wwPDB EM Validation Summary Report (i)

Feb 12, 2026 – 09:13 PM EST

PDB ID	:	9PR4 / pdb_00009pr4
EMDB ID	:	EMD-71797
Title	:	In Situ Structure of the Human Mitochondrial Large Subunit 39S in Complex with TACO1
Authors	:	Wang, S.; Xiong, Y.; Zhang, Y.
Deposited on	:	2025-07-23
Resolution	:	2.77 Å(reported)

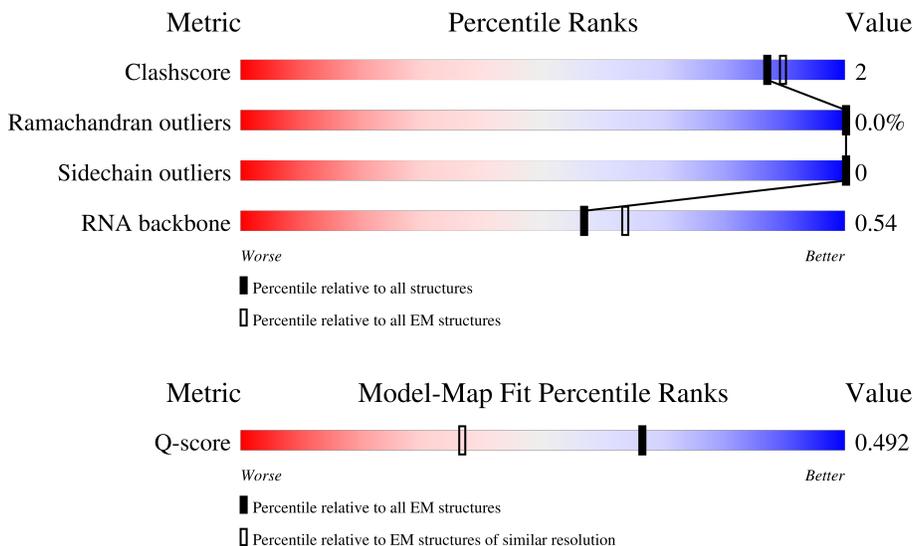The following versions of software and data (see references (i)) were used in the production of this report:

EMDB validation analysis	:	0.0.1.dev131
Mogul	:	2022.3.0, CSD as543be (2022)
MolProbity	:	4-5-2 with Phenix2.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.48

1 Overall quality at a glance ⓘ

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

The reported resolution of this entry is 2.77 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.
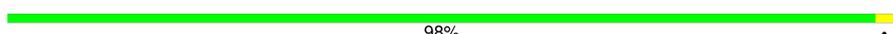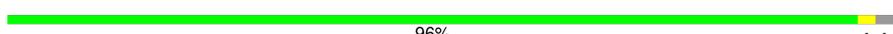
Metric	Percentile Ranks	Value
Clashscore		2
Ramachandran outliers		0.0%
Sidechain outliers		0
RNA backbone		0.54

Worse   *Better*

▮ Percentile relative to all structures
❒ Percentile relative to all EM structures

Metric	Model-Map Fit Percentile Ranks	Value
Q-score		0.492

Worse   *Better*

▮ Percentile relative to all EM structures
❒ Percentile relative to EM structures of similar resolution

Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
RNA backbone	6643	2191	-
Q-score	-	25397	10695 (2.27 - 3.27)

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

Mol	Chain	Length	Quality of chain
1	0	188	58% · 41%
2	1	65	5% · 78% 8% 14%
3	2	92	50% 50%

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Mol	Chain	Length	Quality of chain
4	3	188	48% 49%
5	4	103	34% 63%
6	5	423	90% 7%
7	6	380	91% 7%
8	7	338	81% 6% 13%
9	8	206	22% 63% 5% 33%
10	9	137	89% 9%
11	C	297	49% 38% 18% 44%
12	D	305	77% 22%
13	E	348	85% 12%
14	F	311	78% 19%
15	G	198	36% 22% 14% 64%
15	t	198	13% 23% 77%
15	u	198	12% 14% 84%
15	v	198	16% 15% 84%
15	w	198	16% 15% 84%
15	x	198	16% 14% 84%
15	y	198	16% 13% 84%
16	H	267	33% 72% 24%
17	I	261	17% 75% 6% 19%
18	J	192	15% 85% 6% 9%
19	K	178	98%
20	L	145	77% 21%
21	M	296	96%
22	N	251	84% 12%

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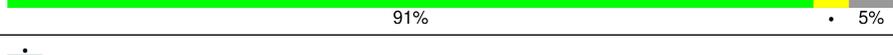| Mol	Chain	Length	Quality of chain
23	O	175	83% 5% 12%
24	P	180	78% 20%
25	Q	292	73% 25%
26	R	149	93% 6%
27	S	205	77% 21%
28	T	206	80% 19%
29	U	153	13% 95% 5%
30	V	216	91% 5%
31	W	148	76% 22%
32	X	256	93% 5%
33	Y	250	72% 28%
34	Z	161	74% 24%
35	b	215	68% 30%
36	d	306	15% 72% 13% 15%
37	e	279	36% 76% 9% 15%
38	g	166	79% 19%
39	h	158	68% 30%
40	i	128	75% 24%
41	j	123	5% 76% 24%
42	k	112	88% 9%
43	l	138	5% 58% 41%
44	m	128	20% 45% 5% 49%
45	n	43	49% 74% 26%
46	o	102	90% 8%
47	q	222	23% 70% 9% 20%

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Mol	Chain	Length	Quality of chain
48	r	196	81% · 17%
49	z	325	75% / 67% 11% 22%
50	A	1558	75% 23% ·
51	c	332	85% · 14%
52	f	212	21% / 66% 8% 26%
53	p	206	8% / 70% · 29%
54	s	439	85% · 12%
55	OX	435	6% / 9% · 90%
56	a	142	13% / 70% · 27%
57	B	72	12% / 56% 32% 12%
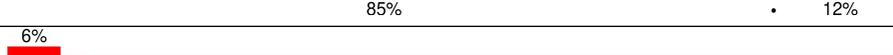
2 Entry composition ⓘ

There are 64 unique types of molecules in this entry. The entry contains 111602 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 39S ribosomal protein L32, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	0	110	898	554	176	162	6	0	0

- Molecule 2 is a protein called 39S ribosomal protein L33, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	1	56	464	296	89	77	2	0	0

- Molecule 3 is a protein called 39S ribosomal protein L34, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	2	46	377	233	83	60	1	0	0

- Molecule 4 is a protein called 39S ribosomal protein L35, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	3	95	832	539	162	128	3	0	0

- Molecule 5 is a protein called 39S ribosomal protein L36, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	4	38	342	217	72	49	4	0	0

- Molecule 6 is a protein called 39S ribosomal protein L37, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	5	394	3210	2073	560	566	11	0	0

- Molecule 7 is a protein called 39S ribosomal protein L38, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	6	354	Total 2948	C 1881	N 525	O 533	S 9	0	0

- Molecule 8 is a protein called 39S ribosomal protein L39, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	7	294	Total 2390	C 1529	N 405	O 438	S 18	0	0

- Molecule 9 is a protein called 39S ribosomal protein L40, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	8	139	Total 1179	C 752	N 207	O 218	S 2	0	0

- Molecule 10 is a protein called 39S ribosomal protein L41, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	9	124	Total 997	C 644	N 170	O 181	S 2	0	0

- Molecule 11 is a protein called Translational activator of cytochrome c oxidase 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	C	166	Total 1286	C 796	N 226	O 258	S 6	0	0

- Molecule 12 is a protein called 39S ribosomal protein L2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	D	238	Total 1859	C 1157	N 376	O 317	S 9	0	0

- Molecule 13 is a protein called 39S ribosomal protein L3, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	E	305	Total 2406	C 1545	N 418	O 432	S 11	0	0

- Molecule 14 is a protein called 39S ribosomal protein L4, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	F	252	Total 2031	C 1305	N 370	O 350	S 6	0	0

- Molecule 15 is a protein called 39S ribosomal protein L12, mitochondrial.

Mol	Chain	Residues	Atoms				AltConf	Trace
15	G	72	Total 558	C 358	N 97	O 103	0	0
15	t	46	Total 354	C 228	N 56	O 70	0	0
15	u	32	Total 257	C 168	N 40	O 49	0	0
15	v	32	Total 257	C 168	N 40	O 49	0	0
15	w	31	Total 245	C 159	N 39	O 47	0	0
15	x	31	Total 245	C 159	N 39	O 47	0	0
15	y	31	Total 245	C 159	N 39	O 47	0	0

- Molecule 16 is a protein called 39S ribosomal protein L9, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	H	202	Total 1661	C 1067	N 304	O 286	S 4	0	0

- Molecule 17 is a protein called 39S ribosomal protein L10, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
17	I	212	Total 1695	C 1088	N 304	O 292	S 11	0	0

- Molecule 18 is a protein called 39S ribosomal protein L11, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
18	J	175	Total 1330	C 847	N 237	O 244	S 2	0	0

- Molecule 19 is a protein called Large ribosomal subunit protein uL13m.

Mol	Chain	Residues	Atoms					AltConf	Trace
19	K	178	Total	C	N	O	S	0	0
			1455	936	259	253	7		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
K	1	ACE	-	acetylation	UNP H2QWN0
K	132	TYR	ASP	conflict	UNP H2QWN0

- Molecule 20 is a protein called 39S ribosomal protein L14, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	L	115	Total	C	N	O	S	0	0
			890	559	171	155	5		

- Molecule 21 is a protein called 39S ribosomal protein L15, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
21	M	291	Total	C	N	O	S	0	0
			2327	1483	430	408	6		

- Molecule 22 is a protein called 39S ribosomal protein L16, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	N	222	Total	C	N	O	S	0	0
			1786	1143	326	307	10		

- Molecule 23 is a protein called 39S ribosomal protein L17, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
23	O	154	Total	C	N	O	S	0	0
			1259	792	241	219	7		

- Molecule 24 is a protein called 39S ribosomal protein L18, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
24	P	144	Total	C	N	O	S	0	0
			1173	733	224	211	5		

- Molecule 25 is a protein called 39S ribosomal protein L19, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
25	Q	220	1834	1174	326	325	9	0	0

- Molecule 26 is a protein called 39S ribosomal protein L20, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
26	R	140	1154	732	231	187	4	0	0

- Molecule 27 is a protein called 39S ribosomal protein L21, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
27	S	161	1293	835	227	227	4	0	0

- Molecule 28 is a protein called 39S ribosomal protein L22, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
28	T	166	1369	875	254	233	7	0	0

- Molecule 29 is a protein called 39S ribosomal protein L23, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
29	U	152	1248	786	234	225	3	0	0

- Molecule 30 is a protein called 39S ribosomal protein L24, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
30	V	205	1676	1068	298	302	8	0	0

- Molecule 31 is a protein called 39S ribosomal protein L27, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
31	W	116	904	577	171	153	3	0	0

- Molecule 32 is a protein called 39S ribosomal protein L28, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
32	X	244	Total 2044	C 1322	N 352	O 365	S 5	0	0

- Molecule 33 is a protein called 39S ribosomal protein L47, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
33	Y	181	Total 1556	C 995	N 298	O 259	S 4	0	0

- Molecule 34 is a protein called 39S ribosomal protein L30, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
34	Z	122	Total 996	C 636	N 186	O 171	S 3	0	0

- Molecule 35 is a protein called 39S ribosomal protein L43, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
35	b	150	Total 1193	C 742	N 231	O 217	S 3	0	0

- Molecule 36 is a protein called 39S ribosomal protein L45, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
36	d	259	Total 2124	C 1357	N 369	O 384	S 14	0	0

- Molecule 37 is a protein called 39S ribosomal protein L46, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
37	e	238	Total 1931	C 1222	N 339	O 364	S 6	0	0

- Molecule 38 is a protein called 39S ribosomal protein L49, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
38	g	134	Total 1113	C 719	N 193	O 199	S 2	0	0

- Molecule 39 is a protein called 39S ribosomal protein L50, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
39	h	110	Total 895	C 568	N 156	O 168	S 3	0	0

- Molecule 40 is a protein called 39S ribosomal protein L51, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
40	i	97	Total 828	C 532	N 165	O 127	S 4	0	0

- Molecule 41 is a protein called 39S ribosomal protein L52, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
41	j	94	Total 745	C 463	N 144	O 136	S 2	0	0

- Molecule 42 is a protein called Large ribosomal subunit protein mL53.

Mol	Chain	Residues	Atoms					AltConf	Trace
42	k	102	Total 774	C 479	N 148	O 142	S 5	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
k	1	ACE	-	acetylation	UNP Q96EL3

- Molecule 43 is a protein called 39S ribosomal protein L54, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
43	l	82	Total 688	C 437	N 120	O 128	S 3	0	0

- Molecule 44 is a protein called 39S ribosomal protein L55, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
44	m	65	Total 541	C 333	N 112	O 94	S 2	0	0

- Molecule 45 is a protein called Nascent polypeptide.

Mol	Chain	Residues	Atoms				AltConf	Trace
45	n	32	Total 160	C 96	N 32	O 32	0	0

- Molecule 46 is a protein called Ribosomal protein 63, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
46	o	94	Total 798	C 501	N 165	O 129	S 3	0	0

- Molecule 47 is a protein called Growth arrest and DNA damage-inducible proteins-interacting protein 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
47	q	177	Total 1495	C 929	N 292	O 269	S 5	0	0

- Molecule 48 is a protein called 39S ribosomal protein S18a, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
48	r	162	Total 1322	C 839	N 252	O 223	S 8	0	0

- Molecule 49 is a protein called Large ribosomal subunit protein uL1m.

Mol	Chain	Residues	Atoms					AltConf	Trace
49	z	252	Total 2027	C 1304	N 336	O 381	S 6	0	0

- Molecule 50 is a RNA chain called 16S mitochondrial rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
50	A	1558	Total 33070	C 14843	N 5963	O 10706	P 1558	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	A	deletion	GB 2756414513
A	?	-	C	deletion	GB 2756414513
A	?	-	U	deletion	GB 2756414513

- Molecule 51 is a protein called 39S ribosomal protein L44, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
51	c	286	2299	1470	397	423	9	0	0

- Molecule 52 is a protein called 39S ribosomal protein L48, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
52	f	157	1252	799	207	242	4	0	0

- Molecule 53 is a protein called Peptidyl-tRNA hydrolase ICT1, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
53	p	147	1205	748	228	225	4	0	0

- Molecule 54 is a protein called 39S ribosomal protein S30, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
54	s	385	3148	2018	558	558	14	0	0

- Molecule 55 is a protein called Mitochondrial inner membrane protein OXA1L.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
55	OX	42	359	221	75	62	1	0	0

- Molecule 56 is a protein called 39S ribosomal protein L42, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
56	a	103	865	543	155	162	5	0	0

- Molecule 57 is a RNA chain called mitochondrial tRNAVal.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
57	B	72	1524	685	269	498	72	0	0

- Molecule 58 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
58	0	1	Total 1	Zn 1	0
58	4	1	Total 1	Zn 1	0

- Molecule 59 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms		AltConf
59	3	1	Total 1	K 1	0
59	6	1	Total 1	K 1	0
59	D	1	Total 1	K 1	0
59	M	1	Total 1	K 1	0
59	N	1	Total 1	K 1	0
59	W	1	Total 1	K 1	0
59	o	1	Total 1	K 1	0
59	A	29	Total 29	K 29	0

- Molecule 60 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
60	D	2	Total 2	Mg 2	0
60	E	1	Total 1	Mg 1	0
60	g	1	Total 1	Mg 1	0
60	A	137	Total 137	Mg 137	0

- Molecule 61 is FE2/S2 (INORGANIC) CLUSTER (CCD ID: FES) (formula: Fe_2S_2) (labeled as "Ligand of Interest" by depositor).
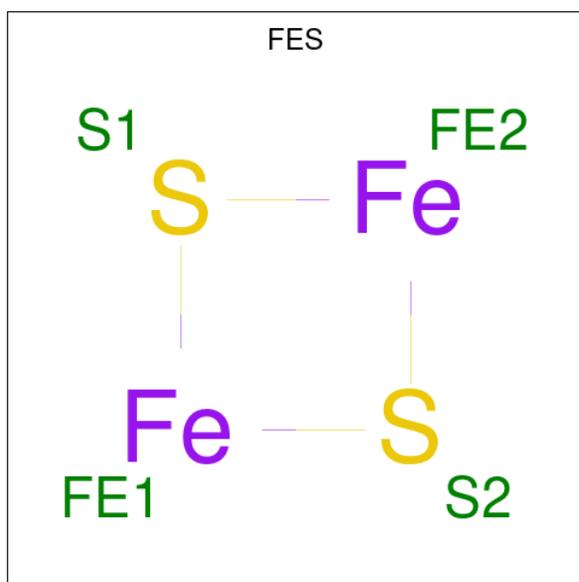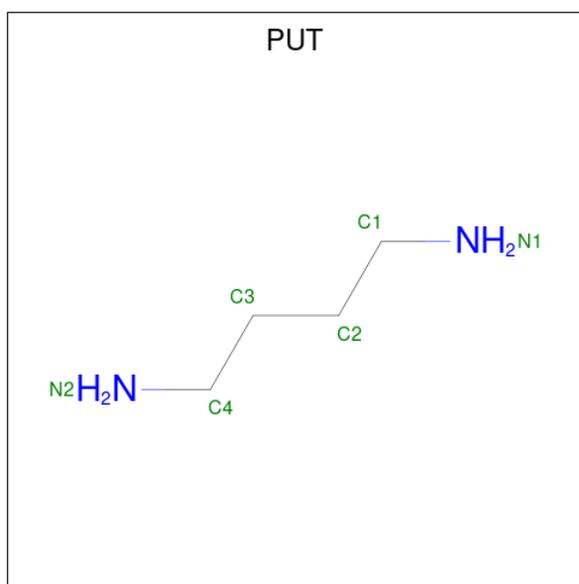
Mol	Chain	Residues	Atoms			AltConf
			Total	Fe	S	
61	r	1	4	2	2	0

