



wwPDB X-ray Structure Validation Summary Report ⓘ

Jul 20, 2026 – 08:12 PM EDT

PDB ID : 12CL / pdb_000012cl
Title : Crystal structure of canine myeloperoxidase inhibited by SPIN from *Staphylococcus delphini*
Authors : Fatehi, S.; Geisbrecht, B.V.
Deposited on : 2026-03-26
Resolution : 2.10 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.50

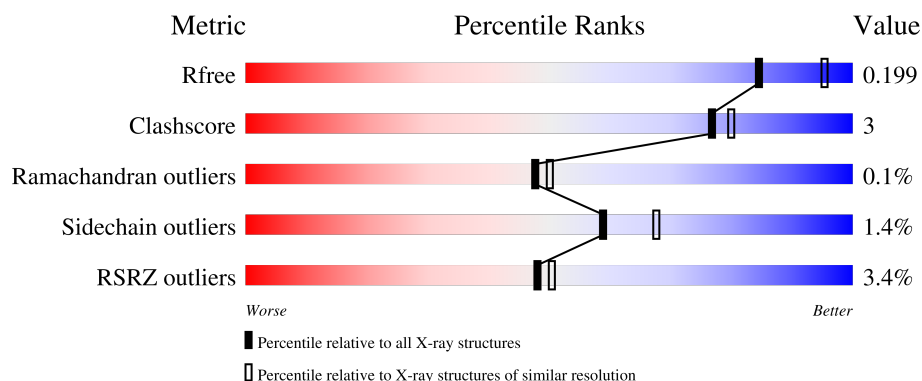
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



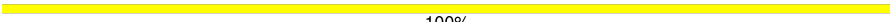
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	741	 2% 71% 6% 23%
1	B	741	 2% 71% 6% 23%
2	C	77	 4% 83% 8% 9%
2	D	77	 9% 82% 9% 9%
3	F	3	 33% 67%

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Mol	Chain	Length	Quality of chain
3	I	3	 100%
4	E	6	 33% 67%
4	H	6	 33% 67%

2 Entry composition

There are 12 unique types of molecules in this entry. The entry contains 11582 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 Myeloperoxidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	570	Total	C	N	O	S	0	0	0
			4569	2879	839	823	28			
1	B	570	Total	C	N	O	S	0	0	0
			4569	2879	839	823	28			

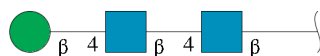
- Molecule 2 is a protein called SPIN family peroxidase inhibitor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	70	Total	C	N	O	S	0	0	0
			559	345	97	116	1			
2	D	70	Total	C	N	O	S	0	0	0
			559	345	97	116	1			

There are 10 discrepancies between the modelled and reference sequences:

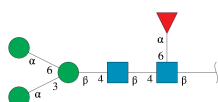
Chain	Residue	Modelled	Actual	Comment	Reference
C	23	GLY	-	expression tag	UNP A0A2A4GXB5
C	24	SER	-	expression tag	UNP A0A2A4GXB5
C	25	THR	-	expression tag	UNP A0A2A4GXB5
C	26	GLY	-	expression tag	UNP A0A2A4GXB5
C	27	SER	-	expression tag	UNP A0A2A4GXB5
D	23	GLY	-	expression tag	UNP A0A2A4GXB5
D	24	SER	-	expression tag	UNP A0A2A4GXB5
D	25	THR	-	expression tag	UNP A0A2A4GXB5
D	26	GLY	-	expression tag	UNP A0A2A4GXB5
D	27	SER	-	expression tag	UNP A0A2A4GXB5

- Molecule 3 is an oligosaccharide called beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	F	3	Total	C	N	O	0	0	0
			39	22	2	15			
3	I	3	Total	C	N	O	0	0	0
			39	22	2	15			

- Molecule 4 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose.

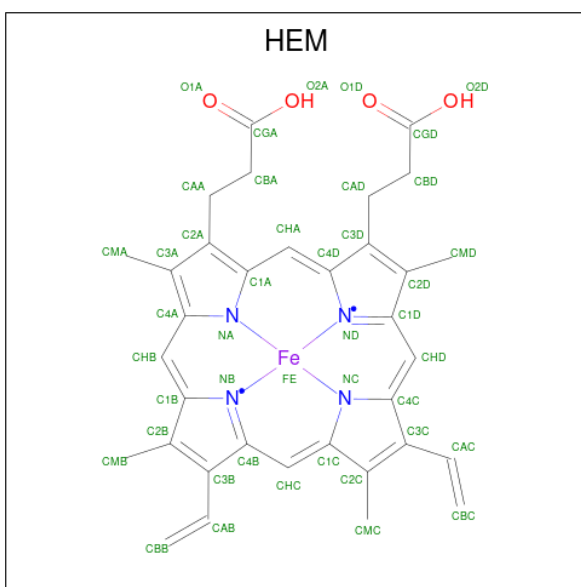


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	E	6	Total	C	N	O	0	0	0
			71	40	2	29			
4	H	6	Total	C	N	O	0	0	0
			71	40	2	29			

- Molecule 5 is CALCIUM ION (CCD ID: CA) (formula: Ca).

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

- Molecule 6 is PROTOPORPHYRIN IX CONTAINING FE (CCD ID: HEM) (formula: C₃₄H₃₂FeN₄O₄).

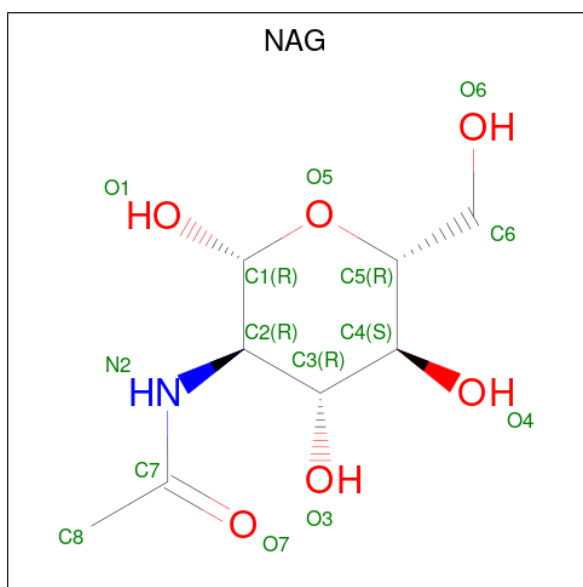


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
6	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0

- Molecule 7 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

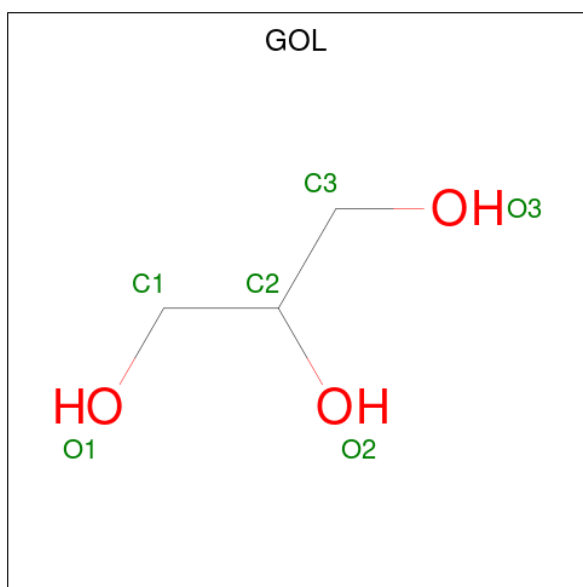
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total Cl 1 1	0	0
7	B	1	Total Cl 1 1	0	0

- Molecule 8 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



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

- Molecule 9 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



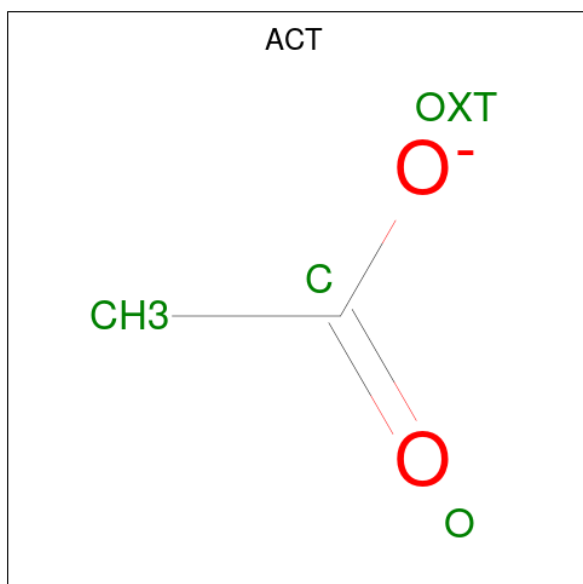
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	A	1	Total	C	O	0	0
			6	3	3		

