



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 11:39 PM UTC

PDB ID : 9C0P / pdb_00009c0p
Title : M. tuberculosis PKS13 acyltransferase (AT) domain in complex with SuFEx inhibitor CEC215
Authors : Krieger, I.V.; Tang, S.; Sacchettini, J.C.; TB Structural Genomics Consortium (TBSGC)
Deposited on : 2024-05-27
Resolution : 1.87 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

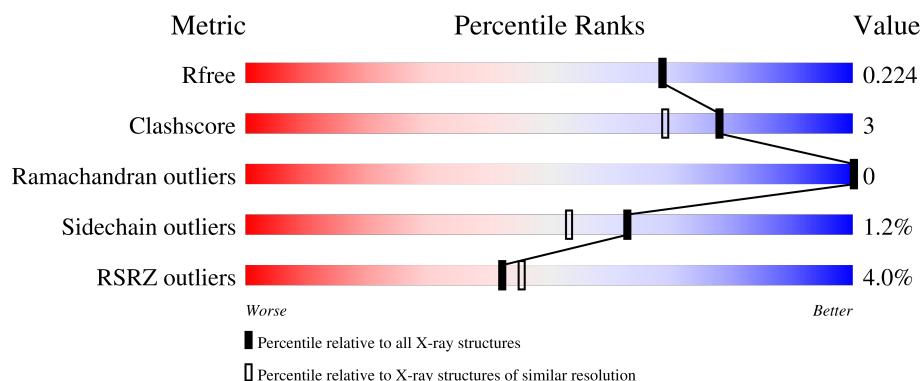
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.87 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	1220 (1.88-1.88)
Clashscore	190562	1234 (1.88-1.88)
Ramachandran outliers	187476	1222 (1.88-1.88)
Sidechain outliers	187428	1222 (1.88-1.88)
RSRZ outliers	180081	1220 (1.88-1.88)

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	512	2% 85% 6% 9%
1	B	512	5% 86% • 9%
2	C	2	50% 50%
2	D	2	50% 50%

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Mol	Chain	Length	Quality of chain
2	E	2	 100%
2	F	2	 50% 50%
2	G	2	 100%
2	H	2	 50% 50%
2	I	2	 50% 50%
2	J	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
5	A1ATV	A	1110	-	X	-	-

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 8013 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 Polyketide synthase Pks13.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	468	Total	C	N	O	S	0	6	0
			3580	2267	619	681	13			
1	B	468	Total	C	N	O	S	0	8	0
			3602	2278	630	682	12			

There are 48 discrepancies between the modelled and reference sequences:

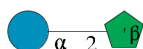
Chain	Residue	Modelled	Actual	Comment	Reference
A	552	MET	-	initiating methionine	UNP I6X8D2
A	553	HIS	-	expression tag	UNP I6X8D2
A	554	HIS	-	expression tag	UNP I6X8D2
A	555	HIS	-	expression tag	UNP I6X8D2
A	556	HIS	-	expression tag	UNP I6X8D2
A	557	HIS	-	expression tag	UNP I6X8D2
A	558	HIS	-	expression tag	UNP I6X8D2
A	559	SER	-	expression tag	UNP I6X8D2
A	560	SER	-	expression tag	UNP I6X8D2
A	561	GLY	-	expression tag	UNP I6X8D2
A	562	VAL	-	expression tag	UNP I6X8D2
A	563	ASP	-	expression tag	UNP I6X8D2
A	564	LEU	-	expression tag	UNP I6X8D2
A	565	GLY	-	expression tag	UNP I6X8D2
A	566	THR	-	expression tag	UNP I6X8D2
A	567	GLU	-	expression tag	UNP I6X8D2
A	568	ASN	-	expression tag	UNP I6X8D2
A	569	LEU	-	expression tag	UNP I6X8D2
A	570	TYR	-	expression tag	UNP I6X8D2
A	571	PHE	-	expression tag	UNP I6X8D2
A	572	GLN	-	expression tag	UNP I6X8D2
A	573	SER	-	expression tag	UNP I6X8D2
A	574	ASN	-	expression tag	UNP I6X8D2
A	575	ALA	-	expression tag	UNP I6X8D2
B	552	MET	-	initiating methionine	UNP I6X8D2

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Chain	Residue	Modelled	Actual	Comment	Reference
B	553	HIS	-	expression tag	UNP I6X8D2
B	554	HIS	-	expression tag	UNP I6X8D2
B	555	HIS	-	expression tag	UNP I6X8D2
B	556	HIS	-	expression tag	UNP I6X8D2
B	557	HIS	-	expression tag	UNP I6X8D2
B	558	HIS	-	expression tag	UNP I6X8D2
B	559	SER	-	expression tag	UNP I6X8D2
B	560	SER	-	expression tag	UNP I6X8D2
B	561	GLY	-	expression tag	UNP I6X8D2
B	562	VAL	-	expression tag	UNP I6X8D2
B	563	ASP	-	expression tag	UNP I6X8D2
B	564	LEU	-	expression tag	UNP I6X8D2
B	565	GLY	-	expression tag	UNP I6X8D2
B	566	THR	-	expression tag	UNP I6X8D2
B	567	GLU	-	expression tag	UNP I6X8D2
B	568	ASN	-	expression tag	UNP I6X8D2
B	569	LEU	-	expression tag	UNP I6X8D2
B	570	TYR	-	expression tag	UNP I6X8D2
B	571	PHE	-	expression tag	UNP I6X8D2
B	572	GLN	-	expression tag	UNP I6X8D2
B	573	SER	-	expression tag	UNP I6X8D2
B	574	ASN	-	expression tag	UNP I6X8D2
B	575	ALA	-	expression tag	UNP I6X8D2

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



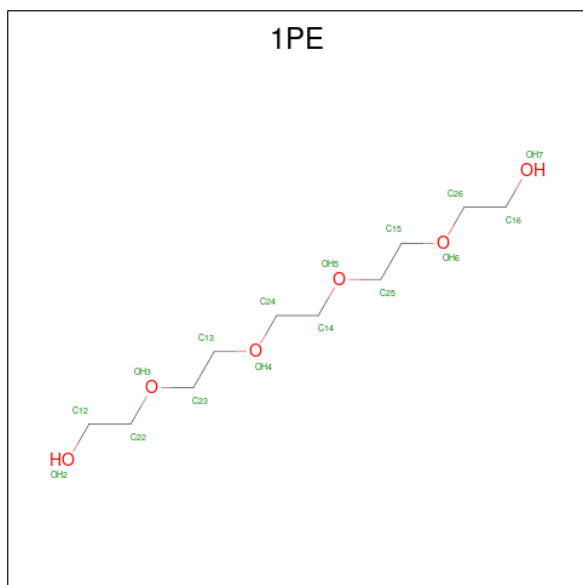
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	C	2	Total	C	O	0	0	0
			23	12	11			
2	D	2	Total	C	O	0	0	0
			23	12	11			
2	E	2	Total	C	O	0	0	0
			23	12	11			
2	F	2	Total	C	O	0	0	0
			23	12	11			
2	G	2	Total	C	O	0	0	0
			23	12	11			

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	H	2	Total	C	O	0	0	0
			23	12	11			
2	I	2	Total	C	O	0	0	0
			23	12	11			
2	J	2	Total	C	O	0	0	0
			23	12	11			

- Molecule 3 is PENTAETHYLENE GLYCOL (CCD ID: 1PE) (formula: $C_{10}H_{22}O_6$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			16	10	6		
3	A	1	Total	C	O	0	0
			16	10	6		
3	A	1	Total	C	O	0	0
			13	8	5		
3	A	1	Total	C	O	0	0
			7	4	3		
3	A	1	Total	C	O	0	0
			7	4	3		
3	A	1	Total	C	O	0	0
			7	4	3		
3	B	1	Total	C	O	0	0
			7	4	3		
3	B	1	Total	C	O	0	0
			10	6	4		

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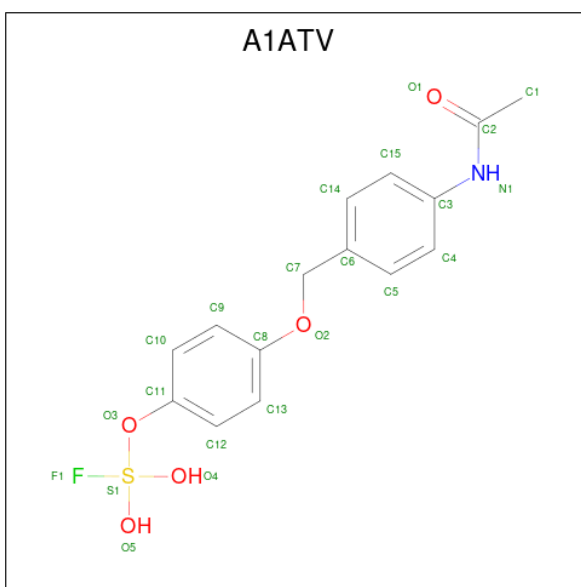
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total	C	O	0	0
			10	6	4		

- Molecule 4 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

- Molecule 5 is N-{4-[(4-{[fluorodi(hydroxy)-lambda 4 -sulfanyl]oxy}phenoxy)methyl]phenyl} acetamide (CCD ID: A1ATV) (formula: C₁₅H₁₆FNO₅S) (labeled as "Ligand of Interest" by depositor).

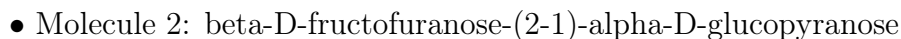
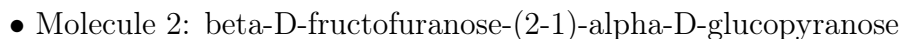


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	S	0	0
			22	15	1	5	1		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	259	Total	O	0	0
			259	259		
6	B	253	Total	O	0	0
			253	253		

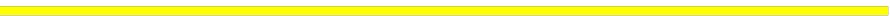
- Molecule 1: Polyketide synthase Pks13



Chain D:  50% 50%

GLC1
FRU2

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

Chain E:  100%

GLC1
FRU2

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

Chain F:  50% 50%

GLC1
FRU2

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

Chain G:  100%

GLC1
FRU2

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

Chain H:  50% 50%

GLC1
FRU2

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

Chain I:  50% 50%

GLC1
FRU2

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

Chain J:  50% 50%

GLC1
FRU2

4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	106.67Å 106.67Å 258.89Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	34.58 – 1.87 34.58 – 1.87	Depositor EDS
% Data completeness (in resolution range)	80.9 (34.58-1.87) 80.9 (34.58-1.87)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.53 (at 1.87Å)	Xtriage
Refinement program	PDB-REDO	Depositor
R, R_{free}	0.172 , 0.198 0.199 , 0.224	Depositor DCC
R_{free} test set	5023 reflections (4.08%)	wwPDB-VP
Wilson B-factor (Å ²)	27.2	Xtriage
Anisotropy	0.181	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 42.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	8013	wwPDB-VP
Average B, all atoms (Å ²)	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.90% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: SO4, 1PE, FRU, GLC, A1ATV

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	0.81	4/3672 (0.1%)	0.89	2/4986 (0.0%)
1	B	0.72	3/3700 (0.1%)	0.89	1/5021 (0.0%)
All	All	0.77	7/7372 (0.1%)	0.89	3/10007 (0.0%)

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	5
1	B	0	5
All	All	0	10

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	801	SER	C-N	26.16	1.70	1.34
1	A	800	GLN	C-N	10.74	1.48	1.33
1	B	635	SER	C-N	-10.04	1.20	1.33
1	B	995	MET	SD-CE	8.82	2.01	1.79
1	A	1029	MET	SD-CE	-6.73	1.62	1.79
1	A	1016	ALA	C-O	-6.46	1.16	1.23
1	B	946	ILE	CG1-CD1	-6.14	1.27	1.51

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	801	SER	O-C-N	-8.01	111.94	122.59
1	B	902	PHE	CA-CB-CG	5.71	119.51	113.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	646	ASP	CA-CB-CG	5.53	118.13	112.60

There are no chirality outliers.