- Molecule 62 is SPERMIDINE (CCD ID: SPD) (formula: $C_7H_{19}N_3$) (labeled as "Ligand of Interest" by depositor).
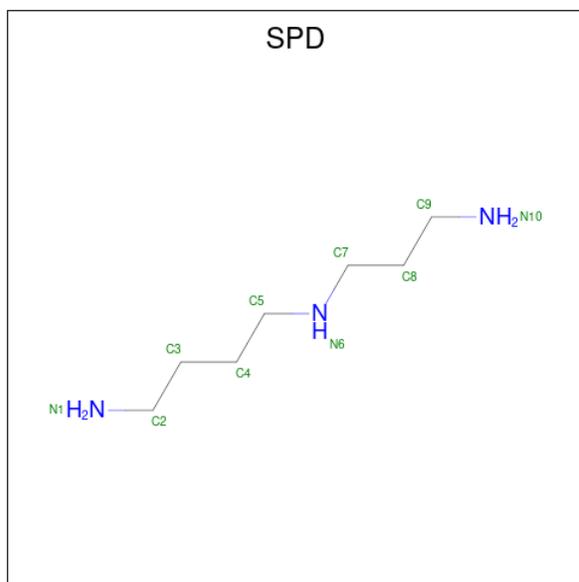
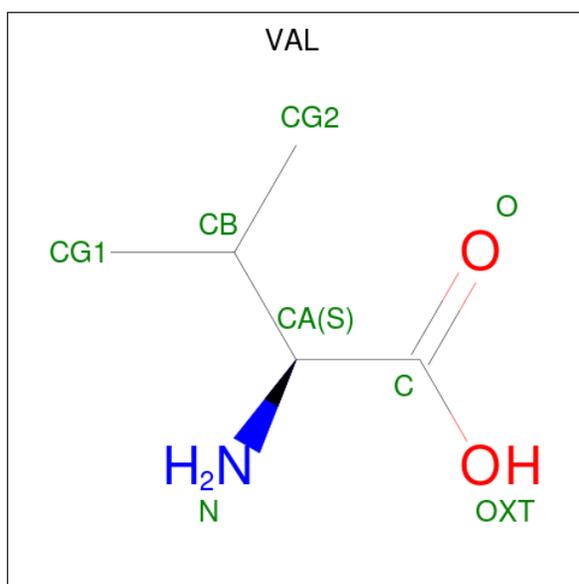
Mol	Chain	Residues	Atoms			AltConf
62	A	1	Total	C	N	0
			10	7	3	
62	A	1	Total	C	N	0
			10	7	3	

- Molecule 63 is 1,4-DIAMINOBUTANE (CCD ID: PUT) (formula: $C_4H_{12}N_2$).

Mol	Chain	Residues	Atoms			AltConf
63	A	1	Total	C	N	0
			6	4	2	

- Molecule 64 is VALINE (CCD ID: VAL) (formula: $C_5H_{11}NO_2$).

| Mol	Chain	Residues	Atoms				AltConf
64	B	1	Total	C	N	O	0
			7	5	1	1	

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.
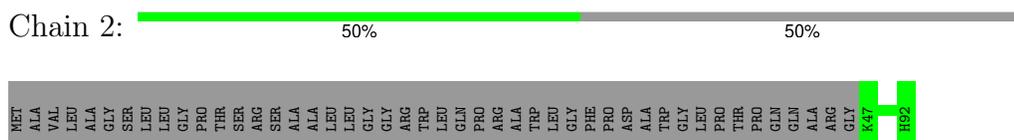
- Molecule 1: 39S ribosomal protein L32, mitochondrial
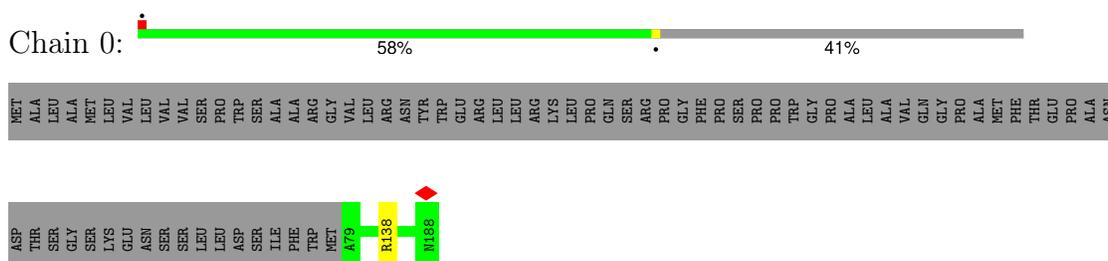
- Molecule 2: 39S ribosomal protein L33, mitochondrial
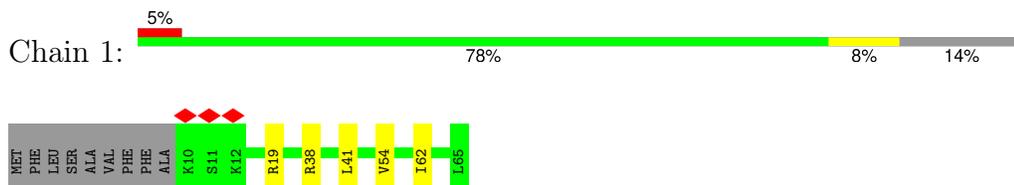
- Molecule 3: 39S ribosomal protein L34, mitochondrial

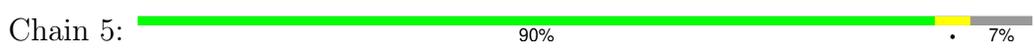- Molecule 4: 39S ribosomal protein L35, mitochondrial

- Molecule 5: 39S ribosomal protein L36, mitochondrial

MET ALA ASN LEU PHE ILE ARG LYS MET VAL ASN PRO LEU LEU TYR LEU SER ARG HIS THR VAL LYS PRO ARG ALA LEU SER THR PHE LEU PHE GLY SER ILE ARG GLY ALA ALA PRO VAL VAL GLU PRO GLY ALA ALA VAL ARG SER LEU LEU SER PRO GLY LEU LEU PRO HIS LEU

LEU PRO ALA LEU GLY F66 K69 L72 M103

• Molecule 6: 39S ribosomal protein L37, mitochondrial

Chain 5:   90%   •   7%

MET ALA LEU ALA SER GLY PRO ALA ARG ARG ALA LEU GLY SER GLY GLN LEU LEU GLY LEU GLY PHE GLY ALA PRO ARG ARG GLY A30 L98 L113 I129 Q165 T166 T167 T175 R201 R215 T232 D272 A311 F354 L364 L373 R395

L417 A423

• Molecule 7: 39S ribosomal protein L38, mitochondrial

Chain 6:   91%   •   7%

MET ALA ALA PRO TRP TRP ARG ALA ALA LEU CYS GLU CYS ARG ARG ARG TRP GLY PHE SER THR SER ALA VAL LEU GLY R27 K81 T82 D83 P84 K85 E86 R106 L161 E181 V187 Y206 W214 L225 H234 P257 D276 T300 F319 Y380

• Molecule 8: 39S ribosomal protein L39, mitochondrial

Chain 7:   81%   6%   13%
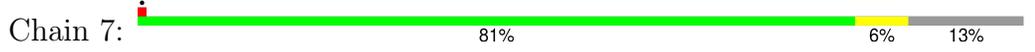
MET GLU ALA LEU ALA MET GLY SER ARG ALA LEU ARG TRP LEU VAL ALA PRO GLY GLY ILE LYS TRP ARG PHE ILE ALA THR SER SER ALA SER Q34 R61 L107 P112 W113 D114 K117 L128 N139 M150 G151 C152 V153 I154 L166 V174 Y181

F260 P267 F276 L286 R296 L302 P303 V304 L317 D327 GLN SER LYS ALA THR GLU GLU CYS THR SER THR

• Molecule 9: 39S ribosomal protein L40, mitochondrial

Chain 8:   22%   63%   5%   33%

MET THR ALA SER VAL LEU ARG SER ILE SER LEU ALA LEU ARG PRO THR ARG SER GLY LEU LEU GLY LEU THR TRP GLN THR GLN LEU LEU ARG GLU GLU THR HIS GLN ARG ALA SER LEU LEU SER PHE TRP GLU GLU ILE PRO MET ARG GLU GLU PRO LEU LEU LYS LYS LYS LYS VAL ASP PRO LYS LYS

ASP GLN GLU ALA K65 E66 R67 L68 K69 R70 K71 I72 R73 K74 L75 E76 K77 A78 T79 Q80 F88 P91 L92 L95 D96 K97 A98 R99 Q103 V104 E105 L106 L117 K125 I136 R137 A138 E141 E145 E148 E149 L152 E153 L157 R164 K173

I182 P187 R191 Y192 N193 D194 V198 Y199 T200 Q201 V202 E203 PHE LYS ARG

• Molecule 10: 39S ribosomal protein L41, mitochondrial

Chain 9: 89% 9%

MET GLY VAL LEU ALA ALA ALA ARG CYS LEU VAL ARG G14 L86 L91 R137
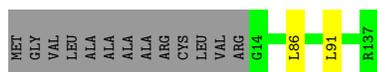
• Molecule 11: Translational activator of cytochrome c oxidase 1

Chain C: 49% 38% 18% 44%

MET SER ALA TRP ALA ALA ALA SER LEU SER ARG ALA ALA ALA ARG CYS LEU LEU ALA ARG GLY PRO GLY VAL ARG ALA ALA PRO PRO ARG ASP PRO ARG PRO SER HIS PRO GLU PRO ARG GLY CYS GLY ALA ALA PRO GLY ARG THR LEU HIS PHE THR ALA VAL PRO ALA GLY HIS

ASN LYS TRP SER LYS VAL ARG HIS ILE LYS GLY PRO LYS ASP VAL GLU ARG SER ILE PHE SER LYS LEU CYS LEU ASN ILE ARG LEU ALA VAL LYS GLU GLY GLY PRO ASN PRO GLU HIS ASN SER SER ASN LEU ALA ASN ILE LEU GLU VAL CYS ARG SER LYS HIS MET PRO LYS SER

THR ILE GLU GLU THR ALA LEU LYS MET GLU GLU LYS SER K132 D133 T134 Y135 L136 L137 Y138 E139 G140 R141 G142 P143 G144 G145 S146 S147 L148 L149 I150 E151 A152 L153 S154 N155 S156 S157 H158 K159 C160 Q161 A162 D163 I164 R165 H166 I167 L168 N169 K170 N171 G172 G173 V174 M175 A176 V177 G178 A179 R180

H181 S182 F183 D184 K185 K186 G187 V188 I189 V190 V191 E192 V193 E194 D195 R196 E197 K198 K199 A200 V201 N202 L203 E204 R205 A206 L207 E208 M209 A210 I211 E212 A213 G214 A215 E216 D217 V218 K219 E220 T221 E222 D223 E224 E225 E226 R227 N228 V229 F230 K231 F232 I233 A236 S237 S238 L239 H240 Q241

V242 R243 K244 K245 L246 D247 S248 L249 G250 L251 C252 S253 V254 S255 C256 A257 L258 E259 F260 I261 P262 N263 S264 K265 V266 Q267 L268 A269 E270 P271 D272 L273 E274 Q275 A276 A277 H278 L279 A282 L283 S284 N285 H286 E287 D288 V289 I290 H291 V292 Y293 D294 N295 I296 E297
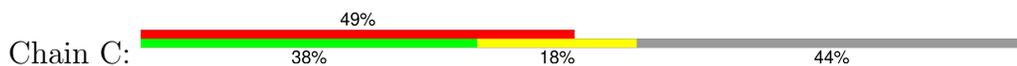
• Molecule 12: 39S ribosomal protein L2, mitochondrial

Chain D: 77% 22%

MET ALA LEU CYS ALA LEU THR ARG ALA LEU ARG SER LEU ASN LEU ALA PRO PRO THR VAL ALA ALA PRO ALA PRO SER LEU PHE PRO ALA ALA GLN MET MET ASN ASN GLY LEU LEU GLN GLN PRO SER ALA LEU MET LEU LEU PRO CYS ARG PRO VAL LEU THR SER VAL ALA LEU ASN

A61 R171 Q205 R208 I257 R262 L298 PRO SER ALA SER ALA GLN SER

• Molecule 13: 39S ribosomal protein L3, mitochondrial

Chain E: 85% 12%

MET PRO GLY TRP ARG LEU LEU THR GLN GLN VAL GLY ALA GLN VAL LEU LEU GLY ARG LEU GLY ASP GLY LEU LEU ALA ALA LEU LEU GLY PRO GLY ASN ARG THR HIS ILE TRP LEU PHE VAL ARG GLY LEU HIS GLY K44 S45 D50 L53 L80 M107 N139 T144 I178

A244 I248 G323 D324 E325 A348
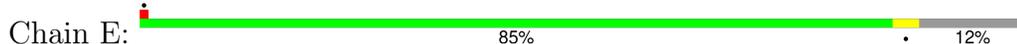
• Molecule 14: 39S ribosomal protein L4, mitochondrial

Chain F: 78% 19%

MET LEU GLN PHE VAL ARG ALA GLY ALA ARG ALA TRP LEU ARG PRO GLY THR GLY SER GLN GLY LEU SER SER LEU ALA GLU GLU ALA ALA ARG ALA THR GLU GLU PRO GLU GLN VAL ALA SER GLU GLY LEU **P44** **W65** **D94** **Q103** **L218** **I230** **L248** **N249** **M253**

V260 **R295** PRO LEU PRO HIS ALA THR GLN GLY PRO ALA ALA THR PRO TYR HIS CYS

• Molecule 15: 39S ribosomal protein L12, mitochondrial

Chain G:
36%
22% 14% 64%

MET LEU PRO ALA ALA ARG PRO LEU TRP GLY PRO CYS LEU GLY LEU ARG ALA ALA PHE ARG LEU ALA ARG ARG GLN VAL PRO CYS VAL CYS ALA VAL ARG HIS MET ARG SER GLY HIS GLN ARG CYS GLU ALA VAL LEU ALA GLY ALA PRO LEU ASP ASN ALA PRO LYS GLU TYR

PRO PRO LYS GLN ILE GLN GLN LEU VAL GLN ASP ILE ALA SER LEU THR LEU LEU GLU ILE SER ASP LEU ASN GLU LEU LEU LYS LYS THR LEU LYS ILE GLN ASP VAL GLY LEU VAL PRO MET GLY GLY VAL MET SER GLY ALA VAL PRO ALA ALA ALA GLN GLU ALA VAL GLU GLU ASP
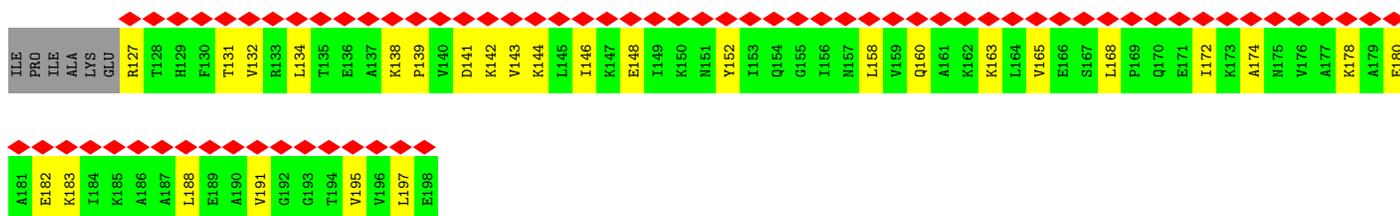
ILE PRO ILE ALA LYS GLU **R127** **T128** **H129** **F130** **T131** **V132** **R133** **L134** **T135** **E136** **A137** **K138** **P139** **V140** **D141** **K142** **V143** **K144** **L145** **I146** **K147** **E148** **I149** **K150** **N151** **Y152** **I153** **Q154** **G155** **I156** **N157** **L158** **V159** **Q160** **A161** **K162** **K163** **L164** **V165** **E166** **S167** **L168** **P169** **Q170** **E171** **I172** **K173** **A174** **N175** **V176** **A177** **K178** **A179** **E180**

