



## wwPDB EM Validation Summary Report ⓘ

Jun 1, 2026 – 02:31 PM JST

PDB ID : 9X0X / pdb\_00009x0x  
EMDB ID : EMD-66448  
Title : Pseudomonas aeruginosa (PAO1) Outer membrane PilQ (Secretin) with SlkB  
in C14 symmetry  
Authors : Kwon, O.; Lee, Y.; Ryu, B.; Yoo, Y.; Chung, J.; Cho, H.  
Deposited on : 2025-09-30  
Resolution : 2.45 Å(reported)  
Based on initial model : .

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 : 1.8.5 (274361), 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) : 2.49

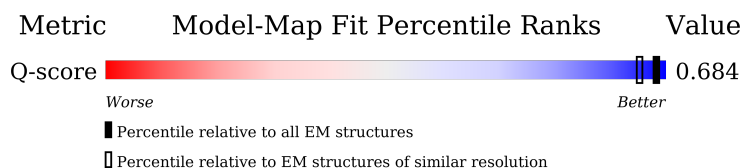
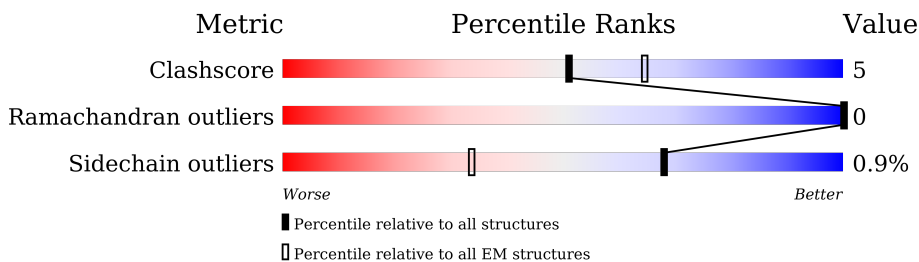
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 2.45 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.

























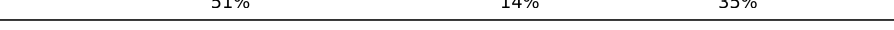

Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	5931 ( 1.96 - 2.95 )

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	714	
1	B	714	
1	C	714	
1	D	714	

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Mol	Chain	Length	Quality of chain
1	E	714	 38%6%56%
1	F	714	 38%5%56%
1	G	714	 38%6%56%
1	H	714	 38%5%56%
1	I	714	 38%5%56%
1	J	714	 38%5%56%
1	K	714	 38%6%56%
1	L	714	 38%6%56%
1	M	714	 38%6%56%
1	N	714	 38%5%56%
2	O	114	 49%16%35%
2	P	114	 50%15%35%
2	Q	114	 51%14%35%
2	R	114	 51%14%35%
2	S	114	 51%14%35%
2	T	114	 51%14%35%
2	U	114	 51%14%35%
2	V	114	 51%14%35%
2	W	114	 51%14%35%
2	X	114	 51%14%35%
2	Y	114	 52%13%35%
2	Z	114	 51%14%35%
2	a	114	 51%14%35%
2	b	114	 51%14%35%

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 41454 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 Fimbrial assembly protein PilQ.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		
1	B	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		
1	C	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		
1	D	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		
1	E	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		
1	F	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		
1	G	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		
1	H	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		
1	I	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		
1	J	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		
1	K	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		
1	L	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		
1	M	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		
1	N	311	Total	C	N	O	S	0	0
			2389	1503	413	466	7		

- Molecule 2 is a protein called Multidrug transporter.

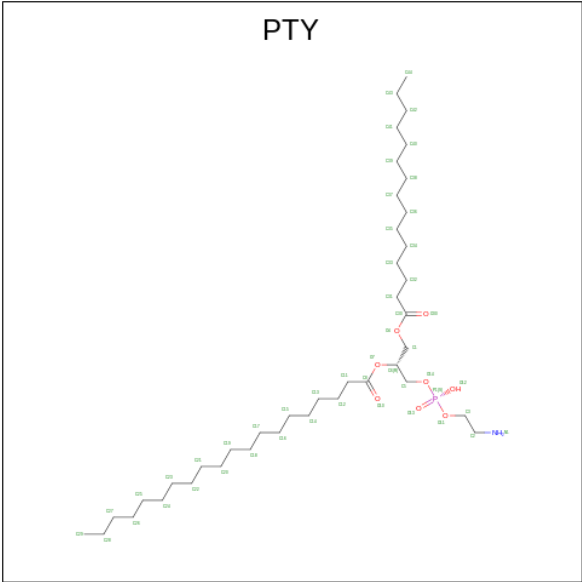
Mol	Chain	Residues	Atoms					AltConf	Trace
2	O	74	Total	C	N	O	S	0	0
			522	340	83	95	4		

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Mol	Chain	Residues	Atoms					AltConf	Trace
2	S	74	Total 522	C 340	N 83	O 95	S 4	0	0
2	P	74	Total 522	C 340	N 83	O 95	S 4	0	0
2	Q	74	Total 522	C 340	N 83	O 95	S 4	0	0
2	R	74	Total 522	C 340	N 83	O 95	S 4	0	0
2	T	74	Total 522	C 340	N 83	O 95	S 4	0	0
2	U	74	Total 522	C 340	N 83	O 95	S 4	0	0
2	V	74	Total 522	C 340	N 83	O 95	S 4	0	0
2	W	74	Total 522	C 340	N 83	O 95	S 4	0	0
2	X	74	Total 522	C 340	N 83	O 95	S 4	0	0
2	Y	74	Total 522	C 340	N 83	O 95	S 4	0	0
2	Z	74	Total 522	C 340	N 83	O 95	S 4	0	0
2	a	74	Total 522	C 340	N 83	O 95	S 4	0	0
2	b	74	Total 522	C 340	N 83	O 95	S 4	0	0


- Molecule 3 is PHOSPHATIDYLETHANOLAMINE (CCD ID: PTY) (formula: C<sub>40</sub>H<sub>80</sub>NO<sub>8</sub>P).

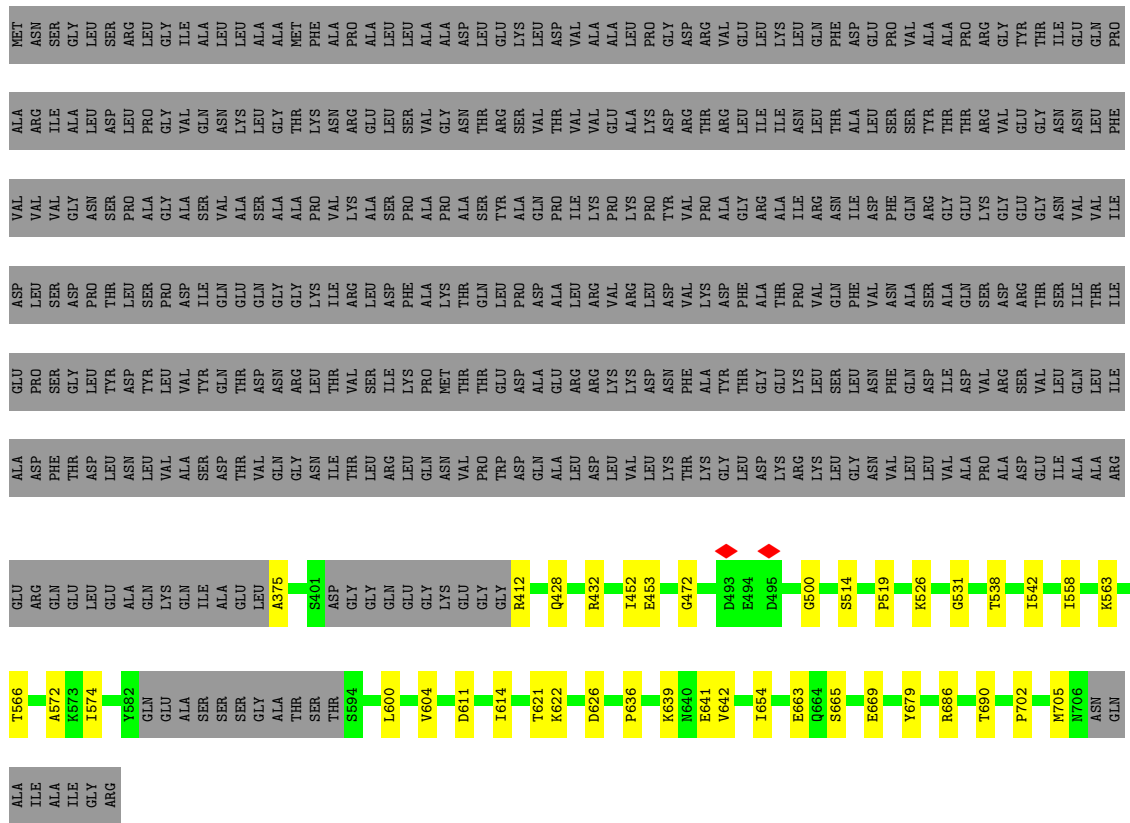


Mol	Chain	Residues	Atoms					AltConf
3	E	1	Total	C	N	O	P	0
			50	40	1	8	1	
3	O	1	Total	C	N	O	P	0
			50	40	1	8	1	
3	O	1	Total	C	N	O	P	0
			50	40	1	8	1	
3	S	1	Total	C	N	O	P	0
			50	40	1	8	1	
3	P	1	Total	C	N	O	P	0
			50	40	1	8	1	
3	Q	1	Total	C	N	O	P	0
			50	40	1	8	1	
3	R	1	Total	C	N	O	P	0
			50	40	1	8	1	
3	T	1	Total	C	N	O	P	0
			50	40	1	8	1	
3	U	1	Total	C	N	O	P	0
			50	40	1	8	1	
3	V	1	Total	C	N	O	P	0
			50	40	1	8	1	
3	W	1	Total	C	N	O	P	0
			50	40	1	8	1	
3	X	1	Total	C	N	O	P	0
			50	40	1	8	1	
3	Z	1	Total	C	N	O	P	0
			50	40	1	8	1	
3	a	1	Total	C	N	O	P	0
			50	40	1	8	1	




