wwPDB X-ray Structure Validation Summary Report (i)

May 26, 2020 – 11:38 am BST

PDB ID	:	2E75
Title	:	Crystal Structure of the Cytochrome b6f Complex with 2-nonyl-4-hydroxyquinoline N-oxide (NQNO) from M.laminosus
Authors	:	Cramer, W.A.; Yamashita, E.; Zhang, H.
Deposited on	:	2007-01-05
Resolution	:	3.55 Å(reported)

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

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

The following versions of software and data (see references (1)) were used in the production of this report:

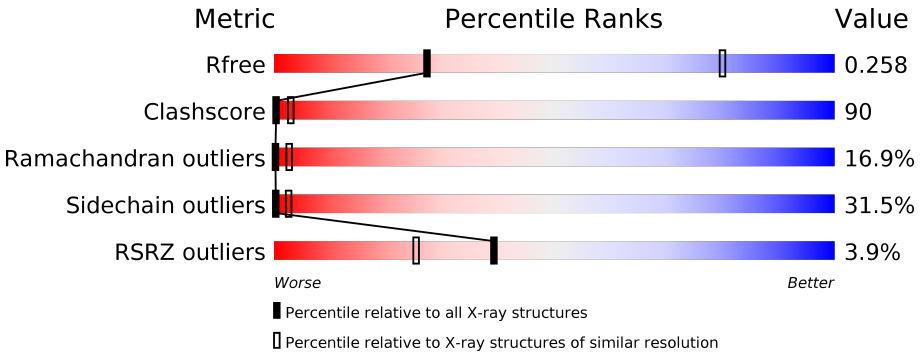
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.11
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.55 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1020 (3.62-3.50)
Clashscore	141614	1100 (3.62-3.50)
Ramachandran outliers	138981	1065 (3.62-3.50)
Sidechain outliers	138945	1066 (3.62-3.50)
RSRZ outliers	127900	1009 (3.64-3.48)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for >=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 electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	215	13% 47% 28% 12%
2	B	160	11% 42% 29% 18%
3	C	289	6% 15% 44% 32% 9%
4	D	179	12% 16% 47% 23% 6% 7%
5	E	32	6% 22% 47% 25%
6	F	35	9% 31% 20% 31% 9%

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Mol	Chain	Length	Quality of chain
7	G	37	
8	H	29	

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

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
10	HEM	A	301	-	-	X	-
10	HEM	A	302	-	-	X	-
10	HEM	C	301	-	-	X	-
11	OPC	A	1002	-	-	X	-
12	UMQ	A	1102	X	-	-	-
12	UMQ	A	1103	X	-	-	-
12	UMQ	A	1104	X	-	-	-
12	UMQ	C	1101	X	-	-	-
13	QNO	A	501	X	-	-	-
14	CLA	B	201	X	-	-	-
15	FES	D	200	-	-	X	-
16	SQD	D	201	X	X	-	-
17	BCR	G	101	-	X	-	-

2 Entry composition

There are 18 unique types of molecules in this entry. The entry contains 8046 atoms, of which 0 are hydrogens and 0 are deuteriums.

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

- Molecule 1 is a protein called Cytochrome b6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	215	Total	C	N	O	S	0	0	0
			1711	1140	272	288	11			

- Molecule 2 is a protein called Cytochrome b6-f complex subunit 4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	160	Total	C	N	O	S	0	0	0
			1249	841	193	209	6			

- Molecule 3 is a protein called Apocytochrome f.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	288	Total	C	N	O	S	0	0	0
			2216	1415	369	424	8			

- Molecule 4 is a protein called Cytochrome b6-f complex iron-sulfur subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	166	Total	C	N	O	S	0	0	0
			1260	805	218	230	7			

- Molecule 5 is a protein called Cytochrome b6-f complex subunit 6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	E	32	Total	C	N	O	S	0	0	0
			248	179	34	34	1			

- Molecule 6 is a protein called Cytochrome b6-f complex subunit 7.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
6	F	32	Total	C	N	O	S	0	0	0
			242	165	35	40	2			

- Molecule 7 is a protein called Cytochrome b6-f complex subunit 5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
7	G	37	Total	C	N	O	S	0	0	0
			283	188	44	50	1			

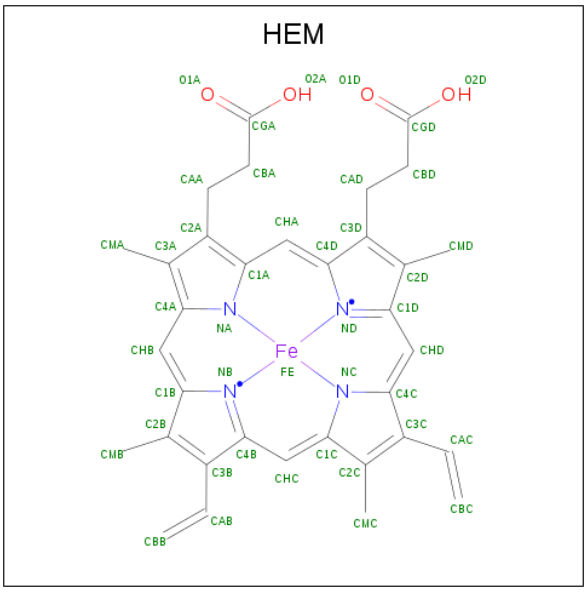
- Molecule 8 is a protein called Cytochrome b6-f complex subunit 8.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
8	H	29	Total	C	N	O	S	0	0	0
			230	156	36	36	2			

- Molecule 9 is CADMIUM ION (three-letter code: CD) (formula: Cd).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	B	1	Total	Cd	0	0
			1	1		
9	A	1	Total	Cd	0	0
			1	1		

- Molecule 10 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
10	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
10	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

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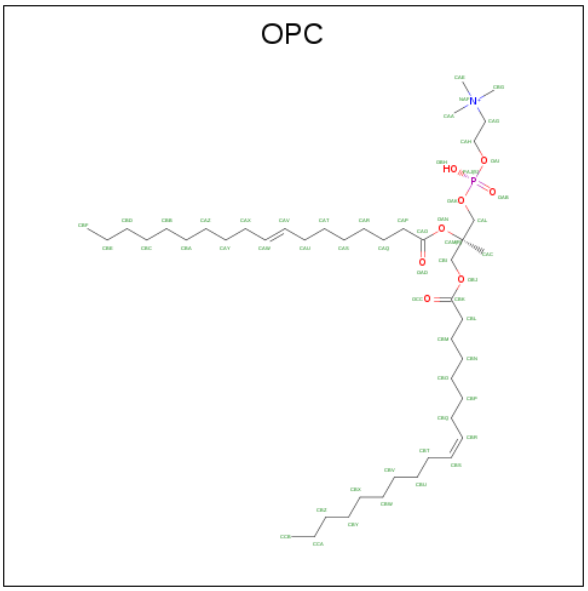
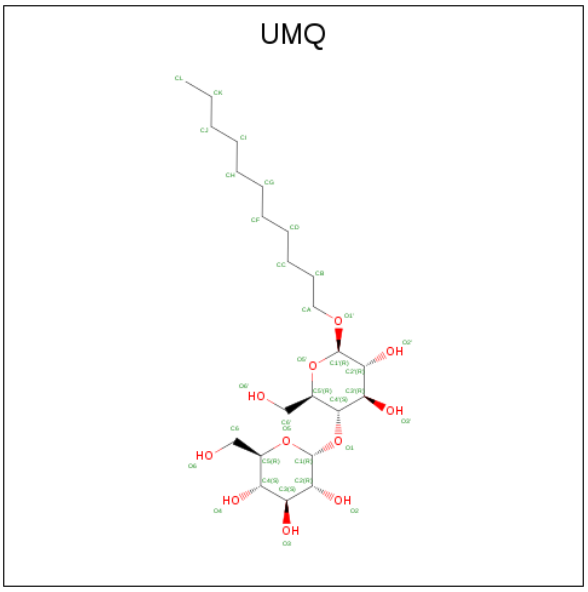
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
10	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
10	C	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- Molecule 11 is (7R,17E)-4-HYDROXY-N,N,N,7-TETRAMETHYL-7-[(8E)-OCTADEC-8-ENOYLOXY]-10-OXO-3,5,9-TRIOXA-4-PHOSPHAHEPTACOS-17-EN-1-AMINIUM 4-OXIDE (three-letter code: OPC) (formula: $C_{45}H_{87}NO_8P$).



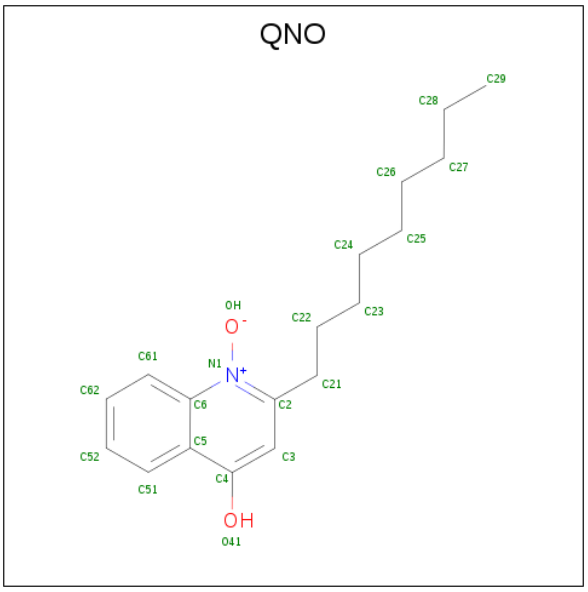
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
11	A	1	Total	C	N	O	P	0	0
			54	44	1	8	1		
11	B	1	Total	C	N	O	P	0	0
			54	44	1	8	1		

- Molecule 12 is UNDECYL-MALTOSIDE (three-letter code: UMQ) (formula: $C_{23}H_{44}O_{11}$).



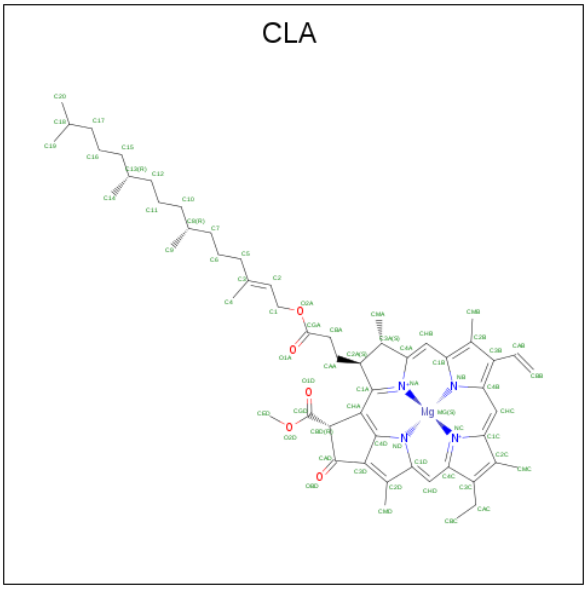
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
12	A	1	Total C O 34 23 11	0	0
12	A	1	Total C O 34 23 11	0	0
12	A	1	Total C O 34 23 11	0	0
12	C	1	Total C O 34 23 11	0	0

- Molecule 13 is 2-NONYL-4-HYDROXYQUINOLINE N-OXIDE (three-letter code: QNO) (formula: $C_{18}H_{25}NO_2$).



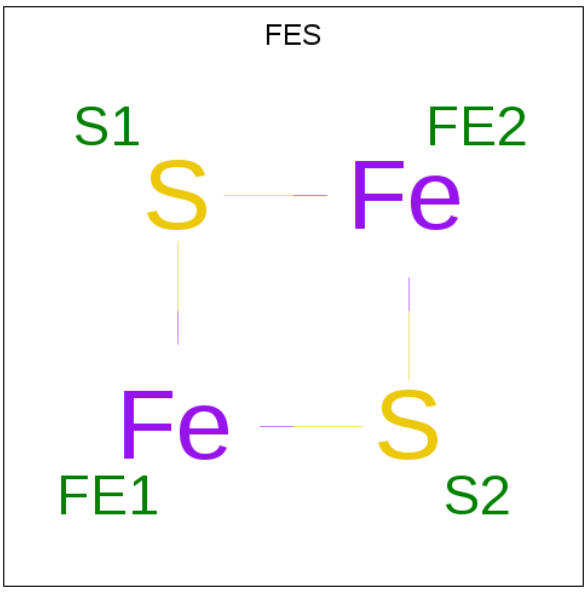
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
13	A	1	Total	C	N	O	0	0
			21	18	1	2		

- Molecule 14 is CHLOROPHYLL A (three-letter code: CLA) (formula: $C_{55}H_{72}MgN_4O_5$).



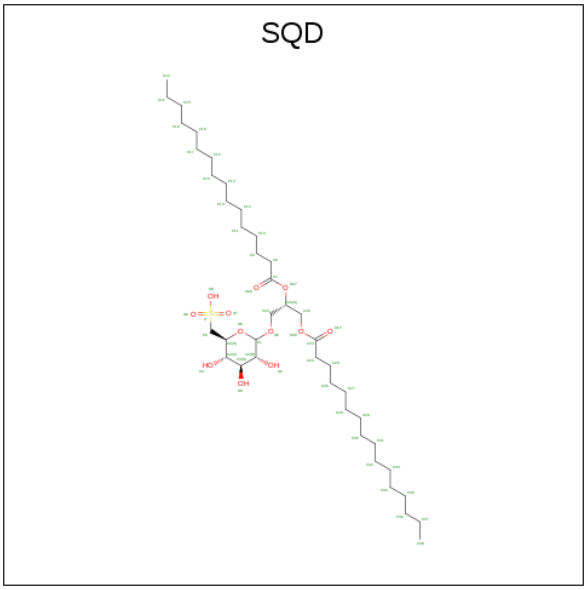
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
14	B	1	Total	C	Mg	N	O	0	0
			65	55	1	4	5		

- Molecule 15 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe_2S_2).



