



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 05:03 PM UTC

PDB ID : 4QI7 / pdb_00004qi7
Title : Cellobiose dehydrogenase from *Neurospora crassa*, NcCDH
Authors : Tan, T.C.; Gandini, R.; Sygmund, C.; Kittl, R.; Haltrich, D.; Ludwig, R.;
Hallberg, B.M.; Divne, C.
Deposited on : 2014-05-30
Resolution : 2.90 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

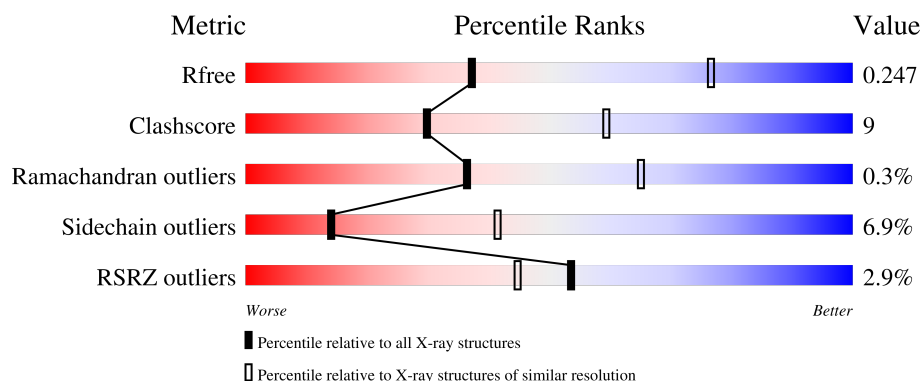
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

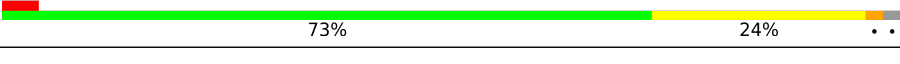
The reported resolution of this entry is 2.90 Å.

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	2481 (2.90-2.90)
Clashscore	190562	2690 (2.90-2.90)
Ramachandran outliers	187476	2623 (2.90-2.90)
Sidechain outliers	187428	2625 (2.90-2.90)
RSRZ outliers	180081	2481 (2.90-2.90)

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	806	 2% 74% 23% .
1	B	806	 4% 73% 24% . .

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 12482 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.

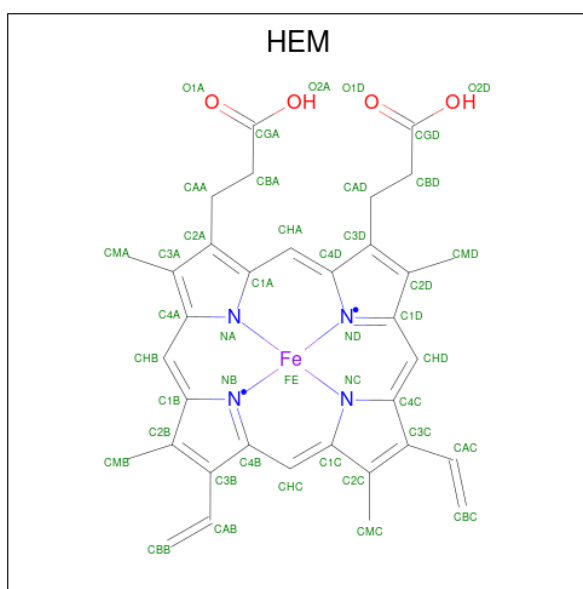
- Molecule 1 is a protein called Cellobiose dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	805	Total	C	N	O	S	0	0	0
			6061	3810	1042	1182	27			
1	B	792	Total	C	N	O	S	0	0	0
			5979	3762	1029	1162	26			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	PCA	-	expression tag	UNP Q7RXM0
B	1	PCA	-	expression tag	UNP Q7RXM0

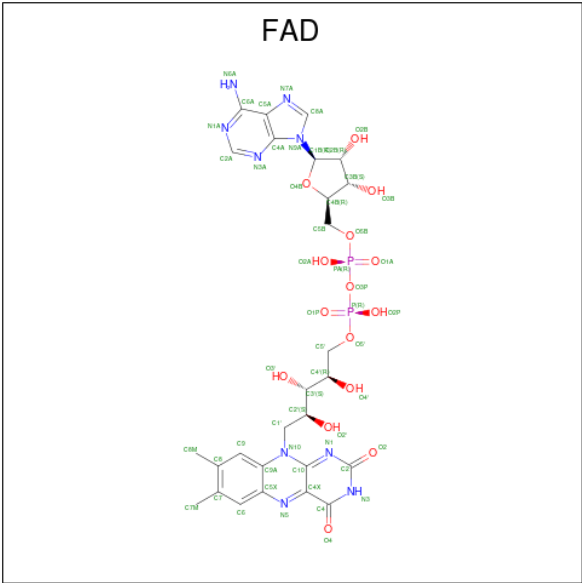
- Molecule 2 is PROTOPORPHYRIN IX CONTAINING FE (CCD ID: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).

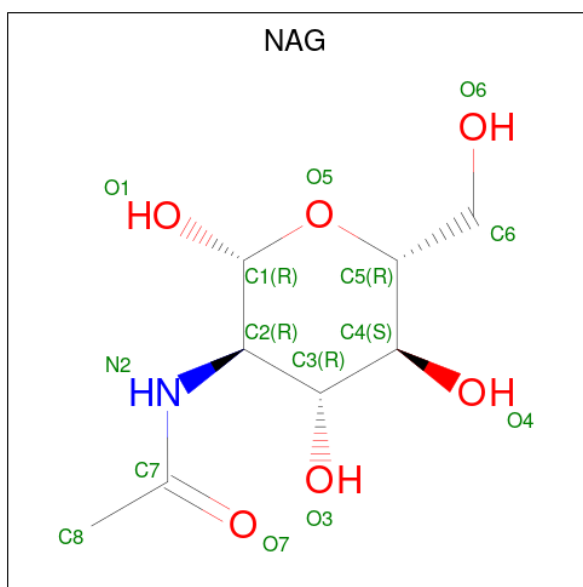


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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

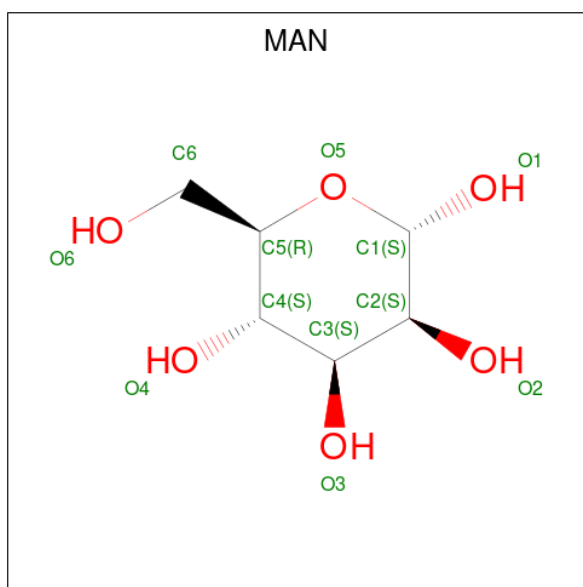
- Molecule 3 is FLAVIN-ADENINE DINUCLEOTIDE (CCD ID: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).





Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			14	8	1	5		
4	A	1	Total	C	N	O	0	0
			14	8	1	5		
4	A	1	Total	C	N	O	0	0
			14	8	1	5		
4	A	1	Total	C	N	O	0	0
			14	8	1	5		
4	A	1	Total	C	N	O	0	0
			14	8	1	5		
4	A	1	Total	C	N	O	0	0
			14	8	1	5		
4	B	1	Total	C	N	O	0	0
			14	8	1	5		
4	B	1	Total	C	N	O	0	0
			14	8	1	5		
4	B	1	Total	C	N	O	0	0
			14	8	1	5		
4	B	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 5 is alpha-D-mannopyranose (CCD ID: MAN) (formula: C₆H₁₂O₆).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			11	6	5		
5	A	1	Total	C	O	0	0
			11	6	5		
5	B	1	Total	C	O	0	0
			11	6	5		
5	B	1	Total	C	O	0	0
			11	6	5		

- Molecule 6 is PLATINUM (II) ION (CCD ID: PT) (formula: Pt).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	12	Total	Pt	0	0
			12	12		
6	B	8	Total	Pt	0	0
			8	8		

- Molecule 7 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	3	Total	Mg	0	0
			3	3		
7	B	1	Total	Mg	0	0
			1	1		

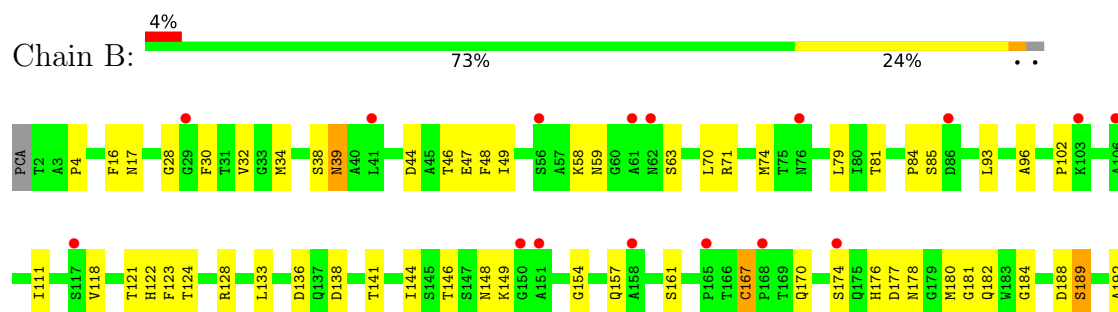
3 Residue-property plots

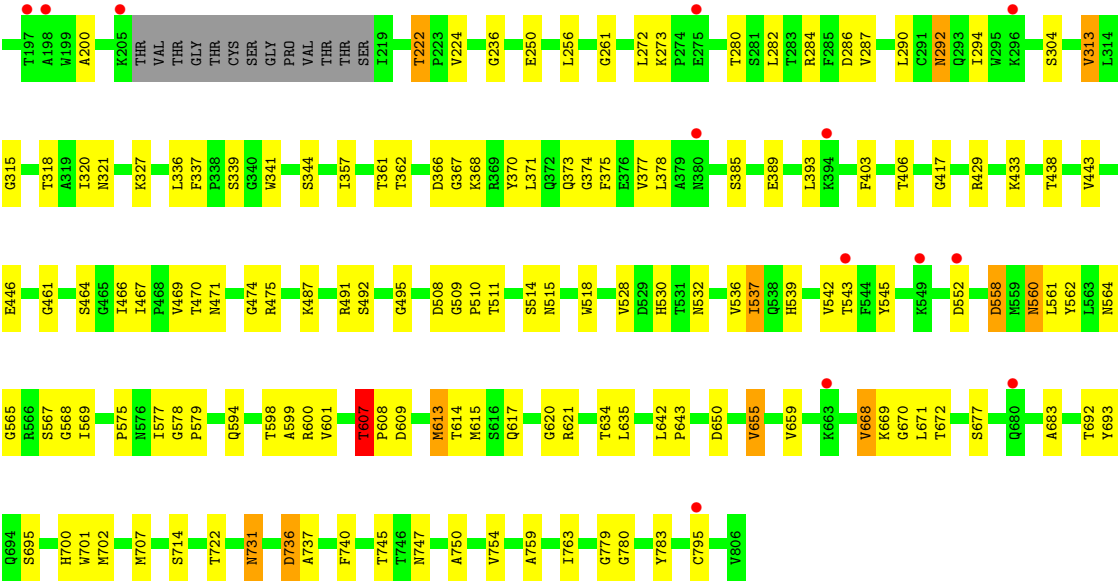
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: Cellobiose dehydrogenase



