



# wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 31, 2020 – 07:34 AM BST

PDB ID : 6Q8W  
Title : Respiratory complex I from *Thermus thermophilus* with bound Aureothin.  
Authors : Gutierrez-Fernandez, J.; Minhas, G.S.; Sazanov, L.A.  
Deposited on : 2018-12-16  
Resolution : 3.40 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : 1.13  
EDS : **FAILED**  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.13

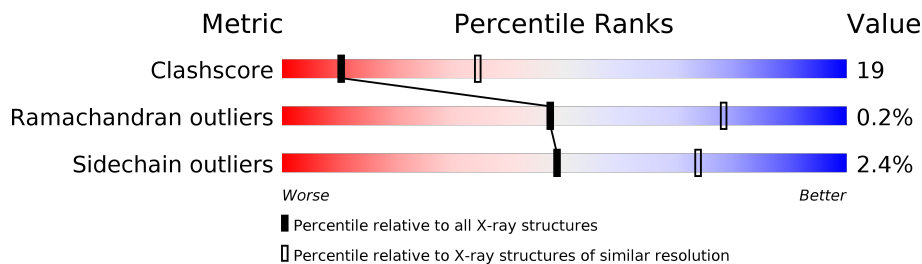
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.40 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)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	1055 (3.48-3.32)
Ramachandran outliers	138981	1038 (3.48-3.32)
Sidechain outliers	138945	1038 (3.48-3.32)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower 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  $\leq 5\%$

Note EDS failed to run properly.

Mol	Chain	Length	Quality of chain
1	1	438	
1	B	438	
2	2	181	
2	C	181	
3	3	783	
3	D	783	
4	4	409	
4	E	409	

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Mol	Chain	Length	Quality of chain
5	5	207	57% 36% • 5%
5	F	207	60% 33% • 5%
6	6	181	35% 54% • 8%
6	G	181	44% 45% • 8%
7	9	182	61% 37% ••
7	O	182	60% 38% •••
8	7	129	71% 27% ••
8	I	129	70% 28% ••
9	W	131	68% 28% ••
9	X	131	76% 20% ••
10	A	119	51% 45% ••
10	P	119	55% 40% ••
11	J	176	53% 37% • 9%
11	R	176	55% 35% • 9%
12	K	95	64% 34% •
12	S	95	69% 29% •
13	L	606	66% 33% •
13	T	606	66% 33% •
14	M	469	65% 34% •
14	U	469	64% 35% •
15	N	427	67% 32% •
15	V	427	69% 30%
16	H	365	50% 43% ••
16	Q	365	50% 43% •••

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
17	SF4	1	501	-	-	X	-
17	SF4	B	501	-	-	X	-
19	FES	3	804	-	-	X	-
19	FES	C	201	-	-	X	-
19	FES	D	804	-	-	X	-

## 2 Entry composition [i](#)

There are 20 unique types of molecules in this entry. The entry contains 74144 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, 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-quinone oxidoreductase subunit 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	1	437	Total 3417	C 2180	N 595	O 624	S 18	0	0	0
1	B	437	Total 3417	C 2180	N 595	O 624	S 18	0	0	0

- Molecule 2 is a protein called NADH-quinone oxidoreductase subunit 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	2	178	Total 1406	C 895	N 238	O 265	S 8	0	0	0
2	C	178	Total 1406	C 895	N 238	O 265	S 8	0	0	0

- Molecule 3 is a protein called NADH-quinone oxidoreductase subunit 3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	3	756	Total 5895	C 3754	N 1057	O 1053	S 31	0	0	0
3	D	756	Total 5895	C 3754	N 1057	O 1053	S 31	0	0	0

- Molecule 4 is a protein called NADH-quinone oxidoreductase subunit 4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	4	384	Total 3067	C 1975	N 522	O 559	S 11	0	0	0
4	E	384	Total 3067	C 1975	N 522	O 559	S 11	0	0	0

- Molecule 5 is a protein called NADH-quinone oxidoreductase subunit 5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
5	5	196	Total 1607	C 1043	N 273	O 288	S 3	0	0	0
5	F	196	Total 1607	C 1043	N 273	O 288	S 3	0	0	0

- Molecule 6 is a protein called NADH-quinone oxidoreductase subunit 6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
6	6	166	Total 1289	C 815	N 235	O 226	S 13	0	0	0
6	G	166	Total 1289	C 815	N 235	O 226	S 13	0	0	0

- Molecule 7 is a protein called NADH-quinone oxidoreductase subunit 9.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
7	9	180	Total 1388	C 890	N 232	O 255	S 11	0	0	0
7	O	180	Total 1388	C 890	N 232	O 255	S 11	0	0	0

- Molecule 8 is a protein called NADH-quinone oxidoreductase subunit 15.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
8	7	127	Total 1031	C 664	N 183	O 181	S 3	0	0	0
8	I	127	Total 1031	C 664	N 183	O 181	S 3	0	0	0

- Molecule 9 is a protein called Uncharacterized protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
9	W	127	Total 967	C 623	N 165	O 175	S 4	0	0	0
9	X	127	Total 967	C 623	N 165	O 175	S 4	0	0	0

- Molecule 10 is a protein called NADH-quinone oxidoreductase subunit 7.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
10	A	117	Total 910	C 624	N 138	O 144	S 4	0	0	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
10	P	117	910	624	138	144	4	0	0	0

- Molecule 11 is a protein called NADH-quinone oxidoreductase subunit 10.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
11	J	160	1183	806	183	191	3	0	0	0
11	R	160	1183	806	183	191	3	0	0	0

- Molecule 12 is a protein called NADH-quinone oxidoreductase subunit 11.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
12	K	95	703	456	118	126	3	0	0	0
12	S	95	703	456	118	126	3	0	0	0

- Molecule 13 is a protein called NADH-quinone oxidoreductase subunit 12.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
13	L	605	4604	3089	740	756	19	0	0	0
13	T	605	4604	3089	740	756	19	0	0	0

- Molecule 14 is a protein called NADH-quinone oxidoreductase subunit 13.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
14	M	467	3489	2363	546	572	8	0	0	0
14	U	467	3489	2363	546	572	8	0	0	0

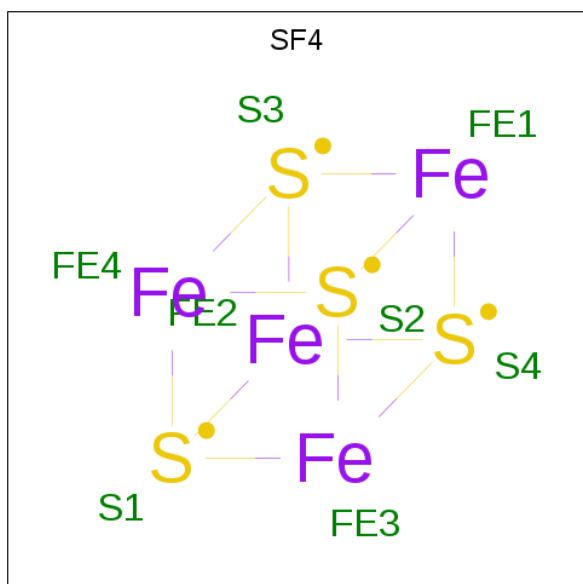
- Molecule 15 is a protein called NADH-quinone oxidoreductase subunit 14.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
15	N	427	3154	2125	505	518	6	0	0	0
15	V	427	3154	2125	505	518	6	0	0	0

- Molecule 16 is a protein called NADH-quinone oxidoreductase subunit 8.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
16	H	353	Total 2838	C 1943	N 431	O 457	S 7	0	0	0
16	Q	353	Total 2838	C 1943	N 431	O 457	S 7	0	0	0

- Molecule 17 is IRON/SULFUR CLUSTER (three-letter code: SF4) (formula: Fe<sub>4</sub>S<sub>4</sub>).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf	
			Total	Fe S			
17	1	1	Total 8	Fe 4	S 4	0	0
17	3	1	Total 8	Fe 4	S 4	0	0
17	3	1	Total 8	Fe 4	S 4	0	0
17	3	1	Total 8	Fe 4	S 4	0	0
17	6	1	Total 8	Fe 4	S 4	0	0
17	9	1	Total 8	Fe 4	S 4	0	0
17	9	1	Total 8	Fe 4	S 4	0	0
17	B	1	Total 8	Fe 4	S 4	0	0
17	D	1	Total 8	Fe 4	S 4	0	0

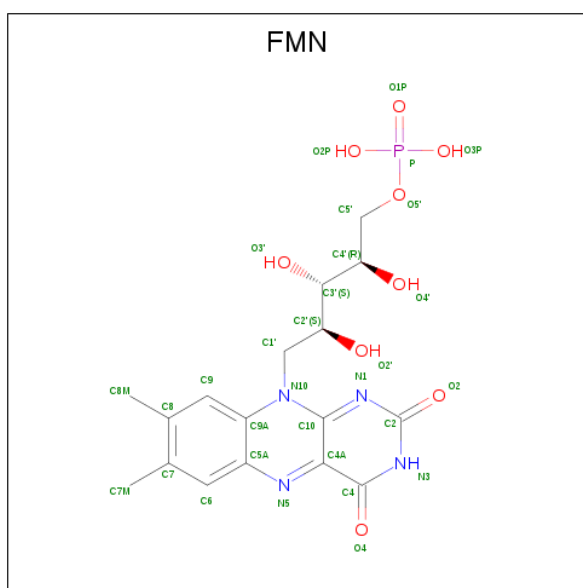
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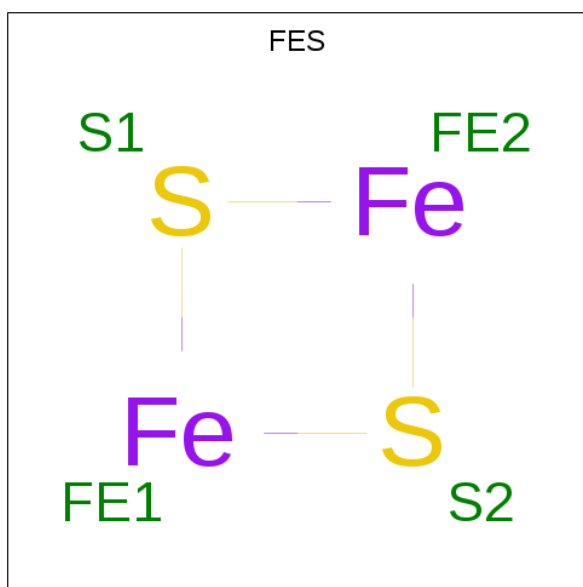
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
17	D	1	Total	Fe	S	0	0
			8	4	4		
17	D	1	Total	Fe	S	0	0
			8	4	4		
17	G	1	Total	Fe	S	0	0
			8	4	4		
17	O	1	Total	Fe	S	0	0
			8	4	4		
17	O	1	Total	Fe	S	0	0
			8	4	4		

- Molecule 18 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: C<sub>17</sub>H<sub>21</sub>N<sub>4</sub>O<sub>9</sub>P).