- Molecule 1: Fimbrial assembly protein PilQ

Chain C:  38% 5% 56%

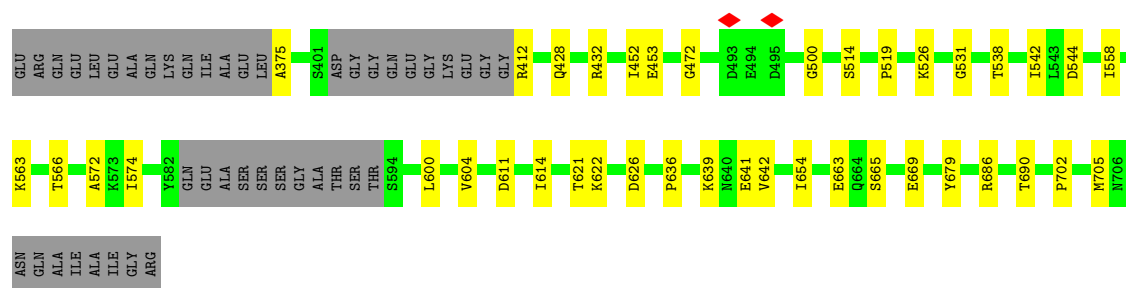


- Molecule 1: Fimbrial assembly protein PilQ

Chain D:  38% 5% 56%

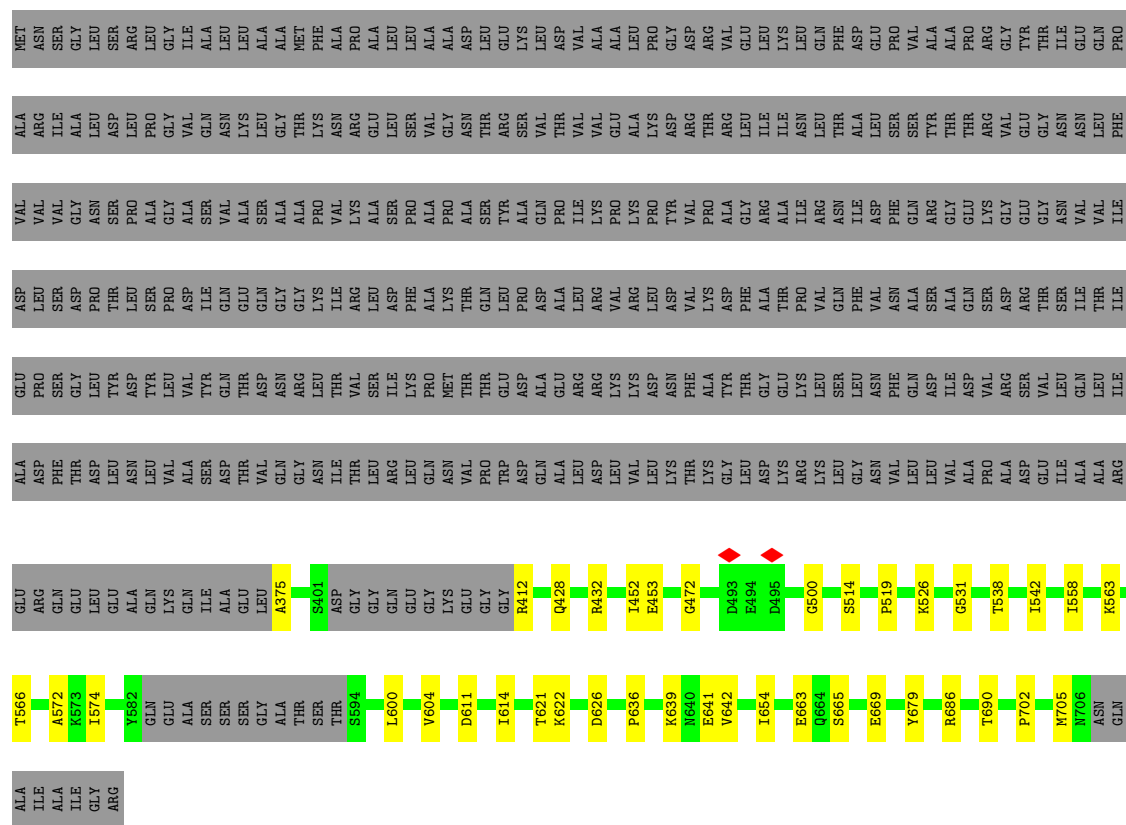


ALA	GLU	ASP	VAL	ALA	MET
PRO	LEU	LEU	VAL	ARG	ASN
PRO	SER	SER	VAL	ILE	GLY
GLY	ASP	ASP	GLY	ALA	LEU
LEU	PRO	PRO	ASN	LEU	SER
TYR	THR	THR	SER	ASP	ARG
ASP	LEU	LEU	PRO	LEU	LEU
ASP	SER	SER	ALA	PRO	GLY
LEU	PRO	PRO	GLY	LEU	ILE
VAL	ALA	ASP	ALA	VAL	ALA
SER	TYR	ILE	SER	GLN	LEU
THR	GLN	GLN	VAL	ASN	LEU
THR	GLU	GLU	ALA	LYS	LEU
ASP	GLN	GLN	SER	LEU	ALA
VAL	ASN	GLY	ALA	GLY	ALA
GLY	ARG	GLY	ALA	THR	MET
ASN	LEU	LYS	PRO	LYS	PHE
LEU	THR	ILE	VAL	ASN	ALA
VAL	VAL	ARG	LYS	ARG	PRO
THR	SER	LEU	ALA	GLU	ALA
ARG	ILE	ASP	SER	LEU	LEU
LYS	LYS	PHE	PRO	SER	LEU
PRO	PRO	ALA	PRO	VAL	ALA
MET	MET	LYS	PRO	GLY	ALA
THR	THR	THR	ALA	ASN	ASP
GLU	GLU	GLN	SER	THR	GLU
TRP	GLU	LEU	TYR	ARG	LYS
ASN	ASP	PRO	ALA	SER	LEU
GLN	ALA	ASP	GLN	VAL	LEU
ALA	GLU	ALA	PRO	THR	ASP
LEU	ARG	LEU	ILE	VAL	VAL
ASP	ARG	ARG	LYS	VAL	ALA
LEU	LYS	VAL	PRO	GLU	ALA
VAL	LYS	ARG	LYS	ALA	LEU
LEU	ASP	LEU	PRO	LYS	PRO
LYS	ASN	ASP	TYR	ASP	GLY
THR	PHE	VAL	VAL	ASP	ASP
LYS	GLY	LYS	PRO	THR	ARG
GLY	TYR	ASP	ALA	ARG	VAL
LEU	THR	PHE	GLY	LEU	LEU
ASP	GLY	ALA	ARG	ILE	LEU
LYS	GLU	THR	ALA	ILE	LYS
ARG	LYS	PRO	ILE	ASN	LEU
LYS	LEU	VAL	ARG	LEU	GLN
LEU	SER	GLN	ASN	THR	PHE
GLY	LEU	PHE	ILE	ALA	ASP
ASN	ASN	VAL	ASP	LEU	GLU
VAL	PHE	ASN	PHE	SER	PRO
LEU	GLN	ALA	GLN	SER	VAL
LEU	ASP	SER	ARG	TYR	ALA
VAL	ILE	ALA	GLY	THR	ALA
ALA	ASP	ALA	GLU	THR	PRO
PRO	VAL	SER	LYS	ARG	ARG
ALA	ARG	ASP	GLY	VAL	GLY
ASP	SER	ARG	GLU	GLU	TYR
GLU	VAL	THR	GLY	GLY	THR
ILE	LEU	SER	ASN	ASN	ILE
ALA	GLN	ILE	VAL	ASN	GLU
ALA	LEU	THR	VAL	LEU	GLN
ARG	ILE	ILE	ILE	THR	PRO



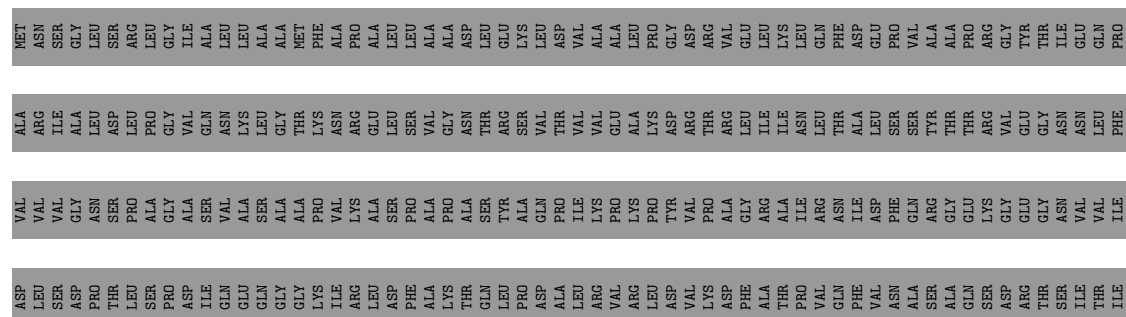
• Molecule 1: Fimbrial assembly protein PilQ

Chain H: 38% 5% 56%

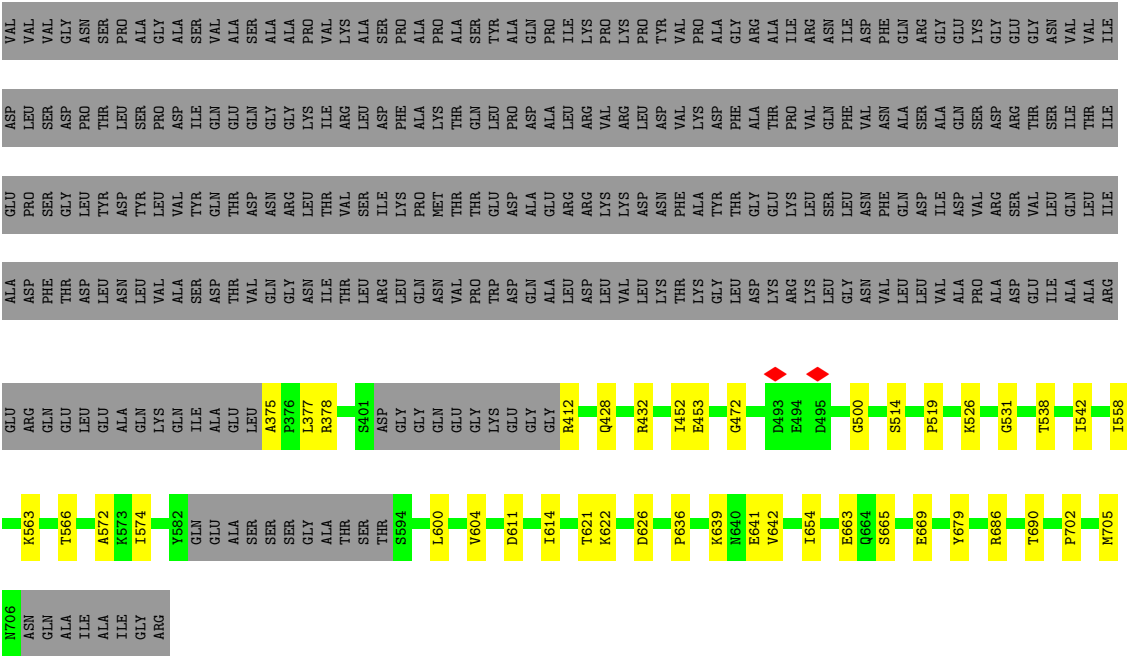


• Molecule 1: Fimbrial assembly protein PilQ

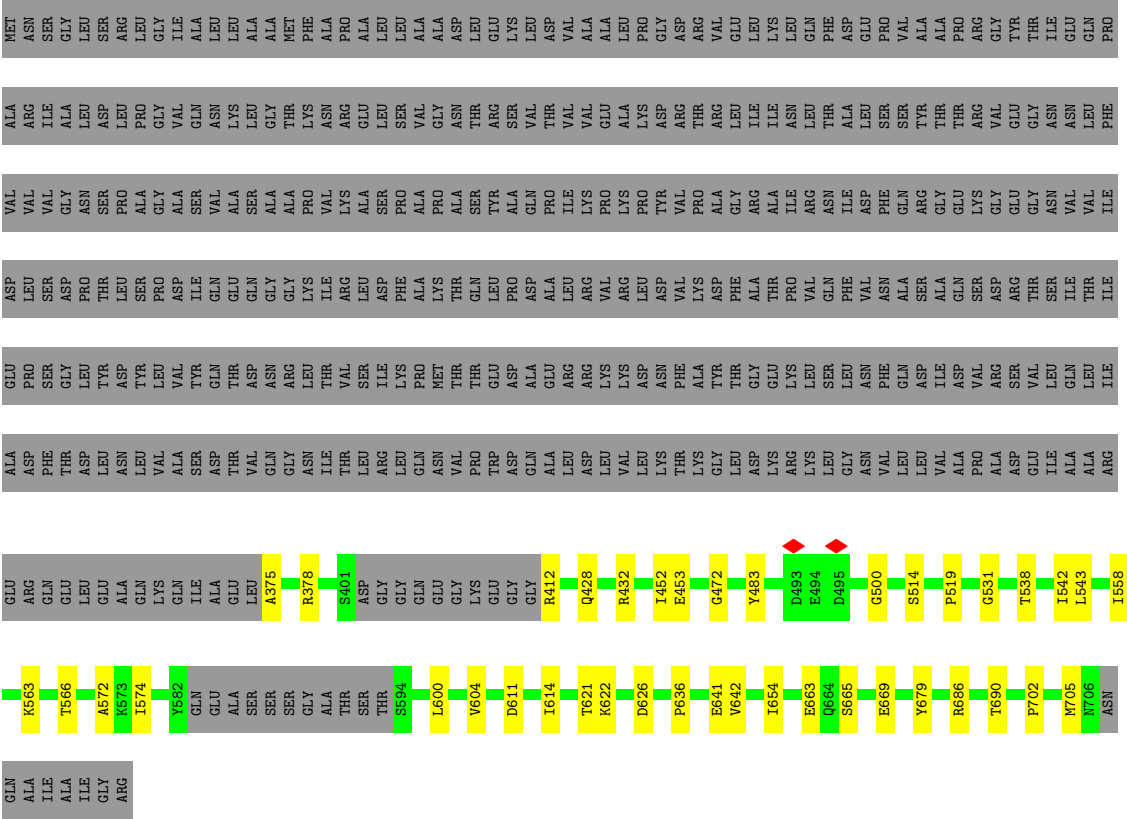
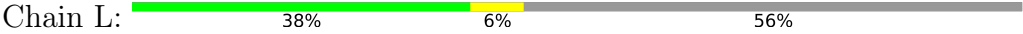
Chain I: 38% 5% 56%



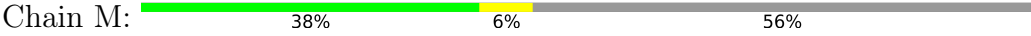




● Molecule 1: Fimbrial assembly protein PilQ



● Molecule 1: Fimbrial assembly protein PilQ





ALA
ILE
ALA
ILE
GLY
ARG

• Molecule 2: Multidrug transporter



MET	ASN	LEU	PHE	ARG	THR	THR	ALA	LEU	VAL	LEU	ALA	LEU	THR	THR	GLY	LEU	SER	SER	MET	PRO	ALA	LEU	ASP	ALA	ASP	ALA	GLN	GLU	ASN	ALA	SER	GLY	ASP	PRO	M36	V39	E40	A41	Y45	D50	L51	R55	P56	F57	L58	A61	T62	S72	P93	A97	F98
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V99	R100	C101	L102	T106	Y109	ASN	HIS	ASP	GLU	SER
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• Molecule 2: Multidrug transporter



MET	ASN	LEU	PHE	ARG	THR	THR	ALA	LEU	VAL	LEU	ALA	LEU	THR	THR	GLY	LEU	SER	SER	MET	PRO	ALA	LEU	ASP	ALA	ASP	ALA	VAL	GLN	GLU	ASN	ALA	SER	GLY	ASP	PRO	M36	A41	Y45	D50	L51	R55	P56	F57	L58	A61	T62	S72	P93	A97	F98	V99	R100
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C101	L102	T106	Y109	ASN	HIS	ASP	GLU	SER
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• Molecule 2: Multidrug transporter



