



wwPDB EM Validation Summary Report ⓘ

Dec 11, 2022 – 05:16 pm GMT

PDB ID : 6SUF
EMDB ID : EMD-10313
Title : Structure of Photorhabdus luminescens Tc holotoxin pore
Authors : Roderer, D.; Raunser, S.
Deposited on : 2019-09-13
Resolution : 3.40 Å(reported)

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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.dev43
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.9
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.31.3

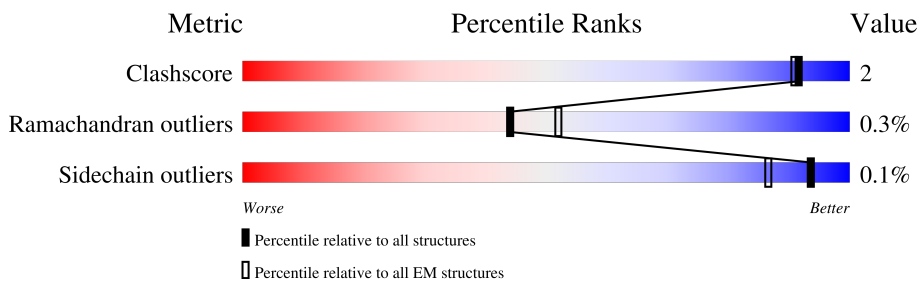
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.40 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	2516	
1	B	2516	
1	C	2516	
1	D	2516	
1	E	2516	
2	F	2439	

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 108112 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 TcdA1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	2292	18197	11530	3083	3525	59	0	0
1	B	2292	18197	11530	3083	3525	59	0	0
1	C	2292	18197	11530	3083	3525	59	0	0
1	D	2292	18197	11530	3083	3525	59	0	0
1	E	2292	18197	11530	3083	3525	59	0	0

There are 5 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	904	GLU	GLN	conflict	UNP Q9RN43
B	904	GLU	GLN	conflict	UNP Q9RN43
C	904	GLU	GLN	conflict	UNP Q9RN43
D	904	GLU	GLN	conflict	UNP Q9RN43
E	904	GLU	GLN	conflict	UNP Q9RN43

- Molecule 2 is a protein called TcdB2,TccC3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	F	2147	17127	10729	3040	3323	35	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
F	543	GLU	ASP	conflict	UNP Q8GF99
F	1475	PRO	-	linker	UNP Q8GF99
F	1476	GLY	-	linker	UNP Q8GF99
F	1477	SER	-	linker	UNP Q8GF99

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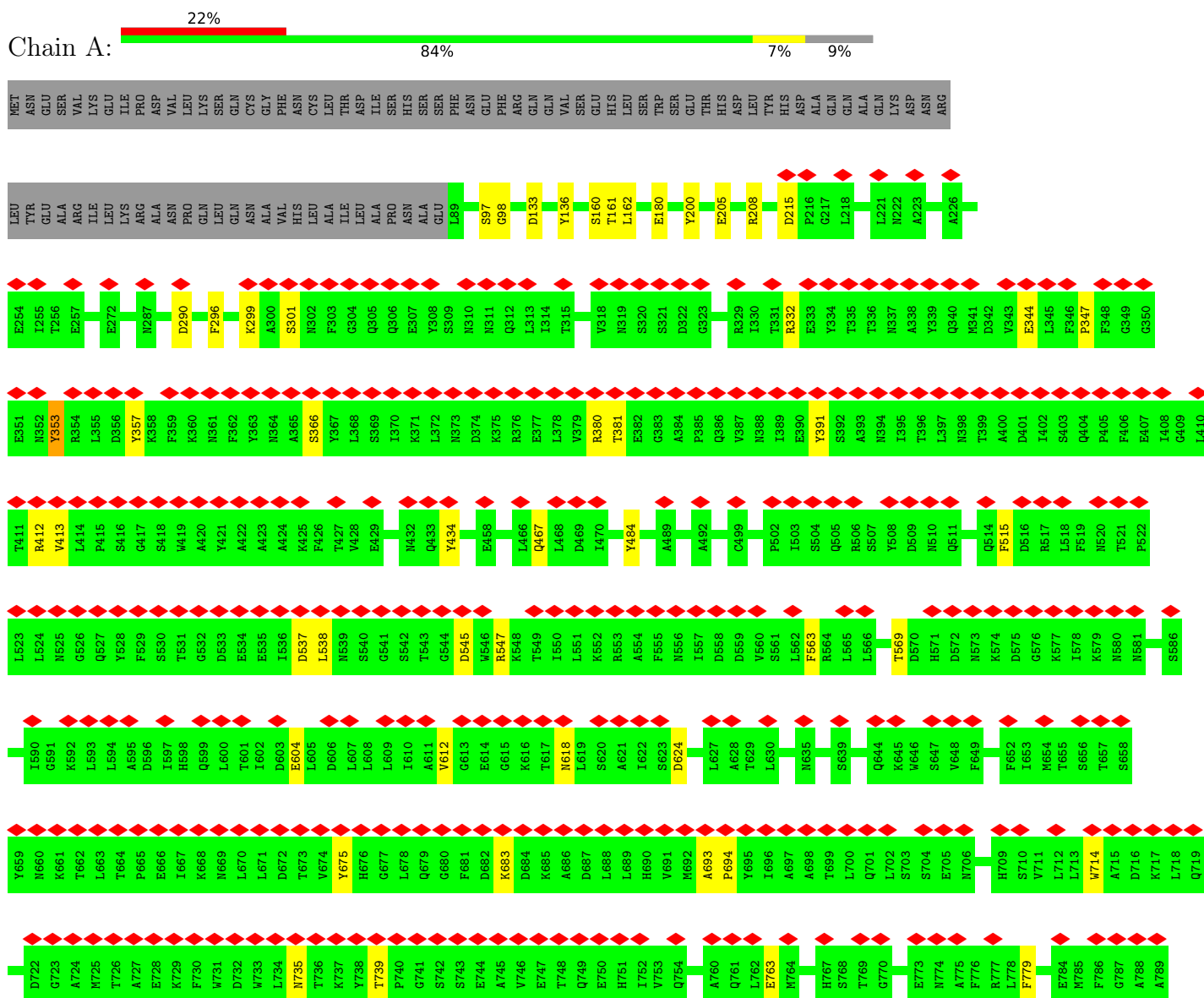
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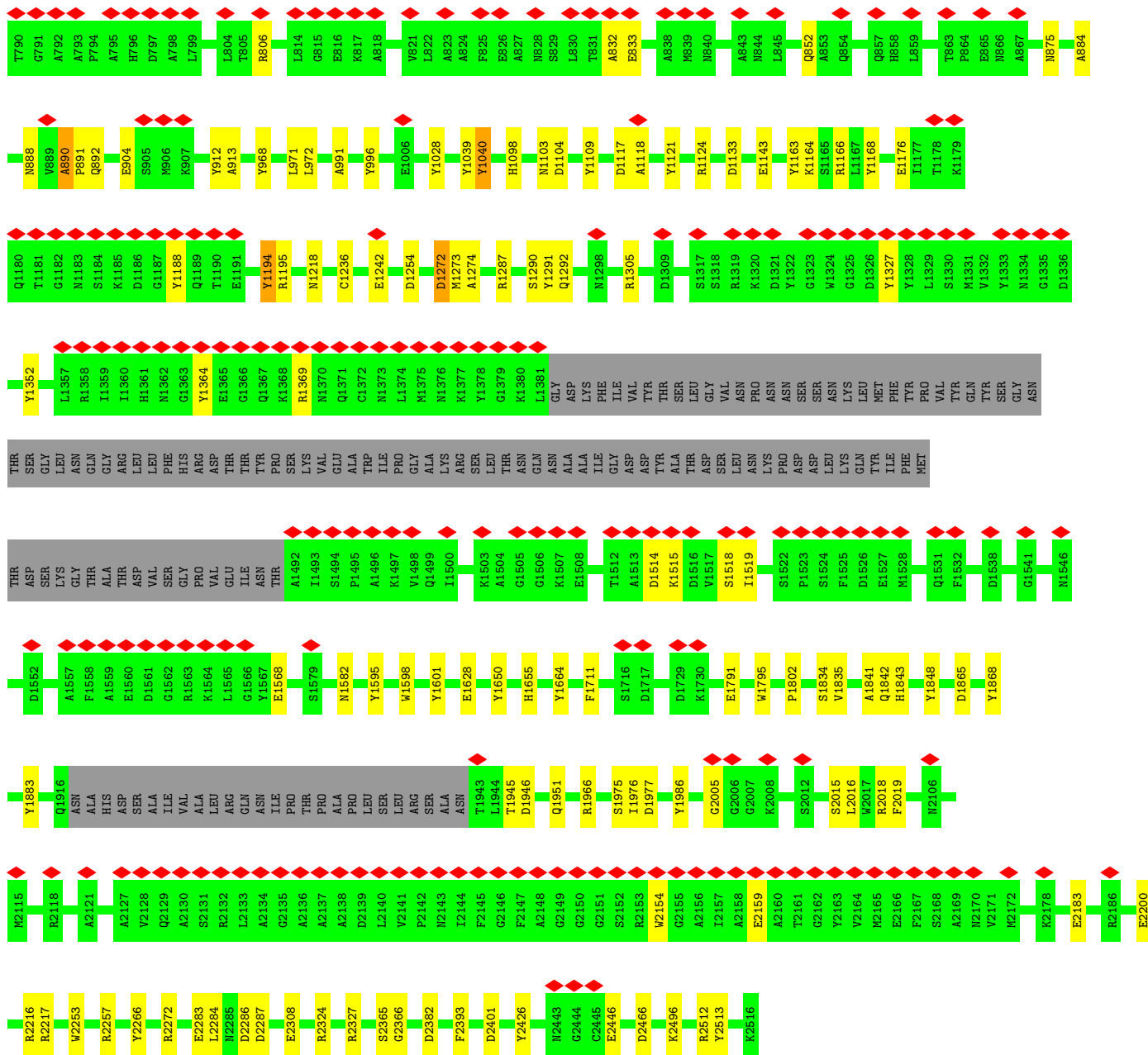
Chain	Residue	Modelled	Actual	Comment	Reference
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F	1479	PRO	-	linker	UNP Q8GF99

