wwPDB EM Validation Summary Report (i)

Dec 19, 2022 – 10:56 am GMT

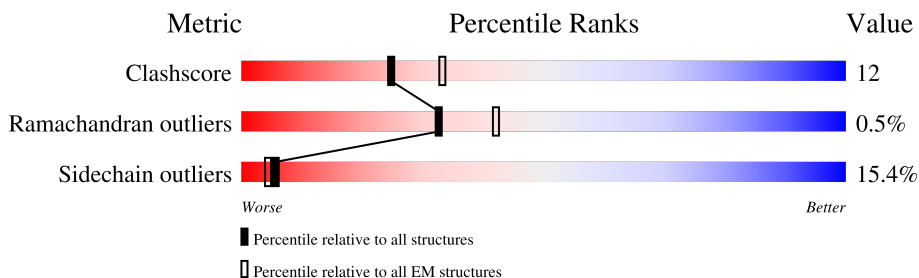|		
PDB ID	:	7OMM
EMDB ID	:	EMD-12990
Title	:	Cryo-EM structure of N. gonorhoeae LptDE in complex with ProMacrobodies (MBPs have not been built de novo)
Authors	:	Botte, M.; Ni, D.; Schenck, S.; Zimmermann, I.; Chami, M.; Bocquet, N.; Egloff, P.; Bucher, D.; Trabuco, M.; Cheng, R.K.Y.; Brunner, J.D.; Seeger, M.A.; Stahlberg, H.; Hennig, M.
Deposited on	:	2021-05-24
Resolution	:	3.40 Å(reported)

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 3.40 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	Percentile Ranks	Value
Clashscore		12
Ramachandran outliers		0.5%
Sidechain outliers		15.4%

Worse   *Better*

▌ Percentile relative to all structures
◻ Percentile relative to all EM structures

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	801	8% 60% 25% • 13%
2	B	165	5% 61% 16% 22%
3	C	520	69% 80% 11% • 8%
4	D	526	69% 45% 35% 13% 7%

2 Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 13981 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 LPS-assembly protein LptD.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	698	Total	C	N	O	S	0	0
			5462	3430	985	1038	9		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	13	SER	ALA	conflict	UNP Q5F651

- Molecule 2 is a protein called LPS-assembly lipoprotein LptE.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	128	Total	C	N	O	S	0	0
			1020	640	179	198	3		

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	160	HIS	-	expression tag	UNP A0A5K1Q6A7
B	161	HIS	-	expression tag	UNP A0A5K1Q6A7
B	162	HIS	-	expression tag	UNP A0A5K1Q6A7
B	163	HIS	-	expression tag	UNP A0A5K1Q6A7
B	164	HIS	-	expression tag	UNP A0A5K1Q6A7
B	165	HIS	-	expression tag	UNP A0A5K1Q6A7

- Molecule 3 is a protein called ProMacrobody 21,Maltodextrin-binding protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	479	Total	C	N	O	S	0	0
			3731	2397	614	710	10		

There are 37 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	484	PRO	-	expression tag	UNP A0A0F8L1I7
C	485	GLY	-	expression tag	UNP A0A0F8L1I7
C	486	SER	-	expression tag	UNP A0A0F8L1I7
C	487	GLY	-	expression tag	UNP A0A0F8L1I7
C	488	GLY	-	expression tag	UNP A0A0F8L1I7
C	489	GLY	-	expression tag	UNP A0A0F8L1I7
C	490	SER	-	expression tag	UNP A0A0F8L1I7
C	491	ALA	-	expression tag	UNP A0A0F8L1I7
C	492	TRP	-	expression tag	UNP A0A0F8L1I7
C	493	SER	-	expression tag	UNP A0A0F8L1I7
C	494	HIS	-	expression tag	UNP A0A0F8L1I7
C	495	PRO	-	expression tag	UNP A0A0F8L1I7
C	496	GLN	-	expression tag	UNP A0A0F8L1I7
C	497	PHE	-	expression tag	UNP A0A0F8L1I7
C	498	GLU	-	expression tag	UNP A0A0F8L1I7
C	499	LYS	-	expression tag	UNP A0A0F8L1I7
C	500	GLY	-	expression tag	UNP A0A0F8L1I7
C	501	GLY	-	expression tag	UNP A0A0F8L1I7
C	502	GLY	-	expression tag	UNP A0A0F8L1I7
C	503	SER	-	expression tag	UNP A0A0F8L1I7
C	504	GLY	-	expression tag	UNP A0A0F8L1I7
C	505	GLY	-	expression tag	UNP A0A0F8L1I7
C	506	GLY	-	expression tag	UNP A0A0F8L1I7
C	507	SER	-	expression tag	UNP A0A0F8L1I7
C	508	GLY	-	expression tag	UNP A0A0F8L1I7
C	509	GLY	-	expression tag	UNP A0A0F8L1I7
C	510	SER	-	expression tag	UNP A0A0F8L1I7
C	511	ALA	-	expression tag	UNP A0A0F8L1I7
C	512	TRP	-	expression tag	UNP A0A0F8L1I7
C	513	SER	-	expression tag	UNP A0A0F8L1I7
C	514	HIS	-	expression tag	UNP A0A0F8L1I7
C	515	PRO	-	expression tag	UNP A0A0F8L1I7
C	516	GLN	-	expression tag	UNP A0A0F8L1I7
C	517	PHE	-	expression tag	UNP A0A0F8L1I7
C	518	GLU	-	expression tag	UNP A0A0F8L1I7
C	519	LYS	-	expression tag	UNP A0A0F8L1I7
C	520	ALA	-	expression tag	UNP A0A0F8L1I7

