



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 25, 2023 – 12:10 pm GMT

PDB ID : 7ZQR
Title : Crystal structure of CYP125 from Mycobacterium tuberculosis in complex with an inhibitor
Authors : Snee, M.; Katariya, M.; Tunncliffe, R.; Levy, C.; Leys, D.
Deposited on : 2022-05-02
Resolution : 1.79 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 : 2.32.1
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) : 2.32.1

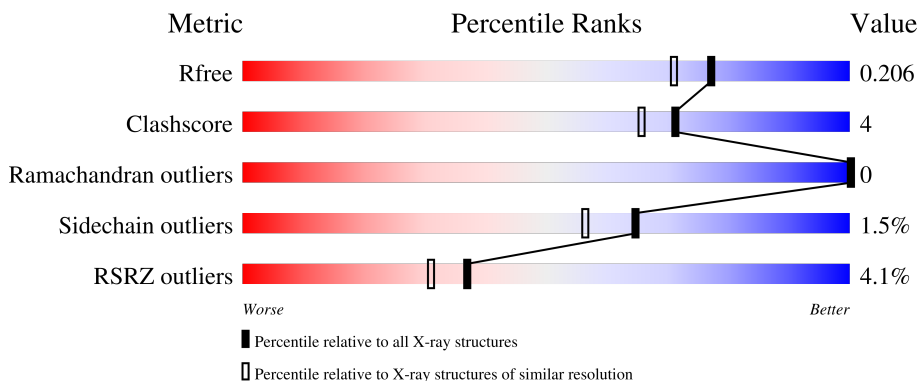
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION


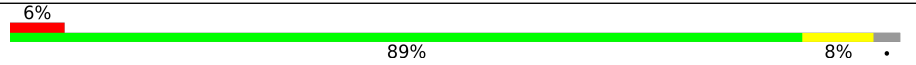
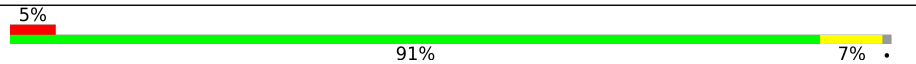
The reported resolution of this entry is 1.79 Å.

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	5950 (1.80-1.80)
Clashscore	141614	6793 (1.80-1.80)
Ramachandran outliers	138981	6697 (1.80-1.80)
Sidechain outliers	138945	6696 (1.80-1.80)
RSRZ outliers	127900	5850 (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 ≥ 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	418	 90% 8% ..
1	B	418	 89% 8% .
1	C	418	 91% 7% .

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 10789 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 Steroid C26-monooxygenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	411	3345	2128	581	618	18	0	22	0
1	B	405	3219	2041	561	602	15	0	7	0
1	C	412	3262	2066	570	609	17	0	5	0

There are 6 discrepancies between the modelled and reference sequences:

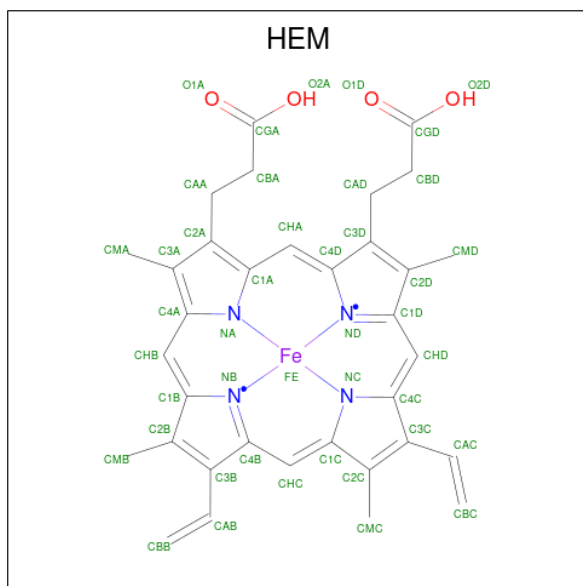
Chain	Residue	Modelled	Actual	Comment	Reference
A	16	ASN	-	expression tag	UNP P9WPP1
A	17	GLY	-	expression tag	UNP P9WPP1
B	16	ASN	-	expression tag	UNP P9WPP1
B	17	GLY	-	expression tag	UNP P9WPP1
C	16	ASN	-	expression tag	UNP P9WPP1
C	17	GLY	-	expression tag	UNP P9WPP1

- Molecule 2 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



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

- Molecule 3 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).



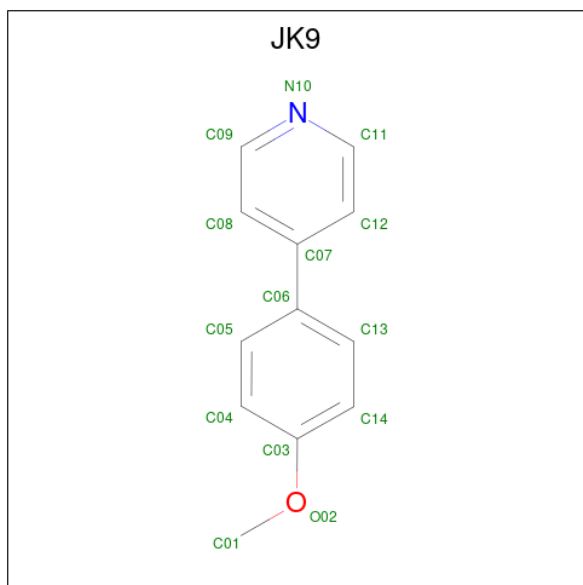
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

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

- Molecule 4 is 4-(4-methoxyphenyl)pyridine (three-letter code: JK9) (formula: C₁₂H₁₁NO) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	A	1	14	12	1	1	0	0
4	B	1	14	12	1	1	0	0
4	C	1	14	12	1	1	0	0

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



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

- Molecule 6 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

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

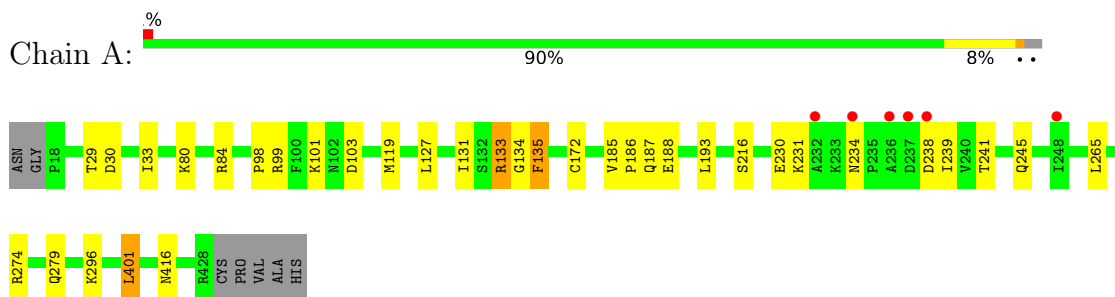
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	358	Total 358	O 358	0	0
7	B	214	Total 214	O 214	0	0
7	C	163	Total 163	O 163	0	0

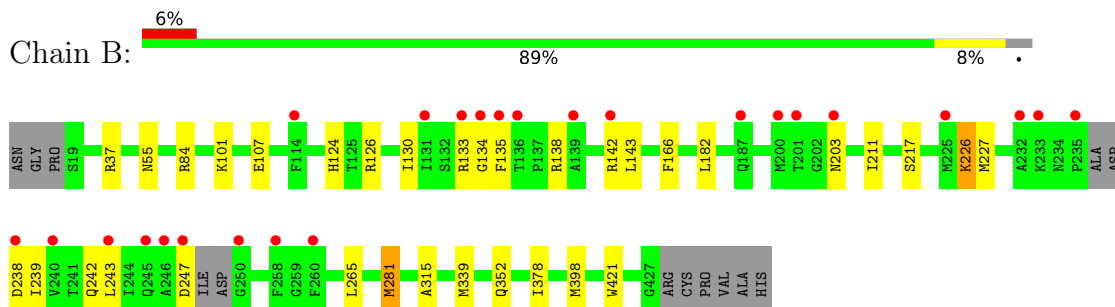
3 Residue-property plots [i](#)

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.

