Full wwPDB X-ray Structure Validation Report ⓘ

Apr 28, 2025 – 10:19 AM EDT

PDB ID	:	9C2R / pdb_00009c2r
Title	:	M. tuberculosis PKS13 acyltransferase (AT) domain sulfate free apo form
Authors	:	Krieger, I.K.; Tang, S.; Sacchettini, J.C.; TB Structural Genomics Consortium (TBSGC)
Deposited on	:	2024-05-31
Resolution	:	2.18 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:

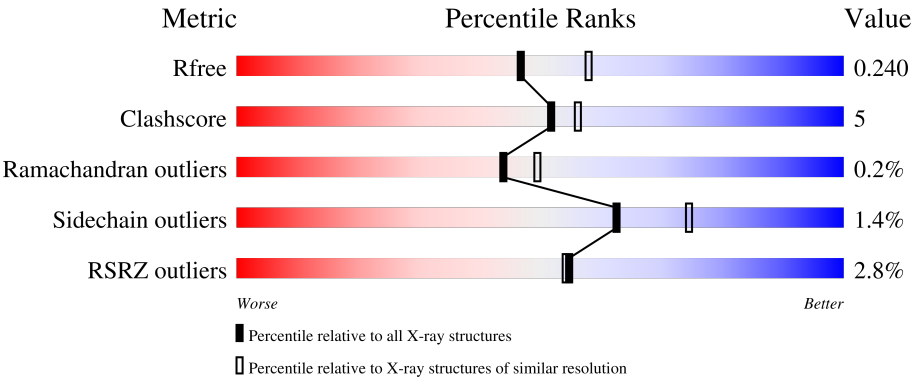
MolProbity	:	4-5-2 with Phenix2.0rc1
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.006 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.43.1

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.18 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}	164625	8336 (2.20-2.16)
Clashscore	180529	9404 (2.20-2.16)
Ramachandran outliers	177936	9297 (2.20-2.16)
Sidechain outliers	177891	9297 (2.20-2.16)
RSRZ outliers	164620	8337 (2.20-2.16)

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 <=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% 80% 11% 9%
1	B	512	4% 80% 11% 9%
2	C	2	50% 50%
2	D	2	50% 50%
2	E	2	100%

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Mol	Chain	Length	Quality of chain
2	F	2	50% 50%
2	G	2	50% 50%
2	H	2	50% 50%
2	I	2	50% 50%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 7658 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	1	0
			3565	2253	620	679	13			
1	B	468	Total	C	N	O	S	0	2	0
			3572	2257	622	681	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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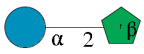
Chain	Residue	Modelled	Actual	Comment	Reference
B	553	HIS	-	expression tag	UNP I6X8D2
B	554	HIS	-	expression tag	UNP I6X8D2
B	555	HIS	-	expression tag	UNP I6X8D2
B	556	HIS	-	expression tag	UNP I6X8D2
B	557	HIS	-	expression tag	UNP I6X8D2
B	558	HIS	-	expression tag	UNP I6X8D2
B	559	SER	-	expression tag	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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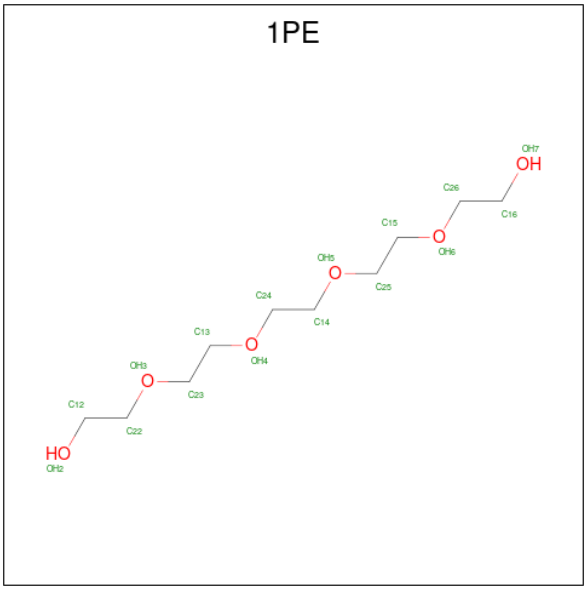
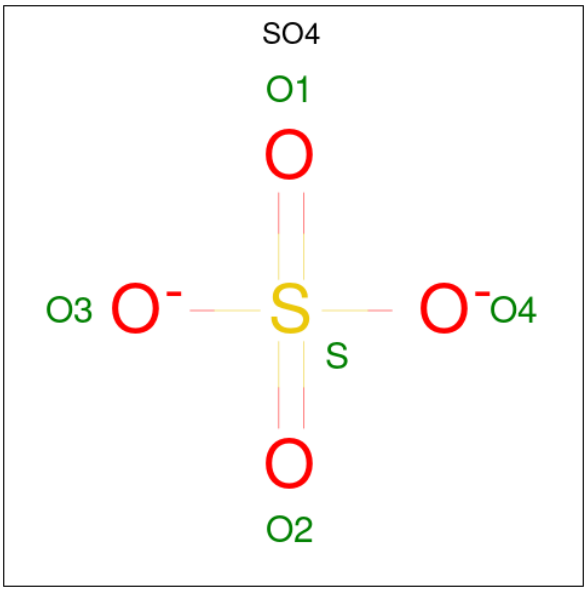
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf	Trace
2	H	2	Total C O 23 12 11	0	0	0
2	I	2	Total C O 23 12 11	0	0	0

