Full wwPDB X-ray Structure Validation Report (i)

Dec 18, 2023 – 02:21 am GMT

PDB ID	:	3ZS0
Title	:	Human Myeloperoxidase inactivated by TX2
Authors	:	Tiden, A.K.; Sjogren, T.; Svensson, M.; Bernlind, A.; Senthilmohan, R.; Auchere, F.; Norman, H.; Markgren, P.O.; Gustavsson, S.; Schmidt, S.; Lundquist, S.; Forbes, L.V.; Magon, N.J.; Jameson, G.N.; Eriksson, H.; Kettle, A.J.
Deposited on	:	2011-06-21
Resolution	:	2.30 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:

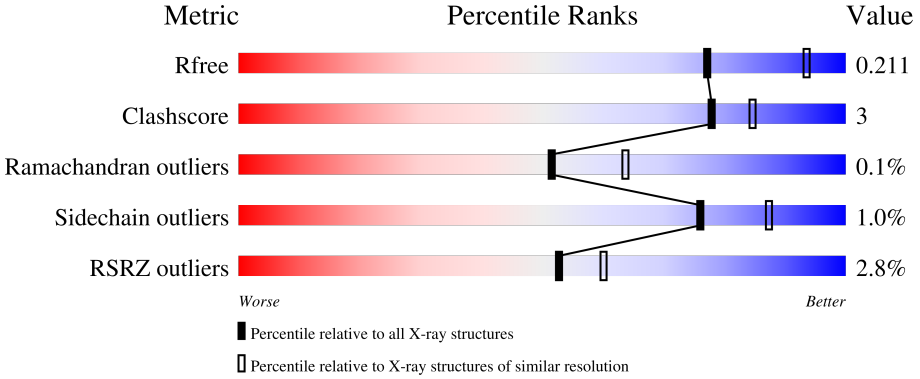
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 2.30 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	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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	108	3% 89% 6%
1	B	108	% 93%
2	C	467	2% 94% 5%
2	D	467	4% 91% 8%
3	E	6	17% 67% 17%

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Mol	Chain	Length	Quality of chain
4	F	5	20% 80%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	MAN	E	4	X	-	-	-

2 Entry composition (i)

There are 12 unique types of molecules in this entry. The entry contains 10054 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.

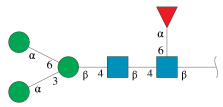
- Molecule 1 is a protein called MYELOPEROXIDASE LIGHT CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	104	837	529	148	155	5	0	0	0
1	B	104	837	529	148	155	5	0	0	0

- Molecule 2 is a protein called MYELOPEROXIDASE HEAVY CHAIN.

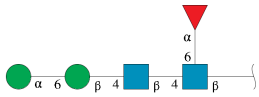
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	466	3732	2351	687	667	27	0	0	0
2	D	466	3732	2351	687	667	27	0	0	0

- Molecule 3 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.



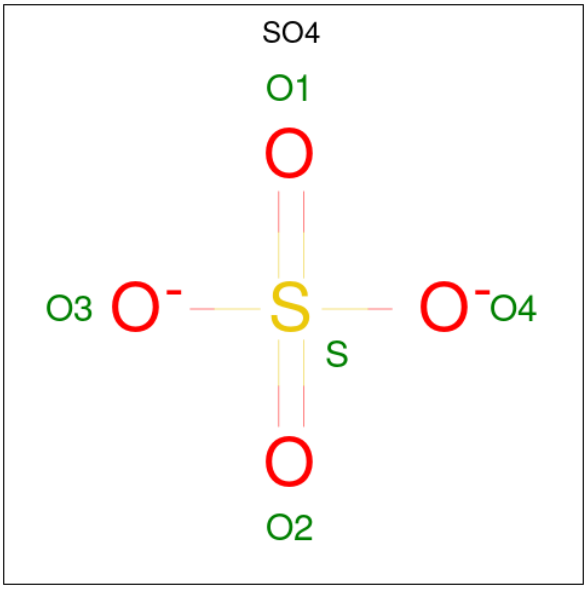
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	E	6	71	40	2	29	0	0	0

- Molecule 4 is an oligosaccharide called 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.



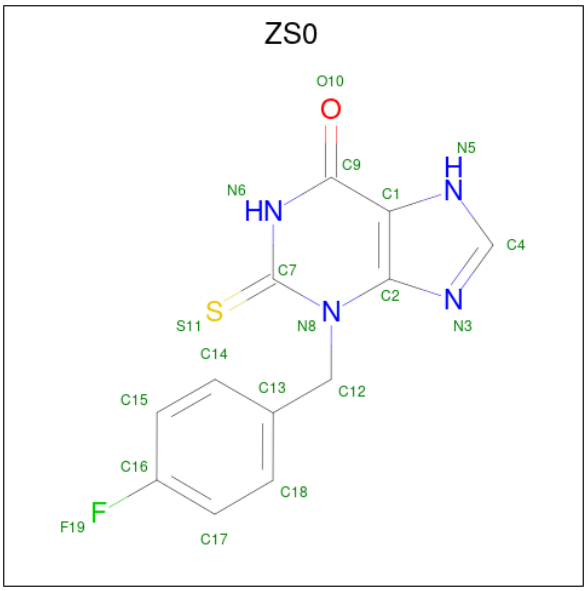
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
4	F	5	60	34	2	24	0	0	0

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



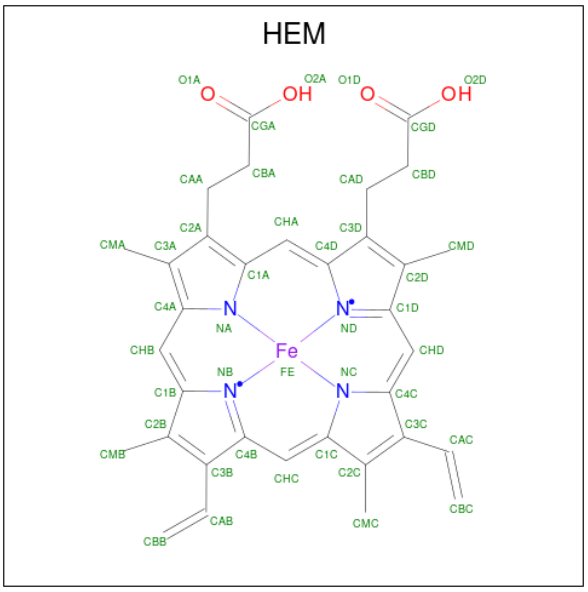
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	O	S			
5	B	1	5	4	1		0	0
			Total	O	S			
5	C	1	5	4	1		0	0
			Total	O	S			
5	C	1	5	4	1		0	0

- Molecule 6 is 3-(4-FLUOROBENZYL)-2-THIOXO-1,2,3,7-TETRAHYDRO-6H-PURIN-6-ONE (three-letter code: ZS0) (formula: $C_{12}H_9FN_4OS$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	F	N	O	S		
6	C	1	19	12	1	4	1	1	0	0
			Total	C	F	N	O	S		
6	D	1	19	12	1	4	1	1	0	0

- Molecule 7 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		
7	C	1	43	34	1	4	4	0	0

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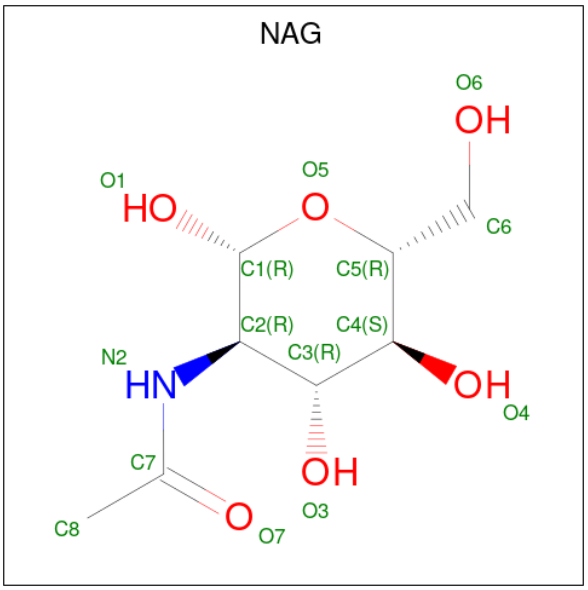
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	Fe	N	O		
7	D	1	43	34	1	4	4	0	0

- Molecule 8 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			
8	C	1	14	8	1	5		0	0
			Total	C	N	O			
8	C	1	14	8	1	5		0	0
			Total	C	N	O			
8	D	1	14	8	1	5		0	0
			Total	C	N	O			
8	D	1	14	8	1	5		0	0

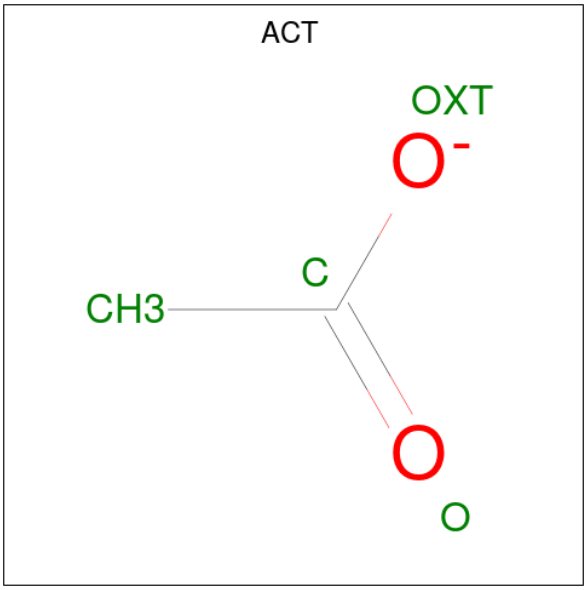
- Molecule 9 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Ca		
9	C	1	1	1	0	0
			Total	Ca		
9	D	1	1	1	0	0