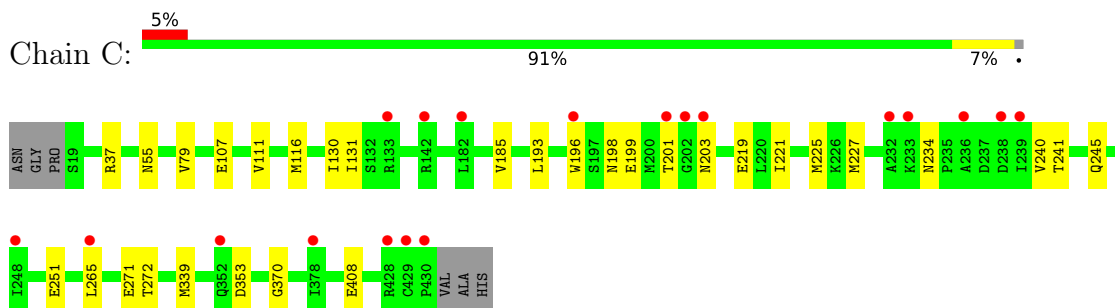
- Molecule 1: Steroid C26-monooxygenase



- Molecule 1: Steroid C26-monooxygenase



- Molecule 1: Steroid C26-monooxygenase



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	136.78Å 69.11Å 144.78Å 90.00° 94.01° 90.00°	Depositor
Resolution (Å)	68.22 – 1.79 68.22 – 1.79	Depositor EDS
% Data completeness (in resolution range)	99.8 (68.22-1.79) 94.7 (68.22-1.79)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.32 (at 1.80Å)	Xtrriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.180 , 0.208 0.178 , 0.206	Depositor DCC
R_{free} test set	6421 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å ²)	27.6	Xtrriage
Anisotropy	0.090	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 42.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	10789	wwPDB-VP
Average B, all atoms (Å ²)	40.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.19% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, CL, SO4, HEM, JK9

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	0.46	0/3481	0.66	0/4719
1	B	0.37	0/3321	0.57	0/4502
1	C	0.36	0/3361	0.57	0/4560
All	All	0.40	0/10163	0.60	0/13781

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 [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	3345	0	3276	25	0
1	B	3219	0	3110	19	0
1	C	3262	0	3152	20	0
2	A	6	0	8	1	0
3	A	43	0	30	1	0
3	B	43	0	30	4	0
3	C	43	0	30	6	0
4	A	14	0	0	0	0
4	B	14	0	0	0	0
4	C	14	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	25	0	0	1	0
5	B	10	0	0	0	0
5	C	10	0	0	0	0
6	A	5	0	0	1	0
6	B	1	0	0	0	0
7	A	358	0	0	5	0
7	B	214	0	0	0	0
7	C	163	0	0	4	0
All	All	10789	0	9636	69	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 (69) 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:134:GLY:HA2	1:B:239:ILE:HD12	1.58	0.85
3:C:501:HEM:O1A	7:C:601:HOH:O	1.96	0.84
1:A:231:LYS:NZ	1:A:238:ASP:OD2	2.10	0.84
1:A:187:GLN:OE1	7:A:1301:HOH:O	2.06	0.74
1:C:130:ILE:HD11	1:C:251:GLU:HG3	1.69	0.73
1:A:134[B]:GLY:HA2	1:A:239:ILE:HB	1.72	0.72
1:C:201:THR:HG23	1:C:271:GLU:CD	2.12	0.70
1:A:84:ARG:NH2	5:A:1207:SO4:O3	2.28	0.67
1:B:138:ARG:O	1:B:142:ARG:HG3	1.95	0.67
3:B:501:HEM:HBC2	3:B:501:HEM:HMC2	1.75	0.67
1:C:408:GLU:OE1	7:C:602:HOH:O	2.14	0.66
1:C:198:ASN:O	1:C:201:THR:HB	1.95	0.65
1:C:234[A]:ASN:ND2	7:C:607:HOH:O	2.34	0.60
1:B:133:ARG:NH1	1:B:242:GLN:O	2.36	0.59
1:C:107:GLU:O	1:C:111:VAL:HG13	2.03	0.58
1:B:37:ARG:HD2	1:C:37:ARG:HD2	1.87	0.57
1:C:185:VAL:HG21	1:C:193:LEU:HD22	1.85	0.57
1:B:226:LYS:N	1:B:226:LYS:HD3	2.19	0.56
1:C:227[A]:MET:SD	1:C:240:VAL:HG21	2.46	0.56
1:B:124:HIS:HE1	3:B:501:HEM:O2D	1.89	0.55
1:B:133:ARG:NH2	1:B:247:ASP:OD1	2.40	0.55
1:B:101:LYS:HZ1	1:B:203:ASN:HB2	1.71	0.54
3:C:501:HEM:HMC1	3:C:501:HEM:HBC2	1.89	0.54
1:A:30:ASP:HB3	1:A:33:ILE:HD12	1.89	0.54
1:A:230:GLU:OE2	1:A:234:ASN:ND2	2.41	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:107:GLU:H	1:B:107:GLU:CD	2.11	0.52
1:C:79:VAL:HG22	1:C:339:MET:HB3	1.91	0.52
1:C:116:MET:SD	1:C:131:ILE:HD12	2.50	0.52
1:B:126:ARG:O	1:B:130:ILE:HG13	2.09	0.52
1:A:135[B]:PHE:HZ	1:A:265:LEU:HD11	1.75	0.51
1:A:188:GLU:CD	1:A:188:GLU:H	2.14	0.51
1:C:241:THR:O	1:C:245:GLN:HG2	2.13	0.49
1:B:203:ASN:ND2	1:B:211:ILE:O	2.44	0.49
1:C:370:GLY:HA3	3:C:501:HEM:HBA1	1.96	0.48
1:A:279:GLN:HE22	1:A:416:ASN:ND2	2.12	0.48
1:C:265:LEU:CD1	3:C:501:HEM:HBC1	2.44	0.48
1:A:274[A]:ARG:NH2	7:A:1311:HOH:O	2.47	0.47
1:A:185:VAL:HG21	1:A:193:LEU:HD22	1.96	0.47
1:A:101:LYS:HD2	2:A:1201:GOL:H12	1.96	0.47
3:C:501:HEM:HBC2	3:C:501:HEM:CMC	2.45	0.47
3:A:1202:HEM:HBC2	3:A:1202:HEM:HMC1	1.97	0.46
1:B:135:PHE:CE1	1:B:378:ILE:HD12	2.51	0.46
1:A:216[A]:SER:OG	7:A:1302:HOH:O	2.20	0.46
1:B:166:PHE:CZ	1:B:281:MET:HG2	2.52	0.45
1:B:352:GLN:HG3	1:B:352:GLN:O	2.16	0.45
1:C:221:ILE:O	1:C:225:MET:HG2	2.17	0.45
1:C:353:ASP:OD1	1:C:353:ASP:N	2.49	0.44
1:B:265:LEU:CD1	3:B:501:HEM:HBC1	2.48	0.44
3:B:501:HEM:HBC2	3:B:501:HEM:CMC	2.44	0.44
1:A:80:LYS:HB3	1:A:80:LYS:HE3	1.70	0.44
1:A:241:THR:O	1:A:245:GLN:HB2	2.18	0.44
1:B:143:LEU:HD11	1:B:182:LEU:HB2	2.00	0.44
1:A:127:LEU:O	1:A:131[A]:ILE:HG12	2.18	0.43
1:A:133[A]:ARG:HH11	1:A:133[A]:ARG:HB3	1.83	0.42
1:C:196:TRP:CE2	1:C:219:GLU:HB3	2.54	0.42
1:A:98:PRO:O	6:A:1213:CL:CL	2.75	0.42
1:C:265:LEU:HD11	3:C:501:HEM:HBC1	2.00	0.42
1:A:29:THR:O	1:A:99:ARG:HD3	2.21	0.41
1:A:103:ASP:OD1	7:A:1303:HOH:O	2.22	0.41
1:B:281:MET:HB3	1:B:421:TRP:HZ3	1.85	0.41
1:B:315:ALA:HA	1:B:339:MET:O	2.20	0.41
1:A:119:MET:SD	1:A:127:LEU:HD12	2.61	0.41
1:B:239:ILE:O	1:B:243:LEU:HD23	2.21	0.41
1:A:186:PRO:HB2	1:A:188:GLU:OE2	2.20	0.41
1:A:84:ARG:HG3	7:A:1312:HOH:O	2.20	0.41
1:A:172[A]:CYS:SG	1:A:274[A]:ARG:NH1	2.92	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:201:THR:HG23	1:C:271:GLU:OE1	2.21	0.40
1:C:272:THR:OG1	7:C:603:HOH:O	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	431/418 (103%)	418 (97%)	13 (3%)	0	100	100
1	B	406/418 (97%)	397 (98%)	9 (2%)	0	100	100
1	C	415/418 (99%)	403 (97%)	12 (3%)	0	100	100
All	All	1252/1254 (100%)	1218 (97%)	34 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	354/341 (104%)	347 (98%)	7 (2%)	55	44
1	B	337/341 (99%)	328 (97%)	9 (3%)	44	31
1	C	341/341 (100%)	338 (99%)	3 (1%)	78	75
All	All	1032/1023 (101%)	1013 (98%)	19 (2%)	65	48

