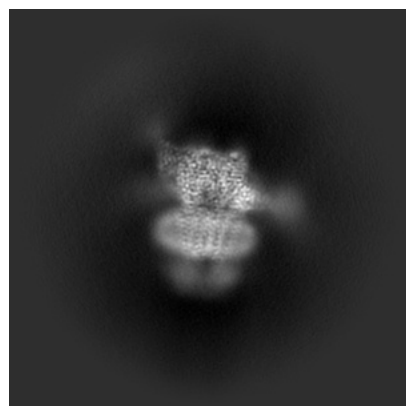
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-53216. These allow visual inspection of the internal detail of the map and identification of artifacts.

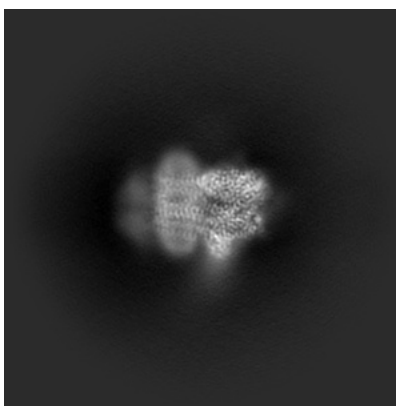
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

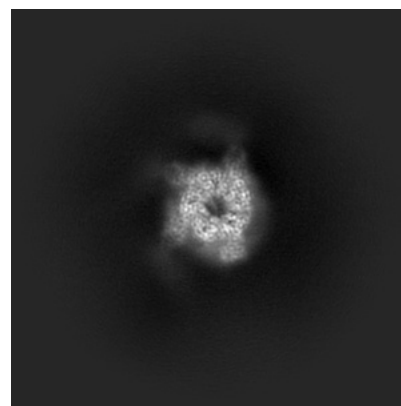
6.1.1 Primary map



X

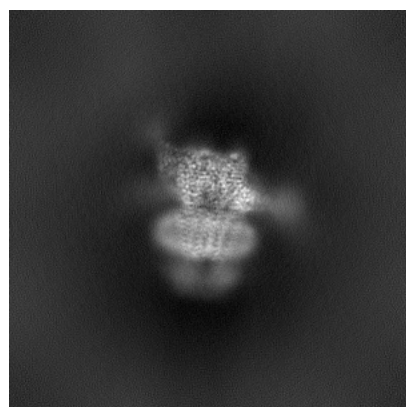


Y

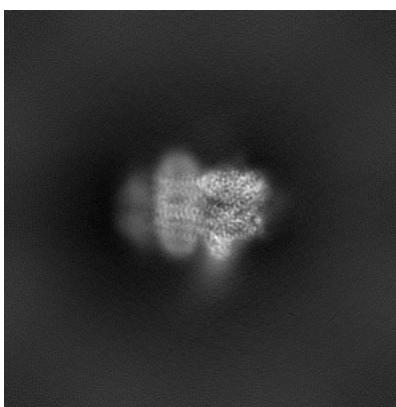


Z

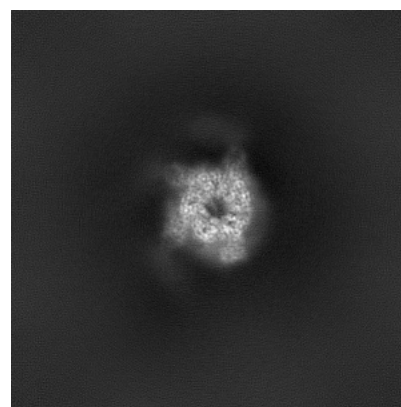
6.1.2 Raw map



X



Y

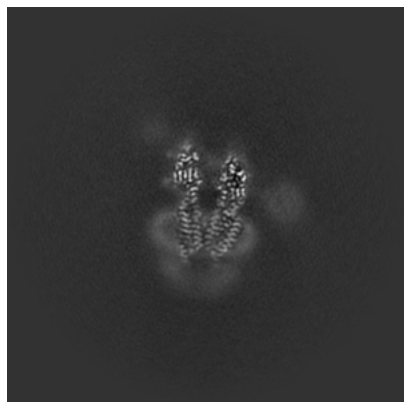


Z

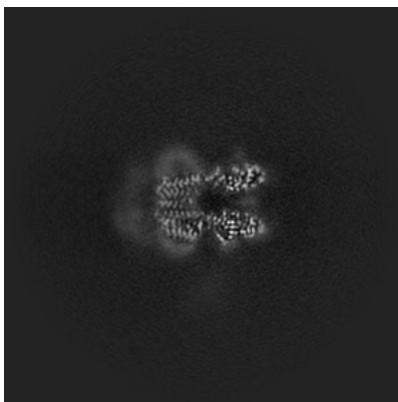
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

