Full wwPDB EM Validation Report ⓘ

Jul 9, 2025 – 01:34 PM JST

PDB ID	:	8ZUF / pdb_00008zuf
EMDB ID	:	EMD-60483
Title	:	Cryo-EM structure of P.nat ACE2 mutant in complex with MOW15-22 RBD
Authors	:	Tang, J.; Deng, Z.
Deposited on	:	2024-06-09
Resolution	:	3.31 Å(reported)

This is a Full wwPDB EM 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/EMValidationReportHelp
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:

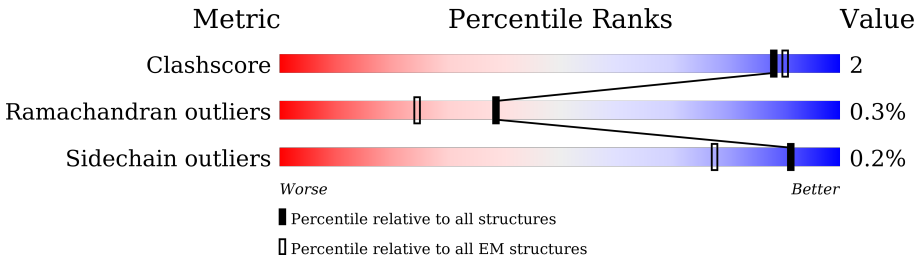
EMDB validation analysis	:	FAILED
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0rc1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.44

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.31 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)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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%

Mol	Chain	Length	Quality of chain
1	A	782	70% 5% 25%
2	B	213	78% 8% 13%
3	C	3	100%
3	H	3	67% 33%
4	D	2	100%
4	E	2	100%
4	F	2	100%
4	G	2	100%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 5745 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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.

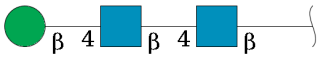
- Molecule 1 is a protein called Angiotensin-converting enzyme.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	585	4327	2826	758	716	27	0	0

- Molecule 2 is a protein called MOW15-22 RBD.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	185	1171	736	215	214	6	0	0

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



Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
3	C	3	39	22	2	15	0	0
3	H	3	39	22	2	15	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				AltConf	Trace
			Total	C	N	O		
4	D	2	28	16	2	10	0	0

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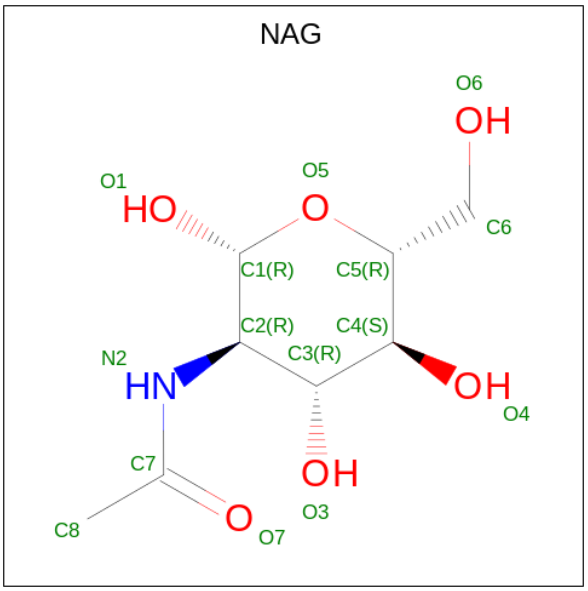
Mol	Chain	Residues	Atoms	AltConf	Trace
4	E	2	Total C N O 28 16 2 10	0	0
4	F	2	Total C N O 28 16 2 10	0	0
4	G	2	Total C N O 28 16 2 10	0	0

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 6 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

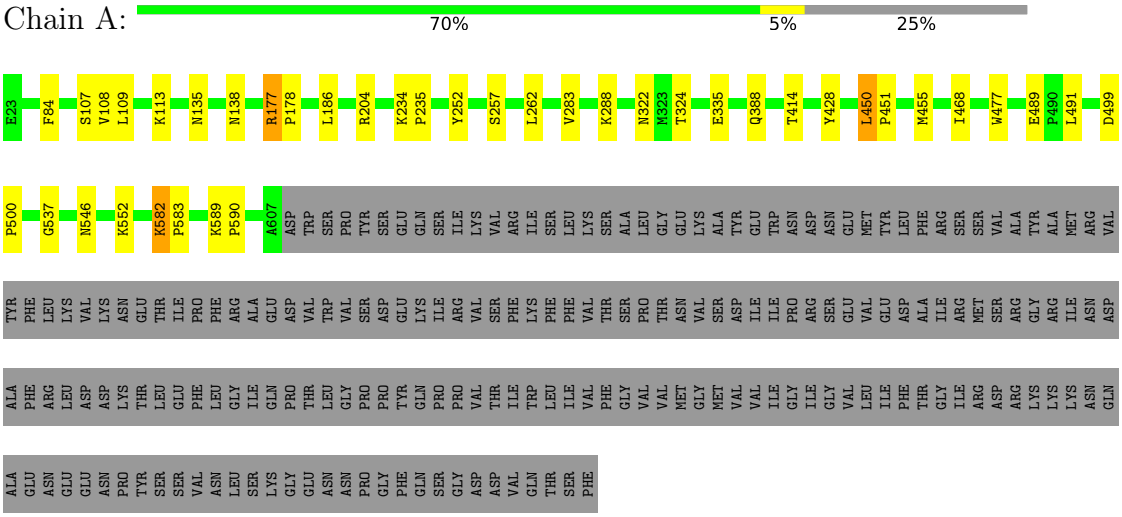
Mol	Chain	Residues	Atoms	AltConf
6	A	1	Total Zn 1 1	0

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. 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. 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.

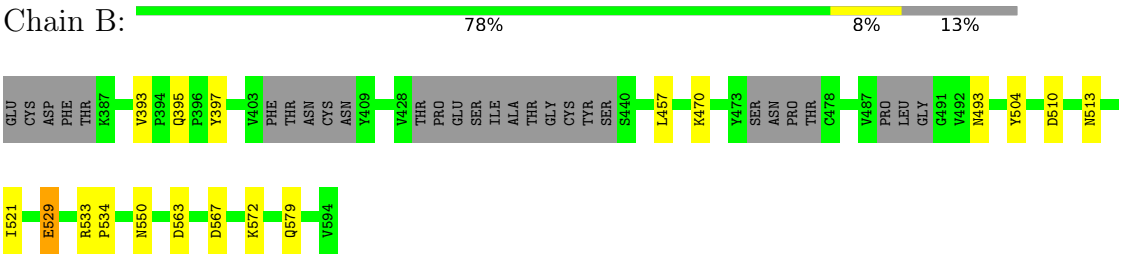
• Molecule 1: Angiotensin-converting enzyme

Chain A:



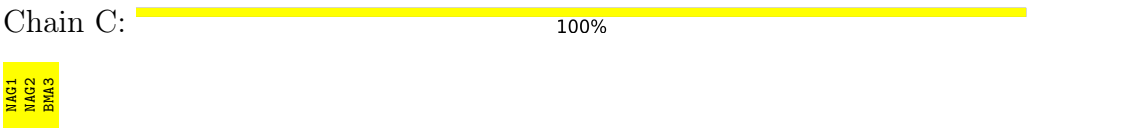
• Molecule 2: MOW15-22 RBD

Chain B:



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

Chain C:

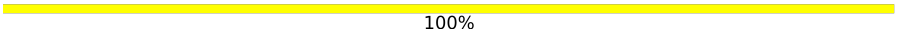


• Molecule 3: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain H:

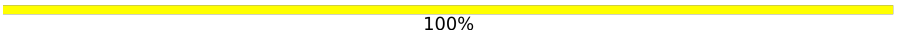
• Molecule 4: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain D:



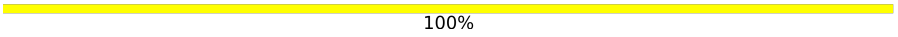
• Molecule 4: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E:



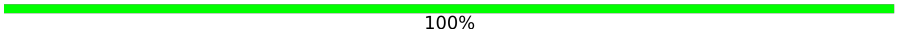
• Molecule 4: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain F:



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

Chain G:



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	244733	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING ONLY	Depositor
Microscope	JEOL CRYO ARM 300	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	40	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: BMA, NAG, 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	0.58	0/4457	0.90	39/6093 (0.6%)
2	B	0.60	0/1198	1.17	23/1647 (1.4%)
All	All	0.59	0/5655	0.96	62/7740 (0.8%)

There are no bond length outliers.

All (62) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	513	ASN	CA-C-N	7.73	127.45	119.56
2	B	513	ASN	C-N-CA	7.73	127.45	119.56
1	A	283	VAL	CA-C-N	7.38	126.91	119.24
1	A	283	VAL	C-N-CA	7.38	126.91	119.24
1	A	257	SER	CA-C-N	7.26	126.97	119.56
1	A	257	SER	C-N-CA	7.26	126.97	119.56
1	A	537	GLY	CA-C-N	6.89	126.86	119.76
1	A	537	GLY	C-N-CA	6.89	126.86	119.76
2	B	521	ILE	CA-C-N	6.65	127.19	119.47
2	B	521	ILE	C-N-CA	6.65	127.19	119.47
1	A	468	ILE	CA-C-N	6.59	126.55	120.03
1	A	468	ILE	C-N-CA	6.59	126.55	120.03
1	A	252	TYR	CA-C-N	6.58	126.53	119.76
1	A	252	TYR	C-N-CA	6.58	126.53	119.76
1	A	428	TYR	CA-C-N	6.58	126.49	119.85
1	A	428	TYR	C-N-CA	6.58	126.49	119.85
2	B	395	GLN	CA-C-N	6.58	127.10	119.47
2	B	395	GLN	C-N-CA	6.58	127.10	119.47
2	B	579	GLN	CA-C-N	6.54	126.50	120.03
2	B	579	GLN	C-N-CA	6.54	126.50	120.03
2	B	393	VAL	CA-C-N	6.46	126.42	120.03
2	B	393	VAL	C-N-CA	6.46	126.42	120.03

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	388	GLN	CA-C-N	6.40	126.43	119.90
1	A	388	GLN	C-N-CA	6.40	126.43	119.90
1	A	450	LEU	CA-C-N	6.33	126.08	119.05
1	A	450	LEU	C-N-CA	6.33	126.08	119.05
1	A	414	THR	CA-C-N	6.27	126.47	119.32
1	A	414	THR	C-N-CA	6.27	126.47	119.32
2	B	493	ASN	CA-C-N	6.24	126.19	119.76
2	B	493	ASN	C-N-CA	6.24	126.19	119.76
1	A	489	GLU	CA-C-N	6.22	126.41	119.32
1	A	489	GLU	C-N-CA	6.22	126.41	119.32
1	A	84	PHE	CA-C-N	6.21	126.16	119.76
1	A	84	PHE	C-N-CA	6.21	126.16	119.76
2	B	457	LEU	CA-C-N	6.21	126.16	119.76
2	B	457	LEU	C-N-CA	6.21	126.16	119.76
1	A	135	ASN	CA-C-N	6.20	125.89	119.56
1	A	135	ASN	C-N-CA	6.20	125.89	119.56
2	B	510	ASP	CA-C-N	6.00	127.34	119.84
2	B	510	ASP	C-N-CA	6.00	127.34	119.84
2	B	470	LYS	CA-C-N	6.00	125.94	119.76
2	B	470	LYS	C-N-CA	6.00	125.94	119.76
1	A	138	ASN	CA-C-N	5.92	127.24	119.84
1	A	138	ASN	C-N-CA	5.92	127.24	119.84
2	B	550	ASN	N-CA-C	-5.91	101.53	110.28
2	B	567	ASP	CA-C-N	5.86	125.79	119.76
2	B	567	ASP	C-N-CA	5.86	125.79	119.76
1	A	491	LEU	CA-C-N	5.85	125.79	119.76
1	A	491	LEU	C-N-CA	5.85	125.79	119.76
1	A	335	GLU	CA-C-N	5.73	125.66	119.76
1	A	335	GLU	C-N-CA	5.73	125.66	119.76
1	A	324	THR	CA-C-N	5.63	125.74	119.32
1	A	324	THR	C-N-CA	5.63	125.74	119.32
1	A	262	LEU	CA-C-N	5.47	125.74	119.83
1	A	262	LEU	C-N-CA	5.47	125.74	119.83
1	A	177	ARG	CA-C-N	5.28	124.79	119.19
1	A	177	ARG	C-N-CA	5.28	124.79	119.19
1	A	204	ARG	N-CA-C	-5.11	106.83	113.16
1	A	582	LYS	CA-C-N	5.03	125.30	119.47
1	A	582	LYS	C-N-CA	5.03	125.30	119.47
2	B	529	GLU	CA-C-N	5.01	125.24	119.83
2	B	529	GLU	C-N-CA	5.01	125.24	119.83

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	4327	0	3779	16	0
2	B	1171	0	809	4	0
3	C	39	0	34	0	0
3	H	39	0	34	1	0
4	D	28	0	25	0	0
4	E	28	0	25	0	0
4	F	28	0	25	0	0
4	G	28	0	25	0	0
5	A	42	0	39	1	0
5	B	14	0	13	0	0
6	A	1	0	0	0	0
All	All	5745	0	4808	19	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 2.