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	133[A]	ARG
1	A	133[B]	ARG
1	A	135[A]	PHE
1	A	135[B]	PHE
1	A	296	LYS
1	A	401[A]	LEU
1	A	401[B]	LEU
1	B	55	ASN
1	B	84	ARG
1	B	217	SER
1	B	226	LYS
1	B	227	MET
1	B	238	ASP
1	B	281	MET
1	B	398[A]	MET
1	B	398[B]	MET
1	C	55	ASN
1	C	199	GLU
1	C	203	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	124	HIS
1	B	242	GLN
1	C	242	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

Of 22 ligands modelled in this entry, 6 are monoatomic - leaving 16 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
5	SO4	B	503	-	4,4,4	0.15	0	6,6,6	0.15	0
2	GOL	A	1201	-	5,5,5	1.03	0	5,5,5	1.14	1 (20%)
3	HEM	B	501	4,1	41,50,50	1.65	9 (21%)	45,82,82	1.61	10 (22%)
3	HEM	C	501	4,1	41,50,50	1.38	5 (12%)	45,82,82	1.47	7 (15%)
5	SO4	A	1204	-	4,4,4	0.14	0	6,6,6	0.09	0
5	SO4	A	1205	-	4,4,4	0.13	0	6,6,6	0.16	0
5	SO4	A	1207	-	4,4,4	0.14	0	6,6,6	0.05	0
5	SO4	C	504	-	4,4,4	0.12	0	6,6,6	0.09	0
3	HEM	A	1202	4,1	41,50,50	1.57	5 (12%)	45,82,82	1.40	9 (20%)
4	JK9	C	502	3	15,15,15	1.12	1 (6%)	19,19,19	0.92	0
4	JK9	B	502	3	15,15,15	1.15	1 (6%)	19,19,19	0.95	0
5	SO4	B	504	-	4,4,4	0.15	0	6,6,6	0.13	0
4	JK9	A	1203	3	15,15,15	1.26	2 (13%)	19,19,19	0.80	0
5	SO4	A	1208	-	4,4,4	0.16	0	6,6,6	0.33	0
5	SO4	C	503	-	4,4,4	0.15	0	6,6,6	0.12	0
5	SO4	A	1206	-	4,4,4	0.18	0	6,6,6	0.07	0

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	GOL	A	1201	-	-	0/4/4/4	-
3	HEM	B	501	4,1	-	2/12/54/54	-
3	HEM	C	501	4,1	-	0/12/54/54	-
3	HEM	A	1202	4,1	-	2/12/54/54	-
4	JK9	C	502	3	-	0/6/6/6	0/2/2/2
4	JK9	B	502	3	-	2/6/6/6	0/2/2/2

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	JK9	A	1203	3	-	0/6/6/6	0/2/2/2

All (23) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1202	HEM	C3C-C2C	-4.24	1.34	1.40
3	A	1202	HEM	CAA-C2A	4.01	1.57	1.52
3	B	501	HEM	C3C-C2C	-3.86	1.35	1.40
4	B	502	JK9	C07-C06	-3.77	1.39	1.49
4	C	502	JK9	C07-C06	-3.76	1.39	1.49
3	A	1202	HEM	C3C-CAC	3.67	1.55	1.47
3	C	501	HEM	C3C-C2C	-3.55	1.35	1.40
3	B	501	HEM	C3C-CAC	3.52	1.55	1.47
3	C	501	HEM	C3C-CAC	3.25	1.54	1.47
4	A	1203	JK9	C07-C06	-2.95	1.41	1.49
3	A	1202	HEM	CAB-C3B	2.94	1.55	1.47
3	B	501	HEM	CAB-C3B	2.80	1.55	1.47
3	B	501	HEM	CAA-C2A	2.77	1.56	1.52
3	B	501	HEM	C1A-NA	2.67	1.41	1.36
3	B	501	HEM	FE-NB	2.63	2.09	1.96
3	C	501	HEM	CAB-C3B	2.55	1.54	1.47
3	C	501	HEM	CAA-C2A	2.51	1.55	1.52
4	A	1203	JK9	O02-C03	2.46	1.42	1.37
3	A	1202	HEM	CMB-C2B	2.26	1.55	1.50
3	B	501	HEM	CMB-C2B	2.25	1.55	1.50
3	B	501	HEM	C1B-NB	-2.18	1.36	1.40
3	B	501	HEM	FE-ND	2.09	2.07	1.96
3	C	501	HEM	CMB-C2B	2.02	1.55	1.50

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	501	HEM	C4D-ND-C1D	4.05	109.26	105.07
3	C	501	HEM	CMA-C3A-C4A	-3.71	122.76	128.46
3	B	501	HEM	C4A-C3A-C2A	3.48	109.42	107.00
3	B	501	HEM	C4C-CHD-C1D	3.32	126.94	122.56
3	B	501	HEM	C1B-NB-C4B	3.20	108.38	105.07
3	C	501	HEM	CMC-C2C-C3C	3.19	130.64	124.68
3	A	1202	HEM	C4D-ND-C1D	2.95	108.12	105.07
3	C	501	HEM	C4C-CHD-C1D	2.69	126.11	122.56
3	B	501	HEM	CMB-C2B-C1B	-2.44	121.32	125.04
3	A	1202	HEM	CMC-C2C-C3C	2.41	129.19	124.68

