WORLDWIDE
wwPDB
PROTEIN DATA BANK

Full wwPDB EM Validation Report (i)

Dec 2, 2025 – 05:04 am GMT

PDB ID	:	7PNZ / pdb_00007pnz
EMDB ID	:	EMD-13557
Title	:	Assembly intermediate of human mitochondrial ribosome small subunit without mS37 in complex with RBFA and METTL15 conformation c
Authors	:	Itoh, Y.; Khawaja, A.; Rorbach, J.; Amunts, A.
Deposited on	:	2021-09-08
Resolution	:	3.09 Å(reported)
Based on initial model	:	6RW4

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

EMDB validation analysis	:	0.0.1.dev129
Mogul	:	1.8.4, CSD as541be (2020)
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)	:	2.46

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 3.09 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.
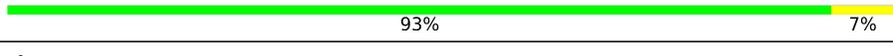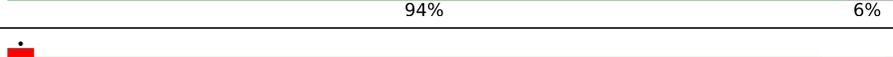
Metric	Percentile Ranks	Value
Clashscore		2
Ramachandran outliers		0.0%
Sidechain outliers		0.1%
RNA backbone		0.61

Worse   *Better*

▮ Percentile relative to all structures
◻ Percentile relative to all EM structures

Metric	Model-Map Fit Percentile Ranks	Value
Q-score		0.533

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	14003 (2.59 - 3.59)

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	A	955	80% 19%
2	B	296	72% 24%
3	C	167	74% 5% 21%

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Mol	Chain	Length	Quality of chain
4	D	430	76% · 20%
5	E	125	87% 7% 6%
6	F	242	5% 79% 5% 15%
7	G	396	6% 79% · 17%
8	H	201	63% 6% 30%
9	I	194	65% 5% · 29%
10	J	138	76% · 22%
11	K	128	70% 9% 21%
12	L	257	5% 63% · 32%
13	M	137	82% · 13%
14	N	130	78% 6% 15%
15	O	258	73% · 25%
16	P	142	61% 7% 32%
17	Q	86	93% 7%
18	R	360	76% 6% 18%
19	S	190	69% · 29%
20	T	173	92% 5% ·
21	U	205	82% · 14%
22	V	414	82% 5% 13%
23	W	187	52% · 47%
24	X	398	81% 8% 12%
25	Y	395	7% 36% · 62%
26	Z	106	94% 6%
27	0	218	92% 7% ·
28	1	323	83% · 14%

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Mol	Chain	Length	Quality of chain
29	3	199	35% · 64%
30	4	689	20% 81% 5% 14%
31	a	343	20% 52% 9% 38%
32	b	407	54% 67% 8% 25%

2 Entry composition (i)

There are 41 unique types of molecules in this entry. The entry contains 132218 atoms, of which 60960 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 RNA chain called 12S mitochondrial rRNA.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	A	951	Total	C	H	N	O	P	0	0
			30467	9060	10269	3636	6551	951		

- Molecule 2 is a protein called 28S ribosomal protein S2, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
2	B	225	Total	C	H	N	O	S	0	0
			3644	1164	1816	331	323	10		

- Molecule 3 is a protein called 28S ribosomal protein S24, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
3	C	132	Total	C	H	N	O	S	0	0
			2172	699	1089	195	185	4		

- Molecule 4 is a protein called 28S ribosomal protein S5, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
4	D	343	Total	C	H	N	O	S	0	0
			5536	1713	2805	518	487	13		

- Molecule 5 is a protein called 28S ribosomal protein S6, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
5	E	118	Total	C	H	N	O	S	0	0
			1891	592	955	168	172	4		

- Molecule 6 is a protein called 28S ribosomal protein S7, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
6	F	205	Total	C	H	N	O	S	15	0
			3673	1158	1869	324	311	11		

- Molecule 7 is a protein called 28S ribosomal protein S9, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
7	G	327	Total 5378	C 1710	H 2690	N 477	O 487	S 14	0	0

- Molecule 8 is a protein called 28S ribosomal protein S10, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
8	H	140	Total 2336	C 745	H 1184	N 194	O 210	S 3	0	0

- Molecule 9 is a protein called 28S ribosomal protein S11, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
9	I	137	Total 2081	C 642	H 1061	N 192	O 182	S 4	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	184	5F0	ASN	conflict	UNP P82912

- Molecule 10 is a protein called 28S ribosomal protein S12, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
10	J	108	Total 1727	C 521	H 888	N 169	O 143	S 6	0	0

- Molecule 11 is a protein called 28S ribosomal protein S14, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
11	K	101	Total 1748	C 537	H 886	N 179	O 141	S 5	0	0

- Molecule 12 is a protein called 28S ribosomal protein S15, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
12	L	174	Total 2994	C 925	H 1541	N 270	O 251	S 7	0	0

- Molecule 13 is a protein called 28S ribosomal protein S16, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
13	M	119	Total	C	H	N	O	S	0	0
			1908	594	966	185	157	6		

- Molecule 14 is a protein called 28S ribosomal protein S17, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
14	N	110	Total	C	H	N	O	S	0	0
			1797	562	929	156	147	3		

- Molecule 15 is a protein called 28S ribosomal protein S18b, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
15	O	193	Total	C	H	N	O	S	0	0
			3149	1014	1557	294	277	7		

- Molecule 16 is a protein called 28S ribosomal protein S18c, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
16	P	97	Total	C	H	N	O	S	0	0
			1588	501	807	134	138	8		

- Molecule 17 is a protein called 28S ribosomal protein S21, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
17	Q	86	Total	C	H	N	O	S	0	0
			1502	460	758	150	126	8		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
Q	50	ARG	CYS	variant	UNP P82921

- Molecule 18 is a protein called 28S ribosomal protein S22, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
18	R	295	Total	C	H	N	O	S	0	0
			4838	1533	2429	413	455	8		

- Molecule 19 is a protein called 28S ribosomal protein S23, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
19	S	135	Total 2227	C 716	H 1116	N 198	O 196	S 1	0	0

- Molecule 20 is a protein called 28S ribosomal protein S25, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
20	T	168	Total 2765	C 877	H 1394	N 239	O 244	S 11	0	0

- Molecule 21 is a protein called 28S ribosomal protein S26, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
21	U	176	Total 2988	C 916	H 1500	N 301	O 267	S 4	0	0

- Molecule 22 is a protein called 28S ribosomal protein S27, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
22	V	362	Total 5933	C 1904	H 2964	N 495	O 558	S 12	0	0

- Molecule 23 is a protein called 28S ribosomal protein S28, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
23	W	100	Total 1592	C 498	H 803	N 141	O 146	S 4	0	0

- Molecule 24 is a protein called 28S ribosomal protein S29, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
24	X	352	Total 5694	C 1822	H 2845	N 499	O 517	S 11	0	0

- Molecule 25 is a protein called 28S ribosomal protein S31, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
25	Y	149	Total 2444	C 801	H 1198	N 207	O 234	S 4	0	0

- Molecule 26 is a protein called 28S ribosomal protein S33, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
26	Z	100	Total 1699	C 534	H 860	N 153	O 148	S 4	0	0

- Molecule 27 is a protein called 28S ribosomal protein S34, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
27	0	215	Total 3584	C 1130	H 1797	N 339	O 313	S 5	0	0

- Molecule 28 is a protein called 28S ribosomal protein S35, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
28	1	278	Total 4545	C 1430	H 2289	N 386	O 429	S 11	0	0

- Molecule 29 is a protein called Aurora kinase A-interacting protein.

Mol	Chain	Residues	Atoms						AltConf	Trace
29	3	71	Total 1331	C 403	H 702	N 135	O 90	S 1	0	0

- Molecule 30 is a protein called Pentatricopeptide repeat domain-containing protein 3, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
30	4	590	Total 9556	C 3056	H 4781	N 809	O 882	S 28	0	0

- Molecule 31 is a protein called Putative ribosome-binding factor A, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
31	a	211	Total 3361	C 1050	H 1679	N 298	O 325	S 9	0	0

- Molecule 32 is a protein called 12S rRNA N4-methylcytidine (m4C) methyltransferase.

Mol	Chain	Residues	Atoms						AltConf	Trace
32	b	307	Total 4856	C 1517	H 2463	N 426	O 437	S 13	0	0

- Molecule 33 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (CCD ID: NAD) (formula: $C_{21}H_{27}N_7O_{14}P_2$).

NAD

Mol	Chain	Residues	Atoms						AltConf
			Total	C	H	N	O	P	
33	A	1	70	21	26	7	14	2	0

- Molecule 34 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
34	A	58	Total	Mg	0
			58	58	
34	B	1	Total	Mg	0
			1	1	
34	X	1	Total	Mg	0
			1	1	
34	3	1	Total	Mg	0
			1	1	

- Molecule 35 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms		AltConf
35	A	17	Total	K	0
			17	17	

- Molecule 36 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
36	O	1	Total	Zn	0
			1	1	

- Molecule 37 is FE2/S2 (INORGANIC) CLUSTER (CCD ID: FES) (formula: Fe_2S_2) (labeled as "Ligand of Interest" by depositor).
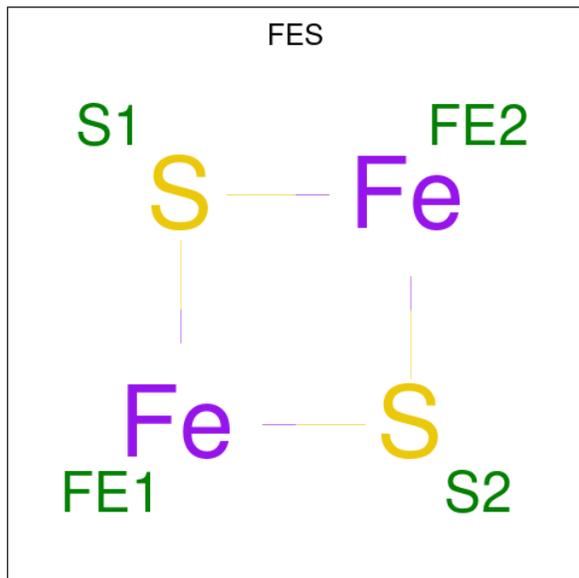
Mol	Chain	Residues	Atoms			AltConf
37	P	1	Total	Fe	S	0
			4	2	2	
37	T	1	Total	Fe	S	0
			4	2	2	

- Molecule 38 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).

Mol	Chain	Residues	Atoms						AltConf
			Total	C	H	N	O	P	
38	X	1	43	10	12	5	13	3	0

- Molecule 39 is GUANOSINE-5'-DIPHOSPHATE (CCD ID: GDP) (formula: $C_{10}H_{15}N_5O_{11}P_2$).

Mol	Chain	Residues	Atoms						AltConf
			Total	C	H	N	O	P	
39	X	1	40	10	12	5	11	2	0

- Molecule 40 is S-ADENOSYL-L-HOMOCYSTEINE (CCD ID: SAH) (formula: $C_{14}H_{20}N_6O_5S$).
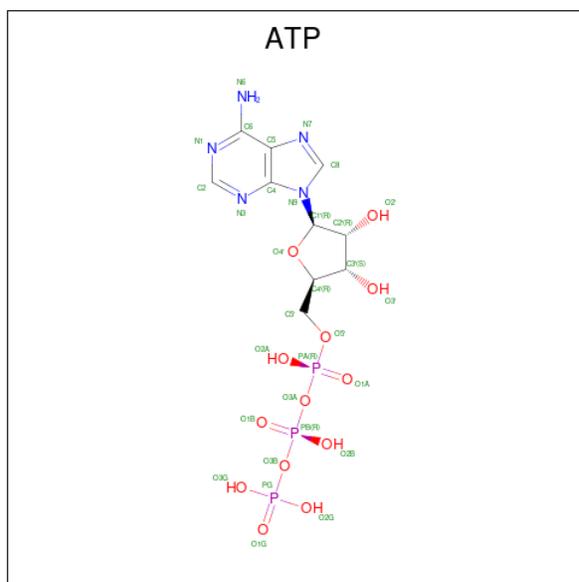
Mol	Chain	Residues	Atoms						AltConf
			Total	C	H	N	O	S	
40	b	1	46	14	20	6	5	1	0

- Molecule 41 is water.

Mol	Chain	Residues	Atoms		AltConf
41	A	648	Total 648	O 648	0
41	B	6	Total 6	O 6	0
41	C	21	Total 21	O 21	0
41	D	31	Total 31	O 31	0
41	F	4	Total 4	O 4	0
41	G	15	Total 15	O 15	0
41	H	19	Total 19	O 19	0
41	J	8	Total 8	O 8	0
41	K	24	Total 24	O 24	0
41	L	8	Total 8	O 8	0
41	M	23	Total 23	O 23	0
41	N	12	Total 12	O 12	0
41	O	11	Total 11	O 11	0
41	P	2	Total 2	O 2	0
41	Q	5	Total 5	O 5	0
41	R	20	Total 20	O 20	0
41	S	1	Total 1	O 1	0
41	T	9	Total 9	O 9	0
41	U	10	Total 10	O 10	0

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Mol	Chain	Residues	Atoms		AltConf
41	V	1	Total 1	O 1	0
41	W	1	Total 1	O 1	0
41	X	2	Total 2	O 2	0
41	Y	1	Total 1	O 1	0
41	Z	7	Total 7	O 7	0
41	0	21	Total 21	O 21	0
41	1	7	Total 7	O 7	0
41	3	7	Total 7	O 7	0
41	4	2	Total 2	O 2	0
41	a	2	Total 2	O 2	0

3 Residue-property plots ⓘ

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: 12S mitochondrial rRNA

Chain A: 80%   19%
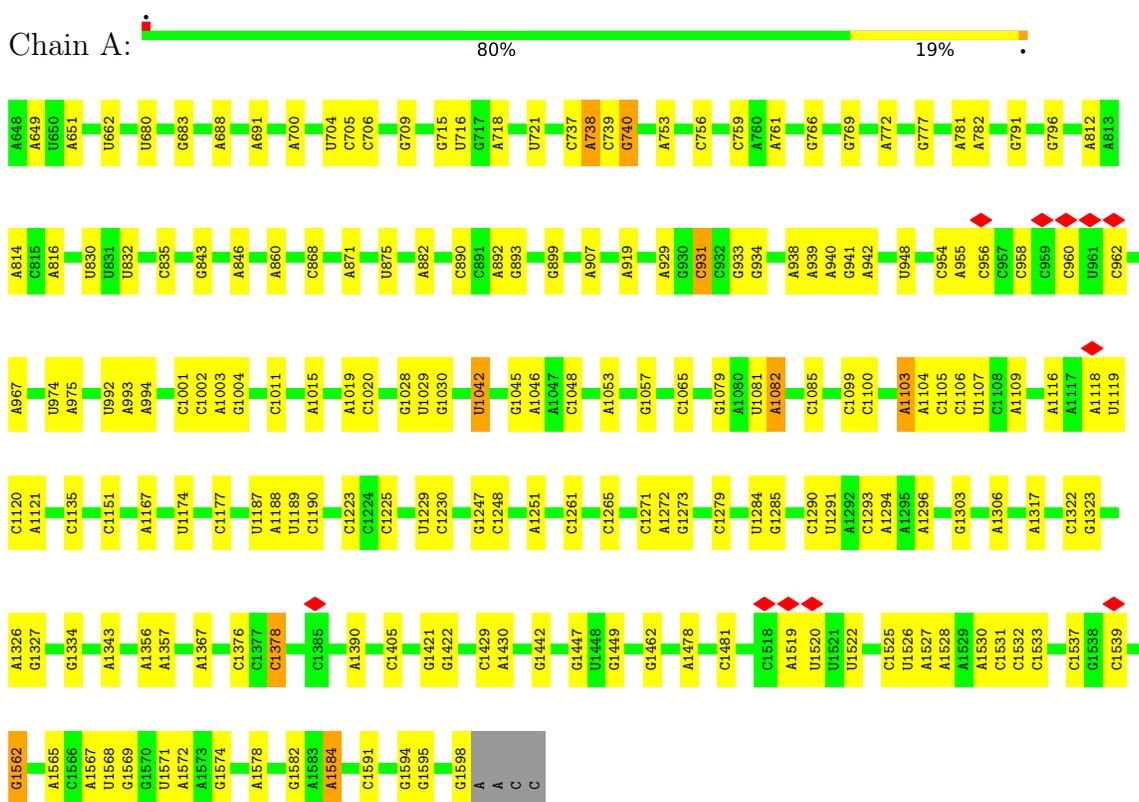
- Molecule 2: 28S ribosomal protein S2, mitochondrial