• Molecule 4 is a protein called ProMacrobody 51,Maltodextrin-binding protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	D	489	3768	2422	614	723	9	0	0

There are 37 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	490	PRO	-	expression tag	UNP A0A0F8L1I7
D	491	GLY	-	expression tag	UNP A0A0F8L1I7
D	492	SER	-	expression tag	UNP A0A0F8L1I7
D	493	GLY	-	expression tag	UNP A0A0F8L1I7
D	494	GLY	-	expression tag	UNP A0A0F8L1I7
D	495	GLY	-	expression tag	UNP A0A0F8L1I7
D	496	SER	-	expression tag	UNP A0A0F8L1I7
D	497	ALA	-	expression tag	UNP A0A0F8L1I7
D	498	TRP	-	expression tag	UNP A0A0F8L1I7
D	499	SER	-	expression tag	UNP A0A0F8L1I7
D	500	HIS	-	expression tag	UNP A0A0F8L1I7
D	501	PRO	-	expression tag	UNP A0A0F8L1I7
D	502	GLN	-	expression tag	UNP A0A0F8L1I7
D	503	PHE	-	expression tag	UNP A0A0F8L1I7
D	504	GLU	-	expression tag	UNP A0A0F8L1I7
D	505	LYS	-	expression tag	UNP A0A0F8L1I7
D	506	GLY	-	expression tag	UNP A0A0F8L1I7
D	507	GLY	-	expression tag	UNP A0A0F8L1I7
D	508	GLY	-	expression tag	UNP A0A0F8L1I7
D	509	SER	-	expression tag	UNP A0A0F8L1I7
D	510	GLY	-	expression tag	UNP A0A0F8L1I7
D	511	GLY	-	expression tag	UNP A0A0F8L1I7
D	512	GLY	-	expression tag	UNP A0A0F8L1I7
D	513	SER	-	expression tag	UNP A0A0F8L1I7
D	514	GLY	-	expression tag	UNP A0A0F8L1I7
D	515	GLY	-	expression tag	UNP A0A0F8L1I7
D	516	SER	-	expression tag	UNP A0A0F8L1I7
D	517	ALA	-	expression tag	UNP A0A0F8L1I7
D	518	TRP	-	expression tag	UNP A0A0F8L1I7
D	519	SER	-	expression tag	UNP A0A0F8L1I7
D	520	HIS	-	expression tag	UNP A0A0F8L1I7
D	521	PRO	-	expression tag	UNP A0A0F8L1I7
D	522	GLN	-	expression tag	UNP A0A0F8L1I7
D	523	PHE	-	expression tag	UNP A0A0F8L1I7
D	524	GLU	-	expression tag	UNP A0A0F8L1I7
D	525	LYS	-	expression tag	UNP A0A0F8L1I7
D	526	ALA	-	expression tag	UNP A0A0F8L1I7

3 Residue-property plots ⓘ

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: LPS-assembly protein LptD

• Molecule 2: LPS-assembly lipoprotein LptE

Chain B:

5%

61% 16% 22%

MET ASN LYS ILE PHE LEU THR ALA ALA ALA LEU VAL LEU GLY ALA CYS GLY PHE HIS LEU LYS GLY ALA ASP GLY ILE SER PRO PRO LEU T31 H36 I37 E38 G39 G40 Q44 L47 Q53 D59 D60 A61 A62 G63 A64 Q65 M66 T67 L68 R69 S74 A86 V87

I88 T96 K103 E106 P107 K110 P111 S115 D121 Y122 A123 L128 E133 V150 L153 T154 K157 A158 GLU HIS HIS HIS HIS HIS HIS

• Molecule 3: ProMacrobody 21,Maltodextrin-binding protein

Chain C:

69%

80% 11% • 8%

GLY PRO SER GLN V5 L14 V15 Q16 P17 S20 C25 M37 Q42 A43 P44 G45 K46 E47 R48 I54 N55 S56 A57 G58 N59 E60 T61 A64 D65 S66 V67 R70 F71 T72 R75 V82 Q85 S88 L89 K90 P91 A95 C99 D103 I104

Y112 V121 P122 P123 L124 V125 I126 W127 I128 N129 G130 D131 K132 N135 G136 L137 A138 E139 V140 G141 K142 K143 F144 E145 K146 D147 T148 G149 I150 K151 V152 T153 V154 E155 H156 P157 D158 K159 L160 E161 E162 K163 F164 P165 Q166 V167 A168 A169 T170 G171 D172 G173 P174 D175 I176 I177 F178

W179 A180 H181 D182 R183 F184 G185 G186 Y187 A188 Q189 S190 G191 L192 L193 A194 E195 I196 T197 P198 D199 K200 A201 F202 Q203 D204 K205 L206 Y207 P208 F209 T210 W211 D212 A213 V214 R215 Y216 N217 G218 K219 L220 I221 A222 Y223 P224 I225 A226 V227 E228 A229 L230 S231 L232 I233 Y234 N235 K236 D237 L238

L239 P240 N241 P242 P243 K244 T245 W246 E247 E248 I249 P250 A251 L252 D253 K254 E255 L256 K257 A258 K259 G260 K261 S262 A263 L264 M265 F266 N267 L268 Q269 E270 P271 Y272 F273 T274 W275 P276 L277 I278 A279 A280 D281 G282 G283 Y284 A285 F286 K287 Y288 E289 N290 G291 K292 Y293 D294 I295 K296 D297 V298

