

wwPDB EM Validation Summary Report (i)

Jun 19, 2024 – 06:08 pm BST

PDB ID	:	8QSJ
EMDB ID	:	EMD-17720
Title	:	Human mitoribosomal large subunit assembly intermediate 2 with GTPBP7
Authors	:	Ritter, C.; Nguyen, T.G.; Kummer, E.
Deposited on	:	2023-10-10
Resolution	:	3.00 Å(reported)

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

We welcome your comments at *validation@mail.wwpdb.org* A user guide is available at https://www.wwpdb.org/validation/2017/EMValidationReportHelp with specific help available everywhere you see the (i) symbol.

The types of validation reports are described at http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references (1)) were used in the production of this report:

EMDB validation analysis	:	0.0.1.dev92
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	4.02b-467
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 3.00 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	$egin{array}{c} { m Whole \ archive} \ (\#{ m Entries}) \end{array}$	${f EM} {f structures} \ (\#{f Entries})$
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826
RNA backbone	4643	859

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

Mol	Chain	Length	Qua	lity of chain
1	0	188	• 57%	• 41%
2	1	65	83%	• 15%
3	2	92	50%	50%
4	3	188	• 51%	49%
5	4	103	36%	64%
6	5	423	·	92% • 7%
7	6	380	12%	92% • 7%
8	7	338	5% 86 ⁴	% · 13%



Mol	Chain	Length	Quality of chain	
9	8	206	37% 47% • 50%	
10	9	137	90%	• 9%
11	А	1603	72% 16%	12%
12	В	72	83%	17%
13	D	305	5% 	21%
14	Е	348	87%	• 12%
15	F	311	80%	19%
16	Н	267	5% 36% • 64%	
17	Ι	261	20% 59% • 37%	
18	J	192	40% 68% ·	29%
19	K	178	● 96%	
20	L	145	• 79%	21%
21	М	296	97%	••
22	N	251	8%	23%
23	Ο	175	▲ 87%	• 12%
24	Р	180	6% 77%	20%
25	Q	292	⊷	24%
26	R	149	94%	6%
27	S	205	77% .	21%
28	Т	206	80%	19%
29	U	153	97%	•••
30	V	216	93%	• 6%
31	W	148		8%
32	X	256	93%	• 5%
33	Y	250	71%	28%

Continued from previous page...



Chain Length Quality of chain Mol i Ζ 34161 75% 24% . 10% 35142 \mathbf{a} 69% • 30% i. 36 b 21567% 30% • 5% 332 37 \mathbf{c} 85% 14% • 21% 38 \mathbf{d} 306 79% 19% 71% 39279е 79% 18% . 40% f 40 21268% 29% . 41 166g 80% 19% • 8% 42h 15869% 30% . 43i 12875% 24% 6% 44123j 72% 27% • 8% k 4511269% 29% . ÷ 461 13816% 83% 27% 47 \mathbf{m} 12824% 73% 12% 481020 90% 8% • 17% 49206р 69% 29% 7% 22250q 62% 36% • i 19651r 73% 26% **.** 52439 \mathbf{S} 86% 12% 5% 53234u 52% 46% 26% 5470v 96% . . 35% 55156W 46% . 49% 8% 3845685% х 12% 11% 57у 38162% 36% • 5% 58334 \mathbf{Z} 92% • 7%





2 Entry composition (i)

There are 64 unique types of molecules in this entry. The entry contains 108265 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		At	oms	AltConf	Trace		
1	0	110	Total 898	C 554	N 176	0 162	S 6	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
2	1	55	Total 455	C 290	N 87	O 76	${ m S} { m 2}$	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
2	0	46	Total	С	Ν	Ο	\mathbf{S}	0	0
0	Z	40	377	233	83	60	1	0	0

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

Mol	Chain	Residues		At	oms	AltConf	Trace		
4	3	95	Total 832	C 539	N 162	0 128	$\frac{S}{3}$	0	0

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

Mol	Chain	Residues		Ato	\mathbf{ms}	AltConf	Trace		
5	4	37	Total 333	C 212	N 71	0 47	${ m S} { m 3}$	0	0

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

Mol	Chain	Residues		At	AltConf	Trace			
6	5	394	Total 3210	C 2073	N 560	O 566	S 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		At	oms		Atoms					
8	7	294	Total 2390	C 1529	N 405	0 438	S 18	0	0			

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

Mol	Chain	Residues		At	oms	AltConf	Trace		
9	8	102	Total 860	C 543	N 152	0 163	$\begin{array}{c} \mathrm{S} \\ \mathrm{2} \end{array}$	0	0

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

Mol	Chain	Residues		At	\mathbf{oms}	AltConf	Trace		
10	9	124	Total 997	C 644	N 170	0 181	${S \over 2}$	0	0

• Molecule 11 is a RNA chain called 16S rRNA.

Mol	Chain	Residues		Α	toms			AltConf	Trace
11	А	1418	Total 30108	C 13514	N 5446	O 9730	Р 1418	0	0

• Molecule 12 is a RNA chain called tRNA-Val.

Mol	Chain	Residues		A	toms	AltConf	Trace		
12	В	72	Total 1522	C 683	N 269	0 498	Р 72	0	0

• Molecule 13 is a protein called 39S ribosomal protein L2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	D	240	Total 1872	C 1165	N 378	O 320	S 9	0	0

• Molecule 14 is a protein called 39S ribosomal protein L3, mitochondrial.



Mol	Chain	Residues		At	AltConf	Trace			
14	Е	305	Total 2406	C 1545	N 418	O 432	S 11	0	0

• Molecule 15 is a protein called 39S ribosomal protein L4, mitochondrial.

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

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

Mol	Chain	Residues		Ato	ms	AltConf	Trace	
16	Н	97	Total 802	C 508	N 155	O 139	0	0

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

Mol	Chain	Residues		A	toms	AltConf	Trace		
17	Ι	165	Total 1338	C 863	N 242	O 223	S 10	0	0

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

Mol	Chain	Residues		At	oms	AltConf	Trace		
18	J	137	Total 1040	C 665	N 189	0 184	$\begin{array}{c} \mathrm{S} \\ \mathrm{2} \end{array}$	0	0

• Molecule 19 is a protein called 39S ribosomal protein L13, mitochondrial.

