wwPDB EM Validation Summary Report

Jul 16, 2025 – 11:47 AM JST

PDB ID	:	8ZE2 / pdb_00008ze2
EMDB ID	:	EMD-60021
Title	:	Drosophila melanogaster gustatory receptor 64a(Gr64a) in Sucrose-bound state
Authors	:	Chen, Q.F.; Chen, R.Z.; Zhang, R.
Deposited on	:	2024-05-04
Resolution	:	2.57 Å(reported)

This is a wwPDB EM Validation Summary 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:

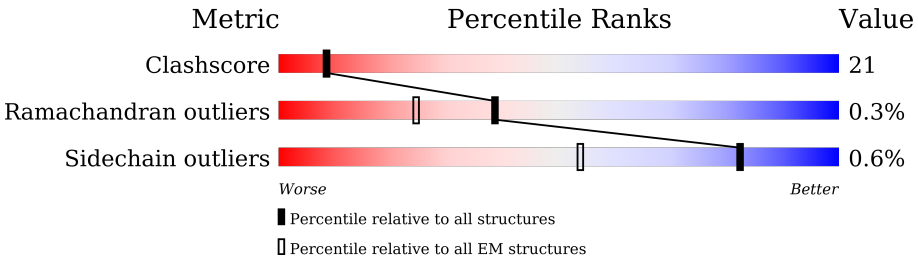
EMDB validation analysis	:	FAILED
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0rc1
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson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

1 Overall quality at a glance

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

The reported resolution of this entry is 2.57 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	472	48% 35% 17%
1	B	472	48% 35% 17%
1	C	472	49% 34% 17%
1	D	472	49% 33% 17%
2	E	2	50% 50%
2	F	2	50% 50%
2	G	2	50% 50%
2	H	2	50% 50%

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	GLC	E	1	-	-	X	-
2	GLC	F	1	-	-	X	-
2	GLC	G	1	-	-	X	-
2	GLC	H	1	-	-	X	-

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 13060 atoms, of which 88 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 Gustatory receptor for sugar taste 64a.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	392	Total	C	N	O	S	0	0
			3220	2132	531	534	23		
1	B	392	Total	C	N	O	S	0	0
			3220	2132	531	534	23		
1	C	392	Total	C	N	O	S	0	0
			3220	2132	531	534	23		
1	D	392	Total	C	N	O	S	0	0
			3220	2132	531	534	23		

There are 64 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	457	LEU	-	expression tag	UNP P83293
A	458	GLU	-	expression tag	UNP P83293
A	459	GLY	-	expression tag	UNP P83293
A	460	GLY	-	expression tag	UNP P83293
A	461	SER	-	expression tag	UNP P83293
A	462	SER	-	expression tag	UNP P83293
A	463	GLY	-	expression tag	UNP P83293
A	464	GLY	-	expression tag	UNP P83293
A	465	TRP	-	expression tag	UNP P83293
A	466	SER	-	expression tag	UNP P83293
A	467	HIS	-	expression tag	UNP P83293
A	468	PRO	-	expression tag	UNP P83293
A	469	GLN	-	expression tag	UNP P83293
A	470	PHE	-	expression tag	UNP P83293
A	471	GLU	-	expression tag	UNP P83293
A	472	LYS	-	expression tag	UNP P83293
B	457	LEU	-	expression tag	UNP P83293
B	458	GLU	-	expression tag	UNP P83293
B	459	GLY	-	expression tag	UNP P83293
B	460	GLY	-	expression tag	UNP P83293
B	461	SER	-	expression tag	UNP P83293
B	462	SER	-	expression tag	UNP P83293

