Full wwPDB X-ray Structure Validation Report ⓘ

Apr 21, 2024 – 10:41 pm BST

PDB ID	:	6XZ9
Title	:	Structure of aldosterone synthase (CYP11B2) in complex with 5-chloro-3,3-dimethyl-2-[5-[1-(1-methylpyrazole-4-carbonyl)azetidin-3-yl]oxy-3-pyridyl]isoindolin-1-one
Authors	:	Kuglstatter, A.; Joseph, C.; Benz, J.
Deposited on	:	2020-02-03
Resolution	:	2.77 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:

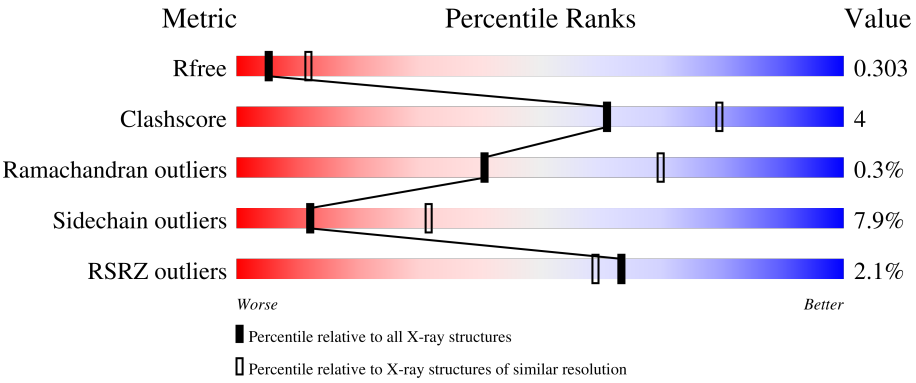
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36.2
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

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 2.77 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	4107 (2.80-2.76)
Clashscore	141614	4575 (2.80-2.76)
Ramachandran outliers	138981	4487 (2.80-2.76)
Sidechain outliers	138945	4489 (2.80-2.76)
RSRZ outliers	127900	4027 (2.80-2.76)

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 <=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	489	4% 82% 11% • 5%
1	B	489	% 80% 15% • •
1	C	489	% 79% 14% • 5%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 11741 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 P450 11B2, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	464	Total	C	N	O	S	0	0	0
			3766	2433	665	648	20			
1	B	473	Total	C	N	O	S	0	0	0
			3832	2471	683	658	20			
1	C	466	Total	C	N	O	S	0	0	0
			3785	2445	670	650	20			

There are 39 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	24	MET	-	initiating methionine	UNP P19099
A	25	ALA	-	expression tag	UNP P19099
A	26	THR	-	expression tag	UNP P19099
A	27	LYS	-	expression tag	UNP P19099
A	504	GLY	-	expression tag	UNP P19099
A	505	GLY	-	expression tag	UNP P19099
A	506	ARG	-	expression tag	UNP P19099
A	507	HIS	-	expression tag	UNP P19099
A	508	HIS	-	expression tag	UNP P19099
A	509	HIS	-	expression tag	UNP P19099
A	510	HIS	-	expression tag	UNP P19099
A	511	HIS	-	expression tag	UNP P19099
A	512	HIS	-	expression tag	UNP P19099
B	24	MET	-	initiating methionine	UNP P19099
B	25	ALA	-	expression tag	UNP P19099
B	26	THR	-	expression tag	UNP P19099
B	27	LYS	-	expression tag	UNP P19099
B	504	GLY	-	expression tag	UNP P19099
B	505	GLY	-	expression tag	UNP P19099
B	506	ARG	-	expression tag	UNP P19099
B	507	HIS	-	expression tag	UNP P19099
B	508	HIS	-	expression tag	UNP P19099
B	509	HIS	-	expression tag	UNP P19099

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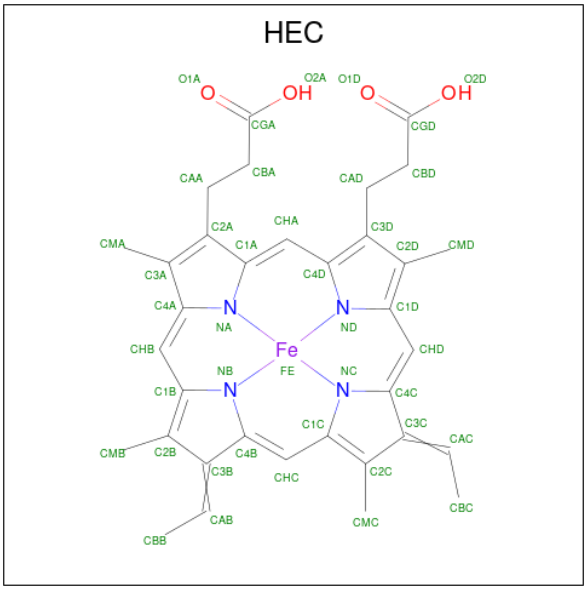
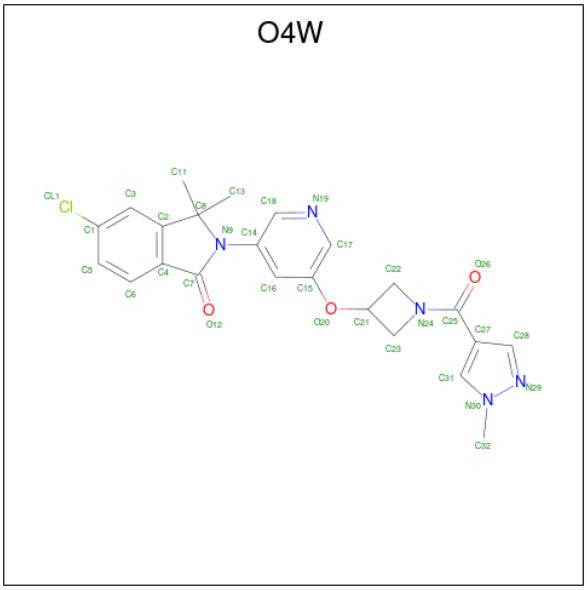
Chain	Residue	Modelled	Actual	Comment	Reference
B	510	HIS	-	expression tag	UNP P19099
B	511	HIS	-	expression tag	UNP P19099
B	512	HIS	-	expression tag	UNP P19099
C	24	MET	-	initiating methionine	UNP P19099
C	25	ALA	-	expression tag	UNP P19099
C	26	THR	-	expression tag	UNP P19099
C	27	LYS	-	expression tag	UNP P19099
C	504	GLY	-	expression tag	UNP P19099
C	505	GLY	-	expression tag	UNP P19099
C	506	ARG	-	expression tag	UNP P19099
C	507	HIS	-	expression tag	UNP P19099
C	508	HIS	-	expression tag	UNP P19099
C	509	HIS	-	expression tag	UNP P19099
C	510	HIS	-	expression tag	UNP P19099
C	511	HIS	-	expression tag	UNP P19099
C	512	HIS	-	expression tag	UNP P19099

- Molecule 2 is HEME C (three-letter code: HEC) (formula: $C_{34}H_{34}FeN_4O_4$).



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

- Molecule 3 is 5-chloranyl-3,3-dimethyl-2-[5-[1-(1-methylpyrazol-4-yl)carbonylazetidin-3-yl]oxypyridin-3-yl]isoindol-1-one (three-letter code: O4W) (formula: $C_{23}H_{22}ClN_5O_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	Cl	N	O	0	0
			32	23	1	5	3		
3	B	1	Total	C	Cl	N	O	0	0
			32	23	1	5	3		
3	C	1	Total	C	Cl	N	O	0	0
			32	23	1	5	3		

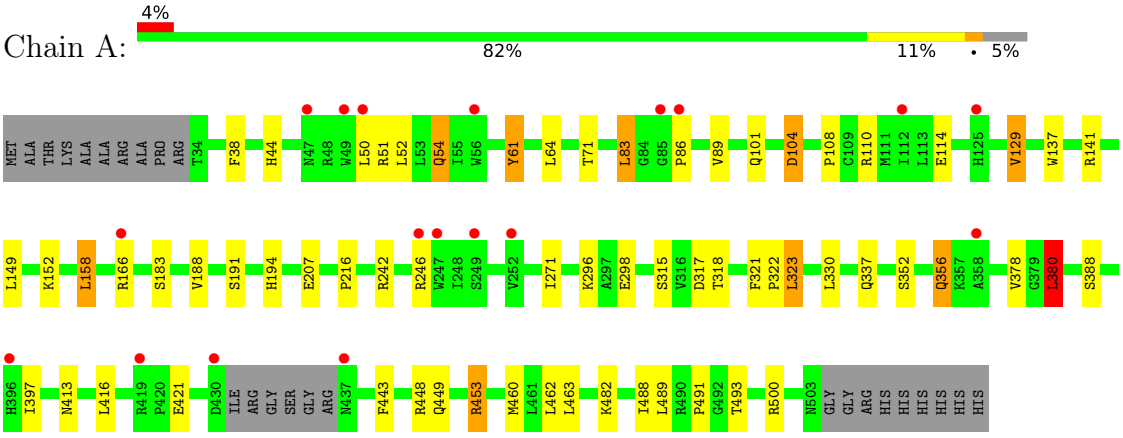
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	42	Total	O	0	0
			42	42		
4	B	48	Total	O	0	0
			48	48		
4	C	43	Total	O	0	0
			43	43		

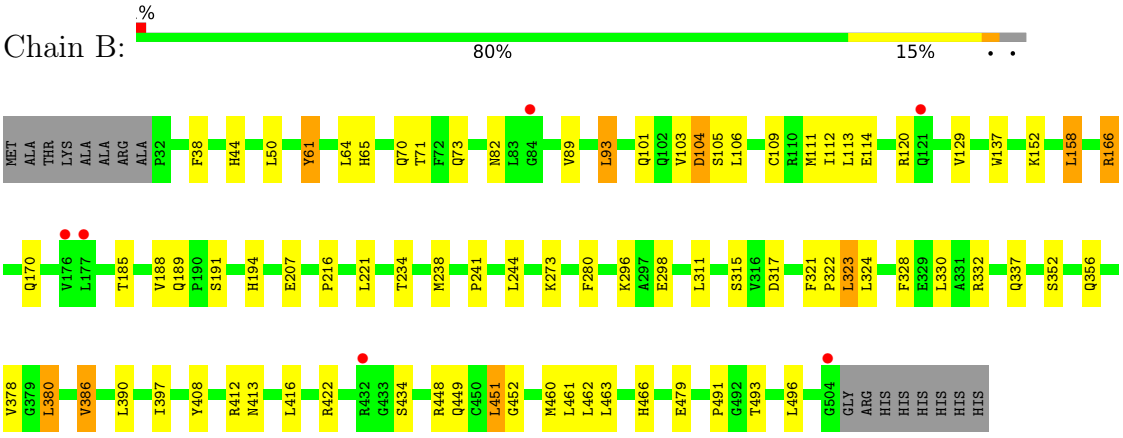
3 Residue-property plots (i)

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.

