



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 01:19 PM UTC

PDB ID : 3NWL / pdb_00003nwl
Title : The crystal structure of the P212121 form of bovine liver catalase previously characterized by electron microscopy
Authors : Foroughi, L.M.; Kang, Y.N.; Matzger, A.J.
Deposited on : 2010-07-09
Resolution : 2.69 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
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

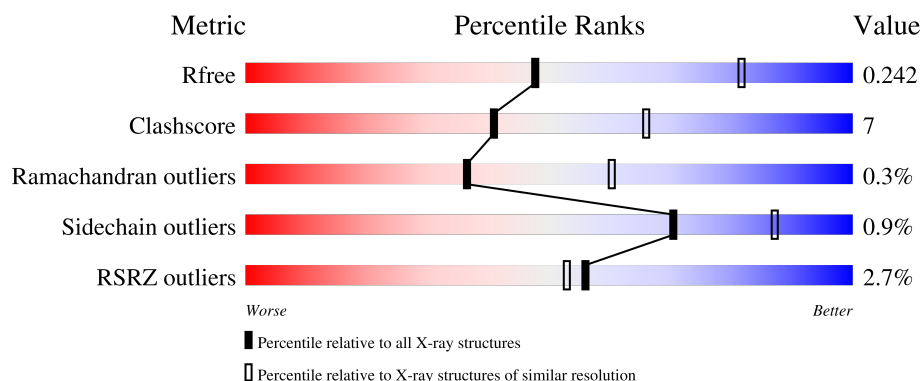
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.69 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	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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	527	 3% 80% 13% • 5%
1	B	527	 3% 82% 12% • 5%
1	C	527	 2% 79% 15% • 5%
1	D	527	 3% 80% 13% • 5%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 16553 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 Catalase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	499	Total	C	N	O	S	0	0	0
			4017	2548	715	740	14			
1	B	499	Total	C	N	O	S	0	0	0
			4017	2548	715	740	14			
1	C	499	Total	C	N	O	S	0	0	0
			4017	2548	715	740	14			
1	D	499	Total	C	N	O	S	0	0	0
			4017	2548	715	740	14			

There are 8 discrepancies between the modelled and reference sequences:

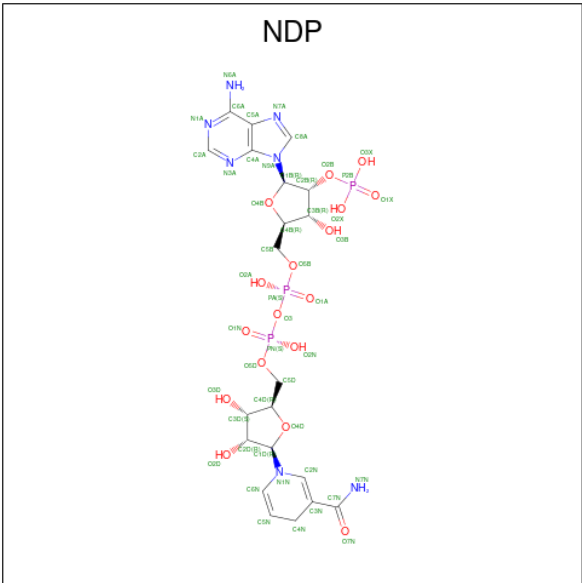
Chain	Residue	Modelled	Actual	Comment	Reference
A	212	ASP	ASN	conflict	UNP P00432
A	225	ASP	ASN	conflict	UNP P00432
B	212	ASP	ASN	conflict	UNP P00432
B	225	ASP	ASN	conflict	UNP P00432
C	212	ASP	ASN	conflict	UNP P00432
C	225	ASP	ASN	conflict	UNP P00432
D	212	ASP	ASN	conflict	UNP P00432
D	225	ASP	ASN	conflict	UNP P00432

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



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

- Molecule 3 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (CCD ID: NDP) (formula: $C_{21}H_{30}N_7O_{17}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
3	B	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
3	C	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
3	D	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

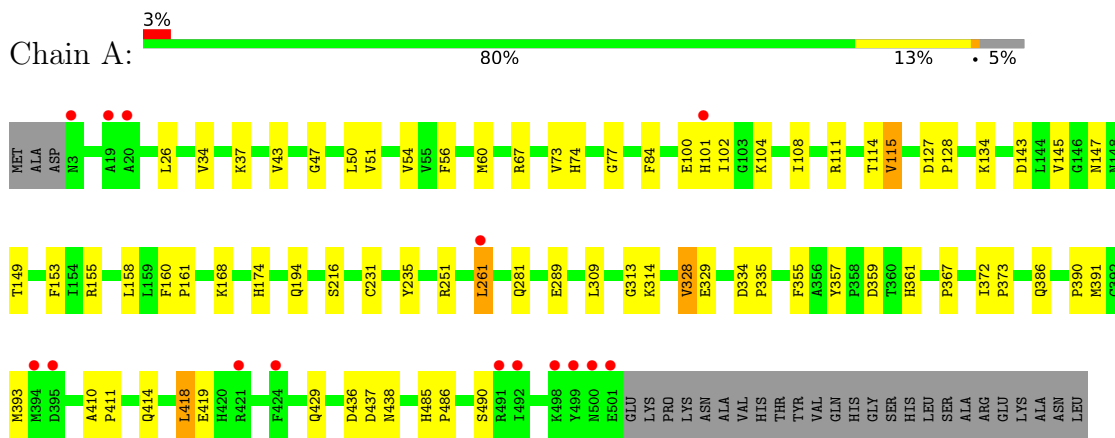
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	37	Total	O	0	0
			37	37		
4	B	21	Total	O	0	0
			21	21		
4	C	31	Total	O	0	0
			31	31		
4	D	32	Total	O	0	0
			32	32		

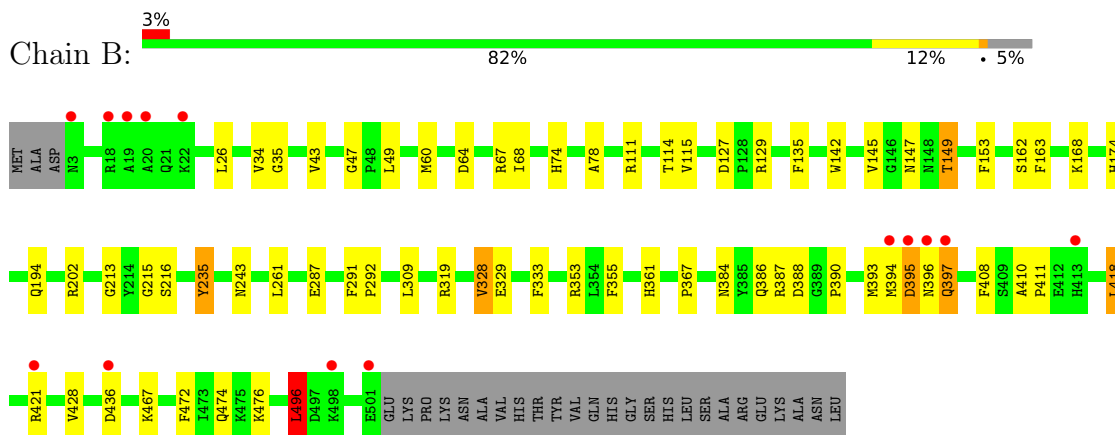
3 Residue-property plots [i](#)

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.

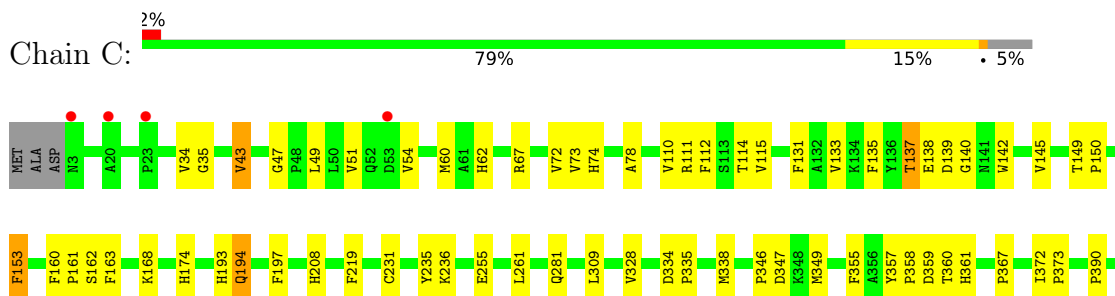
• Molecule 1: Catalase

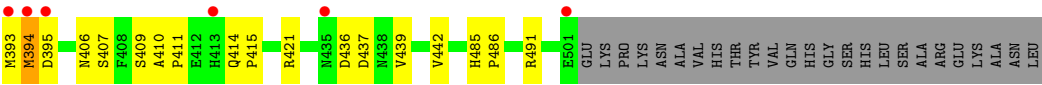


• Molecule 1: Catalase

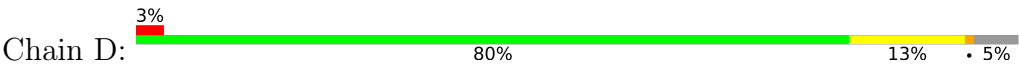


• Molecule 1: Catalase





● Molecule 1: Catalase



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4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	68.65Å 173.74Å 186.32Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.98 – 2.69 39.98 – 2.69	Depositor EDS
% Data completeness (in resolution range)	96.1 (39.98-2.69) 96.0 (39.98-2.69)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.30 (at 2.69Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.203 , 0.241 0.208 , 0.242	Depositor DCC
R_{free} test set	3041 reflections (4.85%)	wwPDB-VP
Wilson B-factor (Å ²)	27.0	Xtriage
Anisotropy	0.400	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 22.4	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	0.91	EDS
Total number of atoms	16553	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.83% 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: NDP, 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	0.93	7/4137 (0.2%)	1.00	14/5619 (0.2%)
1	B	0.85	5/4137 (0.1%)	0.98	8/5619 (0.1%)
1	C	0.91	8/4137 (0.2%)	0.98	11/5619 (0.2%)
1	D	0.92	15/4137 (0.4%)	1.01	11/5619 (0.2%)
All	All	0.90	35/16548 (0.2%)	0.99	44/22476 (0.2%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	C	0	1

All (35) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	137	THR	CB-CG2	-8.06	1.25	1.52
1	A	251	ARG	CZ-NH1	-7.66	1.22	1.32
1	D	111	ARG	CZ-NH1	-7.43	1.22	1.32
1	D	374	VAL	CB-CG1	-6.85	1.29	1.52
1	C	309	LEU	CG-CD2	-6.76	1.30	1.52
1	D	43	VAL	CB-CG2	-6.75	1.30	1.52
1	D	51	VAL	CB-CG1	-6.68	1.30	1.52
1	C	60	MET	SD-CE	-6.68	1.62	1.79
1	C	491	ARG	CZ-NH1	-6.44	1.23	1.32
1	D	51	VAL	CB-CG2	-6.40	1.31	1.52
1	C	309	LEU	CG-CD1	-6.18	1.32	1.52
1	D	374	VAL	CB-CG2	-6.16	1.32	1.52
1	C	153	PHE	CE1-CZ	-6.04	1.20	1.38
1	B	496	LEU	CG-CD1	-5.99	1.32	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	43	VAL	CB-CG1	-5.94	1.32	1.52
1	D	378	TYR	CG-CD1	-5.68	1.27	1.39
1	A	50	LEU	CG-CD1	-5.63	1.33	1.52
1	D	378	TYR	CE2-CZ	-5.49	1.25	1.38
1	A	309	LEU	CG-CD2	-5.47	1.34	1.52
1	B	496	LEU	CG-CD2	-5.47	1.34	1.52
1	A	357	TYR	CG-CD2	-5.46	1.27	1.39
1	D	330	GLN	CD-NE2	-5.45	1.21	1.33
1	D	149	THR	CB-CG2	-5.32	1.34	1.52
1	B	68	ILE	CA-CB	5.30	1.59	1.55
1	C	194	GLN	CD-OE1	-5.28	1.13	1.23
1	D	243	ASN	CG-OD1	-5.25	1.13	1.23
1	A	261	LEU	CG-CD2	-5.24	1.35	1.52
1	C	153	PHE	CG-CD2	-5.24	1.27	1.38
1	A	309	LEU	CG-CD1	-5.21	1.35	1.52
1	D	378	TYR	CG-CD2	-5.21	1.28	1.39
1	D	272	ASN	CB-CG	-5.18	1.39	1.52
1	A	50	LEU	CG-CD2	-5.10	1.35	1.52
1	B	309	LEU	CG-CD2	-5.06	1.35	1.52
1	D	105	ARG	CZ-NH1	-5.06	1.25	1.32
1	B	309	LEU	CG-CD1	-5.01	1.36	1.52

