



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 01:37 AM UTC

PDB ID : 6T9P / pdb_00006t9p
Title : Human Butyrylcholinesterase in complex with 2-(N-hydroxyimino)-N-[(1R)-3-{4-[(2-methyl-1H-imidazol-1-yl)methyl]-1H-1,2,3-triazol-1-yl}-1-phenylpropyl]acetamide
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Deposited on : 2019-10-28
Resolution : 2.70 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

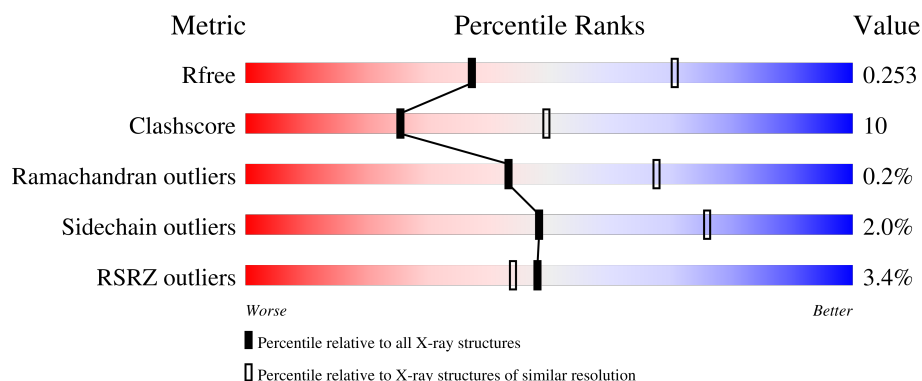
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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

Mol	Chain	Length	Quality of chain
1	A	529	3% 76% 22% ..
2	B	2	100%
2	C	2	100%
3	D	3	67% 33%

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 4438 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 Cholinesterase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	526	4211	2718	709	769	15	0	2	0

There are 4 discrepancies between the modelled and reference sequences:

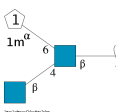
Chain	Residue	Modelled	Actual	Comment	Reference
A	17	GLN	ASN	engineered mutation	UNP P06276
A	455	GLN	ASN	engineered mutation	UNP P06276
A	481	GLN	ASN	engineered mutation	UNP P06276
A	486	GLN	ASN	engineered mutation	UNP P06276

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	B	2	24	14	1	9	0	0	0
2	C	2	24	14	1	9	0	0	0

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



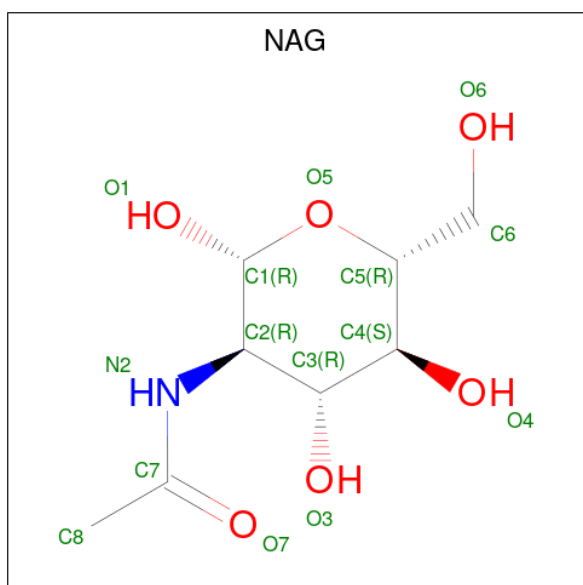
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	D	3	Total	C	N	O	0	0	0
			38	22	2	14			

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



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

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



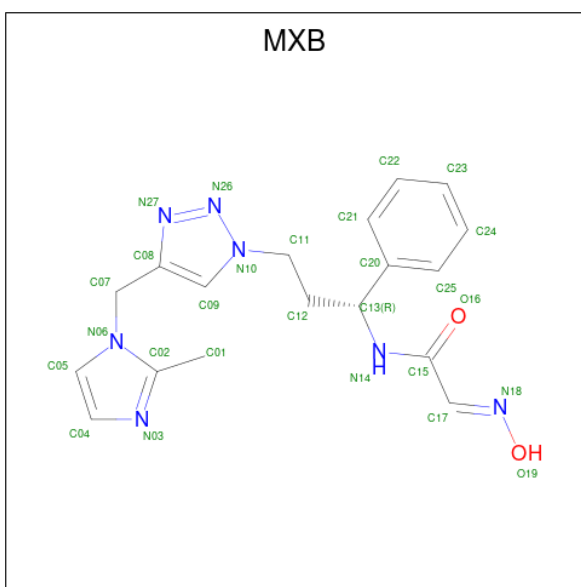
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			14	8	1	5		
5	A	1	Total	C	N	O	0	0
			14	8	1	5		
5	A	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 6 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

- Molecule 7 is (R,E)-2-(hydroxyimino)-N-(3-(4-((2-methyl-1H-imidazol-1-yl)methyl)-1H-1,2,3-triazol-1-yl)-1-phenylpropyl)acetamide (CCD ID: MXB) (formula: C₁₈H₂₁N₇O₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	A	1	Total	C	N	O	0	0
			27	18	7	2		

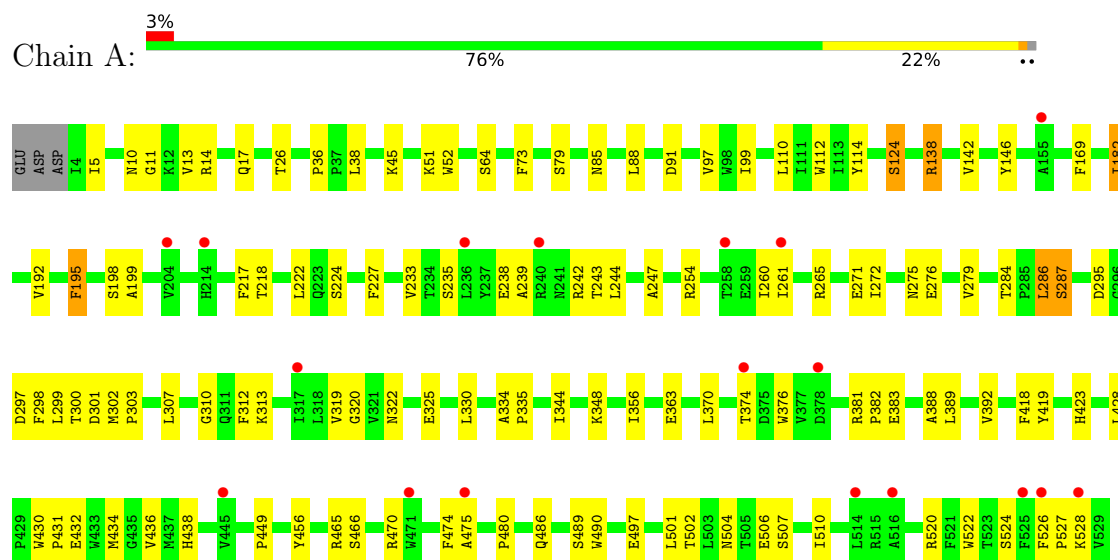
- Molecule 8 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	56	Total O 56 56	0	0

