



wwPDB EM Validation Summary Report ⓘ

Dec 8, 2025 – 04:21 PM EST

PDB ID : 9D48 / pdb_00009d48
EMDB ID : EMD-46553
Title : Atomic model of Ketoacyl Reductase domain and 4 helical bundle of *Candida albicans* Fatty Acid Synthase (FAS) in complex with Palmitoyl-CoA (in vivo binding)
Authors : Hasan, N.S.M.; Keszei, F.A.A.; Mazhab-Jafari, M.T.
Deposited on : 2024-08-12
Resolution : 2.66 Å (reported)
Based on initial model : 6U5V

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:

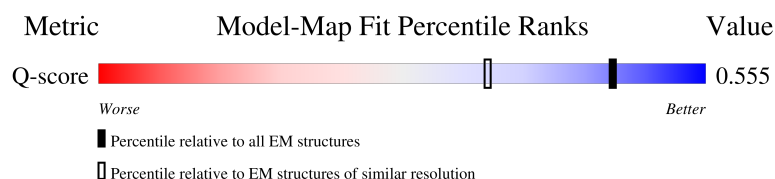
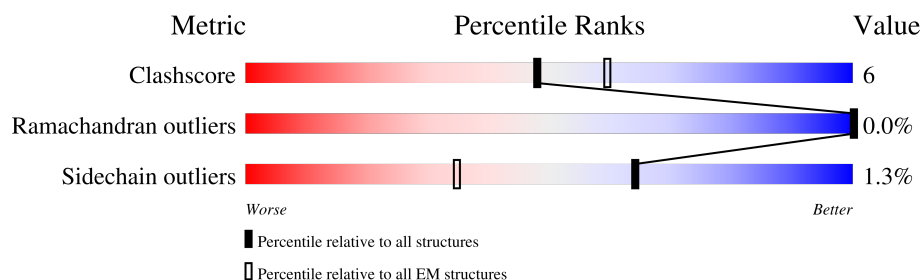
EMDB validation analysis : 0.0.1.dev129
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive 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) : 2.47

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 2.66 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	9119 (2.16 - 3.16)

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	2037	18% 89% 11%
1	E	2037	19% 89% 11%
1	I	2037	19% 89% 11%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
1	M	2037	
1	Q	2037	
1	W	2037	
2	B	1885	
2	F	1885	
2	G	1885	
2	N	1885	
2	R	1885	
2	X	1885	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 163304 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.

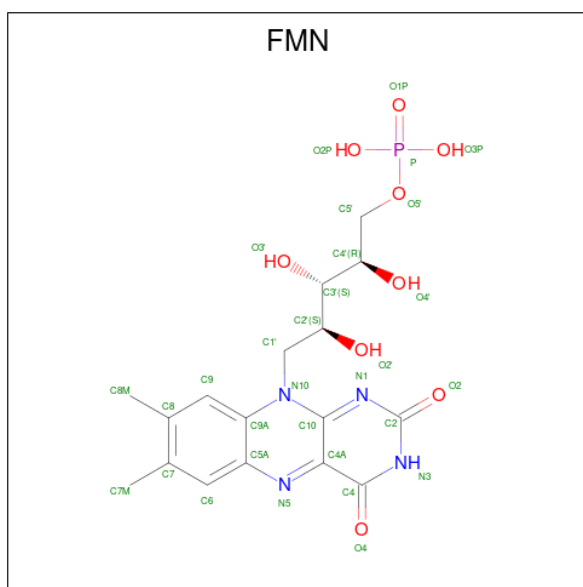
- Molecule 1 is a protein called Fatty acid synthase subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	2031	Total	C	N	O	S	0	0
			15784	10146	2631	2955	52		
1	E	2031	Total	C	N	O	S	0	0
			15784	10146	2631	2955	52		
1	I	2031	Total	C	N	O	S	0	0
			15784	10146	2631	2955	52		
1	M	2031	Total	C	N	O	S	0	0
			15784	10146	2631	2955	52		
1	Q	2031	Total	C	N	O	S	0	0
			15784	10146	2631	2955	52		
1	W	2031	Total	C	N	O	S	0	0
			15784	10146	2631	2955	52		

- Molecule 2 is a protein called Fatty acid synthase subunit alpha.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	1421	Total	C	N	O	S	0	0
			11066	7037	1866	2117	46		
2	F	1421	Total	C	N	O	S	0	0
			11066	7037	1866	2117	46		
2	G	1421	Total	C	N	O	S	0	0
			11066	7037	1866	2117	46		
2	N	1421	Total	C	N	O	S	0	0
			11066	7037	1866	2117	46		
2	R	1421	Total	C	N	O	S	0	0
			11066	7037	1866	2117	46		
2	X	1421	Total	C	N	O	S	0	0
			11066	7037	1866	2117	46		

- Molecule 3 is FLAVIN MONONUCLEOTIDE (CCD ID: FMN) (formula: $C_{17}H_{21}N_4O_9P$).



Mol	Chain	Residues	Atoms					AltConf
3	A	1	Total	C	N	O	P	0
			31	17	4	9	1	
3	E	1	Total	C	N	O	P	0
			31	17	4	9	1	
3	I	1	Total	C	N	O	P	0
			31	17	4	9	1	
3	M	1	Total	C	N	O	P	0
			31	17	4	9	1	
3	Q	1	Total	C	N	O	P	0
			31	17	4	9	1	
3	W	1	Total	C	N	O	P	0
			31	17	4	9	1	

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		AltConf
4	A	80	Total	O	0
			80	80	
4	B	250	Total	O	0
			250	250	
4	E	84	Total	O	0
			84	84	
4	F	256	Total	O	0
			256	256	
4	G	266	Total	O	0
			266	266	
4	I	74	Total	O	0
			74	74	

Continued on next page...

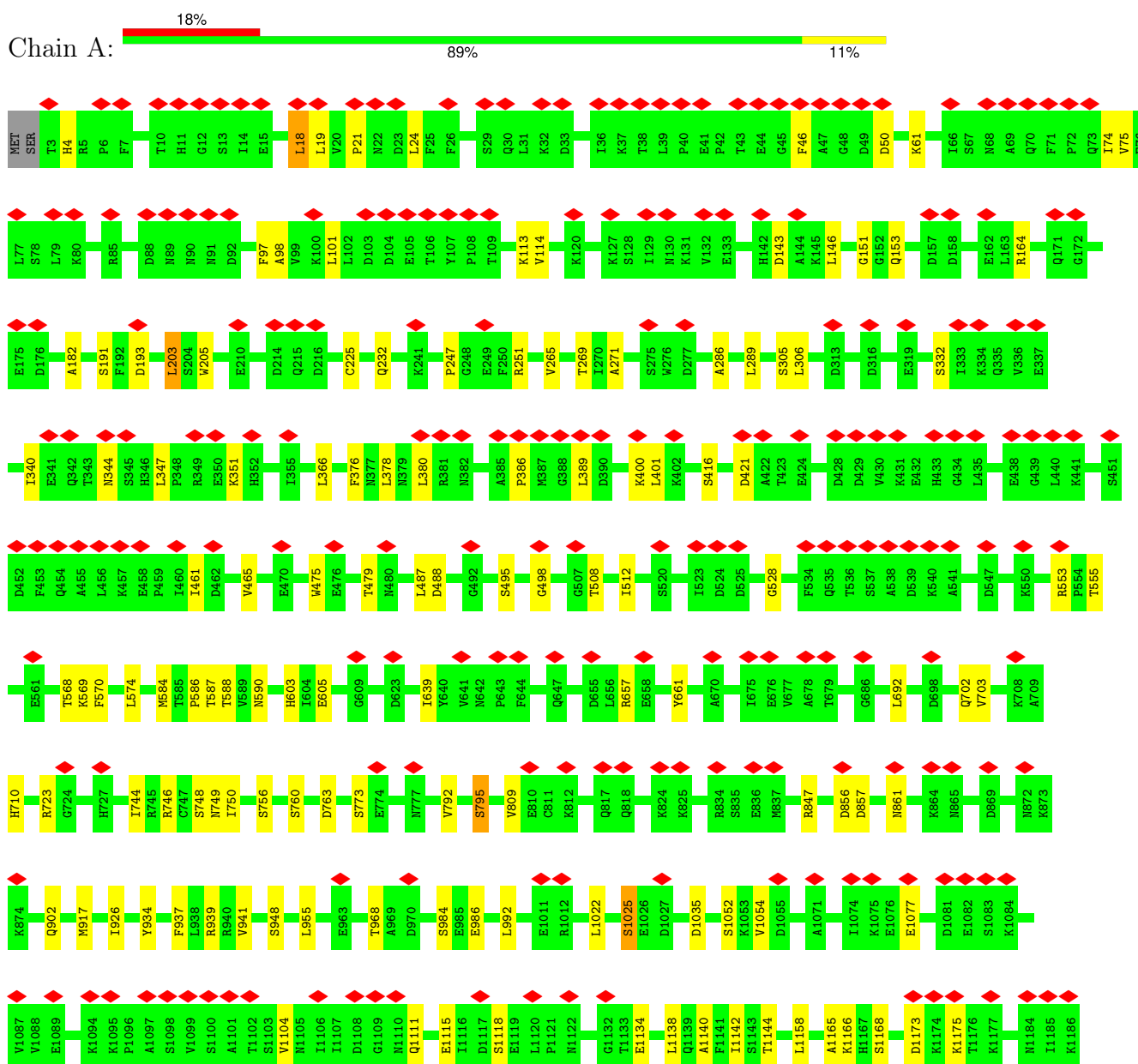
Continued from previous page...

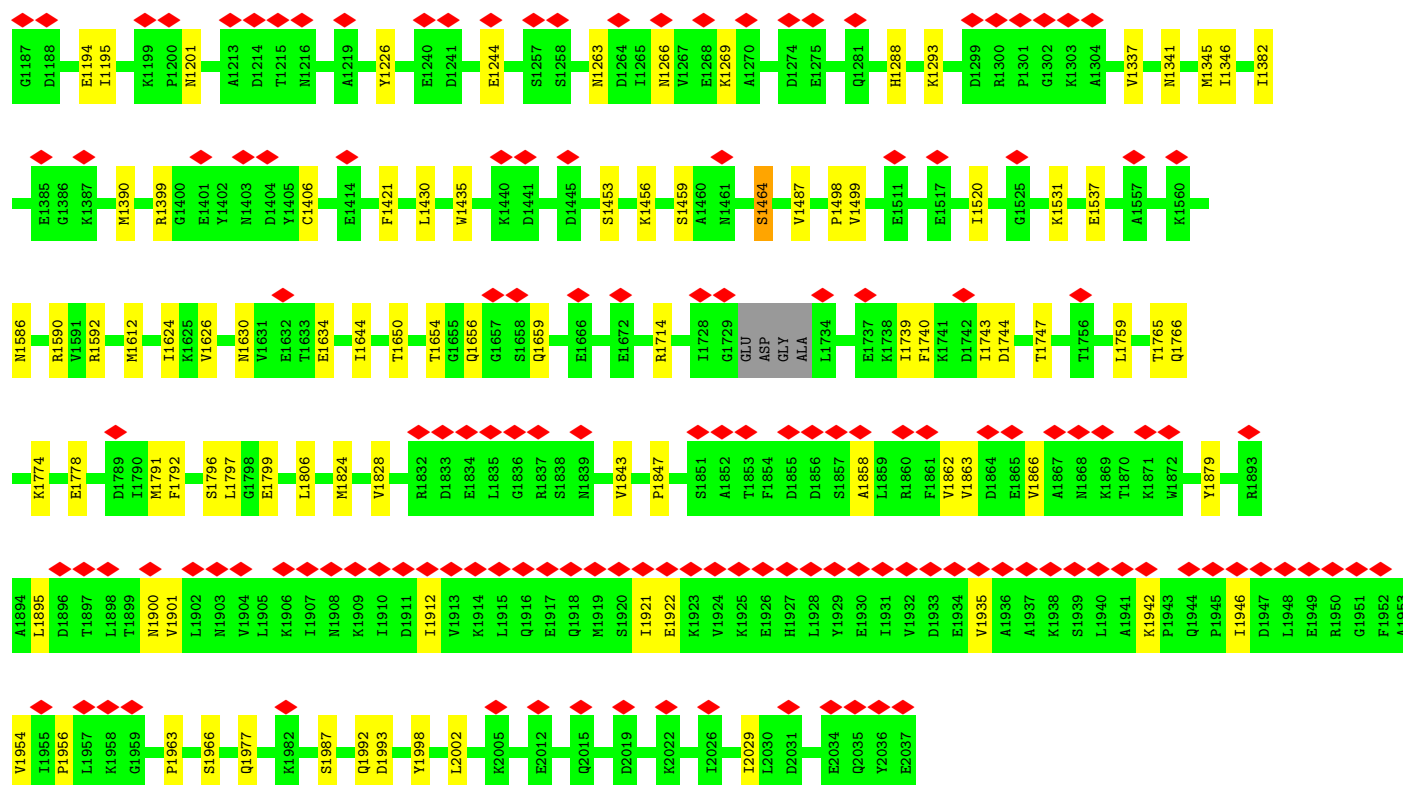
Mol	Chain	Residues	Atoms		AltConf
4	M	73	Total 73	O 73	0
4	N	263	Total 263	O 263	0
4	Q	84	Total 84	O 84	0
4	R	247	Total 247	O 247	0
4	W	86	Total 86	O 86	0
4	X	255	Total 255	O 255	0

3 Residue-property plots

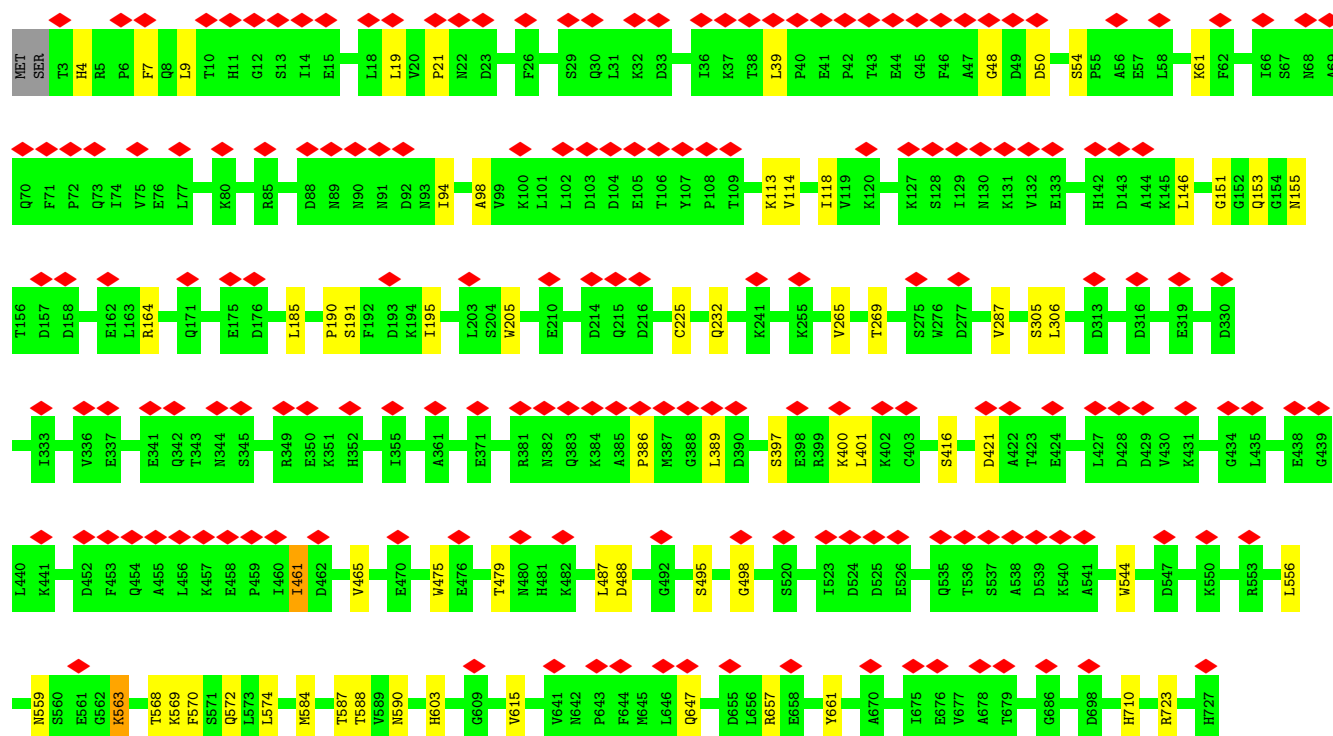
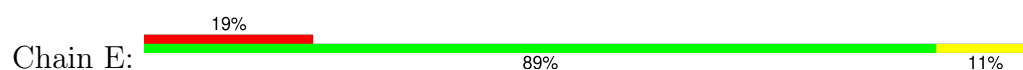
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion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