- Molecule 10 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	C	1	Total Cl 1 1	0	0
10	D	1	Total Cl 1 1	0	0

- Molecule 11 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
11	C	1	Total C O 4 2 2	0	0
11	C	1	Total C O 4 2 2	0	0
11	C	1	Total C O 4 2 2	0	0
11	D	1	Total C O 4 2 2	0	0
11	D	1	Total C O 4 2 2	0	0
11	D	1	Total C O 4 2 2	0	0

- Molecule 12 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
12	A	99	Total O 99 99	0	0
12	B	88	Total O 88 88	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
12	C	226	226	226	0	0
			Total	O		
12	D	149	149	149	0	0

3 Residue-property plots (i)

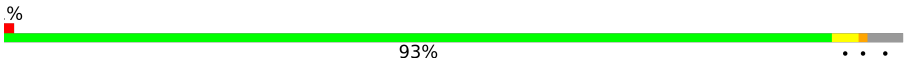
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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 LIGHT CHAIN

Chain A:

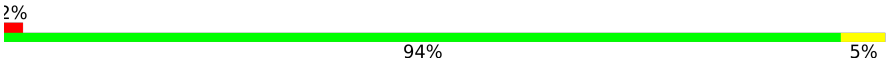
• Molecule 1: MYELOPEROXIDASE LIGHT CHAIN

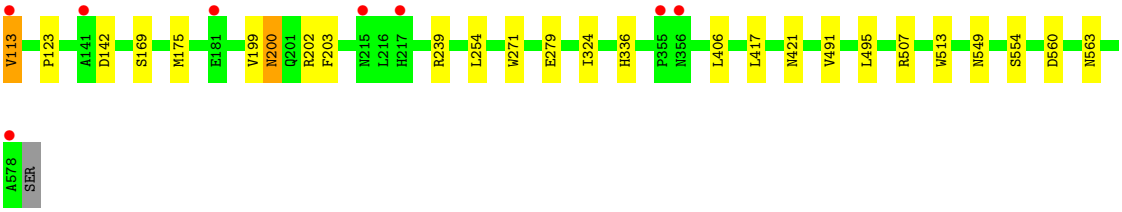
Chain B:



• Molecule 2: MYELOPEROXIDASE HEAVY CHAIN

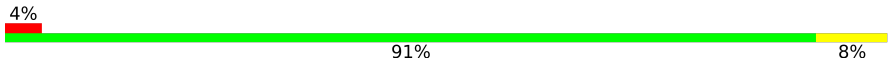
Chain C:

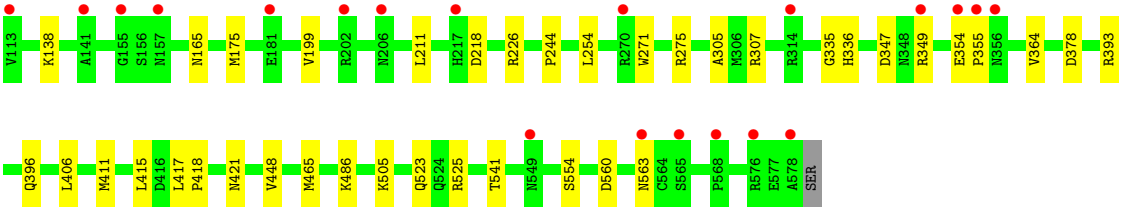




• Molecule 2: MYELOPEROXIDASE HEAVY CHAIN

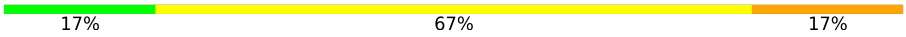
Chain D:





• Molecule 3: 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-acetamid

o-2-deoxy-beta-D-glucopyranose

Chain E: 

• Molecule 4: 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:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	93.91Å 64.11Å 111.45Å 90.00° 97.12° 90.00°	Depositor
Resolution (Å)	30.00 – 2.30 32.71 – 2.21	Depositor EDS
% Data completeness (in resolution range)	96.7 (30.00-2.30) 94.8 (32.71-2.21)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.99 (at 2.22Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.170 , 0.207 0.174 , 0.211	Depositor DCC
R_{free} test set	3185 reflections (5.10%)	wwPDB-VP
Wilson B-factor (Å^2)	18.6	Xtriage
Anisotropy	0.579	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 40.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	10054	wwPDB-VP
Average B, all atoms (Å^2)	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.75% 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: BMA, HEM, FUC, ZS0, NAG, SO4, CA, ACT, MAN, CSO, 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	0.56	0/862	0.78	0/1174
1	B	0.53	0/862	0.76	0/1174
2	C	0.54	0/3810	0.69	1/5168 (0.0%)
2	D	0.54	0/3810	0.66	0/5168
All	All	0.54	0/9344	0.69	1/12684 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	C	142	ASP	CB-CG-OD1	5.82	123.54	118.30

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	837	0	798	8	0
1	B	837	0	798	4	0
2	C	3732	0	3725	17	0
2	D	3732	0	3725	27	0
3	E	71	0	61	1	0
4	F	60	0	52	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	5	0	0	0	0
5	C	10	0	0	0	0
6	C	19	0	9	1	0
6	D	19	0	9	0	0
7	C	43	0	30	5	0
7	D	43	0	30	1	0
8	C	28	0	26	0	0
8	D	28	0	26	0	0
9	C	1	0	0	0	0
9	D	1	0	0	0	0
10	C	1	0	0	0	0
10	D	1	0	0	0	0
11	C	12	0	9	0	0
11	D	12	0	9	2	0
12	A	99	0	0	1	0
12	B	88	0	0	0	0
12	C	226	0	0	3	0
12	D	149	0	0	5	0
All	All	10054	0	9307	53	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.

All (53) 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:A:94:ASP:CG	7:C:1580:HEM:HMD1	1.77	1.04
1:A:94:ASP:OD2	7:C:1580:HEM:HMD1	0.68	0.85
1:B:6:LYS:H	1:B:6:LYS:HD2	1.44	0.83
1:B:6:LYS:HD2	1:B:6:LYS:N	2.00	0.76
2:C:113:VAL:HG21	2:C:123:PRO:O	1.87	0.72
2:C:336:HIS:HD1	2:C:421:ASN:HD21	1.42	0.66
2:D:307:ARG:HH12	11:D:1593:ACT:H2	1.61	0.65
2:D:563:ASN:HB3	12:D:2140:HOH:O	1.97	0.65
2:D:393:ARG:HB2	2:D:396:GLN:HB2	1.78	0.64
1:A:94:ASP:CG	7:C:1580:HEM:CMD	2.52	0.63
2:C:563:ASN:HB3	12:C:2210:HOH:O	2.00	0.61
2:C:554:SER:HB3	2:C:560:ASP:HB3	1.84	0.59
2:D:355:PRO:HD2	12:D:2100:HOH:O	2.04	0.57
2:D:486:LYS:HE3	12:D:2074:HOH:O	2.05	0.57
2:C:199:VAL:HG12	2:C:254:LEU:HD21	1.90	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:200:ASN:ND2	2:C:202:ARG:H	2.06	0.53
2:C:200:ASN:HD22	2:C:202:ARG:H	1.55	0.52
2:D:347:ASP:OD1	2:D:349:ARG:HG2	2.09	0.51
1:B:83:SER:HB3	2:D:554:SER:O	2.12	0.50
2:D:244:PRO:HD3	2:D:364:VAL:O	2.12	0.49
2:C:271:TRP:CZ3	2:C:279:GLU:HG3	2.49	0.48
2:D:554:SER:HB3	2:D:560:ASP:HB3	1.96	0.47
1:A:1:CYS:O	1:A:2:PRO:C	2.52	0.47
2:C:200:ASN:HD22	2:C:203:PHE:H	1.63	0.47
2:D:336:HIS:HD1	2:D:421:ASN:HD21	1.62	0.46
2:C:169:SER:HB2	2:C:324:ILE:HG12	1.98	0.46
2:C:549:ASN:ND2	12:C:2214:HOH:O	2.48	0.46
2:D:199:VAL:HG12	2:D:254:LEU:HD21	1.98	0.45
2:D:138:LYS:HE2	12:D:2013:HOH:O	2.16	0.45
2:D:226:ARG:NH2	12:D:2052:HOH:O	2.39	0.45
2:D:406:LEU:HB3	2:D:415:LEU:HB2	1.98	0.45
2:D:406:LEU:HD22	2:D:417:LEU:HB2	1.99	0.45
2:D:417:LEU:HB3	2:D:418:PRO:HD3	1.97	0.45
6:C:1579:ZS0:S11	7:C:1580:HEM:HAA2	2.57	0.44
2:D:525:ARG:HH21	11:D:1592:ACT:H3	1.81	0.44
2:D:378:ASP:OD1	2:D:541:THR:HB	2.17	0.44
2:D:411:MET:CE	2:D:415:LEU:HD21	2.48	0.43
2:D:505:LYS:HE3	3:E:5:MAN:H61	2.00	0.43
2:C:406:LEU:HD22	2:C:417:LEU:HB2	2.00	0.43
2:D:354:GLU:HB3	2:D:355:PRO:HA	2.00	0.43
2:C:491:VAL:HB	2:C:495:LEU:HB2	2.00	0.43
2:D:271:TRP:CG	2:D:275:ARG:HG2	2.53	0.43
2:D:448:VAL:HB	2:D:465:MET:HG3	2.01	0.43
2:D:305:ALA:HB2	2:D:486:LYS:HE2	2.02	0.42
1:A:94:ASP:OD2	7:C:1580:HEM:C2D	2.56	0.41
1:A:95:HIS:CD2	2:C:239:ARG:CZ	3.04	0.41
1:B:29:PHE:CE1	2:D:165:ASN:HB2	2.56	0.41
2:C:113:VAL:CG2	12:C:2020:HOH:O	2.69	0.41
2:C:507:ARG:HG3	2:C:513:TRP:CE2	2.56	0.41
2:D:211:LEU:HD23	2:D:254:LEU:HD13	2.03	0.41
1:A:13:MET:HE3	12:A:2014:HOH:O	2.21	0.40
1:A:83:SER:HB3	2:C:554:SER:O	2.21	0.40
2:D:335:GLY:HA3	7:D:1580:HEM:CBC	2.52	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	102/108 (94%)	98 (96%)	3 (3%)	1 (1%)	15	17
1	B	102/108 (94%)	100 (98%)	2 (2%)	0	100	100
2	C	463/467 (99%)	448 (97%)	15 (3%)	0	100	100
2	D	463/467 (99%)	452 (98%)	11 (2%)	0	100	100
All	All	1130/1150 (98%)	1098 (97%)	31 (3%)	1 (0%)	51	64

