



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 12:52 AM UTC

PDB ID : 6Q2C / pdb\_00006q2c  
Title : Domain-swapped dimer of Acanthamoeba castellanii CYP51  
Authors : Sharma, V.; Podust, L.M.  
Deposited on : 2019-08-07  
Resolution : 1.80 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](mailto: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>.

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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)  
Xtrriage (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

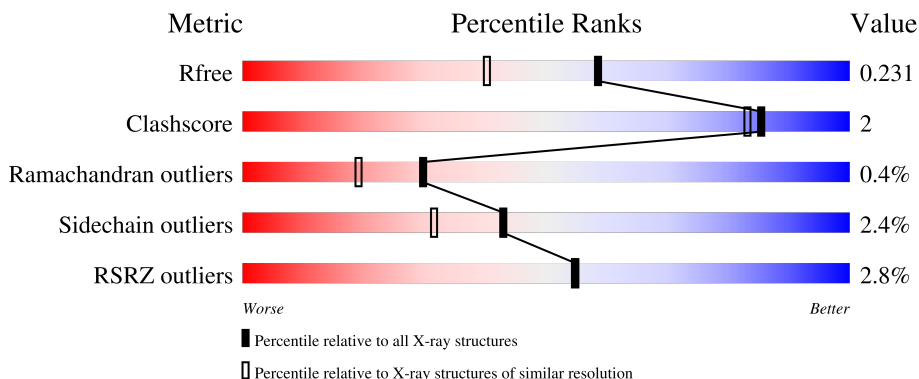
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.80 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	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

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  $\geq 3$ , 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	460	
1	B	460	

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 7890 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 Obtusifoliol 14alphademethylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	449	3601	2327	600	656	18	0	4	0
1	B	449	3583	2317	597	651	18	0	3	0

There are 32 discrepancies between the modelled and reference sequences:

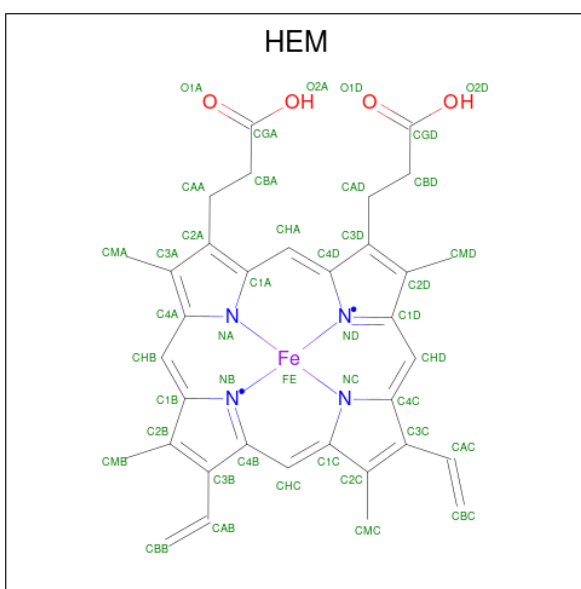
Chain	Residue	Modelled	Actual	Comment	Reference
A	33	MET	-	expression tag	UNP L8GJB3
A	34	ALA	-	expression tag	UNP L8GJB3
A	35	LYS	-	expression tag	UNP L8GJB3
A	36	LYS	-	expression tag	UNP L8GJB3
A	37	THR	-	expression tag	UNP L8GJB3
A	38	SER	-	expression tag	UNP L8GJB3
A	39	SER	-	expression tag	UNP L8GJB3
A	40	LYS	-	expression tag	UNP L8GJB3
A	41	GLY	-	expression tag	UNP L8GJB3
A	42	LYS	-	expression tag	UNP L8GJB3
A	487	HIS	-	expression tag	UNP L8GJB3
A	488	HIS	-	expression tag	UNP L8GJB3
A	489	HIS	-	expression tag	UNP L8GJB3
A	490	HIS	-	expression tag	UNP L8GJB3
A	491	HIS	-	expression tag	UNP L8GJB3
A	492	HIS	-	expression tag	UNP L8GJB3
B	33	MET	-	expression tag	UNP L8GJB3
B	34	ALA	-	expression tag	UNP L8GJB3
B	35	LYS	-	expression tag	UNP L8GJB3
B	36	LYS	-	expression tag	UNP L8GJB3
B	37	THR	-	expression tag	UNP L8GJB3
B	38	SER	-	expression tag	UNP L8GJB3
B	39	SER	-	expression tag	UNP L8GJB3
B	40	LYS	-	expression tag	UNP L8GJB3
B	41	GLY	-	expression tag	UNP L8GJB3

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Chain	Residue	Modelled	Actual	Comment	Reference
B	42	LYS	-	expression tag	UNP L8GJB3
B	487	HIS	-	expression tag	UNP L8GJB3
B	488	HIS	-	expression tag	UNP L8GJB3
B	489	HIS	-	expression tag	UNP L8GJB3
B	490	HIS	-	expression tag	UNP L8GJB3
B	491	HIS	-	expression tag	UNP L8GJB3
B	492	HIS	-	expression tag	UNP L8GJB3

- Molecule 2 is PROTOPORPHYRIN IX CONTAINING FE (CCD ID: HEM) (formula:  $C_{34}H_{32}FeN_4O_4$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
2	A	1	Total	C	Fe	N	O	0	1
			86	68	2	8	8		
2	B	1	Total	C	Fe	N	O	0	1
			86	68	2	8	8		

- Molecule 3 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula:  $C_4H_{10}O_3$ ).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 7 4 3	0	0
3	A	1	Total C O 7 4 3	0	0
3	B	1	Total C O 7 4 3	0	0

- Molecule 4 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total K 1 1	0	0
4	B	1	Total K 1 1	0	0

- Molecule 5 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total Cl 1 1	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	279	Total O 279 279	0	0

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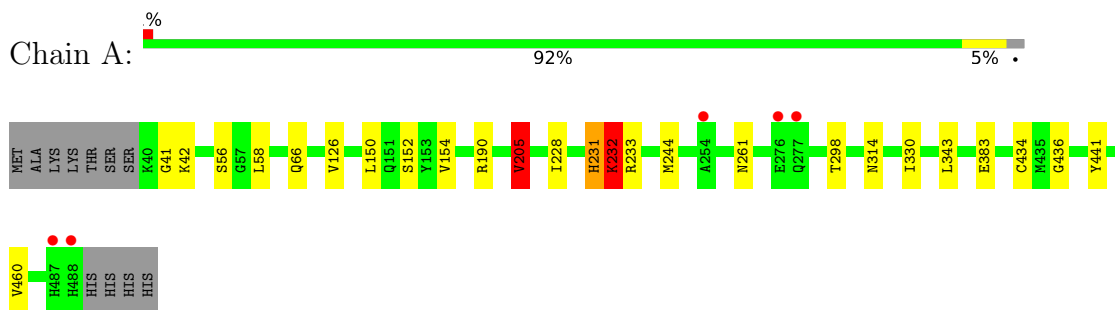
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<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
6	B	231	Total 231	O 231	0	0

