wwPDB EM Validation Summary Report (i)

May 6, 2024 – 01:38 PM EDT

PDB ID	:	7JQ9
EMDB ID	:	EMD-22427
Title	:	Cryo-EM structure of human HUWE1
Authors	:	Hunkeler, M.; Fischer, E.S.
Deposited on	:	2020-08-10
Resolution	:	3.10 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 (i) 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 (i)) were used in the production of this report:

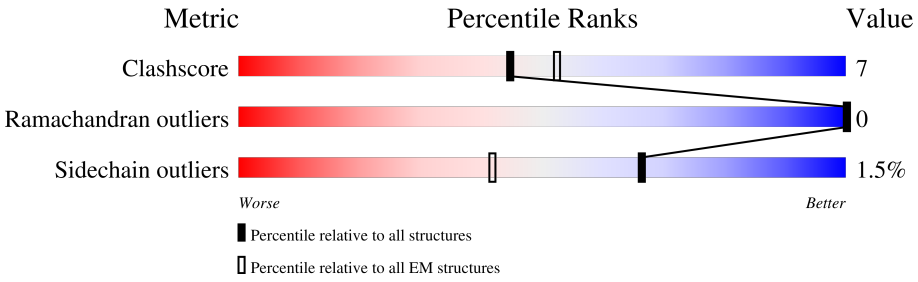
EMDB validation analysis	:	0.0.1.dev92
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

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 3.10 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	4411	11% 45% 10% 45%

2 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 38719 atoms, of which 19554 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 E3 ubiquitin-protein ligase HUWE1.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
1	A	2427	38719	12225	19554	3292	3528	120	0	0

There are 37 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-36	MET	-	expression tag	UNP Q7Z6Z7
A	-35	ASP	-	expression tag	UNP Q7Z6Z7
A	-34	TYR	-	expression tag	UNP Q7Z6Z7
A	-33	LYS	-	expression tag	UNP Q7Z6Z7
A	-32	ASP	-	expression tag	UNP Q7Z6Z7
A	-31	ASP	-	expression tag	UNP Q7Z6Z7
A	-30	ASP	-	expression tag	UNP Q7Z6Z7
A	-29	ASP	-	expression tag	UNP Q7Z6Z7
A	-28	LYS	-	expression tag	UNP Q7Z6Z7
A	-27	LEU	-	expression tag	UNP Q7Z6Z7
A	-26	ALA	-	expression tag	UNP Q7Z6Z7
A	-25	ALA	-	expression tag	UNP Q7Z6Z7
A	-24	ALA	-	expression tag	UNP Q7Z6Z7
A	-23	ASN	-	expression tag	UNP Q7Z6Z7
A	-22	SER	-	expression tag	UNP Q7Z6Z7
A	-21	SER	-	expression tag	UNP Q7Z6Z7
A	-20	ILE	-	expression tag	UNP Q7Z6Z7
A	-19	ASP	-	expression tag	UNP Q7Z6Z7
A	-18	LEU	-	expression tag	UNP Q7Z6Z7
A	-17	ILE	-	expression tag	UNP Q7Z6Z7
A	-16	SER	-	expression tag	UNP Q7Z6Z7
A	-15	THR	-	expression tag	UNP Q7Z6Z7
A	-14	SER	-	expression tag	UNP Q7Z6Z7
A	-13	LEU	-	expression tag	UNP Q7Z6Z7
A	-12	TYR	-	expression tag	UNP Q7Z6Z7
A	-11	LYS	-	expression tag	UNP Q7Z6Z7
A	-10	LYS	-	expression tag	UNP Q7Z6Z7
A	-9	ALA	-	expression tag	UNP Q7Z6Z7

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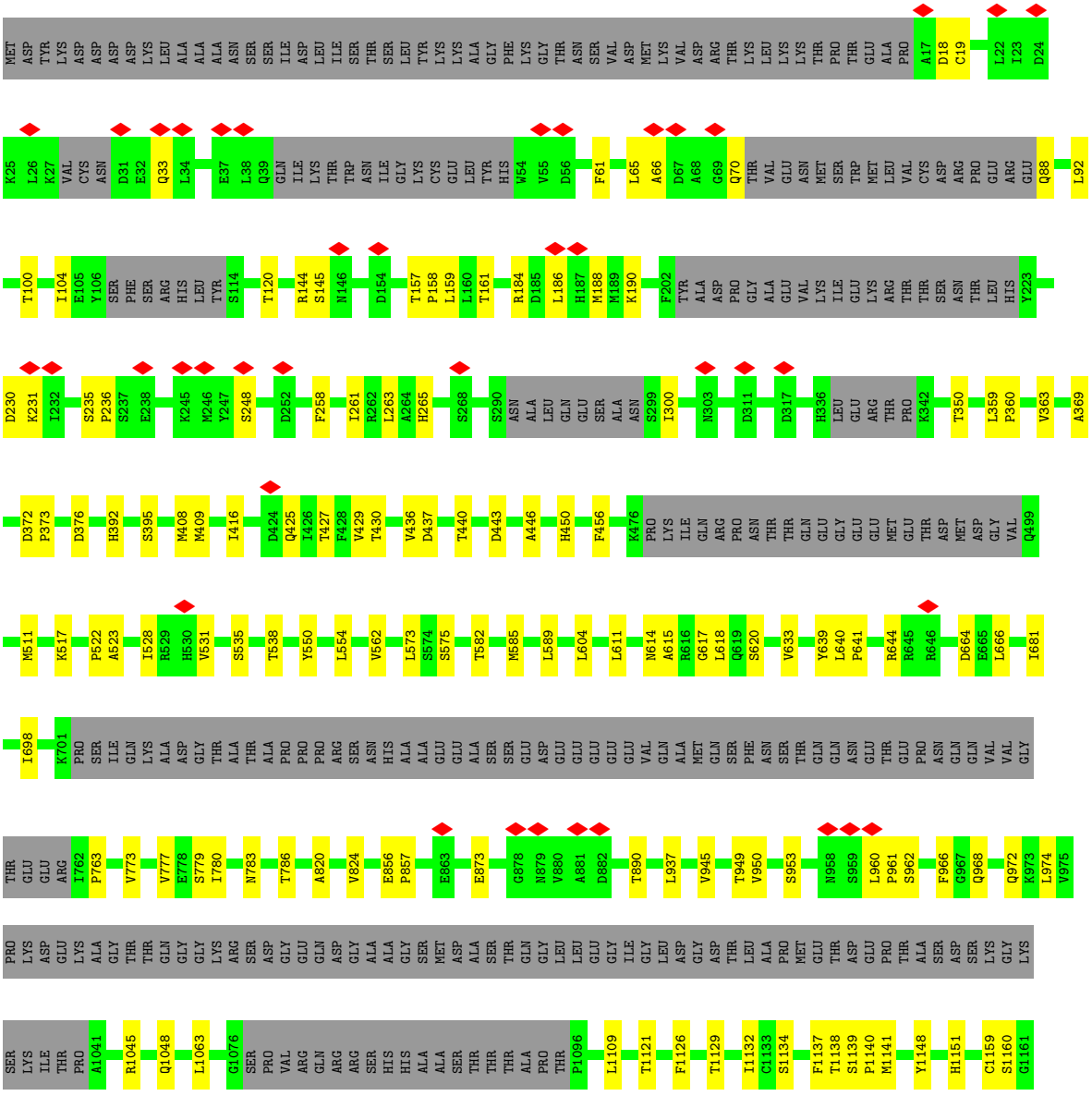
Chain	Residue	Modelled	Actual	Comment	Reference
A	-8	GLY	-	expression tag	UNP Q7Z6Z7
A	-7	PHE	-	expression tag	UNP Q7Z6Z7
A	-6	LYS	-	expression tag	UNP Q7Z6Z7
A	-5	GLY	-	expression tag	UNP Q7Z6Z7
A	-4	THR	-	expression tag	UNP Q7Z6Z7
A	-3	ASN	-	expression tag	UNP Q7Z6Z7
A	-2	SER	-	expression tag	UNP Q7Z6Z7
A	-1	VAL	-	expression tag	UNP Q7Z6Z7
A	0	ASP	-	expression tag	UNP Q7Z6Z7

