wwPDB EM Validation Summary Report

Jan 29, 2022 – 06:18 am GMT

PDB ID	:	7OTW
EMDB ID	:	EMD-13068
Title	:	DNA-PKcs in complex with AZD7648
Authors	:	Liang, S.; Thomas, S.E.; Blundell, T.L.
Deposited on	:	2021-06-10
Resolution	:	2.99 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 following versions of software and data (see references ⓘ) were used in the production of this report:

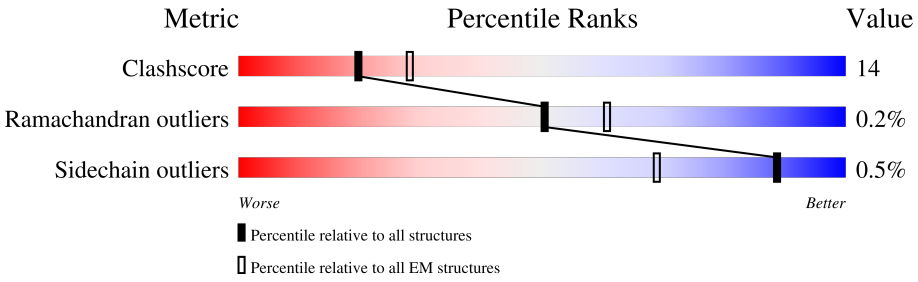
EMDB validation analysis	:	0.0.0.dev97
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	4.02b-467
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.26

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 2.99 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	4148	6% 62% 26% 12%

2 Entry composition (i)

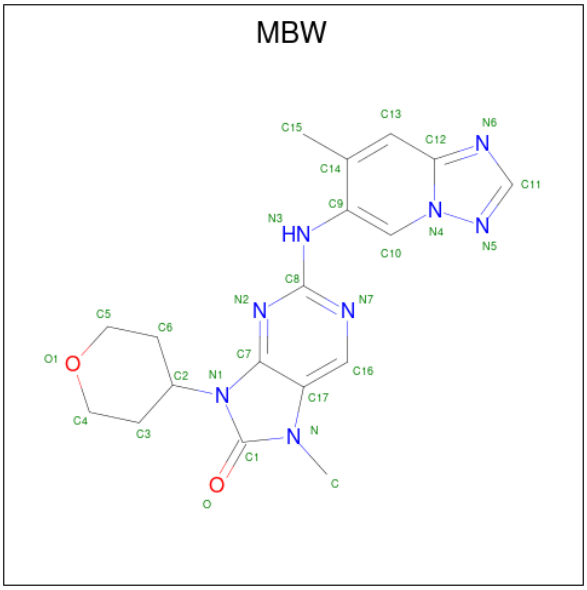
There are 2 unique types of molecules in this entry. The entry contains 29038 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 DNA-dependent protein kinase catalytic subunit,DNA-PKcs.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	3656	29010	18609	4903	5307	191	0	0

- Molecule 2 is 7-methyl-2-[(7-methyl-[1,2,4]triazolo[1,5-a]pyridin-6-yl)amino]-9-(oxan-4-yl)purin-8-one (three-letter code: MBW) (formula: $C_{18}H_{20}N_8O_2$) (labeled as "Ligand of Interest" by depositor).



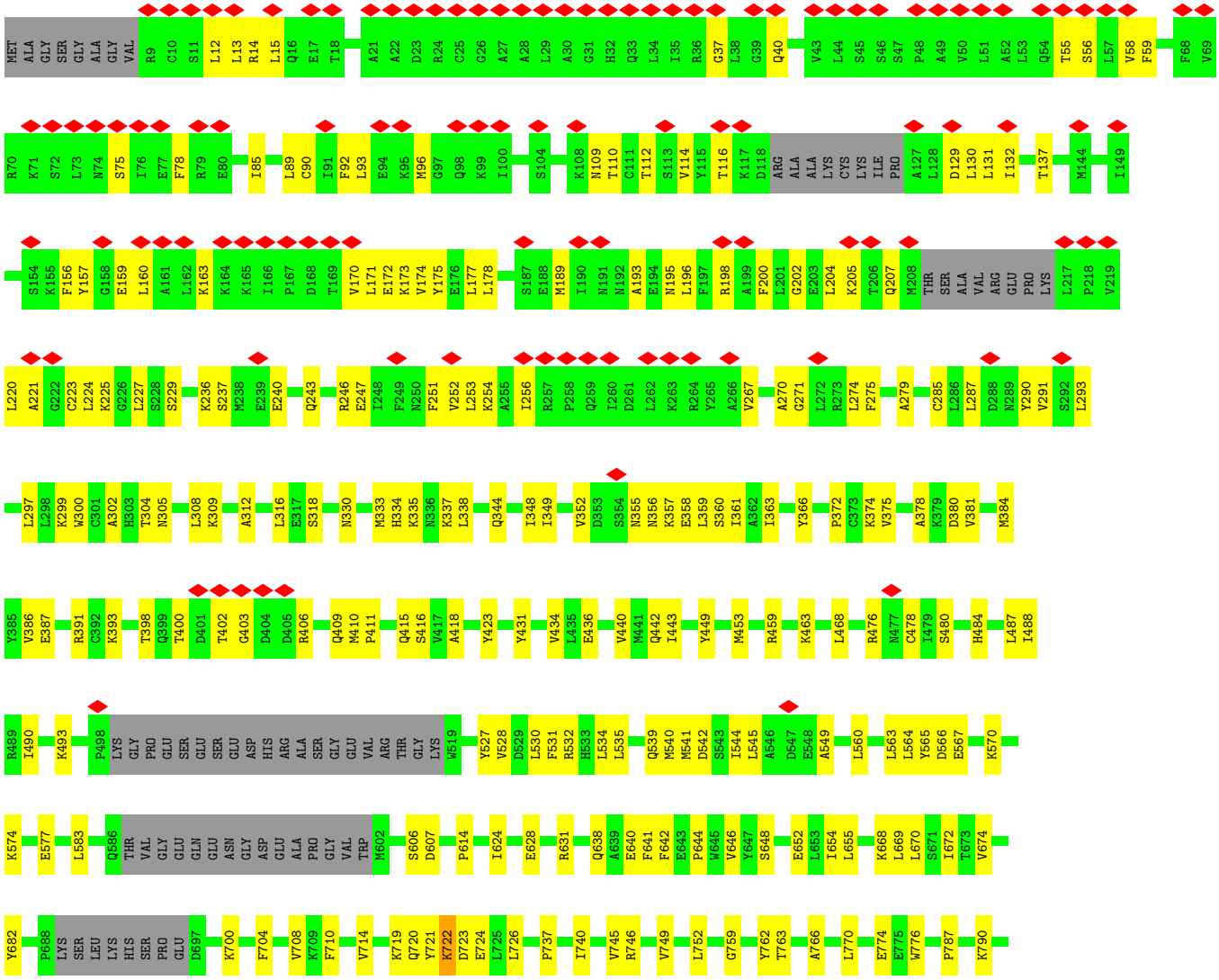
Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
2	A	1	28	18	8	2	0