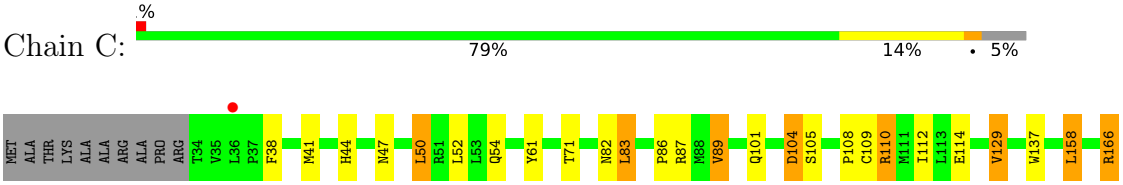
• Molecule 1: Cytochrome P450 11B2, mitochondrial

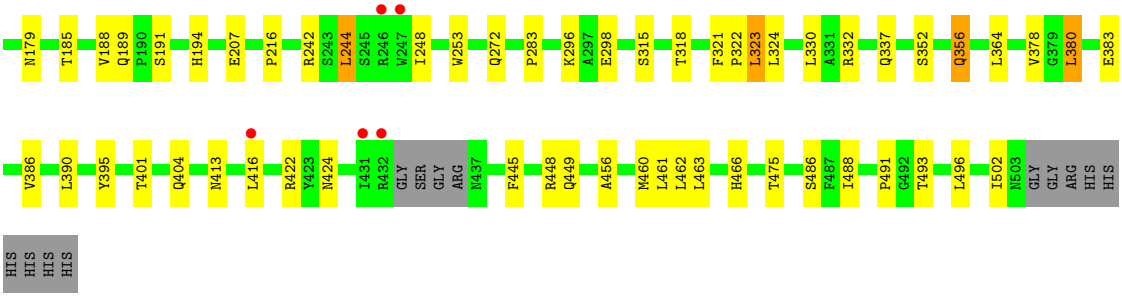


• Molecule 1: Cytochrome P450 11B2, mitochondrial



• Molecule 1: Cytochrome P450 11B2, mitochondrial




N179
T185
V188
Q189
P190
S191
H194
E207
P216
R242
S243
L244
S245
R246
W247
I248
W253
Q272
P283
K296
A297
E298
S315
T318
F321
P322
L323
L324
L330
A331
R332
Q337
S352
Q356
L364
V378
G379
L380
E383
V386
L390
Y395
T401
Q404
N413
L416
R422
Y423
N424
I431
R432
GLY
SER
GLY
ARG
N437
F445
R448
Q449
A456
M460
L461
L462
L463
H466
T475
S486
F487
I488
P491
G492
T493
L496
I502
N503
GLY
GLY
ARG
HIS
HIS
HIS
HIS
HIS
HIS

4 Data and refinement statistics (i)

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α, β, γ	107.68Å 121.60Å 298.70Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.58 – 2.77 48.58 – 2.77	Depositor EDS
% Data completeness (in resolution range)	99.5 (48.58-2.77) 99.5 (48.58-2.77)	Depositor EDS
R_{merge}	0.30	Depositor
R_{sym}	0.30	Depositor
$< I/\sigma(I) >$ [1]	1.11 (at 2.77Å)	Xtriage
Refinement program	BUSTER 2.11.7	Depositor
R, R_{free}	0.234 , 0.273 0.258 , 0.303	Depositor DCC
R_{free} test set	2539 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å^2)	47.8	Xtriage
Anisotropy	0.273	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 50.3	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.89	EDS
Total number of atoms	11741	wwPDB-VP
Average B, all atoms (Å^2)	52.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.81% 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: O4W, 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	0.45	0/3866	0.65	0/5246
1	B	0.45	0/3934	0.66	0/5336
1	C	0.45	0/3885	0.66	0/5271
All	All	0.45	0/11685	0.66	0/15853

There are no bond length outliers.

There are no bond angle outliers.

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	3766	0	3797	26	0
1	B	3832	0	3870	36	0
1	C	3785	0	3821	38	0
2	A	43	0	32	3	0
2	B	43	0	33	5	0
2	C	43	0	32	7	0
3	A	32	0	0	0	0
3	B	32	0	0	0	0
3	C	32	0	0	0	0
4	A	42	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	48	0	0	1	0
4	C	43	0	0	1	0
All	All	11741	0	11585	104	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 4.

All (104) 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:C:386:VAL:HG21	1:C:390:LEU:HD22	1.67	0.77
2:C:601:HEC:HMC1	2:C:601:HEC:HBC3	1.69	0.73
1:C:422:ARG:HD3	1:C:424:ASN:HB2	1.74	0.69
1:B:89:VAL:HG21	1:B:397:ILE:HD12	1.75	0.68
1:B:322:PRO:HD3	1:B:378:VAL:HG11	1.81	0.62
1:B:234:THR:O	1:B:238:MET:HB2	1.99	0.61
1:B:158:LEU:HD23	1:B:462:LEU:HD11	1.83	0.61
1:C:47:ASN:HB3	1:C:50:LEU:HB2	1.84	0.59
1:B:241:PRO:HD2	1:B:244:LEU:HD12	1.85	0.58
2:A:601:HEC:HBB3	2:A:601:HEC:HMB1	1.85	0.58
1:C:101:GLN:HG3	1:C:445:PHE:HD1	1.69	0.58
1:C:108:PRO:HB2	1:C:448:ARG:HG3	1.87	0.56
1:C:283:PRO:HG2	4:C:714:HOH:O	2.04	0.56
1:C:101:GLN:HG3	1:C:445:PHE:CD1	2.41	0.55
4:B:723:HOH:O	1:C:179:ASN:HB3	2.07	0.54
1:C:158:LEU:HD23	1:C:462:LEU:HD11	1.90	0.54
1:C:158:LEU:HD13	1:C:356:GLN:HA	1.90	0.53
1:C:321:PHE:CD2	1:C:491:PRO:HD2	2.44	0.53
1:B:315:SER:HA	2:B:601:HEC:CMC	2.40	0.52
1:B:328:PHE:CZ	1:B:332:ARG:HD2	2.45	0.52
1:B:408:TYR:O	1:B:412:ARG:HG2	2.09	0.52
1:C:315:SER:HB3	2:C:601:HEC:HBC3	1.91	0.52
1:B:101:GLN:O	1:B:104:ASP:HB2	2.10	0.52
1:B:321:PHE:CD2	1:B:491:PRO:HD2	2.46	0.51
1:A:321:PHE:CD2	1:A:491:PRO:HD2	2.46	0.51
1:C:244:LEU:HG	1:C:248:ILE:HD12	1.91	0.51
1:C:87:ARG:HB3	1:C:401:THR:HG23	1.93	0.51
1:A:158:LEU:HD13	1:A:356:GLN:HA	1.91	0.51
1:C:413:ASN:HB3	1:C:416:LEU:HD12	1.94	0.50
1:B:166:ARG:HH21	1:B:466:HIS:CE1	2.30	0.50
1:C:383:GLU:HG2	1:C:404:GLN:HG3	1.93	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:65:HIS:HB3	1:B:380:LEU:HD11	1.94	0.49
1:B:137:TRP:CZ2	1:B:448:ARG:HG2	2.47	0.49
1:A:38:PHE:HE1	1:A:89:VAL:HG22	1.77	0.49
1:A:413:ASN:HB3	1:A:416:LEU:HD12	1.95	0.49
1:A:158:LEU:HD23	1:A:462:LEU:HD11	1.95	0.49
1:B:70:GLN:HA	1:B:73:GLN:HE21	1.78	0.48
1:B:413:ASN:HB3	1:B:416:LEU:HD12	1.94	0.48
1:A:89:VAL:HG21	1:A:397:ILE:HD12	1.94	0.48
1:A:315:SER:HA	2:A:601:HEC:CMC	2.43	0.48
1:A:330:LEU:HB3	1:A:337:GLN:HG3	1.96	0.48
1:A:296:LYS:HB3	1:A:298:GLU:HG3	1.96	0.48
1:A:110:ARG:HG3	4:A:707:HOH:O	2.15	0.47
2:B:601:HEC:HMB1	2:B:601:HEC:HBB2	1.95	0.47
1:C:330:LEU:HB3	1:C:337:GLN:HG3	1.96	0.47
2:C:601:HEC:CBB	2:C:601:HEC:HMB1	2.44	0.47
1:C:41:MET:HA	1:C:395:TYR:CZ	2.49	0.47
1:C:101:GLN:O	1:C:104:ASP:HB2	2.13	0.47
1:C:110:ARG:HH22	2:C:601:HEC:HAD2	1.79	0.47
1:B:330:LEU:HB3	1:B:337:GLN:HG3	1.95	0.47
1:C:38:PHE:HE1	1:C:89:VAL:HG22	1.80	0.47
1:C:83:LEU:HD23	1:C:86:PRO:HB2	1.97	0.47
1:A:51:ARG:O	1:A:54:GLN:HG3	2.15	0.47
1:B:103:VAL:HG21	1:B:390:LEU:HD13	1.97	0.47
1:B:166:ARG:HH21	1:B:466:HIS:HE1	1.63	0.47
1:B:158:LEU:HD13	1:B:356:GLN:HA	1.97	0.46
1:B:296:LYS:HB3	1:B:298:GLU:HG3	1.96	0.46
1:B:44:HIS:CD2	1:B:71:THR:HG21	2.51	0.46
1:B:378:VAL:HG21	2:B:601:HEC:HBB3	1.97	0.46
1:C:296:LYS:HB3	1:C:298:GLU:HG3	1.97	0.46
1:B:311:LEU:HD21	1:B:451:LEU:HD13	1.98	0.46
1:B:315:SER:HA	2:B:601:HEC:HMC3	1.97	0.46
1:B:38:PHE:HE1	1:B:89:VAL:CG2	2.28	0.45
1:B:93:LEU:HD23	1:B:416:LEU:HD11	1.97	0.45
2:C:601:HEC:HMB1	2:C:601:HEC:HBB3	1.98	0.45
1:C:44:HIS:CD2	1:C:71:THR:HG21	2.52	0.45
2:C:601:HEC:HMC1	2:C:601:HEC:CBC	2.42	0.45
1:B:194:HIS:NE2	1:B:216:PRO:HB3	2.32	0.45
1:A:101:GLN:O	1:A:104:ASP:HB2	2.17	0.45
1:C:166:ARG:HH11	1:C:466:HIS:CE1	2.35	0.45
1:C:38:PHE:O	1:C:41:MET:HB2	2.17	0.45
1:A:44:HIS:CD2	1:A:71:THR:HG21	2.51	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:83:LEU:HD23	1:A:86:PRO:HB2	1.98	0.44
1:A:380:LEU:HD22	1:A:489:LEU:HB2	1.98	0.44
1:A:315:SER:HA	2:A:601:HEC:HMC3	1.99	0.44
1:B:452:GLY:HA3	2:B:601:HEC:HBC2	2.00	0.44
1:C:166:ARG:HH11	1:C:466:HIS:HE1	1.65	0.44
1:B:280:PHE:HZ	1:C:475:THR:O	2.01	0.44
1:C:194:HIS:NE2	1:C:216:PRO:HB3	2.33	0.43
1:A:61:TYR:CE1	1:A:64:LEU:HD13	2.53	0.43
1:B:323:LEU:HG	1:B:460:MET:HG2	2.01	0.43
1:C:185:THR:HG22	1:C:496:LEU:HG	2.01	0.43
1:A:108:PRO:HB2	1:A:448:ARG:HG3	1.99	0.43
1:B:189:GLN:HG3	1:B:324:LEU:HD22	2.00	0.43
1:A:129:VAL:HG22	1:A:137:TRP:CD1	2.54	0.42
1:A:183:SER:HB3	1:A:500:ARG:HG3	2.01	0.42
1:B:61:TYR:CE1	1:B:64:LEU:HD13	2.53	0.42
1:C:129:VAL:HG22	1:C:137:TRP:CD1	2.55	0.42
1:C:41:MET:SD	1:C:89:VAL:HG13	2.60	0.42
1:C:456:ALA:HB2	2:C:601:HEC:HMC2	2.02	0.41
1:A:194:HIS:NE2	1:A:216:PRO:HB3	2.35	0.41
1:A:323:LEU:HG	1:A:460:MET:HG2	2.02	0.41
1:B:386:VAL:HG21	1:B:390:LEU:HD22	2.02	0.41
1:C:323:LEU:HG	1:C:460:MET:HG2	2.02	0.41
1:A:141:ARG:HH21	1:A:149:LEU:HD22	1.86	0.41
1:C:318:THR:O	1:C:322:PRO:HD2	2.19	0.41
1:A:38:PHE:HE1	1:A:89:VAL:CG2	2.33	0.41
1:B:106:LEU:HD12	1:B:106:LEU:HA	1.98	0.41
1:C:189:GLN:HG3	1:C:324:LEU:HD22	2.01	0.41
1:B:185:THR:HG22	1:B:496:LEU:HG	2.03	0.40
1:C:242:ARG:HD2	1:C:253:TRP:CZ2	2.56	0.40
1:A:443:PHE:CG	1:A:453:ARG:HG3	2.56	0.40
1:B:273:LYS:HE3	1:C:185:THR:O	2.22	0.40
1:A:318:THR:O	1:A:322:PRO:HD2	2.22	0.40

