



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 03:03 PM UTC

PDB ID : 2Y37 / pdb_00002y37
Title : The discovery of novel, potent and highly selective inhibitors of inducible nitric oxide synthase (iNOS)
Authors : Cheshire, D.R.; Andrews, G.; Beaton, H.G.; Birkinshaw, T.N.; Boughton-Smith, N.; Connolly, S.; Cook, T.R.; Cooper, A.; Cooper, S.L.; Cox, D.; Dixon, J.; Gensmantel, N.; Hamley, P.J.; Harrison, R.; Hartopp, P.; Kack, H.; Luker, T.; Mete, A.; Millichip, I.; Nicholls, D.J.; Pimm, A.D.; St-Gallay, S.A.; Wallace, A.V.
Deposited on : 2010-12-19
Resolution : 2.60 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12

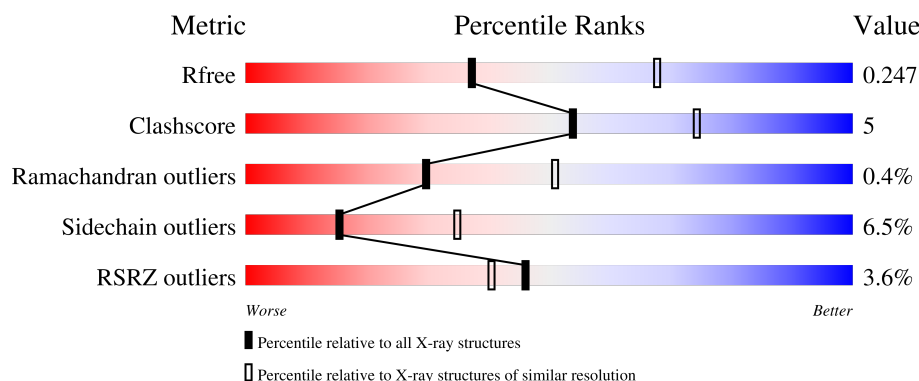
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (2.60-2.60)

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	433	3% 79% 13% 5%
1	B	433	4% 80% 12% 5%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

Ideal geometry (proteins)	: Engh & Huber (2001)
Ideal geometry (DNA, RNA)	: Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	: 2.49

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	GOL	A	1499	-	X	-	-

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 7222 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 NITRIC OXIDE SYNTHASE, INDUCIBLE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	411	Total	C	N	O	S	0	0	0
			3356	2153	579	604	20			
1	B	412	Total	C	N	O	S	0	2	0
			3378	2166	586	606	20			

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



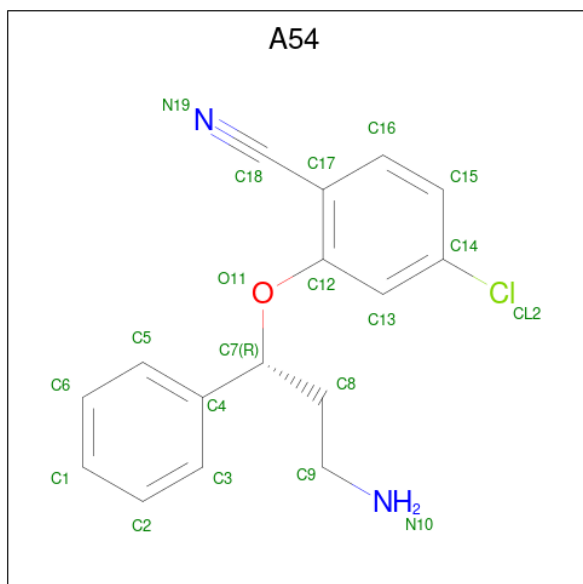
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



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

- Molecule 4 is 2-[(1R)-3-amino-1-phenyl-propoxy]-4-chloro-benzonitrile (CCD ID: A54) (formula: C₁₆H₁₅ClN₂O).



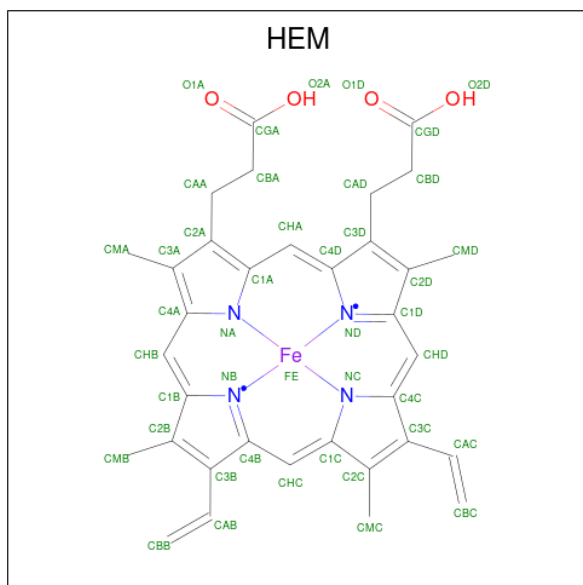
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	Cl	N	O	0	0
			20	16	1	2	1		

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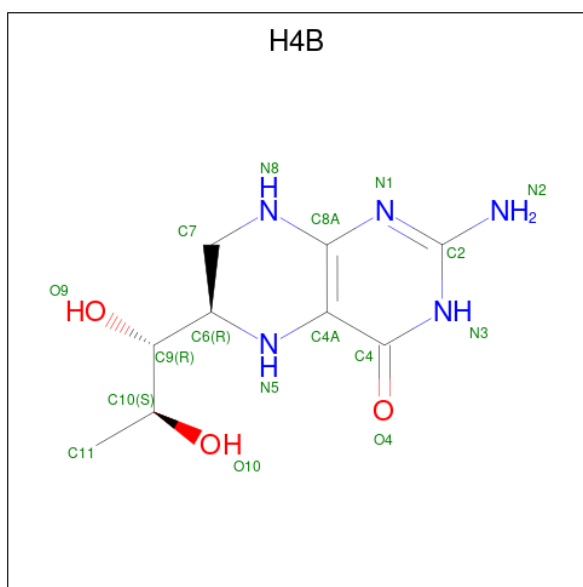
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	B	1	Total	C	Cl	N	O	0	0
			20	16	1	2	1		

- Molecule 5 is PROTOPORPHYRIN IX CONTAINING FE (CCD ID: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).