All (19) 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:546:ASN:HD22	3:H:1:NAG:H83	1.66	0.60
1:A:589:LYS:N	1:A:590:PRO:HD2	2.21	0.56
1:A:107:SER:C	1:A:109:LEU:N	2.66	0.53
1:A:107:SER:C	1:A:109:LEU:H	2.17	0.52
1:A:499:ASP:N	1:A:500:PRO:CD	2.73	0.51
2:B:533:ARG:HG2	2:B:534:PRO:HD2	1.94	0.50
1:A:107:SER:O	1:A:109:LEU:N	2.47	0.47
1:A:450:LEU:HB2	1:A:451:PRO:HD3	1.97	0.47
1:A:582:LYS:N	1:A:583:PRO:CD	2.80	0.44
1:A:177:ARG:HB3	1:A:178:PRO:HD3	2.00	0.44
1:A:113:LYS:HD2	1:A:186:LEU:HD21	2.00	0.44
1:A:234:LYS:HB3	1:A:235:PRO:HD3	1.99	0.44
1:A:288:LYS:NZ	2:B:563:ASP:OD2	2.43	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:113:LYS:HD2	1:A:186:LEU:CD2	2.50	0.42
2:B:397:TYR:O	2:B:534:PRO:HD2	2.20	0.41
2:B:504:TYR:OH	2:B:572:LYS:HD3	2.20	0.41
1:A:177:ARG:N	1:A:178:PRO:HD2	2.35	0.41
1:A:455:MET:HE1	1:A:477:TRP:CE3	2.56	0.41
1:A:322:ASN:OD1	5:A:902:NAG:O5	2.40	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 PDB entries followed by that with respect to all EM entries.

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	583/782 (75%)	574 (98%)	8 (1%)	1 (0%)	44	72
2	B	175/213 (82%)	173 (99%)	1 (1%)	1 (1%)	22	53
All	All	758/995 (76%)	747 (98%)	9 (1%)	2 (0%)	38	67

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	108	VAL
2	B	529	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 PDB entries followed by that with respect to all EM entries.

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	352/695 (51%)	351 (100%)	1 (0%)	91 94
2	B	67/189 (35%)	67 (100%)	0	100 100
All	All	419/884 (47%)	418 (100%)	1 (0%)	91 95

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	552	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	442	GLN
2	B	465	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)

14 monosaccharides are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	NAG	C	1	2,3	14,14,15	1.06	1 (7%)	17,19,21	1.06	1 (5%)
3	NAG	C	2	3	14,14,15	1.12	1 (7%)	17,19,21	1.12	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
3	BMA	C	3	3	11,11,12	1.05	1 (9%)	15,15,17	0.64	0
4	NAG	D	1	4,1	14,14,15	1.08	1 (7%)	17,19,21	1.19	1 (5%)
4	NAG	D	2	4	14,14,15	1.03	1 (7%)	17,19,21	0.91	1 (5%)
4	NAG	E	1	4,1	14,14,15	1.10	1 (7%)	17,19,21	1.05	1 (5%)
4	NAG	E	2	4	14,14,15	1.09	1 (7%)	17,19,21	0.92	1 (5%)
4	NAG	F	1	4,1	14,14,15	1.09	1 (7%)	17,19,21	1.00	1 (5%)
4	NAG	F	2	4	14,14,15	1.13	1 (7%)	17,19,21	0.96	1 (5%)
4	NAG	G	1	4,1	14,14,15	0.39	0	17,19,21	0.56	0
4	NAG	G	2	4	14,14,15	0.40	0	17,19,21	0.49	0
3	NAG	H	1	3,1	14,14,15	1.60	2 (14%)	17,19,21	5.06	4 (23%)
3	NAG	H	2	3	14,14,15	0.39	0	17,19,21	0.46	0
3	BMA	H	3	3	11,11,12	1.03	0	15,15,17	0.60	0

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

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

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	H	1	NAG	C1-C2	3.70	1.57	1.52
4	F	2	NAG	C1-C2	3.19	1.57	1.52
4	E	1	NAG	C1-C2	3.09	1.57	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	2	NAG	C1-C2	3.06	1.56	1.52
4	E	2	NAG	C1-C2	3.04	1.56	1.52
4	D	1	NAG	C1-C2	3.00	1.56	1.52
3	H	1	NAG	C2-N2	2.99	1.51	1.46
4	F	1	NAG	C1-C2	2.97	1.56	1.52
3	C	1	NAG	C1-C2	2.92	1.56	1.52
4	D	2	NAG	C1-C2	2.71	1.56	1.52
3	C	3	BMA	C1-C2	2.10	1.57	1.52

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	H	1	NAG	C2-N2-C7	-16.10	99.97	122.90
3	H	1	NAG	C8-C7-N2	10.78	134.35	116.10
3	H	1	NAG	O7-C7-N2	-5.95	111.01	121.95
3	H	1	NAG	O7-C7-C8	-3.99	114.64	122.06
4	D	1	NAG	C8-C7-N2	2.78	120.81	116.10
3	C	2	NAG	C8-C7-N2	2.60	120.50	116.10
3	C	1	NAG	C8-C7-N2	2.50	120.33	116.10
4	F	2	NAG	C8-C7-N2	2.46	120.27	116.10
4	E	1	NAG	C8-C7-N2	2.32	120.03	116.10
4	E	2	NAG	C8-C7-N2	2.27	119.94	116.10
4	D	2	NAG	C8-C7-N2	2.12	119.69	116.10
4	F	1	NAG	C8-C7-N2	2.10	119.66	116.10

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	H	1	NAG	C8-C7-N2-C2
3	H	1	NAG	O7-C7-N2-C2

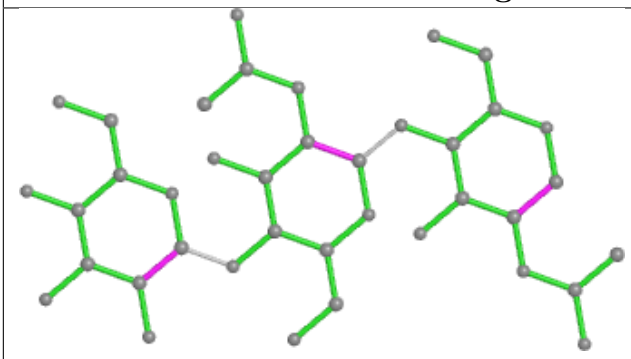
There are no ring outliers.

1 monomer is involved in 1 short contact:

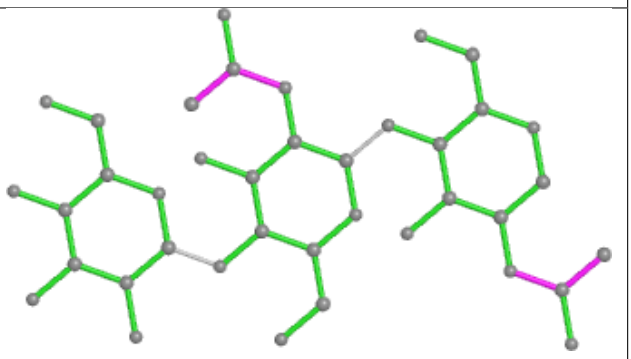
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	H	1	NAG	1	0