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	460/489 (94%)	446 (97%)	13 (3%)	1 (0%)	47 76
1	B	471/489 (96%)	456 (97%)	13 (3%)	2 (0%)	34 64
1	C	462/489 (94%)	445 (96%)	16 (4%)	1 (0%)	47 76
All	All	1393/1467 (95%)	1347 (97%)	42 (3%)	4 (0%)	41 70

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	380	LEU
1	B	380	LEU
1	C	380	LEU
1	B	93	LEU

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	409/426 (96%)	378 (92%)	31 (8%)	13 33
1	B	415/426 (97%)	383 (92%)	32 (8%)	13 32
1	C	411/426 (96%)	376 (92%)	35 (8%)	10 28
All	All	1235/1278 (97%)	1137 (92%)	98 (8%)	12 31

All (98) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	50	LEU
1	A	52	LEU
1	A	54	GLN
1	A	61	TYR
1	A	83	LEU

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Mol	Chain	Res	Type
1	A	104	ASP
1	A	114	GLU
1	A	129	VAL
1	A	152	LYS
1	A	158	LEU
1	A	166	ARG
1	A	188	VAL
1	A	191	SER
1	A	207	GLU
1	A	242	ARG
1	A	246	ARG
1	A	271	ILE
1	A	317	ASP
1	A	323	LEU
1	A	352	SER
1	A	356	GLN
1	A	378	VAL
1	A	380	LEU
1	A	388	SER
1	A	421	GLU
1	A	449	GLN
1	A	453	ARG
1	A	463	LEU
1	A	482	LYS
1	A	488	ILE
1	A	493	THR
1	B	50	LEU
1	B	61	TYR
1	B	82	ASN
1	B	104	ASP
1	B	105	SER
1	B	109	CYS
1	B	111	MET
1	B	112	ILE
1	B	113	LEU
1	B	114	GLU
1	B	120	ARG
1	B	129	VAL
1	B	152	LYS
1	B	158	LEU
1	B	166	ARG
1	B	170	GLN

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Mol	Chain	Res	Type
1	B	188	VAL
1	B	191	SER
1	B	207	GLU
1	B	221	LEU
1	B	317	ASP
1	B	323	LEU
1	B	352	SER
1	B	386	VAL
1	B	422	ARG
1	B	434	SER
1	B	449	GLN
1	B	451	LEU
1	B	461	LEU
1	B	463	LEU
1	B	479	GLU
1	B	493	THR
1	C	50	LEU
1	C	52	LEU
1	C	54	GLN
1	C	61	TYR
1	C	82	ASN
1	C	83	LEU
1	C	89	VAL
1	C	104	ASP
1	C	105	SER
1	C	109	CYS
1	C	110	ARG
1	C	112	ILE
1	C	114	GLU
1	C	129	VAL
1	C	158	LEU
1	C	166	ARG
1	C	188	VAL
1	C	191	SER
1	C	207	GLU
1	C	244	LEU
1	C	272	GLN
1	C	323	LEU
1	C	332	ARG
1	C	352	SER
1	C	356	GLN
1	C	364	LEU

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Mol	Chain	Res	Type
1	C	378	VAL
1	C	380	LEU
1	C	449	GLN
1	C	461	LEU
1	C	463	LEU
1	C	486	SER
1	C	488	ILE
1	C	493	THR
1	C	502	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	107	HIS
1	A	236	GLN
1	A	356	GLN
1	A	393	GLN
1	A	437	ASN
1	A	440	HIS
1	A	478	GLN
1	B	73	GLN
1	B	107	HIS
1	B	155	GLN
1	B	222	ASN
1	B	440	HIS
1	B	466	HIS
1	C	155	GLN
1	C	440	HIS
1	C	466	HIS
1	C	478	GLN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

6 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	$\#\|Z\| > 2$
2	HEC	A	601	3,1	32,50,50	1.70	5 (15%)	24,82,82	2.23	9 (37%)
3	O4W	C	602	2	30,36,36	0.93	1 (3%)	43,55,55	2.71	14 (32%)
2	HEC	C	601	3,1	32,50,50	1.93	7 (21%)	24,82,82	2.31	11 (45%)
2	HEC	B	601	3,1	32,50,50	1.82	7 (21%)	24,82,82	1.87	8 (33%)
3	O4W	B	602	2	30,36,36	0.96	1 (3%)	43,55,55	2.87	12 (27%)
3	O4W	A	602	2	30,36,36	0.90	1 (3%)	43,55,55	2.65	16 (37%)

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
2	HEC	A	601	3,1	-	0/10/54/54	-
3	O4W	C	602	2	-	4/14/44/44	0/5/5/5
2	HEC	C	601	3,1	-	1/10/54/54	-
2	HEC	B	601	3,1	-	2/10/54/54	-
3	O4W	B	602	2	-	3/14/44/44	0/5/5/5
3	O4W	A	602	2	-	4/14/44/44	0/5/5/5

All (22) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	601	HEC	C4B-C3B	5.01	1.52	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	601	HEC	C2B-C3B	-4.88	1.35	1.40
2	A	601	HEC	CBC-CAC	-4.83	1.31	1.49
2	B	601	HEC	C2B-C3B	-4.71	1.35	1.40
2	B	601	HEC	CBB-CAB	-4.32	1.33	1.49
2	C	601	HEC	CBB-CAB	-4.30	1.33	1.49
2	A	601	HEC	C2B-C3B	-4.29	1.36	1.40
2	C	601	HEC	CBC-CAC	-4.10	1.34	1.49
2	B	601	HEC	CBC-CAC	-4.01	1.34	1.49
2	B	601	HEC	C4B-C3B	3.84	1.50	1.43
2	A	601	HEC	CBB-CAB	-3.67	1.35	1.49
2	C	601	HEC	CAA-C2A	-3.56	1.46	1.52
2	A	601	HEC	C4B-C3B	3.06	1.48	1.43
2	B	601	HEC	C3D-C2D	-2.98	1.28	1.37
3	B	602	O4W	C7-N9	-2.84	1.34	1.38
3	C	602	O4W	C7-N9	-2.47	1.35	1.38
2	C	601	HEC	CBD-CGD	2.40	1.56	1.50
2	B	601	HEC	O2A-CGA	2.40	1.38	1.30
2	C	601	HEC	C3C-C2C	-2.39	1.38	1.40
3	A	602	O4W	C7-N9	-2.37	1.35	1.38
2	B	601	HEC	C3C-C2C	-2.20	1.38	1.40
2	A	601	HEC	CAD-C3D	-2.18	1.48	1.52