• Molecule 1: Cellobiose dehydrogenase





4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	133.60Å 141.85Å 147.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	51.04 – 2.90 51.04 – 2.90	Depositor EDS
% Data completeness (in resolution range)	99.9 (51.04-2.90) 99.9 (51.04-2.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.44 (at 2.91Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.3_1477)	Depositor
R, R_{free}	0.185 , 0.235 (Not available) , 0.247	Depositor DCC
R_{free} test set	1995 reflections (3.19%)	wwPDB-VP
Wilson B-factor (Å ²)	71.1	Xtriage
Anisotropy	0.153	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 85.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.068 for -h,l,k	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	12482	wwPDB-VP
Average B, all atoms (Å ²)	77.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.86% 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: HEM, PT, FAD, MG, NAG, MAN

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	0.61	0/6214	1.03	30/8481 (0.4%)
1	B	0.61	1/6130 (0.0%)	1.03	25/8362 (0.3%)
All	All	0.61	1/12344 (0.0%)	1.03	55/16843 (0.3%)

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	A	0	1
1	B	0	1
All	All	0	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	222	THR	C-N	-7.74	1.23	1.33

All (55) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	772	VAL	CA-C-N	8.59	129.11	119.92
1	A	772	VAL	C-N-CA	8.59	129.11	119.92
1	A	148	ASN	N-CA-C	8.32	121.47	111.82
1	A	466	ILE	N-CA-C	7.83	119.15	107.80
1	A	218	SER	N-CA-C	7.76	119.43	110.97
1	B	670	GLY	N-CA-C	-7.12	106.22	114.69
1	B	236	GLY	N-CA-C	7.01	124.31	114.85
1	B	466	ILE	N-CA-C	6.86	118.18	107.28

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	747	ASN	CA-C-N	6.84	126.47	119.56
1	A	747	ASN	C-N-CA	6.84	126.47	119.56
1	A	167	CYS	CA-C-N	6.81	126.61	119.05
1	A	167	CYS	C-N-CA	6.81	126.61	119.05
1	A	417	GLY	CA-C-N	6.71	126.97	119.32
1	A	417	GLY	C-N-CA	6.71	126.97	119.32
1	B	222	THR	O-C-N	-6.54	115.33	121.35
1	A	600	ARG	CA-C-N	-6.42	115.53	122.59
1	A	600	ARG	C-N-CA	-6.42	115.53	122.59
1	B	607	THR	CA-C-N	6.19	126.55	119.92
1	B	607	THR	C-N-CA	6.19	126.55	119.92
1	B	552	ASP	N-CA-C	6.12	117.75	111.14
1	B	495	GLY	CA-C-N	6.06	126.02	119.78
1	B	495	GLY	C-N-CA	6.06	126.02	119.78
1	B	731	ASN	N-CA-C	6.06	120.69	112.88
1	B	368	LYS	N-CA-C	6.05	116.41	107.88
1	A	394	LYS	CA-C-N	-6.03	114.40	122.42
1	A	394	LYS	C-N-CA	-6.03	114.40	122.42
1	A	731	ASN	N-CA-C	6.00	120.30	112.92
1	A	59	ASN	N-CA-C	-5.88	105.69	112.86
1	B	28	GLY	N-CA-C	-5.86	105.24	112.33
1	B	780	GLY	CA-C-N	5.82	125.95	119.32
1	B	780	GLY	C-N-CA	5.82	125.95	119.32
1	A	729	THR	N-CA-C	5.79	118.65	109.50
1	B	336	LEU	N-CA-C	5.77	118.44	111.40
1	B	701	TRP	N-CA-C	5.71	118.75	110.42
1	B	600	ARG	CA-C-N	-5.70	115.67	122.22
1	B	600	ARG	C-N-CA	-5.70	115.67	122.22
1	A	224	VAL	CA-C-N	5.67	126.00	119.93
1	A	224	VAL	C-N-CA	5.67	126.00	119.93
1	B	181	GLY	N-CA-C	5.66	118.61	111.09
1	B	643	PRO	CA-C-O	-5.61	117.06	121.38
1	B	184	GLY	N-CA-C	-5.58	102.27	110.97
1	A	460	ASN	N-CA-C	5.51	117.09	111.14
1	A	690	PRO	CA-C-N	-5.50	116.13	122.95
1	A	690	PRO	C-N-CA	-5.50	116.13	122.95
1	B	138	ASP	CB-CA-C	-5.47	110.25	116.54
1	A	536	VAL	N-CA-C	5.42	115.93	108.12
1	A	217	THR	N-CA-C	5.34	118.96	112.23
1	B	320	ILE	N-CA-C	5.22	118.00	112.83
1	B	668	VAL	N-CA-C	-5.22	101.38	108.06
1	A	140	VAL	N-CA-C	5.19	115.05	107.37

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	170	GLN	N-CA-C	5.18	119.29	112.92
1	A	320	ILE	N-CA-C	5.13	117.91	112.83
1	A	72	GLY	N-CA-C	5.07	120.84	114.25
1	B	609	ASP	N-CA-C	5.06	117.69	111.82
1	A	701	TRP	N-CA-C	5.03	117.63	110.24

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	604	SER	Peptide
1	B	470	THR	Peptide

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	6061	0	5828	103	0
1	B	5979	0	5749	103	0
2	A	43	0	30	6	0
2	B	43	0	30	9	0
3	A	53	0	31	5	0
3	B	53	0	31	3	0
4	A	98	0	91	5	0
4	B	84	0	78	0	0
5	A	22	0	20	0	0
5	B	22	0	20	0	0
6	A	12	0	0	0	0
6	B	8	0	0	0	0
7	A	3	0	0	0	0
7	B	1	0	0	0	0
All	All	12482	0	11908	208	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 9.