- 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 16 10 6	0	0
3	A	1	Total C O 10 6 4	0	0
3	A	1	Total C O 16 10 6	0	0
3	A	1	Total C O 10 6 4	0	0

- Molecule 4 is SULFATE ION (CCD ID: SO4) (formula: O_4S).



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

- Molecule 5 is water.

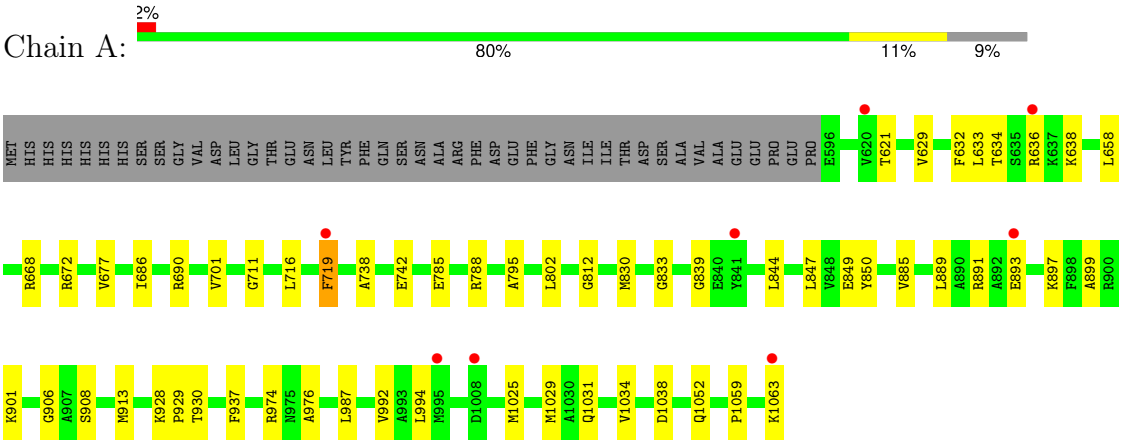
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	145	Total O 145 145	0	0
5	B	123	Total O 123 123	0	0

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 and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

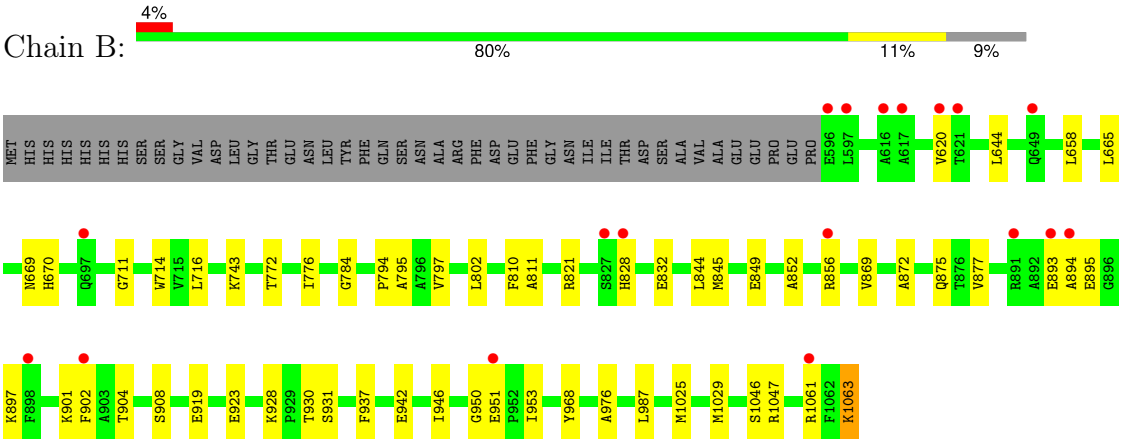
• Molecule 1: Polyketide synthase Pks13

Chain A:



• Molecule 1: Polyketide synthase Pks13

Chain B:



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

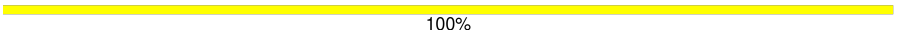
Chain C:

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

Chain D:

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

Chain E:



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

Chain F:

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

Chain G:

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

Chain H:

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

Chain I:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α, β, γ	106.57Å 106.57Å 259.21Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	65.14 – 2.18 65.14 – 2.18	Depositor EDS
% Data completeness (in resolution range)	76.1 (65.14-2.18) 76.1 (65.14-2.18)	Depositor EDS
R_{merge}	0.16	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.80 (at 2.18Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.199 , 0.238 0.205 , 0.240	Depositor DCC
R_{free} test set	3890 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å^2)	42.1	Xtriage
Anisotropy	0.033	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 43.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.51$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	7658	wwPDB-VP
Average B, all atoms (Å^2)	46.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.15% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: FRU, SO4, GLC, 1PE

