wwPDB EM Validation Summary Report ⓘ

Nov 13, 2022 – 05:42 PM EST

PDB ID	:	7JGF
EMDB ID	:	EMD-22325
Title	:	Cryo-EM structure of P. falciparum VAR2CSA FCR3 domains DBL5 and DBL6 at 4.69 A
Authors	:	Ma, R.; Tolia, N.H.
Deposited on	:	2020-07-19
Resolution	:	4.69 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:

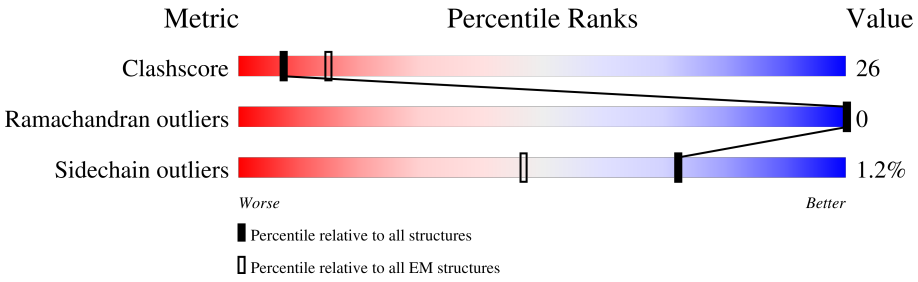
EMDB validation analysis	:	0.0.1.dev43
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	1.9.9
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.31.2

1 Overall quality at a glance (i)

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

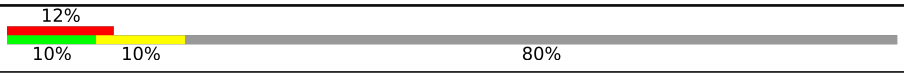
The reported resolution of this entry is 4.69 Å.

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)
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 >=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	2660	

2 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 4477 atoms, of which 30 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	532	4477	2808	30	770	839	30	4	0

There are 11 discrepancies between the modelled and reference sequences:

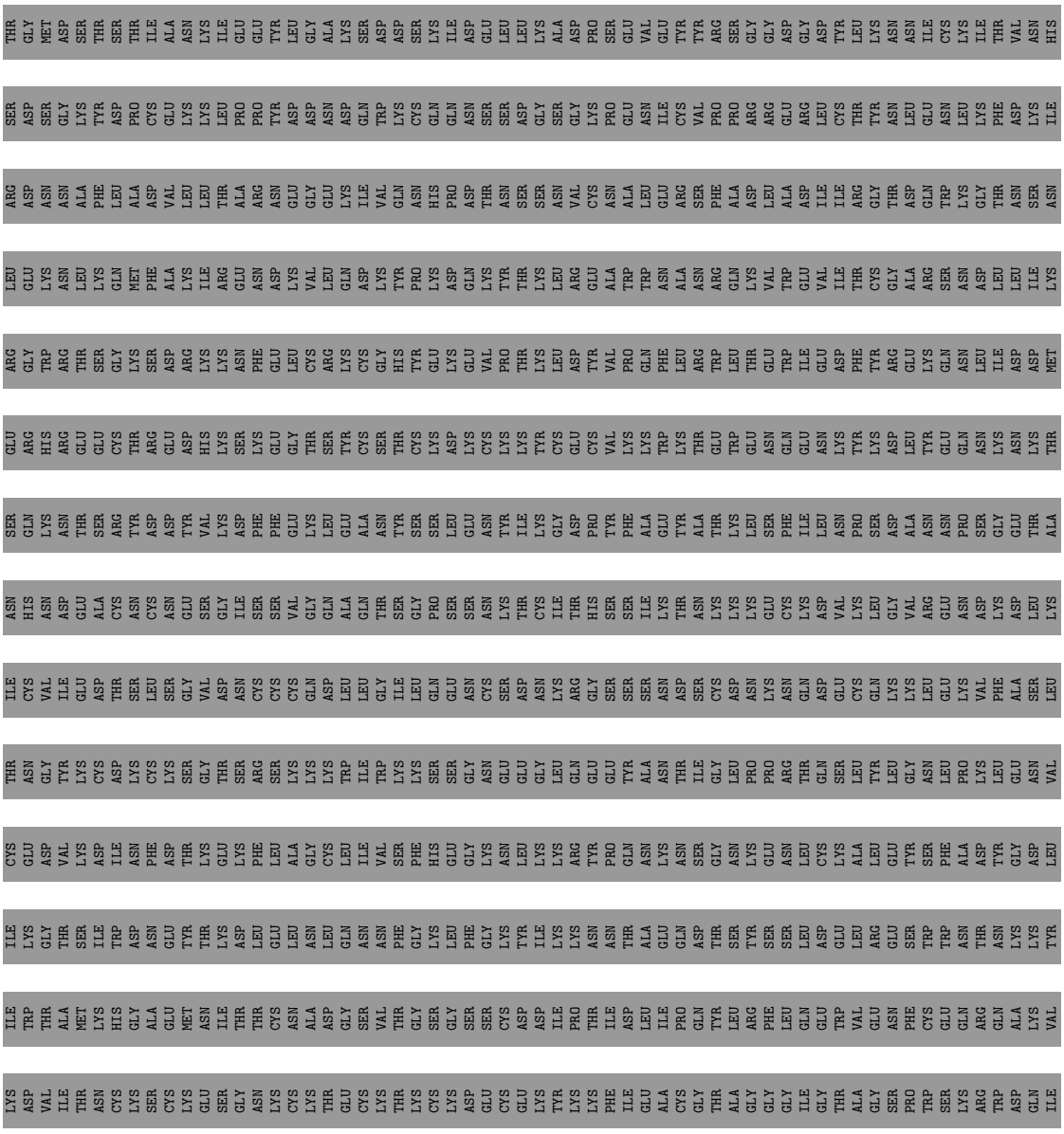
Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	THR	-	expression tag	UNP Q6UDW7
A	0	GLY	-	expression tag	UNP Q6UDW7
A	2650	GLY	-	expression tag	UNP Q6UDW7
A	2651	THR	-	expression tag	UNP Q6UDW7
A	2652	LYS	-	expression tag	UNP Q6UDW7
A	2653	HIS	-	expression tag	UNP Q6UDW7
A	2654	HIS	-	expression tag	UNP Q6UDW7
A	2655	HIS	-	expression tag	UNP Q6UDW7
A	2656	HIS	-	expression tag	UNP Q6UDW7
A	2657	HIS	-	expression tag	UNP Q6UDW7
A	2658	HIS	-	expression tag	UNP Q6UDW7

