

# wwPDB EM Validation Summary Report (i)

Nov 6, 2023 – 12:53 am GMT

PDB ID	:	7PO4
EMDB ID	:	EMD-13562
Title	:	Assembly intermediate of human mitochondrial ribosome large subunit (largely
		unfolded rRNA with MALSU1, L0R8F8 and ACP)
Authors	:	Itoh, Y.; Khawaja, A.; Rorbach, J.; Amunts, A.
Deposited on	:	2021-09-08
Resolution	:	2.56  Å(reported)
Based on initial model	:	6ZM6

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.dev70
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	:	1.9.9
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

# 1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.56 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	$egin{array}{c} { m Whole \ archive} \ (\#{ m Entries}) \end{array}$	${f EM\ structures}\ (\#{ m Entries})$
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	Quality of chain	
1	А	1561	13% 59% 14%	27%
2	В	72	14%	19%
3	D	305	70%	30%
4	Е	348	81%	18%
5	F	311	80%	20%
6	Н	267	9% 36% 64%	
7	Ι	261	67% 79%	21%
8	J	192	91% 91%	9%



Chain Length Quality of chain Mol 9 Κ 177100% 10  $\mathbf{L}$ 14579% 21% 11 М 296 91% 9% 31% 12Ν 25176% 24% ÷ 13Ο 17588% 12% Р 1418080% 20% 15Q 292 75% 25% i R 1614994% 6% i  $\mathbf{S}$ 2051779% 21% i Т 1820681% 19% 15% U 19152100% 6% V 2021695% 5% ÷ 21W 14869% 31% • 22Х 25695% 5% Υ 2325072% 28% Ζ 2416176% 24% 250 18858% 41% • 40% 261 6585% 15% 292 2750% 50%  $\mathbf{3}$ 2818851% 49% i 529423 93% 7% 30 6380 93% 7% 5% 7338 3187% 13% 18% 328 20633% 67% 33 9 13791% 9%

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Continued from previous page... Chain Length Quality of chain Mol 7% 14234 $\mathbf{a}$ 70% 30% • İ.  $\mathbf{b}$ 3521470% 30% 36 332  $\mathbf{c}$ 86% 14% 11% 306 37d 77% 23% 22% 38279е 82% 18% 17% 39f 21228% 72% 16640 g 81% 19% 5% 41 h 15870% 30% 128 42i 73% 27% 7% 43123j 76% 24% 70% 44k 111 91% 9% 58% 1 1384559% 41% 15% 46128 $\mathbf{m}$ 49% 50% 470 10279% 20% • 11% 4820629% р 71% 27% 49222q 73% 27% 14% 19650r 82% 17% • 43951 $\mathbf{S}$ 88% 12% 23% 52198t 23% 77% 16% 52198u 16% 84% 15% 52198v 15% 85% 16% 52198W 16% 84% 16% 5219816% 84% х 16% 19852у 16% 84% 23453 $\mathbf{z}\mathbf{a}$ 53% 47%



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Mol	Chain	Length	G	uality of chain
54	zb	70	9%	99%
55	ZC	156	48%	44%



# 2 Entry composition (i)

There are 61 unique types of molecules in this entry. The entry contains 186318 atoms, of which 85917 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 16SrRNA.

Mol	Chain	Residues			AltConf	Trace				
1	А	1145	Total 36467	C 10915	Н 12165	N 4406	O 7836	Р 1145	0	0

• Molecule 2 is a RNA chain called tRNAVal.

Mol	Chain	Residues			AltConf	Trace				
2	В	72	Total 2293	C 685	Н 769	N 269	0 498	Р 72	0	0

• Molecule 3 is a protein called 39S ribosomal protein L2, mitochondrial.

Mol	Chain	Residues			AltConf	Trace				
3	D	214	Total 3360	C 1023	Н 1703	N 335	0 291	S 8	0	0

• Molecule 4 is a protein called 39S ribosomal protein L3, mitochondrial.

Mol	Chain	Residues			AltConf	Trace				
4	Е	284	Total	С	Н	N	0	S	0	0
		-	4526	1457	2269	384	405	11	-	-

• Molecule 5 is a protein called 39S ribosomal protein L4, mitochondrial.

Mol	Chain	Residues			AltConf	Trace				
5	F	249	Total 4053	C 1293	Н 2042	N 366	0 346	S 6	0	0

• Molecule 6 is a protein called 39S ribosomal protein L9, mitochondrial.

Mol	Chain	Residues		Α	AltConf	Trace			
6	Н	97	Total 1649	C 508	Н 847	N 155	O 139	0	0



• Molecule 7 is a protein called 39S ribosomal protein L10, mitochondrial.

Mol	Chain	Residues			AltConf	Trace				
7	Ι	206	Total 3397	C 1065	Н 1740	N 297	0 284	S 11	0	0

• Molecule 8 is a protein called 39S ribosomal protein L11, mitochondrial.

Mol	Chain	Residues			Atom	.s			AltConf	Trace
8	Т	175	Total	С	Η	Ν	Ο	$\mathbf{S}$	0	0
0	J	175	2738	847	1408	237	244	2	0	0

• Molecule 9 is a protein called 39S ribosomal protein L13, mitochondrial.

Mol	Chain	Residues			Atom	.s			AltConf	Trace
9	K	177	Total 2907	C 936	Н 1452	N 259	O 253	${ m S} 7$	0	0

• Molecule 10 is a protein called 39S ribosomal protein L14, mitochondrial.

Mol	Chain	Residues			Aton	ıs			AltConf	Trace
10	L	115	Total 1832	C 559	Н 942	N 171	O 155	${f S}{5}$	0	0

• Molecule 11 is a protein called 39S ribosomal protein L15, mitochondrial.

Mol	Chain	Residues			Atoms	5			AltConf	Trace
11	М	269	Total 4357	C 1383	H 2208	N 379	0 382	$\frac{S}{5}$	0	0

• Molecule 12 is a protein called 39S ribosomal protein L16, mitochondrial.

Mol	Chain	Residues			Atom	.s			AltConf	Trace
19	Ν	101	Total	С	Η	Ν	Ο	S	0	0
12	11	191	3114	995	1560	279	271	9	0	0

• Molecule 13 is a protein called 39S ribosomal protein L17, mitochondrial.

Mol	Chain	Residues			Atom	IS			AltConf	Trace
13	О	154	Total 2554	C 792	H 1295	N 241	0 219	S 7	0	0

• Molecule 14 is a protein called 39S ribosomal protein L18, mitochondrial.



Mol	Chain	Residues			Atom	IS			AltConf	Trace
14	Р	144	Total 2339	С 733	Н 1166	N 224	O 211	${ m S}{ m 5}$	0	0

• Molecule 15 is a protein called 39S ribosomal protein L19, mitochondrial.

Mol	Chain	Residues			Atom	s			AltConf	Trace
15	Q	220	Total 3707	C 1174	Н 1873	N 326	O 325	S 9	0	0

• Molecule 16 is a protein called 39S ribosomal protein L20, mitochondrial.

Mol	Chain	Residues			Atom	.S			AltConf	Trace
16	R	140	Total 2369	C 732	Н 1215	N 231	O 187	${S \over 4}$	0	0

• Molecule 17 is a protein called 39S ribosomal protein L21, mitochondrial.

Mol	Chain	Residues			Atom	S			AltConf	Trace
17	S	161	Total 2659	C 835	Н 1366	N 227	0 227	${S \over 4}$	0	0

• Molecule 18 is a protein called 39S ribosomal protein L22, mitochondrial.

Mol	Chain	Residues			Atom	S			AltConf	Trace
18	Т	166	Total 2780	C 875	H 1411	N 254	0 233	S 7	0	0

• Molecule 19 is a protein called 39S ribosomal protein L23, mitochondrial.

Mol	Chain	Residues			Atom	IS			AltConf	Trace
19	U	152	Total 2483	C 788	Н 1232	N 234	O 226	${ m S} { m 3}$	0	0

• Molecule 20 is a protein called 39S ribosomal protein L24, mitochondrial.

Mol	Chain	Residues			Atom	5			AltConf	Trace
20	V	205	Total 3364	C 1068	Н 1688	N 298	O 302	S 8	0	0

• Molecule 21 is a protein called 39S ribosomal protein L27, mitochondrial.



Mol	Chain	Residues			Aton	ns			AltConf	Trace
21	W	102	Total 1647	$\begin{array}{c} \mathrm{C} \\ 523 \end{array}$	Н 835	N 152	O 134	${ m S} { m 3}$	0	0

• Molecule 22 is a protein called 39S ribosomal protein L28, mitochondrial.

Mol	Chain	Residues			Atoms	S			AltConf	Trace
22	Х	244	Total 4104	C 1322	Н 2060	N 352	O 365	${ m S}{ m 5}$	0	0

• Molecule 23 is a protein called 39S ribosomal protein L47, mitochondrial.

Mol	Chain	Residues			Atom	.s			AltConf	Trace
23	Y	181	Total 3154	C 995	Н 1598	N 298	0 259	S 4	0	0

• Molecule 24 is a protein called 39S ribosomal protein L30, mitochondrial.

Mol	Chain	Residues			Atom	.s			AltConf	Trace
24	7	199	Total	С	Η	Ν	0	$\mathbf{S}$	0	0
24		122	2041	636	1045	186	171	3	0	0

• Molecule 25 is a protein called 39S ribosomal protein L32, mitochondrial.