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	501	HEM	CMC-C2C-C3C	2.37	129.12	124.68
3	B	501	HEM	C2D-C1D-ND	-2.35	107.07	109.88
3	C	501	HEM	CHD-C1D-ND	2.29	126.92	124.43
3	A	1202	HEM	CHD-C1D-ND	2.27	126.89	124.43
3	A	1202	HEM	C3D-C4D-ND	-2.26	107.65	110.17
3	A	1202	HEM	CAD-CBD-CGD	-2.22	108.81	113.60
3	C	501	HEM	C1B-NB-C4B	2.22	107.37	105.07
3	A	1202	HEM	CHB-C1B-NB	2.22	127.13	124.38
3	C	501	HEM	C4A-C3A-C2A	2.17	108.51	107.00
3	B	501	HEM	C3D-C4D-ND	-2.16	107.76	110.17
3	B	501	HEM	CBA-CAA-C2A	2.15	116.28	112.62
3	A	1202	HEM	CAA-CBA-CGA	-2.09	107.90	113.76
3	B	501	HEM	CAD-CBD-CGD	-2.09	109.10	113.60
3	A	1202	HEM	CHA-C4D-ND	2.07	126.94	124.38
2	A	1201	GOL	C3-C2-C1	-2.06	103.71	111.70
3	A	1202	HEM	C3B-C2B-C1B	2.01	107.98	106.49
3	C	501	HEM	CMA-C3A-C2A	2.01	128.73	124.94

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1202	HEM	C3A-C2A-CAA-CBA
3	B	501	HEM	C1A-C2A-CAA-CBA
3	B	501	HEM	C3A-C2A-CAA-CBA
3	A	1202	HEM	C1A-C2A-CAA-CBA
4	B	502	JK9	C04-C03-O02-C01
4	B	502	JK9	C14-C03-O02-C01

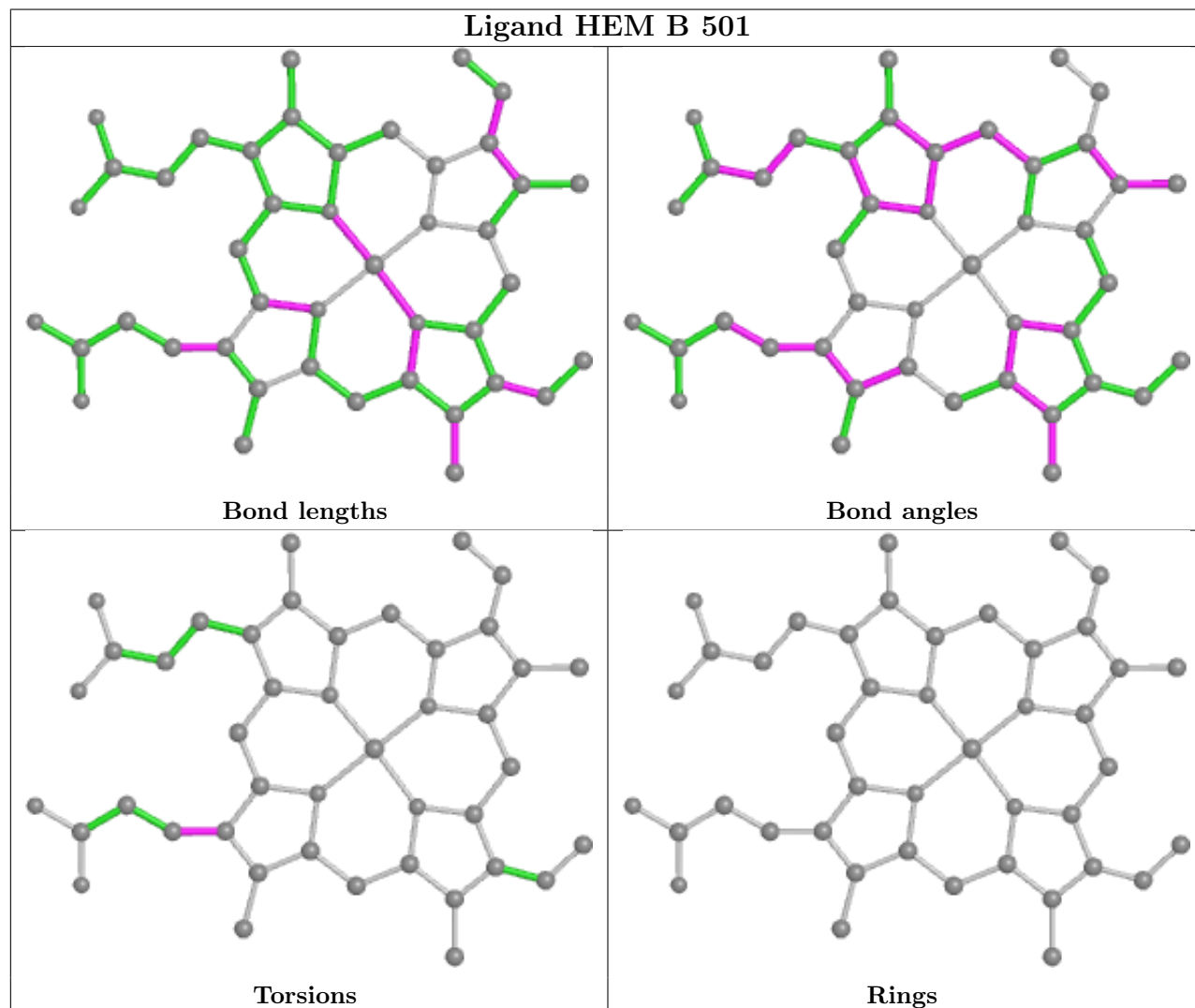
There are no ring outliers.

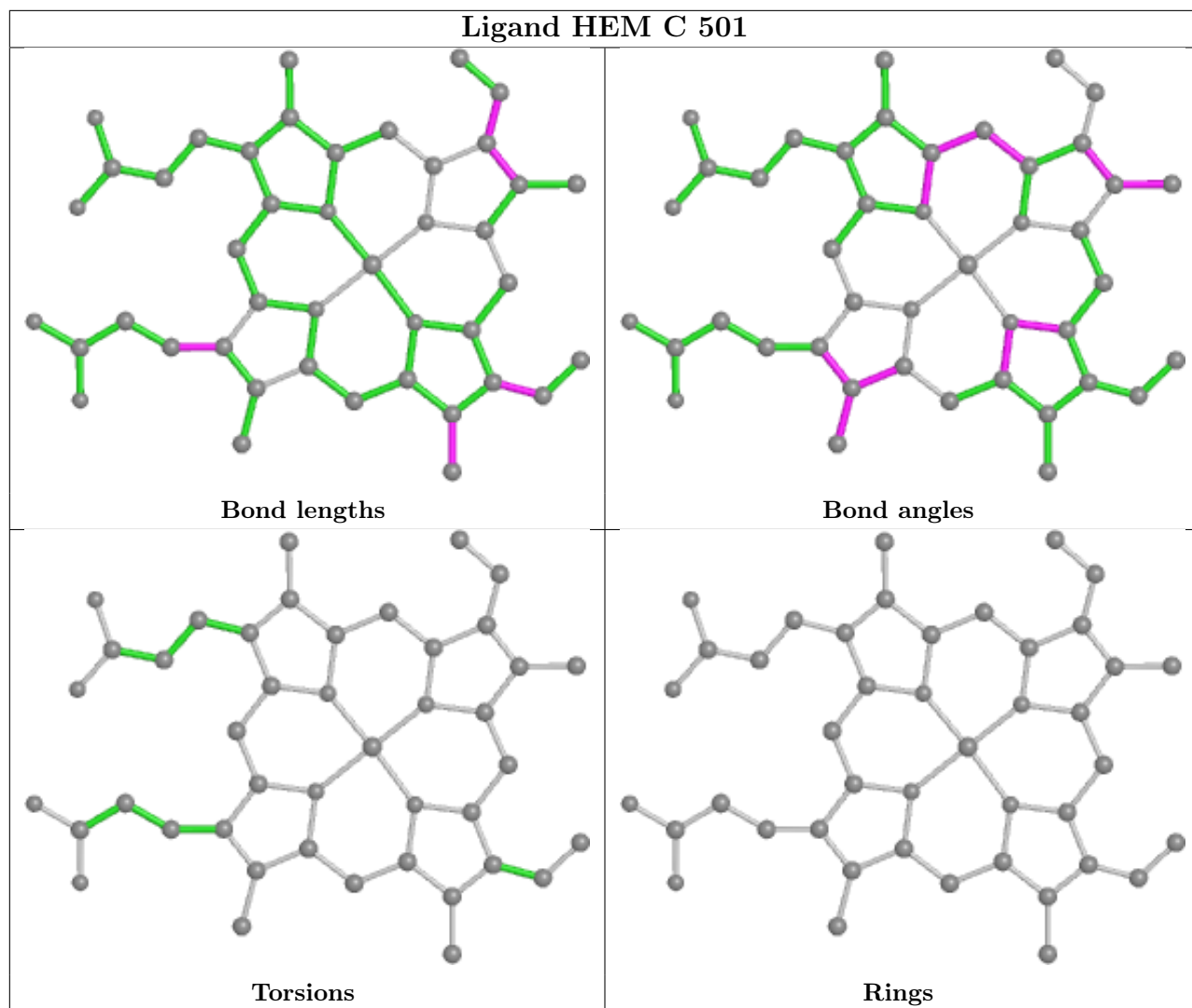
5 monomers are involved in 13 short contacts:

