



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 03:15 PM UTC

PDB ID : 1V6X / pdb_00001v6x
Title : Crystal Structure Of Xylanase From Streptomyces Olivaceoviridis E-86 Complexed With 3(3)-4-O-methyl-alpha-D-glucuronosyl-xylotriose
Authors : Fujimoto, Z.; Kaneko, S.; Kuno, A.; Kobayashi, H.; Kusakabe, I.; Mizuno, H.
Deposited on : 2003-12-04
Resolution : 2.10 Å(reported)

This is a wwPDB X-ray Structure 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/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) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

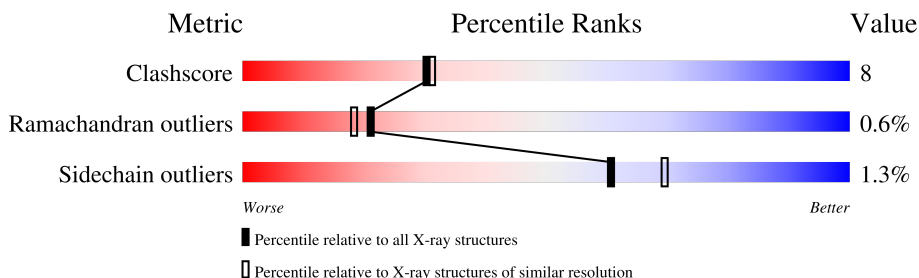
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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))
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	436	82% 17% .
1	B	436	79% 19% .
2	C	4	25% 75%
2	E	4	50% 50%
2	G	4	25% 75%
3	D	2	50% 50%
3	H	2	50% 50%
4	F	3	33% 33% 33%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 7528 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 ENDO-1,4-BETA-D-XYLANASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	436	Total	C	N	O	S	0	0	0
			3288	2020	596	656	16			
1	B	436	Total	C	N	O	S	0	0	0
			3288	2020	596	656	16			

- Molecule 2 is an oligosaccharide called 4-O-methyl-alpha-D-glucopyranuronic acid-(1-2)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose.



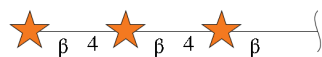
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	C	4	Total	C	O	0	0	0
			41	22	19			
2	E	4	Total	C	O	0	0	0
			41	22	19			
2	G	4	Total	C	O	0	0	0
			41	22	19			

- Molecule 3 is an oligosaccharide called beta-D-xylopyranose-(1-4)-beta-D-xylopyranose.



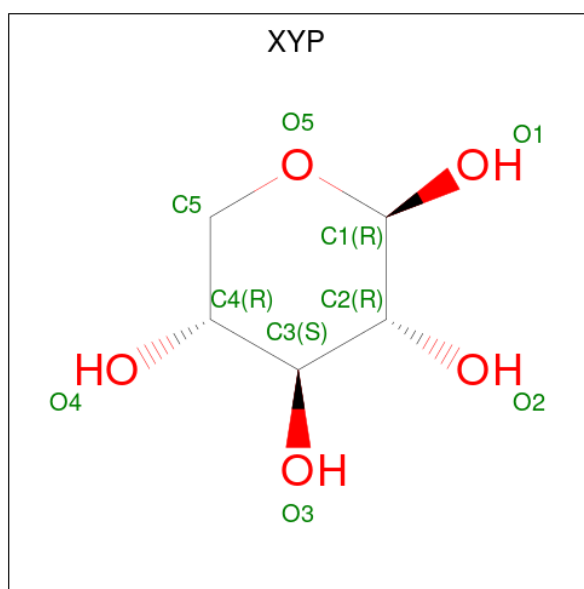
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
3	D	2	Total	C	O	0	0	0
			19	10	9			
3	H	2	Total	C	O	0	0	0
			19	10	9			

- Molecule 4 is an oligosaccharide called beta-D-xylopyranose-(1-4)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose.



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
4	F	3	Total	C	O	0	0	0
			28	15	13			

- Molecule 5 is beta-D-xylopyranose (CCD ID: XYP) (formula: C₅H₁₀O₅).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total	C	O	0	0
			10	5	5		
5	B	1	Total	C	O	0	0
			10	5	5		

- Molecule 6 is water.