MET	ASN	LEU	PHE	ARG	THR	THR	ALA	LEU	VAL	LEU	ALA	LEU	THR	THR	GLY	LEU	SER	SER	MET	PRO	ALA	LEU	ASP	ALA	ASP	ALA	VAL	GLN	GLU	ASN	ALA	SER	GLY	ASP	PRO	M36	A41	Y45	D50	L51	R55	P56	F57	L58	A61	T62	S72	S79	P93	A97	F98
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

V99	R100	C101	L102	T106	Y109	ASN	HIS	ASP	GLU	SER
-----	------	------	------	------	------	-----	-----	-----	-----	-----

• Molecule 2: Multidrug transporter



MET	ASN	LEU	PHE	ARG	THR	THR	ALA	LEU	VAL	LEU	ALA	LEU	THR	THR	GLY	LEU	SER	SER	MET	PRO	ALA	LEU	ASP	ALA	ASP	ALA	VAL	GLN	GLU	ASN	ALA	SER	GLY	ASP	PRO	M36	A41	Y45	D50	L51	R55	P56	F57	L58	A61	T62	S72	P93	A97	F98	V99	R100
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------

C101	L102	T106	Y109	ASN	HIS	ASP	GLU	SER
------	------	------	------	-----	-----	-----	-----	-----

• Molecule 2: Multidrug transporter





- Chain T: 



- Chain U:  51% 14% 35%



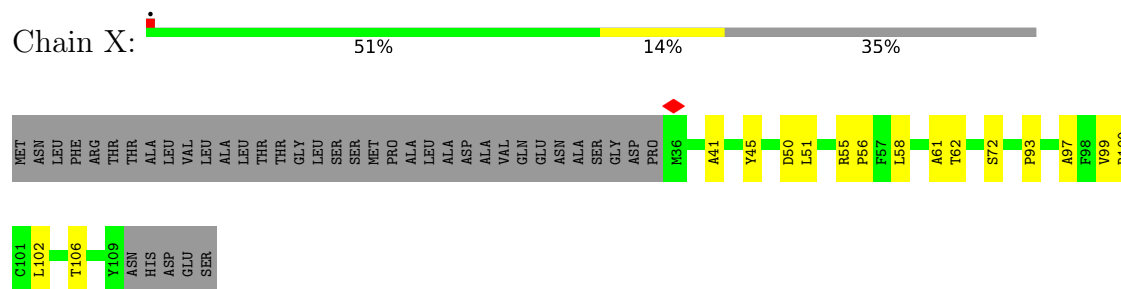
- Chain V: 



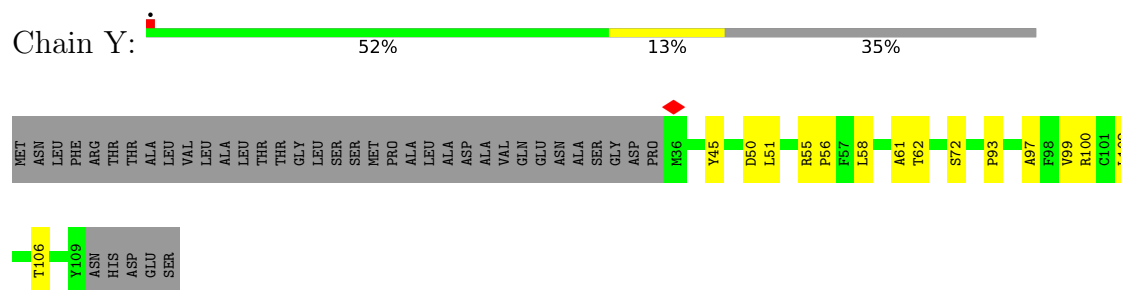
- Chain W:  51% 14% 35%



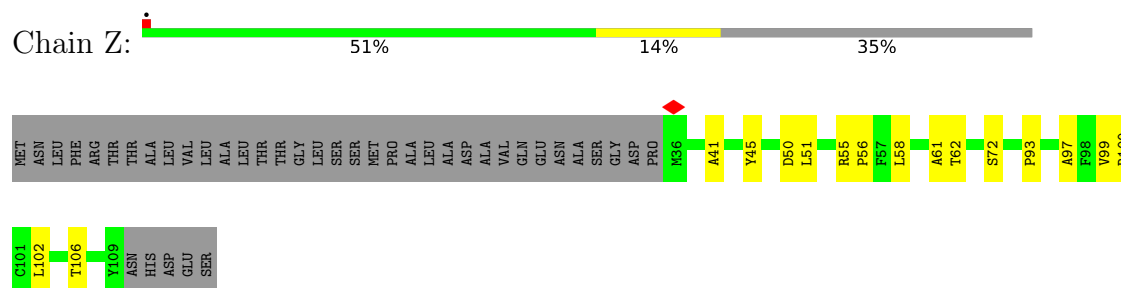
- 



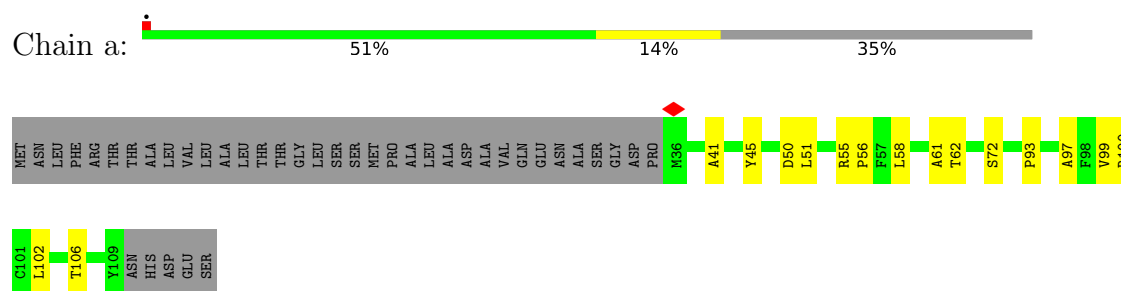
- Molecule 2: Multidrug transporter



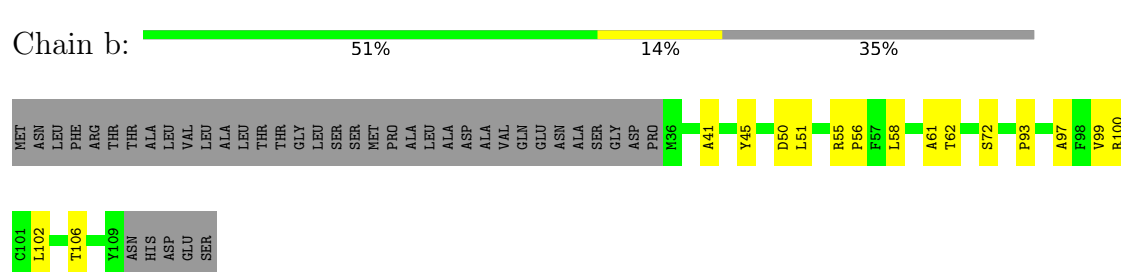
- Molecule 2: Multidrug transporter



- Molecule 2: Multidrug transporter



- Molecule 2: Multidrug transporter



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	111983	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 ( $e^-/\text{\AA}^2$ )	53.1	Depositor
Minimum defocus (nm)	700	Depositor
Maximum defocus (nm)	1800	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	1.643	Depositor
Minimum map value	-1.027	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.050	Depositor
Recommended contour level	0.27	Depositor
Map size (Å)	413.1, 413.1, 413.1	wwPDB
Map dimensions	510, 510, 510	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.81, 0.81, 0.81	Depositor

## 5 Model quality

### 5.1 Standard geometry

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

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	0.34	0/2425	0.35	0/3282
1	B	0.35	0/2425	0.35	0/3282
1	C	0.35	0/2425	0.35	0/3282
1	D	0.35	0/2425	0.35	0/3282
1	E	0.35	0/2425	0.35	0/3282
1	F	0.35	0/2425	0.35	0/3282
1	G	0.35	0/2425	0.35	0/3282
1	H	0.34	0/2425	0.35	0/3282
1	I	0.35	0/2425	0.35	0/3282
1	J	0.35	0/2425	0.35	0/3282
1	K	0.35	0/2425	0.35	0/3282
1	L	0.35	0/2425	0.35	0/3282
1	M	0.35	0/2425	0.35	0/3282
1	N	0.35	0/2425	0.35	0/3282
2	O	0.37	0/533	0.56	0/728
2	P	0.37	0/533	0.56	0/728
2	Q	0.37	0/533	0.56	0/728
2	R	0.37	0/533	0.56	0/728
2	S	0.37	0/533	0.56	0/728
2	T	0.37	0/533	0.56	0/728
2	U	0.37	0/533	0.56	0/728
2	V	0.37	0/533	0.56	0/728
2	W	0.37	0/533	0.56	0/728
2	X	0.37	0/533	0.56	0/728
2	Y	0.37	0/533	0.56	0/728
2	Z	0.37	0/533	0.56	0/728
2	a	0.37	0/533	0.56	0/728
2	b	0.38	0/533	0.55	0/728
All	All	0.35	0/41412	0.39	0/56140

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

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	2389	0	2422	28	0
1	B	2389	0	2422	26	0
1	C	2389	0	2422	26	0
1	D	2389	0	2422	26	0
1	E	2389	0	2422	27	0
1	F	2389	0	2422	26	0
1	G	2389	0	2422	27	0
1	H	2389	0	2422	27	0
1	I	2389	0	2422	27	0
1	J	2389	0	2422	26	0
1	K	2389	0	2422	30	0
1	L	2389	0	2422	28	0
1	M	2389	0	2422	28	0
1	N	2389	0	2422	26	0
2	O	522	0	532	15	0
2	P	522	0	532	14	0
2	Q	522	0	532	15	0
2	R	522	0	532	14	0
2	S	522	0	532	14	0
2	T	522	0	532	14	0
2	U	522	0	532	14	0
2	V	522	0	532	13	0
2	W	522	0	532	13	0
2	X	522	0	532	14	0
2	Y	522	0	532	14	0
2	Z	522	0	532	15	0
2	a	522	0	532	15	0
2	b	522	0	532	14	0
3	E	50	0	79	5	0
3	O	100	0	158	11	0
3	P	50	0	79	5	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	Q	50	0	79	6	0
3	R	50	0	79	5	0
3	S	50	0	79	5	0
3	T	50	0	79	6	0
3	U	50	0	79	5	0
3	V	50	0	79	5	0
3	W	50	0	79	5	0
3	X	50	0	79	6	0
3	Z	50	0	79	5	0
3	a	50	0	79	6	0
All	All	41454	0	42462	461	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 461 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:Y:51:LEU:HD11	2:Z:72:SER:HB3	1.64	0.79
1:B:642:VAL:HB	1:C:574:ILE:HD12	1.72	0.71
1:A:574:ILE:HD12	1:N:642:VAL:HB	1.72	0.71
1:A:642:VAL:HB	1:B:574:ILE:HD12	1.72	0.71
1:M:642:VAL:HB	1:N:574:ILE:HD12	1.72	0.71

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	305/714 (43%)	294 (96%)	11 (4%)	0	100	100
1	B	305/714 (43%)	294 (96%)	11 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	305/714 (43%)	294 (96%)	11 (4%)	0	100	100
1	D	305/714 (43%)	294 (96%)	11 (4%)	0	100	100
1	E	305/714 (43%)	294 (96%)	11 (4%)	0	100	100
1	F	305/714 (43%)	294 (96%)	11 (4%)	0	100	100
1	G	305/714 (43%)	294 (96%)	11 (4%)	0	100	100
1	H	305/714 (43%)	294 (96%)	11 (4%)	0	100	100
1	I	305/714 (43%)	294 (96%)	11 (4%)	0	100	100
1	J	305/714 (43%)	294 (96%)	11 (4%)	0	100	100
1	K	305/714 (43%)	294 (96%)	11 (4%)	0	100	100
1	L	305/714 (43%)	294 (96%)	11 (4%)	0	100	100
1	M	305/714 (43%)	294 (96%)	11 (4%)	0	100	100
1	N	305/714 (43%)	294 (96%)	11 (4%)	0	100	100
2	O	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
2	P	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
2	Q	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
2	R	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
2	S	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
2	T	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
2	U	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
2	V	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
2	W	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
2	X	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
2	Y	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
2	Z	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
2	a	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
2	b	72/114 (63%)	71 (99%)	1 (1%)	0	100	100
All	All	5278/11592 (46%)	5110 (97%)	168 (3%)	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	266/595 (45%)	264 (99%)	2 (1%)	73	83
1	B	266/595 (45%)	264 (99%)	2 (1%)	73	83
1	C	266/595 (45%)	264 (99%)	2 (1%)	73	83
1	D	266/595 (45%)	264 (99%)	2 (1%)	73	83
1	E	266/595 (45%)	264 (99%)	2 (1%)	73	83
1	F	266/595 (45%)	264 (99%)	2 (1%)	73	83
1	G	266/595 (45%)	264 (99%)	2 (1%)	73	83
1	H	266/595 (45%)	264 (99%)	2 (1%)	73	83
1	I	266/595 (45%)	264 (99%)	2 (1%)	73	83
1	J	266/595 (45%)	264 (99%)	2 (1%)	73	83
1	K	266/595 (45%)	264 (99%)	2 (1%)	73	83
1	L	266/595 (45%)	264 (99%)	2 (1%)	73	83
1	M	266/595 (45%)	264 (99%)	2 (1%)	73	83
1	N	266/595 (45%)	264 (99%)	2 (1%)	73	83
2	O	52/84 (62%)	51 (98%)	1 (2%)	50	64
2	P	52/84 (62%)	51 (98%)	1 (2%)	50	64
2	Q	52/84 (62%)	51 (98%)	1 (2%)	50	64
2	R	52/84 (62%)	51 (98%)	1 (2%)	50	64
2	S	52/84 (62%)	51 (98%)	1 (2%)	50	64
2	T	52/84 (62%)	51 (98%)	1 (2%)	50	64
2	U	52/84 (62%)	51 (98%)	1 (2%)	50	64
2	V	52/84 (62%)	51 (98%)	1 (2%)	50	64
2	W	52/84 (62%)	51 (98%)	1 (2%)	50	64
2	X	52/84 (62%)	51 (98%)	1 (2%)	50	64
2	Y	52/84 (62%)	51 (98%)	1 (2%)	50	64
2	Z	52/84 (62%)	51 (98%)	1 (2%)	50	64