Mol	Chain	Residues		At	oms	AltConf	Trace		
19	K	177	Total 1455	C 936	N 259	O 253	${ m S} 7$	0	0

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

Mol	Chain	Residues		At	oms			AltConf	Trace
20	L	115	Total 890	C 559	N 171	0 155	${f S}{5}$	0	0

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



Mol	Chain	Residues		At	oms			AltConf	Trace
21	М	291	Total 2327	C 1483	N 430	O 408	S 6	0	0

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

Mol	Chain	Residues		Ate	AltConf	Trace			
22	Ν	194	Total 1583	C 1014	N 291	O 269	S 9	0	0

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

Mol	Chain	Residues		At	oms	AltConf	Trace		
23	Ο	154	Total 1259	C 792	N 241	0 219	S 7	0	0

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

Mol	Chain	Residues		At	oms			AltConf	Trace
24	Р	144	Total 1173	C 733	N 224	0 211	${ m S}{ m 5}$	0	0

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

Mol	Chain	Residues		At	oms			AltConf	Trace
25	Q	221	Total 1843	C 1179	N 327	0 328	${ m S} 9$	0	0

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

Mol	Chain	Residues		At	oms			AltConf	Trace
26	R	140	Total 1154	C 732	N 231	0 187	${f S}$ 4	0	0

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

Mol	Chain	Residues		At	oms			AltConf	Trace
27	S	161	Total 1293	C 835	N 227	0 227	$\begin{array}{c} \mathrm{S} \\ 4 \end{array}$	0	0

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



Mol	Chain	Residues		At	oms	AltConf	Trace		
28	Т	166	Total 1369	C 875	N 254	O 233	${ m S} 7$	0	0

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

Mol	Chain	Residues		At	oms	AltConf	Trace		
29	U	152	Total 1251	C 788	N 234	O 226	${ m S} { m 3}$	0	0

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

Mol	Chain	Residues		Ate		AltConf	Trace		
30	V	204	Total 1667	C 1062	N 296	0 301	S 8	0	0

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

Mol	Chain	Residues		At	oms			AltConf	Trace
31	W	106	Total 835	C 536	N 157	0 139	${ m S} { m 3}$	0	0

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

Mol	Chain	Residues		At	AltConf	Trace			
32	Х	244	Total 2044	C 1322	N 352	O 365	${ m S}{ m 5}$	0	0

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

Mol	Chain	Residues		At	oms		AltConf	Trace	
33	Y	181	Total 1556	C 995	N 298	O 259	${f S}$ 4	0	0

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

Mol	Chain	Residues		At	oms	AltConf	Trace		
34	Ζ	122	Total 996	C 636	N 186	0 171	${ m S} { m 3}$	0	0

• Molecule 35 is a protein called 39S ribosomal protein L42, mitochondrial.



Mol	Chain	Residues		At	oms			AltConf	Trace
35	a	100	Total 840	C 529	N 152	0 154	${ m S}{ m 5}$	0	0

• Molecule 36 is a protein called Large ribosomal subunit protein mL43.

Mol	Chain	Residues		At	oms	AltConf	Trace		
36	b	150	Total 1189	C 739	N 230	O 217	${ m S} { m 3}$	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
b	2	ACE	-	acetylation	UNP Q8N983

• Molecule 37 is a protein called 39S ribosomal protein L44, mitochondrial.

Mol	Chain	Residues		Ate	AltConf	Trace			
37	С	286	Total 2299	C 1470	N 397	0 423	S 9	0	0

• Molecule 38 is a protein called 39S ribosomal protein L45, mitochondrial.

Mol	Chain	Residues		At	AltConf	Trace			
38	d	249	Total 2039	C 1306	N 352	O 367	S 14	0	0

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

Mol	Chain	Residues		Ate	AltConf	Trace			
39	е	228	Total 1848	C 1174	N 326	0 342	S 6	0	0

• Molecule 40 is a protein called 39S ribosomal protein L48, mitochondrial.

Mol	Chain	Residues		At	\mathbf{oms}	AltConf	Trace		
40	f	150	Total 1196	C 764	N 197	0 231	${S \atop 4}$	0	0

• Molecule 41 is a protein called 39S ribosomal protein L49, mitochondrial.



Mol	Chain	Residues		At	oms	AltConf	Trace		
41	g	134	Total 1113	C 719	N 193	O 199	${ m S} { m 2}$	0	0

• Molecule 42 is a protein called 39S ribosomal protein L50, mitochondrial.

Mol	Chain	Residues		At	oms	AltConf	Trace		
42	h	110	Total 895	C 568	N 156	0 168	${ m S} { m 3}$	0	0

• Molecule 43 is a protein called 39S ribosomal protein L51, mitochondrial.

Mol	Chain	Residues		At	oms	AltConf	Trace		
43	i	97	Total 828	C 532	N 165	0 127	${S \atop 4}$	0	0

• Molecule 44 is a protein called 39S ribosomal protein L52, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
44	j	90	Total 722	C 449	N 140	0 131	${ m S} { m 2}$	0	0

• Molecule 45 is a protein called 39S ribosomal protein L53, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
45	k	80	Total 627	C 392	N 116	0 114	${ m S}{ m 5}$	0	0

• Molecule 46 is a protein called 39S ribosomal protein L54, mitochondrial.

Mol	Chain	Residues		Aton	ıs	AltConf	Trace	
46	1	23	Total 221	C 137	N 52	O 32	0	0

• Molecule 47 is a protein called 39S ribosomal protein L55, mitochondrial.

Mol	Chain	Residues		Atc	\mathbf{ms}	AltConf	Trace		
47	m	35	Total 292	C 187	N 55	O 48	${S \over 2}$	0	0

• Molecule 48 is a protein called Ribosomal protein 63, mitochondrial.



Mol	Chain	Residues		At	oms	AltConf	Trace		
48	О	94	Total 798	C 501	N 165	O 129	${ m S} { m 3}$	0	0

• Molecule 49 is a protein called Peptidyl-tRNA hydrolase ICT1, mitochondrial.

Mol	Chain	Residues		At	oms	AltConf	Trace		
49	р	147	Total 1205	C 748	N 228	0 225	${S \over 4}$	0	0

• Molecule 50 is a protein called Growth arrest and DNA damage-inducible proteins-interacting protein 1.

Mol	Chain	Residues		At	oms	AltConf	Trace		
50	q	141	Total 1177	C 732	N 229	0 211	${f S}{5}$	0	0

• Molecule 51 is a protein called 39S ribosomal protein S18a, mitochondrial.

Mol	Chain	Residues		At	oms		AltConf	Trace	
51	r	146	Total 1203	С 764	N 232	0 199	S 8	0	0

• Molecule 52 is a protein called 39S ribosomal protein S30, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
52	S	386	Total 3155	C 2023	N 559	O 559	S 14	0	0

• Molecule 53 is a protein called Mitochondrial assembly of ribosomal large subunit protein 1.

Mol	Chain	Residues		\mathbf{A}	toms		AltConf	Trace	
53	u	126	Total 1044	C 671	N 172	0 191	S 10	0	0

• Molecule 54 is a protein called MIEF1 upstream open reading frame protein.

Mol	Chain	Residues		Ato	ms	AltConf	Trace	
54	V	69	Total 588	C 372	N 116	O 100	0	0

• Molecule 55 is a protein called Acyl carrier protein, mitochondrial.



Mol	Chain	Residues	Atoms				AltConf	Trace	
55	W	79	Total 638	C 410	N 95	O 128	${ m S}{ m 5}$	0	0

• Molecule 56 is a protein called 5-methylcytosine rRNA methyltransferase NSUN4.

Mol	Chain	Residues	Atoms				AltConf	Trace	
56	x	338	Total 2676	C 1703	N 467	0 489	S 17	0	0

• Molecule 57 is a protein called Transcription termination factor 4, mitochondrial.

Mol	Chain	Residues	Atoms			AltConf	Trace		
57	У	244	Total 1980	C 1264	N 342	0 362	S 12	0	0

• Molecule 58 is a protein called Mitochondrial ribosome-associated GTPase 1.