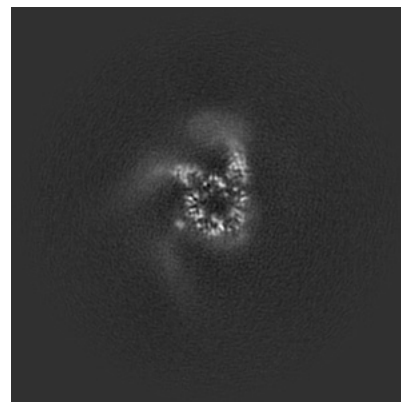
6.2.1 Primary map



X Index: 185

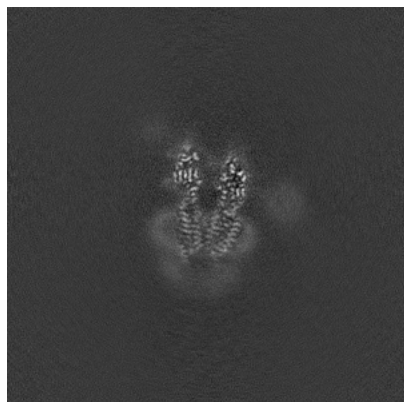


Y Index: 185

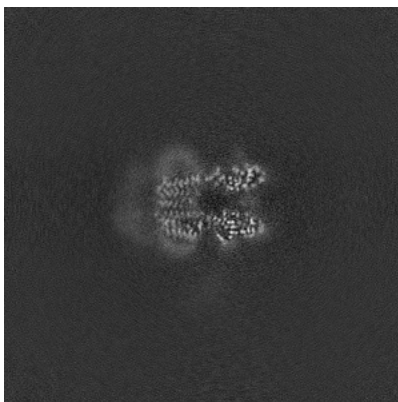


Z Index: 185

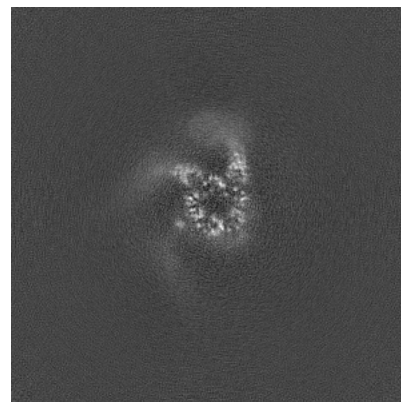
6.2.2 Raw map



X Index: 185



Y Index: 185

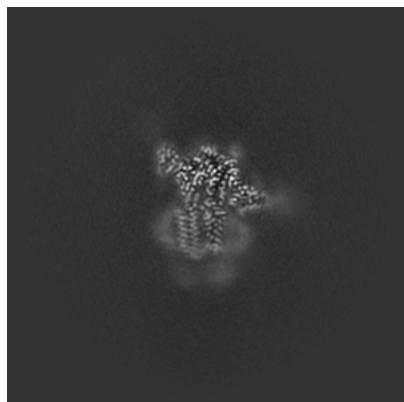


Z Index: 185

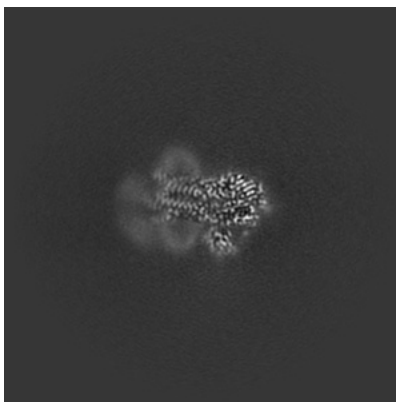
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

