



## wwPDB EM Validation Summary Report ⓘ

Nov 13, 2022 – 05:52 PM EST

PDB ID : 7JGG  
EMDB ID : EMD-22326  
Title : Cryo-EM structure of *P. falciparum* VAR2CSA NF45 DBL5 and DBL6 domains at 4.88 Å  
Authors : Ma, R.; Tolia, N.H.  
Deposited on : 2020-07-19  
Resolution : 4.88 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](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

---

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

EMDB validation analysis : 0.0.1.dev43  
MolProbity : 4.02b-467  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.9  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.31.2

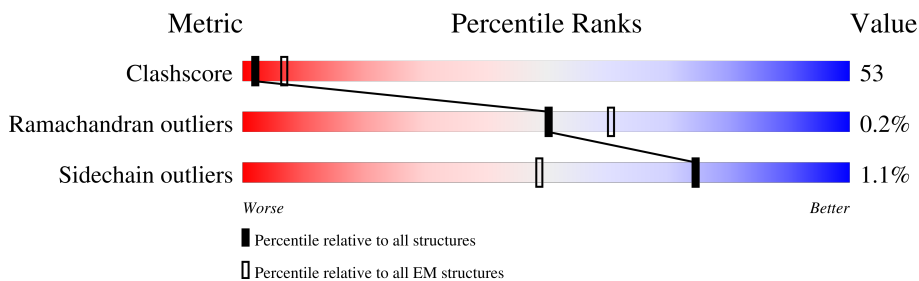
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 4.88 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)
Clashscore	158937	4297
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  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion  $< 40\%$ ). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	2653	

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 4210 atoms, of which 28 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 Erythrocyte membrane protein 1.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
1	A	506	4210	2643	28	713	799	27	0	0

There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	THR	-	expression tag	UNP W7K270
A	0	GLY	-	expression tag	UNP W7K270
A	2643	GLY	-	expression tag	UNP W7K270
A	2644	THR	-	expression tag	UNP W7K270
A	2645	LYS	-	expression tag	UNP W7K270
A	2646	HIS	-	expression tag	UNP W7K270
A	2647	HIS	-	expression tag	UNP W7K270
A	2648	HIS	-	expression tag	UNP W7K270
A	2649	HIS	-	expression tag	UNP W7K270
A	2650	HIS	-	expression tag	UNP W7K270
A	2651	HIS	-	expression tag	UNP W7K270