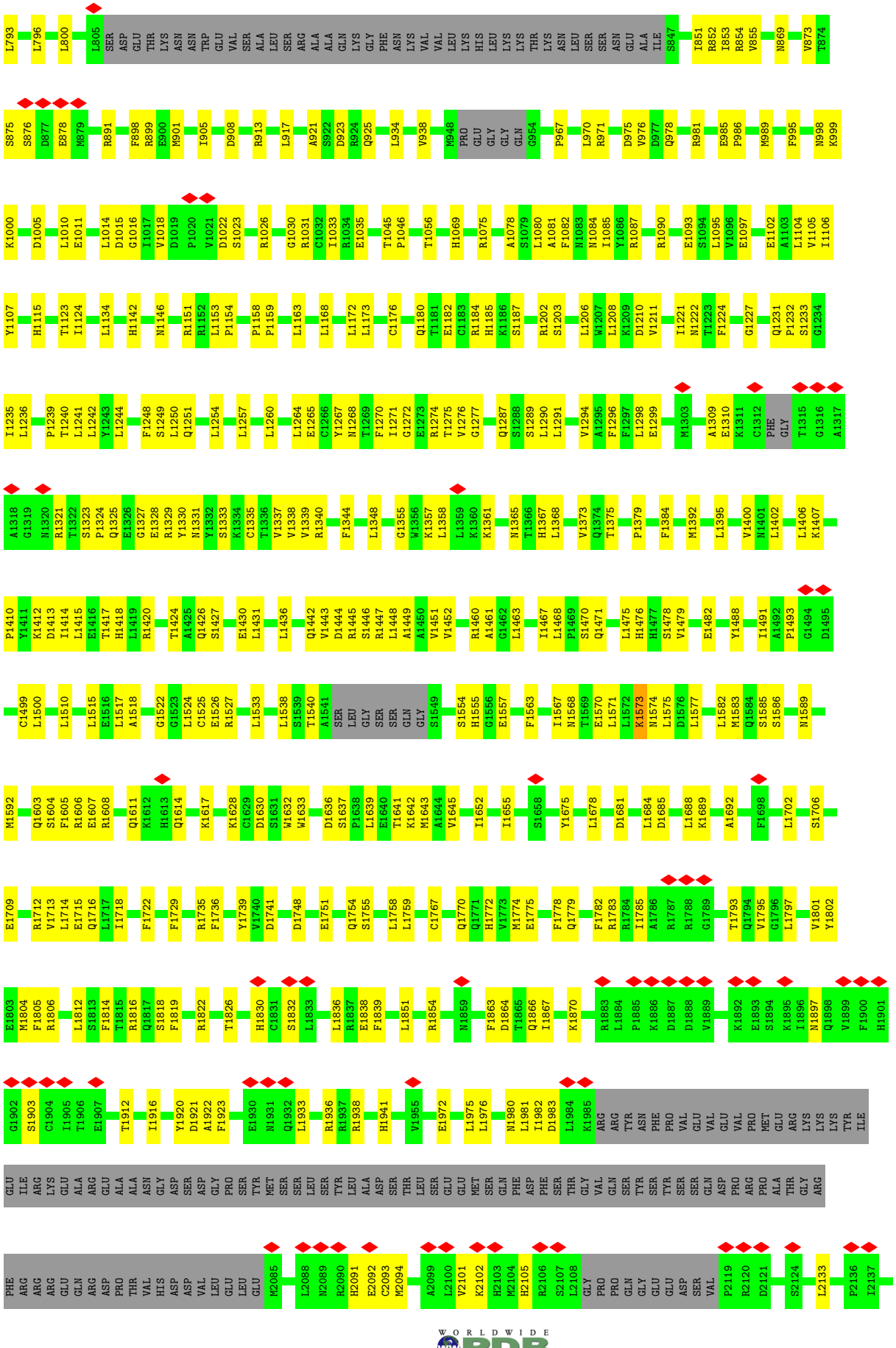
3 Residue-property plots (i)

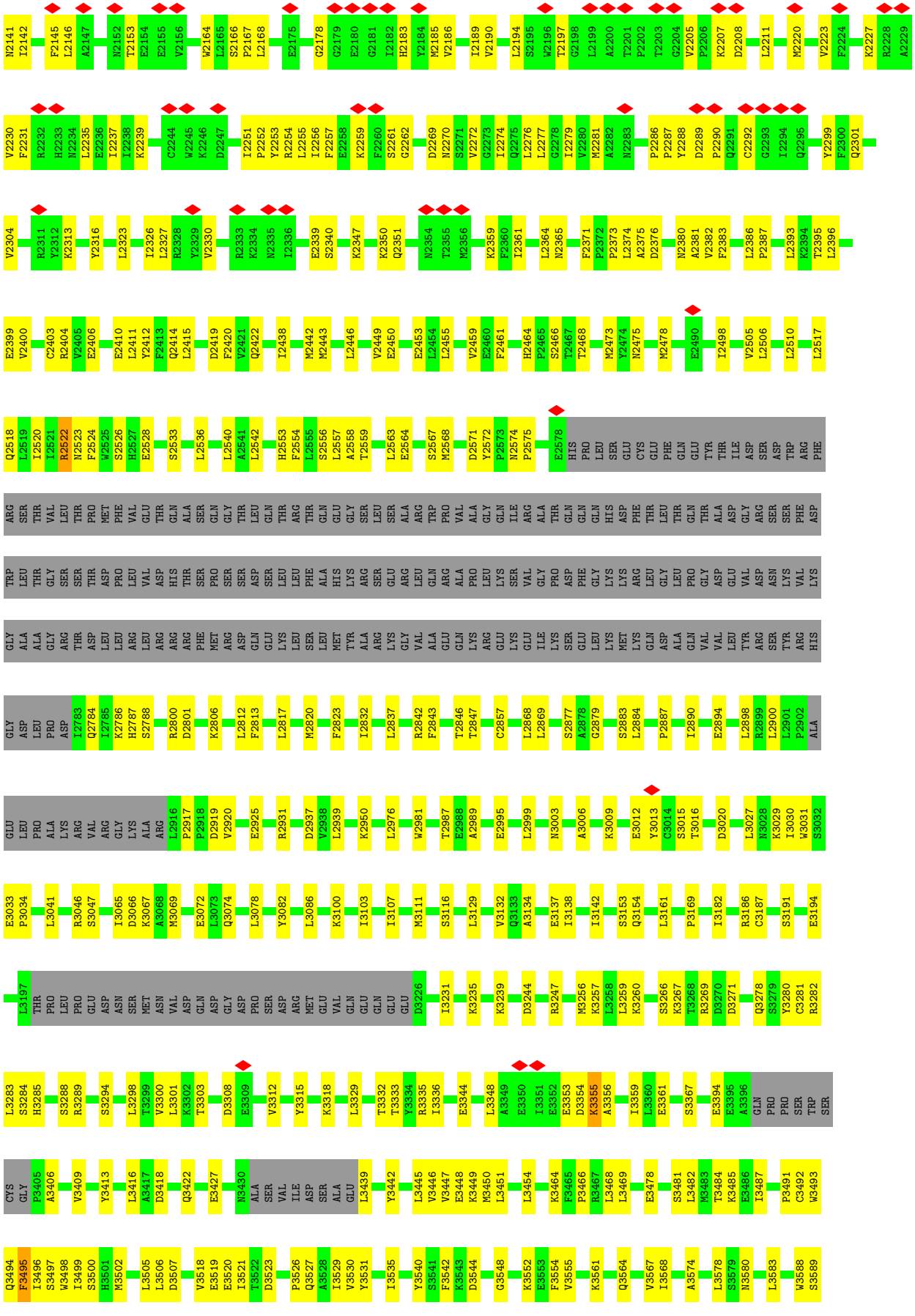
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion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