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	0/3642	0.54	1/4943 (0.0%)
1	B	0.40	0/3653	0.54	0/4959
All	All	0.38	0/7295	0.54	1/9902 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	839	GLY	N-CA-C	5.17	120.74	110.77

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	3565	0	3543	36	0
1	B	3572	0	3545	36	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	1	0
2	G	23	0	21	0	0
2	H	23	0	21	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	I	23	0	21	1	0
3	A	52	0	70	6	0
4	A	20	0	0	0	0
4	B	20	0	0	1	0
5	A	145	0	0	4	0
5	B	123	0	0	4	0
All	All	7658	0	7305	73	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 5.

All (73) 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:889:LEU:HD22	1:A:899:ALA:HB1	1.58	0.85
1:A:632:PHE:HB3	1:A:636:ARG:HH12	1.45	0.81
1:A:632:PHE:HB3	1:A:636:ARG:NH1	1.97	0.78
1:A:913:MET:HE1	3:A:1101:1PE:H141	1.74	0.69
1:B:828[A]:HIS:NE2	1:B:832:GLU:OE2	2.26	0.69
1:B:946:ILE:HD12	1:B:953:ILE:HD13	1.78	0.66
1:A:668:ARG:HG2	1:A:1059:PRO:HD3	1.80	0.62
1:A:1038:ASP:H	3:A:1102:1PE:H122	1.66	0.60
1:B:669:ASN:ND2	5:B:1201:HOH:O	2.29	0.59
1:B:951:GLU:OE1	1:B:951:GLU:N	2.30	0.58
1:B:852:ALA:O	1:B:856:ARG:HG3	2.06	0.55
1:B:1046:SER:HB3	2:F:1:GLC:H61	1.88	0.55
1:B:716:LEU:HD11	1:B:987:LEU:HD12	1.89	0.55
1:B:849:GLU:HB3	1:B:897:LYS:HB3	1.89	0.54
1:B:902:PHE:HD1	1:B:904:THR:HG22	1.72	0.54
1:A:974:ARG:HD3	5:A:1245:HOH:O	2.08	0.53
1:A:716:LEU:HD11	1:A:987:LEU:HD12	1.91	0.53
1:A:849:GLU:HB3	1:A:897:LYS:HB3	1.91	0.52
1:A:850:TYR:OH	1:A:891:ARG:HG2	2.10	0.52
1:A:1025:MET:O	1:A:1029:MET:HG3	2.11	0.51
1:A:633:LEU:HB2	1:A:636:ARG:HD3	1.93	0.50
1:B:1047:ARG:HD2	5:B:1295:HOH:O	2.10	0.50
1:A:788:ARG:HD3	5:A:1313:HOH:O	2.09	0.50
1:A:677:VAL:HG22	1:A:701:VAL:HG22	1.94	0.50
1:A:893:GLU:OE1	1:A:899:ALA:HB3	2.13	0.48
1:A:844:LEU:HD13	1:A:901:LYS:HD3	1.94	0.48
1:A:812:GLY:O	1:A:930:THR:OG1	2.30	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:869:VAL:HB	1:B:877:VAL:HB	1.95	0.47
1:B:714:TRP:CG	1:B:794:PRO:HB3	2.49	0.47
1:B:828[A]:HIS:CD2	1:B:832:GLU:OE2	2.67	0.47
1:B:821:ARG:HG2	5:B:1270:HOH:O	2.14	0.47
1:A:738:ALA:O	1:A:742:GLU:HG3	2.15	0.46
1:A:830:MET:HE3	1:A:908:SER:HB3	1.98	0.46
1:B:658:LEU:HD12	1:B:658:LEU:HA	1.77	0.46
1:A:1052:GLN:H	1:A:1052:GLN:CD	2.24	0.45
1:A:686:ILE:O	1:A:690:ARG:HG2	2.17	0.45
1:A:711:GLY:HA2	3:A:1102:1PE:H232	1.97	0.45
1:B:919:GLU:O	1:B:923:GLU:HG3	2.17	0.45
1:B:1063:LYS:HB3	1:B:1063:LYS:HE2	1.61	0.45
1:A:833:GLY:HA3	3:A:1101:1PE:H131	1.98	0.45
1:B:644:LEU:HD21	1:B:665:LEU:HD11	2.00	0.44
1:B:797:VAL:HG21	1:B:811:ALA:HB2	1.98	0.44
1:B:844:LEU:HD13	1:B:901:LYS:HD3	2.00	0.44
1:A:992:VAL:HG23	5:A:1231:HOH:O	2.18	0.44
1:A:847:LEU:O	1:A:899:ALA:HA	2.18	0.43
1:B:849:GLU:HG3	1:B:875:GLN:HG2	1.99	0.43
1:B:937:PHE:CZ	1:B:976:ALA:HA	2.53	0.43
3:A:1101:1PE:H131	3:A:1101:1PE:H222	1.77	0.43
1:B:1025:MET:O	1:B:1029:MET:HG3	2.18	0.43
1:B:828[A]:HIS:CE1	1:B:832:GLU:OE2	2.71	0.43
1:B:893:GLU:C	1:B:895:GLU:H	2.26	0.43
1:B:1063:LYS:NZ	4:B:1101:SO4:O2	2.52	0.42
1:B:928:LYS:O	1:B:930:THR:HG23	2.19	0.42
1:A:711:GLY:HA3	1:A:795:ALA:HB2	2.02	0.42
1:A:885:VAL:O	1:A:889:LEU:HG	2.19	0.42
1:A:937:PHE:CZ	1:A:976:ALA:HA	2.54	0.42
1:A:1031:GLN:HA	1:A:1034:VAL:HG12	2.01	0.42
1:A:719:PHE:HB2	5:A:1207:HOH:O	2.20	0.41
1:B:845:MET:HE1	1:B:908:SER:OG	2.20	0.41
1:A:849:GLU:O	1:A:897:LYS:HD3	2.19	0.41
1:A:634:THR:O	1:A:638:LYS:HG3	2.21	0.41
1:A:785:GLU:HA	1:A:785:GLU:OE1	2.20	0.41
1:B:1061:ARG:HA	5:B:1285:HOH:O	2.20	0.41
1:A:994:LEU:HD23	1:A:994:LEU:HA	1.90	0.41
1:B:711:GLY:HA3	1:B:795:ALA:HB2	2.01	0.41
1:B:872:ALA:HB3	1:B:875:GLN:HB2	2.01	0.41
1:A:928:LYS:HE3	1:A:929:PRO:O	2.21	0.41
1:B:772:THR:O	1:B:776:ILE:HG13	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:931:SER:OG	1:B:950:GLY:O	2.33	0.41
1:B:784:GLY:HA3	1:B:810:PHE:CZ	2.56	0.41
1:B:670:HIS:CD2	2:I:1:GLC:H2	2.56	0.40
1:A:906:GLY:O	3:A:1101:1PE:H151	2.21	0.40
1:B:942:GLU:HA	1:B:968:TYR:CD2	2.55	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	467/512 (91%)	457 (98%)	9 (2%)	1 (0%)	44	49
1	B	468/512 (91%)	455 (97%)	12 (3%)	1 (0%)	44	49
All	All	935/1024 (91%)	912 (98%)	21 (2%)	2 (0%)	44	49