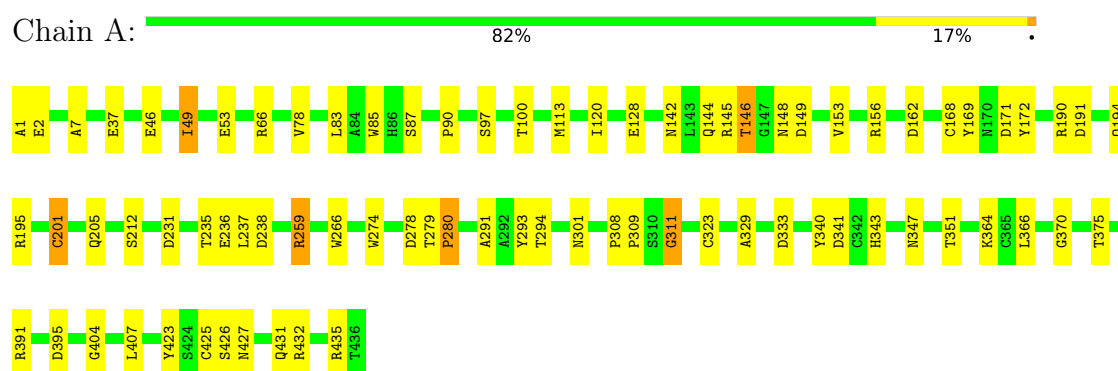
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	360	Total	O	0	0
			360	360		
6	B	383	Total	O	0	0
			383	383		

3 Residue-property plots

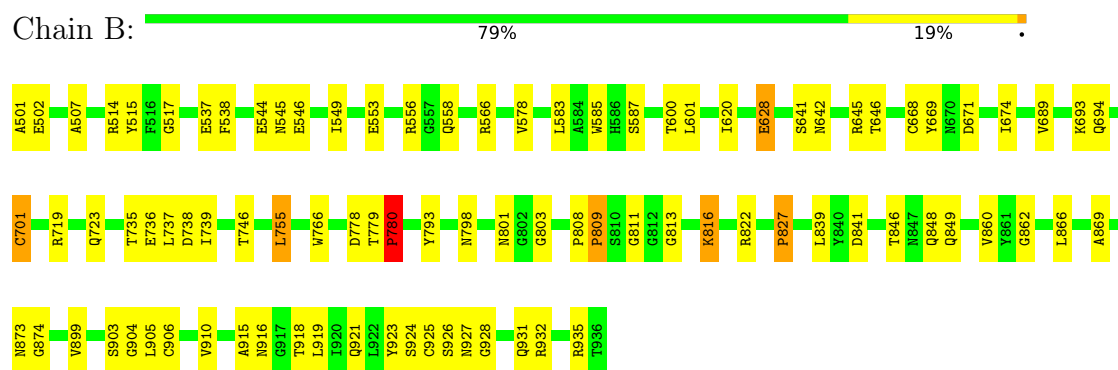
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded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

Note EDS was not executed.

• Molecule 1: ENDO-1,4-BETA-D-XYLANASE



• Molecule 1: ENDO-1,4-BETA-D-XYLANASE



• Molecule 2: 4-O-methyl-alpha-D-glucopyranuronic acid-(1-2)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose



• Molecule 2: 4-O-methyl-alpha-D-glucopyranuronic acid-(1-2)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose

Chain E:  50% 50%


XYP1
XYP2
XYP3
GCV4

- Molecule 2: 4-O-methyl-alpha-D-glucopyranuronic acid-(1-2)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose

Chain G:  25% 75%


XYP1
XYP2
XYP3
GCV4

- Molecule 3: beta-D-xylopyranose-(1-4)-beta-D-xylopyranose

Chain D:  50% 50%

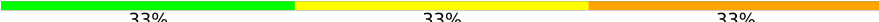

XYP1
XYP2

- Molecule 3: beta-D-xylopyranose-(1-4)-beta-D-xylopyranose

Chain H:  50% 50%


XYP3
XYP2

- Molecule 4: beta-D-xylopyranose-(1-4)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose

Chain F:  33% 33% 33%


XYP1
XYP2
XYP3

4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	74.54Å 94.24Å 137.43Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.62 – 2.10	Depositor
% Data completeness (in resolution range)	98.8 (29.62-2.10)	Depositor
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.194 , 0.235	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	7528	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

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: XYP, GCV

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	0.36	0/3356	0.94	19/4556 (0.4%)
1	B	0.36	0/3356	0.93	15/4556 (0.3%)
All	All	0.36	0/6712	0.94	34/9112 (0.4%)

There are no bond length outliers.