All (208) 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:4:PRO:HB2	1:B:17:ASN:HD22	1.41	0.83
1:B:176:HIS:CE1	2:B:901:HEM:NA	2.48	0.81
1:A:101:MET:HE1	1:A:173:LEU:H	1.46	0.78
1:A:79:LEU:HD22	2:A:901:HEM:HAC	1.67	0.76
1:A:63:SER:HA	1:A:161:SER:HB3	1.67	0.76
1:B:133:LEU:HD22	1:B:144:ILE:HD11	1.68	0.73
1:A:176:HIS:CD2	1:A:176:HIS:H	2.06	0.73
1:B:374:GLY:HA3	1:B:613:MET:HE1	1.70	0.72
1:B:601:VAL:HG12	1:B:613:MET:HE2	1.72	0.71
1:B:176:HIS:CD2	2:B:901:HEM:NC	2.58	0.71
1:B:491:ARG:HD3	1:B:635:LEU:HD13	1.72	0.70
1:B:287:VAL:HB	1:B:290:LEU:HD12	1.72	0.70
1:A:265:THR:HA	1:A:283:THR:HG21	1.75	0.68
1:B:469:VAL:HB	1:B:474:GLY:HA3	1.75	0.67
1:A:35:ALA:HB3	1:A:49:ILE:HB	1.77	0.67
1:B:692:THR:HG23	1:B:695:SER:H	1.60	0.66
1:B:47:GLU:OE2	1:B:128:ARG:NE	2.27	0.66
1:B:96:ALA:HB2	1:B:102:PRO:HB3	1.78	0.65
1:B:44:ASP:HA	1:B:146:THR:HG22	1.78	0.65
1:B:594:GLN:HG2	1:B:745:THR:HG23	1.78	0.65
1:A:601:VAL:HG12	1:A:613:MET:HG2	1.79	0.64
1:B:39:ASN:N	1:B:39:ASN:OD1	2.30	0.64
1:A:117:SER:HB2	1:A:124:THR:HB	1.80	0.63
1:A:575:PRO:HB3	1:A:602:GLU:OE2	1.98	0.63
1:A:96:ALA:HB2	1:A:102:PRO:HB3	1.81	0.63
2:A:901:HEM:HBA2	2:A:901:HEM:HMA2	1.81	0.63
1:B:128:ARG:HD2	1:B:200:ALA:HB1	1.83	0.61
1:B:177:ASP:OD1	1:B:178:ASN:N	2.34	0.61
1:A:41:LEU:HD22	1:A:149:LYS:HD3	1.84	0.60
1:A:450:ILE:O	1:A:731:ASN:ND2	2.35	0.60
1:A:491:ARG:HD3	1:A:635:LEU:HD13	1.85	0.58
1:B:63:SER:HA	1:B:161:SER:HB3	1.84	0.58
1:B:121:THR:HG22	1:B:122:HIS:CE1	2.38	0.58
1:B:136:ASP:OD1	1:B:141:THR:HA	2.03	0.58
1:B:250:GLU:HG2	1:B:429:ARG:NH2	2.17	0.58
4:A:904:NAG:H82	1:B:461:GLY:HA3	1.86	0.58
1:B:594:GLN:OE1	1:B:621:ARG:NH2	2.36	0.58
1:A:157:GLN:HB3	1:A:178:ASN:HB3	1.86	0.57
1:B:373:GLN:HB2	1:B:543:THR:HG22	1.85	0.57
1:B:46:THR:HG23	1:B:47:GLU:HB3	1.85	0.57
1:A:536:VAL:HB	1:A:674:ALA:HB3	1.87	0.57
1:B:389:GLU:HB2	1:B:403:PHE:CZ	2.40	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:81:THR:HG22	1:A:92:ASN:O	2.05	0.57
1:B:375:PHE:CE1	1:B:579:PRO:HB3	2.40	0.56
1:B:71:ARG:HD3	1:B:144:ILE:HG22	1.88	0.56
1:B:366:ASP:OD1	1:B:367:GLY:N	2.37	0.56
1:A:327:LYS:HG3	1:A:354:LEU:HD11	1.88	0.55
1:A:224:VAL:HG23	1:A:464:SER:O	2.07	0.55
1:A:469:VAL:HB	1:A:474:GLY:HA3	1.89	0.55
1:B:545:TYR:CE1	1:B:569:ILE:HG21	2.41	0.55
1:B:564:ASN:OD1	1:B:565:GLY:N	2.39	0.55
1:A:676:PRO:HB3	1:A:685:PHE:HB2	1.88	0.55
1:A:148:ASN:N	1:A:149:LYS:HA	2.22	0.55
1:B:642:LEU:HD21	1:B:693:TYR:HB3	1.88	0.55
1:A:283:THR:HG23	1:A:285:PHE:H	1.72	0.54
4:A:906:NAG:O7	4:A:906:NAG:O3	2.24	0.54
1:A:109:ALA:HB1	1:A:132:CYS:SG	2.48	0.54
1:A:542:VAL:HB	1:A:611:TYR:HA	1.89	0.54
1:A:752:ILE:HD13	3:A:902:FAD:H5'2	1.90	0.54
1:A:176:HIS:HE1	2:A:901:HEM:C4D	2.26	0.53
1:B:702:MET:HG2	1:B:737:ALA:HB1	1.90	0.53
1:A:321:ASN:HB2	3:A:902:FAD:N5	2.24	0.53
1:A:747:ASN:HB3	3:A:902:FAD:C2	2.38	0.53
1:A:726:VAL:O	1:A:729:THR:OG1	2.23	0.52
1:B:287:VAL:HG22	1:B:562:TYR:HE2	1.74	0.52
1:A:692:THR:HG22	1:A:695:SER:HB2	1.91	0.52
1:B:537:ILE:HD12	1:B:671:LEU:HD11	1.92	0.52
1:B:558:ASP:OD1	1:B:558:ASP:N	2.35	0.52
1:B:38:SER:HA	1:B:192:ALA:HB1	1.92	0.52
1:A:693:TYR:O	1:A:697:ARG:HB3	2.10	0.51
1:A:44:ASP:OD1	1:A:145:SER:OG	2.28	0.51
1:B:315:GLY:O	1:B:318:THR:OG1	2.29	0.51
1:B:47:GLU:HG2	1:B:48:PHE:N	2.25	0.51
1:B:575:PRO:O	1:B:577:ILE:HG13	2.10	0.51
1:A:17:ASN:O	1:A:33:GLY:HA2	2.11	0.51
1:A:89:VAL:O	1:A:113:GLN:NE2	2.39	0.51
1:A:229:SER:OG	1:A:470:THR:HG22	2.11	0.51
1:B:371:LEU:HD11	1:B:545:TYR:HD1	1.76	0.51
1:B:93:LEU:HD11	1:B:111:ILE:HG13	1.93	0.50
1:A:654:VAL:HG12	1:A:686:VAL:HG21	1.93	0.50
1:A:721:ASP:HB3	1:A:727:TYR:CZ	2.47	0.50
1:B:601:VAL:HG23	1:B:601:VAL:O	2.11	0.50
1:B:321:ASN:HB2	3:B:902:FAD:C4X	2.42	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:406:THR:OG1	1:B:577:ILE:O	2.22	0.50
1:A:544:PHE:HB2	1:A:610:GLY:HA2	1.93	0.50
1:A:72:GLY:HA2	1:A:154:GLY:H	1.77	0.50
1:B:79:LEU:HD22	2:B:901:HEM:HAC	1.93	0.49
1:A:321:ASN:HB2	3:A:902:FAD:C4X	2.42	0.49
1:A:642:LEU:O	1:A:646:LYS:HE3	2.13	0.49
1:B:515:ASN:HA	1:B:518:TRP:CD1	2.48	0.49
1:B:81:THR:HG22	2:B:901:HEM:HBC2	1.95	0.49
1:A:293:GLN:HE22	1:A:296:LYS:HD3	1.78	0.49
1:A:700:HIS:O	1:A:702:MET:HG3	2.13	0.49
1:A:262:PHE:HZ	1:A:301:ILE:HD13	1.76	0.48
1:B:273:LYS:HD3	1:B:282:LEU:O	2.12	0.48
1:B:562:TYR:HA	1:B:567:SER:H	1.76	0.48
1:A:22:SER:OG	1:A:25:GLN:HG3	2.13	0.48
1:A:747:ASN:HB3	3:A:902:FAD:O2	2.14	0.48
1:B:747:ASN:HB3	3:B:902:FAD:C2	2.44	0.48
1:B:272:LEU:O	1:B:284:ARG:HG2	2.14	0.48
1:B:341:TRP:CD2	1:B:707:MET:HE1	2.47	0.48
1:A:72:GLY:HA2	1:A:154:GLY:N	2.29	0.48
1:A:601:VAL:HG23	1:A:601:VAL:O	2.14	0.47
1:B:44:ASP:HA	1:B:146:THR:CG2	2.44	0.47
1:B:341:TRP:CG	1:B:707:MET:HE1	2.49	0.47
1:A:128:ARG:CZ	1:A:130:GLN:HE21	2.27	0.47
1:A:47:GLU:OE1	1:A:196:TYR:OH	2.30	0.47
1:B:327:LYS:HB2	1:B:393:LEU:O	2.14	0.47
1:A:797:LYS:HB2	1:A:803:TRP:CE2	2.50	0.47
1:B:74:MET:HB2	2:B:901:HEM:C1D	2.49	0.47
1:B:167:CYS:HB3	1:B:170:GLN:HB2	1.97	0.47
1:B:176:HIS:CE1	2:B:901:HEM:C1A	3.03	0.47
1:B:375:PHE:HE1	1:B:579:PRO:HB3	1.79	0.47
1:A:293:GLN:HG3	1:A:551:TRP:CE3	2.50	0.46
1:A:19:TRP:CE2	1:A:185:ALA:HB1	2.49	0.46
1:B:224:VAL:HG23	1:B:464:SER:O	2.15	0.46
1:B:491:ARG:HD2	1:B:508:ASP:OD2	2.16	0.46
1:B:176:HIS:CD2	2:B:901:HEM:C1C	3.04	0.46
1:B:578:GLY:N	1:B:599:ALA:O	2.49	0.46
1:B:759:ALA:O	1:B:763:ILE:HG13	2.15	0.46
1:A:122:HIS:HD2	4:A:903:NAG:H5	1.81	0.46
1:B:750:ALA:O	1:B:754:VAL:HG23	2.16	0.46
1:B:337:PHE:HD2	1:B:707:MET:HE2	1.81	0.46
1:A:287:VAL:HB	1:A:290:LEU:HD12	1.98	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:176:HIS:CE1	2:A:901:HEM:C4D	3.04	0.45
1:A:659:VAL:HG12	1:A:663:LYS:HE2	1.99	0.45
1:A:272:LEU:O	1:A:284:ARG:HG2	2.16	0.45
1:A:668:VAL:HG12	1:A:671:LEU:HB2	1.98	0.45
1:A:176:HIS:CD2	2:A:901:HEM:NC	2.84	0.45
1:A:238:GLY:H	1:A:242:ILE:HD12	1.81	0.45
1:B:154:GLY:HA2	1:B:182:GLN:HA	1.99	0.45
1:A:287:VAL:HG22	1:A:562:TYR:HE2	1.81	0.45
1:B:378:LEU:HD21	1:B:537:ILE:CD1	2.46	0.45
1:A:676:PRO:HB3	1:A:685:PHE:CB	2.46	0.45
1:B:560:ASN:O	1:B:564:ASN:ND2	2.50	0.45
1:A:441:LYS:HD2	1:A:456:GLU:CD	2.42	0.45
1:B:357:ILE:HD13	1:B:417:GLY:HA2	1.99	0.44
1:B:370:TYR:CE2	1:B:568:GLY:HA2	2.52	0.44
1:A:138:ASP:HB3	1:A:139:GLY:H	1.67	0.44
1:B:528:VAL:HG12	1:B:702:MET:O	2.18	0.44
1:A:363:PRO:HB2	1:A:571:ALA:O	2.18	0.44
1:B:30:PHE:HB2	1:B:157:GLN:NE2	2.31	0.44
1:B:509:GLY:N	1:B:510:PRO:HD2	2.32	0.44
1:A:705:ASN:HB3	1:A:719:VAL:HG11	1.99	0.43
1:B:176:HIS:HE1	2:B:901:HEM:C1A	2.35	0.43
1:B:558:ASP:HA	1:B:561:LEU:HB3	1.99	0.43
1:A:73:ALA:O	1:A:77:ASN:ND2	2.48	0.43
1:A:615:MET:HB2	1:A:615:MET:HE3	1.76	0.43
1:B:779:GLY:HA2	1:B:783:TYR:CD2	2.53	0.43
1:A:338:PRO:HD2	1:A:707:MET:HE3	1.99	0.43
1:B:530:HIS:CD2	1:B:620:GLY:HA2	2.53	0.43
1:B:539:HIS:HB3	1:B:542:VAL:HG23	2.01	0.43
1:A:538:GLN:HG3	1:A:672:THR:HB	2.01	0.43
1:B:84:PRO:HD3	1:B:123:PHE:CZ	2.53	0.43
1:B:487:LYS:O	1:B:491:ARG:HG3	2.18	0.43
1:B:443:VAL:HG22	1:B:492:SER:OG	2.19	0.43
1:A:14:ILE:HG23	1:A:199:TRP:CE3	2.53	0.43
1:A:491:ARG:HD2	1:A:508:ASP:OD1	2.18	0.43
1:A:606:GLU:HB2	1:A:675:TYR:OH	2.19	0.43
1:A:409:MET:O	1:A:416:GLY:HA3	2.19	0.42
1:B:148:ASN:O	1:B:149:LYS:HG2	2.18	0.42
1:A:446:GLU:OE2	1:A:794:LYS:NZ	2.45	0.42
1:A:647:ASP:HA	1:A:648:PRO:HD2	1.79	0.42
1:A:273:LYS:HE2	1:A:282:LEU:O	2.19	0.42
1:B:136:ASP:CG	1:B:141:THR:HA	2.44	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:9:HIS:HA	1:A:10:PRO:HD3	1.91	0.42
1:A:594:GLN:HG2	1:A:745:THR:HG23	2.00	0.42
1:B:256:LEU:HD12	1:B:433:LYS:O	2.19	0.42
1:A:651:LYS:O	1:A:655:VAL:HG23	2.18	0.42
1:A:669:LYS:HG2	4:A:908:NAG:H83	2.01	0.42
1:A:779:GLY:HA2	1:A:783:TYR:CD2	2.54	0.42
1:B:16:PHE:HE2	1:B:49:ILE:HG22	1.85	0.42
1:B:176:HIS:HD2	2:B:901:HEM:C1C	2.38	0.42
1:A:177:ASP:OD1	1:A:177:ASP:N	2.52	0.42
1:A:238:GLY:N	1:A:242:ILE:HD12	2.34	0.42
1:A:290:LEU:HD22	1:A:551:TRP:HE3	1.84	0.42
1:A:337:PHE:O	1:A:342:LYS:HE2	2.19	0.42
1:A:623:ALA:O	1:A:626:ARG:NH2	2.53	0.42
1:B:188:ASP:OD1	1:B:189:SER:N	2.49	0.42
1:B:261:GLY:HA3	1:B:313:VAL:HA	2.01	0.42
1:B:607:THR:HA	1:B:608:PRO:HD3	1.84	0.42
1:A:705:ASN:O	1:A:739:ILE:HA	2.20	0.41
1:B:70:LEU:HA	1:B:70:LEU:HD23	1.74	0.41
1:B:292:ASN:OD1	1:B:575:PRO:HD3	2.20	0.41
1:A:285:PHE:HZ	1:A:301:ILE:HD12	1.85	0.41
1:A:247:LYS:HA	1:A:247:LYS:HD2	1.90	0.41
1:A:264:SER:OG	1:A:265:THR:N	2.54	0.41
1:A:122:HIS:CD2	4:A:903:NAG:H5	2.55	0.41
1:B:475:ARG:HA	1:B:731:ASN:HB2	2.03	0.41
1:A:575:PRO:HG2	1:A:602:GLU:HG3	2.02	0.41
1:B:272:LEU:HD23	1:B:272:LEU:HA	1.71	0.41
1:B:736:ASP:HB2	3:B:902:FAD:O2P	2.20	0.41
1:A:42:THR:OG1	1:A:43:THR:N	2.54	0.41
1:A:545:TYR:CE1	1:A:569:ILE:HD13	2.56	0.41
1:B:702:MET:HE2	1:B:740:PHE:CG	2.56	0.41
1:A:489:LEU:HD12	1:A:705:ASN:ND2	2.36	0.41
1:B:58:LYS:HE2	1:B:59:ASN:OD1	2.21	0.41
1:B:655:VAL:HG11	1:B:683:ALA:HA	2.03	0.41
1:A:421:THR:OG1	1:A:422:TYR:N	2.53	0.40
1:A:546:ASP:O	1:A:547:PHE:HB2	2.20	0.40
1:B:542:VAL:HG22	1:B:613:MET:HE3	2.03	0.40
1:B:599:ALA:HA	1:B:614:THR:O	2.21	0.40
1:B:700:HIS:O	1:B:702:MET:HG3	2.21	0.40
1:A:58:LYS:HA	1:A:58:LYS:HD2	1.86	0.40
1:A:74:MET:HB2	2:A:901:HEM:C1D	2.56	0.40
1:A:441:LYS:HE2	1:A:441:LYS:HB3	1.71	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:532:ASN:HA	1:B:617:GLN:O	2.22	0.40
1:A:799:ASN:HB2	1:A:801:TRP:H	1.87	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	803/806 (100%)	766 (95%)	35 (4%)	2 (0%)	43	72
1	B	788/806 (98%)	752 (95%)	34 (4%)	2 (0%)	36	65
All	All	1591/1612 (99%)	1518 (95%)	69 (4%)	4 (0%)	36	65

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	471	ASN
1	A	605	PHE
1	B	736	ASP
1	A	219	ILE

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.