Mol	Chain	Residues			Aton	ns			AltConf	Trace
25	0	110	Total 1799	C 554	Н 901	N 176	O 162	S 6	0	0

• Molecule 26 is a protein called 39S ribosomal protein L33, mitochondrial.

Mol	Chain	Residues		A	Atom	s			AltConf	Trace
26	1	55	Total 954	C 290	Н 499	N 87	O 76	${ m S} { m 2}$	0	0

• Molecule 27 is a protein called 39S ribosomal protein L34, mitochondrial.

Mol	Chain	Residues		ŀ	Atoms	5			AltConf	Trace
27	2	46	Total 784	C 233	Н 407	N 83	O 60	S 1	0	0

• Molecule 28 is a protein called 39S ribosomal protein L35, mitochondrial.



Mol	Chain	Residues			Atom	ıs			AltConf	Trace
28	3	95	Total	C	Н	N	0	S	0	0
			1716	539	884	162	128	3		

• Molecule 29 is a protein called 39S ribosomal protein L37, mitochondrial.

Mol	Chain	Residues			Atom	.s			AltConf	Trace
29	5	394	Total	С	Н	N	0	S	0	0
			6417	2073	3207	560	566	11		ě

• Molecule 30 is a protein called 39S ribosomal protein L38, mitochondrial.

Mol	Chain	Residues			Atoms	5			AltConf	Trace
30	6	354	Total 5790	C 1881	Н 2842	N 525	O 533	S 9	0	0

• Molecule 31 is a protein called 39S ribosomal protein L39, mitochondrial.

Mol	Chain	Residues			Atom	S			AltConf	Trace
21	7	204	Total	$\mathbf{C}$	Η	Ν	Ο	$\mathbf{S}$	0	0
		234	4788	1529	2398	405	438	18		0

• Molecule 32 is a protein called 39S ribosomal protein L40, mitochondrial.

Mol	Chain	Residues			Atom	S			AltConf	Trace
32	8	138	Total 2363	C 746	Н 1193	N 205	0 217	${S \over 2}$	0	0

• Molecule 33 is a protein called 39S ribosomal protein L41, mitochondrial.

Mol	Chain	Residues			Aton	ns			AltConf	Trace
33	9	124	Total 1985	C 644	Н 988	N 170	0 181	${ m S} { m 2}$	0	0

• Molecule 34 is a protein called 39S ribosomal protein L42, mitochondrial.

Mol	Chain	Residues			Aton	ns			AltConf	Trace
34	a	100	Total 1652	C 529	Н 812	N 152	0 154	${S \atop 5}$	0	0

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



Mol	Chain	Residues			Atom	IS			AltConf	Trace
35	b	150	Total 2392	С 744	Н 1196	N 231	O 218	${ m S} { m 3}$	0	0

• Molecule 36 is a protein called 39S ribosomal protein L44, mitochondrial.

Mol	Chain	Residues			Atoms	5			AltConf	Trace
36	с	286	Total 4621	C 1470	Н 2322	N 397	O 423	S 9	0	0

• Molecule 37 is a protein called 39S ribosomal protein L45, mitochondrial.

Mol	Chain	Residues			Atom	S			AltConf	Trace
37	d	236	Total 3851	C 1233	Н 1918	N 335	O 351	S 14	0	0

• Molecule 38 is a protein called 39S ribosomal protein L46, mitochondrial.

Mol	Chain	Residues			Atoms	5			AltConf	Trace
38	е	228	Total 3699	C 1174	Н 1851	N 326	0 342	S 6	0	0

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

Mol	Chain	Residues			Atom	S			AltConf	Trace
39	f	153	Total 2449	C 778	Н 1229	N 201	O 237	$\frac{S}{4}$	0	0

• Molecule 40 is a protein called 39S ribosomal protein L49, mitochondrial.

Mol	Chain	Residues			Atom	S			AltConf	Trace
40	g	134	Total 2210	C 719	Н 1097	N 193	O 199	${ m S} { m 2}$	0	0

• Molecule 41 is a protein called 39S ribosomal protein L50, mitochondrial.

Mol	Chain	Residues			Aton	ns			AltConf	Trace
41	h	110	Total 1777	C 568	Н 882	N 156	0 168	${ m S} { m 3}$	0	0

• Molecule 42 is a protein called 39S ribosomal protein L51, mitochondrial.



Mol	Chain	Residues			Aton	ns			AltConf	Trace
42	i	93	Total 1612	$\begin{array}{c} \mathrm{C} \\ 509 \end{array}$	Н 820	N 157	O 122	$\frac{S}{4}$	0	0

• Molecule 43 is a protein called 39S ribosomal protein L52, mitochondrial.

Mol	Chain	Residues			Aton	ns			AltConf	Trace
43	j	94	Total 1492	C 463	Н 747	N 144	O 136	${ m S} { m 2}$	0	0

• Molecule 44 is a protein called 39S ribosomal protein L53, mitochondrial.

Mol	Chain	Residues			AltConf	Trace				
44	k	101	Total 1558	C 479	Н 784	N 148	0 142	${ m S}{ m 5}$	0	0

• Molecule 45 is a protein called 39S ribosomal protein L54, mitochondrial.

Mol	Chain	Residues			AltConf	Trace				
45	1	82	Total 1363	C 437	Н 675	N 120	0 128	${ m S} { m 3}$	0	0

• Molecule 46 is a protein called 39S ribosomal protein L55, mitochondrial.

Mol	Chain	Residues			AltConf	Trace				
46	m	64	Total 1096	C 330	Н 560	N 111	O 93	${S \over 2}$	0	0

• Molecule 47 is a protein called Ribosomal protein 63, mitochondrial.

Mol	Chain	Residues			AltConf	Trace				
47	О	82	Total 1395	C 438	Н 697	N 141	0 116	${ m S} { m 3}$	0	0

• Molecule 48 is a protein called Peptidyl-tRNA hydrolase ICT1, mitochondrial.

Mol	Chain	Residues			AltConf	Trace				
48	р	147	Total 2431	C 748	Н 1226	N 228	0 225	$\frac{S}{4}$	0	0

• Molecule 49 is a protein called Growth arrest and DNA damage-inducible proteins-interacting protein 1.



Mol	Chain	Residues			AltConf	Trace				
49	q	161	Total 2678	C 841	Н 1328	N 260	0 244	${ m S}{ m 5}$	0	0

• Molecule 50 is a protein called 39S ribosomal protein S18a, mitochondrial.

Mol	Chain	Residues			AltConf	Trace				
50	r	162	Total 2659	C 830	H 1337	N 252	0 223	S 8	0	0

• Molecule 51 is a protein called 39S ribosomal protein S30, mitochondrial.

Mol	Chain	Residues			AltConf	Trace				
51	s	386	Total 6296	C 2023	Н 3141	N 559	O 559	S 14	0	0

• Molecule 52 is a protein called 39S ribosomal protein L12, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
52	+	46	Total	С	Η	Ν	0	0	0
52	U	40	732	228	378	56	70	0	0
52	11	30	Total	С	Η	Ν	0	0	0
52	u	52	541	168	284	40	49	0	0
52	17	20	Total	С	Η	Ν	0	0	0
52	v	29	486	152	253	36	45	0	0
52	117	21	Total	С	Η	Ν	0	0	0
52	W	51	520	159	275	39	47	0	0
52	v	21	Total	С	Н	Ν	0	0	0
52	А	51	520	159	275	39	47	0	0
52	V	31	Total	С	Η	Ν	0	0	0
02	У	51	520	159	275	39	47	0	

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

Mol	Chain	Residues			AltConf	Trace				
53	za	123	Total 2019	C 648	Н 1007	N 169	0 185	S 10	0	0

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

Mol	Chain	Residues		Α	AltConf	Trace			
54	zb	69	Total 1194	C 372	H 605	N 116	O 101	0	0



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

Mol	Chain	Residues			AltConf	Trace				
55	ZC	87	Total 1397	C 452	Н 692	N 103	0 144	S 6	0	0

• Molecule 56 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	AltConf
56	А	33	Total Mg 33 33	0
56	В	1	Total Mg 1 1	0
56	g	1	Total Mg 1 1	0

• Molecule 57 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms	AltConf			
57	А	7	Total K 7 7	0			
57	6	1	Total K 1 1	0			

• Molecule 58 is ZINC ION (three-letter code: ZN) (formula: Zn).

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

• Molecule 59 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe<sub>2</sub>S<sub>2</sub>).





Mol	Chain	Residues	Atoms	AltConf
59	r	1	TotalFeS422	0

• Molecule 60 is S-[2-({N-[(2R)-2-hydroxy-3,3-dimethyl-4-(phosphonooxy)butanoyl]-beta -alanyl}amino)ethyl] dodecanethioate (three-letter code: 8Q1) (formula: C<sub>23</sub>H<sub>45</sub>N<sub>2</sub>O<sub>8</sub>PS) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues		Atoms								
60	70	1	Total	С	Η	Ν	0	Р	$\mathbf{S}$	0		
	ze	1	77	23	43	2	7	1	1	0		

• Molecule 61 is water.



