wwPDB EM Validation Summary Report (i)

Dec 2, 2025 – 12:37 pm GMT

PDB ID	:	9I1J / pdb_00009i1j
EMDB ID	:	EMD-52571
Title	:	Cryo-EM structure of mouse RNF213:UBE2L3 transthiolation intermediate, chemically stabilized, and ATPgS
Authors	:	Grabarczyk, D.B.; Ahel, J.; Clausen, T.
Deposited on	:	2025-01-16
Resolution	:	3.80 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:

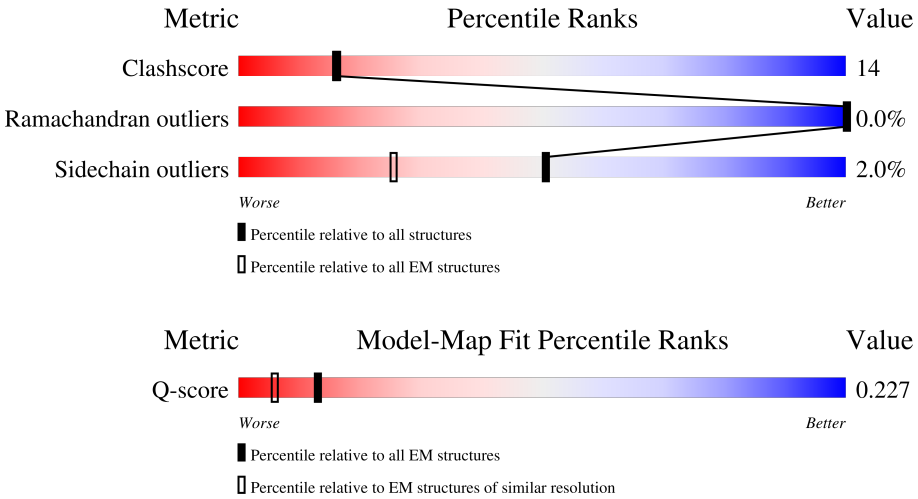
EMDB validation analysis	:	0.0.1.dev129
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.46

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 3.80 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)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
Q-score	-	25397	10198 (3.30 - 4.30)

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	4836	14% 62% 29% • 9%
2	B	166	7% 73% 19% 8%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
6	ADP	A	5205	-	-	X	-
6	ADP	A	5206	-	-	X	-

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 36793 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 E3 ubiquitin-protein ligase RNF213.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	4423	35465	22611	6087	6556	211	0	0

There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	326	MET	-	initiating methionine	UNP E9Q555
A	327	ALA	-	expression tag	UNP E9Q555
A	328	SER	-	expression tag	UNP E9Q555
A	329	TRP	-	expression tag	UNP E9Q555
A	330	SER	-	expression tag	UNP E9Q555
A	331	HIS	-	expression tag	UNP E9Q555
A	332	PRO	-	expression tag	UNP E9Q555
A	333	GLN	-	expression tag	UNP E9Q555
A	334	PHE	-	expression tag	UNP E9Q555
A	335	GLU	-	expression tag	UNP E9Q555
A	336	LYS	-	expression tag	UNP E9Q555
A	337	GLY	-	expression tag	UNP E9Q555
A	338	SER	-	expression tag	UNP E9Q555
A	?	-	VAL	deletion	UNP E9Q555
A	?	-	ARG	deletion	UNP E9Q555
A	?	-	ASN	deletion	UNP E9Q555
A	?	-	ARG	deletion	UNP E9Q555
A	5149	GLY	-	expression tag	UNP E9Q555
A	5150	GLY	-	expression tag	UNP E9Q555
A	5151	GLY	-	expression tag	UNP E9Q555
A	5152	HIS	-	expression tag	UNP E9Q555
A	5153	HIS	-	expression tag	UNP E9Q555
A	5154	HIS	-	expression tag	UNP E9Q555
A	5155	HIS	-	expression tag	UNP E9Q555
A	5156	HIS	-	expression tag	UNP E9Q555
A	5157	HIS	-	expression tag	UNP E9Q555
A	5158	HIS	-	expression tag	UNP E9Q555
A	5159	HIS	-	expression tag	UNP E9Q555

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Chain	Residue	Modelled	Actual	Comment	Reference
A	5160	HIS	-	expression tag	UNP E9Q555
A	5161	HIS	-	expression tag	UNP E9Q555

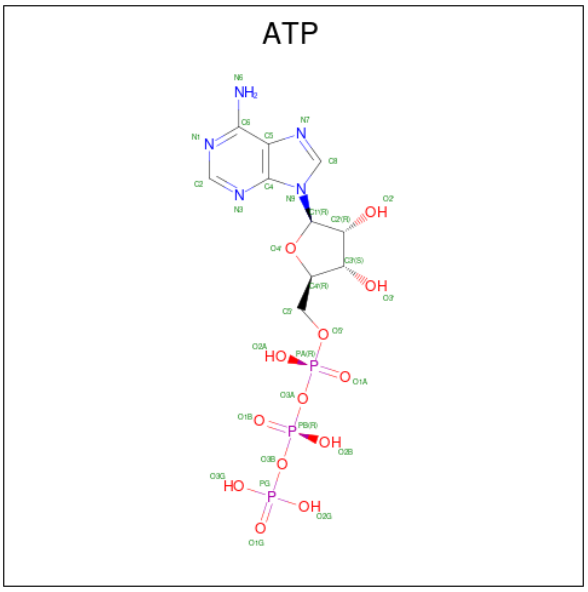
- Molecule 2 is a protein called Ubiquitin-conjugating enzyme E2 L3.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	153	Total	C	N	O	S	0	0
			1240	792	214	230	4		

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-11	GLY	-	expression tag	UNP P68036
B	-10	TRP	-	expression tag	UNP P68036
B	-9	SER	-	expression tag	UNP P68036
B	-8	HIS	-	expression tag	UNP P68036
B	-7	PRO	-	expression tag	UNP P68036
B	-6	GLN	-	expression tag	UNP P68036
B	-5	PHE	-	expression tag	UNP P68036
B	-4	GLU	-	expression tag	UNP P68036
B	-3	LYS	-	expression tag	UNP P68036
B	-2	PRO	-	expression tag	UNP P68036
B	-1	GLY	-	expression tag	UNP P68036
B	0	SER	-	expression tag	UNP P68036
B	17	SER	CYS	conflict	UNP P68036
B	137	SER	CYS	conflict	UNP P68036

- Molecule 3 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
3	A	1	Total	C	N	O	P	0
			31	10	5	13	3	

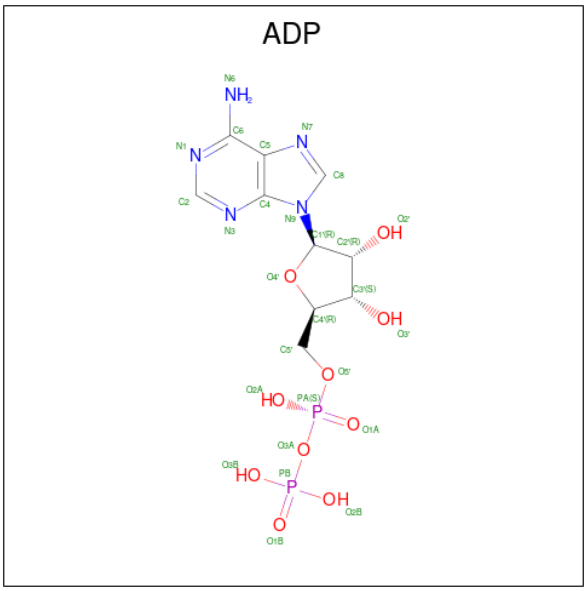
- Molecule 4 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
4	A	1	Total	Mg	0
			1	1	

- Molecule 5 is ZINC ION (CCD ID: ZN) (formula: Zn).

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

- Molecule 6 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$) (labeled as "Ligand of Interest" by depositor).



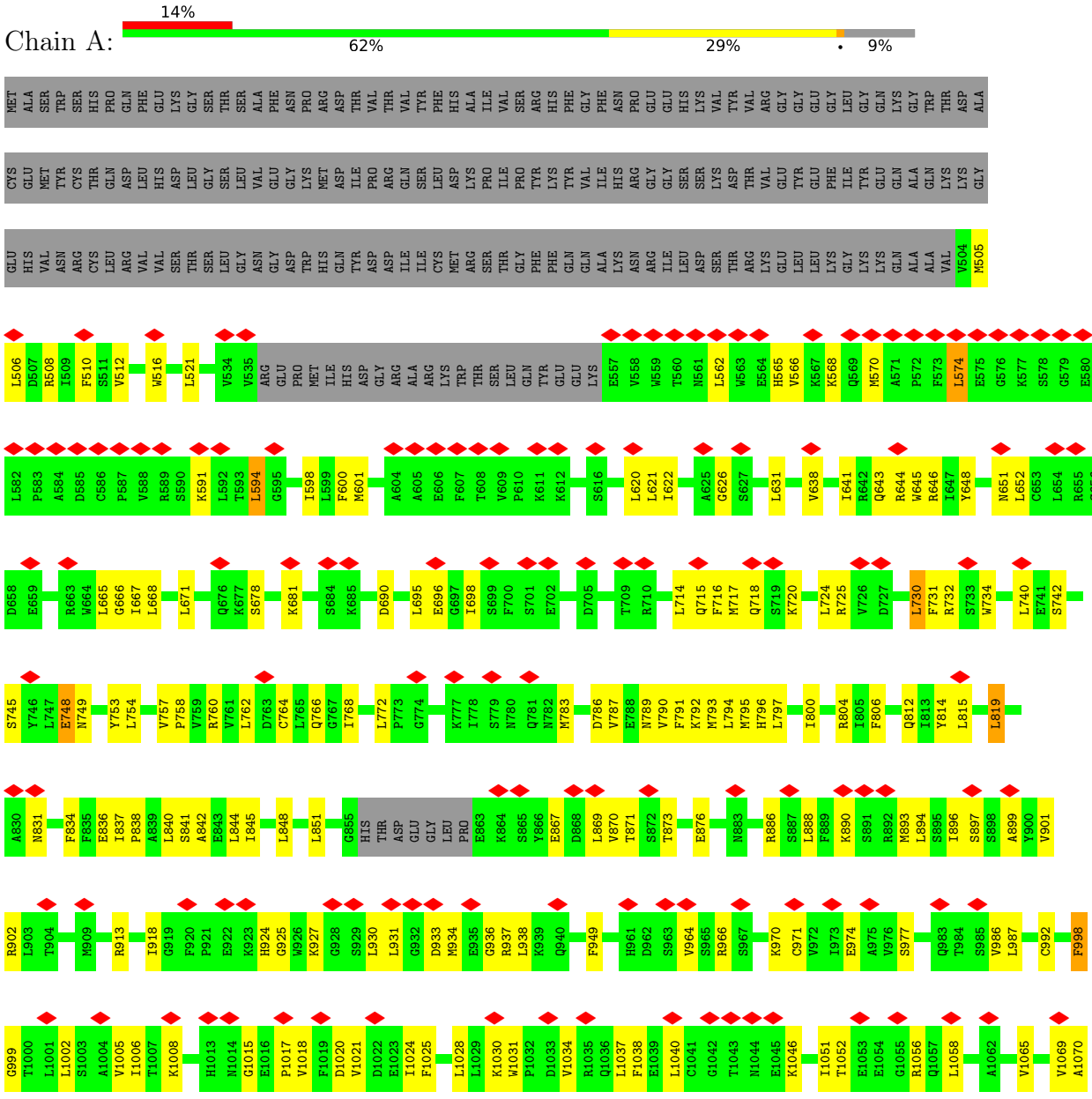
Mol	Chain	Residues	Atoms					AltConf
6	A	1	Total	C	N	O	P	0
			27	10	5	10	2	
6	A	1	Total	C	N	O	P	0
			27	10	5	10	2	