3 Residue-property plots

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

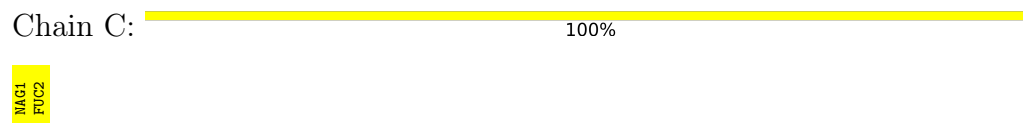
- Molecule 1: Cholinesterase



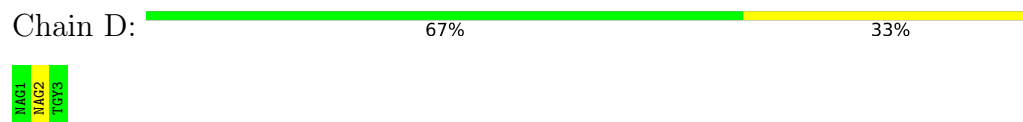
- Molecule 2: alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 2: alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose



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



4 Data and refinement statistics

Property	Value	Source
Space group	I 4 2 2	Depositor
Cell constants a, b, c, α , β , γ	154.14Å 154.14Å 127.52Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	41.43 – 2.70 41.43 – 2.70	Depositor EDS
% Data completeness (in resolution range)	99.9 (41.43-2.70) 99.9 (41.43-2.70)	Depositor EDS
R_{merge}	0.19	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.43 (at 2.69Å)	Xtriage
Refinement program	PHENIX 1.19.1_4122	Depositor
R, R_{free}	0.210 , 0.252 0.208 , 0.253	Depositor DCC
R_{free} test set	1069 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	73.0	Xtriage
Anisotropy	0.434	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 47.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	4438	wwPDB-VP
Average B, all atoms (Å ²)	71.0	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.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: TGY, NAG, GOL, SO4, FUC, MXB

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	0.41	0/4334	0.61	0/5883

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	138	ARG	Sidechain

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	4211	0	4111	83	1
2	B	24	0	22	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	24	0	22	0	0
3	D	38	0	24	0	0
4	A	6	0	8	1	0
5	A	42	0	39	0	0
6	A	10	0	0	0	0
7	A	27	0	0	0	0
8	A	56	0	0	2	0
All	All	4438	0	4226	83	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 10.