All (10) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1061	ARG	Sidechain
1	A	826	ARG	Sidechain
1	A	891	ARG	Sidechain
1	A	900	ARG	Sidechain
1	A	974	ARG	Sidechain
1	B	1042	ARG	Sidechain
1	B	1047	ARG	Sidechain
1	B	724	ARG	Sidechain
1	B	826	ARG	Sidechain
1	B	900	ARG	Sidechain

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	3580	0	3570	22	0
1	B	3602	0	3605	20	0
2	C	23	0	21	0	0
2	D	23	0	21	0	0
2	E	23	0	21	0	0
2	F	23	0	21	0	0
2	G	23	0	21	0	0
2	H	23	0	21	0	0
2	I	23	0	21	0	0
2	J	23	0	21	0	0
3	A	66	0	88	4	0
3	B	27	0	35	5	0
4	A	15	0	0	0	0
4	B	5	0	0	0	0
5	A	22	0	0	1	0
6	A	259	0	0	5	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	253	0	0	4	0
All	All	8013	0	7466	42	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 3.

All (42) 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:801:SER:C	1:A:802:LEU:N	1.70	1.49
1:B:995:MET:CE	1:B:995:MET:SD	2.01	1.45
1:A:826:ARG:NH1	5:A:1110:A1ATV:O5	2.08	0.86
1:A:801:SER:C	1:A:802:LEU:CA	2.63	0.70
1:B:723:HIS:HD2	6:B:1385:HOH:O	1.81	0.63
1:A:992[A]:VAL:HG23	6:A:1373:HOH:O	1.99	0.62
1:B:1042:ARG:NH1	6:B:1201:HOH:O	2.28	0.58
1:A:674:ARG:HD2	3:A:1102:1PE:H162	1.87	0.56
1:B:801:SER:HA	3:B:1101:1PE:C12	2.36	0.56
1:A:801:SER:OG	1:A:909:HIS:HE1	1.90	0.55
1:A:828:HIS:HE1	1:A:923:GLU:OE1	1.91	0.54
1:A:913:MET:HE1	3:A:1101:1PE:H142	1.93	0.51
1:B:668[B]:ARG:HG3	1:B:668[B]:ARG:HH11	1.77	0.50
1:A:974:ARG:NH2	1:A:1003:ASP:OD2	2.45	0.49
1:A:676:VAL:HG23	1:A:1034:VAL:CG2	2.43	0.49
1:B:889:LEU:HD22	1:B:899:ALA:HB1	1.93	0.49
1:A:707:PRO:HB3	3:A:1102:1PE:H161	1.93	0.49
1:B:801:SER:HA	3:B:1101:1PE:H122	1.95	0.47
1:A:789:HIS:ND1	6:A:1201:HOH:O	2.36	0.47
1:B:769:ILE:HD11	1:B:904:THR:HA	1.98	0.46
1:A:1018:LYS:HD3	1:A:1018:LYS:HA	1.48	0.46
1:A:844:LEU:HD13	1:A:901:LYS:HD3	1.98	0.46
1:A:723:HIS:HD2	6:A:1353:HOH:O	1.97	0.46
1:B:801:SER:HA	3:B:1101:1PE:H121	1.98	0.46
1:A:823:ILE:HD12	1:A:826:ARG:HD2	1.98	0.45
1:A:913:MET:HE1	3:A:1101:1PE:C14	2.47	0.45
1:B:769:ILE:HD13	1:B:902:PHE:CE1	2.51	0.45
1:A:596:GLU:N	6:A:1206:HOH:O	2.51	0.44
1:B:915:PRO:CG	3:B:1102:1PE:H121	2.48	0.44
1:B:891:ARG:HG2	1:B:891:ARG:HH11	1.83	0.43
1:A:992[A]:VAL:CG2	6:A:1373:HOH:O	2.63	0.43
1:B:836:MET:HG2	3:B:1102:1PE:H221	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:849:GLU:HB3	1:A:897:LYS:HB3	2.00	0.43
1:B:946:ILE:HD13	1:B:953:ILE:HD13	2.01	0.43
1:B:801:SER:HB3	6:B:1354:HOH:O	2.19	0.43
1:B:995:MET:CE	1:B:995:MET:CG	2.94	0.42
1:A:942:GLU:HA	1:A:968:TYR:CG	2.56	0.41
1:A:636:ARG:HG2	1:A:636:ARG:HH11	1.86	0.41
1:B:849:GLU:HB3	1:B:897:LYS:HB3	2.03	0.41
1:B:686:ILE:O	1:B:690:ARG:HG2	2.20	0.41
1:B:826:ARG:NH2	6:B:1212:HOH:O	2.47	0.40
1:B:891:ARG:NH1	1:B:891:ARG:CG	2.85	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 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	472/512 (92%)	463 (98%)	9 (2%)	0	100	100
1	B	474/512 (93%)	466 (98%)	8 (2%)	0	100	100
All	All	946/1024 (92%)	929 (98%)	17 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	373/406 (92%)	370 (99%)	3 (1%)	73	68
1	B	375/406 (92%)	369 (98%)	6 (2%)	55	43
All	All	748/812 (92%)	739 (99%)	9 (1%)	63	53

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

Mol	Chain	Res	Type
1	A	793	LYS
1	A	1018	LYS
1	A	1039	LEU
1	B	649	GLN
1	B	828	HIS
1	B	857	GLU
1	B	889	LEU
1	B	891	ARG
1	B	1039	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	723	HIS
1	A	765	GLN
1	A	780	GLN
1	A	800	GLN
1	A	828	HIS
1	A	909	HIS
1	A	996	GLN
1	A	1010	GLN
1	B	723	HIS
1	B	780	GLN
1	B	996	GLN
1	B	1010	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 ⓘ

16 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	C	1	2	11,11,12	0.58	0	15,15,17	0.94	2 (13%)
2	FRU	C	2	2	11,12,12	0.40	0	10,18,18	0.65	0
2	GLC	D	1	2	11,11,12	0.53	0	15,15,17	1.15	2 (13%)
2	FRU	D	2	2	11,12,12	0.48	0	10,18,18	0.61	0
2	GLC	E	1	2	11,11,12	1.28	2 (18%)	15,15,17	0.98	1 (6%)
2	FRU	E	2	2	11,12,12	0.55	0	10,18,18	1.10	1 (10%)
2	GLC	F	1	2	11,11,12	0.63	0	15,15,17	1.00	2 (13%)
2	FRU	F	2	2	11,12,12	0.41	0	10,18,18	0.68	0
2	GLC	G	1	2	11,11,12	0.57	0	15,15,17	0.66	0
2	FRU	G	2	2	11,12,12	0.45	0	10,18,18	0.92	0
2	GLC	H	1	2	11,11,12	0.72	1 (9%)	15,15,17	0.78	1 (6%)
2	FRU	H	2	2	11,12,12	0.44	0	10,18,18	0.45	0
2	GLC	I	1	2	11,11,12	0.64	0	15,15,17	0.96	1 (6%)
2	FRU	I	2	2	11,12,12	0.40	0	10,18,18	0.62	0
2	GLC	J	1	2	11,11,12	0.64	0	15,15,17	1.09	2 (13%)
2	FRU	J	2	2	11,12,12	0.46	0	10,18,18	0.74	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	C	1	2	-	0/2/19/22	0/1/1/1
2	FRU	C	2	2	-	2/5/24/24	0/1/1/1
2	GLC	D	1	2	-	0/2/19/22	0/1/1/1
2	FRU	D	2	2	-	0/5/24/24	0/1/1/1
2	GLC	E	1	2	-	1/2/19/22	0/1/1/1
2	FRU	E	2	2	-	0/5/24/24	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	GLC	F	1	2	-	0/2/19/22	0/1/1/1
2	FRU	F	2	2	-	0/5/24/24	0/1/1/1
2	GLC	G	1	2	-	2/2/19/22	0/1/1/1
2	FRU	G	2	2	-	0/5/24/24	0/1/1/1
2	GLC	H	1	2	-	0/2/19/22	0/1/1/1
2	FRU	H	2	2	-	0/5/24/24	0/1/1/1
2	GLC	I	1	2	-	0/2/19/22	0/1/1/1
2	FRU	I	2	2	-	0/5/24/24	0/1/1/1
2	GLC	J	1	2	-	1/2/19/22	0/1/1/1
2	FRU	J	2	2	-	0/5/24/24	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	1	GLC	O5-C5	2.85	1.49	1.43
2	E	1	GLC	C2-C3	2.52	1.56	1.52
2	H	1	GLC	O5-C5	2.03	1.47	1.43

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	J	1	GLC	C1-O5-C5	3.09	116.33	112.19
2	D	1	GLC	C1-O5-C5	3.03	116.25	112.19
2	I	1	GLC	C1-O5-C5	2.71	115.82	112.19
2	E	1	GLC	C1-O5-C5	2.45	115.46	112.19
2	E	2	FRU	O1-C1-C2	2.34	116.86	111.67
2	H	1	GLC	C1-O5-C5	2.28	115.24	112.19
2	F	1	GLC	C1-O5-C5	2.26	115.22	112.19
2	F	1	GLC	C1-C2-C3	2.23	112.88	109.64
2	J	1	GLC	C1-C2-C3	2.15	112.78	109.64
2	C	1	GLC	C1-O5-C5	2.06	114.94	112.19
2	D	1	GLC	C1-C2-C3	2.03	112.60	109.64
2	C	1	GLC	O3-C3-C2	-2.03	105.92	110.05

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	2	FRU	C4-C5-C6-O6
2	C	2	FRU	O5-C5-C6-O6
2	G	1	GLC	O5-C5-C6-O6

