



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:11 AM UTC

PDB ID : 6H5L / pdb_00006h5l
Title : Kuenenia stuttgartiensis reducing HAO-like protein complex
Kustc0457/Kustc0458
Authors : Dietl, A.; Maalcke, W.; Barends, T.R.M.
Deposited on : 2018-07-25
Resolution : 2.60 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

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

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:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

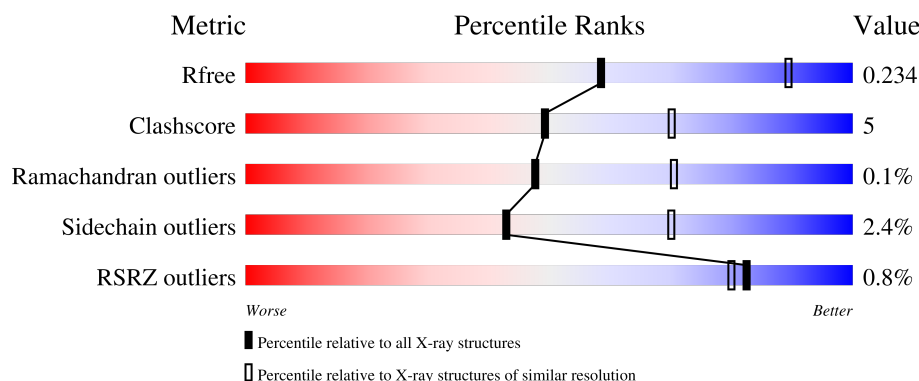
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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}	180053	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (2.60-2.60)

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 of 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 $\leq 5\%$. 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	517	 85% 13% ..
2	B	226	 85% 12% .

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 6471 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.

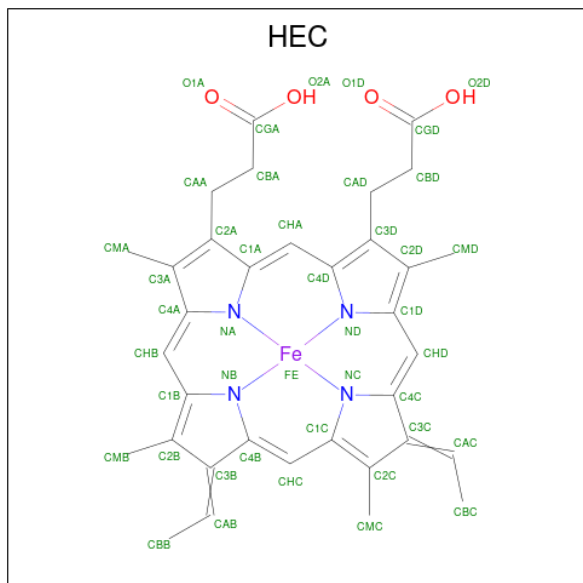
- Molecule 1 is a protein called Similar to hydroxylamine oxidoreductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	506	Total	C	N	O	S	0	0	0
			4107	2598	711	764	34			

- Molecule 2 is a protein called Conserved hypothetical cytochrome protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	220	Total	C	N	O	S	0	0	0
			1737	1105	285	339	8			

- Molecule 3 is HEME C (CCD ID: HEC) (formula: $C_{34}H_{34}FeN_4O_4$).



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

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

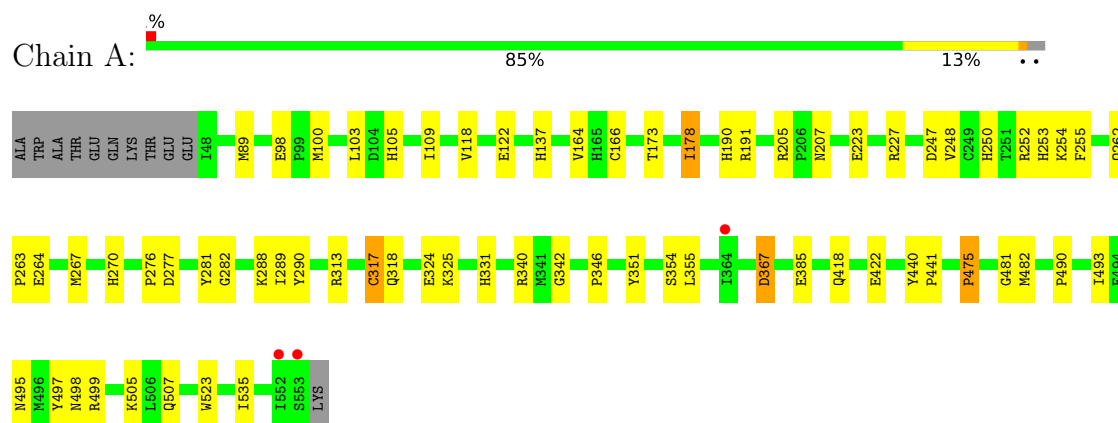
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	144	Total 144	O 144	0	0
4	B	53	Total 53	O 53	0	0

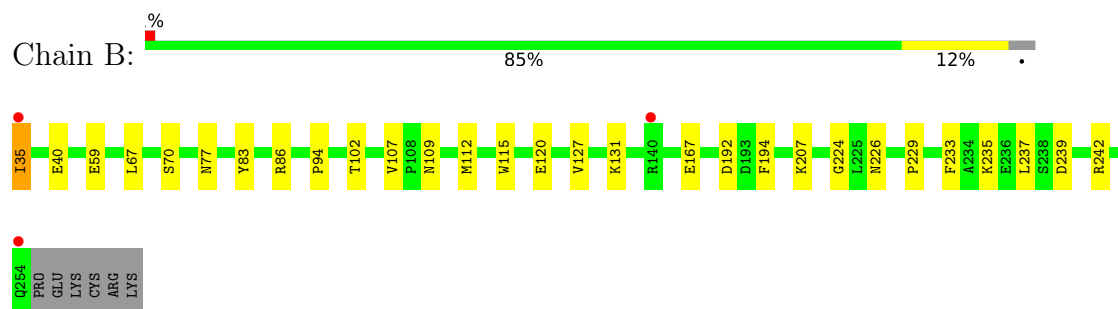
3 Residue-property plots [i](#)

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



- Molecule 2: Conserved hypothetical cytochrome protein



4 Data and refinement statistics

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, α , β , γ	140.20Å 140.20Å 262.11Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	59.14 – 2.60 59.14 – 2.60	Depositor EDS
% Data completeness (in resolution range)	94.5 (59.14-2.60) 94.6 (59.14-2.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.05 (at 2.61Å)	Xtriage
Refinement program	PHENIX (1.13_2998: ???)	Depositor
R, R_{free}	0.189 , 0.234 0.190 , 0.234	Depositor DCC
R_{free} test set	1471 reflections (4.76%)	wwPDB-VP
Wilson B-factor (Å ²)	28.6	Xtriage
Anisotropy	0.413	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 41.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	6471	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.65% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: HEC

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	0.21	0/4230	0.41	3/5732 (0.1%)
2	B	0.11	0/1785	0.31	0/2420
All	All	0.18	0/6015	0.38	3/8152 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	475	PRO	CA-C-N	7.56	135.58	121.97
1	A	475	PRO	C-N-CA	7.56	135.58	121.97
1	A	475	PRO	N-CA-C	5.35	119.97	111.26

There are no chirality outliers.

There are no planarity outliers.

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	4107	0	3876	46	0
2	B	1737	0	1676	20	0
3	A	344	0	240	12	0
3	B	86	0	60	6	0
4	A	144	0	0	0	0
4	B	53	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	6471	0	5852	65	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 5.

All (65) 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:367:ASP:OD1	1:A:367:ASP:N	2.19	0.76
1:A:103:LEU:HD21	3:A:601:HEC:HBC2	1.67	0.74
2:B:86:ARG:NH2	2:B:224:GLY:O	2.22	0.71
1:A:482:MET:HE1	1:A:499:ARG:HA	1.72	0.71
1:A:137:HIS:HB3	1:A:164:VAL:HB	1.77	0.66
2:B:239:ASP:OD1	2:B:242:ARG:NH2	2.33	0.61
2:B:86:ARG:HH21	2:B:226:ASN:H	1.49	0.60
1:A:255:PHE:CE2	3:A:602:HEC:HBC2	2.40	0.56
2:B:102:THR:HG21	3:B:302:HEC:HBA2	1.87	0.56
1:A:481:GLY:HA3	1:A:490:PRO:HG3	1.88	0.56
1:A:118:VAL:O	1:A:122:GLU:HB2	2.06	0.54
1:A:276:PRO:HG3	1:A:507:GLN:HG2	1.90	0.53
1:A:318:GLN:OE1	1:A:318:GLN:N	2.39	0.53
2:B:233:PHE:CZ	3:B:301:HEC:HBB2	2.44	0.52
2:B:109:ASN:ND2	2:B:207:LYS:O	2.40	0.52
1:A:247:ASP:OD2	1:A:252:ARG:HG3	2.10	0.51
2:B:112:MET:HE1	3:B:302:HEC:NB	2.25	0.51
2:B:112:MET:HE1	3:B:302:HEC:C4B	2.41	0.51
1:A:190:HIS:CD2	3:A:603:HEC:NB	2.79	0.50
1:A:493:ILE:HD11	1:A:535:ILE:HG23	1.94	0.50
2:B:107:VAL:HG23	2:B:112:MET:HG2	1.94	0.49
1:A:440:TYR:CG	1:A:441:PRO:HD2	2.48	0.48
1:A:270:HIS:HB3	1:A:277:ASP:HB2	1.96	0.48
2:B:229:PRO:HG2	3:B:301:HEC:HMD1	1.96	0.48
1:A:281:TYR:HB3	3:A:607:HEC:HBB2	1.96	0.47
2:B:77:ASN:HB3	2:B:194:PHE:CE1	2.48	0.47
1:A:263:PRO:HD2	1:A:290:TYR:CZ	2.49	0.47
1:A:252:ARG:HD2	1:A:253:HIS:CE1	2.50	0.47
1:A:354:SER:OG	1:A:422:GLU:OE1	2.30	0.46
1:A:264:GLU:HA	1:A:267:MET:HG3	1.97	0.46
1:A:418:GLN:HB2	1:A:497:TYR:CZ	2.50	0.46
1:A:264:GLU:HG3	1:A:267:MET:HE2	1.97	0.46
1:A:205:ARG:HD2	3:A:604:HEC:O1A	2.16	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:192:ASP:HB3	2:B:194:PHE:H	1.81	0.45
1:A:109:ILE:HD11	1:A:178:ILE:HD12	1.98	0.45
1:A:346:PRO:O	1:A:351:TYR:OH	2.33	0.45
1:A:317:CYS:HA	3:A:607:HEC:CHC	2.47	0.45
1:A:207:ASN:O	3:A:606:HEC:HBD1	2.16	0.44
1:A:89:MET:HE2	1:A:98:GLU:HB2	1.99	0.43
1:A:282:GLY:O	1:A:288:LYS:HE2	2.18	0.43
2:B:237:LEU:O	2:B:242:ARG:NH1	2.50	0.43
1:A:331:HIS:HE1	3:A:605:HEC:C4B	2.31	0.43
1:A:495:ASN:HA	1:A:498:ASN:HB2	2.01	0.43
2:B:115:TRP:CE2	3:B:302:HEC:HBB2	2.53	0.43
1:A:482:MET:SD	1:A:498:ASN:HB3	2.58	0.43
1:A:191:ARG:HA	1:A:191:ARG:HD2	1.78	0.43
2:B:127:VAL:O	2:B:131:LYS:HG3	2.19	0.43
1:A:164:VAL:HG22	3:A:603:HEC:HBC2	2.00	0.42
1:A:355:LEU:HD21	1:A:475:PRO:HG2	2.01	0.42
2:B:112:MET:HE3	2:B:112:MET:HA	2.01	0.42
1:A:289:ILE:HG21	1:A:313:ARG:HD3	2.01	0.42
1:A:223:GLU:O	1:A:227:ARG:HG3	2.20	0.41
1:A:100:MET:HE1	1:A:105:HIS:CE1	2.55	0.41
2:B:86:ARG:HG2	2:B:94:PRO:HB3	2.02	0.41
1:A:385:GLU:HG2	2:B:70:SER:HA	2.01	0.41
1:A:281:TYR:CE1	3:A:607:HEC:HMC2	2.56	0.41
1:A:324:GLU:HG2	1:A:325:LYS:HG2	2.03	0.41
2:B:35:ILE:HG13	2:B:120:GLU:HG2	2.01	0.41
2:B:83:TYR:CG	2:B:94:PRO:HG3	2.56	0.41
1:A:440:TYR:CD1	1:A:441:PRO:HD2	2.56	0.41
1:A:137:HIS:CD2	3:A:603:HEC:ND	2.89	0.41
1:A:331:HIS:HE1	3:A:605:HEC:NB	2.19	0.40
1:A:523:TRP:N	1:A:523:TRP:CD1	2.89	0.40
1:A:342:GLY:O	1:A:505:LYS:NZ	2.51	0.40
1:A:354:SER:HG	1:A:422:GLU:CD	2.26	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	504/517 (98%)	488 (97%)	15 (3%)	1 (0%)	43	66
2	B	218/226 (96%)	216 (99%)	2 (1%)	0	100	100
All	All	722/743 (97%)	704 (98%)	17 (2%)	1 (0%)	48	70

