



Full wwPDB EM Validation Report ⓘ

May 20, 2024 – 04:49 pm BST

PDB ID : 6G72
EMDB ID : EMD-4356
Title : Mouse mitochondrial complex I in the deactive state
Authors : Agip, A.N.A.; Blaza, J.N.; Bridges, H.R.; Viscomi, C.; Rawson, S.; Muench, S.P.; Hirst, J.
Deposited on : 2018-04-04
Resolution : 3.90 Å(reported)

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 ⓘ 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 ⓘ](#)) were used in the production of this report:

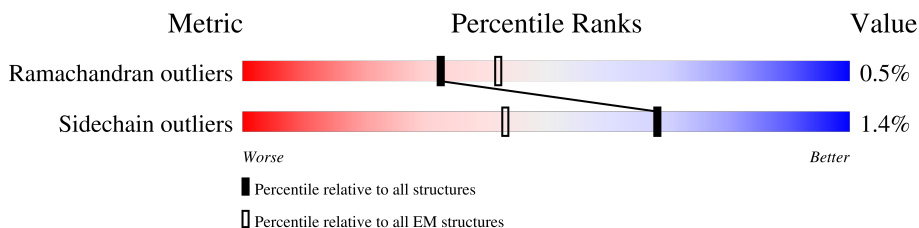
EMDB validation analysis : 0.0.1.dev92
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36.2

1 Overall quality at a glance i

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

The reported resolution of this entry is 3.90 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	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. 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	A	115	
2	B	224	
3	C	263	
4	D	463	
5	E	248	
6	F	464	
7	G	727	
8	H	318	
9	I	212	

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Mol	Chain	Length	Quality of chain
10	J	172	45% 96%
11	K	98	31% 98%
12	L	607	36% 98%
13	M	459	17% 99%
14	N	345	18% 97%
15	O	355	35% 88% 10%
16	P	377	34% 76% 23%
17	Q	175	23% 69% 29%
18	R	116	23% 79% 18%
19	S	99	52% 83% 16%
20	T	156	42% 48% 52%
20	U	156	35% 53% 44%
21	V	116	48% 94%
22	W	131	44% 86% 13%
23	X	172	33% 97%
24	Y	143	47% 96%
25	Z	144	30% 95%
26	a	70	26% 89% 7%
27	b	84	42% 94% 5%
28	c	76	33% 61% 38%
29	d	120	32% 96%
30	e	106	27% 94%
31	f	57	39% 84% 11%
32	g	151	28% 64% 33%
33	h	189	24% 70% 28%

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Mol	Chain	Length	Quality of chain
34	i	128	
35	j	105	
36	k	104	
37	l	186	
38	m	129	
39	n	179	
40	o	137	
41	p	176	
42	q	145	
43	r	113	
44	s	104	

2 Entry composition

There are 52 unique types of molecules in this entry. The entry contains 64923 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called NADH-ubiquinone oxidoreductase chain 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	94	753	519	105	124	5	0	0

- Molecule 2 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 7, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	155	1241	793	222	212	14	0	0

- Molecule 3 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 3, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	206	1712	1105	294	310	3	0	0

- Molecule 4 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	D	421	3391	2170	579	618	24	0	0

- Molecule 5 is a protein called NADH dehydrogenase [ubiquinone] flavoprotein 2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	E	212	1648	1048	277	312	11	0	0

- Molecule 6 is a protein called NADH dehydrogenase [ubiquinone] flavoprotein 1, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	F	428	3301	2080	590	609	22	0	0

- Molecule 7 is a protein called NADH-ubiquinone oxidoreductase 75 kDa subunit, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	G	688	5296	3321	919	1015	41	0	0

- Molecule 8 is a protein called NADH-ubiquinone oxidoreductase chain 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
8	H	306	2444	1645	371	406	22	0	0

- Molecule 9 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 8, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	I	178	1408	885	243	268	12	0	0

- Molecule 10 is a protein called NADH-ubiquinone oxidoreductase chain 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
10	J	171	1195	789	181	212	13	0	0

- Molecule 11 is a protein called NADH-ubiquinone oxidoreductase chain 4L.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
11	K	98	737	477	112	137	11	0	0

- Molecule 12 is a protein called NADH-ubiquinone oxidoreductase chain 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
12	L	606	4800	3182	746	827	45	0	0

- Molecule 13 is a protein called NADH-ubiquinone oxidoreductase chain 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
13	M	459	3632	2408	567	617	40	0	0

- Molecule 14 is a protein called NADH-ubiquinone oxidoreductase chain 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
14	N	344	2696	1791	416	452	37	0	0

- Molecule 15 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 10, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
15	O	320	2607	1674	431	492	10	0	0

- Molecule 16 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 9, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
16	P	291	2306	1470	417	412	7	0	0

- Molecule 17 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 4, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
17	Q	125	1015	642	179	190	4	0	0

- Molecule 18 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 6, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
18	R	95	748	464	138	143	3	0	0

- Molecule 19 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
19	S	83	667	419	126	119	3	0	0

- Molecule 20 is a protein called Acyl carrier protein, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
20	T	75	604	388	89	122	5	0	0
20	U	88	706	453	104	144	5	0	0

- Molecule 21 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
21	V	112	915	596	152	164	3	0	0

- Molecule 22 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
22	W	114	970	619	180	165	6	0	0

- Molecule 23 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
23	X	171	1396	889	250	247	10	0	0

- Molecule 24 is a protein called MCG5603.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
24	Y	140	1037	662	175	192	8	0	0

- Molecule 25 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 13.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
25	Z	139	1152	741	204	199	8	0	0

- Molecule 26 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
26	a	67	Total	C	N	O	S	0	0
			548	356	97	91	4		

- Molecule 27 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
27	b	83	Total	C	N	O	S	0	0
			651	427	105	115	4		

- Molecule 28 is a protein called NADH dehydrogenase [ubiquinone] 1 subunit C1, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
28	c	47	Total	C	N	O	S	0	0
			389	255	67	66	1		

- Molecule 29 is a protein called NADH dehydrogenase [ubiquinone] 1 subunit C2.

Mol	Chain	Residues	Atoms					AltConf	Trace
29	d	119	Total	C	N	O	S	0	0
			985	645	167	164	9		

- Molecule 30 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
30	e	104	Total	C	N	O	S	0	0
			870	550	161	151	8		

- Molecule 31 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
31	f	51	Total	C	N	O	S	0	0
			433	278	78	75	2		

- Molecule 32 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 11, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
32	g	101	Total	C	N	O	S	0	0
			850	549	136	161	4		

- Molecule 33 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 5, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
33	h	137	1154	758	192	201	3	0	0

- Molecule 34 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
34	i	101	820	534	141	142	3	0	0

- Molecule 35 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
35	j	60	525	345	88	91	1	0	0

- Molecule 36 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
36	k	72	582	384	100	97	1	0	0

- Molecule 37 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 8, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
37	l	152	1274	821	213	229	11	0	0

- Molecule 38 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 4.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
38	m	124	1035	667	186	182	0	0

- Molecule 39 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 9.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
39	n	176	1527	976	274	266	11	0	0

- Molecule 40 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
40	o	105	898	565	167	158	8	0	0

- Molecule 41 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 10.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
41	p	170	1438	903	258	269	8	0	0

- Molecule 42 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 12.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
42	q	144	1200	771	213	211	5	0	0

- Molecule 43 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
43	r	99	796	504	148	141	3	0	0

- Molecule 44 is a protein called NADH dehydrogenase [ubiquinone] flavoprotein 3, mitochondrial.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
44	s	40	336	211	60	65	0	0

- Molecule 45 is IRON/SULFUR CLUSTER (three-letter code: SF4) (formula: Fe₄S₄).



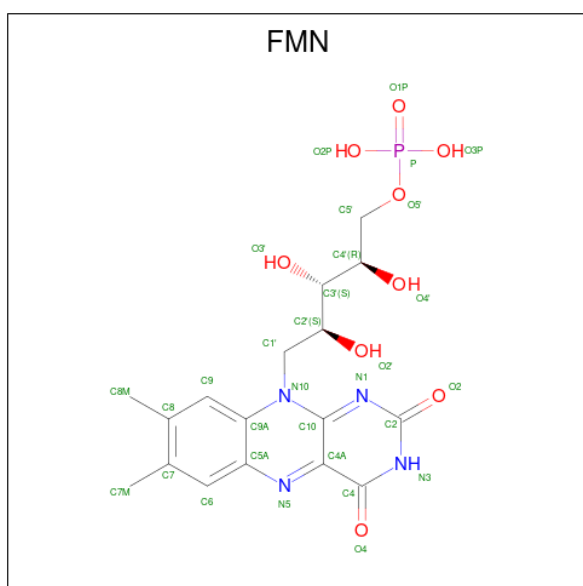
Mol	Chain	Residues	Atoms			AltConf
			Total	Fe	S	
45	B	1	8	4	4	0
45	F	1	8	4	4	0
45	G	1	8	4	4	0
45	G	1	8	4	4	0
45	I	1	8	4	4	0
45	I	1	8	4	4	0

- Molecule 46 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe₂S₂).



Mol	Chain	Residues	Atoms			AltConf
46	E	1	Total	Fe	S	0
			4	2	2	
46	G	1	Total	Fe	S	0
			4	2	2	

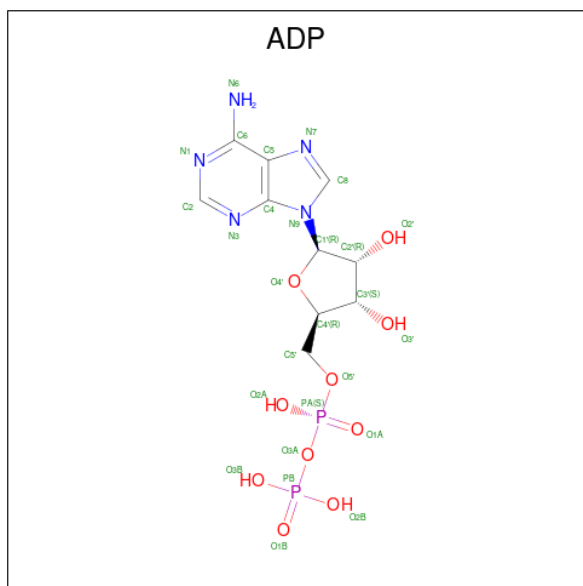
- Molecule 47 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: C₁₇H₂₁N₄O₉P).



Mol	Chain	Residues	Atoms					AltConf
47	F	1	Total	C	N	O	P	0
			31	17	4	9	1	

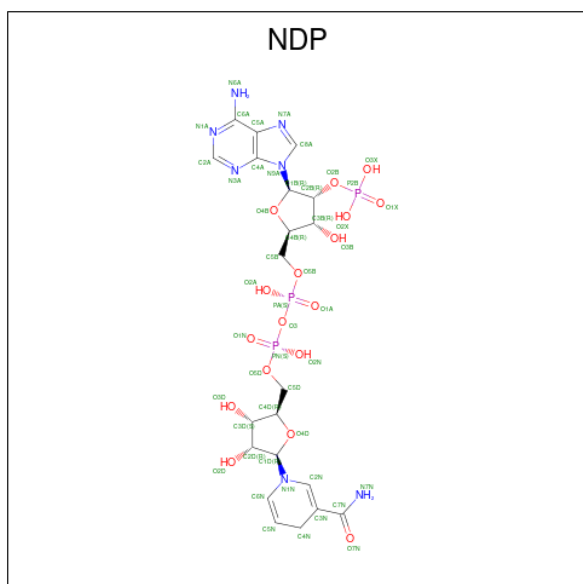
- Molecule 48 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula:

$C_{10}H_{15}N_5O_{10}P_2$).



Mol	Chain	Residues	Atoms				AltConf	
			Total	C	N	O		P
48	O	1	27	10	5	10	2	0

- Molecule 49 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NDP) (formula: $C_{21}H_{30}N_7O_{17}P_3$).

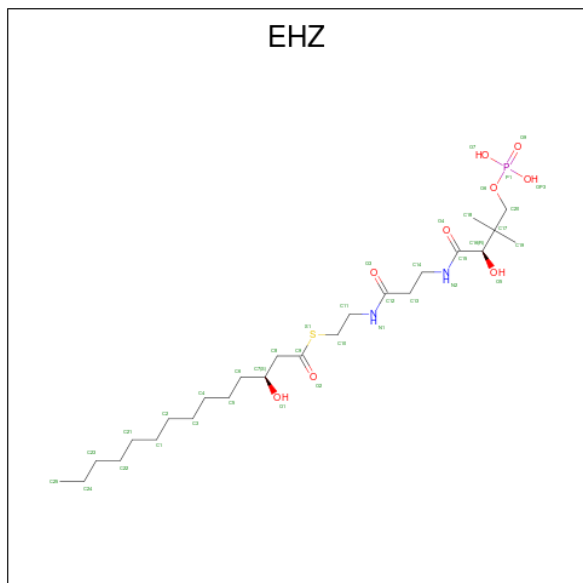


Mol	Chain	Residues	Atoms				AltConf	
			Total	C	N	O		P
49	P	1	48	21	7	17	3	0

- Molecule 50 is ZINC ION (three-letter code: ZN) (formula: Zn).

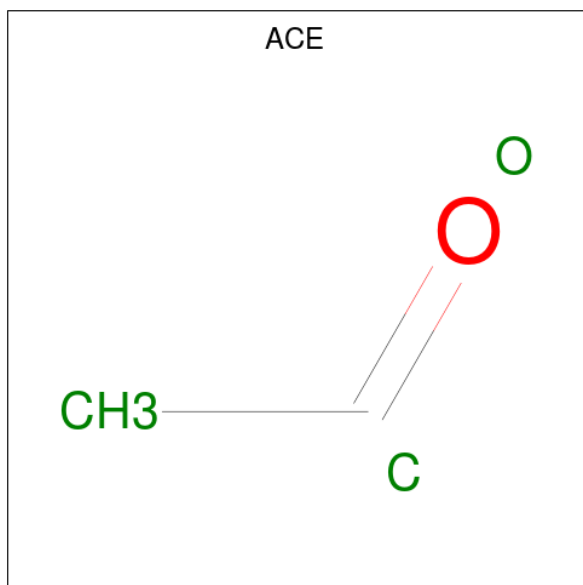
Mol	Chain	Residues	Atoms		AltConf
50	R	1	Total	Zn	0
			1	1	

- Molecule 51 is {S}-[2-[3-[[2 {R}]-3,3-dimethyl-2-oxidanyl-4-phosphonoxy-butanoyl]amino]propanoylamino]ethyl] (3 {S})-3-oxidanyltetradecanethioate (three-letter code: EHZ) (formula: C₂₅H₄₉N₂O₉PS).



Mol	Chain	Residues	Atoms					AltConf	
			Total	C	N	O	P		S
51	T	1	34	22	2	8	1	1	0
51	U	1	35	23	2	8	1	1	0

- Molecule 52 is ACETYL GROUP (three-letter code: ACE) (formula: C₂H₄O).

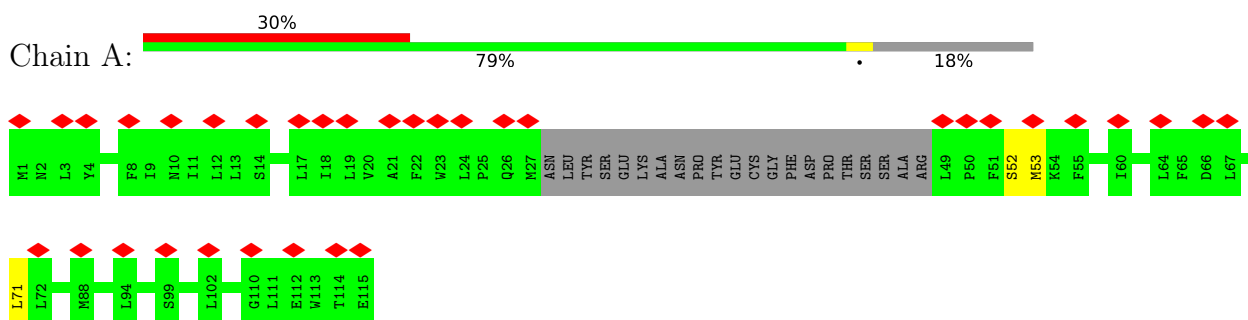


Mol	Chain	Residues	Atoms			AltConf
			Total	C	O	
52	q	1	3	2	1	0

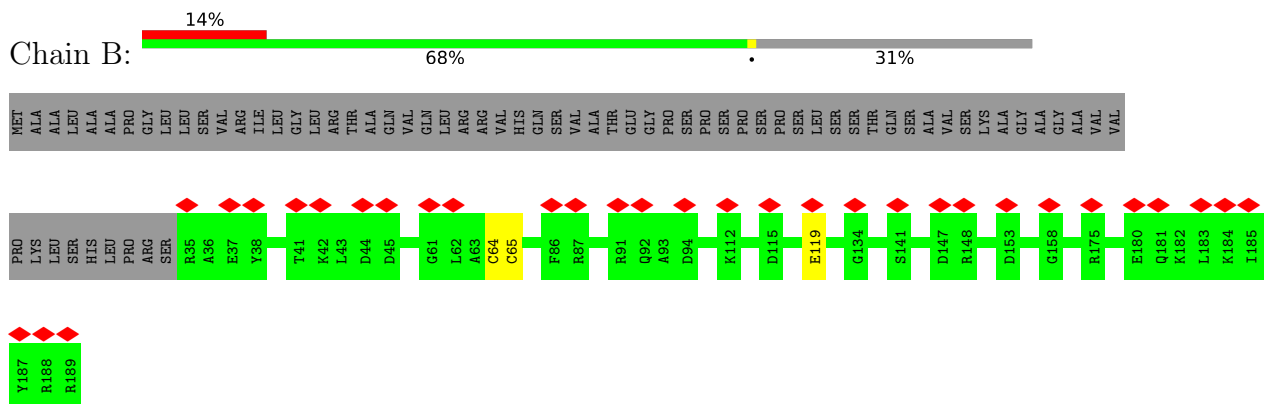
3 Residue-property plots [i](#)

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.

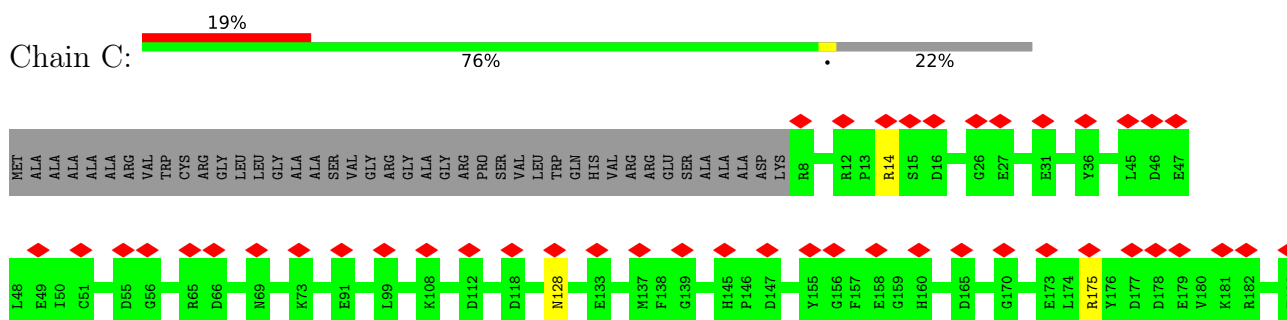
- Molecule 1: NADH-ubiquinone oxidoreductase chain 3

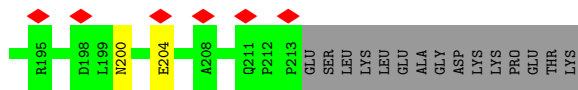


- Molecule 2: NADH dehydrogenase [ubiquinone] iron-sulfur protein 7, mitochondrial

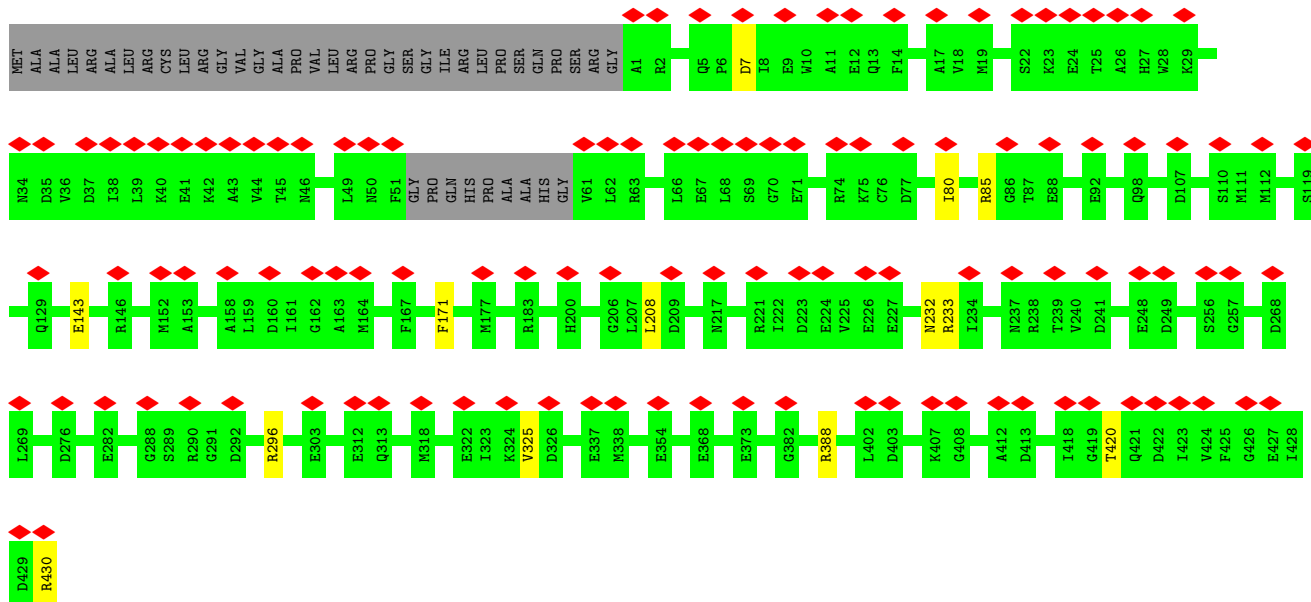
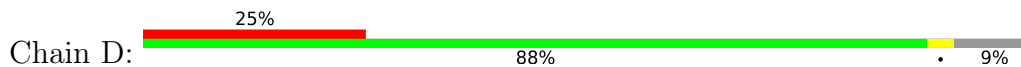