All (44) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	328	VAL	CB-CA-C	-12.47	98.91	110.63
1	D	115	VAL	N-CA-C	11.08	120.88	111.90
1	A	115	VAL	N-CA-C	10.92	120.74	111.90
1	B	329	GLU	N-CA-C	-10.23	100.93	113.41
1	A	328	VAL	CB-CA-C	-10.14	101.09	110.63
1	A	115	VAL	CB-CA-C	-9.45	102.23	111.30
1	C	115	VAL	N-CA-C	9.21	119.36	111.90
1	A	251	ARG	NE-CZ-NH2	8.47	126.82	119.20
1	D	111	ARG	NE-CZ-NH2	8.39	126.75	119.20
1	C	439	VAL	N-CA-C	7.25	120.60	113.71
1	A	54	VAL	N-CA-C	-7.19	104.37	113.22
1	C	115	VAL	CB-CA-C	-7.01	104.57	111.30
1	C	439	VAL	CB-CA-C	-6.96	104.08	110.63
1	C	54	VAL	N-CA-C	-6.95	104.67	113.22
1	D	115	VAL	CB-CA-C	-6.78	104.79	111.30
1	B	436	ASP	N-CA-C	-6.72	101.02	110.50
1	A	329	GLU	N-CA-C	-6.54	104.34	112.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	145	VAL	N-CA-C	6.44	113.10	106.21
1	A	328	VAL	N-CA-C	6.42	119.81	113.71
1	D	54	VAL	N-CA-C	-6.40	103.98	113.39
1	D	100	GLU	N-CA-C	6.34	117.85	111.07
1	D	452	GLU	N-CA-C	6.04	117.53	111.07
1	C	491	ARG	NE-CZ-NH2	5.99	124.59	119.20
1	C	309	LEU	CD1-CG-CD2	-5.78	98.08	110.80
1	C	328	VAL	CB-CA-C	-5.76	105.27	110.91
1	B	215	GLY	N-CA-C	-5.74	107.54	114.66
1	A	436	ASP	N-CA-C	-5.69	103.02	110.53
1	B	149	THR	CB-CA-C	-5.62	100.77	109.20
1	A	309	LEU	CD1-CG-CD2	-5.55	98.58	110.80
1	B	115	VAL	CB-CA-C	-5.52	105.50	110.91
1	C	43	VAL	CB-CA-C	-5.47	104.30	111.25
1	B	496	LEU	CD1-CG-CD2	-5.44	98.83	110.80
1	C	409	SER	N-CA-C	5.31	118.91	111.74
1	A	50	LEU	CD1-CG-CD2	-5.26	99.22	110.80
1	A	100	GLU	N-CA-C	5.25	117.41	111.11
1	A	418	LEU	CD1-CG-CD2	-5.25	99.25	110.80
1	D	215	GLY	N-CA-C	-5.25	108.45	115.32
1	D	366	GLY	CA-C-N	5.24	125.30	119.32
1	D	366	GLY	C-N-CA	5.24	125.30	119.32
1	A	313	GLY	N-CA-C	5.22	118.76	111.19
1	C	137	THR	OG1-CB-CG2	-5.13	99.04	109.30
1	A	490	SER	CB-CA-C	-5.09	102.88	110.88
1	D	452	GLU	CA-CB-CG	-5.05	103.99	114.10
1	B	287	GLU	N-CA-C	-5.02	106.32	112.90

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	111	ARG	Sidechain

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	4017	0	3839	59	0
1	B	4017	0	3838	62	0
1	C	4017	0	3839	70	0
1	D	4017	0	3839	53	0
2	A	43	0	30	3	0
2	B	43	0	30	3	0
2	C	43	0	30	11	0
2	D	43	0	30	4	0
3	A	48	0	26	0	0
3	B	48	0	26	0	0
3	C	48	0	26	4	0
3	D	48	0	26	0	0
4	A	37	0	0	0	0
4	B	21	0	0	1	0
4	C	31	0	0	0	0
4	D	32	0	0	1	0
All	All	16553	0	15579	209	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 7.

All (209) 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:387:ARG:NH1	1:B:397:GLN:NE2	1.89	1.19
1:B:111:ARG:HD3	2:B:527:HEM:O1D	1.51	1.11
1:B:387:ARG:NH1	1:B:397:GLN:CD	2.10	1.08
1:B:387:ARG:HH11	1:B:397:GLN:NE2	1.49	1.03
1:B:387:ARG:NH1	1:B:397:GLN:HE22	1.65	0.95
2:C:527:HEM:HHC	2:C:527:HEM:HBB2	1.52	0.90
1:C:197:PHE:CD1	3:C:528:NDP:H2A	2.08	0.89
2:C:527:HEM:HBB2	2:C:527:HEM:CHC	2.02	0.86
1:C:360:THR:HG21	2:C:527:HEM:HBA1	1.58	0.84
1:B:394:MET:O	1:B:396:ASN:N	2.13	0.81
1:B:418:LEU:HD22	1:B:421:ARG:NH2	1.96	0.81
1:A:261:LEU:HD22	1:D:175:LEU:HD21	1.63	0.81
1:B:396:ASN:O	1:B:397:GLN:HB2	1.79	0.80
1:B:387:ARG:NH1	1:B:397:GLN:OE1	2.15	0.80
1:B:149:THR:HG21	1:B:194:GLN:OE1	1.82	0.79
1:A:261:LEU:HD22	1:D:175:LEU:CD2	2.14	0.78
1:B:386:GLN:O	1:B:397:GLN:NE2	2.17	0.77
1:A:429:GLN:HB3	1:B:421:ARG:HG2	1.68	0.76