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	340	ARG

5.3.2 Protein sidechains ⓘ

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	438/447 (98%)	429 (98%)	9 (2%)	47	73
2	B	192/198 (97%)	186 (97%)	6 (3%)	35	63
All	All	630/645 (98%)	615 (98%)	15 (2%)	43	70

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	166	CYS
1	A	173	THR
1	A	178	ILE
1	A	248	VAL
1	A	250	HIS
1	A	254	LYS
1	A	262	GLN
1	A	317	CYS
1	A	367	ASP
2	B	35	ILE
2	B	40	GLU

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Mol	Chain	Res	Type
2	B	59	GLU
2	B	67	LEU
2	B	167	GLU
2	B	235	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	139	HIS
1	A	275	HIS
1	A	461	ASN
1	A	487	GLN

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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

10 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	HEC	A	608	1	46,50,50	1.86	5 (10%)	58,82,82	1.80	4 (6%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	HEC	A	601	1	46,50,50	1.85	5 (10%)	58,82,82	1.83	4 (6%)
3	HEC	A	604	4,1	46,50,50	1.89	7 (15%)	58,82,82	1.76	5 (8%)
3	HEC	A	607	1	46,50,50	1.84	5 (10%)	58,82,82	1.91	4 (6%)
3	HEC	B	302	2	46,50,50	1.85	6 (13%)	58,82,82	1.99	6 (10%)
3	HEC	A	602	1	46,50,50	1.84	6 (13%)	58,82,82	1.84	3 (5%)
3	HEC	A	606	1	46,50,50	1.84	6 (13%)	58,82,82	1.94	5 (8%)
3	HEC	A	605	1	46,50,50	1.82	5 (10%)	58,82,82	1.93	3 (5%)
3	HEC	A	603	1	46,50,50	1.84	6 (13%)	58,82,82	1.93	4 (6%)
3	HEC	B	301	2	46,50,50	1.85	6 (13%)	58,82,82	1.83	4 (6%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	HEC	A	608	1	-	9/14/54/54	-
3	HEC	A	601	1	-	6/14/54/54	-
3	HEC	A	604	4,1	-	10/14/54/54	-
3	HEC	A	607	1	-	9/14/54/54	-
3	HEC	B	302	2	-	8/14/54/54	-
3	HEC	A	602	1	-	8/14/54/54	-
3	HEC	A	606	1	-	8/14/54/54	-
3	HEC	A	605	1	-	4/14/54/54	-
3	HEC	A	603	1	-	6/14/54/54	-
3	HEC	B	301	2	-	4/14/54/54	-

All (57) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	604	HEC	CAB-C3B	6.52	1.56	1.35
3	A	608	HEC	CAC-C3C	6.36	1.55	1.35
3	A	601	HEC	CAC-C3C	6.33	1.55	1.35
3	A	604	HEC	CAC-C3C	6.31	1.55	1.35
3	A	603	HEC	CAC-C3C	6.27	1.55	1.35
3	B	301	HEC	CAC-C3C	6.25	1.55	1.35
3	A	602	HEC	CAC-C3C	6.25	1.55	1.35
3	A	607	HEC	CAC-C3C	6.21	1.55	1.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	301	HEC	CAB-C3B	6.21	1.55	1.35
3	B	302	HEC	CAC-C3C	6.20	1.55	1.35
3	B	302	HEC	CAB-C3B	6.20	1.55	1.35
3	A	606	HEC	CAC-C3C	6.20	1.55	1.35
3	A	606	HEC	CAB-C3B	6.19	1.55	1.35
3	A	608	HEC	CAB-C3B	6.18	1.55	1.35
3	A	602	HEC	CAB-C3B	6.17	1.55	1.35
3	A	605	HEC	CAB-C3B	6.16	1.55	1.35
3	A	601	HEC	CAB-C3B	6.14	1.54	1.35
3	A	605	HEC	CAC-C3C	6.12	1.54	1.35
3	A	607	HEC	CAB-C3B	6.11	1.54	1.35
3	A	603	HEC	CAB-C3B	6.10	1.54	1.35
3	A	604	HEC	C3D-C2D	5.95	1.54	1.38
3	B	301	HEC	C3D-C2D	5.81	1.54	1.38
3	A	608	HEC	C3D-C2D	5.81	1.54	1.38
3	A	601	HEC	C3D-C2D	5.78	1.54	1.38
3	A	606	HEC	C3D-C2D	5.77	1.53	1.38
3	A	603	HEC	C3D-C2D	5.75	1.53	1.38
3	A	607	HEC	C3D-C2D	5.75	1.53	1.38
3	B	302	HEC	C3D-C2D	5.74	1.53	1.38
3	A	605	HEC	C3D-C2D	5.59	1.53	1.38
3	A	602	HEC	C3D-C2D	5.57	1.53	1.38
3	A	601	HEC	CMC-C2C	2.23	1.55	1.50
3	B	301	HEC	CMC-C2C	2.19	1.55	1.50
3	A	604	HEC	CMB-C2B	2.18	1.55	1.50
3	A	603	HEC	CMC-C2C	2.18	1.55	1.50
3	A	604	HEC	CMC-C2C	2.17	1.55	1.50
3	A	607	HEC	C3B-C2B	-2.16	1.33	1.41
3	B	302	HEC	CMA-C3A	2.13	1.55	1.50
3	A	608	HEC	CMB-C2B	2.12	1.55	1.50
3	A	606	HEC	CMB-C2B	2.11	1.55	1.50
3	A	601	HEC	CMB-C2B	2.09	1.55	1.50
3	A	605	HEC	CMC-C2C	2.09	1.55	1.50
3	A	602	HEC	CMA-C3A	2.08	1.55	1.50
3	A	606	HEC	CMC-C2C	2.08	1.55	1.50
3	A	602	HEC	C3B-C2B	-2.08	1.34	1.41
3	A	607	HEC	C3C-C2C	-2.07	1.34	1.41
3	B	301	HEC	CMB-C2B	2.06	1.55	1.50
3	A	602	HEC	CMC-C2C	2.06	1.55	1.50
3	B	301	HEC	CMA-C3A	2.06	1.55	1.50
3	B	302	HEC	CMC-C2C	2.05	1.55	1.50
3	B	302	HEC	C3B-C2B	-2.05	1.34	1.41

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	605	HEC	C3B-C2B	-2.04	1.34	1.41
3	A	603	HEC	C3B-C2B	-2.04	1.34	1.41
3	A	608	HEC	CMC-C2C	2.03	1.54	1.50
3	A	604	HEC	CMD-C2D	2.02	1.54	1.50
3	A	606	HEC	C3B-C2B	-2.02	1.34	1.41
3	A	603	HEC	CMA-C3A	2.01	1.54	1.50
3	A	604	HEC	CMA-C3A	2.01	1.54	1.50

All (42) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	606	HEC	CBC-CAC-C3C	-8.95	109.56	127.43
3	A	605	HEC	CBC-CAC-C3C	-8.74	109.97	127.43
3	B	302	HEC	CBC-CAC-C3C	-8.62	110.21	127.43
3	A	607	HEC	CBC-CAC-C3C	-8.48	110.48	127.43
3	A	603	HEC	CBB-CAB-C3B	-8.48	110.49	127.43
3	A	603	HEC	CBC-CAC-C3C	-8.45	110.55	127.43
3	A	602	HEC	CBB-CAB-C3B	-8.43	110.58	127.43
3	B	301	HEC	CBC-CAC-C3C	-8.43	110.59	127.43
3	A	605	HEC	CBB-CAB-C3B	-8.40	110.64	127.43
3	B	302	HEC	CBB-CAB-C3B	-8.32	110.80	127.43
3	A	601	HEC	CBB-CAB-C3B	-8.06	111.32	127.43
3	A	604	HEC	CBC-CAC-C3C	-8.03	111.39	127.43
3	A	608	HEC	CBB-CAB-C3B	-8.00	111.45	127.43
3	A	607	HEC	CBB-CAB-C3B	-7.82	111.81	127.43
3	A	602	HEC	CBC-CAC-C3C	-7.68	112.08	127.43
3	A	601	HEC	CBC-CAC-C3C	-7.67	112.10	127.43
3	A	606	HEC	CBB-CAB-C3B	-7.46	112.52	127.43
3	B	301	HEC	CBB-CAB-C3B	-7.41	112.62	127.43
3	A	608	HEC	CBC-CAC-C3C	-7.10	113.23	127.43
3	A	604	HEC	CBB-CAB-C3B	-5.13	117.18	127.43
3	A	601	HEC	C4D-ND-C1D	3.84	112.08	105.82
3	A	604	HEC	C4D-ND-C1D	3.77	111.97	105.82
3	A	607	HEC	C4D-ND-C1D	3.75	111.94	105.82
3	B	301	HEC	C4D-ND-C1D	3.73	111.91	105.82
3	A	603	HEC	C4D-ND-C1D	3.71	111.87	105.82
3	A	608	HEC	C4D-ND-C1D	3.66	111.78	105.82
3	B	302	HEC	C4D-ND-C1D	3.62	111.72	105.82
3	A	606	HEC	C4D-ND-C1D	3.60	111.69	105.82
3	A	605	HEC	C4D-ND-C1D	3.60	111.69	105.82
3	A	602	HEC	C4D-ND-C1D	3.57	111.64	105.82
3	A	604	HEC	C2A-C1A-NA	-3.26	107.18	110.32

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	607	HEC	C2A-C1A-NA	-2.96	107.46	110.32
3	A	604	HEC	CMB-C2B-C1B	-2.90	121.01	125.42
3	B	302	HEC	CAA-C2A-C3A	2.74	133.00	127.87
3	A	606	HEC	C2A-C1A-NA	-2.72	107.70	110.32
3	A	603	HEC	C2A-C1A-NA	-2.56	107.85	110.32
3	B	302	HEC	CBA-CAA-C2A	2.43	119.24	112.53
3	A	608	HEC	C2A-C1A-NA	-2.39	108.02	110.32
3	B	302	HEC	CAA-C2A-C1A	-2.39	120.00	124.85
3	B	301	HEC	C2A-C1A-NA	-2.33	108.08	110.32
3	A	606	HEC	CMC-C2C-C1C	-2.32	121.89	125.42
3	A	601	HEC	C2A-C1A-NA	-2.29	108.11	110.32

There are no chirality outliers.