Mol	Chain	Residues	Atoms			AltConf	Trace		
58	Z	311	Total 2443	C 1549	N 445	0 433	S 16	0	0

• Molecule 59 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	AltConf
59	0	1	Total Zn 1 1	0
59	4	1	Total Zn 1 1	0

• Molecule 60 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	AltConf
60	А	35	Total Mg 35 35	0
60	М	1	Total Mg 1 1	0
60	g	1	Total Mg 1 1	0
60	Z	1	Total Mg 1 1	0

• Molecule 61 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe_2S_2)



(labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	AltConf
61	r	1	TotalFeS422	0

• Molecule 62 is S-(2-{[N-(2-HYDROXY-4-{[HYDROXY(OXIDO)PHOSPHINO]OXY}-3,3-D IMETHYLBUTANOYL)-BETA-ALANYL]AMINO}ETHYL) DECANETHIOATE (three-letter code: PM8) (formula: C₂₁H₄₁N₂O₇PS) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				AltConf		
69		1	Total	С	Ν	Ο	Р	S	0
62 W	Ţ	32	21	2	7	1	1	0	



• Molecule 63 is S-ADENOSYLMETHIONINE (three-letter code: SAM) (formula: $C_{15}H_{22}N_6O_5S$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues		Atc	\mathbf{ms}			AltConf
63	х	1	Total 27	C 15	N 6	O 5	S 1	0

• Molecule 64 is PHOSPHOAMINOPHOSPHONIC ACID-GUANYLATE ESTER (three-letter code: GNP) (formula: $C_{10}H_{17}N_6O_{13}P_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues		Ate	oms			AltConf
64	Z	1	Total 32	C 10	N 6	O 13	Р 3	0



3 Residue-property plots (i)

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

Chain 0:	57%	• 41%
MET ALA LEU ALA MET MET LEU VAL VAL VAL	SER TRP SER ALA ALA ALA ALA ALA ARG CLY CLY CLU TRP ARG CLU CLU CLU CLU CLU CLU CLU CLU CLU CLU	PR0 GLN SER ARG PR0 GLY PR0 GLY PR0 PR0 PR0 PR0 PR0 PR0 CLN ALA ALA ALA ALA ALA ALA ALA ALA ALA A
		_ ±
ASP THR SER GLY SER LYS GLU ASN SER SER	LLEU ALED ALED ALED TLE PHE TRP MET AT9 C16 C16 C16 C16 C16 C16 C16 C16 C16 C16	202 - 202 -
• Molecule 2:	39S ribosomal protein L33,	mitochondrial
Chain 1: 5%	83%	• 15%
	•••	
MET PHE LEU SER ALA PHE PHE ALA LYS	811 813 13 16 16	
• Molecule 3:	39S ribosomal protein L34,	mitochondrial
Chain 2:	50%	50%
MET ALL VAL VAL VAL VAL VAL VAL VAL VAL VAL	PRI STHEFT ALLACT ALLACT CLERCA ALLACT ALLAC	
• Molecule 4:	39S ribosomal protein L35,	mitochondrial
Chain 3:	51%	49%
MET ALA ALA ALA ALA PHE ALA GLY ALA VAL	ARG ALA ALA SER GLY GLY TLE LEU ALC ARG ASN ASN ASN ARG SER TTR ARG ARG ARG ARG ARG ARG ARG ARG ARG AR	VAL LYS ALN ALN ALN LLU TLEU TLEU TLEU TLEU ARG GLY THR HIS TLE GLY VAL VAL VAL VAL VAL VAL LEU VAL LEU VAL
		•
THR THR SER GLU ARG ASN LEU THR CYS GLY	HIS THR SER VAL LLEU ASN ARG ARG ARG ARC ARC ARC CLEU PRO PRO PRO PRO LLEU LEU LLEU VAL LLEU VAL VAL VAL VAL	ARG SER L94 D174 V188
• Molecule 5:		mitashandrial
• Molecule 5.	39S ribosomal protein L36,	mitochondinar
Chain 4:	39S ribosomal protein L36, 36%	64%



• Molecule 6: 39S ribosomal protein L37, mitochondrial

Chain 5:	92%	• 7%
MET ALA LEU ALA SER SER PRO ALA ALA ALA ALA ALA	C C C C C C C C C C C C C C C C C C C	D151 F266 A423 A423 A423
• Molecule 7: 39	S ribosomal protein L38, mitochondrial	
Chain 6:	92%	• 7%
MET ALA ALA PRD PRD TRP TRP TRP ALA ALA ALA CVS CVS	CVS CVS ARG ARG ARG CLY PHE SER CLY CLEU CLEU CLEU CLEU CLEU CLEU CLEU CLEU	E80 K81 F84 F84 K87 K87 K95 K95 K95 K95 K95 K102 E119 E119 E119 E119 E119 K121
S129 ◆ D133 ◆ D160 ◆ G180 ◆	1132 ♦ 1183 ♦ 1183 ♦ 1183 ♦ 1200 ♦ 1200 ♦ 1200 € 1217 ↓ 1217 ↓ 1217 ↓ 1271 ♦ 1271 ♦ 1271 ♦	F281 F281 S282 E283 F298 D302 T310 M311 Y380 Y380
• Molecule 8: 39	S ribosomal protein L39, mitochondrial	l
Chain 7:	86%	• 13%
MET GLU GLU ALA ALA ALA MET GLY SER ALA ALA ALA ALA ALA	TRP LLEU VAL VAL ALA PRO GLY GLY GLY GLY GLY CLY CLY CLZ SER SER SER SER SER SER SER SER SER SER	861 B109 S187 K196 K196 K196 K196 F223 F223 F230 F230 E242
q246 ♦ q290 ♦ b327 ♦ GLN GLN ALA ALA	GUU CYS STRR SER TIRR TIRR	
• Molecule 9: 39	S ribosomal protein L40, mitochondrial	L
Chain 8:	37% 47% •	50%
MET THR ALA SER VAL LEU ARG SER ILEU LEU ALA	LEU PRO STHR STHR CLFU CLFU CLFU CLFU CLFU CLFU CLFU CLFU	LEU PRO MET PRO ARC SRR CLYS LYS LYS LYS LYS LYS LYS LYS LYS LYS
ASP GLM GLU GLU LYS LYS ARG LYS LYS LYS LYS	ANG LANG LANG LEU LEU LEU LEU CLU CLU CLU CLU CLU CLU CLU CLU CLU CL	R100 P102 P102 Q103 C104 E105 F108 E106 E106 E106 R113 A115 L116 A115 L116 K113 K119 K119 K119 K120
E128 M131 E132 E132 E133 D134 T135 T135 R137 A138	L140 E141 E141 A142 0144 E145 E145 E149 0151 L150 0151 L157 E153 S154 E153 E153 E153 A159 A159 A159 A150 L157 L157 L157 L157 L157 L157 L157 L157	K163 K164 P165 P166 P166 P170 P170 P170 P170 P171 P176 P176 P177 P180 P181 P181 P181 P183