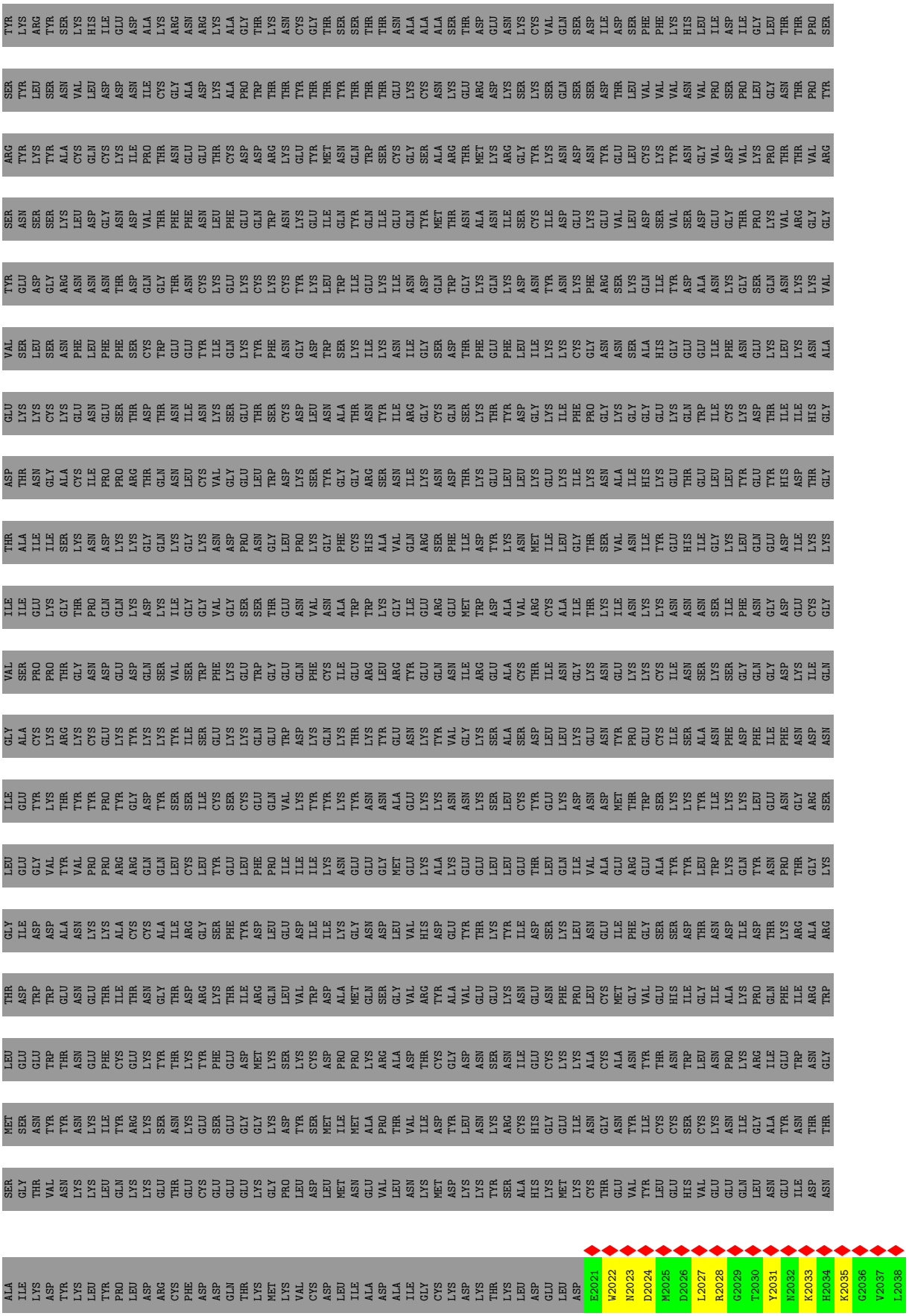
3 Residue-property plots (i)