All (72) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	601	HEC	C2B-C3B-CAB-CBB
3	A	601	HEC	C4B-C3B-CAB-CBB
3	A	601	HEC	C2C-C3C-CAC-CBC
3	A	601	HEC	C4C-C3C-CAC-CBC
3	A	602	HEC	C2B-C3B-CAB-CBB
3	A	602	HEC	C4B-C3B-CAB-CBB
3	A	602	HEC	C2C-C3C-CAC-CBC
3	A	602	HEC	C4C-C3C-CAC-CBC
3	A	603	HEC	C2B-C3B-CAB-CBB
3	A	603	HEC	C4B-C3B-CAB-CBB
3	A	603	HEC	C2C-C3C-CAC-CBC
3	A	604	HEC	C2B-C3B-CAB-CBB
3	A	604	HEC	C4B-C3B-CAB-CBB
3	A	604	HEC	C2C-C3C-CAC-CBC
3	A	604	HEC	C4C-C3C-CAC-CBC
3	A	605	HEC	C2B-C3B-CAB-CBB
3	A	605	HEC	C2C-C3C-CAC-CBC
3	A	606	HEC	C2B-C3B-CAB-CBB
3	A	606	HEC	C4B-C3B-CAB-CBB
3	A	607	HEC	C2B-C3B-CAB-CBB
3	A	607	HEC	C4B-C3B-CAB-CBB
3	A	607	HEC	C2C-C3C-CAC-CBC
3	A	608	HEC	C2B-C3B-CAB-CBB
3	A	608	HEC	C4B-C3B-CAB-CBB
3	A	608	HEC	C2C-C3C-CAC-CBC
3	A	608	HEC	C4C-C3C-CAC-CBC

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Mol	Chain	Res	Type	Atoms
3	B	301	HEC	C2B-C3B-CAB-CBB
3	B	301	HEC	C4B-C3B-CAB-CBB
3	B	301	HEC	C2C-C3C-CAC-CBC
3	B	302	HEC	C2B-C3B-CAB-CBB
3	B	302	HEC	C4B-C3B-CAB-CBB
3	B	302	HEC	C2C-C3C-CAC-CBC
3	B	302	HEC	C3A-C2A-CAA-CBA
3	B	302	HEC	C1A-C2A-CAA-CBA
3	A	602	HEC	C1A-C2A-CAA-CBA
3	A	602	HEC	C3A-C2A-CAA-CBA
3	A	604	HEC	C2D-C3D-CAD-CBD
3	A	607	HEC	C2A-CAA-CBA-CGA
3	A	605	HEC	C4B-C3B-CAB-CBB
3	A	605	HEC	C4C-C3C-CAC-CBC
3	A	606	HEC	C4C-C3C-CAC-CBC
3	A	607	HEC	C4C-C3C-CAC-CBC
3	B	301	HEC	C4C-C3C-CAC-CBC
3	B	302	HEC	C4C-C3C-CAC-CBC
3	A	608	HEC	C3D-CAD-CBD-CGD
3	A	606	HEC	C2C-C3C-CAC-CBC
3	A	604	HEC	C2A-CAA-CBA-CGA
3	A	607	HEC	CAD-CBD-CGD-O1D
3	A	603	HEC	CAD-CBD-CGD-O1D
3	A	607	HEC	CAA-CBA-CGA-O2A
3	A	606	HEC	CAD-CBD-CGD-O1D
3	A	603	HEC	CAD-CBD-CGD-O2D
3	A	607	HEC	CAD-CBD-CGD-O2D
3	A	604	HEC	CAA-CBA-CGA-O1A
3	A	607	HEC	CAA-CBA-CGA-O1A
3	A	604	HEC	C4D-C3D-CAD-CBD
3	B	302	HEC	CAD-CBD-CGD-O2D
3	A	604	HEC	CAA-CBA-CGA-O2A
3	A	606	HEC	CAD-CBD-CGD-O2D
3	A	602	HEC	CAA-CBA-CGA-O2A
3	A	608	HEC	CAD-CBD-CGD-O2D
3	A	602	HEC	CAA-CBA-CGA-O1A
3	B	302	HEC	CAD-CBD-CGD-O1D
3	A	601	HEC	CAD-CBD-CGD-O2D
3	A	608	HEC	CAA-CBA-CGA-O2A
3	A	608	HEC	CAD-CBD-CGD-O1D
3	A	606	HEC	C2D-C3D-CAD-CBD
3	A	604	HEC	C1A-C2A-CAA-CBA

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Mol	Chain	Res	Type	Atoms
3	A	601	HEC	CAD-CBD-CGD-O1D
3	A	608	HEC	CAA-CBA-CGA-O1A
3	A	603	HEC	C4C-C3C-CAC-CBC
3	A	606	HEC	CAA-CBA-CGA-O2A

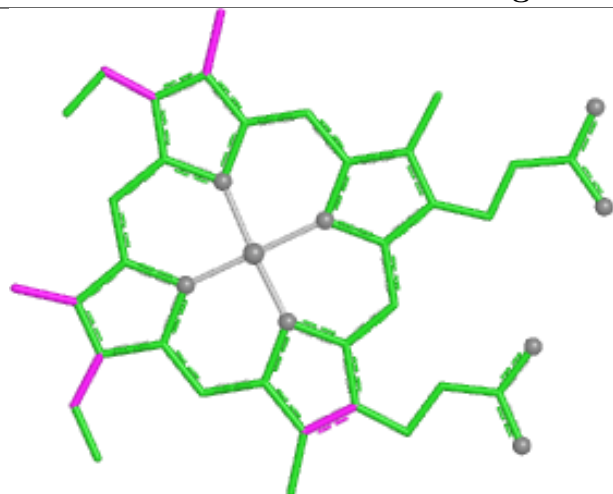
There are no ring outliers.

9 monomers are involved in 18 short contacts:

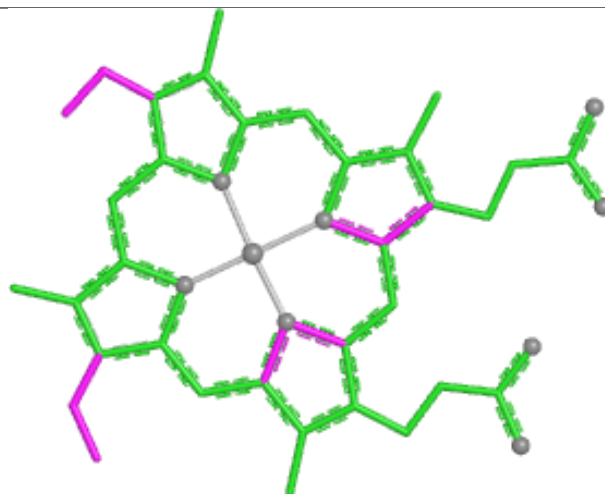
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	601	HEC	1	0
3	A	604	HEC	1	0
3	A	607	HEC	3	0
3	B	302	HEC	4	0
3	A	602	HEC	1	0
3	A	606	HEC	1	0
3	A	605	HEC	2	0
3	A	603	HEC	3	0
3	B	301	HEC	2	0