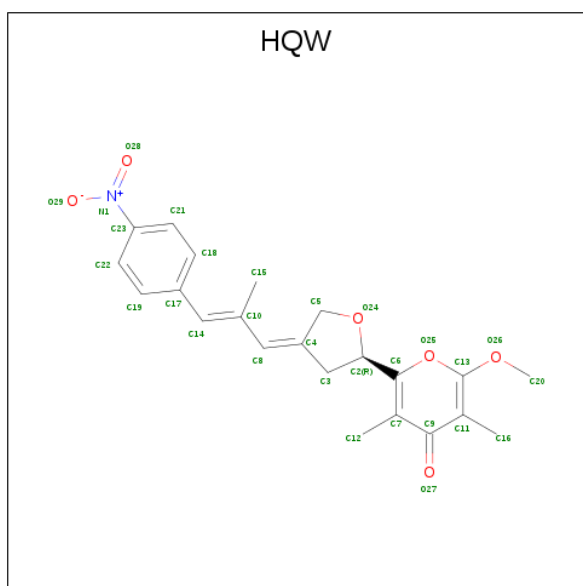
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
18	1	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
18	B	1	Total	C	N	O	P	0	0
			31	17	4	9	1		

- Molecule 19 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe<sub>2</sub>S<sub>2</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
19	2	1	Total Fe S 4 2 2	0	0
19	3	1	Total Fe S 4 2 2	0	0
19	C	1	Total Fe S 4 2 2	0	0
19	D	1	Total Fe S 4 2 2	0	0

- Molecule 20 is Aureothin (three-letter code: HQW) (formula: C<sub>22</sub>H<sub>23</sub>NO<sub>6</sub>) (labeled as "Ligand of Interest" by author).



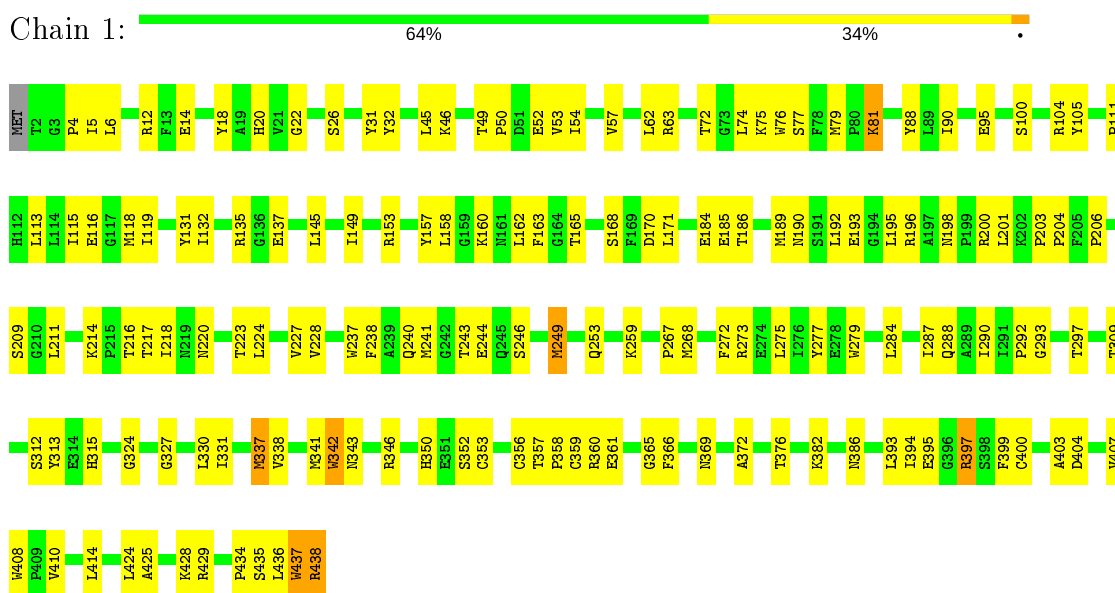
<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>				<b>ZeroOcc</b>	<b>AltConf</b>
20	4	1	Total	C	N	O	0	0
			29	22	1	6		
20	E	1	Total	C	N	O	0	0
			29	22	1	6		

### 3 Residue-property plots [i](#)

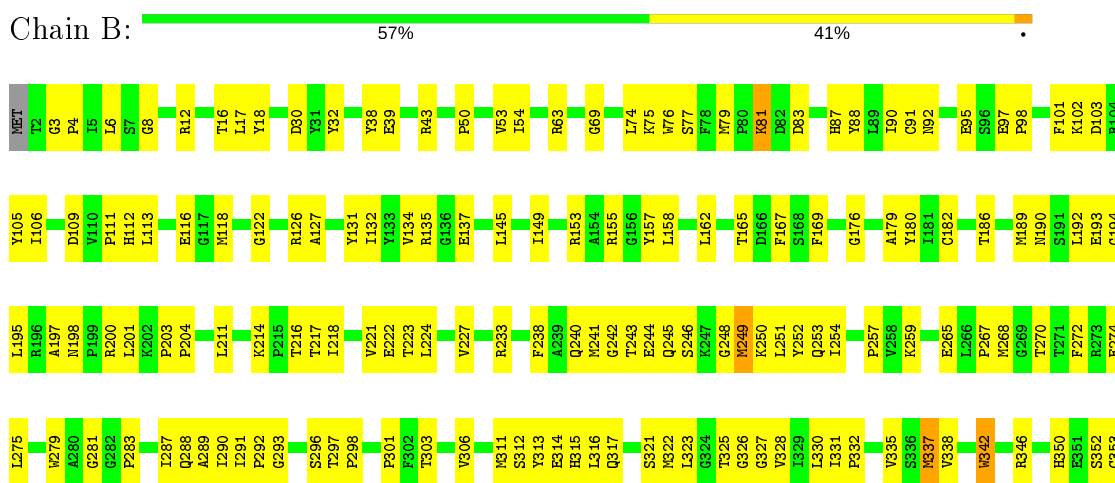
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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. 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.

Note EDS failed to run properly.

- Molecule 1: NADH-quinone oxidoreductase subunit 1

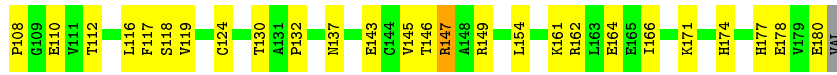
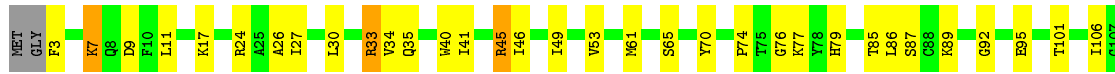


- Molecule 1: NADH-quinone oxidoreductase subunit 1

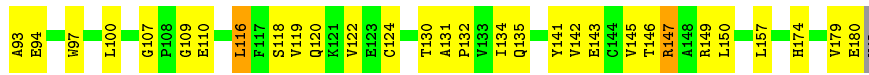
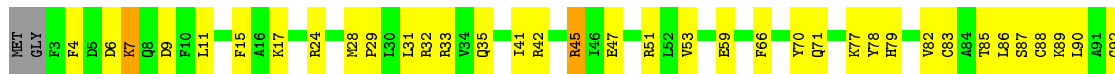




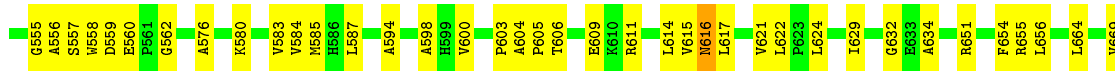
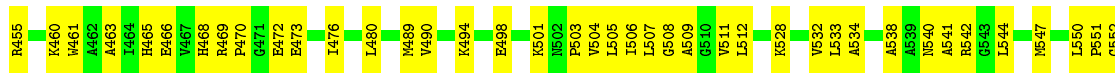
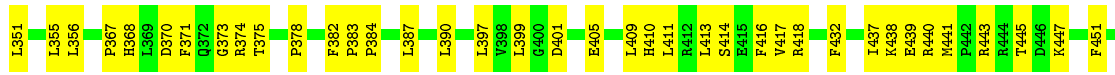
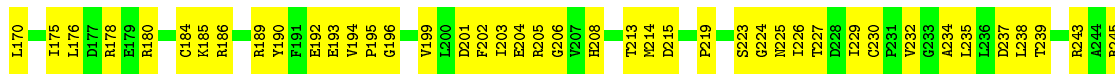
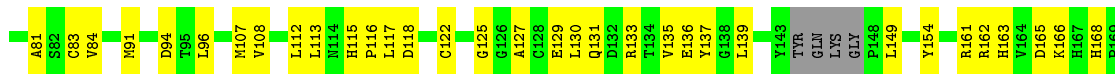
• Molecule 2: NADH-quinone oxidoreductase subunit 2