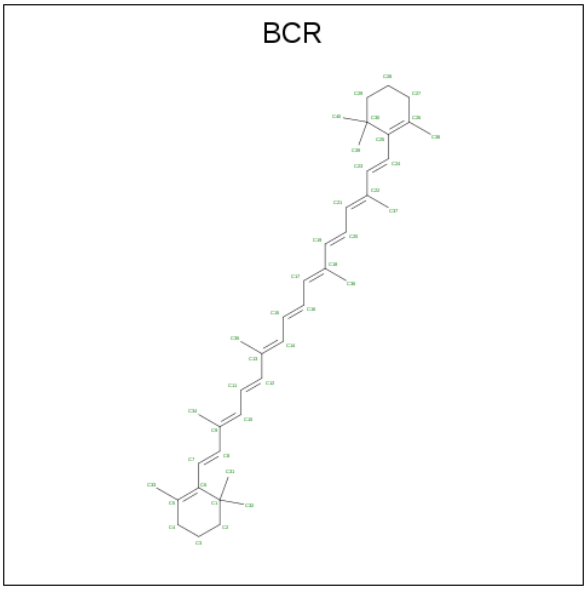
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	Fe	S		
15	D	1	4	2	2	0	0

- Molecule 16 is 1,2-DI-O-ACYL-3-O-[6-DEOXY-6-SULFO-ALPHA-D-GLUCOPYRANOSYL]-SN-GLYCEROL (three-letter code: SQD) (formula: $C_{41}H_{78}O_{12}S$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	O	S		
16	D	1	54	41	12	1	0	0

- Molecule 17 is BETA-CAROTENE (three-letter code: BCR) (formula: $C_{40}H_{56}$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
17	G	1	Total C 40 40	0	0

- Molecule 18 is water.

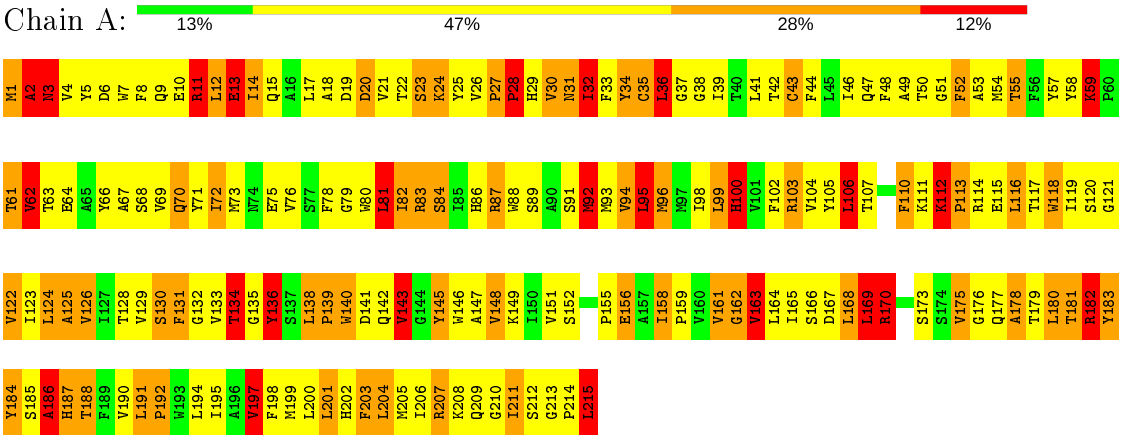
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
18	A	3	Total O 3 3	0	0
18	B	2	Total O 2 2	0	0

3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA 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 electron 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 dot above a residue indicates a poor fit to the electron density (RSRZ > 2). 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.

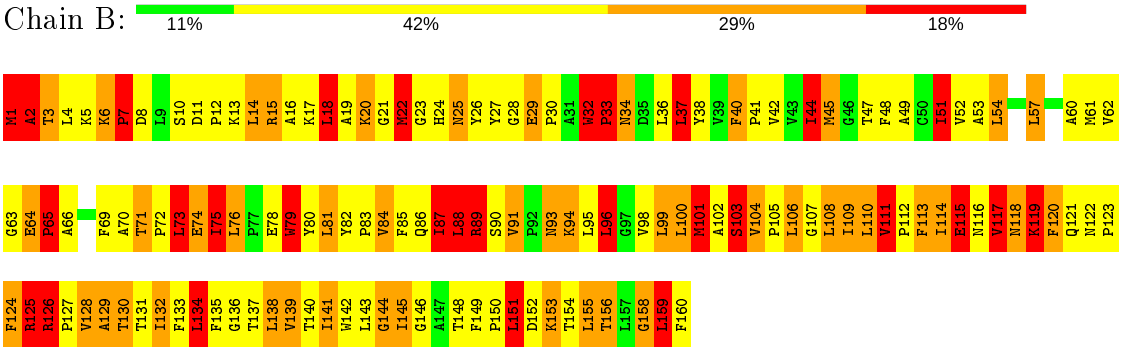
- Molecule 1: Cytochrome b6

Chain A:



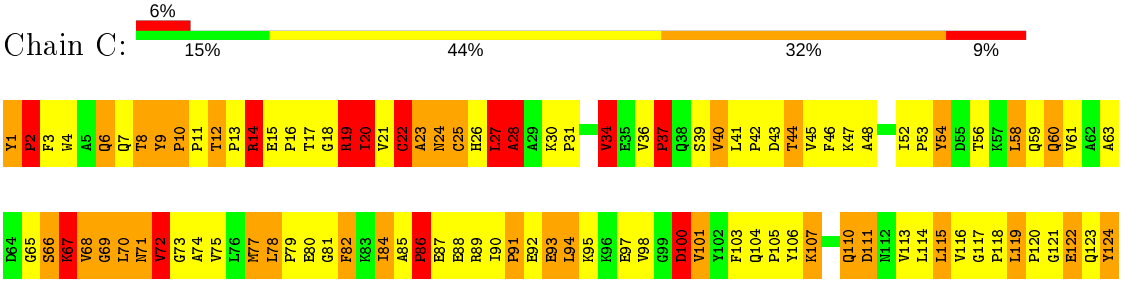
- Molecule 2: Cytochrome b6-f complex subunit 4

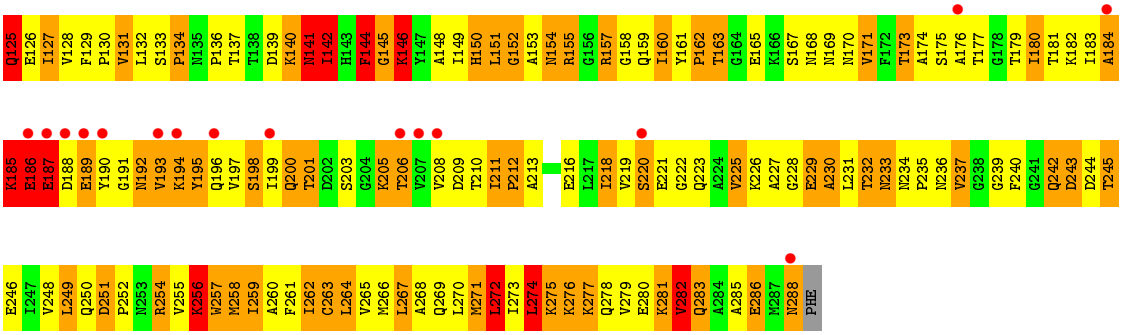
Chain B:



- Molecule 3: Apocytochrome f

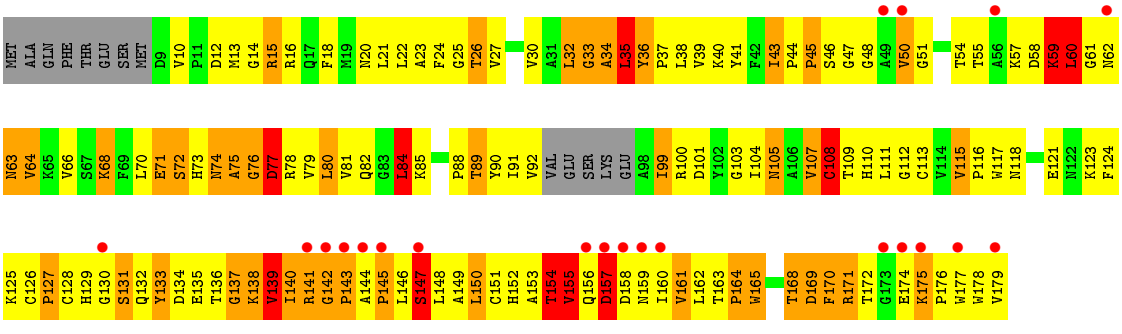
Chain C:





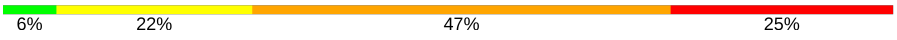
• Molecule 4: Cytochrome b6-f complex iron-sulfur subunit

Chain D:



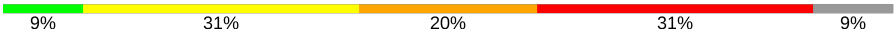
• Molecule 5: Cytochrome b6-f complex subunit 6

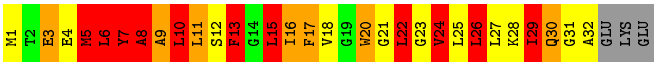
Chain E:



• Molecule 6: Cytochrome b6-f complex subunit 7

Chain F:





• Molecule 7: Cytochrome b6-f complex subunit 5

Chain G:

• Molecule 8: Cytochrome b6-f complex subunit 8

Chain H:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, α, β, γ	159.16Å 159.16Å 362.27Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	49.94 – 3.55 49.94 – 3.55	Depositor EDS
% Data completeness (in resolution range)	99.5 (49.94-3.55) 99.7 (49.94-3.55)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	5.89 (at 3.57Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.201 , 0.267 0.198 , 0.258	Depositor DCC
R_{free} test set	1703 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å^2)	94.2	Xtriage
Anisotropy	0.189	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.26 , 85.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.88	EDS
Total number of atoms	8046	wwPDB-VP
Average B, all atoms (Å^2)	56.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.10% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: UMQ, CLA, CD, FES, OPC, HEM, QNO, BCR, SQD

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	1.99	39/1763 (2.2%)	2.01	64/2405 (2.7%)
2	B	1.88	24/1288 (1.9%)	2.04	46/1765 (2.6%)
3	C	1.53	29/2264 (1.3%)	1.52	25/3082 (0.8%)
4	D	1.26	3/1292 (0.2%)	1.37	14/1760 (0.8%)
5	E	1.79	3/253 (1.2%)	1.95	8/340 (2.4%)
6	F	2.27	10/246 (4.1%)	2.19	12/331 (3.6%)
7	G	1.78	3/289 (1.0%)	1.87	7/391 (1.8%)
8	H	1.97	6/236 (2.5%)	2.11	12/323 (3.7%)
All	All	1.73	117/7631 (1.5%)	1.78	188/10397 (1.8%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	6
2	B	0	7
3	C	0	8
5	E	0	4
6	F	0	1
7	G	0	4
8	H	0	2
All	All	0	32

The worst 5 of 117 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	15	ARG	CZ-NH1	11.16	1.47	1.33
2	B	115	GLU	CG-CD	11.14	1.68	1.51
1	A	122	VAL	CA-CB	-10.27	1.33	1.54

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	87	GLU	CG-CD	9.96	1.66	1.51
3	C	72	VAL	CB-CG1	-9.56	1.32	1.52

The worst 5 of 188 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	15	ARG	NE-CZ-NH2	-24.30	108.15	120.30
1	A	106	LEU	CB-CG-CD1	-12.98	88.93	111.00
1	A	83	ARG	NE-CZ-NH1	-12.94	113.83	120.30
2	B	125	ARG	NE-CZ-NH1	-12.28	114.16	120.30
2	B	15	ARG	NE-CZ-NH1	10.86	125.73	120.30

There are no chirality outliers.

5 of 32 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	113	PRO	Peptide
1	A	135	GLY	Peptide
1	A	158	ILE	Peptide
1	A	2	ALA	Peptide
1	A	27	PRO	Peptide

5.2 Too-close contacts (i)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1711	0	1736	339	0
2	B	1249	0	1308	324	0
3	C	2216	0	2232	414	0
4	D	1260	0	1243	185	0
5	E	248	0	284	77	0
6	F	242	0	260	69	0
7	G	283	0	289	61	0
8	H	230	0	239	82	0
9	A	1	0	0	0	0
9	B	1	0	0	0	0
10	A	129	0	90	56	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
10	C	43	0	30	22	0
11	A	54	0	79	27	0
11	B	54	0	83	11	0
12	A	102	0	123	11	0
12	C	34	0	42	10	0
13	A	21	0	24	7	0
14	B	65	0	72	16	0
15	D	4	0	0	3	0
16	D	54	0	53	11	0
17	G	40	0	52	12	0
18	A	3	0	0	0	0
18	B	2	0	0	0	0
All	All	8046	0	8239	1456	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 90.

The worst 5 of 1456 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:59:LYS:CE	1:A:59:LYS:CD	1.75	1.60
2:B:88:LEU:CG	2:B:88:LEU:CD1	1.75	1.59
6:F:6:LEU:CD2	6:F:6:LEU:CG	1.75	1.59
8:H:29:LEU:CD2	8:H:29:LEU:CG	1.78	1.58
5:E:12:ILE:CD1	5:E:12:ILE:CG1	1.79	1.58

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	213/215 (99%)	142 (67%)	53 (25%)	18 (8%)	1 10
2	B	158/160 (99%)	91 (58%)	36 (23%)	31 (20%)	0 2
3	C	286/289 (99%)	195 (68%)	50 (18%)	41 (14%)	0 4
4	D	162/179 (90%)	93 (57%)	39 (24%)	30 (18%)	0 2
5	E	30/32 (94%)	9 (30%)	10 (33%)	11 (37%)	0 0
6	F	30/35 (86%)	14 (47%)	8 (27%)	8 (27%)	0 0
7	G	35/37 (95%)	13 (37%)	9 (26%)	13 (37%)	0 0
8	H	27/29 (93%)	14 (52%)	6 (22%)	7 (26%)	0 0
All	All	941/976 (96%)	571 (61%)	211 (22%)	159 (17%)	0 3

5 of 159 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	2	ALA
1	A	23	SER
1	A	28	PRO
1	A	112	LYS
1	A	136	TYR

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	184/184 (100%)	138 (75%)	46 (25%)	0 4
2	B	137/137 (100%)	98 (72%)	39 (28%)	0 3
3	C	242/243 (100%)	151 (62%)	91 (38%)	0 1
4	D	134/146 (92%)	96 (72%)	38 (28%)	0 3
5	E	25/25 (100%)	17 (68%)	8 (32%)	0 2
6	F	24/27 (89%)	11 (46%)	13 (54%)	0 0
7	G	28/28 (100%)	20 (71%)	8 (29%)	0 3
8	H	24/24 (100%)	16 (67%)	8 (33%)	0 2

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	798/814 (98%)	547 (68%)	251 (32%)	0 2

5 of 251 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	C	94	LEU
3	C	182	LYS
6	F	22	LEU
3	C	111	ASP
3	C	142	ILE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 23 such sidechains are listed below:

Mol	Chain	Res	Type
3	C	168	ASN
3	C	233	ASN
4	D	132	GLN
3	C	170	ASN
3	C	234	ASN

5.3.3 RNA

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains

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

5.5 Carbohydrates

There are no carbohydrates in this entry.