G299 V300 D301 N302 A303 G304 A305 K306 A307 G308 L309 T310 F311 L312 V313 D314 L315 I316 K317 N318 K319 H320 M321 N322 A323 D324 T325 D326 Y327 S328 I329 A330 E331 A332 A333 F334 N335 K336 G337 E338 T339 A340 M341 T342 I343 N344 G345 P346 W347 A348 W349 S350 N351 I352 D353 T354 S355 K356 V357 N358

Y359 G360 V361 T362 V363 L364 P365 T366 F367 K368 G369 Q370 P371 S372 K373 P374 F375 V378 L379 S380 A381 G382 I383 N384 A385 A386 S387 P388 N389 K390 E391 L392 A393 K394 E395 F396 L397 E398 N399 Y400 L401 L402 T403 D404 E405 G406 L407 E408 A409 V410 N411 K412 D413 K414 P415 L416 G417 A418 V419

A420 L421 K422 S423 Y424 E425 E426 E427 L428 A429 K430 D431 P432 R433 I434 A435 A436 T437 M438 E439 N440 A441 Q442 K443 G444 E445 I446 M447 P448 N449 I450 P451 Q452 M453 S454 A455 F456 W457 Y458 A459 V460 R461 T462 A463 V464 I465 N466 A467 A468 S469 G470 R471 Q472 T473 V474 D475 E476 A477 L478 K479

D480 A481 Q482 T483 PRO GLY SER GLY GLY SER ALA TRP SER HIS PRO GLN PHE GLU LYS GLY GLY SER GLY GLY SER GLY GLY SER ALA TRP SER HIS PRO GLN PHE GLU LYS ALA

• Molecule 4: ProMacrobody 51,Maltodextrin-binding protein

Chain D:

69%

45% 35% 13% 7%

G1 P2 S3 Q4 V5 Q6 L7 V8 E9 S10 G11 G12 G13 S14 V15 Q16 A17 G18 G19 S20 L21 R22 L23 S24 C25 A26 A27 S30 I31 S32 S33 I34 T35 Y36 L37 G38 W39 F40 A43 P44 G45 K46 E47 R48 E49 G50 V51 A52 A53 L54 A55 T56 Y57 Y58 G59 H60 T61 Y62

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	184206	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 $(e^-/\text{Å}^2)$	50	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	3.965	Depositor
Minimum map value	-1.718	Depositor
Average map value	0.003	Depositor
Map value standard deviation	0.048	Depositor
Recommended contour level	0.45	Depositor
Map size (Å)	344.4, 344.4, 344.4	wwPDB
Map dimensions	390, 390, 390	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.8830769, 0.8830769, 0.8830769	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	0.38	0/5594	0.59	0/7569
2	B	0.27	0/1034	0.44	0/1400
3	C	0.63	0/3829	0.87	0/5208
4	D	0.63	0/3865	0.74	0/5260
All	All	0.52	0/14322	0.71	0/19437

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	5462	0	5221	127	0
2	B	1020	0	1024	20	0
3	C	3731	0	3645	32	0
4	D	3768	0	3692	153	0
All	All	13981	0	13582	321	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 12.

The worst 5 of 321 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

WORLDWIDE
wwPDB
PROTEIN DATA BANK

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:D:131:VAL:HB	4:D:180:PRO:HB3	1.36	1.07
4:D:333:TYR:O	4:D:333:TYR:HD1	1.40	1.04
4:D:401:GLU:OE1	4:D:401:GLU:O	1.82	0.97
4:D:333:TYR:O	4:D:333:TYR:CD1	2.28	0.87
4:D:333:TYR:CD1	4:D:333:TYR:C	2.43	0.86

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	694/801 (87%)	570 (82%)	120 (17%)	4 (1%)	25	57
2	B	126/165 (76%)	118 (94%)	8 (6%)	0	100	100
3	C	477/520 (92%)	457 (96%)	17 (4%)	3 (1%)	25	57
4	D	487/526 (93%)	464 (95%)	21 (4%)	2 (0%)	34	67
All	All	1784/2012 (89%)	1609 (90%)	166 (9%)	9 (0%)	32	61

5 of 9 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	261	PRO
3	C	390	LYS
4	D	163	PRO
1	A	207	ASP
1	A	265	ALA

5.3.2 Protein sidechains ⓘ

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	556/632 (88%)	509 (92%)	47 (8%)	10	35
2	B	108/136 (79%)	108 (100%)	0	100	100
3	C	384/409 (94%)	361 (94%)	23 (6%)	19	49
4	D	387/409 (95%)	236 (61%)	151 (39%)	0	0
All	All	1435/1586 (90%)	1214 (85%)	221 (15%)	6	11