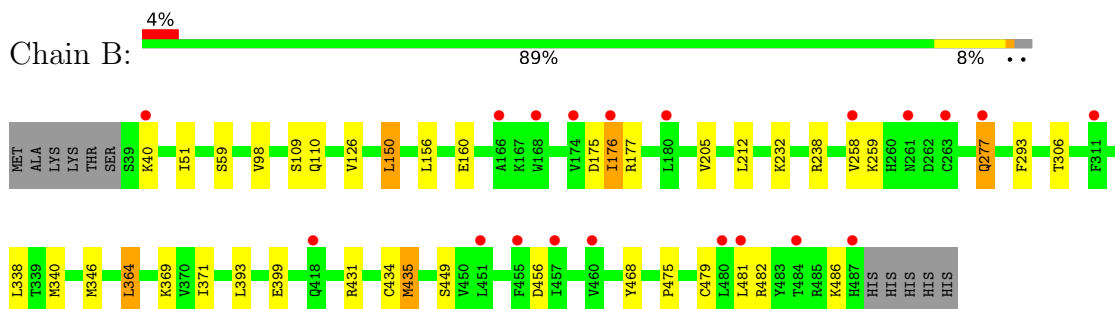
### 3 Residue-property plots [i](#)

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: Obtusifoliol 14alphademethylase



- Molecule 1: Obtusifoliol 14alphademethylase



## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	100.35Å 101.57Å 123.74Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	78.51 – 1.80 78.51 – 1.80	Depositor EDS
% Data completeness (in resolution range)	98.1 (78.51-1.80) 98.1 (78.51-1.80)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.34 (at 1.80Å)	Xtrriage
Refinement program	REFMAC 5.8.0135	Depositor
R, $R_{free}$	0.185 , 0.227 0.193 , 0.231	Depositor DCC
$R_{free}$ test set	5787 reflections (4.93%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	44.6	Xtrriage
Anisotropy	0.235	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 32.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.009 for k,h,-l	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	7890	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	50.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.84% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: HEM, K, PEG, CL

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	A	1.32	8/3690 (0.2%)	1.18	11/4996 (0.2%)
1	B	1.29	12/3672 (0.3%)	1.17	9/4974 (0.2%)
All	All	1.31	20/7362 (0.3%)	1.18	20/9970 (0.2%)

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	232	LYS	N-CA	9.91	1.58	1.46
1	B	98	VAL	CA-CB	7.38	1.58	1.54
1	A	232	LYS	CA-C	-6.58	1.44	1.52
1	A	154	VAL	CA-C	6.36	1.58	1.52
1	A	231	HIS	C-N	-6.08	1.25	1.33
1	B	176	ILE	N-CA	5.82	1.53	1.46
1	B	293	PHE	C-O	-5.63	1.17	1.24
1	A	343	LEU	CA-C	5.63	1.60	1.52
1	B	481	LEU	C-O	5.61	1.31	1.23
1	B	306	THR	CA-C	5.57	1.60	1.52
1	A	441	TYR	CA-C	5.54	1.59	1.52
1	A	330	ILE	CA-C	5.35	1.59	1.52
1	B	110	GLN	C-O	-5.34	1.17	1.24
1	B	59	SER	C-O	-5.24	1.17	1.24
1	B	277	GLN	CA-C	5.17	1.59	1.52
1	A	298	THR	C-O	5.08	1.29	1.24
1	B	449	SER	C-O	-5.05	1.18	1.24
1	B	175	ASP	CA-C	5.02	1.59	1.52
1	B	212	LEU	CA-C	-5.01	1.46	1.52
1	B	456	ASP	C-O	5.00	1.29	1.23

All (20) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	231	HIS	N-CA-C	-8.38	96.97	110.20
1	A	314	ASN	N-CA-C	8.17	119.81	111.07
1	A	232	LYS	N-CA-CB	7.96	123.95	110.49
1	A	205	VAL	CB-CA-C	-7.62	101.71	112.22
1	B	176	ILE	N-CA-CB	7.53	120.79	110.54
1	A	233	ARG	NE-CZ-NH2	6.95	125.45	119.20
1	B	258	VAL	N-CA-C	6.85	117.00	110.42
1	A	205	VAL	N-CA-CB	6.48	120.30	110.58
1	B	51	ILE	CA-C-N	-6.31	114.27	120.52
1	B	51	ILE	C-N-CA	-6.31	114.27	120.52
1	B	238	ARG	NE-CZ-NH2	6.29	124.87	119.20
1	A	154	VAL	N-CA-CB	5.93	114.24	110.50
1	B	277	GLN	N-CA-C	5.80	118.86	110.28
1	A	42	LYS	N-CA-C	5.71	118.94	109.46
1	B	486	LYS	N-CA-C	-5.43	100.84	109.59
1	B	435	MET	CG-SD-CE	5.40	112.78	100.90
1	A	231	HIS	CA-C-N	-5.37	111.28	121.54
1	A	231	HIS	C-N-CA	-5.37	111.28	121.54
1	B	176	ILE	CB-CA-C	-5.33	104.94	112.14
1	A	41	GLY	N-CA-C	5.33	118.53	110.75

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	3601	0	3560	12	0
1	B	3583	0	3528	12	0
2	A	86	0	60	6	0
2	B	86	0	60	9	0
3	A	14	0	20	0	0
3	B	7	0	10	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
5	B	1	0	0	0	0
6	A	279	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	231	0	0	1	0
All	All	7890	0	7238	32	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 2.

