

Jun 19, 2024 – 04:34 pm BST

PDB ID 80IT : EMDB ID : EMD-16899 Title : 39S human mitochondrial large ribosomal subunit with mtRF1 and P-site tRNA Saurer, M.; Leibundgut, M.; Scaiola, A.; Schoenhut, T.; Ban, N. Authors : Deposited on 2023-03-23 : 2.90 Å(reported) Resolution : Based on initial models ., 7QI4 :

This is a Full wwPDB EM Validation 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. dev 92
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	4.02b-467
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 2.90 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		Quality of chain	
1	B1	198	23% 23%	77%	
1	B2	198	16% 16%	84%	
1	B3	198	16% 16%	84%	
1	B4	198	16% 16%	84%	
1	B5	198	16% 16%	84%	
1	B6	198	16%	84%	
2	B7	3		100% 67%	33%
3	B8	1561	7%	84%	15%



Mol	Chain	Length	Quality of chain	
4	B9	72	39%	21%
5	BA	206	81%	19%
6	BB	153	20%	
7	BC	216	27%	
1		140	5%	5%
8	BD	148	78%	22%
9	BE	256	95%	5%
10	BF	250	72%	28%
11	BG	161	76%	24%
12	BH	188	5% 59% 41	%
13	BI	65	8%	14%
14	BJ	92	50% 50%	
15	BK	188	51% 49%	
16	BL	305	78%	22%
17	BM	348	88%	12%
18	BN	311	81%	19%
19	BO	267	48%	24%
20	BP	261	46%	19%
21	BO	192	81%	0%
21	BB	178	•	370
22		145	99%	
23	BS	145	79%	21%
24	BT	296	98%	•
25	BU	251	88%	12%
26	BV	175	88%	12%
27	BW	180	80%	20%
28	BX	292	6% 77%	23%



Conti	nued fron	n previous	page	
Mol	Chain	Length	Quality of chain	
29	BY	149	94%	6%
30	ΒZ	205	79%	21%
31	Ba	123	76%	24%
32	Bb	112	90%	10%
33	Bc	138	59%	41%
34	Bd	128	52%	48%
35	Be	102	91%	• 8%
36	Bf	206	71%	29%
37	Bg	222	73%	27%
38	Bh	196	82%	• 17%
39	Bi	439	88%	12%
40	Bj	325	50%	50%
41	Bl	103	37% 63	%
42	Bm	423	93%	7%
43	Bn	380	93%	7%
44	Bo	338	87%	13%
45	Вр	206	71%	29%
46	Bq	137	91%	9%
47	Br	142	70%	30%
48	Bs	215	70%	30%
49	Bt	332	86%	14%
50	Bu	306	78%	• 21%
51	Bv	279	85%	15%
52	Bw	212	35% 74%	26%
53	Bx	166	81%	19%



Conti	nued fron	n previous	page							
Mol	Chain	Length	Quality of chain							
54	By	158	70%		30%					
55	Bz	128	75%	•	24%					
56	AG	71	55%		23%					
57	Aa	484	79%		21%					



2 Entry composition (i)

There are 63 unique types of molecules in this entry. The entry contains 113095 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.

Mol	Chain	Residues		Aton	ıs		AltConf	Trace
1	R1	46	Total	С	Ν	0	0	0
		40	354	228	56	70	0	0
1	Bu	20	Total	С	Ν	0	0	0
	D2	52	257	168	40	49	0	0
1	D3	20	Total	С	Ν	0	0	0
	1 D9	52	257	168	40	49	0	
1	R/	21	Total	С	Ν	0	0	0
1	D4	51	245	159	39	47	0	0
1	R5	21	Total	С	Ν	0	0	0
	D0	51	245	159	39	47	0	0
1	R6	21	Total	С	Ν	0	0	0
1	D0	В0 31	245	159	39	47	U	U

• Molecule 1 is a protein called 39S ribosomal protein L12, mitochondrial.

• Molecule 2 is a RNA chain called E-site tRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	Β7	3	Total 62	C 28	N 11	O 20	Р 3	0	0

• Molecule 3 is a RNA chain called 16S rRNA.

Mol	Chain	Residues		1	AltConf	Trace			
3	B8	1558	Total 33070	C 14843	N 5963	O 10706	Р 1558	0	0

• Molecule 4 is a RNA chain called CP Val-tRNA(Val).

Mol	Chain	Residues		\mathbf{A}	toms	AltConf	Trace		
4	B9	72	Total 1524	C 685	N 269	0 498	Р 72	0	0

There are 2 discrepancies between the modelled and reference sequences:



Chain	Residue	Modelled	Actual	Comment	Reference
B9	70	С	G	conflict	GB NC_012920.1
B9	72	А	U	conflict	GB NC_012920.1

• Molecule 5 is a protein called 39S ribosomal protein L22, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	ВА	166	Total 1369	C 875	N 254	0 233	${ m S} 7$	0	0

• Molecule 6 is a protein called 39S ribosomal protein L23, mitochondrial.

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

• Molecule 7 is a protein called 39S ribosomal protein L24, mitochondrial.

Mol	Chain	Residues		Ate	oms			AltConf	Trace
7	BC	205	Total 1676	C 1068	N 298	O 302	S 8	0	0

• Molecule 8 is a protein called 39S ribosomal protein L27, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
8	BD	116	Total 904	C 577	N 171	0 153	${ m S} { m 3}$	0	0

• Molecule 9 is a protein called 39S ribosomal protein L28, mitochondrial.

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

• Molecule 10 is a protein called 39S ribosomal protein L47, mitochondrial.

Mol	Chain	Residues		At	oms		AltConf	Trace	
10	BF	181	Total 1556	C 995	N 298	O 259	$\frac{S}{4}$	0	0

• Molecule 11 is a protein called 39S ribosomal protein L30, mitochondrial.



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

• Molecule 12 is a protein called 39S ribosomal protein L32, mitochondrial.

Mol	Chain	Residues		At	oms	AltConf	Trace		
12	BH	110	Total 898	C 554	N 176	0 162	S 6	0	0

• Molecule 13 is a protein called 39S ribosomal protein L33, mitochondrial.

Mol	Chain	Residues		Atc	\mathbf{ms}	AltConf	Trace		
13	BI	56	Total 464	C 296	N 89	O 77	${S \over 2}$	0	0

• Molecule 14 is a protein called 39S ribosomal protein L34, mitochondrial.

Mol	Chain	Residues		Ato	\mathbf{ms}			AltConf	Trace
14	BJ	46	Total 377	C 233	N 83	O 60	S 1	0	0

• Molecule 15 is a protein called 39S ribosomal protein L35, mitochondrial.

Mol	Chain	Residues		At	oms	AltConf	Trace		
15	BK	95	Total 832	C 539	N 162	0 128	${ m S} { m 3}$	0	0

• Molecule 16 is a protein called 39S ribosomal protein L2, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
16	BL	238	Total 1859	C 1157	N 376	0 317	${ m S} 9$	0	0

• Molecule 17 is a protein called 39S ribosomal protein L3, mitochondrial.

Mol	Chain	Residues		At		AltConf	Trace		
17	BM	305	Total 2406	C 1545	N 418	0 432	S 11	0	0

• Molecule 18 is a protein called 39S ribosomal protein L4, mitochondrial.



Mol	Chain	Residues		At	oms			AltConf	Trace
18	BN	252	Total 2031	C 1305	N 370	O 350	S 6	0	0

• Molecule 19 is a protein called 39S ribosomal protein L9, mitochondrial.

Mol	Chain	Residues		Ate	AltConf	Trace			
19	BO	202	Total 1661	C 1067	N 304	O 286	$\frac{S}{4}$	0	0

• Molecule 20 is a protein called 39S ribosomal protein L10, mitochondrial.

Mol	Chain	Residues		Atoms					Trace
20	BP	212	Total 1695	C 1088	N 304	O 292	S 11	0	0

• Molecule 21 is a protein called 39S ribosomal protein L11, mitochondrial.

Mol	Chain	Residues		At	\mathbf{oms}	AltConf	Trace		
21	BQ	175	Total 1330	C 847	N 237	0 244	${ m S} { m 2}$	0	0

• Molecule 22 is a protein called 39S ribosomal protein L13, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
22	BR	177	Total 1455	C 936	N 259	0 253	S 7	0	0

• Molecule 23 is a protein called 39S ribosomal protein L14, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
23	BS	115	Total 890	C 559	N 171	0 155	${ m S}{ m 5}$	0	0

• Molecule 24 is a protein called 39S ribosomal protein L15, mitochondrial.

Mol	Chain	Residues		Ate	AltConf	Trace			
24	BT	291	Total 2327	C 1483	N 430	0 408	S 6	0	0

• Molecule 25 is a protein called 39S ribosomal protein L16, mitochondrial.



Mol	Chain	Residues		At	AltConf	Trace			
25	BU	222	Total 1786	C 1143	N 326	O 307	S 10	0	0

• Molecule 26 is a protein called 39S ribosomal protein L17, mitochondrial.

Mol	Chain	Residues		Atoms					Trace
26	BV	154	Total 1259	C 792	N 241	O 219	${ m S} 7$	0	0

• Molecule 27 is a protein called 39S ribosomal protein L18, mitochondrial.

Mol	Chain	Residues		At	oms	AltConf	Trace		
27	BW	144	Total 1173	C 733	N 224	0 211	${f S}{5}$	0	0

• Molecule 28 is a protein called 39S ribosomal protein L19, mitochondrial.

Mol	Chain	Residues		Ate	oms			AltConf	Trace
28	BX	224	Total 1866	C 1194	N 330	O 333	S 9	0	0

• Molecule 29 is a protein called 39S ribosomal protein L20, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
29	BY	140	Total 1154	C 732	N 231	0 187	S 4	0	0

• Molecule 30 is a protein called 39S ribosomal protein L21, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
30	ΒZ	161	Total 1293	C 835	N 227	0 227	${f S}$ 4	0	0

• Molecule 31 is a protein called 39S ribosomal protein L52, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
31	Ba	94	Total 745	C 463	N 144	0 136	${ m S} { m 2}$	0	0

• Molecule 32 is a protein called 39S ribosomal protein L53, mitochondrial.



Mol	Chain	Residues		At	oms	AltConf	Trace		
32	Bb	101	Total 774	C 479	N 148	0 142	${ m S}{ m 5}$	0	0

• Molecule 33 is a protein called 39S ribosomal protein L54, mitochondrial.