5 of 221 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	D	130	LEU
4	D	238	LEU
4	D	485	LYS
4	D	416	VAL
4	D	143	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	581	GLN
3	C	59	ASN
3	C	100	ASN
1	A	314	GLN
1	A	201	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-12990. 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 |
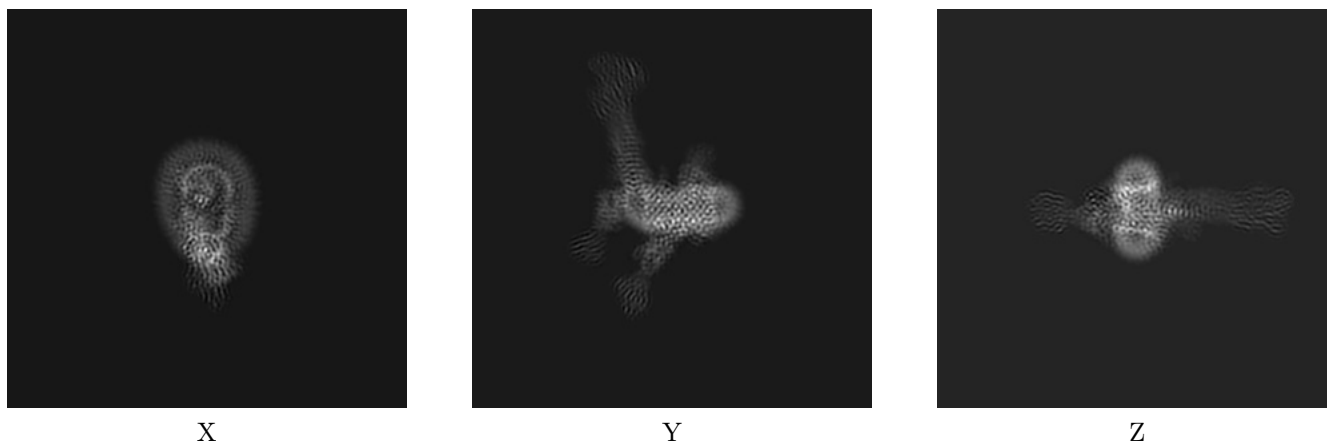
The images above show the map projected in three orthogonal directions.

6.2 Central slices ⓘ

6.2.1 Primary map

| X Index: 195 | Y Index: 195 | Z Index: 195 |
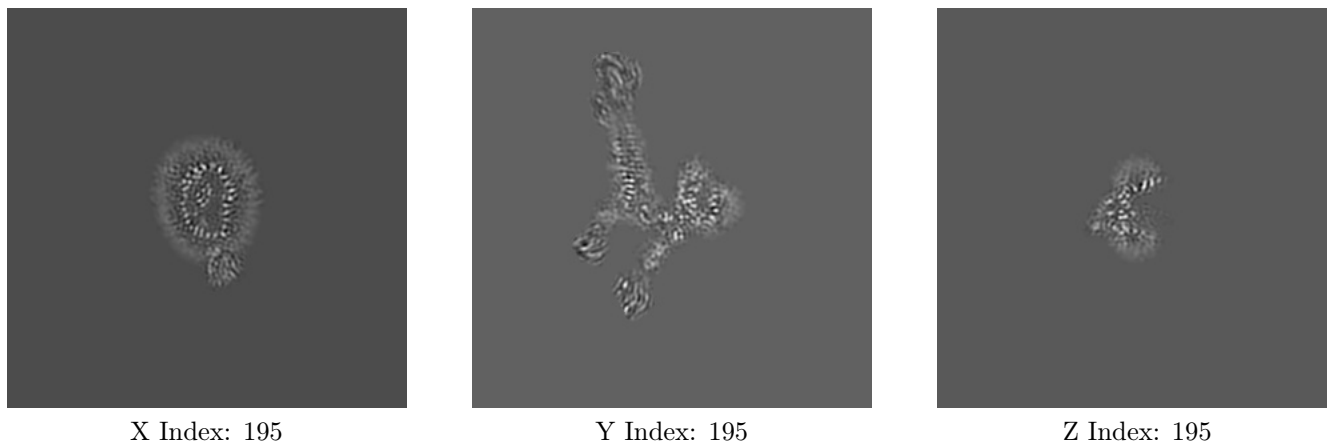
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices ⓘ
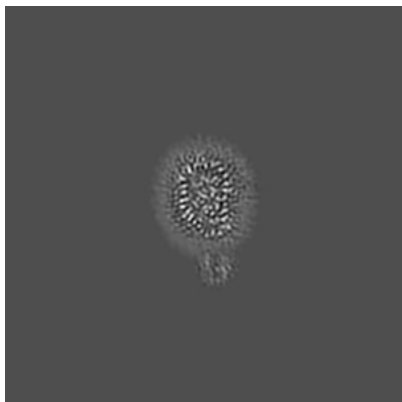
6.3.1 Primary map

| X Index: 185 | Y Index: 189 | Z Index: 216 |
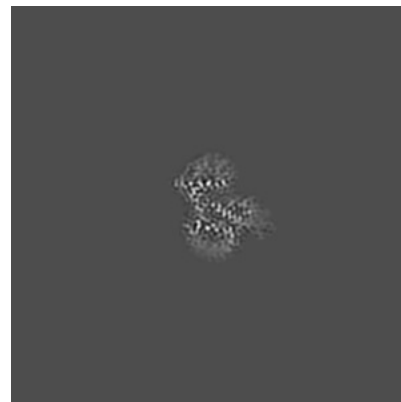
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal surface views ⓘ