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	643/643 (100%)	602 (94%)	41 (6%)	16	44
1	B	632/643 (98%)	585 (93%)	47 (7%)	13	38
All	All	1275/1286 (99%)	1187 (93%)	88 (7%)	14	41

All (88) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	58	LYS
1	A	112	THR
1	A	169	THR
1	A	176	HIS
1	A	177	ASP
1	A	189	SER
1	A	222	THR
1	A	242	ILE
1	A	280	THR
1	A	292	ASN
1	A	320	ILE
1	A	356	ARG
1	A	361	THR
1	A	364	SER
1	A	368	LYS
1	A	414	GLU
1	A	430	SER
1	A	431	ASN
1	A	453	VAL
1	A	466	ILE
1	A	467	ILE
1	A	511	THR
1	A	533	THR
1	A	536	VAL
1	A	538	GLN
1	A	543	THR
1	A	553	ASN
1	A	581	PHE
1	A	598	THR
1	A	605	PHE
1	A	614	THR
1	A	626	ARG

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Mol	Chain	Res	Type
1	A	668	VAL
1	A	686	VAL
1	A	691	VAL
1	A	709	THR
1	A	722	THR
1	A	743	VAL
1	A	782	THR
1	A	784	THR
1	A	795	CYS
1	B	32	VAL
1	B	34	MET
1	B	39	ASN
1	B	85	SER
1	B	118	VAL
1	B	124	THR
1	B	167	CYS
1	B	174	SER
1	B	180	MET
1	B	189	SER
1	B	222	THR
1	B	280	THR
1	B	286	ASP
1	B	292	ASN
1	B	294	ILE
1	B	304	SER
1	B	313	VAL
1	B	339	SER
1	B	344	SER
1	B	361	THR
1	B	362	THR
1	B	377	VAL
1	B	385	SER
1	B	438	THR
1	B	446	GLU
1	B	467	ILE
1	B	511	THR
1	B	514	SER
1	B	536	VAL
1	B	537	ILE
1	B	558	ASP
1	B	560	ASN
1	B	598	THR

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Mol	Chain	Res	Type
1	B	607	THR
1	B	613	MET
1	B	615	MET
1	B	634	THR
1	B	650	ASP
1	B	655	VAL
1	B	659	VAL
1	B	668	VAL
1	B	669	LYS
1	B	672	THR
1	B	677	SER
1	B	714	SER
1	B	722	THR
1	B	795	CYS

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	76	ASN
1	A	122	HIS
1	A	130	GLN
1	A	148	ASN
1	A	152	GLN
1	A	170	GLN
1	A	405	HIS
1	A	437	ASN
1	A	532	ASN
1	A	540	ASN
1	A	699	ASN
1	B	17	ASN
1	B	76	ASN
1	B	308	GLN
1	B	321	ASN
1	B	398	GLN
1	B	437	ASN
1	B	449	HIS
1	B	532	ASN
1	B	538	GLN
1	B	656	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 45 ligands modelled in this entry, 24 are monoatomic - leaving 21 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
4	NAG	A	907	1	14,14,15	0.26	0	17,19,21	0.85	1 (5%)
4	NAG	B	904	1	14,14,15	0.42	0	17,19,21	0.65	0
4	NAG	B	903	1	14,14,15	0.22	0	17,19,21	0.70	0
3	FAD	B	902	-	58,58,58	1.12	6 (10%)	85,89,89	1.73	21 (24%)
4	NAG	B	907	1	14,14,15	0.56	0	17,19,21	0.65	0
4	NAG	A	908	1	14,14,15	0.40	0	17,19,21	0.72	1 (5%)
4	NAG	A	906	1	14,14,15	0.87	1 (7%)	17,19,21	1.51	1 (5%)
4	NAG	A	905	1	14,14,15	0.30	0	17,19,21	0.55	0
4	NAG	B	908	1	14,14,15	0.68	1 (7%)	17,19,21	0.60	0
4	NAG	A	909	1	14,14,15	0.29	0	17,19,21	0.52	0
5	MAN	A	910	1	11,11,12	1.08	0	15,15,17	1.30	3 (20%)
5	MAN	B	909	1	11,11,12	1.95	2 (18%)	15,15,17	0.96	0
4	NAG	B	906	1	14,14,15	0.22	0	17,19,21	0.74	1 (5%)
4	NAG	A	904	1	14,14,15	0.35	0	17,19,21	0.60	0
4	NAG	B	905	1	14,14,15	0.37	0	17,19,21	0.48	0
4	NAG	A	903	1	14,14,15	0.33	0	17,19,21	0.34	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	MAN	A	911	1	11,11,12	1.89	3 (27%)	15,15,17	0.92	0
2	HEM	A	901	1	50,50,50	2.82	25 (50%)	67,82,82	3.49	38 (56%)
2	HEM	B	901	1	50,50,50	2.90	23 (46%)	67,82,82	3.28	33 (49%)
5	MAN	B	910	1	11,11,12	2.38	6 (54%)	15,15,17	1.12	1 (6%)
3	FAD	A	902	-	58,58,58	1.14	6 (10%)	85,89,89	1.75	20 (23%)

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	NAG	A	907	1	-	2/6/23/26	0/1/1/1
4	NAG	B	904	1	-	1/6/23/26	0/1/1/1
4	NAG	B	903	1	-	0/6/23/26	0/1/1/1
3	FAD	B	902	-	-	3/34/50/50	0/6/6/6
4	NAG	B	907	1	-	0/6/23/26	0/1/1/1
4	NAG	A	908	1	-	2/6/23/26	0/1/1/1
4	NAG	A	906	1	-	4/6/23/26	0/1/1/1
4	NAG	A	905	1	-	0/6/23/26	0/1/1/1
4	NAG	B	908	1	-	0/6/23/26	0/1/1/1
4	NAG	A	909	1	-	0/6/23/26	0/1/1/1
5	MAN	A	910	1	-	2/2/19/22	0/1/1/1
5	MAN	B	909	1	-	2/2/19/22	0/1/1/1
4	NAG	B	906	1	-	0/6/23/26	0/1/1/1
4	NAG	A	904	1	-	4/6/23/26	0/1/1/1
4	NAG	B	905	1	-	2/6/23/26	0/1/1/1
4	NAG	A	903	1	-	2/6/23/26	0/1/1/1
5	MAN	A	911	1	-	2/2/19/22	0/1/1/1
2	HEM	A	901	1	-	7/14/54/54	-
2	HEM	B	901	1	-	2/14/54/54	-
5	MAN	B	910	1	-	2/2/19/22	0/1/1/1
3	FAD	A	902	-	-	6/34/50/50	0/6/6/6

All (73) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	901	HEM	FE-NB	6.72	2.15	1.94

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	901	HEM	FE-ND	6.52	2.15	1.94
2	A	901	HEM	FE-ND	5.77	2.12	1.94
2	B	901	HEM	C3C-C2C	5.69	1.48	1.37
2	A	901	HEM	C4C-NC	5.39	1.49	1.39
2	A	901	HEM	FE-NB	5.38	2.11	1.94
2	B	901	HEM	C1A-NA	5.17	1.49	1.39
2	B	901	HEM	C4A-NA	5.12	1.49	1.39
5	B	910	MAN	C2-C3	4.91	1.60	1.52
2	A	901	HEM	C1A-NA	4.82	1.48	1.39
2	A	901	HEM	C3C-C2C	4.79	1.46	1.37
2	B	901	HEM	C1C-NC	4.76	1.48	1.39
2	B	901	HEM	C3B-C2B	4.57	1.46	1.37
2	B	901	HEM	C3D-C2D	4.55	1.46	1.36
5	B	909	MAN	C1-C2	4.43	1.62	1.52
2	A	901	HEM	CHC-C1C	4.42	1.47	1.38
2	A	901	HEM	C3B-C2B	4.37	1.46	1.37
2	B	901	HEM	CHD-C4C	4.32	1.46	1.38
2	A	901	HEM	FE-NC	-4.25	1.81	1.95
2	A	901	HEM	C1C-NC	4.23	1.47	1.39
2	A	901	HEM	C3D-C2D	4.21	1.45	1.36
2	A	901	HEM	C4A-NA	4.14	1.47	1.39
2	B	901	HEM	CHC-C1C	4.12	1.46	1.38
2	B	901	HEM	C4C-NC	4.11	1.47	1.39
2	A	901	HEM	CHD-C4C	4.05	1.46	1.38
2	B	901	HEM	CHA-C4D	3.88	1.46	1.38
5	B	909	MAN	O2-C2	3.88	1.51	1.43
2	A	901	HEM	CHA-C4D	3.71	1.45	1.38
2	A	901	HEM	C2A-C3A	3.59	1.48	1.38
5	A	911	MAN	C2-C3	3.54	1.57	1.52
2	A	901	HEM	CHC-C4B	3.40	1.46	1.39
3	A	902	FAD	C4X-N5	3.33	1.38	1.30
2	B	901	HEM	C2A-C3A	3.33	1.47	1.38
5	B	910	MAN	C4-C5	3.31	1.60	1.53
3	B	902	FAD	C4X-N5	3.23	1.37	1.30
2	B	901	HEM	CHC-C4B	3.21	1.46	1.39
2	B	901	HEM	CHA-C1A	3.15	1.46	1.39
2	A	901	HEM	CHA-C1A	3.09	1.46	1.39
2	B	901	HEM	CHB-C4A	3.04	1.46	1.39
3	A	902	FAD	C2A-N3A	2.86	1.39	1.33
2	A	901	HEM	CHD-C1D	2.85	1.45	1.39
2	B	901	HEM	CHB-C1B	2.79	1.44	1.38
5	B	910	MAN	C4-C3	2.78	1.59	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	901	HEM	CHB-C4A	2.78	1.45	1.39
2	A	901	HEM	C1A-C2A	2.77	1.50	1.44
2	A	901	HEM	CHB-C1B	2.75	1.44	1.38
3	B	902	FAD	C2A-N1A	2.69	1.38	1.33
2	B	901	HEM	CHD-C1D	2.69	1.45	1.39
5	B	910	MAN	C1-C2	2.68	1.58	1.52
5	A	911	MAN	C4-C3	2.67	1.59	1.52
2	B	901	HEM	C4D-C3D	2.66	1.49	1.45
2	B	901	HEM	C4A-C3A	2.64	1.49	1.43
2	B	901	HEM	C1A-C2A	2.62	1.49	1.44
2	A	901	HEM	C1B-NB	-2.58	1.35	1.40
3	A	902	FAD	C2A-N1A	2.56	1.38	1.33
4	A	906	NAG	O5-C1	2.54	1.48	1.43
2	A	901	HEM	C4D-ND	-2.50	1.35	1.40
2	A	901	HEM	C1C-C2C	2.47	1.50	1.45
2	A	901	HEM	C4A-C3A	2.45	1.48	1.43
5	B	910	MAN	O5-C5	2.39	1.48	1.43
4	B	908	NAG	C1-C2	2.39	1.55	1.52
3	A	902	FAD	C10-N1	2.30	1.37	1.33
3	B	902	FAD	C2A-N3A	2.29	1.38	1.33
3	A	902	FAD	C5A-N7A	-2.26	1.35	1.39
5	B	910	MAN	O3-C3	2.25	1.48	1.43
2	B	901	HEM	C4D-ND	-2.23	1.36	1.40
3	B	902	FAD	C10-N1	2.22	1.37	1.33
3	B	902	FAD	C8A-N7A	2.18	1.35	1.31
3	B	902	FAD	C5A-N7A	-2.17	1.35	1.39
3	A	902	FAD	C8A-N7A	2.16	1.35	1.31
2	A	901	HEM	C4D-C3D	2.07	1.48	1.45
5	A	911	MAN	O2-C2	2.06	1.47	1.43
2	B	901	HEM	C1B-C2B	2.02	1.48	1.44