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	719	PHE
1	B	894	ALA

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	369/406 (91%)	363 (98%)	6 (2%)	58 70
1	B	370/406 (91%)	366 (99%)	4 (1%)	70 80
All	All	739/812 (91%)	729 (99%)	10 (1%)	62 74

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	621	THR
1	A	629	VAL
1	A	658	LEU
1	A	672	ARG
1	A	802	LEU
1	A	1063	LYS
1	B	620	VAL
1	B	743	LYS
1	B	802	LEU
1	B	1063	LYS

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

Mol	Chain	Res	Type
1	A	749	GLN
1	A	1031	GLN
1	B	749	GLN
1	B	780	GLN
1	B	800	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	$\#\|Z\| > 2$
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	0.39	0	10,18,18	0.65	0
2	GLC	D	1	2	11,11,12	0.52	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	1.29	2 (18%)	15,15,17	0.98	1 (6%)
2	FRU	E	2	2	11,12,12	0.56	0	10,18,18	1.10	1 (10%)
2	GLC	F	1	2	11,11,12	0.57	0	15,15,17	0.67	0
2	FRU	F	2	2	11,12,12	0.45	0	10,18,18	0.92	0
2	GLC	G	1	2	11,11,12	0.71	0	15,15,17	0.78	1 (6%)
2	FRU	G	2	2	11,12,12	0.44	0	10,18,18	0.45	0
2	GLC	H	1	2	11,11,12	0.64	0	15,15,17	0.96	1 (6%)
2	FRU	H	2	2	11,12,12	0.39	0	10,18,18	0.61	0
2	GLC	I	1	2	11,11,12	0.63	0	15,15,17	1.09	2 (13%)
2	FRU	I	2	2	11,12,12	0.47	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
2	GLC	F	1	2	-	2/2/19/22	0/1/1/1
2	FRU	F	2	2	-	0/5/24/24	0/1/1/1
2	GLC	G	1	2	-	0/2/19/22	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

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

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	1	GLC	O5-C5	2.87	1.49	1.43
2	E	1	GLC	C2-C3	2.56	1.56	1.52