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

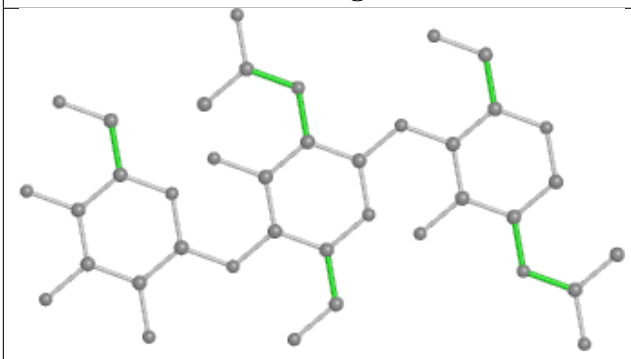
Oligosaccharide Chain C



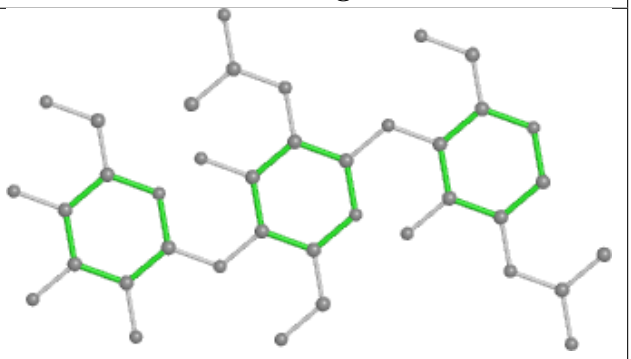
Bond lengths



Bond angles

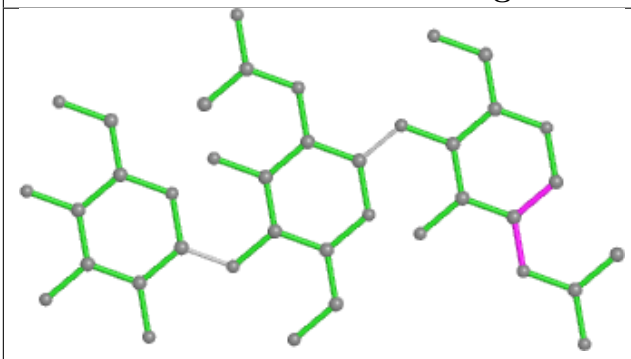


Torsions

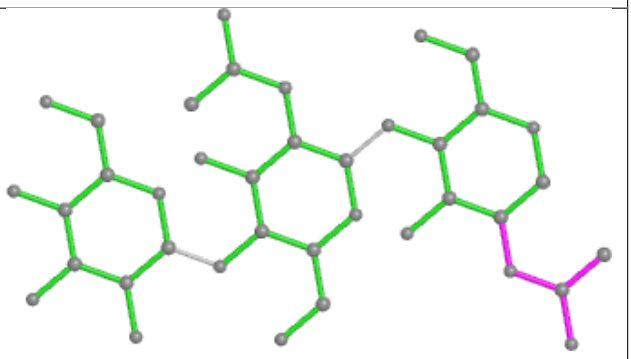


Rings

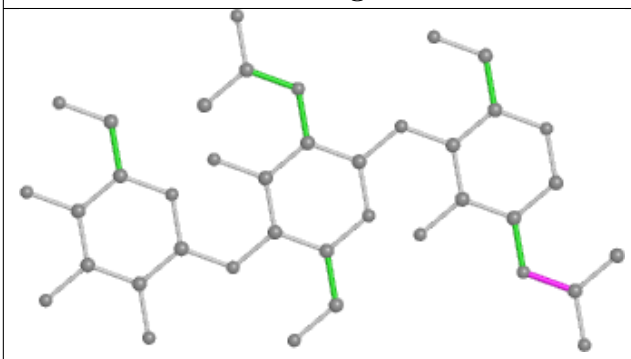
Oligosaccharide Chain H



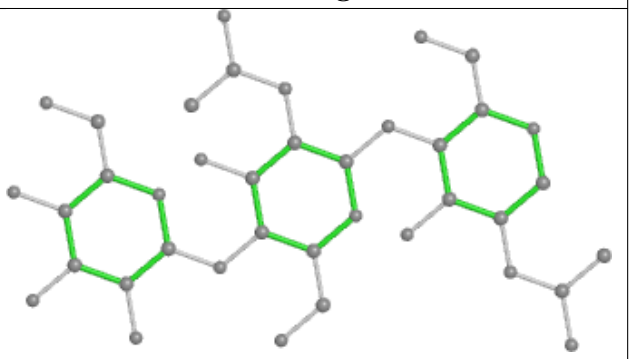
Bond lengths



Bond angles

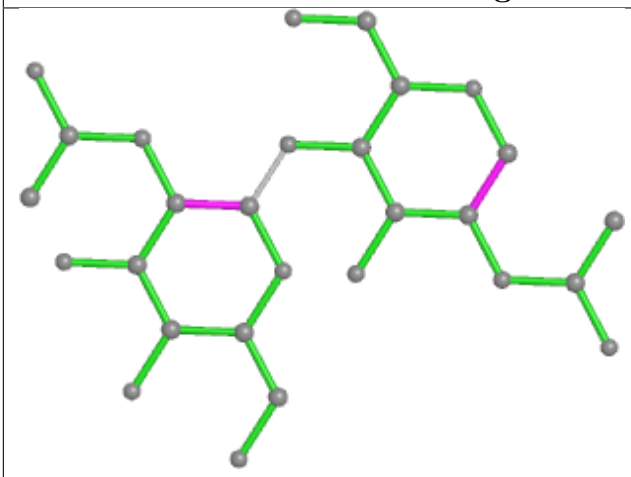


Torsions

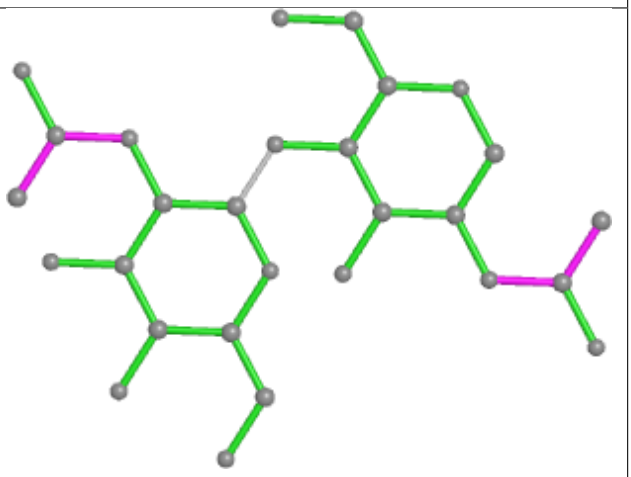


Rings

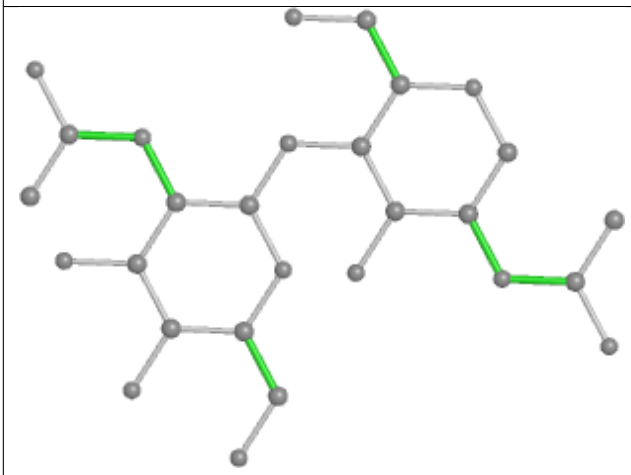
Oligosaccharide Chain D



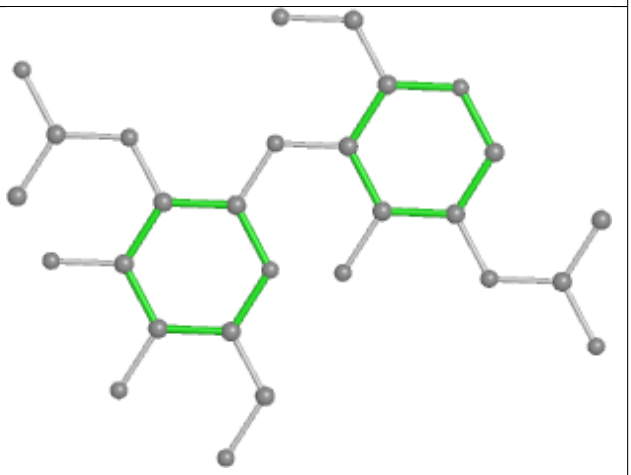
Bond lengths