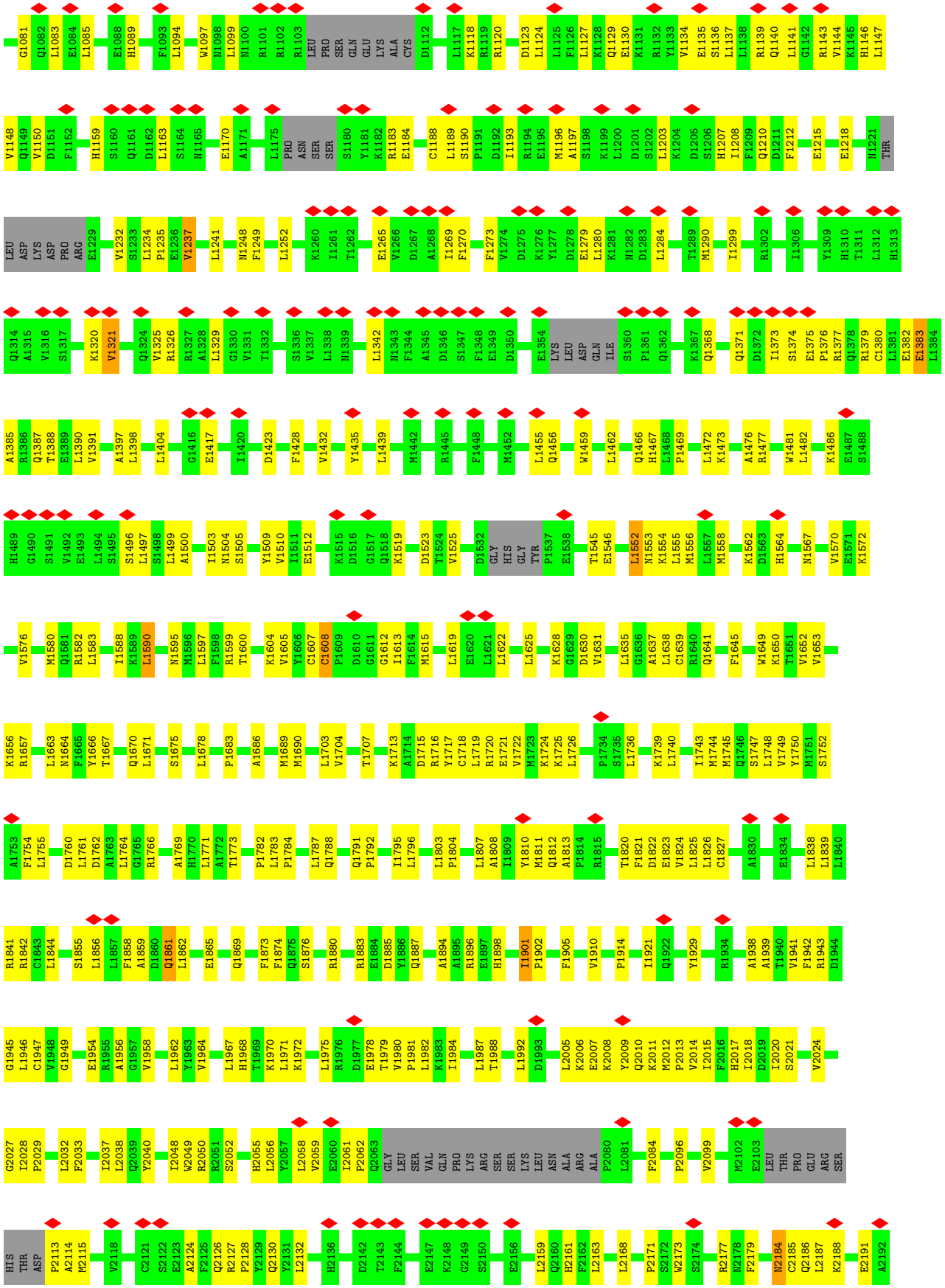
3 Residue-property plots (i)

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 RNF213

Chain A:

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V1148 Q1149 V1150 D1151 F1152 H1159 S1160 Q1161 D1162 L1163 S1164 N1165 E1170 A1171 L1175 PRO ASN SER SER S1180 Y1181 K1182 R1183 E1184 C1188 L1189 S1190 P1191 D1192 I1193 R1194 E1195 M1196 A1197 S1198 K1199 L1200 D1201 S1202 L1203 K1204 D1205 S1206 H1207 I1208 F1209 Q1210 D1211 F1212 E1215 E1218 N1221 THR
LEU ASP LYS ASP PRO ARG E1229 V1232 S1233 L1234 P1235 E1236 V1237 L1241 N1248 F1249 L1252 K1260 I1261 T1262 E1265 V1266 D1267 A1268 I1269 F1270 F1273 V1274 D1275 K1276 Y1277 D1278 E1279 L1280 K1281 N1282 D1283 L1284 T1289 M1290 I1299 R1302 I1306 Y1309 H1310 T1311 L1312 H1313
Q1314 A1315 V1316 S1317 K1320 V1321 Q1324 V1325 R1326 R1327 A1328 L1329 G1330 V1331 T1332 S1336 V1337 L1338 N1339 L1342 N1343 F1344 A1345 D1346 S1347 F1348 E1349 D1350 E1354 LYS LEU ASP GLN ILE S1360 P1361 Q1362 K1367 Q1368 Q1371 D1372 I1373 S1374 E1375 P1376 R1377 Q1378 R1379 C1380 L1381 E1382 E1383 L1384
A1385 R1386 Q1387 T1388 E1389 L1390 V1391 A1397 L1398 L1404 G1416 E1417 I1420 D1423 F1428 V1432 Y1435 L1439 M1442 R1445 F1448 M1452 L1455 Q1456 W1459 L1462 Q1466 H1467 L1468 P1469 L1472 K1473 A1476 R1477 W1481 L1482 K1486 E1487 S1488
H1489 G1490 S1491 V1492 E1493 L1494 S1495 S1496 L1497 S1498 L1499 A1500 I1503 N1504 S1505 Y1509 V1510 I1511 E1512 K1515 D1516 G1517 Q1518 K1519 D1523 T1524 V1525 D1532 GLY HIS GLY TYR P1537 E1538 T1545 E1546 L1552 N1553 K1554 L1555 M1556 L1557 M1558 K1562 D1563 H1564 N1567 V1570 E1571 K1572
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K1656 R1657 L1663 N1664 F1665 Y1666 T1667 Q1670 L1671 S1675 L1678 P1683 A1686 M1689 M1690 L1703 V1704 T1707 K1713 A1714 D1715 R1716 Y1717 C1718 L1719 R1720 E1721 V1722 M1723 K1724 K1725 L1726 P1734 S1735 L1736 K1739 L1740 I1743 M1744 M1745 Q1746 S1747 L1748 V1749 Y1750 M1751 S1752
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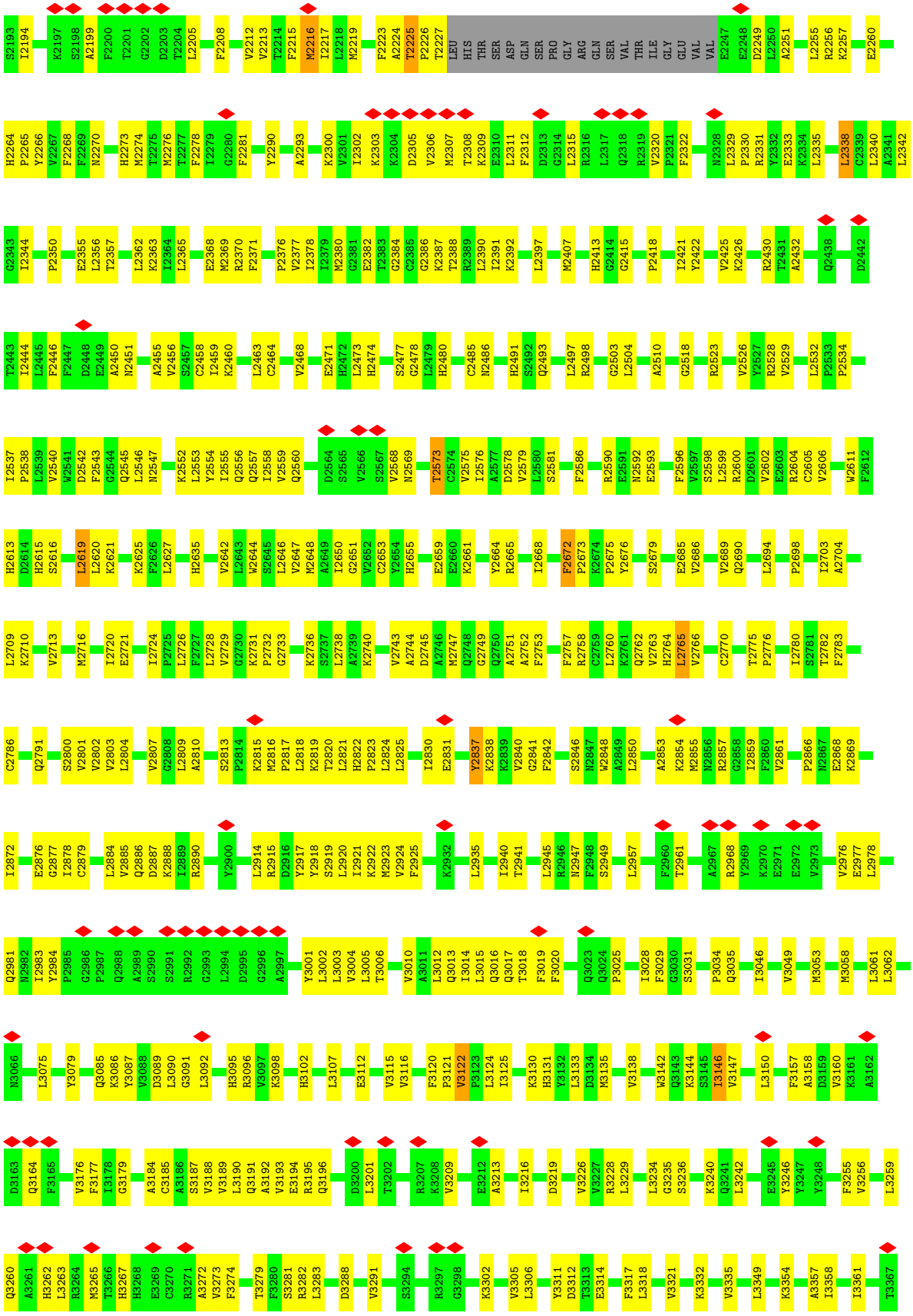
R1841 R1842 C1843 L1844 S1855 L1856 L1857 F1858 A1859 D1860 Q1861 L1862 E1865 Q1869 F1873 F1874 Q1875 S1876 R1880 R1883 E1884 D1885 Y1886 Q1887 A1894 A1895 R1896 E1897 H1898 I1901 P1902 F1905 V1910 P1914 I1921 Q1922 Y1929 R1934 A1938 A1939 T1940 V1941 F1942 R1943 D1944
G1945 L1946 C1947 V1948 G1949 E1954 R1955 A1956 G1957 V1958 L1962 Y1963 V1964 L1967 H1968 T1969 K1970 L1971 K1972 L1975 R1976 D1977 E1978 T1979 V1980 P1981 L1982 K1983 I1984 L1987 T1988 L1992 D1993 L2005 K2006 E2007 K2008 Y2009 Q2010 K2011 M2012 P2013 V2014 I2015 F2016 H2017 I2018 D2019 I2020 S2021 V2024
G2027 I2028 P2029 L2032 F2033 I2037 L2038 Q2039 Y2040 I2048 W2049 R2050 R2061 S2052 H2055 L2056 Y2057 L2058 V2059 E2060 I2061 P2062 Q2063 GLY LEU SER VAL GLN PRO LYS ARG SER SER LYS LEU ASN ALA ARG ALA P2080 L2081 F2084 P2096 V2099 M2102 E2103 LEU THR PRO GLU ARG SER
HIS THR ASP P2113 A2114 M2115 V2118 C2121 S2122 E2123 A2124 F2125 Q2126 R2127 P2128 Y2129 Q2130 Y2131 L2132 H2136 D2142 T2143 F2144 E2147 K2148 G2149 S2150 E2156 L2159 Q2160 H2161 F2162 L2163 L2168 P2171 S2172 W2173 S2174 R2177 N2178 F2179 N2184 C2185 Q2186 L2187 K2188 E2191 A2192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H2613 D2614 H2615 S2616 L2619 L2620 K2621 K2625 F2626 L2627 H2635 V2642 L2643 W2644 S2645 L2646 V2647 M2648 A2649 I2650 G2651 V2652 C2653 Y2654 H2655 E2659 E2660 K2661 Y2664 R2665 I2668 F2672 P2673 K2674 P2675 Y2676 S2679 E2685 V2686 V2689 Q2690 L2694 P2698 I2703 A2704
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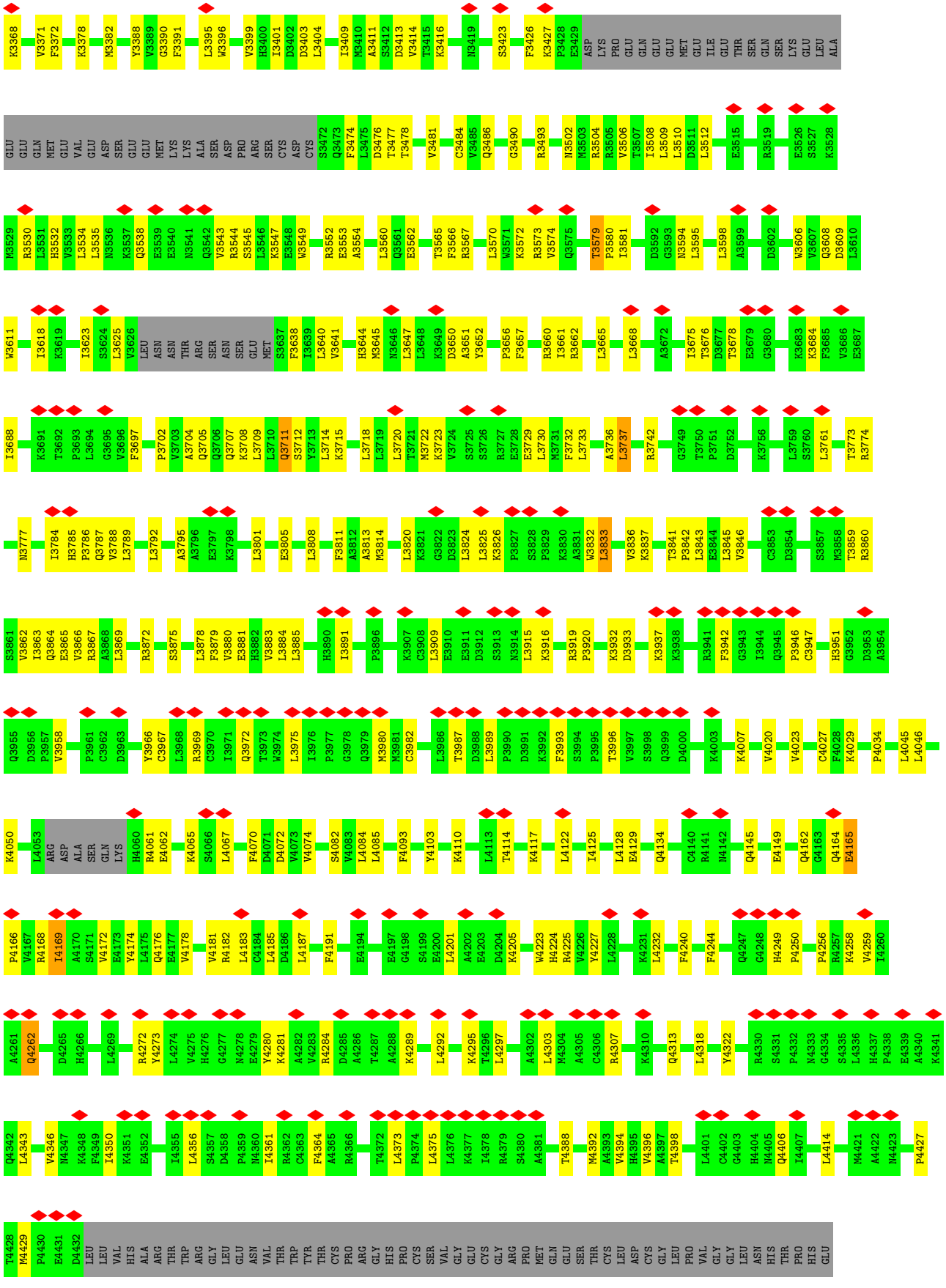
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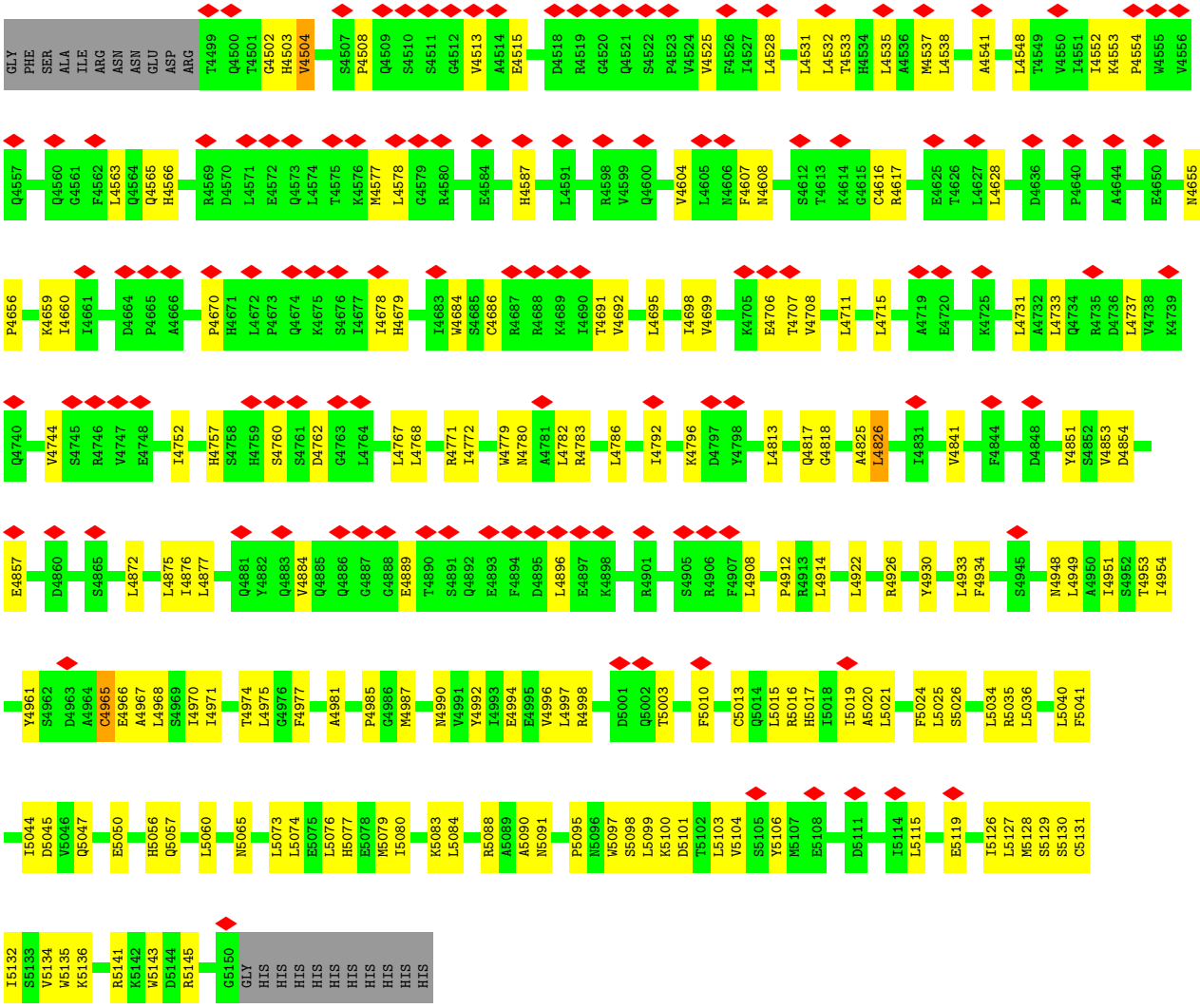
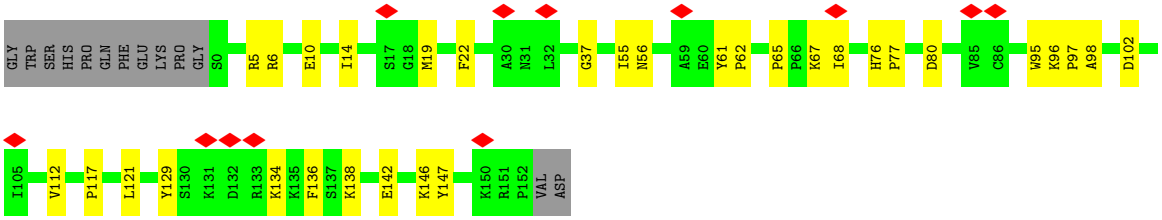
W3611 I3618 K3619 I3623 S3624 L3625 V3626 LEU ASN ASN THR ARG SER ASN SER GLU MET S3637 F3638 I3639 L3640 V3641 H3644 M3645 N3646 L3647 L3648 K3649 D3650 A3651 Y3652 P3656 F3657 R3660 I3661 R3662 L3665 L3668 A3672 I3675 T3676 D3677 T3678 E3679 G3680 K3683 K3684 F3685 V3686 E3687
I3688 K3691 T3692 P3693 L3694 G3695 V3696 F3697 P3702 V3703 A3704 Q3705 Q3706 Q3707 K3708 L3709 L3710 Q3711 S3712 Y3713 L3714 K3715 L3718 L3719 L3720 T3721 M3722 K3723 V3724 S3725 S3726 R3727 E3728 E3729 L3730 M3731 F3732 L3733 A3736 L3737 R3742 G3749 T3750 P3751 D3752 K3756 L3759 S3760 L3761 T3773 R3774
N3777 I3784 H3785 P3786 Q3787 V3788 L3789 L3792 A3795 A3796 E3797 K3798 L3801 E3805 L3808 F3811 A3812 A3813 M3814 L3820 K3821 G3822 D3823 L3824 L3825 K3826 P3827 S3828 P3829 K3830 A3831 W3832 L3833 V3836 K3837 T3841 P3842 L3843 E3844 L3845 V3846 C3853 D3854 S3857 M3858 T3859 R3860
S3861 V3862 I3863 Q3864 E3865 V3866 R3867 A3868 L3869 R3872 S3875 L3878 P3879 V3880 E3881 H3882 V3883 L3884 L3885 H3890 I3891 P3896 K3907 C3908 L3909 E3910 E3911 D3912 S3913 N3914 L3915 K3916 R3919 P3920 K3932 D3933 K3937 K3938 R3941 F3942 G3943 I3944 Q3945 P3946 C3947 H3951 G3952 D3953 A3954
Q3955 D3956 P3957 V3958 P3961 C3962 D3963 Y3966 C3967 L3968 R3969 C3970 I3971 Q3972 T3973 W3974 L3975 I3976 P3977 G3978 Q3979 M3980 M3981 C3982 L3986 T3987 D3988 L3989 P3990 D3991 K3992 F3993 S3994 P3995 T3996 V3997 S3998 Q3999 D4000 K4003 K4007 V4020 V4023 C4027 F4028 K4029 P4034 L4045 L4046
K4050 L4053 ARG ASP ALA SER GLN LYS H4060 R4061 E4062 K4065 S4066 L4067 F4070 D4071 D4072 V4073 V4074 S4082 V4083 L4084 L4085 F4093 Y4103 K4110 L4113 T4114 K4117 L4122 I4125 L4128 E4129 Q4134 C4140 R4141 N4142 Q4145 E4149 Q4162 G4163 Q4164 E4165
P4166 V4167 R4168 I4169 A4170 S4171 V4172 E4173 Y4174 L4175 Q4176 E4177 V4178 V4181 R4182 L4183 C4184 L4185 D4186 L4187 F4191 E4194 E4197 G4198 S4199 E4200 L4201 A4202 E4203 D4204 K4205 W4223 H4224 R4225 V4226 Y4227 L4228 K4231 L4232 F4240 F4244 Q4247 G4248 H4249 P4250 P4256 R4257 K4258 V4259 I4260
A4261 Q4262 D4265 H4266 L4269 R4272 Y4273 L4274 V4275 H4276 G4277 N4278 E4279 Y4280 K4281 A4282 V4283 R4284 D4285 A4286 T4287 A4288 K4289 L4292 K4295 T4296 L4297 A4302 L4303 M4304 A4305 C4306 R4307 K4310 Q4313 L4318 Y4322 R4330 S4331 P4332 N4333 G4334 S4335 L4336 H4337 P4338 E4339 A4340 K4341
Q4342 L4343 V4346 N4347 K4348 F4349 I4350 K4351 E4352 I4355 L4356 S4357 D4358 P4359 N4360 I4361 R4362 C4363 F4364 A4365 R4366 T4372 L4373 P4374 L4375 L4376 K4377 I4378 R4379 S4380 A4381 T4388 M4392 A4393 V4394 H4395 V4396 A4397 T4398 L4401 C4402 G4403 H4404 N4405 Q4406 I4407 L4414 M4421 A4422 N4423 P4427
T4428 M4429 P4430 E4431 D4432 LEU LEU VAL HIS ALA ARG THR TRP ARG GLY LEU GLU ASN VAL THR TRP TYR THR CYS PRO ARG GLY HIS PRO CYS SER VAL GLY GLU CYS GLY ARG PRO MET GLN GLU SER THR CYS LEU ASP CYS GLY LEU PRO VAL GLY GLY LEU ASN HIS THR PRO HIS GLU



