



## wwPDB EM Validation Summary Report ⓘ

Dec 7, 2022 – 04:09 PM JST

PDB ID : 7VMM  
EMDB ID : EMD-33936  
Title : Structure of recombinant RyR2 (EGTA dataset, class 1, closed state)  
Authors : Kobayashi, T.; Tsutsumi, A.; Kurebayashi, N.; Kodama, M.; Kikkawa, M.;  
Murayama, T.; Ogawa, H.  
Deposited on : 2021-10-09  
Resolution : 3.50 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](mailto: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>.

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

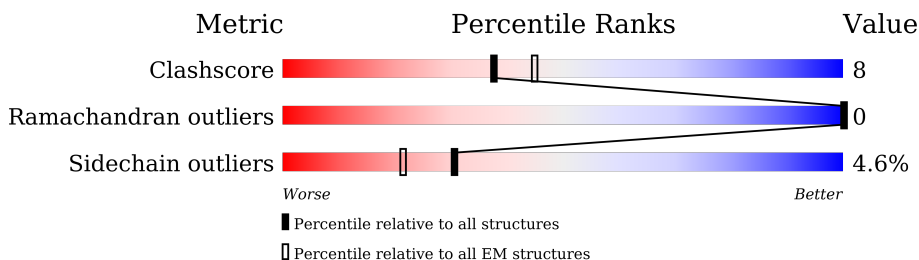
EMDB validation analysis : 0.0.1.dev43  
MolProbity : 4.02b-467  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.9  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 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 3.50 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  $\geq 3$ , 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	4966	
1	B	4966	
1	C	4966	
1	D	4966	
2	G	176	
2	H	176	
2	I	176	
2	J	176	

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 123564 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 Ryanodine receptor 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	4044	30071	19035	5243	5617	176	0	0
1	B	4044	30071	19035	5243	5617	176	0	0
1	C	4044	30071	19035	5243	5617	176	0	0
1	D	4044	30071	19035	5243	5617	176	0	0

- Molecule 2 is a protein called Peptidyl-prolyl cis-trans isomerase FKBP1B.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	G	107	819	516	144	155	4	0	0
2	H	107	819	516	144	155	4	0	0
2	I	107	819	516	144	155	4	0	0
2	J	107	819	516	144	155	4	0	0

There are 276 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
G	-67	MET	-	initiating methionine	UNP P68106
G	-66	GLY	-	expression tag	UNP P68106
G	-65	SER	-	expression tag	UNP P68106
G	-64	SER	-	expression tag	UNP P68106
G	-63	HIS	-	expression tag	UNP P68106
G	-62	HIS	-	expression tag	UNP P68106
G	-61	HIS	-	expression tag	UNP P68106
G	-60	HIS	-	expression tag	UNP P68106
G	-59	HIS	-	expression tag	UNP P68106

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Chain	Residue	Modelled	Actual	Comment	Reference
G	-58	HIS	-	expression tag	UNP P68106
G	-57	SER	-	expression tag	UNP P68106
G	-56	SER	-	expression tag	UNP P68106
G	-55	GLY	-	expression tag	UNP P68106
G	-54	LEU	-	expression tag	UNP P68106
G	-53	VAL	-	expression tag	UNP P68106
G	-52	PRO	-	expression tag	UNP P68106
G	-51	ARG	-	expression tag	UNP P68106
G	-50	GLY	-	expression tag	UNP P68106
G	-49	SER	-	expression tag	UNP P68106
G	-48	HIS	-	expression tag	UNP P68106
G	-47	MET	-	expression tag	UNP P68106
G	-46	ALA	-	expression tag	UNP P68106
G	-45	SER	-	expression tag	UNP P68106
G	-44	MET	-	expression tag	UNP P68106
G	-43	ASP	-	expression tag	UNP P68106
G	-42	GLU	-	expression tag	UNP P68106
G	-41	LYS	-	expression tag	UNP P68106
G	-40	THR	-	expression tag	UNP P68106
G	-39	THR	-	expression tag	UNP P68106
G	-38	GLY	-	expression tag	UNP P68106
G	-37	TRP	-	expression tag	UNP P68106
G	-36	ARG	-	expression tag	UNP P68106
G	-35	GLY	-	expression tag	UNP P68106
G	-34	GLY	-	expression tag	UNP P68106
G	-33	HIS	-	expression tag	UNP P68106
G	-32	VAL	-	expression tag	UNP P68106
G	-31	VAL	-	expression tag	UNP P68106
G	-30	GLU	-	expression tag	UNP P68106
G	-29	GLY	-	expression tag	UNP P68106
G	-28	LEU	-	expression tag	UNP P68106
G	-27	ALA	-	expression tag	UNP P68106
G	-26	GLY	-	expression tag	UNP P68106
G	-25	GLU	-	expression tag	UNP P68106
G	-24	LEU	-	expression tag	UNP P68106
G	-23	GLU	-	expression tag	UNP P68106
G	-22	GLN	-	expression tag	UNP P68106
G	-21	LEU	-	expression tag	UNP P68106
G	-20	ARG	-	expression tag	UNP P68106
G	-19	ALA	-	expression tag	UNP P68106
G	-18	ARG	-	expression tag	UNP P68106
G	-17	LEU	-	expression tag	UNP P68106

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Chain	Residue	Modelled	Actual	Comment	Reference
G	-16	GLU	-	expression tag	UNP P68106
G	-15	HIS	-	expression tag	UNP P68106
G	-14	HIS	-	expression tag	UNP P68106
G	-13	PRO	-	expression tag	UNP P68106
G	-12	GLN	-	expression tag	UNP P68106
G	-11	GLY	-	expression tag	UNP P68106
G	-10	GLN	-	expression tag	UNP P68106
G	-9	ARG	-	expression tag	UNP P68106
G	-8	GLU	-	expression tag	UNP P68106
G	-7	PRO	-	expression tag	UNP P68106
G	-6	GLY	-	expression tag	UNP P68106
G	-5	SER	-	expression tag	UNP P68106
G	-4	GLY	-	expression tag	UNP P68106
G	-3	GLY	-	expression tag	UNP P68106
G	-2	SER	-	expression tag	UNP P68106
G	-1	GLY	-	expression tag	UNP P68106
G	0	GLY	-	expression tag	UNP P68106
G	1	THR	-	expression tag	UNP P68106
H	-67	MET	-	initiating methionine	UNP P68106
H	-66	GLY	-	expression tag	UNP P68106
H	-65	SER	-	expression tag	UNP P68106
H	-64	SER	-	expression tag	UNP P68106
H	-63	HIS	-	expression tag	UNP P68106
H	-62	HIS	-	expression tag	UNP P68106
H	-61	HIS	-	expression tag	UNP P68106
H	-60	HIS	-	expression tag	UNP P68106
H	-59	HIS	-	expression tag	UNP P68106
H	-58	HIS	-	expression tag	UNP P68106
H	-57	SER	-	expression tag	UNP P68106
H	-56	SER	-	expression tag	UNP P68106
H	-55	GLY	-	expression tag	UNP P68106
H	-54	LEU	-	expression tag	UNP P68106
H	-53	VAL	-	expression tag	UNP P68106
H	-52	PRO	-	expression tag	UNP P68106
H	-51	ARG	-	expression tag	UNP P68106
H	-50	GLY	-	expression tag	UNP P68106
H	-49	SER	-	expression tag	UNP P68106
H	-48	HIS	-	expression tag	UNP P68106
H	-47	MET	-	expression tag	UNP P68106
H	-46	ALA	-	expression tag	UNP P68106
H	-45	SER	-	expression tag	UNP P68106
H	-44	MET	-	expression tag	UNP P68106

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Chain	Residue	Modelled	Actual	Comment	Reference
H	-43	ASP	-	expression tag	UNP P68106
H	-42	GLU	-	expression tag	UNP P68106
H	-41	LYS	-	expression tag	UNP P68106
H	-40	THR	-	expression tag	UNP P68106
H	-39	THR	-	expression tag	UNP P68106
H	-38	GLY	-	expression tag	UNP P68106
H	-37	TRP	-	expression tag	UNP P68106
H	-36	ARG	-	expression tag	UNP P68106
H	-35	GLY	-	expression tag	UNP P68106
H	-34	GLY	-	expression tag	UNP P68106
H	-33	HIS	-	expression tag	UNP P68106
H	-32	VAL	-	expression tag	UNP P68106
H	-31	VAL	-	expression tag	UNP P68106
H	-30	GLU	-	expression tag	UNP P68106
H	-29	GLY	-	expression tag	UNP P68106
H	-28	LEU	-	expression tag	UNP P68106
H	-27	ALA	-	expression tag	UNP P68106
H	-26	GLY	-	expression tag	UNP P68106
H	-25	GLU	-	expression tag	UNP P68106
H	-24	LEU	-	expression tag	UNP P68106
H	-23	GLU	-	expression tag	UNP P68106
H	-22	GLN	-	expression tag	UNP P68106
H	-21	LEU	-	expression tag	UNP P68106
H	-20	ARG	-	expression tag	UNP P68106
H	-19	ALA	-	expression tag	UNP P68106
H	-18	ARG	-	expression tag	UNP P68106
H	-17	LEU	-	expression tag	UNP P68106
H	-16	GLU	-	expression tag	UNP P68106
H	-15	HIS	-	expression tag	UNP P68106
H	-14	HIS	-	expression tag	UNP P68106
H	-13	PRO	-	expression tag	UNP P68106
H	-12	GLN	-	expression tag	UNP P68106
H	-11	GLY	-	expression tag	UNP P68106
H	-10	GLN	-	expression tag	UNP P68106
H	-9	ARG	-	expression tag	UNP P68106
H	-8	GLU	-	expression tag	UNP P68106
H	-7	PRO	-	expression tag	UNP P68106
H	-6	GLY	-	expression tag	UNP P68106
H	-5	SER	-	expression tag	UNP P68106
H	-4	GLY	-	expression tag	UNP P68106
H	-3	GLY	-	expression tag	UNP P68106
H	-2	SER	-	expression tag	UNP P68106

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Chain	Residue	Modelled	Actual	Comment	Reference
H	-1	GLY	-	expression tag	UNP P68106
H	0	GLY	-	expression tag	UNP P68106
H	1	THR	-	expression tag	UNP P68106
I	-67	MET	-	initiating methionine	UNP P68106
I	-66	GLY	-	expression tag	UNP P68106
I	-65	SER	-	expression tag	UNP P68106
I	-64	SER	-	expression tag	UNP P68106
I	-63	HIS	-	expression tag	UNP P68106
I	-62	HIS	-	expression tag	UNP P68106
I	-61	HIS	-	expression tag	UNP P68106
I	-60	HIS	-	expression tag	UNP P68106
I	-59	HIS	-	expression tag	UNP P68106
I	-58	HIS	-	expression tag	UNP P68106
I	-57	SER	-	expression tag	UNP P68106
I	-56	SER	-	expression tag	UNP P68106
I	-55	GLY	-	expression tag	UNP P68106
I	-54	LEU	-	expression tag	UNP P68106
I	-53	VAL	-	expression tag	UNP P68106
I	-52	PRO	-	expression tag	UNP P68106
I	-51	ARG	-	expression tag	UNP P68106
I	-50	GLY	-	expression tag	UNP P68106
I	-49	SER	-	expression tag	UNP P68106
I	-48	HIS	-	expression tag	UNP P68106
I	-47	MET	-	expression tag	UNP P68106
I	-46	ALA	-	expression tag	UNP P68106
I	-45	SER	-	expression tag	UNP P68106
I	-44	MET	-	expression tag	UNP P68106
I	-43	ASP	-	expression tag	UNP P68106
I	-42	GLU	-	expression tag	UNP P68106
I	-41	LYS	-	expression tag	UNP P68106
I	-40	THR	-	expression tag	UNP P68106
I	-39	THR	-	expression tag	UNP P68106
I	-38	GLY	-	expression tag	UNP P68106
I	-37	TRP	-	expression tag	UNP P68106
I	-36	ARG	-	expression tag	UNP P68106
I	-35	GLY	-	expression tag	UNP P68106
I	-34	GLY	-	expression tag	UNP P68106
I	-33	HIS	-	expression tag	UNP P68106
I	-32	VAL	-	expression tag	UNP P68106
I	-31	VAL	-	expression tag	UNP P68106
I	-30	GLU	-	expression tag	UNP P68106
I	-29	GLY	-	expression tag	UNP P68106