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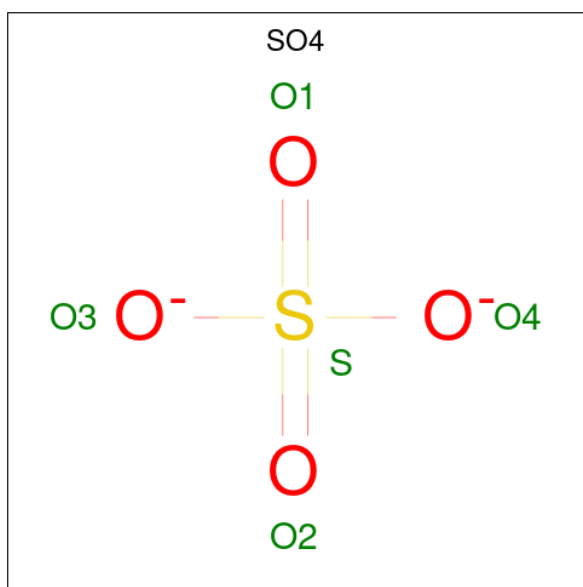
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	A	1	Total	C	O	0	0
			6	3	3		
9	A	1	Total	C	O	0	0
			6	3	3		
9	A	1	Total	C	O	0	0
			6	3	3		
9	A	1	Total	C	O	0	0
			6	3	3		
9	B	1	Total	C	O	0	0
			6	3	3		
9	B	1	Total	C	O	0	0
			6	3	3		

- Molecule 10 is ACETATE ION (CCD ID: ACT) (formula: $C_2H_3O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
10	A	1	Total	C	O	0	0
			4	2	2		
10	A	1	Total	C	O	0	0
			4	2	2		
10	A	1	Total	C	O	0	0
			4	2	2		
10	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 11 is SULFATE ION (CCD ID: SO4) (formula: O_4S).



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

- Molecule 12 is water.

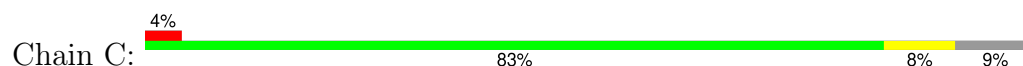
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
12	A	402	Total	O	0	0
			402	402		
12	B	415	Total	O	0	0
			415	415		

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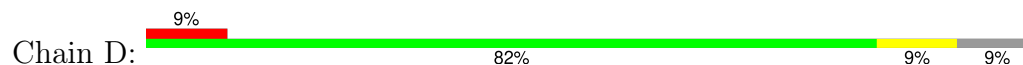
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
12	C	22	Total 22	O 22	0	0
12	D	27	Total 27	O 27	0	0

- Molecule 2: SPIN family peroxidase inhibitor



- Molecule 2: SPIN family peroxidase inhibitor



- Molecule 3: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 3: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 4: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 4: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	132.70Å 145.38Å 107.61Å 90.00° 114.85° 90.00°	Depositor
Resolution (Å)	49.42 – 2.10 49.42 – 2.10	Depositor EDS
% Data completeness (in resolution range)	99.0 (49.42-2.10) 99.5 (49.42-2.10)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.83 (at 2.10Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.167 , 0.199 0.168 , 0.199	Depositor DCC
R_{free} test set	2000 reflections (1.84%)	wwPDB-VP
Wilson B-factor (Å ²)	27.6	Xtriage
Anisotropy	0.260	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 48.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	11582	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.11% 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: MAN, SO4, CA, BMA, HEM, NAG, FUC, ACT, GOL, CL

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	0.32	0/4681	0.49	0/6362
1	B	0.31	0/4681	0.48	2/6362 (0.0%)
2	C	0.29	0/566	0.42	0/765
2	D	0.24	0/566	0.40	0/765
All	All	0.31	0/10494	0.48	2/14254 (0.0%)

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

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	B	715	ASN	CA-C-N	5.81	132.16	121.70
1	B	715	ASN	C-N-CA	5.81	132.16	121.70

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	432	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	4569	0	4508	32	0
1	B	4569	0	4509	26	0
2	C	559	0	544	3	0
2	D	559	0	544	3	0
3	F	39	0	34	0	0
3	I	39	0	34	0	0
4	E	71	0	61	0	0
4	H	71	0	61	0	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
6	A	43	0	30	8	0
6	B	43	0	30	0	0
7	A	1	0	0	0	0
7	B	1	0	0	0	0
8	A	28	0	26	1	0
8	B	14	0	13	0	0
9	A	30	0	38	8	0
9	B	12	0	16	2	0
10	A	12	0	9	2	0
10	B	4	0	3	0	0
11	A	20	0	0	0	0
11	B	30	0	0	0	0
12	A	402	0	0	0	0
12	B	415	0	0	1	0
12	C	22	0	0	0	0
12	D	27	0	0	1	0
All	All	11582	0	10460	62	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 3.

The worst 5 of 62 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:176:ILE:H	9:B:810:GOL:H31	1.32	0.90

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
9:A:816:GOL:H11	1:B:200:PRO:HA	1.63	0.80
1:A:327:ARG:HH12	9:A:805:GOL:H32	1.45	0.79
1:A:432:ARG:HG3	1:A:432:ARG:HH11	1.48	0.78
1:A:260:ASP:OD2	6:A:802:HEM:HMD3	1.90	0.71

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	566/741 (76%)	551 (97%)	15 (3%)	0	100	100
1	B	566/741 (76%)	549 (97%)	16 (3%)	1 (0%)	43	44
2	C	68/77 (88%)	67 (98%)	1 (2%)	0	100	100
2	D	68/77 (88%)	65 (96%)	3 (4%)	0	100	100
All	All	1268/1636 (78%)	1232 (97%)	35 (3%)	1 (0%)	48	50

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	321	ASP

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	501/643 (78%)	494 (99%)	7 (1%)	59	67
1	B	501/643 (78%)	497 (99%)	4 (1%)	73	81
2	C	64/69 (93%)	63 (98%)	1 (2%)	55	64
2	D	64/69 (93%)	60 (94%)	4 (6%)	16	14
All	All	1130/1424 (79%)	1114 (99%)	16 (1%)	59	67

5 of 16 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	D	55	ILE
2	D	40	ASP
1	B	283	ILE
2	D	29	VAL
1	B	242	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	33	ASN
2	D	77	ASN
1	B	659	GLN
1	B	706	ASN
1	B	715	ASN

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 ⓘ

18 monosaccharides are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The

Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	NAG	E	1	1,4	14,14,15	0.57	0	17,19,21	1.05	1 (5%)
4	NAG	E	2	4	14,14,15	0.37	0	17,19,21	0.66	0
4	BMA	E	3	4	11,11,12	1.06	1 (9%)	15,15,17	0.90	1 (6%)
4	MAN	E	4	4	11,11,12	0.63	0	15,15,17	1.24	2 (13%)
4	MAN	E	5	4	11,11,12	0.83	0	15,15,17	0.90	1 (6%)
4	FUC	E	6	4	10,10,11	0.86	0	14,14,16	0.78	0
3	NAG	F	1	1,3	14,14,15	0.23	0	17,19,21	0.79	1 (5%)
3	NAG	F	2	3	14,14,15	0.65	1 (7%)	17,19,21	0.60	0
3	BMA	F	3	3	11,11,12	0.75	0	15,15,17	0.65	0
4	NAG	H	1	1,4	14,14,15	0.22	0	17,19,21	1.05	1 (5%)
4	NAG	H	2	4	14,14,15	0.44	0	17,19,21	0.48	0
4	BMA	H	3	4	11,11,12	1.34	1 (9%)	15,15,17	0.98	1 (6%)
4	MAN	H	4	4	11,11,12	1.47	2 (18%)	15,15,17	2.09	3 (20%)
4	MAN	H	5	4	11,11,12	0.99	1 (9%)	15,15,17	0.74	1 (6%)
4	FUC	H	6	4	10,10,11	0.81	0	14,14,16	0.63	0
3	NAG	I	1	1,3	14,14,15	0.26	0	17,19,21	0.84	1 (5%)
3	NAG	I	2	3	14,14,15	0.76	1 (7%)	17,19,21	0.62	0
3	BMA	I	3	3	11,11,12	0.96	1 (9%)	15,15,17	0.68	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NAG	E	1	1,4	-	0/6/23/26	0/1/1/1
4	NAG	E	2	4	-	0/6/23/26	0/1/1/1
4	BMA	E	3	4	-	0/2/19/22	0/1/1/1
4	MAN	E	4	4	-	0/2/19/22	0/1/1/1
4	MAN	E	5	4	-	0/2/19/22	0/1/1/1
4	FUC	E	6	4	-	-	0/1/1/1
3	NAG	F	1	1,3	-	0/6/23/26	0/1/1/1
3	NAG	F	2	3	-	2/6/23/26	0/1/1/1
3	BMA	F	3	3	-	0/2/19/22	0/1/1/1
4	NAG	H	1	1,4	-	0/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NAG	H	2	4	-	0/6/23/26	0/1/1/1
4	BMA	H	3	4	-	0/2/19/22	0/1/1/1
4	MAN	H	4	4	-	0/2/19/22	0/1/1/1
4	MAN	H	5	4	-	0/2/19/22	0/1/1/1
4	FUC	H	6	4	-	-	0/1/1/1
3	NAG	I	1	1,3	-	0/6/23/26	0/1/1/1
3	NAG	I	2	3	-	0/6/23/26	0/1/1/1
3	BMA	I	3	3	-	2/2/19/22	0/1/1/1