The worst 5 of 34 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	583	LEU	N-CA-C	9.37	123.21	111.69
1	A	83	LEU	N-CA-C	8.32	121.92	111.69
1	B	735	THR	N-CA-C	8.32	123.79	112.90
1	B	553	GLU	CA-C-N	7.56	127.94	119.32
1	B	553	GLU	C-N-CA	7.56	127.94	119.32

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	3288	0	3093	46	0
1	B	3288	0	3090	62	0
2	C	41	0	9	1	0
2	E	41	0	9	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	G	41	0	9	2	0
3	D	19	0	0	0	0
3	H	19	0	0	1	0
4	F	28	0	0	1	0
5	B	20	0	0	0	0
6	A	360	0	0	5	0
6	B	383	0	0	6	0
All	All	7528	0	6210	109	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 8.

The worst 5 of 109 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:1:ALA:HB1	1:A:7:ALA:HB1	1.50	0.93
1:B:798:ASN:HB3	6:B:1331:HOH:O	1.76	0.83
1:A:311:GLY:HA2	1:A:351:THR:HG23	1.64	0.79
1:A:142:ASN:HA	1:A:145:ARG:NH1	2.00	0.75
1:B:873:ASN:ND2	1:B:924:SER:H	1.86	0.74

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	434/436 (100%)	414 (95%)	19 (4%)	1 (0%)	43	44
1	B	434/436 (100%)	410 (94%)	20 (5%)	4 (1%)	14	10
All	All	868/872 (100%)	824 (95%)	39 (4%)	5 (1%)	21	18

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	811	GLY
1	B	927	ASN
1	A	311	GLY
1	B	809	PRO
1	B	827	PRO

5.3.2 Protein sidechains ⓘ

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	341/341 (100%)	338 (99%)	3 (1%)	70	78
1	B	341/341 (100%)	335 (98%)	6 (2%)	51	60
All	All	682/682 (100%)	673 (99%)	9 (1%)	61	69

5 of 9 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	816	LYS
1	B	827	PRO
1	B	601	LEU
1	B	701	CYS
1	B	755	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	893	ASN
1	B	921	GLN
1	B	673	ASN
1	B	814	GLN
1	B	849	GLN

5.3.3 RNA ⓘ

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 ⓘ

19 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	XYP	C	1	2	10,10,10	0.44	0	14,14,14	0.64	0
2	XYP	C	2	2	9,9,10	0.49	0	10,12,14	0.95	1 (10%)
2	XYP	C	3	2	9,9,10	0.59	0	10,12,14	0.89	1 (10%)
2	GCV	C	4	2	13,13,14	0.80	0	14,18,20	0.72	0
3	XYP	D	1	3	10,10,10	0.55	0	14,14,14	0.61	0
3	XYP	D	2	3	9,9,10	0.65	0	10,12,14	0.90	1 (10%)
2	XYP	E	1	2	10,10,10	0.56	0	14,14,14	0.65	0
2	XYP	E	2	2	9,9,10	0.55	0	10,12,14	0.86	1 (10%)
2	XYP	E	3	2	9,9,10	0.72	0	10,12,14	0.96	1 (10%)
2	GCV	E	4	2	13,13,14	0.78	0	14,18,20	0.71	0
4	XYP	F	1	4	10,10,10	0.56	0	14,14,14	0.64	0
4	XYP	F	2	4	9,9,10	0.64	0	10,12,14	0.92	1 (10%)
4	XYP	F	3	4	9,9,10	0.70	0	10,12,14	0.90	1 (10%)
2	XYP	G	1	2	10,10,10	0.40	0	14,14,14	0.66	0
2	XYP	G	2	2	9,9,10	0.49	0	10,12,14	1.05	1 (10%)
2	XYP	G	3	2	9,9,10	0.69	0	10,12,14	0.94	1 (10%)
2	GCV	G	4	2	13,13,14	0.80	0	14,18,20	0.76	0
3	XYP	H	1	3	10,10,10	0.53	0	14,14,14	0.62	0
3	XYP	H	2	3	9,9,10	0.62	0	10,12,14	0.88	1 (10%)