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Chain	Residue	Modelled	Actual	Comment	Reference
I	-28	LEU	-	expression tag	UNP P68106
I	-27	ALA	-	expression tag	UNP P68106
I	-26	GLY	-	expression tag	UNP P68106
I	-25	GLU	-	expression tag	UNP P68106
I	-24	LEU	-	expression tag	UNP P68106
I	-23	GLU	-	expression tag	UNP P68106
I	-22	GLN	-	expression tag	UNP P68106
I	-21	LEU	-	expression tag	UNP P68106
I	-20	ARG	-	expression tag	UNP P68106
I	-19	ALA	-	expression tag	UNP P68106
I	-18	ARG	-	expression tag	UNP P68106
I	-17	LEU	-	expression tag	UNP P68106
I	-16	GLU	-	expression tag	UNP P68106
I	-15	HIS	-	expression tag	UNP P68106
I	-14	HIS	-	expression tag	UNP P68106
I	-13	PRO	-	expression tag	UNP P68106
I	-12	GLN	-	expression tag	UNP P68106
I	-11	GLY	-	expression tag	UNP P68106
I	-10	GLN	-	expression tag	UNP P68106
I	-9	ARG	-	expression tag	UNP P68106
I	-8	GLU	-	expression tag	UNP P68106
I	-7	PRO	-	expression tag	UNP P68106
I	-6	GLY	-	expression tag	UNP P68106
I	-5	SER	-	expression tag	UNP P68106
I	-4	GLY	-	expression tag	UNP P68106
I	-3	GLY	-	expression tag	UNP P68106
I	-2	SER	-	expression tag	UNP P68106
I	-1	GLY	-	expression tag	UNP P68106
I	0	GLY	-	expression tag	UNP P68106
I	1	THR	-	expression tag	UNP P68106
J	-67	MET	-	initiating methionine	UNP P68106
J	-66	GLY	-	expression tag	UNP P68106
J	-65	SER	-	expression tag	UNP P68106
J	-64	SER	-	expression tag	UNP P68106
J	-63	HIS	-	expression tag	UNP P68106
J	-62	HIS	-	expression tag	UNP P68106
J	-61	HIS	-	expression tag	UNP P68106
J	-60	HIS	-	expression tag	UNP P68106
J	-59	HIS	-	expression tag	UNP P68106
J	-58	HIS	-	expression tag	UNP P68106
J	-57	SER	-	expression tag	UNP P68106
J	-56	SER	-	expression tag	UNP P68106

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Chain	Residue	Modelled	Actual	Comment	Reference
J	-55	GLY	-	expression tag	UNP P68106
J	-54	LEU	-	expression tag	UNP P68106
J	-53	VAL	-	expression tag	UNP P68106
J	-52	PRO	-	expression tag	UNP P68106
J	-51	ARG	-	expression tag	UNP P68106
J	-50	GLY	-	expression tag	UNP P68106
J	-49	SER	-	expression tag	UNP P68106
J	-48	HIS	-	expression tag	UNP P68106
J	-47	MET	-	expression tag	UNP P68106
J	-46	ALA	-	expression tag	UNP P68106
J	-45	SER	-	expression tag	UNP P68106
J	-44	MET	-	expression tag	UNP P68106
J	-43	ASP	-	expression tag	UNP P68106
J	-42	GLU	-	expression tag	UNP P68106
J	-41	LYS	-	expression tag	UNP P68106
J	-40	THR	-	expression tag	UNP P68106
J	-39	THR	-	expression tag	UNP P68106
J	-38	GLY	-	expression tag	UNP P68106
J	-37	TRP	-	expression tag	UNP P68106
J	-36	ARG	-	expression tag	UNP P68106
J	-35	GLY	-	expression tag	UNP P68106
J	-34	GLY	-	expression tag	UNP P68106
J	-33	HIS	-	expression tag	UNP P68106
J	-32	VAL	-	expression tag	UNP P68106
J	-31	VAL	-	expression tag	UNP P68106
J	-30	GLU	-	expression tag	UNP P68106
J	-29	GLY	-	expression tag	UNP P68106
J	-28	LEU	-	expression tag	UNP P68106
J	-27	ALA	-	expression tag	UNP P68106
J	-26	GLY	-	expression tag	UNP P68106
J	-25	GLU	-	expression tag	UNP P68106
J	-24	LEU	-	expression tag	UNP P68106
J	-23	GLU	-	expression tag	UNP P68106
J	-22	GLN	-	expression tag	UNP P68106
J	-21	LEU	-	expression tag	UNP P68106
J	-20	ARG	-	expression tag	UNP P68106
J	-19	ALA	-	expression tag	UNP P68106
J	-18	ARG	-	expression tag	UNP P68106
J	-17	LEU	-	expression tag	UNP P68106
J	-16	GLU	-	expression tag	UNP P68106
J	-15	HIS	-	expression tag	UNP P68106
J	-14	HIS	-	expression tag	UNP P68106

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Chain	Residue	Modelled	Actual	Comment	Reference
J	-13	PRO	-	expression tag	UNP P68106
J	-12	GLN	-	expression tag	UNP P68106
J	-11	GLY	-	expression tag	UNP P68106
J	-10	GLN	-	expression tag	UNP P68106
J	-9	ARG	-	expression tag	UNP P68106
J	-8	GLU	-	expression tag	UNP P68106
J	-7	PRO	-	expression tag	UNP P68106
J	-6	GLY	-	expression tag	UNP P68106
J	-5	SER	-	expression tag	UNP P68106
J	-4	GLY	-	expression tag	UNP P68106
J	-3	GLY	-	expression tag	UNP P68106
J	-2	SER	-	expression tag	UNP P68106
J	-1	GLY	-	expression tag	UNP P68106
J	0	GLY	-	expression tag	UNP P68106
J	1	THR	-	expression tag	UNP P68106

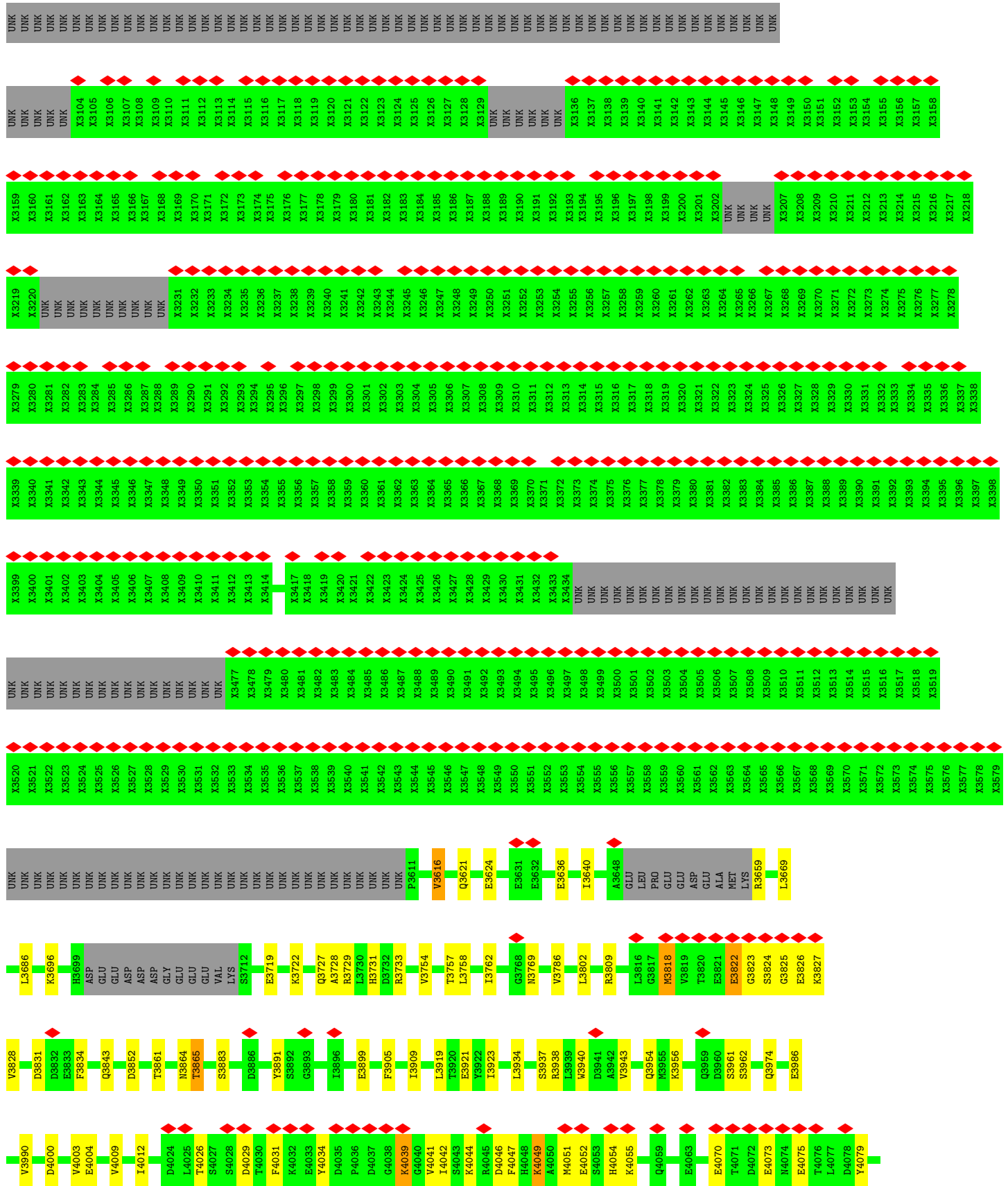
- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

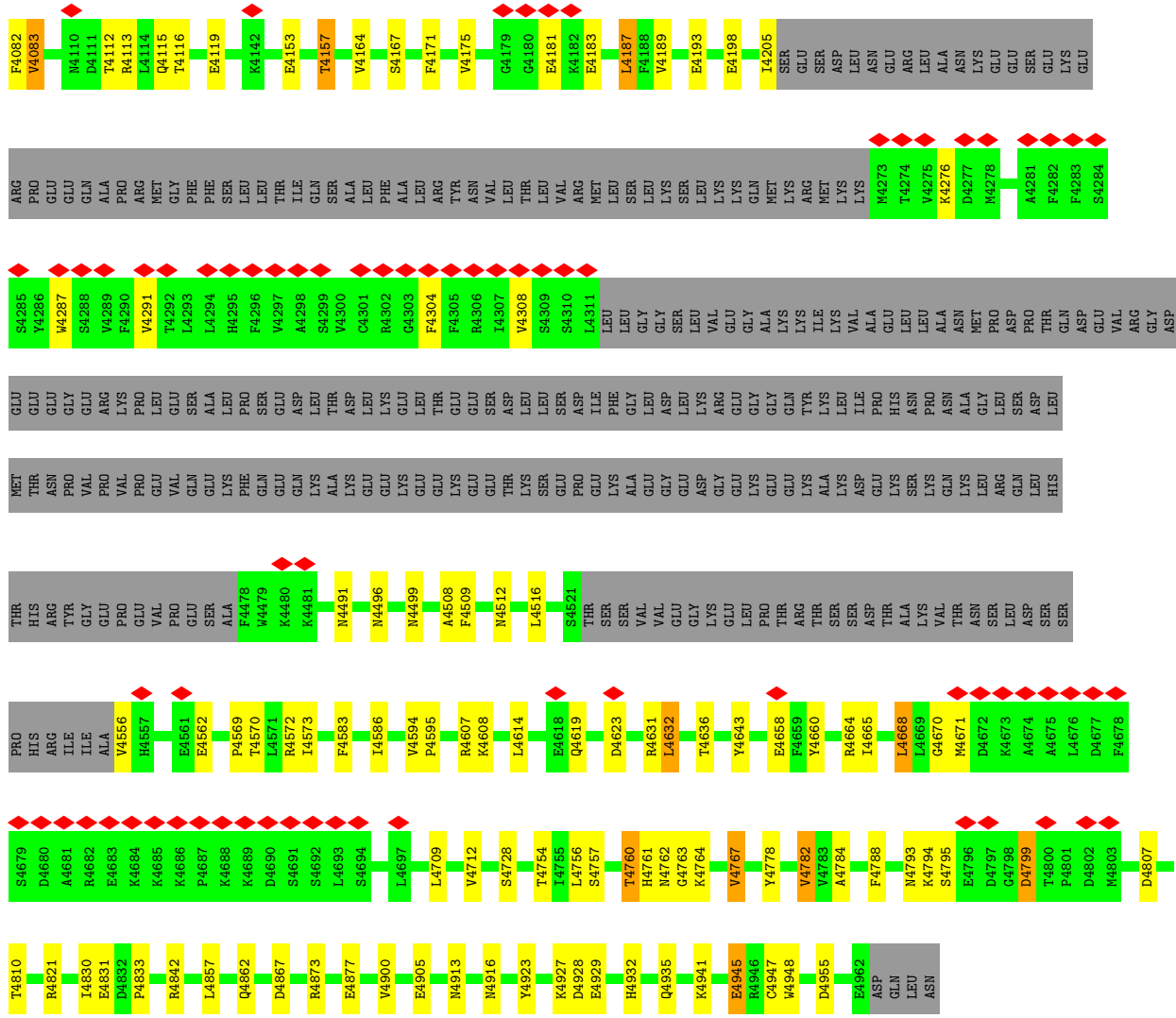
Mol	Chain	Residues	Atoms		AltConf
3	A	1	Total 1	Zn 1	0
3	B	1	Total 1	Zn 1	0
3	C	1	Total 1	Zn 1	0
3	D	1	Total 1	Zn 1	0