• Molecule 2: Ubiquitin-conjugating enzyme E2 L3

Chain B:



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	31607	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	50	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor
Maximum map value	0.024	Depositor
Minimum map value	-0.012	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.001	Depositor
Recommended contour level	0.0047	Depositor
Map size (Å)	379.96, 379.96, 379.96	wwPDB
Map dimensions	322, 322, 322	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.18, 1.18, 1.18	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MG, ADP, ATP, 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	0.15	0/36204	0.41	4/48982 (0.0%)
2	B	0.16	0/1271	0.40	0/1719
All	All	0.15	0/37475	0.41	4/50701 (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 (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	4604	VAL	N-CA-C	-5.66	106.97	112.29
1	A	748	GLU	CA-C-N	-5.57	113.41	122.65
1	A	748	GLU	C-N-CA	-5.57	113.41	122.65
1	A	3711	GLN	CA-CB-CG	5.27	124.64	114.10

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	4165	GLU	Peptide
1	A	641	ILE	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	35465	0	35592	1019	0
2	B	1240	0	1240	25	0
3	A	31	0	12	6	0
4	A	1	0	0	0	0
5	A	2	0	0	0	0
6	A	54	0	24	28	0
All	All	36793	0	36868	1037	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 1037 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:2704:ALA:HB3	6:A:5206:ADP:N6	1.45	1.31
1:A:2704:ALA:CB	6:A:5206:ADP:HN61	1.65	1.09
1:A:2922:LYS:NZ	6:A:5206:ADP:H1'	1.85	0.92
1:A:717:MET:HE1	1:A:749:ASN:HD21	1.40	0.86
1:A:2757:PHE:HA	1:A:2760:LEU:HD12	1.57	0.84

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	4393/4836 (91%)	4059 (92%)	332 (8%)	2 (0%)	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	151/166 (91%)	150 (99%)	1 (1%)	0	100	100
All	All	4544/5002 (91%)	4209 (93%)	333 (7%)	2 (0%)	100	100

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	3122	VAL
1	A	4166	PRO

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	3968/4342 (91%)	3887 (98%)	81 (2%)	50	68
2	B	135/148 (91%)	135 (100%)	0	100	100
All	All	4103/4490 (91%)	4022 (98%)	81 (2%)	50	68

5 of 81 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3579	THR
1	A	4752	ILE
1	A	3678	THR
1	A	4262	GLN
1	A	4965	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 48 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	2981	GLN
1	A	3673	GLN
1	A	3016	GLN
1	A	3541	ASN
1	A	3777	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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 6 ligands modelled in this entry, 3 are monoatomic - leaving 3 for Mogul analysis.

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	$\#\|Z\| > 2$
6	ADP	A	5206	-	24,29,29	0.94	1 (4%)	29,45,45	1.47	4 (13%)
6	ADP	A	5205	-	24,29,29	0.97	1 (4%)	29,45,45	1.45	5 (17%)
3	ATP	A	5201	-	26,33,33	0.59	0	31,52,52	0.82	2 (6%)

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
6	ADP	A	5206	-	-	7/12/32/32	0/3/3/3
6	ADP	A	5205	-	-	7/12/32/32	0/3/3/3
3	ATP	A	5201	-	-	6/18/38/38	0/3/3/3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	5205	ADP	C5-C4	2.60	1.47	1.40
6	A	5206	ADP	C5-C4	2.51	1.47	1.40

The worst 5 of 11 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	A	5206	ADP	PA-O3A-PB	-4.05	118.92	132.83
6	A	5205	ADP	PA-O3A-PB	-3.56	120.62	132.83
6	A	5206	ADP	N3-C2-N1	-3.05	123.91	128.68
6	A	5205	ADP	N3-C2-N1	-3.02	123.96	128.68
6	A	5206	ADP	C3'-C2'-C1'	3.00	105.50	100.98

There are no chirality outliers.

5 of 20 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	5201	ATP	C5'-O5'-PA-O1A
3	A	5201	ATP	O4'-C4'-C5'-O5'
6	A	5205	ADP	C5'-O5'-PA-O1A
6	A	5205	ADP	C5'-O5'-PA-O2A
6	A	5205	ADP	C5'-O5'-PA-O3A

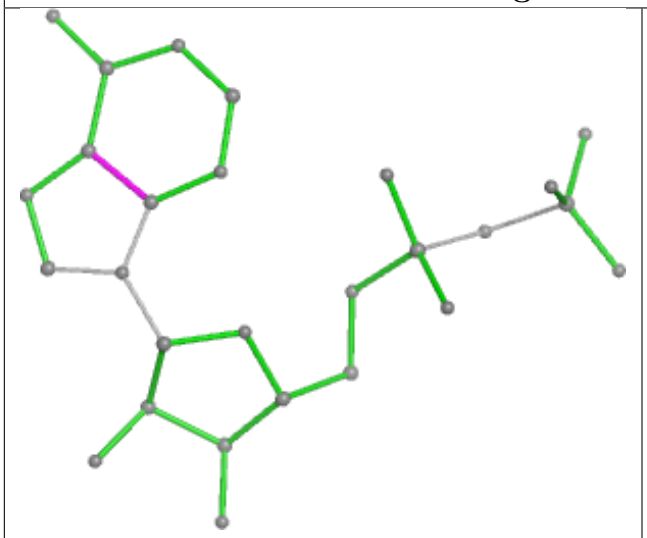
There are no ring outliers.

3 monomers are involved in 34 short contacts:

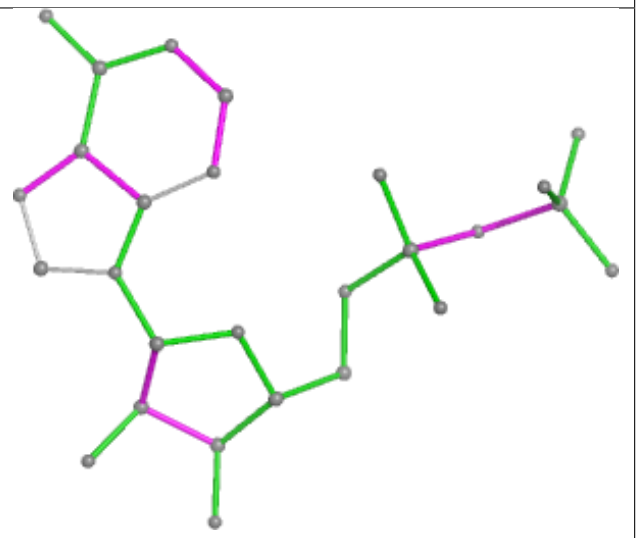
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	5206	ADP	9	0
6	A	5205	ADP	19	0
3	A	5201	ATP	6	0

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.

