



Full wwPDB EM Validation Report ⓘ

Jun 12, 2024 – 05:33 pm BST

PDB ID : 8RT5
EMDB ID : EMD-19479
Title : I-layer structure (TrwF/VirB9CTD, TrwE/VirB10CTD) of the outer membrane core complex from the fully-assembled R388 type IV secretion system determined by cryo-EM.
Authors : Mace, K.; Waksman, G.
Deposited on : 2024-01-25
Resolution : 2.69 Å(reported)

This is a Full wwPDB EM Validation 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.dev92
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36.2

1 Overall quality at a glance

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

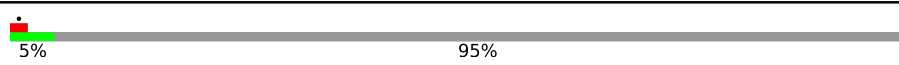
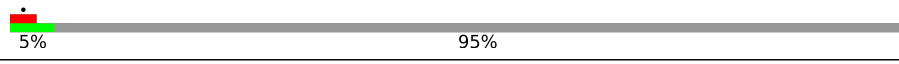
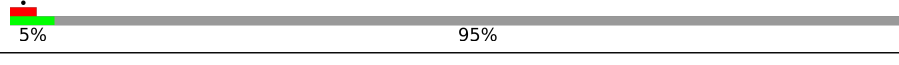
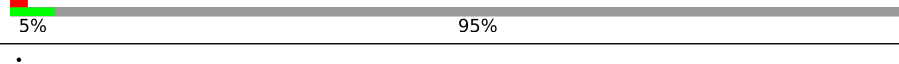
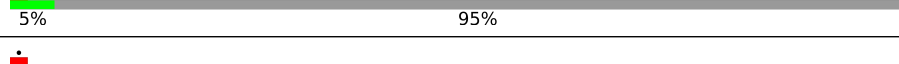
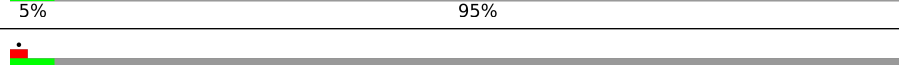
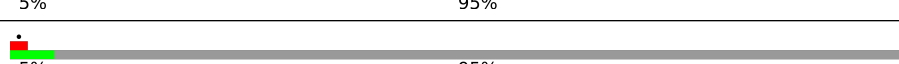
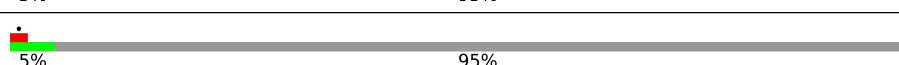

The reported resolution of this entry is 2.69 Å.

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.



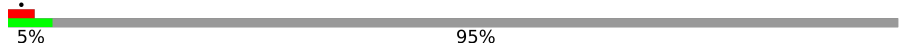
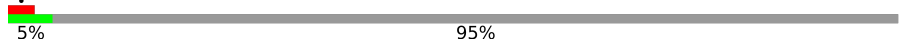
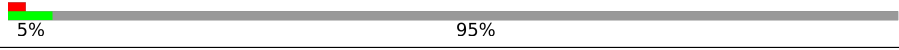
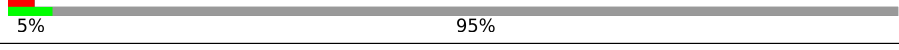
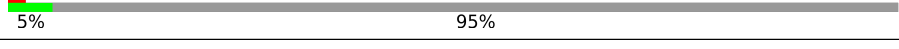
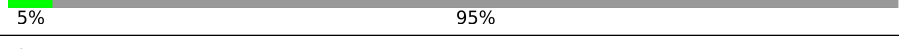
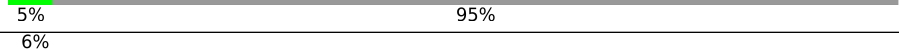
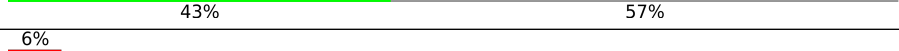
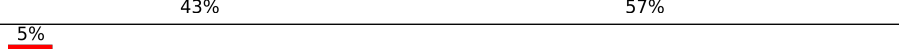
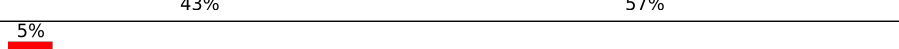













Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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	395	 5% 95%
1	D	395	 5% 95%
1	G	395	 5% 95%
1	J	395	 5% 95%
1	M	395	 5% 95%
1	P	395	 5% 95%
1	S	395	 5% 95%
1	V	395	 5% 95%
1	Y	395	 5% 95%

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Mol	Chain	Length	Quality of chain	
1	b	395		
1	e	395		
1	h	395		
1	k	395		
1	n	395		
1	u	395		
1	y	395		
2	B	266		
2	E	266		
2	H	266		
2	K	266		
2	N	266		
2	Q	266		
2	T	266		
2	W	266		
2	Z	266		
2	c	266		
2	f	266		
2	i	266		
2	l	266		
2	o	266		
2	v	266		
2	z	266		

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 17456 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 TrwE protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	19	149	92	29	27	1	0	0
1	D	19	149	92	29	27	1	0	0
1	G	19	149	92	29	27	1	0	0
1	J	19	149	92	29	27	1	0	0
1	M	19	149	92	29	27	1	0	0
1	P	19	149	92	29	27	1	0	0
1	S	19	149	92	29	27	1	0	0
1	u	19	149	92	29	27	1	0	0
1	V	19	149	92	29	27	1	0	0
1	Y	19	149	92	29	27	1	0	0
1	b	19	149	92	29	27	1	0	0
1	e	19	149	92	29	27	1	0	0
1	h	19	149	92	29	27	1	0	0
1	k	19	149	92	29	27	1	0	0
1	n	19	149	92	29	27	1	0	0
1	y	19	149	92	29	27	1	0	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	335	ASP	ASN	conflict	UNP O50337
D	335	ASP	ASN	conflict	UNP O50337
G	335	ASP	ASN	conflict	UNP O50337
J	335	ASP	ASN	conflict	UNP O50337
M	335	ASP	ASN	conflict	UNP O50337
P	335	ASP	ASN	conflict	UNP O50337
S	335	ASP	ASN	conflict	UNP O50337
u	335	ASP	ASN	conflict	UNP O50337
V	335	ASP	ASN	conflict	UNP O50337
Y	335	ASP	ASN	conflict	UNP O50337
b	335	ASP	ASN	conflict	UNP O50337
e	335	ASP	ASN	conflict	UNP O50337
h	335	ASP	ASN	conflict	UNP O50337
k	335	ASP	ASN	conflict	UNP O50337
n	335	ASP	ASN	conflict	UNP O50337
y	335	ASP	ASN	conflict	UNP O50337

- Molecule 2 is a protein called TrwF protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	115	942	591	173	175	3	0	0
2	E	115	942	591	173	175	3	0	0
2	H	115	942	591	173	175	3	0	0
2	K	115	942	591	173	175	3	0	0
2	N	115	942	591	173	175	3	0	0
2	Q	115	942	591	173	175	3	0	0
2	T	115	942	591	173	175	3	0	0
2	v	115	942	591	173	175	3	0	0
2	W	115	942	591	173	175	3	0	0
2	Z	115	942	591	173	175	3	0	0
2	c	115	942	591	173	175	3	0	0
2	f	115	942	591	173	175	3	0	0

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Mol	Chain	Residues	Atoms					AltConf	Trace
2	i	115	Total	C	N	O	S	0	0
			942	591	173	175	3		
2	l	115	Total	C	N	O	S	0	0
			942	591	173	175	3		
2	o	115	Total	C	N	O	S	0	0
			942	591	173	175	3		
2	z	115	Total	C	N	O	S	0	0
			942	591	173	175	3		

There are 304 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	71	ASP	ILE	conflict	UNP O50336
B	72	SER	PRO	conflict	UNP O50336
B	73	GLU	LYS	conflict	UNP O50336
B	74	ALA	PRO	conflict	UNP O50336
B	75	TYR	MET	conflict	UNP O50336
B	76	ALA	PRO	conflict	UNP O50336
B	77	PHE	LEU	conflict	UNP O50336
B	78	ALA	PRO	conflict	UNP O50336
B	79	ARG	GLY	conflict	UNP O50336
B	80	LYS	ARG	conflict	UNP O50336
B	81	GLY	ALA	conflict	UNP O50336
B	82	ARG	GLY	conflict	UNP O50336
B	83	HIS	ILE	conflict	UNP O50336
B	84	ILE	PHE	conflict	UNP O50336
B	85	PHE	LEU	conflict	UNP O50336
B	86	ILE	SER	conflict	UNP O50336
B	87	LYS	SER	conflict	UNP O50336
B	88	PRO	ARG	conflict	UNP O50336
B	89	GLN	THR	conflict	UNP O50336
E	71	ASP	ILE	conflict	UNP O50336
E	72	SER	PRO	conflict	UNP O50336
E	73	GLU	LYS	conflict	UNP O50336
E	74	ALA	PRO	conflict	UNP O50336
E	75	TYR	MET	conflict	UNP O50336
E	76	ALA	PRO	conflict	UNP O50336
E	77	PHE	LEU	conflict	UNP O50336
E	78	ALA	PRO	conflict	UNP O50336
E	79	ARG	GLY	conflict	UNP O50336
E	80	LYS	ARG	conflict	UNP O50336
E	81	GLY	ALA	conflict	UNP O50336
E	82	ARG	GLY	conflict	UNP O50336