All (32) 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:B:160[B]:GLU:OE2	1:B:160[B]:GLU:HA	1.50	1.10
1:A:205:VAL:HG13	1:A:244:MET:SD	2.29	0.72
1:A:231:HIS:O	1:A:232:LYS:CB	2.32	0.71
1:B:160[B]:GLU:OE2	1:B:160[B]:GLU:CA	2.30	0.71
1:B:435:MET:HE3	2:B:501[B]:HEM:HMD3	1.74	0.67
1:B:435:MET:HE3	2:B:501[A]:HEM:HMD3	1.77	0.65
2:B:501[B]:HEM:HMC2	2:B:501[B]:HEM:HBC2	1.79	0.65
2:B:501[B]:HEM:HBD1	2:B:501[B]:HEM:HHA	1.80	0.64
1:A:434:CYS:HA	2:A:501[B]:HEM:CHA	2.29	0.62
1:A:228:ILE:O	1:A:231:HIS:O	2.18	0.61
2:A:501[B]:HEM:HMC2	2:A:501[B]:HEM:HBC2	1.83	0.61
1:A:231:HIS:O	1:A:232:LYS:HB3	2.02	0.59
2:A:501[A]:HEM:HBC2	2:A:501[A]:HEM:HMC2	1.85	0.58
2:B:501[A]:HEM:HMC1	2:B:501[A]:HEM:HBC2	1.86	0.57
1:B:338:LEU:HD11	1:B:346:MET:HE1	1.86	0.56
1:A:152:SER:HB3	1:A:261:ASN:ND2	2.22	0.54
1:B:369:LYS:NZ	6:B:603:HOH:O	2.41	0.54
1:A:434:CYS:HA	2:A:501[B]:HEM:C4D	2.44	0.52
1:B:150:LEU:C	1:B:340:MET:HE1	2.35	0.51
2:A:501[B]:HEM:HBC2	2:A:501[B]:HEM:CMC	2.40	0.51
1:A:205:VAL:CG1	1:A:244:MET:SD	2.99	0.49
2:B:501[B]:HEM:HBB2	2:B:501[B]:HEM:HMB2	1.96	0.48
1:B:109:SER:HB2	1:B:371:ILE:HD11	1.96	0.47
2:B:501[B]:HEM:HBB2	2:B:501[B]:HEM:CMB	2.44	0.46
1:A:66[B]:GLN:OE1	1:B:232:LYS:CE	2.65	0.45
1:B:177:ARG:NH1	1:B:475:PRO:O	2.50	0.43
1:A:460:VAL:O	6:A:601:HOH:O	2.21	0.42
1:A:152:SER:HB3	1:A:261:ASN:CG	2.45	0.42
2:B:501[B]:HEM:HBC2	2:B:501[B]:HEM:CMC	2.47	0.41
1:B:434:CYS:HA	2:B:501[A]:HEM:C4D	2.56	0.41
1:A:436:GLY:HA3	2:A:501[B]:HEM:C3C	2.56	0.40
1:B:364:LEU:HD21	1:B:468:TYR:CE1	2.57	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	451/460 (98%)	443 (98%)	6 (1%)	2 (0%)	30	19
1	B	450/460 (98%)	442 (98%)	6 (1%)	2 (0%)	30	19
All	All	901/920 (98%)	885 (98%)	12 (1%)	4 (0%)	30	19

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	232	LYS
1	A	126	VAL
1	B	126	VAL
1	B	259	LYS

### 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	382/397 (96%)	376 (98%)	6 (2%)	55	47
1	B	377/397 (95%)	365 (97%)	12 (3%)	34	22
All	All	759/794 (96%)	741 (98%)	18 (2%)	43	31

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	56	SER
1	A	58	LEU
1	A	150	LEU
1	A	190	ARG
1	A	205	VAL
1	A	383	GLU
1	B	40	LYS
1	B	150	LEU
1	B	156	LEU
1	B	176	ILE
1	B	205	VAL
1	B	277	GLN
1	B	364	LEU
1	B	393	LEU
1	B	399	GLU
1	B	431	ARG
1	B	479	CYS
1	B	482	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	260	HIS
1	A	408	ASN
1	B	200	ASN
1	B	210	GLN
1	B	408	ASN

### 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 oligosaccharides in this entry.

## 5.6 Ligand geometry

Of 10 ligands modelled in this entry, 3 are monoatomic - leaving 7 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	HEM	B	501[A]	6,1	50,50,50	1.45	6 (12%)	67,82,82	1.53	14 (20%)
2	HEM	A	501[B]	6,1	50,50,50	1.53	8 (16%)	67,82,82	1.82	16 (23%)
2	HEM	A	501[A]	6,1	50,50,50	1.59	7 (14%)	67,82,82	1.67	15 (22%)
3	PEG	B	502	-	6,6,6	1.01	0	5,5,5	1.25	0
3	PEG	A	502	-	6,6,6	0.85	0	5,5,5	0.83	0
3	PEG	A	503	-	6,6,6	0.62	0	5,5,5	0.71	0
2	HEM	B	501[B]	6,1	50,50,50	1.40	5 (10%)	67,82,82	1.69	17 (25%)

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	HEM	B	501[A]	6,1	-	0/14/54/54	-
2	HEM	A	501[B]	6,1	-	0/14/54/54	-
2	HEM	A	501[A]	6,1	-	0/14/54/54	-
3	PEG	B	502	-	-	1/4/4/4	-
3	PEG	A	502	-	-	2/4/4/4	-
3	PEG	A	503	-	-	2/4/4/4	-
2	HEM	B	501[B]	6,1	-	4/14/54/54	-

All (26) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501[B]	HEM	C1B-NB	-4.69	1.32	1.40
2	B	501[A]	HEM	FE-NB	4.53	2.08	1.94
2	A	501[A]	HEM	FE-NB	4.36	2.08	1.94
2	A	501[B]	HEM	FE-NC	4.18	2.09	1.95
2	A	501[A]	HEM	FE-NC	4.13	2.08	1.95

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501[B]	HEM	FE-NC	3.97	2.08	1.95
2	B	501[A]	HEM	C1B-NB	-3.93	1.33	1.40
2	B	501[B]	HEM	C1B-NB	-3.90	1.33	1.40
2	A	501[A]	HEM	C1B-NB	-3.81	1.33	1.40
2	B	501[B]	HEM	FE-NB	3.81	2.06	1.94
2	B	501[A]	HEM	FE-NC	3.77	2.07	1.95
2	A	501[B]	HEM	FE-NB	3.54	2.05	1.94
2	A	501[B]	HEM	C4B-NB	-3.34	1.32	1.38
2	A	501[A]	HEM	C4B-NB	-3.03	1.32	1.38
2	A	501[A]	HEM	C4D-ND	-2.75	1.35	1.40
2	B	501[B]	HEM	C4B-NB	-2.57	1.33	1.38
2	B	501[A]	HEM	C4B-NB	-2.54	1.33	1.38
2	A	501[A]	HEM	C4D-C3D	2.54	1.49	1.45
2	B	501[A]	HEM	FE-NA	2.26	2.02	1.95
2	A	501[B]	HEM	C1B-C2B	-2.18	1.40	1.44
2	B	501[A]	HEM	C4D-C3D	2.12	1.48	1.45
2	A	501[B]	HEM	C4D-ND	-2.11	1.36	1.40
2	A	501[A]	HEM	CBD-CGD	2.09	1.55	1.50
2	A	501[B]	HEM	FE-NA	2.08	2.02	1.95
2	A	501[B]	HEM	C1C-C2C	-2.05	1.41	1.45
2	B	501[B]	HEM	C4D-C3D	2.00	1.48	1.45