Mol	Chain	Residues	Atoms	AltConf		
61	А	1157	Total O 1157 1157	0		
61	В	26	TotalO2626	0		
61	D	14	Total         O           14         14	0		
61	Е	77	Total O 77 77	0		
61	F	81	Total         O           81         81	0		
61	Н	7	Total O 7 7	0		
61	K	29	TotalO2929	0		
61	L	38	Total O 38 38	0		
61	М	53	$\begin{array}{cc} \text{Total} & \text{O} \\ 53 & 53 \end{array}$	0		
61	Ν	1	Total O 1 1	0		
61	Ο	33	Total O 33 33	0		
61	Р	52	$\begin{array}{cc} \text{Total} & \text{O} \\ 52 & 52 \end{array}$	0		
61	Q	79	Total O 79 79	0		
61	R	56	$\begin{array}{cc} \text{Total} & \text{O} \\ 56 & 56 \end{array}$	0		
61	S	35	Total O 35 35	0		
61	Т	43	Total O 43 43	0		
61	U	44	Total         O           44         44	0		
61	V	29	TotalO2929	0		
61	W	16	Total         O           16         16	0		
61	Х	16	Total O 16 16	0		
61	Y	46	Total         O           46         46	0		
61	Ζ	23	$\begin{array}{cc} \text{Total} & \text{O} \\ 23 & 23 \end{array}$	0		



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Mol	Chain	Residues	Atoms	AltConf
61	0	26	Total O 26 26	0
61	2	32	Total O 32 32	0
61	3	36	Total O 36 36	0
61	5	32	Total O 32 32	0
61	6	49	TotalO4949	0
61	7	11	Total         O           11         11	0
61	8	5	Total O 5 5	0
61	9	29	TotalO2929	0
61	a	18	Total O 18 18	0
61	b	54	Total O 54 54	0
61	с	42	$\begin{array}{cc} \text{Total} & \text{O} \\ 42 & 42 \end{array}$	0
61	d	7	Total O 7 7	0
61	е	1	Total O 1 1	0
61	f	6	Total O 6 6	0
61	g	28	TotalO2828	0
61	h	7	Total O 7 7	0
61	i	43	Total         O           43         43	0
61	j	27	TotalO2727	0
61	m	1	Total O 1 1	0
61	О	16	Total         O           16         16	0
61	р	12	TotalO1212	0



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Mol	Chain	Residues	Atoms	AltConf
61	q	8	Total O 8 8	0
61	r	7	Total O 7 7	0
61	s	86	Total         O           86         86	0
61	za	5	Total O 5 5	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: 16SrRNA











• Molecule 5: 39S ribosomal protein L4, mitochondrial

Chain F:	80%		20%	-	
MET LEU CLN CLN PHE VAL ARG CLY ALA ARG ALA ALA	TAP LEU ARC ARC CLIN CLIN CLIN CLIN SER SER ALLA ALLA ALLA ALLA ALLA	ALA ARG ARG ARG ARU CUU CUU CIU CIU CIU CIU	GLV GLV LEU LEU P44 Q130 CLY GLY GLY GLY GLY A135 A135 A135 A135	R295 PRO LEU PRO HIIS ALA	
THR GLN GLY GLY ALA ALA ALA ALA THR PRO TYR HIS CYS					
• Molecule 6: 3	39S ribosomal protein l	29, mitochondria	ıl		
Chain H:	36%	6	4%	-	
MET ALA ALA PRU VAL VAL VAL THR THR THR FRO GLY	ALA LEEU LEEU ARG ALA ARG ALA ARG ALA ARC CLY CLEU CLN CLN CLN CLN	LEU LEU LEU ARG ARG ARG AIG AIA AIA AIA AIA AIA AIA	LEU LEU ALA CYS ASN ASN SER SER GIN ASN GIN GIN TSS GIN	K91 199 4100 E103	
N104 V105 G106 V107 R108 G109 D110 L111	L118 + R122 + E135 + E141 + E142 + E143 + L146 + L146 + R147 +	E149 GLY CLYS LLYS LLEU CLYS CLYS CLYS CLN CLN CLN CLN CLN CLN CLN CLN CLN CLN	GLY GLU ALA ALA ALA VAL LYS LYS CYS CYS CYS CYS CYS CYS CYS CYS CYS C	GLY MET LYS ASN ASN VAL LYS TRP GLU LEU ASN	
PRO GLU ILE VAL ALA ARG HIS PHE PHE PHE CYS ASN	LEU GLY VAL VAL VAL ALA HIS PRO FIR LEU FIR CLU GLU FIR	THR ARG GLY GLY GLU TRP GLU CYS GLU VAL	ASIN GLY GLY ASP ASP ASP VAL PRO MET SER VAL VAL SER VAL VAL	PHE GLU LYS PRO LYS THR	
LYS ARG TYR TYR TRP TRP LEU ALA GLN ALA	ALA LYS ALA AEA AEA PRO FRO FRO CLN CLN CLN				
• Molecule 7: 3	39S ribosomal protein I	L10, mitochondr	ial		
Chain I:	67% 79%		21%		
MET ALA ALA ALA ALA ALA ALA ALA CLV ALA CLV CLV CLV CLV CLV	CLU LEU LEU CLU CLU CLU CLU CLU CLU CLU CLU CLU CL	GUY SER LYS ALA VAL THR R35 H35 H35 R37	A55 P68 P65 P71 P72 P72 P72 P72 E74 E74 E74 E76 C77 C77	L78 179 180 181 181 183 R84 R84 E88 E88 E86 E86	A87
A88 190 191 192 192 193 193 195	A97 98 798 799 799 799 799 700 7102 7104 7105 7105 7105 7105	K109 L110 L111 M112 H114 H114 C115 L116 K117 K117	H119 K120 L121 L122 M123 K124 V125 F126 F126 F126 H128 H128	V130 V130 K132 P133 F134 F134 E136 E136 B137 S138	K139 Y140 Q141 Q141 L143 P145 P145
1148 6149 M150 M151 M152 M152 L153 V155 V155	E157 E158 E158 P159 N160 V161 E163 M164 V165 N165 N165 L168 L168	1170 1177 1172 1173 1174 1175 1176 1176 1176	6179 C180 D182 D182 D183 T184 T184 T184 T186 S187 S187 R188 R189	6190 F191 1192 N193 Y194 S195 K196 K196 F197	5199 F201 F201 L202 V203 Q205 G205 E206
V208 G209 G210 L211 T212 C213 C213 L214 T215	q217 7218 4217 5220 5220 1222 1222 4224 4224 7226 7225 7226 7226	L229 T230 1231 L232 L233 D234 Q235 Q235 Q235 C235 C235 C235 C235 C235 C235 C235 C	ACC 4240 4240 61U 1YS ASP ASP MET ASP ASN ASN ASN ASN ASN ASN ASN	PRO ASP PRO ASP THR VAL PRO ASP SER SER	

• Molecule 8: 39S ribosomal protein L11, mitochondrial





• Molecule 13:	39S ribosomal protein L17, mitochondrial		
Chain O:	88%	12%	
MET ARG LEU SER SER ALA ALA ALA ALA ALA	A157 A167 A162 A162 A162 A162 A162 A162 A162 A17 A17 A17 A17 A17 A17 A17 A17		
• Molecule 14:	39S ribosomal protein L18, mitochondrial		
Chain P:	80%	20%	
MET ALA LEU LEU SER ARG FHE GLY LEU	SER SER ARG ARG ARG ARG CYS ARG ALA ALA ALA ALA ALA ALA ALA ALA ALA AL		
• Molecule 15:	39S ribosomal protein L19, mitochondrial		
Chain Q:	75%	25%	
MET ALA ALA ALA CYS CYS CYS ALA ALA ALA GLY HIS TRP	ALA ALA MET MET GLY GLY GLY GLN ALA ARG CLN ALA ALA ALA ALA ALA ALA ALA ALA ALA A	GLY PRO SER GLU PRO GLY ALA PHE GLN	PRO PRO LYS PRO
• Molecule 16:	39S ribosomal protein L20, mitochondrial		
Chain B.	94%	6%	
MET MET PHE LEU GIA LEU LEU LEU	4 12 12 14 4 12 12 14 4 15 16 6 4 6 4 6 4 6 4 6 4 6 4 6 4 6	0,0	
• Molecule 17:	39S ribosomal protein L21, mitochondrial		
Chain S:	79%	21%	
MET ALA ALA SER SER SER LEU THR THR LEU CIV	ARG LEU LEU ARG SER SER SER SER PRO PRO GLY SER ARG ALA ALA ALA ALA ALA ARG CUY SER ARG SER ARG ARG ARG ARG ARG CUY SER ARG CUY SER THR SER ARG CUY SER PRO GLY SER ARG CUY SER PRO GLY SER ARG SER ARG CUY SER SER SER SER SER SER SER SER SER SER		
• Molecule 18:	39S ribosomal protein L22, mitochondrial		
Chain T:	81%	19%	
MET ALA ALA ALA ALA ALA CLU CLU CLU CLU CLU CLU	LEU LEU HIS ASN LEU ASN LEU ASN ASS ASS ASS ALA LEU CLU CLU CLU CLU CLU CLU CLU CLU CLU CL	1212	

