



wwPDB EM Validation Summary Report ⓘ

Oct 16, 2023 – 03:07 PM EDT

PDB ID : 8T22
EMDB ID : EMD-40978
Title : Cryo-EM structure of mink variant Y453F trimeric spike protein bound to one mink ACE2 receptors at downRBD conformation
Authors : Ahn, H.M.; Calderon, B.; Fan, X.; Gao, Y.; Horgan, N.; Zhou, B.; Liang, B.
Deposited on : 2023-06-05
Resolution : 3.83 Å(reported)

This is a wwPDB EM Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

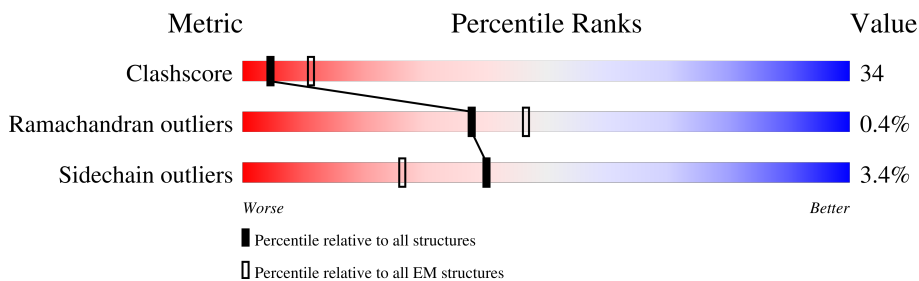
EMDB validation analysis : 0.0.1.dev70
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.9
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

1 Overall quality at a glance

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.83 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	1269	
1	B	1269	
1	C	1269	
2	D	771	

2 Entry composition i

There are 2 unique types of molecules in this entry. The entry contains 23961 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 Spike glycoprotein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	748	5813	3714	961	1112	26	0	0
1	B	748	5813	3714	961	1112	26	0	0
1	C	954	7431	4748	1234	1416	33	0	0

There are 228 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	HIS	deletion	UNP P0DTC2
A	?	-	VAL	deletion	UNP P0DTC2
A	453	PHE	TYR	variant	UNP P0DTC2
A	614	GLY	ASP	engineered mutation	UNP P0DTC2
A	682	GLY	ARG	engineered mutation	UNP P0DTC2
A	683	SER	ARG	engineered mutation	UNP P0DTC2
A	685	SER	ARG	engineered mutation	UNP P0DTC2
A	817	PRO	PHE	engineered mutation	UNP P0DTC2
A	892	PRO	ALA	engineered mutation	UNP P0DTC2
A	899	PRO	ALA	engineered mutation	UNP P0DTC2
A	942	PRO	ALA	engineered mutation	UNP P0DTC2
A	986	PRO	LYS	engineered mutation	UNP P0DTC2
A	987	PRO	VAL	engineered mutation	UNP P0DTC2
A	1209	GLY	-	expression tag	UNP P0DTC2
A	1210	SER	-	expression tag	UNP P0DTC2
A	1211	GLY	-	expression tag	UNP P0DTC2
A	1212	SER	-	expression tag	UNP P0DTC2
A	1213	GLY	-	expression tag	UNP P0DTC2
A	1214	SER	-	expression tag	UNP P0DTC2
A	1215	GLY	-	expression tag	UNP P0DTC2
A	1216	SER	-	expression tag	UNP P0DTC2
A	1217	GLY	-	expression tag	UNP P0DTC2
A	1218	TYR	-	expression tag	UNP P0DTC2
A	1219	ILE	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	1220	PRO	-	expression tag	UNP P0DTC2
A	1221	GLU	-	expression tag	UNP P0DTC2
A	1222	ALA	-	expression tag	UNP P0DTC2
A	1223	PRO	-	expression tag	UNP P0DTC2
A	1224	ARG	-	expression tag	UNP P0DTC2
A	1225	ASP	-	expression tag	UNP P0DTC2
A	1226	GLY	-	expression tag	UNP P0DTC2
A	1227	GLN	-	expression tag	UNP P0DTC2
A	1228	ALA	-	expression tag	UNP P0DTC2
A	1229	TYR	-	expression tag	UNP P0DTC2
A	1230	VAL	-	expression tag	UNP P0DTC2
A	1231	ARG	-	expression tag	UNP P0DTC2
A	1232	LYS	-	expression tag	UNP P0DTC2
A	1233	ASP	-	expression tag	UNP P0DTC2
A	1234	GLY	-	expression tag	UNP P0DTC2
A	1235	GLU	-	expression tag	UNP P0DTC2
A	1236	TRP	-	expression tag	UNP P0DTC2
A	1237	VAL	-	expression tag	UNP P0DTC2
A	1238	LEU	-	expression tag	UNP P0DTC2
A	1239	LEU	-	expression tag	UNP P0DTC2
A	1240	SER	-	expression tag	UNP P0DTC2
A	1241	THR	-	expression tag	UNP P0DTC2
A	1242	PHE	-	expression tag	UNP P0DTC2
A	1243	LEU	-	expression tag	UNP P0DTC2
A	1244	GLY	-	expression tag	UNP P0DTC2
A	1245	SER	-	expression tag	UNP P0DTC2
A	1246	GLY	-	expression tag	UNP P0DTC2
A	1247	SER	-	expression tag	UNP P0DTC2
A	1248	GLY	-	expression tag	UNP P0DTC2
A	1249	SER	-	expression tag	UNP P0DTC2
A	1250	GLY	-	expression tag	UNP P0DTC2
A	1251	HIS	-	expression tag	UNP P0DTC2
A	1252	HIS	-	expression tag	UNP P0DTC2
A	1253	HIS	-	expression tag	UNP P0DTC2
A	1254	HIS	-	expression tag	UNP P0DTC2
A	1255	HIS	-	expression tag	UNP P0DTC2
A	1256	HIS	-	expression tag	UNP P0DTC2
A	1257	GLY	-	expression tag	UNP P0DTC2
A	1258	LEU	-	expression tag	UNP P0DTC2
A	1259	ASN	-	expression tag	UNP P0DTC2
A	1260	ASP	-	expression tag	UNP P0DTC2
A	1261	ILE	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	1262	PHE	-	expression tag	UNP P0DTC2
A	1263	GLU	-	expression tag	UNP P0DTC2
A	1264	ALA	-	expression tag	UNP P0DTC2
A	1265	GLN	-	expression tag	UNP P0DTC2
A	1266	LYS	-	expression tag	UNP P0DTC2
A	1267	ILE	-	expression tag	UNP P0DTC2
A	1268	GLU	-	expression tag	UNP P0DTC2
A	1269	TRP	-	expression tag	UNP P0DTC2
A	1270	HIS	-	expression tag	UNP P0DTC2
A	1271	GLU	-	expression tag	UNP P0DTC2
B	?	-	HIS	deletion	UNP P0DTC2
B	?	-	VAL	deletion	UNP P0DTC2
B	453	PHE	TYR	variant	UNP P0DTC2
B	614	GLY	ASP	engineered mutation	UNP P0DTC2
B	682	GLY	ARG	engineered mutation	UNP P0DTC2
B	683	SER	ARG	engineered mutation	UNP P0DTC2
B	685	SER	ARG	engineered mutation	UNP P0DTC2
B	817	PRO	PHE	engineered mutation	UNP P0DTC2
B	892	PRO	ALA	engineered mutation	UNP P0DTC2
B	899	PRO	ALA	engineered mutation	UNP P0DTC2
B	942	PRO	ALA	engineered mutation	UNP P0DTC2
B	986	PRO	LYS	engineered mutation	UNP P0DTC2
B	987	PRO	VAL	engineered mutation	UNP P0DTC2
B	1209	GLY	-	expression tag	UNP P0DTC2
B	1210	SER	-	expression tag	UNP P0DTC2
B	1211	GLY	-	expression tag	UNP P0DTC2
B	1212	SER	-	expression tag	UNP P0DTC2
B	1213	GLY	-	expression tag	UNP P0DTC2
B	1214	SER	-	expression tag	UNP P0DTC2
B	1215	GLY	-	expression tag	UNP P0DTC2
B	1216	SER	-	expression tag	UNP P0DTC2
B	1217	GLY	-	expression tag	UNP P0DTC2
B	1218	TYR	-	expression tag	UNP P0DTC2
B	1219	ILE	-	expression tag	UNP P0DTC2
B	1220	PRO	-	expression tag	UNP P0DTC2
B	1221	GLU	-	expression tag	UNP P0DTC2
B	1222	ALA	-	expression tag	UNP P0DTC2
B	1223	PRO	-	expression tag	UNP P0DTC2
B	1224	ARG	-	expression tag	UNP P0DTC2
B	1225	ASP	-	expression tag	UNP P0DTC2
B	1226	GLY	-	expression tag	UNP P0DTC2
B	1227	GLN	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
B	1228	ALA	-	expression tag	UNP P0DTC2
B	1229	TYR	-	expression tag	UNP P0DTC2
B	1230	VAL	-	expression tag	UNP P0DTC2
B	1231	ARG	-	expression tag	UNP P0DTC2
B	1232	LYS	-	expression tag	UNP P0DTC2
B	1233	ASP	-	expression tag	UNP P0DTC2
B	1234	GLY	-	expression tag	UNP P0DTC2
B	1235	GLU	-	expression tag	UNP P0DTC2
B	1236	TRP	-	expression tag	UNP P0DTC2
B	1237	VAL	-	expression tag	UNP P0DTC2
B	1238	LEU	-	expression tag	UNP P0DTC2
B	1239	LEU	-	expression tag	UNP P0DTC2
B	1240	SER	-	expression tag	UNP P0DTC2
B	1241	THR	-	expression tag	UNP P0DTC2
B	1242	PHE	-	expression tag	UNP P0DTC2
B	1243	LEU	-	expression tag	UNP P0DTC2
B	1244	GLY	-	expression tag	UNP P0DTC2
B	1245	SER	-	expression tag	UNP P0DTC2
B	1246	GLY	-	expression tag	UNP P0DTC2
B	1247	SER	-	expression tag	UNP P0DTC2
B	1248	GLY	-	expression tag	UNP P0DTC2
B	1249	SER	-	expression tag	UNP P0DTC2
B	1250	GLY	-	expression tag	UNP P0DTC2
B	1251	HIS	-	expression tag	UNP P0DTC2
B	1252	HIS	-	expression tag	UNP P0DTC2
B	1253	HIS	-	expression tag	UNP P0DTC2
B	1254	HIS	-	expression tag	UNP P0DTC2
B	1255	HIS	-	expression tag	UNP P0DTC2
B	1256	HIS	-	expression tag	UNP P0DTC2
B	1257	GLY	-	expression tag	UNP P0DTC2
B	1258	LEU	-	expression tag	UNP P0DTC2
B	1259	ASN	-	expression tag	UNP P0DTC2
B	1260	ASP	-	expression tag	UNP P0DTC2
B	1261	ILE	-	expression tag	UNP P0DTC2
B	1262	PHE	-	expression tag	UNP P0DTC2
B	1263	GLU	-	expression tag	UNP P0DTC2
B	1264	ALA	-	expression tag	UNP P0DTC2
B	1265	GLN	-	expression tag	UNP P0DTC2
B	1266	LYS	-	expression tag	UNP P0DTC2
B	1267	ILE	-	expression tag	UNP P0DTC2
B	1268	GLU	-	expression tag	UNP P0DTC2
B	1269	TRP	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
B	1270	HIS	-	expression tag	UNP P0DTC2
B	1271	GLU	-	expression tag	UNP P0DTC2
C	?	-	HIS	deletion	UNP P0DTC2
C	?	-	VAL	deletion	UNP P0DTC2
C	453	PHE	TYR	variant	UNP P0DTC2
C	614	GLY	ASP	engineered mutation	UNP P0DTC2
C	682	GLY	ARG	engineered mutation	UNP P0DTC2
C	683	SER	ARG	engineered mutation	UNP P0DTC2
C	685	SER	ARG	engineered mutation	UNP P0DTC2
C	817	PRO	PHE	engineered mutation	UNP P0DTC2
C	892	PRO	ALA	engineered mutation	UNP P0DTC2
C	899	PRO	ALA	engineered mutation	UNP P0DTC2
C	942	PRO	ALA	engineered mutation	UNP P0DTC2
C	986	PRO	LYS	engineered mutation	UNP P0DTC2
C	987	PRO	VAL	engineered mutation	UNP P0DTC2
C	1209	GLY	-	expression tag	UNP P0DTC2
C	1210	SER	-	expression tag	UNP P0DTC2
C	1211	GLY	-	expression tag	UNP P0DTC2
C	1212	SER	-	expression tag	UNP P0DTC2
C	1213	GLY	-	expression tag	UNP P0DTC2
C	1214	SER	-	expression tag	UNP P0DTC2
C	1215	GLY	-	expression tag	UNP P0DTC2
C	1216	SER	-	expression tag	UNP P0DTC2
C	1217	GLY	-	expression tag	UNP P0DTC2
C	1218	TYR	-	expression tag	UNP P0DTC2
C	1219	ILE	-	expression tag	UNP P0DTC2
C	1220	PRO	-	expression tag	UNP P0DTC2
C	1221	GLU	-	expression tag	UNP P0DTC2
C	1222	ALA	-	expression tag	UNP P0DTC2
C	1223	PRO	-	expression tag	UNP P0DTC2
C	1224	ARG	-	expression tag	UNP P0DTC2
C	1225	ASP	-	expression tag	UNP P0DTC2
C	1226	GLY	-	expression tag	UNP P0DTC2
C	1227	GLN	-	expression tag	UNP P0DTC2
C	1228	ALA	-	expression tag	UNP P0DTC2
C	1229	TYR	-	expression tag	UNP P0DTC2
C	1230	VAL	-	expression tag	UNP P0DTC2
C	1231	ARG	-	expression tag	UNP P0DTC2
C	1232	LYS	-	expression tag	UNP P0DTC2
C	1233	ASP	-	expression tag	UNP P0DTC2
C	1234	GLY	-	expression tag	UNP P0DTC2
C	1235	GLU	-	expression tag	UNP P0DTC2