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

- Molecule 6 is 5,6,7,8-TETRAHYDROBIOPTERIN (CCD ID: H4B) (formula: $C_9H_{15}N_5O_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	N	O	0	0
			17	9	5	3		
6	B	1	Total	C	N	O	0	0
			17	9	5	3		

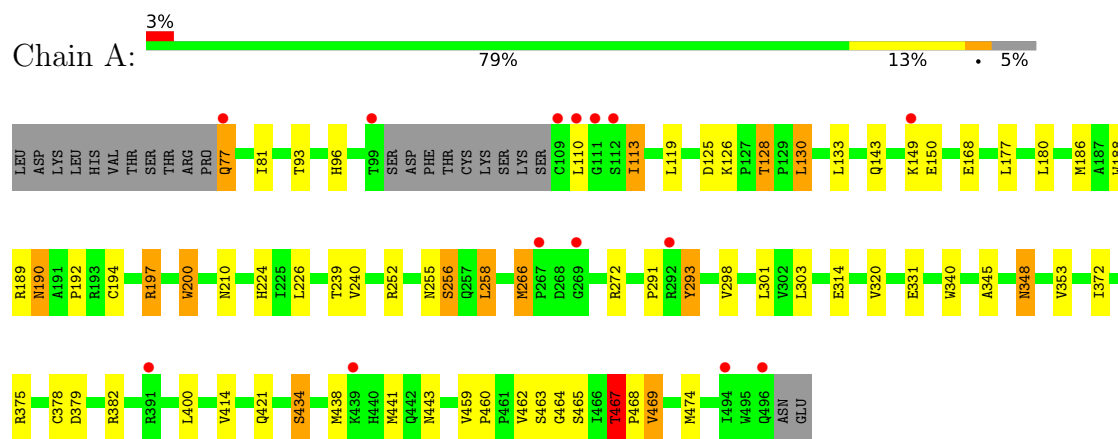
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	152	Total	O	0	0
			152	152		
7	B	149	Total	O	0	0
			149	149		

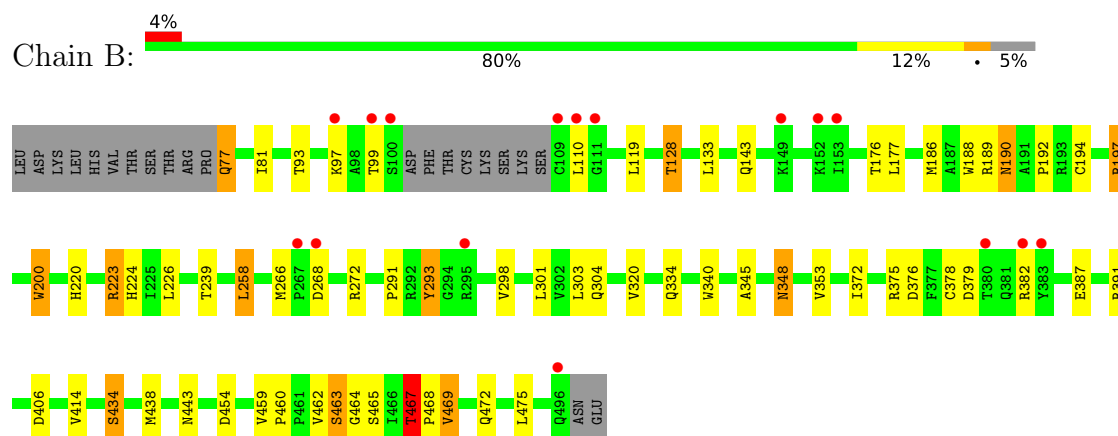
3 Residue-property plots [i](#)

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: NITRIC OXIDE SYNTHASE, INDUCIBLE



• Molecule 1: NITRIC OXIDE SYNTHASE, INDUCIBLE



4 Data and refinement statistics

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, α , β , γ	212.49Å 212.49Å 115.37Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	26.21 – 2.60 26.21 – 2.60	Depositor EDS
% Data completeness (in resolution range)	99.1 (26.21-2.60) 98.8 (26.21-2.60)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.08 (at 2.61Å)	Xtriage
Refinement program	BUSTER 2.9.5	Depositor
R, R_{free}	0.208 , 0.242 0.209 , 0.247	Depositor DCC
R_{free} test set	2392 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å ²)	51.8	Xtriage
Anisotropy	0.234	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 57.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	7222	wwPDB-VP
Average B, all atoms (Å ²)	56.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.23% 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: GOL, SO4, H4B, A54, 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	0.82	1/3454 (0.0%)	1.34	18/4696 (0.4%)
1	B	0.82	0/3482	1.35	18/4732 (0.4%)
All	All	0.82	1/6936 (0.0%)	1.35	36/9428 (0.4%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	113	ILE	CG1-CD1	-5.16	1.31	1.51

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	348	ASN	N-CA-C	7.03	121.56	112.92
1	A	125	ASP	CA-CB-CG	6.80	119.41	112.60
1	A	110	LEU	CA-C-N	6.33	127.01	119.98
1	A	110	LEU	C-N-CA	6.33	127.01	119.98
1	B	348	ASN	N-CA-C	6.30	121.01	112.88
1	B	110	LEU	CA-C-N	6.05	126.69	119.98
1	B	110	LEU	C-N-CA	6.05	126.69	119.98
1	A	378	CYS	N-CA-C	6.02	120.78	113.38
1	B	293	TYR	N-CA-C	6.00	119.82	111.90
1	A	128	THR	CB-CA-C	5.93	118.92	109.62
1	A	93	THR	CA-C-N	5.85	128.92	120.38
1	A	93	THR	C-N-CA	5.85	128.92	120.38
1	A	197	ARG	N-CA-C	5.82	119.48	112.38
1	B	378	CYS	N-CA-C	5.76	120.47	113.38
1	B	197	ARG	N-CA-C	5.74	119.39	112.38
1	A	293	TYR	N-CA-C	5.71	119.43	111.90
1	B	467	THR	CB-CA-C	5.62	117.30	108.88
1	B	93	THR	CA-C-N	5.57	128.51	120.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	93	THR	C-N-CA	5.57	128.51	120.38
1	B	190	ASN	CA-CB-CG	5.56	118.16	112.60
1	A	255	ASN	CA-C-N	5.51	127.94	120.44
1	A	255	ASN	C-N-CA	5.51	127.94	120.44
1	A	467	THR	CB-CA-C	5.44	117.04	108.88
1	A	190	ASN	CA-CB-CG	5.38	117.98	112.60
1	A	303	LEU	N-CA-C	5.37	117.71	109.07
1	B	128	THR	CB-CA-C	5.35	118.50	109.67
1	B	176	THR	N-CA-C	-5.32	103.36	110.55
1	A	256	SER	N-CA-C	-5.18	105.54	111.14
1	B	463	SER	N-CA-C	5.15	118.69	111.74
1	A	443	ASN	CA-CB-CG	5.14	117.74	112.60
1	A	463	SER	N-CA-C	5.08	118.60	111.74
1	B	454	ASP	CA-C-N	5.08	127.34	120.38
1	B	454	ASP	C-N-CA	5.08	127.34	120.38
1	B	303	LEU	N-CA-C	5.07	117.23	109.07
1	B	443	ASN	CA-C-N	5.00	127.25	120.44
1	B	443	ASN	C-N-CA	5.00	127.25	120.44

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	3356	0	3255	28	0
1	B	3378	0	3286	29	1
2	A	10	0	0	0	0
2	B	5	0	0	0	0
3	A	6	0	8	2	0
3	B	6	0	8	1	0
4	A	20	0	15	1	0
4	B	20	0	15	1	0
5	A	43	0	30	5	0
5	B	43	0	30	5	0
6	A	17	0	15	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	17	0	15	1	0
7	A	152	0	0	1	0
7	B	149	0	0	2	1
All	All	7222	0	6677	66	2

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 5.