 $\bullet$  Molecule 19: 39S ribosomal protein L23, mitochondrial



Chain U:	100%	
******	****	
A2 E113 E115 D115 E116 S117 P118 F119	6120 8121 1126 1126 1126 1128 8128 8128 8138 8138 8138 8138 8138	
• Molecule 20:	39S ribosomal protein L24, mitochondrial	
Chain V.	95%	
	570	
MET ARG LEU SER ALA LEU LEU LEU ALA SER SER SER	K12 M102 M126 M126 D127 T138 E140 C141 E142 E158 E158 E168 Y216 Y216	
• Molecule 21:	39S ribosomal protein L27, mitochondrial	
Chain W:	69% 31%	
	••••	
MET ALA SER VAL VAL LEU ALA LEU ARG ARG	THR THR ALA ALA ALA ALA THR FRO FRO FRO FRO FRO FRO FRO FRO FRO FR	
• Molecule 22:	39S ribosomal protein L28, mitochondrial	
Chain X:	95% 5%	
MET P2 E179 E182 Q241 Q242	CA33 E205 ALA VAL LYS ALA ALA ALA GLN GLN GLN	
• Molecule 23:	39S ribosomal protein L47 mitochondrial	
- 1010100410 201		
Chain Y:	72% 28%	
MET ALA ALA ALA GLY LEU LEU LEU LEU CYS ARG	ANG VAL SER SER SER SER SER ALA LUU LUU VAL VAL THR CLN CAN CLN CAN CLN CAN CLN CAN CLN CAN CLN CAN CLN CAN CLN CAN CLN CAN CLN CAN CAN CAN CAN CAN CAN CAN CAN CAN CA	THR THR LEU SER
ARC LYS C63 C63 C53 ALA ALA ALA C1N S1R S1R S1R	AAL.	
• Molecule 24:	39S ribosomal protein L30, mitochondrial	
Chain Z:	76% 24%	
	•	
MET ALA GLY ILE LEU LEU VAL VAL VAL VAL VAL TRP	PRO PRO CLV ARC ARC ARC CLV CLV CLV CLV CLV CLV CLV CLV CLV CL	
• Molecule 25:	39S ribosomal protein L32, mitochondrial	
Chain 0.	590/ /10/	
	5078 - 41/0	

W O R L D W I D E PROTEIN DATA BANK

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ASP	THR	SER	GLY	SER	LYS	GLU	ASN	SER	SER	LEU	LEU	ASP	SER	ILE	PHE	TRP	MET	A79	E167	F185	N188

• Molecule 26: 39S ribosomal protein L33, mitochondrial

	40%			
Chain 1:	85	%	15%	
MET MET LEU LEU SER ALA PHE PHE ALA ALA CVS	K12 S13 K14 K14 L17 V18 K13 K33 K33 K33 K33 K33 K33 K33	L37 R38 E39 K40 K51 K51 K51 K51 K50 K60	I62 R63 S64 L65	
• Molecule 27:	39S ribosomal protein	L34, mitochondrial		
Chain 2:	50%		50%	
MET ALA VAL LEU GLY SER SER LEU LEU CLY PRO	THR THR ARG SER ARG SER ALA ALA ALA CLU CLU CLU CLU CLU CLU CLU CLU ARG CLU ARG ARG ARG ARG	TRP LEU GLY PHE PRO PRO ASP ASP ASP ALA CLEU CLEU CLEU CLEU CLEU CLEU CLEU CLEU	GLN ALA ARG GLY K47 H92 H92	
• Molecule 28:	39S ribosomal protein	L35, mitochondrial		
Chain 3:	51%		49%	
MET ALA ALA SER ALA ALA GLY ALA VAL ARG	ALA ALA SER GLY GLY CLEU PRO PRO ASN LEU LEU LEU LEU ASR ASN THR SER THR	ARG CYS CYS CYS CYS CYS CYS LYS CYS ASR CYS CYS CYS CYS CYS CYS CYS CYS CYS CYS	THR GLY ARG PHE SER HIS CLN THR PRO PRO VAL VAL SER SER	THR PRO ARG LEU
THR THR SER GLU GLU LEU CVS GLY HIS	THR SER VAL TLE TLE ALA ALA PRO PRO PRO PRO PRO PRO SER VAL LEU SET	LEU VAL VAL ARG ARG SER L94 V188		
• Molecule 29:	39S ribosomal protein	L37, mitochondrial		
Chain 5:		93%	7%	
MET ALA LEU LEU SER SER GLY PRO ALA ALA ALA	LEU ALA OLY SER CLY SER CLY CLU CLU CLU CLU CLU CLU CLY CLY CLY CLY CLY CLY CLY CLY CLA CLY CLA CLY CLA CLA CLA CLA CLA CLA CLA CLA CLA CLA	GLY A30 D141 R144 R395 A423		
• Molecule 30:	39S ribosomal protein	L38, mitochondrial		
Chain 6:		93%	7%	
MET ALA ALA ALA PRO TRP TRP TRP ALA ALA ALA LEU CYS	CLU CTS ARG ARG ARG ARG ARG CTY ARA SER SER SER SER SER SER SER SER SER SER	D39 R47 T32 D83 F84 K85 Y330		
• Molecule 31:	39S ribosomal protein	L39, mitochondrial		
Chain 7:	8.	7%	13%	



<u> </u>
MET ALA ALA ALA ALA ALA ALA ALA ALA ALA AL
D327 D327 GLN SER THR THR CVS CVS THR SER THR
$\bullet$ Molecule 32: 39S ribosomal protein L40, mitochondrial
18%       Chain 8:       67%       33%
MET ALA ALA ALA ALA ALA ALA ALA ALA ALA AL
••••••••••••••••••••••••••••••••••••••
ASP ASP ALA ALA ALA ALA ALA ALA CLN GGU CLN CTA ALA ATA ASP ALA ASP ASP ALA ASP ASP ALA ASP ASP ASP ASP ASP ASP ASP ASP ASP AS
• Molecule 33: 39S ribosomal protein L41, mitochondrial
Chain 9: 91% 9%
MET VAL ALA ALA ALA ALA ALA ARG CYS LEU VAL CYS CYS CYS CYS CYS CIO TIO BIO C 107 TIO BIO C 107 TIO B
• Molecule 34: 39S ribosomal protein L42, mitochondrial
Chain a: 70% · 30%
MET VALL VALL VALL VALL VALL VALL VALL VAL
• Molecule 35: 39S ribosomal protein L43, mitochondrial
Chain b: 70% 30%
T2 12 14 14 14 14 14 14 14 14 14 14
PR0 LEU VAL CYS SER ALA
$\bullet$ Molecule 36: 39S ribosomal protein L44, mitochondrial
Chain c: 86% 14%
MET VAL VAL CEV CEV CEV CEV CEV CEV CEV CEV CEV CEV



• Molecule 37: 39S i	ribosomal protein L45, mite	ochondrial	
Chain d:	77%	23%	
MET ALA ALA PRO PRO CLN CLN CLN CLN CLN CSER SER ARG ARG	LEU GLY TRP PHE PHE PRO GLN VAL CLN VAL LEU VAL CLA ALA ALA ALA ALA VAL VAL VAL VAL	ARL THR LYS LYS ARG PHE PRO PRO PRO PRO PRO PRO FFO K51 K51 K51 K51	K54 E55 M57 P69 E70
KY1 S72 D73 D94 A95 A95 S88 S88 S88 S88 S88 LEU LEU LEU LEU	GUT GLY CLY CLY CLE CLE ALRC ARC ARC ARC ARC ARC ARC ARC ARC ARC A	K135           \$201           \$201           M202           M203           M204           M205           M204           M203           M204	PRO GLAN LEU ALA
• Molecule 38: 39S 1	ribosomal protein L46, mite	ochondrial	
22%			
Chain e:	82%	18%	
MET ALA ALA ALA PRO PRO ALA ARG CLEU CLEU CLEU ALA CLY GLY	TRP ARG ARG CUU CUU CUU ARG CUU TRP ARG CUU TRP ARG SER SER SER SER SER SER SER SER SER SER	ALA ALA ALA ALA PRO SER SER ASN ASN ASN ASN ASN ASN ASN ASN ASN ASN	R95 R97 L98 K100 K101 LYS ALA
ASP LEU HTS ASP GLU GLU GLU GLU GLU GLU 1114 L115 L115	A117 4 0118 0 0119 0 0122 0 1226 0 1226 0 1226 0 1220 0 1220 0 1230 0 1230 0 1230 0 1330  0000000	K143 F165 F165 0166 0167 0167 0168 0168 0168 0181 E197 F217	P218 q219 A220 M221 M221 M224 S225 M226 M226 Q242 Q242 A246
C247 N248 K249 C250 H251 K265 K265 L278			
• Molecule 39: 39S	ribosomal protein L48, mite	ochondrial	
Chain f:	70%	200/	I
	1270	2070	
MET SER GLY THR THR LEU LEU CYS CYS CYS ARC CYS ARC ARC	111 PHE LYS GLN GLN ALA ALA ALA ALA ALA ALA ALA ALA ALA A	ALLANDER SET ALLANDER SET ALLANDER ALLANDER ALLANDER ALLANDER SER ALLANDER ALLANDE	LVS LVS LVS LVS LVS VAL VAL
GLU V77 R78 A79 A19 N31 L122 D85 D85 L137 L137	D139 0140 0140 8141 8143 M144 L145 L145 D147 E191 E191 F194 F194 F194 F194	F198 K199 A200 P202 F202 E203 E205 E205 E205 L207 L1207 L1207 L1207 L175 L175 L175 L175 L175 L175 L175	
• Molecule 40: 39S	ribosomal protein L49, mite	ochondrial	
Chain g:	81%	19%	
MET ALA ALA ALA ALA ALA ALA ALA ALA CLEU CLEU ARG CLY TRP ARG CLY TRP TRP	GLY VAL CALA CLA ARG CLY CLY CLY CLY CLY LEU LEU LEU LEU LEU CLA CLA PR3 PR3 PR3 PR3		
• Molecule 41: 39S	ribosomal protein L50, mite	ochondrial	
Chain h:	70%	30%	
- 110111 11.	1070	۵٬ ۵۵	



