

# Integrative Structure Validation Report

October 09, 2025 - 04:44 PM PDT

*The following software was used in the production of this report:*

*IHMValidation Version 3.0*

*Python-IHM Version 2.5*

*MolProbity Version 4.5.2*

*EMDB validation analysis Version 0.0.1.dev127*

*ChimeraX Version 1.9*


*Chimera Version 1.19*

*MapQ Version 1.8.1*

PDB ID	9A3R   pdb_00009a3r
PDB-Dev ID	PDBDEV_00000212
Structure Title	Vimentin intermediate filament tetramer
Structure Authors	Eibauer, M.; Medalia, O.
Deposited on	2023-06-05

*This is a PDB-IHM Structure Validation Report.*

*We welcome your comments at [helpdesk@pdb-ihm.org](mailto:helpdesk@pdb-ihm.org)*

*A user guide is available at [https://pdb-ihm.org/validation\\_help.html](https://pdb-ihm.org/validation_help.html) with specific help available everywhere you see the  symbol.*

*List of references used to build this report is available [here](#).*

## 1. Overview

### 1.1. Summary

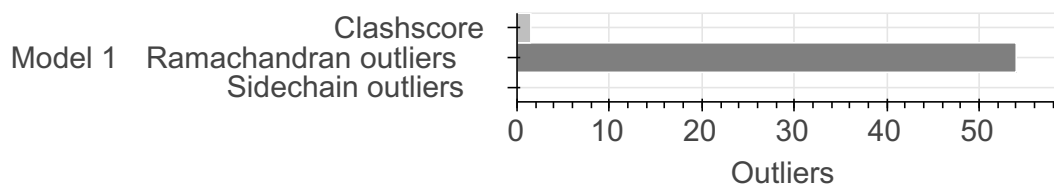
*This entry consists of 1 model(s). A total of 5 dataset(s) were used to build this entry.*

Name	Type	Count
3DEM volume	Experimental data	2
Mass Spectrometry data	Experimental data	1
De Novo model	Starting model	2

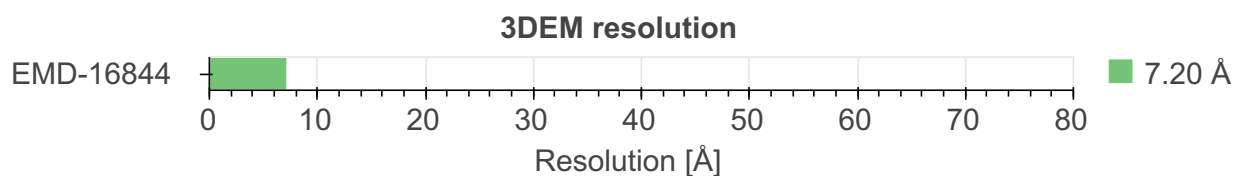
## 1.2. Overall quality

This validation report contains model quality assessments for all structures, data quality and fit to model assessments for SAS and crosslinking-MS datasets. Data quality and fit to model assessments for other datasets and model uncertainty are under development. Number of plots is limited to 256.

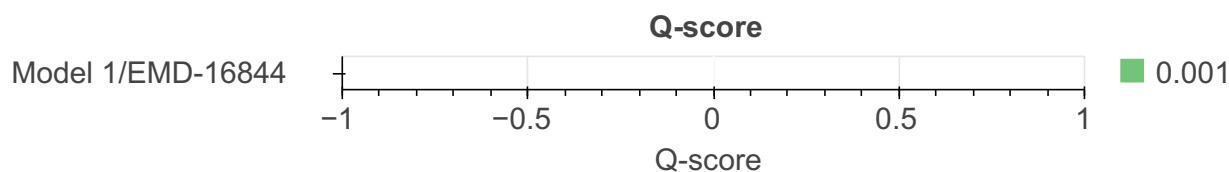
### Model Quality: MolProbity Analysis



### Data Quality



### Fit to Data Used for Modeling



## 2. Model Details

### 2.1. Ensemble information

This entry consists of 0 distinct ensemble(s).

### 2.2. Representation

This entry has 1 representation(s).

ID	Model(s)	Entity ID	Molecule name	Chain(s) [auth]	Total residues	Rigid segments	Flexible segments	Model coverage/ Starting model coverage (%)	Scale
1	1	1	Vimentin	A	466	-	1-466	100.00 / 100.00	Atomic
				B					
				C					
				D					

### 2.3. Datasets used for modeling ?

There are 5 unique datasets used to build the models in this entry.

ID	Dataset type	Database name	Data access code
1	3DEM volume	EMDB	<a href="#">EMD-16844</a>
2	3DEM volume	Not available	Not available
3	Mass Spectrometry data	Not available	Not available
4	De Novo model	Not available	Not available
5	De Novo model	Not available	Not available

### 2.4. Methodology and software ?

This entry is a result of 1 distinct protocol(s).

Step number	Protocol ID	Method name	Method type	Method description	Number of computed models	Multi state modeling	Multi scale modeling
1	1	Molecular dynamics flexible fitting	Molecular dynamics flexible fitting	The vimentin dimer starting model was fitted by molecular dynamics flexible fitting to an elongated version of the electron density map EMD-16844. Spatial restraints derived from chemical crosslinking and from an electron density map indicating the position of the vimentin tail domains were applied in the modelling procedure.	1	False	False

There are 4 software packages reported in this entry.

ID	Software name	Software version	Software classification	Software location
1	<a href="#">AlphaFold</a>	2.1.2	model building	<a href="https://alphafold.ebi.ac.uk/">https://alphafold.ebi.ac.uk/</a>
2	<a href="#">ClusPro</a>	2.00	model docking	<a href="https://cluspro.org/">https://cluspro.org/</a>
3	<a href="#">Namdinator</a>	Not available	molecular dynamics flexible fitting	<a href="https://namdinator.au.dk/">https://namdinator.au.dk/</a>
4	<a href="#">UCSF Chimera</a>	1.15	model visualization	<a href="https://www.cgl.ucsf.edu/chimerax/">https://www.cgl.ucsf.edu/chimerax/</a>