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	2	PRO

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	90/93 (97%)	88 (98%)	2 (2%)	52	69
1	B	90/93 (97%)	88 (98%)	2 (2%)	52	69
2	C	410/411 (100%)	407 (99%)	3 (1%)	84	92
2	D	410/411 (100%)	407 (99%)	3 (1%)	84	92
All	All	1000/1008 (99%)	990 (99%)	10 (1%)	76	87

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	4	GLN
1	A	54	ASN
1	B	6	LYS
1	B	54	ASN
2	C	113	VAL
2	C	175	MET
2	C	200	ASN
2	D	175	MET
2	D	218	ASP
2	D	523	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	4	GLN
1	A	54	ASN
1	B	54	ASN
2	C	133	ASN
2	C	200	ASN
2	C	467	GLN
2	C	549	ASN
2	D	133	ASN
2	D	549	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)

2 non-standard protein/DNA/RNA residues are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	CSO	C	150	2	3,6,7	0.48	0	0,6,8	-	-

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	CSO	D	150	2	3,6,7	0.66	0	0,6,8	-	-

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	CSO	C	150	2	-	0/1/5/7	-
2	CSO	D	150	2	-	0/1/5/7	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates (i)

11 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	E	1	3,2	14,14,15	0.67	0	17,19,21	1.63	1 (5%)
3	NAG	E	2	3	14,14,15	0.58	0	17,19,21	1.06	1 (5%)
3	BMA	E	3	3	11,11,12	0.60	0	15,15,17	1.88	3 (20%)
3	MAN	E	4	3	11,11,12	0.72	0	15,15,17	3.18	5 (33%)
3	MAN	E	5	3	11,11,12	0.50	0	15,15,17	1.27	2 (13%)
3	FUC	E	6	3	10,10,11	0.60	0	14,14,16	0.89	0
4	NAG	F	1	4,2	14,14,15	0.55	0	17,19,21	1.48	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
4	NAG	F	2	4	14,14,15	0.62	0	17,19,21	0.86	0
4	BMA	F	3	4	11,11,12	0.72	0	15,15,17	1.07	1 (6%)
4	MAN	F	4	4	11,11,12	0.55	0	15,15,17	1.08	2 (13%)
4	FUC	F	5	4	10,10,11	0.62	0	14,14,16	1.10	2 (14%)

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	E	1	3,2	-	0/6/23/26	0/1/1/1
3	NAG	E	2	3	-	0/6/23/26	0/1/1/1
3	BMA	E	3	3	-	0/2/19/22	0/1/1/1
3	MAN	E	4	3	1/1/4/5	0/2/19/22	0/1/1/1
3	MAN	E	5	3	-	0/2/19/22	0/1/1/1
3	FUC	E	6	3	-	-	0/1/1/1
4	NAG	F	1	4,2	-	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	FUC	F	5	4	-	-	0/1/1/1

There are no bond length outliers.

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	E	4	MAN	C1-C2-C3	-9.06	98.53	109.67
3	E	4	MAN	C1-O5-C5	-6.24	103.74	112.19
3	E	1	NAG	C1-O5-C5	5.14	119.15	112.19
4	F	1	NAG	C1-O5-C5	4.73	118.59	112.19
3	E	3	BMA	O3-C3-C4	-4.40	100.17	110.35
3	E	3	BMA	C1-C2-C3	3.87	114.42	109.67
3	E	5	MAN	C1-O5-C5	3.73	117.25	112.19
3	E	4	MAN	O5-C1-C2	3.21	115.72	110.77
3	E	2	NAG	C1-O5-C5	2.80	115.99	112.19
3	E	4	MAN	O5-C5-C6	2.70	111.43	107.20
4	F	4	MAN	O5-C5-C6	2.67	111.39	107.20
4	F	3	BMA	C1-C2-C3	2.44	112.67	109.67
4	F	4	MAN	C1-O5-C5	2.44	115.49	112.19
3	E	3	BMA	C2-C3-C4	2.36	114.98	110.89

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	E	5	MAN	O5-C5-C6	2.15	110.57	107.20
4	F	5	FUC	O2-C2-C1	2.14	113.53	109.15
4	F	5	FUC	O5-C5-C6	2.10	111.85	107.33
3	E	4	MAN	C3-C4-C5	2.10	113.99	110.24

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	E	4	MAN	C1

There are no torsion outliers.

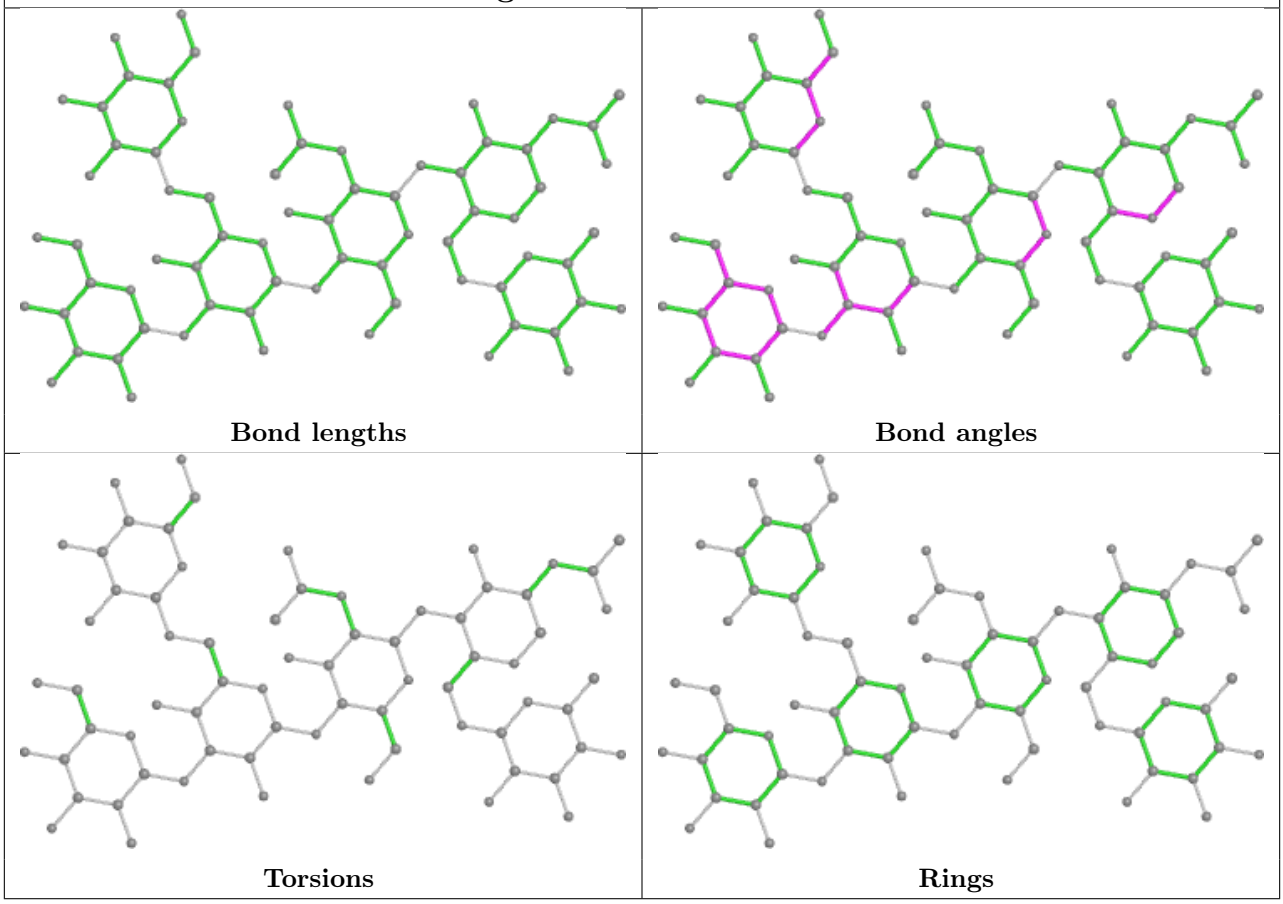
There are no ring outliers.

