wwPDB EM Validation Summary Report

Sep 22, 2022 – 06:25 am BST

PDB ID	:	7QSO
EMDB ID	:	EMD-14140
Title	:	Bovine complex I in lipid nanodisc, State 3 (Slack)
Authors	:	Chung, I.; Bridges, H.R.; Hirst, J.
Deposited on	:	2022-01-13
Resolution	:	3.02 Å(reported)

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

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

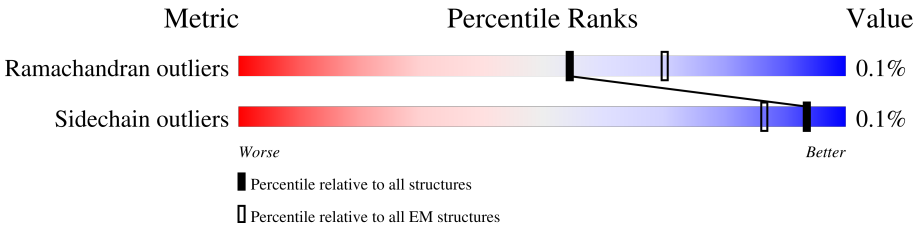
EMDB validation analysis	:	0.0.1.dev8
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	4.02b-467
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.30

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 3.02 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 <=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	7%, 92%, 7%
2	B	216	73%, 27%
3	C	266	79%, 21%
4	D	463	84%, 16%
5	E	249	86%, 14%
6	F	464	93%, 7%
7	G	727	96%
8	H	318	99%
9	I	212	83%, 17%

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Mol	Chain	Length	Quality of chain
10	J	175	17% 90% 8%
11	K	98	88% 12%
12	L	606	90% 10%
13	M	459	100%
14	N	347	100%
15	O	343	93% 7%
16	P	380	6% 84% 16%
17	Q	175	71% 29%
18	R	124	77% 23%
19	S	99	88% 12%
20	T	156	7% 53% 46%
20	U	156	56% 44%
21	V	116	97%
22	W	128	90% 10%
23	X	172	99%
24	Y	141	15% 23% 77%
25	Z	144	99%
26	a	70	100%
27	b	84	99%
28	c	76	63% 37%
29	d	120	98%
30	e	106	93% 7%
31	f	57	19% 96%
32	g	154	58% 42%
33	h	189	75% 24%

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Mol	Chain	Length	Quality of chain
34	i	127	12% 97%
35	j	108	5% 65% 35%
36	k	98	7% 83% 17%
37	l	186	84% 16%
38	m	129	14% 98%
39	n	179	6% 96%
40	o	137	5% 87% 12%
41	p	176	98%
42	q	145	100%
43	r	113	84% 15%
44	s	109	41% 59%

2 Entry composition (i)

There are 59 unique types of molecules in this entry. The entry contains 66112 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	107	864	587	125	147	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	158	1260	803	227	216	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	210	1743	1123	299	318	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	388	3110	1984	538	564	24	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	129	ARG	GLN	variant	UNP P17694

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

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	214	Total	C	N	O	S	0	0
			1659	1059	278	312	10		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	432	Total	C	N	O	S	0	0
			3324	2094	594	616	20		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	700	Total	C	N	O	S	0	0
			5360	3356	934	1030	40		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
8	H	318	Total	C	N	O	S	0	0
			2509	1681	385	420	23		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
9	I	176	Total	C	N	O	S	0	0
			1414	889	243	270	12		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
10	J	161	Total	C	N	O	S	0	0
			1226	827	173	214	12		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
11	K	86	Total	C	N	O	S	0	0
			647	425	96	111	15		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
12	L	547	Total	C	N	O	S	0	0
			4334	2880	667	746	41		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
13	M	459	Total	C	N	O	S	0	0
			3654	2436	570	609	39		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
14	N	347	Total	C	N	O	S	0	0
			2733	1817	416	457	43		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
15	O	320	Total	C	N	O	S	0	0
			2589	1662	429	488	10		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
O	255	LYS	ASN	variant	UNP P34942

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

Mol	Chain	Residues	Atoms					AltConf	Trace
16	P	320	Total	C	N	O	S	0	0
			2560	1652	452	451	5		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
17	Q	125	Total	C	N	O	S	0	0
			1016	641	181	191	3		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
18	R	96	Total	C	N	O	S	0	0
			740	454	140	143	3		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
19	S	87	Total	C	N	O	S	0	0
			701	439	133	127	2		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
20	T	84	Total	C	N	O	S	0	0
			681	439	100	137	5		
20	U	88	Total	C	N	O	S	0	0
			707	454	104	144	5		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
21	V	113	Total	C	N	O	S	0	0
			919	595	155	166	3		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
22	W	115	Total	C	N	O	S	0	0
			977	625	181	167	4		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
23	X	171	Total	C	N	O	S	0	0
			1402	887	253	252	10		

- Molecule 24 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 11.

Mol	Chain	Residues	Atoms					AltConf	Trace
24	Y	33	Total	C	N	O	S	0	0
			248	162	39	46	1		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
25	Z	142	Total	C	N	O	S	0	0
			1157	743	202	203	9		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
26	a	70	Total	C	N	O	S	0	0
			569	365	104	95	5		

- 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	425	109	115	2		

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

Mol	Chain	Residues	Atoms				AltConf	Trace
28	c	48	Total	C	N	O	0	0
			405	268	69	68		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
29	d	120	Total	C	N	O	S	0	0
			999	650	172	172	5		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
30	e	99	Total	C	N	O	S	0	0
			829	523	158	142	6		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
31	f	57	Total	C	N	O	S	0	0
			492	322	86	82	2		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
32	g	90	Total	C	N	O	S	0	0
			750	483	124	139	4		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
33	h	143	Total	C	N	O	S	0	0
			1186	776	203	205	2		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
34	i	127	Total	C	N	O	S	0	0
			1097	722	191	183	1		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
35	j	70	Total	C	N	O	S	0	0
			592	387	98	106	1		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
36	k	81	Total	C	N	O	S	0	0
			653	427	110	114	2		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
37	l	156	Total	C	N	O	S	0	0
			1314	850	216	240	8		

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

Mol	Chain	Residues	Atoms				AltConf	Trace
38	m	127	Total	C	N	O	0	0
			1061	681	187	193		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
39	n	171	Total	C	N	O	S	0	0
			1487	952	272	256	7		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
40	o	120	Total	C	N	O	S	0	0
			1035	645	199	183	8		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
41	p	173	Total	C	N	O	S	0	0
			1455	912	268	267	8		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
42	q	145	Total	C	N	O	S	0	0
			1209	778	216	210	5		

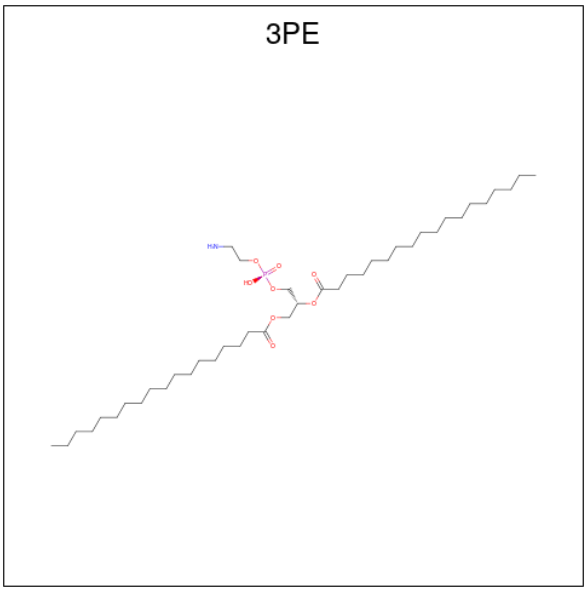
- Molecule 43 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
43	r	96	Total	C	N	O	S	0	0
			785	496	146	140	3		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
44	s	45	Total	C	N	O	S	0	0
			380	238	67	74	1		

- Molecule 45 is 1,2-Distearoyl-sn-glycerophosphoethanolamine (three-letter code: 3PE) (formula: $C_{41}H_{82}NO_8P$).



Mol	Chain	Residues	Atoms					AltConf
45	A	1	Total	C	N	O	P	0
			124	94	3	24	3	
45	A	1	Total	C	N	O	P	0
			124	94	3	24	3	
45	A	1	Total	C	N	O	P	0
			124	94	3	24	3	
45	H	1	Total	C	N	O	P	0
			33	23	1	8	1	
45	I	1	Total	C	N	O	P	0
			84	64	2	16	2	
45	I	1	Total	C	N	O	P	0
			84	64	2	16	2	
45	L	1	Total	C	N	O	P	0
			77	57	2	16	2	

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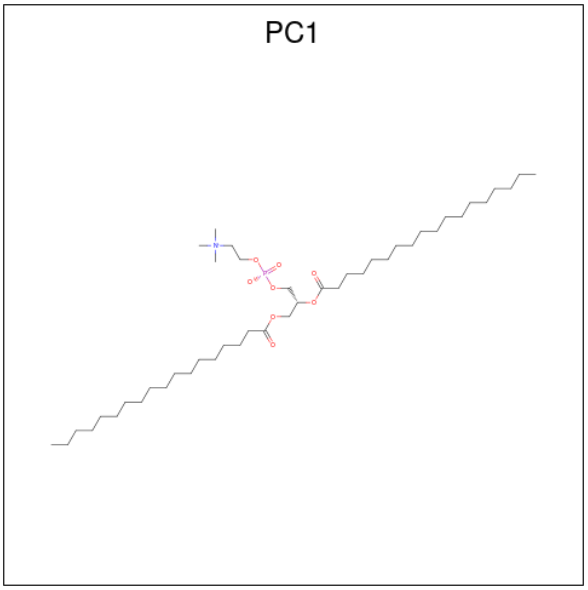
Mol	Chain	Residues	Atoms					AltConf
45	L	1	Total	C	N	O	P	0
			77	57	2	16	2	
45	M	1	Total	C	N	O	P	0
			38	28	1	8	1	
45	N	1	Total	C	N	O	P	0
			84	64	2	16	2	
45	N	1	Total	C	N	O	P	0
			84	64	2	16	2	
45	Y	1	Total	C	N	O	P	0
			39	29	1	8	1	
45	h	1	Total	C	N	O	P	0
			32	22	1	8	1	
45	r	1	Total	C	N	O	P	0
			49	39	1	8	1	

- Molecule 46 is 1,2-DIACYL-SN-GLYCERO-3-PHOSPHOCHOLINE (three-letter code: PC1) (formula: $C_{44}H_{88}NO_8P$).



Mol	Chain	Residues	Atoms					AltConf
46	B	1	Total	C	N	O	P	0
			101	81	2	16	2	
46	B	1	Total	C	N	O	P	0
			101	81	2	16	2	
46	J	1	Total	C	N	O	P	0
			43	33	1	8	1	
46	M	1	Total	C	N	O	P	0
			46	36	1	8	1	

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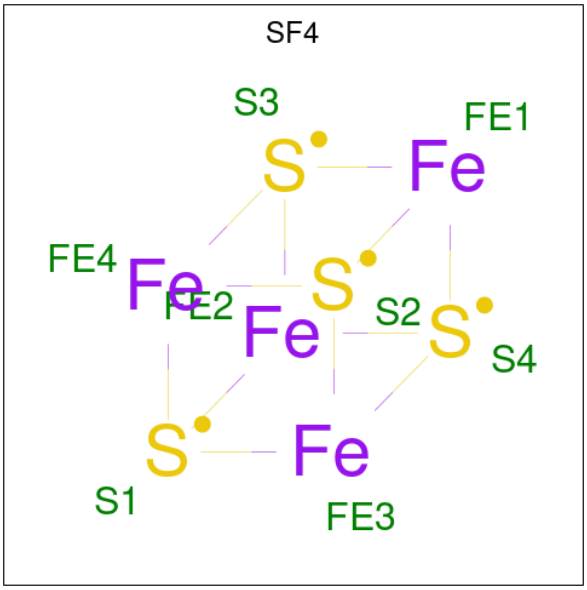
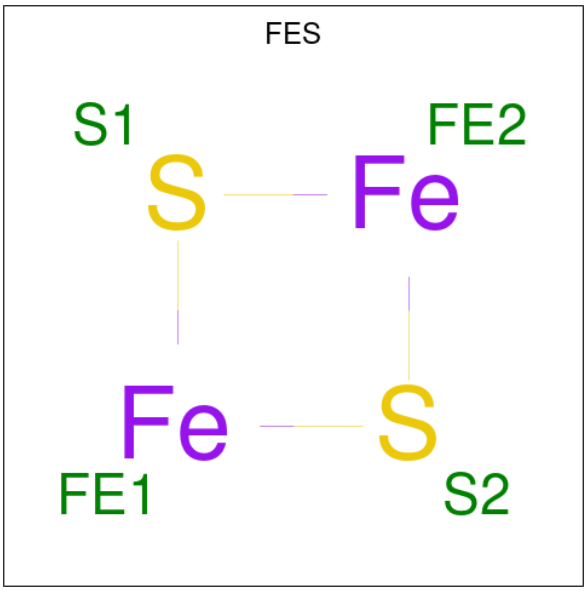
Mol	Chain	Residues	Atoms	AltConf
46	d	1	Total C N O P 33 23 1 8 1	0
46	q	1	Total C N O P 37 27 1 8 1	0

- Molecule 47 is IRON/SULFUR CLUSTER (three-letter code: SF4) (formula: Fe_4S_4).



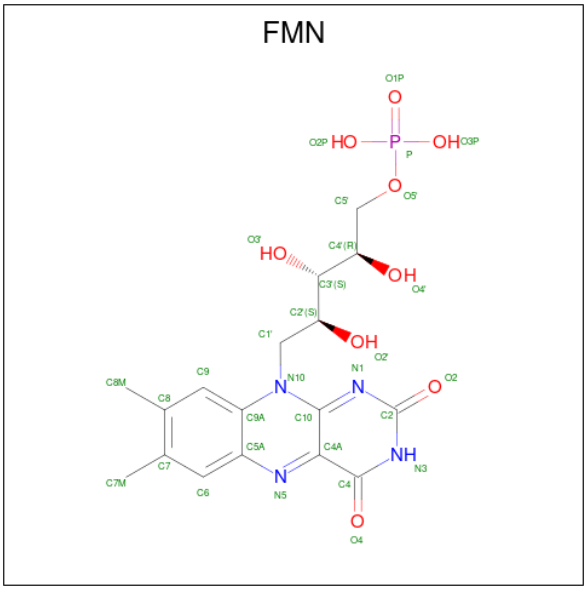
Mol	Chain	Residues	Atoms	AltConf
47	B	1	Total Fe S 8 4 4	0
47	F	1	Total Fe S 8 4 4	0
47	G	1	Total Fe S 16 8 8	0
47	G	1	Total Fe S 16 8 8	0
47	I	1	Total Fe S 16 8 8	0
47	I	1	Total Fe S 16 8 8	0

- Molecule 48 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe_2S_2).



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

- Molecule 49 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: $C_{17}H_{21}N_4O_9P$).

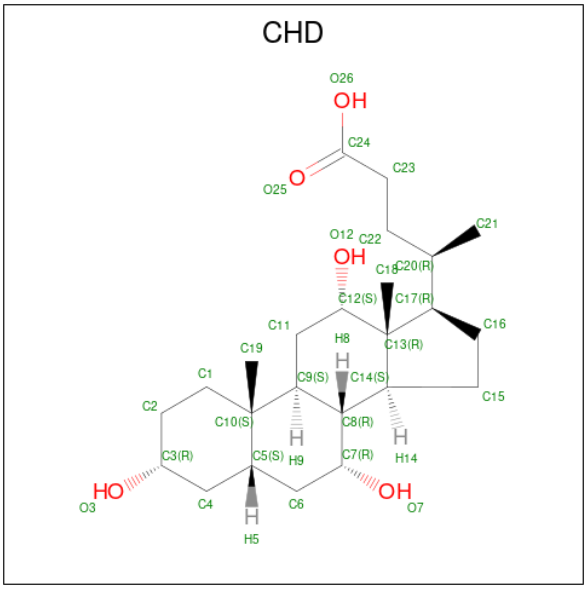


Mol	Chain	Residues	Atoms					AltConf
49	F	1	Total	C	N	O	P	0
			31	17	4	9	1	

- Molecule 50 is POTASSIUM ION (three-letter code: K) (formula: K).

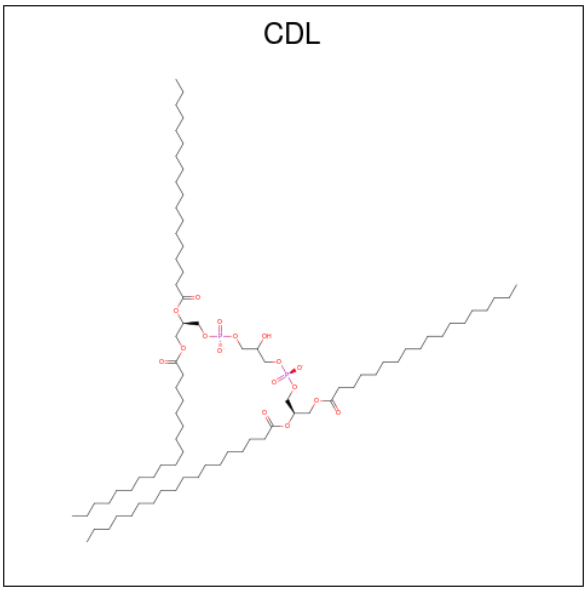
Mol	Chain	Residues	Atoms	AltConf
50	G	1	Total K 1 1	0

- Molecule 51 is CHOLIC ACID (three-letter code: CHD) (formula: $C_{24}H_{40}O_5$).



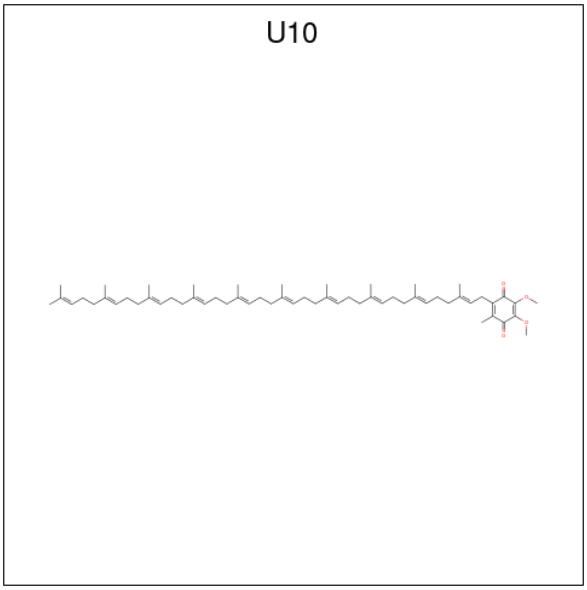
Mol	Chain	Residues	Atoms	AltConf
51	H	1	Total C O 29 24 5	0
51	L	1	Total C O 29 24 5	0

- Molecule 52 is CARDIOLIPIN (three-letter code: CDL) (formula: $C_{81}H_{156}O_{17}P_2$).



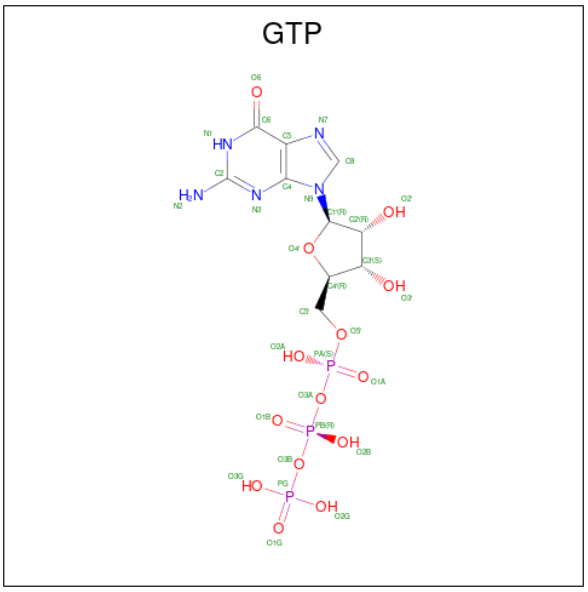
Mol	Chain	Residues	Atoms				AltConf
52	L	1	Total	C	O	P	0
			75	56	17	2	
52	N	1	Total	C	O	P	0
			73	54	17	2	
52	X	1	Total	C	O	P	0
			79	60	17	2	
52	d	1	Total	C	O	P	0
			65	46	17	2	
52	h	1	Total	C	O	P	0
			77	58	17	2	
52	r	1	Total	C	O	P	0
			60	41	17	2	

- Molecule 53 is UBIQUINONE-10 (three-letter code: U10) (formula: $C_{59}H_{90}O_4$).



Mol	Chain	Residues	Atoms			AltConf
53	M	1	Total	C	O	0
			63	59	4	

- Molecule 54 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GTP) (formula: $C_{10}H_{16}N_5O_{14}P_3$).

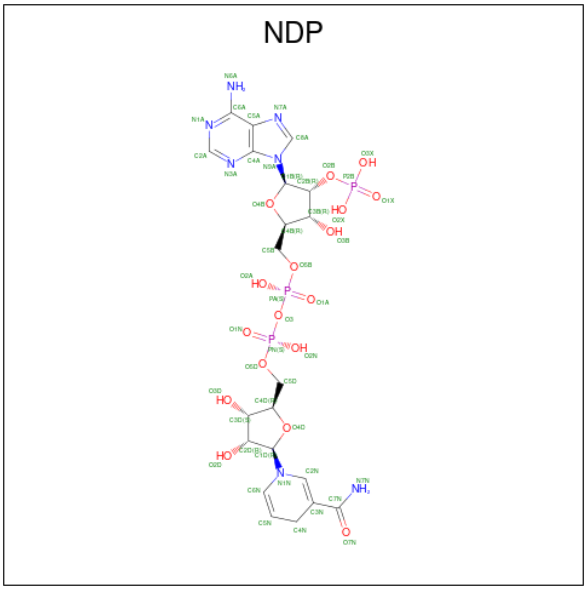


Mol	Chain	Residues	Atoms					AltConf
54	O	1	Total	C	N	O	P	0
			32	10	5	14	3	

- Molecule 55 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
55	O	1	Total	Mg	0
			1	1	

- Molecule 56 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NDP) (formula: $C_{21}H_{30}N_7O_{17}P_3$).

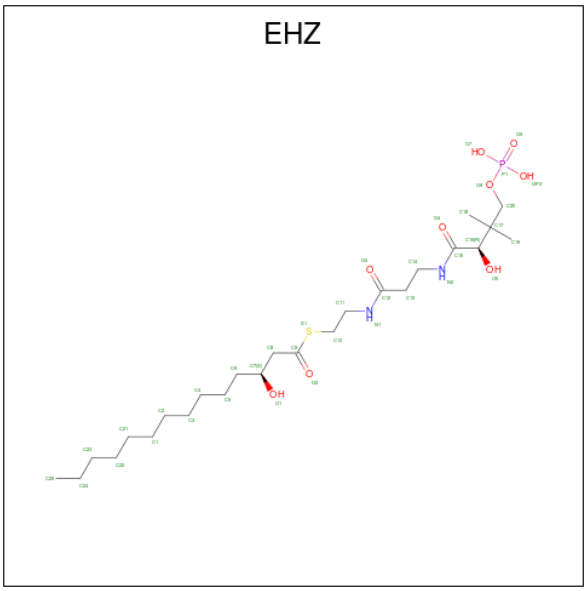


Mol	Chain	Residues	Atoms					AltConf
56	P	1	Total	C	N	O	P	0
			48	21	7	17	3	

- Molecule 57 is ZINC ION (three-letter code: ZN) (formula: Zn).