Chain B: 72%   24%
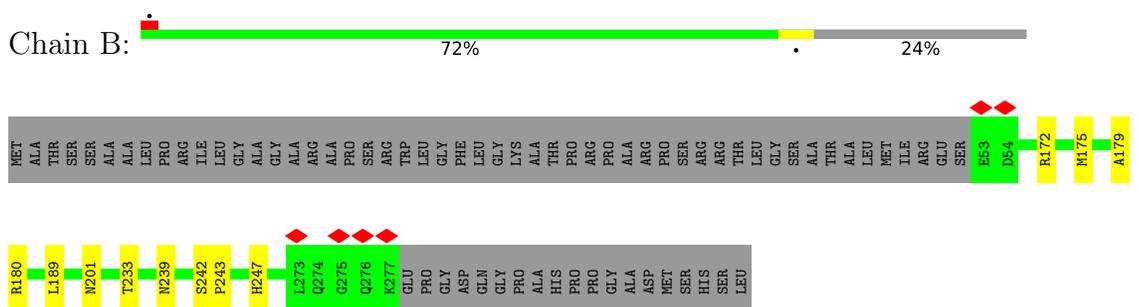
- Molecule 3: 28S ribosomal protein S24, mitochondrial

Chain C:

74%   5%   21%

MET ALA ALA SER VAL CYS SER GLY LEU LEU GLY PRO ARG VAL LEU SER TRP SER ARG GLU LEU PRO CYS ALA TRP ARG ALA LEU HIS THR SER PRO VAL CYS ALA K36 A58 P59 V90 M96 D106 Q107 L108 Y132 V136 T157 L167

• Molecule 4: 28S ribosomal protein S5, mitochondrial

Chain D:

76%   20%

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

ALA SER LEU SER ARG ALA LEU GLN THR GLN CYS CYS ILE SER SER PRO SER HIS LEU MET SER GLN GLN TYR ARG PRO TYR S88 L103 K116 R117 T118 K119 K120 R123 I132 L144 K183 K184 M185 W193 W198 L203 C211 M231 V245 A271

V276 Y285 S339 E372 E398 D399 V421 T430

• Molecule 5: 28S ribosomal protein S6, mitochondrial

Chain E:

87%   7%   6%

MET P2 I26 V36 E40 H54 S55 Y63 F64 L65 V94 E101 L102 L117 Y118 S119 THR LYS LYS ARG LYS LYS

• Molecule 6: 28S ribosomal protein S7, mitochondrial

5%

Chain F:

79%   5%   15%

MET ALA ALA PRO ALA VAL LYS VAL ALA ARG GLY TRP SER GLY LEU ALA LEU GLY VAL VAL ARG ARG ALA ALA LEU LEU GLN LEU PRO GLY LEU THR GLN VAL ARG TRP S35 E56 E57 L58 T59 E60 A79 S109 Q113 Q147 N151 L158 V159 P160 I161 L162 K163 G164 G165

R166 F167 V170 P171 D193 K194 M229 R234 A237 H238 Y239 ARG TRP TRP

• Molecule 7: 28S ribosomal protein S9, mitochondrial

6%

Chain G:

79%   17%

MET ALA ALA PRO CYS VAL SER TYR GLY GLY ALA VAL SER TYR ARG LEU LEU LEU TRP GLY ARG GLY SER LEU ALA ARG LYS GLN GLY LEU TRP LYS SER THR ALA ALA PRO GLU LEU GLN THR ASN VAL ARG GLN ILE LEU ARG LEU ARG HIS THR A53 F54 V55 I56 P57 K58 K59 N60

V61 P62 T63 S64 K65 R66 E67 T70 F73 G115 K174 H175 Q176 SER HIS LEU LEU GLN ALA LYS SER LEU LEU PRO GLU LYS THR VAL THR ARG ASP V194 I195 V210 L229 A236 E237 E238 V241 V248 T249 L250 E264 Q312 F315 H318 L369
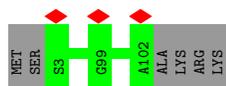
E378 K381 R388 R389 R396

• Molecule 8: 28S ribosomal protein S10, mitochondrial

Chain H:

63%   6%   30%

MET ALA ALA ARG THR ALA PHE GLY ALA VAL CYS ARG ARG LEU TRP GLN GLY LEU GLY ASN PHE SER VAL ASN THR SER LYS ASN THR ALA LYS ASN GLY GLY LEU LEU LEU SER THR ASN MET LYS TRP VAL GLN PHE SER ASN L50 T59 D84 E92 V108 S123

I126 Y127 K128 R131 R141 C142 L143 L148 V155 I184 I188 W189 GLU THR LEU SER GLU GLU LYS GLU GLU SER LYS SER
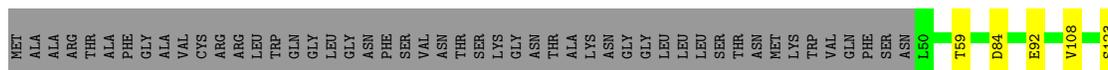
• Molecule 9: 28S ribosomal protein S11, mitochondrial

Chain I:

65%   5%   29%

MET GLN ALA VAL ARG ASN ALA GLY SER ARG PHE LEU ARG SER TRP THR TRP PRO GLN THR ALA GLY ARG VAL VAL ALA ARG THR PRO ALA GLY THR ILE CYS THR GLY ALA ARG GLN LEU GLN ASP ALA ALA ALA LYS GLN LYS VAL GLU GLN ASN ALA ALA PRO SER HIS T58 K59

Q96 I97 Q98 S111 T114 A161 M162 H163 T179 5FO184 R192 K193 L194

• Molecule 10: 28S ribosomal protein S12, mitochondrial

Chain J:

76%   22%

MET SER TRP SER GLY LEU LEU HIS GLY LEU LEU ASN THR SER LEU THR CYS GLY PRO ALA LEU VAL PRO ARG LEU TRP ALA THR CYS SER MET A31 P42 R78 D117 K138

• Molecule 11: 28S ribosomal protein S14, mitochondrial

Chain K:

70%   9%   21%

MET ALA ALA PHE MET LEU GLY SER LEU LEU ARG THR PHE LYS GLN MET VAL PRO SER ALA SER GLY GLN VAL ARG SER H28 M34 V38 R58 D72 P79 S82 M93 T94 S95 R112 L120 I123 W128

• Molecule 12: 28S ribosomal protein S15, mitochondrial

Chain L:

5%

63%   32%

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

SER ARG L63 D66 K84 V85 D86 D87 K107 M112 I115 V116 I181 R197 V213 T217 R224 L227 K228 A229 A230 A231 A232 A233 Q234 K235 Q236 ALA LYS ARG ARG ASN PRO ASP SER PRO ALA LYS ALA ILE PRO LYS THR LEU LYS ASP SER GLN

• Molecule 13: 28S ribosomal protein S16, mitochondrial

Chain M:

82% • 13%

MET VAL HIS LEU THR THR LEU LEU CYS **K10** A11 I19 L83 E88 G92 L93 A94 T125 D126 A127 E128 ALA THR ASP THR GLU ALA GLU THR

• Molecule 14: 28S ribosomal protein S17, mitochondrial

Chain N:

78% 6% 15%

MET SER VAL V4 R5 S6 V14 C58 L69 R73 L81 A82 E83 V88 S112 E113 THR THR GLN LEU SER LYS ASN LEU GLU GLU LEU ASN ILE SER SER ALA GLN

• Molecule 15: 28S ribosomal protein S18b, mitochondrial

Chain O:

73% • 25%

MET ALA ALA SER VAL LEU ASN THR VAL LEU ARG ARG LEU PRO MET LEU SER LEU PHE ARG GLY SER HIS ARG VAL GLN VAL PRO LEU GLN THR LEU CYS THR LYS ALA PRO SER GLU GLU ASP SER LEU SER SER VAL P47 I48 D53 S185 P208 L213 S214 P239 PRO

ARG THR PRO ALA GLU ALA SER THR GLY GLN THR GLY PRO GLN SER ALA LEU

• Molecule 16: 28S ribosomal protein S18c, mitochondrial

Chain P:

61% 7% 32%

MET ALA ALA VAL VAL ALA VAL CYS GLY GLY LEU GLY GLY ARG LYS LYS LEU LEU THR HIS LEU VAL THR ALA ALA VAL SER LEU THR HIS PRO GLY THR HIS THR VAL LEU TRP ARG GLY CYS SER GLN GLN VAL SER S46 D73 Y74 K75 T88 M117 G118 R139 Y140 R141 E142

• Molecule 17: 28S ribosomal protein S21, mitochondrial

Chain Q:

93% 7%

A2 E20 M32 D33 I39 L75 K78 C87

• Molecule 18: 28S ribosomal protein S22, mitochondrial

Chain R:

76% 6% 18%

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

GLY SER PRO E64 T65 K66 F70 Q76 F158 I161 S162 H167 R170 K183 R189 D190 I193 Y219 S239 T240 E241 R256 L262 T265 V276 Q302 V306 L307 D310 A321 A322 R355 H356 S357 A358 ALA SER

• Molecule 19: 28S ribosomal protein S23, mitochondrial

Chain S:

69% 29%

MET A2 C96 V100 L106 E111 T112 L117 G129 R133 R134 V135 G136 GLU ALA ARG THR GLN HIS GLY SER HIS VAL SER ARG LYS SER GLU HIS LEU SER VAL ARG PRO GLN THR ALA LEU GLU GLU ASN GLU THR LYS GLU VAL PRO GLN GLN HIS

LEU GLU ALA PRO ALA ASP GLN SER LYS GLY LEU LEU PRO PRO

• Molecule 20: 28S ribosomal protein S25, mitochondrial

Chain T:

92% 5%

MET P2 V29 V32 L76 Q85 T92 H125 R132 L136 R160 A166 L167 K168 A169 ASP ALA GLN ASP

• Molecule 21: 28S ribosomal protein S26, mitochondrial

Chain U:

82% 14%

MET LEU ARG ALA LEU SER ARG LEU GLY ALA GLY THR PRO CYS ARG PRO ARG ALA PRO LEU VAL LEU PRO ALA ARG GLY R27 L34 I39 L70 R71 V75 R129 Q135 E138 T169 N172 Y187 Q201 R202 ARG ASP SER

• Molecule 22: 28S ribosomal protein S27, mitochondrial

Chain V:

82% 5% 13%

MET ALA ALA SER ILE VAL ARG ARG GLY MET LEU LEU ALA ARG GLN VAL LEU LEU PRO GLN LEU SER PRO ALA GLY LYS ARG TYR L29 L30 V35 D36 S37 H38 R74 N78 Q134 N141 D149 V163 V167 A172 L190 L208 L225 L236

E271 L280 L290 A293 ASP GLY ALA SER GLU GLU GLN SER GLN ASN GLU ASP GLU ASN GLN GLY SER E311 K312 I319 E323 V360 L364 E398 K401 Q402 E403 Y404 Q405 A406 Q407 LYS ALA ALA LYS ALA SER ALA

• Molecule 23: 28S ribosomal protein S28, mitochondrial

Chain W:

52% 47%

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

GLU LEU LEU GLN LYS VAL GLU PRO LEU GLU GLN LYS GLY SER SER PRO LYS N76 I114 L142 T160 S175 LYS ASP SER ARG LYS GLU GLU HIS HIS GLU LYS

• Molecule 24: 28S ribosomal protein S29, mitochondrial

Chain X:

81% 8% 12%

First row residues:

MET MET LEU LYS GLY ILE THR ARG LEU ILE SER ARG ILE HIS LYS LEU LEU ASP PRO GLY ARG PHE LEU HIS MET GLY THR GLN ARG GLN SER ILE ALA ALA HIS LEU ASP ASN GLN VAL PRO VAL GLU SER PRO ARG **A47** R50 E96 L108 Y119 R123 K130

Second row residues:

V141 L151 I152 L153 Q201 E206 K212 R213 L244 L247 K248 R249 L268 T272 R276 I282 E286 L293 N299 T313 L337 E362 E375 E379 L380 L381 N385 S389 H394 L398

• Molecule 25: 28S ribosomal protein S31, mitochondrial

Chain Y:

7% 36% 62%

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

GLY THR ASN SER VAL ILE CYS SER SER LYS LYS ASP LYS SER GLN SER VAL ARG THR GLU GLN THR SER GLU THR LYS GLU THR SER GLU GLN ASP SER GLU LYS ASN THR LYS LYS ASP LEU LEU GLY ILE ILE LYS MET LYS VAL GLU LEU SER THR VAL VAL ARG THR LYS PRO

PRO LYS ARG ARG PRO LEU LYS SER LEU GLU ALA THR LEU GLY ARG LEU ARG ARG ALA THR GLU GLU PRO LEU ASP LEU SER GLU VAL VAL ALA ALA SER ALA VAL ALA ASP SER LEU PRO ASP LYS GLN THR THR LYS SER GLU LEU LEU SER GLN

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

THR ASP ASP LEU LYS LYS **R247 K248 N249** I250 **K254 R255 L256 N257 I258 F259 D260 M261 M262 A263 V264 T265 K266 E267 A268 P269 E270 T271 D272 T273 S274** I332 **D385** **N391 I392 Q393 F394 N395**

• Molecule 26: 28S ribosomal protein S33, mitochondrial

Chain Z:

94% 6%

MET SER **S3** **G99** **A102** ALA LYS ARG LYS

• Molecule 27: 28S ribosomal protein S34, mitochondrial

Chain 0:

92% 7%

MET ALA ARG **K4 K5 V6** L21 L41 T42 R43 R49 A54 W55 V58 C93 R101 N108 L109 D110 T119 Y136 **P157 E158 D159** L191 **V218**

• Molecule 28: 28S ribosomal protein S35, mitochondrial

Chain 1:

83% 14%

MET ALA ALA ALA ALA LEU PRO ALA TRP LEU SER LEU GLN SER ARG ALA ARG THR LEU ARG ALA PHE SER THR ALA VAL TYR SER ALA THR PRO VAL PRO THR PRO SER LEU PRO GLU ARG THR PRO GLY ASN GLU **R46 P47** R56 M60 A80 F129 Y221 **E238**

E245 T265 **E273 K274 N275 M276 E277 I278 N279 K280** E281 E282 L283 E304 I309 **T323**

• Molecule 29: Aurora kinase A-interacting protein

Chain 3:

• Molecule 30: Pentatricopeptide repeat domain-containing protein 3, mitochondrial

Chain 4:

• Molecule 31: Putative ribosome-binding factor A, mitochondrial

Chain a:

• Molecule 32: 12S rRNA N4-methylcytidine (m4C) methyltransferase

Chain b:

54%

67%   8%   25%
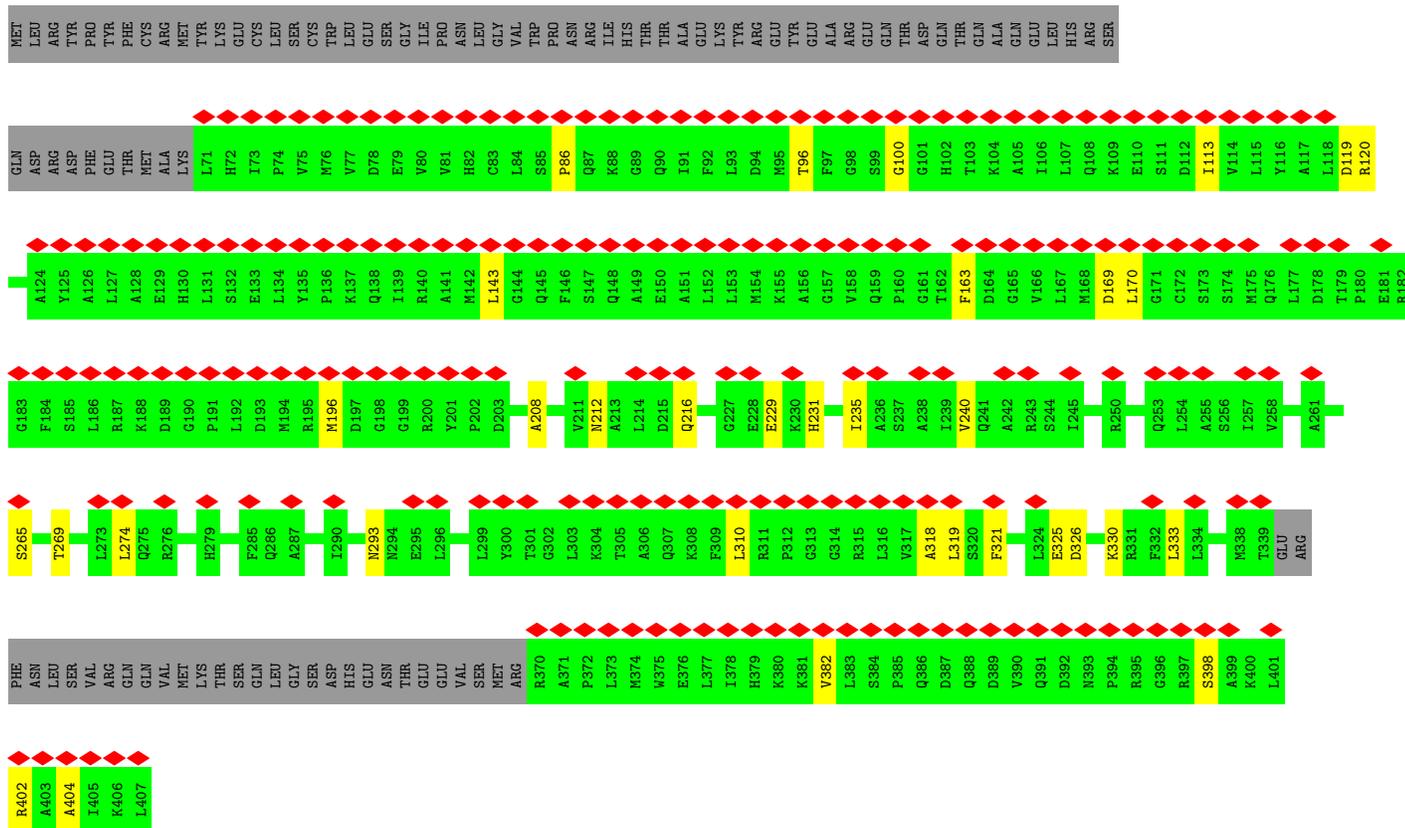
4　Experimental information　ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	27022	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 $(e^-/\text{Å}^2)$	31	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	165000	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	1.589	Depositor
Minimum map value	-0.844	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.031	Depositor
Recommended contour level	0.11	Depositor
Map size (Å)	388.80002, 388.80002, 388.80002	wwPDB
Map dimensions	576, 576, 576	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.675, 0.675, 0.675	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: AYA, NAD, FES, K, ATP, MA6, 5MC, GDP, SAH, MG, 5F0, 5MU, B8T, 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	0.11	0/22468	0.20	0/34978
2	B	0.11	0/1871	0.28	0/2531
3	C	0.13	0/1113	0.27	0/1505
4	D	0.12	0/2783	0.27	0/3724
5	E	0.11	0/953	0.26	0/1289
6	F	0.10	0/1846	0.24	0/2482
7	G	0.11	0/2746	0.26	0/3681
8	H	0.13	0/1178	0.28	0/1598
9	I	0.11	0/1030	0.27	0/1386
10	J	0.14	0/855	0.30	0/1148
11	K	0.14	0/880	0.32	0/1182
12	L	0.11	0/1477	0.25	0/1974
13	M	0.14	0/963	0.30	0/1295
14	N	0.12	0/886	0.28	0/1199
15	O	0.11	0/1648	0.27	0/2243
16	P	0.13	0/798	0.30	0/1070
17	Q	0.12	0/748	0.31	0/994
18	R	0.11	0/2456	0.24	0/3317
19	S	0.12	0/1138	0.26	0/1533
20	T	0.11	0/1402	0.28	0/1883
21	U	0.12	0/1510	0.27	0/2025
22	V	0.09	0/3030	0.22	0/4093
23	W	0.10	0/801	0.24	0/1079
24	X	0.10	0/2921	0.26	0/3954
25	Y	0.10	0/1280	0.24	0/1725
26	Z	0.12	0/857	0.26	0/1141
27	0	0.13	0/1834	0.31	0/2484
28	1	0.11	0/2304	0.25	0/3117
29	3	0.13	0/640	0.33	0/844
30	4	0.09	0/4883	0.23	0/6608
31	a	0.11	0/1710	0.29	0/2302
32	b	0.09	0/2436	0.27	0/3287