Bond angles

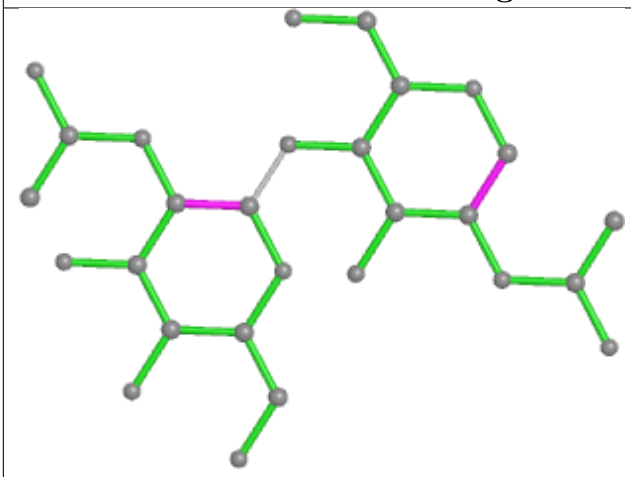


Torsions

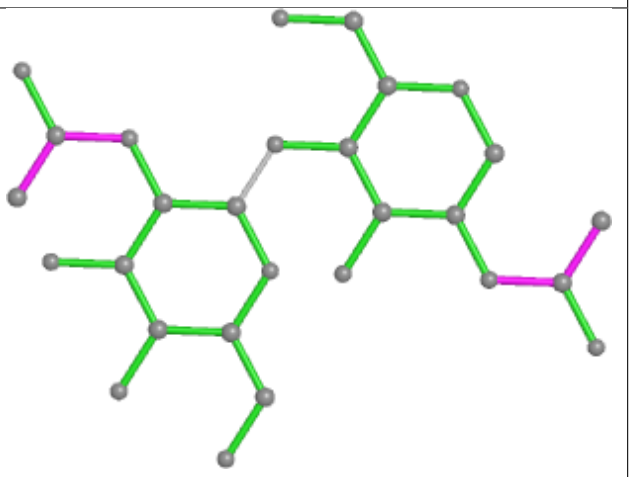


Rings

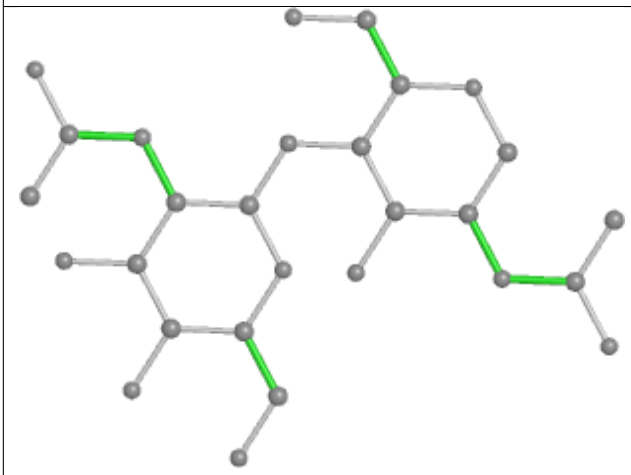
Oligosaccharide Chain E



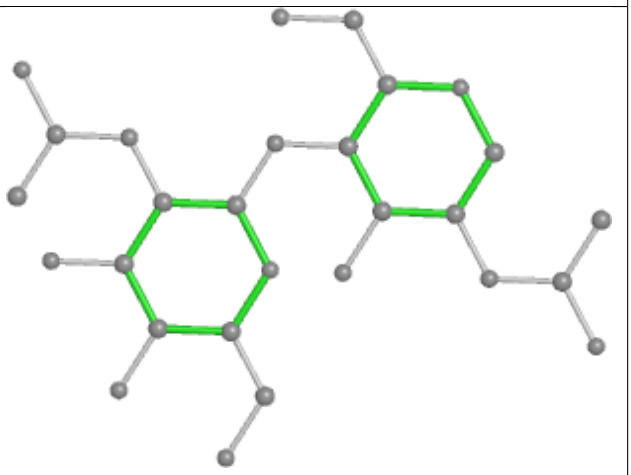
Bond lengths



Bond angles

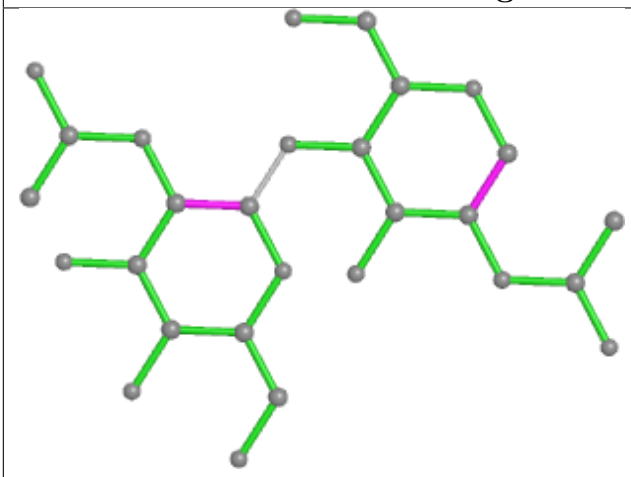


Torsions

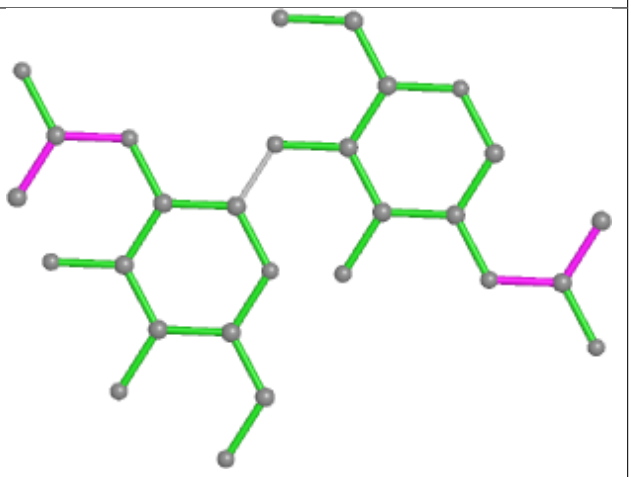


Rings

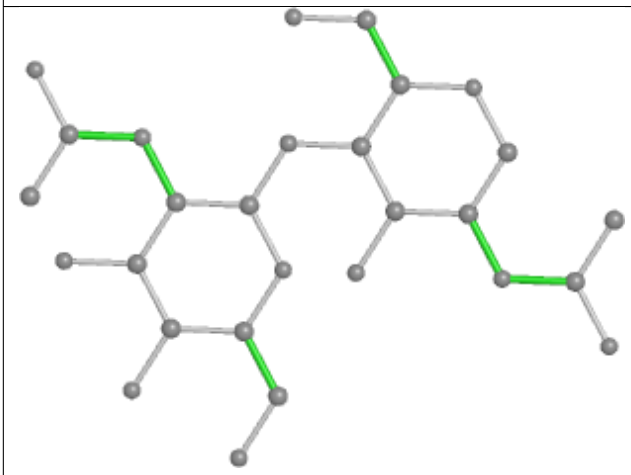
Oligosaccharide Chain F



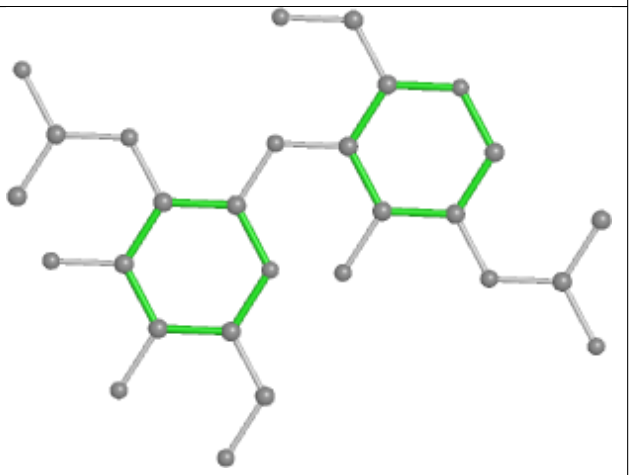
Bond lengths



Bond angles

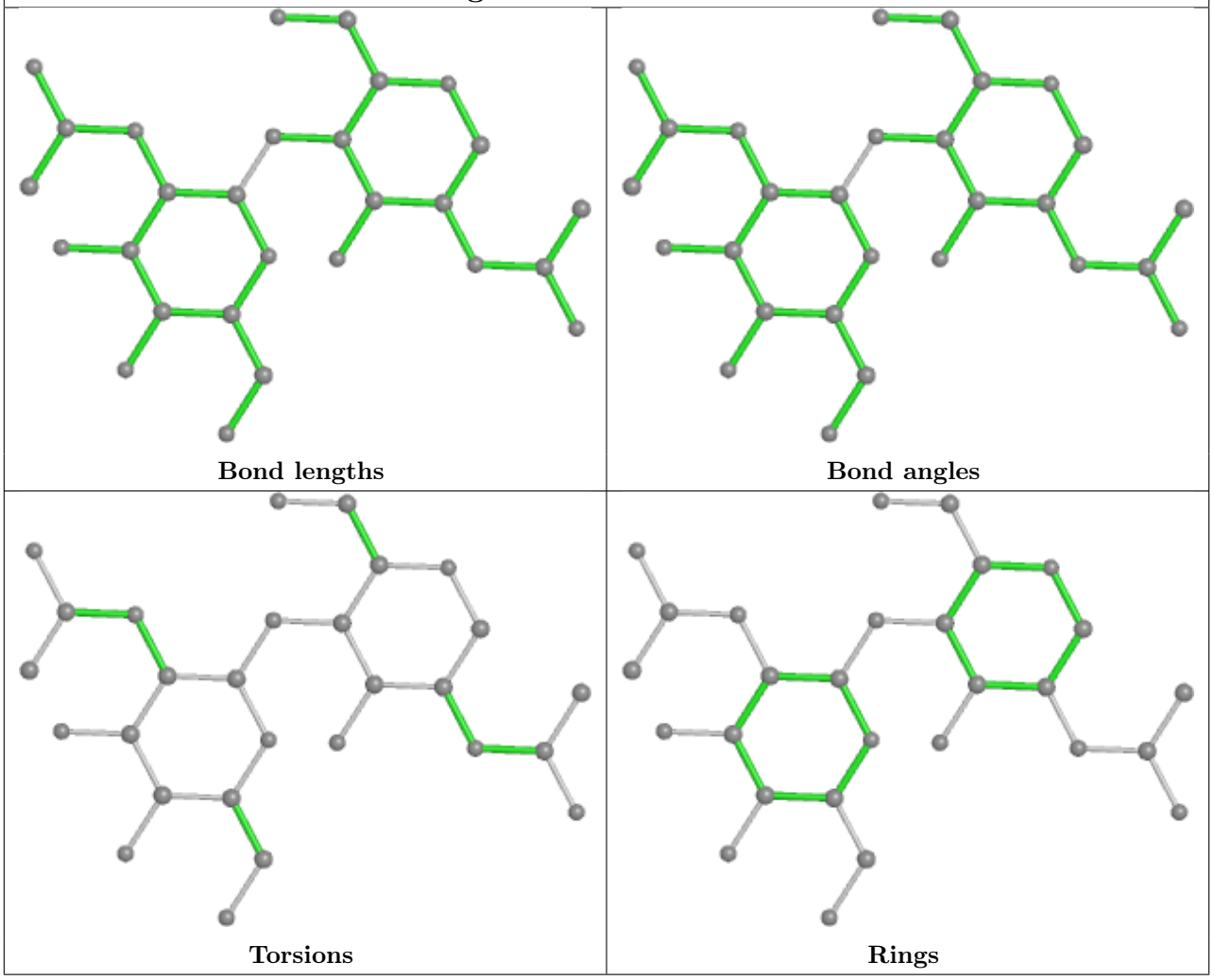


Torsions



Rings

Oligosaccharide Chain G



5.6 Ligand geometry (i)

Of 5 ligands modelled in this entry, 1 is monoatomic - leaving 4 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	$\#\|Z\| > 2$
5	NAG	A	902	1	14,14,15	1.09	1 (7%)	17,19,21	1.01	1 (5%)
5	NAG	A	903	1	14,14,15	0.37	0	17,19,21	0.54	0
5	NAG	B	700	2	14,14,15	1.16	1 (7%)	17,19,21	1.12	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
5	NAG	A	901	1	14,14,15	1.12	1 (7%)	17,19,21	1.06	1 (5%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	A	902	1	-	0/6/23/26	0/1/1/1
5	NAG	A	903	1	-	3/6/23/26	0/1/1/1
5	NAG	B	700	2	-	0/6/23/26	0/1/1/1
5	NAG	A	901	1	-	0/6/23/26	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	700	NAG	C1-C2	3.33	1.57	1.52
5	A	901	NAG	C1-C2	3.10	1.57	1.52
5	A	902	NAG	C1-C2	3.03	1.56	1.52