All (83) 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:348:LYS:HD2	1:A:348:LYS:H	1.44	0.83
1:A:51:LYS:HD3	1:A:51:LYS:H	1.53	0.73
1:A:242:ARG:HH22	4:A:601:GOL:H2	1.56	0.69
1:A:227:PHE:HZ	1:A:307:LEU:HB2	1.61	0.65
1:A:474:PHE:HB2	1:A:480:PRO:HB3	1.80	0.63
1:A:26:THR:HB	1:A:99:ILE:HG12	1.79	0.63
1:A:244:LEU:HD22	1:A:247:ALA:HB3	1.83	0.61
1:A:85:ASN:OD1	1:A:124:SER:HB2	2.01	0.60
1:A:198:SER:HA	1:A:224:SER:O	2.00	0.60
1:A:271:GLU:O	1:A:275:ASN:ND2	2.35	0.59
1:A:36:PRO:HB2	1:A:38:LEU:HD12	1.88	0.56
1:A:370:LEU:O	1:A:374:THR:OG1	2.17	0.56
1:A:319:VAL:O	1:A:418:PHE:HA	2.06	0.56
1:A:431:PRO:HG2	1:A:434:MET:HG3	1.87	0.55
1:A:5:ILE:HD11	1:A:14:ARG:NH1	2.23	0.54
1:A:520:ARG:O	1:A:524:SER:OG	2.14	0.54
1:A:522:TRP:O	1:A:527:PRO:HD3	2.08	0.53
1:A:10:ASN:N	1:A:10:ASN:OD1	2.42	0.52
1:A:192:VAL:H	1:A:218:THR:HG23	1.75	0.52
1:A:419:TYR:HB3	1:A:490:TRP:CH2	2.45	0.52
1:A:45:LYS:NZ	1:A:297:ASP:OD2	2.31	0.52
1:A:227:PHE:CZ	1:A:307:LEU:HB2	2.44	0.51
1:A:110:LEU:HD11	1:A:475:ALA:HB1	1.92	0.51
1:A:222:LEU:HD13	1:A:319:VAL:HG22	1.92	0.51
1:A:17:GLN:HE21	1:A:17:GLN:HA	1.76	0.51
1:A:217:PHE:O	1:A:313:LYS:HE3	2.11	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:97:VAL:HG22	1:A:142:VAL:HG22	1.91	0.50
1:A:242:ARG:HG2	1:A:279:VAL:HG12	1.93	0.50
1:A:344:ILE:HG23	1:A:382:PRO:O	2.12	0.49
1:A:284:THR:O	1:A:287:SER:HB2	2.13	0.48
1:A:11:GLY:HA3	1:A:52:TRP:CE2	2.49	0.48
1:A:428:LEU:HD23	1:A:430:TRP:H	1.78	0.48
1:A:335:PRO:HD3	1:A:356:ILE:HD12	1.95	0.48
1:A:430:TRP:HB3	1:A:431:PRO:HD2	1.94	0.48
1:A:299:LEU:HA	1:A:299:LEU:HD12	1.53	0.48
1:A:235:SER:OG	1:A:238:GLU:HG2	2.13	0.47
1:A:110:LEU:HD11	1:A:475:ALA:CB	2.44	0.47
1:A:310:GLY:HA2	1:A:312:PHE:CE2	2.48	0.47
1:A:423:HIS:O	1:A:436:VAL:HG13	2.15	0.47
1:A:320:GLY:HA3	1:A:419:TYR:CE2	2.50	0.47
1:A:430:TRP:HB3	1:A:434:MET:HE2	1.96	0.47
1:A:524:SER:O	1:A:528:LYS:HE3	2.15	0.47
1:A:348:LYS:H	1:A:348:LYS:CD	2.18	0.46
1:A:504:ASN:ND2	1:A:507:SER:O	2.46	0.46
1:A:51:LYS:H	1:A:51:LYS:CD	2.23	0.46
1:A:497:GLU:HG3	8:A:721:HOH:O	2.16	0.45
1:A:261:ILE:O	1:A:265:ARG:HG3	2.16	0.45
1:A:330:LEU:HD22	1:A:389:LEU:HD23	1.97	0.45
1:A:272:ILE:O	1:A:276:GLU:HG3	2.16	0.45
1:A:449:PRO:HA	1:A:456:TYR:CD2	2.52	0.45
1:A:295:ASP:OD2	1:A:297:ASP:HB3	2.18	0.44
1:A:528:LYS:NZ	8:A:707:HOH:O	2.49	0.44
1:A:198:SER:OG	1:A:199:ALA:N	2.51	0.44
1:A:38:LEU:HD11	1:A:91:ASP:HB2	2.00	0.43
1:A:301:ASP:OD1	1:A:302:MET:N	2.42	0.43
1:A:330:LEU:O	1:A:334:ALA:HB3	2.18	0.43
1:A:275:ASN:O	1:A:279:VAL:HG23	2.18	0.43
1:A:169:PHE:CZ	1:A:298:PHE:HB2	2.53	0.43
1:A:112:TRP:HA	1:A:195:PHE:O	2.19	0.43
1:A:466:SER:O	1:A:470:ARG:HG3	2.18	0.43
1:A:465:ARG:HA	1:A:465:ARG:HD2	1.63	0.43
1:A:73:PHE:HB2	1:A:79:SER:OG	2.18	0.42
1:A:374:THR:HG22	1:A:376:TRP:CH2	2.54	0.42
1:A:381:ARG:NH2	1:A:383:GLU:OE1	2.43	0.42
1:A:138:ARG:O	1:A:138:ARG:HG3	2.20	0.42
1:A:284:THR:H	1:A:287:SER:HB2	1.84	0.42
1:A:284:THR:HG22	1:A:286:LEU:H	1.85	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:419:TYR:HB3	1:A:490:TRP:CZ2	2.54	0.42
1:A:233:VAL:HG21	1:A:303:PRO:HG3	2.02	0.42
1:A:239:ALA:O	1:A:243:THR:HG23	2.19	0.42
1:A:114:TYR:CE1	1:A:146:TYR:CE1	3.08	0.41
1:A:388:ALA:O	1:A:392:VAL:HG23	2.20	0.41
1:A:325:GLU:O	1:A:438:HIS:HB2	2.21	0.41
1:A:501:LEU:HD12	1:A:502:THR:N	2.35	0.41
1:A:64:SER:O	1:A:88:LEU:HA	2.20	0.41
1:A:497:GLU:H	1:A:497:GLU:HG2	1.65	0.41
1:A:182:ILE:HD12	1:A:182:ILE:HA	1.80	0.41
1:A:227:PHE:CD1	1:A:227:PHE:C	2.99	0.41
1:A:254:ARG:HB2	1:A:260:ILE:HG13	2.03	0.41
1:A:489:SER:O	1:A:510:ILE:HD11	2.21	0.40
1:A:526:PHE:H	1:A:527:PRO:HD2	1.87	0.40
1:A:325:GLU:OE1	1:A:438:HIS:HD2	2.04	0.40
1:A:322:ASN:O	1:A:325:GLU:HG2	2.21	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)
1:A:138:ARG:NH2	1:A:300:THR:O[4_575]	2.02	0.18

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	526/529 (99%)	489 (93%)	36 (7%)	1 (0%)	43 68

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	506	GLU

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	453/454 (100%)	444 (98%)	9 (2%)	48 76

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	VAL
1	A	124	SER
1	A	182	ILE
1	A	195	PHE
1	A	286	LEU
1	A	287	SER
1	A	363	GLU
1	A	432	GLU
1	A	486	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	17	GLN
1	A	35	GLN
1	A	159	ASN
1	A	266	ASN
1	A	438	HIS

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

7 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	0.57	0	17,19,21	0.44	0
2	FUC	B	2	2	10,10,11	0.82	0	14,14,16	0.77	0
2	NAG	C	1	1,2	14,14,15	0.59	0	17,19,21	0.73	1 (5%)
2	FUC	C	2	2	10,10,11	1.34	1 (10%)	14,14,16	1.09	1 (7%)
3	NAG	D	1	1,3	14,14,15	0.29	0	17,19,21	0.54	0
3	NAG	D	2	3	14,14,15	0.43	0	17,19,21	0.71	1 (5%)
3	TGY	D	3	3	10,10,11	0.73	0	14,14,17	0.90	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
2	NAG	B	1	1,2	-	2/6/23/26	0/1/1/1
2	FUC	B	2	2	-	-	0/1/1/1
2	NAG	C	1	1,2	-	2/6/23/26	0/1/1/1
2	FUC	C	2	2	-	-	0/1/1/1
3	NAG	D	1	1,3	-	2/6/23/26	0/1/1/1
3	NAG	D	2	3	-	2/6/23/26	0/1/1/1
3	TGY	D	3	3	-	-	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	2	FUC	C2-C3	2.70	1.56	1.52

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	2	FUC	O5-C5-C4	2.36	113.81	109.55
3	D	2	NAG	C1-O5-C5	2.12	115.03	112.19
2	C	1	NAG	C1-O5-C5	2.02	114.89	112.19

There are no chirality outliers.