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Chain	Residue	Modelled	Actual	Comment	Reference
E	83	HIS	ILE	conflict	UNP O50336
E	84	ILE	PHE	conflict	UNP O50336
E	85	PHE	LEU	conflict	UNP O50336
E	86	ILE	SER	conflict	UNP O50336
E	87	LYS	SER	conflict	UNP O50336
E	88	PRO	ARG	conflict	UNP O50336
E	89	GLN	THR	conflict	UNP O50336
H	71	ASP	ILE	conflict	UNP O50336
H	72	SER	PRO	conflict	UNP O50336
H	73	GLU	LYS	conflict	UNP O50336
H	74	ALA	PRO	conflict	UNP O50336
H	75	TYR	MET	conflict	UNP O50336
H	76	ALA	PRO	conflict	UNP O50336
H	77	PHE	LEU	conflict	UNP O50336
H	78	ALA	PRO	conflict	UNP O50336
H	79	ARG	GLY	conflict	UNP O50336
H	80	LYS	ARG	conflict	UNP O50336
H	81	GLY	ALA	conflict	UNP O50336
H	82	ARG	GLY	conflict	UNP O50336
H	83	HIS	ILE	conflict	UNP O50336
H	84	ILE	PHE	conflict	UNP O50336
H	85	PHE	LEU	conflict	UNP O50336
H	86	ILE	SER	conflict	UNP O50336
H	87	LYS	SER	conflict	UNP O50336
H	88	PRO	ARG	conflict	UNP O50336
H	89	GLN	THR	conflict	UNP O50336
K	71	ASP	ILE	conflict	UNP O50336
K	72	SER	PRO	conflict	UNP O50336
K	73	GLU	LYS	conflict	UNP O50336
K	74	ALA	PRO	conflict	UNP O50336
K	75	TYR	MET	conflict	UNP O50336
K	76	ALA	PRO	conflict	UNP O50336
K	77	PHE	LEU	conflict	UNP O50336
K	78	ALA	PRO	conflict	UNP O50336
K	79	ARG	GLY	conflict	UNP O50336
K	80	LYS	ARG	conflict	UNP O50336
K	81	GLY	ALA	conflict	UNP O50336
K	82	ARG	GLY	conflict	UNP O50336
K	83	HIS	ILE	conflict	UNP O50336
K	84	ILE	PHE	conflict	UNP O50336
K	85	PHE	LEU	conflict	UNP O50336
K	86	ILE	SER	conflict	UNP O50336

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Chain	Residue	Modelled	Actual	Comment	Reference
K	87	LYS	SER	conflict	UNP O50336
K	88	PRO	ARG	conflict	UNP O50336
K	89	GLN	THR	conflict	UNP O50336
N	71	ASP	ILE	conflict	UNP O50336
N	72	SER	PRO	conflict	UNP O50336
N	73	GLU	LYS	conflict	UNP O50336
N	74	ALA	PRO	conflict	UNP O50336
N	75	TYR	MET	conflict	UNP O50336
N	76	ALA	PRO	conflict	UNP O50336
N	77	PHE	LEU	conflict	UNP O50336
N	78	ALA	PRO	conflict	UNP O50336
N	79	ARG	GLY	conflict	UNP O50336
N	80	LYS	ARG	conflict	UNP O50336
N	81	GLY	ALA	conflict	UNP O50336
N	82	ARG	GLY	conflict	UNP O50336
N	83	HIS	ILE	conflict	UNP O50336
N	84	ILE	PHE	conflict	UNP O50336
N	85	PHE	LEU	conflict	UNP O50336
N	86	ILE	SER	conflict	UNP O50336
N	87	LYS	SER	conflict	UNP O50336
N	88	PRO	ARG	conflict	UNP O50336
N	89	GLN	THR	conflict	UNP O50336
Q	71	ASP	ILE	conflict	UNP O50336
Q	72	SER	PRO	conflict	UNP O50336
Q	73	GLU	LYS	conflict	UNP O50336
Q	74	ALA	PRO	conflict	UNP O50336
Q	75	TYR	MET	conflict	UNP O50336
Q	76	ALA	PRO	conflict	UNP O50336
Q	77	PHE	LEU	conflict	UNP O50336
Q	78	ALA	PRO	conflict	UNP O50336
Q	79	ARG	GLY	conflict	UNP O50336
Q	80	LYS	ARG	conflict	UNP O50336
Q	81	GLY	ALA	conflict	UNP O50336
Q	82	ARG	GLY	conflict	UNP O50336
Q	83	HIS	ILE	conflict	UNP O50336
Q	84	ILE	PHE	conflict	UNP O50336
Q	85	PHE	LEU	conflict	UNP O50336
Q	86	ILE	SER	conflict	UNP O50336
Q	87	LYS	SER	conflict	UNP O50336
Q	88	PRO	ARG	conflict	UNP O50336
Q	89	GLN	THR	conflict	UNP O50336
T	71	ASP	ILE	conflict	UNP O50336

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Chain	Residue	Modelled	Actual	Comment	Reference
T	72	SER	PRO	conflict	UNP O50336
T	73	GLU	LYS	conflict	UNP O50336
T	74	ALA	PRO	conflict	UNP O50336
T	75	TYR	MET	conflict	UNP O50336
T	76	ALA	PRO	conflict	UNP O50336
T	77	PHE	LEU	conflict	UNP O50336
T	78	ALA	PRO	conflict	UNP O50336
T	79	ARG	GLY	conflict	UNP O50336
T	80	LYS	ARG	conflict	UNP O50336
T	81	GLY	ALA	conflict	UNP O50336
T	82	ARG	GLY	conflict	UNP O50336
T	83	HIS	ILE	conflict	UNP O50336
T	84	ILE	PHE	conflict	UNP O50336
T	85	PHE	LEU	conflict	UNP O50336
T	86	ILE	SER	conflict	UNP O50336
T	87	LYS	SER	conflict	UNP O50336
T	88	PRO	ARG	conflict	UNP O50336
T	89	GLN	THR	conflict	UNP O50336
v	71	ASP	ILE	conflict	UNP O50336
v	72	SER	PRO	conflict	UNP O50336
v	73	GLU	LYS	conflict	UNP O50336
v	74	ALA	PRO	conflict	UNP O50336
v	75	TYR	MET	conflict	UNP O50336
v	76	ALA	PRO	conflict	UNP O50336
v	77	PHE	LEU	conflict	UNP O50336
v	78	ALA	PRO	conflict	UNP O50336
v	79	ARG	GLY	conflict	UNP O50336
v	80	LYS	ARG	conflict	UNP O50336
v	81	GLY	ALA	conflict	UNP O50336
v	82	ARG	GLY	conflict	UNP O50336
v	83	HIS	ILE	conflict	UNP O50336
v	84	ILE	PHE	conflict	UNP O50336
v	85	PHE	LEU	conflict	UNP O50336
v	86	ILE	SER	conflict	UNP O50336
v	87	LYS	SER	conflict	UNP O50336
v	88	PRO	ARG	conflict	UNP O50336
v	89	GLN	THR	conflict	UNP O50336
W	71	ASP	ILE	conflict	UNP O50336
W	72	SER	PRO	conflict	UNP O50336
W	73	GLU	LYS	conflict	UNP O50336
W	74	ALA	PRO	conflict	UNP O50336
W	75	TYR	MET	conflict	UNP O50336

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Chain	Residue	Modelled	Actual	Comment	Reference
W	76	ALA	PRO	conflict	UNP O50336
W	77	PHE	LEU	conflict	UNP O50336
W	78	ALA	PRO	conflict	UNP O50336
W	79	ARG	GLY	conflict	UNP O50336
W	80	LYS	ARG	conflict	UNP O50336
W	81	GLY	ALA	conflict	UNP O50336
W	82	ARG	GLY	conflict	UNP O50336
W	83	HIS	ILE	conflict	UNP O50336
W	84	ILE	PHE	conflict	UNP O50336
W	85	PHE	LEU	conflict	UNP O50336
W	86	ILE	SER	conflict	UNP O50336
W	87	LYS	SER	conflict	UNP O50336
W	88	PRO	ARG	conflict	UNP O50336
W	89	GLN	THR	conflict	UNP O50336
Z	71	ASP	ILE	conflict	UNP O50336
Z	72	SER	PRO	conflict	UNP O50336
Z	73	GLU	LYS	conflict	UNP O50336
Z	74	ALA	PRO	conflict	UNP O50336
Z	75	TYR	MET	conflict	UNP O50336
Z	76	ALA	PRO	conflict	UNP O50336
Z	77	PHE	LEU	conflict	UNP O50336
Z	78	ALA	PRO	conflict	UNP O50336
Z	79	ARG	GLY	conflict	UNP O50336
Z	80	LYS	ARG	conflict	UNP O50336
Z	81	GLY	ALA	conflict	UNP O50336
Z	82	ARG	GLY	conflict	UNP O50336
Z	83	HIS	ILE	conflict	UNP O50336
Z	84	ILE	PHE	conflict	UNP O50336
Z	85	PHE	LEU	conflict	UNP O50336
Z	86	ILE	SER	conflict	UNP O50336
Z	87	LYS	SER	conflict	UNP O50336
Z	88	PRO	ARG	conflict	UNP O50336
Z	89	GLN	THR	conflict	UNP O50336
c	71	ASP	ILE	conflict	UNP O50336
c	72	SER	PRO	conflict	UNP O50336
c	73	GLU	LYS	conflict	UNP O50336
c	74	ALA	PRO	conflict	UNP O50336
c	75	TYR	MET	conflict	UNP O50336
c	76	ALA	PRO	conflict	UNP O50336
c	77	PHE	LEU	conflict	UNP O50336
c	78	ALA	PRO	conflict	UNP O50336
c	79	ARG	GLY	conflict	UNP O50336

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Chain	Residue	Modelled	Actual	Comment	Reference
c	80	LYS	ARG	conflict	UNP O50336
c	81	GLY	ALA	conflict	UNP O50336
c	82	ARG	GLY	conflict	UNP O50336
c	83	HIS	ILE	conflict	UNP O50336
c	84	ILE	PHE	conflict	UNP O50336
c	85	PHE	LEU	conflict	UNP O50336
c	86	ILE	SER	conflict	UNP O50336
c	87	LYS	SER	conflict	UNP O50336
c	88	PRO	ARG	conflict	UNP O50336
c	89	GLN	THR	conflict	UNP O50336
f	71	ASP	ILE	conflict	UNP O50336
f	72	SER	PRO	conflict	UNP O50336
f	73	GLU	LYS	conflict	UNP O50336
f	74	ALA	PRO	conflict	UNP O50336
f	75	TYR	MET	conflict	UNP O50336
f	76	ALA	PRO	conflict	UNP O50336
f	77	PHE	LEU	conflict	UNP O50336
f	78	ALA	PRO	conflict	UNP O50336
f	79	ARG	GLY	conflict	UNP O50336
f	80	LYS	ARG	conflict	UNP O50336
f	81	GLY	ALA	conflict	UNP O50336
f	82	ARG	GLY	conflict	UNP O50336
f	83	HIS	ILE	conflict	UNP O50336
f	84	ILE	PHE	conflict	UNP O50336
f	85	PHE	LEU	conflict	UNP O50336
f	86	ILE	SER	conflict	UNP O50336
f	87	LYS	SER	conflict	UNP O50336
f	88	PRO	ARG	conflict	UNP O50336
f	89	GLN	THR	conflict	UNP O50336
i	71	ASP	ILE	conflict	UNP O50336
i	72	SER	PRO	conflict	UNP O50336
i	73	GLU	LYS	conflict	UNP O50336
i	74	ALA	PRO	conflict	UNP O50336
i	75	TYR	MET	conflict	UNP O50336
i	76	ALA	PRO	conflict	UNP O50336
i	77	PHE	LEU	conflict	UNP O50336
i	78	ALA	PRO	conflict	UNP O50336
i	79	ARG	GLY	conflict	UNP O50336
i	80	LYS	ARG	conflict	UNP O50336
i	81	GLY	ALA	conflict	UNP O50336
i	82	ARG	GLY	conflict	UNP O50336
i	83	HIS	ILE	conflict	UNP O50336