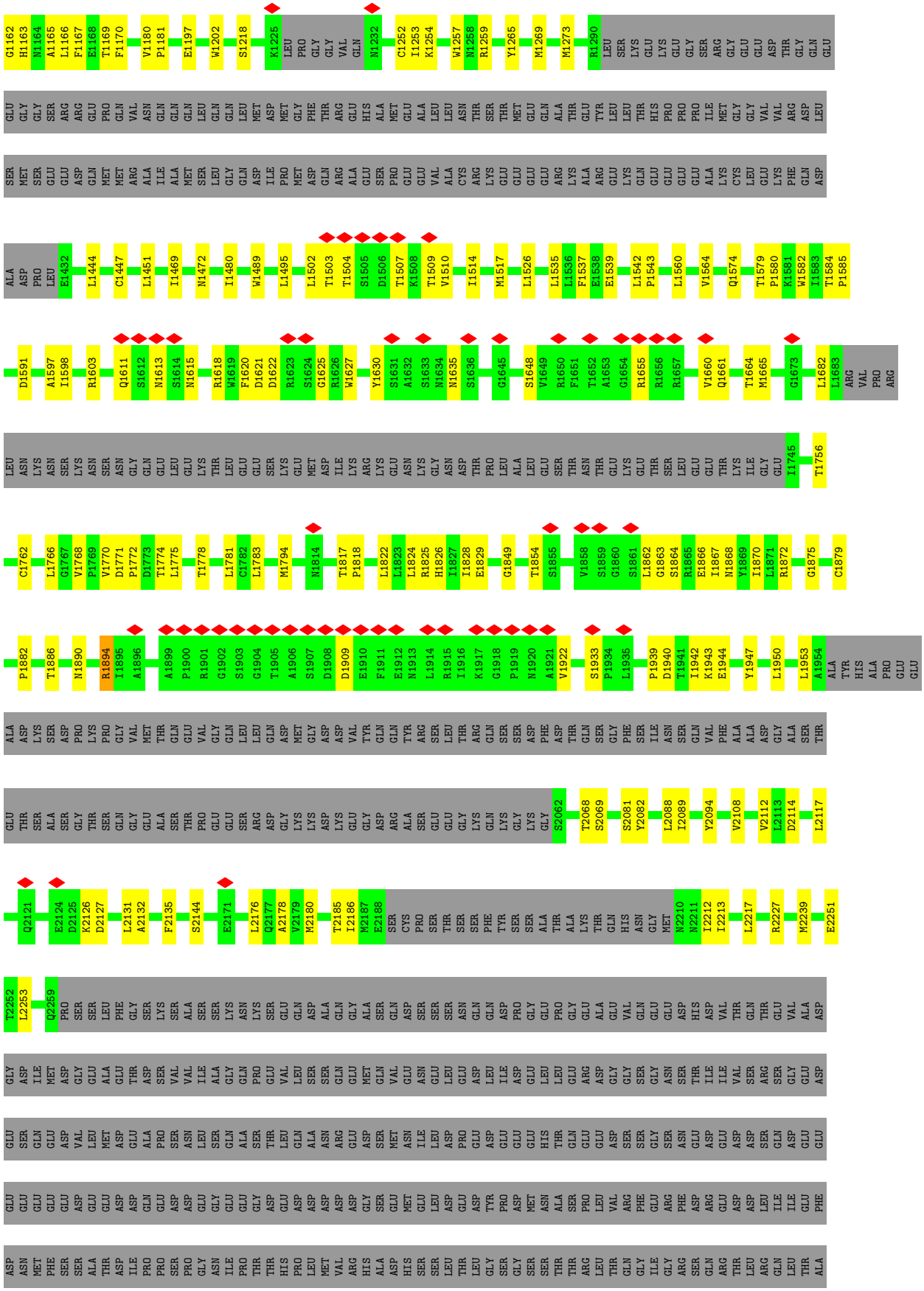
3 Residue-property plots (i)

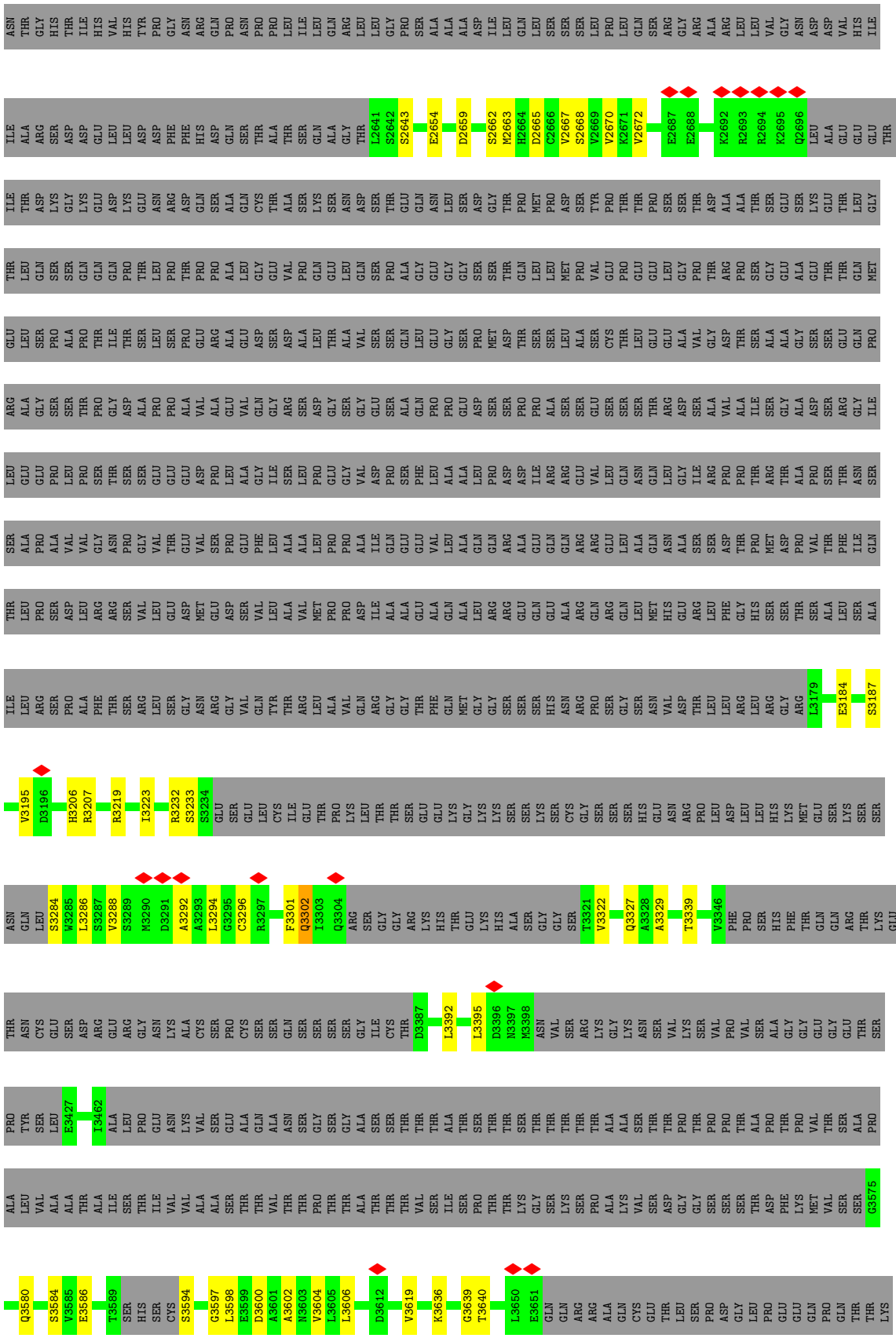
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion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