- Molecule 3: NADH dehydrogenase [ubiquinone] iron-sulfur protein 3, mitochondrial

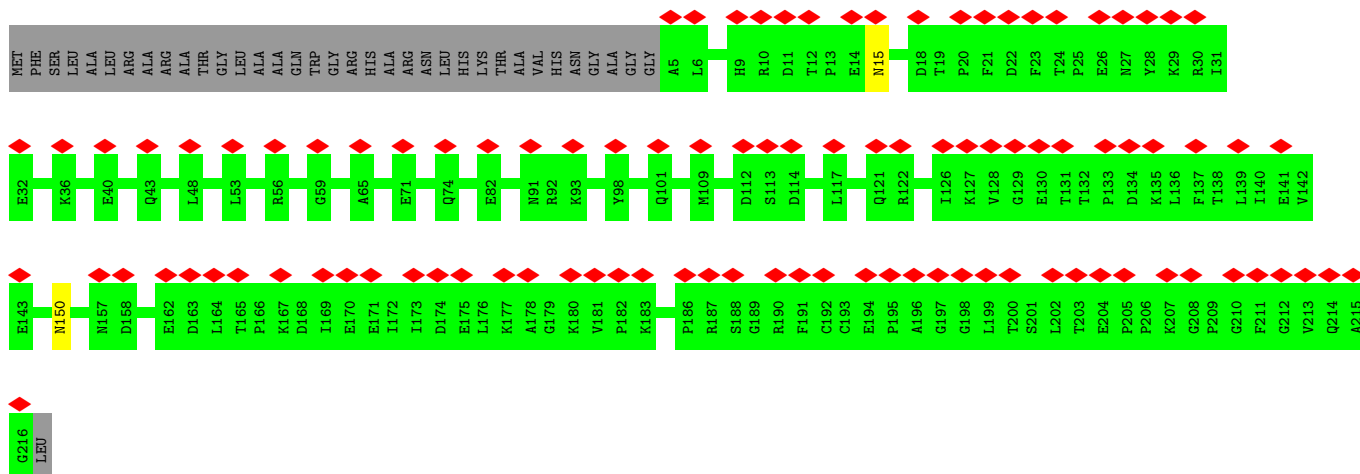
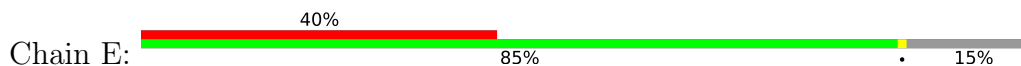




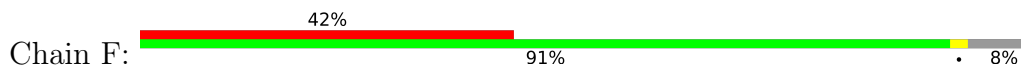
• Molecule 4: NADH dehydrogenase [ubiquinone] iron-sulfur protein 2, mitochondrial

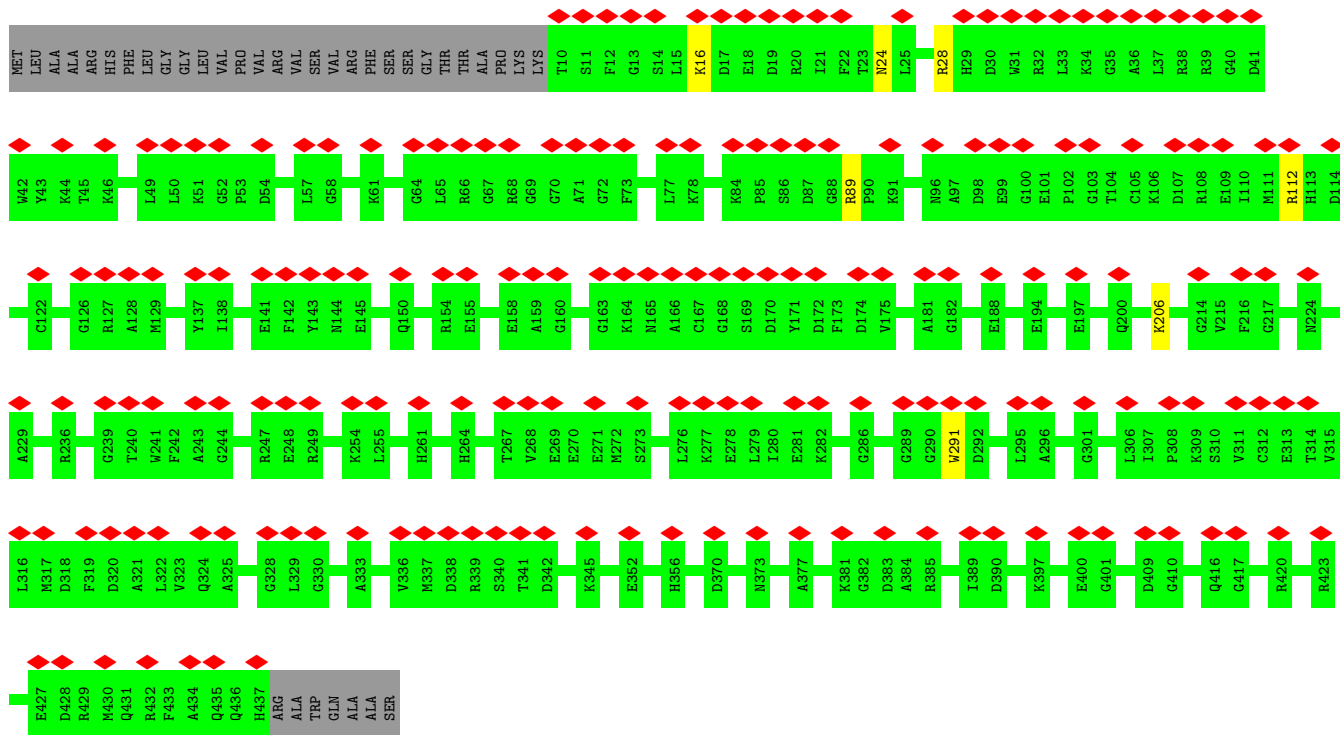


• Molecule 5: NADH dehydrogenase [ubiquinone] flavoprotein 2, mitochondrial

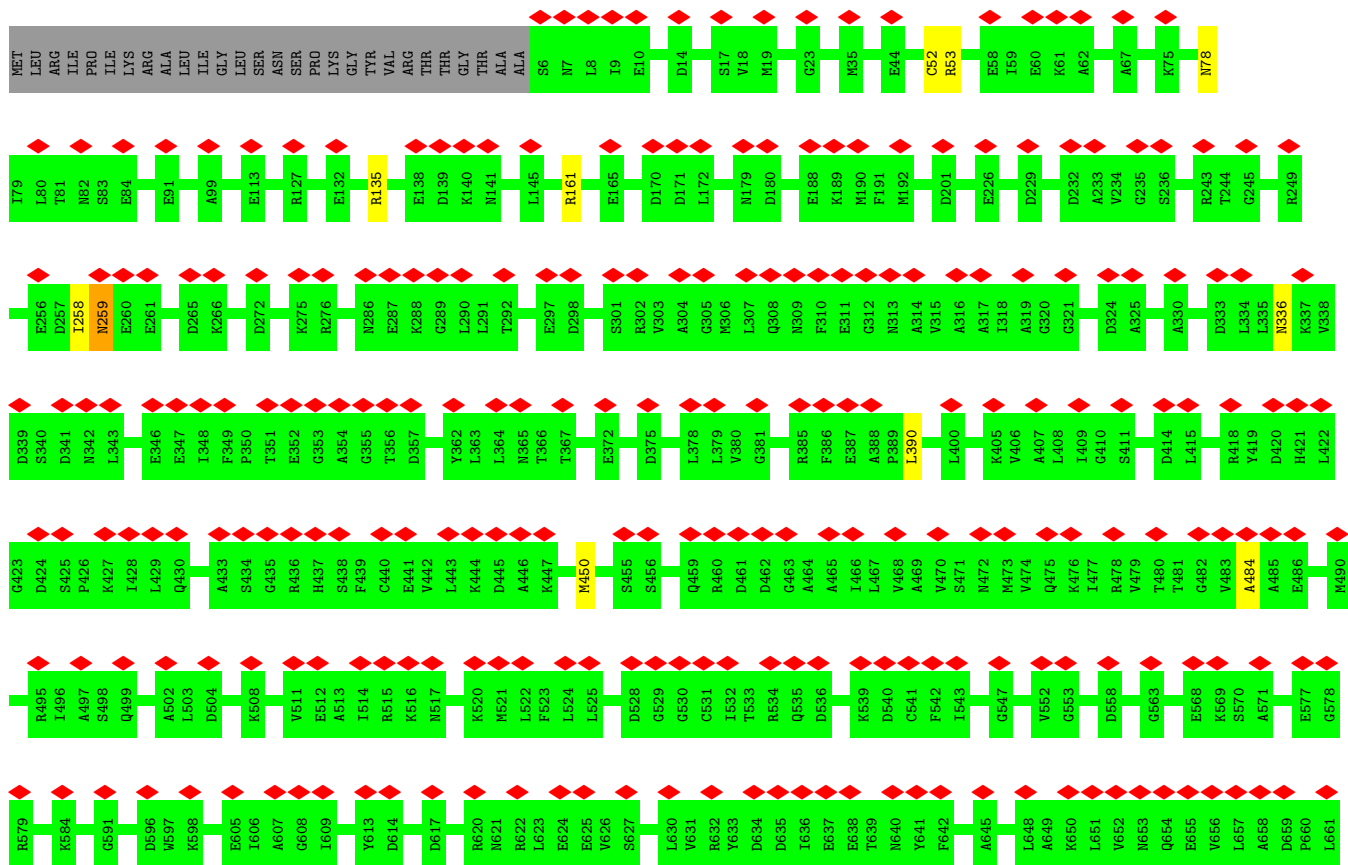
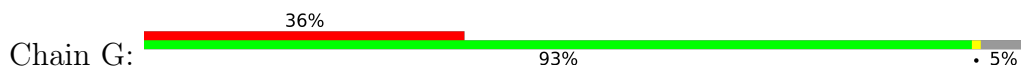


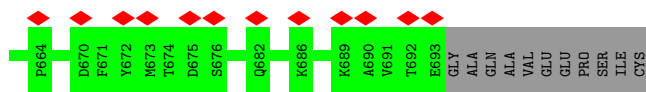
• Molecule 6: NADH dehydrogenase [ubiquinone] flavoprotein 1, mitochondrial





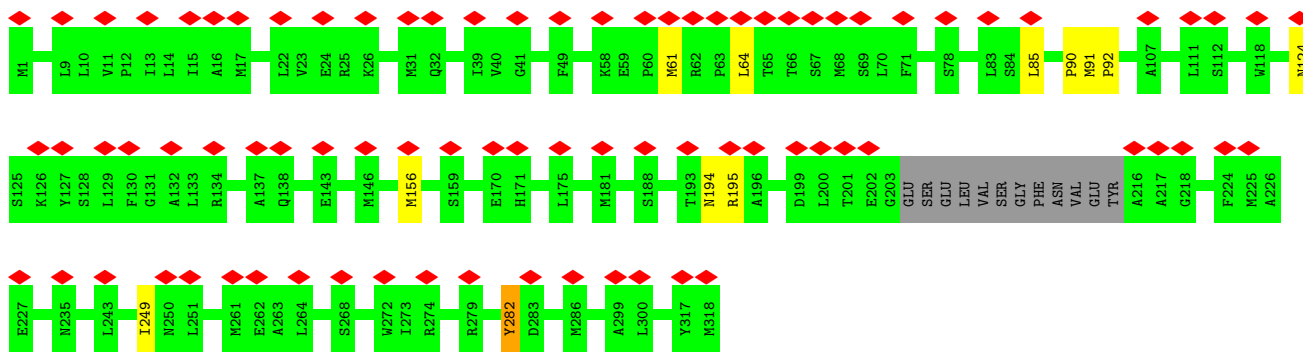
• Molecule 7: NADH-ubiquinone oxidoreductase 75 kDa subunit, mitochondrial





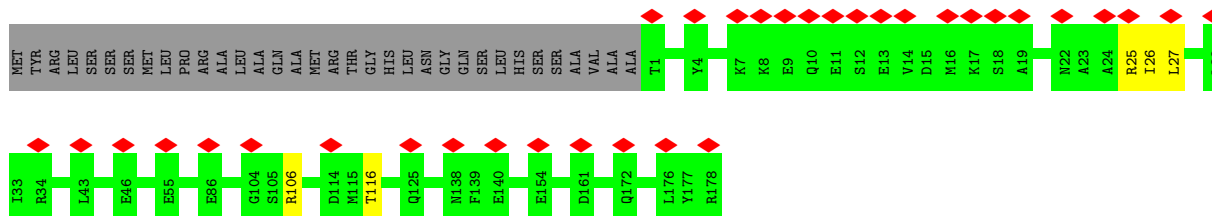
- Molecule 8: NADH-ubiquinone oxidoreductase chain 1

Chain H: 26% 92%



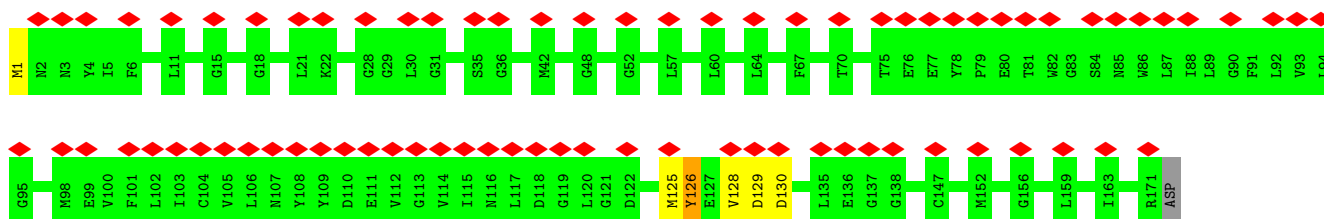
- Molecule 9: NADH dehydrogenase [ubiquinone] iron-sulfur protein 8, mitochondrial

Chain I: 16% 82% 16%



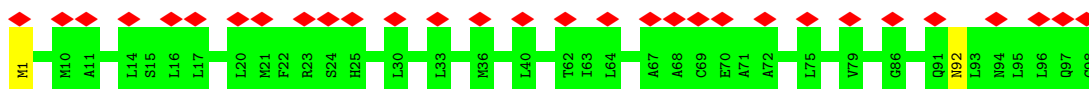
- Molecule 10: NADH-ubiquinone oxidoreductase chain 6

Chain J: 45% 96%

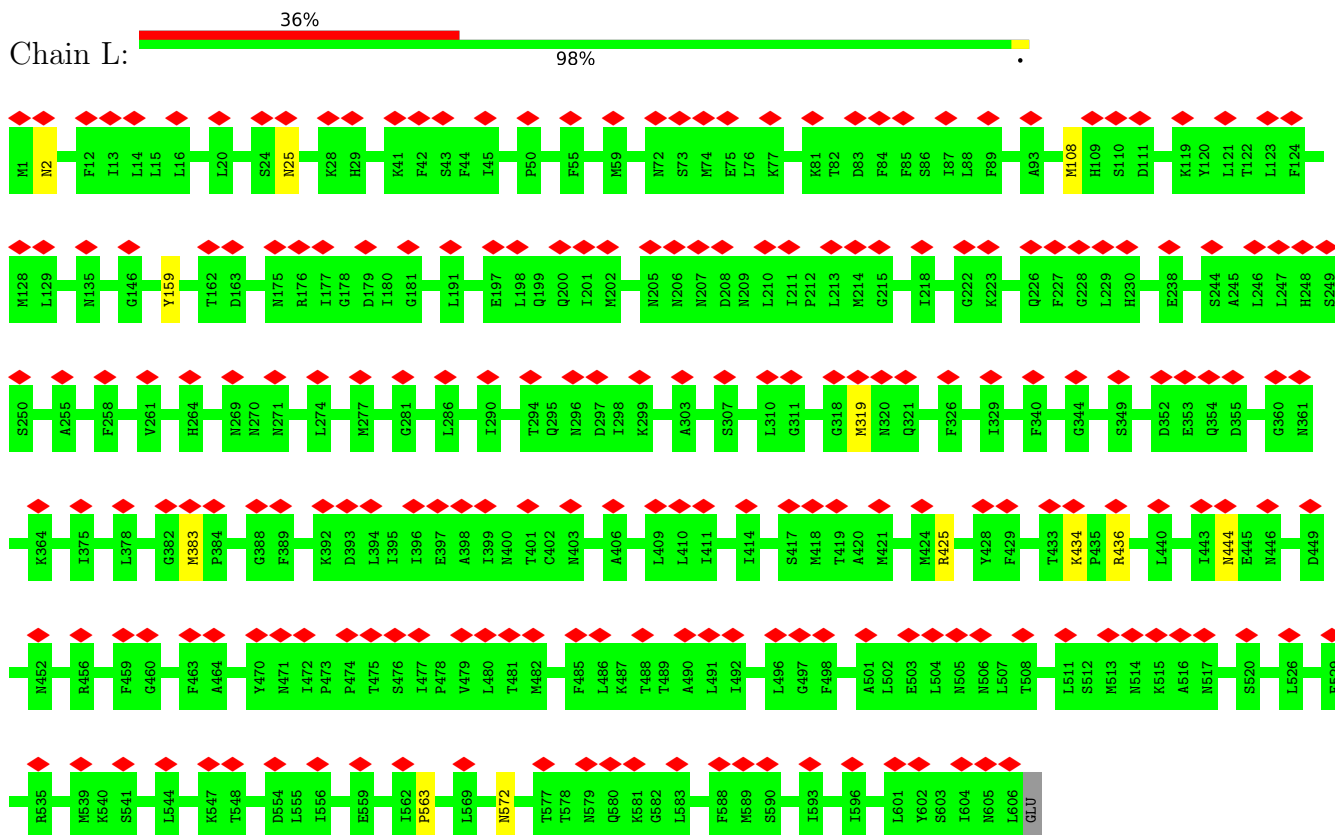


- Molecule 11: NADH-ubiquinone oxidoreductase chain 4L

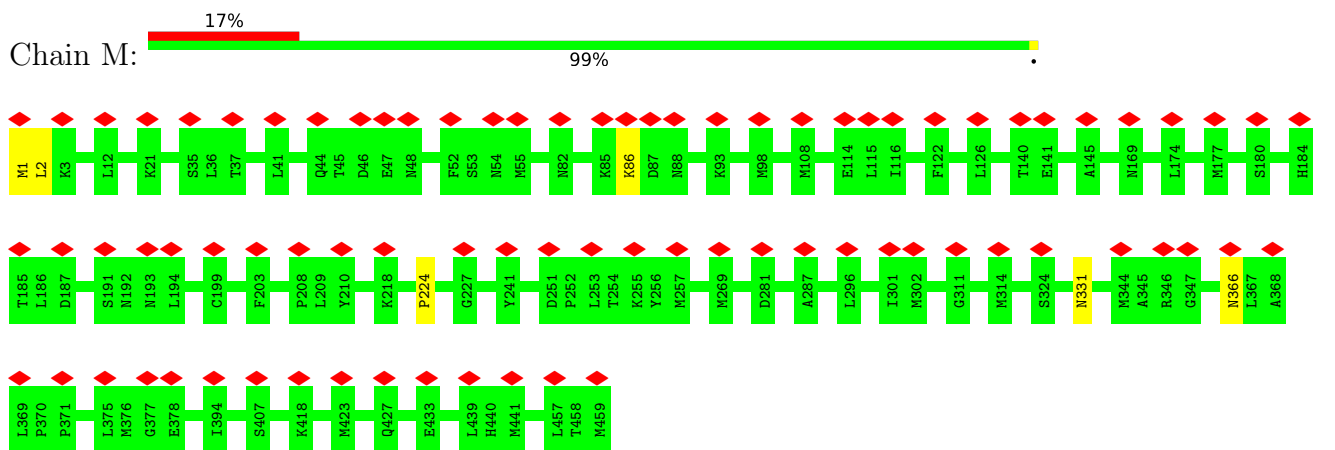
Chain K: 31% 98%



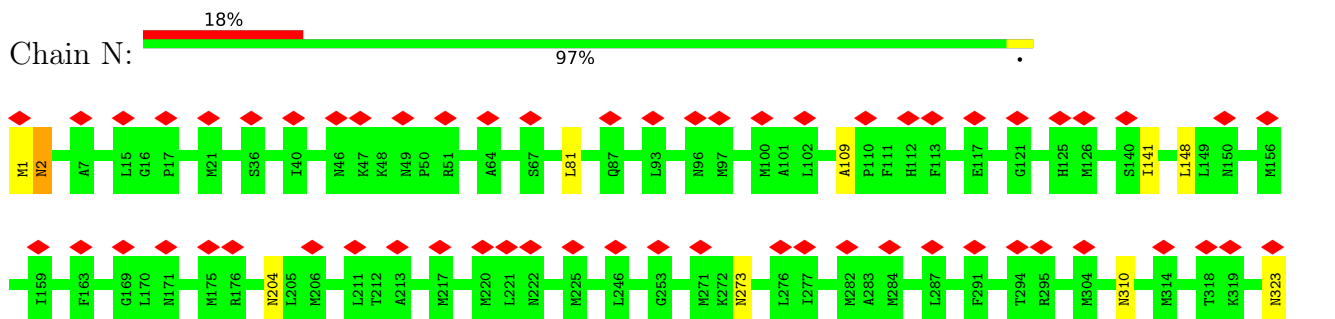
- Molecule 12: NADH-ubiquinone oxidoreductase chain 5