A181 **E182** **K183** **I184** **K185** **A186** **A187** **L188** **E189** **A190** **V191** **G192** **G193** **T194** **V195** **V196** **L197** **E198**

• Molecule 15: 39S ribosomal protein L12, mitochondrial

Chain t:
13%
23% 77%

MET LEU PRO ALA ALA ARG PRO LEU TRP GLY PRO CYS LEU GLY LEU ARG ALA ALA ALA PHE ARG LEU ALA ARG ARG GLN VAL PRO CYS VAL CYS ALA VAL ARG HIS MET ARG SER GLY HIS GLN ARG CYS **E46** **N55** **E59** **P62** **K63** **Q66** **L67** **V68** **Q69** **D70** **I71**

A72 **S73** **L74** **T75** **L76** **L77** **E78** **I79** **S80** **D81** **L82** **N83** **E84** **L85** **L86** **K87** **K88** **T89** **L90** **K91** ILE GLN ASP VAL GLY LEU VAL PRO MET GLY GLY VAL MET SER GLY ALA VAL PRO ALA ALA ALA LYS GLU ALA GLN GLU ALA VAL GLU GLU ASP ILE PRO ILE ALA LYS GLU ARG THR HIS PHE THR

VAL ARG LEU THR GLU ALA LYS PRO VAL ASP LYS VAL LYS LEU ILE LYS LEU GLN ILE LYS ASN TYR ILE LEU GLN ILE ILE ASN LEU VAL GLN ALA LYS LEU LYS VAL LEU GLU VAL SER LEU PRO GLN GLU ILE LYS ALA ASN VAL ALA LYS ALA GLU GLU ALA GLU GLU LYS ILE LYS ALA ALA LEU GLU GLU ALA VAL

GLY GLY THR VAL VAL LEU GLU

• Molecule 15: 39S ribosomal protein L12, mitochondrial

Chain u:
12%
14% • 84%

MET LEU PRO ALA ALA ARG PRO LEU TRP GLY PRO CYS LEU GLY LEU ARG ALA ALA ALA PHE ARG LEU ALA ARG ARG GLN VAL PRO CYS VAL CYS VAL ARG HIS MET ARG SER GLY HIS GLN ARG CYS GLU ALA LEU ALA ALA GLY ALA PRO LEU ASP ASN ALA PRO LYS GLU **Y60**

P61 **P62** **K63** **I64** **Q65** **Q66** **L67** **V68** **Q69** **D70** **I71** **A72** **S73** **L74** **T75** **L76** **L77** **E78** **I79** **S80** **D81** **E84** **L85** **L86** **K87** **K88** **T89** **L90** **K91** ILE GLN ASP VAL GLY LEU VAL PRO MET GLY GLY VAL MET SER GLY ALA VAL PRO ALA ALA ALA GLN GLU ALA VAL GLU GLU ASP ILE

PRO ILE ALA LYS GLU ARG THR HIS PHE THR VAL ARG LEU THR GLU ALA LYS PRO VAL ASP LYS VAL LYS LEU ILE LYS GLU ILE LYS ASN TYR GLN GLY ILE ASN LEU VAL GLU ALA LYS LYS LEU VAL GLU SER LEU PRO GLN GLU ILE LYS ALA ASN VAL ALA LYS ALA GLU ALA

GLU LYS ILE ALA ALA LEU GLU ALA VAL GLY GLY THR VAL LEU GLU

• Molecule 15: 39S ribosomal protein L12, mitochondrial

Chain v:

MET LEU PRO ALA ALA ARG PRO LEU TRP GLY PRO CYS LEU GLY ARG ALA ALA ALA PHE ARG LEU ALA ARG ARG GLN VAL PRO CYS VAL CYS ALA VAL ARG HIS MET ARG SER GLY HIS GLN ARG CYS GLU ALA LEU ALA GLY PRO LEU ASP ASN ALA PRO LYS GLU **Y60**

P61 P62 K63 I64 Q65 Q66 L67 V68 Q69 D70 I71 A72 S73 L74 T75 L76 L77 E78 I79 S80 D81 L82 N83 E84 L85 L86 K87 K88 T89 L90 K91 ILE GLN ASP VAL GLY LEU VAL PRO MET GLY VAL MET SER GLY ALA VAL PRO ALA ALA ALA GLN GLU ALA VAL GLU GLU ASP

ILE PRO ILE ALA LYS GLU ARG THR HIS PHE THR VAL ARG LEU THR GLU ALA LYS PRO VAL ASP LYS VAL LYS LEU ILE LYS GLU ILE LYS ASN TYR ILE GLN GLY ILE ASN LEU VAL GLN ALA LYS LYS LEU VAL GLU SER LEU PRO GLN GLU ILE LYS ALA ASN VAL ALA LYS ALA GLU

ALA GLU LYS ILE LYS ALA ALA LEU GLU ALA VAL GLY GLY THR VAL LEU GLU

• Molecule 15: 39S ribosomal protein L12, mitochondrial

Chain w:

MET LEU PRO ALA ALA ARG PRO LEU TRP GLY PRO CYS LEU GLY ARG ALA ALA ALA PHE ARG LEU ALA ARG ARG GLN VAL PRO CYS VAL CYS ALA VAL ARG HIS MET ARG SER GLY HIS GLN ARG CYS GLU ALA LEU ALA GLY PRO LEU ASP ASN ALA PRO LYS GLU TYR

P61 P62 K63 I64 Q65 Q66 L67 V68 Q69 D70 I71 A72 S73 L74 T75 L76 L77 E78 I79 S80 D81 L82 N83 E84 L85 L86 K87 K88 T89 L90 K91 ILE GLN ASP VAL GLY LEU VAL PRO MET GLY VAL MET SER GLY ALA VAL PRO ALA ALA ALA GLN GLU ALA VAL GLU GLU ASP

ILE PRO ILE ALA LYS GLU ARG THR HIS PHE THR VAL ARG LEU THR GLU ALA LYS PRO VAL ASP LYS VAL LYS LEU ILE LYS GLU ILE LYS ASN TYR ILE GLN GLY ILE ASN LEU VAL GLN ALA LYS LYS LEU VAL GLU SER LEU PRO GLN GLU ILE LYS ALA ASN VAL ALA LYS ALA GLU

ALA GLU LYS ILE LYS ALA ALA LEU GLU ALA VAL GLY GLY THR VAL LEU GLU

• Molecule 15: 39S ribosomal protein L12, mitochondrial

Chain x:

MET LEU PRO ALA ALA ARG PRO LEU TRP GLY PRO CYS LEU GLY ARG ALA ALA ALA PHE ARG LEU ALA ARG ARG GLN VAL PRO CYS VAL CYS ALA VAL ARG HIS MET ARG SER GLY HIS GLN ARG CYS GLU ALA LEU ALA GLY PRO LEU ASP ASN ALA PRO LYS GLU TYR

P61 P62 K63 I64 Q65 Q66 L67 V68 Q69 D70 I71 A72 S73 L74 T75 L76 L77 E78 I79 S80 D81 L82 N83 E84 L85 L86 K87 K88 T89 L90 K91 ILE GLN ASP VAL GLY LEU VAL PRO MET GLY VAL MET SER GLY ALA VAL PRO ALA ALA ALA GLN GLU ALA VAL GLU GLU ASP

ILE PRO ILE ALA LYS GLU ARG THR HIS PHE THR VAL ARG LEU THR GLU ALA LYS PRO VAL ASP LYS VAL LYS LEU ILE LYS GLU ILE LYS ASN TYR ILE GLN GLY ILE ASN LEU VAL GLN ALA LYS LYS LEU VAL GLU SER LEU PRO GLN GLU ILE LYS ALA ASN VAL ALA LYS ALA GLU

ALA GLU LYS ILE LYS ALA ALA LEU GLU ALA VAL GLY GLY THR VAL LEU GLU

- Molecule 15: 39S ribosomal protein L12, mitochondrial

Chain y:

16%

13% 84%

- Molecule 16: 39S ribosomal protein L9, mitochondrial

Chain H:

33%

72% 24%

- Molecule 17: 39S ribosomal protein L10, mitochondrial

Chain I:

17%

75% 6% 19%

- Molecule 18: 39S ribosomal protein L11, mitochondrial

Chain J:

15%

85% 6% 9%

L151 R154 D158 A181 D182 L183 A184 A185 Q186 E187 E188 A189 A190 K191 K192

• Molecule 19: Large ribosomal subunit protein uL13m
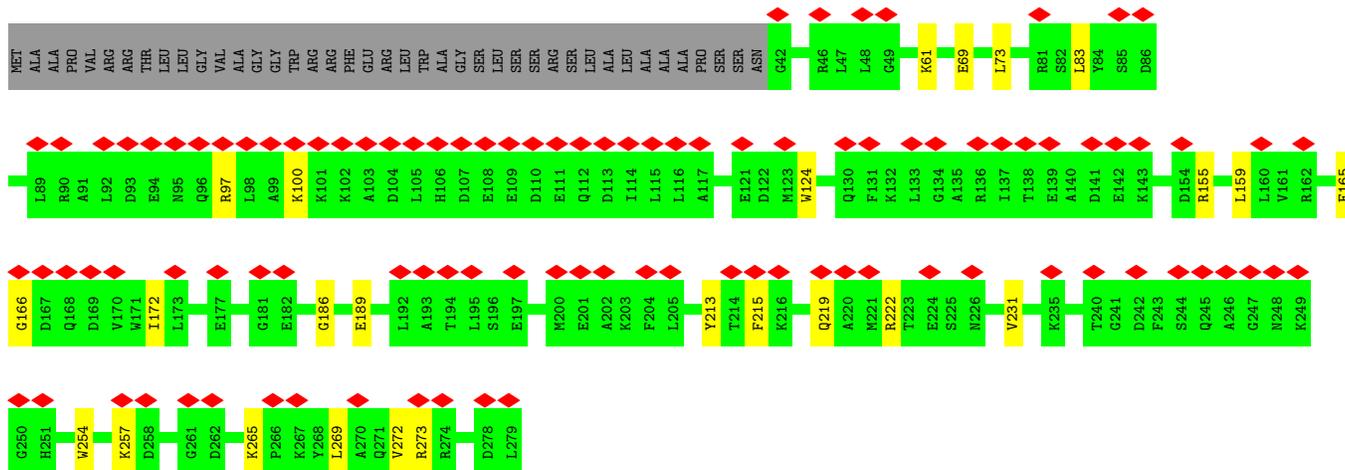
Chain K:

98%

ACE1 L20 M60 I133 L141 L178

• Molecule 20: 39S ribosomal protein L14, mitochondrial

Chain L:

77% 21%

MET ALA PHE THR GLY LEU TRP GLY PRO PHE THR CYS VAL SER ARG VAL LEU SER HIS HIS CYS PHE SER THR THR GLY SER LEU SER A31 I32 L46 K78 N103 V145

• Molecule 21: 39S ribosomal protein L15, mitochondrial

Chain M:

96%

MET ALA GLY PRO LEU Q6 N30 P40 P79 A177 R203 P226 K281 S296

• Molecule 22: 39S ribosomal protein L16, mitochondrial

Chain N:

84% 12%

MET TRP ARG LEU LEU ALA ARG ALA SER ALA PRO LEU LEU ARG VAL PRO LEU SER ASP SER TRP ALA LEU LEU PRO ALA SER ALA GLY V30 V36 K67 M104 V124 R133 R139 R158 I218 M223 I226 V251

• Molecule 23: 39S ribosomal protein L17, mitochondrial

Chain O:

83% 5% 12%

MET ARG LEU SER VAL ALA ALA ALA I9 S10 A44 P45 W46 V49 D50 M107 A121 L144 E161 A162 SER ASN HIS SER SER HIS THR ALA GLN THR PRO GLY ILE

• Molecule 24: 39S ribosomal protein L18, mitochondrial

Chain P:

78% 20%

MET ALA LEU ARG SER ARG PHE TRP GLY LEU PHE SER VAL CYS ARG ASN PRO GLY CYS ARG PHE ALA ALA LEU SER THR SER SER GLU PRO ALA ALA LYS PRO GLU VAL D37 V44 V94 W110 L132 E180

• Molecule 25: 39S ribosomal protein L19, mitochondrial

Chain Q:
73%   25%

MET ALA ALA CYS ILE ALA ALA GLY HIS TRP ALA ALA MET GLY LEU GLY ARG SER PHE GLN ALA ALA ARG THR LEU LEU PRO PRO PRO ALA SER ILE ALA CYS ARG VAL HIS GLY PRO VAL ARG GLN GLN SER THR GLY PRO SER GLU PRO GLY ALA PHE GLN PRO PRO LYS PRO

VAL ILE VAL ASP LYS HIS ARG PRO VAL GLU PRO GLU R73 L100 L117 L145 G146 L151 N212 I286 R291 S292

- Molecule 26: 39S ribosomal protein L20, mitochondrial

Chain R:
93%   6%

MET VAL PHE LEU THR ALA GLN LEU TRP L10 L90 V91 K136 H149

- Molecule 27: 39S ribosomal protein L21, mitochondrial

Chain S:
77%   21%

MET ALA ALA SER LEU THR VAL THR LEU GLY ARG LEU ALA SER ALA CYS SER HIS SER ILE LEU ARG PRO SER GLY PRO GLY ALA ALA SER LEU TRP SER ALA SER ARG ARG PHE ASN SER GLN SER THR S45 Y46 L47 F96 K163 R173 F180 L205

- Molecule 28: 39S ribosomal protein L22, mitochondrial

Chain T:
80%   19%

MET ALA ALA ALA VAL LEU GLY GLN LEU GLY ALA LEU TRP ILE HIS ASN LEU ARG SER ARG GLY LYS LEU SER LEU GLY VAL LEU PRO GLN SER TYR ILE HIS THR SER ALA SER LEU ASP I41 R62 Y193 L206

- Molecule 29: 39S ribosomal protein L23, mitochondrial

Chain U:
13%
95%   5%

MET A2 V65 V97 D115 E116 S117 P118 E119 G120 S121 A122 A123 D124 D125 L126 Y127 S128 M129 L130 E131 E132 E133 R134 Q135 Q136 R137 L153

- Molecule 30: 39S ribosomal protein L24, mitochondrial

Chain V:
91%   5%

MET ARG LEU SER ALA LEU LEU ALA LEU ALA SER K12 V13 T14 Y55 V79 I80 W85 V86 M102 D103 I133 E142 V146 Y216

- Molecule 31: 39S ribosomal protein L27, mitochondrial

Chain W:
76%   22%

MET ALA SER VAL VAL LEU ALA LEU ARG THR ARG THR VAL VAL THR SER LEU LEU SER PRO THR PRO ALA THR ALA LEU ALA VAL ARG TYR ALA SER K33 K34 S35 G36 G37 S38 I67 V131 L148

• Molecule 32: 39S ribosomal protein L28, mitochondrial

Chain X:

93%   5%

MET P2 I20 E34 E35 R36 L166 I196 L243 S244 E245 PRO ALA VAL VAL GLN LYS ARG ALA SER GLY GLN

• Molecule 33: 39S ribosomal protein L47, mitochondrial

Chain Y:

72%   28%

MET ALA ALA GLY LEU LEU ALA LEU LEU CYS ARG ARG VAL SER SER ALA LEU LYS SER SER ARG SER LEU ILE THR PRO GLN VAL PRO ALA CYS THR GLY PHE PHE LEU SER LEU LEU PRO LYS SER THR PRO ASN VAL THR SER PHE HIS GLN TYR ARG LEU HIS THR THR LEU SER

ARG LYS G63 I176 E243 ALA GLN LYS SER SER LEU VAL

• Molecule 34: 39S ribosomal protein L30, mitochondrial

Chain Z:

74%   24%

MET ALA GLY ILE LEU ARG LEU VAL VAL GLN TRP PRO GLY PRO GLY ARG LEU GLN THR VAL THR LYS GLY VAL GLU SER LEU ILE CYS THR ASP TRP ILE ARG HIS K35 T70 P97 Q156 LYS ALA HIS GLU SER

• Molecule 35: 39S ribosomal protein L43, mitochondrial

Chain b:

68%   30%

MET T2 I89 K92 D106 I126 P151 ALA PRO ALA GLN ASP THR GLY LEU ARG LEU SER ALA VAL ALA PRO GLN ILE LEU LEU PRO GLY TRP PRO ASP PRO PRO ASP LEU PRO THR VAL ASP PRO ILE SER SER SER LEU THR SER ALA PRO ALA PRO MET LEU SER ALA

