



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 4, 2026 – 10:48 PM EDT

PDB ID : 1FJ0 / pdb_00001fj0
Title : STRUCTURE DETERMINATION OF THE FERRICYTOCHROME C2
FROM RHODOPSEUDOMONAS PALUSTRIS
Authors : Geremia, S.
Deposited on : 2000-08-07
Resolution : 1.70 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	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.50

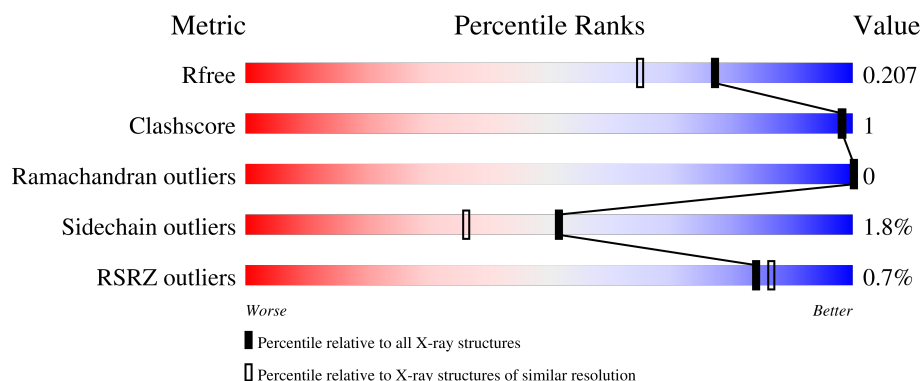
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

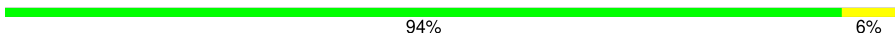
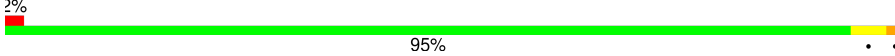
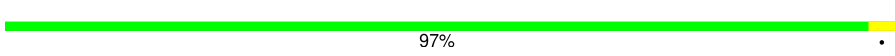
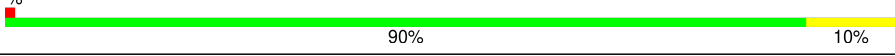
The reported resolution of this entry is 1.70 Å.

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	5551 (1.70-1.70)
Clashscore	190562	5924 (1.70-1.70)
Ramachandran outliers	187476	5846 (1.70-1.70)
Sidechain outliers	187428	5846 (1.70-1.70)
RSRZ outliers	180081	5554 (1.70-1.70)

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	114	 94% 6%
1	B	114	 2% 95% . .
1	C	114	 97% .
1	D	114	 1% 90% 10%

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
3	HEC	A	115	X	-	-	-
3	HEC	B	115	X	-	-	-
3	HEC	C	115	X	-	-	-
3	HEC	D	115	X	-	-	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 4264 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 C2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	114	Total	C	N	O	S	0	0	0
			855	541	150	159	5			
1	B	114	Total	C	N	O	S	0	1	0
			858	543	150	159	6			
1	C	114	Total	C	N	O	S	0	0	0
			855	541	150	159	5			
1	D	114	Total	C	N	O	S	0	0	0
			855	541	150	159	5			

There are 20 discrepancies between the modelled and reference sequences:

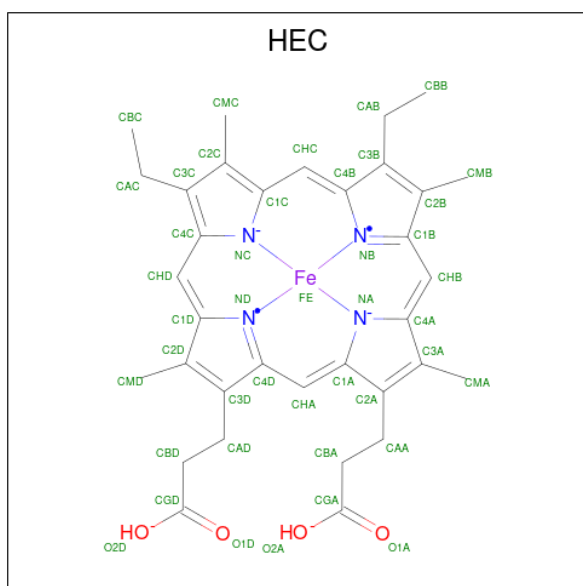
Chain	Residue	Modelled	Actual	Comment	Reference
A	29	ALA	GLY	conflict	UNP P00091
A	64	VAL	ILE	conflict	UNP P00091
A	65	PRO	ASN	conflict	UNP P00091
A	68	ALA	ASN	conflict	UNP P00091
A	80	GLU	ASP	conflict	UNP P00091
B	29	ALA	GLY	conflict	UNP P00091
B	64	VAL	ILE	conflict	UNP P00091
B	65	PRO	ASN	conflict	UNP P00091
B	68	ALA	ASN	conflict	UNP P00091
B	80	GLU	ASP	conflict	UNP P00091
C	29	ALA	GLY	conflict	UNP P00091
C	64	VAL	ILE	conflict	UNP P00091
C	65	PRO	ASN	conflict	UNP P00091
C	68	ALA	ASN	conflict	UNP P00091
C	80	GLU	ASP	conflict	UNP P00091
D	29	ALA	GLY	conflict	UNP P00091
D	64	VAL	ILE	conflict	UNP P00091
D	65	PRO	ASN	conflict	UNP P00091
D	68	ALA	ASN	conflict	UNP P00091
D	80	GLU	ASP	conflict	UNP P00091

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	O	S		0	0
			5	4	1			
2	C	1	Total	O	S		0	0
			5	4	1			

- Molecule 3 is HEME C (CCD ID: HEC) (formula: C₃₄H₃₆FeN₄O₄).



