



wwPDB EM Validation Summary Report ⓘ

Dec 14, 2023 – 02:42 PM JST

PDB ID : 8JB5
EMDB ID : EMD-36141
Title : The cryo-EM structure of Paeniclostridium sordellii lethal toxin (TcsL)
Authors : Zhan, X.; Tao, L.
Deposited on : 2023-05-08
Resolution : 2.90 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.dev70
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) : 2.36

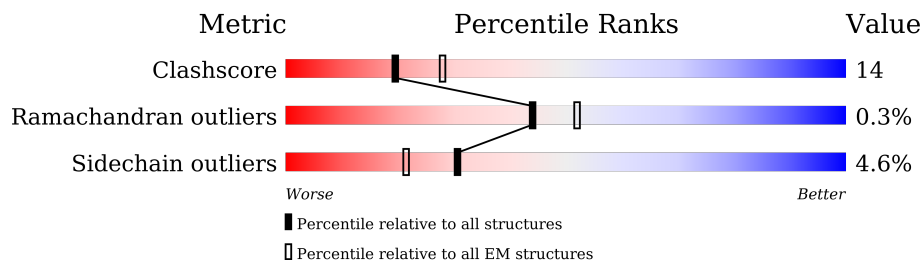
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 2.90 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 $\leq 5\%$. 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	2372	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 19027 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 Cytotoxin-L.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	2355	19026	12183	3022	3774	47	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	2365	HIS	-	expression tag	UNP T0D3N5
A	2366	HIS	-	expression tag	UNP T0D3N5
A	2367	HIS	-	expression tag	UNP T0D3N5
A	2368	HIS	-	expression tag	UNP T0D3N5
A	2369	HIS	-	expression tag	UNP T0D3N5
A	2370	HIS	-	expression tag	UNP T0D3N5
A	2371	HIS	-	expression tag	UNP T0D3N5
A	2372	HIS	-	expression tag	UNP T0D3N5

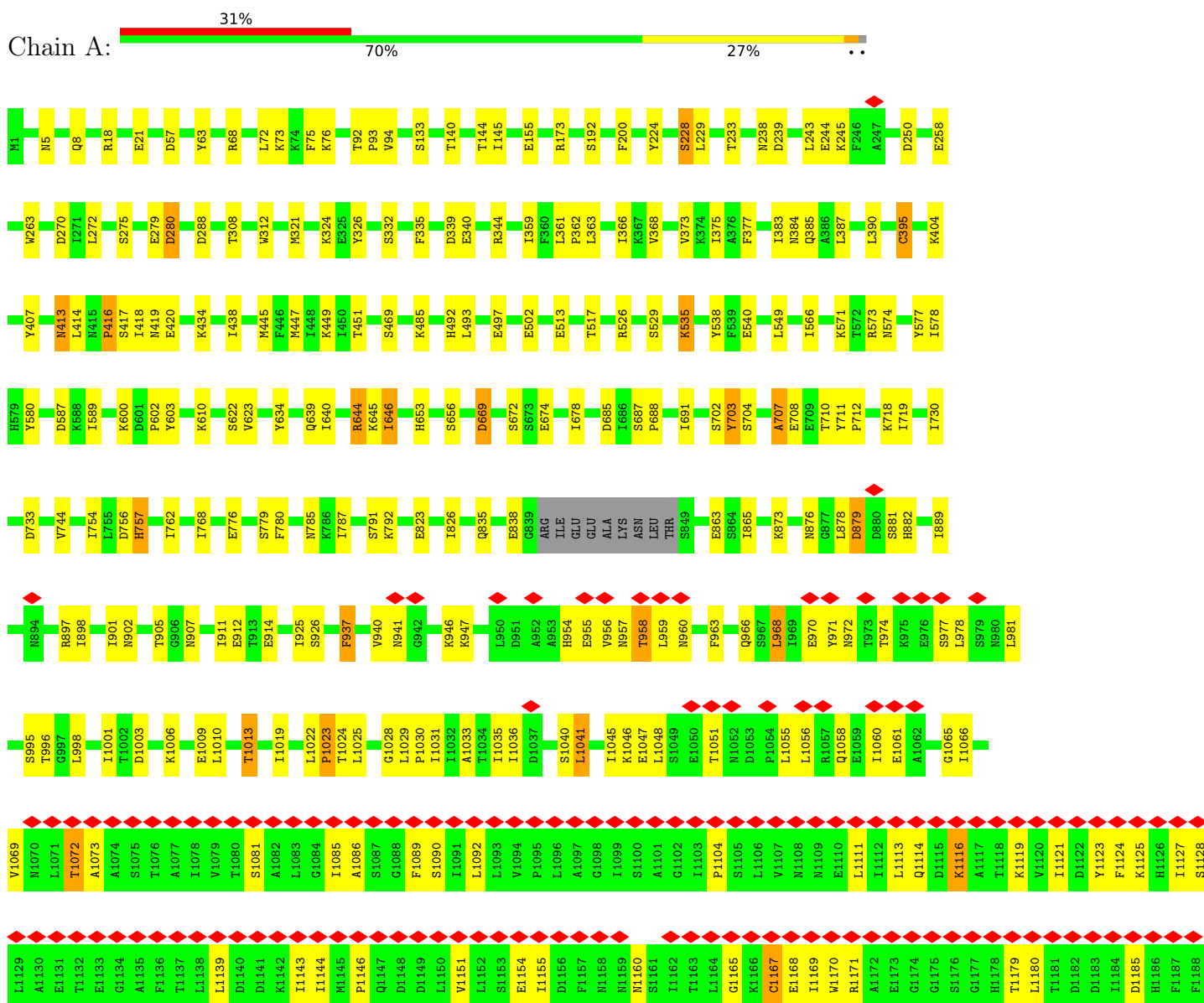
- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
			Total	Zn	
2	A	1	1	1	0

