Full wwPDB X-ray Structure Validation Report (i)

Jun 26, 2024 – 08:39 PM EDT

PDB ID	:	5QJ3
Title	:	CRYSTAL STRUCTURE OF MYELOPEROXIDASE SUBFORM C (MPO) COMPLEX WITH COMPOUND-24 AKA 7-({4-CHLORO-3'-FLUORO-[1,1'- BIPHENYL]-3-YL}METHOXY)-3H-[1,2,3]TRIAZOLO[4,5-B]PYRIDIN-5-AMINE
Authors	:	Khan, J.A.
Deposited on	:	2018-09-26
Resolution	:	2.76 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 (i) 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 (i)) were used in the production of this report:

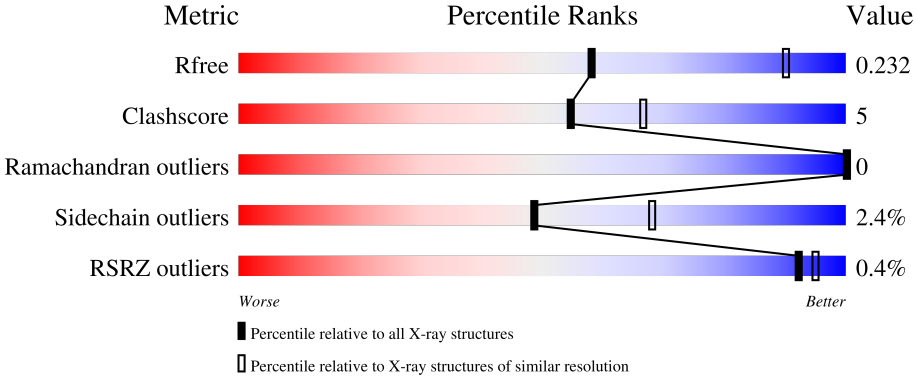
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.76 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1235 (2.78-2.74)
Clashscore	141614	1277 (2.78-2.74)
Ramachandran outliers	138981	1257 (2.78-2.74)
Sidechain outliers	138945	1257 (2.78-2.74)
RSRZ outliers	127900	1207 (2.78-2.74)

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 <=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	105	83% 15% •
1	D	105	87% 11% •
2	B	467	89% 10% •
2	E	467	% 89% 10%
3	C	2	100%

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Mol	Chain	Length	Quality of chain
3	G	2	50% 50%
4	F	6	50% 33% 17%
4	H	6	67% 33%

2 Entry composition (i)

There are 10 unique types of molecules in this entry. The entry contains 9480 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
			Total	C	N	O	S			
1	A	103	818	519	145	149	5	0	0	0
1	D	103	813	517	142	149	5	0	0	0

- Molecule 2 is a protein called Myeloperoxidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	464	3635	2305	652	651	27	20	0	0
2	E	465	3689	2335	663	663	28	31	1	0

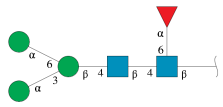
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	112	ALA	GLY	conflict	UNP P05164
E	112	ALA	GLY	conflict	UNP P05164

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

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	C	2	28	16	2	10	0	0	0
3	G	2	28	16	2	10	0	0	0

- 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.

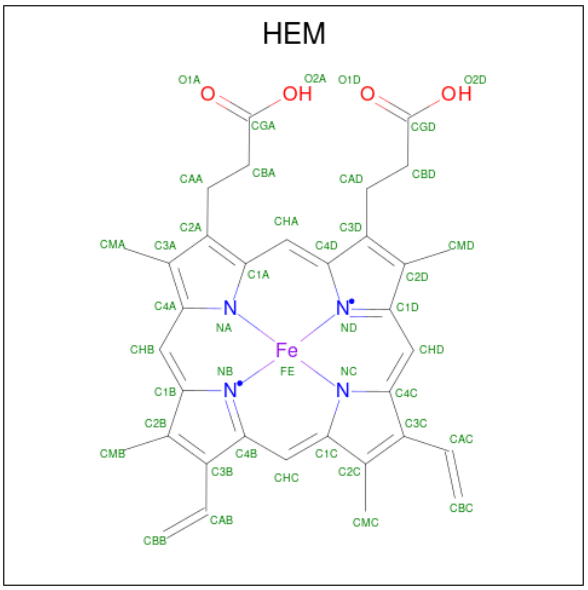


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
4	F	6	71	40	2	29	0	0	0
			Total	C	N	O			
4	H	6	71	40	2	29	0	0	0

- Molecule 5 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

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

- Molecule 6 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).



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

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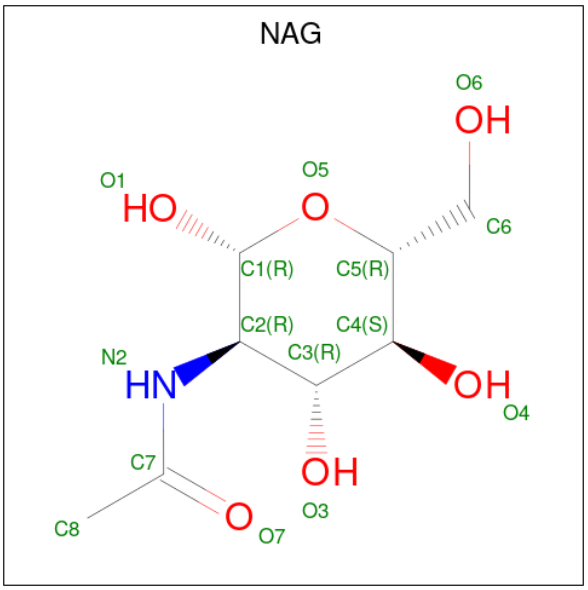
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	Fe	N	O		
6	E	1	43	34	1	4	4	0	0

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).

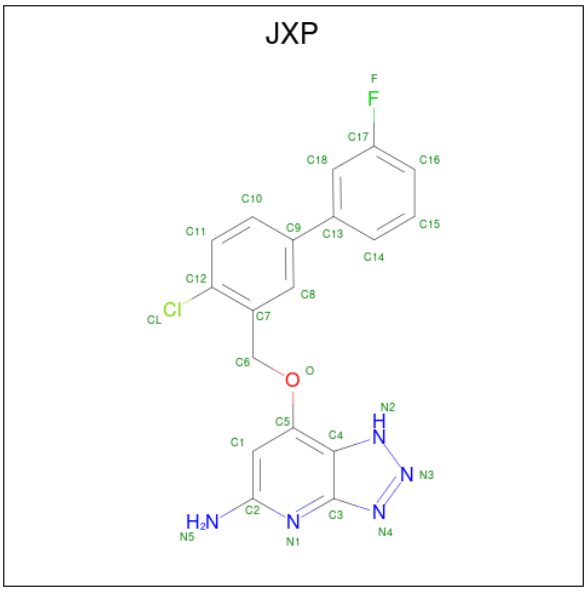


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O			
7	B	1	14	8	1	5		0	0
7	E	1	14	8	1	5		0	0

- Molecule 8 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Ca		
8	B	1	1	1	0	0
8	E	1	1	1	0	0

- Molecule 9 is 7-[(4-chloro-3'-fluoro[1,1'-biphenyl]-3-yl)methoxy]-1H-[1,2,3]triazolo[4,5-b]pyridin-5-amine (three-letter code: JXP) (formula: $C_{18}H_{13}ClFN_5O$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	Cl	F	N	O		
9	B	1	33	24	1	2	5	1	0	1

- Molecule 10 is water.

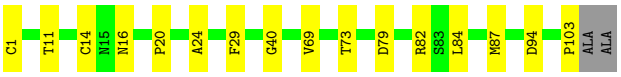
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
10	A	17	17	17	0	0
			Total	O		
10	B	66	66	66	0	0
			Total	O		
10	D	19	19	19	0	0
			Total	O		
10	E	74	74	74	0	0

3 Residue-property plots (i)

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

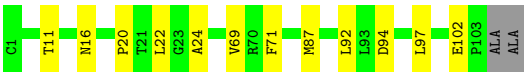
• Molecule 1: Myeloperoxidase

Chain A:



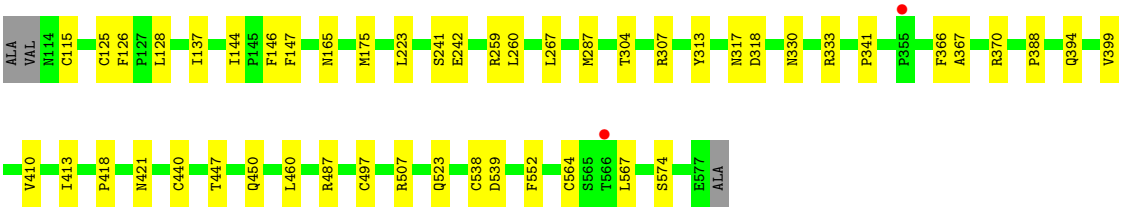
• Molecule 1: Myeloperoxidase

Chain D:



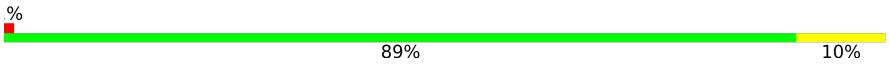
• Molecule 2: Myeloperoxidase

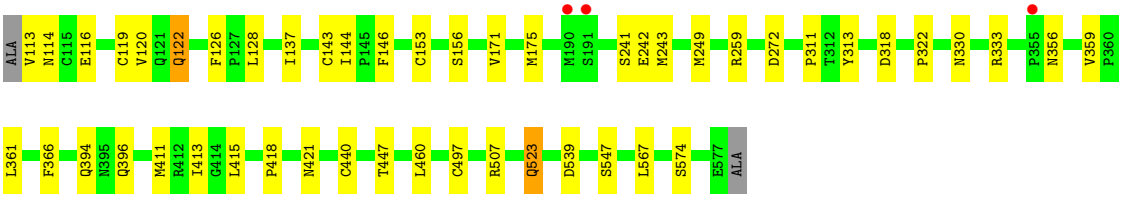
Chain B:



• Molecule 2: Myeloperoxidase

Chain E:





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

Chain C: 100%

NAG1 NAG2

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

Chain G: 50% 50%

NAG1 NAG2

• 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

Chain F: 50% 33% 17%

NAG1 NAG2 BMA3 MAN4 MAN5 FUC6

• 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

Chain H: 67% 33%

NAG1 NAG2 BMA3 MAN4 MAN5 FUC6

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α, β, γ	106.54Å 106.54Å 238.69Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	38.44 – 2.76 47.65 – 2.76	Depositor EDS
% Data completeness (in resolution range)	100.0 (38.44-2.76) 100.0 (47.65-2.76)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.14	Depositor
$< I/\sigma(I) >$ [1]	4.19 (at 2.77Å)	Xtriage
Refinement program	BUSTER 2.11.2	Depositor
R, R_{free}	0.184 , 0.228 0.187 , 0.232	Depositor DCC
R_{free} test set	1815 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å^2)	39.7	Xtriage
Anisotropy	0.259	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.29 , 41.3	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	9480	wwPDB-VP
Average B, all atoms (Å^2)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.68% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: NAG, CA, HEM, CL, BMA, FUC, MAN, JXP

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	0.51	0/843	0.70	0/1150
1	D	0.48	0/838	0.71	0/1144
2	B	0.52	0/3721	0.66	0/5059
2	E	0.52	0/3774	0.68	0/5126
All	All	0.51	0/9176	0.68	0/12479

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts (i)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	818	0	774	15	0
1	D	813	0	765	10	0
2	B	3635	0	3577	32	0
2	E	3689	0	3661	35	0
3	C	28	0	25	0	0
3	G	28	0	25	0	0
4	F	71	0	61	3	0
4	H	71	0	61	0	0
5	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	1	0	0	0	0
6	B	43	0	30	7	0
6	E	43	0	30	11	0
7	B	14	0	13	0	0
7	E	14	0	13	0	0
8	B	1	0	0	0	0
8	E	1	0	0	0	0
9	B	33	0	0	0	0
10	A	17	0	0	0	0
10	B	66	0	0	0	0
10	D	19	0	0	0	0
10	E	74	0	0	0	0
All	All	9480	0	9035	84	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 5.

All (84) 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)
2:B:317:ASN:ND2	4:F:1:NAG:C1	1.68	1.54
1:A:94:ASP:OD2	6:B:601:HEM:HMD3	1.33	1.23
1:D:94:ASP:OD2	6:E:601:HEM:HMD1	1.16	1.22
1:D:94:ASP:OD2	6:E:601:HEM:CMD	2.00	1.10
1:A:94:ASP:OD2	6:B:601:HEM:CMD	2.01	1.08
2:B:538:CYS:HG	2:B:564:CYS:HG	0.98	0.91
2:B:242:GLU:OE2	6:B:601:HEM:HMB1	1.72	0.90
2:E:242:GLU:OE2	6:E:601:HEM:HMB1	1.72	0.89
2:E:243:MET:SD	6:E:601:HEM:HBB1	2.16	0.85
2:E:243:MET:SD	6:E:601:HEM:CBB	2.65	0.85
2:E:411:MET:HE1	2:E:415:LEU:HG	1.61	0.81
2:B:317:ASN:CG	4:F:1:NAG:C1	2.50	0.79
2:B:115:CYS:HG	2:B:125:CYS:HG	0.79	0.77
2:E:313:TYR:CD1	2:E:507:ARG:HD3	2.27	0.69
2:B:313:TYR:CD1	2:B:507:ARG:HD3	2.28	0.68
2:E:440:CYS:HG	2:E:497:CYS:HG	1.22	0.67
1:A:94:ASP:CG	6:B:601:HEM:HMD3	2.13	0.67
2:E:313:TYR:HD1	2:E:507:ARG:HD3	1.60	0.66
2:B:313:TYR:HD1	2:B:507:ARG:HD3	1.59	0.66
2:B:242:GLU:OE2	6:B:601:HEM:CMB	2.44	0.66
6:E:601:HEM:HBB2	6:E:601:HEM:HHC	1.77	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:260:LEU:HD11	2:B:287:MET:HE1	1.81	0.63
2:B:333:ARG:HH11	2:B:421:ASN:ND2	1.98	0.62
2:B:367:ALA:HB1	2:B:370:ARG:HG3	1.82	0.62
2:E:333:ARG:HH11	2:E:421:ASN:ND2	1.98	0.61
2:E:411:MET:HE3	2:E:413:ILE:O	2.02	0.59
2:E:333:ARG:HH11	2:E:421:ASN:HD22	1.50	0.58
2:E:242:GLU:OE2	6:E:601:HEM:CMB	2.47	0.58
2:B:333:ARG:HH11	2:B:421:ASN:HD22	1.50	0.57
2:B:317:ASN:ND2	4:F:1:NAG:C2	2.64	0.54
2:E:119:CYS:HG	2:E:143:CYS:HG	0.65	0.54
1:A:94:ASP:OD2	6:B:601:HEM:HMD2	2.04	0.54
2:B:341:PRO:HG3	2:B:399:VAL:HG11	1.92	0.51
2:E:126:PHE:O	2:E:146:PHE:HB3	2.11	0.51
2:B:241:SER:O	2:B:366:PHE:HA	2.13	0.49
1:A:84:LEU:HD22	1:A:87:MET:HE3	1.94	0.49
2:B:128:LEU:HB2	2:B:144:ILE:HB	1.95	0.49
2:E:356:ASN:HB3	2:E:359:VAL:HG22	1.95	0.48
2:B:126:PHE:O	2:B:146:PHE:HB3	2.12	0.48
2:E:113:VAL:HG21	2:E:122:GLN:HB3	1.94	0.48
2:B:259:ARG:HD2	2:B:539:ASP:HB3	1.95	0.47
2:E:128:LEU:HB2	2:E:144:ILE:HB	1.96	0.47
2:B:394:GLN:HB3	2:B:460:LEU:HD22	1.96	0.47
1:A:1:CYS:HG	1:A:14:CYS:CB	2.28	0.46
6:B:601:HEM:HBC2	6:B:601:HEM:HMC2	1.97	0.46
1:D:92:LEU:HD22	2:E:249:MET:HB3	1.97	0.46
2:B:223:LEU:HB2	2:B:410:VAL:HG12	1.97	0.46
2:B:115:CYS:HB2	2:B:147:PHE:CE1	2.51	0.46
1:A:11:THR:O	1:A:24:ALA:HA	2.16	0.46
2:E:333:ARG:NH2	6:E:601:HEM:HAD1	2.31	0.46
1:D:11:THR:O	1:D:24:ALA:HA	2.16	0.45
2:E:241:SER:O	2:E:366:PHE:HA	2.17	0.45
2:E:394:GLN:HB3	2:E:460:LEU:HD22	1.98	0.45
2:B:447:THR:H	2:B:450:GLN:HE21	1.64	0.45
2:E:333:ARG:HH21	6:E:601:HEM:HAD1	1.81	0.45
1:A:29:PHE:CE1	2:B:165:ASN:HB2	2.51	0.45
6:E:601:HEM:HMC2	6:E:601:HEM:HBC2	1.98	0.45
2:E:259:ARG:HD2	2:E:539:ASP:HB3	1.98	0.44
1:A:40:GLY:HA3	1:D:20:PRO:HG2	2.00	0.44
2:E:243:MET:SD	6:E:601:HEM:CAB	3.05	0.44
2:B:440:CYS:CB	2:B:497:CYS:HG	2.29	0.44
2:E:137:ILE:HG12	2:E:413:ILE:HD11	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:153:CYS:SG	2:E:156:SER:HB2	2.58	0.43
2:E:440:CYS:CB	2:E:497:CYS:HG	2.29	0.43
1:A:69:VAL:HG11	2:B:418:PRO:HG2	1.99	0.43
1:A:1:CYS:SG	1:A:14:CYS:SG	3.07	0.43
1:A:103:PRO:HG2	2:B:147:PHE:HD2	1.84	0.43
2:E:411:MET:HE2	2:E:411:MET:HB2	1.68	0.43
1:D:97:LEU:HD21	2:E:171:VAL:HG22	2.01	0.42
1:A:82:ARG:HA	2:B:552:PHE:O	2.20	0.42
1:D:22:LEU:HB3	2:E:322:PRO:HD2	2.01	0.42
2:B:333:ARG:NH1	2:B:421:ASN:HD22	2.17	0.42
2:B:304:THR:HG22	2:B:307:ARG:HH21	1.84	0.42
2:E:114:ASN:ND2	2:E:116:GLU:HB2	2.35	0.41
2:E:114:ASN:HD21	2:E:116:GLU:HB2	1.86	0.41
1:A:16:ASN:O	1:A:20:PRO:HA	2.21	0.41
1:A:79:ASP:O	2:B:388:PRO:HB3	2.21	0.41
2:B:538:CYS:CB	2:B:564:CYS:HG	2.30	0.41
1:D:16:ASN:O	1:D:20:PRO:HA	2.21	0.41
2:E:523:GLN:H	2:E:523:GLN:CD	2.24	0.41
2:B:137:ILE:HG12	2:B:413:ILE:HD11	2.03	0.40
1:D:71:PHE:CG	2:E:396:GLN:HA	2.56	0.40
1:D:69:VAL:HG11	2:E:418:PRO:HG2	2.03	0.40
2:E:311:PRO:O	2:E:507:ARG:NH2	2.50	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	101/105 (96%)	99 (98%)	2 (2%)	0	100	100
1	D	101/105 (96%)	99 (98%)	2 (2%)	0	100	100
2	B	462/467 (99%)	446 (96%)	16 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	E	464/467 (99%)	448 (97%)	16 (3%)	0	100	100
All	All	1128/1144 (99%)	1092 (97%)	36 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	86/90 (96%)	85 (99%)	1 (1%)	71	82
1	D	85/90 (94%)	83 (98%)	2 (2%)	49	68
2	B	388/411 (94%)	380 (98%)	8 (2%)	53	71
2	E	400/411 (97%)	388 (97%)	12 (3%)	41	61
All	All	959/1002 (96%)	936 (98%)	23 (2%)	49	68