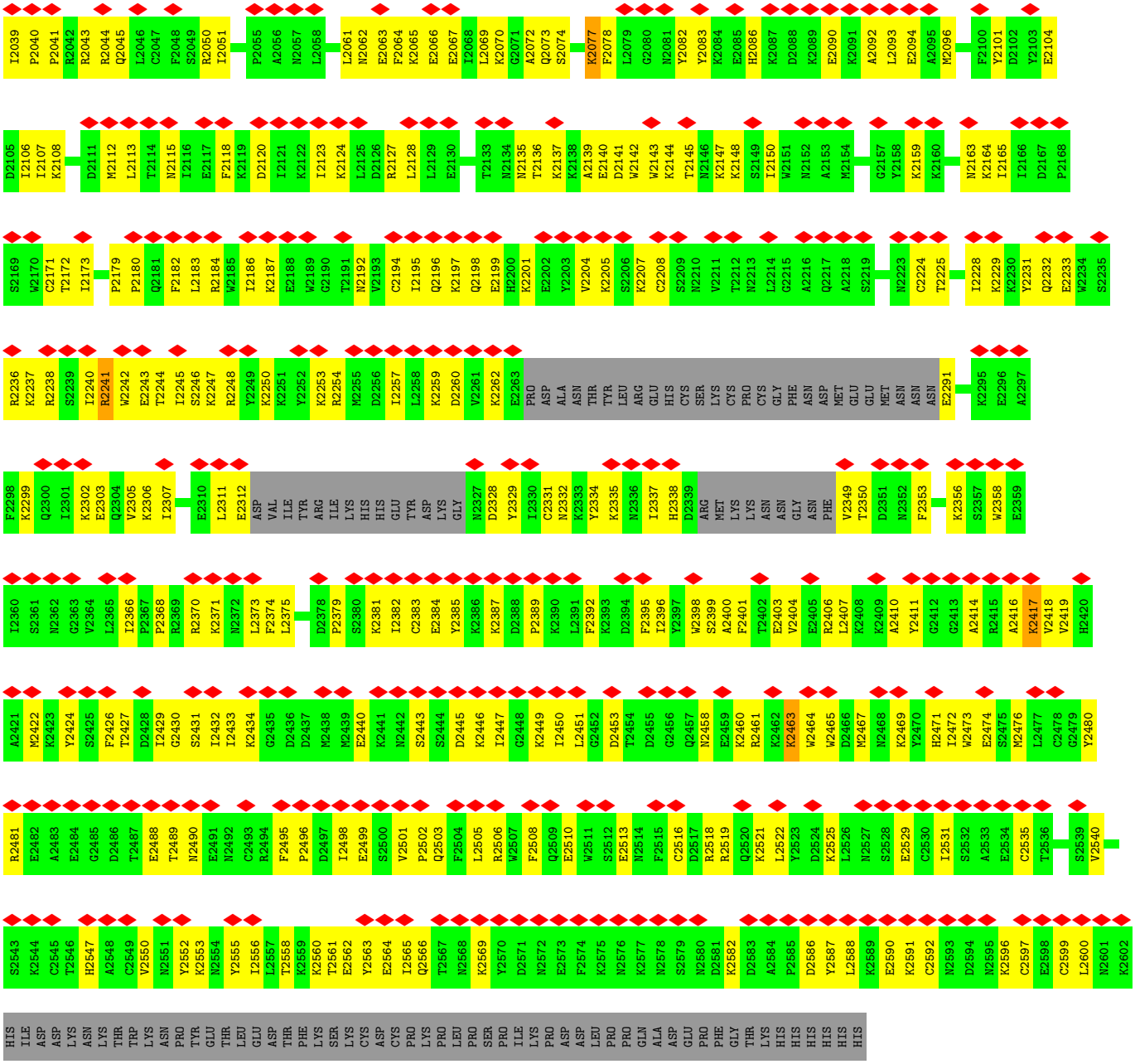
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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: Erythrocyte membrane protein 1

Chain A:




E2021
W2022
N2023
D2024
M2026
D2026
L2027
R2028
G2029
T2030
Y2031
N2032
K2033
H2034
K2035
G2036
V2037
L2038


I2039 P2040 P2041 R2042 R2043 R2044 Q2045 L2046 C2047 F2048 S2049 R2050 I2051 P2055 A2056 N2057 L2058 L2061 N2062 E2063 F2064 K2065 E2066 E2067 I2068 L2069 K2070 G2071 A2072 Q2073 S2074 K2077 F2078 L2079 G2080 N2081 Y2082 Y2083 K2084 E2085 H2086 K2087 D2088 K2089 E2090 K2091 A2092 L2093 E2094 A2095 M2096 F2100 Y2101 D2102 Y2103 E2104
D2105 I2106 I2107 K2108 D2111 M2112 L2113 T2114 N2115 I2116 E2117 F2118 K2119 D2120 I2121 K2122 I2123 K2124 L2125 D2126 R2127 L2128 L2129 E2130 T2133 N2134 N2135 T2136 K2137 K2138 A2139 E2140 D2141 W2142 W2143 K2144 T2145 N2146 K2147 K2148 S2149 I2150 W2151 N2152 A2153 M2154 G2157 Y2158 K2159 K2160 N2163 K2164 I2165 I2166 D2167 P2168
S2169 W2170 C2171 T2172 I2173 P2179 P2180 Q2181 F2182 L2183 R2184 W2185 I2186 K2187 E2188 W2189 G2190 T2191 N2192 Y2193 C2194 I2195 Q2196 K2197 Q2198 E2199 H2200 K2201 E2202 Y2203 V2204 K2205 S2206 K2207 C2208 S2209 N2210 V2211 T2212 N2213 L2214 G2215 A2216 Q2217 A2218 S2219 N2223 C2224 T2225 I2228 K2229 K2230 Y2231 Q2232 E2233 W2234 S2235
R2236 K2237 R2238 S2239 I2240 R2241 W2242 E2243 T2244 I2245 S2246 K2247 R2248 Y2249 K2250 K2251 Y2252 K2253 R2254 M2255 D2256 I2257 L2258 K2259 D2260 V2261 K2262 E2263 PRO ASP ALA ASN THR TYR LEU ARG GLU HIS CYS SER LYS CYS PRO CYS GLY PHE ASN ASP MET GLU GLU MET ASN ASN ASN E2291 K2295 E2296 A2297
F2298 K2299 Q2300 I2301 K2302 E2303 Q2304 V2305 K2306 I2307 E2310 L2311 E2312 ASP VAL ILE TYR ARG ILE LYS HIS HIS GLU TYR ASP LYS GLY N2327 D2328 Y2329 I2330 C2331 N2332 K2333 Y2334 K2335 N2336 I2337 H2338 D2339 ARG MET LYS LYS ASN ASN GLY ASN PHE V2349 T2350 D2351 N2352 F2353 K2356 S2357 W2358 E2359
I2360 S2361 N2362 G2363 V2364 L2365 I2366 P2367 P2368 R2369 R2370 K2371 N2372 L2373 F2374 L2375 D2378 P2379 S2380 K2381 I2382 C2383 E2384 Y2385 K2386 K2387 D2388 P2389 K2390 L2391 F2392 K2393 D2394 F2395 I2396 Y2397 W2398 S2399 A2400 F2401 T2402 E2403 V2404 E2405 R2406 L2407 K2408 K2409 A2410 Y2411 G2412 G2413 A2414 R2415 A2416 K2417 V2418 V2419 H2420
A2421 M2422 K2423 Y2424 S2425 F2426 T2427 D2428 I2429 G2430 S2431 I2432 I2433 K2434 G2435 D2436 D2437 M2438 M2439 E2440 K2441 N2442 S2443 S2444 D2445 K2446 I2447 G2448 K2449 I2450 L2451 G2452 D2453 T2454 D2455 G2456 Q2457 N2458 E2459 K2460 R2461 K2462 K2463 W2464 W2465 D2466 M2467 N2468 K2469 Y2470 H2471 I2472 W2473 E2474 S2475 M2476 L2477 C2478 G2479 Y2480
R2481 E2482 A2483 E2484 G2485 D2486 T2487 E2488 T2489 N2490 E2491 N2492 C2493 R2494 F2495 P2496 D2497 I2498 E2499 S2500 V2501 P2502 Q2503 F2504 L2505 R2506 W2507 F2508 Q2509 E2510 W2511 S2512 E2513 N2514 F2515 C2516 D2517 R2518 R2519 Q2520 K2521 L2522 Y2523 D2524 K2525 L2526 N2527 S2528 E2529 C2530 I2531 S2532 A2533 E2534 C2535 T2536 S2539 V2540
S2543 K2544 C2545 T2546 H2547 A2548 C2549 V2550 N2551 Y2552 K2553 W2554 Y2555 I2556 L2557 T2558 K2559 K2560 T2561 E2562 Y2563 E2564 I2565 Q2566 T2567 N2568 K2569 Y2570 D2571 N2572 E2573 F2574 K2575 N2576 K2577 N2578 S2579 N2580 D2581 K2582 D2583 A2584 P2585 D2586 Y2587 L2588 K2589 E2590 K2591 C2592 N2593 D2594 N2595 K2596 C2597 E2598 C2599 L2600 N2601 K2602
HIS ILE ASP ASP LYS ASN LYS THR TRP LYS ASN PRO TYR GLU THR LEU GLU ASP THR PHE LYS SER LYS CYS ASP CYS PRO LYS PRO LEU PRO SER PRO ILE LYS PRO ASP ASP LEU PRO PRO GLN ALA ASP GLU PRO PHE GLY THR LYS HIS HIS HIS HIS HIS HIS