3 Residue-property plots

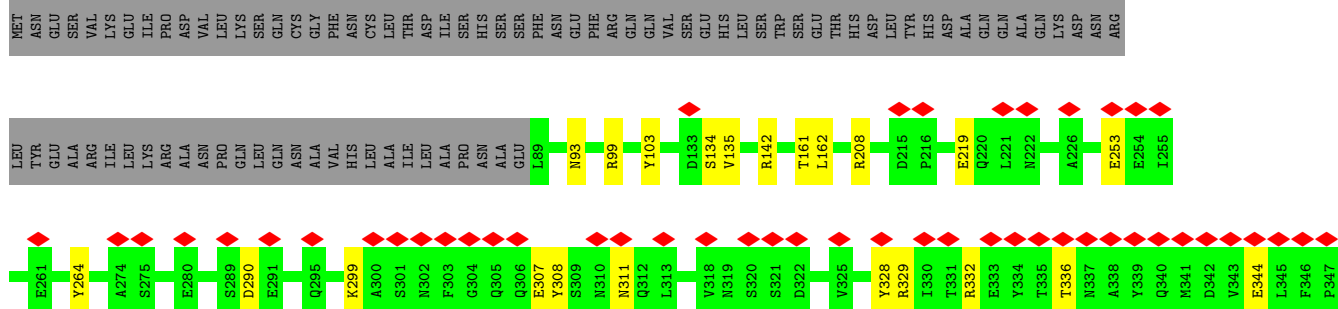
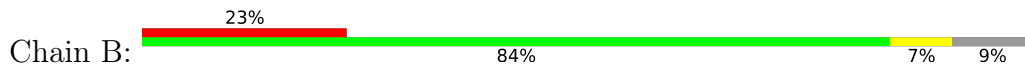
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion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

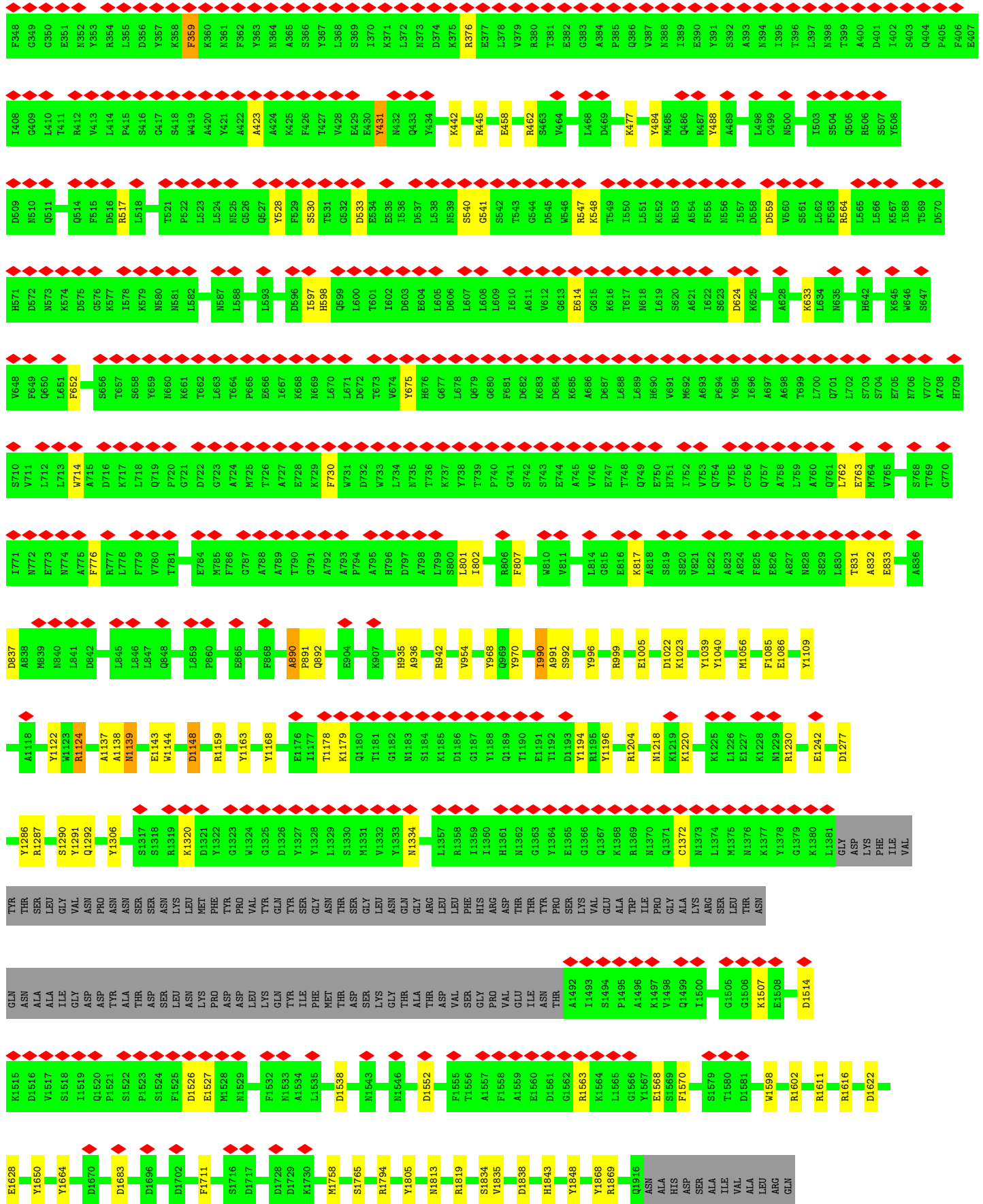
• Molecule 1: TcdA1

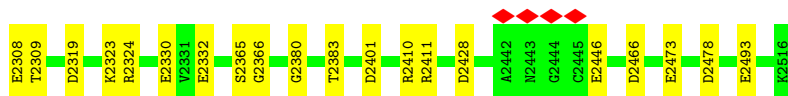
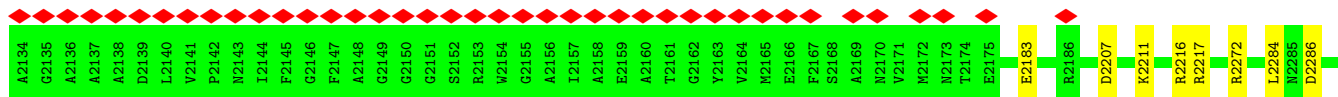
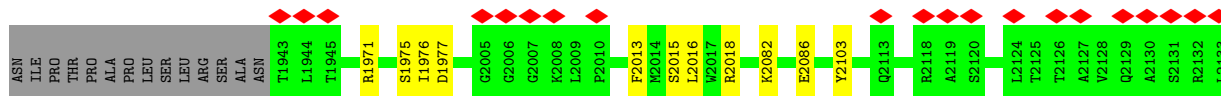




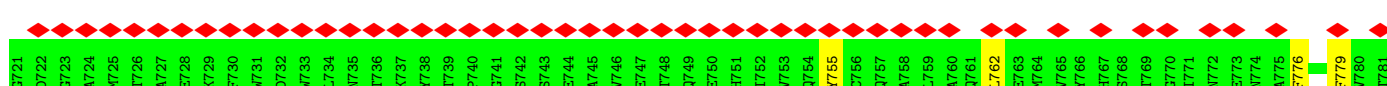
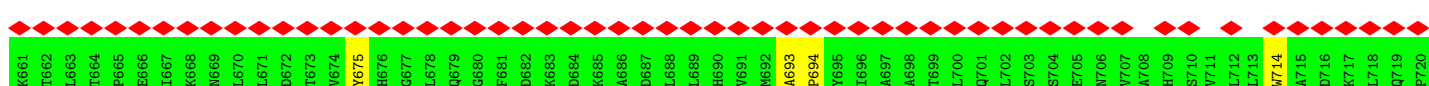
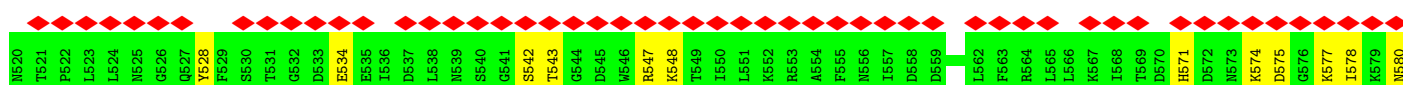
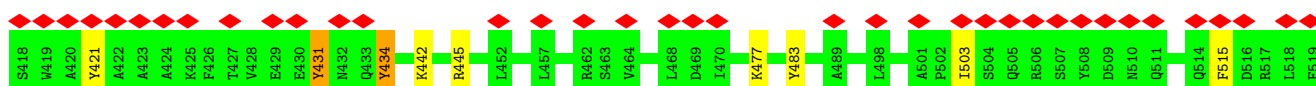
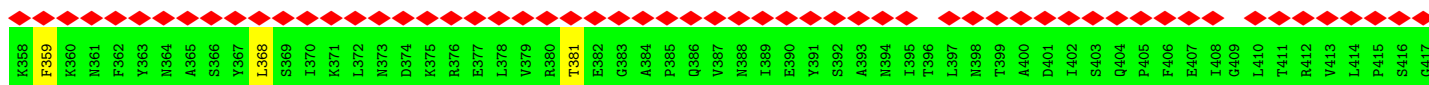
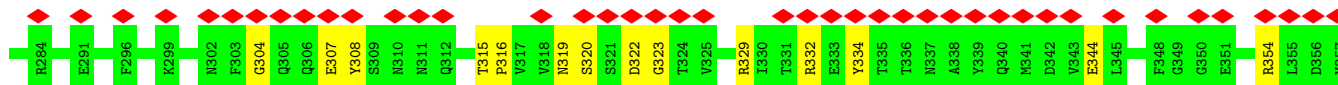
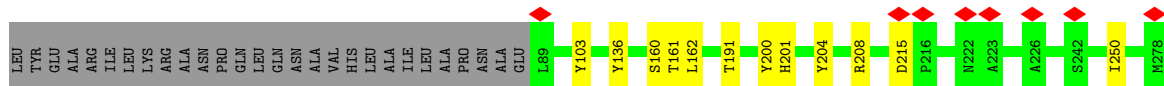
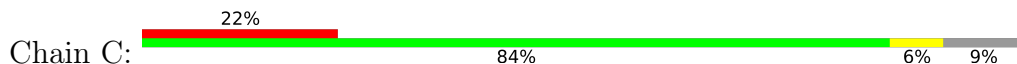
• Molecule 1: TcdA1