Mol	Chain	Residues		At	oms	AltConf	Trace		
33	Bc	82	Total 688	С 437	N 120	0 128	${ m S} { m 3}$	0	0

• Molecule 34 is a protein called 39S ribosomal protein L55, mitochondrial.

Mol	Chain	Residues		Ate	oms	AltConf	Trace		
34	Bd	66	Total 550	C 338	N 114	O 96	$\begin{array}{c} \mathrm{S} \\ \mathrm{2} \end{array}$	0	0

• Molecule 35 is a protein called Ribosomal protein 63, mitochondrial.

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

• Molecule 36 is a protein called Peptidyl-tRNA hydrolase ICT1, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
36	Bf	147	Total 1205	C 748	N 228	0 225	${S \atop 4}$	0	0

• Molecule 37 is a protein called Growth arrest and DNA damage-inducible proteins-interacting protein 1.

Mol	Chain	Residues		At	oms	AltConf	Trace		
37	Bg	161	Total 1350	C 841	N 260	0 244	${ m S}{ m 5}$	0	0

• Molecule 38 is a protein called 39S ribosomal protein S18a, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
38	Bh	162	Total 1322	C 839	N 252	0 223	S 8	0	0

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



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

• Molecule 40 is a protein called 39S ribosomal protein L1, mitochondrial.

Mol	Chain	Residues		At	oms	AltConf	Trace		
40	Bj	164	Total 1327	C 856	N 217	O 250	$\frac{S}{4}$	0	0

• Molecule 41 is a protein called 39S ribosomal protein L36, mitochondrial.

Mol	Chain	Residues		Atc	\mathbf{ms}	AltConf	Trace		
41	Bl	38	Total 342	C 217	N 72	O 49	${S \atop 4}$	0	0

• Molecule 42 is a protein called 39S ribosomal protein L37, mitochondrial.

Mol	Chain	Residues		At	AltConf	Trace			
42	Bm	394	Total 3210	C 2073	N 560	0 566	S 11	0	0

• Molecule 43 is a protein called 39S ribosomal protein L38, mitochondrial.

Mol	Chain	Residues		At	oms			AltConf	Trace
43	Bn	354	Total 2948	C 1881	N 525	O 533	S 9	0	0

• Molecule 44 is a protein called 39S ribosomal protein L39, mitochondrial.

Mol	Chain	Residues		At	AltConf	Trace			
44	Во	294	Total 2390	C 1529	N 405	0 438	S 18	0	0

• Molecule 45 is a protein called 39S ribosomal protein L40, mitochondrial.

Mol	Chain	Residues		At	AltConf	Trace			
45	Вр	147	Total 1243	C 790	N 218	0 233	$\begin{array}{c} \mathrm{S} \\ \mathrm{2} \end{array}$	0	0

• Molecule 46 is a protein called 39S ribosomal protein L41, mitochondrial.



Mol	Chain	Residues		At	oms			AltConf	Trace
46	Bq	124	Total 997	C 644	N 170	0 181	${ m S} { m 2}$	0	0

• Molecule 47 is a protein called 39S ribosomal protein L42, mitochondrial.

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

• Molecule 48 is a protein called Large ribosomal subunit protein mL43.

Mol	Chain	Residues		At	oms			AltConf	Trace
48	Bs	151	Total 1196	С 744	N 231	0 218	${ m S} { m 3}$	0	0

There is a discrepancy between the modelled and reference sequences:

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

• Molecule 49 is a protein called 39S ribosomal protein L44, mitochondrial.

Mol	Chain	Residues		Ate	oms			AltConf	Trace
49	Bt	286	Total 2299	C 1470	N 397	0 423	S 9	0	0

• Molecule 50 is a protein called 39S ribosomal protein L45, mitochondrial.

Mol	Chain	Residues		At	AltConf	Trace			
50	Bu	241	Total 1985	C 1273	N 340	O 359	S 13	0	0

• Molecule 51 is a protein called 39S ribosomal protein L46, mitochondrial.

Mol	Chain	Residues		At	AltConf	Trace			
51	Bv	238	Total 1931	C 1222	N 339	0 364	S 6	0	0

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



Mol	Chain	Residues		At	AltConf	Trace			
52	Bw	157	Total 1252	C 799	N 207	O 242	$\frac{S}{4}$	0	0

• Molecule 53 is a protein called 39S ribosomal protein L49, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
53	Bx	134	Total 1113	C 719	N 193	O 199	${S \over 2}$	0	0

• Molecule 54 is a protein called 39S ribosomal protein L50, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
54	Ву	110	Total 895	C 568	N 156	0 168	${ m S} { m 3}$	0	0

• Molecule 55 is a protein called 39S ribosomal protein L51, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
55	Bz	97	Total 828	C 532	N 165	0 127	${S \atop 4}$	0	0

• Molecule 56 is a RNA chain called P-site Met-tRNA(Met).

Mol	Chain	Residues	Atoms					AltConf	Trace
56	AG	71	Total 1504	C 674	N 264	O 495	Р 71	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
AG	69	C	-	insertion	GB NC_012920.1
AG	70	С	-	insertion	GB NC_012920.1

• Molecule 57 is a protein called Peptide chain release factor 1, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
57	Aa	381	Total 3114	C 1940	N 569	O 592	S 13	0	0

There are 41 discrepancies between the modelled and reference sequences:



Chain	Residue	Modelled	Actual	Comment	Reference
Aa	311	ALA	GLY	engineered mutation	UNP 075570
Aa	312	ALA	GLY	engineered mutation	UNP 075570
Aa	446	GLY	-	expression tag	UNP 075570
Aa	447	GLY	-	expression tag	UNP 075570
Aa	448	SER	-	expression tag	UNP 075570
Aa	449	GLY	-	expression tag	UNP 075570
Aa	450	GLY	-	expression tag	UNP 075570
Aa	451	SER	-	expression tag	UNP 075570
Aa	452	GLY	-	expression tag	UNP 075570
Aa	453	GLY	-	expression tag	UNP 075570
Aa	454	SER	-	expression tag	UNP 075570
Aa	455	GLY	-	expression tag	UNP 075570
Aa	456	GLY	-	expression tag	UNP 075570
Aa	457	SER	-	expression tag	UNP 075570
Aa	458	GLY	-	expression tag	UNP 075570
Aa	459	GLY	-	expression tag	UNP 075570
Aa	460	SER	-	expression tag	UNP 075570
Aa	461	GLY	-	expression tag	UNP 075570
Aa	462	GLY	-	expression tag	UNP 075570
Aa	463	ASP	-	expression tag	UNP 075570
Aa	464	TYR	-	expression tag	UNP 075570
Aa	465	LYS	-	expression tag	UNP 075570
Aa	466	ASP	-	expression tag	UNP 075570
Aa	467	HIS	-	expression tag	UNP 075570
Aa	468	ASP	-	expression tag	UNP 075570
Aa	469	GLY	-	expression tag	UNP 075570
Aa	470	ASP	-	expression tag	UNP 075570
Aa	471	TYR	-	expression tag	UNP 075570
Aa	472	LYS	-	expression tag	UNP 075570
Aa	473	ASP	-	expression tag	UNP 075570
Aa	474	HIS	-	expression tag	UNP 075570
Aa	475	ASP	-	expression tag	UNP 075570
Aa	476	ILE	-	expression tag	UNP 075570
Aa	477	ASP	-	expression tag	UNP 075570
Aa	478	TYR	-	expression tag	UNP 075570
Aa	479	LYS	-	expression tag	UNP 075570
Aa	480	ASP	-	expression tag	UNP 075570
Aa	481	ASP	-	expression tag	UNP 075570
Aa	482	ASP	-	expression tag	UNP 075570
Aa	483	ASP	-	expression tag	UNP 075570
Aa	484	LYS	-	expression tag	UNP 075570

• Molecule 58 is POTASSIUM ION (three-letter code: K) (formula: K).



Mol	Chain	Residues	Atoms	AltConf
58	B8	30	Total K 30 30	0
58	BL	1	Total K 1 1	0
58	BT	1	Total K 1 1	0
58	Be	1	Total K 1 1	0
58	Bn	1	Total K 1 1	0

 $\bullet\,$ Molecule 59 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	AltConf
59	B8	216	Total Mg 216 216	0
59	BD	1	Total Mg 1 1	0
59	BL	3	Total Mg 3 3	0
59	BN	1	Total Mg 1 1	0
59	BO	1	Total Mg 1 1	0
59	BR	1	Total Mg 1 1	0
59	BT	1	Total Mg 1 1	0
59	BV	1	Total Mg 1 1	0
59	Bx	1	Total Mg 1 1	0
59	AG	1	Total Mg 1 1	0
59	Aa	1	$\begin{array}{ccc} \overline{\text{Total}} & \overline{\text{Mg}} \\ 1 & 1 \end{array}$	0





Mol	Chain	Residues	Atoms			AltConf	
60	B9	1	Total 7	$\begin{array}{c} \mathrm{C} \\ 5 \end{array}$	N 1	0 1	0

• Molecule 61 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	AltConf
61	BH	1	Total Zn 1 1	0
61	Bl	1	Total Zn 1 1	0

• Molecule 62 is FE-S-O HYBRID CLUSTER (three-letter code: FS2) (formula: $Fe_4O_3S_2$).



Mol	Chain	Residues	Atoms	AltConf
62	Bh	1	TotalFeS422	0

• Molecule 63 is METHIONINE (three-letter code: MET) (formula: $C_5H_{11}NO_2S$).