All (66) 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:266:MET:HE2	1:B:272:ARG:HE	1.46	0.79
1:A:266:MET:HE2	1:A:272:ARG:HE	1.58	0.68
1:B:304:GLN:HE22	3:B:1498:GOL:H12	1.64	0.61
1:B:376:ASP:HA	1:B:382[B]:ARG:HD3	1.83	0.61
1:B:186:MET:HE1	1:B:189:ARG:HH11	1.67	0.59
5:A:1501:HEM:HHC	5:A:1501:HEM:HBB2	1.84	0.59
1:B:298:VAL:HG21	1:B:320:VAL:HG11	1.87	0.57
1:A:252:ARG:NH1	3:A:1499:GOL:H11	2.21	0.56
1:A:298:VAL:HG21	1:A:320:VAL:HG11	1.89	0.54
1:B:81:ILE:HD11	1:B:475:LEU:HG	1.89	0.54
1:B:438:MET:HA	1:B:438:MET:HE2	1.90	0.54
1:A:186:MET:HE1	1:A:189:ARG:HH11	1.71	0.54
1:A:438:MET:HA	1:A:438:MET:HE2	1.89	0.53
5:B:1500:HEM:HBC2	5:B:1500:HEM:HMC2	1.90	0.53
1:B:438:MET:HE3	1:B:469:VAL:HG12	1.91	0.53
1:B:194:CYS:HB3	1:B:197:ARG:HD2	1.91	0.53
1:B:220:HIS:HD2	1:B:223[B]:ARG:HH21	1.56	0.53
1:A:438:MET:HE3	1:A:469:VAL:HG12	1.91	0.52
4:B:1499:A54:H92C	5:B:1500:HEM:O1A	2.10	0.52
1:B:220:HIS:HD2	1:B:223[B]:ARG:NH2	2.08	0.52
1:A:258:LEU:HB2	1:A:345:ALA:HB3	1.93	0.51
1:B:258:LEU:HB2	1:B:345:ALA:HB3	1.92	0.51
1:A:143:GLN:NE2	7:A:2019:HOH:O	2.44	0.51
1:A:190:ASN:O	1:A:192:PRO:HD3	2.10	0.51
1:A:194:CYS:HB3	1:A:197:ARG:HD2	1.91	0.51
1:A:465:SER:C	1:A:467:THR:H	2.19	0.51
1:B:465:SER:C	1:B:467:THR:H	2.19	0.51
1:B:190:ASN:O	1:B:192:PRO:HD3	2.10	0.51
1:A:441:MET:HE1	1:A:474:MET:HG2	1.93	0.50
4:A:1500:A54:H92C	5:A:1501:HEM:O1A	2.12	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:252:ARG:HH11	3:A:1499:GOL:H11	1.78	0.48
1:A:188:TRP:CE3	1:A:200:TRP:HA	2.49	0.47
5:B:1500:HEM:HHA	5:B:1500:HEM:HBA2	1.96	0.47
1:A:460:PRO:HD2	1:A:467:THR:HG21	1.96	0.47
1:B:460:PRO:HD2	1:B:467:THR:HG21	1.97	0.47
1:B:188:TRP:CE3	1:B:200:TRP:HA	2.49	0.46
1:A:375:ARG:NH1	1:A:379:ASP:OD2	2.47	0.46
1:B:375:ARG:NH1	1:B:379:ASP:OD2	2.48	0.46
5:A:1501:HEM:HMC1	5:A:1501:HEM:HBC2	1.98	0.45
1:A:130:LEU:HD11	1:A:168:GLU:HA	1.97	0.45
1:B:224:HIS:HD2	1:B:239:THR:OG1	2.00	0.45
1:A:375:ARG:HH21	6:A:1502:H4B:C4	2.29	0.45
1:B:77:GLN:HA	7:B:2002:HOH:O	2.16	0.45
1:A:77:GLN:O	1:A:96:HIS:HE1	2.00	0.45
1:A:224:HIS:HD2	1:A:239:THR:OG1	1.99	0.44
1:B:258:LEU:HD12	1:B:258:LEU:HA	1.86	0.44
1:B:143:GLN:NE2	7:B:2017:HOH:O	2.50	0.44
1:B:340:TRP:CD1	1:B:372:ILE:HG12	2.53	0.43
1:B:464:GLY:O	1:B:467:THR:HG22	2.18	0.43
1:A:459:VAL:HG22	1:A:469:VAL:HG23	1.99	0.43
1:A:464:GLY:O	1:A:467:THR:HG22	2.18	0.43
1:B:459:VAL:HG22	1:B:469:VAL:HG23	2.00	0.43
1:A:434:SER:HB3	1:A:468:PRO:HD2	2.00	0.42
1:B:434:SER:HB3	1:B:468:PRO:HD2	2.01	0.41
1:A:291:PRO:HG2	1:A:293:TYR:CE2	2.55	0.41
1:A:379:ASP:HB2	1:A:382:ARG:HG2	2.03	0.41
1:B:224:HIS:CD2	1:B:239:THR:OG1	2.74	0.41
1:A:188:TRP:CH2	5:A:1501:HEM:HMC3	2.56	0.41
1:B:291:PRO:HG2	1:B:293:TYR:CE2	2.56	0.41
1:B:438:MET:HE1	1:B:472:GLN:HG2	2.02	0.41
5:B:1500:HEM:HHC	5:B:1500:HEM:HBB2	2.03	0.41
1:A:180:LEU:HD11	1:A:240:VAL:HG11	2.02	0.40
1:A:340:TRP:CD1	1:A:372:ILE:HG12	2.56	0.40
5:B:1500:HEM:O2A	6:B:1501:H4B:N2	2.51	0.40
1:B:387:GLU:HG2	1:B:391:ARG:HE	1.86	0.40
5:A:1501:HEM:HBC2	5:A:1501:HEM:CMC	2.51	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:B:2138:HOH:O	7:B:2138:HOH:O[11_554]	1.94	0.26
1:B:406:ASP:OD1	1:B:463:SER:OG[11_554]	2.17	0.03

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	407/433 (94%)	391 (96%)	15 (4%)	1 (0%)	43	66
1	B	410/433 (95%)	384 (94%)	24 (6%)	2 (0%)	24	46
All	All	817/866 (94%)	775 (95%)	39 (5%)	3 (0%)	30	51

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	200	TRP
1	B	268	ASP
1	B	200	TRP

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	359/381 (94%)	331 (92%)	28 (8%)	11	26
1	B	362/381 (95%)	342 (94%)	20 (6%)	19	41
All	All	721/762 (95%)	673 (93%)	48 (7%)	15	33

All (48) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	77	GLN
1	A	81	ILE
1	A	113	ILE
1	A	119	LEU
1	A	126	LYS
1	A	128	THR
1	A	130	LEU
1	A	133	LEU
1	A	149	LYS
1	A	150	GLU
1	A	177	LEU
1	A	210	ASN
1	A	226	LEU
1	A	256	SER
1	A	258	LEU
1	A	266	MET
1	A	301	LEU
1	A	314	GLU
1	A	331	GLU
1	A	348	ASN
1	A	353	VAL
1	A	400	LEU
1	A	414	VAL
1	A	421	GLN
1	A	434	SER
1	A	462	VAL
1	A	467	THR
1	A	469	VAL
1	B	77	GLN
1	B	97	LYS
1	B	99	THR
1	B	119	LEU
1	B	128	THR
1	B	133	LEU
1	B	177	LEU
1	B	223[A]	ARG
1	B	223[B]	ARG
1	B	226	LEU
1	B	258	LEU
1	B	301	LEU
1	B	334	GLN
1	B	348	ASN