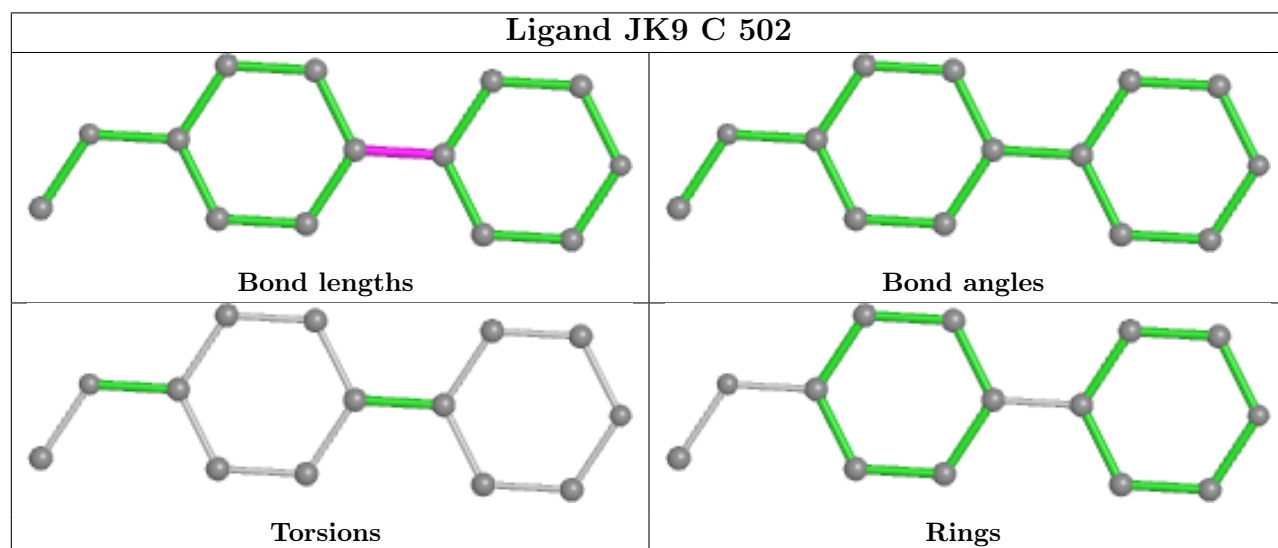
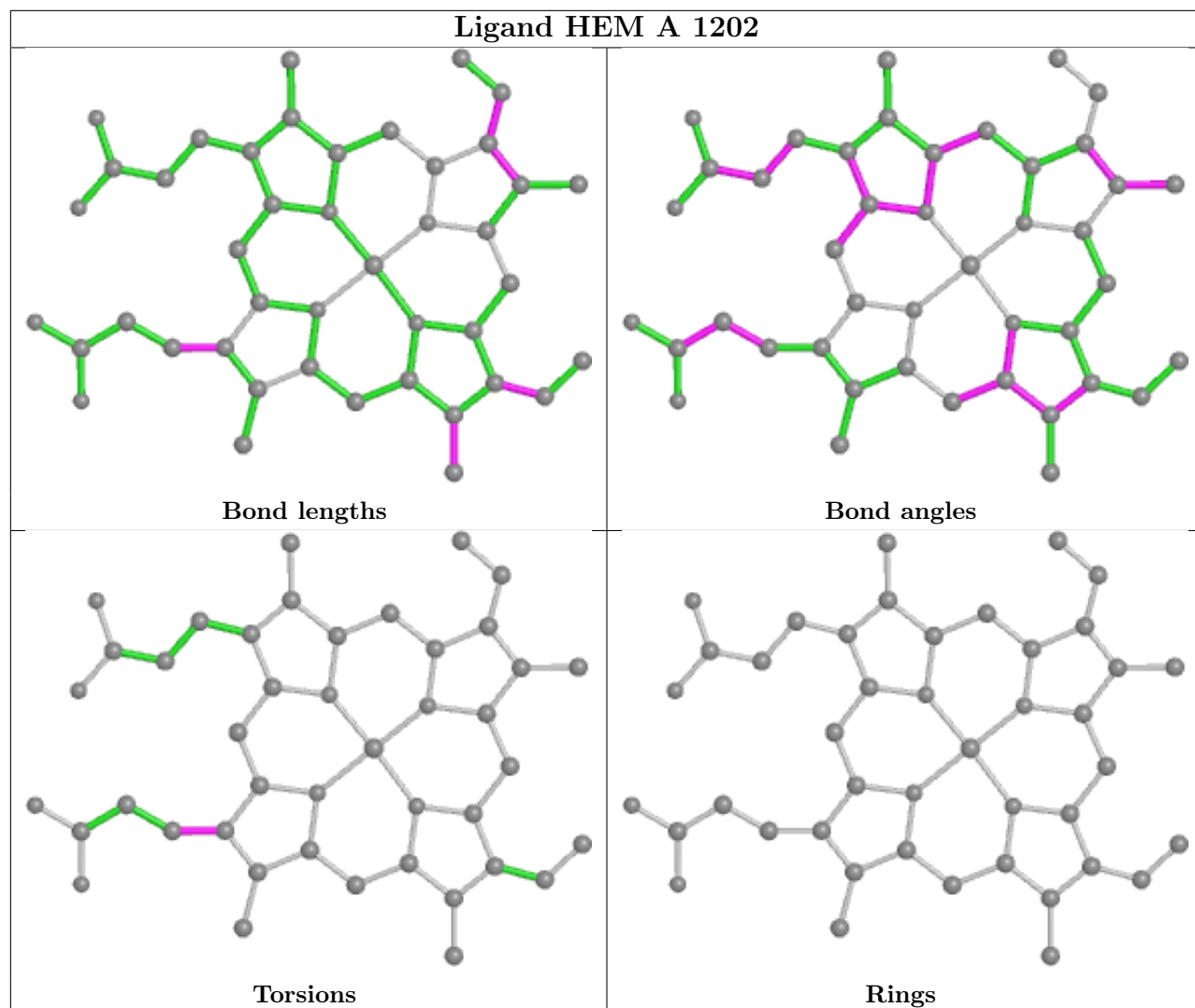
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1201	GOL	1	0
3	B	501	HEM	4	0
3	C	501	HEM	6	0
5	A	1207	SO4	1	0
3	A	1202	HEM	1	0