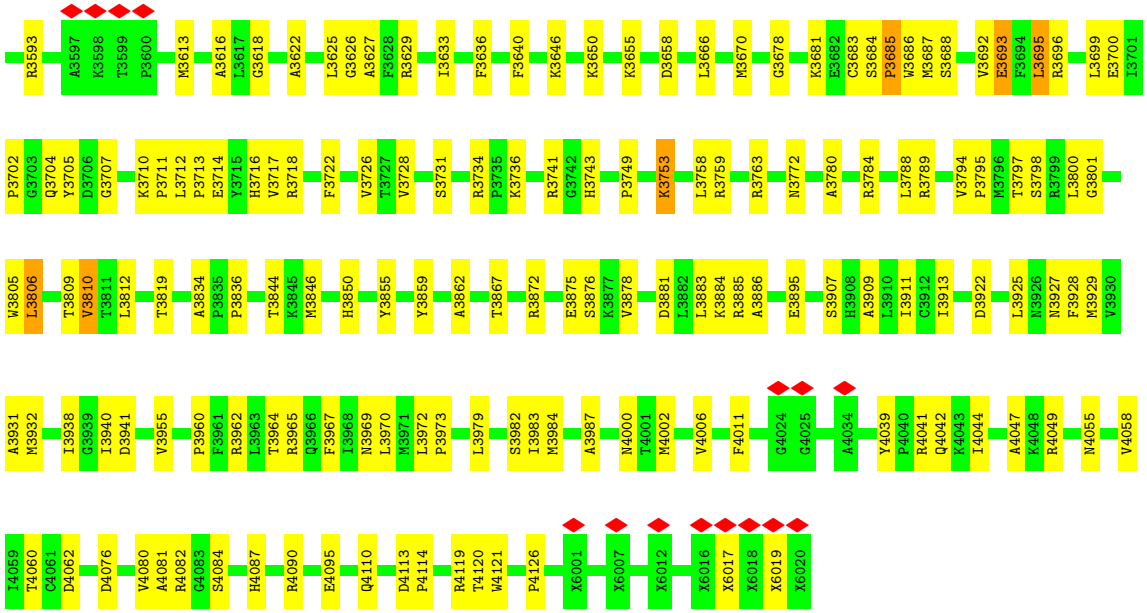
- Molecule 1: DNA-dependent protein kinase catalytic subunit,DNA-PKcs

Chain A:




L793 L796 L800 L805 SER ASP GLU THR LYS ASN ASN TRP GLU VAL SER ALA LEU SER ARG ALA ALA GLN LYS GLY PHE ASN LYS VAL VAL LEU LYS HIS LEU LYS LYS THR LYS ASN LEU SER SER ASN GLU ALA ILE S847 I851 R852 I853 R854 V855 N869 V873 T874
S875 S876 D877 E878 N879 R891 F898 R899 E900 M901 I905 D908 R913 L917 A921 S922 D923 R924 Q925 L934 V938 W948 PRO GLU GLY GLY GLN G954 P967 L970 R971 D975 V976 D977 Q978 R981 E985 P986 M989 F995 N998 K999
K1000 D1005 L1010 E1011 L1014 D1015 G1016 I1017 V1018 D1019 P1020 V1021 D1022 S1023 R1026 G1030 R1031 C1032 I1033 R1034 E1035 T1045 P1046 T1056 H1069 R1075 A1078 S1079 L1080 A1081 F1082 N1083 N1084 I1085 Y1086 R1087 R1090 E1093 S1094 L1095 V1096 E1097 E1102 A1103 L1104 V1105 I1106
Y1107 H1115 T1123 I1124 L1134 H1142 N1146 R1151 R1152 L1153 P1154 P1158 P1159 L1163 L1168 L1172 L1173 C1176 Q1180 T1181 E1182 C1183 R1184 H1185 K1186 S1187 R1202 S1203 L1206 W1207 L1208 K1209 D1210 V1211 I1221 N1222 T1223 F1224 G1227 Q1231 P1232 S1233 G1234
I1235 L1236 P1239 T1240 L1241 L1242 Y1243 L1244 F1248 S1249 L1250 Q1251 L1254 L1257 L1260 L1264 E1265 G1266 Y1267 N1268 T1269 F1270 I1271 G1272 E1273 R1274 T1275 V1276 G1277 Q1287 S1288 S1289 L1290 L1291 V1294 A1295 F1296 F1297 L1298 E1299 M1303 A1309 E1310 K1311 C1312 PHE GLY T1315 G1316 A1317
A1318 G1319 N1320 R1321 T1322 S1323 P1324 Q1325 E1326 G1327 E1328 R1329 Y1330 N1331 Y1332 S1333 K1334 C1335 T1336 V1337 V1338 V1339 R1340 F1344 L1348 G1355 W1356 K1357 L1358 L1359 K1360 K1361 N1365 T1366 H1367 L1368 V1373 Q1374 T1375 P1379 F1384 M1392 L1395 V1400 N1401 L1402 L1406 K1407
P1410 Y1411 K1412 D1413 I1414 L1415 E1416 T1417 H1418 L1419 R1420 T1424 A1425 Q1426 S1427 E1430 L1431 L1436 Q1442 V1443 D1444 R1445 S1446 R1447 L1448 A1449 A1450 V1451 V1452 R1460 A1461 G1462 L1463 I1467 L1468 P1469 S1470 Q1471 L1475 H1476 H1477 S1478 V1479 E1482 Y1488 I1491 A1492 P1493 G1494 D1495
C1499 L1500 L1510 L1515 E1516 L1517 A1518 G1522 G1523 L1524 C1525 E1526 R1527 L1533 L1538 S1539 T1540 A1541 SER LEU GLY SER SER GLN GLY S1549 S1554 H1555 G1556 E1557 F1563 I1567 N1568 T1569 E1570 L1571 L1572 K1573 N1574 L1575 D1576 L1577 L1582 M1583 Q1584 S1585 S1586 N1589
M1592 Q1603 S1604 F1605 R1606 E1607 R1608 Q1611 K1612 H1613 Q1614 K1617 K1628 C1629 D1630 S1631 W1632 W1633 D1636 S1637 P1638 L1639 E1640 T1641 K1642 M1643 A1644 V1645 I1652 I1655 S1658 Y1675 L1678 D1681 L1684 D1685 L1688 K1689 A1692 F1698 L1702 S1706
E1709 R1712 V1713 L1714 E1715 Q1716 L1717 I1718 F1722 F1729 R1735 F1736 Y1739 V1740 D1741 D1748 E1751 Q1754 S1755 L1758 L1759 C1767 Q1770 Q1771 H1772 V1773 M1774 E1775 F1778 Q1779 F1782 R1783 R1784 I1785 A1786 R1787 R1788 G1789 T1793 Q1794 V1795 G1796 L1797 V1801 Y1802
E1803 M1804 F1805 R1806 L1812 S1813 F1814 T1815 R1816 Q1817 S1818 F1819 R1822 T1826 H1830 C1831 S1832 L1833 L1836 R1837 E1838 F1839 L1851 R1854 N1859 F1863 D1864 T1865 Q1866 I1867 K1870 R1883 L1884 P1885 K1886 D1887 D1888 V1889 K1892 E1893 S1894 K1895 I1896 N1897 Q1898 V1899 F1900 H1901
G1902 S1903 C1904 I1905 T1906 E1907 T1912 I1916 Y1920 D1921 A1922 F1923 E1930 N1931 Q1932 L1933 R1936 R1937 R1938 H1941 V1955 E1972 L1975 L1976 N1980 L1981 I1982 D1983 L1984 K1985 ARG ARG TYR ASN PHE PRO VAL GLU VAL GLU VAL PRO MET GLU ARG LYS LYS TYR ILE
GLU ILE ARG LYS GLU ALA ARG GLU ALA ALA ASN GLY ASP SER ASP GLY PRO SER TYR MET SER SER LEU SER TYR LEU ALA ASP SER THR LEU SER GLU GLU MET SER GLN PHE ASP PHE SER THR GLY VAL GLN SER TYR SER TYR SER SER GLN ASP PRO ARG PRO ALA THR GLY ARG
PHE ARG ARG ARG GLU GLN ARG ASP PRO THR VAL HIS ASP ASP VAL LEU GLU LEU GLU M2085 L2088 N2089 R2090 H2091 E2092 C2093 M2094 A2099 L2100 V2101 K2102 H2103 M2104 H2105 R2106 S2107 L2108 GLY PRO PRO GLN GLY GLU GLU ASP SER VAL P2119 R2120 D2121 S2124 L2133 P2136 I2137