## 3. Data quality ?

### 3.3. 3DEM ?

This section describes quality of the 3DEM datasets

#### [EMD-16844](#)

##### 3.3.1. Experimental information ?

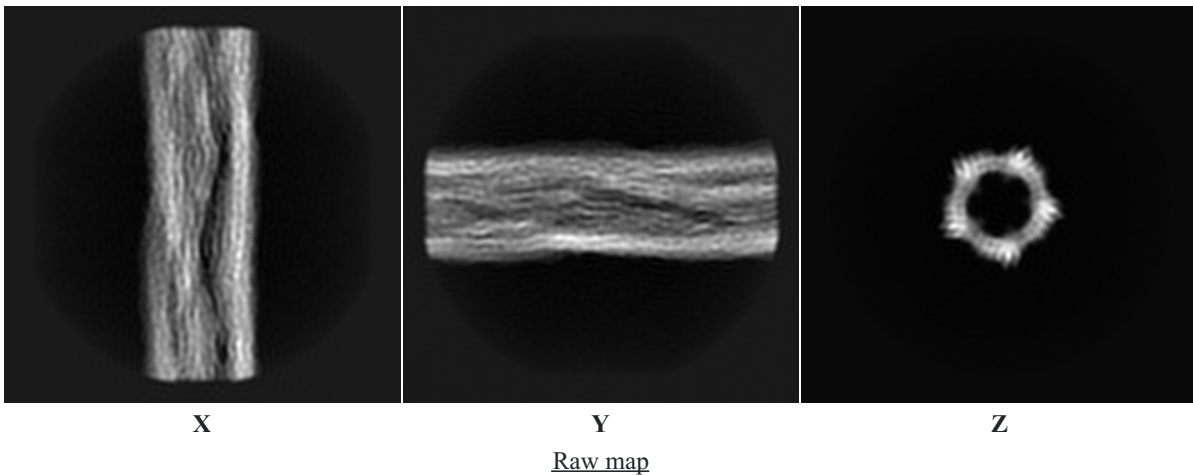
EM reconstruction method:	HELICAL
Resolution:	7.20 Å
Recommended level:	0.005
Estimated volume:	767.93 nm <sup>3</sup>
Specimen preparation:	Preparation ID 1 Vitrification
Map-only validation report:	<a href="#">wwPDB validation report</a>

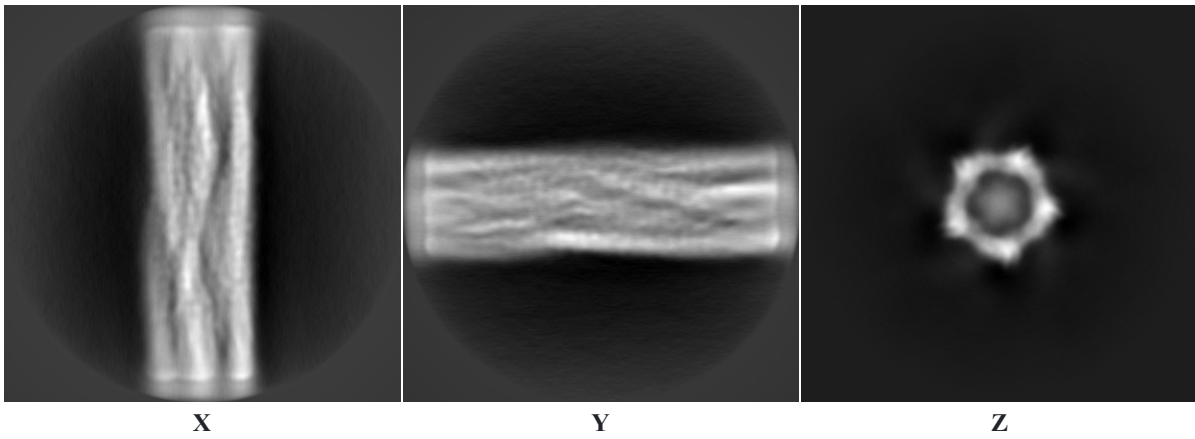
##### 3.3.2. Map visualisation ?

This section contains visualisations of the EMDB entry EMD-16844. 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.