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	H	4	MAN	C4-C5	3.22	1.59	1.53
4	H	3	BMA	O5-C1	-2.90	1.38	1.43
4	E	3	BMA	O5-C1	-2.54	1.39	1.43
3	I	2	NAG	O5-C1	-2.53	1.39	1.43
4	H	5	MAN	O5-C5	2.44	1.48	1.43

The worst 5 of 13 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	H	4	MAN	C1-O5-C5	6.02	120.25	112.19
4	E	4	MAN	C1-O5-C5	3.51	116.90	112.19
4	H	4	MAN	O2-C2-C3	-3.29	103.34	110.15
4	E	1	NAG	C1-O5-C5	3.03	116.25	112.19
3	I	1	NAG	C1-O5-C5	2.79	115.92	112.19

There are no chirality outliers.

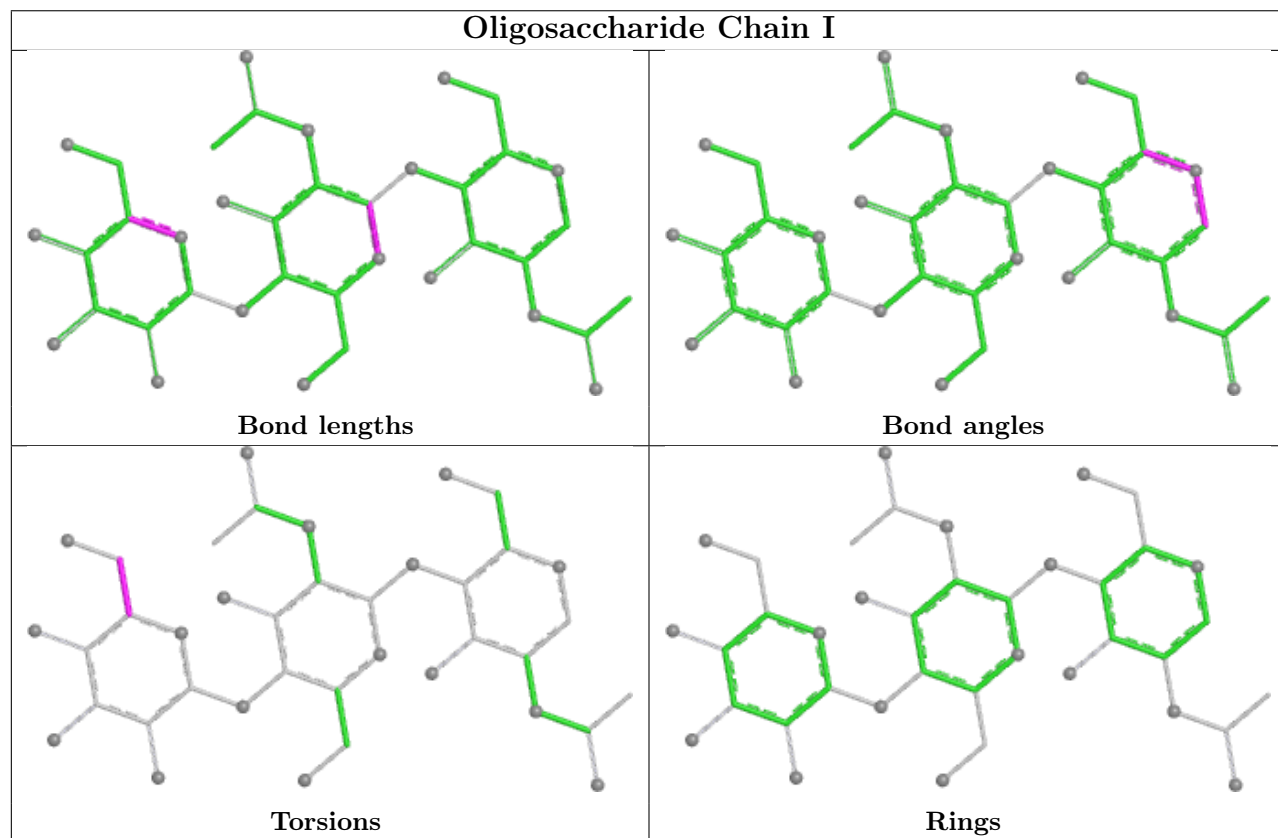
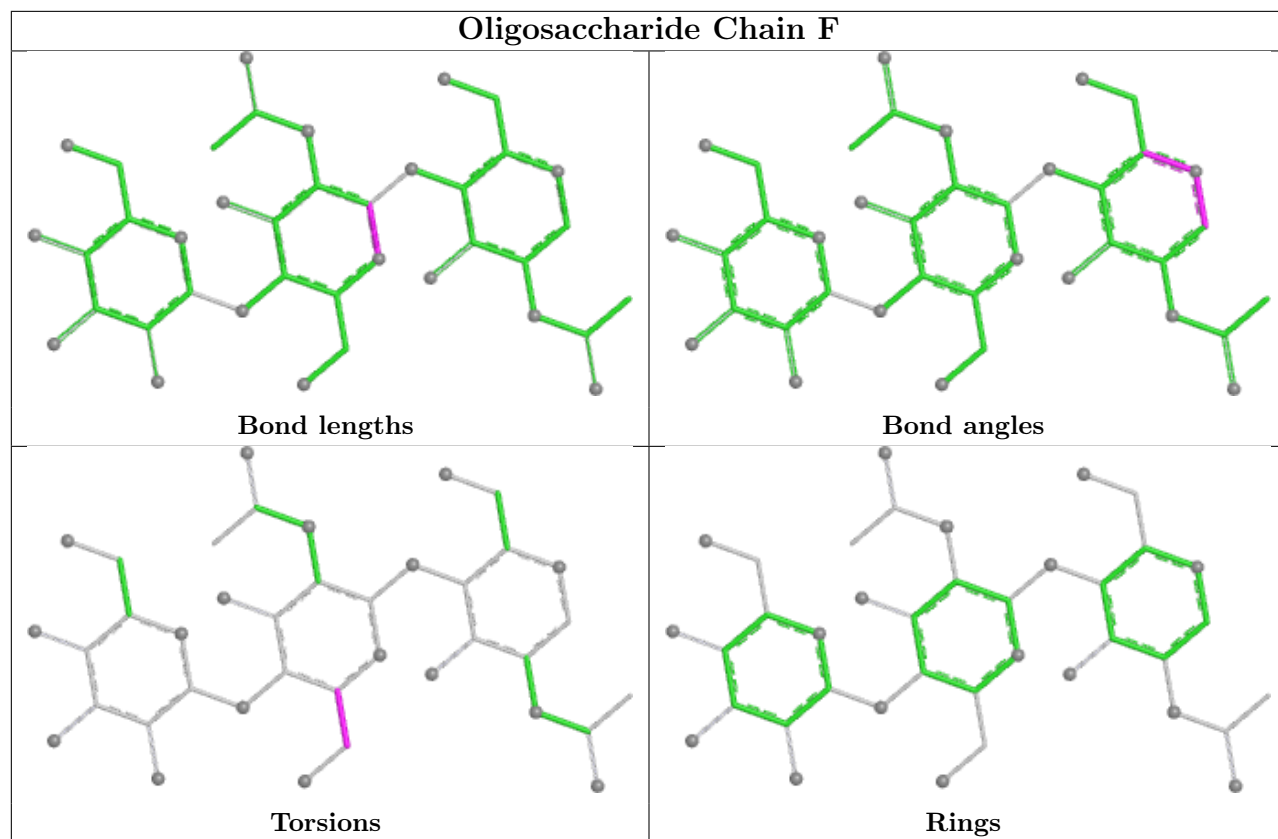
All (4) torsion outliers are listed below:

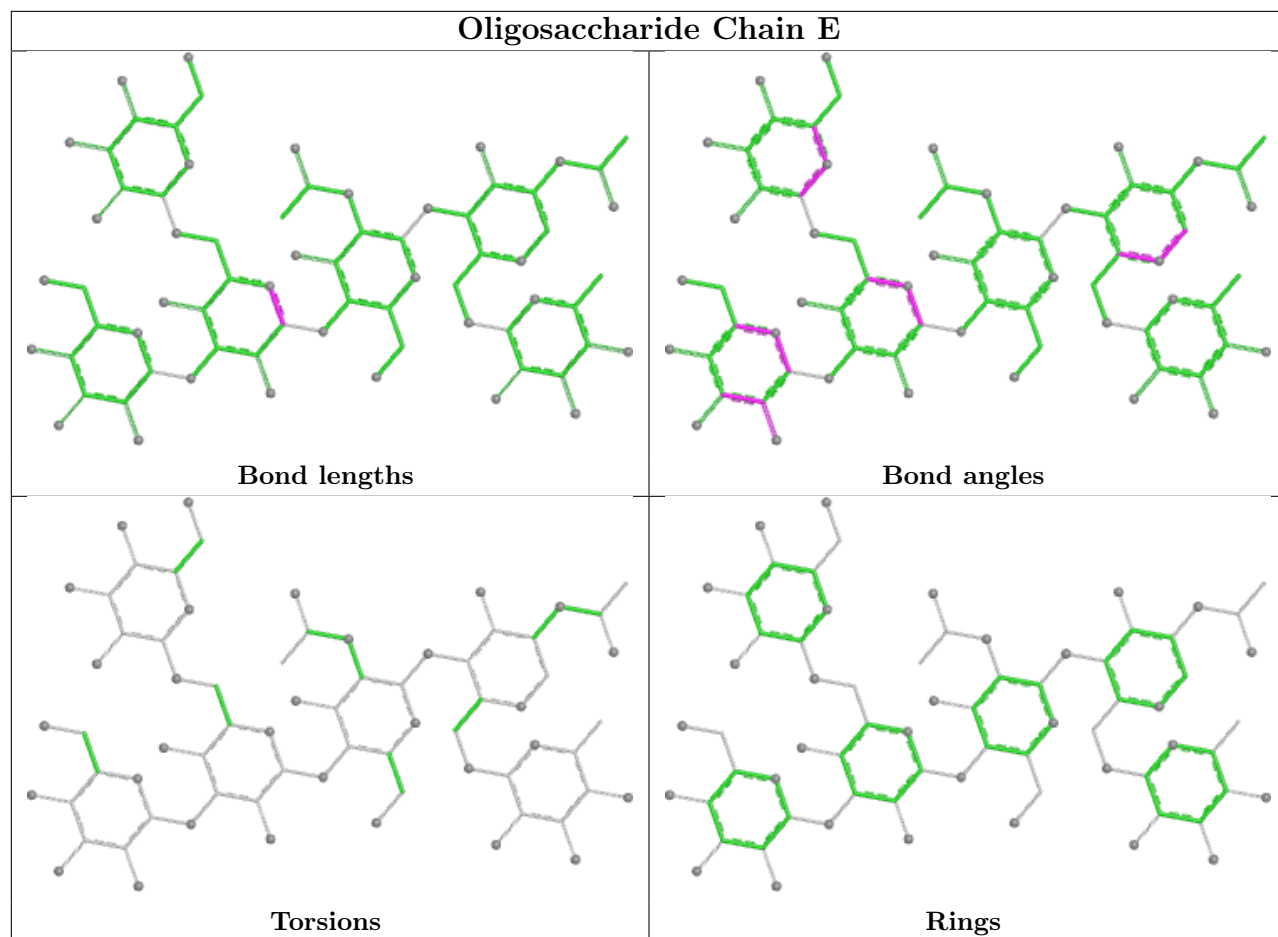
Mol	Chain	Res	Type	Atoms
3	I	3	BMA	O5-C5-C6-O6
3	I	3	BMA	C4-C5-C6-O6
3	F	2	NAG	O5-C5-C6-O6
3	F	2	NAG	C4-C5-C6-O6

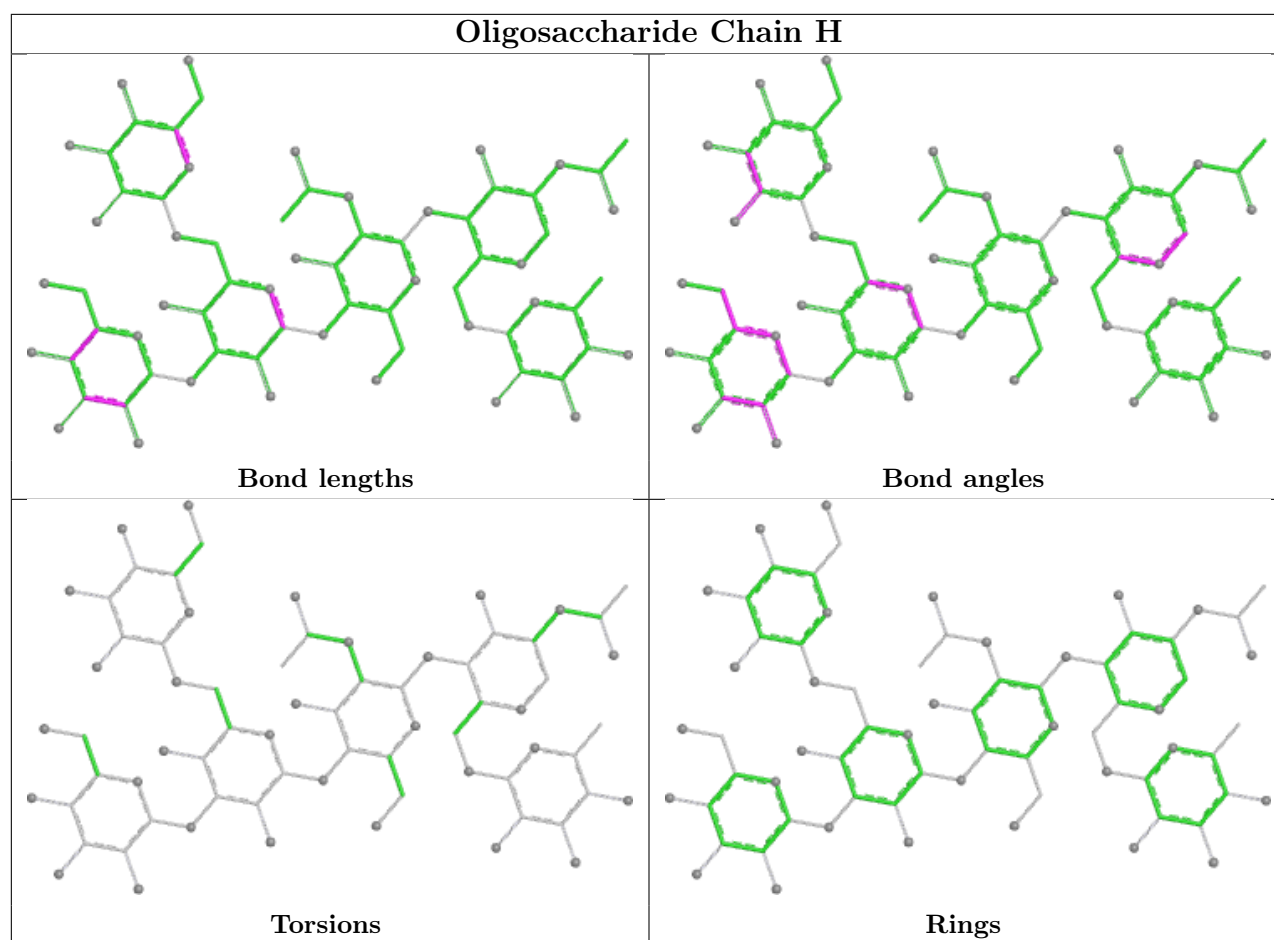
There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.