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	I	1	GLC	C1-O5-C5	3.08	116.32	112.19
2	D	1	GLC	C1-O5-C5	3.06	116.28	112.19
2	H	1	GLC	C1-O5-C5	2.70	115.81	112.19
2	E	1	GLC	C1-O5-C5	2.43	115.45	112.19
2	E	2	FRU	O1-C1-C2	2.35	116.86	111.67
2	G	1	GLC	C1-O5-C5	2.28	115.24	112.19
2	I	1	GLC	C1-C2-C3	2.17	112.81	109.64
2	C	1	GLC	C1-O5-C5	2.06	114.95	112.19
2	D	1	GLC	C1-C2-C3	2.04	112.62	109.64
2	C	1	GLC	O3-C3-C2	-2.02	105.94	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	F	1	GLC	O5-C5-C6-O6
2	I	1	GLC	C4-C5-C6-O6
2	F	1	GLC	C4-C5-C6-O6
2	E	1	GLC	C4-C5-C6-O6

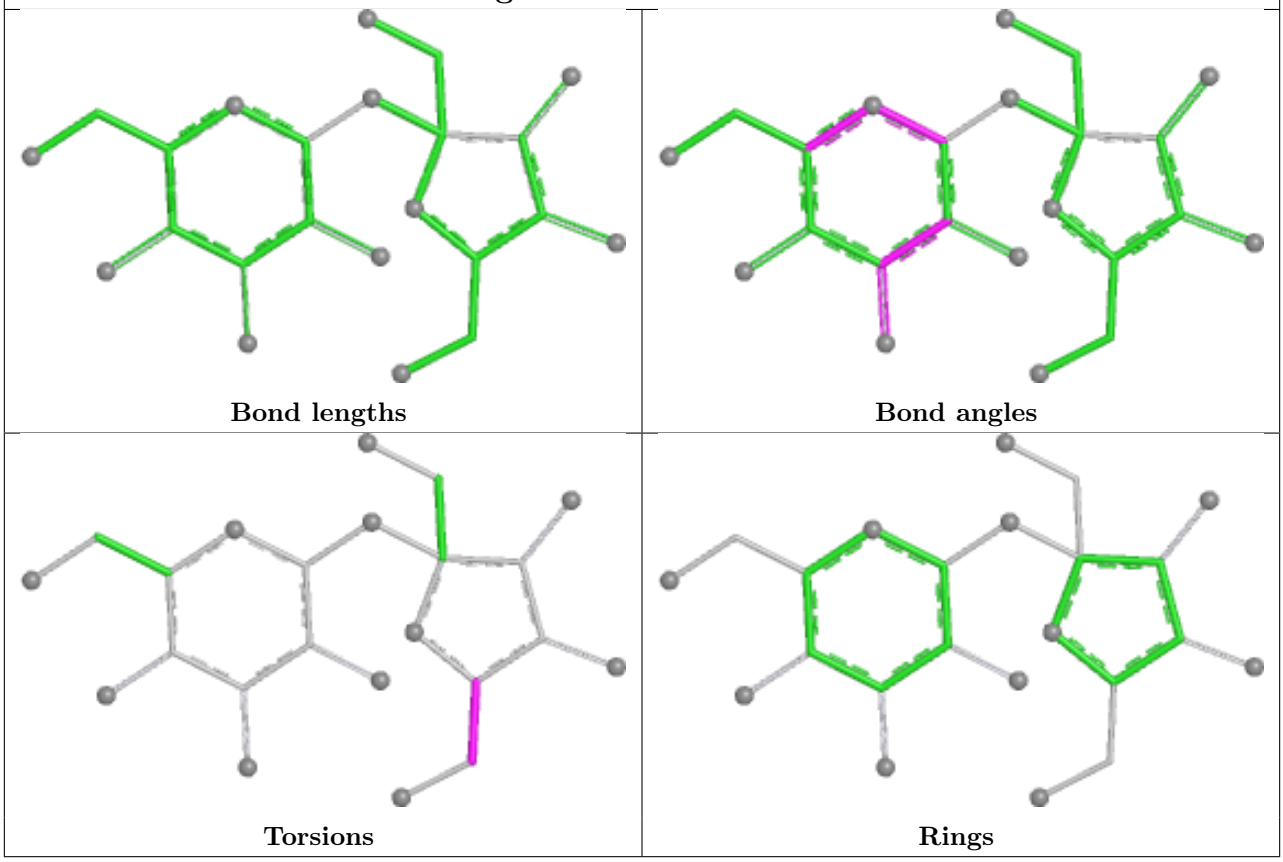
There are no ring outliers.

2 monomers are involved in 2 short contacts:

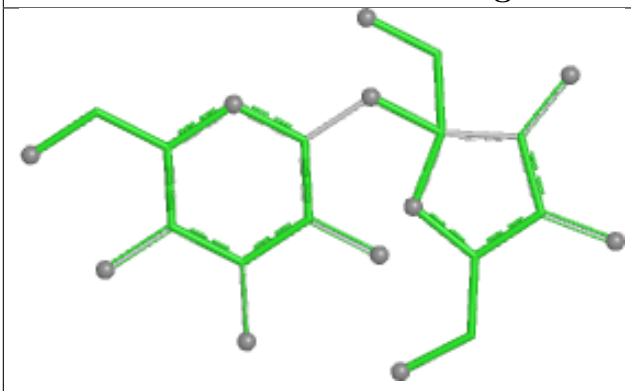
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	1	GLC	1	0
2	I	1	GLC	1	0