MET ALA ALA ALA ALA ALA ARG CLY CLY THR ARG ARG ARG ARG ARG ARG ARG THR TTRP	VAL VAL SER GLY PRO CYS ARG GLU PHE TRP SER	ARG PHE ARG LYS CLU CLU CLU PRO PRO PRO PRO PRO PRO THR VAL VAL VAL VAL	GLU LYS LYS GLU GLU GLU FRO E64 E64	S80 S81 L82 P83 S84 S84 Y158	
• Molecule 42: 39S rib	osomal protein	L51, mitochondrial	l		
Chain i:	73%		27%	-	
MET ALA ALA GLY ASN ASN ALA GLY ARG ALA ARG ARG ARG ARG ARG ARG ARG VAR	PRO LEU ALA ALA ARG SER PHE SER LEU CLY VAL	PR0 ARG LEU LEU L124 GLY CLYS PHE ARG			
• Molecule 43: 39S rib	osomal protein	L52, mitochondrial	l		
Chain j:	76%		24%	-	
MET ALA ALA ALA ALA ALA CLY THR VILL ULEU VILL ARG ARG ARG ARG CLY VIL	SER VAL ALA ALA ALA A23 A23 E101 G102 G102 H103	K104 Q105 E106 N107 L116 L116 FR0 FR0 FR0 FR0 FR0 FR0 FR0 FR0	GLN		
• Molecule 44: 39S rib	osomal protein	L53, mitochondrial	l		
Chain k:	70%	91%	9%		
A2 A3 A4 L5 A6 A6 L8 C9 C9 C9 C10 V13 V13 V13	q15 V16 R17 V18 Q19 F20 F20 F22	E24 K25 N25 V27 E28 F31 F33 F33 F33	E40 K41 V42 R43 S44 T45 N46 N46 N48	C449 C550 V51 152 A53 A53 D54 V55 R56 R56	LE7
F68 669 070 071 H72 H72 K73 L74 M76 R77 G78 C78 L84	F90 A91 S92 H93 T94 R95 A96 R97	D98 A99 6101 6101 6101 6101 A10 A12 A12 A12 A12 A12 A12 A12 A12 A12 A12	GLY ARG		
• Molecule 45: 39S rib	osomal protein	L54, mitochondrial	1		
Chain l:	59%		41%	-	
MET ALA ALA TYPR LYPS LYP PHE PHE ALA ARA ALA TYP ALA ALA CLY TYP	ALA ALA TRP GLU LEU LEU LEU ASN PRO ALA THR SER SER	ARC LEU LEU LEU LEU ALA ALA ALA ALA ALA CYS LYS CYS CYS CYS CYS CYS CYS CYS CYS CYS C	GLY GLY LYS LYS SER GLY CYS CLY GLY THR THR THR	A55 L56 K57 D58 P59 D60	
V61 C82 C82 D64 P65 P65 P65 Q67 Q67 C168 Q67 C168 T170 Y71 X71 M73	G74 V75 I77 Y78 K79 E80 G81	482 484 784 785 186 785 790 899 792 792	P93 E94 W95 L96 F97 E98 M99 N100 L110	6102 103 104 104 105 1105 1107 1107 1107 1107 1107 1107	L110 D111 P112 E113 S114 R115 E116 V117 W118 W118 W118 W120
L1.21 R1.23 K1.23 Q1.24 N1.25 N1.26 N1.26 R1.28 R1.28 R1.31 L1.32 R1.31 L1.32 S1.33	K134 K136 ARG LEU				
• Molecule 46: 39S rib	osomal protein	L55, mitochondrial	l		
Chain m:	49%		50%	_	



MET ALLA MALANA   ALLA MALANAAA ALLA MALANAAA ALLA MALANAAA ALLA MALANAAAAAAAAAA	TRP TRP ARG ARG ARG ARG A1A A1A A1A B82 B82 B82 B82 B82 B83 B82 B83 B83 B83 B83 B84 B83 B84 B84 B84 B84 B84 B84 B84 B84 B84 B84
ARG LYS CLU CLU CLU CLU CLU CLU CLU CLU CLU CLU	
• Molecule 47: Ribosomal protein 63, n	nitochondrial
Chain o: 79%	• 20%
MET PHE LLEU THR ALA ALA LLEU LLEU ARG GLY ARG CLY MR ARG CLY MR ARG CLY MR ARG CLY RLE CLY RLE CLY RLE CLY CLY RLE CLY CLY CLA CLY CLA CLA CLA CLA CLA CLA CLA CLA CLA CLA	
• Molecule 48: Peptidyl-tRNA hydrolas	se ICT1, mitochondrial
Chain p: 71%	29%
MET ALA ALA ALA ARG CYS CYS CYS CYS CHT ARG CLU CLU CLU CLU CLU CLU CLU CLU CLU CLU	LEU LIVS LVS LVS LVS LVS LVS LVS ASP ASP ASP ASP CG4 ASP CG4 ASP CG4 ASP CG4 ASP CG4 ASP CG1 CG1 ASP CG1 CG1 CG1 CG1 CG1 CG1 CG1 CG1 CG1 CG1
VAL N93 K94 F164 P165 F167 P165 F1769 F1769 F170 E171 D172 E171 H194 H194 H194 A14 A14 A14 A14 A14 A14 A14 A14 A14 A1	ASP
• Molecule 49: Growth arrest and DNA	damage-inducible proteins-interacting protein 1
27% Chain q: 73%	27%
	2.73
MET ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	R114 E118 E113 C124 C124 C124 C124 C125 C124 C125 C124 C125 C125 C125 C125 C125 C125 C125 C125
KI50     MET       E151     ALA       E151     ALA       R152     SER       R153     ALA       R153     ALA       R153     ALA       A154     ALA       A155     SER       A156     ALA       A157     LEU       A158     LEU       A159     CLY       A158     CLY       A158     CLY       A158     CLY       A158     CLY       A153     ALA       A154     PLO       A155     CLY       A156     CLY       A154     ALA       A154     PLO       A155     CLY       A166     CLY       A167     CLY       A166     CLY       A166     CLY       A167     CLY       A166     CLY       A166     CLY       A166     CLY       A166     CLY	S172     A117       A17     A17       F175     F175       F176     A117       F177     F176       F176     A117       F177     E118       C119     A117       E17     E118       E17     E118       E17     E118       E17     E118       E17     E123       L179     M126       D181     M126       D181     M126       E183     M121       K184     M131       K185     M131       K184     M131       K185     M131       K185     M131       K185     M131       K185     M131       K186     M131       K187     M134       K188     M146       M148     M146       M148     M146       M148       M149 </td
VAL KISO ALA EI51 • MET ALA E151 • ALA ALA ALS • CLA PRO ALA ALS • CLA ALA ALA ALA ALA	S172     M.113       R173     R.173       R175     R.175       R175     R.17       R176     R.17       R177     R.17       R181     R.17       R181     R.12       R182     R.126       R182     R.127       R182     R.127       R182     R.127       R182     R.126       R182     R.127       R182     R.133       R184     R.133       R184     R.133       R140     R.134       R141     R.135       R143     R.140       R144     R.146       R144     R.146       A.145     R.146       A.146     R.146       A.146     R.146       A.146     A.146       A.146     A.146       A.147     A.146       A.146     A.146       A.147     A.146       A.148     A.146       A.146     A.146       A.147     A.146       A
MAN MANUAL SCIENCE STREET, STR	188°       1175         188°       1175         188°       1175         188°       1133         188°       1144         188°
Image: Section of the section of th	18a, mitochondrial 18a, mitochondrial 18a, 17%
Image: Section of the section of th	W WYW