Mol	Chain	Residues	Atoms			AltConf		
63		1	Total	С	Ν	0	\mathbf{S}	0
03	05 AG	1	8	5	1	1	1	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 L12, mitochondrial



61 662 64 64 64 66 66 66 66 68	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	888 800 800 800 800 800 800 800
		н н жночургун 20072004ун 4440067904
ILE PRO ALA ALA ALA CLY GLU GLU ARG HIS PHE PHE THR	VAL LEU THR ALA ALA ALA ALA ALA ALA CLYS ALA CLYS CLYS CLYS CLS CLS CLS CLS CLS CLS CLS CLS CLS CL	ILE RSNU ASNU ASNU ASNU ASNU ASU ASU ASNU ASN
ALA GLU GLU LYS LYS LYS LYS ALA ALA GLU ALA VAL	GLY THR VAL LEU GLU GLU	
• Molecule 1: 3	39S ribosomal protein L12, mitoo	chondrial
Chain B4:	16% 16%	84%
MET LEU LEU ALA ALA ALA ALA ALA PRO PRO LEU TRP CLY	PRO CYS LEU GLY LEU ARG ALA ALA ALA ALA ALA ARG ARG CYS CYS CYS CYS CYS CYS	HIS ARG SER SER SER SER CLV CLV CVS CVS CVS CVS CVS CVS CVS CVS CVS CV
Pe1 Pe2 K63 C65 Q65 C65 C65 C65 C65 C65 C65 C65 C65 C65 C	069 171 171 171 873 873 174 1775 1775 1775 1776 1776 1777 1776 1776 1777 1776 1777 1776 1776 1777 1776 1777 1776 1776 1777 1776 1777 1776 1777 1776 1777 1776 1777 1777 1776 1777 1777 1776 1777 1777 1776 1777 1776 1777 1785 1861 1862 1861 1862 1861 1862	K88 K89 L190 K91 K91 K91 K91 K91 K81 K87 K12 K12 K12 K12 K12 K12 K12 K12 K12 K12
ILE PRO ALA ALA GLU GLU HIS PHE THR THR	VAL VAL THR THR THR THR AG AC AC AC AC AC AC AC AC AC AC AC AC AC	ILE LEU VAL VAL ALA ALA ALA CLVS CLVS CLVS CLV CLVS CLV CLV CLV ALA ASN ASN ALA ASN ALA ASN ASN ALA ASN ASN ASN CLV
ALA GLU LYS LYS LYS LYS ALA ALA GLU GLU VAL	GLY GLY THR VAL LEU GLU	
• Molecule 1: 3	39S ribosomal protein L12, mitoo	chondrial
Chain B5:	16%	84%
MET LEU PRO ALA ALA ALA ARG PRO LEU TRP CUY	PRO CYS CYS CYS CILU CYS CYS ALA ALA ALA ALA ARG CLU CYS CYS CYS CYS CYS CYS CYS CYS CYS CYS	HIS MET MET AET SER SER CLY GLN GLN GLN ALA ALA ALA ALA ALA ALA ALA ALA ALA CYS GLU CYS GLU CYS GLU TYR TYR
P61 P62 K63 F64 Q65 Q65 L67 L67	069 171 171 172 172 175 175 176 177 176 177 179 880 181 182 183 183 183 183 183 183 183 183 183 183	K38 190 190 190 190 190 190 190 190
ILE PRO ILYS LYS GLU ARG HIS PHE THR	VAL VAL THR THR THR THR ALEU VAL VAL VAL VAL CYS UVS CVS CVS CVS CVS CVS CVS CVS CVS CVS C	ILE LEU VAL CALA ALA ALA ALA CLU CLU CLU CLU CLU CLU CLU CLU CLU CLU
ALA GLU CVS GLU LVS LVS ALA ALA CLU GLU ALA VAL	GLY GLY THR VAL LEU GLU	
• Molecule 1: 5	39S ribosomal protein L12, mitoo	chondrial
Chain B6:	16%	84%
MET LEU PRO ALA ALA ALA ARG PRO FRO CLY GLY	PR0 CYS CYS CYS CYS CYS CYS ALA ALA ALA ALA ALA ARG CYS CYS CYS CYS CYS CYS CYS CYS CYS CYS	HIS MET MET AET SER GLV GLV GLV GLV ALA ALA ALA ALA ALA ALA ALA ALA ALA A
P61 P62 K63 164 Q65 C66 L67 V68	0699 DT70 A/Y2 S73 S73 S73 LT75 LT75 LT75 S800 S800 D81 L82 E84 E84 E84 E84 E84 K87	K88 T39 L1LE L1LE L1LE L1LE CLI ALA ALA ALA ALA ALA ALA ALA ALA ALA A
ILE PRO ALA LYS GLU GLU ARG HIS THR THR	VAL LEU THR ARG GLU GLU ARD PRO ASP VAL LYS LYS LYS LYS CLU CYS CLU CYS CLU CYS CLU CYS CLU CYS CLU CYS CLU CYS CLU CYS CU CYS CU CYS CU C CU C CU C CU C	ILLE VAL VAL ASN VAL ASN CLYS CLYS CLYS CLU CLS CLU CLU CLU CLU CLU CLU CLU CLU CLU CLU



ALA GLU LYS CLYS LYS ALA ALA ALA CLEU GLU GLV VAL VAL VAL VAL VAL CLEU GLU GLU

• Molecule 2: E-site tRNA





• Molecule 5:	39S ribosomal protein L22, mitochondrial		
Chain BA:	81%	19%	
MET ALA ALA ALA ALA LEU CLY GLY GLY	TRP TRP TRP TILE HILE HILE ASN ASN ASN ASN ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	L5 / C29 / C	
• Molecule 6:	39S ribosomal protein L23, mitochondrial		
Chain BB:	99%		
MET A2 L28 E113 E113 D115 E116	S117 P118 E119 C128 S121 A122 A122 D125 L126 T126 T126 T126 T126 T126 T126 T126 T	G152	
• Molecule 7:	39S ribosomal protein L24, mitochondrial		
Chain BC:	95%	5%	
MET ARG SEE SEE ALA ALA ALA ALA	Rata K12 V13 T14 L15 R33 R33 R33 R50 R50 R51 R52 R51 R52 R51 R51 R51 R51 R51 R51 R51 R51	P103 P104 H117 H117 H118 H121 P125 M126 M126	R128 K129 F131 E132 E132 F137 F136 F137 F138 F139 F139 F139
C1 41 E1 42 R1 43 S1 47 T1 48 R1 49 S1 50	R152 R155 1153 R156 P157 P157 P157 P157 P158 P157 P157 P158 P157 P167 P163 P165 P165 P165 P165 P167 P168 P169 P172 P172 P184 P184 <t< td=""><td></td><td></td></t<>		
• Molecule 8:	39S ribosomal protein L27, mitochondrial		
Chain BD:	78%	22%	
MET ALA SER VAL VAL LEU ALA LEU ARG ARG	TARA TARA ALA ALA ALA ALA LEU LEU FRO FRO FRO FRO FRO ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	1 48	
• Molecule 9:	39S ribosomal protein L28, mitochondrial		
Chain BE:	95%	5%	
MET P2 E33 E34 E35 R36 E179	D1 80		
• Molecule 10	39S ribosomal protein L47, mitochondrial		
Chain BF:	72%	28%	
MET ALA ALA ALA ALA GLY CLY LEU LEU LEU LEU CYS	ARKA VALC SER SER SER ALA LLEU LLEU LLEU LLEU THR VAL ARKA CLA VAL ARKA CLA VAL ARKA CLA VAL ARKA CLA VAL CLA VAL CLEU VAL CLA VAL CLEU VAL VAL VAL VAL VAL VAL VAL VAL VAL VAL	PRO ASN VAL THR SER PHE HIS GLN TYR ARG LEU LEU LEU HIS THR	LEU SER



ARG LYS G63 D151 R162 R162 R198	K235 K237 L241 A242 A1A A1A A1A A1A A1A A1A A1A A1A A1A A1	
• Molecule 11:	39S ribosomal protein L30, mitochondrial	
Chain BG:	76%	24%
	• • •	_
MET ALA GLY CGLY LEU VAL VAL VAL CTRP	PR0 CLV CLV CLV CLV CLV CLV CLV CLV CLV CLV	HIS SER
• Molecule 12:	39S ribosomal protein L32, mitochondrial	
Chain BH:	59%	41%
MET ALA LEU LEU MET LEU VAL VAL VAL VAL SER SER	PR0 SER ALA ALA ARG CLT CLEU CLEU ARG CLT CLEU ARG CLU CLEU ARG CLU CLEU ARG CLU CLEU ARG CLU PR0 CLU PR0 CLU PR0 CLU PR0 ARG CLU PR0 ARG CLU PR0 ARG CLU PR0 C CLU PR0 C CLU PR0 C CLU PR0 C CLU PR0 C C C CLU PR0 C C C C C C C C C C C C C C C C C C C	CLY PRO ALA LEU LEU CLN CLN CLN CLN CLN CLN CLN CLN CLN CLN
ASP THR CLY CLY CLY SER ASN ASN LEU	LEU LEU SER TILE TRP MET A79 E112 E163 Q169 Q170 Q170 Q170 M188 M188	
• Molecule 13:	39S ribosomal protein L33, mitochondrial	
Chain BI:	86%	14%
MET PHE LEU SER ALA PHE PHE PHE K10	811 813 133 136 166 133 13 13 13 13 13 13 13 13 13 13 13 13	
• Molecule 14:	39S ribosomal protein L34, mitochondrial	
Chain BJ:	50%	50%
MET ALA VAL LEU LEU GLY SER LEU LEU CLEU CLEU	THR SER SER ALA ALA ALA ALA CLEU CLU CLU CLU CLU CLU CLU CLU CLU CLU CL	ALA ARG GLY K47 H92
• Molecule 15:	39S ribosomal protein L35, mitochondrial	
Chain BK:	51%	49%
MET ALA ALA SER SER ALA ALA ALA VAL ABG	ALA ALA SER CLFU CLFU CLFU ARC ASN ASN ASN ASN ASN ASN ASN ASN ASN ASN	GLY ARG PHE SER SER TILE CLN TILE CLN TILE VAL VAL VAL SER SER SER SER SER SER SER
THR THR SER GLU ARN ASN LEU THR CYS GYS HIS	THR THR VAL LEU LEU ARS ARS ARS VAL LEU VAL LEU VAL LEU VAL LEU VAL LEU VAL LEU VAL LEU VAL LEU VAL VAL VAL LEU VAL	
• Molecule 16:	39S ribosomal protein L2, mitochondrial	
Chain BL:	78%	22%