5.6 Ligand geometry

Of 17 ligands modelled in this entry, 2 are monoatomic - leaving 15 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	$\#\|Z\| > 2$
17	BCR	G	101	-	41,41,41	3.66	22 (53%)	56,56,56	6.75	35 (62%)
11	OPC	A	1002	-	53,53,54	2.10	13 (24%)	59,61,64	2.85	27 (45%)
10	HEM	A	302	1	27,50,50	2.57	12 (44%)	17,82,82	3.52	7 (41%)
12	UMQ	A	1104	-	35,35,35	1.60	3 (8%)	46,46,46	2.77	12 (26%)
13	QNO	A	501	10	22,22,22	2.61	5 (22%)	20,28,28	2.56	5 (25%)
15	FES	D	200	4	0,4,4	0.00	-	-		
10	HEM	A	303	1,18,13	27,50,50	2.99	8 (29%)	17,82,82	3.81	10 (58%)
12	UMQ	A	1103	-	35,35,35	1.73	5 (14%)	46,46,46	2.94	16 (34%)
10	HEM	A	301	1	27,50,50	2.31	10 (37%)	17,82,82	2.98	8 (47%)
12	UMQ	A	1102	1	35,35,35	2.03	7 (20%)	46,46,46	3.06	20 (43%)
16	SQD	D	201	-	53,54,54	2.52	24 (45%)	62,65,65	4.84	35 (56%)
14	CLA	B	201	18	59,73,73	2.07	13 (22%)	67,113,113	3.56	39 (58%)
10	HEM	C	301	3	27,50,50	2.50	15 (55%)	17,82,82	2.29	5 (29%)
12	UMQ	C	1101	-	35,35,35	1.85	8 (22%)	46,46,46	3.38	20 (43%)
11	OPC	B	1001	-	53,53,54	2.12	16 (30%)	59,61,64	2.52	26 (44%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
17	BCR	G	101	-	-	10/29/63/63	0/2/2/2
11	OPC	A	1002	-	-	23/57/57/60	-
10	HEM	A	302	1	-	1/6/54/54	-
12	UMQ	A	1104	-	2/2/10/10	16/20/60/60	0/2/2/2
13	QNO	A	501	10	1/1/0/0	3/9/9/9	0/2/2/2
15	FES	D	200	4	-	-	0/1/1/1
10	HEM	A	303	1,18,13	-	2/6/54/54	-
12	UMQ	A	1103	-	2/2/10/10	12/20/60/60	0/2/2/2
10	HEM	A	301	1	-	0/6/54/54	-
10	HEM	C	301	3	-	0/6/54/54	-
16	SQD	D	201	-	3/3/9/9	24/49/69/69	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
14	CLA	B	201	18	4/4/20/25	12/37/135/135	-
12	UMQ	A	1102	1	2/2/10/10	12/20/60/60	0/2/2/2
12	UMQ	C	1101	-	2/2/10/10	9/20/60/60	0/2/2/2
11	OPC	B	1001	-	-	25/57/57/60	-

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
17	G	101	BCR	C8-C9	-11.19	1.21	1.45
10	A	303	HEM	C3C-C2C	-9.38	1.27	1.40
13	A	501	QNO	C2-N1	8.91	1.51	1.36
10	A	303	HEM	C3B-C2B	-8.81	1.28	1.40
14	B	201	CLA	OBD-CAD	8.13	1.33	1.22

The worst 5 of 265 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
17	G	101	BCR	C7-C8-C9	28.81	169.77	126.23
17	G	101	BCR	C24-C23-C22	25.52	164.79	126.23
17	G	101	BCR	C8-C7-C6	16.10	172.42	127.20
17	G	101	BCR	C23-C24-C25	14.56	168.11	127.20
16	D	201	SQD	O4-C4-C3	13.41	141.36	110.35

5 of 16 chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
12	A	1104	UMQ	C2'
12	A	1104	UMQ	C1'
16	D	201	SQD	C3
16	D	201	SQD	C5
16	D	201	SQD	C4

5 of 149 torsion outliers are listed below:

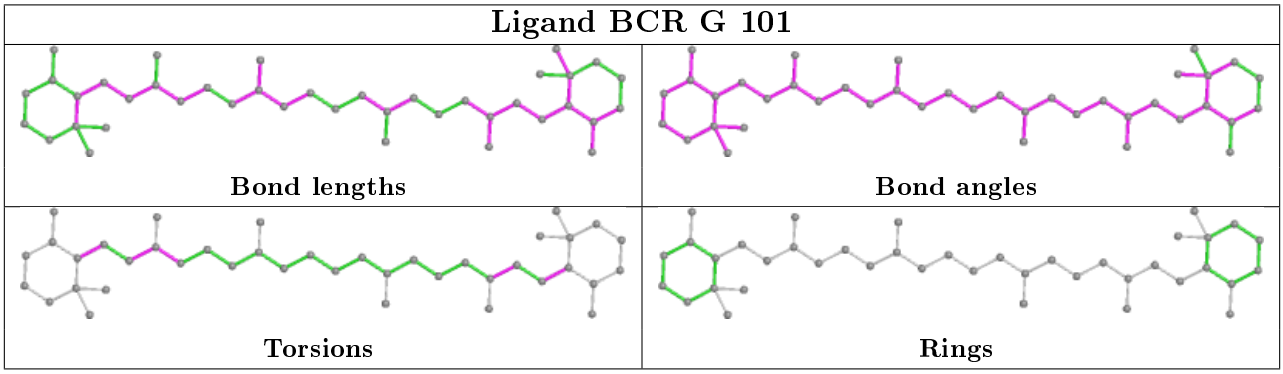
Mol	Chain	Res	Type	Atoms
17	G	101	BCR	C7-C8-C9-C34
17	G	101	BCR	C21-C22-C23-C24
17	G	101	BCR	C37-C22-C23-C24
11	A	1002	OPC	NAF-CAG-CAH-OAI
11	A	1002	OPC	CBO-CBP-CBQ-CBR

There are no ring outliers.

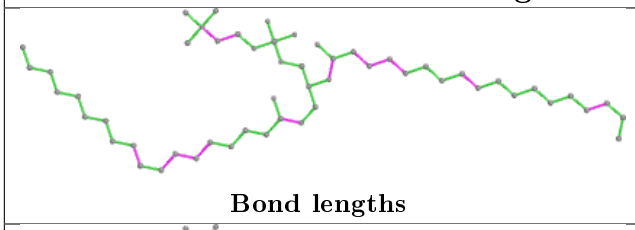
15 monomers are involved in 184 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
17	G	101	BCR	12	0
11	A	1002	OPC	27	0
10	A	302	HEM	25	0
12	A	1104	UMQ	2	0
13	A	501	QNO	7	0
15	D	200	FES	3	0
10	A	303	HEM	9	0
12	A	1103	UMQ	2	0
10	A	301	HEM	22	0
12	A	1102	UMQ	7	0
16	D	201	SQD	11	0
14	B	201	CLA	16	0
10	C	301	HEM	22	0
12	C	1101	UMQ	10	0
11	B	1001	OPC	11	0

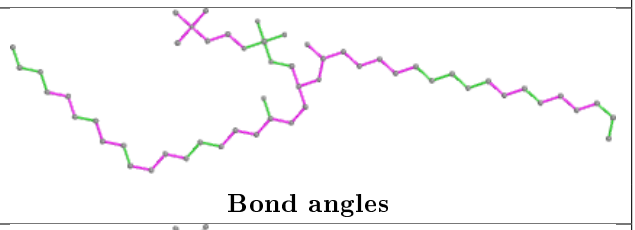
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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



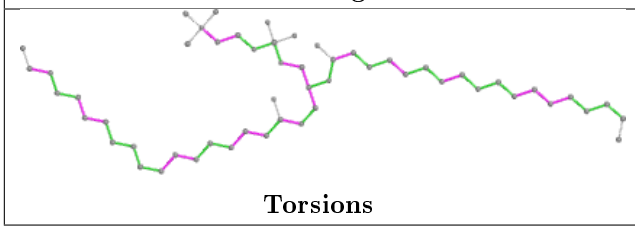
Ligand OPC A 1002



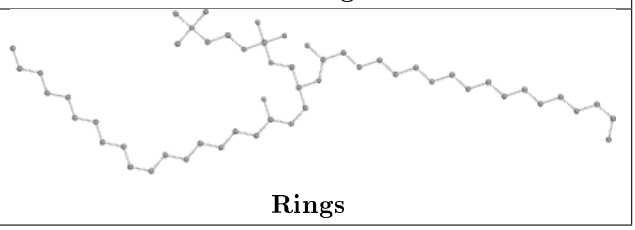
Bond lengths



Bond angles

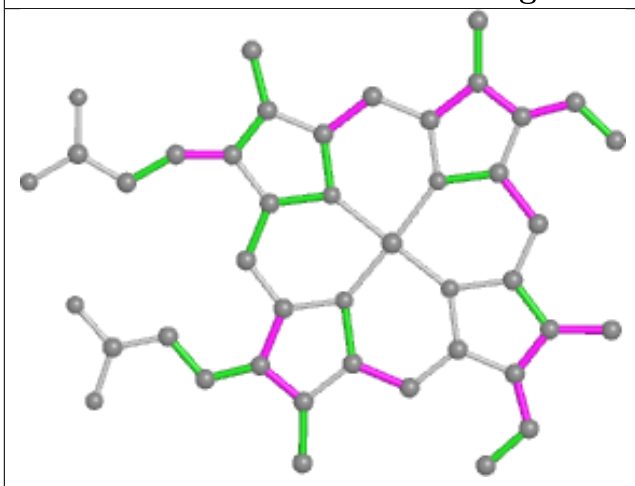


Torsions



Rings

Ligand HEM A 302



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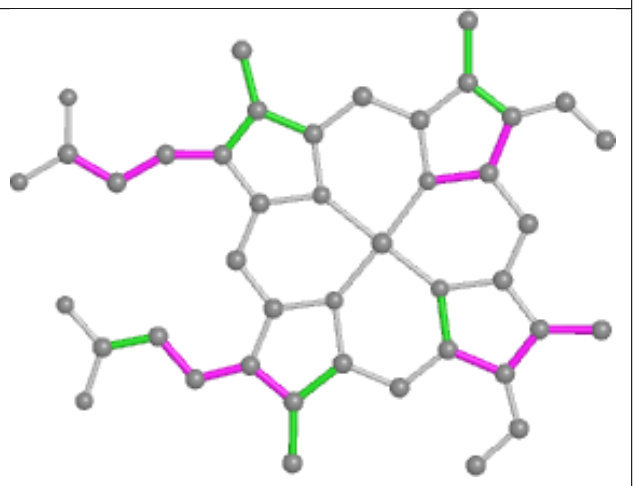

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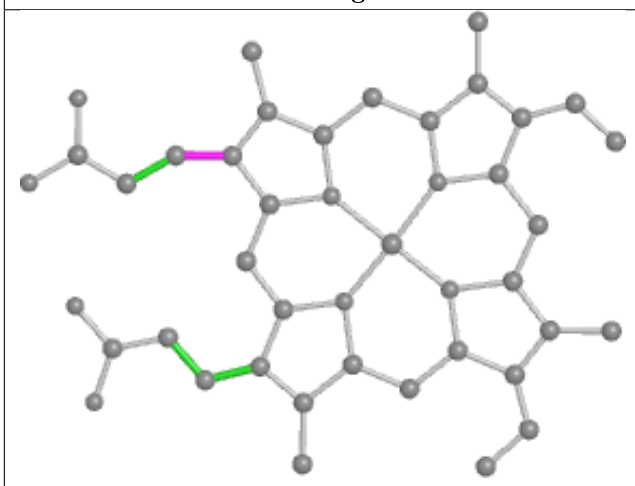

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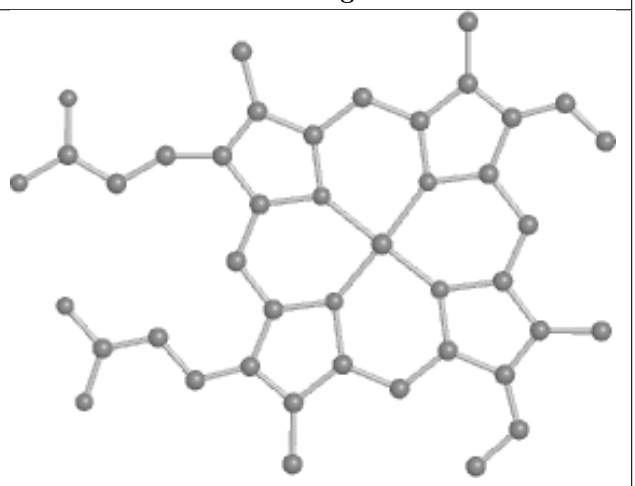
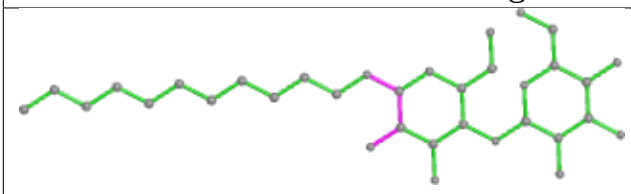
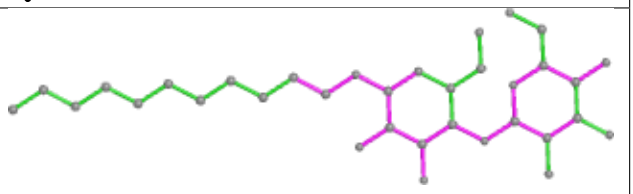