R3593 A3597 K3598 T3599 P3600 M3613 A3616 L3617 G3618 A3622 L3625 G3626 A3627 F3628 R3629 I3633 F3636 F3640 K3646 K3650 K3655 D3658 L3666 M3670 G3678 K3681 E3682 C3683 S3684 P3685 W3686 M3687 S3688 V3692 E3693 F3694 L3695 R3696 L3699 E3700 I3701
P3702 G3703 Q3704 Y3705 D3706 G3707 K3710 P3711 L3712 P3713 E3714 Y3715 H3716 V3717 R3718 F3722 V3726 T3727 V3728 S3731 R3734 P3735 K3736 R3741 G3742 H3743 P3749 K3753 L3758 R3759 R3763 N3772 A3780 R3784 L3788 R3789 V3794 P3795 M3796 T3797 S3798 R3799 L3800 G3801
W3805 L3806 T3809 V3810 T3811 L3812 T3819 A3834 P3835 P3836 T3844 K3845 M3846 H3850 Y3855 Y3859 A3862 T3867 R3872 E3875 S3876 K3877 V3878 D3881 L3882 L3883 K3884 R3885 A3886 E3895 S3907 H3908 A3909 L3910 I3911 C3912 I3913 D3922 L3925 N3926 N3927 F3928 M3929 V3930
A3931 M3932 I3938 G3939 I3940 D3941 V3955 P3960 F3961 R3962 L3963 T3964 R3965 Q3966 F3967 I3968 N3969 L3970 M3971 L3972 P3973 L3979 S3982 I3983 M3984 A3987 N4000 T4001 M4002 V4006 F4011 G4024 G4025 A4034 Y4039 P4040 R4041 Q4042 K4043 I4044 A4047 K4048 R4049 N4055 V4058
I4059 T4060 C4061 D4062 D4076 V4080 A4081 R4082 G4083 S4084 H4087 R4090 E4095 Q4110 D4113 P4114 R4119 T4120 W4121 P4126 X6001 X6007 X6012 X6016 X6017 X6018 X6019 X6020

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	164192	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 ($e^-/Å^2$)	46.8	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	1.623	Depositor
Minimum map value	-0.529	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.042	Depositor
Recommended contour level	0.2	Depositor
Map size (Å)	339.04, 339.04, 339.04	wwPDB
Map dimensions	260, 260, 260	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.304, 1.304, 1.304	Depositor

5 Model quality

5.1 Standard geometry

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

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	0.44	0/29502	0.54	0/39893

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	29010	0	29194	766	0
2	A	28	0	0	0	0
All	All	29038	0	29194	766	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 766 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:3810:VAL:CG2	1:A:3932:MET:SD	2.45	1.05
1:A:3810:VAL:HG21	1:A:3932:MET:SD	2.02	1.00

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:3812:LEU:HB3	1:A:3925:LEU:O	1.73	0.88
1:A:3288:SER:O	1:A:3289:ARG:NH1	2.06	0.87
1:A:3451:LEU:HD23	1:A:3454:LEU:HD12	1.56	0.87

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	3602/4148 (87%)	3237 (90%)	359 (10%)	6 (0%)	47 82

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	3693	GLU
1	A	3695	LEU
1	A	2787	HIS
1	A	3495	PHE
1	A	723	ASP

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	3196/3671 (87%)	3181 (100%)	15 (0%)	88 96

5 of 15 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3355	LYS
1	A	3806	LEU
1	A	3693	GLU
1	A	3810	VAL
1	A	3714	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	2305	ASN
1	A	2351	GLN
1	A	3564	GLN
1	A	2365	ASN
1	A	2105	HIS

5.3.3 RNA (i)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains (i)

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

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
2	MBW	A	6101	-	23,32,32	1.11	1 (4%)	19,47,47	0.57	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	MBW	A	6101	-	-	3/4/16/16	1/5/5/5

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	6101	MBW	C9-C14	3.78	1.48	1.40

There are no bond angle outliers.