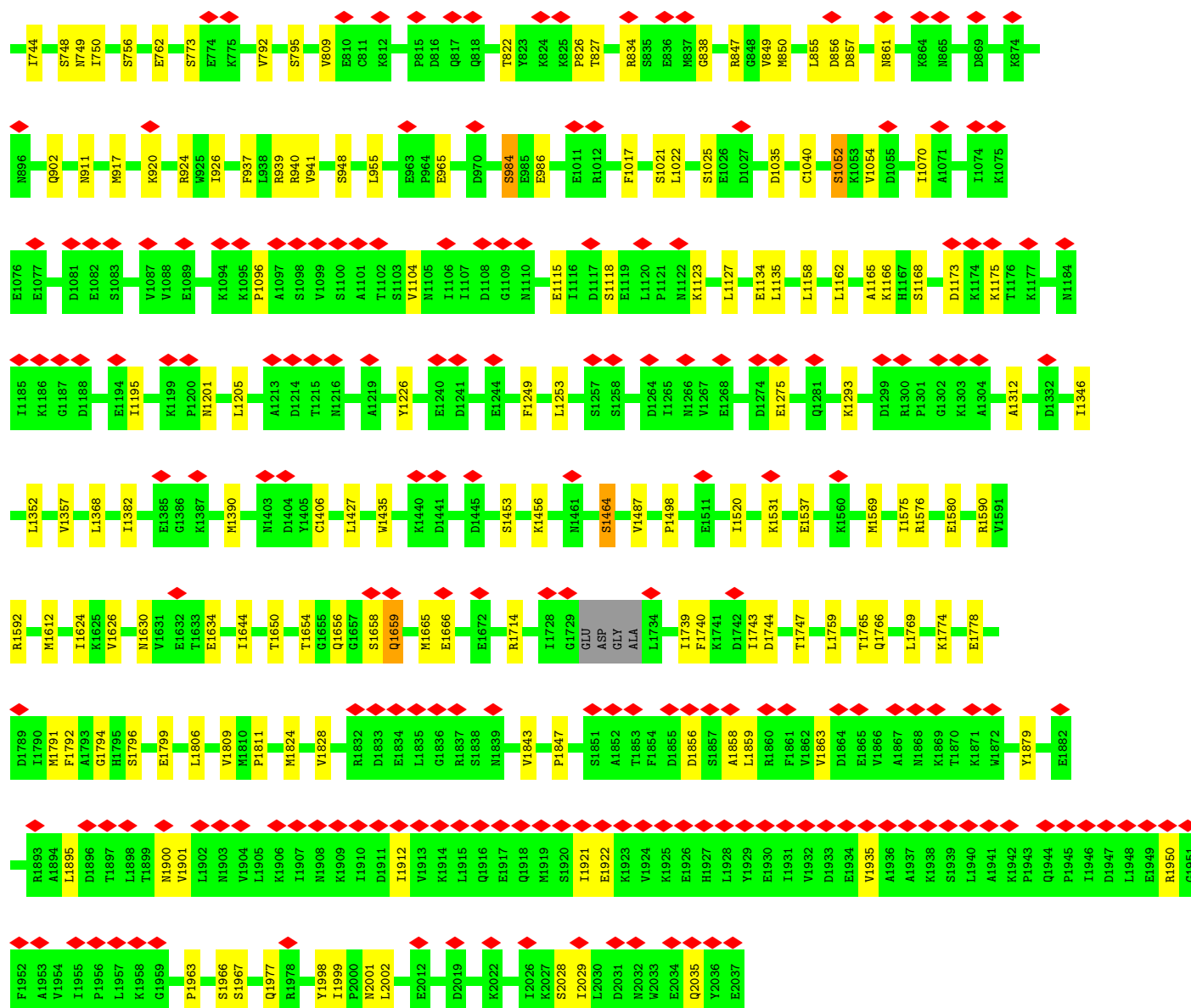
• Molecule 1: Fatty acid synthase subunit beta



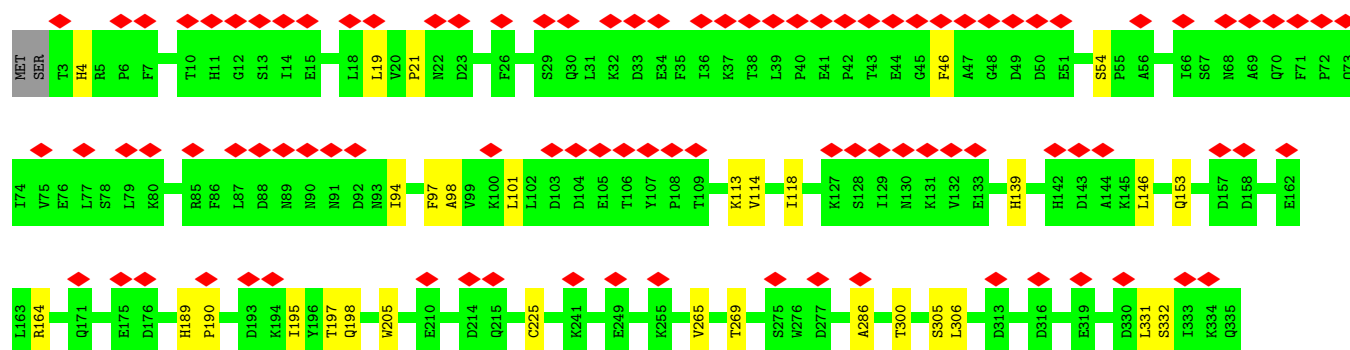
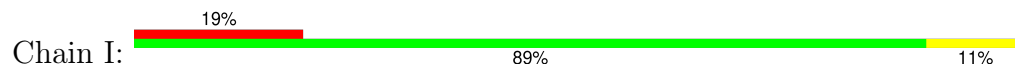


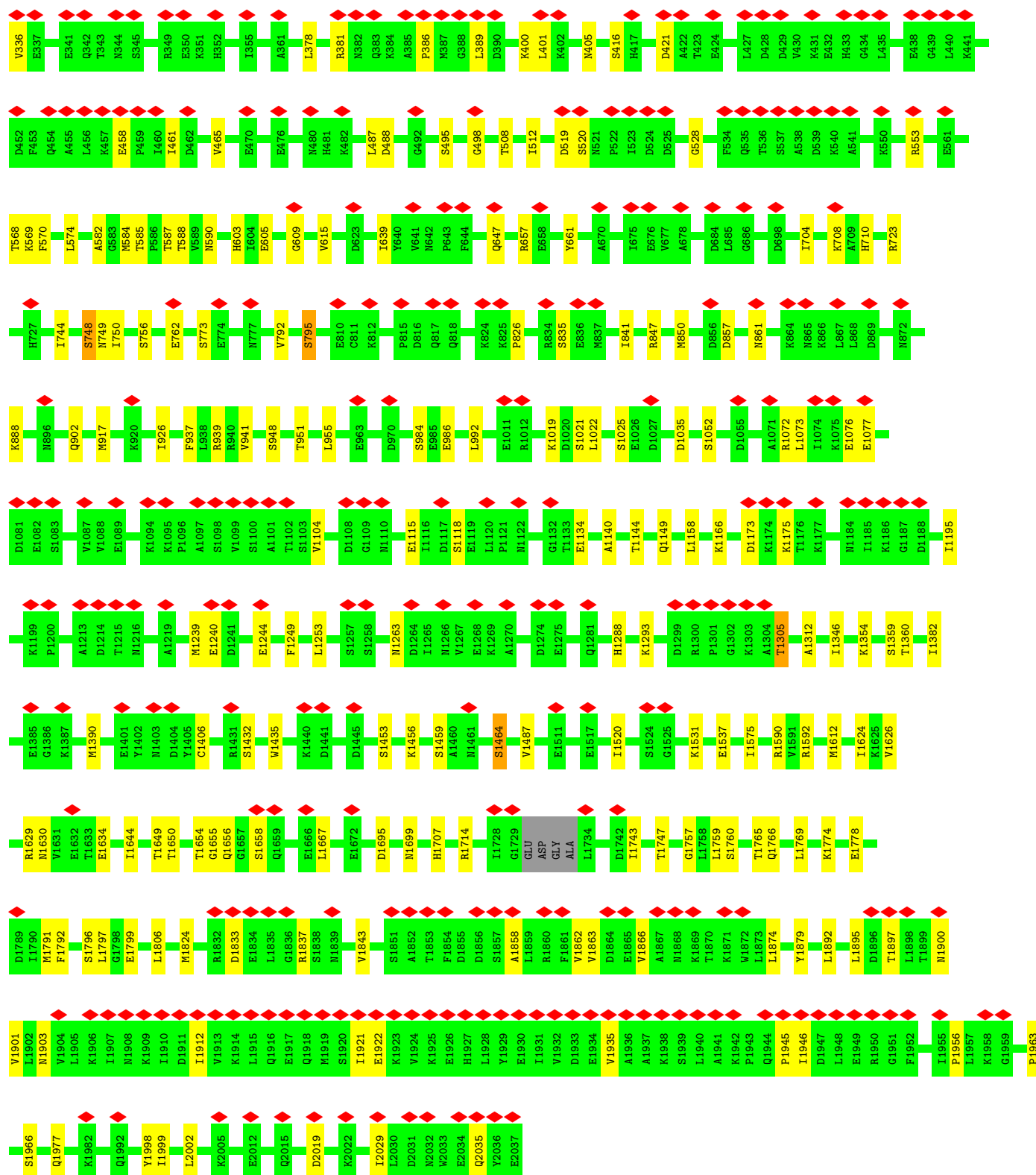
• Molecule 1: Fatty acid synthase subunit beta



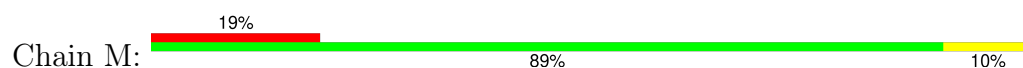


• Molecule 1: Fatty acid synthase subunit beta





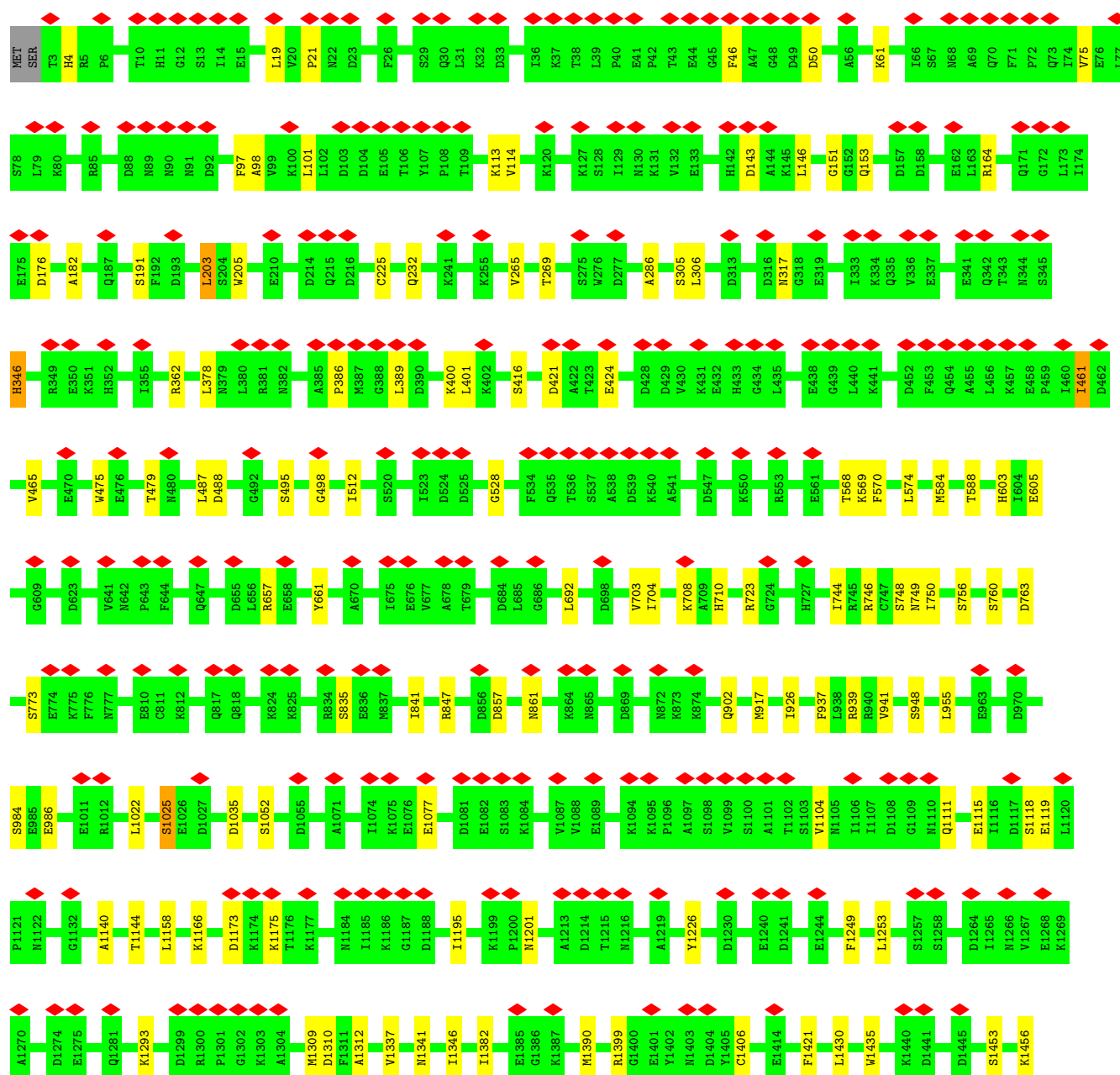
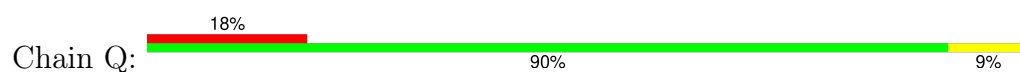
• Molecule 1: Fatty acid synthase subunit beta