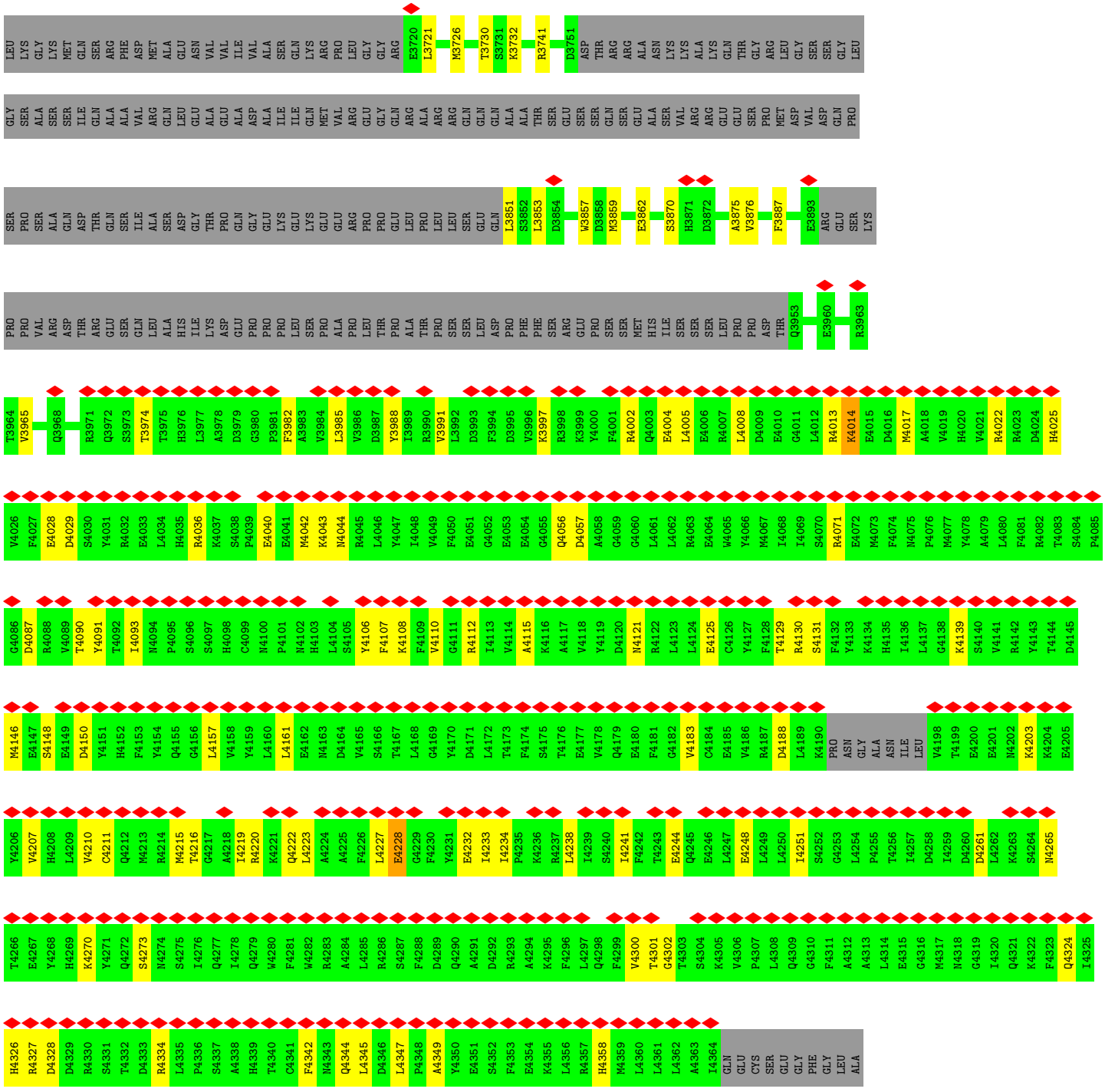
- Molecule 1: E3 ubiquitin-protein ligase HUWE1

Chain A:






L2641
S2642
S2643
E2654
D2659
S2662
M2663
H2664
D2665
C2666
V2667
S2668
V2669
V2670
K2671
V2672
E2687
E2688
K2692
R2693
R2694
K2695
Q2696
L3179
E3184
S3187
V3195
D3196
H3206
R3207
R3219
I3223
R3232
S3233
S3234
S3284
W3285
L3286
S3287
V3288
S3289
M3290
D3291
A3292
A3293
L3294
G3295
C3296
R3297
F3301
Q3302
I3303
Q3304
T3321
V3322
Q3327
A3328
A3329
T3339
V3346
D3387
L3392
I3395
D3396
N3397
M3398
E3427
I3462
G3575
Q3580
S3584
V3585
E3586
T3589
S3594
G3597
L3598
E3599
D3600
A3601
A3602
N3603
V3604
L3605
L3606
D3612
V3619
K3636
G3639
T3640
L3650
E3651


LEU LYS GLY LYS MET GLN SER ARG PHE ASP MET ALA GLU ASN VAL VAL ILE VAL ALA SER GLN LYS ARG PRO LEU GLY GLY ARG E3720 L3721 M3726 T3730 S3731 K3732 R3741 D3751 ASP THR ARG ARG ALA ASN LYS LYS ALA LYS GLN THR GLY ARG LEU GLY SER SER GLY LEU
GLY SER ALA SER SER ILE GLN ALA ALA VAL ARG GLN LEU GLU ALA GLU ALA ASP ALA ILE ILE GLN MET VAL ARG GLU GLY GLN ARG ALA ARG ARG GLN GLN GLN ALA ALA THR SER GLU SER SER GLN SER GLU ALA SER VAL ARG ARG GLU GLU SER PRO MET ASP VAL ASP GLN PRO
SER PRO SER ALA GLN ASP THR GLN SER ILE ALA SER ASP GLY THR PRO GLN GLY GLU LYS GLU LYS GLU GLU ARG PRO PRO GLU LEU PRO LEU LEU SER GLU GLN L3851 S3862 L3853 D3864 W3857 D3868 M3859 E3862 S3870 H3871 D3872 A3875 V3876 F3887 E3393 ARG GLU SER LYS
PRO PRO VAL ARG ASP THR ARG GLU SER GLN LEU ALA HIS ILE LYS ASP GLU PRO PRO PRO LEU SER PRO ALA PRO LEU THR PRO PRO SER SER LEU ASP PRO PHE PHE SER ARG GLU PRO SER SER MET HIS ILE SER SER SER LEU PRO PRO ASP THR Q3953 E3960 R3963
T3964 V3965 Q3968 R3971 Q3972 S3973 T3974 T3975 H3976 L3977 A3978 D3979 G3980 P3981 F3982 A3983 V3984 L3985 V3986 D3987 Y3988 T3989 R3990 V3991 L3992 D3993 F3994 D3995 V3996 K3997 R3998 K3999 Y4000 F4001 R4002 Q4003 E4004 L4005 E4006 R4007 L4008 D4009 E4010 G4011 L4012 R4013 K4014 E4015 D4016 M4017 A4018 V4019 H4020 V4021 R4022 R4023 D4024 H4025
V4026 F4027 E4028 D4029 S4030 Y4031 R4032 E4033 L4034 H4035 R4036 K4037 S4038 P4039 E4040 E4041 M4042 K4043 N4044 R4045 L4046 Y4047 I4048 V4049 F4050 E4051 G4052 E4053 E4054 G4055 Q4056 D4057 A4058 G4059 G4060 L4061 L4062 R4063 E4064 W4065 Y4066 M4067 I4068 I4069 S4070 R4071 E4072 M4073 F4074 N4075 P4076 M4077 Y4078 A4079 L4080 F4081 R4082 T4083 S4084 P4085
G4086 D4087 R4088 V4089 T4090 Y4091 T4092 I4093 N4094 P4095 S4096 S4097 H4098 C4099 N4100 P4101 N4102 H4103 L4104 S4105 Y4106 F4107 K4108 F4109 V4110 G4111 R4112 I4113 V4114 A4115 K4116 A4117 V4118 Y4119 D4120 N4121 R4122 L4123 L4124 E4125 C4126 Y4127 F4128 T4129 R4130 S4131 F4132 Y4133 K4134 H4135 I4136 L4137 G4138 K4139 S4140 V4141 R4142 Y4143 T4144 D4145
M4146 E4147 S4148 E4149 D4150 Y4151 H4152 F4153 Y4154 Q4155 G4156 L4157 V4158 Y4159 L4160 L4161 E4162 N4163 D4164 V4165 S4166 T4167 L4168 G4169 Y4170 D4171 L4172 T4173 F4174 S4175 T4176 E4177 V4178 Q4179 E4180 F4181 G4182 V4183 C4184 E4185 V4186 R4187 D4188 L4189 K4190 PRO ASN GLY ALA ASN ILE LEU V4198 T4199 E4200 E4201 N4202 K4203 K4204 E4205
Y4206 V4207 H4208 L4209 V4210 C4211 Q4212 M4213 R4214 M4215 T4216 G4217 A4218 I4219 R4220 K4221 Q4222 L4223 A4224 A4225 F4226 L4227 E4228 G4229 F4230 Y4231 E4232 I4233 I4234 P4235 K4236 R4237 L4238 I4239 S4240 I4241 F4242 T4243 E4244 Q4245 E4246 L4247 E4248 L4249 L4250 I4251 S4252 G4253 L4254 P4255 T4256 I4257 D4258 I4259 D4260 D4261 L4262 K4263 S4264 N4265
T4266 E4267 Y4268 H4269 K4270 Y4271 Q4272 S4273 N4274 S4275 I4276 Q4277 I4278 Q4279 W4280 F4281 W4282 R4283 A4284 L4285 R4286 S4287 F4288 D4289 Q4290 A4291 D4292 R4293 A4294 K4295 F4296 L4297 Q4298 F4299 V4300 T4301 G4302 T4303 S4304 K4305 V4306 P4307 L4308 Q4309 G4310 F4311 A4312 A4313 L4314 E4315 G4316 M4317 N4318 G4319 I4320 Q4321 K4322 F4323 Q4324 I4325
H4326 R4327 D4328 D4329 R4330 S4331 T4332 D4333 R4334 L4335 P4336 S4337 A4338 H4339 T4340 C4341 F4342 N4343 Q4344 L4345 D4346 L4347 P4348 A4349 Y4350 E4351 S4352 F4353 E4354 K4355 L4356 R4357 H4358 M4359 L4360 L4361 L4362 A4363 I4364 GLN GLU CYS SER GLU GLY PHE GLY LEU ALA

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	762898	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION; standard correction in Relion	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	45.68	Depositor
Minimum defocus (nm)	-800	Depositor
Maximum defocus (nm)	-2500	Depositor
Magnification	105000	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.127	Depositor
Minimum map value	-0.068	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.002	Depositor
Recommended contour level	0.014	Depositor
Map size (Å)	300.3, 300.3, 300.3	wwPDB
Map dimensions	364, 364, 364	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.825, 0.825, 0.825	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	0.36	0/19509	0.56	0/26411

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	19165	19554	19539	262	0
All	All	19165	19554	19539	262	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 7.