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#|Z| >5	RMSZ	#|Z| >5
All	All	0.11	0/73445	0.24	0/103671

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
9	I	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
9	I	184	5F0	Mainchain

5.2   Too-close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	20198	10269	10253	64	0
2	B	1828	1816	1815	7	0
3	C	1083	1089	1088	6	0
4	D	2731	2805	2804	12	0
5	E	936	955	954	8	0
6	F	1804	1869	1868	8	0
7	G	2688	2690	2687	11	0
8	H	1152	1184	1183	10	0
9	I	1020	1061	1053	9	0
10	J	839	888	887	2	0
11	K	862	886	885	7	0
12	L	1453	1541	1540	6	0
13	M	942	966	965	5	0
14	N	868	929	928	6	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
15	O	1592	1557	1557	3	0
16	P	781	807	806	9	0
17	Q	744	758	758	7	0
18	R	2409	2429	2428	14	0
19	S	1111	1116	1115	2	0
20	T	1371	1394	1393	7	0
21	U	1488	1500	1499	5	0
22	V	2969	2964	2961	12	0
23	W	789	803	802	2	0
24	X	2849	2845	2843	20	0
25	Y	1246	1198	1197	6	0
26	Z	839	860	858	0	0
27	0	1787	1797	1796	11	0
28	1	2256	2289	2288	8	0
29	3	629	702	702	1	0
30	4	4775	4781	4779	24	0
31	a	1682	1679	1675	31	0
32	b	2393	2463	2457	24	0
33	A	44	26	26	0	0
34	3	1	0	0	0	0
34	A	58	0	0	0	0
34	B	1	0	0	0	0
34	X	1	0	0	0	0
35	A	17	0	0	0	0
36	O	1	0	0	0	0
37	P	4	0	0	0	0
37	T	4	0	0	0	0
38	X	31	12	12	0	0
39	X	28	12	12	0	0
40	b	26	20	19	1	0
41	0	21	0	0	0	0
41	1	7	0	0	0	0
41	3	7	0	0	0	0
41	4	2	0	0	0	0
41	A	648	0	0	10	0
41	B	6	0	0	1	0
41	C	21	0	0	1	0
41	D	31	0	0	2	0
41	F	4	0	0	0	0
41	G	15	0	0	0	0
41	H	19	0	0	1	0
41	J	8	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
41	K	24	0	0	0	0
41	L	8	0	0	0	0
41	M	23	0	0	3	0
41	N	12	0	0	0	0
41	O	11	0	0	0	0
41	P	2	0	0	0	0
41	Q	5	0	0	0	0
41	R	20	0	0	2	0
41	S	1	0	0	0	0
41	T	9	0	0	0	0
41	U	10	0	0	0	0
41	V	1	0	0	0	0
41	W	1	0	0	0	0
41	X	2	0	0	0	0
41	Y	1	0	0	0	0
41	Z	7	0	0	0	0
41	a	2	0	0	0	0
All	All	71258	60960	60893	287	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.