• Molecule 2: NADH-quinone oxidoreductase subunit 2

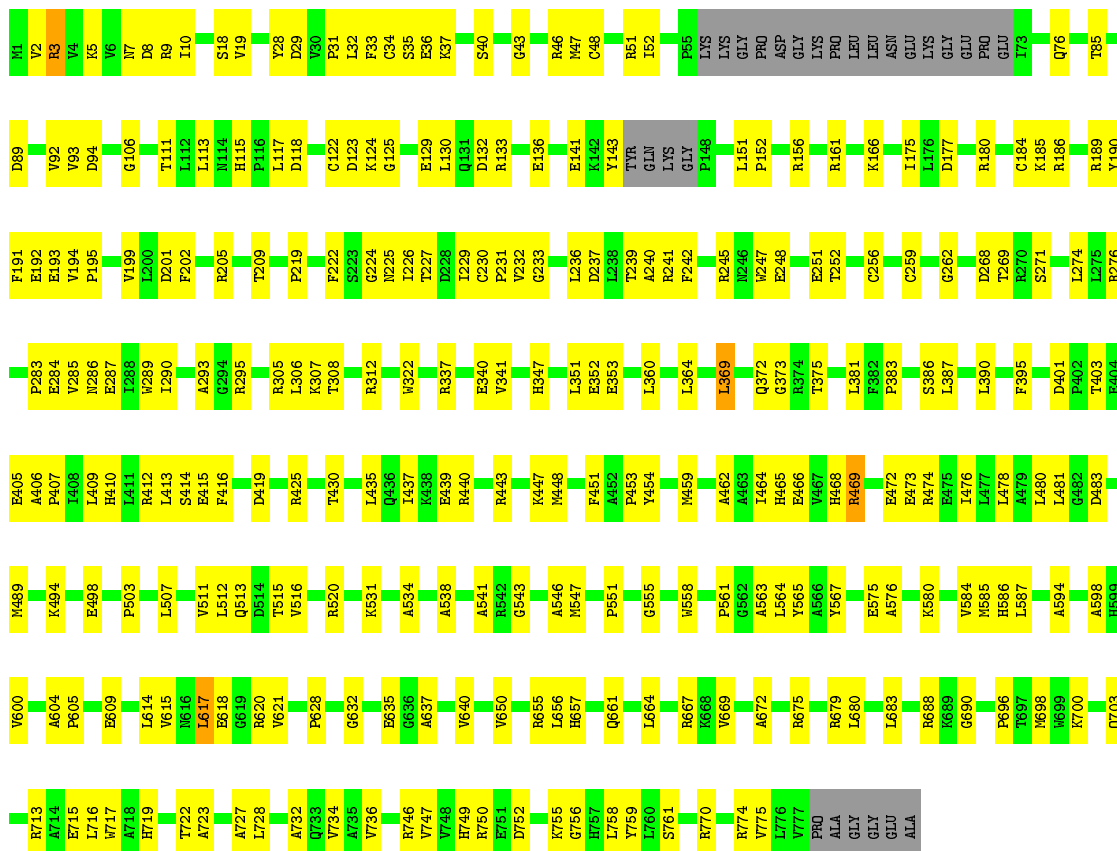


• Molecule 3: NADH-quinone oxidoreductase subunit 3

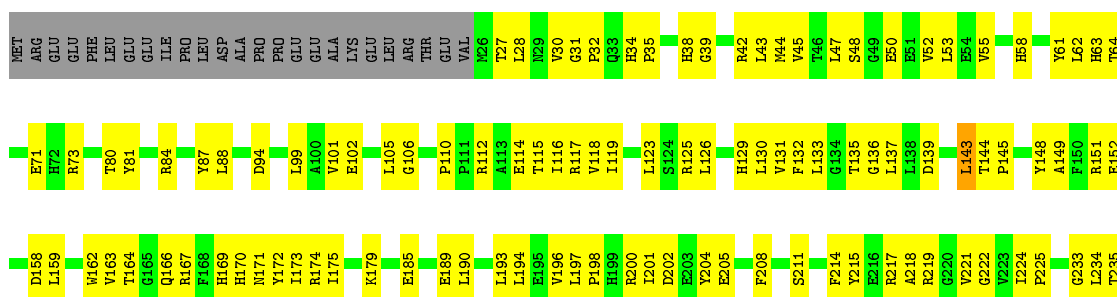




• Molecule 3: NADH-quinone oxidoreductase subunit 3

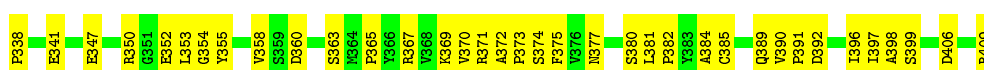
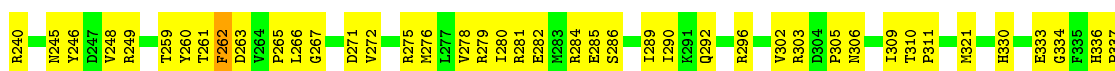


• Molecule 4: NADH-quinone oxidoreductase subunit 4

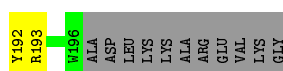
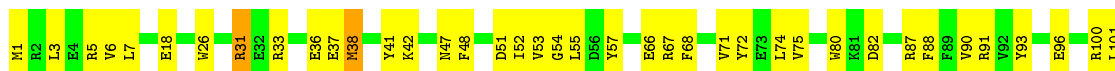




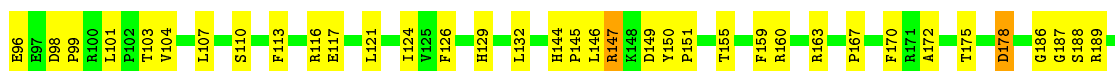
• Molecule 4: NADH-quinone oxidoreductase subunit 4

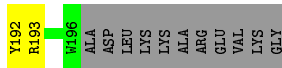


• Molecule 5: NADH-quinone oxidoreductase subunit 5



• Molecule 5: NADH-quinone oxidoreductase subunit 5





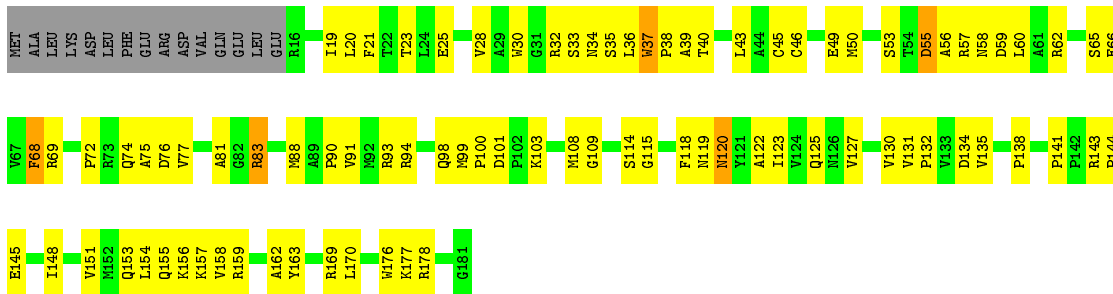
- Molecule 6: NADH-quinone oxidoreductase subunit 6

Chain 6: 35% 54% 8%



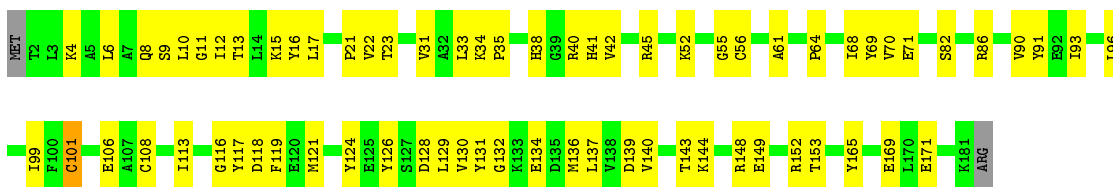
- Molecule 6: NADH-quinone oxidoreductase subunit 6

Chain G: 44% 45% 8%



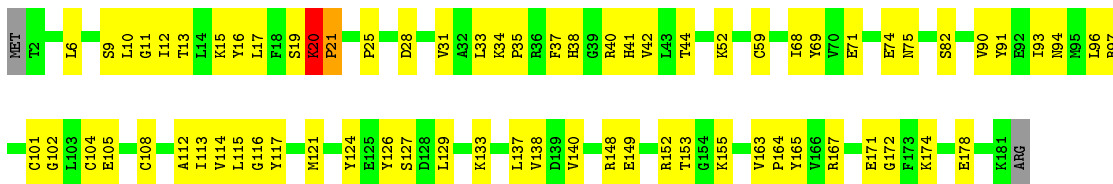
- Molecule 7: NADH-quinone oxidoreductase subunit 9

Chain 9: 61% 37% 2%



- Molecule 7: NADH-quinone oxidoreductase subunit 9

Chain O: 60% 38% 2%





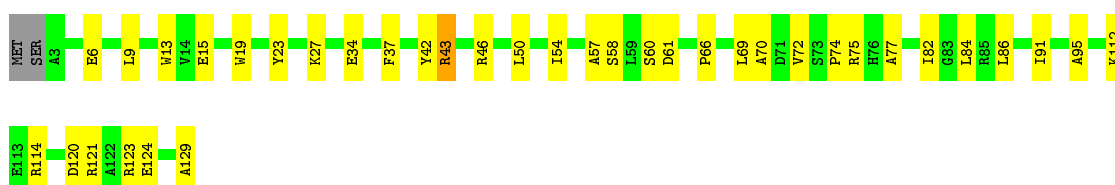
- Molecule 8: NADH-quinone oxidoreductase subunit 15

Chain 7:  71% 27% ..



