



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 6, 2026 – 03:36 PM JST

PDB ID : 7Y0R / pdb_00007y0r
Title : Crystal structure of the P450 BM3 heme domain mutant F87L/V78S/A184V in complex with N-imidazolyl-hexanoyl-L-phenylalanine, p-toluidine and hydroxylamine
Authors : Jiang, Y.; Dong, S.; Feng, Y.; Cong, Z.
Deposited on : 2022-06-06
Resolution : 2.09 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	:	1.8.5 (274361), CSD as541be (2020)
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

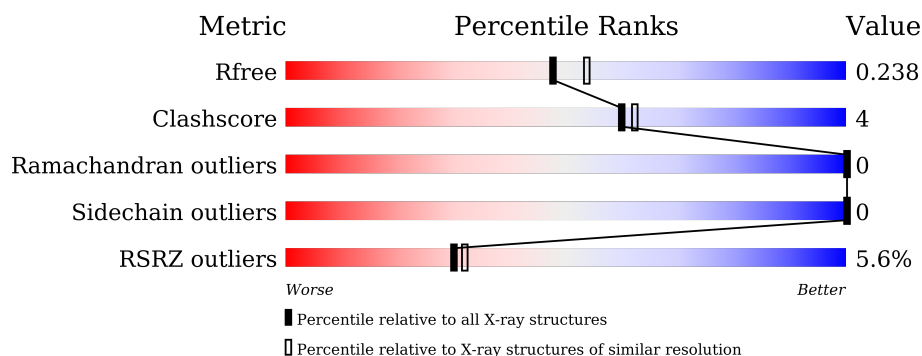
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.09 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	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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	465	
1	B	465	

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 7894 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.

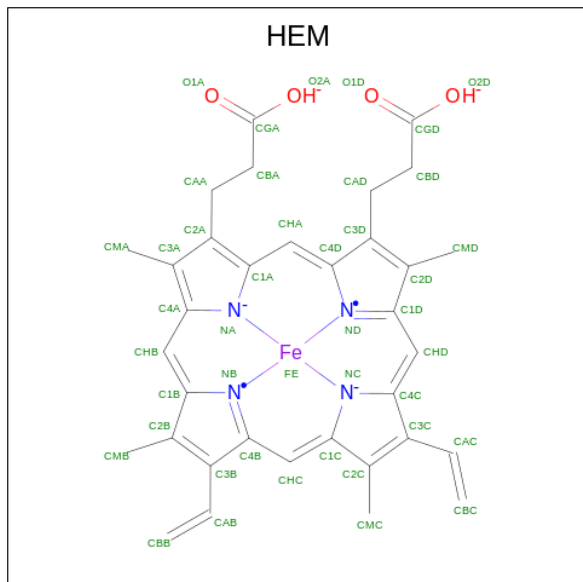
- Molecule 1 is a protein called Bifunctional cytochrome P450/NADPH-P450 reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	452	Total	C	N	O	S	0	0	0
			3544	2272	605	650	17			
1	B	451	Total	C	N	O	S	0	0	0
			3551	2275	606	653	17			

There are 24 discrepancies between the modelled and reference sequences:

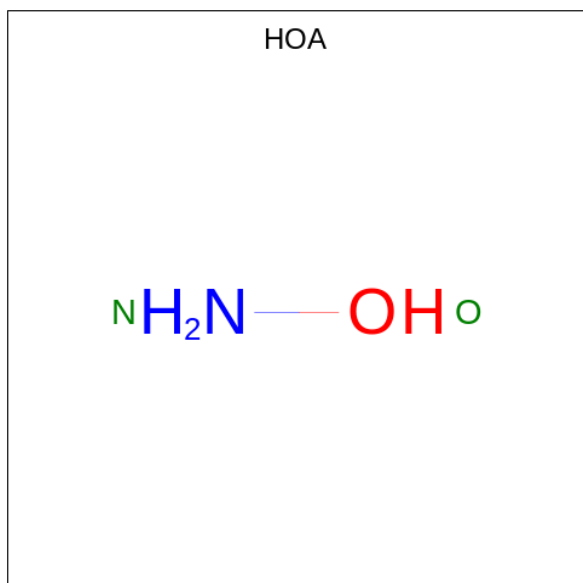
Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP P14779
A	78	SER	VAL	engineered mutation	UNP P14779
A	87	LEU	PHE	engineered mutation	UNP P14779
A	184	VAL	ALA	engineered mutation	UNP P14779
A	456	LEU	-	expression tag	UNP P14779
A	457	GLU	-	expression tag	UNP P14779
A	458	HIS	-	expression tag	UNP P14779
A	459	HIS	-	expression tag	UNP P14779
A	460	HIS	-	expression tag	UNP P14779
A	461	HIS	-	expression tag	UNP P14779
A	462	HIS	-	expression tag	UNP P14779
A	463	HIS	-	expression tag	UNP P14779
B	-1	GLY	-	expression tag	UNP P14779
B	78	SER	VAL	engineered mutation	UNP P14779
B	87	LEU	PHE	engineered mutation	UNP P14779
B	184	VAL	ALA	engineered mutation	UNP P14779
B	456	LEU	-	expression tag	UNP P14779
B	457	GLU	-	expression tag	UNP P14779
B	458	HIS	-	expression tag	UNP P14779
B	459	HIS	-	expression tag	UNP P14779
B	460	HIS	-	expression tag	UNP P14779
B	461	HIS	-	expression tag	UNP P14779
B	462	HIS	-	expression tag	UNP P14779
B	463	HIS	-	expression tag	UNP P14779

- Molecule 2 is PROTOPORPHYRIN IX CONTAINING FE (CCD ID: HEM) (formula: $C_{34}H_{32}FeN_4O_4$) (labeled as "Ligand of Interest" by depositor).



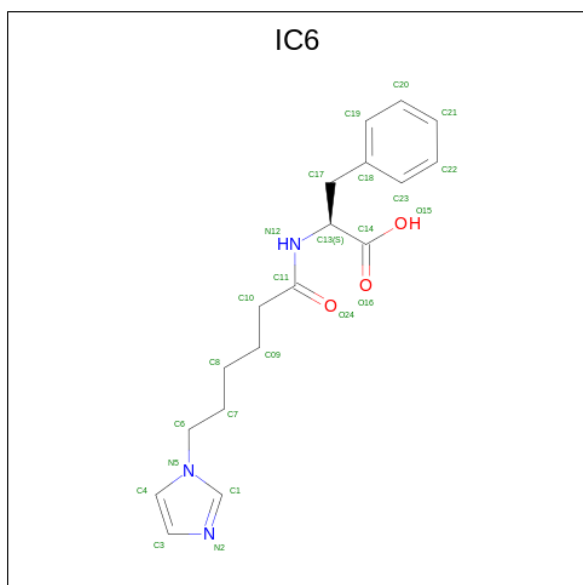
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- Molecule 3 is HYDROXYAMINE (CCD ID: HOA) (formula: H_3NO) (labeled as "Ligand of Interest" by depositor).



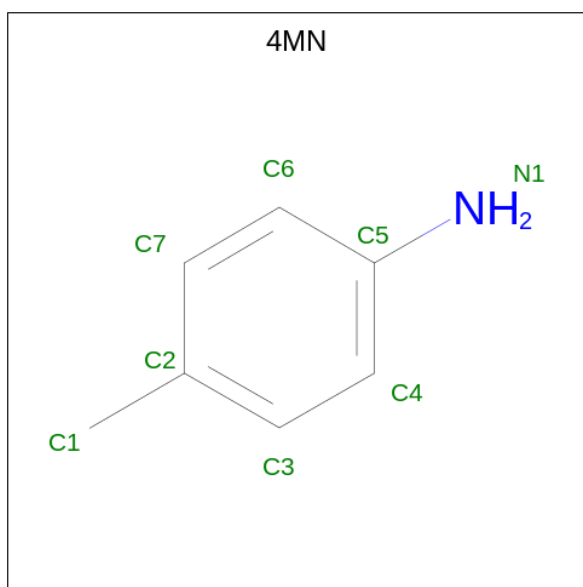
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	N	O	0	0
			2	1	1		
3	B	1	Total	N	O	0	0
			2	1	1		

- Molecule 4 is (2S)-2-(6-imidazol-1-ylhexanoylamino)-3-phenyl-propanoic acid (CCD ID: IC6) (formula: C₁₈H₂₃N₃O₃) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	1
			24	18	3	3		
4	A	1	Total	C	N	O	0	1
			24	18	3	3		
4	B	1	Total	C	N	O	0	1
			24	18	3	3		
4	B	1	Total	C	N	O	0	1
			24	18	3	3		

- Molecule 5 is 4-METHYLANILINE (CCD ID: 4MN) (formula: C₇H₉N) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	N	0	0
			8	7	1		
5	B	1	Total	C	N	0	0
			8	7	1		

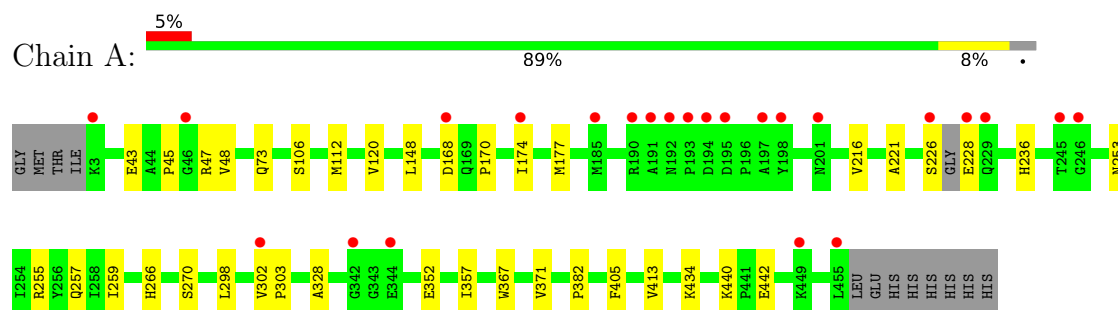
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	299	Total	O	0	0
			299	299		
6	B	298	Total	O	0	0
			298	298		

