wwPDB EM Validation Summary Report

May 18, 2026 – 12:24 PM EDT

PDB ID	:	10ET / pdb_000010et
EMDB ID	:	EMD-75118
Title	:	Chloroplast Glutamyl Peptidase D855N in open-closed conformation
Authors	:	Ehrlich, J.J.; Routray, P.; van Wijk, K.J.; Kawate, T.
Deposited on	:	2026-01-15
Resolution	:	3.00 Å(reported)

This is a wwPDB EM Validation Summary Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/EMValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references ⓘ) were used in the production of this report:

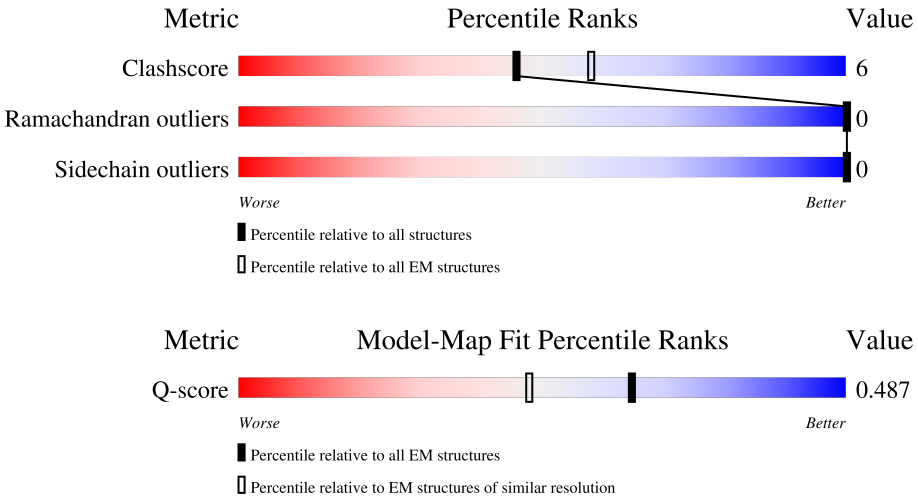
EMDB validation analysis	:	0.0.1.dev132
MolProbity	:	4-5-2 with Phenix2.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh &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

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 3.00 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	14081 (2.50 - 3.50)

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 <=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	907	27% 73% 15% 12%
1	B	907	7% 77% 12% 11%

2 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 12659 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 Isoform 2 of Probable glutamyl endopeptidase, chloroplastic.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	B	807	Total	C	N	O	S	0	0
			6366	4046	1092	1207	21		
1	A	797	Total	C	N	O	S	0	0
			6293	4003	1076	1193	21		

There are 18 discrepancies between the modelled and reference sequences:

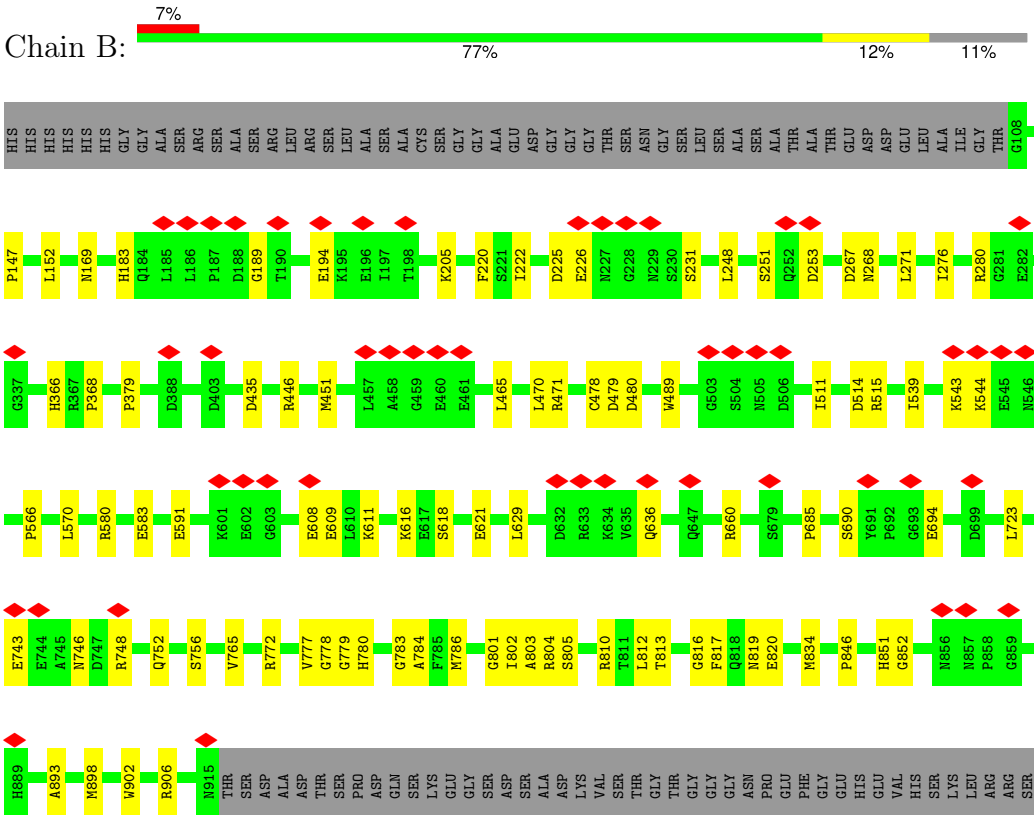
Chain	Residue	Modelled	Actual	Comment	Reference
B	54	HIS	-	expression tag	UNP Q8VZF3
B	55	HIS	-	expression tag	UNP Q8VZF3
B	56	HIS	-	expression tag	UNP Q8VZF3
B	57	HIS	-	expression tag	UNP Q8VZF3
B	58	HIS	-	expression tag	UNP Q8VZF3
B	59	HIS	-	expression tag	UNP Q8VZF3
B	60	GLY	-	expression tag	UNP Q8VZF3
B	61	GLY	-	expression tag	UNP Q8VZF3
B	855	ASN	ASP	engineered mutation	UNP Q8VZF3
A	55	HIS	-	expression tag	UNP Q8VZF3
A	56	HIS	-	expression tag	UNP Q8VZF3
A	57	HIS	-	expression tag	UNP Q8VZF3
A	58	HIS	-	expression tag	UNP Q8VZF3
A	59	HIS	-	expression tag	UNP Q8VZF3
A	60	HIS	-	expression tag	UNP Q8VZF3
A	61	GLY	-	expression tag	UNP Q8VZF3
A	62	GLY	-	expression tag	UNP Q8VZF3
A	855	ASN	ASP	engineered mutation	UNP Q8VZF3

3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

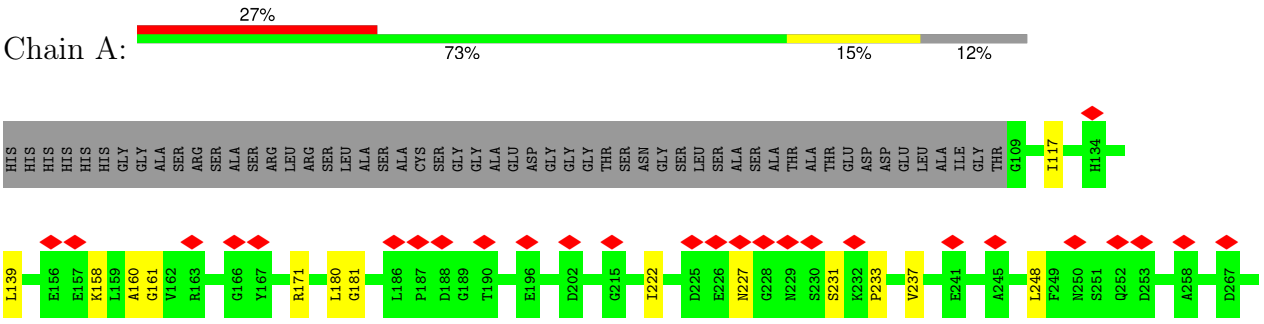
• Molecule 1: Isoform 2 of Probable glutamyl endopeptidase, chloroplastic