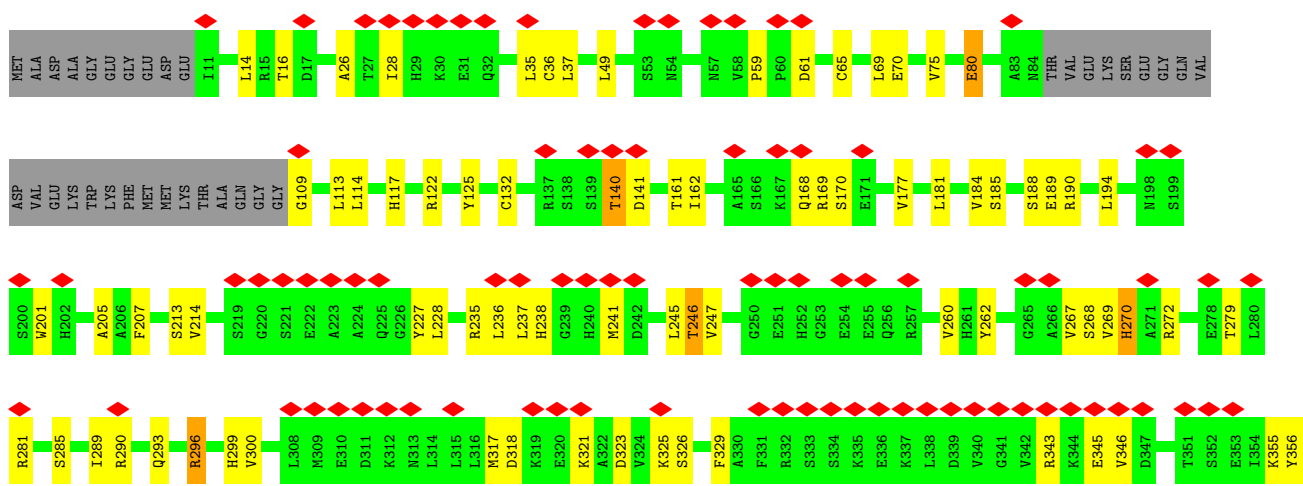






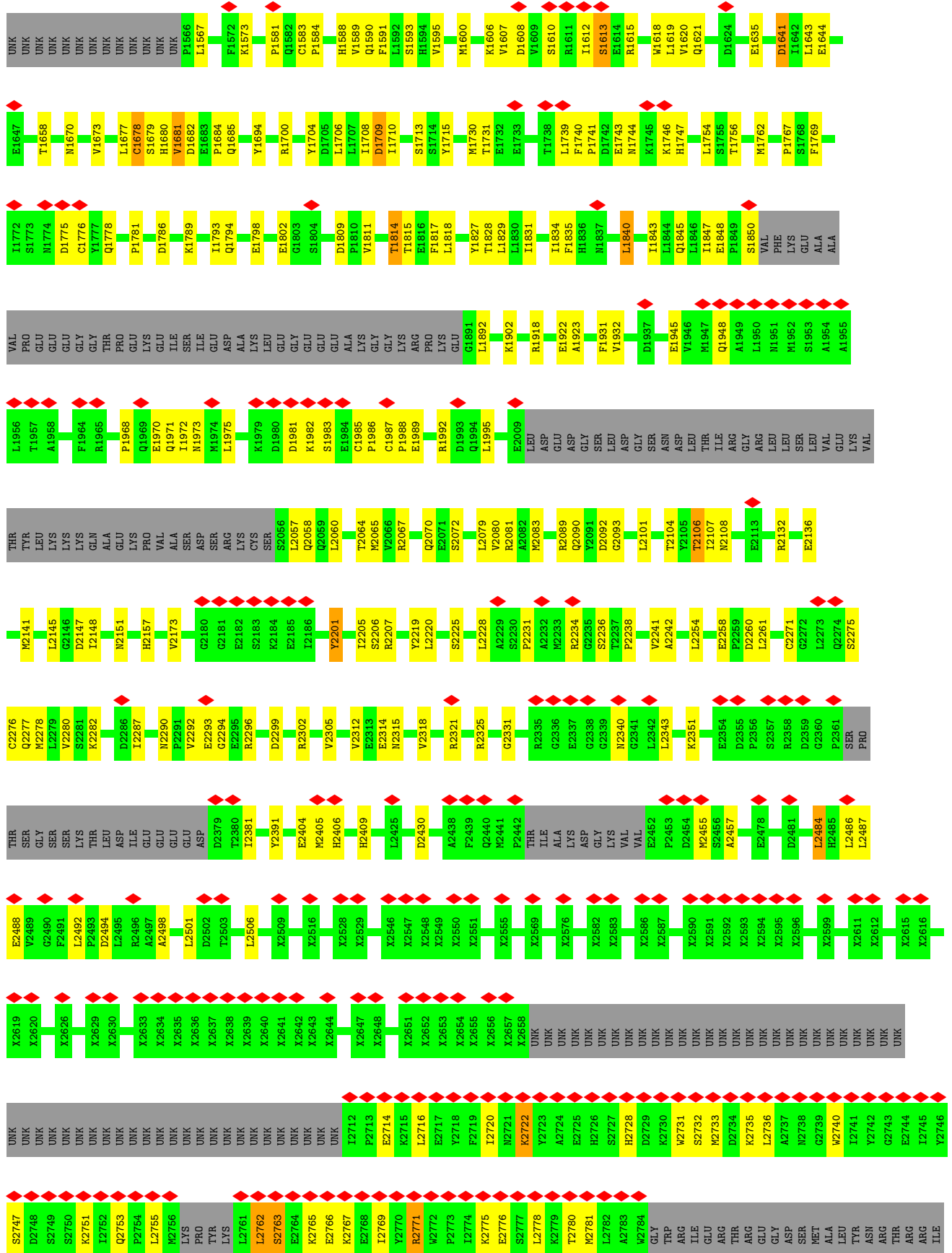


• Molecule 1: Ryanodine receptor 2

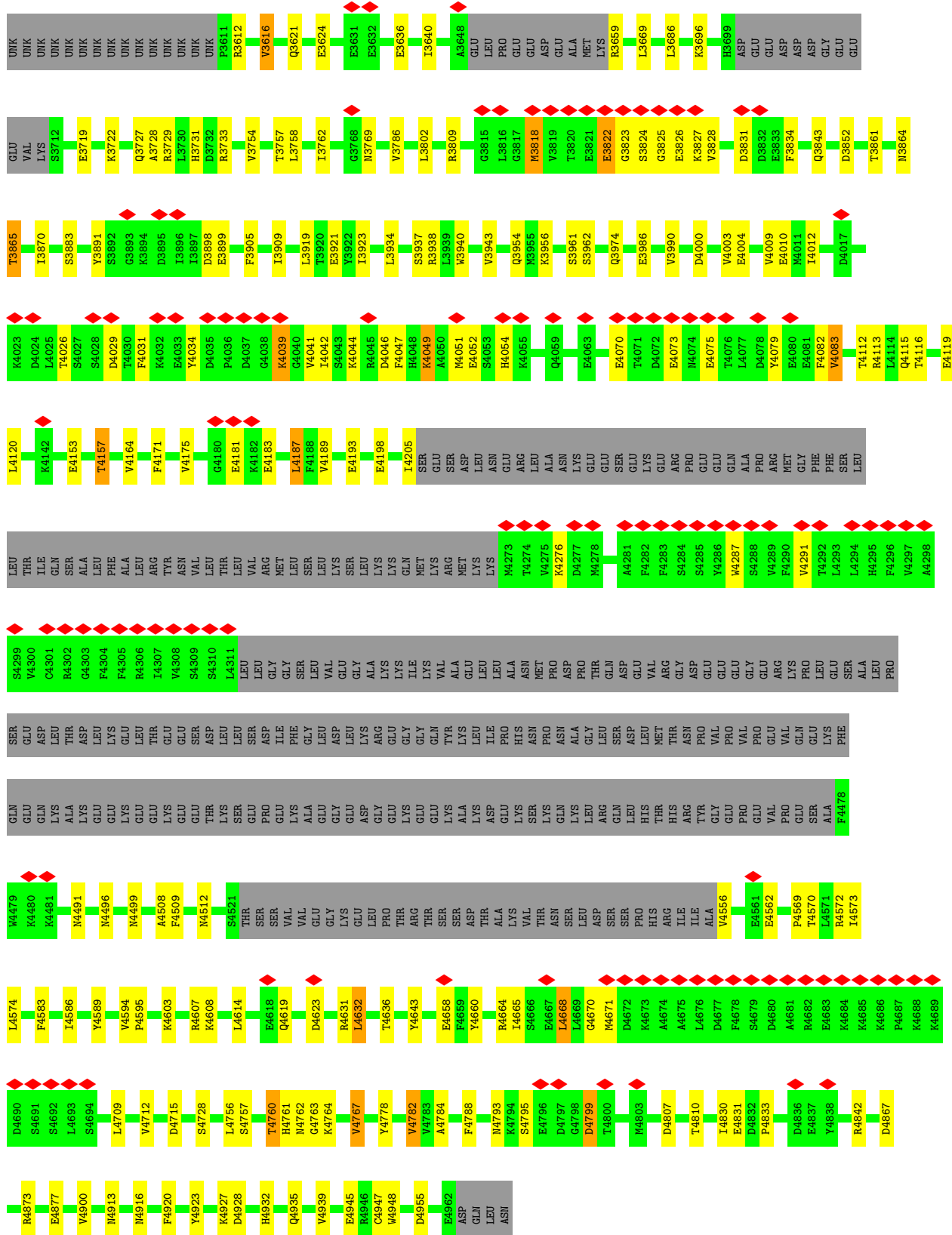






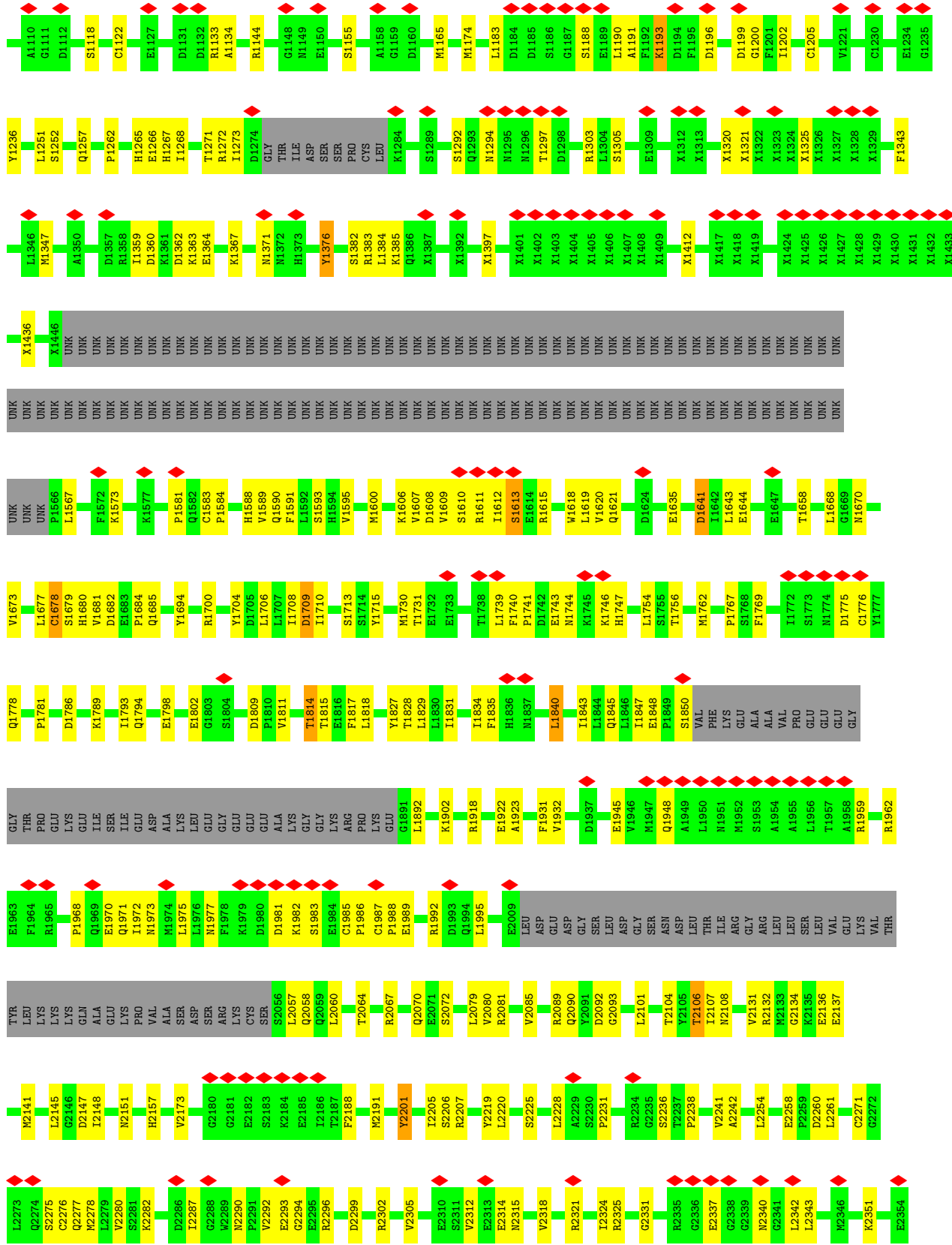






• Molecule 1: Ryanodine receptor 2

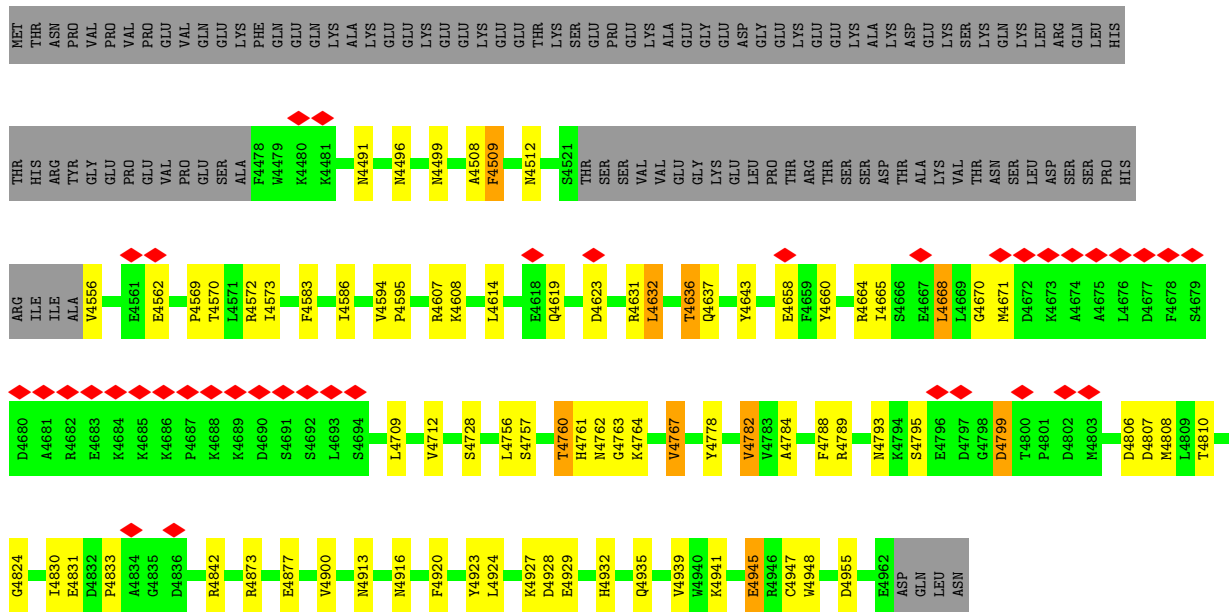




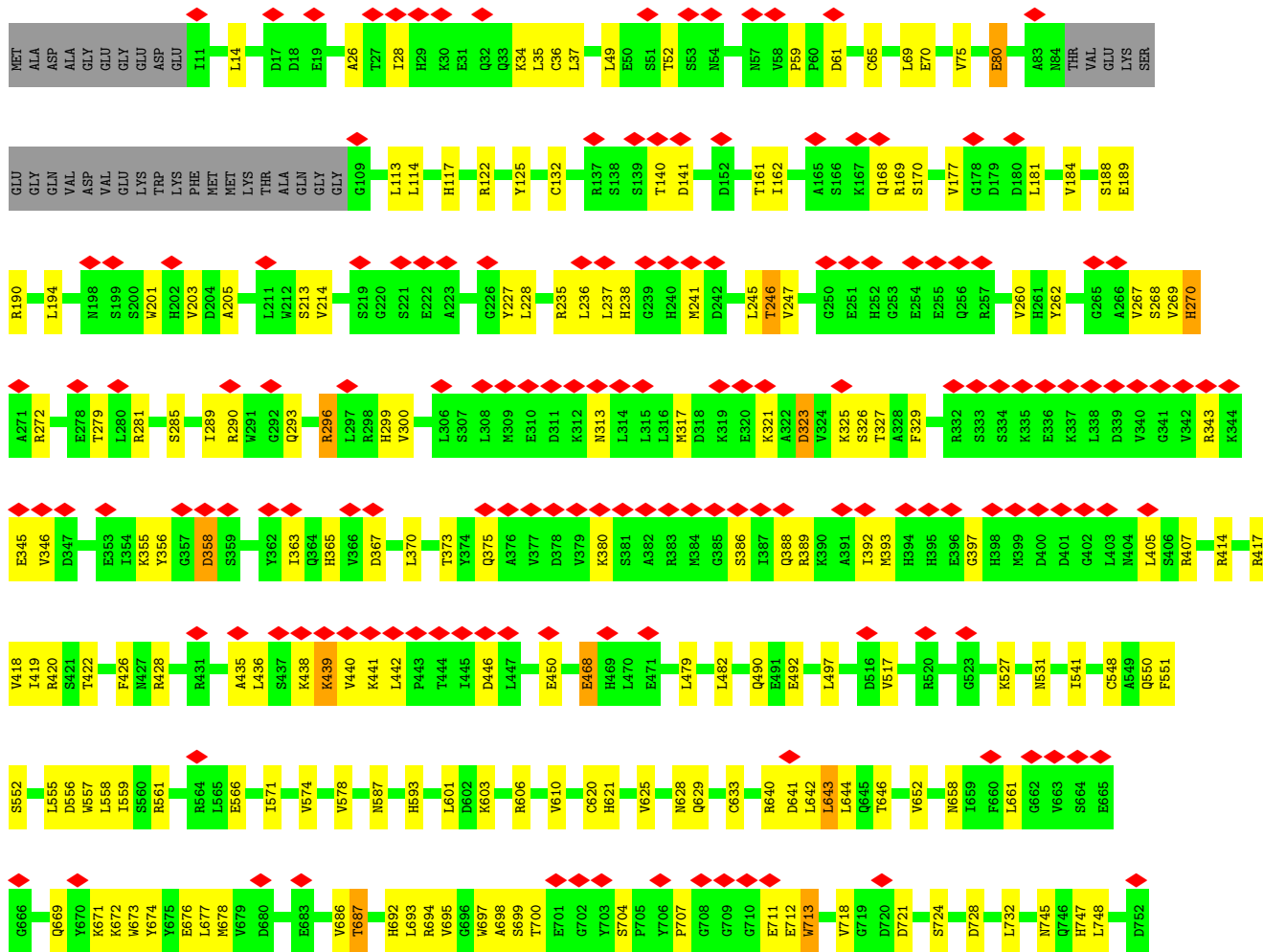


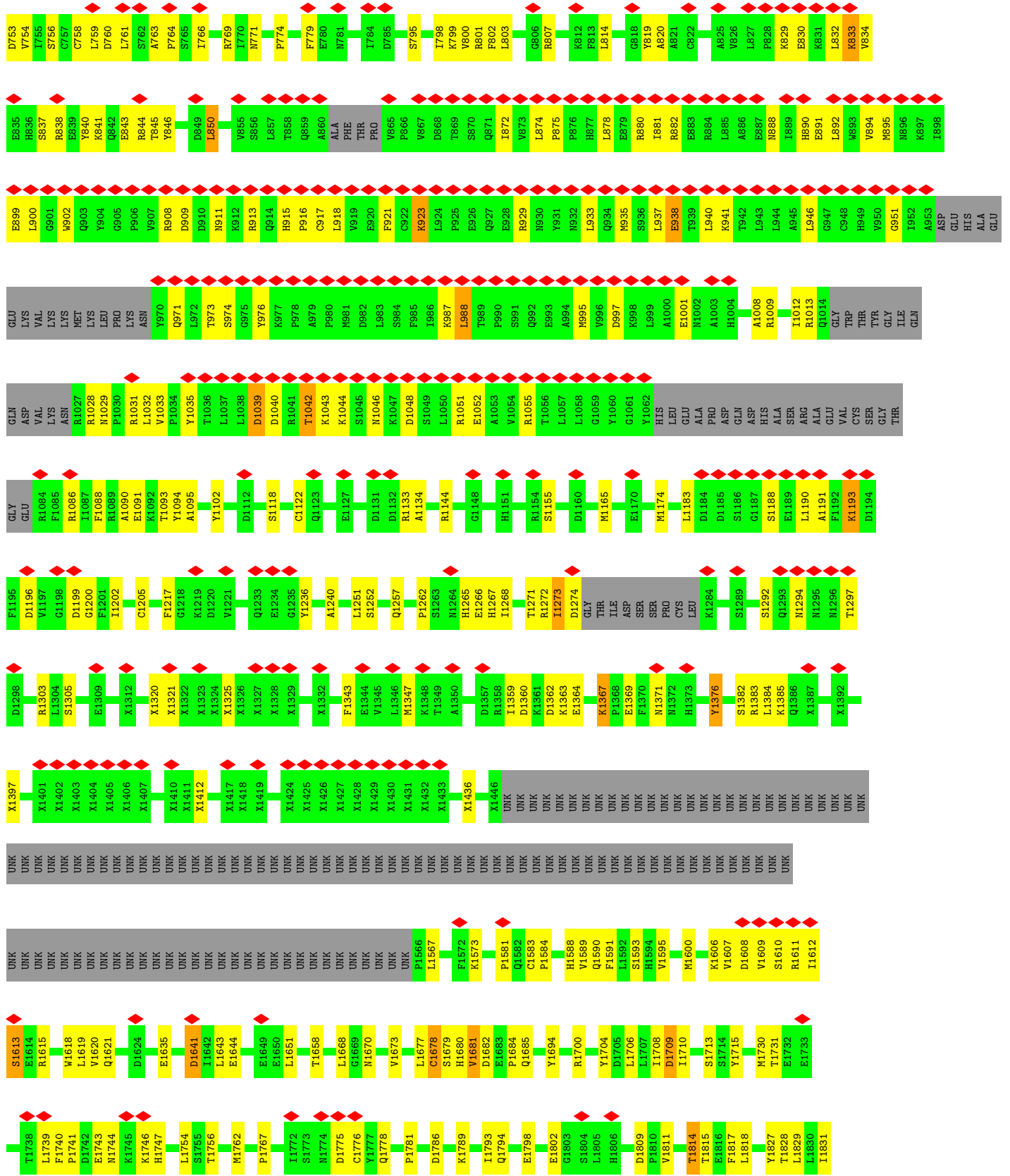


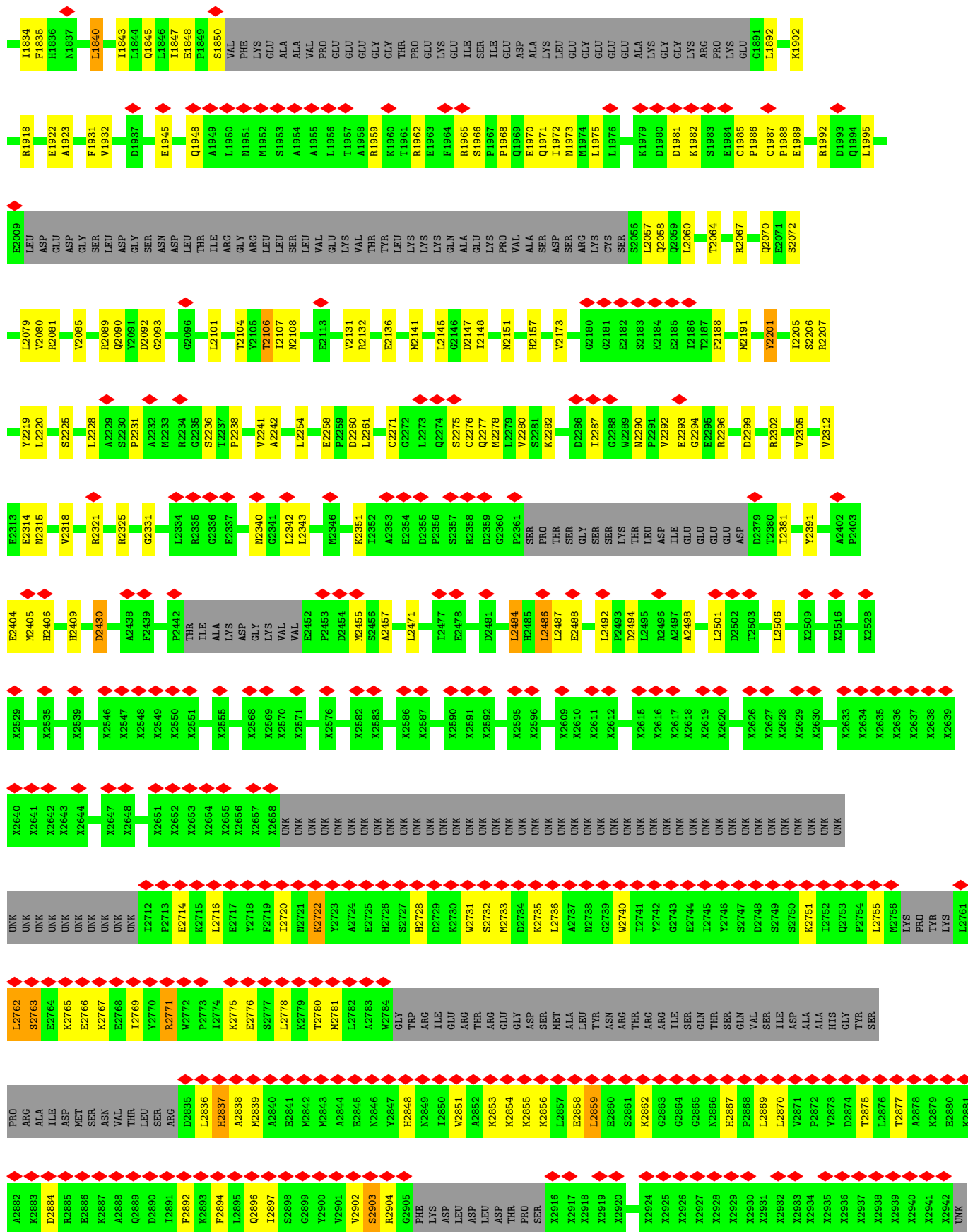
GLU	S4285	ARG	I4093	V4009	D3852	GLU	UNK	X3527	X3406	X3346	X3285
GLU	Y4286	PRO	V4097	I4012	T3861	GLU	UNK	X3528	X3407	X3347	X3286
GLY	W4287	GLU	H4110	K4023	T3861	ASP	UNK	X3529	X3408	X3348	X3287
GLU	S4288	GLN	D4111	D4024	N3864	ASP	UNK	X3530	X3409	X3349	X3288
ARG	W4289	ALA	T4112	D4024	T3865	GLY	UNK	X3531	X3410	X3350	X3289
PRO	F4290	PRO	R4113	L4025	T3865	GLU	UNK	X3532	X3411	X3351	X3290
PRO	V4291	ARG	L4114	T4026	V3874	GLU	UNK	X3533	X3412	X3352	X3291
LEU	T4292	MET	Q4115	S4027	S3883	VAL	UNK	X3534	X3413	X3353	X3292
GLY	L4293	PHE	T4116	S4027	S3883	LYS	UNK	X3535	X3414	X3354	X3293
SER	L4294	PHE	T4116	S4028	Y3891	LYS	UNK	X3536	X3415	X3355	X3294
ALA	H4295	SER	E4119	D4029	Y3891	LYS	UNK	X3537	X3416	X3356	X3295
LEU	F4296	LEU	K4142	T4030	S3892	VAL	UNK	X3538	X3419	X3357	X3297
PRO	W4297	LEU	F4031	T4031	S3892	ASP	UNK	X3539	X3420	X3358	X3298
SER	W4297	THR	K4032	K4032	G3894	UNK	UNK	X3540	X3421	X3359	X3299
GLU	A4298	ILE	E4153	E4033	D3895	UNK	UNK	X3541	X3422	X3360	X3300
ASP	A4298	GLN	E4153	E4033	D3895	UNK	UNK	X3542	X3423	X3361	X3301
LEU	S4299	SER	T4157	Y4034	I3897	UNK	UNK	X3543	X3424	X3362	X3302
THR	V4300	SER	T4157	D4035	D3898	UNK	UNK	X3544	X3425	X3363	X3303
ASP	C4301	ALA	V4164	P4036	E3899	UNK	UNK	X3545	X3426	X3364	X3304
LEU	R4302	PHE	S4167	D4037	F3905	UNK	UNK	X3546	X3427	X3365	X3305
GLU	G4303	ALA	S4167	G4038	F3905	UNK	UNK	X3547	X3428	X3366	X3306
LEU	F4304	LEU	F4171	G4040	I3809	UNK	UNK	X3548	X3429	X3367	X3307
THR	F4305	ARG	V4175	V4041	L3919	UNK	UNK	X3549	X3430	X3368	X3308
GLU	R4306	ASN	V4175	V4041	L3919	UNK	UNK	X3550	X3431	X3369	X3309
GLU	I4307	VAL	V4175	V4042	T3920	UNK	UNK	X3551	X3432	X3370	X3310
SER	I4307	VAL	V4175	V4042	T3920	UNK	UNK	X3552	X3433	X3371	X3311
ASP	V4308	LEU	G4180	S4043	E3921	UNK	UNK	X3553	X3434	X3372	X3312
LEU	V4308	THR	G4180	S4043	E3921	UNK	UNK	X3554	UNK	X3373	X3313
LEU	S4309	THR	E4181	R4045	Y3922	UNK	UNK	X3555	UNK	X3374	X3313
LEU	S4310	VAL	E4181	R4045	I3923	UNK	UNK	X3556	UNK	X3375	X3314
ASP	S4310	VAL	E4183	F4047	L3923	UNK	UNK	X3557	UNK	X3376	X3315
ASP	L4311	MET	E4183	F4047	L3923	UNK	UNK	X3558	UNK	X3377	X3316
LEU	UNK	LEU	L4187	H4049	L3934	UNK	UNK	X3559	UNK	X3378	X3317
LEU	UNK	LEU	L4187	H4049	L3934	UNK	UNK	X3560	UNK	X3379	X3318
GLY	UNK	SER	F4188	K4050	S3937	UNK	UNK	X3561	UNK	X3380	X3319
GLY	UNK	LEU	V4189	A4050	R3938	UNK	UNK	X3562	UNK	X3381	X3320
SER	UNK	LEU	V4189	A4050	L3939	UNK	UNK	X3563	UNK	X3382	X3321
LEU	UNK	SER	E4193	M4051	W3940	UNK	UNK	X3564	UNK	X3383	X3322
LEU	UNK	LEU	E4193	M4051	W3940	UNK	UNK	X3565	UNK	X3384	X3323
VAL	UNK	LEU	S4052	S4052	V3943	UNK	UNK	X3566	UNK	X3385	X3324
LEU	UNK	LEU	H4054	H4054	V3943	UNK	UNK	X3567	UNK	X3386	X3325
GLY	UNK	GLN	R4055	R4055	Q3954	UNK	UNK	X3568	UNK	X3387	X3326
GLY	UNK	GLN	R4055	R4055	Q3954	UNK	UNK	X3569	UNK	X3388	X3327