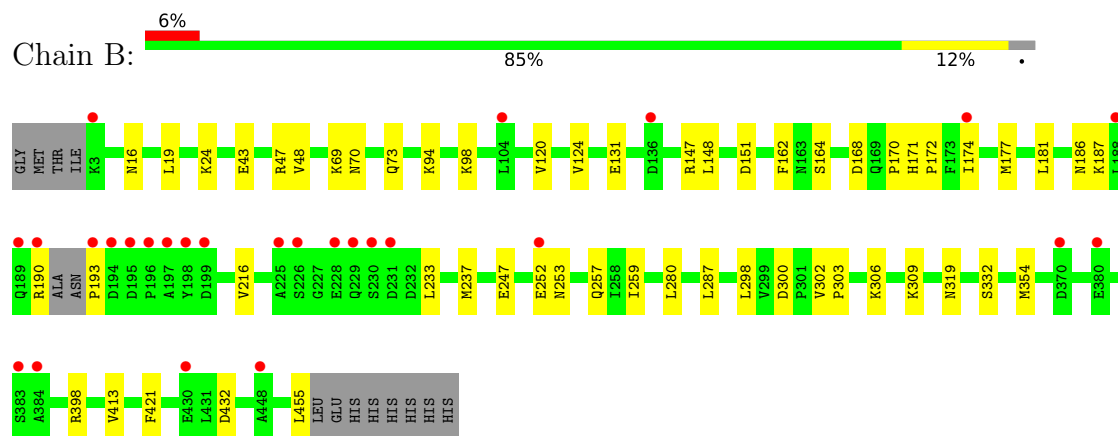
3 Residue-property plots

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: Bifunctional cytochrome P450/NADPH-P450 reductase



- Molecule 1: Bifunctional cytochrome P450/NADPH-P450 reductase



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	59.03Å 149.91Å 65.76Å 90.00° 100.58° 90.00°	Depositor
Resolution (Å)	39.71 – 2.09 39.71 – 2.09	Depositor EDS
% Data completeness (in resolution range)	93.6 (39.71-2.09) 86.8 (39.71-2.09)	Depositor EDS
R_{merge}	0.17	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.40 (at 2.08Å)	Xtriage
Refinement program	PHENIX 1.18.2_3874	Depositor
R, R_{free}	0.214 , 0.241 0.214 , 0.238	Depositor DCC
R_{free} test set	1892 reflections (2.84%)	wwPDB-VP
Wilson B-factor (Å ²)	25.2	Xtriage
Anisotropy	0.454	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 47.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	7894	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 11.26% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: IC6, HOA, 4MN, HEM

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	0.38	2/3625 (0.1%)	0.50	0/4913
1	B	0.31	1/3632 (0.0%)	0.45	1/4920 (0.0%)
All	All	0.35	3/7257 (0.0%)	0.48	1/9833 (0.0%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	382	PRO	C-O	-7.04	1.16	1.24
1	B	306	LYS	C-O	-5.80	1.17	1.24
1	A	221	ALA	C-O	-5.36	1.17	1.24

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	168	ASP	N-CA-C	-5.06	106.27	112.90

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	3544	0	3450	26	0
1	B	3551	0	3470	31	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	43	0	30	2	0
2	B	43	0	30	2	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
4	A	48	0	0	1	0
4	B	48	0	0	0	0
5	A	8	0	9	0	0
5	B	8	0	9	0	0
6	A	299	0	0	7	0
6	B	298	0	0	5	0
All	All	7894	0	6998	61	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 (61) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:170:PRO:HB3	1:A:174:ILE:HD11	1.54	0.87
1:A:45:PRO:HG2	6:A:617:HOH:O	1.84	0.78
1:B:354:MET:HE3	6:B:603:HOH:O	1.87	0.72
1:B:177:MET:HE3	1:B:181:LEU:HD12	1.71	0.72
1:B:94:LYS:NZ	6:B:602:HOH:O	2.20	0.71
1:B:120:VAL:HG11	1:B:302:VAL:HG13	1.73	0.71
1:B:170:PRO:HB3	1:B:174:ILE:HD11	1.79	0.65
1:A:120:VAL:HG11	1:A:302:VAL:HG13	1.79	0.65
1:A:255:ARG:NE	6:A:608:HOH:O	2.30	0.64
1:A:255:ARG:NH2	6:A:610:HOH:O	2.31	0.63
1:A:367:TRP:HB2	1:A:371:VAL:HG12	1.80	0.62
1:B:43:GLU:HG2	1:B:48:VAL:HG22	1.82	0.60
1:A:43:GLU:HG2	1:A:48:VAL:HG22	1.83	0.60
1:A:112:MET:HE1	1:A:405:PHE:HB2	1.83	0.59
1:B:171:HIS:ND1	1:B:172:PRO:HD2	2.18	0.59
1:B:253:ASN:O	1:B:257:GLN:HG2	2.03	0.58
1:B:186:ASN:O	1:B:190:ARG:HG2	2.04	0.57
2:A:501:HEM:HMC2	2:A:501:HEM:HBC2	1.86	0.56
1:B:193:PRO:N	6:B:620:HOH:O	2.39	0.55
1:A:434:LYS:HD3	1:A:442:GLU:OE1	2.06	0.55
1:A:106:SER:HB3	1:A:236:HIS:CD2	2.42	0.55
1:B:280:LEU:HB3	1:B:287:LEU:HD12	1.89	0.55
1:A:216:VAL:HG21	1:A:259:ILE:HG13	1.89	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:501:HEM:HBC2	2:B:501:HEM:HMC2	1.90	0.54
2:A:501:HEM:HMB1	2:A:501:HEM:HBB2	1.90	0.53
2:B:501:HEM:HMB1	2:B:501:HEM:HBB2	1.91	0.52
1:A:148:LEU:HD21	1:A:413:VAL:HG21	1.91	0.52
1:A:255:ARG:CD	6:A:608:HOH:O	2.58	0.52
1:B:177:MET:HE3	1:B:181:LEU:CD1	2.38	0.51
1:B:187:LYS:HA	1:B:190:ARG:HG3	1.93	0.51
1:B:216:VAL:HG21	1:B:259:ILE:HG13	1.93	0.50
1:B:233:LEU:HG	1:B:237:MET:HE3	1.92	0.50
1:B:252:GLU:HG3	1:B:253:ASN:N	2.26	0.50
1:A:253:ASN:O	1:A:257:GLN:HG2	2.11	0.49
1:B:148:LEU:HD21	1:B:413:VAL:HG21	1.95	0.49
1:B:300:ASP:OD2	6:B:601:HOH:O	2.20	0.49
1:A:298:LEU:HD22	1:A:303:PRO:HB3	1.95	0.48
1:B:24:LYS:NZ	1:B:432:ASP:OD1	2.41	0.47
1:A:434:LYS:HB2	1:A:442:GLU:HB2	1.97	0.46
1:A:47:ARG:NH1	4:A:505[B]:IC6:O15	2.42	0.46
1:B:16:ASN:HB3	1:B:19:LEU:HD12	1.98	0.46
1:B:319:ASN:ND2	6:B:628:HOH:O	2.44	0.45
1:B:298:LEU:HD22	1:B:303:PRO:HB3	1.99	0.44
1:A:255:ARG:HH21	1:A:255:ARG:HG3	1.83	0.44
1:A:270:SER:OG	1:A:440:LYS:NZ	2.41	0.44
1:B:147:ARG:HG2	1:B:164:SER:HB3	1.99	0.44
1:B:309:LYS:HA	1:B:309:LYS:HD3	1.88	0.43
1:B:70:ASN:HB3	1:B:332:SER:OG	2.18	0.43
1:B:98:LYS:HE3	1:B:247:GLU:HB2	2.00	0.43
1:A:47:ARG:NH1	1:A:73:GLN:HB2	2.34	0.43
1:A:177:MET:HE2	1:A:266:HIS:HE1	1.84	0.43
1:A:226:SER:O	1:A:228:GLU:N	2.53	0.41
1:B:131:GLU:HG3	1:B:421:PHE:CZ	2.55	0.41
1:A:255:ARG:HD3	6:A:608:HOH:O	2.19	0.41
1:A:352:GLU:HB3	6:A:605:HOH:O	2.21	0.41
1:A:328:ALA:O	1:A:357:ILE:HD12	2.21	0.41
1:B:47:ARG:NH1	1:B:73:GLN:HB2	2.36	0.40
1:B:151:ASP:OD1	1:B:162:PHE:HB2	2.21	0.40
1:B:69:LYS:HD3	1:B:398:ARG:CZ	2.51	0.40
1:A:168:ASP:N	6:A:601:HOH:O	2.23	0.40
1:B:124:VAL:HG13	1:B:455:LEU:HD13	2.04	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	448/465 (96%)	434 (97%)	14 (3%)	0	100	100
1	B	447/465 (96%)	434 (97%)	13 (3%)	0	100	100
All	All	895/930 (96%)	868 (97%)	27 (3%)	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	369/409 (90%)	369 (100%)	0	100	100
1	B	373/409 (91%)	373 (100%)	0	100	100
All	All	742/818 (91%)	742 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	134	ASN
1	A	206	GLN
1	A	213	ASN
1	A	236	HIS
1	B	70	ASN
1	B	201	ASN