6.4.1 Primary map

| X | Y | Z |

The images above show the 3D surface view of the map at the recommended contour level 0.45. 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 ⓘ
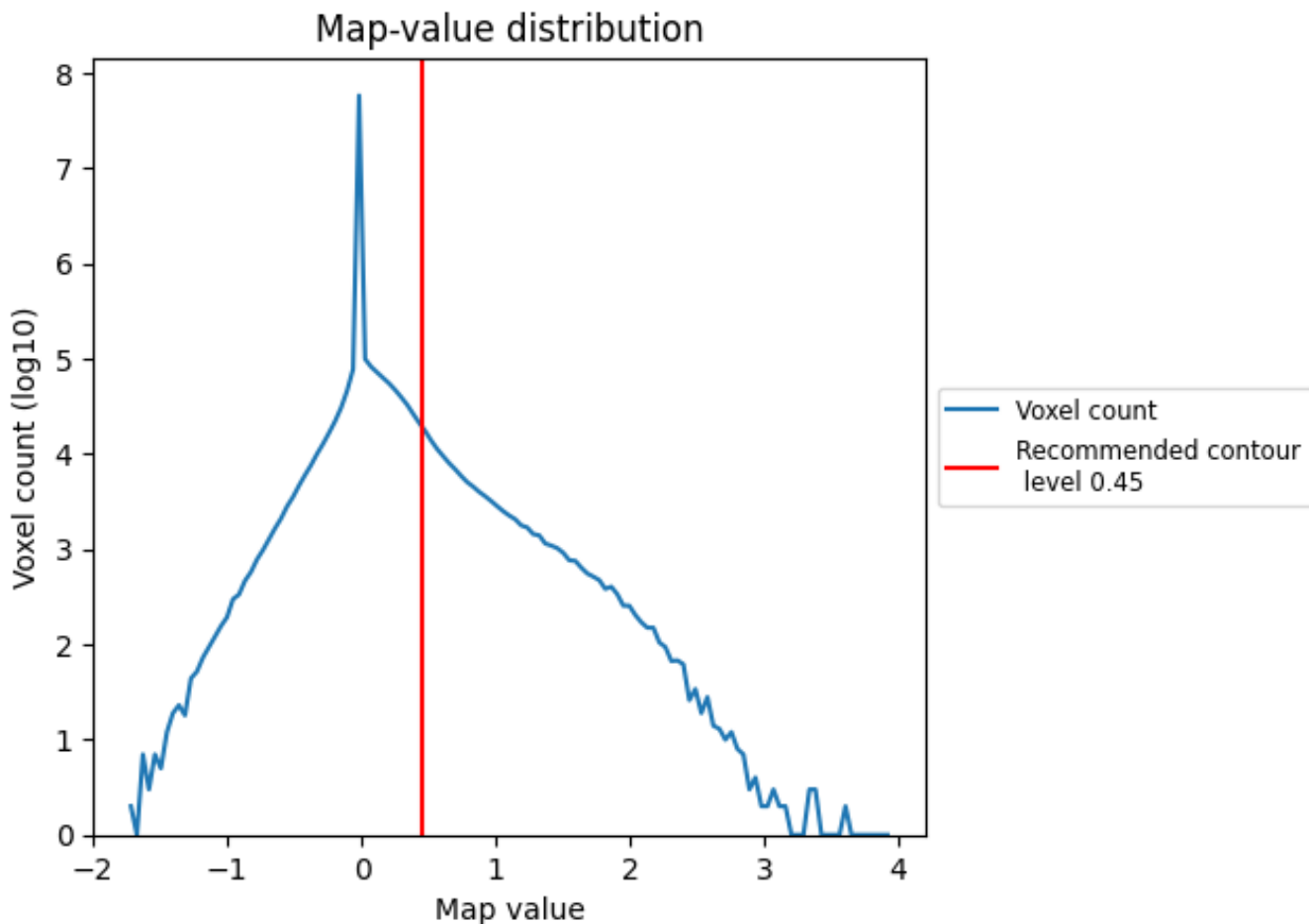
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2 Volume estimate (i)
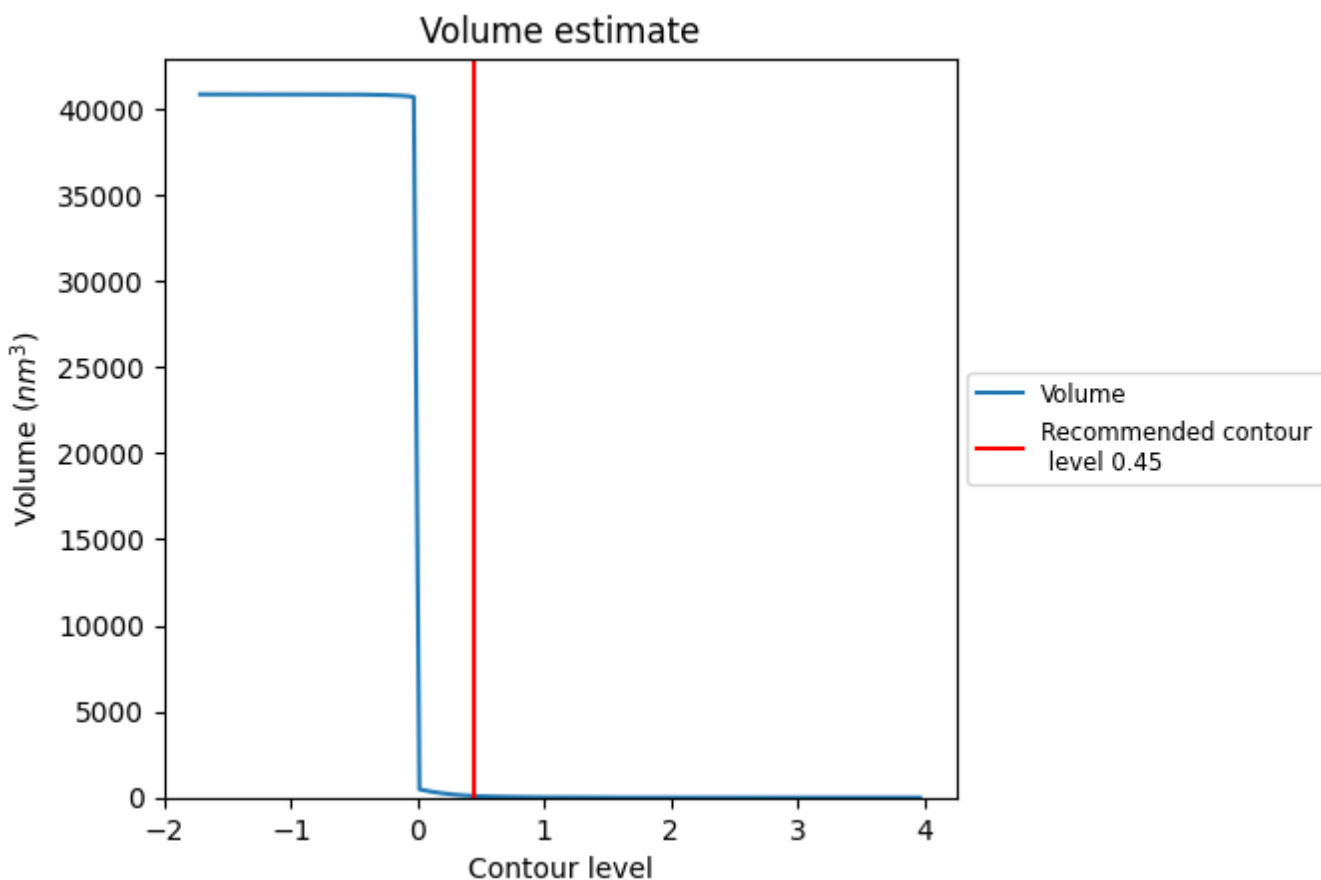
The volume at the recommended contour level is 91 nm^3; this corresponds to an approximate mass of 82 kDa.