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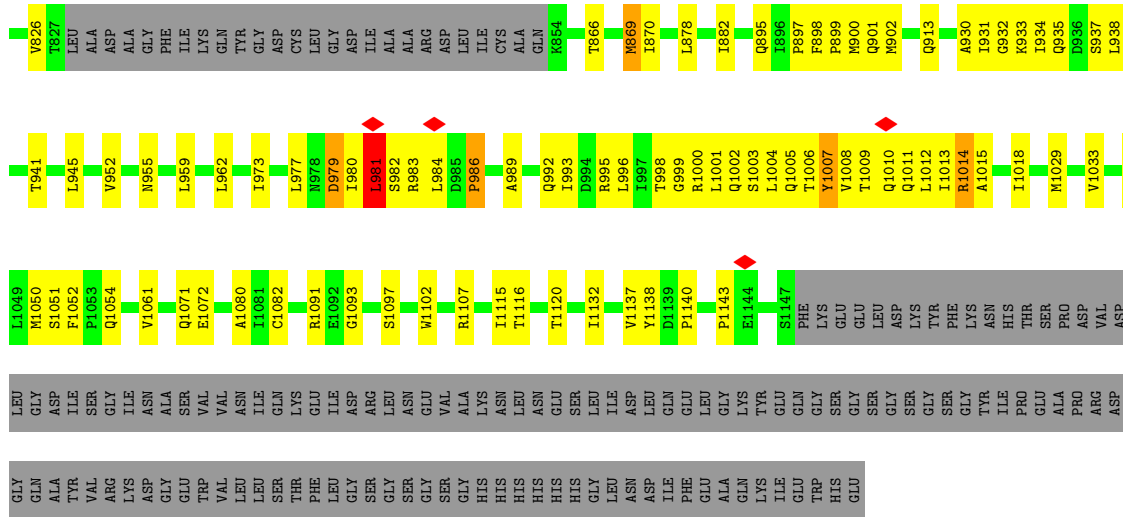
Chain	Residue	Modelled	Actual	Comment	Reference
C	1236	TRP	-	expression tag	UNP P0DTC2
C	1237	VAL	-	expression tag	UNP P0DTC2
C	1238	LEU	-	expression tag	UNP P0DTC2
C	1239	LEU	-	expression tag	UNP P0DTC2
C	1240	SER	-	expression tag	UNP P0DTC2
C	1241	THR	-	expression tag	UNP P0DTC2
C	1242	PHE	-	expression tag	UNP P0DTC2
C	1243	LEU	-	expression tag	UNP P0DTC2
C	1244	GLY	-	expression tag	UNP P0DTC2
C	1245	SER	-	expression tag	UNP P0DTC2
C	1246	GLY	-	expression tag	UNP P0DTC2
C	1247	SER	-	expression tag	UNP P0DTC2
C	1248	GLY	-	expression tag	UNP P0DTC2
C	1249	SER	-	expression tag	UNP P0DTC2
C	1250	GLY	-	expression tag	UNP P0DTC2
C	1251	HIS	-	expression tag	UNP P0DTC2
C	1252	HIS	-	expression tag	UNP P0DTC2
C	1253	HIS	-	expression tag	UNP P0DTC2
C	1254	HIS	-	expression tag	UNP P0DTC2
C	1255	HIS	-	expression tag	UNP P0DTC2
C	1256	HIS	-	expression tag	UNP P0DTC2
C	1257	GLY	-	expression tag	UNP P0DTC2
C	1258	LEU	-	expression tag	UNP P0DTC2
C	1259	ASN	-	expression tag	UNP P0DTC2
C	1260	ASP	-	expression tag	UNP P0DTC2
C	1261	ILE	-	expression tag	UNP P0DTC2
C	1262	PHE	-	expression tag	UNP P0DTC2
C	1263	GLU	-	expression tag	UNP P0DTC2
C	1264	ALA	-	expression tag	UNP P0DTC2
C	1265	GLN	-	expression tag	UNP P0DTC2
C	1266	LYS	-	expression tag	UNP P0DTC2
C	1267	ILE	-	expression tag	UNP P0DTC2
C	1268	GLU	-	expression tag	UNP P0DTC2
C	1269	TRP	-	expression tag	UNP P0DTC2
C	1270	HIS	-	expression tag	UNP P0DTC2
C	1271	GLU	-	expression tag	UNP P0DTC2

- Molecule 2 is a protein called Angiotensin-converting enzyme.

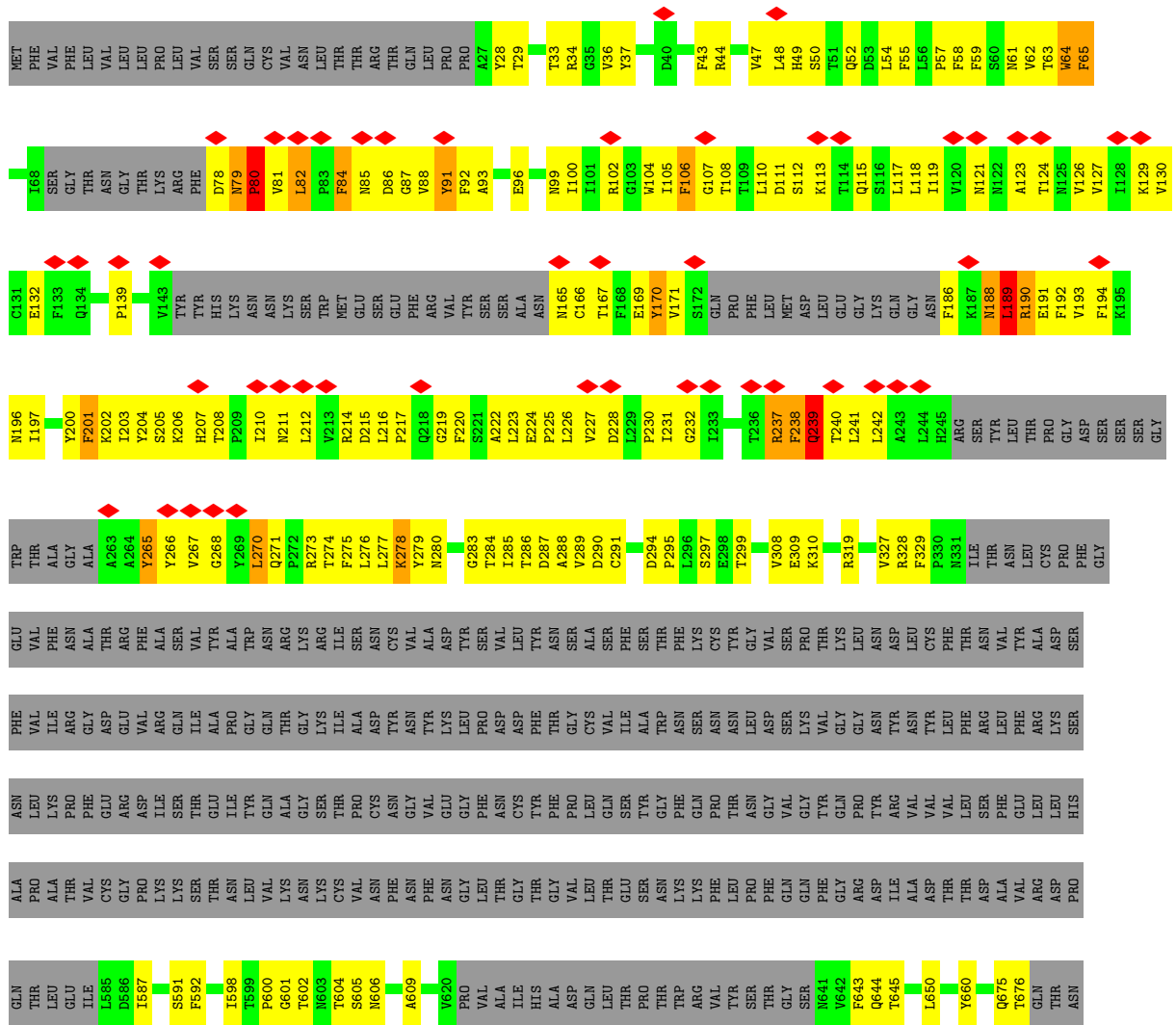
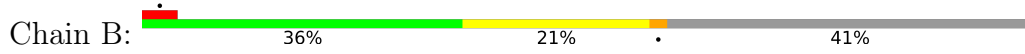
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	D	596	4904	3133	824	918	29	0	0