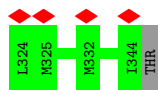


- Molecule 13: NADH-ubiquinone oxidoreductase chain 4



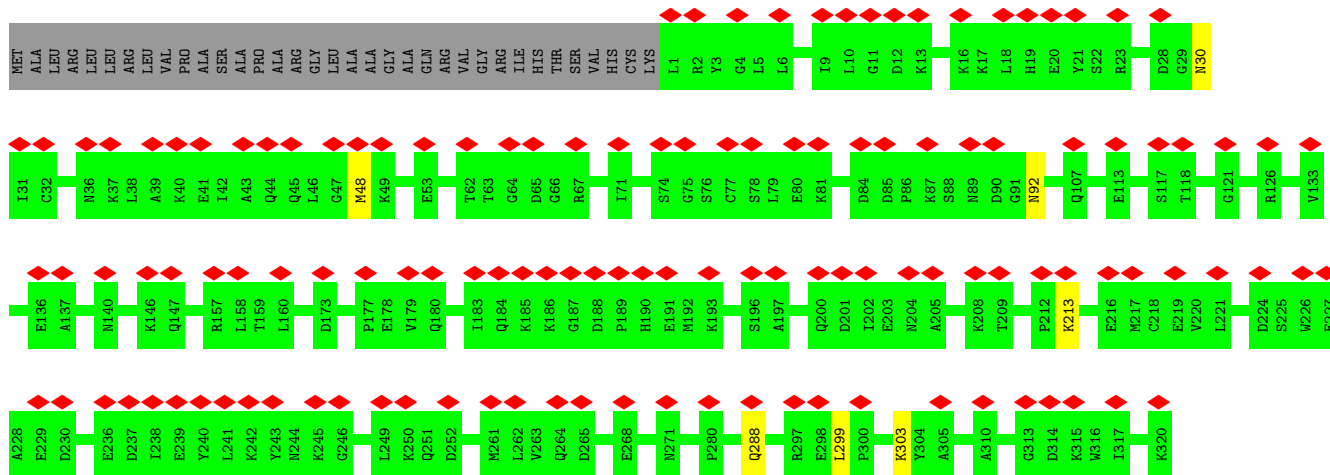
- Molecule 14: NADH-ubiquinone oxidoreductase chain 2





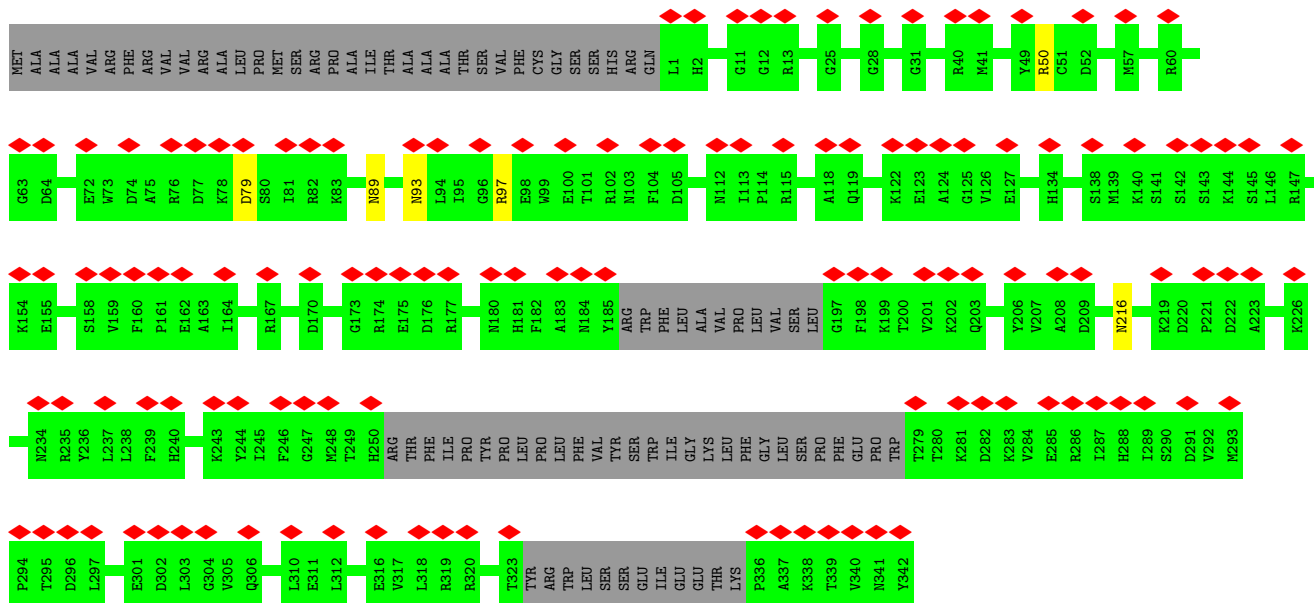
- Molecule 15: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 10, mitochondrial

Chain O: 35% 88% 10%



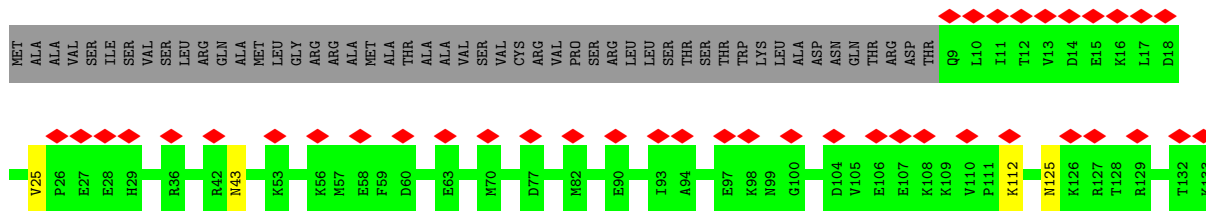
- Molecule 16: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 9, mitochondrial

Chain P: 34% 76% 23%

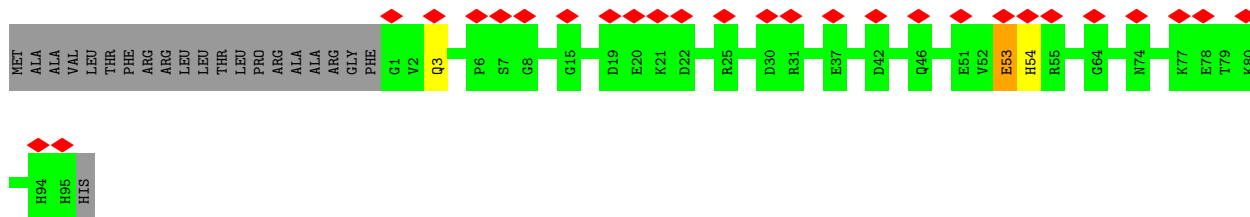
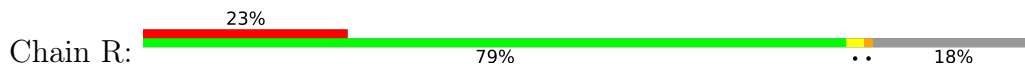


- Molecule 17: NADH dehydrogenase [ubiquinone] iron-sulfur protein 4, mitochondrial

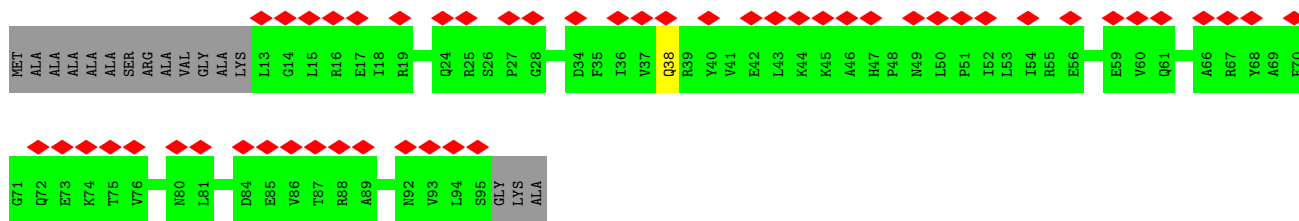
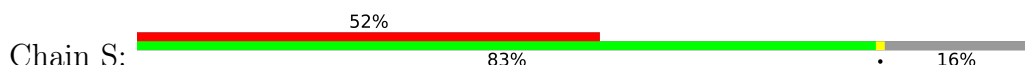
Chain Q: 23% 69% 29%



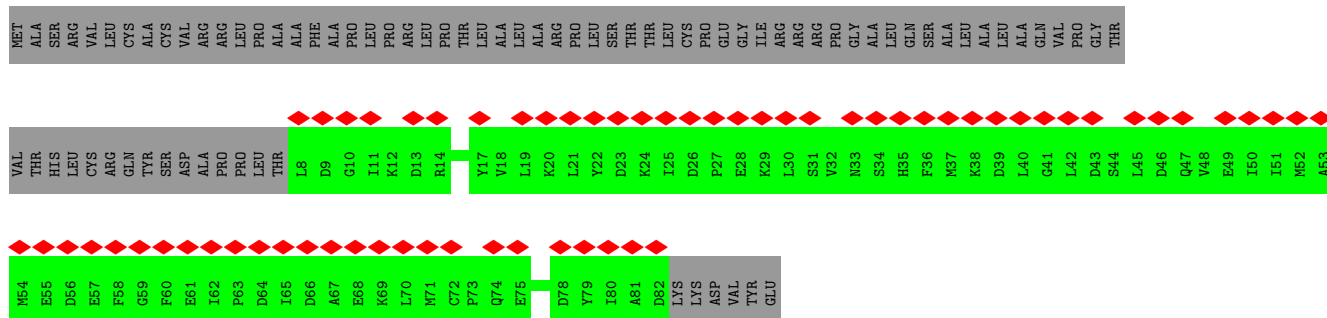
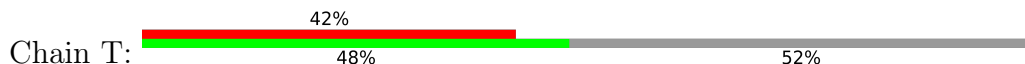
• Molecule 18: NADH dehydrogenase [ubiquinone] iron-sulfur protein 6, mitochondrial



• Molecule 19: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 2

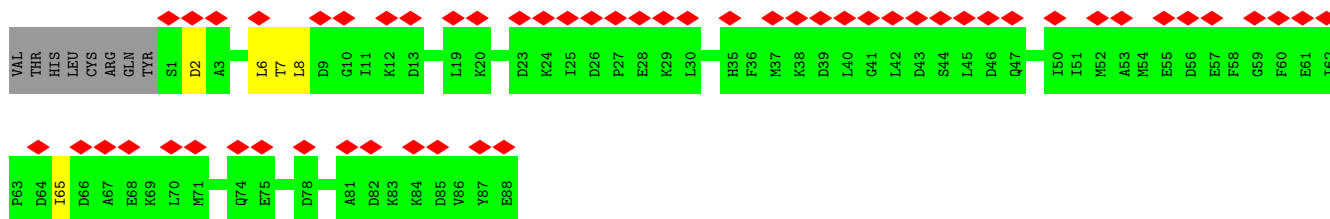


• Molecule 20: Acyl carrier protein, mitochondrial



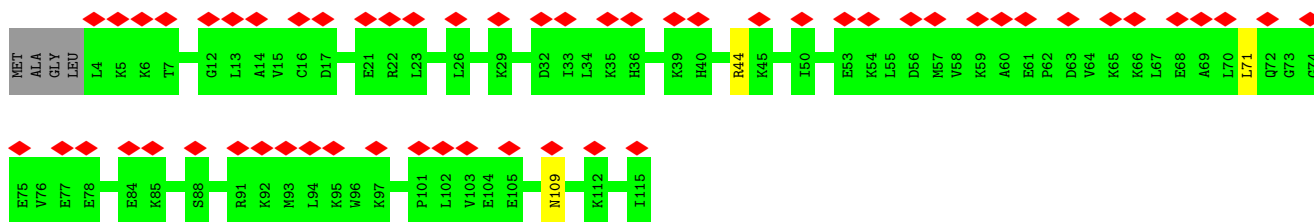
• Molecule 20: Acyl carrier protein, mitochondrial





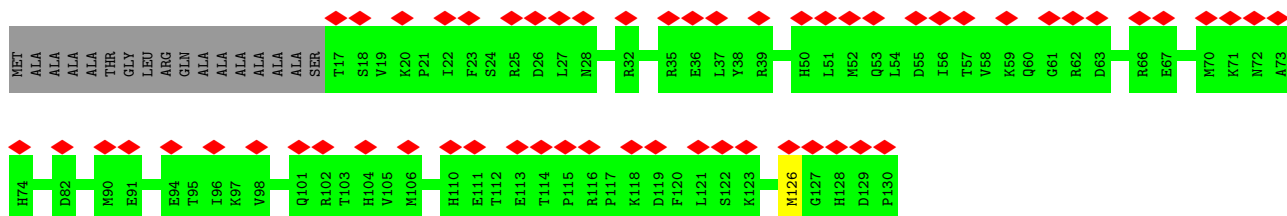
- Molecule 21: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 5

Chain V: 48% 94%



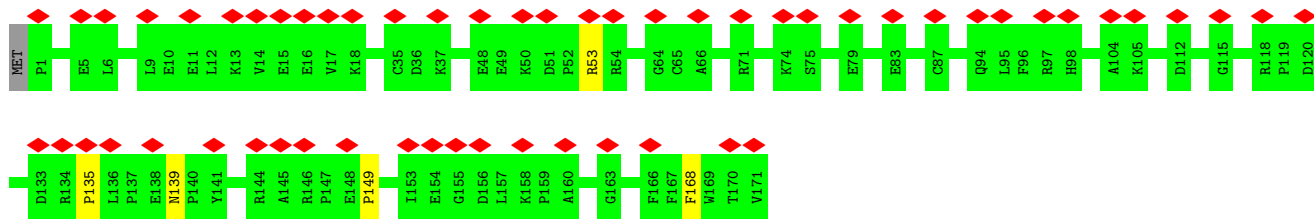
- Molecule 22: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 6

Chain W: 44% 86% 13%



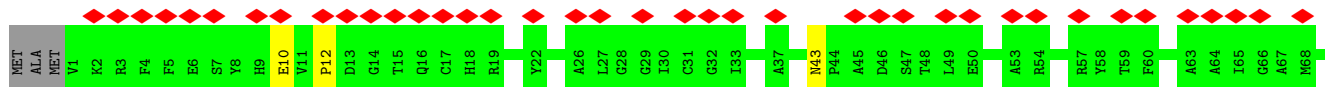
- Molecule 23: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 8

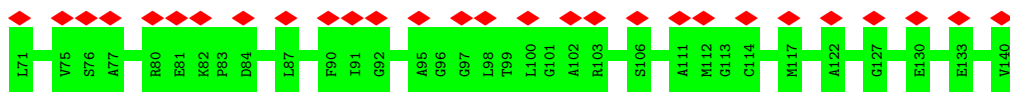
Chain X: 33% 97%



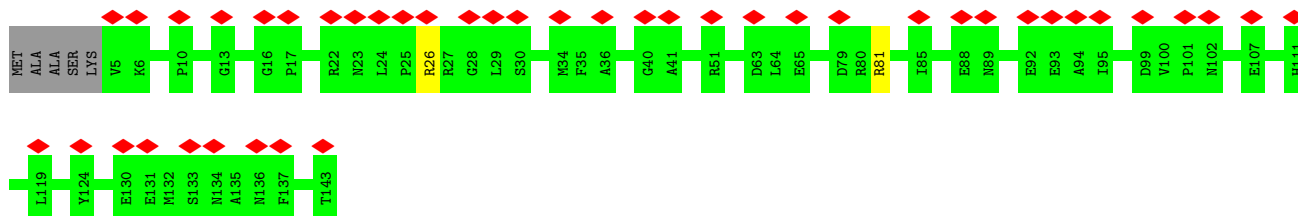
- Molecule 24: MCG5603

Chain Y: 47% 96%

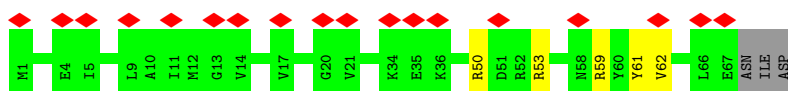
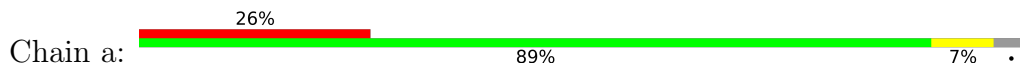




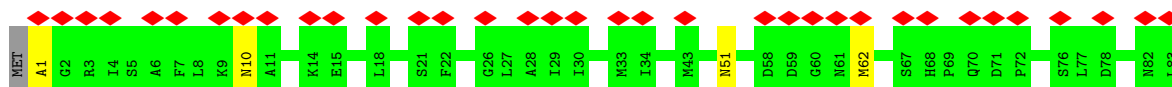
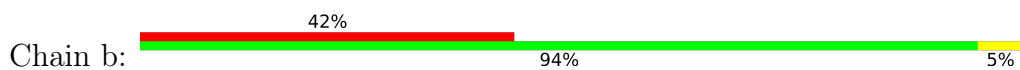
- Molecule 25: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 13



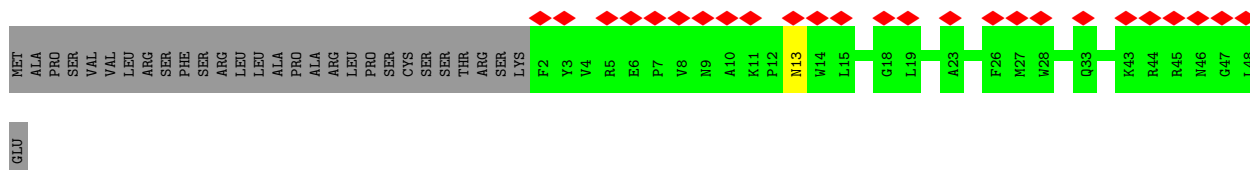
- Molecule 26: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 1



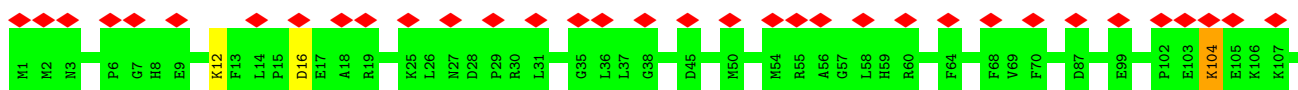
- Molecule 27: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 3

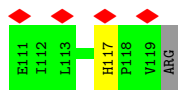


- Molecule 28: NADH dehydrogenase [ubiquinone] 1 subunit C1, mitochondrial

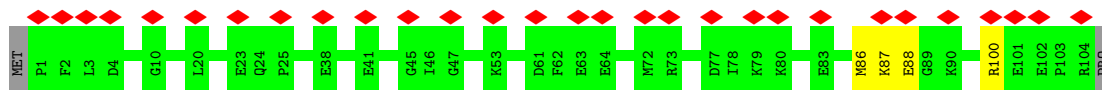
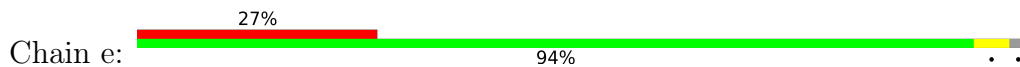