ALA	UNK	MET	Q4059	Q4059	K3955	UNK	UNK	X3570	UNK	X3389	X3328
ALA	UNK	MET	Q4059	Q4059	K3955	UNK	UNK	X3571	UNK	X3390	X3329
LEU	UNK	LEU	E4063	E4063	K3956	UNK	UNK	X3572	UNK	X3391	X3330
LEU	UNK	LEU	E4063	E4063	K3956	UNK	UNK	X3573	UNK	X3392	X3331
LEU	UNK	LEU	E4070	E4070	S3961	UNK	UNK	X3574	UNK	X3393	X3332
LEU	UNK	LEU	T4071	T4071	S3962	UNK	UNK	X3575	UNK	X3394	X3333
LEU	UNK	LEU	D4072	D4072	S3962	UNK	UNK	X3576	UNK	X3395	X3334
LEU	UNK	LEU	E4073	E4073	M3971	UNK	UNK	X3577	UNK	X3396	X3335
ALA	UNK	ALA	M4074	M4074	M3971	UNK	UNK	X3578	UNK	X3397	X3336
ASN	UNK	ASN	E4075	E4075	M3971	UNK	UNK	X3579	UNK	X3398	X3339
ASN	UNK	ASN	E4075	E4075	M3971	UNK	UNK	UNK	UNK	X3399	X3340
PRO	UNK	PRO	T4076	T4076	Q3822	UNK	UNK	UNK	UNK	X3400	X3341
ASP	UNK	ASP	L4077	L4077	Q3822	UNK	UNK	UNK	UNK	X3401	X3342
PRO	UNK	PRO	D4078	D4078	Q3822	UNK	UNK	UNK	UNK	X3402	X3343
THR	UNK	THR	Y4079	Y4079	Q3822	UNK	UNK	UNK	UNK	X3403	X3344
GLN	UNK	GLN	F4082	F4082	Q3822	UNK	UNK	UNK	UNK	X3404	X3345
ASP	UNK	ASP	F4082	F4082	Q3822	UNK	UNK	UNK	UNK	UNK	UNK
VAL	UNK	VAL	V4083	V4083	Q3822	UNK	UNK	UNK	UNK	UNK	UNK
VAL	UNK	VAL	V4083	V4083	Q3822	UNK	UNK	UNK	UNK	UNK	UNK
ARG	UNK	ARG	V4083	V4083	Q3822	UNK	UNK	UNK	UNK	UNK	UNK
GLY	UNK	GLY	H4087	H4087	Q3822	UNK	UNK	UNK	UNK	UNK	UNK
ASP	UNK	ASP	H4087	H4087	Q3822	UNK	UNK	UNK	UNK	UNK	UNK



● Molecule 1: Ryanodine receptor 2







B3733	R3611	UNK	X3550	X3490	X3370	X3310	X3249	X3189	X3128	UNK	X3008	X2961	X2968	X2976	X2985	X2991	X3000	X3006	X3007	X3104	X3106	X3107	X3108	X3109	X3110	X3111	X3112	X3113	X3114	X3115	X3116	X3117	X3118	X3119	X3120	X3121	X3122	X3123	X3124	X3125	X3126	X3127	X3169	X3170	X3171	X3172	X3173	X3174	X3175	X3176	X3177	X3178	X3179	X3180	X3181	X3182	X3183	X3184	X3185	X3186	X3187	X3188	X3231	X3232	X3233	X3234	X3235	X3236	X3237	X3238	X3239	X3240	X3241	X3242	X3243	X3244	X3245	X3246	X3247	X3248	X3298	X3299	X3300	X3301	X3302	X3303	X3304	X3305	X3306	X3307	X3308	X3309	X3341	X3342	X3343	X3344	X3345	X3346	X3347	X3348	X3349	X3350	X3351	X3352	X3353	X3354	X3355	X3356	X3357	X3358	X3359	X3360	X3361	X3362	X3363	X3364	X3365	X3366	X3367	X3368	X3369	X3431	X3432	X3433	X3434	X3477	X3478	X3479	X3480	X3481	X3482	X3483	X3484	X3485	X3486	X3487	X3488	X3489	X3528	X3529	X3530	X3531	X3532	X3533	X3534	X3535	X3536	X3537	X3538	X3539	X3540	X3541	X3542	X3543	X3544	X3545	X3546	X3547	X3548	X3549	X3616	V3616	Q3621	E3624	E3631	E3632	E3636	I3640	A3648	GLU	X3814	G3815	L3816	G3817	M3818	V3819	T3820	E3821	E3822	G3823	S3824	G3825	E3826	K3696	H3699	ASP	GLU	D3831	D3832	E3833	F3834	R3840	Q3843	D3852	T3861	N3864	T3865	I3870	S3883	Y3891	S3892	G3893	K3894	D3895	I3896	P3611	V3616	Q3621	E3624	E3631	E3632	E3636	I3640	A3648	GLU	X3814	G3815	L3816	G3817	M3818	V3819	T3820	E3821	E3822	G3823	S3824	G3825	E3826	K3696	H3699	ASP	GLU	D3831	D3832	E3833	F3834	R3840	Q3843	D3852	T3861	N3864	T3865	I3870	S3883	Y3891	S3892	G3893	K3894	D3895	I3896
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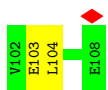


• Molecule 2: Peptidyl-prolyl cis-trans isomerase FKBP1B



MET	GLY	SER	SER	HIS	HIS	HIS	HIS	HIS	HIS	SER	SER	GLY	LEU	VAL	PRO	ARG	GLY	SER	SER	HIS	MET	ALA	SER	SER	MET	ASP	GLU	LYS	THR	THR	THR	GLY	GLY	TRP	ARG	GLY	GLY	VAL	VAL	GLU	GLY	LEU	ALA	GLY	GLY	LEU	LEU	GLN	LEU	ARG	ARG	ALA	ALA	ARG	LEU	GLU	HIS	HIS	HIS	PRO	PRO	GLN	GLY	GLN	ARG	ARG	GLU