##### 3.3.2.1. Orthogonal projections ?

###### Primary map

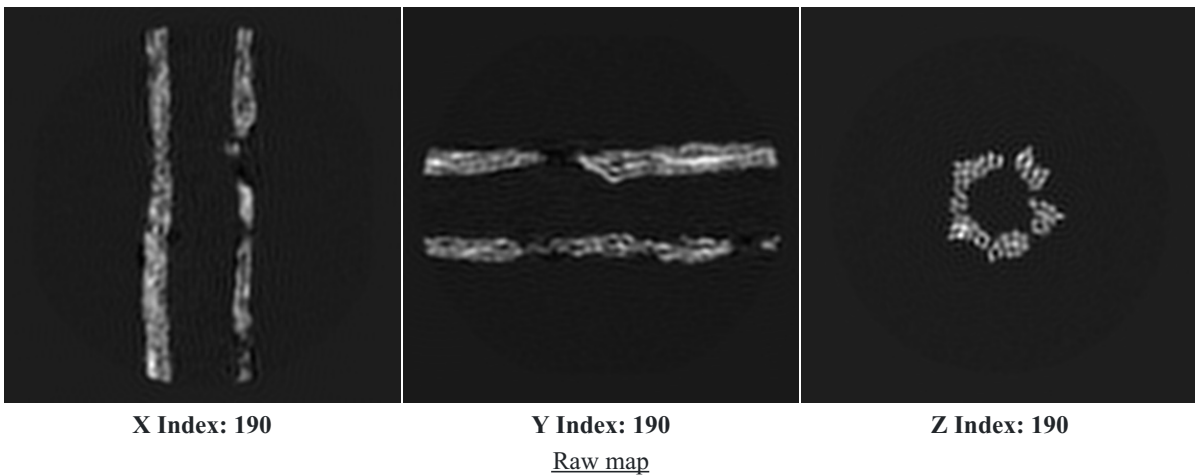




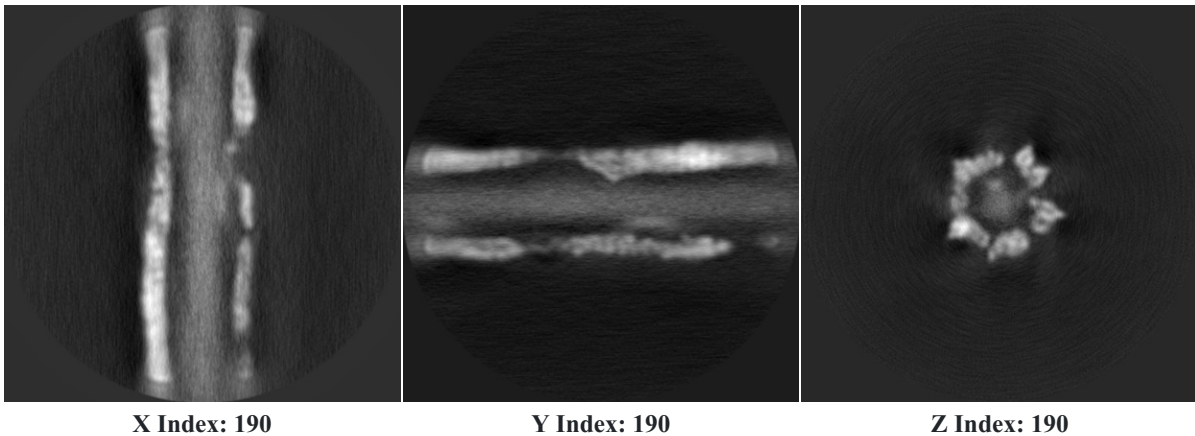
The images above show the map projected in three orthogonal directions.