- Molecule 29: NADH dehydrogenase [ubiquinone] 1 subunit C2

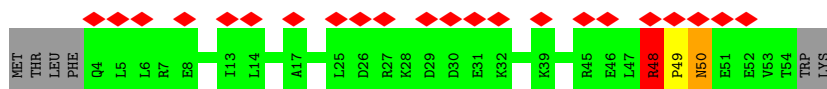
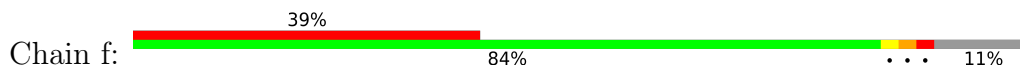




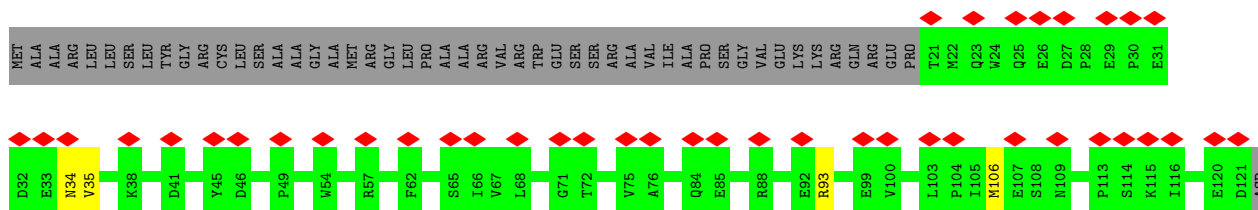
- Molecule 30: NADH dehydrogenase [ubiquinone] iron-sulfur protein 5



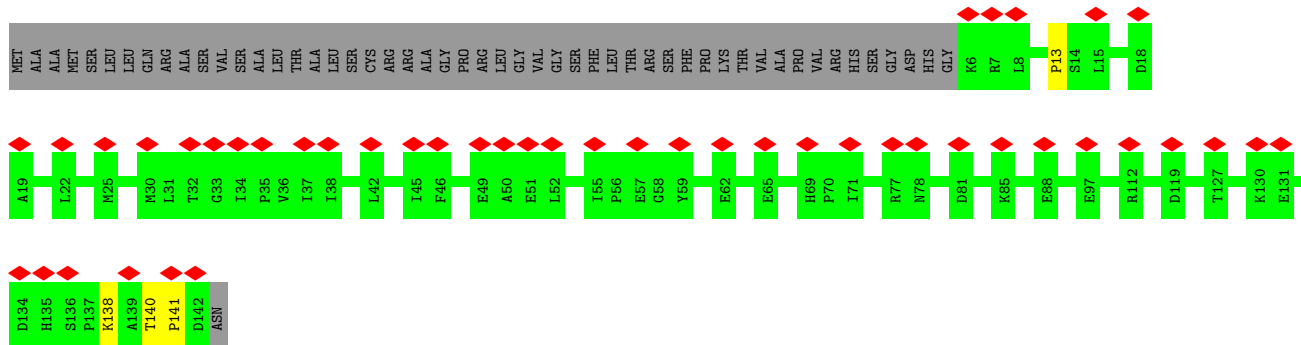
- Molecule 31: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 1



- Molecule 32: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 11, mitochondrial

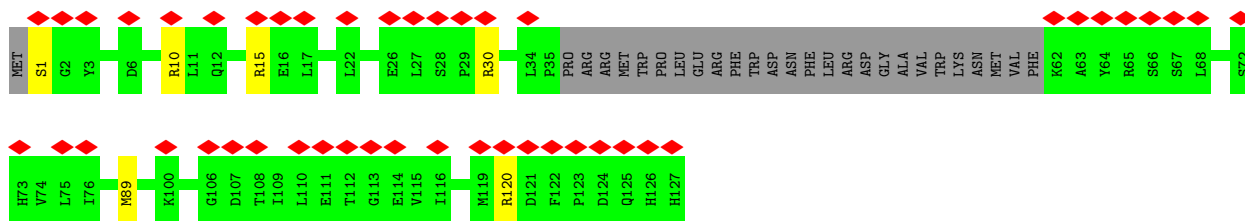


- Molecule 33: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 5, mitochondrial

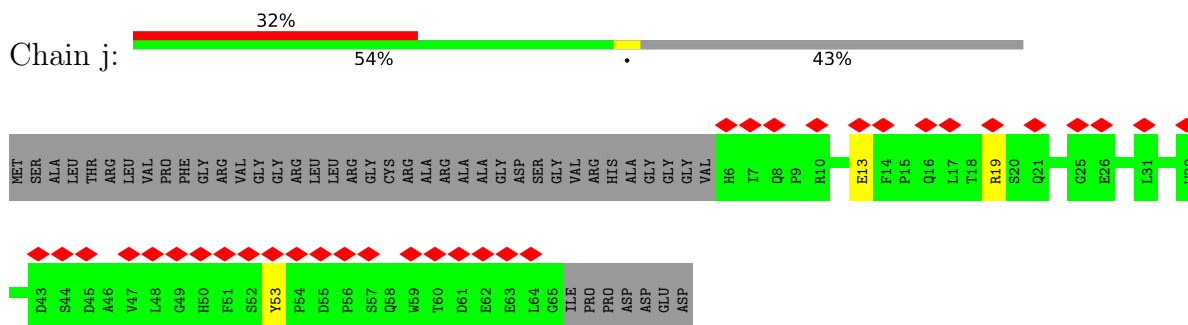


- Molecule 34: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 6

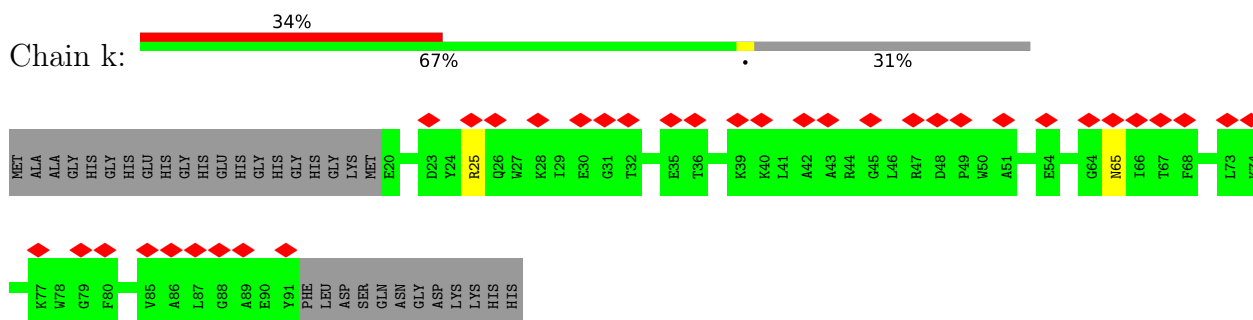




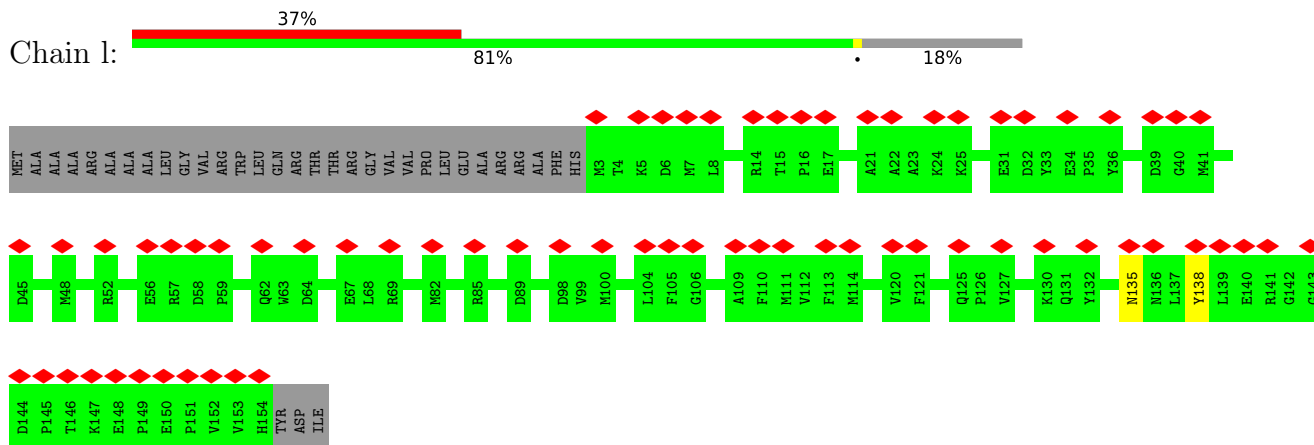
- Molecule 35: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 2, mitochondrial



- Molecule 36: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 3

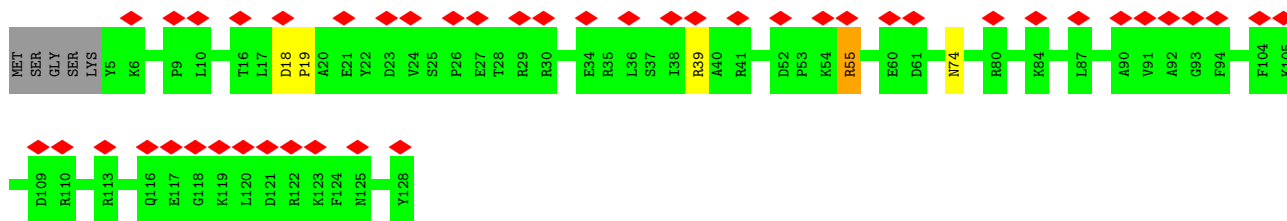


- Molecule 37: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 8, mitochondrial



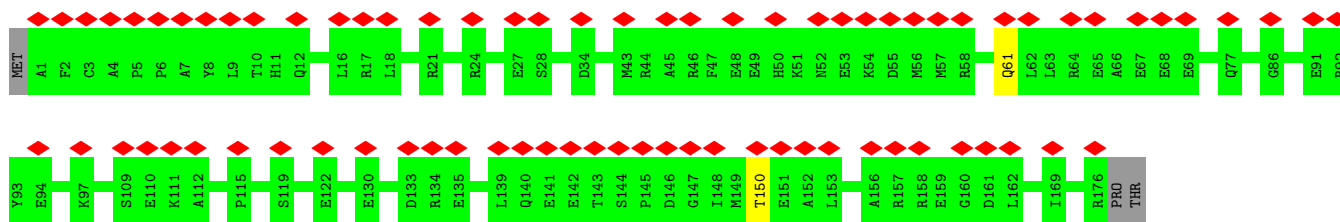
- Molecule 38: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 4





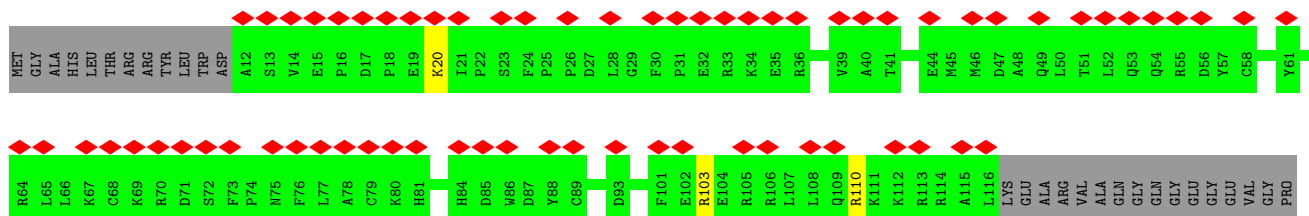
- Molecule 39: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 9

Chain n: 43% 97%



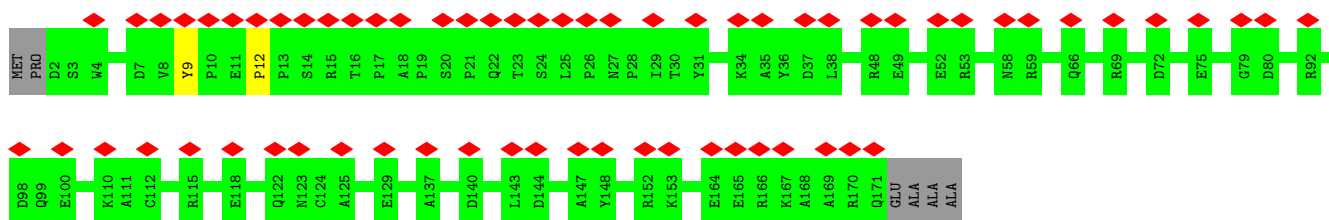
- Molecule 40: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 7

Chain o: 50% 74% 23%



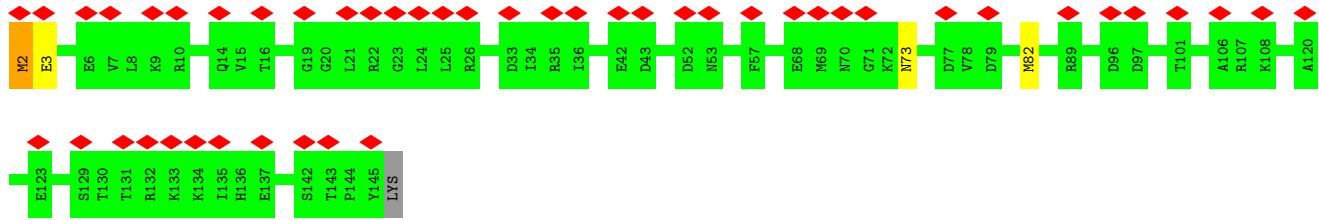
- Molecule 41: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 10

Chain p: 37% 95%

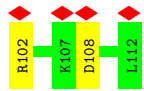
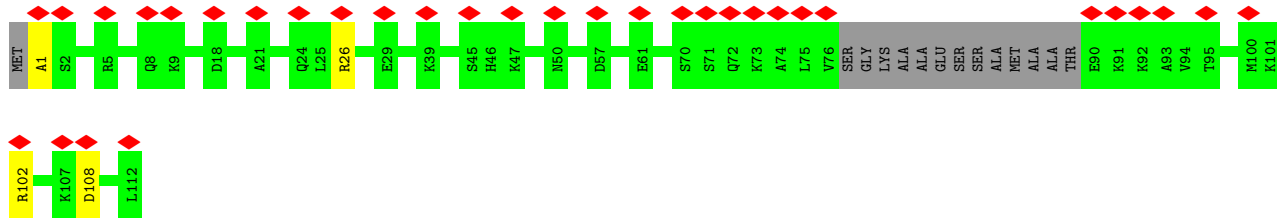
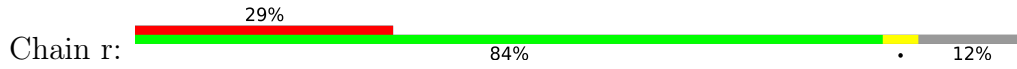


- Molecule 42: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 12

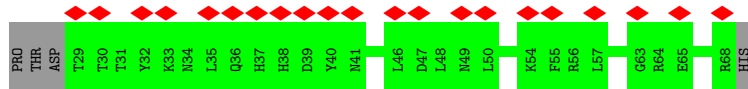
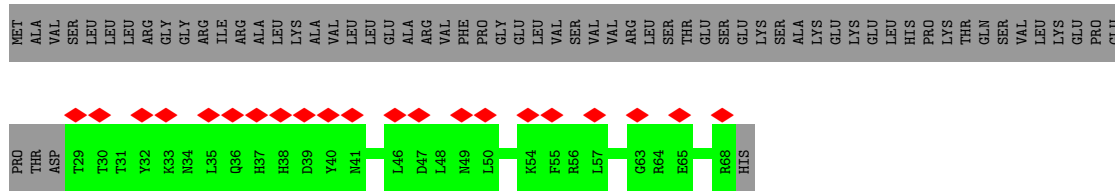
Chain q: 32% 97%



- Molecule 43: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 7



- Molecule 44: NADH dehydrogenase [ubiquinone] flavoprotein 3, mitochondrial



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	17066	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50.0	Depositor
Minimum defocus (nm)	2200	Depositor
Maximum defocus (nm)	3400	Depositor
Magnification	37600	Depositor
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor
Maximum map value	0.514	Depositor
Minimum map value	-0.126	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.012	Depositor
Recommended contour level	0.075	Depositor
Map size (\AA)	484.12003, 484.12003, 484.12003	wwPDB
Map dimensions	364, 364, 364	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.33, 1.33, 1.33	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NDP, EHZ, FES, 2MR, AYA, FME, SF4, ACE, SAC, ADP, ZN, FMN

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# $ Z > 5$	RMSZ	# $ Z > 5$
1	A	0.47	0/762	0.66	1/1043 (0.1%)
2	B	0.67	0/1272	0.70	0/1722
3	C	0.61	0/1762	0.70	0/2401
4	D	0.63	0/3462	0.69	2/4689 (0.0%)
5	E	0.46	0/1688	0.65	0/2300
6	F	0.51	0/3376	0.66	0/4561
7	G	0.51	0/5383	0.66	2/7293 (0.0%)
8	H	0.53	0/2508	0.65	1/3428 (0.0%)
9	I	0.68	0/1438	0.74	0/1946
10	J	0.55	0/1211	0.67	0/1650
11	K	0.50	0/738	0.64	0/1002
12	L	0.51	0/4913	0.65	0/6686
13	M	0.55	0/3709	0.66	0/5052
14	N	0.54	0/2748	0.66	2/3741 (0.1%)
15	O	0.51	0/2674	0.63	1/3626 (0.0%)
16	P	0.46	0/2356	0.66	1/3180 (0.0%)
17	Q	0.50	0/1038	0.66	0/1401
18	R	0.51	0/762	0.63	0/1026
19	S	0.41	0/678	0.71	0/915
20	T	0.30	0/613	0.51	0/826
20	U	0.36	0/718	0.54	0/970
21	V	0.43	0/937	0.65	0/1270
22	W	0.44	0/993	0.68	0/1335
23	X	0.50	0/1434	0.64	0/1937
24	Y	0.42	0/1061	0.62	0/1439
25	Z	0.50	0/1183	0.69	0/1597
26	a	0.50	0/561	0.73	1/755 (0.1%)
27	b	0.51	0/666	0.60	0/914
28	c	0.42	0/400	0.59	0/544
29	d	0.54	0/1017	0.70	0/1373
30	e	0.50	0/892	0.65	0/1187
31	f	0.41	0/443	0.74	0/596

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
32	g	0.54	0/878	0.64	0/1196
33	h	0.55	0/1189	0.65	0/1610
34	i	0.46	0/836	0.62	0/1138
35	j	0.45	0/548	0.67	0/748
36	k	0.46	0/601	0.69	0/814
37	l	0.50	0/1327	0.61	0/1811
38	m	0.49	0/1064	0.73	1/1444 (0.1%)
39	n	0.55	0/1581	0.66	0/2140
40	o	0.42	0/919	0.64	0/1232
41	p	0.52	0/1471	0.66	0/1988
42	q	0.58	1/1242 (0.1%)	0.69	1/1691 (0.1%)
43	r	0.48	0/806	0.75	1/1090 (0.1%)
44	s	0.39	0/345	0.62	0/468
All	All	0.52	1/66203 (0.0%)	0.66	14/89775 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
2	B	0	1
4	D	0	3
5	E	0	1
6	F	0	2
7	G	0	4
8	H	0	5
9	I	0	2
10	J	0	2
12	L	0	4
14	N	0	1
17	Q	0	1
18	R	0	1
20	U	0	1
21	V	0	1
23	X	0	1
26	a	0	1
29	d	0	4
30	e	0	1
31	f	0	2
32	g	0	2

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Mol	Chain	#Chirality outliers	#Planarity outliers
33	h	0	1
34	i	0	1
35	j	0	1
37	l	0	1
38	m	0	2
39	n	0	2
40	o	0	1
41	p	0	2
All	All	0	52

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
42	q	2	MET	CA-C	-7.94	1.32	1.52

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
16	P	79	ASP	CB-CG-OD1	7.76	125.28	118.30
38	m	18	ASP	CB-CG-OD1	6.54	124.18	118.30
43	r	108	ASP	CB-CG-OD1	6.44	124.09	118.30
4	D	208	LEU	CA-CB-CG	6.04	129.20	115.30
14	N	148	LEU	CA-CB-CG	5.78	128.59	115.30
7	G	53	ARG	NE-CZ-NH1	5.77	123.19	120.30
8	H	85	LEU	CA-CB-CG	5.71	128.43	115.30
14	N	81	LEU	CA-CB-CG	5.54	128.03	115.30
7	G	161	ARG	NE-CZ-NH1	5.50	123.05	120.30
15	O	299	LEU	CA-CB-CG	5.45	127.83	115.30
42	q	2	MET	CG-SD-CE	5.34	108.74	100.20
4	D	233	ARG	NE-CZ-NH2	-5.33	117.63	120.30
1	A	71	LEU	CA-CB-CG	5.16	127.17	115.30
26	a	53	ARG	NE-CZ-NH2	5.02	122.81	120.30

There are no chirality outliers.