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	B	700	NAG	C8-C7-N2	2.46	120.27	116.10
5	A	901	NAG	C8-C7-N2	2.40	120.16	116.10
5	A	902	NAG	C8-C7-N2	2.27	119.94	116.10

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	903	NAG	C8-C7-N2-C2
5	A	903	NAG	O7-C7-N2-C2
5	A	903	NAG	O5-C5-C6-O6

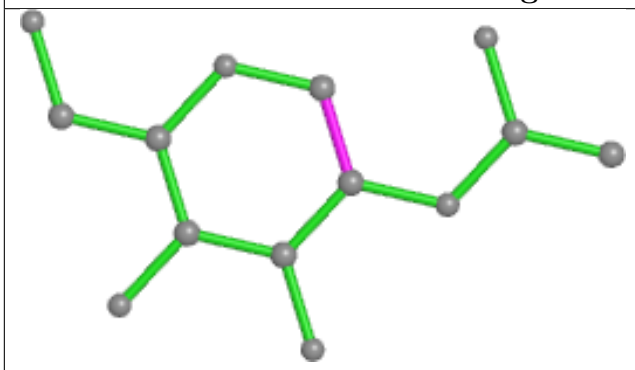
There are no ring outliers.

1 monomer is involved in 1 short contact:

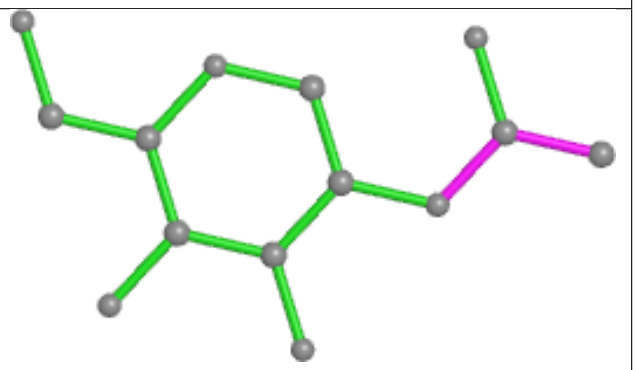
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	902	NAG	1	0

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.