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

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	C	1	Total	C	O		
			6	3	3	0	0

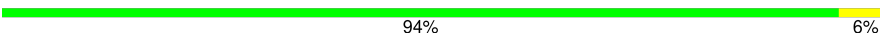
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	161	Total	O		
			161	161	0	0
5	B	169	Total	O		
			169	169	0	0
5	C	166	Total	O		
			166	166	0	0
5	D	157	Total	O		
			157	157	0	0

3 Residue-property plots [i](#)

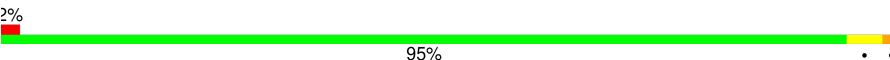
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density.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

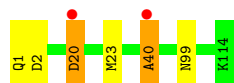
- Molecule 1: CYTOCHROME C2

Chain A: 

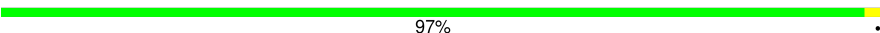


- Molecule 1: CYTOCHROME C2

Chain B: 

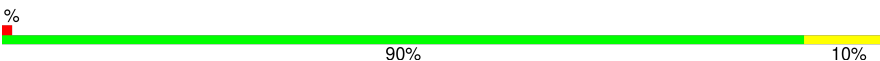


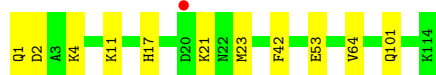
- Molecule 1: CYTOCHROME C2

Chain C: 



- Molecule 1: CYTOCHROME C2

Chain D: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	50.31Å 71.53Å 66.66Å 90.00° 93.52° 90.00°	Depositor
Resolution (Å)	50.00 – 1.70 50.00 – 1.70	Depositor EDS
% Data completeness (in resolution range)	99.9 (50.00-1.70) 99.8 (50.00-1.70)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.32 (at 1.70Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.178 , 0.218 0.173 , 0.207	Depositor DCC
R_{free} test set	2648 reflections (5.10%)	wwPDB-VP
Wilson B-factor (Å ²)	11.0	Xtriage
Anisotropy	0.310	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.46 , 68.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	4264	wwPDB-VP
Average B, all atoms (Å ²)	16.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 44.93 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.4227e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: PCA, GOL, HEC, SO4

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	0.65	0/863	1.30	2/1165 (0.2%)
1	B	0.67	0/871	1.35	4/1175 (0.3%)
1	C	0.68	0/863	1.29	1/1165 (0.1%)
1	D	0.69	0/863	1.32	7/1165 (0.6%)
All	All	0.67	0/3460	1.32	14/4670 (0.3%)

There are no bond length outliers.

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	2	ASP	CA-CB-CG	-8.66	103.94	112.60
1	B	2	ASP	CA-CB-CG	7.97	120.57	112.60
1	A	17	HIS	CA-CB-CG	5.91	119.71	113.80
1	D	17	HIS	CA-CB-CG	5.68	119.48	113.80
1	D	101	GLN	OE1-CD-NE2	-5.56	117.04	122.60
1	B	99	ASN	CA-CB-CG	-5.28	107.32	112.60
1	A	19	ALA	CA-C-O	5.22	126.07	120.70
1	B	40	ALA	CA-C-O	-5.21	115.46	121.19
1	C	17	HIS	CA-CB-CG	5.19	118.99	113.80
1	D	64	VAL	CA-C-N	5.14	124.45	118.85
1	D	64	VAL	C-N-CA	5.14	124.45	118.85
1	D	42	PHE	CA-CB-CG	-5.11	108.69	113.80
1	D	53	GLU	CB-CG-CD	5.06	121.21	112.60
1	B	20	ASP	N-CA-C	5.01	119.54	113.38

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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	855	0	862	2	0
1	B	858	0	867	1	0
1	C	855	0	862	1	0
1	D	855	0	862	1	0
2	A	5	0	0	0	0
2	C	5	0	0	0	0
3	A	43	0	30	0	0
3	B	43	0	30	0	0
3	C	43	0	30	0	0
3	D	43	0	30	0	0
4	C	6	0	8	1	0
5	A	161	0	0	1	0
5	B	169	0	0	0	0
5	C	166	0	0	0	0
5	D	157	0	0	0	0
All	All	4264	0	3581	4	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 1.

All (4) 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)
4:C:655:GOL:H11	1:D:11:LYS:HE3	1.74	0.68
1:B:40:ALA:HB1	1:C:101:GLN:HG2	1.85	0.58
1:A:21:LYS:HD3	5:A:713:HOH:O	2.17	0.44
1:A:97:LEU:HD23	1:A:103:ARG:HG2	2.02	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	112/114 (98%)	110 (98%)	2 (2%)	0	100	100
1	B	113/114 (99%)	109 (96%)	4 (4%)	0	100	100
1	C	112/114 (98%)	110 (98%)	2 (2%)	0	100	100
1	D	112/114 (98%)	110 (98%)	2 (2%)	0	100	100
All	All	449/456 (98%)	439 (98%)	10 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	85/85 (100%)	84 (99%)	1 (1%)	63	51
1	B	86/85 (101%)	83 (96%)	3 (4%)	32	15
1	C	85/85 (100%)	85 (100%)	0	100	100
1	D	85/85 (100%)	82 (96%)	3 (4%)	32	15
All	All	341/340 (100%)	334 (98%)	7 (2%)	51	30

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	23	MET
1	B	20	ASP

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Mol	Chain	Res	Type
1	B	23[A]	MET
1	B	23[B]	MET
1	D	4	LYS
1	D	21	LYS
1	D	23	MET

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

Mol	Chain	Res	Type
1	B	12	GLN
1	B	101	GLN
1	C	101	GLN
1	D	12	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