1 monomer is involved in 1 short contact:

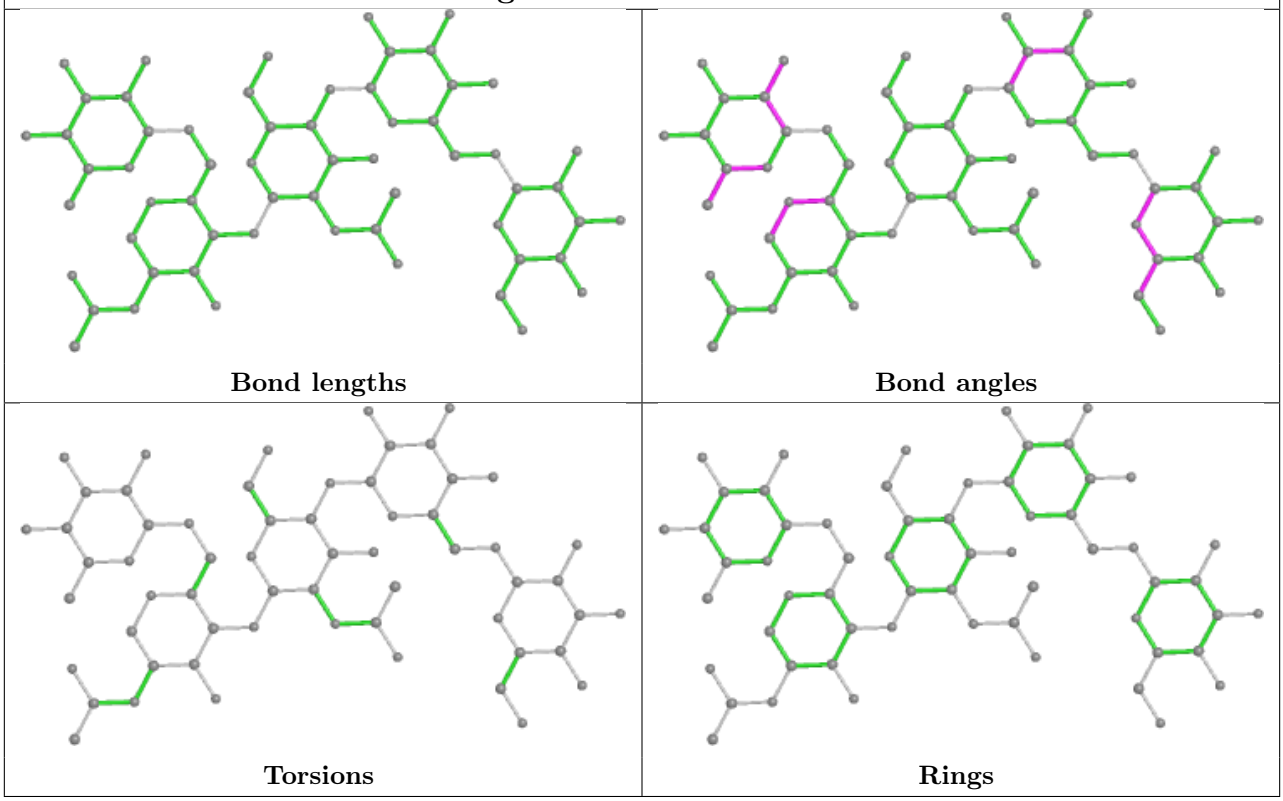
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	E	5	MAN	1	0

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

Oligosaccharide Chain E



Oligosaccharide Chain F



5.6 Ligand geometry (i)

Of 21 ligands modelled in this entry, 4 are monoatomic - leaving 17 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	D	1583	2	14,14,15	0.46	0	17,19,21	1.25	1 (5%)
11	ACT	C	1595	-	3,3,3	0.80	0	3,3,3	1.33	0
11	ACT	C	1597	-	3,3,3	0.76	0	3,3,3	1.37	0
7	HEM	C	1580	1,6,2	41,50,50	2.15	16 (39%)	45,82,82	2.05	11 (24%)
8	NAG	C	1583	2	14,14,15	0.51	0	17,19,21	1.41	1 (5%)
8	NAG	C	1582	2	14,14,15	0.48	0	17,19,21	0.94	1 (5%)
5	SO4	B	1105	-	4,4,4	0.14	0	6,6,6	0.09	0
5	SO4	C	1593	-	4,4,4	0.12	0	6,6,6	0.10	0
11	ACT	D	1592	-	3,3,3	0.79	0	3,3,3	1.51	0
11	ACT	D	1593	-	3,3,3	0.73	0	3,3,3	1.20	0
6	ZS0	D	1579	7	17,21,21	1.05	1 (5%)	18,30,30	1.83	4 (22%)
11	ACT	C	1596	-	3,3,3	0.79	0	3,3,3	1.25	0
11	ACT	D	1591	-	3,3,3	0.84	0	3,3,3	1.25	0
8	NAG	D	1582	2	14,14,15	0.52	0	17,19,21	1.15	1 (5%)
6	ZS0	C	1579	7	17,21,21	1.29	1 (5%)	18,30,30	1.75	6 (33%)
7	HEM	D	1580	1,6,2	41,50,50	2.23	16 (39%)	45,82,82	1.68	9 (20%)
5	SO4	C	1594	-	4,4,4	0.14	0	6,6,6	0.11	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	D	1583	2	-	0/6/23/26	0/1/1/1
7	HEM	C	1580	1,6,2	-	4/12/54/54	-
8	NAG	C	1583	2	-	0/6/23/26	0/1/1/1
8	NAG	C	1582	2	-	0/6/23/26	0/1/1/1
6	ZS0	D	1579	7	-	1/4/4/4	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
8	NAG	D	1582	2	-	0/6/23/26	0/1/1/1
6	ZS0	C	1579	7	-	0/4/4/4	0/3/3/3
7	HEM	D	1580	1,6,2	-	4/12/54/54	-

All (34) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	D	1580	HEM	CHA-C4D	5.31	1.48	1.35
7	D	1580	HEM	CHB-C1B	4.88	1.47	1.35
7	C	1580	HEM	CHB-C1B	4.43	1.46	1.35
6	C	1579	ZS0	C7-S11	4.38	1.75	1.67
7	C	1580	HEM	CHA-C4D	4.34	1.46	1.35
7	C	1580	HEM	CBB-CAB	4.19	1.51	1.30
7	D	1580	HEM	CBB-CAB	4.17	1.51	1.30
7	C	1580	HEM	C4D-ND	-3.74	1.33	1.40
7	C	1580	HEM	C1B-NB	-3.53	1.34	1.40
7	D	1580	HEM	C1B-NB	-3.50	1.34	1.40
7	D	1580	HEM	FE-ND	3.36	2.13	1.96
7	D	1580	HEM	C4D-ND	-3.22	1.34	1.40
7	C	1580	HEM	FE-NB	3.19	2.12	1.96
7	C	1580	HEM	CBC-CAC	3.15	1.50	1.29
7	D	1580	HEM	CBC-CAC	3.15	1.50	1.29
7	D	1580	HEM	FE-NB	3.14	2.12	1.96
7	C	1580	HEM	C2C-C1C	3.05	1.49	1.42
7	C	1580	HEM	FE-ND	3.05	2.12	1.96
7	C	1580	HEM	C1D-C2D	3.03	1.50	1.44
6	D	1579	ZS0	C7-S11	3.01	1.72	1.67
7	C	1580	HEM	C1D-ND	-2.83	1.33	1.38
7	D	1580	HEM	C4D-C3D	2.81	1.49	1.45
7	D	1580	HEM	C4B-NB	-2.77	1.33	1.38
7	C	1580	HEM	C1B-C2B	2.64	1.49	1.44
7	D	1580	HEM	C1D-ND	-2.60	1.33	1.38
7	D	1580	HEM	C2C-C1C	2.57	1.48	1.42
7	C	1580	HEM	CHD-C1D	2.57	1.48	1.41
7	D	1580	HEM	C1B-C2B	2.56	1.49	1.44
7	D	1580	HEM	C4A-CHB	2.40	1.47	1.41
7	D	1580	HEM	C1D-C2D	2.32	1.49	1.44
7	C	1580	HEM	C4D-C3D	2.29	1.49	1.45
7	C	1580	HEM	C4B-NB	-2.17	1.34	1.38
7	C	1580	HEM	CHC-C4B	2.14	1.47	1.41
7	D	1580	HEM	C1A-CHA	2.00	1.46	1.41