• Molecule 10: 39S ribosomal protein L41, mitochondrial













• Molecule 20: 39S ribosomal protein L14, mitochondrial



- E167 E180
- Molecule 25: 39S ribosomal protein L19, mitochondrial



Chain Q:	75%	• 24%
MET ALA ALA CYS CYS CYS CLA ALA ALA ALA ALA ALA ALA ALA ALA ALA	ALM ALA ALA ALA ALA ALA FRO PRO PRO PRO PRO PRO PRO PRO ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	PRO VAL VAL GLN GLN GLN GLN GLN GLY PRO GLY ALA ALA ALA ALA ALA PRO PRO PRO PRO PRO
VAL TILE VAL ASP HTS ASP HTS ASP PRO PRO PRO PRO PRO PRO PRO PRO PRO PR	P211 P211 N212 Q252 R269 R291 S292	
• Molecule 26: 39S ribosor	mal protein L20, mitochom	drial
Chain R:	94%	6%
MET VAL VAL THEU LEU LEU LEU LEU LEU CAL CAL CAL CAL CAL CAL CAL CAL CAL CAL		
• Molecule 27: 39S riboso	mal protein L21, mitochom	drial
Chain S:	77%	• 21%
MET ALA ALA ALA SER SER SER SER SER THR THR THR THR THR THR THR CYS SER ALA ALA ALA ALA ALA ALA ALA ALA	ILEU LEU LEU PRO PRO PRO PRO GLY PRO GLY ALA ALA ALA ALA ALA ALA ALA ALA ALA A	ASN SER ASN SER SER SER SER SER THR THR T107 SIG SIG SIG SIG SIG
• Molecule 28: 39S riboson	mal protein L22, mitochon	drial
Chain T:	80%	• 19%
MET ALA ALA ALA ALA ALA ALA CLU GLY GLY GLY GLY GLY CLEU CLEU ALS ALS ALS ALS ALS CLEU CLEU ALS ALA ALA ALA ALA ALA ALA ALA ALA ALA	GLY CLYS CLYS LYS LEU ALA ALA CLEU VAL CLEU CLN CLN CLN CLN CLN CLN CLN CLN CLN CLN	I41 I41 G59 D79 F182 F183 L206
• Molecule 29: 39S riboson	mal protein L23, mitochon	drial
Chain U:	97%	
MET A2 R3 R3 R3 B1 E113 E115 E115 E115 E115 E115 C120 C120	A1123 A123 D124 D125 L126 Y127 S128 M129 E130 E130 E132 E132 R134 Q136 Q136	
• Molecule 30: 39S riboso	mal protein L24, mitochon	drial
Chain V:	93%	• 6%
MET ARG LEU LEU LEU LEU LEU LEU ALA ALA ALA ALA ALA ALA CI SE DS DS	d59 ★ K68 ★ L70 ★ K68 ★ L70 ★ K68 ★ L70 ★ L70 ↓ 175 ↓ 171 ↓ 1101 ↓ 1102	R128 P130 P131 P131 P132 P132 P132 P132 P132 P132 P132 P132 P132 P132 P153 P153 P153 P153 P153 P162
163 164 168 180 1216 1216		



• Molecule 31:	39S ribosomal protein L27, mitochondrial	
Chain W:	70% .	28%
MET ALA SER VAL VAL LEU LEU ALG ARG ARG ARG	THR THR THR THR THR THR THR FRO FRO FRO FRO THR THR THR THR THR THR THR THR THR THR	Cata K455 S46 R50 L148
• Molecule 32:	39S ribosomal protein L28, mitochondrial	
Chain X:	93%	• 5%
MET P2 331 1.32 6.33 6.33 6.33 6.33 6.33 6.33 6.33 6	D142 Q241 A242 L243 S244 PR0 ALA ALA ALA ALA ALA ALA ALA AL	
• Molecule 33:	39S ribosomal protein L47, mitochondrial	
Chain Y:	71% .	28%
MET ALA ALA ALA ALA GLY LEU LEU LEU CYS ARG	ARG VAL SER SER SER SER LIEU LIEU CYS SER ARG CYS CYS CYS CYS CYS CYS CYS CYS CYS CYS	PRO VAL VAL THR THR PHE PHE THR THR THR THR THR THR THR SER SER
ARG LYS G63 K72 N195 D206	H240 H240 L241 E243 E243 GLN GLN CLVS SER SER SER VAL	
• Molecule 34:	39S ribosomal protein L30, mitochondrial	
Chain Z:	75%	• 24%
Chain Z:	222%	• 24%
Chain Z:	75%	• 24%
Chain Z:	75%	24%
Chain Z:	75% 39S ribosomal protein L42, mitochondrial	- 24%
Chain Z:	75% 39S ribosomal protein L42, mitochondrial	• 24%
Chain Z:	75% 39S ribosomal protein L42, mitochondrial 69% Large ribosomal subunit protein mL43	24%
Chain Z:	75% 39S ribosomal protein L42, mitochondrial 69% Large ribosomal subunit protein mL43 67%	24%
Chain Z:	75% 39S ribosomal protein L42, mitochondrial 69% Large ribosomal subunit protein mL43 67%	24%

SER ALA VAL SER CYS CYS CYS PRO PRO PRO PRO PRO PRO PRO PRO PRO SER ALA

• Molecule 37: 39S ribosomal protein L44, mitochondrial

Chain c:	85%	• 14%	
MET ALA SER GLY LEU VAL LEU LEU LEU LEU	CLM CLM CLM CARG CARG CARG CARG CARG CARG FRO FRO FRO FRO FRO FRO FRO FRO FRO FRO	0107 1108 0109 0109 010 010 011 0115 0115 0115 0118 0118 0118 0118 01252	1219 1307
K318 P319 K320 GLU THR LEU ALA GLU GLU	SER TILE ALA ALA SER		
• Molecule 38	: 39S ribosomal protein L45, mitochondria	al	
Chain d:	21% 79%	• 19%	
MET ALA ALA ALA PLO TLE PRO GLY CLY SER	CTS LEU SER ARG CLY TRP TRP TRP TRP TRP PRO CLU VAL CLU VAL CLA CLA CLA CLA CLA CLA CLA CLA CLA C	F41 G47 K54 K54 K56 K56 K62 A60 R61 K62 A63 A63 A63	C66 769 769
E70 K71 S72 D73 H77 E92 G92	D94 A96 A96 197 197 S98 S99 CU0 S100 CU1 CU2 CU3 CU4 CU4	A130 N131 F132 F132 F133 N135 D136 D136 D158 S201 M202 M203	N204
K240 +	P289 E291 E291 E292 E293 E294 E294 E295 E294 E10 GLN GLN GLN GLN GLN GLN GLN ALA ALA		
• Molecule 39	: 39S ribosomal protein L46, mitochondria	al	
Chain e:	71% 79%	• 18%	
MET ALA ALA ALA PRO PRO VAL ARG THR THR TLEU LEU	VAL VAL VAL ALA ALA CLY CLU CLU ARG CLU TRP ARG CLU TRP ARG CLU TRP ARG SER ARG SER ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	C42 843 843 844 845 845 147 154 646 450 450 450 450 453 153 854 855	KG1 F62 T64
P65 L666 Q67 E68 M70 A71 S72 S72	1774 1776 1776 1779 1779 1779 1779 1779 1835 1835 1835 1837 1837 1837 1837 1837 1832 1832 1832 1832 1832 1832 1837 1837 1837 1837 1837 1837 1837 1837	A39 K100 K101 K101 L75 A5P A5P A5P A5P A5P A5P A5P A5P A113 A113 A113 A113 A113 A113 A113 A11	L1116
q126 K127 F128 [1129 Q130 P131 F131 K132 K133	C134 A135 A135 A135 A1436 A1440 A1440 A1443 A1444 A144 A144 A144 A144 A144 A1	V155 V156 (1160 V161 V161 V161 K165 F165 C166 C166 O167 D167 U170 V170	Li 173 Pi 174 Qi 175 Ei 177 Pi 180 Ci 181 Ci 184 Li 184 Ri 185 Ci 186
T187 A188 E189 T191 L192 A193 T194	L195 E197 E197 N199 M200 E201 M202 F204 M202 F204 M203 F204 M203 F204 M202 C205 C206 M207 M207 M207 M207 M207 M201 M207 M203 M207 M203 M207 M203 M207 M203 M203 M203 M203 M203 M203 M203 M203	M221 H222 T223 E224 S225 N226 M226 M226 M229 K230 Y231 F233 F233 F233 K235	1235 1237 1238 1238 1238 1238 1238 1234 1240 1241 1234 1241 1234 1245 1245 1245 1247 1247 1247 1247 1247 1247 1247 1247
N248 K249 C250 H251 H251 V255 V255	K557 D268 E259 C266 C261 C266 F266 F266 F266 F266 F266 F269 F270 F273 R273 R273 F277 C278 F277 F277 F277 F277 C278 F277 C278 C278 C278 C278 C278 C278 C278 C		