4 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	$\# Z > 2$
1	PCA	C	1	1	7,8,9	2.09	1 (14%)	9,10,12	2.07	3 (33%)
1	PCA	A	1	1	7,8,9	2.09	1 (14%)	9,10,12	2.35	3 (33%)
1	PCA	D	1	1	7,8,9	2.25	2 (28%)	9,10,12	1.82	3 (33%)
1	PCA	B	1	1	7,8,9	2.46	2 (28%)	9,10,12	2.45	3 (33%)

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
1	PCA	C	1	1	-	0/0/11/13	0/1/1/1
1	PCA	A	1	1	-	0/0/11/13	0/1/1/1
1	PCA	D	1	1	-	0/0/11/13	0/1/1/1
1	PCA	B	1	1	-	0/0/11/13	0/1/1/1

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	1	PCA	CD-N	5.53	1.48	1.34
1	D	1	PCA	CD-N	5.15	1.47	1.34
1	A	1	PCA	CD-N	4.87	1.46	1.34
1	C	1	PCA	CD-N	4.83	1.46	1.34
1	B	1	PCA	CB-CG	-2.34	1.47	1.53
1	D	1	PCA	CB-CG	-2.08	1.48	1.53

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	1	PCA	OE-CD-CG	5.20	136.00	126.72
1	A	1	PCA	OE-CD-CG	4.30	134.38	126.72
1	A	1	PCA	OE-CD-N	-4.24	115.78	124.96
1	C	1	PCA	OE-CD-CG	4.22	134.24	126.72
1	B	1	PCA	OE-CD-N	-4.02	116.25	124.96
1	D	1	PCA	CB-CG-CD	3.28	109.48	104.41
1	C	1	PCA	OE-CD-N	-3.14	118.15	124.96
1	D	1	PCA	OE-CD-N	-3.09	118.26	124.96
1	A	1	PCA	CB-CG-CD	2.86	108.84	104.41
1	C	1	PCA	CB-CG-CD	2.45	108.20	104.41
1	D	1	PCA	O-C-CA	-2.27	118.94	124.77
1	B	1	PCA	CB-CG-CD	2.14	107.72	104.41

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates

There are no oligosaccharides in this entry.

5.6 Ligand geometry

7 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	115	1	50,50,50	1.19	4 (8%)	68,82,82	1.13	4 (5%)
4	GOL	C	655	-	5,5,5	0.55	0	5,5,5	0.61	0
2	SO4	A	657	-	4,4,4	0.66	0	6,6,6	0.15	0
3	HEC	B	115	1	50,50,50	1.23	6 (12%)	68,82,82	1.22	8 (11%)
3	HEC	C	115	1	50,50,50	1.16	6 (12%)	68,82,82	1.18	5 (7%)
2	SO4	C	656	-	4,4,4	0.68	0	6,6,6	0.17	0
3	HEC	D	115	1	50,50,50	1.13	4 (8%)	68,82,82	1.15	5 (7%)

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	115	1	1/1/3/7	4/14/54/54	-
4	GOL	C	655	-	-	4/4/4/4	-
3	HEC	B	115	1	1/1/3/7	4/14/54/54	-
3	HEC	C	115	1	1/1/3/7	4/14/54/54	-
3	HEC	D	115	1	1/1/3/7	4/14/54/54	-

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	115	HEC	CMC-C2C	2.90	1.56	1.50
3	C	115	HEC	CMC-C2C	2.50	1.55	1.50
3	C	115	HEC	C3C-C2C	-2.42	1.32	1.38
3	C	115	HEC	CMD-C2D	2.37	1.55	1.50
3	B	115	HEC	C3C-C2C	-2.36	1.32	1.38
3	A	115	HEC	CMD-C2D	2.28	1.55	1.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	115	HEC	CMB-C2B	2.17	1.55	1.50
3	D	115	HEC	C3C-C2C	-2.14	1.33	1.38
3	D	115	HEC	CMC-C2C	2.12	1.55	1.50
3	B	115	HEC	FE-NA	2.12	2.02	1.95
3	B	115	HEC	C2A-C3A	-2.11	1.32	1.36
3	D	115	HEC	CMB-C2B	2.08	1.55	1.50
3	A	115	HEC	FE-NB	2.08	2.01	1.94
3	B	115	HEC	CMC-C2C	2.07	1.55	1.50
3	C	115	HEC	CAA-C2A	2.07	1.56	1.51
3	C	115	HEC	FE-NA	2.04	2.01	1.95
3	D	115	HEC	CMD-C2D	2.02	1.54	1.50
3	B	115	HEC	CMD-C2D	2.01	1.54	1.50
3	A	115	HEC	C1D-ND	-2.01	1.36	1.40
3	B	115	HEC	CAA-C2A	2.00	1.56	1.51

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	115	HEC	C2A-C1A-NA	-3.15	107.28	110.32
3	D	115	HEC	CHB-C4A-NA	2.99	127.71	124.45
3	B	115	HEC	C2A-C1A-NA	-2.87	107.55	110.32
3	B	115	HEC	CAC-C3C-C4C	-2.65	121.27	124.91
3	C	115	HEC	CAC-C3C-C4C	-2.57	121.38	124.91
3	A	115	HEC	CMC-C2C-C1C	-2.54	121.54	125.42
3	C	115	HEC	CAC-C3C-C2C	2.53	130.89	126.89
3	B	115	HEC	CHB-C4A-NA	2.49	127.16	124.45
3	C	115	HEC	CHB-C4A-NA	2.46	127.13	124.45
3	B	115	HEC	CBA-CAA-C2A	-2.38	105.96	112.53
3	A	115	HEC	C3D-C4D-ND	-2.35	108.08	110.35
3	D	115	HEC	O1D-CGD-CBD	-2.33	115.71	123.09
3	C	115	HEC	CBA-CAA-C2A	-2.31	106.14	112.53
3	B	115	HEC	O1A-CGA-CBA	-2.30	115.80	123.09
3	A	115	HEC	CBA-CAA-C2A	-2.18	106.50	112.53
3	A	115	HEC	CHB-C4A-NA	2.11	126.75	124.45
3	B	115	HEC	CHA-C4D-ND	2.11	126.69	124.42
3	D	115	HEC	CAD-CBD-CGD	2.10	119.24	113.67
3	B	115	HEC	CAA-CBA-CGA	2.08	119.19	113.67
3	D	115	HEC	CBA-CAA-C2A	-2.06	106.83	112.53
3	B	115	HEC	CAC-C3C-C2C	2.05	130.14	126.89
3	C	115	HEC	C2A-C1A-NA	-2.01	108.39	110.32