• Molecule 17: 39S ribosomal protein L3, mitochondrial

	<u>.</u>			
Chain BM:		88%	12%	I
		N N N N N N N N N N N N N N N N N N N	4 4 40 40 10 1 24 4 4	48 ◆ ◆ ◆
8 5 5 5 4 5 5 5 5 5		26 H LE G A V R LE H LI H H H H H H H H H H H H H H H H H	K1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	EC EC A3
• Molecule	18: 39S ribosomal protei	n L4, mitochondrial		
Chain BN:	•	81%	19%	
			** * * * *	
MET LEU GLN PHE VAL ARG ALA GLY ALA	ARG ALA ALA ALA ALA ALBU ARG CLY CLY CLY CLY CLY CLY CLY CLU CLU	ALA ALA ALA ALA ALA ALA ALA ALA ALA CLU CLU CLU CLU CLU CLU CLU CLU	P444 E45 E52 E52 E52 E73 E73 E73 E73 E73 E73 E73 E73 E73 E73	PRO HIS ALA THR GLN
GLY PRO ALA ALA ALA THR PRO TYR HIS CYS				
• Molecule	19: 39S ribosomal protei	n L9, mitochondrial		
	48%			
Chain BO:	76	5%	24%	
HET LLA PRO PRO TAL THR LLA PRO PRO	LIA LIA JEU LEU JEU LEU LIA LIA LEU LEU LEU LEU LA LA	LEU LEU LEG LEG LEG LLA LLA LLA LEU LEU LEU LEU LEU LEU LEU	HE HE JEU JEU SER LEV SER SER SER SER	
~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	044114404041140020			
	110 113 122 137 138 138 138 138 141 141	143 145 146 146 147 148 149 150 150	155 157 157 157 158 159 161 161 162 163	166 167 168 168 169 171 172 173 173 175 175
<u>й</u> ст щ с	o o o a a a a a a a a a a a a a a a a a	и и и и и и и и и и и и и и и и и и и	H O H X A O H A H A X	F T X N O K T M P G K
8 8 8 8 8 8 9 0 0 0 0 0 0 0 0 0 0 0 0 0			22 21 22 25 25 25 25 25 25 25 25 25 25 25 25	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
		22 22 22 22 22 22 22 22 22 22 22 22 22	12 12 12 12 12 12 12 12 12 12 12 12 12 1	12 12 12 12 12 12 12 12 12 12 12 12 12 1

• Molecule 20: 39S ribosomal protein L10, mitochondrial







• Molecule 25:	39S ribosomal protein L16, mitochondrial	
Chain BU:	88%	12%
MET TRP ARG LEU LEU LEU ALA ALA ALA ALA ALA	LEU LEU LEU ARG VAL ARG SER SER SER SER ALA ALA ALA ALA CLS CLS CLS CLS CLS CLS CLS CLS CLS CLS	C167 E168 K200
• Molecule 26:	39S ribosomal protein L17, mitochondrial	
Chain BV:	88%	12%
MET ARG LEU SER VAL ALA ALA ALA I9	R157 Q158 S159 C160 C160 A162 S183 S182 S183 S183 S183 S183 S183 S183 S183 S183	
• Molecule 27:	39S ribosomal protein L18, mitochondrial	
Chain BW:	80%	20%
MET ALA ALA LEU ARG SER ARG SER ARG CTRP CLY LEU	SER SER VAL CYS ARG CYS ARG CYS ARG CYS ARG CYS ARG ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	E180
• Molecule 28:	39S ribosomal protein L19, mitochondrial	
Chain BX:	77%	23%
MET ALA ALA ALA ALA CYS CYS CYS ALA ALA ALA HIS HIS	ALA MET GLY MET GLY MET GLY MLA ALA ALA ALA ALA ALA ALA ALA ALA ALA	GLU PRO GLY ALA ALA PLE GLN PRO PRO PRO PRO PRO
VAL TLE VAL ASP LYS HTS ARG PRO ETO	P71 E72 R73 R74 R74 C209 P211 N208 P211 N212 P211 N212 P211 N212 P211 R291 R291 S292 S292	
• Molecule 29:	39S ribosomal protein L20, mitochondrial	
Chain BY:	94%	6%
MET VAL PHE LEU THR ALA GLN TRP TRP	C133 C135 E137 H149	
• Molecule 30:	39S ribosomal protein L21, mitochondrial	
Chain BZ:	79%	21%
MET ALA ALA SER SER SER LEU THR THR THR CEU	ALA LEU ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	E78 E78

• Molecule 31: 39S ribosomal protein L52, mitochondrial



Chain Ba:	76%		24%	
MET ALA ALA ALA ALA LEU CLEU CLEU CLEU CLEU ARG ARG ARG ARG ARG CYS SER SER VAL	ALA ALA TRP A23 E100 E101 Q102 R103 K104 Q105 E106 H107	A108 A114 S115 LIYS LIYS SER PRO PRO PRO SER CLN		
• Molecule 32: 39S riboso	mal protein L53, mit	ochondrial		
Chain Bb:	90%		10%	
MET A2 L5 L5 A6 R7 G9 C9 C10 R11 E24 K14 K14 K14 K25	v3/ E40 K41 L47 N48 C49 S50 V51 T52 A53 A53	V55 H57 D58 C59 S60 S60 V64 V64 L67	F 08 669 070 671 H72 R73	A95 A98 A100 G101 G17 GLY A10 A12 A12 A12 A12 A12 A12
THR GLY ARG				
• Molecule 33: 39S riboson	mal protein L54, mit	ochondrial		
Chain Bc:	59%	41%		
MET ALA LIAR LIYBS LIFU ARG ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	GLU LEU LEU ASN ASN ASN ALA ALA ALA ALA ARP	TYR ALA LIYS PRO PRO PRO PRO PRO ALA ALA ALA ALA CLY SER CLY	GLY ALA VAL THR SER GLU ASS CLS6	K57 569 960
V61 C62 T63 D64 P65 P65 P65 P65 P65 T69 T70 Y71 Y71 Y71 Y71 Y71 Y72 Y75	N76 177 778 778 778 681 681 681 681 983 983 785 785 785	P88 P88 A90 F91 F93 F93 F97 F97	M99 N100 L101 G102 K105 T106	E100 E100 E100 E110 P111 E113 E113 E114 E116 E116 ARG
• Molecule 34: 39S riboson	mal protein L55, mit	ochondrial		
Chain Bd:	52%	48%		
MET ALA ALA ALA ALA ALA CALA GLY CLEU CLEU CLEU CLEU CLEU CLEU CLEU CLEU	CLY CLA ALA ALA ARG ARG ARG LEU HIS SER THR SER ALA ALA ALA	S33 V43 Q46 V67 K58 K58 K58 C05	D60 G61 S62 S62 R69 F71 F71	R73 M74 L75 A776 P778 P778
D80 L81 D32 C85 C85 C85 C85 C85 C85 C86 C88 C89 C83 C93 C93 C93 C93 C93 C93 C93 C93 C93 C9	K95 R96 E97 A98 A98 CUP CLEU CLEU ARC CLU CLU CLU	GLU LEU SER ASP ASP ASP ASP LEU VAL CLU CLU ARC ARC CLN	PHE TRP THR ARG THR LYS LYS	
• Molecule 35: Ribosomal	protein 63, mitochor	ndrial		
Chain Be:	91%		• 8%	
MET PHE LEU TER ALLA ALLA RI RI RI S102				
• Molecule 36: Peptidyl-th	RNA hydrolase ICT1	, mitochondrial		
Chain Bf:	71%		29%	



MET ALA ALA ALA ALA ALA ARG CYS CYS CYS CYS CYS CYS CYS ARG GLY VAL ARG ALA ALA ALA ALA ALA	PRO PRO PRO ALA ALA CYS CYS PRO ALA ALA	HIS LVS CLN CLN CLN CLN ASP ASP CLY THR E38 E31	G54 S55 D56 R60 V61 P62 M63	Ge4 LYS CLN GLN ALA ASP S70 D71	R76	
R83 S84 S85 S85 S85 C45 C42 C42 C42 C42 C42 C42 A50 A50 A50 A50 A50 A50 A50 A50 A50 A50	A106 + E109 + E113 + E1	T164 P165 K166 E167 P168 K170 E171 E171	V173 K174 L175 R179 E186	H194 8195 ALA VAL LYS THR SER ARG	ARG VAL ASP MET ASP	
• Molecule 37: Growth a	rrest and DNA	damage-inducib	le proteins-inte	eracting prot	ein 1	
Chain Bg:	73%		27%			
MET ALA ALA ALA ALA ALA VAL ALA ALA CLEU CLEU CLEU CLEU ALA ALA ALA ALA ALA	PRO GLY SER SER ARG GLY Y25 R28 R28 R28	R133 R149 R155 R153 R153 R130	895 6110 61111 611110 611100000000	q138 q139 R140 E141 W142 W143 E144	K145 A146 Q147 A148 D149	
K150 E151 R152 A154 A155 A155 A155 A155 A155 A155 C155 C155	L164 C165 7165 7165 0167 7168 1169 P170 P170 R171	A173 R174 F175 Q176 E177 L178 Q180 Q180	L182 E183 K184 K185 GLU ARG LVS LVS LVS LFU LFU LTVS	GLU GLU GLU GLN LYS LYS LYS GLN	ALA ARG ALA ALA ALA ALA ALA ALA	ALA
VAL GLN GLN ASP ARA PRO ALA ALA ALA ALA SER SER SER						
• Molecule 38: 39S ribose	omal protein S1	8a, mitochondri	al			
Chain Bh:	82%		• 17	7%		
MET ALA ALA ALA ALA LEU LEU CYS CYS CYS CYS CYS CYS CYS CYS CYS CYS	ALA GLY GLY ALA ALA ALA THR SER SER ARG	PR0 ALA ALA ARG GLY F35 E40 Q42 E43	G44 K45 E50 C70 E137 G138	V139		
• Molecule 39: 39S ribose	omal protein S3	0, mitochondria	1			
Chain Bi:	88%	ó		12%		
MET ALA ALA ALA ALA ALA ALA ALA ARG CYS CYS CYS CYS CYS CLU CLU CLU CLU CLU CLU CLU CLU CLU	THR ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	THR THR CYS CYS CYS CYS GLN ASP ALA T39 P40 P41	A42 A42 E74 A123 A123 E124 P125 GUU		A136	
L137 D138 L139 A140 D148 D148 R160 R160 R161 D234 D234	P258 K265 N386 E403 D407	D409 D415 K430 E431 E432 E432 SER SCR	LEU LEU GLU ASN			
• Molecule 40: 39S ribose	omal protein L1	, mitochondrial				
Chain Bj:	50% 50%	_	50%			
MET ALA ALA ALA ALA ALA ARG CYS CYS CYS ALA ALA ALA CLN ALA ALA ALA ALA ALA ALA ALA ALA ALA A	LEU SER LYS LYS MET VAL TYR GLN THR SER LEU CVS	SER SER VAL ASN ASN ARG PRO ASN ARG	PHE ALA ALA ALA ALA ALA LYS SER LYS LYS	THR LYS LYS GLY ALA LYS GLU LYS		
	•••••	•••••	•••••			
T61 P62 D63 E644 K65 K66 D67 E68 D67 E68 D67 E68 D67 E68 D67 E68 I109 K71 I72 K73	Y75 P76 Y77 M78 M78 E79 C80 E81 E81 E83	D84 D85 V86 Y87 L88 K89 K89 R90 R90 R90 Y92	P93 R94 195 196 Y97 E98 E98 V99 E100	K101 A102 V103 H104 L105 L105 K107	K106 F109 Q116 L111 D113	7115 8116 8116 8117 8117 8118 9119 8119 8119