5.6 Ligand geometry [i](#)

Of 30 ligands modelled in this entry, 4 are monoatomic - leaving 26 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
8	NAG	A	804	1	14,14,15	0.47	0	17,19,21	0.59	0
11	SO4	B	805	-	4,4,4	0.26	0	6,6,6	0.20	0
6	HEM	B	807	1	50,50,50	1.80	10 (20%)	67,82,82	1.47	13 (19%)
9	GOL	B	810	-	5,5,5	0.92	0	5,5,5	0.91	0
10	ACT	B	812	-	3,3,3	1.01	0	3,3,3	1.30	0
11	SO4	A	814	-	4,4,4	0.31	0	6,6,6	0.17	0
9	GOL	A	805	-	5,5,5	0.49	0	5,5,5	1.14	1 (20%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
9	GOL	A	809	-	5,5,5	1.77	1 (20%)	5,5,5	0.82	0
11	SO4	B	803	-	4,4,4	0.30	0	6,6,6	0.15	0
6	HEM	A	802	1	50,50,50	1.87	8 (16%)	67,82,82	1.80	18 (26%)
8	NAG	B	809	1	14,14,15	0.22	0	17,19,21	0.60	0
10	ACT	A	811	-	3,3,3	1.34	0	3,3,3	1.40	0
9	GOL	A	816	-	5,5,5	1.10	0	5,5,5	1.12	1 (20%)
8	NAG	A	817	1	14,14,15	0.63	0	17,19,21	0.73	0
11	SO4	A	815	-	4,4,4	0.25	0	6,6,6	0.16	0
11	SO4	A	812	-	4,4,4	0.25	0	6,6,6	0.26	0
11	SO4	B	801	-	4,4,4	0.34	0	6,6,6	0.35	0
9	GOL	B	811	-	5,5,5	0.68	0	5,5,5	1.16	0
11	SO4	B	804	-	4,4,4	0.26	0	6,6,6	0.30	0
9	GOL	A	808	-	5,5,5	0.99	0	5,5,5	0.85	0
11	SO4	B	802	-	4,4,4	0.30	0	6,6,6	0.26	0
11	SO4	A	813	-	4,4,4	0.25	0	6,6,6	0.26	0
11	SO4	B	813	-	4,4,4	0.21	0	6,6,6	0.36	0
10	ACT	A	810	-	3,3,3	1.08	0	3,3,3	1.39	0
9	GOL	A	806	-	5,5,5	0.96	0	5,5,5	1.03	1 (20%)
10	ACT	A	807	-	3,3,3	1.24	0	3,3,3	1.34	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
8	NAG	A	804	1	-	0/6/23/26	0/1/1/1
9	GOL	A	816	-	-	2/4/4/4	-
6	HEM	B	807	1	-	5/14/54/54	-
8	NAG	A	817	1	-	2/6/23/26	0/1/1/1
9	GOL	B	811	-	-	4/4/4/4	-
9	GOL	A	806	-	-	4/4/4/4	-
9	GOL	A	808	-	-	2/4/4/4	-
9	GOL	B	810	-	-	4/4/4/4	-
9	GOL	A	805	-	-	4/4/4/4	-
9	GOL	A	809	-	-	4/4/4/4	-
6	HEM	A	802	1	-	4/14/54/54	-
8	NAG	B	809	1	-	0/6/23/26	0/1/1/1

The worst 5 of 19 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	802	HEM	FE-NC	5.96	2.14	1.95
6	B	807	HEM	FE-NB	5.76	2.12	1.94
6	A	802	HEM	FE-NB	5.11	2.10	1.94
6	A	802	HEM	FE-NA	4.89	2.11	1.95
6	B	807	HEM	FE-NC	4.71	2.10	1.95

The worst 5 of 34 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	802	HEM	CMD-C2D-C1D	6.30	134.88	125.03
6	A	802	HEM	C2D-C1D-ND	-3.94	105.35	109.90
6	A	802	HEM	CMD-C2D-C3D	-3.91	115.58	126.15
6	B	807	HEM	CAC-C3C-C4C	3.91	134.15	124.82
6	B	807	HEM	CAC-C3C-C2C	-3.58	116.79	128.43

There are no chirality outliers.

5 of 35 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
9	A	805	GOL	C1-C2-C3-O3
9	A	806	GOL	O1-C1-C2-C3
9	A	806	GOL	C1-C2-C3-O3
9	A	806	GOL	O2-C2-C3-O3
9	A	816	GOL	O1-C1-C2-O2

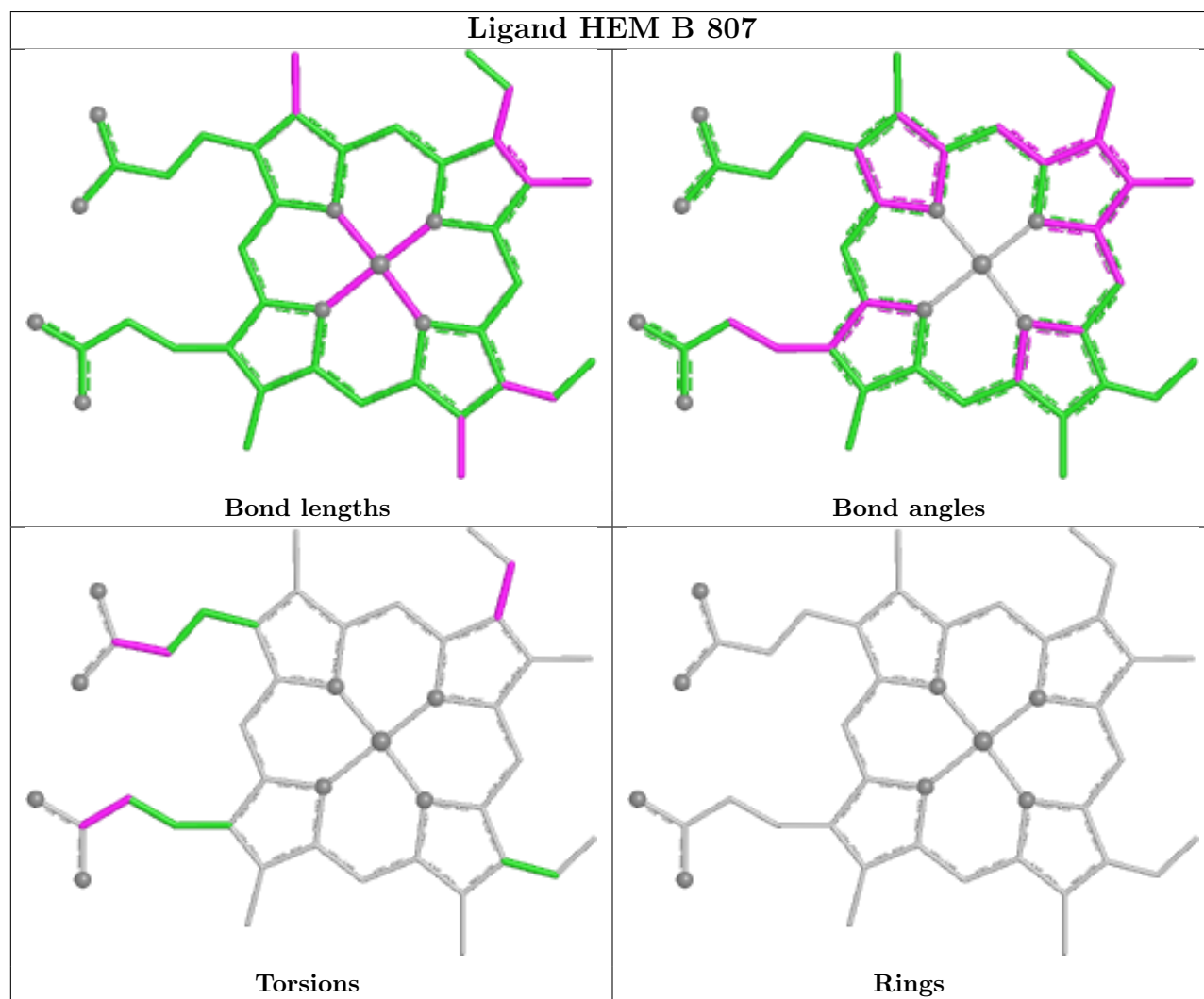
There are no ring outliers.