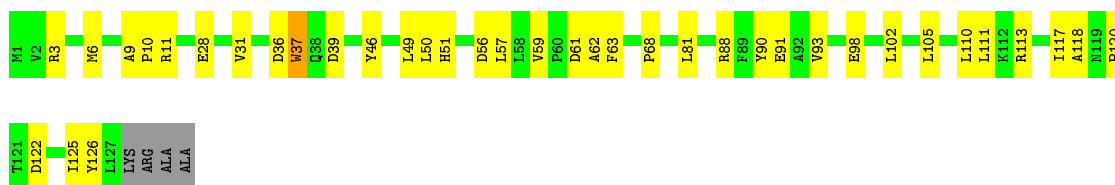
- Molecule 8: NADH-quinone oxidoreductase subunit 15

Chain I:  70% 28% ..



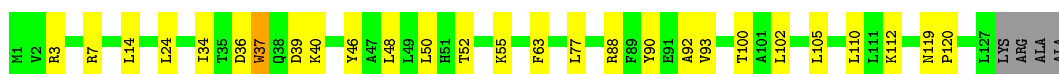
- Molecule 9: Uncharacterized protein

Chain W:  68% 28% ..



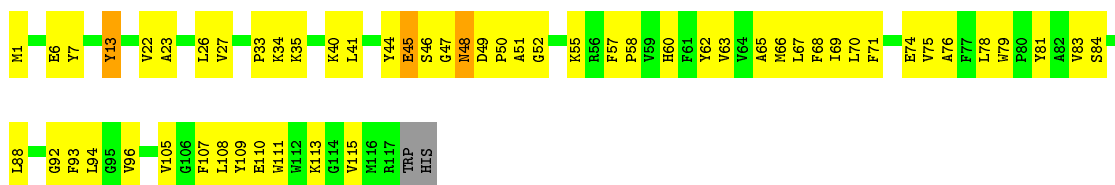
- Molecule 9: Uncharacterized protein

Chain X:  76% 20% ..



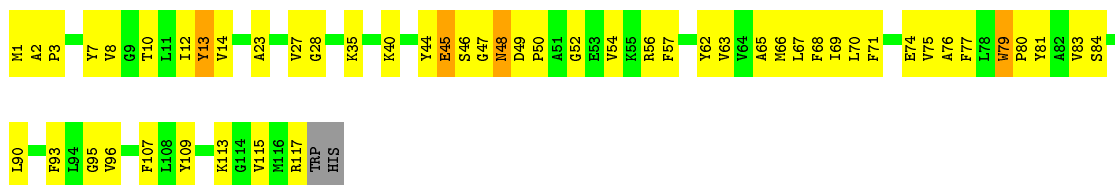
- Molecule 10: NADH-quinone oxidoreductase subunit 7

Chain A:  51% 45% ..



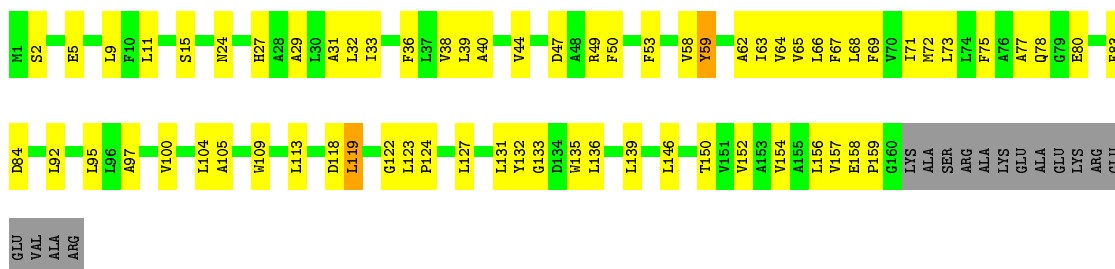
- Molecule 10: NADH-quinone oxidoreductase subunit 7

Chain P:  55% 40%



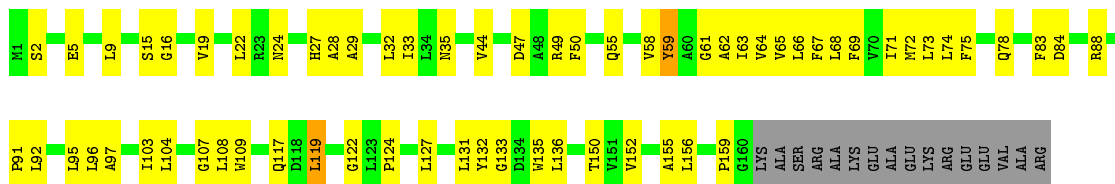
- Molecule 11: NADH-quinone oxidoreductase subunit 10

Chain J:  53% 37% 9%



- Molecule 11: NADH-quinone oxidoreductase subunit 10

Chain R:  55% 35% 9%



- Molecule 12: NADH-quinone oxidoreductase subunit 11

Chain K:  64% 34%



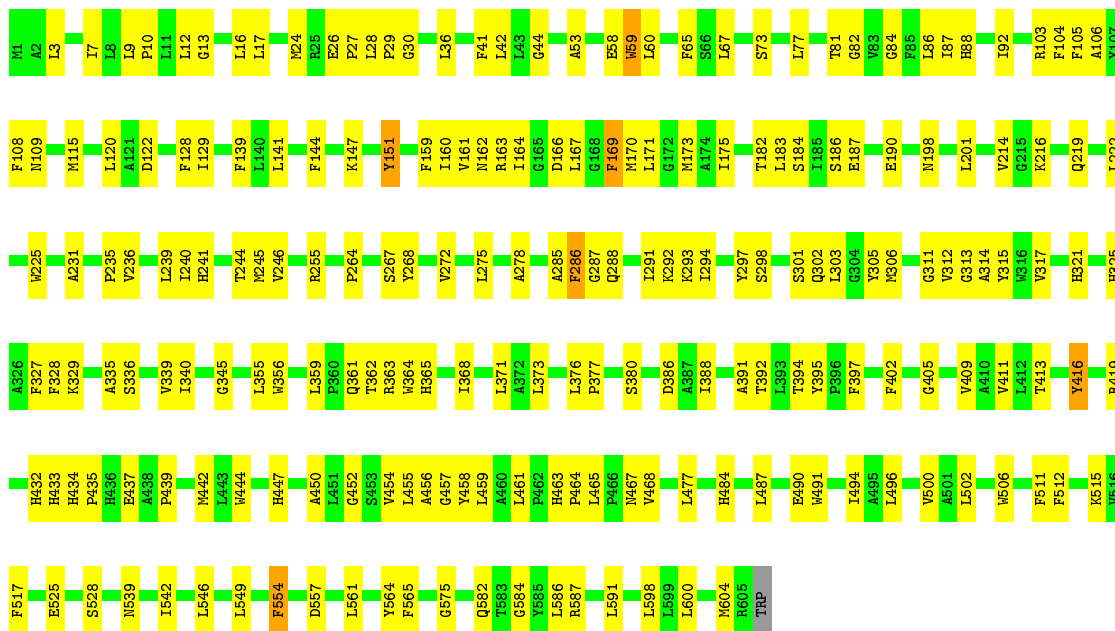
- Molecule 12: NADH-quinone oxidoreductase subunit 11