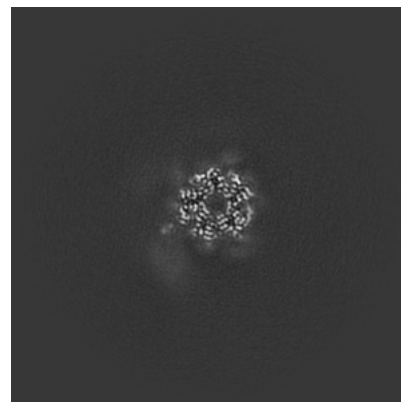
6.3.1 Primary map



X Index: 210

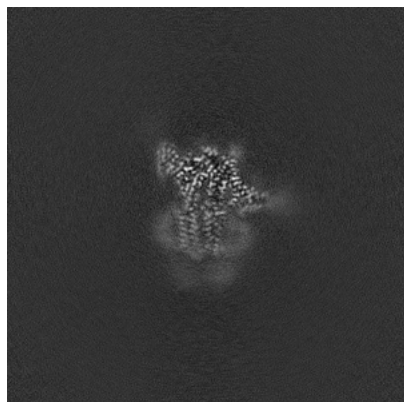


Y Index: 166

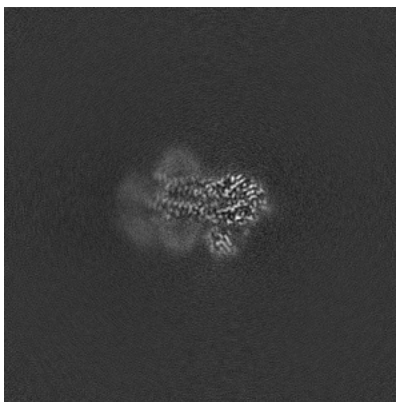


Z Index: 211

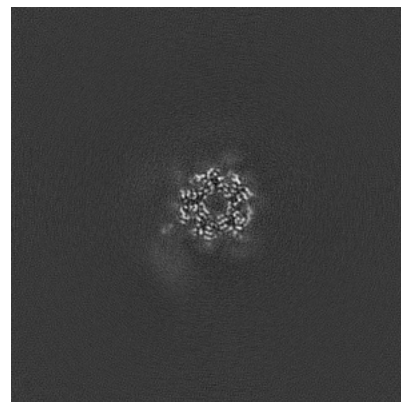
6.3.2 Raw map



X Index: 209



Y Index: 165

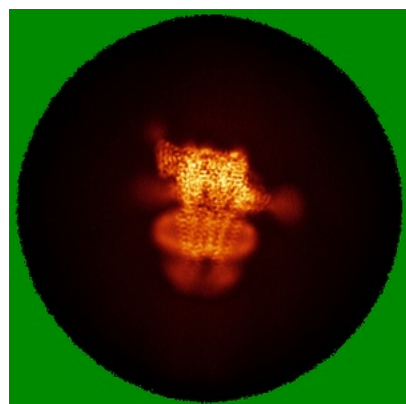


Z Index: 211

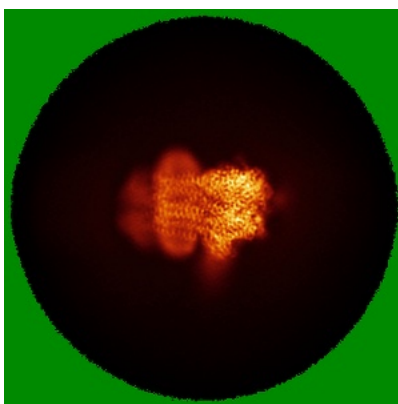
The images above show the largest variance slices of the map in three orthogonal directions.

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

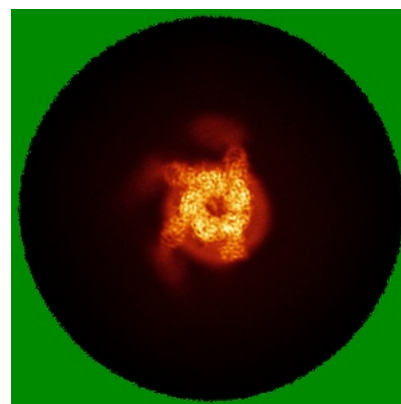
6.4.1 Primary map



X

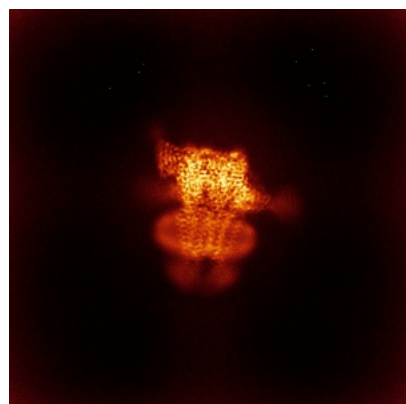


Y

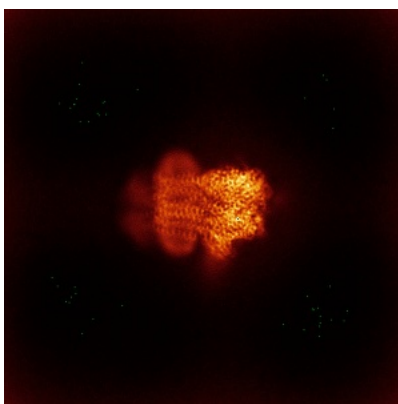


Z

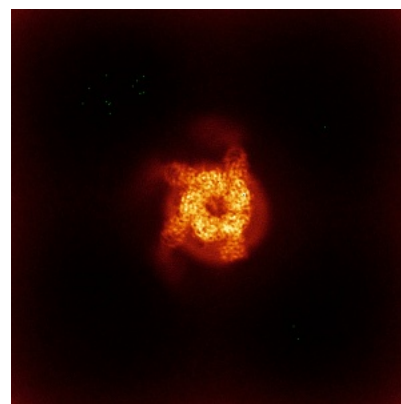
6.4.2 Raw map



X



Y

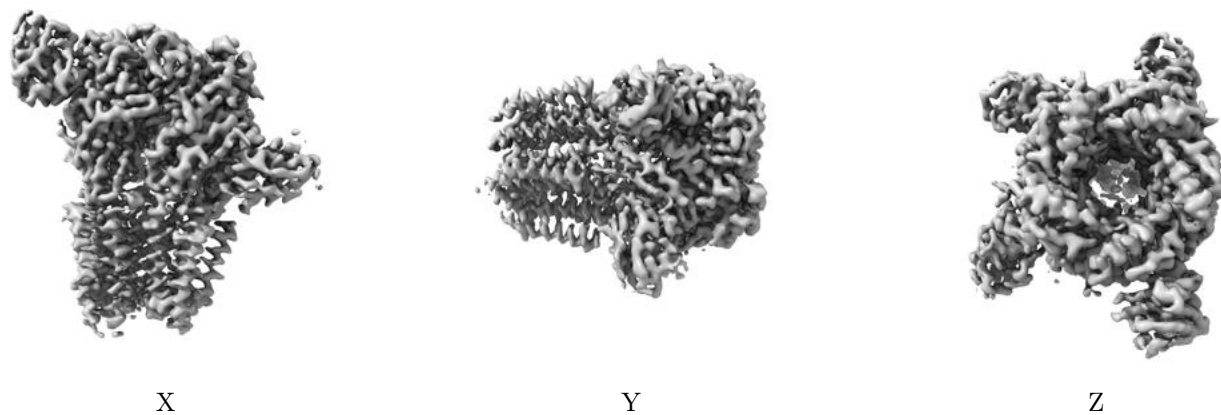


Z

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.