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Mol	Chain	Res	Type
1	B	239	ASN
1	B	359	GLN
1	B	404	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

10 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	HOA	A	502	2	0,1,1	-	-	-		
2	HEM	B	501	1,3	50,50,50	1.41	8 (16%)	66,82,82	1.28	7 (10%)
4	IC6	B	505[B]	-	25,25,25	1.55	2 (8%)	31,31,31	2.05	8 (25%)
2	HEM	A	501	1,3	50,50,50	1.40	8 (16%)	66,82,82	1.24	5 (7%)
5	4MN	B	504	-	8,8,8	0.83	1 (12%)	10,10,10	0.72	0
4	IC6	B	503[A]	-	25,25,25	1.41	2 (8%)	31,31,31	0.88	1 (3%)
5	4MN	A	504	-	8,8,8	0.85	1 (12%)	10,10,10	0.69	0
4	IC6	A	503[A]	-	25,25,25	1.42	2 (8%)	31,31,31	0.92	1 (3%)
4	IC6	A	505[B]	-	25,25,25	1.69	1 (4%)	31,31,31	2.85	8 (25%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	HOA	B	502	2	0,1,1	-	-	-		

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
4	IC6	B	505[B]	-	-	7/20/20/20	0/2/2/2
2	HEM	B	501	1,3	-	2/14/54/54	-
2	HEM	A	501	1,3	-	2/14/54/54	-
5	4MN	B	504	-	-	-	0/1/1/1
4	IC6	B	503[A]	-	-	4/20/20/20	0/2/2/2
5	4MN	A	504	-	-	-	0/1/1/1
4	IC6	A	503[A]	-	-	4/20/20/20	0/2/2/2
4	IC6	A	505[B]	-	-	5/20/20/20	0/2/2/2

All (25) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	505[B]	IC6	C11-N12	6.86	1.48	1.34
4	B	505[B]	IC6	C11-N12	6.17	1.47	1.34
4	A	503[A]	IC6	C11-N12	5.54	1.45	1.34
4	B	503[A]	IC6	C11-N12	5.46	1.45	1.34
2	B	501	HEM	FE-NC	4.16	2.09	1.95
2	A	501	HEM	FE-NA	3.65	2.07	1.95
2	A	501	HEM	FE-ND	3.58	2.05	1.94
2	B	501	HEM	FE-NB	3.27	2.05	1.94
2	A	501	HEM	CAB-C3B	3.06	1.55	1.47
2	A	501	HEM	CAC-C3C	2.96	1.55	1.47
2	B	501	HEM	CAC-C3C	2.96	1.55	1.47
2	B	501	HEM	CAB-C3B	2.95	1.55	1.47
2	A	501	HEM	FE-NB	2.63	2.03	1.94
2	B	501	HEM	FE-ND	2.57	2.02	1.94
2	B	501	HEM	FE-NA	2.45	2.03	1.95
2	A	501	HEM	FE-NC	2.39	2.03	1.95
2	A	501	HEM	CMB-C2B	2.33	1.55	1.50
5	A	504	4MN	C5-N1	2.26	1.46	1.38
5	B	504	4MN	C5-N1	2.20	1.46	1.38
2	B	501	HEM	CMB-C2B	2.18	1.55	1.50
4	B	503[A]	IC6	O24-C11	-2.16	1.18	1.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	503[A]	IC6	O24-C11	-2.15	1.18	1.23
2	A	501	HEM	CMC-C2C	2.10	1.55	1.50
2	B	501	HEM	CMC-C2C	2.10	1.55	1.50
4	B	505[B]	IC6	O24-C11	-2.09	1.19	1.23

All (30) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	505[B]	IC6	C10-C11-N12	8.75	131.01	115.83
4	A	505[B]	IC6	C13-N12-C11	8.09	142.46	121.65
4	B	505[B]	IC6	C10-C11-N12	6.57	127.23	115.83
4	A	505[B]	IC6	O24-C11-N12	-5.78	113.20	122.95
4	B	505[B]	IC6	C13-N12-C11	4.54	133.33	121.65
4	A	505[B]	IC6	C14-C13-N12	4.33	120.80	110.55
4	A	505[B]	IC6	C17-C13-N12	-4.02	102.32	110.79
4	B	505[B]	IC6	O24-C11-N12	-3.89	116.38	122.95
4	A	505[B]	IC6	C18-C17-C13	3.63	123.40	113.39
4	A	505[B]	IC6	O24-C11-C10	-3.42	115.76	122.02
4	B	505[B]	IC6	C17-C13-N12	-3.40	103.62	110.79
2	B	501	HEM	C4A-NA-C1A	3.30	108.58	105.35
2	B	501	HEM	C4D-ND-C1D	3.23	108.41	105.07
2	A	501	HEM	C1B-NB-C4B	3.15	108.32	105.07
4	B	505[B]	IC6	O24-C11-C10	-3.08	116.38	122.02
2	A	501	HEM	C4D-ND-C1D	3.01	108.19	105.07
2	B	501	HEM	C1B-NB-C4B	2.99	108.16	105.07
2	A	501	HEM	C4A-NA-C1A	2.91	108.20	105.35
4	B	505[B]	IC6	C18-C17-C13	2.90	121.39	113.39
2	A	501	HEM	C4C-NC-C1C	2.86	108.15	105.35
2	B	501	HEM	C4C-NC-C1C	2.52	107.81	105.35
4	A	503[A]	IC6	C10-C11-N12	2.44	120.06	115.83
2	B	501	HEM	CBD-CAD-C3D	-2.43	105.88	112.63
2	B	501	HEM	C3D-C4D-ND	-2.41	107.48	110.17
4	A	505[B]	IC6	O15-C14-O16	-2.33	118.80	124.09
4	B	505[B]	IC6	O15-C14-C13	2.30	121.03	113.40
4	B	503[A]	IC6	C10-C11-N12	2.18	119.61	115.83
4	B	505[B]	IC6	O15-C14-O16	-2.12	119.28	124.09
2	A	501	HEM	C3D-C4D-ND	-2.09	107.84	110.17
2	B	501	HEM	C2A-C1A-NA	-2.05	107.85	110.15

There are no chirality outliers.

All (24) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	505[B]	IC6	C10-C11-N12-C13
4	A	505[B]	IC6	C10-C11-N12-C13
4	A	505[B]	IC6	O24-C11-N12-C13
4	B	505[B]	IC6	O24-C11-N12-C13
4	A	503[A]	IC6	N5-C6-C7-C8
4	A	505[B]	IC6	N5-C6-C7-C8
4	B	505[B]	IC6	C8-C09-C10-C11
4	B	505[B]	IC6	C14-C13-C17-C18
4	B	505[B]	IC6	N5-C6-C7-C8
4	B	503[A]	IC6	N5-C6-C7-C8
4	A	505[B]	IC6	C6-C7-C8-C09
4	A	503[A]	IC6	C10-C09-C8-C7
4	B	505[B]	IC6	N12-C13-C17-C18
4	B	505[B]	IC6	C6-C7-C8-C09
4	B	503[A]	IC6	C10-C09-C8-C7
4	A	503[A]	IC6	C7-C6-N5-C4
4	A	503[A]	IC6	C7-C6-N5-C1
4	B	503[A]	IC6	C7-C6-N5-C4
2	A	501	HEM	CAD-CBD-CGD-O1D
2	B	501	HEM	CAD-CBD-CGD-O1D
2	B	501	HEM	CAD-CBD-CGD-O2D
2	A	501	HEM	CAD-CBD-CGD-O2D
4	B	503[A]	IC6	C7-C6-N5-C1
4	A	505[B]	IC6	C14-C13-C17-C18