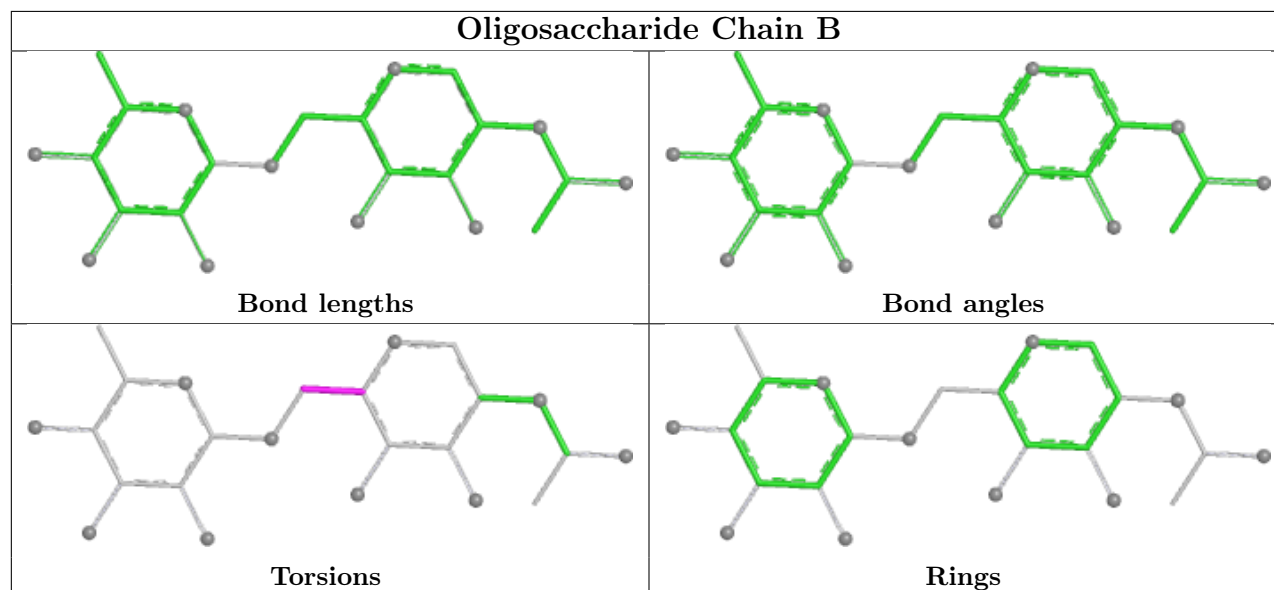
All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	D	1	NAG	O5-C5-C6-O6
3	D	1	NAG	C4-C5-C6-O6
2	C	1	NAG	C1-C2-N2-C7
2	B	1	NAG	C4-C5-C6-O6
2	B	1	NAG	O5-C5-C6-O6
3	D	2	NAG	C4-C5-C6-O6
3	D	2	NAG	O5-C5-C6-O6
2	C	1	NAG	C3-C2-N2-C7

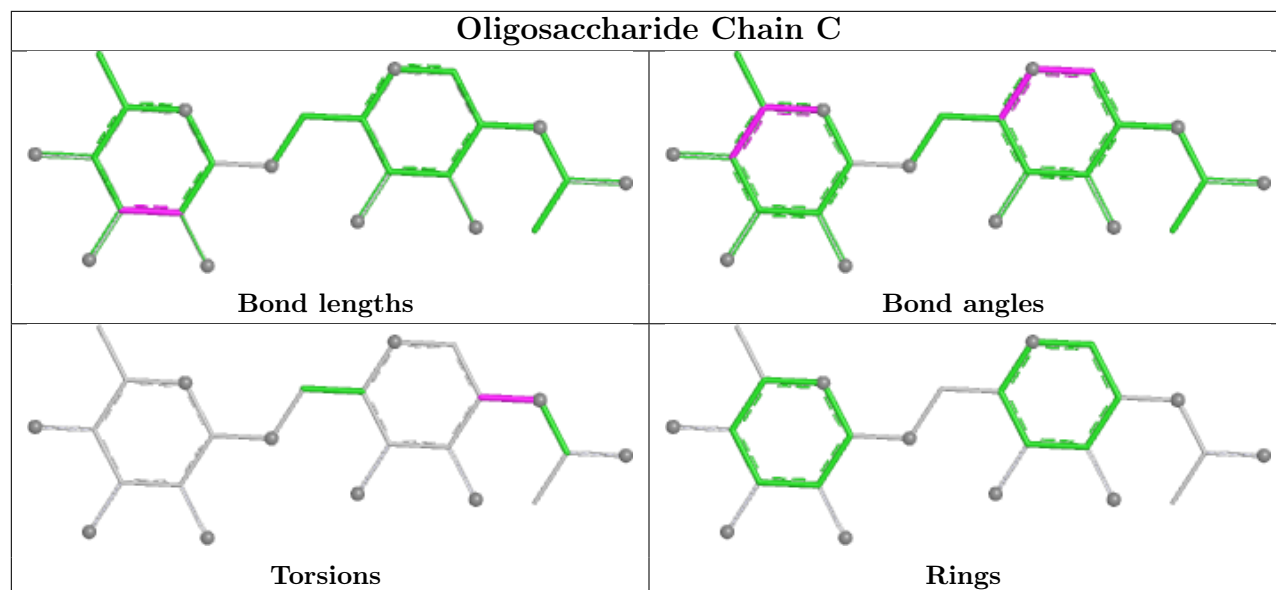
There are no ring outliers.

No monomer is involved in short contacts.