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	6101	MBW	N7-C8-N3-C9
2	A	6101	MBW	N2-C8-N3-C9
2	A	6101	MBW	C10-C9-N3-C8

All (1) ring outliers are listed below:

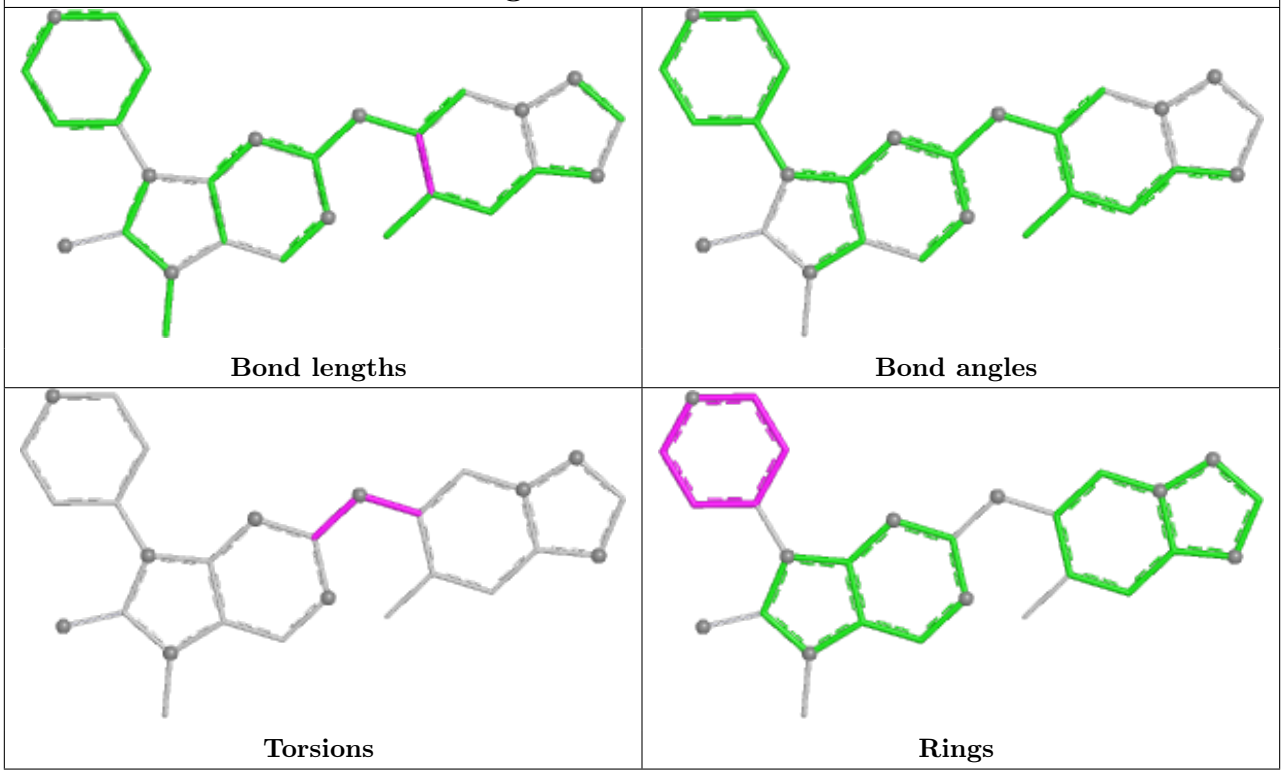
Mol	Chain	Res	Type	Atoms
2	A	6101	MBW	C2-C3-C4-C5-C6-O1

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier.

The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand MBW A 6101



5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	A	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	4128:MET	C	6001:UNK	N	82.11

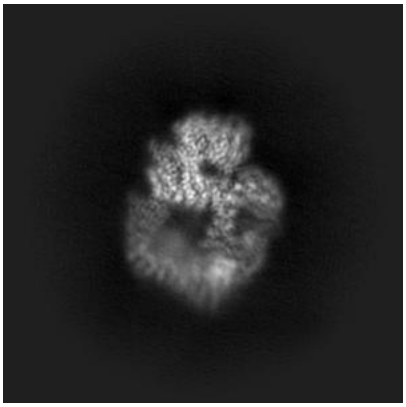
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-13068. These allow visual inspection of the internal detail of the map and identification of artifacts.

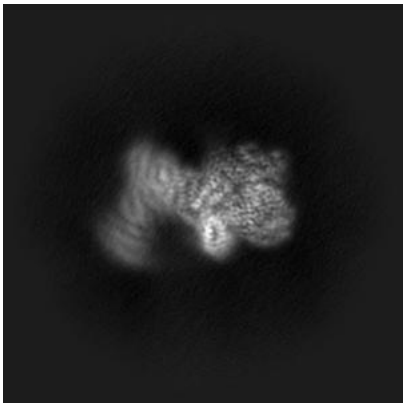
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections

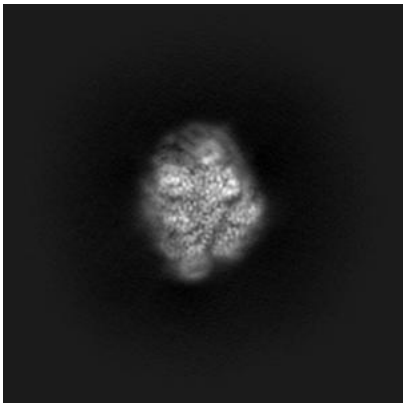
6.1.1 Primary map



X



Y

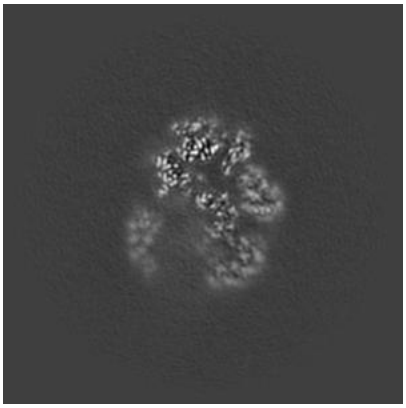


Z

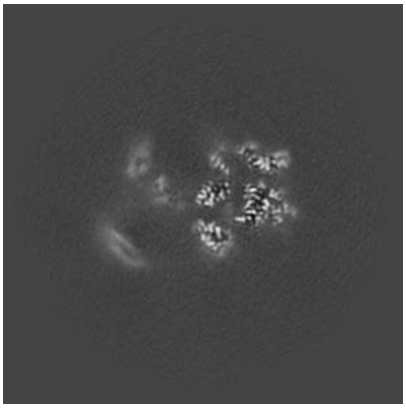
The images above show the map projected in three orthogonal directions.