VAL SER CYS LEU PRO ILE VAL PRO ALA LEU THR THR VAL CYS SER ALA

• Molecule 36: 39S ribosomal protein L45, mitochondrial

Chain d:

15%
72%   13%   15%

MET ALA ALA PRO ILE PRO GLN GLY PHE SER CYS LEU SER ARG PHE LEU GLY TRP TRP PHE ARG GLN PRO VAL LEU VAL THR GLN SER ALA ALA ILE VAL PRO VAL ARG T37 K38 K39 R40 F41 T42 P43 P44 I45 Y46 Q47 P48 K49 F50 K51 T52 E53 K54 E55 L65 P69 E70

K71 S72 D73 F85 P90 P91 E92 A95 R96 I97 S98 S99 L100 S101 K102 E103 G104 L105 I106 E107 R108 T109 E110 R111 M112 K113 K114 T115 Q119 K135 P138 E139 K140 I144 L152 V164 C168 I176 V186 V194 V197 S201 M202 M203 N204

Q205 G206 N207 V208 Y209 I212 Q220 T221 R230 P239 Y245 L252 T253 M261 H262 W269 E295 ALA GLN GLY GLU ALA GLN LYS PRO GLN LEU ALA

• Molecule 37: 39S ribosomal protein L46, mitochondrial

Chain e:

36%

76% 9% 15%

MET ALA ALA PRO VAL ARG ARG THR LEU LEU GLY VAL ALA GLY GLY TRP ARG ARG PHE GLU ARG LEU TRP ALA GLY SER LEU SER SER ARG SER LEU ALA LEU ALA ALA ALA PRO SER SER ASN G42 R46 L47 L48 G49 K61 E69 L73 R81 S82 L83 Y84 S85 D86

L89 R90 A91 L92 D93 E94 N95 Q96 R97 L98 A99 K100 K101 K102 A103 D104 L105 H106 D107 E108 E109 D110 E111 Q112 D113 I114 L115 L116 A117 E121 D122 M123 W124 Q130 F131 K132 L133 G134 A135 R136 I137 T138 E139 A140 D141 E142 K143 D154 R155 L159 L160 V161 R162 F165

G166 D167 Q168 D169 V170 W171 I172 L173 E177 G181 E182 G186 E189 L192 A193 T194 L195 S196 E197 M200 E201 A202 K203 F204 L205 Y213 T214 F215 K216 Q219 A220 M221 R222 T223 E224 S225 N226 V231 K235 T240 G241 D242 F243 S244 Q245 A246 G247 N248 K249

G250 H251 W254 K257 D258 G261 D262 K265 P266 K267 Y268 L269 A270 Q271 V272 R273 R274 D278 L279

• Molecule 38: 39S ribosomal protein L49, mitochondrial

Chain g:

79% 19%

MET ALA ALA THR MET PHE ARG ALA THR LEU ARG GLY TRP ARG THR GLY VAL GLN ARG GLY CYS GLY LEU ARG LEU LEU SER GLN THR GLN GLY PRO P33 V42 V109 T146 F166

• Molecule 39: 39S ribosomal protein L50, mitochondrial

Chain h:

68% 30%

MET ALA ALA SER VAL GLY ILE THR ARG ARG VAL PHE MET THR VAL SER GLY THR PRO CYS ARG GLU PHE TRP ARG PHE ARG LYS GLU LYS GLU PRO VAL VAL VAL GLU THR VAL GLU GLU LYS LYS GLU PRO I49 S80 P83 L117 K139 Y158

• Molecule 40: 39S ribosomal protein L51, mitochondrial

Chain i:

75% 24%

MET ALA GLY ASN LEU LEU SER GLY ALA GLY ARG ARG LEU TRP ASP VAL PRO LEU ALA CYS SER PHE SER LEU GLY VAL PRO ARG LEU I32 G61 R128

• Molecule 41: 39S ribosomal protein L52, mitochondrial

Chain j:

5%

76% 24%

MET ALA ALA LEU GLY THR VAL LEU PHE THR GLY VAL ARG ARG LEU HIS CYS SER VAL ALA ALA TRP A23 G24 R103 K104 Q105 E106 N107 S115 L116 LYS SER PRO LEU PRO SER GLN

• Molecule 42: Large ribosomal subunit protein mL53

Chain k: 88%   •   9%

ACE1 F23 L74 H93 D98 A99 A100 G101 S102 GLY ASP LYS PRO GLY ALA ASP THR GLY ARG

• Molecule 43: 39S ribosomal protein L54, mitochondrial

Chain l: 5%   58%   •   41%

MET ALA THR LYS ARG LEU PHE GLY ALA THR ARG THR ALA GLY TRP GLY ALA TRP GLU LEU LEU ASN PRO ALA THR SER GLY ARG LEU LEU ALA ARG ASP TYR ALA LYS LYS PRO VAL MET LYS GLY ALA LYS SER GLY LYS GLY ALA VAL THR SER GLU A55 L56 K57 D58 G74

Q82 L96 F97 E98 Q124 K136 ARG LEU

• Molecule 44: 39S ribosomal protein L55, mitochondrial

Chain m: 20%   45%   5%   49%

MET ALA ALA VAL GLY SER LEU LEU GLY ARG LEU ARG GLN SER THR VAL LYS ALA THR GLY PRO ALA LEU ARG ARG LEU HIS THR SER SER TRP ARG ALA D34 L40 A47 L55 L56 Q59 D60 G61 S62 T63 R67 Y68 R69 E70 P71 R72 R73 A76 I79 D80

L81 D82 T83 L84 S85 P86 E87 E88 R89 R90 A91 R92 L93 R94 K95 R96 E97 A98 GLN LEU GLN SER ARG LYS GLU TYR GLU GLN GLU LEU SER ASP ASP LEU HIS VAL GLU ARG TYR ARG GLN PHE TRP THR ARG ALA THR LYS LYS

• Molecule 45: Nascent polypeptide

Chain n: 49%   74%   26%

X46 X47 X48 X49 X50 X51 X52 X53 X54 X55 X56 X57 X58 X59 X60 X70 X71 X72 X73 X74 X75 X76 X77 UNK UNK UNK UNK UNK UNK UNK UNK UNK UNK

• Molecule 46: Ribosomal protein 63, mitochondrial

Chain o: 90%   •   8%

MET PHE LEU THR ALA LEU LEU TRP R9 R15 I18 S102

• Molecule 47: Growth arrest and DNA damage-inducible proteins-interacting protein 1

Chain q:

23%

70%   9%   20%

MET ALA ALA SER VAL ARG GLN ALA ARG SER LEU LEU GLY VAL ALA ALA THR LEU ALA PRO GLY SER ARG GLY Y25 P40 Q51 R117 I121 M128 Q138 E141 E144 Q147 A148 D149 K150 E151 R152 R153 A154 R155 L156 Q157 A158 E159 A160 Q161 E162 L163 L164

G165 Y166 Q167 V168 D169 P170 R171 S172 A173 R174 F175 Q176 E177 L178 L179 Q180 D181 L182 E183 L184 K185 E186 R187 K188 R189 L190 K191 E192 E193 K194 Q195 K196 R197 K198 K199 E200 A201 ARG ALA ALA LEU ALA ALA VAL GLN ASP ALA ALA SER GLY ALA PRO SER SER

- Molecule 48: 39S ribosomal protein S18a, mitochondrial

Chain r:

81%   17%

MET ALA ALA LEU LYS ALA LEU VAL SER GLY CYS GLY ARG LEU LEU ARG GLY LEU LEU ALA GLY PRO ALA ALA THR SER TRP SER ARG LEU PRO ALA ARG GLY F35 C73 M99 K103 I115 E137 G138 H196

- Molecule 49: Large ribosomal subunit protein uL1m

Chain z:

75%

67%   11%   22%

MET ALA ALA ALA VAL ARG CYS MET GLY ARG ALA LEU ILE HIS HIS GLN ARG HIS SER LEU SER LYS MET VAL TYR GLN THR SER LEU CYS SER CYS SER VAL ASN ILE ARG VAL PRO ASN ARG HIS PHE ALA ALA ALA THR LYS SER ALA LYS LYS THR LYS GLY ALA LYS GLU LYS

T61 P62 D63 E64 K65 K66 D67 E68 I69 E70 K71 I72 K73 A74 Y75 P76 Y77 M78 E79 G80 E81 P82 E83 D84 D85 V86 Y87 L88 K89 R90 L91 Y92 P93 R94 Q95 I96 Y97 E98 V99 E100 K101 A102 V103 H104 L105 L106 K107 K108 F109 Q110 I111 L112 D113 F114 T115 S116 P117 K118 Q119 S120

V121 Y122 L123 D124 L125 T126 L127 D128 M129 A130 L131 G132 K133 K134 K135 N136 V137 E138 P139 F140 T141 S142 V143 L144 S145 L146 P147 Y148 P149 F150 A151 S152 E153 I154 N155 K156 V157 A158 V159 F160 T161 E162 N163 A164 S165 E166 V167 K168 I169 A170 E171 E172 N173 G174 A175 A176 F177 A178 G179 G180

T181 S182 L183 I184 Q185 K186 I187 W188 D189 D190 E191 I192 V193 A194 D195 F196 Y197 V198 A199 V200 P201 E202 I203 M204 P205 E206 L207 N208 R209 L210 R211 K212 K213 L214 N215 K216 K217 Y218 P219 K220 L221 S222 R223 N224 S225 I226 G227 R228 D229 I230 P231 K232 M233 L234 E235 L236 F237 K238 N239 G240

H241 E242 I243 K244 V245 D246 E247 E248 R249 E250 N251 F252 L253 Q254 T255 K256 I257 A258 T259 L260 D261 M262 S263 S264 D265 Q266 I267 A268 A269 N270 L271 Q272 A273 V274 I275 N276 E277 V278 C279 R280 H281 R282 P283 L284 E285 L286 G287 E288 F289 V290 V291 R292 A293 F294 L295 R296 S297 E301 G302

L303 L304 L305 K306 I307 D308 P309 L310 L311 P312 LYS GLU VAL LYS ASN GLU GLU SER GLU LYS GLU ASP ALA

- Molecule 50: 16S mitochondrial rRNA

Chain A:

75%   23%

G1671 G1681 C1689 A1692 C1699 U1700 U1704 A1708 G1709 A1710 C1711 A1718 G1719 A1724 A1727 U1728 A1736 A1737 G1748 C1749 G1750 A1751 G1760 A1761 A1762 C1765 A1777 U1780 A1805 U1806 U1807 A1808 U1809 C1812 G1816 C1817 A1821 C1827 A1828 A1829

• Molecule 51: 39S ribosomal protein L44, mitochondrial

Chain c: 85%   14%

• Molecule 52: 39S ribosomal protein L48, mitochondrial

Chain f:

21%

66%   8%   26%

MET SER GLY THR LEU GLU LYS VAL LEU CYS LEU ARG ASN ASN THR ILE PHE LYS GLN ALA PHE SER LEU LEU ARG PHE ARG THR SER GLY GLU LYS PRO ILE TYR SER VAL GLY ILE LEU LEU SER ILE ARG PRO Y48 E66 E67 P68 LYS LYS LYS GLY LYS LYS VAL GLU

V77 R78 A79 I80 N81 L82 Y86 E87 Y88 G89 V90 Y125 K130 T131 I132 E133 V134 L135 Q136 L137 Q138 D139 Q140 G141 S142 K143 M144 L145 L146 D147 S148 V149 L150 F166 I169 F170 L171 E172 I173 I174 L184 H189 T190 E191 E192 D193 F194 K195 G196 R197 F198 K199 A200

R201 P202 E203 L204 E205 E206 L207 L208 A209 K210 L211 K212

• Molecule 53: Peptidyl-tRNA hydrolase ICT1, mitochondrial

Chain p:

8%

70%   .   29%

MET ALA ALA THR ARG CYS LEU ARG TRP GLY LEU SER ARG ALA GLY VAL TRP LEU LEU PRO PRO ALA ARG CYS PRO ARG ARG ALA LEU HIS LYS GLN ASP LYS LYS ASP GLY THR E38 L45 N63 G64 ALA LYS GLN ALA ASP S70 R83 S84 S85 G86 PRO GLY GLN ASN VAL

N93 L133 M157 T164 P165 K166 E167 P168 T169 K170 E171 L175 H194 S195 ALA VAL LYS THR SER ARG VAL ASP MET ASP

• Molecule 54: 39S ribosomal protein S30, mitochondrial

Chain s:

.

85%   .   12%

MET ALA ALA ARG CYS TRP ARG PRO LEU LEU ARG GLY PRO ARG LEU SER LEU HIS THR ALA ALA ASN ALA ALA ALA THR ALA THR THR GLU THR THR CYS GLN ASP VAL ALA ALA T39 I63 E64 R65 W66 T69 T84 P119 A123 E124 P125 GLU PRO GLU PRO GLU PRO

GLU PRO GLU PRO A136 L137 V145 R160 R165 L187 N280 H281 W394 V422 E431 E432 K433 SER GLN LEU LEU GLU ASN

• Molecule 55: Mitochondrial inner membrane protein OXA1L

Chain OX:

6%

9%   .   90%

MET ALA MET GLY LEU MET CYS GLY ARG ARG GLU LEU LEU ARG LEU GLN LEU SER ARG GLY ARG VAL HIS SER VAL ALA GLY PRO SER GLN TRP LEU GLY LYS PRO LEU THR ARG LEU LEU PHE PRO ALA ALA PRO CYS CYS ARG PRO HIS TYR LEU PHE LEU ALA ALA SER GLY

PRO ARG SER LEU SER THR SER ALA ILE SER PHE ALA GLU GLY VAL GLN ALA PRO PRO VAL VAL ALA ALA THR PRO SER PRO THR ALA VAL PRO GLU GLY VAL VAL ALA SER GLY THR THR ALA ASP VAL VAL GLN THR ALA ALA GLU GLN GLN SER PHE ALA GLU LEU GLY LEU GLY SER TYR THR

PRO VAL GLY LEU ILE GLN ASN LEU LEU GLU PHE MET HIS VAL ASP LEU GLY LEU TRP TRP GLY ALA ILE ALA ALA CYS THR VAL PHE ALA ARG CYS LEU LEU PHE PRO LEU ILE VAL LYS GLN GLN LYS ILE LYS LYS MET GLN GLU ASN ALA HIS ALA ALA ARG ILE HIS ASN HIS LEU PRO GLU ILE GLN LYS PHE SER

SER ARG ILE LEU GLU ALA LYS LEU ALA GLY ASP HIS ILE GLU TYR TYR LYS ALA SER SER GLU MET ALA LEU TYR GLN LYS LYS HIS GLY ILE ILE LYS LYS TYR LYS PRO LEU ILE LEU PRO VAL THR GLN ALA PRO ILE PHE ILE SER PHE ILE ALA LEU ARG GLU MET ALA ASN LEU

• Molecule 56: 39S ribosomal protein L42, mitochondrial

Chain a:

• Molecule 57: mitochondrial tRNAVal

Chain B:

4   Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	131357	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{Å}^2)$	55	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	4000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.795	Depositor
Minimum map value	-0.325	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.023	Depositor
Recommended contour level	0.08	Depositor
Map size (Å)	512.63995, 512.63995, 512.63995	wwPDB
Map dimensions	480, 480, 480	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.068, 1.068, 1.068	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: 1MA, ACE, 2MG, PUT, OMU, ZN, MG, PSU, OMG, SPD, FES, K

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	0	0.22	0/913	0.25	0/1224
2	1	0.21	0/469	0.28	0/621
3	2	0.26	0/383	0.28	0/507
4	3	0.26	0/853	0.27	0/1136
5	4	0.24	0/350	0.23	0/461
6	5	0.20	0/3305	0.28	0/4502
7	6	0.18	0/3043	0.28	0/4140
8	7	0.19	0/2447	0.29	0/3310
9	8	0.13	0/1204	0.29	0/1621
10	9	0.20	0/1025	0.26	0/1379
11	C	0.14	0/1302	0.31	0/1751
12	D	0.21	0/1896	0.28	0/2549
13	E	0.23	0/2475	0.30	0/3355
14	F	0.25	0/2090	0.30	0/2842
15	G	0.19	0/562	0.52	0/754
15	t	0.15	0/358	0.32	0/486
15	u	0.22	0/259	0.39	0/350
15	v	0.15	0/259	0.36	0/350
15	w	0.20	0/246	0.50	0/331
15	x	0.14	0/246	0.35	0/331
15	y	0.16	0/246	0.42	0/331
16	H	0.15	0/1698	0.29	0/2292
17	I	0.16	0/1731	0.31	0/2345
18	J	0.14	0/1348	0.29	0/1813
19	K	0.25	0/1497	0.27	0/2031
20	L	0.20	0/905	0.27	0/1218
21	M	0.24	0/2381	0.30	0/3212
22	N	0.21	0/1833	0.27	0/2468
23	O	0.23	0/1283	0.27	0/1727
24	P	0.20	0/1199	0.25	0/1623
25	Q	0.20	0/1875	0.26	0/2523
26	R	0.25	0/1175	0.26	0/1572