All (52) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	52	SER	Peptide
2	B	119	GLU	Peptide
4	D	143	GLU	Peptide
4	D	171	PHE	Peptide

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Mol	Chain	Res	Type	Group
4	D	420	THR	Peptide
5	E	150	ASN	Peptide
6	F	206	LYS	Peptide
6	F	291	TRP	Peptide
7	G	258	ILE	Peptide
7	G	259	ASN	Peptide
7	G	390	LEU	Peptide
7	G	484	ALA	Peptide
8	H	249	ILE	Peptide
8	H	282	TYR	Peptide
8	H	64	LEU	Peptide
8	H	90	PRO	Peptide
8	H	91	MET	Peptide
9	I	116	THR	Peptide
9	I	26	ILE	Peptide
10	J	126	TYR	Peptide
10	J	129	ASP	Peptide
12	L	108	MET	Peptide
12	L	159	TYR	Peptide
12	L	383	MET	Peptide
12	L	434	LYS	Peptide
14	N	141	ILE	Peptide
17	Q	25	VAL	Peptide
18	R	53	GLU	Peptide
20	U	65	ILE	Peptide
21	V	71	LEU	Peptide
23	X	149	PRO	Peptide
26	a	61	TYR	Peptide
29	d	104	LYS	Peptide
29	d	117	HIS	Peptide
29	d	12	LYS	Peptide
29	d	16	ASP	Peptide
30	e	87	LYS	Peptide
31	f	48	ARG	Peptide
31	f	50	ASN	Peptide
32	g	106	MET	Peptide
32	g	35	VAL	Peptide
33	h	140	THR	Peptide
34	i	120	ARG	Peptide
35	j	53	TYR	Peptide
37	l	135	ASN	Peptide
38	m	19	PRO	Peptide

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Mol	Chain	Res	Type	Group
38	m	55	ARG	Peptide
39	n	150	THR	Peptide
39	n	61	GLN	Peptide
40	o	20	LYS	Peptide
41	p	12	PRO	Peptide
41	p	9	TYR	Peptide

5.2 Too-close contacts [i](#)

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

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	90/115 (78%)	73 (81%)	16 (18%)	1 (1%)	14	51
2	B	153/224 (68%)	132 (86%)	21 (14%)	0	100	100
3	C	204/263 (78%)	151 (74%)	52 (26%)	1 (0%)	29	67
4	D	416/463 (90%)	338 (81%)	75 (18%)	3 (1%)	22	60
5	E	210/248 (85%)	169 (80%)	41 (20%)	0	100	100
6	F	426/464 (92%)	351 (82%)	75 (18%)	0	100	100
7	G	686/727 (94%)	576 (84%)	109 (16%)	1 (0%)	51	84
8	H	302/318 (95%)	247 (82%)	52 (17%)	3 (1%)	15	52
9	I	176/212 (83%)	145 (82%)	30 (17%)	1 (1%)	25	63
10	J	169/172 (98%)	137 (81%)	28 (17%)	4 (2%)	6	37
11	K	96/98 (98%)	95 (99%)	1 (1%)	0	100	100
12	L	604/607 (100%)	508 (84%)	94 (16%)	2 (0%)	41	75
13	M	457/459 (100%)	406 (89%)	49 (11%)	2 (0%)	34	71
14	N	342/345 (99%)	305 (89%)	35 (10%)	2 (1%)	25	63

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
15	O	318/355 (90%)	267 (84%)	50 (16%)	1 (0%)	41	75
16	P	283/377 (75%)	230 (81%)	53 (19%)	0	100	100
17	Q	123/175 (70%)	102 (83%)	21 (17%)	0	100	100
18	R	93/116 (80%)	74 (80%)	17 (18%)	2 (2%)	6	38
19	S	81/99 (82%)	71 (88%)	10 (12%)	0	100	100
20	T	73/156 (47%)	66 (90%)	7 (10%)	0	100	100
20	U	86/156 (55%)	71 (83%)	14 (16%)	1 (1%)	13	49
21	V	110/116 (95%)	91 (83%)	19 (17%)	0	100	100
22	W	112/131 (86%)	102 (91%)	10 (9%)	0	100	100
23	X	169/172 (98%)	135 (80%)	32 (19%)	2 (1%)	13	49
24	Y	138/143 (96%)	118 (86%)	18 (13%)	2 (1%)	11	46
25	Z	137/144 (95%)	116 (85%)	21 (15%)	0	100	100
26	a	65/70 (93%)	53 (82%)	11 (17%)	1 (2%)	10	45
27	b	81/84 (96%)	67 (83%)	14 (17%)	0	100	100
28	c	45/76 (59%)	41 (91%)	4 (9%)	0	100	100
29	d	117/120 (98%)	100 (86%)	17 (14%)	0	100	100
30	e	102/106 (96%)	76 (74%)	25 (24%)	1 (1%)	15	52
31	f	49/57 (86%)	37 (76%)	10 (20%)	2 (4%)	3	27
32	g	99/151 (66%)	77 (78%)	22 (22%)	0	100	100
33	h	135/189 (71%)	111 (82%)	22 (16%)	2 (2%)	10	45
34	i	97/128 (76%)	78 (80%)	19 (20%)	0	100	100
35	j	58/105 (55%)	40 (69%)	16 (28%)	2 (3%)	3	31
36	k	70/104 (67%)	48 (69%)	22 (31%)	0	100	100
37	l	150/186 (81%)	108 (72%)	41 (27%)	1 (1%)	22	60
38	m	122/129 (95%)	101 (83%)	21 (17%)	0	100	100
39	n	174/179 (97%)	148 (85%)	26 (15%)	0	100	100
40	o	103/137 (75%)	81 (79%)	22 (21%)	0	100	100
41	p	168/176 (96%)	133 (79%)	35 (21%)	0	100	100
42	q	142/145 (98%)	110 (78%)	30 (21%)	2 (1%)	11	46
43	r	95/113 (84%)	70 (74%)	25 (26%)	0	100	100
44	s	38/104 (36%)	30 (79%)	8 (21%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	7964/9214 (86%)	6585 (83%)	1340 (17%)	39 (0%)	32 67

All (39) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
9	I	27	LEU
10	J	126	TYR
35	j	13	GLU
37	l	138	TYR
7	G	259	ASN
8	H	282	TYR
15	O	303	LYS
18	R	54	HIS
31	f	48	ARG
42	q	3	GLU
3	C	204	GLU
4	D	80	ILE
10	J	130	ASP
13	M	2	LEU
13	M	224	PRO
24	Y	10	GLU
30	e	88	GLU
33	h	13	PRO
4	D	7	ASP
14	N	2	ASN
18	R	53	GLU
20	U	8	LEU
24	Y	12	PRO
26	a	62	VAL
1	A	53	MET
8	H	194	ASN
10	J	125	MET
23	X	135	PRO
35	j	19	ARG
42	q	82	MET
4	D	325	VAL
12	L	2	ASN
23	X	168	PHE
33	h	141	PRO
14	N	109	ALA
8	H	92	PRO
12	L	563	PRO

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Mol	Chain	Res	Type
10	J	128	VAL
31	f	49	PRO

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	81/103 (79%)	81 (100%)	0	100	100
2	B	131/185 (71%)	129 (98%)	2 (2%)	65	80
3	C	188/227 (83%)	184 (98%)	4 (2%)	53	73
4	D	362/394 (92%)	358 (99%)	4 (1%)	73	84
5	E	183/206 (89%)	182 (100%)	1 (0%)	88	93
6	F	343/370 (93%)	338 (98%)	5 (2%)	65	80
7	G	580/610 (95%)	575 (99%)	5 (1%)	78	87
8	H	268/279 (96%)	264 (98%)	4 (2%)	65	80
9	I	145/178 (82%)	143 (99%)	2 (1%)	67	81
10	J	105/137 (77%)	105 (100%)	0	100	100
11	K	87/87 (100%)	86 (99%)	1 (1%)	73	84
12	L	548/549 (100%)	542 (99%)	6 (1%)	73	84
13	M	414/414 (100%)	411 (99%)	3 (1%)	84	90
14	N	306/307 (100%)	301 (98%)	5 (2%)	62	79
15	O	284/309 (92%)	279 (98%)	5 (2%)	59	77
16	P	251/325 (77%)	246 (98%)	5 (2%)	55	74
17	Q	112/153 (73%)	109 (97%)	3 (3%)	44	67
18	R	80/96 (83%)	79 (99%)	1 (1%)	69	82
19	S	74/80 (92%)	73 (99%)	1 (1%)	67	81
20	T	69/135 (51%)	69 (100%)	0	100	100
20	U	81/135 (60%)	78 (96%)	3 (4%)	34	60
21	V	100/102 (98%)	98 (98%)	2 (2%)	55	74

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
22	W	108/114 (95%)	107 (99%)	1 (1%)	78	87
23	X	153/154 (99%)	151 (99%)	2 (1%)	69	82
24	Y	105/107 (98%)	104 (99%)	1 (1%)	76	86
25	Z	120/123 (98%)	118 (98%)	2 (2%)	60	78
26	a	57/60 (95%)	55 (96%)	2 (4%)	36	62
27	b	72/73 (99%)	69 (96%)	3 (4%)	30	57
28	c	41/67 (61%)	40 (98%)	1 (2%)	49	69
29	d	106/107 (99%)	105 (99%)	1 (1%)	78	87
30	e	92/94 (98%)	90 (98%)	2 (2%)	52	71
31	f	47/53 (89%)	45 (96%)	2 (4%)	29	57
32	g	92/129 (71%)	90 (98%)	2 (2%)	52	71
33	h	122/162 (75%)	121 (99%)	1 (1%)	81	89
34	i	87/119 (73%)	83 (95%)	4 (5%)	27	55
35	j	56/87 (64%)	56 (100%)	0	100	100
36	k	55/78 (70%)	53 (96%)	2 (4%)	35	61
37	l	137/161 (85%)	137 (100%)	0	100	100
38	m	110/114 (96%)	107 (97%)	3 (3%)	44	67
39	n	161/164 (98%)	161 (100%)	0	100	100
40	o	98/121 (81%)	96 (98%)	2 (2%)	55	74
41	p	155/158 (98%)	155 (100%)	0	100	100
42	q	130/131 (99%)	128 (98%)	2 (2%)	65	80
43	r	88/96 (92%)	86 (98%)	2 (2%)	50	71
44	s	39/95 (41%)	39 (100%)	0	100	100
All	All	7023/7948 (88%)	6926 (99%)	97 (1%)	68	81

All (97) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	64	CYS
2	B	65	CYS
3	C	14	ARG
3	C	128	ASN
3	C	175	ARG
3	C	200	ASN

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Mol	Chain	Res	Type
4	D	232	ASN
4	D	296	ARG
4	D	388	ARG
4	D	430	ARG
5	E	15	ASN
6	F	16	LYS
6	F	24	ASN
6	F	28	ARG
6	F	89	ARG
6	F	112	ARG
7	G	52	CYS
7	G	78	ASN
7	G	135	ARG
7	G	336	ASN
7	G	450	MET
8	H	61	MET
8	H	124	ASN
8	H	156	MET
8	H	195	ARG
9	I	25	ARG
9	I	106	ARG
11	K	92	ASN
12	L	25	ASN
12	L	319	MET
12	L	425	ARG
12	L	436	ARG
12	L	444	ASN
12	L	572	ASN
13	M	86	LYS
13	M	331	ASN
13	M	366	ASN
14	N	2	ASN
14	N	204	ASN
14	N	273	ASN
14	N	310	ASN
14	N	323	ASN
15	O	30	ASN
15	O	48	MET
15	O	92	ASN
15	O	213	LYS
15	O	288	GLN
16	P	50	ARG

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Mol	Chain	Res	Type
16	P	89	ASN
16	P	93	ASN
16	P	97	ARG
16	P	216	ASN
17	Q	43	ASN
17	Q	112	LYS
17	Q	125	ASN
18	R	3	GLN
19	S	38	GLN
20	U	2	ASP
20	U	6	LEU
20	U	7	THR
21	V	44	ARG
21	V	109	ASN
22	W	126	MET
23	X	53	ARG
23	X	139	ASN
24	Y	43	ASN
25	Z	26	ARG
25	Z	81	ARG
26	a	50	ARG
26	a	59	ARG
27	b	10	ASN
27	b	51	ASN
27	b	62	MET
28	c	13	ASN
29	d	104	LYS
30	e	86	MET
30	e	100	ARG
31	f	48	ARG
31	f	50	ASN
32	g	34	ASN
32	g	93	ARG
33	h	138	LYS
34	i	10	ARG
34	i	15	ARG
34	i	30	ARG
34	i	89	MET
36	k	25	ARG
36	k	65	ASN
38	m	39	ARG
38	m	55	ARG

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Mol	Chain	Res	Type
38	m	74	ASN
40	o	103	ARG
40	o	110	ARG
42	q	2	MET
42	q	73	ASN
43	r	26	ARG
43	r	102	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (74) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	108	GLN
2	B	104	ASN
3	C	211	GLN
4	D	114	ASN
4	D	232	ASN
4	D	347	HIS
5	E	15	ASN
5	E	67	ASN
6	F	263	ASN
7	G	36	GLN
7	G	78	ASN
7	G	237	ASN
7	G	499	GLN
7	G	546	GLN
8	H	5	ASN
8	H	124	ASN
8	H	194	ASN
8	H	235	ASN
8	H	304	HIS
9	I	138	ASN
9	I	152	ASN
11	K	7	ASN
12	L	25	ASN
12	L	444	ASN
12	L	452	ASN
12	L	572	ASN
13	M	48	ASN
13	M	51	ASN
13	M	81	GLN
13	M	139	GLN
13	M	175	ASN

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Mol	Chain	Res	Type
13	M	366	ASN
14	N	171	ASN
14	N	273	ASN
14	N	316	HIS
14	N	323	ASN
14	N	342	GLN
15	O	30	ASN
15	O	204	ASN
15	O	294	ASN
16	P	37	HIS
16	P	93	ASN
16	P	250	HIS
17	Q	51	ASN
17	Q	125	ASN
21	V	109	ASN
21	V	110	GLN
22	W	101	GLN
22	W	128	HIS
23	X	98	HIS
23	X	103	GLN
23	X	139	ASN
24	Y	43	ASN
24	Y	88	ASN
25	Z	54	GLN
26	a	31	ASN
27	b	10	ASN
27	b	45	ASN
28	c	13	ASN
29	d	27	ASN
31	f	50	ASN
32	g	34	ASN
33	h	63	HIS
34	i	73	HIS
35	j	42	HIS
36	k	65	ASN
37	l	27	ASN
38	m	74	ASN
39	n	168	HIS
41	p	99	GLN
42	q	73	ASN
42	q	88	HIS
43	r	8	GLN

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Mol	Chain	Res	Type
44	s	36	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
34	SAC	i	1	34	7,8,9	1.02	0	8,9,11	0.94	1 (12%)
14	FME	N	1	14	8,9,10	1.00	0	7,9,11	1.61	1 (14%)
10	FME	J	1	10	8,9,10	0.95	0	7,9,11	1.32	1 (14%)
13	FME	M	1	13	8,9,10	1.08	1 (12%)	7,9,11	1.03	0
1	FME	A	1	1	8,9,10	1.00	0	7,9,11	0.68	0
27	AYA	b	1	27	6,7,8	1.12	0	5,8,10	2.29	3 (60%)
4	2MR	D	85	4	10,12,13	2.57	3 (30%)	5,13,15	4.83	3 (60%)
43	AYA	r	1	43	6,7,8	1.23	1 (16%)	5,8,10	1.61	2 (40%)
12	FME	L	1	12	8,9,10	0.96	0	7,9,11	0.71	0
11	FME	K	1	11	8,9,10	0.92	0	7,9,11	1.74	1 (14%)
8	FME	H	1	8	8,9,10	0.94	0	7,9,11	0.65	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
34	SAC	i	1	34	-	0/7/8/10	-
14	FME	N	1	14	-	2/7/9/11	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
10	FME	J	1	10	-	3/7/9/11	-
13	FME	M	1	13	-	1/7/9/11	-
1	FME	A	1	1	-	3/7/9/11	-
27	AYA	b	1	27	-	2/4/6/8	-
4	2MR	D	85	4	-	3/10/13/15	-
43	AYA	r	1	43	-	0/4/6/8	-
12	FME	L	1	12	-	4/7/9/11	-
11	FME	K	1	11	-	3/7/9/11	-
8	FME	H	1	8	-	3/7/9/11	-

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	85	2MR	CZ-NH2	5.35	1.45	1.33
4	D	85	2MR	CZ-NE	5.34	1.45	1.34
4	D	85	2MR	CQ1-NH1	-2.32	1.41	1.46
13	M	1	FME	CA-N	-2.27	1.43	1.46
43	r	1	AYA	CA-N	-2.23	1.44	1.46

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	85	2MR	NE-CZ-NH2	9.10	127.82	119.48
4	D	85	2MR	CD-NE-CZ	4.25	131.37	123.41
4	D	85	2MR	CQ2-NH2-CZ	3.79	132.24	123.86
11	K	1	FME	C-CA-N	3.75	116.50	109.73
27	b	1	AYA	CA-N-CT	3.67	126.86	121.52
14	N	1	FME	C-CA-N	3.55	116.14	109.73
10	J	1	FME	C-CA-N	3.07	115.27	109.73
43	r	1	AYA	CB-CA-N	2.91	112.84	109.61
27	b	1	AYA	CM-CT-N	2.44	120.23	116.10
34	i	1	SAC	OG-CB-CA	-2.23	105.28	110.97
27	b	1	AYA	CB-CA-N	2.03	111.87	109.61
43	r	1	AYA	CA-N-CT	2.01	124.45	121.52

There are no chirality outliers.

All (24) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	1	FME	C-CA-CB-CG

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Mol	Chain	Res	Type	Atoms
4	D	85	2MR	N-CA-CB-CG
8	H	1	FME	N-CA-CB-CG
10	J	1	FME	O1-CN-N-CA
10	J	1	FME	C-CA-CB-CG
11	K	1	FME	C-CA-CB-CG
12	L	1	FME	O1-CN-N-CA
12	L	1	FME	C-CA-CB-CG
14	N	1	FME	N-CA-CB-CG
14	N	1	FME	CA-CB-CG-SD
27	b	1	AYA	OT-CT-N-CA
27	b	1	AYA	CM-CT-N-CA
1	A	1	FME	N-CA-CB-CG
11	K	1	FME	N-CA-CB-CG
12	L	1	FME	N-CA-CB-CG
13	M	1	FME	CA-CB-CG-SD
11	K	1	FME	CB-CG-SD-CE
4	D	85	2MR	C-CA-CB-CG
1	A	1	FME	CB-CG-SD-CE
8	H	1	FME	CB-CG-SD-CE
4	D	85	2MR	NE-CD-CG-CB
12	L	1	FME	CB-CA-N-CN
8	H	1	FME	C-CA-CB-CG
10	J	1	FME	N-CA-CB-CG

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 15 ligands modelled in this entry, 1 is monoatomic - leaving 14 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
46	FES	E	301	5	0,4,4	-	-	-		
45	SF4	G	802	7	0,12,12	-	-	-		
45	SF4	F	502	6	0,12,12	-	-	-		
45	SF4	G	801	7	0,12,12	-	-	-		
46	FES	G	803	7	0,4,4	-	-	-		
47	FMN	F	501	-	33,33,33	1.16	2 (6%)	48,50,50	1.39	9 (18%)
51	EHZ	U	201	20	27,34,37	1.79	6 (22%)	33,42,47	1.18	3 (9%)
48	ADP	O	401	-	24,29,29	1.02	2 (8%)	29,45,45	1.42	3 (10%)
49	NDP	P	501	-	45,52,52	2.31	8 (17%)	53,80,80	1.55	9 (16%)
51	EHZ	T	201	20	26,33,37	1.80	5 (19%)	32,41,47	1.35	2 (6%)
52	ACE	q	201	42	1,2,2	0.34	0	1,1,1	0.67	0
45	SF4	B	201	2	0,12,12	-	-	-		
45	SF4	I	202	9	0,12,12	-	-	-		
45	SF4	I	201	9	0,12,12	-	-	-		

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
46	FES	E	301	5	-	-	0/1/1/1
45	SF4	G	802	7	-	-	0/6/5/5
45	SF4	F	502	6	-	-	0/6/5/5
45	SF4	G	801	7	-	-	0/6/5/5
46	FES	G	803	7	-	-	0/1/1/1
47	FMN	F	501	-	-	7/18/18/18	0/3/3/3
51	EHZ	U	201	20	-	16/40/42/45	-
48	ADP	O	401	-	-	2/12/32/32	0/3/3/3
49	NDP	P	501	-	-	8/30/77/77	0/5/5/5
51	EHZ	T	201	20	-	7/39/41/45	-
45	SF4	B	201	2	-	-	0/6/5/5
45	SF4	I	202	9	-	-	0/6/5/5
45	SF4	I	201	9	-	-	0/6/5/5

All (23) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
49	P	501	NDP	P2B-O2B	12.85	1.83	1.59
51	U	201	EHZ	C15-N2	5.53	1.45	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
51	T	201	EHZ	C15-N2	5.52	1.45	1.33
51	T	201	EHZ	C12-N1	5.32	1.45	1.33
51	U	201	EHZ	C12-N1	5.31	1.45	1.33
49	P	501	NDP	PN-O5D	3.59	1.73	1.59
47	F	501	FMN	C4A-N5	3.11	1.36	1.30
49	P	501	NDP	O2B-C2B	-3.09	1.32	1.44
51	T	201	EHZ	C9-S1	2.51	1.82	1.76
51	U	201	EHZ	C9-S1	2.49	1.82	1.76
49	P	501	NDP	O5D-C5D	-2.42	1.35	1.44
49	P	501	NDP	O3D-C3D	-2.34	1.37	1.43
47	F	501	FMN	C10-N1	2.28	1.37	1.33
49	P	501	NDP	C7N-N7N	2.28	1.39	1.33
51	T	201	EHZ	O4-C15	-2.27	1.18	1.23
51	U	201	EHZ	O4-C15	-2.26	1.18	1.23
51	U	201	EHZ	O3-C12	-2.25	1.18	1.23
48	O	401	ADP	C5-C4	2.19	1.46	1.40
51	T	201	EHZ	O3-C12	-2.16	1.18	1.23
51	U	201	EHZ	O6-C20	-2.09	1.39	1.44
49	P	501	NDP	O2D-C2D	-2.05	1.38	1.43
48	O	401	ADP	O4'-C1'	2.02	1.43	1.41
49	P	501	NDP	PA-O5B	2.00	1.67	1.59

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
49	P	501	NDP	PN-O3-PA	-5.52	113.87	132.83
51	T	201	EHZ	C8-C9-S1	5.05	119.87	113.63
51	U	201	EHZ	C8-C9-S1	4.20	118.82	113.63
48	O	401	ADP	N3-C2-N1	-3.65	122.97	128.68
47	F	501	FMN	C4-N3-C2	-3.64	118.91	125.64
48	O	401	ADP	PA-O3A-PB	-3.41	121.12	132.83
49	P	501	NDP	O2B-P2B-O1X	-3.30	96.67	109.39
47	F	501	FMN	C4A-C10-N10	3.05	120.93	116.48
47	F	501	FMN	C4A-C10-N1	-2.98	117.82	124.73
49	P	501	NDP	PN-O5D-C5D	-2.89	104.72	121.68
47	F	501	FMN	C4A-C4-N3	2.88	120.51	113.19
49	P	501	NDP	C2A-N1A-C6A	-2.54	114.41	118.75
47	F	501	FMN	O4-C4-C4A	-2.52	119.92	126.60
49	P	501	NDP	O3X-P2B-O2X	2.47	117.08	107.64
51	U	201	EHZ	C19-C17-C16	2.46	113.08	108.82
47	F	501	FMN	C4-C4A-C10	2.41	120.84	116.79
51	T	201	EHZ	C10-S1-C9	2.32	109.10	101.87

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
49	P	501	NDP	O7N-C7N-N7N	-2.29	117.51	122.88
47	F	501	FMN	C1'-N10-C9A	2.27	124.29	120.51
48	O	401	ADP	C4-C5-N7	-2.25	107.06	109.40
49	P	501	NDP	PA-O5B-C5B	-2.24	108.52	121.68
47	F	501	FMN	C10-N1-C2	2.13	121.16	116.90
49	P	501	NDP	C5B-C4B-C3B	-2.12	107.22	115.18
47	F	501	FMN	C10-C4A-N5	-2.12	120.35	124.86
49	P	501	NDP	O2N-PN-O1N	2.02	122.24	112.24
51	U	201	EHZ	C10-S1-C9	2.01	108.13	101.87

There are no chirality outliers.