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	XYP	C	1	2	-	-	0/1/1/1
2	XYP	C	2	2	-	-	0/1/1/1
2	XYP	C	3	2	-	-	0/1/1/1
2	GCV	C	4	2	-	1/6/23/26	0/1/1/1
3	XYP	D	1	3	-	-	0/1/1/1
3	XYP	D	2	3	-	-	0/1/1/1
2	XYP	E	1	2	-	-	0/1/1/1
2	XYP	E	2	2	-	-	0/1/1/1
2	XYP	E	3	2	-	-	0/1/1/1
2	GCV	E	4	2	-	0/6/23/26	0/1/1/1
4	XYP	F	1	4	-	-	0/1/1/1
4	XYP	F	2	4	-	-	0/1/1/1
4	XYP	F	3	4	-	-	0/1/1/1
2	XYP	G	1	2	-	-	0/1/1/1
2	XYP	G	2	2	-	-	0/1/1/1
2	XYP	G	3	2	-	-	0/1/1/1
2	GCV	G	4	2	-	2/6/23/26	0/1/1/1
3	XYP	H	1	3	-	-	0/1/1/1
3	XYP	H	2	3	-	-	0/1/1/1

There are no bond length outliers.

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	G	2	XYP	C4-C3-C2	-2.97	107.39	110.92
2	E	3	XYP	C4-C3-C2	-2.80	107.60	110.92
4	F	2	XYP	C4-C3-C2	-2.58	107.86	110.92
4	F	3	XYP	C4-C3-C2	-2.58	107.86	110.92
2	G	3	XYP	C4-C3-C2	-2.57	107.87	110.92

There are no chirality outliers.

All (3) torsion outliers are listed below:

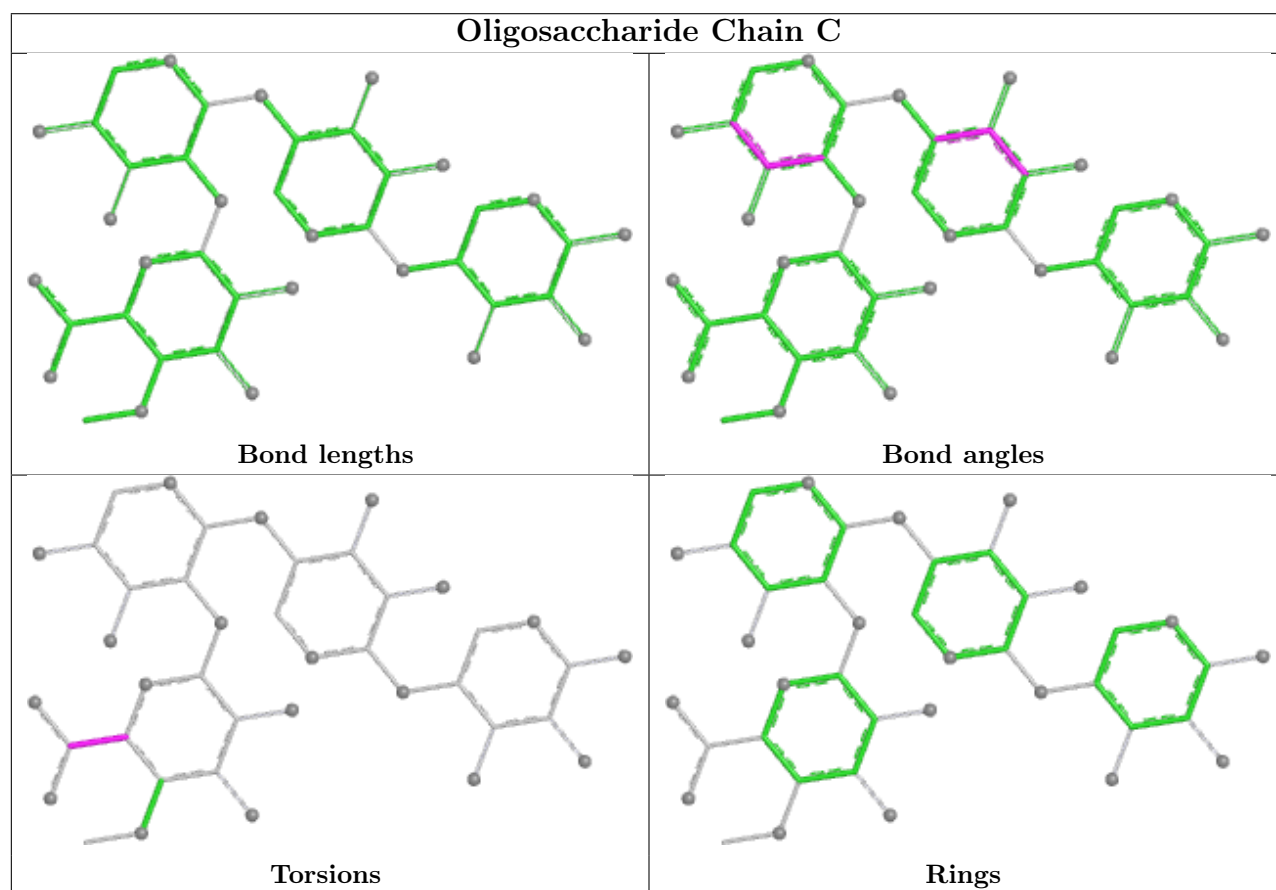
Mol	Chain	Res	Type	Atoms
2	G	4	GCV	C3-C4-O4-C7
2	G	4	GCV	C5-C4-O4-C7
2	C	4	GCV	O5-C5-C6-O6B