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

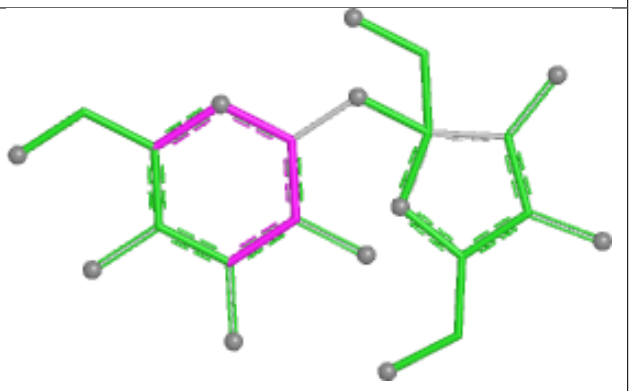
Oligosaccharide Chain C



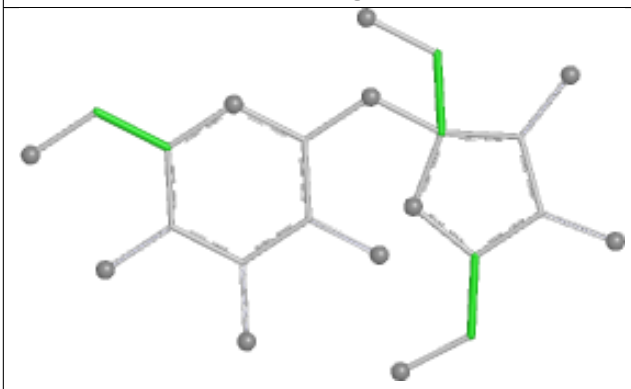
Oligosaccharide Chain D



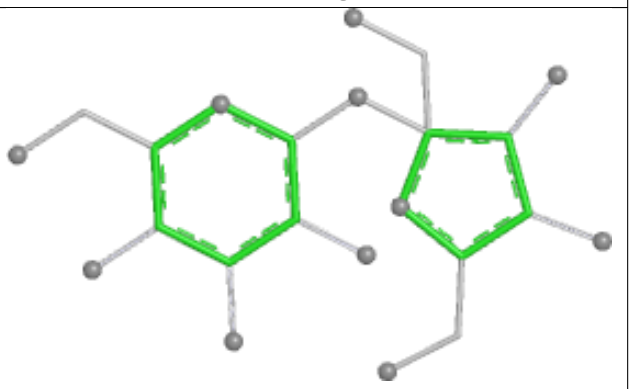
Bond lengths



Bond angles

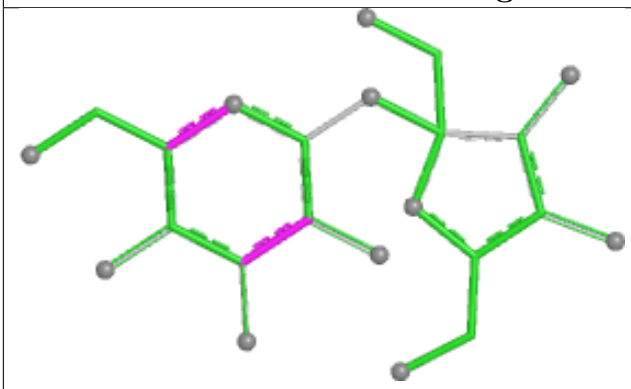


Torsions

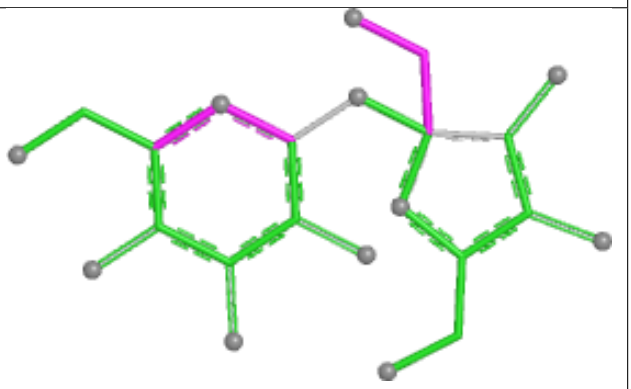


Rings