All (62) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501[B]	HEM	CHC-C4B-NB	5.41	130.24	124.42
2	A	501[B]	HEM	C1B-NB-C4B	4.81	110.90	105.21
2	B	501[B]	HEM	CAD-C3D-C4D	4.69	132.88	124.70
2	A	501[B]	HEM	O2D-CGD-CBD	4.56	128.42	114.00
2	B	501[B]	HEM	CHC-C4B-NB	4.44	129.21	124.42
2	A	501[A]	HEM	CHC-C4B-NB	4.44	129.20	124.42
2	A	501[A]	HEM	C1B-NB-C4B	3.86	109.77	105.21
2	B	501[A]	HEM	O2A-CGA-O1A	-3.83	113.48	123.33
2	A	501[B]	HEM	O1D-CGD-CBD	-3.67	111.45	123.09
2	B	501[A]	HEM	CHD-C4C-NC	3.59	128.36	124.45
2	A	501[B]	HEM	CHA-C4D-C3D	-3.53	118.72	125.23
2	A	501[B]	HEM	CHA-C4D-ND	3.48	128.67	124.37
2	A	501[A]	HEM	C3D-C4D-ND	3.48	113.98	110.17
2	B	501[A]	HEM	CHC-C4B-NB	3.46	128.15	124.42
2	B	501[B]	HEM	C1B-NB-C4B	3.27	109.08	105.21
2	B	501[B]	HEM	CAD-C3D-C2D	-3.15	121.97	127.87
2	A	501[A]	HEM	CHA-C4D-C3D	-3.12	119.47	125.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501[A]	HEM	O2A-CGA-CBA	2.98	123.41	114.00
2	A	501[A]	HEM	CHD-C4C-NC	2.91	127.62	124.45
2	B	501[B]	HEM	CHB-C1B-NB	2.90	127.95	124.37
2	B	501[A]	HEM	O2A-CGA-CBA	2.85	123.01	114.00
2	B	501[B]	HEM	CHD-C1D-ND	2.84	127.48	124.42
2	A	501[A]	HEM	CAD-C3D-C4D	2.83	129.63	124.70
2	B	501[A]	HEM	C4B-C3B-C2B	-2.80	104.70	107.28
2	A	501[B]	HEM	C3B-C4B-NB	-2.80	107.46	109.47
2	B	501[A]	HEM	C1B-NB-C4B	2.79	108.52	105.21
2	A	501[B]	HEM	CHB-C1B-NB	2.75	127.76	124.37
2	A	501[B]	HEM	CAA-C2A-C1A	2.74	130.30	124.94
2	B	501[B]	HEM	C1A-CHA-C4D	-2.73	119.83	126.25
2	A	501[B]	HEM	C4B-C3B-C2B	-2.66	104.83	107.28
2	B	501[B]	HEM	CHD-C1D-C2D	-2.65	120.84	125.03
2	B	501[B]	HEM	C3B-C4B-NB	-2.64	107.58	109.47
2	B	501[A]	HEM	O2D-CGD-CBD	2.61	122.25	114.00
2	B	501[B]	HEM	CAA-CBA-CGA	-2.59	106.79	113.67
2	B	501[B]	HEM	CHD-C4C-NC	2.55	127.23	124.45
2	A	501[A]	HEM	CHD-C1D-C2D	-2.52	121.05	125.03
2	B	501[B]	HEM	O2A-CGA-CBA	2.51	121.94	114.00
2	B	501[A]	HEM	CAD-C3D-C4D	2.48	129.02	124.70
2	B	501[A]	HEM	CHA-C4D-C3D	-2.48	120.66	125.23
2	B	501[A]	HEM	C1A-CHA-C4D	-2.34	120.75	126.25
2	B	501[A]	HEM	C4C-NC-C1C	2.32	109.61	105.82
2	A	501[A]	HEM	CHD-C1D-ND	2.29	126.88	124.42
2	B	501[B]	HEM	CBD-CAD-C3D	2.28	118.83	112.53
2	A	501[B]	HEM	CHD-C1D-ND	2.27	126.87	124.42
2	B	501[B]	HEM	O2D-CGD-CBD	2.26	121.13	114.00
2	A	501[A]	HEM	O2A-CGA-O1A	-2.25	117.54	123.33
2	A	501[B]	HEM	CBD-CAD-C3D	2.25	118.76	112.53
2	A	501[B]	HEM	C3D-C4D-ND	2.19	112.57	110.17
2	A	501[B]	HEM	CHD-C4C-NC	2.17	126.82	124.45
2	A	501[A]	HEM	C3B-C4B-NB	-2.17	107.91	109.47
2	B	501[B]	HEM	CHA-C4D-ND	2.15	127.03	124.37
2	B	501[A]	HEM	C3D-C4D-ND	2.12	112.49	110.17
2	A	501[B]	HEM	CAB-C3B-C2B	2.09	135.22	128.43
2	B	501[B]	HEM	CHA-C4D-C3D	-2.06	121.44	125.23
2	A	501[A]	HEM	CAC-C3C-C4C	-2.05	119.92	124.82
2	A	501[A]	HEM	CBA-CAA-C2A	2.05	118.21	112.53
2	A	501[B]	HEM	C4C-NC-C1C	2.04	109.15	105.82
2	A	501[A]	HEM	CAA-C2A-C1A	2.04	128.92	124.94
2	A	501[A]	HEM	C4D-C3D-C2D	-2.04	103.92	106.89

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	501[A]	HEM	CMD-C2D-C1D	2.03	128.20	125.03
2	B	501[B]	HEM	C4C-NC-C1C	2.01	109.10	105.82
2	B	501[A]	HEM	CHA-C4D-ND	2.00	126.85	124.37

There are no chirality outliers.

All (9) torsion outliers are listed below:

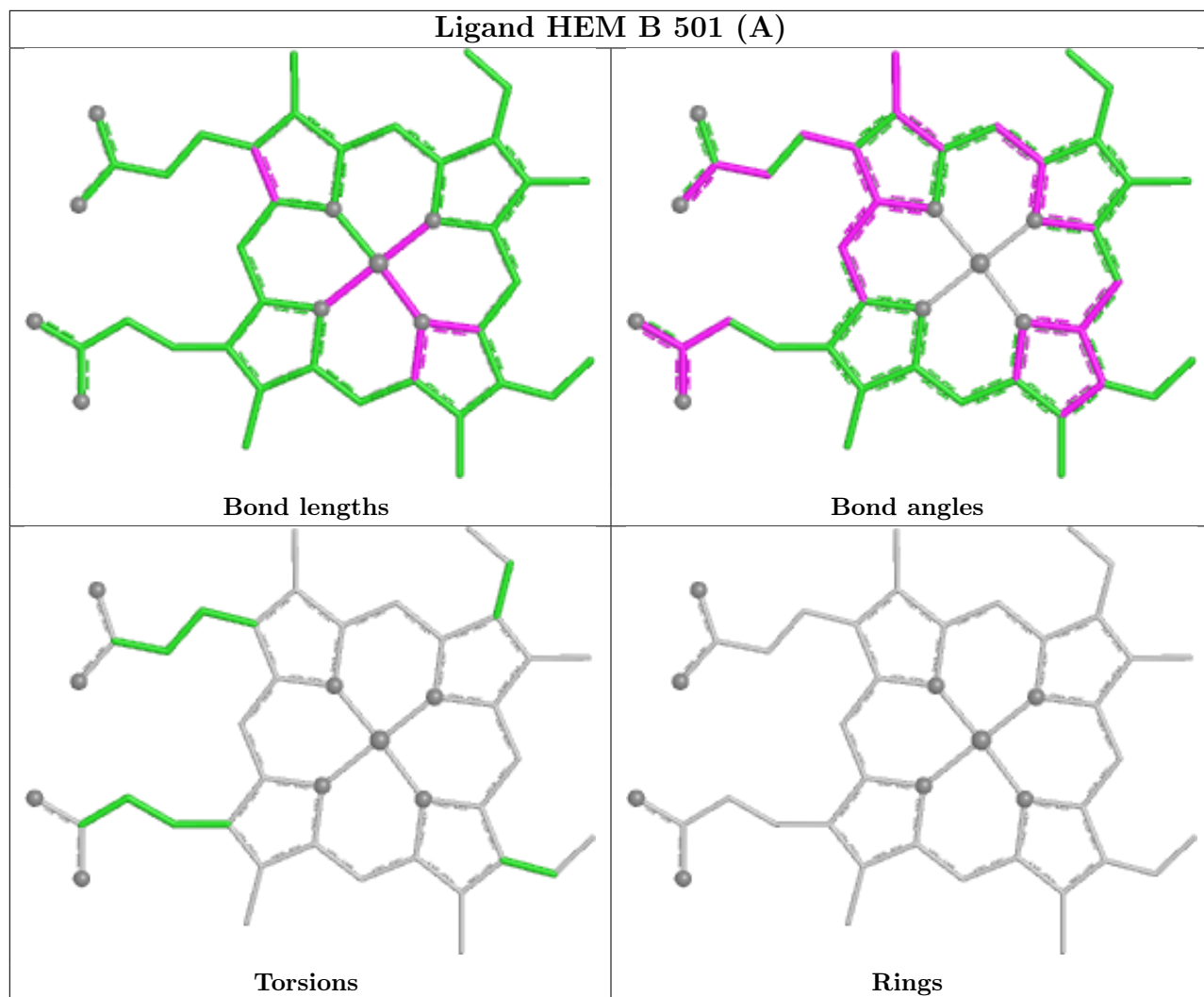
Mol	Chain	Res	Type	Atoms
2	B	501[B]	HEM	C2D-C3D-CAD-CBD
2	B	501[B]	HEM	C4D-C3D-CAD-CBD
3	B	502	PEG	C1-C2-O2-C3
3	A	502	PEG	O1-C1-C2-O2
3	A	503	PEG	O1-C1-C2-O2
3	A	503	PEG	C4-C3-O2-C2
2	B	501[B]	HEM	CAD-CBD-CGD-O1D
2	B	501[B]	HEM	CAD-CBD-CGD-O2D
3	A	502	PEG	O2-C3-C4-O4

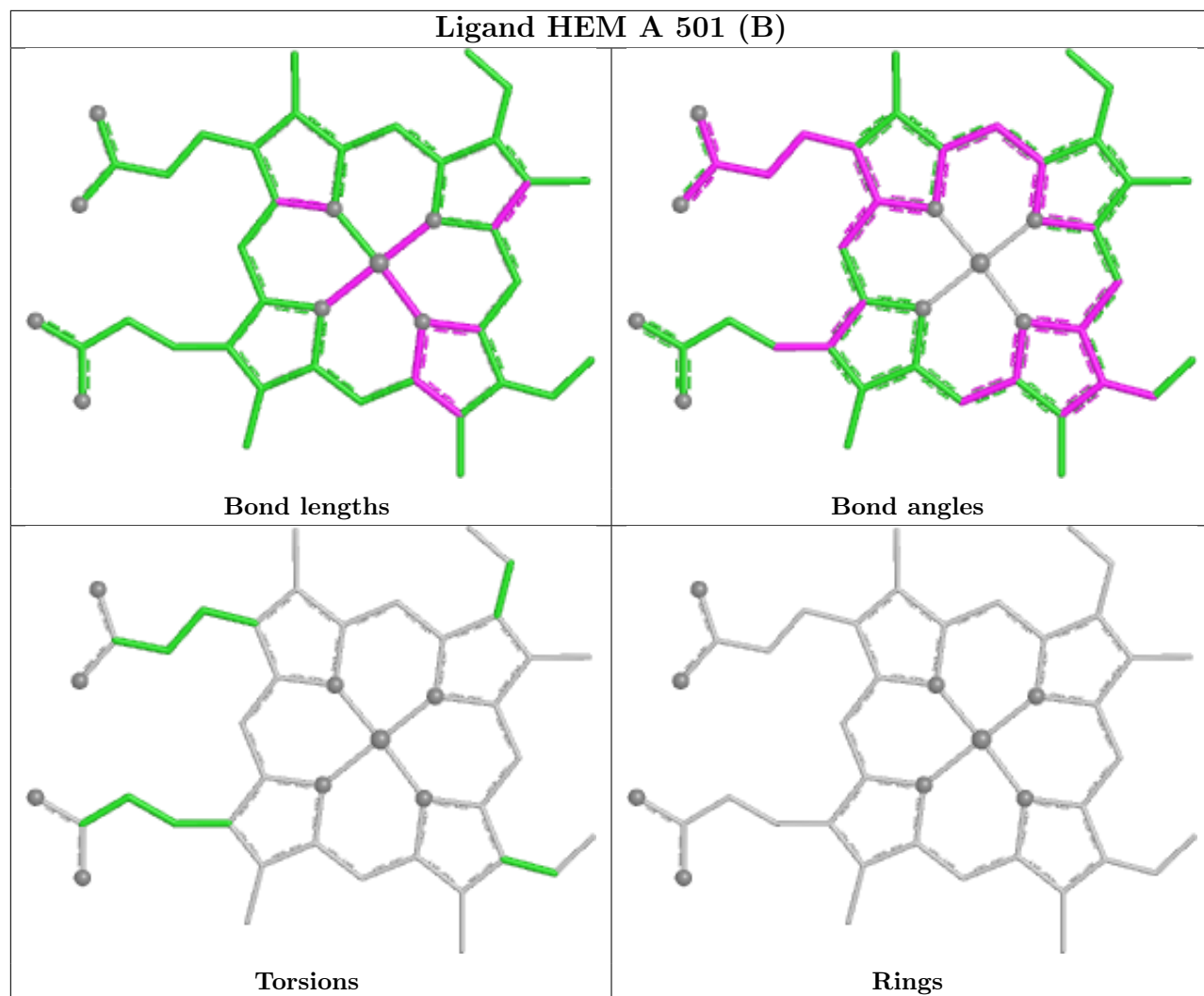
There are no ring outliers.