### 3.3.2.2. Central slices ?

#### Primary map



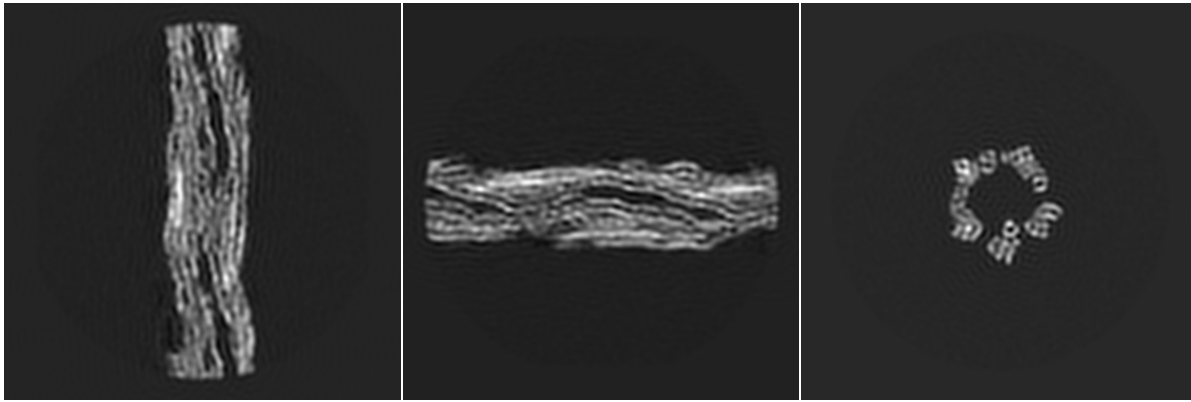
#### Raw map



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

### 3.3.2.3. Largest variance slices ?

#### Primary map

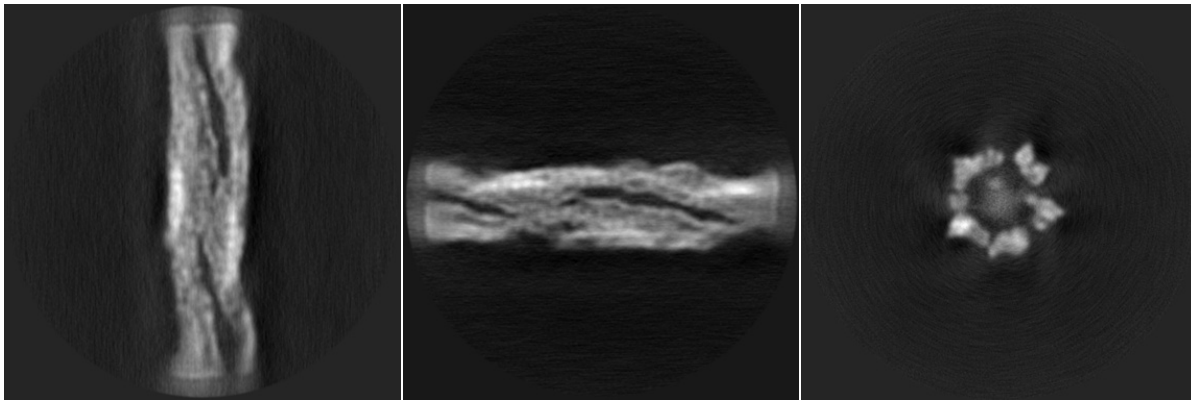


X Index: 155

Y Index: 229

Z Index: 160

Raw map



X Index: 153

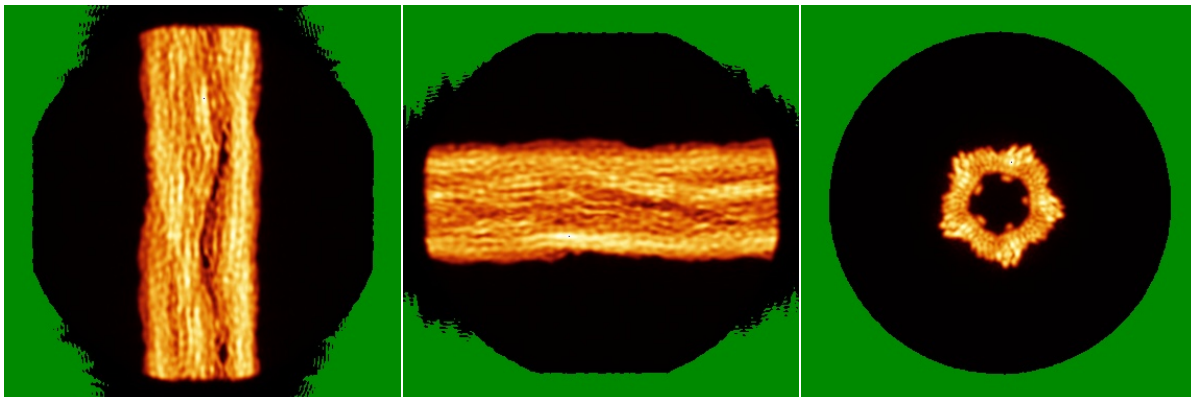
Y Index: 229

Z Index: 194

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

#### 3.3.2.4 Orthogonal standard-deviation projections (false-color) ?

Primary map

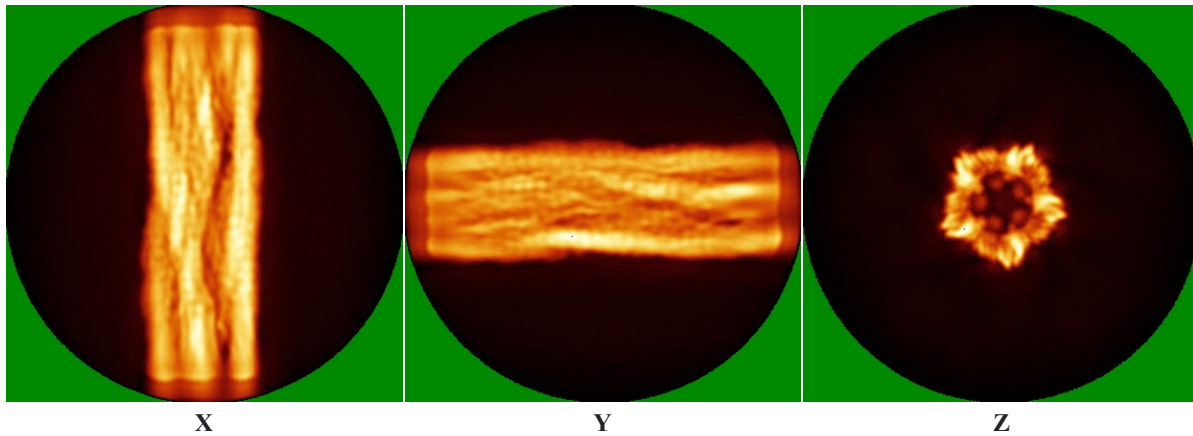


X

Y

Z

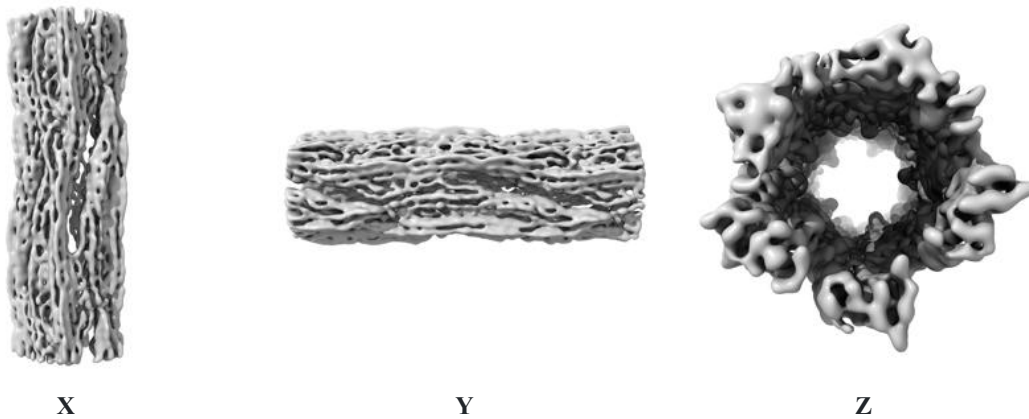
Raw map



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.

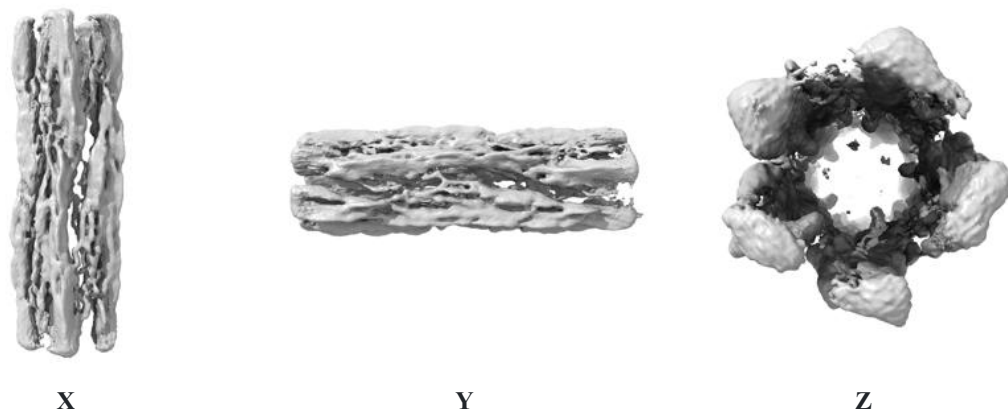
#### 3.3.2.5. Orthogonal surface views [?](#)

##### Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.005 . These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

##### Raw map



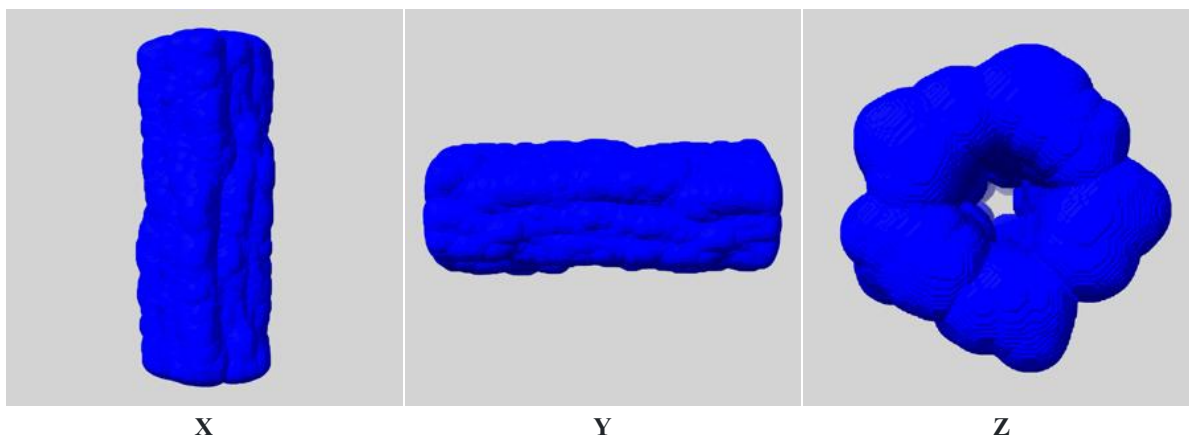
These images show the 3D surface of the raw map. The raw map's contour level 0.000 was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

#### 3.3.2.6. Mask visualisation [?](#)

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.