VAL	K2566	L2499	I2434	P2369	Q2307	A2288	M2106	L2040
LYS	K2567	F2500	I2435	P2370	V2308	I2289	L2107	C2041
ASN	E2568	N2501	K2436	R2371	D2309	K2244	L2108	F2042
CYS	Y2569	N2502	D2439	R2372	I2310	K2245	N2109	S2043
MET	Q2570	D2503	MET	N2373	P2311	Y2246	I2110	R2044
CYS	S2571	D2504	K2441	N2374	E2315	K2247	Q2111	I2045
LYS	L2572	E2505	M2442	L2375	A2315	G2248	F2112	
PRO	N2573	R2510	N2443	F2376	ASP	M2249	K2113	
PRO	Q2575	W2511	N2444	K2378	VAL	G2249	D2114	F2049
PRO	Y2576	N2445	S2445	L2379	ILE	ASP	I2115	A2050
PRO	D2577	E2514	K2448	R2380	ARG	GLU	K2116	N2051
ALA	N2578	W2515	I2449	E2381	LEU	PHE	R2117	N2052
SER	N2579	T2516	I2449	S2382	LYS	ASN	L2118	N2053
ASN	K2580	E2517	G2450	D2383	HIS	THR	D2120	W2054
ASN	K2581	N2518	K2451	I2384	HIS	PHE	R2121	L2055
GLY	F2519	F2519	I2452	C2385	GLU	LYS	K2122	K2056
THR	E2582	C2520	L2453	C2386	TYR	ASN	L2123	E2057
LYS	T2583	T2521	G2454	K2387	ASP	ILE	L2124	F2058
HIS	K2584	K2522	D2455	Y2388	LYS	LYS	E2125	K2059
HIS	A2585	G2456	G2456	K2388	GLY	GLU	K2126	E2060
HIS	E2586	V2457	V2457	R2389	N2330	PRO	E2127	E2061
HIS	K2587	G2458	G2458	L2389	D2331	ASP	N2127	I2062
HIS	K2588	Q2459	Q2459	L2393	Y2332	ALA	N2128	A2066
HIS	E2589	E2528	N2460	F2394	I2333	ASN	N2129	Q2067
HIS	S2590	N2529	N2461	K2395	C2334	GLU	T2130	S2068
	P2591	K2530	E2461	I2398	N2335	PRO	E2131	E2069
	E2592	W2531	K2462	Y2399	K2336	ASN	K2132	E2070
	F2593	T2532	R2463	I2399	Y2337	ALA	W2133	K2071
	F2594	N2535	K2464	I2399	K2338	ASN	D2134	F2072
	K2595	N2536	R2465	L2402	N2339	ASN	D2135	K2073
	D2596	S2536	W2466	I2403	I2340	GLU	W2136	
	K2597	A2537	V2467	E2405	N2341	LEU	W2137	Y2076
	C2598	K2538	D2468	V2406	V2342	LYS	E2138	Y2077
	N2599	CYS	M2469	E2407	ASN	LYS	T2139	N2078
	G2600	ASN	N2470	R2408	MET	HIS	N2140	Y2079
	E2601	THR	K2471	L2409	LYS	CYS	K2141	E2079
	C2602	SER	Y2472	L2410	LYS	SER	K2142	
	L2605	ASN	H2473	K2411	ASN	LYS	I2143	D2082
	S2606	G2544	I2474	V2412	ASN	CYS	S2144	K2083
	E2607	V2545	W2475	Y2413	ASP	PRO	W2145	E2084
THR	PHE	V2546	E2476	G2414	ASP	CYS	E2214	K2085
ASP	GLU	D2547	S2477	E2415	THR	GLY	K2215	A2086
THR	ARG	I2548	M2478	A2416	TRP	PHE	N2217	L2087
ARG	TRP	L2479	L2479	A2417	THR	ASN	C2218	E2088
LYS	ASN	K2483	K2483	K2417	D2354	ASP	K2158	K2089
GLU	LYS	Y2486	Y2486	T2418	L2355	MET	I2159	K2090
THR	THR	G2487	G2487	V2419	V2356	GLN	I2160	K2091
THR	ARG	ASN	ASN	V2420	K2357	GLU	D2161	N2092
LYS	LYS	SER	SER	M2424	N2358	ILE	P2162	S2093
ASN	ASN	GLU	GLU	K2425	S2359	THR	Q2226	F2094
PRO	PRO	ASN	ASN	Y2426	S2360	LYS	E2227	Y2095
TYR	TYR	ASP	ASP	S2427	D2361	TYR	W2164	D2096
GLU	GLU	ASN	ASN	F2428	ILE	TYR	W2228	Y2097
THR	THR	ASN	ASN	F2429	LYS	ASN	T2166	E2098
THR	THR	ARG	ARG	D2430	G2365	GLU	I2167	Y2099
LEU	LEU	LYS	LYS	I2431	L2367	THR	P2168	I2100
ASP	ASP	MET	MET	G2432	L2367	TYR	K2231	I2101
THR	THR	D2497	D2497	S2433	L2368		R2232	K2102
GLU	GLU	D2498	D2498	S2433	L2368		W2286	G2103
							E2237	S2104
							T2172	P2174
							P2173	

## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	157702	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	57	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	29.549	Depositor
Minimum map value	-4.473	Depositor
Average map value	0.000	Depositor
Map value standard deviation	1.000	Depositor
Recommended contour level	5.0	Depositor
Map size (Å)	317.4, 317.4, 317.4	wwPDB
Map dimensions	300, 300, 300	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.058, 1.058, 1.058	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	0.24	0/4264	0.38	1/5710 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	A	2040	LEU	CB-CG-CD1	5.92	121.06	111.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	2039	GLN	Peptide

### 5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4182	28	4095	440	0

*Continued on next page...*



Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	4182	28	4095	440	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 53.

The worst 5 of 440 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:A:2548:LYS:HE3	1:A:2550:GLU:HB3	1.38	1.04
1:A:2244:LYS:HG2	1:A:2247:LYS:HE2	1.37	1.03
1:A:2198:VAL:HG21	1:A:2222:ILE:HD13	1.42	1.01
1:A:2369:PRO:HG2	1:A:2372:ARG:HB3	1.44	0.98
1:A:2407:GLU:HA	1:A:2410:LYS:HZ3	1.27	0.98

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	490/2653 (18%)	473 (96%)	16 (3%)	1 (0%)	47 81

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	2040	LEU

### 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	461/2419 (19%)	456 (99%)	5 (1%)	73 85

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2191	LYS
1	A	2336	LYS
1	A	2372	ARG
1	A	2419	LYS
1	A	2465	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	2140	ASN
1	A	2175	GLN
1	A	2374	ASN
1	A	2459	GLN
1	A	2506	HIS

### 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.

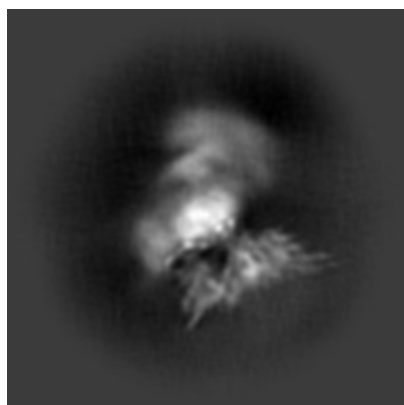
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-22326. These allow visual inspection of the internal detail of the map and identification of artifacts.