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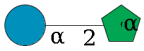
Chain	Residue	Modelled	Actual	Comment	Reference
B	463	GLY	-	expression tag	UNP P83293
B	464	GLY	-	expression tag	UNP P83293
B	465	TRP	-	expression tag	UNP P83293
B	466	SER	-	expression tag	UNP P83293
B	467	HIS	-	expression tag	UNP P83293
B	468	PRO	-	expression tag	UNP P83293
B	469	GLN	-	expression tag	UNP P83293
B	470	PHE	-	expression tag	UNP P83293
B	471	GLU	-	expression tag	UNP P83293
B	472	LYS	-	expression tag	UNP P83293
C	457	LEU	-	expression tag	UNP P83293
C	458	GLU	-	expression tag	UNP P83293
C	459	GLY	-	expression tag	UNP P83293
C	460	GLY	-	expression tag	UNP P83293
C	461	SER	-	expression tag	UNP P83293
C	462	SER	-	expression tag	UNP P83293
C	463	GLY	-	expression tag	UNP P83293
C	464	GLY	-	expression tag	UNP P83293
C	465	TRP	-	expression tag	UNP P83293
C	466	SER	-	expression tag	UNP P83293
C	467	HIS	-	expression tag	UNP P83293
C	468	PRO	-	expression tag	UNP P83293
C	469	GLN	-	expression tag	UNP P83293
C	470	PHE	-	expression tag	UNP P83293
C	471	GLU	-	expression tag	UNP P83293
C	472	LYS	-	expression tag	UNP P83293
D	457	LEU	-	expression tag	UNP P83293
D	458	GLU	-	expression tag	UNP P83293
D	459	GLY	-	expression tag	UNP P83293
D	460	GLY	-	expression tag	UNP P83293
D	461	SER	-	expression tag	UNP P83293
D	462	SER	-	expression tag	UNP P83293
D	463	GLY	-	expression tag	UNP P83293
D	464	GLY	-	expression tag	UNP P83293
D	465	TRP	-	expression tag	UNP P83293
D	466	SER	-	expression tag	UNP P83293
D	467	HIS	-	expression tag	UNP P83293
D	468	PRO	-	expression tag	UNP P83293
D	469	GLN	-	expression tag	UNP P83293
D	470	PHE	-	expression tag	UNP P83293
D	471	GLU	-	expression tag	UNP P83293
D	472	LYS	-	expression tag	UNP P83293

- Molecule 2 is an oligosaccharide called alpha-D-glucopyranose-(1-2)-alpha-D-fructofuranose.



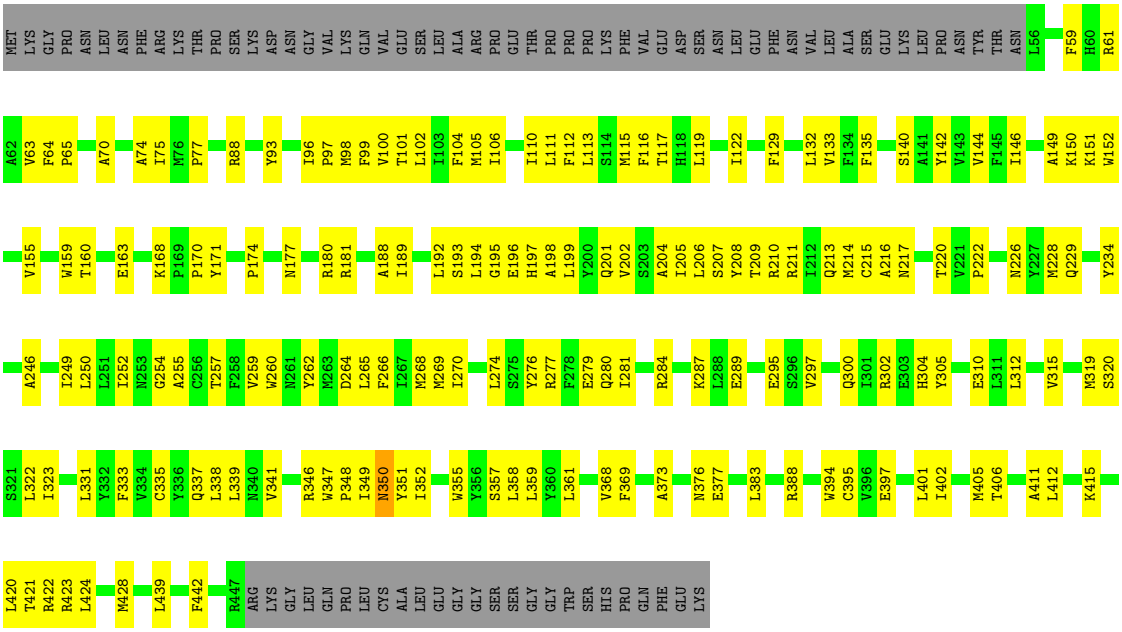
Mol	Chain	Residues	Atoms				AltConf	Trace
2	E	2	Total	C	H	O	0	0
			45	12	22	11		
2	F	2	Total	C	H	O	0	0
			45	12	22	11		
2	G	2	Total	C	H	O	0	0
			45	12	22	11		
2	H	2	Total	C	H	O	0	0
			45	12	22	11		

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.