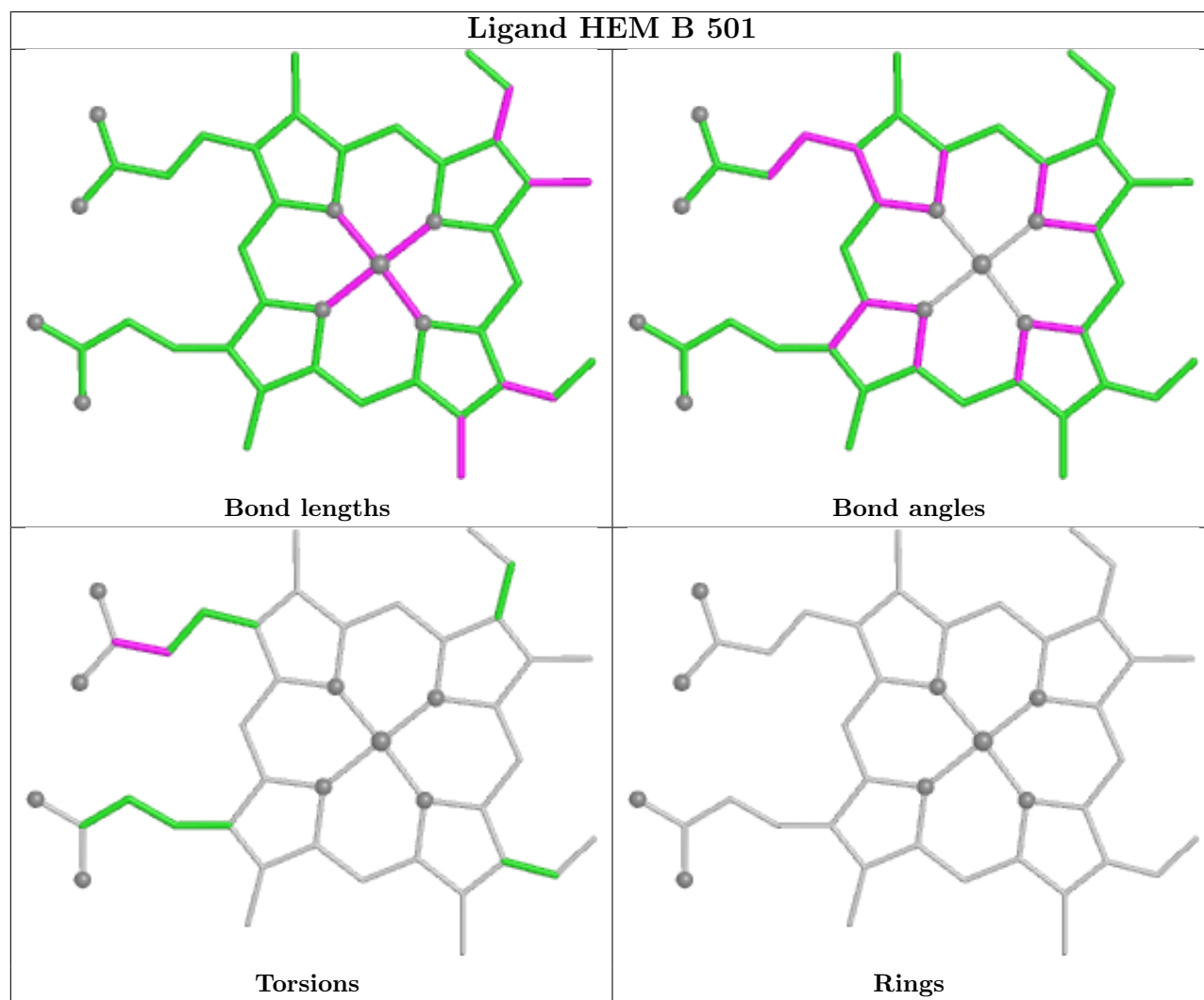
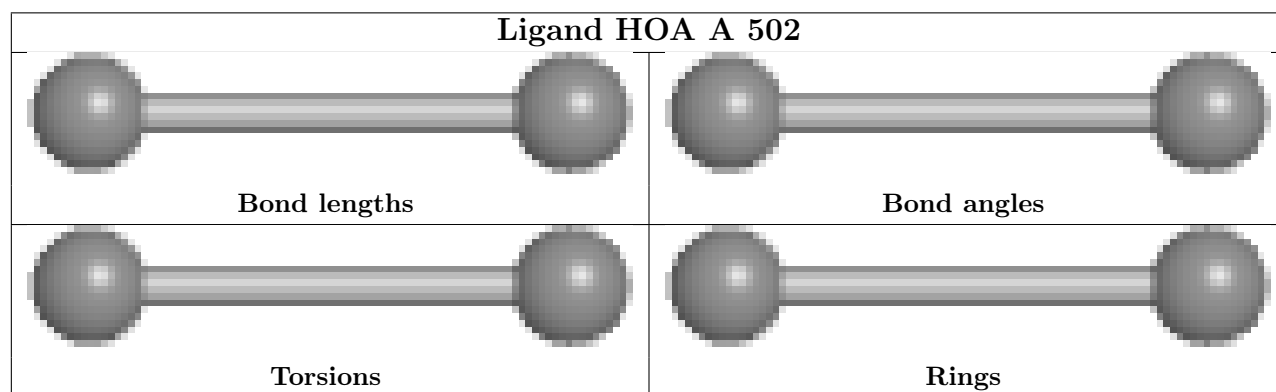
There are no ring outliers.

3 monomers are involved in 5 short contacts:

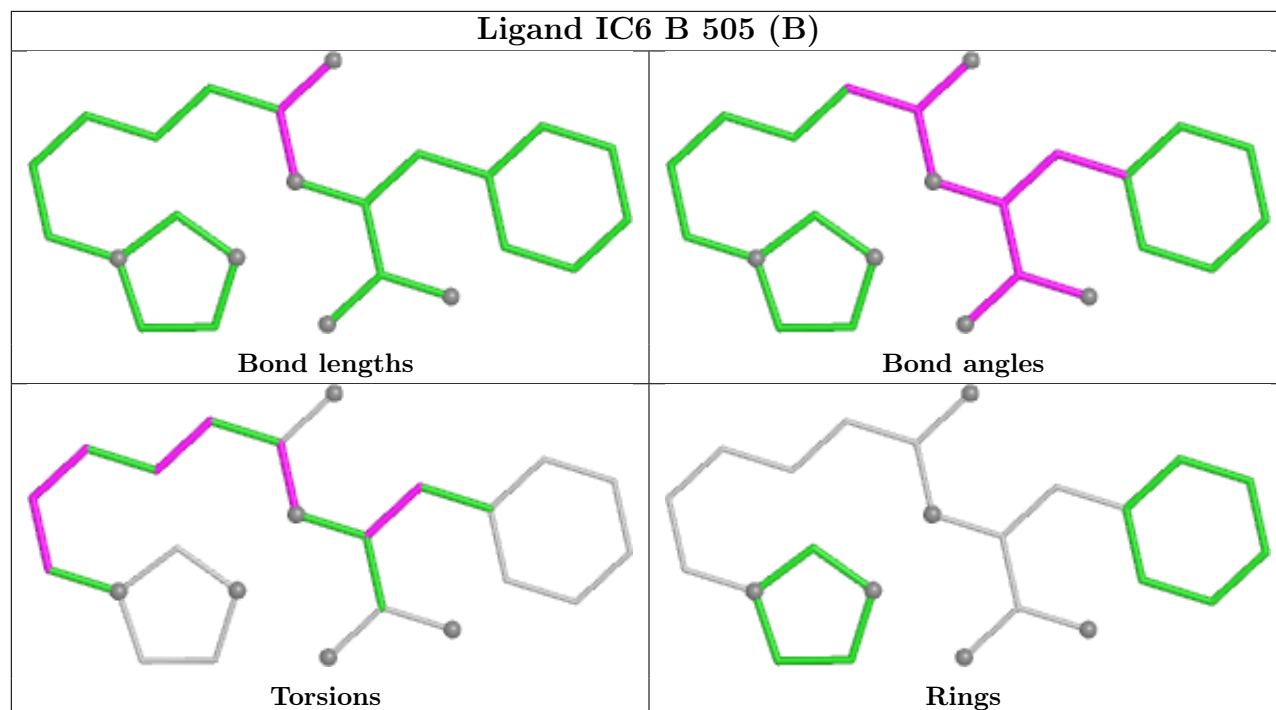
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	501	HEM	2	0
2	A	501	HEM	2	0
4	A	505[B]	IC6	1	0

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.

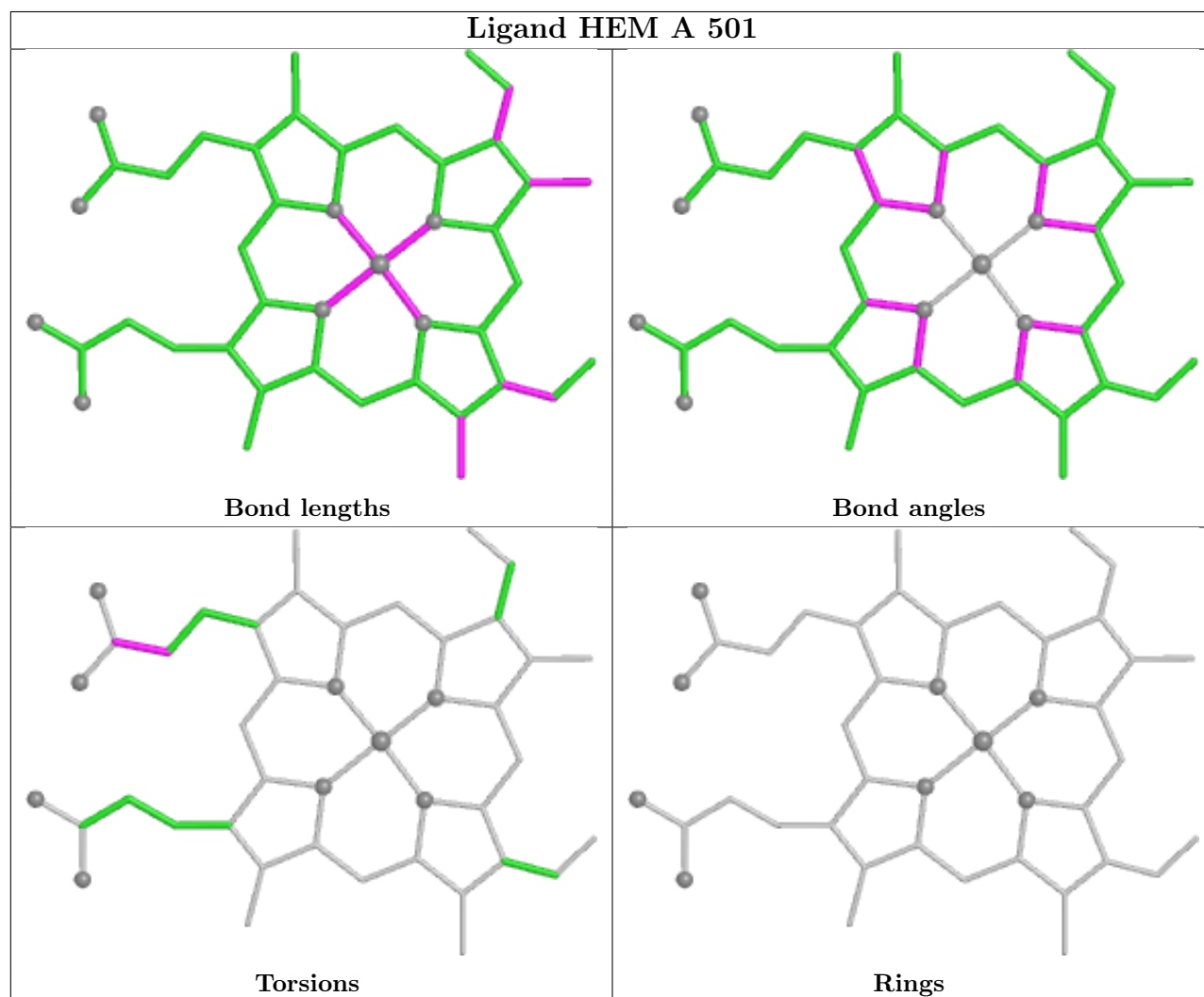
The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