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PRO	GLY	SER	GLY	GLY	SER	GLY	GLY	THR	G2	S9	D12	K19	C23	V24	Y27	Q32	D38	S39	S40	R41	D42	R43	K48	F49	R50	I51	E55	K58	E61	L69	R72	T78	P79	D80	V81	Y83	H88	I92	T97	D101
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• Molecule 2: Peptidyl-prolyl cis-trans isomerase FKBP1B



MET	GLY	SER	SER	HIS	HIS	HIS	HIS	HIS	HIS	SER	SER	GLY	LEU	VAL	PRO	ARG	GLY	SER	SER	HIS	MET	ALA	SER	SER	MET	ASP	GLU	LYS	THR	THR	THR	GLY	GLY	TRP	ARG	GLY	GLY	VAL	VAL	GLU	GLY	LEU	ALA	GLY	GLY	LEU	LEU	GLN	LEU	LEU	ARG	ALA	ALA	ARG	LEU	GLU	HIS	HIS	HIS	PRO	PRO	GLN	GLY	GLN	ARG	ARG	GLU
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PRO	GLY	SER	GLY	GLY	SER	GLY	GLY	THR	G2	S9	D12	K19	C23	V24	V25	H26	Y27	T28	Q32	D38	S39	S40	R41	D42	R43	K48	F49	R50	I51	K53	G54	E55	K58	E61	L69	R72	T78	P79	D80	V81	A82	Y83	H88	V91
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• Molecule 2: Peptidyl-prolyl cis-trans isomerase FKBP1B



MET	GLY	SER	SER	HIS	HIS	HIS	HIS	HIS	HIS	SER	SER	GLY	LEU	VAL	PRO	ARG	GLY	SER	SER	HIS	MET	ALA	SER	SER	MET	ASP	GLU	LYS	THR	THR	THR	GLY	GLY	TRP	ARG	GLY	GLY	VAL	VAL	GLU	GLY	LEU	ALA	GLY	GLY	LEU	LEU	GLN	LEU	LEU	ARG	ALA	ALA	ARG	ARG	LEU	GLU	HIS	HIS	HIS	PRO	PRO	GLN	GLY	GLN	ARG	ARG	GLU
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PRO	GLY	SER	GLY	GLY	SER	GLY	GLY	THR	G2	S9	D12	K19	C23	V24	Y27	Q32	K35	D38	S39	S40	R43	R43	K48	F49	R50	I51	G52	K53	G54	E55	K58	E61	L69	R72	T78	P79	D80	V81	H88	I92	T97
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## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	45120	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 ( $e^-/\text{\AA}^2$ )	50	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.129	Depositor
Minimum map value	-0.069	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.004	Depositor
Recommended contour level	0.019	Depositor
Map size (Å)	513.60004, 513.60004, 513.60004	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.284, 1.284, 1.284	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:  
ZN

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	A	0.25	0/26895	0.42	0/36316
1	B	0.25	0/26895	0.42	0/36316
1	C	0.25	0/26895	0.42	0/36316
1	D	0.25	0/26895	0.42	0/36316
2	G	0.26	0/835	0.47	0/1123
2	H	0.26	0/835	0.47	0/1123
2	I	0.26	0/835	0.47	0/1123
2	J	0.26	0/835	0.47	0/1123
All	All	0.25	0/110920	0.42	0/149756

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	1
1	B	0	1
1	C	0	1
1	D	0	1
All	All	0	4

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	468	GLU	Peptide

*Continued on next page...*

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Mol	Chain	Res	Type	Group
1	B	468	GLU	Peptide
1	C	468	GLU	Peptide
1	D	468	GLU	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	30071	0	26714	459	0
1	B	30071	0	26714	452	0
1	C	30071	0	26714	462	0
1	D	30071	0	26714	466	0
2	G	819	0	821	18	0
2	H	819	0	821	17	0
2	I	819	0	821	20	0
2	J	819	0	821	17	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
All	All	123564	0	110140	1884	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 8.