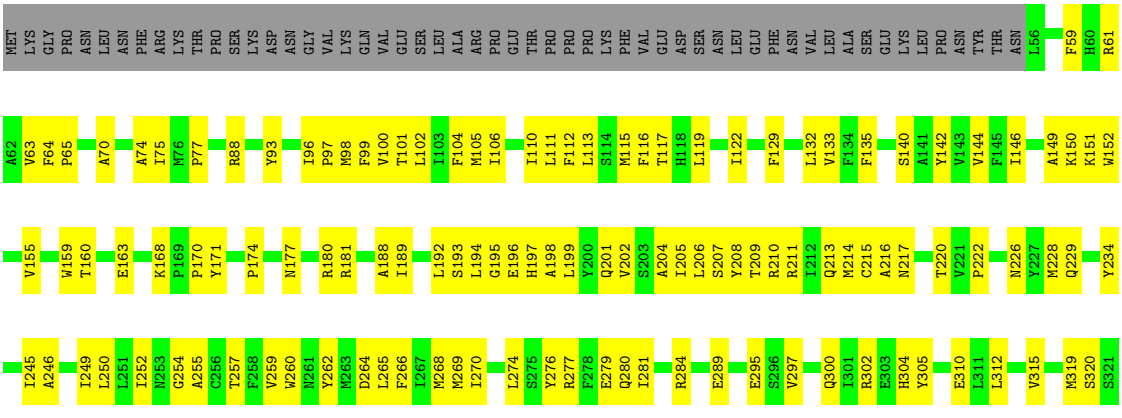
• Molecule 1: Gustatory receptor for sugar taste 64a

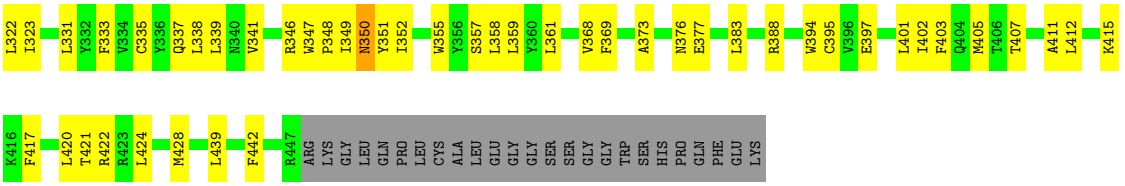
Chain A:



• Molecule 1: Gustatory receptor for sugar taste 64a

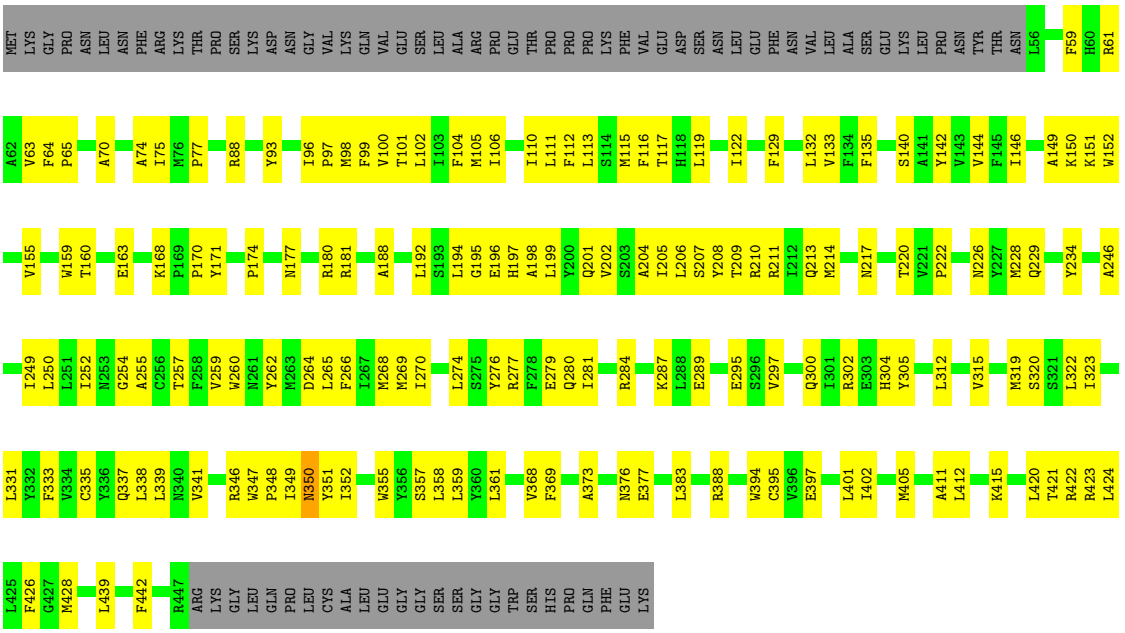
Chain B:





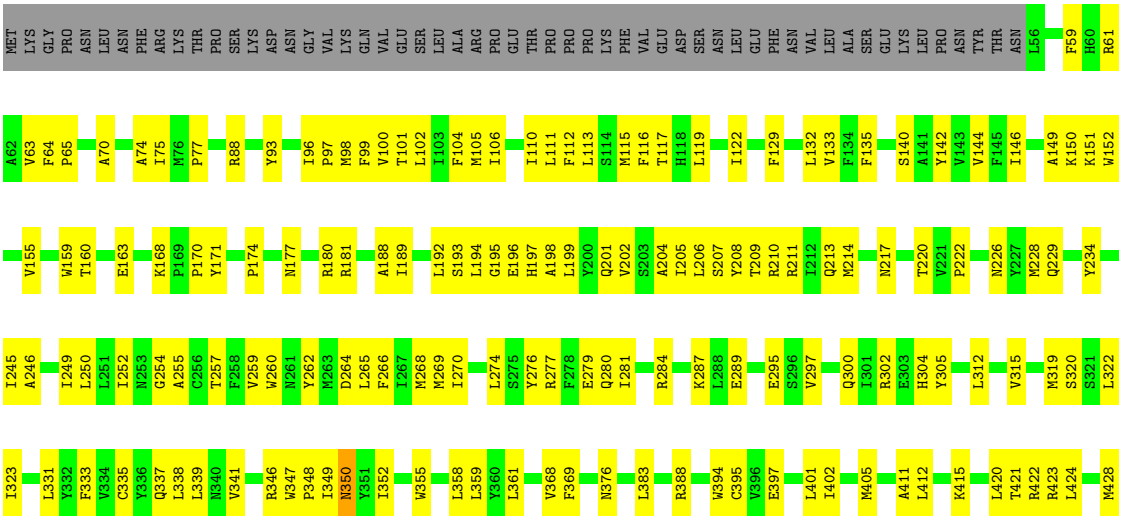
• Molecule 1: Gustatory receptor for sugar taste 64a

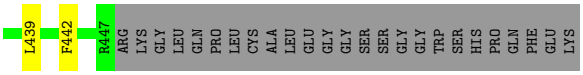
Chain C:



• Molecule 1: Gustatory receptor for sugar taste 64a

Chain D:





- Molecule 2: alpha-D-glucopyranose-(1-2)-alpha-D-fructofuranose

Chain E:

- Molecule 2: alpha-D-glucopyranose-(1-2)-alpha-D-fructofuranose

Chain F:

- Molecule 2: alpha-D-glucopyranose-(1-2)-alpha-D-fructofuranose

Chain G:

- Molecule 2: alpha-D-glucopyranose-(1-2)-alpha-D-fructofuranose

Chain H:

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	413565	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	48.24	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	1800	Depositor
Magnification	Not provided	
Image detector	TFS FALCON 4i (4k 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: GLC, Z9N

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	0.19	0/3301	0.43	0/4477
1	B	0.19	0/3301	0.43	0/4477
1	C	0.19	0/3301	0.43	0/4477
1	D	0.19	0/3301	0.43	0/4477
All	All	0.19	0/13204	0.43	0/17908

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	3220	0	3331	143	0
1	B	3220	0	3331	145	0
1	C	3220	0	3331	138	0
1	D	3220	0	3331	136	0
2	E	23	22	10	16	0
2	F	23	22	10	12	0
2	G	23	22	10	10	0
2	H	23	22	10	11	0
All	All	12972	88	13364	554	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 21.