All (4) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	A	115	HEC	NA
3	B	115	HEC	NA
3	C	115	HEC	NA
3	D	115	HEC	NA

All (20) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	655	GOL	C1-C2-C3-O3
3	B	115	HEC	C4C-C3C-CAC-CBC
3	D	115	HEC	C4C-C3C-CAC-CBC
3	C	115	HEC	C2C-C3C-CAC-CBC
3	B	115	HEC	C2C-C3C-CAC-CBC
3	A	115	HEC	C2B-C3B-CAB-CBB
3	A	115	HEC	C4C-C3C-CAC-CBC
3	C	115	HEC	C4C-C3C-CAC-CBC
3	D	115	HEC	C2C-C3C-CAC-CBC
3	B	115	HEC	C2B-C3B-CAB-CBB
4	C	655	GOL	O1-C1-C2-C3
3	C	115	HEC	C2B-C3B-CAB-CBB
3	D	115	HEC	C2B-C3B-CAB-CBB
3	A	115	HEC	C2C-C3C-CAC-CBC
4	C	655	GOL	O1-C1-C2-O2
4	C	655	GOL	O2-C2-C3-O3
3	B	115	HEC	C4B-C3B-CAB-CBB
3	A	115	HEC	C4B-C3B-CAB-CBB
3	C	115	HEC	C4B-C3B-CAB-CBB
3	D	115	HEC	C4B-C3B-CAB-CBB

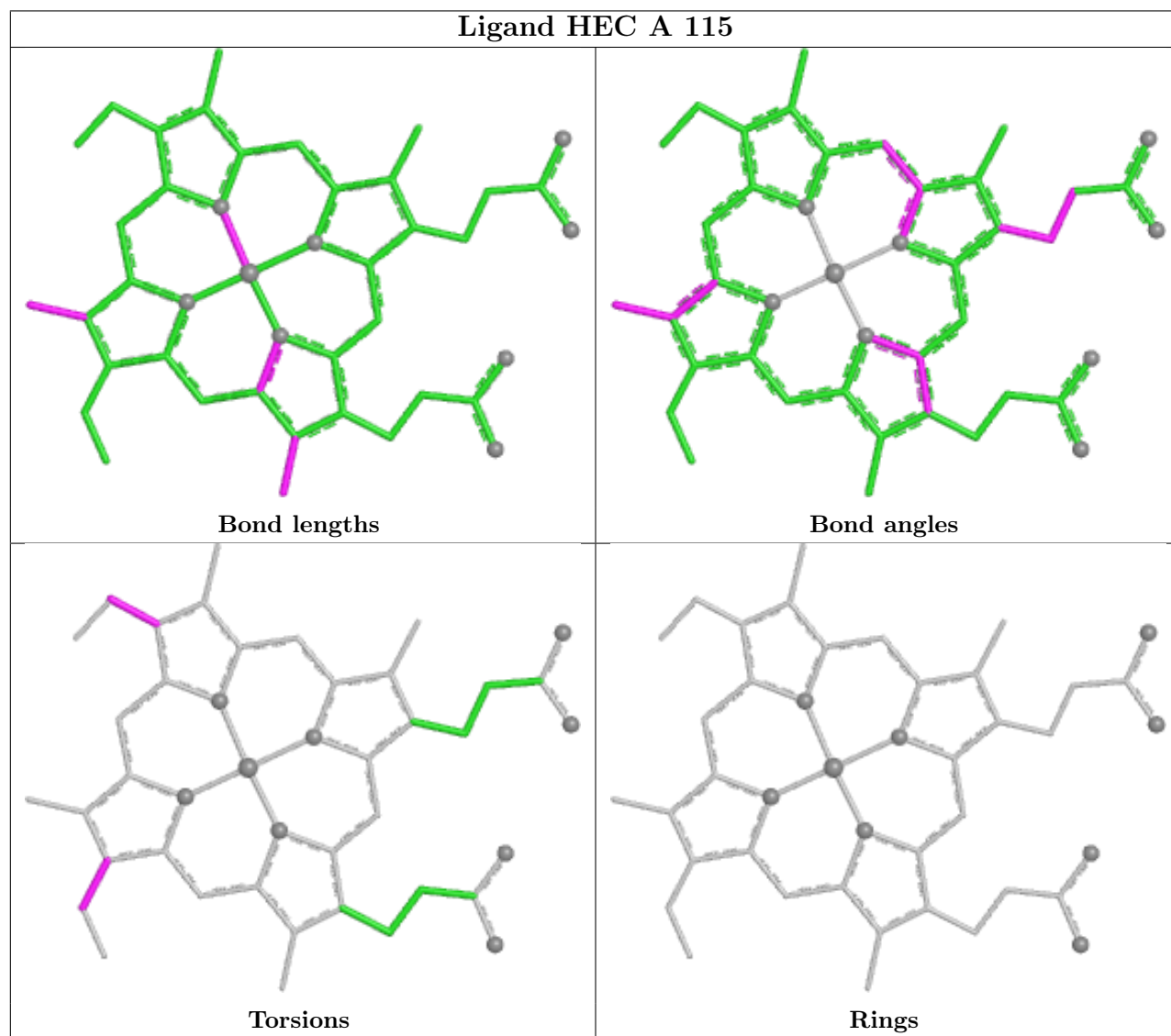
There are no ring outliers.