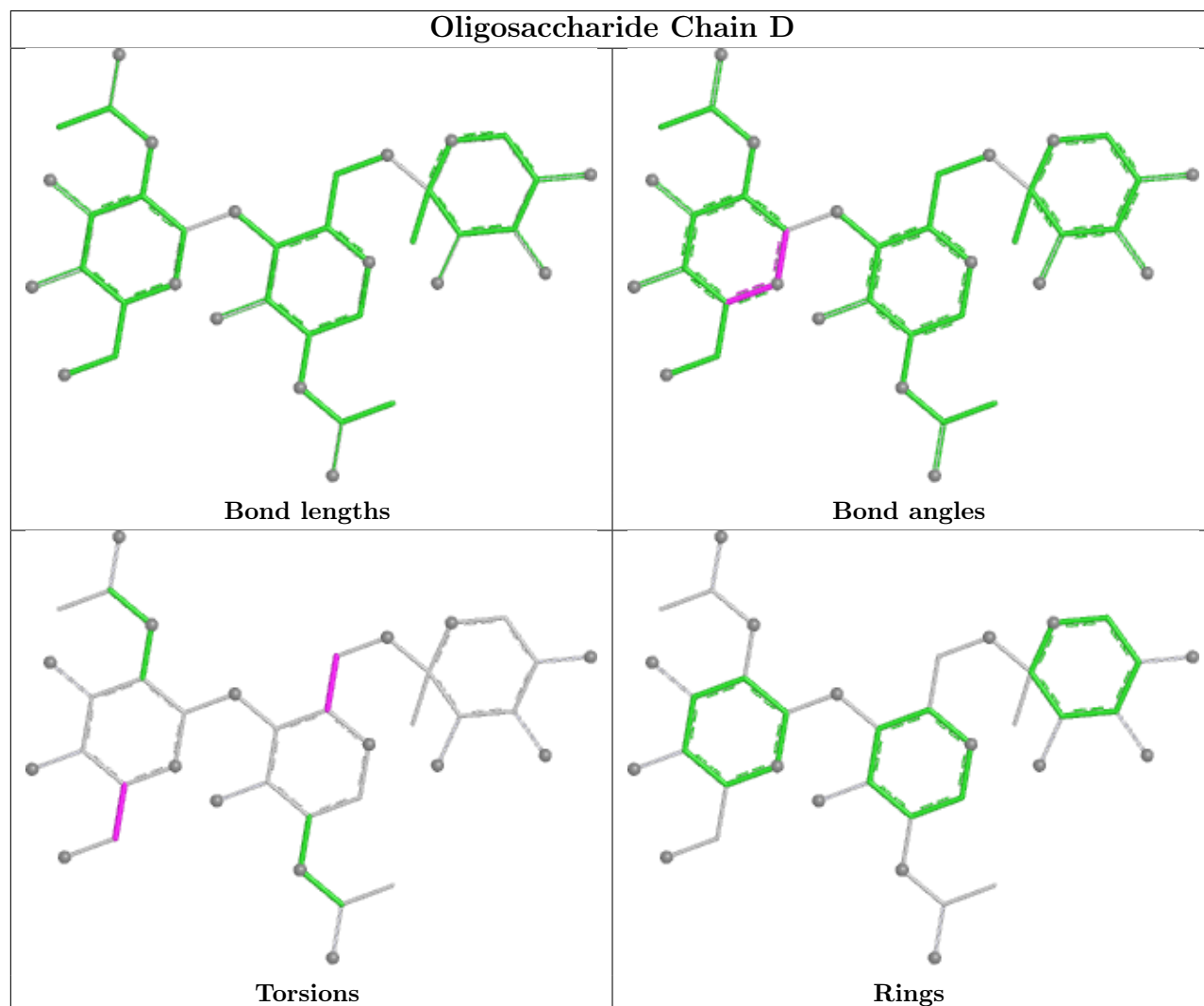
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.



Oligosaccharide Chain C



Oligosaccharide Chain D



5.6 Ligand geometry

7 ligands 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
5	NAG	A	604	1	14,14,15	0.65	0	17,19,21	0.72	1 (5%)
4	GOL	A	601	-	5,5,5	1.21	0	5,5,5	0.66	0
7	MXB	A	607	-	28,29,29	3.54	16 (57%)	30,38,38	1.80	9 (30%)
5	NAG	A	603	1	14,14,15	0.50	0	17,19,21	0.45	0
6	SO4	A	606	-	4,4,4	0.27	0	6,6,6	0.27	0
5	NAG	A	602	1	14,14,15	0.90	1 (7%)	17,19,21	0.54	0
6	SO4	A	605	-	4,4,4	0.28	0	6,6,6	0.09	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
5	NAG	A	604	1	-	0/6/23/26	0/1/1/1
7	MXB	A	607	-	-	8/20/20/20	0/3/3/3
4	GOL	A	601	-	-	0/4/4/4	-
5	NAG	A	603	1	-	1/6/23/26	0/1/1/1
5	NAG	A	602	1	-	2/6/23/26	0/1/1/1

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	607	MXB	C12-C13	8.32	1.63	1.53
7	A	607	MXB	C17-N18	8.11	1.37	1.27
7	A	607	MXB	C13-N14	6.20	1.54	1.46
7	A	607	MXB	C09-N10	5.88	1.44	1.34
7	A	607	MXB	C20-C13	5.47	1.59	1.52
7	A	607	MXB	C08-N27	4.34	1.43	1.36
7	A	607	MXB	C11-N10	3.33	1.55	1.47

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	607	MXB	C07-C08	3.05	1.54	1.50
7	A	607	MXB	C09-C08	3.05	1.41	1.36
7	A	607	MXB	C02-N06	3.01	1.42	1.36
7	A	607	MXB	C15-N14	2.87	1.40	1.34
5	A	602	NAG	O5-C1	2.82	1.48	1.43
7	A	607	MXB	N10-N26	2.36	1.38	1.34
7	A	607	MXB	C04-N03	2.29	1.42	1.38
7	A	607	MXB	C05-N06	2.28	1.43	1.38
7	A	607	MXB	C21-C20	2.18	1.42	1.39
7	A	607	MXB	C25-C20	2.08	1.42	1.39

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	607	MXB	O19-N18-C17	3.63	118.52	111.29
7	A	607	MXB	C09-N10-N26	-3.45	107.39	110.75
7	A	607	MXB	O16-C15-N14	-3.36	118.06	122.44
7	A	607	MXB	N10-N26-N27	3.21	109.91	107.02
7	A	607	MXB	C13-N14-C15	2.76	125.78	122.08
7	A	607	MXB	C09-C08-N27	-2.39	105.22	108.12
7	A	607	MXB	C25-C20-C21	-2.33	115.42	118.30
7	A	607	MXB	C20-C13-N14	2.28	115.96	112.07
5	A	604	NAG	C1-O5-C5	2.27	115.23	112.19
7	A	607	MXB	C08-N27-N26	2.09	111.26	109.01

There are no chirality outliers.