MET MET ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	K121 ◆
N1 43 N1 65 N1 68 N1 98 N1 98 N1 98 N1 98 N1 98 N1 98 N1 93 N1 94 N2 54 N2 55 N2 55 N2 55 N2 55 N2 55 N2 55 N2 54 N2 54	12386 9287 12289 9291
S292 H323 H323 H1A CLU CLU CLU CLU CLU CLU CLU CLU CLU CLU	
\bullet Molecule 45: 39S ribosomal protein L40, mitochondrial	
49% Chain Bp: 71% 29%	
MET NET NALA ALA ALA SER ALA SER SER ALA ALA ALA ALA ALA ALA ALA ALA ALA AL	
D61 D61 R62 R64 R65 R65 R65 R65 R65 R67 R70 R70 R71 R71 R72 R73 R74 R75 R74 R77 R74 R75 R75 R74 R74 R75 R75 R76 R179 R179 R190 R191 R193 R194 R195 R196 R191 R193 R194 R195 R196 R1910 R1910 R1011 P102 R101 R101 R101 R101 R101 R101 R101 R101	R113 R113 E132 R137 E141
L147 E148 E148 E148 E149 C1150 C1150 C1155 E153 S154 F155 A159 A159 A159 A159 A159 A159 F171 F163 F174 F170 F163 F174 F163 F163 F163 F163 F163 F174 F163 F171 F163 F171 F163 F171 F163 F171 F163 F171 F171 F171 F171 F171 F171 F171 F17	q201 V202 E203 PHE LYS ARG
• Molecule 46: 39S ribosomal protein L41, mitochondrial	
Chain Bq: 91% 9%	
MET VALL LEUU LLA ALLA ALLA ALLA ALLA ALLA AL	
\bullet Molecule 47: 39S ribosomal protein L42, mitochondrial	
Chain Br: 70% 30%	
MET ALA ALA ALA ALA ALA ALA ALA ALA ALA CVAL ITRP ITRP ITRP ITRP ITRP ITRP ITRP ITRP	
K 68 E 101 H 102 C 105 H 142 A ↓ ↓	
\bullet Molecule 48: Large ribosomal subunit protein mL43	
Chain Bs: 70% 30%	





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K203 F204 L205 G206 M207 P209 C210 G211 H212 Y213 Y213 T214	F215 K216 F217 P218 Q219 A220 M221 R222 T223 E224	S225 N226 L227 Q228 A229 K230 V231 F233 F233	F234 L237 L238 L239 T240 G241 G241 D242	F243 S244 Q245 A246 G247 N248	K249 G250 H251 H252 V253 W254	V255 T256 K257 D258 E259	L260 G261 D262 Y263
L264 K265 P266 K267 V268 V272 R273 R273 R273 F275 V276 V276	D278 ♦						
• Molecule 52: 39S r	ribosomal protein	L48, mitochondr	ial				
Chain Bw:	35% 74%		2	26%			
MET SER GLY THR LEU CLU CLU CVS LEU CVS CVS CVS CVS CVS CVS CVS THR ASN	TLE PHE LYS GLN ALA PHE SER LEU LEU LEU LEU ARC ARC ARC	SER GLY GLU LYE PRO LYE TYE SER VAL GLY GLY TLE	LEU LEU SER ILE SER ARC PRO Y48	A65 E66 E67 E67 LYS LYS LYS	LYS GLY VAL VAL		
GLU V77 R78 A79 A79 180 N81 L82 C83 C83 C83 C83 C83 C83 C83 C83 C83 C83	H94 L95 L95 A97 A97 E104 1119 Y125	A126	L137 Q138 Q149 G141 S142 K143	M144 L145 L146 D147 T151	L162 S163 A164 T165 F166 A167	E169 E172 E172	-
K187 E188 H189 E191 E191 E192 E193 F193 G196 R197 R197	K199 A200 R201 P202 E203 E205 E205 E205 E205	A209 K209 K211 K212 K212					
• Molecule 53: 39S r	ribosomal protein	L49, mitochondr	ial				
Chain Bx:	81	%		19%			
MET ALA ALA ALA ALA AET ARG ARG ARG ARG CLY ARG ARG TRP ARG TRP	GLY VAL GLN GLN ARG GLY CYS CYS GLY LEU LEU LEU SER SER GLN	THR GLN GLY PRO P33 P33 P33 P33 P33 P33 P34	E64 H65 D77 K134	D154			
• Molecule 54: 39S r	ribosomal protein	L50, mitochondr	ial				
Chain By:	70%		30%	6			
MET ALA ALA ALA ALA ARG SER SER SER SER CLY THR THR ARG ARG PHE PHE PHE	TRP THR VAL SER SER GLY THR PRO GLY CYS GLY FHC GLU TRP SER	ARG PHE ARG LYS CLU CLU CLU PRO PRO VAL VAL VAL CLU	THR VAL GLU GLU CIS CIS CLU PRO PRO	L50 V51 R58 E64 D65	868 R69 L70		
E71 E76 F78 F78 G79 S81 C193 S84 P83 S84 S84	W86 087 D88 E92 E92 D93 H103	D107 R122 L127 D128 Q135 D136	R137				
• Molecule 55: 39S r	ribosomal protein	L51, mitochondr	ial				
Chain Bz:	75%		• 2	24%			
MET ALA GLY ASN ASN LEU LEU CLY GLY GLY GLY ARG ARG ARG ARG ARG ARG ARG	TRP VAL PAO LEU ARG CYS CYS SER PHE SER SER CLY VAL VAL	PRO ARG LEU 132 V43 V43 V43 V128					
• Molecule 56: P-site	e Met-tRNA(Met))					





ASP ASP ASP LYS



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	41288	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 $(e^-/\text{\AA}^2)$	60	Depositor
Minimum defocus (nm)	600	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	81000	Depositor
Image detector	GATAN K3 $(6k \times 4k)$	Depositor
Maximum map value	4.267	Depositor
Minimum map value	-1.999	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.146	Depositor
Recommended contour level	0.75	Depositor
Map size (Å)	542.72, 542.72, 542.72	wwPDB
Map dimensions	512, 512, 512	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.06, 1.06, 1.06	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: OMG, 2MG, RSQ, OMU, K, ACE, ZN, SAC, MG, 1MA, PSU, FS2, AYA

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		Bond angles		
	Chain	RMSZ	# Z > 5	RMSZ	# Z > 5	
1	B1	0.23	0/358	0.34	0/486	
1	B2	0.23	0/259	0.31	0/350	
1	B3	0.21	0/259	0.34	0/350	
1	B4	0.21	0/246	0.34	0/331	
1	B5	0.21	0/246	0.33	0/331	
1	B6	0.21	0/246	0.33	0/331	
2	B7	0.13	0/68	0.69	0/103	
3	B8	0.21	1/36876~(0.0%)	0.68	1/57402~(0.0%)	
4	B9	0.30	1/1627~(0.1%)	0.66	0/2527	
5	BA	0.25	0/1403	0.47	0/1886	
6	BB	0.25	0/1274	0.50	0/1723	
7	BC	0.24	0/1721	0.48	0/2333	
8	BD	0.26	0/926	0.47	0/1244	
9	BE	0.24	0/2099	0.44	0/2837	
10	BF	0.23	0/1593	0.47	0/2136	
11	BG	0.23	0/1021	0.45	0/1378	
12	BH	0.24	0/913	0.50	0/1224	
13	BI	0.24	0/469	0.53	0/621	
14	BJ	0.23	0/383	0.52	0/507	
15	BK	0.24	0/853	0.50	0/1136	
16	BL	0.24	0/1896	0.53	0/2549	
17	BM	0.25	0/2475	0.45	0/3355	
18	BN	0.24	0/2090	0.48	0/2842	
19	BO	0.23	0/1698	0.47	0/2292	
20	BP	0.23	0/1731	0.45	0/2345	
21	BQ	0.24	0/1348	0.44	0/1813	
22	BR	0.24	0/1490	0.45	0/2021	
23	BS	0.23	0/905	0.50	0/1218	
24	BT	0.25	0/2381	0.50	0/3212	
25	BU	0.24	0/1833	0.49	0/2468	
26	BV	0.24	0/1283	0.50	0/1727	
27	BW	0.23	0/1199	0.50	0/1623	



Mal	Chain	Bo	ond lengths	B	ond angles
INIOI	Chain	RMSZ	# Z > 5	RMSZ	# Z > 5
28	BX	0.24	0/1908	0.48	0/2569
29	BY	0.24	0/1175	0.50	0/1572
30	ΒZ	0.24	0/1320	0.49	0/1789
31	Ba	0.24	0/760	0.46	0/1023
32	Bb	0.24	0/777	0.50	0/1048
33	Bc	0.23	0/707	0.44	0/960
34	Bd	0.23	0/558	0.57	0/749
35	Be	0.24	0/819	0.51	0/1097
36	Bf	0.23	0/1223	0.47	0/1641
37	Bg	0.23	0/1384	0.47	0/1869
38	Bh	0.24	0/1362	0.49	0/1846
39	Bi	0.24	0/3239	0.48	0/4400
40	Bj	0.24	0/1354	0.45	0/1831
41	Bl	0.24	0/350	0.54	0/461
42	Bm	0.25	0/3305	0.46	0/4502
43	Bn	0.25	0/3043	0.48	0/4140
44	Bo	0.24	0/2447	0.43	0/3310
45	Bp	0.24	0/1269	0.43	0/1708
46	Bq	0.25	0/1025	0.45	0/1379
47	Br	0.24	0/866	0.49	0/1174
48	Bs	0.24	0/1219	0.52	0/1651
49	Bt	0.24	0/2347	0.44	0/3171
50	Bu	0.24	0/2039	0.45	0/2759
51	Bv	0.23	0/1970	0.45	0/2658
52	Bw	0.24	0/1273	0.42	0/1716
53	Bx	0.25	0/1151	0.47	0/1569
54	By	0.23	0/918	0.43	0/1249
55	Bz	0.24	0/850	0.49	0/1135
56	AG	0.31	$1/\overline{1588}~(0.1\%)$	0.69	0/2466
57	Aa	0.24	0/3162	0.47	0/4253
All	All	0.23	3/118577~(0.0%)	0.56	$1/16839\overline{6}\ (0.0\%)$