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:43:VAL:O	1:C:43:VAL:HG23	1.82	0.76
1:A:261:LEU:HD21	1:D:173:THR:O	1.88	0.74
1:D:361:HIS:NE2	2:D:527:HEM:O1A	2.21	0.73
1:B:394:MET:C	1:B:396:ASN:H	1.97	0.71
1:C:145:VAL:HG21	1:C:335:PRO:HD3	1.75	0.69
1:A:355:PHE:HE1	1:B:355:PHE:HE1	1.42	0.68
1:A:485:HIS:ND1	1:A:486:PRO:HD2	2.09	0.68
2:C:527:HEM:HHC	2:C:527:HEM:CBB	2.24	0.68
1:B:328:VAL:HG12	1:B:328:VAL:O	1.93	0.67
1:B:387:ARG:HH12	1:B:397:GLN:CD	2.02	0.67
1:B:410:ALA:HB1	1:B:411:PRO:HD2	1.76	0.67
1:C:78:ALA:HB2	1:C:261:LEU:HD12	1.77	0.67
1:C:421:ARG:HD2	1:D:429:GLN:OE1	1.93	0.67
1:B:387:ARG:HH11	1:B:397:GLN:HE22	1.27	0.66
1:C:137:THR:HB	1:C:140:GLY:O	1.95	0.66
1:C:73:VAL:HG12	1:C:74:HIS:CD2	2.31	0.66
1:D:78:ALA:CB	1:D:261:LEU:HD12	2.26	0.65
1:A:101:HIS:CD2	1:A:104:LYS:HB2	2.31	0.65
1:B:111:ARG:HD3	2:B:527:HEM:CGD	2.26	0.65
1:D:78:ALA:HB2	1:D:261:LEU:HD12	1.79	0.65
1:C:43:VAL:O	1:C:47:GLY:HA3	1.98	0.64
1:C:78:ALA:CB	1:C:261:LEU:HD12	2.27	0.64
1:C:361:HIS:HE1	2:C:527:HEM:O2A	1.80	0.64
1:A:168:LYS:HE2	1:D:67:ARG:HH21	1.63	0.63
1:C:410:ALA:HB1	1:C:411:PRO:HD2	1.82	0.61
1:C:367:PRO:HG2	1:C:390:PRO:HG2	1.82	0.61
1:B:367:PRO:HG2	1:B:390:PRO:HG2	1.81	0.61
1:C:49:LEU:HD23	1:D:51:VAL:HG21	1.82	0.61
1:A:328:VAL:HG12	1:A:328:VAL:O	2.00	0.60
1:B:319:ARG:NH1	4:B:544:HOH:O	2.34	0.60
1:B:67:ARG:HH21	1:C:168:LYS:HE2	1.65	0.60
1:A:261:LEU:CD2	1:D:175:LEU:HD21	2.30	0.60
1:D:410:ALA:HB1	1:D:411:PRO:HD2	1.82	0.60
2:D:527:HEM:HMC2	2:D:527:HEM:HBC2	1.83	0.60
1:D:138:GLU:OE1	4:D:555:HOH:O	2.15	0.59
1:A:60:MET:HE1	1:D:161:PRO:HD3	1.83	0.59
1:A:410:ALA:HB1	1:A:411:PRO:HD2	1.84	0.59
1:A:127:ASP:OD1	1:A:128:PRO:HD2	2.02	0.59
1:A:174:HIS:HB3	1:D:261:LEU:HD21	1.85	0.59
1:C:349:MET:HE3	2:C:527:HEM:HBB1	1.85	0.58
1:B:328:VAL:O	1:B:328:VAL:CG1	2.51	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:193:HIS:CD2	1:C:197:PHE:HE2	2.20	0.58
1:A:56:PHE:HA	1:D:158:LEU:HD21	1.85	0.57
1:A:410:ALA:HB1	1:A:411:PRO:CD	2.34	0.57
1:B:147:ASN:CG	2:B:527:HEM:HAC	2.30	0.57
1:A:361:HIS:HE1	2:A:527:HEM:O1A	1.88	0.57
1:A:74:HIS:O	1:A:111:ARG:NH2	2.37	0.57
1:A:102:ILE:HD12	1:A:102:ILE:H	1.71	0.56
1:C:410:ALA:HB1	1:C:411:PRO:CD	2.36	0.56
1:A:143:ASP:HB2	1:A:334:ASP:O	2.06	0.56
1:A:26:LEU:HG	1:A:34:VAL:CG2	2.35	0.56
1:C:137:THR:HG22	1:C:139:ASP:H	1.71	0.56
1:C:51:VAL:HG21	1:D:49:LEU:HD23	1.89	0.55
1:C:73:VAL:HG12	1:C:74:HIS:N	2.21	0.55
1:C:360:THR:CG2	2:C:527:HEM:HBA1	2.35	0.55
1:D:410:ALA:HB1	1:D:411:PRO:CD	2.37	0.55
1:A:393:MET:HE3	1:C:393:MET:HG3	1.88	0.55
1:A:429:GLN:CB	1:B:421:ARG:HG2	2.37	0.54
1:C:219:PHE:HD1	1:C:338:MET:HE1	1.72	0.54
1:C:407:SER:OG	1:D:183:ASP:OD1	2.19	0.54
1:B:111:ARG:NH1	1:B:328:VAL:HG12	2.22	0.54
1:C:349:MET:HE3	2:C:527:HEM:CBB	2.38	0.54
1:D:333:PHE:O	1:D:361:HIS:HE1	1.90	0.54
1:A:391:MET:HB3	1:A:393:MET:HE2	1.88	0.54
1:B:174:HIS:HB3	1:C:261:LEU:HD21	1.90	0.54
1:B:43:VAL:O	1:B:47:GLY:HA3	2.08	0.54
1:A:51:VAL:HG21	1:B:49:LEU:HD23	1.89	0.54
1:A:391:MET:HE3	1:A:393:MET:CE	2.39	0.53
1:C:236:LYS:NZ	3:C:528:NDP:O3X	2.38	0.53
1:C:153:PHE:CE1	1:C:194:GLN:HG3	2.44	0.52
1:A:73:VAL:HG23	1:A:74:HIS:HD2	1.75	0.52
1:C:349:MET:CE	2:C:527:HEM:HBB1	2.38	0.52
1:C:149:THR:HB	1:C:150:PRO:HD2	1.91	0.52
1:B:64:ASP:OD2	1:C:359:ASP:OD2	2.28	0.52
1:B:74:HIS:HA	1:B:114:THR:O	2.09	0.51
1:B:60:MET:HE1	1:C:161:PRO:HD3	1.91	0.51
1:C:160:PHE:HB3	1:C:161:PRO:HD3	1.91	0.51
1:B:168:LYS:HE2	1:C:67:ARG:HH21	1.76	0.51
1:B:394:MET:C	1:B:396:ASN:N	2.59	0.51
2:D:527:HEM:HBC2	2:D:527:HEM:CMC	2.40	0.51
1:C:421:ARG:HD2	1:D:429:GLN:CD	2.36	0.51
1:B:384:ASN:O	1:B:397:GLN:OE1	2.28	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:110:VAL:HG22	1:D:133:VAL:HG22	1.93	0.50
1:B:153:PHE:CE2	1:B:194:GLN:HG3	2.47	0.49
1:B:26:LEU:HG	1:B:34:VAL:CG2	2.43	0.49
1:A:359:ASP:OD2	1:D:64:ASP:OD2	2.29	0.49
1:B:396:ASN:O	1:B:397:GLN:CB	2.54	0.49
1:D:18:ARG:HG2	1:D:18:ARG:O	2.12	0.49
1:C:197:PHE:CE1	3:C:528:NDP:H2A	2.47	0.49
1:D:215:GLY:O	1:D:217:HIS:N	2.45	0.49
1:A:155:ARG:NH2	1:A:438:ASN:OD1	2.36	0.49
1:A:367:PRO:HG2	1:A:390:PRO:HG2	1.95	0.49
1:C:74:HIS:HA	1:C:114:THR:O	2.12	0.49
1:C:197:PHE:HD1	3:C:528:NDP:H2A	1.67	0.49
1:B:396:ASN:O	1:B:396:ASN:OD1	2.30	0.48
1:B:474:GLN:OE1	1:B:496:LEU:HD23	2.13	0.48
1:A:43:VAL:O	1:A:47:GLY:HA3	2.13	0.48
1:D:367:PRO:HG2	1:D:390:PRO:HG2	1.95	0.48
1:A:74:HIS:HA	1:A:114:THR:O	2.13	0.48
1:A:67:ARG:HH21	1:D:168:LYS:HE2	1.78	0.48
1:B:202:ARG:HA	1:B:243:ASN:OD1	2.13	0.48
1:C:219:PHE:CD1	1:C:338:MET:HE1	2.49	0.48
1:D:82:GLY:HA3	1:D:316:VAL:O	2.14	0.48
1:A:328:VAL:O	1:A:328:VAL:CG1	2.61	0.47
1:A:145:VAL:HG21	1:A:335:PRO:HD3	1.97	0.47
1:B:428:VAL:HG22	1:C:43:VAL:HG12	1.96	0.47
1:D:216:SER:OG	2:D:527:HEM:CBC	2.62	0.47
1:D:186:SER:HB2	1:D:476:LYS:HG2	1.97	0.47
1:D:74:HIS:HA	1:D:114:THR:O	2.15	0.47
1:C:112:PHE:CD1	1:C:208:HIS:HB3	2.51	0.46
1:C:162:SER:O	1:C:163:PHE:C	2.58	0.46
1:C:231:CYS:HA	1:C:281:GLN:O	2.15	0.46
1:A:418:LEU:HD12	1:A:419:GLU:H	1.81	0.46
1:D:143:ASP:HB2	1:D:334:ASP:O	2.15	0.46
1:A:437:ASP:OD1	1:A:437:ASP:C	2.59	0.46
1:B:127:ASP:O	1:B:129:ARG:NH1	2.49	0.46
1:C:193:HIS:CD2	1:C:197:PHE:CE2	3.04	0.45
1:D:467:LYS:HD3	1:D:499:TYR:CD1	2.51	0.45
1:C:436:ASP:O	1:C:437:ASP:C	2.59	0.45
1:B:111:ARG:NH1	1:B:328:VAL:CG1	2.80	0.45
1:A:386:GLN:HB3	1:C:62:HIS:ND1	2.30	0.45
1:C:485:HIS:ND1	1:C:486:PRO:HD2	2.31	0.45
1:C:137:THR:HG22	1:C:138:GLU:N	2.32	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:355:PHE:HE1	1:D:355:PHE:HE1	1.65	0.45
1:D:436:ASP:O	1:D:437:ASP:C	2.56	0.45
1:B:135:PHE:HB2	1:B:142:TRP:HB3	1.98	0.44
1:B:408:PHE:HA	1:D:15:LYS:HD2	1.98	0.44
1:D:77:GLY:HA2	1:D:112:PHE:O	2.17	0.44
1:C:72:VAL:CG1	2:C:527:HEM:HMA1	2.47	0.44
1:B:367:PRO:HG2	1:B:390:PRO:CG	2.44	0.44
1:A:101:HIS:NE2	1:A:104:LYS:HB2	2.32	0.44
1:D:160:PHE:O	1:D:161:PRO:C	2.58	0.44
1:B:291:PHE:CD1	1:B:292:PRO:HD2	2.53	0.44
1:D:160:PHE:HB3	1:D:161:PRO:HD3	2.00	0.44
1:C:372:ILE:O	1:C:373:PRO:C	2.59	0.43
1:A:391:MET:HE3	1:A:393:MET:HE1	2.00	0.43
1:C:160:PHE:O	1:C:161:PRO:C	2.61	0.43
1:C:349:MET:CE	2:C:527:HEM:CBB	2.97	0.43
1:A:153:PHE:CE2	1:A:194:GLN:HG3	2.54	0.43
1:C:135:PHE:HB2	1:C:142:TRP:HB3	2.01	0.43
1:C:334:ASP:OD1	1:C:361:HIS:HD2	2.02	0.43
1:A:160:PHE:HB3	1:A:161:PRO:HD3	2.00	0.43
1:D:357:TYR:HB2	1:D:358:PRO:HD3	2.00	0.43
1:B:145:VAL:HB	1:B:353:ARG:NH2	2.34	0.42
1:C:219:PHE:CD1	1:C:338:MET:CE	3.02	0.42
1:A:37:LYS:HB3	1:A:37:LYS:HE2	1.75	0.42
1:A:102:ILE:HD12	1:A:102:ILE:N	2.32	0.42
1:B:418:LEU:HD22	1:B:421:ARG:HH21	1.78	0.42
1:A:147:ASN:CG	2:A:527:HEM:HAC	2.45	0.42
1:C:414:GLN:HA	1:C:415:PRO:HD3	1.94	0.42
1:A:51:VAL:HG21	1:B:49:LEU:CD2	2.50	0.42
1:C:346:PRO:O	1:C:347:ASP:C	2.63	0.42
1:D:446:TYR:CZ	1:D:455:ARG:HD2	2.55	0.42
1:A:74:HIS:CD2	2:A:527:HEM:C4D	3.08	0.42
1:A:372:ILE:O	1:A:373:PRO:C	2.63	0.42
1:C:43:VAL:O	1:C:43:VAL:CG2	2.56	0.42
1:D:43:VAL:HG12	1:D:48:PRO:HD2	2.01	0.42
1:A:84:PHE:HA	1:A:314:LYS:O	2.20	0.42
1:A:77:GLY:HA3	1:A:111:ARG:NH1	2.35	0.41
1:A:231:CYS:HA	1:A:281:GLN:O	2.21	0.41
1:B:162:SER:O	1:B:163:PHE:C	2.63	0.41
1:B:213:GLY:HA3	1:B:235:TYR:CE1	2.54	0.41
1:B:393:MET:HG3	1:D:393:MET:SD	2.60	0.41
1:C:406:ASN:HD21	1:C:410:ALA:HB3	1.84	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:67:ARG:NH2	1:D:168:LYS:HE2	2.36	0.41
1:B:333:PHE:O	1:B:361:HIS:HE1	2.04	0.41
1:A:149:THR:HG21	1:A:194:GLN:HE22	1.84	0.41
1:A:414:GLN:O	1:C:35:GLY:HA2	2.21	0.41
1:C:110:VAL:HG22	1:C:133:VAL:HG22	2.03	0.41
1:A:26:LEU:HG	1:A:34:VAL:HG22	2.03	0.41
1:B:78:ALA:HB2	1:B:261:LEU:HD13	2.02	0.41
1:B:261:LEU:HD21	1:C:174:HIS:HB3	2.01	0.41
1:A:43:VAL:HG21	1:B:43:VAL:HG21	2.01	0.41
1:B:35:GLY:HA2	1:D:414:GLN:O	2.21	0.41
1:D:112:PHE:CD1	1:D:208:HIS:HB3	2.56	0.41
1:D:162:SER:O	1:D:163:PHE:C	2.61	0.41
1:A:108:ILE:HA	1:A:134:LYS:O	2.21	0.41
1:A:158:LEU:HD21	1:D:56:PHE:HA	2.02	0.41
1:C:131:PHE:CD1	1:C:131:PHE:C	2.99	0.41
1:C:357:TYR:HB2	1:C:358:PRO:HD3	2.02	0.41
1:D:145:VAL:HG21	1:D:335:PRO:HD3	2.01	0.41
1:B:394:MET:O	1:B:395:ASP:C	2.58	0.41
1:B:396:ASN:HB2	1:D:326:ALA:HB2	2.02	0.41
1:C:367:PRO:HB2	1:C:390:PRO:HD2	2.03	0.41
1:D:16:GLU:C	1:D:18:ARG:H	2.29	0.41
1:D:98:VAL:HG22	1:D:98:VAL:O	2.21	0.41
1:C:394:MET:HB3	1:C:395:ASP:H	1.71	0.40
1:C:43:VAL:HG11	1:D:43:VAL:HG11	2.02	0.40
1:A:115:VAL:O	1:A:115:VAL:HG12	2.20	0.40
1:B:472:PHE:CD1	1:B:472:PHE:C	2.99	0.40
1:C:51:VAL:HG21	1:D:49:LEU:CD2	2.51	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	497/527 (94%)	479 (96%)	17 (3%)	1 (0%)	43	68
1	B	497/527 (94%)	476 (96%)	17 (3%)	4 (1%)	16	37
1	C	497/527 (94%)	481 (97%)	16 (3%)	0	100	100
1	D	497/527 (94%)	474 (95%)	22 (4%)	1 (0%)	43	68
All	All	1988/2108 (94%)	1910 (96%)	72 (4%)	6 (0%)	36	60

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	395	ASP
1	B	397	GLN
1	D	216	SER
1	A	216	SER
1	B	216	SER
1	B	388	ASP

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	431/454 (95%)	429 (100%)	2 (0%)	81	92
1	B	431/454 (95%)	426 (99%)	5 (1%)	63	84
1	C	431/454 (95%)	426 (99%)	5 (1%)	63	84
1	D	431/454 (95%)	427 (99%)	4 (1%)	70	87
All	All	1724/1816 (95%)	1708 (99%)	16 (1%)	70	87

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	235	TYR
1	A	289	GLU
1	B	235	TYR
1	B	418	LEU
1	B	467	LYS

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Mol	Chain	Res	Type
1	B	476	LYS
1	B	496	LEU
1	C	34	VAL
1	C	235	TYR
1	C	255	GLU
1	C	394	MET
1	C	442	VAL
1	D	100	GLU
1	D	104	LYS
1	D	235	TYR
1	D	388	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (22) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	13	HIS
1	A	39	ASN
1	A	361	HIS
1	A	414	GLN
1	A	432	ASN
1	B	32	ASN
1	B	39	ASN
1	B	101	HIS
1	B	167	GLN
1	B	397	GLN
1	B	414	GLN
1	B	461	ASN
1	C	13	HIS
1	C	167	GLN
1	C	361	HIS
1	C	432	ASN
1	D	32	ASN
1	D	39	ASN
1	D	243	ASN
1	D	414	GLN
1	D	423	HIS
1	D	461	ASN

5.3.3 RNA ⓘ

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](#)

8 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	HEM	C	527	1	50,50,50	1.76	7 (14%)	67,82,82	1.51	11 (16%)
3	NDP	C	528	-	51,52,52	1.28	5 (9%)	71,80,80	1.56	11 (15%)
3	NDP	A	528	-	51,52,52	1.51	8 (15%)	71,80,80	1.80	13 (18%)
2	HEM	B	527	1	50,50,50	1.81	8 (16%)	67,82,82	1.31	8 (11%)
2	HEM	A	527	1	50,50,50	1.66	8 (16%)	67,82,82	1.45	10 (14%)
3	NDP	D	528	-	51,52,52	1.70	7 (13%)	71,80,80	1.46	11 (15%)
2	HEM	D	527	1	50,50,50	1.74	10 (20%)	67,82,82	1.50	9 (13%)
3	NDP	B	528	-	51,52,52	1.45	7 (13%)	71,80,80	1.63	11 (15%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	HEM	C	527	1	-	7/14/54/54	-
3	NDP	C	528	-	-	6/34/77/77	0/5/5/5
3	NDP	A	528	-	-	6/34/77/77	0/5/5/5
2	HEM	B	527	1	-	6/14/54/54	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	HEM	A	527	1	-	6/14/54/54	-
3	NDP	D	528	-	-	6/34/77/77	0/5/5/5
2	HEM	D	527	1	-	3/14/54/54	-
3	NDP	B	528	-	-	6/34/77/77	0/5/5/5

All (60) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	527	HEM	C3D-C2D	7.36	1.52	1.36
2	C	527	HEM	C3D-C2D	7.24	1.52	1.36
2	D	527	HEM	C3D-C2D	6.09	1.49	1.36
2	A	527	HEM	C3D-C2D	5.86	1.49	1.36
3	B	528	NDP	C4N-C3N	-5.33	1.39	1.50
3	D	528	NDP	PA-O3	5.24	1.65	1.59
3	D	528	NDP	C4N-C3N	-5.16	1.40	1.50
3	D	528	NDP	PN-O3	5.09	1.65	1.59
3	C	528	NDP	C4N-C3N	-5.08	1.40	1.50
2	C	527	HEM	FE-NC	4.79	2.11	1.95
3	A	528	NDP	C4N-C3N	-4.55	1.41	1.50
3	A	528	NDP	PN-O3	4.42	1.64	1.59
2	B	527	HEM	FE-ND	4.40	2.08	1.94
3	B	528	NDP	PN-O3	4.10	1.63	1.59
3	D	528	NDP	P2B-O2B	4.07	1.66	1.59
2	D	527	HEM	FE-NB	3.94	2.07	1.94
2	C	527	HEM	CAC-C3C	3.69	1.57	1.47
3	C	528	NDP	C4N-C5N	-3.66	1.39	1.49
2	A	527	HEM	CAC-C3C	3.62	1.57	1.47
3	B	528	NDP	C4N-C5N	-3.42	1.40	1.49
3	A	528	NDP	C4N-C5N	-3.38	1.40	1.49
2	A	527	HEM	FE-NA	3.36	2.06	1.95
2	D	527	HEM	CAC-C3C	3.33	1.56	1.47
2	D	527	HEM	FE-NA	3.32	2.06	1.95
2	C	527	HEM	FE-NA	3.27	2.06	1.95
2	B	527	HEM	FE-NB	3.26	2.04	1.94
2	A	527	HEM	CAB-C3B	3.23	1.56	1.47
2	B	527	HEM	CAC-C3C	3.22	1.56	1.47
3	D	528	NDP	C4N-C5N	-3.09	1.41	1.49
2	B	527	HEM	CAB-C3B	2.89	1.55	1.47
3	A	528	NDP	C8A-N7A	2.87	1.37	1.31
3	A	528	NDP	PA-O3	2.85	1.62	1.59
2	A	527	HEM	FE-NC	2.79	2.04	1.95