All (287) 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:1046:A:O2'	1:A:1048:C:OP2	1.96	0.83
12:L:112:MET:O	12:L:116:VAL:HG22	1.79	0.83
1:A:941:G:O2'	1:A:1109:A:OP2	2.04	0.74
4:D:285:TYR:OH	4:D:372:GLU:OE2	2.09	0.71
30:4:451:ASP:OD1	30:4:454:ARG:NH1	2.25	0.69
13:M:88:GLU:O	41:M:201:HOH:O	2.12	0.68
1:A:931:C:OP2	41:A:1801:HOH:O	2.12	0.67
1:A:1135:C:OP1	41:A:1803:HOH:O	2.13	0.66
18:R:190:ASP:OD2	41:R:401:HOH:O	2.14	0.66
30:4:200:ASP:OD2	30:4:243:ASN:N	2.28	0.66
1:A:769:G:OP2	14:N:73:ARG:NH2	2.30	0.65
1:A:1099:C:N3	41:A:1819:HOH:O	2.30	0.64
1:A:1272:A:N1	1:A:1303:G:O2'	2.25	0.64
32:b:265:SER:O	32:b:269:THR:HG23	1.99	0.62
1:A:691:A:N7	1:A:716:U:O2'	2.33	0.62
1:A:875:U:O2'	1:A:882:A:N1	2.34	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
27:O:41:LEU:HD13	27:O:55:TRP:CG	2.36	0.61
28:1:60:MET:HE1	28:1:80:ALA:O	2.00	0.61
18:R:239:SER:OG	18:R:241:GLU:OE1	2.19	0.60
5:E:117:LEU:HD13	31:a:56:VAL:CG2	2.31	0.60
16:P:140:TYR:OH	17:Q:33:ASP:OD1	2.18	0.60
14:N:6:SER:OG	14:N:69:LEU:O	2.18	0.60
32:b:86:PRO:HB3	32:b:113:ILE:HD12	1.84	0.60
31:a:184:ASP:OD1	31:a:185:LYS:N	2.34	0.59
31:a:130:THR:HG22	31:a:137:ARG:NH1	2.17	0.59
1:A:948:U:OP2	1:A:1045:G:N1	2.33	0.59
9:I:163:HIS:ND1	31:a:144:LEU:HD22	2.17	0.59
3:C:90:VAL:HG21	11:K:93:MET:HE1	1.83	0.59
1:A:1100:C:OP2	41:A:1806:HOH:O	2.17	0.59
24:X:299:ASN:ND2	28:1:265:THR:OG1	2.36	0.58
7:G:210:VAL:HG12	7:G:210:VAL:O	2.03	0.58
32:b:163:PHE:O	32:b:310:LEU:HD12	2.03	0.58
1:A:1378:C:O2	24:X:389:SER:OG	2.21	0.58
1:A:1584:MA6:OP1	29:3:145:LYS:NZ	2.33	0.58
9:I:163:HIS:CE1	31:a:144:LEU:HD22	2.37	0.58
32:b:196:MET:SD	32:b:293:ASN:ND2	2.77	0.58
1:A:1079:G:N2	1:A:1562:G:O3'	2.37	0.58
4:D:123:ARG:NH2	41:D:503:HOH:O	2.35	0.57
1:A:929:A:H1'	4:D:421:VAL:HG22	1.87	0.57
18:R:276:VAL:HG11	18:R:307:LEU:HD12	1.87	0.57
9:I:163:HIS:NE2	17:Q:20:GLU:OE1	2.38	0.57
1:A:781:A:OP1	1:A:782:A:O2'	2.15	0.56
30:4:564:ILE:HG22	30:4:567:THR:HB	1.86	0.56
18:R:162:SER:O	18:R:170:ARG:NH2	2.38	0.56
1:A:1230:C:OP2	1:A:1442:G:O2'	2.20	0.56
2:B:239:ASN:ND2	2:B:242:SER:OG	2.38	0.56
4:D:193:TRP:O	41:D:501:HOH:O	2.18	0.55
31:a:56:VAL:HG12	31:a:57:TRP:H	1.72	0.55
6:F:237:ALA:HB3	31:a:190:LEU:HD13	1.88	0.55
30:4:573:ALA:O	30:4:577:ASN:ND2	2.39	0.55
1:A:705:C:OP2	27:O:136:TYR:OH	2.17	0.55
31:a:130:THR:HG22	31:a:137:ARG:CZ	2.36	0.55
9:I:111:SER:OG	9:I:114:THR:HG23	2.06	0.55
32:b:119:ASP:O	32:b:143:LEU:HD12	2.06	0.55
18:R:162:SER:O	18:R:170:ARG:NH1	2.40	0.54
18:R:262:LEU:O	18:R:265:THR:OG1	2.18	0.54
32:b:318:ALA:C	32:b:319:LEU:HD12	2.33	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:G:318:HIS:NE2	24:X:379:GLU:OE2	2.41	0.54
31:a:56:VAL:HG12	31:a:57:TRP:N	2.23	0.54
15:O:208:PRO:HG2	15:O:213:LEU:HD21	1.90	0.54
32:b:318:ALA:O	32:b:319:LEU:HD12	2.09	0.53
10:J:78:ARG:NE	10:J:117:ASP:OD2	2.41	0.53
28:1:304:GLU:OE1	28:1:309:ILE:HD11	2.08	0.53
6:F:158[A]:LEU:HD23	6:F:171[A]:PRO:HA	1.91	0.53
1:A:662:U:OP2	4:D:339:SER:OG	2.26	0.53
5:E:94:VAL:CG1	16:P:117:MET:HE1	2.39	0.53
6:F:79:ALA:O	7:G:312:GLN:NE2	2.41	0.53
15:O:185:SER:O	18:R:183:LYS:NZ	2.41	0.53
11:K:34:MET:O	11:K:38:VAL:HG23	2.09	0.52
24:X:151:LEU:HD23	24:X:247:LEU:HD22	1.90	0.52
1:A:934:G:O2'	1:A:940:A:N1	2.36	0.52
30:4:151:ASP:OD1	30:4:152:ILE:N	2.41	0.52
12:L:86:ASP:OD1	12:L:87:ASP:N	2.41	0.52
30:4:631:VAL:HG21	30:4:649:VAL:HG21	1.90	0.52
12:L:66:ASP:OD1	12:L:107:LYS:NZ	2.35	0.52
22:V:225:LEU:HD21	22:V:280:LEU:HD23	1.92	0.52
32:b:321:PHE:N	32:b:325:GLU:OE1	2.42	0.52
32:b:326:ASP:O	32:b:330:LYS:N	2.39	0.52
22:V:360:VAL:HG13	22:V:364:LEU:HD22	1.92	0.52
24:X:276:ARG:NH2	24:X:286:GLU:OE1	2.43	0.52
27:0:54:ALA:O	27:0:58:VAL:HG23	2.10	0.52
32:b:382:VAL:HG23	32:b:382:VAL:O	2.10	0.52
11:K:34:MET:HE3	11:K:95:SER:HB2	1.92	0.51
25:Y:259:PHE:HB2	30:4:363:ILE:HD11	1.93	0.51
31:a:113:VAL:HG13	31:a:166:LEU:HD13	1.92	0.51
8:H:148:LEU:HD23	8:H:148:LEU:H	1.76	0.51
31:a:120:LEU:HD22	31:a:152:MET:CG	2.41	0.51
30:4:618:ALA:O	30:4:622:ASN:N	2.43	0.51
30:4:631:VAL:CG2	30:4:649:VAL:HG21	2.40	0.51
31:a:184:ASP:O	31:a:185:LYS:HB3	2.11	0.51
27:0:42:THR:HG22	27:0:49:ARG:HG2	1.92	0.50
22:V:134:GLN:NE2	27:0:108:ASN:OD1	2.43	0.50
32:b:216:GLN:CG	32:b:240:VAL:HG21	2.41	0.50
1:A:1528:A:OP1	27:0:101:ARG:NH1	2.41	0.50
19:S:96:CYS:O	19:S:100:VAL:HG23	2.11	0.50
22:V:236:LEU:HD12	22:V:290:LEU:HD13	1.94	0.50
5:E:63:TYR:OH	16:P:118:GLY:O	2.18	0.50
16:P:139:ARG:O	17:Q:32:MET:HE1	2.12	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
13:M:11:ALA:N	41:M:203:HOH:O	2.45	0.49
19:S:106:LEU:HB2	19:S:117:LEU:HD11	1.93	0.49
1:A:1177:C:O2'	1:A:1567:A:N1	2.40	0.49
1:A:1104:A:OP1	1:A:1591:C:O2'	2.24	0.49
32:b:382:VAL:HG11	32:b:402:ARG:CZ	2.42	0.49
1:A:1057:G:H4'	1:A:1578:A:H4'	1.94	0.49
32:b:216:GLN:HG3	32:b:240:VAL:HG21	1.93	0.49
32:b:321:PHE:O	32:b:398:SER:OG	2.26	0.49
24:X:206:GLU:OE2	24:X:249:ARG:NH2	2.46	0.49
31:a:120:LEU:HD21	31:a:151:HIS:ND1	2.28	0.49
1:A:1279:C:O2'	1:A:1296:A:N1	2.39	0.49
1:A:1028:G:OP1	41:A:1809:HOH:O	2.20	0.48
1:A:1317:A:N7	41:A:1829:HOH:O	2.35	0.48
1:A:781:A:N1	12:L:197:ARG:NH2	2.59	0.48
1:A:974:U:O2'	1:A:975:A:N7	2.46	0.48
30:4:256:GLU:HG3	30:4:287:LEU:HD22	1.94	0.48
11:K:120:LEU:HB3	11:K:123:ILE:HD12	1.95	0.48
18:R:161:ILE:O	20:T:125:HIS:NE2	2.40	0.48
22:V:35:VAL:HG12	22:V:35:VAL:O	2.12	0.48
7:G:229:LEU:HD21	7:G:241:VAL:HG11	1.95	0.48
31:a:301:VAL:O	31:a:302:GLU:C	2.56	0.48
1:A:1530:A:N1	1:A:1531:C:N4	2.62	0.48
32:b:229:GLU:CD	32:b:235:ILE:HD12	2.38	0.48
1:A:1532:C:O4'	27:0:21:LEU:HD21	2.13	0.48
30:4:294:PHE:HB3	30:4:323:MET:HE2	1.96	0.48
3:C:96:MET:HB2	3:C:108:LEU:HD11	1.96	0.47
1:A:1334:G:OP1	41:A:1808:HOH:O	2.20	0.47
2:B:233:THR:O	41:B:401:HOH:O	2.20	0.47
12:L:213:VAL:O	12:L:217:THR:HG23	2.14	0.47
2:B:243:PRO:O	2:B:247:HIS:ND1	2.46	0.47
21:U:169:THR:N	21:U:172:ASN:OD1	2.45	0.47
24:X:119:TYR:OH	28:1:273:GLU:OE2	2.31	0.47
18:R:189:ARG:NH2	41:R:402:HOH:O	2.35	0.47
1:A:843:G:N2	1:A:846:A:OP2	2.46	0.47
7:G:248:VAL:O	7:G:248:VAL:HG13	2.15	0.47
25:Y:264:VAL:HG12	25:Y:265:THR:N	2.29	0.47
30:4:372:TYR:CE2	30:4:400:LEU:HD21	2.49	0.47
30:4:615:MET:CE	30:4:649:VAL:HG22	2.45	0.47
31:a:60:SER:N	31:a:61:PRO:HD3	2.29	0.47
24:X:380:LEU:HD21	24:X:398:LEU:HD12	1.97	0.47
1:A:756:C:O2'	1:A:759:C:OP1	2.21	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:D:132:ILE:HG22	4:D:144:LEU:HD11	1.97	0.47
30:4:58:VAL:HG23	30:4:58:VAL:O	2.15	0.47
1:A:931:C:O2'	41:A:1807:HOH:O	2.18	0.47
3:C:157:THR:OG1	30:4:92:ASP:OD2	2.26	0.47
24:X:151:LEU:CD2	24:X:247:LEU:HD22	2.45	0.47
14:N:58:CYS:SG	14:N:81:LEU:HD22	2.55	0.46
6:F:193:ASP:OD1	6:F:194:LYS:N	2.48	0.46
1:A:715:G:HO2'	1:A:816:A:HO2'	1.63	0.46
3:C:58:ALA:HB1	3:C:59:PRO:CD	2.45	0.46
21:U:70:LEU:CD2	27:0:191:LEU:HD11	2.46	0.46
30:4:380:ASP:HB2	30:4:422:ILE:HD11	1.95	0.46
1:A:1306:A:N7	41:A:1830:HOH:O	2.36	0.46
2:B:179:ALA:CB	2:B:189:LEU:HD21	2.45	0.46
31:a:171:GLN:O	31:a:174:ARG:NH1	2.41	0.46
31:a:184:ASP:O	31:a:185:LYS:CB	2.64	0.46
6:F:170[B]:VAL:HG13	6:F:237:ALA:HA	1.97	0.46
8:H:108:VAL:HG22	8:H:143:LEU:HD23	1.97	0.46
14:N:83:GLU:OE1	20:T:85:GLN:NE2	2.43	0.46
31:a:125:SER:N	31:a:139:TYR:O	2.49	0.46
1:A:812:A:O2'	1:A:814:A:N1	2.45	0.46
8:H:148:LEU:HD23	8:H:148:LEU:N	2.30	0.46
1:A:769:G:N2	1:A:772:A:OP2	2.47	0.45
24:X:380:LEU:HD21	24:X:398:LEU:CD1	2.45	0.45
4:D:245:VAL:HG22	4:D:271:ALA:HB1	1.99	0.45
7:G:70:THR:HG23	7:G:73:PHE:H	1.81	0.45
31:a:162:HIS:CD2	31:a:166:LEU:HD11	2.52	0.45
31:a:176:VAL:O	31:a:176:VAL:HG13	2.16	0.45
31:a:143:THR:HG22	31:a:144:LEU:N	2.32	0.45
4:D:198:TRP:CD2	31:a:292:LEU:HD13	2.51	0.45
31:a:110:THR:HG23	31:a:110:THR:O	2.17	0.45
31:a:120:LEU:HD22	31:a:152:MET:HG2	1.97	0.45
1:A:1265:C:OP1	11:K:112:ARG:NH2	2.40	0.45
13:M:19:ILE:HB	13:M:83:LEU:HD23	1.98	0.45
21:U:71:ARG:O	21:U:75:VAL:HG23	2.17	0.45
24:X:123:ARG:NH2	24:X:337:LEU:O	2.50	0.45
31:a:163:MET:HA	31:a:166:LEU:HD12	1.99	0.45
1:A:1569:G:OP2	1:A:1572:A:O2'	2.35	0.44
22:V:190:LEU:HD11	22:V:208:LEU:HD11	2.00	0.44
1:A:1103:A:N7	1:A:1574:G:O2'	2.38	0.44
9:I:97:ILE:HD11	9:I:161:ALA:HB1	1.99	0.44
1:A:1429:C:OP1	7:G:388:ARG:NH2	2.45	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
18:R:167:HIS:HB3	18:R:193:ILE:HD13	2.00	0.44
20:T:92:THR:O	20:T:92:THR:HG22	2.18	0.44
25:Y:258:ILE:HD11	30:4:317:LEU:HD22	2.00	0.44
30:4:615:MET:HE1	30:4:649:VAL:HG22	1.98	0.44
31:a:132:ASP:O	31:a:133:PHE:HB2	2.18	0.44
1:A:700:A:N1	1:A:709:G:O2'	2.39	0.44
1:A:955:A:O4'	1:A:1042:U:H1'	2.17	0.44
1:A:1174:U:O2'	4:D:231:MET:O	2.32	0.44
2:B:180:ARG:NH1	4:D:211:CYS:SG	2.89	0.44
3:C:106:ASP:O	41:C:201:HOH:O	2.21	0.44
5:E:54:HIS:O	5:E:55:SER:OG	2.33	0.44
24:X:153:LEU:HD21	24:X:244:LEU:HD22	1.99	0.44
5:E:65:LEU:HD21	16:P:75:LYS:HD3	2.00	0.44
1:A:1085:C:OP1	9:I:192:ARG:NE	2.51	0.44
16:P:88:THR:OG1	17:Q:33:ASP:OD2	2.24	0.44
1:A:738:A:H2'	1:A:740:G:C5	2.53	0.44
12:L:115:ILE:HG21	12:L:181:ILE:HD13	2.00	0.43
24:X:272:THR:OG1	24:X:282:ILE:O	2.34	0.43
25:Y:332:ILE:HD13	28:1:221:TYR:CD1	2.53	0.43
1:A:992:U:O2'	1:A:994:A:OP2	2.33	0.43
1:A:1003:A:O2'	9:I:96:GLN:OE1	2.35	0.43
22:V:141:ASN:ND2	22:V:172:ALA:O	2.42	0.43
6:F:147:GLN:NE2	6:F:151:ASN:OD1	2.50	0.43
21:U:34:LEU:HD23	21:U:39:ILE:HD13	2.01	0.43
23:W:114:ILE:HG21	23:W:142:LEU:HD11	2.00	0.43
31:a:142:THR:HG22	31:a:143:THR:N	2.33	0.43
1:A:706:C:OP1	27:0:43:ARG:NE	2.42	0.43
20:T:32:VAL:HG22	20:T:76:LEU:HD22	2.01	0.43
14:N:88:VAL:O	14:N:88:VAL:HG13	2.19	0.43
24:X:130:LYS:NZ	24:X:313:THR:OG1	2.47	0.43
24:X:268:LEU:HD21	24:X:293:LEU:HD23	2.00	0.43
16:P:141:ARG:O	16:P:142:GLU:C	2.61	0.43
3:C:132:TYR:O	3:C:136:VAL:HG23	2.19	0.43
8:H:59:THR:O	8:H:59:THR:HG23	2.19	0.43
22:V:74:ARG:O	22:V:78:ASN:ND2	2.49	0.43
31:a:120:LEU:HD22	31:a:152:MET:HG3	2.01	0.43
7:G:315:PHE:CD2	7:G:369:LEU:HD21	2.54	0.43
8:H:92:GLU:OE1	8:H:141:ARG:NH1	2.43	0.42
30:4:200:ASP:OD1	30:4:200:ASP:N	2.52	0.42
24:X:50:ARG:NH2	24:X:96:GLU:OE2	2.43	0.42
32:b:96:THR:HG21	32:b:169:ASP:O	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:E:40:GLU:OE1	21:U:187:TYR:OH	2.29	0.42
20:T:132:ARG:NH1	20:T:136:LEU:O	2.52	0.42
6:F:109:SER:OG	6:F:113:GLN:NE2	2.53	0.42
18:R:302:GLN:O	18:R:306:VAL:HG23	2.20	0.42
24:X:108:LEU:HD23	24:X:141:VAL:HG21	2.02	0.42
24:X:380:LEU:HD23	24:X:394:HIS:CD2	2.54	0.42
8:H:155:VAL:HG21	28:1:129:PHE:CB	2.50	0.42
11:K:58:ARG:NE	11:K:72:ASP:OD1	2.39	0.42
11:K:79:PRO:O	11:K:82:SER:OG	2.27	0.42
18:R:70:PHE:O	18:R:76:GLN:NE2	2.51	0.42
1:A:899:G:O2'	1:A:907:A:N1	2.46	0.42
1:A:1004:G:O2'	9:I:98:GLN:NE2	2.52	0.42
28:1:56:ARG:NH1	30:4:91:ASP:OD2	2.47	0.42
32:b:208:ALA:O	32:b:212:ASN:ND2	2.53	0.42
13:M:92:GLY:O	41:M:202:HOH:O	2.22	0.42
1:A:1294:A:OP1	2:B:201:ASN:ND2	2.53	0.42
16:P:73:ASP:OD1	16:P:74:TYR:N	2.53	0.42
32:b:169:ASP:OD1	32:b:170:LEU:N	2.53	0.42
1:A:1053:A:N1	1:A:1100:C:O2'	2.50	0.42
24:X:50:ARG:NE	24:X:362:GLU:OE1	2.51	0.42
32:b:333:LEU:HD22	32:b:404:ALA:CB	2.50	0.42
4:D:203:LEU:HD22	7:G:56:ILE:HD11	2.02	0.41
25:Y:250:ILE:O	30:4:358:ARG:NE	2.51	0.41
27:0:110:ASP:OD1	27:0:110:ASP:N	2.52	0.41
1:A:1478:A:N1	1:A:1565:A:O2'	2.52	0.41
2:B:172:ARG:O	2:B:175:MET:HG2	2.19	0.41
8:H:184:ILE:O	8:H:184:ILE:HG22	2.20	0.41
30:4:166:VAL:HG23	30:4:167:LYS:N	2.36	0.41
30:4:331:ASN:OD1	30:4:334:THR:OG1	2.37	0.41
4:D:103:LEU:HD11	4:D:123:ARG:HB2	2.03	0.41
5:E:94:VAL:HG11	16:P:117:MET:HE1	2.01	0.41
7:G:378:GLU:OE1	7:G:381:LYS:NZ	2.53	0.41
31:a:108:LEU:HD23	31:a:117:LEU:HD21	2.02	0.41
32:b:100:GLY:N	40:b:501:SAH:O	2.47	0.41
15:O:214:SER:OG	22:V:319:ILE:HG23	2.20	0.41
24:X:381:LEU:O	24:X:385:ASN:N	2.51	0.41
5:E:26:ILE:HG23	5:E:36:VAL:HG21	2.03	0.41
8:H:123:SER:O	41:H:301:HOH:O	2.22	0.41
22:V:236:LEU:HD21	22:V:323:GLU:HB3	2.02	0.41
32:b:274:LEU:HG	32:b:274:LEU:O	2.20	0.41
1:A:1449:G:O6	41:A:1810:HOH:O	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
30:4:305:ILE:HG22	30:4:306:ASN:N	2.35	0.41
1:A:683:G:OP1	20:T:160:ARG:NH1	2.53	0.41
1:A:715:G:O2'	1:A:816:A:O2'	2.35	0.41
1:A:843:G:N1	1:A:846:A:OP2	2.50	0.41
1:A:1081:U:H5'	1:A:1082:A:O5'	2.21	0.41
6:F:162[A]:LEU:HD13	6:F:167[A]:PHE:CE1	2.56	0.41
22:V:30:LEU:HD12	22:V:149:ASP:HB2	2.03	0.41
31:a:60:SER:N	31:a:61:PRO:CD	2.84	0.41
32:b:120:ARG:NH2	32:b:293:ASN:O	2.53	0.41
32:b:229:GLU:OE2	32:b:231:HIS:N	2.52	0.41
13:M:94:ALA:HB2	18:R:158:PHE:CD1	2.56	0.41
17:Q:75:LEU:HD21	23:W:160:THR:HG21	2.02	0.41
25:Y:332:ILE:HD13	28:1:221:TYR:CE1	2.56	0.41
17:Q:78:LYS:HG3	31:a:68:THR:HG21	2.03	0.40
32:b:333:LEU:HD22	32:b:404:ALA:HB3	2.03	0.40
1:A:931:C:C2	10:J:42:PRO:HD3	2.56	0.40
1:A:1029:U:H2'	1:A:1030:G:H5'	2.02	0.40
1:A:1322:C:H2'	1:A:1323:G:O4'	2.21	0.40
7:G:115:GLY:N	8:H:84:ASP:OD2	2.52	0.40
8:H:128:LYS:O	8:H:131:ARG:NE	2.47	0.40
14:N:14:VAL:HG23	20:T:29:VAL:HG11	2.04	0.40
18:R:219:TYR:O	18:R:256:ARG:NH1	2.54	0.40
22:V:163:VAL:O	22:V:167:VAL:HG23	2.21	0.40
27:0:93:CYS:HA	27:0:119:THR:O	2.22	0.40
9:I:179:THR:HG21	17:Q:39:ILE:HD13	2.03	0.40

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	
2	B	223/296 (75%)	222 (100%)	1 (0%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	C	130/167 (78%)	128 (98%)	2 (2%)	0	100	100
4	D	341/430 (79%)	334 (98%)	7 (2%)	0	100	100
5	E	116/125 (93%)	116 (100%)	0	0	100	100
6	F	218/242 (90%)	213 (98%)	5 (2%)	0	100	100
7	G	323/396 (82%)	318 (98%)	5 (2%)	0	100	100
8	H	138/201 (69%)	136 (99%)	1 (1%)	1 (1%)	19	51
9	I	134/194 (69%)	132 (98%)	2 (2%)	0	100	100
10	J	106/138 (77%)	104 (98%)	2 (2%)	0	100	100
11	K	99/128 (77%)	98 (99%)	1 (1%)	0	100	100
12	L	172/257 (67%)	172 (100%)	0	0	100	100
13	M	117/137 (85%)	117 (100%)	0	0	100	100
14	N	108/130 (83%)	108 (100%)	0	0	100	100
15	O	191/258 (74%)	189 (99%)	2 (1%)	0	100	100
16	P	95/142 (67%)	94 (99%)	1 (1%)	0	100	100
17	Q	84/86 (98%)	84 (100%)	0	0	100	100
18	R	293/360 (81%)	286 (98%)	7 (2%)	0	100	100
19	S	133/190 (70%)	132 (99%)	1 (1%)	0	100	100
20	T	166/173 (96%)	164 (99%)	2 (1%)	0	100	100
21	U	174/205 (85%)	174 (100%)	0	0	100	100
22	V	358/414 (86%)	353 (99%)	5 (1%)	0	100	100
23	W	98/187 (52%)	97 (99%)	1 (1%)	0	100	100
24	X	350/398 (88%)	346 (99%)	4 (1%)	0	100	100
25	Y	147/395 (37%)	146 (99%)	1 (1%)	0	100	100
26	Z	98/106 (92%)	97 (99%)	1 (1%)	0	100	100
27	0	213/218 (98%)	212 (100%)	1 (0%)	0	100	100
28	1	276/323 (85%)	272 (99%)	4 (1%)	0	100	100
29	3	69/199 (35%)	69 (100%)	0	0	100	100
30	4	586/689 (85%)	580 (99%)	6 (1%)	0	100	100
31	a	203/343 (59%)	196 (97%)	6 (3%)	1 (0%)	25	58
32	b	303/407 (74%)	295 (97%)	8 (3%)	0	100	100
All	All	6062/7934 (76%)	5984 (99%)	76 (1%)	2 (0%)	100	100

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
8	H	126	ILE
31	a	185	LYS

5.3.2   Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	B	198/249 (80%)	198 (100%)	0	100	100
3	C	115/143 (80%)	115 (100%)	0	100	100
4	D	286/357 (80%)	285 (100%)	1 (0%)	91	95
5	E	100/107 (94%)	100 (100%)	0	100	100
6	F	195/209 (93%)	195 (100%)	0	100	100
7	G	285/342 (83%)	284 (100%)	1 (0%)	89	94
8	H	130/180 (72%)	130 (100%)	0	100	100
9	I	104/146 (71%)	104 (100%)	0	100	100
10	J	93/118 (79%)	93 (100%)	0	100	100
11	K	91/113 (80%)	91 (100%)	0	100	100
12	L	158/226 (70%)	158 (100%)	0	100	100
13	M	97/113 (86%)	97 (100%)	0	100	100
14	N	96/115 (84%)	96 (100%)	0	100	100
15	O	174/230 (76%)	174 (100%)	0	100	100
16	P	88/123 (72%)	88 (100%)	0	100	100
17	Q	78/78 (100%)	78 (100%)	0	100	100
18	R	264/318 (83%)	264 (100%)	0	100	100
19	S	116/164 (71%)	116 (100%)	0	100	100
20	T	153/157 (98%)	153 (100%)	0	100	100
21	U	152/174 (87%)	152 (100%)	0	100	100
22	V	325/364 (89%)	324 (100%)	1 (0%)	91	95

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
23	W	87/158 (55%)	87 (100%)	0	100	100
24	X	311/351 (89%)	311 (100%)	0	100	100
25	Y	137/357 (38%)	137 (100%)	0	100	100
26	Z	90/95 (95%)	90 (100%)	0	100	100
27	0	188/190 (99%)	188 (100%)	0	100	100
28	1	256/291 (88%)	256 (100%)	0	100	100
29	3	65/166 (39%)	65 (100%)	0	100	100
30	4	527/609 (86%)	527 (100%)	0	100	100
31	a	186/288 (65%)	186 (100%)	0	100	100
32	b	257/350 (73%)	257 (100%)	0	100	100
All	All	5402/6881 (78%)	5399 (100%)	3 (0%)	92	97

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	D	276	VAL
7	G	389	ARG
22	V	36	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (39) such sidechains are listed below:

Mol	Chain	Res	Type
3	C	116	GLN
3	C	154	HIS
4	D	415	GLN
6	F	113	GLN
6	F	146	HIS
6	F	214	HIS
7	G	77	GLN
7	G	308	GLN
8	H	109	HIS
8	H	125	HIS
9	I	87	HIS
9	I	98	GLN
10	J	105	HIS
10	J	134	HIS
12	L	162	GLN