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B8	1	G	OP3-P	-10.68	1.48	1.61
4	B9	1	С	OP3-P	-10.62	1.48	1.61
56	AG	1	А	OP3-P	-10.50	1.48	1.61

All (1) bond angle outliers are listed below:



Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
3	B8	1419	А	N1-C6-N6	-5.07	115.56	118.60

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	ntiles
1	B1	44/198~(22%)	44 (100%)	0	0	100	100
1	B2	30/198~(15%)	30 (100%)	0	0	100	100
1	B3	30/198~(15%)	29~(97%)	1 (3%)	0	100	100
1	B4	29/198~(15%)	29 (100%)	0	0	100	100
1	B5	29/198~(15%)	29 (100%)	0	0	100	100
1	B6	29/198~(15%)	29 (100%)	0	0	100	100
5	BA	164/206~(80%)	162 (99%)	2(1%)	0	100	100
6	BB	150/153~(98%)	148 (99%)	2(1%)	0	100	100
7	BC	203/216~(94%)	201 (99%)	2(1%)	0	100	100
8	BD	114/148~(77%)	113 (99%)	1 (1%)	0	100	100
9	BE	242/256~(94%)	240 (99%)	2(1%)	0	100	100
10	BF	179/250~(72%)	178 (99%)	1 (1%)	0	100	100
11	BG	120/161~(74%)	119 (99%)	1 (1%)	0	100	100
12	BH	$10\overline{8/188}~(57\%)$	108 (100%)	0	0	100	100
13	BI	54/65~(83%)	53~(98%)	1 (2%)	0	100	100



Mol	Chain	Analysed	Favoured	Allowed	Outliers	Perce	ntiles
14	BJ	44/92~(48%)	43~(98%)	1 (2%)	0	100	100
15	BK	93/188~(50%)	92 (99%)	1 (1%)	0	100	100
16	BL	236/305~(77%)	230~(98%)	6(2%)	0	100	100
17	BM	303/348~(87%)	300 (99%)	3~(1%)	0	100	100
18	BN	250/311~(80%)	246 (98%)	4(2%)	0	100	100
19	ВО	200/267~(75%)	193~(96%)	7~(4%)	0	100	100
20	BP	210/261~(80%)	205~(98%)	5(2%)	0	100	100
21	BQ	173/192~(90%)	172 (99%)	1 (1%)	0	100	100
22	BR	175/178~(98%)	174 (99%)	1 (1%)	0	100	100
23	BS	113/145~(78%)	113 (100%)	0	0	100	100
24	BT	289/296~(98%)	285 (99%)	4 (1%)	0	100	100
25	BU	220/251~(88%)	219 (100%)	1 (0%)	0	100	100
26	BV	152/175~(87%)	149 (98%)	3(2%)	0	100	100
27	BW	142/180~(79%)	139 (98%)	3(2%)	0	100	100
28	BX	222/292~(76%)	220 (99%)	2(1%)	0	100	100
29	BY	138/149~(93%)	137 (99%)	1 (1%)	0	100	100
30	BZ	159/205~(78%)	158 (99%)	1 (1%)	0	100	100
31	Ba	92/123~(75%)	91~(99%)	1 (1%)	0	100	100
32	Bb	99/112~(88%)	99 (100%)	0	0	100	100
33	Bc	80/138~(58%)	80 (100%)	0	0	100	100
34	Bd	64/128~(50%)	64 (100%)	0	0	100	100
35	Be	92/102~(90%)	92 (100%)	0	0	100	100
36	Bf	141/206~(68%)	140 (99%)	1 (1%)	0	100	100
37	Bg	159/222~(72%)	158 (99%)	1 (1%)	0	100	100
38	Bh	160/196~(82%)	158 (99%)	2(1%)	0	100	100
39	Bi	382/439~(87%)	377~(99%)	5(1%)	0	100	100
40	Bj	160/325~(49%)	156~(98%)	4(2%)	0	100	100
41	Bl	36/103~(35%)	36 (100%)	0	0	100	100
42	Bm	392/423~(93%)	388~(99%)	4 (1%)	0	100	100
43	Bn	$352/380~(\overline{93\%})$	343 (97%)	9~(3%)	0	100	100
44	Bo	292/338~(86%)	285 (98%)	7(2%)	0	100	100



Mol	Chain	Analysed	Favoured	Allowed	Outliers	Perce	entiles
45	Bp	145/206~(70%)	145 (100%)	0	0	100	100
46	Bq	122/137~(89%)	120 (98%)	2(2%)	0	100	100
47	Br	96/142~(68%)	96 (100%)	0	0	100	100
48	Bs	149/215~(69%)	146 (98%)	3 (2%)	0	100	100
49	Bt	282/332~(85%)	278~(99%)	4 (1%)	0	100	100
50	Bu	235/306~(77%)	233 (99%)	2 (1%)	0	100	100
51	Bv	236/279~(85%)	230~(98%)	6 (2%)	0	100	100
52	Bw	153/212~(72%)	151 (99%)	2 (1%)	0	100	100
53	Bx	132/166~(80%)	129 (98%)	3 (2%)	0	100	100
54	By	108/158~(68%)	107 (99%)	1 (1%)	0	100	100
55	Bz	95/128~(74%)	95 (100%)	0	0	100	100
57	Aa	379/484~(78%)	376 (99%)	3 (1%)	0	100	100
All	All	9277/12666~(73%)	9160 (99%)	117 (1%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent 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
1	B1	40/158~(25%)	40 (100%)	0	100 100
1	B2	31/158~(20%)	31 (100%)	0	100 100
1	B3	31/158~(20%)	31 (100%)	0	100 100
1	B4	30/158~(19%)	30 (100%)	0	100 100
1	B5	30/158~(19%)	30~(100%)	0	100 100
1	B6	30/158~(19%)	30 (100%)	0	100 100
5	BA	146/176~(83%)	146 (100%)	0	100 100
6	BB	134/135~(99%)	133 (99%)	1 (1%)	84 95
7	BC	183/191~(96%)	183 (100%)	0	100 100



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Mol	Chain	Analysed	Rotameric	Outliers	Perce	ntiles
8	BD	94/119~(79%)	94 (100%)	0	100	100
9	BE	220/229~(96%)	220 (100%)	0	100	100
10	BF	163/223~(73%)	162 (99%)	1 (1%)	86	96
11	BG	113/147~(77%)	113 (100%)	0	100	100
12	BH	99/164~(60%)	99 (100%)	0	100	100
13	BI	53/60~(88%)	53 (100%)	0	100	100
14	BJ	40/72~(56%)	40 (100%)	0	100	100
15	BK	88/166~(53%)	88 (100%)	0	100	100
16	BL	192/245~(78%)	192 (100%)	0	100	100
17	BM	260/290~(90%)	260 (100%)	0	100	100
18	BN	219/262~(84%)	219 (100%)	0	100	100
19	BO	182/228~(80%)	182 (100%)	0	100	100
20	BP	194/232~(84%)	194 (100%)	0	100	100
21	BQ	138/150~(92%)	138 (100%)	0	100	100
22	BR	154/155~(99%)	154 (100%)	0	100	100
23	BS	98/124~(79%)	98 (100%)	0	100	100
24	BT	246/249~(99%)	246 (100%)	0	100	100
25	BU	189/211~(90%)	188 (100%)	1 (0%)	88	96
26	BV	134/150~(89%)	134 (100%)	0	100	100
27	BW	126/155~(81%)	126 (100%)	0	100	100
28	BX	206/256~(80%)	206 (100%)	0	100	100
29	BY	118/126~(94%)	118 (100%)	0	100	100
30	BZ	146/180~(81%)	146 (100%)	0	100	100
31	Ba	74/97~(76%)	74 (100%)	0	100	100
32	Bb	83/90~(92%)	83 (100%)	0	100	100
33	Bc	76/116~(66%)	76 (100%)	0	100	100
34	Bd	59/113~(52%)	59 (100%)	0	100	100
35	Be	80/87~(92%)	79~(99%)	1 (1%)	69	90
36	Bf	135/181 (75%)	135 (100%)	0	100	100
37	Bg	$\overline{138/178}$ (78%)	138 (100%)	0	100	100
38	Bh	$147/\overline{169}~(87\%)$	146 (99%)	1 (1%)	84	95



Mol	Chain	Analysed	Rotameric	Outliers	Perce	ntiles
39	Bi	340/381~(89%)	339~(100%)	1 (0%)	92	98
40	Bj	150/287~(52%)	150 (100%)	0	100	100
41	Bl	37/89~(42%)	37~(100%)	0	100	100
42	Bm	353/368~(96%)	351~(99%)	2(1%)	86	96
43	Bn	313/332~(94%)	313~(100%)	0	100	100
44	Bo	270/303~(89%)	269 (100%)	1 (0%)	91	97
45	Bp	136/190~(72%)	136 (100%)	0	100	100
46	Bq	104/112~(93%)	104 (100%)	0	100	100
47	Br	96/133~(72%)	96 (100%)	0	100	100
48	Bs	132/185~(71%)	131~(99%)	1 (1%)	81	94
49	Bt	251/288~(87%)	251 (100%)	0	100	100
50	Bu	223/274~(81%)	221~(99%)	2(1%)	78	93
51	Bv	207/236~(88%)	207 (100%)	0	100	100
52	Bw	139/188~(74%)	139 (100%)	0	100	100
53	Bx	124/148~(84%)	124 (100%)	0	100	100
54	By	104/148~(70%)	104 (100%)	0	100	100
55	Bz	86/110 (78%)	85 (99%)	1 (1%)	71	91
57	Aa	338/427 (79%)	333 (98%)	5 (2%)	65	87
All	All	8322/10873 (76%)	8304 (100%)	18 (0%)	93	98

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
6	BB	28	LEU
10	BF	198	ARG
25	BU	59	VAL
35	Be	82	PHE
38	Bh	70	CYS
39	Bi	157	LEU
42	Bm	146	HIS
42	Bm	395	ARG
44	Bo	143	TRP
48	Bs	121	THR
50	Bu	81	THR
50	Bu	89	VAL
55	Bz	43	VAL