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

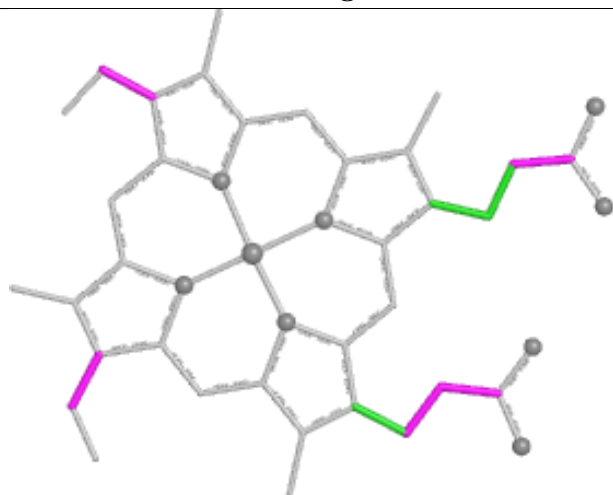
Ligand HEC A 608



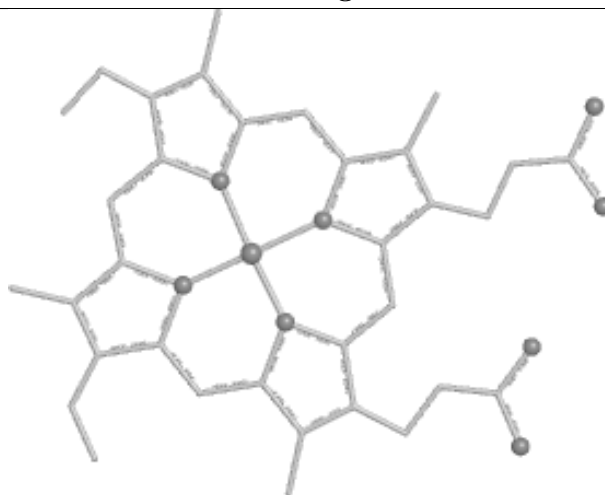
Bond lengths



Bond angles

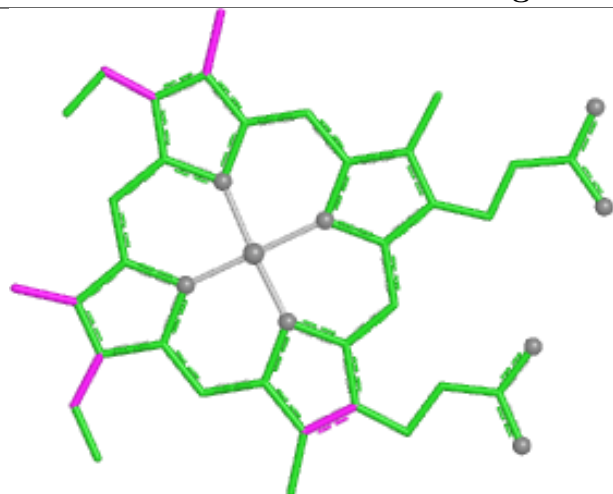


Torsions

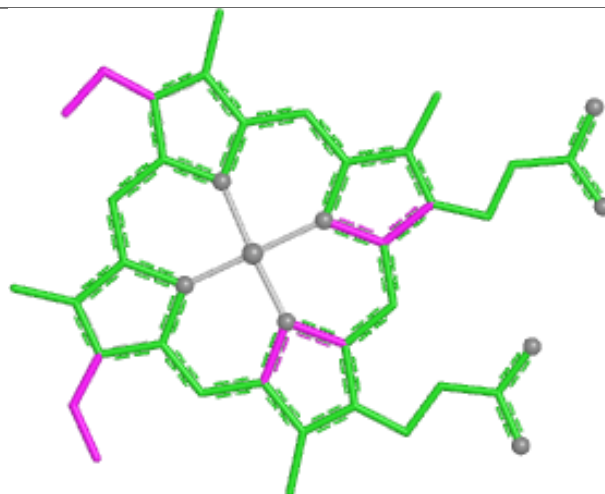


Rings

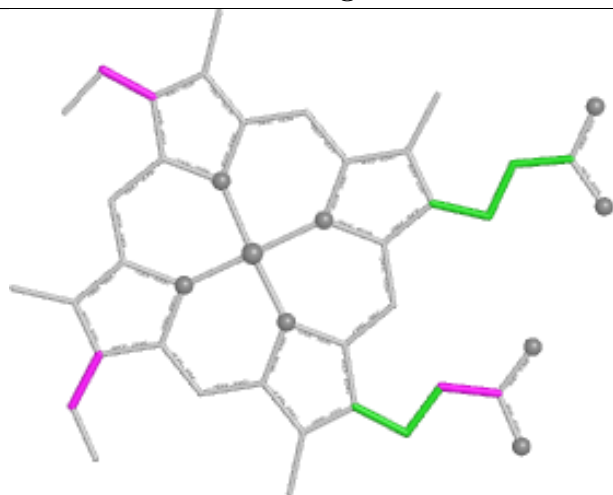
Ligand HEC A 601



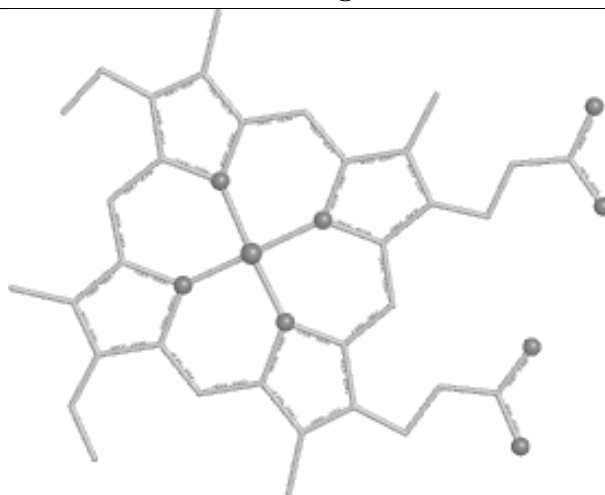
Bond lengths



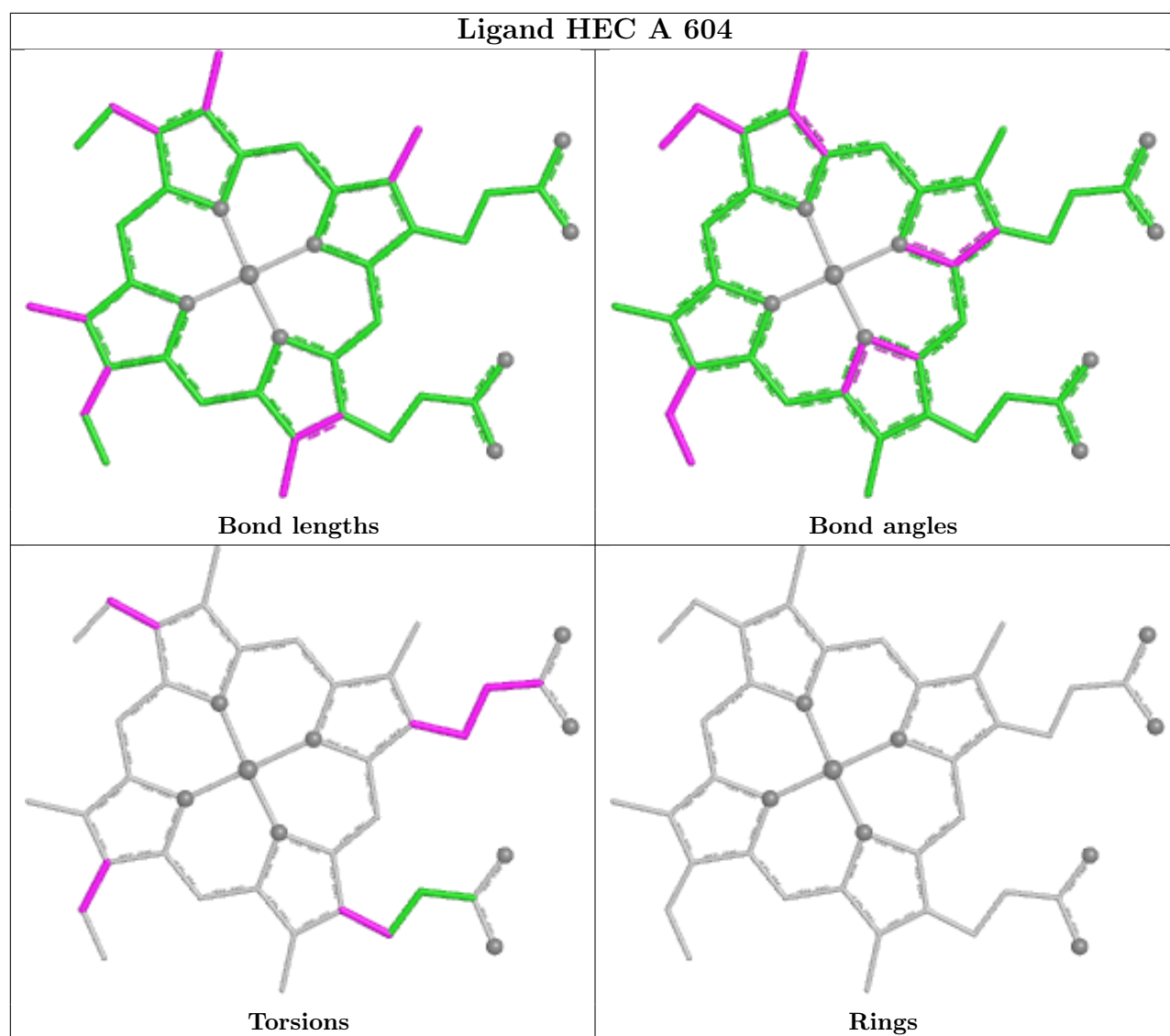
Bond angles



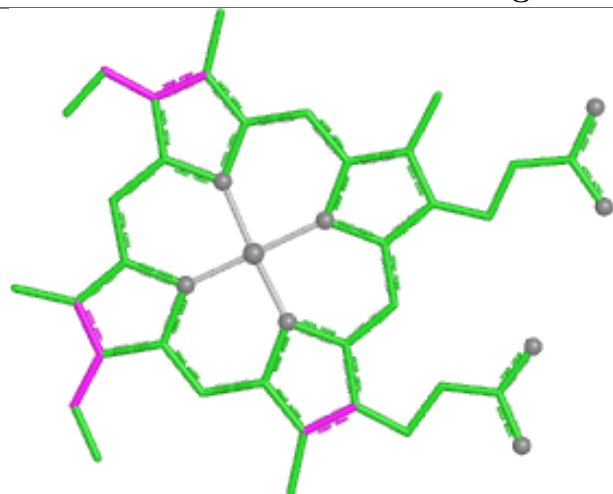
Torsions



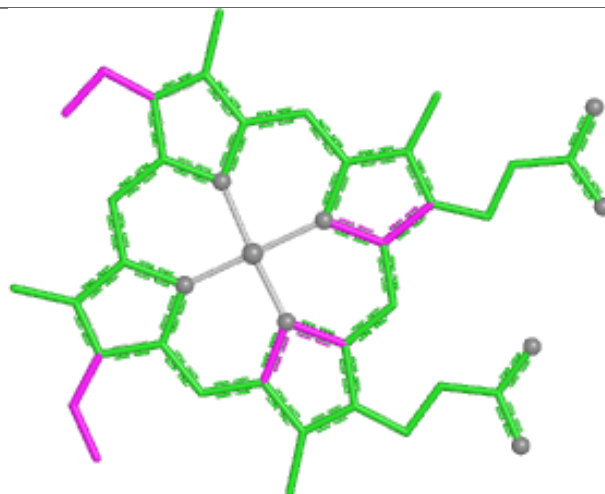
Rings



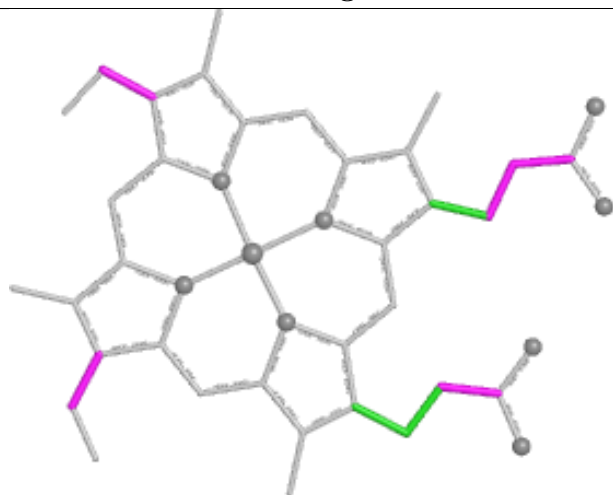
Ligand HEC A 607



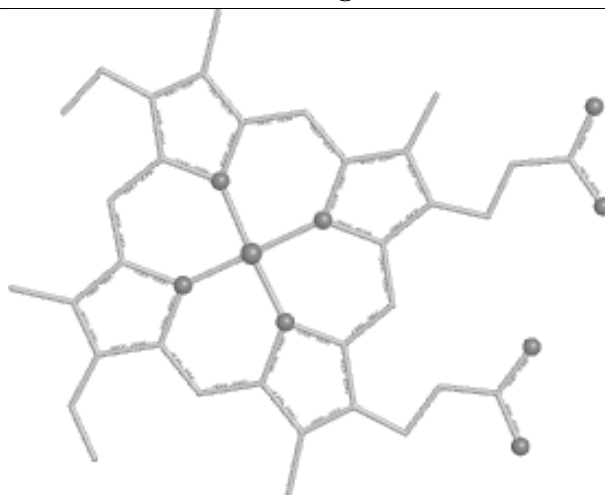
Bond lengths



Bond angles

