Full wwPDB X-ray Structure Validation Report ⓘ

Nov 20, 2023 – 03:21 pm GMT

PDB ID	:	8BOW
Title	:	X-ray structure of human glutamate carboxypeptidase II (GCPII) in complex with an inhibitor 617
Authors	:	Motlova, L.; Barinka, C.; Benesova, M.
Deposited on	:	2022-11-15
Resolution	:	1.58 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references ⓘ) were used in the production of this report:

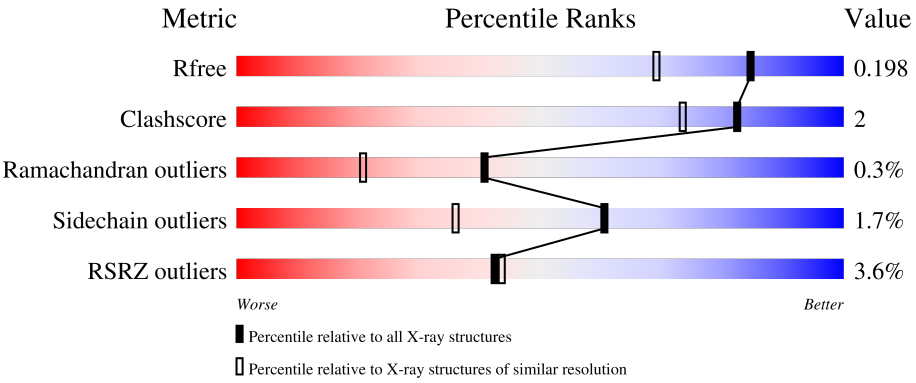
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
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 1.58 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	5534 (1.60-1.56)
Clashscore	141614	5861 (1.60-1.56)
Ramachandran outliers	138981	5708 (1.60-1.56)
Sidechain outliers	138945	5703 (1.60-1.56)
RSRZ outliers	127900	5431 (1.60-1.56)

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	707	4% 91% 7%
2	B	3	100%
2	F	3	33% 67%
3	C	5	100%
4	D	2	100%

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Mol	Chain	Length	Quality of chain
5	E	4	25% 75%

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
2	BMA	B	3	-	-	-	X
4	NAG	D	2	-	-	-	X

2 Entry composition

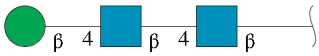
There are 11 unique types of molecules in this entry. The entry contains 6787 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Glutamate carboxypeptidase 2.

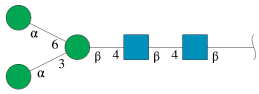
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	692	5830	3739	983	1086	22	0	42	0

- Molecule 2 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
			Total	C	N	O			
2	B	3	39	22	2	15	0	0	0
2	F	3	39	22	2	15	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)-2-acetamido-2-deoxy-beta-D-glucopyranose.

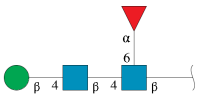


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	C	5	61	34	2	25	0	0	0

- Molecule 4 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
4	D	2	Total C N O 28 16 2 10	0	0	0

- Molecule 5 is an oligosaccharide called 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
5	E	4	Total C N O 49 28 2 19	0	0	0

- Molecule 6 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	2	Total Zn 2 2	0	0

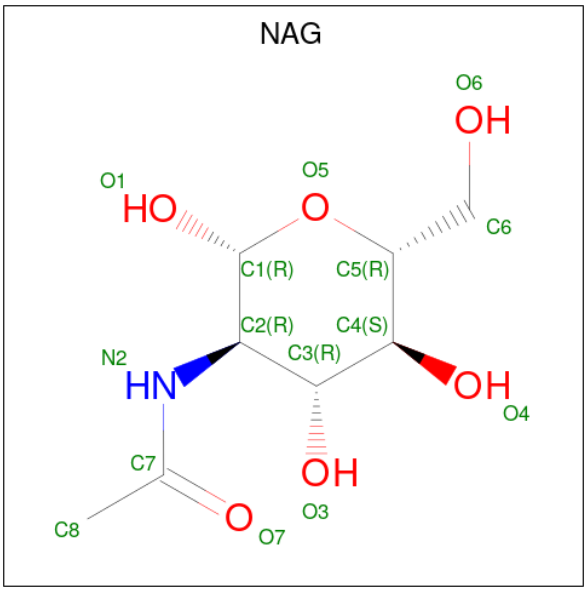
- Molecule 7 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total Ca 1 1	0	0

- Molecule 8 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

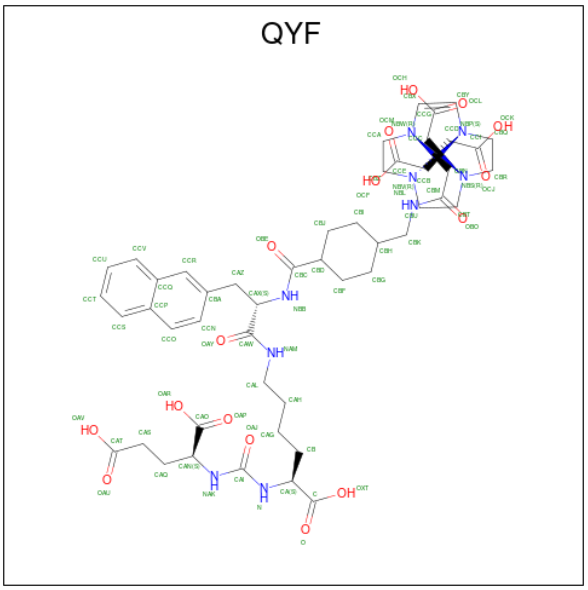
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	1	Total Cl 1 1	0	0

- Molecule 9 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).



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

- Molecule 10 is (2 {S})-2-[[(2 {S})-6-[[(2 {S})-3-naphthalen-2-yl-2-[[4-[[2-[(11 {Z})-4,7,10-tris (2-hydroxy-2-oxoethyl)-1,4,7,10-tetrazacyclododec-11-en-1-yl]ethanoylamino]methyl]cyclohexyl]carbonylamino]propanoyl]amino]-1-oxidanyl-1-oxidanylidene-hexan-2-yl]carbamoylamino]pentanedioic acid (three-letter code: QYF) (formula: $C_{49}H_{69}N_9O_{16}$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
10	A	1	Total	C	N	O	0	0
			74	49	9	16		

- Molecule 11 is water.

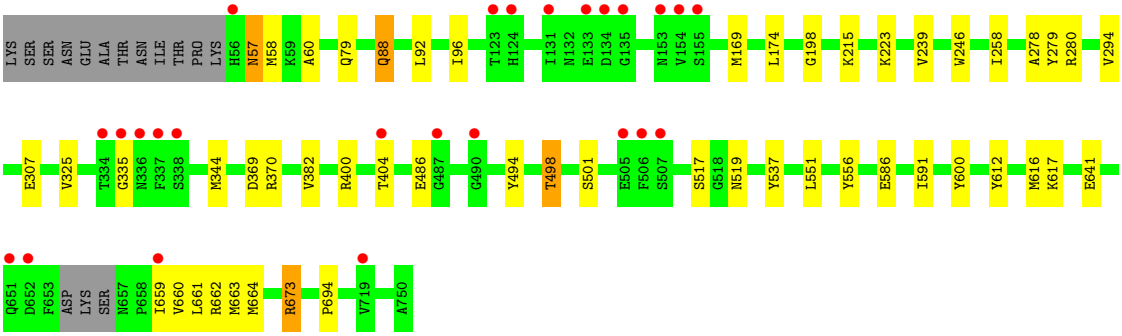
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	A	635	Total	O	0	0
			635	635		

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.