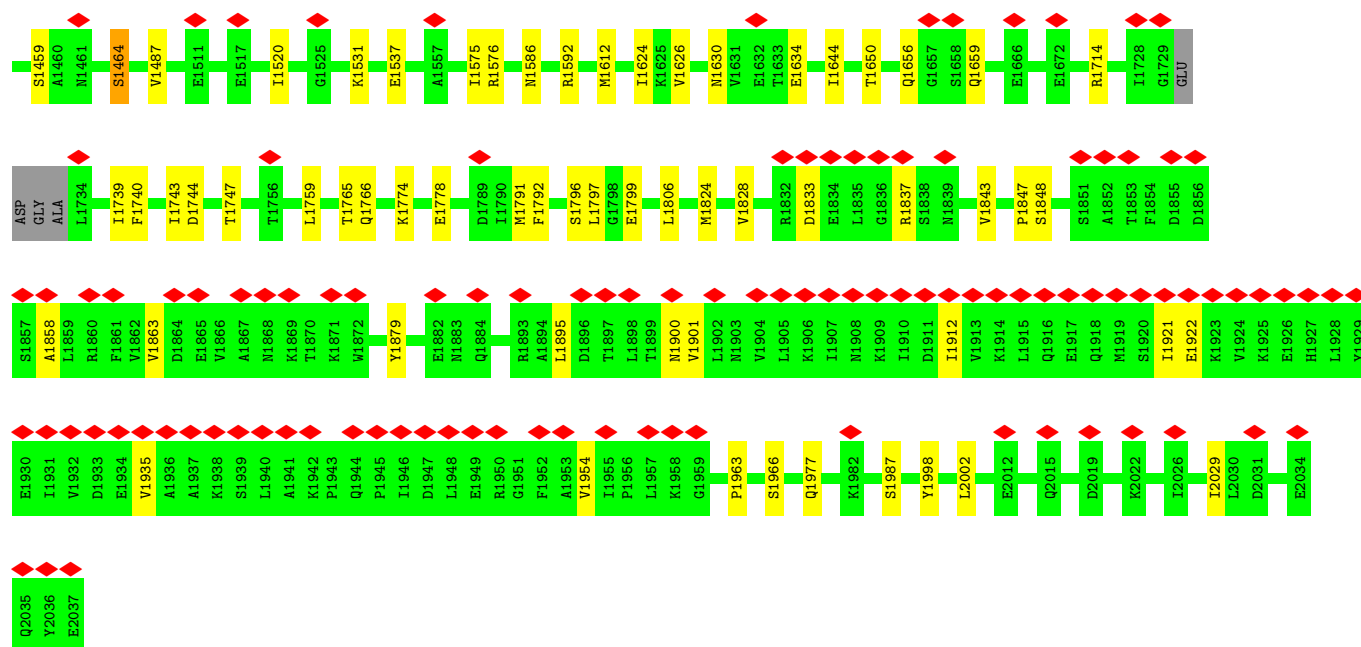


G1798	E1799	L1806	M1824	R1832	D1833	E1834	L1835	G1836	R1837	S1838	N1839	V1843	S1851	A1852	T1853	F1854	D1855	D1856	S1857	L1858	R1859	F1860	V1861	V1862	V1863	D1864	E1865	V1866	A1867	N1868	K1869	T1870	K1871	L1872	L1873	L1874	Y1879	L1895	D1896	T1897	L1898	T1899	F1792	N1900	V1901	L1902	N1903	V1904	L1905	K1906	I1907	N1908	K1909																																										
R1629	N1630	V1631	E1632	T1633	E1634	I1644	T1649	T1650	Q1656	G1657	S1658	Q1659	E1666	E1672	H1707	R1714	I1728	G1729	GLU	ASP	GLY	ALA	L1734	D1742	I1743	D1744	T1747	G1757	L1758	L1759	S1760	T1765	Q1766	K1774	E1778	D1789	I1790	M1791	F1792	G1793	H1794	H1795	S1796	L1797	D1798	T1799	F1792	N1900	V1901	L1902	N1903	V1904	L1905	K1906	I1907	N1908	K1909																																						
G1386	K1387	M1390	E1401	Y1402	N1403	D1404	E1414	R1431	W1435	K1440	D1441	D1445	S1453	K1456	S1459	A1460	N1461	S1464	V1487	V1499	E1511	E1517	I1520	S1524	G1525	K1531	E1537	I1575	N1590	W1591	R1592	M1612	I1624	K1625	V1626	G1386	K1387	M1390	E1401	Y1402	N1403	D1404	E1414	R1431	W1435	K1440	D1441	D1445	S1453	K1456	S1459	A1460	N1461	S1464	V1487	V1499	E1511	E1517	I1520	S1524	G1525	K1531	E1537	I1575	N1590	W1591	R1592	M1612	I1624	K1625	V1626																								
D1188	I1195	K1199	P1200	A1213	D1214	T1215	N1216	A1219	E1240	D1241	E1244	S1257	S1258	N1263	D1264	I1265	N1266	V1267	K1268	A1270	D1274	E1275	Q1281	H1288	K1293	D1299	R1300	P1301	G1302	K1303	A1304	T1305	A1312	I1346	K1354	T1359	S1359	T1360	I1362	E1385	D1188	I1195	K1199	P1200	A1213	D1214	T1215	N1216	A1219	E1240	D1241	E1244	S1257	S1258	N1263	D1264	I1265	N1266	V1267	K1268	A1270	D1274	E1275	Q1281	H1288	K1293	D1299	R1300	P1301	G1302	K1303	A1304	T1305	A1312	I1346	K1354	T1359	S1359	T1360	I1362	E1385														
E1076	E1077	D1081	E1082	S1083	V1087	V1088	E1089	K1094	K1095	P1096	A1097	S1098	V1099	S1100	A1101	T1102	S1103	V1104	D1108	G1109	N1110	E1115	I1116	D1117	S1118	E1119	L1120	P1121	N1122	G1132	T1133	E1134	A1140	T1144	L1158	L1162	K1166	D1173	K1174	N1175	T1176	L1177	M1184	T1185	K1186	G1187	E1076	E1077	D1081	E1082	S1083	V1087	V1088	E1089	K1094	K1095	P1096	A1097	S1098	V1099	S1100	A1101	T1102	S1103	V1104	D1108	G1109	N1110	E1115	I1116	D1117	S1118	E1119	L1120	P1121	N1122	G1132	T1133	E1134	A1140	T1144	L1158	L1162	K1166	D1173	K1174	N1175	T1176	L1177	M1184	T1185	K1186	G1187		
K874	D885	K888	N896	Q902	M917	K920	I926	F937	L938	R939	R940	V941	S948	L955	E963	D970	S984	E985	E986	L992	E1011	R1012	K1019	D1020	S1021	L1022	S1025	E1026	D1027	D1035	S1052	K1053	V1054	D1055	A1071	R1072	L1073	I1074	K1075	K874	D885	K888	N896	Q902	M917	K920	I926	F937	L938	R939	R940	V941	S948	L955	E963	D970	S984	E985	E986	L992	E1011	R1012	K1019	D1020	S1021	L1022	S1025	E1026	D1027	D1035	S1052	K1053	V1054	D1055	A1071	R1072	L1073	I1074	K1075																
R723	H727	I744	S748	N749	I750	S756	E762	S773	E774	N777	V809	E810	C811	K812	P815	D816	Q817	Q818	Y823	K824	K825	P826	R834	S835	E836	M837	I841	R847	M850	D856	D857	N861	K864	N865	K866	L867	L868	D869	N872	K873	R723	H727	I744	S748	N749	I750	S756	E762	S773	E774	N777	V809	E810	C811	K812	P815	D816	Q817	Q818	Y823	K824	K825	P826	R834	S835	E836	M837	I841	R847	M850	D856	D857	N861	K864	N865	K866	L867	L868	D869	N872	K873														
E561	T568	K569	F570	L574	A582	G583	N584	T585	P586	T587	T588	N590	H603	L604	E605	G609	V615	D623	I639	V640	V641	N642	P643	F644	Q647	R657	E658	Y661	A670	I675	E676	V677	A678	D684	L685	G686	D698	I704	K708	A709	H710	E561	T568	K569	F570	L574	A582	G583	N584	T585	P586	T587	T588	N590	H603	L604	E605	G609	V615	D623	I639	V640	V641	N642	P643	F644	Q647	R657	E658	Y661	A670	I675	E676	V677	A678	D684	L685	G686	D698	I704	K708	A709	H710												
K441	D452	F453	Q454	A455	L456	K457	E458	P459	I460	K461	D462	R463	V464	E470	E476	N480	H481	K482	L487	D488	G492	S495	L498	D390	P395	K400	L401	K402	N405	S416	H417	D421	A422	T423	E424	L427	D428	D429	V430	K431	L432	S433	K334	Q335	E438	G439	L440	K441	D452	F453	Q454	A455	L456	K457	E458	P459	I460	K461	D462	R463	V464	E470	E476	N480	H481	K482	L487	D488	G492	S495	L498	D390	P395	K400	L401	K402	N405	S416	H417	D421	A422	T423	E424	L427	D428	D429	V430	K431	L432	S433	K334	Q335	E438	G439	L440
V336	E337	E341	Q342	T343	N344	S345	R349	E350	K351	H352	I355	A361	L378	R381	N382	Q383	K384	A385	P386	M387	G388	L389	D390	P395	K400	L401	K402	N405	S416	H417	D421	A422	T423	E424	L427	D428	D429	V430	K431	L432	S433	K334	Q335	E438	G439	L440	V336	E337	E341	Q342	T343	N344	S345	R349	E350	K351	H352	I355	A361	L378	R381	N382	Q383	K384	A385	P386	M387	G388	L389	D390	P395	K400	L401	K402	N405	S416	H417	D421	A422	T423	E424	L427	D428	D429	V430	K431	L432	S433	K334	Q335	E438	G439	L440		
R164	Q171	E175	D176	I181	H189	P190	D193	W205	E210	D214	Q215	C225	V230	K241	L245	E249	K255	V265	T269	S275	V276	D277	A286	T300	S305	L306	D313	D316	E319	D330	L331	S332	I333	K334	Q335	E338	G339	L340	V336	E337	E341	Q342	T343	N344	S345	R349	E350	K351	H352	I355	A361	L378	R381	N382	Q383	K384	A385	P386	M387	G388	L389	D390	P395	K400	L401	K402	N405	S416	H417	D421	A422	T423	E424	L427	D428	D429	V430	K431	L432	S433	K334	Q335	E438	G439	L440										
I74	V75	E76	L77	K80	R85	F86	L87	D88	N89	N90	N91	D92	N93	I94	A98	V99	K100	D103	D104	E105	T106	Y107	P108	T109	K113	V114	I118	K120	K127	S128	I129	M130	K131	V132	E133	H139	H142	D143	A144	K145	L146	Q153	D157	D158	E162	L163	I74	V75	E76	L77	K80	R85	F86	L87	D88	N89	N90	N91	D92	N93	I94	A98	V99	K100	D103	D104	E105	T106	Y107	P108	T109	K113	V114	I118	K120	K127	S128	I129	M130	K131	V132	E133	H139	H142	D143	A144	K145	L146	Q153	D157	D158	E162	L163		

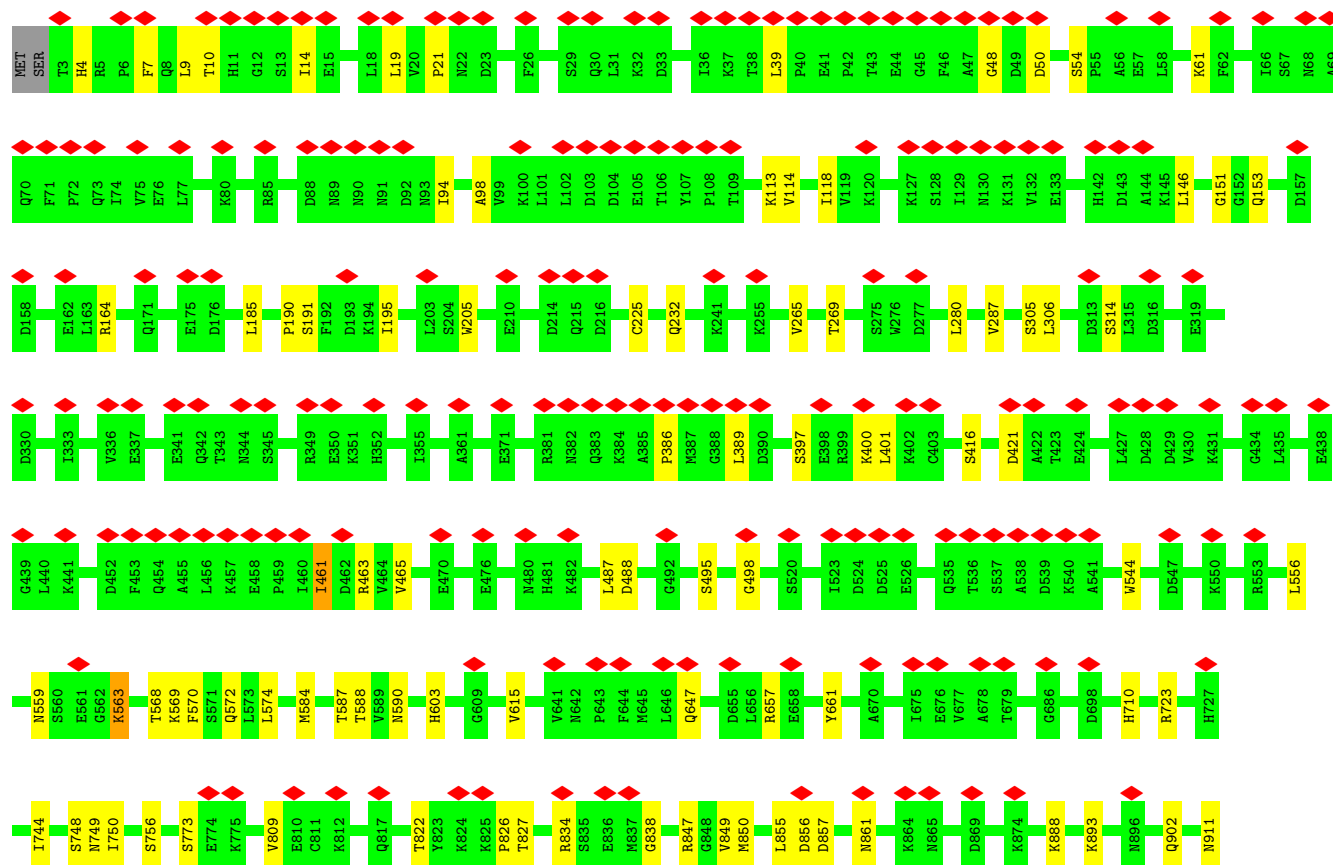
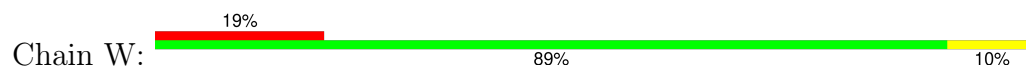


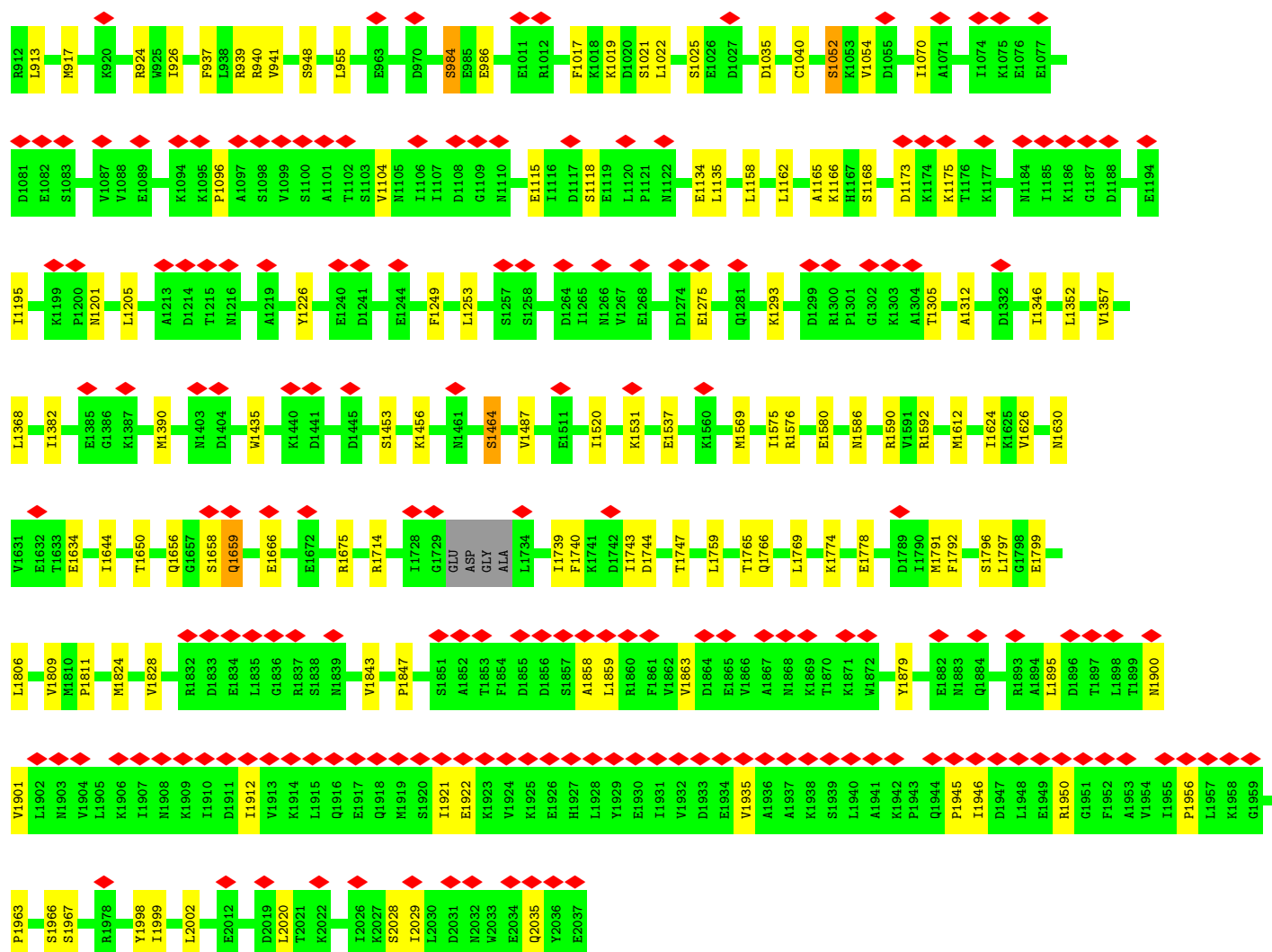
• Molecule 1: Fatty acid synthase subunit beta