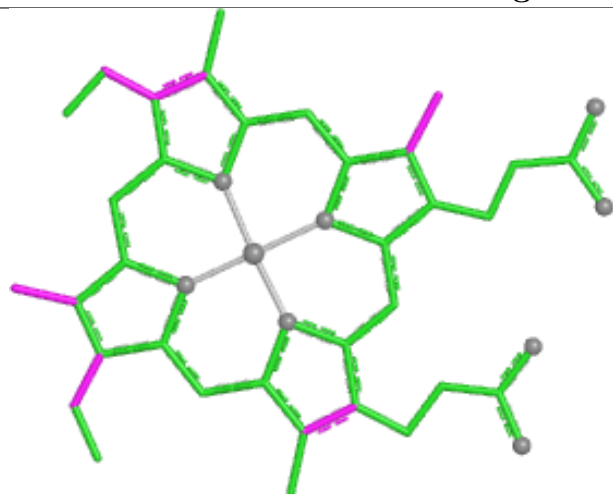


Torsions

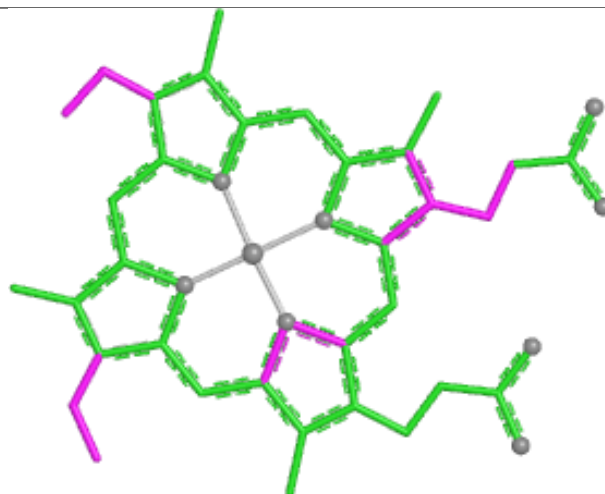


Rings

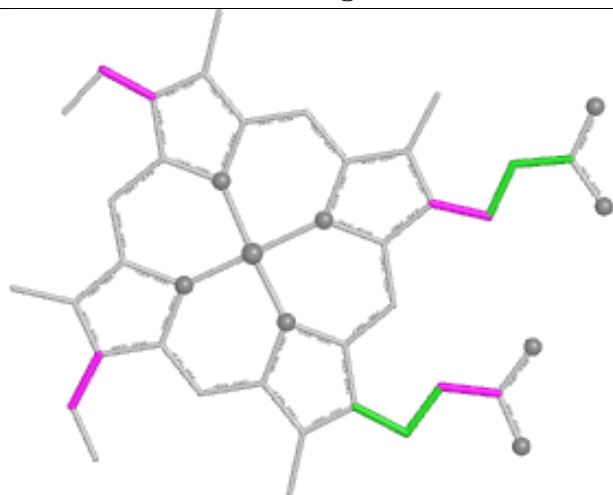
Ligand HEC B 302



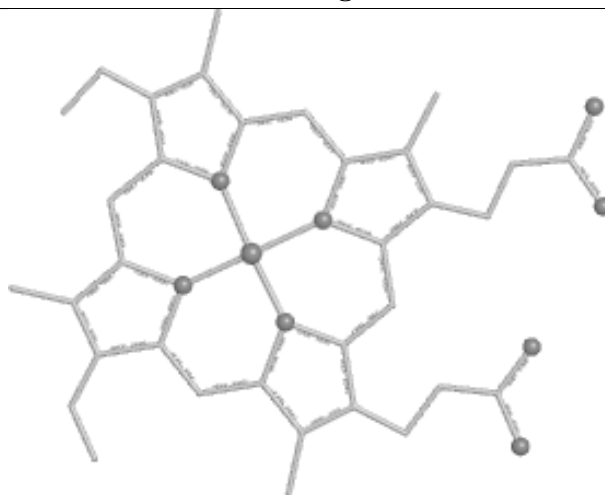
Bond lengths



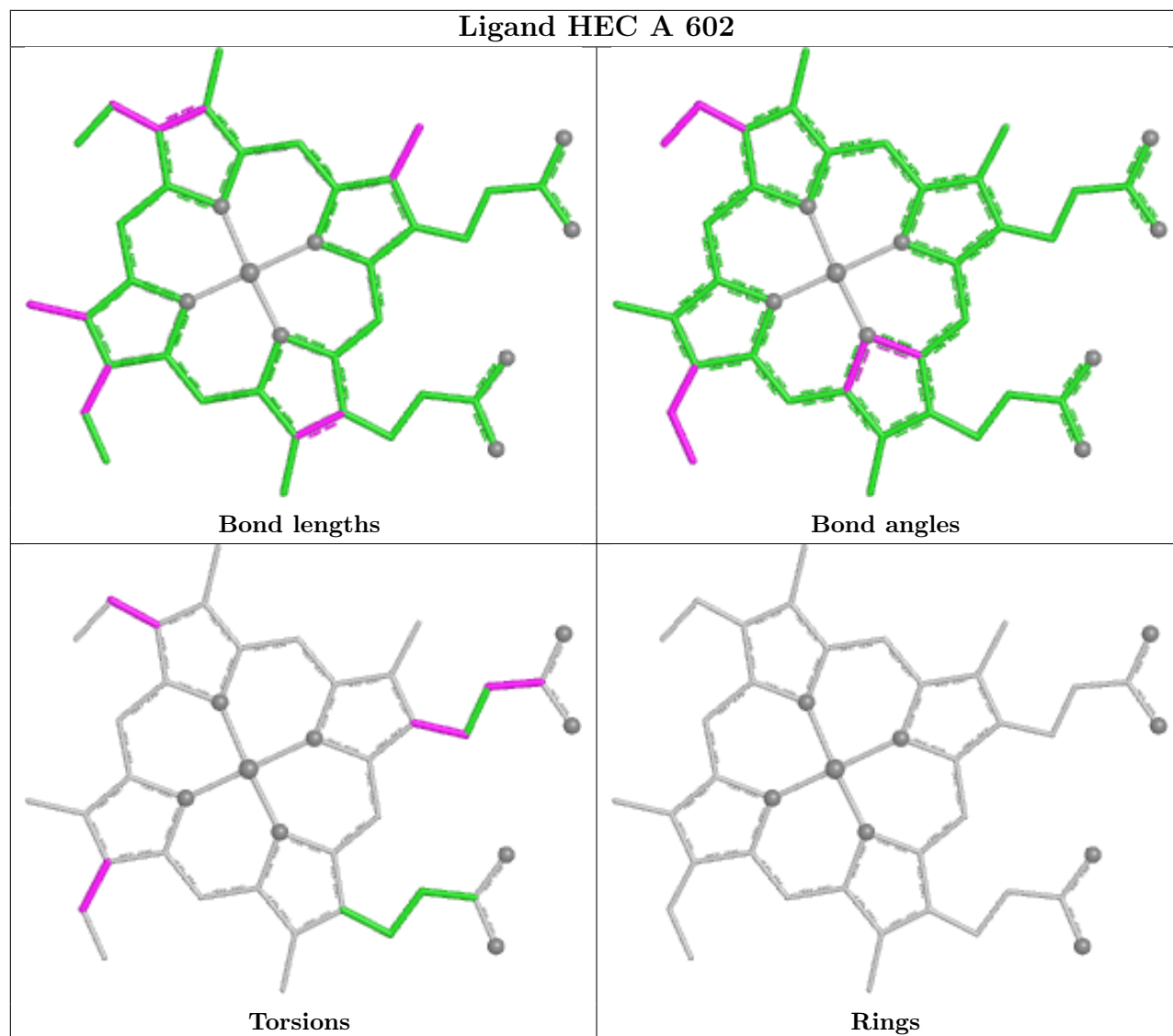
Bond angles



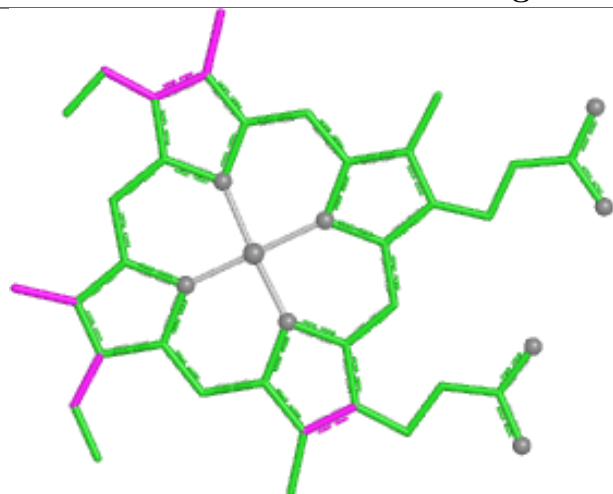
Torsions



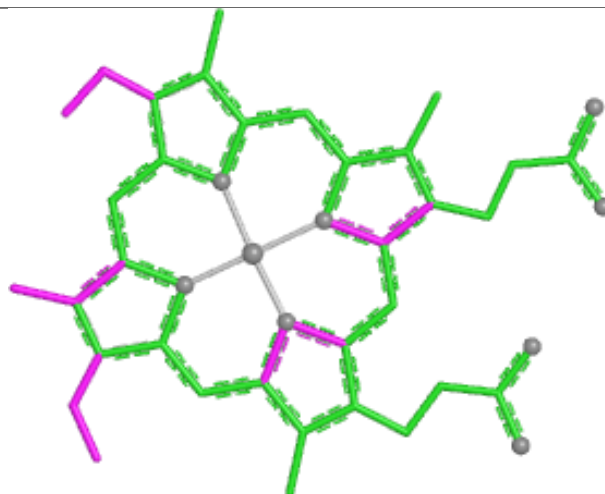
Rings



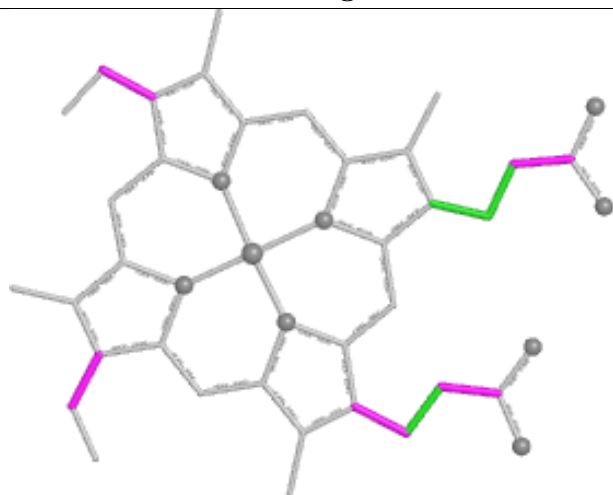
Ligand HEC A 606



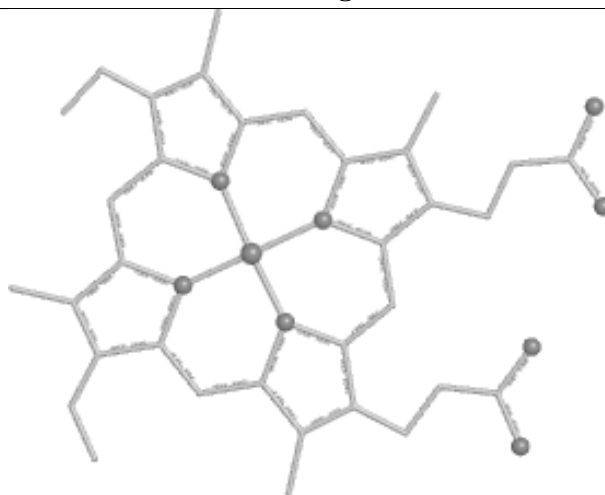
Bond lengths



Bond angles

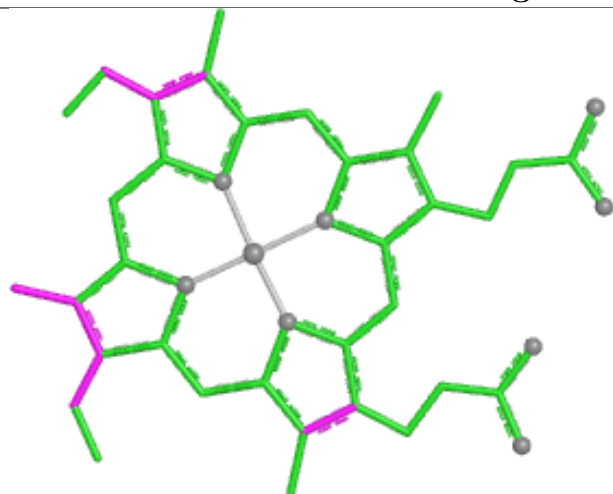


Torsions

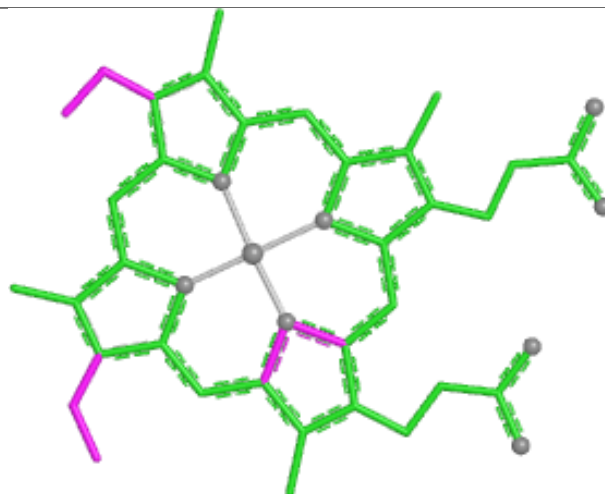


Rings

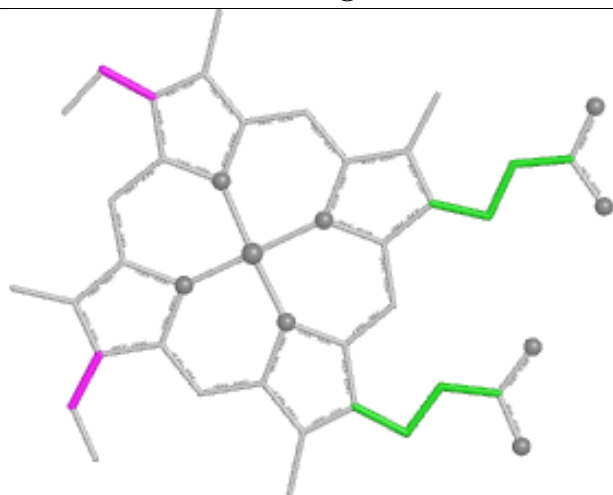
Ligand HEC A 605



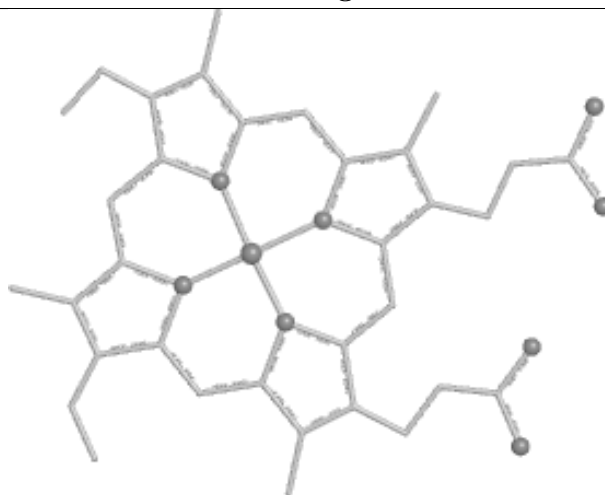