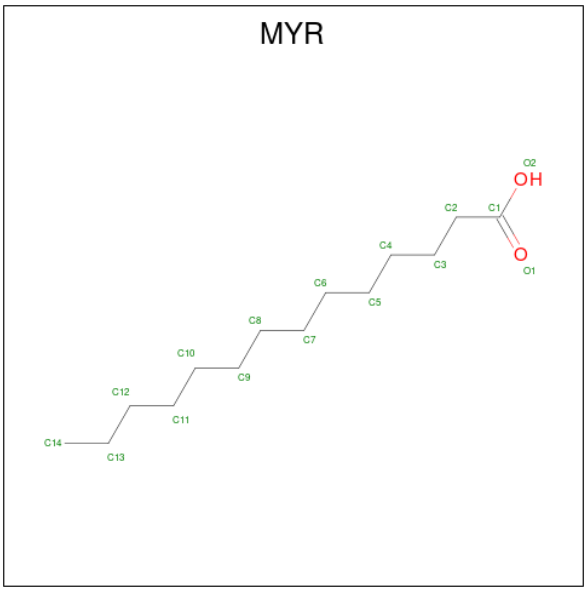
Mol	Chain	Residues	Atoms		AltConf
57	R	1	Total	Zn	0
			1	1	

- Molecule 58 is {S}-[2-[3-[[(2 {R})-3,3-dimethyl-2-oxidanyl-4-phosphonooxy-butanoyl]amino]propanoylamino]ethyl] (3 {S})-3-oxidanyltetradecanethioate (three-letter code: EHZ) (formula: $C_{25}H_{49}N_2O_9PS$).



Mol	Chain	Residues	Atoms						AltConf
58	T	1	Total	C	N	O	P	S	0
			37	25	2	8	1	1	
58	U	1	Total	C	N	O	P	S	0
			37	25	2	8	1	1	

- Molecule 59 is MYRISTIC ACID (three-letter code: MYR) (formula: $C_{14}H_{28}O_2$).

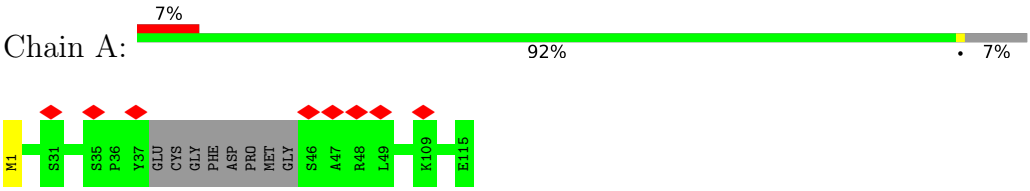


Mol	Chain	Residues	Atoms			AltConf
59	o	1	Total	C	O	0
			15	14	1	

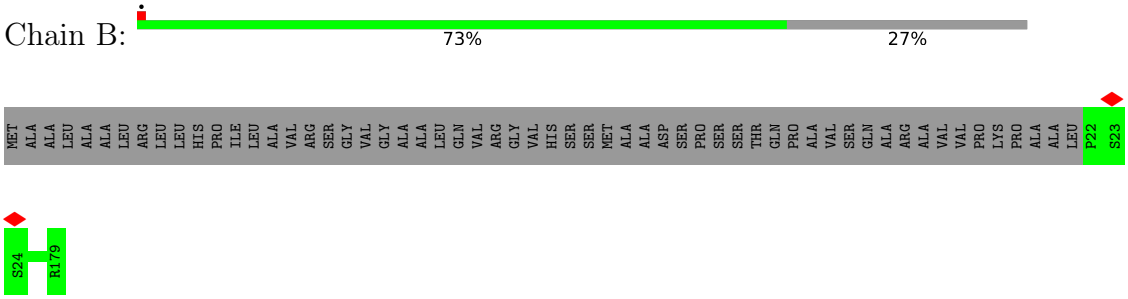
3 Residue-property plots (i)

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.

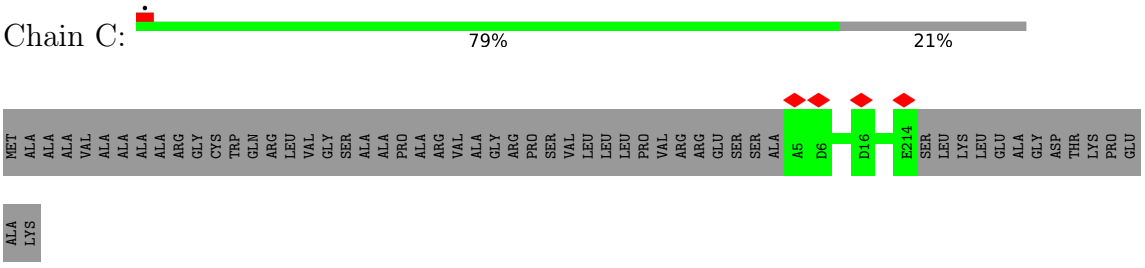
• Molecule 1: NADH-ubiquinone oxidoreductase chain 3



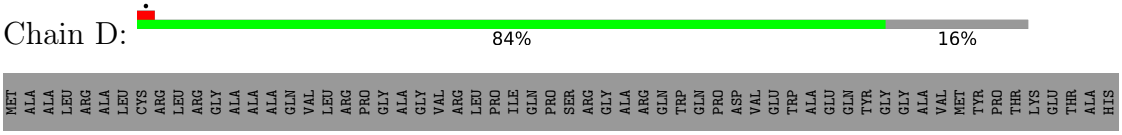
• Molecule 2: NADH dehydrogenase [ubiquinone] iron-sulfur protein 7, mitochondrial

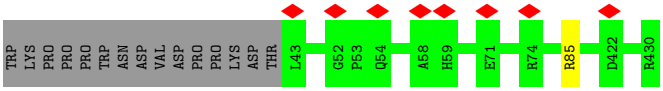


• Molecule 3: NADH dehydrogenase [ubiquinone] iron-sulfur protein 3, mitochondrial



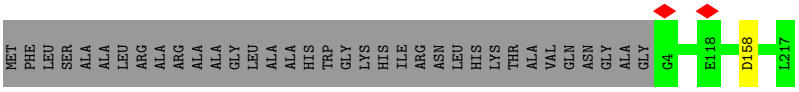
• Molecule 4: NADH dehydrogenase [ubiquinone] iron-sulfur protein 2, mitochondrial





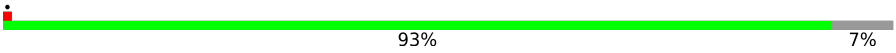
• Molecule 5: NADH dehydrogenase [ubiquinone] flavoprotein 2, mitochondrial

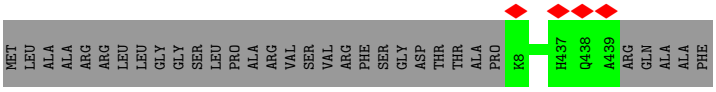
Chain E:



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

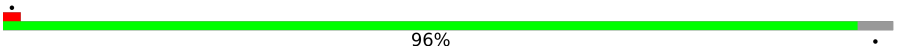
Chain F:

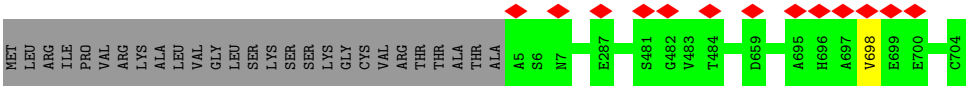




• Molecule 7: NADH-ubiquinone oxidoreductase 75 kDa subunit, mitochondrial

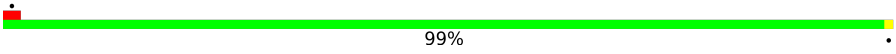
Chain G:

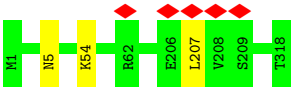




• Molecule 8: NADH-ubiquinone oxidoreductase chain 1

Chain H:



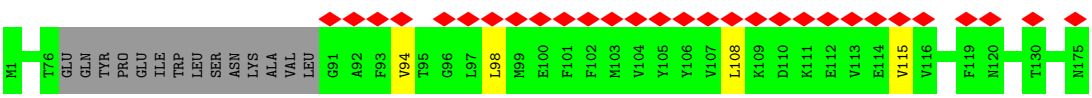


• Molecule 9: NADH dehydrogenase [ubiquinone] iron-sulfur protein 8, mitochondrial

Chain I:

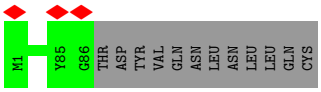
• Molecule 10: NADH-ubiquinone oxidoreductase chain 6

Chain J:



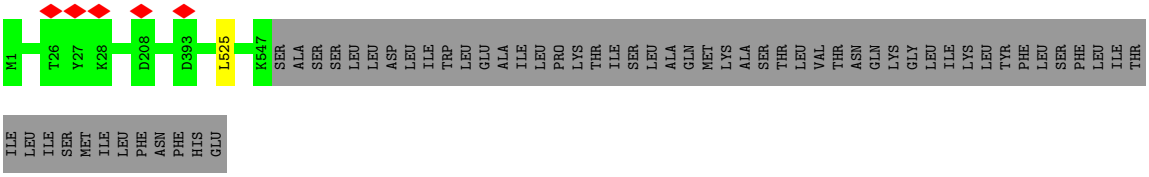
• Molecule 11: NADH-ubiquinone oxidoreductase chain 4L

Chain K:



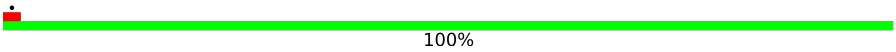
• Molecule 12: NADH-ubiquinone oxidoreductase chain 5

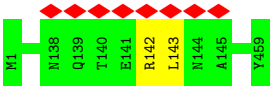
Chain L:



• Molecule 13: NADH-ubiquinone oxidoreductase chain 4

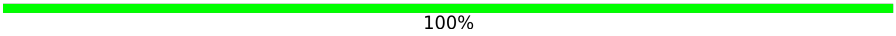
Chain M:





• Molecule 14: NADH-ubiquinone oxidoreductase chain 2

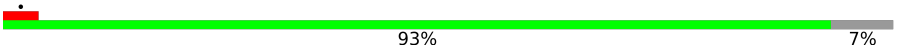
Chain N:

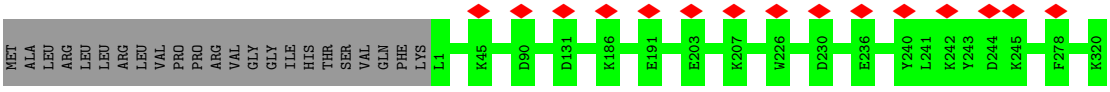


There are no outlier residues recorded for this chain.

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

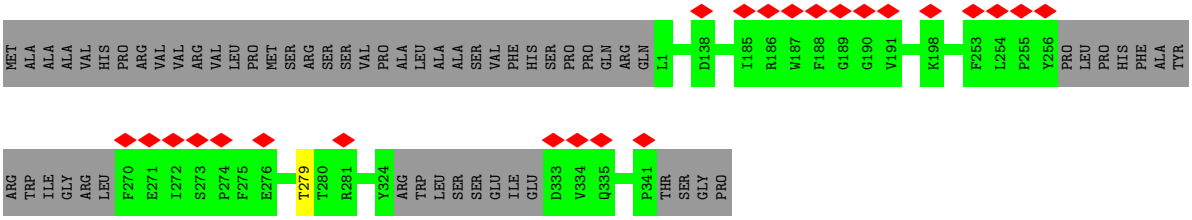
Chain O:





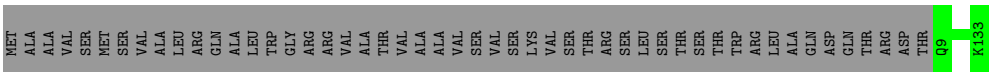
• Molecule 16: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 9, mitochondrial

Chain P:



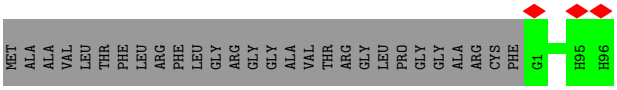
• Molecule 17: NADH dehydrogenase [ubiquinone] iron-sulfur protein 4, mitochondrial

Chain Q:



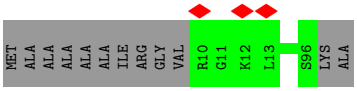
• Molecule 18: NADH dehydrogenase [ubiquinone] iron-sulfur protein 6, mitochondrial

Chain R:



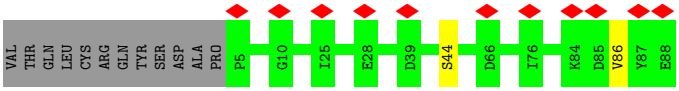
• Molecule 19: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 2

Chain S:



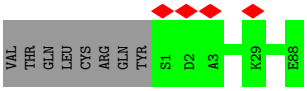
• Molecule 20: Acyl carrier protein, mitochondrial

Chain T:



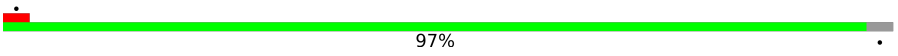
• Molecule 20: Acyl carrier protein, mitochondrial

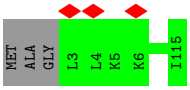
Chain U:



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

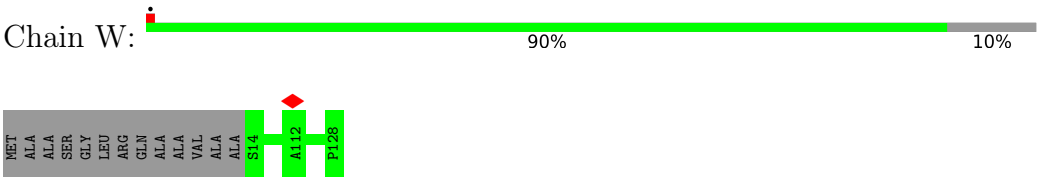
Chain V:





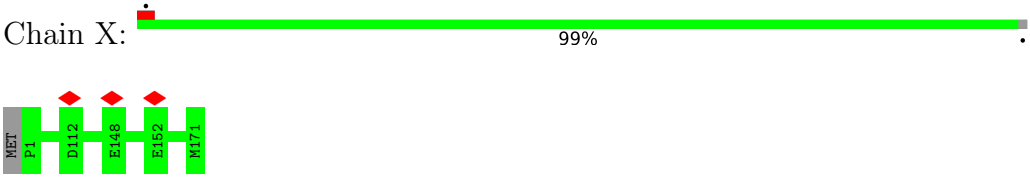
• Molecule 22: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 6

Chain W:



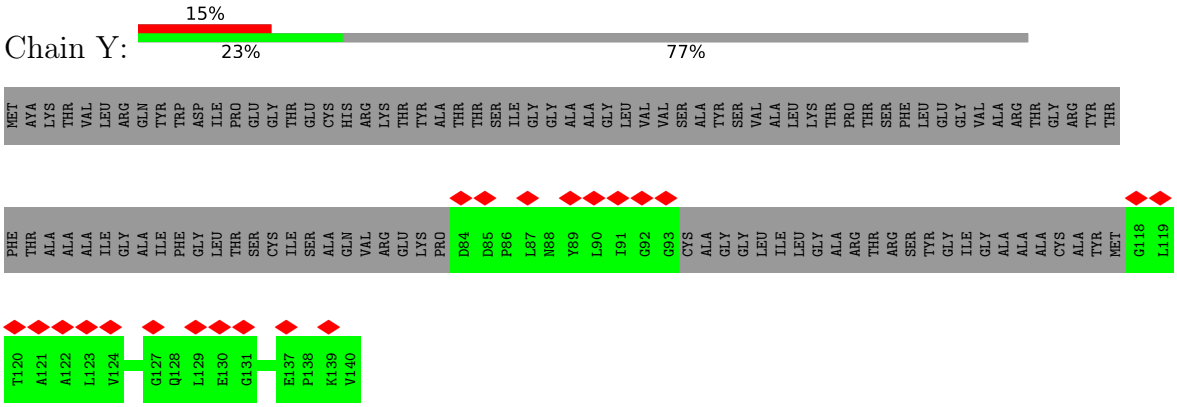
• Molecule 23: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 8

Chain X:



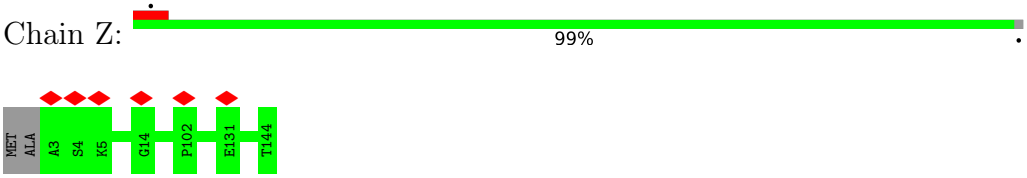
• Molecule 24: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 11

Chain Y:



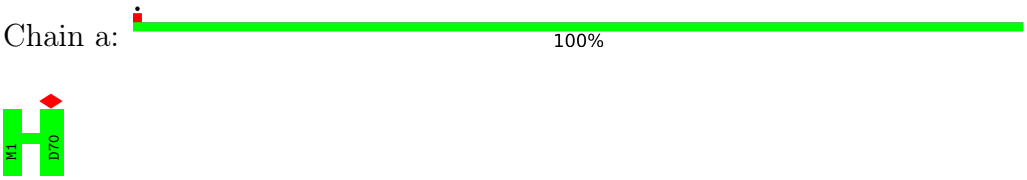
• Molecule 25: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 13

Chain Z:



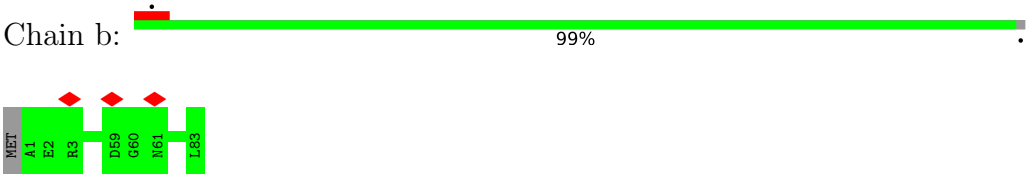
• Molecule 26: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 1

Chain a:



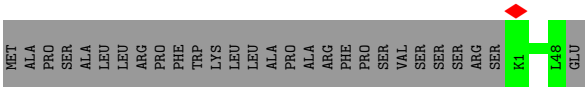
• Molecule 27: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 3

Chain b:



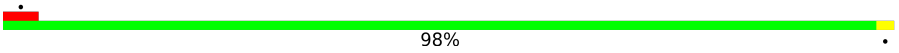
• Molecule 28: NADH dehydrogenase [ubiquinone] 1 subunit C1, mitochondrial

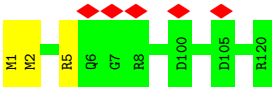
Chain c:



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

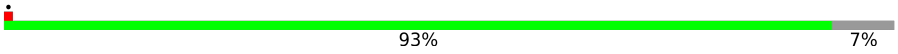
Chain d:

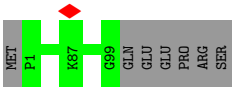




• Molecule 30: NADH dehydrogenase [ubiquinone] iron-sulfur protein 5

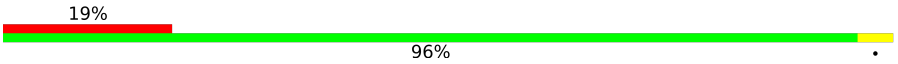
Chain e:

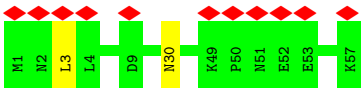




• Molecule 31: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 1

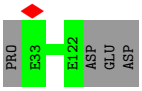
Chain f:





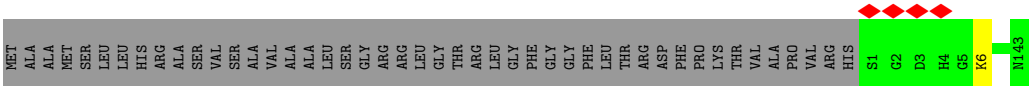
• Molecule 32: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 11, mitochondrial

Chain g:



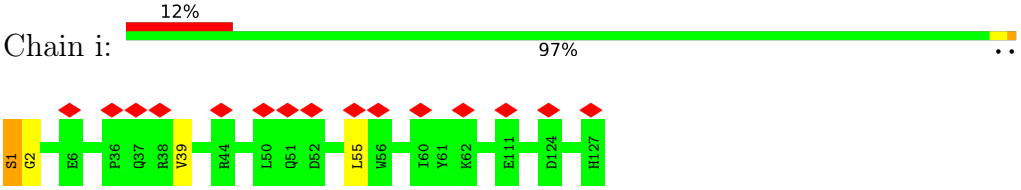
• Molecule 33: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 5, mitochondrial

Chain h:



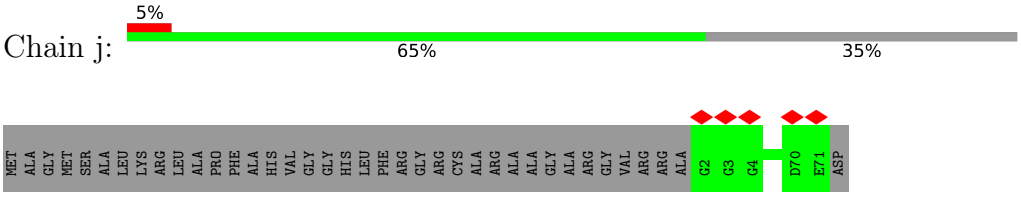
• Molecule 34: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 6

Chain i:



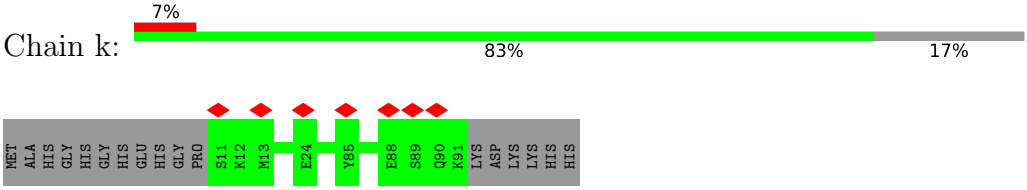
• Molecule 35: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 2, mitochondrial

Chain j:



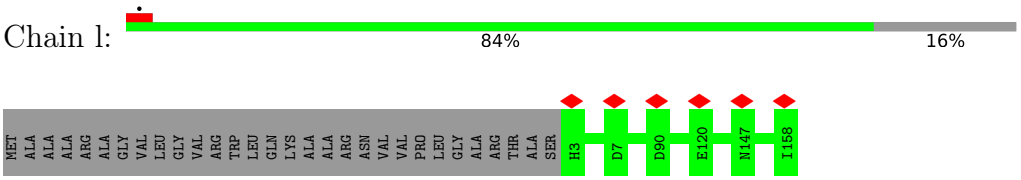
• Molecule 36: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 3

Chain k:



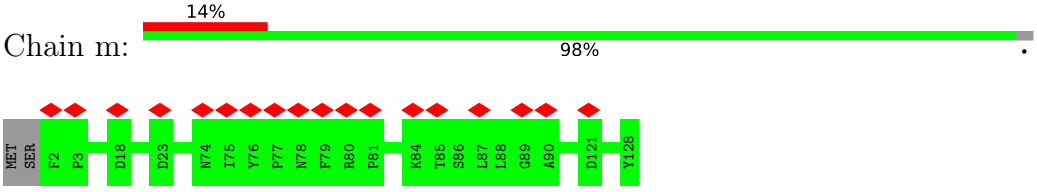
• Molecule 37: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 8, mitochondrial