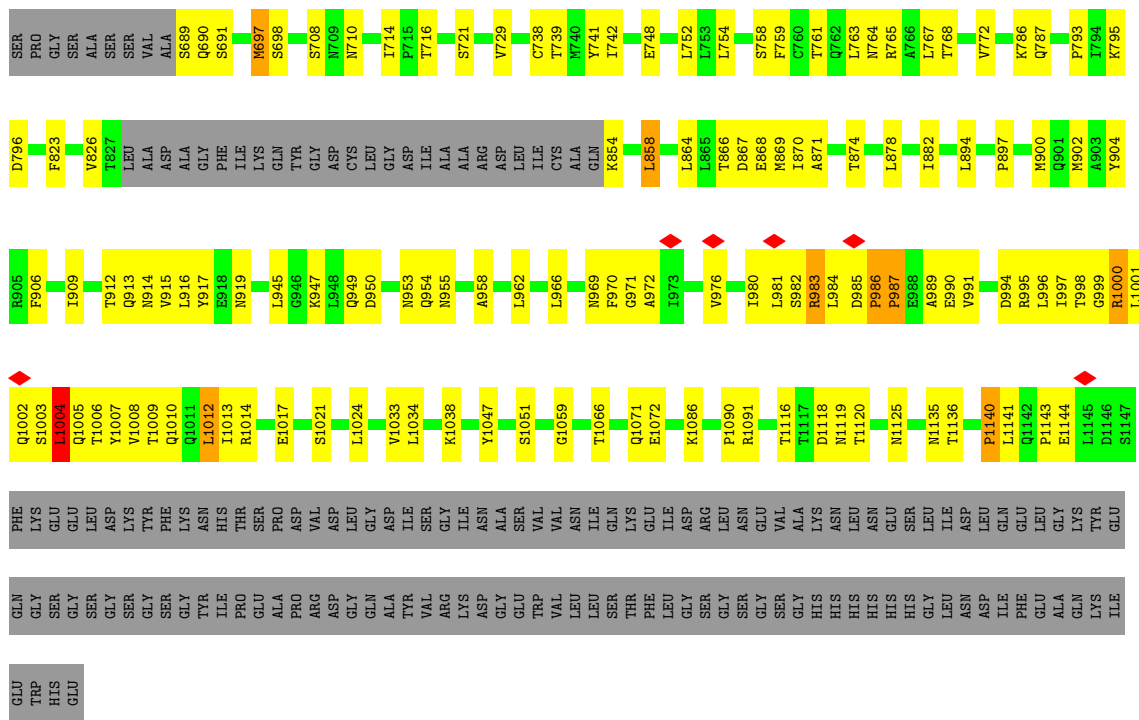
There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	740	GLY	-	expression tag	UNP A0A7T0Q2W2
D	741	SER	-	expression tag	UNP A0A7T0Q2W2
D	742	GLY	-	expression tag	UNP A0A7T0Q2W2
D	743	SER	-	expression tag	UNP A0A7T0Q2W2
D	744	GLY	-	expression tag	UNP A0A7T0Q2W2
D	745	SER	-	expression tag	UNP A0A7T0Q2W2
D	746	GLY	-	expression tag	UNP A0A7T0Q2W2
D	747	HIS	-	expression tag	UNP A0A7T0Q2W2
D	748	HIS	-	expression tag	UNP A0A7T0Q2W2
D	749	HIS	-	expression tag	UNP A0A7T0Q2W2
D	750	HIS	-	expression tag	UNP A0A7T0Q2W2
D	751	HIS	-	expression tag	UNP A0A7T0Q2W2
D	752	HIS	-	expression tag	UNP A0A7T0Q2W2
D	753	GLY	-	expression tag	UNP A0A7T0Q2W2
D	754	SER	-	expression tag	UNP A0A7T0Q2W2
D	755	GLY	-	expression tag	UNP A0A7T0Q2W2
D	756	SER	-	expression tag	UNP A0A7T0Q2W2
D	757	GLY	-	expression tag	UNP A0A7T0Q2W2
D	758	LEU	-	expression tag	UNP A0A7T0Q2W2
D	759	ASN	-	expression tag	UNP A0A7T0Q2W2
D	760	ASP	-	expression tag	UNP A0A7T0Q2W2
D	761	ILE	-	expression tag	UNP A0A7T0Q2W2
D	762	PHE	-	expression tag	UNP A0A7T0Q2W2
D	763	GLU	-	expression tag	UNP A0A7T0Q2W2
D	764	ALA	-	expression tag	UNP A0A7T0Q2W2
D	765	GLN	-	expression tag	UNP A0A7T0Q2W2
D	766	LYS	-	expression tag	UNP A0A7T0Q2W2
D	767	ILE	-	expression tag	UNP A0A7T0Q2W2
D	768	GLU	-	expression tag	UNP A0A7T0Q2W2
D	769	TRP	-	expression tag	UNP A0A7T0Q2W2
D	770	HIS	-	expression tag	UNP A0A7T0Q2W2
D	771	GLU	-	expression tag	UNP A0A7T0Q2W2

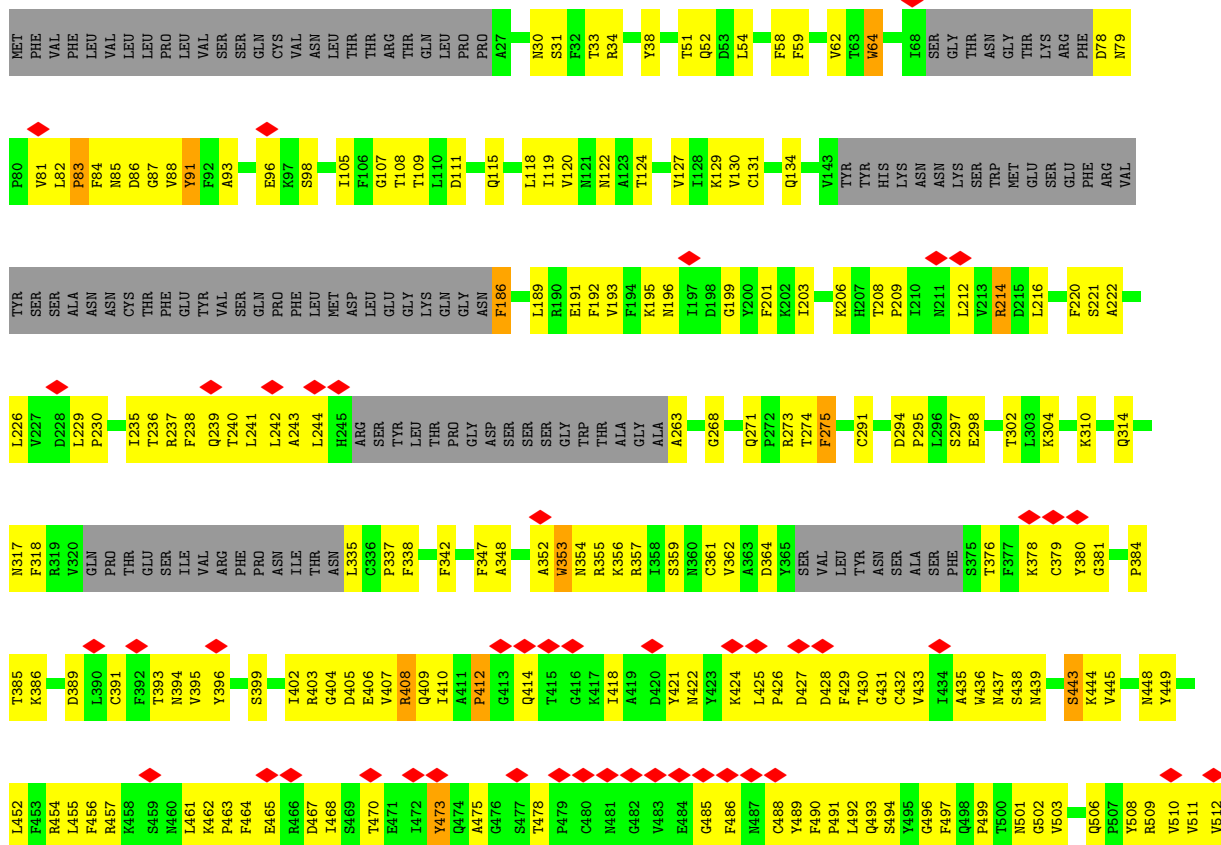


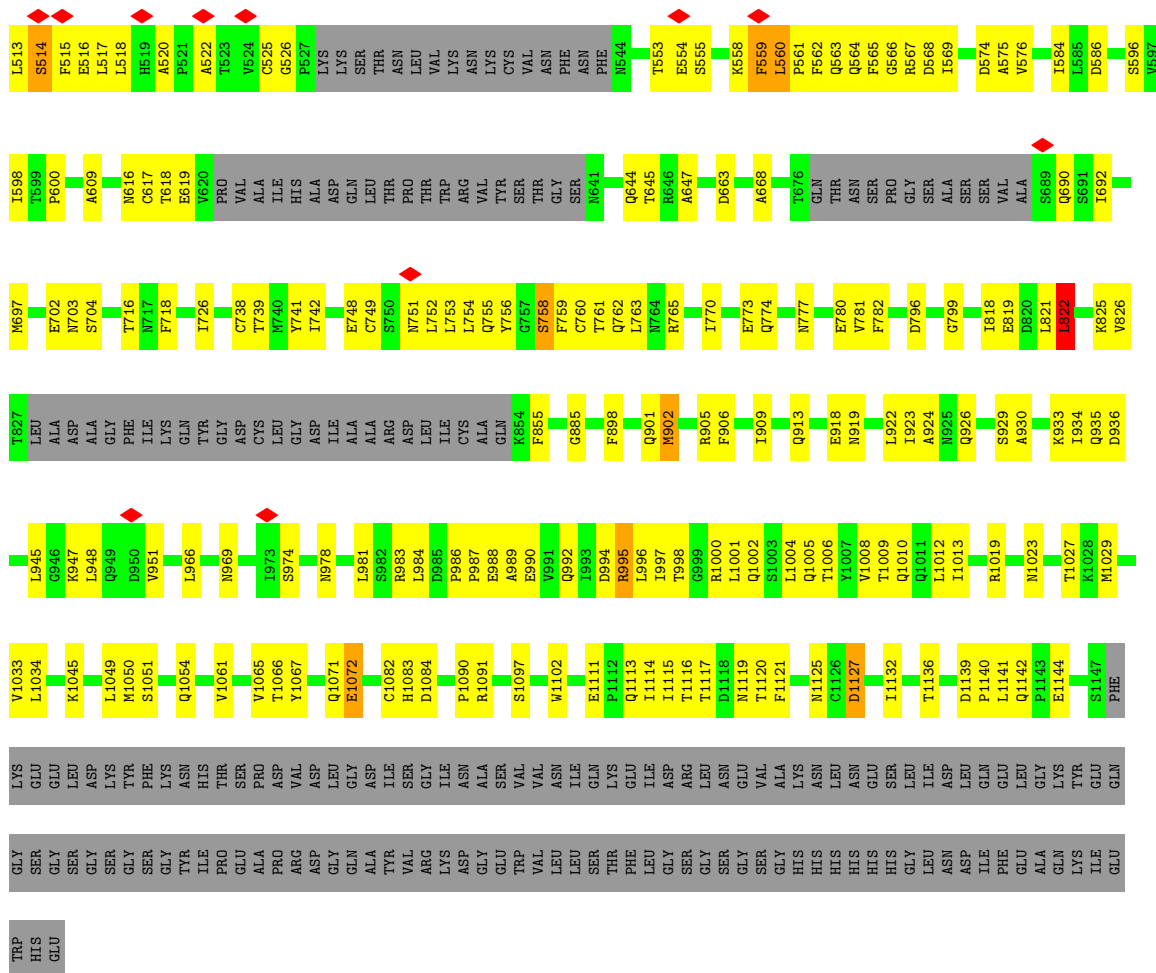
● Molecule 1: Spike glycoprotein



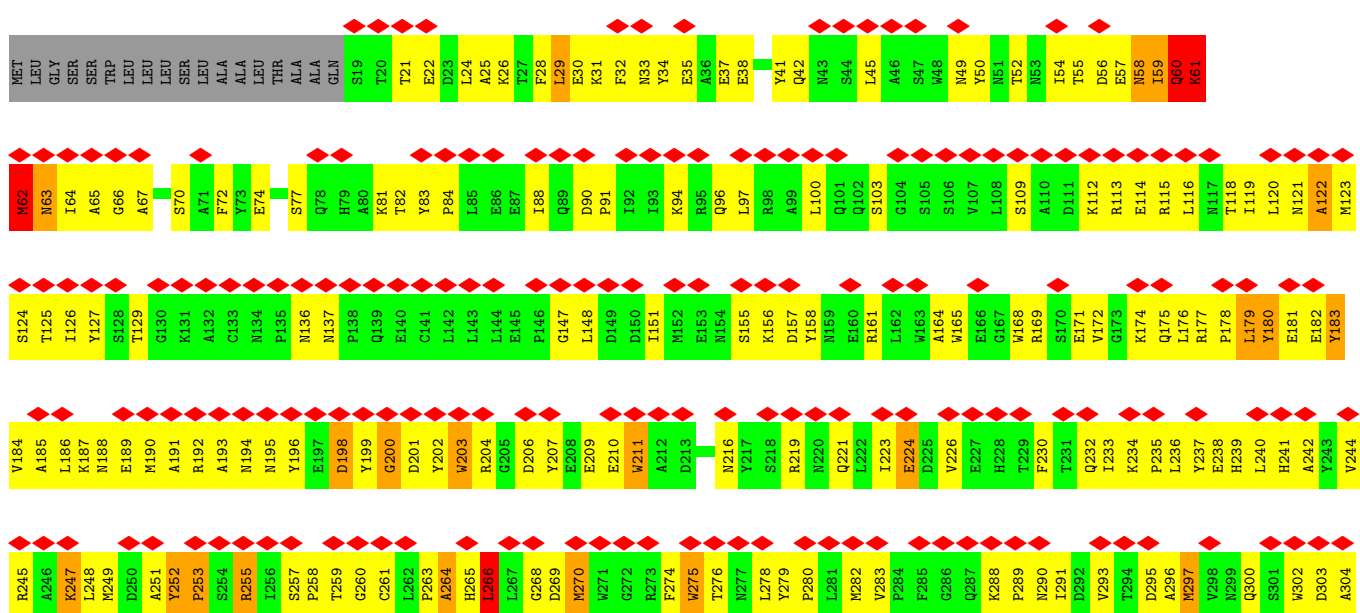
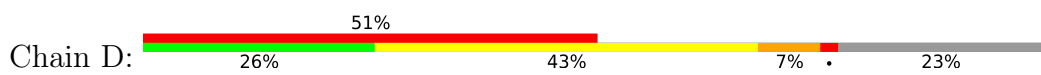