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	73	THR
2	B	175	MET
2	B	267	LEU
2	B	318	ASP
2	B	330	ASN
2	B	487	ARG
2	B	523	GLN
2	B	567	LEU
2	B	574	SER
1	D	87	MET
1	D	102	GLU
2	E	120	VAL
2	E	122	GLN
2	E	175	MET
2	E	272	ASP
2	E	318	ASP

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Mol	Chain	Res	Type
2	E	330	ASN
2	E	361	LEU
2	E	447	THR
2	E	523	GLN
2	E	547	SER
2	E	567	LEU
2	E	574	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	121	GLN
2	B	421	ASN
2	B	450	GLN
2	E	114	ASN
2	E	356	ASN
2	E	421	ASN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

16 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	$\#\|Z\| > 2$
3	NAG	C	1	3	14,14,15	0.27	0	17,19,21	0.78	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	NAG	C	2	3	14,14,15	0.29	0	17,19,21	0.86	1 (5%)
4	NAG	F	1	4	14,14,15	0.34	0	17,19,21	0.76	1 (5%)
4	NAG	F	2	4	14,14,15	0.31	0	17,19,21	0.61	0
4	BMA	F	3	4	11,11,12	0.30	0	15,15,17	0.68	0
4	MAN	F	4	4	11,11,12	0.24	0	15,15,17	0.77	1 (6%)
4	MAN	F	5	4	11,11,12	0.33	0	15,15,17	1.05	1 (6%)
4	FUC	F	6	4	10,10,11	0.49	0	14,14,16	0.63	0
3	NAG	G	1	3	14,14,15	0.29	0	17,19,21	0.66	0
3	NAG	G	2	3	14,14,15	0.27	0	17,19,21	0.86	1 (5%)
4	NAG	H	1	4	14,14,15	0.30	0	17,19,21	0.74	0
4	NAG	H	2	4	14,14,15	0.33	0	17,19,21	0.64	0
4	BMA	H	3	4	11,11,12	0.23	0	15,15,17	0.56	0
4	MAN	H	4	4	11,11,12	0.25	0	15,15,17	0.85	1 (6%)
4	MAN	H	5	4	11,11,12	0.30	0	15,15,17	1.08	1 (6%)
4	FUC	H	6	4	10,10,11	0.39	0	14,14,16	0.60	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
3	NAG	C	1	3	-	0/6/23/26	0/1/1/1
3	NAG	C	2	3	-	2/6/23/26	0/1/1/1
4	NAG	F	1	4	-	0/6/23/26	0/1/1/1
4	NAG	F	2	4	-	0/6/23/26	0/1/1/1
4	BMA	F	3	4	-	0/2/19/22	0/1/1/1
4	MAN	F	4	4	-	0/2/19/22	0/1/1/1
4	MAN	F	5	4	-	2/2/19/22	0/1/1/1
4	FUC	F	6	4	-	-	0/1/1/1
3	NAG	G	1	3	-	0/6/23/26	0/1/1/1
3	NAG	G	2	3	-	2/6/23/26	0/1/1/1
4	NAG	H	1	4	-	0/6/23/26	0/1/1/1
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	-	1/2/19/22	0/1/1/1
4	FUC	H	6	4	-	-	0/1/1/1

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	F	5	MAN	C1-O5-C5	3.12	116.42	112.19
4	H	4	MAN	C1-O5-C5	3.06	116.33	112.19
4	H	5	MAN	C1-O5-C5	3.05	116.32	112.19
4	F	4	MAN	C1-O5-C5	2.65	115.78	112.19
3	G	2	NAG	C1-O5-C5	2.65	115.78	112.19
3	C	2	NAG	C1-O5-C5	2.49	115.56	112.19
3	C	1	NAG	C1-C2-N2	-2.38	106.43	110.49
4	F	1	NAG	O5-C1-C2	-2.18	107.85	111.29

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	C	2	NAG	C4-C5-C6-O6
3	G	2	NAG	C4-C5-C6-O6
3	C	2	NAG	O5-C5-C6-O6
4	H	5	MAN	C4-C5-C6-O6
4	F	5	MAN	C4-C5-C6-O6
3	G	2	NAG	O5-C5-C6-O6
4	F	5	MAN	O5-C5-C6-O6

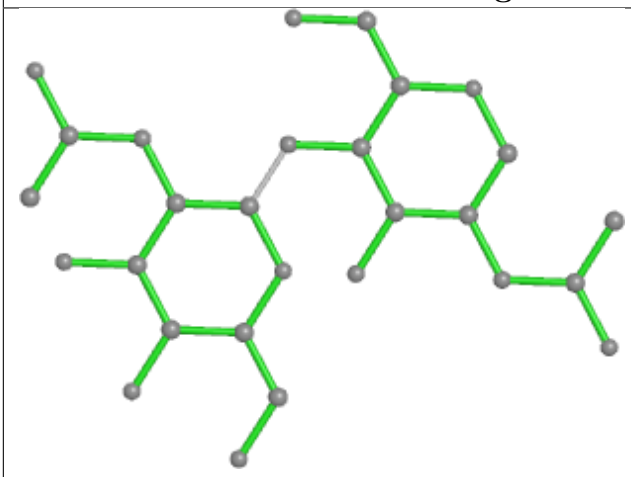
There are no ring outliers.

1 monomer is involved in 3 short contacts:

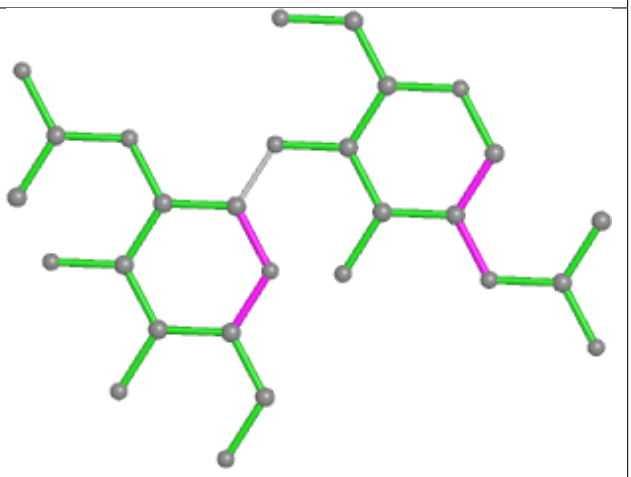
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	F	1	NAG	3	0