All (34) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
7	C	1580	HEM	C3B-C2B-C1B	-5.86	102.14	106.49
7	D	1580	HEM	C3B-C2B-C1B	-5.53	102.39	106.49
7	C	1580	HEM	CBA-CAA-C2A	-4.65	104.69	112.62
7	C	1580	HEM	C4C-CHD-C1D	4.60	128.63	122.56
8	C	1583	NAG	C1-O5-C5	4.14	117.80	112.19
7	C	1580	HEM	CMC-C2C-C3C	3.98	132.13	124.68
8	D	1583	NAG	C1-O5-C5	3.93	117.52	112.19
7	D	1580	HEM	CMC-C2C-C3C	3.89	131.96	124.68
7	C	1580	HEM	C4B-CHC-C1C	3.71	127.45	122.56
8	D	1582	NAG	C1-O5-C5	3.62	117.09	112.19
6	C	1579	ZS0	C4-N3-C2	3.56	108.27	101.92
6	C	1579	ZS0	C4-N5-C1	3.42	109.50	102.99
6	D	1579	ZS0	C4-N3-C2	3.32	107.84	101.92
6	D	1579	ZS0	C13-C12-N8	3.30	118.95	113.39
6	D	1579	ZS0	C4-N5-C1	3.29	109.25	102.99
7	C	1580	HEM	C4A-C3A-C2A	-3.28	104.71	107.00
7	C	1580	HEM	C4D-C3D-C2D	-3.00	102.53	106.90
6	D	1579	ZS0	S11-C7-N8	-2.99	120.78	123.43
7	C	1580	HEM	C2B-C1B-NB	2.86	113.23	109.84
7	C	1580	HEM	C3D-C4D-ND	2.83	113.32	110.17
7	C	1580	HEM	CAD-C3D-C4D	2.72	129.41	124.66
8	C	1582	NAG	C1-O5-C5	2.68	115.82	112.19
7	D	1580	HEM	CBA-CAA-C2A	-2.67	108.07	112.62
7	D	1580	HEM	C2B-C1B-NB	2.52	112.83	109.84
7	D	1580	HEM	C4C-CHD-C1D	2.49	125.84	122.56
6	C	1579	ZS0	S11-C7-N8	-2.48	121.24	123.43
7	D	1580	HEM	C1D-C2D-C3D	-2.28	104.56	106.96
6	C	1579	ZS0	C1-C9-N6	2.27	117.97	113.95
7	D	1580	HEM	CBD-CAD-C3D	-2.24	106.40	112.63
7	D	1580	HEM	C4A-C3A-C2A	-2.17	105.49	107.00
6	C	1579	ZS0	C18-C13-C14	2.15	121.55	118.17
7	C	1580	HEM	C4D-ND-C1D	2.04	107.18	105.07
7	D	1580	HEM	C4D-ND-C1D	2.04	107.18	105.07
6	C	1579	ZS0	O10-C9-C1	-2.02	120.43	124.37

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	C	1580	HEM	CAA-CBA-CGA-O2A
7	C	1580	HEM	CAD-CBD-CGD-O2D

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Mol	Chain	Res	Type	Atoms
7	D	1580	HEM	CAD-CBD-CGD-O2D
6	D	1579	ZS0	C13-C12-N8-C2
7	C	1580	HEM	CAD-CBD-CGD-O1D
7	D	1580	HEM	CAD-CBD-CGD-O1D
7	D	1580	HEM	CAA-CBA-CGA-O2A
7	C	1580	HEM	CAA-CBA-CGA-O1A
7	D	1580	HEM	CAA-CBA-CGA-O1A

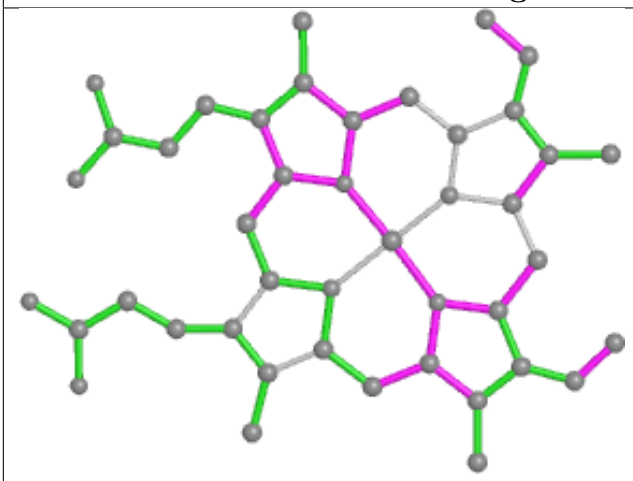
There are no ring outliers.

5 monomers are involved in 8 short contacts:

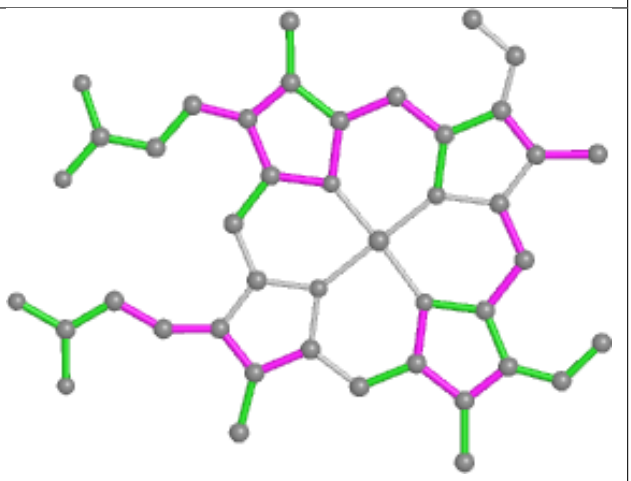
Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	C	1580	HEM	5	0
11	D	1592	ACT	1	0
11	D	1593	ACT	1	0
6	C	1579	ZS0	1	0
7	D	1580	HEM	1	0

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 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.