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\#|Z|>5$	RMSZ	$\#|Z|>5$
27	S	0.25	0/1320	0.31	0/1789
28	T	0.23	0/1403	0.26	0/1886
29	U	0.24	0/1279	0.34	0/1730
30	V	0.19	0/1721	0.26	0/2333
31	W	0.24	0/926	0.26	0/1244
32	X	0.21	0/2099	0.25	0/2837
33	Y	0.23	0/1593	0.24	0/2136
34	Z	0.23	0/1021	0.27	0/1378
35	b	0.24	0/1218	0.28	0/1649
36	d	0.17	0/2181	0.32	0/2949
37	e	0.13	0/1970	0.31	0/2658
38	g	0.23	0/1151	0.28	0/1569
39	h	0.17	0/918	0.25	0/1249
40	i	0.26	0/850	0.27	0/1135
41	j	0.20	0/760	0.23	0/1023
42	k	0.14	0/783	0.23	0/1057
43	l	0.13	0/707	0.27	0/960
44	m	0.10	0/549	0.29	0/737
46	o	0.24	0/819	0.27	0/1097
47	q	0.17	0/1529	0.30	0/2055
48	r	0.22	0/1362	0.29	0/1846
49	z	0.14	0/2067	0.35	0/2793
50	A	0.26	0/36876	0.29	0/57402
51	c	0.20	0/2347	0.25	0/3171
52	f	0.16	0/1273	0.32	0/1716
53	p	0.17	0/1223	0.27	0/1641
54	s	0.23	0/3231	0.29	0/4389
55	OX	0.18	0/366	0.49	0/491
56	a	0.21	0/891	0.34	0/1208
57	B	0.17	0/1626	0.27	0/2523
All	All	0.22	0/116915	0.29	0/165806

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen

atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	0	898	0	916	1	0
2	1	464	0	511	3	0
3	2	377	0	406	0	0
4	3	832	0	883	4	0
5	4	342	0	361	2	0
6	5	3210	0	3206	9	0
7	6	2948	0	2841	6	0
8	7	2390	0	2397	11	0
9	8	1179	0	1205	13	0
10	9	997	0	987	1	0
11	C	1286	0	1270	33	0
12	D	1859	0	1920	2	0
13	E	2406	0	2415	5	0
14	F	2031	0	2065	6	0
15	G	558	0	612	20	0
15	t	354	0	377	0	0
15	u	257	0	283	4	0
15	v	257	0	283	1	0
15	w	245	0	275	3	0
15	x	245	0	275	2	0
15	y	245	0	275	4	0
16	H	1661	0	1734	6	0
17	I	1695	0	1785	12	0
18	J	1330	0	1407	8	0
19	K	1455	0	1452	2	0
20	L	890	0	941	2	0
21	M	2327	0	2395	6	0
22	N	1786	0	1817	9	0
23	O	1259	0	1294	5	0
24	P	1173	0	1165	3	0
25	Q	1834	0	1872	4	0
26	R	1154	0	1214	2	0
27	S	1293	0	1365	3	0
28	T	1369	0	1410	3	0
29	U	1248	0	1228	4	0
30	V	1676	0	1687	5	0
31	W	904	0	934	2	0
32	X	2044	0	2060	3	0
33	Y	1556	0	1597	1	0
34	Z	996	0	1044	2	0
35	b	1193	0	1191	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
36	d	2124	0	2125	28	0
37	e	1931	0	1916	17	0
38	g	1113	0	1097	2	0
39	h	895	0	881	2	0
40	i	828	0	857	1	0
41	j	745	0	746	1	0
42	k	774	0	784	2	0
43	l	688	0	673	2	0
44	m	541	0	564	5	0
45	n	160	0	40	0	0
46	o	798	0	804	2	0
47	q	1495	0	1492	15	0
48	r	1322	0	1348	3	0
49	z	2027	0	2076	21	0
50	A	33070	0	16793	104	0
51	c	2299	0	2320	2	0
52	f	1252	0	1269	16	0
53	p	1205	0	1223	2	0
54	s	3148	0	3131	8	0
55	OX	359	0	355	5	0
56	a	865	0	829	3	0
57	B	1524	0	779	16	0
58	0	1	0	0	0	0
58	4	1	0	0	0	0
59	3	1	0	0	0	0
59	6	1	0	0	0	0
59	A	29	0	0	0	0
59	D	1	0	0	0	0
59	M	1	0	0	0	0
59	N	1	0	0	0	0
59	W	1	0	0	0	0
59	o	1	0	0	0	0
60	A	137	0	0	0	0
60	D	2	0	0	0	0
60	E	1	0	0	0	0
60	g	1	0	0	0	0
61	r	4	0	0	0	0
62	A	20	0	38	0	0
63	A	6	0	12	0	0
64	B	7	0	8	2	0
All	All	111602	0	95515	397	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 397 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)
17:I:64:CYS:HB3	48:r:73:CYS:SG	2.20	0.80
47:q:164:LEU:HB3	47:q:168:VAL:HG21	1.66	0.76
28:T:62:ARG:HE	36:d:230:ARG:HD2	1.51	0.75
14:F:103:GLN:HE22	14:F:249:ASN:HD22	1.35	0.75
15:G:143:VAL:HA	15:G:146:ILE:HG12	1.71	0.73

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	0	108/188 (57%)	108 (100%)	0	0	100	100
2	1	54/65 (83%)	54 (100%)	0	0	100	100
3	2	44/92 (48%)	43 (98%)	1 (2%)	0	100	100
4	3	93/188 (50%)	92 (99%)	1 (1%)	0	100	100
5	4	36/103 (35%)	36 (100%)	0	0	100	100
6	5	392/423 (93%)	385 (98%)	7 (2%)	0	100	100
7	6	352/380 (93%)	342 (97%)	10 (3%)	0	100	100
8	7	292/338 (86%)	283 (97%)	9 (3%)	0	100	100
9	8	137/206 (66%)	135 (98%)	2 (2%)	0	100	100
10	9	122/137 (89%)	120 (98%)	2 (2%)	0	100	100
11	C	164/297 (55%)	159 (97%)	5 (3%)	0	100	100
12	D	236/305 (77%)	229 (97%)	7 (3%)	0	100	100
13	E	303/348 (87%)	294 (97%)	9 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
14	F	250/311 (80%)	246 (98%)	4 (2%)	0	100	100
15	G	70/198 (35%)	65 (93%)	5 (7%)	0	100	100
15	t	44/198 (22%)	43 (98%)	1 (2%)	0	100	100
15	u	30/198 (15%)	29 (97%)	1 (3%)	0	100	100
15	v	30/198 (15%)	29 (97%)	1 (3%)	0	100	100
15	w	29/198 (15%)	26 (90%)	3 (10%)	0	100	100
15	x	29/198 (15%)	28 (97%)	1 (3%)	0	100	100
15	y	29/198 (15%)	26 (90%)	3 (10%)	0	100	100
16	H	200/267 (75%)	196 (98%)	4 (2%)	0	100	100
17	I	210/261 (80%)	208 (99%)	2 (1%)	0	100	100
18	J	173/192 (90%)	172 (99%)	1 (1%)	0	100	100
19	K	176/178 (99%)	175 (99%)	1 (1%)	0	100	100
20	L	113/145 (78%)	111 (98%)	2 (2%)	0	100	100
21	M	289/296 (98%)	284 (98%)	5 (2%)	0	100	100
22	N	220/251 (88%)	219 (100%)	1 (0%)	0	100	100
23	O	152/175 (87%)	148 (97%)	4 (3%)	0	100	100
24	P	142/180 (79%)	138 (97%)	4 (3%)	0	100	100
25	Q	218/292 (75%)	217 (100%)	1 (0%)	0	100	100
26	R	138/149 (93%)	137 (99%)	1 (1%)	0	100	100
27	S	159/205 (78%)	158 (99%)	1 (1%)	0	100	100
28	T	164/206 (80%)	164 (100%)	0	0	100	100
29	U	150/153 (98%)	148 (99%)	2 (1%)	0	100	100
30	V	203/216 (94%)	202 (100%)	1 (0%)	0	100	100
31	W	114/148 (77%)	112 (98%)	2 (2%)	0	100	100
32	X	242/256 (94%)	239 (99%)	3 (1%)	0	100	100
33	Y	179/250 (72%)	176 (98%)	3 (2%)	0	100	100
34	Z	120/161 (74%)	119 (99%)	1 (1%)	0	100	100
35	b	148/215 (69%)	143 (97%)	5 (3%)	0	100	100
36	d	257/306 (84%)	243 (95%)	13 (5%)	1 (0%)	30	58
37	e	236/279 (85%)	226 (96%)	10 (4%)	0	100	100
38	g	132/166 (80%)	130 (98%)	2 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
39	h	108/158 (68%)	103 (95%)	5 (5%)	0	100	100
40	i	95/128 (74%)	95 (100%)	0	0	100	100
41	j	92/123 (75%)	90 (98%)	2 (2%)	0	100	100
42	k	100/112 (89%)	100 (100%)	0	0	100	100
43	l	80/138 (58%)	79 (99%)	1 (1%)	0	100	100
44	m	63/128 (49%)	62 (98%)	1 (2%)	0	100	100
46	o	92/102 (90%)	92 (100%)	0	0	100	100
47	q	175/222 (79%)	175 (100%)	0	0	100	100
48	r	160/196 (82%)	159 (99%)	1 (1%)	0	100	100
49	z	250/325 (77%)	235 (94%)	15 (6%)	0	100	100
51	c	282/332 (85%)	280 (99%)	2 (1%)	0	100	100
52	f	153/212 (72%)	148 (97%)	5 (3%)	0	100	100
53	p	141/206 (68%)	138 (98%)	3 (2%)	0	100	100
54	s	381/439 (87%)	372 (98%)	9 (2%)	0	100	100
55	OX	38/435 (9%)	34 (90%)	4 (10%)	0	100	100
56	a	99/142 (70%)	98 (99%)	1 (1%)	0	100	100
All	All	9288/13112 (71%)	9097 (98%)	190 (2%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
36	d	47	GLN

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	0	99/164 (60%)	99 (100%)	0	100	100
2	1	53/60 (88%)	53 (100%)	0	100	100

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	2	40/72 (56%)	40 (100%)	0	100	100
4	3	88/166 (53%)	88 (100%)	0	100	100
5	4	37/89 (42%)	37 (100%)	0	100	100
6	5	353/368 (96%)	353 (100%)	0	100	100
7	6	313/332 (94%)	313 (100%)	0	100	100
8	7	270/303 (89%)	270 (100%)	0	100	100
9	8	129/190 (68%)	129 (100%)	0	100	100
10	9	104/112 (93%)	104 (100%)	0	100	100
11	C	141/245 (58%)	141 (100%)	0	100	100
12	D	192/245 (78%)	192 (100%)	0	100	100
13	E	260/290 (90%)	260 (100%)	0	100	100
14	F	219/262 (84%)	219 (100%)	0	100	100
15	G	60/158 (38%)	60 (100%)	0	100	100
15	t	40/158 (25%)	40 (100%)	0	100	100
15	u	31/158 (20%)	31 (100%)	0	100	100
15	v	31/158 (20%)	31 (100%)	0	100	100
15	w	30/158 (19%)	30 (100%)	0	100	100
15	x	30/158 (19%)	30 (100%)	0	100	100
15	y	30/158 (19%)	30 (100%)	0	100	100
16	H	182/228 (80%)	182 (100%)	0	100	100
17	I	194/232 (84%)	194 (100%)	0	100	100
18	J	138/150 (92%)	138 (100%)	0	100	100
19	K	155/155 (100%)	155 (100%)	0	100	100
20	L	98/124 (79%)	98 (100%)	0	100	100
21	M	246/249 (99%)	246 (100%)	0	100	100
22	N	189/211 (90%)	189 (100%)	0	100	100
23	O	134/150 (89%)	134 (100%)	0	100	100
24	P	126/155 (81%)	126 (100%)	0	100	100
25	Q	202/256 (79%)	202 (100%)	0	100	100
26	R	118/126 (94%)	118 (100%)	0	100	100
27	S	146/180 (81%)	146 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
28	T	146/176 (83%)	146 (100%)	0	100	100
29	U	134/135 (99%)	134 (100%)	0	100	100
30	V	183/191 (96%)	183 (100%)	0	100	100
31	W	94/119 (79%)	94 (100%)	0	100	100
32	X	220/229 (96%)	220 (100%)	0	100	100
33	Y	163/223 (73%)	163 (100%)	0	100	100
34	Z	113/147 (77%)	113 (100%)	0	100	100
35	b	132/186 (71%)	132 (100%)	0	100	100
36	d	237/274 (86%)	237 (100%)	0	100	100
37	e	207/236 (88%)	207 (100%)	0	100	100
38	g	124/148 (84%)	124 (100%)	0	100	100
39	h	104/148 (70%)	104 (100%)	0	100	100
40	i	86/110 (78%)	86 (100%)	0	100	100
41	j	74/97 (76%)	74 (100%)	0	100	100
42	k	83/89 (93%)	83 (100%)	0	100	100
43	l	76/116 (66%)	76 (100%)	0	100	100
44	m	58/113 (51%)	58 (100%)	0	100	100
46	o	80/87 (92%)	80 (100%)	0	100	100
47	q	153/178 (86%)	153 (100%)	0	100	100
48	r	147/169 (87%)	147 (100%)	0	100	100
49	z	226/287 (79%)	226 (100%)	0	100	100
51	c	251/288 (87%)	251 (100%)	0	100	100
52	f	139/188 (74%)	139 (100%)	0	100	100
53	p	135/181 (75%)	135 (100%)	0	100	100
54	s	339/381 (89%)	339 (100%)	0	100	100
55	OX	38/372 (10%)	38 (100%)	0	100	100
56	a	99/133 (74%)	99 (100%)	0	100	100
All	All	8319/11221 (74%)	8319 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 49 such sidechains are listed below:

Mol	Chain	Res	Type
37	e	67	GLN
47	q	60	GLN
37	e	106	HIS
37	e	251	HIS
15	t	65	GLN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
50	A	1556/1558 (99%)	247 (15%)	2 (0%)
57	B	70/72 (97%)	16 (22%)	0
All	All	1626/1630 (99%)	263 (16%)	2 (0%)

5 of 263 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
50	A	1681	G
50	A	1689	C
50	A	1692	A
50	A	1699	C
50	A	1700	U

All (2) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
50	A	2245	A
50	A	2484	C

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

8 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
57	1MA	B	9	57	17,25,26	0.82	1 (5%)	17,37,40	0.88	0
50	OMG	A	3040	50	19,26,27	1.02	2 (10%)	21,38,41	0.73	0
50	OMG	A	2815	59,50	19,26,27	1.04	3 (15%)	21,38,41	0.71	1 (4%)
50	PSU	A	3067	50	18,21,22	1.12	2 (11%)	21,30,33	0.80	1 (4%)
57	2MG	B	10	57	18,26,27	1.07	2 (11%)	16,38,41	0.81	0
50	1MA	A	2617	50	17,25,26	0.85	1 (5%)	17,37,40	0.76	0
57	PSU	B	39	57	18,21,22	1.03	1 (5%)	21,30,33	0.72	0
50	OMU	A	3039	59,50	19,22,23	0.31	0	25,31,34	0.74	1 (4%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
57	1MA	B	9	57	-	0/3/25/26	0/3/3/3
50	OMG	A	3040	50	-	0/5/27/28	0/3/3/3
50	OMG	A	2815	59,50	-	0/5/27/28	0/3/3/3
50	PSU	A	3067	50	-	1/7/25/26	0/2/2/2
57	2MG	B	10	57	-	0/5/27/28	0/3/3/3
50	1MA	A	2617	50	-	0/3/25/26	0/3/3/3
57	PSU	B	39	57	-	0/7/25/26	0/2/2/2
50	OMU	A	3039	59,50	-	0/9/27/28	0/2/2/2

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
57	B	39	PSU	C6-C5	3.57	1.39	1.35
50	A	3067	PSU	C6-C5	3.53	1.39	1.35
50	A	2815	OMG	C5-C6	-2.76	1.42	1.47
50	A	3040	OMG	C5-C6	-2.69	1.42	1.47
57	B	10	2MG	C5-C6	-2.62	1.42	1.47

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
50	A	3039	OMU	C2'-C1'-N1	-2.73	109.05	114.24
50	A	3067	PSU	O4'-C1'-C2'	2.39	108.46	105.15
50	A	2815	OMG	O6-C6-C5	2.01	128.31	124.32

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
50	A	3067	PSU	O4'-C4'-C5'-O5'

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
57	B	9	1MA	1	0
50	A	2815	OMG	1	0