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: Cytotoxin-L



V2199	E2139	G2079	Y2019	S1798	S1639	S1441	S1373	K1310	K1249	S1189
Y2200	L2140	W2080	F2020	T1799	L1649	D1442	K1374	M1311	L1250	S1190
Y2201	G2141	G2081	F1800	F1800	G1650	G1445	L1375	L1312	L1251	P1191
F2202	Y2142	T2082	G2021	S1801	F1542	K1446	M1376	S1313	D1252	S1192
G2203	Q2143	T2083	K2022	A1804	T1543	I1447	I1377	I1314	I1253	I1193
E2204	Q2144	D2084	E2025	D1807	D1546	D1448	E1378	F1316	I1254	T1194
T2205	N2145	D2085	L1666	D1807	T1547	H1449	N1380	F1315	R1255	Y1195
Y2206	N2146	G2086	Y1662	Y1812	N1548	I1450	N1381	Y1317	D1256	R1196
K2207	N2147	S2087	I1664	I1813	I1549	G1451	K1381	I1318	H1257	K1197
E2208	L2148	F1814	D1665	F1814	I1550	F1452	I1382	S1319	Y1258	P1198
Y2209	N2149	D1820	G1668	D1820	N1553	N1453	I1383	G1320	E1259	M1199
F2150	Y2090	M1821	I1670	M1821	Y1556	G1454	L1384	Y1322	G1260	L1200
Y2151	D2091	M1831	S1671	M1831	L1557	H1456	L1385	S1324	Q1261	S1201
I2152	D2092	M1840	D1686	M1840	G1561	Q1457	H1387	L1325	F1262	I1202
D2153	D2093	D1841	D1688	D1841	K1573	K1458	T1388	Y1263	Y1263	Y1203
E2154	N2094	S1842	R1687	S1842	S1574	Y1459	I1389	Y1264	D1264	D1204
S2155	T2095	Y1979	R1687	Y1979	A1575	I1460	M1390	R1265	Y1265	Y1205
G2156	A2096	S1872	V1692	S1872	I1576	P1461	F1391	S1328	Y1266	L1206
L2157	E2097	F1886	V1692	F1886	S1663	S1462	Y1392	P1329	F1267	M1207
V2158	A2098	D1981	L1698	S1876	Y1464	S1465	G1393	M1331	A1268	I1208
L2159	C2099	N1982	Y1699	I1465	T1578	Y1466	H1394	M1332	F1269	K1209
E2160	T2100	N1983	I1719	T1578	L1582	D1466	E1397	M1333	I1270	K1210
G2161	G2101	L1895	D1722	I1577	F1586	N1467	R1400	I1334	A1271	E1211
G2162	G2102	L1900	D1722	T1577	F1588	E1468	F1401	I1334	D1272	K1212
L2163	L2103	L1906	I1726	L1582	S1588	K1470	I1402	L1336	A1273	I1213
D2164	V2104	L1906	I1726	L1582	S1588	R1495	S1403	M1337	I1274	D1214
T2165	I2105	F1909	S1738	I1591	N1496	N1496	L1404	L1338	F1215	F1215
P2166	N2106	F1909	S1738	I1591	Y1497	Y1497	T1405	L1339	S1216	S1216
D2167	D2107	F1926	V1742	M1598	M1499	M1499	F1406	E1340	S1217	K1217
G2168	C2108	I1927	M1745	L1599	P1500	P1500	S1407	M1344	K1277	D1218
Y2169	K2109	G1928	M1745	L1599	D1501	D1501	I1408	W1344	L1278	D1219
K2170	K2110	K1929	S1756	I1603	M1602	M1602	L1409	V1345	K1279	L1219
Y2171	Y2111	L1930	S1756	I1603	I1603	S1502	L1409	V1345	P1280	M1220
F2172	G2052	D1933	Q1761	E1604	E1604	M1603	E1410	V1348	R1281	V1221
A2173	E2053	F1998	P1762	F1605	F1605	M1504	D1411	D1349	I1282	L1222
P2174	L2054	Y1999	Q1763	F1605	F1605	M1505	I1412	M1350	E1283	P1223
N2175	T2055	N2001	R1767	D1608	D1608	L1505	N1413	V1351	E1284	N1224
L2176	T2056	Y1938	R1767	M1609	M1609	L1507	I1414	F1352	T1285	A1225
N2177	Y2057	Y1938	F1772	F1611	F1611	D1512	I1415	K1353	N1286	P1226
V2178	N2058	A1945	F1772	I1612	I1612	K1514	E1417	M1354	V1287	M1227
M2179	G2059	A1947	D1775	E1623	E1623	K1514	D1419	I1355	R1288	R1228
L2180	N2060	V1948	T1776	L1624	L1624	K1515	L1420	T1356	I1289	R1228
T2181	Q2007	W1949	D1787	C1626	C1626	K1516	L1421	I1357	N1290	F1230
N2181	V2008	L1951	V1791	D1627	D1627	K1521	V1421	E1358	L1291	G1231
I2182	G2009	L1952	K1795	D1629	D1629	G1522	S1424	S1359	D1292	Y1232
Y2183	Y2010	D1953	I1796	I1634	I1634	L1527	K1426	D1360	G1293	E1233
Q2185	G2065	D1954	I1797	Y1635	Y1635	K1533	I1427	E1361	N1294	M1234
A2186	K2066	E1955	T1956	F1636	F1636	D1534	C1433	I1362	T1295	G1235
V2187	L2067	T1956	T1956	D1535	D1535	D1535	L1436	K1363	R1296	W1236
Y2188	Y2068	G2015	G2015	D1535	D1535	D1535	I1437	G1364	F1298	T1237
S2190	F2070	K2016	K2016	D1535	D1535	D1535	E1438	G1365	P1238	P1238
G2191	F2130	Y2017	Y2017	D1535	D1535	D1535	M1439	E1366	L1299	G1239
L2192	I2072	F2018	F2018	D1535	D1535	D1535	S1440	L1367	F1240	F1240
V2193	S2073	S2073	S2073	D1535	D1535	D1535	L1440	G1368	R1241	R1241
R2194	N2074	N2074	N2074	D1535	D1535	D1535	L1436	E1368	S1242	S1242
S2195	T2075	T2075	T2075	D1535	D1535	D1535	I1437	L1368	L1243	L1243
N2196	A2076	A2076	A2076	D1535	D1535	D1535	M1439	L1367	D1244	D1244
E2197	V2077	V2077	V2077	D1535	D1535	D1535	S1440	E1369	M1245	M1245
D2198	I2138	I2138	I2138	D1535	D1535	D1535	L1440	L1371	G1247	G1247

N2259	N2260	Y2261	Y2262	F2263	N2264	E2265	D2266	G2267	K2268	H2269	Q2270	F2271	G2272	Y2273	L2274	H2275	I2276	K2277	D2278	K2279	H2280	F2281	Y2282	F2283	G2284	K2285	D2286	G2287	K2288	H2289	Q2290	I2291	G2292	V2293	F2294	H2295	T2296	F2297	D2298	G2299	F2300	H2301	Y2302	F2303	A2304	H2305	Q2306	H2307	T2308	L2309	D2310	H2311	F2312	F2313	E2314	G2315	E2316	S2317	I2318	N2319	Y2320	T2321	G2322	W2323	L2324	D2325	L2326	D2327	G2328	K2329	R2330	Y2331	Y2332	F2333	T2334	D2335	E2336	Y2337	I2338	A2339	A2340	T2341	G2342	S2343	L2344	T2345	I2346	D2347	G2348	Y2349	N2350	Y2351	Y2352	F2353	D2354	P2355	D2356	T2357	A2358	E2359	L2360	V2361	V2362	S2363	E2364	HIS	HIS	HIS	HIS	HIS	HIS	HIS	HIS
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4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	229156	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.204	Depositor
Minimum map value	-0.099	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.005	Depositor
Recommended contour level	0.02	Depositor
Map size (\AA)	321.752, 321.752, 321.752	wwPDB
Map dimensions	296, 296, 296	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.087, 1.087, 1.087	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section:
ZN

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	0.41	0/19409	0.51	5/26261 (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	2

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	416	PRO	CA-N-CD	-12.75	93.65	111.50
1	A	1535	ASP	CB-CG-OD2	5.24	123.02	118.30
1	A	1982	ASP	CB-CG-OD2	5.22	123.00	118.30
1	A	669	ASP	CB-CG-OD2	5.21	122.99	118.30
1	A	1394	ASP	CB-CG-OD2	5.17	122.95	118.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1028	GLY	Peptide
1	A	1452	PHE	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	19026	0	18584	525	0
2	A	1	0	0	0	0
All	All	19027	0	18584	525	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 14.