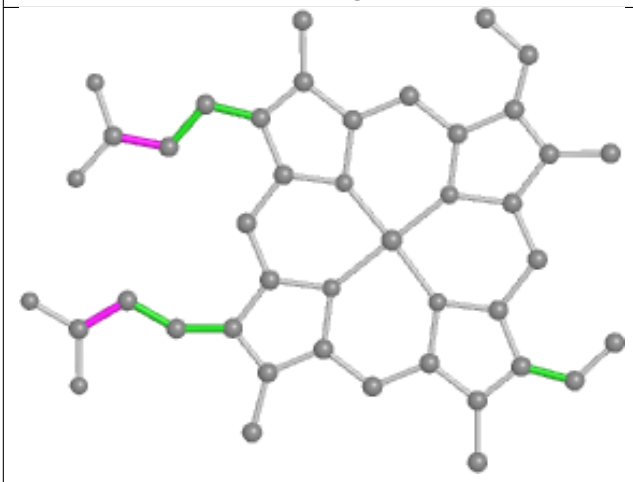
Ligand HEM C 1580



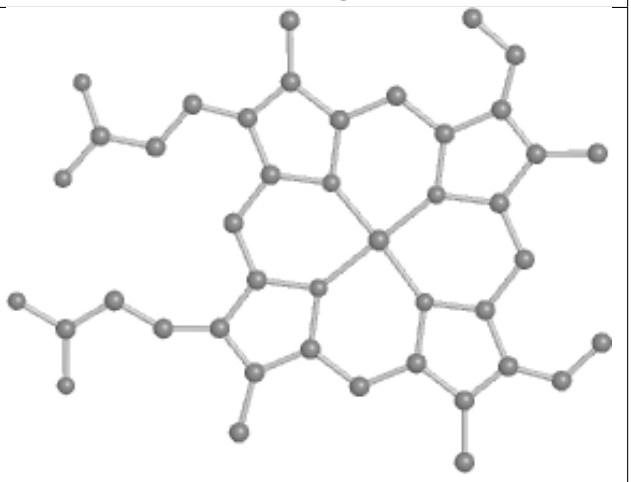
Bond lengths



Bond angles

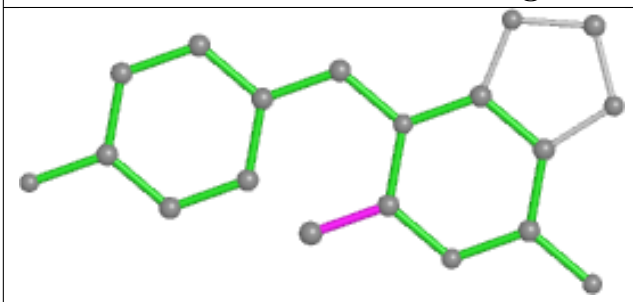


Torsions

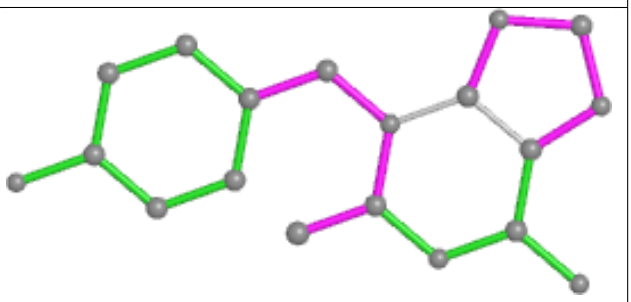


Rings

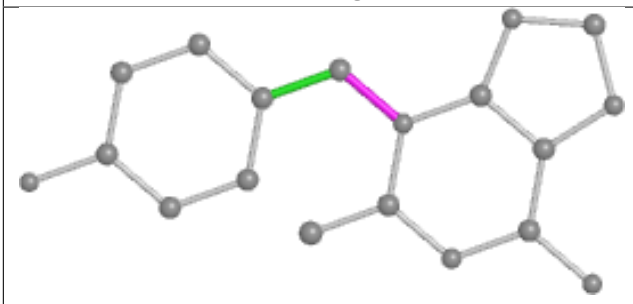
Ligand ZS0 D 1579



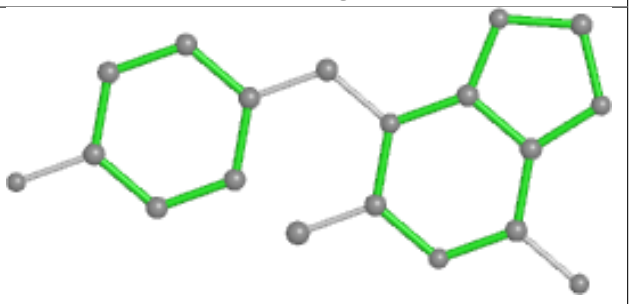
Bond lengths



Bond angles

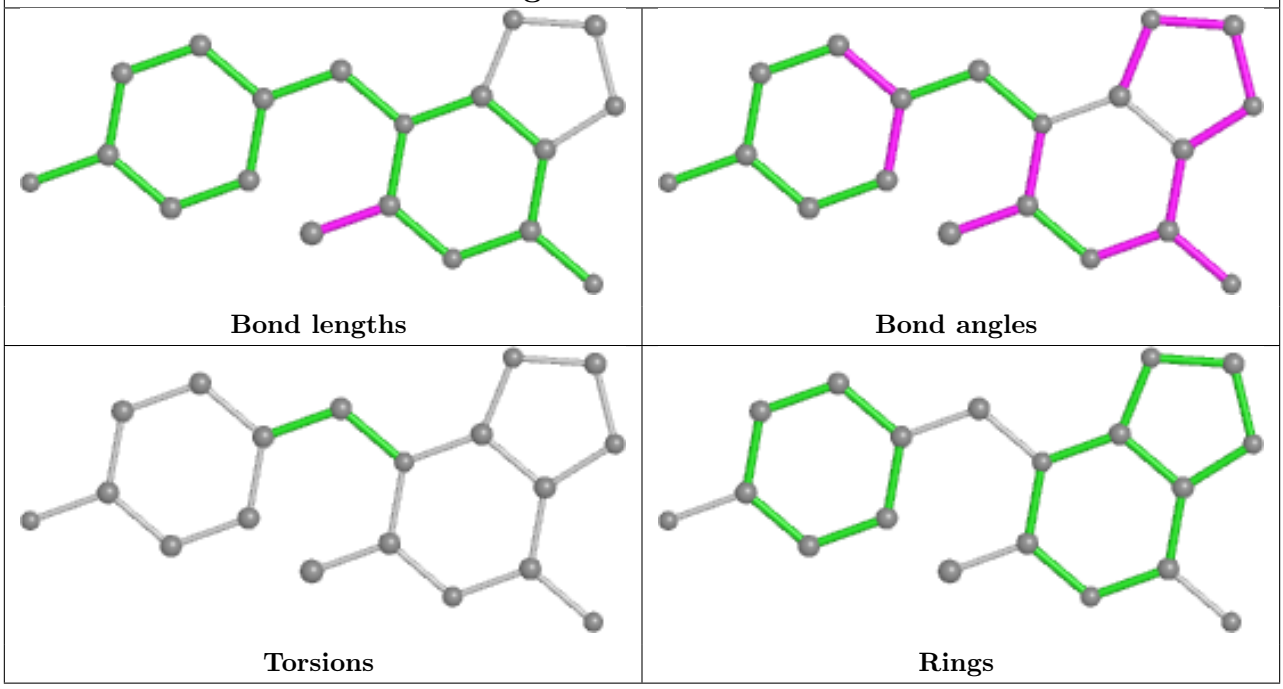


Torsions

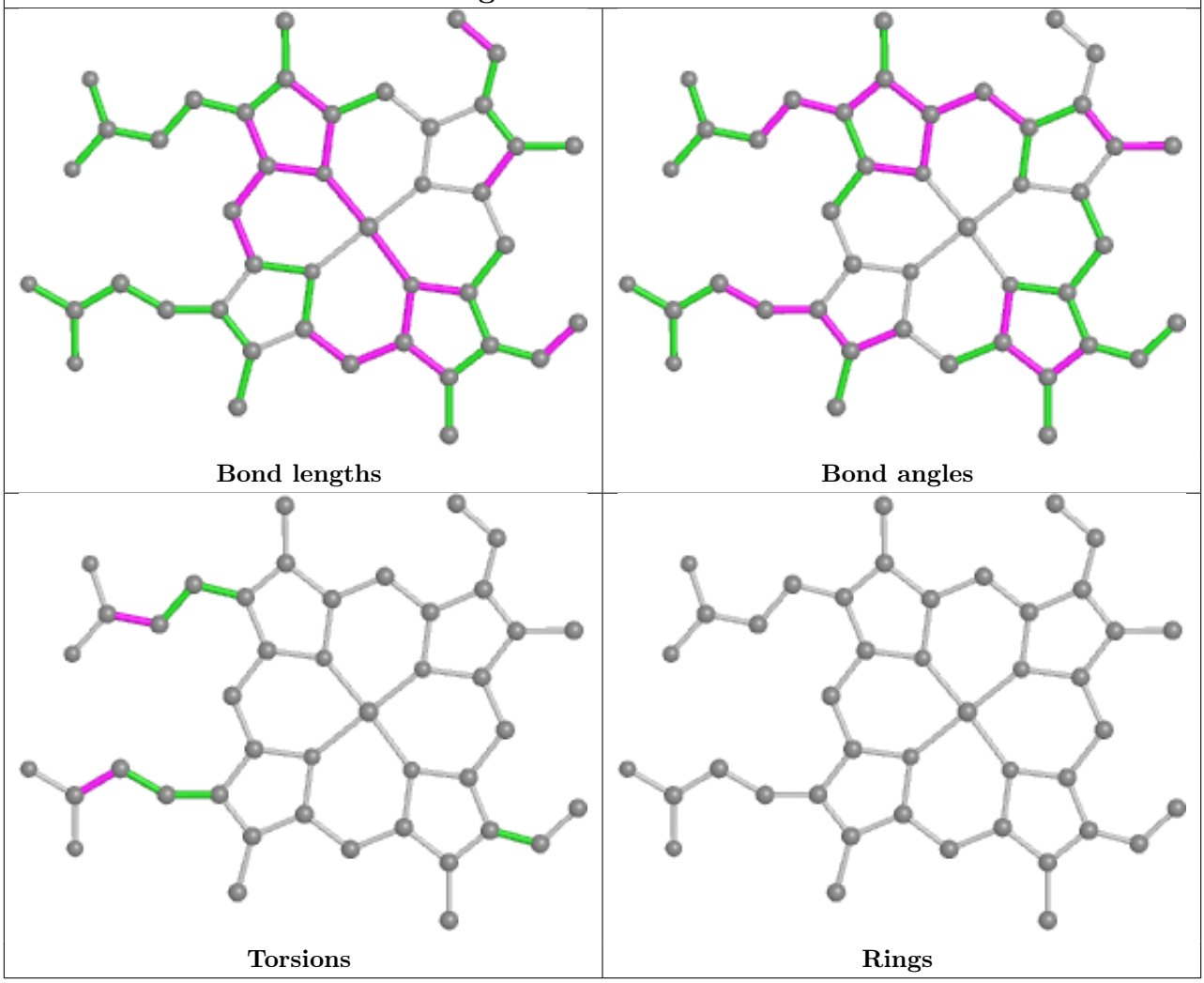


Rings

Ligand ZS0 C 1579



Ligand HEM D 1580



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	104/108 (96%)	-0.29	3 (2%)	51	58	10, 14, 26, 49	0
1	B	104/108 (96%)	-0.24	1 (0%)	82	86	12, 18, 30, 36	0
2	C	465/467 (99%)	-0.34	8 (1%)	70	76	6, 16, 29, 43	0
2	D	465/467 (99%)	-0.01	20 (4%)	35	42	10, 22, 37, 46	0
All	All	1138/1150 (98%)	-0.19	32 (2%)	53	60	6, 19, 35, 49	0

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	355	PRO	6.7
2	C	355	PRO	6.3
2	D	217	HIS	4.8
2	C	217	HIS	4.6
1	A	3	GLU	4.1
2	C	113	VAL	3.5
2	D	568	PRO	3.4
2	D	155	GLY	3.1
1	A	4	GLN	3.1
1	B	104	ALA	3.0
2	D	113	VAL	2.9
2	C	181	GLU	2.9
2	D	563	ASN	2.8
2	C	356	ASN	2.7
2	D	314	ARG	2.6
2	D	181	GLU	2.5
2	D	565	SER	2.4
2	D	578	ALA	2.4
2	D	270	ARG	2.4
2	D	349	ARG	2.3
2	C	215	ASN	2.2

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Mol	Chain	Res	Type	RSRZ
2	D	206	ASN	2.2
2	C	578	ALA	2.2
2	D	157	ASN	2.2
2	D	356	ASN	2.1
2	D	202	ARG	2.1
2	D	576	ARG	2.1
2	D	354	GLU	2.1
2	C	141	ALA	2.1
1	A	2	PRO	2.0
2	D	549	ASN	2.0
2	D	141	ALA	2.0

6.2 Non-standard residues in protein, DNA, RNA chains (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
2	CSO	D	150	7/8	0.94	0.13	18,18,26,26	0
2	CSO	C	150	7/8	0.96	0.11	15,16,22,23	0