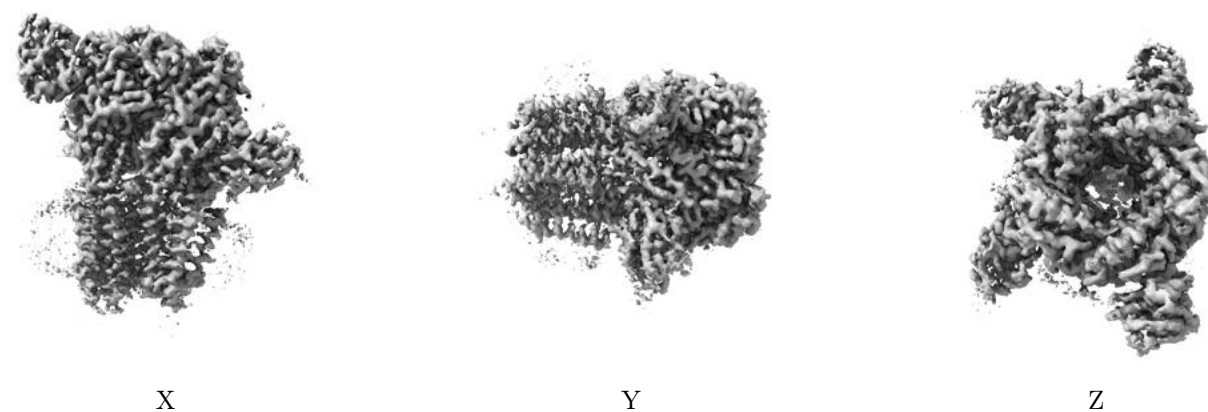
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.225. 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.

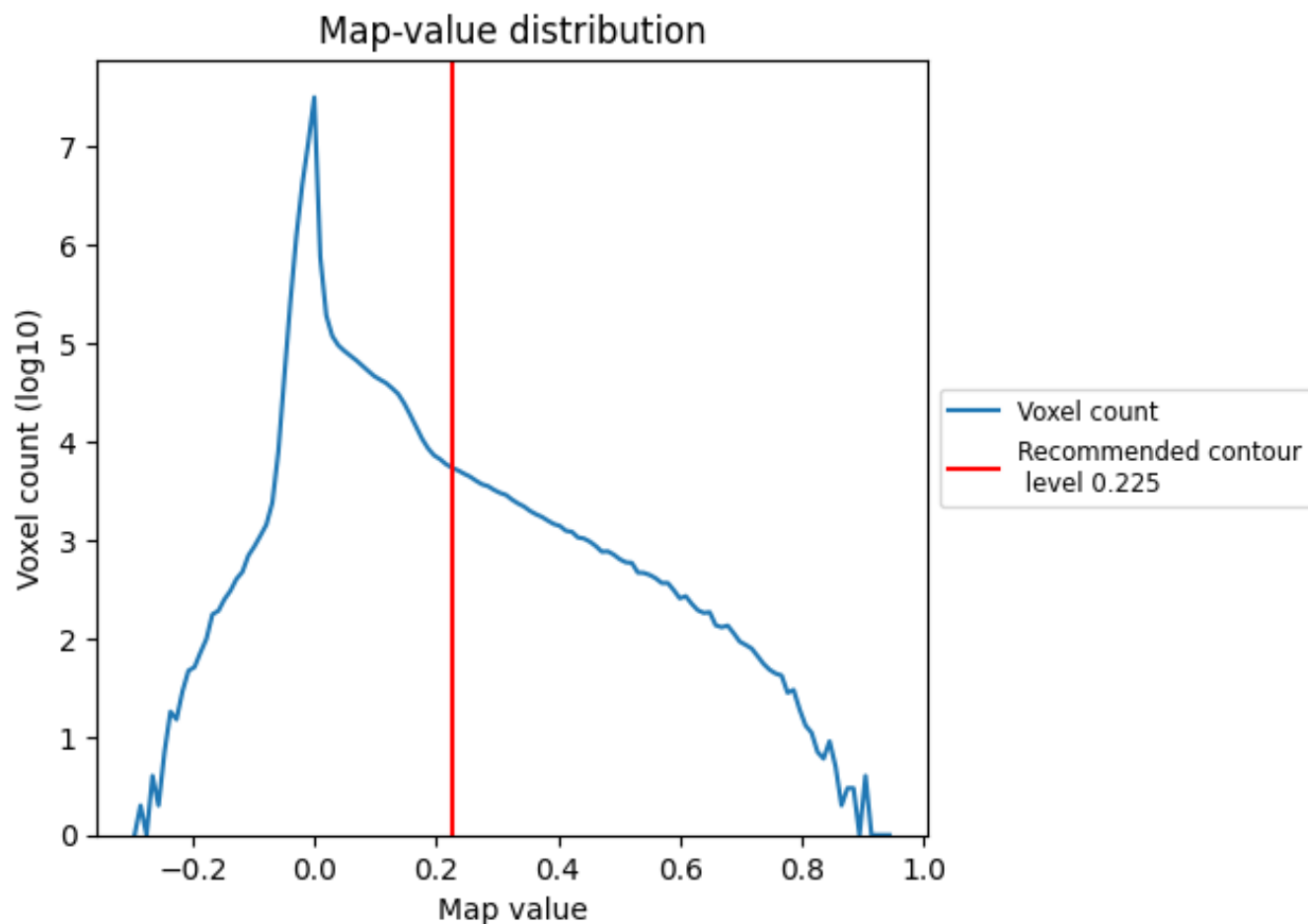
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