The worst 5 of 262 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:4056:GLN:OE1	1:A:4057:ASP:N	2.10	0.84
1:A:1109:LEU:HD22	1:A:1138:THR:HG22	1.63	0.80
1:A:2227:ARG:NH2	1:A:3184:GLU:OE1	2.16	0.79
1:A:1829:GLU:OE2	1:A:2082:TYR:OH	2.01	0.77
1:A:1134:SER:O	1:A:1138:THR:HG23	1.83	0.77

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	2369/4411 (54%)	2308 (97%)	61 (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	2149/3839 (56%)	2117 (98%)	32 (2%)	65 85

5 of 32 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	4203	LYS
1	A	4228	GLU
1	A	2185	THR
1	A	2144	SER
1	A	4273	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	1258	ASN

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Mol	Chain	Res	Type
1	A	3302	GLN
1	A	4343	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 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

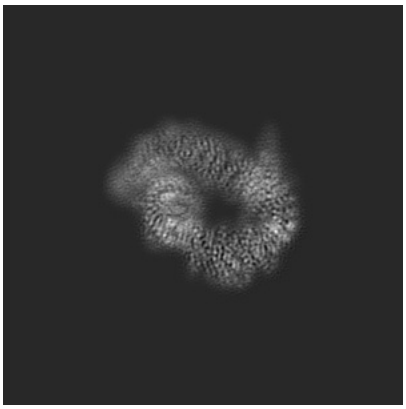
This section contains visualisations of the EMDB entry EMD-22427. These allow visual inspection of the internal detail of the map and identification of artifacts.

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

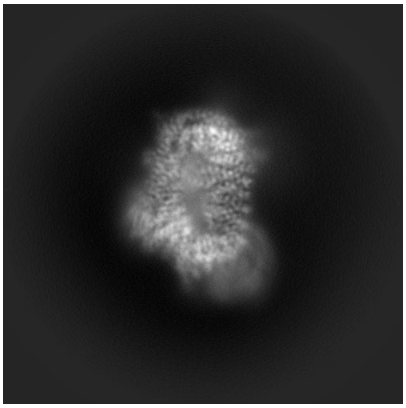
X



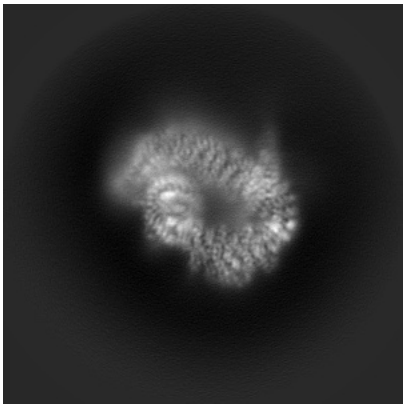
Y

Z

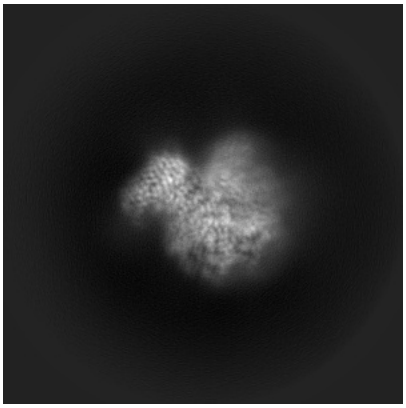
6.1.2 Raw map



X



Y

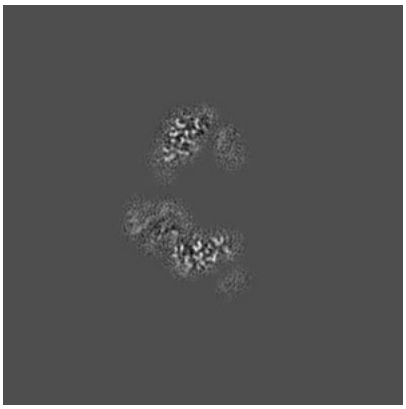


Z

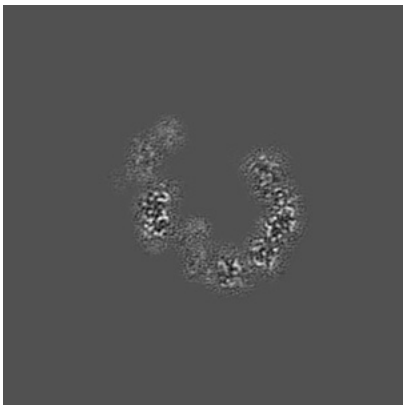
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

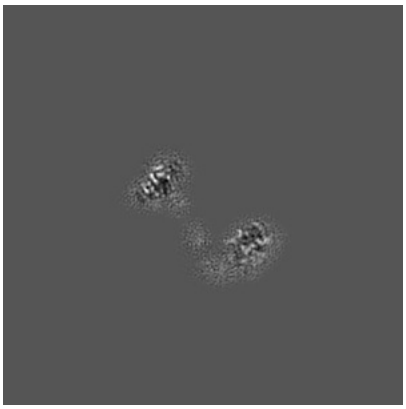
6.2.1 Primary map



X Index: 182

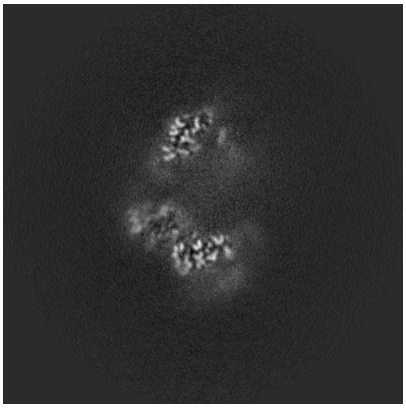


Y Index: 182

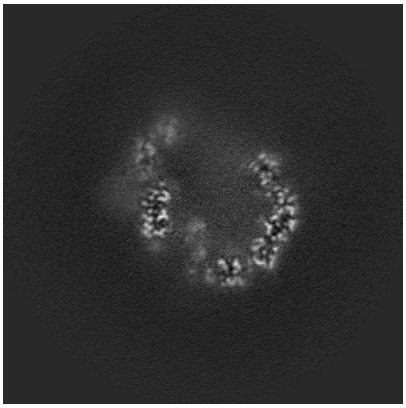


Z Index: 182

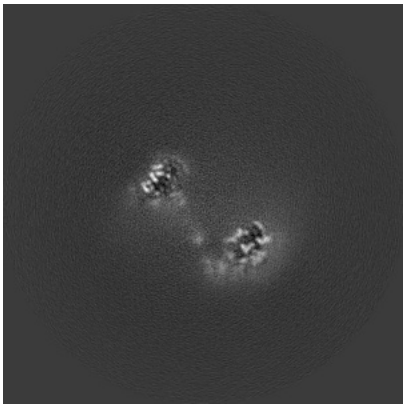
6.2.2 Raw map



X Index: 182



Y Index: 182

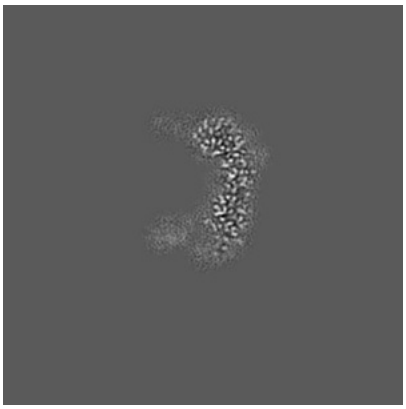


Z Index: 182

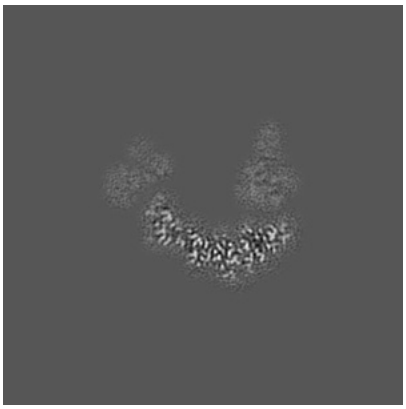
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