The worst 5 of 1884 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:2404:GLU:HG3	1:A:2405:MET:H	1.38	0.89
1:B:2404:GLU:HG3	1:B:2405:MET:H	1.38	0.89
1:D:2404:GLU:HG3	1:D:2405:MET:H	1.38	0.88
1:C:2404:GLU:HG3	1:C:2405:MET:H	1.38	0.87
1:A:4821:ARG:NH2	1:D:4824:GLY:O	2.08	0.86

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	3255/4966 (66%)	3051 (94%)	204 (6%)	0	100	100
1	B	3255/4966 (66%)	3050 (94%)	205 (6%)	0	100	100
1	C	3255/4966 (66%)	3050 (94%)	205 (6%)	0	100	100
1	D	3255/4966 (66%)	3049 (94%)	206 (6%)	0	100	100
2	G	105/176 (60%)	102 (97%)	3 (3%)	0	100	100
2	H	105/176 (60%)	102 (97%)	3 (3%)	0	100	100
2	I	105/176 (60%)	102 (97%)	3 (3%)	0	100	100
2	J	105/176 (60%)	102 (97%)	3 (3%)	0	100	100
All	All	13440/20568 (65%)	12608 (94%)	832 (6%)	0	100	100

There are no Ramachandran outliers to report.

### 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	2862/3387 (84%)	2726 (95%)	136 (5%)	25	60
1	B	2862/3387 (84%)	2726 (95%)	136 (5%)	25	60
1	C	2862/3387 (84%)	2727 (95%)	135 (5%)	26	60
1	D	2862/3387 (84%)	2726 (95%)	136 (5%)	25	60
2	G	88/140 (63%)	87 (99%)	1 (1%)	73	88
2	H	88/140 (63%)	86 (98%)	2 (2%)	50	77

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	I	88/140 (63%)	87 (99%)	1 (1%)	73	88
2	J	88/140 (63%)	87 (99%)	1 (1%)	73	88
All	All	11800/14108 (84%)	11252 (95%)	548 (5%)	31	61

5 of 548 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	1196	ASP
1	D	1641	ASP
1	D	1193	LYS
1	D	3852	ASP
1	B	1367	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 177 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	2274	GLN
1	D	888	ASN
1	C	2480	GLN
2	I	26	HIS
1	D	1371	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](#)

Of 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 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.

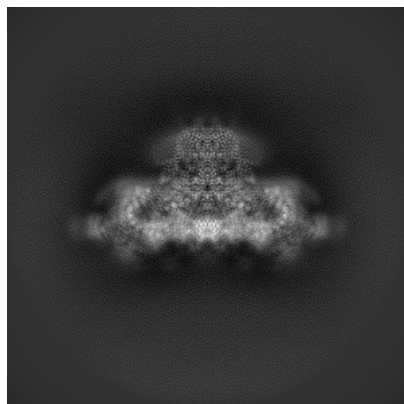
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-33936. These allow visual inspection of the internal detail of the map and identification of artifacts.

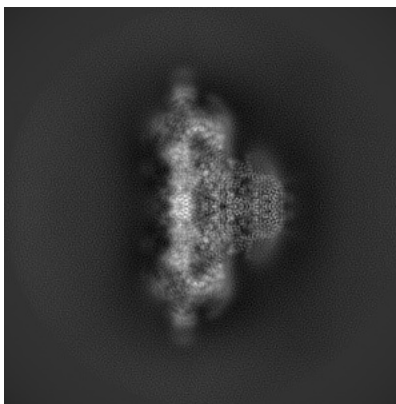
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

### 6.1 Orthogonal projections [i](#)

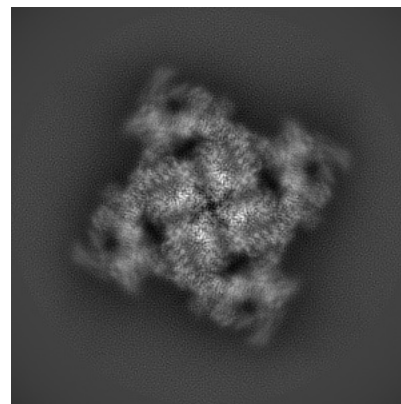
#### 6.1.1 Primary map



X

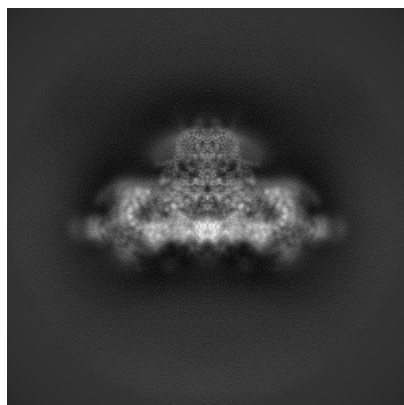


Y

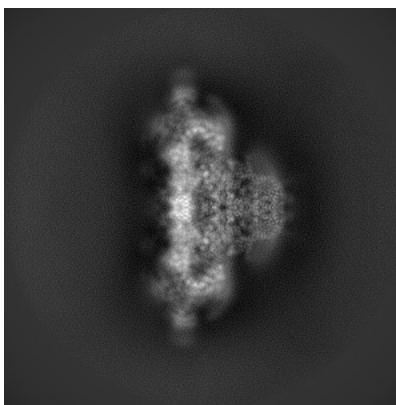


Z

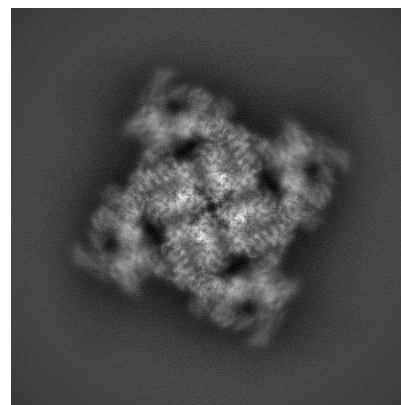
#### 6.1.2 Raw map



X



Y



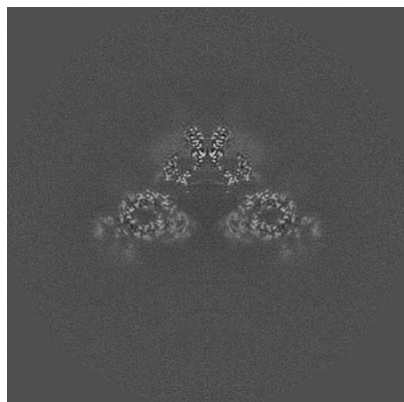
Z

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

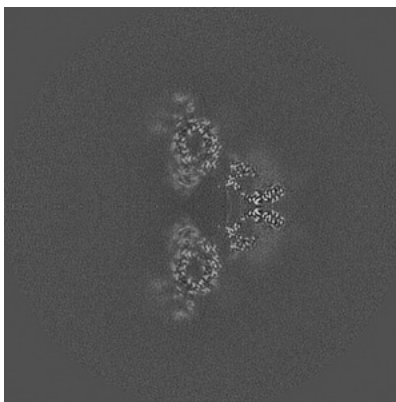


## 6.2 Central slices [i](#)

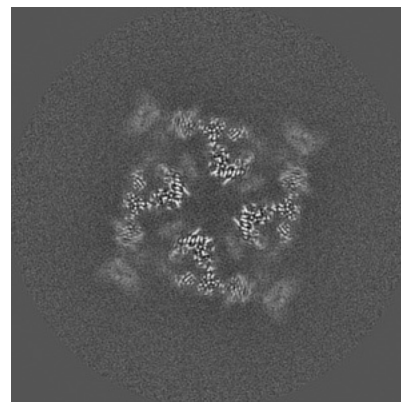
### 6.2.1 Primary map



X Index: 200

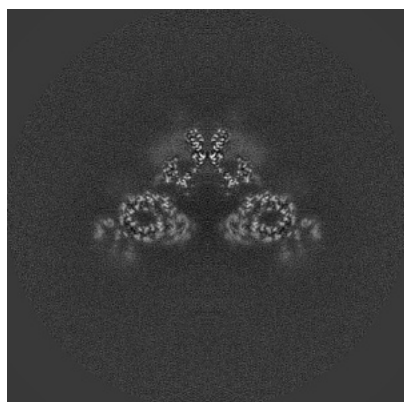


Y Index: 200

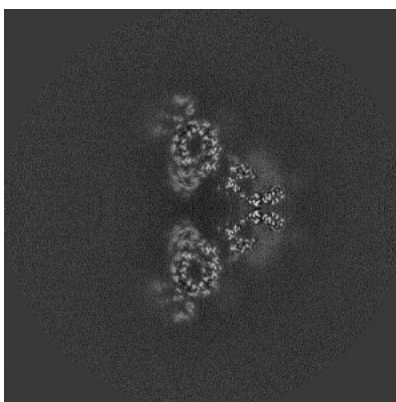


Z Index: 200

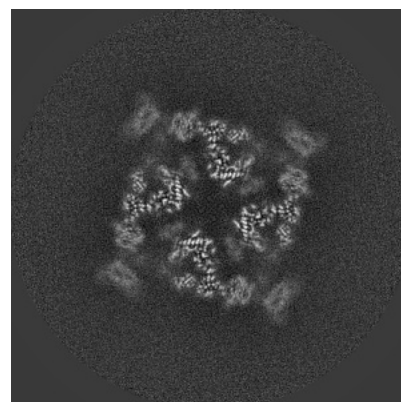
### 6.2.2 Raw map



X Index: 200



Y Index: 200

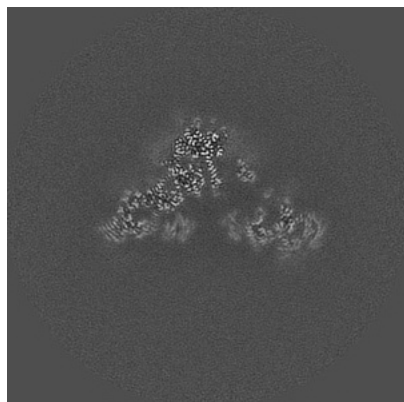


Z Index: 200

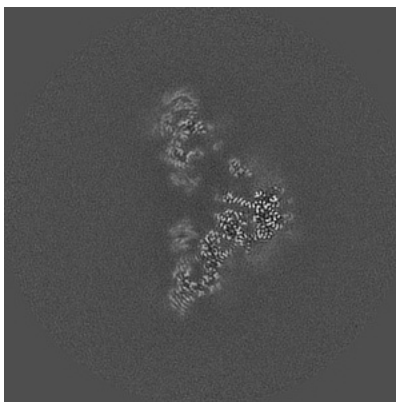
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices [i](#)

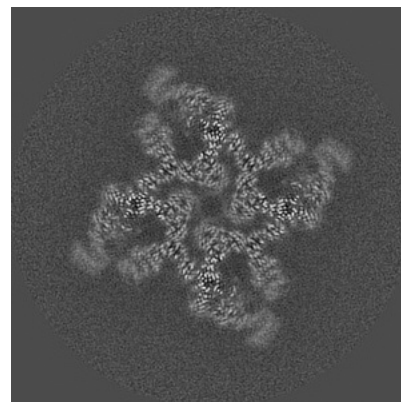
### 6.3.1 Primary map



X Index: 193

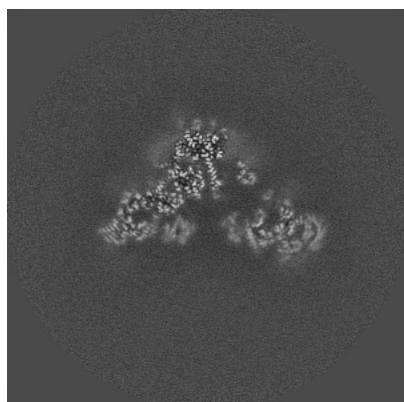


Y Index: 207

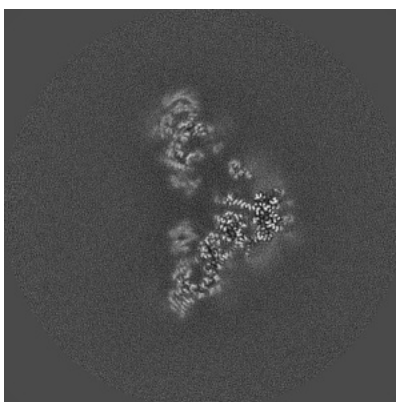


Z Index: 180

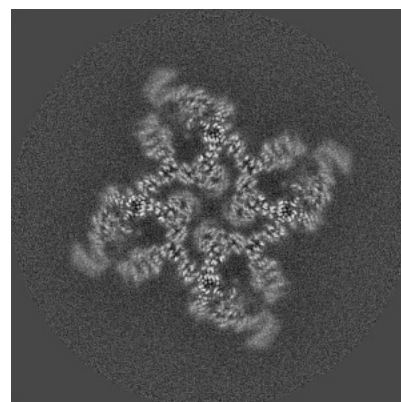
### 6.3.2 Raw map



X Index: 193



Y Index: 207

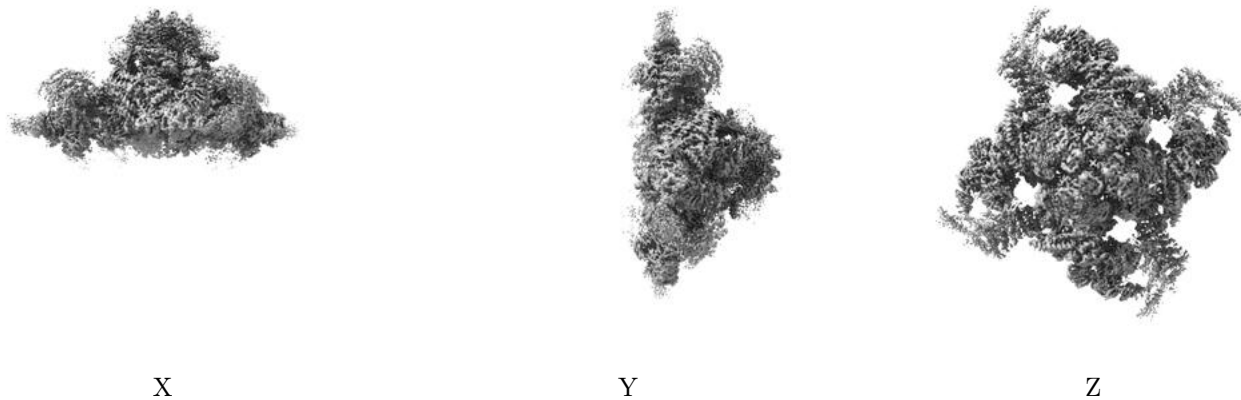


Z Index: 180

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



The images above show the 3D surface view of the map at the recommended contour level 0.019. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