The worst 5 of 525 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:1023:PRO:HG3	1:A:1649:TYR:CZ	1.49	1.48
1:A:1956:THR:HG23	1:A:1986:MET:N	1.21	1.45
1:A:1956:THR:CG2	1:A:1986:MET:N	1.86	1.38
1:A:1023:PRO:CG	1:A:1649:TYR:CZ	2.18	1.26
1:A:1180:LEU:HD21	1:A:1185:ASP:OD1	1.34	1.22

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	2351/2372 (99%)	2210 (94%)	135 (6%)	6 (0%)	41 71

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	707	ALA
1	A	1948	GLU
1	A	1029	LEU
1	A	1762	PRO
1	A	2342	GLY

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	2130/2146 (99%)	2033 (95%)	97 (5%)	27 60

5 of 97 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1433	CYS
1	A	1698	LEU
1	A	1527	LEU
1	A	1598	ASN
1	A	1801	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 26 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	1109	ASN
1	A	1520	ASN
1	A	2260	ASN
1	A	1453	ASN
1	A	1553	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](#)

Of 1 ligands modelled in this entry, 1 is monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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.

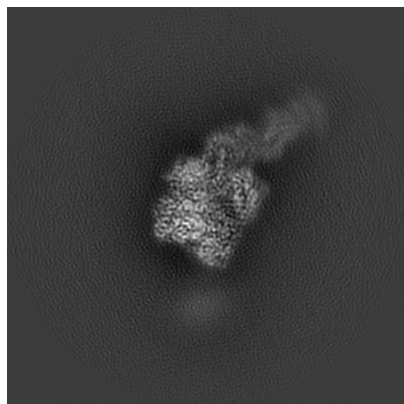
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-36141. These allow visual inspection of the internal detail of the map and identification of artifacts.

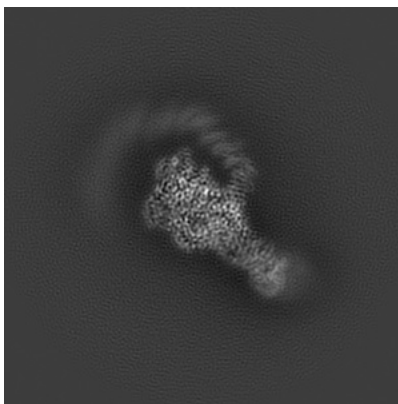
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

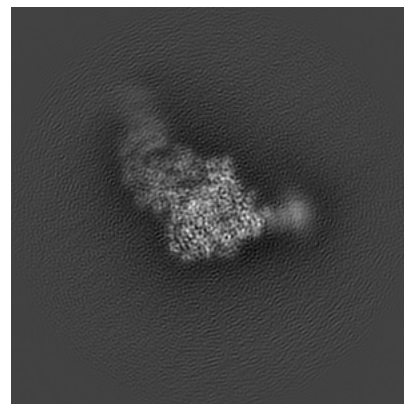
6.1.1 Primary map



X

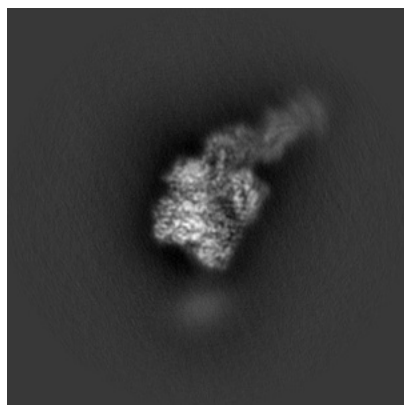


Y

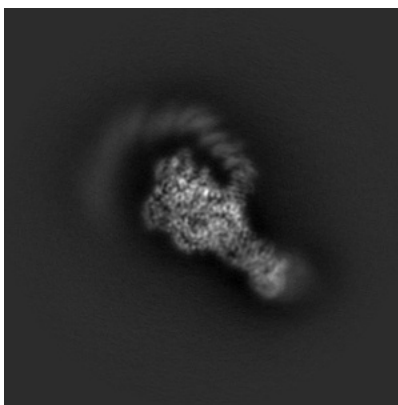


Z

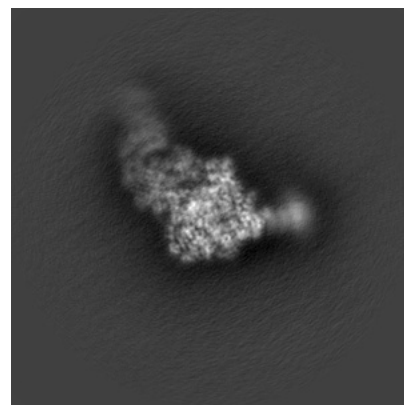
6.1.2 Raw map



X



Y

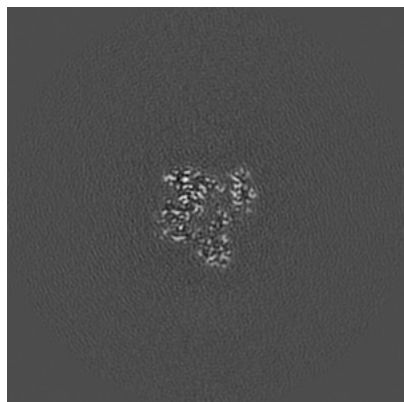


Z

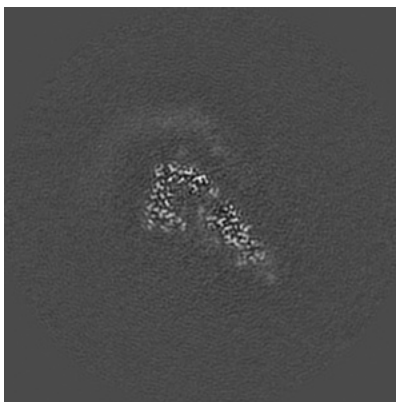
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