All (40) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
47	F	501	FMN	N10-C1'-C2'-O2'
47	F	501	FMN	N10-C1'-C2'-C3'
47	F	501	FMN	C3'-C4'-C5'-O5'
47	F	501	FMN	O4'-C4'-C5'-O5'
47	F	501	FMN	C5'-O5'-P-O1P
47	F	501	FMN	C5'-O5'-P-O2P
48	O	401	ADP	PB-O3A-PA-O5'
51	T	201	EHZ	O1-C7-C8-C9
51	T	201	EHZ	C11-C10-S1-C9
51	T	201	EHZ	C12-C13-C14-N2
51	T	201	EHZ	O2-C9-S1-C10
51	T	201	EHZ	C8-C9-S1-C10
51	U	201	EHZ	C15-C16-C17-C18
51	U	201	EHZ	C15-C16-C17-C19
51	U	201	EHZ	C15-C16-C17-C20
51	U	201	EHZ	O5-C16-C17-C18
51	U	201	EHZ	O5-C16-C17-C19
51	U	201	EHZ	O5-C16-C17-C20
51	U	201	EHZ	O2-C9-S1-C10
51	U	201	EHZ	C8-C9-S1-C10
49	P	501	NDP	C3B-C2B-O2B-P2B
49	P	501	NDP	C1B-C2B-O2B-P2B
51	T	201	EHZ	S1-C10-C11-N1
51	U	201	EHZ	C3-C4-C5-C6
49	P	501	NDP	O4D-C4D-C5D-O5D
51	U	201	EHZ	C1-C2-C3-C4
49	P	501	NDP	C3D-C4D-C5D-O5D
47	F	501	FMN	C5'-O5'-P-O3P

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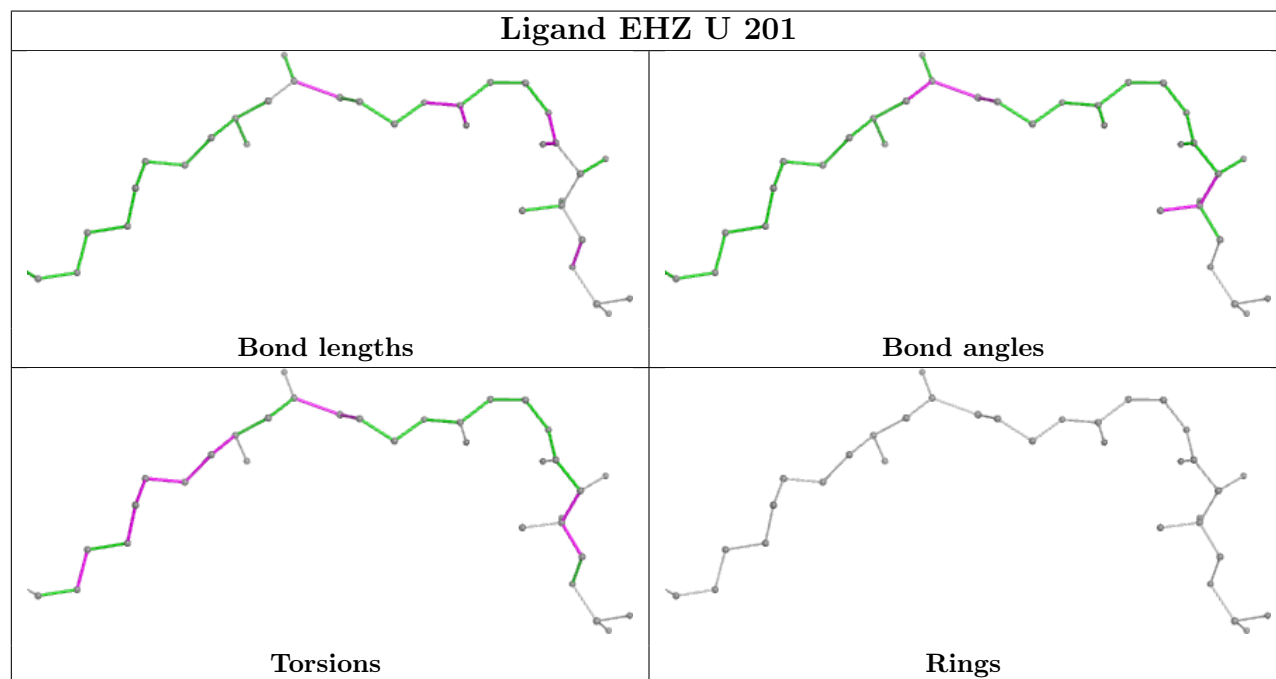
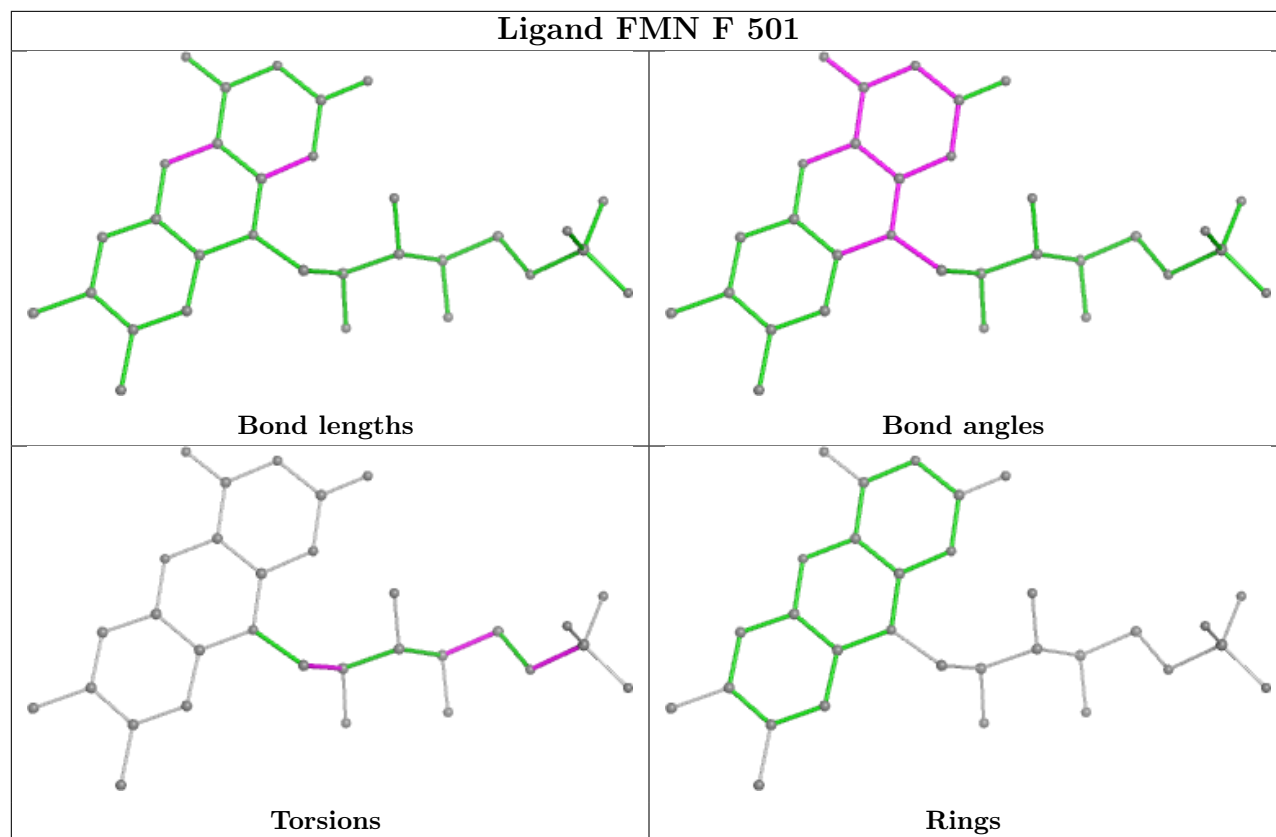
Continued from previous page...

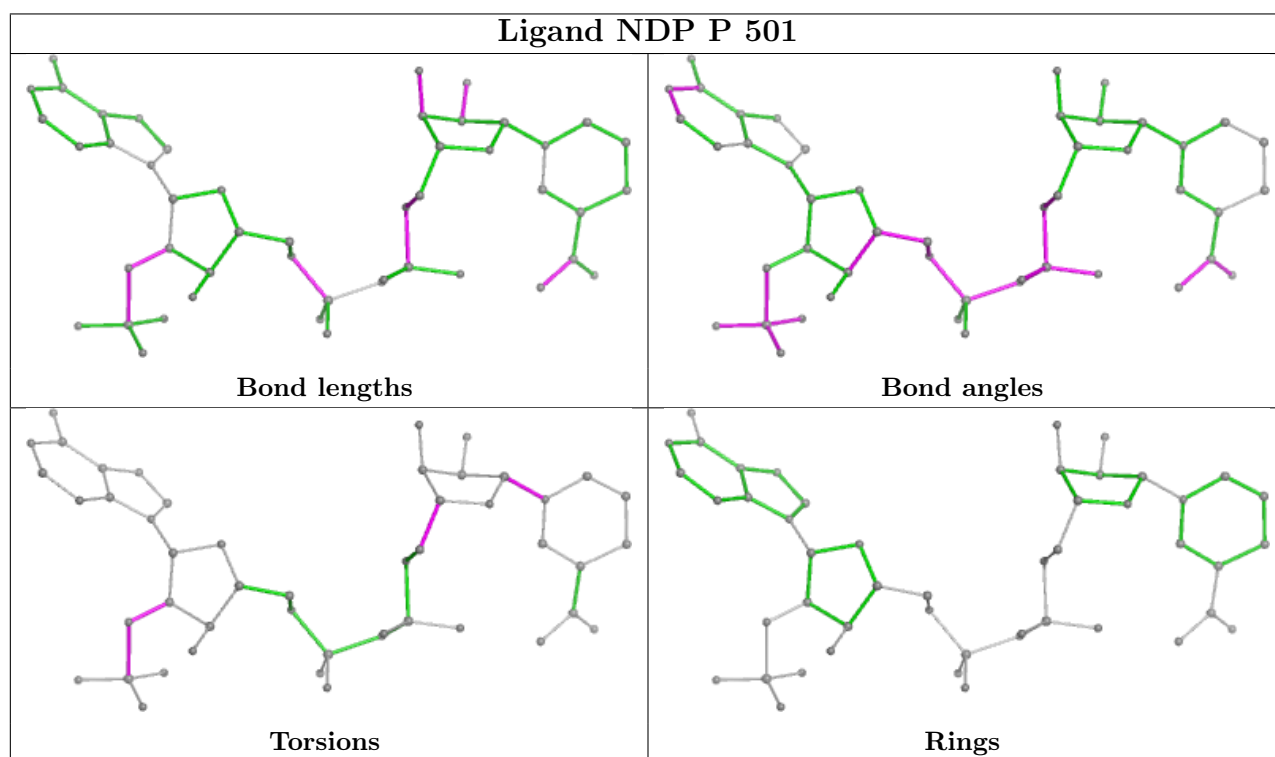
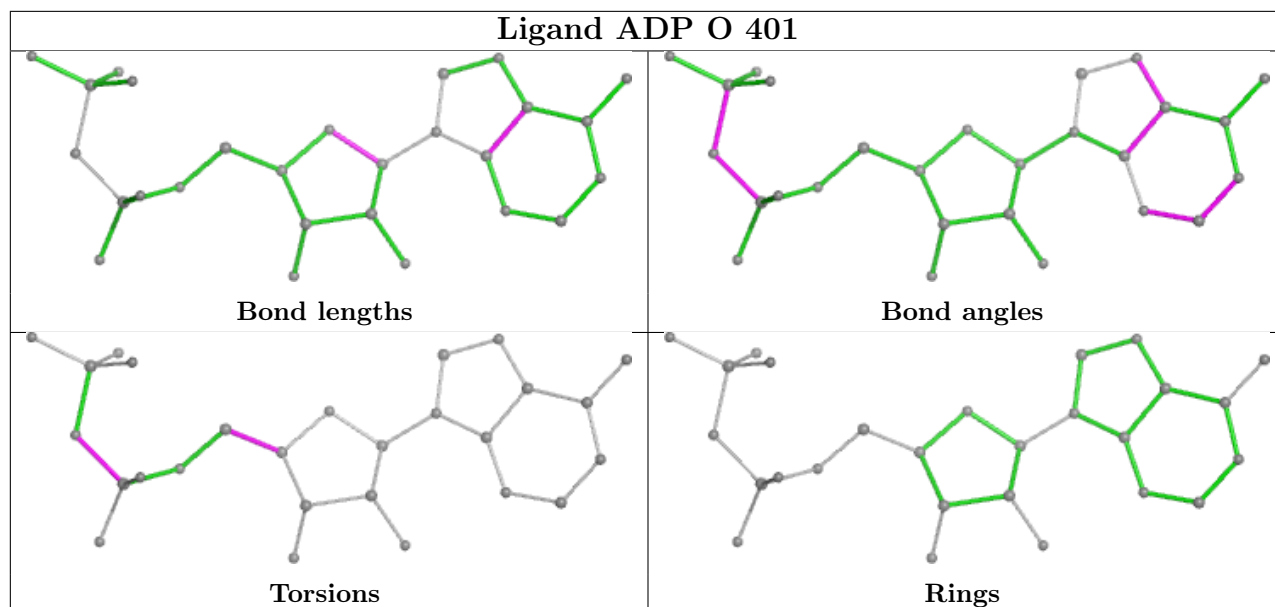
Mol	Chain	Res	Type	Atoms
49	P	501	NDP	C2B-O2B-P2B-O3X
51	U	201	EHZ	C5-C6-C7-O1
51	T	201	EHZ	C6-C7-C8-C9
51	U	201	EHZ	C2-C1-C21-C22
48	O	401	ADP	O4'-C4'-C5'-O5'
49	P	501	NDP	O4D-C1D-N1N-C6N
51	U	201	EHZ	C18-C17-C20-O6
51	U	201	EHZ	C4-C5-C6-C7
51	U	201	EHZ	C11-C10-S1-C9
49	P	501	NDP	C2B-O2B-P2B-O1X
49	P	501	NDP	C2B-O2B-P2B-O2X
51	U	201	EHZ	C2-C3-C4-C5

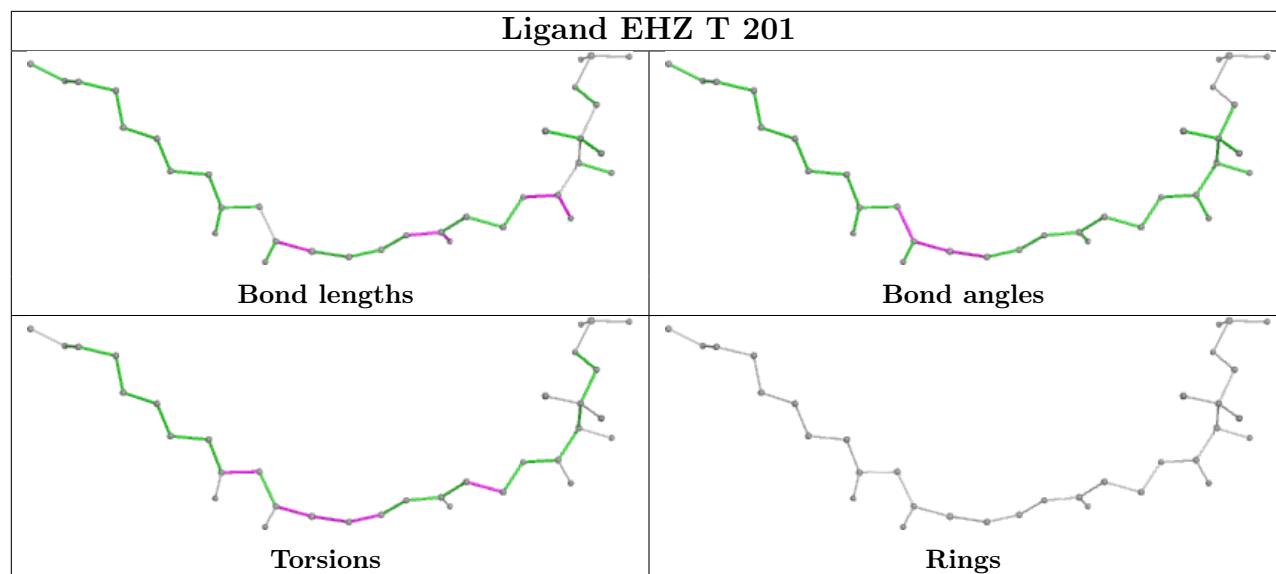
There are no ring outliers.

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 than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.







5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

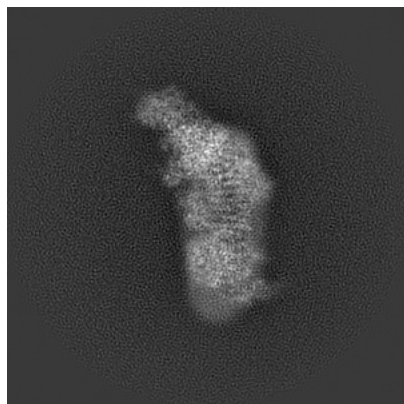
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-4356. These allow visual inspection of the internal detail of the map and identification of artifacts.