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Mol	Chain	Res	Type
14	N	9	HIS
20	T	14	GLN
22	V	134	GLN
22	V	145	ASN
22	V	245	HIS
23	W	121	HIS
24	X	69	ASN
24	X	143	HIS
24	X	164	ASN
24	X	302	HIS
25	Y	285	GLN
26	Z	82	GLN
27	0	32	GLN
27	0	192	ASN
28	1	146	HIS
28	1	185	HIS
28	1	231	HIS
30	4	295	ASN
30	4	322	HIS
30	4	346	HIS
31	a	90	HIS
31	a	162	HIS
31	a	183	GLN
32	b	212	ASN

5.3.3 RNA (i)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	A	950/955 (99%)	110 (11%)	0

All (110) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	A	649	A
1	A	651	A
1	A	680	U
1	A	688	A
1	A	704	U
1	A	718	A
1	A	721	U
1	A	737	C

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Mol	Chain	Res	Type
1	A	738	A
1	A	739	C
1	A	740	G
1	A	753	A
1	A	761	A
1	A	766	G
1	A	777	G
1	A	791	G
1	A	796	G
1	A	830	U
1	A	832	U
1	A	835	C
1	A	860	A
1	A	868	C
1	A	871	A
1	A	890	C
1	A	892	A
1	A	893	G
1	A	919	A
1	A	931	C
1	A	933	G
1	A	938	A
1	A	939	A
1	A	942	A
1	A	954	C
1	A	956	C
1	A	958	C
1	A	960	C
1	A	962	C
1	A	967	A
1	A	993	A
1	A	1001	C
1	A	1002	C
1	A	1011	C
1	A	1015	A
1	A	1019	A
1	A	1020	C
1	A	1042	U
1	A	1065	C
1	A	1082	A
1	A	1103	A
1	A	1105	C

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Mol	Chain	Res	Type
1	A	1106	C
1	A	1107	U
1	A	1116	A
1	A	1118	A
1	A	1119	U
1	A	1120	C
1	A	1121	A
1	A	1151	C
1	A	1167	A
1	A	1187	U
1	A	1188	A
1	A	1189	U
1	A	1190	C
1	A	1223	C
1	A	1225	C
1	A	1229	U
1	A	1247	G
1	A	1248	C
1	A	1251	A
1	A	1261	C
1	A	1271	C
1	A	1273	G
1	A	1284	U
1	A	1285	G
1	A	1290	C
1	A	1291	U
1	A	1293	C
1	A	1326	A
1	A	1327	G
1	A	1343	A
1	A	1356	A
1	A	1357	A
1	A	1367	A
1	A	1376	C
1	A	1378	C
1	A	1390	A
1	A	1405	C
1	A	1421	G
1	A	1422	G
1	A	1430	A
1	A	1447	G
1	A	1462	G

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Mol	Chain	Res	Type
1	A	1481	C
1	A	1519	A
1	A	1520	U
1	A	1522	U
1	A	1525	C
1	A	1526	U
1	A	1527	A
1	A	1533	C
1	A	1537	C
1	A	1539	C
1	A	1562	G
1	A	1568	U
1	A	1571	U
1	A	1582	G
1	A	1584	MA6
1	A	1594	G
1	A	1595	G
1	A	1598	G

There are no RNA pucker outliers to report.

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

7 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	$\#\|Z\| > 2$
1	B8T	A	1486	1	19,22,23	0.31	0	26,31,34	0.33	0
1	MA6	A	1583	1	18,26,27	0.75	0	19,38,41	0.58	0
1	MA6	A	1584	1	18,26,27	0.76	0	19,38,41	0.61	0
1	5MU	A	1076	1	19,22,23	0.28	0	28,32,35	0.30	0
9	5F0	I	184	9	8,8,9	0.58	0	7,9,11	1.03	1 (14%)
1	5MC	A	1488	1	18,22,23	0.32	0	26,32,35	0.45	0
17	AYA	Q	2	17	6,7,8	0.75	0	5,8,10	0.67	0

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
1	B8T	A	1486	1	-	1/7/27/28	0/2/2/2
1	MA6	A	1583	1	-	0/7/29/30	0/3/3/3
1	MA6	A	1584	1	-	1/7/29/30	0/3/3/3
1	5MU	A	1076	1	-	0/7/25/26	0/2/2/2
9	5F0	I	184	9	-	0/9/9/10	-
1	5MC	A	1488	1	-	0/7/25/26	0/2/2/2
17	AYA	Q	2	17	-	0/4/6/8	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
9	I	184	5F0	O-C-CB	-2.32	118.66	125.43

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	1584	MA6	C4'-C5'-O5'-P
1	A	1486	B8T	O4'-C4'-C5'-O5'

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	1584	MA6	1	0

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 85 ligands modelled in this entry, 79 are monoatomic - leaving 6 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	#$|Z| > 2$
37	FES	P	201	16,5	0,4,4	-	-	-		
38	ATP	X	501	34	26,33,33	0.75	0	31,52,52	0.64	0
37	FES	T	201	13,20	0,4,4	-	-	-		
39	GDP	X	502	-	24,30,30	0.87	1 (4%)	30,47,47	0.62	0
33	NAD	A	1701	34	42,48,48	0.58	0	50,73,73	0.59	1 (2%)
40	SAH	b	501	-	24,28,28	0.69	0	25,40,40	0.78	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
37	FES	P	201	16,5	-	-	0/1/1/1
38	ATP	X	501	34	-	0/18/38/38	0/3/3/3
37	FES	T	201	13,20	-	-	0/1/1/1
39	GDP	X	502	-	-	1/12/32/32	0/3/3/3
33	NAD	A	1701	34	-	2/26/62/62	0/5/5/5
40	SAH	b	501	-	-	4/11/31/31	0/3/3/3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
39	X	502	GDP	C5-C6	-2.10	1.43	1.47

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
33	A	1701	NAD	C5A-C6A-N6A	2.32	123.88	120.35
40	b	501	SAH	C5-C6-N6	2.27	123.81	120.35

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
40	b	501	SAH	OXT-C-CA-N
40	b	501	SAH	OXT-C-CA-CB
40	b	501	SAH	O-C-CA-CB
40	b	501	SAH	O-C-CA-N
33	A	1701	NAD	PA-O3-PN-O1N
33	A	1701	NAD	PA-O3-PN-O2N
39	X	502	GDP	C5'-O5'-PA-O1A

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
40	b	501	SAH	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less 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 FES P 201

Bond lengths

Bond angles

Torsions

Rings

Ligand FES T 201

Bond lengths

Bond angles

Torsions

Rings

Ligand GDP X 502

Bond lengths

Bond angles

Torsions

Rings

Ligand NAD A 1701

Bond lengths

Bond angles

Torsions

Rings

Ligand SAH b 501

Bond lengths

Bond angles

Torsions

Rings
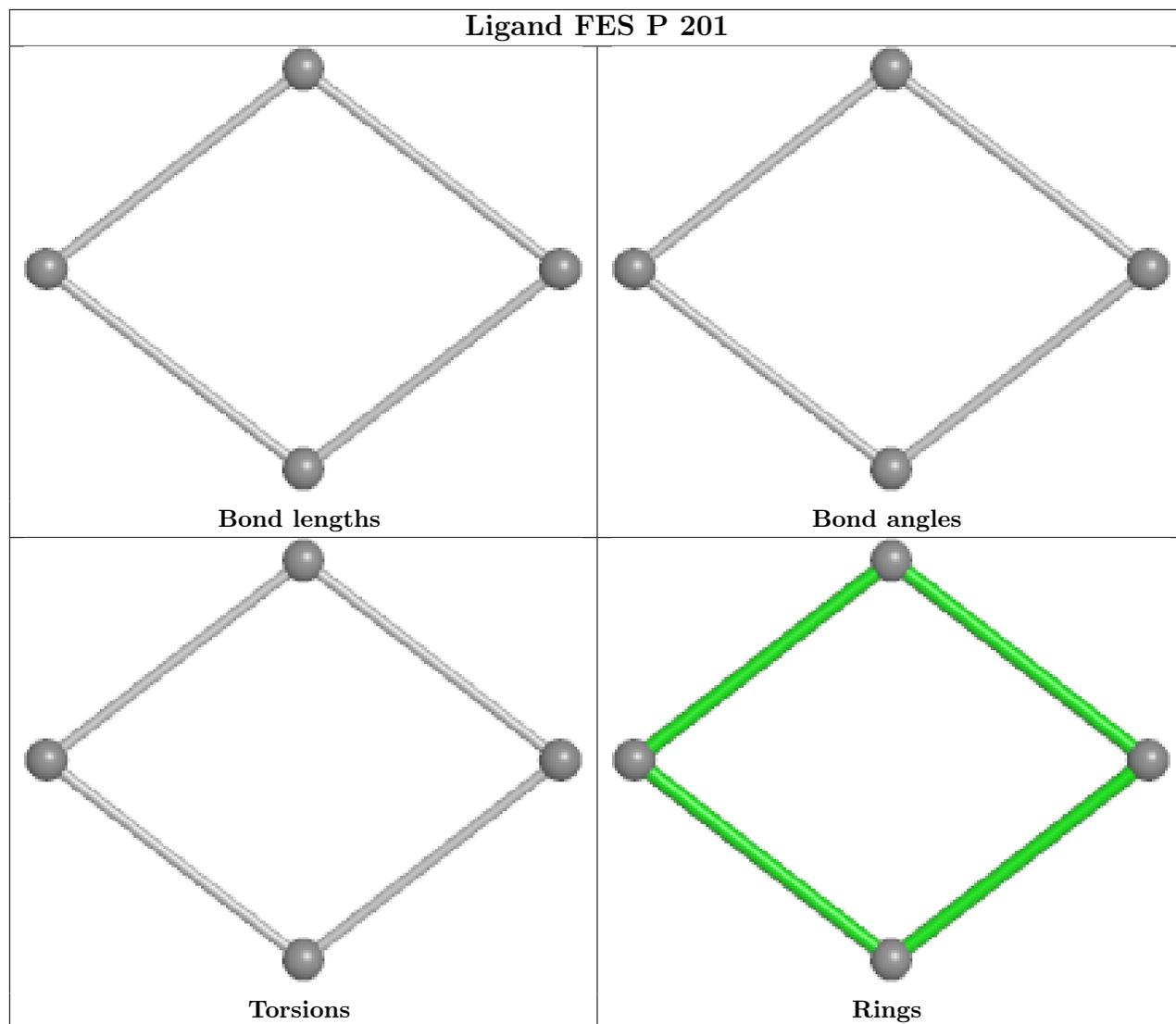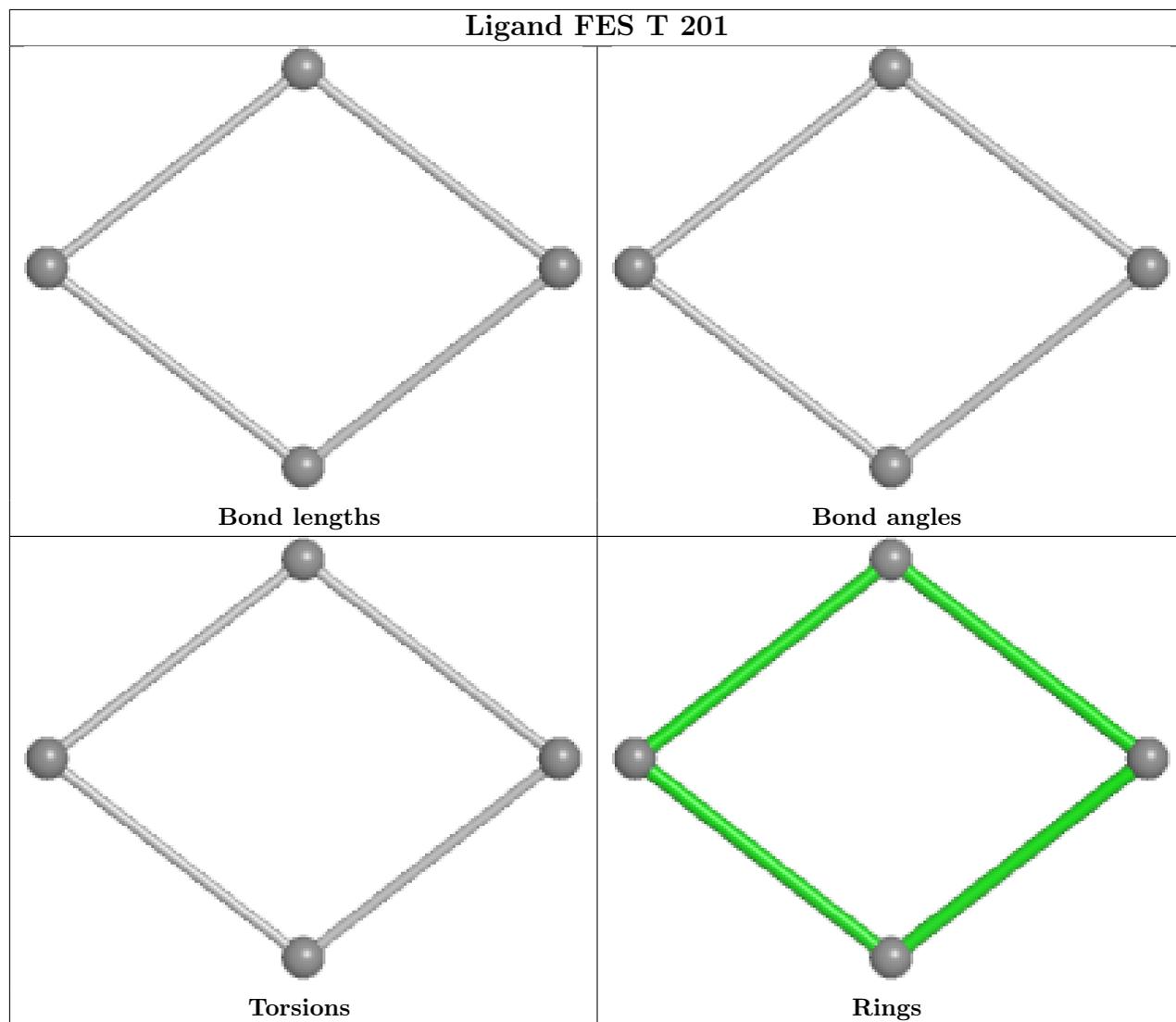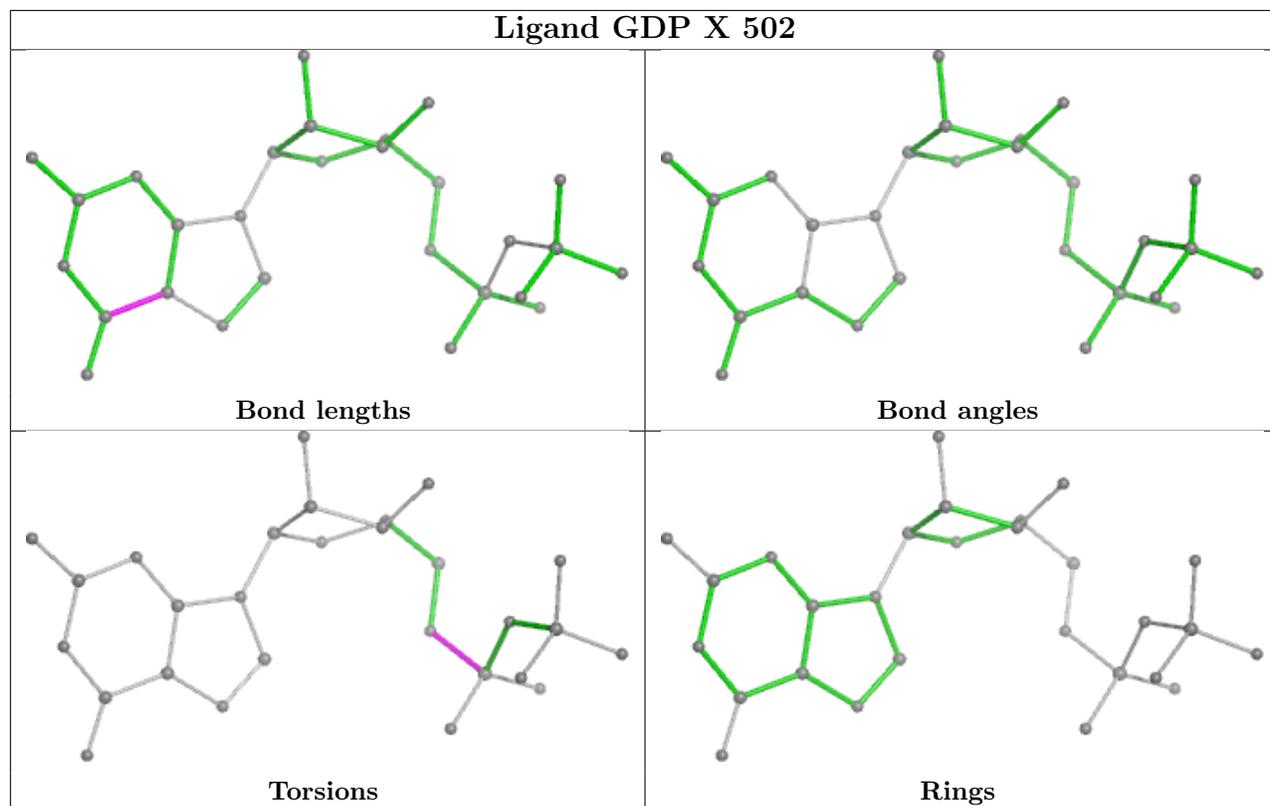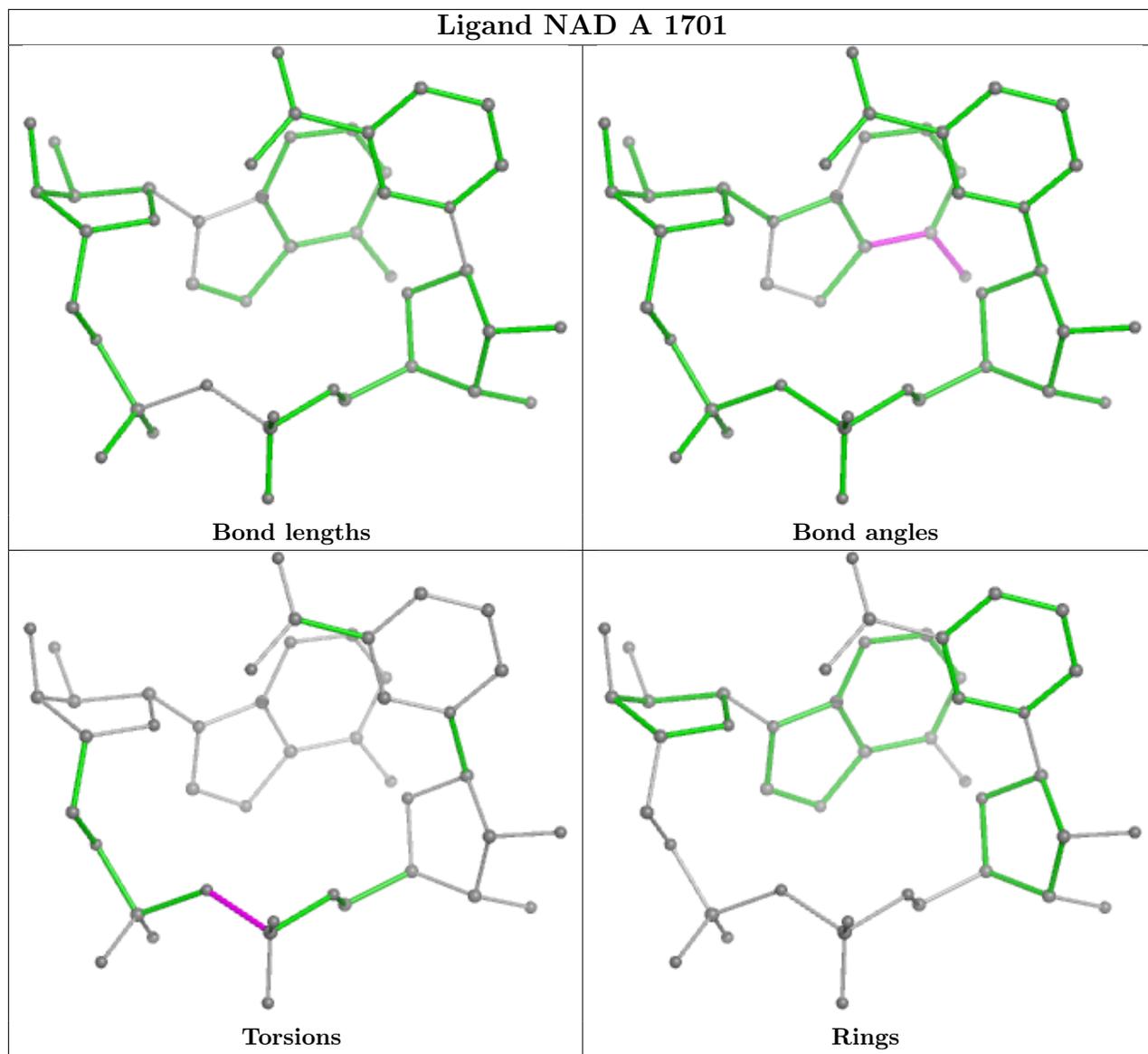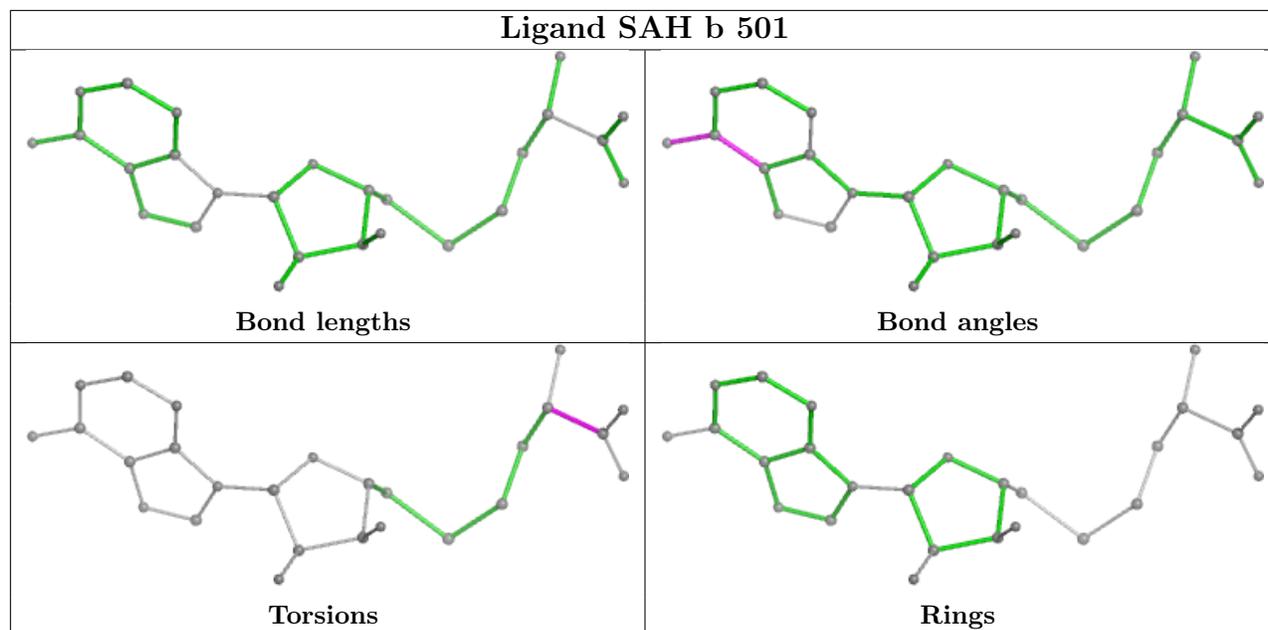
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Map visualisation ⓘ