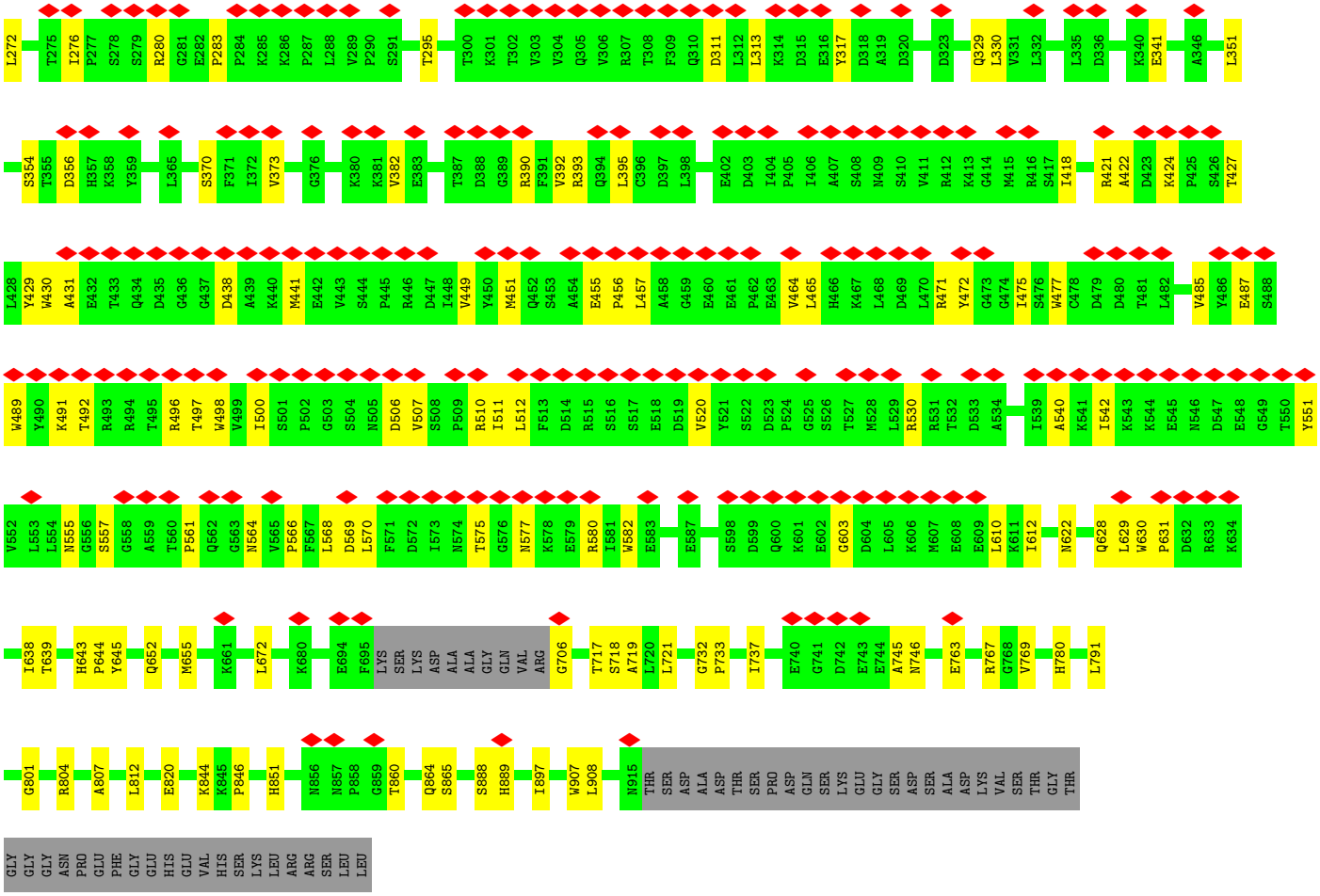
Chain B:



• Molecule 1: Isoform 2 of Probable glutamyl endopeptidase, chloroplastic

Chain A:




L272 T275 I276 P277 S278 S279 R280 G281 E282 P283 P284 K285 K286 P287 L288 V289 P290 S291 T295 T300 K301 T302 V303 V304 Q305 V306 R307 T308 F309 Q310 D311 L312 L313 K314 D315 E316 Y317 D318 A319 D320 D323 Q329 L330 V331 L332 L335 D336 K340 E341 A346 L351
S354 T355 D356 H357 K358 Y359 L365 S370 F371 I372 V373 G376 K380 K381 V382 E383 T387 D388 G389 R390 F391 V392 R393 Q394 L395 C396 D397 L398 E402 D403 I404 P405 I406 A407 S408 N409 S410 V411 R412 K413 G414 M415 R416 S417 I418 R421 A422 D423 K424 P425 S426 T427
L428 Y429 W430 A431 E432 T433 Q434 D435 G436 G437 D438 A439 K440 M441 E442 V443 S444 P445 R446 D447 I448 V449 Y450 M451 Q452 S453 A454 E455 P456 L457 A458 G459 E460 E461 P462 E463 V464 L465 H466 K467 L468 D469 L470 R471 Y472 G473 G474 I475 S476 W477 C478 D479 D480 T481 L482 V485 Y486 E487 S488
W489 Y490 K491 T492 R493 R494 T495 R496 T497 W498 V499 I500 S501 P502 G503 S504 N505 D506 V507 S508 P509 R510 I511 L512 F513 D514 R515 S516 S517 E518 D519 V520 Y521 S522 D523 P524 G525 S526 T527 M528 L529 R530 R531 T532 D533 A534 I539 A540 K541 I542 K543 K544 E545 N546 D547 E548 G549 T550 Y551
V552 L553 L554 N555 G556 S557 G558 A559 T560 P561 Q562 G563 N564 V565 P566 F567 L568 D569 L570 F571 D572 I573 N574 T575 G576 N577 K578 E579 R580 I581 W582 E583 E587 S598 D599 Q600 K601 E602 G603 D604 L605 K606 M607 E608 E609 L610 K611 I612 N622 Q628 L629 W630 P631 D632 R633 K634
I638 T639 H643 P644 Y645 Q652 M655 K661 L672 K680 E694 F695 LYS SER LYS ASP ALA ALA GLY GLN VAL ARG G706 T717 S718 A719 L720 L721 G732 P733 I737 E740 G741 D742 E743 E744 A745 N746 E763 R767 G768 V769 H780 L791
G801 R804 A807 L812 E820 K844 K845 P846 H851 N856 N857 P858 G859 T860 Q864 S865 S888 H889 I897 W907 L908 N915 THR SER ASP ALA ASP THR SER PRO ASP GLN SER LYS GLU GLY SER ASP SER ALA ASP LYS VAL SER THR GLY THR
GLY GLY GLY ASN PRO GLU PHE GLY GLU HIS GLU VAL HIS SER LYS LEU ARG ARG SER LEU LEU

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	70609	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 ($e^-/Å^2$)	50	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	96000	Depositor
Image detector	FEI FALCON I (4k x 4k)	Depositor
Maximum map value	0.666	Depositor
Minimum map value	-0.387	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.014	Depositor
Recommended contour level	0.1	Depositor
Map size (Å)	284.96, 284.96, 284.96	wwPDB
Map dimensions	208, 208, 208	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.37, 1.37, 1.37	Depositor

5 Model quality

5.1 Standard geometry

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	0.10	0/6455	0.28	0/8781
1	B	0.11	0/6529	0.29	0/8880
All	All	0.11	0/12984	0.29	0/17661

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	6293	0	6194	91	0
1	B	6366	0	6273	66	0
All	All	12659	0	12467	156	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 6.