Chain S:  69% 29%

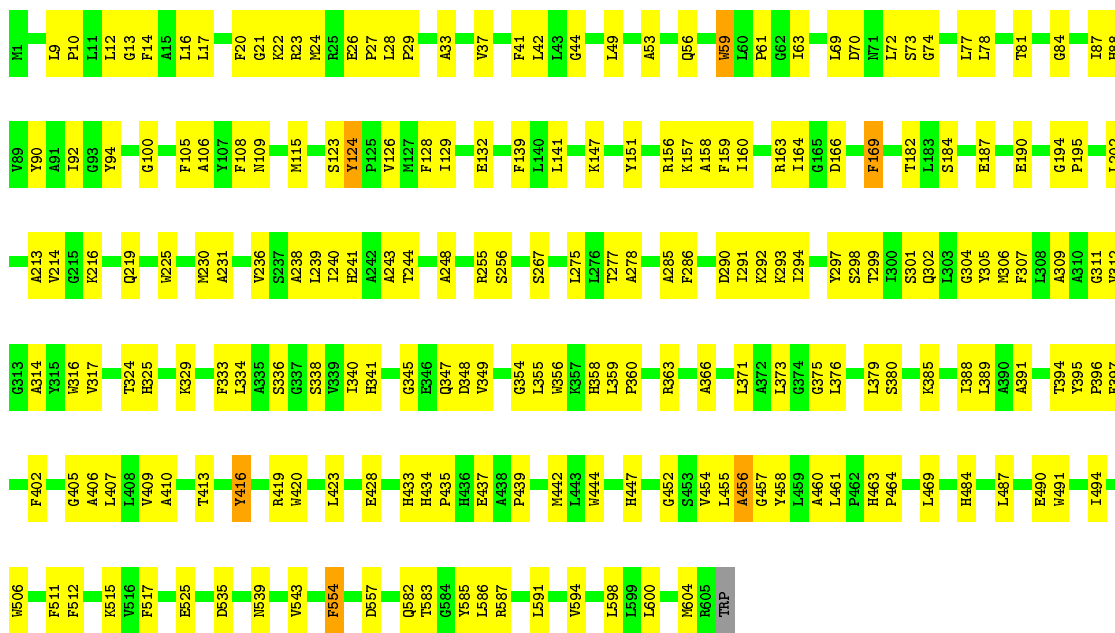


- Molecule 13: NADH-quinone oxidoreductase subunit 12

Chain L:  66% 33%

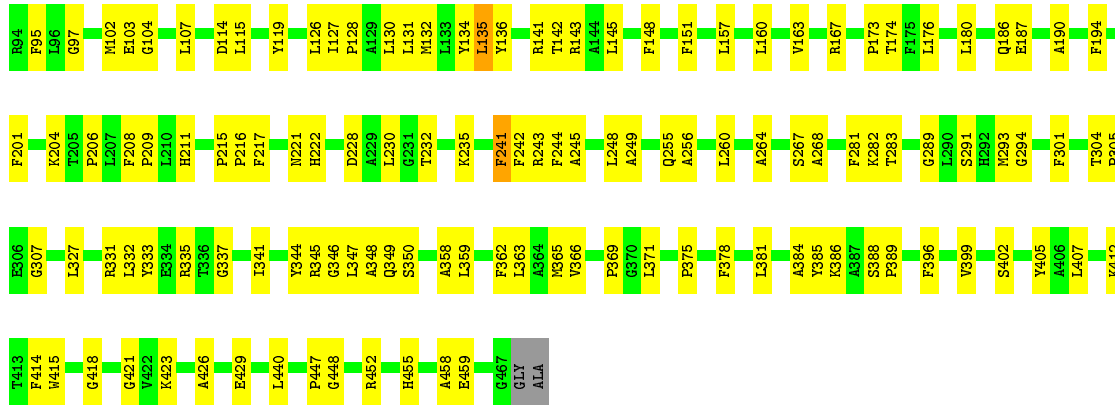


• Molecule 13: NADH-quinone oxidoreductase subunit 12



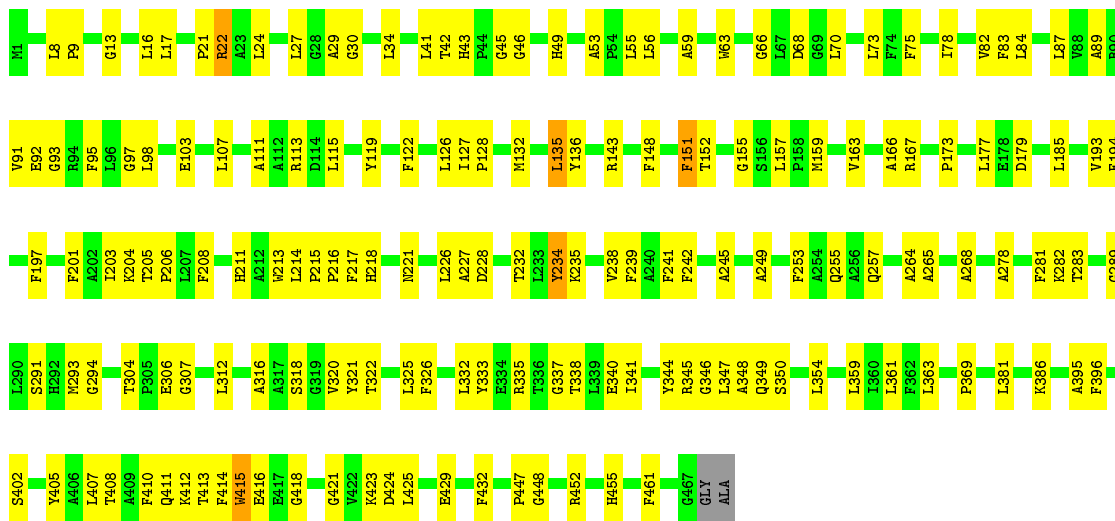
• Molecule 14: NADH-quinone oxidoreductase subunit 13





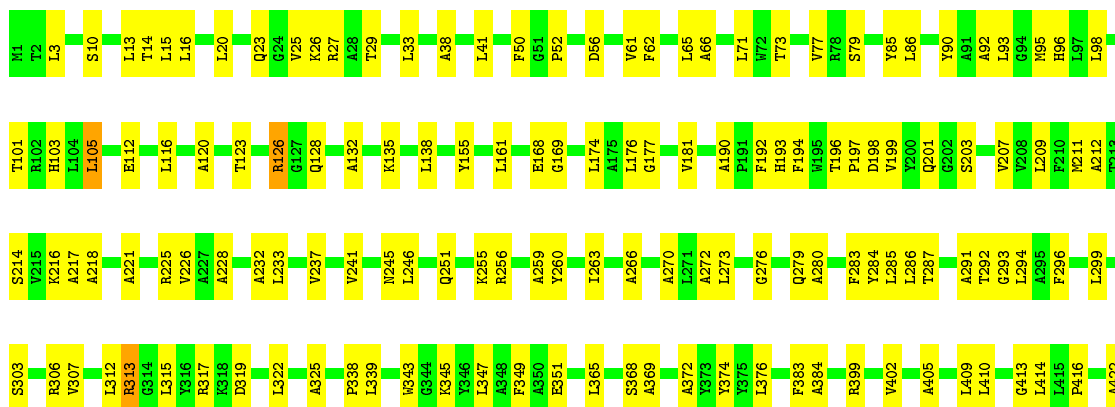
• Molecule 14: NADH-quinone oxidoreductase subunit 13

Chain U: 64% 35%



• Molecule 15: NADH-quinone oxidoreductase subunit 14

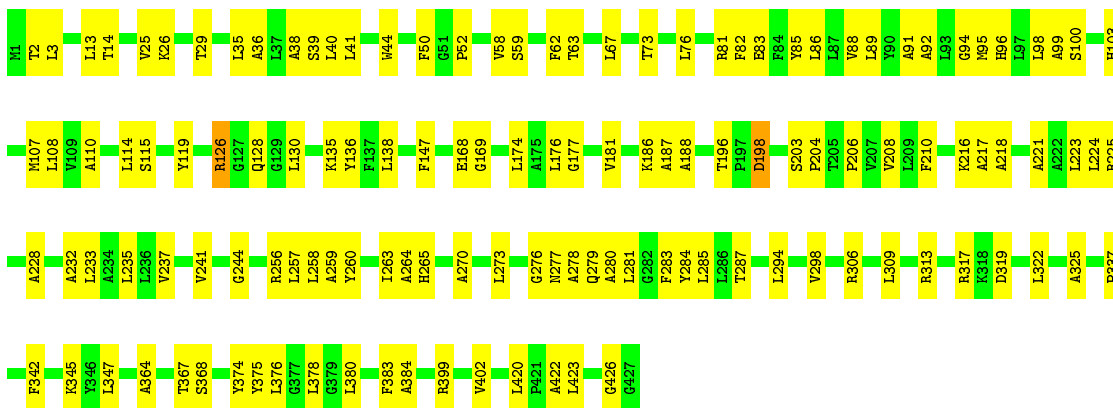
Chain N: 67% 32%



L423  
G427

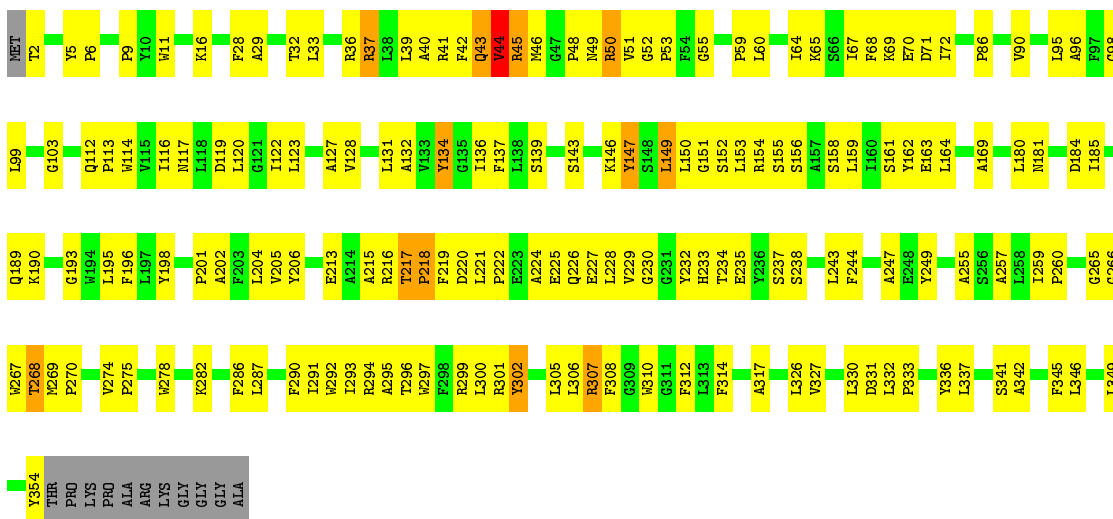
• Molecule 15: NADH-quinone oxidoreductase subunit 14

Chain V: 69% 30%



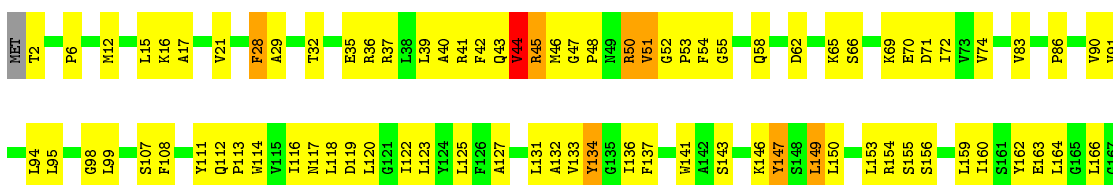
• Molecule 16: NADH-quinone oxidoreductase subunit 8

Chain H: 50% 43%



• Molecule 16: NADH-quinone oxidoreductase subunit 8

Chain Q: 50% 43%



L168	G266	THR
A169	W267	PRO
L176	T268	LYS
V177	M269	PRO
L180	P270	ALA
M181	V271	ARG
I185	L272	LYS
V186	E273	GLY
M187	V274	GLY
W188	P275	GLY
Q189	W278	ALA
F196	F286	
A202	L287	
V205	F288	
A209	F289	
S210	F290	
M211	I291	
A212	W292	
E213	I293	
A214	R294	
A215	A295	
R216	T296	
T217	W297	
P218	F298	
F219	R299	
D220	L300	
L221	R301	
P222	Y302	
E223	D668	
A224	Q304	
E225	L305	
Q226	I306	
L228	R307	
V229	W310	
G230	L313	
G231	F314	
Y232	A325	
E235	I326	
Y236	V327	
S237	L330	
S238	D331	
L239	L332	
K240	R333	
L243	A334	
F244	T335	
E246	Y336	
Y249	L337	
P260	A342	
	L346	
	Y354	