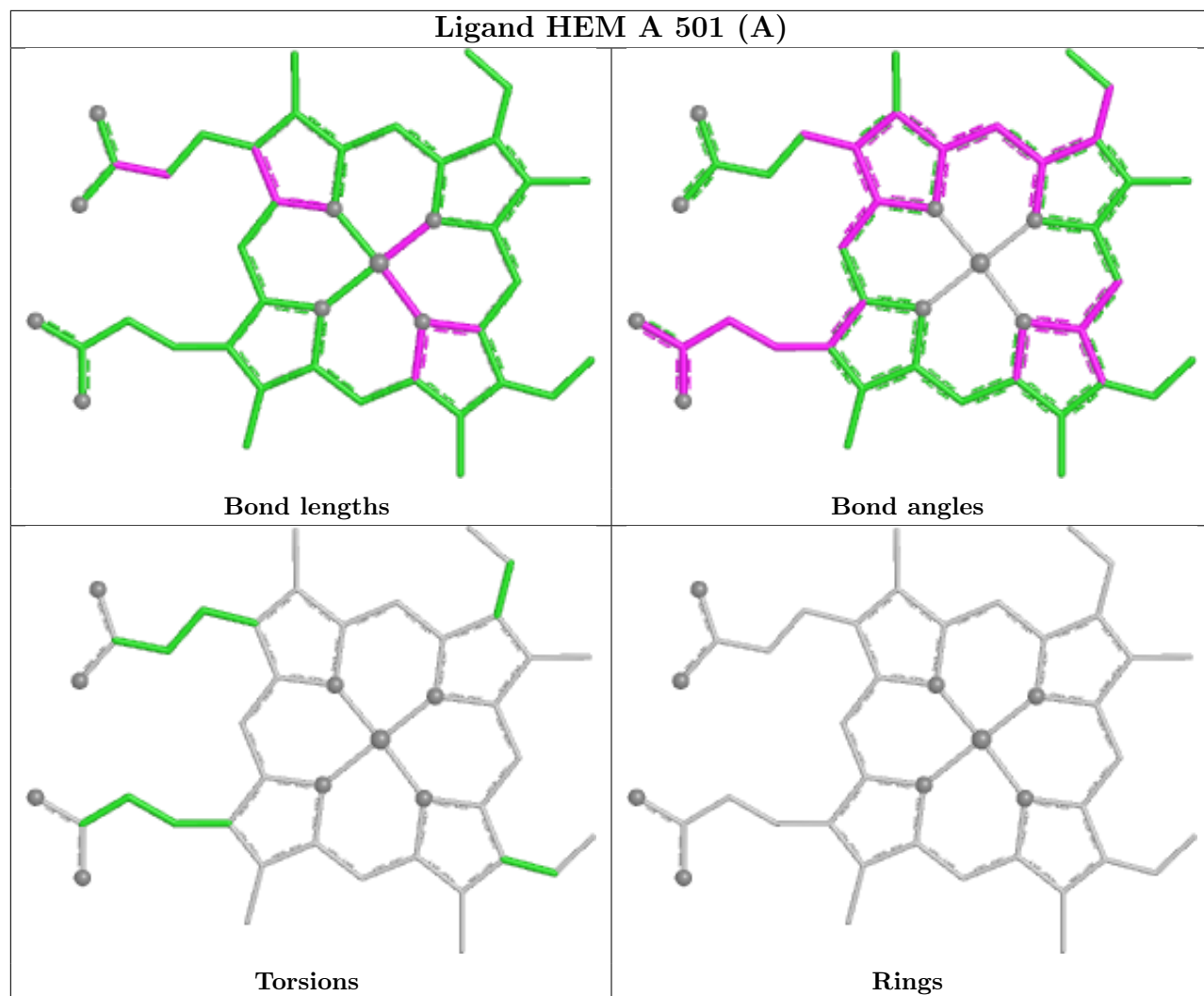
4 monomers are involved in 15 short contacts:

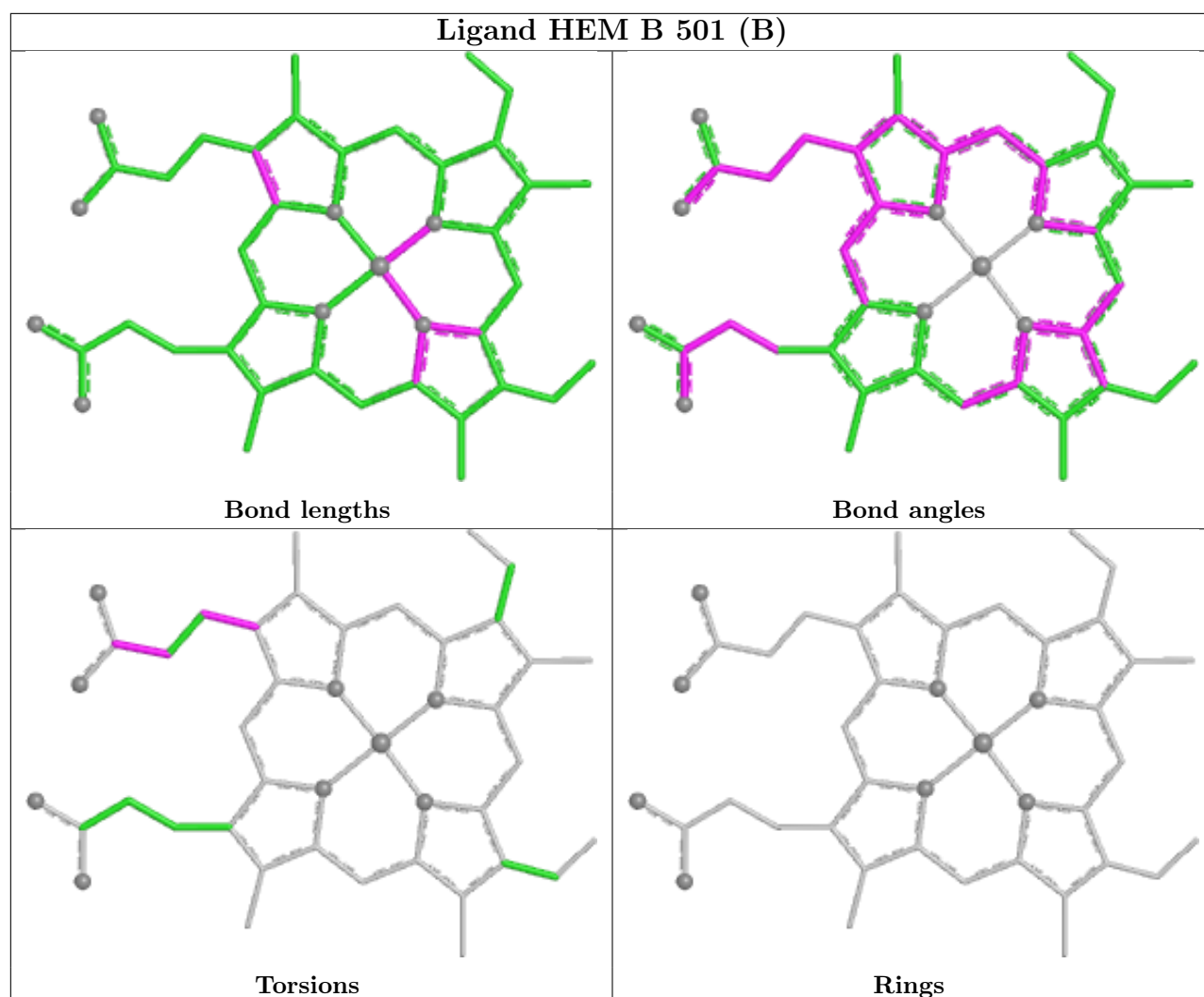
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	501[A]	HEM	3	0
2	A	501[B]	HEM	5	0
2	A	501[A]	HEM	1	0
2	B	501[B]	HEM	6	0