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Mol	Chain	Res	Type
1	B	353	VAL
1	B	414	VAL
1	B	434	SER
1	B	462	VAL
1	B	467	THR
1	B	469	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	96	HIS
1	A	115	ASN
1	A	210	ASN
1	A	220	HIS
1	A	224	HIS
1	A	231	ASN
1	A	308	GLN
1	A	348	ASN
1	A	364	ASN
1	A	421	GLN
1	A	476	ASN
1	A	496	GLN
1	B	77	GLN
1	B	83	ASN
1	B	220	HIS
1	B	224	HIS
1	B	231	ASN
1	B	265	GLN
1	B	308	GLN
1	B	348	ASN
1	B	364	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 [i](#)

11 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
4	A54	A	1500	-	21,21,21	0.88	1 (4%)	27,27,27	0.65	0
4	A54	B	1499	-	21,21,21	0.76	1 (4%)	27,27,27	0.76	0
5	HEM	B	1500	1	50,50,50	1.13	3 (6%)	67,82,82	1.66	19 (28%)
6	H4B	A	1502	-	17,18,18	1.95	5 (29%)	14,26,26	2.10	5 (35%)
3	GOL	B	1498	-	5,5,5	0.43	0	5,5,5	0.62	0
3	GOL	A	1499	-	5,5,5	0.84	0	5,5,5	1.96	2 (40%)
2	SO4	A	1497	-	4,4,4	0.33	0	6,6,6	0.33	0
2	SO4	A	1498	-	4,4,4	0.26	0	6,6,6	0.07	0
5	HEM	A	1501	1	50,50,50	1.45	8 (16%)	67,82,82	1.65	15 (22%)
2	SO4	B	1497	-	4,4,4	0.32	0	6,6,6	0.32	0
6	H4B	B	1501	-	17,18,18	1.94	3 (17%)	14,26,26	2.22	7 (50%)

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	A54	A	1500	-	-	1/13/13/13	0/2/2/2
4	A54	B	1499	-	-	2/13/13/13	0/2/2/2
5	HEM	B	1500	1	-	4/14/54/54	-
6	H4B	A	1502	-	-	2/8/17/17	0/2/2/2
3	GOL	B	1498	-	-	2/4/4/4	-
3	GOL	A	1499	-	-	4/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	HEM	A	1501	1	-	1/14/54/54	-
6	H4B	B	1501	-	-	3/8/17/17	0/2/2/2

All (21) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	1502	H4B	C4A-C8A	4.85	1.46	1.38
5	A	1501	HEM	C3B-C4B	4.40	1.53	1.44
6	B	1501	H4B	C7-N8	4.39	1.50	1.46
6	B	1501	H4B	C4A-C8A	4.27	1.45	1.38
5	A	1501	HEM	C4D-ND	-3.10	1.34	1.40
6	B	1501	H4B	C6-N5	3.08	1.52	1.47
6	A	1502	H4B	C2-N1	3.06	1.40	1.33
5	A	1501	HEM	C1D-ND	-3.05	1.32	1.38
5	A	1501	HEM	C3D-C2D	-3.03	1.30	1.36
6	A	1502	H4B	C2-N2	3.00	1.41	1.34
5	A	1501	HEM	C1B-NB	-2.79	1.35	1.40
5	B	1500	HEM	C1B-NB	-2.72	1.35	1.40
6	A	1502	H4B	C4A-N5	2.58	1.43	1.37
6	A	1502	H4B	C7-N8	2.45	1.48	1.46
4	B	1499	A54	O11-C12	2.17	1.41	1.37
4	A	1500	A54	O11-C12	2.16	1.41	1.37
5	A	1501	HEM	C2A-C3A	-2.13	1.33	1.38
5	B	1500	HEM	C3D-C2D	-2.11	1.32	1.36
5	A	1501	HEM	CMA-C3A	-2.05	1.46	1.50
5	A	1501	HEM	FE-NB	2.02	2.01	1.94
5	B	1500	HEM	C1D-ND	-2.01	1.34	1.38

All (48) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	1501	HEM	C2B-C1B-NB	4.81	115.37	109.84
5	B	1500	HEM	CBD-CAD-C3D	-4.14	101.08	112.53
5	A	1501	HEM	CBA-CAA-C2A	-4.13	101.10	112.53
5	B	1500	HEM	O2D-CGD-O1D	-3.85	113.44	123.33
6	B	1501	H4B	C2-N1-C8A	3.84	120.14	113.36
6	A	1502	H4B	O9-C9-C10	3.74	116.27	109.14
6	B	1501	H4B	C11-C10-C9	3.49	116.39	112.11
6	B	1501	H4B	O9-C9-C10	3.47	115.75	109.14
5	B	1500	HEM	CMA-C3A-C4A	3.39	130.57	125.42
6	A	1502	H4B	C2-N1-C8A	3.27	119.13	113.36
6	A	1502	H4B	O9-C9-C6	3.19	116.92	109.28

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	1499	GOL	O3-C3-C2	-3.15	96.20	110.38
5	A	1501	HEM	C4C-C3C-C2C	-3.13	104.10	106.81
5	A	1501	HEM	CBD-CAD-C3D	-2.99	104.27	112.53
5	B	1500	HEM	CHD-C1D-ND	2.95	127.60	124.42
6	A	1502	H4B	O4-C4-C4A	-2.90	120.26	127.26
5	A	1501	HEM	C3B-C4B-NB	2.86	111.52	109.47
6	B	1501	H4B	C2-N3-C4	-2.83	119.99	125.11
5	B	1500	HEM	C3B-C4B-NB	2.73	111.43	109.47
5	B	1500	HEM	CHD-C1D-C2D	-2.60	120.93	125.03
5	B	1500	HEM	C4C-NC-C1C	-2.52	101.72	105.82
5	B	1500	HEM	O2D-CGD-CBD	2.48	121.82	114.00
5	A	1501	HEM	C4B-C3B-C2B	-2.46	105.02	107.28
5	A	1501	HEM	CHD-C1D-C2D	-2.46	121.15	125.03
6	B	1501	H4B	O10-C10-C9	-2.45	105.71	109.77
5	A	1501	HEM	C1D-C2D-C3D	-2.43	104.42	106.98
6	A	1502	H4B	C4A-C4-N3	2.37	118.65	112.13
5	B	1500	HEM	C4C-CHD-C1D	-2.34	121.06	126.02
6	B	1501	H4B	C4A-C4-N3	2.30	118.44	112.13
5	A	1501	HEM	CAA-C2A-C1A	2.27	129.38	124.94
5	B	1500	HEM	C2B-C1B-NB	2.27	112.45	109.84
5	B	1500	HEM	C4A-NA-C1A	-2.27	102.12	105.82
5	B	1500	HEM	CHA-C4D-ND	2.23	127.12	124.37
5	A	1501	HEM	C1B-NB-C4B	-2.17	102.63	105.21
5	A	1501	HEM	CMB-C2B-C1B	2.17	128.43	125.03
3	A	1499	GOL	O2-C2-C1	2.17	118.18	109.18
5	B	1500	HEM	O2A-CGA-O1A	-2.14	117.82	123.33
6	B	1501	H4B	C4-C4A-N5	2.14	122.09	116.27
5	B	1500	HEM	C4B-C3B-C2B	-2.13	105.33	107.28
5	A	1501	HEM	CHB-C1B-C2B	-2.11	120.94	126.95
5	B	1500	HEM	C1A-CHA-C4D	-2.11	121.29	126.25
5	A	1501	HEM	CHB-C4A-C3A	-2.10	121.34	127.43
5	A	1501	HEM	CHD-C4C-C3C	-2.10	121.67	125.21
5	A	1501	HEM	C4A-NA-C1A	-2.07	102.44	105.82
5	B	1500	HEM	C2C-C1C-NC	2.06	113.45	109.64
5	B	1500	HEM	CMD-C2D-C1D	2.06	128.25	125.03
5	B	1500	HEM	CBA-CAA-C2A	-2.04	106.90	112.53
5	B	1500	HEM	C4A-CHB-C1B	-2.01	121.51	126.25

There are no chirality outliers.