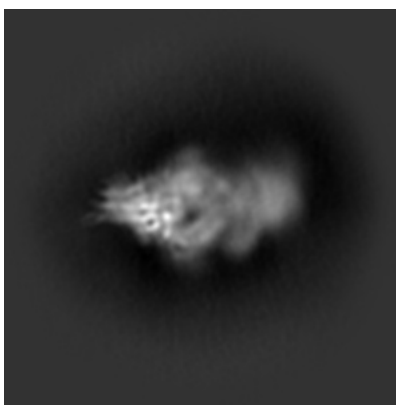
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

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

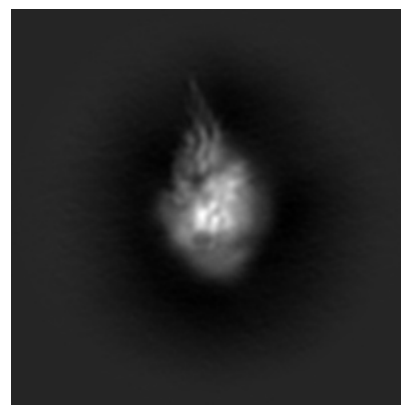
#### 6.1.1 Primary map



X



Y

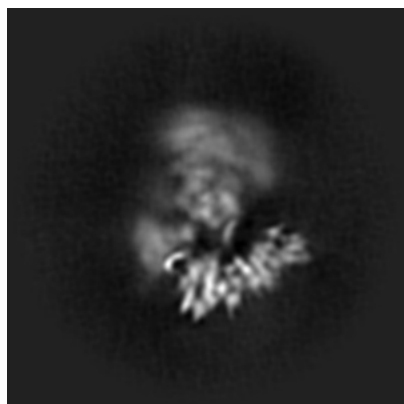


Z

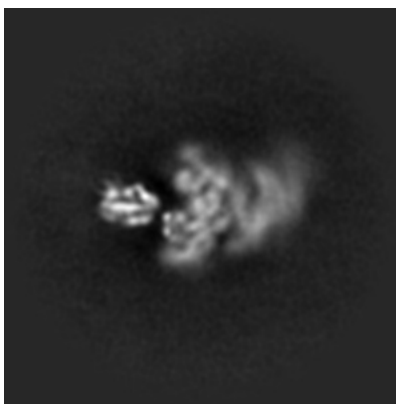
The images above show the map projected in three orthogonal directions.

### 6.2 Central slices [i](#)

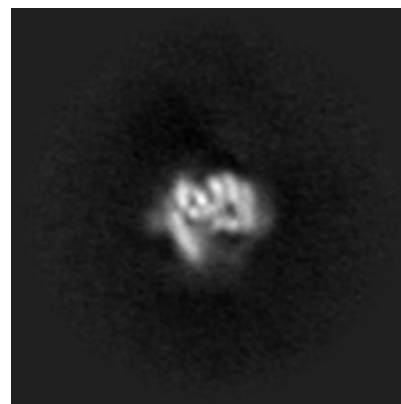
#### 6.2.1 Primary map



X Index: 150



Y Index: 150

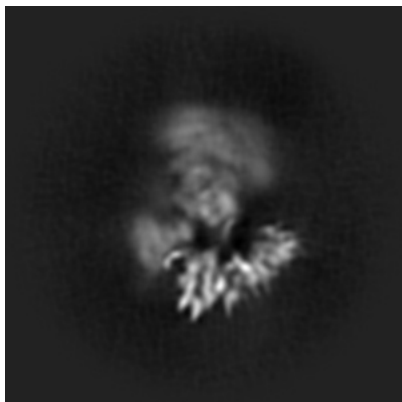


Z Index: 150

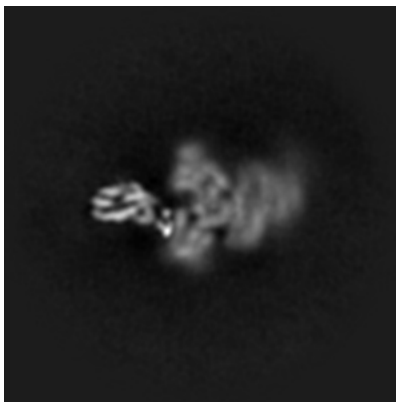
The images above show central slices of the map in three orthogonal directions.