Chain l:



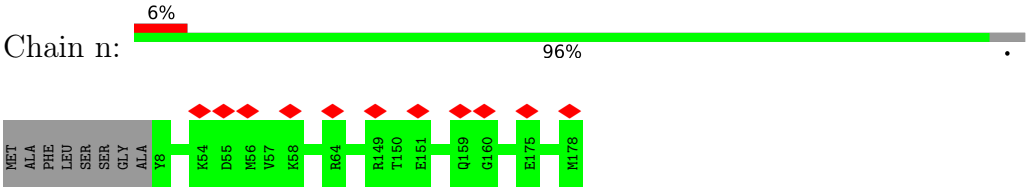
• Molecule 38: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 4

Chain m:



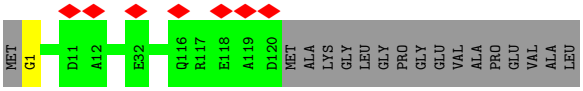
• Molecule 39: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 9

Chain n:



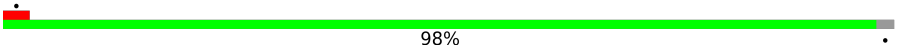
• Molecule 40: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 7

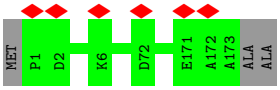
Chain o:



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

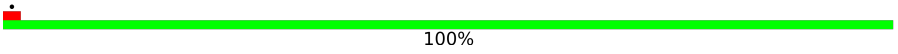
Chain p:

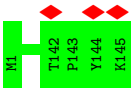




• Molecule 42: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 12

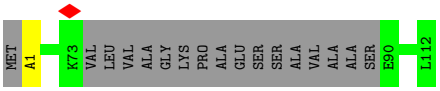
Chain q:





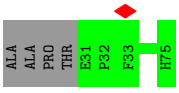
• Molecule 43: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 7

Chain r:



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

Chain s:



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	22019	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 ($e^-/Å^2$)	40.5	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2400	Depositor
Magnification	81000	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	34.528	Depositor
Minimum map value	-14.853	Depositor
Average map value	-0.001	Depositor
Map value standard deviation	0.958	Depositor
Recommended contour level	5.5	Depositor
Map size (Å)	479.744, 479.744, 479.744	wwPDB
Map dimensions	640, 640, 640	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.7496, 0.7496, 0.7496	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CDL, ZN, MG, FME, NDP, FMN, FES, 3PE, AME, K, MYR, SAC, SF4, PC1, EHZ, 2MR, U10, CHD, GTP, AYA

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\#\|Z\| > 5$	RMSZ	$\#\|Z\| > 5$
1	A	0.32	0/876	0.42	0/1199
2	B	0.42	0/1292	0.47	0/1747
3	C	0.38	0/1794	0.44	0/2443
4	D	0.38	0/3170	0.46	0/4285
5	E	0.35	0/1699	0.44	0/2312
6	F	0.34	0/3398	0.45	0/4591
7	G	0.34	0/5450	0.46	1/7388 (0.0%)
8	H	0.35	0/2571	0.46	2/3513 (0.1%)
9	I	0.41	0/1445	0.46	0/1956
10	J	0.36	0/1246	0.60	6/1687 (0.4%)
11	K	0.41	0/646	0.48	0/872
12	L	0.32	0/4443	0.42	2/6047 (0.0%)
13	M	0.33	0/3738	0.44	1/5097 (0.0%)
14	N	0.31	0/2792	0.43	0/3800
15	O	0.30	0/2651	0.39	0/3587
16	P	0.33	0/2626	0.44	0/3557
17	Q	0.35	0/1039	0.46	0/1404
18	R	0.37	0/753	0.43	0/1014
19	S	0.30	0/712	0.44	0/957
20	T	0.29	0/692	0.49	1/932 (0.1%)
20	U	0.31	0/719	0.42	0/971
21	V	0.29	0/939	0.36	0/1272
22	W	0.32	0/1001	0.39	0/1345
23	X	0.35	0/1439	0.44	0/1942
24	Y	0.24	0/252	0.37	0/340
25	Z	0.36	0/1186	0.42	0/1599
26	a	0.34	0/584	0.40	0/786
27	b	0.33	0/672	0.39	0/923
28	c	0.32	0/418	0.37	0/567
29	d	0.37	0/1018	0.41	0/1375
30	e	0.33	0/850	0.45	0/1136

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#|Z| >5	RMSZ	#|Z| >5
31	f	0.33	0/505	0.50	2/681 (0.3%)
32	g	0.35	0/772	0.39	0/1046
33	h	0.33	0/1221	0.40	0/1651
34	i	0.31	0/1127	0.51	3/1534 (0.2%)
35	j	0.30	0/619	0.39	0/848
36	k	0.29	0/672	0.38	0/906
37	l	0.33	0/1369	0.39	0/1873
38	m	0.31	0/1088	0.42	0/1472
39	n	0.31	0/1540	0.38	0/2085
40	o	0.34	1/1060 (0.1%)	0.40	0/1420
41	p	0.34	0/1489	0.40	0/2008
42	q	0.37	0/1250	0.45	0/1698
43	r	0.34	0/798	0.42	0/1079
44	s	0.32	0/392	0.43	0/531
All	All	0.34	1/66013 (0.0%)	0.44	18/89476 (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
34	i	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
40	o	1	GLY	CA-C	5.13	1.60	1.51

The worst 5 of 18 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
10	J	94	VAL	CG1-CB-CG2	7.03	122.14	110.90
20	T	86	VAL	CG1-CB-CG2	7.02	122.14	110.90
34	i	39	VAL	CG1-CB-CG2	6.91	121.96	110.90
10	J	115	VAL	CG1-CB-CG2	6.82	121.81	110.90
7	G	698	VAL	CG1-CB-CG2	6.64	121.52	110.90

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
34	i	1	SAC	Mainchain

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	103/115 (90%)	97 (94%)	6 (6%)	0	100	100
2	B	156/216 (72%)	149 (96%)	7 (4%)	0	100	100
3	C	208/266 (78%)	202 (97%)	6 (3%)	0	100	100
4	D	385/463 (83%)	368 (96%)	17 (4%)	0	100	100
5	E	212/249 (85%)	204 (96%)	7 (3%)	1 (0%)	29	66
6	F	430/464 (93%)	410 (95%)	20 (5%)	0	100	100
7	G	698/727 (96%)	676 (97%)	22 (3%)	0	100	100
8	H	316/318 (99%)	301 (95%)	15 (5%)	0	100	100
9	I	174/212 (82%)	170 (98%)	4 (2%)	0	100	100
10	J	157/175 (90%)	144 (92%)	13 (8%)	0	100	100
11	K	84/98 (86%)	82 (98%)	2 (2%)	0	100	100
12	L	545/606 (90%)	515 (94%)	30 (6%)	0	100	100
13	M	457/459 (100%)	449 (98%)	7 (2%)	1 (0%)	47	81
14	N	345/347 (99%)	336 (97%)	9 (3%)	0	100	100
15	O	318/343 (93%)	309 (97%)	9 (3%)	0	100	100
16	P	314/380 (83%)	299 (95%)	14 (4%)	1 (0%)	41	75
17	Q	123/175 (70%)	122 (99%)	1 (1%)	0	100	100
18	R	94/124 (76%)	89 (95%)	5 (5%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
19	S	85/99 (86%)	84 (99%)	1 (1%)	0	100	100
20	T	82/156 (53%)	78 (95%)	4 (5%)	0	100	100
20	U	86/156 (55%)	81 (94%)	5 (6%)	0	100	100
21	V	111/116 (96%)	107 (96%)	4 (4%)	0	100	100
22	W	113/128 (88%)	108 (96%)	5 (4%)	0	100	100
23	X	169/172 (98%)	164 (97%)	5 (3%)	0	100	100
24	Y	29/141 (21%)	26 (90%)	3 (10%)	0	100	100
25	Z	140/144 (97%)	136 (97%)	4 (3%)	0	100	100
26	a	68/70 (97%)	67 (98%)	1 (2%)	0	100	100
27	b	81/84 (96%)	79 (98%)	2 (2%)	0	100	100
28	c	46/76 (60%)	45 (98%)	1 (2%)	0	100	100
29	d	118/120 (98%)	116 (98%)	1 (1%)	1 (1%)	19	55
30	e	97/106 (92%)	93 (96%)	4 (4%)	0	100	100
31	f	55/57 (96%)	53 (96%)	2 (4%)	0	100	100
32	g	88/154 (57%)	84 (96%)	4 (4%)	0	100	100
33	h	141/189 (75%)	137 (97%)	4 (3%)	0	100	100
34	i	125/127 (98%)	119 (95%)	5 (4%)	1 (1%)	19	55
35	j	68/108 (63%)	66 (97%)	2 (3%)	0	100	100
36	k	79/98 (81%)	79 (100%)	0	0	100	100
37	l	154/186 (83%)	144 (94%)	10 (6%)	0	100	100
38	m	125/129 (97%)	115 (92%)	10 (8%)	0	100	100
39	n	169/179 (94%)	161 (95%)	8 (5%)	0	100	100
40	o	118/137 (86%)	114 (97%)	4 (3%)	0	100	100
41	p	171/176 (97%)	166 (97%)	5 (3%)	0	100	100
42	q	143/145 (99%)	141 (99%)	2 (1%)	0	100	100
43	r	92/113 (81%)	87 (95%)	5 (5%)	0	100	100
44	s	43/109 (39%)	41 (95%)	2 (5%)	0	100	100
All	All	7915/9212 (86%)	7613 (96%)	297 (4%)	5 (0%)	54	85

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
5	E	158	ASP

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Mol	Chain	Res	Type
34	i	2	GLY
13	M	142	ARG
16	P	279	THR
29	d	2	MET

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	94/100 (94%)	94 (100%)	0	100 100
2	B	134/175 (77%)	134 (100%)	0	100 100
3	C	190/228 (83%)	190 (100%)	0	100 100
4	D	334/392 (85%)	334 (100%)	0	100 100
5	E	183/205 (89%)	183 (100%)	0	100 100
6	F	345/368 (94%)	345 (100%)	0	100 100
7	G	586/608 (96%)	586 (100%)	0	100 100
8	H	274/274 (100%)	272 (99%)	2 (1%)	84 94
9	I	151/175 (86%)	151 (100%)	0	100 100
10	J	128/141 (91%)	128 (100%)	0	100 100
11	K	73/85 (86%)	73 (100%)	0	100 100
12	L	479/533 (90%)	479 (100%)	0	100 100
13	M	412/412 (100%)	412 (100%)	0	100 100
14	N	315/315 (100%)	315 (100%)	0	100 100
15	O	283/303 (93%)	283 (100%)	0	100 100
16	P	276/327 (84%)	276 (100%)	0	100 100
17	Q	112/153 (73%)	112 (100%)	0	100 100
18	R	79/97 (81%)	79 (100%)	0	100 100
19	S	77/82 (94%)	77 (100%)	0	100 100
20	T	78/135 (58%)	77 (99%)	1 (1%)	69 88

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
20	U	81/135 (60%)	81 (100%)	0	100 100
21	V	101/102 (99%)	101 (100%)	0	100 100
22	W	108/114 (95%)	108 (100%)	0	100 100
23	X	154/155 (99%)	154 (100%)	0	100 100
24	Y	25/102 (24%)	25 (100%)	0	100 100
25	Z	120/121 (99%)	120 (100%)	0	100 100
26	a	59/59 (100%)	59 (100%)	0	100 100
27	b	71/72 (99%)	71 (100%)	0	100 100
28	c	44/68 (65%)	44 (100%)	0	100 100
29	d	105/105 (100%)	104 (99%)	1 (1%)	76 91
30	e	89/96 (93%)	89 (100%)	0	100 100
31	f	54/54 (100%)	53 (98%)	1 (2%)	57 83
32	g	81/131 (62%)	81 (100%)	0	100 100
33	h	124/158 (78%)	123 (99%)	1 (1%)	81 93
34	i	120/120 (100%)	120 (100%)	0	100 100
35	j	61/84 (73%)	61 (100%)	0	100 100
36	k	63/76 (83%)	63 (100%)	0	100 100
37	l	140/159 (88%)	140 (100%)	0	100 100
38	m	113/115 (98%)	113 (100%)	0	100 100
39	n	156/161 (97%)	156 (100%)	0	100 100
40	o	109/120 (91%)	109 (100%)	0	100 100
41	p	156/157 (99%)	156 (100%)	0	100 100
42	q	131/131 (100%)	131 (100%)	0	100 100
43	r	86/97 (89%)	86 (100%)	0	100 100
44	s	44/92 (48%)	44 (100%)	0	100 100
All	All	6998/7892 (89%)	6992 (100%)	6 (0%)	93 98

5 of 6 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
29	d	5	ARG
31	f	30	ASN
33	h	6	LYS

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Mol	Chain	Res	Type
8	H	54	LYS
8	H	5	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
12	L	514	HIS
29	d	88	HIS
33	h	143	ASN
30	e	96	HIS
12	L	248	HIS

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	$\#\|Z\| > 2$
12	FME	L	1	12	8,9,10	0.96	0	7,9,11	0.91	0
8	FME	H	1	8	8,9,10	0.98	0	7,9,11	0.88	0
10	FME	J	1	10	8,9,10	0.91	0	7,9,11	0.90	0
43	AYA	r	1	43	6,7,8	1.25	1 (16%)	5,8,10	1.39	1 (20%)
1	FME	A	1	1	8,9,10	0.96	1 (12%)	7,9,11	0.76	0
11	FME	K	1	11	8,9,10	0.92	0	7,9,11	0.97	0
34	SAC	i	1	34	7,8,9	1.84	1 (14%)	8,9,11	1.62	1 (12%)
29	AME	d	1	29	9,10,11	1.42	2 (22%)	9,11,13	2.55	2 (22%)
4	2MR	D	85	4	10,12,13	0.51	0	5,13,15	1.26	1 (20%)
14	FME	N	1	14	8,9,10	0.96	0	7,9,11	0.85	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
13	FME	M	1	13	8,9,10	0.96	0	7,9,11	0.80	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
12	FME	L	1	12	-	5/7/9/11	-
8	FME	H	1	8	-	0/7/9/11	-
10	FME	J	1	10	-	5/7/9/11	-
43	AYA	r	1	43	-	0/4/6/8	-
1	FME	A	1	1	-	1/7/9/11	-
11	FME	K	1	11	-	3/7/9/11	-
34	SAC	i	1	34	-	4/7/8/10	-
29	AME	d	1	29	-	4/9/10/12	-
4	2MR	D	85	4	-	3/10/13/15	-
14	FME	N	1	14	-	2/7/9/11	-
13	FME	M	1	13	-	1/7/9/11	-

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
34	i	1	SAC	O-C	4.22	1.36	1.19
29	d	1	AME	CT1-N	3.12	1.45	1.34
43	r	1	AYA	CA-N	-2.45	1.44	1.46
29	d	1	AME	OT-CT1	-2.14	1.18	1.23
1	A	1	FME	CA-N	-2.00	1.43	1.46

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
29	d	1	AME	C-CA-N	-6.48	98.04	109.73
34	i	1	SAC	O-C-CA	-3.99	114.33	124.78
29	d	1	AME	CE-SD-CG	2.99	110.66	100.40
43	r	1	AYA	CB-CA-N	2.82	112.75	109.61
4	D	85	2MR	NE-CZ-NH2	-2.64	117.06	119.48

There are no chirality outliers.

5 of 28 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	1	FME	O1-CN-N-CA
4	D	85	2MR	O-C-CA-CB
4	D	85	2MR	NE-CZ-NH2-CQ2
4	D	85	2MR	NH1-CZ-NH2-CQ2
10	J	1	FME	O1-CN-N-CA

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 46 ligands modelled in this entry, 3 are monoatomic - leaving 43 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	$\#\|Z\| > 2$
45	3PE	H	702	-	32,32,50	1.05	4 (12%)	35,37,55	1.24	2 (5%)
54	GTP	O	401	55	26,34,34	2.92	10 (38%)	32,54,54	1.77	9 (28%)
45	3PE	h	202	-	31,31,50	1.08	4 (12%)	34,36,55	1.05	2 (5%)
45	3PE	A	202	-	42,42,50	0.92	4 (9%)	45,47,55	1.13	2 (4%)
52	CDL	L	702	-	74,74,99	1.01	8 (10%)	80,86,111	1.12	4 (5%)
52	CDL	X	201	-	78,78,99	0.98	8 (10%)	84,90,111	1.11	4 (4%)
52	CDL	h	201	-	76,76,99	0.99	8 (10%)	82,88,111	1.19	5 (6%)
45	3PE	I	201	-	50,50,50	0.86	3 (6%)	53,55,55	1.10	2 (3%)
52	CDL	d	202	-	64,64,99	1.06	8 (12%)	70,76,111	1.13	4 (5%)
59	MYR	o	201	40	14,14,15	0.96	0	13,13,15	0.68	0
47	SF4	G	801	7	0,12,12	-	-	-		
53	U10	M	701	-	63,63,63	2.68	17 (26%)	76,79,79	1.97	22 (28%)
48	FES	G	803	7	0,4,4	-	-	-		

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
56	NDP	P	501	-	45,52,52	2.23	6 (13%)	53,80,80	1.69	10 (18%)
46	PC1	d	201	-	32,32,53	1.22	4 (12%)	38,40,61	1.13	2 (5%)
45	3PE	A	203	-	38,38,50	0.97	4 (10%)	41,43,55	1.13	2 (4%)
51	CHD	H	701	-	32,32,32	3.22	10 (31%)	51,51,51	2.58	21 (41%)
52	CDL	N	403	-	72,72,99	1.03	7 (9%)	78,84,111	1.09	4 (5%)
46	PC1	J	201	-	42,42,53	1.05	4 (9%)	48,50,61	1.03	2 (4%)
45	3PE	N	401	-	34,34,50	1.02	4 (11%)	37,39,55	1.06	2 (5%)
47	SF4	G	802	7	0,12,12	-	-	-		
45	3PE	Y	601	-	38,38,50	0.99	4 (10%)	41,43,55	1.12	2 (4%)
45	3PE	N	402	-	48,48,50	0.87	3 (6%)	51,53,55	1.09	2 (3%)
46	PC1	M	703	-	45,45,53	1.00	3 (6%)	51,53,61	1.04	2 (3%)
49	FMN	F	501	-	33,33,33	1.12	2 (6%)	48,50,50	1.25	6 (12%)
45	3PE	L	701	-	44,44,50	0.91	3 (6%)	47,49,55	1.10	2 (4%)
48	FES	E	301	5	0,4,4	-	-	-		
45	3PE	L	703	-	31,31,50	1.07	3 (9%)	34,36,55	1.17	2 (5%)
47	SF4	I	202	9	0,12,12	-	-	-		
58	EHZ	T	101	20	29,36,37	1.76	5 (17%)	35,44,47	1.52	5 (14%)
58	EHZ	U	101	20	29,36,37	1.69	5 (17%)	35,44,47	1.35	3 (8%)
45	3PE	A	201	-	41,41,50	0.94	4 (9%)	44,46,55	1.14	2 (4%)
45	3PE	r	202	-	48,48,50	0.87	4 (8%)	51,53,55	1.09	2 (3%)
47	SF4	F	502	6	0,12,12	-	-	-		
45	3PE	I	204	-	32,32,50	1.06	4 (12%)	35,37,55	1.11	2 (5%)
45	3PE	M	702	-	37,37,50	0.99	4 (10%)	40,42,55	1.05	2 (5%)
47	SF4	B	302	2	0,12,12	-	-	-		
46	PC1	B	301	-	49,49,53	0.98	4 (8%)	55,57,61	0.94	2 (3%)
47	SF4	I	203	9	0,12,12	-	-	-		
51	CHD	L	704	-	32,32,32	3.19	10 (31%)	51,51,51	2.31	20 (39%)
46	PC1	B	303	-	50,50,53	0.97	4 (8%)	56,58,61	1.03	2 (3%)
52	CDL	r	201	-	59,59,99	1.11	7 (11%)	65,71,111	1.17	4 (6%)
46	PC1	q	701	-	36,36,53	1.13	4 (11%)	42,44,61	1.07	2 (4%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
45	3PE	H	702	-	-	17/36/36/54	-
54	GTP	O	401	55	-	6/18/38/38	0/3/3/3
45	3PE	h	202	-	-	23/35/35/54	-
45	3PE	A	202	-	-	20/46/46/54	-
52	CDL	L	702	-	-	43/85/85/110	-
52	CDL	X	201	-	-	47/89/89/110	-
52	CDL	h	201	-	-	36/87/87/110	-
45	3PE	I	201	-	-	26/54/54/54	-
52	CDL	d	202	-	-	34/75/75/110	-
59	MYR	o	201	40	-	8/11/12/13	-
47	SF4	G	801	7	-	-	0/6/5/5
53	U10	M	701	-	-	28/63/87/87	0/1/1/1
48	FES	G	803	7	-	-	0/1/1/1
56	NDP	P	501	-	-	6/30/77/77	0/5/5/5
46	PC1	d	201	-	-	14/36/36/57	-
45	3PE	A	203	-	-	20/42/42/54	-
51	CHD	H	701	-	-	1/9/74/74	0/4/4/4
52	CDL	N	403	-	-	35/83/83/110	-
46	PC1	J	201	-	-	16/46/46/57	-
45	3PE	N	401	-	-	15/38/38/54	-
47	SF4	G	802	7	-	-	0/6/5/5
45	3PE	Y	601	-	-	14/42/42/54	-
45	3PE	N	402	-	-	25/52/52/54	-
46	PC1	M	703	-	-	14/49/49/57	-
49	FMN	F	501	-	-	5/18/18/18	0/3/3/3
45	3PE	L	701	-	-	27/48/48/54	-
48	FES	E	301	5	-	-	0/1/1/1
45	3PE	L	703	-	-	20/35/35/54	-
47	SF4	I	202	9	-	-	0/6/5/5
58	EHZ	T	101	20	-	14/42/44/45	-
58	EHZ	U	101	20	-	15/42/44/45	-
45	3PE	A	201	-	-	17/45/45/54	-
45	3PE	r	202	-	-	32/52/52/54	-
47	SF4	F	502	6	-	-	0/6/5/5
45	3PE	I	204	-	-	13/36/36/54	-
45	3PE	M	702	-	-	24/41/41/54	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
47	SF4	B	302	2	-	-	0/6/5/5
46	PC1	B	301	-	-	18/53/53/57	-
47	SF4	I	203	9	-	-	0/6/5/5
51	CHD	L	704	-	-	4/9/74/74	0/4/4/4
46	PC1	B	303	-	-	16/54/54/57	-
52	CDL	r	201	-	-	28/70/70/110	-
46	PC1	q	701	-	-	19/40/40/57	-

The worst 5 of 186 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
56	P	501	NDP	P2B-O2B	12.06	1.82	1.59
51	L	704	CHD	C11-C12	8.67	1.67	1.53
51	H	701	CHD	C11-C12	8.67	1.67	1.53
54	O	401	GTP	O6-C6	8.26	1.40	1.23
51	H	701	CHD	C16-C15	7.02	1.73	1.54

The worst 5 of 161 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
56	P	501	NDP	PN-O3-PA	-7.08	108.53	132.83
51	H	701	CHD	C17-C13-C12	6.37	123.48	117.67
51	L	704	CHD	C17-C13-C12	5.81	122.97	117.67
53	M	701	U10	C40-C39-C41	5.63	124.75	115.27
51	H	701	CHD	C17-C13-C14	5.57	105.71	100.09

There are no chirality outliers.