All (120) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	901	HEM	C3B-C2B-C1B	-9.38	99.36	106.41
2	B	901	HEM	C3B-C4B-NB	9.05	115.97	109.47
2	A	901	HEM	C2B-C1B-NB	8.71	119.85	109.84
2	B	901	HEM	C3B-C2B-C1B	-8.67	99.90	106.41
2	B	901	HEM	C2B-C1B-NB	8.56	119.68	109.84
2	A	901	HEM	C3B-C4B-NB	8.15	115.32	109.47
2	A	901	HEM	C2D-C1D-ND	7.90	119.04	109.90
2	B	901	HEM	C2D-C1D-ND	7.90	119.04	109.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	901	HEM	C3D-C4D-ND	7.38	118.26	110.17
2	A	901	HEM	C2A-C1A-NA	7.36	118.31	110.15
2	B	901	HEM	C3D-C4D-ND	6.58	117.38	110.17
2	A	901	HEM	C4A-NA-C1A	-6.06	95.94	105.82
2	B	901	HEM	C2A-C1A-NA	5.93	116.73	110.15
2	B	901	HEM	C4A-NA-C1A	-5.59	96.71	105.82
2	B	901	HEM	C1D-C2D-C3D	-5.32	101.39	106.98
4	A	906	NAG	C1-O5-C5	5.28	119.27	112.19
3	A	902	FAD	C5A-C4A-N3A	-5.25	119.49	126.72
2	A	901	HEM	C4D-ND-C1D	-5.23	99.01	105.21
2	A	901	HEM	C1D-C2D-C3D	-5.16	101.55	106.98
3	B	902	FAD	C5A-C4A-N3A	-5.10	119.69	126.72
2	A	901	HEM	C4C-NC-C1C	-5.09	97.53	105.82
3	B	902	FAD	N3A-C2A-N1A	-4.94	121.11	128.58
2	B	901	HEM	C4D-ND-C1D	-4.80	99.52	105.21
2	B	901	HEM	C1B-NB-C4B	-4.66	99.69	105.21
2	A	901	HEM	C3A-C4A-NA	4.65	117.60	110.14
3	A	902	FAD	N3A-C2A-N1A	-4.58	121.64	128.58
3	A	902	FAD	N9A-C8A-N7A	-4.56	107.47	113.94
2	B	901	HEM	C3C-C2C-C1C	-4.52	102.77	107.05
3	A	902	FAD	C5A-N7A-C8A	4.42	110.39	103.45
2	A	901	HEM	C3C-C2C-C1C	-4.40	102.88	107.05
2	B	901	HEM	CHD-C1D-C2D	-4.28	118.28	125.03
2	B	901	HEM	C3A-C4A-NA	4.23	116.92	110.14
2	A	901	HEM	C1B-NB-C4B	-4.16	100.28	105.21
3	B	902	FAD	C4'-C3'-C2'	-4.09	106.76	113.57
2	A	901	HEM	C2C-C1C-NC	4.06	117.15	109.64
3	A	902	FAD	C4'-C3'-C2'	-4.04	106.85	113.57
2	A	901	HEM	CHD-C1D-C2D	-4.03	118.66	125.03
2	A	901	HEM	CHD-C4C-C3C	-3.98	118.50	125.21
2	A	901	HEM	CHB-C4A-C3A	-3.65	116.84	127.43
2	B	901	HEM	CHB-C4A-C3A	-3.64	116.86	127.43
3	A	902	FAD	C4A-C5A-N7A	-3.64	106.42	110.58
3	B	902	FAD	N9A-C8A-N7A	-3.63	108.78	113.94
3	B	902	FAD	C5A-N7A-C8A	3.60	109.10	103.45
2	A	901	HEM	CHA-C1A-C2A	-3.58	117.47	125.30
2	B	901	HEM	C4C-NC-C1C	-3.57	100.01	105.82
3	B	902	FAD	C2A-N3A-C4A	3.41	120.15	111.83
3	A	902	FAD	N3A-C4A-N9A	3.39	132.93	127.17
3	B	902	FAD	C4A-C5A-N7A	-3.37	106.73	110.58
2	B	901	HEM	C2C-C1C-NC	3.37	115.86	109.64
3	B	902	FAD	C4X-C10-N10	3.35	121.27	116.48

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	901	HEM	C4D-C3D-C2D	-3.29	102.10	106.89
5	B	910	MAN	O3-C3-C2	3.19	116.56	110.05
3	A	902	FAD	C2A-N3A-C4A	3.15	119.53	111.83
3	A	902	FAD	C6A-C5A-C4A	3.10	121.41	117.18
2	A	901	HEM	CHA-C4D-C3D	-3.08	119.55	125.23
3	A	902	FAD	C4X-C10-N10	3.07	120.88	116.48
2	A	901	HEM	CHB-C1B-C2B	-3.04	118.32	126.95
3	A	902	FAD	O4B-C1B-N9A	3.03	113.91	108.09
3	B	902	FAD	C4-N3-C2	-2.98	120.35	125.64
2	B	901	HEM	CHA-C1A-C2A	-2.96	118.81	125.30
3	A	902	FAD	C4-N3-C2	-2.95	120.41	125.64
2	B	901	HEM	C4A-CHB-C1B	-2.93	119.35	126.25
3	B	902	FAD	N3A-C4A-N9A	2.93	132.14	127.17
2	B	901	HEM	C4D-C3D-C2D	-2.92	102.64	106.89
4	A	907	NAG	C1-O5-C5	2.90	116.07	112.19
2	A	901	HEM	C1A-C2A-C3A	-2.79	102.54	106.87
2	B	901	HEM	CHB-C1B-C2B	-2.78	119.04	126.95
2	B	901	HEM	C4B-C3B-C2B	-2.76	104.74	107.28
2	B	901	HEM	CHC-C1C-C2C	-2.74	119.78	125.49
2	A	901	HEM	CMA-C3A-C2A	2.72	131.38	125.62
3	A	902	FAD	O4-C4-C4X	-2.70	119.41	126.53
2	A	901	HEM	CMC-C2C-C1C	2.68	129.44	124.73
2	A	901	HEM	CAD-C3D-C4D	2.67	129.36	124.70
2	B	901	HEM	CMB-C2B-C1B	2.61	129.12	125.03
3	B	902	FAD	O4-C4-C4X	-2.60	119.67	126.53
4	B	906	NAG	C1-O5-C5	2.59	115.66	112.19
3	A	902	FAD	C2B-C1B-N9A	-2.57	106.91	113.30
2	B	901	HEM	CAD-C3D-C4D	2.55	129.15	124.70
2	B	901	HEM	CHB-C1B-NB	-2.54	121.23	124.37
3	B	902	FAD	C6A-C5A-C4A	2.54	120.64	117.18
2	B	901	HEM	CHC-C4B-C3B	-2.50	120.09	125.07
2	B	901	HEM	C1A-CHA-C4D	-2.47	120.43	126.25
3	A	902	FAD	C4X-C4-N3	2.45	119.49	113.25
2	B	901	HEM	CHA-C4D-C3D	-2.44	120.73	125.23
2	A	901	HEM	CHC-C1C-C2C	-2.43	120.44	125.49
2	A	901	HEM	CAA-C2A-C3A	2.41	132.48	127.07
2	A	901	HEM	C4C-CHD-C1D	-2.41	120.89	126.02
2	A	901	HEM	CMD-C2D-C1D	2.39	128.78	125.03
3	B	902	FAD	C1'-N10-C9A	-2.39	115.99	120.63
3	B	902	FAD	C10-C4X-N5	-2.38	119.95	124.81
2	A	901	HEM	C1C-CHC-C4B	-2.37	120.98	126.02
2	B	901	HEM	CMD-C2D-C1D	2.36	128.72	125.03

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	902	FAD	C4X-C4-N3	2.35	119.23	113.25
4	A	908	NAG	C1-O5-C5	2.35	115.33	112.19
2	A	901	HEM	C1A-CHA-C4D	-2.32	120.78	126.25
2	A	901	HEM	CMB-C2B-C1B	2.32	128.66	125.03
3	A	902	FAD	C10-C4X-N5	-2.32	120.08	124.81
5	A	910	MAN	O2-C2-C3	-2.31	105.36	110.15
5	A	910	MAN	O5-C1-C2	2.31	116.29	110.79
2	A	901	HEM	C4B-C3B-C2B	-2.30	105.17	107.28
2	A	901	HEM	C4A-CHB-C1B	-2.29	120.86	126.25
3	A	902	FAD	C4A-N9A-C8A	2.29	108.14	105.74
2	B	901	HEM	C4C-CHD-C1D	-2.25	121.23	126.02
5	A	910	MAN	C1-C2-C3	2.21	112.86	109.64
3	B	902	FAD	C5A-C4A-N9A	2.16	108.16	105.81
3	B	902	FAD	C5X-C9A-N10	2.15	119.91	117.97
2	B	901	HEM	CHD-C4C-C3C	-2.14	121.60	125.21
3	A	902	FAD	C5X-C9A-N10	2.14	119.90	117.97
3	B	902	FAD	C4X-C10-N1	-2.14	119.36	124.59
2	A	901	HEM	CHB-C1B-NB	-2.09	121.78	124.37
3	B	902	FAD	O3B-C3B-C4B	-2.07	105.12	111.08
3	B	902	FAD	O4B-C1B-N9A	2.07	112.06	108.09
2	A	901	HEM	CHC-C1C-NC	-2.06	122.21	124.45
2	B	901	HEM	C1C-CHC-C4B	-2.06	121.64	126.02
3	A	902	FAD	C1'-N10-C9A	-2.05	116.65	120.63
2	B	901	HEM	CHA-C4D-ND	-2.04	121.84	124.37
2	A	901	HEM	CHD-C1D-ND	-2.04	122.23	124.42
2	A	901	HEM	CBD-CAD-C3D	-2.03	106.91	112.53
3	A	902	FAD	C4X-C10-N1	-2.03	119.62	124.59
3	B	902	FAD	C4-C4X-C10	2.01	120.38	116.93

There are no chirality outliers.