All (19) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	1498	GOL	C1-C2-C3-O3
4	A	1500	A54	C12-C17-C18-N19
3	A	1499	GOL	O1-C1-C2-C3
3	A	1499	GOL	C1-C2-C3-O3
3	B	1498	GOL	O2-C2-C3-O3
6	B	1501	H4B	C7-C6-C9-O9
6	A	1502	H4B	O10-C10-C9-O9
3	A	1499	GOL	O1-C1-C2-O2
3	A	1499	GOL	O2-C2-C3-O3
5	B	1500	HEM	C1A-C2A-CAA-CBA
5	A	1501	HEM	C4B-C3B-CAB-CBB
6	A	1502	H4B	C11-C10-C9-O9
6	B	1501	H4B	C11-C10-C9-O9
4	B	1499	A54	C12-C17-C18-N19
6	B	1501	H4B	O10-C10-C9-O9
4	B	1499	A54	C7-C8-C9-N10
5	B	1500	HEM	C3A-C2A-CAA-CBA
5	B	1500	HEM	CAD-CBD-CGD-O2D
5	B	1500	HEM	CAD-CBD-CGD-O1D

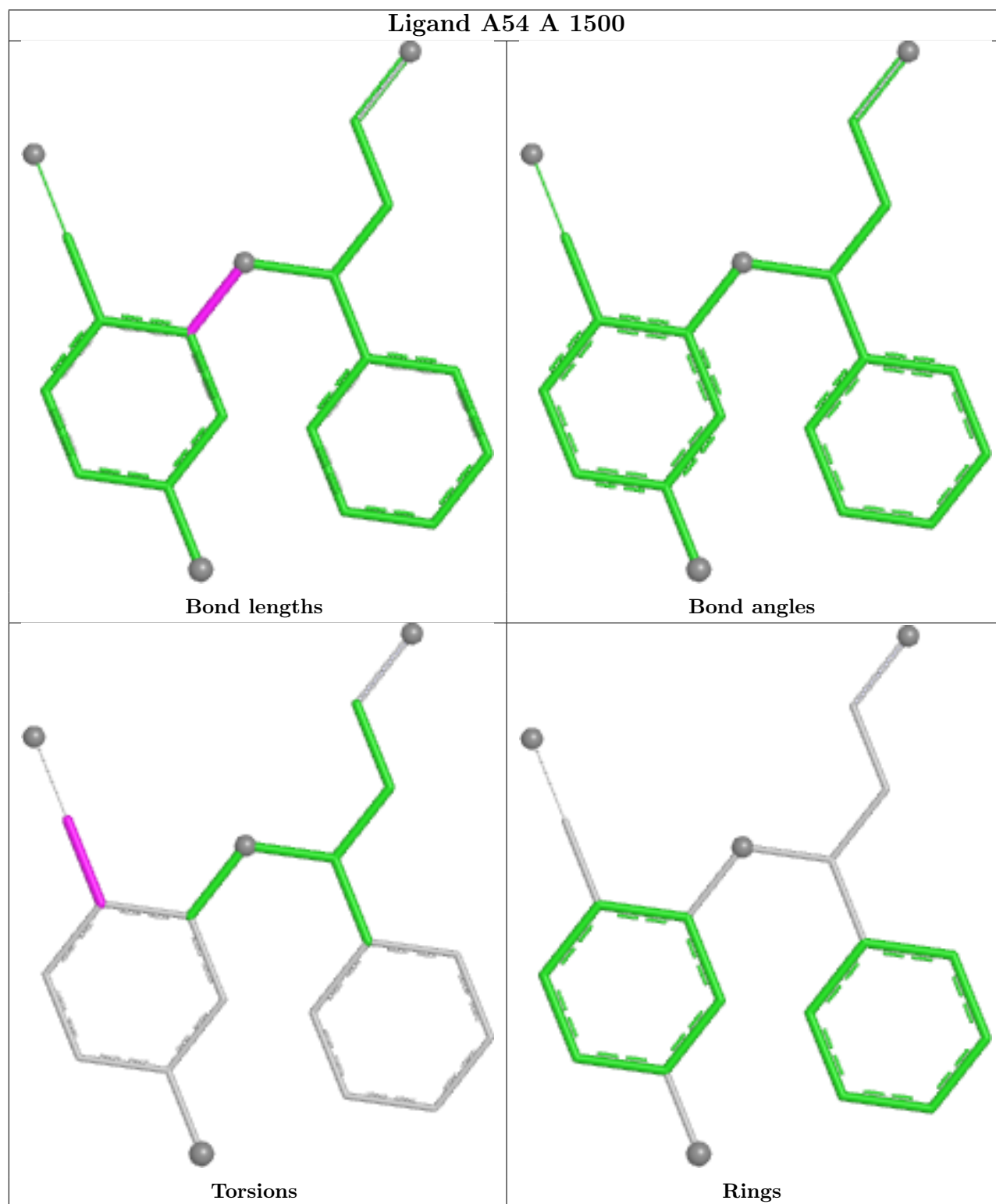
There are no ring outliers.