## 4 Data and refinement statistics

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	95.98Å 340.50Å 264.27Å 90.00° 100.44° 90.00°	Depositor
Resolution (Å)	49.71 – 3.40	Depositor
% Data completeness (in resolution range)	84.1 (49.71-3.40)	Depositor
$R_{merge}$	0.23	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.40 (at 3.40Å)	Xtrriage
Refinement program	PHENIX (dev_3026: ???)	Depositor
R, $R_{free}$	0.213 , 0.234	Depositor
Wilson B-factor (Å <sup>2</sup> )	62.4	Xtrriage
Anisotropy	0.027	Xtrriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.34$ , $\langle L^2 \rangle = 0.17$	Xtrriage
Estimated twinning fraction	0.379 for h,-k,-h-l	Xtrriage
Reported twinning fraction	0.490 for -H,-K,H+L	Depositor
Outliers	0 of 191608 reflections	Xtrriage
Total number of atoms	74144	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	63.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.17% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 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: FMN, SF4, FES, HQW

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	1	0.36	0/3506	0.54	0/4745
1	B	0.29	0/3506	0.49	0/4745
2	2	0.33	0/1439	0.50	0/1953
2	C	0.29	0/1439	0.47	0/1953
3	3	0.43	0/6035	0.66	0/8185
3	D	0.41	0/6035	0.62	1/8185 (0.0%)
4	4	0.39	0/3150	0.60	1/4284 (0.0%)
4	E	0.32	0/3150	0.52	0/4284
5	5	0.40	0/1656	0.60	1/2246 (0.0%)
5	F	0.36	0/1656	0.57	0/2246
6	6	0.46	0/1319	0.66	0/1786
6	G	0.40	0/1319	0.63	1/1786 (0.1%)
7	9	0.51	1/1423 (0.1%)	0.64	0/1933
7	O	0.38	0/1423	0.71	1/1933 (0.1%)
8	7	0.34	0/1059	0.56	1/1429 (0.1%)
8	I	0.31	0/1059	0.53	0/1429
9	W	0.41	0/985	0.68	1/1335 (0.1%)
9	X	0.38	0/985	0.57	0/1335
10	A	0.34	0/940	0.53	0/1280
10	P	0.33	0/940	0.53	0/1280
11	J	0.33	0/1206	0.54	0/1649
11	R	0.29	0/1206	0.49	0/1649
12	K	0.31	0/710	0.51	0/962
12	S	0.30	0/710	0.50	0/962
13	L	0.31	0/4741	0.49	0/6460
13	T	0.28	0/4741	0.46	0/6460
14	M	0.33	0/3591	0.53	0/4896
14	U	0.28	0/3591	0.47	0/4896
15	N	0.34	0/3238	0.50	0/4434
15	V	0.31	0/3238	0.47	0/4434
16	H	0.33	0/2935	0.55	0/4014
16	Q	0.33	0/2935	0.57	1/4014 (0.0%)



Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
All	All	0.35	1/75866 (0.0%)	0.55	8/103182 (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
7	9	0	1
10	A	0	1
10	P	0	1
13	T	0	2
16	H	0	2
16	Q	0	3
All	All	0	10

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	9	101	CYS	CB-SG	-5.81	1.72	1.81

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	O	20	LYS	C-N-CD	-16.21	84.94	120.60
4	4	133	LEU	CA-CB-CG	6.46	130.16	115.30
6	G	169	ARG	C-N-CA	-6.21	106.17	121.70
5	5	189	ARG	NE-CZ-NH1	5.99	123.29	120.30
16	Q	332	LEU	CA-CB-CG	5.45	127.83	115.30

There are no chirality outliers.

5 of 10 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
7	9	21	PRO	Peptide
10	A	45	GLU	Peptide
16	H	217	THR	Peptide
16	H	266	GLY	Peptide
10	P	45	GLU	Peptide

## 5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	1	3417	0	3389	122	0
1	B	3417	0	3389	155	0
2	2	1406	0	1373	63	0
2	C	1406	0	1373	58	0
3	3	5895	0	5931	235	0
3	D	5895	0	5930	196	0
4	4	3067	0	3049	166	0
4	E	3067	0	3049	166	0
5	5	1607	0	1574	81	0
5	F	1607	0	1574	65	0
6	6	1289	0	1299	104	0
6	G	1289	0	1298	99	0
7	9	1388	0	1383	70	0
7	O	1388	0	1383	65	0
8	7	1031	0	1029	35	0
8	I	1031	0	1029	30	0
9	W	967	0	1010	32	0
9	X	967	0	1010	20	0
10	A	910	0	939	59	0
10	P	910	0	939	56	0
11	J	1183	0	1286	55	0
11	R	1183	0	1286	61	0
12	K	703	0	747	34	0
12	S	703	0	747	29	0
13	L	4604	0	4734	170	0
13	T	4604	0	4734	169	0
14	M	3489	0	3606	127	0
14	U	3489	0	3606	125	0
15	N	3154	0	3343	109	0
15	V	3154	0	3343	104	0
16	H	2838	0	2903	173	0
16	Q	2838	0	2903	179	0
17	1	8	0	0	2	0
17	3	24	0	0	1	0
17	6	8	0	0	1	0
17	9	16	0	0	2	0
17	B	8	0	0	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
17	D	24	0	0	2	0
17	G	8	0	0	1	0
17	O	16	0	0	2	0
18	1	31	0	19	1	0
18	B	31	0	19	2	0
19	2	4	0	0	1	0
19	3	4	0	0	2	0
19	C	4	0	0	2	0
19	D	4	0	0	2	0
20	4	29	0	0	0	0
20	E	29	0	0	0	0
All	All	74144	0	75226	2779	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 19.

The worst 5 of 2779 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
9:W:102:LEU:O	9:W:110:LEU:HD13	1.16	1.26
3:D:283:PRO:HG3	3:D:425:ARG:HH21	1.00	1.13
7:O:20:LYS:N	7:O:21:PRO:HD3	1.64	1.08
3:D:283:PRO:CG	3:D:425:ARG:HH21	1.68	1.04
6:6:56:ALA:HB1	16:H:44:VAL:CG1	1.87	1.02

There are no symmetry-related clashes.

## 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 X-ray entries followed by that with respect to entries of similar resolution.

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	1	435/438 (99%)	403 (93%)	32 (7%)	0	<b>100</b> <b>100</b>

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	435/438 (99%)	399 (92%)	36 (8%)	0	100	100
2	2	176/181 (97%)	170 (97%)	6 (3%)	0	100	100
2	C	176/181 (97%)	169 (96%)	7 (4%)	0	100	100
3	3	750/783 (96%)	702 (94%)	48 (6%)	0	100	100
3	D	750/783 (96%)	700 (93%)	50 (7%)	0	100	100
4	4	382/409 (93%)	361 (94%)	21 (6%)	0	100	100
4	E	382/409 (93%)	357 (94%)	25 (6%)	0	100	100
5	5	194/207 (94%)	183 (94%)	11 (6%)	0	100	100
5	F	194/207 (94%)	182 (94%)	12 (6%)	0	100	100
6	6	164/181 (91%)	144 (88%)	20 (12%)	0	100	100
6	G	164/181 (91%)	148 (90%)	16 (10%)	0	100	100
7	9	178/182 (98%)	166 (93%)	12 (7%)	0	100	100
7	O	178/182 (98%)	172 (97%)	5 (3%)	1 (1%)	25	57
8	7	125/129 (97%)	115 (92%)	10 (8%)	0	100	100
8	I	125/129 (97%)	116 (93%)	9 (7%)	0	100	100
9	W	125/131 (95%)	121 (97%)	4 (3%)	0	100	100
9	X	125/131 (95%)	121 (97%)	4 (3%)	0	100	100
10	A	115/119 (97%)	105 (91%)	10 (9%)	0	100	100
10	P	115/119 (97%)	105 (91%)	10 (9%)	0	100	100
11	J	158/176 (90%)	148 (94%)	10 (6%)	0	100	100
11	R	158/176 (90%)	146 (92%)	12 (8%)	0	100	100
12	K	93/95 (98%)	88 (95%)	5 (5%)	0	100	100
12	S	93/95 (98%)	87 (94%)	6 (6%)	0	100	100
13	L	603/606 (100%)	568 (94%)	34 (6%)	1 (0%)	47	78
13	T	603/606 (100%)	569 (94%)	33 (6%)	1 (0%)	47	78
14	M	465/469 (99%)	438 (94%)	27 (6%)	0	100	100
14	U	465/469 (99%)	437 (94%)	28 (6%)	0	100	100
15	N	425/427 (100%)	400 (94%)	25 (6%)	0	100	100
15	V	425/427 (100%)	402 (95%)	23 (5%)	0	100	100
16	H	351/365 (96%)	302 (86%)	42 (12%)	7 (2%)	7	30
16	Q	351/365 (96%)	302 (86%)	42 (12%)	7 (2%)	7	30

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	9478/9796 (97%)	8826 (93%)	635 (7%)	17 (0%)	47 78

5 of 17 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
16	H	45	ARG
16	H	51	VAL
7	O	21	PRO
16	Q	51	VAL
16	H	44	VAL

### 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 X-ray entries followed by that with respect to entries of similar resolution.