• Molecule 1: Spike glycoprotein





● Molecule 2: Angiotensin-converting enzyme



PRO	THR	ASP	D609	E549	V485	P426	T365	R305	G306	I307	D366	M366	T365	G306	D366	I307	D367	M367	T371	F308	D368	F428	F369	F369	E310	E430	D431	D431	A312	E312	K313	F314	F315	V316	S317	V318	G319	L320	L320	P321	N322	M323	M323	T324	E325	G326	F327	W328	Q329	Q329	N330	S331	M332	M332	L333	T334	E335	P336	G337	D338	D338	F340	N339	R340	K341	V342	V343	C344	C344	H345	F346	T347	A348	W349	D350	L351	G352	K353	H354	D355	F356	R357	I358	K359	M360	C361	T362	K363	V364
THR	GLU	VAL	W610	A550	G486	P426	T365	R306	G307	I308	D367	M367	T371	G307	D368	F429	F370	M370	T372	F309	D369	F429	F371	F372	E311	E431	D432	D432	A313	E313	K314	F316	F317	V319	S318	V319	G320	L321	L321	P322	N323	M324	M324	T325	E326	G327	F328	W329	Q330	Q330	N331	S332	M333	M333	L334	T335	E336	P337	G338	D339	D339	F341	N340	R341	K342	V344	V345	C345	C345	H346	F347	T348	A349	W350	D351	L352	G353	K354	H355	D356	F357	R358	I359	K360	M361	C362	T363	K364	V365
GLN	ASP	ASP	A614	K553	P490	S429	F369	E312	E432	D433	D433	A314	E314	F318	F319	V320	S319	V320	G321	L322	L322	P323	N324	M325	M325	T326	E327	G328	F329	W330	Q331	Q331	N332	S333	M334	M334	L335	T336	E337	P338	G339	D340	D340	F342	N341	R342	K343	V346	V347	C346	C346	H347	F348	T349	A350	W351	D352	L353	G354	K355	H356	D357	F358	R359	I360	K361	M362	C363	T364	K365	V366																		
GLY	LEU	LEU	A614	K554	P491	S430	F370	E313	E433	D434	D434	A315	E315	F319	F320	V321	S320	V321	G322	L323	L323	P324	N325	M326	M326	T327	E328	G329	F330	W331	Q332	Q332	N333	S334	M335	M335	L336	T337	E338	P339	G340	D341	D341	F343	N342	R343	K344	V348	V349	C347	C347	H348	F349	T350	A351	W352	D353	L354	G355	K356	H357	D358	F359	R360	I361	K362	M363	C364	T365	K366	V367																		
ASP	VAL	VAL	W611	A551	G487	P427	T366	R307	G308	I309	D368	M368	T372	G308	D369	F430	F371	M371	T373	F310	D370	F430	F373	F374	E314	E434	D435	D435	A316	E316	K315	F317	F321	V322	S321	V322	G323	L324	L324	P325	N326	M327	M327	T328	E329	G330	F331	W332	Q333	Q333	N334	S335	M336	M336	L337	T338	E339	P340	G341	D342	D342	F344	N343	R344	K345	V350	V351	C348	C348	H349	F350	T351	A352	W353	D354	L355	G356	K357	H358	D359	F360	R361	I362	K363	M364	C365	T366	K367	V368
GLY	LEU	LEU	A614	K555	P492	S431	F371	E314	E435	D436	D436	A317	E316	F320	F321	V323	S322	V323	G324	L325	L325	P326	N327	M328	M328	T329	E330	G331	F332	W333	Q334	Q334	N335	S336	M337	M337	L338	T339	E340	P341	G342	D343	D343	F345	N344	R345	K346	V352	V353	C349	C349	H350	F351	T352	A353	W354	D355	L356	G357	K358	H359	D360	F361	R362	I363	K364	M365	C366	T367	K368	V369																		
GLY	LEU	LEU	A614	K556	P493	S432	F372	E315	E436	D437	D437	A318	E317	F321	F322	V324	S323	V324	G325	L326	L326	P327	N328	M329	M329	T330	E331	G332	F333	W334	Q335	Q335	N336	S337	M338	M338	L339	T340	E341	P342	G343	D344	D344	F346	N345	R346	K347	V354	V355	C350	C350	H351	F352	T353	A354	W355	D356	L357	G358	K359	H360	D361	F362	R363	I364	K365	M366	C367	T368	K369	V370																		
THR	GLU	VAL	W612	A552	G488	P428	F373	E316	E437	D438	D438	A319	E318	F322	F323	V325	S324	V325	G326	L327	L327	P328	N329	M330	M330	T331	E332	G333	F334	W335	Q336	Q336	N337	S338	M339	M339	L340	T341	E342	P343	G344	D345	D345	F347	N346	R347	K348	V356	V357	C351	C351	H352	F353	T354	A355	W356	D357	L358	G359	K360	H361	D362	F363	R364	I365	K366	M367	C368	T369	K370	V371																		
LEU	VAL	VAL	W613	A553	G489	P429	F374	E317	E438	D439	D439	A320	E319	F323	F324	V326	S325	V326	G327	L328	L328	P329	N330	M331	M331	T332	E333	G334	F335	W336	Q337	Q337	N338	S339	M340	M340	L341	T342	E343	P344	G345	D346	D346	F348	N347	R348	K349	V358	V359	C352	C352	H353	F354	T355	A356	W357	D358	L359	G360	K361	H362	D363	F364	R365	I366	K367	M368	C369	T370	K371	V372																		
GLY	LEU	LEU	A614	K557	P494	S433	F375	E318	E439	D440	D440	A321	E320	F324	F325	V327	S326	V327	G328	L329	L329	P330	N331	M332	M332	T333	E334	G335	F336	W337	Q338	Q338	N339	S340	M341	M341	L342	T343	E344	P345	G346	D347	D347	F349	N348	R349	K350	V360	V361	C353	C353	H354	F355	T356	A357	W358	D359	L360	G361	K362	H363	D364	F365	R366	I367	K368	M369	C370	T371	K372	V373																		
THR	GLU	VAL	W614	A554	G490	P430	F376	E319	E440	D441	D441	A322	E321	F325	F326	V328	S327	V328	G329	L330	L330	P331	N332	M333	M333	T334	E335	G336	F337	W338	Q339	Q339	N340	S341	M342	M342	L343	T344	E345	P346	G347	D348	D348	F350	N349	R350	K351	V362	V363	C354	C354	H355	F356	T357	A358	W359	D360	L361	G362	K363	H364	D365	F366	R367	I368	K369	M370	C371	T372	K373	V374																		
GLY	LEU	LEU	A614	K558	P495	S434	F377	E320	E441	D442	D442	A323	E322	F326	F327	V329	S328	V329	G330	L331	L331	P332	N333	M334	M334	T335	E336	G337	F338	W339	Q340	Q340	N341	S342	M343	M343	L344	T345	E346	P347	G348	D349	D349	F351	N350	R351	K352	V364	V365	C355	C355	H356	F357	T358	A359	W360	D361	L362	G363	K364	H365	D366	F367	R368	I369	K370	M371	C372	T373	K374	V375																		
GLY	LEU	LEU	A614	K559	P496	S435	F378	E321	E442	D443	D443	A324	E323	F327	F328	V330	S329	V330	G331	L332	L332	P333	N334	M335	M335	T336	E337	G338	F339	W340	Q341	Q341	N342	S343	M344	M344	L345	T346	E347	P348	G349	D350	D350	F352	N351	R352	K353	V366	V367	C356	C356	H357	F358	T359	A360	W361	D362	L363	G364	K365	H366	D367	F368	R369	I370	K371	M372	C373	T374	K375	V376																		
GLY	LEU	LEU	A614	K560	P497	S436	F379	E322	E443	D444	D444	A325	E324	F328	F329	V331	S330	V331	G332	L333	L333	P334	N335	M336	M336	T337	E338	G339	F340	W341	Q342	Q342	N343	S344	M345	M345	L346	T347	E348	P349	G350	D351	D351	F353	N352	R353	K354	V368	V369	C357	C357	H358	F359	T360	A361	W362	D363	L364	G365	K366	H367	D368	F369	R370	I371	K372	M373	C374	T375	K376	V377																		
THR	GLU	VAL	W615	A555	G491	P431	F380	E323	E444	D445	D445	A326	E325	F329	F330	V332	S331	V332	G333	L334	L334	P335	N336	M337	M337	T338	E339	G340	F341	W342	Q343	Q343	N344	S345	M346	M346	L347	T348	E349	P350	G351	D352	D352	F354	N353	R354	K355	V370	V371	C358	C358	H359	F360	T361	A362	W363	D364	L365	G366	K367	H368	D369	F370	R371	I372	K373	M374	C375	T376	K377	V378																		
LEU	VAL	VAL	W616	A556	G492	P432	F381	E324	E445	D446	D446	A327	E326	F330	F331	V333	S332	V333	G334	L335	L335	P336	N337	M338	M338	T339	E340	G341	F342	W343	Q344	Q344	N345	S346	M347	M347	L348	T349	E350	P351	G352	D353	D353	F355	N354	R355	K356	V372	V373	C359	C359	H360	F361	T362	A363	W364	D365	L366	G367	K368	H369	D370	F371	R372	I373	K374	M375	C376	T377	K378	V379																		
GLY	LEU	LEU	A614	K561	P498	S437	F382	E325	E446	D447	D447	A328	E327	F331	F332	V334	S333	V334	G335	L336	L336	P337	N338	M339	M339	T340	E341	G342	F343	W344	Q345	Q345	N346	S347	M348	M348	L349	T350	E351	P352	G353	D354	D354	F356	N355	R356	K357	V374	V375	C360	C360	H361	F362	T363	A364	W365	D366	L367	G368	K369	H370	D371	F372	R373	I374	K375	M376	C377	T378	K379	V380																		
GLY	LEU	LEU	A614	K562	P499	S438	F383	E326	E447	D448	D448	A329	E328	F332	F333	V335	S334	V335	G336	L337	L337	P338	N339	M340	M340	T341	E342	G343	F344	W345	Q346	Q346	N347	S348	M349	M349	L350	T351	E352	P353	G354	D355	D355	F357	N356	R357	K358	V376	V377	C361	C361	H362	F363	T364	A365	W366	D367	L368	G369	K370	H371	D372	F373	R374	I375	K376	M377	C378	T379	K380	V381																		
GLY	LEU	LEU	A614	K563	P500	S439	F384	E327	E448	D449	D449	A330	E329	F333	F334	V336	S335	V336	G337	L338	L338	P339	N340	M341	M341	T342	E343	G344	F345	W346	Q347	Q347	N348	S349	M350	M350	L351	T352	E353	P354	G355	D356	D356	F358	N357	R358	K359	V378	V379	C362	C362	H363	F364	T365	A366	W367	D368	L369	G370	K371	H372	D373	F374	R375	I376	K377	M378	C379	T380	K381	V382																		
GLY	LEU	LEU	A614	K564	P501	S440	F385	E328	E449	D450	D450	A331	E330	F334	F335	V337	S336	V337	G338	L339	L339	P340	N341	M342	M342	T343	E344	G345	F346	W347	Q348	Q348	N349	S350	M351	M351	L352	T353	E354	P355	G356	D357	D357	F359	N358	R359	K360	V380	V381	C363	C363	H364	F365	T366	A367	W368	D369	L370	G371	K372	H373	D374	F375	R380	I381	K382	M379	C380	T381	K383	V383																		
GLY	LEU	LEU	A614	K565	P502	S441	F386	E329	E450	D451	D451	A332	E331	F335	F336	V338	S337	V338	G339	L340	L340	P341	N342																																																																		