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	271442	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 ($e^-/Å^2$)	71.2	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	49.984	Depositor
Minimum map value	-20.013	Depositor
Average map value	0.000	Depositor
Map value standard deviation	1.000	Depositor
Recommended contour level	6.73	Depositor
Map size (Å)	270.848, 270.848, 270.848	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.058, 1.058, 1.058	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	0.25	0/4564	0.43	0/6120

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	4447	30	4371	230	0
All	All	4447	30	4371	230	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 26.

The worst 5 of 230 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:2072:ALA:HB1	1:A:2150:ILE:HD12	1.41	1.01
1:A:2373:LEU:HD22	1:A:2432:ILE:HD13	1.51	0.92
1:A:2165:ILE:HG13	1:A:2173:ILE:HG22	1.49	0.92
1:A:2502:PRO:HD2	1:A:2505:LEU:HD22	1.53	0.91
1:A:2233:GLU:HG3	1:A:2237:LYS:HE2	1.55	0.88

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	529/2660 (20%)	505 (96%)	24 (4%)	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	493/2412 (20%)	486 (99%)	7 (1%)	67 81

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2417	LYS
1	A	2463	LYS
1	A	2518[B]	ARG
1	A	2518[A]	ARG
1	A	2370	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	2135	ASN

5.3.3 RNA

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates

There are no monosaccharides in this entry.

5.6 Ligand geometry

There are no ligands in this entry.

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

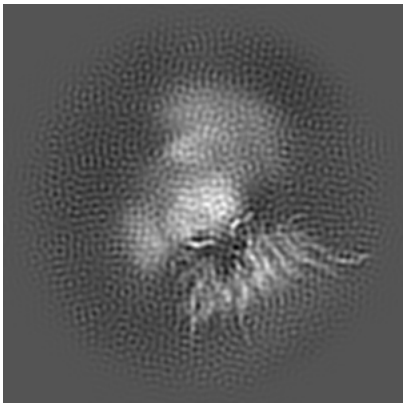
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-22325. These allow visual inspection of the internal detail of the map and identification of artifacts.

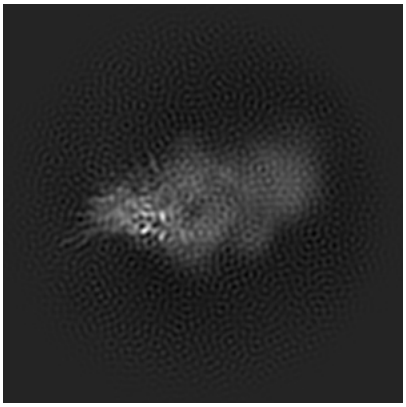
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections

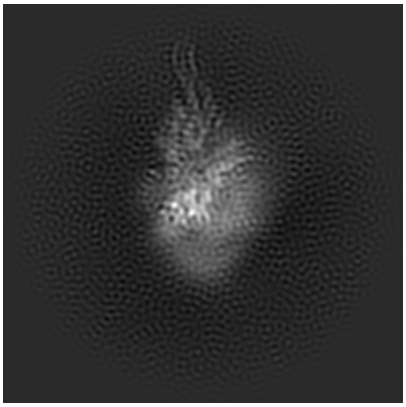
6.1.1 Primary map



X



Y

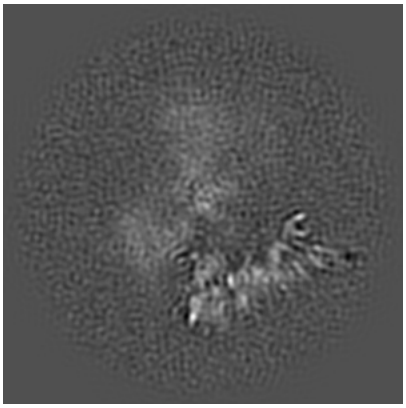


Z

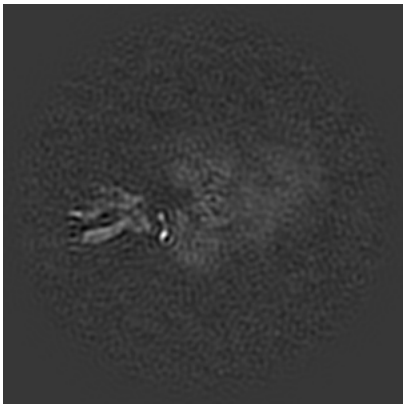
The images above show the map projected in three orthogonal directions.