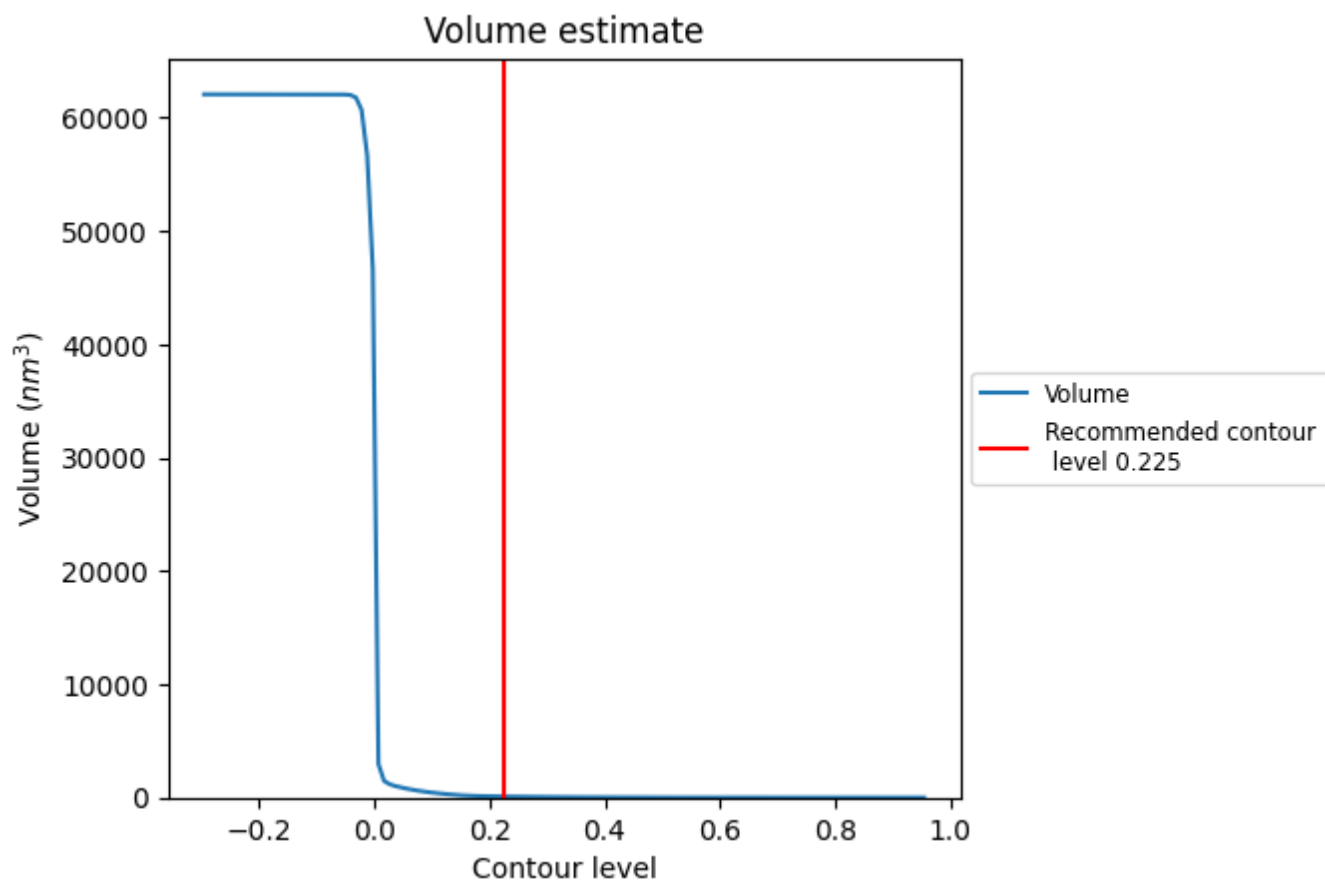
This section contains the results of statistical analysis of the map.

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.

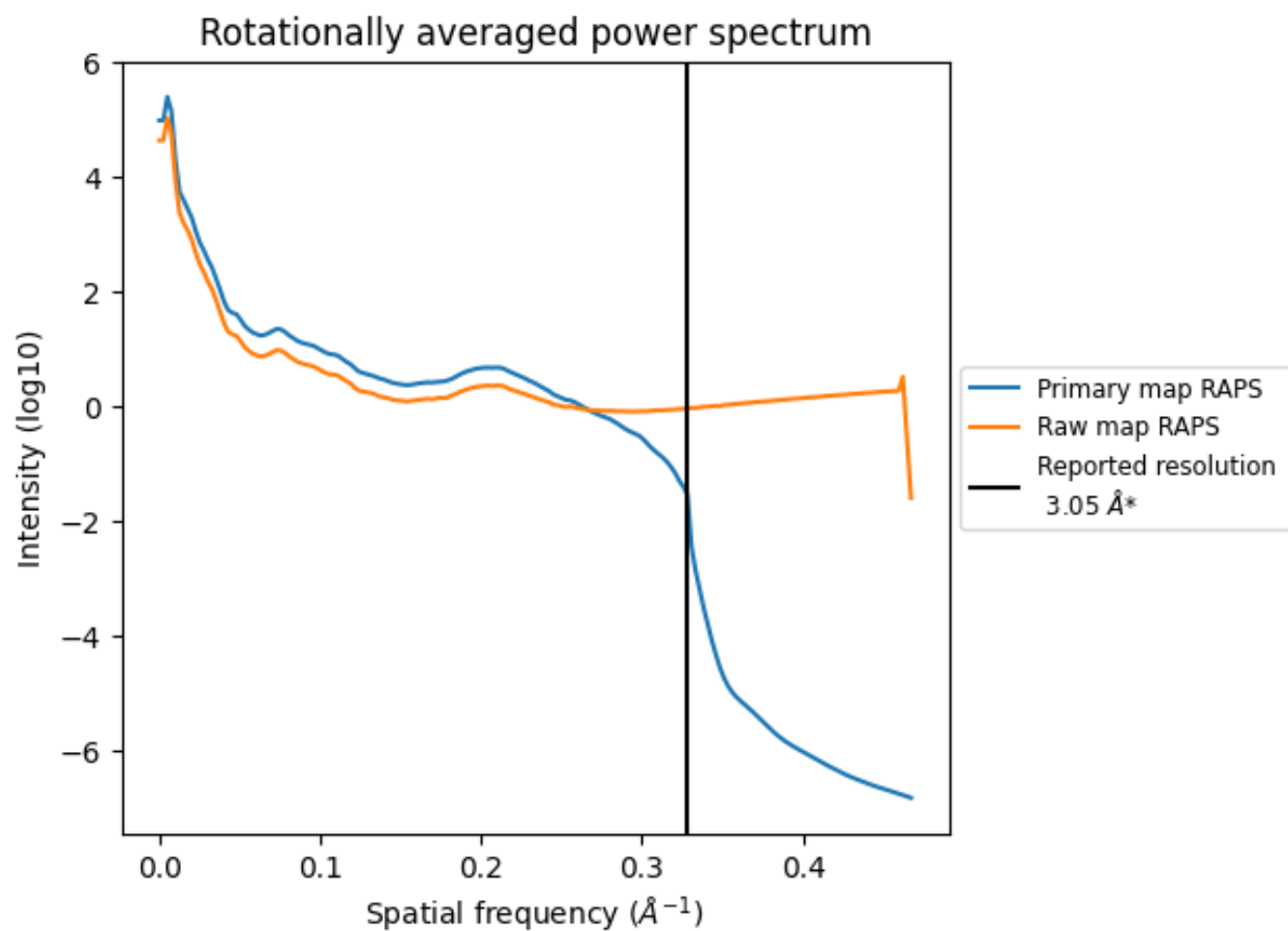
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 90 nm³; this corresponds to an approximate mass of 82 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 ⓘ