### 6.4.2 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.

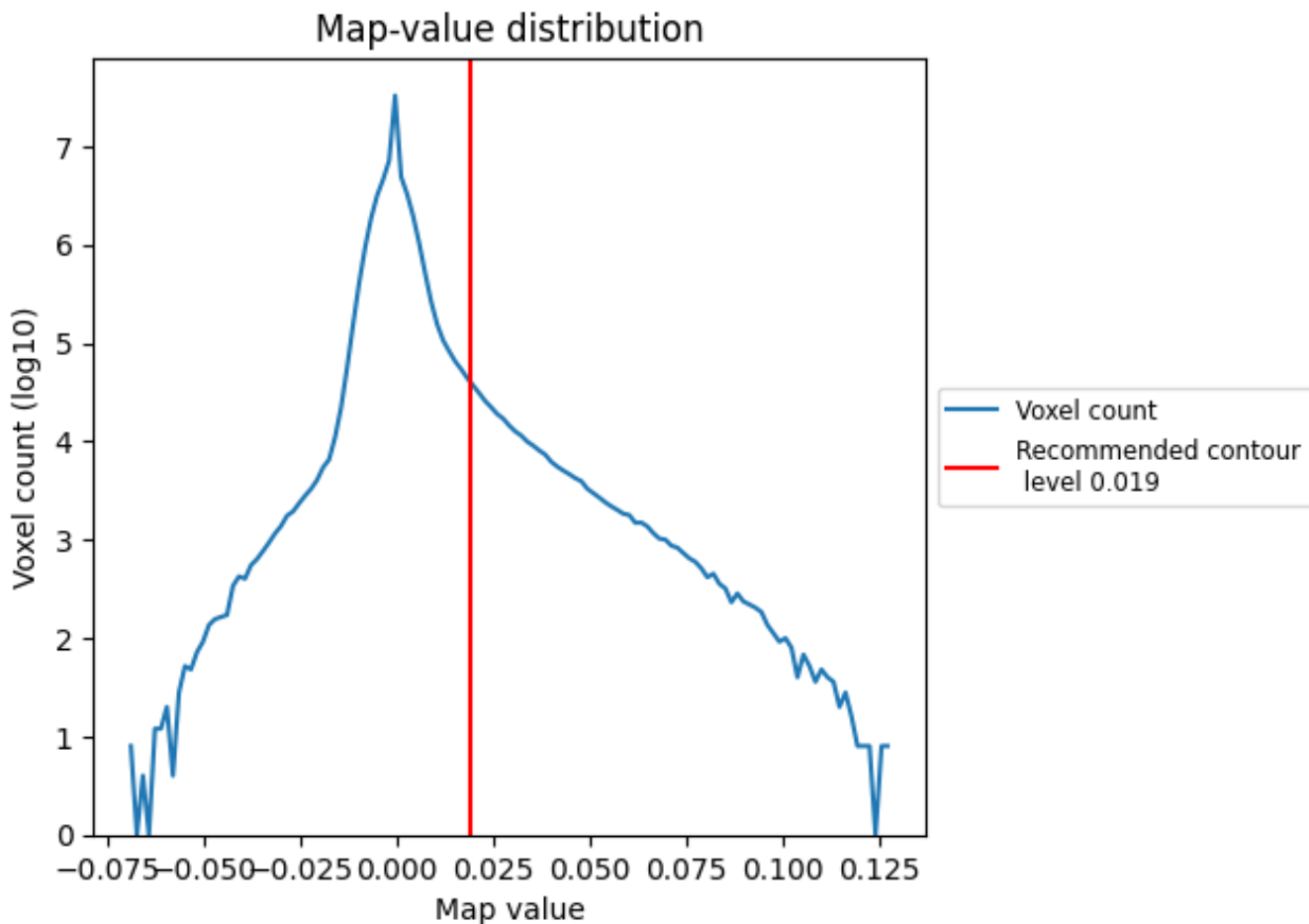
## 6.5 Mask visualisation [i](#)

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

## 7 Map analysis [i](#)

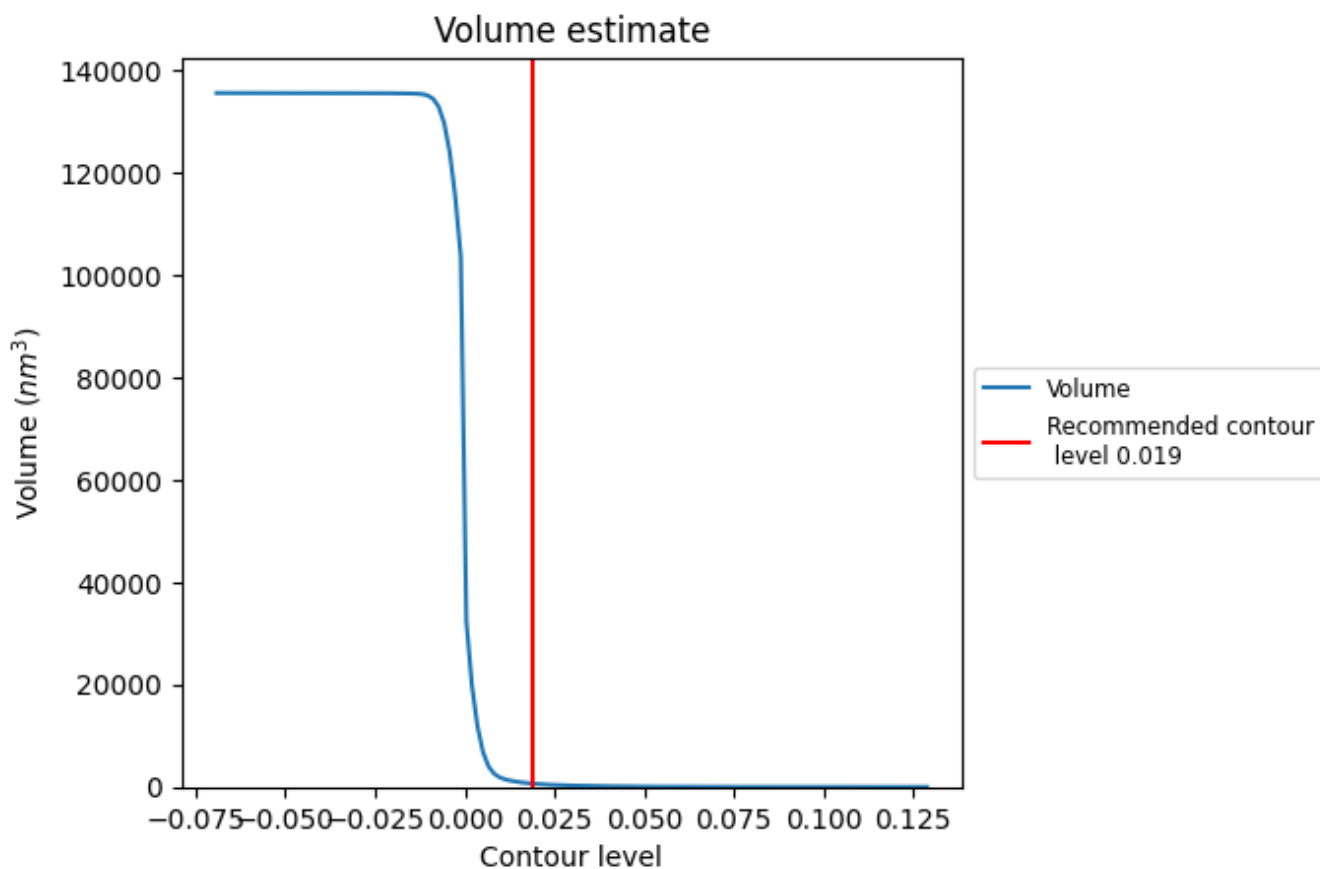
This section contains the results of statistical analysis of the map.

### 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.

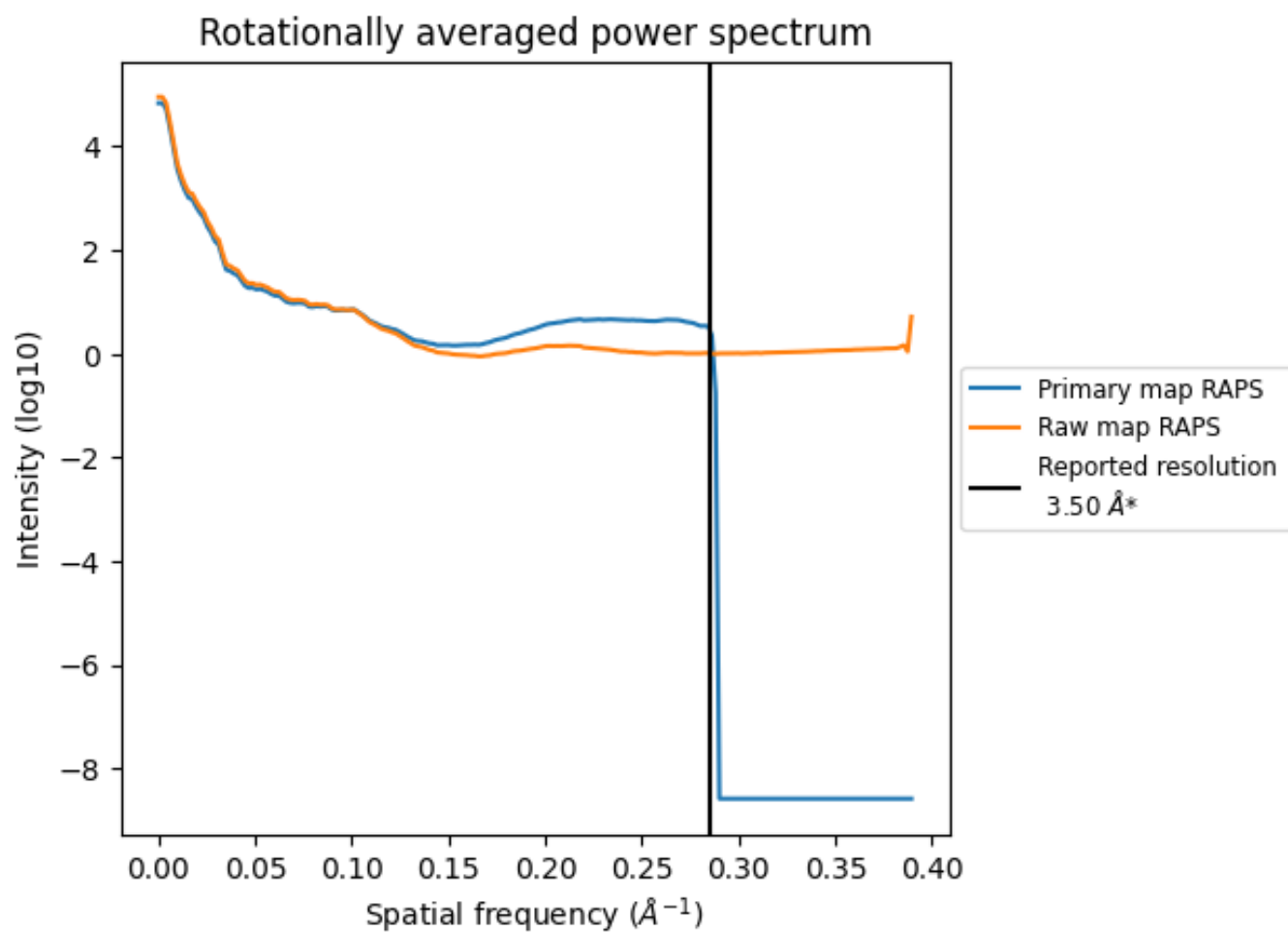
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is  $653 \text{ nm}^3$ ; this corresponds to an approximate mass of 590 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](#)