6.2 Central slices

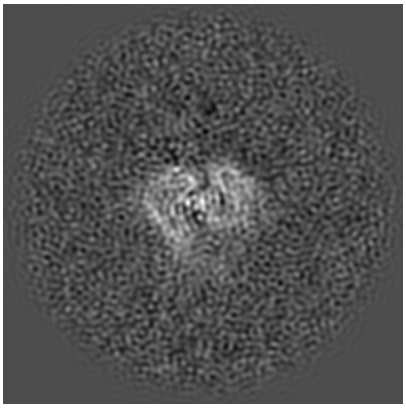
6.2.1 Primary map



X Index: 128



Y Index: 128

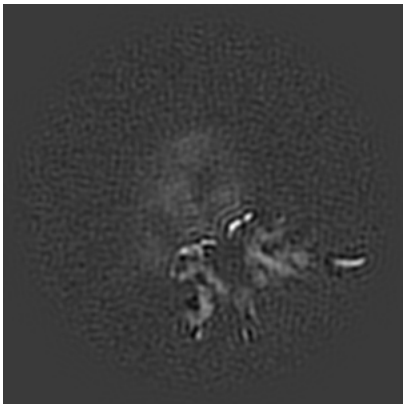


Z Index: 128

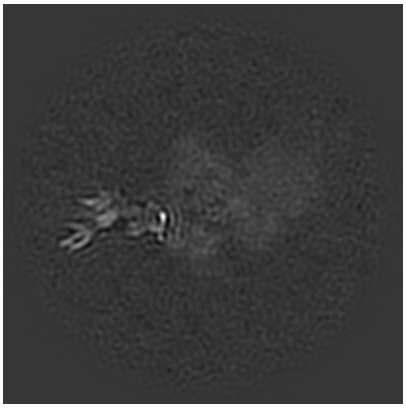
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

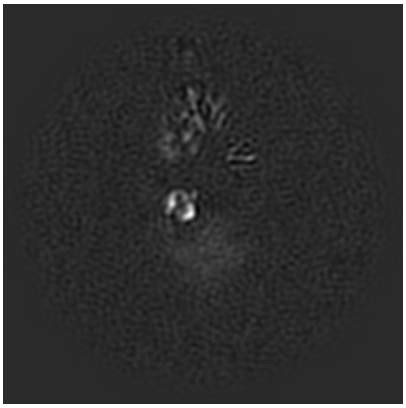
6.3.1 Primary map



X Index: 110



Y Index: 121



Z Index: 102

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 6.73. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

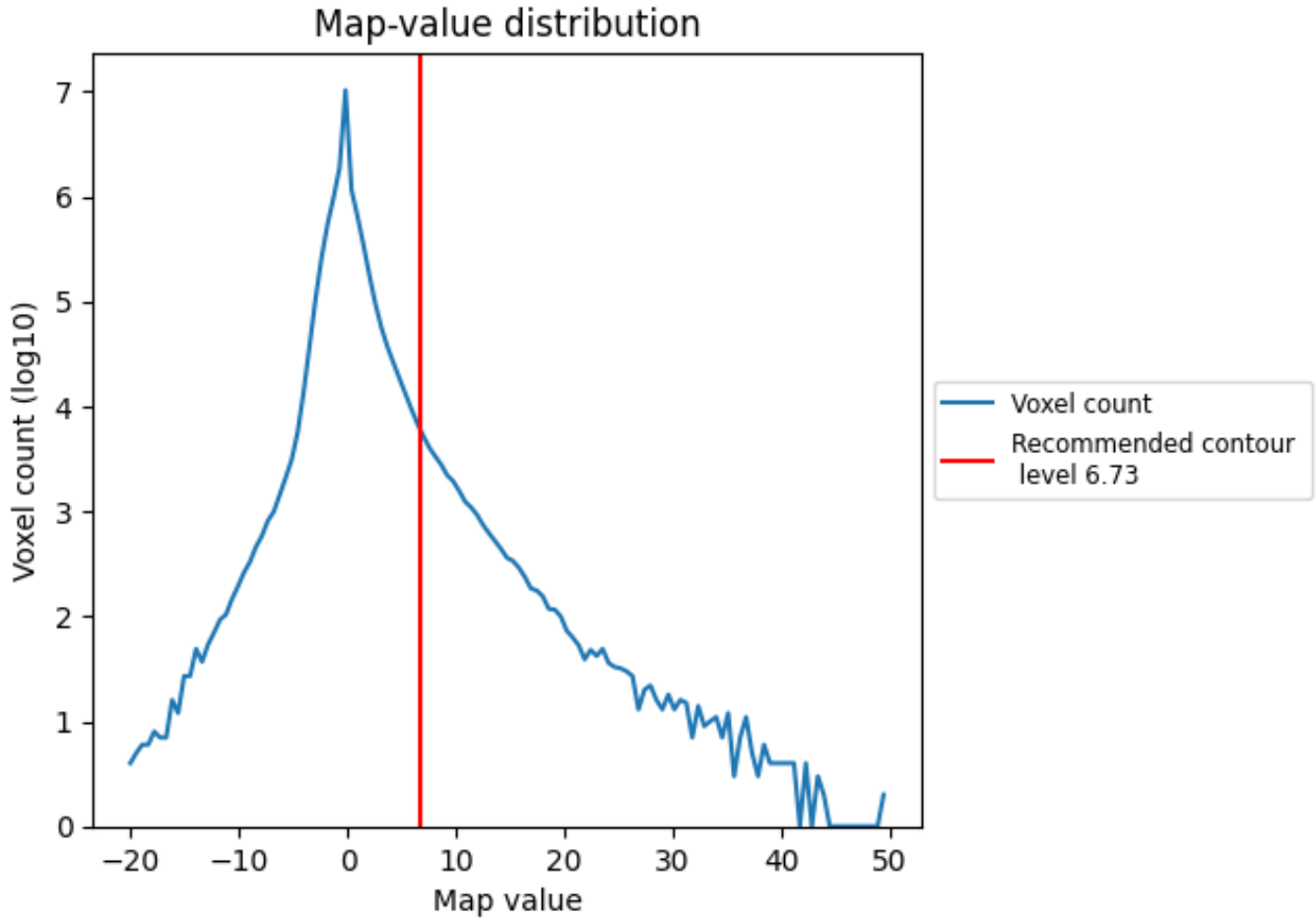
6.5 Mask visualisation (i)