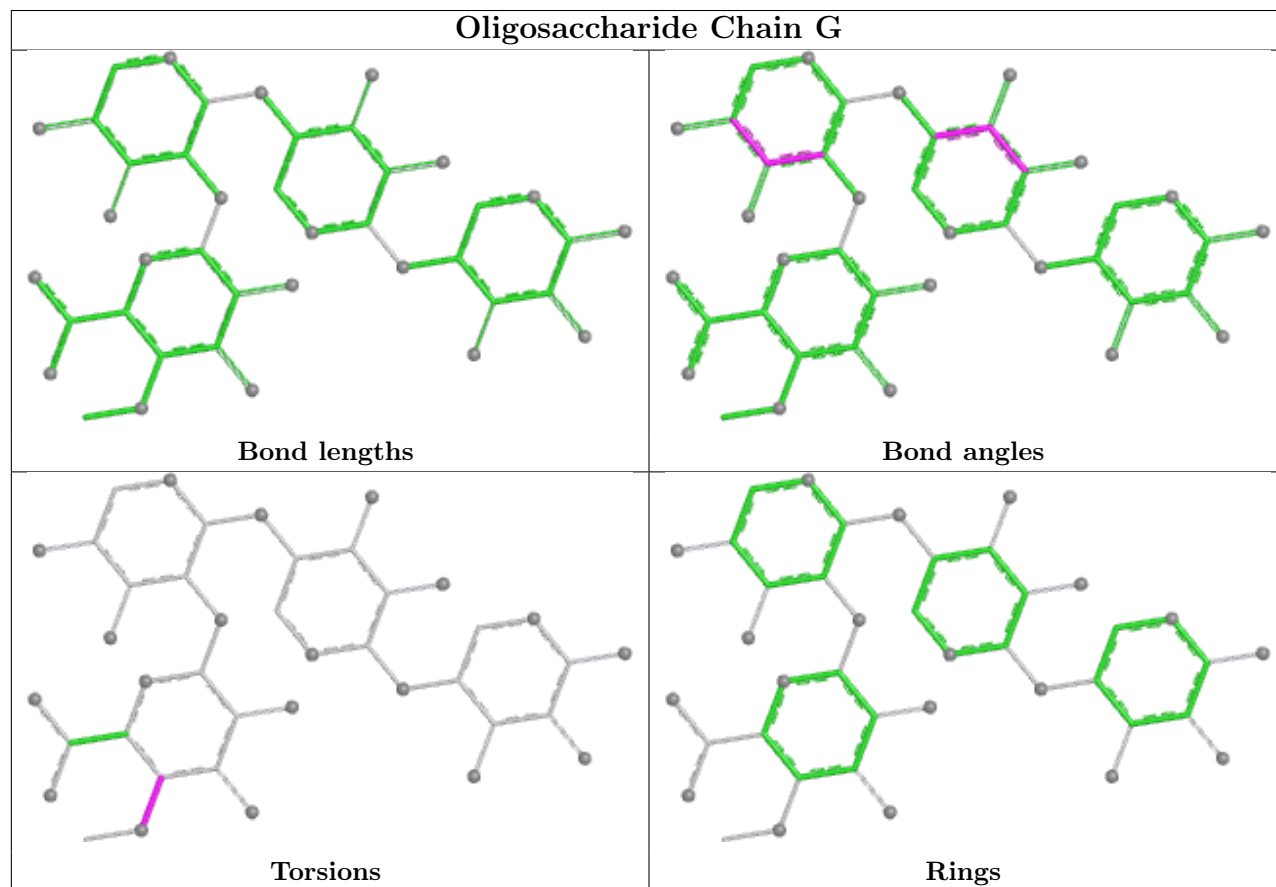