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 ⓘ
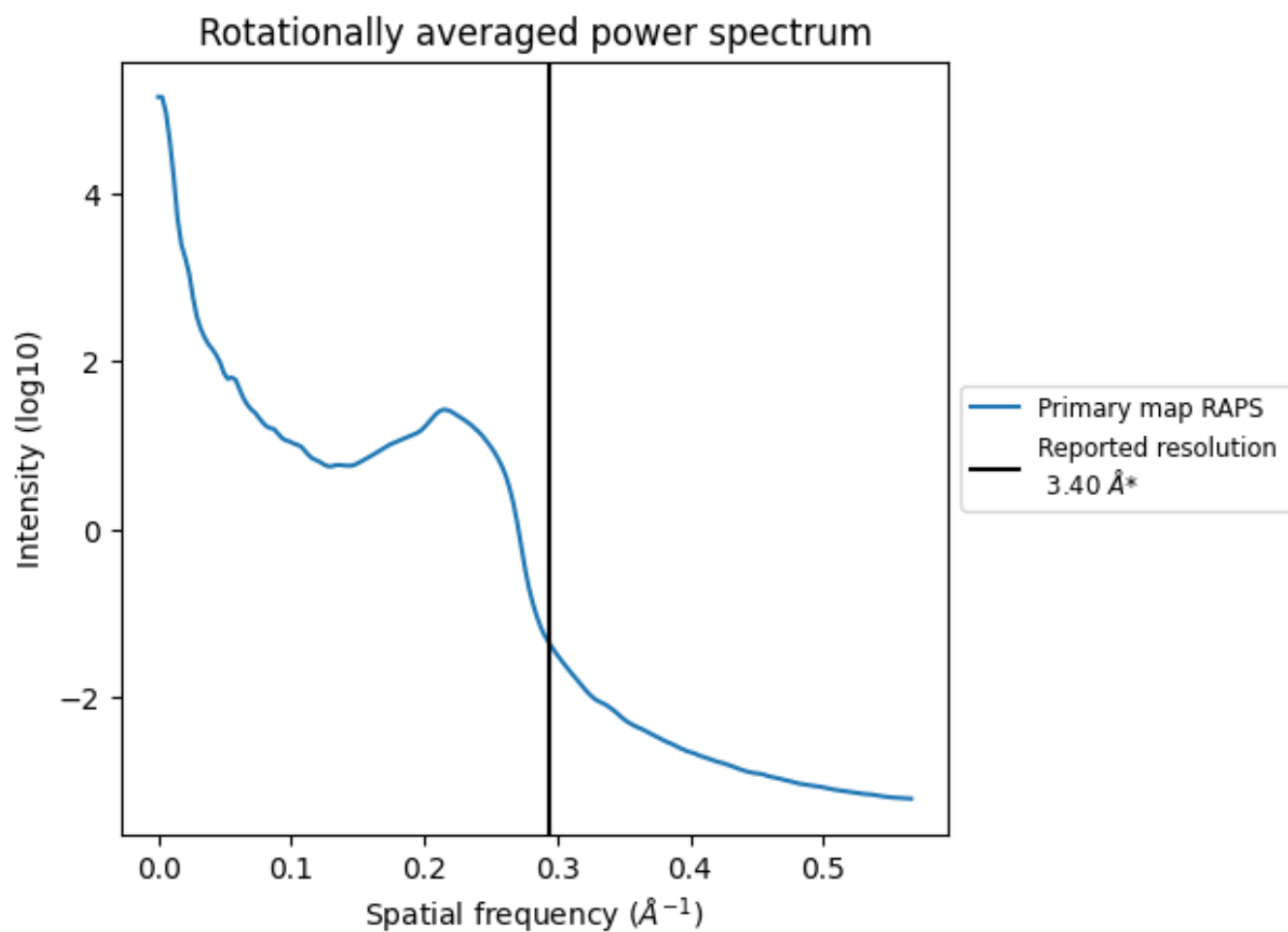
*Reported resolution corresponds to spatial frequency of 0.294 $Å^{-1}$