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	MAN	E	4	11/12	0.74	0.28	45,48,50,50	0
4	MAN	F	4	11/12	0.81	0.17	36,37,37,38	0
4	FUC	F	5	10/11	0.83	0.34	37,40,41,43	0
3	BMA	E	3	11/12	0.89	0.16	27,28,33,40	0
3	MAN	E	5	11/12	0.89	0.20	27,28,29,29	0
3	FUC	E	6	10/11	0.90	0.17	34,36,37,38	0
4	BMA	F	3	11/12	0.91	0.16	28,30,32,33	0
3	NAG	E	1	14/15	0.94	0.11	18,20,25,28	0
4	NAG	F	1	14/15	0.95	0.12	22,24,31,31	0
4	NAG	F	2	14/15	0.96	0.11	16,20,22,25	0

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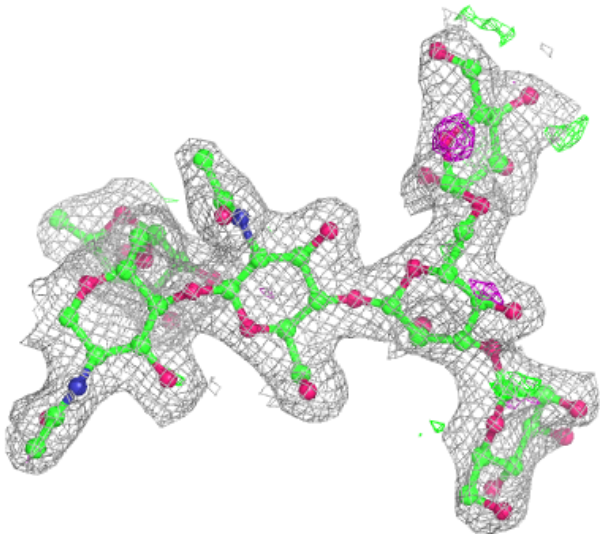
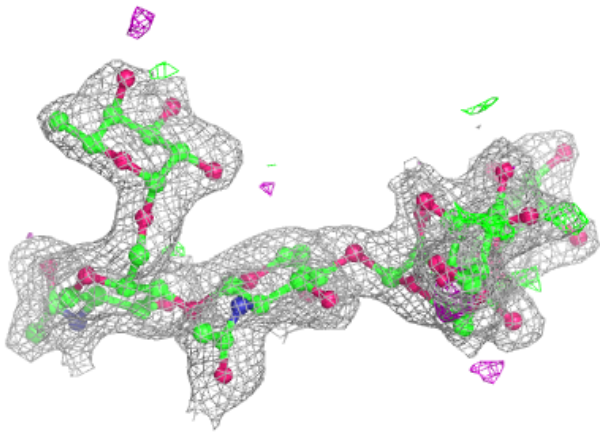
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	NAG	E	2	14/15	0.97	0.11	14,19,21,24	0

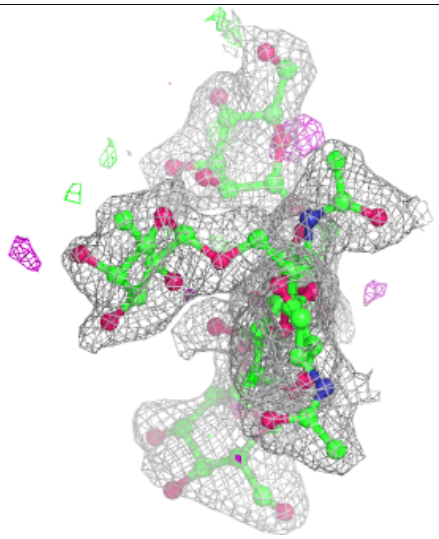
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain E:

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

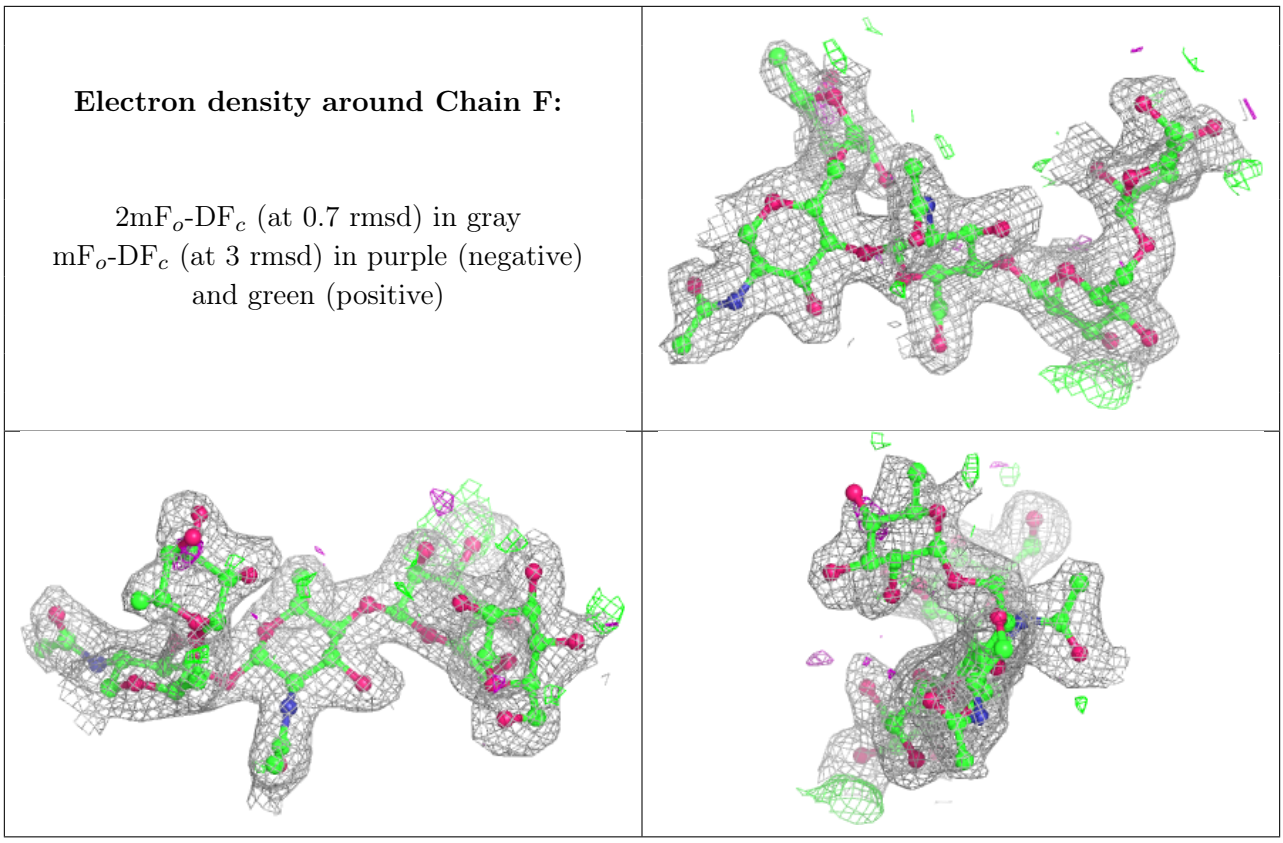






Electron density around Chain F:

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



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	ACT	C	1596	4/4	0.70	0.23	55,56,56,56	0
5	SO4	B	1105	5/5	0.71	0.36	48,49,49,50	5
11	ACT	D	1592	4/4	0.72	0.38	63,63,63,63	0
11	ACT	D	1591	4/4	0.76	0.25	50,51,51,51	0
8	NAG	D	1583	14/15	0.84	0.22	43,45,46,47	0
6	ZS0	D	1579	19/19	0.87	0.19	35,44,45,46	0
6	ZS0	C	1579	19/19	0.90	0.16	27,31,35,35	0
11	ACT	D	1593	4/4	0.90	0.17	38,38,38,38	0
8	NAG	D	1582	14/15	0.91	0.16	30,32,35,35	0
11	ACT	C	1595	4/4	0.92	0.20	55,55,55,55	0
8	NAG	C	1582	14/15	0.93	0.14	24,30,33,33	0
8	NAG	C	1583	14/15	0.93	0.14	29,31,33,34	0
5	SO4	C	1593	5/5	0.93	0.24	76,76,76,76	0
11	ACT	C	1597	4/4	0.96	0.16	35,35,35,35	0