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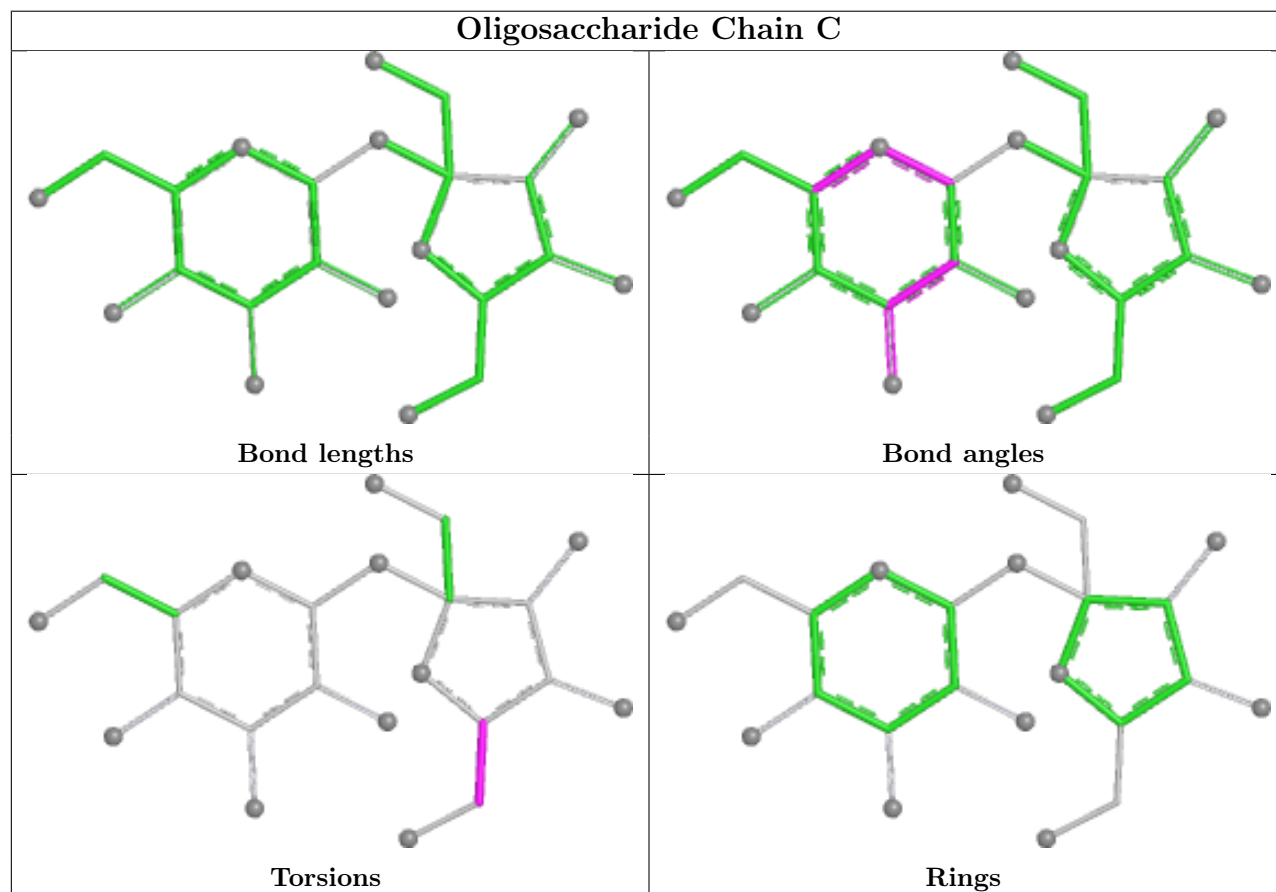
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Mol	Chain	Res	Type	Atoms
2	J	1	GLC	C4-C5-C6-O6
2	G	1	GLC	C4-C5-C6-O6
2	E	1	GLC	C4-C5-C6-O6

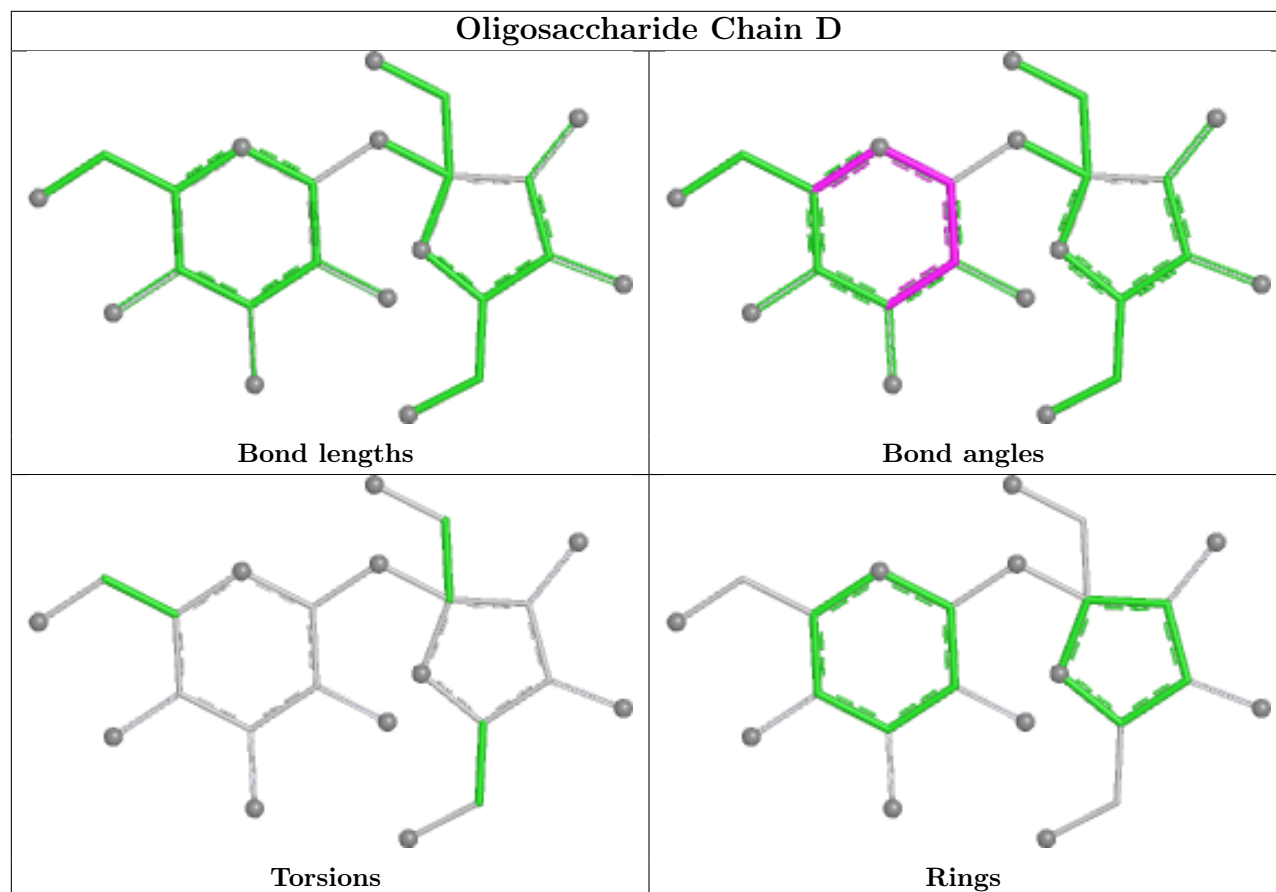
There are no ring outliers.

No monomer is involved in short contacts.

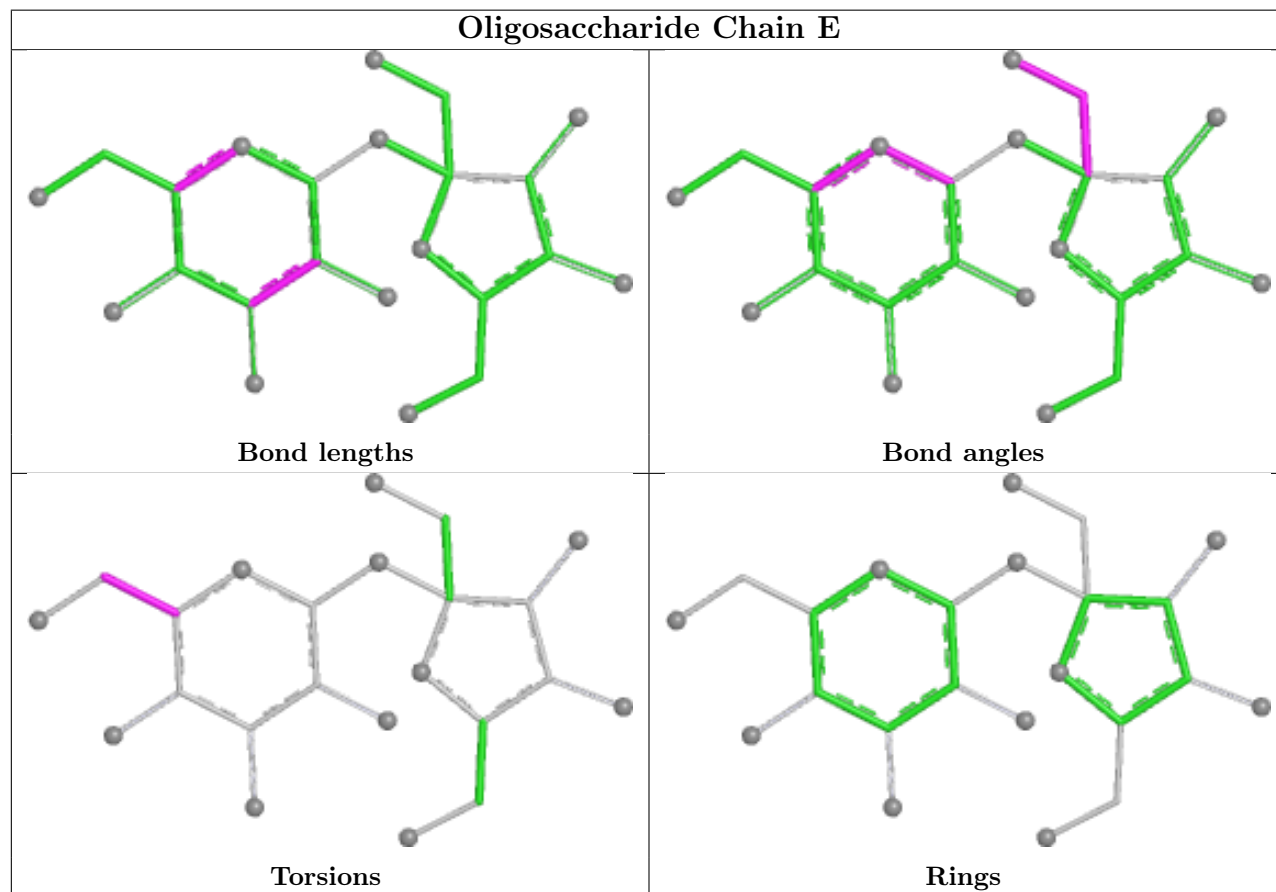
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.