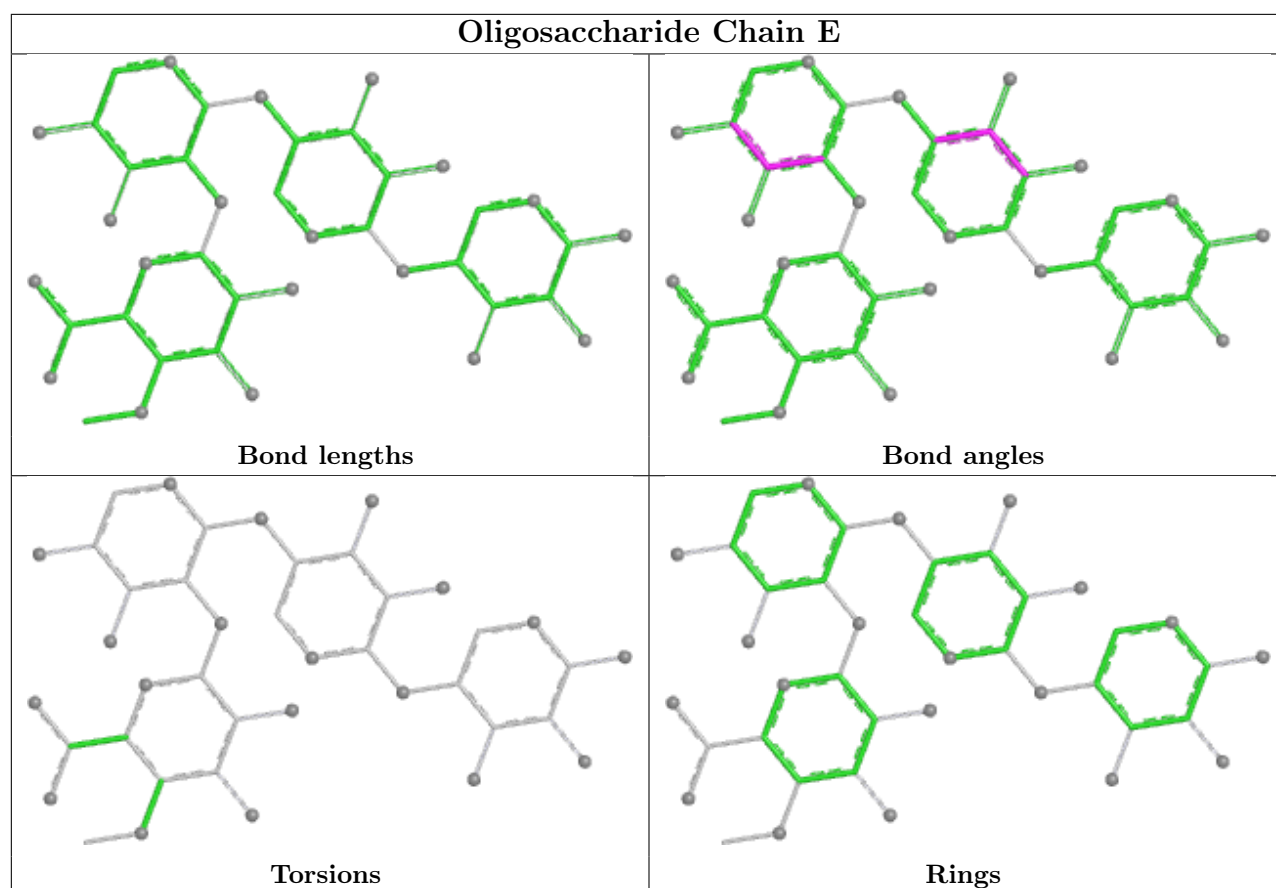
There are no ring outliers.