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	146697	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 ($e^-/\text{\AA}^2$)	49.98	Depositor
Minimum defocus (nm)	750	Depositor
Maximum defocus (nm)	1750	Depositor
Magnification	81000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	1.865	Depositor
Minimum map value	-0.655	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.043	Depositor
Recommended contour level	0.309	Depositor
Map size (\AA)	568.32, 568.32, 568.32	wwPDB
Map dimensions	512, 512, 512	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.11, 1.11, 1.11	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	0.33	0/5938	0.67	8/8084 (0.1%)
1	B	0.30	0/5938	0.63	9/8084 (0.1%)
1	C	0.33	3/7598 (0.0%)	0.64	10/10340 (0.1%)
2	D	0.59	11/5047 (0.2%)	1.08	50/6854 (0.7%)
All	All	0.39	14/24521 (0.1%)	0.76	77/33362 (0.2%)

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	17
1	B	0	7
1	C	0	3
2	D	0	29
All	All	0	56

The worst 5 of 14 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	530	CYS	CB-SG	11.73	2.02	1.82
2	D	63	ASN	N-CA	11.02	1.68	1.46
2	D	62	MET	C-N	9.56	1.56	1.34
2	D	542	CYS	CB-SG	-9.44	1.66	1.82
2	D	60	GLN	CA-C	8.44	1.74	1.52

The worst 5 of 77 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	200	GLY	N-CA-C	14.25	148.73	113.10
1	C	412	PRO	CA-N-CD	-13.60	92.45	111.50
1	C	83	PRO	CA-N-CD	-13.02	93.27	111.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	62	MET	CB-CG-SD	12.81	150.84	112.40
2	D	542	CYS	C-N-CA	11.64	150.80	121.70

There are no chirality outliers.

5 of 56 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	29	THR	Peptide
1	A	30	ASN	Peptide
1	A	33	THR	Peptide
1	A	83	PRO	Peptide
1	A	91	TYR	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	5813	0	5715	376	0
1	B	5813	0	5715	270	0
1	C	7431	0	7268	312	0
2	D	4904	0	4667	709	0
All	All	23961	0	23365	1628	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 34.

The worst 5 of 1628 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:D:63:ASN:N	2:D:63:ASN:CA	1.68	1.52
2:D:60:GLN:C	2:D:60:GLN:CA	1.74	1.50
2:D:530:CYS:CB	2:D:530:CYS:SG	2.02	1.48
2:D:558:LEU:H	2:D:570:LEU:N	1.19	1.39
2:D:531:GLN:N	2:D:543:ASP:H	1.32	1.27

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	730/1269 (58%)	636 (87%)	92 (13%)	2 (0%)	41	74
1	B	730/1269 (58%)	653 (90%)	73 (10%)	4 (0%)	29	66
1	C	934/1269 (74%)	834 (89%)	100 (11%)	0	100	100
2	D	594/771 (77%)	461 (78%)	128 (22%)	5 (1%)	19	56
All	All	2988/4578 (65%)	2584 (86%)	393 (13%)	11 (0%)	38	70

5 of 11 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	85	ASN
1	B	189	LEU
1	B	986	PRO
2	D	198	ASP
2	D	566	TRP

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	657/1101 (60%)	635 (97%)	22 (3%)	38	64
1	B	657/1101 (60%)	631 (96%)	26 (4%)	31	59
1	C	831/1101 (76%)	809 (97%)	22 (3%)	46	69
2	D	524/676 (78%)	504 (96%)	20 (4%)	33	60
All	All	2669/3979 (67%)	2579 (97%)	90 (3%)	40	64

5 of 90 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	378	LYS
2	D	183	TYR
1	C	443	SER
1	C	822	LEU
2	D	247	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 22 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	195	ASN
2	D	416	ASN
2	D	388	GLN
2	D	420	ASN
1	B	271	GLN

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

There are no chain breaks in this entry.

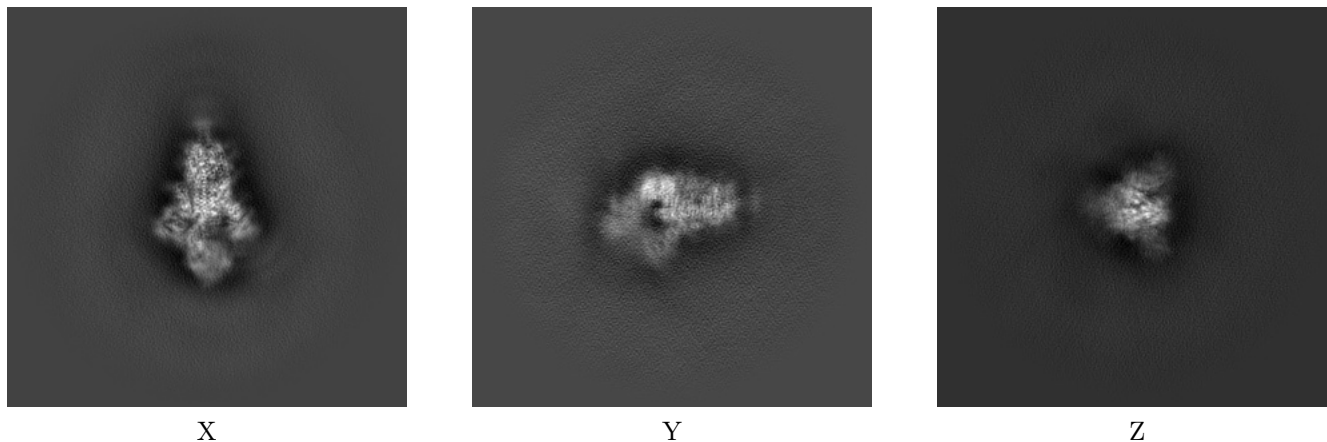
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-40978. These allow visual inspection of the internal detail of the map and identification of artifacts.

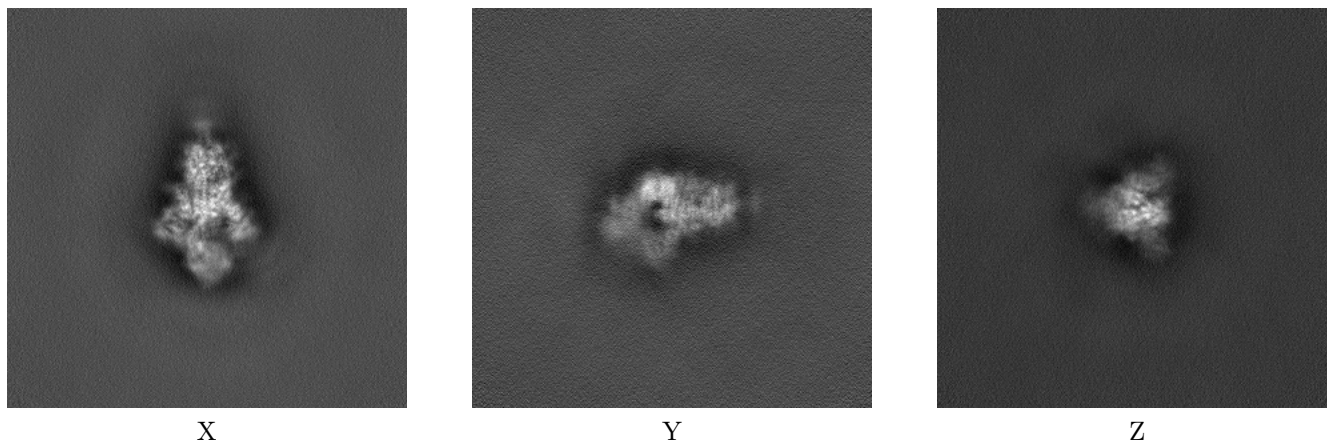
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

6.1.1 Primary map



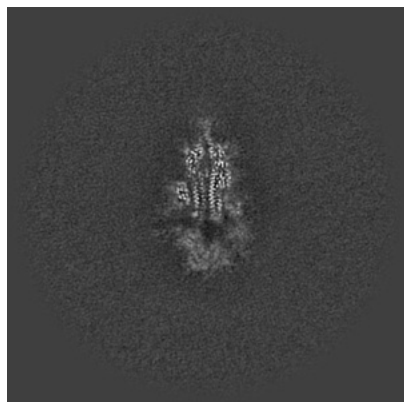
6.1.2 Raw map



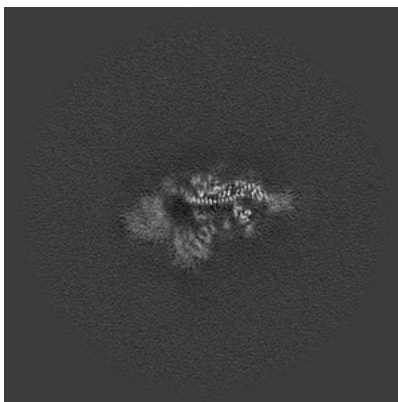
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

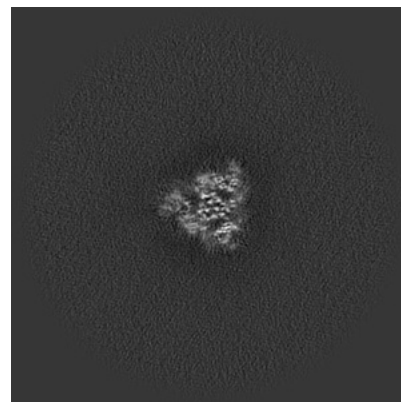
6.2.1 Primary map



X Index: 256



Y Index: 256

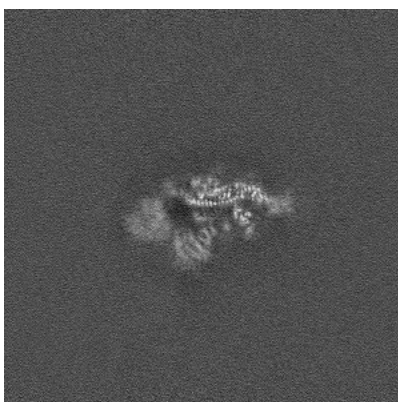


Z Index: 256

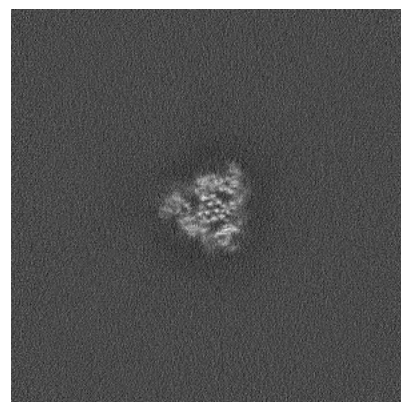
6.2.2 Raw map



X Index: 256



Y Index: 256

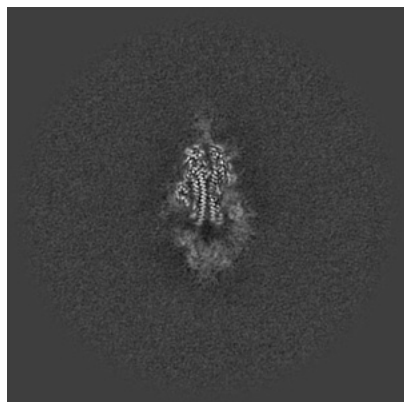


Z Index: 256

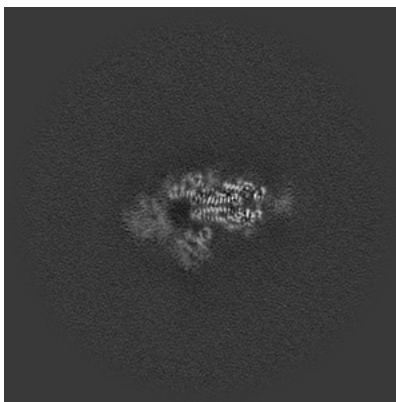
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