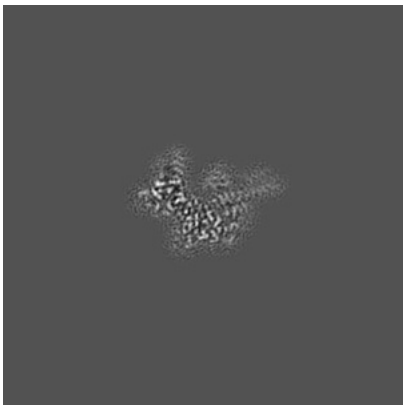
6.3.1 Primary map



X Index: 149

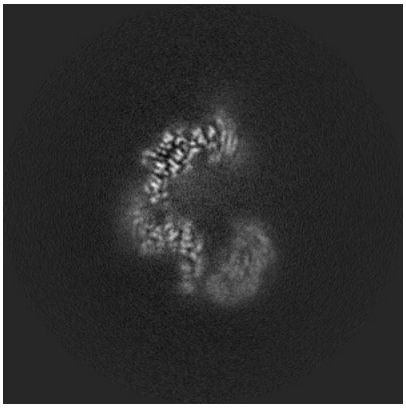


Y Index: 202

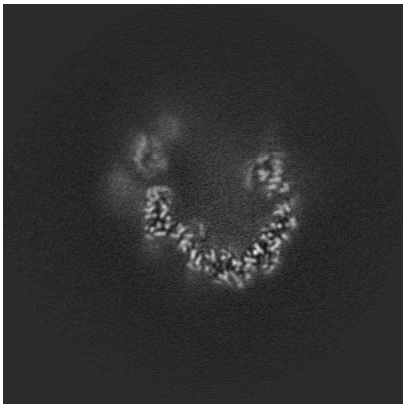


Z Index: 246

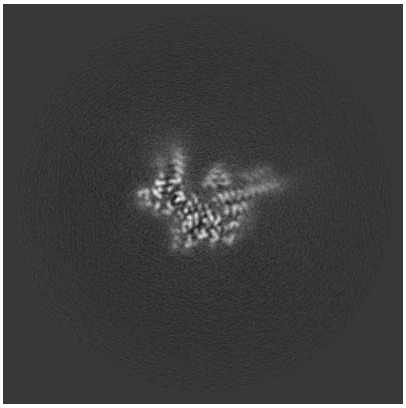
6.3.2 Raw map



X Index: 203



Y Index: 189

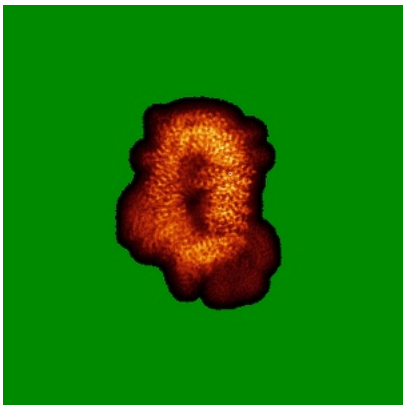


Z Index: 246

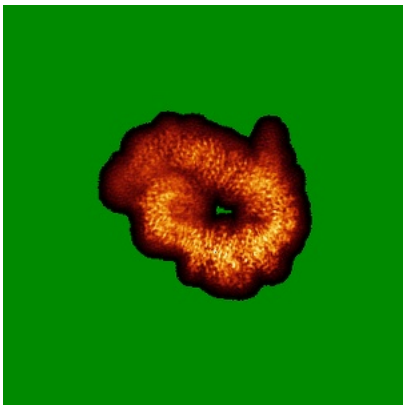
The images above show the largest variance slices of the map in three orthogonal directions.

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

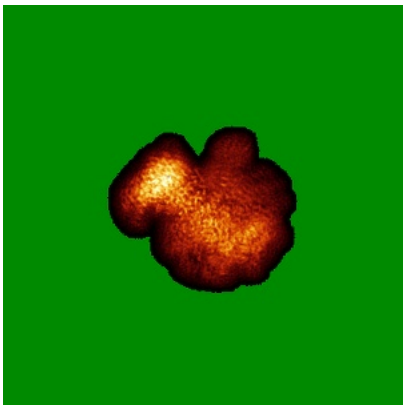
6.4.1 Primary map



X

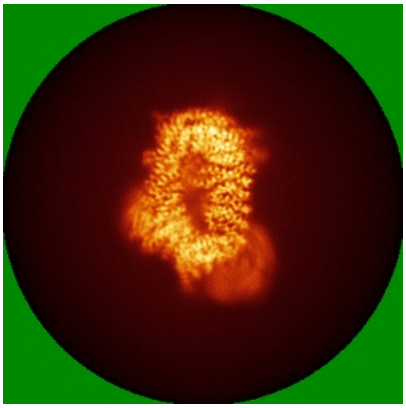


Y

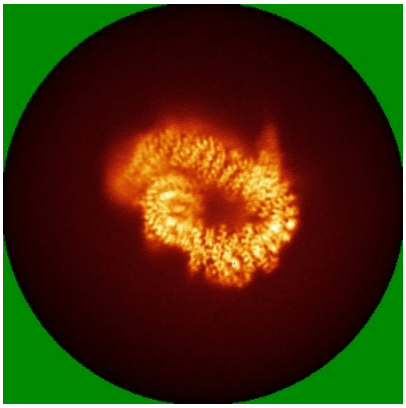


Z

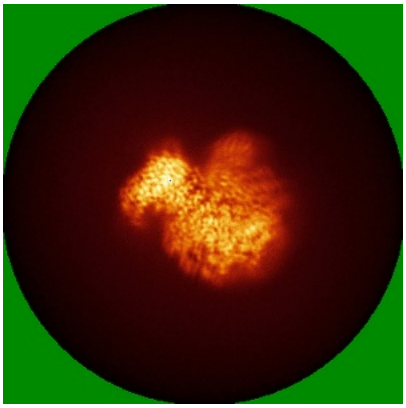
6.4.2 Raw map



X



Y

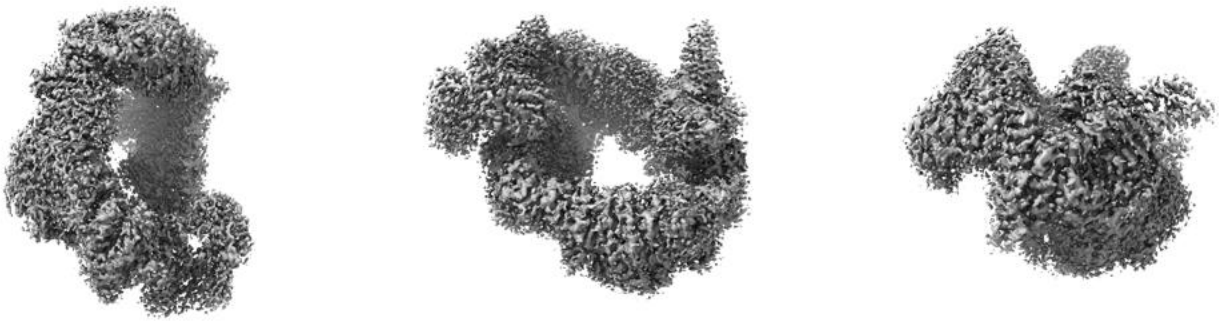


Z

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)

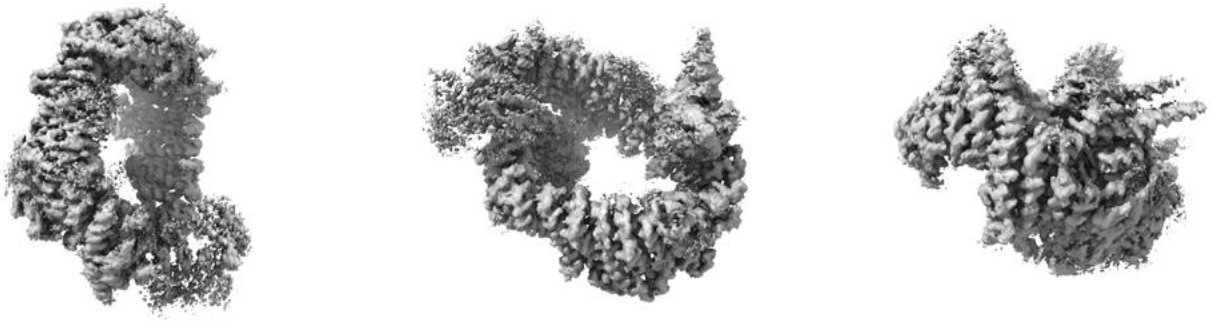
6.5.1 Primary map



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.014. 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.