The worst 5 of 156 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)
1:B:479:ASP:OD1	1:B:480:ASP:N	2.17	0.78
1:A:421:ARG:HH22	1:A:451:MET:HG2	1.47	0.76

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:690:SER:OG	1:B:786:MET:SD	2.48	0.71
1:A:780:HIS:HD2	1:A:804:ARG:HE	1.39	0.71
1:A:421:ARG:HH21	1:A:429:TYR:HB3	1.56	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	793/907 (87%)	769 (97%)	24 (3%)	0	100	100
1	B	805/907 (89%)	778 (97%)	27 (3%)	0	100	100
All	All	1598/1814 (88%)	1547 (97%)	51 (3%)	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	691/772 (90%)	691 (100%)	0	100	100
1	B	698/772 (90%)	698 (100%)	0	100	100
All	All	1389/1544 (90%)	1389 (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. 5 of 24 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	329	GLN
1	A	643	HIS
1	A	577	ASN
1	A	659	GLN
1	B	789	ASN

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)

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.

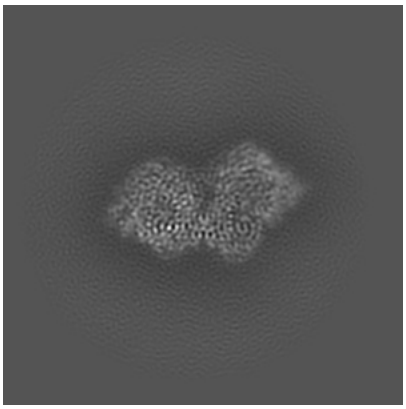
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-75118. These allow visual inspection of the internal detail of the map and identification of artifacts.

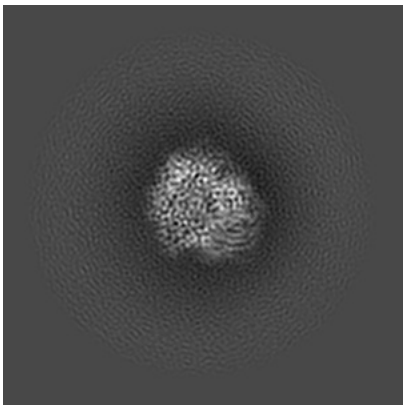
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

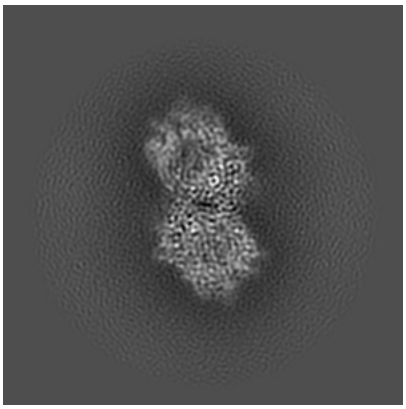
6.1.1 Primary map



X

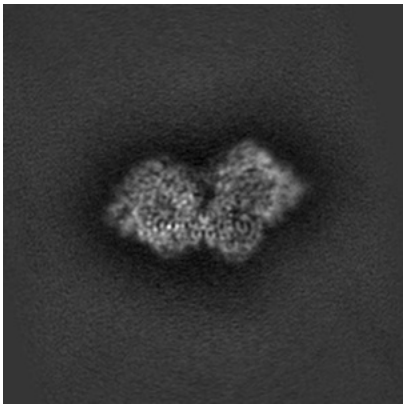


Y



Z

6.1.2 Raw map



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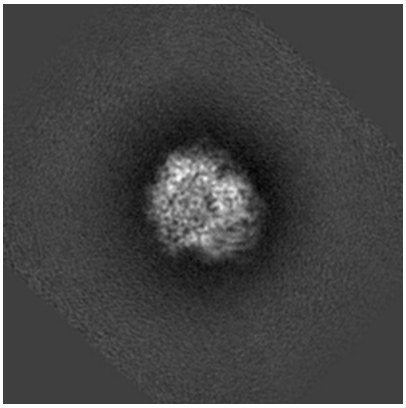
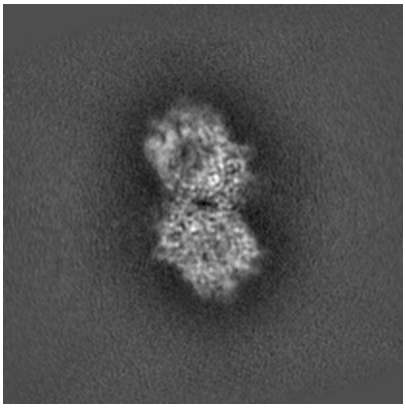


Y

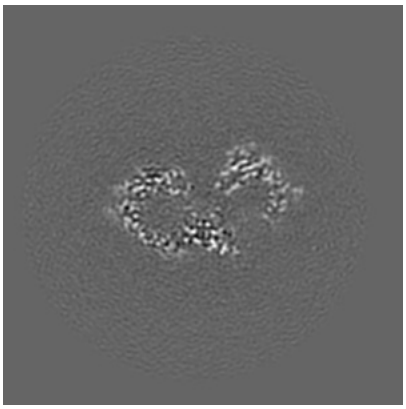


Z

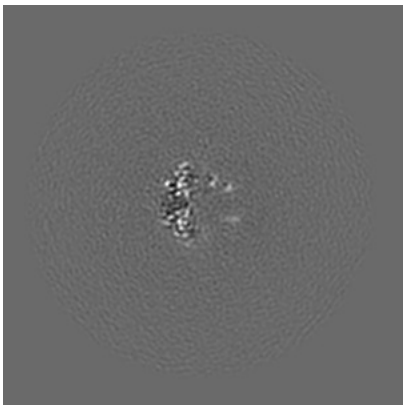
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