L D W I D E

• Molecule 40: 3	9S ribosomal protein L48, 1	mitochondrial		
Chain f:	40% 68%	·	29%	
MET SER GLY THR LEU CLU CYS CYS CYS CYS	ASN THR THR THE PHE LFY CLN CLN PHE CLN PHE CLN CLN CLN CLN CLN CLN CLN CLN CLN CLN	PR.0 TILE TYR SER SER VIL CLY CLY CLY CLY CLY CLY CLY CLY SER SER SER SER ARG	Y48 K64 A65 A65 A10 GLU CLU CLU LYS LYS LYS LYS	OLY
VAL GLU ARG ARA ALA TILE CBS G83 CSS CSS CSS CSS CSS CSS CSS CSS CSS CS	Y86 E87 Y88 G89 G89 G89 C90 L91 L95 L95 L95 L95 Y98 Y98 Y98 Y98 Y101	L102 4 A103 4 S118 5 1119 4 K120 4 V121 5 S124 7 7125 4 A126 4 M127 6	1128 1128 1129 1132 1132 1133 1133 1133 1133 1135 1135	L137 Q138 Q138 Q140 Q140 G141 S142 K143 M144 L145 L145 L145 L145
S148 V149 L150 T151 T152 H153 E154 L162 L162	A164 T165 F166 A167 E166 E168 F170 L171 L171 C175 Q175 B176 P179 E180 E180	R183 5185 5185 1184 1185 1188 1190 5191 5192 5192 5193	K195 G196 R197 R201 K210 L211 K212	
• Molecule 41: 3	9S ribosomal protein L49, 1	mitochondrial		
Chain g:	80%		19%	
MET ALA ALA ALA ALA MET MET PHE ALA ARG ALA ARG ARG ARG	TRP ARG CLY CLY CLY CLY CLY CLZ CLZ CLZ CLZ CLZ CLZ CLZ CLZ CLZ CLZ	P33 D34 \$70 \$109 F166		
• Molecule 42: 3	9S ribosomal protein L50, 1	mitochondrial		
Chain h:	69%		30%	
MET ALA ALA ARG ARG SER SER SER SER GLY THR ARG ARG	VAL MET TRP TRP TRP TRP VAL VAL TRP CVA CVA GLY TRP PRC GLV TRP PRC ARG ARG CVS CVS CVS CVS CVS CVS CVS CVS CVS CVS	GLU LYS GLU GLU GLU VAL VAL VAL THR GLU GLU GLU CLYS GLU	PR0 149 679 580 581 182 P83 P83 S84	E92
D106 D107 C108 C108 C108 V158 V158				
• Molecule 43: 3	9S ribosomal protein L51, 1	mitochondrial		
Chain i:	75%	·	24%	
MET ALA ALA ALA ASN ASN CLY CLZ CLY ALA CLY ARG ARG	LEU TRP ARP ARP PRA PRA ARG CTY CLEU CLEU CLEU CLEU CLEU CLEU CLEU CLEU	R128		
• Molecule 44: 3	9S ribosomal protein L52, 1	mitochondrial		
Chain j:	72%		27%	
MET ALA ALA ALA ALA LEU GLY THR THR THR CLEU CLEU CLEU CLY	ARG ARG LEU HIS CYS SCY SCY SCY AZ3 AZ3 AZ3 AZ3 AZ3 AZ3 AZ3 AZ3 AZ3 AZ3	K104 Q105 E106 A107 A107 A107 A12 CLY SER L28 L27 SER L27 SER	LEU PRO SER GLN	
• Molecule 45: 3	9S ribosomal protein L53, 1	mitochondrial		





\bullet Molecule 50: Growth arrest and DNA damage-inducible proteins-interacting protein 1
Chain q: 62% · 36%
MET MET ALA ALA ALA ALA ALA ALA ALA ALA ALA AL
SER ALA ALA ALA ALA ALA ALA CLU CLEU CLEU CLEU CLEU CLEU CLEU CLEU
\bullet Molecule 51: 39S ribosomal protein S18a, mitochondrial
Chain r: 73% · 26%
MET ALA ALA ALA ALA ALA ALA ALA CYS GCY GCY GCY GCY ALA ALA ALA ALA ALA ALA ALA ALA ALA AL
SER LYS PR0 1144 1147 1148 1196
\bullet Molecule 52: 39S ribosomal protein S30, mitochondrial
Chain s: 86% • 12%
MET ALA ALA ALA ALA ALA ALA ALA ALA ALA PRO CVS CLSU CLSU CLSU CLSU CLSU CLSU CLSU CLS
E168 ◆ 4179 4179 E215 E21
\bullet Molecule 53: Mitochondrial assembly of ribosomal large subunit protein 1
Chain u: 52% · 46%
MET PRO PRO PRO PRO PRO PRO PRO PRO PRO PRO
LEU HIS SER SER SER SER SER SER CLU CLU CLU CLU CLU CLU CLU CLU CLU CLU
CLU CLU ASP ASP ASP ASP ASP ASP ASP CLU CLU CLU CLU CLU CLU CLU CLU CLU CLU
\bullet Molecule 54: MIEF1 upstream open reading frame protein
26% Chain v: 96% ···









GLU THR LEU PRO



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	68901	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE	Depositor
	CORRECTION	
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{\AA}^2)$	40	Depositor
Minimum defocus (nm)	400	Depositor
Maximum defocus (nm)	2800	Depositor
Magnification	Not provided	
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	6.009	Depositor
Minimum map value	-2.665	Depositor
Average map value	-0.004	Depositor
Map value standard deviation	0.204	Depositor
Recommended contour level	0.814	Depositor
Map size (Å)	518.4, 518.4, 518.4	wwPDB
Map dimensions	480, 480, 480	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.08, 1.08, 1.08	Depositor



5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: GNP, SAM, MG, PM8, ACE, FES, ZN, AYA, SAC

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).