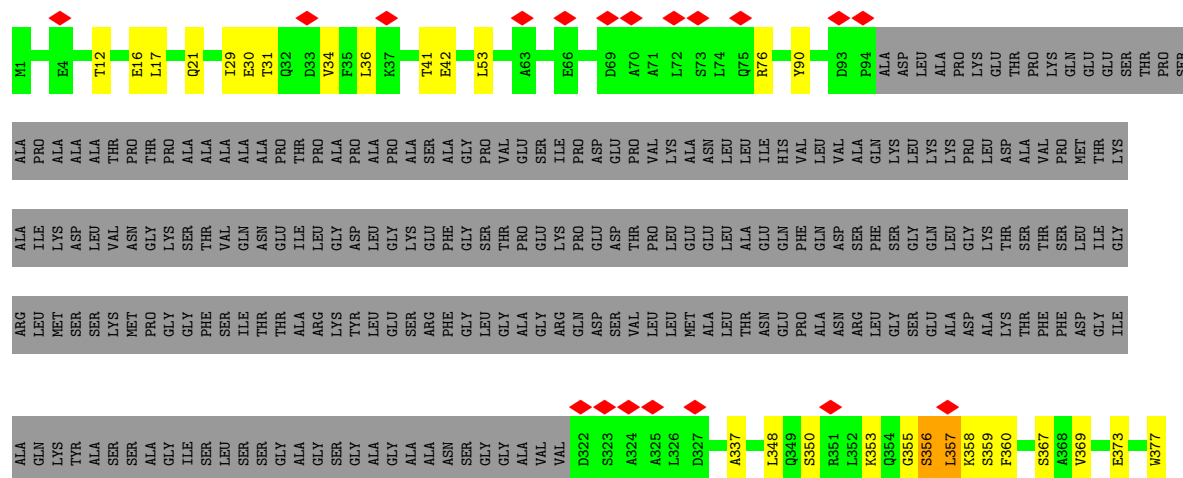
• Molecule 1: Fatty acid synthase subunit beta





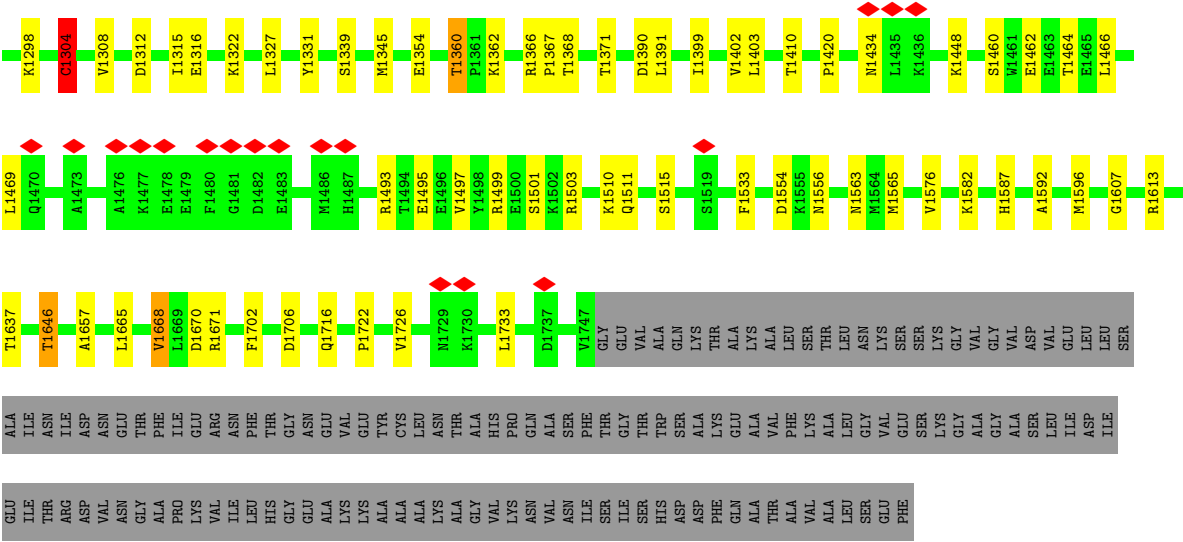
● Molecule 2: Fatty acid synthase subunit alpha

Chain B: 64% 11% 25%









4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, D3	Depositor
Number of particles used	252339	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 ($e^-/\text{\AA}^2$)	51.2	Depositor
Minimum defocus (nm)	600	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor
Maximum map value	6.754	Depositor
Minimum map value	-4.459	Depositor
Average map value	0.009	Depositor
Map value standard deviation	0.273	Depositor
Recommended contour level	0.7	Depositor
Map size (Å)	333.72, 333.72, 333.72	wwPDB
Map dimensions	324, 324, 324	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.03, 1.03, 1.03	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: FMN

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	0.18	0/16153	0.39	1/21953 (0.0%)
1	E	0.21	1/16153 (0.0%)	0.42	3/21953 (0.0%)
1	I	0.20	2/16153 (0.0%)	0.42	4/21953 (0.0%)
1	M	0.20	2/16153 (0.0%)	0.42	4/21953 (0.0%)
1	Q	0.17	0/16153	0.38	0/21953
1	W	0.17	0/16153	0.39	1/21953 (0.0%)
2	B	0.20	0/11293	0.40	0/15287
2	F	0.20	0/11293	0.40	1/15287 (0.0%)
2	G	0.20	0/11293	0.40	1/15287 (0.0%)
2	N	0.20	0/11293	0.40	1/15287 (0.0%)
2	R	0.20	0/11293	0.41	1/15287 (0.0%)
2	X	0.20	0/11293	0.40	1/15287 (0.0%)
All	All	0.19	5/164676 (0.0%)	0.40	18/223440 (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	E	0	1
1	I	0	1
1	M	0	1
1	W	0	1
2	B	0	1
2	F	0	1
2	G	0	1
2	N	0	1
2	R	0	1
2	X	0	1
All	All	0	10

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	190	PRO	CG-CD	-12.46	1.08	1.50
1	M	190	PRO	CG-CD	-9.61	1.18	1.50
1	I	190	PRO	CG-CD	-9.55	1.18	1.50
1	M	190	PRO	CB-CG	-7.15	1.13	1.49
1	I	190	PRO	CB-CG	-7.06	1.14	1.49

The worst 5 of 18 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	190	PRO	N-CD-CG	-20.86	71.92	103.20
1	M	190	PRO	N-CD-CG	-17.69	76.66	103.20
1	I	190	PRO	N-CD-CG	-17.08	77.57	103.20
1	E	190	PRO	CA-CB-CG	-13.66	78.54	104.50
1	M	190	PRO	CA-CB-CG	-12.93	79.94	104.50

There are no chirality outliers.

5 of 10 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	356	SER	Peptide
1	E	1950	ARG	Sidechain
2	F	356	SER	Peptide
2	G	356	SER	Peptide
1	I	381	ARG	Sidechain

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	15784	0	15632	144	0
1	E	15784	0	15632	155	0
1	I	15784	0	15632	159	0
1	M	15784	0	15632	153	0
1	Q	15784	0	15632	128	0
1	W	15784	0	15632	163	0
2	B	11066	0	10904	195	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	F	11066	0	10904	188	0
2	G	11066	0	10904	184	0
2	N	11066	0	10904	176	0
2	R	11066	0	10904	158	0
2	X	11066	0	10904	187	0
3	A	31	0	19	2	0
3	E	31	0	19	0	0
3	I	31	0	19	1	0
3	M	31	0	19	1	0
3	Q	31	0	19	0	0
3	W	31	0	19	0	0
4	A	80	0	0	24	0
4	B	250	0	0	83	0
4	E	84	0	0	48	0
4	F	256	0	0	67	0
4	G	266	0	0	65	0
4	I	74	0	0	51	0
4	M	73	0	0	46	0
4	N	263	0	0	63	0
4	Q	84	0	0	24	0
4	R	247	0	0	56	0
4	W	86	0	0	54	0
4	X	255	0	0	70	0
All	All	163304	0	159330	1813	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 6.

The worst 5 of 1813 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)
2:G:424:LEU:HD12	4:G:2144:HOH:O	1.31	1.26
1:W:1666:GLU:HB2	4:W:2264:HOH:O	1.40	1.20
1:E:1666:GLU:HB2	4:E:2264:HOH:O	1.41	1.18
2:N:1626:GLU:HB3	4:N:2154:HOH:O	1.45	1.17
2:N:1735:PHE:HZ	4:N:2091:HOH:O	1.28	1.16

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	2027/2037 (100%)	1976 (98%)	51 (2%)	0	100	100
1	E	2027/2037 (100%)	1976 (98%)	51 (2%)	0	100	100
1	I	2027/2037 (100%)	1976 (98%)	51 (2%)	0	100	100
1	M	2027/2037 (100%)	1975 (97%)	52 (3%)	0	100	100
1	Q	2027/2037 (100%)	1975 (97%)	52 (3%)	0	100	100
1	W	2027/2037 (100%)	1975 (97%)	52 (3%)	0	100	100
2	B	1413/1885 (75%)	1378 (98%)	34 (2%)	1 (0%)	48	67
2	F	1413/1885 (75%)	1375 (97%)	37 (3%)	1 (0%)	48	67
2	G	1413/1885 (75%)	1373 (97%)	39 (3%)	1 (0%)	48	67
2	N	1413/1885 (75%)	1376 (97%)	36 (2%)	1 (0%)	48	67
2	R	1413/1885 (75%)	1377 (98%)	35 (2%)	1 (0%)	48	67
2	X	1413/1885 (75%)	1375 (97%)	37 (3%)	1 (0%)	48	67
All	All	20640/23532 (88%)	20107 (97%)	527 (3%)	6 (0%)	100	100

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	F	1304	CYS
2	X	1304	CYS
2	R	1589	LYS
2	B	1589	LYS
2	G	1589	LYS

5.3.2 Protein sidechains

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	1713/1784 (96%)	1691 (99%)	22 (1%)	65	80
1	E	1713/1784 (96%)	1690 (99%)	23 (1%)	65	80
1	I	1713/1784 (96%)	1689 (99%)	24 (1%)	62	79
1	M	1713/1784 (96%)	1694 (99%)	19 (1%)	70	84
1	Q	1713/1784 (96%)	1694 (99%)	19 (1%)	70	84
1	W	1713/1784 (96%)	1691 (99%)	22 (1%)	65	80
2	B	1173/1580 (74%)	1157 (99%)	16 (1%)	62	79
2	F	1173/1580 (74%)	1152 (98%)	21 (2%)	54	73
2	G	1173/1580 (74%)	1163 (99%)	10 (1%)	75	87
2	N	1173/1580 (74%)	1160 (99%)	13 (1%)	70	84
2	R	1173/1580 (74%)	1158 (99%)	15 (1%)	65	80
2	X	1173/1580 (74%)	1147 (98%)	26 (2%)	47	68
All	All	17316/20184 (86%)	17086 (99%)	230 (1%)	64	80

5 of 230 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	I	2035	GLN
2	X	1292	SER
2	N	1183	LEU
2	X	1250	MET
1	W	1659	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 137 such sidechains are listed below:

Mol	Chain	Res	Type
2	R	1287	ASN
1	W	30	GLN
1	W	1883	ASN
2	F	1270	GLN
2	F	1119	GLN

5.3.3 RNA ⓘ

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](#)

6 ligands are 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
3	FMN	E	2101	-	33,33,33	1.06	2 (6%)	48,50,50	1.37	8 (16%)
3	FMN	A	2101	-	33,33,33	1.03	2 (6%)	48,50,50	1.37	7 (14%)
3	FMN	M	2101	-	33,33,33	1.06	2 (6%)	48,50,50	1.37	7 (14%)
3	FMN	W	2101	-	33,33,33	1.06	2 (6%)	48,50,50	1.41	10 (20%)
3	FMN	Q	2101	-	33,33,33	1.06	2 (6%)	48,50,50	1.39	7 (14%)
3	FMN	I	2101	-	33,33,33	1.05	2 (6%)	48,50,50	1.38	7 (14%)

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
3	FMN	E	2101	-	-	6/18/18/18	0/3/3/3
3	FMN	A	2101	-	-	2/18/18/18	0/3/3/3
3	FMN	M	2101	-	-	6/18/18/18	0/3/3/3
3	FMN	W	2101	-	-	3/18/18/18	0/3/3/3
3	FMN	Q	2101	-	-	7/18/18/18	0/3/3/3
3	FMN	I	2101	-	-	6/18/18/18	0/3/3/3

The worst 5 of 12 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	Q	2101	FMN	C4A-N5	3.39	1.38	1.30
3	E	2101	FMN	C4A-N5	3.37	1.38	1.30
3	M	2101	FMN	C4A-N5	3.34	1.38	1.30
3	I	2101	FMN	C4A-N5	3.32	1.37	1.30
3	W	2101	FMN	C4A-N5	3.28	1.37	1.30

The worst 5 of 46 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	Q	2101	FMN	C4-N3-C2	-3.88	118.75	125.64
3	I	2101	FMN	C4-N3-C2	-3.84	118.82	125.64
3	M	2101	FMN	C4-N3-C2	-3.83	118.84	125.64
3	W	2101	FMN	C4-N3-C2	-3.72	119.04	125.64
3	A	2101	FMN	C4-N3-C2	-3.69	119.09	125.64

There are no chirality outliers.