All (70) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	602	O4W	C2-C8-N9	9.53	105.99	101.39
3	A	602	O4W	C4-C7-N9	7.91	111.18	106.16
3	C	602	O4W	C4-C7-N9	7.31	110.80	106.16
3	B	602	O4W	C4-C7-N9	7.24	110.75	106.16
3	C	602	O4W	C2-C8-N9	6.56	104.55	101.39
3	A	602	O4W	C2-C8-N9	6.45	104.50	101.39
3	B	602	O4W	C8-C2-C4	-5.90	106.52	110.19
3	C	602	O4W	C32-N30-N29	5.73	127.24	120.50
3	B	602	O4W	C8-N9-C7	-5.64	108.71	112.94
3	A	602	O4W	C8-N9-C7	-5.49	108.82	112.94
3	B	602	O4W	C32-N30-N29	5.48	126.94	120.50
3	C	602	O4W	C28-N29-N30	5.37	109.82	104.23
2	C	601	HEC	CBA-CAA-C2A	-5.20	103.83	112.60
3	A	602	O4W	C32-N30-N29	4.96	126.33	120.50
3	C	602	O4W	C8-C2-C4	-4.88	107.15	110.19
3	C	602	O4W	C3-C2-C8	4.87	134.08	126.46
2	A	601	HEC	O2D-CGD-O1D	-4.85	111.20	123.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	602	O4W	C3-C2-C8	4.75	133.90	126.46
3	C	602	O4W	C8-N9-C7	-4.69	109.42	112.94
3	C	602	O4W	C31-N30-N29	-4.61	107.55	111.56
3	A	602	O4W	C8-C2-C4	-4.55	107.36	110.19
2	C	601	HEC	O2D-CGD-O1D	-4.41	112.30	123.30
3	B	602	O4W	C3-C2-C8	4.33	133.23	126.46
2	A	601	HEC	CMC-C2C-C3C	4.32	130.89	125.82
3	A	602	O4W	C28-N29-N30	3.81	108.20	104.23
2	C	601	HEC	CMD-C2D-C1D	-3.81	122.61	128.46
3	B	602	O4W	C28-N29-N30	3.79	108.18	104.23
2	A	601	HEC	CMC-C2C-C1C	-3.68	122.81	128.46
2	A	601	HEC	CMD-C2D-C1D	-3.50	123.09	128.46
2	B	601	HEC	CMC-C2C-C1C	-3.42	123.20	128.46
2	B	601	HEC	O2D-CGD-O1D	-3.41	114.79	123.30
2	A	601	HEC	CMD-C2D-C3D	3.38	131.31	124.94
2	A	601	HEC	O2D-CGD-CBD	3.35	124.79	114.03
3	B	602	O4W	C31-N30-N29	-3.35	108.64	111.56
3	A	602	O4W	C18-N19-C17	3.33	122.02	117.48
3	B	602	O4W	C18-N19-C17	3.29	121.97	117.48
2	B	601	HEC	CMC-C2C-C3C	3.26	129.66	125.82
3	A	602	O4W	O12-C7-C4	-3.22	122.41	128.68
2	B	601	HEC	O2D-CGD-CBD	3.15	124.15	114.03
3	A	602	O4W	C31-N30-N29	-3.10	108.86	111.56
3	A	602	O4W	C18-C14-N9	3.08	123.25	119.84
2	C	601	HEC	CMB-C2B-C3B	3.02	129.38	125.82
3	C	602	O4W	O12-C7-C4	-2.96	122.92	128.68
2	C	601	HEC	O2D-CGD-CBD	2.85	123.18	114.03
3	B	602	O4W	C27-C25-N24	2.80	122.27	118.72
2	C	601	HEC	CMA-C3A-C2A	2.76	130.15	124.94
2	A	601	HEC	O2A-CGA-CBA	2.71	122.73	114.03
3	C	602	O4W	C27-C25-N24	2.64	122.07	118.72
3	A	602	O4W	C27-C25-N24	2.63	122.06	118.72
2	C	601	HEC	CMC-C2C-C3C	2.57	128.85	125.82
3	C	602	O4W	C18-N19-C17	2.50	120.89	117.48
2	C	601	HEC	CMB-C2B-C1B	-2.48	124.65	128.46
2	C	601	HEC	CMD-C2D-C3D	2.44	129.54	124.94
2	A	601	HEC	O2A-CGA-O1A	-2.43	117.25	123.30
3	B	602	O4W	C13-C8-C2	-2.38	108.41	112.16
2	B	601	HEC	CMB-C2B-C3B	2.36	128.59	125.82
3	C	602	O4W	C13-C8-N9	2.32	114.40	111.46
2	B	601	HEC	CAD-CBD-CGD	-2.26	107.43	113.76
3	A	602	O4W	C13-C8-N9	2.22	114.27	111.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	602	O4W	C18-C14-N9	2.21	122.30	119.84
3	A	602	O4W	C14-C18-N19	-2.17	120.52	122.92
2	C	601	HEC	CMC-C2C-C1C	-2.16	125.14	128.46
2	B	601	HEC	C1D-C2D-C3D	-2.13	105.51	107.00
3	A	602	O4W	O26-C25-N24	-2.12	118.84	122.34
3	A	602	O4W	C13-C8-C2	-2.10	108.86	112.16
2	C	601	HEC	CBD-CAD-C3D	-2.07	109.09	112.62
2	A	601	HEC	C1D-C2D-C3D	-2.04	105.58	107.00
3	C	602	O4W	O26-C25-N24	-2.03	118.97	122.34
2	B	601	HEC	O2A-CGA-CBA	2.01	120.50	114.03
3	B	602	O4W	C6-C4-C2	-2.00	119.31	121.33

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	602	O4W	O26-C25-C27-C31
3	C	602	O4W	C17-C15-O20-C21
3	A	602	O4W	C17-C15-O20-C21
3	B	602	O4W	C17-C15-O20-C21
3	B	602	O4W	C16-C15-O20-C21
3	A	602	O4W	C16-C15-O20-C21
3	C	602	O4W	C16-C15-O20-C21
3	A	602	O4W	O26-C25-C27-C28
3	C	602	O4W	O26-C25-C27-C28
3	C	602	O4W	O26-C25-C27-C31
2	B	601	HEC	CAD-CBD-CGD-O2D
2	B	601	HEC	CAD-CBD-CGD-O1D
3	B	602	O4W	O26-C25-C27-C28
2	C	601	HEC	CAD-CBD-CGD-O1D

There are no ring outliers.

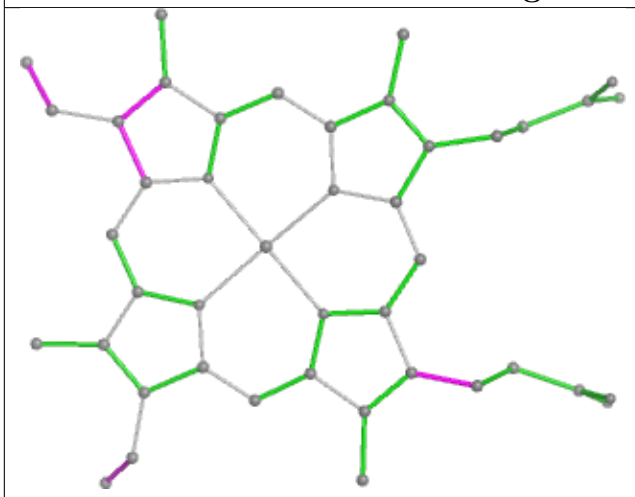
3 monomers are involved in 15 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	601	HEC	3	0
2	C	601	HEC	7	0
2	B	601	HEC	5	0

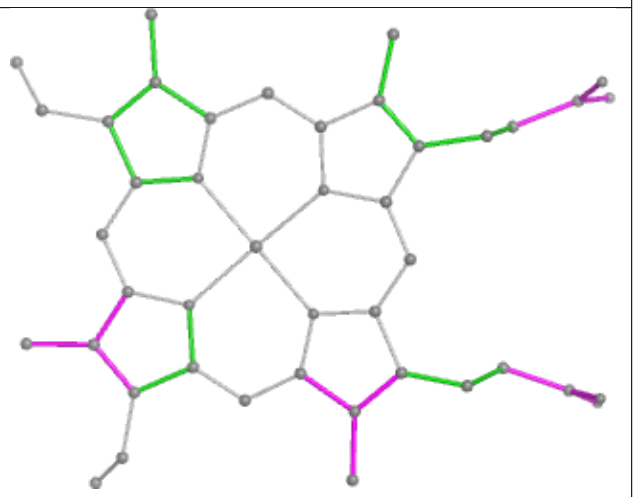
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

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.