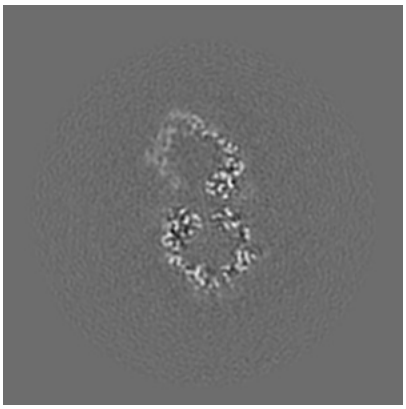
6.2.1 Primary map



X Index: 104

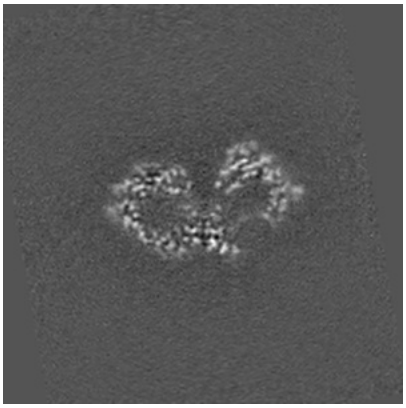


Y Index: 104

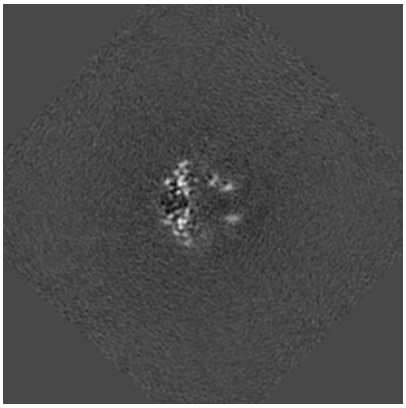


Z Index: 104

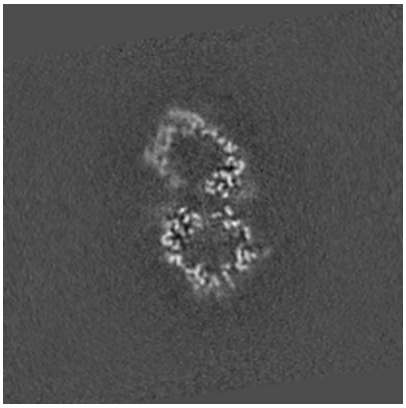
6.2.2 Raw map



X Index: 104



Y Index: 104

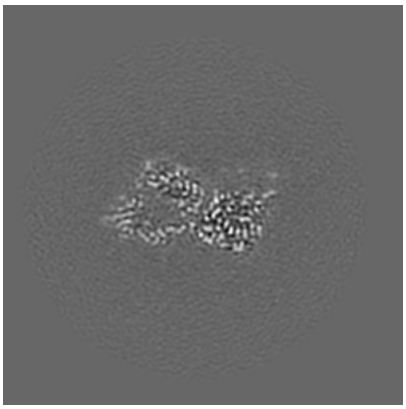


Z Index: 104

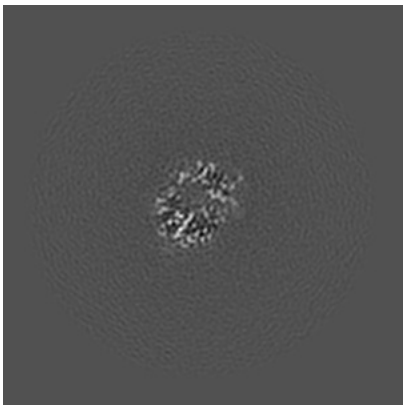
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

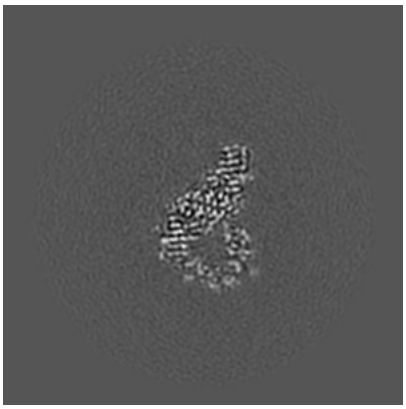
6.3.1 Primary map



X Index: 116

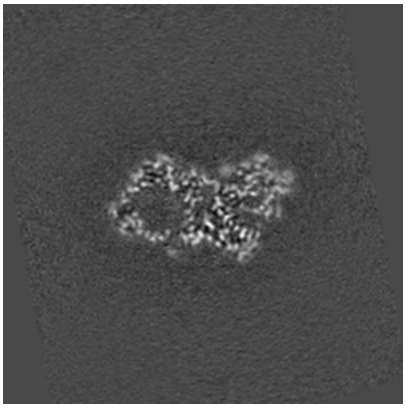


Y Index: 93



Z Index: 91

6.3.2 Raw map



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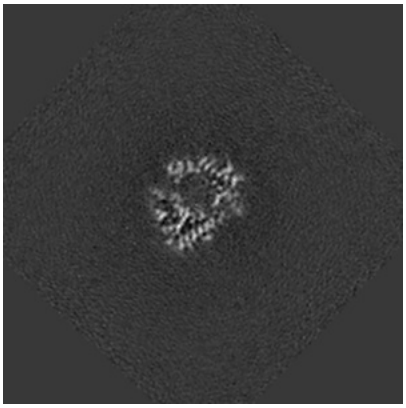

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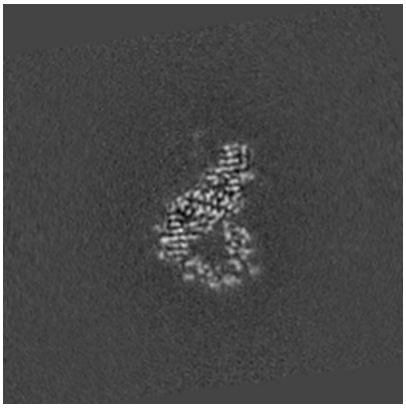
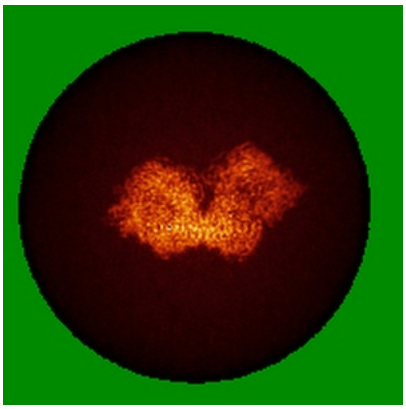


Z Index: 91

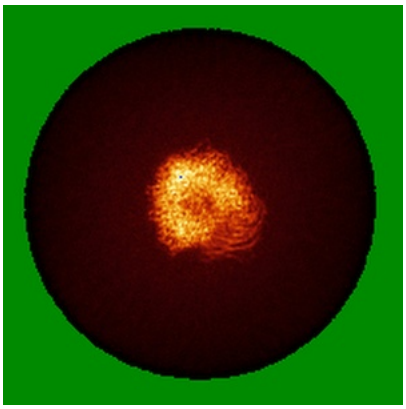
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) (i)

6.4.1 Primary map



X



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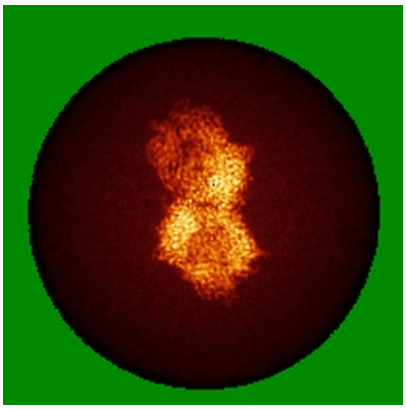
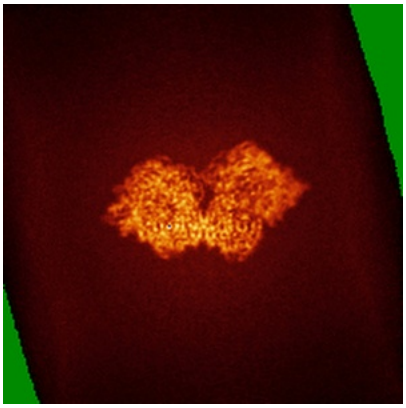


Z

6.4.2 Raw map



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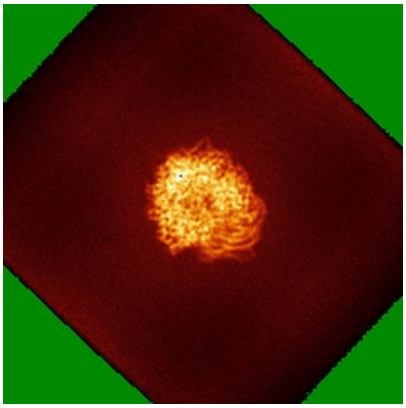
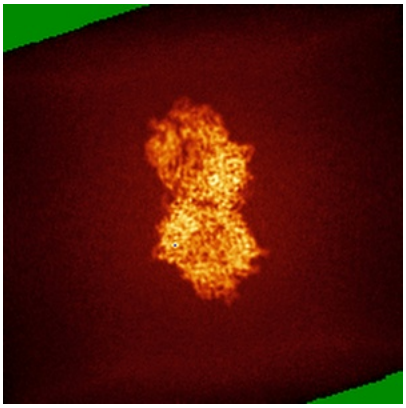