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

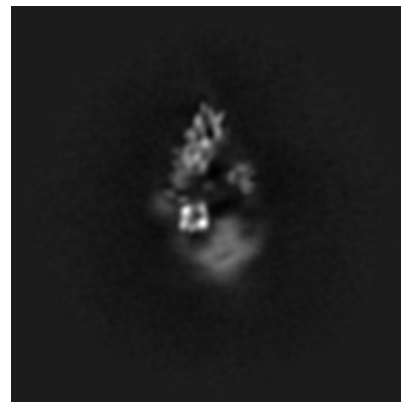
### 6.3.1 Primary map



X Index: 152



Y Index: 144

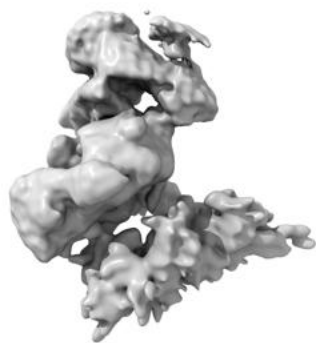


Z Index: 122

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

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

### 6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 5.0. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

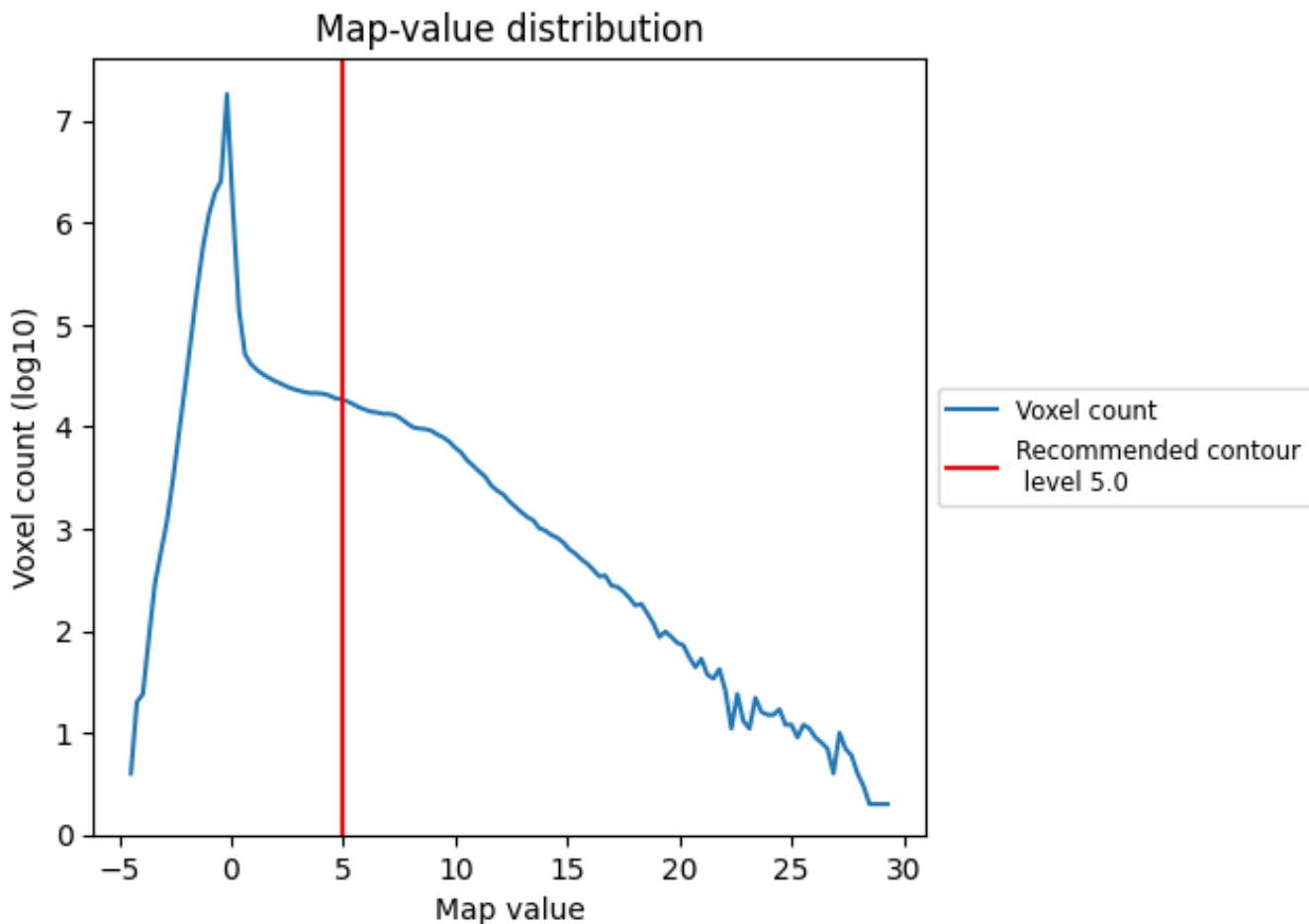
## 6.5 Mask visualisation

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

## 7 Map analysis [i](#)

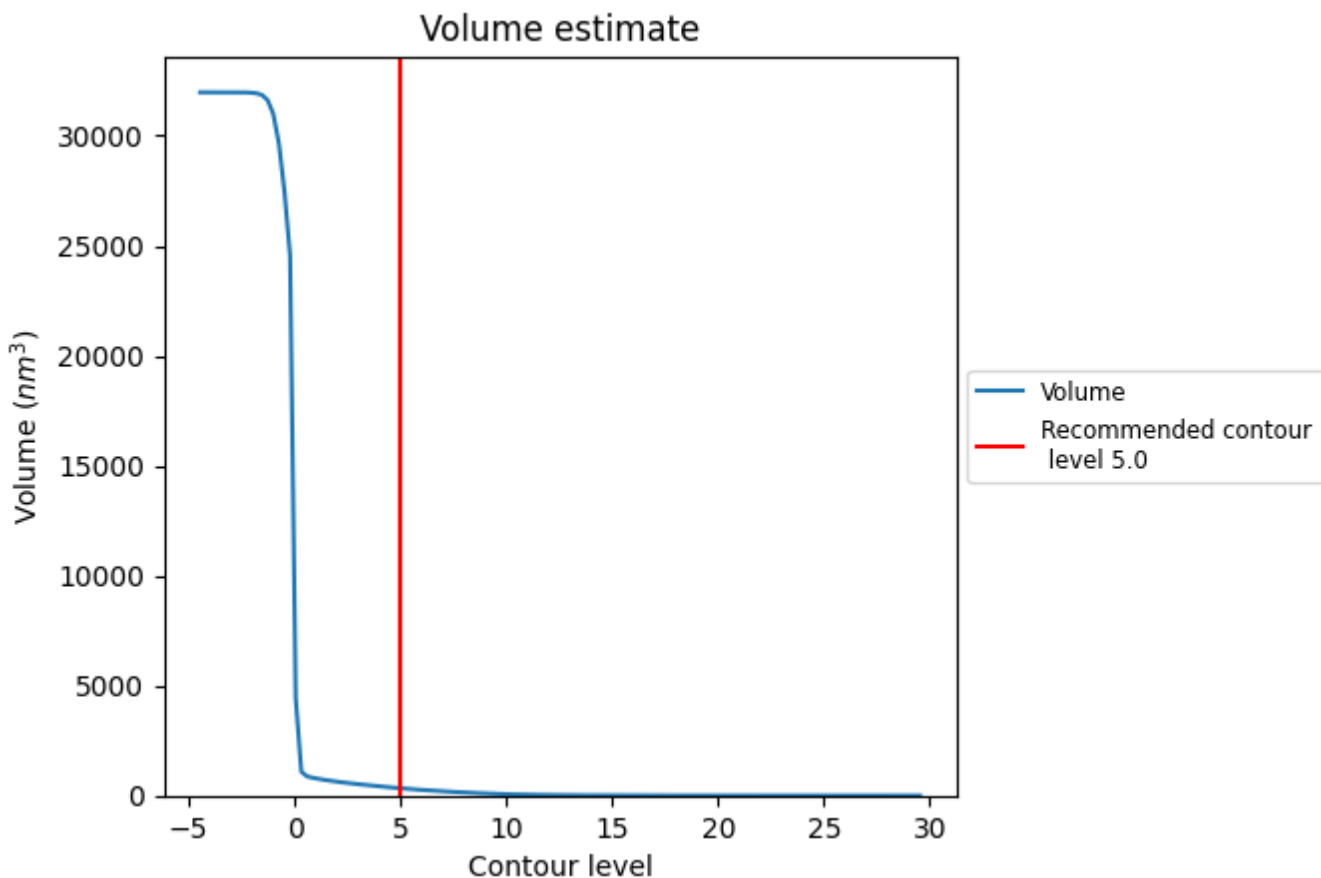
This section contains the results of statistical analysis of the map.