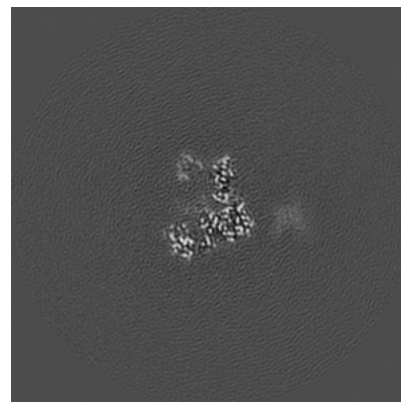
6.2.1 Primary map



X Index: 148

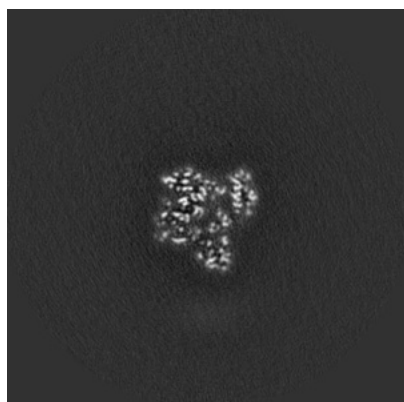


Y Index: 148

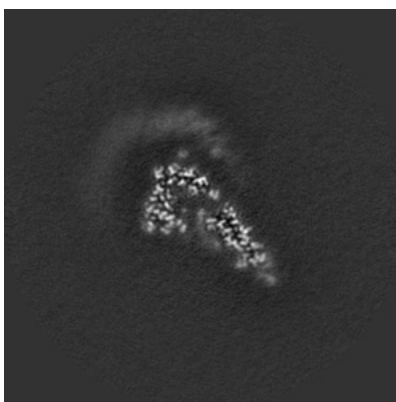


Z Index: 148

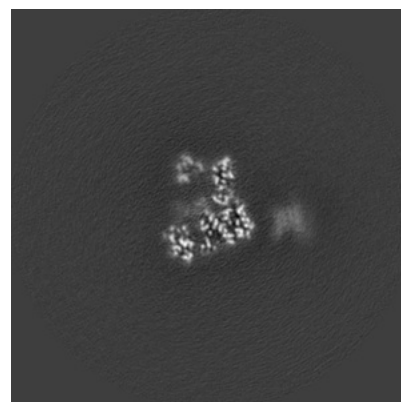
6.2.2 Raw map



X Index: 148



Y Index: 148

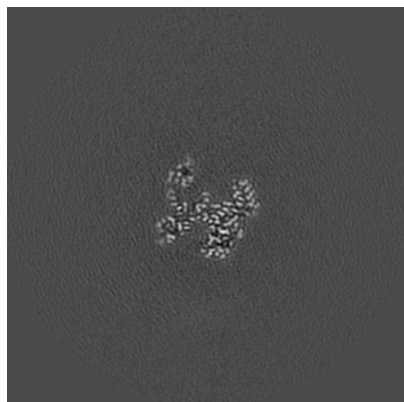


Z Index: 148

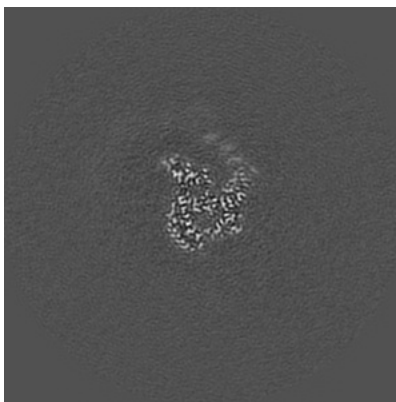
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

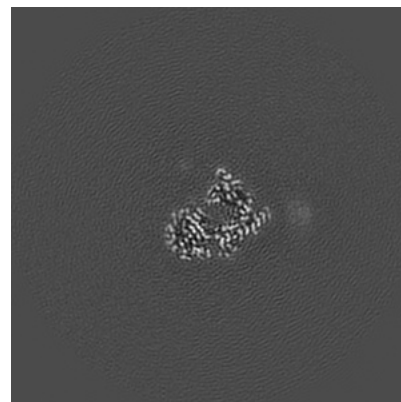
6.3.1 Primary map



X Index: 159

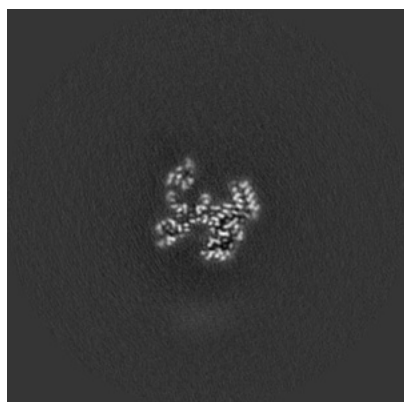


Y Index: 130

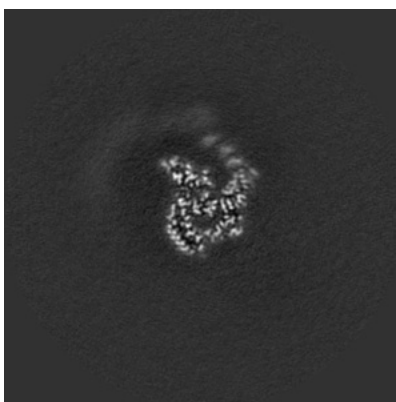


Z Index: 135

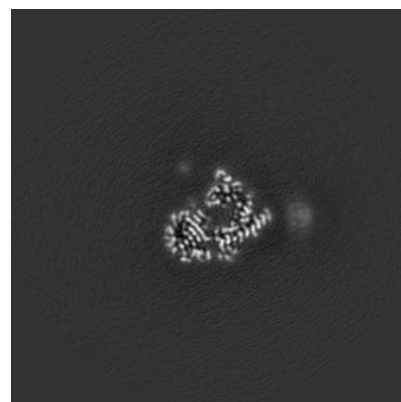
6.3.2 Raw map



X Index: 159



Y Index: 130

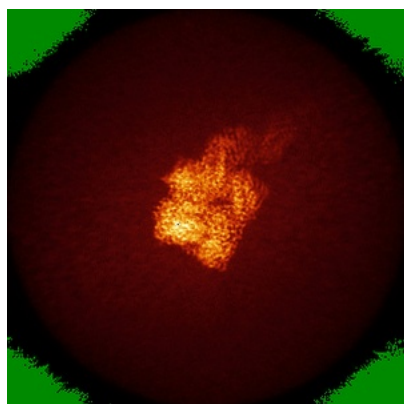


Z Index: 135

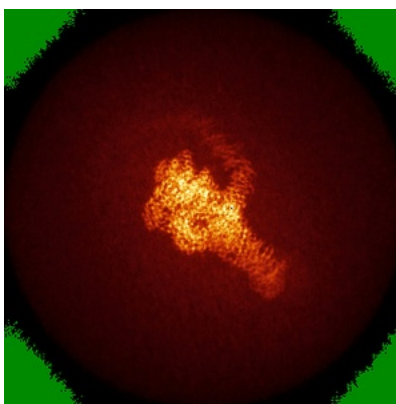
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) [i](#)