All (11) torsion outliers are listed below:

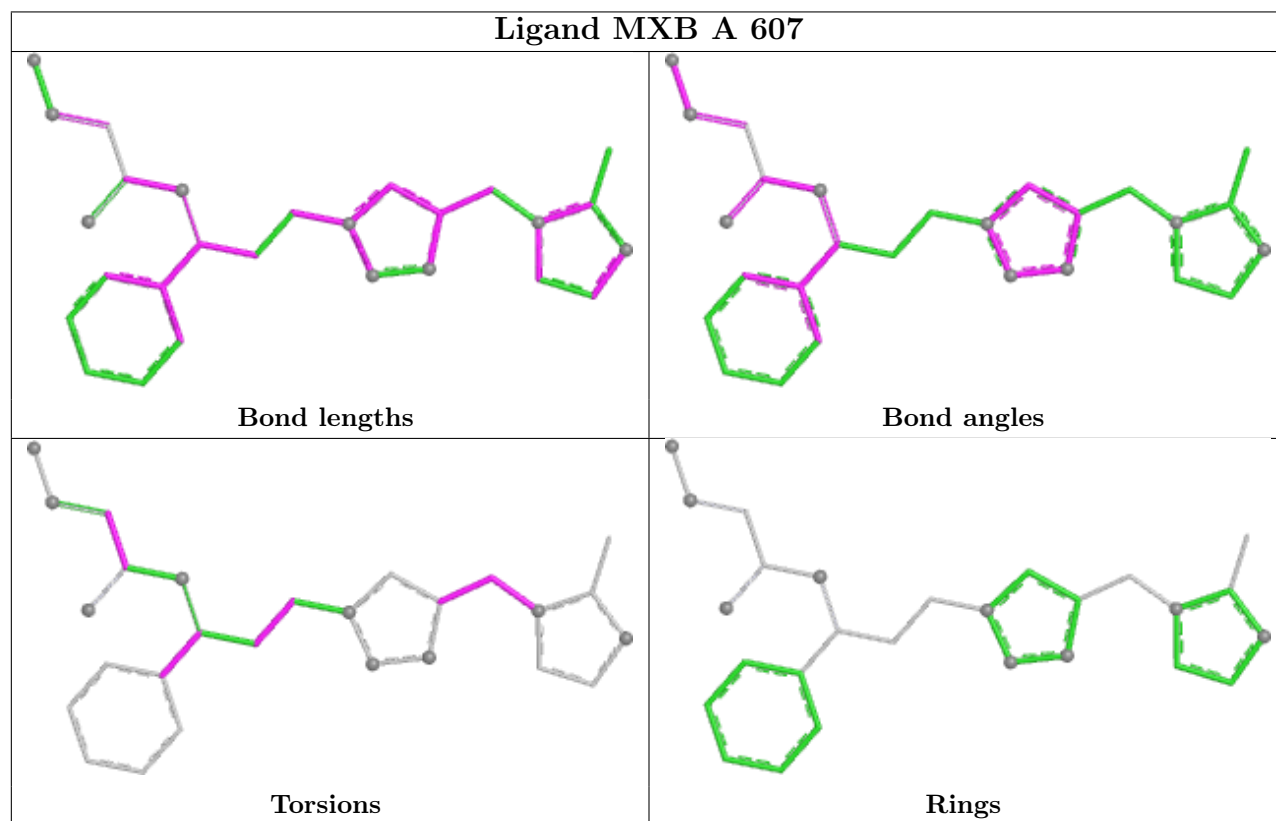
Mol	Chain	Res	Type	Atoms
7	A	607	MXB	N10-C11-C12-C13
7	A	607	MXB	N14-C15-C17-N18
7	A	607	MXB	O16-C15-C17-N18
5	A	602	NAG	O5-C5-C6-O6
7	A	607	MXB	C12-C13-C20-C21
7	A	607	MXB	C12-C13-C20-C25
7	A	607	MXB	N06-C07-C08-N27
7	A	607	MXB	N06-C07-C08-C09
5	A	602	NAG	C4-C5-C6-O6
5	A	603	NAG	C4-C5-C6-O6
7	A	607	MXB	C08-C07-N06-C05

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	601	GOL	1	0

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



5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	526/529 (99%)	0.53	18 (3%) 48 44	29, 64, 103, 172	2 (0%)

All (18) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	374	THR	3.4
1	A	525	PHE	3.3
1	A	471	TRP	3.0
1	A	445	VAL	2.9
1	A	204	VAL	2.8
1	A	258	THR	2.7
1	A	317	ILE	2.6
1	A	261	ILE	2.6
1	A	514	LEU	2.5
1	A	378	ASP	2.5
1	A	475	ALA	2.4
1	A	236	LEU	2.3
1	A	155	ALA	2.3
1	A	528	LYS	2.2
1	A	240	ARG	2.2
1	A	214[A]	HIS	2.1
1	A	526	PHE	2.1
1	A	516	ALA	2.0