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.









## 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<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	449/460 (97%)	0.08	5 (1%) 78 78	21, 45, 66, 100	4 (0%)
1	B	449/460 (97%)	0.45	20 (4%) 38 37	21, 50, 77, 116	3 (0%)
All	All	898/920 (97%)	0.27	25 (2%) 55 55	21, 47, 73, 116	7 (0%)

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	488	HIS	3.2
1	B	176	ILE	3.2
1	B	484	THR	3.0
1	B	451	LEU	3.0
1	B	168	TRP	2.8
1	B	487	HIS	2.7
1	B	166	ALA	2.6
1	B	261	ASN	2.5
1	B	457	ILE	2.4
1	B	174	VAL	2.4
1	B	258	VAL	2.4
1	B	460	VAL	2.4
1	B	311	PHE	2.4
1	B	481	LEU	2.3
1	A	487	HIS	2.3
1	B	418	GLN	2.3
1	B	263	CYS	2.2
1	A	276	GLU	2.2
1	B	480	LEU	2.2
1	B	40	LYS	2.2
1	A	277	GLN	2.2
1	A	254	ALA	2.2
1	B	277	GLN	2.1
1	B	180	LEU	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	455	PHE	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 oligosaccharides in this entry.

## 6.4 Ligands [i](#)

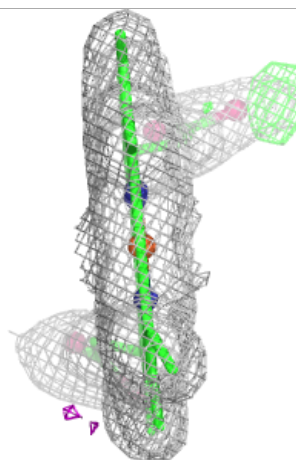
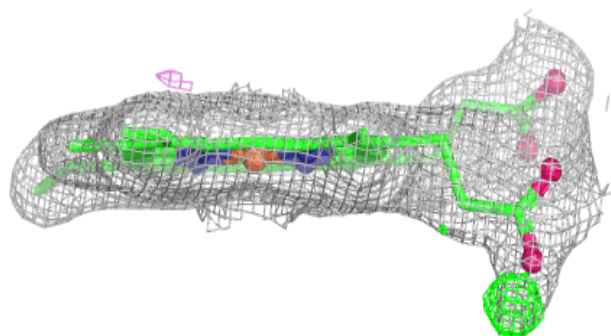
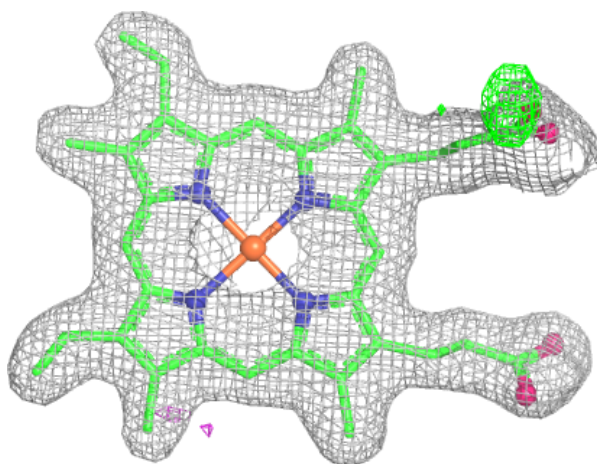
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	PEG	A	502	7/7	0.86	0.21	61,66,73,80	0
3	PEG	B	502	7/7	0.87	0.19	61,66,76,77	0
4	K	B	504	1/1	0.89	0.12	86,86,86,86	0
5	CL	B	503	1/1	0.92	0.18	77,77,77,77	0
3	PEG	A	503	7/7	0.93	0.16	64,66,74,79	0
4	K	A	504	1/1	0.95	0.10	88,88,88,88	0
2	HEM	A	501[A]	43/43	0.97	0.07	29,34,43,48	43
2	HEM	A	501[B]	43/43	0.97	0.07	29,33,36,42	43
2	HEM	B	501[A]	43/43	0.98	0.06	30,33,38,40	43
2	HEM	B	501[B]	43/43	0.98	0.06	33,36,41,47	43

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.

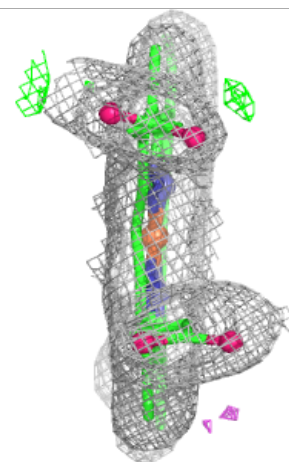
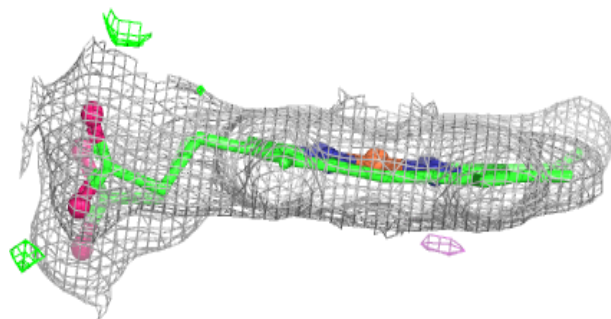
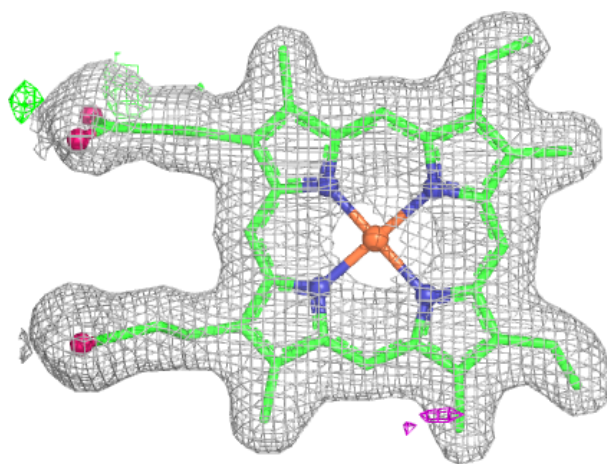
**Electron density around HEM A 501 (A):**