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	527	HEM	FE-NC	2.77	2.04	1.95
2	D	527	HEM	CAB-C3B	2.71	1.54	1.47
3	D	528	NDP	C6N-C5N	2.66	1.41	1.33
2	B	527	HEM	CMD-C2D	2.64	1.56	1.50
3	B	528	NDP	PA-O3	2.56	1.62	1.59
2	B	527	HEM	CMA-C3A	2.51	1.55	1.50
3	A	528	NDP	C6N-C5N	2.48	1.40	1.33
2	A	527	HEM	CMA-C3A	2.47	1.55	1.50
3	D	528	NDP	C8A-N7A	2.46	1.36	1.31
2	C	527	HEM	FE-ND	2.45	2.02	1.94
2	D	527	HEM	CMC-C2C	2.43	1.55	1.50
3	A	528	NDP	C2N-C3N	2.43	1.41	1.35
3	B	528	NDP	C8A-N7A	2.42	1.36	1.31
3	B	528	NDP	P2B-O2B	2.42	1.63	1.59
3	C	528	NDP	C8A-N7A	2.38	1.36	1.31
3	C	528	NDP	C6N-C5N	2.38	1.40	1.33
3	B	528	NDP	C6N-C5N	2.36	1.40	1.33
2	B	527	HEM	FE-NA	2.31	2.02	1.95
2	D	527	HEM	C2A-C3A	-2.31	1.32	1.38
2	C	527	HEM	CMD-C2D	2.24	1.55	1.50
2	A	527	HEM	CMC-C2C	2.23	1.55	1.50
2	C	527	HEM	CAB-C3B	2.16	1.53	1.47
3	C	528	NDP	C2N-C3N	2.13	1.41	1.35
3	A	528	NDP	C4A-N3A	2.09	1.38	1.34
2	D	527	HEM	CMA-C3A	2.08	1.55	1.50
2	D	527	HEM	O1A-CGA	2.04	1.28	1.22
2	A	527	HEM	C3B-C2B	-2.02	1.33	1.37

All (84) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	528	NDP	N3A-C2A-N1A	-6.84	118.23	128.58
3	B	528	NDP	N3A-C2A-N1A	-5.53	120.21	128.58
3	D	528	NDP	N3A-C2A-N1A	-5.27	120.61	128.58
2	D	527	HEM	CAD-CBD-CGD	-5.18	99.93	113.67
3	B	528	NDP	C5A-C4A-N3A	-5.06	119.75	126.72
3	C	528	NDP	N3A-C2A-N1A	-5.03	120.97	128.58
2	A	527	HEM	C4D-ND-C1D	4.83	110.92	105.21
3	A	528	NDP	C2A-N3A-C4A	4.68	123.26	111.83
2	B	527	HEM	C4D-ND-C1D	4.64	110.71	105.21
3	C	528	NDP	C5A-C4A-N3A	-4.46	120.58	126.72
2	D	527	HEM	C4D-ND-C1D	4.37	110.38	105.21

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	527	HEM	C4D-ND-C1D	4.36	110.37	105.21
3	D	528	NDP	C5A-C4A-N3A	-4.30	120.80	126.72
3	A	528	NDP	N9A-C8A-N7A	-4.07	108.17	113.94
3	C	528	NDP	N9A-C8A-N7A	-3.95	108.34	113.94
3	A	528	NDP	C5A-C4A-N3A	-3.79	121.50	126.72
3	B	528	NDP	C2A-N3A-C4A	3.74	120.97	111.83
3	A	528	NDP	C4A-N9A-C8A	3.71	109.63	105.74
3	B	528	NDP	N3A-C4A-N9A	3.66	133.38	127.17
2	C	527	HEM	C3B-C4B-NB	-3.63	106.86	109.47
2	D	527	HEM	C3B-C4B-NB	-3.52	106.94	109.47
3	B	528	NDP	N9A-C8A-N7A	-3.44	109.06	113.94
3	C	528	NDP	C2A-N3A-C4A	3.42	120.19	111.83
2	C	527	HEM	CHC-C4B-NB	3.39	128.07	124.42
2	C	527	HEM	CAD-CBD-CGD	-3.38	104.71	113.67
2	A	527	HEM	CAD-C3D-C4D	3.32	130.49	124.70
3	D	528	NDP	C2A-N3A-C4A	3.27	119.82	111.83
2	A	527	HEM	CMD-C2D-C1D	3.20	130.03	125.03
3	A	528	NDP	N3A-C4A-N9A	3.12	132.47	127.17
3	C	528	NDP	C4A-N9A-C8A	3.10	109.00	105.74
3	B	528	NDP	O2N-PN-O3	3.02	115.44	107.27
2	D	527	HEM	CHD-C1D-ND	3.01	127.66	124.42
3	A	528	NDP	O4B-C1B-N9A	2.94	113.73	108.09
3	D	528	NDP	N9A-C8A-N7A	-2.92	109.80	113.94
2	D	527	HEM	O1D-CGD-CBD	-2.90	113.89	123.09
2	B	527	HEM	CBA-CAA-C2A	-2.88	104.58	112.53
3	C	528	NDP	N3A-C4A-N9A	2.86	132.03	127.17
3	B	528	NDP	C4A-N9A-C8A	2.84	108.72	105.74
3	A	528	NDP	O3X-P2B-O2B	-2.83	94.80	105.85
2	D	527	HEM	C1B-NB-C4B	2.82	108.55	105.21
2	B	527	HEM	CAD-CBD-CGD	-2.82	106.18	113.67
3	A	528	NDP	C5A-C6A-N6A	-2.78	116.41	123.29
2	C	527	HEM	CHD-C1D-ND	2.70	127.33	124.42
3	D	528	NDP	N3A-C4A-N9A	2.68	131.72	127.17
2	B	527	HEM	CHD-C4C-NC	2.66	127.35	124.45
3	A	528	NDP	C4A-N9A-C1B	-2.66	120.42	126.63
2	A	527	HEM	CHA-C4D-ND	2.62	127.61	124.37
3	C	528	NDP	C5A-N7A-C8A	2.58	107.51	103.45
2	B	527	HEM	C1D-C2D-C3D	-2.57	104.28	106.98
3	C	528	NDP	O4D-C1D-N1N	2.48	112.82	108.08
2	C	527	HEM	CBA-CAA-C2A	-2.47	105.70	112.53
3	C	528	NDP	C4A-C5A-N7A	-2.47	107.76	110.58
2	C	527	HEM	CHA-C4D-ND	2.45	127.40	124.37

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	528	NDP	O3X-P2B-O1X	2.45	120.39	110.83
2	C	527	HEM	C4B-C3B-C2B	2.43	109.51	107.28
2	C	527	HEM	CBB-CAB-C3B	-2.41	115.48	127.53
2	D	527	HEM	CHA-C4D-ND	2.40	127.34	124.37
3	B	528	NDP	C5A-N7A-C8A	2.39	107.21	103.45
3	D	528	NDP	O4D-C1D-N1N	2.38	112.62	108.08
3	B	528	NDP	O2A-PA-O1A	2.35	123.37	112.44
3	D	528	NDP	C4A-C5A-N7A	-2.34	107.91	110.58
2	A	527	HEM	CAD-C3D-C2D	-2.30	123.56	127.87
3	A	528	NDP	O3X-P2B-O2X	2.28	116.34	107.80
2	D	527	HEM	C1D-C2D-C3D	-2.27	104.59	106.98
2	A	527	HEM	CBD-CAD-C3D	-2.25	106.31	112.53
3	D	528	NDP	C2A-N1A-C6A	2.21	122.36	118.73
3	A	528	NDP	N6A-C6A-N1A	2.18	123.23	118.38
2	B	527	HEM	CMD-C2D-C1D	2.15	128.39	125.03
3	D	528	NDP	C5A-N7A-C8A	2.15	106.83	103.45
2	A	527	HEM	C3B-C4B-NB	-2.14	107.93	109.47
2	D	527	HEM	CBA-CAA-C2A	-2.14	106.62	112.53
3	B	528	NDP	C4A-C5A-N7A	-2.13	108.14	110.58
2	C	527	HEM	C1B-NB-C4B	2.12	107.72	105.21
3	D	528	NDP	C4A-N9A-C8A	2.12	107.97	105.74
2	A	527	HEM	CHD-C1D-ND	2.12	126.70	124.42
2	A	527	HEM	O2A-CGA-CBA	2.10	120.65	114.00
3	B	528	NDP	O3-PA-O1A	-2.10	104.39	110.70
2	B	527	HEM	CHA-C4D-ND	2.10	126.96	124.37
3	C	528	NDP	C3N-C2N-N1N	-2.09	120.14	123.20
2	C	527	HEM	C1D-C2D-C3D	-2.08	104.80	106.98
2	B	527	HEM	O2D-CGD-CBD	2.07	120.56	114.00
2	A	527	HEM	CBA-CAA-C2A	-2.05	106.86	112.53
3	D	528	NDP	O3B-C3B-C2B	-2.04	105.46	111.19
3	C	528	NDP	C3D-C2D-C1D	2.03	105.30	101.46

There are no chirality outliers.

All (46) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	528	NDP	C5B-O5B-PA-O1A
3	B	528	NDP	O4B-C4B-C5B-O5B
3	B	528	NDP	C3B-C4B-C5B-O5B
2	B	527	HEM	C4D-C3D-CAD-CBD
2	A	527	HEM	C2C-C3C-CAC-CBC
2	B	527	HEM	C2C-C3C-CAC-CBC

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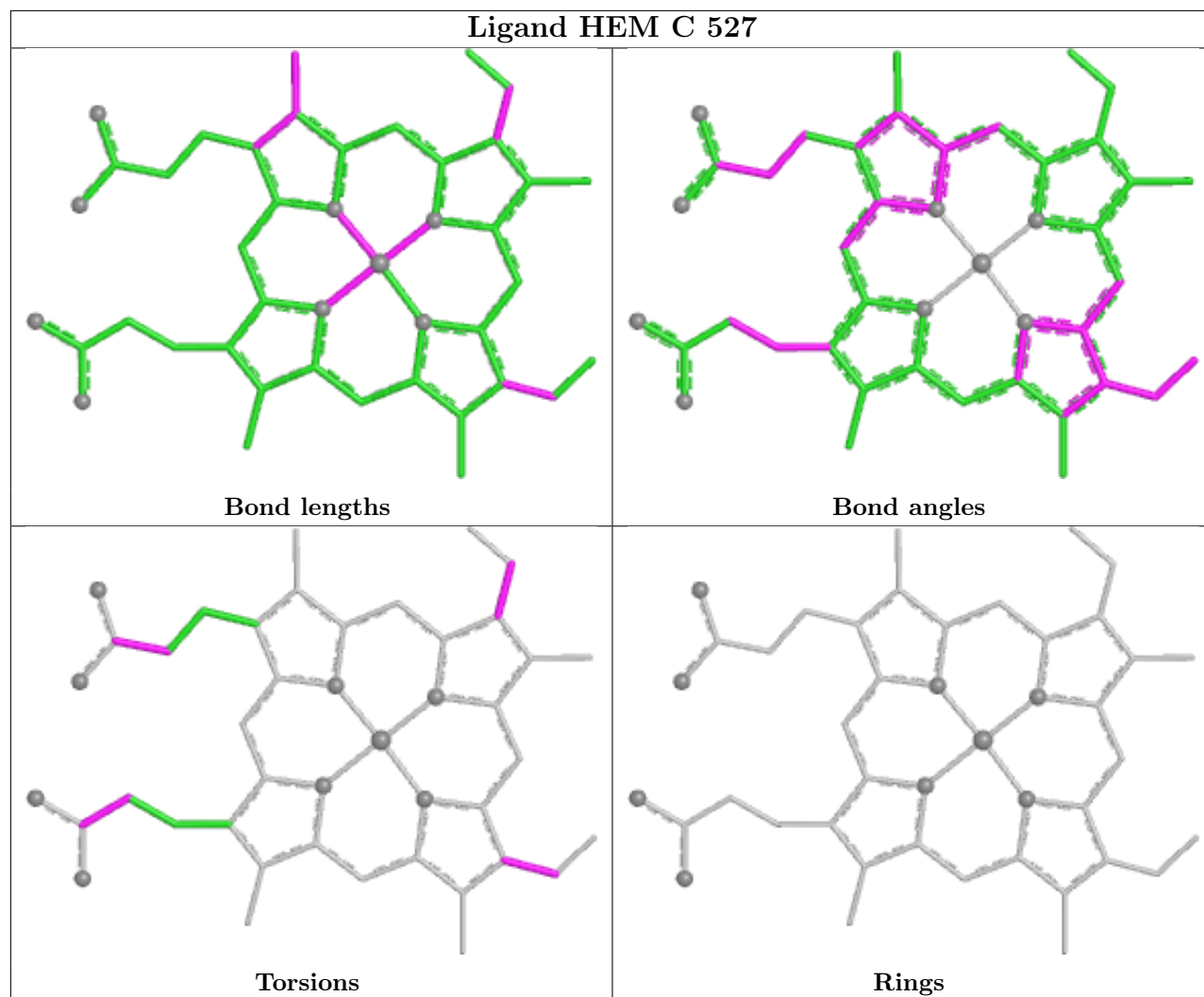
Mol	Chain	Res	Type	Atoms
2	C	527	HEM	C4B-C3B-CAB-CBB
3	D	528	NDP	O4D-C1D-N1N-C6N
3	A	528	NDP	PA-O3-PN-O2N
3	B	528	NDP	PA-O3-PN-O1N
3	B	528	NDP	PA-O3-PN-O2N
2	B	527	HEM	C2D-C3D-CAD-CBD
3	A	528	NDP	O4D-C1D-N1N-C6N
3	B	528	NDP	O4D-C1D-N1N-C6N
3	C	528	NDP	O4D-C1D-N1N-C6N
3	C	528	NDP	C5B-O5B-PA-O1A
3	C	528	NDP	C5D-O5D-PN-O1N
3	D	528	NDP	C5D-O5D-PN-O1N
3	D	528	NDP	O4B-C4B-C5B-O5B
3	D	528	NDP	PA-O3-PN-O2N
2	B	527	HEM	C4C-C3C-CAC-CBC
3	A	528	NDP	C1B-C2B-O2B-P2B
2	B	527	HEM	CAD-CBD-CGD-O1D
2	C	527	HEM	CAA-CBA-CGA-O1A
2	C	527	HEM	CAA-CBA-CGA-O2A
2	B	527	HEM	CAD-CBD-CGD-O2D
3	D	528	NDP	C2N-C3N-C7N-N7N
2	A	527	HEM	CAD-CBD-CGD-O1D
3	C	528	NDP	PN-O3-PA-O2A
3	A	528	NDP	C3B-C2B-O2B-P2B
2	A	527	HEM	CAD-CBD-CGD-O2D
2	C	527	HEM	CAD-CBD-CGD-O2D
2	D	527	HEM	CAD-CBD-CGD-O2D
2	C	527	HEM	C2C-C3C-CAC-CBC
2	D	527	HEM	CAD-CBD-CGD-O1D
2	C	527	HEM	CAD-CBD-CGD-O1D
2	A	527	HEM	C4C-C3C-CAC-CBC
2	C	527	HEM	C4C-C3C-CAC-CBC
3	C	528	NDP	C2B-C1B-N9A-C8A
3	C	528	NDP	PA-O3-PN-O1N
3	D	528	NDP	PA-O3-PN-O1N
2	A	527	HEM	CAA-CBA-CGA-O1A
2	A	527	HEM	CAA-CBA-CGA-O2A
2	D	527	HEM	CAA-CBA-CGA-O2A
3	A	528	NDP	PA-O3-PN-O1N
3	A	528	NDP	O4B-C4B-C5B-O5B