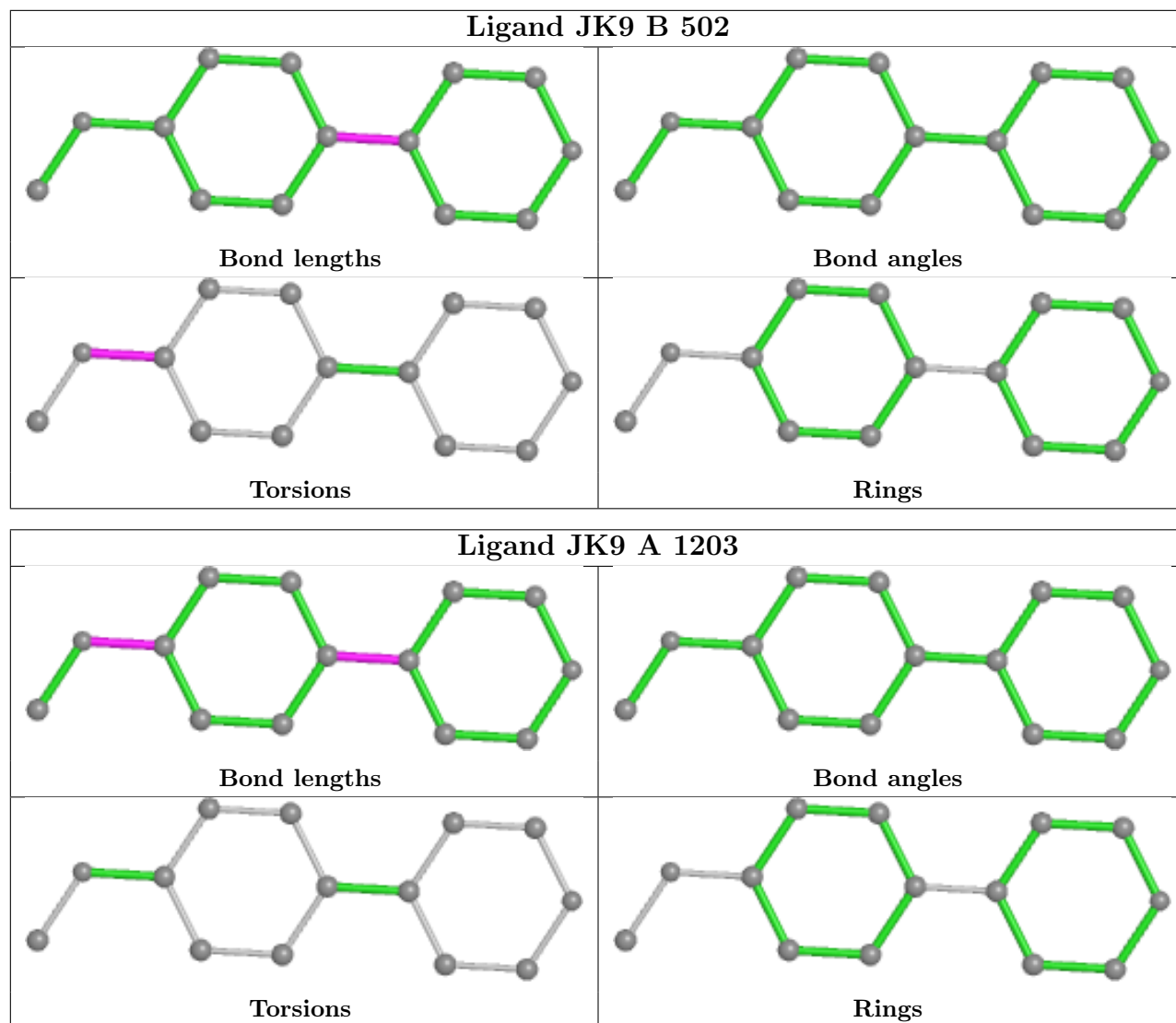
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

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.









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	411/418 (98%)	0.30	6 (1%) 73 70	18, 29, 52, 82	0
1	B	405/418 (96%)	0.31	25 (6%) 20 16	25, 42, 72, 99	0
1	C	412/418 (98%)	0.23	19 (4%) 32 26	30, 43, 70, 89	0
All	All	1228/1254 (97%)	0.28	50 (4%) 37 31	18, 37, 68, 99	0

All (50) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	203	ASN	5.4
1	A	237	ASP	5.1
1	B	250	GLY	5.0
1	B	235	PRO	4.8
1	A	248	ILE	4.6
1	C	201	THR	4.5
1	B	201	THR	4.1
1	C	239	ILE	4.1
1	B	245	GLN	4.1
1	B	131	ILE	3.7
1	B	233	LYS	3.7
1	B	247	ASP	3.6
1	A	236	ALA	3.6
1	C	429	CYS	3.5
1	A	232	ALA	3.5
1	B	135	PHE	3.4
1	C	202	GLY	3.3
1	B	136	THR	3.2
1	C	265	LEU	3.2
1	B	240	VAL	3.1
1	B	139	ALA	3.0
1	B	114	PHE	2.9
1	C	196	TRP	2.9

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Mol	Chain	Res	Type	RSRZ
1	B	225	MET	2.8
1	C	248	ILE	2.7
1	C	378	ILE	2.7
1	C	236	ALA	2.7
1	C	182	LEU	2.7
1	B	246	ALA	2.6
1	C	233	LYS	2.6
1	C	428	ARG	2.6
1	C	238	ASP	2.6
1	B	200	MET	2.5
1	B	258	PHE	2.4
1	B	133	ARG	2.3
1	C	232	ALA	2.3
1	C	430	PRO	2.3
1	B	142	ARG	2.3
1	B	232	ALA	2.3
1	B	238	ASP	2.3
1	C	352	GLN	2.3
1	C	203	ASN	2.3
1	A	234	ASN	2.2
1	B	134	GLY	2.2
1	C	133	ARG	2.2
1	B	260	PHE	2.1
1	B	187	GLN	2.1
1	B	243	LEU	2.1
1	C	142	ARG	2.0
1	A	238	ASP	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,