This section contains visualisations of the EMDB entry EMD-13557. 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 ⓘ
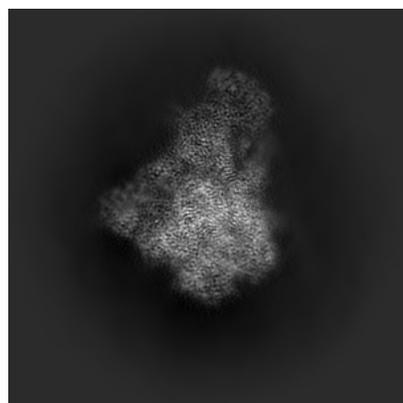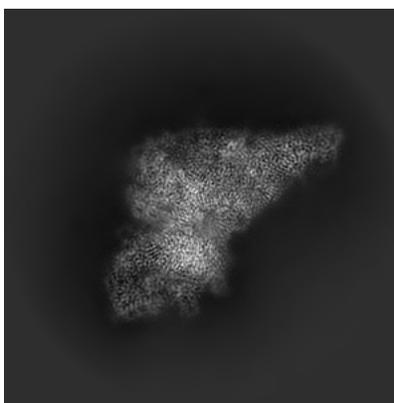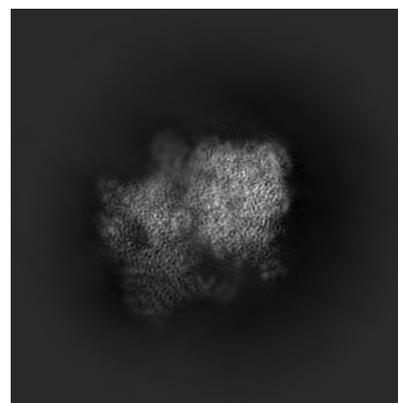
6.1.1 Primary map

X   Y   Z

6.1.2 Raw map

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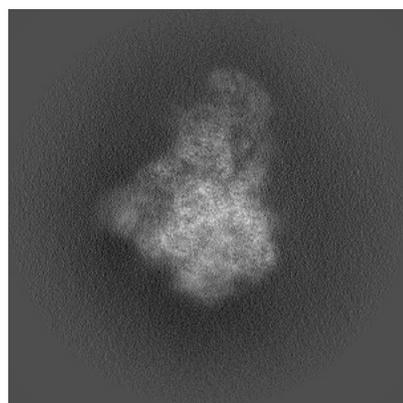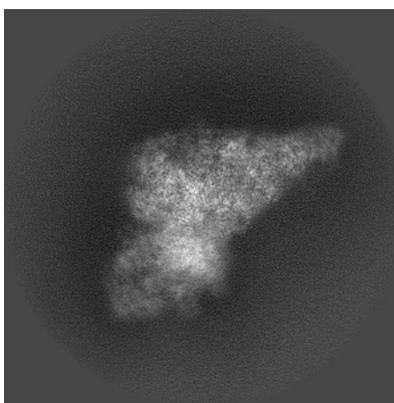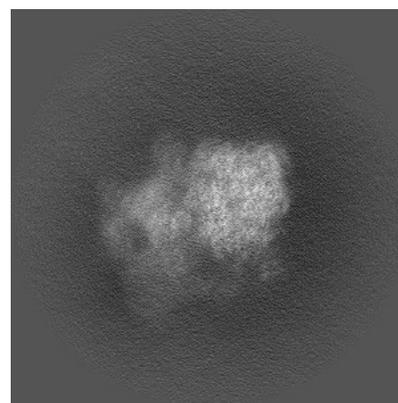
The images above show the map projected in three orthogonal directions.

6.2 Central slices ⓘ
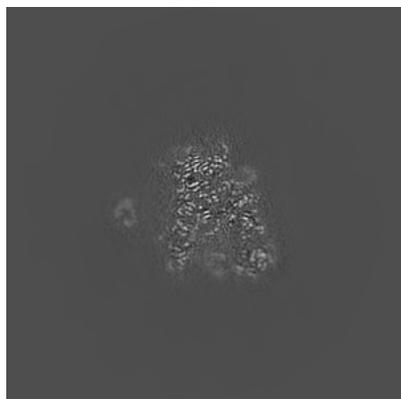
6.2.1 Primary map
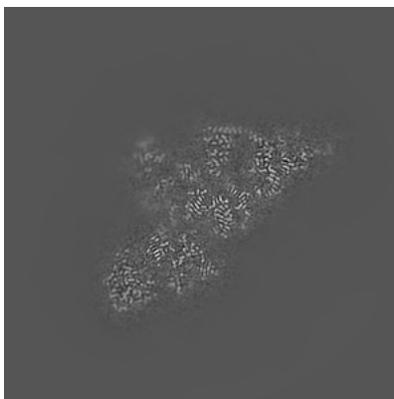
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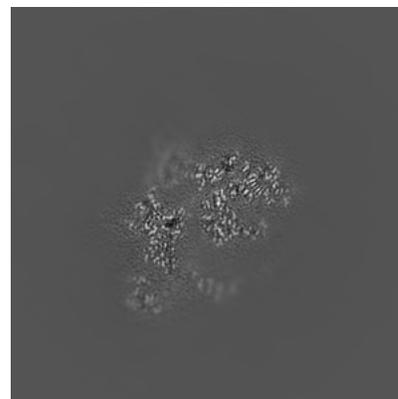
6.2.2 Raw map
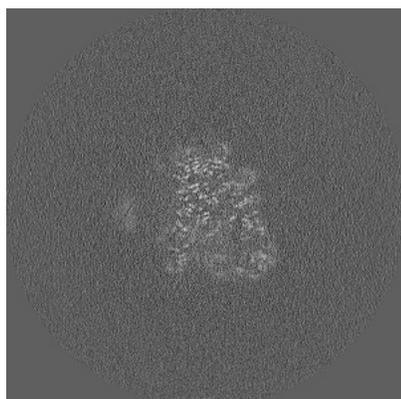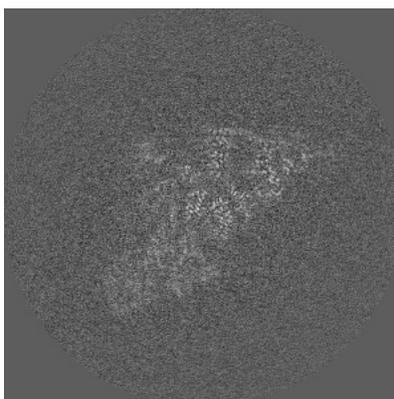
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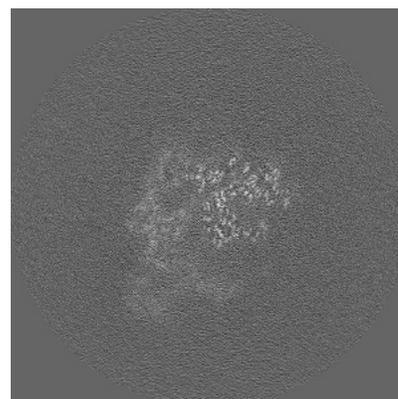
The images above show central slices of the map in three orthogonal directions.

6.3　Largest variance slices (i)

6.3.1　Primary map
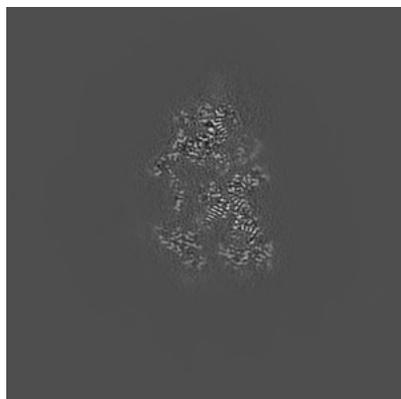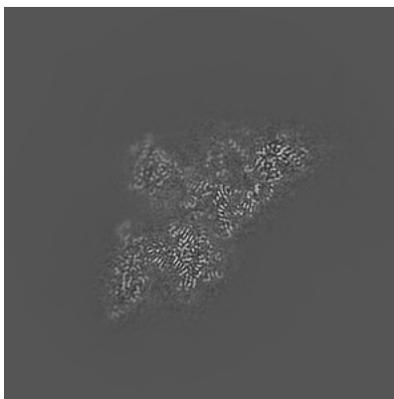
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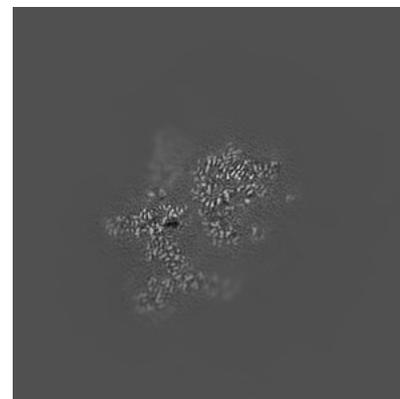
6.3.2　Raw map
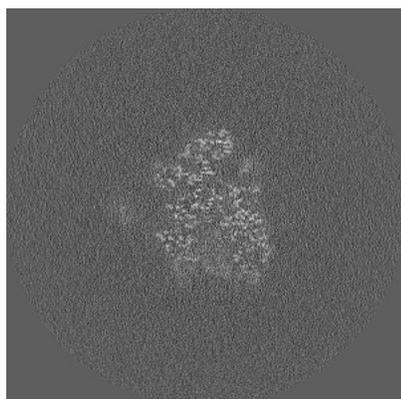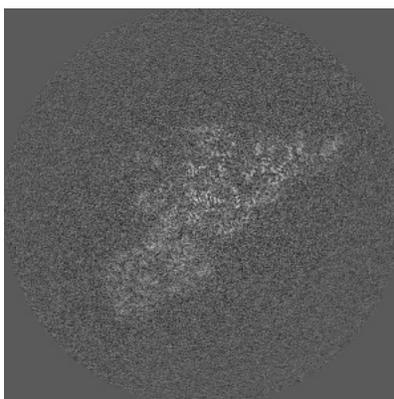
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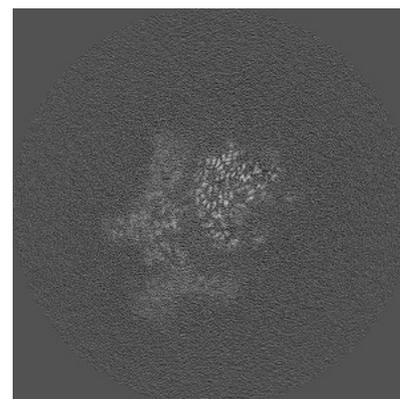
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map
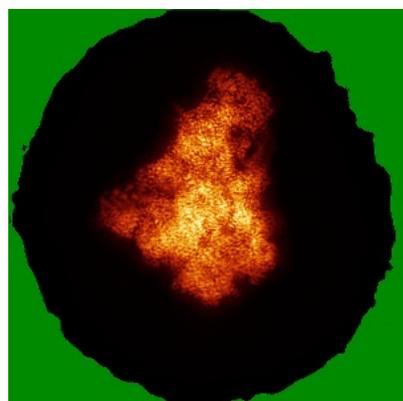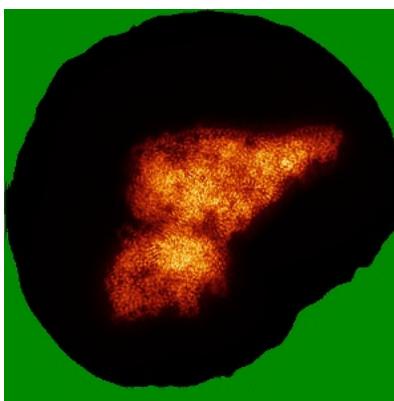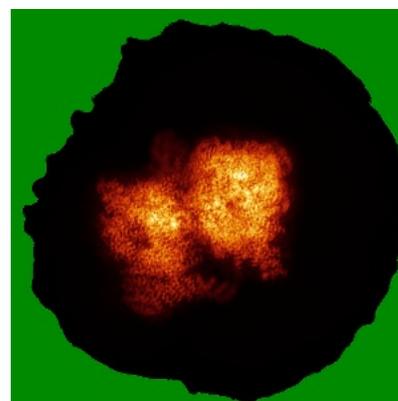
X   Y   Z