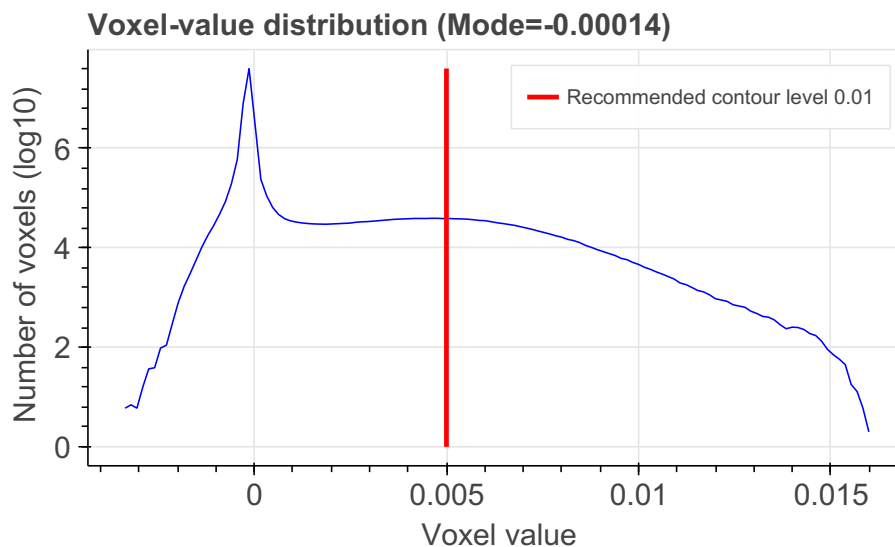
[emd\\_16844\\_msk\\_1.map](#) ?



[3.3.3. Map analysis](#) ?

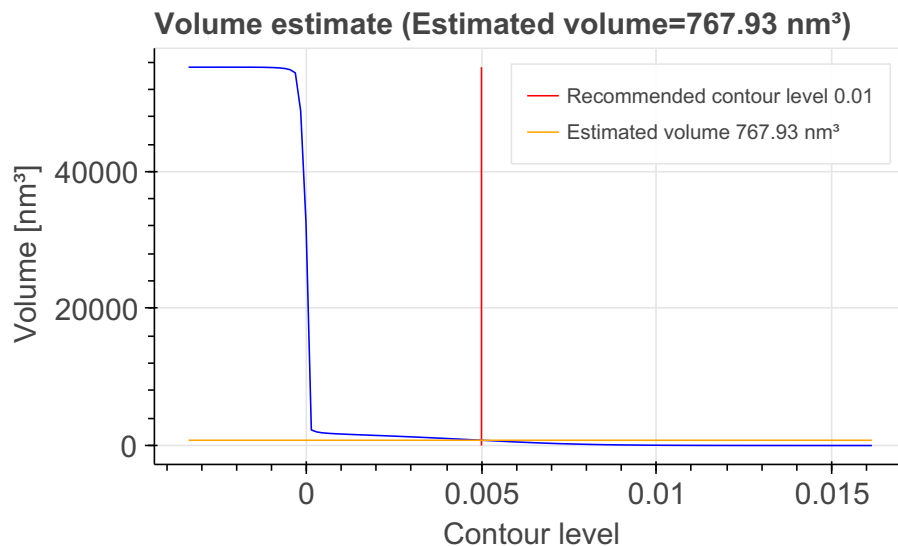
*This section contains the results of statistical analysis of the map.*

[3.3.3.1. Map-value distribution](#) ?



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.

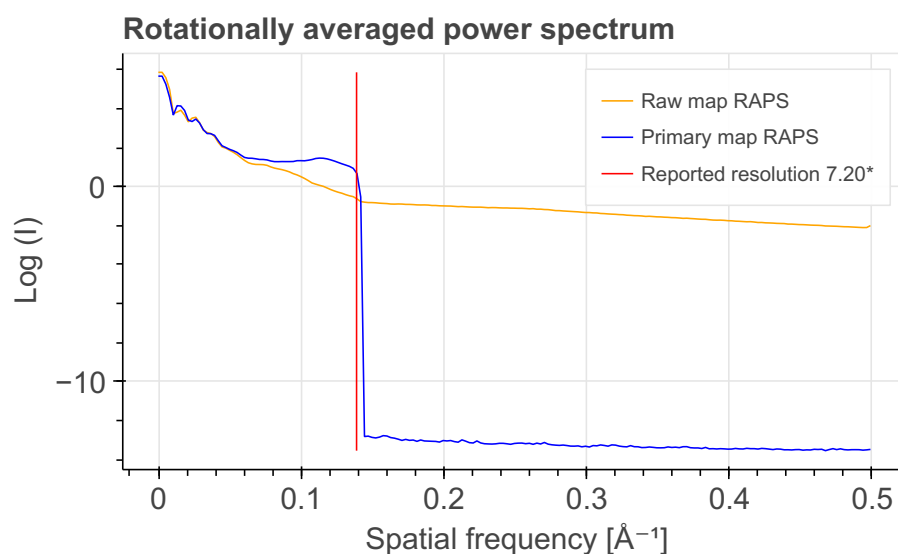
[3.3.3.2. Volume estimate](#) ?



The volume at the recommended contour level is 767.93 nm<sup>3</sup>.

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.

### 3.3.3.3. Rotationally averaged power spectrum ?

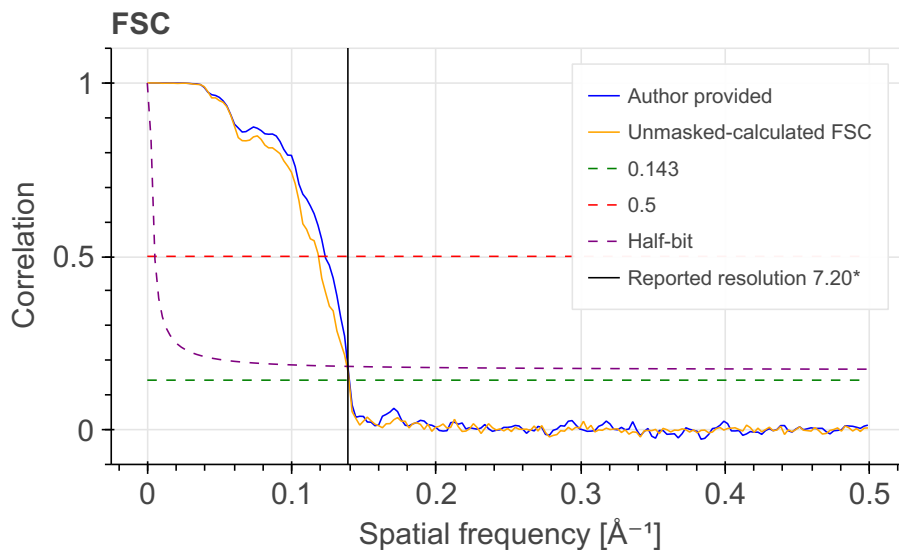


\*Reported resolution corresponds to spatial frequency of 0.139 Å<sup>-1</sup>

### 3.3.4. Fourier-Shell correlation ?

#### 3.3.4.1. FSC ?

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.