5 of 30 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	2101	FMN	C5'-O5'-P-O1P
3	E	2101	FMN	C5'-O5'-P-O1P
3	E	2101	FMN	C5'-O5'-P-O2P
3	I	2101	FMN	C5'-O5'-P-O1P
3	I	2101	FMN	C5'-O5'-P-O2P

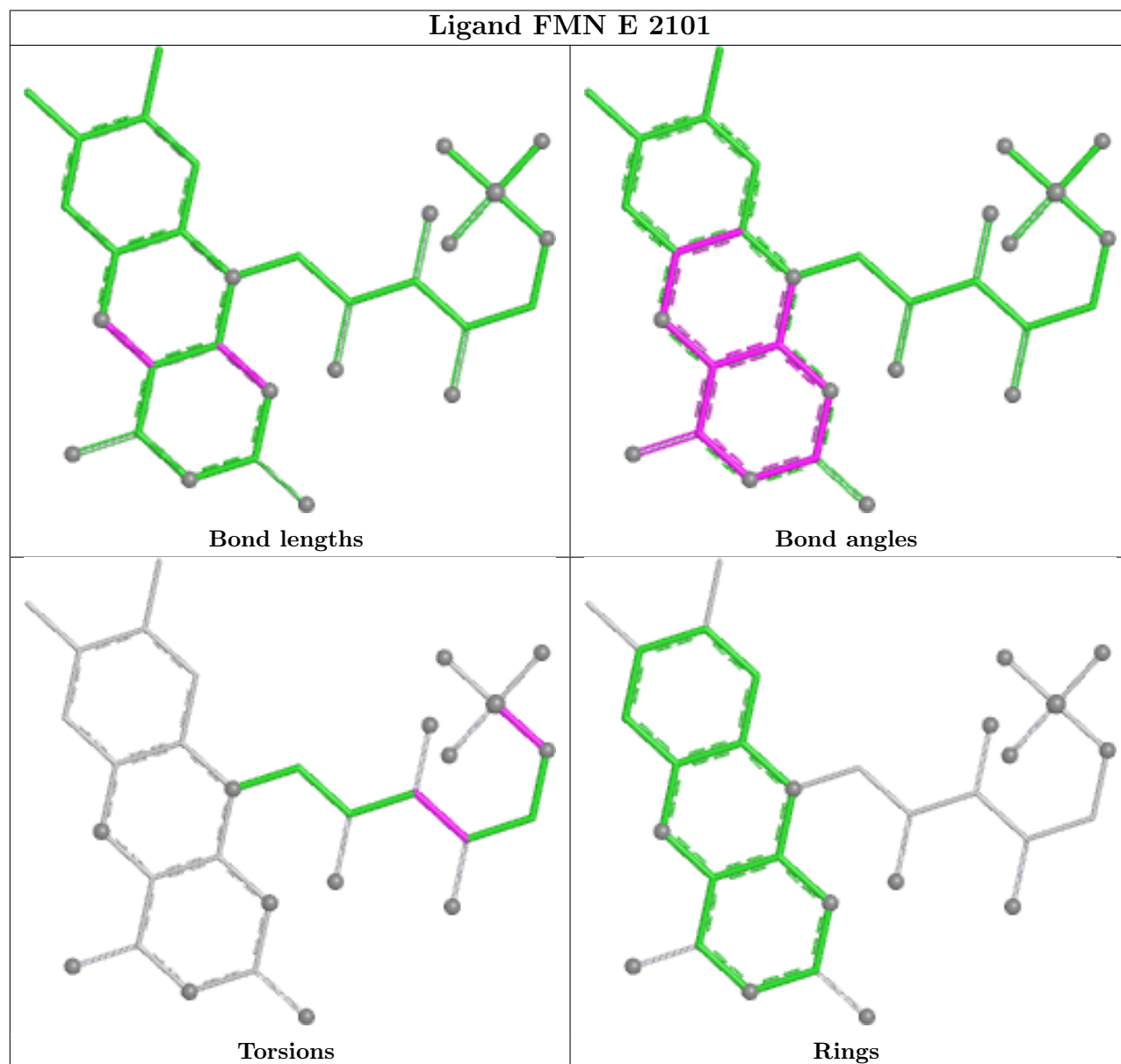
There are no ring outliers.

3 monomers are involved in 4 short contacts:

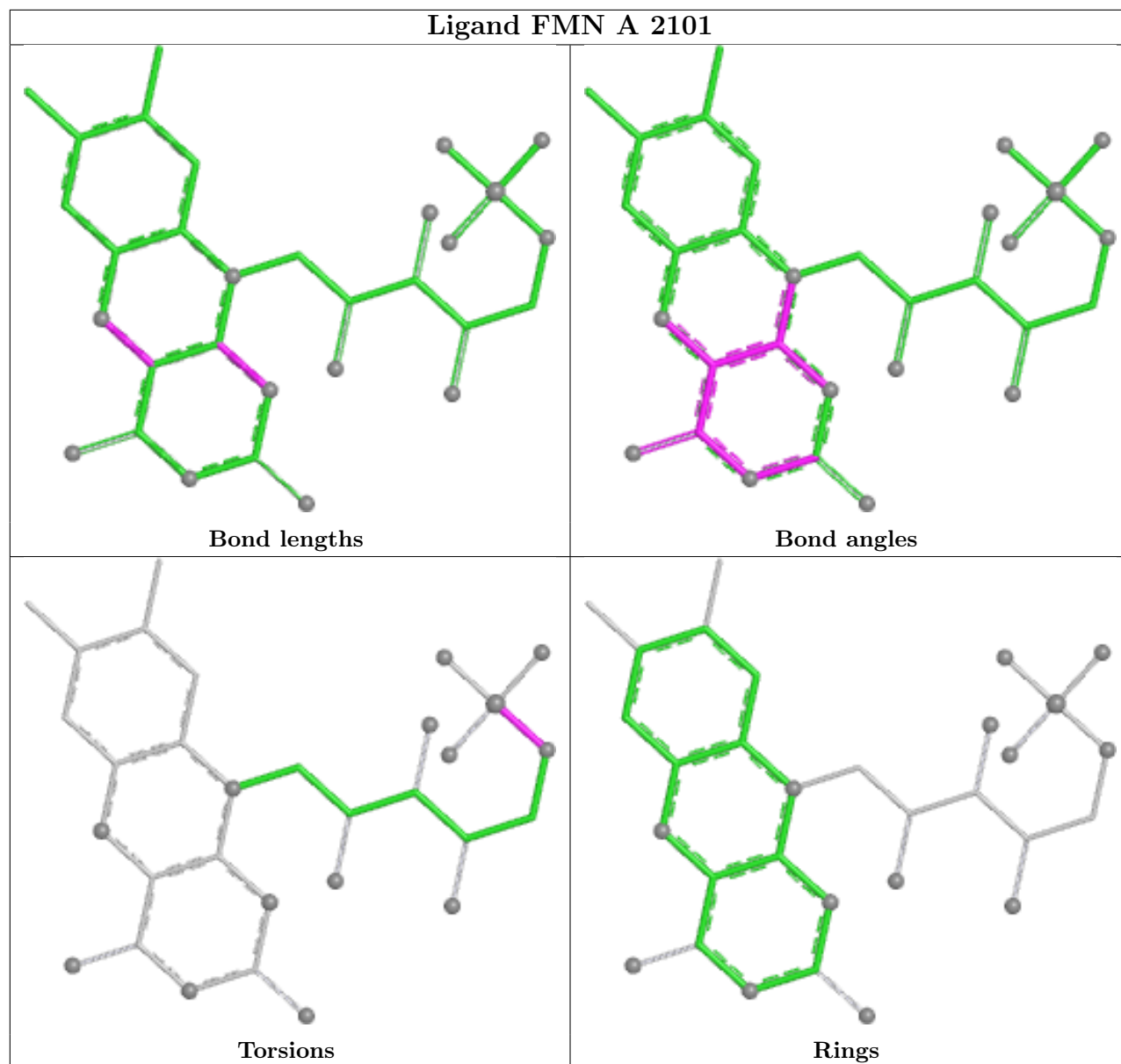
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	2101	FMN	2	0
3	M	2101	FMN	1	0
3	I	2101	FMN	1	0

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 than 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

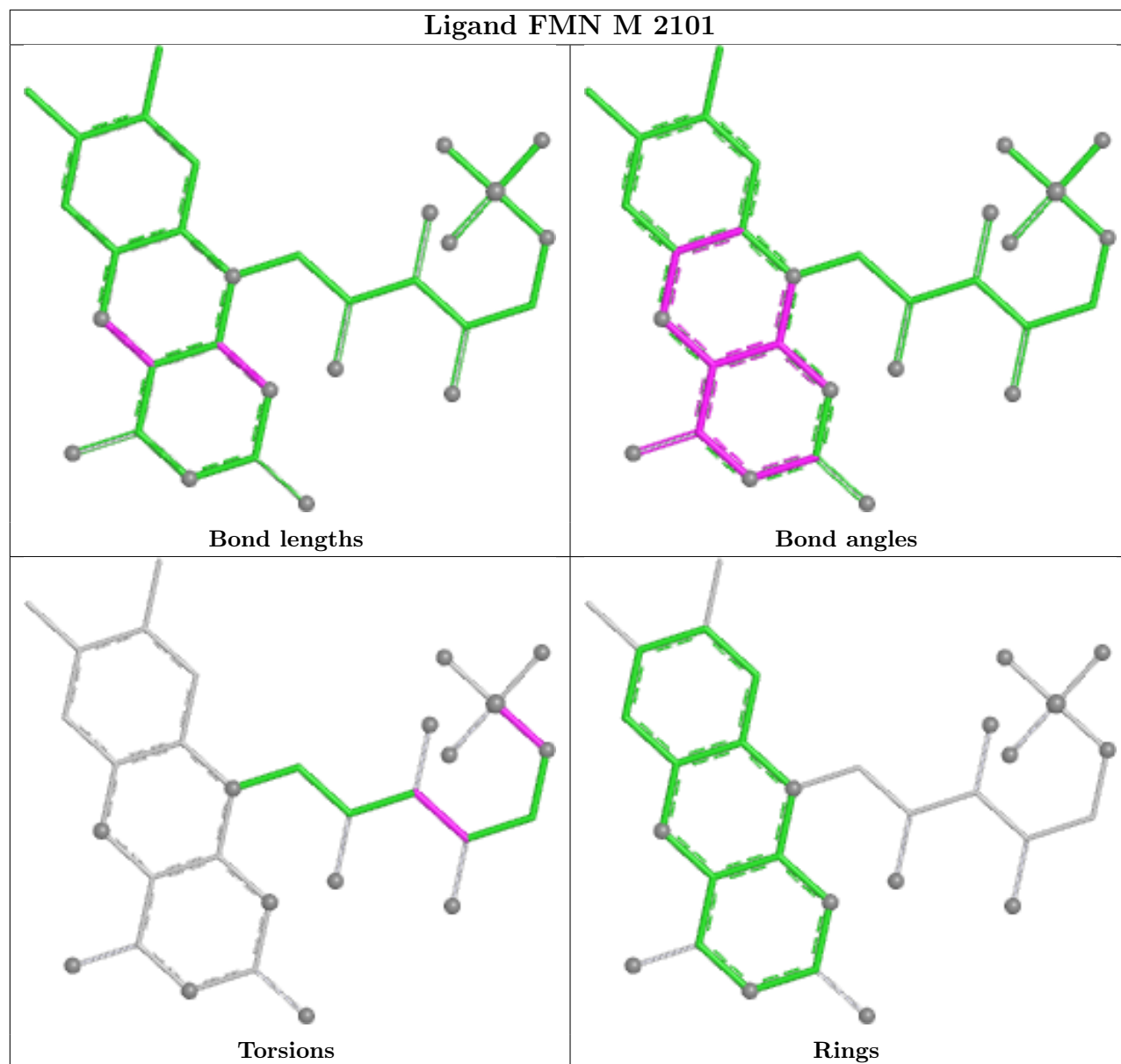
average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