5 of 700 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
45	A	201	3PE	O13-C11-C12-N
45	A	201	3PE	O11-C1-C2-O21
45	A	201	3PE	O22-C21-O21-C2
45	A	202	3PE	C1-O11-P-O12
45	A	202	3PE	C1-O11-P-O14

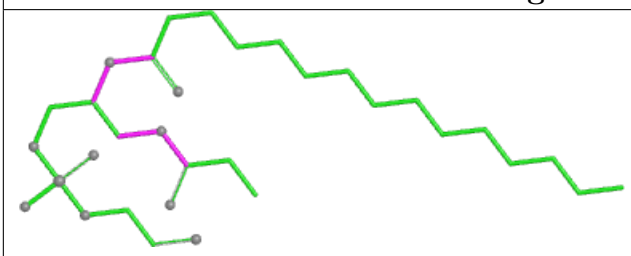
There are no ring outliers.

No monomer is involved in short contacts.

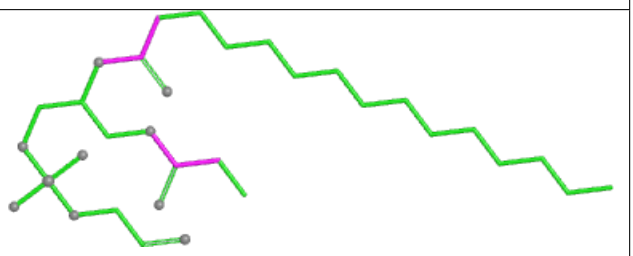
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

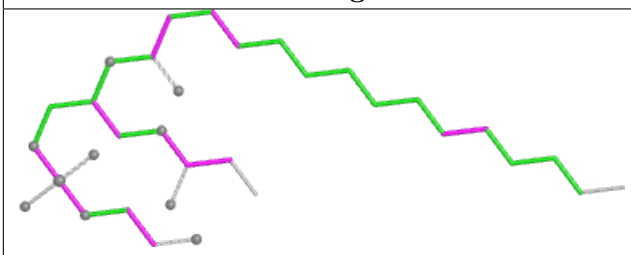
Ligand 3PE H 702



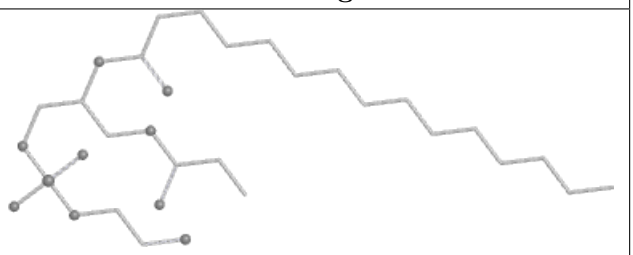
Bond lengths



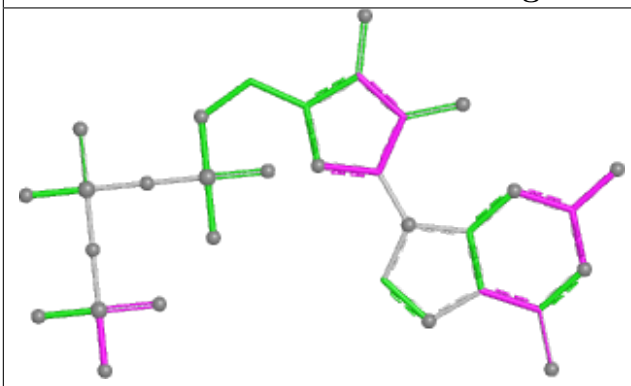
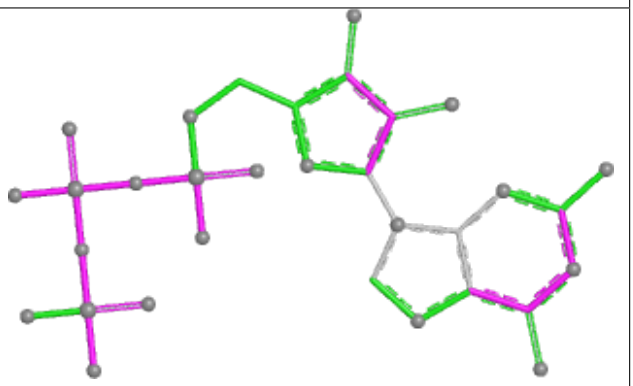
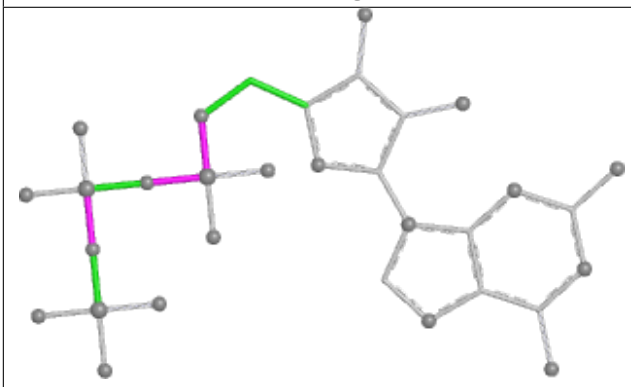
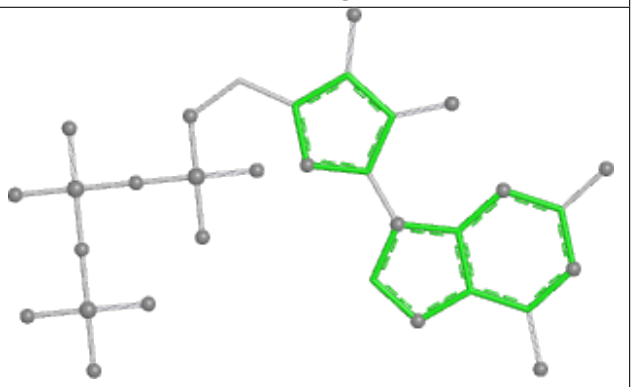
Bond angles

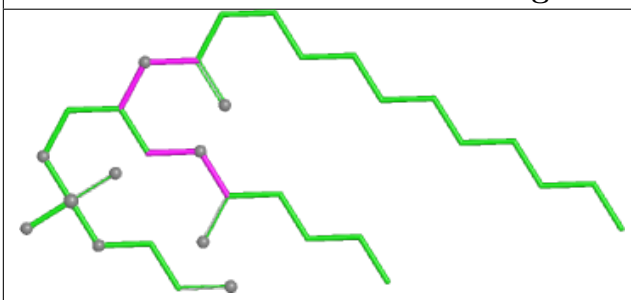
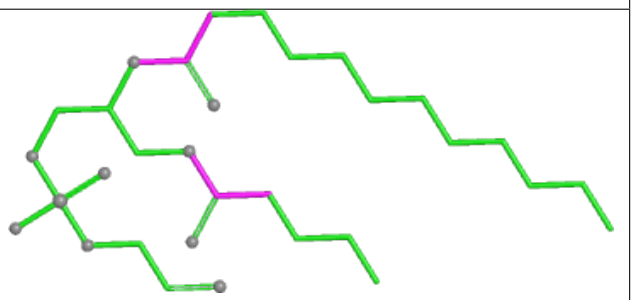
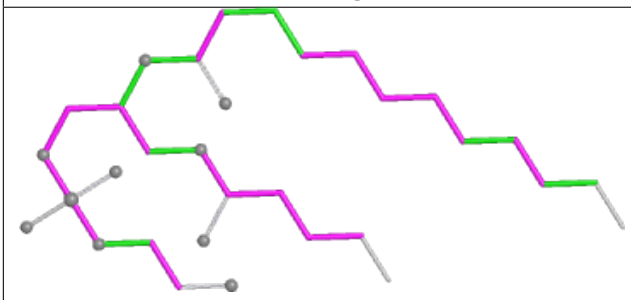
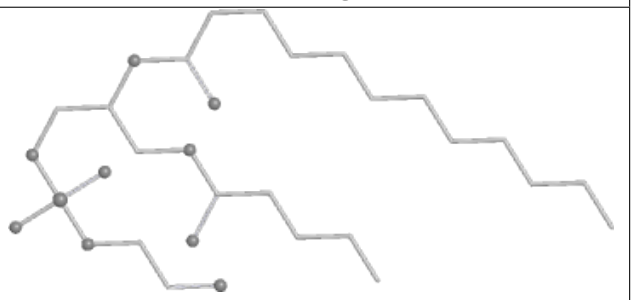


Torsions

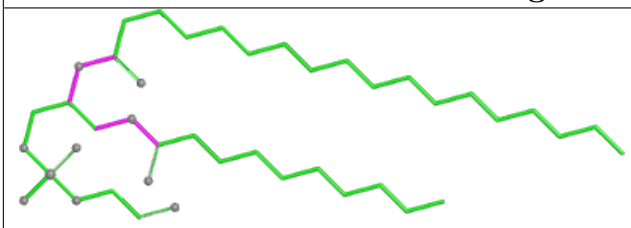


Rings

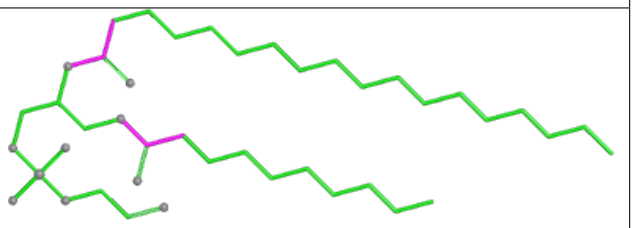
Ligand GTP O 401	
 Bond lengths	 Bond angles
 Torsions	 Rings

Ligand 3PE h 202	
 Bond lengths	 Bond angles
 Torsions	 Rings

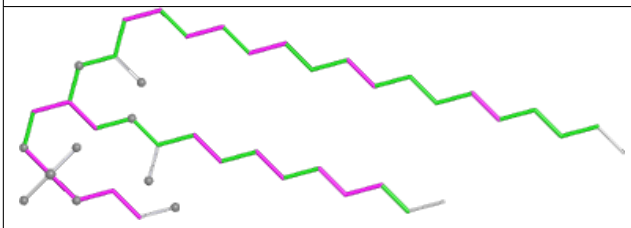
Ligand 3PE A 202



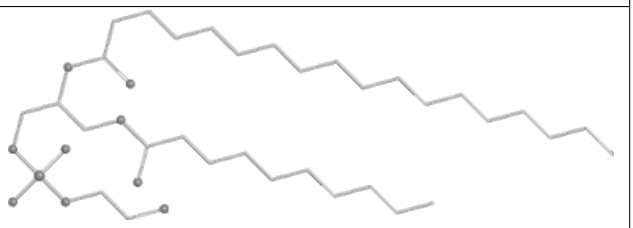
Bond lengths



Bond angles

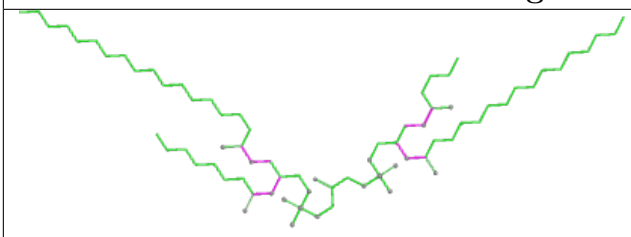


Torsions

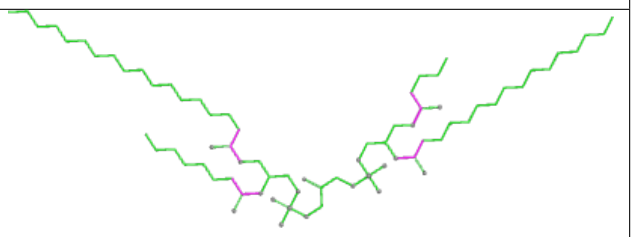


Rings

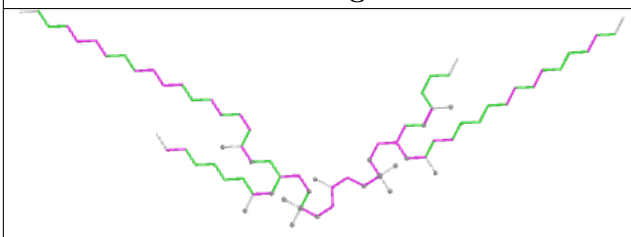
Ligand CDL L 702



Bond lengths



Bond angles



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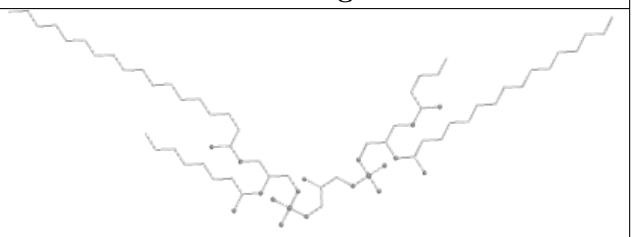
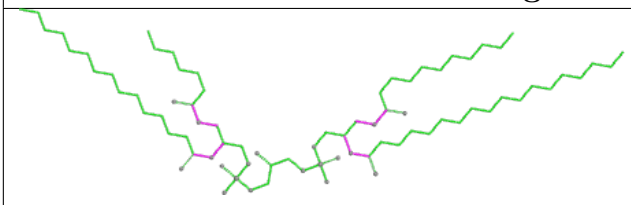


Rings

Ligand CDL X 201



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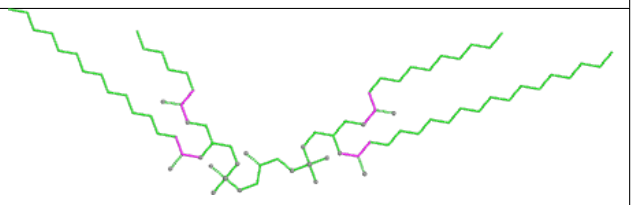
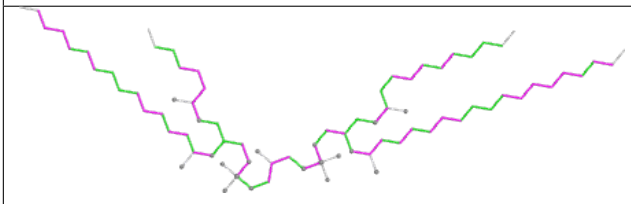


Bond angles



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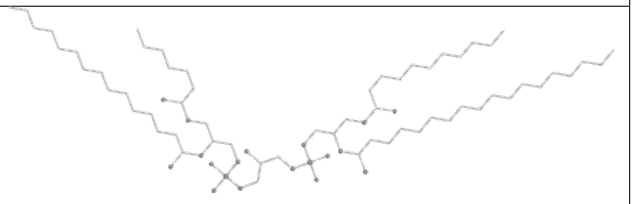
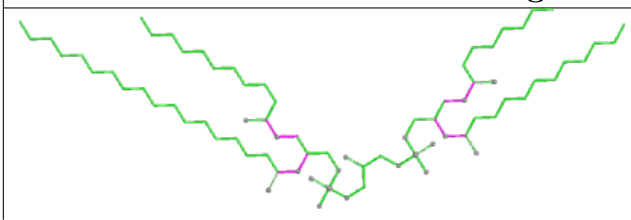
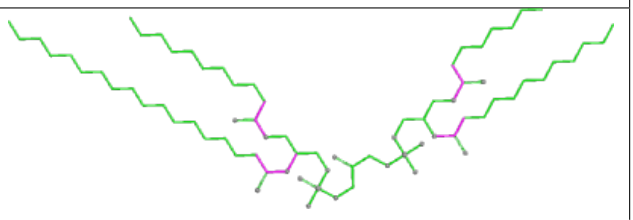


Rings

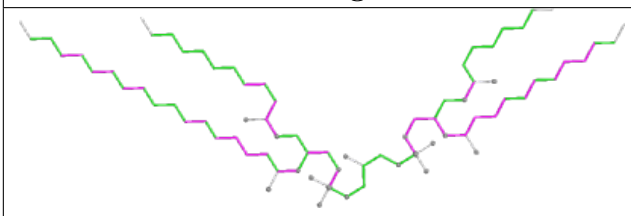
Ligand CDL h 201



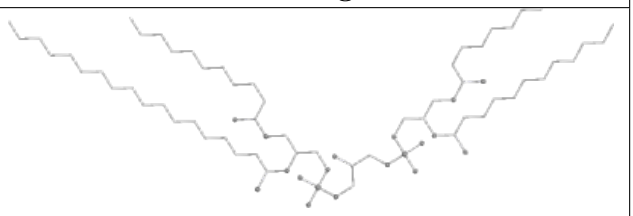
Bond lengths



Bond angles

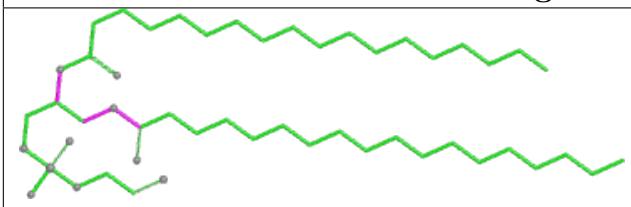


Torsions



Rings

Ligand 3PE I 201



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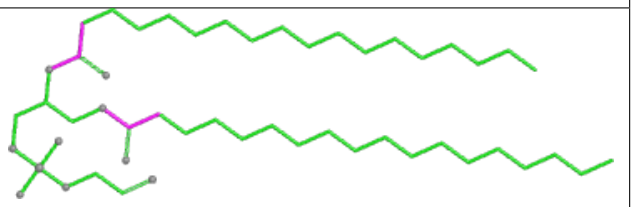
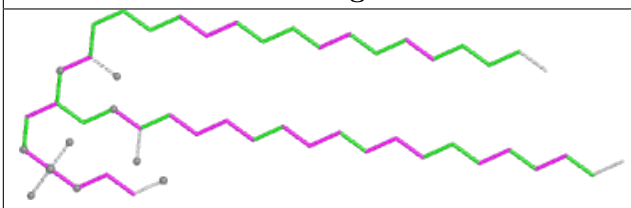
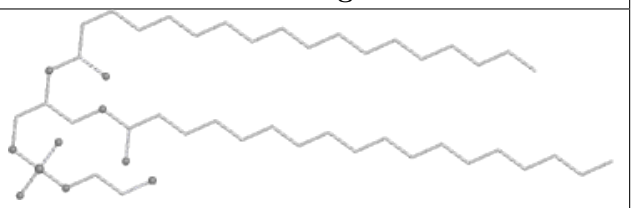


Bond angles

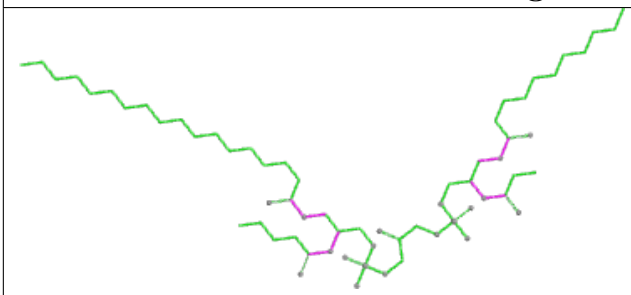


Torsions

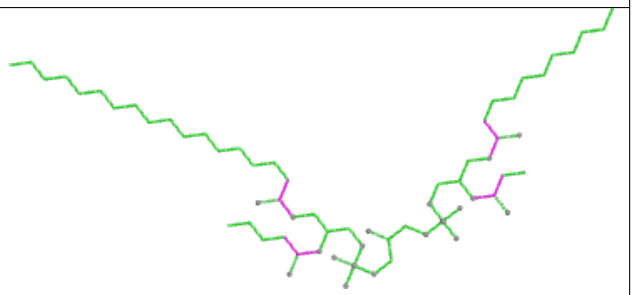


Rings

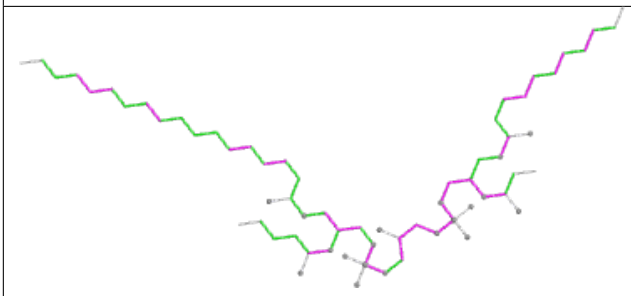
Ligand CDL d 202



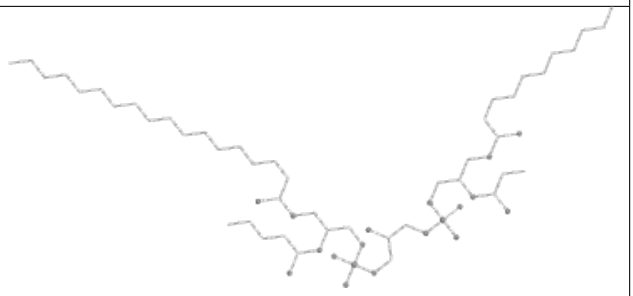
Bond lengths



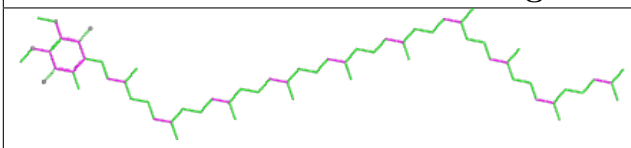
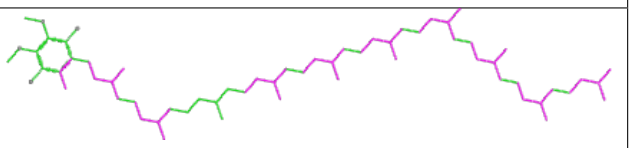
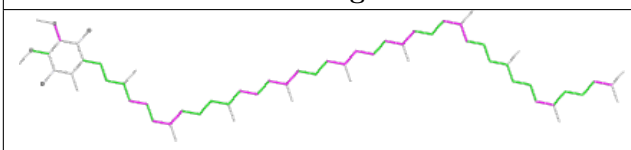
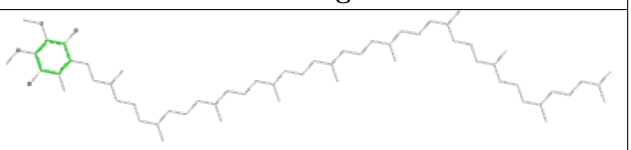
Bond angles