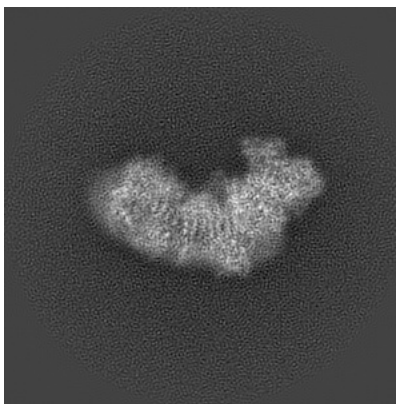
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

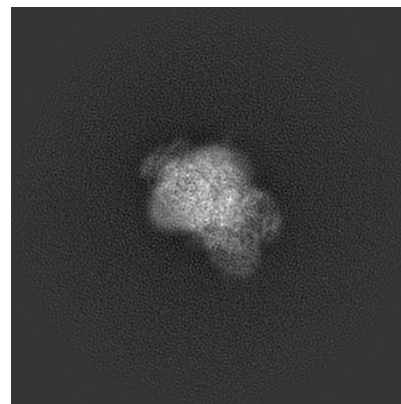
6.1.1 Primary map



X

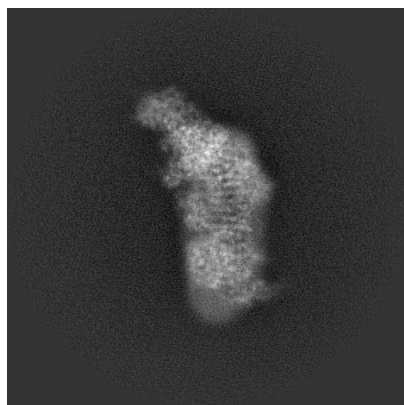


Y

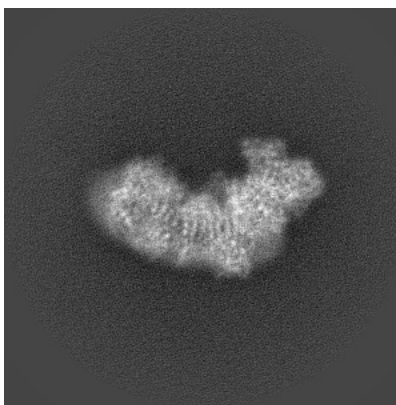


Z

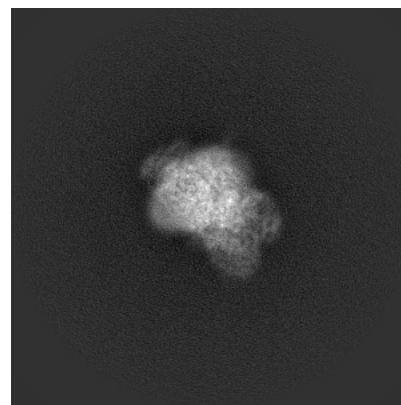
6.1.2 Raw map



X



Y

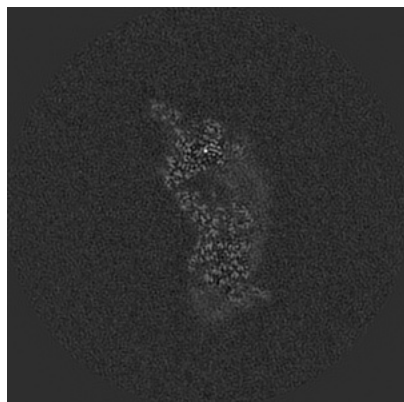


Z

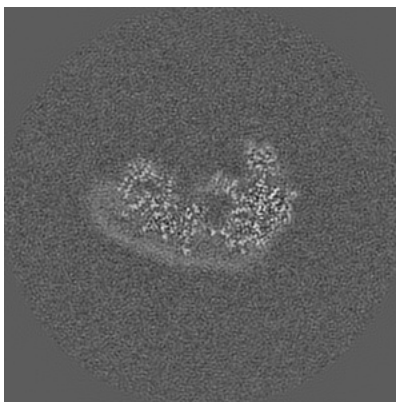
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

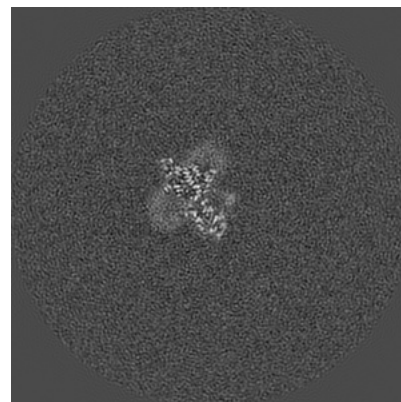
6.2.1 Primary map



X Index: 182

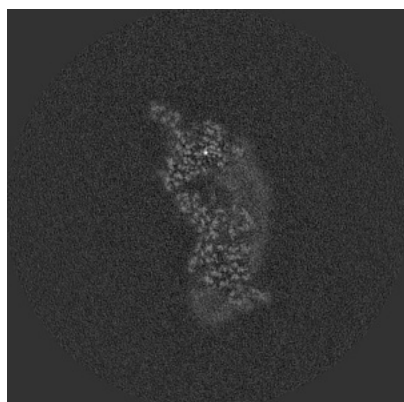


Y Index: 182

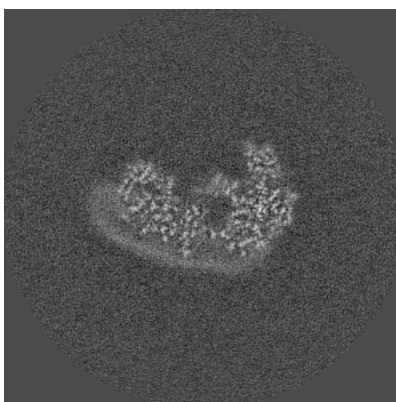


Z Index: 182

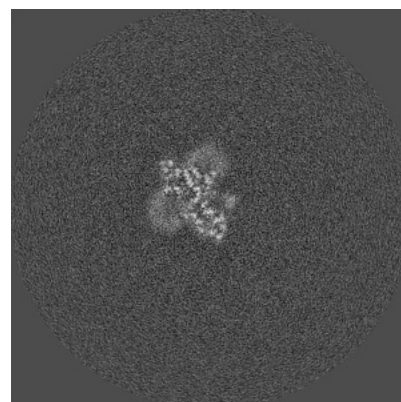
6.2.2 Raw map



X Index: 182



Y Index: 182

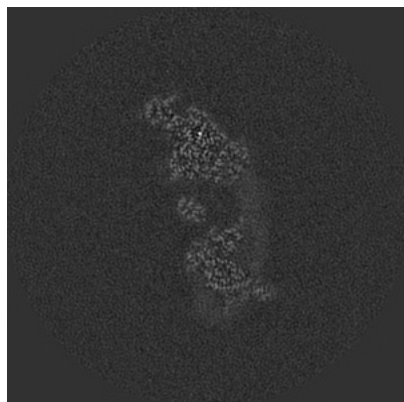


Z Index: 182

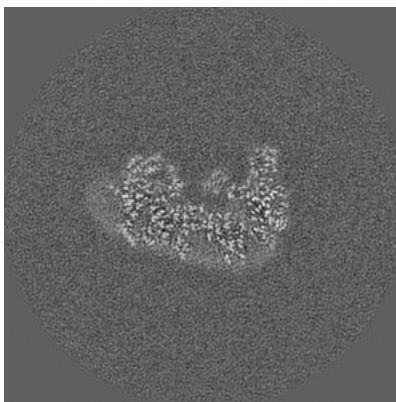
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

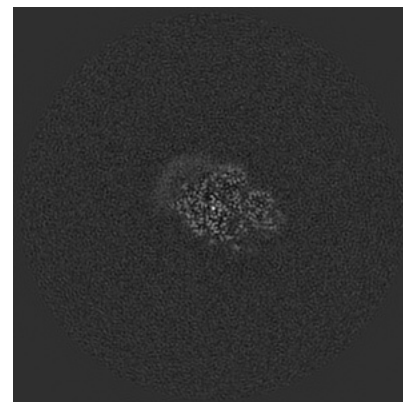
6.3.1 Primary map



X Index: 191

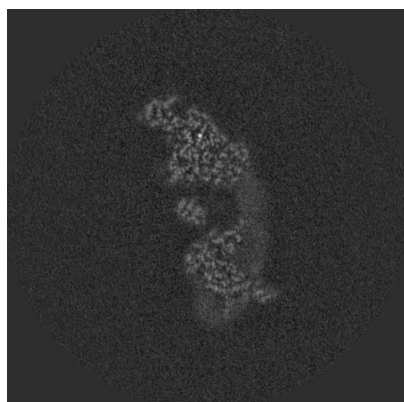


Y Index: 190

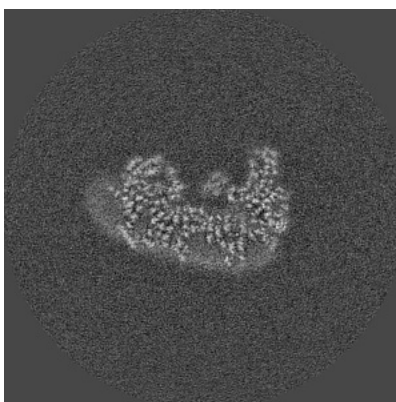


Z Index: 233

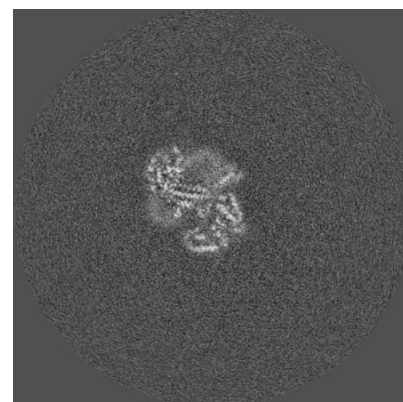
6.3.2 Raw map



X Index: 191



Y Index: 190

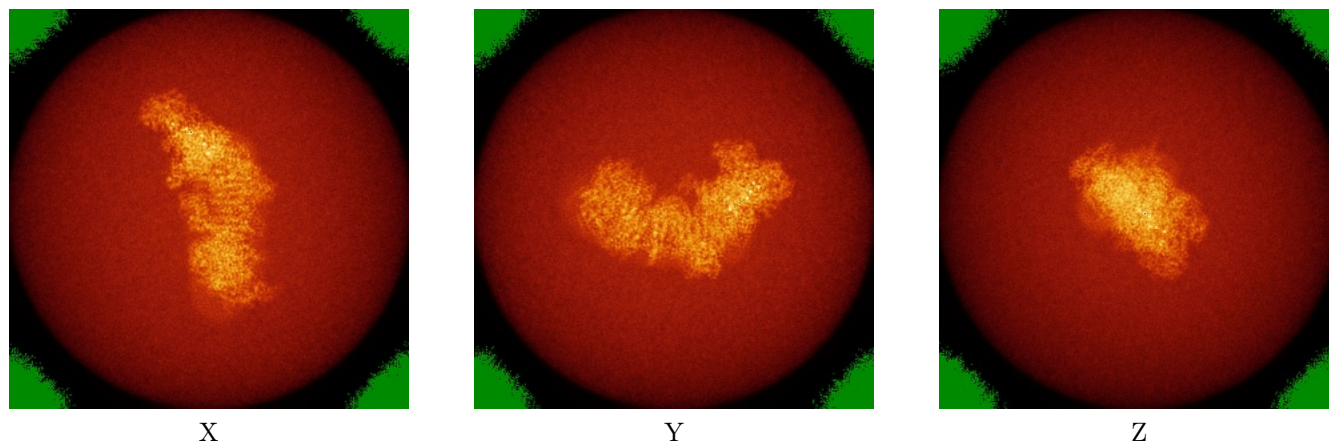


Z Index: 209

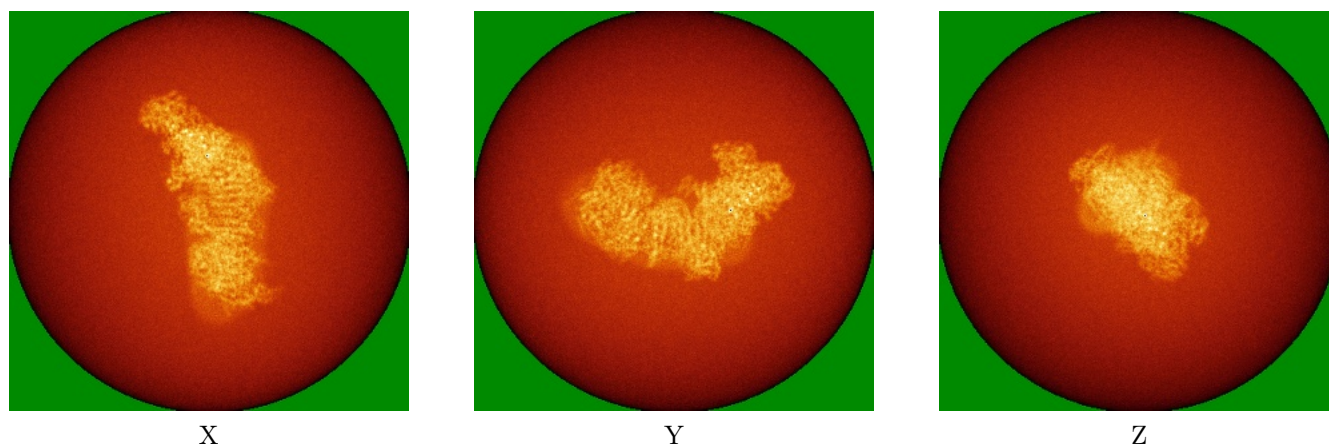
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) [i](#)

6.4.1 Primary map



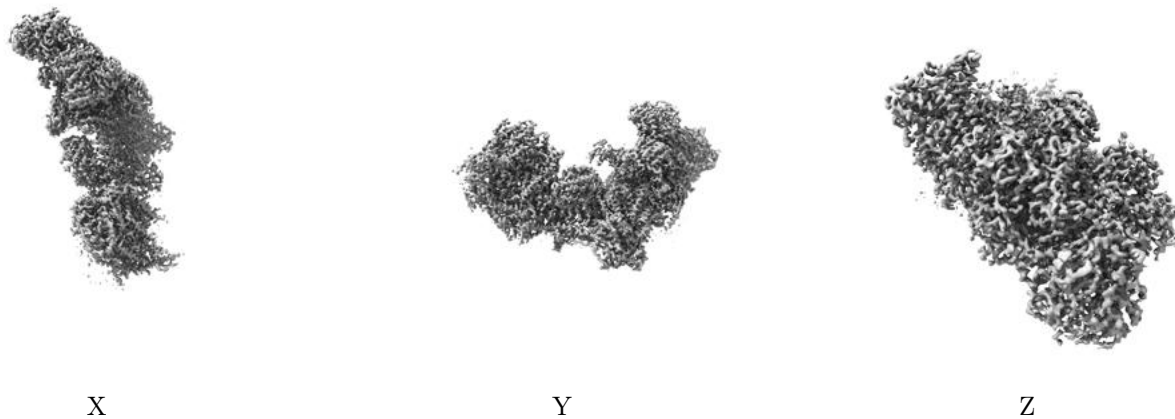
6.4.2 Raw map



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.

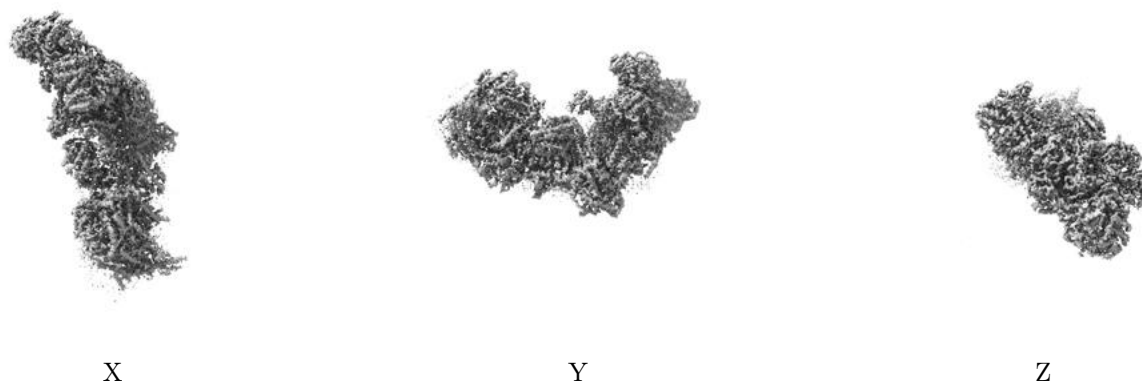
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.075. 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.

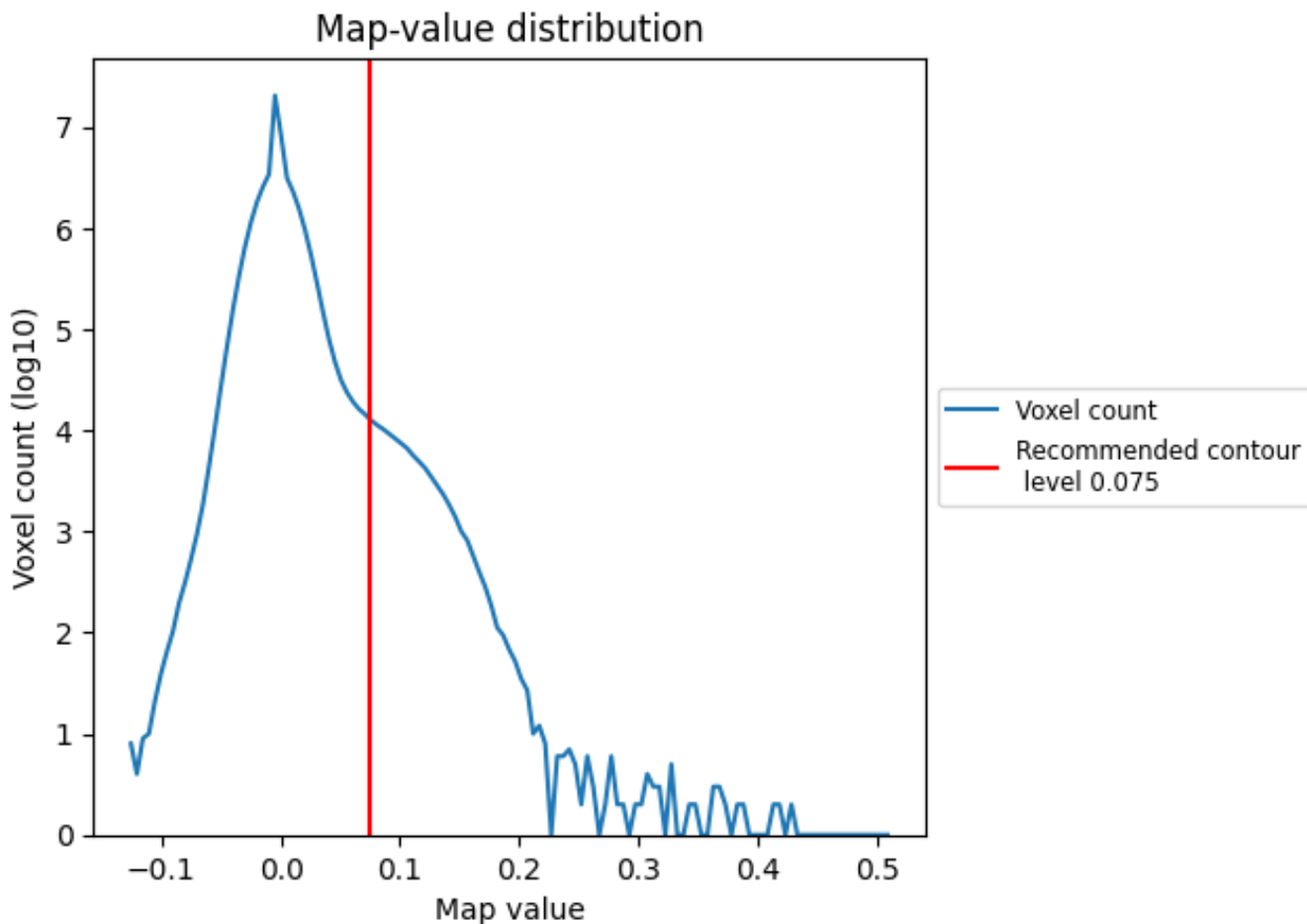
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

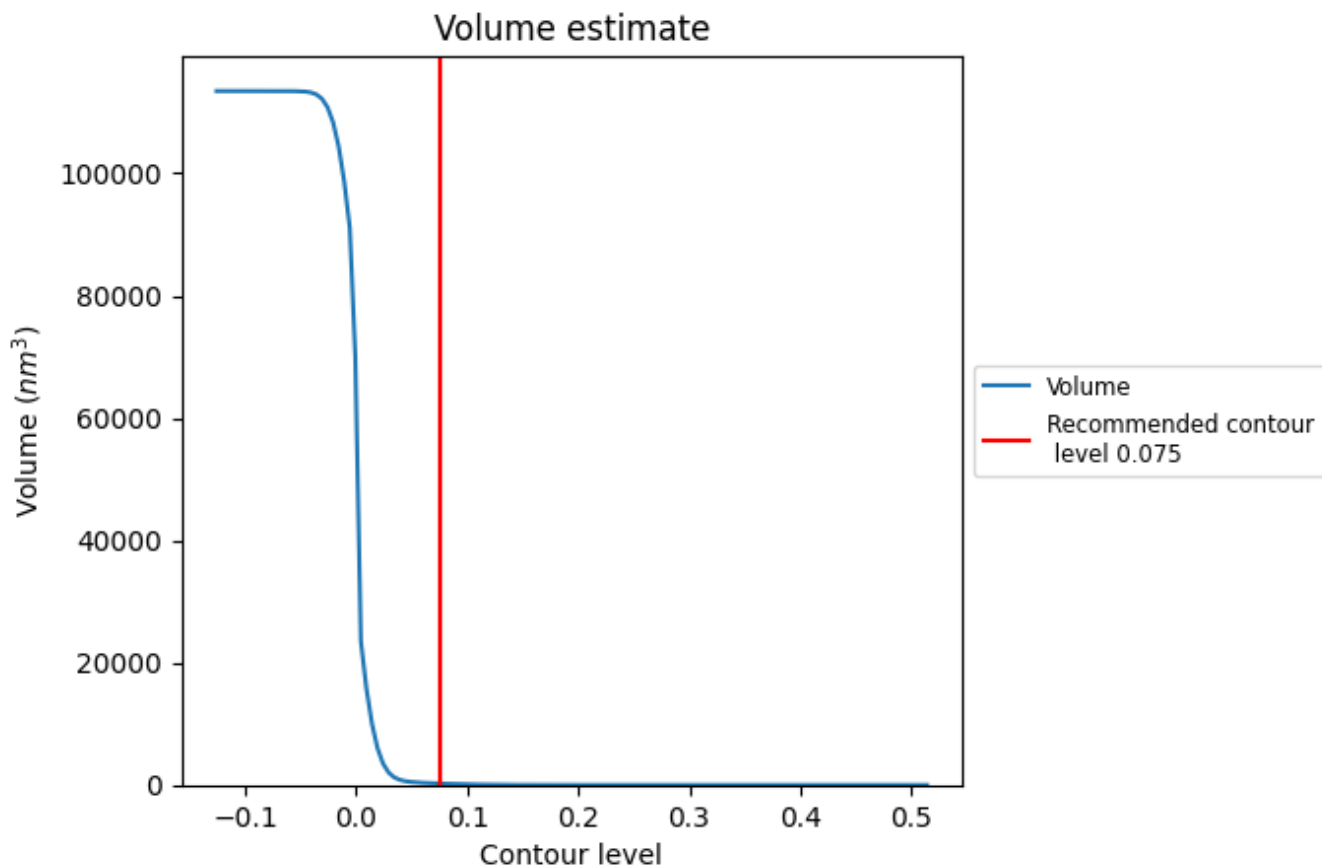
This section contains the results of statistical analysis of the map.