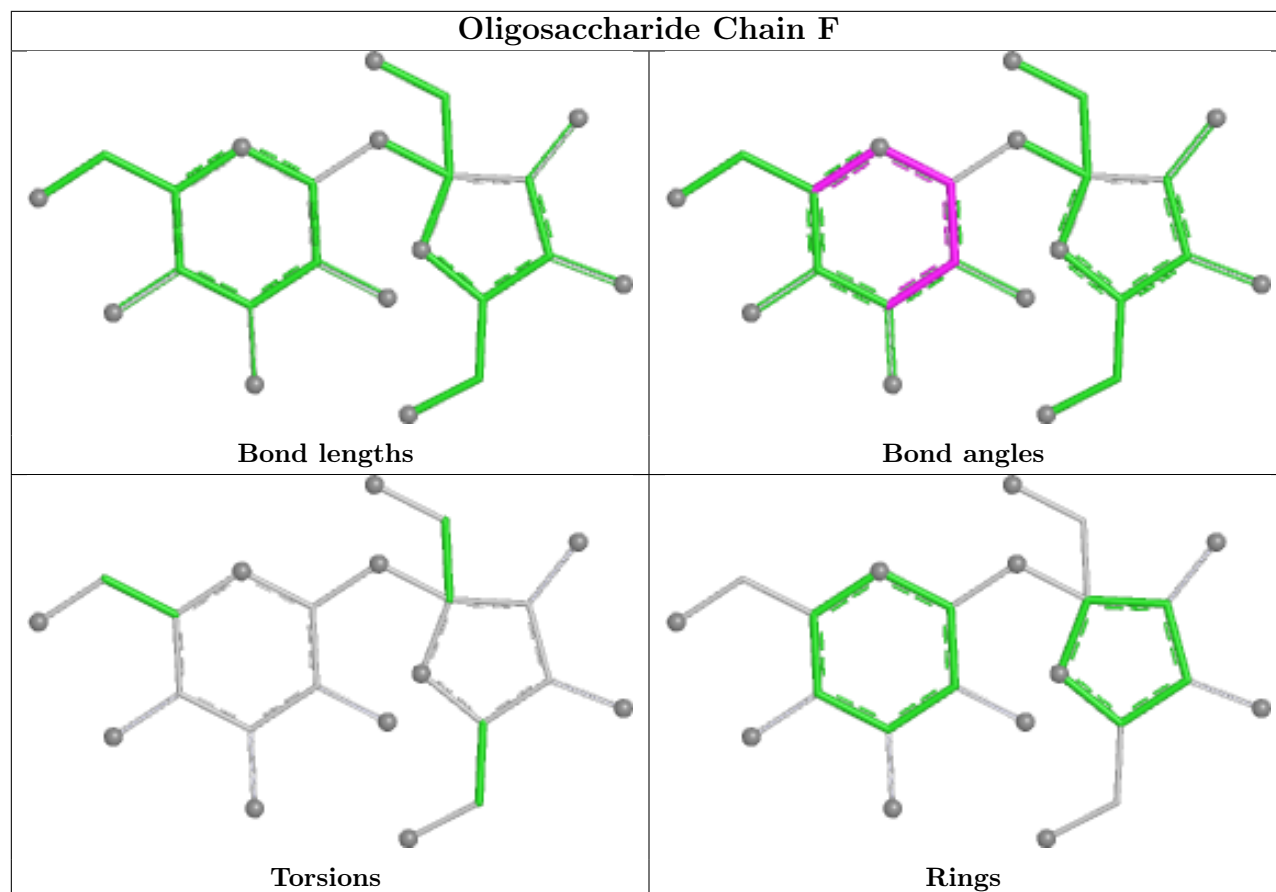
Oligosaccharide Chain D



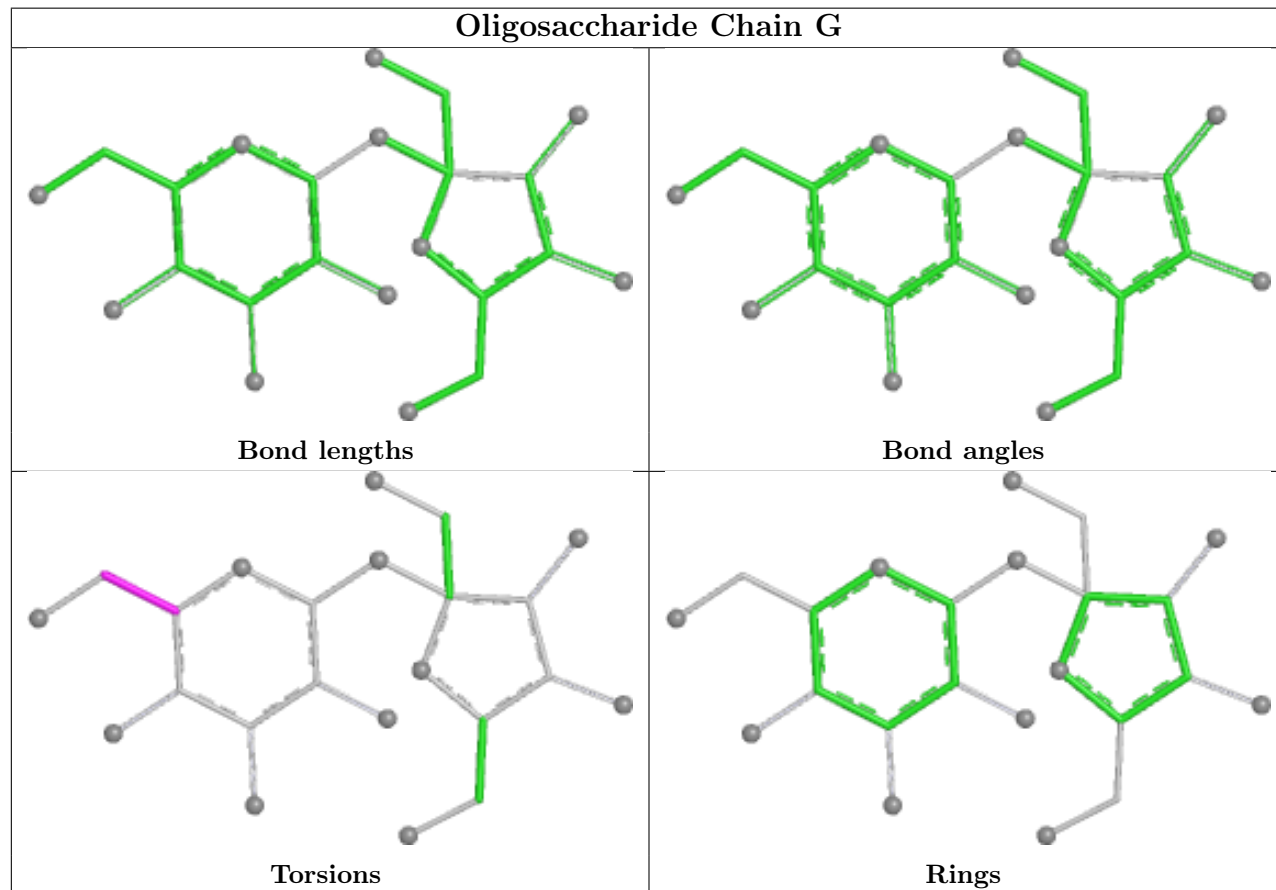
Oligosaccharide Chain E



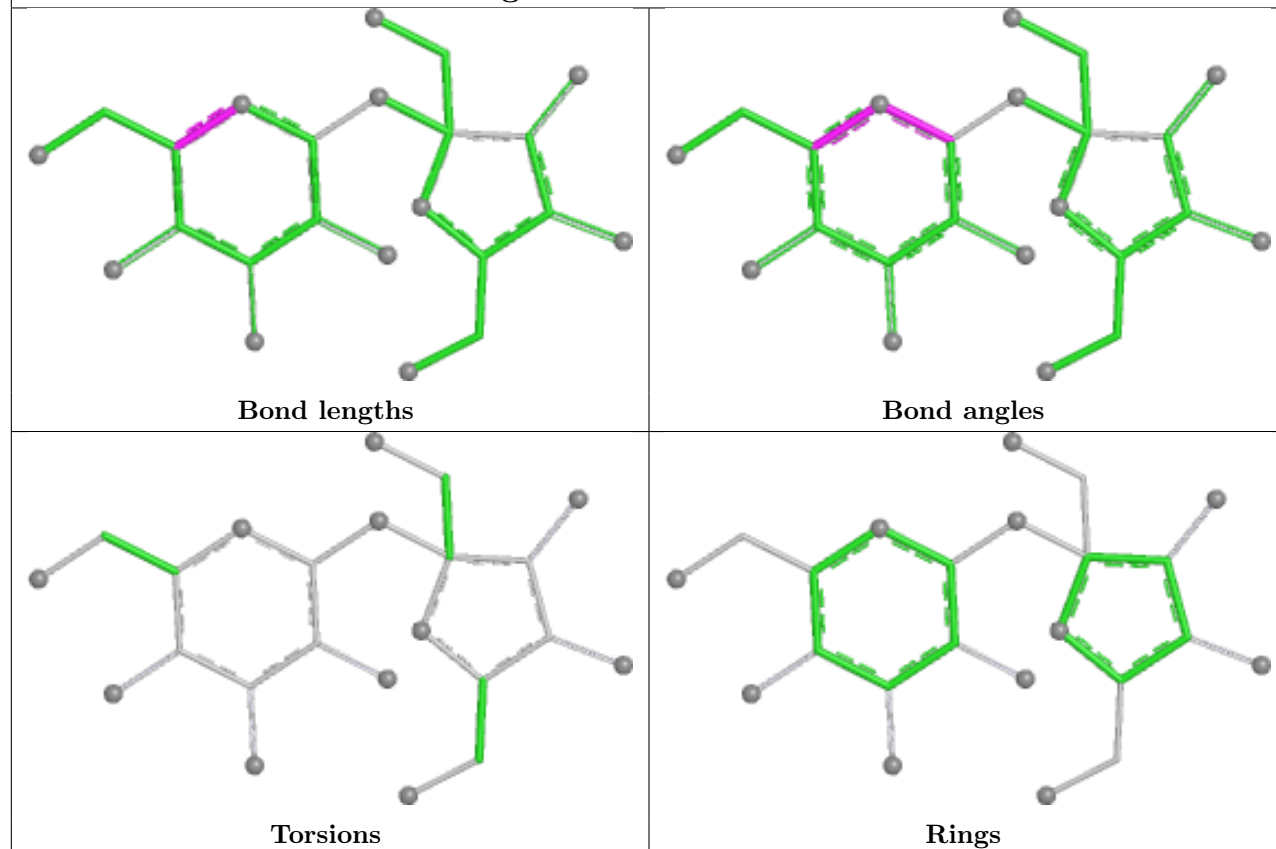
Oligosaccharide Chain F



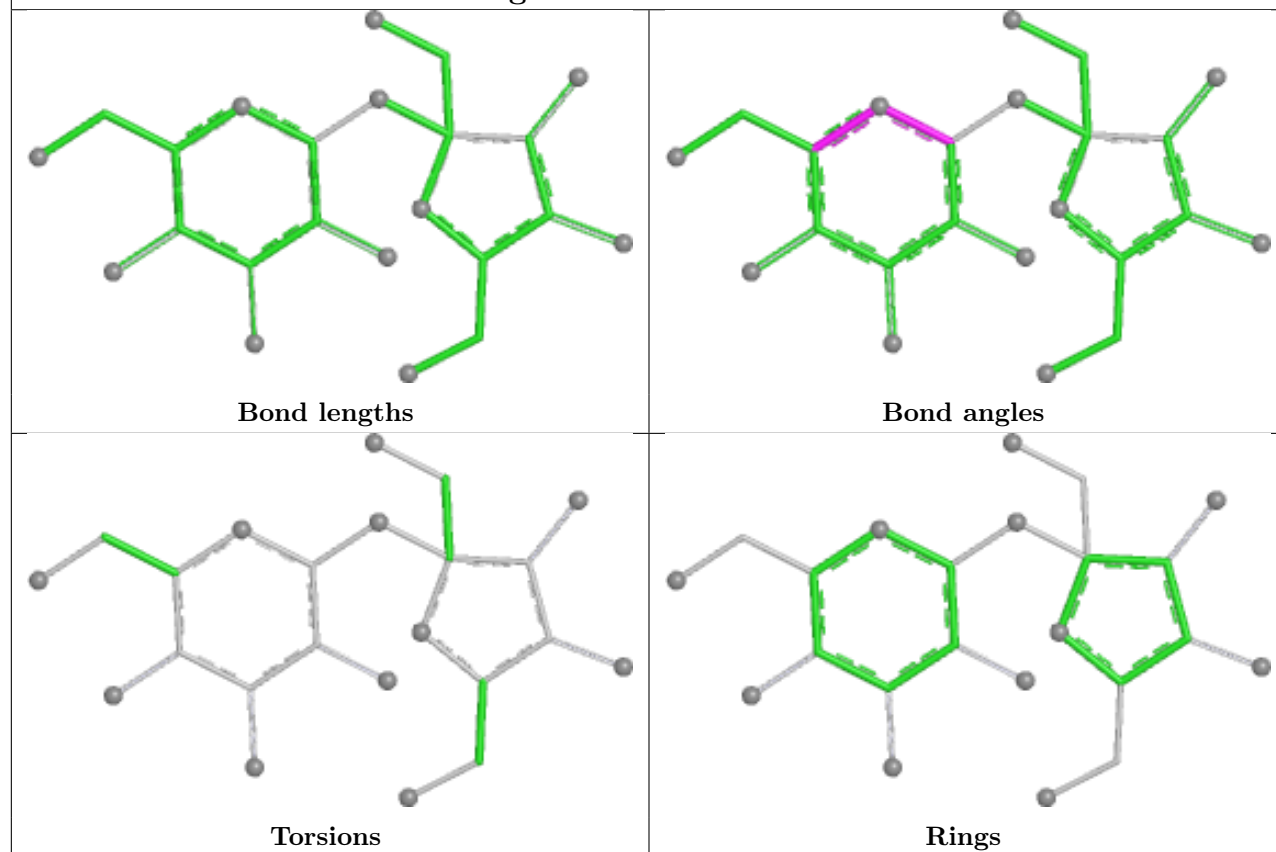
Oligosaccharide Chain G

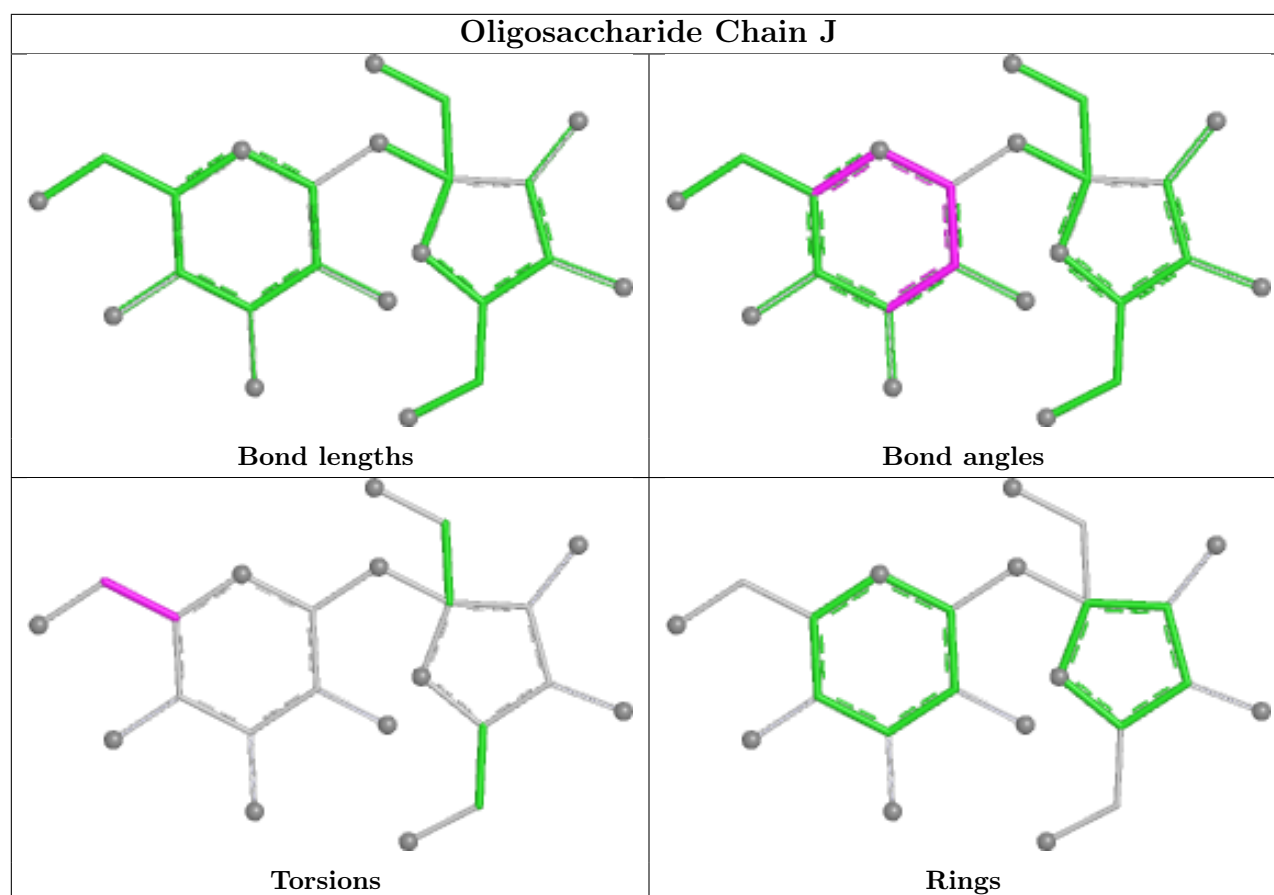


Oligosaccharide Chain H



Oligosaccharide Chain I





5.6 Ligand geometry [i](#)

14 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	$\# Z > 2$
3	1PE	A	1105	-	6,6,15	0.15	0	5,5,14	0.19	0
5	A1ATV	A	1110	1	19,23,24	5.39	14 (73%)	26,30,33	2.35	11 (42%)
4	SO4	A	1108	-	4,4,4	0.33	0	6,6,6	0.12	0
3	1PE	A	1102	-	15,15,15	0.37	0	14,14,14	0.23	0
4	SO4	A	1107	-	4,4,4	0.30	0	6,6,6	0.14	0
3	1PE	A	1104	-	6,6,15	0.20	0	5,5,14	0.21	0
3	1PE	B	1101	-	6,6,15	0.37	0	5,5,14	0.25	0
3	1PE	A	1103	-	12,12,15	0.23	0	11,11,14	0.20	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	1PE	A	1106	-	6,6,15	0.21	0	5,5,14	0.19	0
3	1PE	B	1103	-	9,9,15	0.29	0	8,8,14	0.15	0
3	1PE	A	1101	-	15,15,15	0.32	0	14,14,14	0.22	0
3	1PE	B	1102	-	9,9,15	0.37	0	8,8,14	0.29	0
4	SO4	B	1104	-	4,4,4	0.34	0	6,6,6	0.14	0
4	SO4	A	1109	-	4,4,4	0.31	0	6,6,6	0.11	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	1PE	A	1105	-	-	0/4/4/13	-
5	A1ATV	A	1110	1	-	5/11/13/14	0/2/2/2
3	1PE	A	1102	-	-	5/13/13/13	-
3	1PE	A	1104	-	-	1/4/4/13	-
3	1PE	B	1101	-	-	0/4/4/13	-
3	1PE	A	1103	-	-	7/10/10/13	-
3	1PE	A	1106	-	-	1/4/4/13	-
3	1PE	B	1103	-	-	4/7/7/13	-
3	1PE	A	1101	-	-	5/13/13/13	-
3	1PE	B	1102	-	-	1/7/7/13	-

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	1110	A1ATV	C4-C3	8.91	1.54	1.39
5	A	1110	A1ATV	C15-C14	8.69	1.52	1.38
5	A	1110	A1ATV	C10-C9	8.62	1.52	1.38
5	A	1110	A1ATV	C13-C8	8.49	1.54	1.38
5	A	1110	A1ATV	C5-C6	7.63	1.54	1.38
5	A	1110	A1ATV	C12-C11	7.60	1.53	1.38
5	A	1110	A1ATV	C2-N1	6.33	1.47	1.36
5	A	1110	A1ATV	C9-C8	-4.19	1.30	1.38