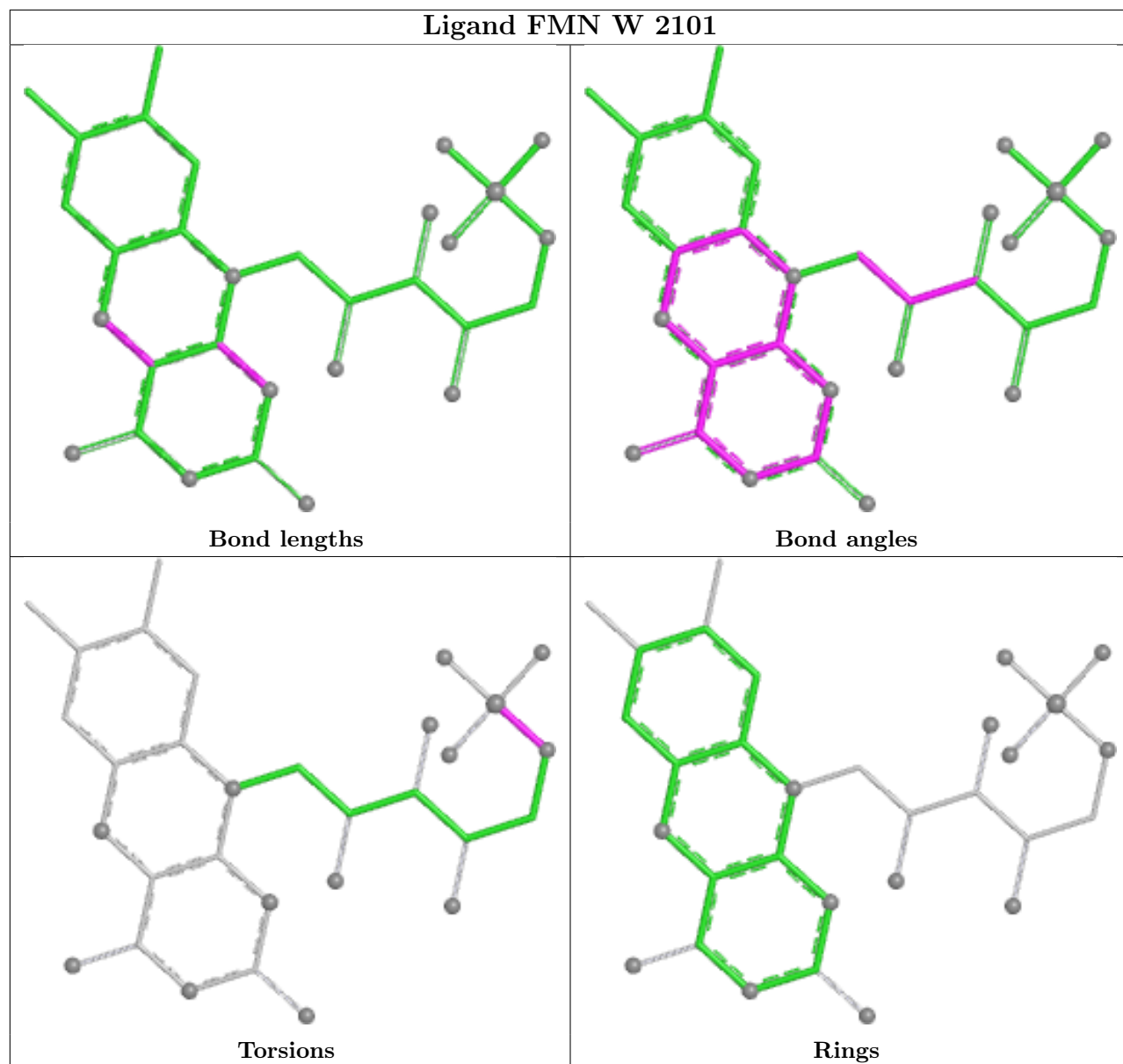
Ligand FMN A 2101

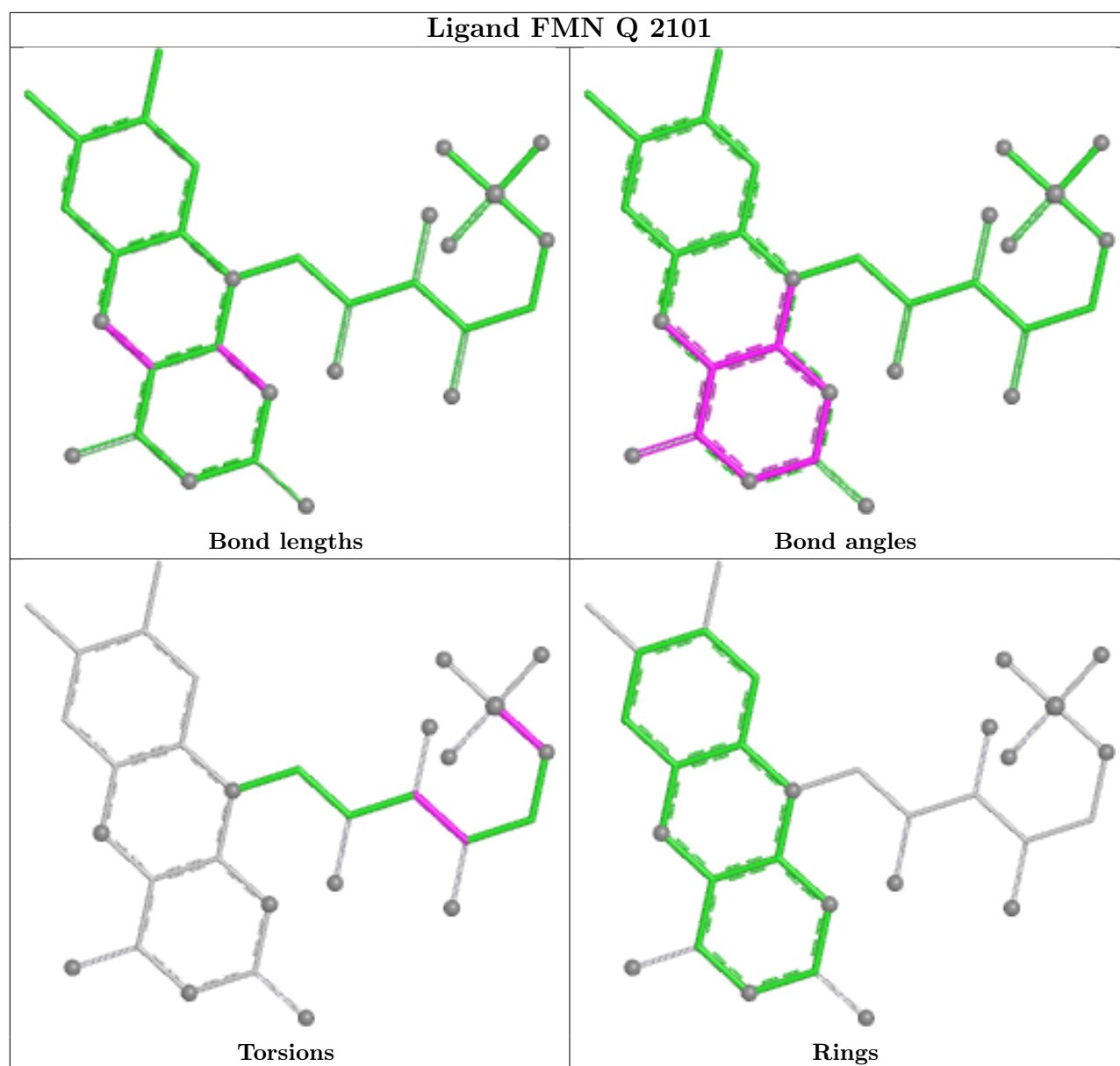


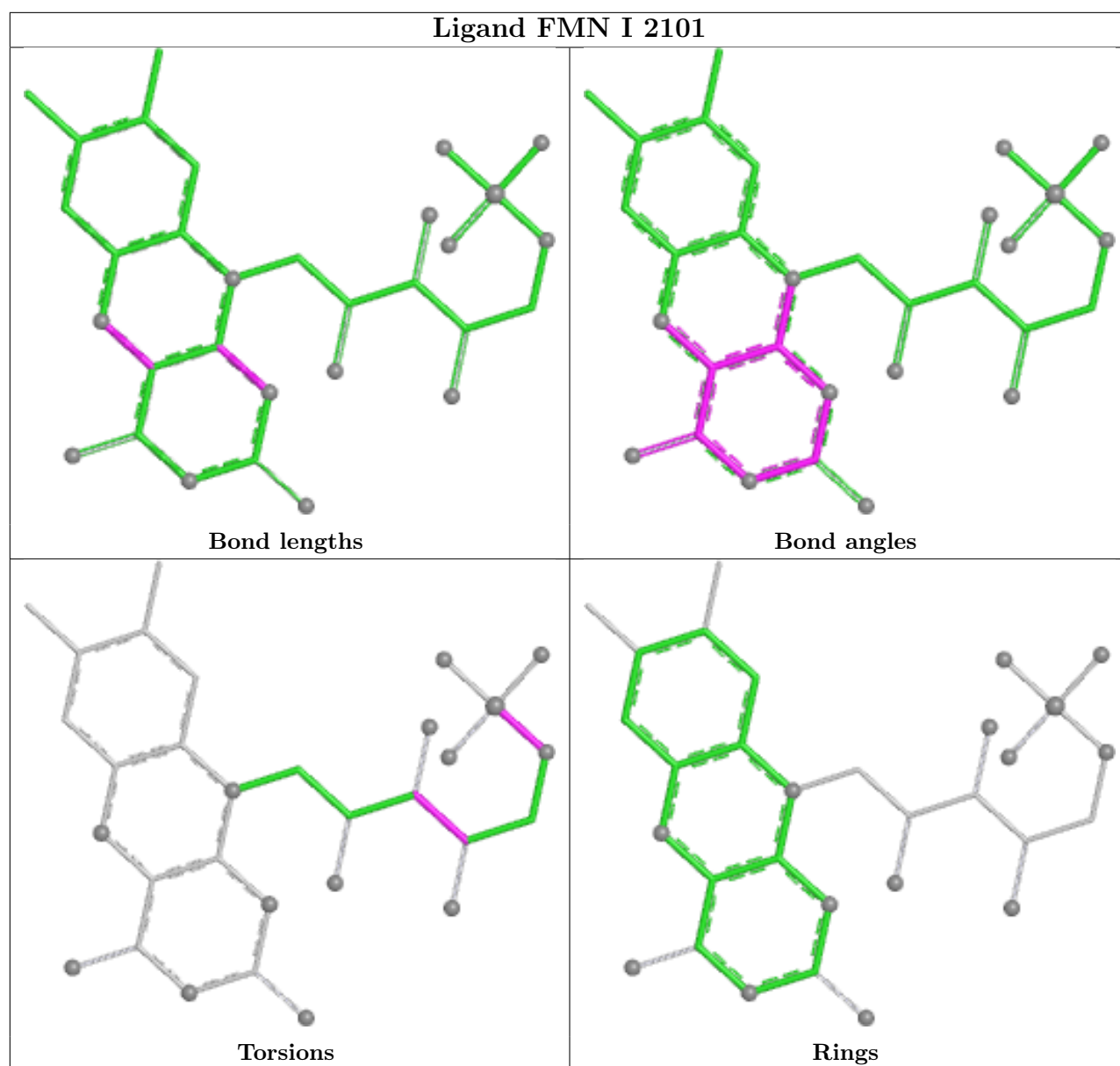
Ligand FMN M 2101



Ligand FMN W 2101







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.

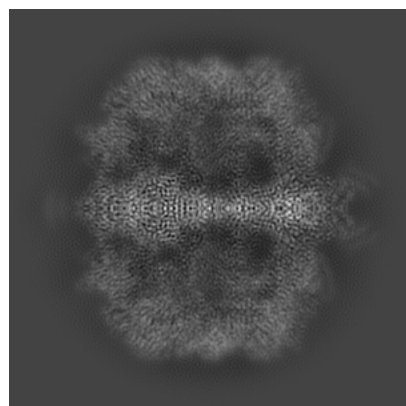
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-46553. These allow visual inspection of the internal detail of the map and identification of artifacts.

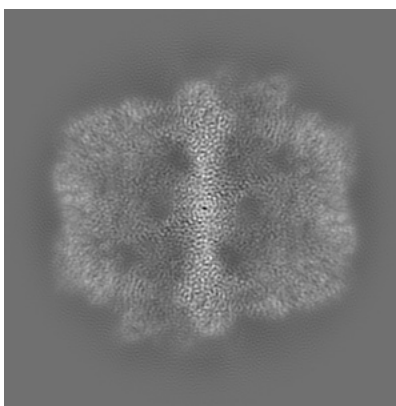
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

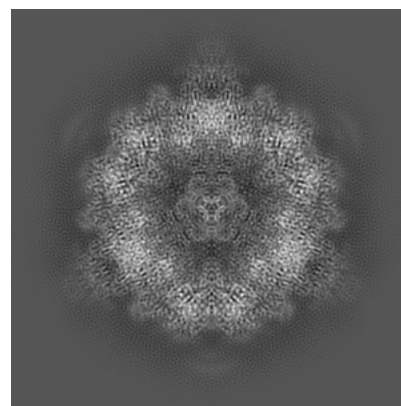
6.1.1 Primary map



X

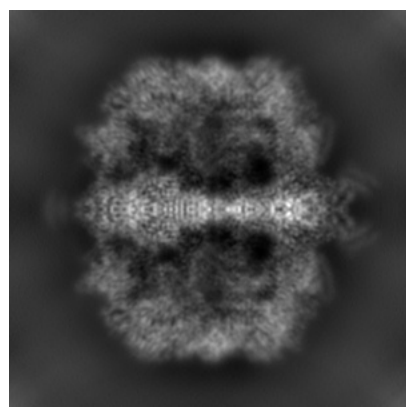


Y

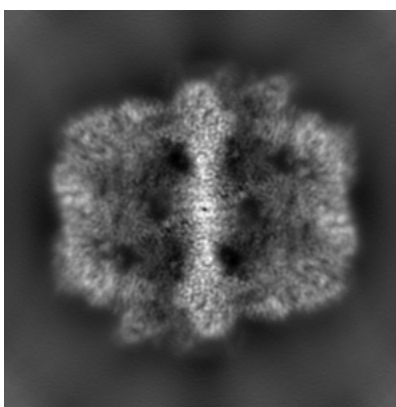


Z

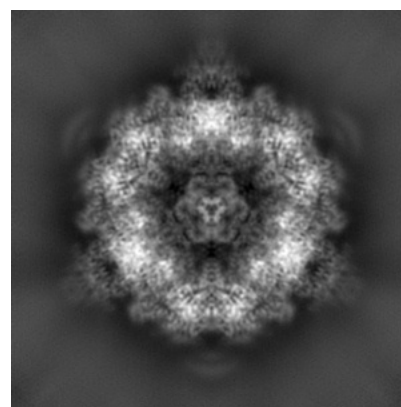
6.1.2 Raw map



X



Y

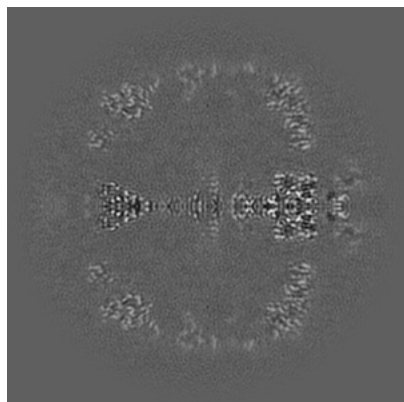


Z

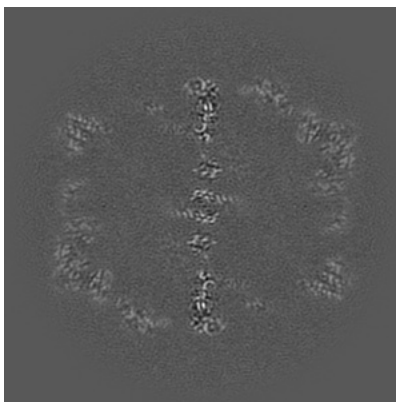
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

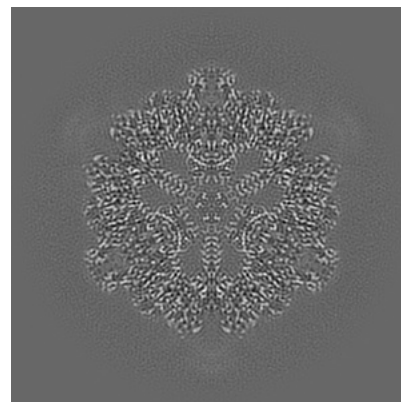
6.2.1 Primary map



X Index: 162

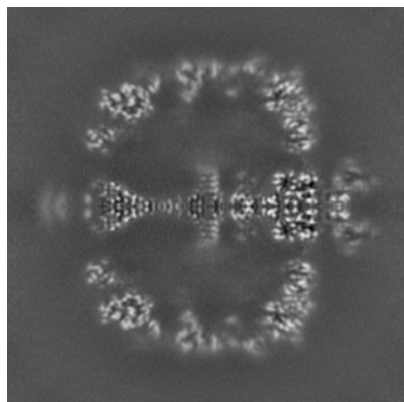


Y Index: 162

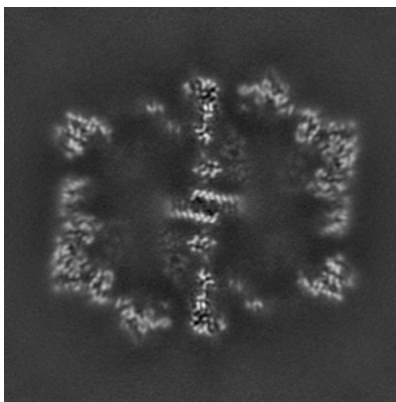


Z Index: 162

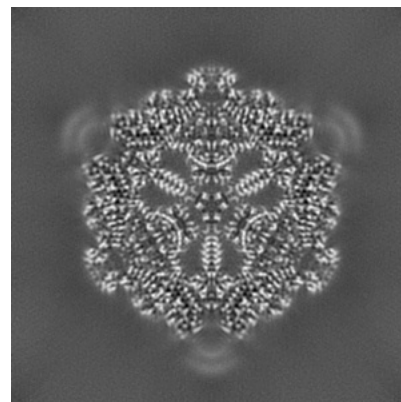
6.2.2 Raw map



X Index: 162



Y Index: 162

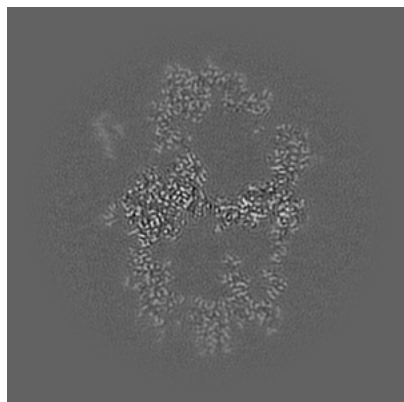


Z Index: 162

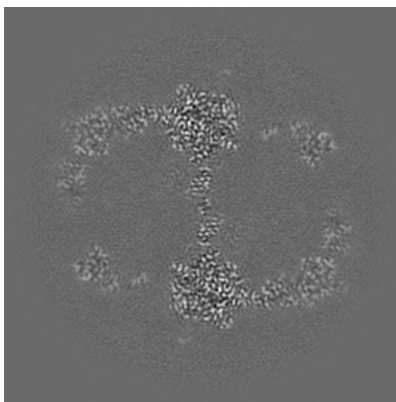
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

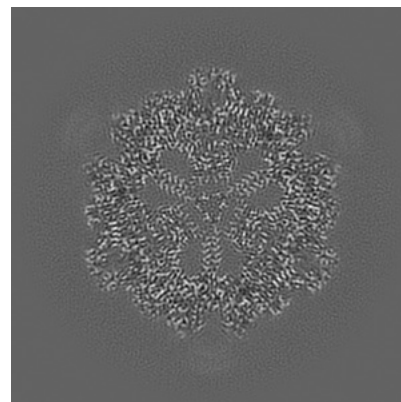
6.3.1 Primary map



X Index: 99

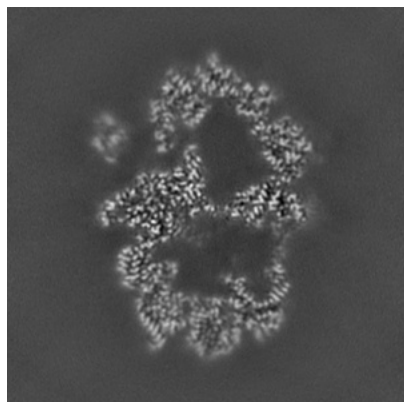


Y Index: 134

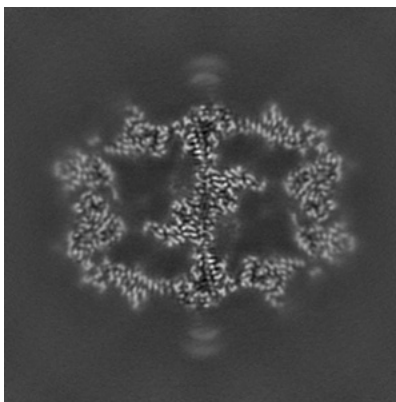


Z Index: 163

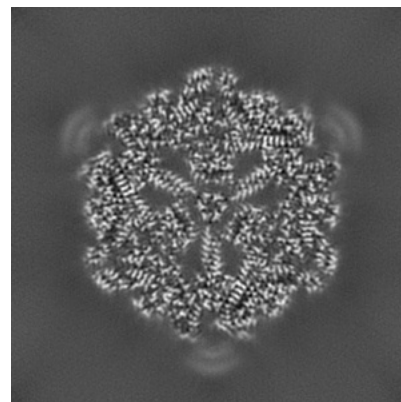
6.3.2 Raw map



X Index: 104



Y Index: 219

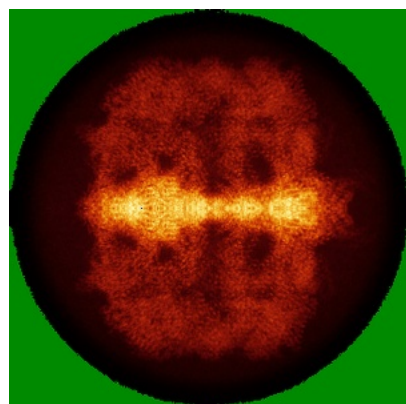


Z Index: 160

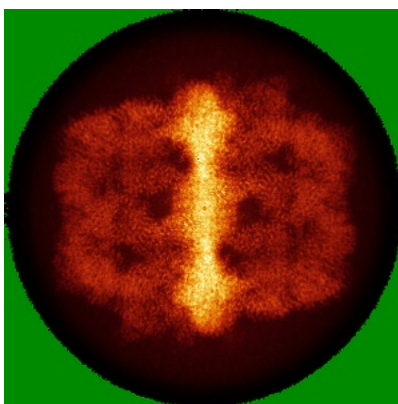
The images above show the largest variance slices of the map in three orthogonal directions.