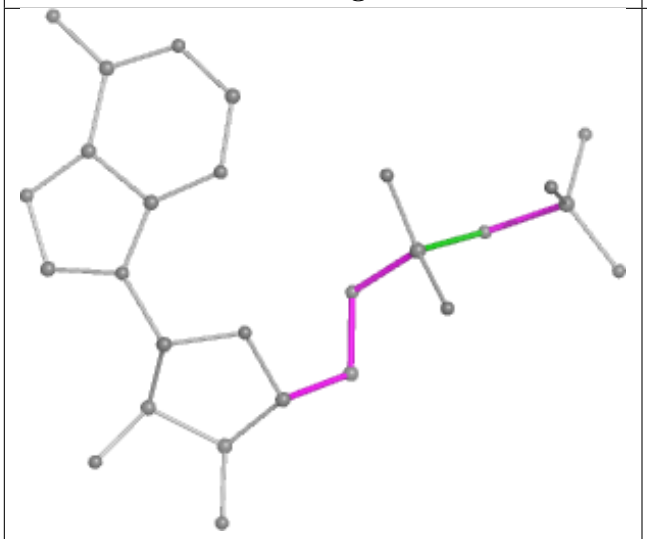
Ligand ADP A 5206



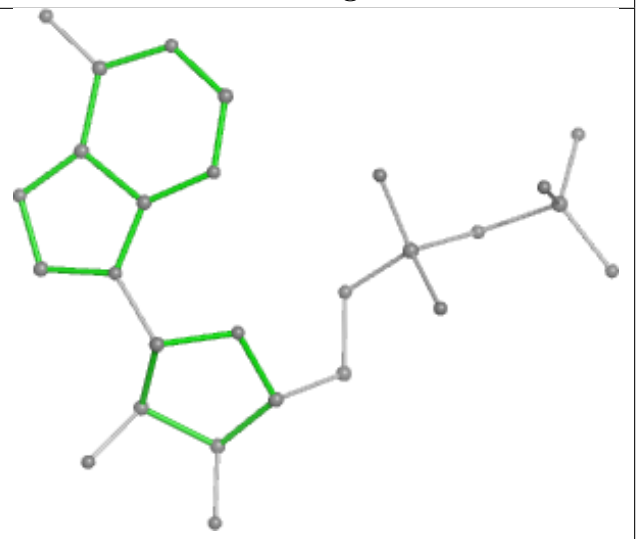
Bond lengths



Bond angles

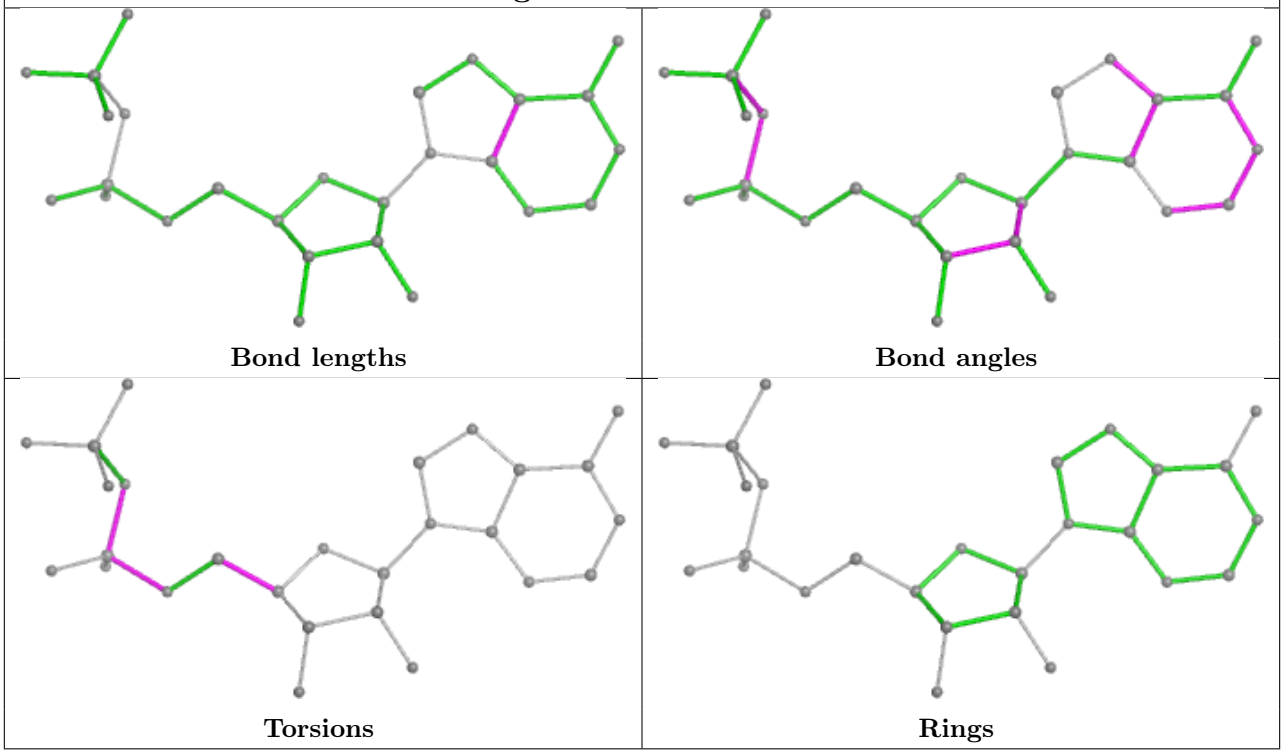


Torsions

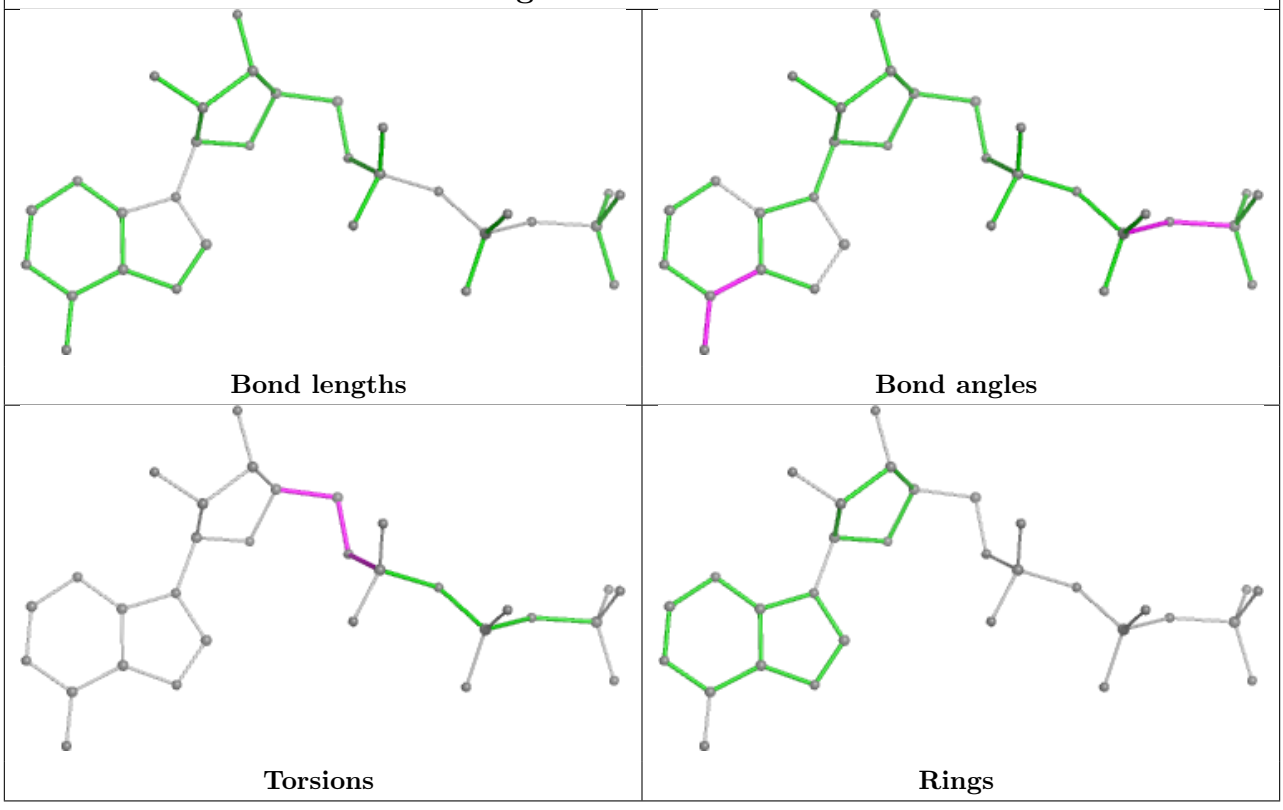


Rings

Ligand ADP A 5205



Ligand ATP A 5201



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.

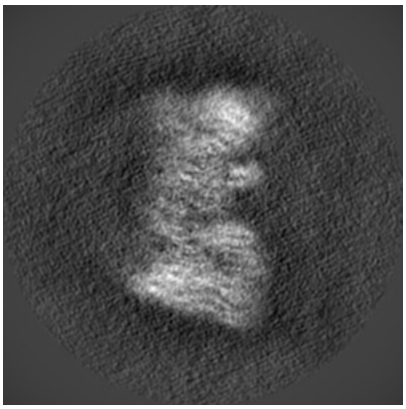
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-52571. 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



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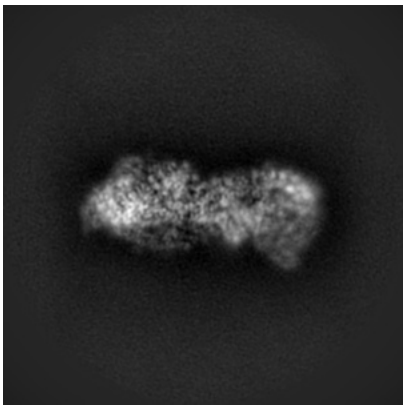

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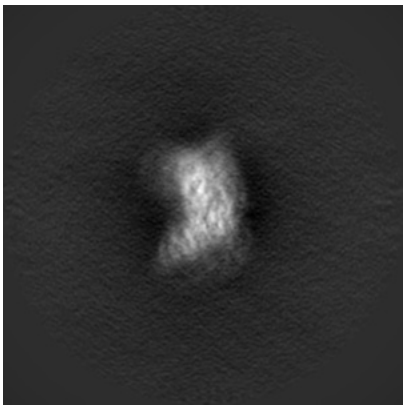
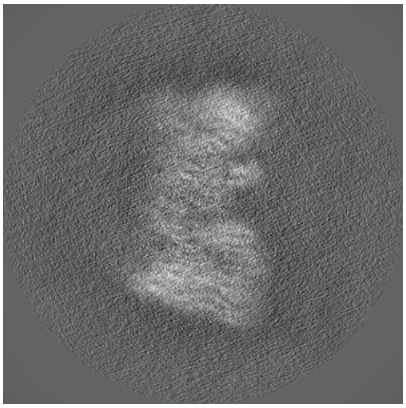
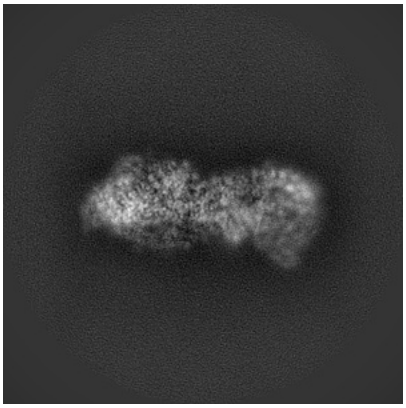


Z

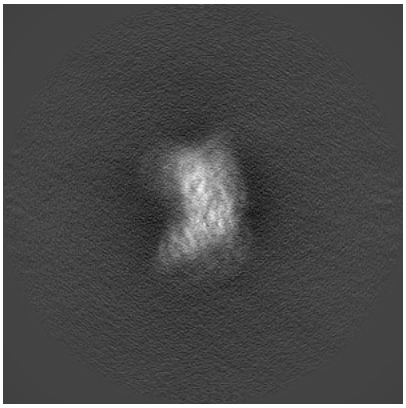
6.1.2 Raw map



X



Y

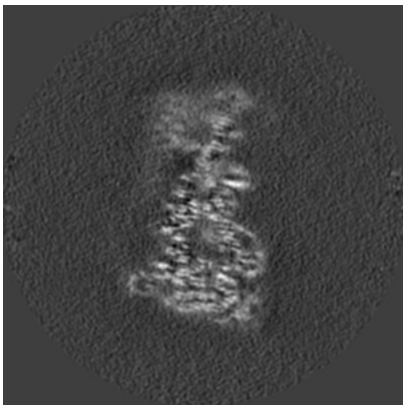


Z

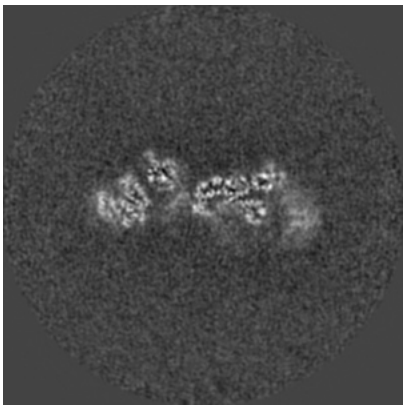
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

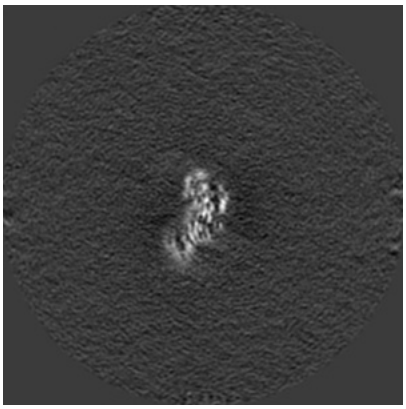
6.2.1 Primary map



X Index: 161

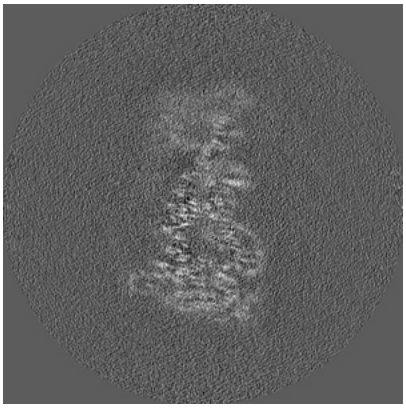


Y Index: 161



Z Index: 161

6.2.2 Raw map



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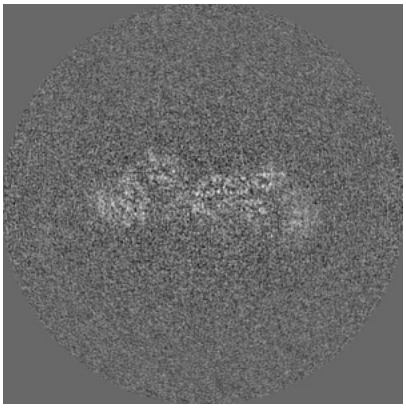