8   Fourier-Shell correlation ⓘ

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-12990 and PDB model 7OMM. Per-residue inclusion information can be found in section 3 on page 6.

9.1 Map-model overlay ⓘ

X   Y   Z
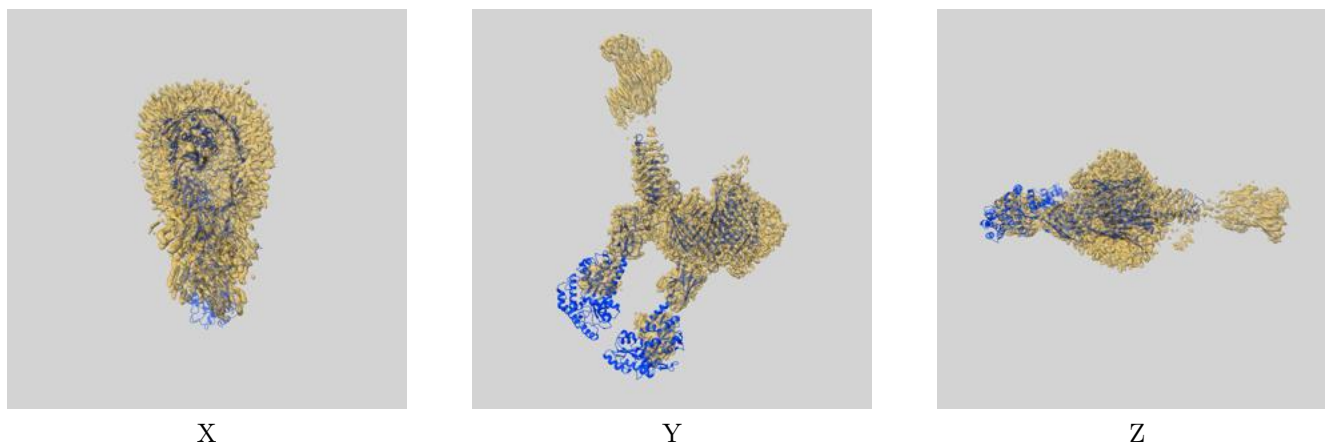
The images above show the 3D surface view of the map at the recommended contour level 0.45 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2   Q-score mapped to coordinate model ⓘ

X   Y   Z
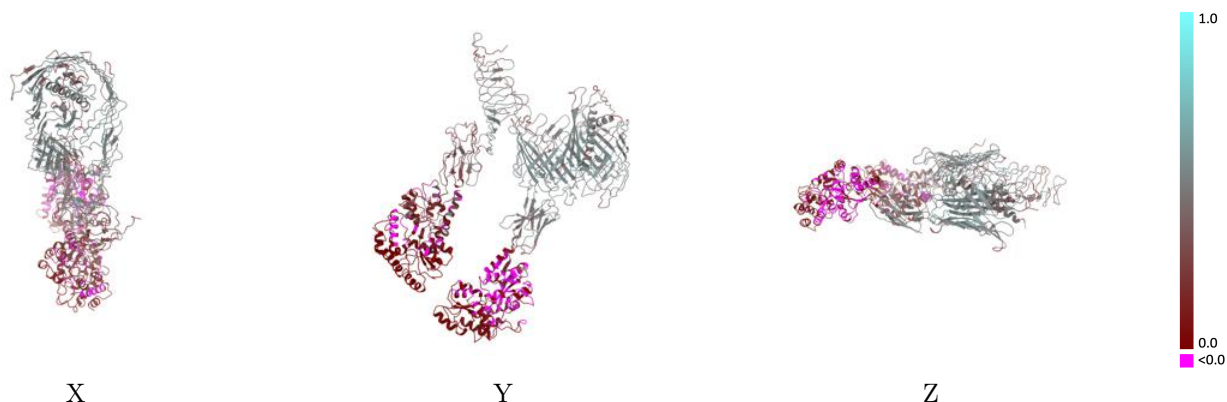
The images above show the model with each residue coloured according its Q-score. This shows
their resolvability in the map with higher Q-score values reflecting better resolvability. Please
note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at
resolutions 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
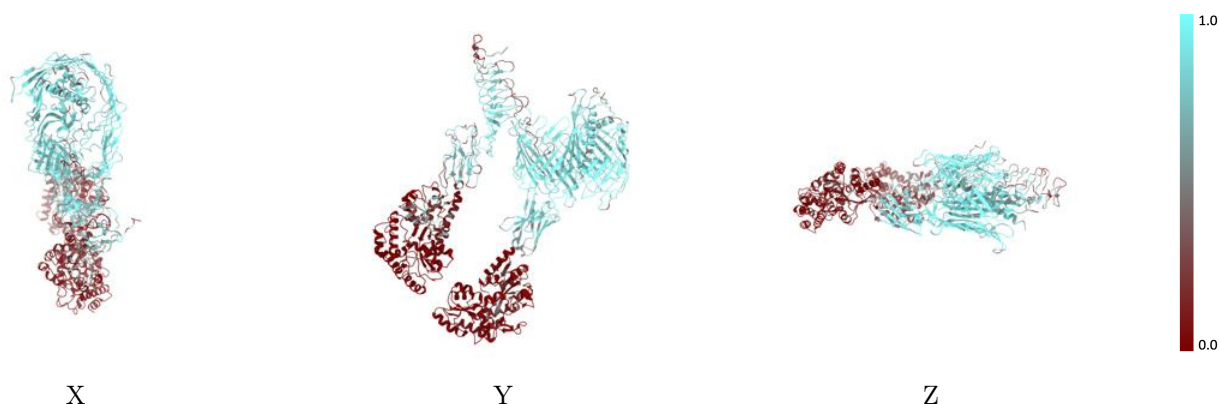
The images above show the model with each residue coloured according to its atom inclusion. This
shows to what extent they are inside the map at the recommended contour level (0.45).