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

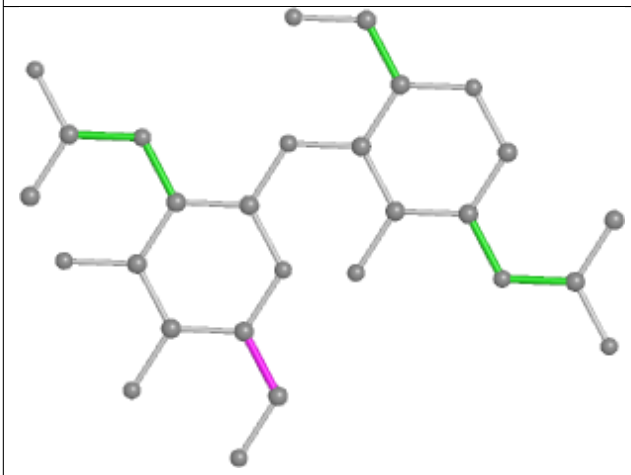
Oligosaccharide Chain C



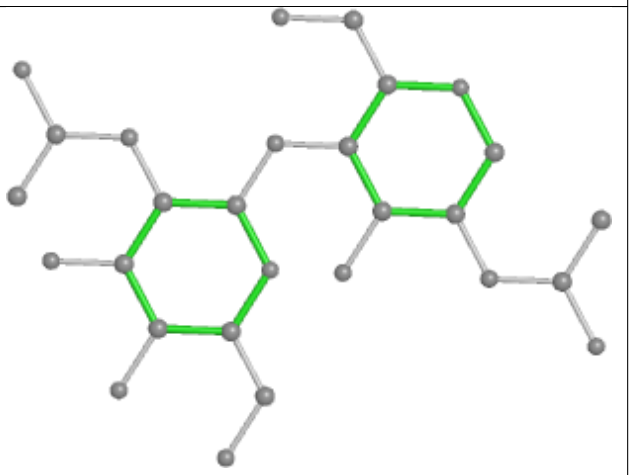
Bond lengths



Bond angles

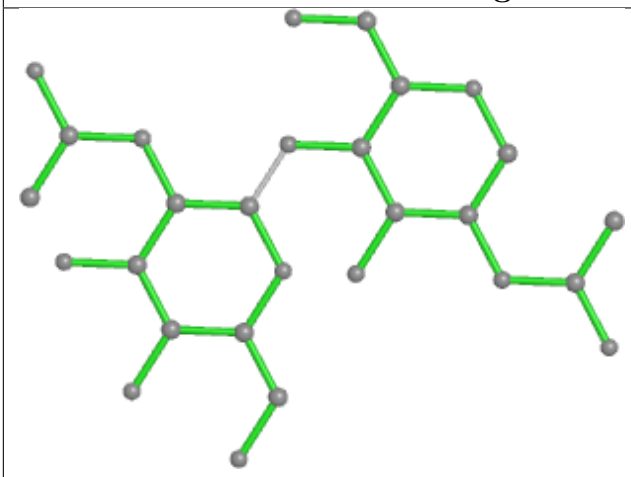


Torsions

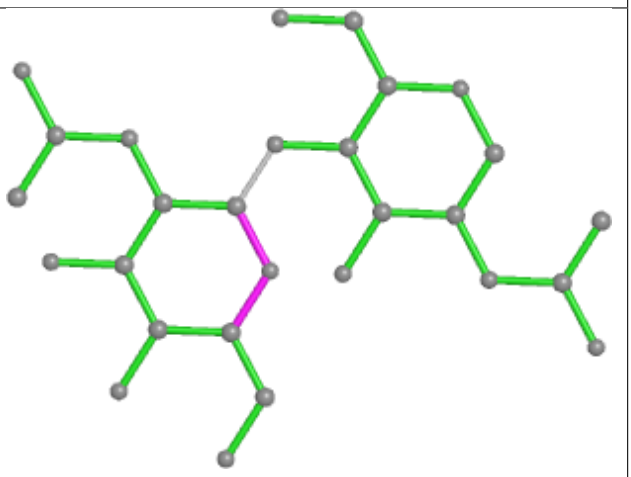


Rings

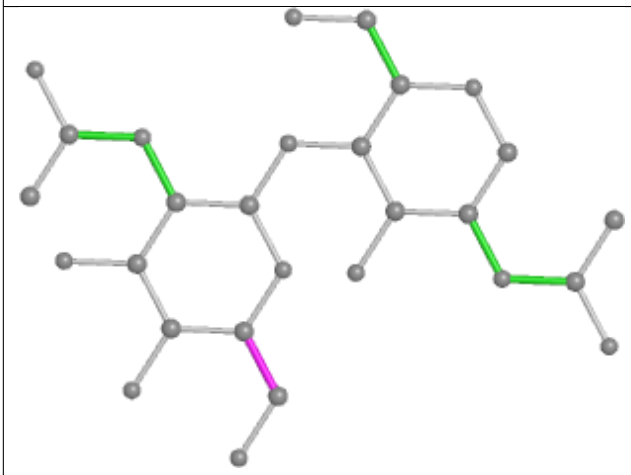
Oligosaccharide Chain G



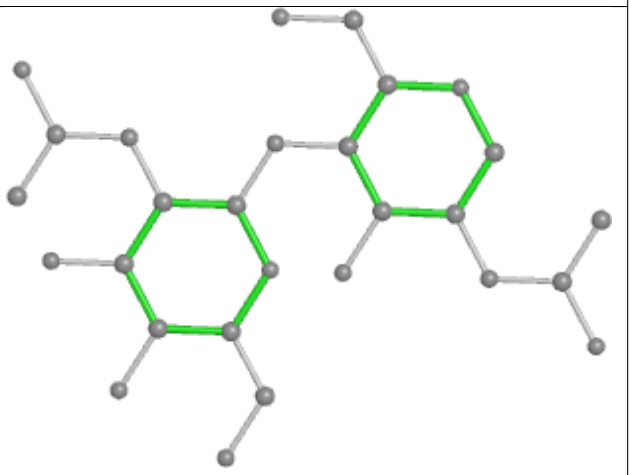
Bond lengths



Bond angles

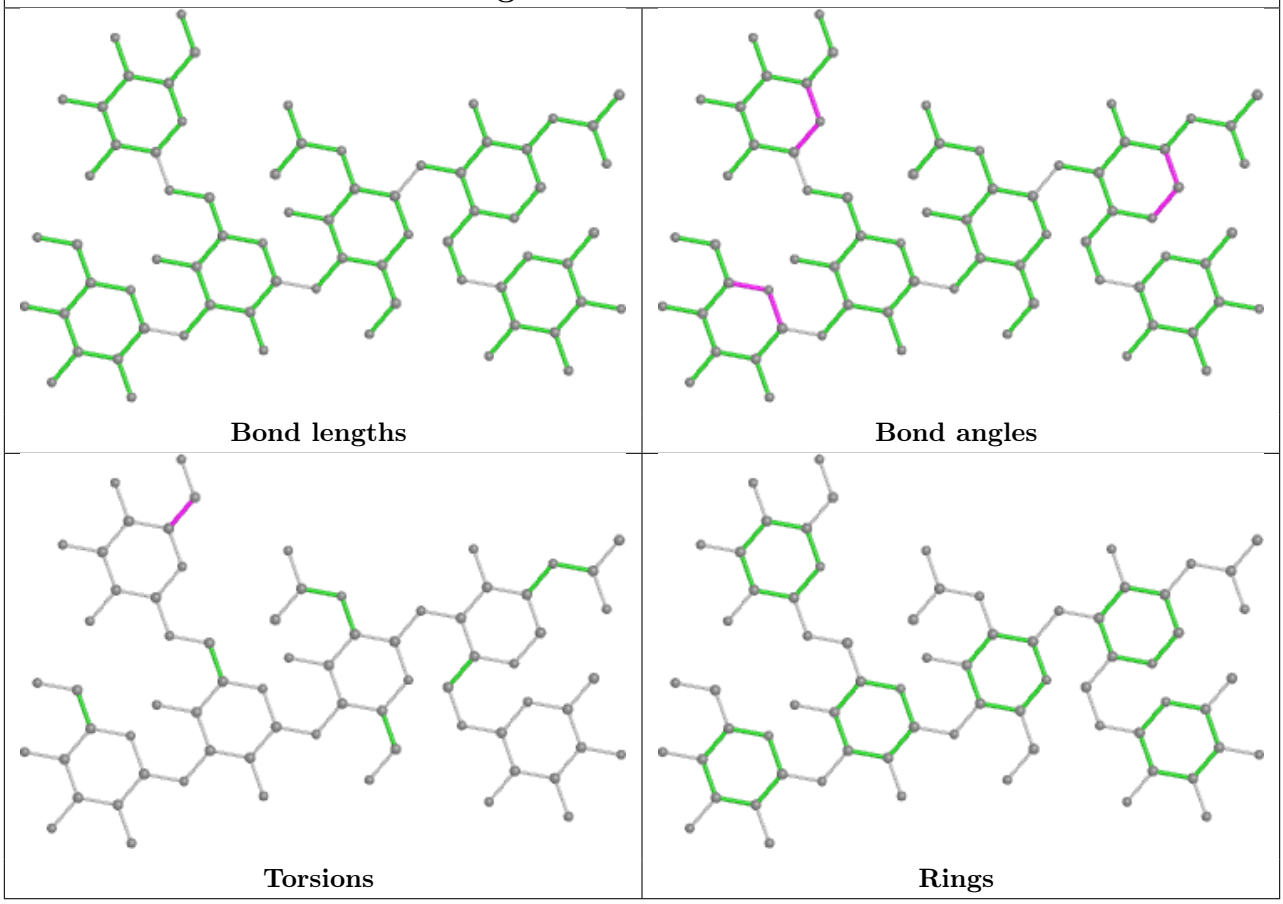


Torsions

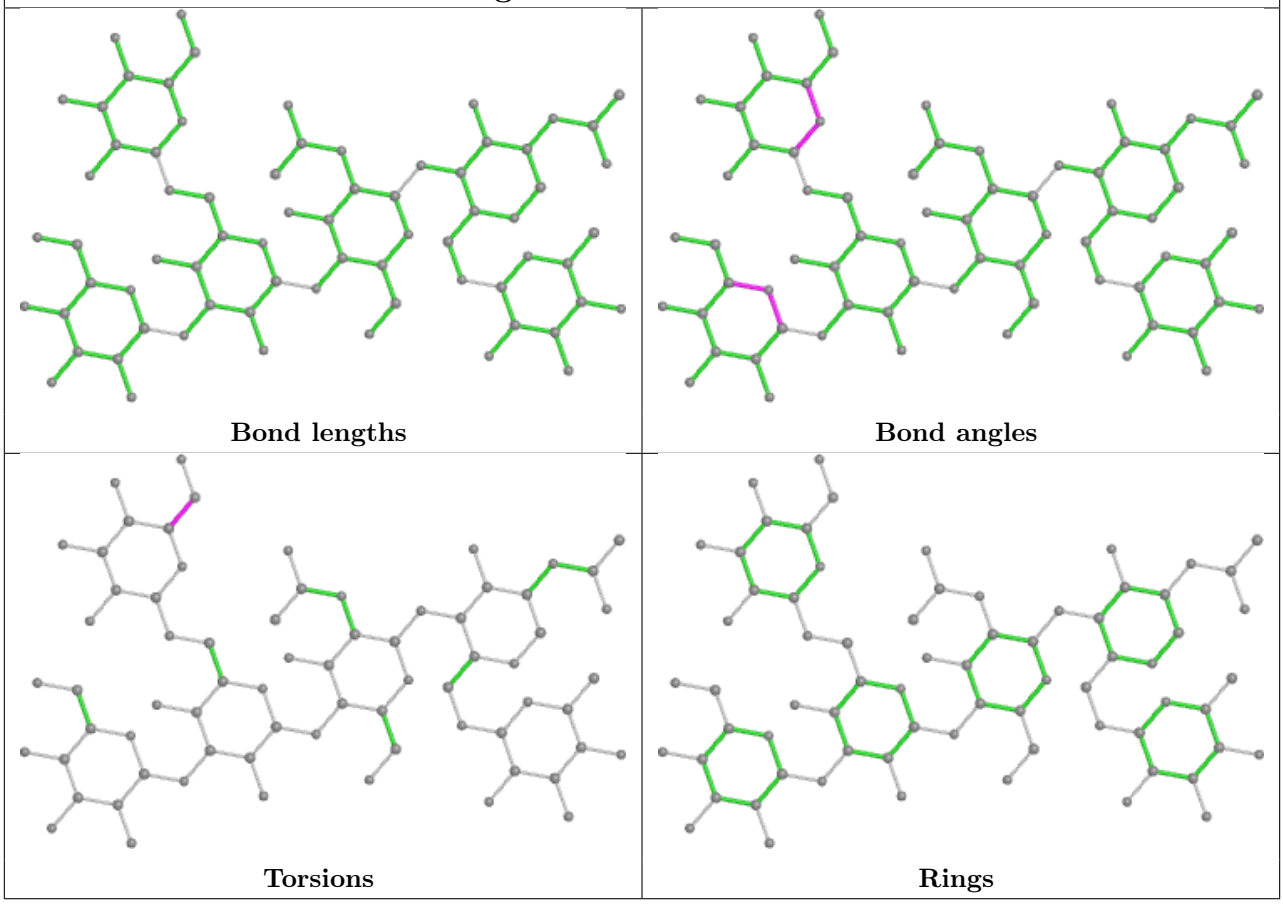


Rings

Oligosaccharide Chain F



Oligosaccharide Chain H



5.6 Ligand geometry (i)

Of 10 ligands modelled in this entry, 4 are monoatomic - leaving 6 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	$\#\|Z\| > 2$
7	NAG	E	602	-	14,14,15	0.29	0	17,19,21	0.85	1 (5%)
9	JXP	B	613[B]	-	27,29,29	1.13	3 (11%)	32,41,41	0.69	1 (3%)
9	JXP	B	613[A]	-	27,29,29	1.13	3 (11%)	32,41,41	0.68	1 (3%)
6	HEM	E	601	2	41,50,50	1.40	7 (17%)	45,82,82	1.84	15 (33%)
6	HEM	B	601	2	41,50,50	1.46	8 (19%)	45,82,82	1.76	13 (28%)
7	NAG	B	602	2	14,14,15	0.29	0	17,19,21	0.91	1 (5%)