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

7 Map analysis

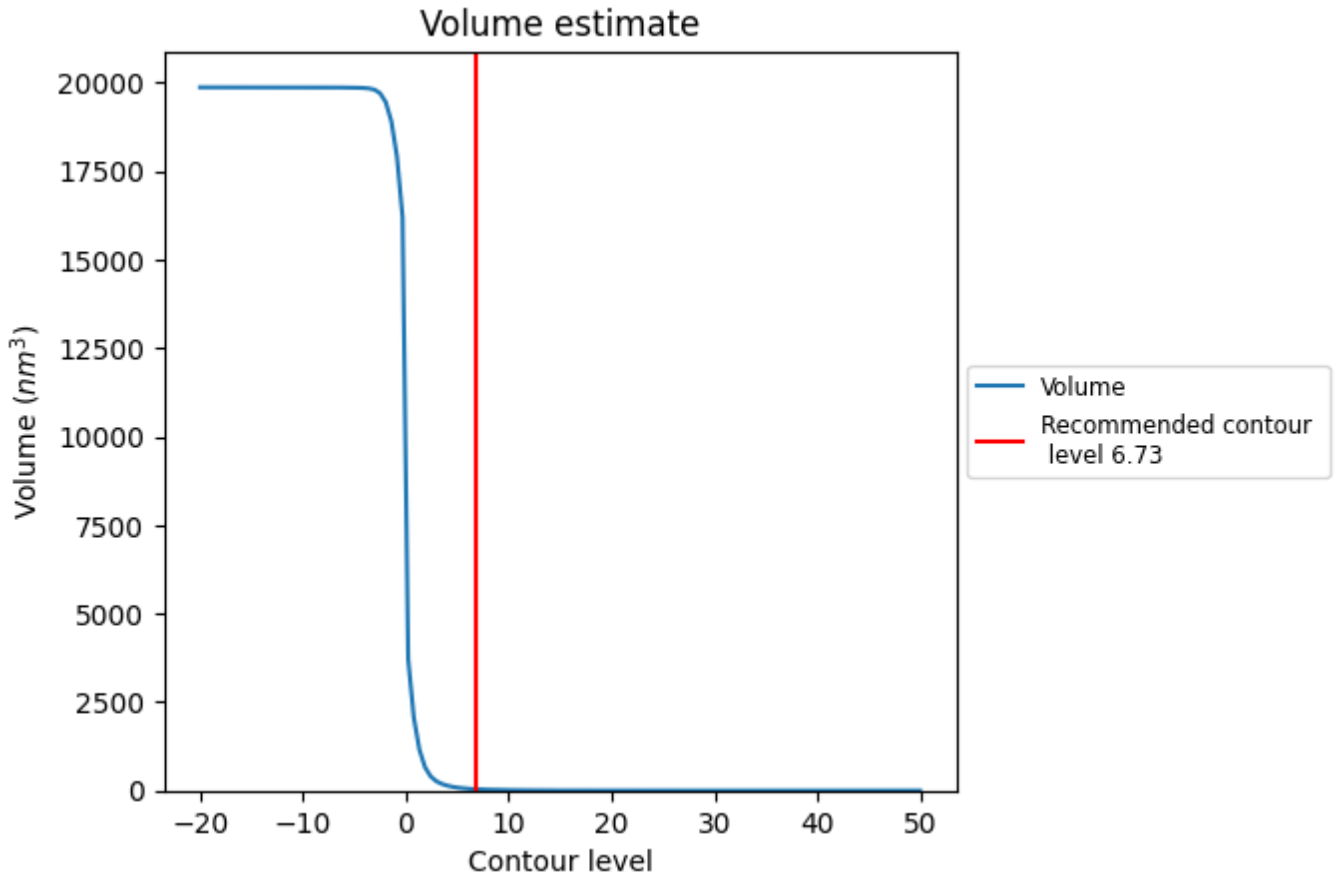
This section contains the results of statistical analysis of the map.

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.