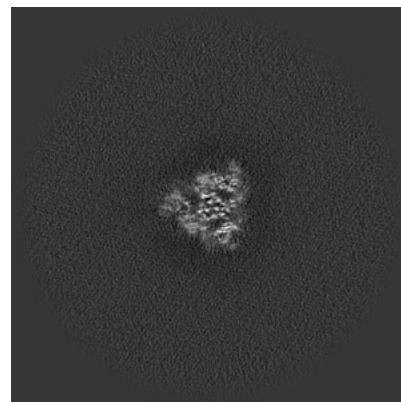
6.3.1 Primary map



X Index: 252

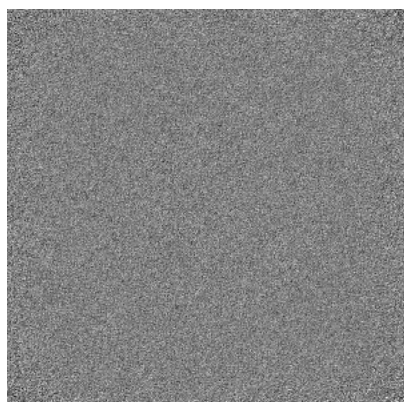


Y Index: 252

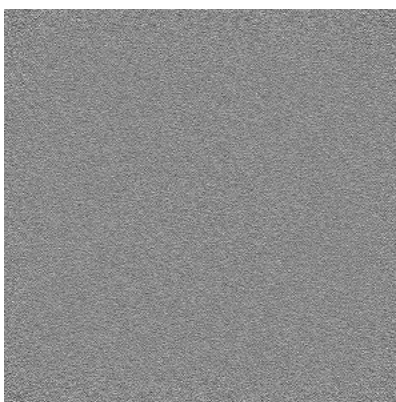


Z Index: 256

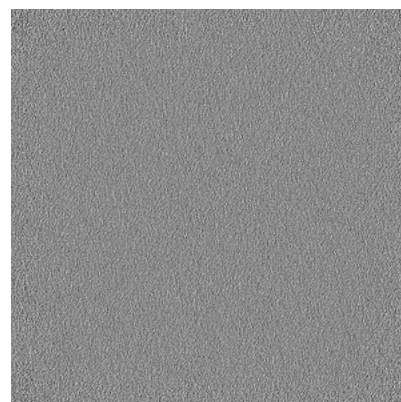
6.3.2 Raw map



X Index: 0



Y Index: 0

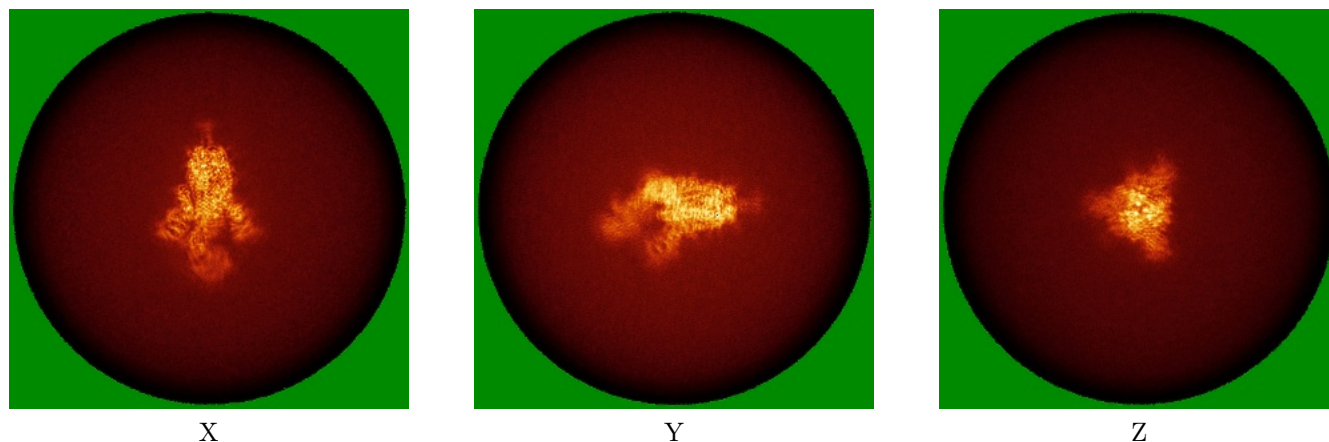


Z Index: 0

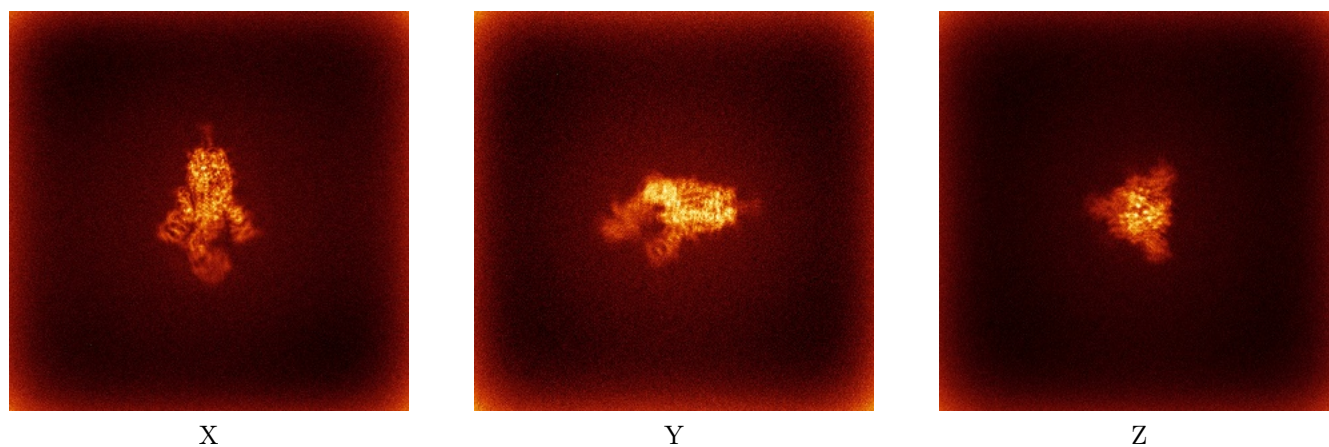
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map



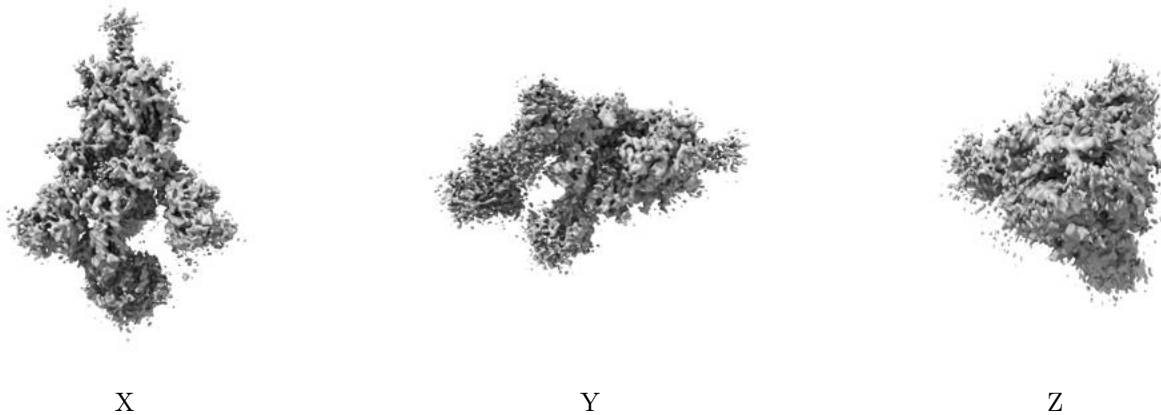
6.4.2 Raw map



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.

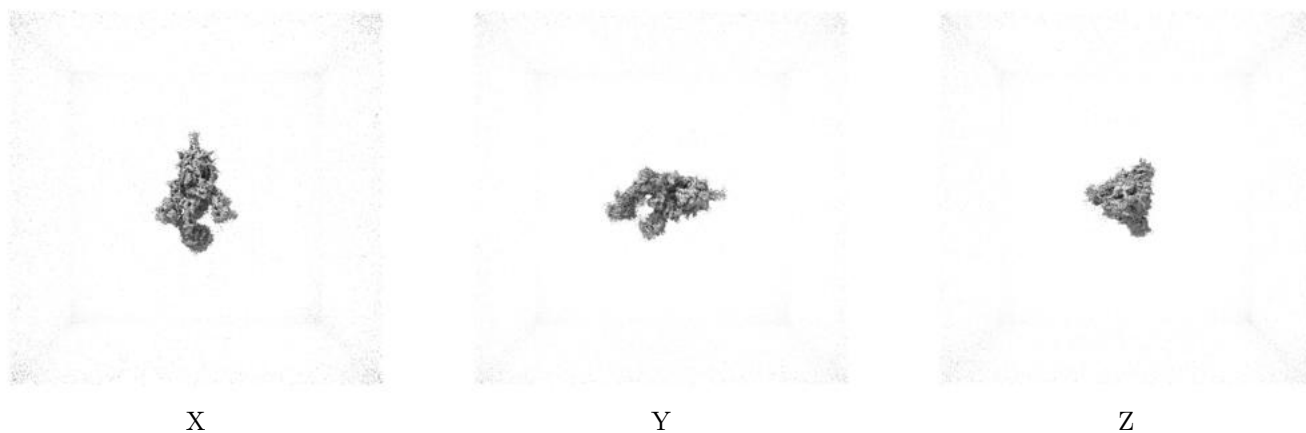
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.309. 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.