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Chain	Residue	Modelled	Actual	Comment	Reference
i	84	ILE	PHE	conflict	UNP O50336
i	85	PHE	LEU	conflict	UNP O50336
i	86	ILE	SER	conflict	UNP O50336
i	87	LYS	SER	conflict	UNP O50336
i	88	PRO	ARG	conflict	UNP O50336
i	89	GLN	THR	conflict	UNP O50336
l	71	ASP	ILE	conflict	UNP O50336
l	72	SER	PRO	conflict	UNP O50336
l	73	GLU	LYS	conflict	UNP O50336
l	74	ALA	PRO	conflict	UNP O50336
l	75	TYR	MET	conflict	UNP O50336
l	76	ALA	PRO	conflict	UNP O50336
l	77	PHE	LEU	conflict	UNP O50336
l	78	ALA	PRO	conflict	UNP O50336
l	79	ARG	GLY	conflict	UNP O50336
l	80	LYS	ARG	conflict	UNP O50336
l	81	GLY	ALA	conflict	UNP O50336
l	82	ARG	GLY	conflict	UNP O50336
l	83	HIS	ILE	conflict	UNP O50336
l	84	ILE	PHE	conflict	UNP O50336
l	85	PHE	LEU	conflict	UNP O50336
l	86	ILE	SER	conflict	UNP O50336
l	87	LYS	SER	conflict	UNP O50336
l	88	PRO	ARG	conflict	UNP O50336
l	89	GLN	THR	conflict	UNP O50336
o	71	ASP	ILE	conflict	UNP O50336
o	72	SER	PRO	conflict	UNP O50336
o	73	GLU	LYS	conflict	UNP O50336
o	74	ALA	PRO	conflict	UNP O50336
o	75	TYR	MET	conflict	UNP O50336
o	76	ALA	PRO	conflict	UNP O50336
o	77	PHE	LEU	conflict	UNP O50336
o	78	ALA	PRO	conflict	UNP O50336
o	79	ARG	GLY	conflict	UNP O50336
o	80	LYS	ARG	conflict	UNP O50336
o	81	GLY	ALA	conflict	UNP O50336
o	82	ARG	GLY	conflict	UNP O50336
o	83	HIS	ILE	conflict	UNP O50336
o	84	ILE	PHE	conflict	UNP O50336
o	85	PHE	LEU	conflict	UNP O50336
o	86	ILE	SER	conflict	UNP O50336
o	87	LYS	SER	conflict	UNP O50336

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Chain	Residue	Modelled	Actual	Comment	Reference
o	88	PRO	ARG	conflict	UNP O50336
o	89	GLN	THR	conflict	UNP O50336
z	71	ASP	ILE	conflict	UNP O50336
z	72	SER	PRO	conflict	UNP O50336
z	73	GLU	LYS	conflict	UNP O50336
z	74	ALA	PRO	conflict	UNP O50336
z	75	TYR	MET	conflict	UNP O50336
z	76	ALA	PRO	conflict	UNP O50336
z	77	PHE	LEU	conflict	UNP O50336
z	78	ALA	PRO	conflict	UNP O50336
z	79	ARG	GLY	conflict	UNP O50336
z	80	LYS	ARG	conflict	UNP O50336
z	81	GLY	ALA	conflict	UNP O50336
z	82	ARG	GLY	conflict	UNP O50336
z	83	HIS	ILE	conflict	UNP O50336
z	84	ILE	PHE	conflict	UNP O50336
z	85	PHE	LEU	conflict	UNP O50336
z	86	ILE	SER	conflict	UNP O50336
z	87	LYS	SER	conflict	UNP O50336
z	88	PRO	ARG	conflict	UNP O50336
z	89	GLN	THR	conflict	UNP O50336

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

• Molecule 1: TrwE protein

Chain M:  5%  95%

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

THR LEU TYR LYS ALA TYR LYS VAL VAL THR LEU VAL ALA VAL ASP ARG ASP LEU PHE ASP SER ASP VAL TYR SER GLN LEU GLY ILE PRO THR LYS

VAL THR K135 T136 P137 Y138 E139 L140 A141 R142 R147 A152 G153 LEU TYR GLN SER ARG LYS VAL ASN ILE LEU VAL ALA VAL ASP ARG ASP LEU PHE ASP SER ASP VAL TYR SER GLN LEU GLY ILE PRO THR LYS

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

LEU ASP ARG GLY SER LYS VAL VAL VAL PHE THR LEU VAL ALA VAL ASP ARG ASP LEU PHE ASP SER ASP VAL TYR SER GLN LEU GLY ILE PRO THR LYS

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

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

• Molecule 1: TrwE protein

Chain P:  5%  95%

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

THR LEU TYR LYS ALA TYR LYS VAL VAL THR LEU VAL ALA VAL ASP ARG ASP LEU PHE ASP SER ASP VAL TYR SER GLN LEU GLY ILE PRO THR LYS

VAL THR K135 T136 P137 Y138 E139 L140 A141 R142 R147 A152 G153 LEU TYR GLN SER ARG LYS VAL ASN ILE LEU VAL ALA VAL ASP ARG ASP LEU PHE ASP SER ASP VAL TYR SER GLN LEU GLY ILE PRO THR LYS

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

LEU ASP ARG GLY SER LYS VAL VAL VAL PHE THR LEU VAL ALA VAL ASP ARG ASP LEU PHE ASP SER ASP VAL TYR SER GLN LEU GLY ILE PRO THR LYS

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

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

• Molecule 1: TrwE protein

Chain S:  5%  95%

LYS ASN GLN GLY GLU ARG VAL ASN ASN THR LYS

● Molecule 1: TrwE protein

Chain k: 5% 95%

MET PHE GLN SER ARG LYS LYS VAL ASP ASP LEU LEU LEU VAL THR THR THR THR THR

THR LEU THR LEU THR LEU THR LEU THR LEU THR LEU THR LEU THR LEU THR LEU THR LEU THR

VAL THR GLN PRO VAL ARG PRO GLN PRO THR LEU LEU LEU LEU LEU LEU LEU LEU LEU LEU
 K135 Y138 E139 L140 A141 R142 E143 R147 A152 G153 SER GLY GLY GLY GLU GLU

LEU GLN PRO MET ARG LYS SER LEU SER LEU LEU LEU LEU LEU LEU LEU LEU LEU LEU LEU

LEU ASP ARG GLY SER LYS VAL VAL PHE SER TYR ALA TYR GLY GLY GLY ASP LEU LEU LEU LEU

TRP GLU ARG PHE GLY VAL ALA ILE MET ILE SER LEU LEU LEU LEU LEU LEU LEU LEU LEU LEU

LYS ASN GLN GLY GLU ARG VAL ASN ASN THR LYS

● Molecule 1: TrwE protein

Chain n: 5% 95%

MET PHE GLY SER ARG LYS LYS VAL ASP ASP LEU LEU LEU VAL THR THR THR THR THR

THR LEU THR LEU THR LEU THR LEU THR LEU THR LEU THR LEU THR LEU THR LEU THR LEU THR

VAL THR GLN PRO VAL ARG PRO GLN PRO THR LEU LEU LEU LEU LEU LEU LEU LEU LEU LEU
 K135 Y138 E139 L140 A141 R142 E143 R147 A152 G153 SER GLY GLY GLY GLU GLU

GLN PRO MET ARG LYS SER LEU SER LEU LEU LEU LEU LEU LEU LEU LEU LEU LEU LEU LEU

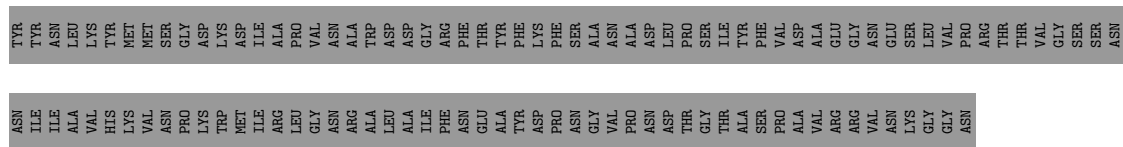
ASP ARG GLY SER LYS VAL VAL PHE TYR GLY GLY GLY LEU LEU LEU LEU LEU LEU LEU LEU LEU

GLU ARG PHE GLY GLY VAL ALA ILE MET ILE SER LEU LEU LEU LEU LEU LEU LEU LEU LEU LEU

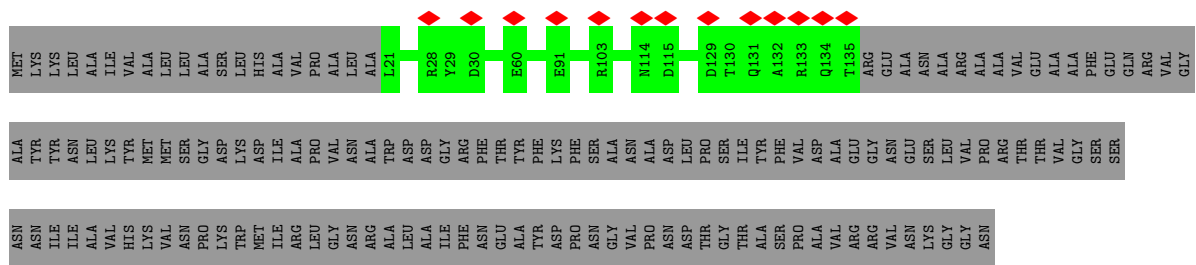
ASN GLN GLY GLU ASN ILE LEU VAL ASP ASP PHE SER TYR THR LEU LEU LEU LEU LEU LEU LEU