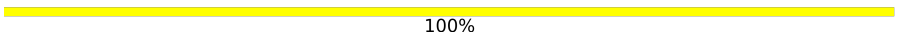
• Molecule 1: Glutamate carboxypeptidase 2

Chain A:



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

Chain B:

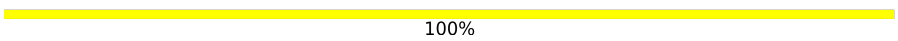


• Molecule 2: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain F:

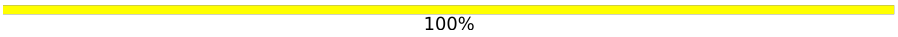
• Molecule 3: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain C:



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

Chain D:



• Molecule 5: 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 E:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α, β, γ	101.28Å 130.00Å 159.49Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.25 – 1.58 45.25 – 1.58	Depositor EDS
% Data completeness (in resolution range)	99.6 (45.25-1.58) 99.6 (45.25-1.58)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.24 (at 1.58Å)	Xtriage
Refinement program	REFMAC 5.8.0135	Depositor
R, R_{free}	0.181 , 0.198 0.180 , 0.198	Depositor DCC
R_{free} test set	2100 reflections (1.46%)	wwPDB-VP
Wilson B-factor (Å^2)	19.6	Xtriage
Anisotropy	0.585	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 44.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	6787	wwPDB-VP
Average B, all atoms (Å^2)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.65% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CA, FUC, CL, QYF, NAG, BMA, MAN, ZN

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$\|Z\|>5$	RMSZ	#$\|Z\|>5$
1	A	0.61	0/5997	0.73	3/8120 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	673	ARG	NE-CZ-NH2	-6.82	116.89	120.30
1	A	370	ARG	NE-CZ-NH1	5.66	123.13	120.30
1	A	673	ARG	NE-CZ-NH1	5.21	122.90	120.30

There are no chirality outliers.

There are no planarity outliers.

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	5830	0	5665	30	0
2	B	39	0	34	0	0
2	F	39	0	34	0	0
3	C	61	0	52	0	0
4	D	28	0	25	0	0
5	E	49	0	43	0	0
6	A	2	0	0	0	0
7	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
8	A	1	0	0	0	0
9	A	28	0	26	1	0
10	A	74	0	0	0	0
11	A	635	0	0	4	1
All	All	6787	0	5879	30	1

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 2.

All (30) 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:660[A]:VAL:O	1:A:664[A]:MET:HG2	1.34	1.23
1:A:494:TYR:O	1:A:498[A]:THR:HG23	1.85	0.75
1:A:641:GLU:HG3	11:A:1355:HOH:O	1.90	0.70
1:A:88:GLN:H	1:A:88:GLN:HE21	1.41	0.67
1:A:486[A]:GLU:OE1	1:A:486[A]:GLU:N	2.29	0.66
1:A:58:MET:CE	1:A:586:GLU:HG2	2.28	0.64
1:A:660[A]:VAL:O	1:A:664[A]:MET:CG	2.29	0.62
1:A:661[A]:LEU:O	1:A:664[A]:MET:HB2	1.98	0.62
1:A:79[B]:GLN:OE1	11:A:902:HOH:O	2.16	0.59
1:A:88:GLN:H	1:A:88:GLN:NE2	2.01	0.58
1:A:612:TYR:CZ	1:A:616:MET:HG3	2.38	0.58
1:A:58:MET:HE1	1:A:586:GLU:HG2	1.87	0.55
1:A:659[B]:ILE:O	1:A:663[B]:MET:HG3	2.09	0.53
1:A:369:ASP:OD2	1:A:662[B]:ARG:NH2	2.33	0.52
1:A:278:ALA:HB3	1:A:280[B]:ARG:CZ	2.41	0.51
1:A:307:GLU:HA	1:A:325:VAL:HG22	1.95	0.48
1:A:517:SER:HB2	1:A:694:PRO:HG3	1.96	0.48
1:A:215[B]:LYS:HE2	11:A:1287:HOH:O	2.14	0.47
1:A:279[B]:TYR:C	1:A:279[B]:TYR:CD1	2.91	0.44
1:A:551:LEU:HD22	1:A:556:TYR:HB2	1.99	0.43
1:A:591[B]:ILE:HG22	1:A:661[B]:LEU:HD21	2.00	0.43
1:A:400:ARG:O	1:A:404[A]:THR:HG23	2.18	0.42
1:A:198:GLY:O	1:A:223:LYS:HE2	2.19	0.42
1:A:169:MET:HA	1:A:344:MET:O	2.21	0.41
1:A:246:TRP:CD1	9:A:806:NAG:H83	2.56	0.41
1:A:591[B]:ILE:CG2	1:A:661[B]:LEU:HD21	2.50	0.41
1:A:617:LYS:HD2	11:A:1137:HOH:O	2.20	0.41
1:A:258:ILE:HD13	1:A:294:VAL:HB	2.04	0.40
1:A:92:LEU:O	1:A:96:ILE:HG12	2.22	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:57:ASN:ND2	1:A:60:ALA:H	2.20	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
11:A:905:HOH:O	11:A:1058:HOH:O[2_565]	1.85	0.35

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	727/707 (103%)	713 (98%)	12 (2%)	2 (0%)	41 21

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	382	VAL
1	A	335	GLY

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	629/603 (104%)	617 (98%)	12 (2%)	57 31

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	57	ASN
1	A	88	GLN
1	A	174	LEU
1	A	239[A]	VAL
1	A	239[B]	VAL
1	A	498[A]	THR
1	A	498[B]	THR
1	A	501	SER
1	A	519	ASN
1	A	537	TYR
1	A	600	TYR
1	A	673	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	57	ASN
1	A	88	GLN
1	A	303	GLN

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)

17 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	$\#\|Z\|>2$
2	NAG	B	1	1,2	14,14,15	0.38	0	17,19,21	1.18	2 (11%)
2	NAG	B	2	2	14,14,15	0.51	0	17,19,21	1.02	1 (5%)
2	BMA	B	3	2	11,11,12	0.64	0	15,15,17	1.24	2 (13%)
3	NAG	C	1	1,3	14,14,15	0.54	0	17,19,21	1.30	3 (17%)
3	NAG	C	2	3	14,14,15	0.43	0	17,19,21	1.39	1 (5%)
3	BMA	C	3	3	11,11,12	0.45	0	15,15,17	0.94	1 (6%)
3	MAN	C	4	3	11,11,12	0.64	0	15,15,17	1.11	2 (13%)
3	MAN	C	5	3	11,11,12	0.63	0	15,15,17	0.86	1 (6%)
4	NAG	D	1	4,1	14,14,15	0.65	0	17,19,21	1.53	1 (5%)
4	NAG	D	2	4	14,14,15	0.68	0	17,19,21	1.44	3 (17%)
5	NAG	E	1	5,1	14,14,15	0.62	0	17,19,21	1.34	2 (11%)
5	NAG	E	2	5	14,14,15	0.70	0	17,19,21	0.98	1 (5%)
5	BMA	E	3	5	11,11,12	0.79	0	15,15,17	2.07	4 (26%)
5	FUC	E	4	5	10,10,11	0.84	0	14,14,16	0.73	0
2	NAG	F	1	1,2	14,14,15	0.48	0	17,19,21	0.99	1 (5%)
2	NAG	F	2	2	14,14,15	0.41	0	17,19,21	0.66	0
2	BMA	F	3	2	11,11,12	0.55	0	15,15,17	1.04	1 (6%)

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

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	F	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	F	2	2	-	0/6/23/26	0/1/1/1
2	BMA	F	3	2	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	E	3	BMA	C1-O5-C5	5.23	119.28	112.19
4	D	1	NAG	C1-O5-C5	5.22	119.27	112.19
3	C	2	NAG	C1-O5-C5	4.74	118.61	112.19
5	E	3	BMA	C3-C4-C5	4.05	117.47	110.24
5	E	1	NAG	C2-N2-C7	3.46	127.83	122.90
4	D	2	NAG	C4-C3-C2	3.05	115.49	111.02
4	D	2	NAG	C2-N2-C7	3.00	127.18	122.90
2	B	2	NAG	C4-C3-C2	2.80	115.12	111.02
2	B	3	BMA	C1-O5-C5	2.75	115.91	112.19
5	E	1	NAG	C8-C7-N2	2.68	120.64	116.10
3	C	1	NAG	C1-O5-C5	2.65	115.78	112.19
2	B	1	NAG	C1-O5-C5	2.51	115.59	112.19
4	D	2	NAG	O5-C5-C6	2.49	111.10	107.20
5	E	3	BMA	O5-C5-C4	2.45	116.79	110.83
5	E	2	NAG	C4-C3-C2	2.45	114.61	111.02
3	C	1	NAG	O5-C1-C2	-2.41	107.48	111.29
3	C	4	MAN	O5-C5-C6	2.29	110.79	107.20
2	F	3	BMA	C1-O5-C5	2.26	115.26	112.19
5	E	3	BMA	C2-C3-C4	2.26	114.81	110.89
3	C	4	MAN	C1-O5-C5	2.21	115.18	112.19
3	C	1	NAG	O4-C4-C5	-2.19	103.86	109.30
3	C	3	BMA	O3-C3-C2	-2.14	105.90	109.99
2	B	3	BMA	C3-C4-C5	2.12	114.02	110.24
2	B	1	NAG	C4-C3-C2	2.07	114.05	111.02
2	F	1	NAG	O5-C5-C4	-2.03	105.88	110.83
3	C	5	MAN	C1-O5-C5	2.02	114.92	112.19