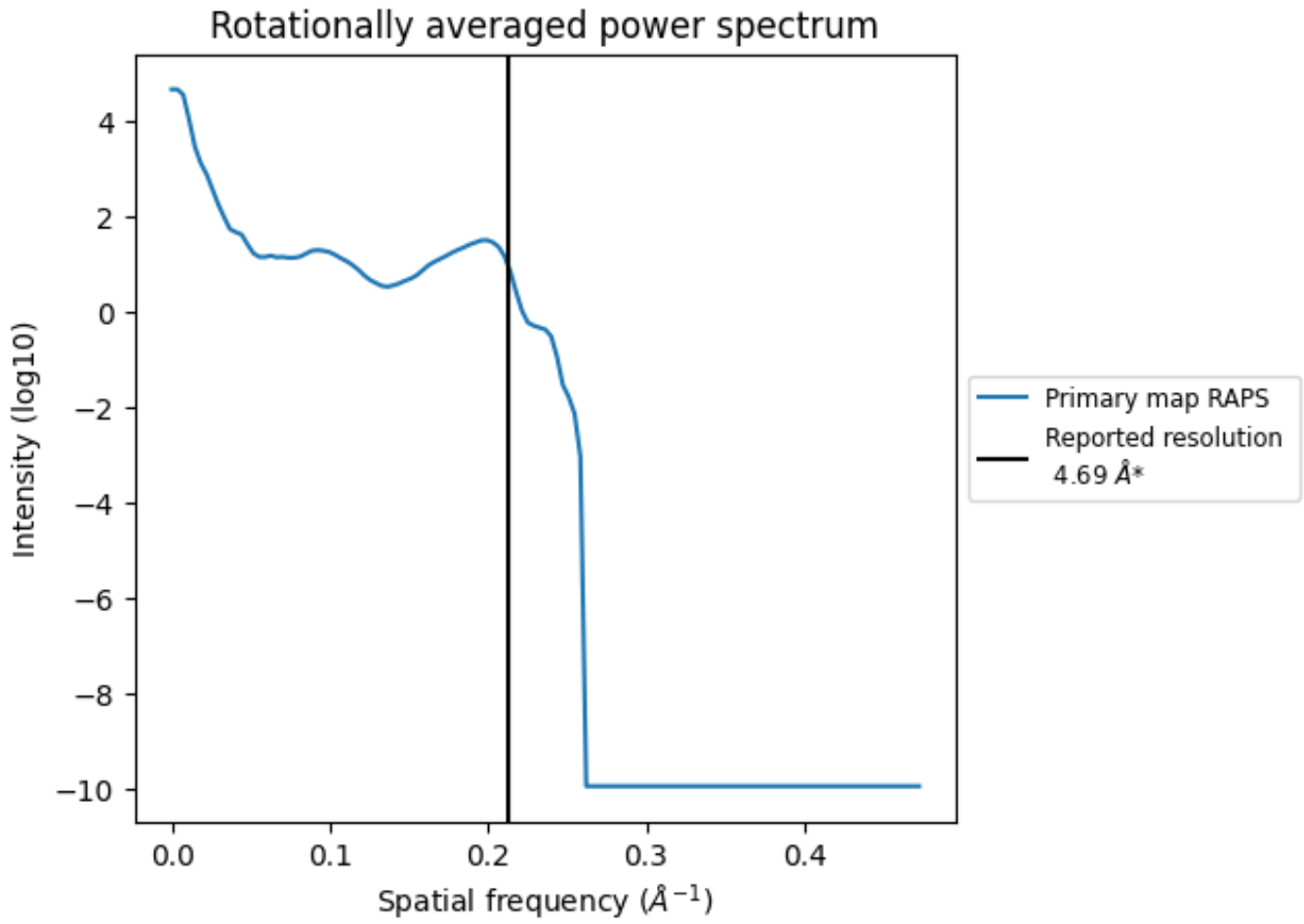
7.2 Volume estimate (i)



The volume at the recommended contour level is 39 nm^3; this corresponds to an approximate mass of 35 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 0.213 Å^{-1}

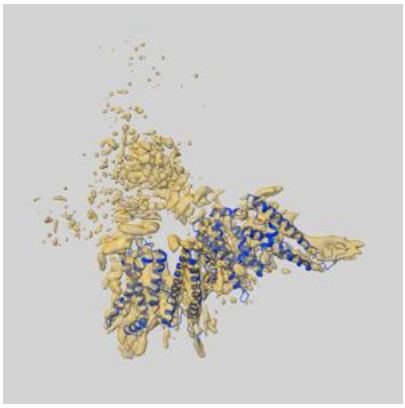
8 Fourier-Shell correlation (i)

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

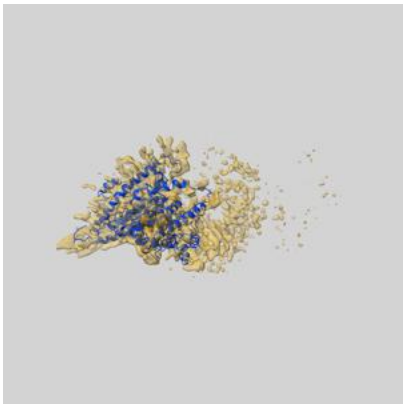
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-22325 and PDB model 7JGF. Per-residue inclusion information can be found in section 3 on page 4.

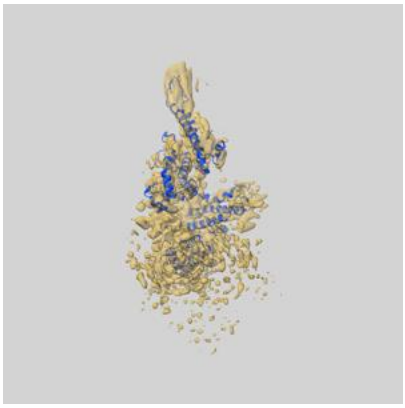
9.1 Map-model overlay



X



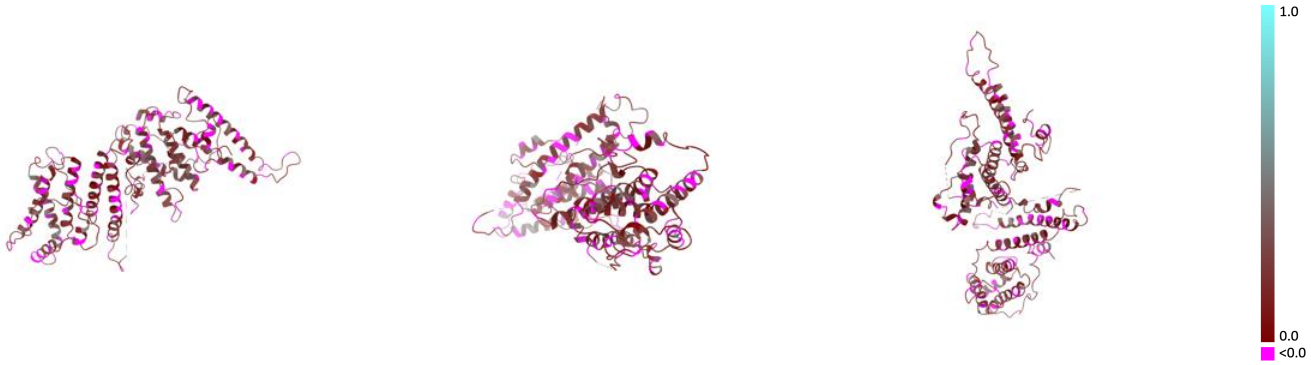
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 6.73 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.