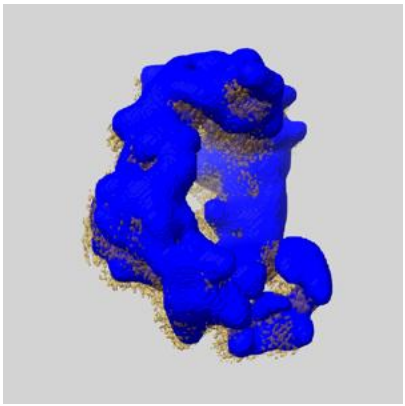
6.6 Mask visualisation (i)

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

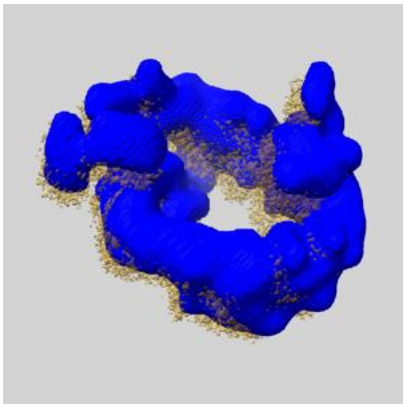
A mask typically either:

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

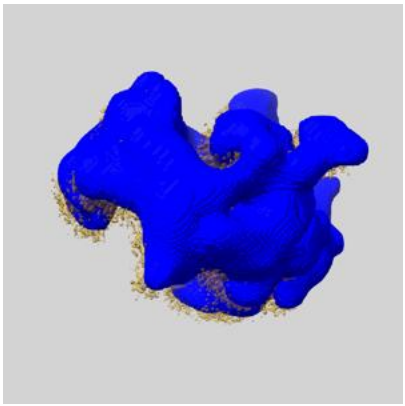
6.6.1 emd_22427_msk_1.map (i)



X



Y

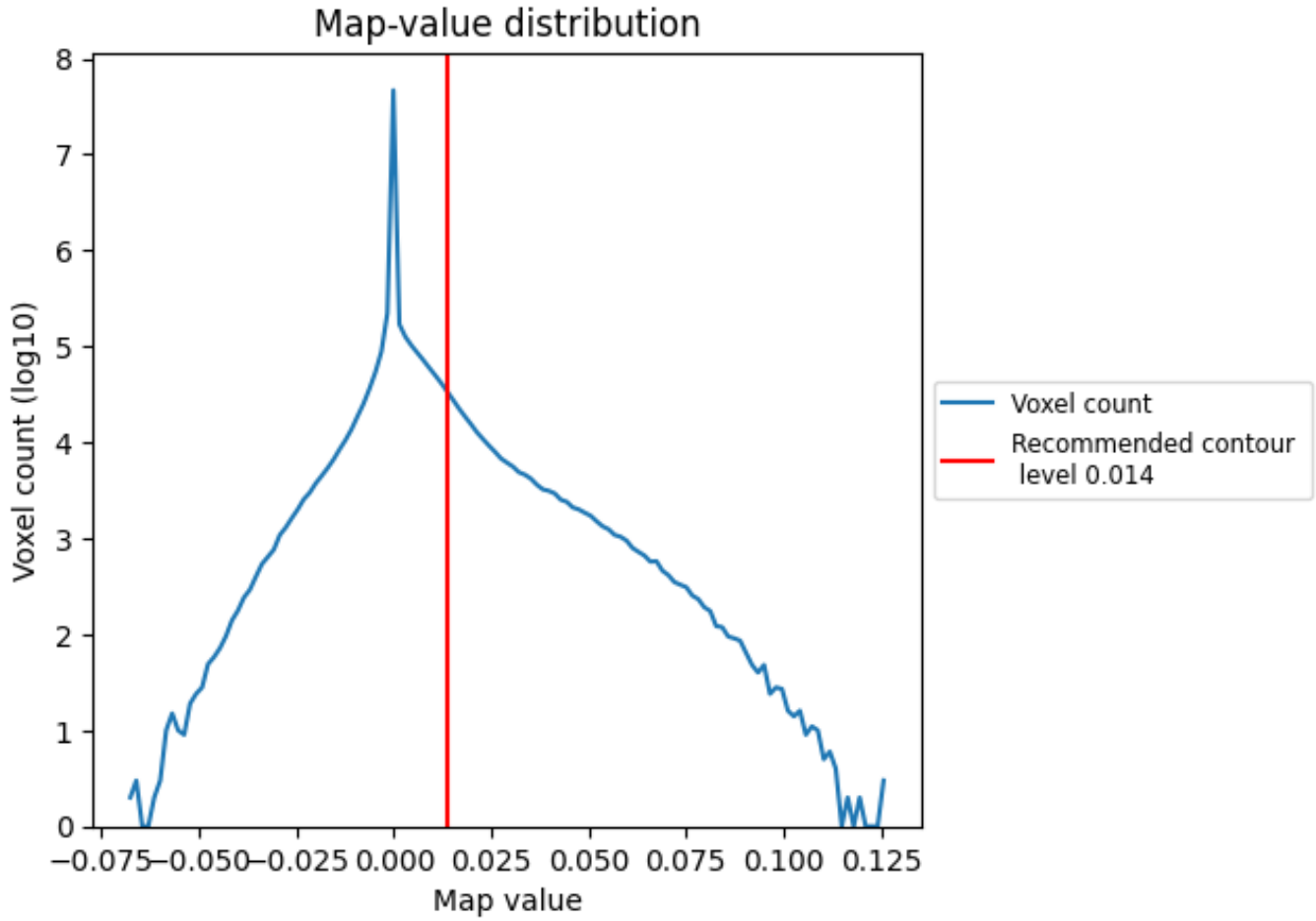


Z

7 Map analysis

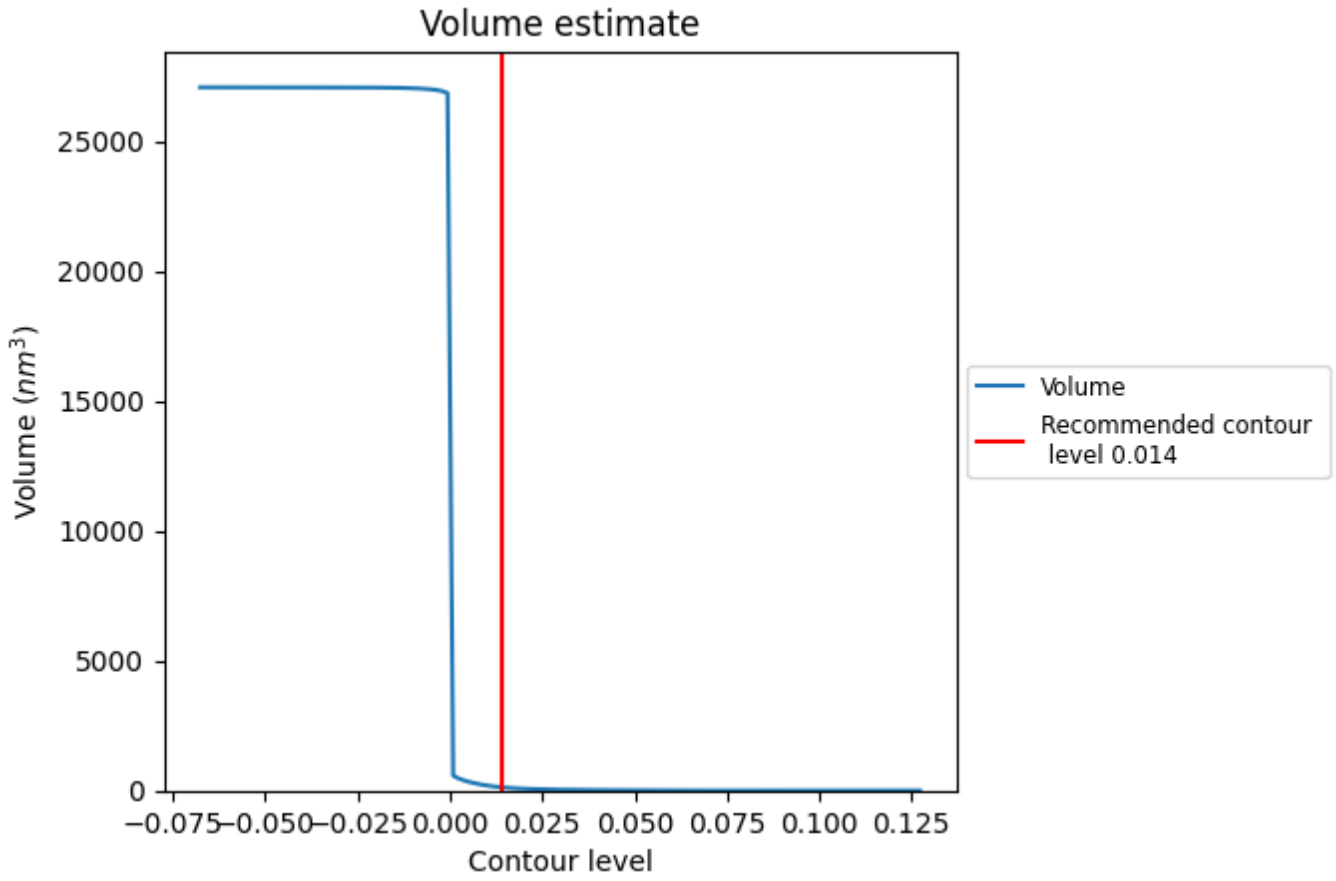
This section contains the results of statistical analysis of the map.