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
7	NAG	E	602	-	-	0/6/23/26	0/1/1/1
9	JXP	B	613[B]	-	-	1/9/9/9	0/4/4/4
9	JXP	B	613[A]	-	-	1/9/9/9	0/4/4/4
6	HEM	E	601	2	-	5/12/54/54	-
6	HEM	B	601	2	-	6/12/54/54	-
7	NAG	B	602	2	-	0/6/23/26	0/1/1/1

All (21) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	E	601	HEM	C4D-ND	-4.05	1.33	1.40
9	B	613[A]	JXP	C3-N4	4.04	1.41	1.34
9	B	613[B]	JXP	C3-N4	4.04	1.41	1.34
9	B	613[A]	JXP	C4-N2	3.19	1.44	1.37
9	B	613[B]	JXP	C4-N2	3.19	1.44	1.37
6	B	601	HEM	C3B-C2B	-2.97	1.31	1.37
6	B	601	HEM	CHB-C1B	2.85	1.42	1.35
6	B	601	HEM	C4D-ND	-2.76	1.35	1.40
6	B	601	HEM	C1B-NB	-2.57	1.35	1.40
6	E	601	HEM	C3D-C2D	-2.54	1.31	1.36
6	B	601	HEM	C1A-CHA	-2.51	1.34	1.41
6	E	601	HEM	C1A-CHA	-2.42	1.34	1.41
6	E	601	HEM	C1B-NB	-2.27	1.36	1.40
6	B	601	HEM	CBA-CGA	2.13	1.55	1.50
6	E	601	HEM	C3B-C2B	-2.12	1.33	1.37
6	B	601	HEM	C3B-C4B	2.12	1.49	1.44
6	E	601	HEM	CHB-C1B	2.11	1.40	1.35
6	B	601	HEM	C3D-C2D	-2.08	1.32	1.36
9	B	613[A]	JXP	C2-N1	2.07	1.36	1.33
9	B	613[B]	JXP	C2-N1	2.07	1.36	1.33
6	E	601	HEM	C1B-C2B	-2.04	1.40	1.44

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	B	601	HEM	CBA-CAA-C2A	-4.80	104.43	112.62
6	E	601	HEM	CHA-C4D-ND	3.92	129.22	124.38
6	E	601	HEM	CBA-CAA-C2A	-3.74	106.23	112.62

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	B	601	HEM	CHA-C4D-ND	3.61	128.85	124.38
6	E	601	HEM	CHA-C4D-C3D	-3.42	118.91	125.33
6	B	601	HEM	CMC-C2C-C3C	3.36	130.96	124.68
6	E	601	HEM	CMC-C2C-C3C	3.32	130.89	124.68
7	B	602	NAG	C1-O5-C5	3.09	116.38	112.19
6	B	601	HEM	CHA-C4D-C3D	-2.91	119.86	125.33
6	E	601	HEM	CHB-C1B-NB	2.80	127.84	124.38
7	E	602	NAG	C1-O5-C5	2.76	115.93	112.19
6	E	601	HEM	C4A-C3A-C2A	-2.73	105.09	107.00
6	E	601	HEM	CHD-C1D-ND	2.71	127.38	124.43
6	E	601	HEM	O2A-CGA-O1A	-2.70	116.57	123.30
6	B	601	HEM	C3B-C2B-C1B	2.62	108.43	106.49
6	B	601	HEM	CHB-C1B-NB	2.51	127.48	124.38
6	E	601	HEM	CBD-CAD-C3D	-2.49	105.71	112.63
6	B	601	HEM	O2A-CGA-O1A	-2.41	117.28	123.30
6	B	601	HEM	O2D-CGD-O1D	-2.30	117.57	123.30
6	B	601	HEM	CBD-CAD-C3D	-2.29	106.27	112.63
6	B	601	HEM	CHB-C1B-C2B	-2.29	120.39	126.72
6	E	601	HEM	O2D-CGD-CBD	2.24	121.22	114.03
6	E	601	HEM	C3B-C2B-C1B	2.22	108.13	106.49
6	B	601	HEM	CMD-C2D-C1D	2.19	128.38	125.04
6	E	601	HEM	CMD-C2D-C1D	2.16	128.32	125.04
6	E	601	HEM	CHB-C1B-C2B	-2.13	120.84	126.72
6	E	601	HEM	CAB-C3B-C2B	-2.07	121.77	128.60
6	B	601	HEM	C4B-C3B-C2B	-2.02	105.51	107.11
6	E	601	HEM	O2D-CGD-O1D	-2.01	118.29	123.30
6	B	601	HEM	O2A-CGA-CBA	2.00	120.47	114.03
9	B	613[A]	JXP	C2-N1-C3	-2.00	116.15	119.22
9	B	613[B]	JXP	C2-N1-C3	-2.00	116.15	119.22

There are no chirality outliers.

All (13) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	B	601	HEM	C2B-C3B-CAB-CBB
6	B	601	HEM	C4B-C3B-CAB-CBB
6	E	601	HEM	C4B-C3B-CAB-CBB
9	B	613[A]	JXP	O-C6-C7-C12
9	B	613[B]	JXP	O-C6-C7-C12
6	B	601	HEM	CAA-CBA-CGA-O1A
6	B	601	HEM	CAA-CBA-CGA-O2A
6	E	601	HEM	CAA-CBA-CGA-O1A

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Mol	Chain	Res	Type	Atoms
6	E	601	HEM	CAD-CBD-CGD-O2D
6	E	601	HEM	CAA-CBA-CGA-O2A
6	E	601	HEM	CAD-CBD-CGD-O1D
6	B	601	HEM	CAD-CBD-CGD-O2D
6	B	601	HEM	CAD-CBD-CGD-O1D

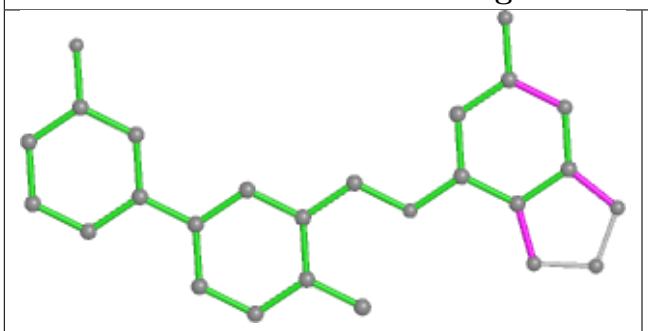
There are no ring outliers.

2 monomers are involved in 18 short contacts:

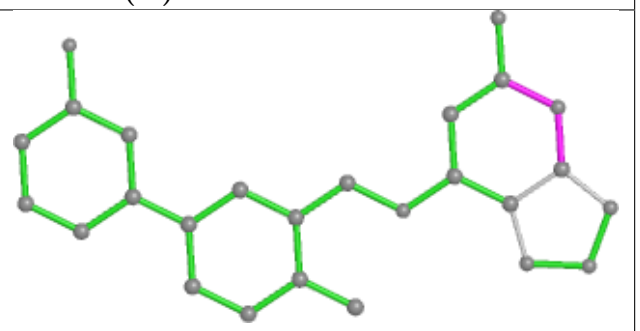
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	E	601	HEM	11	0
6	B	601	HEM	7	0

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

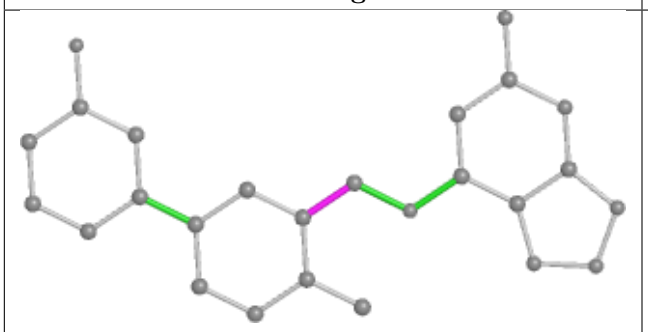
Ligand JXP B 613 (B)