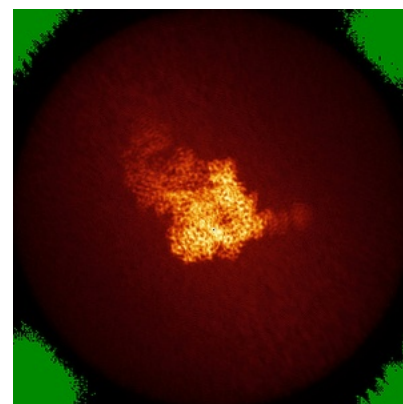
6.4.1 Primary map



X



Y

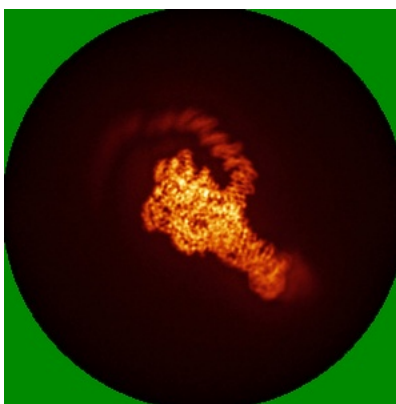


Z

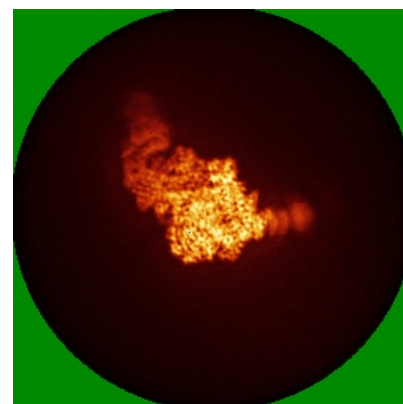
6.4.2 Raw map



X



Y

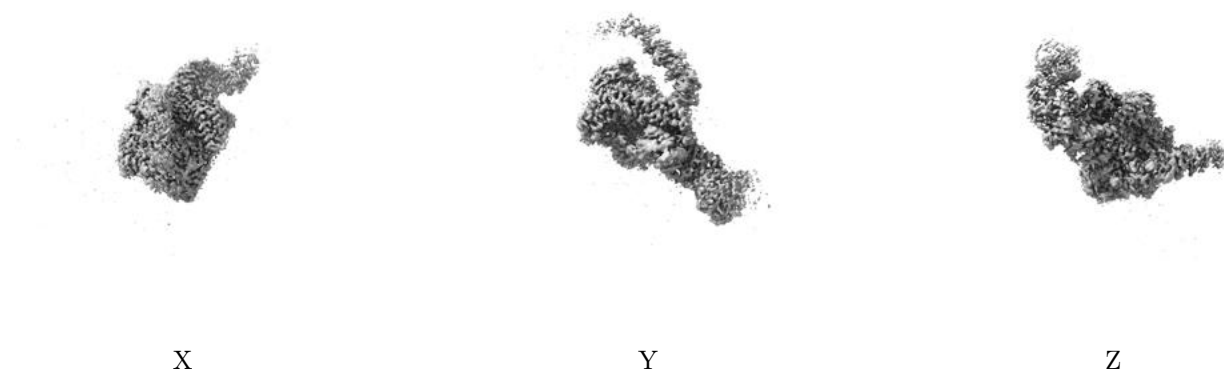


Z

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.

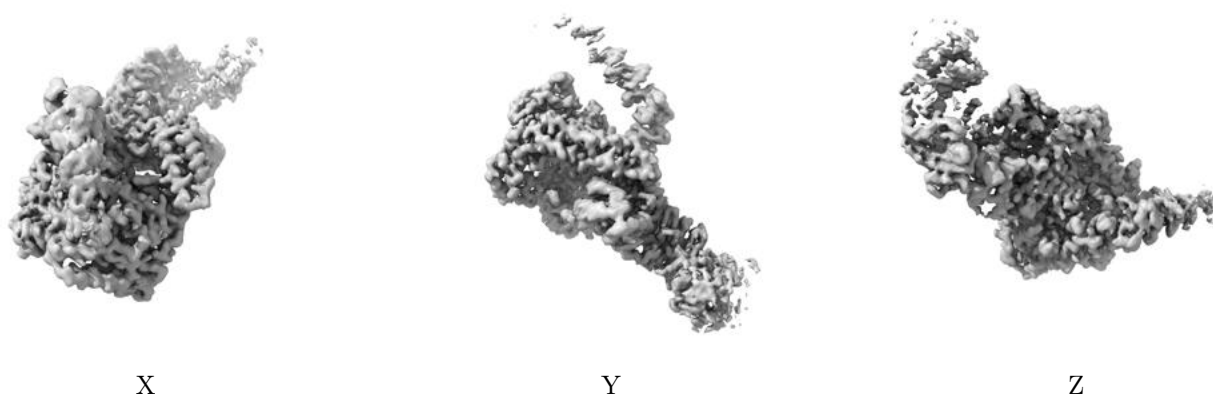
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.02. 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



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.

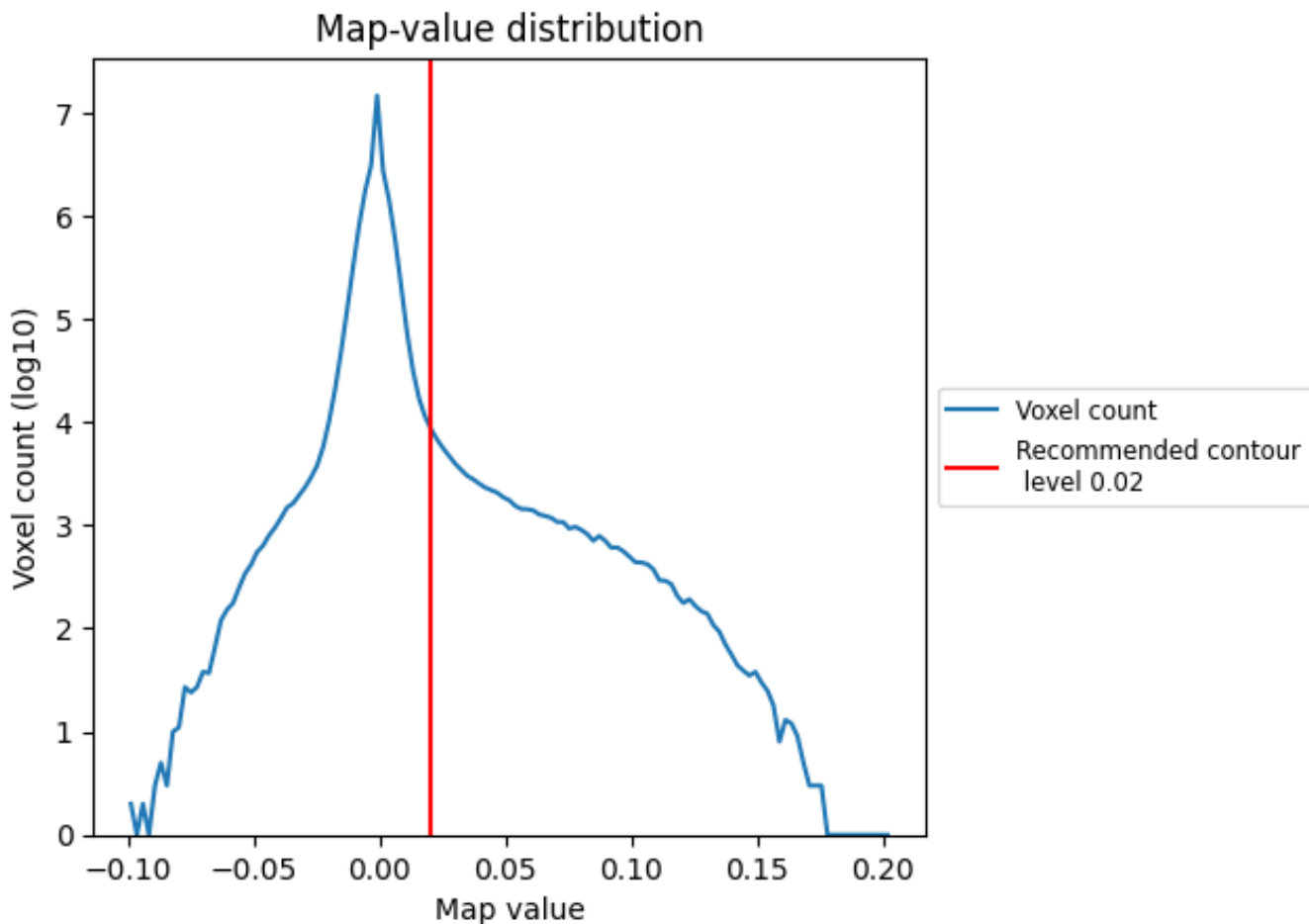
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