\*Reported resolution corresponds to spatial frequency of 0.139 Å<sup>-1</sup>

#### 3.3.4.2. Resolution estimates ?

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	7.20	-	-
Author-provided FSC curve	7.15	8.12	7.20
Unmasked-calculated*	7.16	8.44	7.24

\*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

### 3.4. Mass Spectrometry ?

Validation for this section is under development.

## 4. Model quality ?

For models with atomic structures, MolProbity analysis is performed. For models with coarse-grained or multi-scale structures, excluded volume analysis is performed.

### 4.1b. MolProbity Analysis ?

Excluded volume satisfaction for the models in the entry are listed below. The Analysed column shows the number of particle-particle or particle-atom pairs for which excluded volume was analysed.

#### Standard geometry: bond outliers ?

There are 7 bond length outliers in this entry (0.09% of 7452 assessed bonds). A summary is provided below.

Chain	Res	Type	Atoms	Z	Observed (Å)	Ideal (Å)	Model ID (Worst)	Models (Total)
C	263	PRO	C-N	64.93	2.24	1.33	1	1
C	261	SER	C-N	35.78	0.83	1.33	1	1
D	413	LEU	CA-C	5.45	1.64	1.52	1	1
D	413	LEU	N-CA	5.29	1.56	1.46	1	1

Chain	Res	Type	Atoms	Z	Observed (Å)	Ideal (Å)	Model ID (Worst)	Models (Total)
D	412	SER	C-N	5.17	1.40	1.33	1	1
A	252	GLN	CA-C	4.06	1.61	1.52	1	1
D	413	LEU	C-N	4.02	1.41	1.34	1	1

### Standard geometry: angle outliers

There are 68 bond angle outliers in this entry (0.73% of 9308 assessed bonds). A summary is provided below.

Chain	Res	Type	Atoms	Z	Observed (Å)	Ideal (Å)	Model ID (Worst)	Models (Total)
C	261	SER	O-C-N	53.53	37.35	123.00	1	1
C	263	PRO	O-C-N	20.46	155.74	123.00	1	1
C	263	PRO	CA-C-N	18.39	79.43	116.20	1	1
C	261	SER	CA-C-N	16.49	149.18	116.20	1	1
C	261	SER	C-N-CA	13.30	97.77	121.70	1	1
C	263	PRO	C-N-CA	10.68	102.48	121.70	1	1
D	253	HIS	C-N-CA	9.73	139.22	121.70	1	1
D	413	LEU	CA-C-N	9.66	131.39	116.90	1	1
D	410	ARG	C-N-CA	8.92	137.76	121.70	1	1
A	253	HIS	O-C-N	7.80	110.53	123.00	1	1
C	424	ARG	C-N-CA	7.77	135.68	121.70	1	1
D	86	PHE	C-N-CA	7.51	135.21	121.70	1	1
D	412	SER	C-N-CA	7.36	134.95	121.70	1	1
A	256	ILE	C-N-CA	7.19	134.64	121.70	1	1
C	454	VAL	C-N-CA	6.78	133.91	121.70	1	1
A	436	THR	C-N-CA	6.72	133.79	121.70	1	1
D	253	HIS	CA-C-N	6.65	129.51	116.20	1	1
B	435	ASP	C-N-CA	6.50	133.40	121.70	1	1
B	85	ASP	C-N-CA	6.50	133.40	121.70	1	1
C	435	ASP	C-N-CA	6.50	133.40	121.70	1	1
C	413	LEU	CA-C-N	6.37	126.46	116.90	1	1
D	447	VAL	C-N-CA	6.34	133.10	121.70	1	1
D	253	HIS	O-C-N	6.29	112.93	123.00	1	1
C	85	ASP	C-N-CA	6.02	132.54	121.70	1	1
A	436	THR	O-C-N	5.94	113.50	123.00	1	1
C	264	ASP	C-N-CA	5.79	132.13	121.70	1	1
D	412	SER	CA-C-O	5.66	111.17	120.80	1	1
D	254	VAL	C-N-CA	5.53	131.66	121.70	1	1

Chain	Res	Type	Atoms	Z	Observed (Å)	Ideal (Å)	Model ID (Worst)	Models (Total)
A	252	GLN	C-N-CA	5.49	131.58	121.70	1	1
D	412	SER	CA-C-N	5.48	127.15	116.20	1	1
C	417	ASN	C-N-CA	5.45	131.50	121.70	1	1
B	263	PRO	C-N-CA	5.42	131.46	121.70	1	1
D	414	PRO	N-CA-C	5.38	125.56	112.10	1	1
D	465	LEU	C-N-CA	5.35	131.34	121.70	1	1
A	250	GLN	C-N-CA	5.31	131.26	121.70	1	1
D	413	LEU	O-C-N	5.24	114.61	123.00	1	1
A	253	HIS	C-N-CA	5.07	130.83	121.70	1	1
D	447	VAL	CA-C-N	5.06	126.32	116.20	1	1
A	254	VAL	C-N-CA	4.94	130.58	121.70	1	1
C	454	VAL	O-C-N	4.88	115.20	123.00	1	1
C	436	THR	C-N-CA	4.77	130.29	121.70	1	1
A	257	ASP	N-CA-C	4.70	124.17	111.00	1	1
A	255	GLN	CA-C-N	4.65	106.89	116.20	1	1
A	426	THR	CA-C-O	4.64	112.91	120.80	1	1
D	414	PRO	C-N-CA	4.63	130.04	121.70	1	1
D	418	PHE	C-N-CA	4.54	129.86	121.70	1	1
A	436	THR	CA-C-N	4.51	125.23	116.20	1	1
C	423	LEU	C-N-CA	4.49	129.79	121.70	1	1
D	413	LEU	CA-C-O	4.47	113.20	120.80	1	1
C	415	LEU	CA-C-N	4.45	123.57	116.90	1	1
A	421	LEU	C-N-CA	4.40	129.62	121.70	1	1
B	264	ASP	C-N-CA	4.38	129.59	121.70	1	1
D	447	VAL	O-C-N	4.37	116.01	123.00	1	1
C	68	VAL	C-N-CA	4.34	129.52	121.70	1	1
A	264	ASP	C-N-CA	4.32	129.48	121.70	1	1
C	436	THR	O-C-N	4.26	116.18	123.00	1	1
C	435	ASP	O-C-N	4.25	116.20	123.00	1	1
A	260	VAL	C-N-CA	4.23	129.31	121.70	1	1
B	253	HIS	CA-C-N	4.20	124.59	116.20	1	1
B	435	ASP	CA-C-N	4.19	124.59	116.20	1	1
A	239	GLU	C-N-CA	4.18	129.22	121.70	1	1
C	24	PRO	C-N-CA	4.16	129.19	121.70	1	1
B	466	GLU	CA-C-O	4.09	113.85	120.80	1	1