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	a	52/84 (62%)	51 (98%)	1 (2%)	50	64
2	b	52/84 (62%)	51 (98%)	1 (2%)	50	64
All	All	4452/9506 (47%)	4410 (99%)	42 (1%)	68	81

5 of 42 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	O	99	VAL
2	V	99	VAL
2	S	99	VAL
2	R	99	VAL
2	X	99	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 72 such sidechains are listed below:

Mol	Chain	Res	Type
1	L	488	ASN
1	N	643	ASN
1	L	546	GLN
1	M	555	ASN
1	E	546	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](#)

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

14 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	$\# Z  > 2$
3	PTY	R	801	-	49,49,49	0.93	2 (4%)	52,54,54	1.10	4 (7%)
3	PTY	O	802	-	49,49,49	0.93	2 (4%)	52,54,54	1.10	4 (7%)
3	PTY	Q	801	-	49,49,49	0.93	2 (4%)	52,54,54	1.10	4 (7%)
3	PTY	Z	801	-	49,49,49	0.93	2 (4%)	52,54,54	1.10	3 (5%)
3	PTY	V	801	-	49,49,49	0.93	2 (4%)	52,54,54	1.10	4 (7%)
3	PTY	P	801	-	49,49,49	0.93	2 (4%)	52,54,54	1.11	4 (7%)
3	PTY	S	801	-	49,49,49	0.93	2 (4%)	52,54,54	1.11	4 (7%)
3	PTY	U	801	-	49,49,49	0.93	2 (4%)	52,54,54	1.10	4 (7%)
3	PTY	E	801	-	49,49,49	0.93	2 (4%)	52,54,54	1.11	4 (7%)
3	PTY	X	801	-	49,49,49	0.93	2 (4%)	52,54,54	1.10	4 (7%)
3	PTY	a	801	-	49,49,49	0.93	2 (4%)	52,54,54	1.10	4 (7%)
3	PTY	O	801	-	49,49,49	0.93	2 (4%)	52,54,54	1.10	4 (7%)
3	PTY	W	801	-	49,49,49	0.93	2 (4%)	52,54,54	1.10	4 (7%)
3	PTY	T	801	-	49,49,49	0.93	2 (4%)	52,54,54	1.10	4 (7%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	PTY	R	801	-	-	14/53/53/53	-
3	PTY	O	802	-	-	14/53/53/53	-
3	PTY	Q	801	-	-	14/53/53/53	-
3	PTY	Z	801	-	-	14/53/53/53	-
3	PTY	V	801	-	-	14/53/53/53	-
3	PTY	P	801	-	-	14/53/53/53	-
3	PTY	S	801	-	-	14/53/53/53	-
3	PTY	U	801	-	-	14/53/53/53	-
3	PTY	E	801	-	-	14/53/53/53	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	PTY	X	801	-	-	14/53/53/53	-
3	PTY	a	801	-	-	14/53/53/53	-
3	PTY	O	801	-	-	14/53/53/53	-
3	PTY	W	801	-	-	14/53/53/53	-
3	PTY	T	801	-	-	14/53/53/53	-

The worst 5 of 28 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	U	801	PTY	O4-C30	4.26	1.45	1.33
3	Z	801	PTY	O4-C30	4.26	1.45	1.33
3	P	801	PTY	O4-C30	4.25	1.45	1.33
3	a	801	PTY	O4-C30	4.25	1.45	1.33
3	Q	801	PTY	O4-C30	4.25	1.45	1.33

The worst 5 of 55 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	Q	801	PTY	O7-C8-C11	3.65	119.36	111.50
3	U	801	PTY	O7-C8-C11	3.65	119.36	111.50
3	E	801	PTY	O7-C8-C11	3.65	119.36	111.50
3	X	801	PTY	O7-C8-C11	3.64	119.36	111.50
3	Z	801	PTY	O7-C8-C11	3.64	119.34	111.50

There are no chirality outliers.

5 of 196 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	E	801	PTY	O30-C30-O4-C1
3	O	801	PTY	O30-C30-O4-C1
3	O	802	PTY	O30-C30-O4-C1
3	S	801	PTY	O30-C30-O4-C1
3	P	801	PTY	O30-C30-O4-C1

There are no ring outliers.

14 monomers are involved in 75 short contacts:

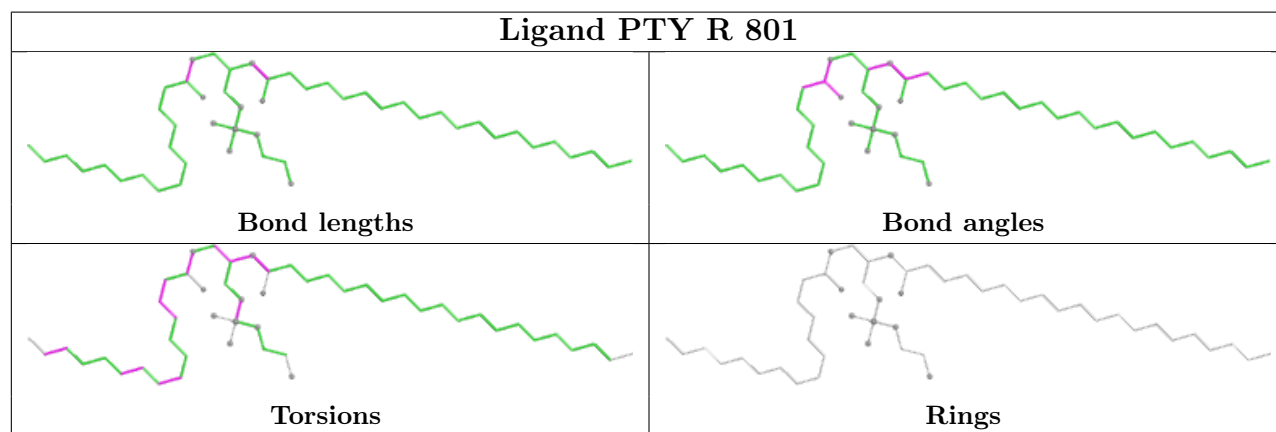
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	R	801	PTY	5	0
3	O	802	PTY	6	0

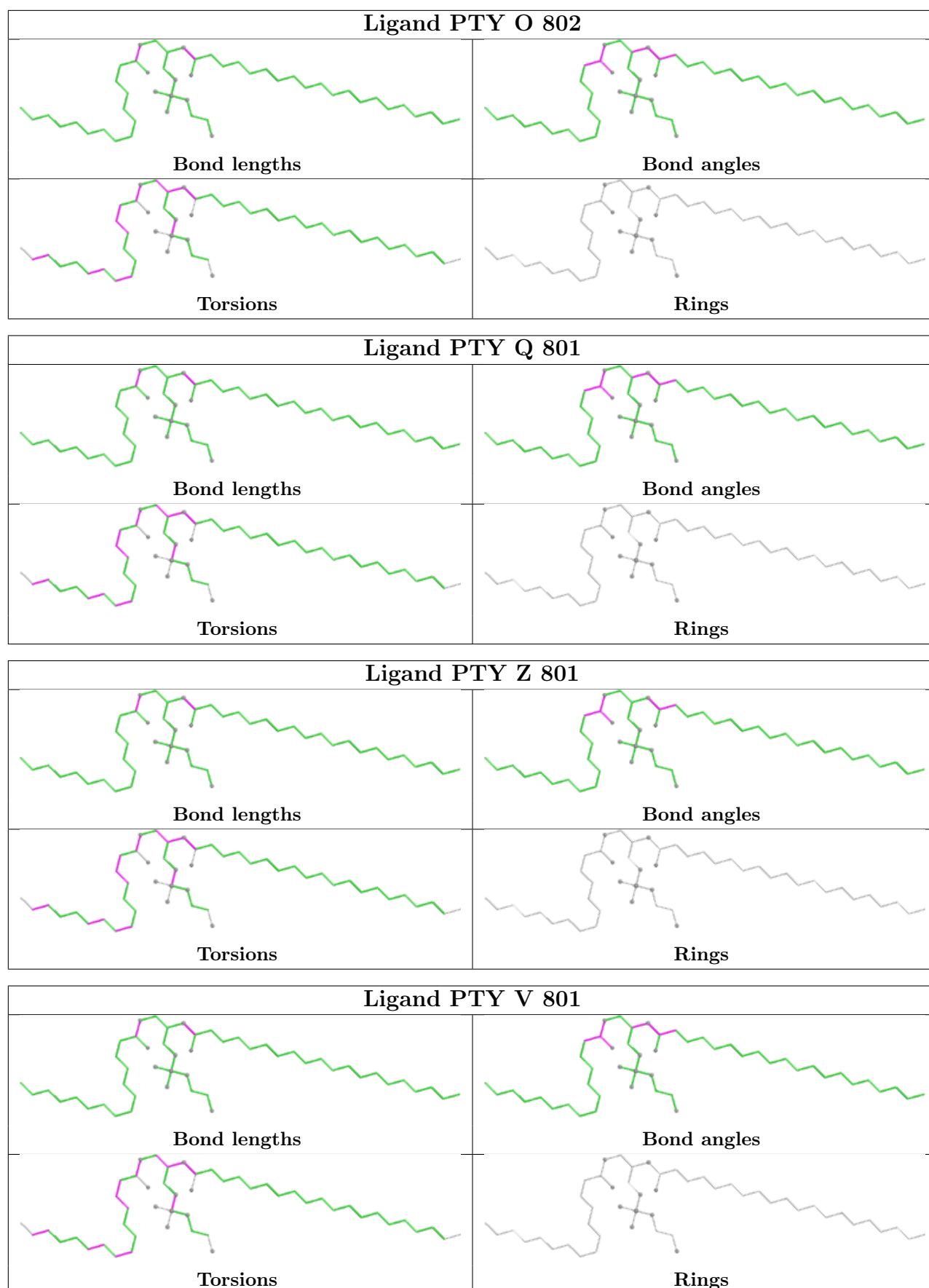
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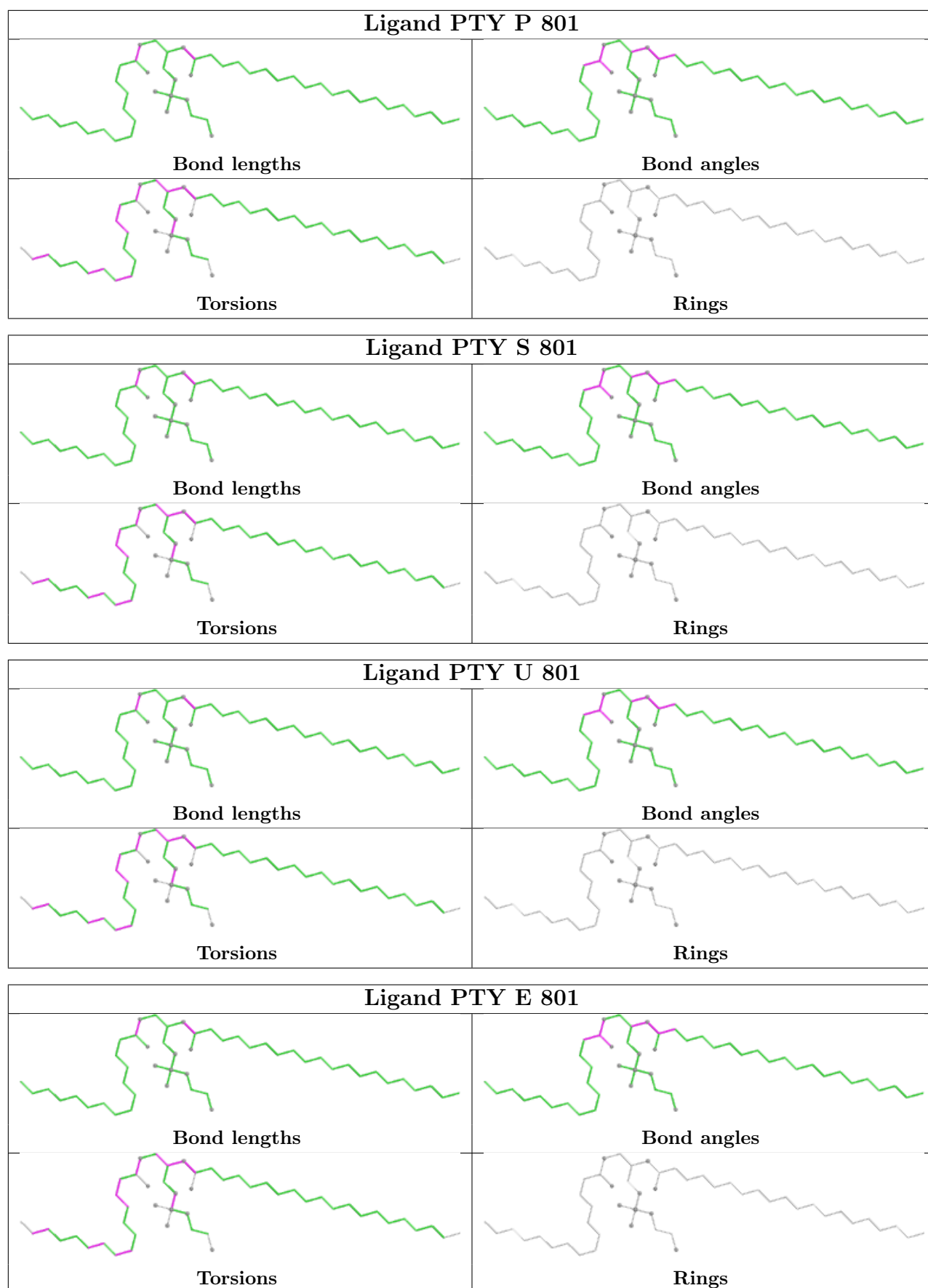
*Continued from previous page...*