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



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

## 7.2 Volume estimate [i](#)

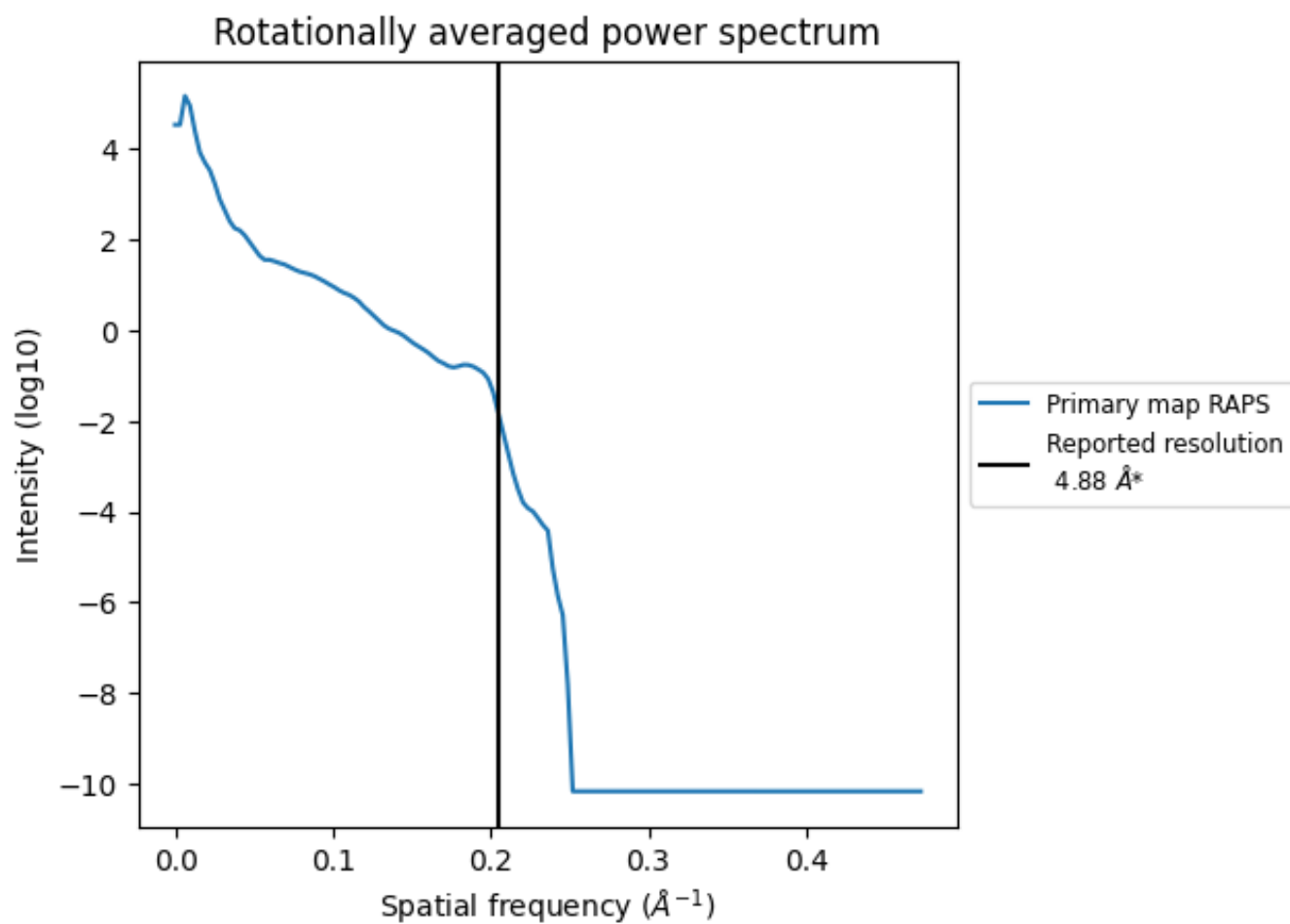


The volume at the recommended contour level is 332 nm<sup>3</sup>; this corresponds to an approximate mass of 300 kDa.