5	A	1110	A1ATV	C15-C3	-4.01	1.32	1.39
5	A	1110	A1ATV	C14-C6	-3.91	1.31	1.38
5	A	1110	A1ATV	C5-C4	-3.35	1.33	1.38
5	A	1110	A1ATV	C10-C11	-2.89	1.33	1.38
5	A	1110	A1ATV	C13-C12	-2.73	1.34	1.38
5	A	1110	A1ATV	C3-N1	2.52	1.46	1.41

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	1110	A1ATV	C1-C2-N1	7.05	125.56	114.95
5	A	1110	A1ATV	C9-C10-C11	4.49	124.85	119.73
5	A	1110	A1ATV	O1-C2-N1	-3.91	117.69	123.06
5	A	1110	A1ATV	C12-C11-C10	-3.32	115.32	120.16
5	A	1110	A1ATV	O1-C2-C1	-2.98	116.75	122.05
5	A	1110	A1ATV	C7-O2-C8	2.52	123.61	117.62
5	A	1110	A1ATV	C12-C13-C8	2.43	122.51	119.73
5	A	1110	A1ATV	O3-C11-C12	2.40	123.43	118.70
5	A	1110	A1ATV	C7-C6-C14	-2.20	115.58	120.64
5	A	1110	A1ATV	C7-C6-C5	2.16	125.61	120.64
5	A	1110	A1ATV	C13-C8-C9	-2.15	117.02	120.16

There are no chirality outliers.

All (29) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	1110	A1ATV	C10-C11-O3-S1
5	A	1110	A1ATV	C12-C11-O3-S1
3	B	1103	1PE	OH4-C13-C23-OH3
5	A	1110	A1ATV	C1-C2-N1-C3
3	A	1102	1PE	OH6-C15-C25-OH5
3	A	1103	1PE	OH6-C15-C25-OH5
5	A	1110	A1ATV	O1-C2-N1-C3
3	A	1102	1PE	OH2-C12-C22-OH3
3	A	1103	1PE	OH2-C12-C22-OH3
3	A	1106	1PE	OH2-C12-C22-OH3
3	B	1102	1PE	OH2-C12-C22-OH3
3	A	1102	1PE	OH7-C16-C26-OH6
3	A	1104	1PE	OH6-C15-C25-OH5
3	A	1101	1PE	C23-C13-OH4-C24
3	B	1103	1PE	OH2-C12-C22-OH3
3	A	1102	1PE	C25-C15-OH6-C26
3	A	1103	1PE	C15-C25-OH5-C14
3	A	1103	1PE	C13-C23-OH3-C22
3	B	1103	1PE	C13-C23-OH3-C22
3	A	1101	1PE	C14-C24-OH4-C13
5	A	1110	A1ATV	C6-C7-O2-C8
3	A	1101	1PE	C16-C26-OH6-C15
3	A	1102	1PE	C23-C13-OH4-C24
3	A	1103	1PE	C23-C13-OH4-C24
3	A	1101	1PE	OH5-C14-C24-OH4

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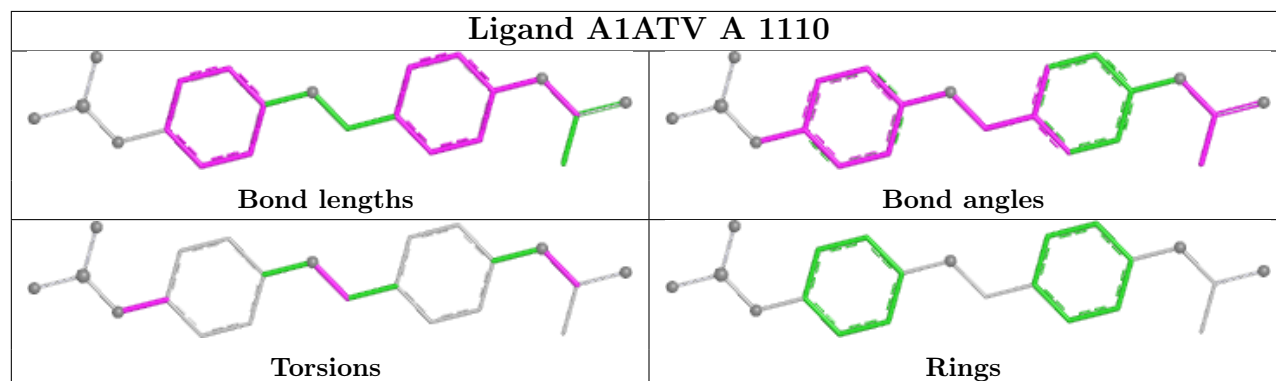
Mol	Chain	Res	Type	Atoms
3	A	1103	1PE	C12-C22-OH3-C23
3	A	1103	1PE	C24-C14-OH5-C25
3	B	1103	1PE	OH5-C14-C24-OH4
3	A	1101	1PE	OH6-C15-C25-OH5

There are no ring outliers.