9.4 Atom inclusion ⓘ
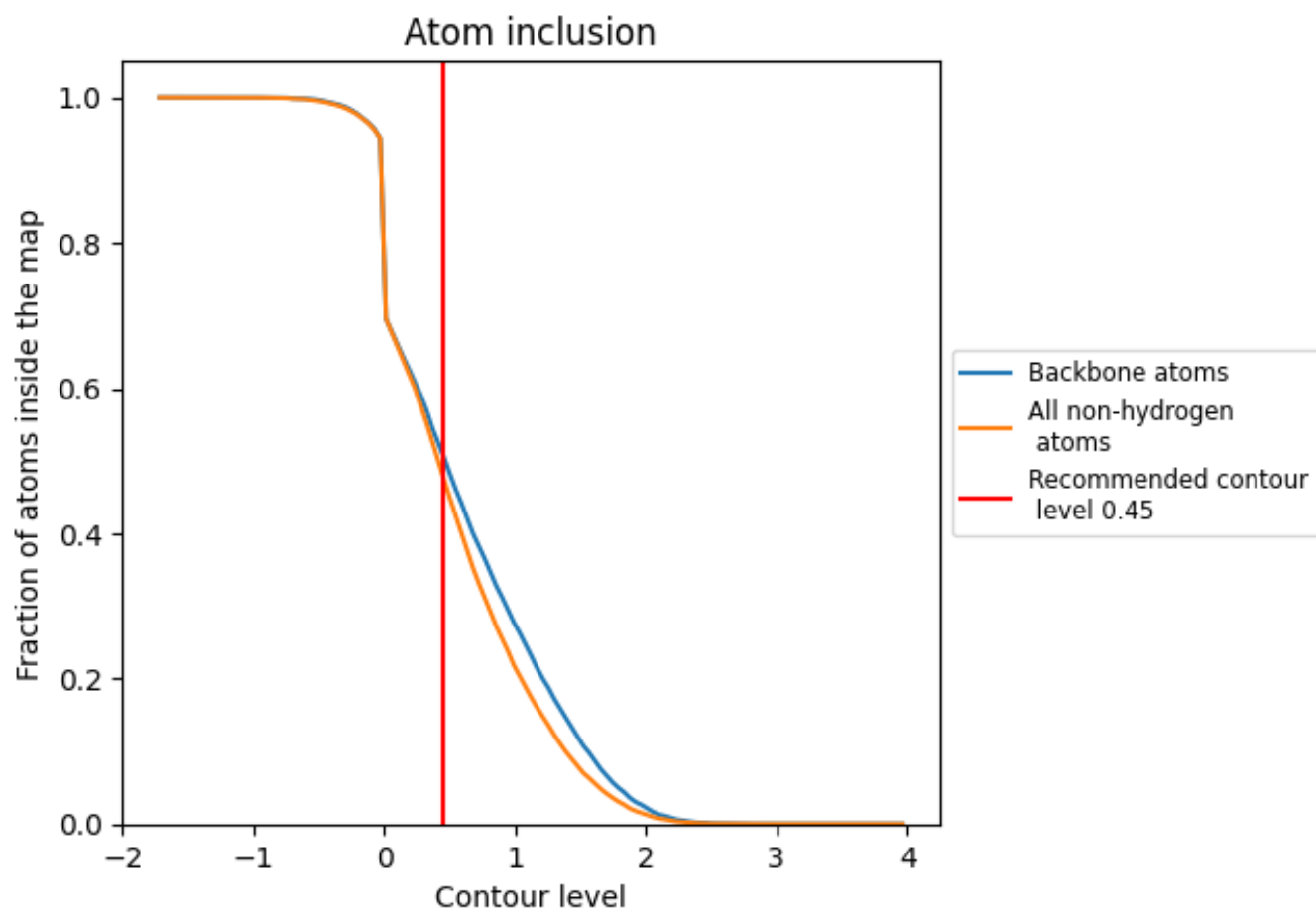
At the recommended contour level, 51% of all backbone atoms, 48% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.45) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.4781	0.2830
A	0.7841	0.4720
B	0.7482	0.4560
C	0.2330	0.1050
D	0.2115	0.1380

1.0

0.0
<0.0