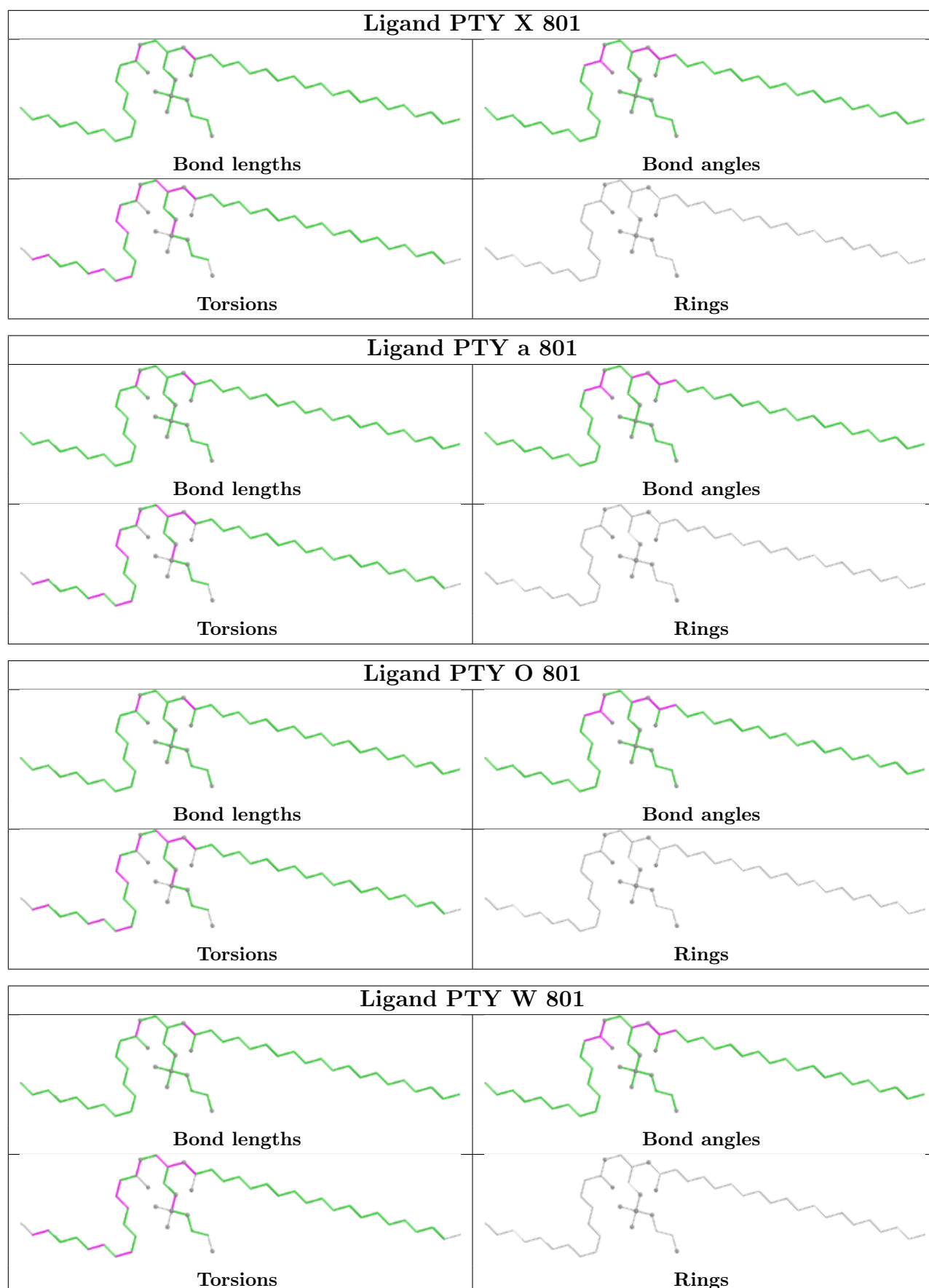
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	Q	801	PTY	6	0
3	Z	801	PTY	5	0
3	V	801	PTY	5	0
3	P	801	PTY	5	0
3	S	801	PTY	5	0
3	U	801	PTY	5	0
3	E	801	PTY	5	0
3	X	801	PTY	6	0
3	a	801	PTY	6	0
3	O	801	PTY	5	0
3	W	801	PTY	5	0
3	T	801	PTY	6	0

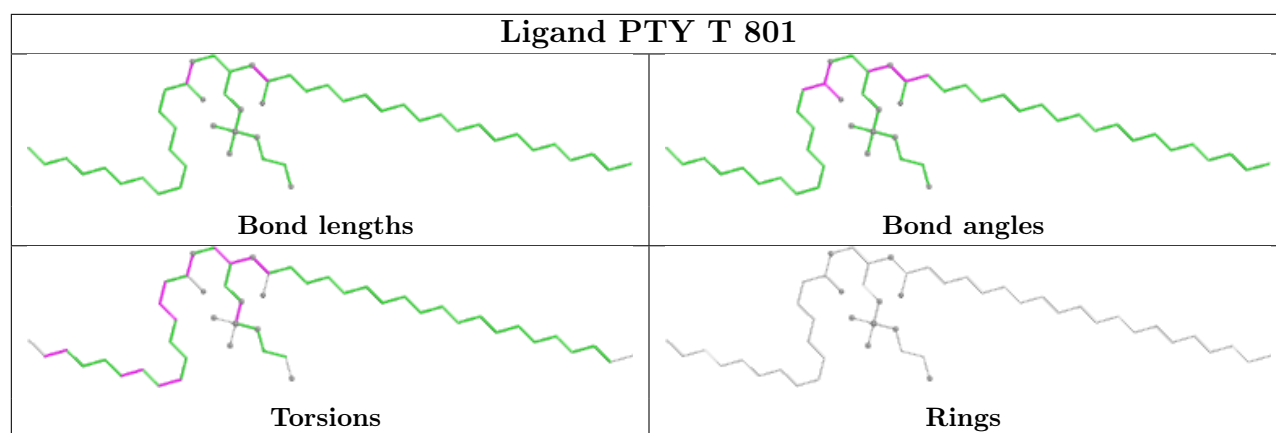
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

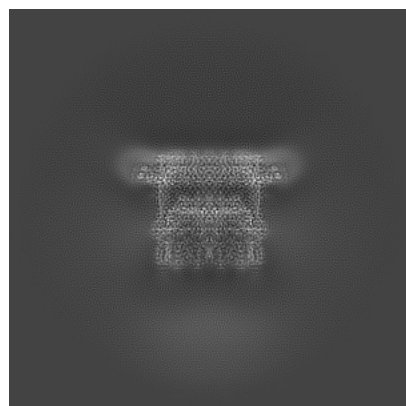
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-66448. These allow visual inspection of the internal detail of the map and identification of artifacts.

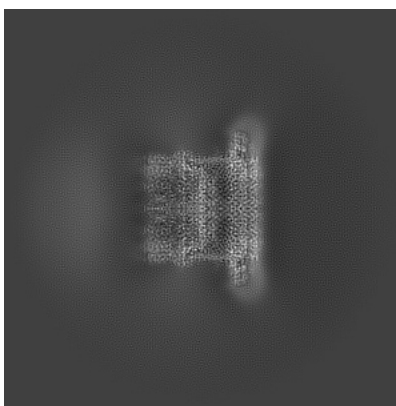
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

### 6.1 Orthogonal projections [i](#)

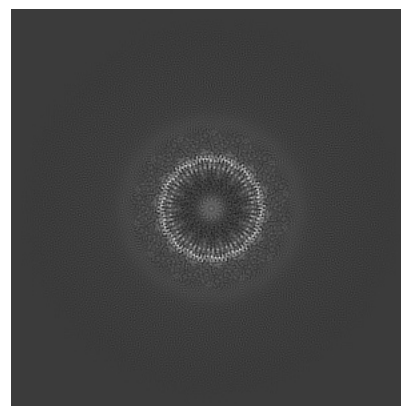
#### 6.1.1 Primary map



X

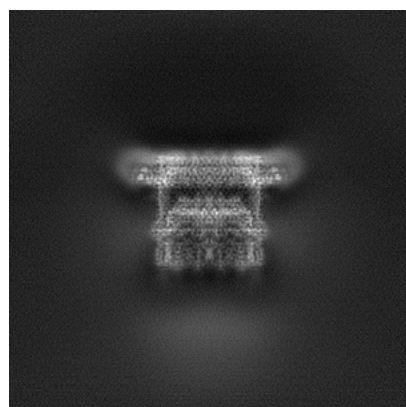


Y

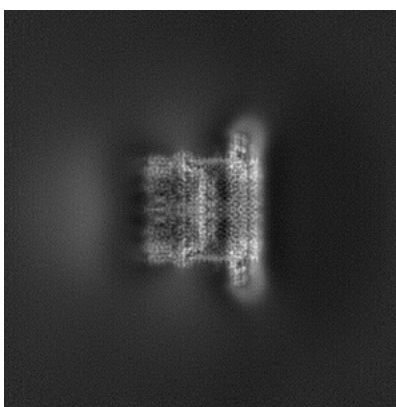


Z

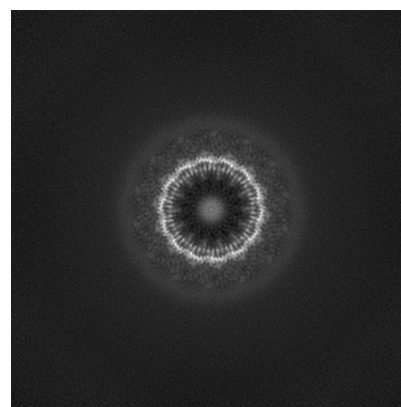
#### 6.1.2 Raw map



X



Y

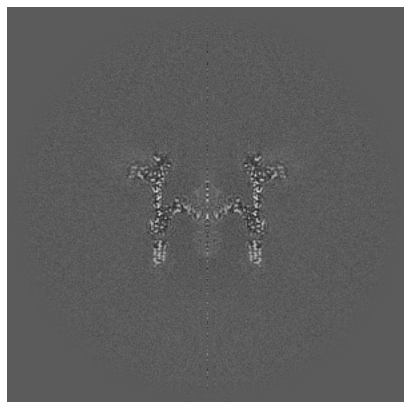


Z

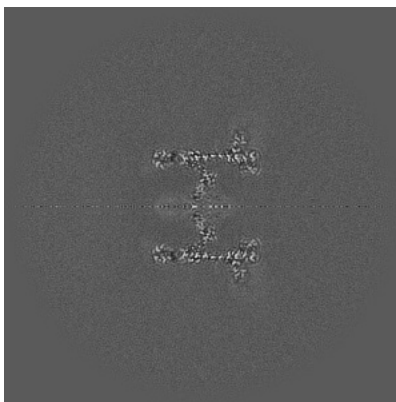
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