6.2 Central slices

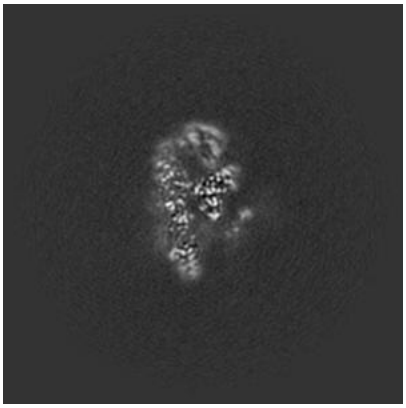
6.2.1 Primary map



X Index: 130



Y Index: 130

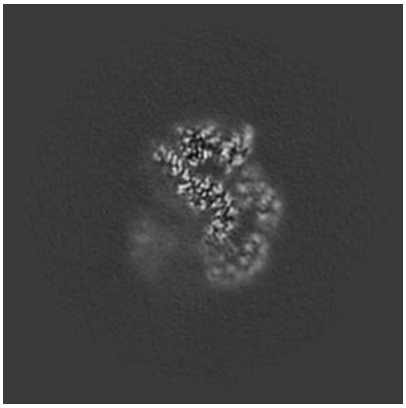


Z Index: 130

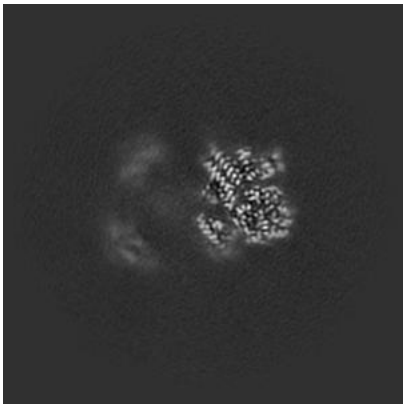
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

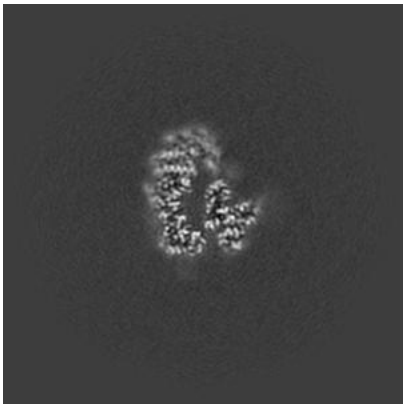
6.3.1 Primary map



X Index: 135



Y Index: 120

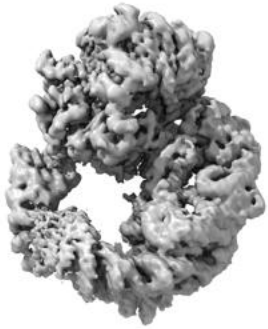


Z Index: 140

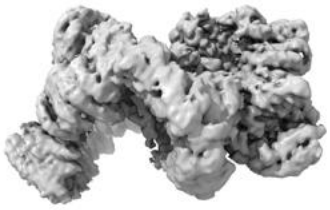
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal surface views (i)

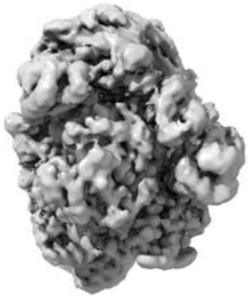
6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.2. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

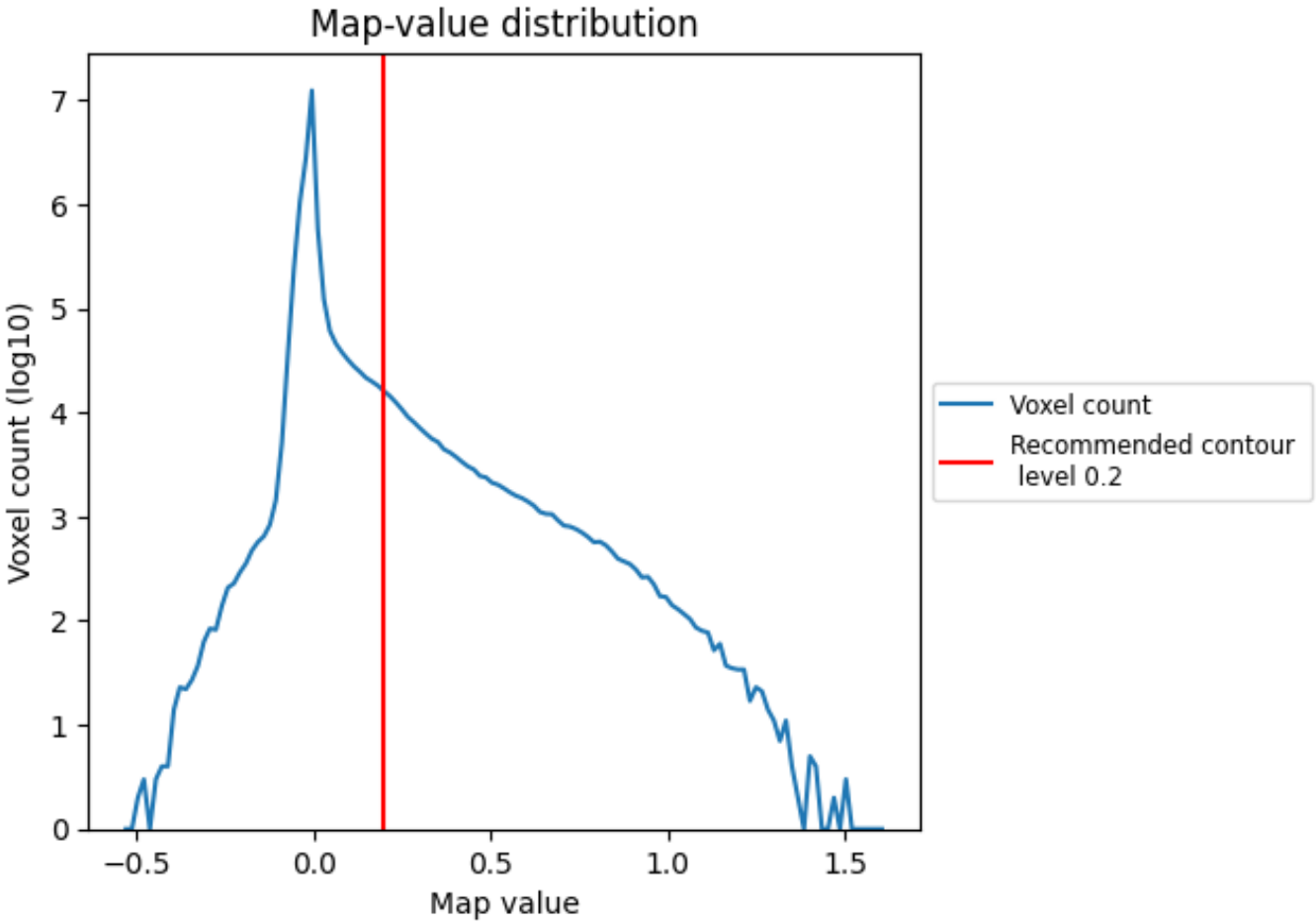
6.5 Mask visualisation (i)