Rings

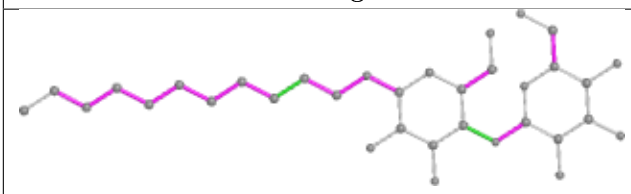
Ligand UMQ A 1104



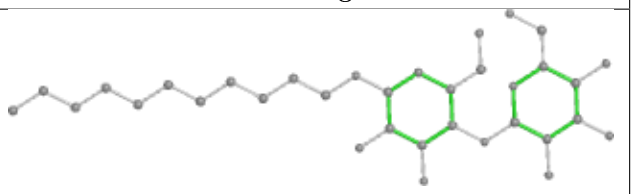
Bond lengths



Bond angles

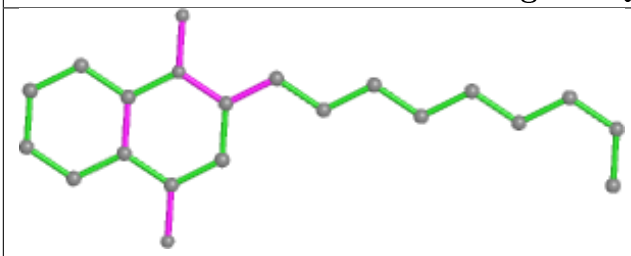


Torsions

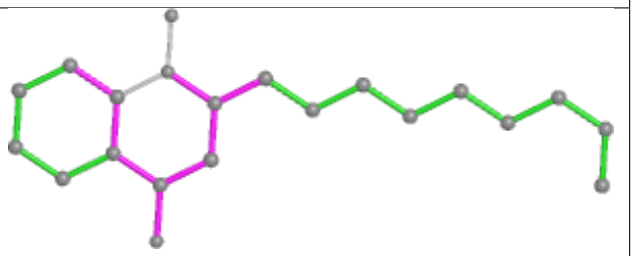


Rings

Ligand QNO A 501



Bond lengths



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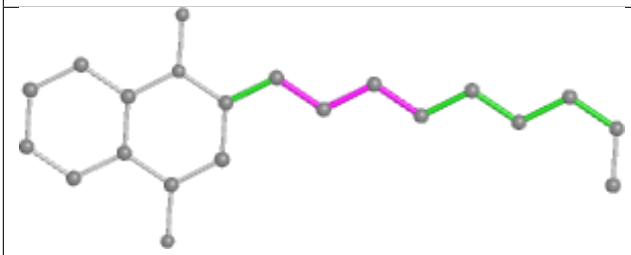
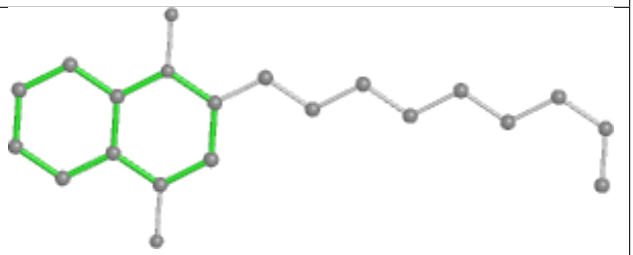
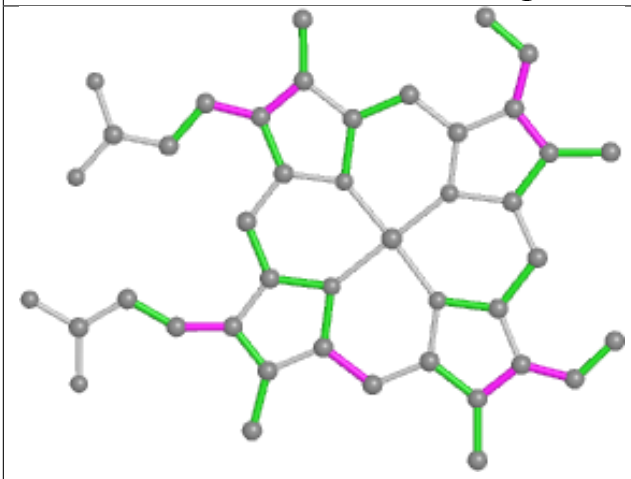


Torsions

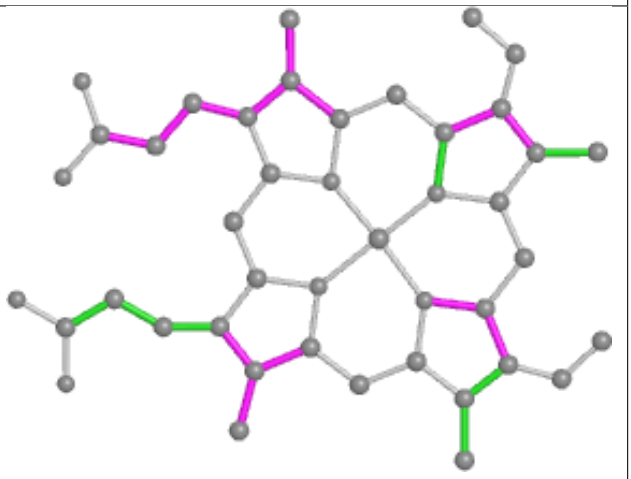


Rings

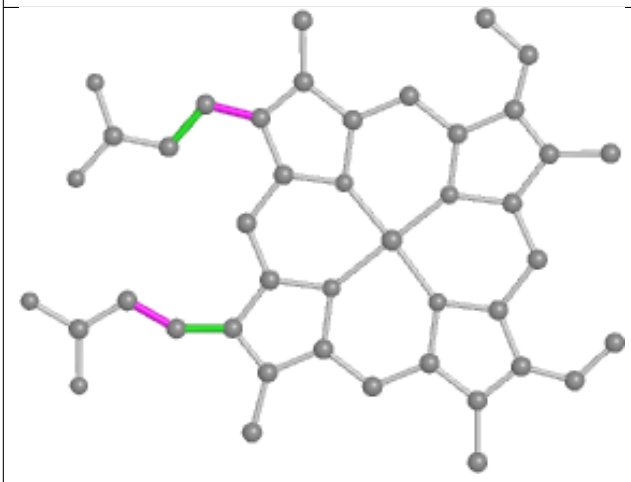
Ligand HEM A 303



Bond lengths



Bond angles



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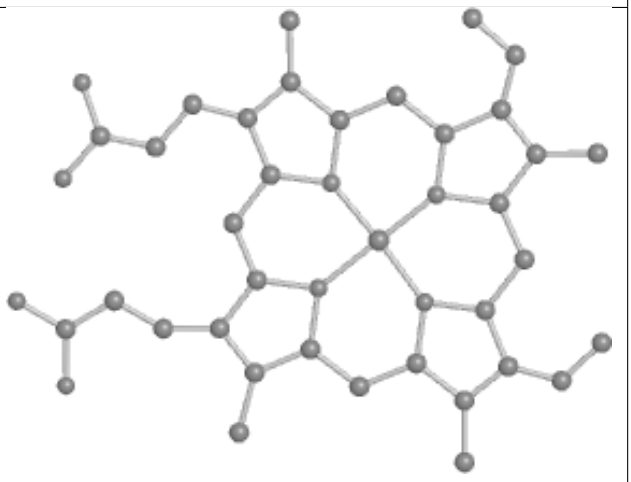
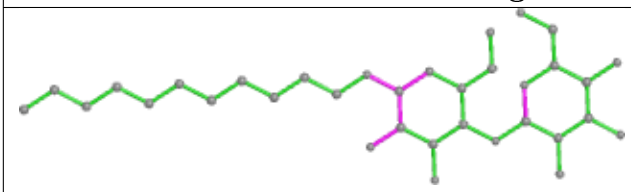
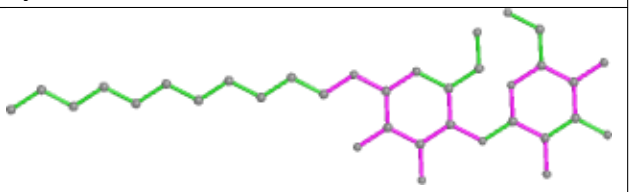