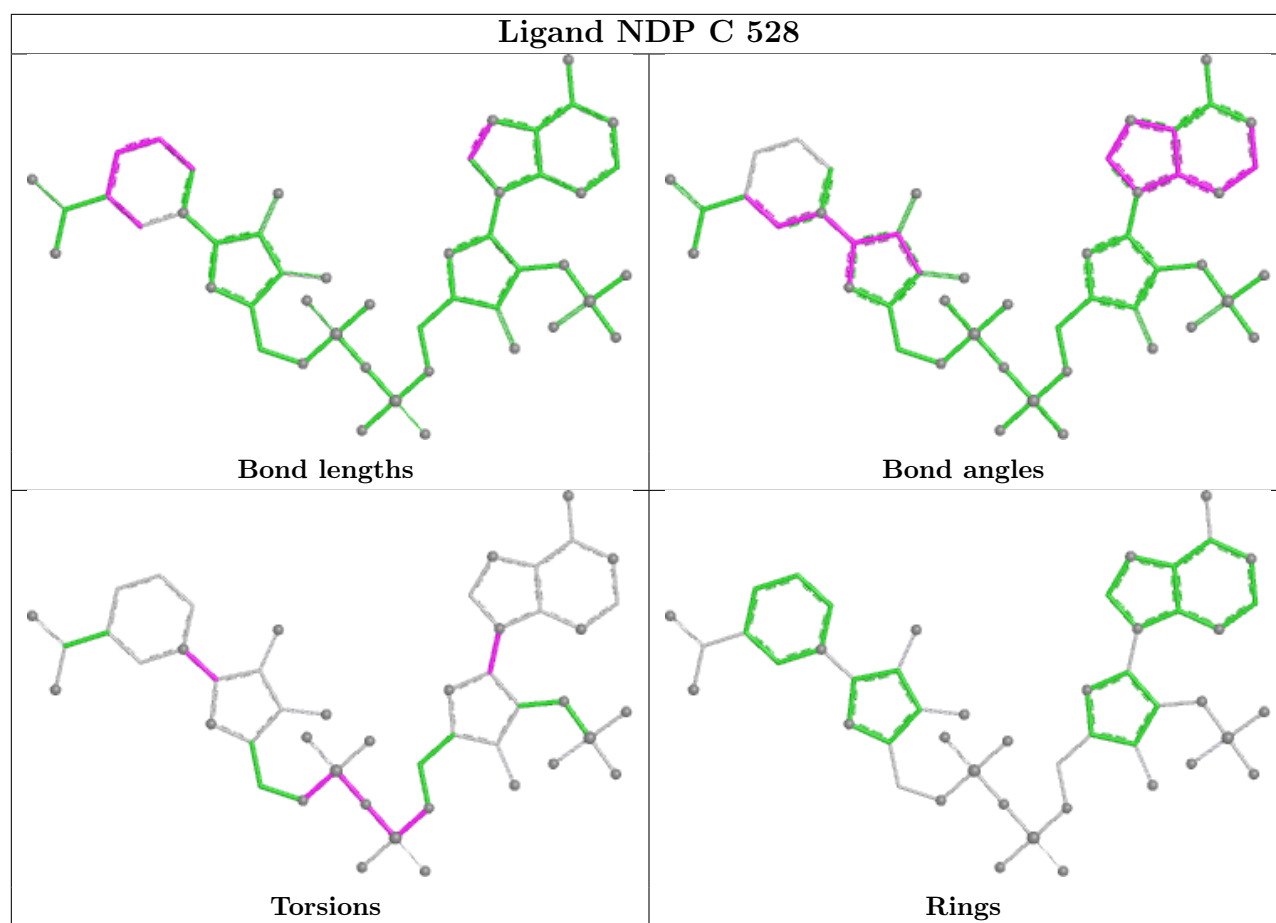
There are no ring outliers.

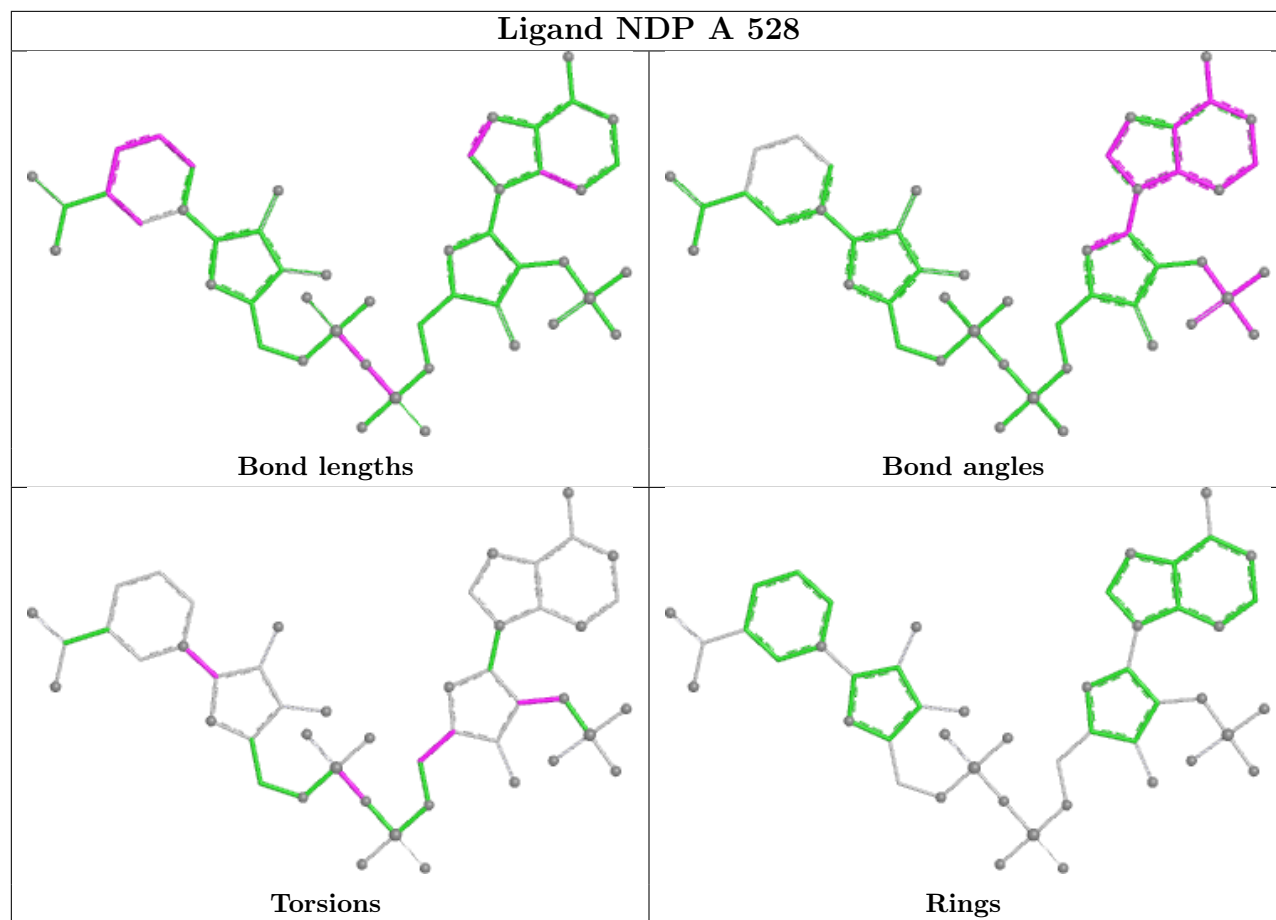
5 monomers are involved in 25 short contacts:

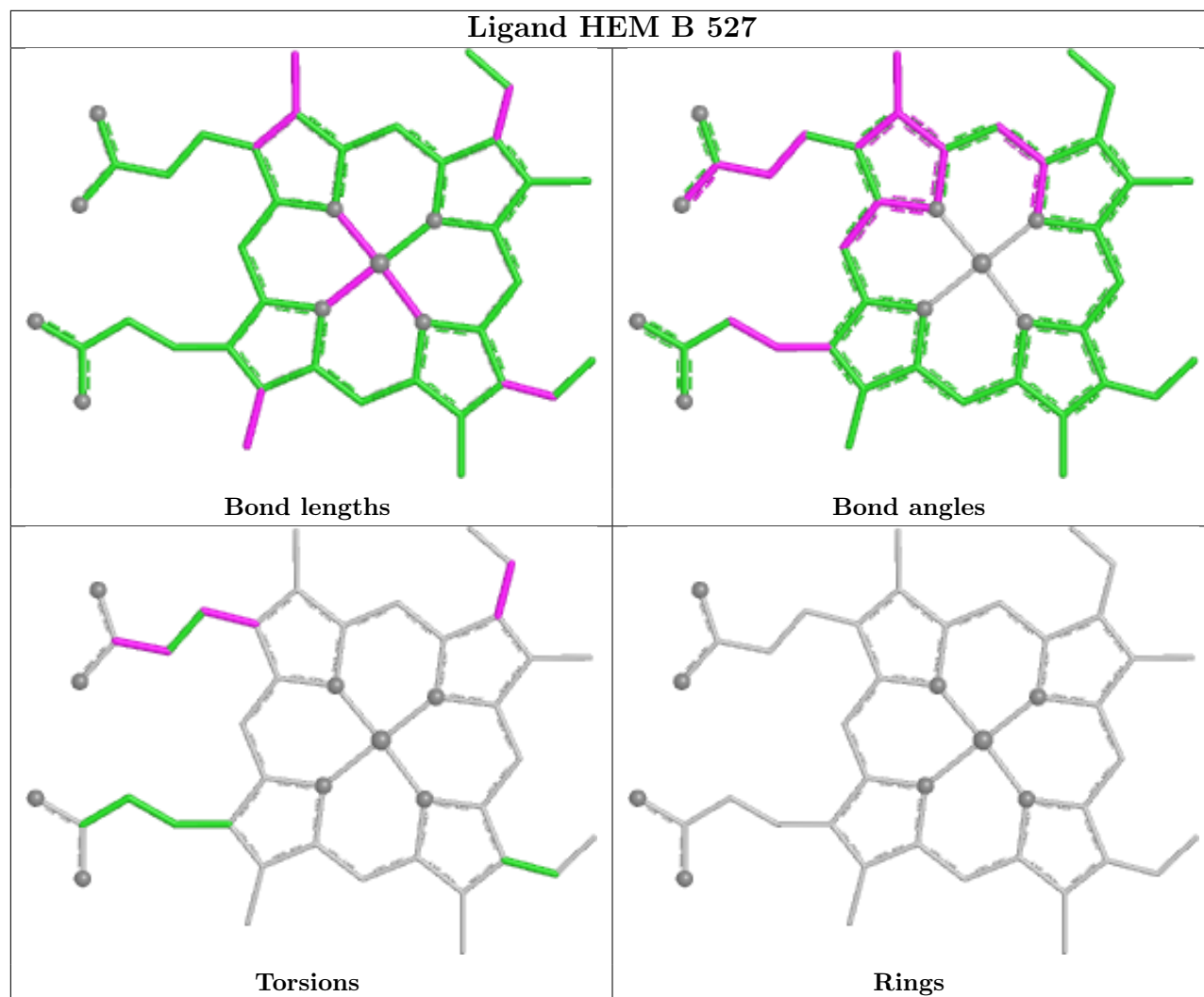
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	527	HEM	11	0
3	C	528	NDP	4	0
2	B	527	HEM	3	0
2	A	527	HEM	3	0
2	D	527	HEM	4	0