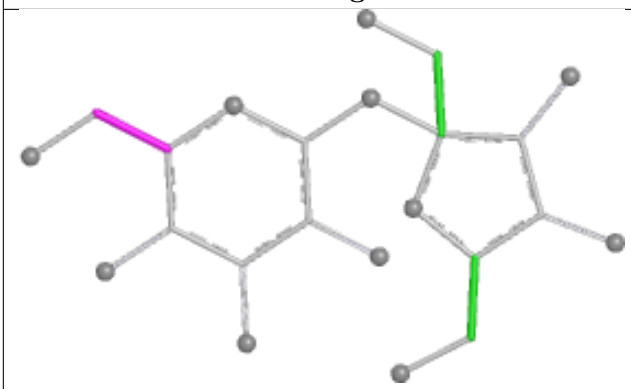
Oligosaccharide Chain E



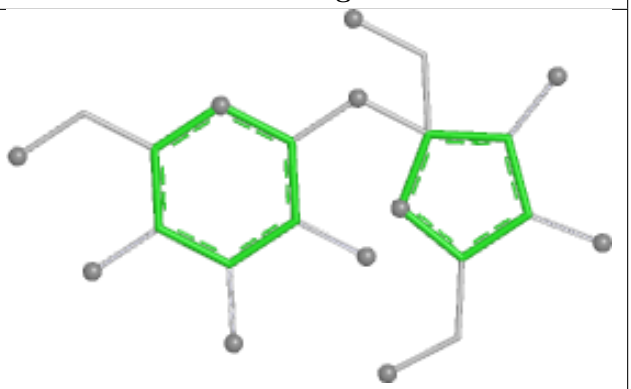
Bond lengths



Bond angles

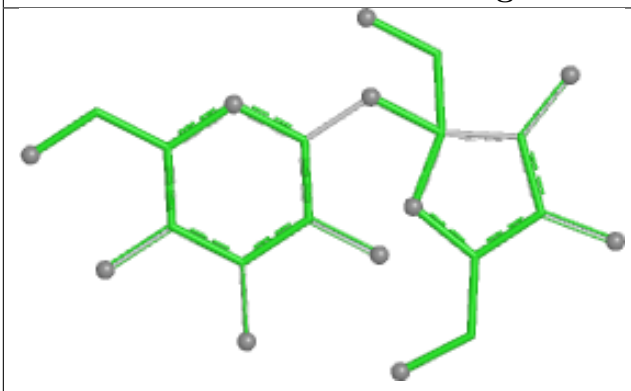


Torsions

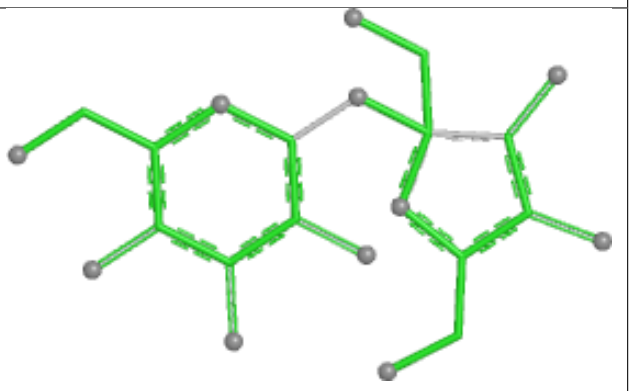


Rings

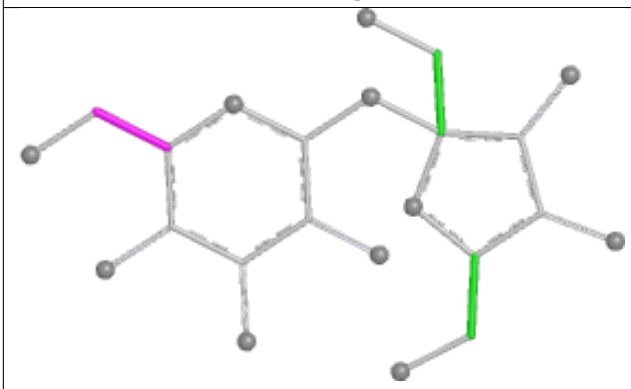
Oligosaccharide Chain F



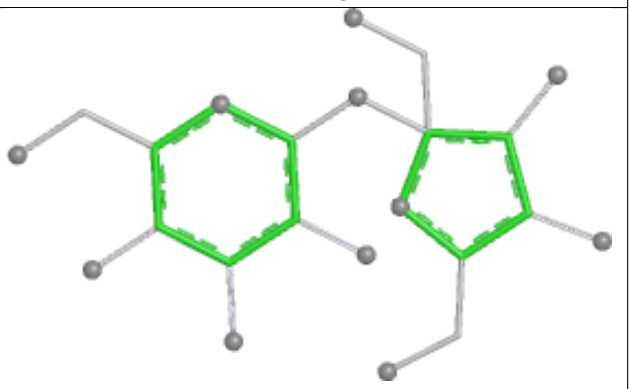
Bond lengths



Bond angles