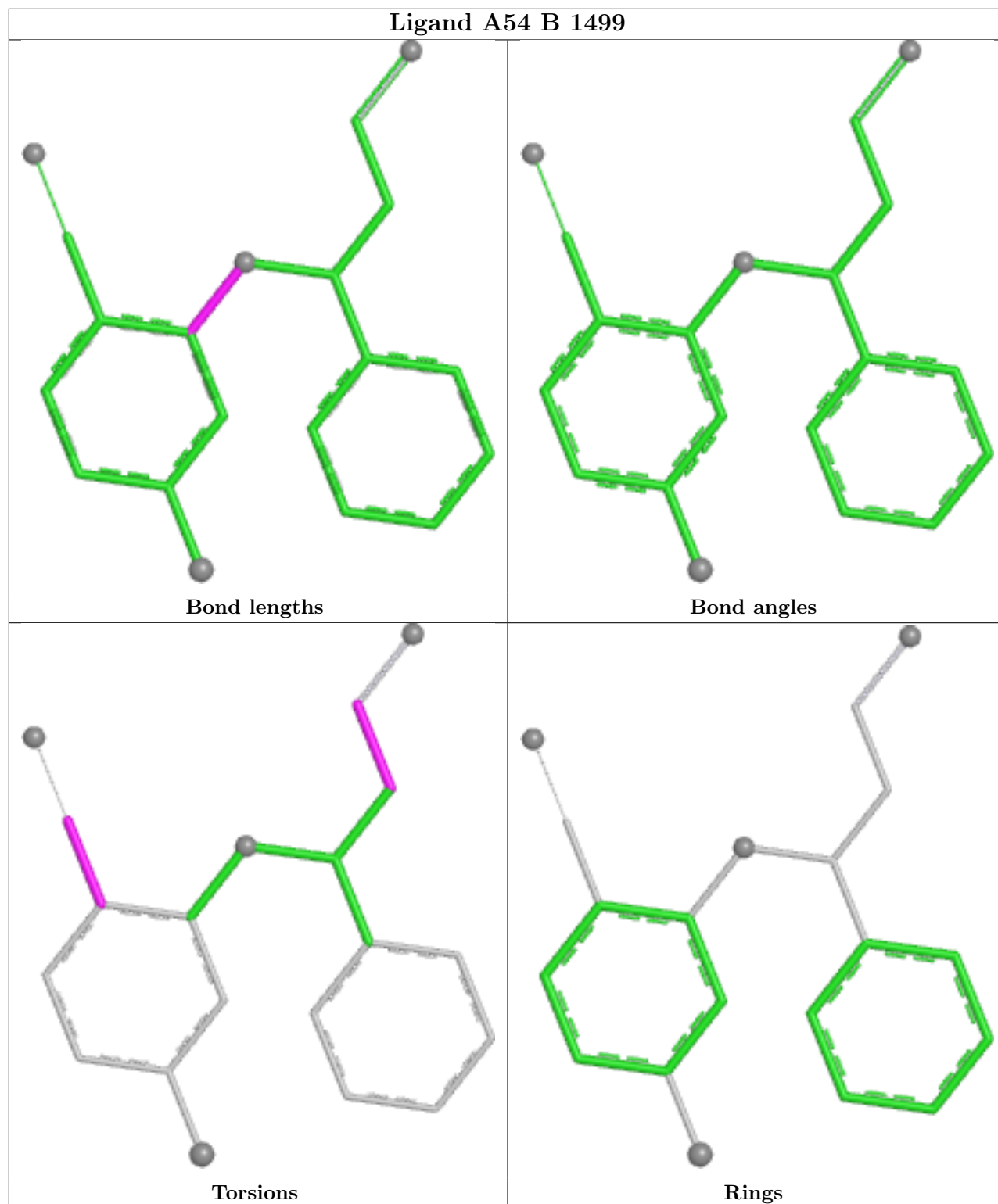
8 monomers are involved in 14 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	1500	A54	1	0
4	B	1499	A54	1	0
5	B	1500	HEM	5	0
6	A	1502	H4B	1	0
3	B	1498	GOL	1	0
3	A	1499	GOL	2	0
5	A	1501	HEM	5	0
6	B	1501	H4B	1	0

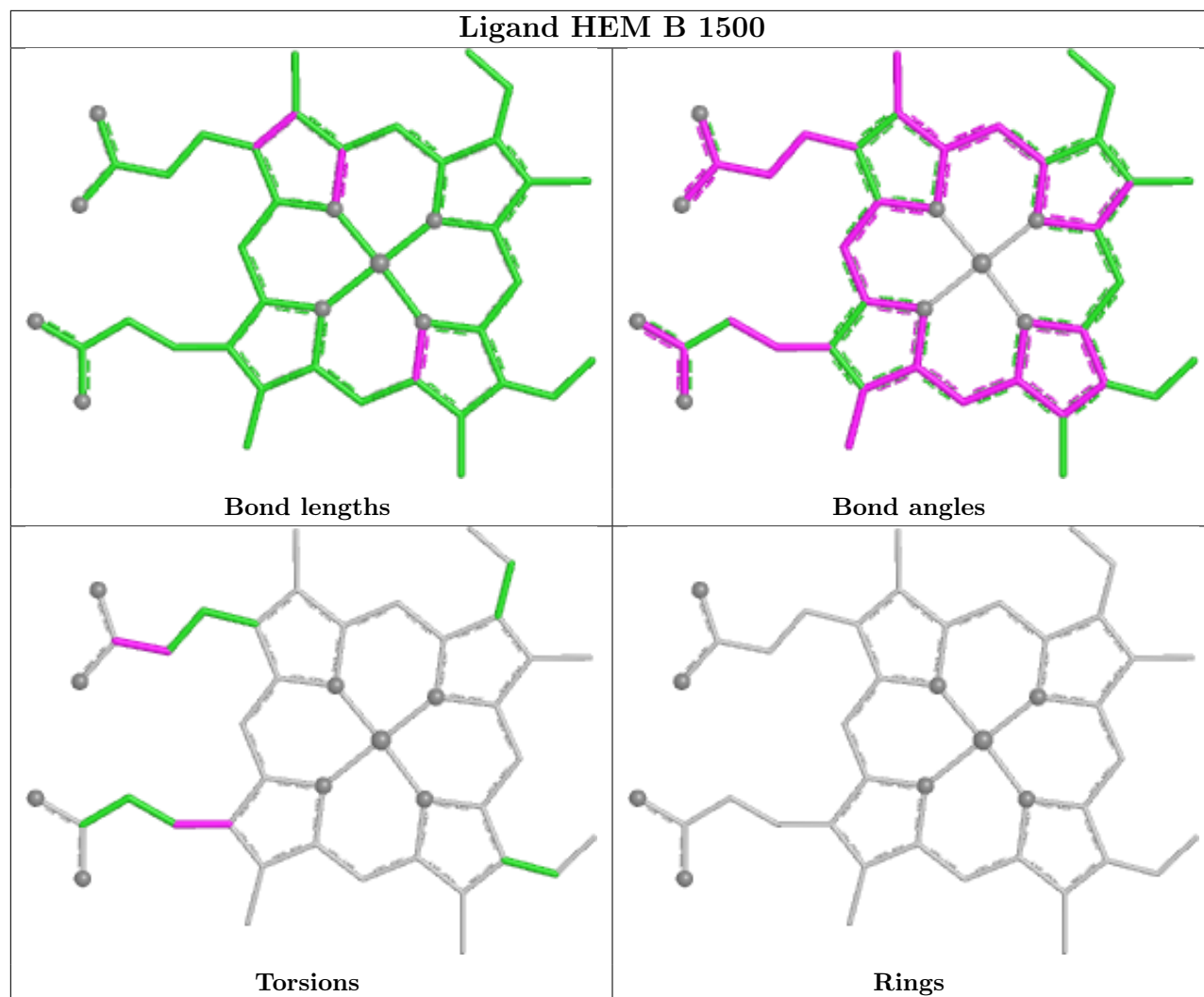
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