WORLDWIDE PROTEIN DATA BANK

• Molecule 51:	39S ribosomal protein S30, mitoche	ondrial	
Chain s:	88%	12%	
MET ALA ALA ALA ALA ALA ARG CYS TRP TRP ARG ARG LEU LEU	ARG GLY PRO PRO SER LEU SER LEU SER ALA ALA ALA ALA ALA ALA ALA ALA ALA CVS CVS CVS CVS CVS CVN ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	ALA T39 P40 P40 P125 CLU P125 CLU PR0 CLU PR0 CLU PR0 CLU PR0 CLU CLU CLU CLU	P135
K433 SER GLN LEU LEU GLU ASN			
• Molecule 52:	39S ribosomal protein L12, mitoch	ondrial	
Chain t:	23% 77%	%	
MET LEU PRO ALA ALA ALA ALA ALA ALA CLEU TRP CLEU CLEU CLEU	PR0 CYS CYS LLEU LLEU ALA ALA ALA ALA ALA ALA ARG CLI VAL VAL VAL CYS CYS CYS CYS MET ARG ARG ARG ARG ARG ARG ARG ARG ARG ARG	ARG SER SER SER SER GL/ GL/ ARG CYS ARG CYS A49 A49 CS0 CS0 CS0 CS0 CS0 CS0 CS0 CS0 CS0 CS0	L53 054 N55 655 P57 756 K58 756 F57 756 F57 756 Y60
P61 P62 K63 F64 G65 G65 C65 C65 C65 C65 C65 C65 C65 C65 C65 C	Properties of the second secon	195 196 111E 111E 111E 111E 111E 111E 111E	ALY VAL VAL PRO PRO ALA ALA ALA ALA ALA ALA ALA ALA ALA CLU CLU CLU CLU CLU CLU CLU CLU CLU
ILE PRO ILE ALA CLVS GLU ARG HIS PHE THR	VAL VAL THR THR THR THR ALA ALA ASP CLU CLV CLV CLV CLV CLV CLV CLV CLV CLV CLV	LEU VAL GLN ALA ALA ALA ALA CLU CLU CLU CLU CLU CLU CLU CLU CLU CLU	ASN VAL ALA ALA GLU GLU
ALA GLU CLYS LYS LYS LYS ALA ALA ALA CLU GLU VAL	GLY THR VAL LEU GLU GLU		
• Molecule 52:	39S ribosomal protein L12, mitoch	ondrial	
Chain u:	% % 84%		-
MET LEU PRO ALA ALA ALA ALA ALA ALA ALA TRC PRO CTT TRP CLEU	PRO PRO CYS CYS LEU CYS ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	ARG SER SER SER SER SER SER CLA CLA ALA ALA ALA ALA ALA ALA ALA ALA	ALA ALA PRO LIYS GLU YBO
P61 P62 P62 K63 F64 Q65 Q65 C66 V68	Cos 171 171 171 173 175 175 175 175 175 175 179 179 179 179 179 179 179 179 179 179	10% 10% 111E 11	ALA VAL VAL ALA ALA ALA ALA ALA ALA ALA
ILE PRO ALA ALA CYS GLU ARG THR HIS THR	VAL VAL THR THR THR ALA ALA ALA ASP CUV CVAL CVS CUV CLEU CUV CLEU CUV CLEU CUV CUV CUV CUV CUV CUV CUV CUV CUV CU	LEU VAL GLA ALA ALA ALA VAL LYS CLU CLU CLU CLU CLU CLU CLU CLU CLU CLU	ASN VAL LYS ALA GLU GLU
ALA GLU CYS CYS LYS LYS ALE ALA ALA CLU GLU ALA VAL	GLY GLY THR VAL LEU GLU GLU		
• Molecule 52:	39S ribosomal protein L12, mitoch	ondrial	
Chain v: 15	%		
HET LEU FPAO ALA ALA ALA ALA ALA ALA ALA ALA ALA A	PRO CYS CYS CLY LEUU LEU ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	ARG SER SER SER ALS GLY ALA ALA ALA ALA ALA ALA ALA ALA ALA A	ASA ALA ALA CLYS CLYS GLYS Y60



P61 P62 P62 P62 P65 P66 P66 P66 P66 P66 P67 P66 P67 P66 P67 P71 P77 P77 P77 P77 P77 P77 P77 P77 P7
11E 11E 12C 12C 12C 12C 12C 12C 12C 12C 12C 12C
ALA LYS LYS LYS ALA ALA ALA CUU CLU CLU CLU CLU CLU CLU
• Molecule 52: 39S ribosomal protein L12, mitochondrial
16%           Chain w:         16%           84%
MET ALA ALA ALA ALA ALA ALA ALA ALA ALA AL
P61 P62 P65 P65 P65 P65 P65 P66 P66 P66 P66 P67 P66 P67 P70 P70 P70 P70 P73 P73 P73 P73 P73 P73 P73 P73 P73 P73
LLE LARG CLU CALU CALU CALU CALU CALU CALU CALU
ALA LYS ALA ALA ALA ALA GLU VAL VAL VAL CUU CLU
• Molecule 52: 39S ribosomal protein L12, mitochondrial
Chain x: 16% 84%
MET LEU PRU ALA ALA ALA ALA ALA ALA CTS CTS CTS CTS CTS CTS CTS ALA ALA ALA ALA ALA ALA ALA ALA ALA AL
••••••
P61           F62           F63           F64           F64
LLE LLE LLE LLE LLE LLE LLE LLE LLE LLE
ALA LYS LYS ALA ALA ALA CLUU CLUU CLUU CLUU CLUU CL
• Molecule 52: 39S ribosomal protein L12, mitochondrial
Chain y: 16% 84%
MET ALA ALA ALA ALA ALA ALA ALA ALA ALA AL
••••••••••••••••••••••••••••••••••••••
P61           753           754           755           755           757           757           757           753           753           754           757           757           753           753           753           753           753           754           757           753           753           753           753           753           754           755           753           754           755           755           756           757           758           758           758           758           758           758           758           758           758           758           758           758           758           758           758           758           758           758
LLE LLE LLE LLE LLE LLE LLE LLE LLE LLE



ALA GLU LYS LYS LYS LYS ALA ALA CYS GLU GLU GLU GLY CYAL VAL	GLU		
• Molecule 53: Mitoch	nondrial assembly of	f ribosomal large subunit protein	1
Chain za:	53%	47%	-
MET GLY PRO GLY GLY ARG ALA ALA ALA LEU LEU LEU LEU LEU TRP TRP	ARG ARG ALA VAL SER SER SER ALA GLY SER ALA ALA ALA	PRLU PRLU GLY GLY FLEU CLEU LEU LEU CLEU CLEU PRL CLY CLY CLY CLY CLY CLY CLY CLY CLY CL	ASNU PHE ARG GLY GLY
H180 H185 S184 S184 S184 S184 P180 G117 G117 G117 A11A O117 A11A A11A A11A A11A A11A A	GLU GLY ARG ARG CLU CLU CLU CLU SER ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	KI52 A204 A205 A207 P206 A207 P209 A207 P209 A207 P209 C10 C10 C10 C10 C10 C10 C10 C10 C10 C10	SER SER VAL THR PTO VAL CLU LEU LEU
CTYS GLU			
• Molecule 54: MIEF	1 upstream open rea	ading frame protein	
<sup>9%</sup> Chain zb:		99%	
NET P3 V4 K41 A48 A48 A48 A48	71		
• Molecule 55: Acyl ca	arrier protein, mito	chondrial	
Chain zc:	48% 56%	44%	-
MET SER ALA SER ARG VAL LEU SER ALA ALA ALA ALA	PHE ALA ALA PRO PRO PRO PRO ARG MET ALA ALA ALA ALA	PRU PRU SER THR THR THR CYS SER ALA THR CLY CYS CYS CYS CYS CYS CYS CYS CYS CYS CY	GLN VAL GLY GLY ARG
<b>****</b>		*************	••••••
VAL THR GLN LEU LEU CYS GLN TYR SER NT 1 P72 P73 L74 L74	175 L76 E77 E77 179 Q80 Q80 Q81 N82 V83 V85	LIB7 K88 L289 P90 P91 P95 P95 P95 E96 E96 C899 V100 V100 N101 S102 S102 S102	M.105 D107 L108 C109 0109 D111 D111 D124 E125 E123 C127 F126 F128
• •••••	******	•••	
1130 P131 D132 1133 A135 E136 E136 K137 L138 M139 C140 P141 P141	E143 E145 V145 V145 Y147 T148 A149 A149 D150 K151 K151	V154 Y155 E156	



# 4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	180400	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE	Depositor
	CORRECTION	
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{\AA}^2)$	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	1.930	Depositor
Minimum map value	-0.865	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.028	Depositor
Recommended contour level	0.1	Depositor
Map size (Å)	405.0, 405.0, 405.0	wwPDB
Map dimensions	720, 720, 720	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.5625,  0.5625,  0.5625	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: SAC, ZN, THC, FES, K, AYA, PSU, MG, 2MG, 1MA, 8Q1

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	А	0.24	1/27190~(0.0%)	0.68	0/42294
2	В	0.33	1/1627~(0.1%)	0.67	0/2527
3	D	0.24	0/1685	0.44	0/2265
4	Е	0.26	0/2321	0.43	0/3144
5	F	0.24	0/2069	0.43	0/2813
6	Н	0.23	0/816	0.41	0/1097
7	Ι	0.24	0/1693	0.39	0/2294
8	J	0.25	0/1348	0.39	0/1813
9	Κ	0.24	0/1490	0.41	0/2021
10	L	0.24	0/905	0.46	0/1218
11	М	0.25	0/2200	0.41	0/2976
12	Ν	0.24	0/1593	0.39	0/2144
13	0	0.24	0/1283	0.41	0/1727
14	Р	0.25	0/1199	0.43	0/1623
15	Q	0.26	0/1875	0.42	0/2523
16	R	0.24	0/1175	0.42	0/1572
17	S	0.24	0/1320	0.45	0/1789
18	Т	0.25	0/1403	0.42	0/1886
19	U	0.25	0/1274	0.43	0/1723
20	V	0.25	0/1721	0.42	0/2333
21	W	0.27	0/834	0.44	0/1126
22	Х	0.24	0/2099	0.38	0/2837
23	Y	0.25	0/1593	0.38	0/2136
24	Z	0.25	0/1021	0.42	0/1378
25	0	0.24	0/913	0.42	0/1224
26	1	0.24	0/460	0.44	0/610
27	2	0.24	0/383	0.44	0/507
28	3	0.24	0/853	0.43	0/1136
29	5	0.25	0/3305	0.42	0/4502
30	6	0.26	0/3043	0.41	0/4140
31	7	0.24	$0/2\overline{447}$	0.39	$0/3\overline{310}$
32	8	0.24	0/1195	0.38	0/1610