1 monomer is involved in 1 short contact:

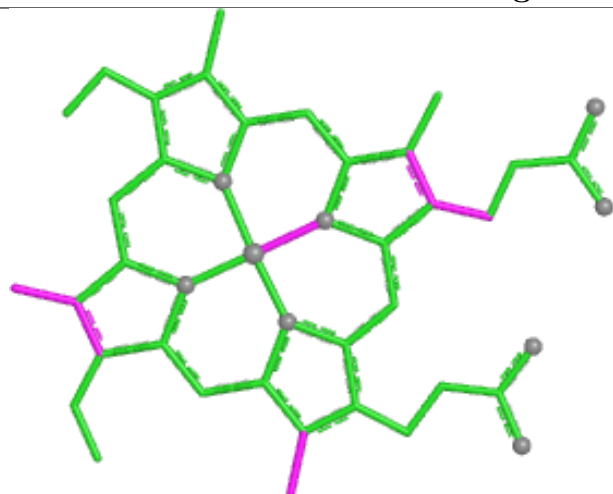
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	655	GOL	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the

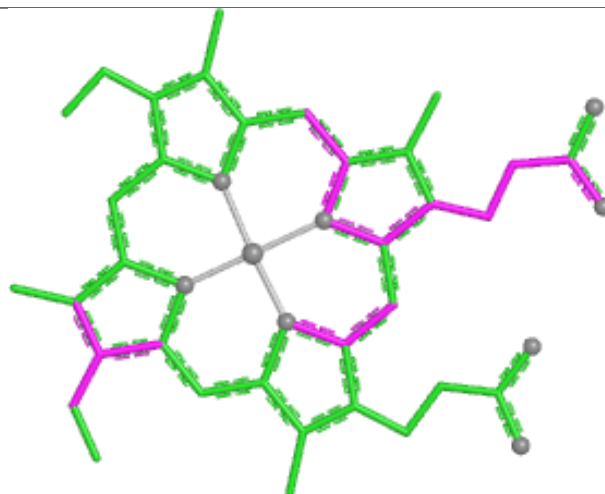
average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