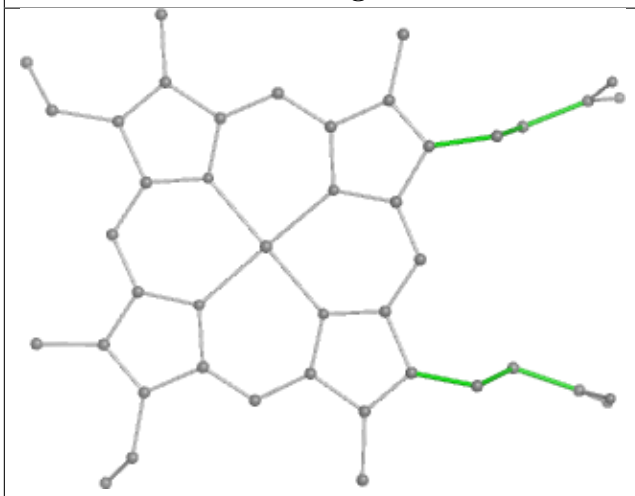
Ligand HEC A 601



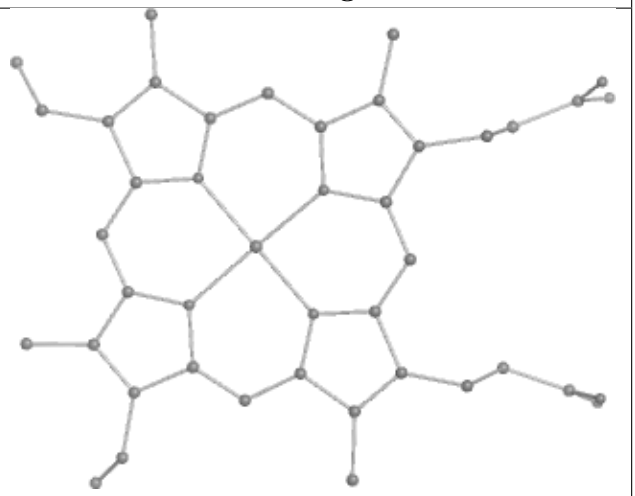
Bond lengths



Bond angles

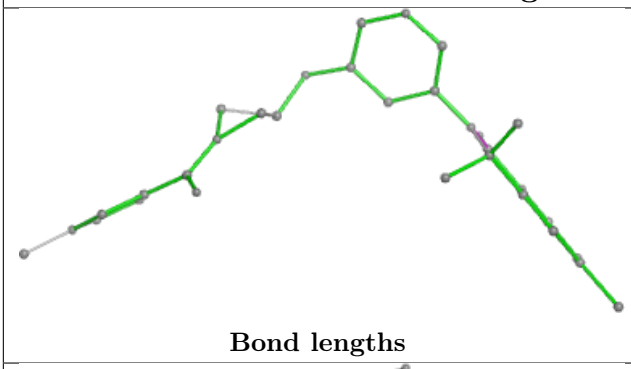


Torsions

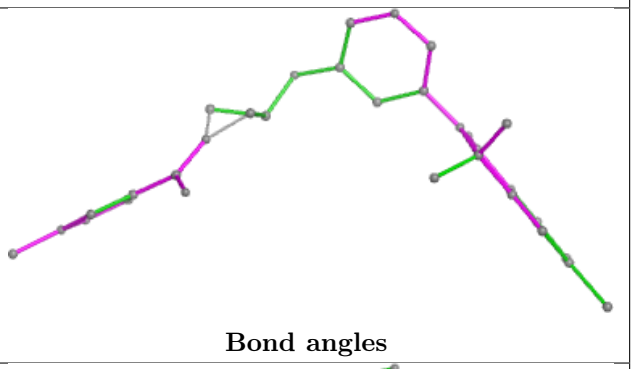


Rings

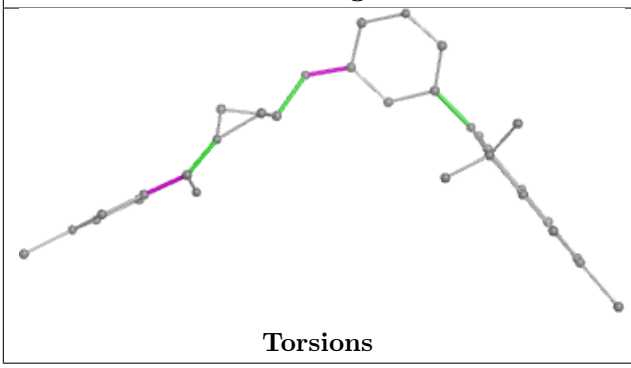
Ligand O4W C 602



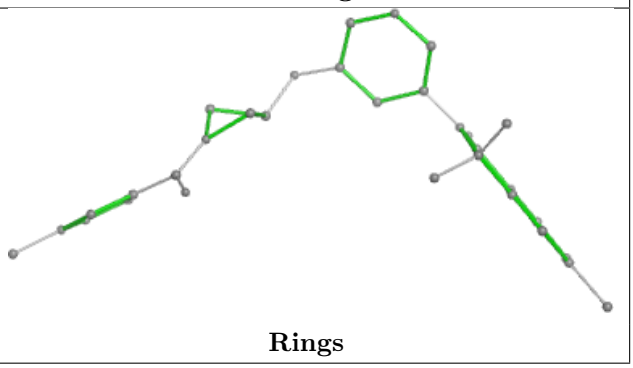
Bond lengths



Bond angles

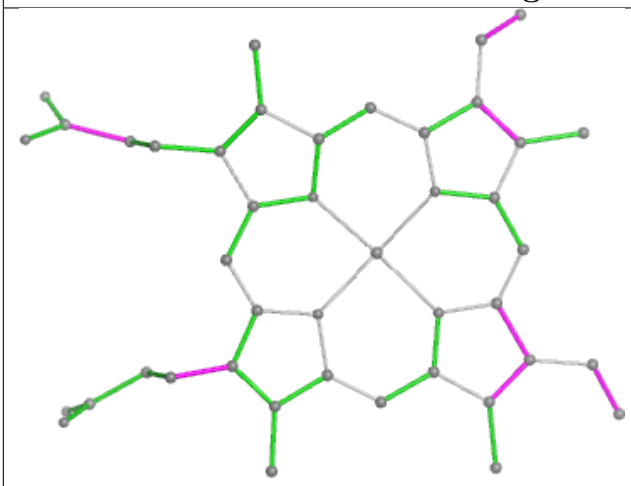


Torsions

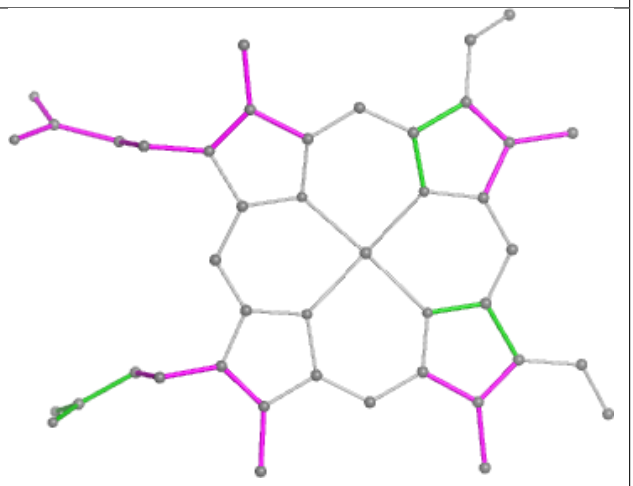


Rings

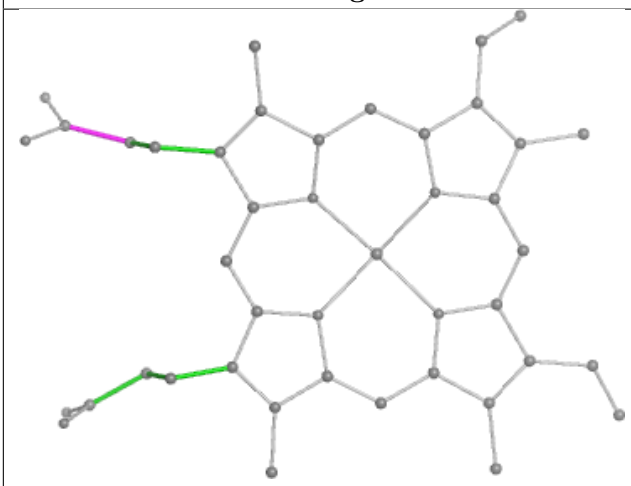
Ligand HEC C 601



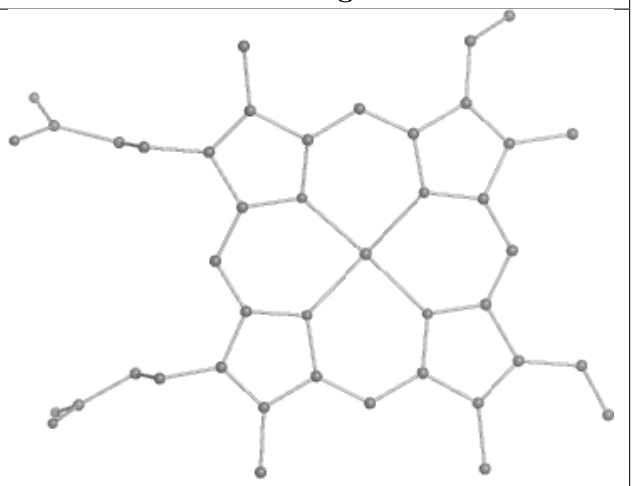
Bond lengths



Bond angles

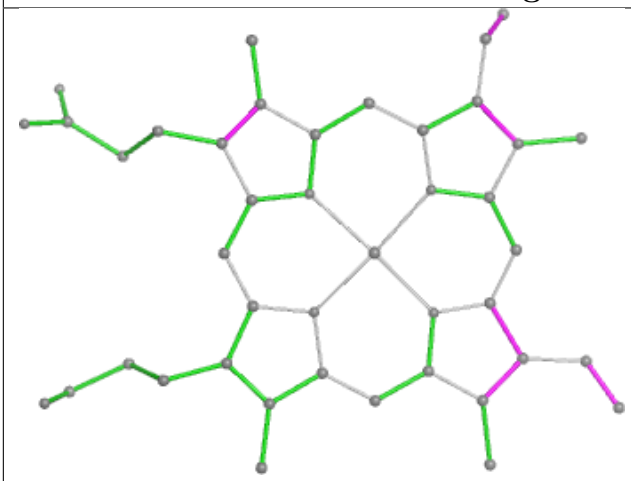


Torsions

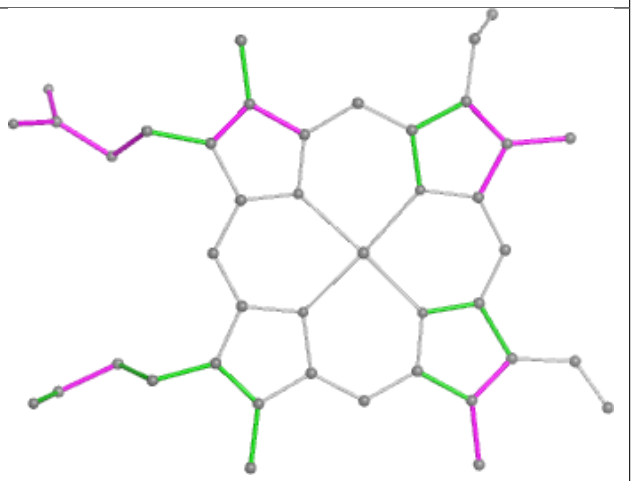


Rings

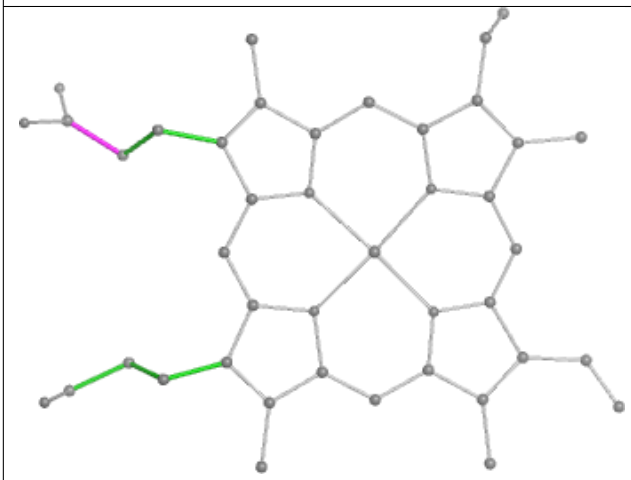
Ligand HEC B 601



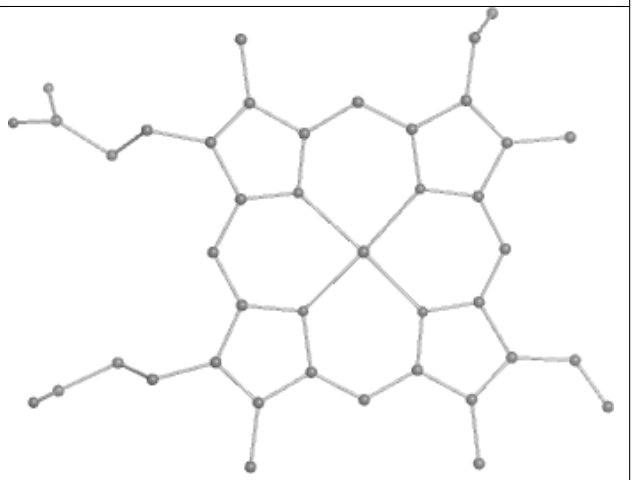
Bond lengths



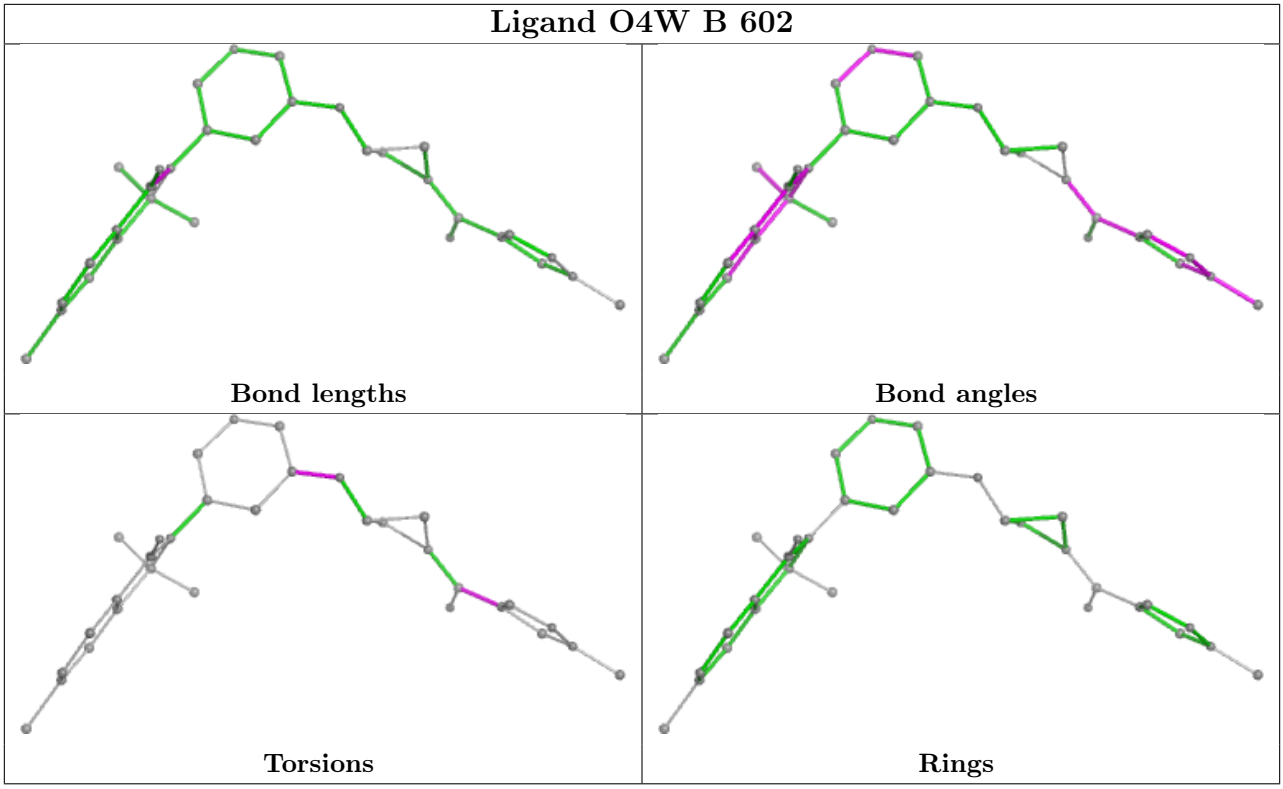
Bond angles

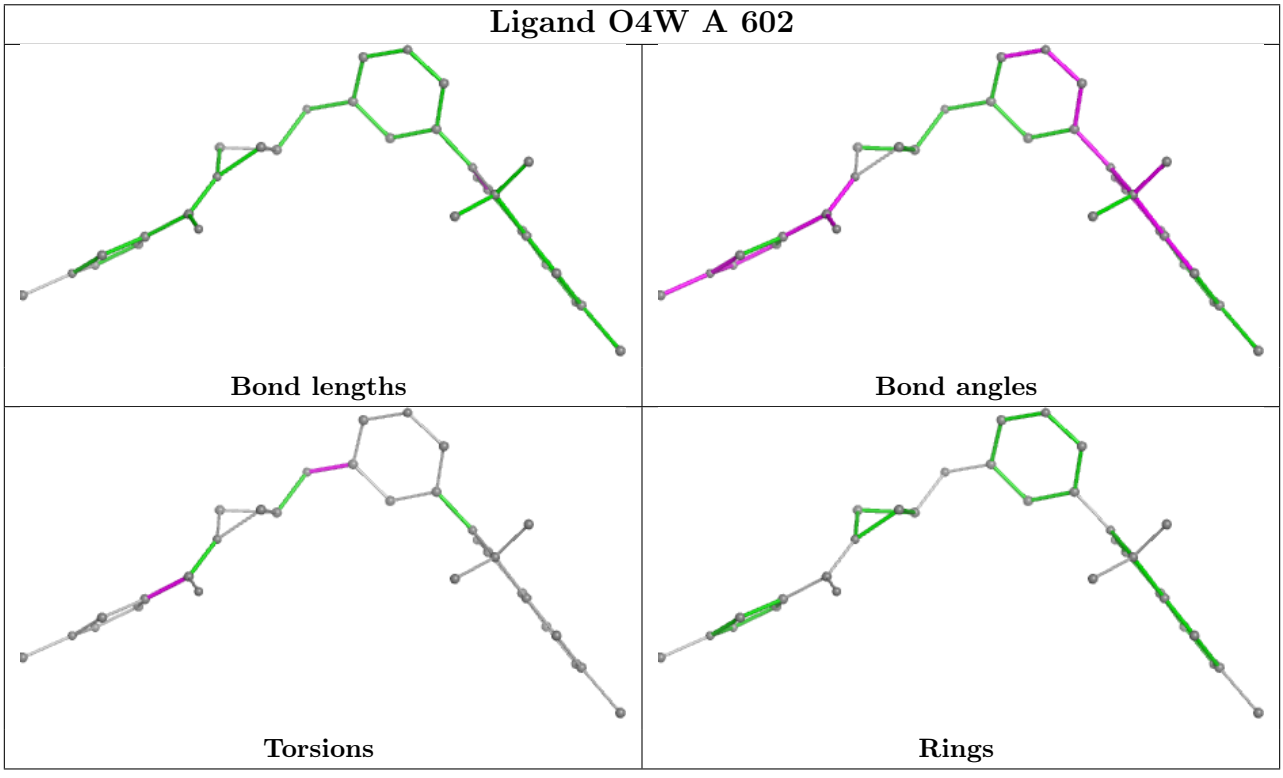


Torsions



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