Chain	Res	Type	Atoms	Z	Observed (Å)	Ideal (Å)	Model ID (Worst)	Models (Total)
D	96	PHE	C-N-CA	4.08	129.05	121.70	1	1
B	412	SER	O-C-N	4.07	116.48	123.00	1	1
A	2	SER	C-N-CA	4.07	129.02	121.70	1	1
A	10	SER	C-N-CA	4.04	128.97	121.70	1	1
A	18	PRO	C-N-CA	4.01	128.92	121.70	1	1

### Too-close contacts

The following all-atom clashscore is based on a MolProbity analysis. All-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The table below contains clashscores for all atomic models in this entry.

Model ID	Clash score	Number of clashes
1	1.49	14

There are 14 clashes. The table below contains the detailed list of all clashes based on a MolProbity analysis. Bad clashes are  $\geq 0.4$  Angstrom.

Atom 1	Atom 2	Clash(Å)	Model ID (Worst)	Models (Total)
C:261:SER:C	C:262:LYS:CA	1.52	1	1
C:263:PRO:C	C:264:ASP:N	0.96	1	1
C:261:SER:CA	C:262:LYS:N	0.95	1	1
C:261:SER:C	C:262:LYS:N	0.93	1	1
C:261:SER:O	C:262:LYS:CA	0.80	1	1
C:263:PRO:CA	C:264:ASP:N	0.77	1	1
C:261:SER:O	C:262:LYS:N	0.64	1	1
C:261:SER:CA	C:262:LYS:CA	0.53	1	1
D:409:SER:C	D:411:ILE:H	0.47	1	1
B:431:LEU:C	B:433:LEU:H	0.46	1	1
C:261:SER:C	C:262:LYS:C	0.46	1	1
D:95:GLU:C	D:97:LYS:H	0.43	1	1
C:17:GLY:C	C:19:GLY:HA3	0.41	1	1
C:263:PRO:C	C:264:ASP:CA	0.40	1	1

### Torsion angles: Protein backbone

In the following table, Ramachandran outliers are listed. The Analysed column shows the number of residues for which the backbone conformation was analysed.

Model ID	Analysed	Favored	Allowed	Outliers
1	1854	1607	193	54

There are 54 unique backbone outliers. Detailed list of outliers are tabulated below.

Chain	Res	Type	Models (Total)
A	9	SER	1
A	19	GLY	1
A	85	ASP	1
A	144	SER	1
A	257	ASP	1
A	258	VAL	1
A	263	PRO	1
A	265	LEU	1
A	413	LEU	1
A	414	PRO	1
A	437	HIS	1
B	4	ARG	1
B	21	ALA	1
B	34	SER	1
B	76	GLY	1
B	79	LEU	1
B	264	ASP	1
B	420	SER	1
B	431	LEU	1
B	435	ASP	1
B	437	HIS	1
B	438	SER	1
C	6	VAL	1
C	18	PRO	1
C	25	SER	1
C	62	ALA	1
C	69	ARG	1
C	71	ARG	1
C	85	ASP	1
C	200	GLU	1
C	265	LEU	1
C	413	LEU	1
C	414	PRO	1
C	418	PHE	1
C	420	SER	1

Chain	Res	Type	Models (Total)
C	455	ILE	1
C	463	ASP	1
D	31	VAL	1
D	77	VAL	1
D	84	VAL	1
D	87	SER	1
D	142	GLY	1
D	252	GLN	1
D	254	VAL	1
D	255	GLN	1
D	259	ASP	1
D	411	ILE	1
D	412	SER	1
D	413	LEU	1
D	414	PRO	1
D	439	LYS	1
D	441	THR	1
D	446	THR	1
D	447	VAL	1

### Torsion angles : Protein sidechains ?

In the following table, sidechain rotameric outliers are listed. The Analysed column shows the number of residues for which the sidechain conformation was analysed.

Model ID	Analysed	Favored	Allowed	Outliers
1	0	0	0	0

## 5. Fit to Data Used for Modeling Assessment ?

### 5.3. 3DEM

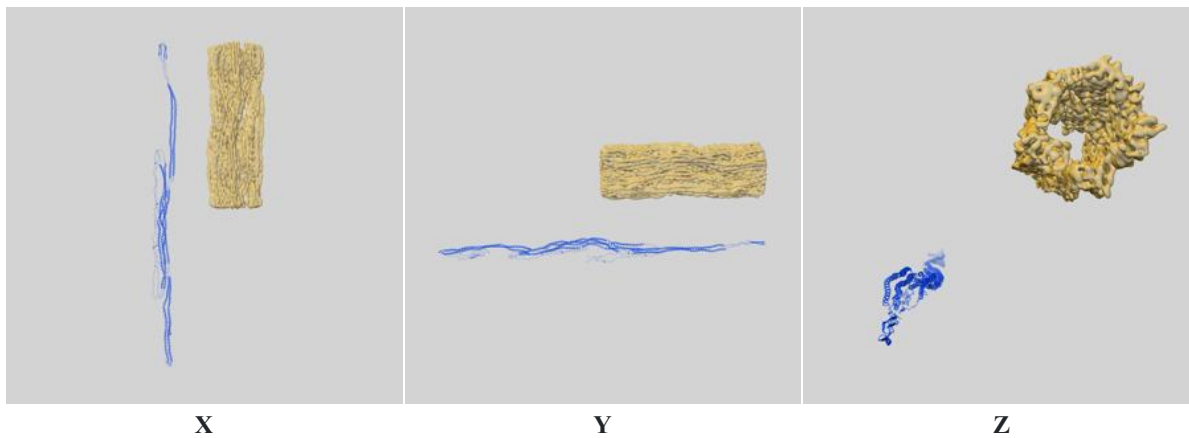
This section describes fit of models to the 3DEM data. Only results for the representative model, selected as a first model with the largest number of asymmetric units.