The worst 5 of 554 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:C:257:THR:HB	2:G:1:GLC:O3	1.39	1.20
1:C:260:TRP:CZ3	2:G:1:GLC:O6	1.99	1.16
1:C:260:TRP:HZ3	2:G:1:GLC:O6	1.29	1.12
1:A:257:THR:HB	2:E:1:GLC:O3	1.49	1.12
1:D:257:THR:HB	2:H:1:GLC:O3	1.48	1.11

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	390/472 (83%)	367 (94%)	22 (6%)	1 (0%)	37	57
1	B	390/472 (83%)	368 (94%)	21 (5%)	1 (0%)	37	57
1	C	390/472 (83%)	367 (94%)	22 (6%)	1 (0%)	37	57
1	D	390/472 (83%)	367 (94%)	22 (6%)	1 (0%)	37	57
All	All	1560/1888 (83%)	1469 (94%)	87 (6%)	4 (0%)	38	57

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	174	PRO
1	B	174	PRO
1	C	174	PRO
1	D	174	PRO

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all 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	355/425 (84%)	353 (99%)	2 (1%)	84 93
1	B	355/425 (84%)	353 (99%)	2 (1%)	84 93
1	C	355/425 (84%)	353 (99%)	2 (1%)	84 93
1	D	355/425 (84%)	353 (99%)	2 (1%)	84 93
All	All	1420/1700 (84%)	1412 (99%)	8 (1%)	82 93

5 of 8 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	350	ASN
1	D	250	LEU
1	C	250	LEU
1	B	350	ASN
1	C	350	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	350	ASN
1	D	300	GLN
1	D	350	ASN
1	B	300	GLN
1	B	350	ASN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

8 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	GLC	E	1	2	11,11,12	1.94	3 (27%)	15,15,17	1.38	3 (20%)
2	Z9N	E	2	2	11,12,12	4.49	6 (54%)	10,18,18	1.09	0
2	GLC	F	1	2	11,11,12	1.94	3 (27%)	15,15,17	1.38	3 (20%)
2	Z9N	F	2	2	11,12,12	4.49	6 (54%)	10,18,18	1.09	0
2	GLC	G	1	2	11,11,12	1.94	3 (27%)	15,15,17	1.38	3 (20%)
2	Z9N	G	2	2	11,12,12	4.49	6 (54%)	10,18,18	1.09	0
2	GLC	H	1	2	11,11,12	1.94	3 (27%)	15,15,17	1.38	3 (20%)
2	Z9N	H	2	2	11,12,12	4.49	6 (54%)	10,18,18	1.09	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
2	GLC	E	1	2	-	0/2/19/22	0/1/1/1
2	Z9N	E	2	2	-	3/5/24/24	0/1/1/1
2	GLC	F	1	2	-	0/2/19/22	0/1/1/1
2	Z9N	F	2	2	-	3/5/24/24	0/1/1/1
2	GLC	G	1	2	-	0/2/19/22	0/1/1/1
2	Z9N	G	2	2	-	3/5/24/24	0/1/1/1
2	GLC	H	1	2	-	0/2/19/22	0/1/1/1
2	Z9N	H	2	2	-	3/5/24/24	0/1/1/1

The worst 5 of 36 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	2	Z9N	C4-C5	-8.70	1.30	1.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	F	2	Z9N	C4-C5	-8.70	1.30	1.53
2	G	2	Z9N	C4-C5	-8.70	1.30	1.53
2	H	2	Z9N	C4-C5	-8.70	1.30	1.53
2	E	2	Z9N	O5-C2	-7.95	1.31	1.43

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	E	1	GLC	C3-C4-C5	-2.64	105.52	110.24
2	F	1	GLC	C3-C4-C5	-2.64	105.52	110.24
2	G	1	GLC	C3-C4-C5	-2.64	105.52	110.24
2	H	1	GLC	C3-C4-C5	-2.64	105.52	110.24
2	E	1	GLC	O5-C5-C6	2.37	110.93	107.20

There are no chirality outliers.