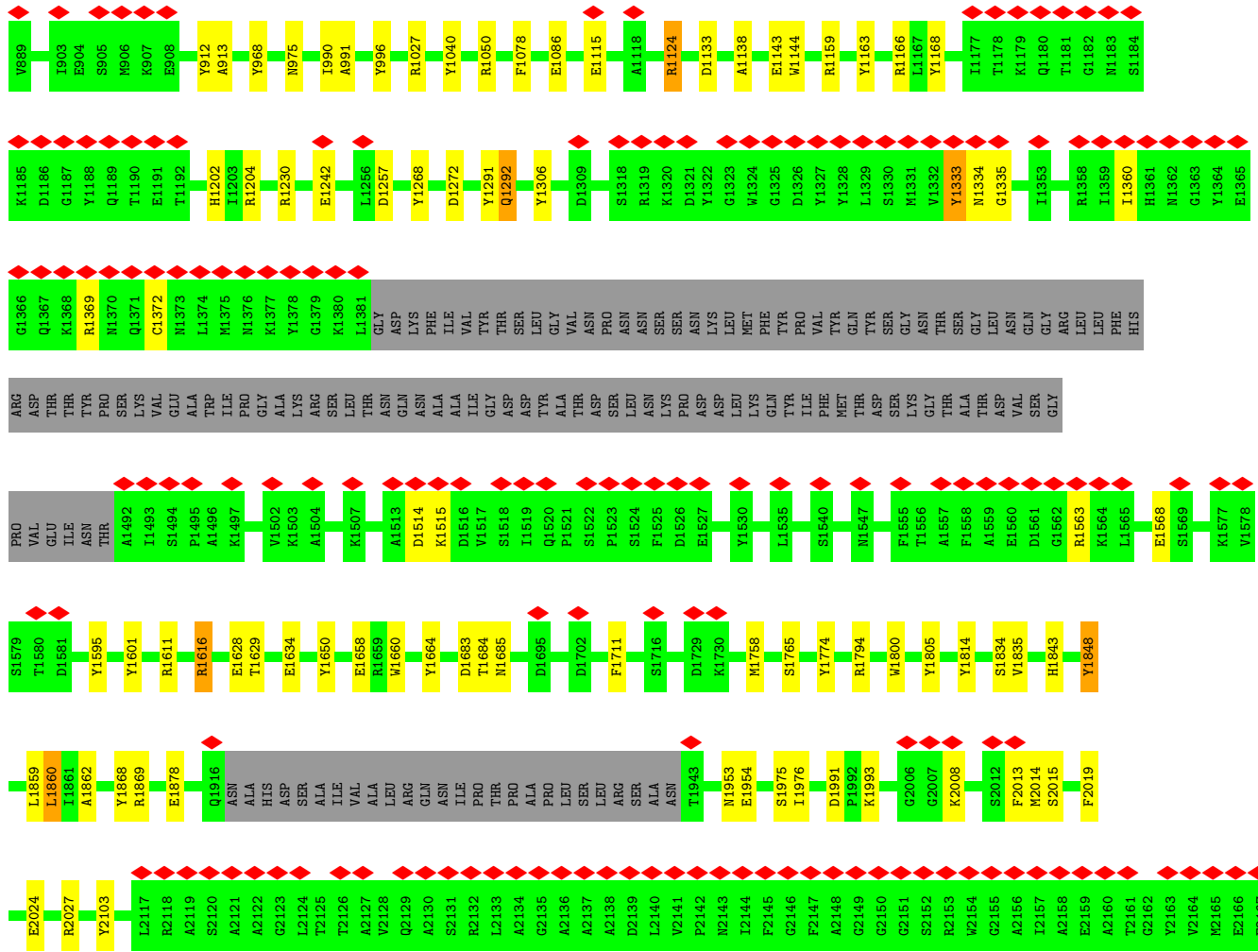




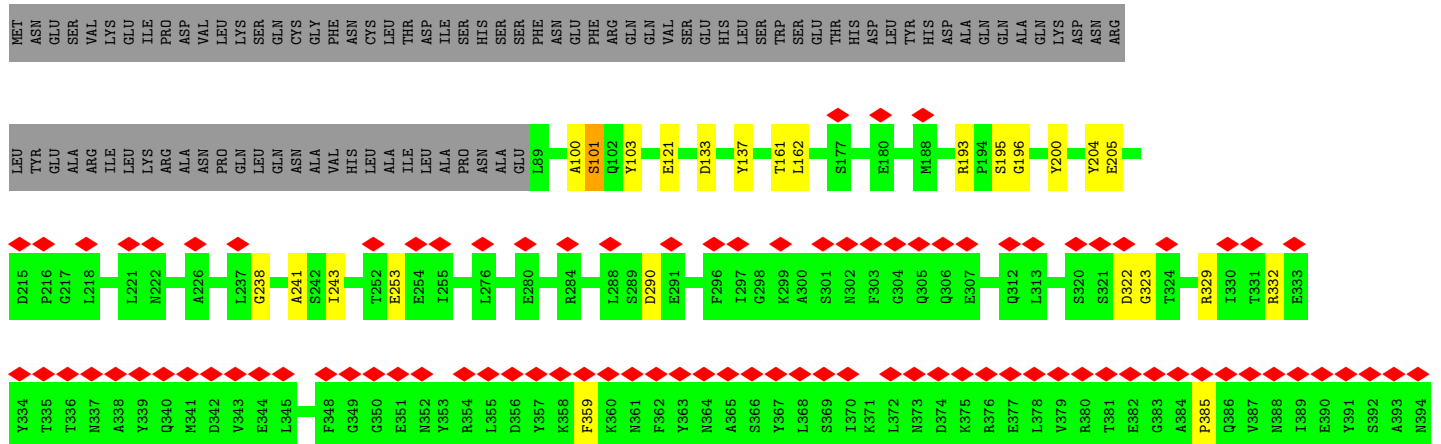
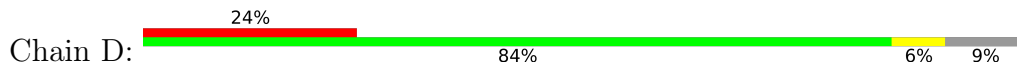