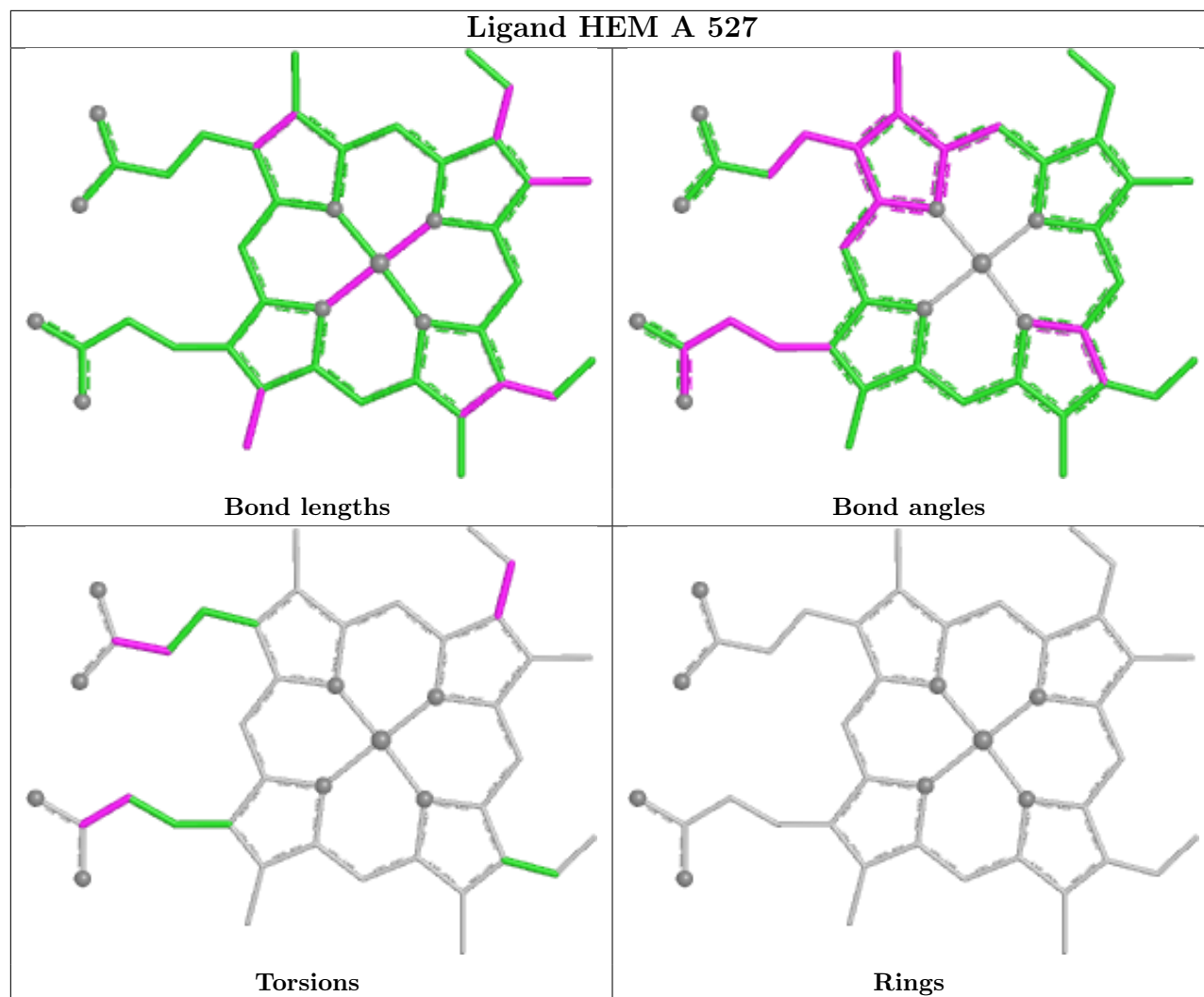
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