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



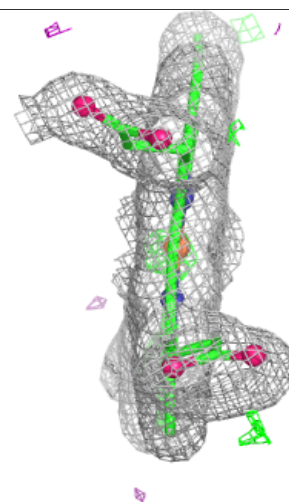
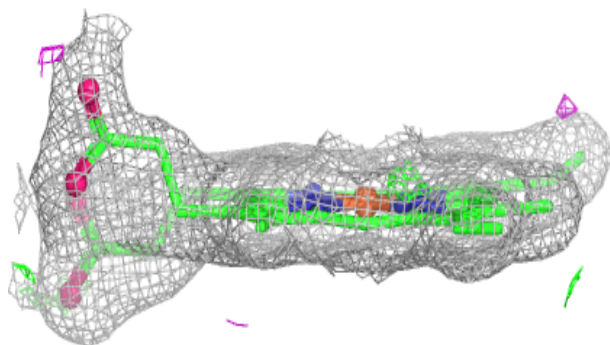
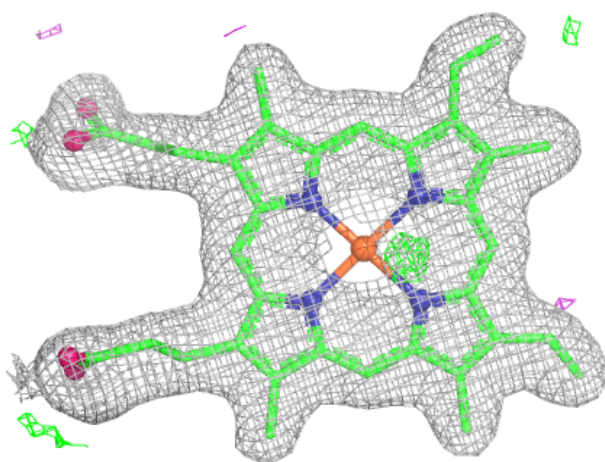
**Electron density around HEM A 501 (B):**

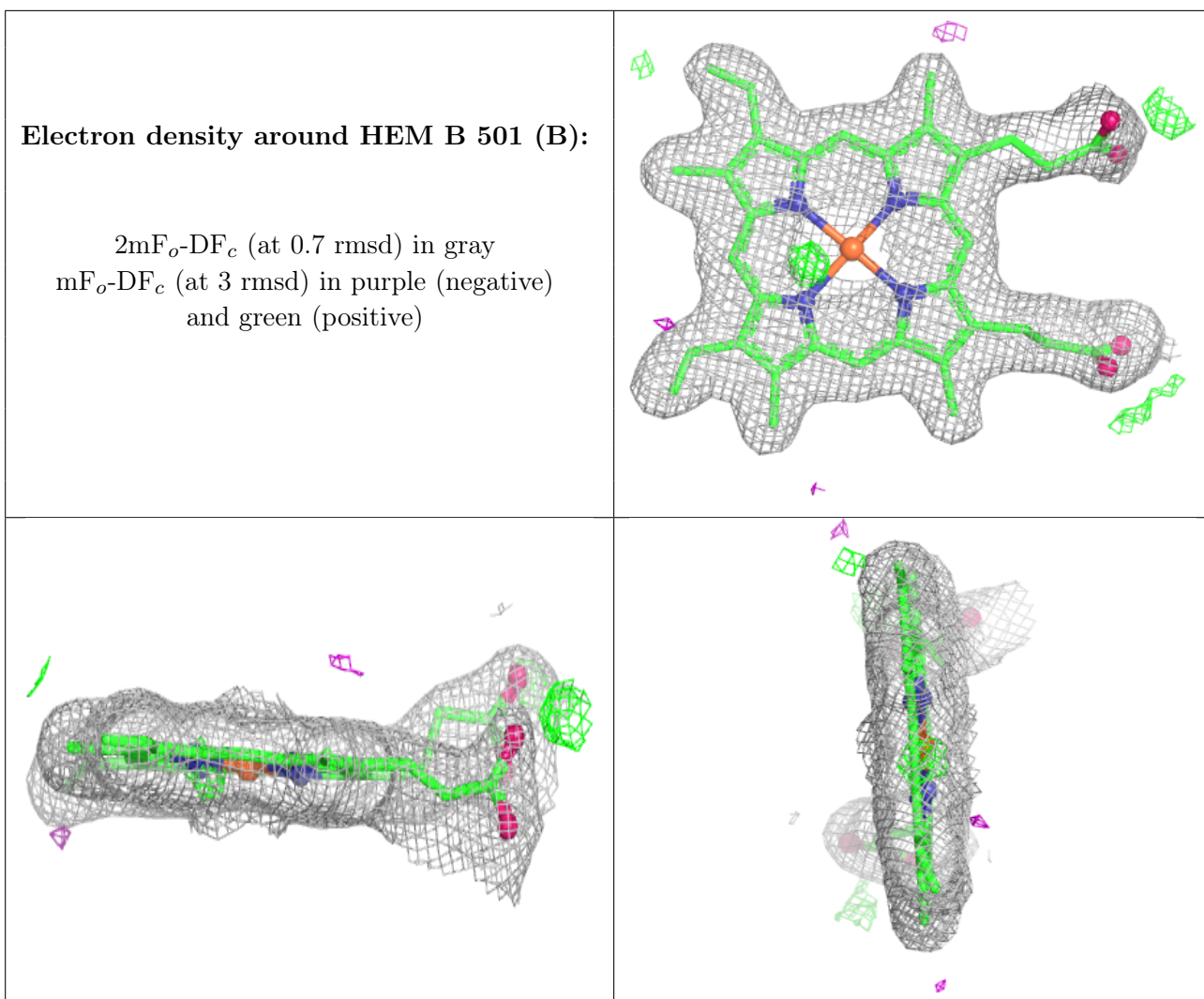
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around HEM B 501 (A):**

$2mF_o-DF_c$  (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.