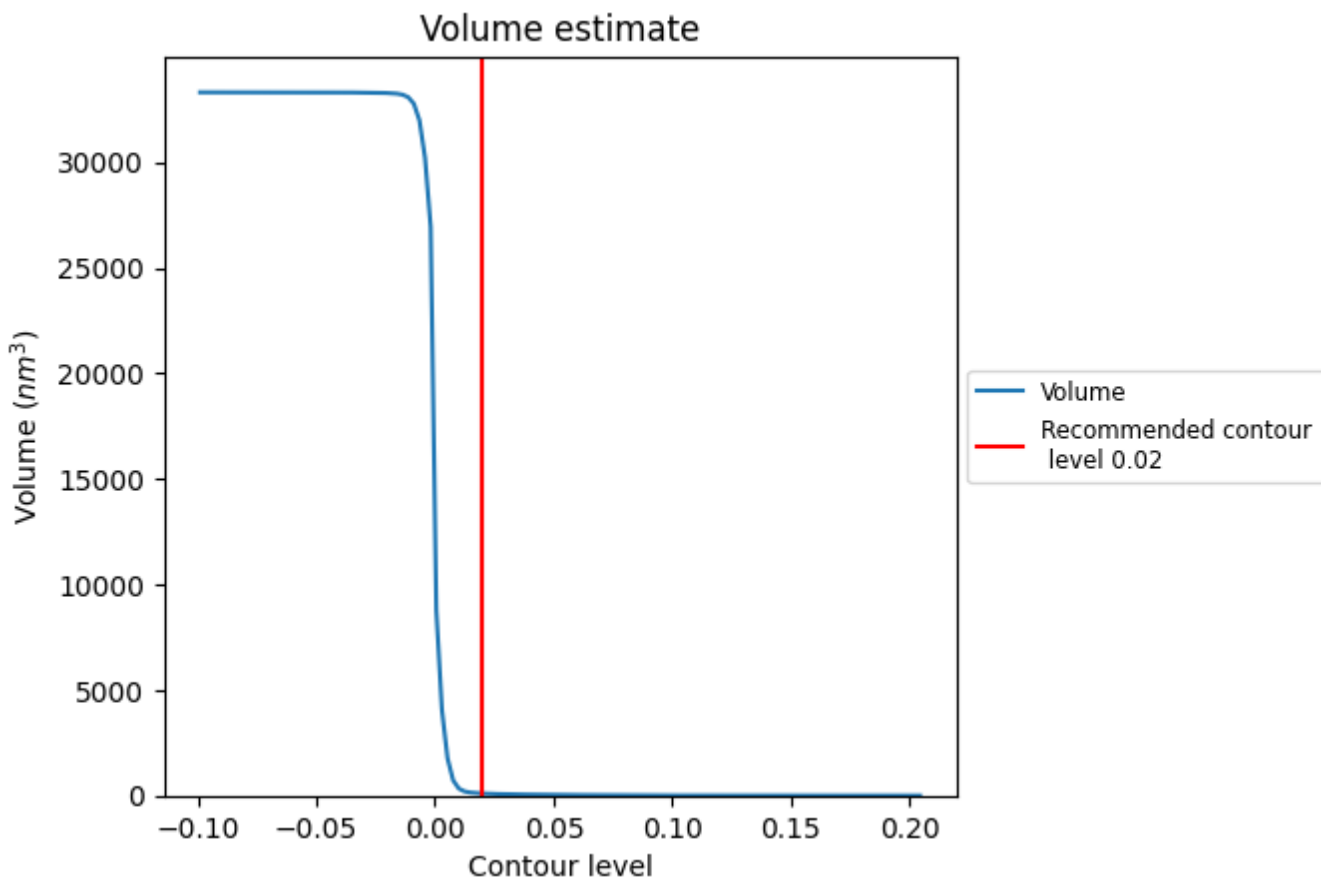
This section contains the results of statistical analysis of the map.

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.

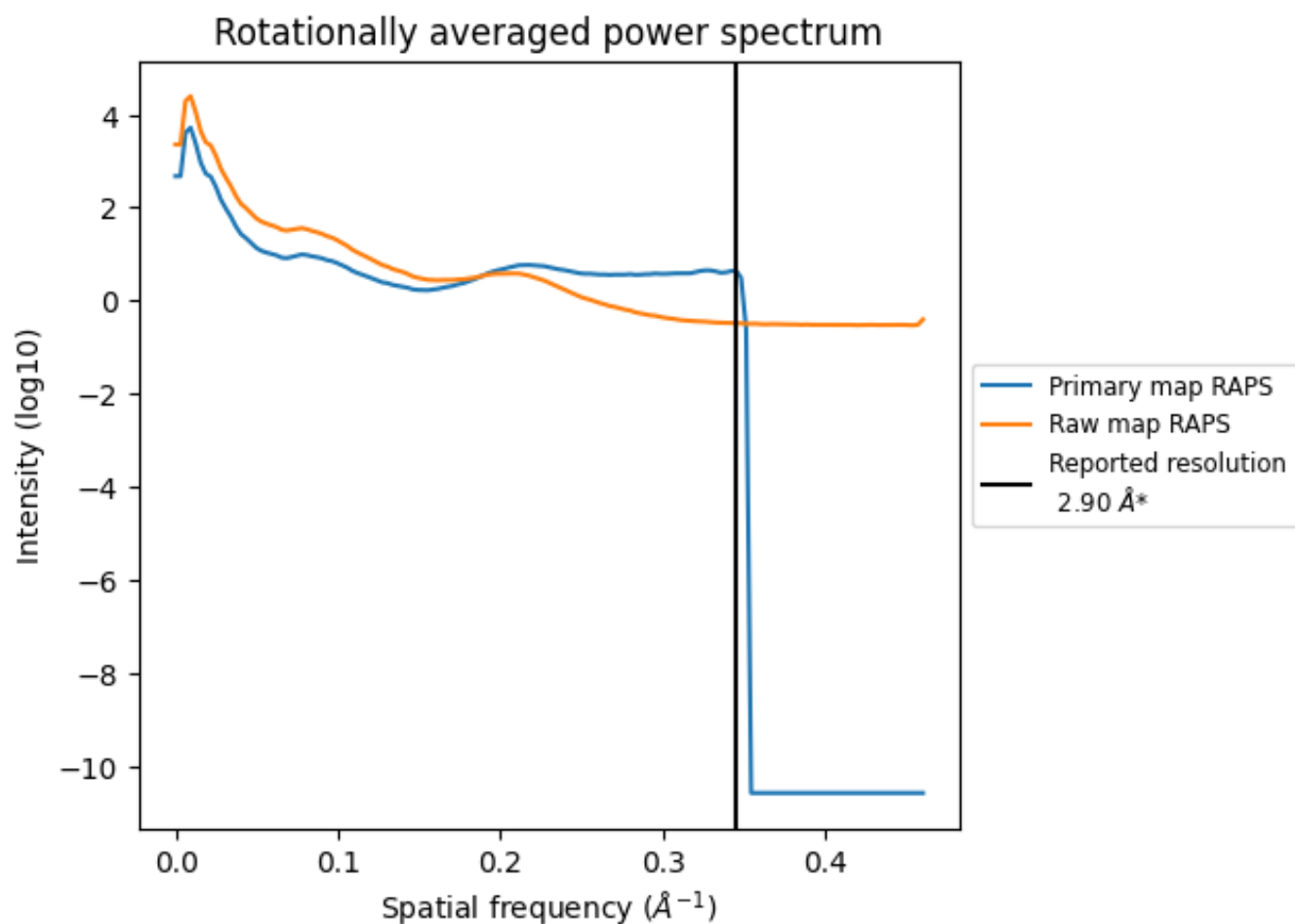
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 100 nm^3 ; this corresponds to an approximate mass of 90 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](#)