● Molecule 1: TrwE protein

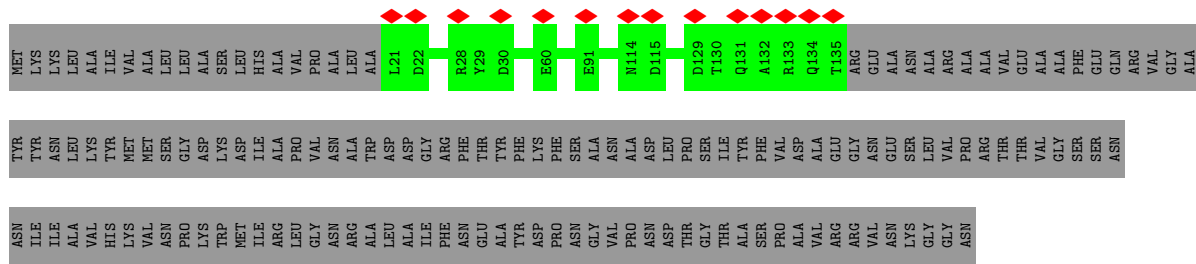
Chain y: 5% 95%



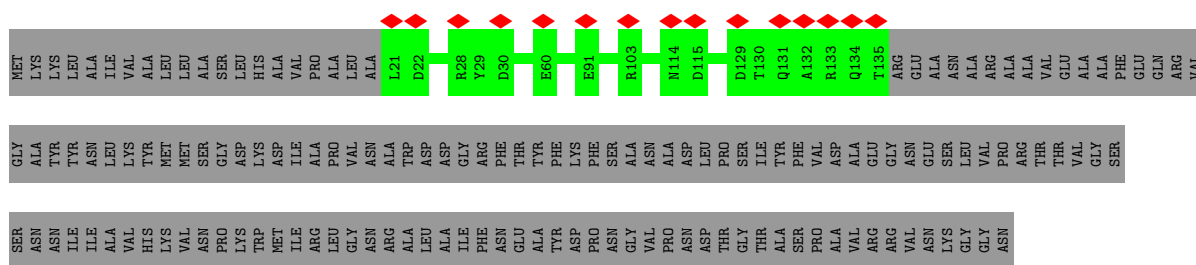
• Molecule 2: TrwF protein



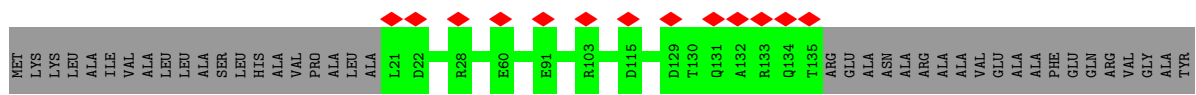
• Molecule 2: TrwF protein



• Molecule 2: TrwF protein



• Molecule 2: TrwF protein



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	784923	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 ($e^-/\text{\AA}^2$)	57.5	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	3300	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.950	Depositor
Minimum map value	-0.337	Depositor
Average map value	0.021	Depositor
Map value standard deviation	0.060	Depositor
Recommended contour level	0.4	Depositor
Map size (Å)	320.1, 320.1, 320.1	wwPDB
Map dimensions	300, 300, 300	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.067, 1.067, 1.067	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	0.32	0/150	0.67	0/199
1	D	0.33	0/150	0.67	0/199
1	G	0.33	0/150	0.67	0/199
1	J	0.32	0/150	0.67	0/199
1	M	0.33	0/150	0.67	0/199
1	P	0.32	0/150	0.67	0/199
1	S	0.33	0/150	0.67	0/199
1	V	0.32	0/150	0.67	0/199
1	Y	0.33	0/150	0.67	0/199
1	b	0.32	0/150	0.67	0/199
1	e	0.33	0/150	0.67	0/199
1	h	0.33	0/150	0.67	0/199
1	k	0.33	0/150	0.67	0/199
1	n	0.33	0/150	0.67	0/199
1	u	0.33	0/150	0.67	0/199
1	y	0.33	0/150	0.67	0/199
2	B	0.39	0/962	0.50	0/1302
2	E	0.39	0/962	0.50	0/1302
2	H	0.39	0/962	0.50	0/1302
2	K	0.39	0/962	0.50	0/1302
2	N	0.39	0/962	0.50	0/1302
2	Q	0.39	0/962	0.50	0/1302
2	T	0.39	0/962	0.50	0/1302
2	W	0.39	0/962	0.50	0/1302
2	Z	0.39	0/962	0.50	0/1302
2	c	0.39	0/962	0.50	0/1302
2	f	0.39	0/962	0.50	0/1302
2	i	0.39	0/962	0.50	0/1302
2	l	0.39	0/962	0.50	0/1302
2	o	0.39	0/962	0.50	0/1302
2	v	0.39	0/962	0.50	0/1302
2	z	0.39	0/962	0.50	0/1302
All	All	0.38	0/17792	0.53	0/24016

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](#)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

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	17/395 (4%)	17 (100%)	0	0	100	100
1	D	17/395 (4%)	17 (100%)	0	0	100	100
1	G	17/395 (4%)	17 (100%)	0	0	100	100
1	J	17/395 (4%)	17 (100%)	0	0	100	100
1	M	17/395 (4%)	17 (100%)	0	0	100	100
1	P	17/395 (4%)	17 (100%)	0	0	100	100
1	S	17/395 (4%)	17 (100%)	0	0	100	100
1	V	17/395 (4%)	17 (100%)	0	0	100	100
1	Y	17/395 (4%)	17 (100%)	0	0	100	100
1	b	17/395 (4%)	17 (100%)	0	0	100	100
1	e	17/395 (4%)	17 (100%)	0	0	100	100
1	h	17/395 (4%)	17 (100%)	0	0	100	100
1	k	17/395 (4%)	17 (100%)	0	0	100	100
1	n	17/395 (4%)	17 (100%)	0	0	100	100
1	u	17/395 (4%)	17 (100%)	0	0	100	100
1	y	17/395 (4%)	17 (100%)	0	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	E	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	H	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	K	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	N	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	Q	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	T	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	W	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	Z	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	c	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	f	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	i	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	l	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	o	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	v	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
2	z	113/266 (42%)	111 (98%)	2 (2%)	0	100	100
All	All	2080/10576 (20%)	2048 (98%)	32 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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	15/318 (5%)	15 (100%)	0	100	100
1	D	15/318 (5%)	15 (100%)	0	100	100
1	G	15/318 (5%)	15 (100%)	0	100	100
1	J	15/318 (5%)	15 (100%)	0	100	100
1	M	15/318 (5%)	15 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	P	15/318 (5%)	15 (100%)	0	100	100
1	S	15/318 (5%)	15 (100%)	0	100	100
1	V	15/318 (5%)	15 (100%)	0	100	100
1	Y	15/318 (5%)	15 (100%)	0	100	100
1	b	15/318 (5%)	15 (100%)	0	100	100
1	e	15/318 (5%)	15 (100%)	0	100	100
1	h	15/318 (5%)	15 (100%)	0	100	100
1	k	15/318 (5%)	15 (100%)	0	100	100
1	n	15/318 (5%)	15 (100%)	0	100	100
1	u	15/318 (5%)	15 (100%)	0	100	100
1	y	15/318 (5%)	15 (100%)	0	100	100
2	B	99/216 (46%)	99 (100%)	0	100	100
2	E	99/216 (46%)	99 (100%)	0	100	100
2	H	99/216 (46%)	99 (100%)	0	100	100
2	K	99/216 (46%)	99 (100%)	0	100	100
2	N	99/216 (46%)	99 (100%)	0	100	100
2	Q	99/216 (46%)	99 (100%)	0	100	100
2	T	99/216 (46%)	99 (100%)	0	100	100
2	W	99/216 (46%)	99 (100%)	0	100	100
2	Z	99/216 (46%)	99 (100%)	0	100	100
2	c	99/216 (46%)	99 (100%)	0	100	100
2	f	99/216 (46%)	99 (100%)	0	100	100
2	i	99/216 (46%)	99 (100%)	0	100	100
2	l	99/216 (46%)	99 (100%)	0	100	100
2	o	99/216 (46%)	99 (100%)	0	100	100
2	v	99/216 (46%)	99 (100%)	0	100	100
2	z	99/216 (46%)	99 (100%)	0	100	100
All	All	1824/8544 (21%)	1824 (100%)	0	100	100

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

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

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.

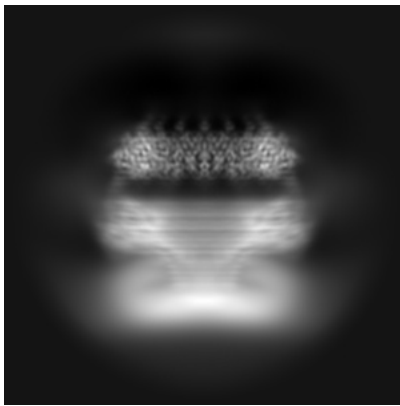
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-19479. These allow visual inspection of the internal detail of the map and identification of artifacts.

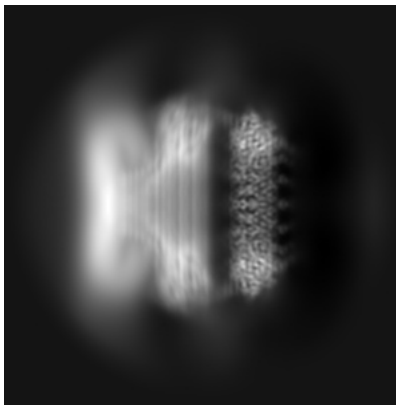
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