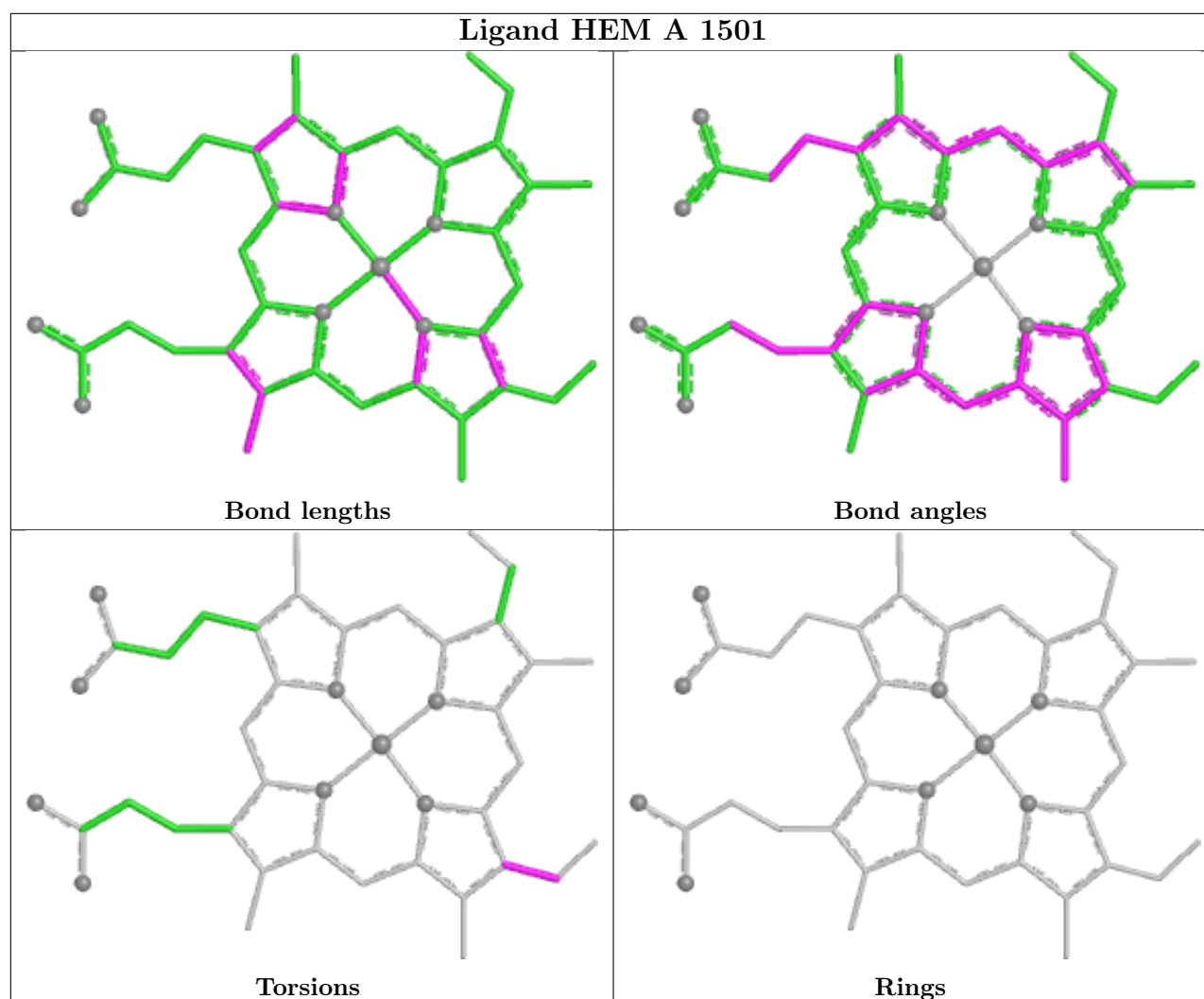
The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





Ligand HEM B 1500





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	411/433 (94%)	0.19	14 (3%)	48 42	34, 54, 86, 104	0
1	B	412/433 (95%)	0.18	16 (3%)	43 38	25, 53, 88, 115	2 (0%)
All	All	823/866 (95%)	0.19	30 (3%)	46 40	25, 53, 88, 115	2 (0%)

All (30) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	110	LEU	4.4
1	B	100	SER	4.1
1	B	382[A]	ARG	3.8
1	A	110	LEU	3.8
1	A	496	GLN	3.4
1	A	99	THR	3.3
1	B	267	PRO	3.1
1	A	267	PRO	3.0
1	A	109	CYS	3.0
1	A	112	SER	3.0
1	A	111	GLY	2.9
1	B	97	LYS	2.7
1	B	111	GLY	2.7
1	A	77	GLN	2.6
1	B	496	GLN	2.4
1	B	99	THR	2.4
1	A	149	LYS	2.3
1	A	269	GLY	2.3
1	A	494	ILE	2.3
1	B	380	THR	2.2
1	B	268	ASP	2.2
1	B	152	LYS	2.2
1	B	295	ARG	2.2
1	A	292	ARG	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	383	TYR	2.2
1	B	109	CYS	2.1
1	A	439	LYS	2.1
1	B	153	ILE	2.0
1	B	149	LYS	2.0
1	A	391	ARG	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

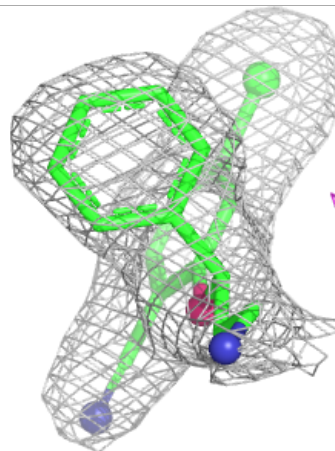
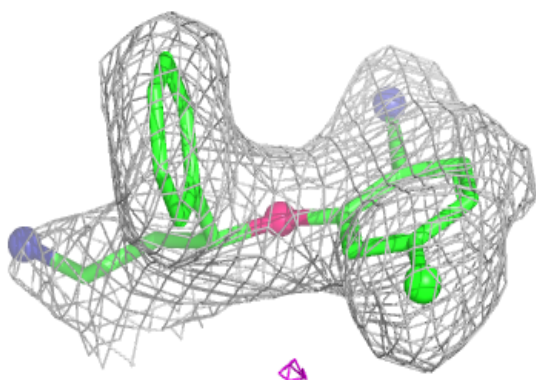
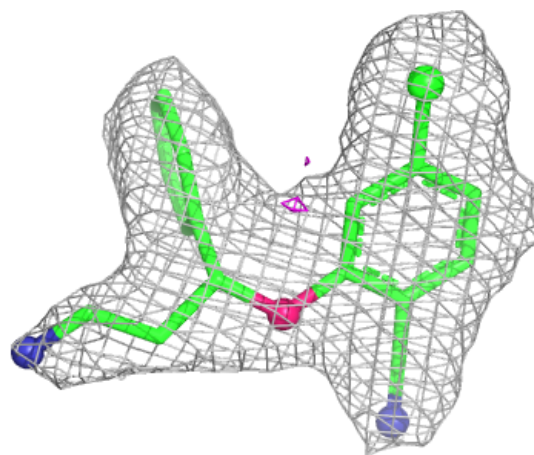
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	SO4	A	1497	5/5	0.65	0.14	119,123,123,125	0
2	SO4	B	1497	5/5	0.69	0.14	112,116,118,118	0
3	GOL	A	1499	6/6	0.82	0.19	71,71,72,72	0
2	SO4	A	1498	5/5	0.88	0.36	198,202,203,204	5
6	H4B	B	1501	17/17	0.90	0.11	53,58,60,61	0
6	H4B	A	1502	17/17	0.93	0.09	53,56,58,60	0
3	GOL	B	1498	6/6	0.93	0.10	56,59,59,59	0
4	A54	A	1500	20/20	0.97	0.07	28,39,54,58	0
4	A54	B	1499	20/20	0.97	0.07	27,39,52,58	0
5	HEM	A	1501	43/43	0.98	0.06	35,36,43,47	0
5	HEM	B	1500	43/43	0.98	0.07	33,34,41,45	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.