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	E	1	NAG	C8-C7-N2-C2
5	E	1	NAG	O7-C7-N2-C2

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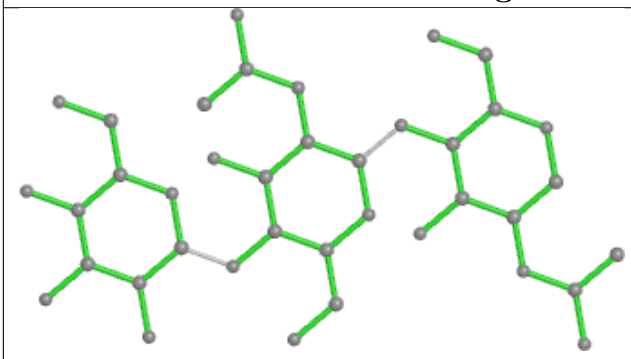
Mol	Chain	Res	Type	Atoms
5	E	2	NAG	C4-C5-C6-O6
3	C	2	NAG	C4-C5-C6-O6
5	E	2	NAG	O5-C5-C6-O6
3	C	1	NAG	C4-C5-C6-O6
3	C	2	NAG	O5-C5-C6-O6
4	D	2	NAG	C4-C5-C6-O6
4	D	2	NAG	O5-C5-C6-O6
3	C	1	NAG	O5-C5-C6-O6

There are no ring outliers.

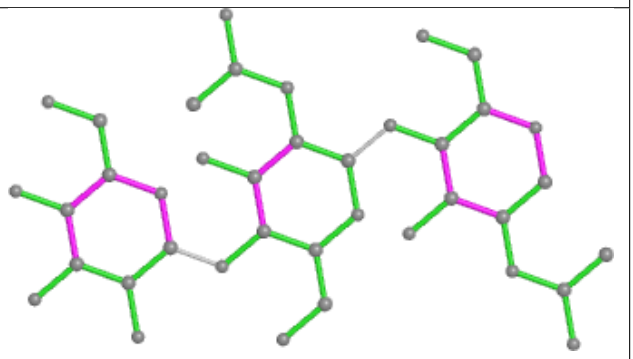
No monomer is involved in short contacts.