Bond lengths



Bond angles

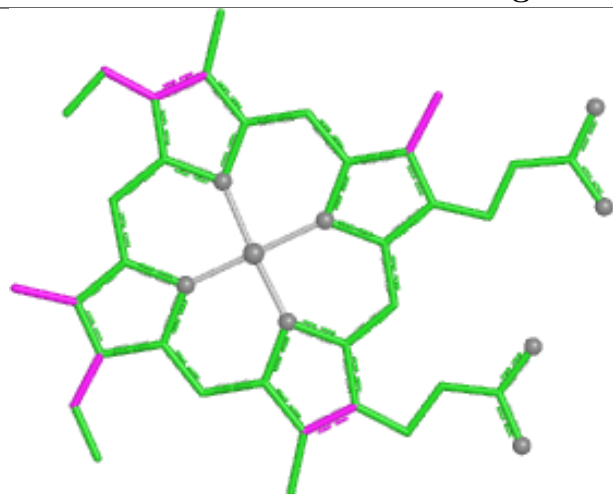


Torsions

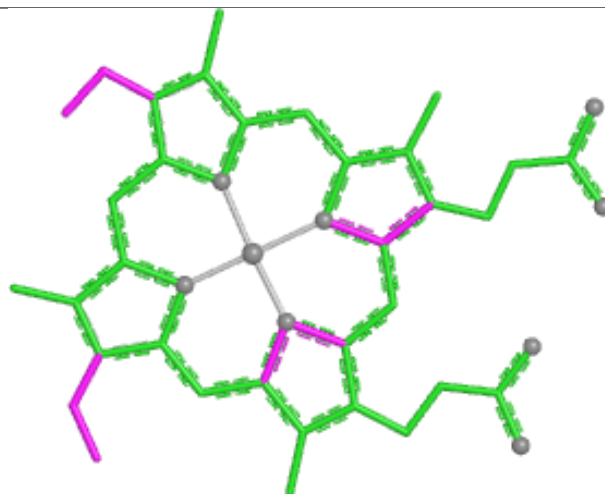


Rings

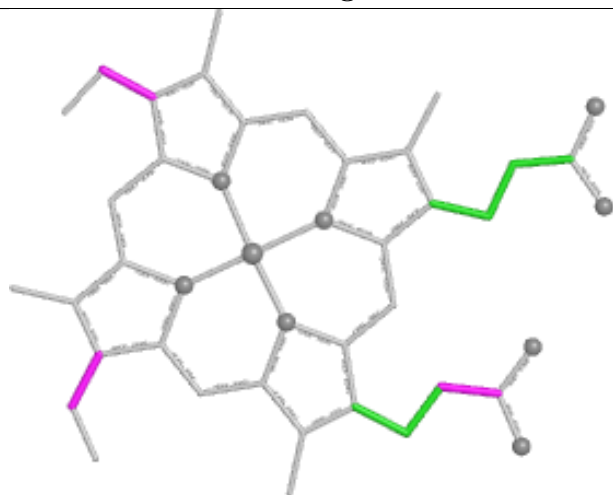
Ligand HEC A 603



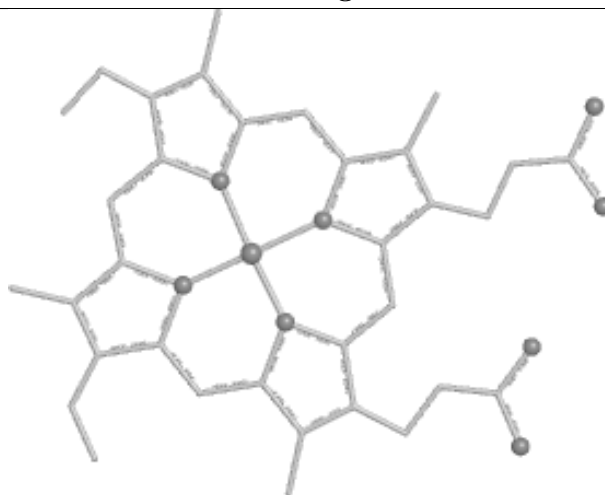
Bond lengths



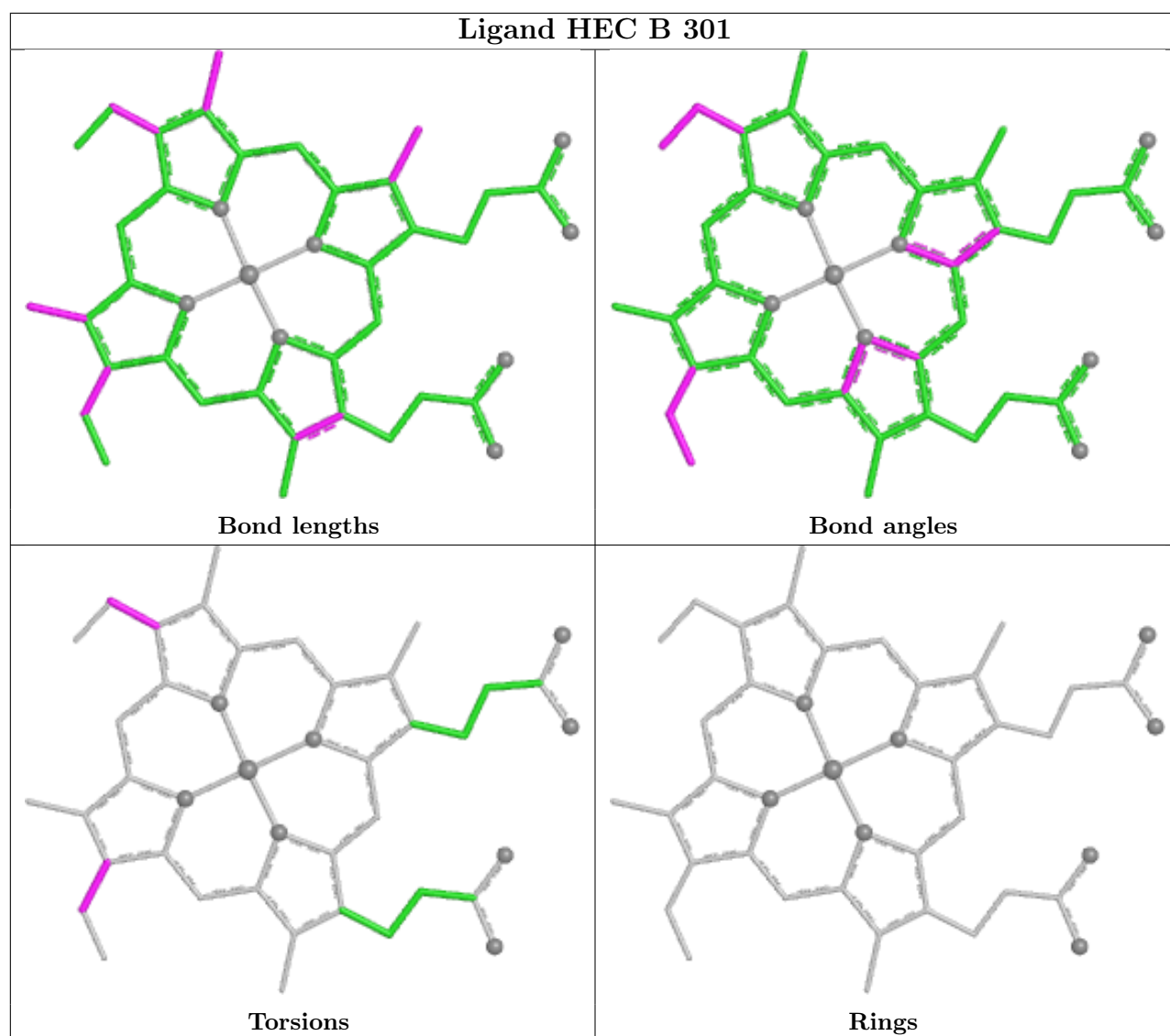
Bond angles



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 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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, 95th 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	506/517 (97%)	-0.35	3 (0%) 85 83	16, 27, 45, 74	0
2	B	220/226 (97%)	-0.05	3 (1%) 73 69	20, 36, 56, 69	0
All	All	726/743 (97%)	-0.26	6 (0%) 82 80	16, 29, 51, 74	0