5 of 12 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	E	2	Z9N	O1-C1-C2-O2
2	E	2	Z9N	O1-C1-C2-O5
2	E	2	Z9N	O1-C1-C2-C3
2	F	2	Z9N	O1-C1-C2-O2
2	F	2	Z9N	O1-C1-C2-O5

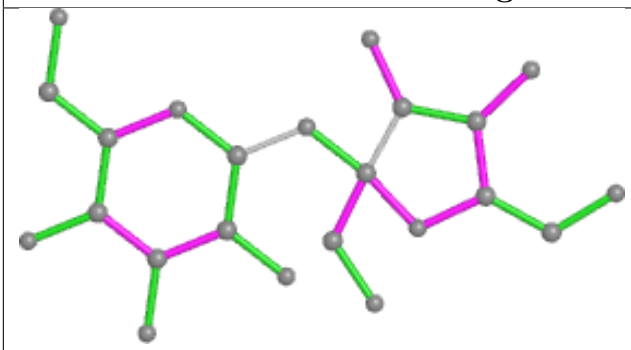
There are no ring outliers.

4 monomers are involved in 49 short contacts:

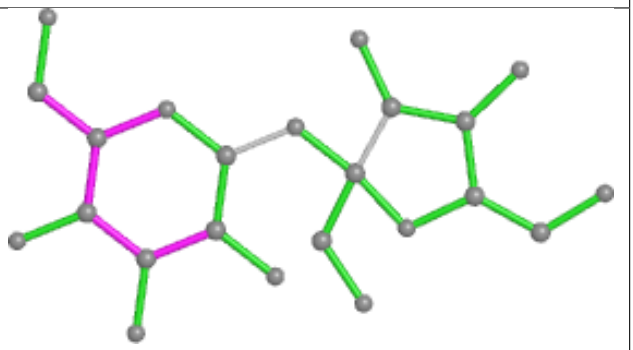
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	H	1	GLC	11	0
2	F	1	GLC	12	0
2	G	1	GLC	10	0
2	E	1	GLC	16	0