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

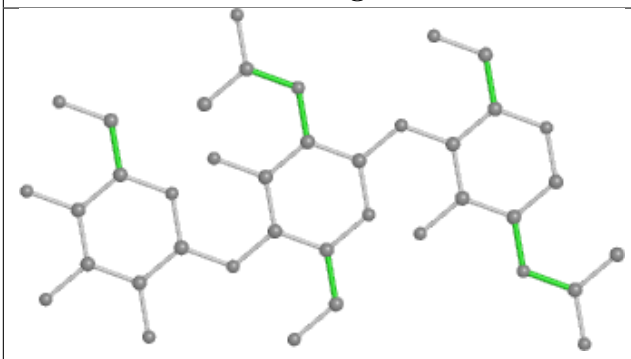
Oligosaccharide Chain B



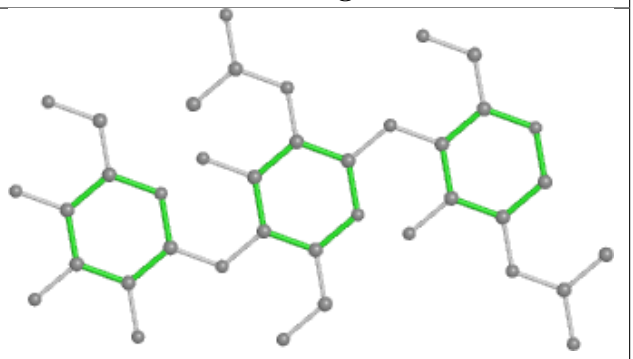
Bond lengths



Bond angles

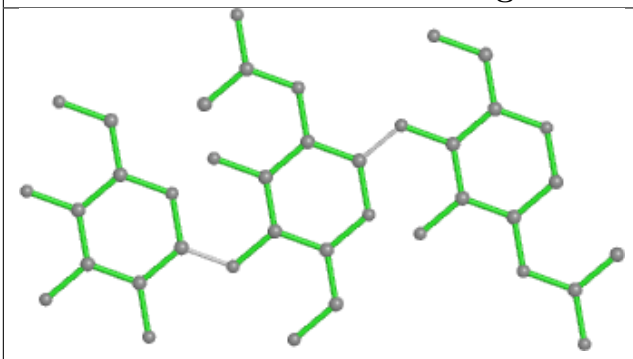


Torsions

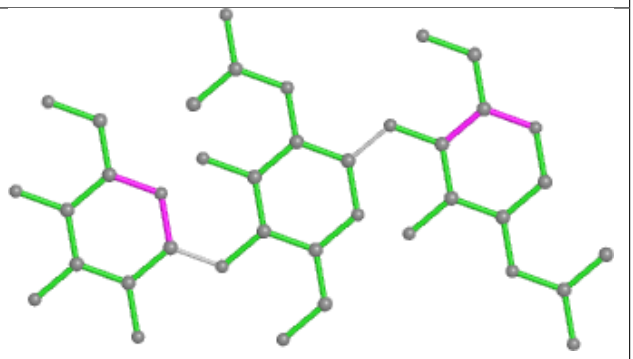


Rings

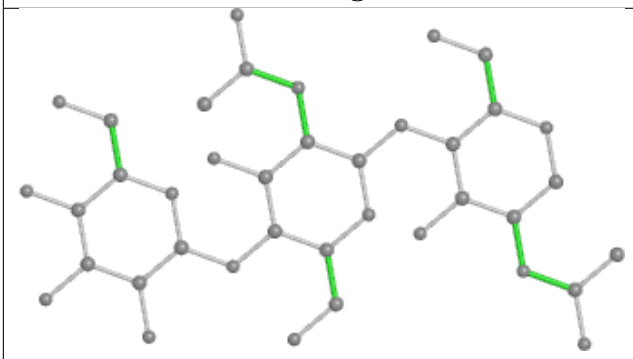
Oligosaccharide Chain F



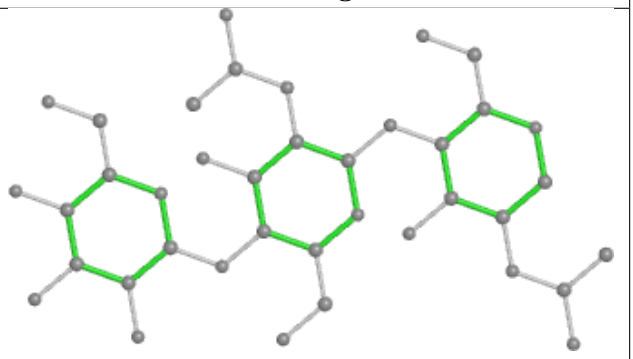
Bond lengths



Bond angles

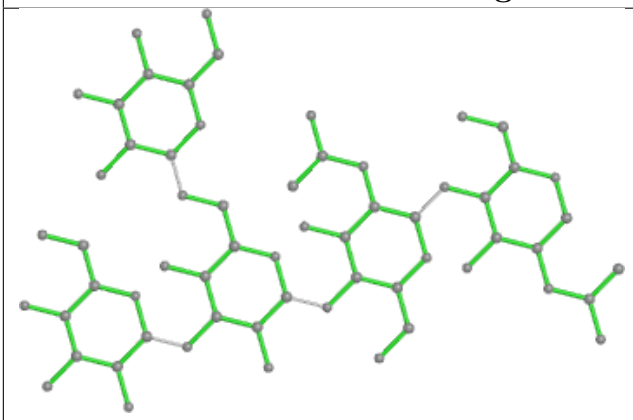


Torsions

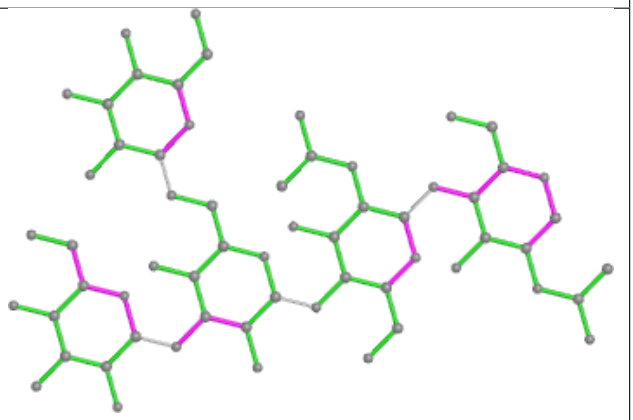


Rings

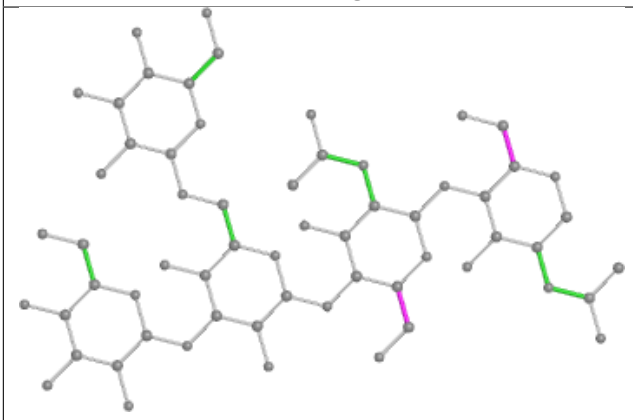
Oligosaccharide Chain C



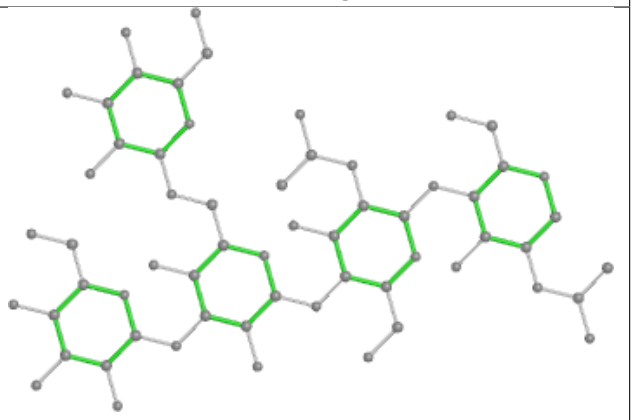
Bond lengths



Bond angles

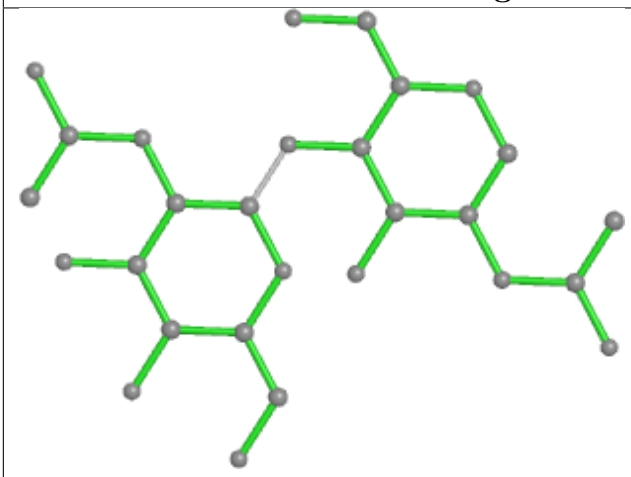


Torsions

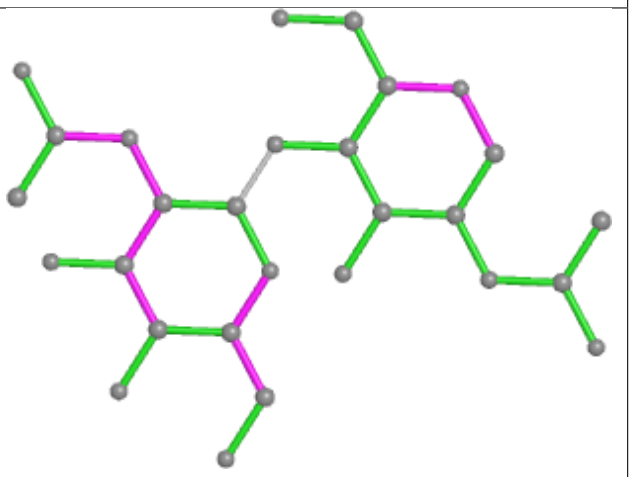


Rings

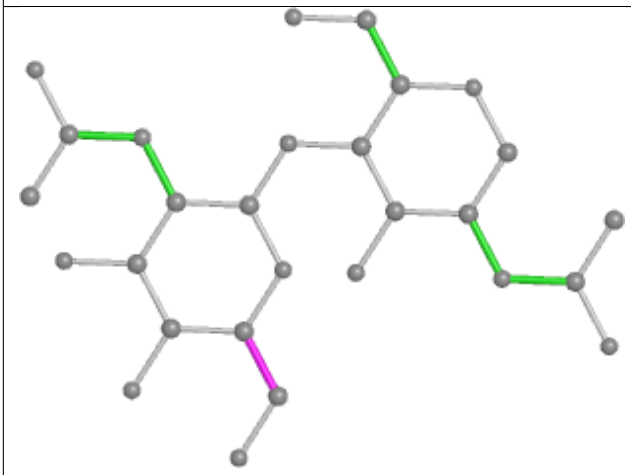
Oligosaccharide Chain D



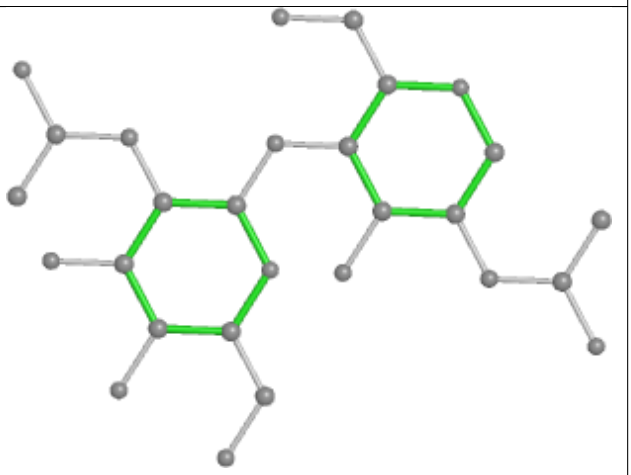
Bond lengths



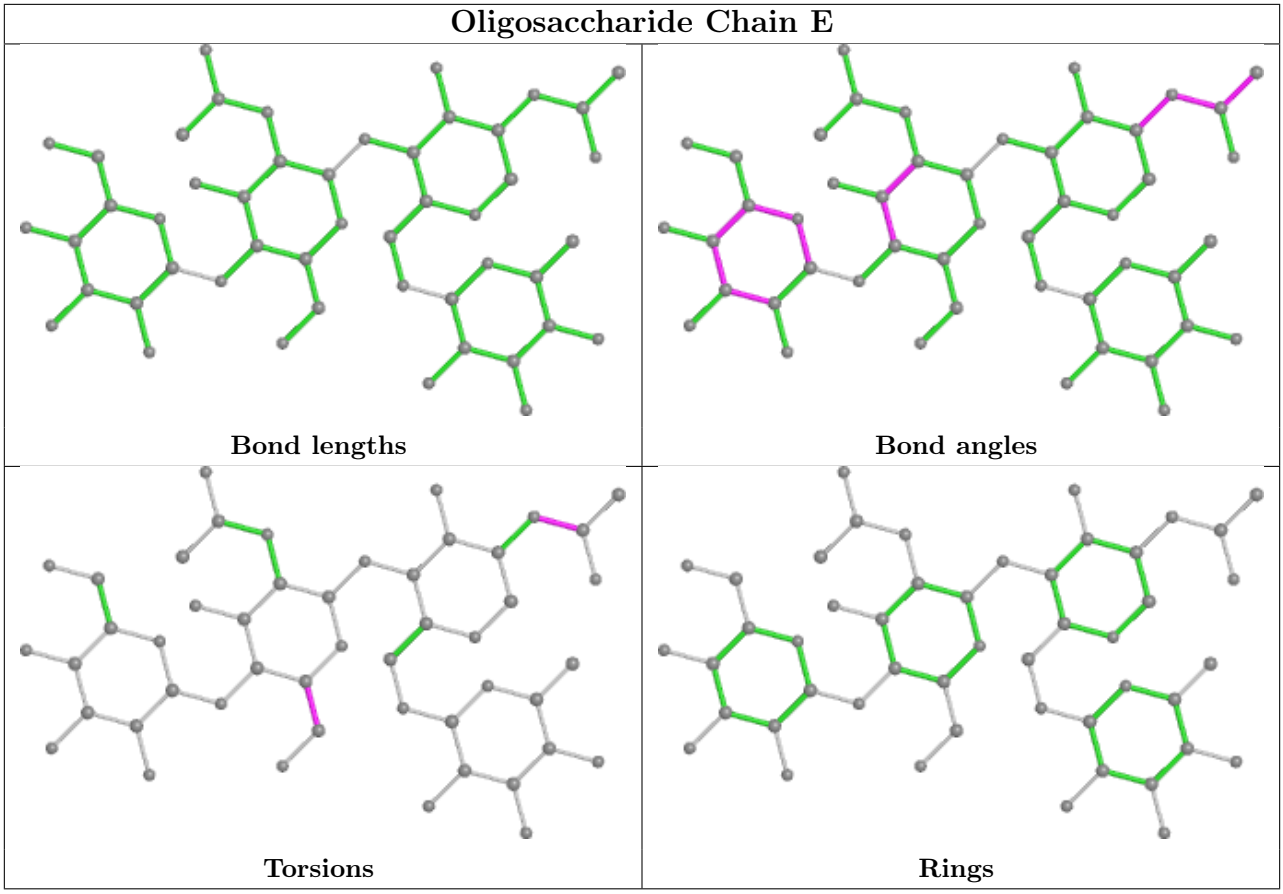
Bond angles



Torsions



Rings



5.6 Ligand geometry (i)

Of 7 ligands modelled in this entry, 4 are monoatomic - leaving 3 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	$\#\|Z\| > 2$
9	NAG	A	805	1	14,14,15	0.72	0	17,19,21	1.55	2 (11%)
10	QYF	A	807	6	77,77,77	1.77	8 (10%)	98,102,102	1.42	13 (13%)
9	NAG	A	806	1	14,14,15	0.65	0	17,19,21	1.61	2 (11%)

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
9	NAG	A	805	1	-	2/6/23/26	0/1/1/1
10	QYF	A	807	6	-	23/86/96/96	0/3/4/4
9	NAG	A	806	1	-	2/6/23/26	0/1/1/1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
10	A	807	QYF	CBY-CBX	8.73	1.56	1.34
10	A	807	QYF	CBY-NBP	4.93	1.48	1.33
10	A	807	QYF	CBX-NBW	4.93	1.48	1.33
10	A	807	QYF	CAZ-CBA	-2.90	1.44	1.51
10	A	807	QYF	CCB-NBP	2.61	1.48	1.45
10	A	807	QYF	CBN-NBW	2.54	1.48	1.45