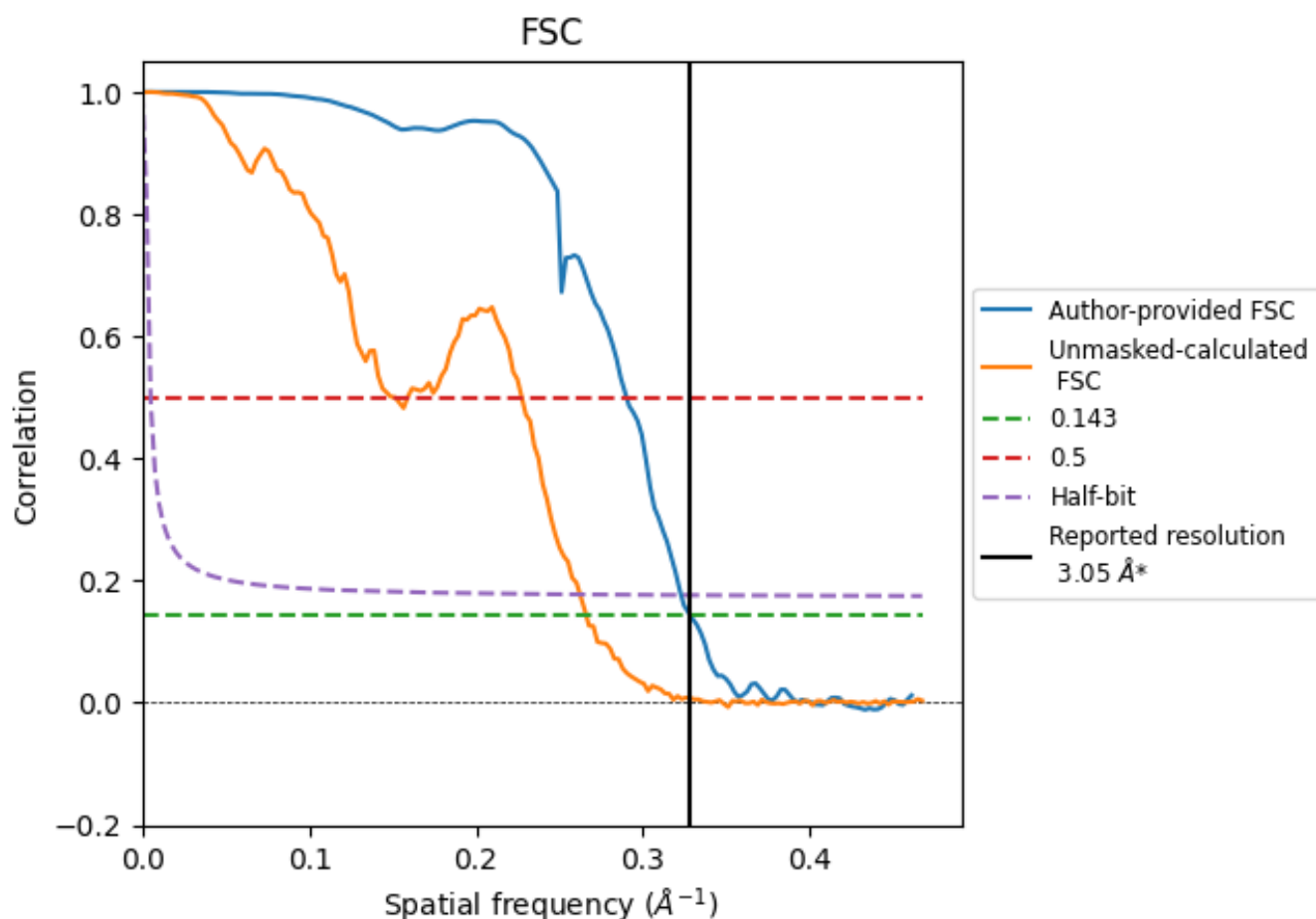


*Reported resolution corresponds to spatial frequency of 0.328 $\text{\AA}^{-1}$

8 Fourier-Shell correlation [i](#)

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

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of $0.328 \text{ \AA}^{-1}$

8.2 Resolution estimates [i](#)

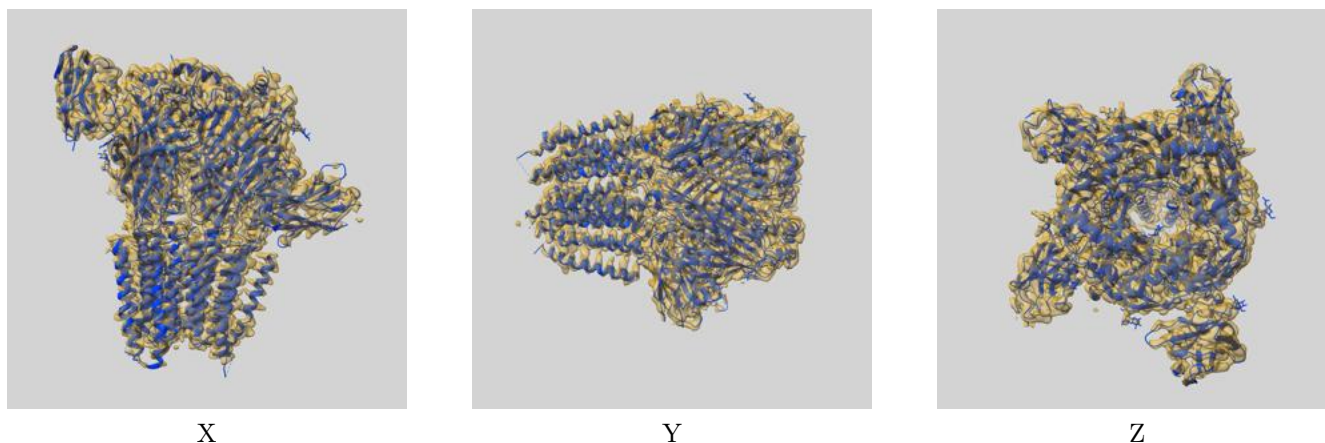
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.05	-	-
Author-provided FSC curve	3.05	3.45	3.10
Unmasked-calculated*	3.76	6.62	3.81