Mol Chair		Bo	ond lengths	Bond angles	
WIOI	Ullalli	RMSZ	# Z  > 5	RMSZ	# Z  > 5
33	9	0.27	0/1025	0.41	0/1379
34	a	0.25	0/866	0.42	0/1174
35	b	0.25	0/1211	0.43	0/1639
36	с	0.24	0/2347	0.39	0/3171
37	d	0.25	0/1984	0.40	0/2683
38	е	0.24	0/1885	0.38	0/2542
39	f	0.25	0/1241	0.40	0/1676
40	g	0.26	0/1151	0.42	0/1569
41	h	0.24	0/918	0.36	0/1249
42	i	0.25	0/813	0.40	0/1089
43	j	0.25	0/760	0.39	0/1023
44	k	0.23	0/777	0.39	0/1048
45	l	0.24	0/707	0.38	0/960
46	m	0.24	0/544	0.40	0/730
47	0	0.23	0/716	0.38	0/960
48	р	0.24	0/1223	0.41	0/1641
49	q	0.24	0/1384	0.37	0/1869
50	r	0.25	0/1362	0.42	0/1846
51	s	0.25	0/3239	0.43	0/4400
52	t	0.23	0/358	0.34	0/486
52	u	0.22	0/259	0.35	0/350
52	V	0.23	0/235	0.34	0/318
52	W	0.22	0/246	0.39	0/331
52	Х	0.22	0/246	0.34	0/331
52	У	0.22	0/246	0.33	0/331
53	za	0.25	0/1036	0.41	0/1402
54	zb	0.24	0/598	0.37	0/796
55	zc	0.23	0/717	0.35	0/967
All	All	0.25	$2/10242\overline{7}\ (0.0\%)$	0.51	0/144258

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	$\mathrm{Ideal}(\mathrm{\AA})$
1	А	1671	G	OP3-P	-10.77	1.48	1.61
2	В	1	С	OP3-P	-10.57	1.48	1.61

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.



### 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	entiles
3	D	212/305~(70%)	210 (99%)	2 (1%)	0	100	100
4	Ε	280/348~(80%)	278 (99%)	2 (1%)	0	100	100
5	F	245/311~(79%)	240 (98%)	5 (2%)	0	100	100
6	Н	95/267~(36%)	91 (96%)	4 (4%)	0	100	100
7	Ι	204/261~(78%)	202 (99%)	2 (1%)	0	100	100
8	J	173/192~(90%)	166 (96%)	7 (4%)	0	100	100
9	K	175/177~(99%)	173 (99%)	2 (1%)	0	100	100
10	L	113/145 (78%)	112 (99%)	1 (1%)	0	100	100
11	М	265/296~(90%)	263 (99%)	2 (1%)	0	100	100
12	Ν	185/251~(74%)	182 (98%)	3 (2%)	0	100	100
13	Ο	152/175~(87%)	149 (98%)	3 (2%)	0	100	100
14	Р	142/180~(79%)	141 (99%)	1 (1%)	0	100	100
15	Q	218/292~(75%)	218 (100%)	0	0	100	100
16	R	138/149~(93%)	137 (99%)	1 (1%)	0	100	100
17	S	159/205~(78%)	158 (99%)	1 (1%)	0	100	100
18	Т	164/206~(80%)	162 (99%)	2 (1%)	0	100	100
19	U	150/152~(99%)	148 (99%)	2 (1%)	0	100	100
20	V	203/216~(94%)	199 (98%)	4 (2%)	0	100	100
21	W	100/148~(68%)	99 (99%)	1 (1%)	0	100	100
22	Х	242/256~(94%)	241 (100%)	1 (0%)	0	100	100
23	Y	179/250~(72%)	178 (99%)	1 (1%)	0	100	100



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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Perce	ntiles
24	Z	120/161~(74%)	119 (99%)	1 (1%)	0	100	100
25	0	108/188~(57%)	108 (100%)	0	0	100	100
26	1	53/65~(82%)	51 (96%)	2(4%)	0	100	100
27	2	44/92~(48%)	43 (98%)	1 (2%)	0	100	100
28	3	93/188~(50%)	92~(99%)	1 (1%)	0	100	100
29	5	392/423~(93%)	387~(99%)	5 (1%)	0	100	100
30	6	352/380~(93%)	342 (97%)	10 (3%)	0	100	100
31	7	292/338~(86%)	286 (98%)	6 (2%)	0	100	100
32	8	136/206~(66%)	132 (97%)	4 (3%)	0	100	100
33	9	122/137~(89%)	120 (98%)	2 (2%)	0	100	100
34	a	96/142~(68%)	92~(96%)	4 (4%)	0	100	100
35	b	148/214~(69%)	144 (97%)	4 (3%)	0	100	100
36	с	282/332~(85%)	281 (100%)	1 (0%)	0	100	100
37	d	232/306~(76%)	230 (99%)	2 (1%)	0	100	100
38	е	224/279~(80%)	222 (99%)	2 (1%)	0	100	100
39	f	149/212~(70%)	149 (100%)	0	0	100	100
40	g	132/166~(80%)	131 (99%)	1 (1%)	0	100	100
41	h	108/158~(68%)	107 (99%)	1 (1%)	0	100	100
42	i	91/128~(71%)	91 (100%)	0	0	100	100
43	j	92/123~(75%)	89~(97%)	3 (3%)	0	100	100
44	k	99/111~(89%)	92~(93%)	7 (7%)	0	100	100
45	1	80/138~(58%)	80 (100%)	0	0	100	100
46	m	62/128~(48%)	62 (100%)	0	0	100	100
47	О	80/102~(78%)	80 (100%)	0	0	100	100
48	р	141/206~(68%)	140 (99%)	1 (1%)	0	100	100
49	q	159/222~(72%)	157 (99%)	2 (1%)	0	100	100
50	r	160/196~(82%)	157 (98%)	3 (2%)	0	100	100
51	s	382/439~(87%)	371 (97%)	11 (3%)	0	100	100
52	t	44/198~(22%)	44 (100%)	0	0	100	100
52	u	30/198~(15%)	29 (97%)	1 (3%)	0	100	100
52	V	27/198~(14%)	27 (100%)	0	0	100	100



Mol	Chain	Analysed	Favoured	Allowed	Outliers	Perce	ntiles
52	W	29/198~(15%)	28~(97%)	1 (3%)	0	100	100
52	х	29/198~(15%)	29 (100%)	0	0	100	100
52	У	29/198~(15%)	29 (100%)	0	0	100	100
53	za	121/234~(52%)	112 (93%)	9~(7%)	0	100	100
54	zb	67/70~(96%)	66~(98%)	1 (2%)	0	100	100
55	zc	85/156~(54%)	79~(93%)	6 (7%)	0	100	100
All	All	8684/12210 (71%)	8545 (98%)	139 (2%)	0	100	100

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There are no Ramachandran outliers to report.

#### 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	Percentiles
3	D	172/245~(70%)	172~(100%)	0	100 100
4	Ε	246/290~(85%)	245~(100%)	1 (0%)	91 95
5	F	217/262~(83%)	217 (100%)	0	100 100
6	Н	88/228~(39%)	88 (100%)	0	100 100
7	Ι	190/232~(82%)	190 (100%)	0	100 100
8	J	138/150~(92%)	138 (100%)	0	100 100
9	Κ	154/154~(100%)	154 (100%)	0	100 100
10	L	98/124~(79%)	98 (100%)	0	100 100
11	М	230/249~(92%)	229 (100%)	1 (0%)	91 95
12	Ν	164/211~(78%)	164 (100%)	0	100 100
13	Ο	134/150~(89%)	134 (100%)	0	100 100
14	Р	126/155~(81%)	126 (100%)	0	100 100
15	Q	202/256~(79%)	202 (100%)	0	100 100
16	R	118/126~(94%)	118 (100%)	0	100 100
17	S	146/180~(81%)	146 (100%)	0	100 100