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

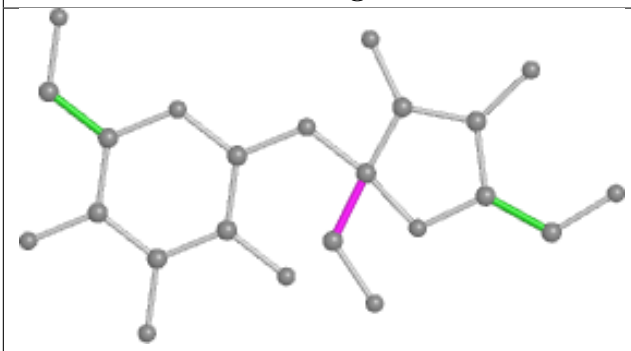
Oligosaccharide Chain E



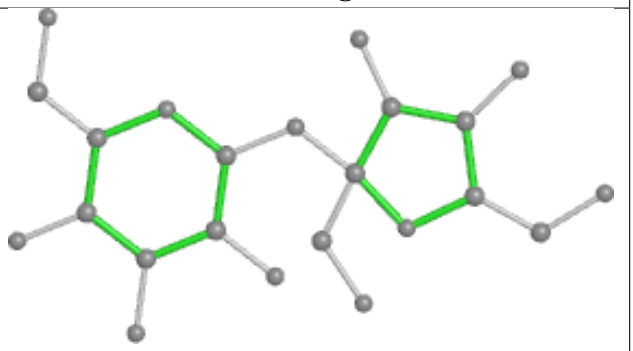
Bond lengths



Bond angles

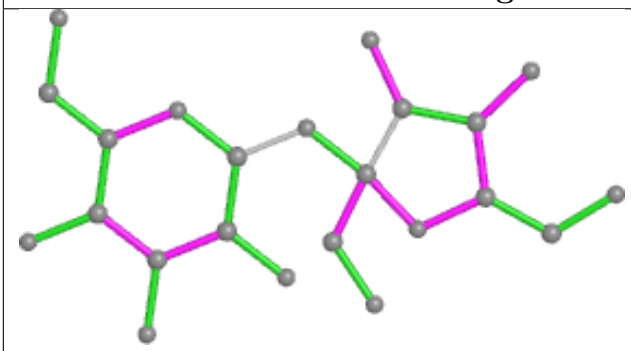


Torsions

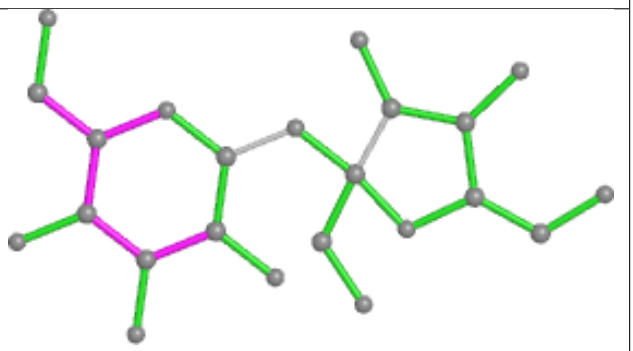


Rings

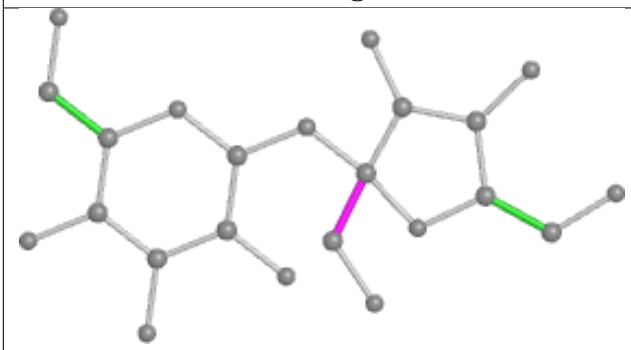
Oligosaccharide Chain F



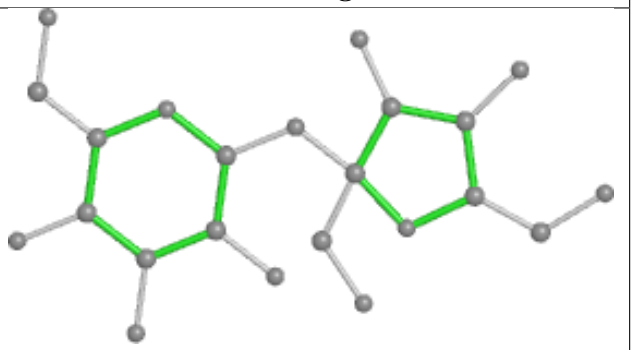
Bond lengths



Bond angles

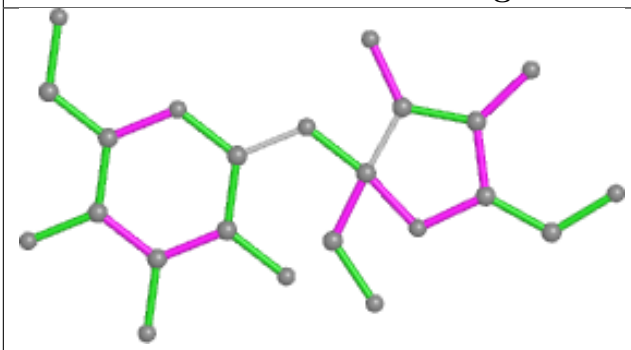


Torsions

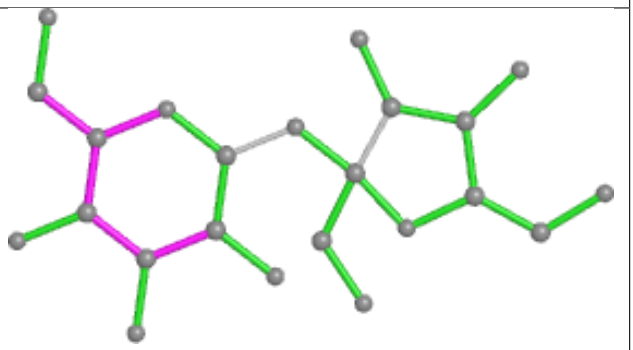