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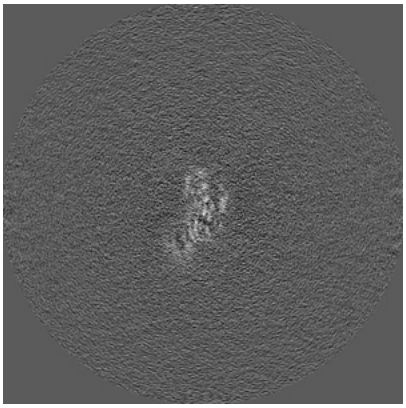
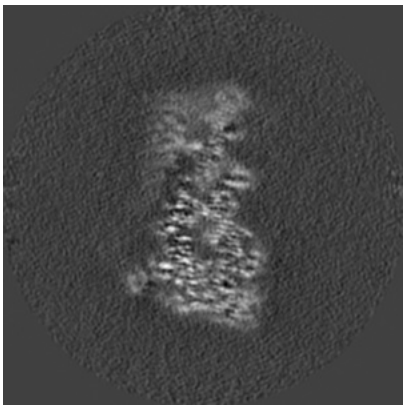


Z Index: 161

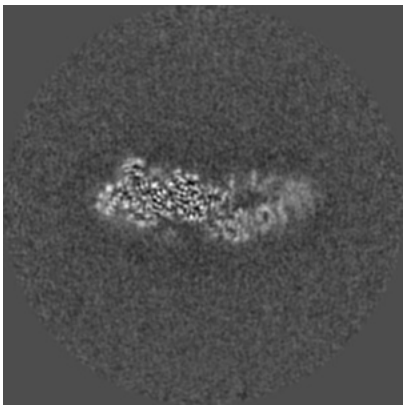
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

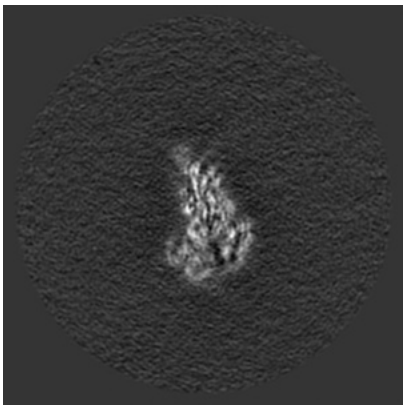
6.3.1 Primary map



X Index: 159

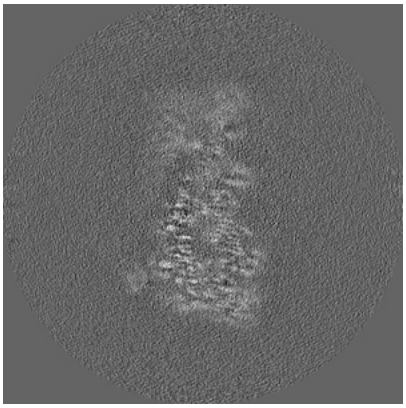


Y Index: 142

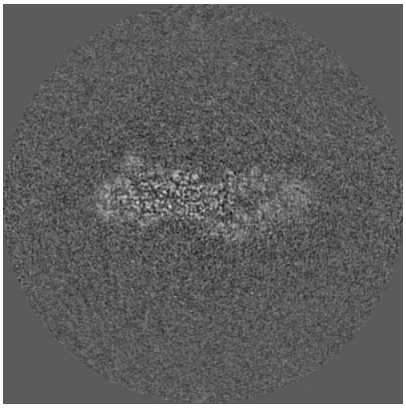


Z Index: 101

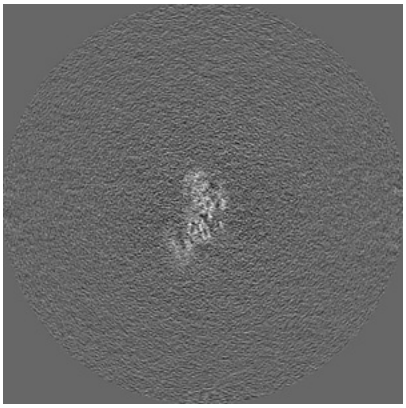
6.3.2 Raw map



X Index: 159



Y Index: 145

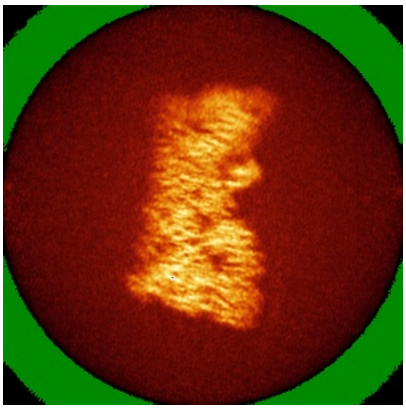


Z Index: 160

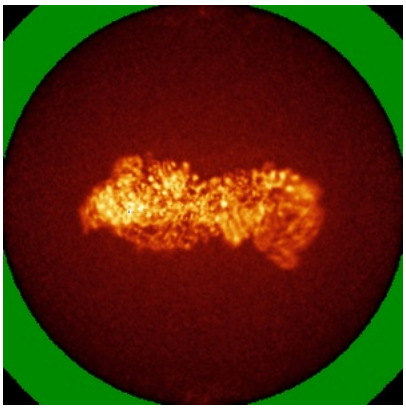
The images above show the largest variance slices of the map in three orthogonal directions.

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

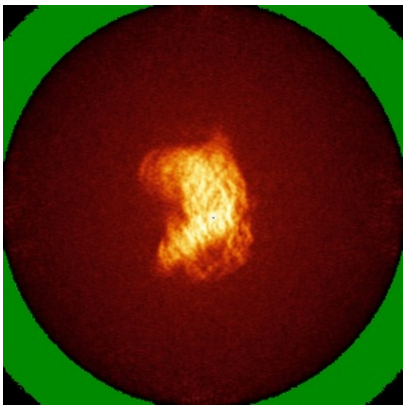
6.4.1 Primary map



X

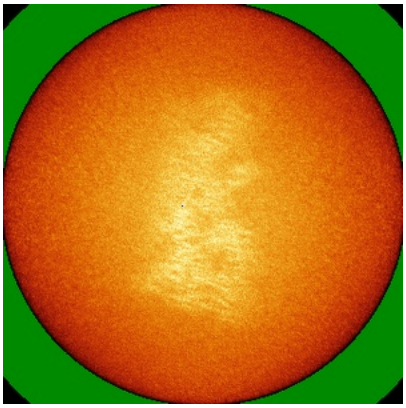


Y

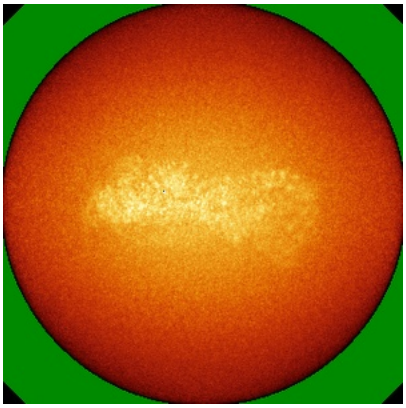


Z

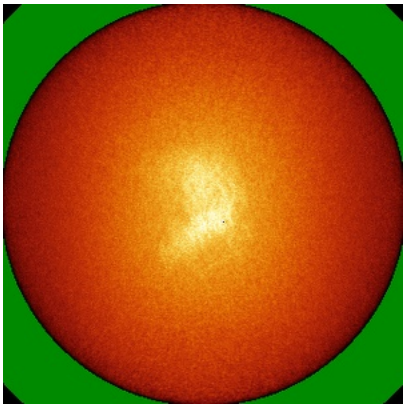
6.4.2 Raw map



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.

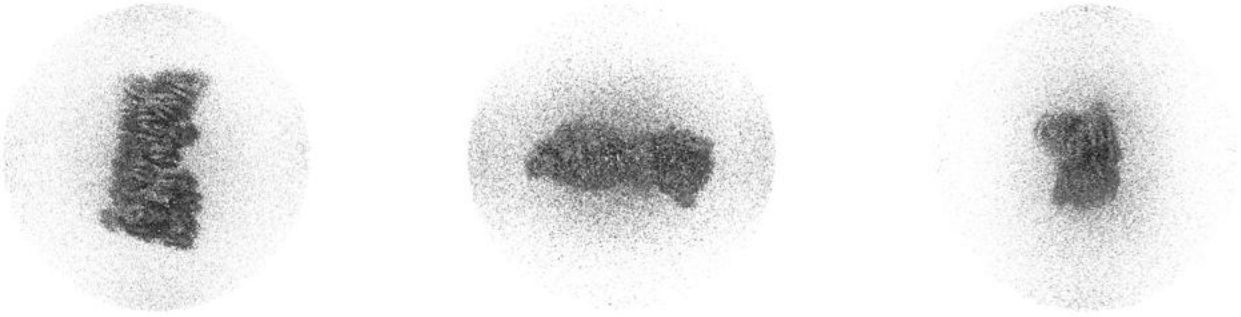
6.5 Orthogonal surface views (i)

6.5.1 Primary map

X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.0047. 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.

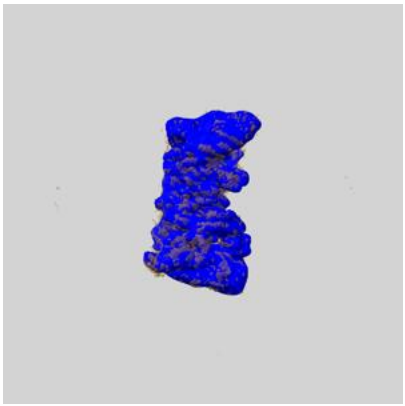
6.6 Mask visualisation (i)

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

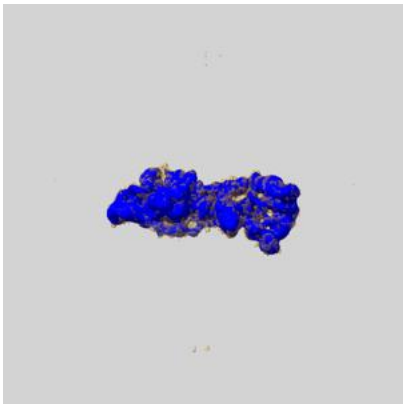
A mask typically either:

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

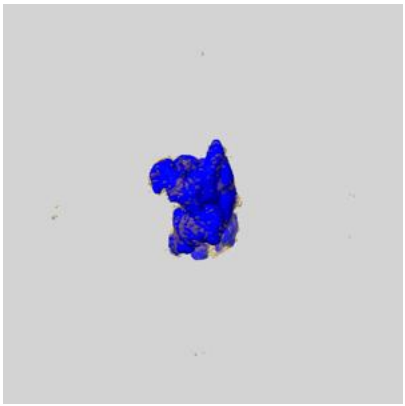
6.6.1 emd_52571_msk_1.map (i)