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

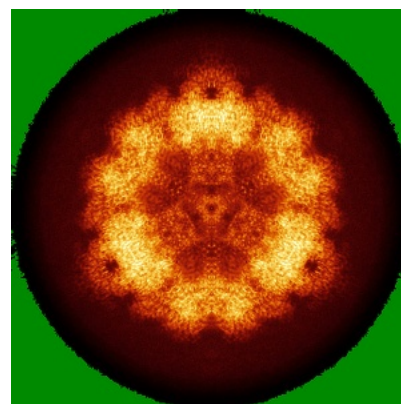
6.4.1 Primary map



X

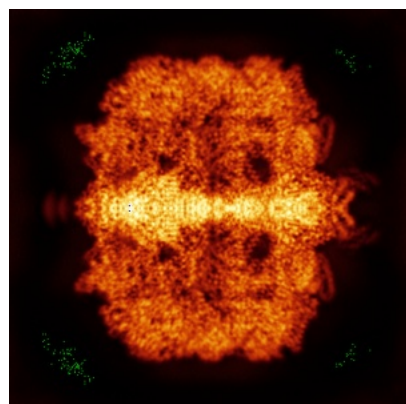


Y

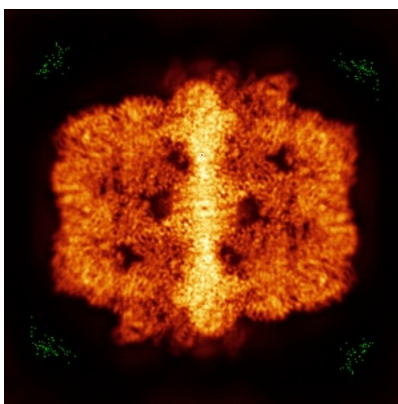


Z

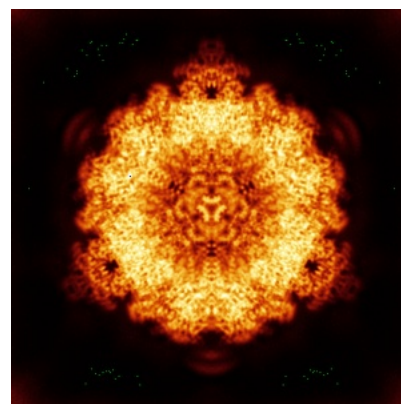
6.4.2 Raw map



X



Y

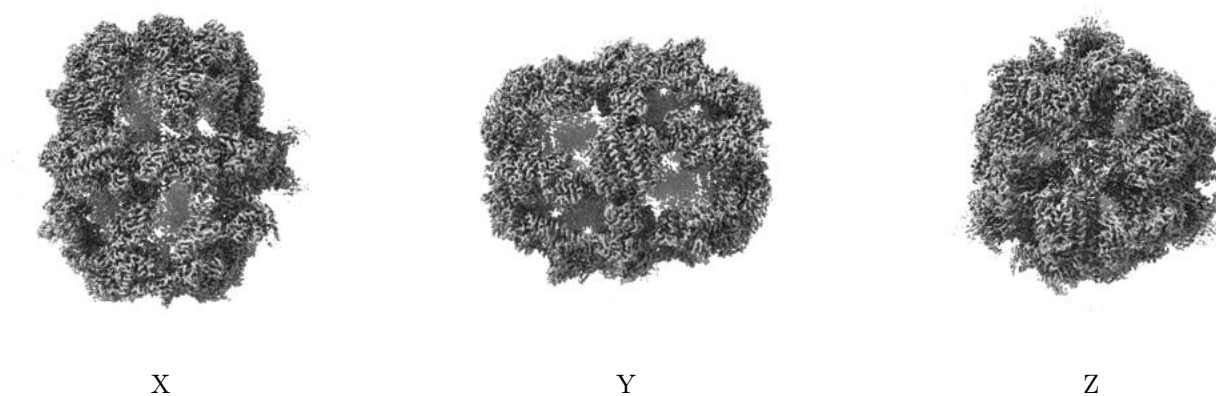


Z

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.

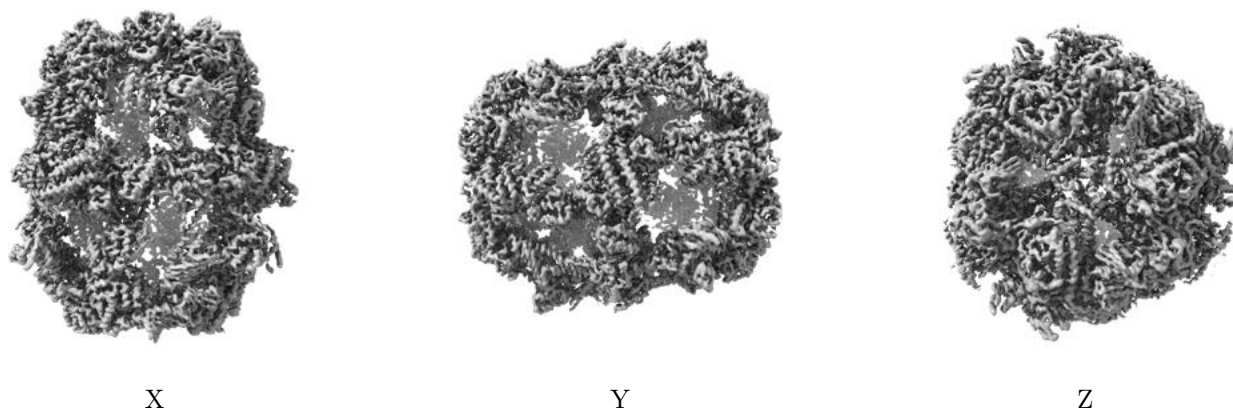
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.7. 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.

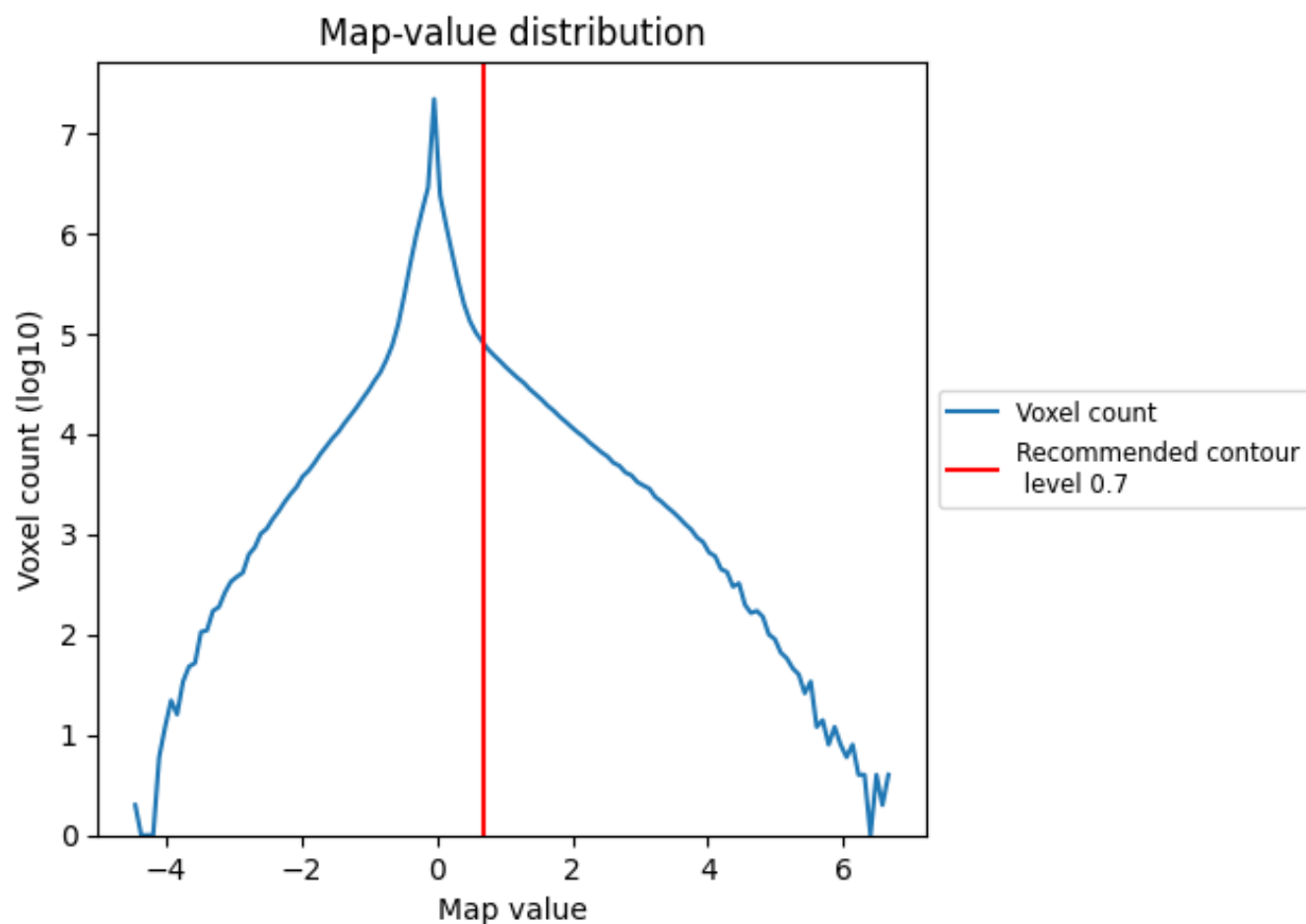
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

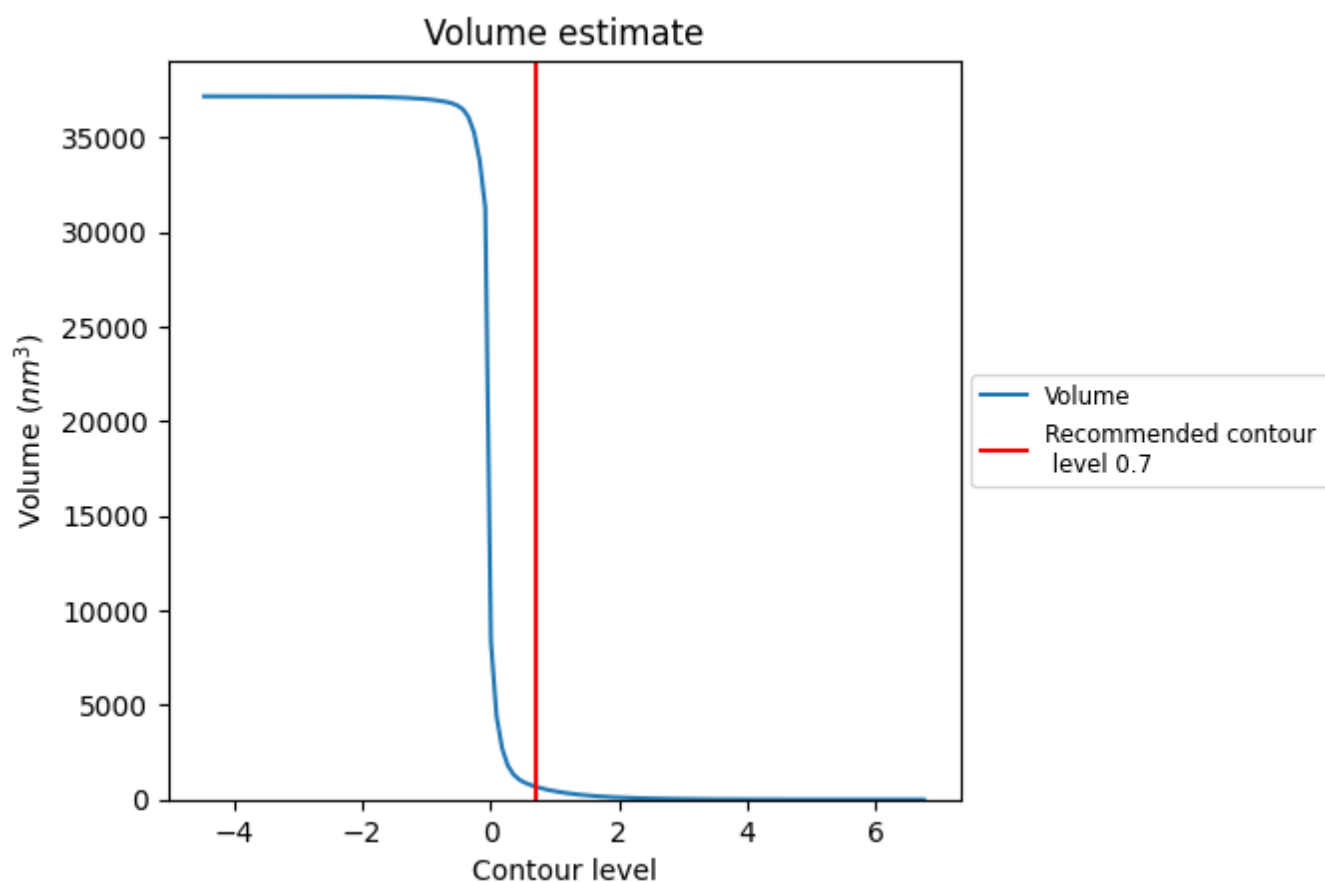
This section contains the results of statistical analysis of the map.

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.