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	*	-	
Mol	Chain	\mathbf{Res}	Type
57	Aa	193	ARG
57	Aa	194	THR
57	Aa	272	MET
57	Aa	314	HIS
57	Aa	317	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (58) such sidechains are listed below:

Mol	Chain	Res	Type
1	B1	69	GLN
1	B1	83	ASN
1	B3	65	GLN
5	BA	126	HIS
10	BF	179	HIS
11	BG	64	HIS
11	BG	150	HIS
17	BM	63	GLN
17	BM	125	GLN
17	BM	137	ASN
17	BM	280	HIS
18	BN	103	GLN
19	BO	192	HIS
19	BO	239	ASN
20	BP	93	ASN
20	BP	142	ASN
20	BP	151	ASN
22	BR	56	HIS
23	BS	143	ASN
26	BV	100	GLN
26	BV	147	GLN
26	BV	154	GLN
27	BW	142	ASN
28	BX	158	GLN
28	BX	253	GLN
29	BY	149	HIS
30	BZ	118	ASN
33	Bc	82	GLN
34	Bd	65	HIS
35	Be	94	HIS
36	Bf	190	GLN
37	Bg	51	GLN
38	Bh	130	ASN



Mol	Chain	Res	Type
39	Bi	152	GLN
39	Bi	238	ASN
39	Bi	239	ASN
39	Bi	240	GLN
39	Bi	343	GLN
39	Bi	358	GLN
40	Bj	266	GLN
42	Bm	221	GLN
42	Bm	353	HIS
42	Bm	384	GLN
43	Bn	307	HIS
44	Bo	69	HIS
44	Bo	198	ASN
44	Bo	247	ASN
44	Bo	298	GLN
47	Br	46	ASN
48	Bs	66	ASN
48	Bs	129	GLN
48	Bs	131	HIS
51	Bv	67	GLN
51	Bv	212	HIS
51	Bv	252	HIS
57	Aa	124	GLN
57	Aa	314	HIS
57	Aa	368	GLN

5.3.3 RNA (i)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	B7	2/3~(66%)	1 (50%)	0
3	B8	1556/1561~(99%)	236~(15%)	1 (0%)
4	B9	71/72~(98%)	11 (15%)	0
56	AG	69/71~(97%)	11 (15%)	0
All	All	1698/1707~(99%)	259~(15%)	1 (0%)

All (259) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
2	B7	76	А
3	B8	2	С
3	B8	11	G



Mol	Chain	Res	Type
3	B8	19	С
3	B8	22	А
3	B8	23	С
3	B8	29	С
3	B8	30	U
3	B8	34	U
3	B8	38	А
3	B8	39	G
3	B8	41	С
3	B8	54	А
3	B8	57	А
3	B8	58	U
3	B8	62	С
3	B8	65	A
3	B8	78	G
3	B8	95	С
3	B8	107	А
3	B8	135	А
3	B8	137	U
3	B8	138	A
3	B8	147	С
3	B8	151	А
3	B8	157	С
3	B8	158	А
3	B8	159	A
3	B8	162	А
3	B8	166	A
3	B8	174	A
3	B8	184	U
3	B8	186	A
3	B8	199	A
3	B8	203	A
3	B8	212	A
3	B8	217	A
3	B8	223	A
3	B8	231	С
3	B8	233	C
3	B8	248	G
3	B8	267	A
3	B8	270	A
3	B8	304	A
3	B8	315	G



Mol	Chain	Res	Type
3	B8	322	С
3	B8	324	А
3	B8	330	С
3	B8	332	G
3	B8	333	А
3	B8	345	G
3	B8	352	G
3	B8	359	А
3	B8	360	U
3	B8	362	G
3	B8	366	С
3	B8	367	U
3	B8	369	А
3	B8	384	U
3	B8	390	А
3	B8	401	U
3	B8	409	С
3	B8	429	U
3	B8	443	G
3	B8	455	С
3	B8	456	U
3	B8	462	А
3	B8	477	G
3	B8	490	А
3	B8	493	А
3	B8	498	U
3	B8	511	А
3	B8	512	G
3	B8	522	A
3	B8	528	А
3	B8	530	A
3	B8	544	A
3	B8	549	С
3	B8	550	A
3	B8	551	С
3	B8	553	A
3	B8	554	С
3	B8	555	С
3	B8	556	U
3	B8	558	A
3	B8	560	A
3	B8	563	U



Mol	Chain	Res	Type
3	B8	567	А
3	B8	571	А
3	B8	573	А
3	B8	575	А
3	B8	576	А
3	B8	592	С
3	B8	593	С
3	B8	614	С
3	B8	615	U
3	B8	627	А
3	B8	630	G
3	B8	652	С
3	B8	661	С
3	B8	662	С
3	B8	675	G
3	B8	679	G
3	B8	680	А
3	B8	683	А
3	B8	687	С
3	B8	693	А
3	B8	702	U
3	B8	704	А
3	B8	720	А
3	B8	729	А
3	B8	731	А
3	B8	734	U
3	B8	737	U
3	B8	745	С
3	B8	763	С
3	B8	764	А
3	B8	776	A
3	B8	781	A
3	B8	782	A
3	B8	808	G
3	B8	814	C
3	B8	815	U
3	B8	823	C
3	B8	832	С
3	B8	850	С
3	B8	851	A
3	B8	857	A
3	B8	870	С



Mol	Chain	Res	Type
3	B8	900	С
3	B8	912	А
3	B8	922	G
3	B8	923	G
3	B8	924	U
3	B8	929	U
3	B8	930	А
3	B8	931	А
3	B8	933	С
3	B8	948	U
3	B8	956	U
3	B8	957	G
3	B8	958	U
3	B8	963	A
3	B8	965	G
3	B8	984	U
3	B8	986	U
3	B8	1013	С
3	B8	1016	G
3	B8	1024	А
3	B8	1026	А
3	B8	1036	А
3	B8	1048	С
3	B8	1049	G
3	B8	1053	А
3	B8	1054	G
3	B8	1055	А
3	B8	1056	С
3	B8	1062	G
3	B8	1075	A
3	B8	1088	G
3	B8	1092	С
3	B8	1093	U
3	B8	1094	A
3	B8	1095	A
3	B8	1097	A
3	B8	1098	A
3	B8	1103	A
3	B8	1105	A
3	B8	1111	U
3	B8	1112	A
3	B8	1113	A



Mol	Chain	Res	Type
3	B8	1119	С
3	B8	1120	А
3	B8	1122	А
3	B8	1140	G
3	B8	1162	А
3	B8	1163	А
3	B8	1177	С
3	B8	1194	U
3	B8	1195	С
3	B8	1213	А
3	B8	1215	U
3	B8	1218	А
3	B8	1219	С
3	B8	1223	A
3	B8	1243	А
3	B8	1246	G
3	B8	1247	G
3	B8	1252	А
3	B8	1258	С
3	B8	1262	G
3	B8	1265	А
3	B8	1286	А
3	B8	1319	G
3	B8	1320	А
3	B8	1322	G
3	B8	1335	А
3	B8	1346	G
3	B8	1359	А
3	B8	1371	U
3	B8	1383	A
3	B8	1384	G
3	B8	1389	A
3	B8	1390	С
3	B8	1400	G
3	B8	1403	С
3	B8	1416	U
3	B8	1419	A
3	B8	1426	U
3	B8	1430	U
3	B8	1432	U
3	B8	1438	U
3	B8	1439	U



Mol	Chain	Res	Type
3	B8	1440	С
3	B8	1441	A
3	B8	1443	А
3	B8	1480	U
3	B8	1487	С
3	B8	1488	А
3	B8	1492	С
3	B8	1499	С
3	B8	1502	С
3	B8	1507	А
3	B8	1519	С
3	B8	1520	А
3	B8	1529	U
3	B8	1530	U
3	B8	1536	С
3	B8	1538	С
3	B8	1540	С
3	B8	1542	С
3	B8	1547	А
3	B8	1548	А
3	B8	1558	U
3	B8	1559	U
3	B8	1560	G
3	B8	1561	U
4	B9	8	U
4	B9	16	С
4	B9	20	A
4	B9	43	G
4	B9	45	U
4	B9	51	С
4	B9	52	U
4	B9	53	U
4	B9	54	A
4	B9	55	A
4	B9	57	U
56	AG	6	G
56	AG	7	G
56	AG	8	U
56	AG	10	A
56	AG	11	G
56	AG	17	U
56	AG	18	A



 $Continued \ from \ previous \ page...$

Mol	Chain	Res	Type
56	AG	45	G
56	AG	52	А
56	AG	53	U
56	AG	55	С

All (1) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
3	B8	575	А

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

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

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

Mol	Type	Chain	Bos	Link	Bo	ond leng	ths	В	ond ang	les
	туре	Ullalli	nes	LIIIK	Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z >2
3	PSU	B8	1397	3	18,21,22	1.38	2 (11%)	22,30,33	1.84	3 (13%)
56	PSU	AG	24	56	18,21,22	1.32	2 (11%)	22,30,33	1.82	3 (13%)
3	OMG	B8	1370	3	18,26,27	0.91	1 (5%)	19,38,41	1.05	2 (10%)
3	OMU	B8	1369	$3,\!58$	19,22,23	1.19	2 (10%)	26,31,34	1.68	5 (19%)
56	PSU	AG	51	56	18,21,22	1.37	2 (11%)	22,30,33	1.79	3 (13%)
56	RSQ	AG	31	56	20,23,24	0.56	0	26,33,36	1.16	2 (7%)
4	1MA	B9	9	4	16,25,26	0.92	2 (12%)	18,37,40	1.11	2 (11%)
3	1MA	B8	947	3	16,25,26	0.86	2 (12%)	18,37,40	1.05	2 (11%)
6	AYA	BB	2	6	6,7,8	0.80	0	5,8,10	0.37	0
22	SAC	BR	2	22	$7,\!8,\!9$	0.54	0	8,9,11	0.95	1 (12%)
4	PSU	B9	37	4	18,21,22	1.34	2 (11%)	22,30,33	1.83	3 (13%)
4	2MG	B9	10	4	18,26,27	1.14	2 (11%)	16,38,41	0.90	1 (6%)
56	PSU	AG	46	56	18,21,22	1.37	2 (11%)	22,30,33	1.83	3 (13%)
3	OMG	B8	1145	3,56,58	18,26,27	0.91	1 (5%)	19,38,41	1.07	2 (10%)
32	AYA	Bb	2	32	6,7,8	0.68	0	5,8,10	0.41	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
3	PSU	B8	1397	3	-	0/7/25/26	0/2/2/2
56	PSU	AG	24	56	-	0/7/25/26	0/2/2/2
3	OMG	B8	1370	3	-	0/5/27/28	0/3/3/3
3	OMU	B8	1369	3,58	-	0/9/27/28	0/2/2/2
56	PSU	AG	51	56	-	2/7/25/26	0/2/2/2
56	RSQ	AG	31	56	-	2/9/27/28	0/2/2/2
4	1MA	B9	9	4	-	0/3/25/26	0/3/3/3
3	1MA	B8	947	3	-	0/3/25/26	0/3/3/3
6	AYA	BB	2	6	-	1/4/6/8	-
22	SAC	BR	2	22	-	0/7/8/10	-
4	PSU	B9	37	4	-	0/7/25/26	0/2/2/2
4	2MG	B9	10	4	-	0/5/27/28	0/3/3/3
56	PSU	AG	46	56	-	0/7/25/26	0/2/2/2
3	OMG	B8	1145	3,56,58	-	0/5/27/28	0/3/3/3
32	AYA	Bb	2	32	-	3/4/6/8	-