Rings

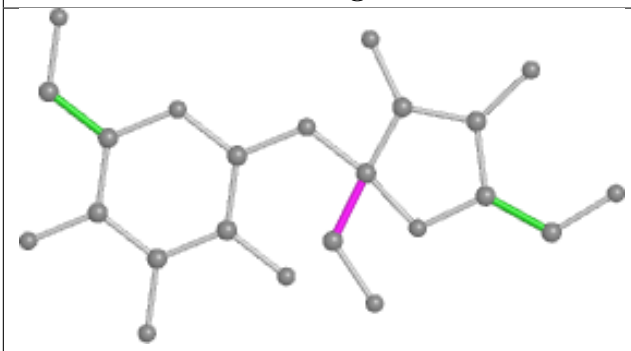
Oligosaccharide Chain G



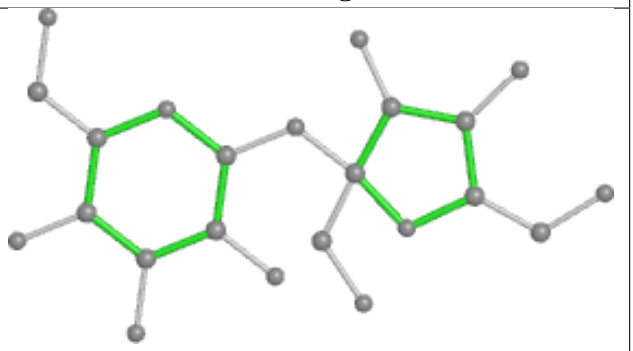
Bond lengths



Bond angles

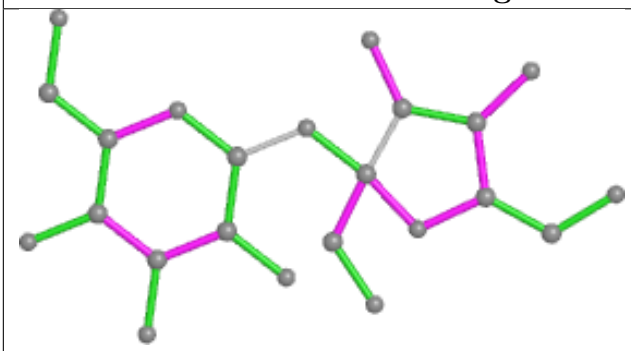


Torsions

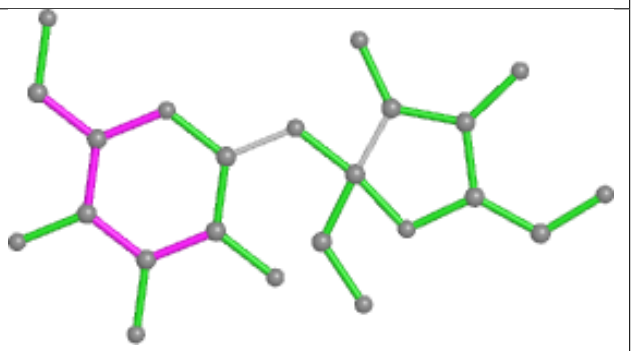


Rings

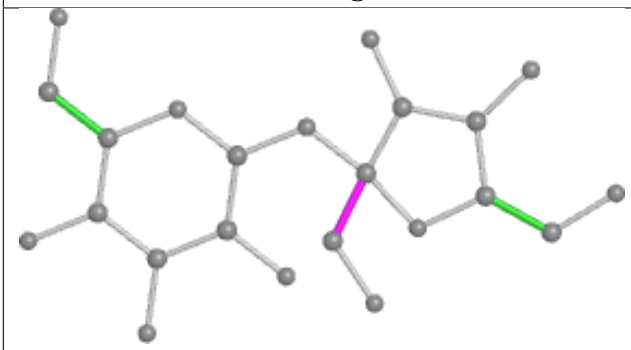
Oligosaccharide Chain H



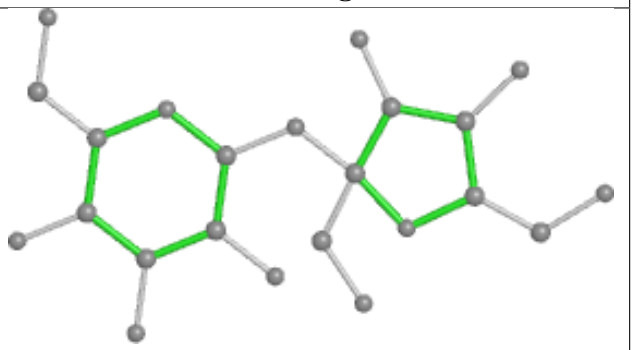
Bond lengths



Bond angles



Torsions



Rings

5.6 Ligand geometry (i)

There are no ligands in this entry.

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.