Mal	Chain	Bond lengths		B	ond angles
MOI			# Z > 5	RMSZ	# Z > 5
1	0	0.24	0/913	0.50	0/1224
2	1	0.24	0/460	0.55	0/610
3	2	0.23	0/383	0.52	0/507
4	3	0.23	0/853	0.51	0/1136
5	4	0.24	0/341	0.57	0/451
6	5	0.24	0/3305	0.45	0/4502
7	6	0.24	0/3043	0.49	0/4140
8	7	0.24	0/2447	0.44	0/3310
9	8	0.25	0/880	0.52	0/1188
10	9	0.26	0/1025	0.48	0/1379
11	А	0.19	0/33679	0.76	16/52392~(0.0%)
12	В	0.30	1/1700~(0.1%)	0.73	0/2641
13	D	0.25	0/1910	0.55	0/2569
14	Ε	0.24	0/2475	0.44	0/3355
15	F	0.24	0/2090	0.48	0/2842
16	Н	0.23	0/816	0.53	0/1097
17	Ι	0.26	0/1368	0.54	0/1849
18	J	0.24	0/1054	0.50	0/1419
19	Κ	0.24	0/1490	0.46	0/2021
20	L	0.24	0/905	0.53	0/1218
21	М	0.25	0/2381	0.50	0/3212
22	Ν	0.25	0/1624	0.52	0/2185
23	0	0.23	0/1283	0.51	0/1727
24	Р	0.24	0/1199	0.53	0/1623
25	\mathbf{Q}	0.24	0/1884	0.49	0/2535
26	R	0.24	$0/1\overline{175}$	0.50	$0/1\overline{572}$
27	S	0.24	0/1320	0.49	0/1789
28	Т	0.25	0/1403	0.47	0/1886
29	U	0.25	0/1274	0.51	0/1723
30	V	0.24	0/1712	0.50	0/2322
31	W	0.24	0/857	0.48	0/1155
32	Х	0.24	0/2099	0.44	0/2837



Mal	Chain	Bo	Bond lengths		Sond angles
WIOI	Ullalli	RMSZ	# Z > 5	RMSZ	# Z > 5
33	Y	0.23	0/1593	0.49	0/2136
34	Ζ	0.23	0/1021	0.46	0/1378
35	a	0.24	0/866	0.49	0/1174
36	b	0.26	0/1211	0.54	0/1639
37	с	0.24	0/2347	0.45	0/3171
38	d	0.25	0/2095	0.47	0/2834
39	е	0.24	0/1885	0.47	0/2542
40	f	0.24	0/1216	0.45	0/1638
41	g	0.25	0/1151	0.50	0/1569
42	h	0.24	0/918	0.47	0/1249
43	i	0.24	0/850	0.50	0/1135
44	j	0.24	0/737	0.48	0/992
45	k	0.25	0/635	0.52	0/855
46	1	0.22	0/226	0.56	0/299
47	m	0.25	0/298	0.59	0/402
48	0	0.23	0/819	0.52	0/1097
49	р	0.23	0/1223	0.50	0/1641
50	q	0.24	0/1208	0.51	0/1633
51	r	0.25	0/1238	0.53	0/1676
52	s	0.24	0/3239	0.48	0/4400
53	u	0.24	0/1069	0.48	0/1447
54	V	0.24	0/597	0.59	0/796
55	W	0.25	0/647	0.44	0/871
56	X	0.24	0/2737	0.46	0/3714
57	У	0.24	0/2011	0.47	0/2702
58	Z	0.24	0/2484	0.49	0/3349
All	All	0.23	$1/1\overline{13669}\ (0.0\%)$	0.60	16/160755~(0.0%)

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 outli		#Planarity outliers
9	8	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
12	В	1602	С	OP3-P	-10.57	1.48	1.61

The worst 5 of 16 bond angle outliers are listed below:



Mol	Chain	Res	Type	Atoms	Z	$\mathbf{Observed}(^{o})$	$Ideal(^{o})$
11	А	1711	С	C2-N1-C1'	8.13	127.74	118.80
11	А	1711	С	N1-C2-O2	8.06	123.74	118.90
11	А	2840	С	C2-N1-C1'	7.37	126.91	118.80
11	А	1728	U	N3-C4-O4	7.33	124.53	119.40
11	А	1711	С	N3-C2-O2	-6.50	117.35	121.90

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	\mathbf{Res}	Type	Group
9	8	169	PHE	Peptide

5.2 Too-close contacts (i)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Perce	ntiles
1	0	108/188~(57%)	108 (100%)	0	0	100	100
2	1	53/65~(82%)	52 (98%)	1 (2%)	0	100	100
3	2	44/92~(48%)	44 (100%)	0	0	100	100
4	3	93/188~(50%)	92~(99%)	1 (1%)	0	100	100
5	4	35/103~(34%)	35 (100%)	0	0	100	100
6	5	392/423~(93%)	383~(98%)	9 (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	100/206~(48%)	96 (96%)	4 (4%)	0	100	100
10	9	122/137~(89%)	119 (98%)	3 (2%)	0	100	100



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contentaca	1.0110	proceed ac	pagem

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Perce	ntiles
13	D	238/305~(78%)	235~(99%)	3~(1%)	0	100	100
14	Е	303/348~(87%)	298~(98%)	5 (2%)	0	100	100
15	F	250/311~(80%)	246 (98%)	4 (2%)	0	100	100
16	Н	95/267~(36%)	95 (100%)	0	0	100	100
17	Ι	163/261~(62%)	151 (93%)	11 (7%)	1 (1%)	25	64
18	J	133/192~(69%)	120 (90%)	13 (10%)	0	100	100
19	K	175/178~(98%)	173 (99%)	2 (1%)	0	100	100
20	L	113/145 (78%)	111 (98%)	2 (2%)	0	100	100
21	М	289/296~(98%)	288 (100%)	1 (0%)	0	100	100
22	N	190/251~(76%)	181 (95%)	8 (4%)	1 (0%)	29	68
23	Ο	152/175~(87%)	150 (99%)	2 (1%)	0	100	100
24	Р	142/180~(79%)	142 (100%)	0	0	100	100
25	Q	219/292~(75%)	216 (99%)	3 (1%)	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	Т	164/206~(80%)	162 (99%)	2 (1%)	0	100	100
29	U	150/153~(98%)	148 (99%)	2 (1%)	0	100	100
30	V	202/216~(94%)	200 (99%)	2 (1%)	0	100	100
31	W	104/148~(70%)	102 (98%)	2 (2%)	0	100	100
32	Х	242/256~(94%)	239 (99%)	3 (1%)	0	100	100
33	Y	179/250~(72%)	178 (99%)	1 (1%)	0	100	100
34	Ζ	120/161~(74%)	118 (98%)	2 (2%)	0	100	100
35	a	96/142~(68%)	95~(99%)	1 (1%)	0	100	100
36	b	148/215~(69%)	145 (98%)	3 (2%)	0	100	100
37	с	282/332~(85%)	278 (99%)	4 (1%)	0	100	100
38	d	245/306~(80%)	239 (98%)	6 (2%)	0	100	100
39	е	224/279~(80%)	217 (97%)	7 (3%)	0	100	100
40	f	146/212~(69%)	139 (95%)	7 (5%)	0	100	100
41	g	132/166~(80%)	131 (99%)	1 (1%)	0	100	100
42	h	108/158~(68%)	106 (98%)	2 (2%)	0	100	100
43	i	95/128~(74%)	95 (100%)	0	0	100	100