• Molecule 1: TcdA1

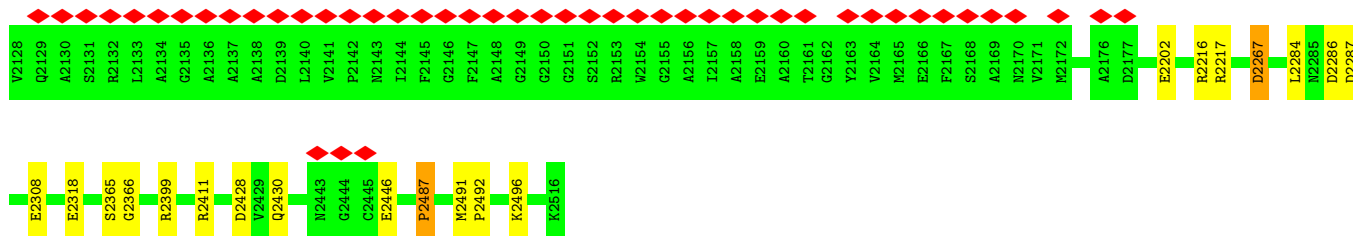




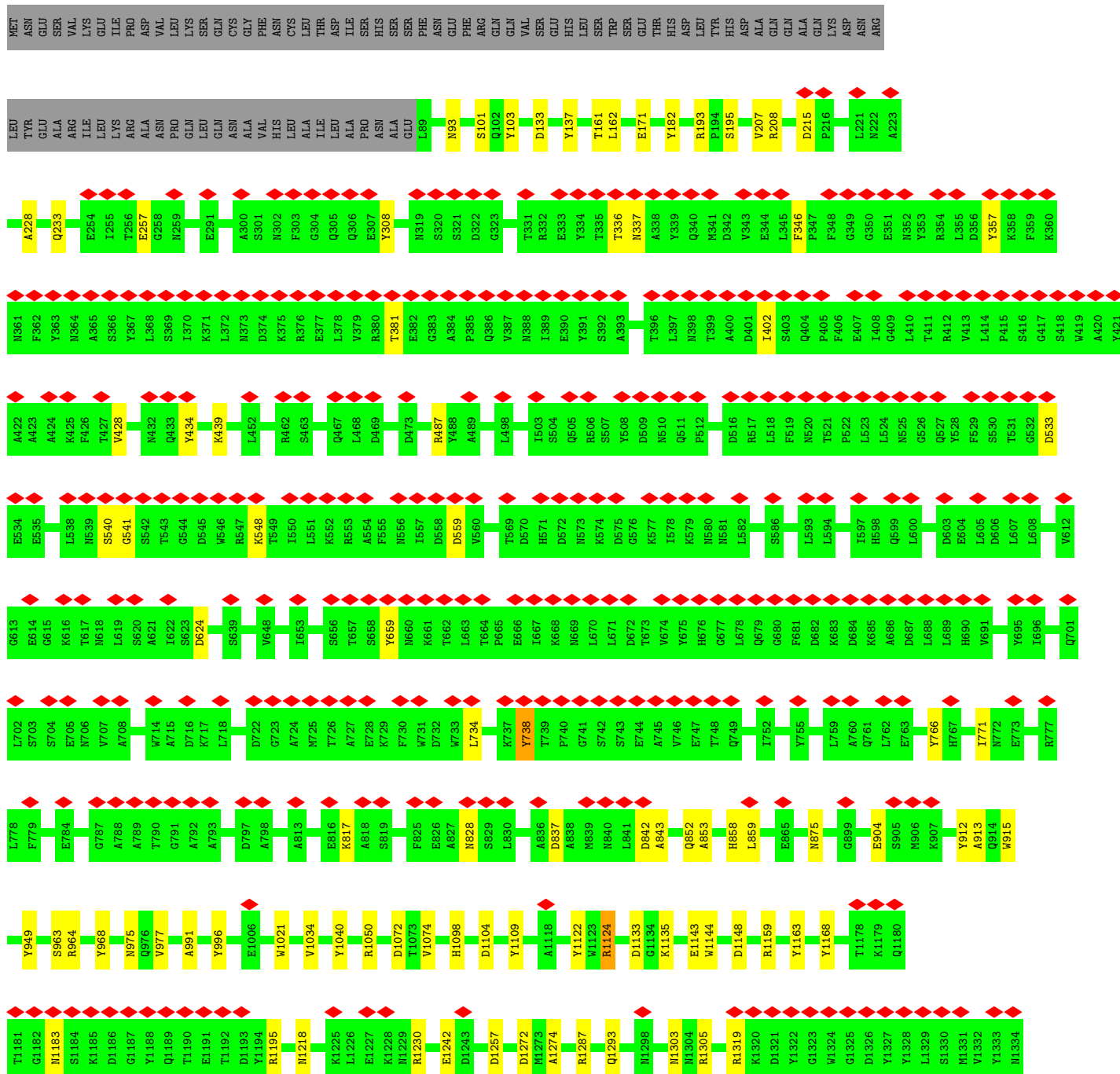
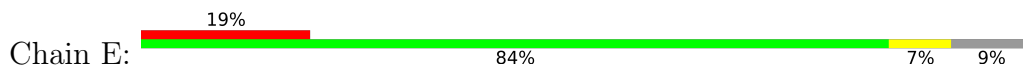
• Molecule 1: TcdA1

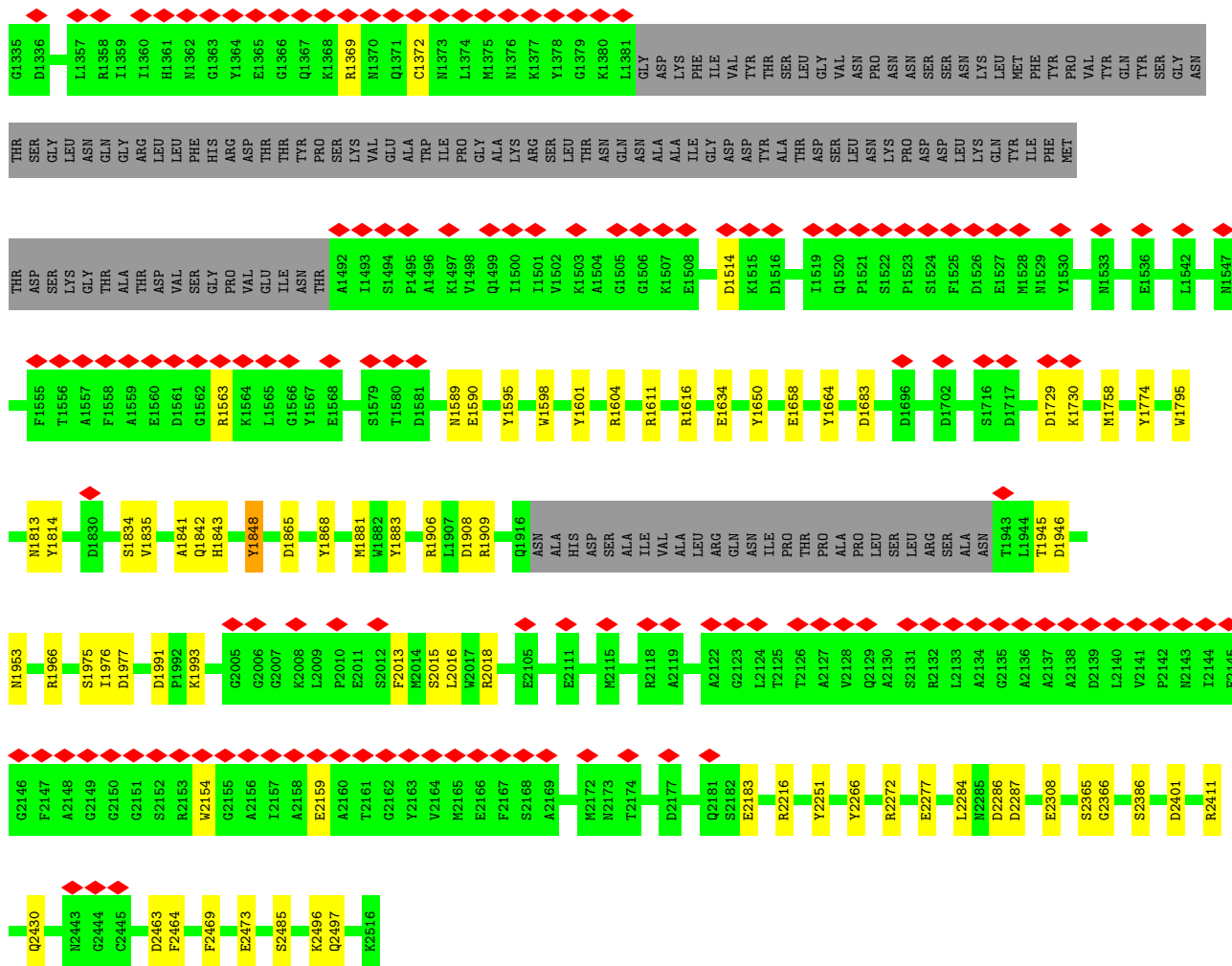


I395	T396	T397	N398	T399	A400	D401	I402	S403	Q404	P405	F406	E407	I408	G409	L410	T411	R412	V413	L414	P415	S416	G417	S418	W419	A420	Y421	A422	A423	A424	K425	F426	T427	E430	Y431	M432	Q433	Y434	S435	K442	R445	R448	L452	I460	V461	R462	S463	L468	D469	I470	Q486	R487											
Y488	A489	I490	H491	A492	E493	T494	A495	L498	C499	N500	F503	E504	S504	Q505	F506	S507	Y508	D509	N510	Q511	P512	S513	Q514	R517	L518	F519	P522	L523	L524	N525	G526	Q527	Y528	F529	S530	T531	G532	D533	E534	E535	L538	N539	S540	G541	S542	T543	G544	D545	W546	R547	K548	T549	I550	L551	K552							
R553	A554	F555	N556	I557	D558	T559	V560	S561	L562	F563	R564	L565	L566	K567	I568	T569	H571	D572	N573	P574	K574	G575	G576	K577	I578	K579	N580	N581	L582	K583	S586	N587	L588	Y589	I590	G591	K592	L593	D596	I597	H598	Q599	L600	D602	G603	E604	L605	D606	I610	A611	V612	K616	T617	N618								
L619	S620	A621	I622	S623	D624	L627	A628	R632	S639	W640	H641	H642	T643	Q644	K645	W646	S647	V648	F649	Q650	L651	F652	I653	M654	T655	S656	T657	S658	Y659	N660	K661	T662	L663	T664	P665	E666	I667	K668	N669	L670	L671	D672	L680	I682	D683	E684	H685	H686	G687	L688	Q689	G680	F681	D682	K683	D684	K685	A686				
D687	L688	L689	H690	V691	M692	A693	P694	I696	A697	A698	T699	L700	Q701	L702	S703	S704	E705	N706	V707	A708	H709	S710	V711	L712	L713	M714	A715	D716	K717	L718	Q719	P720	K621	D722	G723	A724	M725	T726	A727	E728	K729	F730	W731	D732	W733	L734	N735	T736	K737	Y738	T739	P740	F681	D682	K683	D684	K685	A686				
E747	T748	Q749	E750	H751	I752	V753	Q754	Y755	C756	Q757	A758	L759	A760	E763	M764	V765	Y766	S767	S768	V769	G770	I771	N772	E773	M774	A775	F776	R777	L778	F779	V780	T781	K782	P783	E784	F786	G787	A788	A789	T790	G791	A792	A793	P794	A795	H796	D797	A798	L799	S800	L801	I802	M803	R806	D809							
N812	A813	L814	G815	E816	K817	A818	F825	E826	A827	N828	S829	L830	T831	A832	E833	D837	A838	H839	M840	G841	L841	Q854	H855	H856	G857	H858	L859	P860	P861	H862	T863	P864	E865	F868	L874	L878	A884	N888	W889	A890	P891	Q892	Y902	I903	E904	S905	N906	K907	E908													
H935	A936	R942	S963	R964	Y968	N975	A991	Y996	E1005	E1006	Y1040	R1050	E1086	H1098	D1104	F1110	E1115	A1118	G1119	E1120	R1124	D1133	A1137	A1138	N1139	S1142	E1143	W1144	Y1163	R1166	L1167	Y1168	E1176	I1177	P1178	Q1179	Q1180																									
T1181	G1182	N1183	S1184	K1185	D1186	G1187	Y1188	Q1189	T1190	E1191	D1193	Y1194	R1195	H1202	N1218	K1219	K1220	R1230	C1236	E1242	M1261	D1272	D1277	R1305	R1319	K1320	D1321	Y1322	G1323	W1324	G1325	D1326	Y1327	Y1328	L1329	S1330	M1331	Y1332	N1334	G1335	I1337	Y1342	K1343	L1357																		
R1358	I1359	I1360	H1361	N1362	G1363	Y1364	E1365	Q1366	Q1367	K1368	R1369	N1370	Q1371	C1372	N1373	L1374	M1375	N1376	K1377	Y1378	K1380	L1381	GLY	ASP	LYS	ALA	PHE	ILE	ILE	GLY	VAL	ASP	TYR	THR	SER	LEU	LEU	VAL	ASP	VAL	PRO	ASN	ASN	ASN	PRO	ASP	ASP	ASN	LYS	LEU	LEU	MET	TYR	PHE	TYR	PRO	VAL	THR	THR	ASP	GLN	LYS
GLY	THR	ALA	THR	VAL	SER	GLY	PRO	VAL	GLU	ILE	THR	ASN	A1492	I1493	S1494	P1495	A1496	K1497	V1498	Q1499	K1503	A1504	G1505	G1506	K1507	E1508	A1513	D1514	K1515	D1516	V1517	S1518	I1519	Q1520	P1521	S1522	P1523	S1524	F1525	D1526	E1527	N1528	N1529	A1533	A1534	L1535	D1538	L1542	N1543	N1546	A1557											
F1558	A1559	E1560	D1561	I1562	R1563	K1564	L1565	G1566	Y1567	L1576	S1579	T1580	D1581	Y1595	R1604	R1611	R1616	E1634	Y1650	Y1664	D1683	D1696	S1716	D1717	D1729	K1730	M1758	S1765	Y1774	R1794	W1795	Y1805	Y1814	S1834	V1835	A1841	Q1842	H1843																								
Y1848	R1855	Y1868	R1869	T1915	Q1916	ASN	ALA	HIS	ASP	SER	ALA	ILE	VAL	ALA	LEU	ARG	GLN	ASN	ILE	PRO	THR	ALA	PRO	PRO	PRO	PRO	LEU	SER	LEU	ARG	ALA	ASN	I1943	L1944	M1963	S1975	I1976	D1977	G2006	G2007	K2008	S2012	F2013	S2015	L2016	R2118	A2121	A2127														