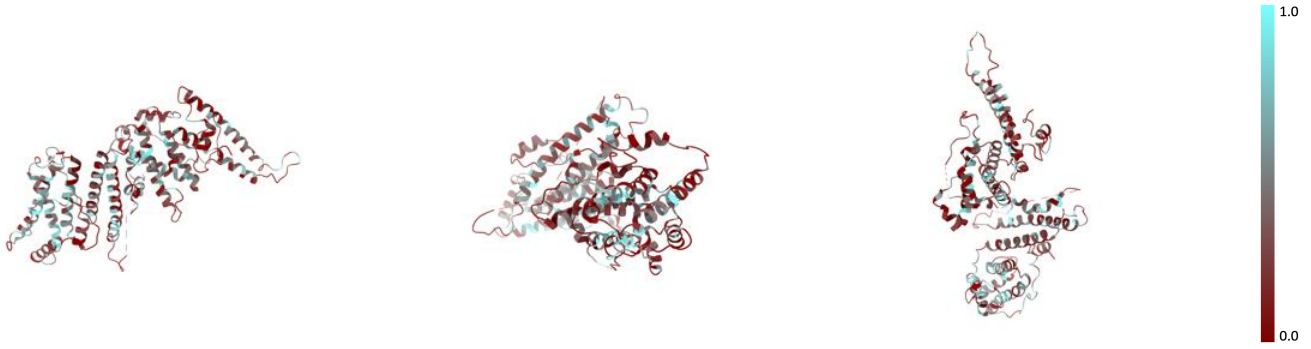
9.2 Q-score mapped to coordinate model (i)



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.

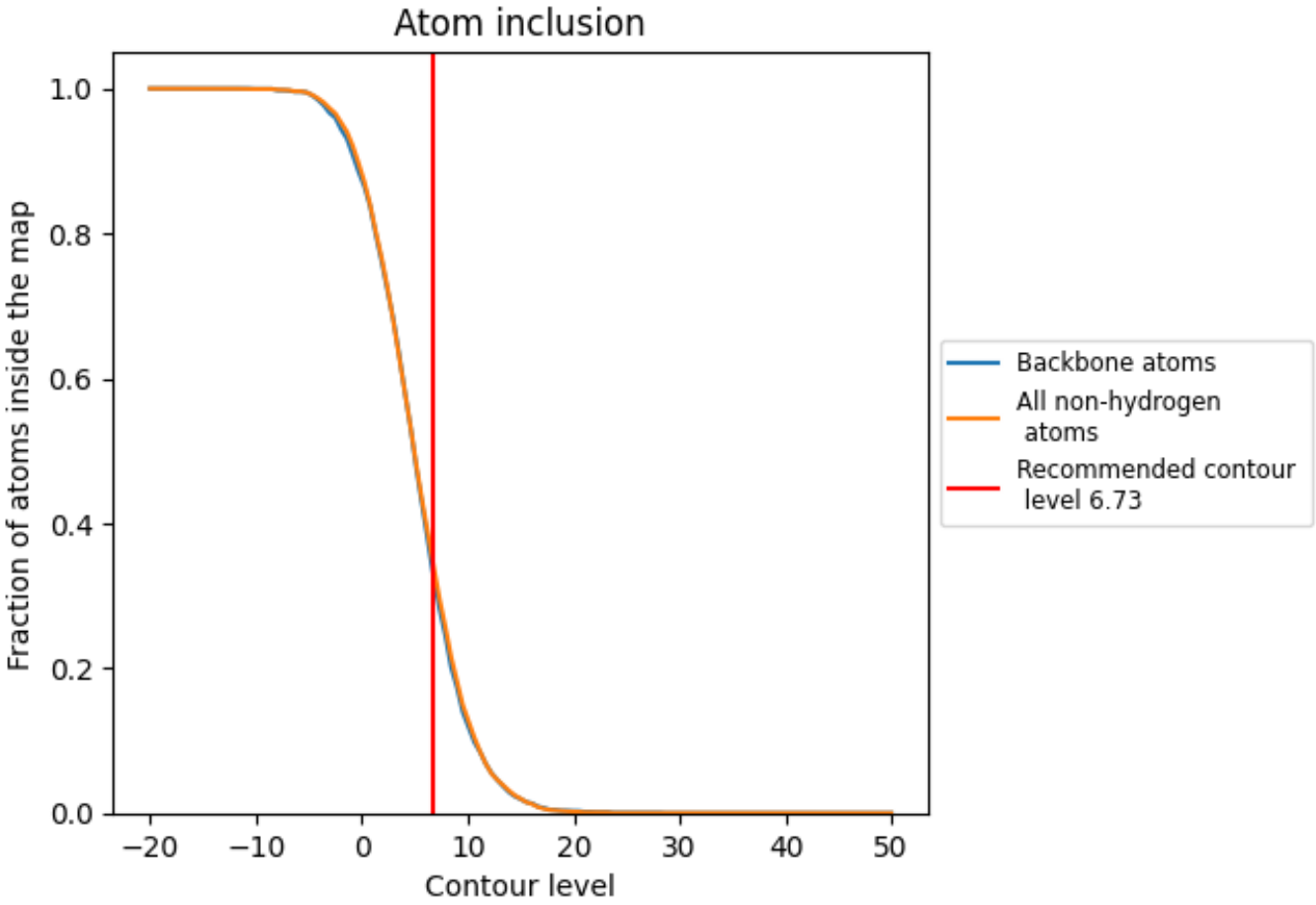
9.3 Atom inclusion mapped to coordinate model (i)



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 (6.73).

9.4 Atom inclusion (i)



At the recommended contour level, 33% of all backbone atoms, 34% 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 (6.73) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.3428	0.1460
A	0.3448	0.1460