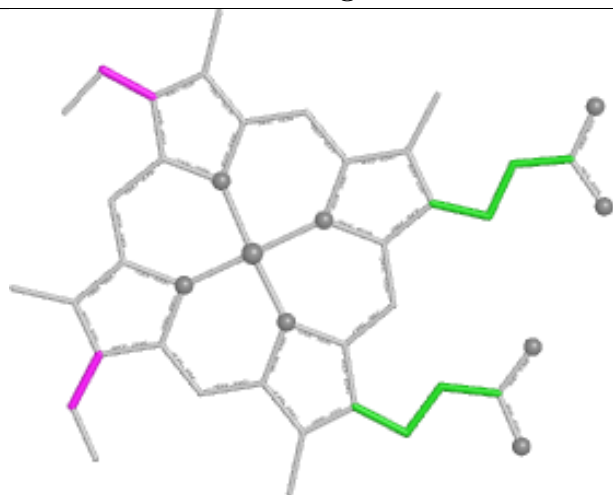
Ligand HEC B 115



Bond lengths



Bond angles

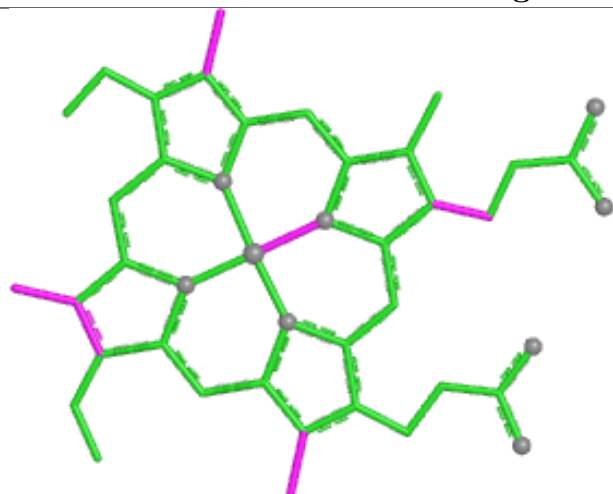


Torsions

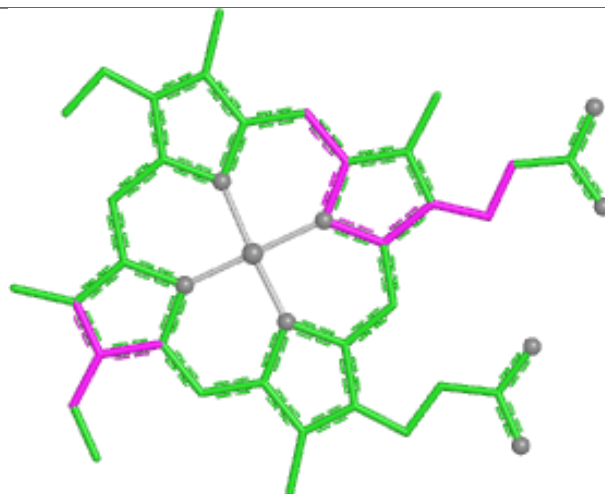


Rings

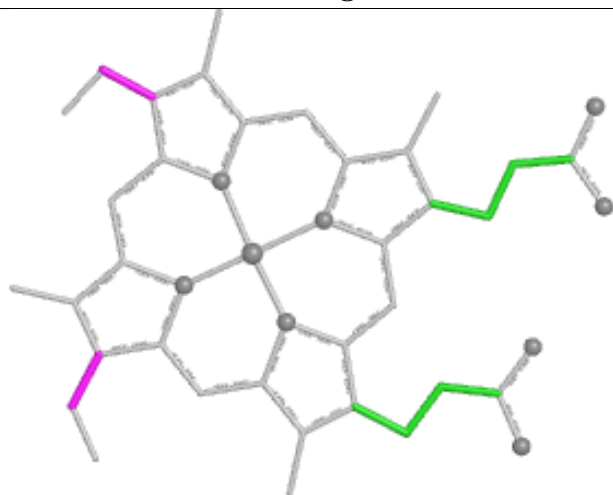
Ligand HEC C 115



Bond lengths



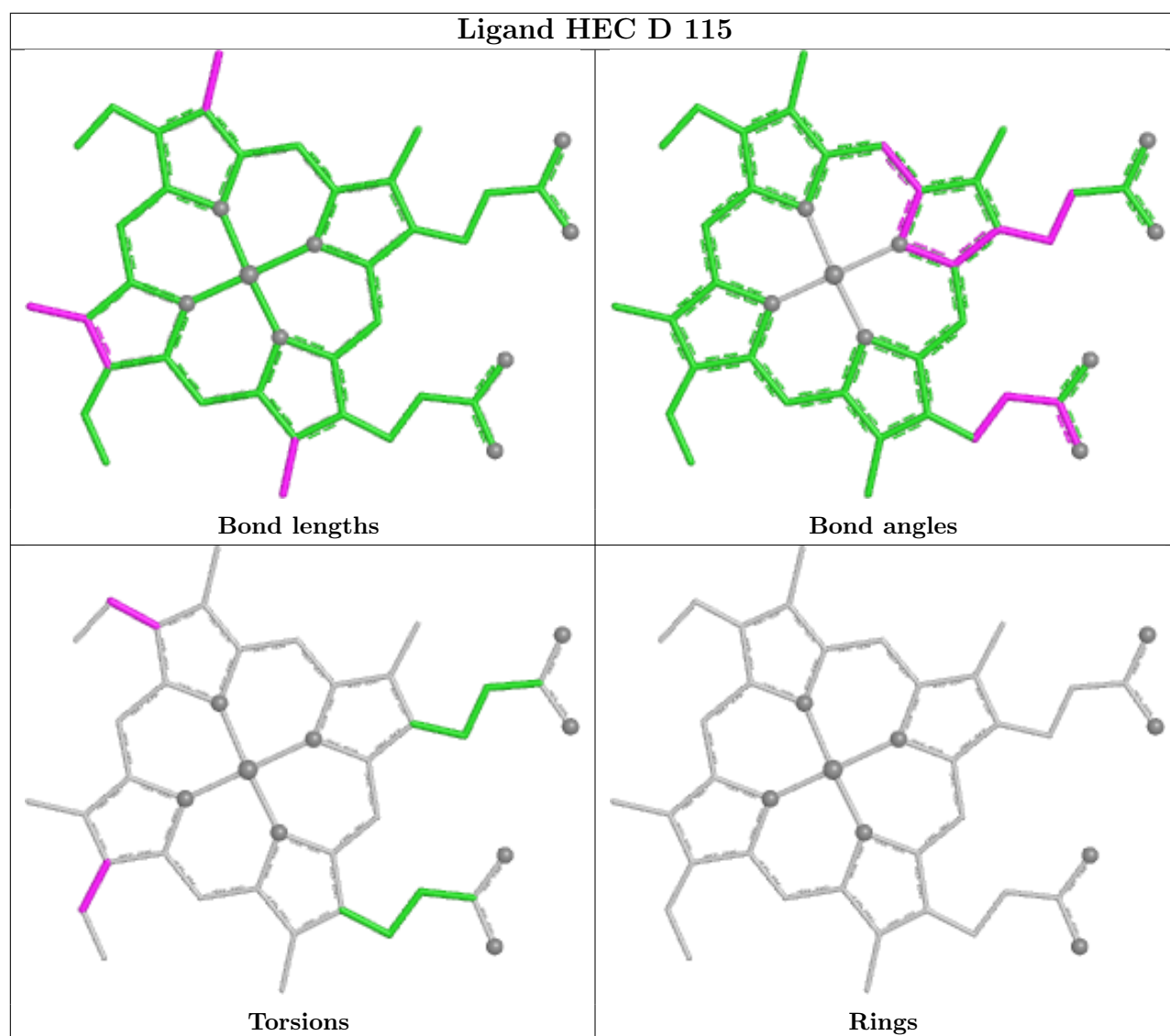
Bond angles



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	113/114 (99%)	-0.49	0 100 100	8, 12, 23, 45	0
1	B	113/114 (99%)	-0.34	2 (1%) 67 72	8, 12, 23, 47	1 (0%)
1	C	113/114 (99%)	-0.48	0 100 100	8, 12, 23, 43	0
1	D	113/114 (99%)	-0.41	1 (0%) 81 83	8, 12, 23, 46	0
All	All	452/456 (99%)	-0.43	3 (0%) 84 86	8, 12, 23, 47	1 (0%)

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	20	ASP	2.7
1	D	20	ASP	2.5
1	B	40	ALA	2.1

6.2 Non-standard residues in protein, DNA, RNA chains [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(Å ²)	Q<0.9
1	PCA	D	1	8/9	0.90	0.11	12,15,18,21	0
1	PCA	B	1	8/9	0.94	0.08	12,15,17,21	0
1	PCA	C	1	8/9	0.95	0.07	12,15,18,21	0
1	PCA	A	1	8/9	0.96	0.06	12,15,18,21	0