Mol	Chain	Analysed	Favoured	Allowed	Outliers	Perce	entiles
44	j	88/123~(72%)	87~(99%)	1 (1%)	0	100	100
45	k	76/112~(68%)	74 (97%)	2 (3%)	0	100	100
46	1	21/138~(15%)	21 (100%)	0	0	100	100
47	m	33/128~(26%)	32 (97%)	1 (3%)	0	100	100
48	0	92/102~(90%)	92 (100%)	0	0	100	100
49	р	141/206~(68%)	137 (97%)	4 (3%)	0	100	100
50	q	139/222~(63%)	139 (100%)	0	0	100	100
51	r	140/196~(71%)	132 (94%)	8 (6%)	0	100	100
52	S	382/439~(87%)	377~(99%)	5 (1%)	0	100	100
53	u	124/234~(53%)	121 (98%)	3 (2%)	0	100	100
54	V	67/70~(96%)	65~(97%)	2 (3%)	0	100	100
55	W	77/156~(49%)	73 (95%)	4 (5%)	0	100	100
56	х	334/384~(87%)	323 (97%)	11 (3%)	0	100	100
57	У	242/381~(64%)	240 (99%)	2 (1%)	0	100	100
58	Z	309/334~(92%)	301 (97%)	8 (3%)	0	100	100
All	All	9252/12228~(76%)	9061 (98%)	189 (2%)	2 (0%)	100	100

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All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
22	Ν	66	PRO
17	Ι	66	PRO

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent side chain 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	Percent	iles
1	0	99/164~(60%)	96~(97%)	3~(3%)	41 7	5
2	1	52/60~(87%)	51 (98%)	1 (2%)	57 8	4
3	2	40/72~(56%)	40 (100%)	0	100 1	00



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Mol	Chain	Analysed	Rotameric	Outliers	Perce	ntiles
4	3	88/166~(53%)	88 (100%)	0	100	100
5	4	36/89~(40%)	36 (100%)	0	100	100
6	5	353/368~(96%)	347~(98%)	6(2%)	60	85
7	6	313/332~(94%)	308~(98%)	5(2%)	62	86
8	7	270/303~(89%)	268~(99%)	2(1%)	84	94
9	8	93/190~(49%)	88~(95%)	5 (5%)	22	57
10	9	104/112~(93%)	103~(99%)	1 (1%)	76	91
13	D	194/245~(79%)	192 (99%)	2(1%)	76	91
14	Ε	260/290~(90%)	257~(99%)	3 (1%)	71	90
15	F	219/262~(84%)	216 (99%)	3 (1%)	67	88
16	Н	88/228~(39%)	86~(98%)	2(2%)	50	80
17	Ι	153/232~(66%)	143 (94%)	10 (6%)	17	50
18	J	112/150~(75%)	106 (95%)	6~(5%)	22	57
19	K	154/155~(99%)	149 (97%)	5(3%)	39	74
20	L	98/124~(79%)	98 (100%)	0	100	100
21	М	246/249~(99%)	242 (98%)	4 (2%)	62	86
22	Ν	167/211~(79%)	163~(98%)	4 (2%)	49	79
23	Ο	134/150~(89%)	132 (98%)	2(2%)	65	87
24	Р	126/155~(81%)	121~(96%)	5(4%)	31	68
25	Q	203/256~(79%)	200~(98%)	3~(2%)	65	87
26	R	118/126~(94%)	118 (100%)	0	100	100
27	S	146/180~(81%)	142 (97%)	4(3%)	44	77
28	Т	146/176~(83%)	144 (99%)	2(1%)	67	88
29	U	134/135~(99%)	131 (98%)	3~(2%)	52	81
30	V	182/191~(95%)	178 (98%)	4 (2%)	52	81
31	W	86/119~(72%)	84 (98%)	2 (2%)	50	80
32	Х	220/229~(96%)	215 (98%)	5 (2%)	50	80
33	Y	163/223~(73%)	160 (98%)	3 (2%)	59	85
34	Ζ	113/147~(77%)	111 (98%)	2(2%)	59	85
35	a	96/133~(72%)	94 (98%)	2(2%)	53	82
36	b	131/185~(71%)	126 (96%)	5 (4%)	33	69



Mol	Chain	Analysed	Rotameric	Outliers	Perce	ntile	es
37	с	251/288~(87%)	247 (98%)	4 (2%)	62	86	
38	d	228/274 (83%)	222 (97%)	6 (3%)	46	78	
39	е	198/236~(84%)	191 (96%)	7 (4%)	36	71	
40	f	133/188 (71%)	127 (96%)	6 (4%)	27	64	
41	g	124/148 (84%)	122 (98%)	2(2%)	62	86	
42	h	104/148~(70%)	103~(99%)	1 (1%)	76	91	
43	i	86/110 (78%)	85~(99%)	1 (1%)	71	90	
44	j	72/97~(74%)	70~(97%)	2(3%)	43	77	
45	k	71/90~(79%)	68~(96%)	3~(4%)	30	66	
46	1	23/116~(20%)	22~(96%)	1 (4%)	29	66	
47	m	31/113~(27%)	27~(87%)	4(13%)	4	19	
48	О	80/87~(92%)	78~(98%)	2(2%)	47	79	
49	р	135/181~(75%)	130~(96%)	5(4%)	34	70	
50	q	119/178~(67%)	116~(98%)	3~(2%)	47	79	
51	r	133/169~(79%)	130~(98%)	3~(2%)	50	80	
52	S	340/381~(89%)	331~(97%)	9~(3%)	46	78	
53	u	118/200~(59%)	114 (97%)	4 (3%)	37	72	
54	v	59/60~(98%)	57~(97%)	2(3%)	37	72	
55	W	73/136~(54%)	66~(90%)	7 (10%)	8	32	
56	Х	293/328~(89%)	283 (97%)	10 (3%)	37	72	
57	У	226/350~(65%)	220 (97%)	6 (3%)	44	77	
58	Z	270/287 (94%)	267 (99%)	3 (1%)	73	90	
All	All	8304/10572 (78%)	8109 (98%)	195 (2%)	53	80	

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5 of 195 residues with a non-rotameric side chain are listed below:

Mol	Chain	Res	Type
39	е	68	GLU
49	р	116	ARG
39	е	167	ASP
43	i	42	LYS
50	q	141	GLU

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



Mol	Chain	Res	Type
22	Ν	98	HIS
56	Х	193	GLN
38	d	211	GLN
57	у	110	ASN
54	V	42	ASN

5.3.3 RNA (i)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
11	А	1401/1603~(87%)	260 (18%)	5~(0%)
12	В	71/72~(98%)	11 (15%)	0
All	All	1472/1675~(87%)	271 (18%)	5~(0%)

5 of 271 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
11	А	1672	С
11	А	1681	G
11	А	1689	С
11	А	1694	U
11	А	1700	U

All (5) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
11	А	2030	U
11	А	2186	С
11	А	2245	А
11	А	2530	А
11	А	2905	А

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

2 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).