Y

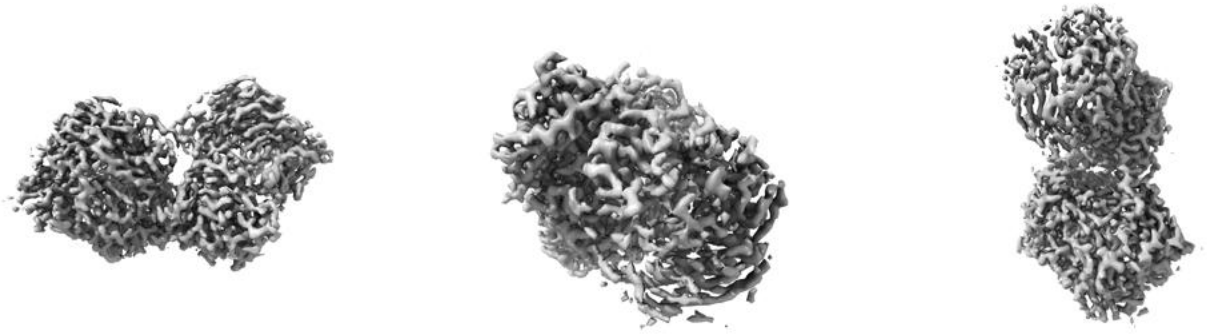


Z

The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views (i)

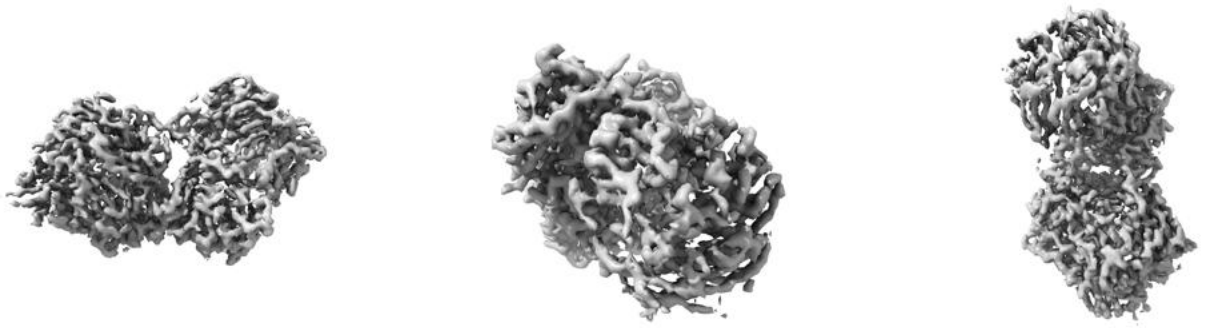
6.5.1 Primary map



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.1. 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



X Y Z

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.

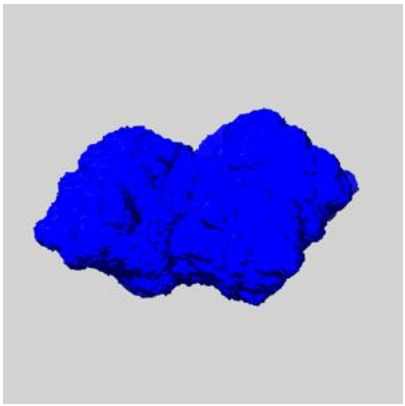
6.6 Mask visualisation

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

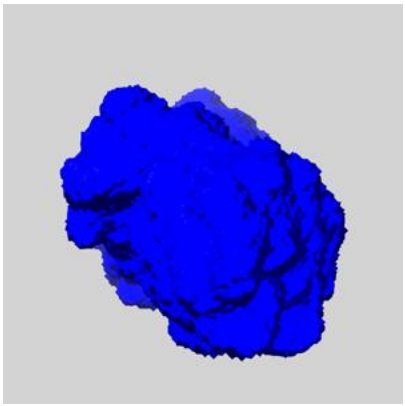
A mask typically either:

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

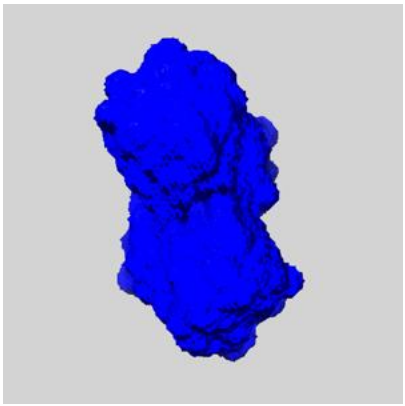
6.6.1 emd_75118_msk_1.map



X



Y

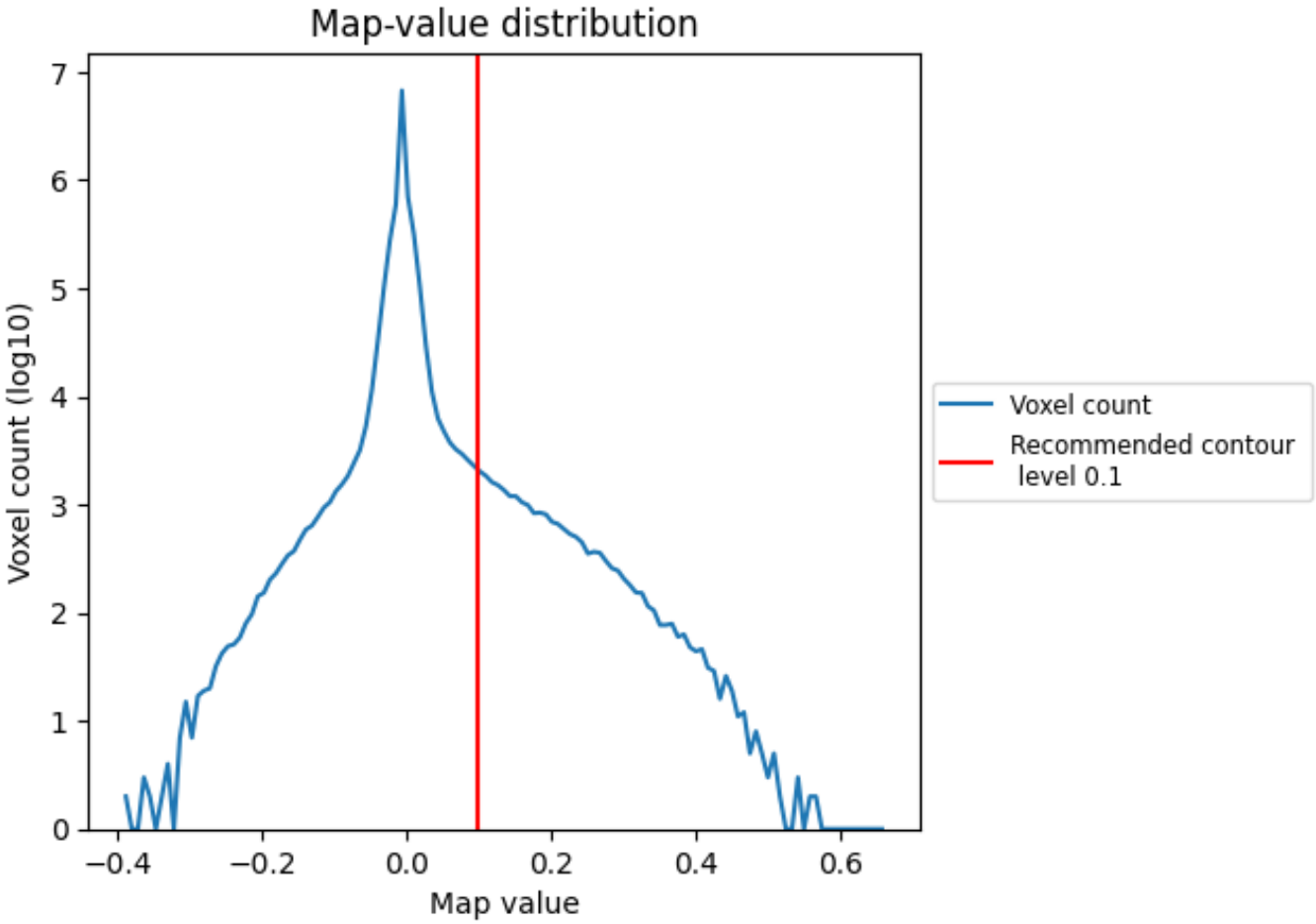


Z

7 Map analysis

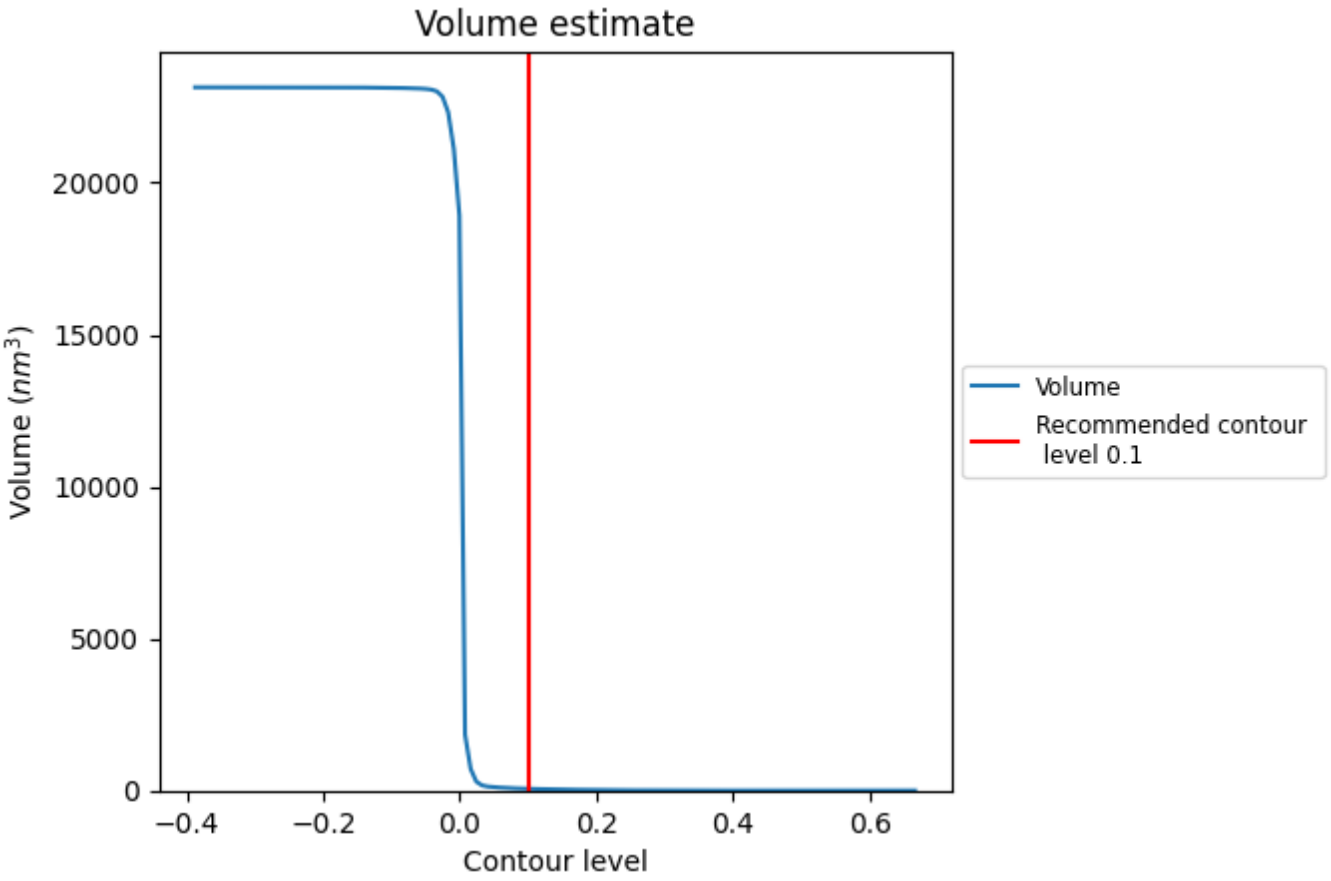
This section contains the results of statistical analysis of the map.

7.1 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.

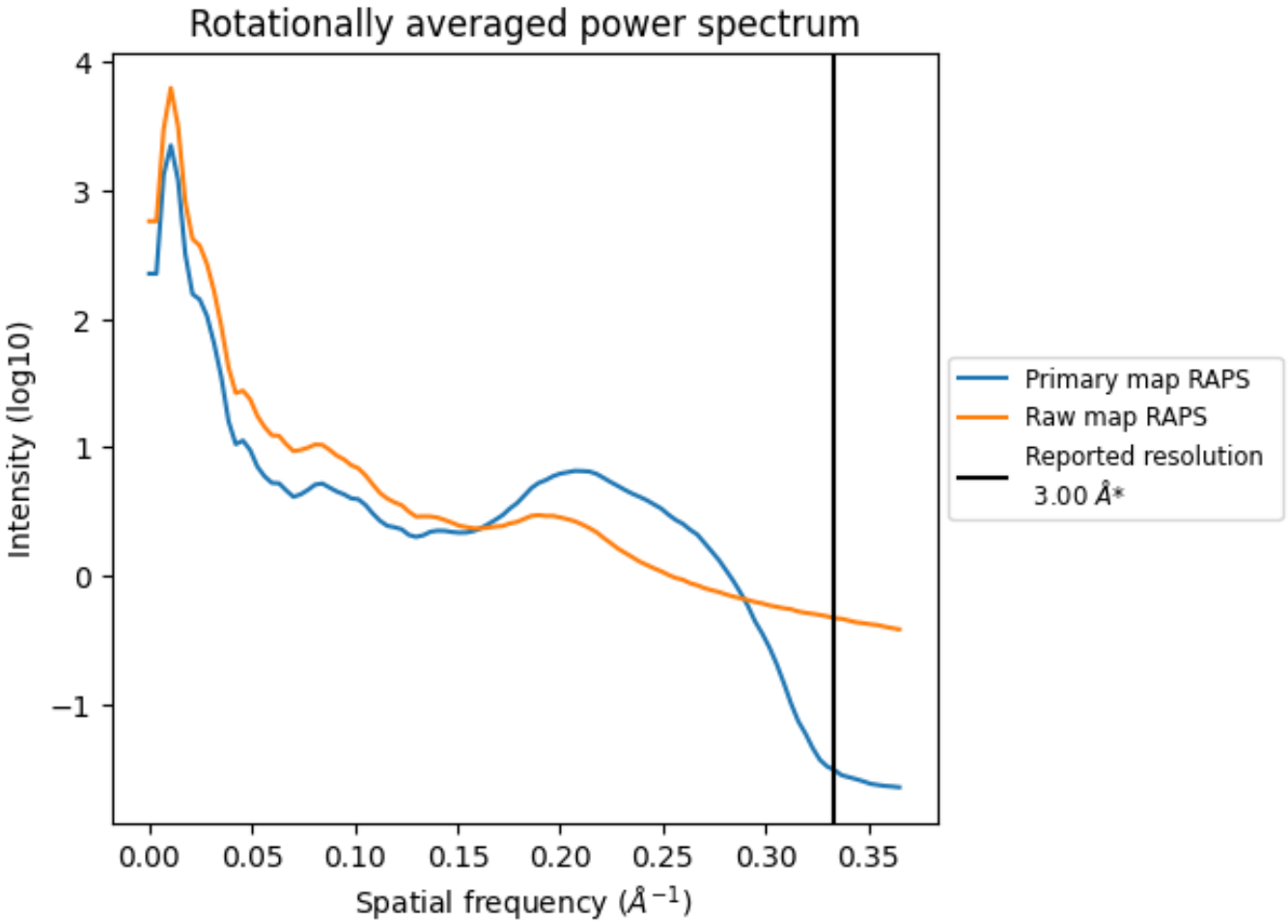
7.2 Volume estimate (i)