10	A	807	QYF	OXT-C	-2.34	1.22	1.30
10	A	807	QYF	CCO-CCN	2.17	1.41	1.36

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
10	A	807	QYF	CBN-NBW-CCA	-5.75	106.55	116.52
9	A	806	NAG	C1-O5-C5	4.58	118.40	112.19
10	A	807	QYF	CBQ-NBP-CBY	-4.29	106.28	121.14
9	A	805	NAG	C1-O5-C5	4.14	117.80	112.19
10	A	807	QYF	CCB-NBP-CBQ	-3.85	109.84	116.52
9	A	805	NAG	O5-C5-C6	3.59	112.83	107.20
10	A	807	QYF	CBR-CBQ-NBP	3.56	117.39	112.07
10	A	807	QYF	CCA-NBW-CBX	-3.17	110.16	121.14
10	A	807	QYF	CAS-CAQ-CAN	-2.41	108.66	113.16
10	A	807	QYF	CCD-NBV-CBZ	2.35	117.67	111.94
9	A	806	NAG	C4-C3-C2	-2.25	107.72	111.02
10	A	807	QYF	OBE-CBC-CBD	-2.22	119.23	122.12
10	A	807	QYF	OAR-CAO-CAN	2.16	120.57	113.40
10	A	807	QYF	CAO-CAN-NAK	-2.15	105.44	110.55
10	A	807	QYF	CBJ-CBI-CBH	-2.12	108.90	112.42
10	A	807	QYF	CBF-CBD-CBJ	2.06	114.31	109.97
10	A	807	QYF	CCC-NBS-CBR	-2.03	107.00	111.94

There are no chirality outliers.

All (27) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
10	A	807	QYF	CBI-CBH-CBK-NBL
10	A	807	QYF	CBM-CBN-NBW-CCA
10	A	807	QYF	CBZ-CCA-NBW-CBN
10	A	807	QYF	CBY-CBX-NBW-CBN
10	A	807	QYF	CBY-CBX-NBW-CCA
10	A	807	QYF	CBX-CBY-NBP-CCB
10	A	807	QYF	CBX-CBY-NBP-CBQ
10	A	807	QYF	CBR-CBQ-NBP-CBY
10	A	807	QYF	CBT-CBU-NBV-CBZ
10	A	807	QYF	NBS-CCC-CCG-OCL
10	A	807	QYF	NBS-CCC-CCG-OCH
10	A	807	QYF	CCA-CBZ-NBV-CCD
9	A	805	NAG	C4-C5-C6-O6
9	A	805	NAG	O5-C5-C6-O6
10	A	807	QYF	OBE-CBC-CBD-CBF
9	A	806	NAG	C4-C5-C6-O6
10	A	807	QYF	NBB-CBC-CBD-CBF
10	A	807	QYF	CCI-CCD-NBV-CBU
10	A	807	QYF	CCE-CCB-NBP-CBY
9	A	806	NAG	O5-C5-C6-O6
10	A	807	QYF	CCG-CCC-NBS-CBT
10	A	807	QYF	CBG-CBH-CBK-NBL
10	A	807	QYF	CCG-CCC-NBS-CBR
10	A	807	QYF	CAH-CAG-CB-CA
10	A	807	QYF	CCI-CCD-NBV-CBZ
10	A	807	QYF	NBL-CBM-CBN-NBW
10	A	807	QYF	OBO-CBM-CBN-NBW

There are no ring outliers.