5 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	1110	A1ATV	1	0
3	A	1102	1PE	2	0
3	B	1101	1PE	3	0
3	A	1101	1PE	2	0
3	B	1102	1PE	2	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

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	A	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	801:SER	C	802:LEU	N	1.70

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	468/512 (91%)	0.02	11 (2%) 59 66	11, 20, 40, 86	6 (1%)
1	B	468/512 (91%)	0.18	26 (5%) 30 32	9, 19, 41, 84	8 (1%)
All	All	936/1024 (91%)	0.10	37 (3%) 42 45	9, 19, 41, 86	14 (1%)

All (37) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	902	PHE	4.6
1	B	894	ALA	4.5
1	A	836[A]	MET	3.4
1	A	620	VAL	3.0
1	B	617	ALA	3.0
1	B	893	GLU	3.0
1	B	616	ALA	2.9
1	B	892	ALA	2.8
1	A	719	PHE	2.8
1	B	856	ARG	2.5
1	B	615	LEU	2.5
1	B	610	ALA	2.5
1	A	841	TYR	2.5
1	B	862	PHE	2.4
1	B	861	ASP	2.4
1	B	891	ARG	2.4
1	B	620	VAL	2.4
1	A	596	GLU	2.3
1	B	896	GLY	2.3
1	B	596	GLU	2.3
1	B	597	LEU	2.3
1	B	1018	LYS	2.3
1	A	699	PRO	2.3
1	B	899	ALA	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	898	PHE	2.2
1	B	951	GLU	2.2
1	A	903	ALA	2.2
1	A	1008	ASP	2.2
1	B	602	GLU	2.2
1	B	888	ILE	2.2
1	B	858	VAL	2.2
1	B	860	SER	2.2
1	B	828	HIS	2.1
1	A	1047	ARG	2.1
1	B	890	ALA	2.1
1	A	1018	LYS	2.1
1	A	636	ARG	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 ⓘ

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.

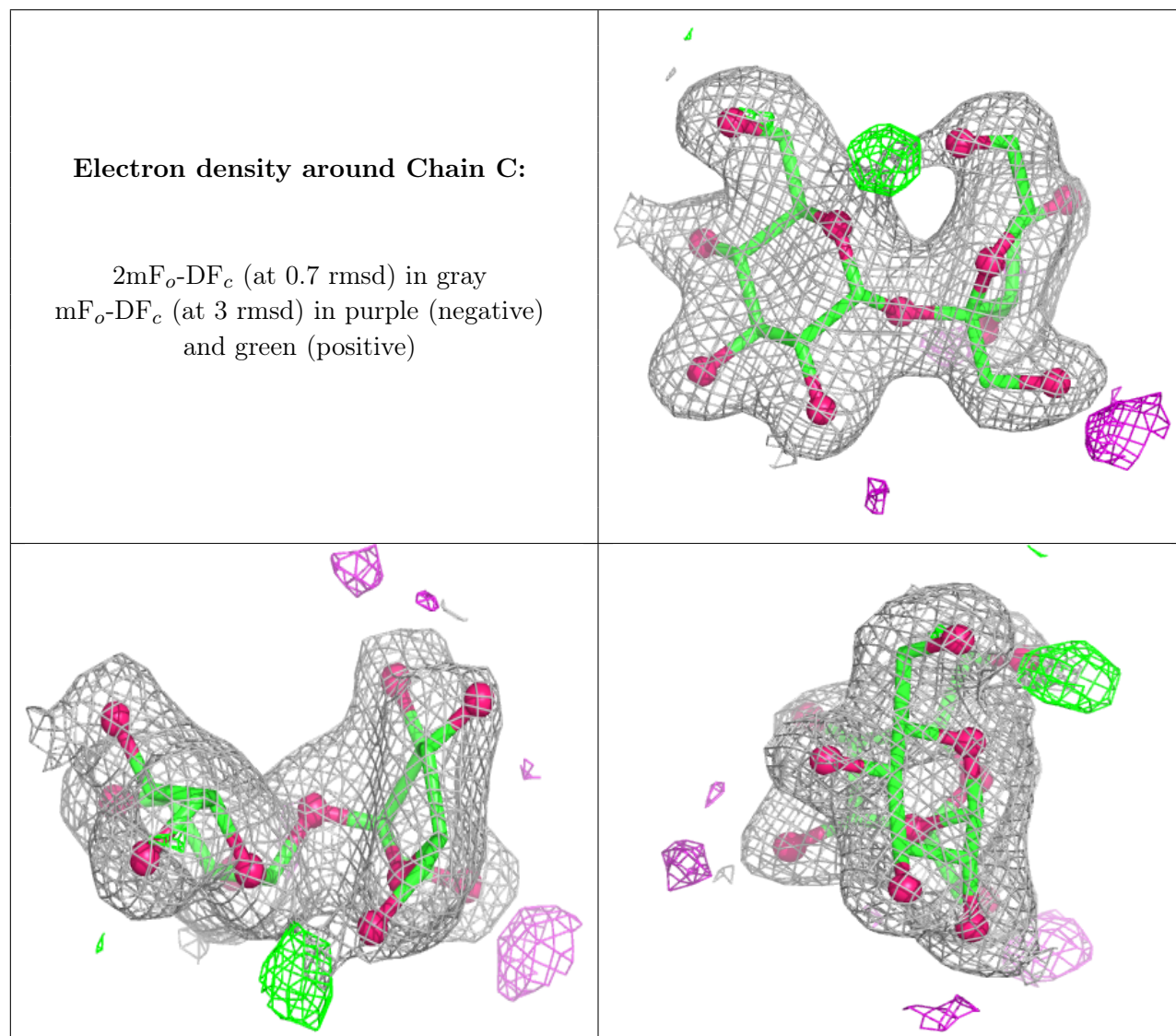
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	FRU	H	2	12/12	0.79	0.15	42,60,72,81	0
2	FRU	I	2	12/12	0.84	0.15	41,59,71,75	0
2	FRU	E	2	12/12	0.87	0.15	26,46,58,64	0
2	GLC	H	1	11/12	0.87	0.13	34,47,55,57	0
2	GLC	E	1	11/12	0.89	0.11	24,38,45,45	0
2	FRU	C	2	12/12	0.89	0.14	31,40,54,60	0
2	FRU	F	2	12/12	0.89	0.10	36,45,50,54	0
2	GLC	G	1	11/12	0.90	0.10	39,42,48,49	0
2	GLC	I	1	11/12	0.90	0.12	31,42,51,56	0
2	GLC	D	1	11/12	0.90	0.12	27,34,45,61	0
2	GLC	F	1	11/12	0.91	0.09	31,37,46,46	0
2	FRU	G	2	12/12	0.91	0.12	28,41,48,54	0
2	FRU	D	2	12/12	0.93	0.09	26,30,32,33	0
2	GLC	J	1	11/12	0.94	0.08	21,25,35,48	0
2	FRU	J	2	12/12	0.94	0.07	19,22,24,26	0

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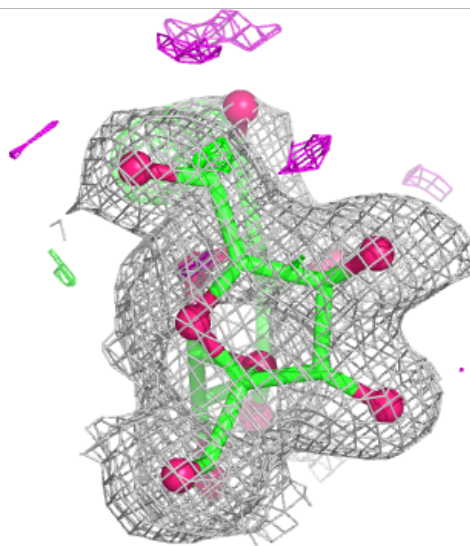
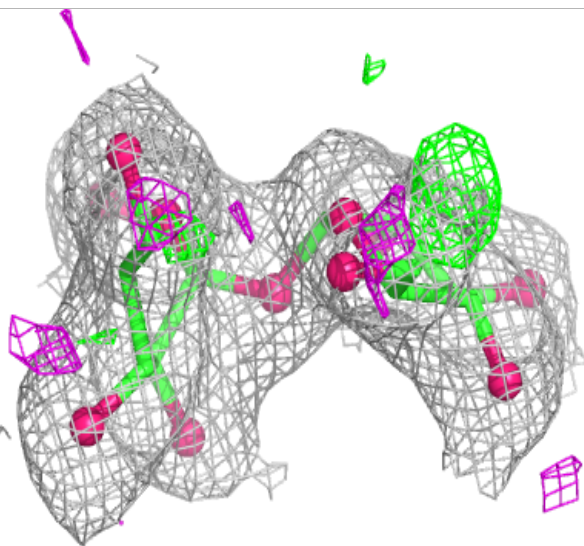
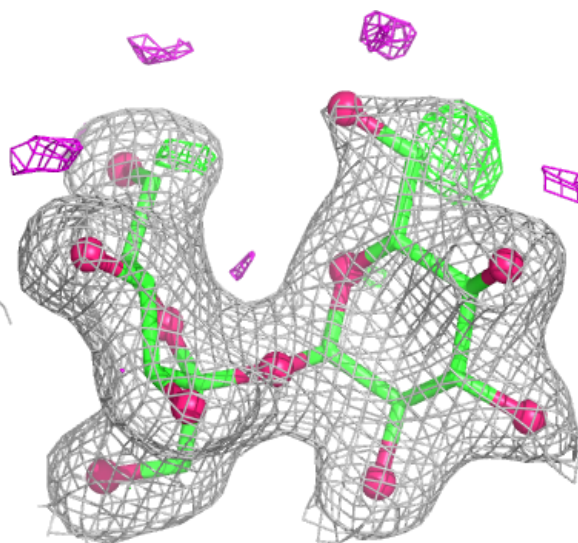
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	GLC	C	1	11/12	0.95	0.08	25,29,30,31	0

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.