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.

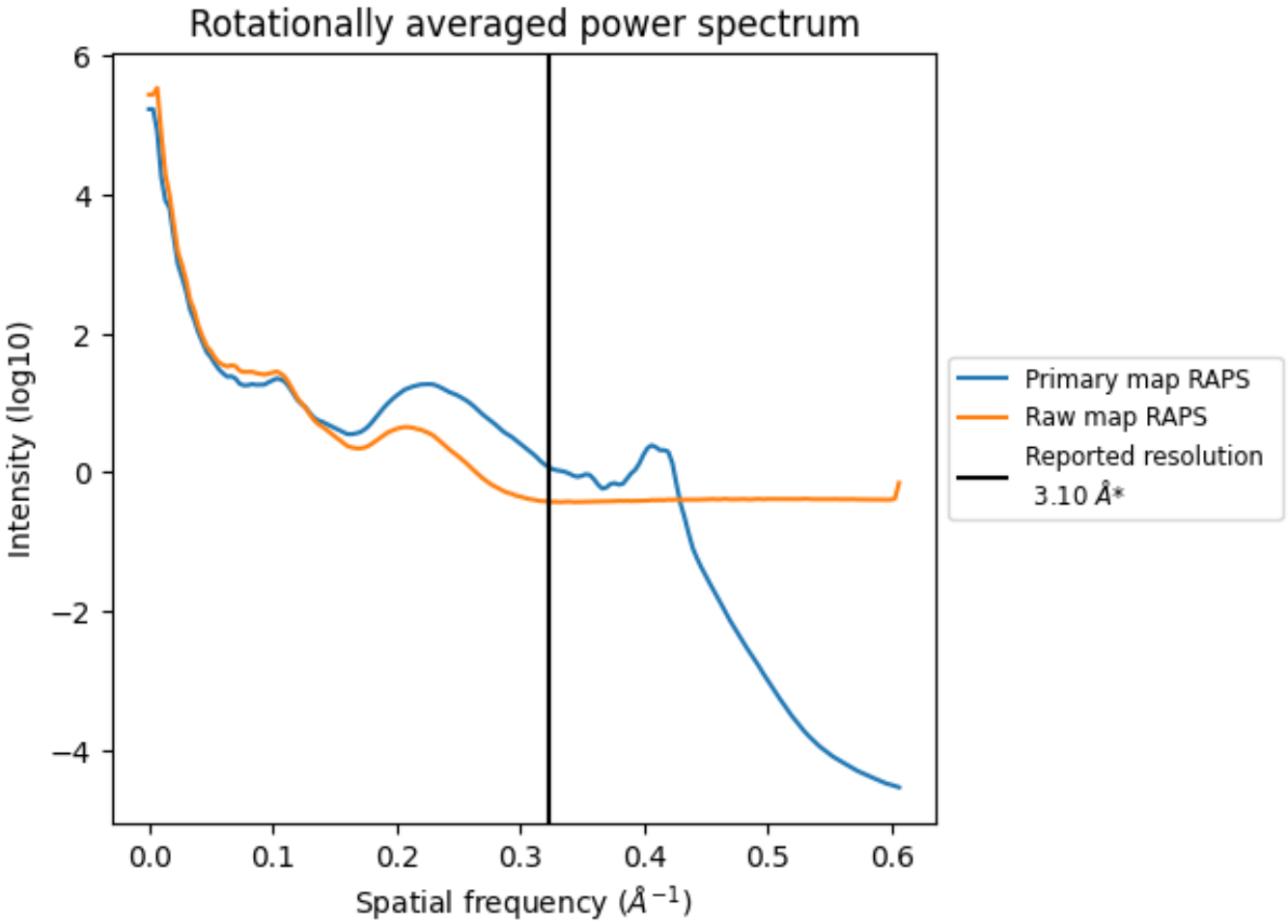
7.2 Volume estimate (i)



The volume at the recommended contour level is 126 nm^3; this corresponds to an approximate mass of 114 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)

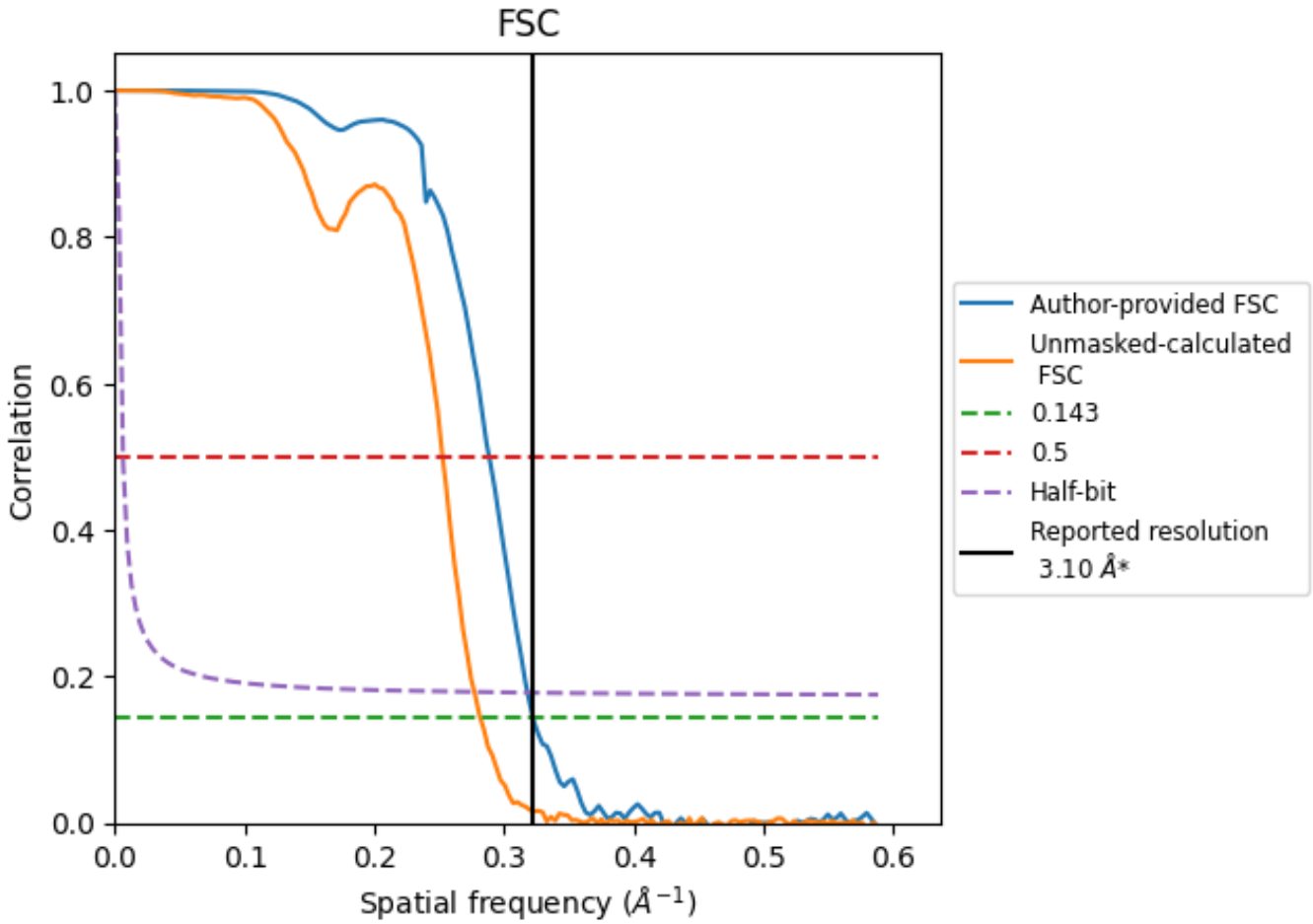


*Reported resolution corresponds to spatial frequency of 0.323 Å^{-1}

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 0.323 Å^{-1}

8.2 Resolution estimates (i)

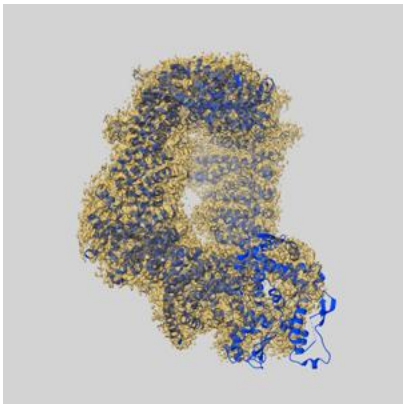
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.10	-	-
Author-provided FSC curve	3.10	3.47	3.14
Unmasked-calculated*	3.55	3.96	3.61

*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 3.55 differs from the reported value 3.1 by more than 10 %

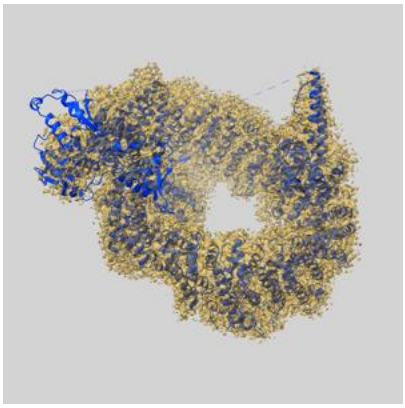
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-22427 and PDB model 7JQ9. Per-residue inclusion information can be found in section 3 on page 5.