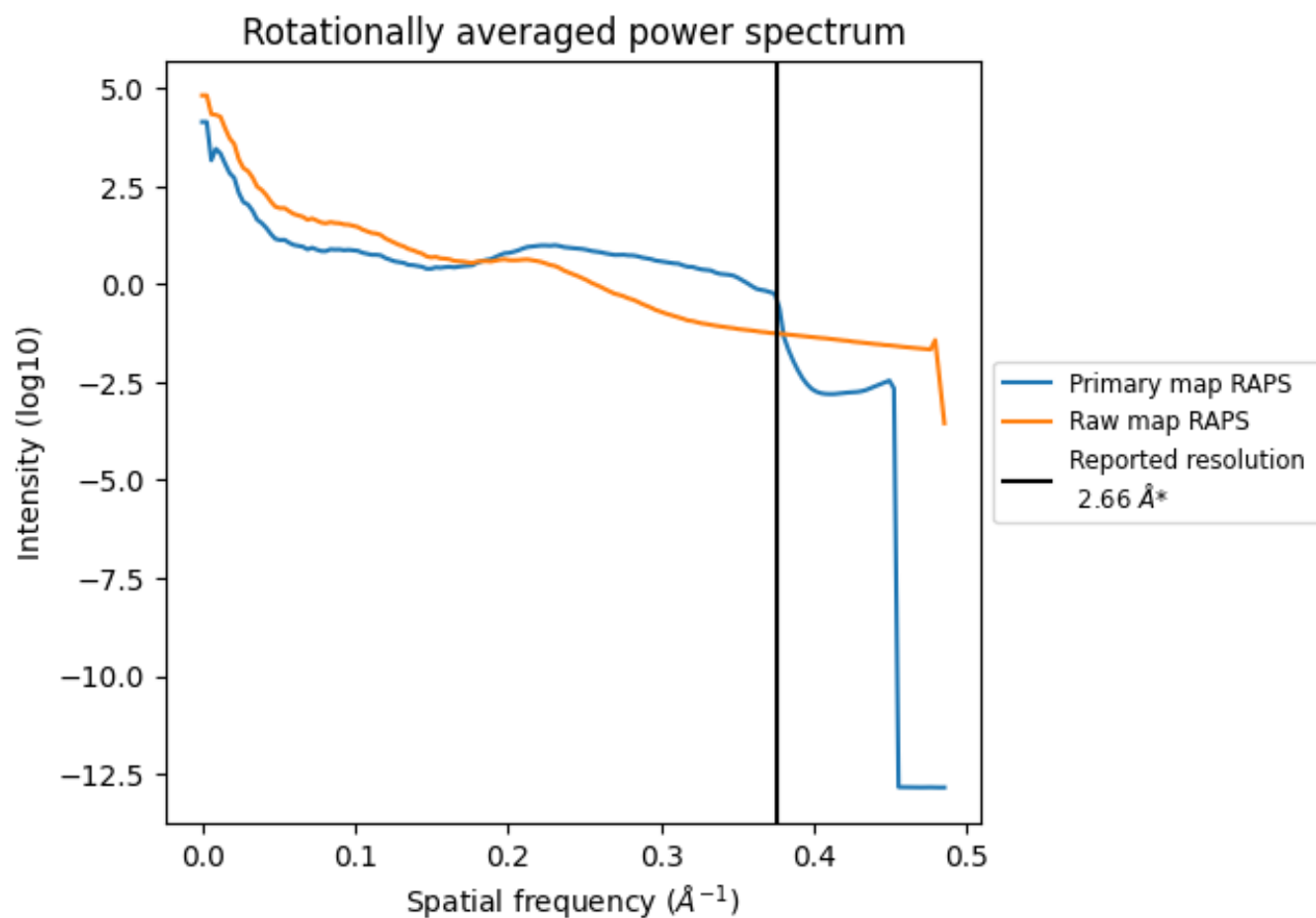
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 686 nm³; this corresponds to an approximate mass of 620 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3 Rotationally averaged power spectrum ⓘ

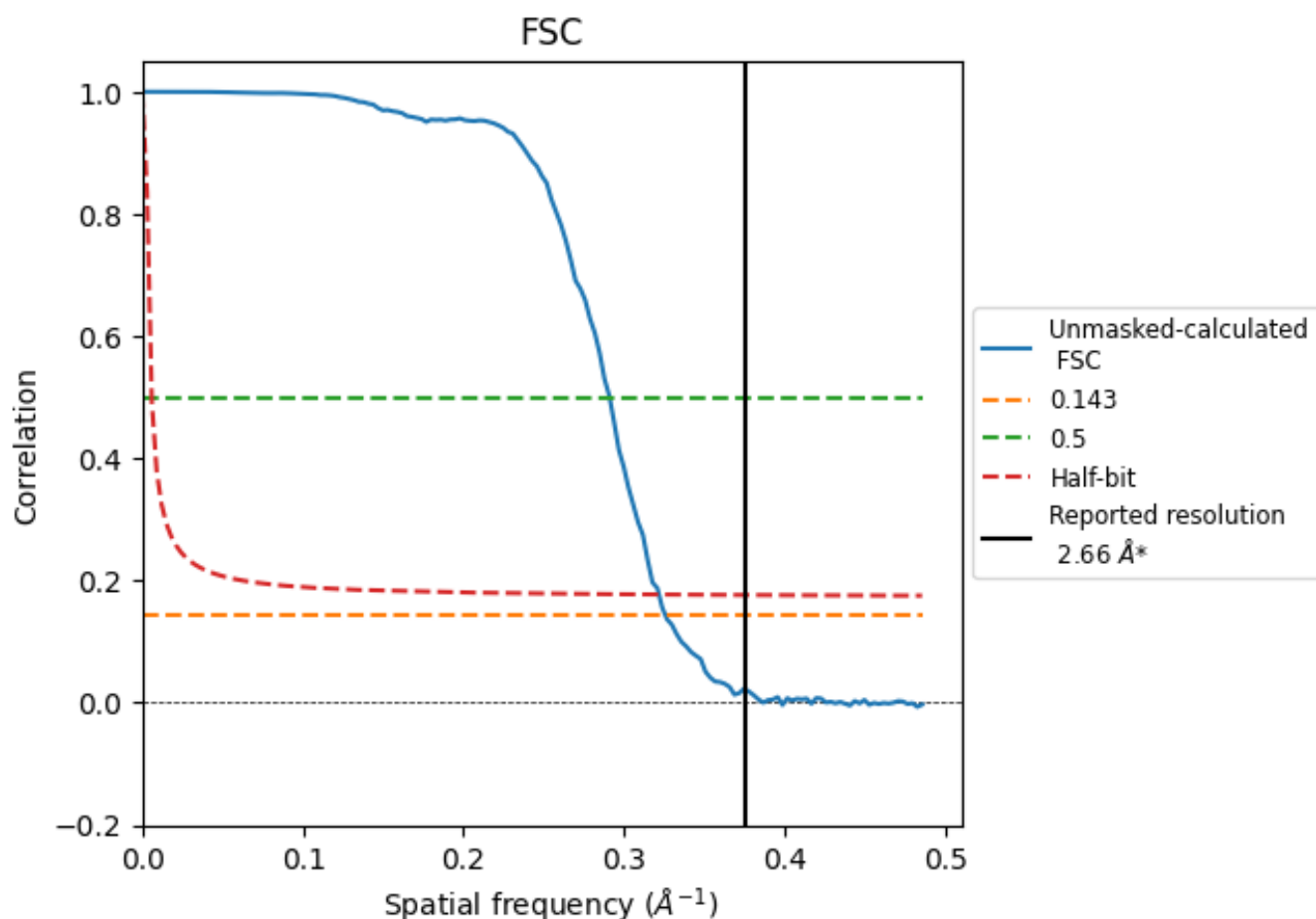


*Reported resolution corresponds to spatial frequency of 0.376 Å⁻¹

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 0.376 Å⁻¹

8.2 Resolution estimates [i](#)

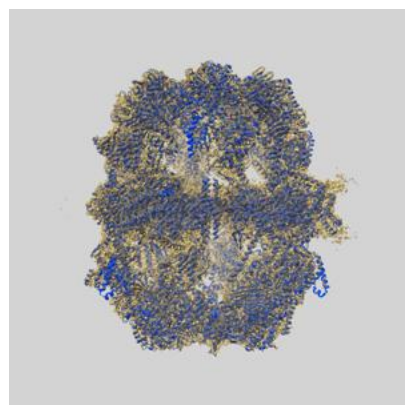
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.66	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.07	3.44	3.11

*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 3.07 differs from the reported value 2.66 by more than 10 %

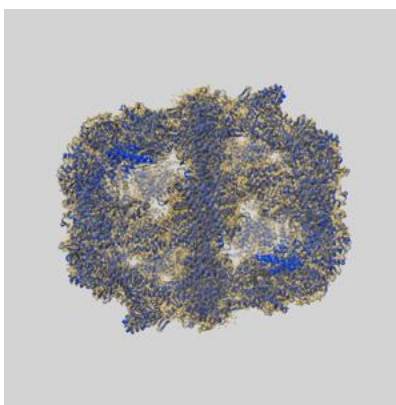
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-46553 and PDB model 9D48. Per-residue inclusion information can be found in section [3](#) on page [7](#).

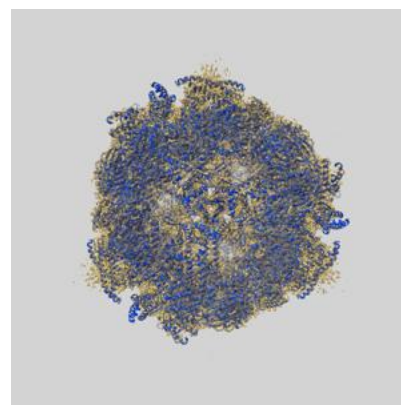
9.1 Map-model overlay [i](#)



X



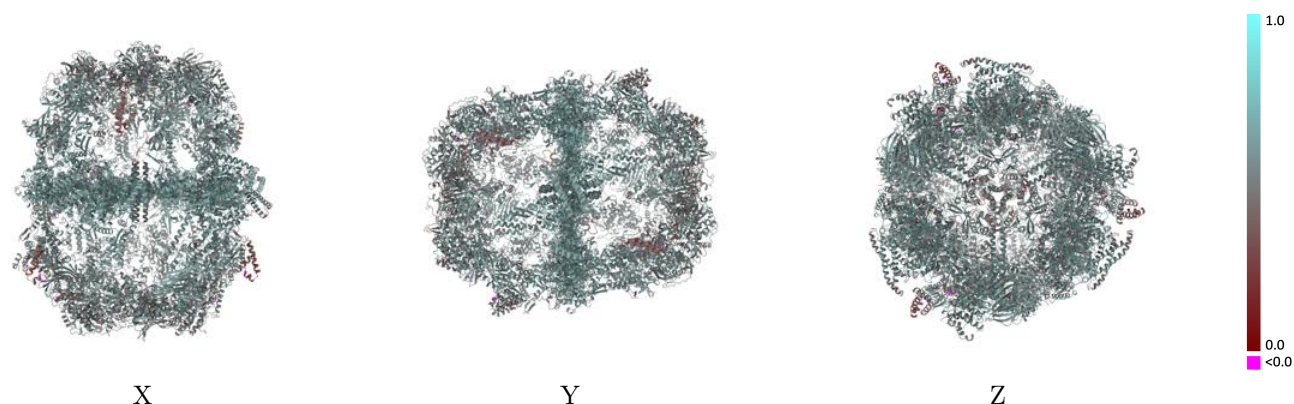
Y



Z

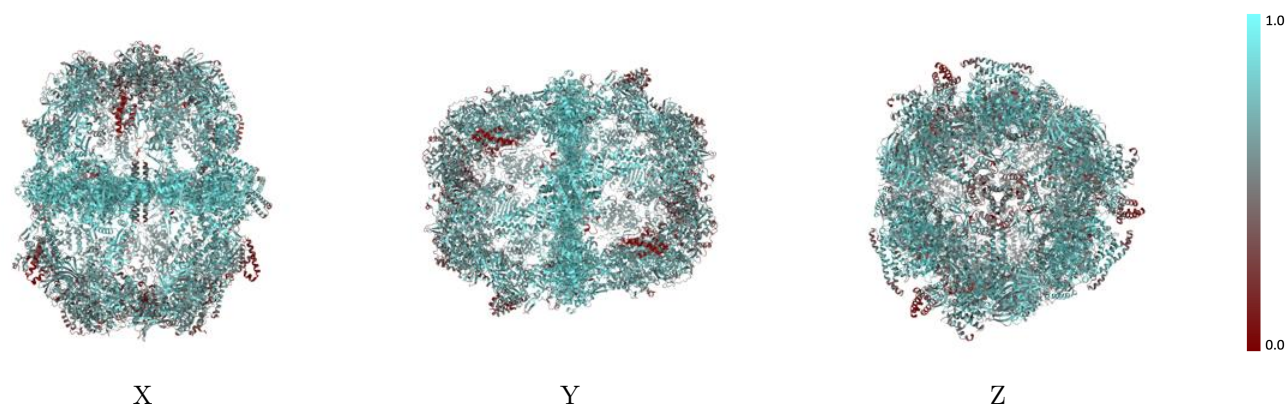
The images above show the 3D surface view of the map at the recommended contour level 0.7 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



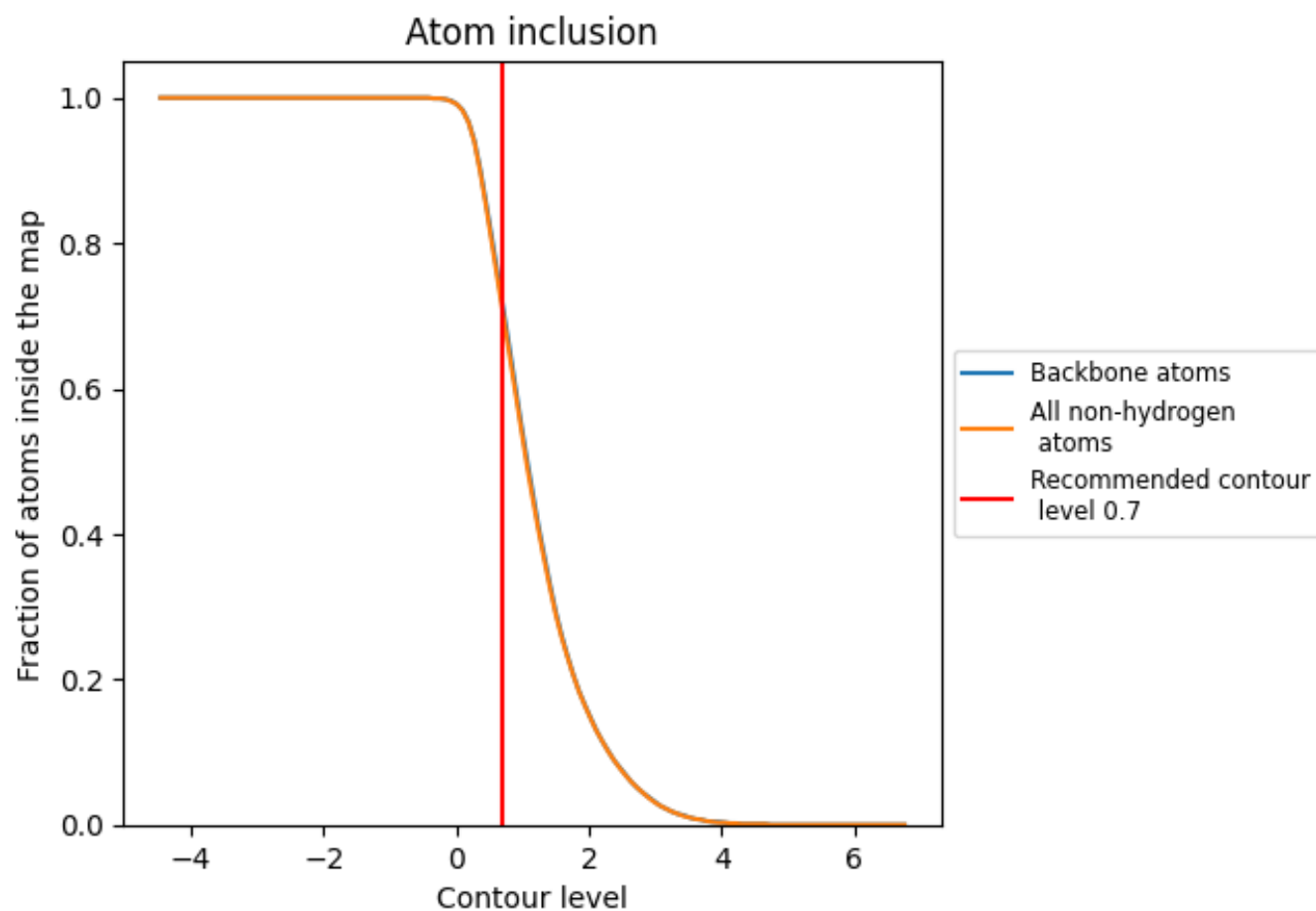
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.7).

9.4 Atom inclusion [i](#)



At the recommended contour level, 71% of all backbone atoms, 70% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.7) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7040	0.5550
A	0.6260	0.5300
B	0.8260	0.5910
E	0.6240	0.5290
F	0.8250	0.5910
G	0.8260	0.5920
I	0.6230	0.5290
M	0.6230	0.5290
N	0.8270	0.5920
Q	0.6250	0.5290
R	0.8240	0.5910
W	0.6240	0.5300
X	0.8250	0.5910

1.0

0.0

<0.0