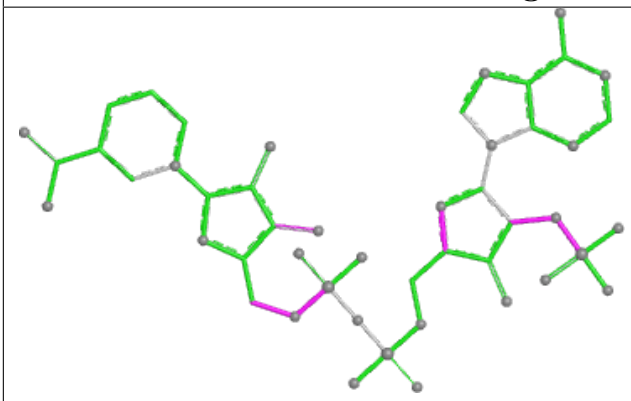
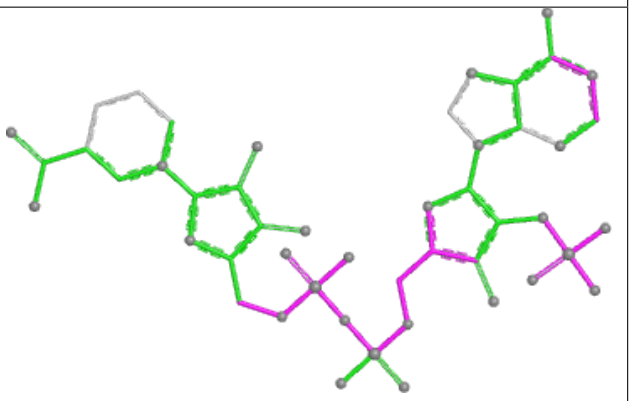
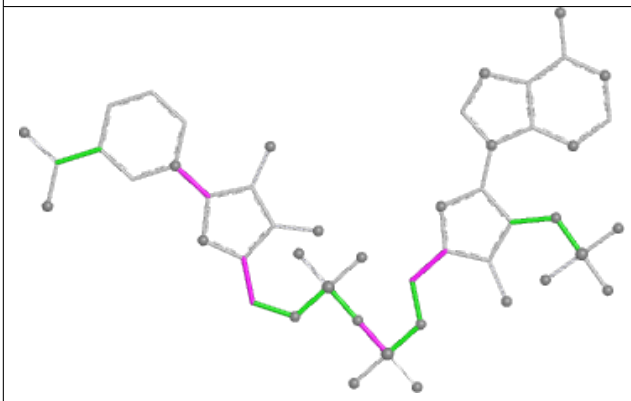
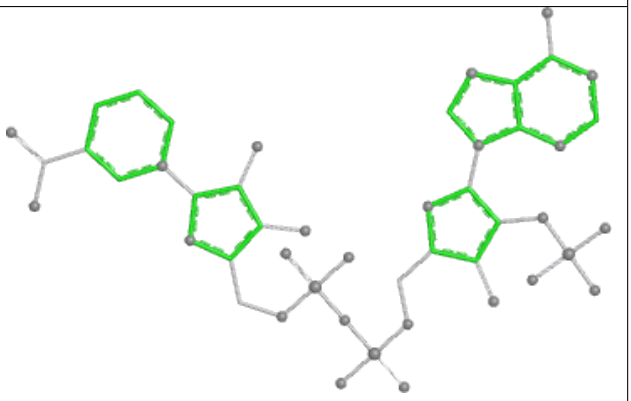


Torsions

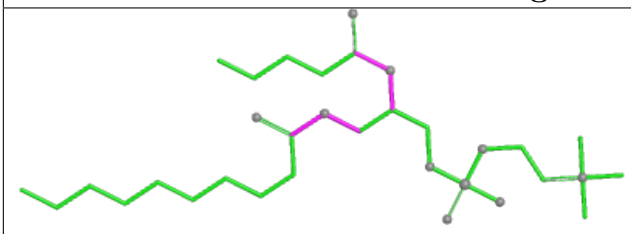


Rings

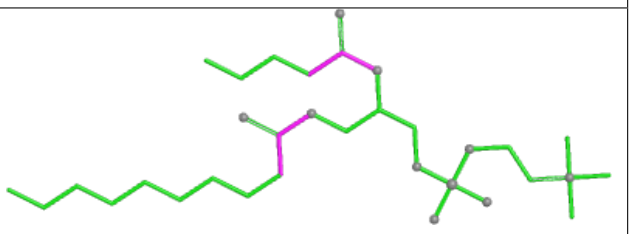
Ligand U10 M 701	
 Bond lengths	 Bond angles
 Torsions	 Rings

Ligand NDP P 501	
 Bond lengths	 Bond angles
 Torsions	 Rings

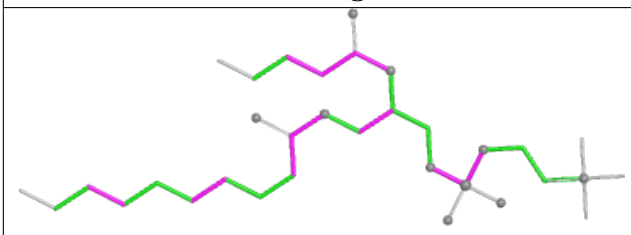
Ligand PC1 d 201



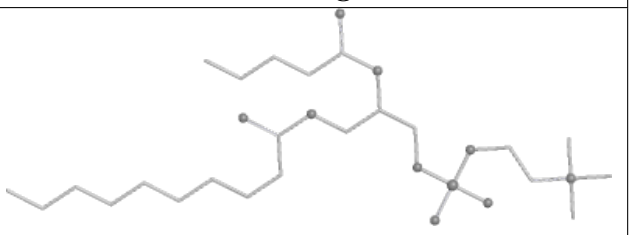
Bond lengths



Bond angles

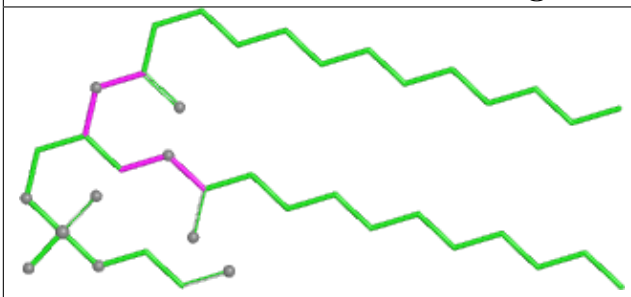


Torsions



Rings

Ligand 3PE A 203



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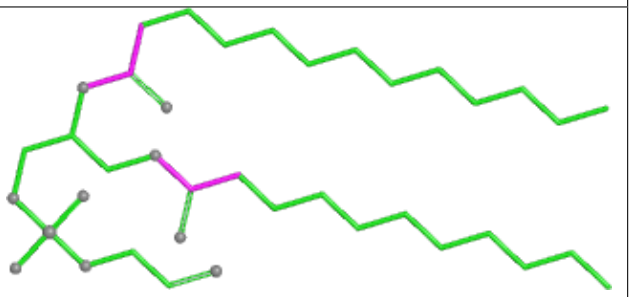
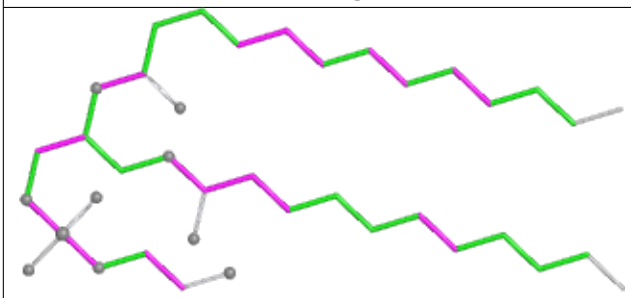


Bond angles



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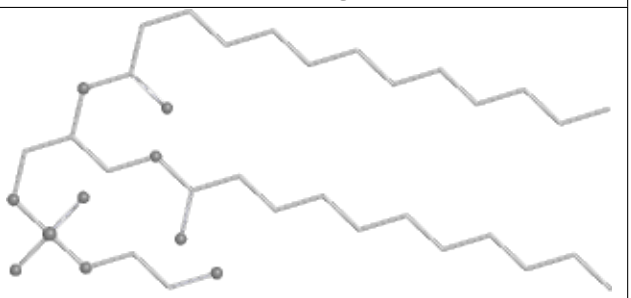
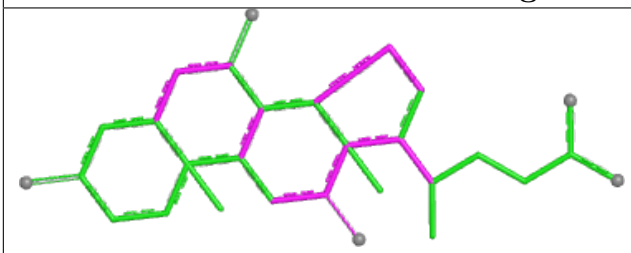
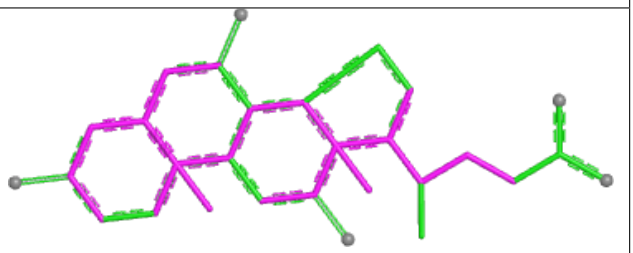


Rings

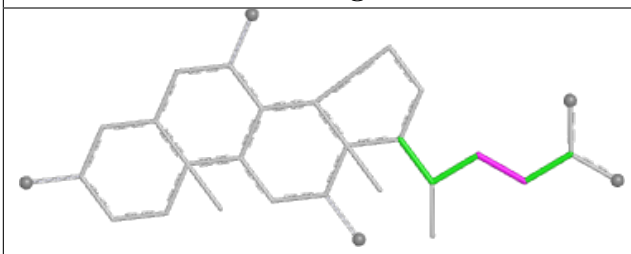
Ligand CHD H 701



Bond lengths



Bond angles



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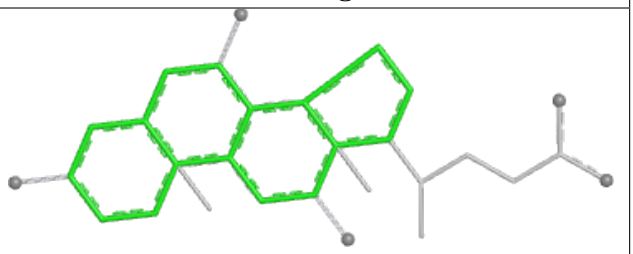
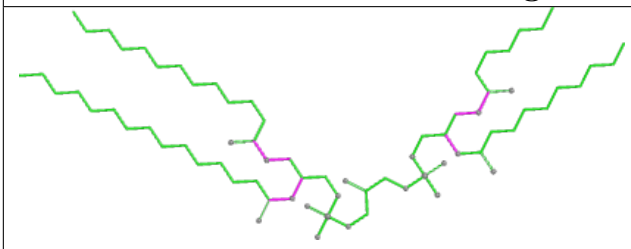
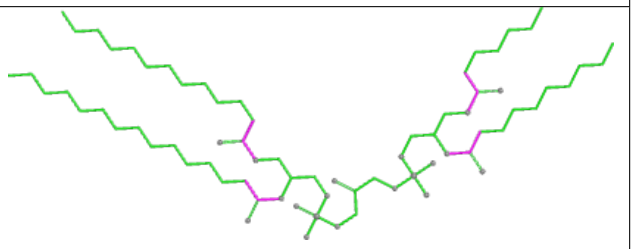


Rings

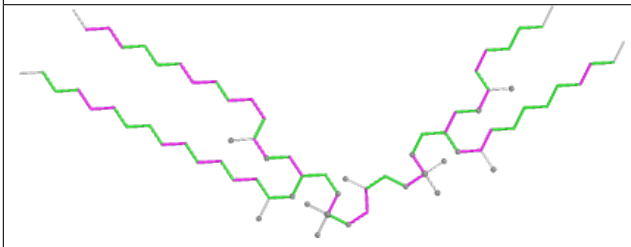
Ligand CDL N 403



Bond lengths



Bond angles



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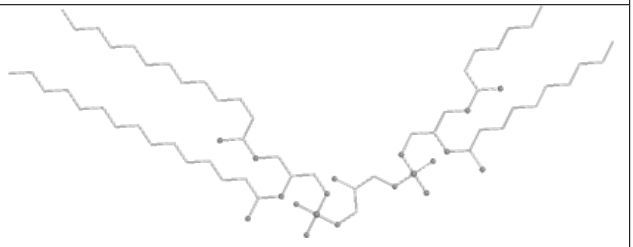
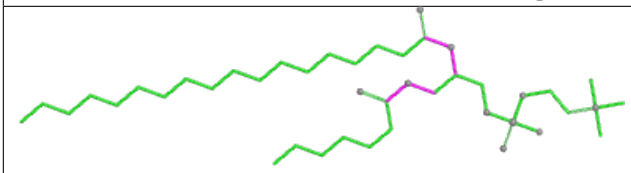


Rings

Ligand PC1 J 201



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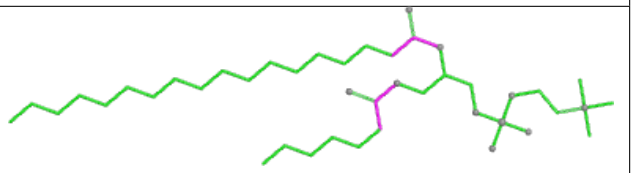
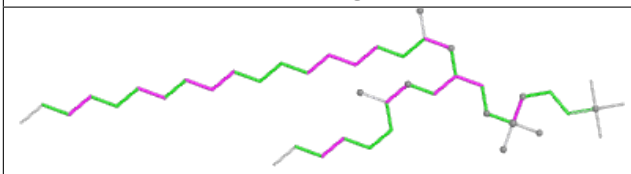
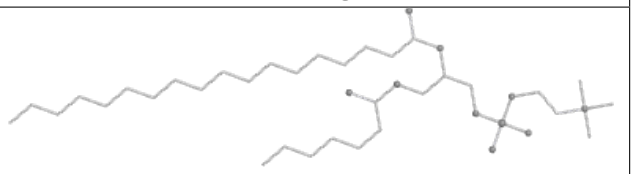


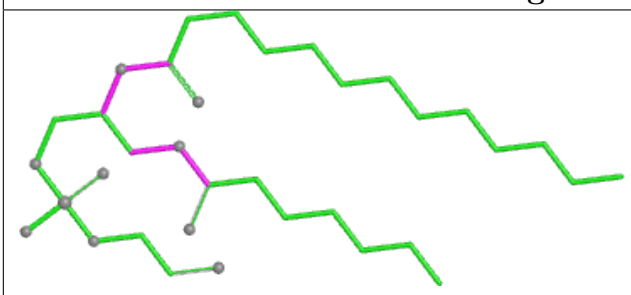
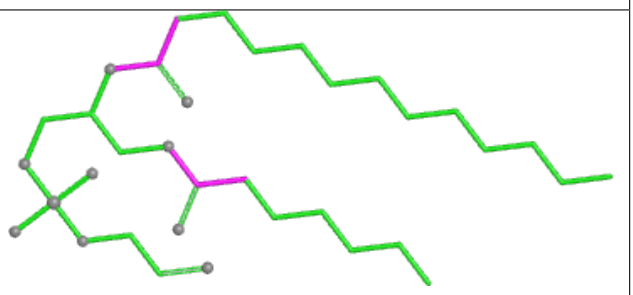
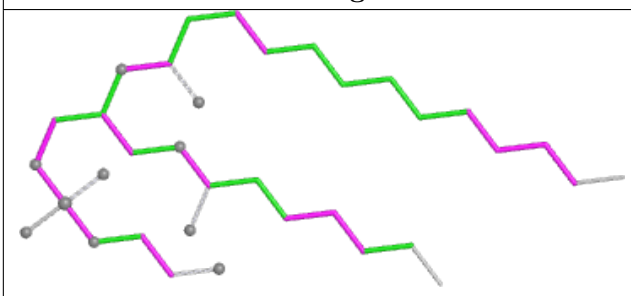
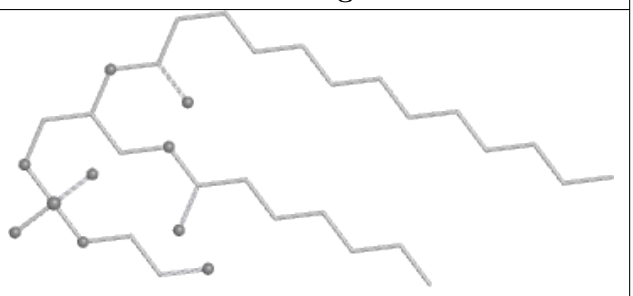
Bond angles

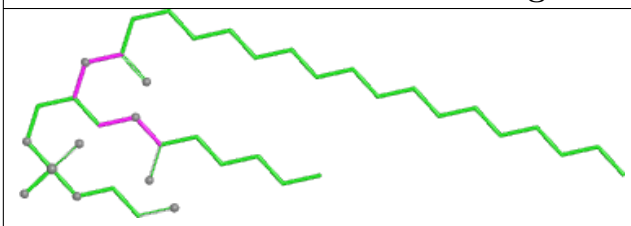
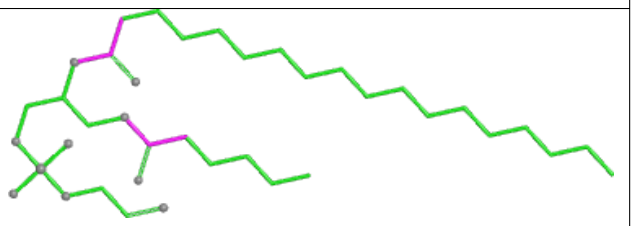
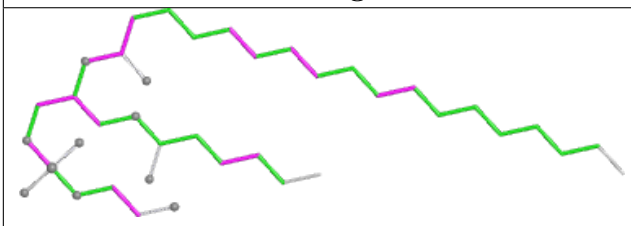
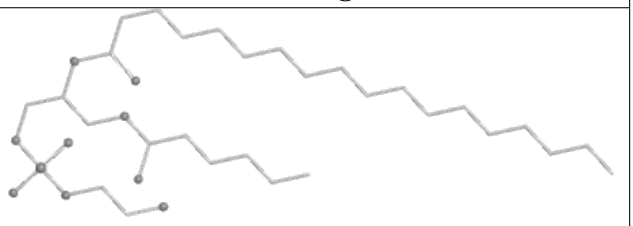


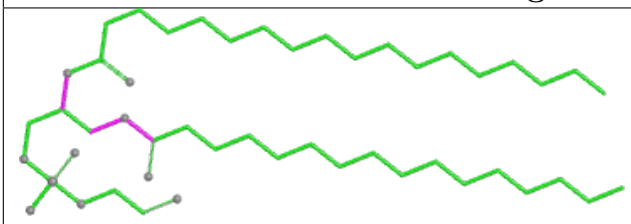
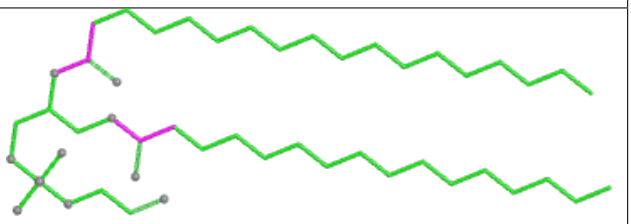
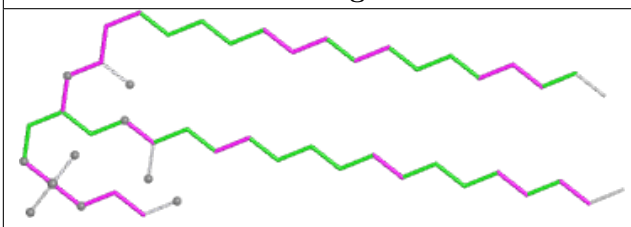
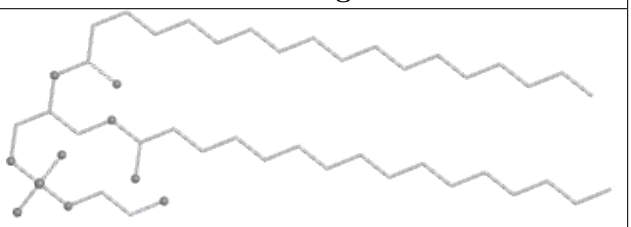
Torsions

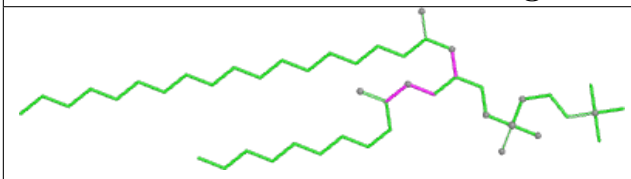
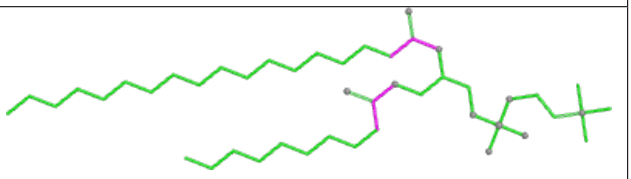
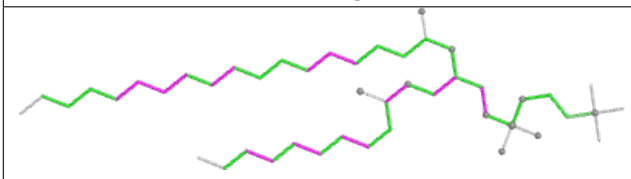
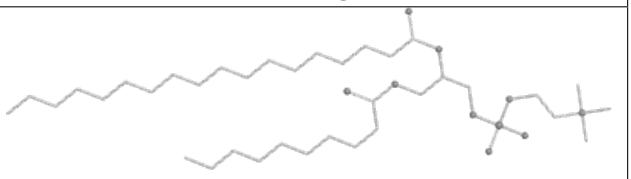


Rings

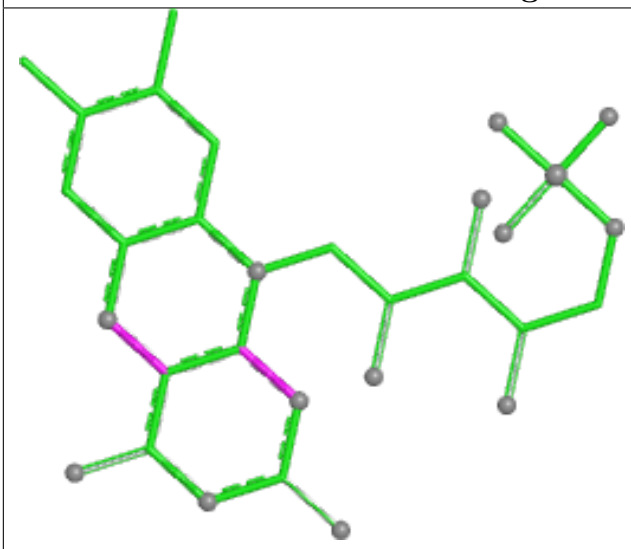
Ligand 3PE N 401	
 Bond lengths	 Bond angles
 Torsions	 Rings

Ligand 3PE Y 601	
 Bond lengths	 Bond angles
 Torsions	 Rings

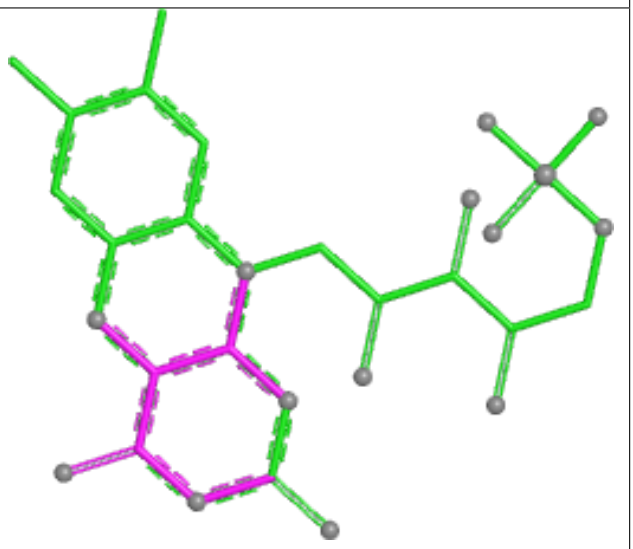
Ligand 3PE N 402	
 Bond lengths	 Bond angles
 Torsions	 Rings