Rings

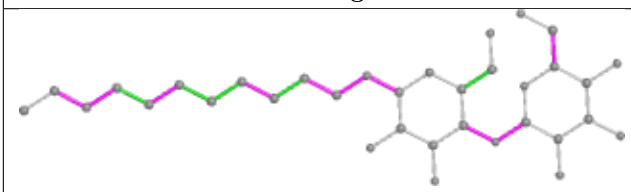
Ligand UMQ A 1103



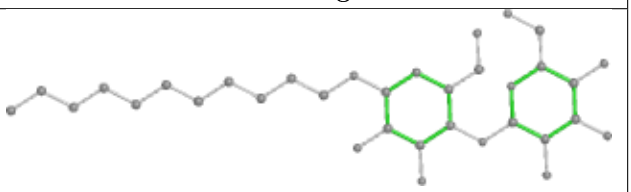
Bond lengths



Bond angles

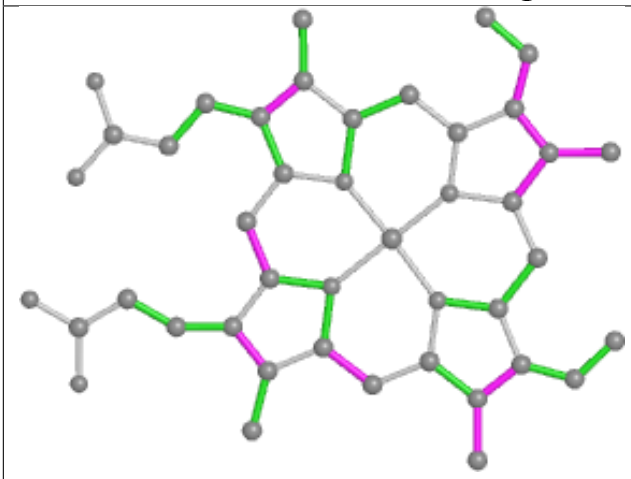


Torsions

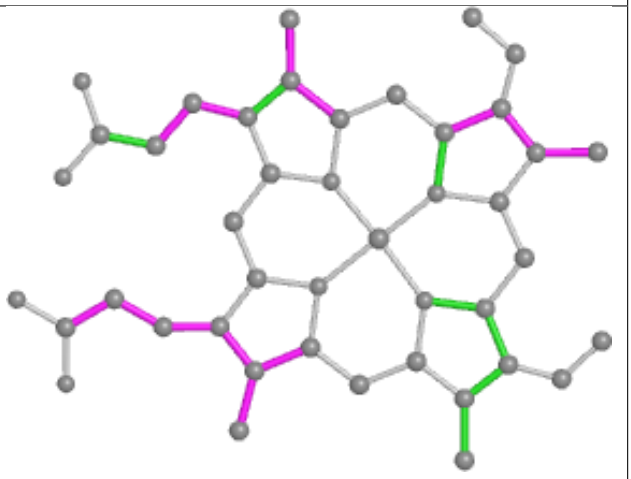


Rings

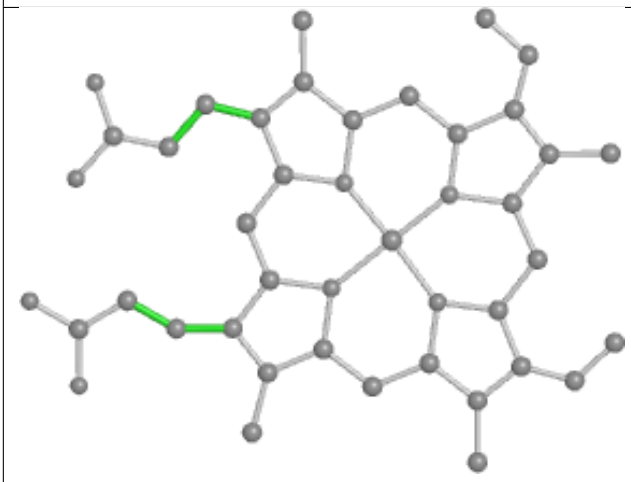
Ligand HEM A 301



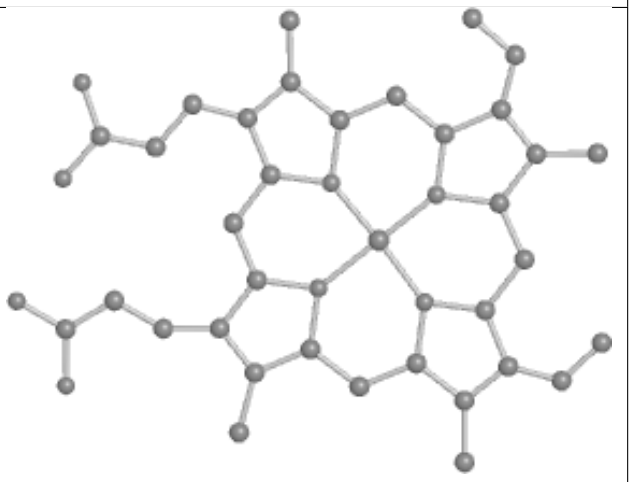
Bond lengths



Bond angles

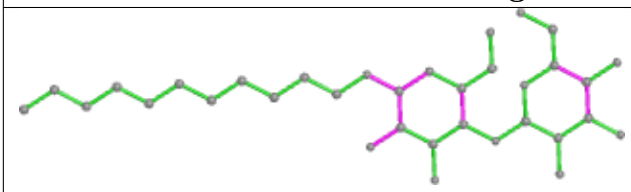


Torsions

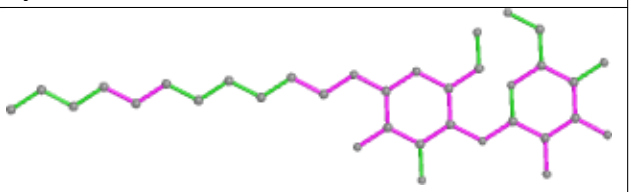


Rings

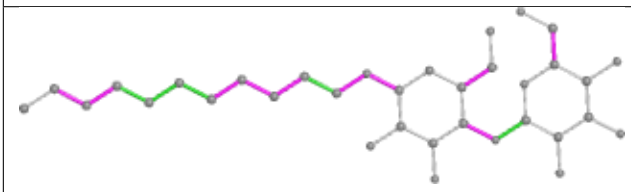
Ligand UMQ A 1102



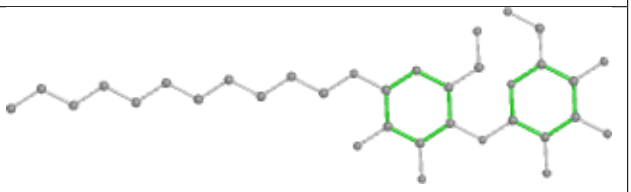
Bond lengths



Bond angles

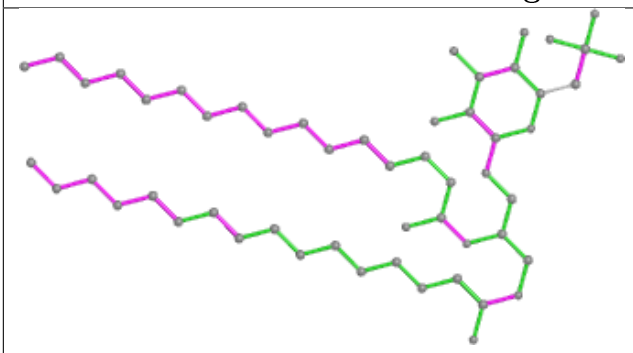


Torsions

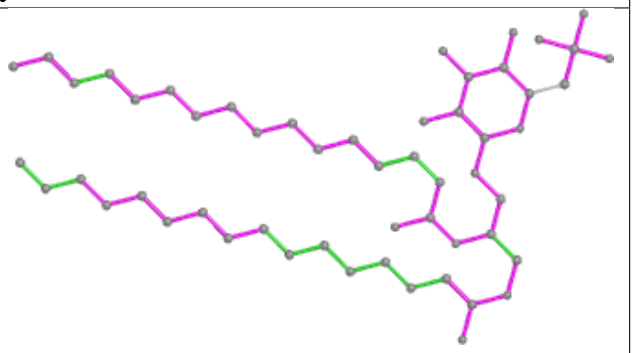


Rings

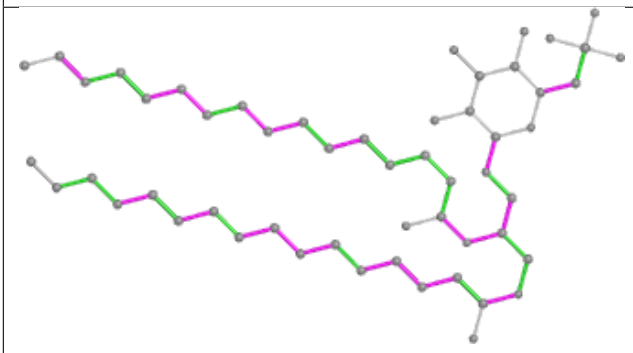
Ligand SQD D 201



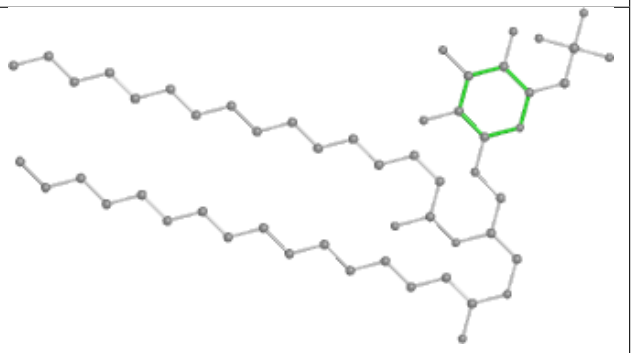
Bond lengths



Bond angles

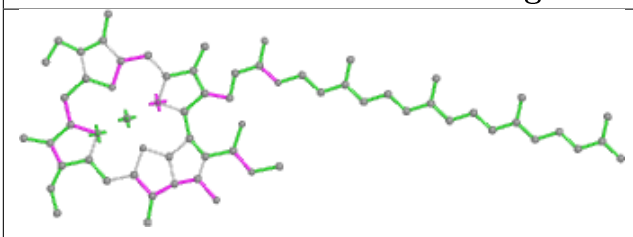


Torsions

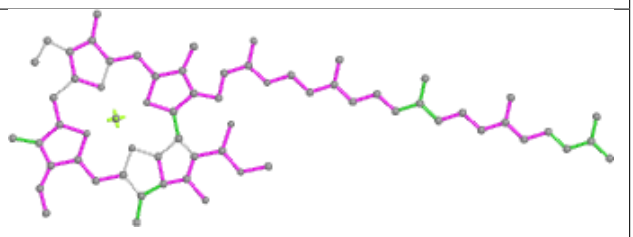


Rings

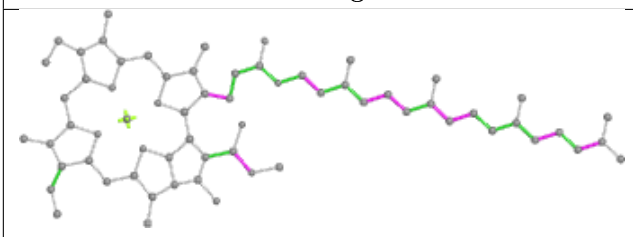
Ligand CLA B 201



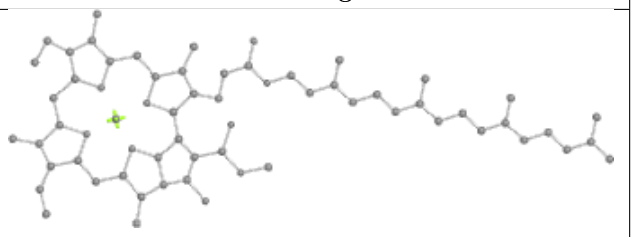
Bond lengths



Bond angles

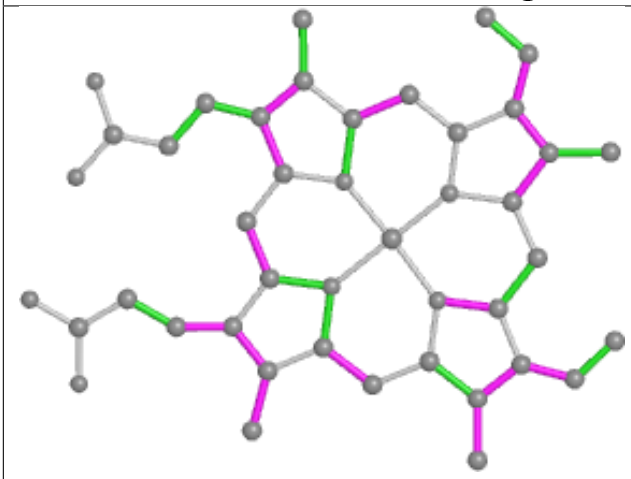


Torsions

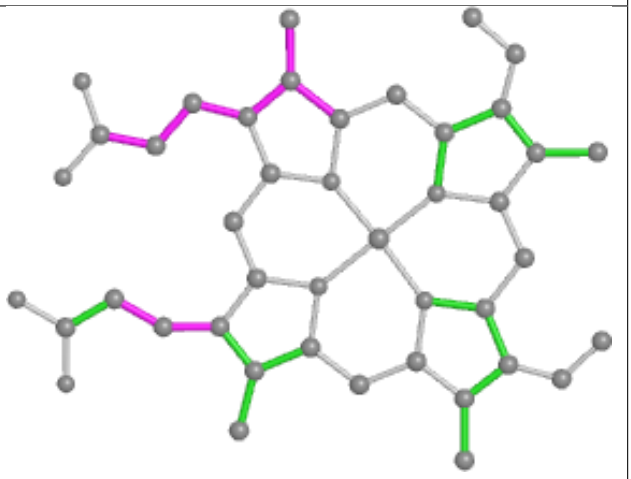


Rings

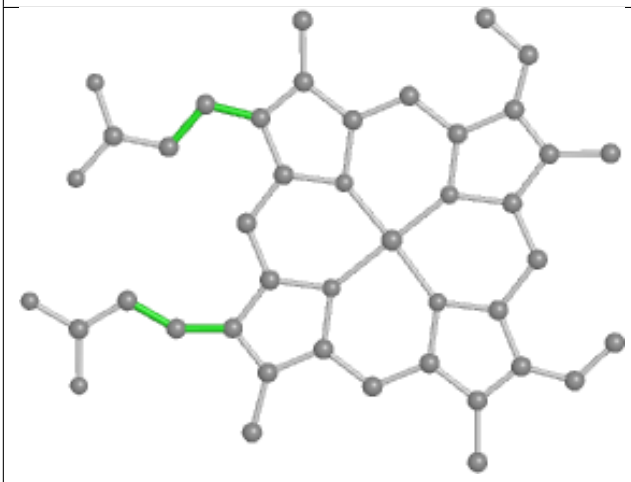
Ligand HEM C 301



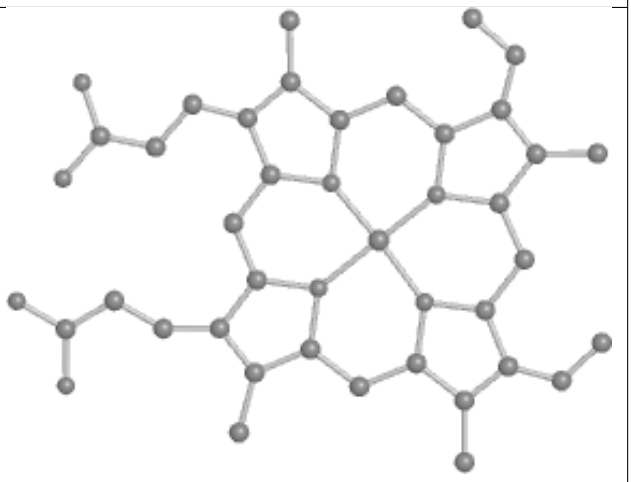
Bond lengths



Bond angles

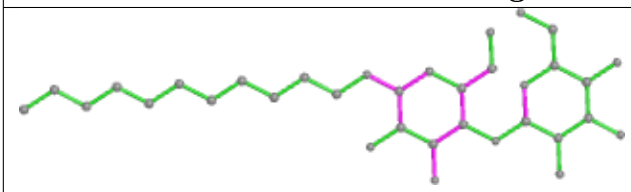


Torsions

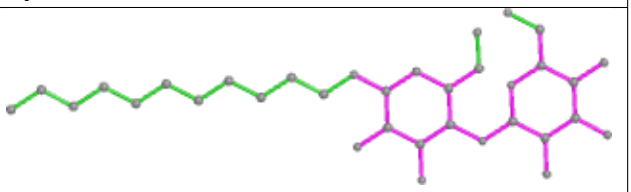


Rings

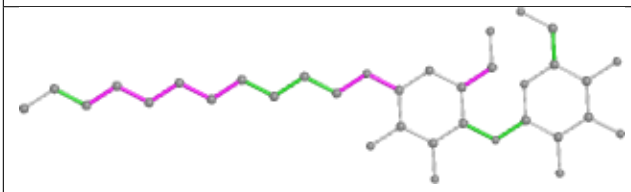
Ligand UMQ C 1101



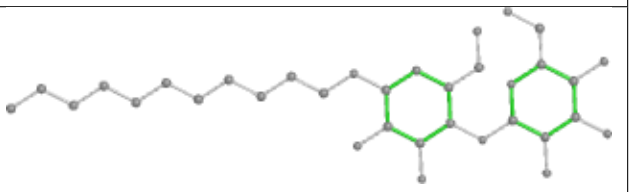
Bond lengths



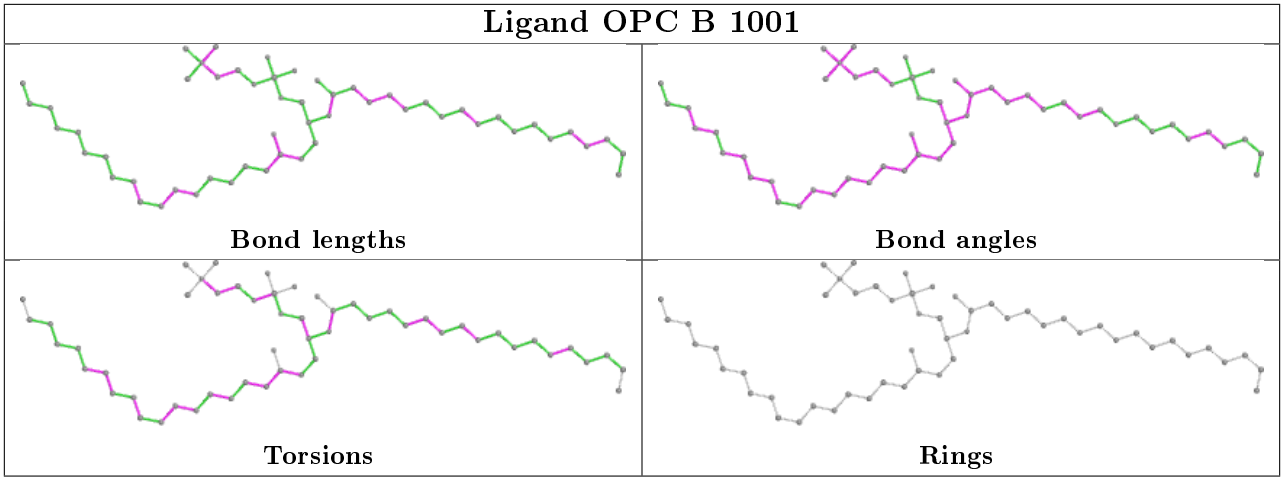
Bond angles



Torsions



Rings



5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å^2)	Q<0.9
1	A	215/215 (100%)	-0.89	0 100 100	4, 22, 60, 162	0
2	B	160/160 (100%)	-0.84	0 100 100	9, 41, 93, 133	0
3	C	288/289 (99%)	-0.13	16 (5%) 24 15	5, 47, 145, 170	1 (0%)
4	D	166/179 (92%)	0.20	21 (12%) 3 3	8, 101, 150, 182	0
5	E	32/32 (100%)	-0.71	0 100 100	22, 52, 98, 119	0
6	F	32/35 (91%)	-0.64	0 100 100	10, 41, 112, 123	0
7	G	37/37 (100%)	-0.79	0 100 100	13, 33, 115, 123	0
8	H	29/29 (100%)	-0.84	0 100 100	15, 28, 51, 97	0
All	All	959/976 (98%)	-0.44	37 (3%) 39 25	4, 42, 139, 182	1 (0%)

The worst 5 of 37 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	D	179	VAL	6.9
4	D	144	ALA	4.1
4	D	49	ALA	4.1
4	D	175	LYS	4.0
4	D	145	PRO	4.0

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

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

6.3 Carbohydrates

There are no carbohydrates in this entry.