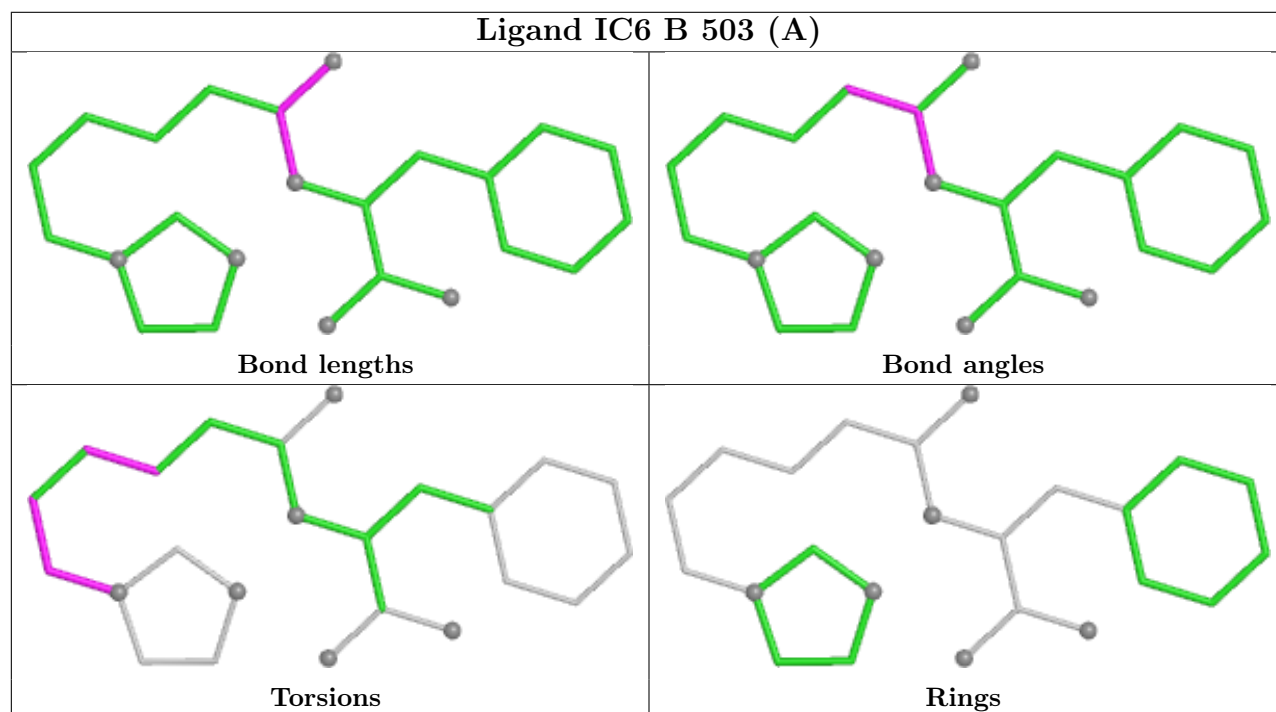
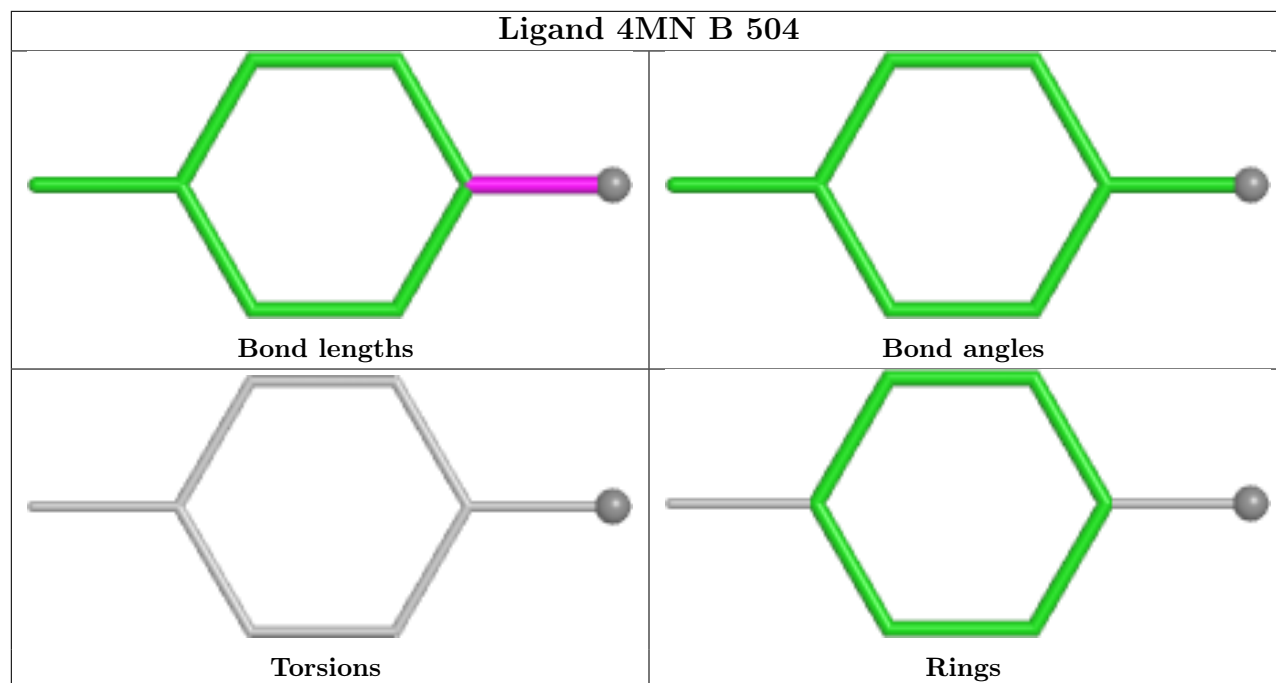