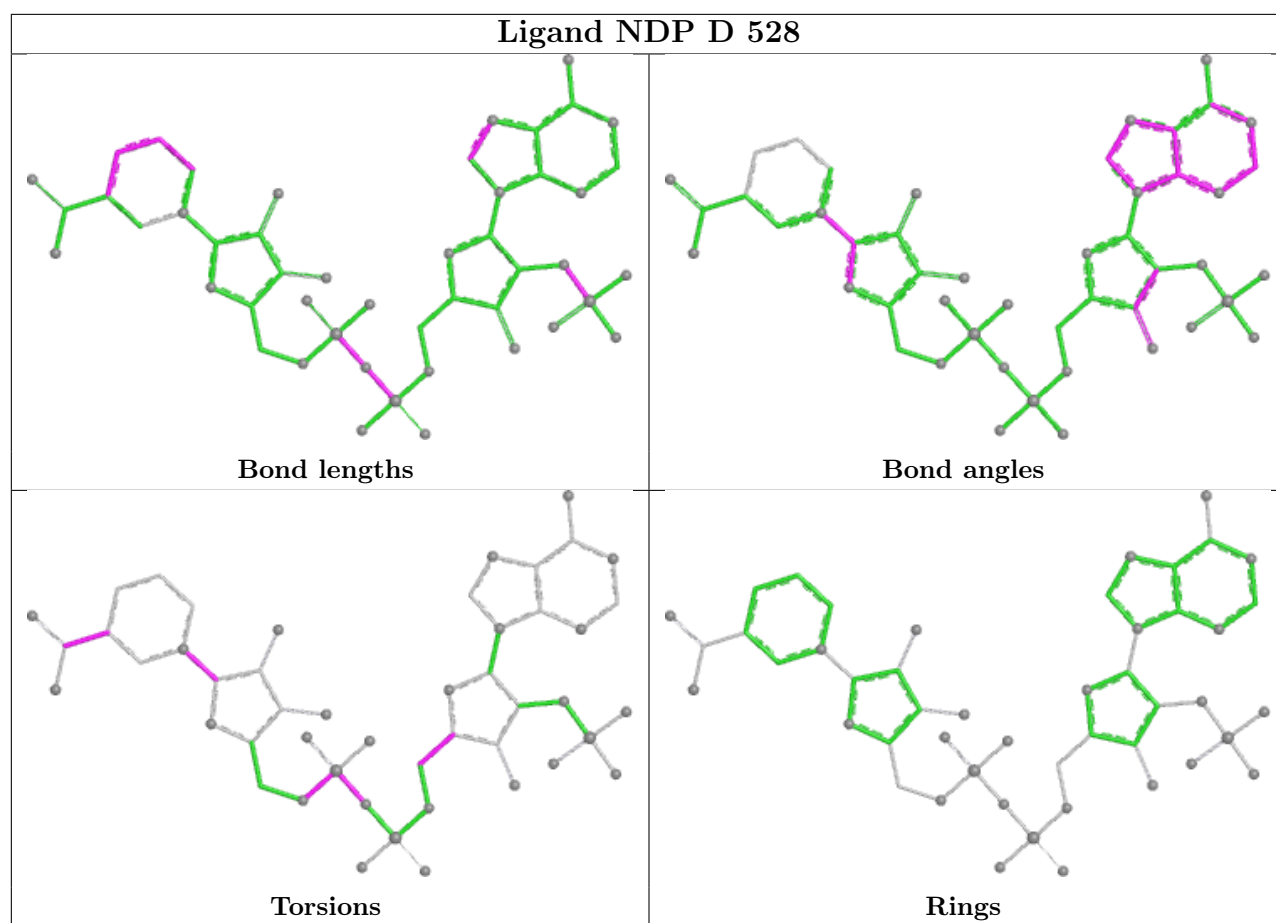


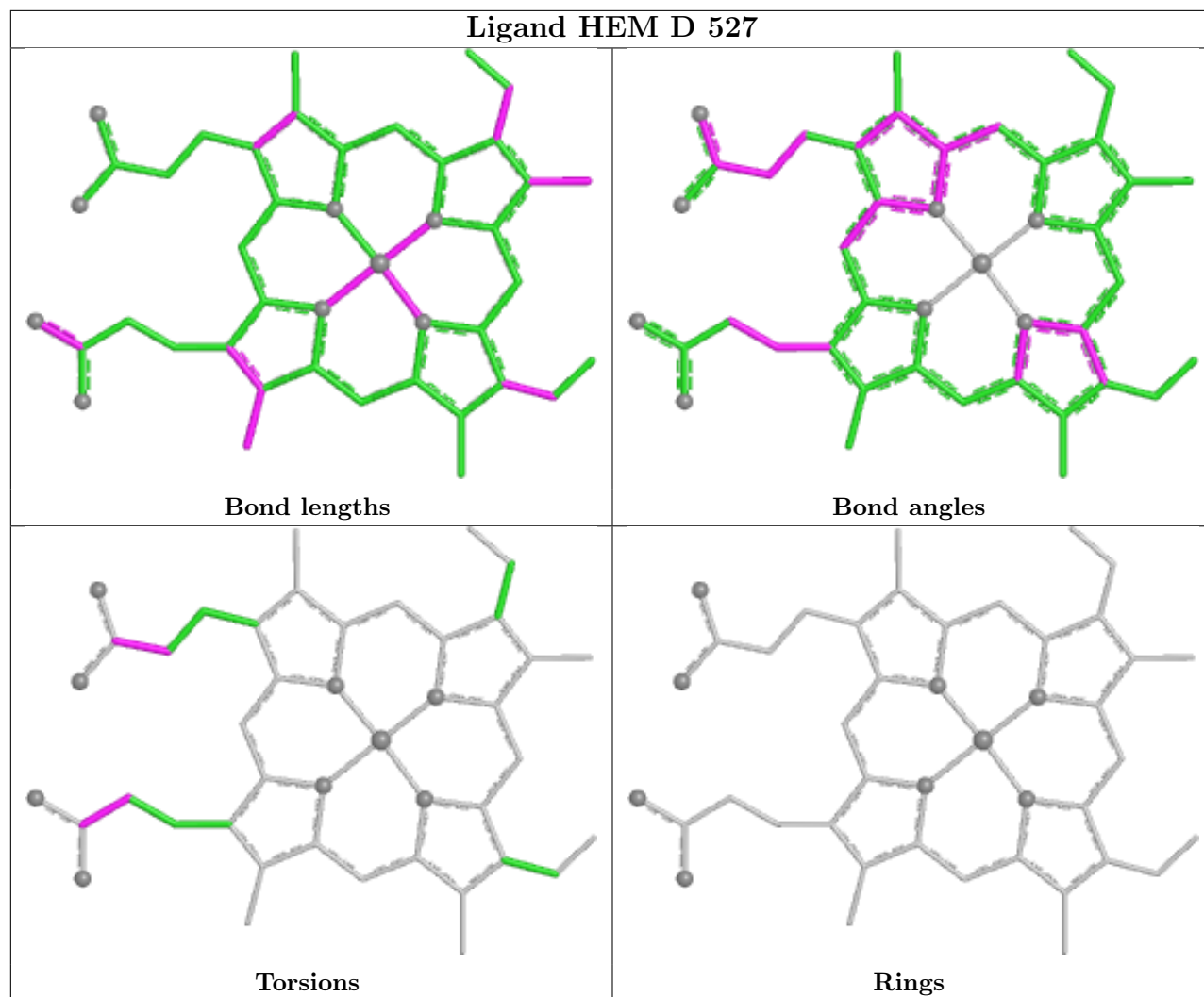


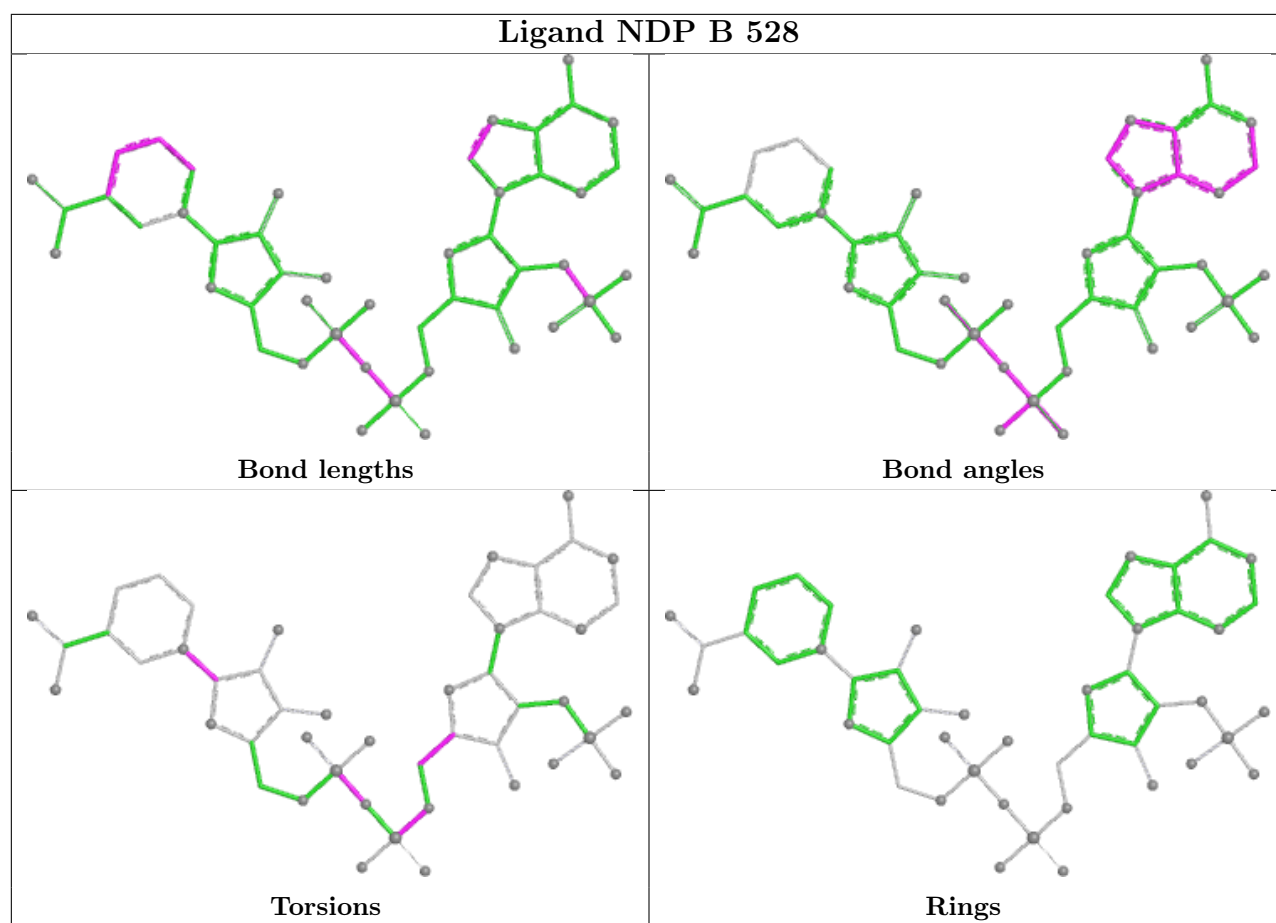












5.7 Other polymers [i](#)

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	499/527 (94%)	0.00	15 (3%)	52	49	16, 22, 51, 101	0
1	B	499/527 (94%)	-0.00	14 (2%)	55	51	17, 25, 48, 62	0
1	C	499/527 (94%)	0.02	10 (2%)	65	62	18, 25, 51, 79	0
1	D	499/527 (94%)	0.11	15 (3%)	52	49	18, 26, 54, 84	0
All	All	1996/2108 (94%)	0.03	54 (2%)	56	53	16, 24, 51, 101	0

All (54) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	395	ASP	6.5
1	B	397	GLN	6.5
1	D	3	ASN	5.7
1	B	394	MET	4.0
1	A	101	HIS	3.7
1	A	501	GLU	3.6
1	C	394	MET	3.4
1	B	22	LYS	3.4
1	A	394	MET	3.4
1	D	394	MET	3.4
1	C	3	ASN	3.3
1	C	435	ASN	3.3
1	B	421	ARG	3.3
1	C	501	GLU	3.2
1	A	395	ASP	3.2
1	A	20	ALA	3.2
1	A	491	ARG	3.2
1	D	20	ALA	3.1
1	A	19	ALA	3.1
1	C	20	ALA	3.1
1	B	19	ALA	3.0

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Mol	Chain	Res	Type	RSRZ
1	D	105	ARG	2.8
1	B	498	LYS	2.8
1	A	261	LEU	2.7
1	D	127	ASP	2.7
1	B	501	GLU	2.7
1	D	23	PRO	2.7
1	A	3	ASN	2.7
1	C	413	HIS	2.6
1	A	500	ASN	2.6
1	D	501	GLU	2.6
1	A	499	TYR	2.5
1	C	395	ASP	2.5
1	B	18	ARG	2.5
1	D	413	HIS	2.5
1	A	492	ILE	2.5
1	D	409	SER	2.5
1	A	424	PHE	2.5
1	A	421	ARG	2.4
1	D	415	PRO	2.4
1	A	498	LYS	2.3
1	C	53	ASP	2.3
1	D	421	ARG	2.3
1	B	396	ASN	2.2
1	B	20	ALA	2.2
1	B	436	ASP	2.2
1	D	393	MET	2.2
1	B	3	ASN	2.1
1	D	22	LYS	2.1
1	D	255	GLU	2.1
1	B	413	HIS	2.1
1	C	23	PRO	2.1
1	C	393	MET	2.0
1	D	4	ARG	2.0

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

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

6.3 Carbohydrates ⓘ

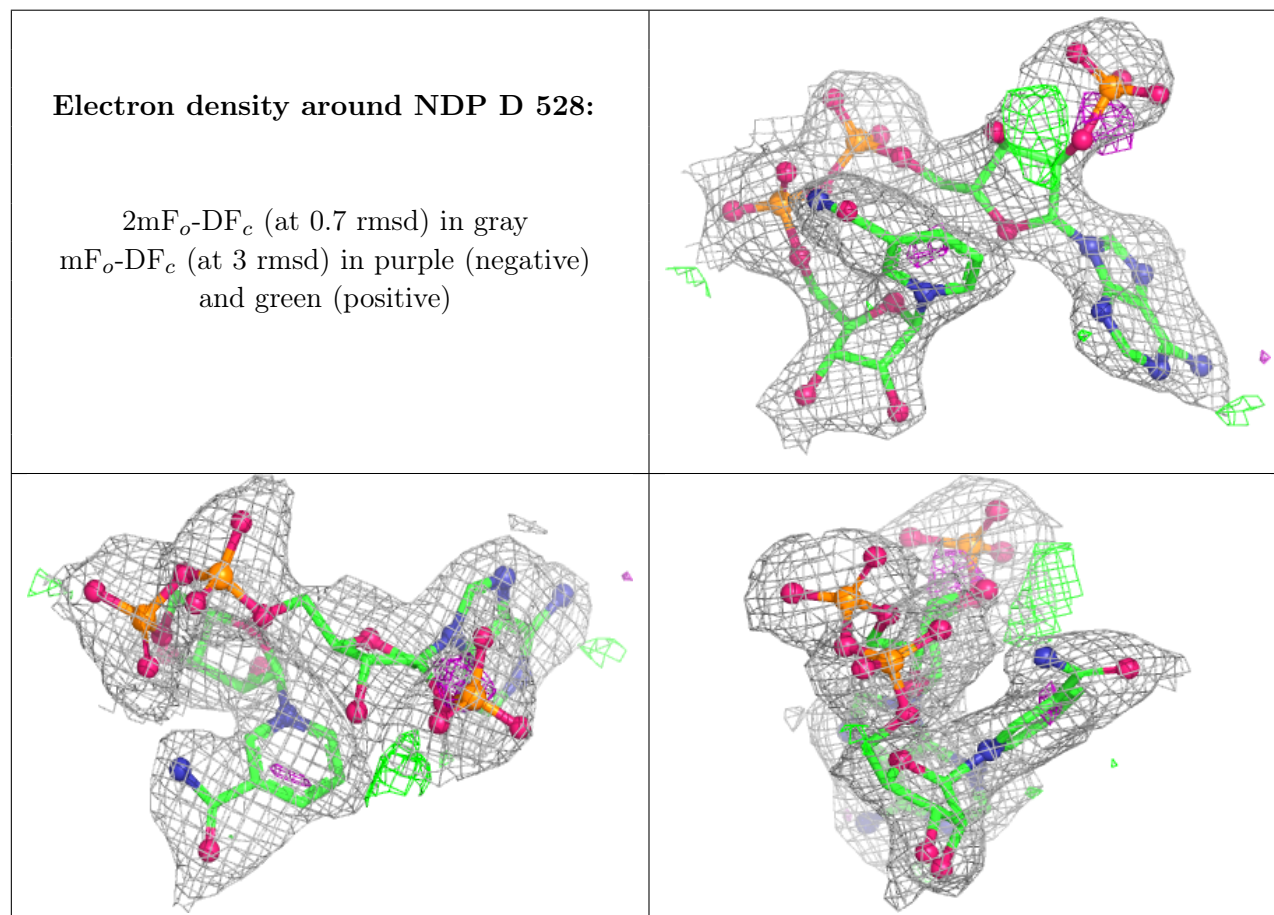
There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

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.

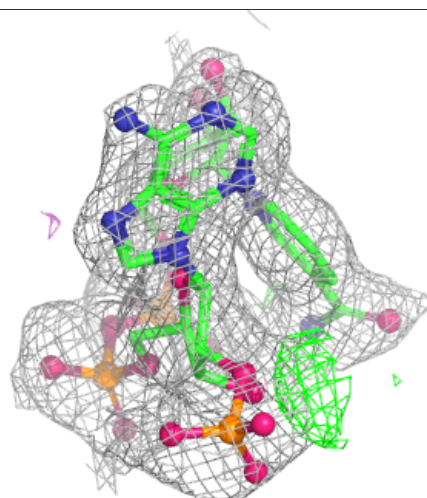
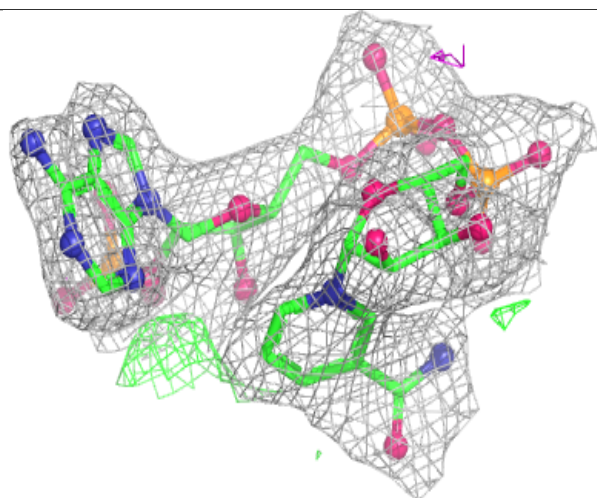
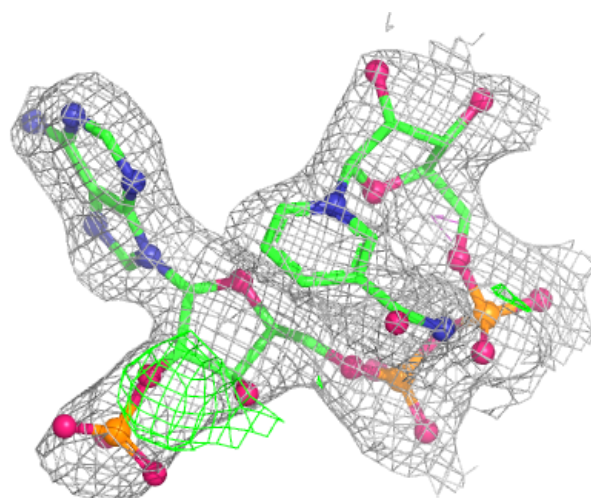
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	NDP	D	528	48/48	0.92	0.10	16,27,42,44	0
3	NDP	B	528	48/48	0.93	0.09	20,31,50,54	0
3	NDP	C	528	48/48	0.94	0.09	24,33,47,49	0
3	NDP	A	528	48/48	0.94	0.09	11,19,37,41	0
2	HEM	C	527	43/43	0.97	0.07	8,14,17,21	0
2	HEM	D	527	43/43	0.97	0.07	2,9,15,17	0
2	HEM	A	527	43/43	0.97	0.08	2,9,19,22	0
2	HEM	B	527	43/43	0.98	0.07	2,13,22,24	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.