6.4 Ligands

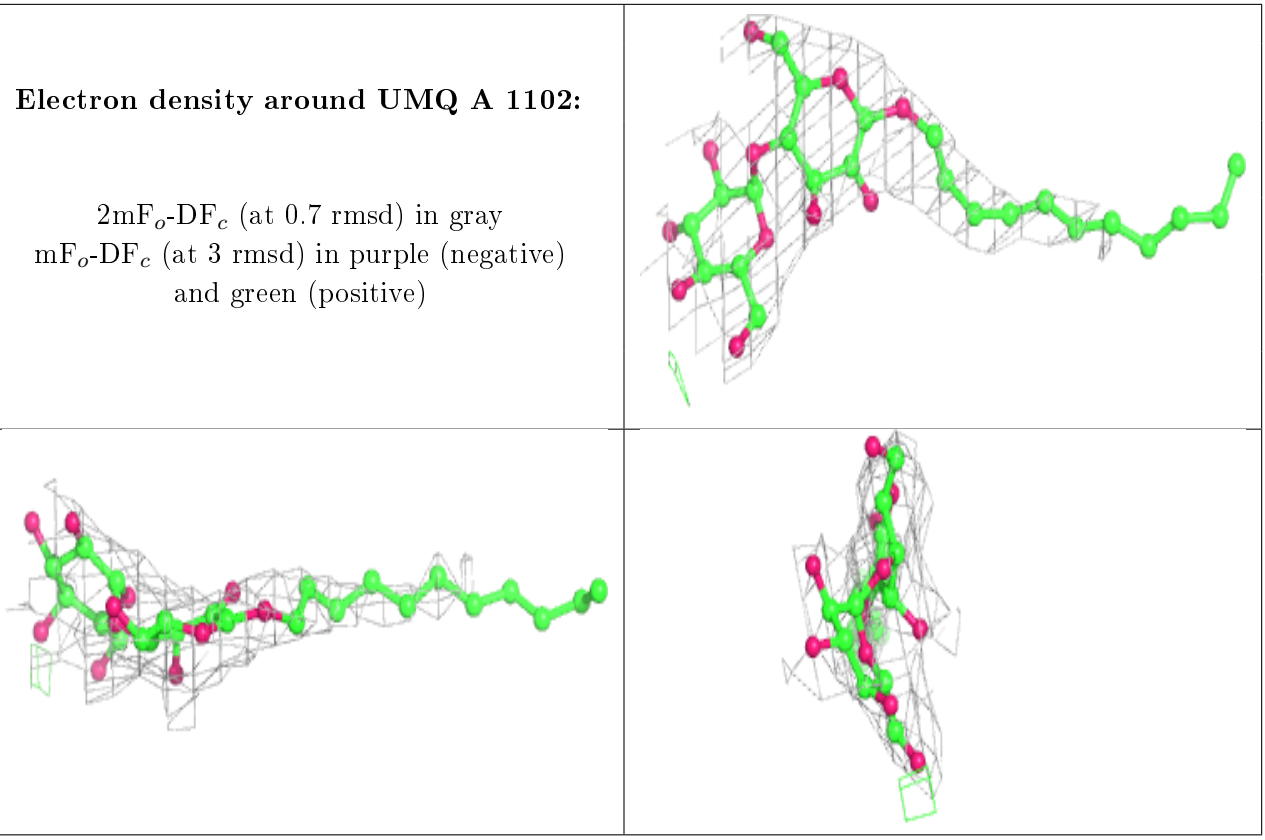
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
12	UMQ	A	1102	34/34	0.83	0.32	31,112,145,149	0
12	UMQ	A	1104	34/34	0.85	0.28	23,131,208,216	0
12	UMQ	C	1101	34/34	0.86	0.23	4,86,151,160	0
16	SQD	D	201	54/54	0.87	0.41	39,165,201,204	0
11	OPC	A	1002	54/55	0.90	0.40	2,64,206,220	0
17	BCR	G	101	40/40	0.93	0.36	2,49,145,149	0
12	UMQ	A	1103	34/34	0.93	0.30	40,101,144,155	0
11	OPC	B	1001	54/55	0.94	0.38	8,70,138,157	0
13	QNO	A	501	21/21	0.95	0.20	45,63,95,120	0
14	CLA	B	201	65/65	0.97	0.20	12,42,72,111	0
9	CD	B	161	1/1	0.98	0.08	161,161,161,161	0
10	HEM	C	301	43/43	0.98	0.21	2,33,74,95	0
15	FES	D	200	4/4	0.98	0.11	89,90,95,104	0
10	HEM	A	303	43/43	0.99	0.15	2,35,56,61	0
10	HEM	A	302	43/43	0.99	0.15	2,8,43,49	0
10	HEM	A	301	43/43	0.99	0.16	2,13,37,60	0
9	CD	A	216	1/1	1.00	0.12	47,47,47,47	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

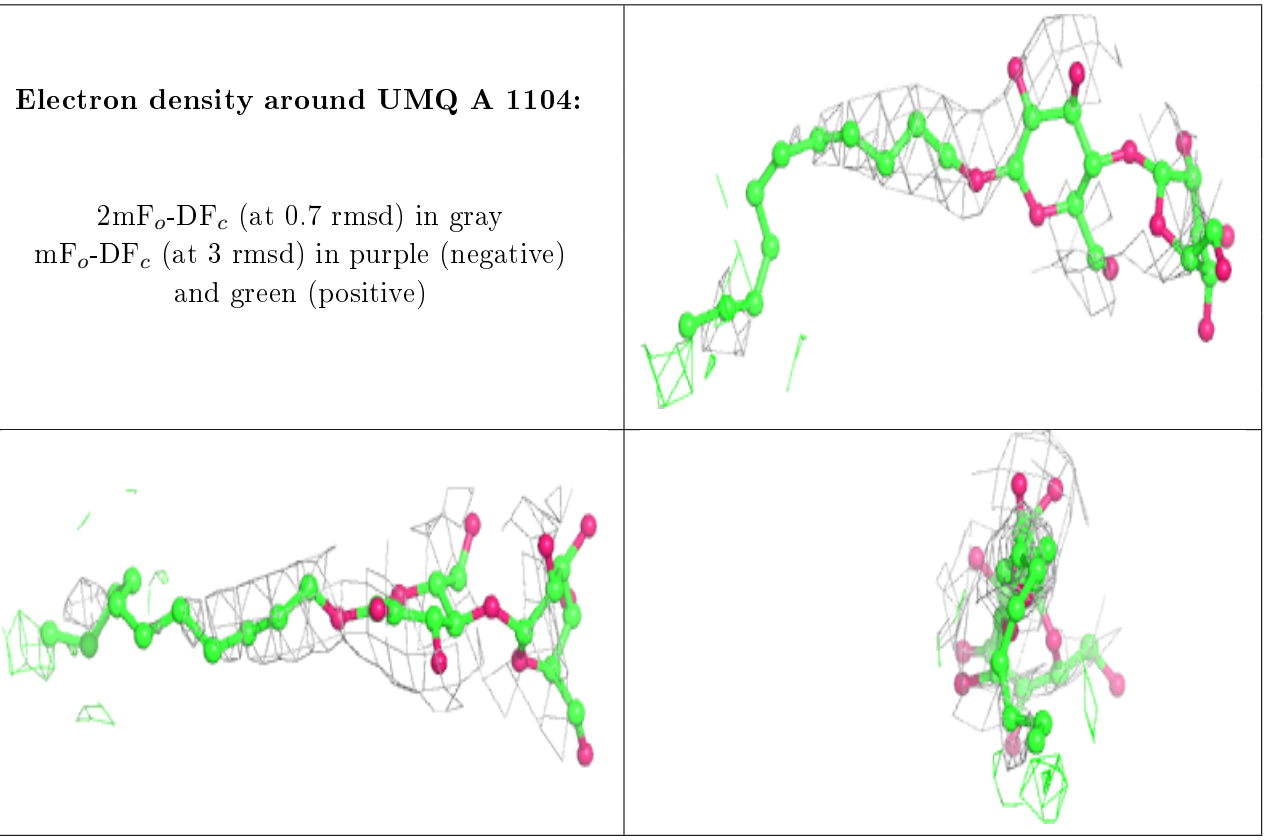
Electron density around UMQ A 1102:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



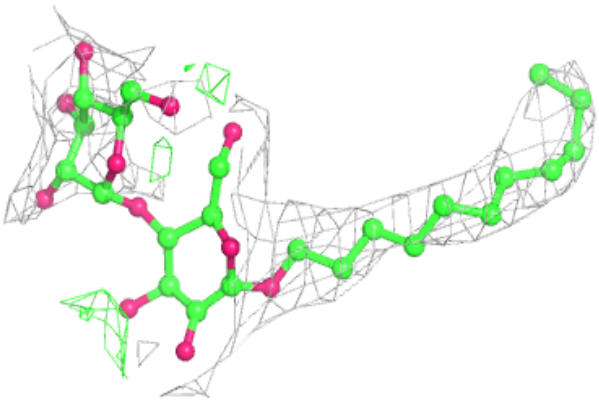
Electron density around UMQ A 1104:

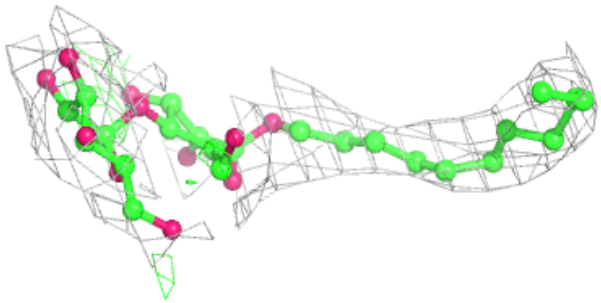
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

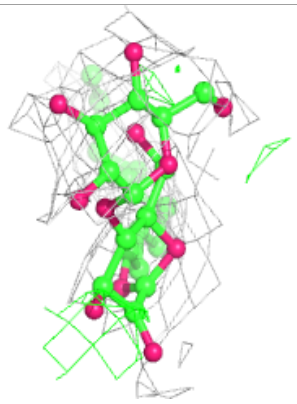


Electron density around UMQ C 1101:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