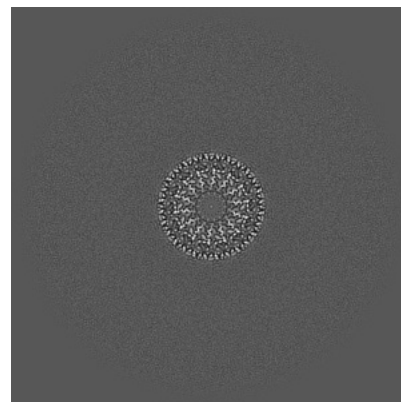
### 6.2.1 Primary map



X Index: 255

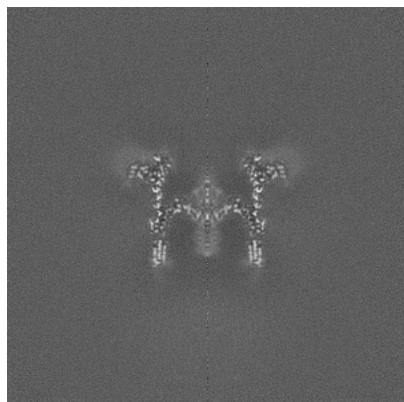


Y Index: 255

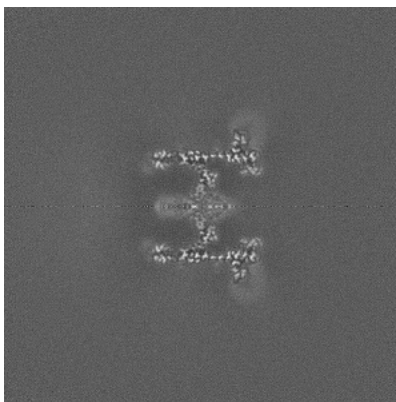


Z Index: 255

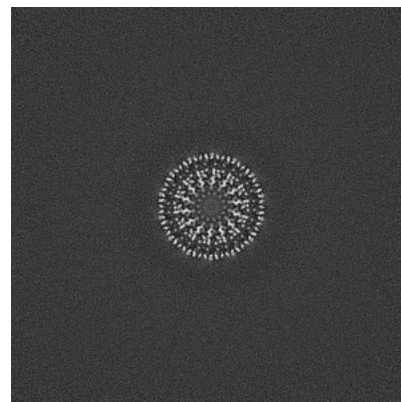
### 6.2.2 Raw map



X Index: 255



Y Index: 255

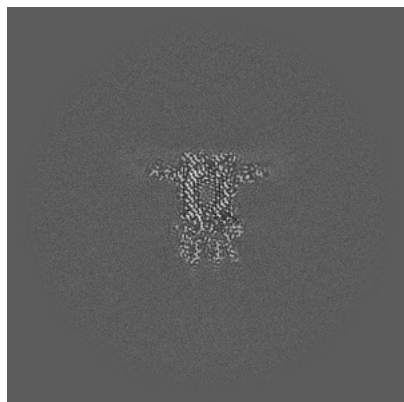


Z Index: 255

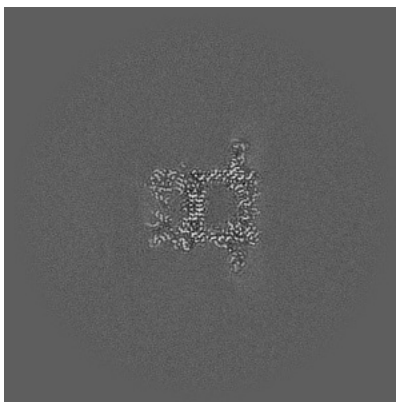
The images above show central slices of the map in three orthogonal directions.

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

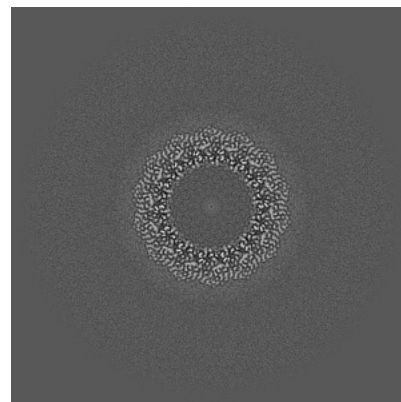
### 6.3.1 Primary map



X Index: 195

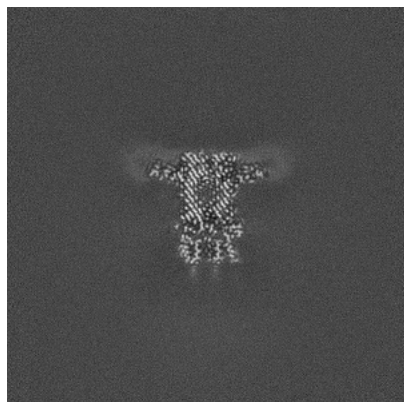


Y Index: 204

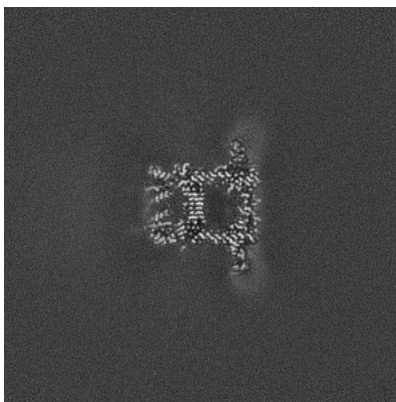


Z Index: 295

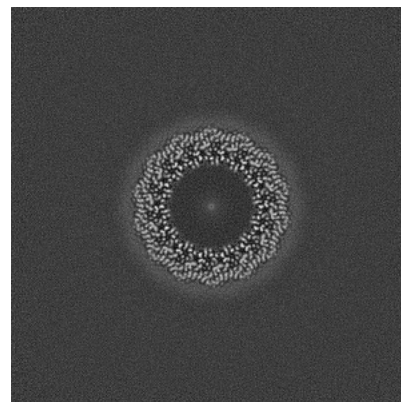
### 6.3.2 Raw map



X Index: 195



Y Index: 306

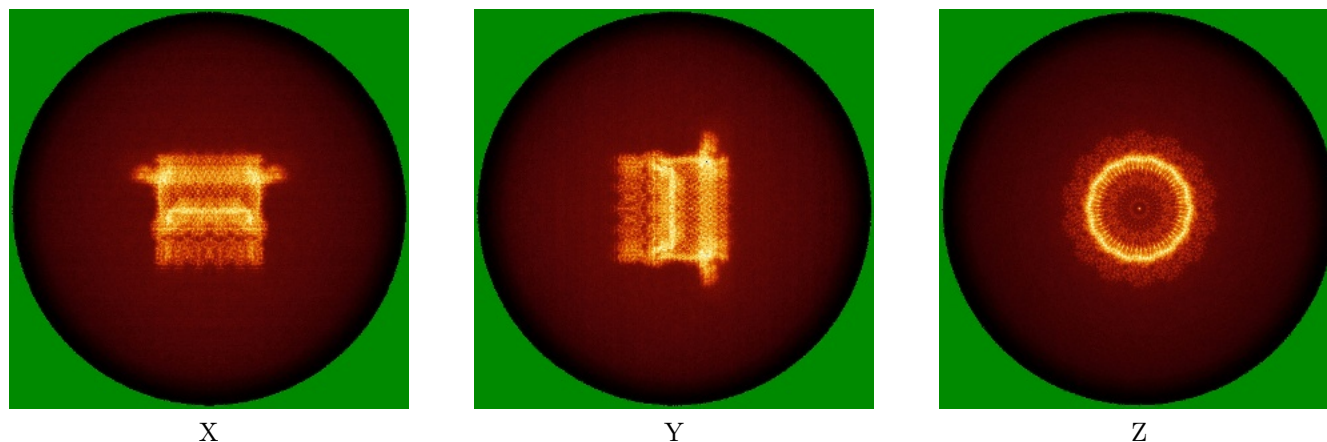


Z Index: 295

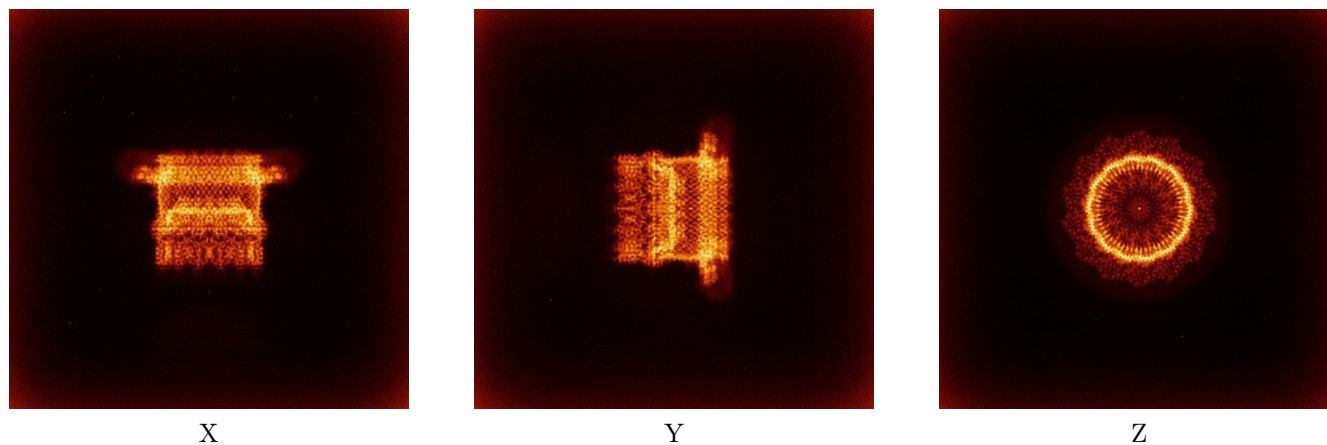
The images above show the largest variance slices of the map in three orthogonal directions.

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

### 6.4.1 Primary map



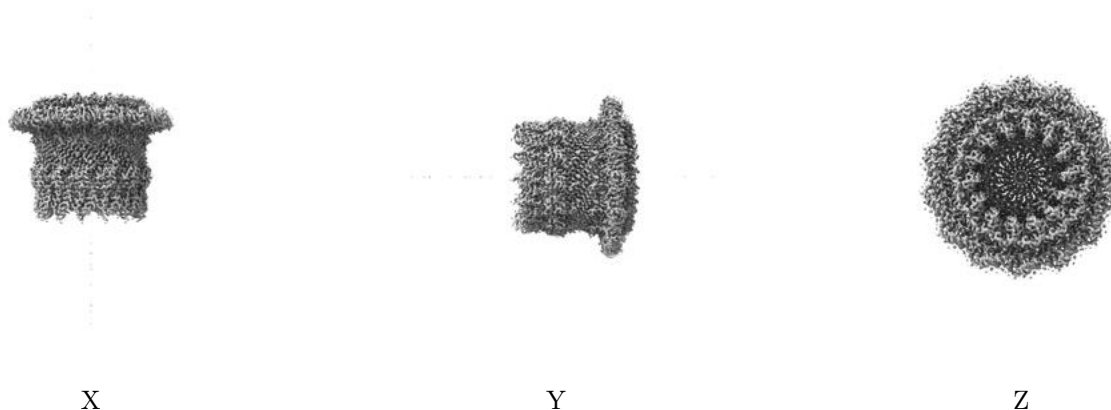
### 6.4.2 Raw map



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.

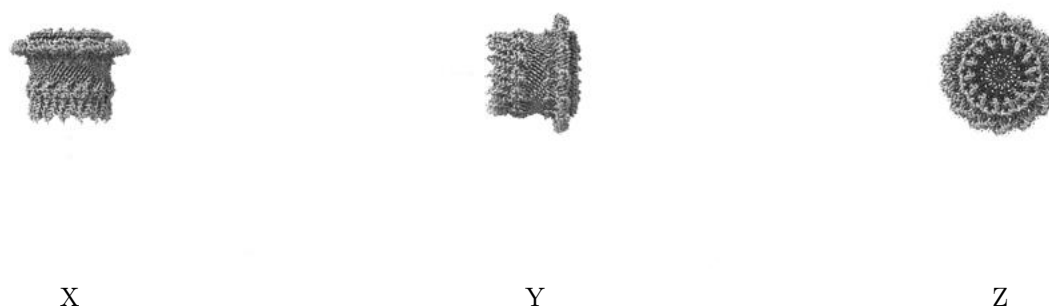
## 6.5 Orthogonal surface views [i](#)

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.27. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

### 6.5.2 Raw map



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

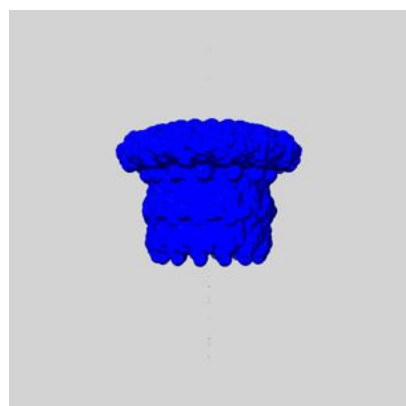
## 6.6 Mask visualisation [i](#)

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

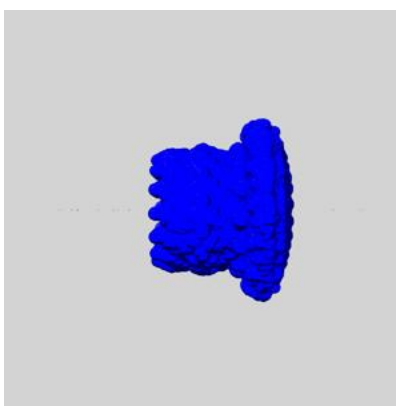
A mask typically either:

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

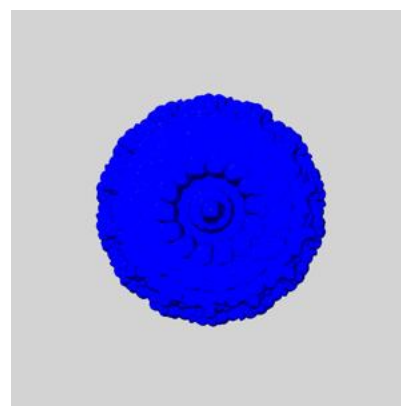
### 6.6.1 emd\_66448\_msk\_1.map [i](#)