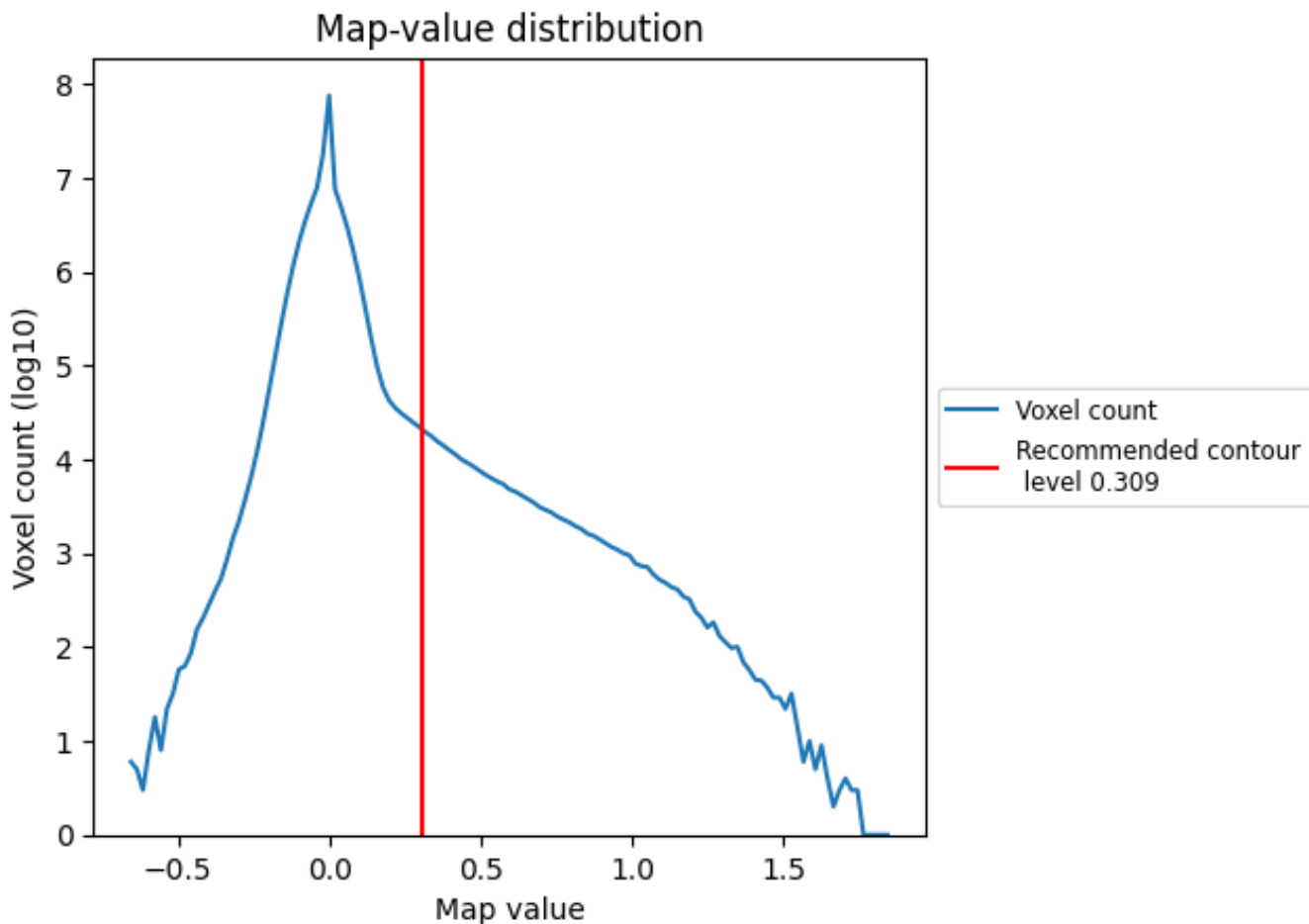
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

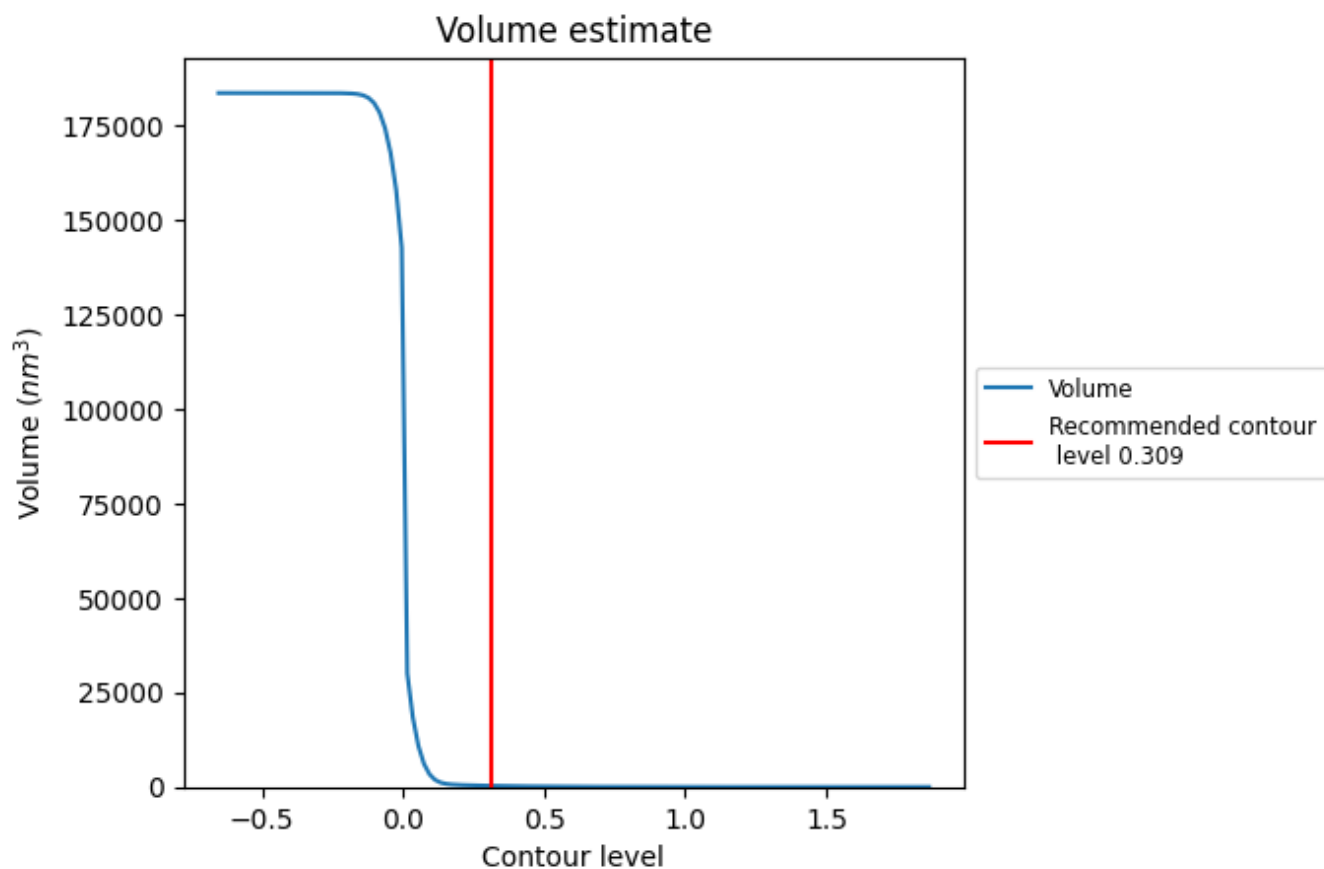
This section contains the results of statistical analysis of the map.

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.

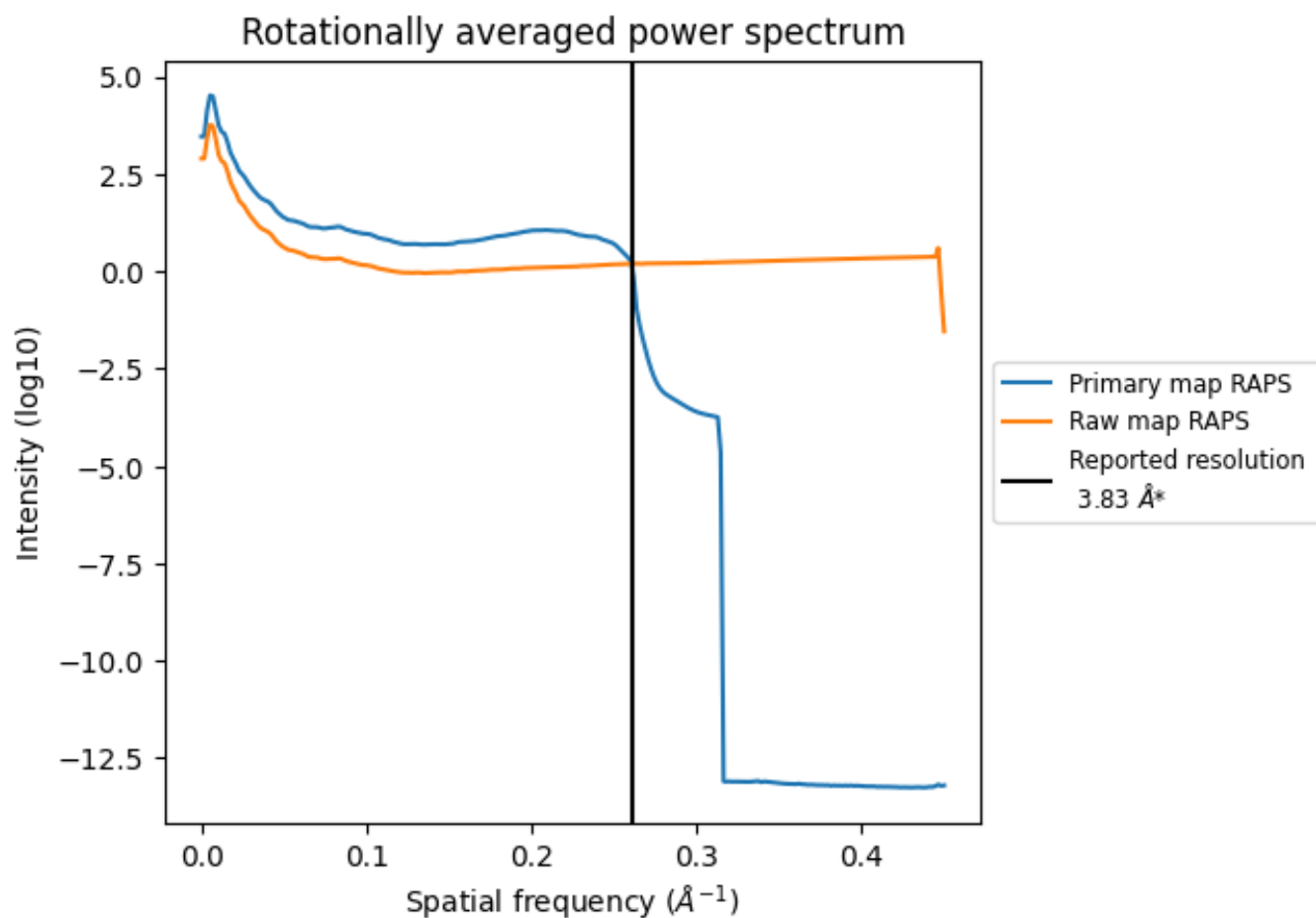
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 298 nm^3 ; this corresponds to an approximate mass of 269 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](#)