Ligand PC1 M 703	
 Bond lengths	 Bond angles
 Torsions	 Rings

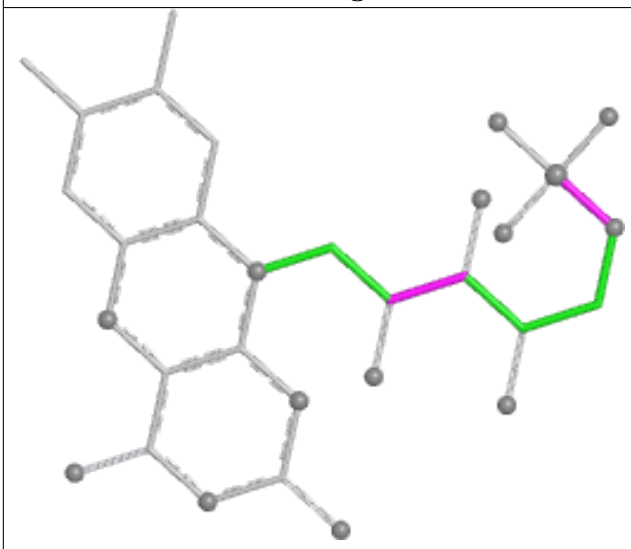
Ligand FMN F 501



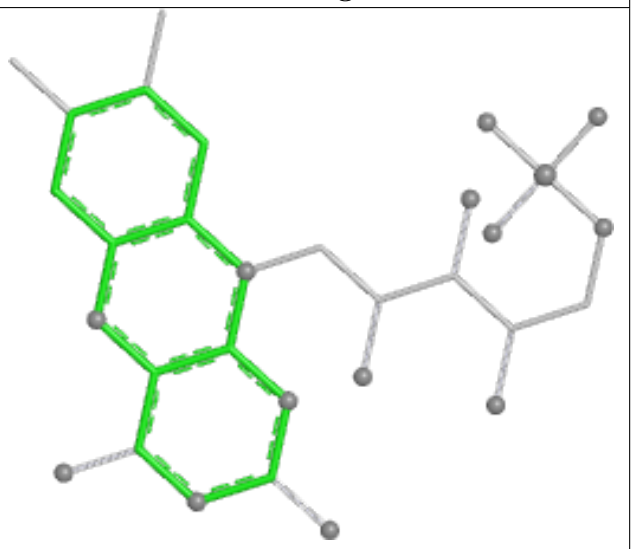
Bond lengths



Bond angles

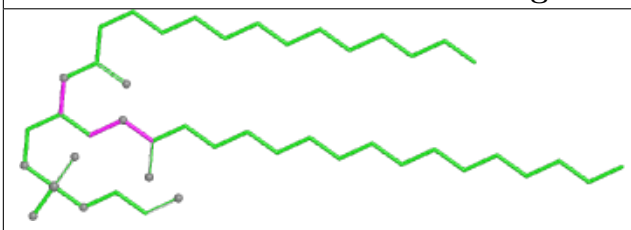


Torsions

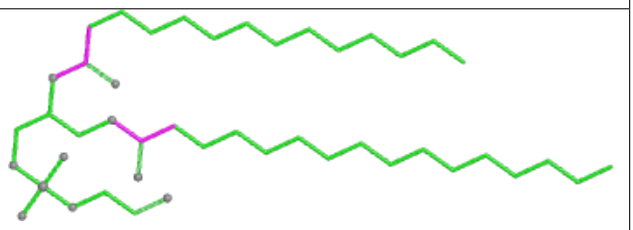


Rings

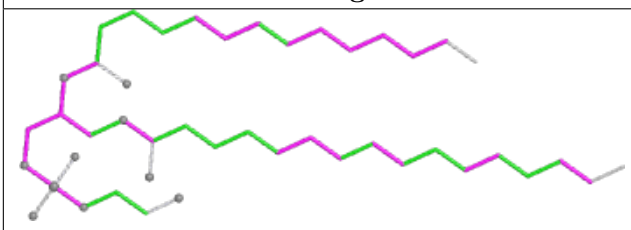
Ligand 3PE L 701



Bond lengths



Bond angles



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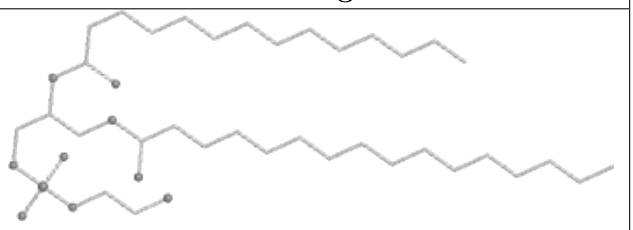
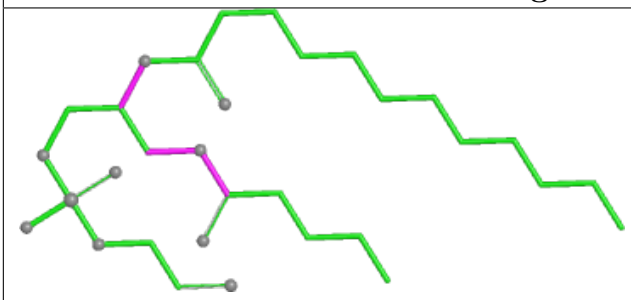
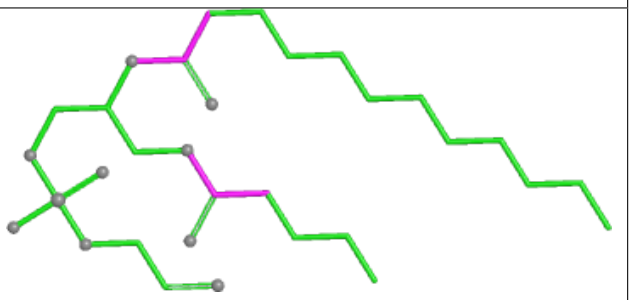