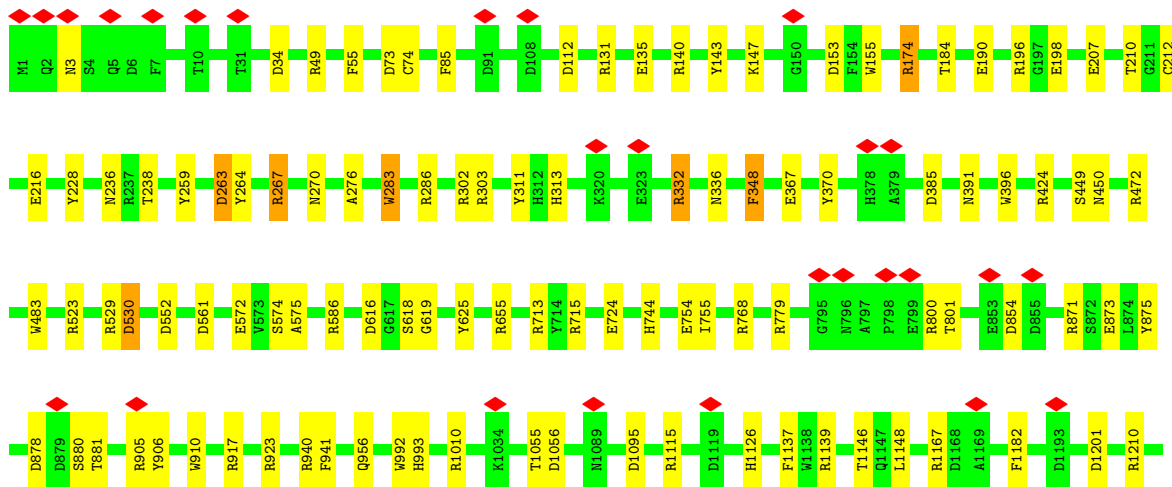
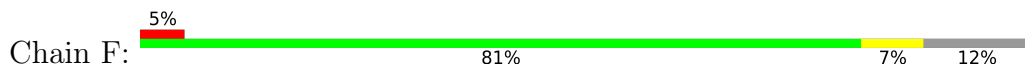


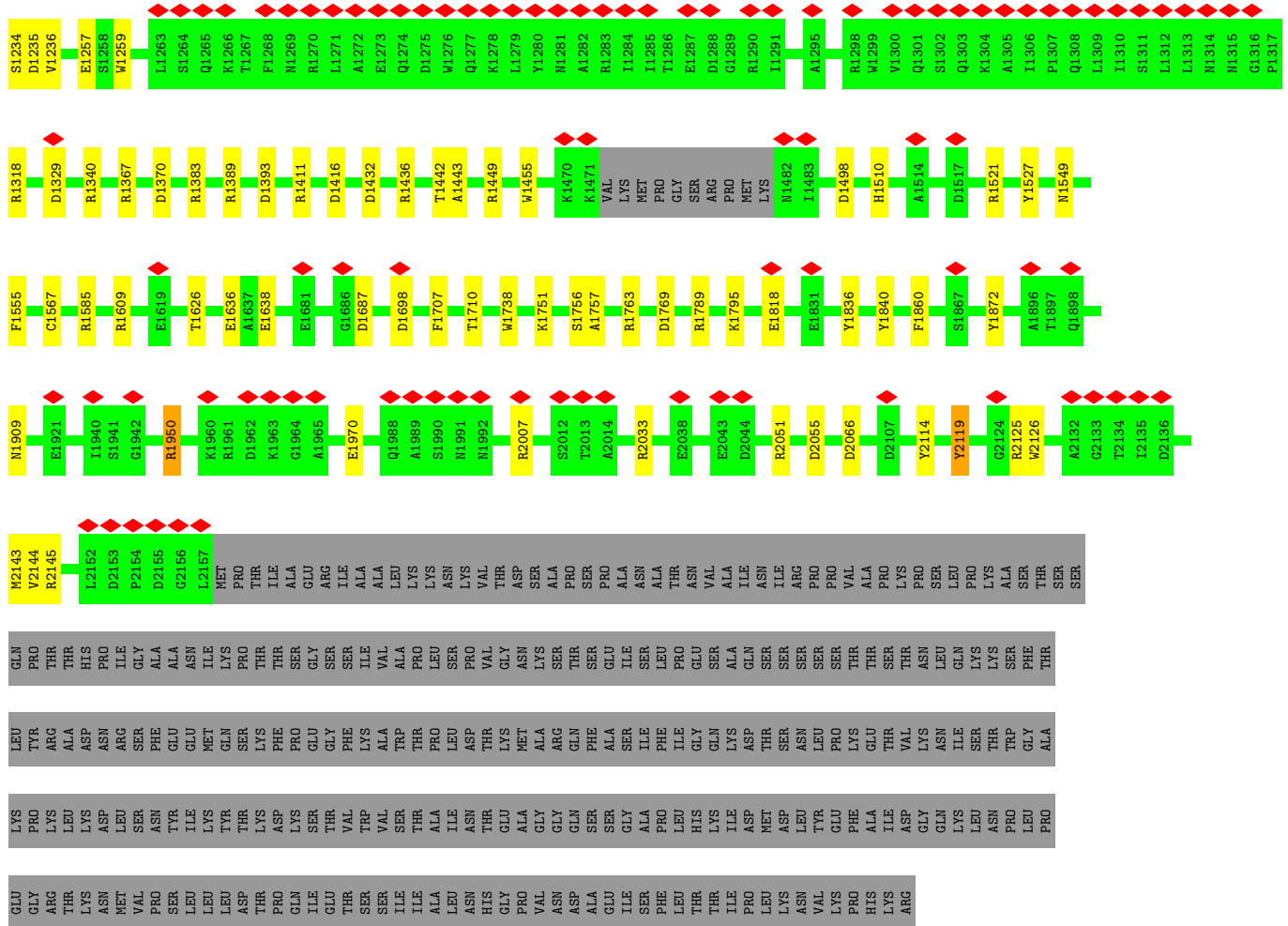
● Molecule 1: TcdA1





• Molecule 2: TcdB2,TccC3





4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	64806	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 ($e^-/\text{\AA}^2$)	60	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.113	Depositor
Minimum map value	-0.059	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.003	Depositor
Recommended contour level	0.015	Depositor
Map size (Å)	440.99997, 440.99997, 440.99997	wwPDB
Map dimensions	420, 420, 420	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.05, 1.05, 1.05	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	1.16	65/18587 (0.3%)	0.94	42/25239 (0.2%)
1	B	1.15	58/18587 (0.3%)	0.95	57/25239 (0.2%)
1	C	1.14	57/18587 (0.3%)	0.96	53/25239 (0.2%)
1	D	1.14	47/18587 (0.3%)	0.94	39/25239 (0.2%)
1	E	1.14	43/18587 (0.2%)	0.94	39/25239 (0.2%)
2	F	1.18	45/17548 (0.3%)	0.99	62/23921 (0.3%)
All	All	1.15	315/110483 (0.3%)	0.95	292/150116 (0.2%)

The worst 5 of 315 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	1372	CYS	CB-SG	-12.62	1.60	1.82
1	A	675	TYR	CB-CG	-10.65	1.35	1.51
1	A	1242	GLU	CG-CD	-10.29	1.36	1.51
1	C	1242	GLU	CG-CD	-9.66	1.37	1.51
1	A	779	PHE	CB-CG	-9.56	1.35	1.51

The worst 5 of 292 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	1585	ARG	NE-CZ-NH2	-12.40	114.10	120.30
2	F	332	ARG	NE-CZ-NH2	-11.14	114.73	120.30
1	B	517	ARG	NE-CZ-NH2	-10.70	114.95	120.30
1	B	1124	ARG	NE-CZ-NH2	-9.93	115.34	120.30
1	A	2018	ARG	NE-CZ-NH2	-9.83	115.38	120.30

There are no chirality outliers.