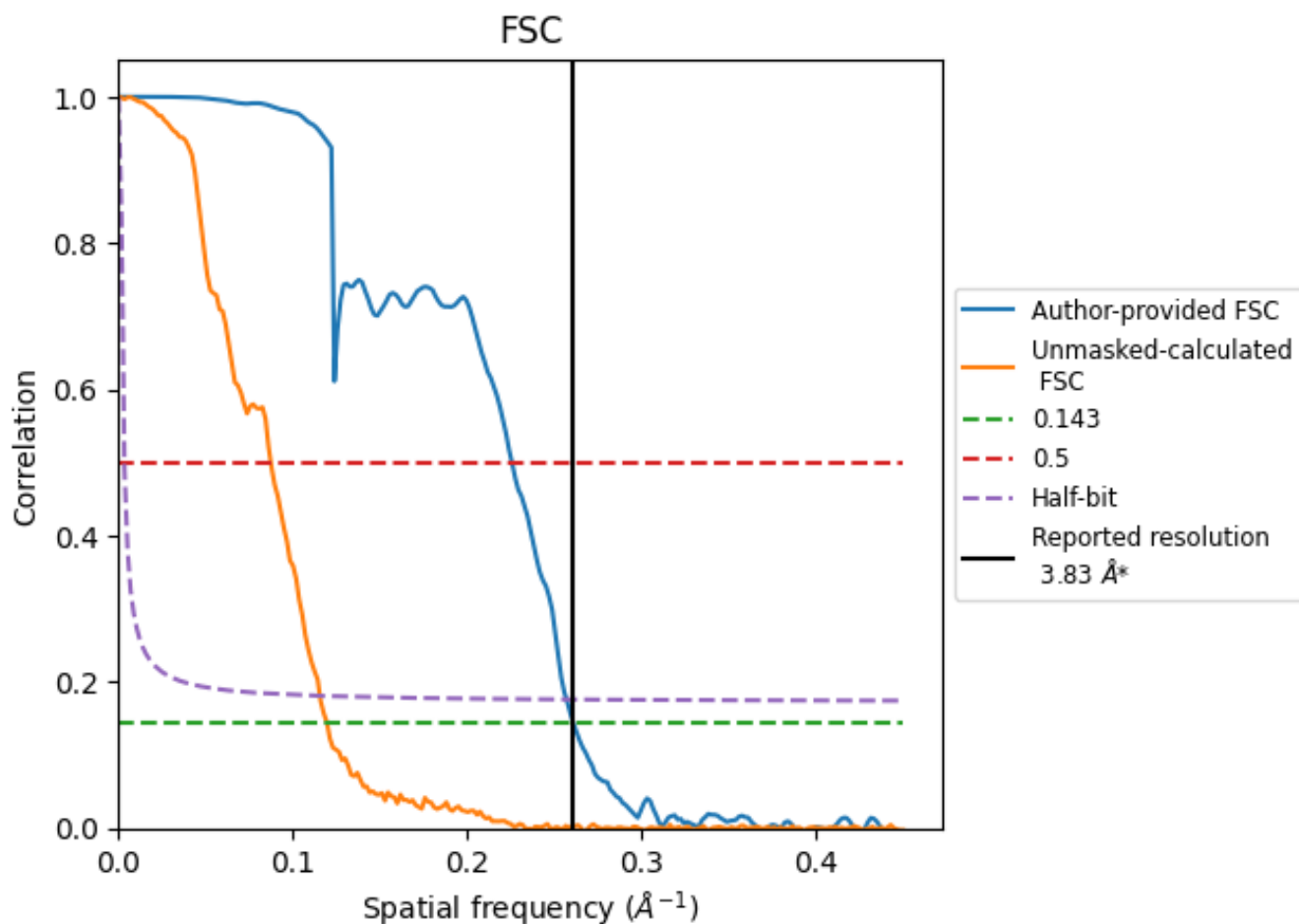


*Reported resolution corresponds to spatial frequency of 0.261 Å⁻¹

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 0.261 Å⁻¹

8.2 Resolution estimates [i](#)

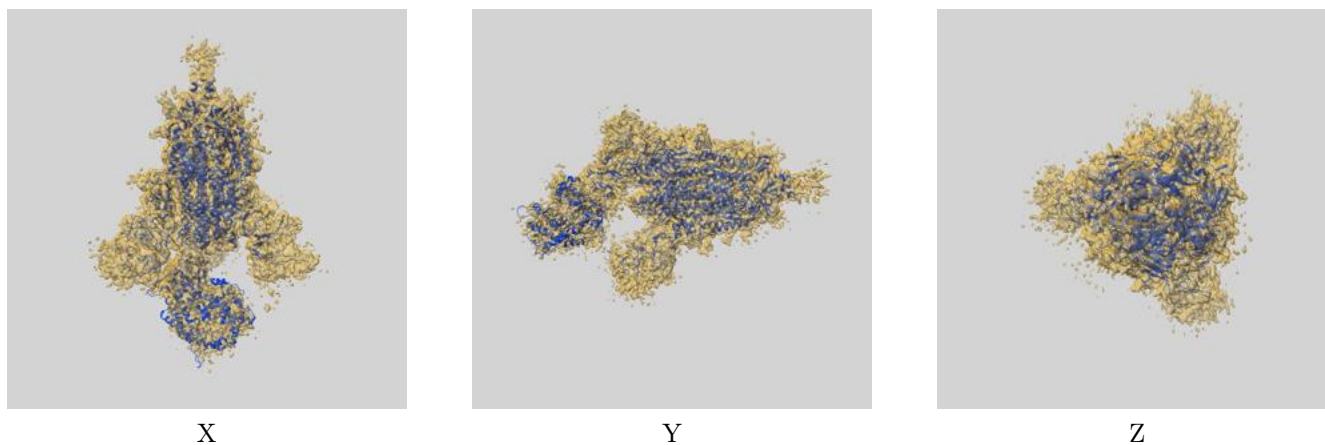
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.83	-	-
Author-provided FSC curve	3.83	4.43	3.89
Unmasked-calculated*	8.35	11.43	8.64

*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 8.35 differs from the reported value 3.83 by more than 10 %

9 Map-model fit [i](#)

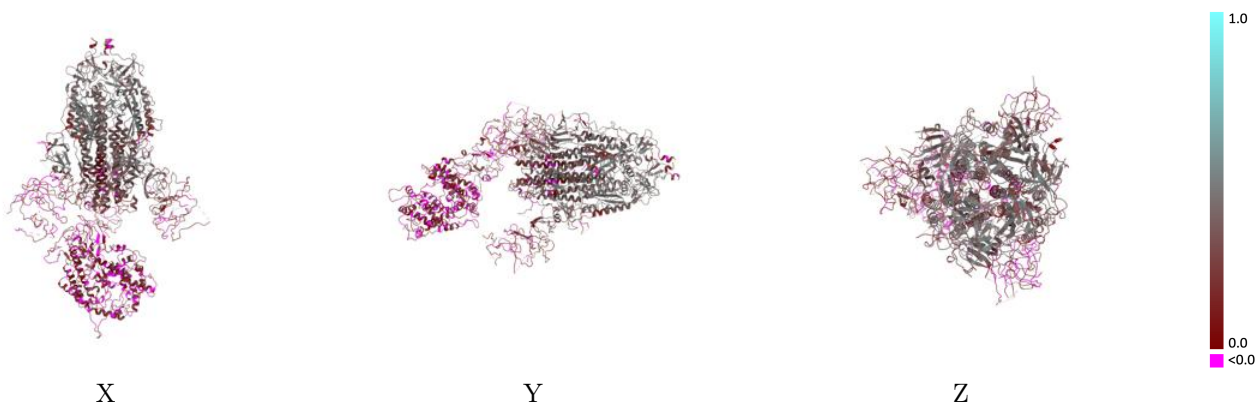
This section contains information regarding the fit between EMDB map EMD-40978 and PDB model 8T22. Per-residue inclusion information can be found in section 3 on page 10.

9.1 Map-model overlay [i](#)



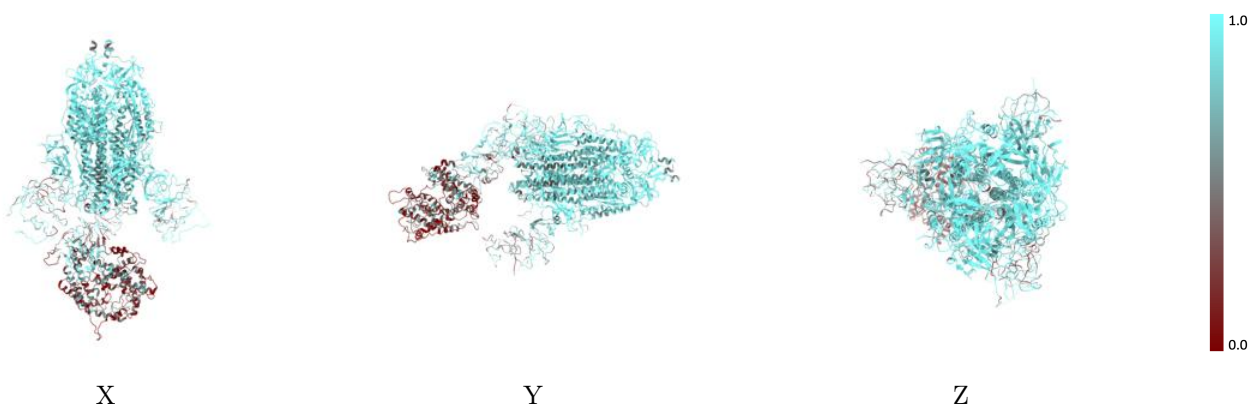
The images above show the 3D surface view of the map at the recommended contour level 0.309 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



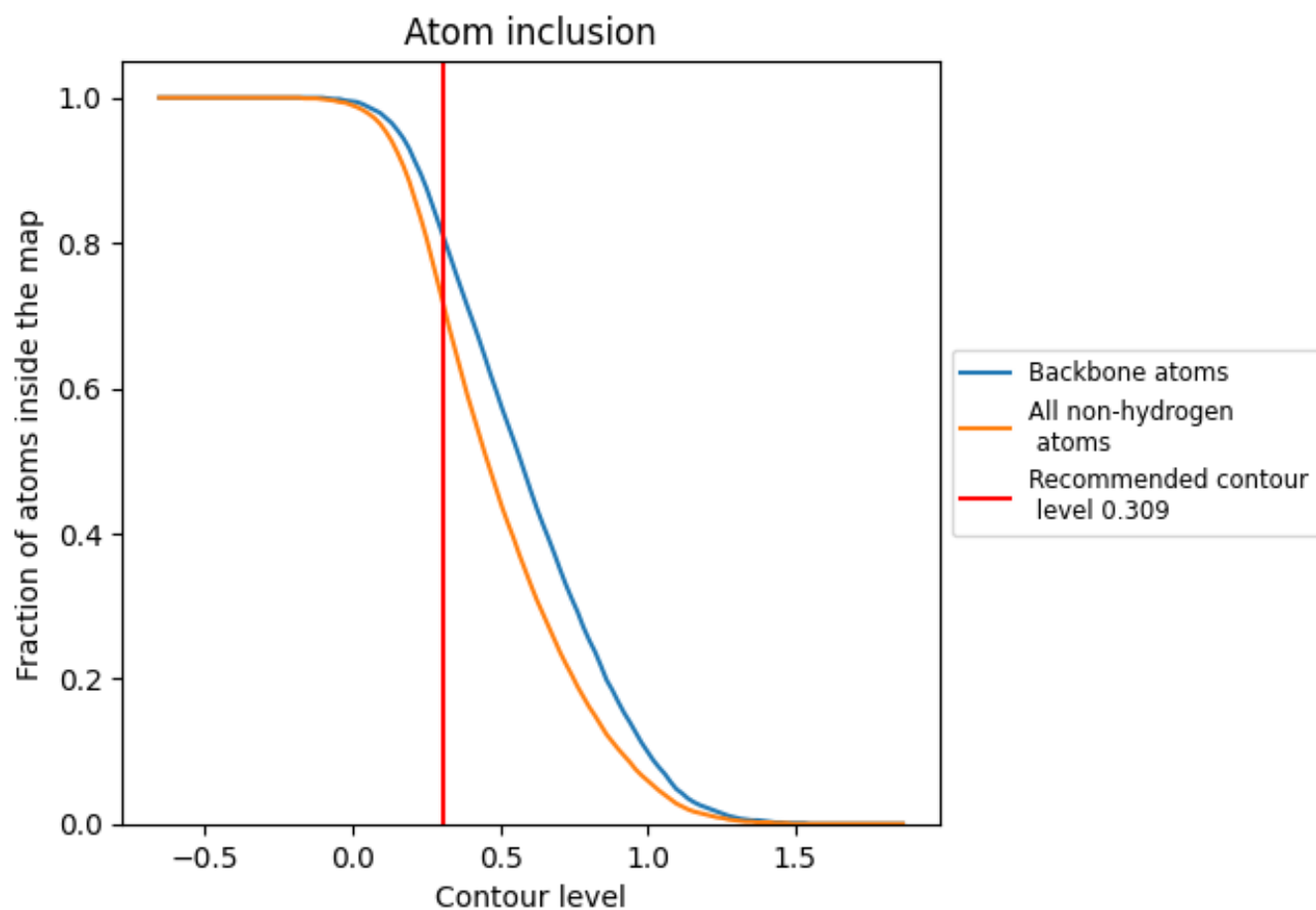
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.309).











9.4 Atom inclusion [i](#)



At the recommended contour level, 81% 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 (0.309) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7140	 0.2580
A	 0.8290	 0.3040
B	 0.8050	 0.3120
C	 0.8220	 0.2940
D	 0.3020	 0.0840