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

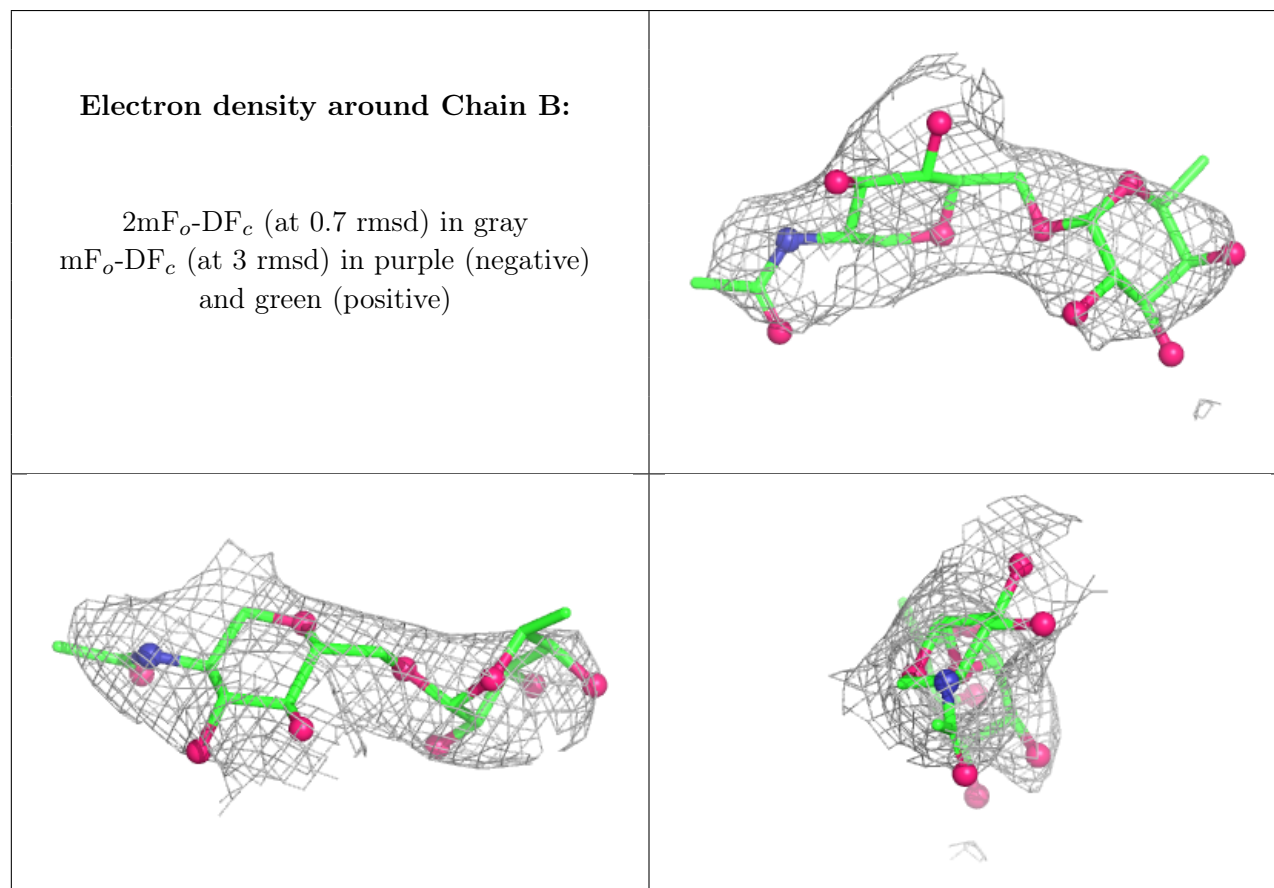
There are no non-standard protein/DNA/RNA residues in this entry.

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.

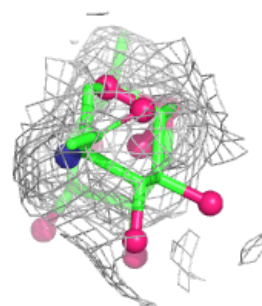
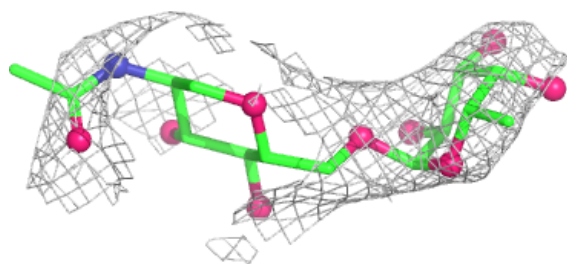
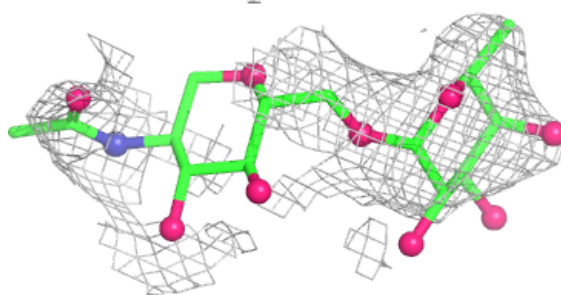
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	NAG	C	1	14/15	0.57	0.12	124,131,133,134	0
2	FUC	C	2	10/11	0.59	0.14	121,133,145,146	0
3	TGY	D	3	10/11	0.60	0.19	126,146,153,154	0
2	FUC	B	2	10/11	0.68	0.10	152,159,167,168	0
2	NAG	B	1	14/15	0.70	0.10	108,124,133,141	0
3	NAG	D	2	14/15	0.76	0.11	102,117,133,137	0
3	NAG	D	1	14/15	0.89	0.09	83,92,108,119	0

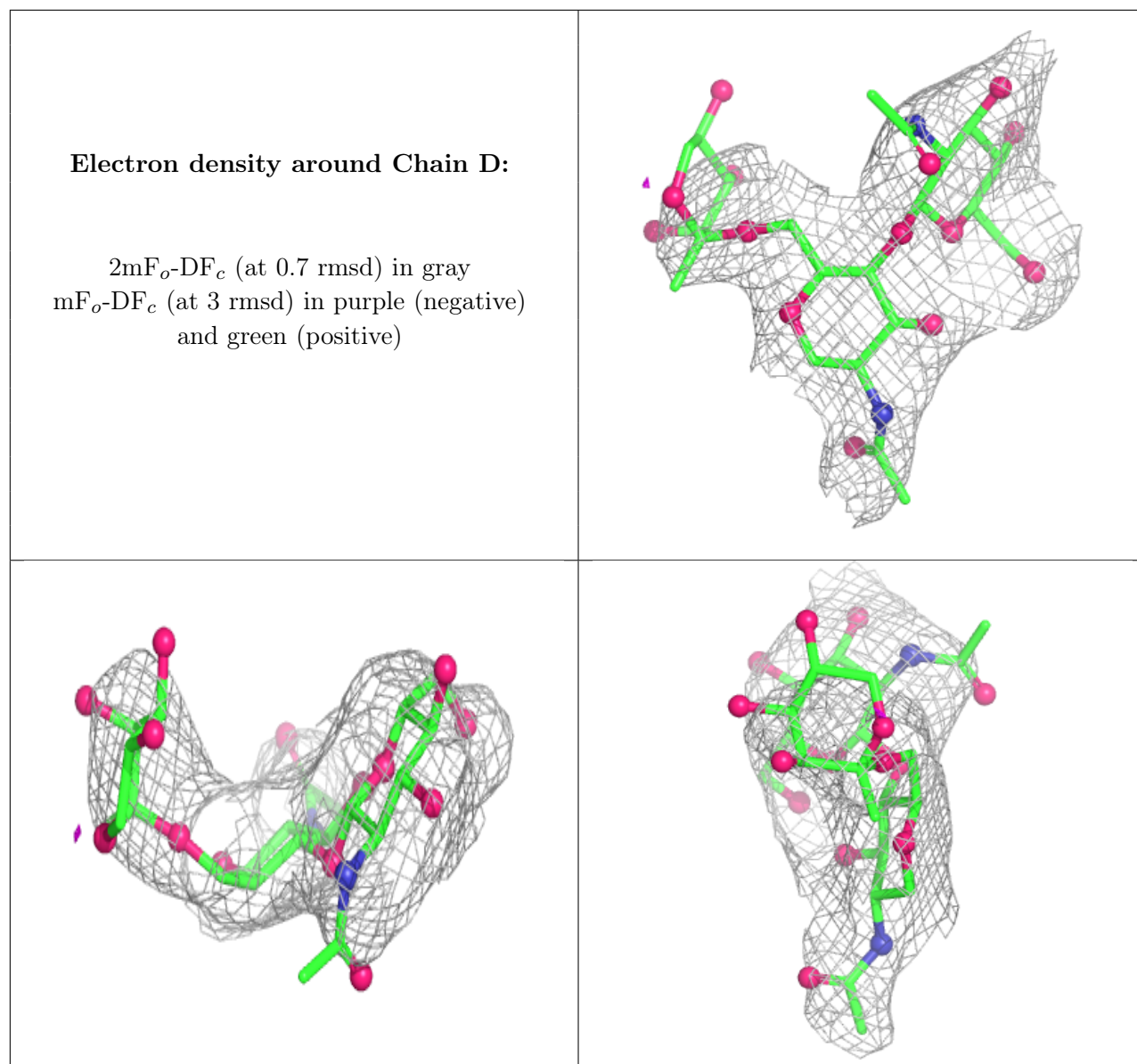
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.