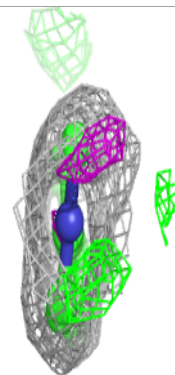
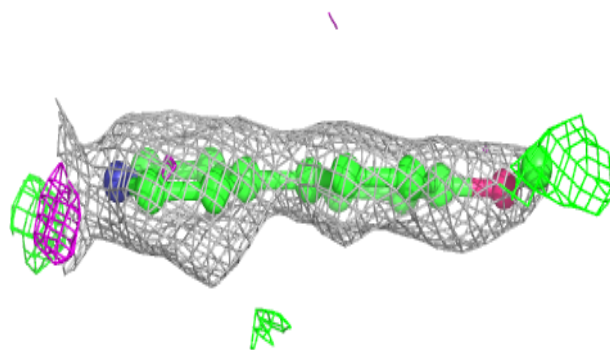
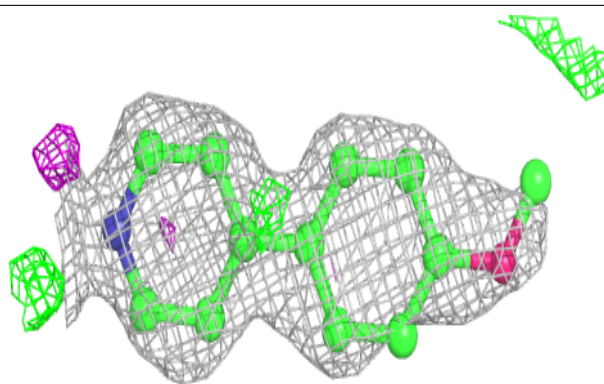
median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	GOL	A	1201	6/6	0.73	0.18	41,48,53,54	0
5	SO4	C	503	5/5	0.73	0.33	63,82,101,106	0
5	SO4	A	1206	5/5	0.74	0.33	55,59,87,97	0
5	SO4	A	1205	5/5	0.80	0.19	43,44,57,64	5
5	SO4	A	1204	5/5	0.85	0.24	67,79,100,103	0
5	SO4	B	504	5/5	0.88	0.29	55,58,76,91	0
6	CL	A	1210	1/1	0.88	0.07	63,63,63,63	0
5	SO4	C	504	5/5	0.90	0.29	54,61,74,89	0
4	JK9	C	502	14/14	0.90	0.30	40,48,57,59	0
5	SO4	A	1207	5/5	0.92	0.21	69,70,92,101	0
5	SO4	A	1208	5/5	0.92	0.17	50,51,58,75	0
4	JK9	B	502	14/14	0.92	0.21	34,39,46,48	0
5	SO4	B	503	5/5	0.94	0.16	62,64,77,85	0
6	CL	A	1211	1/1	0.94	0.08	62,62,62,62	0
4	JK9	A	1203	14/14	0.95	0.12	19,23,32,32	0
6	CL	B	505	1/1	0.95	0.09	49,49,49,49	0
3	HEM	C	501	43/43	0.96	0.11	27,37,48,61	0
6	CL	A	1212	1/1	0.96	0.09	46,46,46,46	0
3	HEM	B	501	43/43	0.96	0.10	23,34,42,46	0
3	HEM	A	1202	43/43	0.98	0.12	15,20,25,27	0
6	CL	A	1213	1/1	0.99	0.06	38,38,38,38	0
6	CL	A	1209	1/1	0.99	0.09	39,39,39,39	0

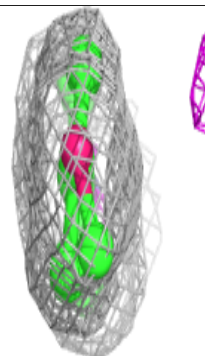
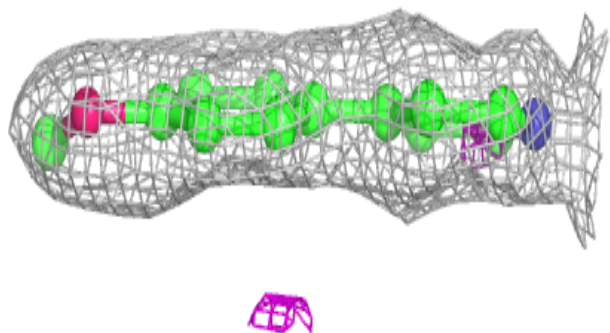
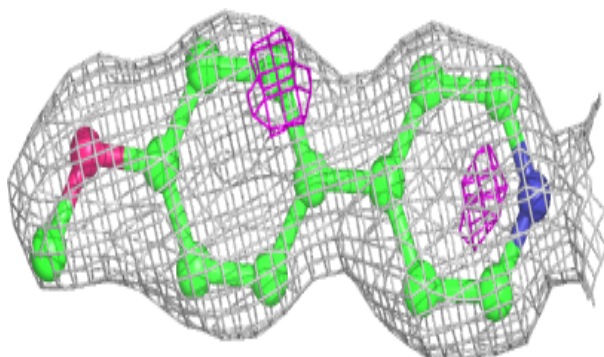
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

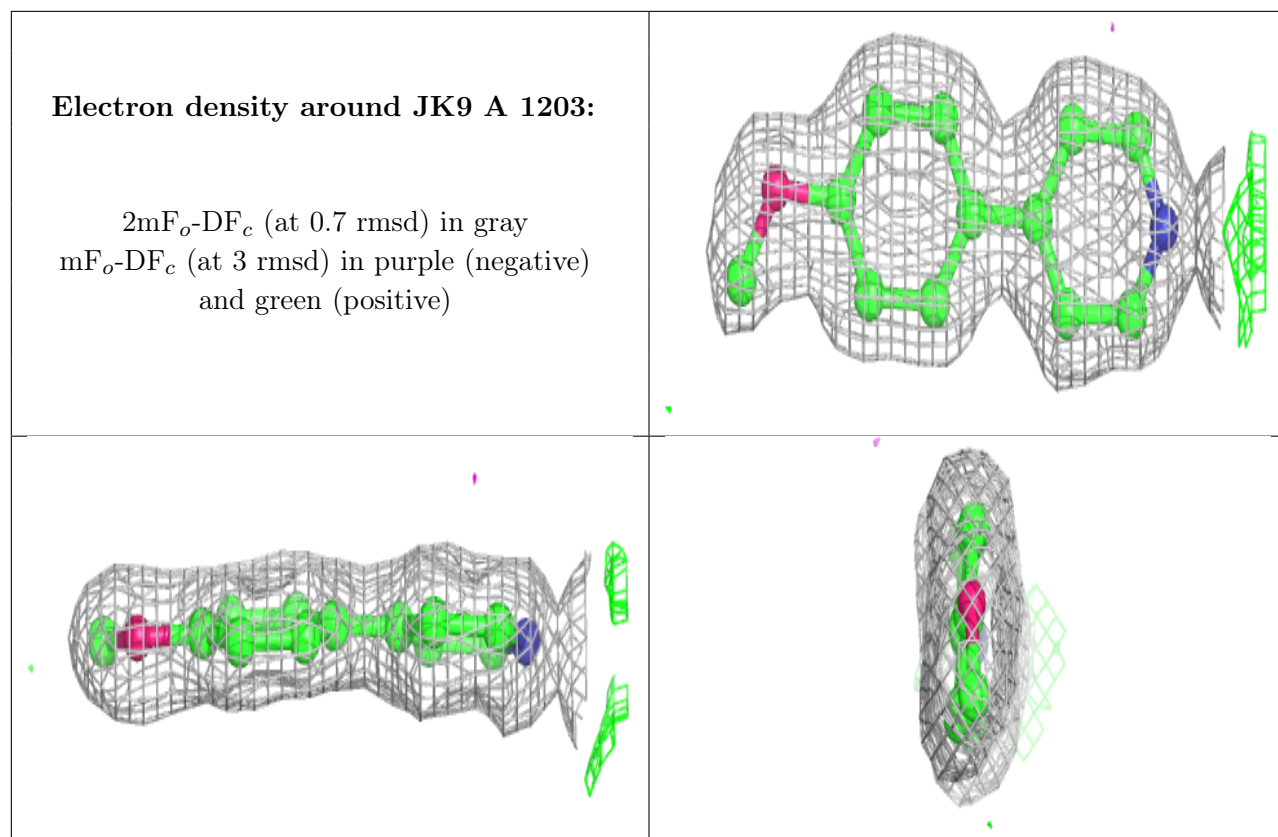
Electron density around JK9 C 502:

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

**Electron density around JK9 B 502:**

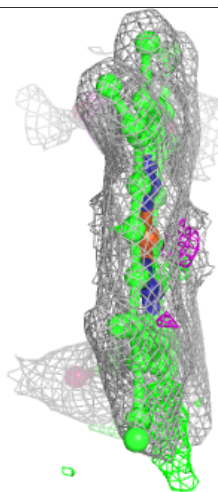
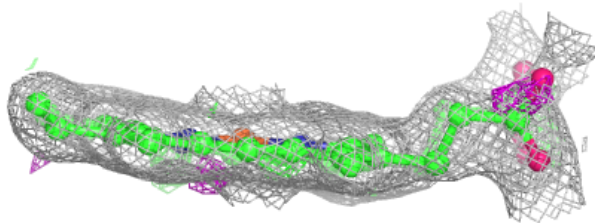
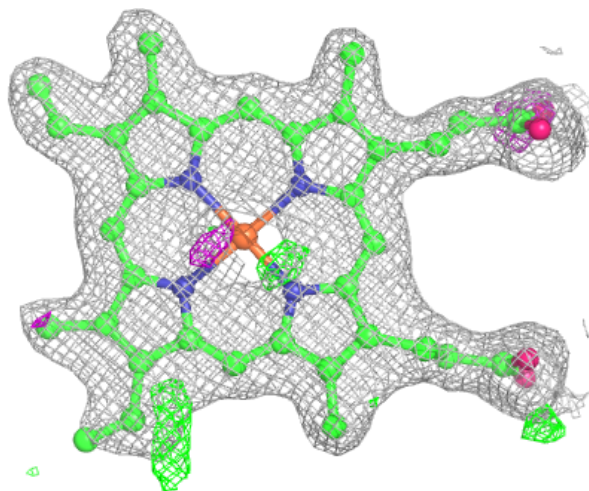
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





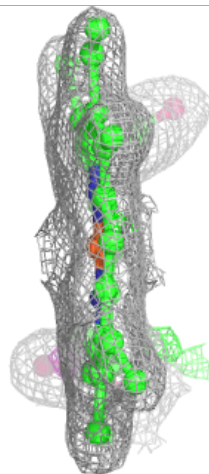
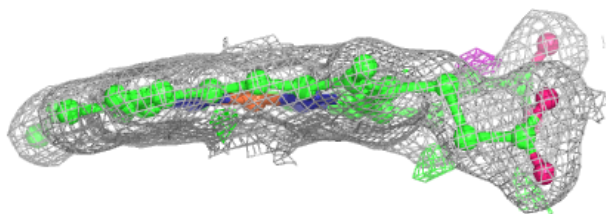
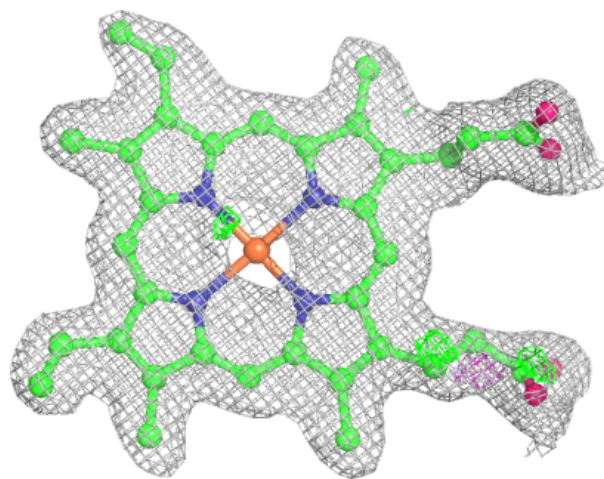
Electron density around HEM C 501:

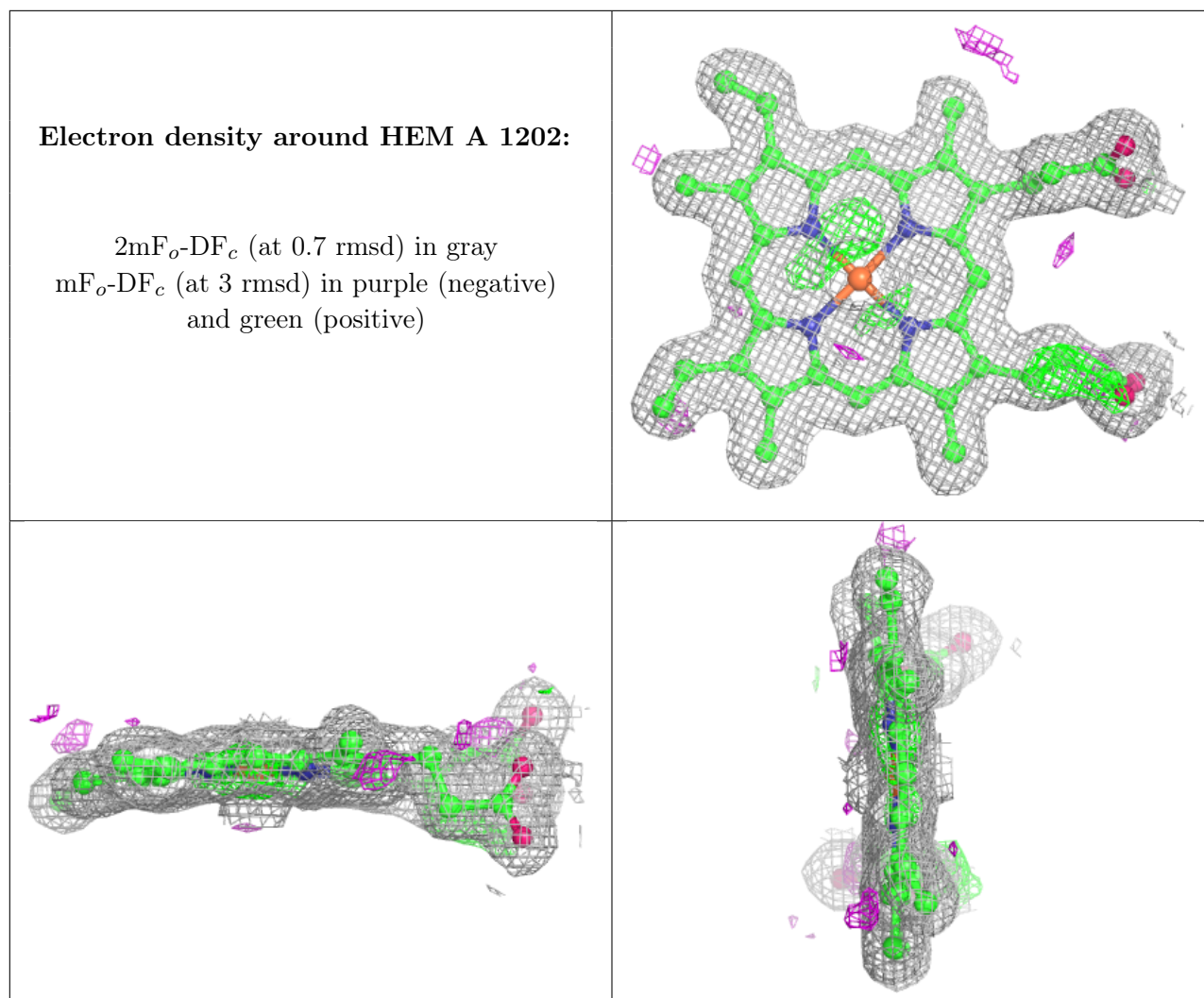
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around HEM B 501:

$2mF_o-DF_c$ (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.