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 0.205 Å<sup>-1</sup>

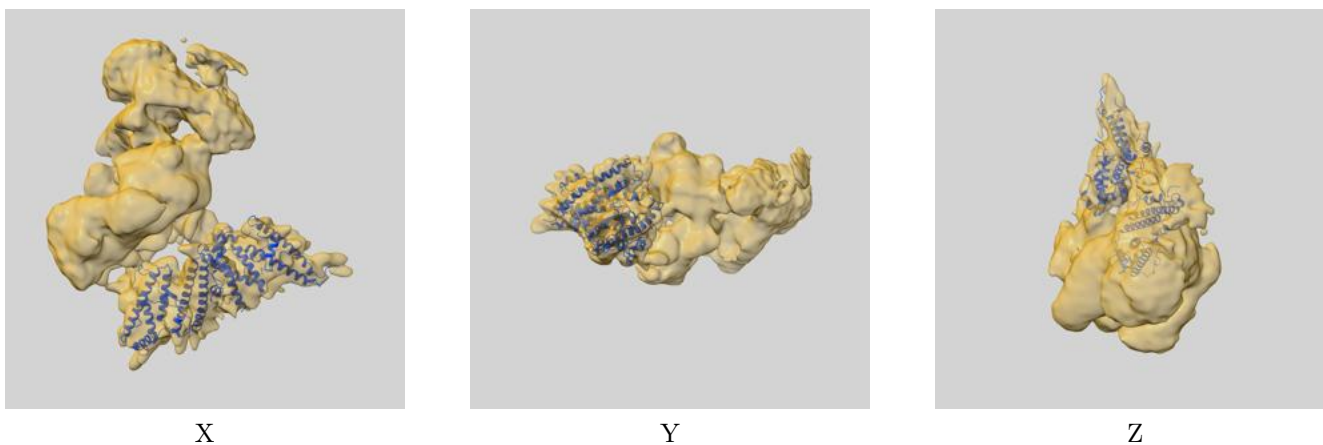
## 8 Fourier-Shell correlation

This section was not generated. No FSC curve or half-maps provided.

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

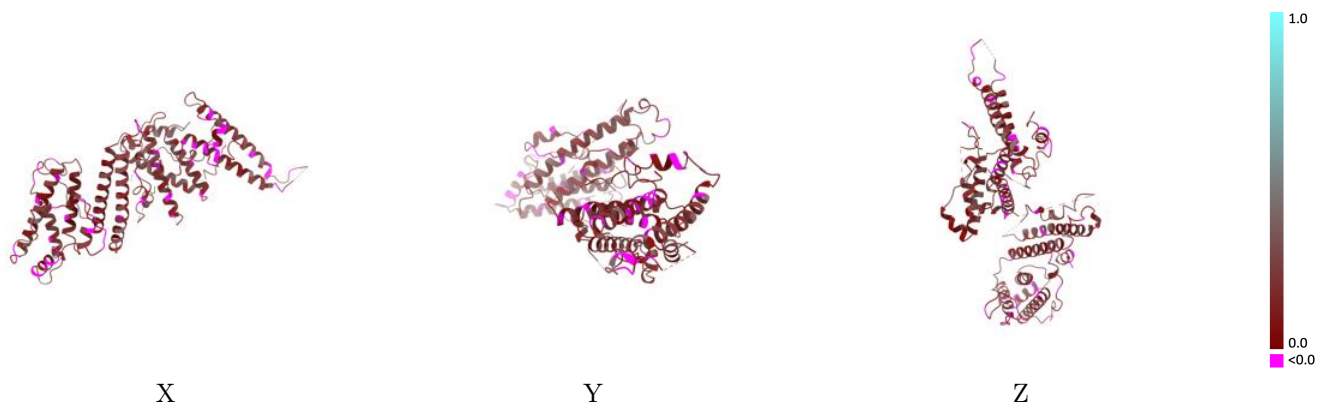
This section contains information regarding the fit between EMDB map EMD-22326 and PDB model 7JGG. Per-residue inclusion information can be found in section 3 on page 4.

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



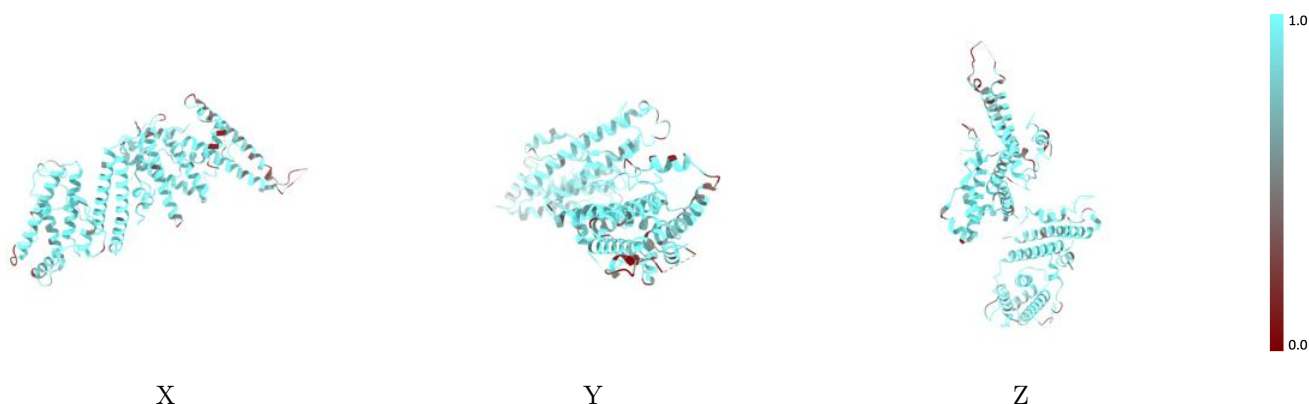
The images above show the 3D surface view of the map at the recommended contour level 5.0 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