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)





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.

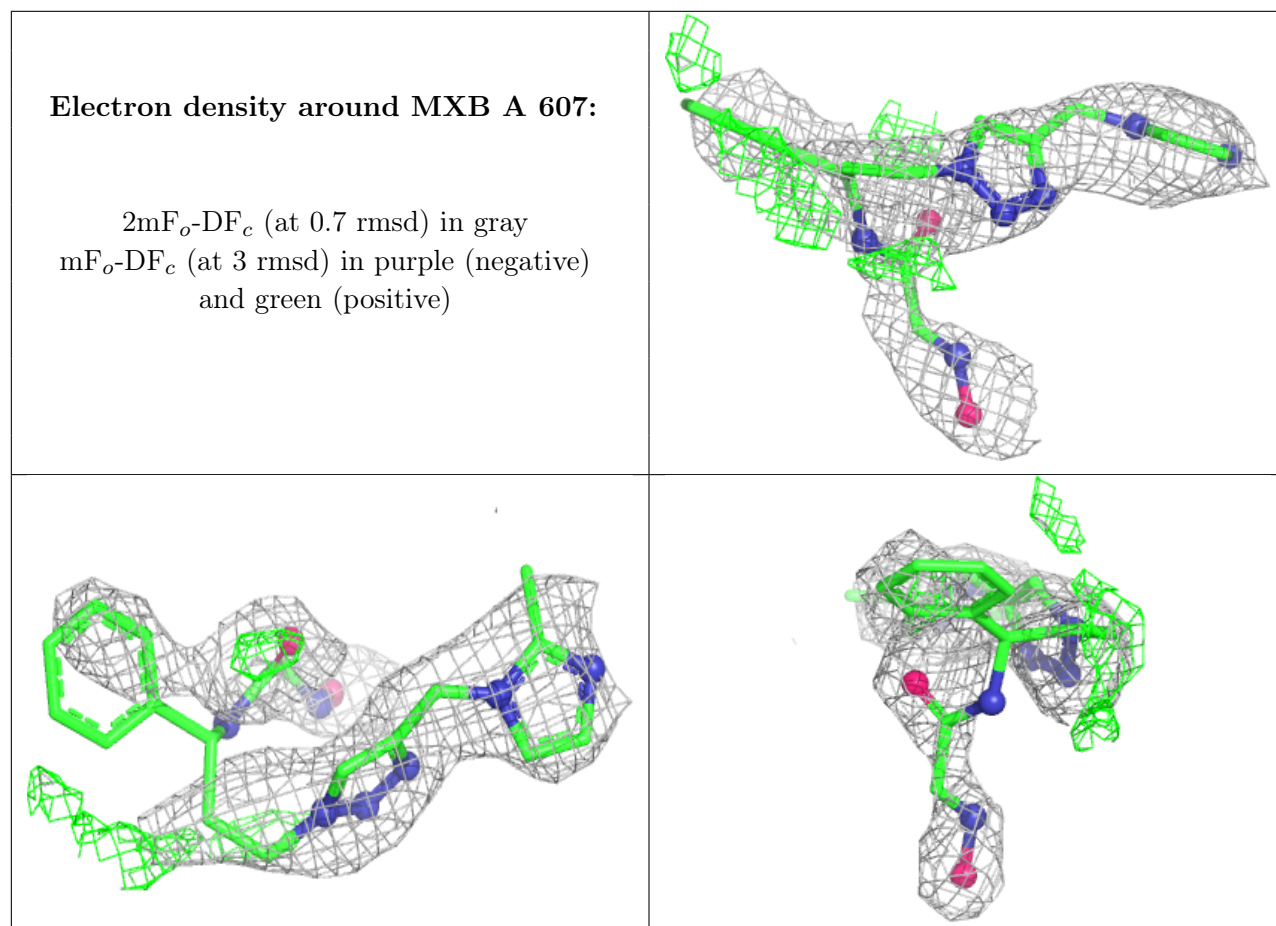
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	NAG	A	603	14/15	0.34	0.14	143,150,159,162	0
6	SO4	A	605	5/5	0.44	0.10	101,112,121,136	0
6	SO4	A	606	5/5	0.64	0.29	86,92,109,117	0
5	NAG	A	602	14/15	0.69	0.12	88,99,105,114	0
5	NAG	A	604	14/15	0.69	0.14	79,105,115,117	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	GOL	A	601	6/6	0.75	0.16	83,88,94,104	0
7	MXB	A	607	27/27	0.77	0.20	70,85,94,97	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.



6.5 Other polymers [i](#)

There are no such residues in this entry.