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	464/489 (94%)	0.36	18 (3%)	39	34	33, 52, 79, 101	0
1	B	473/489 (96%)	0.23	6 (1%)	77	75	29, 47, 70, 98	0
1	C	466/489 (95%)	0.25	6 (1%)	77	75	32, 49, 73, 106	0
All	All	1403/1467 (95%)	0.28	30 (2%)	63	59	29, 50, 74, 106	0

All (30) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	431	ILE	3.2
1	A	50	LEU	2.9
1	A	56	TRP	2.9
1	A	358	ALA	2.9
1	A	249	SER	2.8
1	C	246	ARG	2.7
1	B	176	VAL	2.6
1	B	177	LEU	2.6
1	A	85	GLY	2.5
1	A	252	VAL	2.5
1	A	437	ASN	2.4
1	C	36	LEU	2.4
1	C	432	ARG	2.4
1	C	416	LEU	2.4
1	A	430	ASP	2.4
1	B	121	GLN	2.4
1	B	504	GLY	2.3
1	A	246	ARG	2.3
1	A	112	ILE	2.3
1	C	247	TRP	2.3
1	B	84	GLY	2.3
1	A	166	ARG	2.3
1	A	49	TRP	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	47	ASN	2.1
1	A	86	PRO	2.1
1	A	125	HIS	2.1
1	A	419	ARG	2.1
1	A	247	TRP	2.1
1	A	396	HIS	2.0
1	B	432	ARG	2.0

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 monosaccharides in this entry.