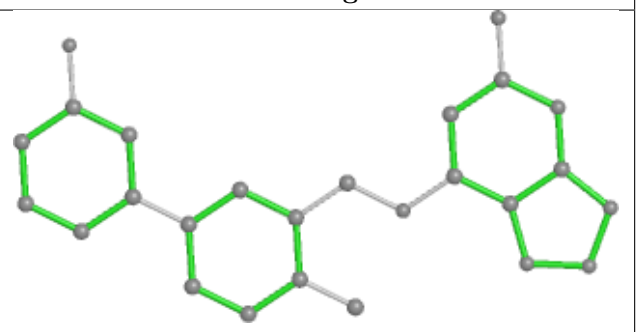
Bond lengths



Bond angles

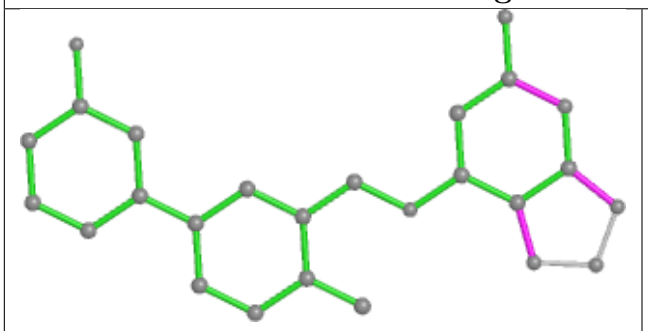


Torsions

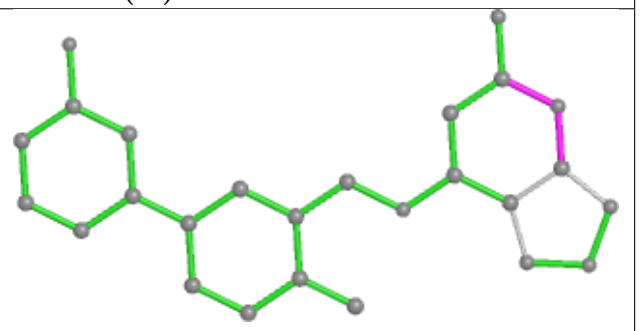


Rings

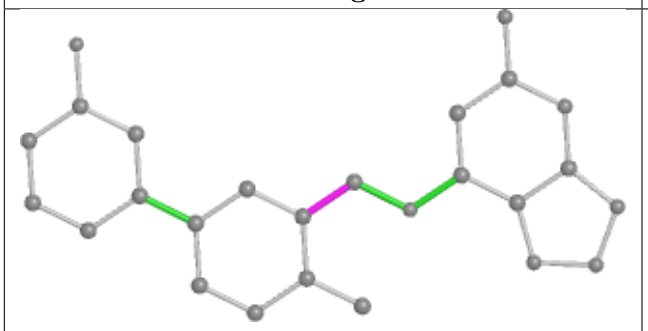
Ligand JXP B 613 (A)