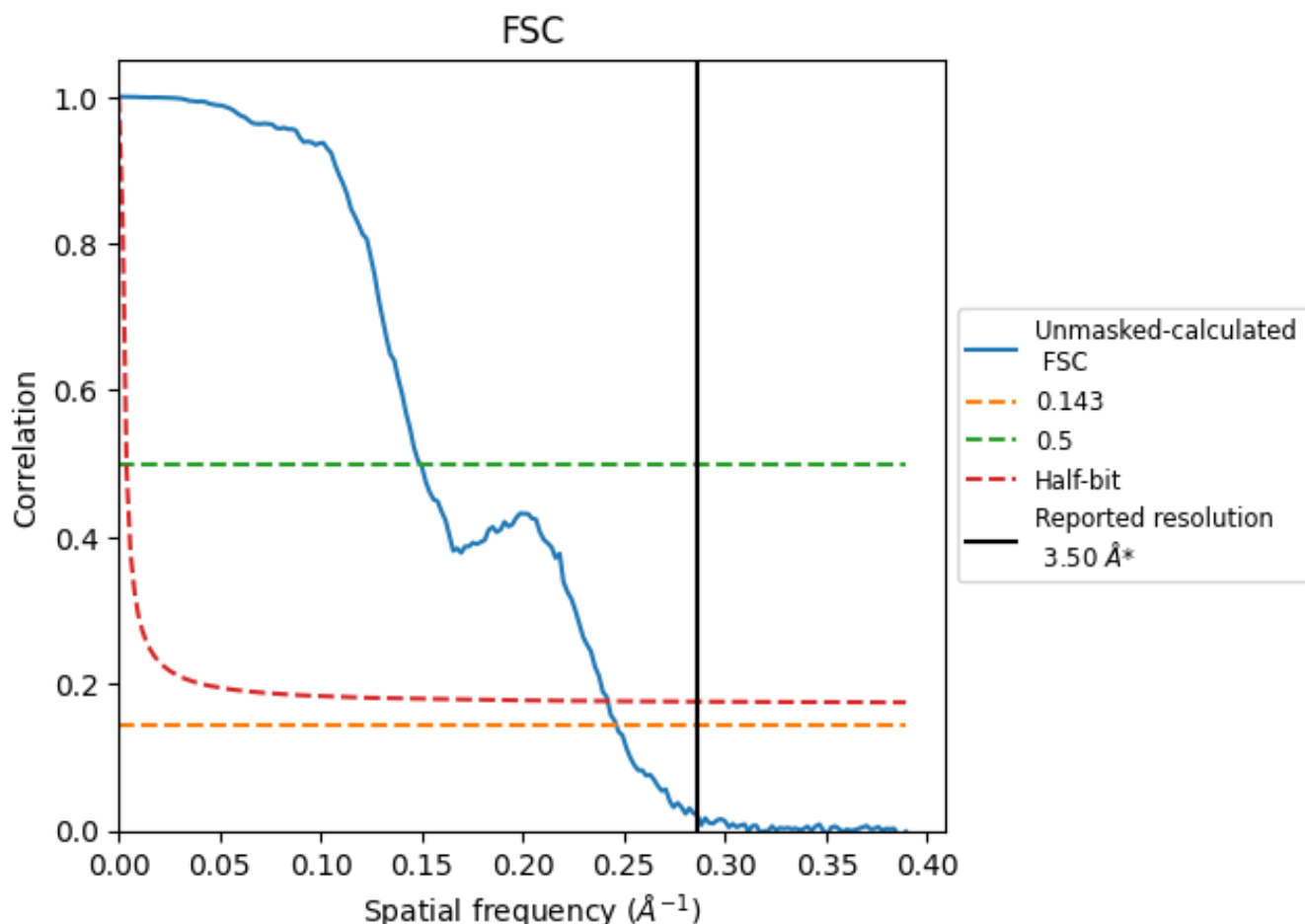


\*Reported resolution corresponds to spatial frequency of 0.286 Å<sup>-1</sup>

## 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  $0.286 \text{\AA}^{-1}$

## 8.2 Resolution estimates [i](#)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.50	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	4.06	6.71	4.13

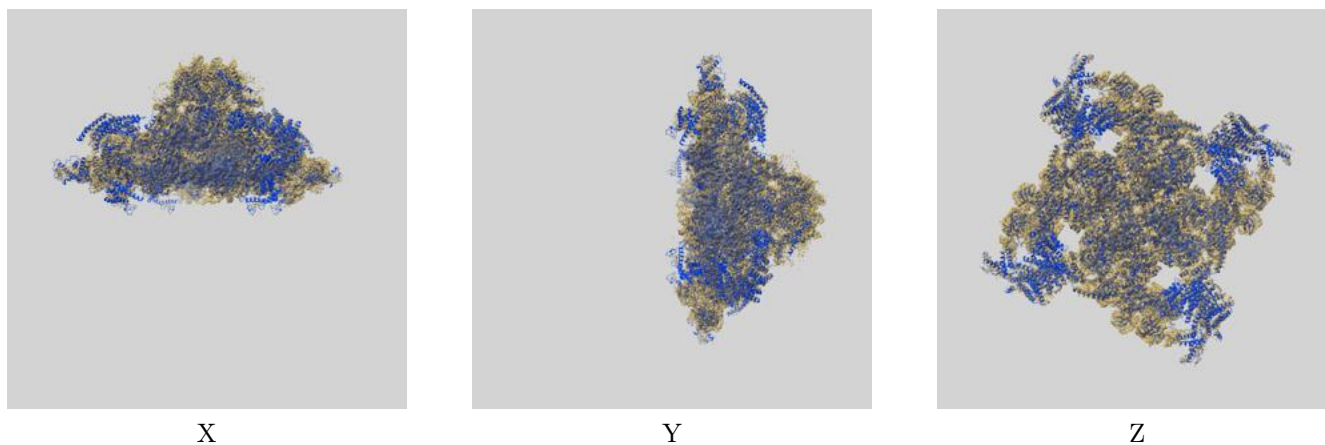
\*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 4.06 differs from the reported value 3.5 by more than 10 %



## 9 Map-model fit [i](#)

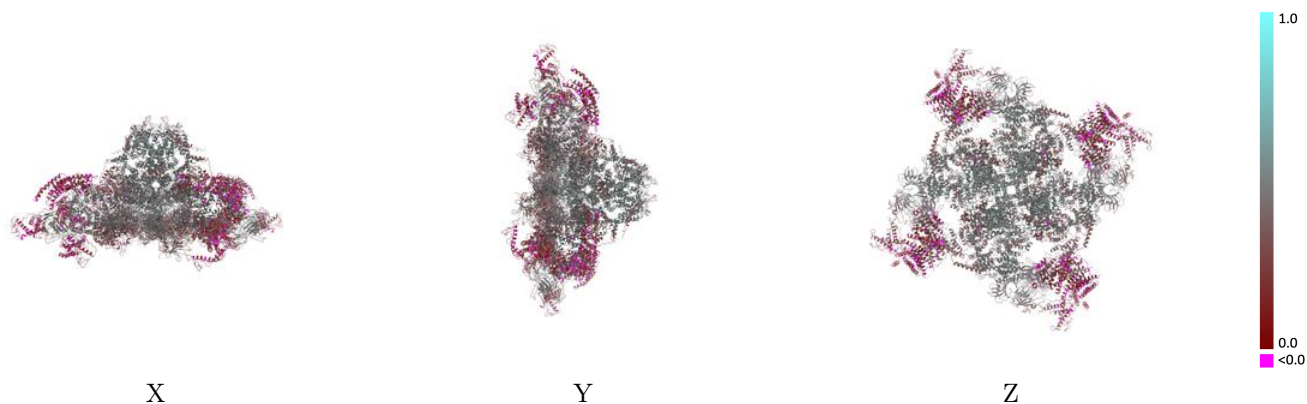
This section contains information regarding the fit between EMDB map EMD-33936 and PDB model 7VMM. Per-residue inclusion information can be found in section 3 on page 11.

### 9.1 Map-model overlay [i](#)



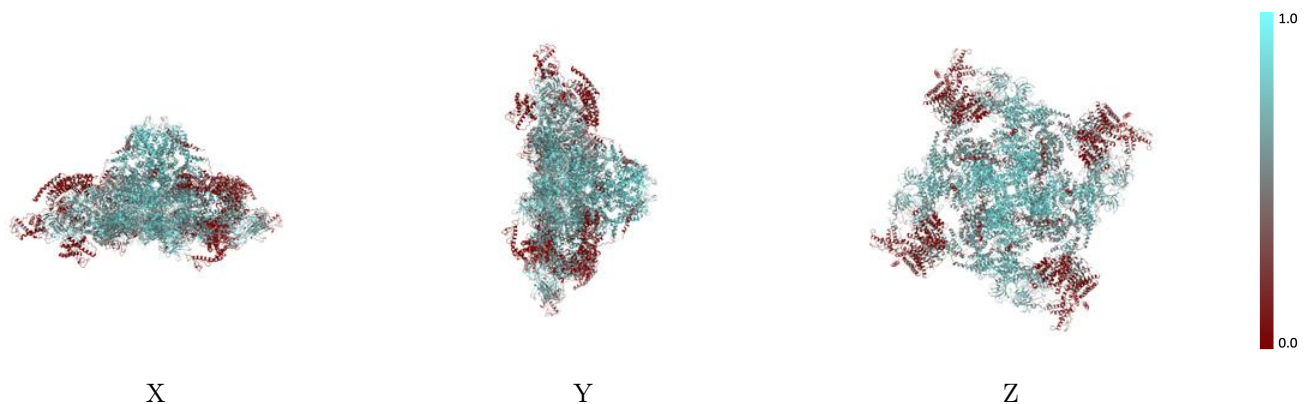
The images above show the 3D surface view of the map at the recommended contour level 0.019 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



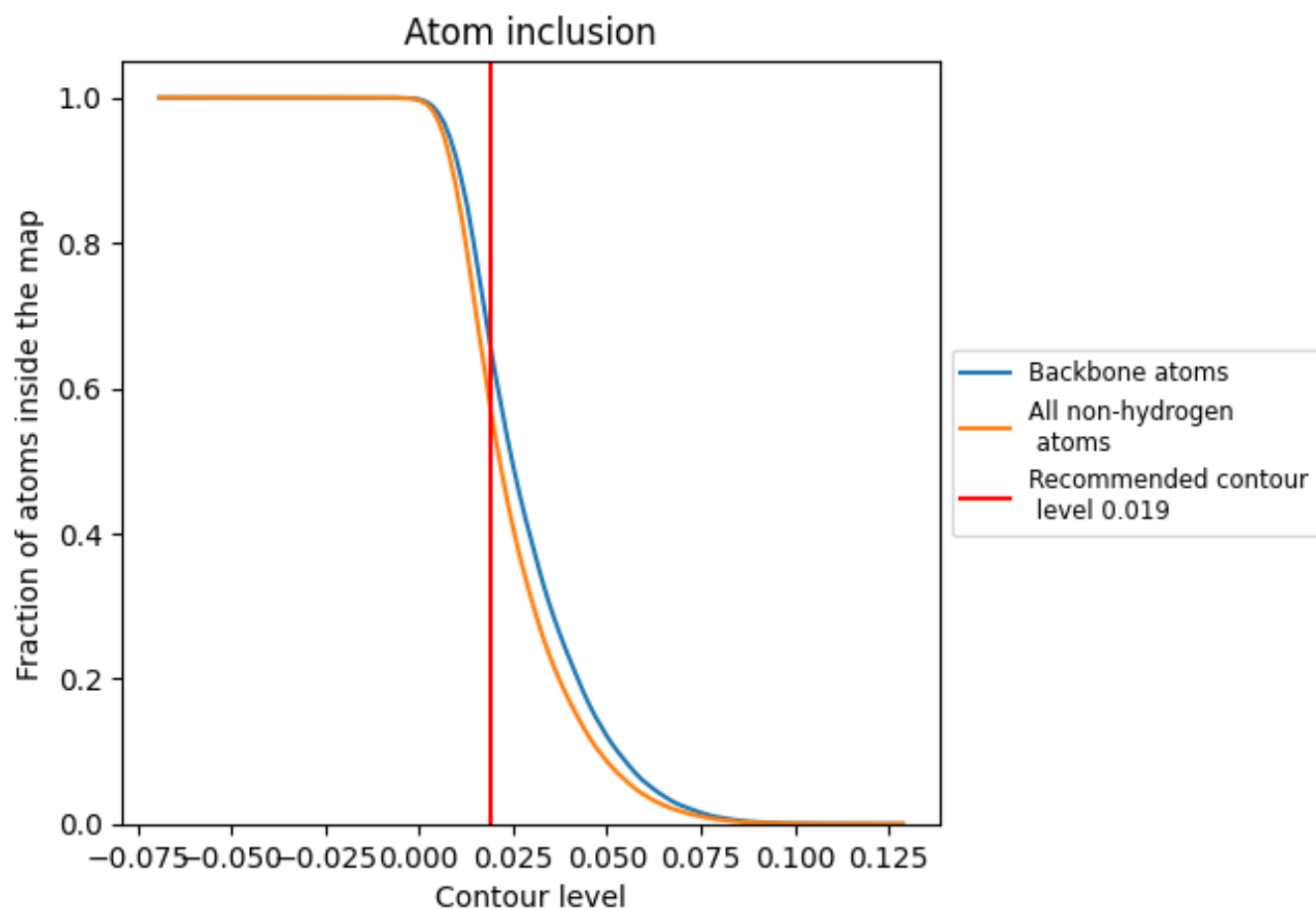
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.019).



















## 9.4 Atom inclusion [i](#)



At the recommended contour level, 66% of all backbone atoms, 57% 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 (0.019) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.5732	 0.3810
A	 0.5696	 0.3790
B	 0.5715	 0.3820
C	 0.5706	 0.3780
D	 0.5686	 0.3760
G	 0.6853	 0.4520
H	 0.6914	 0.4520
I	 0.6815	 0.4520
J	 0.6877	 0.4520