6.4 Ligands (i)

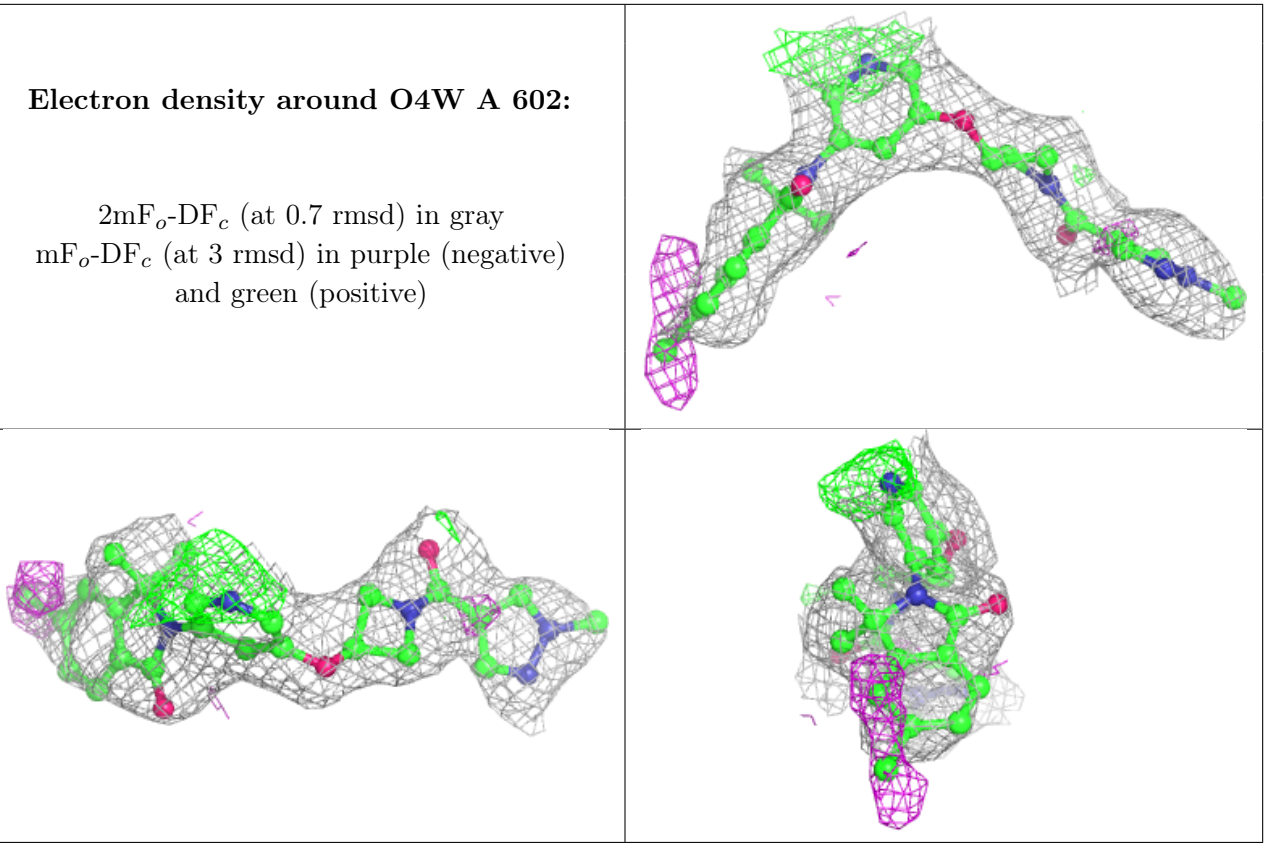
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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
3	O4W	A	602	32/32	0.83	0.28	56,61,73,88	0
3	O4W	C	602	32/32	0.90	0.21	35,42,52,68	0
3	O4W	B	602	32/32	0.91	0.23	33,47,55,70	0
2	HEC	C	601	43/43	0.95	0.18	39,40,44,46	0
2	HEC	A	601	43/43	0.95	0.20	44,45,49,53	0
2	HEC	B	601	43/43	0.96	0.18	32,34,39,39	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.

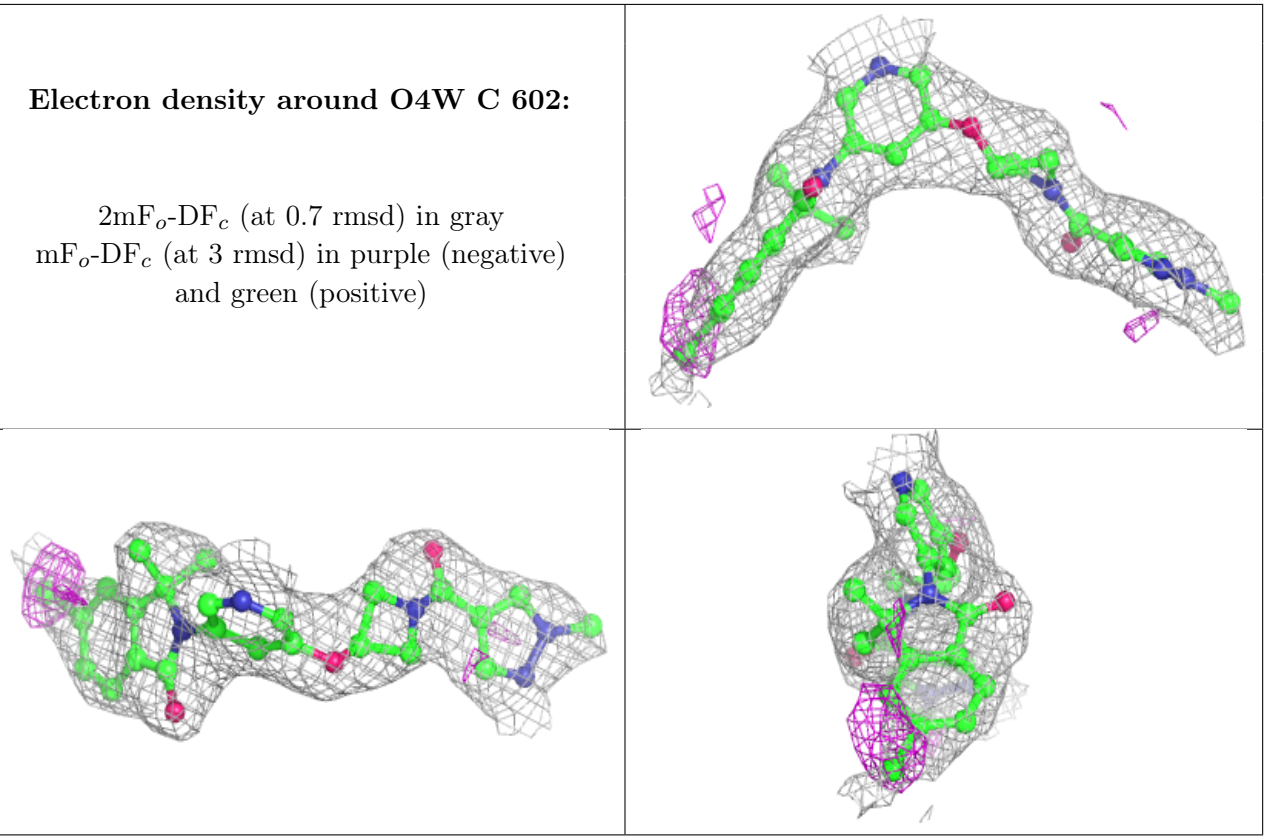
Electron density around O4W A 602:

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



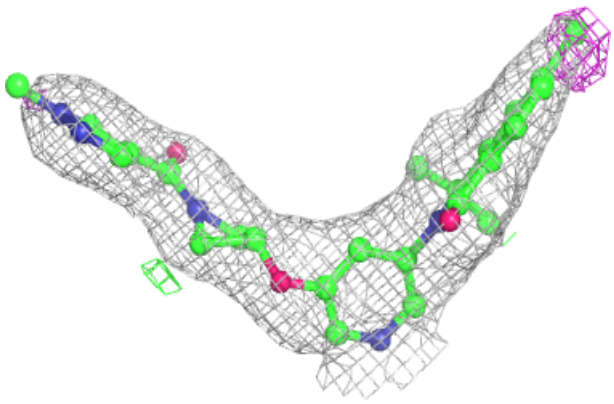
Electron density around O4W C 602:

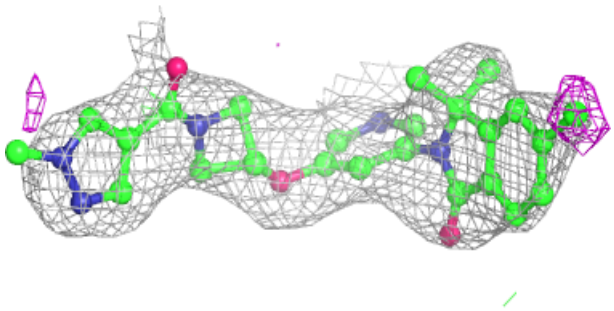
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