X



Y

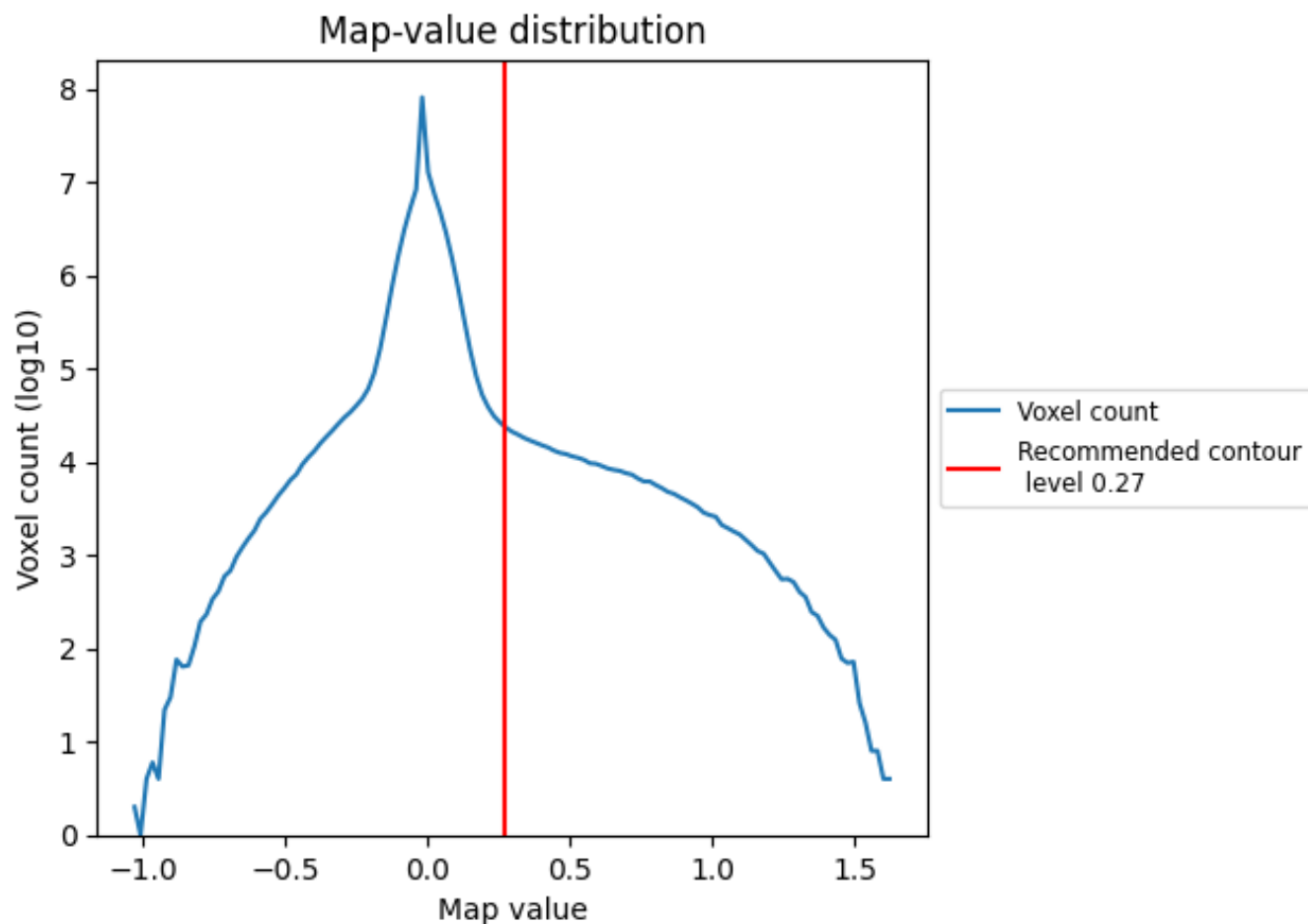


Z

## 7 Map analysis [i](#)

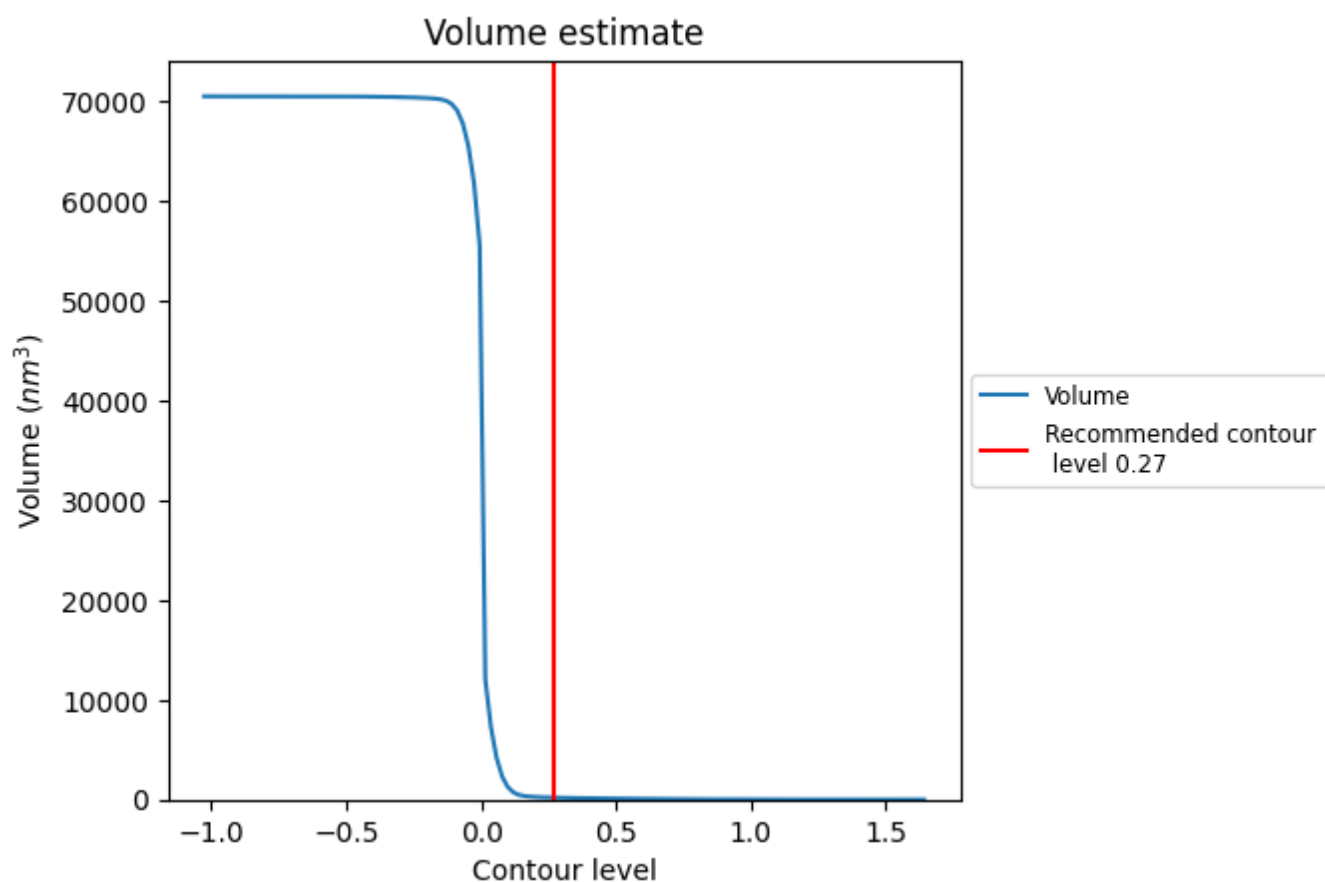
This section contains the results of statistical analysis of the map.

### 7.1 Map-value distribution [i](#)



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

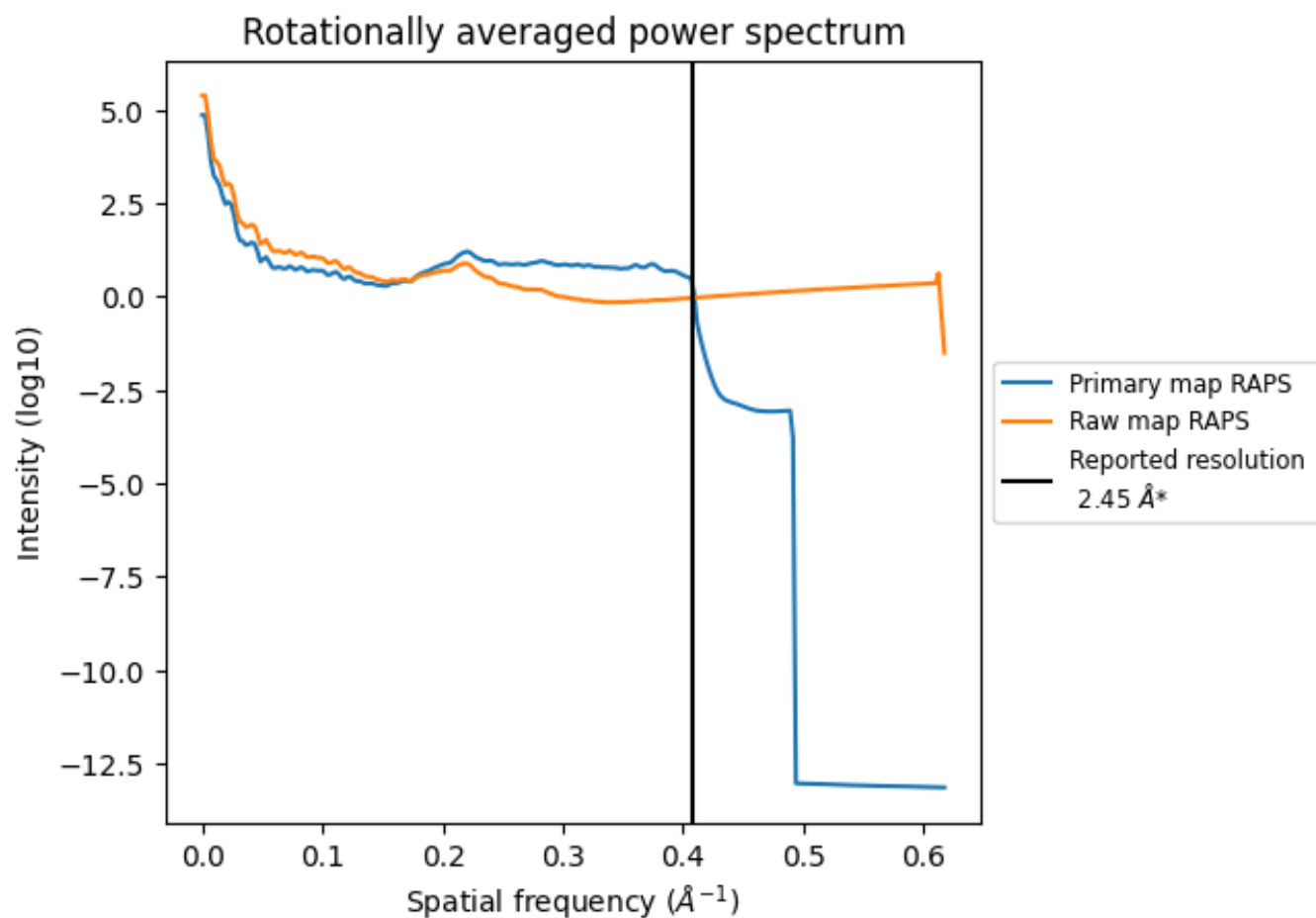
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 197 nm<sup>3</sup>; this corresponds to an approximate mass of 178 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 ⓘ