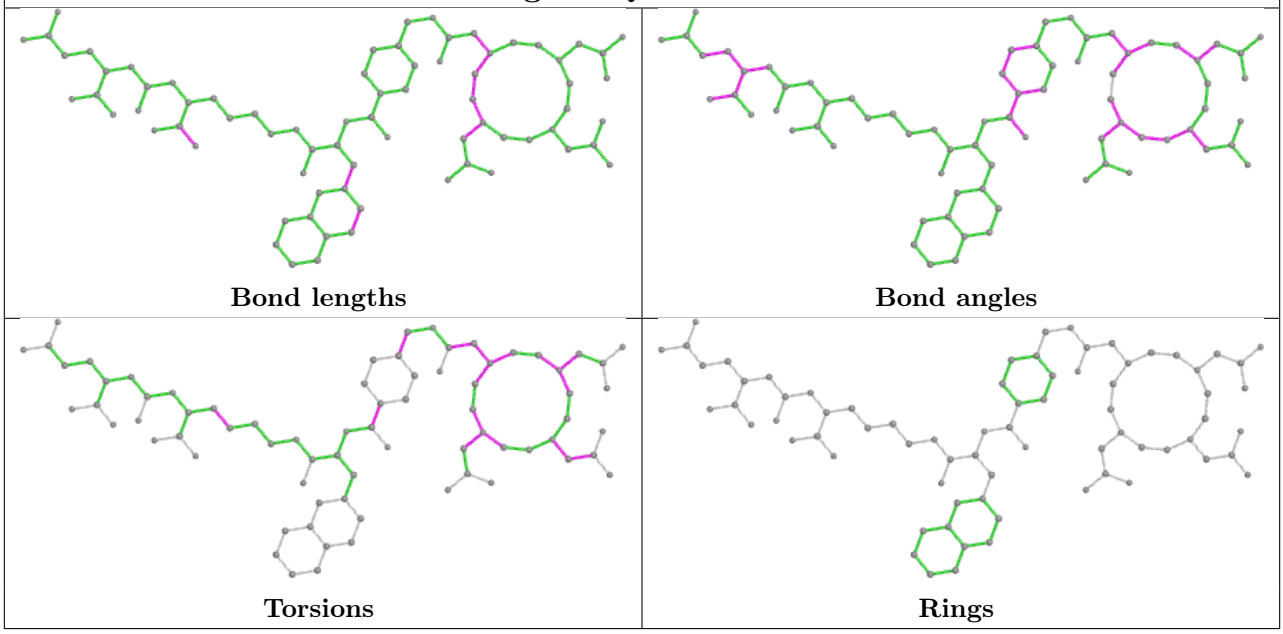
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	A	806	NAG	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 QYF A 807



5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} 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	692/707 (97%)	0.03	25 (3%) 42 44	13, 22, 38, 68	0

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	335	GLY	3.8
1	A	135	GLY	3.3
1	A	153	ASN	3.2
1	A	506	PHE	3.1
1	A	507	SER	2.9
1	A	155	SER	2.7
1	A	124	HIS	2.5
1	A	336	ASN	2.5
1	A	505	GLU	2.5
1	A	719[A]	VAL	2.4
1	A	487	GLY	2.4
1	A	652	ASP	2.4
1	A	123	THR	2.4
1	A	334	THR	2.3
1	A	134	ASP	2.3
1	A	404[A]	THR	2.3
1	A	154	VAL	2.3
1	A	659[A]	ILE	2.2
1	A	133	GLU	2.2
1	A	337	PHE	2.1
1	A	131	ILE	2.1
1	A	490	GLY	2.1
1	A	56	HIS	2.1
1	A	338	SER	2.1
1	A	651	GLN	2.1

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)

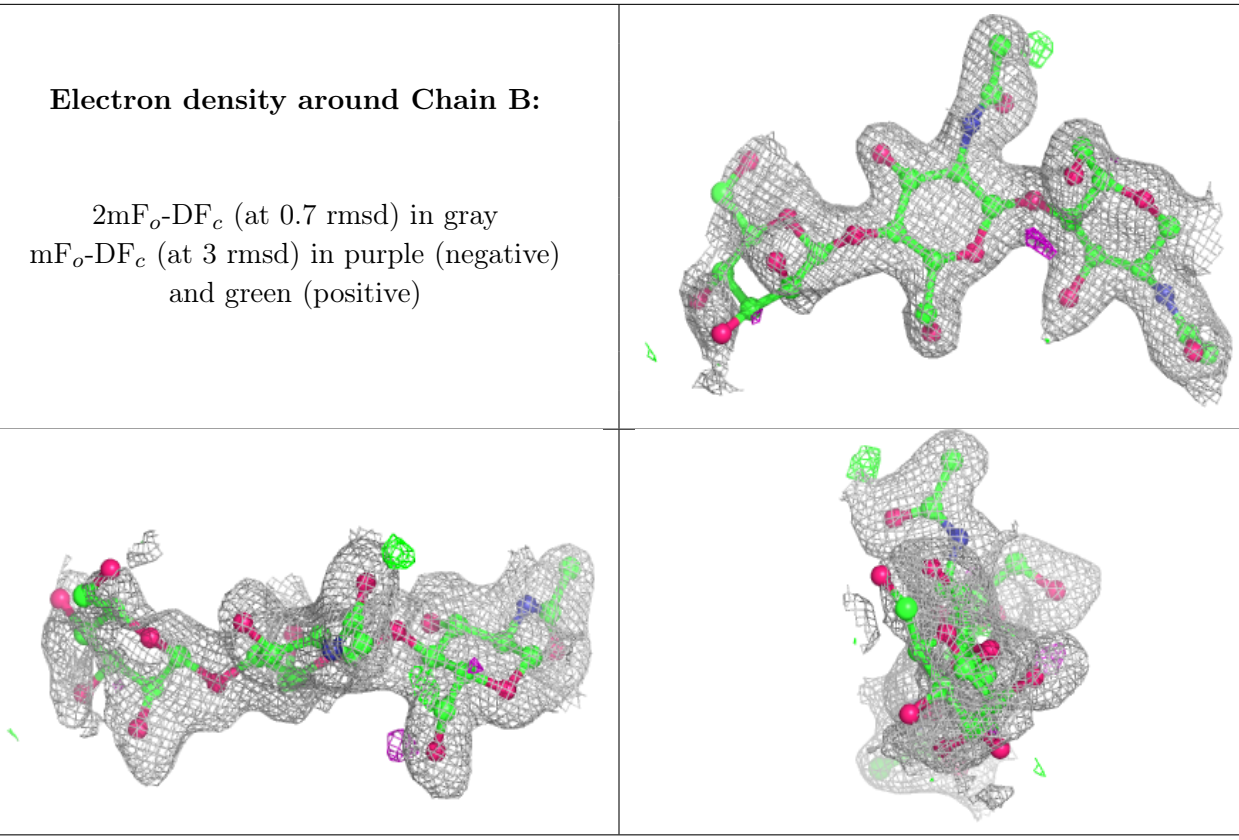
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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	BMA	B	3	11/12	0.43	0.44	74,84,87,88	0
5	BMA	E	3	11/12	0.54	0.40	86,89,92,93	0
4	NAG	D	2	14/15	0.60	0.44	80,84,89,94	0
4	NAG	D	1	14/15	0.69	0.26	46,53,62,74	0
5	FUC	E	4	10/11	0.69	0.38	54,60,62,64	0
2	BMA	F	3	11/12	0.73	0.24	55,61,68,75	0
3	MAN	C	5	11/12	0.78	0.21	61,67,73,73	0
5	NAG	E	2	14/15	0.78	0.26	50,58,67,79	0
2	NAG	B	2	14/15	0.80	0.23	36,48,54,64	0
5	NAG	E	1	14/15	0.84	0.16	39,41,45,50	0
3	NAG	C	2	14/15	0.86	0.12	37,40,43,53	0
3	MAN	C	4	11/12	0.88	0.10	44,45,47,48	0
3	BMA	C	3	11/12	0.89	0.09	40,42,49,53	0
2	NAG	F	2	14/15	0.92	0.11	31,39,45,49	0
2	NAG	B	1	14/15	0.93	0.12	30,35,40,44	0
3	NAG	C	1	14/15	0.93	0.08	19,26,35,42	0
2	NAG	F	1	14/15	0.94	0.08	25,27,29,32	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.