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	1	355/356 (100%)	344 (97%)	11 (3%)	40 68
1	B	355/356 (100%)	345 (97%)	10 (3%)	43 70
2	2	150/152 (99%)	144 (96%)	6 (4%)	31 60
2	C	150/152 (99%)	144 (96%)	6 (4%)	31 60
3	3	609/628 (97%)	599 (98%)	10 (2%)	62 81
3	D	609/628 (97%)	598 (98%)	11 (2%)	59 79
4	4	332/355 (94%)	328 (99%)	4 (1%)	71 85
4	E	332/355 (94%)	326 (98%)	6 (2%)	59 79
5	5	167/175 (95%)	163 (98%)	4 (2%)	49 74
5	F	167/175 (95%)	164 (98%)	3 (2%)	59 79
6	6	135/149 (91%)	125 (93%)	10 (7%)	13 42
6	G	135/149 (91%)	126 (93%)	9 (7%)	16 46
7	9	148/150 (99%)	147 (99%)	1 (1%)	84 92
7	O	148/150 (99%)	146 (99%)	2 (1%)	67 83
8	7	104/106 (98%)	103 (99%)	1 (1%)	76 88
8	I	104/106 (98%)	103 (99%)	1 (1%)	76 88

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
9	W	99/101 (98%)	98 (99%)	1 (1%)	76	88
9	X	99/101 (98%)	98 (99%)	1 (1%)	76	88
10	A	90/92 (98%)	88 (98%)	2 (2%)	52	75
10	P	90/92 (98%)	87 (97%)	3 (3%)	38	66
11	J	118/130 (91%)	114 (97%)	4 (3%)	37	65
11	R	118/130 (91%)	115 (98%)	3 (2%)	47	72
12	K	71/71 (100%)	69 (97%)	2 (3%)	43	70
12	S	71/71 (100%)	69 (97%)	2 (3%)	43	70
13	L	453/454 (100%)	445 (98%)	8 (2%)	59	79
13	T	453/454 (100%)	445 (98%)	8 (2%)	59	79
14	M	332/332 (100%)	324 (98%)	8 (2%)	49	74
14	U	332/332 (100%)	323 (97%)	9 (3%)	44	70
15	N	302/302 (100%)	297 (98%)	5 (2%)	60	80
15	V	302/302 (100%)	297 (98%)	5 (2%)	60	80
16	H	293/300 (98%)	280 (96%)	13 (4%)	28	58
16	Q	293/300 (98%)	282 (96%)	11 (4%)	33	61
All	All	7516/7706 (98%)	7336 (98%)	180 (2%)	49	74

5 of 180 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
16	H	119	ASP
2	C	7	LYS
15	V	198	ASP
16	H	147	TYR
1	B	249	MET

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 55 such sidechains are listed below:

Mol	Chain	Res	Type
15	N	245	ASN
1	B	240	GLN
15	V	245	ASN
16	H	112	GLN
16	H	183	ASN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

22 ligands 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
17	SF4	6	201	6	0,12,12	0.00	-	-		
19	FES	D	804	3	0,4,4	0.00	-	-		
17	SF4	O	201	7	0,12,12	0.00	-	-		
17	SF4	1	501	1	0,12,12	0.00	-	-		
17	SF4	D	803	3	0,12,12	0.00	-	-		
17	SF4	3	802	3	0,12,12	0.00	-	-		
17	SF4	G	201	6	0,12,12	0.00	-	-		
17	SF4	D	801	3	0,12,12	0.00	-	-		
18	FMN	1	502	-	31,33,33	1.48	4 (12%)	40,50,50	1.60	5 (12%)
20	HQW	E	501	-	29,31,31	1.63	6 (20%)	25,44,44	2.14	7 (28%)
17	SF4	3	803	3	0,12,12	0.00	-	-		
19	FES	C	201	2	0,4,4	0.00	-	-		
17	SF4	9	201	7	0,12,12	0.00	-	-		
19	FES	2	201	2	0,4,4	0.00	-	-		
20	HQW	4	501	-	29,31,31	2.02	7 (24%)	25,44,44	1.92	8 (32%)
17	SF4	B	501	1	0,12,12	0.00	-	-		
18	FMN	B	502	-	31,33,33	1.42	4 (12%)	40,50,50	1.64	5 (12%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
17	SF4	3	801	3	0,12,12	0.00	-	-		
17	SF4	D	802	3	0,12,12	0.00	-	-		
17	SF4	O	202	7	0,12,12	0.00	-	-		
19	FES	3	804	3	0,4,4	0.00	-	-		
17	SF4	9	202	7	0,12,12	0.00	-	-		

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
17	SF4	6	201	6	-	-	0/6/5/5
19	FES	D	804	3	-	-	0/1/1/1
17	SF4	O	201	7	-	-	0/6/5/5
17	SF4	1	501	1	-	-	0/6/5/5
17	SF4	D	803	3	-	-	0/6/5/5
17	SF4	3	802	3	-	-	0/6/5/5
17	SF4	G	201	6	-	-	0/6/5/5
17	SF4	D	801	3	-	-	0/6/5/5
18	FMN	1	502	-	-	8/18/18/18	0/3/3/3
20	HQW	E	501	-	-	6/12/27/27	0/3/3/3
17	SF4	3	803	3	-	-	0/6/5/5
19	FES	C	201	2	-	-	0/1/1/1
17	SF4	9	201	7	-	-	0/6/5/5
19	FES	2	201	2	-	-	0/1/1/1
20	HQW	4	501	-	-	6/12/27/27	0/3/3/3
17	SF4	B	501	1	-	-	0/6/5/5
18	FMN	B	502	-	-	8/18/18/18	0/3/3/3
17	SF4	3	801	3	-	-	0/6/5/5
17	SF4	D	802	3	-	-	0/6/5/5
17	SF4	O	202	7	-	-	0/6/5/5
19	FES	3	804	3	-	-	0/1/1/1
17	SF4	9	202	7	-	-	0/6/5/5

The worst 5 of 21 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
20	4	501	HQW	C7-C6	-5.42	1.32	1.39
20	4	501	HQW	C9-C11	4.44	1.54	1.41
18	1	502	FMN	C10-N1	4.16	1.38	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
18	B	502	FMN	C10-N1	4.11	1.38	1.33
20	E	501	HQW	C7-C6	-4.03	1.34	1.39

The worst 5 of 25 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
18	B	502	FMN	C4-N3-C2	5.95	120.17	115.14
18	1	502	FMN	C4-N3-C2	5.92	120.14	115.14
20	E	501	HQW	C11-C9-C7	-5.44	114.78	122.88
18	B	502	FMN	C5A-C9A-N10	4.30	120.83	117.72
20	E	501	HQW	C17-C14-C10	-4.13	123.70	130.74

There are no chirality outliers.

5 of 28 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
18	1	502	FMN	N10-C1'-C2'-O2'
18	1	502	FMN	C1'-C2'-C3'-O3'
18	1	502	FMN	C1'-C2'-C3'-C4'
18	1	502	FMN	O2'-C2'-C3'-O3'
18	1	502	FMN	O2'-C2'-C3'-C4'

There are no ring outliers.

17 monomers are involved in 24 short contacts:

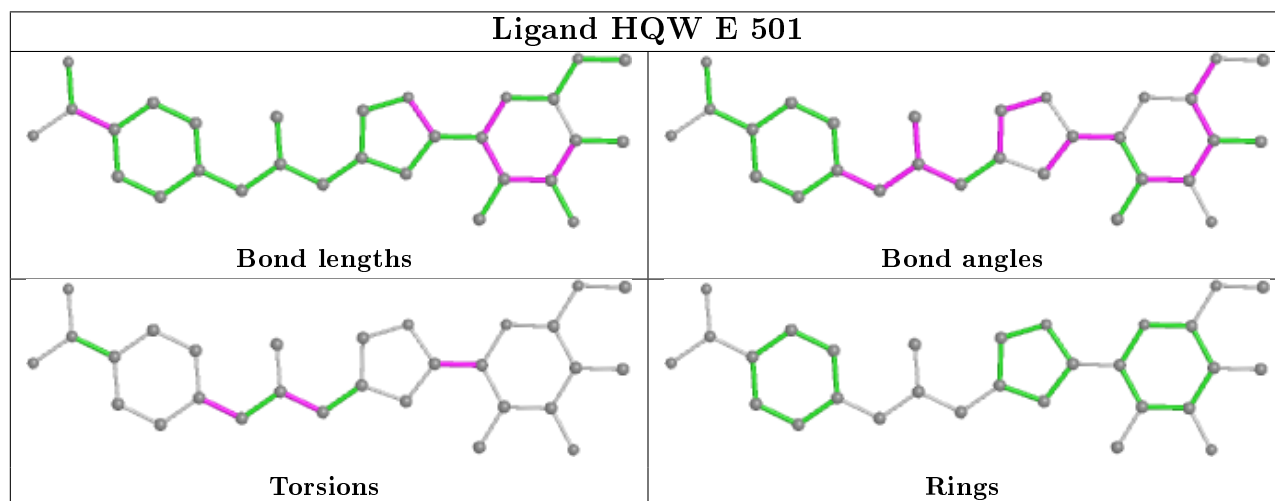
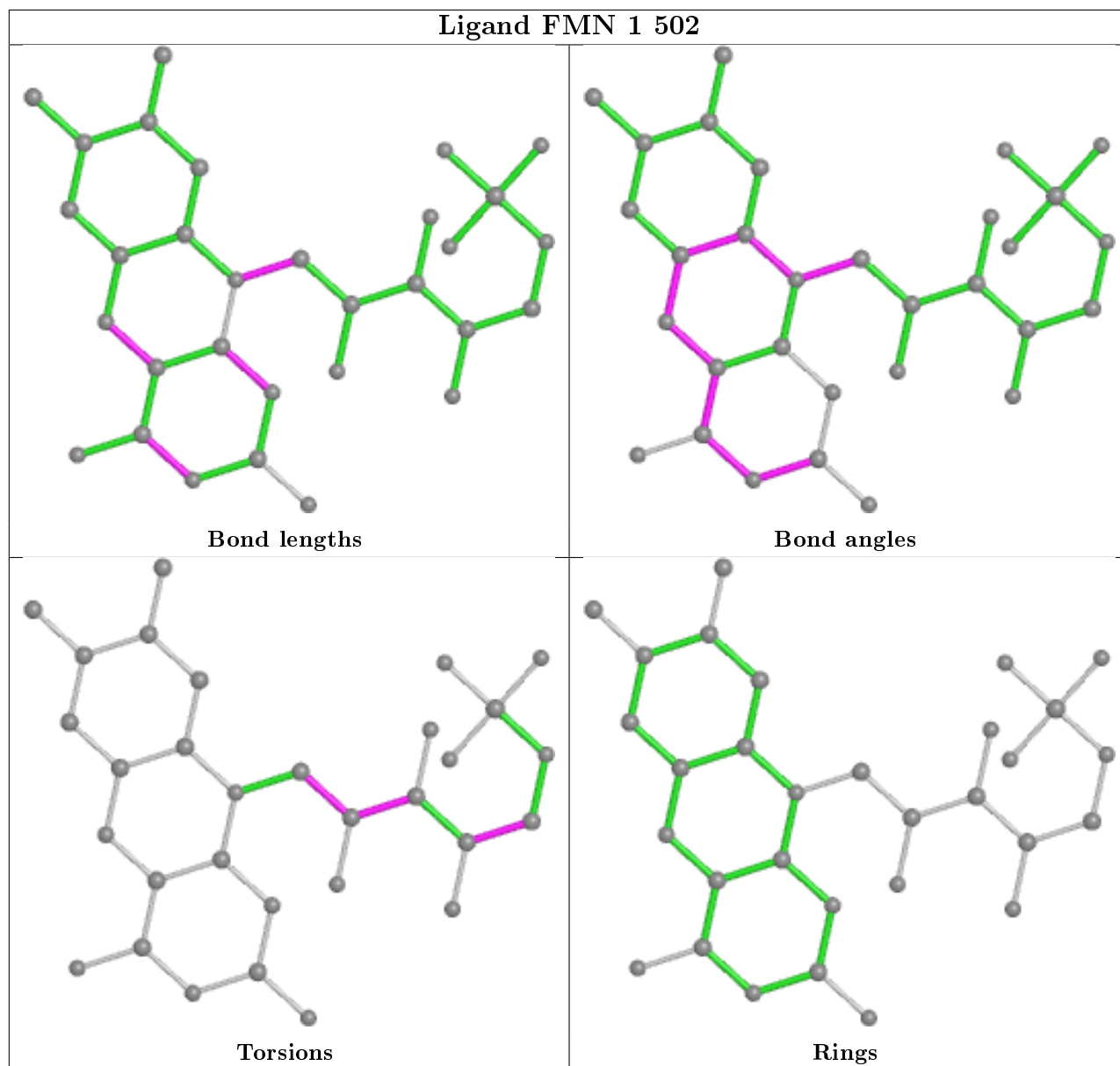
Mol	Chain	Res	Type	Clashes	Symm-Clashes
17	6	201	SF4	1	0
19	D	804	FES	2	0
17	O	201	SF4	1	0
17	1	501	SF4	2	0
17	D	803	SF4	1	0
17	G	201	SF4	1	0
17	D	801	SF4	1	0
18	1	502	FMN	1	0
17	3	803	SF4	1	0
19	C	201	FES	2	0
17	9	201	SF4	1	0
19	2	201	FES	1	0
17	B	501	SF4	3	0
18	B	502	FMN	2	0
17	O	202	SF4	1	0

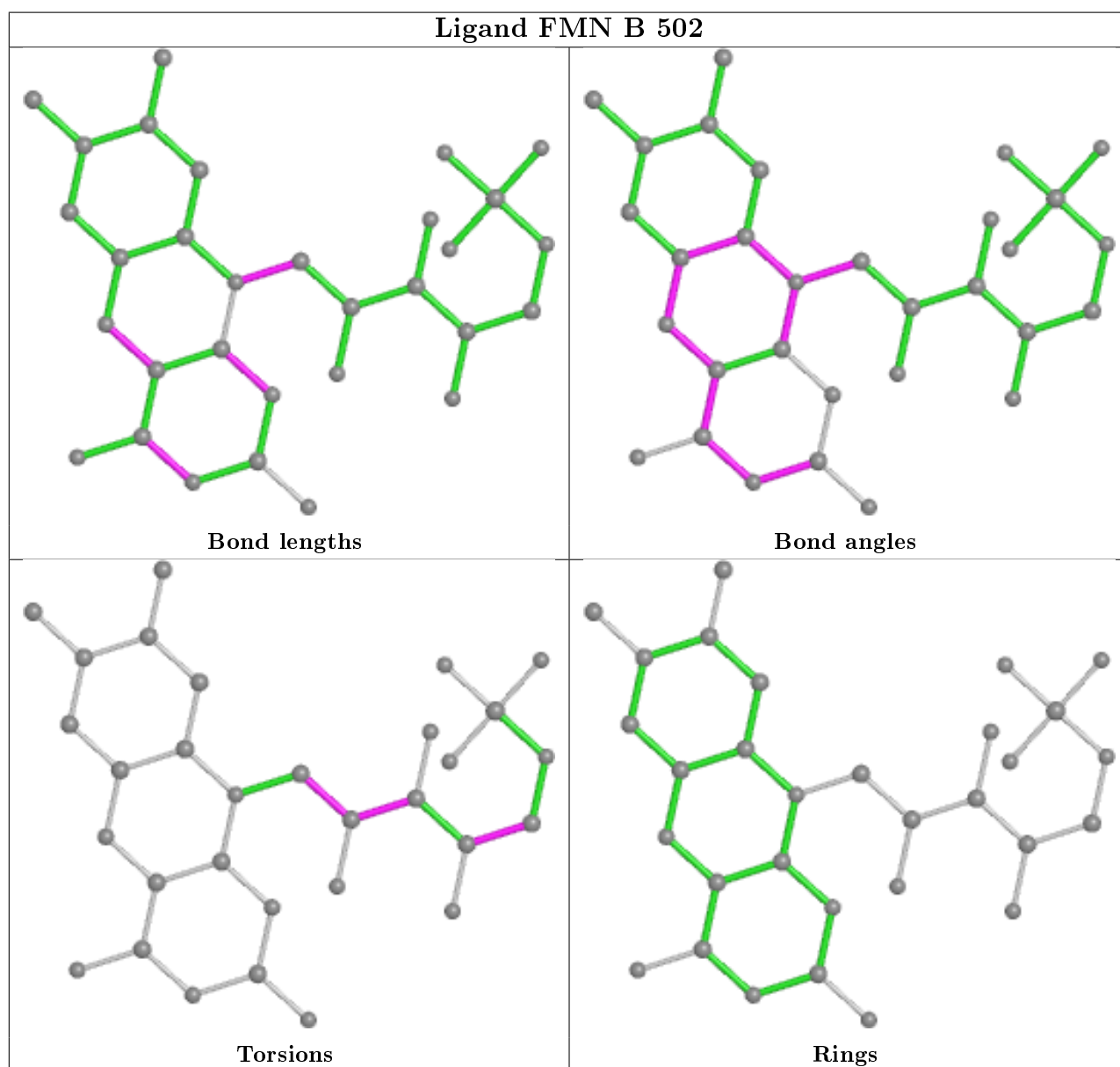
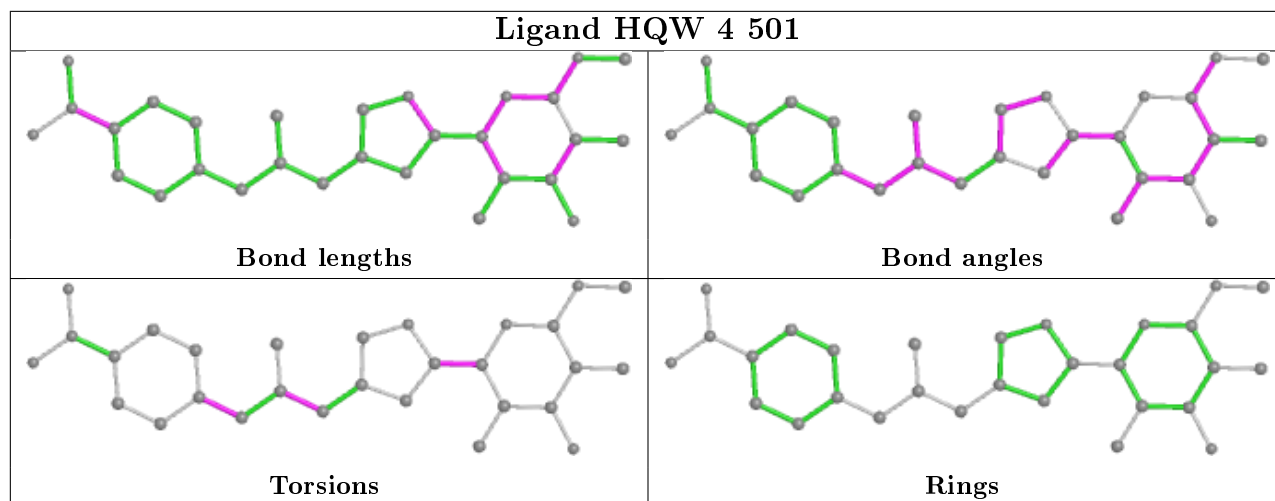
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Mol	Chain	Res	Type	Clashes	Symm-Clashes
19	3	804	FES	2	0
17	9	202	SF4	1	0

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

### 6.1 Protein, DNA and RNA chains

EDS failed to run properly - this section is therefore empty.

### 6.2 Non-standard residues in protein, DNA, RNA chains

EDS failed to run properly - this section is therefore empty.

### 6.3 Carbohydrates

EDS failed to run properly - this section is therefore empty.

### 6.4 Ligands

EDS failed to run properly - this section is therefore empty.

### 6.5 Other polymers

EDS failed to run properly - this section is therefore empty.