4 monomers are involved in 4 short contacts:

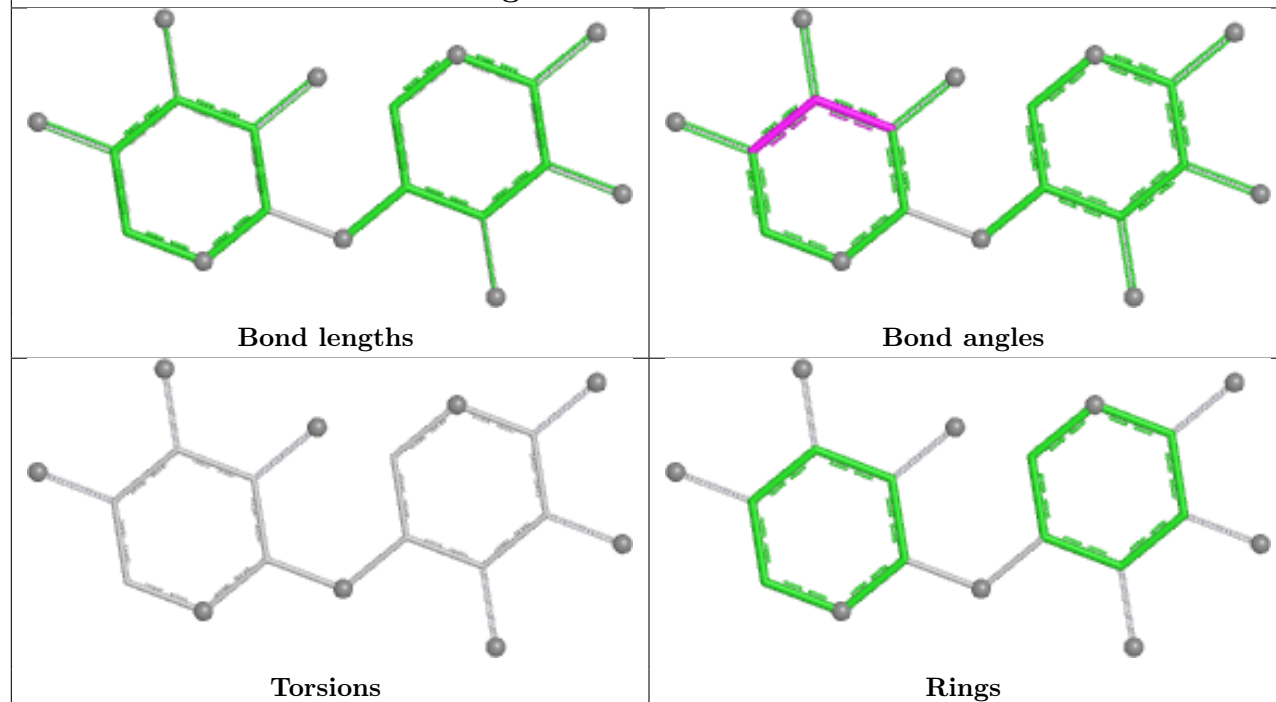
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	1	XYP	1	0
2	G	1	XYP	2	0
4	F	2	XYP	1	0
3	H	2	XYP	1	0