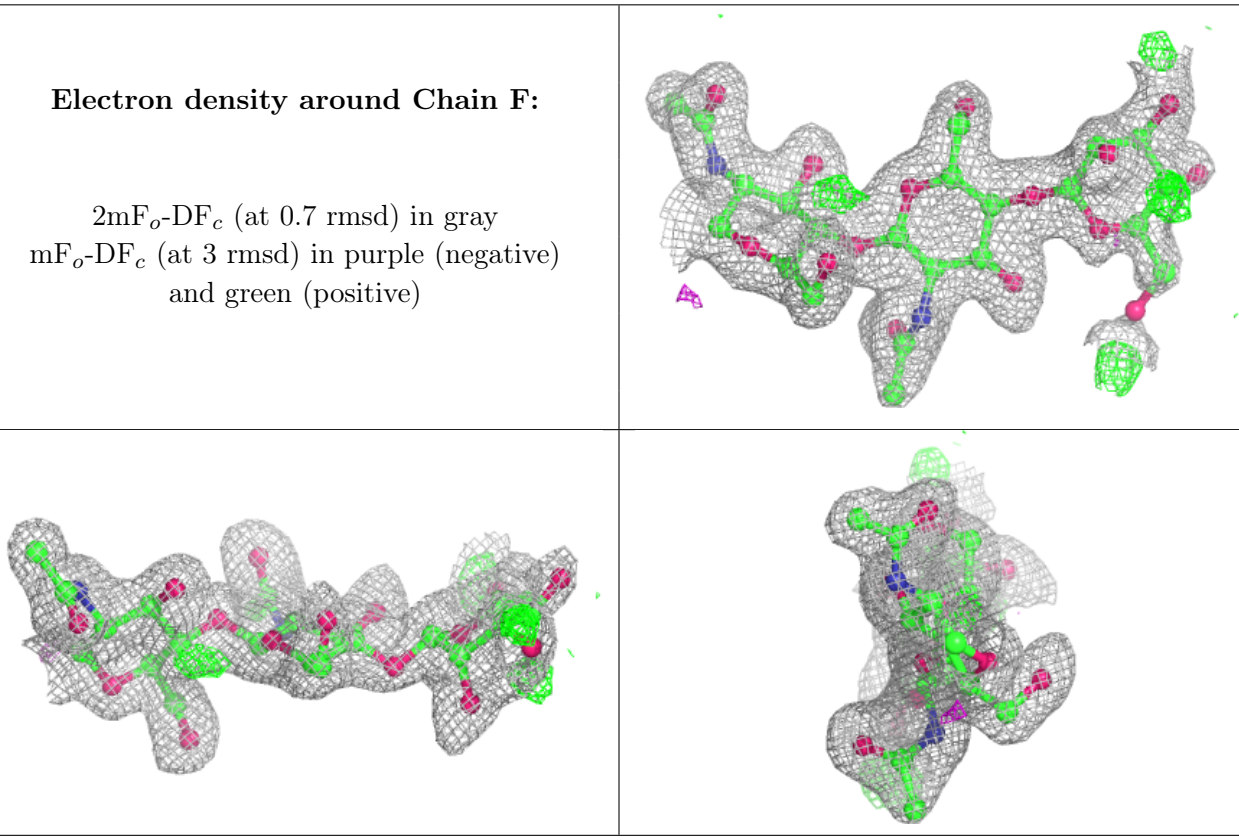
Electron density around Chain B:

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



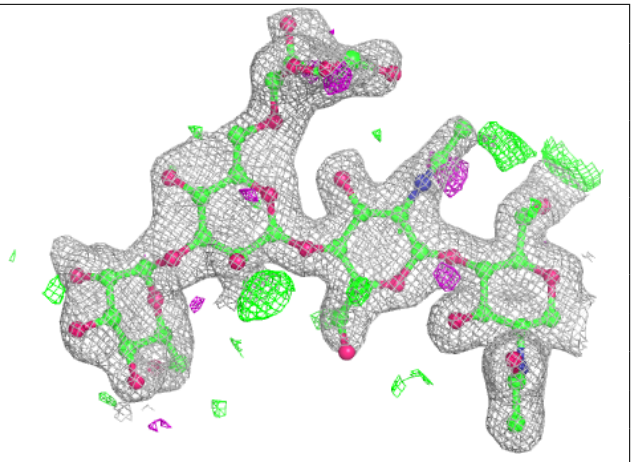
Electron density around Chain F:

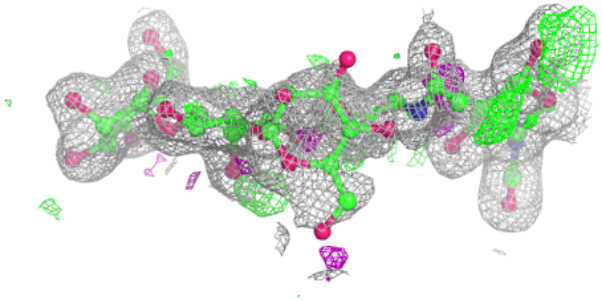
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

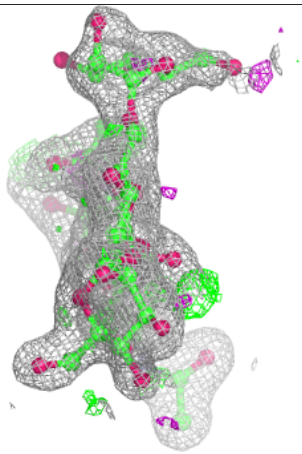


Electron density around Chain C:

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

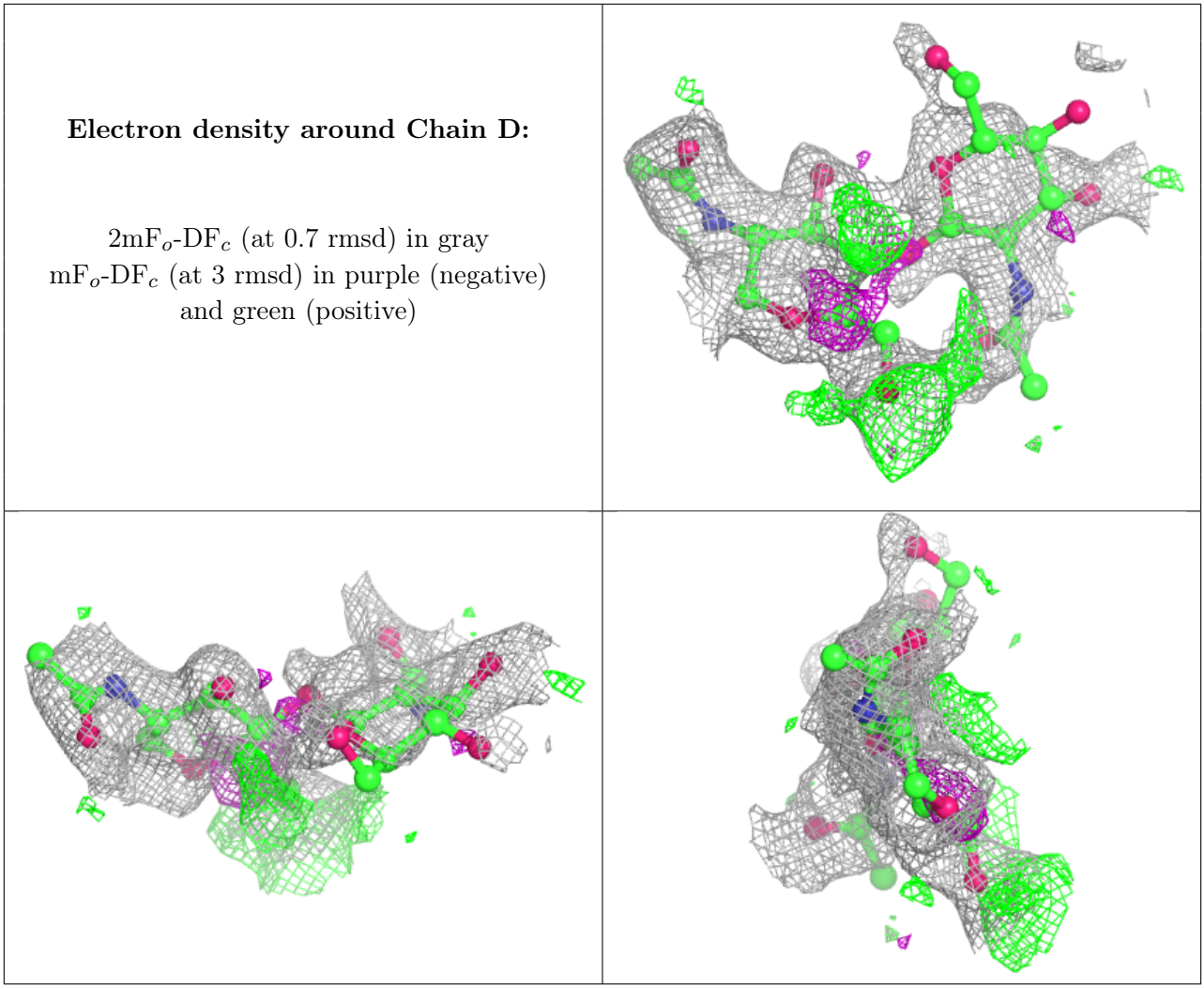






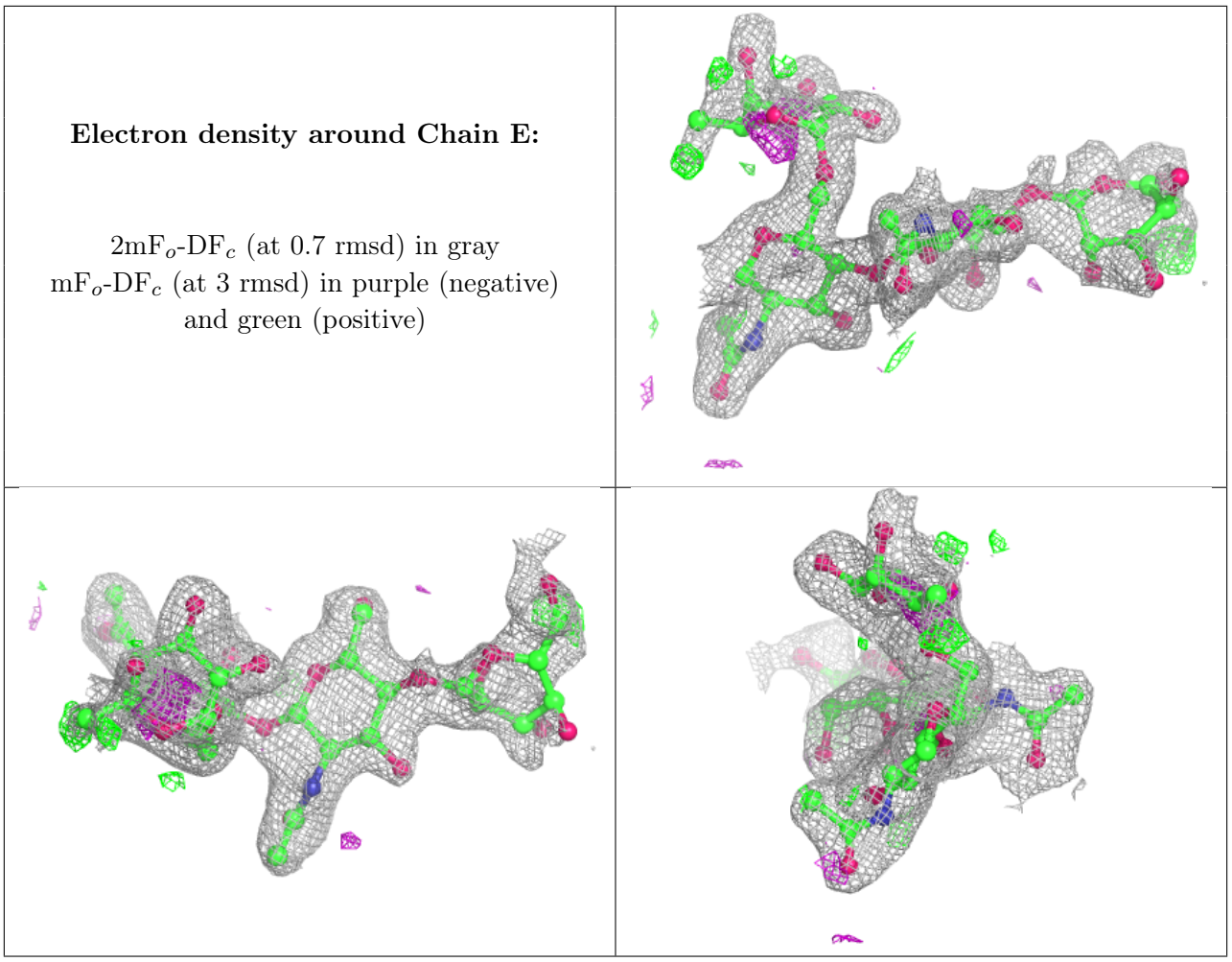
Electron density around Chain D:

$2mF_o$-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

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, 95^{th} 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.

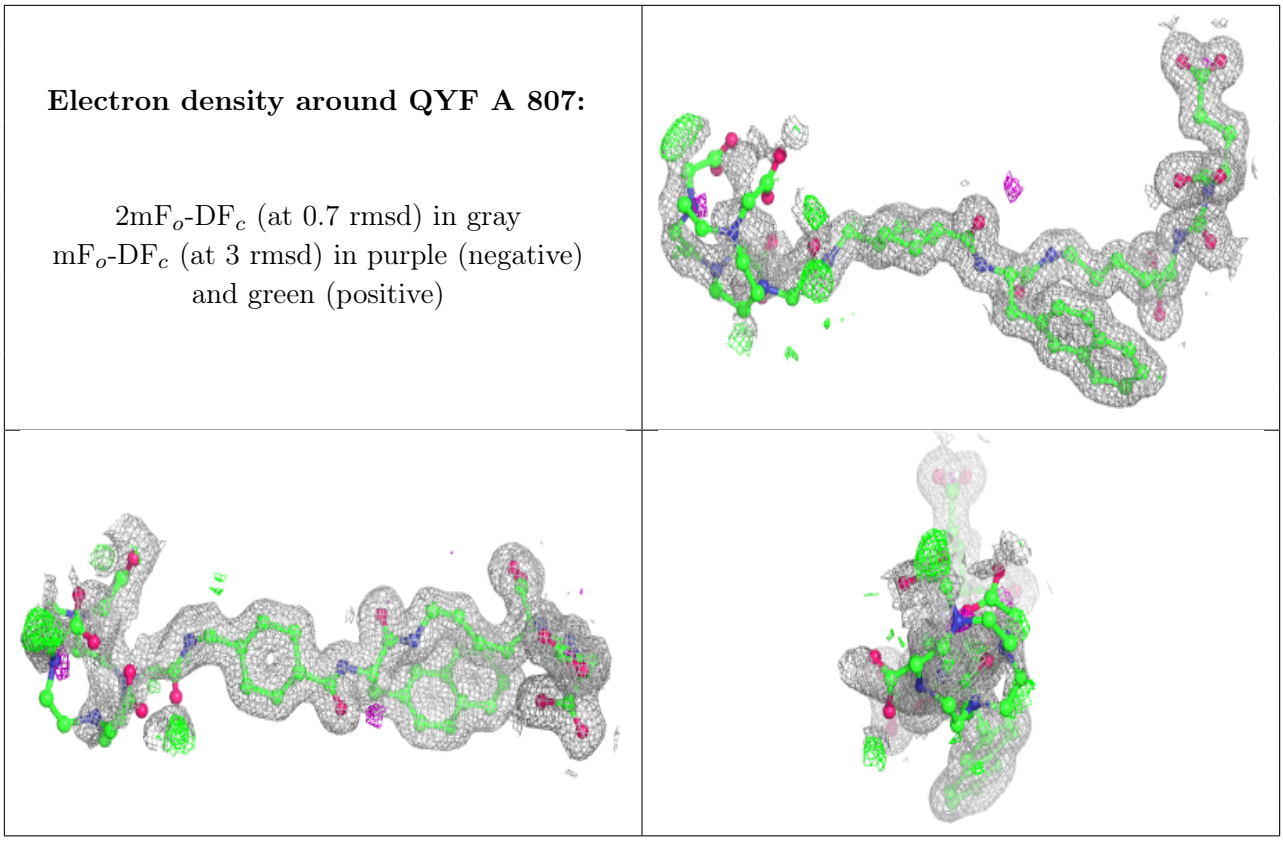
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
9	NAG	A	805	14/15	0.80	0.22	62,67,71,74	0
9	NAG	A	806	14/15	0.86	0.15	29,48,65,68	0
10	QYF	A	807	74/74	0.94	0.15	14,19,115,118	0
8	CL	A	804	1/1	0.99	0.10	19,19,19,19	0
6	ZN	A	802	1/1	1.00	0.04	16,16,16,16	0
7	CA	A	803	1/1	1.00	0.07	15,15,15,15	0
6	ZN	A	801	1/1	1.00	0.07	15,15,15,15	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 QYF A 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

There are no such residues in this entry.