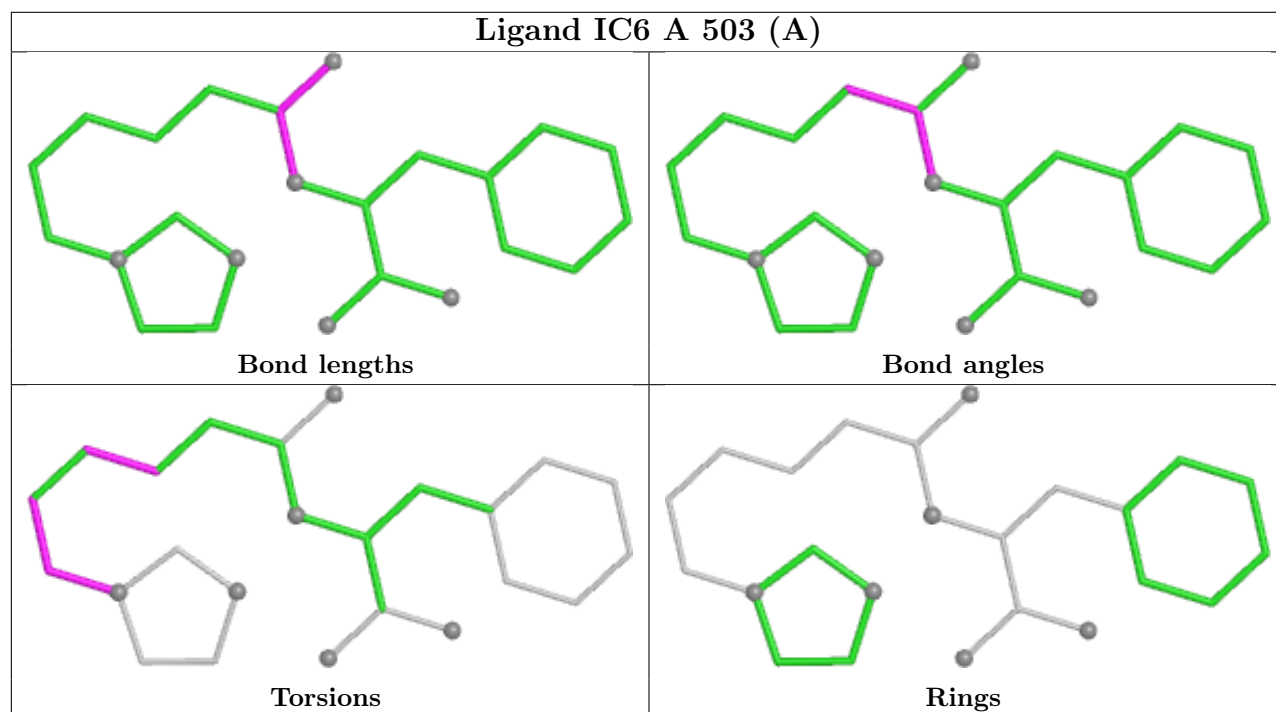
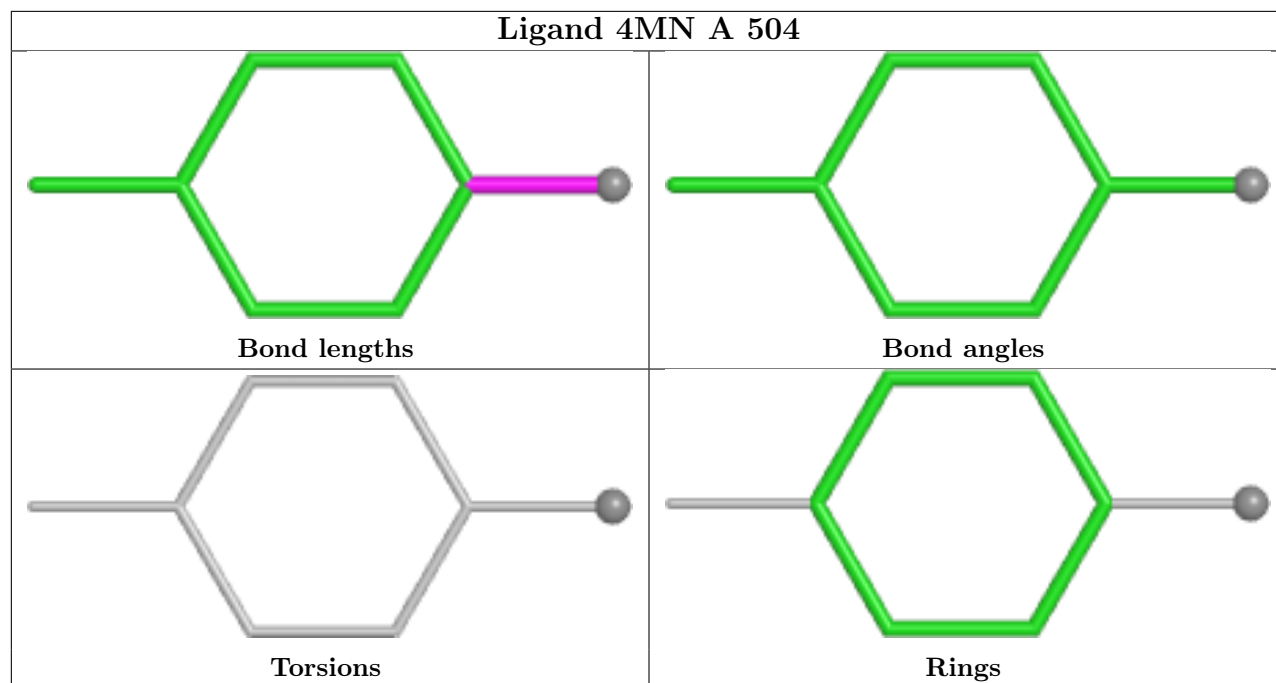
Ligand IC6 B 505 (B)

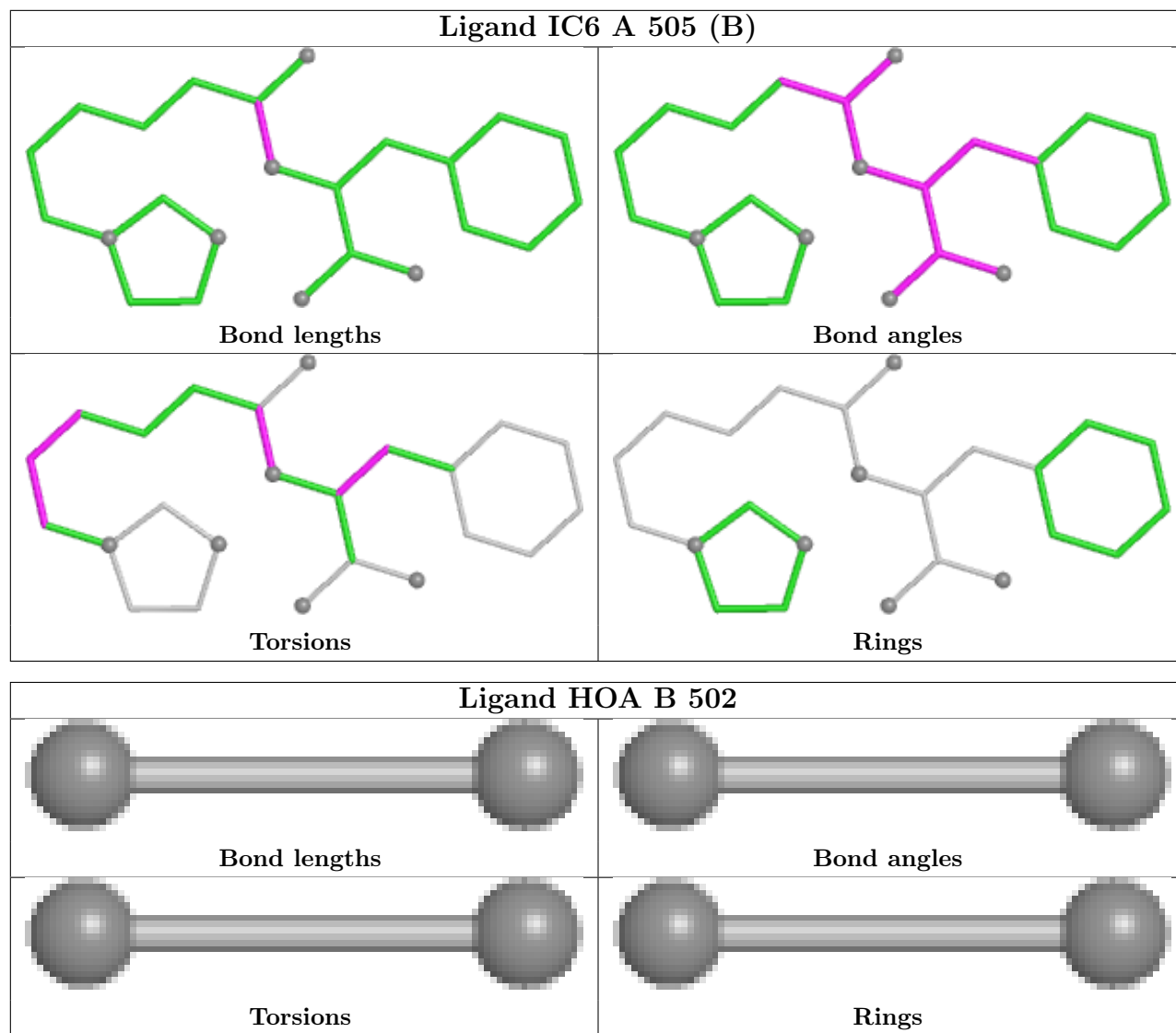


Ligand HEM A 501









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, 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	452/465 (97%)	0.61	24 (5%) 32 34	17, 29, 50, 79	0
1	B	451/465 (96%)	0.60	27 (5%) 27 29	19, 30, 48, 70	0
All	All	903/930 (97%)	0.61	51 (5%) 30 32	17, 29, 49, 79	0

All (51) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	193	PRO	4.7
1	A	245	THR	4.2
1	A	226	SER	4.2
1	A	191	ALA	4.1
1	A	192	ASN	3.9
1	B	194	ASP	3.7
1	A	228	GLU	3.5
1	A	197	ALA	3.5
1	B	226	SER	3.5
1	A	194	ASP	3.5
1	B	197	ALA	3.4
1	A	3	LYS	3.1
1	B	195	ASP	3.1
1	B	189	GLN	3.1
1	A	198	TYR	3.0
1	A	246	GLY	3.0
1	B	225	ALA	2.9
1	A	201	ASN	2.9
1	B	448	ALA	2.9
1	B	104	LEU	2.8
1	B	136	ASP	2.8
1	A	168	ASP	2.8
1	B	193	PRO	2.7
1	B	190	ARG	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	228	GLU	2.7
1	A	449	LYS	2.7
1	A	229	GLN	2.6
1	B	384	ALA	2.6
1	B	198	TYR	2.6
1	B	188	LEU	2.6
1	B	383	SER	2.5
1	B	196	PRO	2.5
1	A	455	LEU	2.4
1	B	3	LYS	2.4
1	A	342	GLY	2.3
1	A	46	GLY	2.3
1	B	199	ASP	2.3
1	A	302	VAL	2.3
1	A	190	ARG	2.3
1	B	229	GLN	2.2
1	B	174	ILE	2.2
1	B	430	GLU	2.2
1	B	252	GLU	2.2
1	B	230	SER	2.2
1	B	370	ASP	2.2
1	A	195	ASP	2.1
1	A	185	MET	2.1
1	A	344	GLU	2.1
1	B	231	ASP	2.1
1	B	380	GLU	2.0
1	A	174	ILE	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,