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	552	ILE	2.9
1	A	553	SER	2.7
2	B	35	ILE	2.2
1	A	364	ILE	2.2
2	B	140	ARG	2.2
2	B	254	GLN	2.2

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

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

6.3 Carbohydrates [i](#)

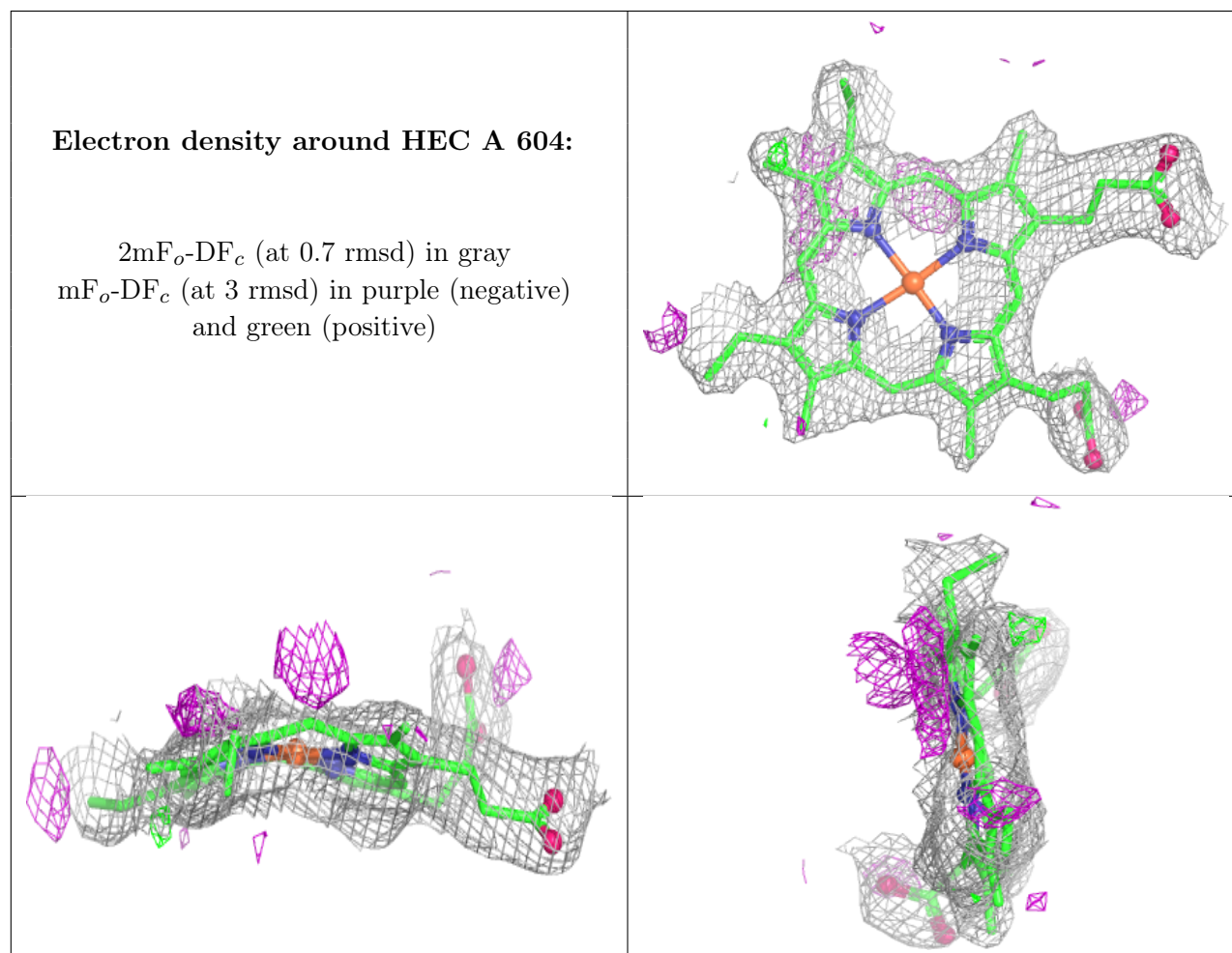
There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

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, 95th 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.

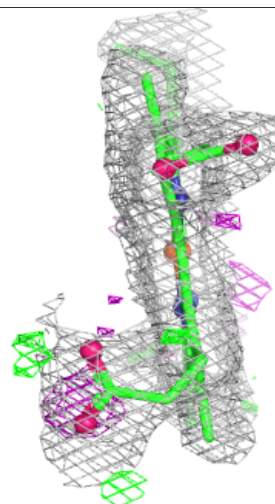
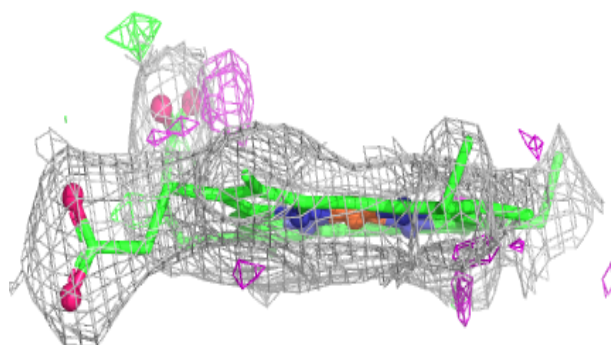
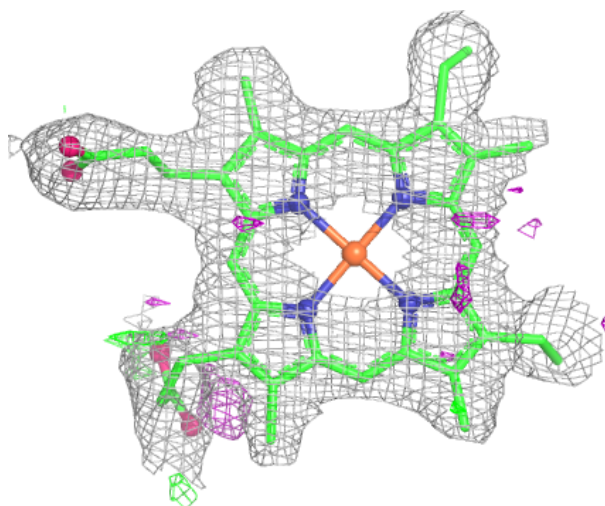
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	HEC	A	604	43/43	0.95	0.10	14,27,35,47	0
3	HEC	A	602	43/43	0.96	0.09	17,24,28,30	0
3	HEC	A	606	43/43	0.96	0.09	16,21,29,33	0
3	HEC	A	601	43/43	0.97	0.08	11,24,28,34	0
3	HEC	A	603	43/43	0.97	0.08	16,25,33,38	0
3	HEC	A	607	43/43	0.97	0.08	10,18,22,31	0
3	HEC	A	608	43/43	0.97	0.07	12,20,23,27	0
3	HEC	B	301	43/43	0.97	0.08	15,31,38,43	0
3	HEC	A	605	43/43	0.98	0.07	14,21,30,44	0
3	HEC	B	302	43/43	0.98	0.07	14,23,31,33	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.



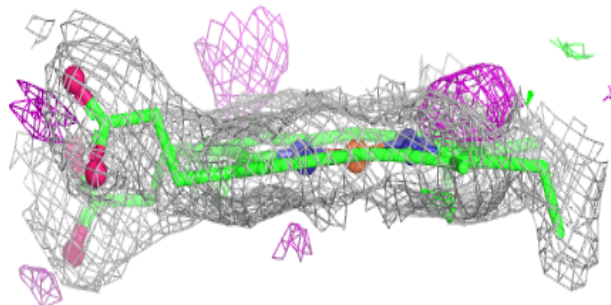
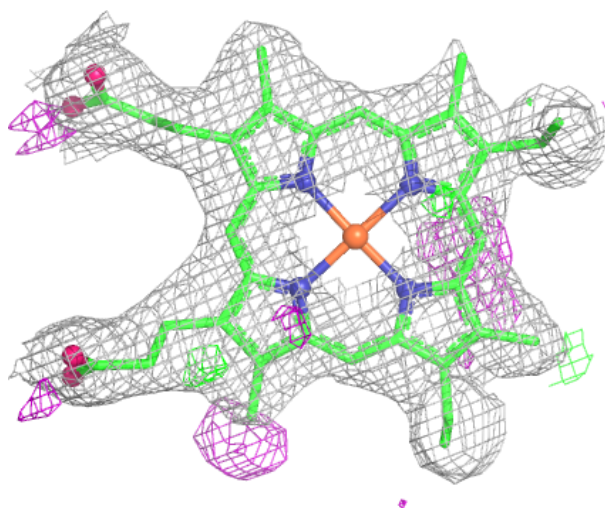
Electron density around HEC A 602:

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



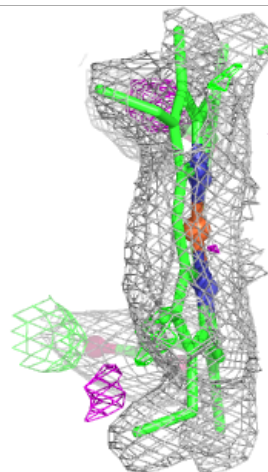
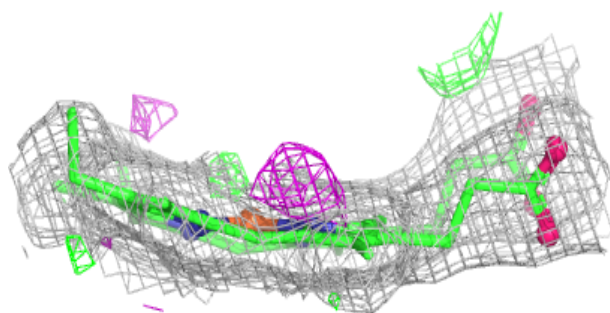
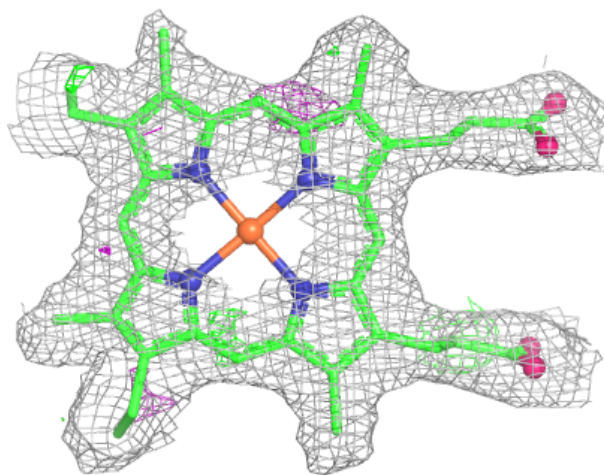
Electron density around HEC A 606:

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



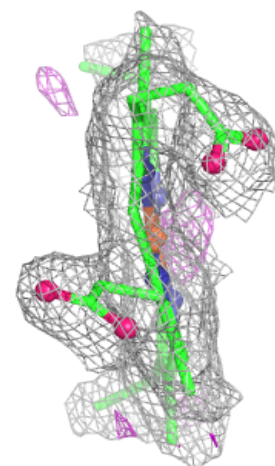
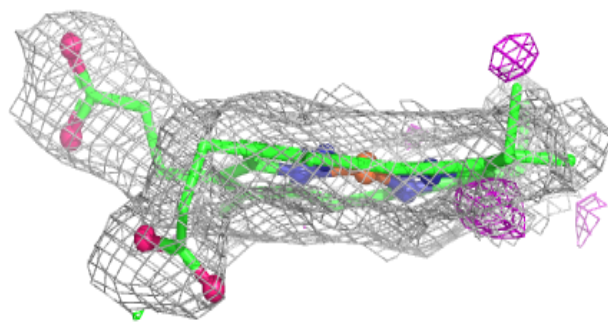
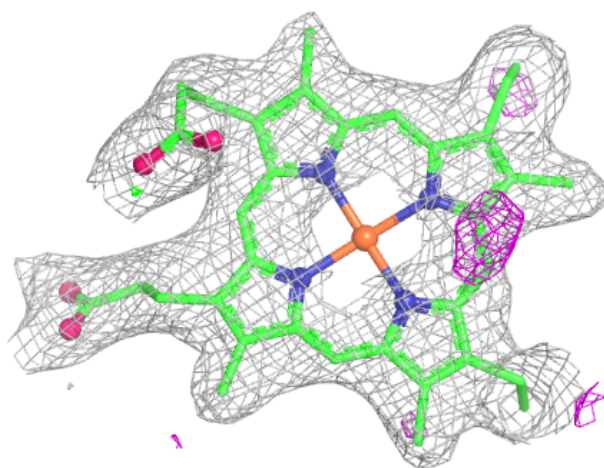
Electron density around HEC A 601:

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



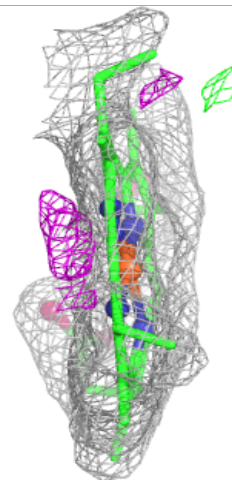
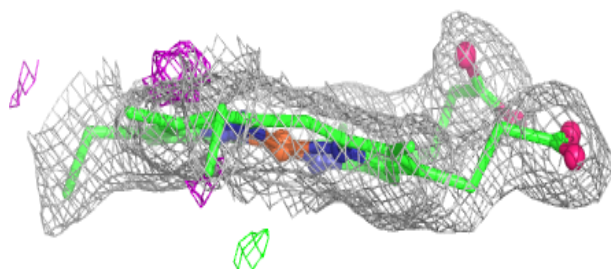
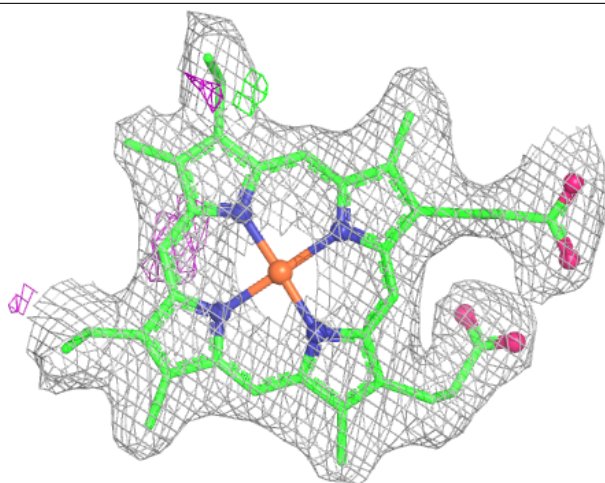
Electron density around HEC A 603:

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



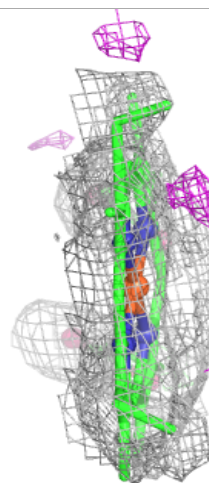
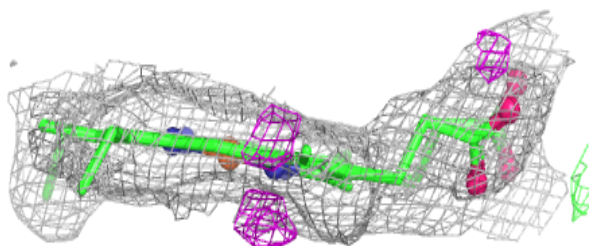
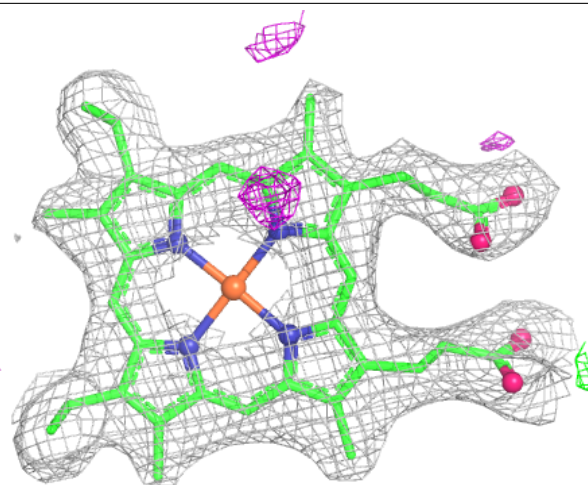
Electron density around HEC A 607:

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



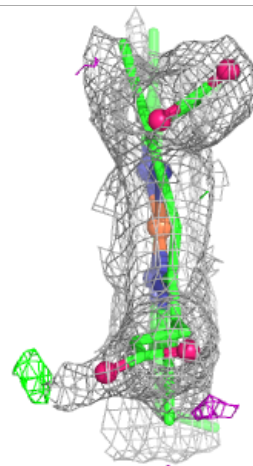
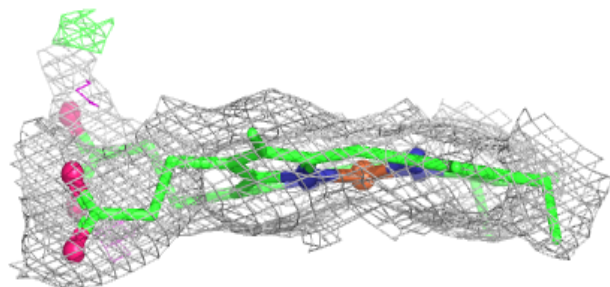
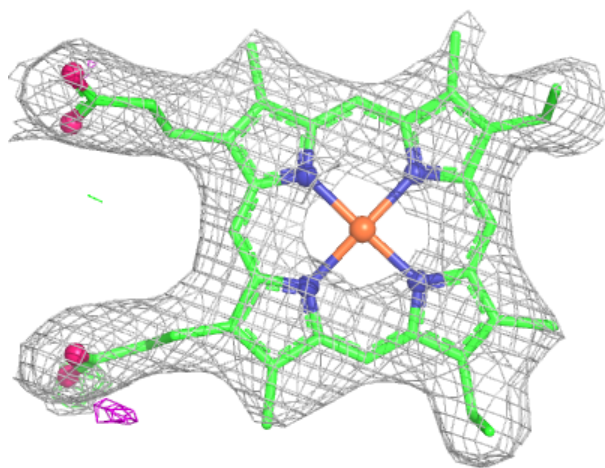
Electron density around HEC A 608:

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



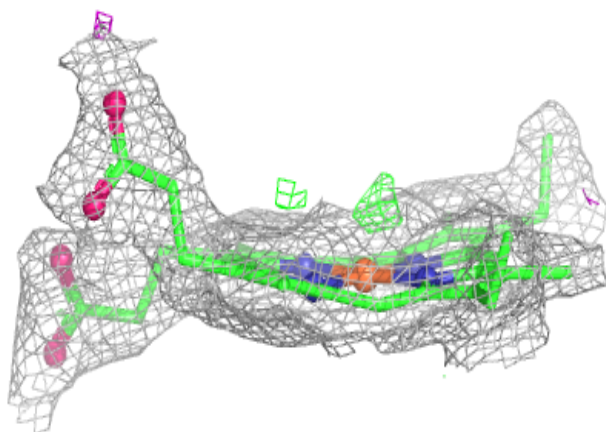
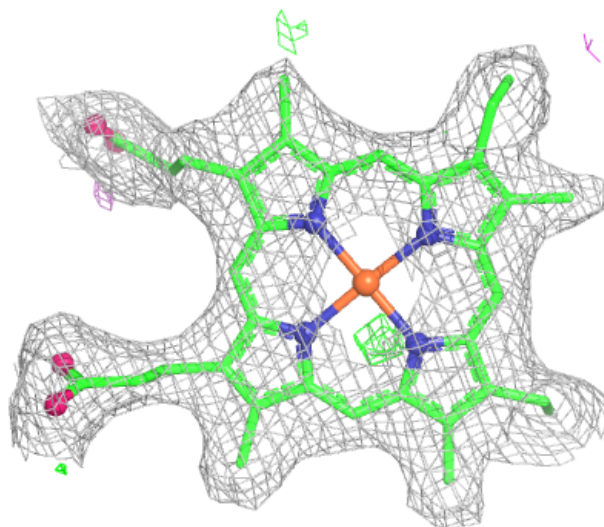
Electron density around HEC B 301:

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



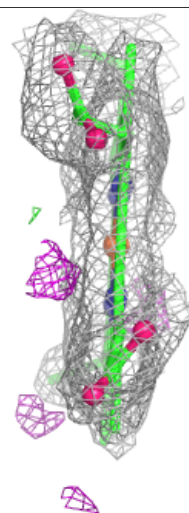
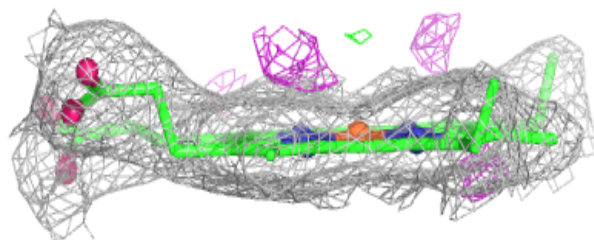
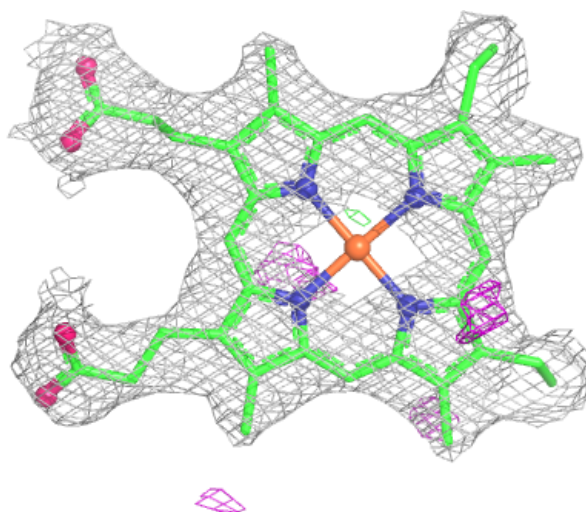
Electron density around HEC A 605:

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



Electron density around HEC B 302:

$2mF_o-DF_c$ (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.