Mal	Turne	Chain	Dec	Tinle	B	ond leng	gths	Bond angles		
IVIOI	туре	Chain	nes	LIIIK	Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z >2
29	AYA	U	2	29	6,7,8	1.27	1 (16%)	$5,\!8,\!10$	1.18	1 (20%)
19	SAC	K	2	19	7,8,9	1.01	0	8,9,11	0.85	1 (12%)

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
29	AYA	U	2	29	-	0/4/6/8	-
19	SAC	K	2	19	-	3/7/8/10	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
29	U	2	AYA	CA-N	-2.44	1.44	1.46

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
29	U	2	AYA	CB-CA-N	2.42	112.30	109.61
19	K	2	SAC	OG-CB-CA	-2.01	105.84	110.97

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
19	Κ	2	SAC	O-C-CA-CB
19	Κ	2	SAC	N-CA-CB-OG
19	Κ	2	SAC	C-CA-CB-OG

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.



5.6 Ligand geometry (i)

Of 44 ligands modelled in this entry, 40 are monoatomic - leaving 4 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).

Mal	Turne	Chain	Dec	Tinle	Bo	ond leng	\mathbf{ths}	Bond angles		
IVIOI	туре	Unain	nes		Counts	RMSZ	# Z >2	Counts	RMSZ	# Z >2
63	SAM	x	401	-	24,29,29	1.21	3 (12%)	23,42,42	1.58	4 (17%)
62	PM8	W	200	55	25,31,31	1.90	6 (24%)	30,38,38	1.75	6 (20%)
64	GNP	Z	401	60	29,34,34	1.60	7 (24%)	33,54,54	2.13	6 (18%)
61	FES	r	201	51	0,4,4	-	-	-		

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
63	SAM	х	401	-	-	4/12/33/33	0/3/3/3
62	PM8	W	200	55	-	13/36/38/38	-
64	GNP	Z	401	60	-	4/14/38/38	0/3/3/3
61	FES	r	201	51	-	-	0/1/1/1

The worst 5 of 16 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	$\mathrm{Ideal}(\mathrm{\AA})$
62	W	200	PM8	C34-N36	5.77	1.46	1.33
62	W	200	PM8	C39-N41	5.32	1.45	1.33
64	Z	401	GNP	PB-O3A	4.29	1.64	1.59
63	Х	401	SAM	C2-N3	4.01	1.38	1.32
64	Z	401	GNP	C6-N1	3.09	1.38	1.33

The worst 5 of 16 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
64	Z	401	GNP	C5-C6-N1	-8.42	111.92	123.43
62	W	200	PM8	C2-C1-S1	5.93	120.36	113.46



Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
64	Z	401	GNP	C2-N1-C6	5.84	125.21	115.93
63	Х	401	SAM	N3-C2-N1	-5.31	120.38	128.68
62	W	200	PM8	O1-C1-C2	-3.40	119.97	123.99

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There are no chirality outliers.

5 of 21 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
62	W	200	PM8	O27-C28-C29-C32
62	W	200	PM8	C32-C34-N36-C37
62	W	200	PM8	N36-C37-C38-C39
62	W	200	PM8	N41-C42-C43-S1
62	W	200	PM8	C42-C43-S1-C1

There are no ring outliers.

No monomer is involved in short contacts.

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.













5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.



6 Map visualisation (i)

This section contains visualisations of the EMDB entry EMD-17720. These allow visual inspection of the internal detail of the map and identification of artifacts.

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

6.1 Orthogonal projections (i)

6.1.1 Primary map



6.1.2 Raw map



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



6.2 Central slices (i)

6.2.1 Primary map



X Index: 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



X Index: 237





Z Index: 242

6.3.2 Raw map



X Index: 250

Y Index: 226



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



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

6.4.1 Primary map



6.4.2 Raw map



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



6.5 Orthogonal surface views (i)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.814. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



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



Mask visualisation (i) 6.6

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

$emd_{17720}_{msk}_{1.map}$ (i) 6.6.1



Х



7 Map analysis (i)

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

7.1 Map-value distribution (i)



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



7.2 Volume estimate (i)



The volume at the recommended contour level is 647 $\rm nm^3;$ this corresponds to an approximate mass of 584 kDa.

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



7.3 Rotationally averaged power spectrum (i)



*Reported resolution corresponds to spatial frequency of 0.333 \AA^{-1}



8 Fourier-Shell correlation (i)

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

8.1 FSC (i)



*Reported resolution corresponds to spatial frequency of 0.333 $\mathrm{\AA^{-1}}$



8.2 Resolution estimates (i)

$\mathbf{Bosolution} \text{ ostimato } (\mathbf{\hat{\lambda}})$	Estimation criterion (FSC cut-off)		
Resolution estimate (A)	0.143	0.5	Half-bit
Reported by author	3.00	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	4.68	9.53	6.31

*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 4.68 differs from the reported value 3.0 by more than 10 %



9 Map-model fit (i)

This section contains information regarding the fit between EMDB map EMD-17720 and PDB model 8QSJ. Per-residue inclusion information can be found in section 3 on page 16.

9.1 Map-model overlay (i)



The images above show the 3D surface view of the map at the recommended contour level 0.814 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.



9.2 Q-score mapped to coordinate model (i)



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

9.3 Atom inclusion mapped to coordinate model (i)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.814).



9.4 Atom inclusion (i)



At the recommended contour level, 84% of all backbone atoms, 77% of all non-hydrogen atoms, are inside the map.



1.0

0.0 <0.0

9.5 Map-model fit summary (i)

The table lists the average atom inclusion at the recommended contour level (0.814) and Q-score for the entire model and for each chain.

\mathbf{Chain}	Atom inclusion	$\mathbf{Q} extsf{-score}$
All	0.7680	0.4930
0	0.8060	0.5420
1	0.7600	0.5180
2	0.8970	0.5980
3	0.9240	0.6070
4	0.8650	0.5570
5	0.8100	0.5290
6	0.7070	0.4530
7	0.7230	0.4500
8	0.2770	0.2360
9	0.8000	0.5130
A	0.8780	0.5350
В	0.6300	0.3020
D	0.7990	0.5340
E	0.8500	0.5550
F	0.8420	0.5390
Н	0.6910	0.4750
Ι	0.5260	0.3510
J	0.3570	0.1980
K	0.8710	0.5760
L	0.8170	0.5460
М	0.8470	0.5590
N	0.7100	0.4730
0	0.8620	0.5680
Р	0.7210	0.4550
Q	0.8000	0.5360
R	0.8750	0.5790
S	0.8330	0.5400
Т	0.8370	0.5590
U	0.7380	0.5100
V	0.6800	0.4460
W	0.8480	0.5750
Х	0.7950	0.5340
Y	0.8210	0.5340
Z	0.8470	0.5610



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Chain	Atom inclusion	Q-score
a	0.7220	0.4820
b	0.8510	0.5410
С	0.7640	0.4860
d	0.5670	0.3940
е	0.1930	0.1730
f	0.3710	0.2980
g	0.8400	0.5350
h	0.6950	0.4210
i	0.8770	0.5830
j	0.7950	0.5090
k	0.6480	0.3900
1	0.6800	0.3900
m	0.1150	0.1670
О	0.7520	0.5350
р	0.6320	0.4340
q	0.6860	0.4490
r	0.8400	0.5160
S	0.8310	0.5490
u	0.6710	0.4510
V	0.5750	0.3340
W	0.3040	0.2010
X	0.6750	0.4630
У	0.6250	0.4220
Z	0.7060	0.4640