Rings

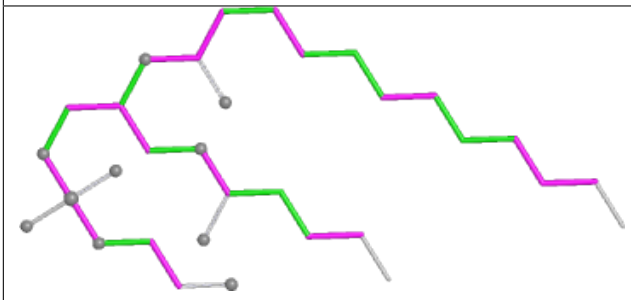
Ligand 3PE L 703



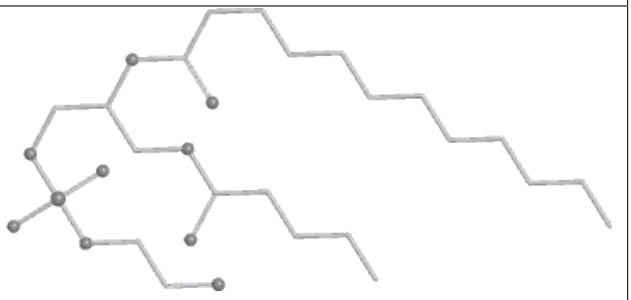
Bond lengths



Bond angles

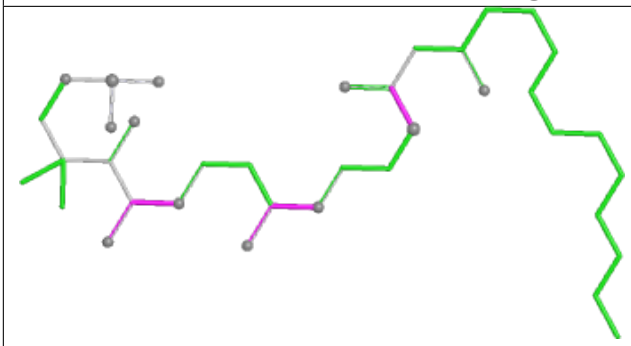


Torsions

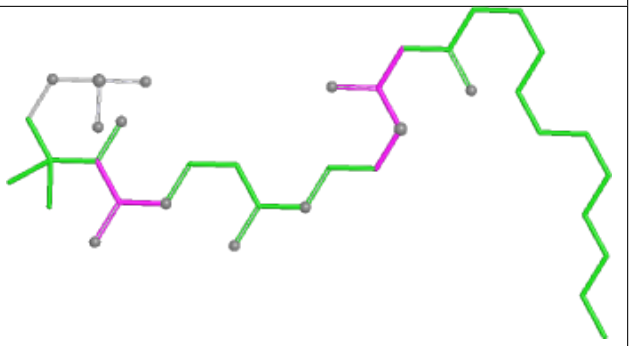


Rings

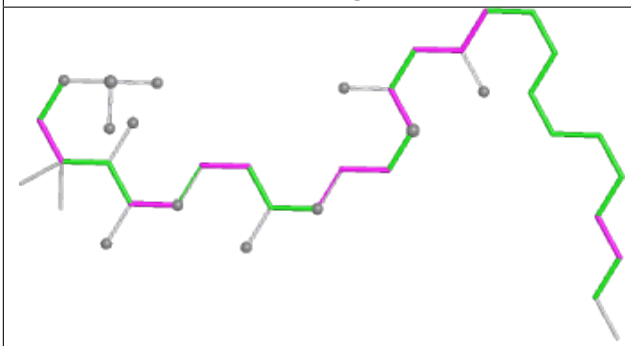
Ligand EHZ T 101



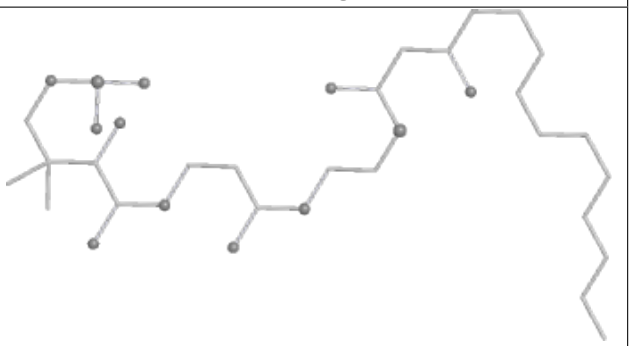
Bond lengths



Bond angles

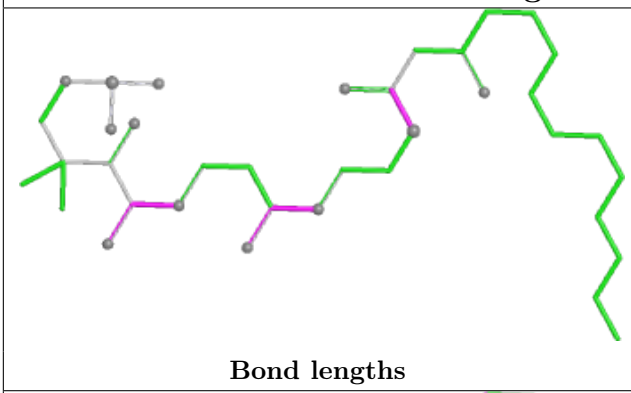


Torsions

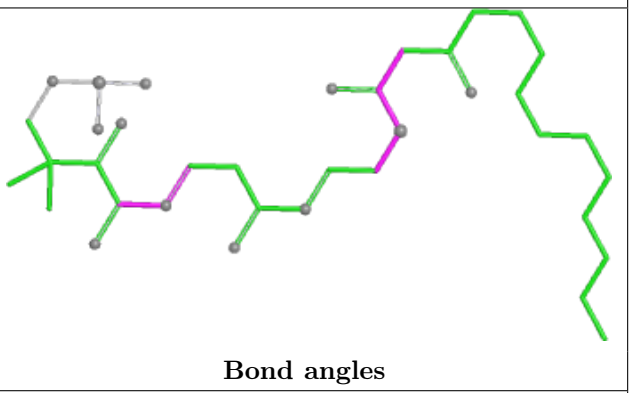


Rings

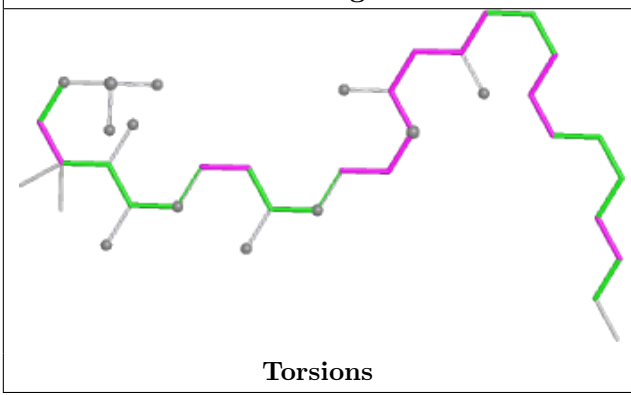
Ligand EHZ U 101



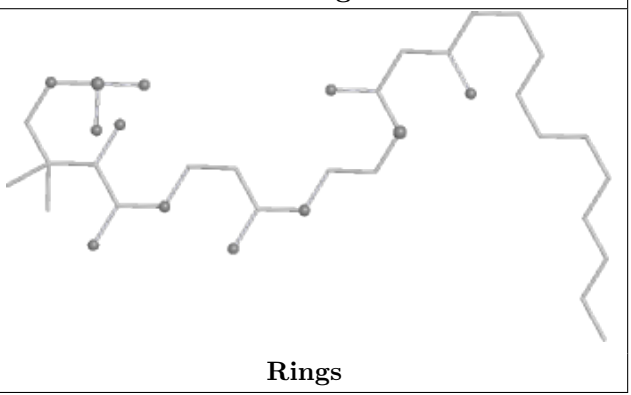
Bond lengths



Bond angles

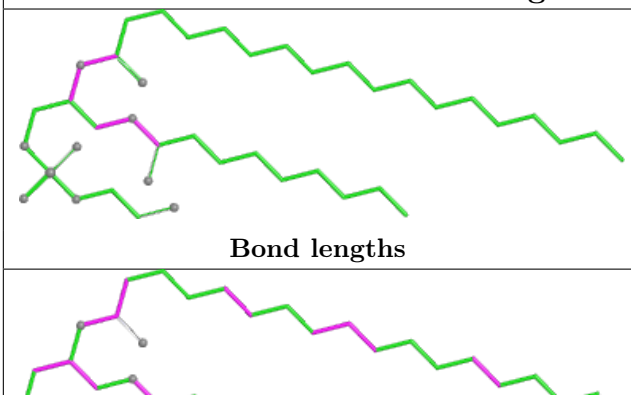


Torsions

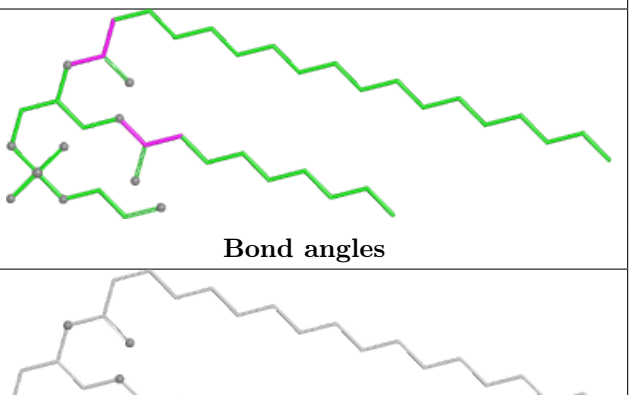


Rings

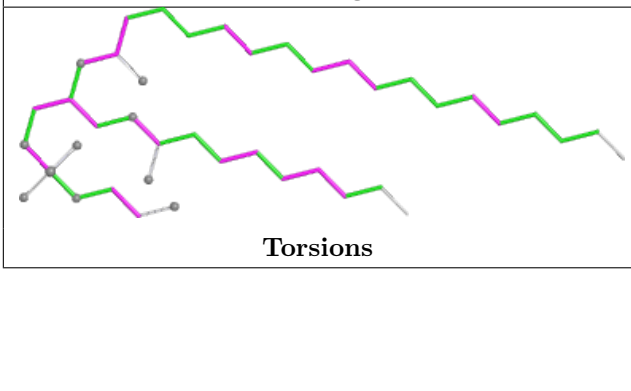
Ligand 3PE A 201



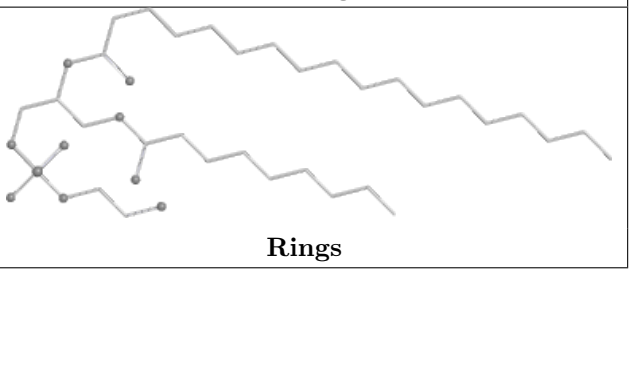
Bond lengths



Bond angles

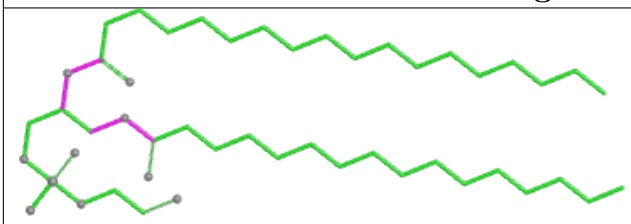


Torsions

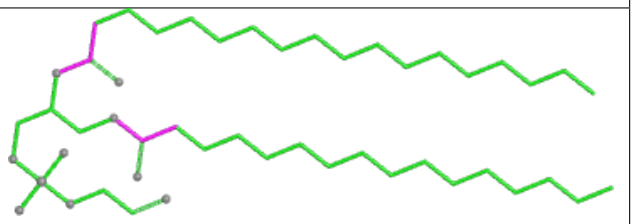


Rings

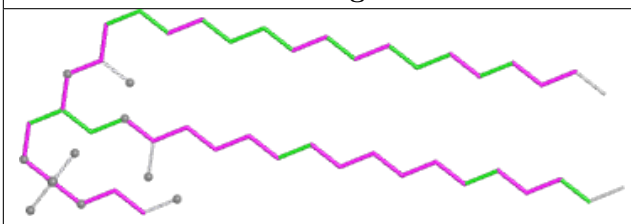
Ligand 3PE r 202



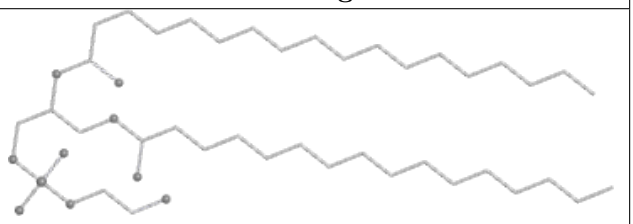
Bond lengths



Bond angles

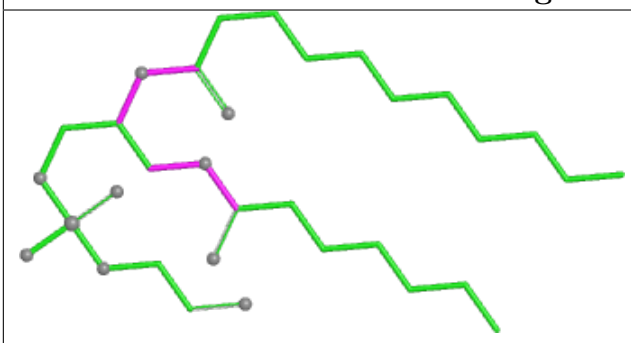


Torsions

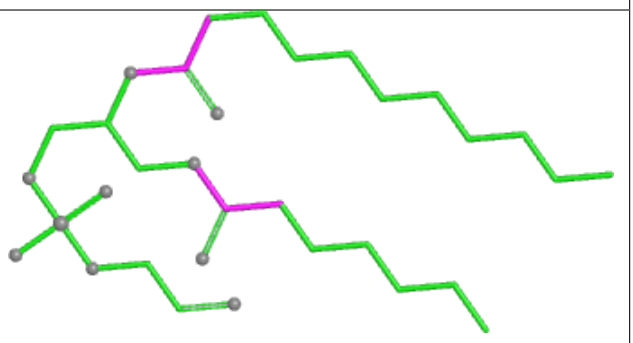


Rings

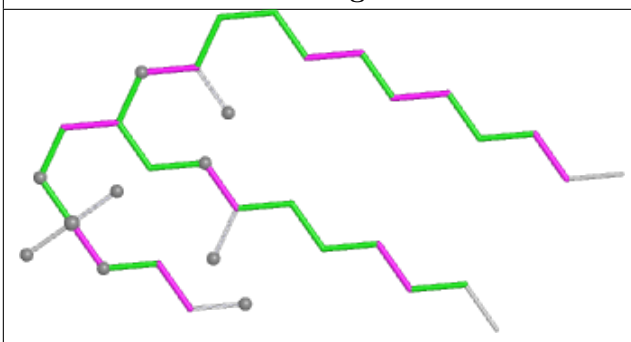
Ligand 3PE I 204



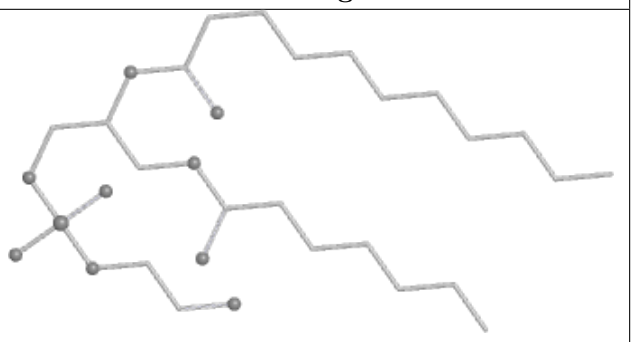
Bond lengths



Bond angles

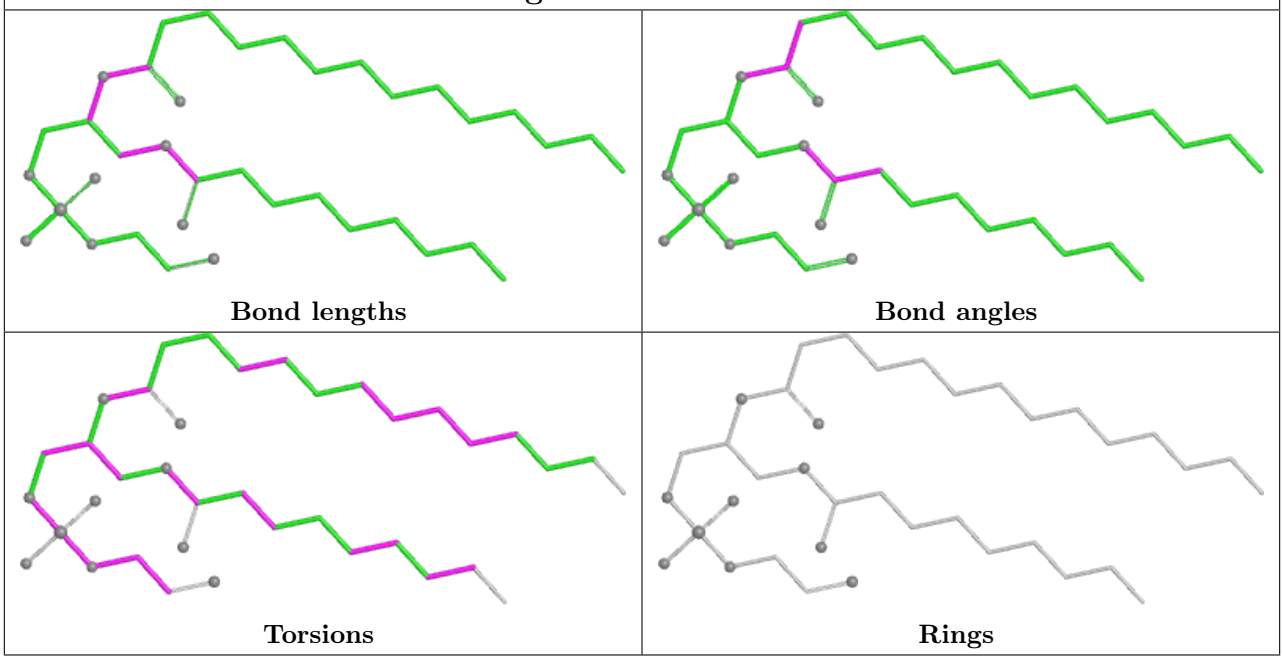


Torsions

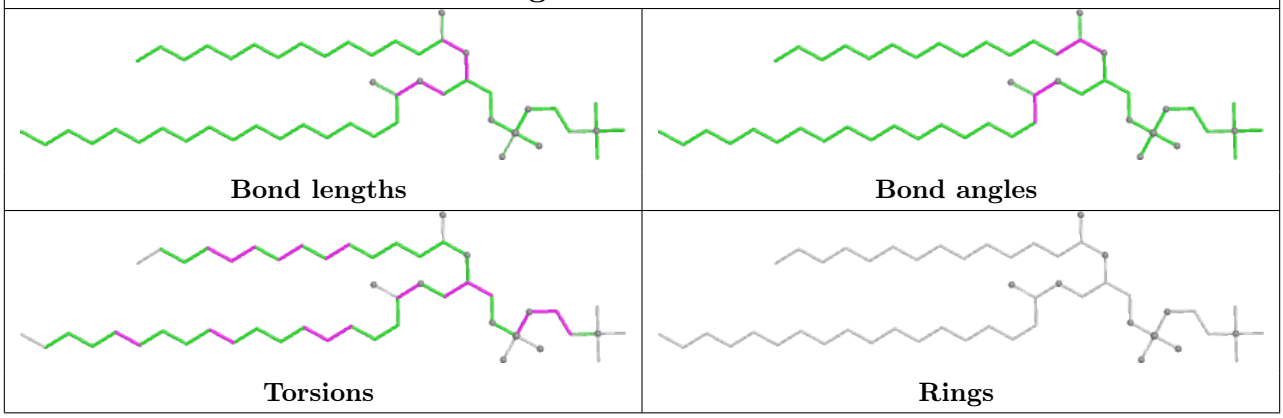


Rings

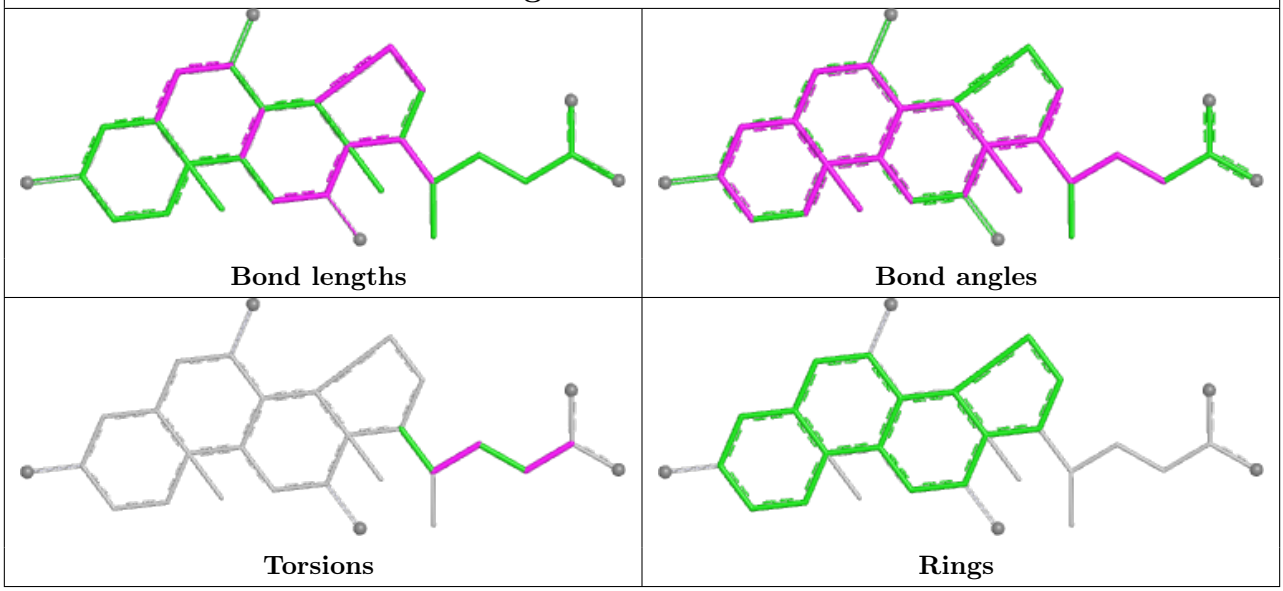
Ligand 3PE M 702

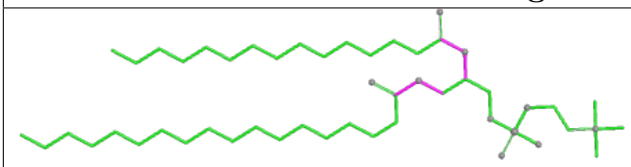
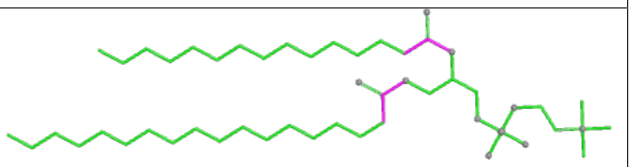
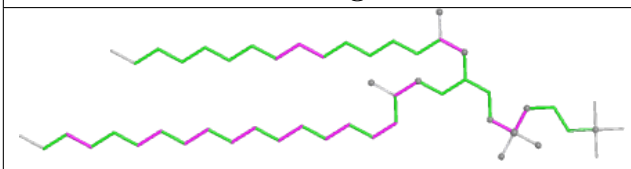
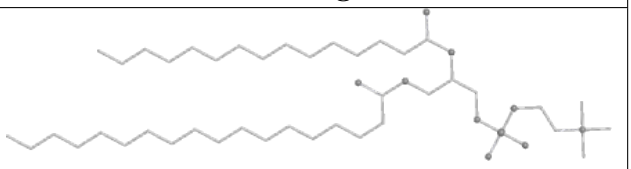


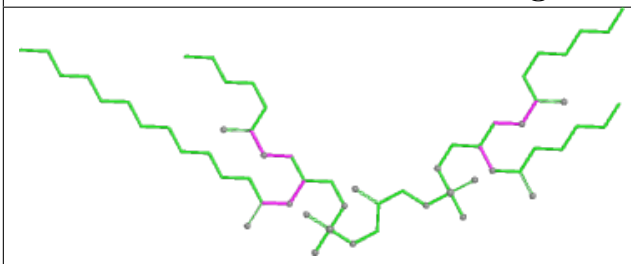
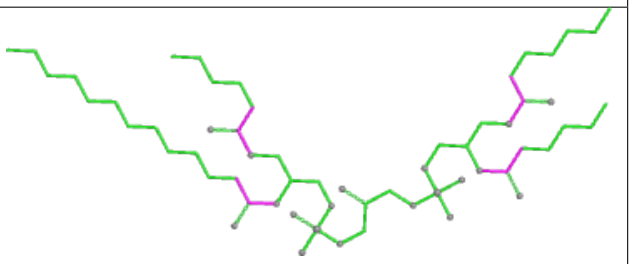
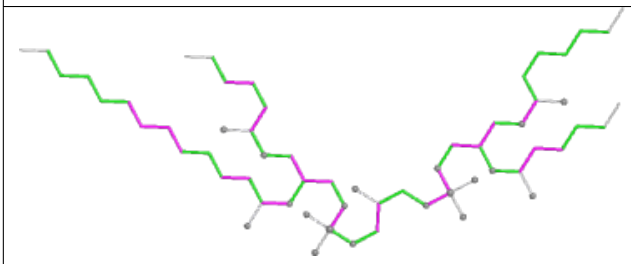
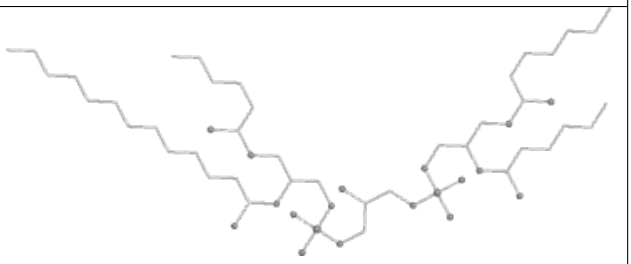
Ligand PC1 B 301

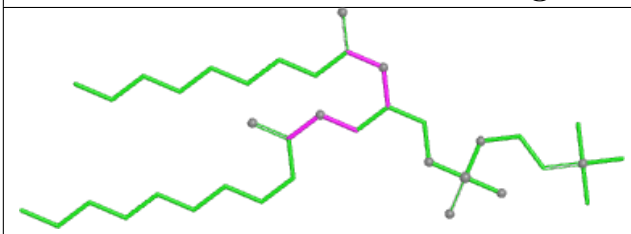
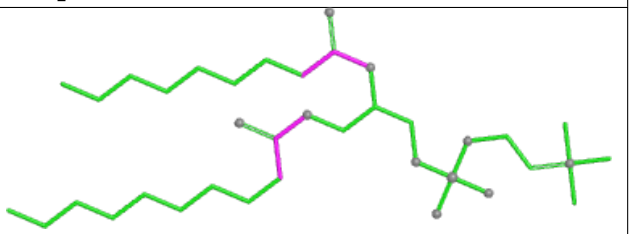
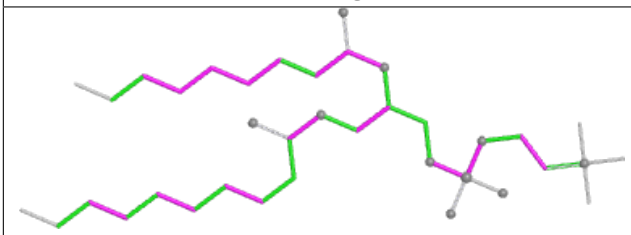
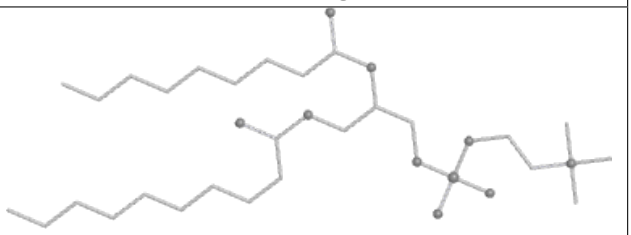


Ligand CHD L 704



Ligand PC1 B 303	
 Bond lengths	 Bond angles
 Torsions	 Rings

Ligand CDL r 201	
 Bond lengths	 Bond angles
 Torsions	 Rings

Ligand PC1 q 701	
 Bond lengths	 Bond angles
 Torsions	 Rings

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.

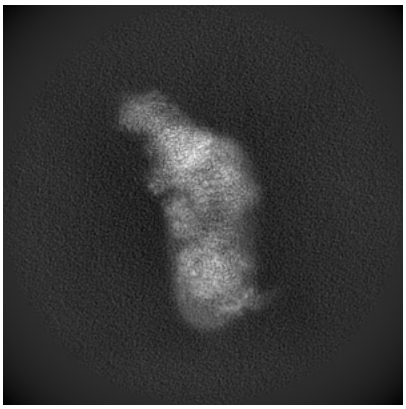
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-14140. These allow visual inspection of the internal detail of the map and identification of artifacts.

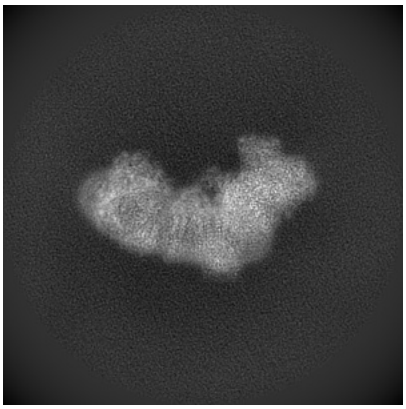
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

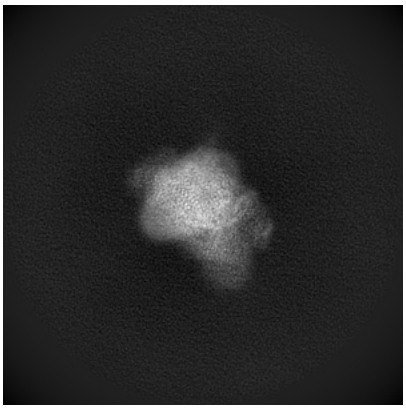
6.1.1 Primary map



X

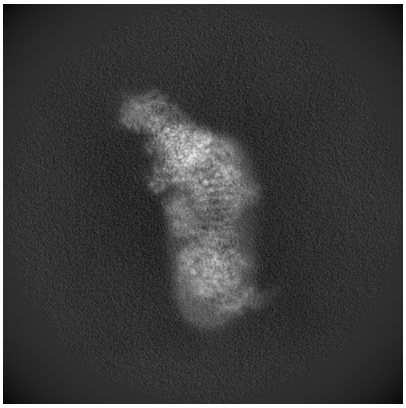


Y

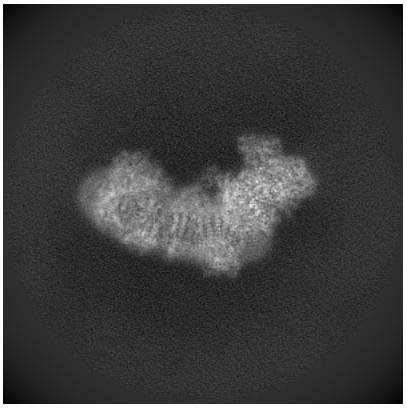


Z

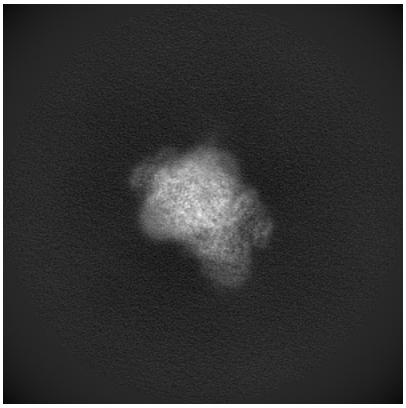
6.1.2 Raw map



X



Y

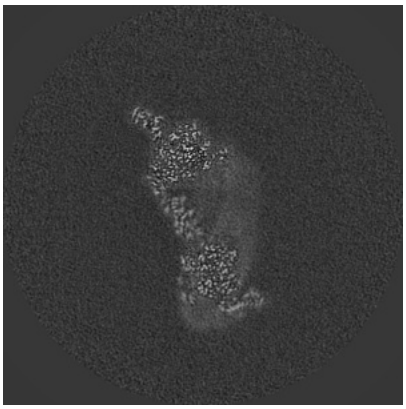


Z

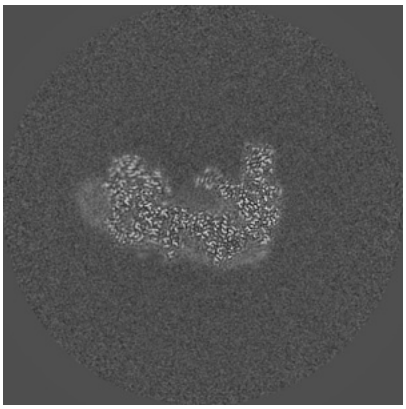
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

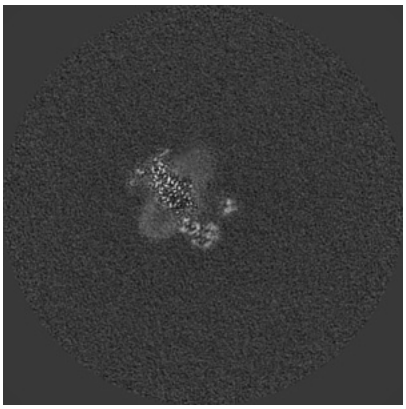
6.2.1 Primary map



X Index: 320

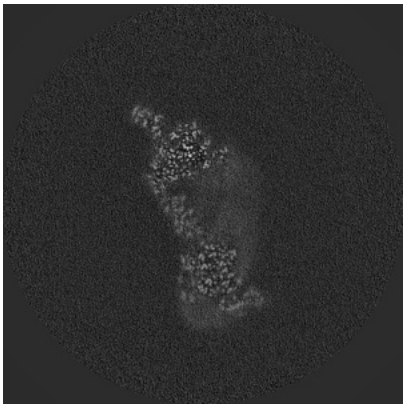


Y Index: 320

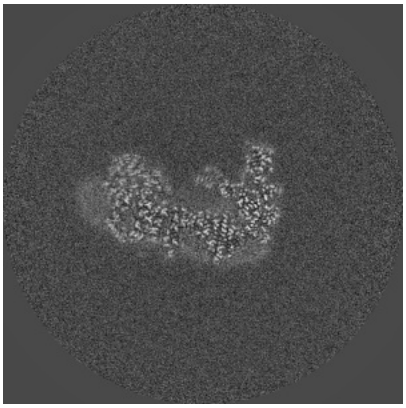


Z Index: 320

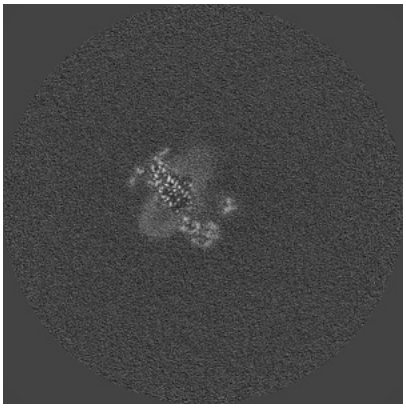
6.2.2 Raw map



X Index: 320



Y Index: 320

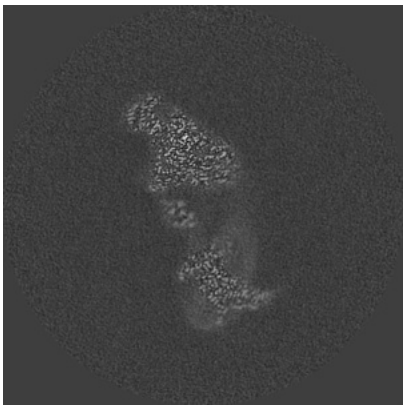


Z Index: 320

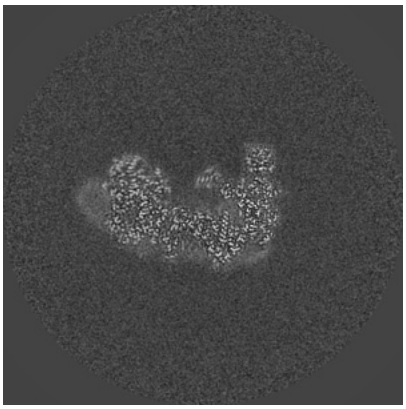
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

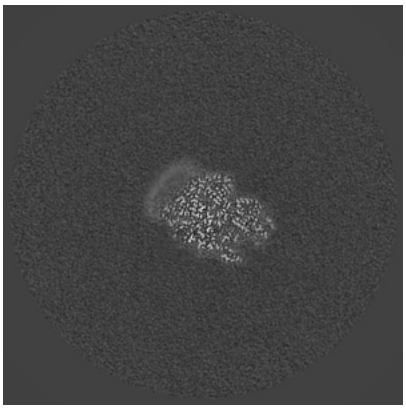
6.3.1 Primary map



X Index: 334

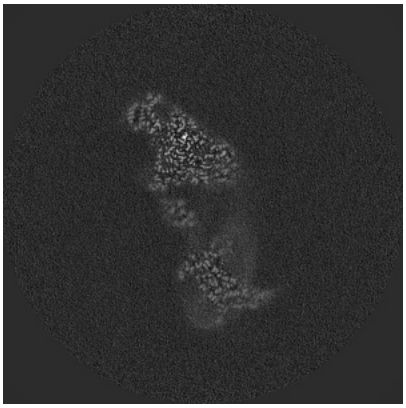


Y Index: 322

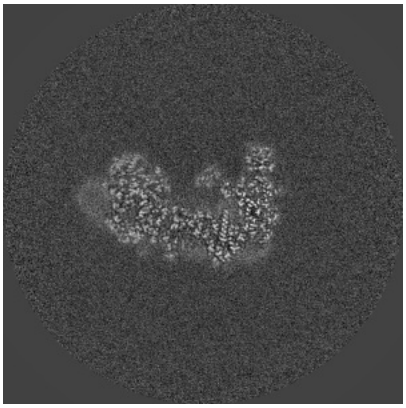


Z Index: 405

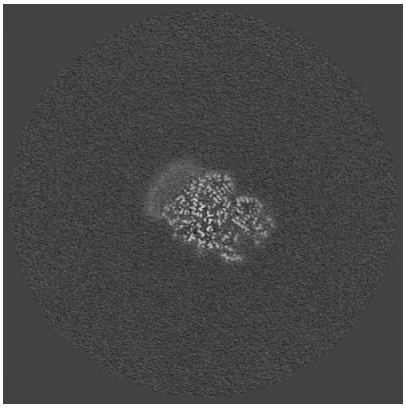
6.3.2 Raw map



X Index: 334



Y Index: 322

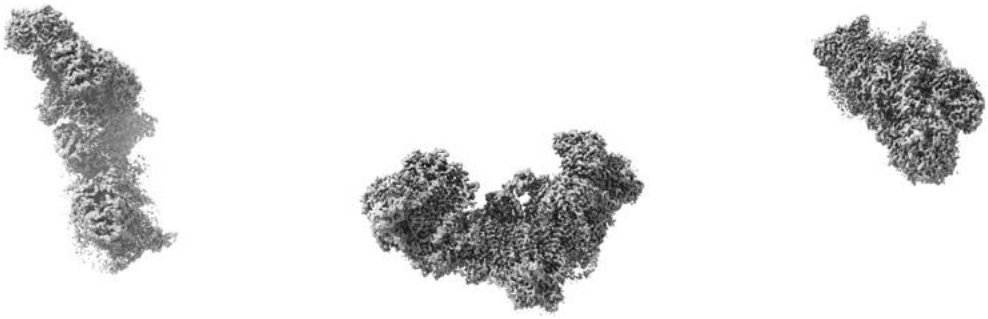


Z Index: 405

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

6.4 Orthogonal surface views (i)

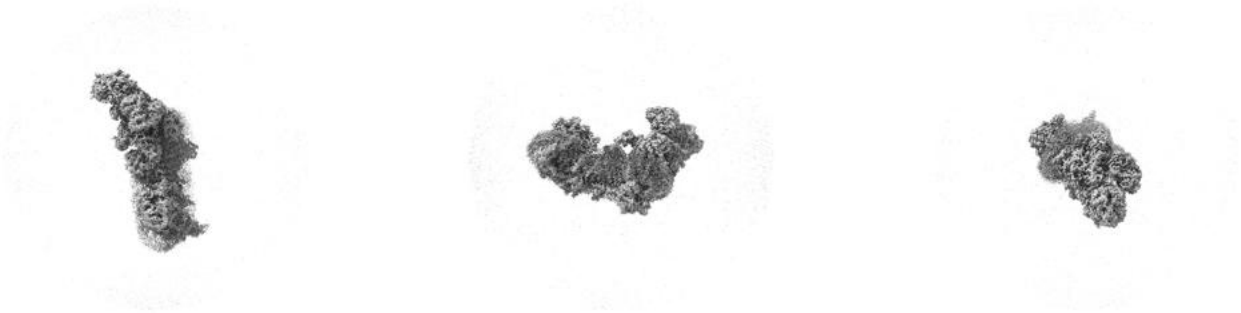
6.4.1 Primary map



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 5.5. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.4.2 Raw map



X Y Z

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.