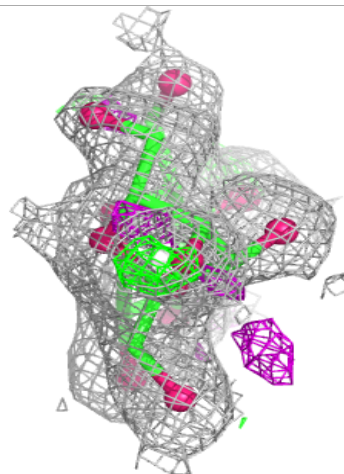
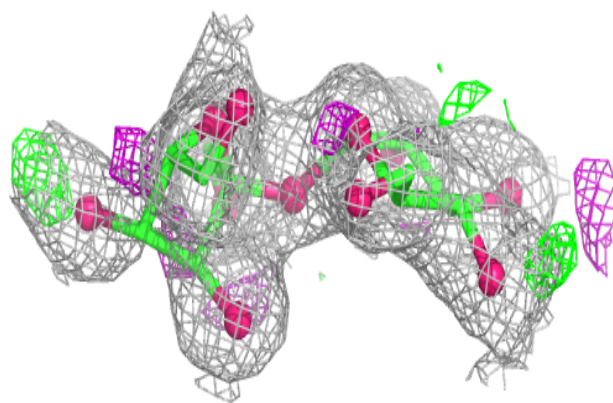
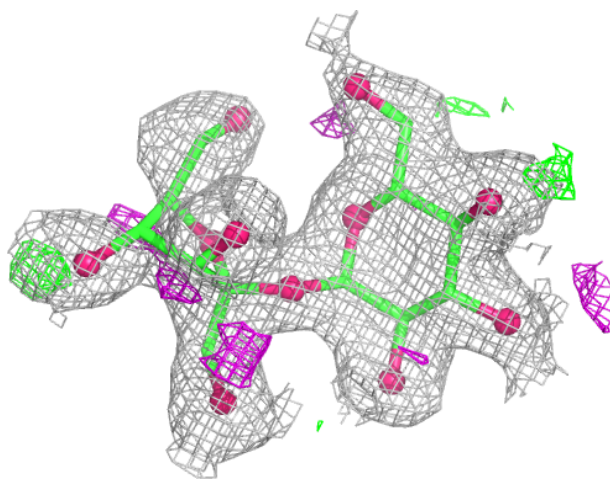
Electron density around Chain D:

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



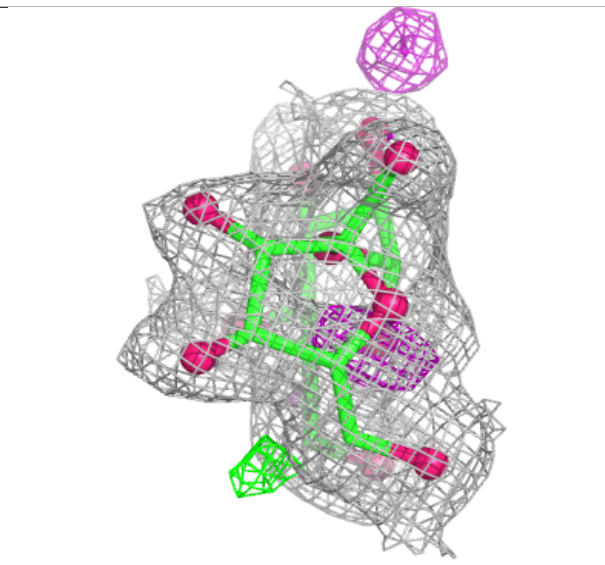
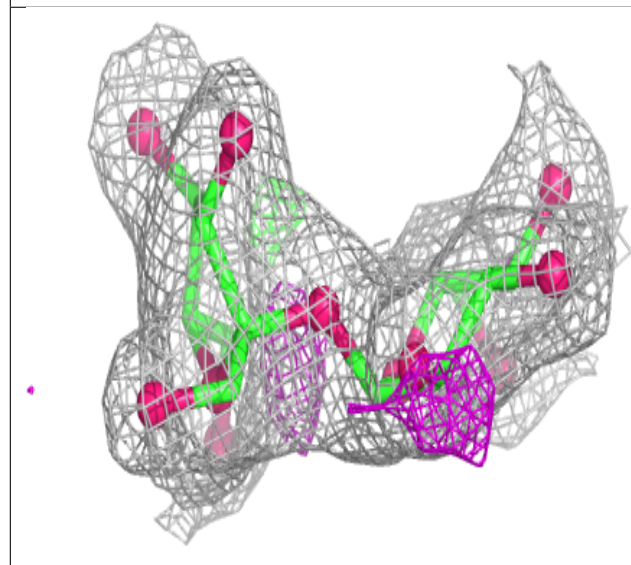
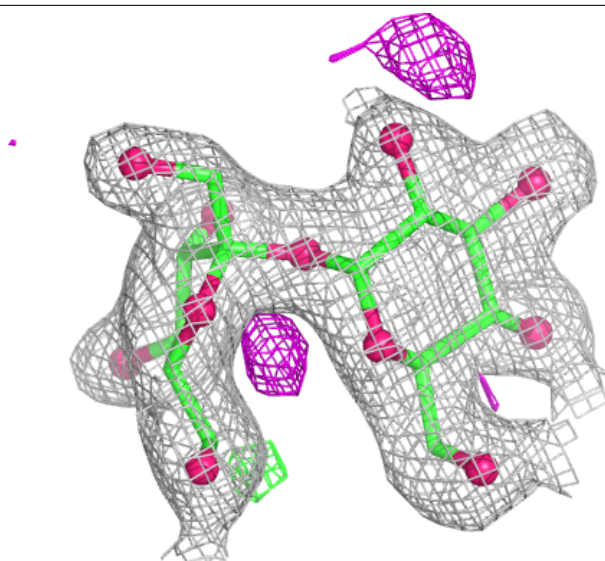
Electron density around Chain E:

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



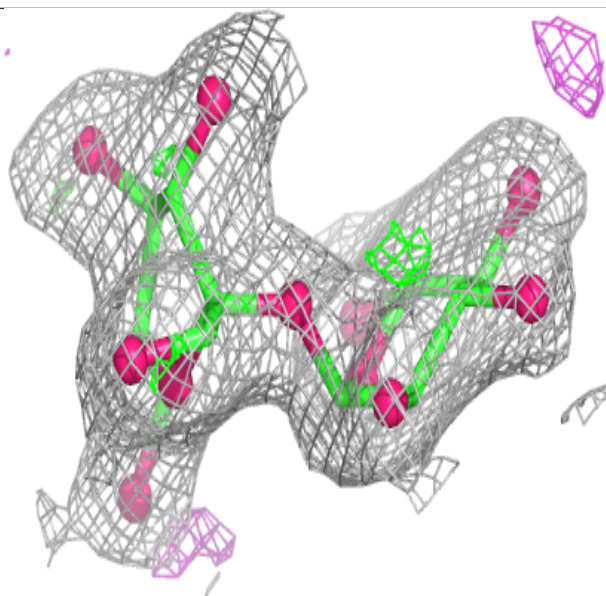
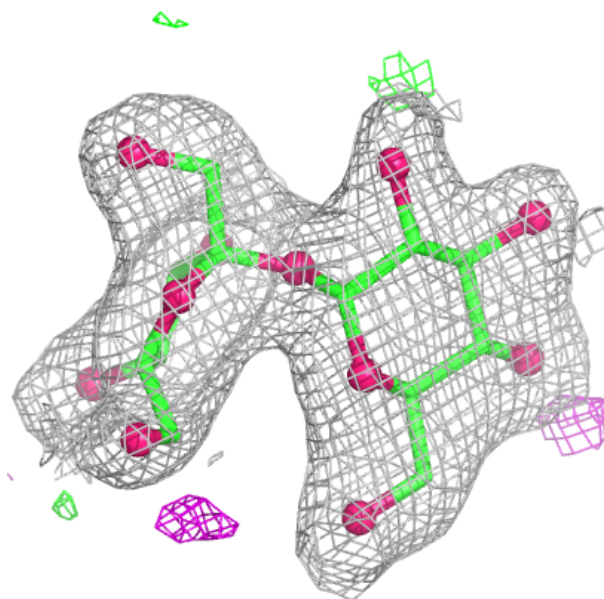
Electron density around Chain F:

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



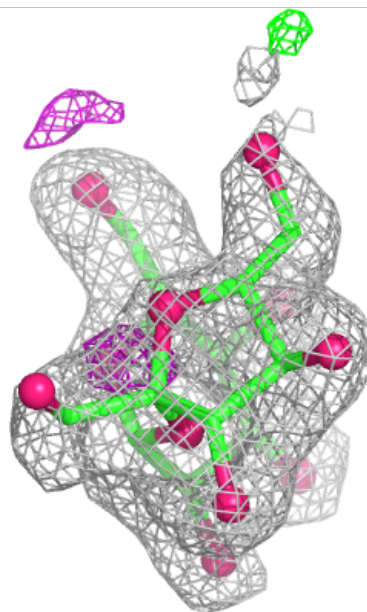
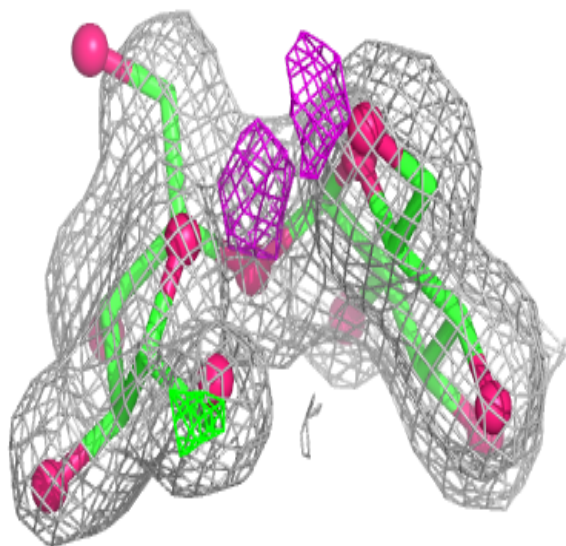
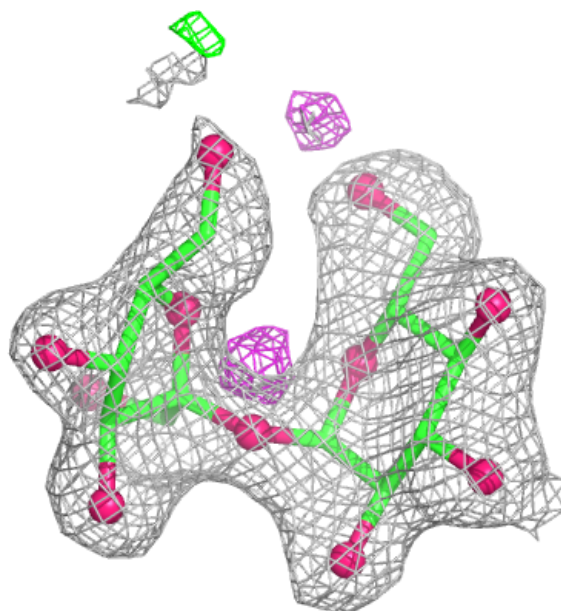
Electron density around Chain G:

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



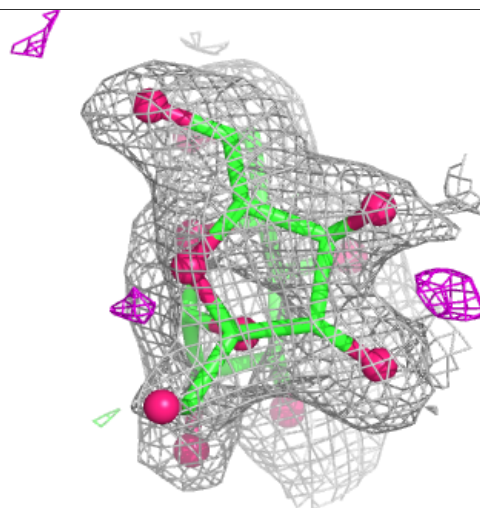
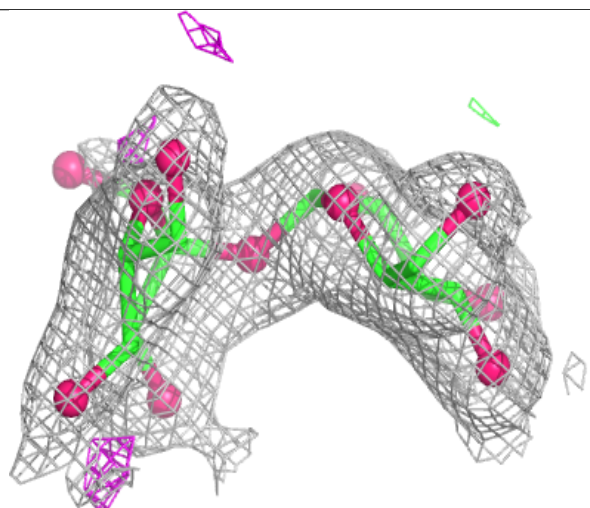
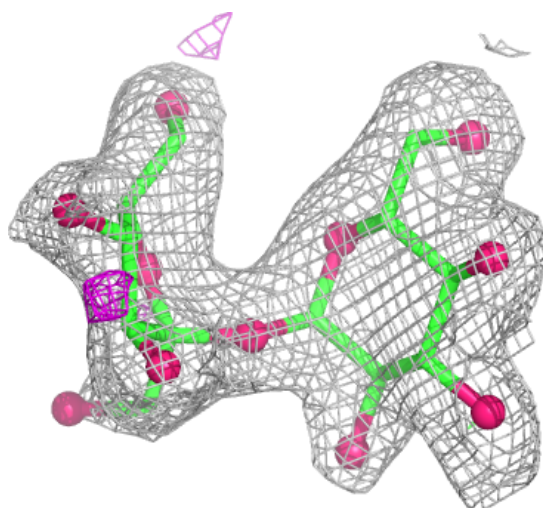
Electron density around Chain H:

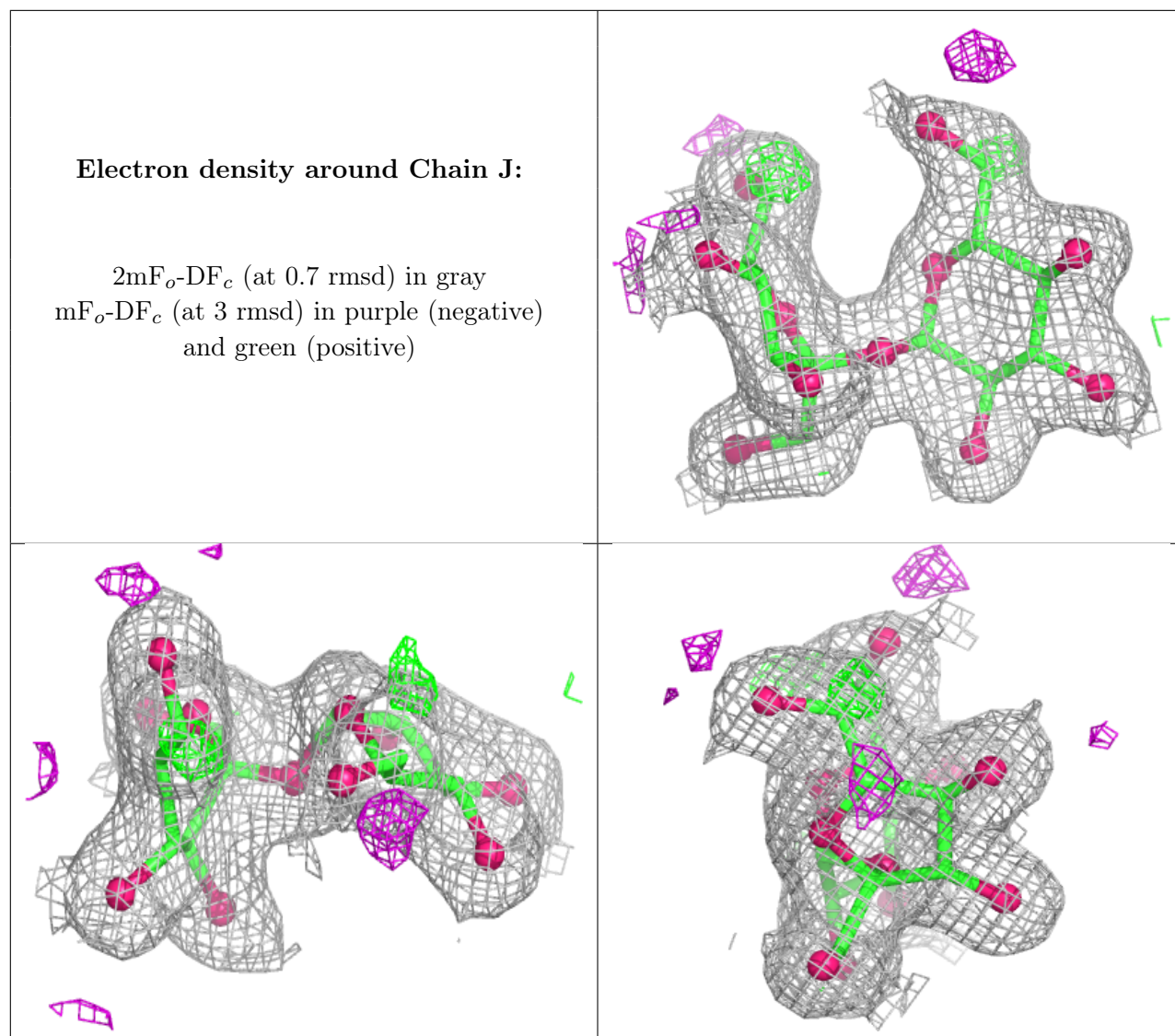
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain I:

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





6.4 Ligands ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 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.

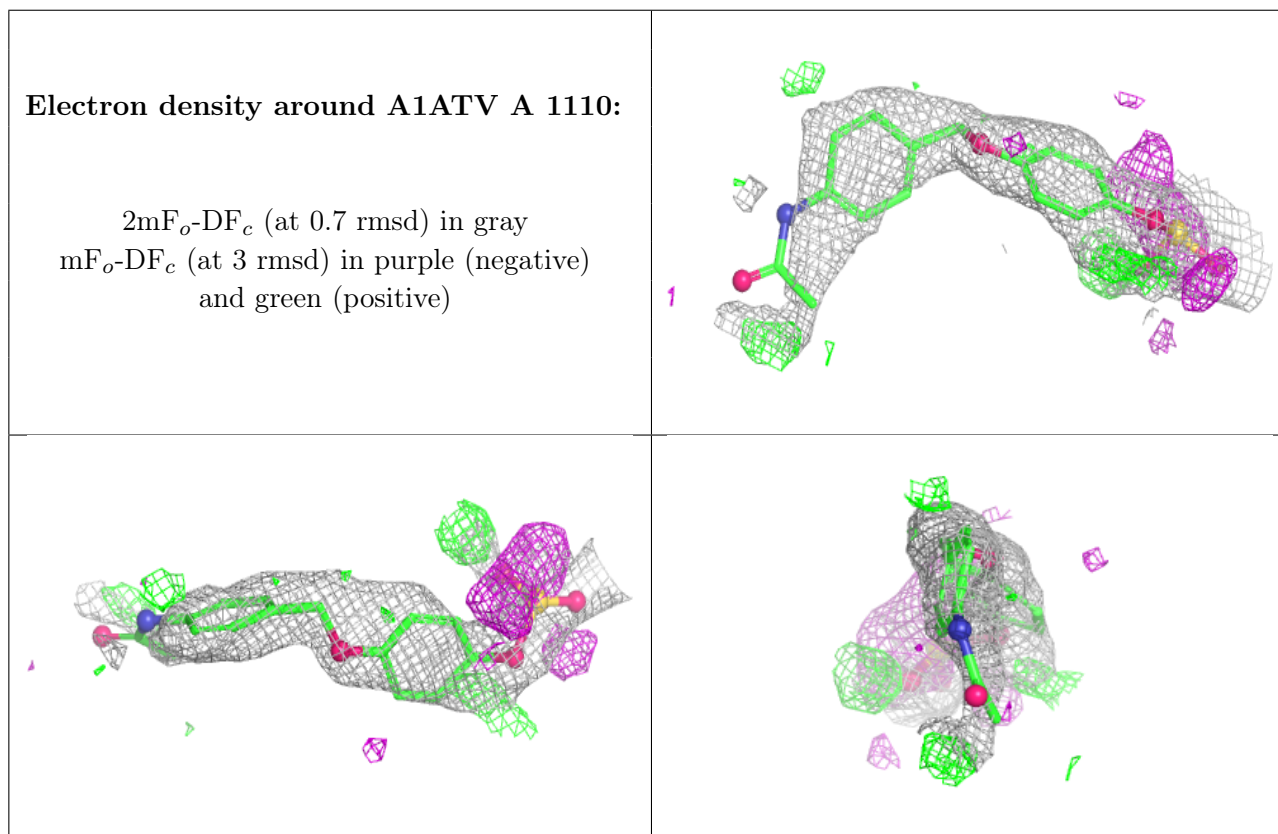
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	1PE	A	1102	16/16	0.68	0.40	42,96,120,123	0
5	A1ATV	A	1110	22/23	0.68	0.28	47,70,112,131	0
3	1PE	B	1103	10/16	0.75	0.27	59,80,90,95	0
3	1PE	A	1103	13/16	0.75	0.27	42,90,103,111	0
4	SO4	A	1109	5/5	0.77	0.15	73,82,105,123	0
3	1PE	B	1102	10/16	0.77	0.30	30,63,75,76	0
3	1PE	A	1104	7/16	0.83	0.20	61,70,76,86	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	SO4	A	1107	5/5	0.83	0.15	61,89,100,121	0
3	1PE	A	1106	7/16	0.87	0.22	53,69,78,78	0
3	1PE	A	1105	7/16	0.87	0.19	59,65,76,77	0
4	SO4	A	1108	5/5	0.90	0.15	68,81,88,98	0
3	1PE	B	1101	7/16	0.91	0.17	29,42,50,60	0
3	1PE	A	1101	16/16	0.92	0.16	28,41,75,90	0
4	SO4	B	1104	5/5	0.99	0.07	18,20,23,27	5

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 ⓘ

There are no such residues in this entry.