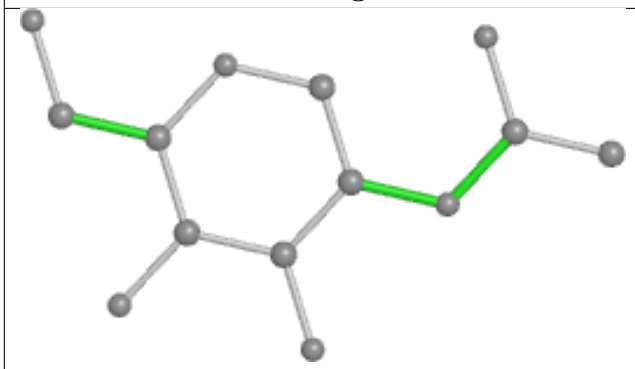
Ligand NAG A 902



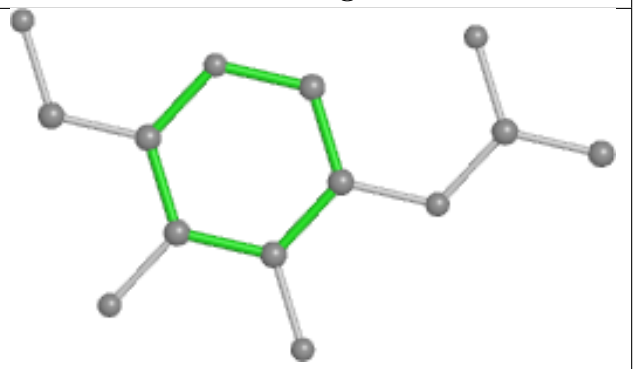
Bond lengths



Bond angles

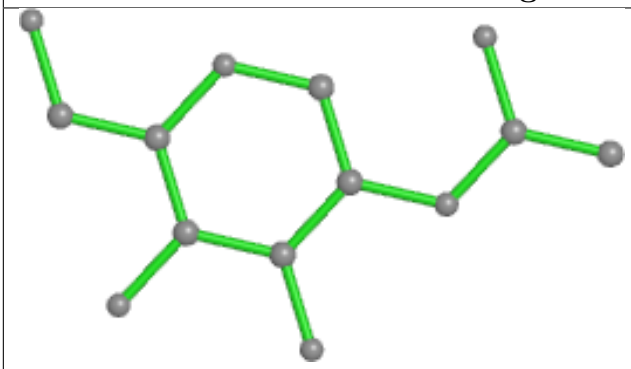


Torsions

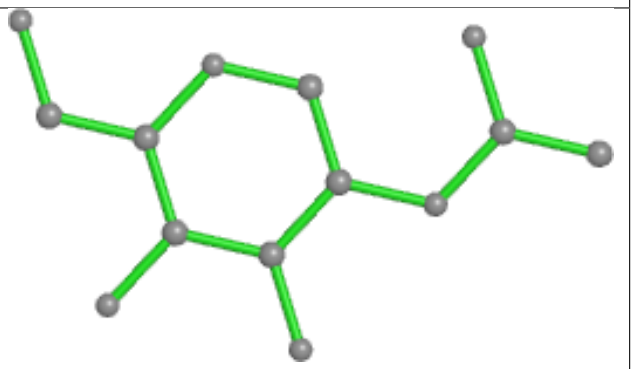


Rings

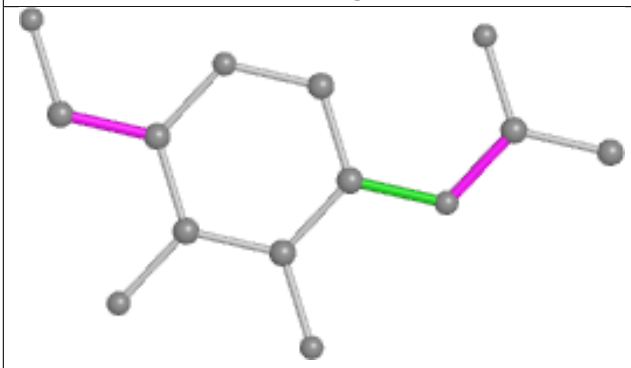
Ligand NAG A 903



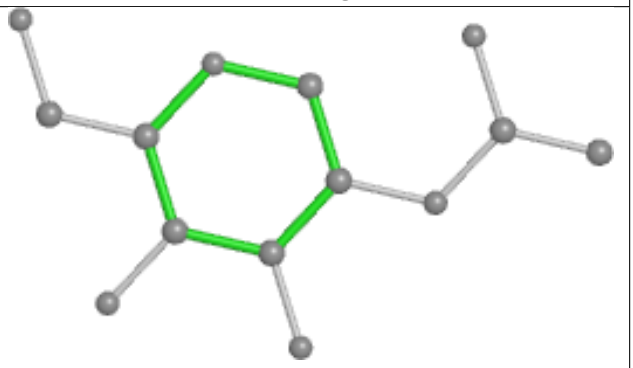
Bond lengths



Bond angles

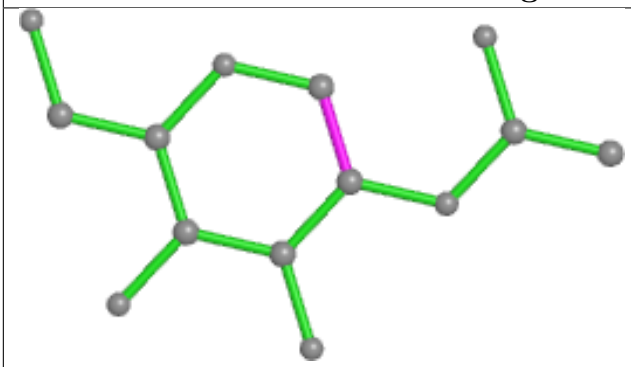


Torsions

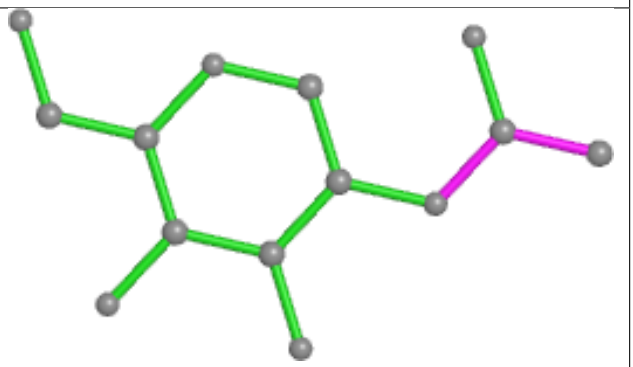


Rings

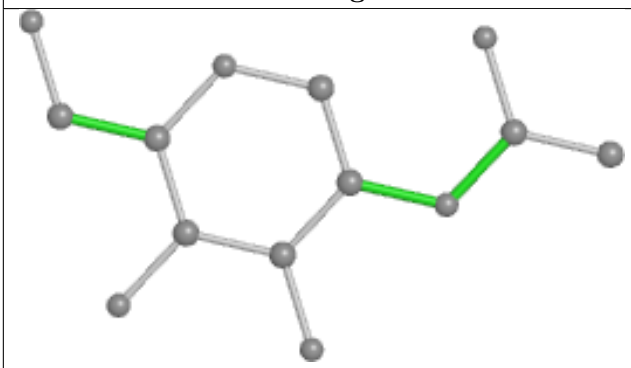
Ligand NAG B 700



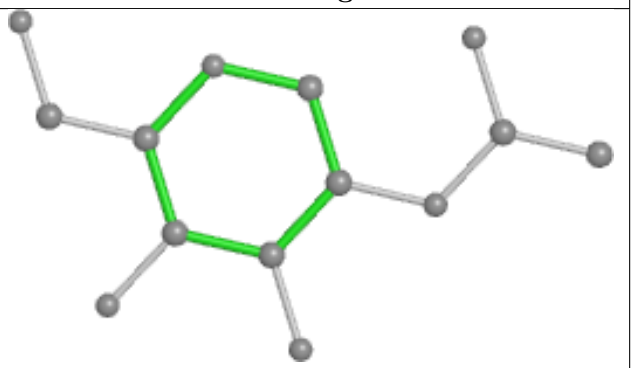
Bond lengths



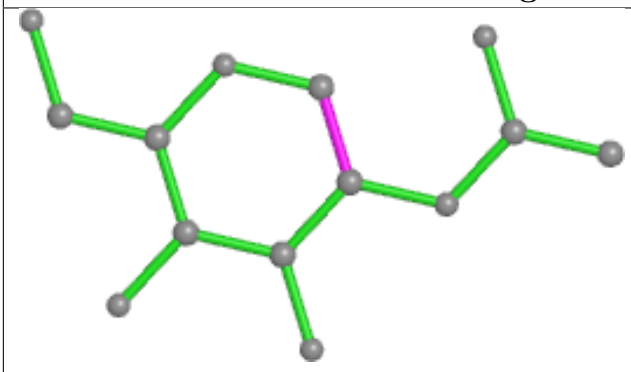
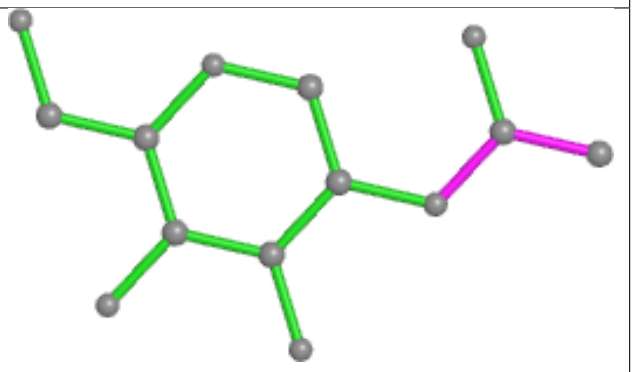
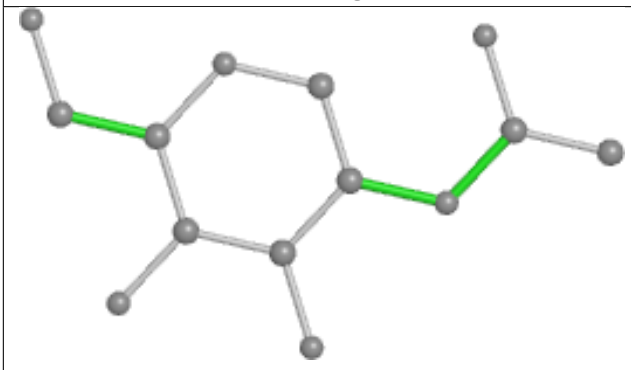
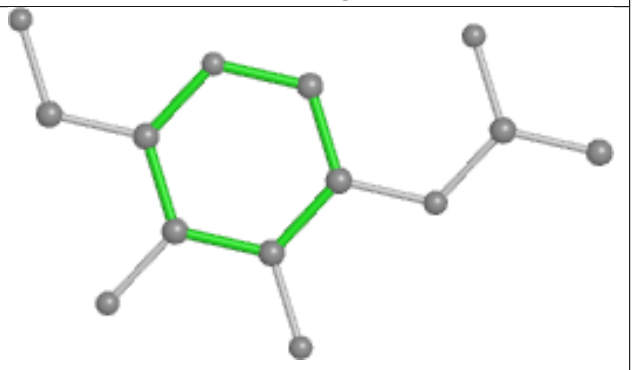
Bond angles



Torsions



Rings

Ligand NAG A 901	
 Bond lengths	 Bond angles
 Torsions	 Rings

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.