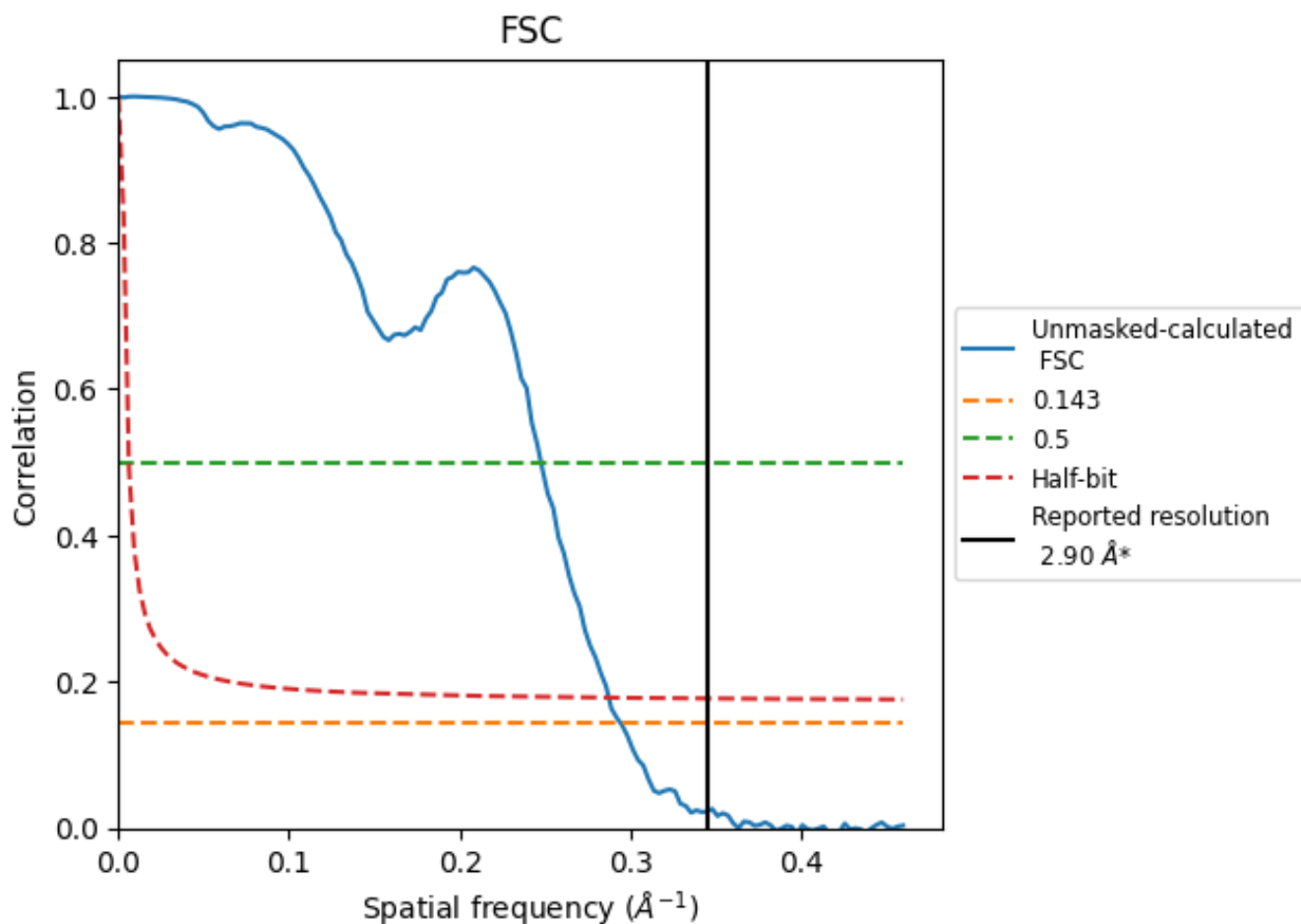


*Reported resolution corresponds to spatial frequency of 0.345 Å⁻¹

8 Fourier-Shell correlation [i](#)

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 [i](#)



*Reported resolution corresponds to spatial frequency of 0.345 \AA^{-1}

8.2 Resolution estimates [i](#)

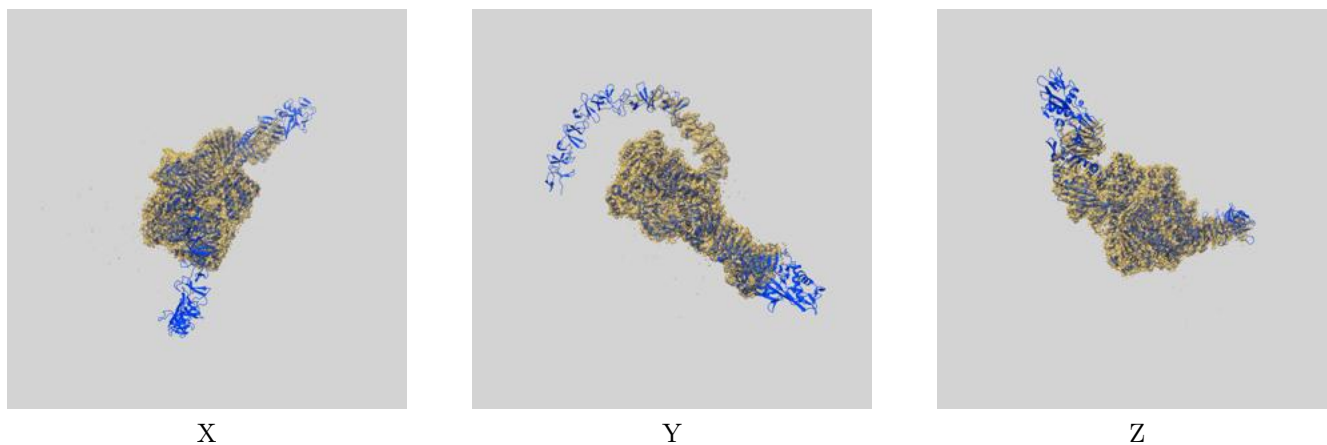
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.90	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.40	4.04	3.48

*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 3.40 differs from the reported value 2.9 by more than 10 %