#### EMD-16844

##### 5.3.1. Map-model fit ?

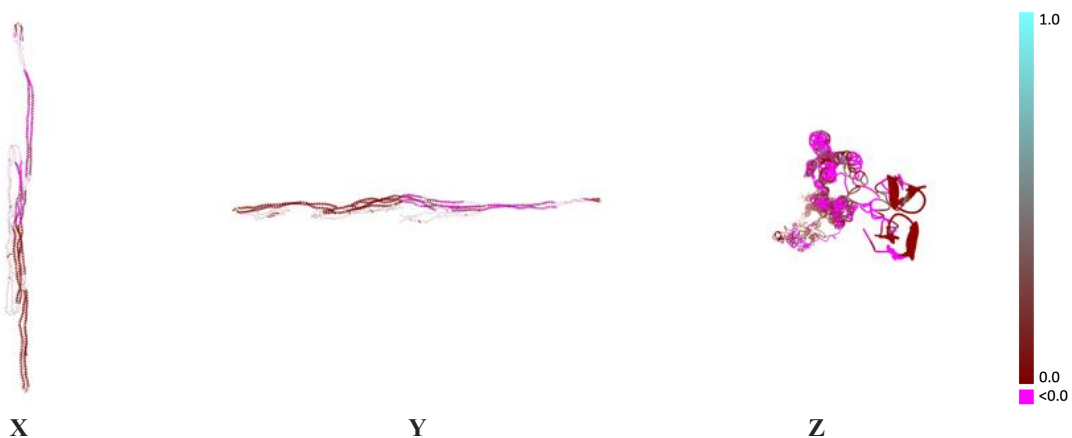
Only results for the representative Model 1 are shown.

##### 5.3.1.1 Map-model overlay ?



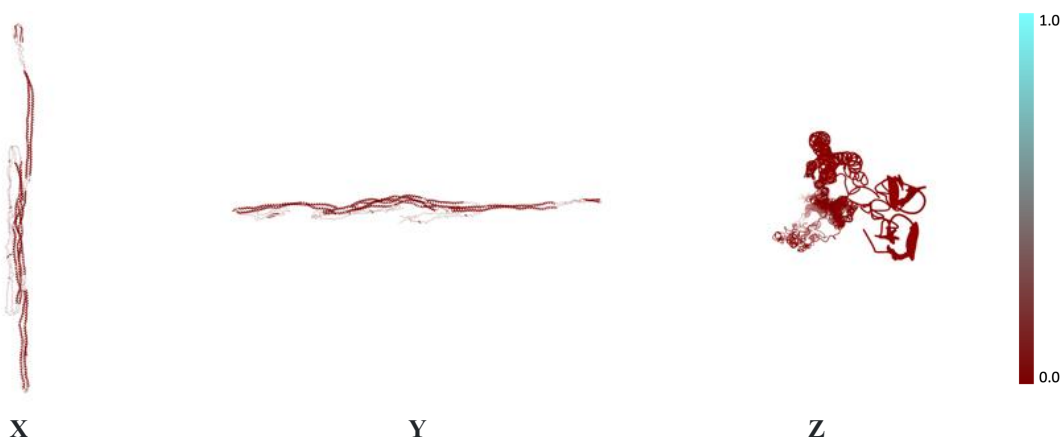
The images above show the 3D surface view of the map at the recommended contour level 0.005 at 50% transparency in yellow overlaid with a ribbon representation of the model colored in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

#### 5.3.1.2. Q-score mapped to coordinate model



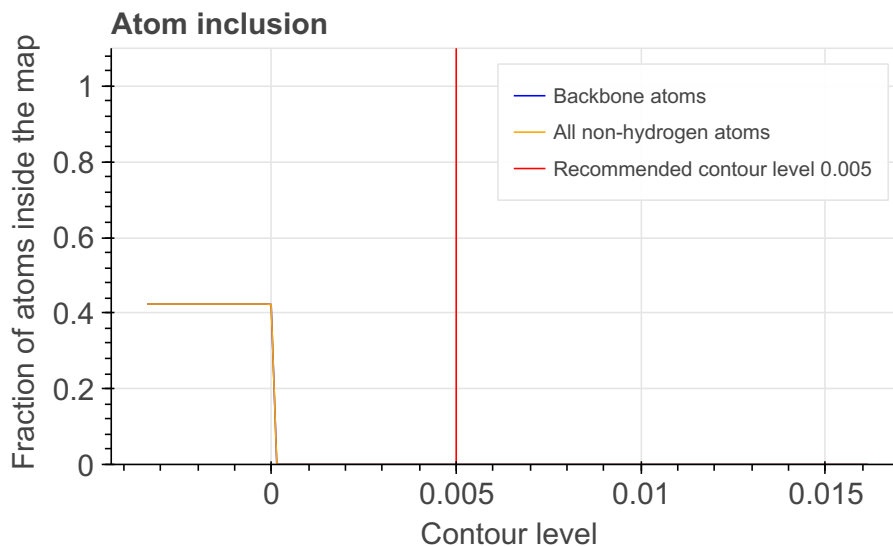
The images above show the model with each residue colored according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

#### 5.3.1.3. Atom inclusion mapped to coordinate model



The images above show the model with each residue colored according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level 0.005.

#### 5.3.1.4. Atom inclusion



At the recommended contour level, 0% of all backbone atoms, 0% of all non-hydrogen atoms, are inside the map.

#### 5.3.1.5. Map-model fit summary ?

The table lists the average atom inclusion at the recommended contour level ( 0.005 ) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.000	0.001
A	0.000	0.009
B	0.000	0.011
C	0.000	-0.012
D	0.000	-0.006



#### 5.4. Mass Spectrometry ?

Validation for this section is under development.

## 6. Fit to Data Used for Validation Assessment ?

Validation for this section is under development.

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