All (43) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	902	FAD	N10-C1'-C2'-O2'
3	A	902	FAD	N10-C1'-C2'-C3'
3	B	902	FAD	N10-C1'-C2'-O2'
4	A	904	NAG	C4-C5-C6-O6
2	A	901	HEM	C3A-C2A-CAA-CBA
4	A	904	NAG	O5-C5-C6-O6
4	A	903	NAG	O5-C5-C6-O6
4	A	906	NAG	O5-C5-C6-O6
4	A	908	NAG	O5-C5-C6-O6

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Mol	Chain	Res	Type	Atoms
2	A	901	HEM	C1A-C2A-CAA-CBA
4	A	903	NAG	C4-C5-C6-O6
5	B	910	MAN	O5-C5-C6-O6
5	A	911	MAN	O5-C5-C6-O6
4	B	905	NAG	O5-C5-C6-O6
4	A	906	NAG	C4-C5-C6-O6
5	B	910	MAN	C4-C5-C6-O6
4	B	905	NAG	C4-C5-C6-O6
5	B	909	MAN	C4-C5-C6-O6
4	A	904	NAG	C8-C7-N2-C2
4	A	904	NAG	O7-C7-N2-C2
4	A	908	NAG	C4-C5-C6-O6
5	A	911	MAN	C4-C5-C6-O6
5	A	910	MAN	C4-C5-C6-O6
5	B	909	MAN	O5-C5-C6-O6
3	B	902	FAD	O4B-C4B-C5B-O5B
3	B	902	FAD	C3B-C4B-C5B-O5B
5	A	910	MAN	O5-C5-C6-O6
4	A	907	NAG	O5-C5-C6-O6
2	A	901	HEM	C2A-CAA-CBA-CGA
3	A	902	FAD	PA-O3P-P-O5'
4	A	906	NAG	C1-C2-N2-C7
2	A	901	HEM	C2C-C3C-CAC-CBC
4	A	906	NAG	C3-C2-N2-C7
3	A	902	FAD	O4B-C4B-C5B-O5B
2	A	901	HEM	CAD-CBD-CGD-O1D
2	A	901	HEM	CAD-CBD-CGD-O2D
2	B	901	HEM	CAD-CBD-CGD-O1D
4	A	907	NAG	C4-C5-C6-O6
2	B	901	HEM	CAD-CBD-CGD-O2D
3	A	902	FAD	P-O3P-PA-O1A
3	A	902	FAD	C3B-C4B-C5B-O5B
2	A	901	HEM	C4C-C3C-CAC-CBC
4	B	904	NAG	C4-C5-C6-O6

There are no ring outliers.

8 monomers are involved in 28 short contacts:

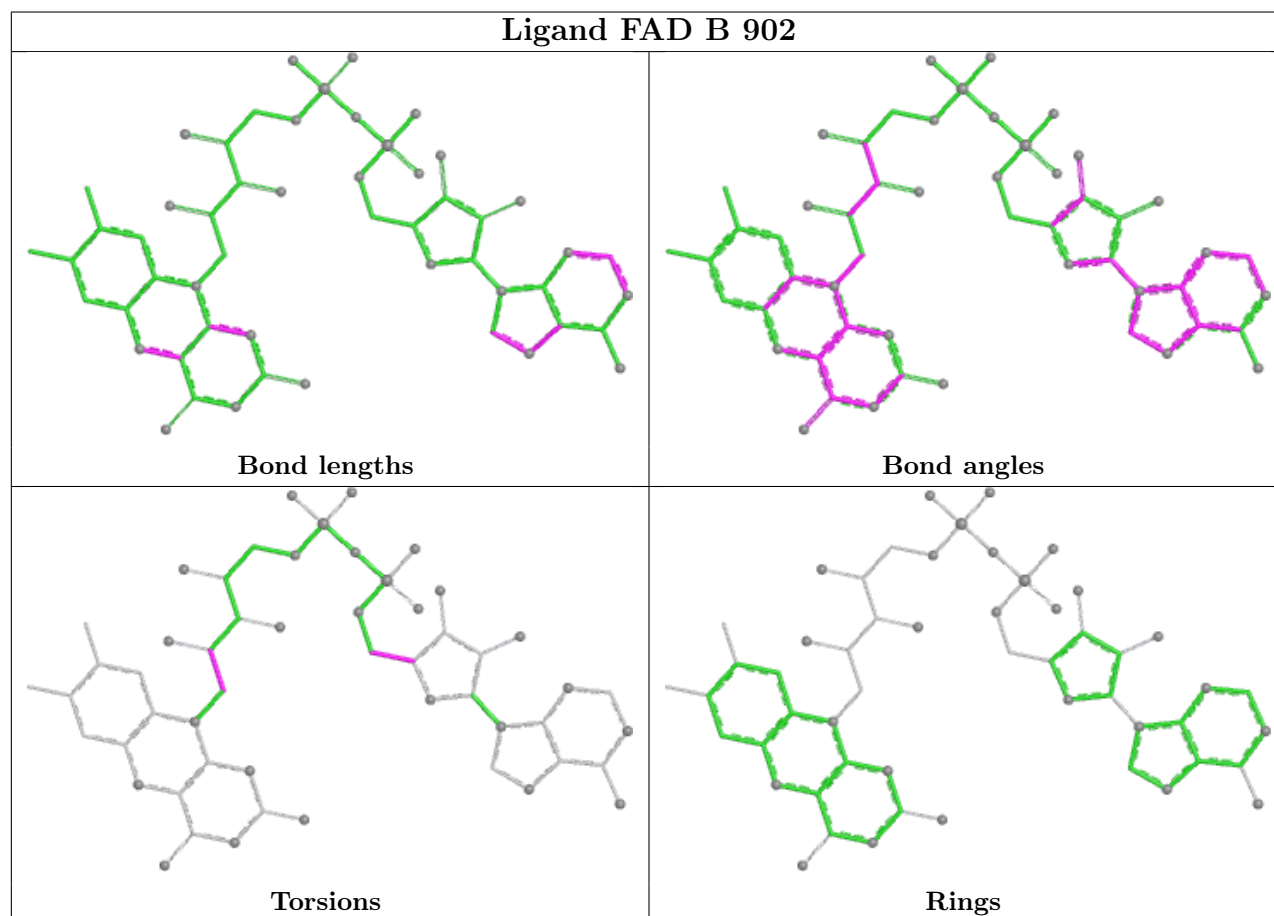
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	902	FAD	3	0
4	A	908	NAG	1	0
4	A	906	NAG	1	0