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Mol	Chain	Analysed	Rotameric	Outliers	Perce	ntiles
18	Т	146/176~(83%)	146 (100%)	0	100	100
19	U	134/134~(100%)	134~(100%)	0	100	100
20	V	183/191~(96%)	183 (100%)	0	100	100
21	W	84/119~(71%)	84 (100%)	0	100	100
22	Х	220/229~(96%)	220 (100%)	0	100	100
23	Y	163/223~(73%)	163~(100%)	0	100	100
24	Z	113/147~(77%)	113 (100%)	0	100	100
25	0	99/164~(60%)	98~(99%)	1 (1%)	76	84
26	1	52/60~(87%)	52~(100%)	0	100	100
27	2	40/72~(56%)	40 (100%)	0	100	100
28	3	88/166~(53%)	88 (100%)	0	100	100
29	5	353/368~(96%)	353~(100%)	0	100	100
30	6	313/332~(94%)	313~(100%)	0	100	100
31	7	270/303~(89%)	269 (100%)	1 (0%)	91	95
32	8	128/190~(67%)	128 (100%)	0	100	100
33	9	104/112~(93%)	104 (100%)	0	100	100
34	a	96/133~(72%)	95~(99%)	1 (1%)	76	84
35	b	131/184~(71%)	131 (100%)	0	100	100
36	с	251/288~(87%)	251~(100%)	0	100	100
37	d	215/274~(78%)	215 (100%)	0	100	100
38	е	198/236~(84%)	198 (100%)	0	100	100
39	f	136/188~(72%)	136 (100%)	0	100	100
40	g	124/148~(84%)	124~(100%)	0	100	100
41	h	104/148~(70%)	104 (100%)	0	100	100
42	i	83/110 (76%)	83 (100%)	0	100	100
43	j	$74/97\ (76\%)$	74 (100%)	0	100	100
44	k	$83/\overline{89}\ (93\%)$	83 (100%)	0	100	100
45	1	76/116~(66%)	76 (100%)	0	100	100
46	m	58/113~(51%)	57~(98%)	1 (2%)	60	74
47	0	71/87~(82%)	70~(99%)	1 (1%)	67	78
48	р	135/181~(75%)	135 (100%)	0	100	100



Mol	Chain	Analysed	Rotameric	Outliers	Perce	ntiles
49	q	138/178~(78%)	138 (100%)	0	100	100
50	r	147/169~(87%)	146 (99%)	1 (1%)	84	90
51	S	340/381~(89%)	339 (100%)	1 (0%)	92	96
52	t	40/158~(25%)	40 (100%)	0	100	100
52	u	31/158~(20%)	31 (100%)	0	100	100
52	v	28/158~(18%)	28 (100%)	0	100	100
52	W	30/158~(19%)	30 (100%)	0	100	100
52	х	30/158~(19%)	30 (100%)	0	100	100
52	У	30/158~(19%)	30 (100%)	0	100	100
53	za	114/200~(57%)	114 (100%)	0	100	100
54	zb	59/60~(98%)	59 (100%)	0	100	100
55	zc	$8\overline{1/136}~(60\%)$	81 (100%)	0	100	100
All	All	$781\overline{6}/10462~(75\%)$	7807 (100%)	9 (0%)	93	97

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5 of 9 residues with a non-rotameric side chain are listed below:

Mol	Chain	$\operatorname{Res}$	Type
50	r	184	ASN
51	s	327	ASN
31	7	143	TRP
34	a	122	ARG
46	m	94	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
18	Т	75	HIS
21	W	65	ASN
39	f	111	HIS
51	s	420	GLN
52	V	65	GLN

### 5.3.3 RNA (i)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	А	1133/1561~(72%)	223~(19%)	0



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Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	В	71/72~(98%)	11 (15%)	0
All	All	1204/1633~(73%)	234~(19%)	0

5 of 234 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	А	1674	А
1	А	1678	С
1	А	1679	U
1	А	1681	G
1	А	1688	А

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).

Mal	Turne	Chain	Dec	Tink	Bo	ond leng	$\mathbf{ths}$	B	ond ang	les
WIOI	туре	Unain	nes		Counts	RMSZ	# Z >2	Counts	RMSZ	# Z  > 2
2	1MA	В	9	2	$16,\!25,\!26$	1.20	2 (12%)	18,37,40	0.95	1 (5%)
44	AYA	k	2	44	6,7,8	0.81	0	5,8,10	0.53	0
2	PSU	В	39	2	18,21,22	0.51	0	22,30,33	0.55	0
19	AYA	U	2	19	6,7,8	0.78	0	5,8,10	0.52	0
2	2MG	В	10	2	$18,\!26,\!27$	0.95	2 (11%)	16,38,41	0.68	0
35	THC	b	2	35	8,9,10	0.30	0	9,11,13	0.64	0
9	SAC	K	2	9	7,8,9	0.21	0	8,9,11	0.60	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
2	1MA	В	9	2	-	0/3/25/26	0/3/3/3
44	AYA	k	2	44	-	0/4/6/8	-
2	PSU	В	39	2	-	0/7/25/26	0/2/2/2
19	AYA	U	2	19	-	1/4/6/8	-
2	2MG	В	10	2	-	0/5/27/28	0/3/3/3
35	THC	b	2	35	-	0/8/10/12	-
9	SAC	K	2	9	-	0/7/8/10	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	$\operatorname{Ideal}(\operatorname{\AA})$
2	В	9	1MA	C6-N6	3.29	1.35	1.27
2	В	10	2MG	C5-C6	-2.37	1.42	1.47
2	В	9	1MA	C5-C4	-2.19	1.37	1.43
2	В	10	2MG	C8-N7	-2.07	1.31	1.35

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Ζ	$Observed(^{o})$	$Ideal(^{o})$
2	В	9	1MA	N1-C6-N6	2.93	127.23	119.77

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
19	U	2	AYA	C-CA-N-CT

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 46 ligands modelled in this entry, 44 are monoatomic - leaving 2 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	Typo	Chain	Res Link		Bo	ond leng	$\mathbf{ths}$	B	ond ang	les
	туре	Chain	nes		Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z >2
59	FES	r	201	50,7	0,4,4	-	-	-		
60	8Q1	zc	201	55	27,33,34	0.13	0	32,40,43	0.25	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
60	8Q1	zc	201	55	-	3/38/40/41	-
59	FES	r	201	50,7	-	-	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
60	zc	201	8Q1	C42-C43-S44-C1
60	zc	201	8Q1	N41-C42-C43-S44
60	zc	201	8Q1	N36-C37-C38-C39

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



Ligand 8Q1 zc 201

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-13562. 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: 360



Y Index: 360



Z Index: 360

#### 6.2.2 Raw map



X Index: 250

Y Index: 250



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: 420



Y Index: 405



Z Index: 335

#### 6.3.2 Raw map



X Index: 225

Y Index: 281



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 0.1. 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

#### $emd_{13562}_{msk}_{1.map}$ (i) 6.6.1



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# 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 509  $\text{nm}^3$ ; this corresponds to an approximate mass of 459 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 0.391  ${\rm \AA^{-1}}$ 



# 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 0.391  $\mathrm{\AA^{-1}}$ 



### 8.2 Resolution estimates (i)

$\begin{bmatrix} Bosolution ostimato (Å) \end{bmatrix}$	Estim	Estimation criterion (FSC cut-off)				
Resolution estimate (A)	0.143	0.5	Half-bit			
Reported by author	2.56	-	-			
Author-provided FSC curve	2.55	3.00	2.65			
Unmasked-calculated*	2.98	3.70	3.03			

\*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 2.98 differs from the reported value 2.56 by more than 10 %



# 9 Map-model fit (i)

This section contains information regarding the fit between EMDB map EMD-13562 and PDB model 7PO4. Per-residue inclusion information can be found in section 3 on page 19.

### 9.1 Map-model overlay (i)



The images above show the 3D surface view of the map at the recommended contour level 0.1 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 (0.1).



### 9.4 Atom inclusion (i)



At the recommended contour level, 79% of all backbone atoms, 78% of all non-hydrogen atoms, are inside the map.



### 9.5 Map-model fit summary (i)

The table lists the average atom inclusion at the recommended contour level (0.1) and Q-score for the entire model and for each chain.

$\mathbf{Chain}$	Atom inclusion	Q-score
All	0.7800	0.5950
0	0.9070	0.6800
1	0.4370	0.4890
2	0.9860	0.7510
3	0.9730	0.7030
5	0.9020	0.6370
6	0.9210	0.6560
7	0.8010	0.5980
8	0.5670	0.4900
9	0.8800	0.6560
А	0.7910	0.5840
В	0.7750	0.5580
D	0.8250	0.6170
Ε	0.9410	0.6660
$\mathbf{F}$	0.9540	0.7080
Н	0.6440	0.5460
Ι	0.1510	0.3200
J	0.0000	0.1440
Κ	0.9520	0.6820
$\mathbf{L}$	0.9660	0.6690
М	0.9370	0.6720
Ν	0.4920	0.4840
О	0.9420	0.6820
Р	0.9660	0.6870
Q	0.9330	0.6600
R	0.9680	0.7270
$\mathbf{S}$	0.9350	0.6820
Т	0.9510	0.6980
U	0.8440	0.6480
V	0.8450	0.6200
W	0.9550	0.6760
X	0.8650	0.6240
Y	0.9530	0.6930
Z	0.9290	0.6780
a	0.8450	0.6450

0.0 <0.0

1.0



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Chain	Atom inclusion	Q-score
b	0.9640	0.7190
с	0.9050	0.6630
d	0.7530	0.5690
е	0.5890	0.5300
f	0.6520	0.5480
g	0.9330	0.6840
h	0.8420	0.6190
i	0.9780	0.7380
j	0.8490	0.6460
k	0.1910	0.3970
1	0.0570	0.2700
m	0.5760	0.4850
0	0.9420	0.6800
р	0.7600	0.5770
q	0.5440	0.5040
r	0.7960	0.5830
S	0.9270	0.6790
t	0.0000	0.1930
u	0.0000	0.1390
V	0.0000	0.1330
W	0.0000	0.0320
х	0.0000	0.0900
У	0.0000	0.0730
za	0.8000	0.5840
zb	0.6770	0.5270
ZC	0.1580	0.3610