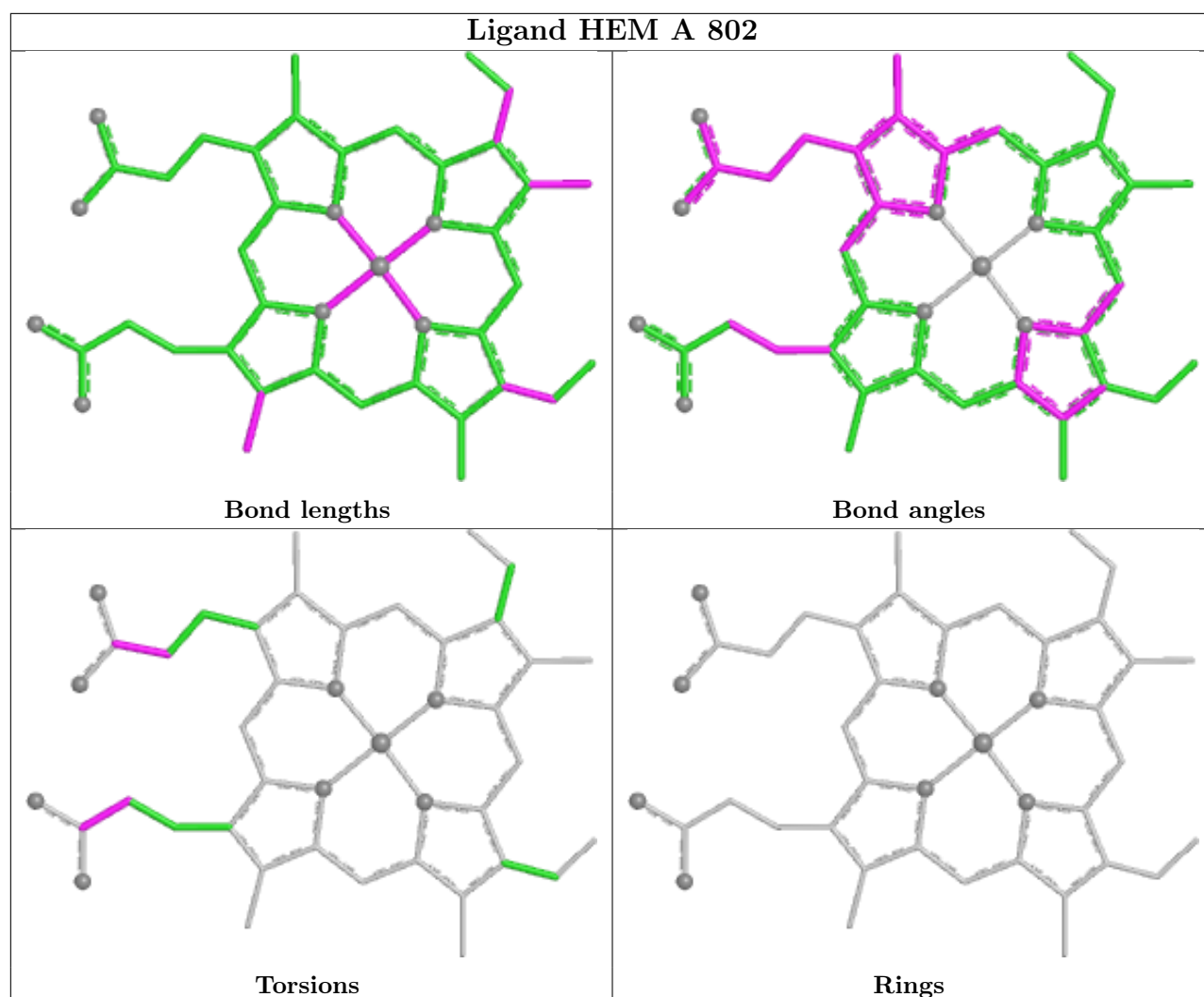
10 monomers are involved in 20 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	B	810	GOL	1	0
9	A	805	GOL	3	0
9	A	809	GOL	1	0
6	A	802	HEM	8	0
9	A	816	GOL	2	0
8	A	817	NAG	1	0
9	B	811	GOL	1	0
9	A	808	GOL	2	0
10	A	810	ACT	1	0
10	A	807	ACT	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,

bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	570/741 (76%)	-0.23	18 (3%) 50 53	17, 31, 59, 102	0
1	B	570/741 (76%)	-0.25	16 (2%) 55 57	18, 32, 58, 112	0
2	C	70/77 (90%)	0.37	3 (4%) 40 41	34, 43, 59, 98	0
2	D	70/77 (90%)	0.68	7 (10%) 12 13	37, 50, 77, 104	0
All	All	1280/1636 (78%)	-0.15	44 (3%) 48 50	17, 33, 60, 112	0

The worst 5 of 44 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	521	PRO	4.3
1	B	347	ASP	4.3
1	B	169	GLU	4.1
1	A	732	THR	4.0
1	A	521	PRO	3.9

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](#)

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.

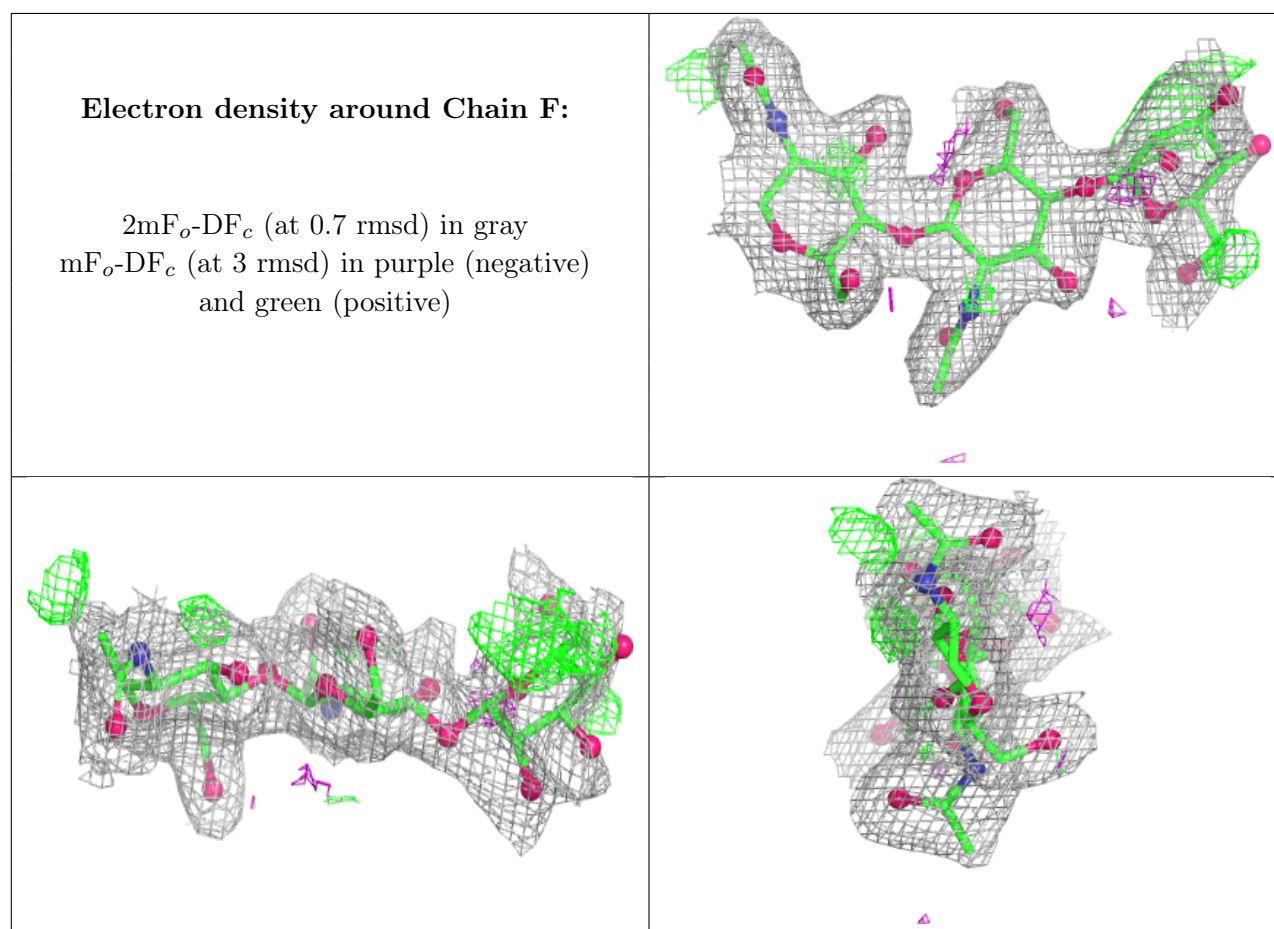
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	BMA	E	3	11/12	0.38	0.18	24,28,31,36	0
4	BMA	H	3	11/12	0.67	0.15	25,29,30,35	0