X



Y

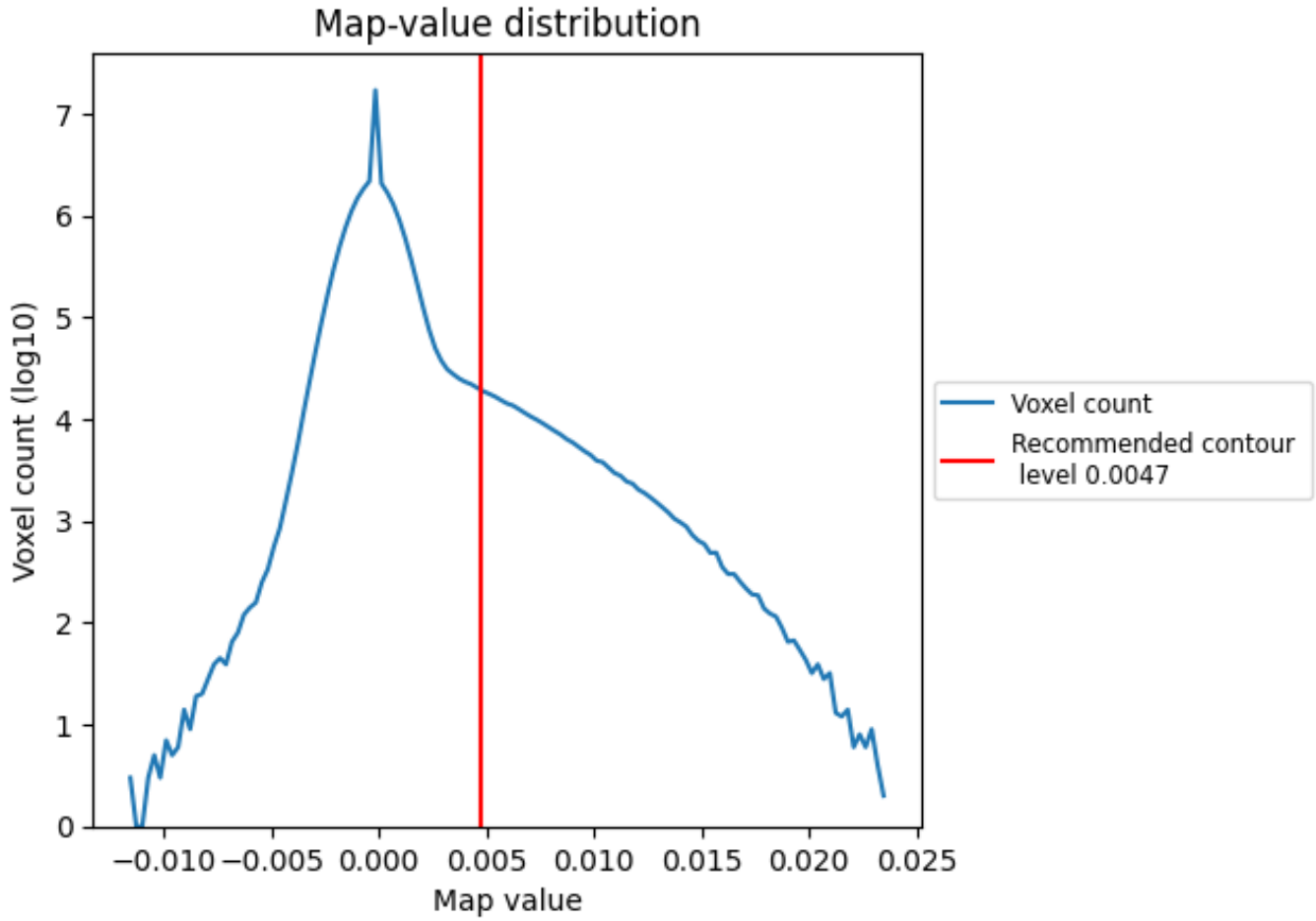


Z

7 Map analysis

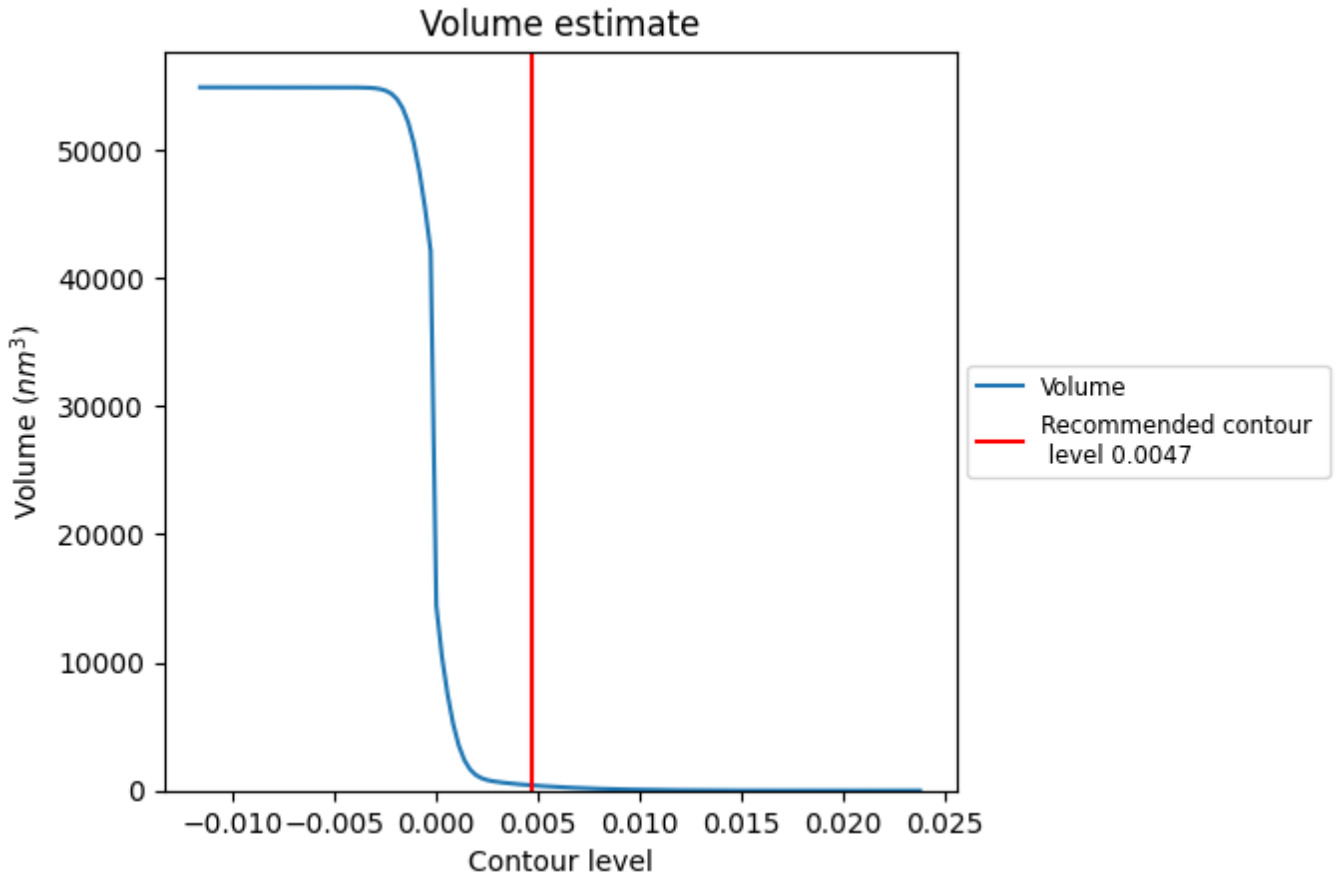
This section contains the results of statistical analysis of the map.

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.

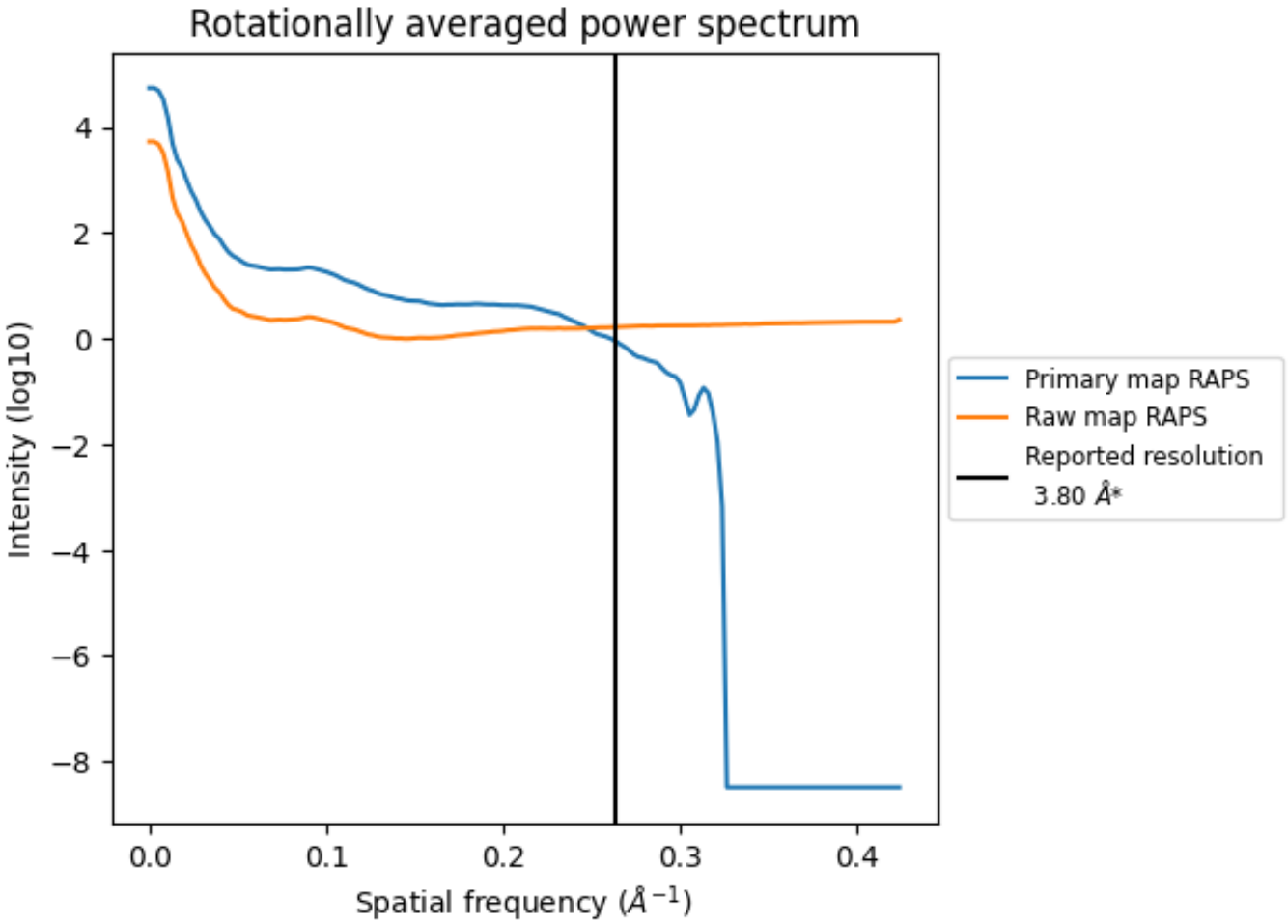
7.2 Volume estimate (i)



The volume at the recommended contour level is 411 nm^3; this corresponds to an approximate mass of 371 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)