The volume at the recommended contour level is 58 nm^3; this corresponds to an approximate mass of 53 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)

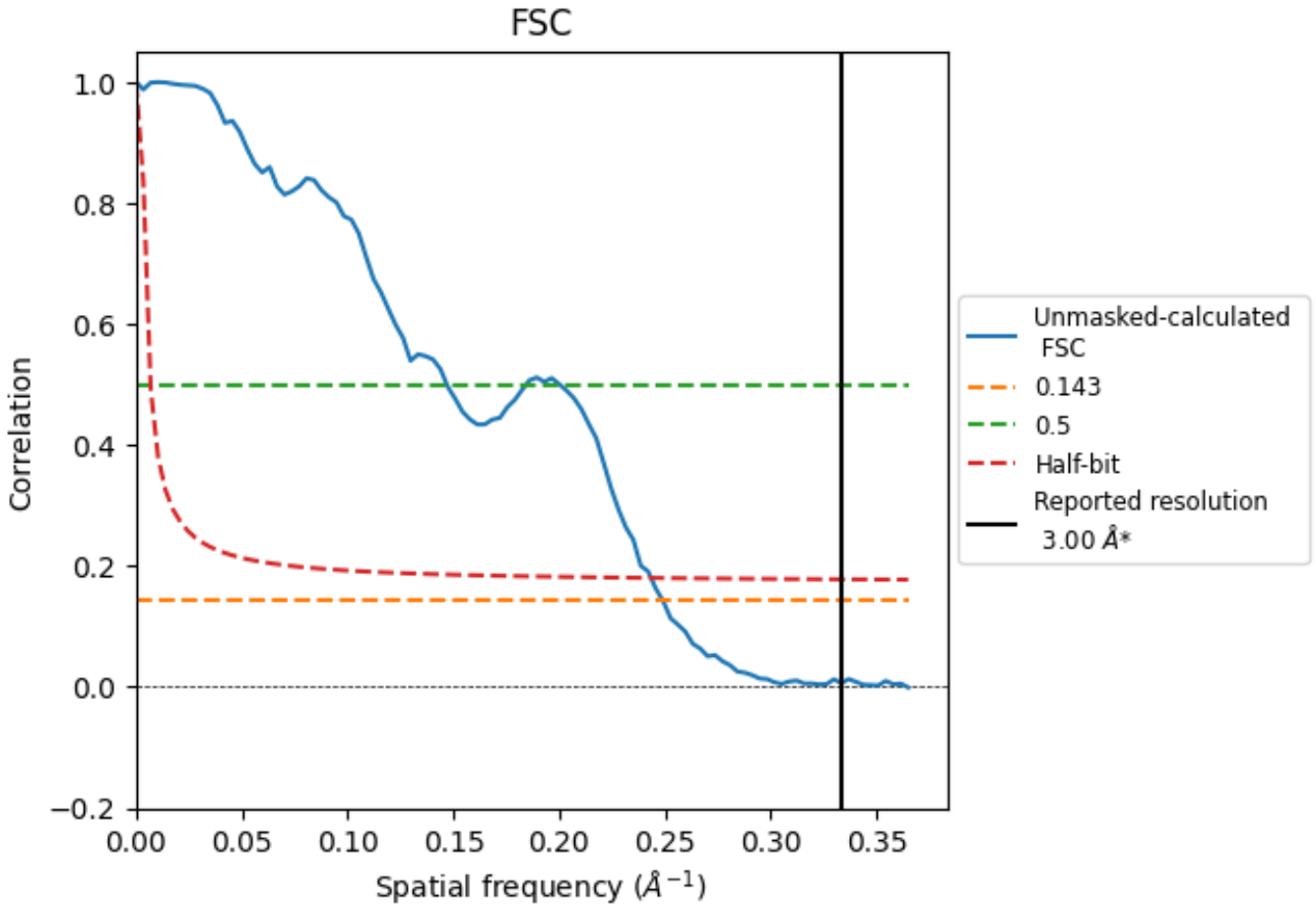


*Reported resolution corresponds to spatial frequency of 0.333 Å^{-1}

8 Fourier-Shell correlation

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



*Reported resolution corresponds to spatial frequency of 0.333 Å^{-1}

8.2 Resolution estimates (i)

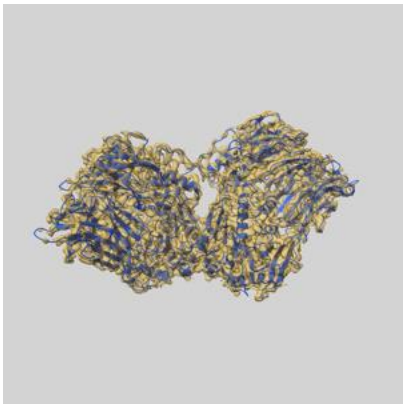
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.00	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	4.02	6.81	4.11

*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 4.02 differs from the reported value 3.0 by more than 10 %

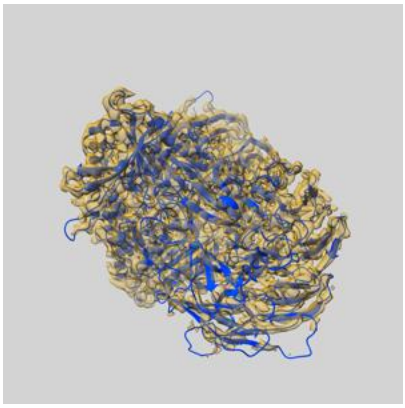
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-75118 and PDB model 10ET. Per-residue inclusion information can be found in section 3 on page 4.