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands

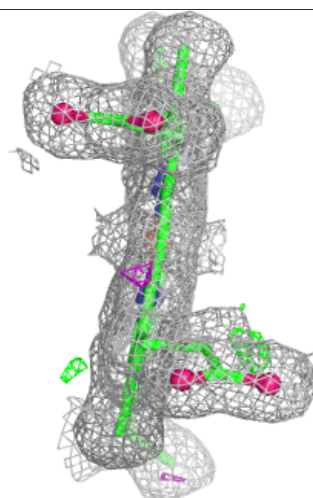
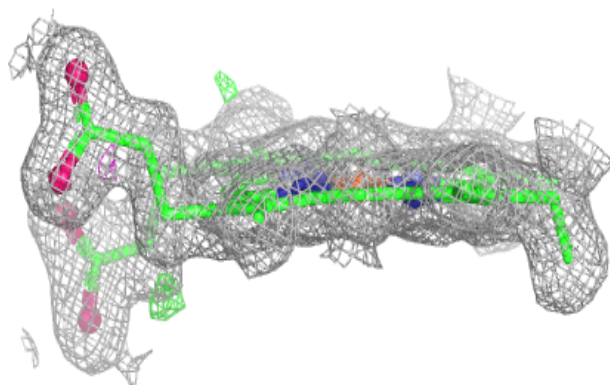
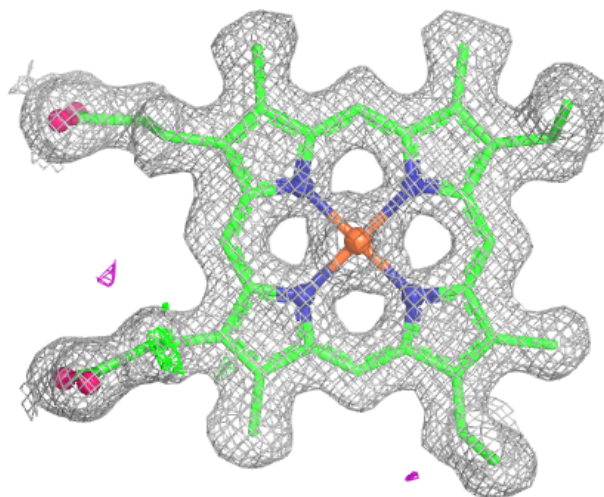
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	GOL	C	655	6/6	0.82	0.16	21,22,45,47	0
2	SO4	A	657	5/5	0.91	0.10	30,38,45,78	0
2	SO4	C	656	5/5	0.94	0.11	33,34,37,89	0
3	HEC	B	115	43/43	0.99	0.04	6,8,10,11	0
3	HEC	C	115	43/43	0.99	0.04	6,8,10,11	0
3	HEC	D	115	43/43	0.99	0.04	6,8,10,11	0
3	HEC	A	115	43/43	0.99	0.04	6,8,10,11	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.

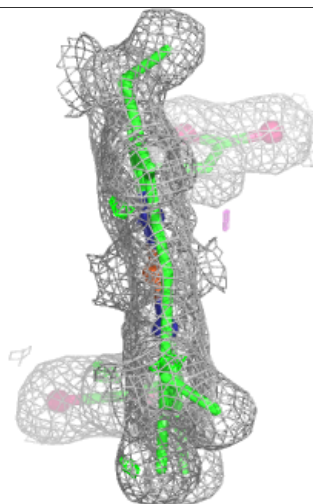
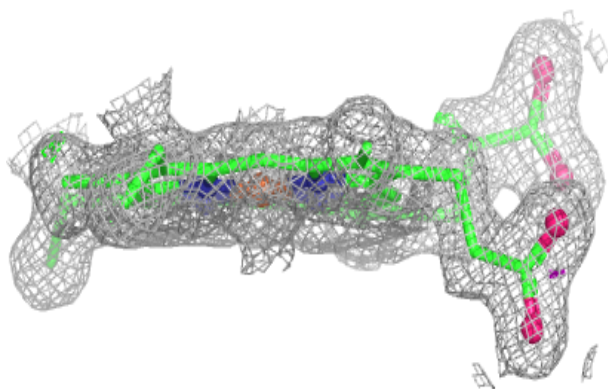
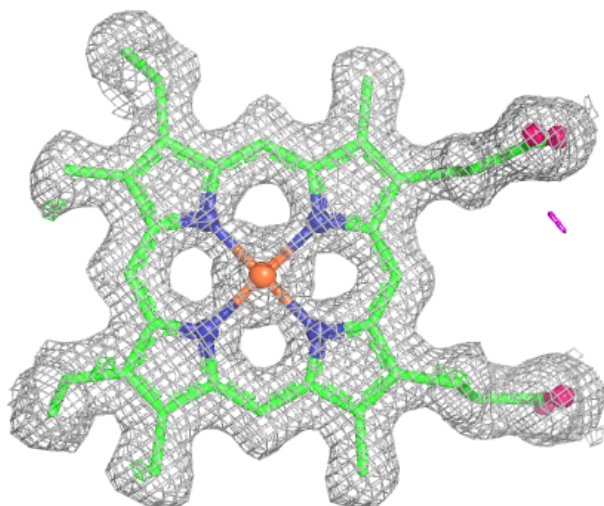
Electron density around HEC B 115:

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



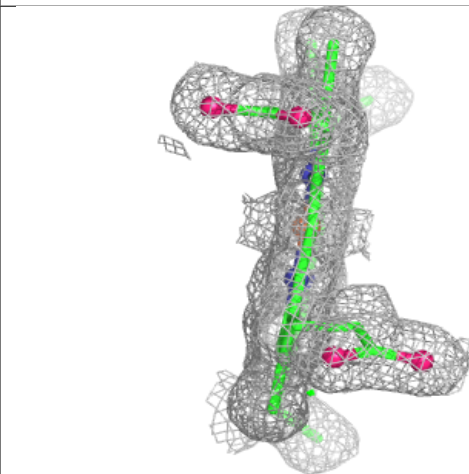
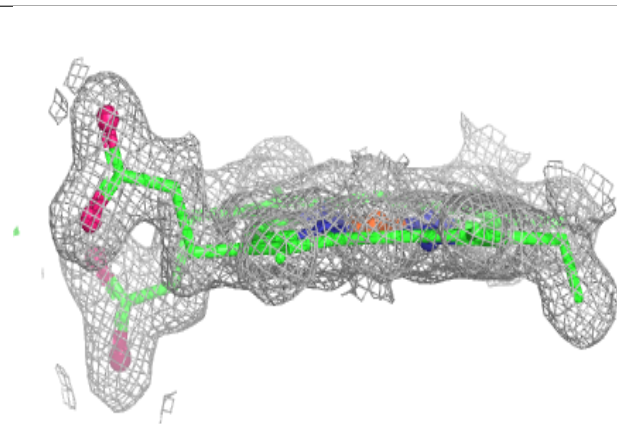
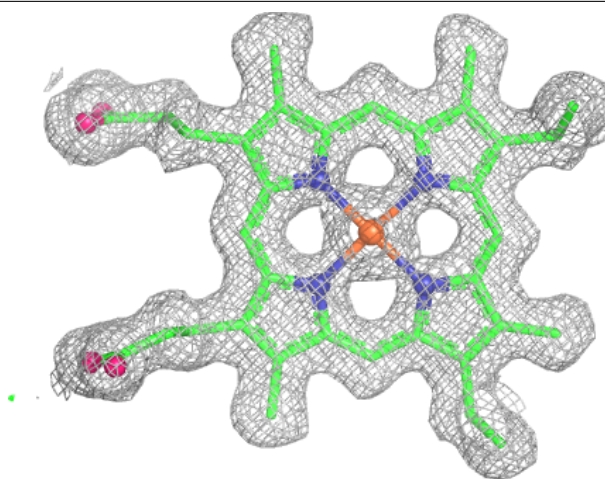
Electron density around HEC C 115:

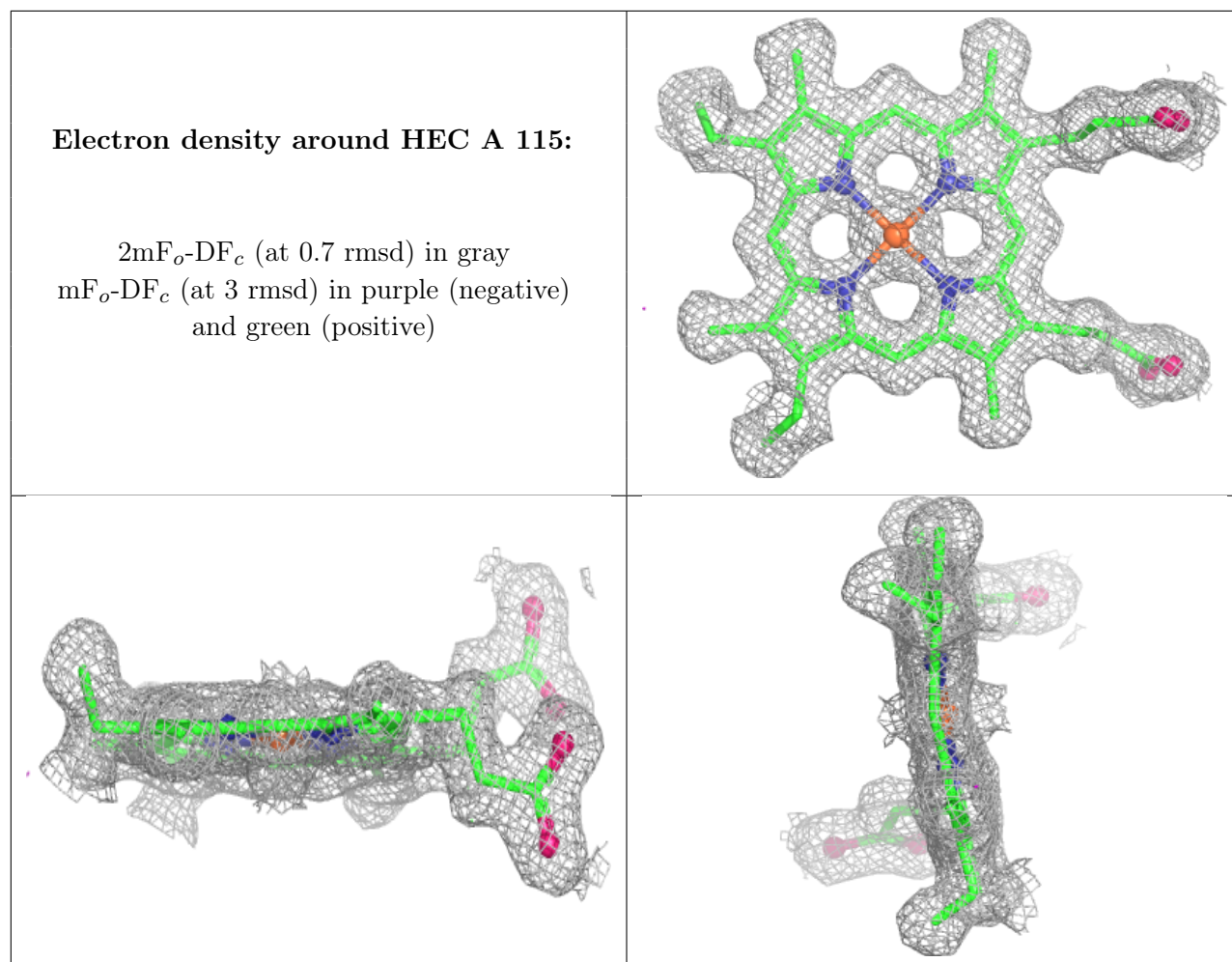
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around HEC D 115:

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





6.5 Other polymers [i](#)

There are no such residues in this entry.