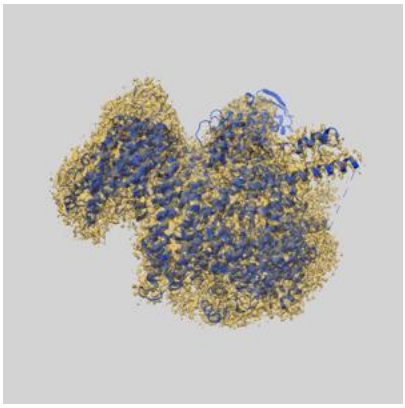
9.1 Map-model overlay



X



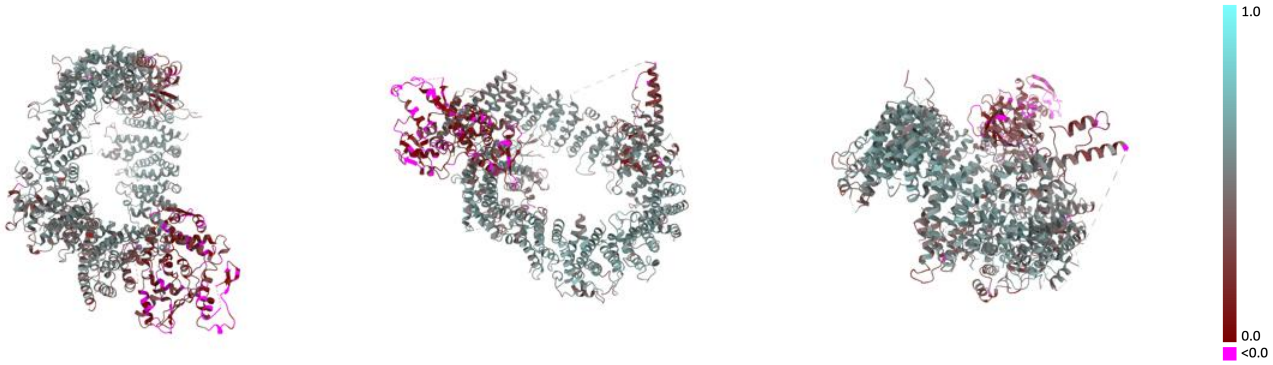
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.014 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.

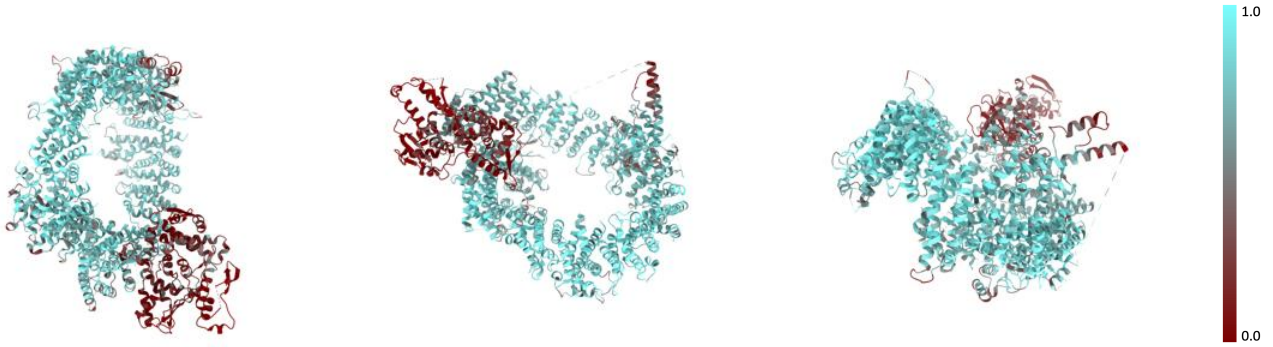
9.2 Q-score mapped to coordinate model (i)



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.

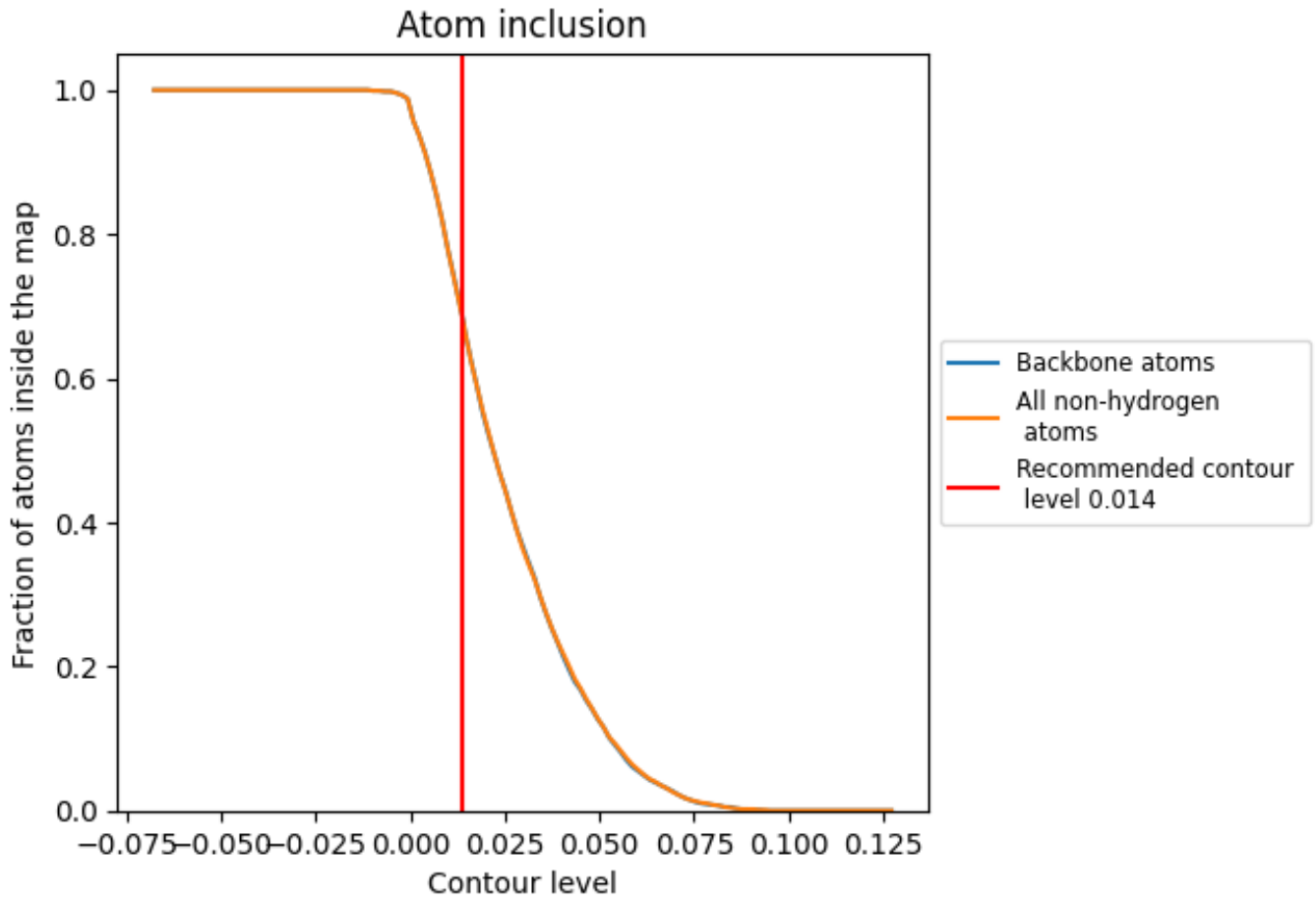
9.3 Atom inclusion mapped to coordinate model (i)



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 (0.014).

9.4 Atom inclusion (i)



At the recommended contour level, 68% of all backbone atoms, 68% 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 (0.014) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.6800	0.4290
A	0.6810	0.4290