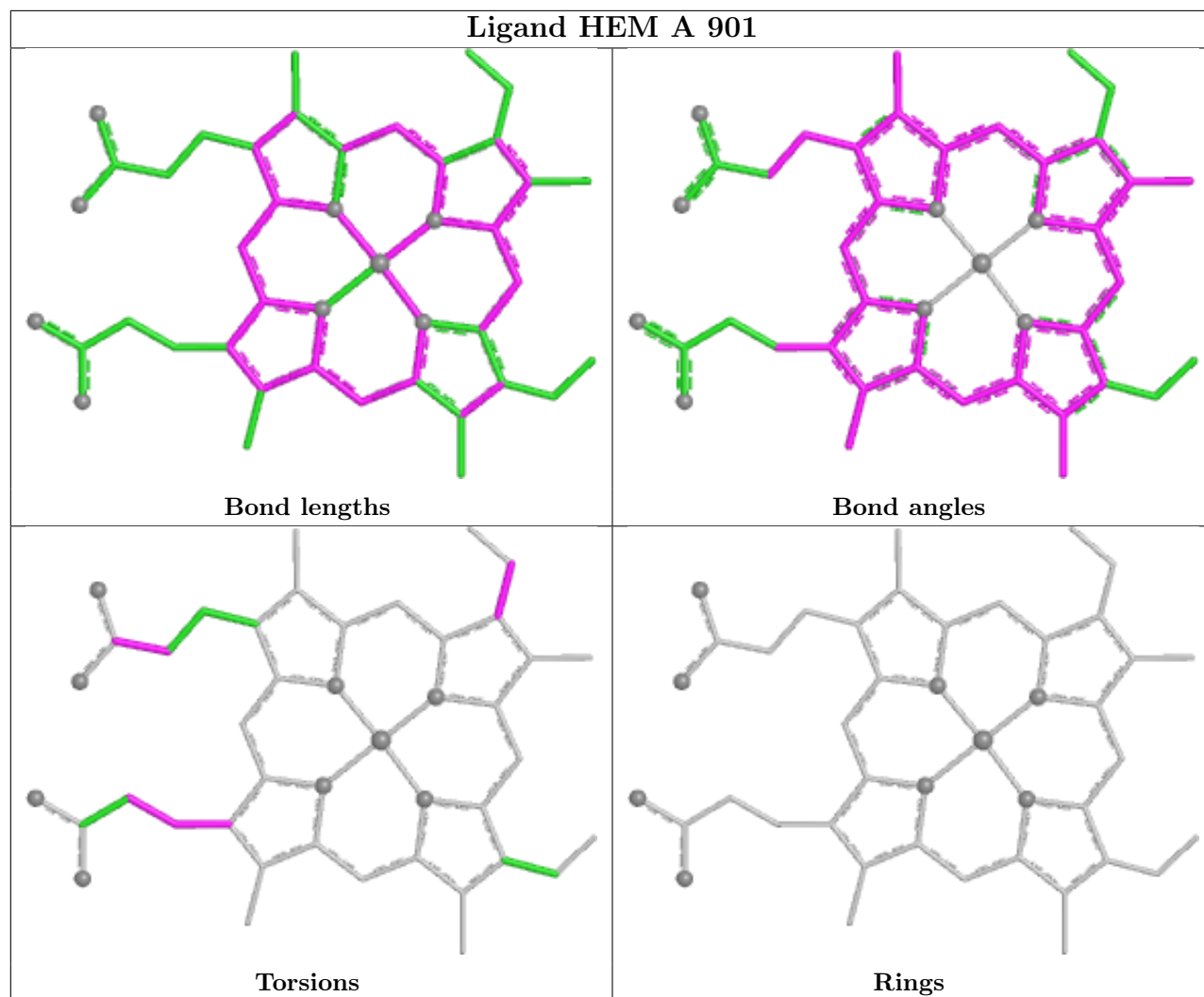
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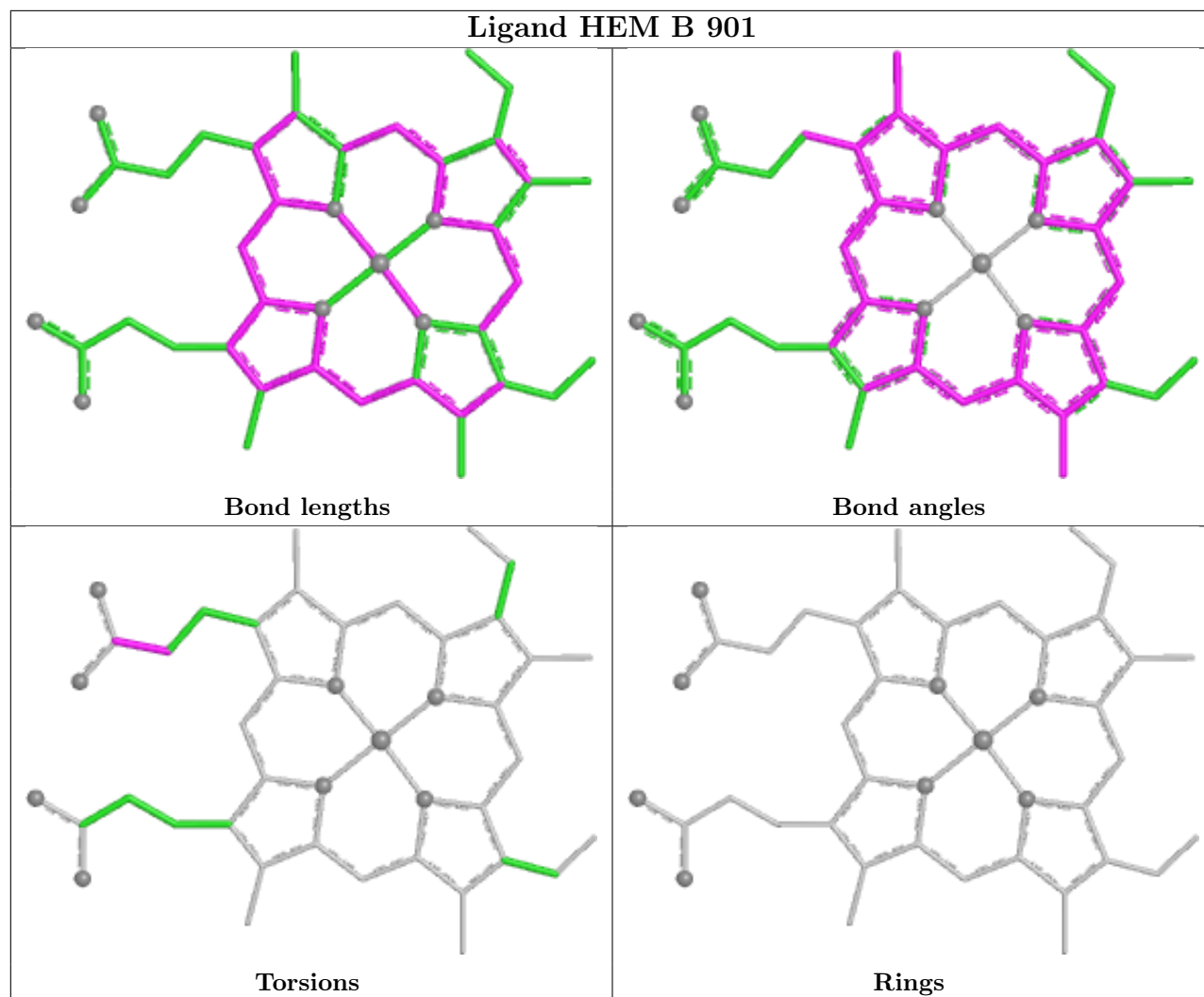
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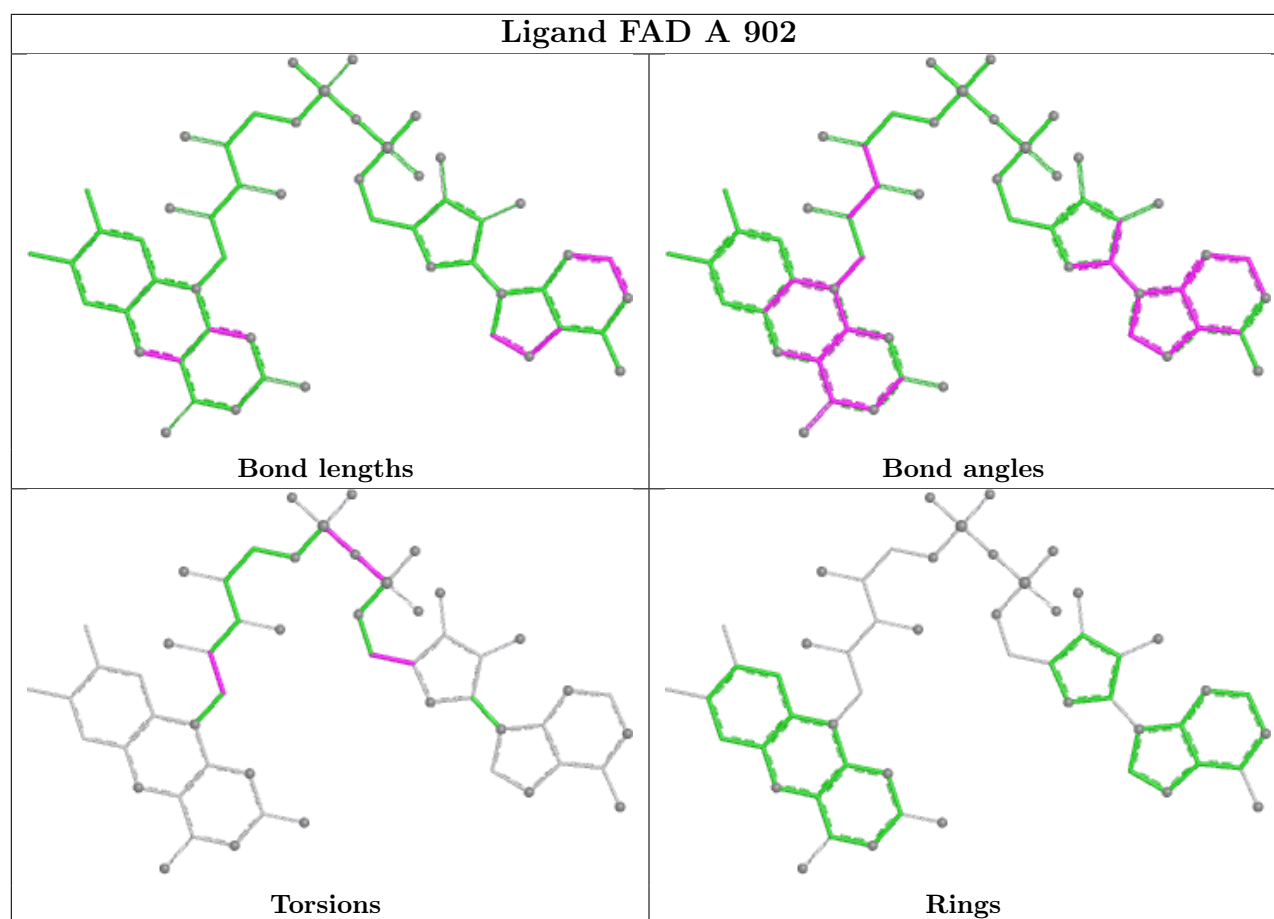
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	904	NAG	1	0
4	A	903	NAG	2	0
2	A	901	HEM	6	0
2	B	901	HEM	9	0
3	A	902	FAD	5	0

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	805/806 (99%)	-0.13	17 (2%) 63 54	22, 69, 122, 179	0
1	B	792/806 (98%)	0.06	29 (3%) 45 37	25, 75, 149, 196	0
All	All	1597/1612 (99%)	-0.03	46 (2%) 53 45	22, 71, 138, 196	0

All (46) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	168	PRO	5.3
1	B	795	CYS	3.5
1	B	275	GLU	3.4
1	A	795	CYS	3.4
1	B	41	LEU	3.4
1	B	198	ALA	3.2
1	B	543	THR	3.2
1	A	71	ARG	3.1
1	A	669	LYS	3.1
1	B	158	ALA	3.0
1	A	57	ALA	3.0
1	B	680	GLN	2.9
1	B	61	ALA	2.8
1	A	275	GLU	2.8
1	A	217	THR	2.8
1	B	549	LYS	2.8
1	A	796	GLU	2.7
1	B	103	LYS	2.7
1	A	799	ASN	2.7
1	B	76	ASN	2.6
1	B	86	ASP	2.6
1	B	205	LYS	2.6
1	A	210	THR	2.5
1	B	174	SER	2.5

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Mol	Chain	Res	Type	RSRZ
1	B	150	GLY	2.5
1	A	61	ALA	2.5
1	B	151	ALA	2.5
1	B	117	SER	2.5
1	B	197	THR	2.4
1	B	62	ASN	2.4
1	B	380	ASN	2.4
1	A	602	GLU	2.4
1	A	543	THR	2.3
1	B	394	LYS	2.3
1	B	663	LYS	2.3
1	A	180	MET	2.2
1	B	106	ALA	2.2
1	A	215	VAL	2.1
1	B	56	SER	2.1
1	B	296	LYS	2.1
1	B	552	ASP	2.1
1	A	64	GLY	2.0
1	B	29	GLY	2.0
1	B	165	PRO	2.0
1	A	11	ASP	2.0
1	A	368	LYS	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	NAG	A	906	14/15	0.60	0.17	72,105,123,124	0