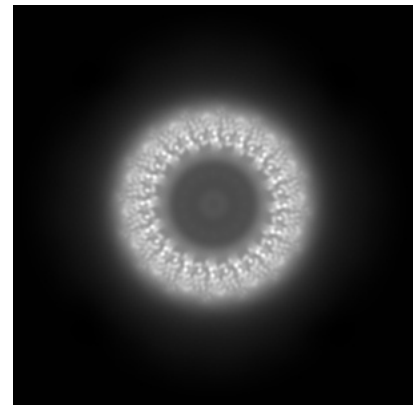
6.1.1 Primary map



X

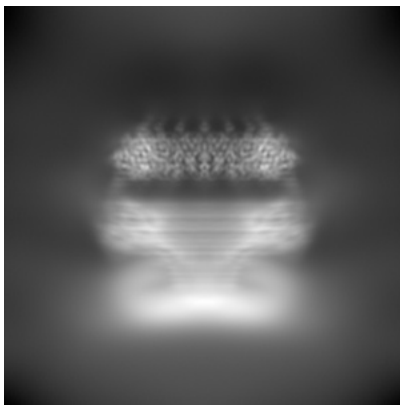


Y

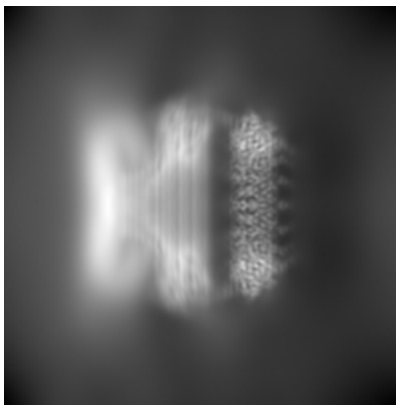


Z

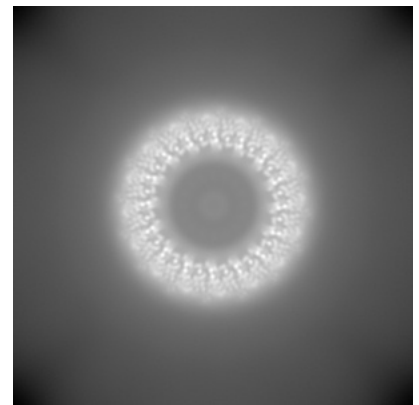
6.1.2 Raw map



X



Y

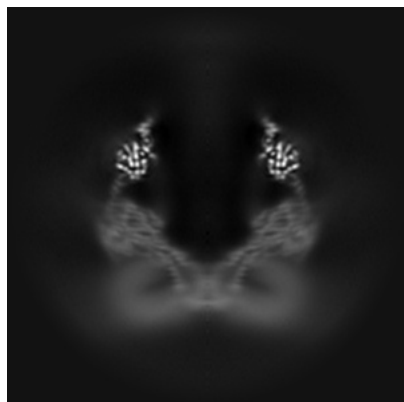


Z

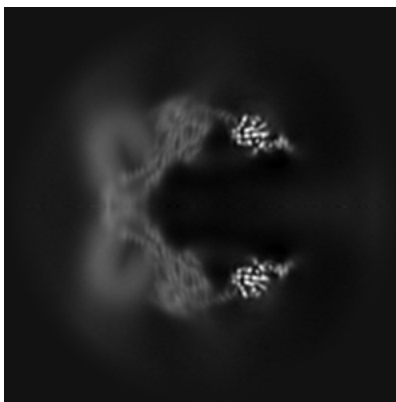
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

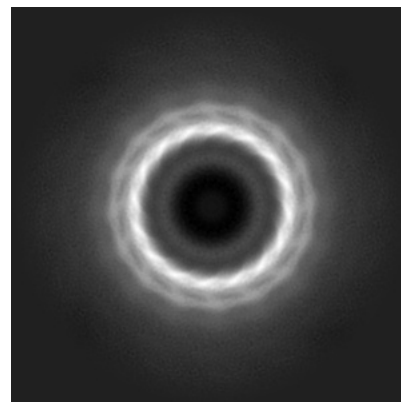
6.2.1 Primary map



X Index: 150

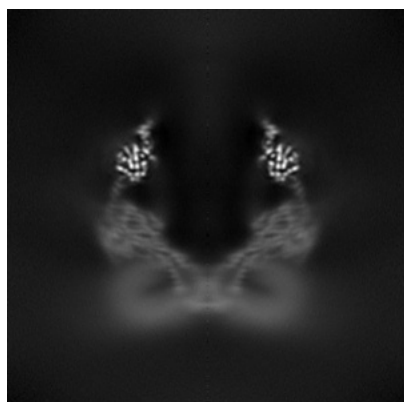


Y Index: 150

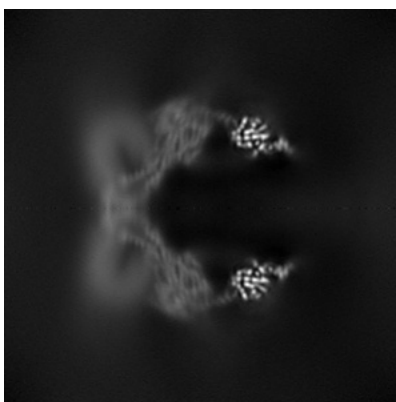


Z Index: 150

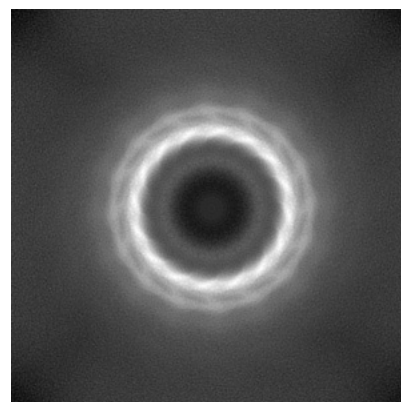
6.2.2 Raw map



X Index: 150



Y Index: 150

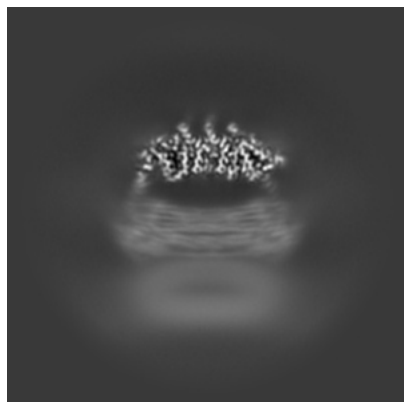


Z Index: 150

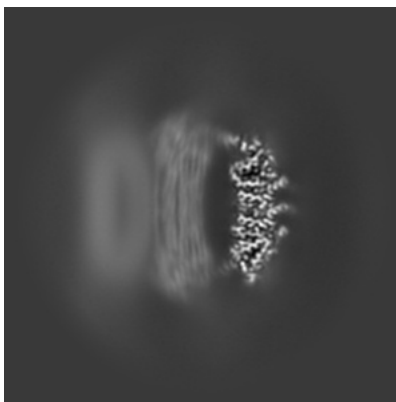
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