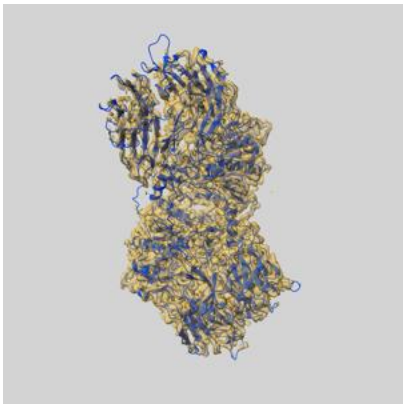
9.1 Map-model overlay



X



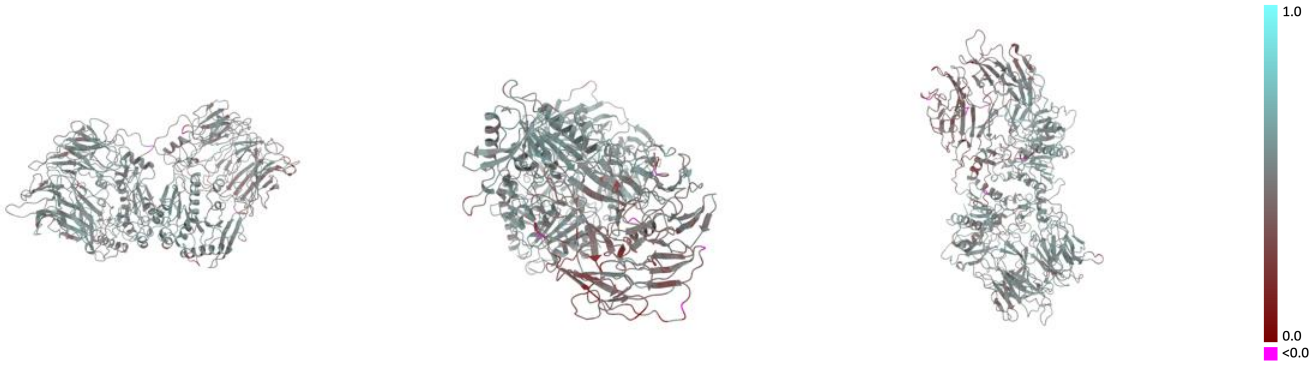
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.1 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.

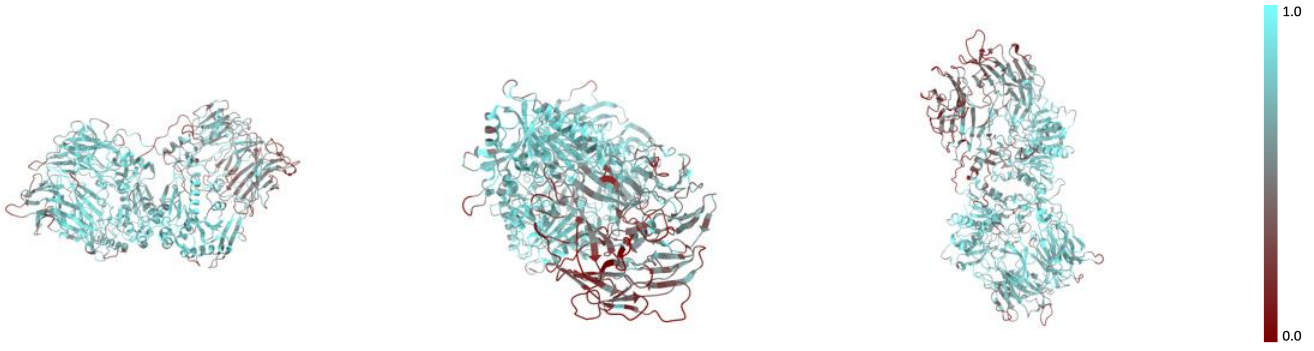
9.2 Q-score mapped to coordinate model



X Y Z

The images above show the model with each residue coloured according 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.

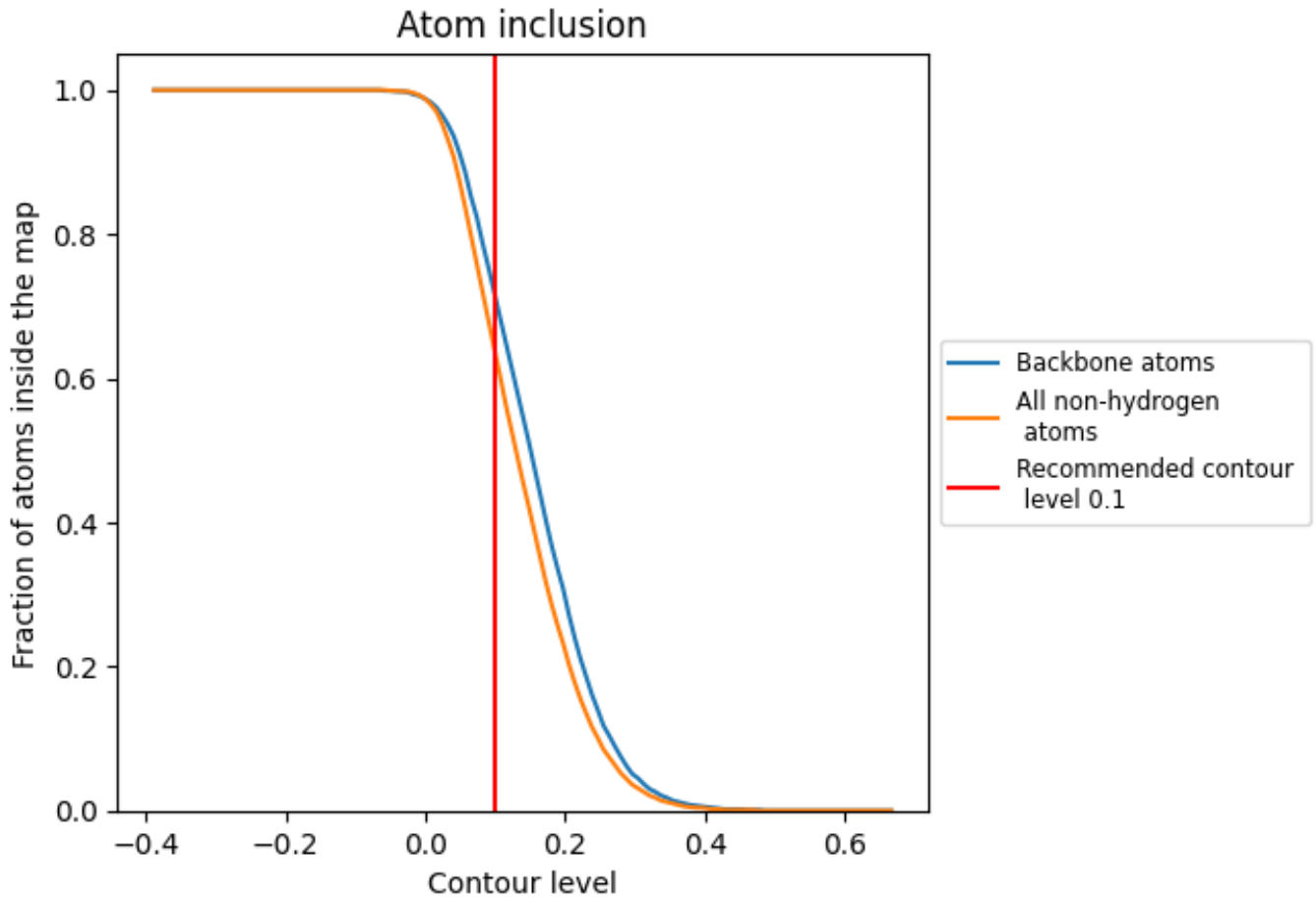
9.3 Atom inclusion mapped to coordinate model



X Y Z

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 (0.1).

9.4 Atom inclusion (i)



At the recommended contour level, 71% of all backbone atoms, 63% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary (i)

The table lists the average atom inclusion at the recommended contour level (0.1) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.6340	0.4870
A	0.5480	0.4590
B	0.7200	0.5140