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 184 ligands modelled in this entry, 179 are monoatomic - leaving 5 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#|Z| > 2$	Counts	RMSZ	$\#|Z| > 2$
63	PUT	A	3304	-	5,5,5	0.13	0	4,4,4	0.22	0
62	SPD	A	3302	-	9,9,9	0.17	0	8,8,8	0.21	0
62	SPD	A	3303	-	9,9,9	0.15	0	8,8,8	0.28	0
61	FES	r	201	48,17	0,4,4	-	-	-		
64	VAL	B	101	57	4,6,7	0.78	0	6,7,9	1.02	1 (16%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
63	PUT	A	3304	-	-	0/3/3/3	-
62	SPD	A	3302	-	-	0/7/7/7	-
62	SPD	A	3303	-	-	1/7/7/7	-
61	FES	r	201	48,17	-	-	0/1/1/1
64	VAL	B	101	57	-	0/5/6/8	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
64	B	101	VAL	O-C-CA	-2.33	118.78	124.77

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
62	A	3303	SPD	C2-C3-C4-C5

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
64	B	101	VAL	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand SPD A 3302

Bond lengths

Bond angles

Torsions

Rings

Ligand SPD A 3303

Bond lengths

Bond angles

Torsions

Rings

Ligand FES r 201

Bond lengths

Bond angles

Torsions

Rings
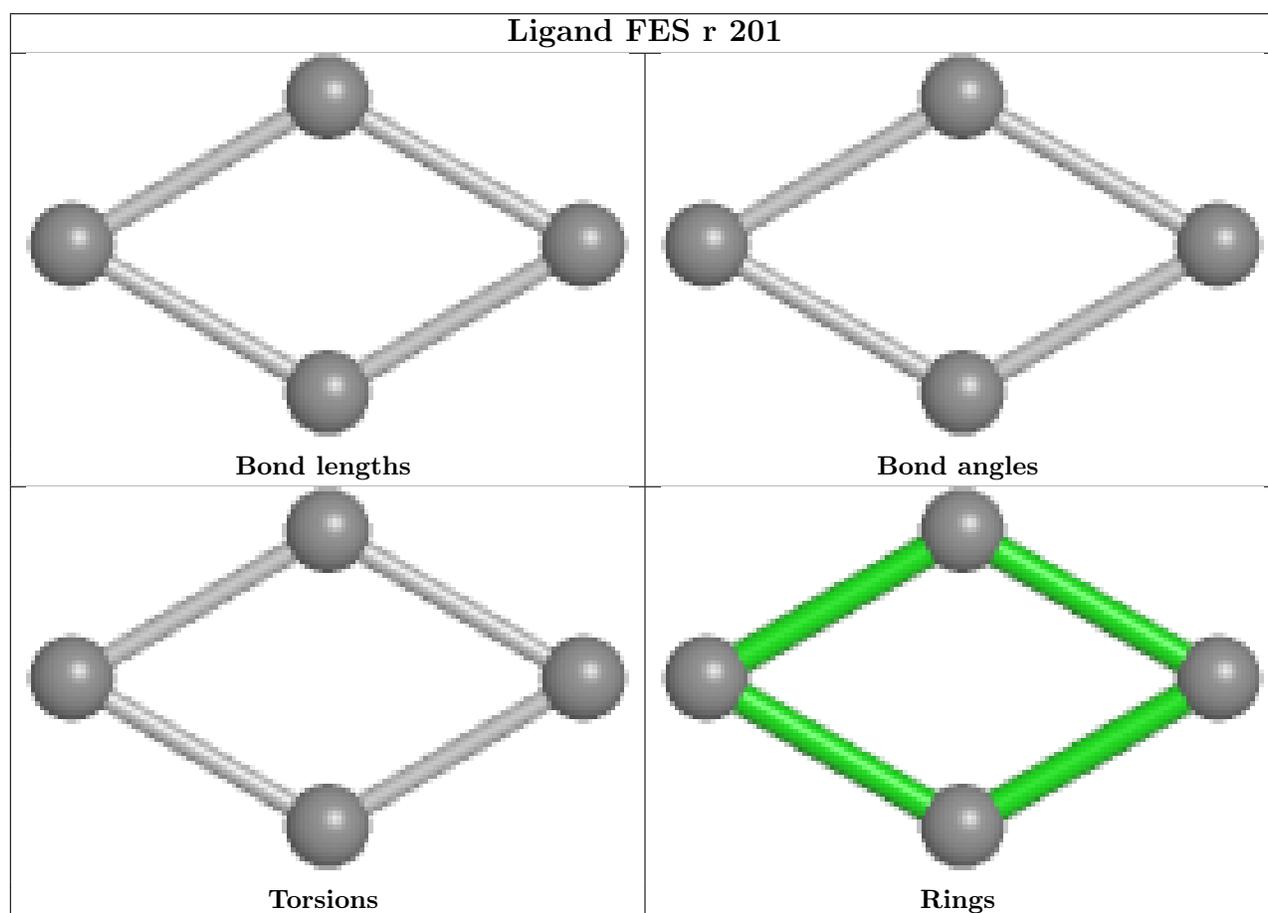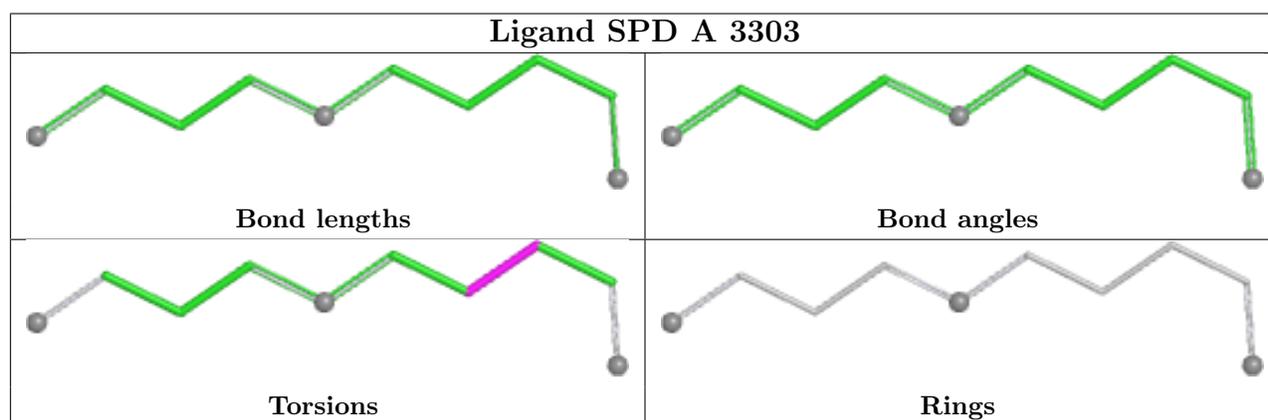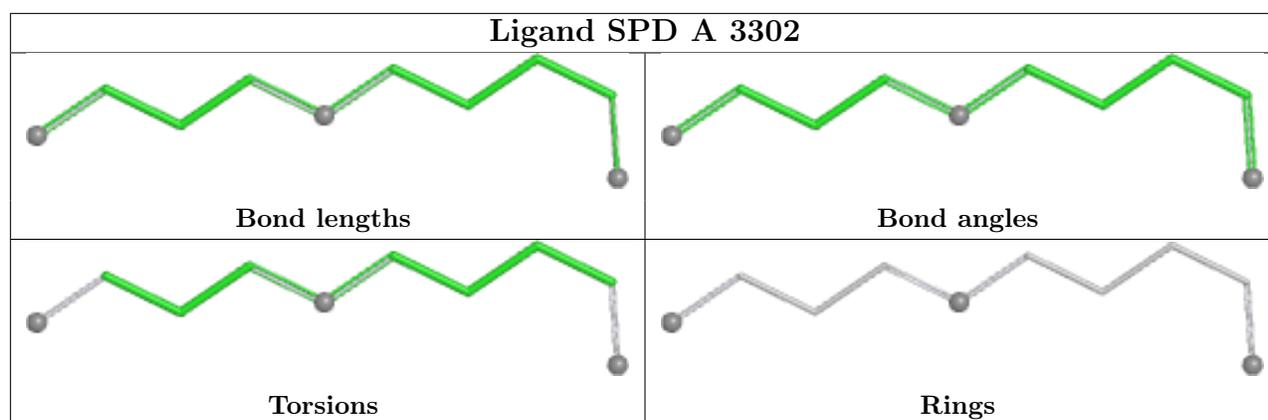
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

The following chains have linkage breaks:

Mol	Chain	Number of breaks
50	A	1
57	B	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	2357:C	O3'	2361:G	P	9.33
1	B	46:A	O3'	48:U	P	4.49

6 Map visualisation ⓘ

This section contains visualisations of the EMDB entry EMD-71797. These allow visual inspection of the internal detail of the map and identification of artifacts.

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

6.1 Orthogonal projections ⓘ
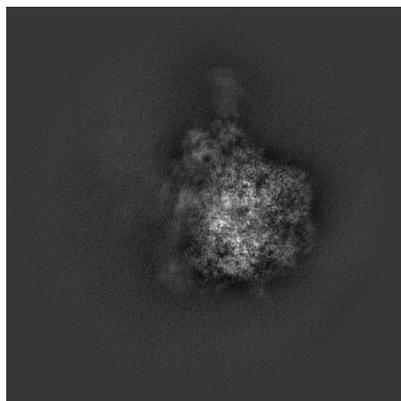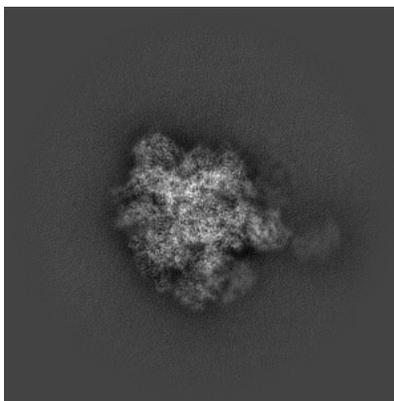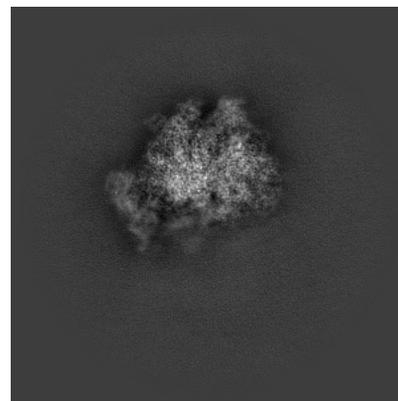
6.1.1 Primary map

| X | Y | Z |

6.1.2 Raw map

| X | Y | Z |
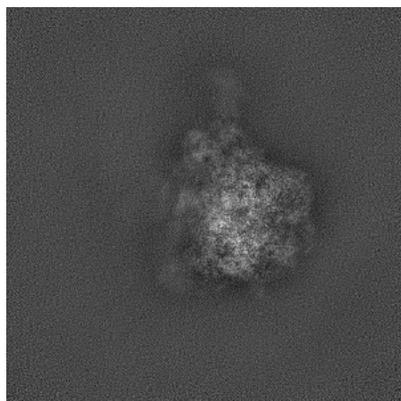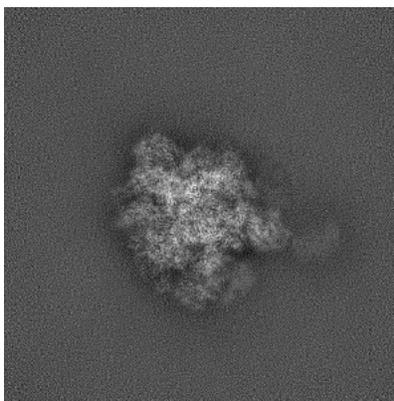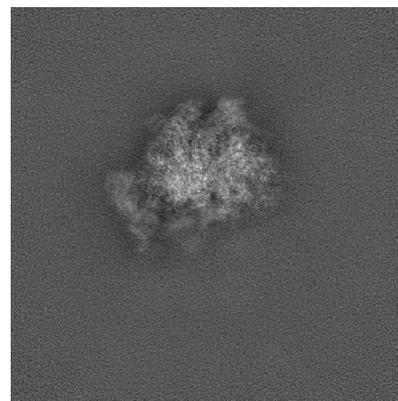
The images above show the map projected in three orthogonal directions.

6.2   Central slices ⓘ
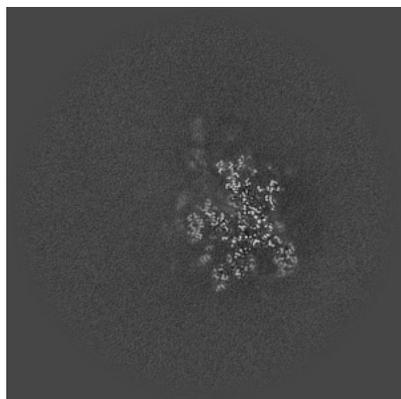
6.2.1   Primary map
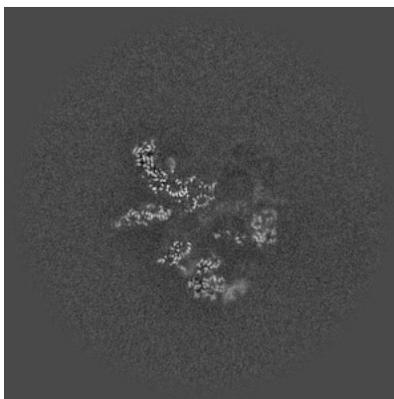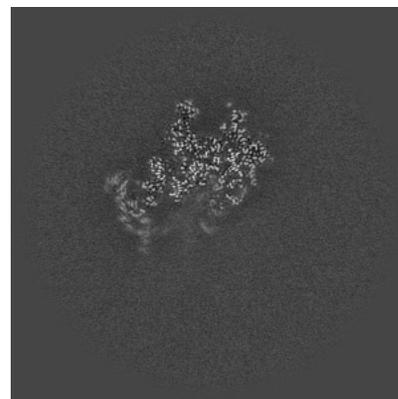
| X Index: 240 | Y Index: 240 | Z Index: 240 |

6.2.2   Raw map
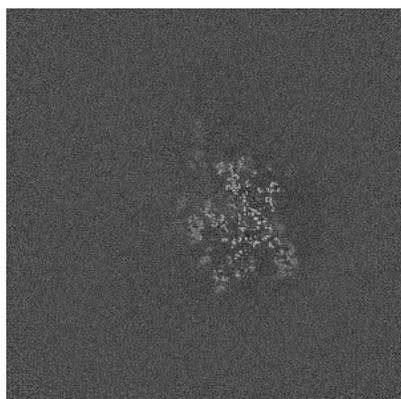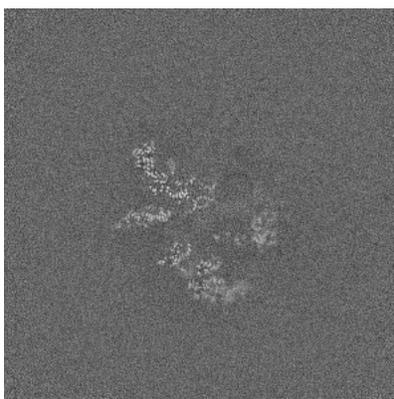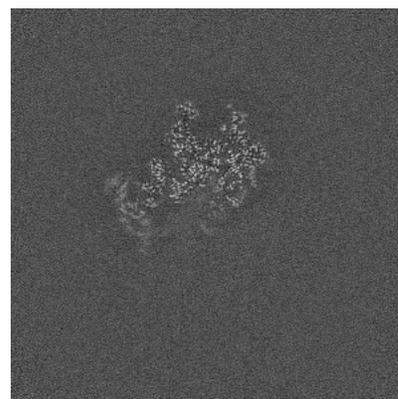
| X Index: 240 | Y Index: 240 | Z Index: 240 |