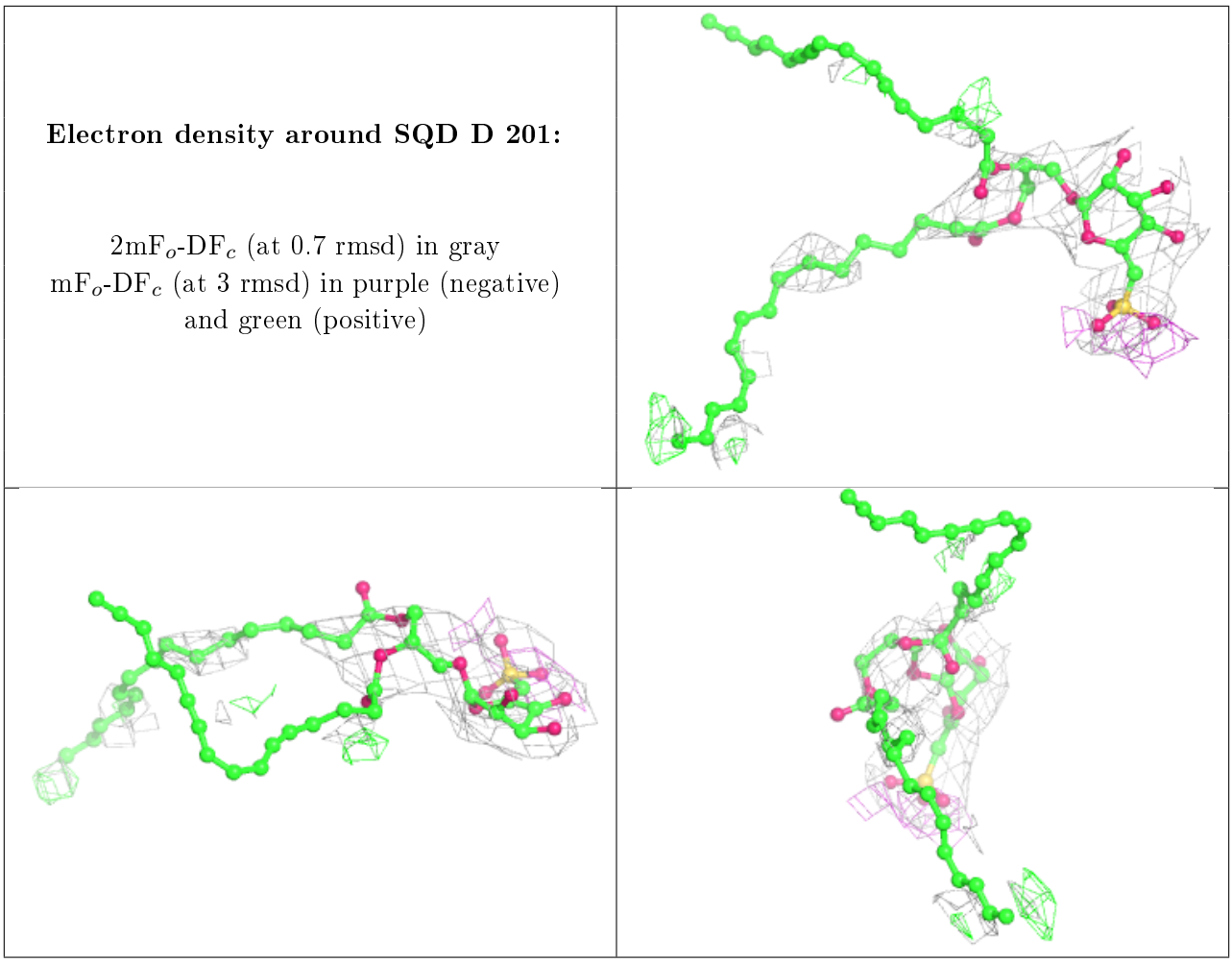






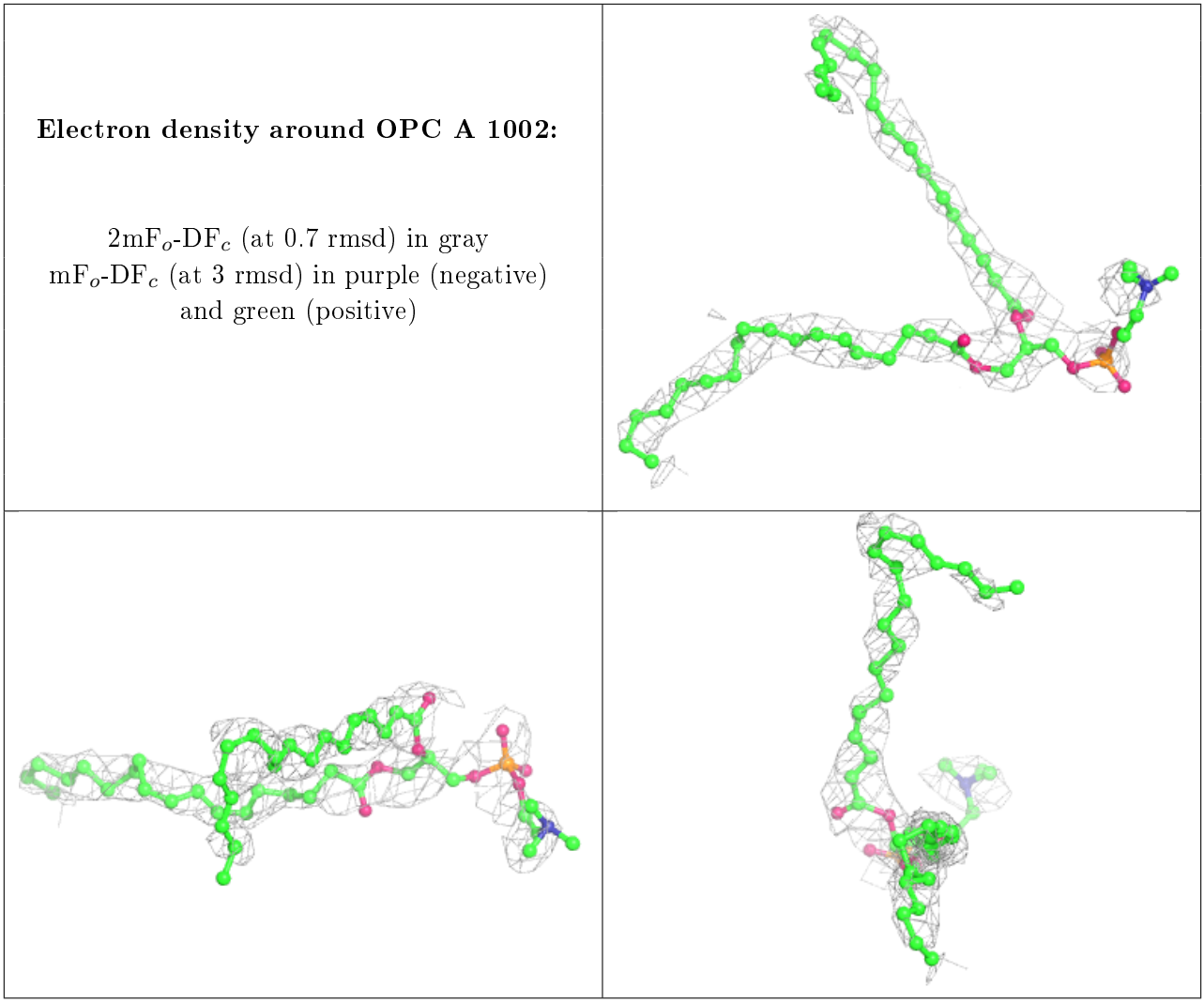
Electron density around SQD D 201:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



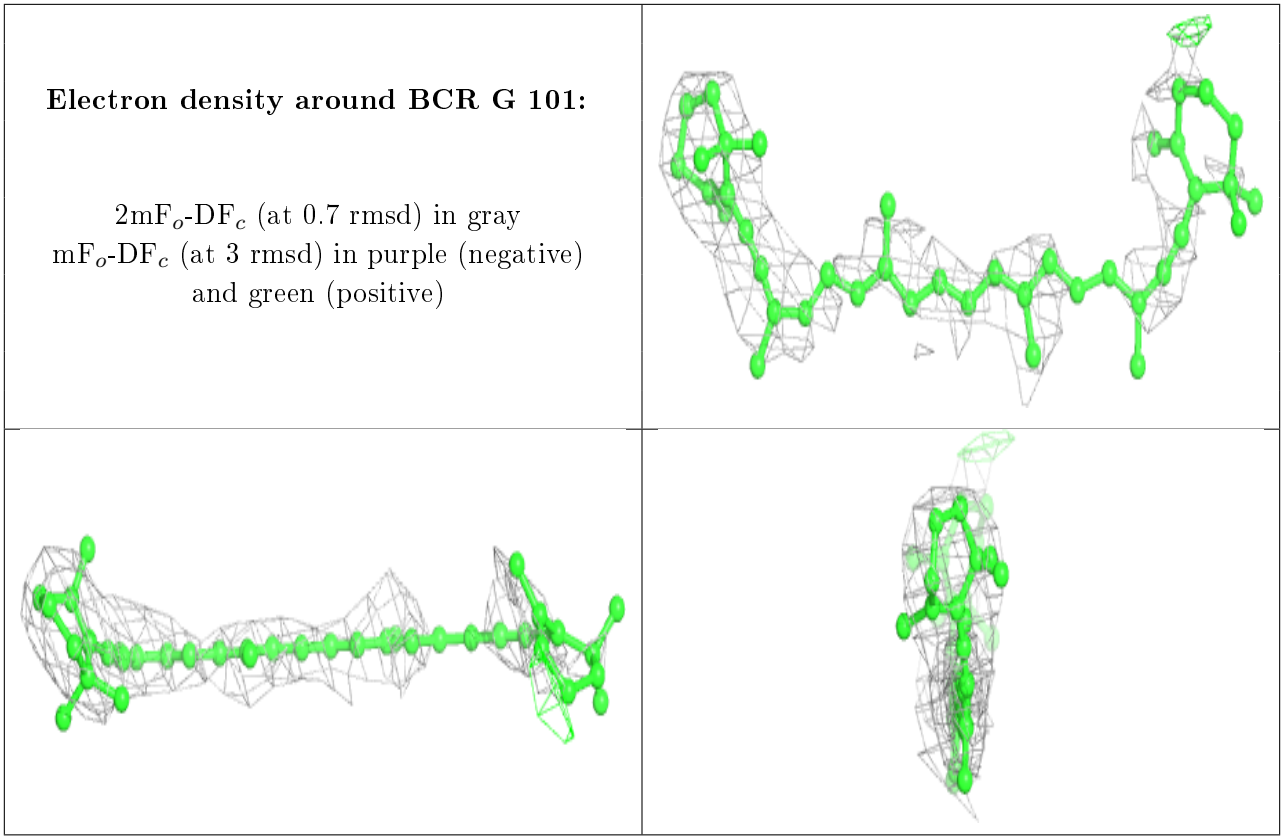
Electron density around OPC A 1002:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



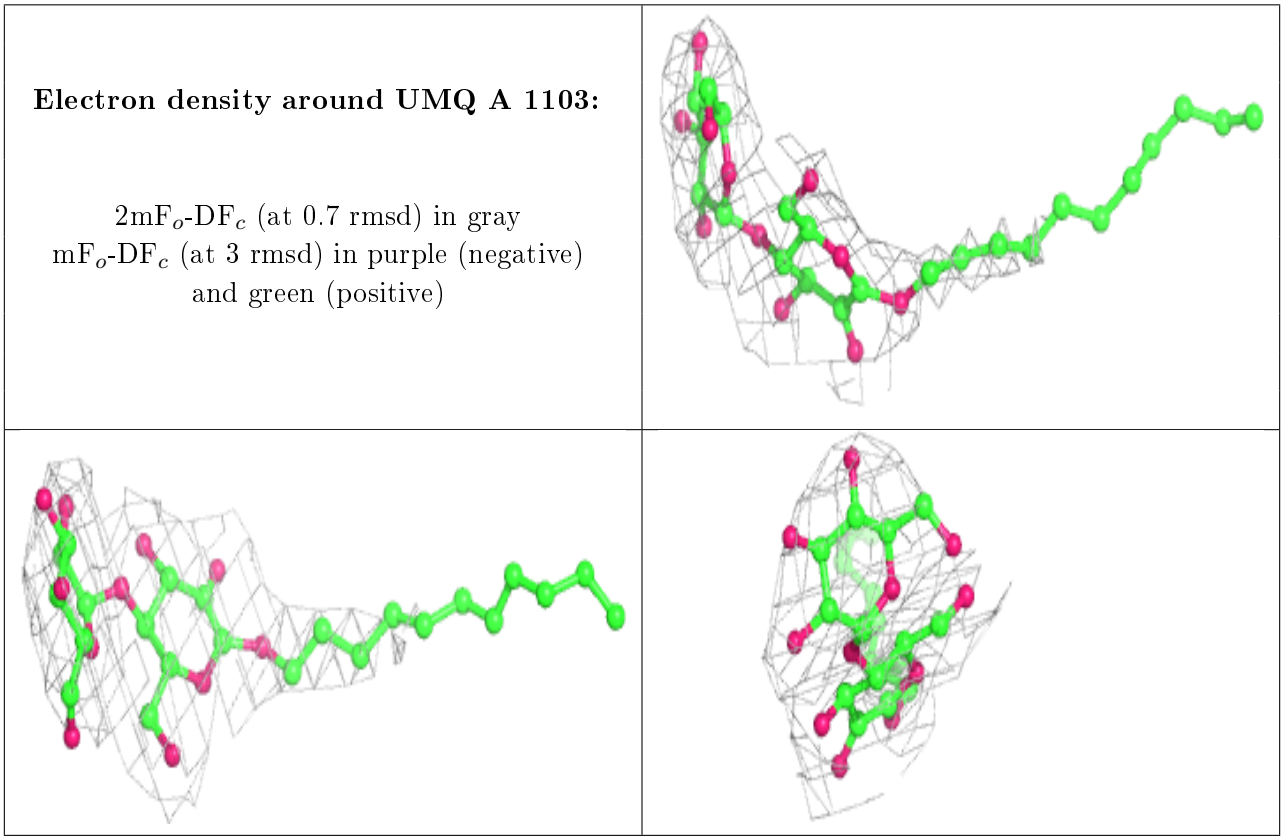
Electron density around BCR G 101:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



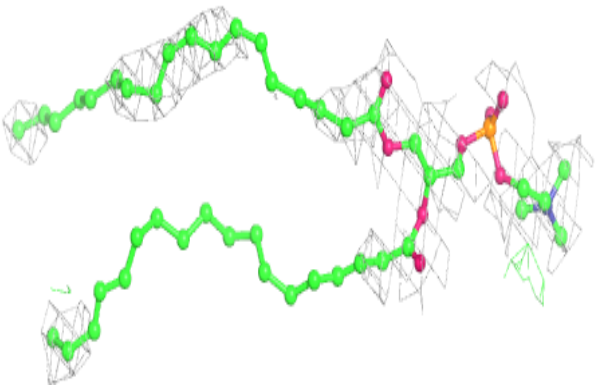
Electron density around UMQ A 1103:

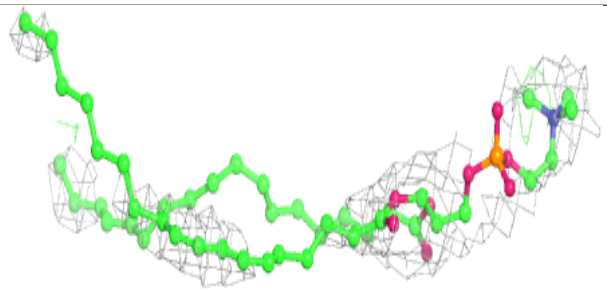
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

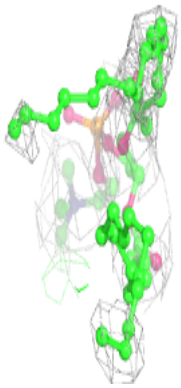


Electron density around OPC B 1001:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

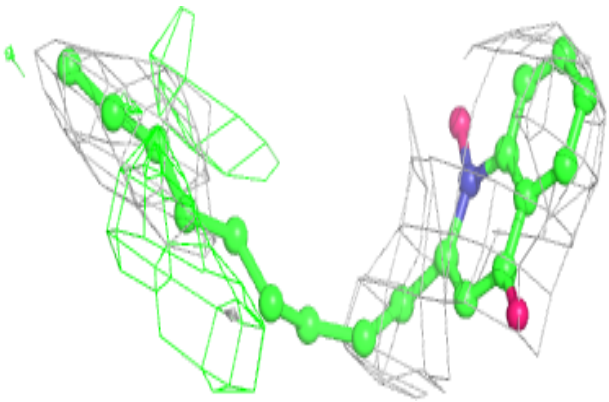


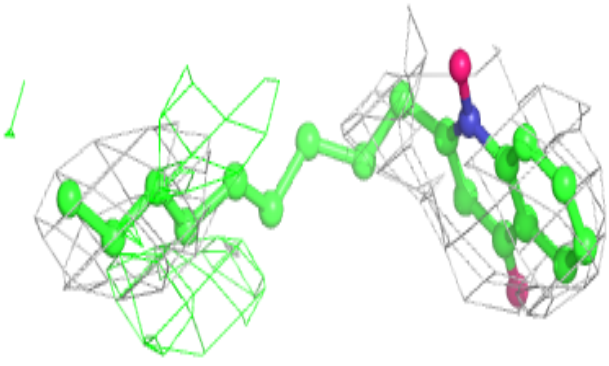


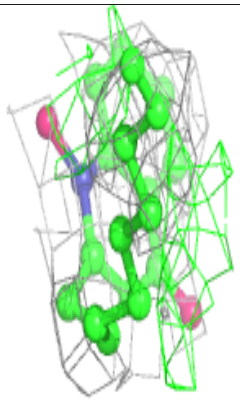


Electron density around QNO A 501:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