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.76 differs from the reported value 3.05 by more than 10 %

9 Map-model fit [i](#)

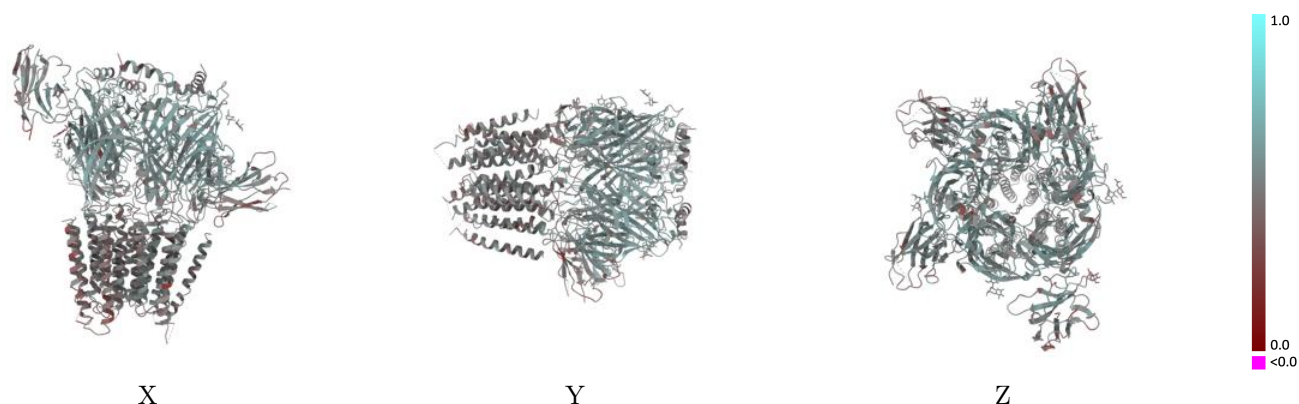
This section contains information regarding the fit between EMDB map EMD-53216 and PDB model 9QK1. Per-residue inclusion information can be found in section 3 on page 11.

9.1 Map-model overlay [i](#)



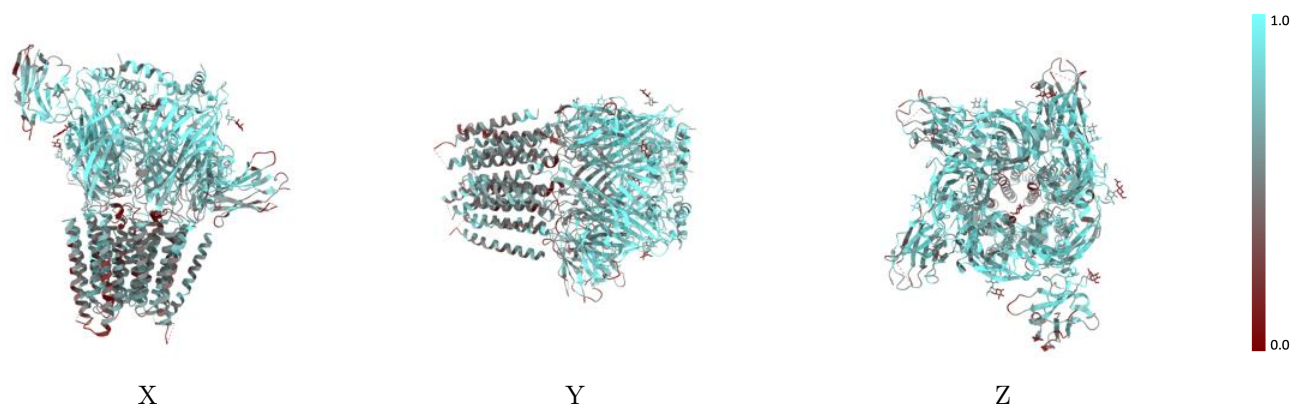
The images above show the 3D surface view of the map at the recommended contour level 0.225 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