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

7 Map analysis

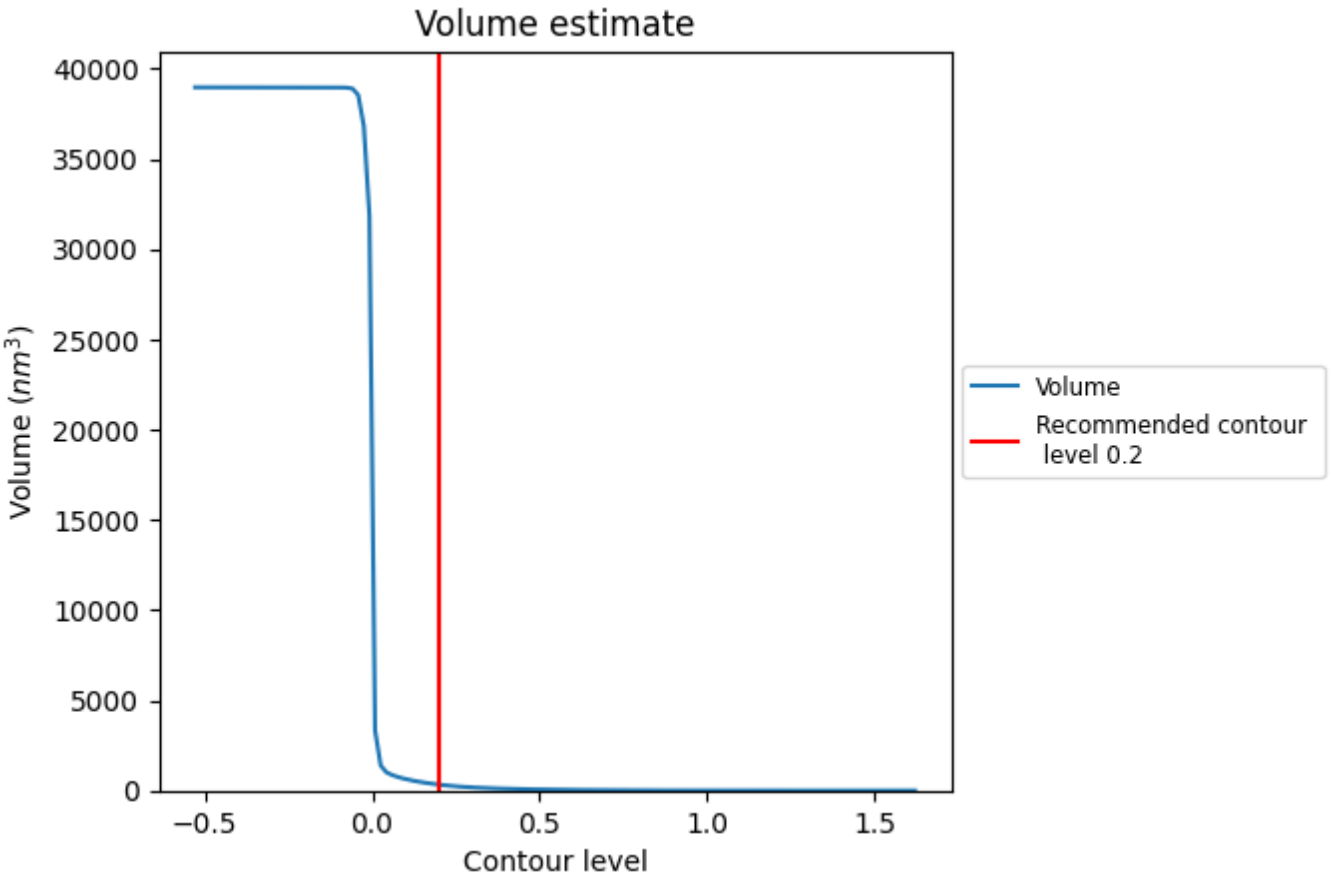
This section contains the results of statistical analysis of the map.

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.

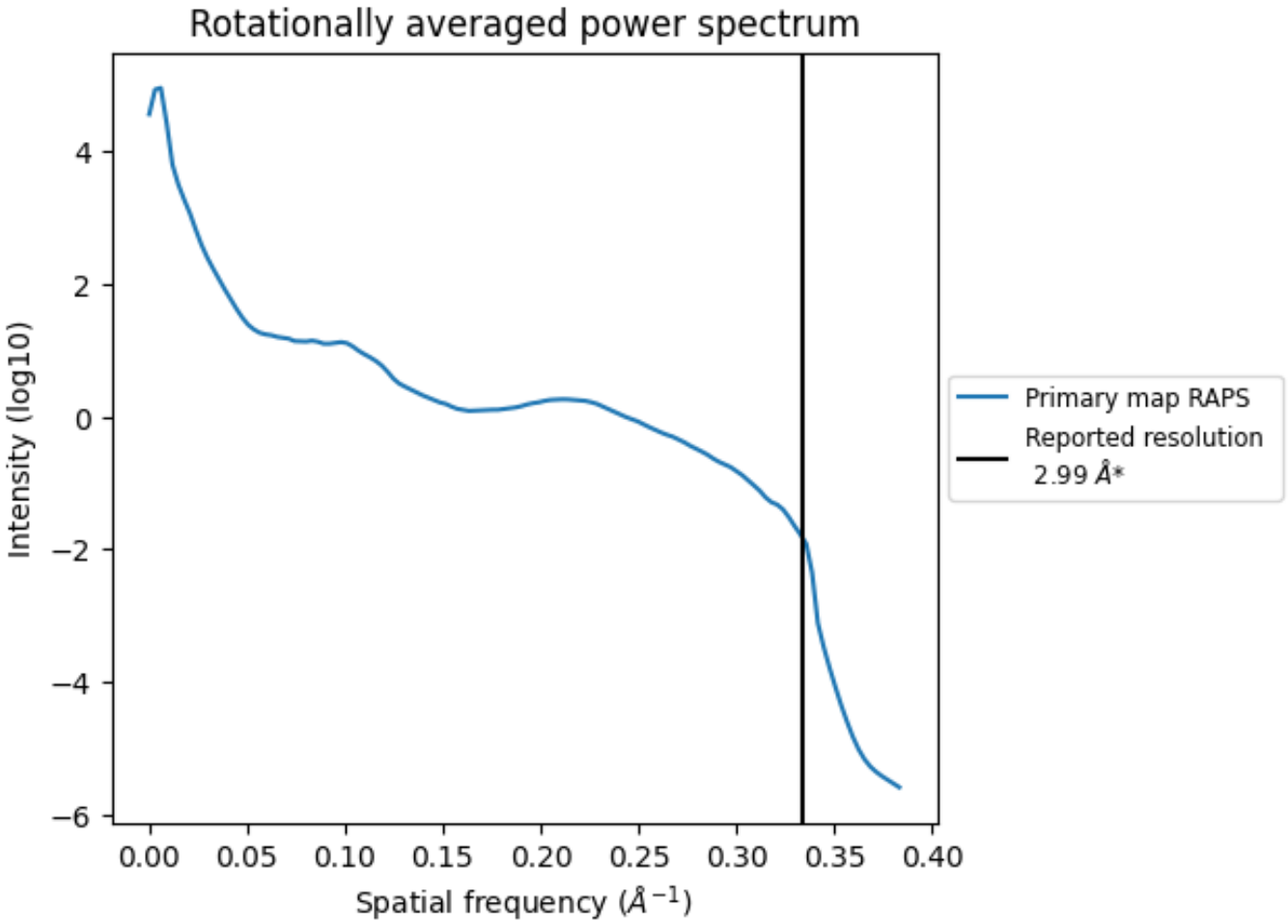
7.2 Volume estimate (i)