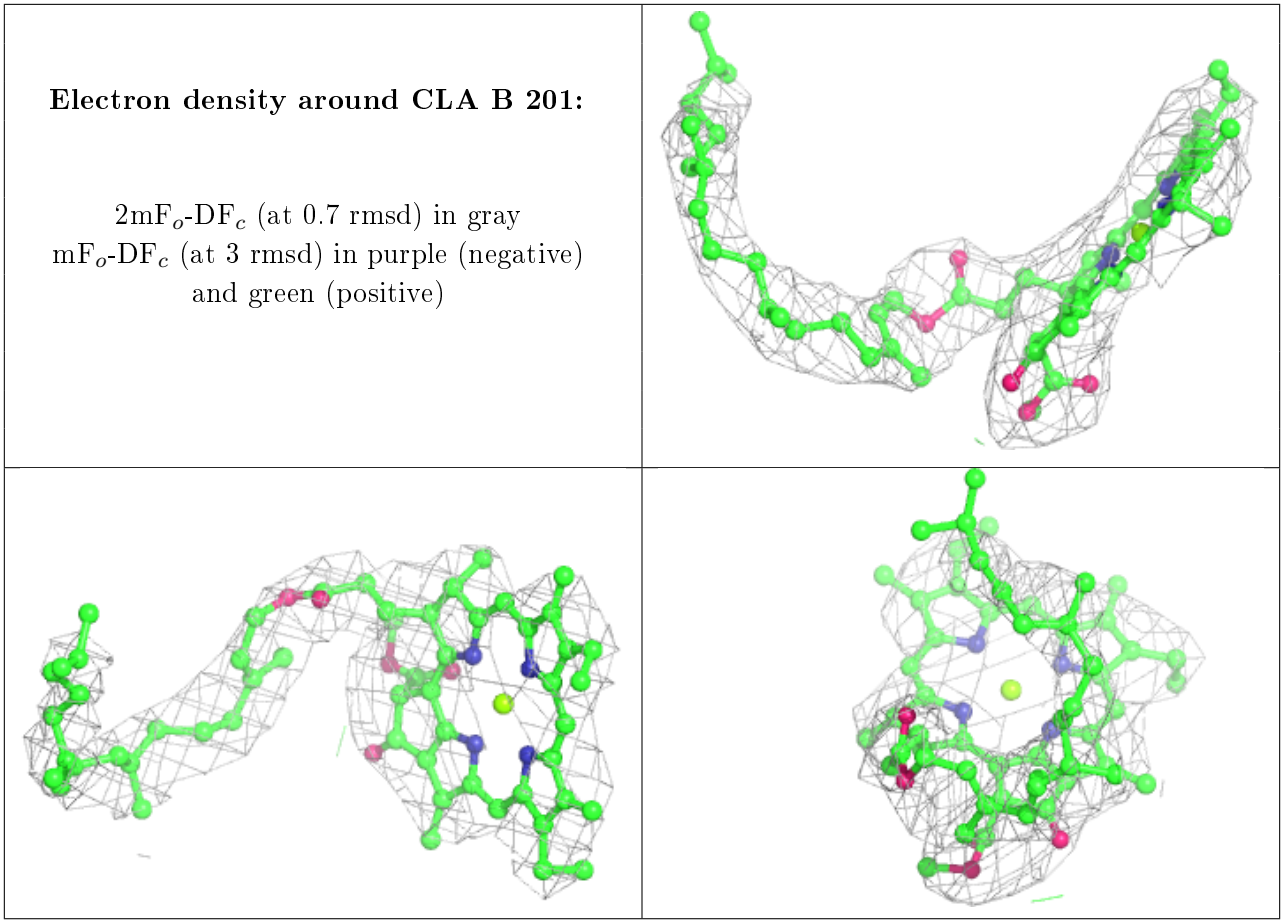






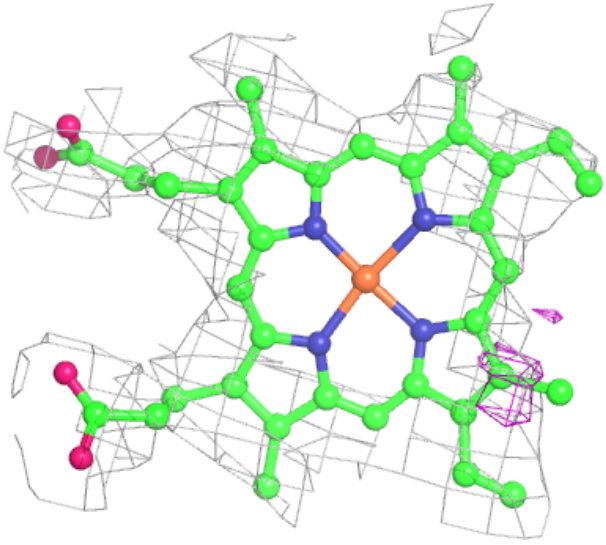
Electron density around CLA B 201:

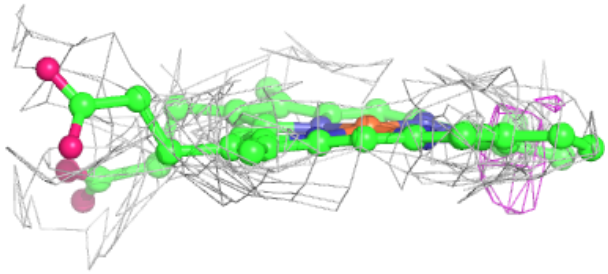
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

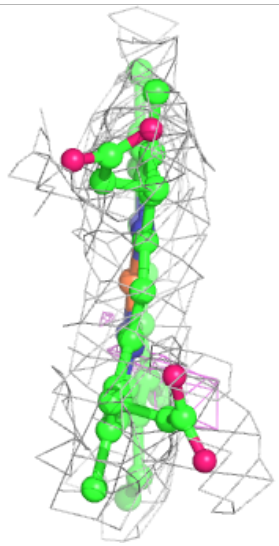


Electron density around HEM C 301:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

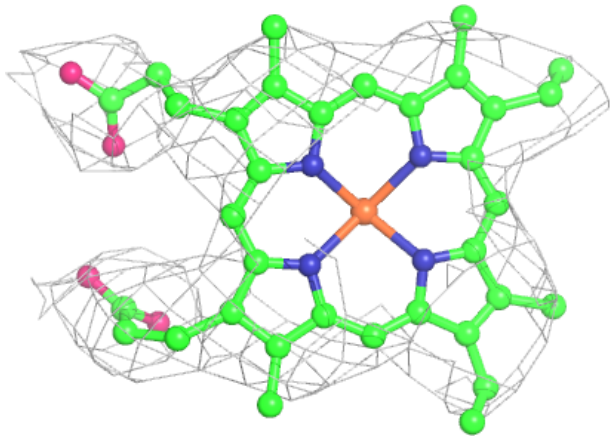


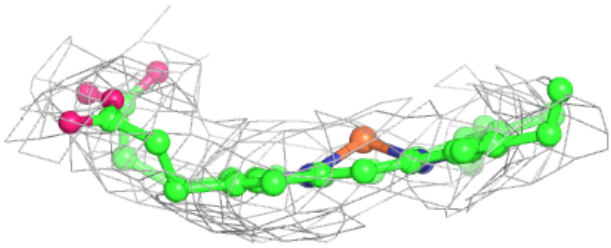


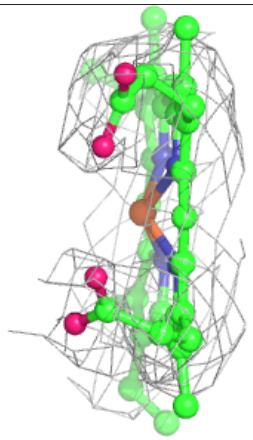


Electron density around HEM A 303:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

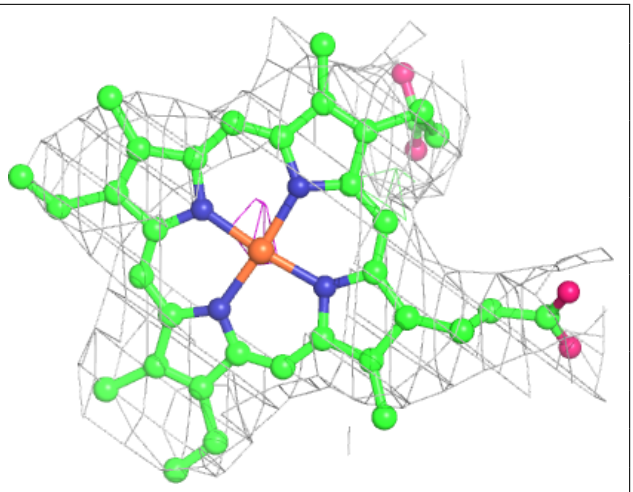


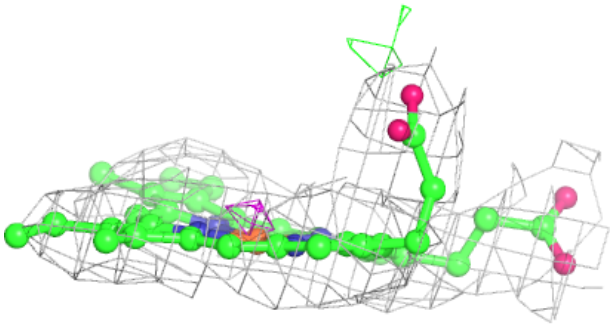


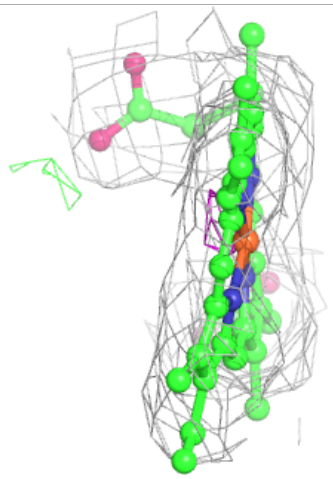


Electron density around HEM A 302:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

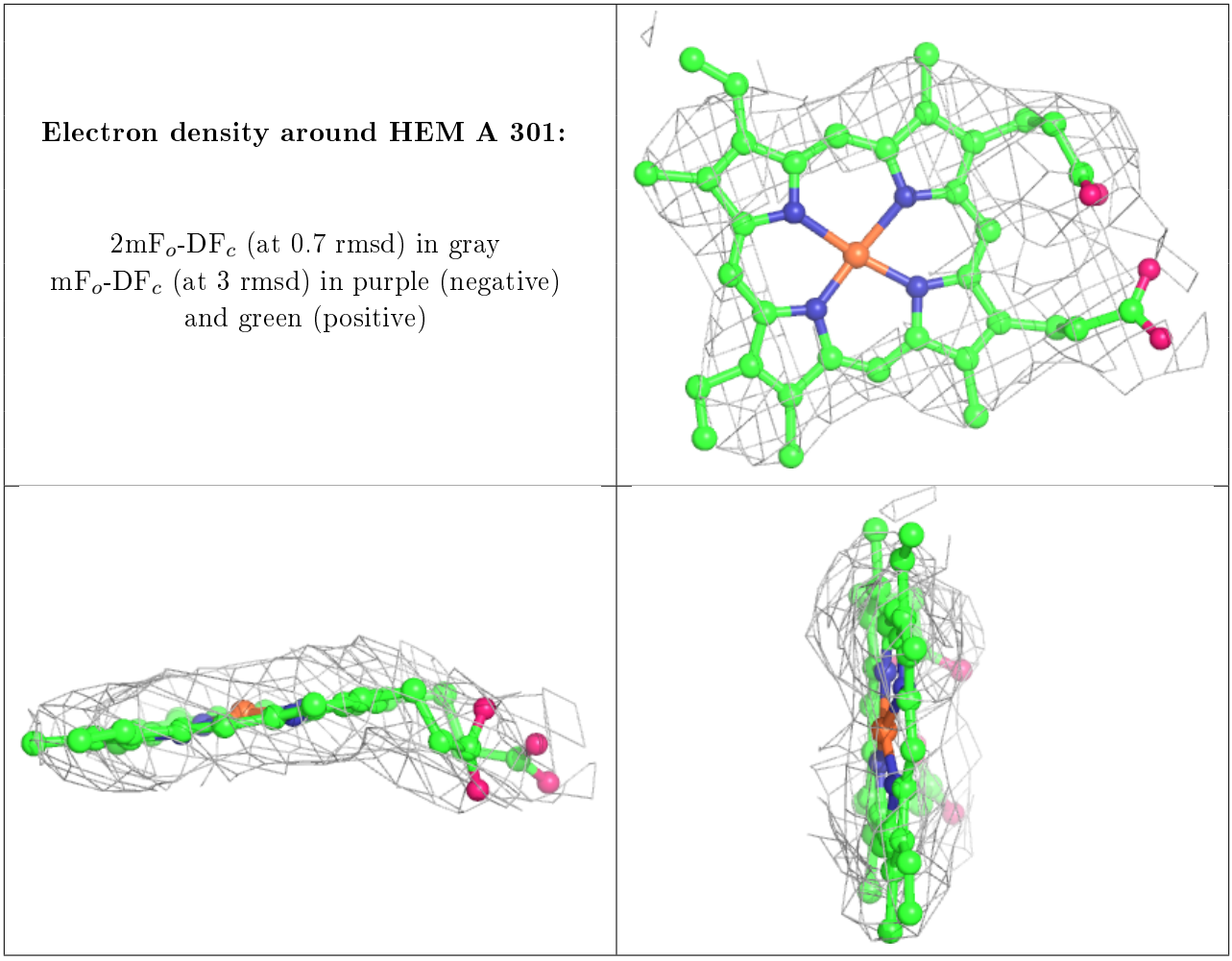






Electron density around HEM A 301:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



6.5 Other polymers

There are no such residues in this entry.