9 Map-model fit [i](#)

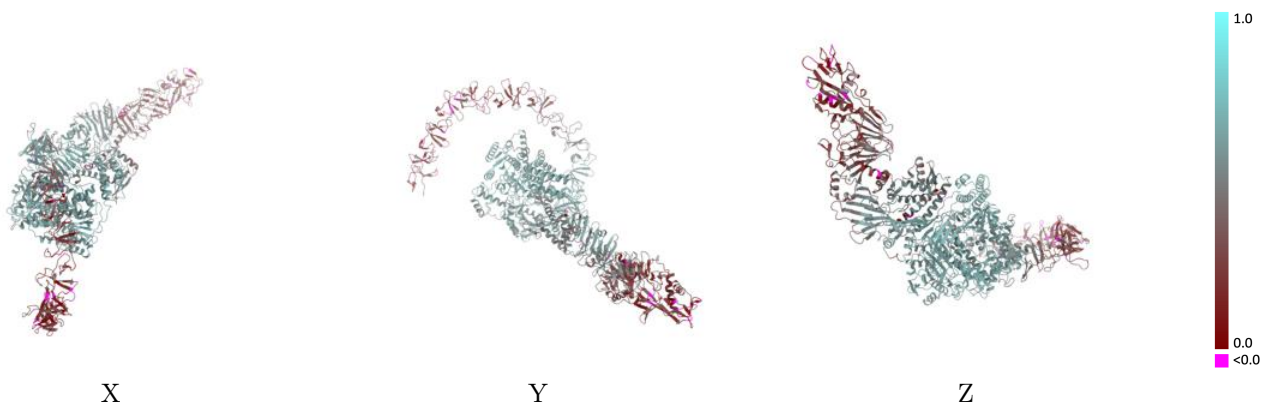
This section contains information regarding the fit between EMDB map EMD-36141 and PDB model 8JB5. Per-residue inclusion information can be found in section [3](#) on page [4](#).

9.1 Map-model overlay [i](#)



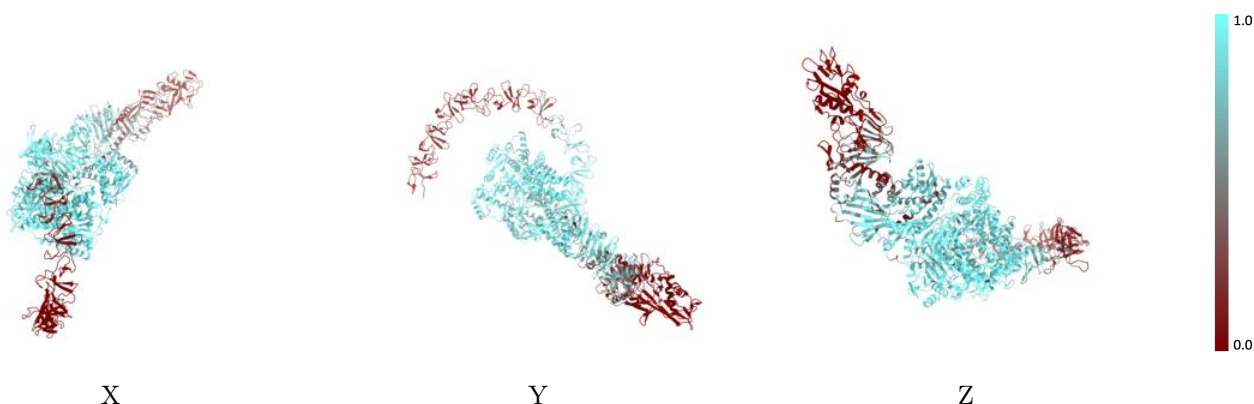
The images above show the 3D surface view of the map at the recommended contour level 0.02 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



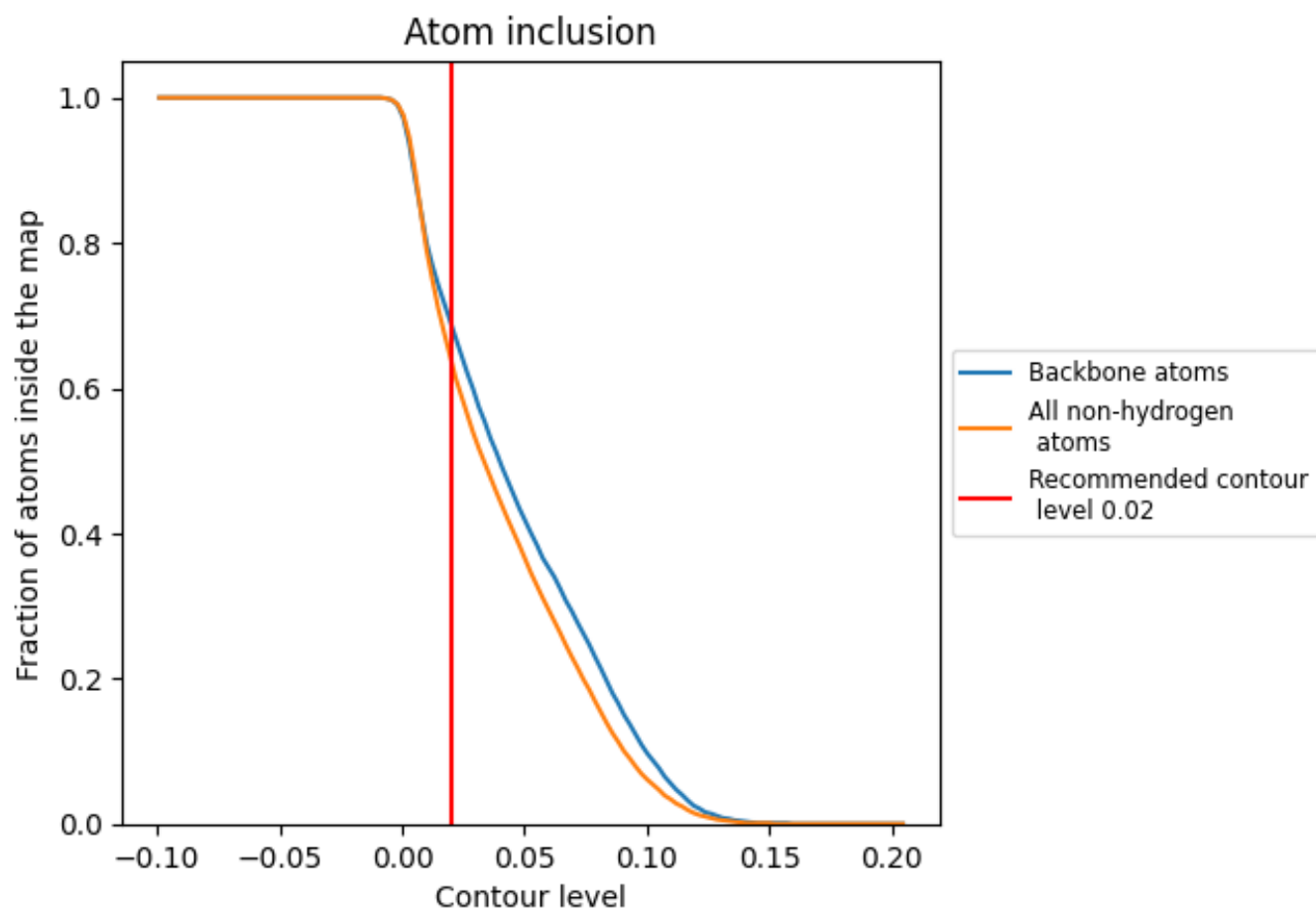
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.02).





9.4 Atom inclusion [i](#)



At the recommended contour level, 69% of all backbone atoms, 64% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary [i](#)

The table lists the average atom inclusion at the recommended contour level (0.02) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6390	 0.4770
A	 0.6390	 0.4770