There are no planarity outliers.

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	18197	0	17794	53	0
1	B	18197	0	17794	58	0
1	C	18197	0	17794	48	0
1	D	18197	0	17794	55	0
1	E	18197	0	17794	60	0
2	F	17127	0	16494	54	0
All	All	108112	0	105464	322	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 2.

The worst 5 of 322 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:D:290:ASP:N	1:D:290:ASP:OD1	2.35	0.59
2:F:153:ASP:O	2:F:174:ARG:NH2	2.37	0.58
1:B:624:ASP:OD1	1:B:624:ASP:N	2.37	0.58
1:C:575:ASP:OD2	1:C:577:LYS:NZ	2.35	0.57
1:B:2319:ASP:OD2	1:B:2323:LYS:NZ	2.37	0.57

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	2286/2516 (91%)	2220 (97%)	58 (2%)	8 (0%)	41 72

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	2286/2516 (91%)	2222 (97%)	61 (3%)	3 (0%)	51	82
1	C	2286/2516 (91%)	2228 (98%)	51 (2%)	7 (0%)	41	72
1	D	2286/2516 (91%)	2223 (97%)	57 (2%)	6 (0%)	41	72
1	E	2286/2516 (91%)	2230 (98%)	49 (2%)	7 (0%)	41	72
2	F	2143/2439 (88%)	2089 (98%)	50 (2%)	4 (0%)	47	78
All	All	13573/15019 (90%)	13212 (97%)	326 (2%)	35 (0%)	44	72

5 of 35 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	891	PRO
1	B	891	PRO
1	D	101	SER
1	D	891	PRO
1	D	1138	ALA

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	1960/2157 (91%)	1959 (100%)	1 (0%)	93	98
1	B	1960/2157 (91%)	1960 (100%)	0	100	100
1	C	1960/2157 (91%)	1959 (100%)	1 (0%)	93	98
1	D	1960/2157 (91%)	1958 (100%)	2 (0%)	93	98
1	E	1960/2157 (91%)	1959 (100%)	1 (0%)	93	98
2	F	1854/2109 (88%)	1851 (100%)	3 (0%)	93	98
All	All	11654/12894 (90%)	11646 (100%)	8 (0%)	93	98

5 of 8 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	F	472	ARG

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	F	313	HIS
1	E	1319	ARG
1	D	968	TYR
2	F	267	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 15 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	735	ASN
2	F	1650	HIS
1	C	1520	GLN
2	F	1825	ASN
1	E	735	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

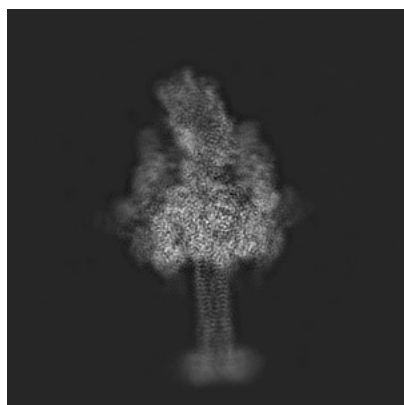
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-10313. These allow visual inspection of the internal detail of the map and identification of artifacts.

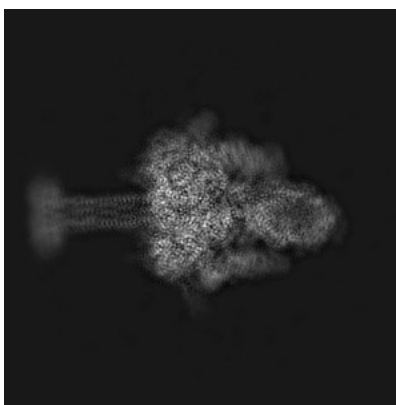
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

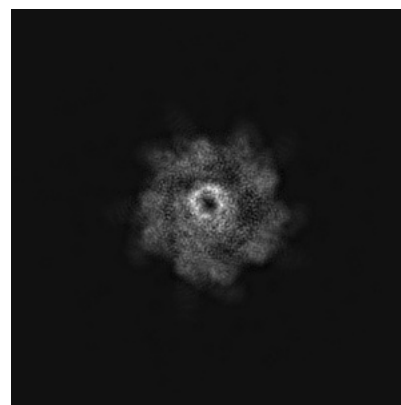
6.1.1 Primary map



X



Y

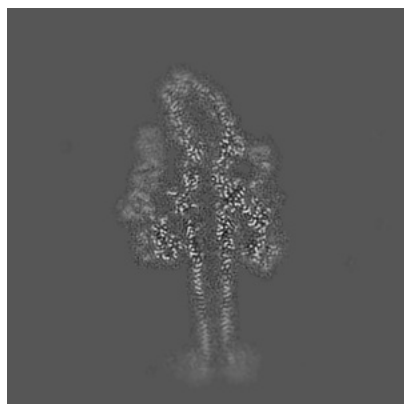


Z

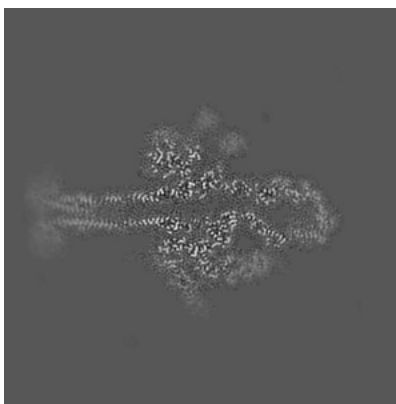
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

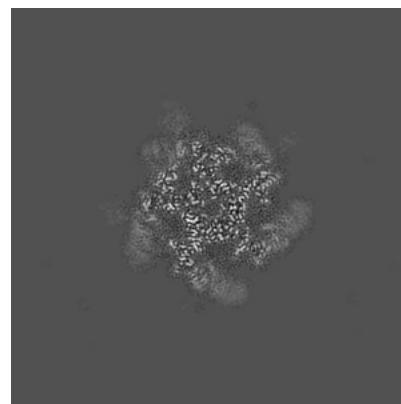
6.2.1 Primary map



X Index: 210



Y Index: 210

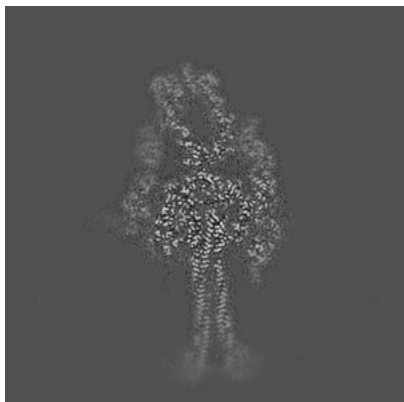


Z Index: 210

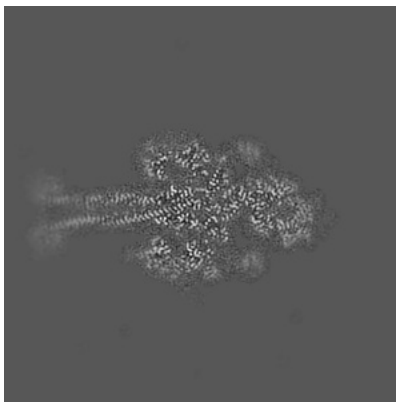
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

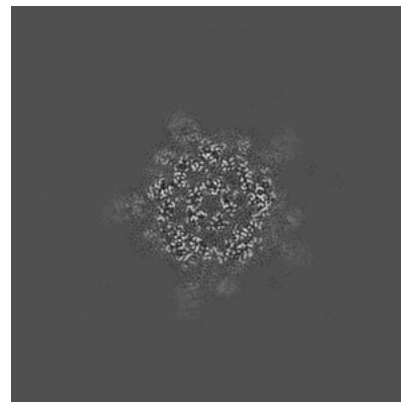
6.3.1 Primary map



X Index: 197



Y Index: 225



Z Index: 196

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

6.4 Orthogonal surface views [i](#)

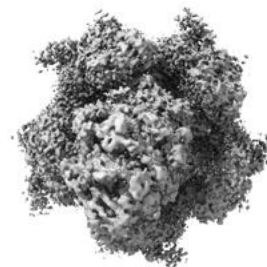
6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.015. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