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

6.3 Largest variance slices (i)

6.3.1 Primary map
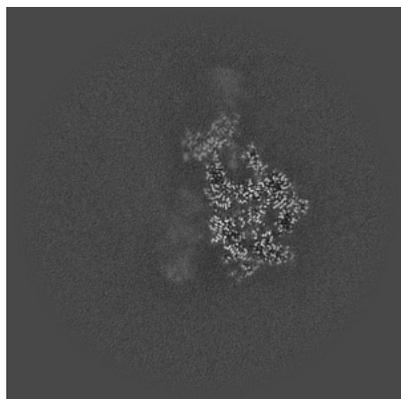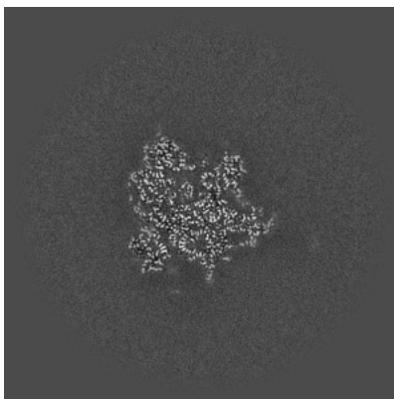
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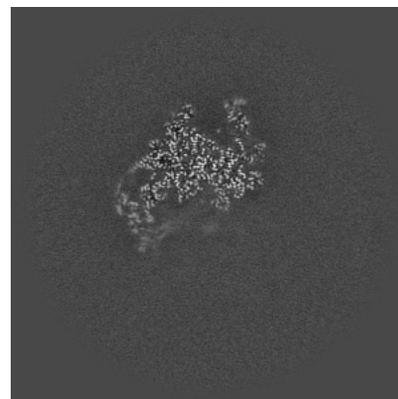
6.3.2 Raw map
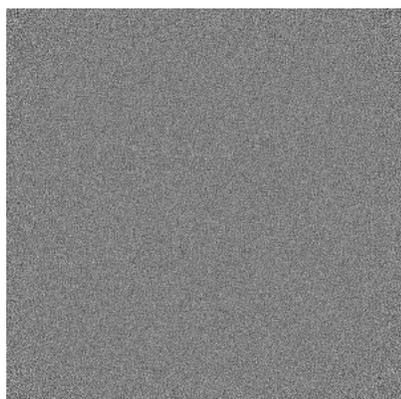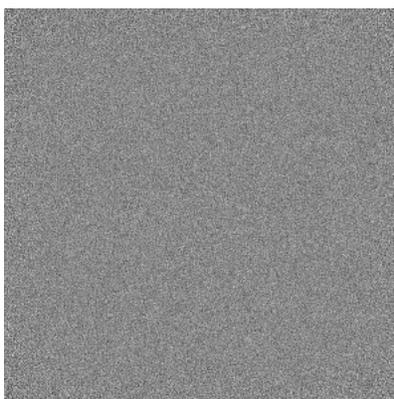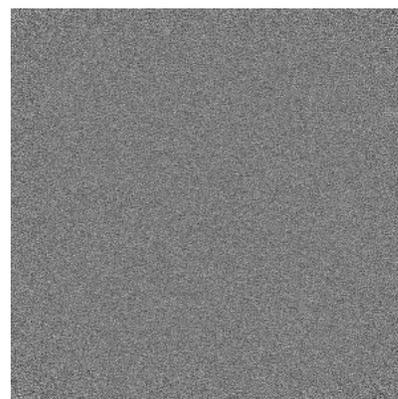
| X Index: 0 | Y Index: 0 | Z Index: 0 |

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

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

6.4.1　Primary map

X　　　　　　　　Y　　　　　　　　Z

6.4.2　Raw map

X　　　　　　　　Y　　　　　　　　Z
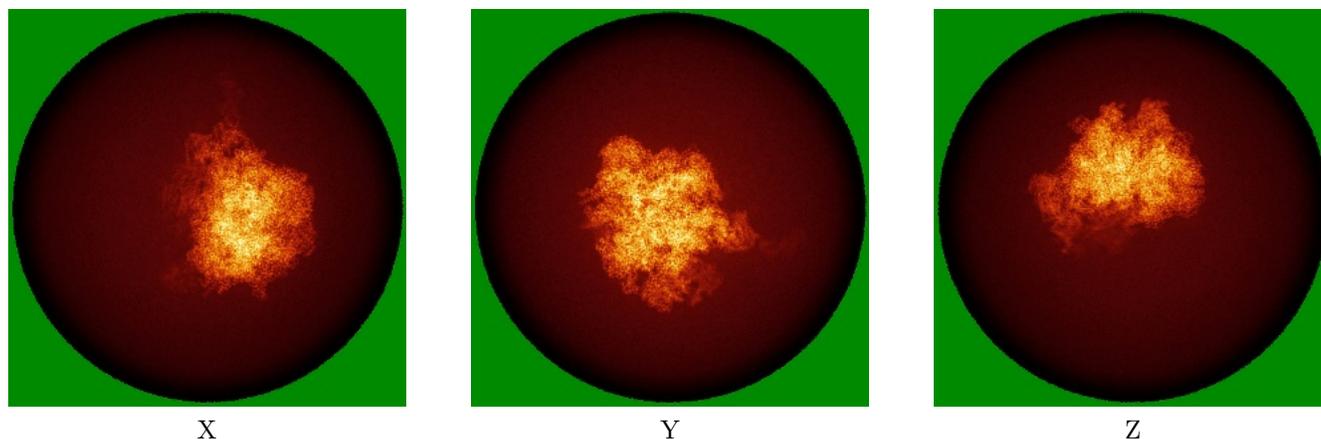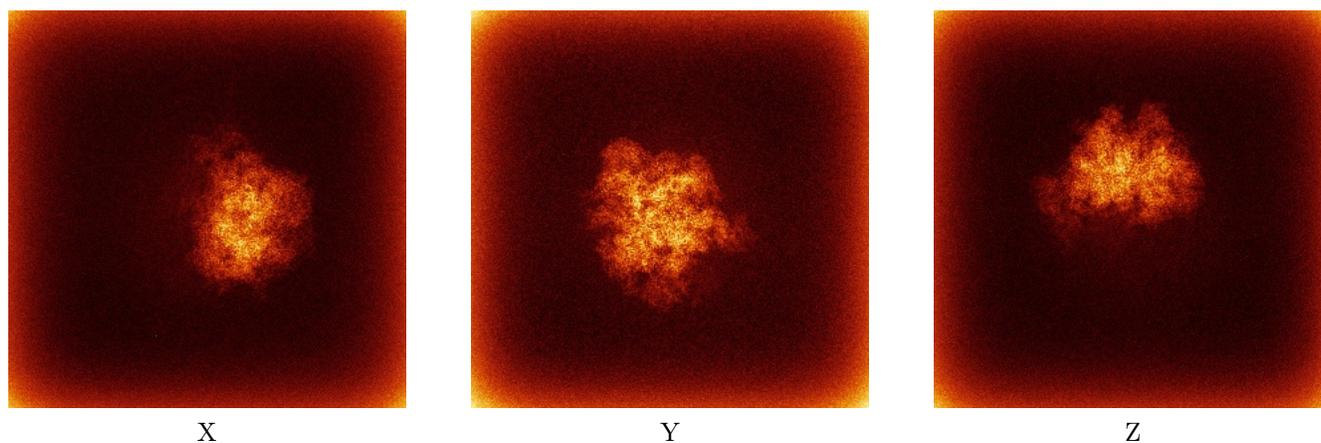
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views ⓘ

6.5.1 Primary map

| X | Y | Z |

The images above show the 3D surface view of the map at the recommended contour level 0.08. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map

| X | Y | Z |
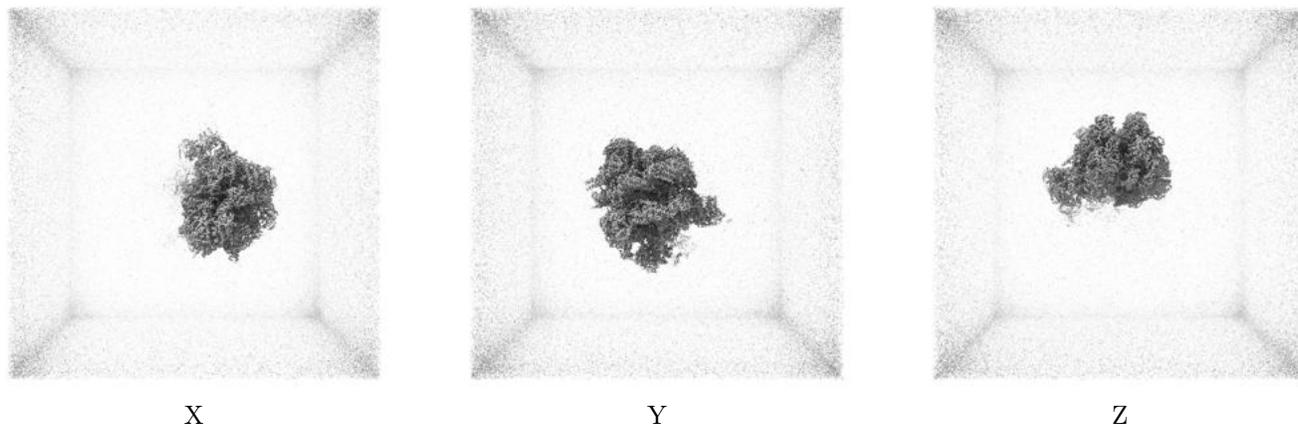
These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

6.6 Mask visualisation ⓘ

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

A mask typically either:

- Encompasses the whole structure

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

6.6.1 emd_71797_msk_1.map ⓘ

X   Y   Z
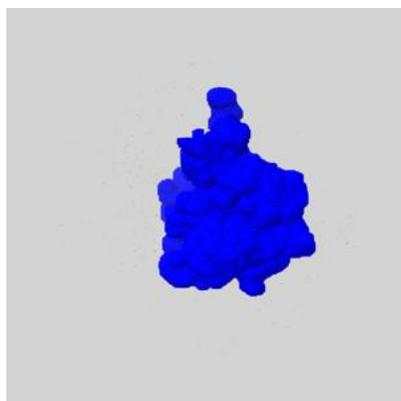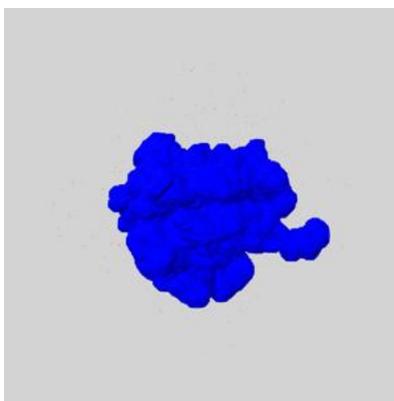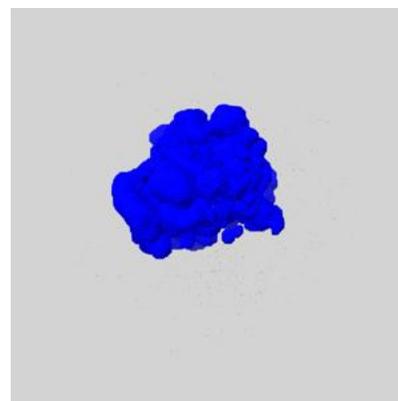
7 Map analysis ⓘ

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

7.1 Map-value distribution ⓘ

The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2　Volume estimate ⓘ
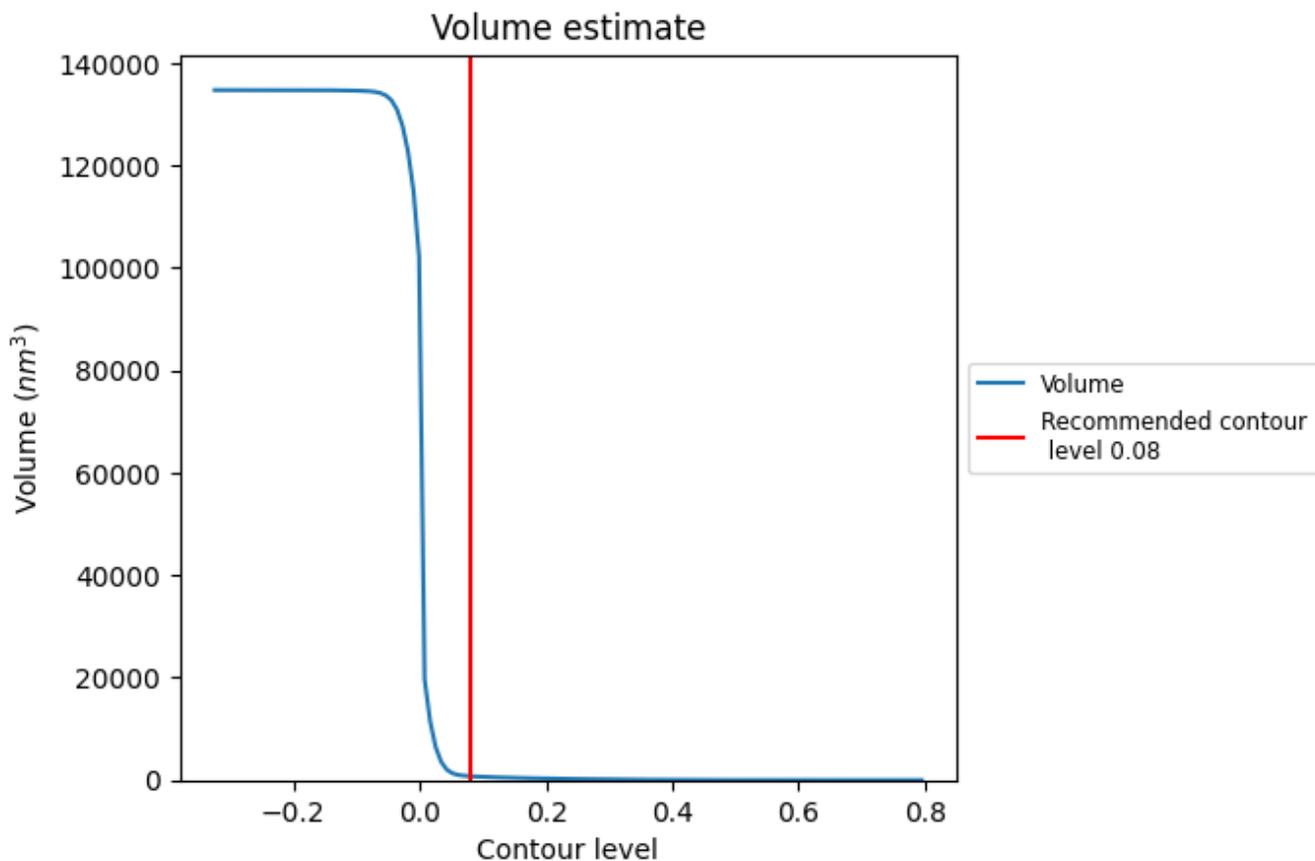
The volume at the recommended contour level is 762 nm^3; this corresponds to an approximate mass of 688 kDa.

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

7.3 Rotationally averaged power spectrum ⓘ
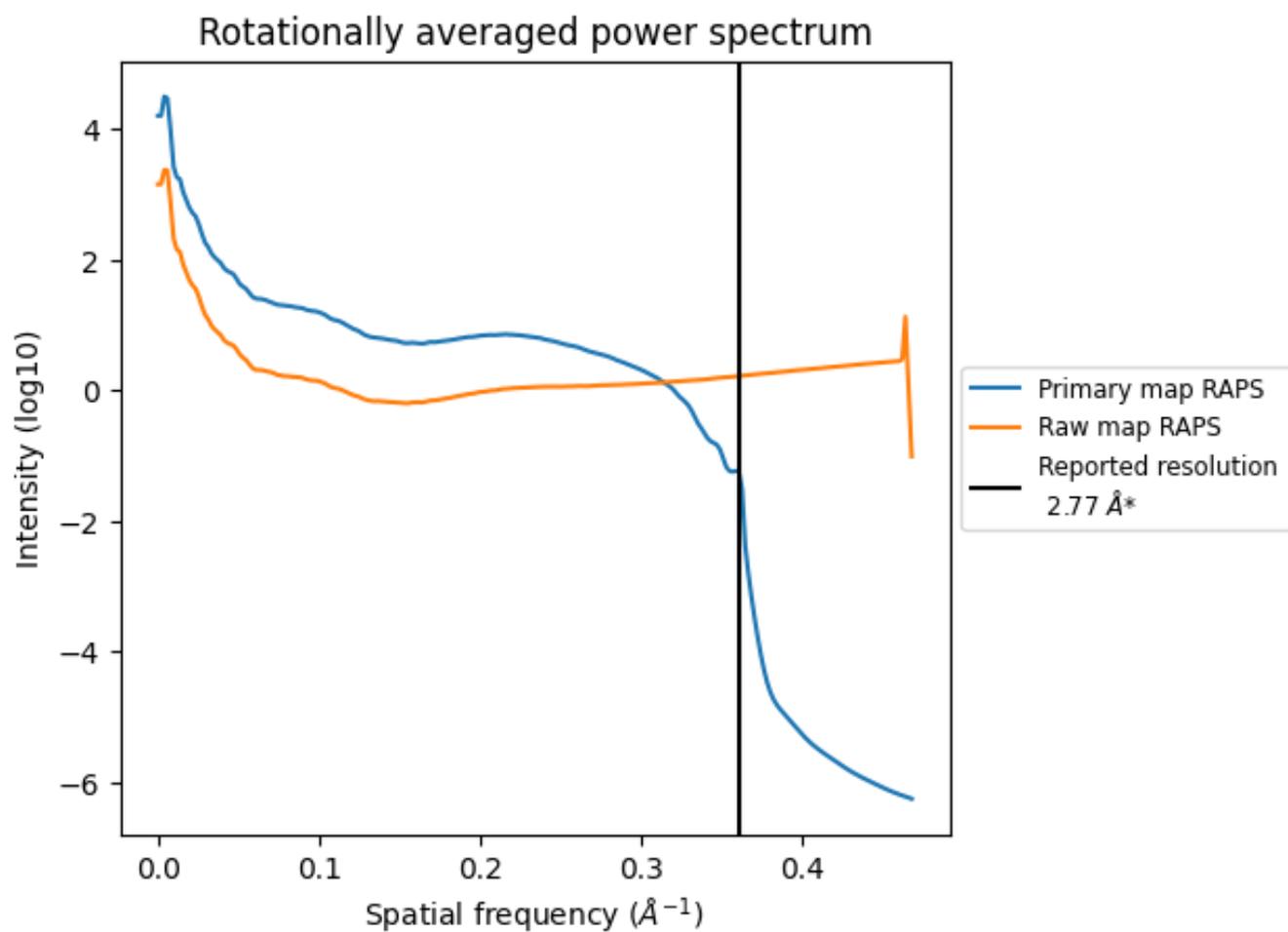
*Reported resolution corresponds to spatial frequency of 0.361 Å^{-1}