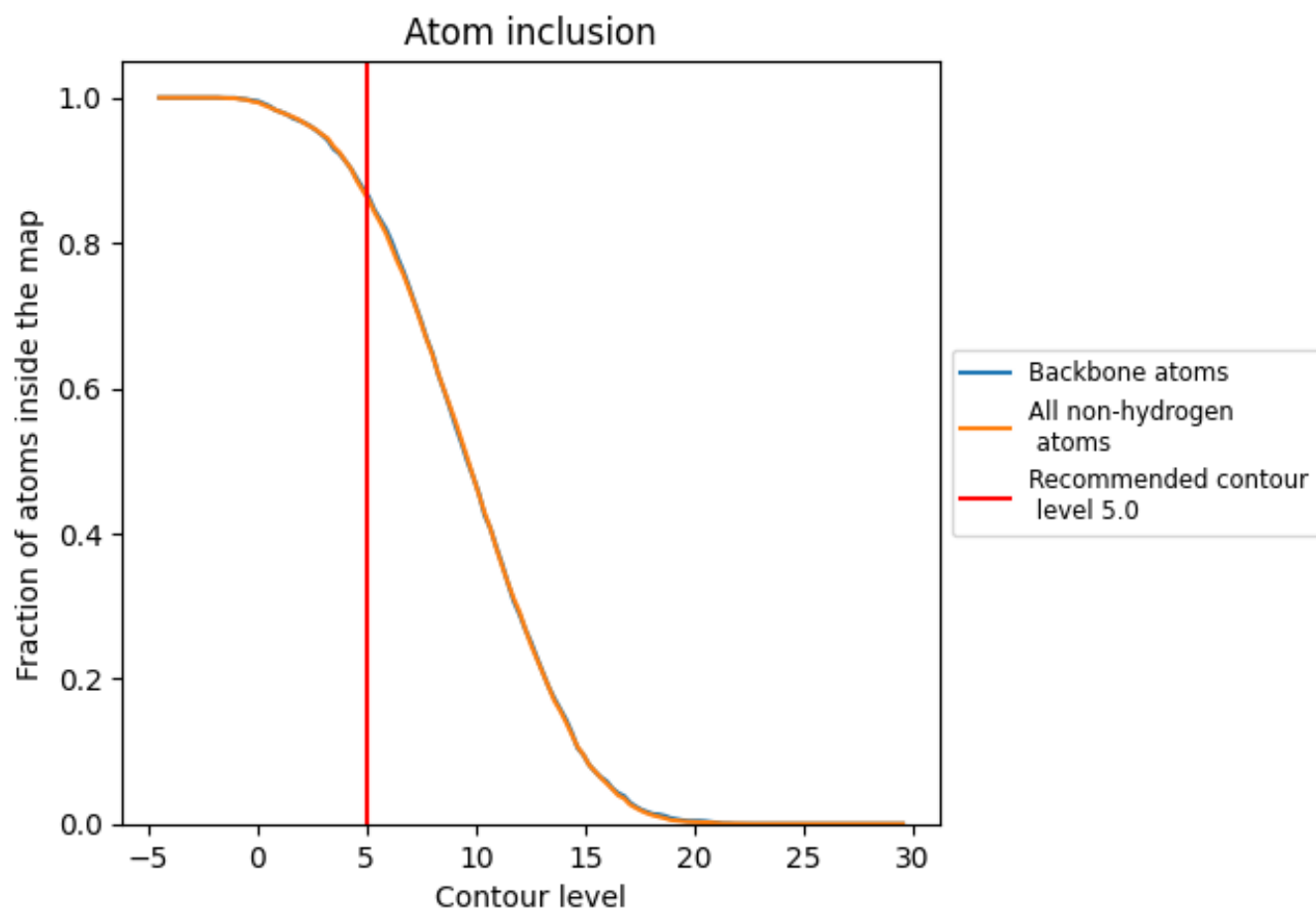
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (5.0).





## 9.4 Atom inclusion [i](#)



At the recommended contour level, 87% of all backbone atoms, 86% 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 (5.0) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8638	 0.1540
A	 0.8660	 0.1540