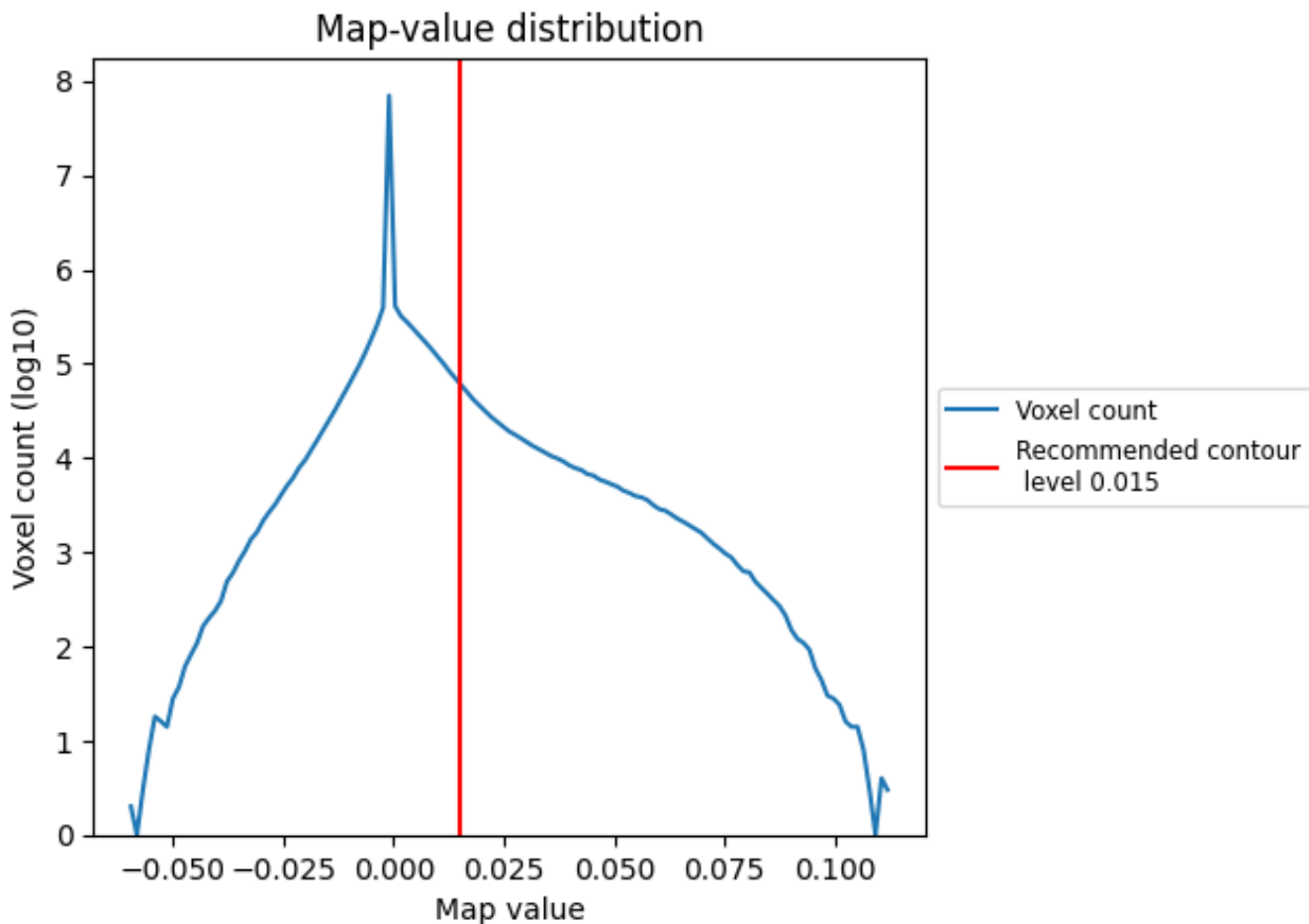
6.5 Mask visualisation

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

7 Map analysis [i](#)

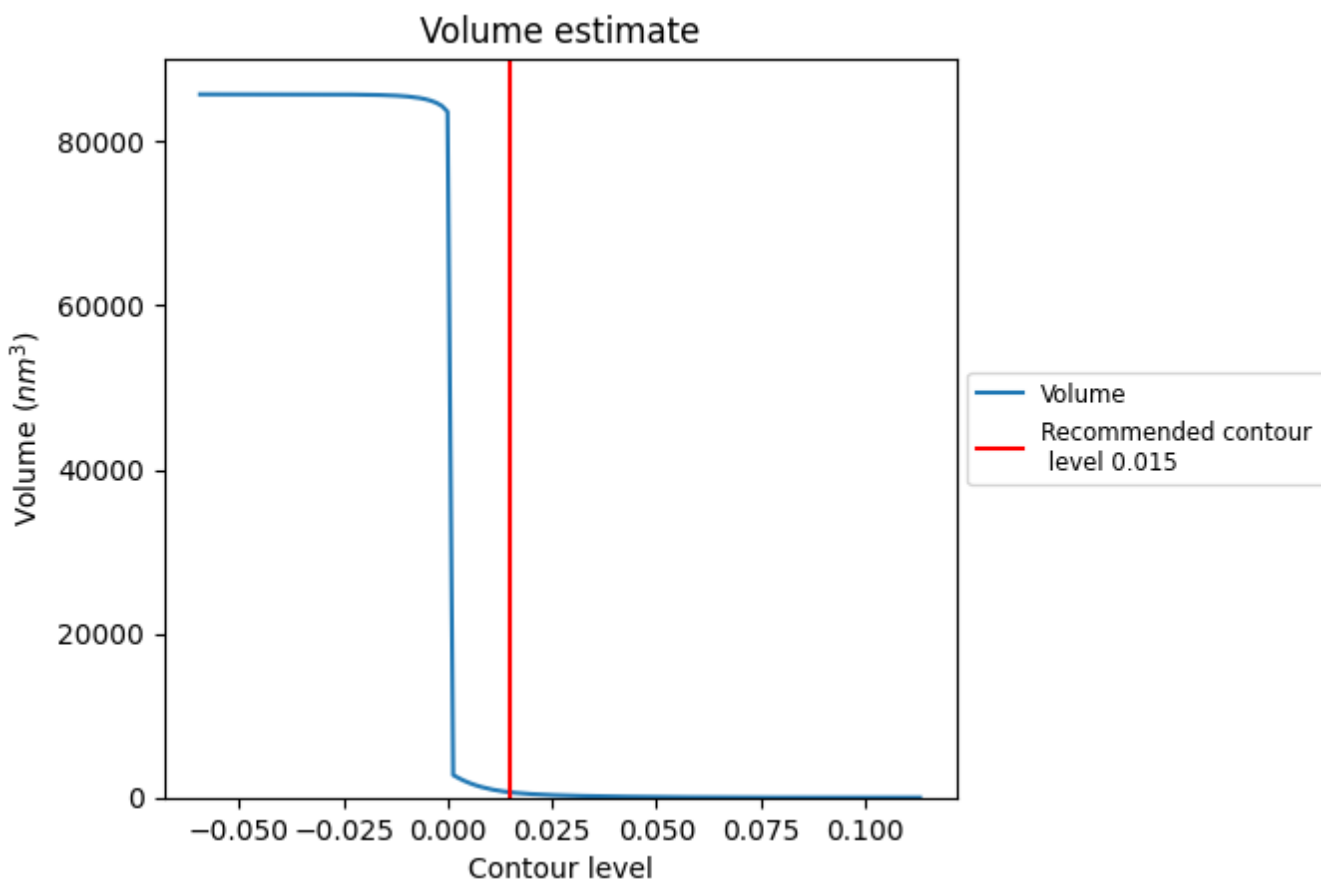
This section contains the results of statistical analysis of the map.

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.

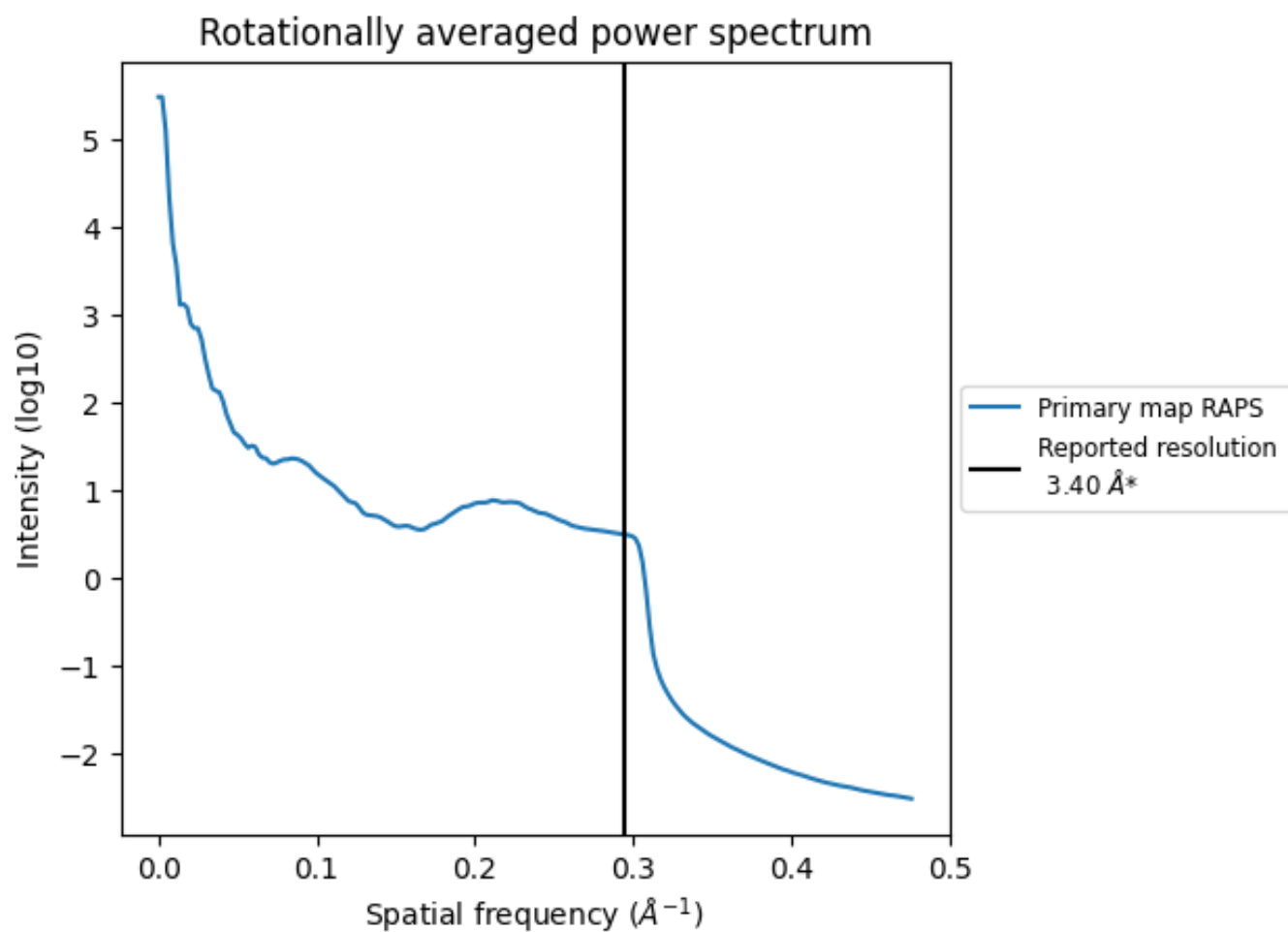
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 639 nm³; this corresponds to an approximate mass of 577 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 0.294 Å⁻¹