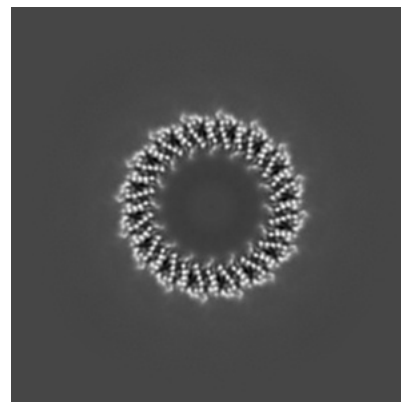
6.3.1 Primary map



X Index: 104

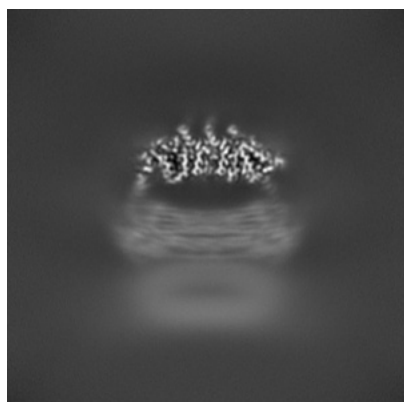


Y Index: 104

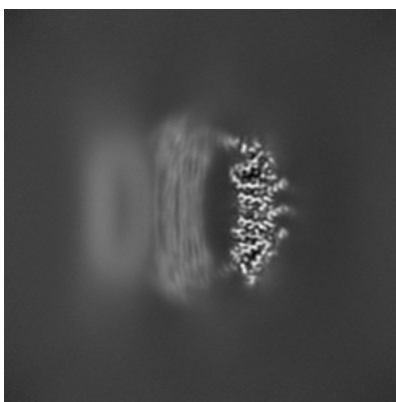


Z Index: 187

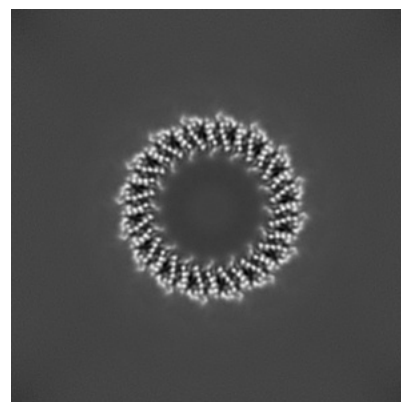
6.3.2 Raw map



X Index: 104



Y Index: 104

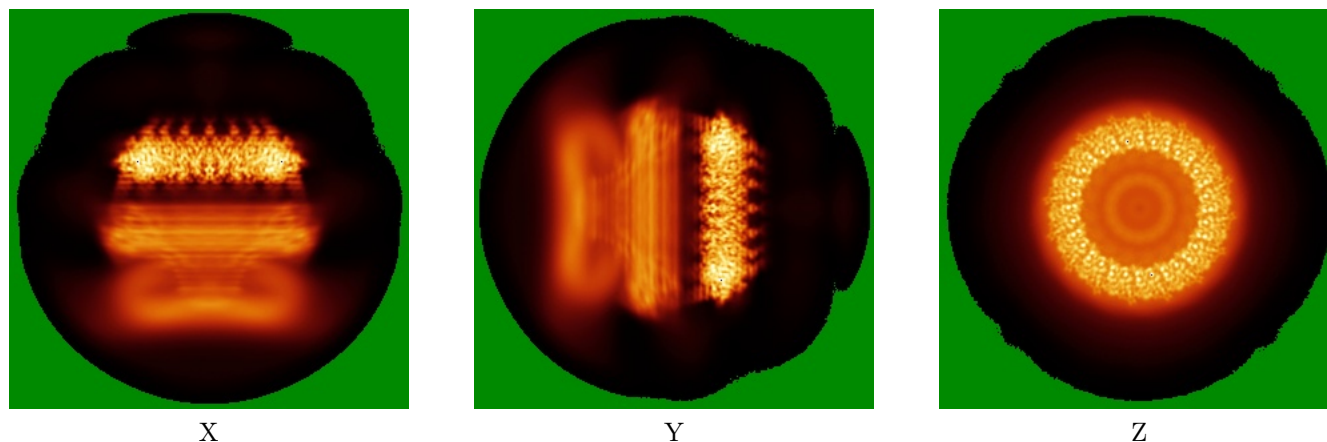


Z Index: 187

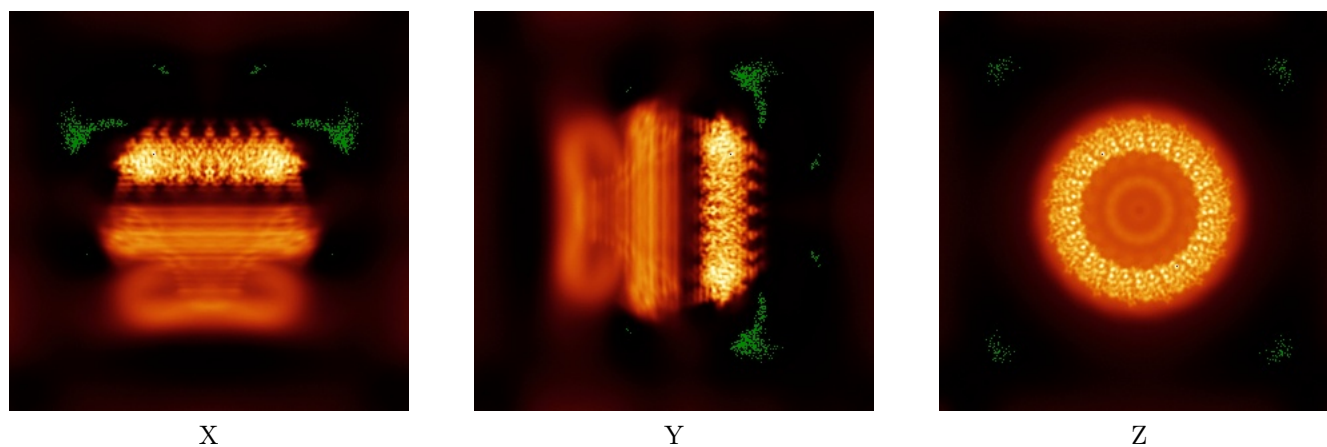
The images above show the largest variance slices of the map in three orthogonal directions.

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.

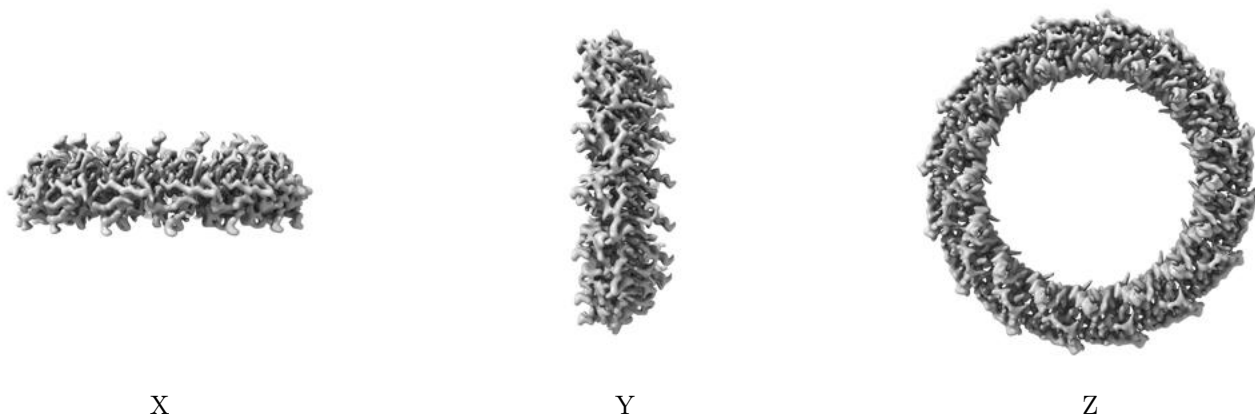
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.4. 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.

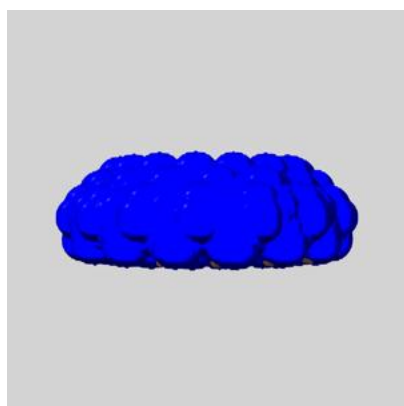
6.6 Mask visualisation [i](#)

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

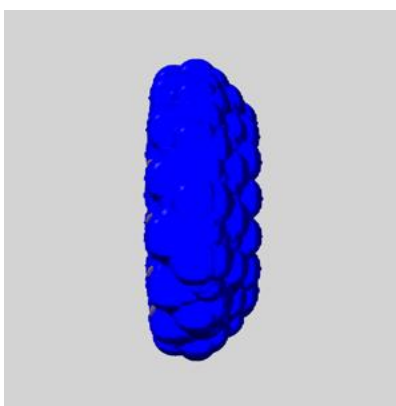
A mask typically either:

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

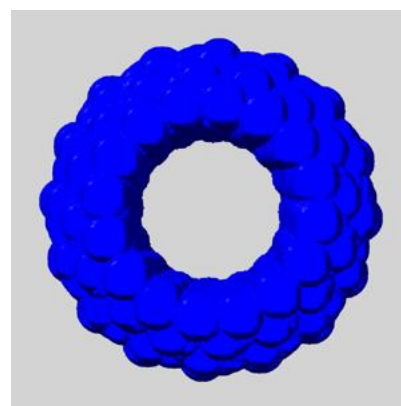
6.6.1 emd_19479_msk_1.map [i](#)