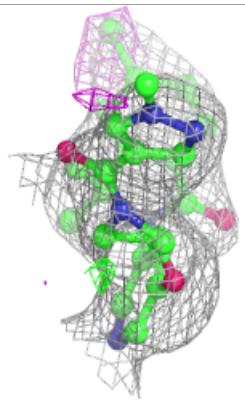


Electron density around O4W B 602:

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

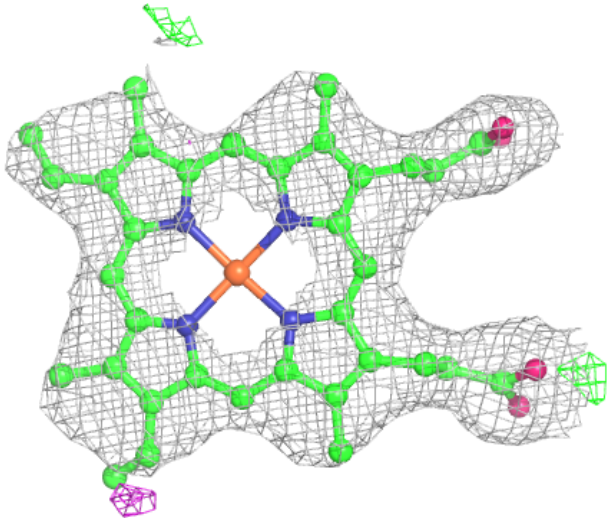


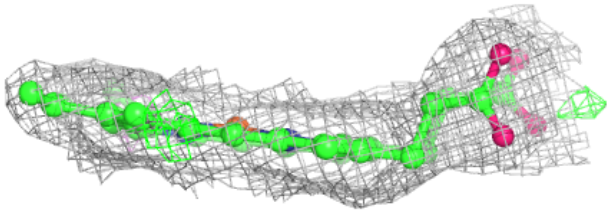


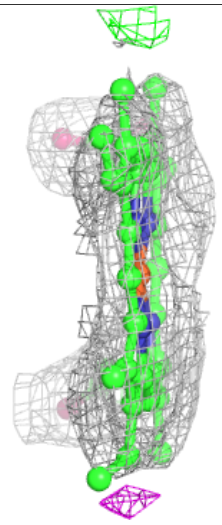


Electron density around HEC C 601:

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

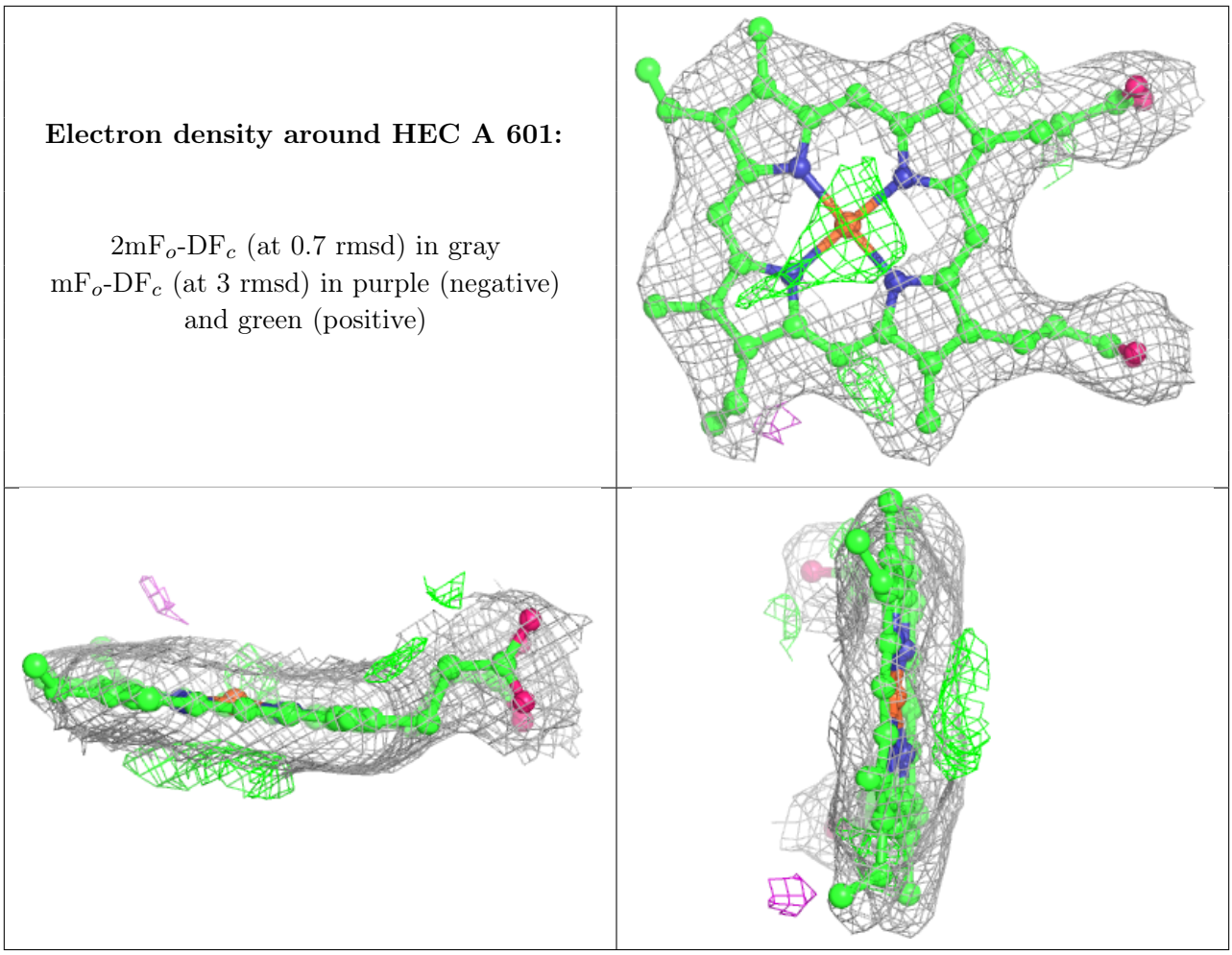






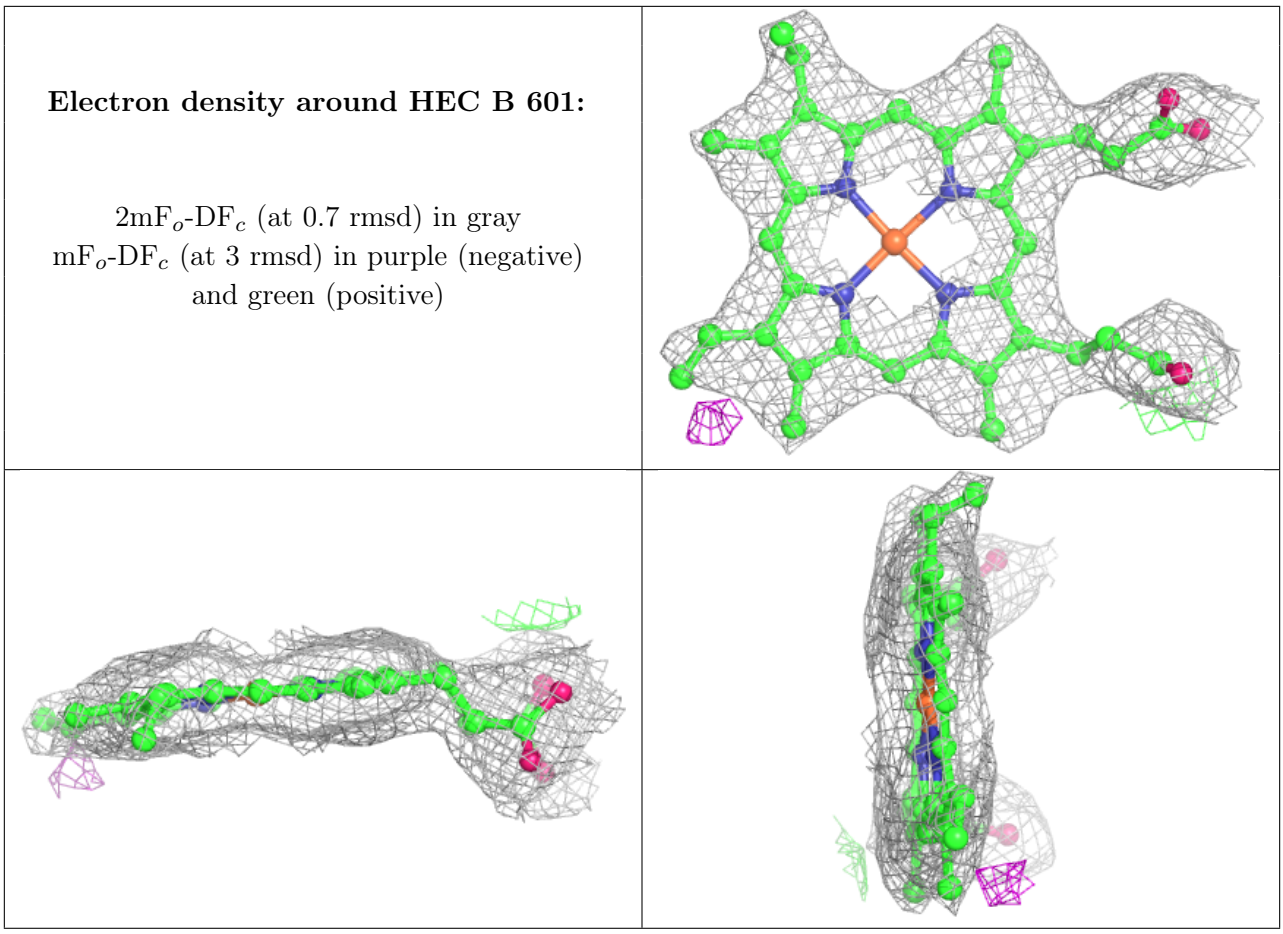
Electron density around HEC A 601:

$2mF_o$-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 B 601:

$2mF_o$-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.