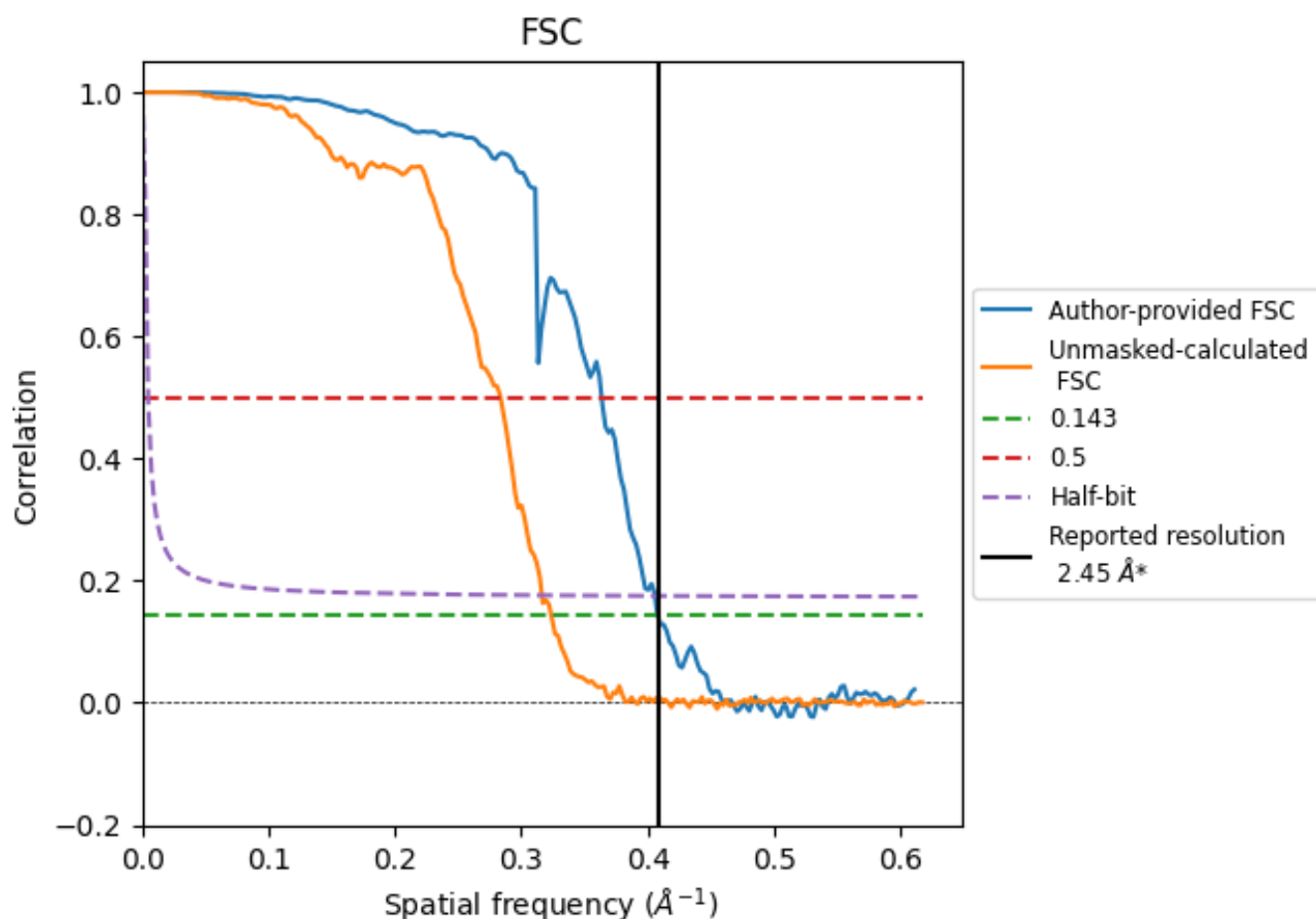


\*Reported resolution corresponds to spatial frequency of 0.408  $\text{\AA}^{-1}$

## 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 0.408  $\text{\AA}^{-1}$

## 8.2 Resolution estimates [i](#)

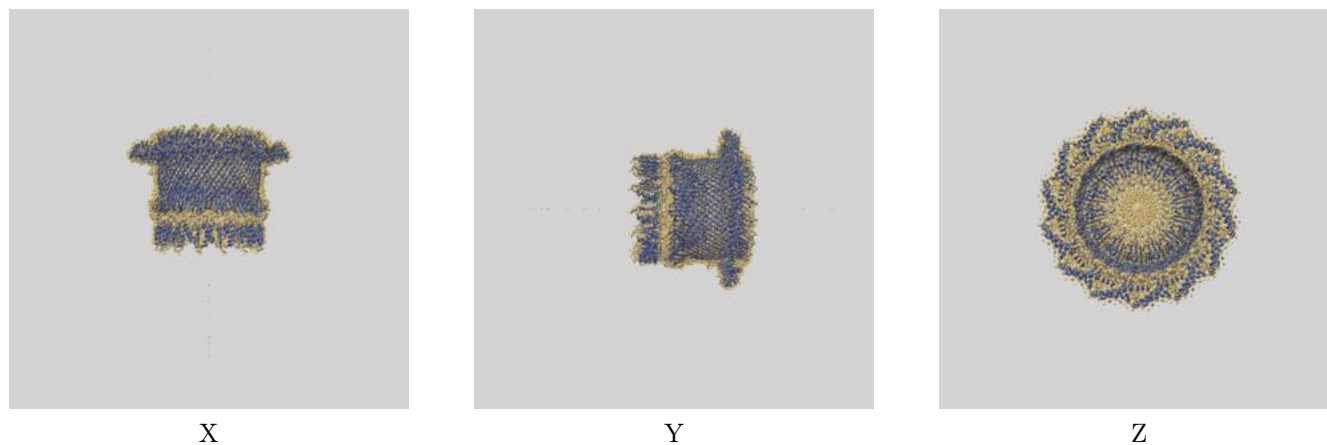
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.45	-	-
Author-provided FSC curve	2.45	2.75	2.46
Unmasked-calculated*	3.09	3.53	3.16

\*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 3.09 differs from the reported value 2.45 by more than 10 %

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

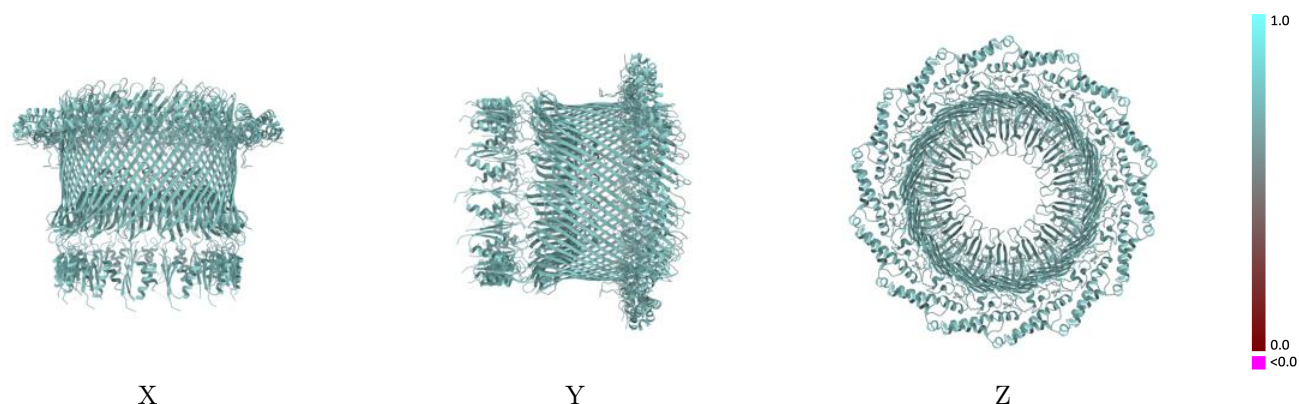
This section contains information regarding the fit between EMDB map EMD-66448 and PDB model 9X0X. Per-residue inclusion information can be found in section [3](#) on page [7](#).

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



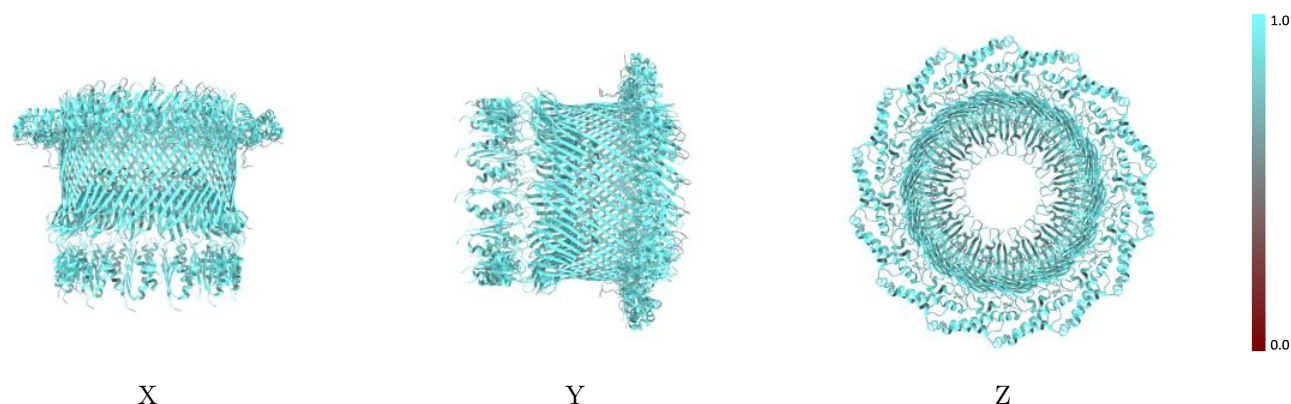
The images above show the 3D surface view of the map at the recommended contour level 0.27 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



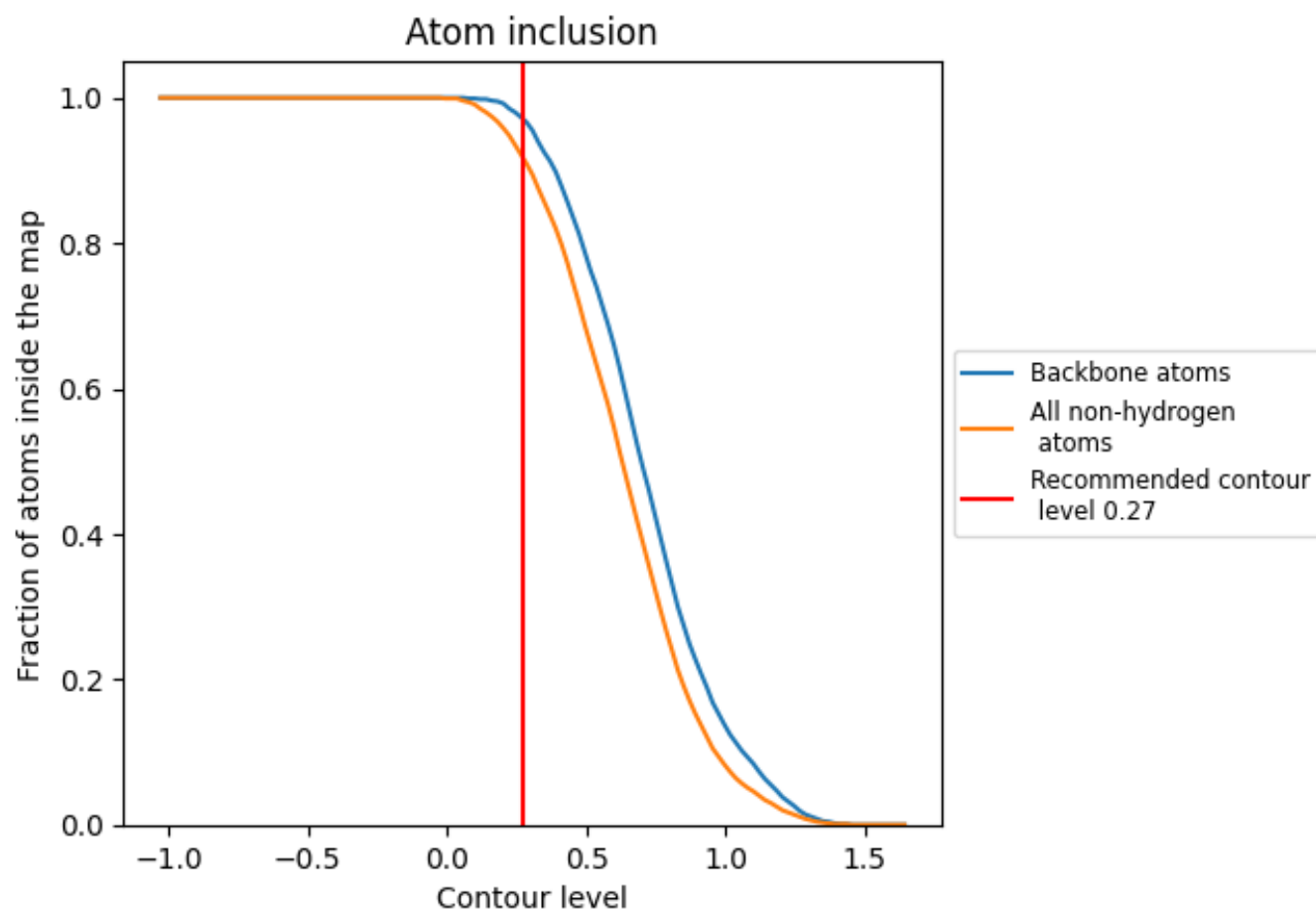
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.27).



























































## 9.4 Atom inclusion [i](#)



At the recommended contour level, 97% of all backbone atoms, 92% 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 (0.27) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.9200	 0.6840
A	 0.9280	 0.6880
B	 0.9280	 0.6870
C	 0.9280	 0.6870
D	 0.9300	 0.6870
E	 0.9270	 0.6860
F	 0.9280	 0.6880
G	 0.9270	 0.6880
H	 0.9280	 0.6880
I	 0.9280	 0.6870
J	 0.9270	 0.6880
K	 0.9290	 0.6870
L	 0.9280	 0.6870
M	 0.9280	 0.6870
N	 0.9270	 0.6860
O	 0.8750	 0.6650
P	 0.8940	 0.6700
Q	 0.8850	 0.6680
R	 0.8900	 0.6700
S	 0.8870	 0.6710
T	 0.8830	 0.6700
U	 0.8880	 0.6710
V	 0.8870	 0.6690
W	 0.8940	 0.6690
X	 0.8870	 0.6690
Y	 0.9010	 0.6690
Z	 0.8880	 0.6690
a	 0.8870	 0.6710
b	 0.8950	 0.6730