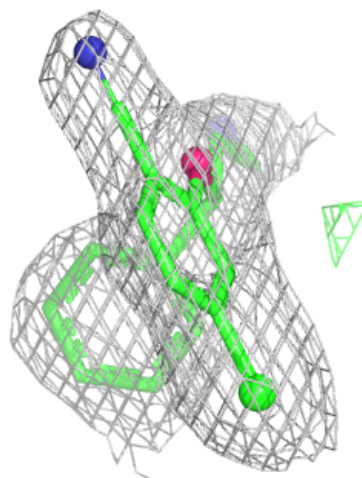
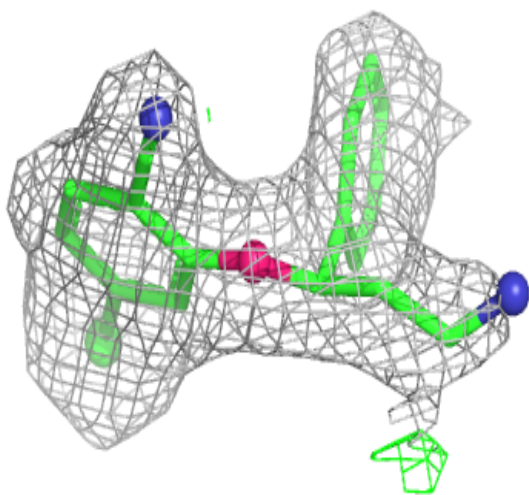
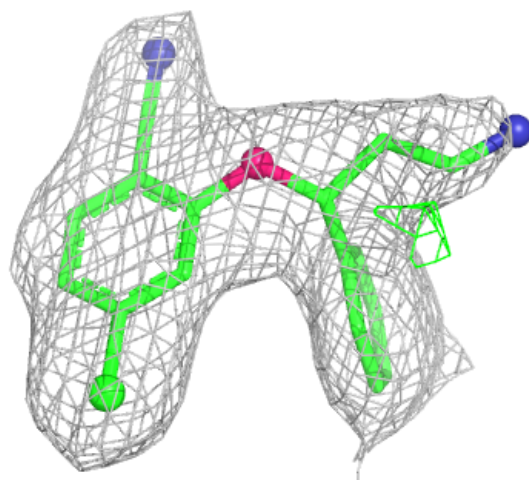
Electron density around A54 A 1500:

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



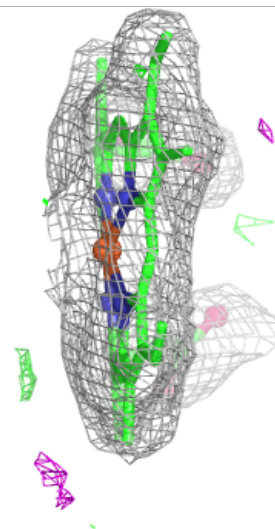
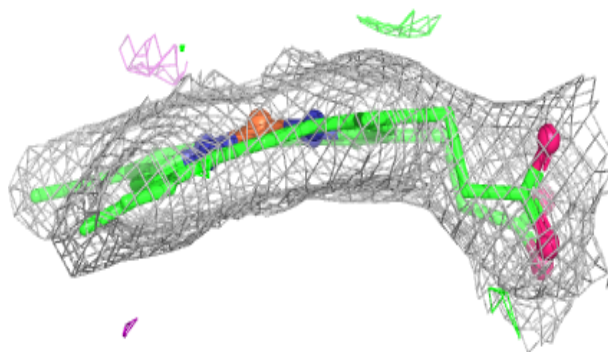
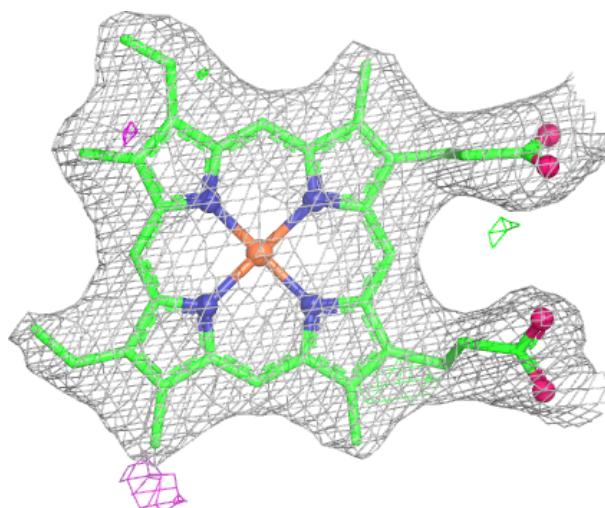
Electron density around A54 B 1499:

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



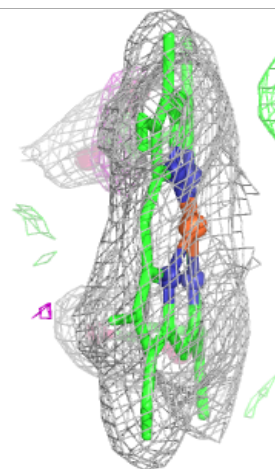
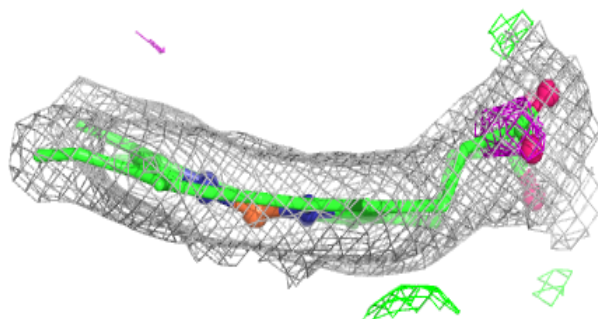
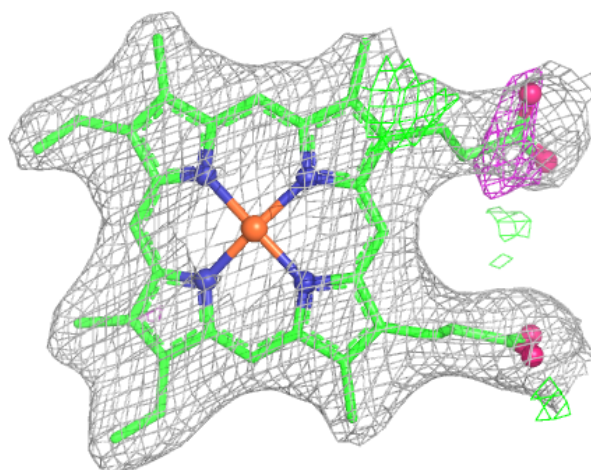
Electron density around HEM A 1501:

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



Electron density around HEM B 1500:

$2mF_o-DF_c$ (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.