6.4.2 Raw map

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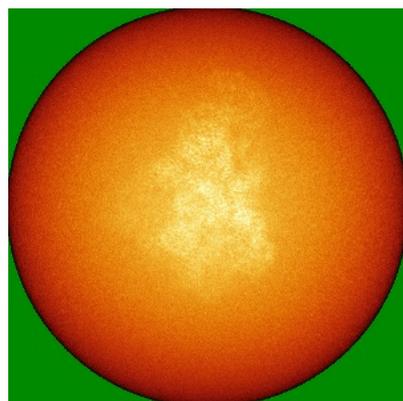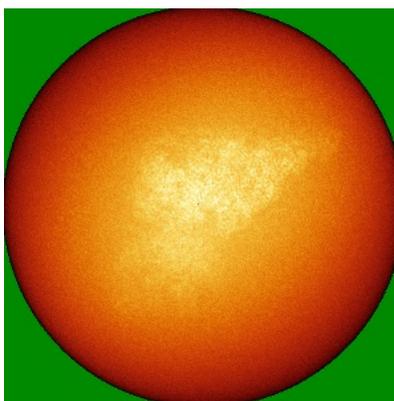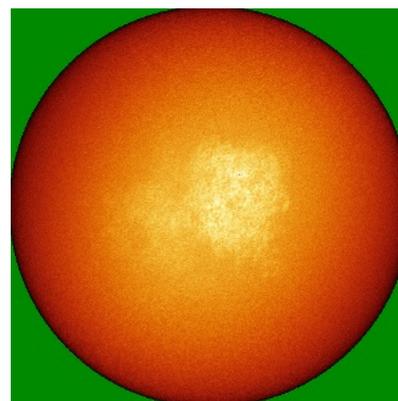
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views (i)

6.5.1 Primary map

| X | Y | Z |
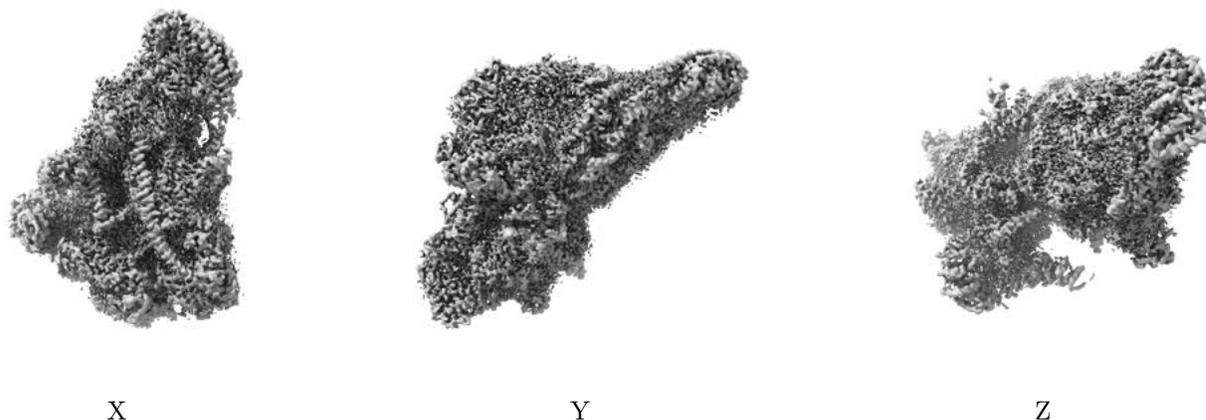
The images above show the 3D surface view of the map at the recommended contour level 0.11. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map

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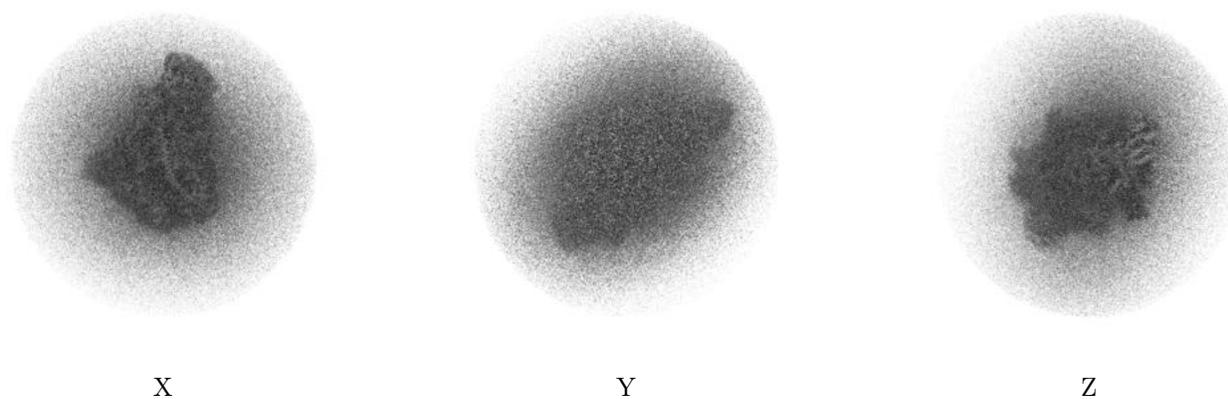
These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

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_13557_msk_1.map ⓘ
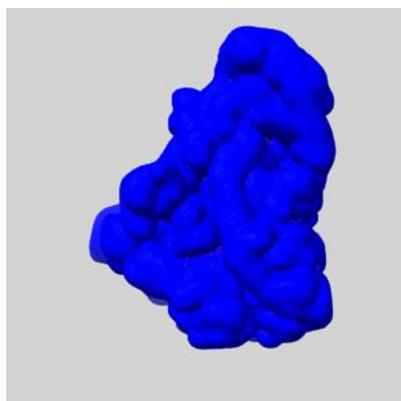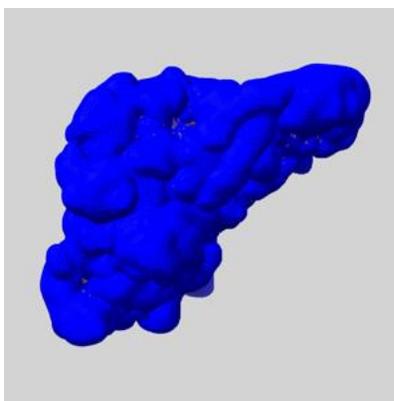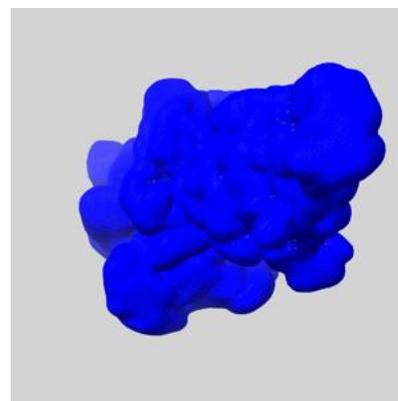
X　　　　　　　　　　　　Y　　　　　　　　　　　　Z

7 Map analysis (i)

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

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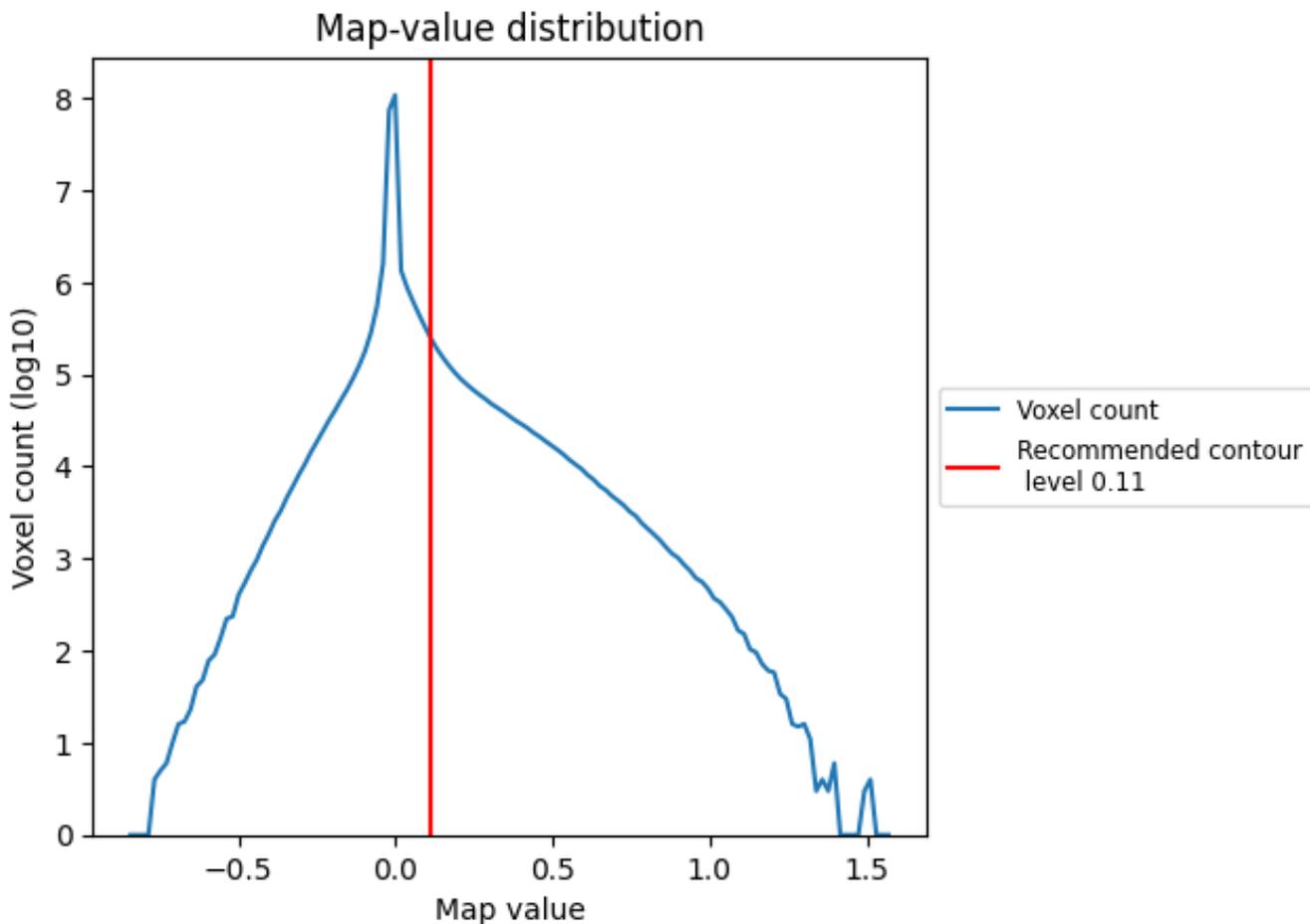
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2 Volume estimate ⓘ
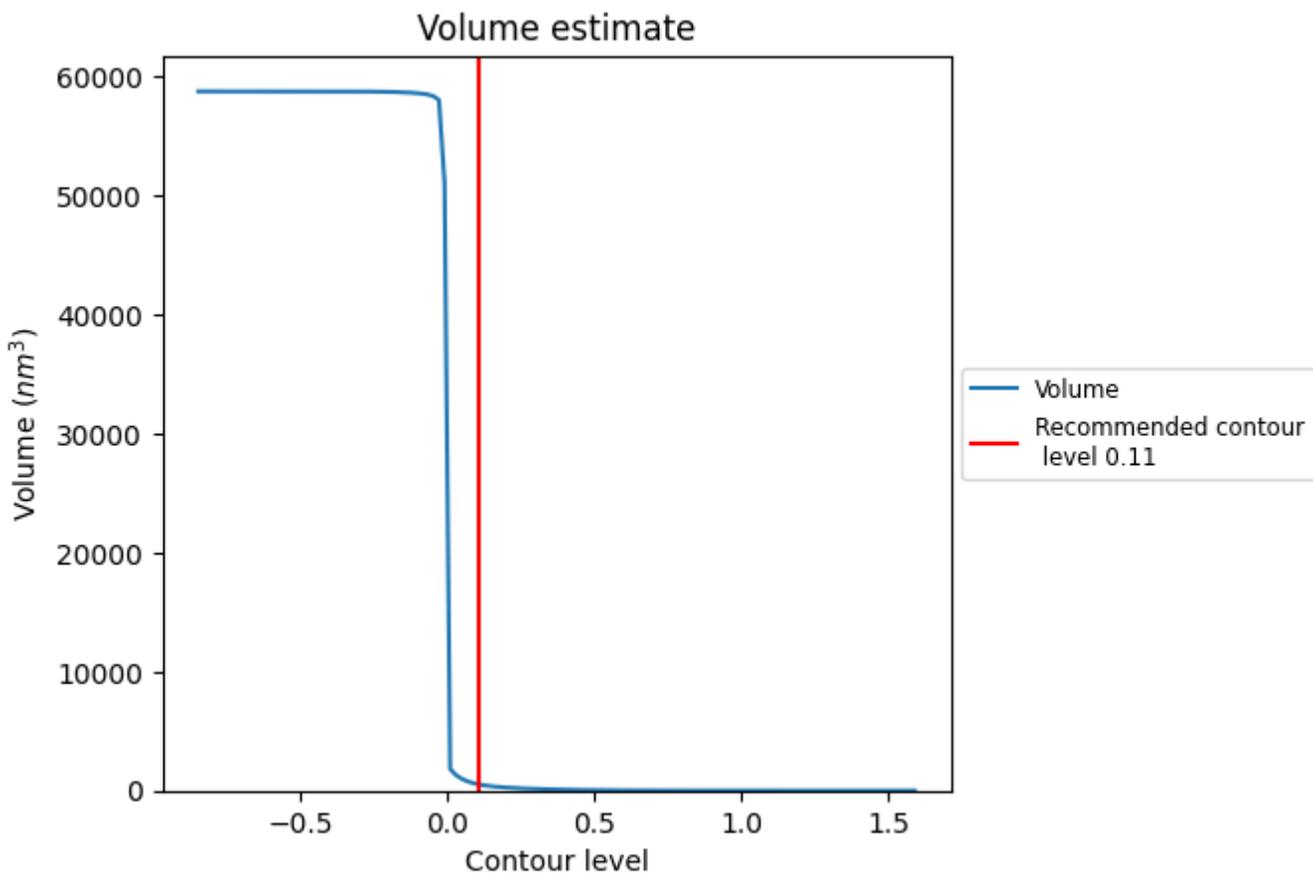
The volume at the recommended contour level is 515 nm^3; this corresponds to an approximate mass of 466 kDa.