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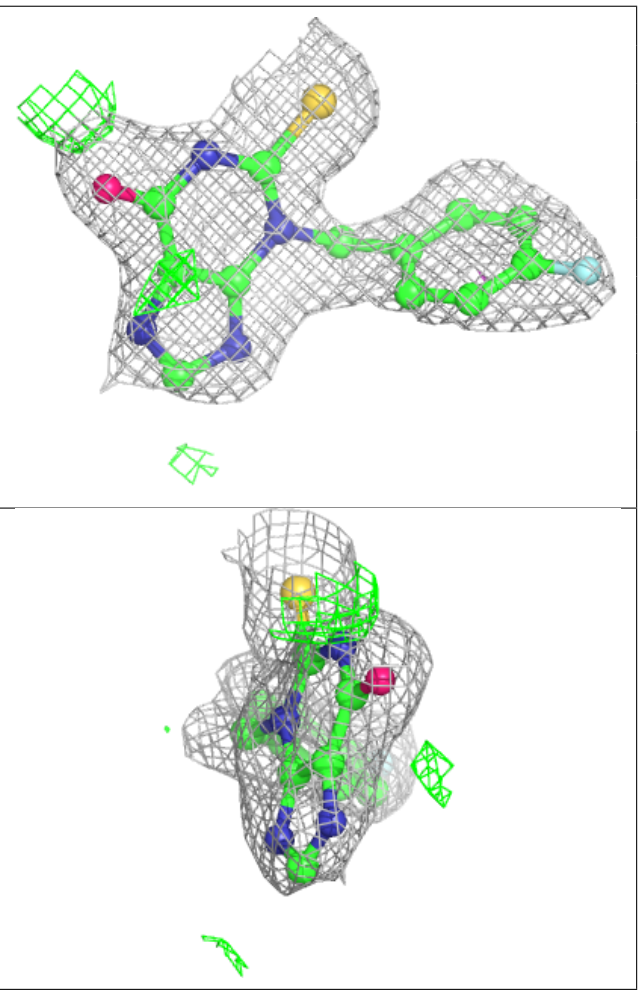
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
7	HEM	C	1580	43/43	0.96	0.15	7,12,18,25	0
5	SO4	C	1594	5/5	0.97	0.19	44,45,45,46	0
7	HEM	D	1580	43/43	0.97	0.17	13,17,23,27	0
9	CA	C	1591	1/1	0.99	0.09	11,11,11,11	0
9	CA	D	1594	1/1	0.99	0.08	14,14,14,14	0
10	CL	C	1592	1/1	1.00	0.09	8,8,8,8	0
10	CL	D	1595	1/1	1.00	0.12	12,12,12,12	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.

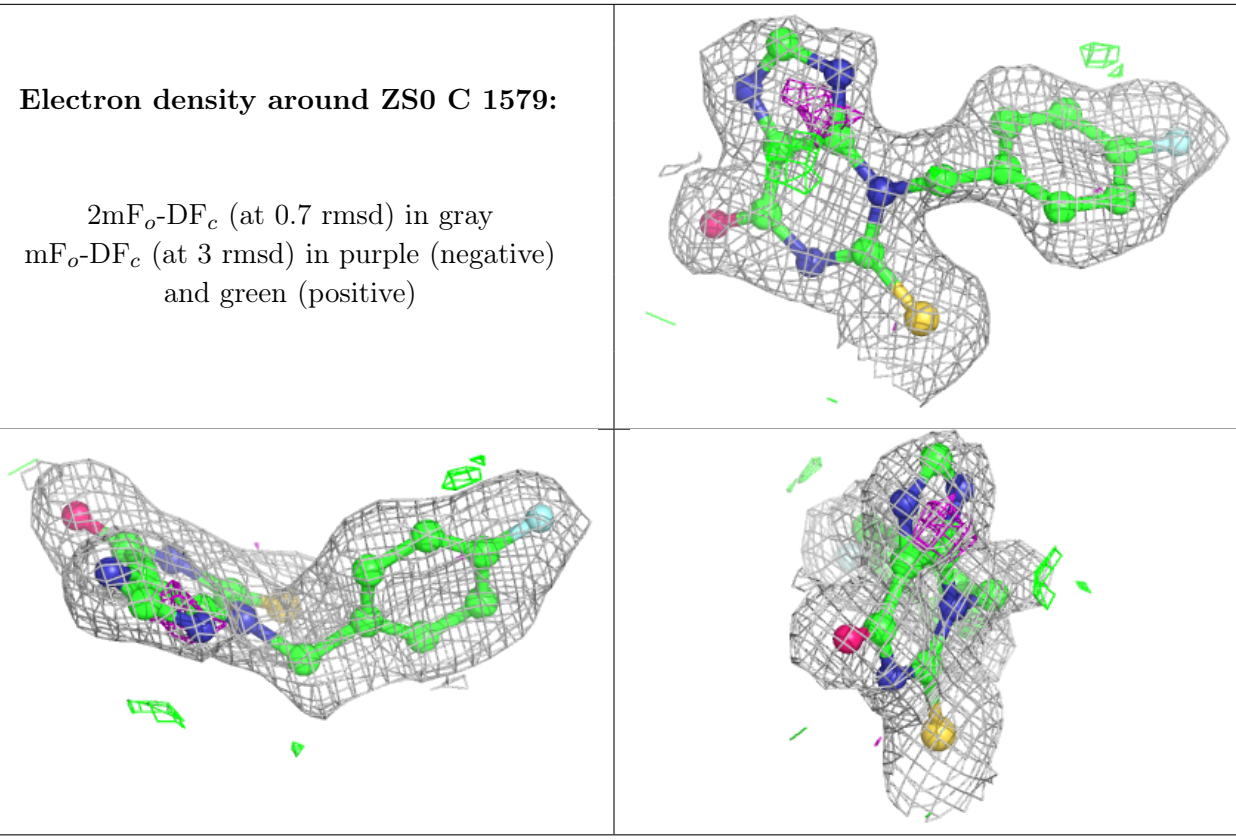
Electron density around ZS0 D 1579:

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 ZS0 C 1579:

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



Electron density around HEM C 1580:

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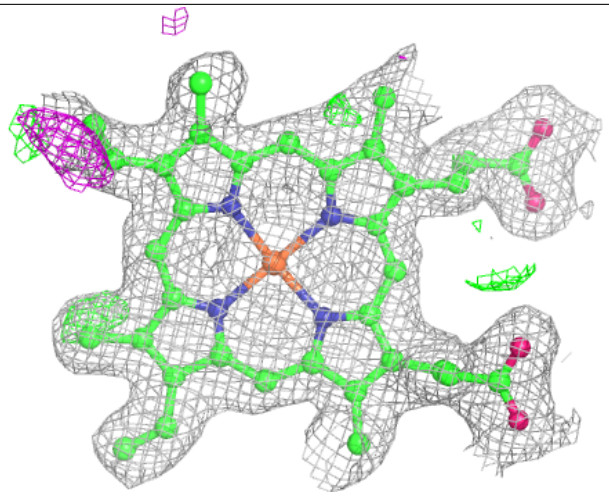
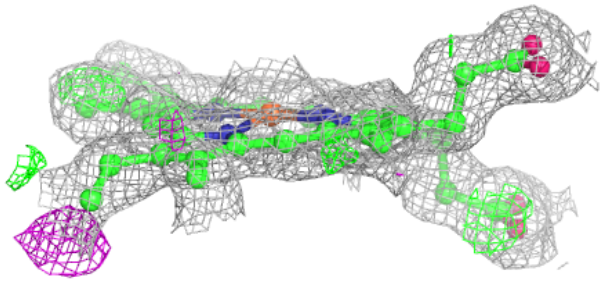
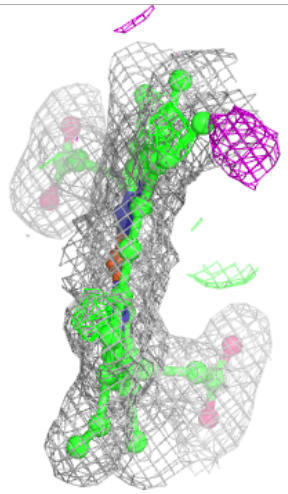
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

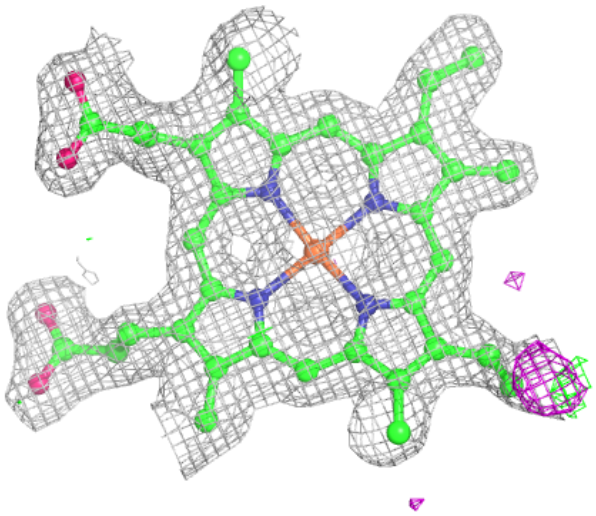


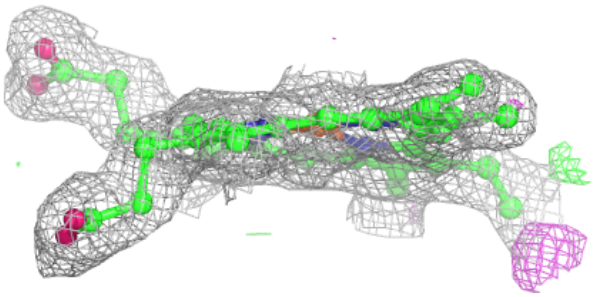


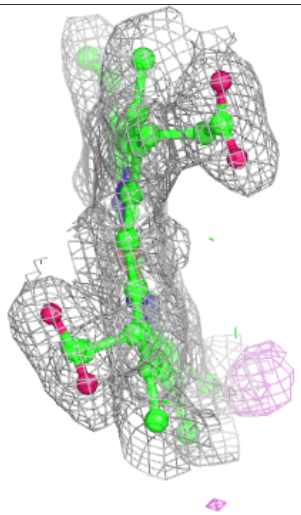


Electron density around HEM D 1580:

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.