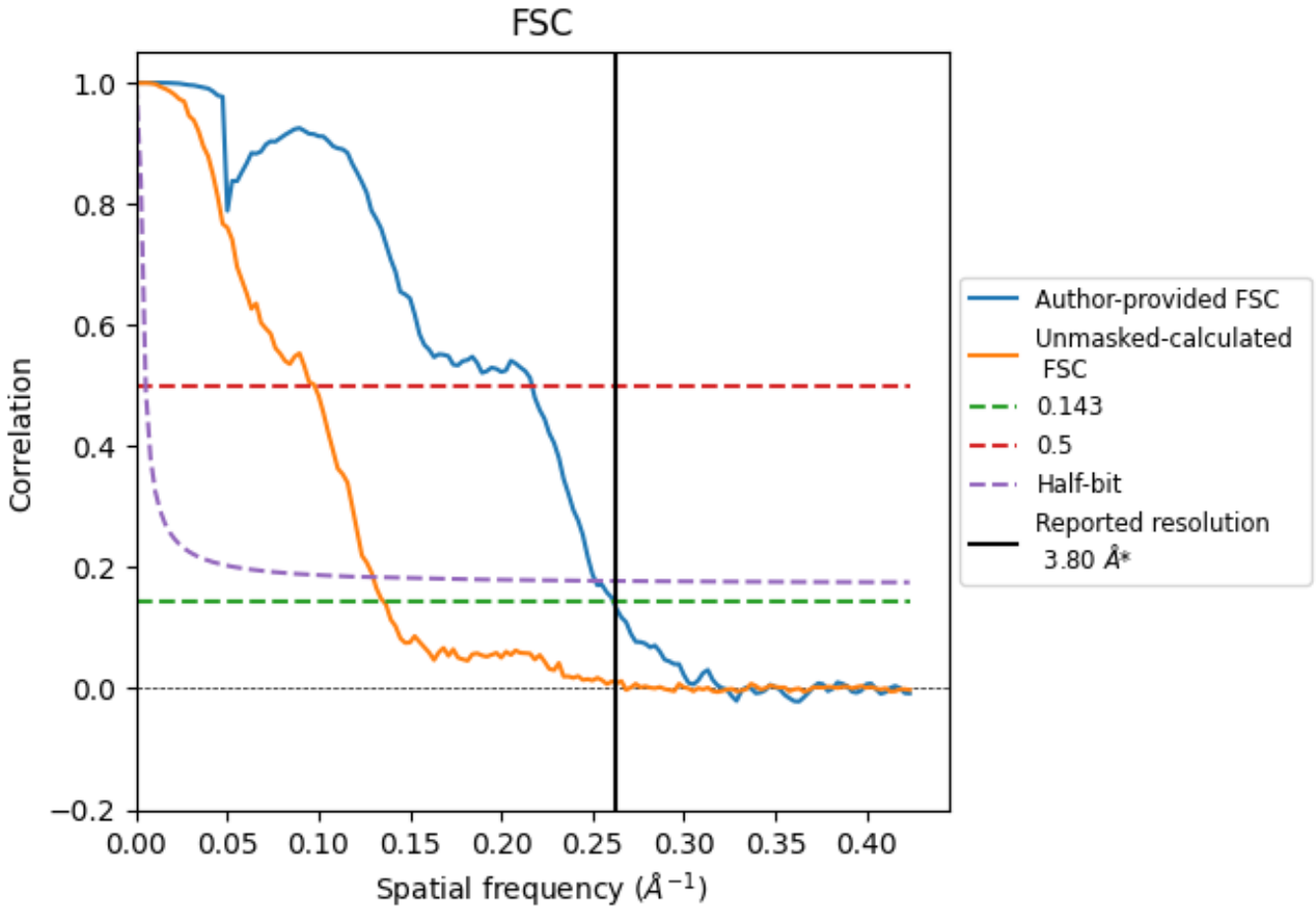


*Reported resolution corresponds to spatial frequency of 0.263 Å^{-1}

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 0.263 Å^{-1}

8.2 Resolution estimates (i)

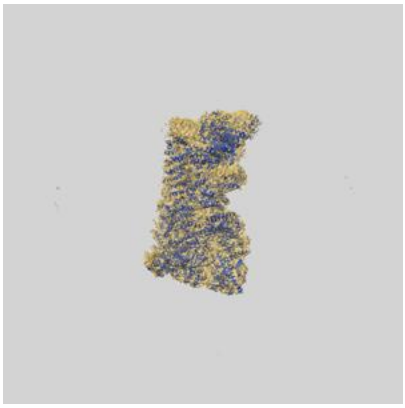
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.80	-	-
Author-provided FSC curve	3.82	4.61	3.97
Unmasked-calculated*	7.37	10.25	7.71

*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 7.37 differs from the reported value 3.8 by more than 10 %

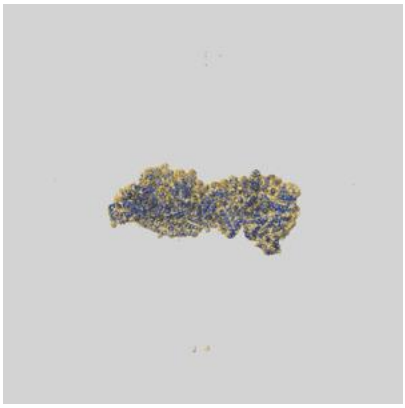
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-52571 and PDB model 9I1J. Per-residue inclusion information can be found in section 3 on page 8.

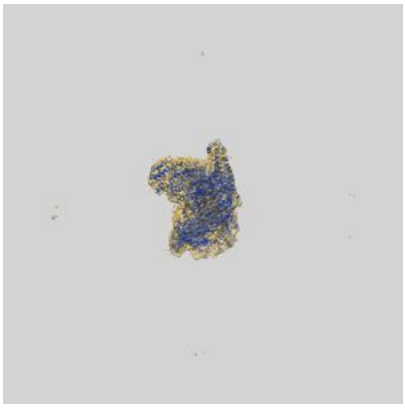
9.1 Map-model overlay



X



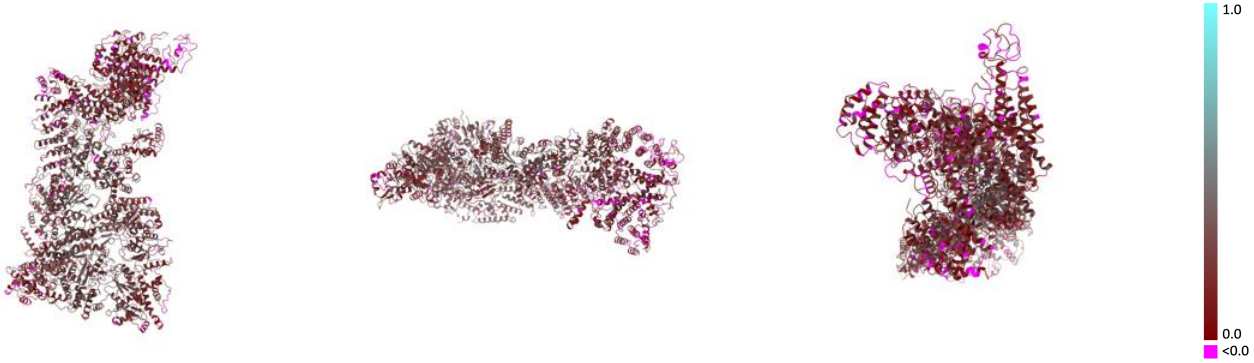
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.0047 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.

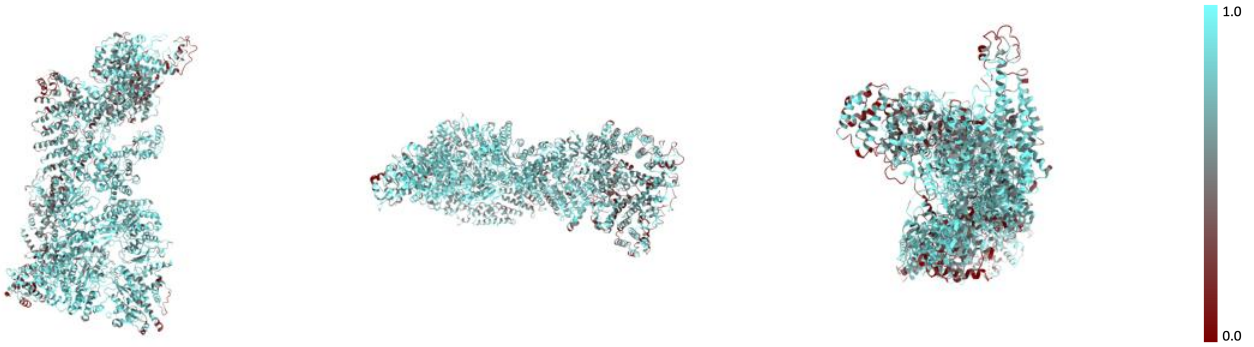
9.2 Q-score mapped to coordinate model (i)



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.

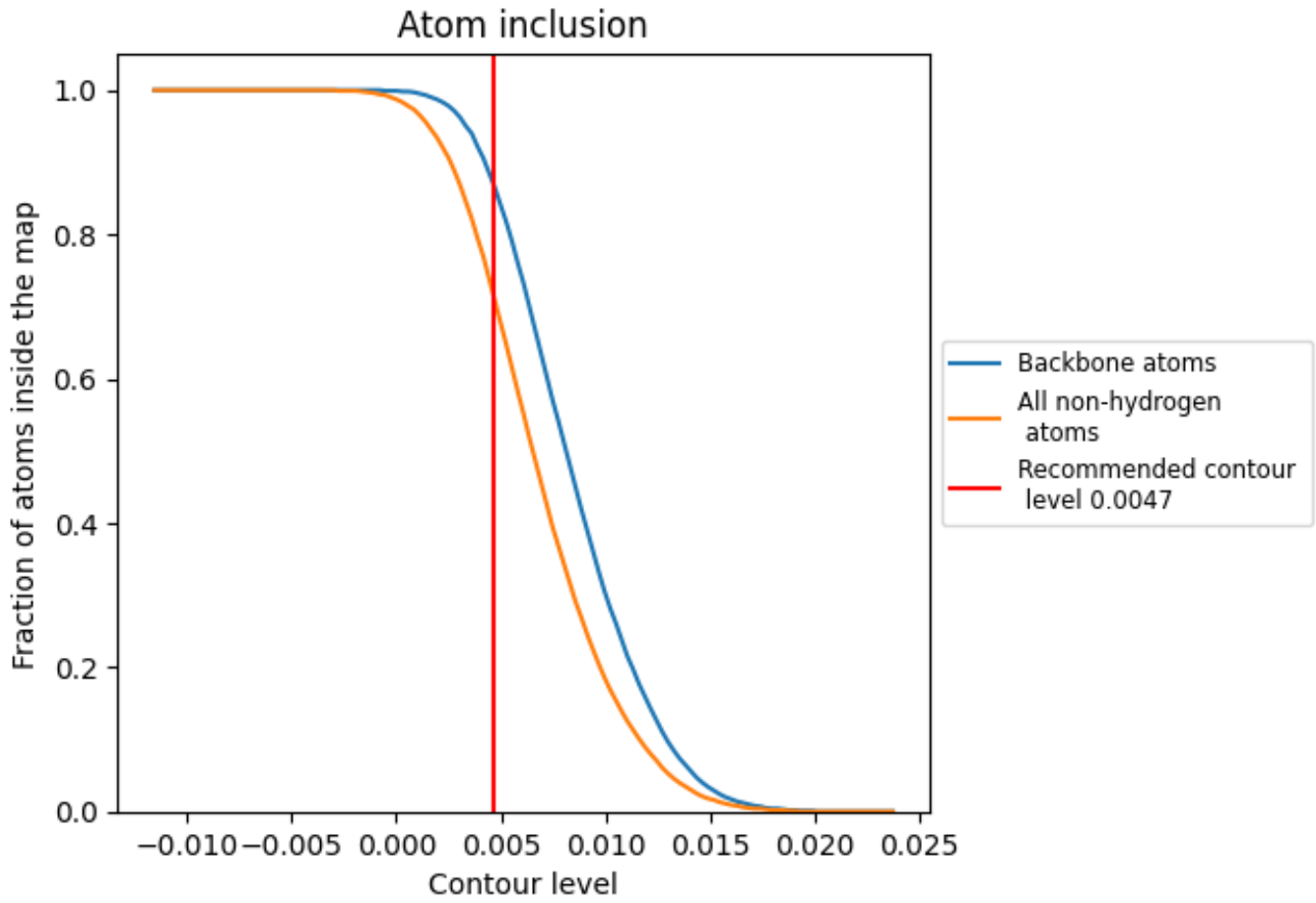
9.3 Atom inclusion mapped to coordinate model (i)



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 (0.0047).

9.4 Atom inclusion (i)



At the recommended contour level, 87% of all backbone atoms, 71% 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 (0.0047) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7100	0.2270
A	0.7080	0.2290
B	0.7800	0.1800