X



Y

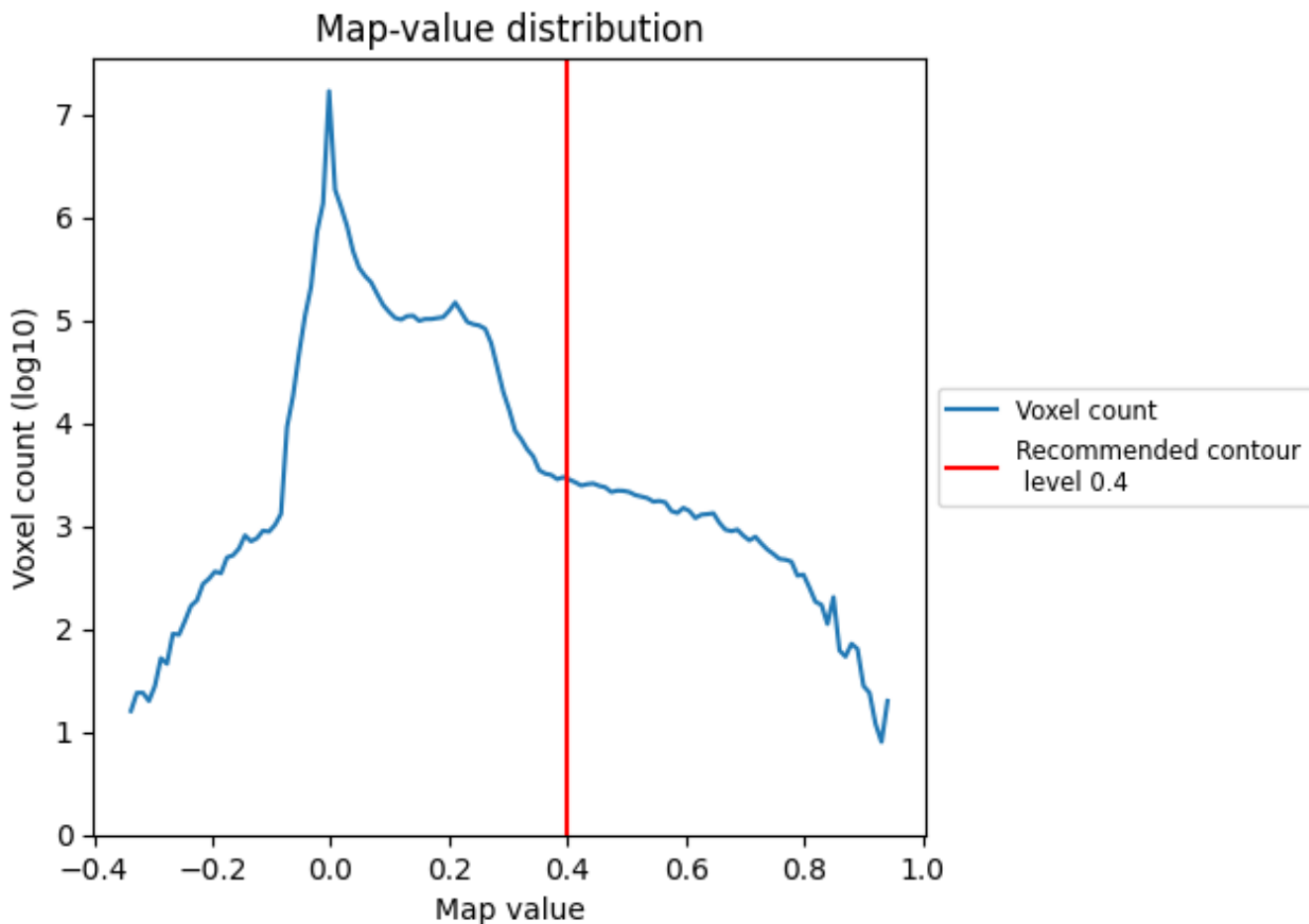


Z

7 Map analysis [i](#)

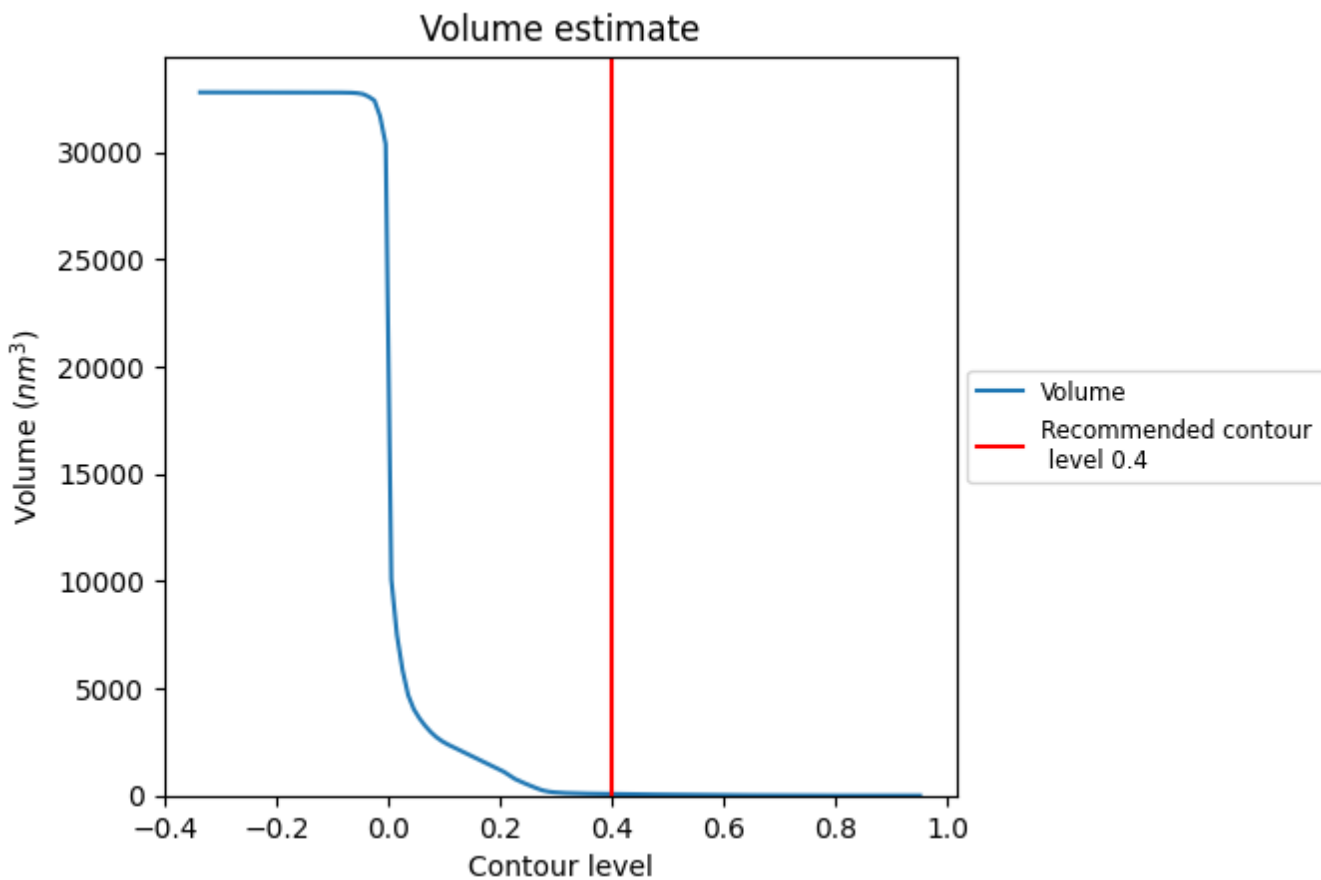
This section contains the results of statistical analysis of the map.

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.

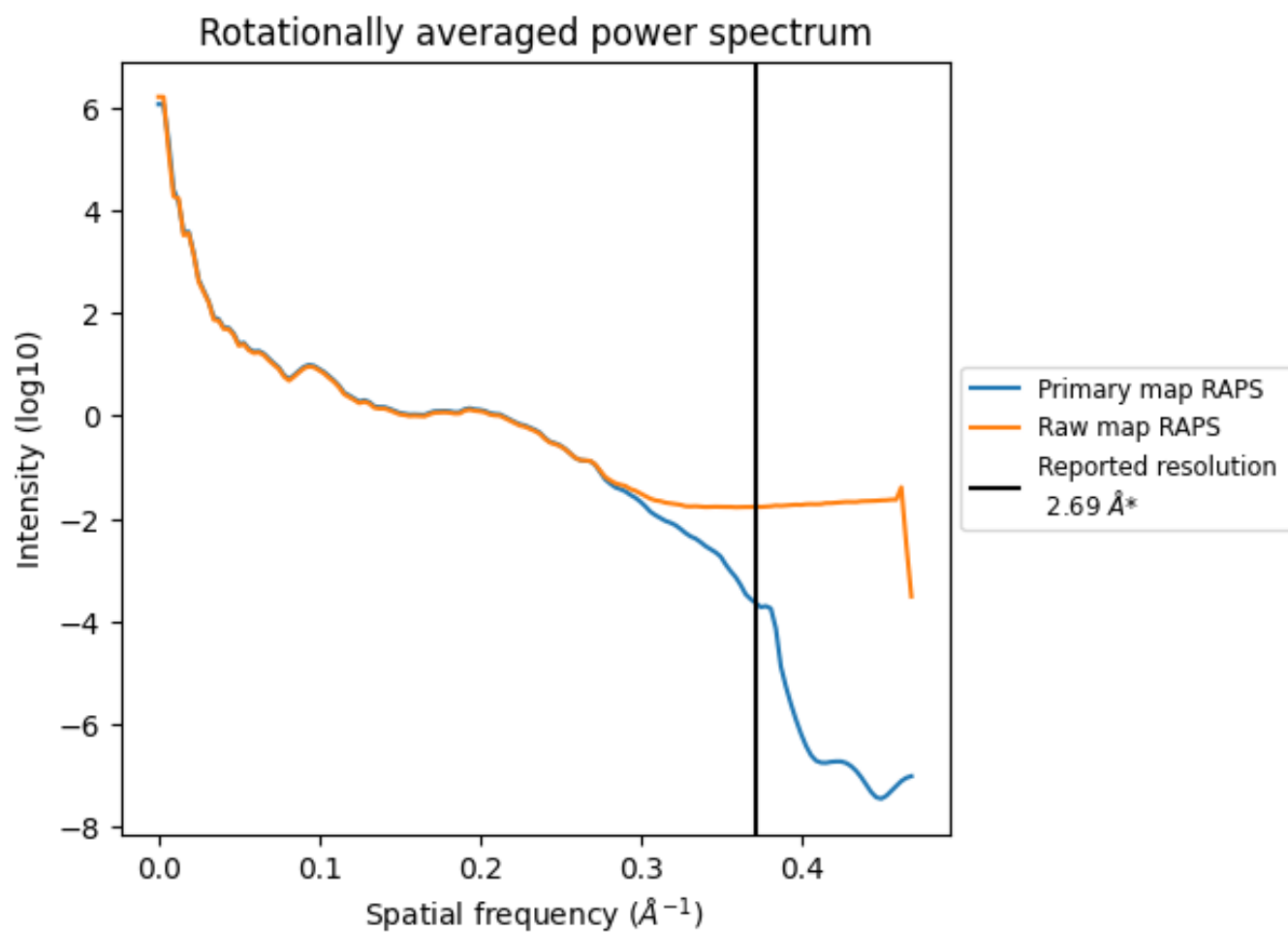
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 74 nm³; this corresponds to an approximate mass of 67 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3 Rotationally averaged power spectrum i

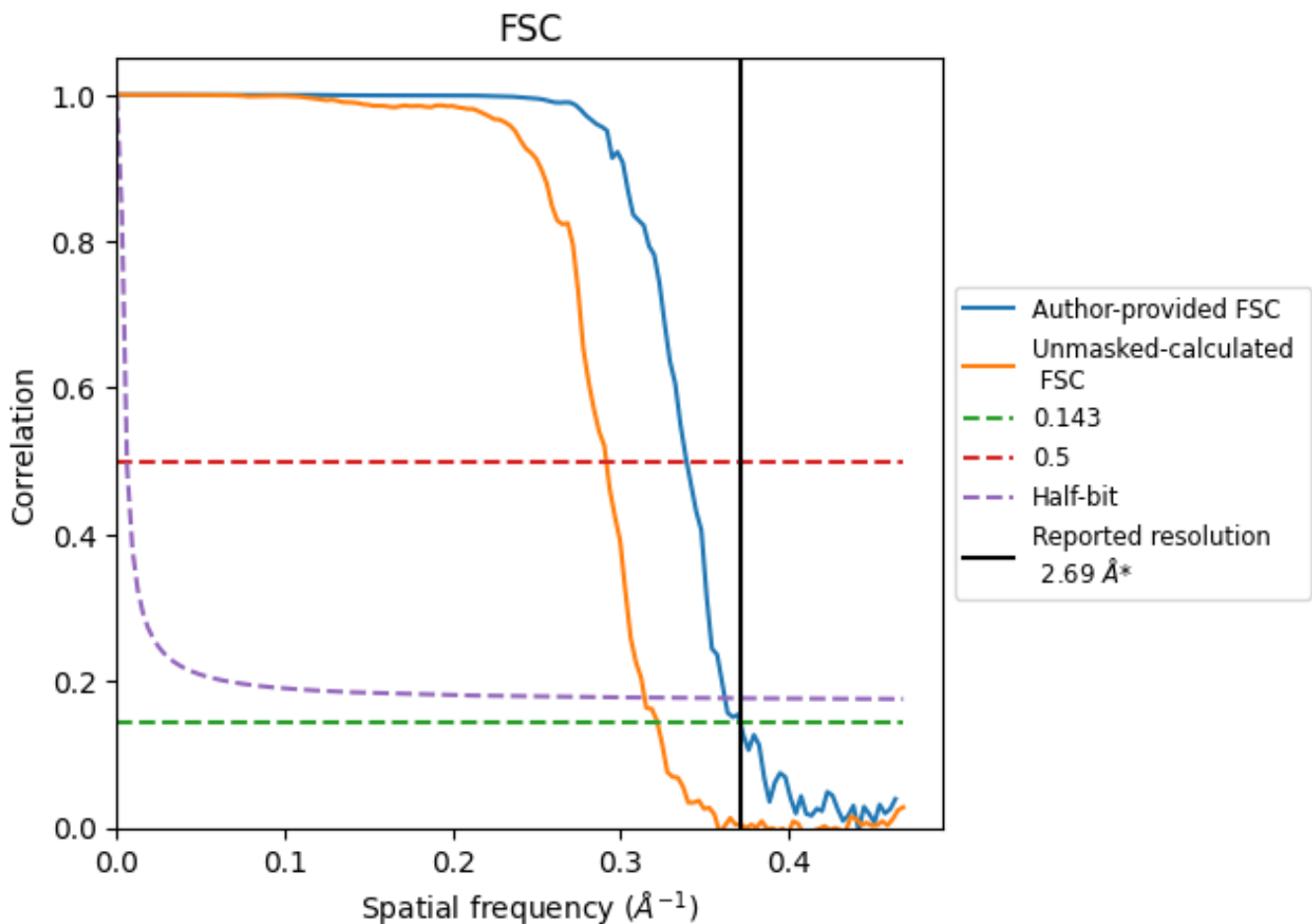


*Reported resolution corresponds to spatial frequency of 0.372 \AA^{-1}

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 0.372 Å⁻¹

8.2 Resolution estimates [i](#)

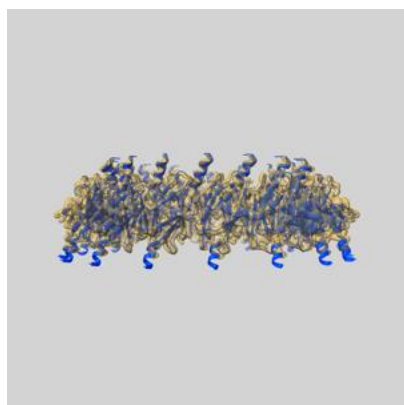
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.69	-	-
Author-provided FSC curve	2.69	2.95	2.76
Unmasked-calculated*	3.10	3.43	3.18

*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 3.10 differs from the reported value 2.69 by more than 10 %

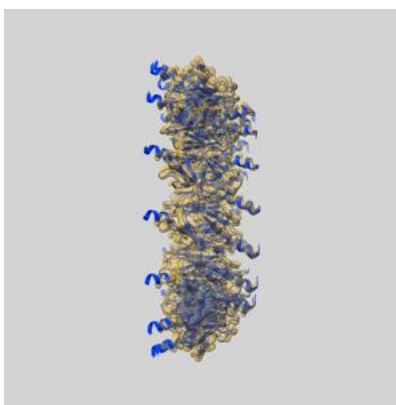
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-19479 and PDB model 8RT5. Per-residue inclusion information can be found in section 3 on page 14.