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.

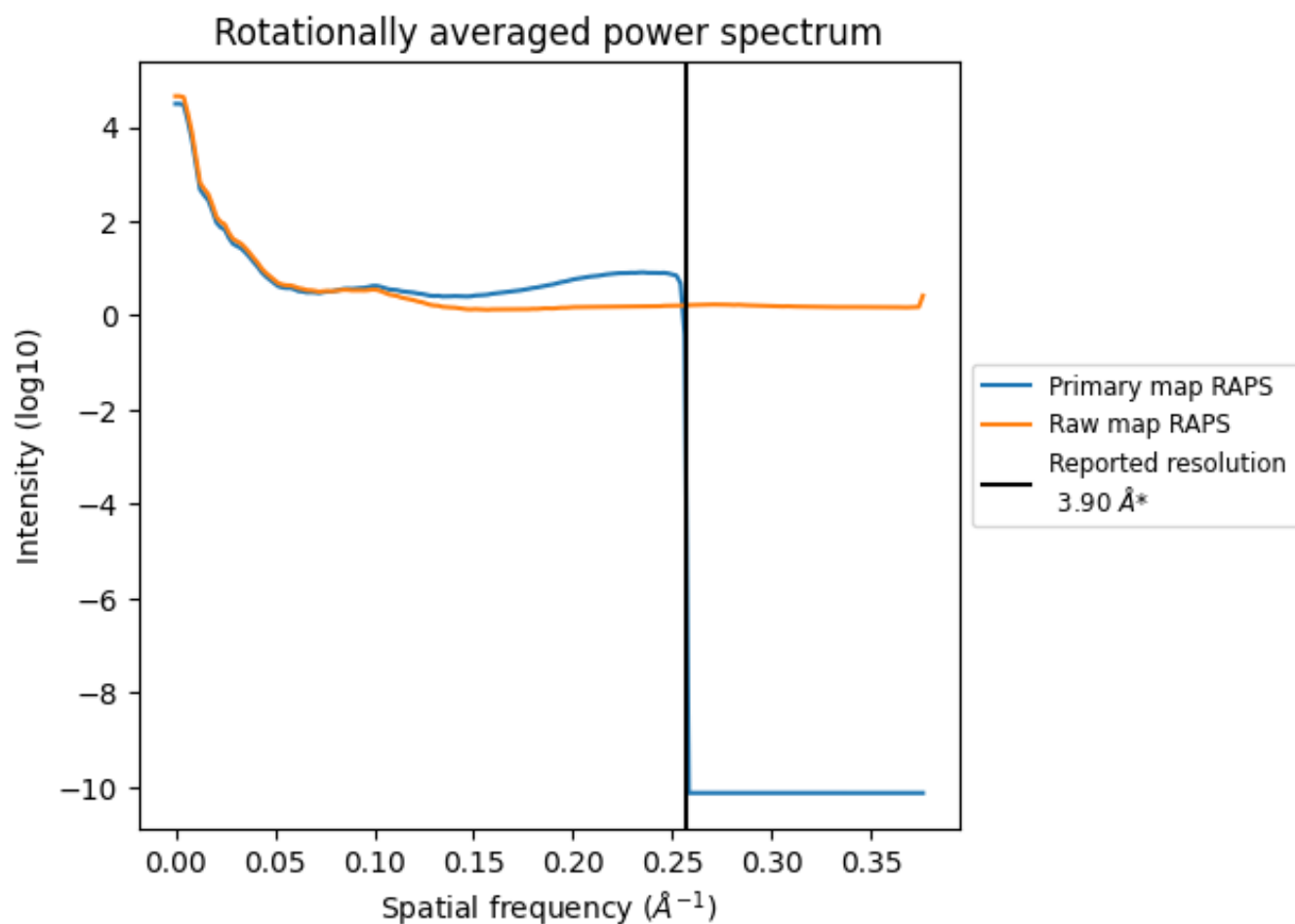
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 232 nm^3 ; this corresponds to an approximate mass of 210 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](#)

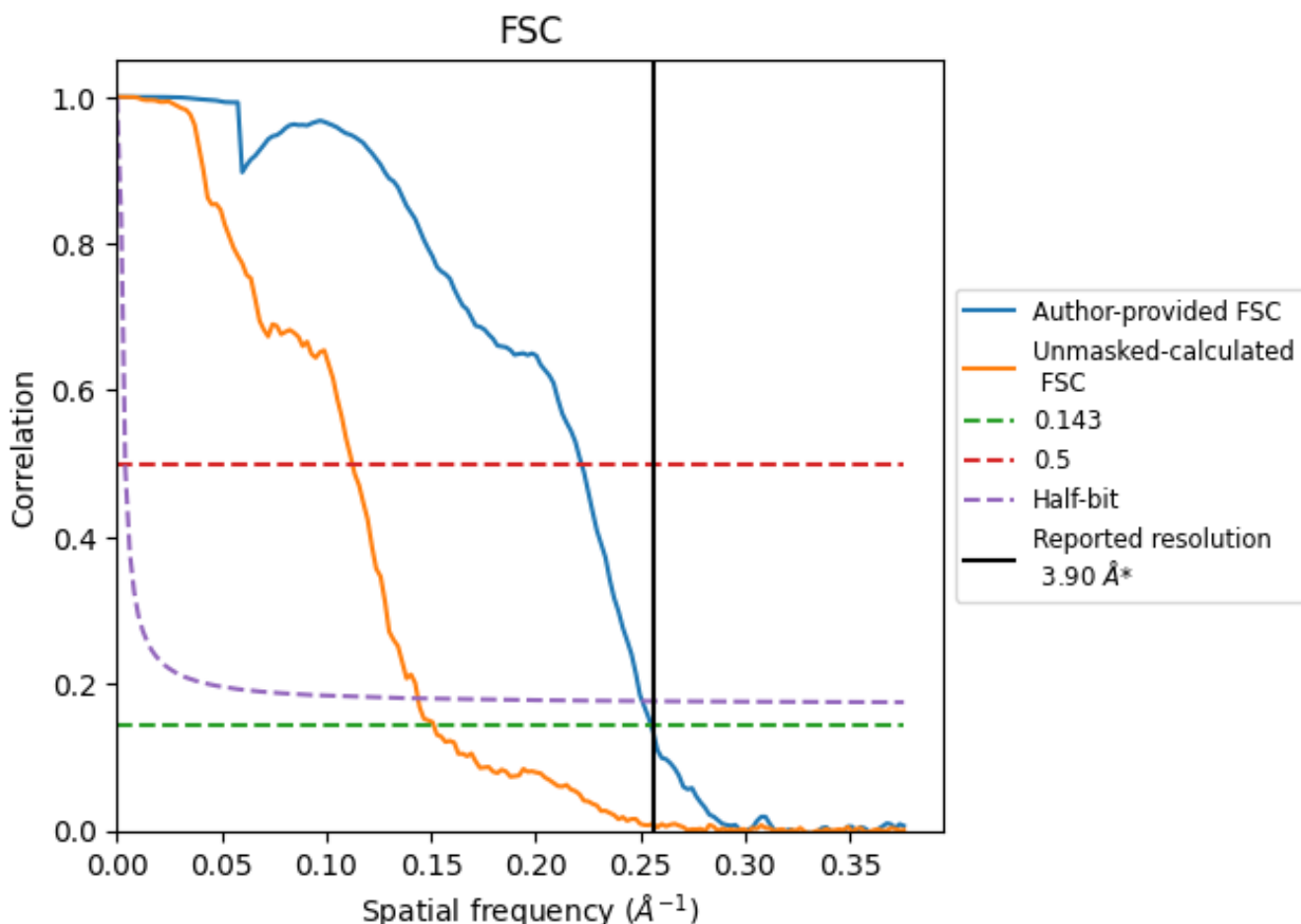


*Reported resolution corresponds to spatial frequency of 0.256 Å⁻¹

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 0.256 Å⁻¹

8.2 Resolution estimates

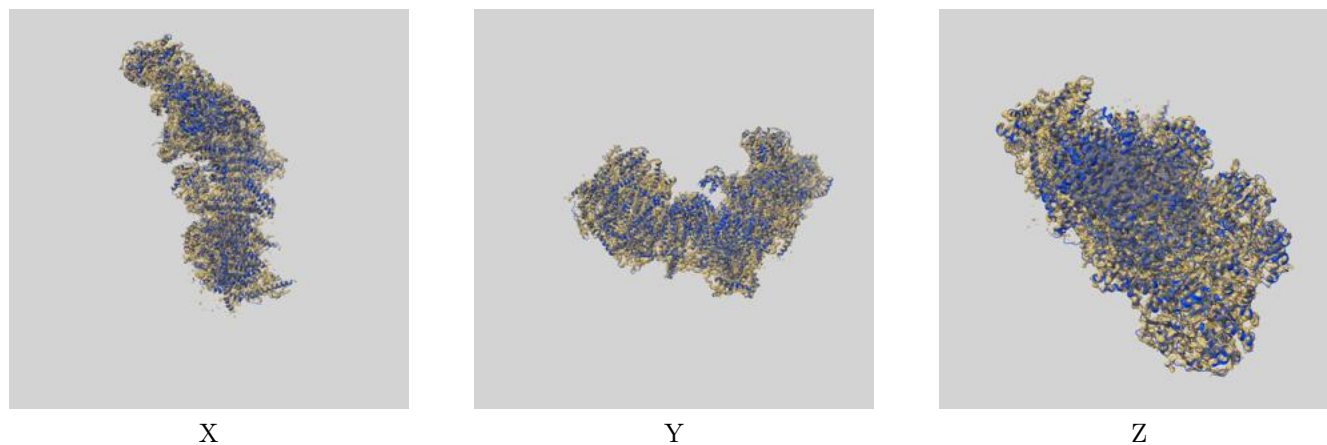
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.90	-	-
Author-provided FSC curve	3.92	4.51	3.98
Unmasked-calculated*	6.61	8.89	6.95

*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 6.61 differs from the reported value 3.9 by more than 10 %

9 Map-model fit [i](#)

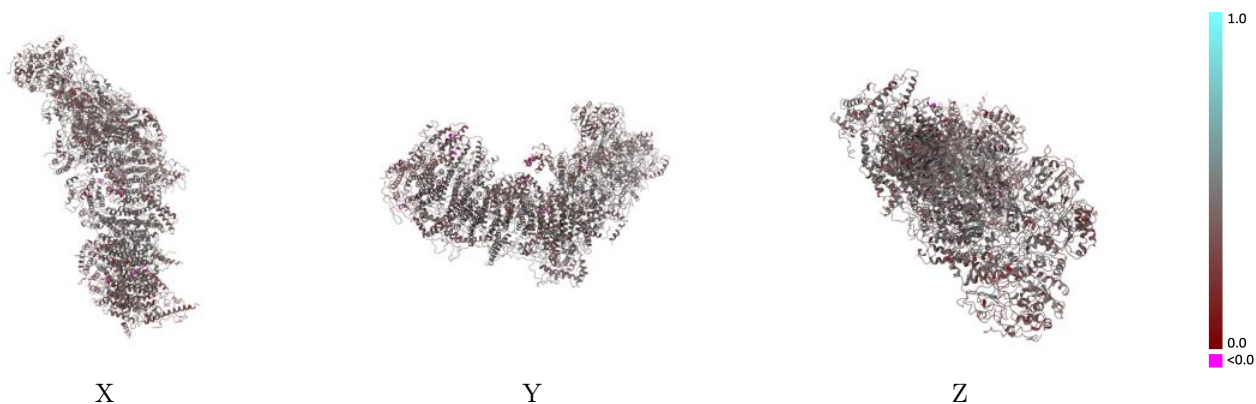
This section contains information regarding the fit between EMDB map EMD-4356 and PDB model 6G72. Per-residue inclusion information can be found in section 3 on page 17.

9.1 Map-model overlay [i](#)



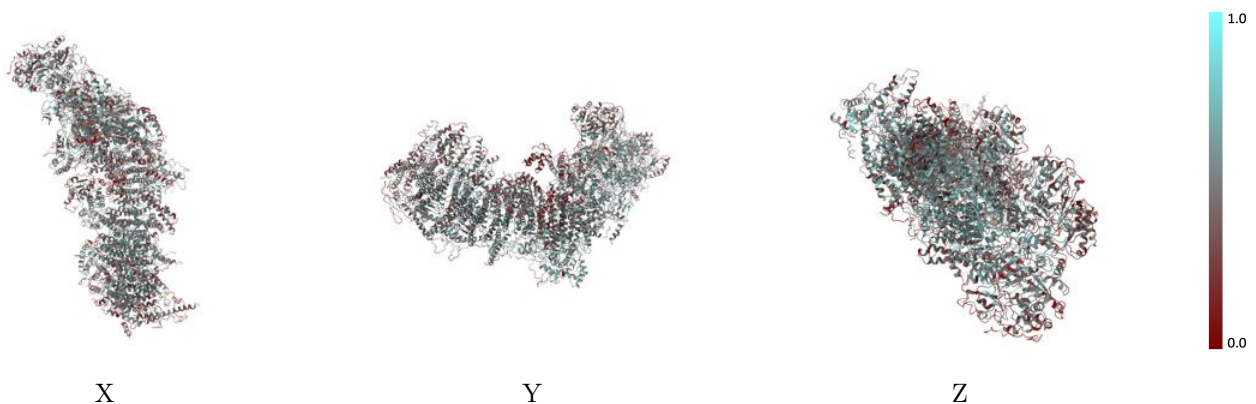
The images above show the 3D surface view of the map at the recommended contour level 0.075 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model [i](#)



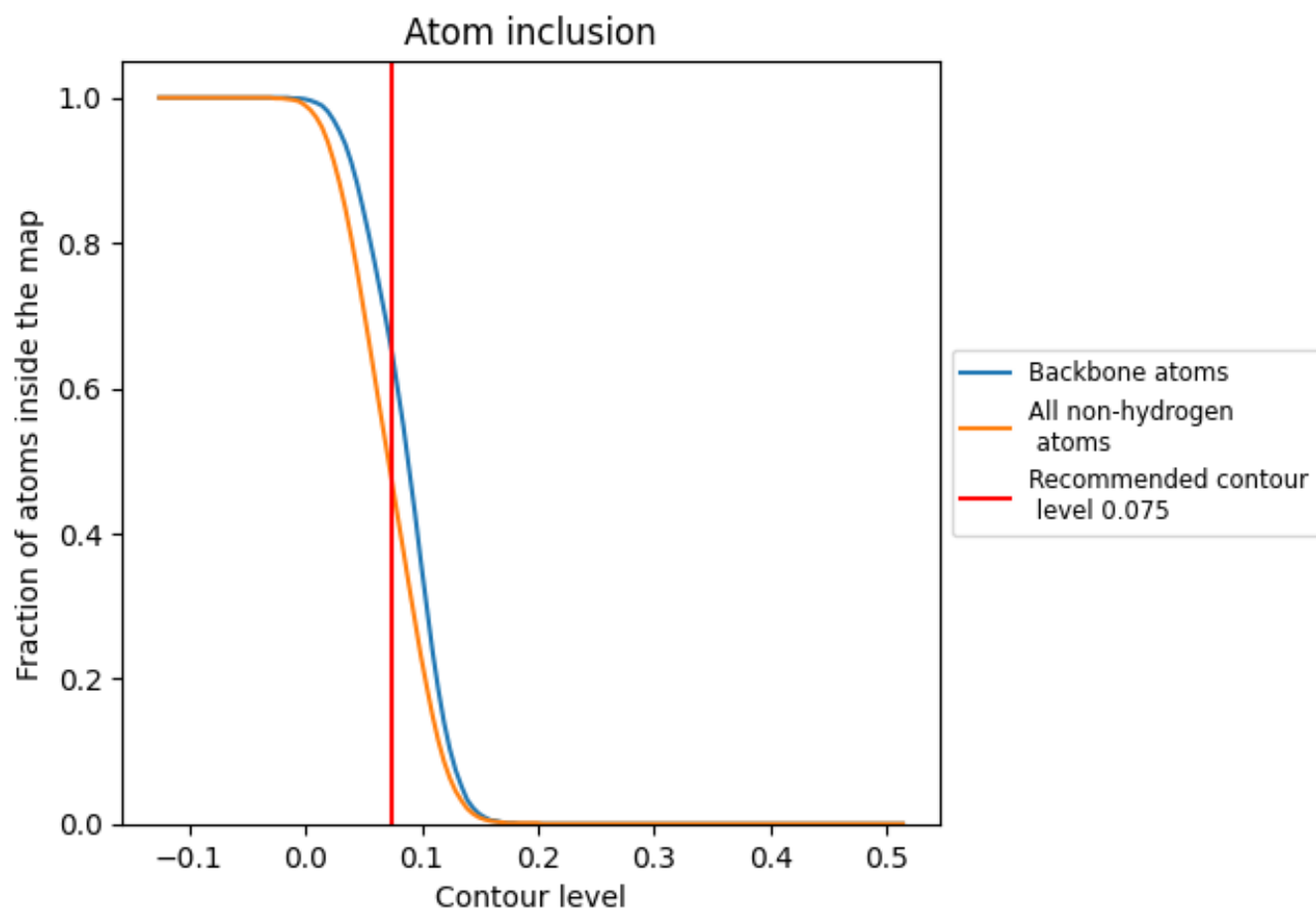
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.075).

9.4 Atom inclusion [i](#)



At the recommended contour level, 64% of all backbone atoms, 47% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary

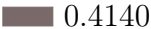
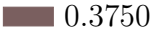
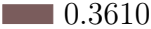
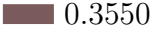
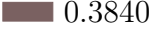
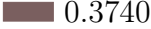
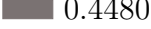
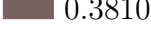
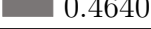
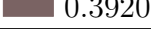
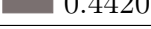
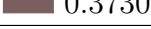
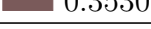
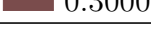
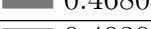
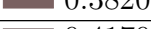
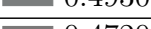
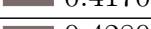
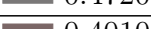
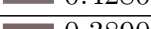
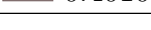
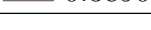
The table lists the average atom inclusion at the recommended contour level (0.075) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.4660	0.4000
A	0.4360	0.4190
B	0.5530	0.4330
C	0.5300	0.4250
D	0.5270	0.4260
E	0.4120	0.3850
F	0.4380	0.3840
G	0.4710	0.4030
H	0.4940	0.4150
I	0.5710	0.4210
J	0.4030	0.3940
K	0.4760	0.4090
L	0.4700	0.4040
M	0.5280	0.4280
N	0.5310	0.4220
O	0.4520	0.3970
P	0.4210	0.3990
Q	0.4750	0.4170
R	0.4970	0.4180
S	0.3290	0.3550
T	0.1820	0.2500
U	0.3290	0.3200
V	0.4310	0.3770
W	0.4040	0.3820
X	0.4900	0.4140
Y	0.4070	0.3950
Z	0.4900	0.3990
a	0.5120	0.4100
b	0.4560	0.4190
c	0.4180	0.4150
d	0.4750	0.4060
e	0.5140	0.4160
f	0.4180	0.3920
g	0.4620	0.3790
h	0.5100	0.4090



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Chain	Atom inclusion	Q-score
i	 0.4140	 0.3750
j	 0.3610	 0.3550
k	 0.3840	 0.3740
l	 0.4480	 0.3810
m	 0.4640	 0.3920
n	 0.4420	 0.3730
o	 0.3530	 0.3000
p	 0.4680	 0.3820
q	 0.4930	 0.4170
r	 0.4720	 0.4280
s	 0.4010	 0.3890