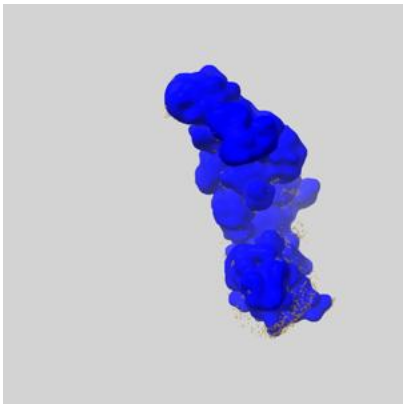
6.5 Mask visualisation (i)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

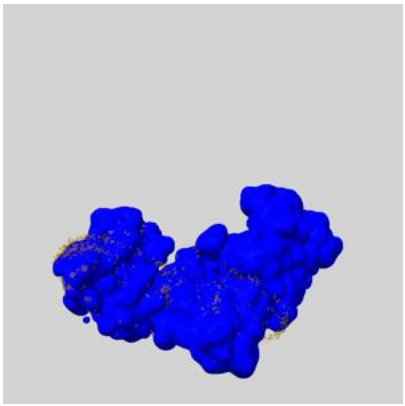
A mask typically either:

- Encompasses the whole structure
- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

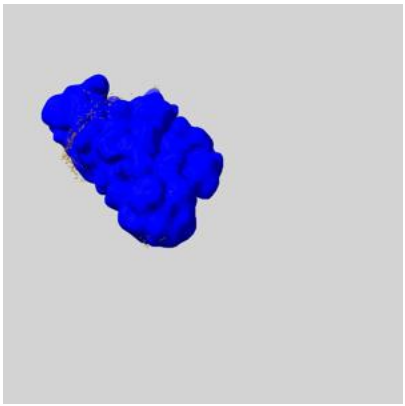
6.5.1 emd_14140_msk_1.map (i)



X



Y

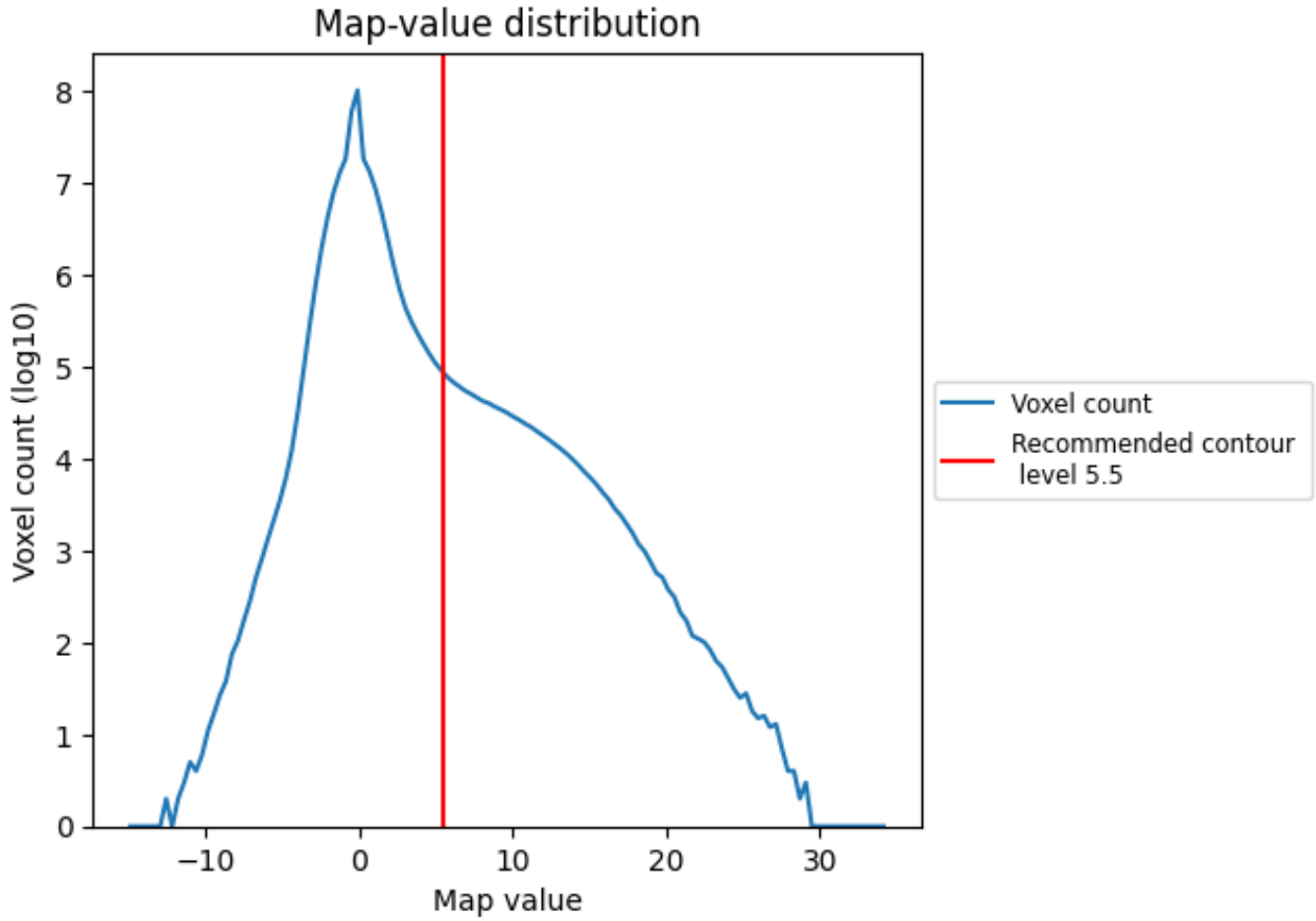


Z

7 Map analysis

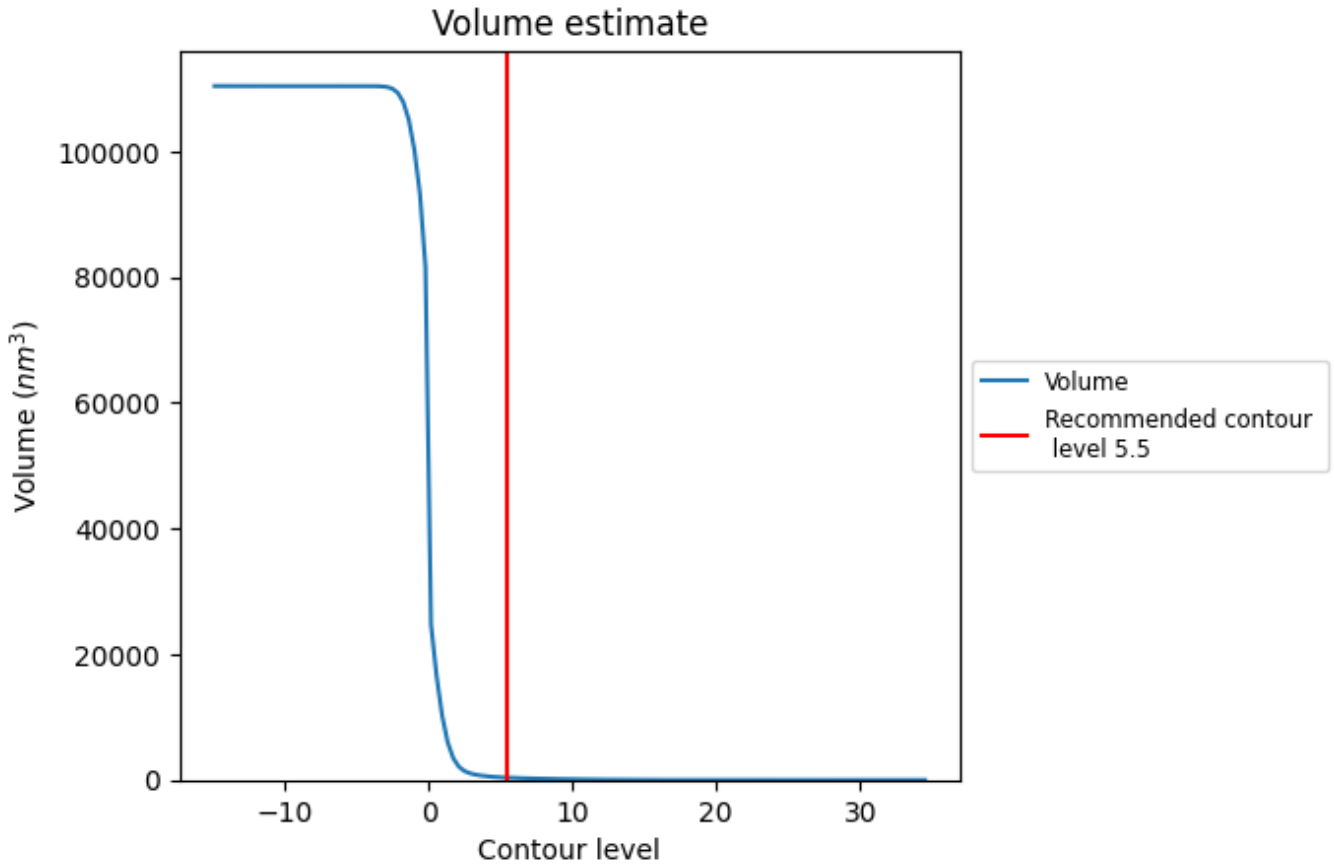
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution



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.

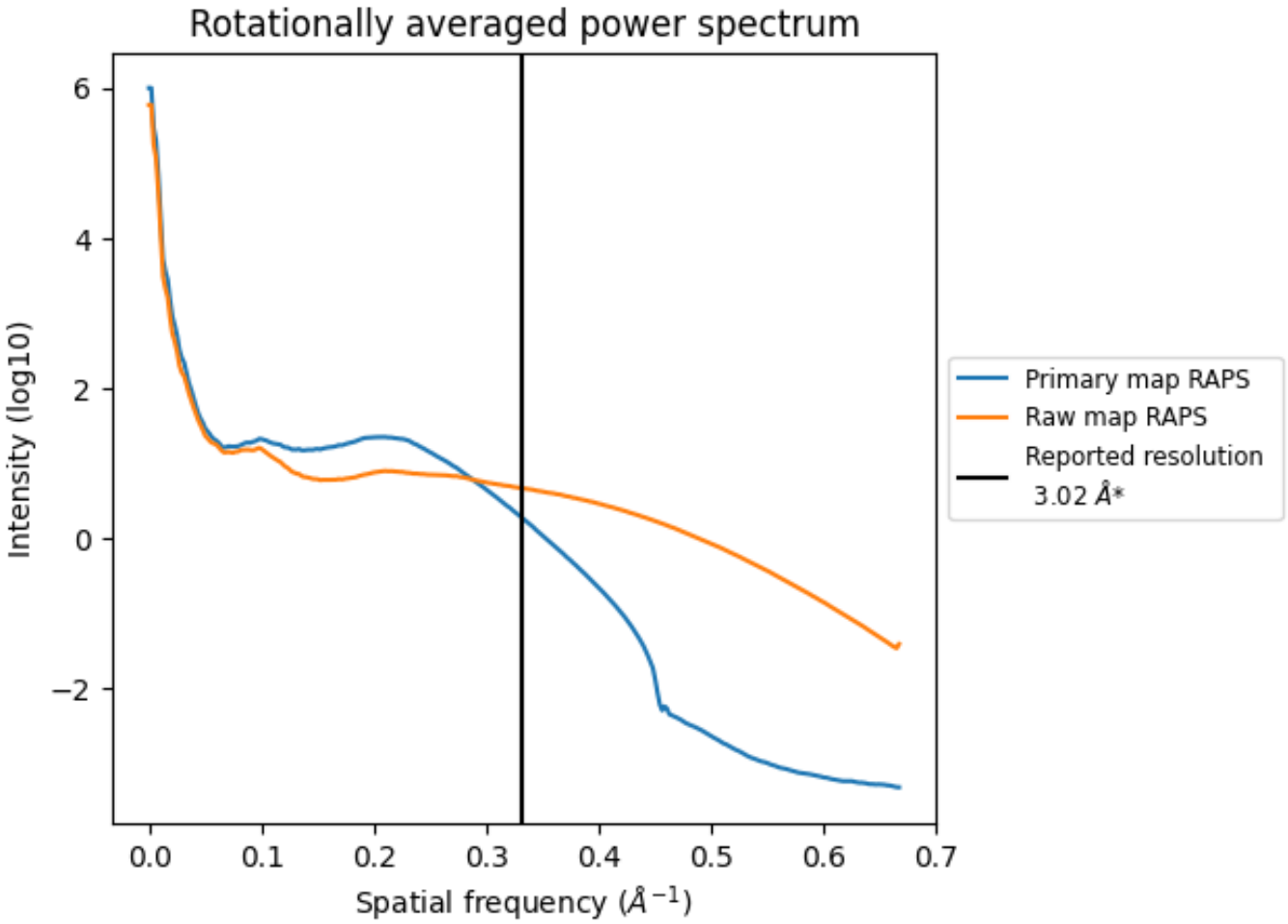
7.2 Volume estimate (i)



The volume at the recommended contour level is 362 nm^3; this corresponds to an approximate mass of 327 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)

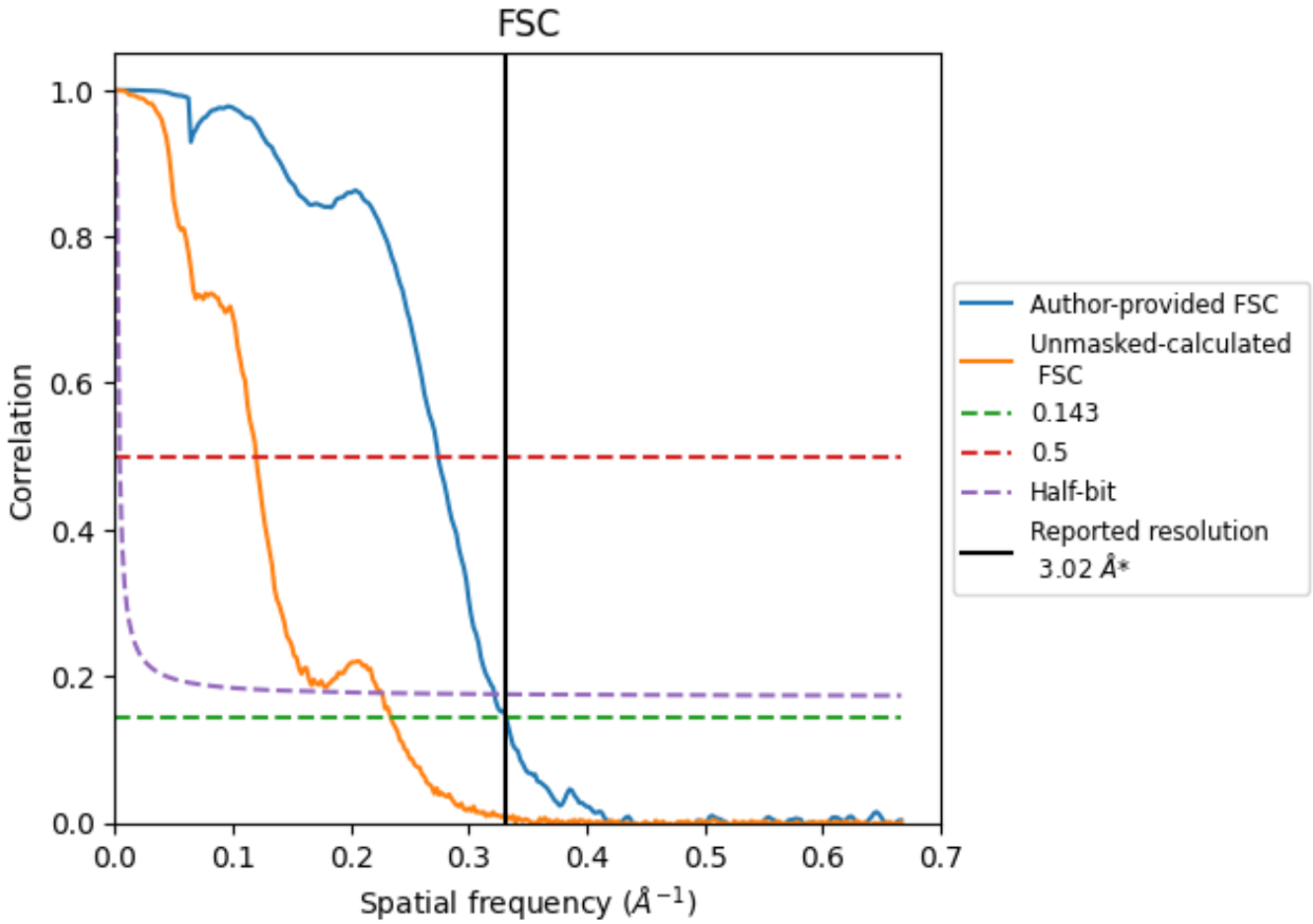


*Reported resolution corresponds to spatial frequency of 0.331 Å^{-1}

8 Fourier-Shell correlation

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



*Reported resolution corresponds to spatial frequency of 0.331 Å^{-1}

8.2 Resolution estimates (i)

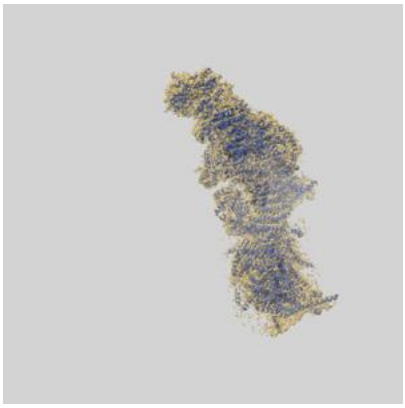
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.02	-	-
Author-provided FSC curve	3.01	3.65	3.11
Unmasked-calculated*	4.27	8.34	4.42

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 4.27 differs from the reported value 3.02 by more than 10 %

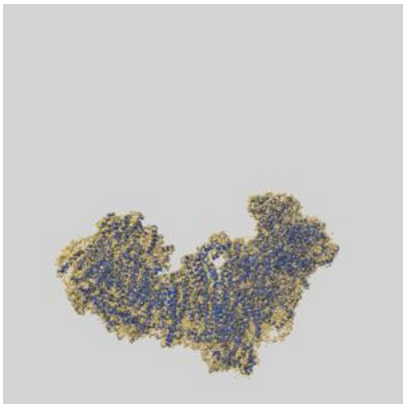
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-14140 and PDB model 7QSO. Per-residue inclusion information can be found in section 3 on page 21.

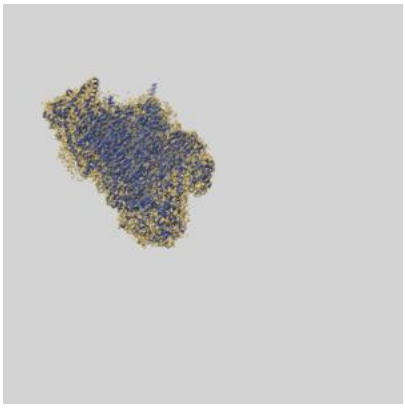
9.1 Map-model overlay



X



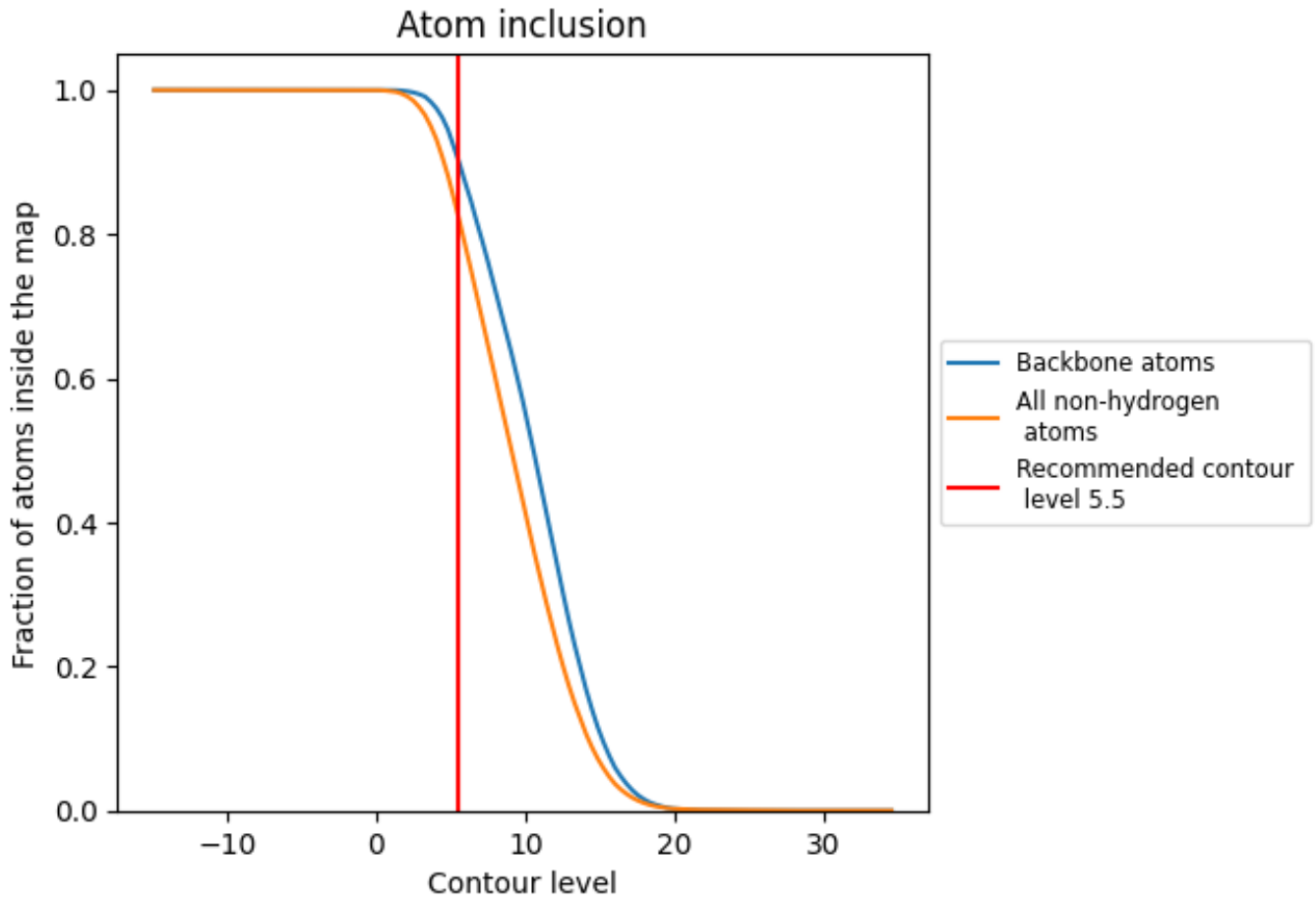
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 5.5 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 Atom inclusion (i)



At the recommended contour level, 90% of all backbone atoms, 83% of all non-hydrogen atoms, are inside the map.