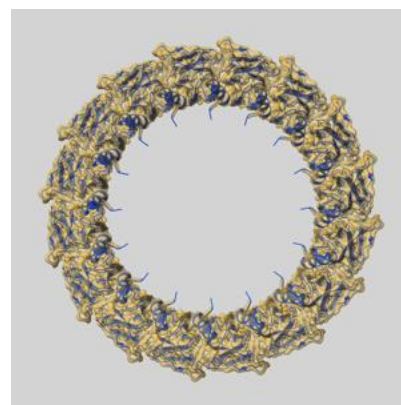
9.1 Map-model overlay [i](#)



X



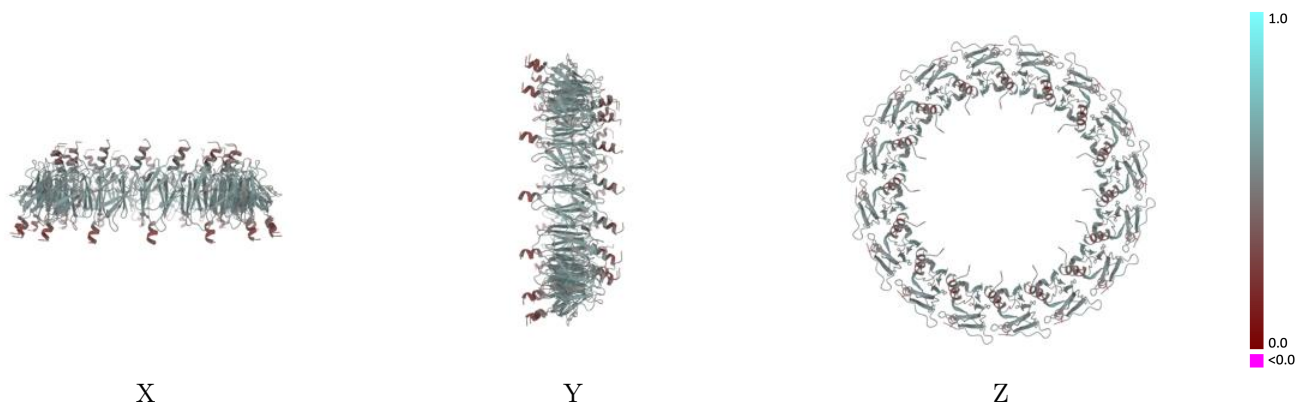
Y



Z

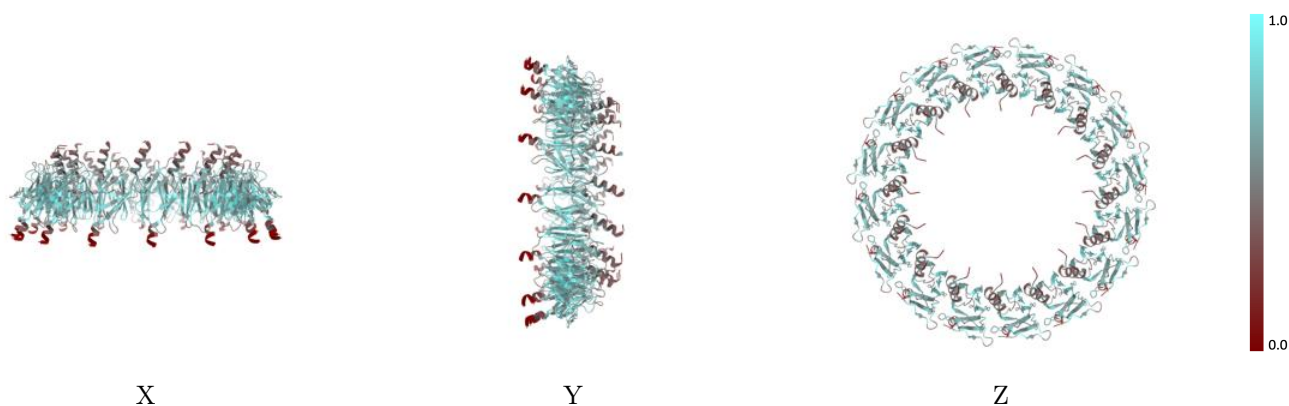
The images above show the 3D surface view of the map at the recommended contour level 0.4 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



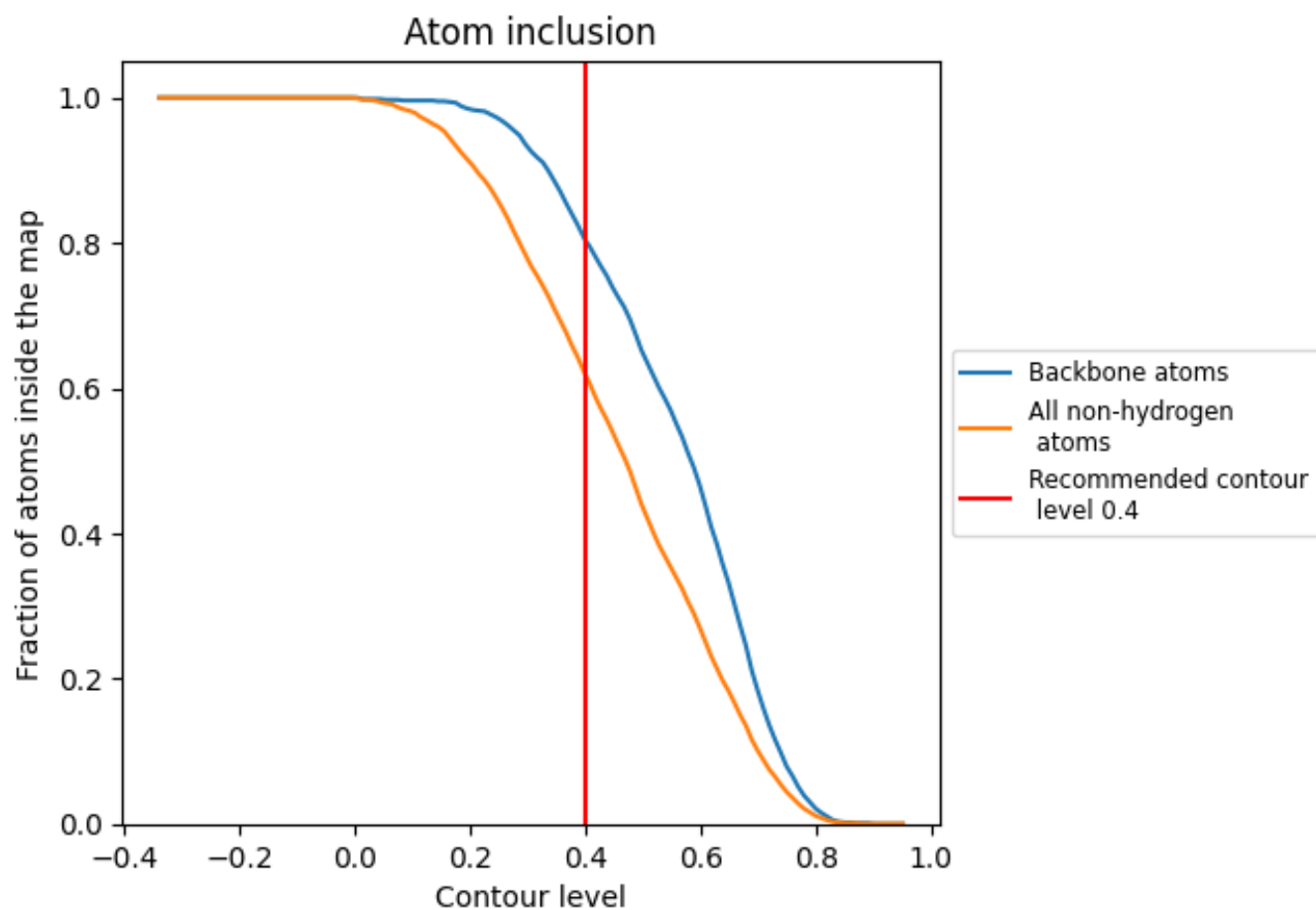
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.4).



































































9.4 Atom inclusion [i](#)



At the recommended contour level, 80% of all backbone atoms, 62% 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 (0.4) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6190	 0.5050
A	 0.4150	 0.4560
B	 0.6500	 0.5150
D	 0.4220	 0.4570
E	 0.6490	 0.5140
G	 0.4150	 0.4530
H	 0.6490	 0.5160
J	 0.3940	 0.4470
K	 0.6560	 0.5150
M	 0.4010	 0.4380
N	 0.6500	 0.5140
P	 0.4080	 0.4520
Q	 0.6540	 0.5130
S	 0.4150	 0.4350
T	 0.6560	 0.5150
V	 0.4010	 0.4520
W	 0.6530	 0.5120
Y	 0.4010	 0.4540
Z	 0.6540	 0.5120
b	 0.4010	 0.4530
c	 0.6500	 0.5130
e	 0.4150	 0.4630
f	 0.6550	 0.5150
h	 0.3940	 0.4520
i	 0.6450	 0.5140
k	 0.4080	 0.4330
l	 0.6520	 0.5110
n	 0.4010	 0.4330
o	 0.6560	 0.5130
u	 0.3940	 0.4360
v	 0.6500	 0.5150
y	 0.4150	 0.4590
z	 0.6560	 0.5160