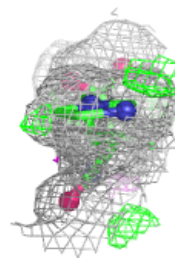
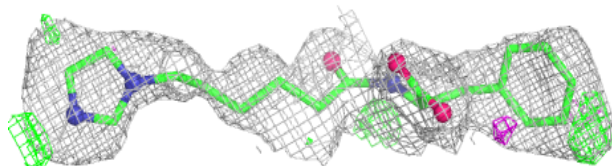
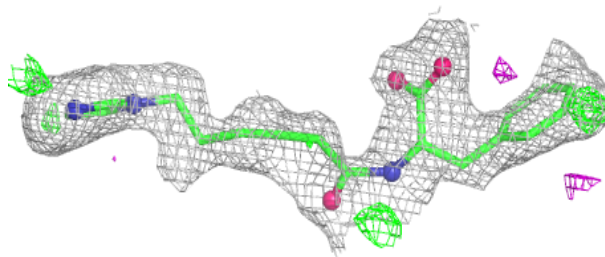
median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	IC6	B	505[B]	24/24	0.79	0.16	25,28,33,35	24
4	IC6	B	503[A]	24/24	0.85	0.14	21,25,28,30	24
5	4MN	A	504	8/8	0.85	0.14	25,27,33,34	0
4	IC6	A	505[B]	24/24	0.86	0.13	22,26,31,32	24
4	IC6	A	503[A]	24/24	0.88	0.13	20,23,26,27	24
5	4MN	B	504	8/8	0.89	0.11	28,30,32,36	0
3	HOA	A	502	2/2	0.94	0.12	25,25,25,28	0
3	HOA	B	502	2/2	0.95	0.09	23,23,23,28	0
2	HEM	A	501	43/43	0.96	0.07	13,19,24,30	0
2	HEM	B	501	43/43	0.97	0.07	16,21,26,27	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.

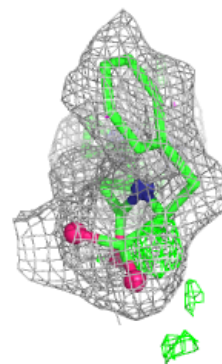
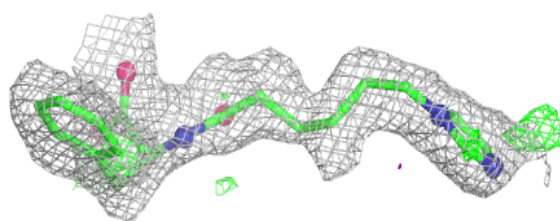
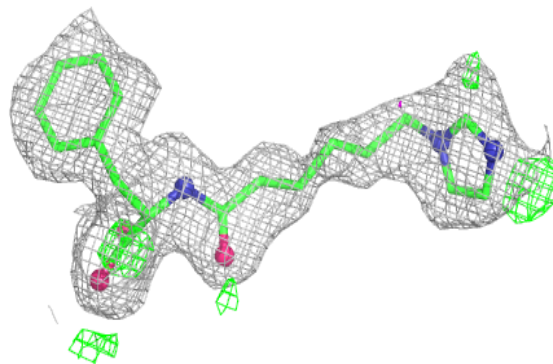
Electron density around IC6 B 505 (B):

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

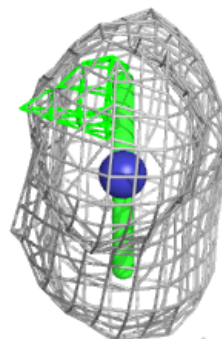
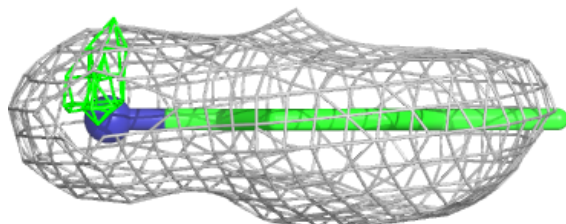
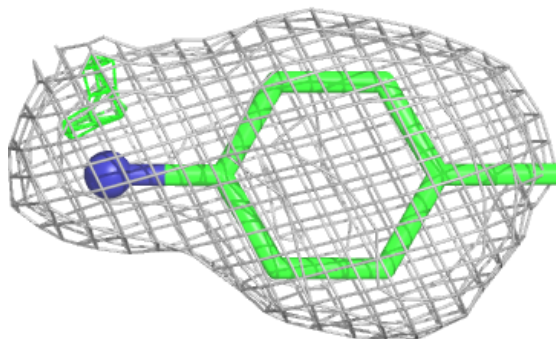


Electron density around IC6 B 503 (A):

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

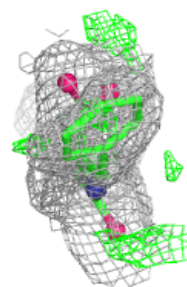
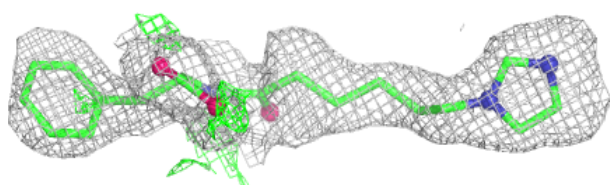
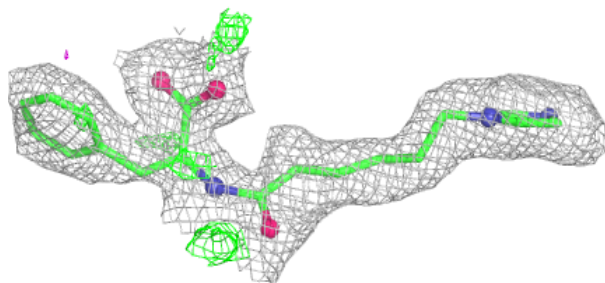
**Electron density around 4MN A 504:**

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

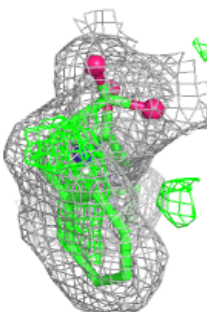
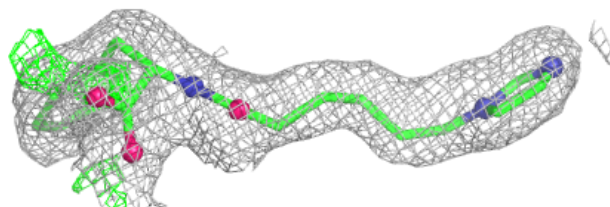
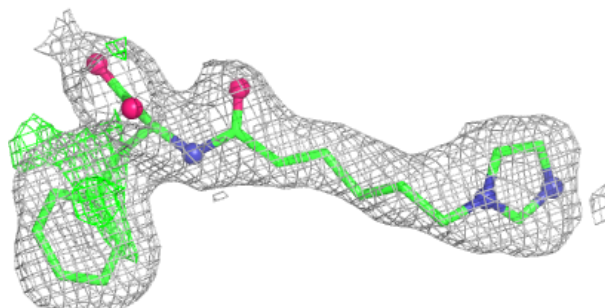


Electron density around IC6 A 505 (B):

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

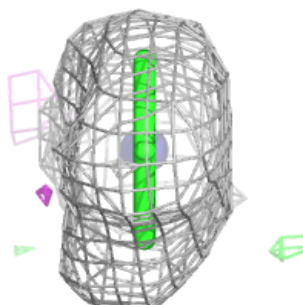
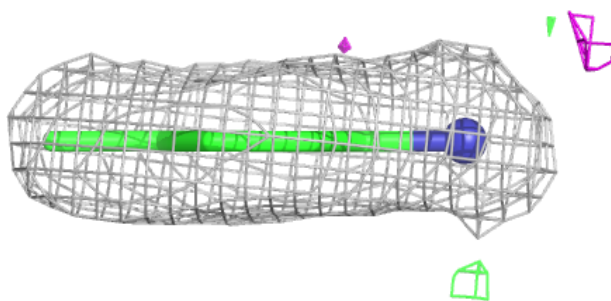
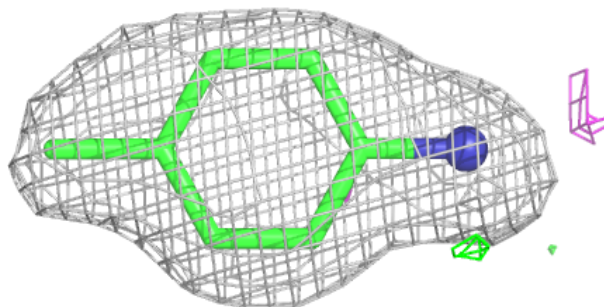
**Electron density around IC6 A 503 (A):**