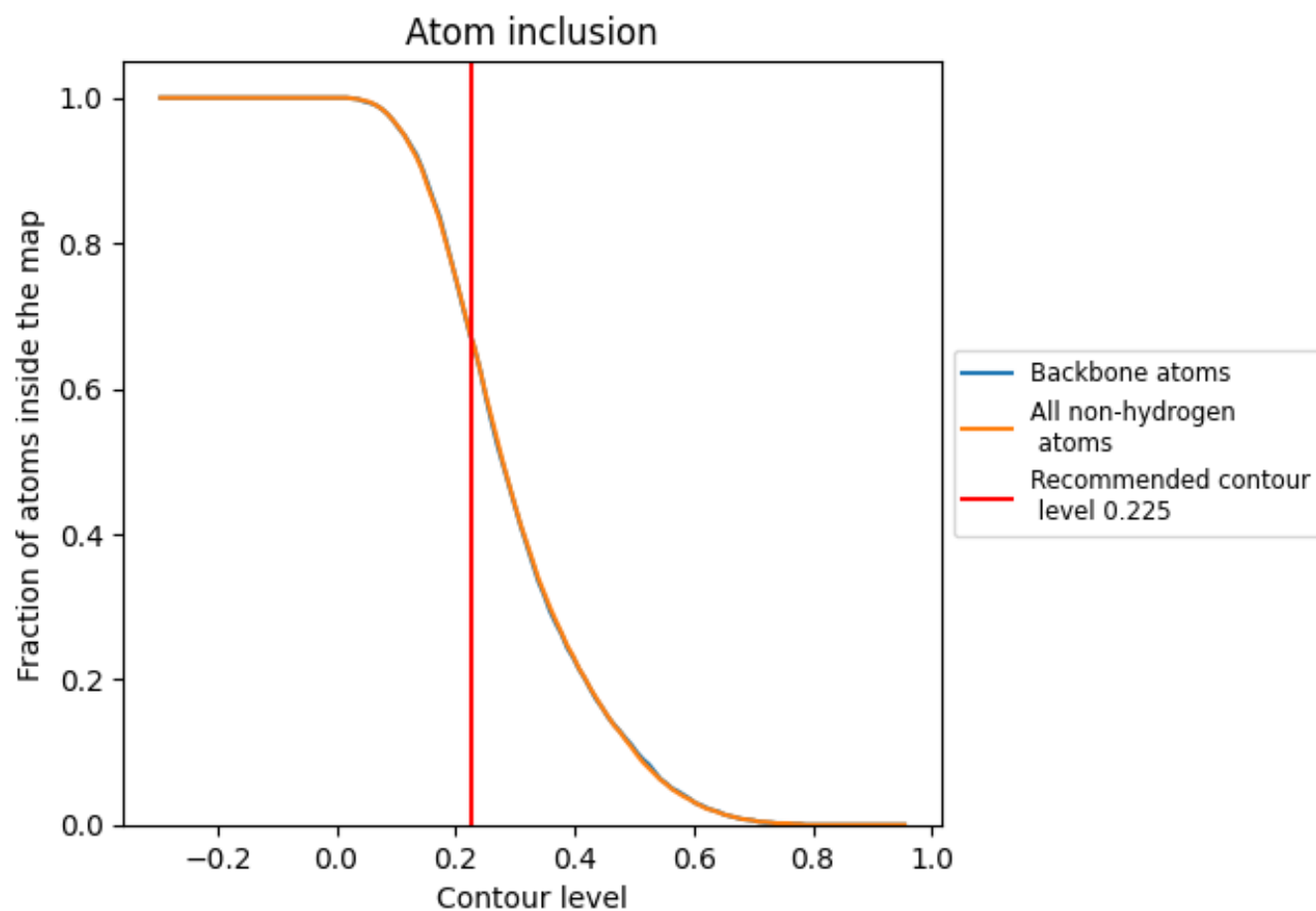
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.225).

9.4 Atom inclusion [i](#)



At the recommended contour level, 67% of all backbone atoms, 67% 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 (0.225) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6740	 0.5000
A	 0.6790	 0.4920
B	 0.6970	 0.5050
C	 0.7100	 0.5110
D	 0.7070	 0.5150
E	 0.7010	 0.5120
F	 0.6670	 0.4740
G	 0.6220	 0.4820
H	 0.6400	 0.4610
I	 0.6940	 0.4850
L	 0.3930	 0.4910
M	 0.5400	 0.5240
N	 0.3930	 0.4430
O	 0.8600	 0.5500
P	 0.3210	 0.4970
Q	 0.7600	 0.5090
R	 0.2860	 0.4660
S	 0.7600	 0.5430