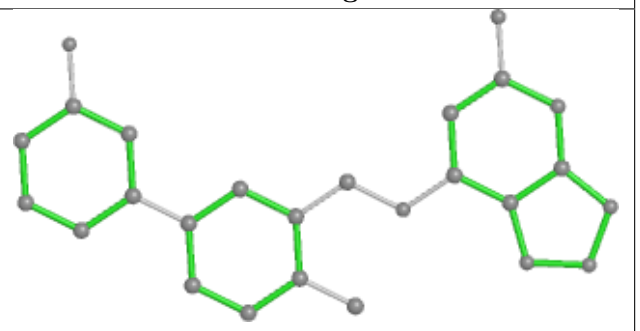
Bond lengths



Bond angles

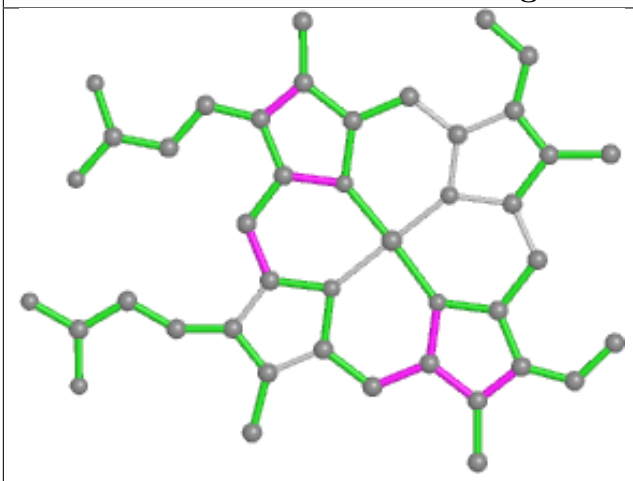


Torsions

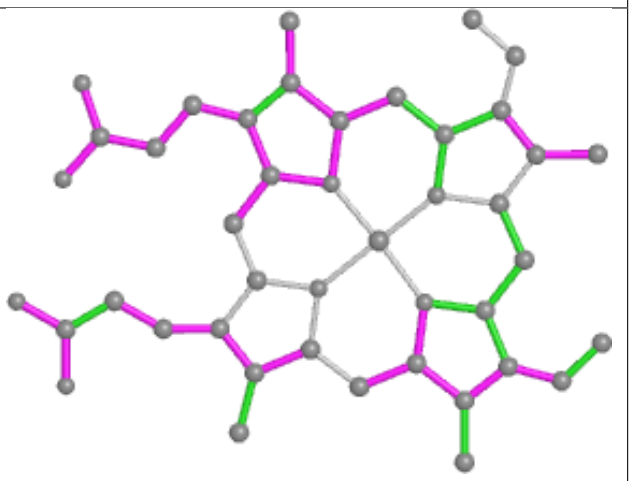


Rings

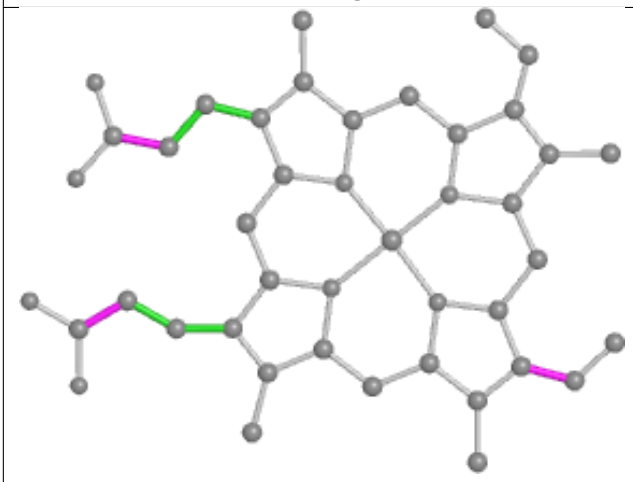
Ligand HEM E 601



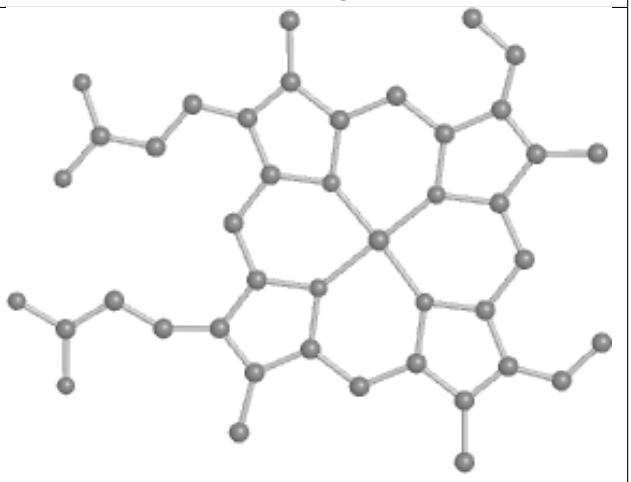
Bond lengths



Bond angles

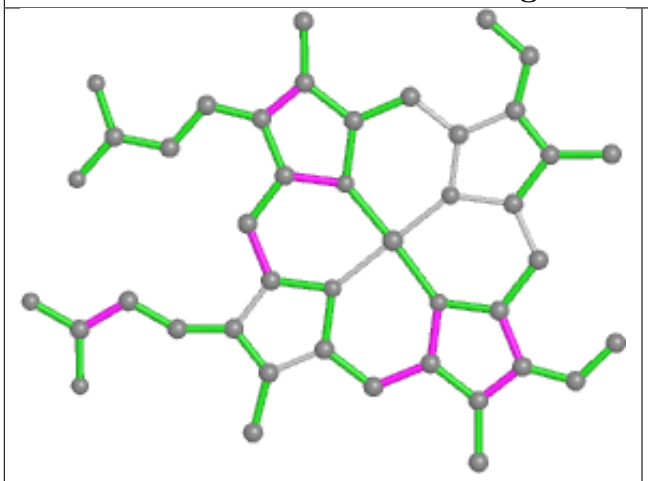


Torsions

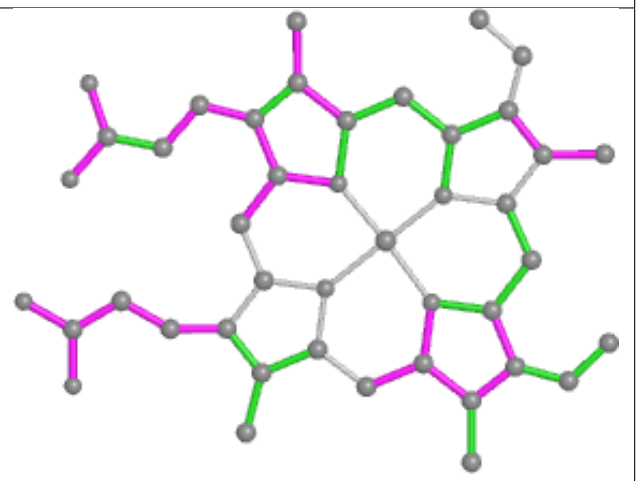


Rings

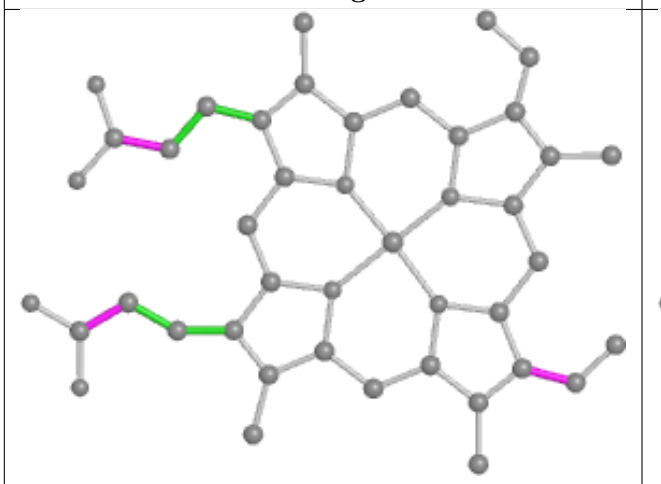
Ligand HEM B 601



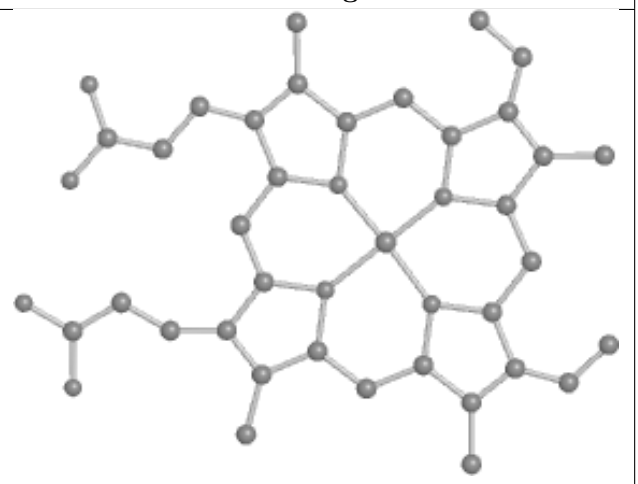
Bond lengths



Bond angles



Torsions



Rings

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	103/105 (98%)	-0.50	0	100	100	23, 34, 57, 71	0
1	D	103/105 (98%)	-0.41	0	100	100	22, 32, 52, 64	0
2	B	464/467 (99%)	-0.42	2 (0%)	92	95	18, 38, 57, 76	5 (1%)
2	E	465/467 (99%)	-0.40	3 (0%)	89	92	20, 34, 52, 72	9 (1%)
All	All	1135/1144 (99%)	-0.42	5 (0%)	92	95	18, 36, 55, 76	14 (1%)

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	E	190	MET	2.5
2	E	191	SER	2.3
2	B	566	THR	2.2
2	B	355	PRO	2.2
2	E	355	PRO	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)

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	NAG	C	2	14/15	0.83	0.27	62,73,77,80	0
3	NAG	C	1	14/15	0.89	0.18	64,68,72,73	0

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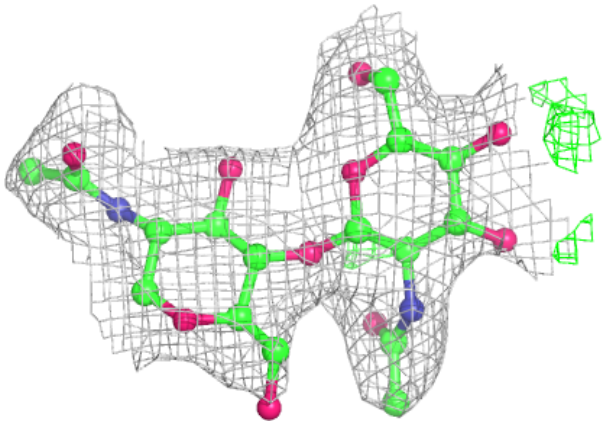
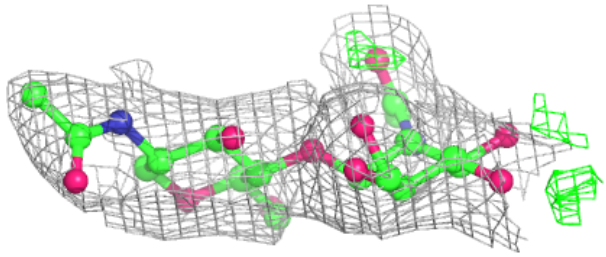
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	NAG	G	2	14/15	0.90	0.18	54,68,73,73	0
4	MAN	F	4	11/12	0.90	0.22	60,63,66,66	0
3	NAG	G	1	14/15	0.93	0.13	48,55,58,58	0
4	MAN	H	5	11/12	0.93	0.14	29,39,44,47	0
4	NAG	F	1	14/15	0.94	0.14	34,36,49,51	0
4	MAN	H	4	11/12	0.95	0.11	56,60,62,62	0
4	MAN	F	5	11/12	0.95	0.12	32,38,41,43	0
4	FUC	F	6	10/11	0.96	0.11	36,40,43,48	0
4	NAG	H	1	14/15	0.96	0.11	28,33,36,37	0
4	NAG	H	2	14/15	0.97	0.10	20,29,34,40	0
4	BMA	H	3	11/12	0.97	0.12	41,45,48,50	0
4	NAG	F	2	14/15	0.97	0.10	19,29,32,36	0
4	BMA	F	3	11/12	0.97	0.10	41,44,46,50	0
4	FUC	H	6	10/11	0.97	0.13	42,47,49,53	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 C:

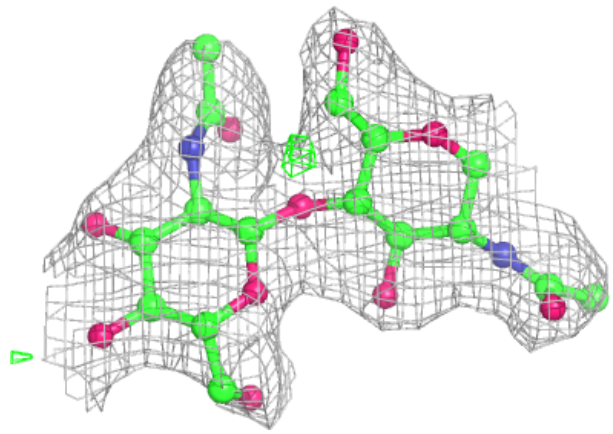
2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative) and green (positive)

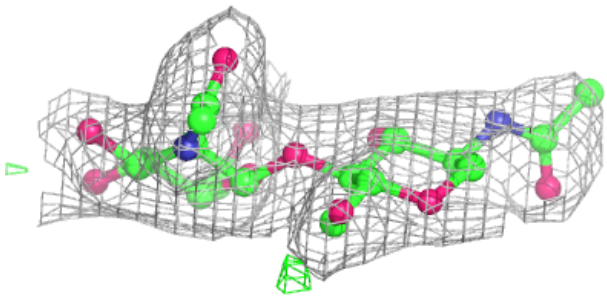


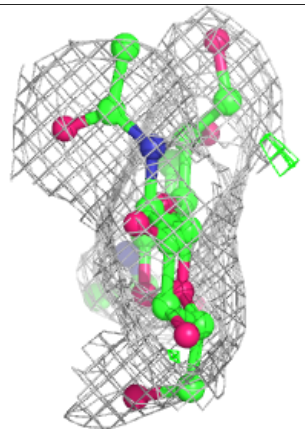


Electron density around Chain G:

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

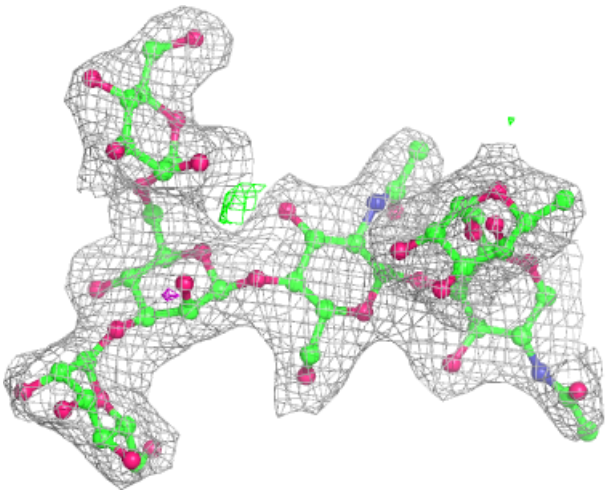


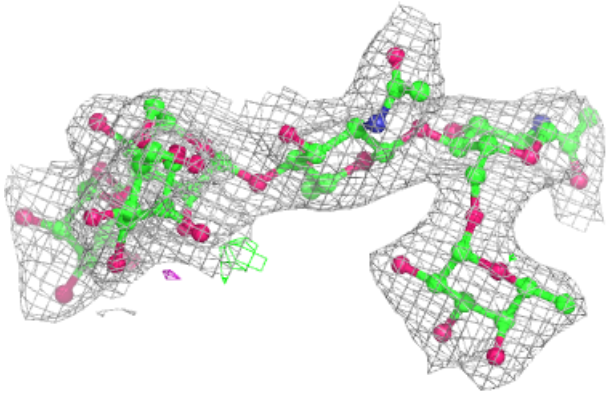


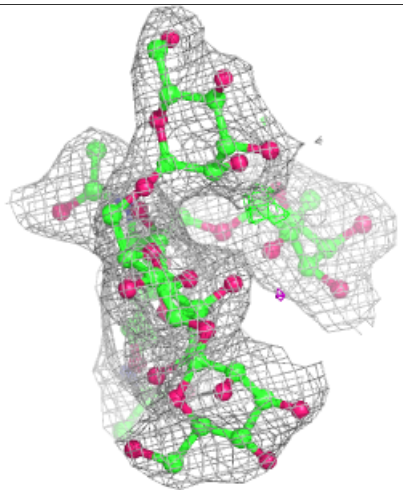


Electron density around Chain F:

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

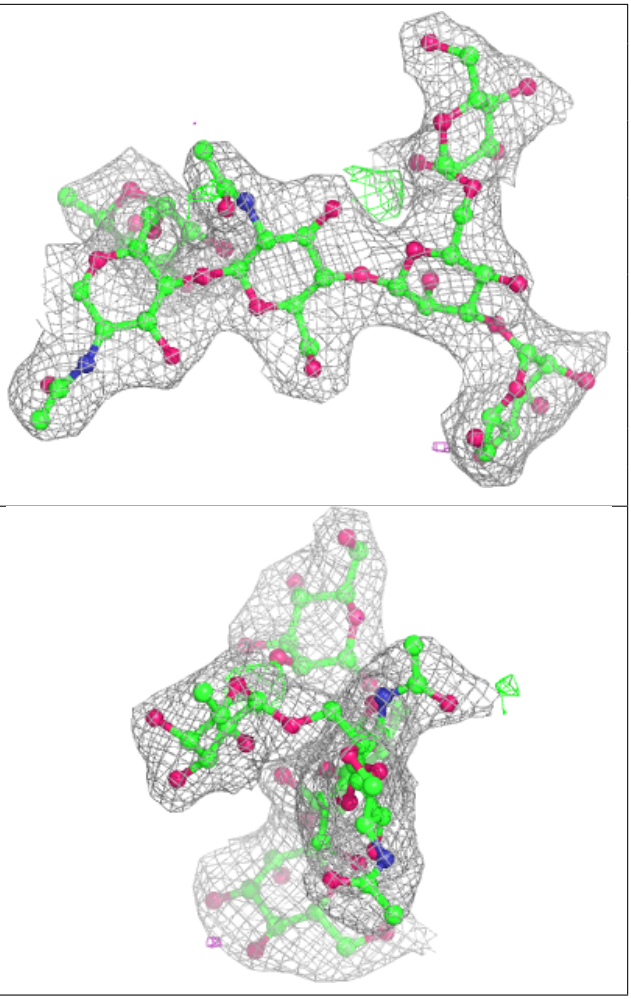






Electron density around Chain H:

$2mF_o$-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)

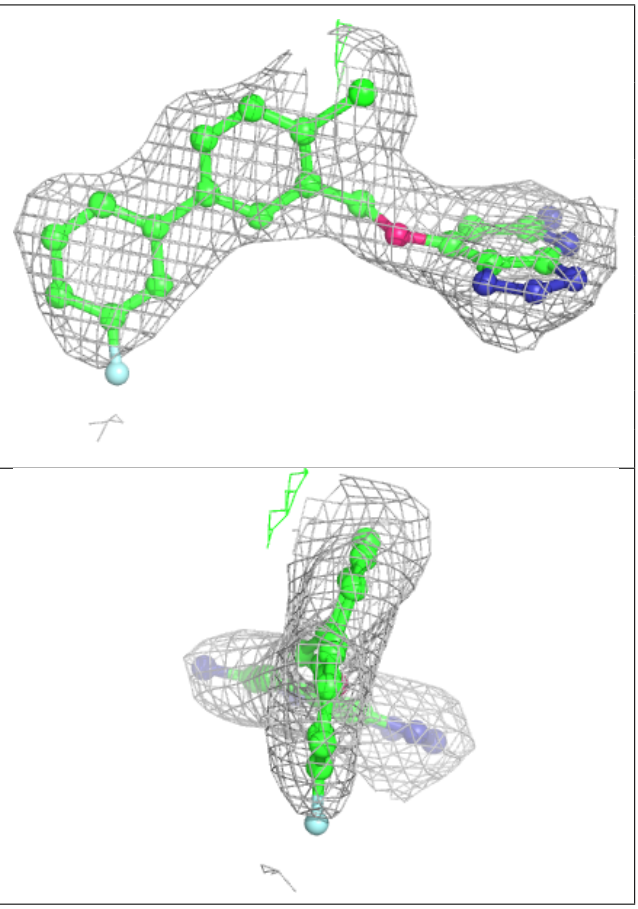
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
7	NAG	B	602	14/15	0.90	0.17	48,58,60,60	0
7	NAG	E	602	14/15	0.94	0.31	35,45,54,56	0
9	JXP	B	613[A]	26/26	0.96	0.15	40,45,50,54	7
9	JXP	B	613[B]	26/26	0.96	0.15	40,45,50,54	7
6	HEM	B	601	43/43	0.97	0.14	31,32,35,43	0
6	HEM	E	601	43/43	0.97	0.14	27,28,33,44	0
5	CL	A	201	1/1	0.98	0.08	36,36,36,36	0
5	CL	B	612	1/1	0.99	0.18	38,38,38,38	0
8	CA	E	611	1/1	0.99	0.10	23,23,23,23	0
8	CA	B	611	1/1	1.00	0.16	31,31,31,31	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.

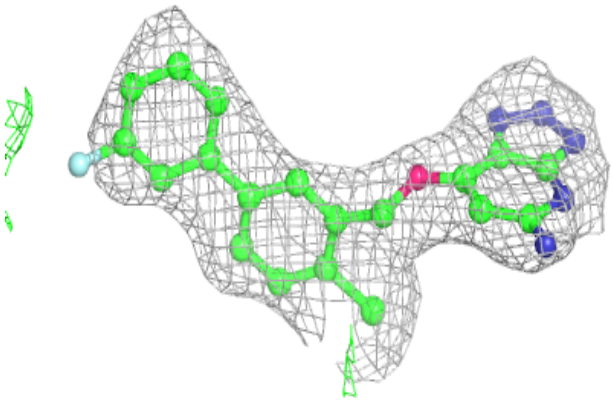
Electron density around JXP B 613 (A):

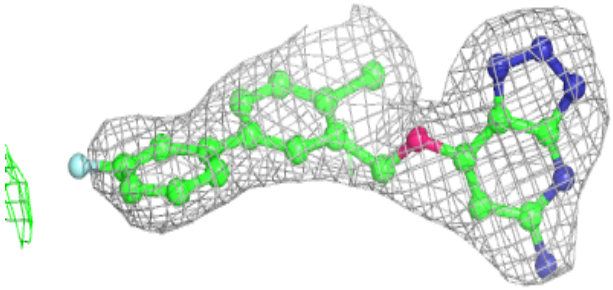
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

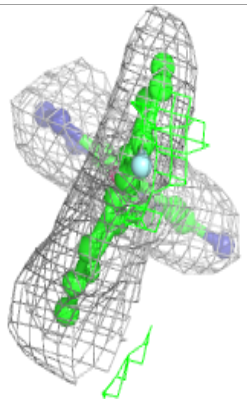


Electron density around JXP B 613 (B):

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

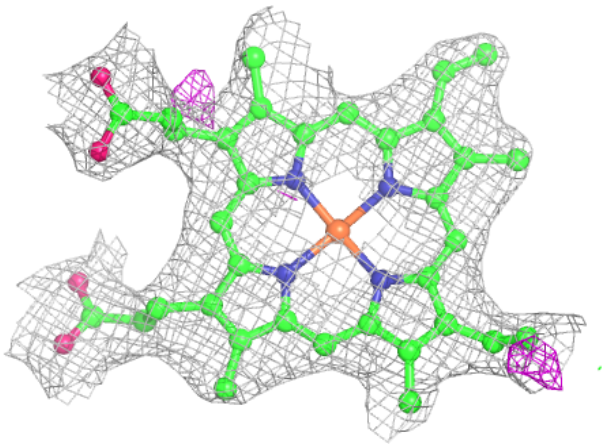


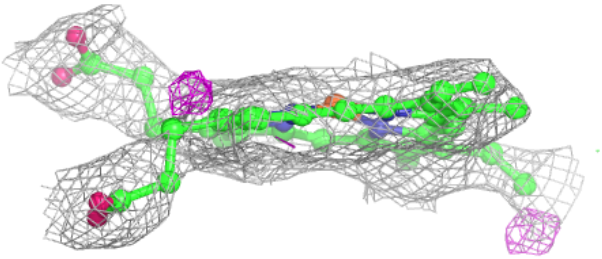


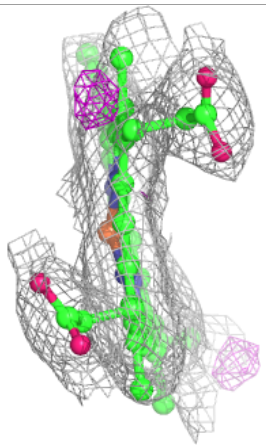


Electron density around HEM B 601:

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

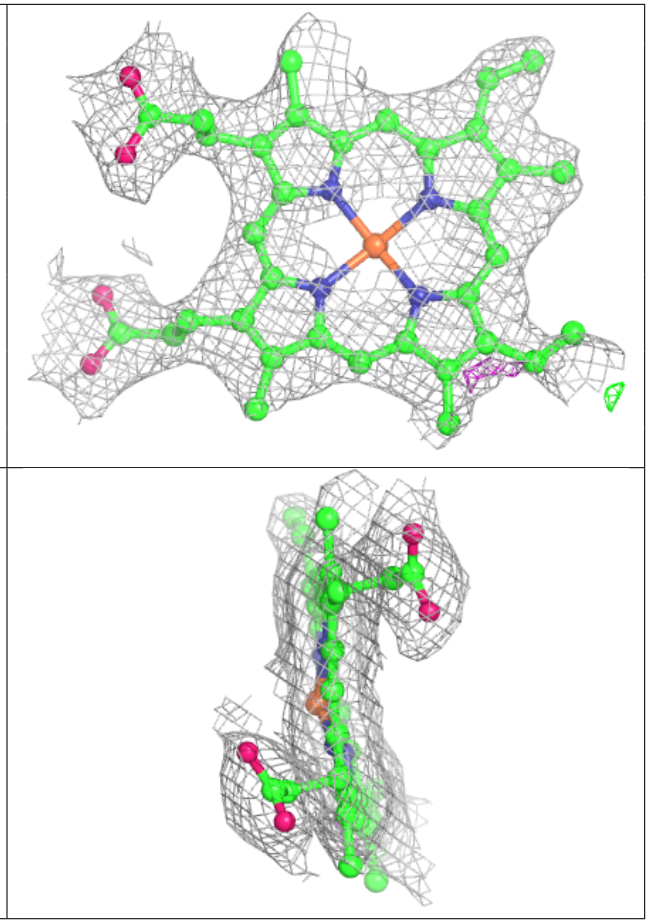






Electron density around HEM E 601:

$2mF_o$-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.