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
56	AG	46	PSU	C6-C5	3.34	1.39	1.35
56	AG	51	PSU	C6-C5	3.33	1.39	1.35
4	B9	37	PSU	C6-C5	3.17	1.39	1.35
56	AG	24	PSU	C6-C5	3.16	1.39	1.35
3	B8	1397	PSU	C6-C5	3.10	1.38	1.35
4	B9	10	2MG	C8-N7	-2.91	1.30	1.35
3	B8	1397	PSU	C4-N3	-2.76	1.33	1.38
4	B9	37	PSU	C4-N3	-2.65	1.33	1.38
56	AG	46	PSU	C4-N3	-2.62	1.34	1.38
56	AG	24	PSU	C4-N3	-2.56	1.34	1.38
3	B8	1369	OMU	C4-N3	-2.50	1.34	1.38
56	AG	51	PSU	C4-N3	-2.49	1.34	1.38
3	B8	1145	OMG	C6-N1	-2.48	1.34	1.37
3	B8	1370	OMG	C6-N1	-2.45	1.34	1.37
4	B9	10	2MG	C5-C6	-2.31	1.42	1.47
4	B9	9	1MA	C8-N7	-2.28	1.31	1.35
3	B8	947	1MA	C8-N7	-2.23	1.31	1.35
3	B8	947	1MA	C5-C4	-2.23	1.37	1.43
4	B9	9	1MA	C5-C4	-2.16	1.37	1.43



Mol	Chain	Res	Type	Atoms	\mathbf{Z}	Observed(Å)	Ideal(Å)
3	B8	$13\overline{69}$	OMU	C2-N3	-2.16	1.34	1.38

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
3	B8	1397	PSU	N1-C2-N3	5.92	121.84	115.13
56	AG	46	PSU	N1-C2-N3	5.78	121.68	115.13
4	B9	37	PSU	N1-C2-N3	5.75	121.64	115.13
56	AG	24	PSU	N1-C2-N3	5.75	121.64	115.13
56	AG	51	PSU	N1-C2-N3	5.64	121.52	115.13
3	B8	1369	OMU	C4-N3-C2	-4.39	120.79	126.58
3	B8	1369	OMU	N3-C2-N1	4.11	120.35	114.89
4	B9	37	PSU	C4-N3-C2	-3.83	120.83	126.34
56	AG	46	PSU	C4-N3-C2	-3.76	120.92	126.34
56	AG	24	PSU	C4-N3-C2	-3.76	120.92	126.34
3	B8	1397	PSU	C4-N3-C2	-3.72	120.98	126.34
56	AG	51	PSU	C4-N3-C2	-3.55	121.23	126.34
3	B8	1369	OMU	C5-C4-N3	3.53	120.12	114.84
56	AG	24	PSU	O2-C2-N1	-3.31	119.15	122.79
3	B8	1397	PSU	O2-C2-N1	-3.30	119.16	122.79
56	AG	51	PSU	O2-C2-N1	-3.25	119.21	122.79
4	B9	37	PSU	O2-C2-N1	-3.20	119.27	122.79
56	AG	46	PSU	O2-C2-N1	-3.15	119.32	122.79
3	B8	1369	OMU	O4-C4-C5	-2.91	120.04	125.16
56	AG	31	RSQ	C1'-N1-C6	-2.88	116.33	121.12
56	AG	31	RSQ	C1'-N1-C2	2.85	124.79	118.42
22	BR	2	SAC	O-C-CA	-2.54	118.12	124.78
3	B8	1370	OMG	C8-N7-C5	2.27	107.32	102.99
3	B8	1145	OMG	C8-N7-C5	2.23	107.24	102.99
3	B8	1369	OMU	O2-C2-N1	-2.21	119.84	122.79
4	B9	10	2MG	O6-C6-C5	2.18	128.63	124.37
4	B9	9	1MA	N1-C6-N6	2.17	125.29	119.77
4	B9	9	1MA	C5-C6-N1	-2.14	110.70	113.90
3	B8	947	1MA	N1-C6-N6	2.13	125.18	119.77
3	B8	1370	OMG	C5-C6-N1	2.12	117.70	113.95
3	B8	947	1MA	C5-C6-N1	-2.12	110.73	113.90
3	B8	1145	OMG	C5-C6-N1	2.09	117.65	113.95

There are no chirality outliers.

All (8) torsion outliers are listed below:



Mol	Chain	Res	Type	Atoms
56	AG	51	PSU	O4'-C1'-C5-C4
56	AG	51	PSU	O4'-C1'-C5-C6
32	Bb	2	AYA	OT-CT-N-CA
32	Bb	2	AYA	CM-CT-N-CA
56	AG	31	RSQ	C2'-C1'-N1-C2
56	AG	31	RSQ	C2'-C1'-N1-C6
6	BB	2	AYA	C-CA-N-CT
32	Bb	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 267 ligands modelled in this entry, 264 are monoatomic - leaving 3 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	Link Bond lengths				Bond angles		
	Type	Unam	nes		Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z >2	
63	MET	AG	101	56	6,7,8	0.46	0	2,7,9	0.13	0	
60	VAL	B9	101	4	4,6,7	0.53	0	6,7,9	0.90	0	
62	FS2	Bh	201	20,38	0,5,14	-	-	-			

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	MET	AG	101	56	-	1/5/6/8	-
60	VAL	B9	101	4	-	3/5/6/8	-



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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
62	FS2	Bh	201	$20,\!38$	-	-	0/2/2/6

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
60	B9	101	VAL	N-CA-CB-CG2
60	B9	101	VAL	C-CA-CB-CG1
60	B9	101	VAL	C-CA-CB-CG2
63	AG	101	MET	O-C-CA-CB

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.



6 Map visualisation (i)

This section contains visualisations of the EMDB entry EMD-16899. 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: 256





Z Index: 256

6.2.2 Raw map



X Index: 256

Y Index: 256

Z Index: 256

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: 297





Z Index: 269

6.3.2 Raw map



X Index: 0

Y Index: 0



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



6.4 Orthogonal standard-deviation projections (False-color) (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 0.75. 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.

6.6 Mask visualisation (i)

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



7 Map analysis (i)

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

7.1 Map-value distribution (i)



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



7.2 Volume estimate (i)



The volume at the recommended contour level is 590 $\rm nm^3;$ this corresponds to an approximate mass of 533 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 0.345 $\mathrm{\AA^{-1}}$



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 0.345 $\mathrm{\AA^{-1}}$



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	2.90	-	-			
Author-provided FSC curve	2.90	3.29	2.94			
Unmasked-calculated*	4.83	9.30	5.93			

*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 4.83 differs from the reported value 2.9 by more than 10 %



9 Map-model fit (i)

This section contains information regarding the fit between EMDB map EMD-16899 and PDB model 80IT. 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 0.75 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 (0.75).



9.4 Atom inclusion (i)



At the recommended contour level, 71% of all backbone atoms, 68% 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 (0.75) and Q-score for the entire model and for each chain.

\mathbf{Chain}	Atom inclusion	$\mathbf{Q} extsf{-score}$
All	0.6780	0.4910
AG	0.3600	0.3100
Aa	0.0150	0.1020
B1	0.0230	0.1990
B2	0.0080	0.0960
B3	0.0000	0.0740
B4	0.0000	0.0850
B5	0.0000	-0.0030
B6	0.0000	0.0050
Β7	0.1290	0.4350
B8	0.8620	0.5550
B9	0.5550	0.3740
BA	0.7920	0.5740
BB	0.6950	0.5180
BC	0.5170	0.4850
BD	0.8150	0.5780
BE	0.7160	0.5340
BF	0.7450	0.5540
BG	0.8010	0.5690
BH	0.7130	0.5520
BI	0.6900	0.5230
BJ	0.8750	0.6110
BK	0.8690	0.6040
BL	0.8090	0.5720
BM	0.8030	0.5620
BN	0.7970	0.5710
BO	0.2840	0.2670
BP	0.3740	0.3490
BQ	0.1620	0.2570
BR	0.8370	0.5830
BS	0.8100	0.5700
BT	0.7910	0.5700
BU	0.7720	0.5530
BV	0.7930	0.5660
BW	0.7570	0.5470

0.0 <0.0

1.0



Chain	Atom inclusion	Q-score
BX	0.7470	0.5400
BY	0.8150	0.5830
BZ	0.7850	0.5660
Ba	0.6760	0.5070
Bb	0.4720	0.4420
Bc	0.3020	0.3210
Bd	0.3530	0.3110
Be	0.8460	0.5870
Bf	0.5220	0.4570
Bg	0.4640	0.3870
Bh	0.7760	0.5420
Bi	0.7540	0.5470
Bj	0.0030	0.0410
Bl	0.8530	0.5780
Bm	0.7440	0.5420
Bn	0.6680	0.4950
Bo	0.5930	0.4880
Bp	0.2910	0.3170
Bq	0.6800	0.5170
Br	0.6560	0.5020
Bs	0.7970	0.5730
Bt	0.6830	0.5290
Bu	0.4640	0.4540
Bv	0.2030	0.2770
Bw	0.4040	0.3890
Bx	0.7410	0.5500
By	0.5190	0.4880
Bz	0.8530	0.5910