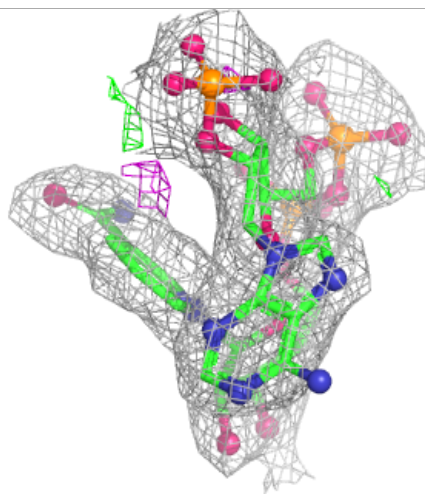
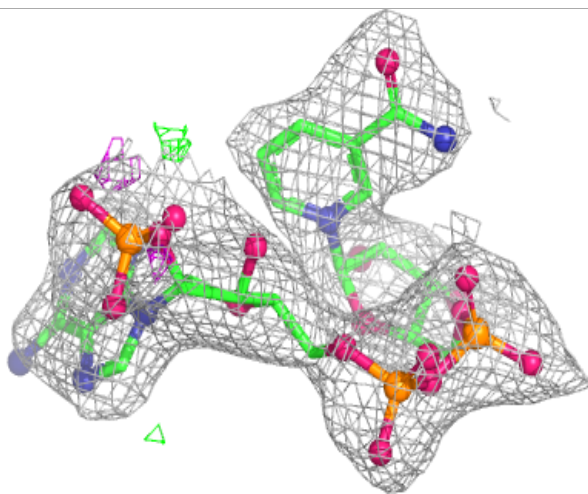
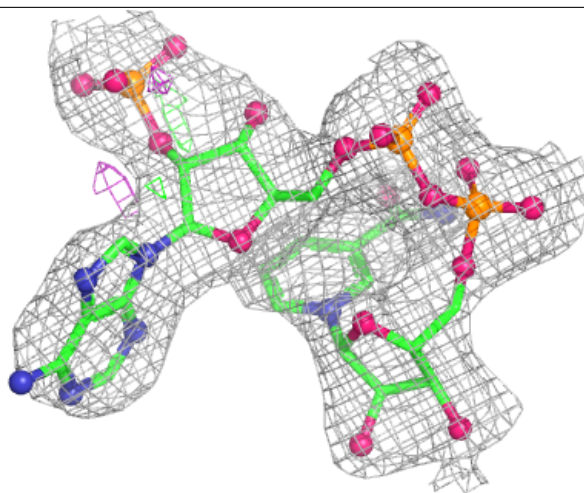
Electron density around NDP B 528:

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



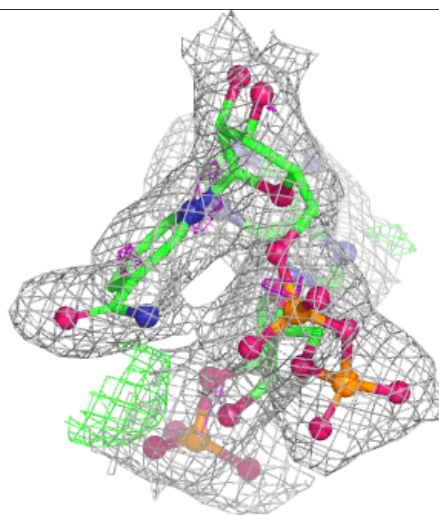
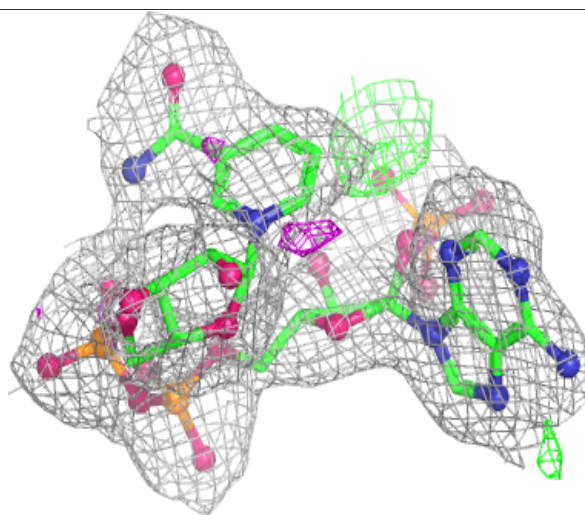
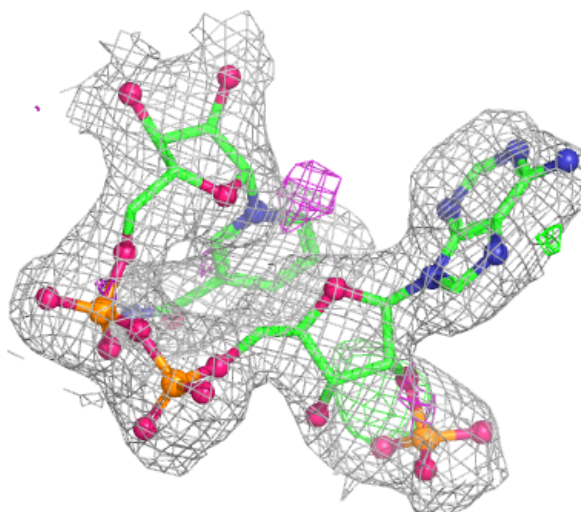
Electron density around NDP C 528:

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



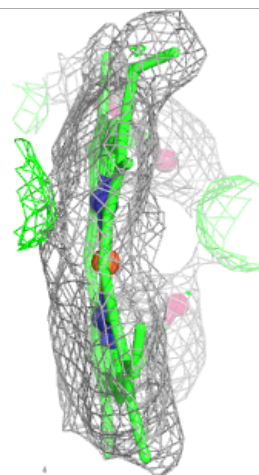
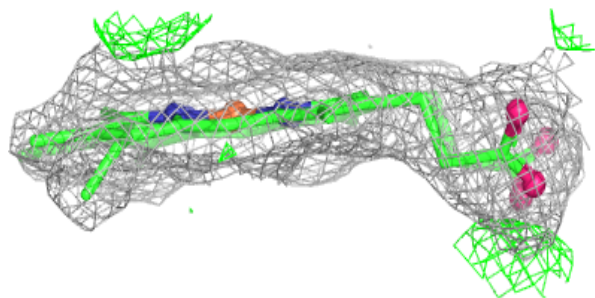
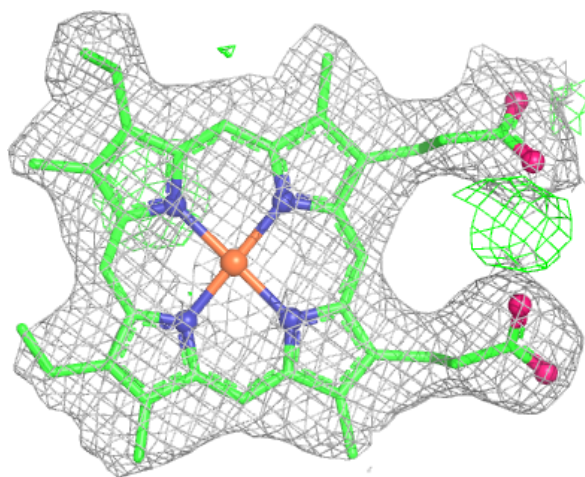
Electron density around NDP A 528:

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



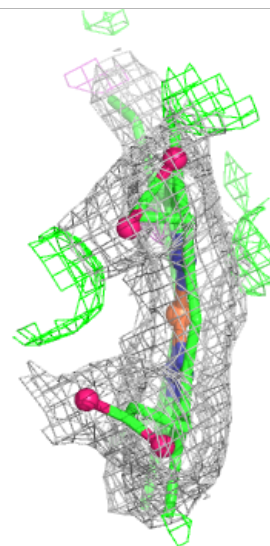
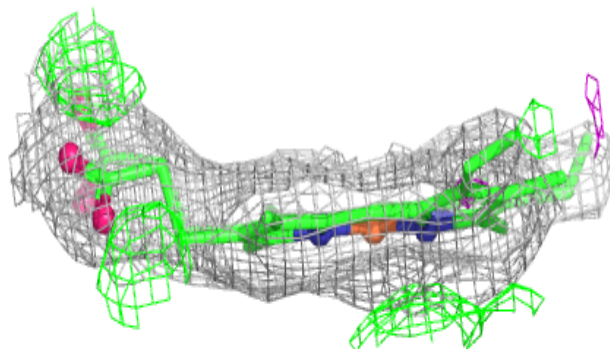
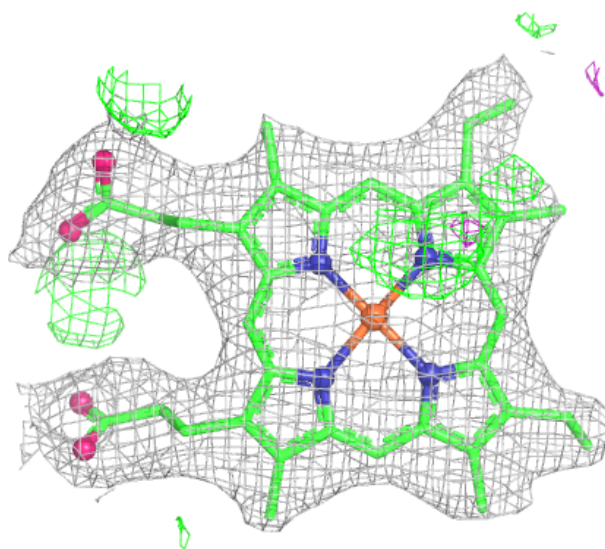
Electron density around HEM C 527:

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



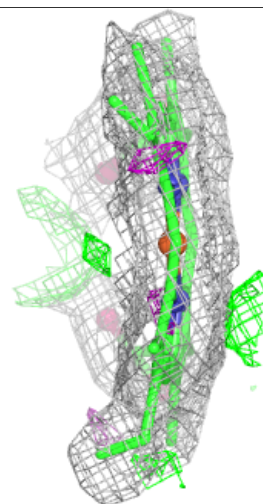
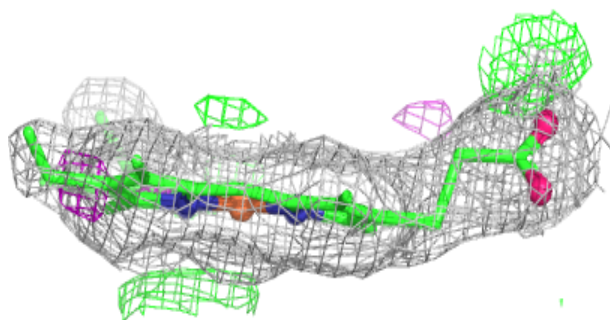
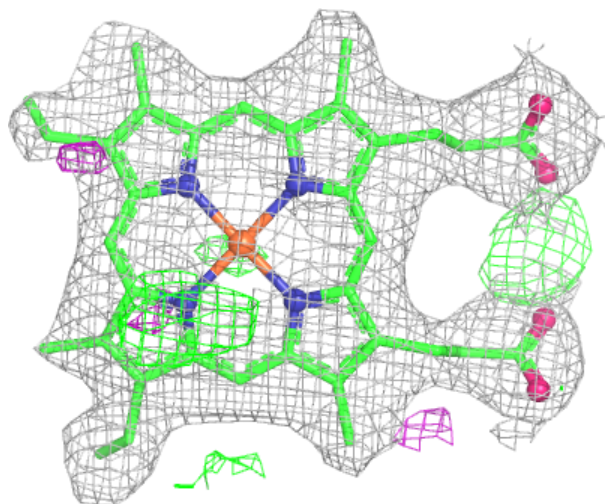
Electron density around HEM D 527:

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



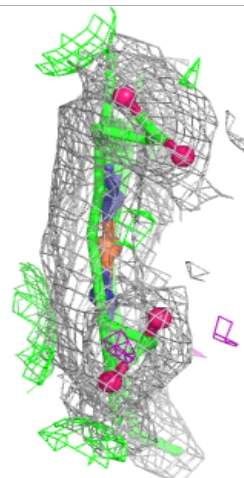
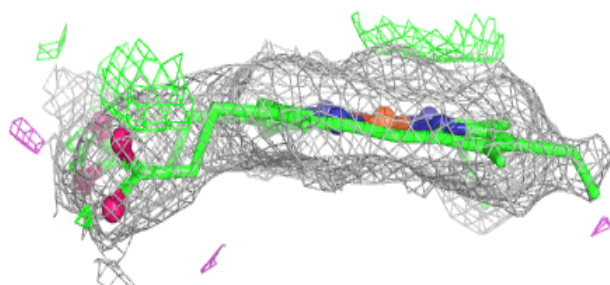
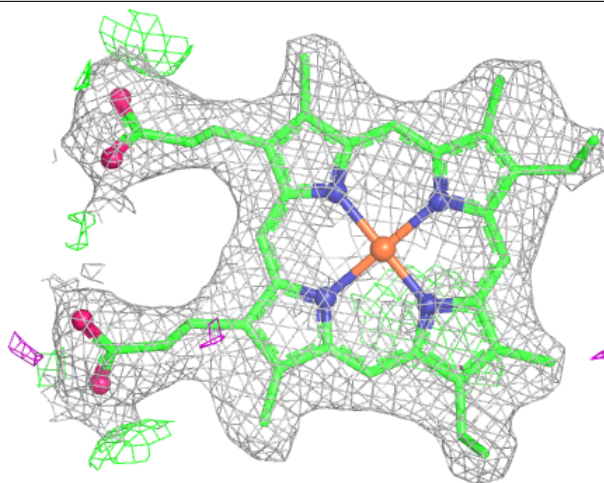
Electron density around HEM A 527:

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



Electron density around HEM B 527:

$2mF_o-DF_c$ (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.