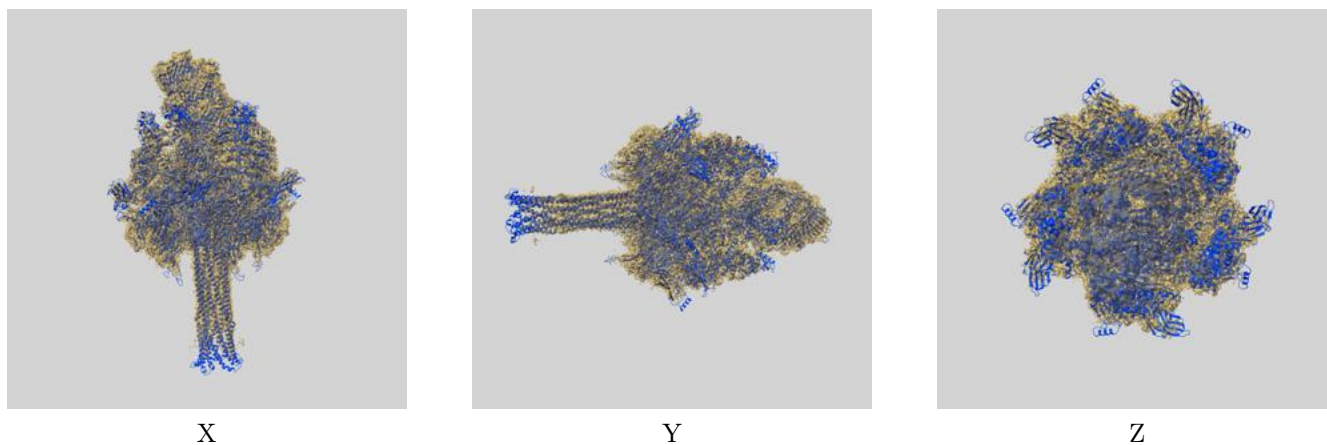
8 Fourier-Shell correlation

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

9 Map-model fit [i](#)

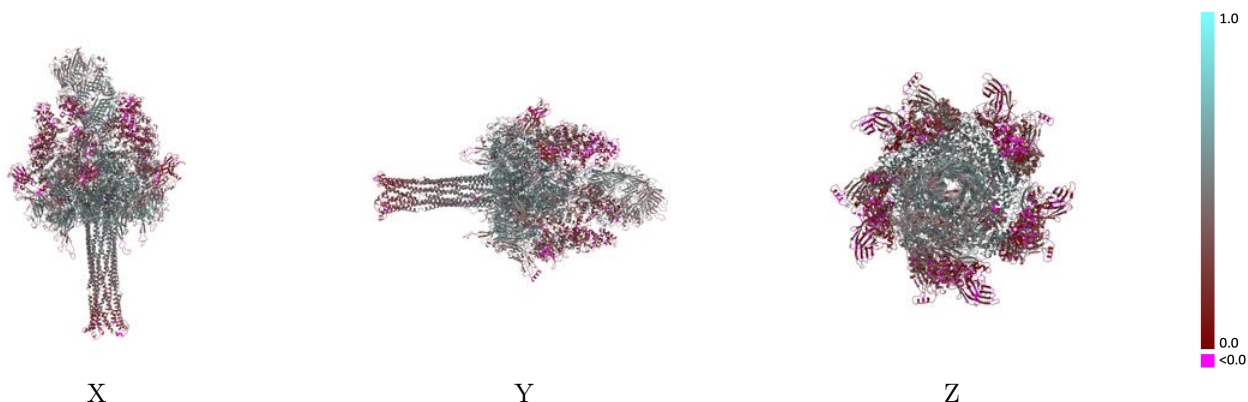
This section contains information regarding the fit between EMDB map EMD-10313 and PDB model 6SUF. Per-residue inclusion information can be found in section 3 on page 5.

9.1 Map-model overlay [i](#)



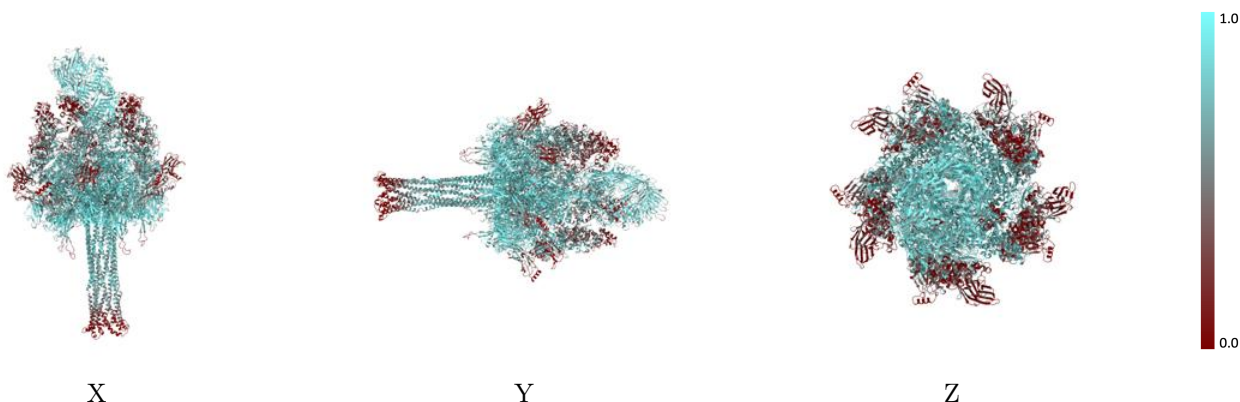
The images above show the 3D surface view of the map at the recommended contour level 0.015 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



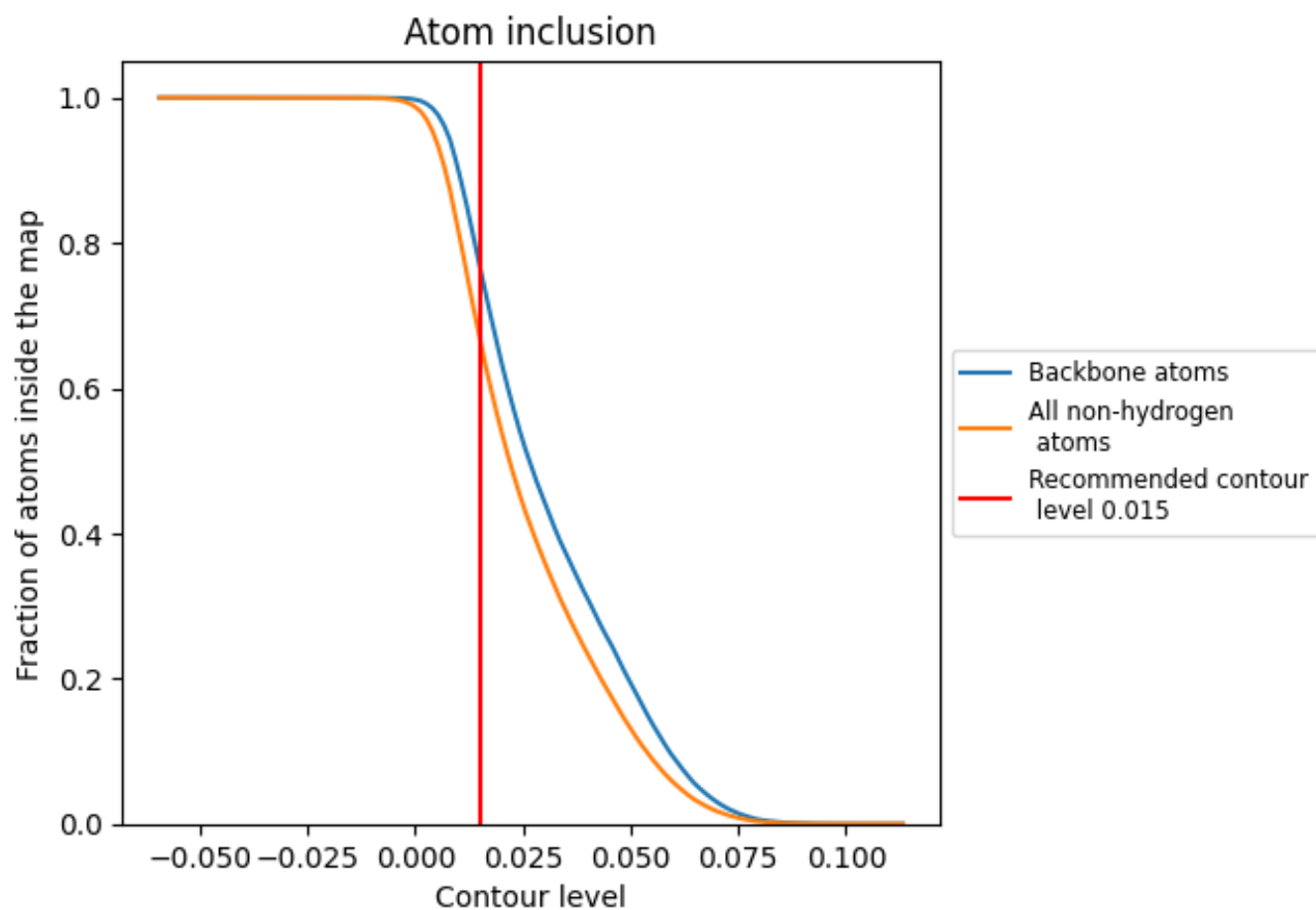
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

9.3 Atom inclusion mapped to coordinate model [i](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.015).















9.4 Atom inclusion [i](#)



At the recommended contour level, 77% of all backbone atoms, 67% 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 (0.015) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6675	 0.3960
A	 0.6463	 0.3870
B	 0.6358	 0.3810
C	 0.6387	 0.3850
D	 0.6306	 0.3760
E	 0.6649	 0.3940
F	 0.7970	 0.4590