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

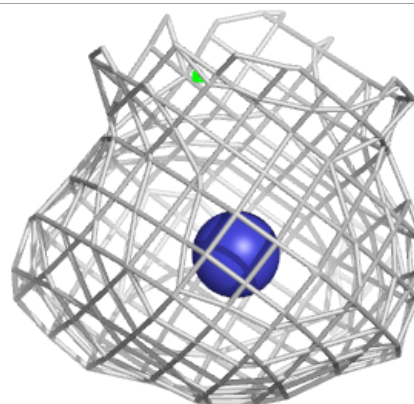
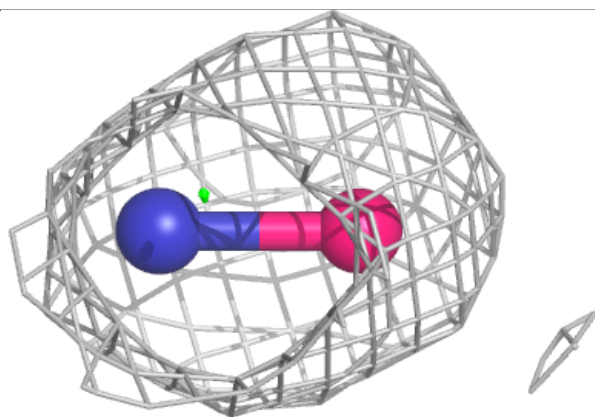
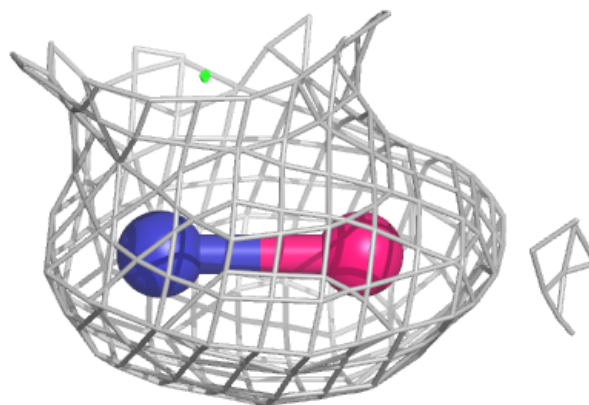


Electron density around 4MN B 504:

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and green (positive)

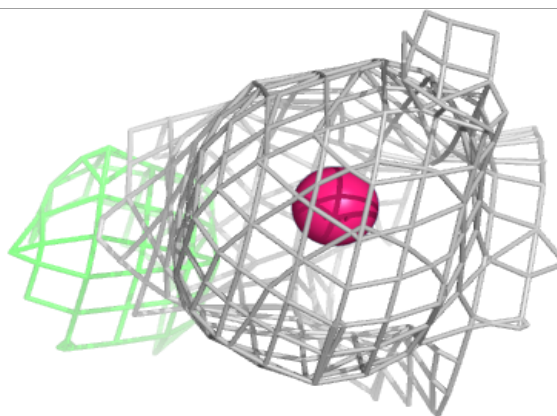
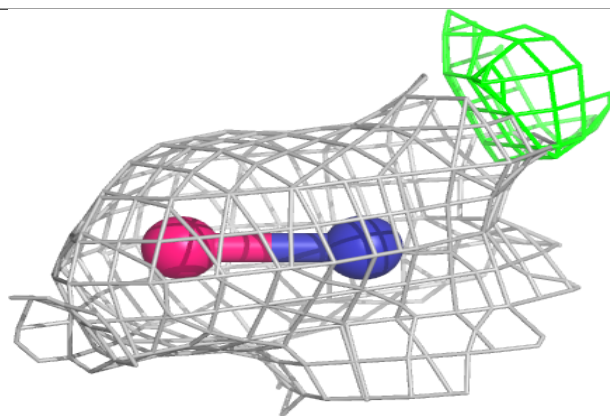
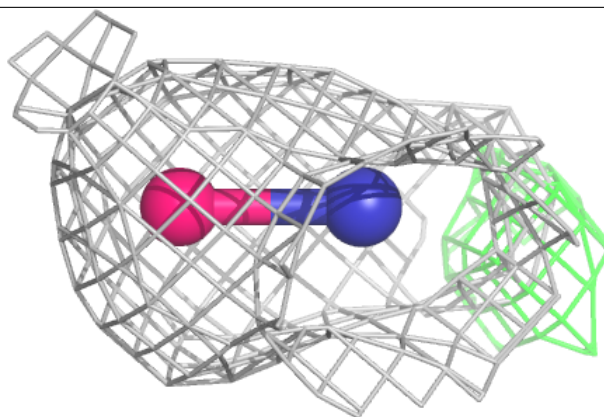
**Electron density around HOA A 502:**

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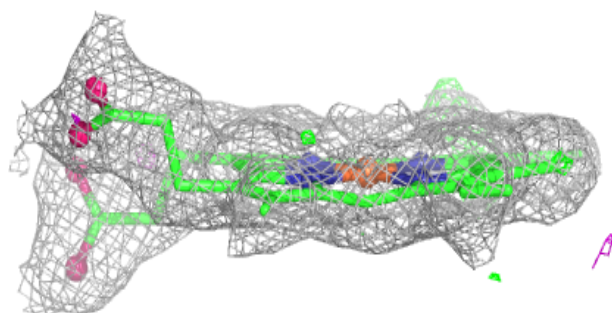
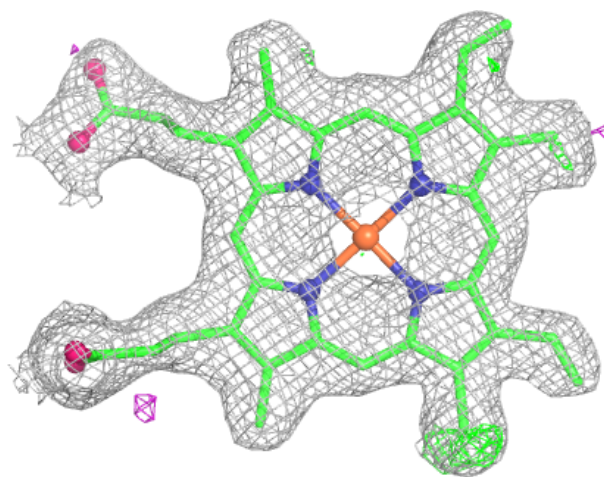
Electron density around HOA B 502:

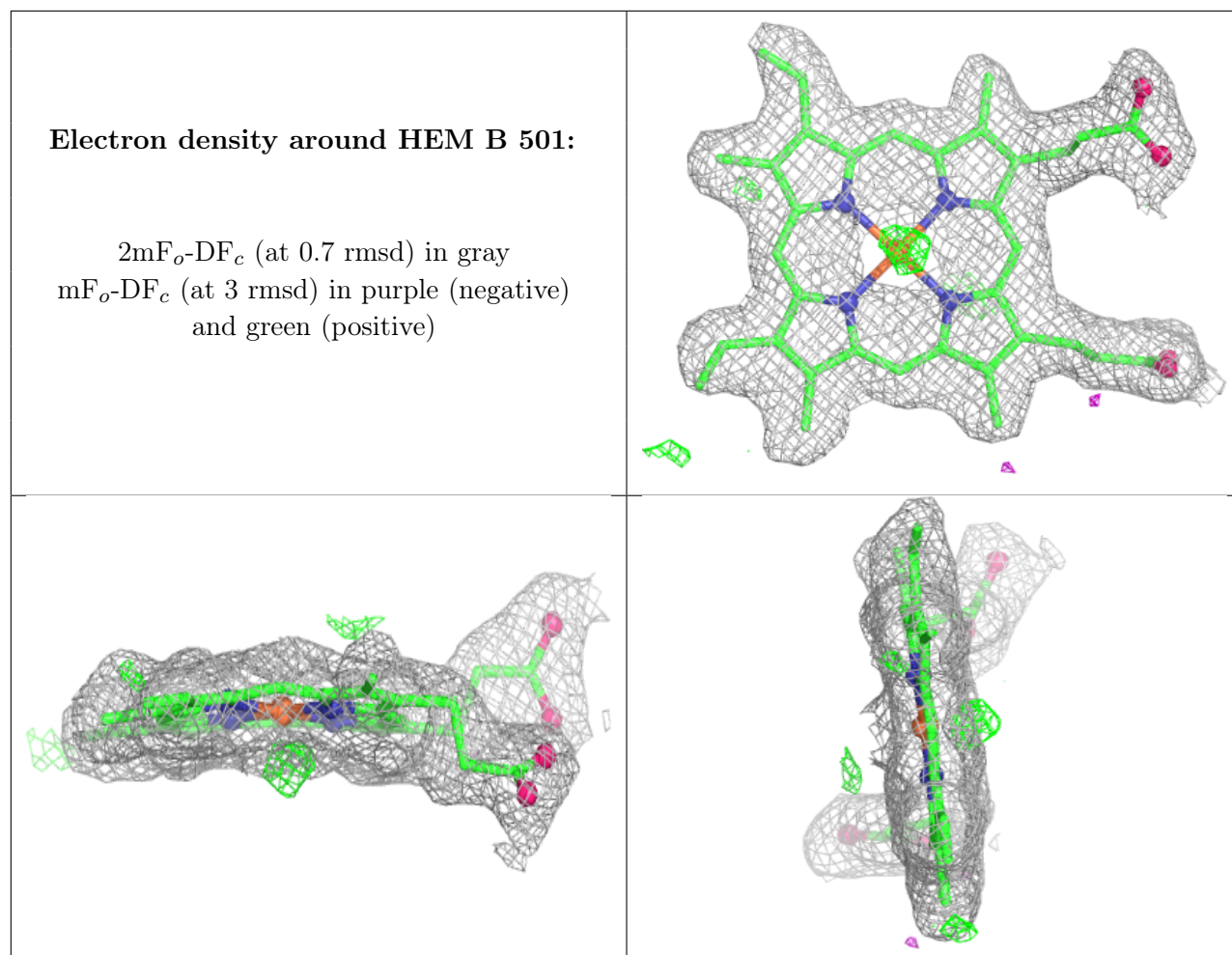
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around HEM A 501:

$2mF_o-DF_c$ (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.