The volume at the recommended contour level is 328 nm^3; this corresponds to an approximate mass of 296 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 0.334 Å^{-1}

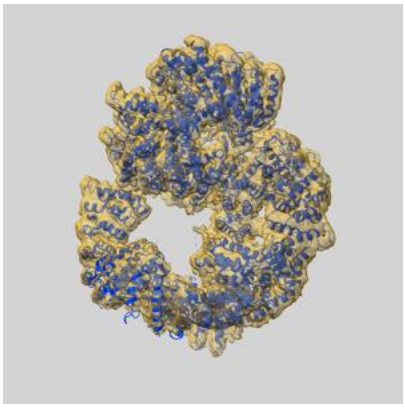
8 Fourier-Shell correlation

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

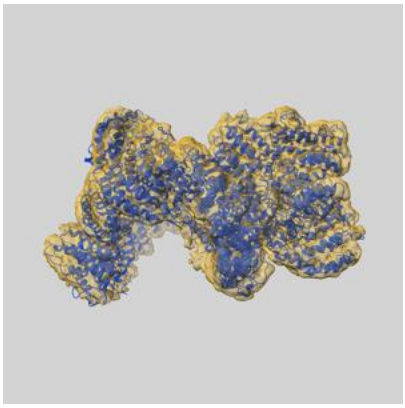
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-13068 and PDB model 7OTW. Per-residue inclusion information can be found in section 3 on page 4.

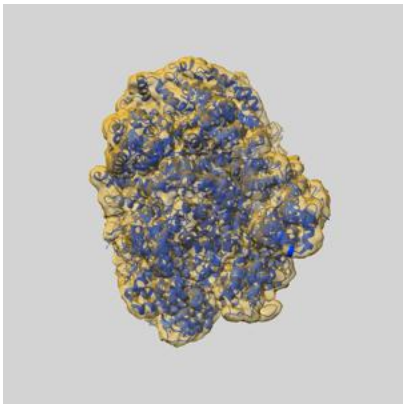
9.1 Map-model overlay



X



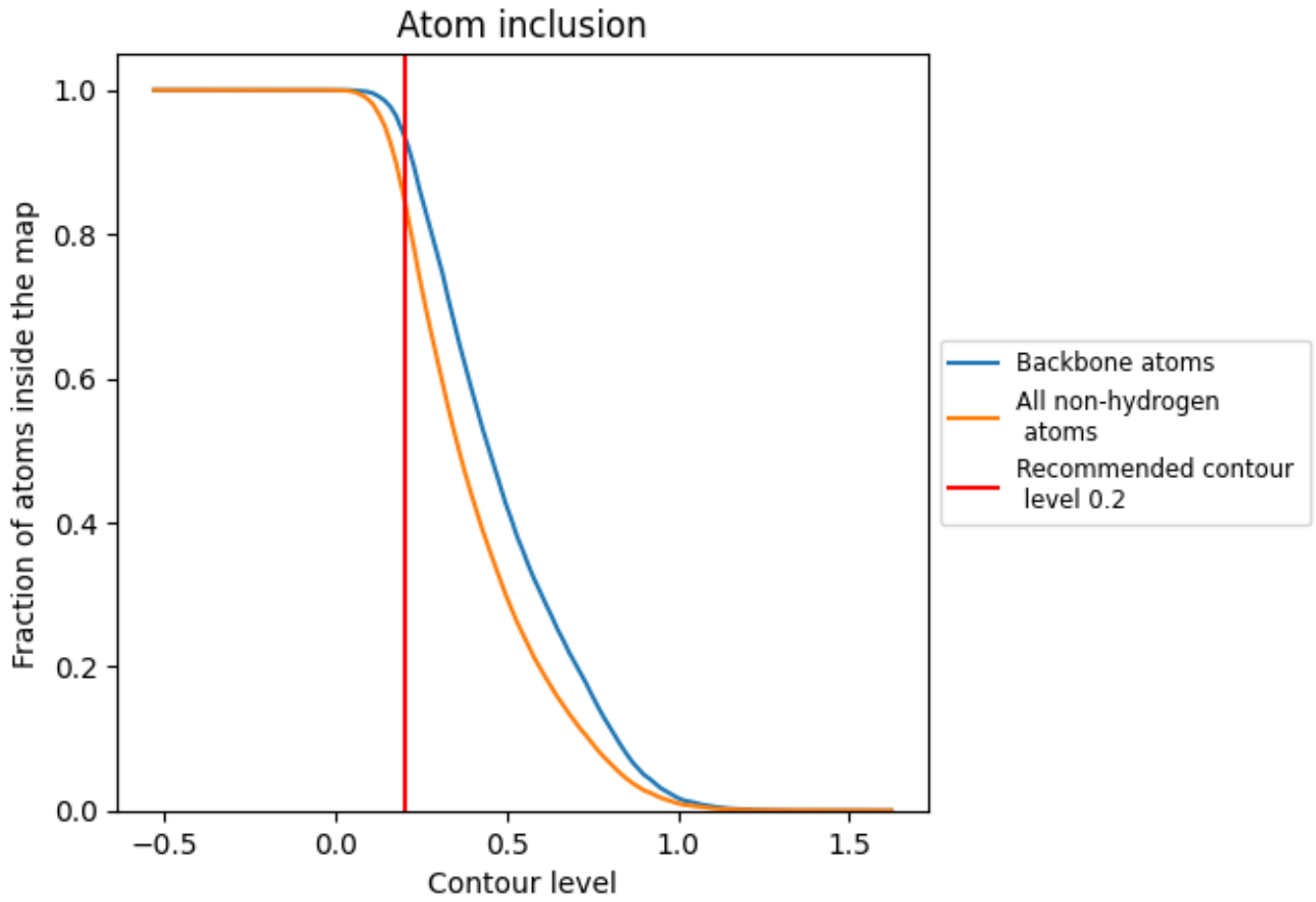
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.2 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 Atom inclusion (i)



At the recommended contour level, 94% of all backbone atoms, 85% of all non-hydrogen atoms, are inside the map.