8   Fourier-Shell correlation ⓘ

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1   FSC ⓘ
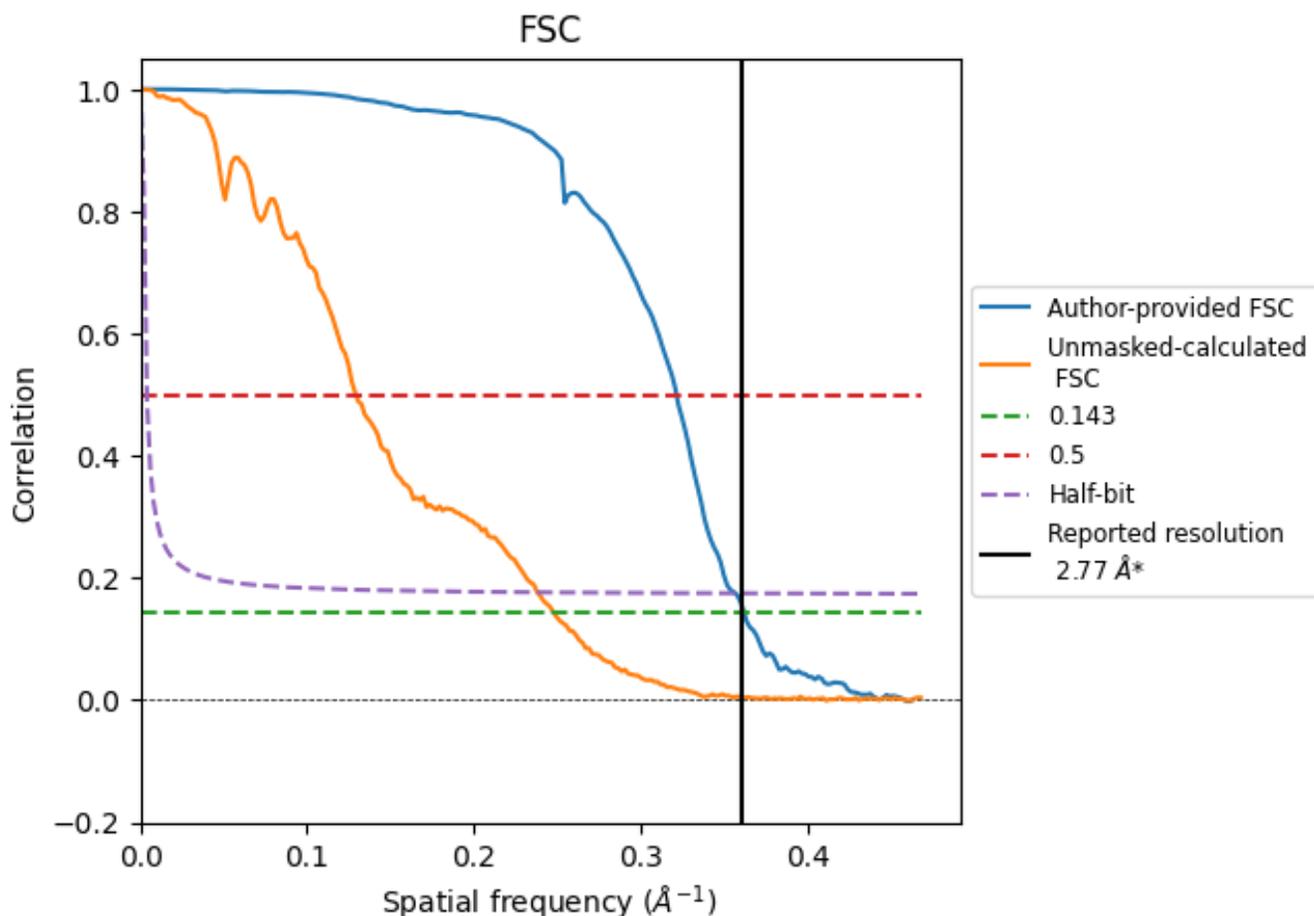
*Reported resolution corresponds to spatial frequency of 0.361 Å^{-1}

8.2   Resolution estimates ⓘ

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.77	-	-
Author-provided FSC curve	2.76	3.11	2.80
Unmasked-calculated*	4.03	7.73	4.20

*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 4.03 differs from the reported value 2.77 by more than 10 %

9 Map-model fit (i)

This section contains information regarding the fit between EMDB map EMD-71797 and PDB model 9PR4. Per-residue inclusion information can be found in section 3 on page 18.

## 9.1 Map-model overlay (i)

| X | Y | Z |
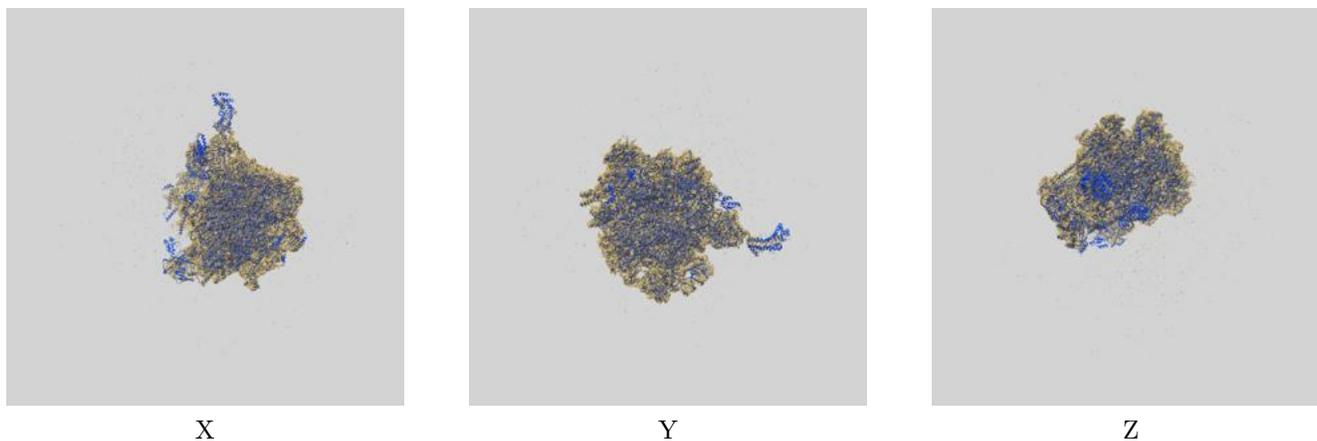
The images above show the 3D surface view of the map at the recommended contour level 0.08 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

## 9.2   Q-score mapped to coordinate model ⓘ

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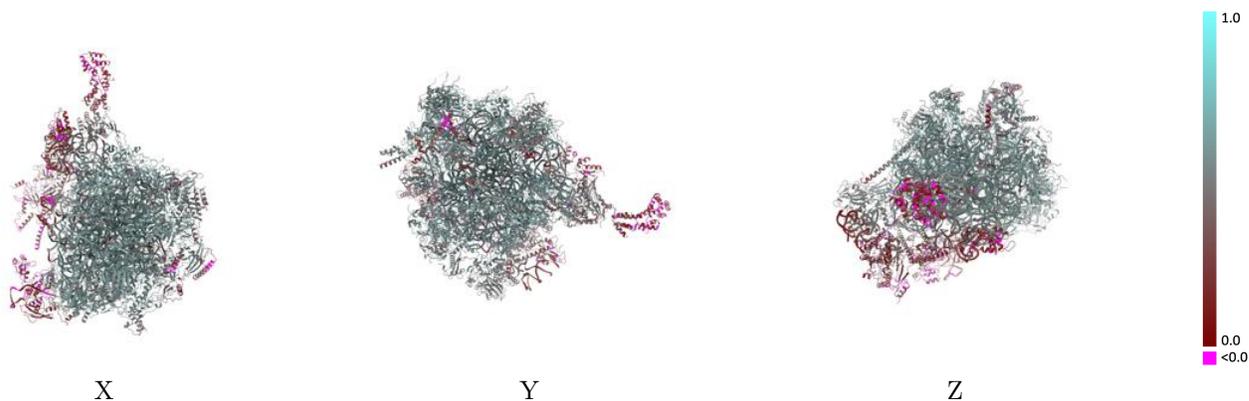
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

9.3   Atom inclusion mapped to coordinate model ⓘ

X   Y   Z
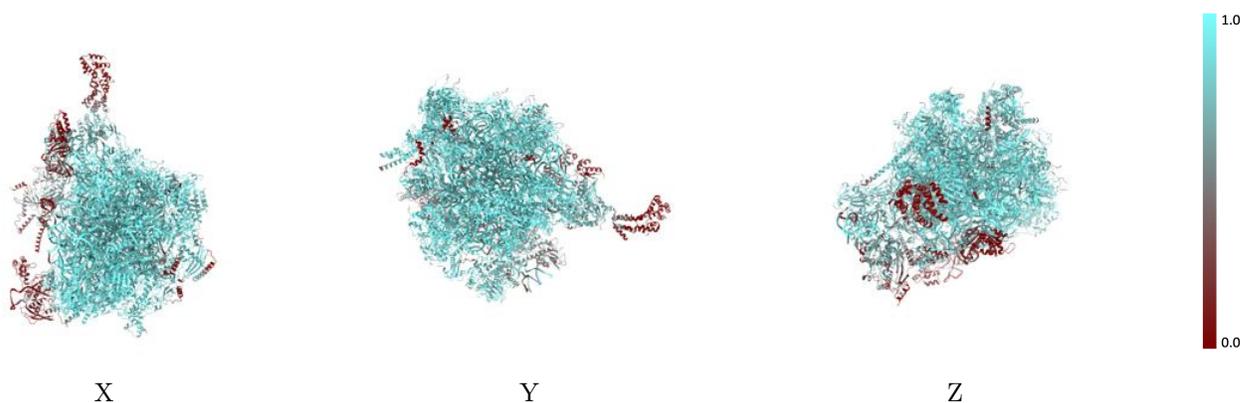
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.08).

9.4 Atom inclusion ⓘ
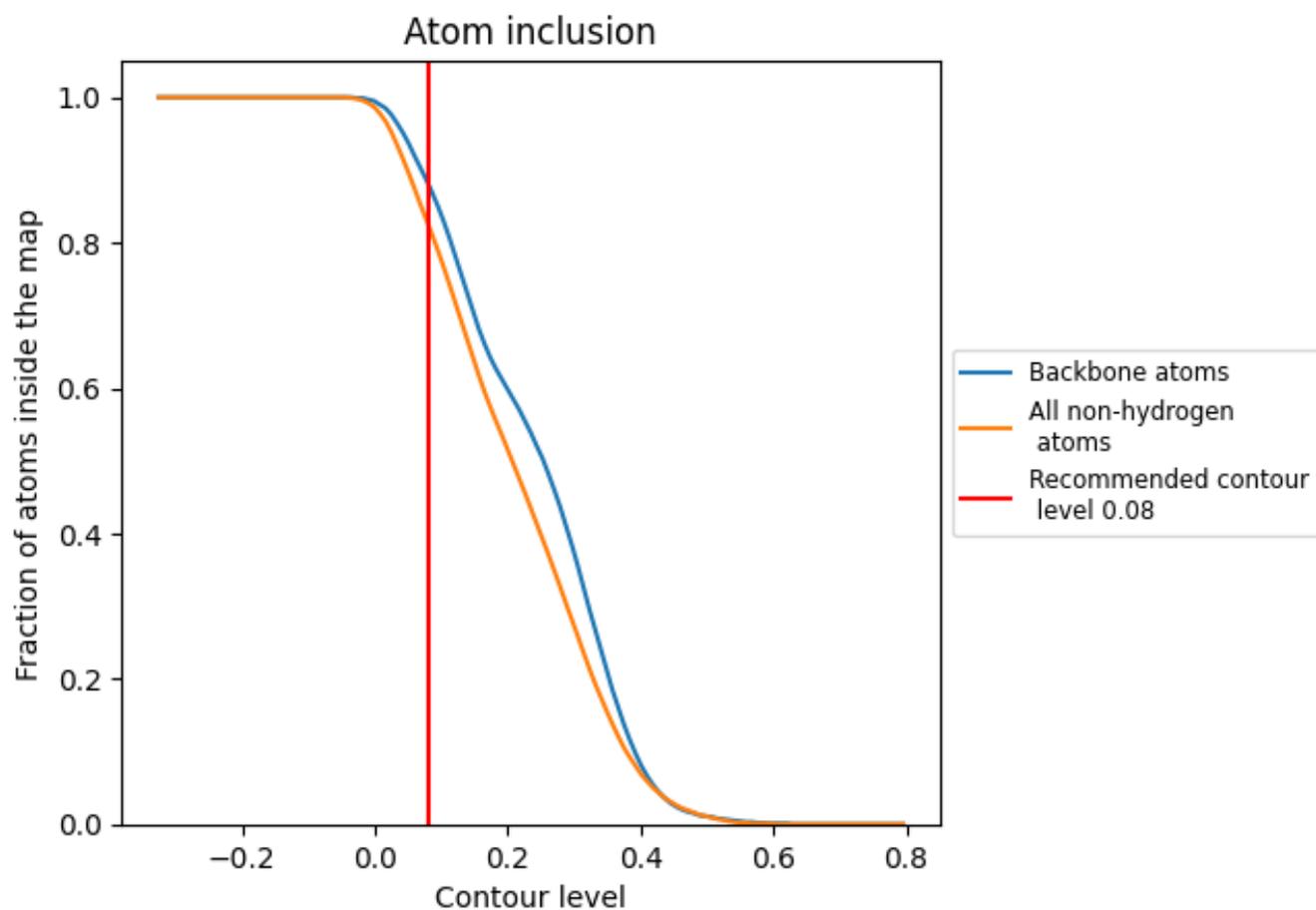
At the recommended contour level, 88% of all backbone atoms, 83% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.08) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8260	0.4920
0	0.9060	0.5590
1	0.8270	0.5150
2	0.9610	0.5980
3	0.9610	0.5960
4	0.9140	0.5800
5	0.8950	0.5460
6	0.8430	0.4880
7	0.8480	0.5010
8	0.4920	0.2480
9	0.8940	0.5460
A	0.9380	0.5390
B	0.7830	0.3090
C	0.1750	0.2480
D	0.9090	0.5660
E	0.9200	0.5680
F	0.9460	0.5790
G	0.0270	0.1290
H	0.5080	0.3180
I	0.6250	0.3780
J	0.6230	0.3130
K	0.9460	0.5790
L	0.9060	0.5590
M	0.9380	0.5740
N	0.9070	0.5570
O	0.9290	0.5670
OX	0.3180	0.2900
P	0.8780	0.5300
Q	0.8910	0.5530
R	0.9330	0.5740
S	0.9230	0.5650
T	0.9350	0.5840
U	0.8160	0.4950
V	0.8510	0.5100
W	0.8980	0.5690

1.0

0.0
<0.0

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WORLDWIDE
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PROTEIN DATA BANK

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Chain	Atom inclusion	Q-score
X	0.8980	0.5460
Y	0.9120	0.5620
Z	0.9280	0.5750
a	0.7720	0.4820
b	0.9420	0.5780
c	0.8950	0.5320
d	0.7130	0.4470
e	0.4500	0.1920
f	0.5340	0.2850
g	0.9210	0.5620
h	0.8600	0.5020
i	0.9510	0.5920
j	0.8500	0.5160
k	0.7850	0.4660
l	0.7270	0.3820
m	0.4590	0.2220
n	0.3750	0.3070
o	0.9500	0.5850
p	0.7770	0.4640
q	0.6100	0.3770
r	0.9070	0.5560
s	0.9060	0.5560
t	0.3340	0.2330
u	0.2620	0.1610
v	0.0310	0.0660
w	0.0330	0.0720
x	0.0200	0.0470
y	0.0120	0.0360
z	0.0690	0.0770