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 ⓘ
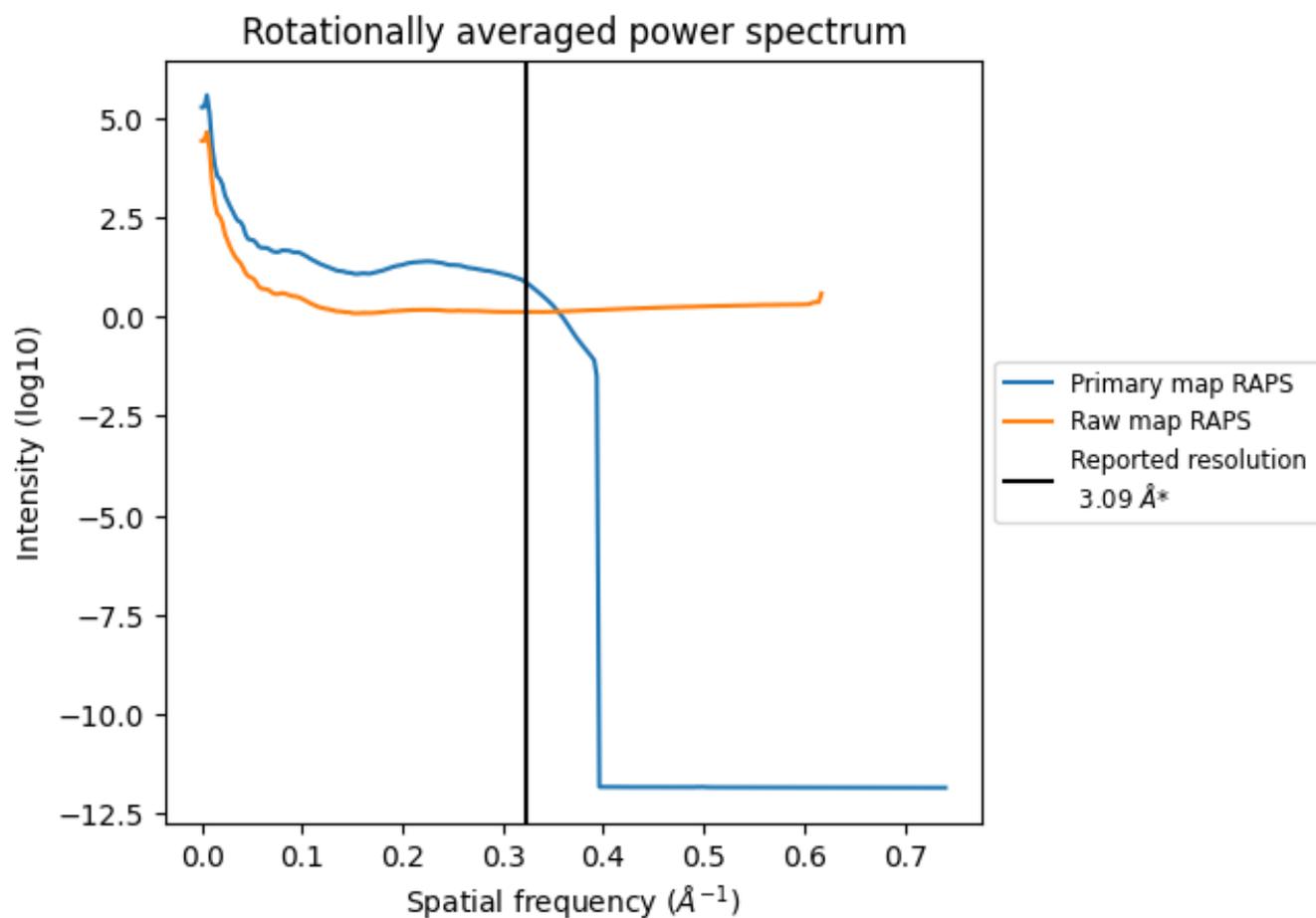
*Reported resolution corresponds to spatial frequency of 0.324 Å^{-1}

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 ⓘ
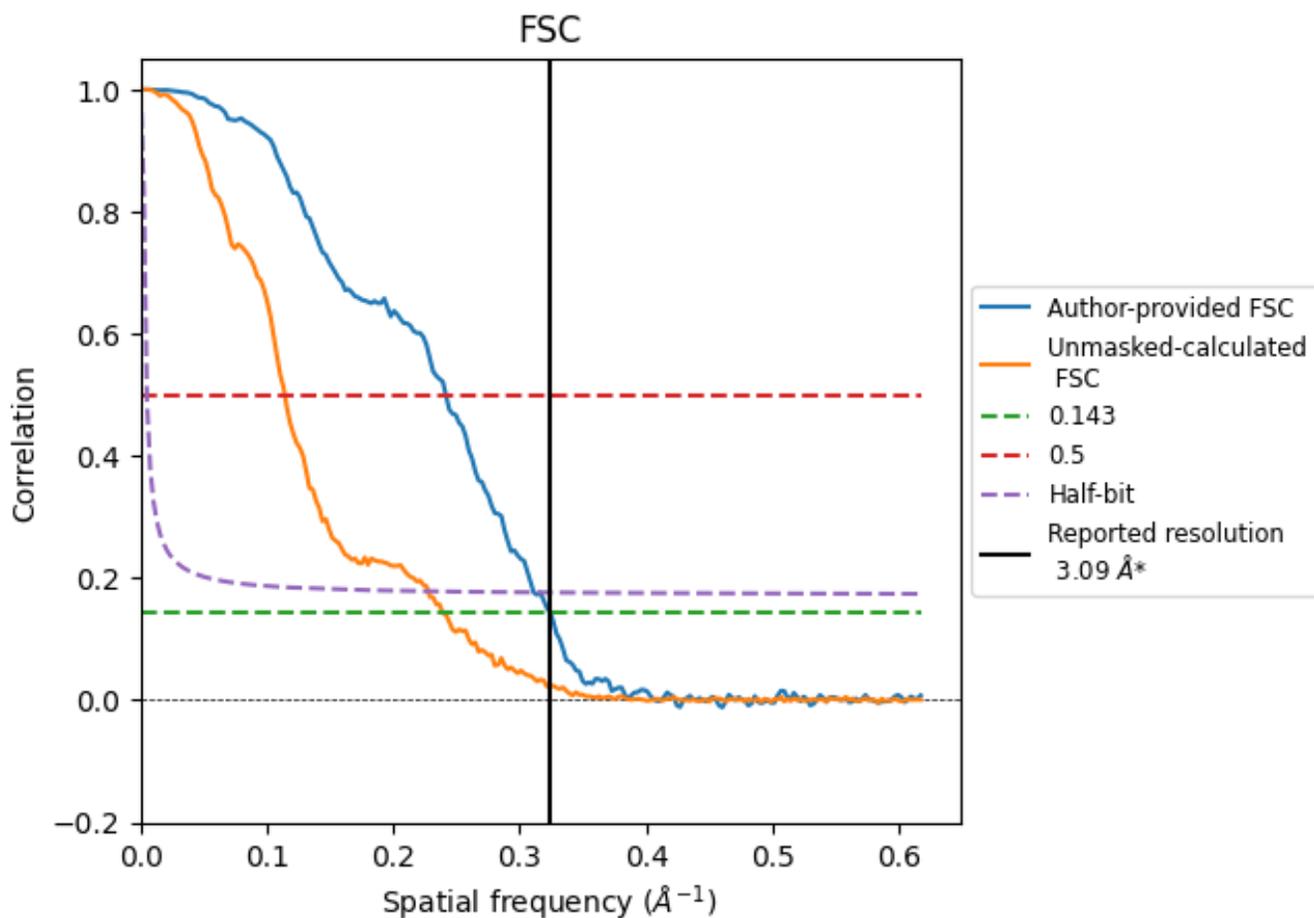
*Reported resolution corresponds to spatial frequency of 0.324 Å^{-1}

8.2 Resolution estimates ⓘ

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.09	-	-
Author-provided FSC curve	3.08	4.14	3.21
Unmasked-calculated*	4.18	8.76	4.39

*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 4.18 differs from the reported value 3.09 by more than 10 %

9   Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-13557 and PDB model 7PNZ. Per-residue inclusion information can be found in section 3 on page 15.

9.1   Map-model overlay ⓘ


X   Y   Z
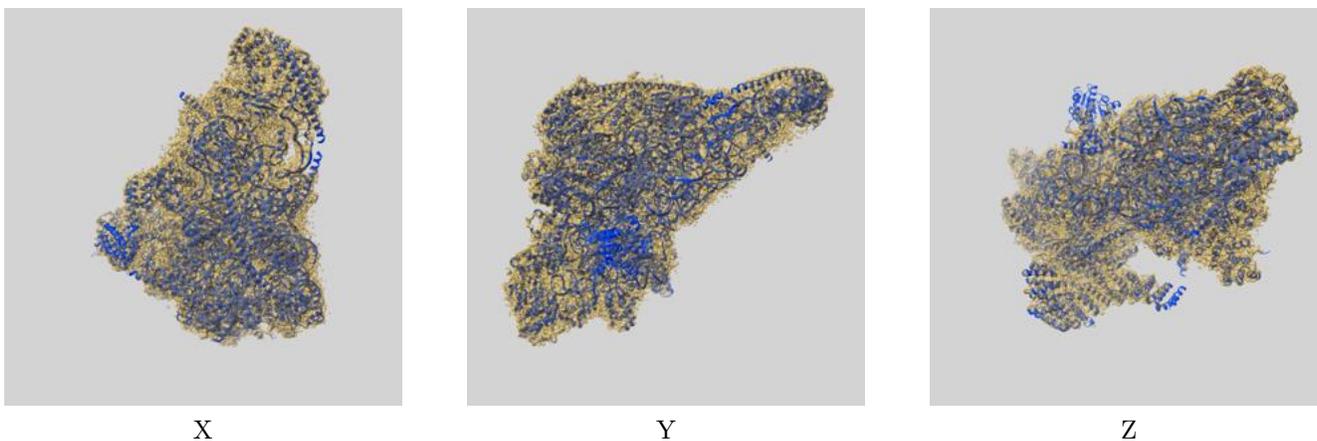
The images above show the 3D surface view of the map at the recommended contour level 0.11 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2   Q-score mapped to coordinate model ⓘ


X   Y   Z
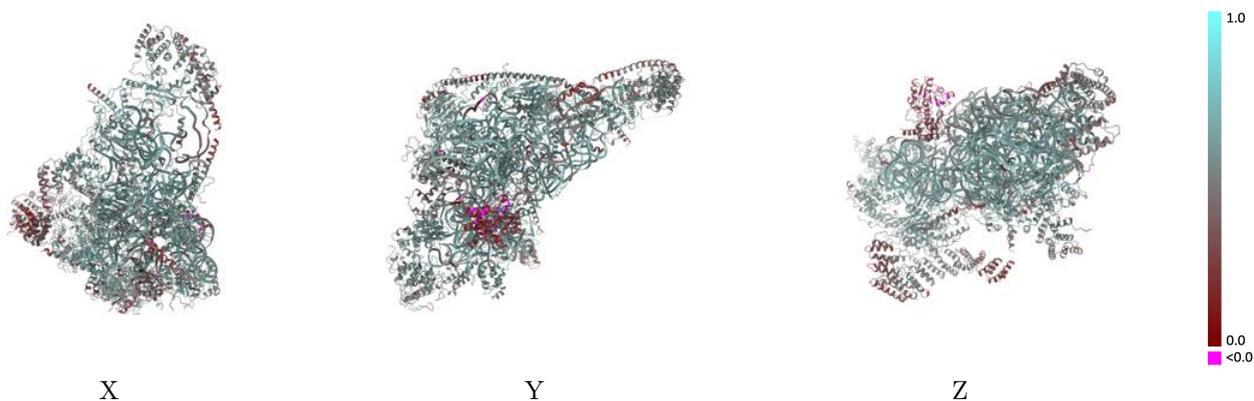
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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
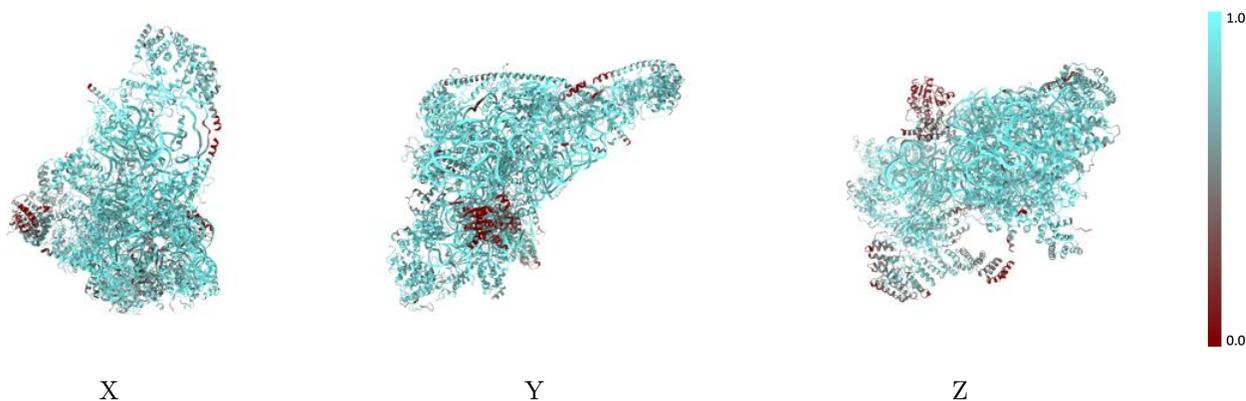
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.11).

9.4 Atom inclusion ⓘ
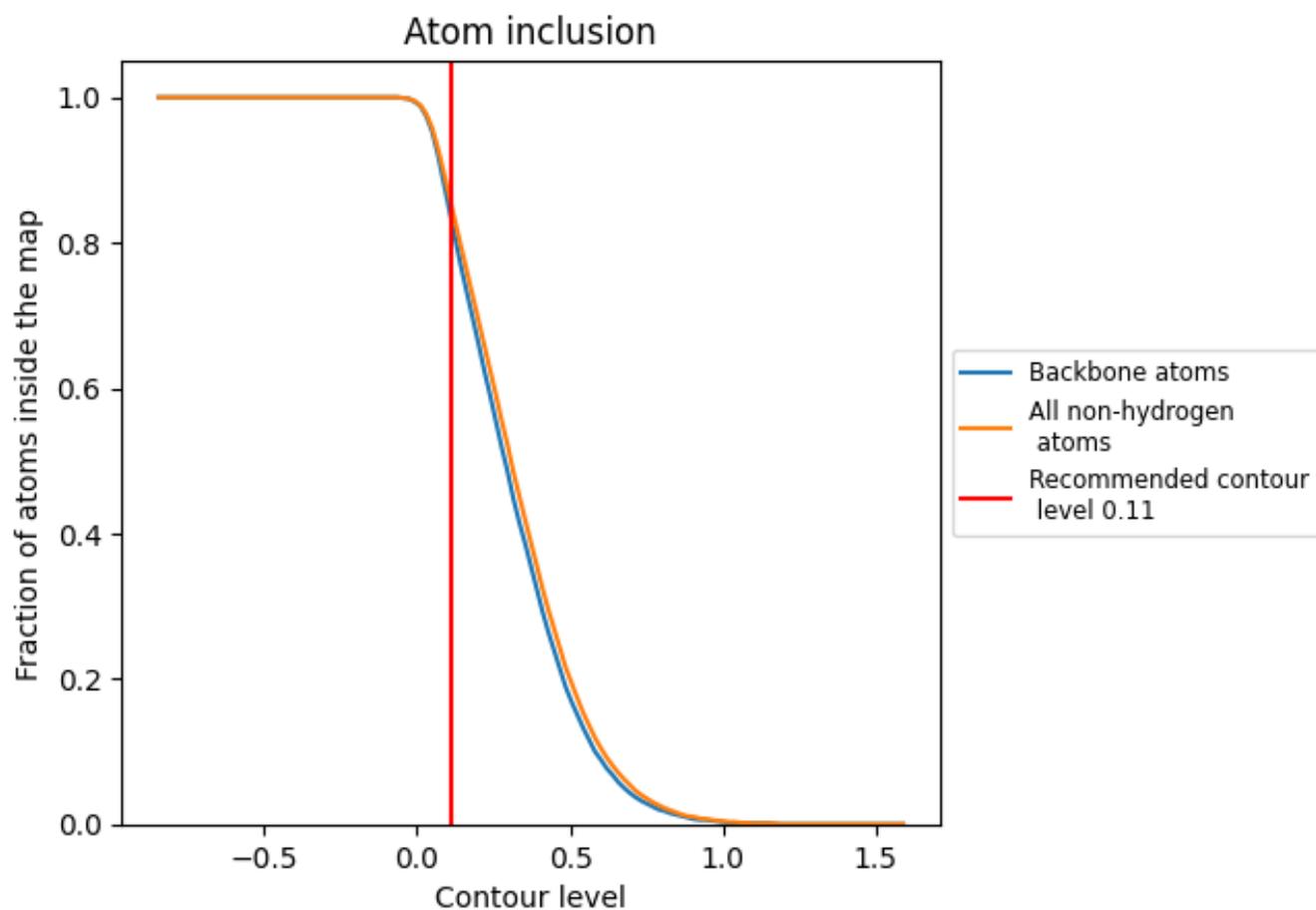
At the recommended contour level, 84% of all backbone atoms, 86% of all non-hydrogen atoms, are inside the map.

9.5　Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.11) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8550	0.5330
0	0.8940	0.5510
1	0.8200	0.5230
3	0.8980	0.5500
4	0.6220	0.4100
A	0.9640	0.5980
B	0.9220	0.5840
C	0.9720	0.6280
D	0.8830	0.5590
E	0.8560	0.5410
F	0.8160	0.5080
G	0.8230	0.5250
H	0.8940	0.5810
I	0.8600	0.5170
J	0.9330	0.5970
K	0.9520	0.6320
L	0.8500	0.5380
M	0.9220	0.6010
N	0.9290	0.6060
O	0.9180	0.5800
P	0.8950	0.5670
Q	0.9250	0.5750
R	0.8460	0.5270
S	0.8020	0.4980
T	0.9160	0.5810
U	0.7850	0.4900
V	0.7780	0.4770
W	0.8720	0.5470
X	0.8670	0.5420
Y	0.7140	0.4880
Z	0.8780	0.5550
a	0.5170	0.3160
b	0.2300	0.1970

1.0

0.0
<0.0