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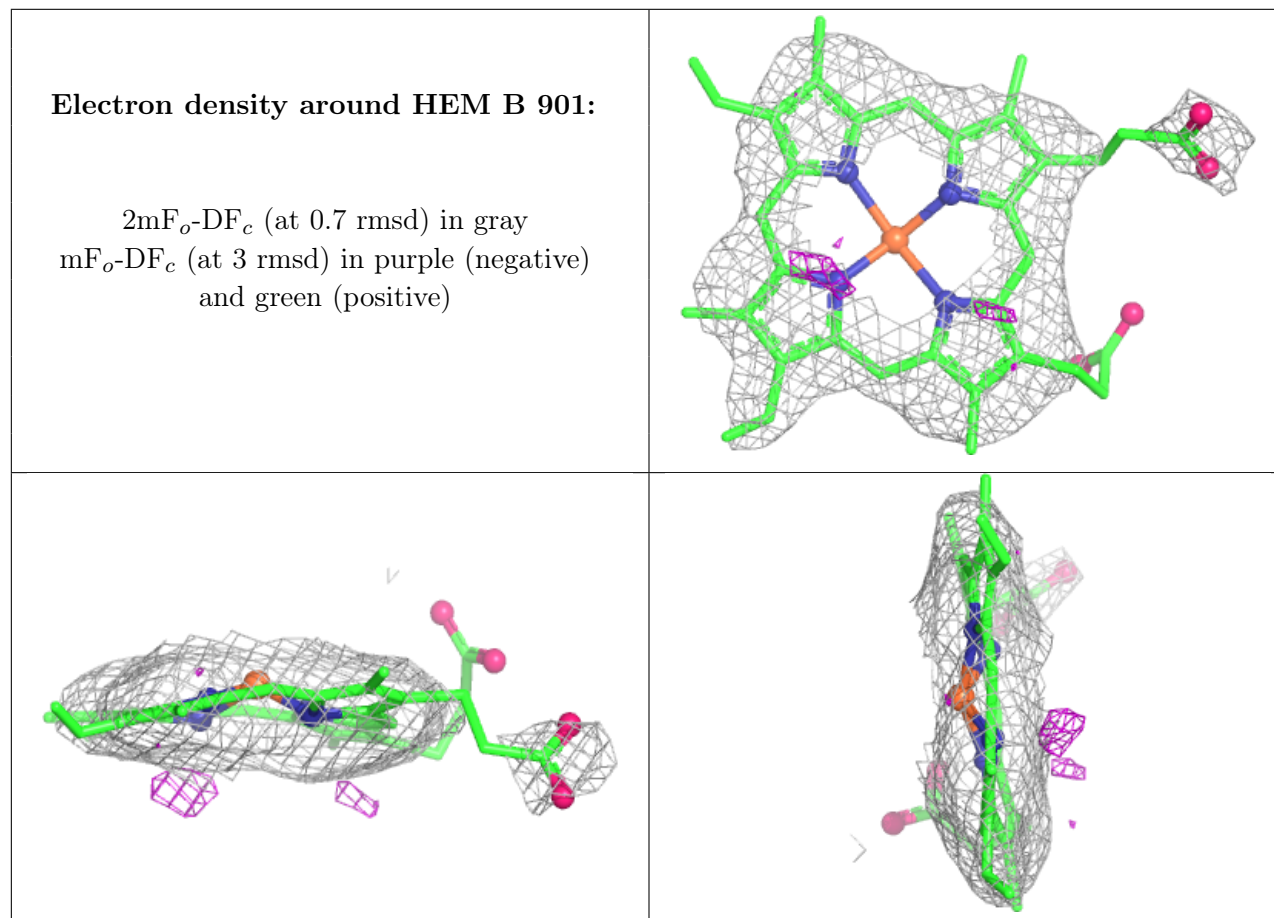
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
5	MAN	A	911	11/12	0.64	0.10	89,101,108,109	0
4	NAG	B	908	14/15	0.66	0.12	75,91,103,106	0
5	MAN	A	910	11/12	0.67	0.14	91,100,115,119	0
4	NAG	A	904	14/15	0.74	0.14	90,104,121,121	0
5	MAN	B	910	11/12	0.74	0.10	61,92,106,106	0
6	PT	A	921	1/1	0.76	0.25	282,282,282,282	0
4	NAG	A	909	14/15	0.78	0.10	66,83,98,100	0
4	NAG	B	907	14/15	0.81	0.13	86,119,129,129	0
4	NAG	B	904	14/15	0.81	0.12	85,104,111,123	0
5	MAN	B	909	11/12	0.82	0.13	73,81,96,96	0
4	NAG	A	908	14/15	0.85	0.11	83,106,124,129	0
4	NAG	B	906	14/15	0.87	0.10	59,75,109,118	0
4	NAG	A	903	14/15	0.87	0.09	96,105,116,123	0
4	NAG	B	903	14/15	0.88	0.08	98,111,115,117	0
4	NAG	A	905	14/15	0.89	0.11	79,96,105,113	0
7	MG	A	924	1/1	0.89	0.51	73,73,73,73	0
6	PT	B	912	1/1	0.90	0.12	147,147,147,147	1
4	NAG	B	905	14/15	0.90	0.08	81,99,103,107	0
7	MG	B	919	1/1	0.90	0.17	54,54,54,54	0
6	PT	A	915	1/1	0.91	0.11	155,155,155,155	1
6	PT	A	914	1/1	0.92	0.11	156,156,156,156	1
6	PT	B	914	1/1	0.92	0.10	134,134,134,134	1
7	MG	A	925	1/1	0.93	0.32	54,54,54,54	0
6	PT	A	917	1/1	0.93	0.09	151,151,151,151	1
4	NAG	A	907	14/15	0.94	0.07	63,76,109,116	0
2	HEM	B	901	43/43	0.95	0.10	60,86,110,126	0
6	PT	B	913	1/1	0.95	0.09	146,146,146,146	1
6	PT	B	918	1/1	0.96	0.10	132,132,132,132	0
6	PT	B	915	1/1	0.96	0.07	164,164,164,164	1
6	PT	A	916	1/1	0.97	0.07	117,117,117,117	1
3	FAD	A	902	53/53	0.97	0.07	20,52,93,102	0
6	PT	B	916	1/1	0.97	0.09	106,106,106,106	1
6	PT	A	918	1/1	0.97	0.08	123,123,123,123	1
6	PT	A	913	1/1	0.97	0.09	120,120,120,120	0
3	FAD	B	902	53/53	0.97	0.08	20,54,90,97	0
7	MG	A	926	1/1	0.97	0.13	56,56,56,56	0
2	HEM	A	901	43/43	0.97	0.09	55,78,100,129	0
6	PT	A	920	1/1	0.98	0.08	114,114,114,114	1
6	PT	A	922	1/1	0.98	0.12	133,133,133,133	0
6	PT	A	919	1/1	0.99	0.09	107,107,107,107	0
6	PT	A	912	1/1	0.99	0.13	84,84,84,84	0
6	PT	B	917	1/1	0.99	0.10	102,102,102,102	0

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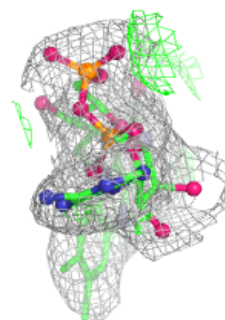
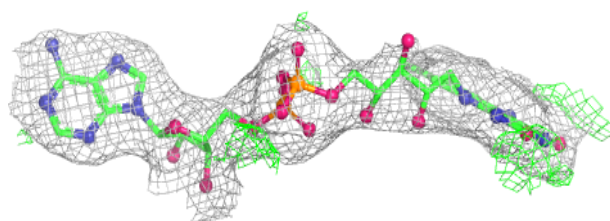
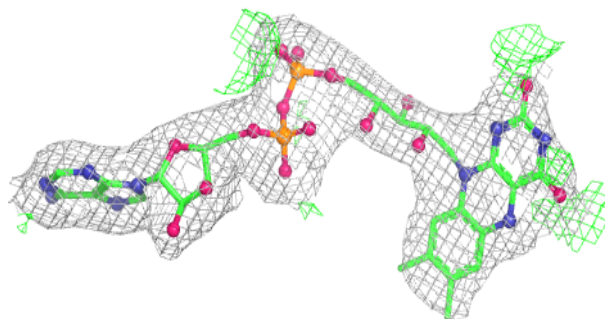
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
6	PT	A	923	1/1	0.99	0.06	92,92,92,92	1
6	PT	B	911	1/1	1.00	0.11	71,71,71,71	0

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.

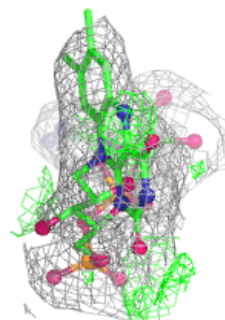
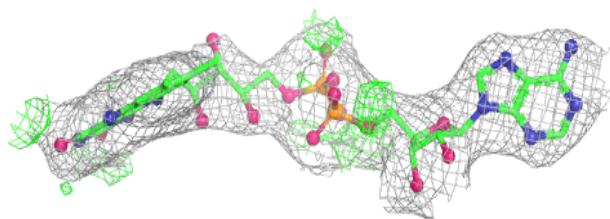
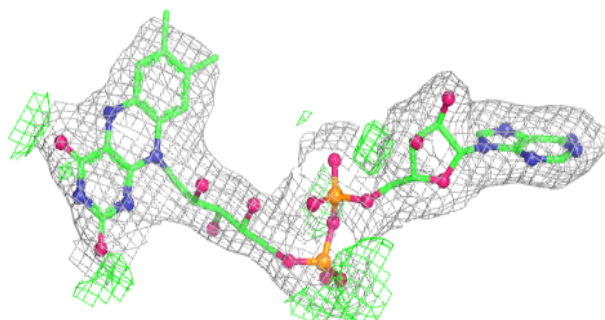


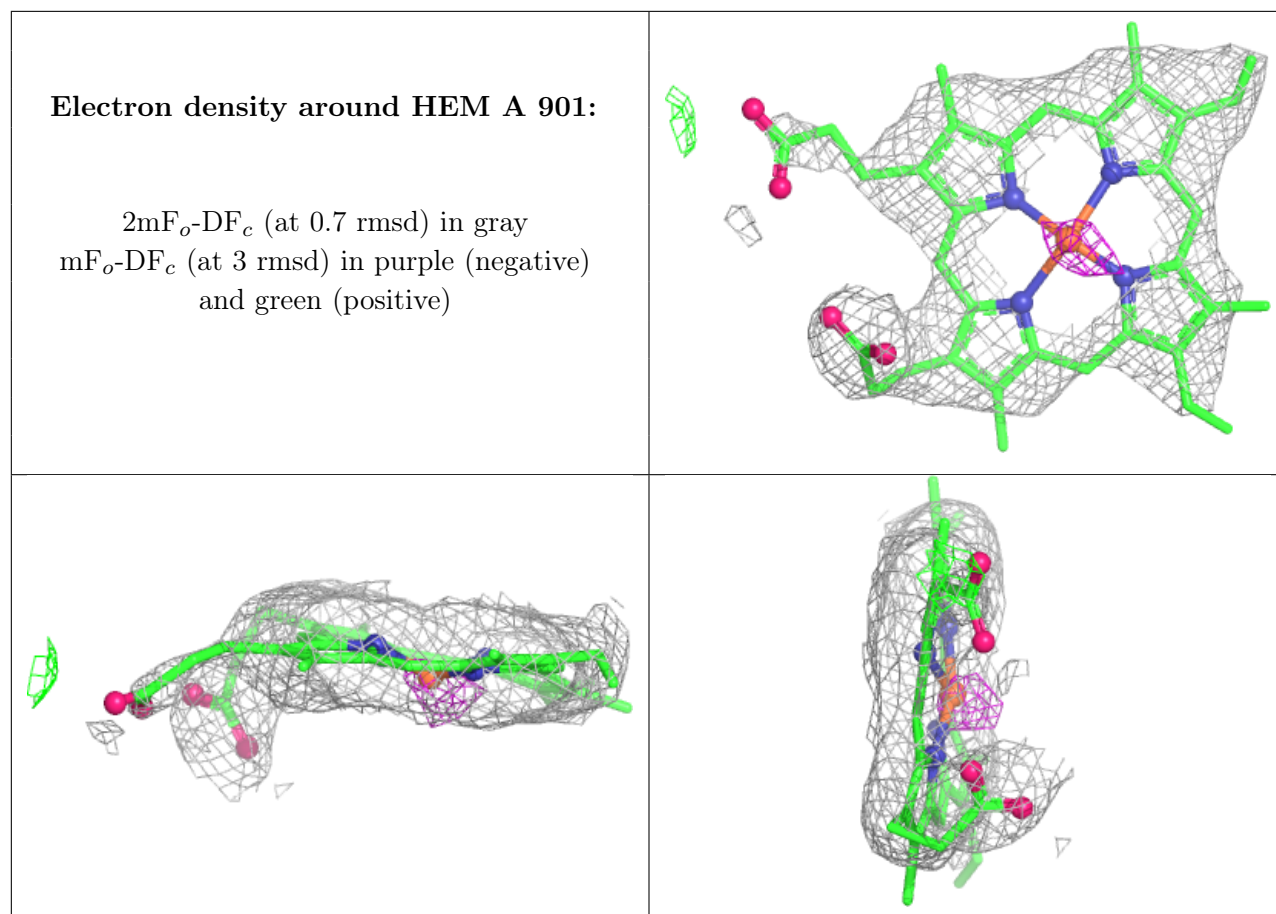
Electron density around FAD A 902:

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

**Electron density around FAD B 902:**

$2mF_o-DF_c$ (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.