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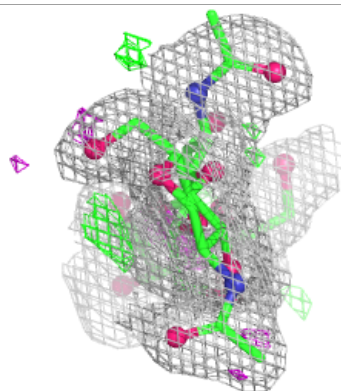
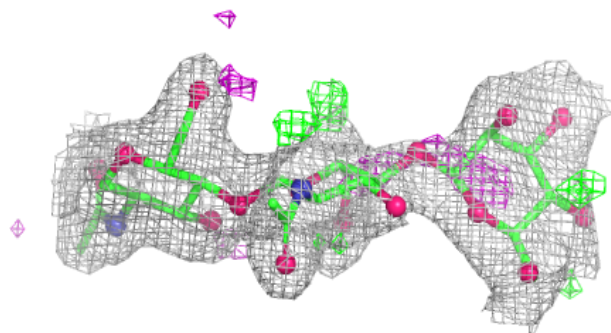
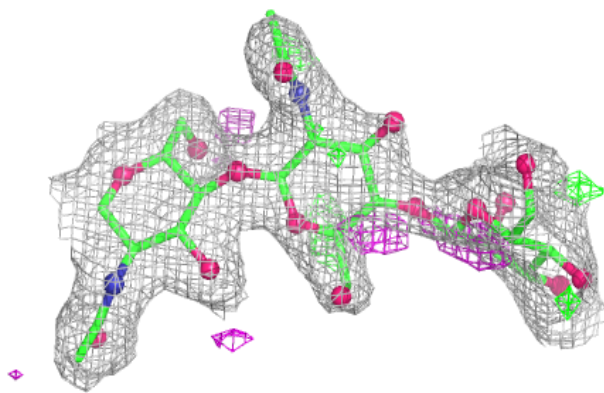
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	NAG	H	2	14/15	0.85	0.14	18,23,25,26	0
3	NAG	I	1	14/15	-	-	29,31,35,37	0
3	NAG	I	2	14/15	-	-	42,48,60,62	0
3	BMA	I	3	11/12	-	-	61,66,69,72	0
4	NAG	E	2	14/15	0.87	0.11	21,23,26,28	0
4	NAG	E	1	14/15	0.93	0.08	23,26,35,37	0
4	NAG	H	1	14/15	0.94	0.07	21,24,29,30	0
4	MAN	E	4	11/12	-	-	42,48,53,60	0
4	MAN	E	5	11/12	-	-	33,35,39,47	0
4	FUC	E	6	10/11	-	-	32,39,39,40	0
3	NAG	F	1	14/15	0.96	0.06	30,33,36,38	0
3	NAG	F	2	14/15	0.97	0.06	38,47,59,66	0
3	BMA	F	3	11/12	0.97	0.04	72,76,80,81	0
4	MAN	H	4	11/12	-	-	39,45,50,55	0
4	MAN	H	5	11/12	-	-	32,34,41,45	0
4	FUC	H	6	10/11	-	-	30,36,41,41	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.



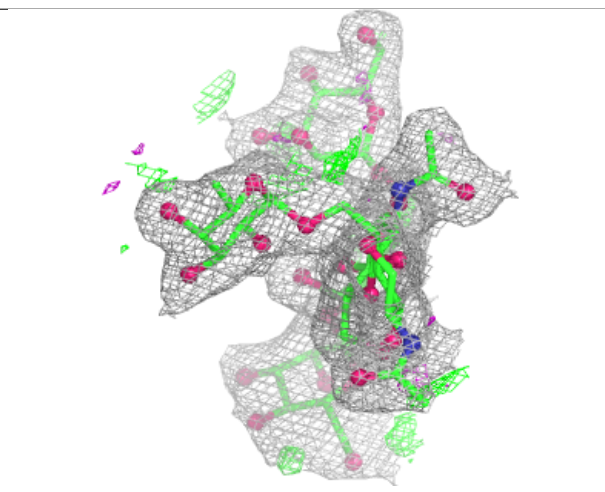
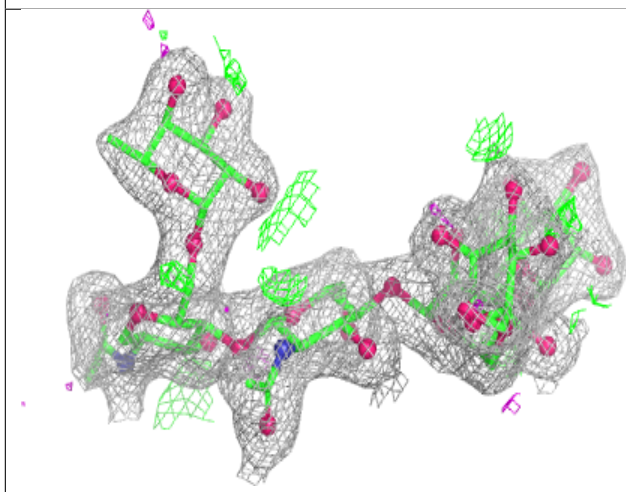
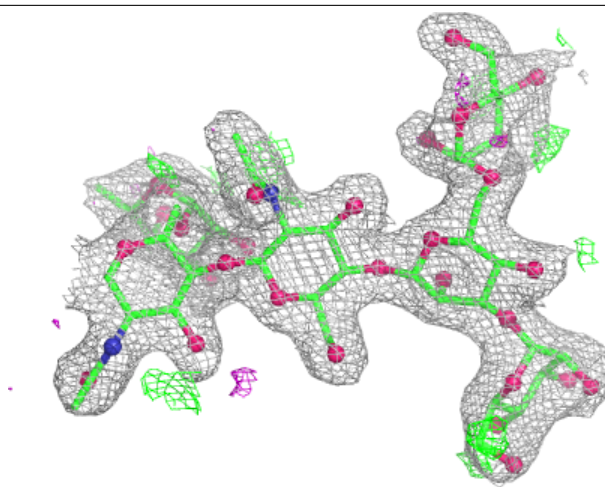
Electron density around Chain I:

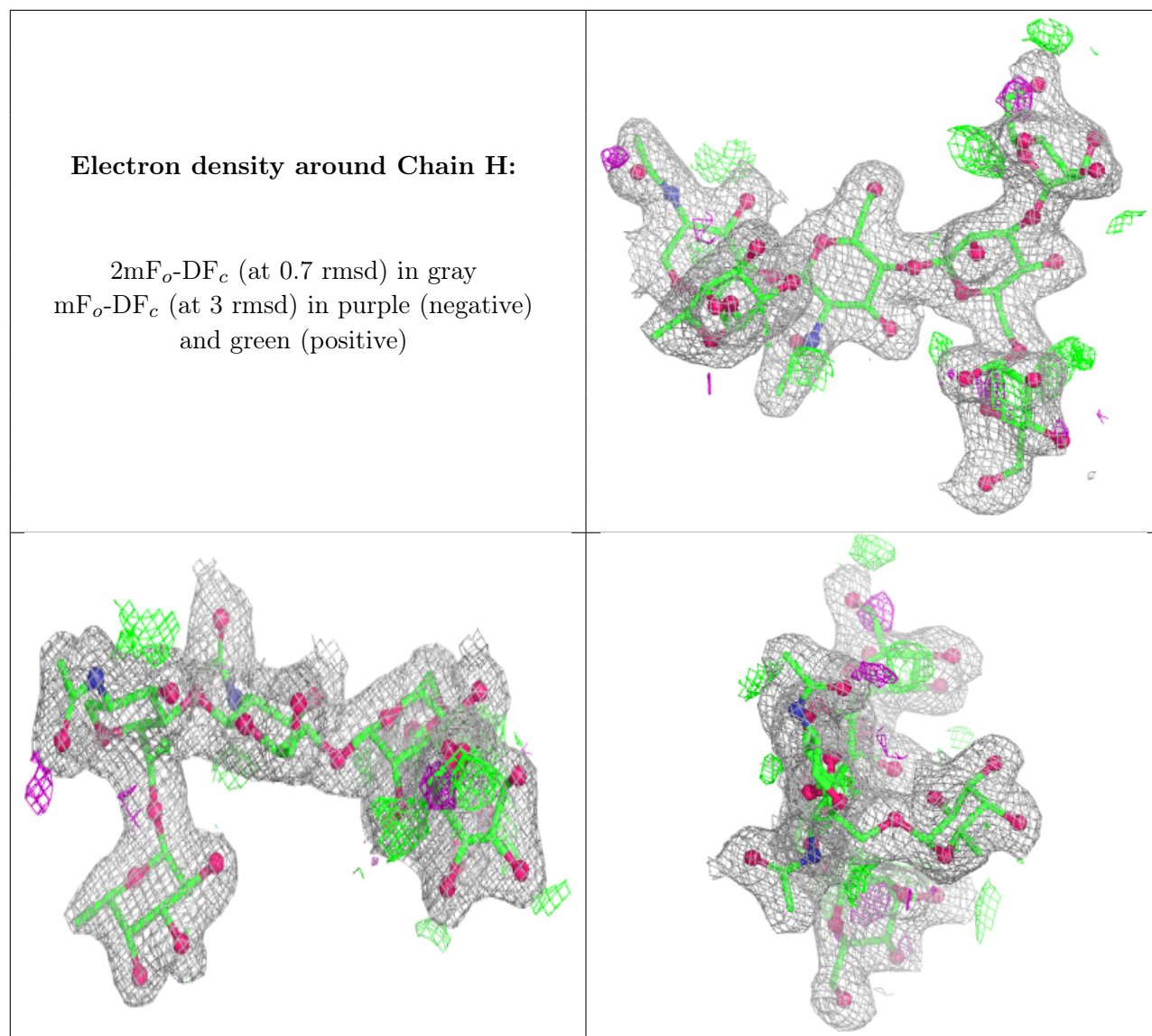
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain E:

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





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
11	SO4	B	805	5/5	0.78	0.13	68,69,71,76	0
9	GOL	A	805	6/6	0.79	0.19	42,46,50,51	0
11	SO4	A	814	5/5	0.80	0.11	55,56,69,71	0
10	ACT	A	811	4/4	0.81	0.18	42,49,50,52	0
8	NAG	B	809	14/15	0.84	0.12	53,54,59,62	0
9	GOL	A	808	6/6	0.84	0.15	42,48,50,51	0

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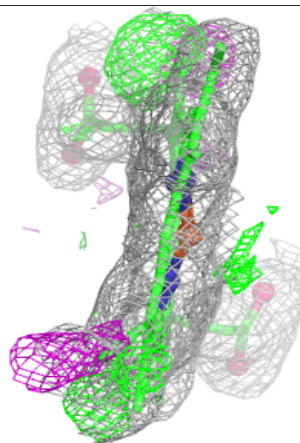
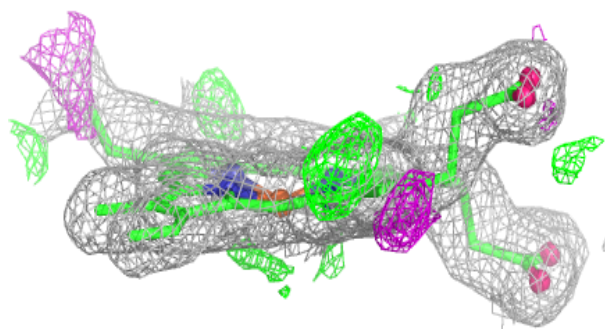
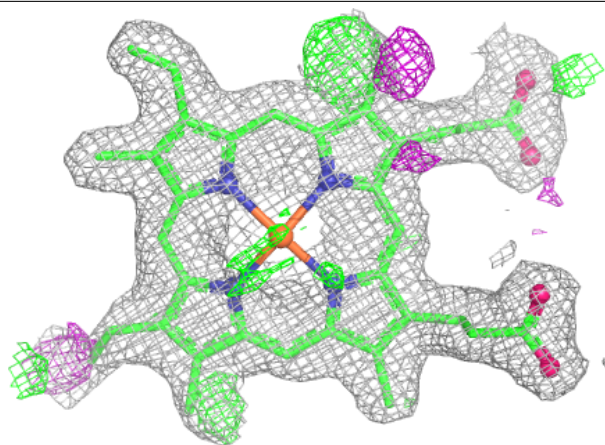
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
9	GOL	B	811	6/6	0.84	0.16	37,43,54,55	0
11	SO4	A	812	5/5	0.85	0.17	51,56,59,63	0
8	NAG	A	804	14/15	0.85	0.13	58,61,65,66	0
10	ACT	B	812	4/4	0.85	0.13	33,39,40,43	0
11	SO4	B	803	5/5	0.86	0.13	48,52,60,63	0
9	GOL	A	806	6/6	0.86	0.16	39,43,49,52	0
10	ACT	A	807	4/4	0.88	0.19	51,52,54,54	0
9	GOL	A	816	6/6	0.88	0.12	25,31,35,36	0
11	SO4	A	813	5/5	0.88	0.10	52,55,64,64	0
11	SO4	B	804	5/5	0.89	0.09	56,57,61,64	0
9	GOL	B	810	6/6	0.89	0.12	29,33,39,43	0
9	GOL	A	809	6/6	0.91	0.11	26,27,31,34	0
8	NAG	A	817	14/15	0.92	0.09	36,39,41,49	0
10	ACT	A	810	4/4	0.95	0.10	19,24,27,28	0
11	SO4	B	813	5/5	0.95	0.09	37,39,42,43	0
6	HEM	A	802	43/43	0.96	0.08	20,26,35,44	0
11	SO4	A	815	5/5	0.96	0.20	48,48,50,58	0
11	SO4	B	802	5/5	0.97	0.09	37,39,40,40	0
11	SO4	B	801	5/5	0.98	0.10	29,29,32,34	0
6	HEM	B	807	43/43	0.98	0.07	23,29,33,43	0
5	CA	A	801	1/1	0.99	0.04	22,22,22,22	0
5	CA	B	806	1/1	1.00	0.02	22,22,22,22	0
7	CL	A	803	1/1	1.00	0.02	19,19,19,19	0
7	CL	B	808	1/1	1.00	0.02	21,21,21,21	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.

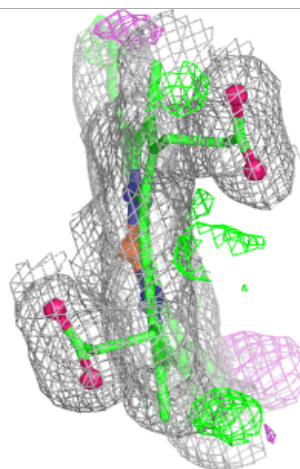
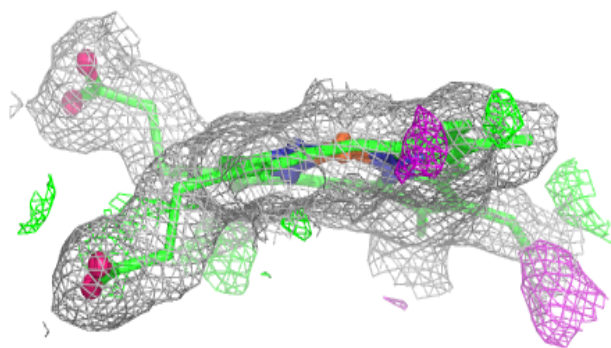
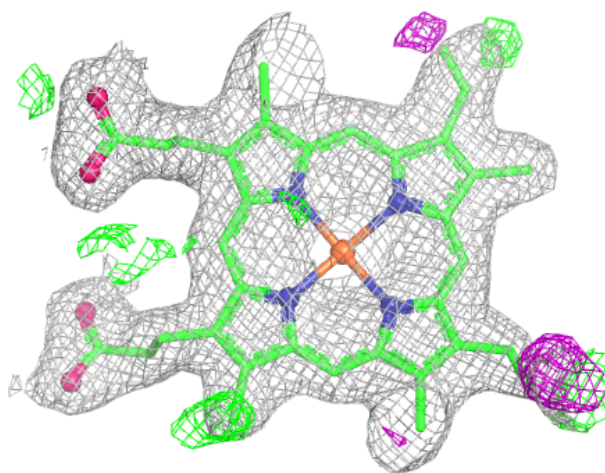
Electron density around HEM A 802:

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



Electron density around HEM B 807:

$2mF_o-DF_c$ (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.