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

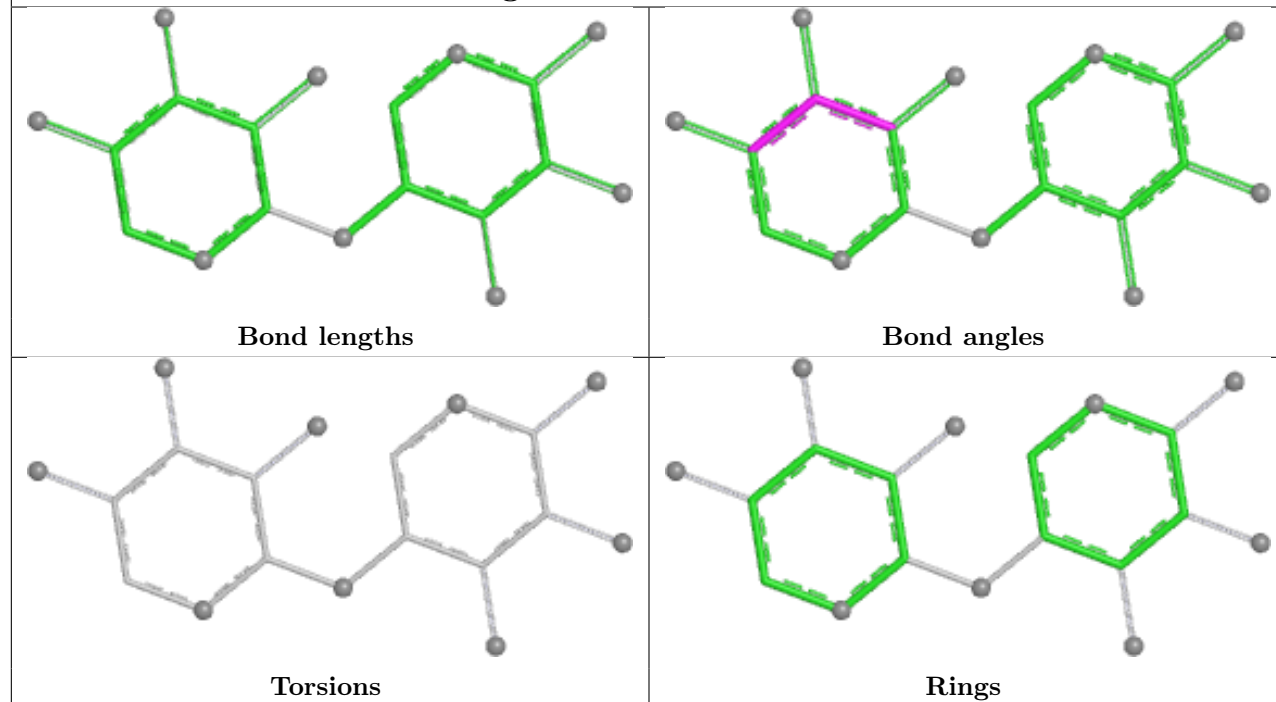


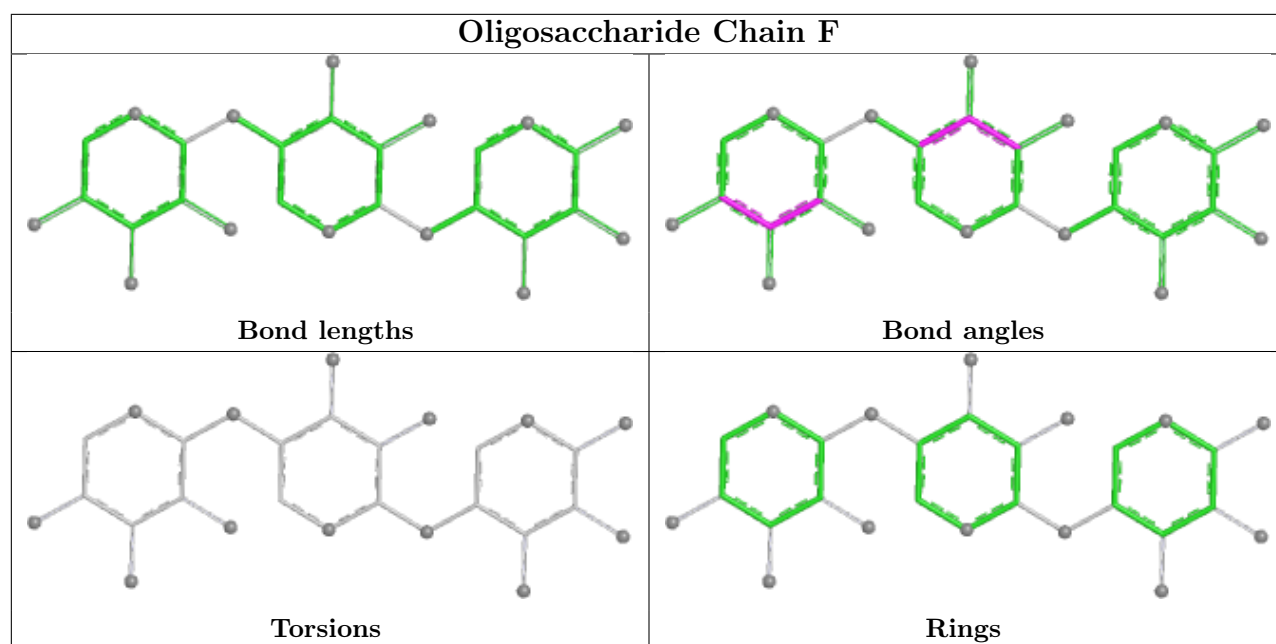


Oligosaccharide Chain D



Oligosaccharide Chain H





5.6 Ligand geometry [i](#)

2 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	XYP	B	971	-	10,10,10	0.51	0	14,14,14	0.63	0
5	XYP	B	961	-	10,10,10	0.52	0	14,14,14	0.61	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	XYP	B	971	-	-	-	0/1/1/1
5	XYP	B	961	-	-	-	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.