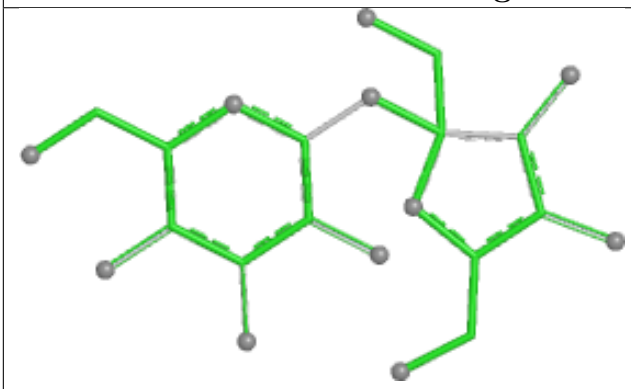


Torsions

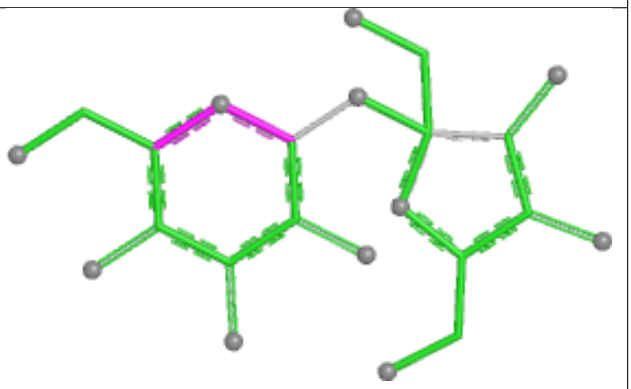


Rings

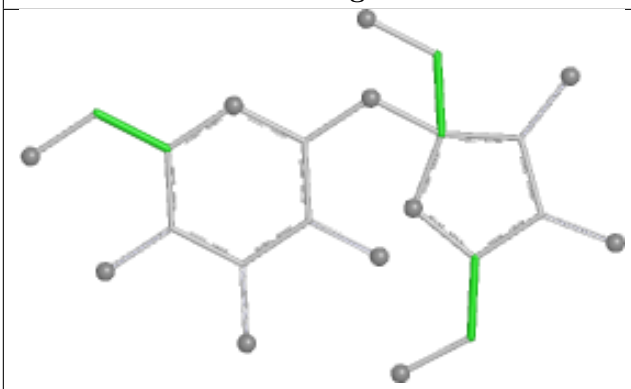
Oligosaccharide Chain G



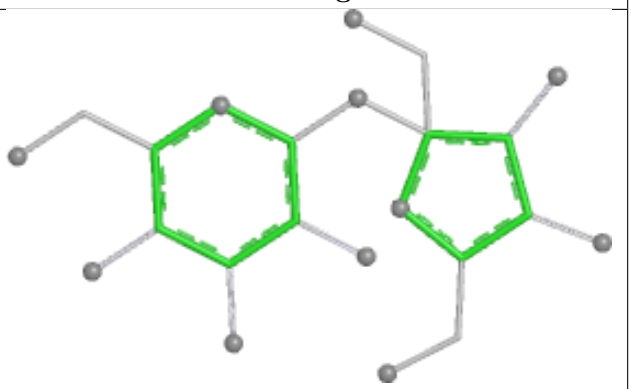
Bond lengths



Bond angles

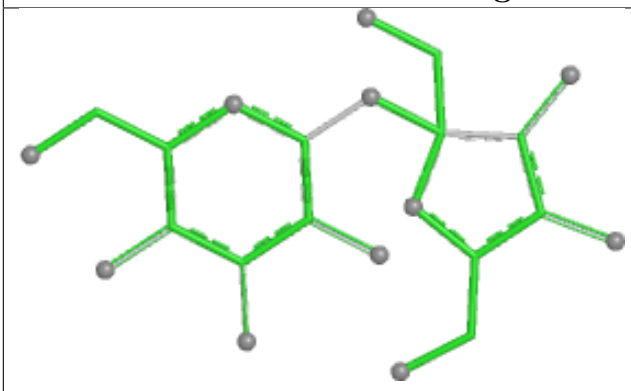


Torsions

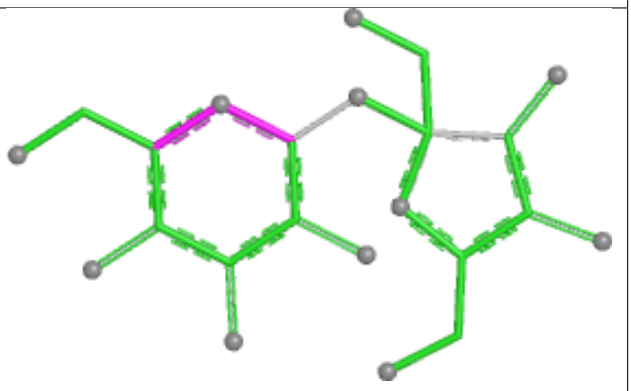


Rings

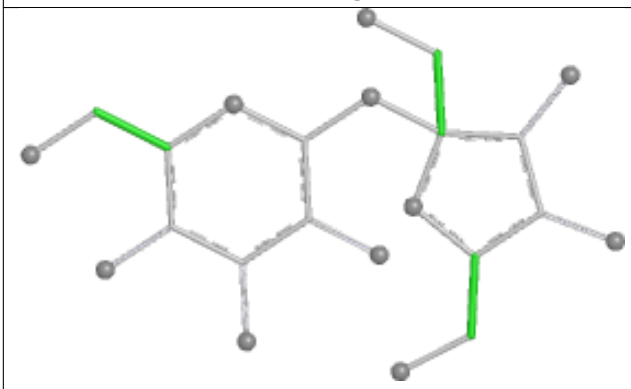
Oligosaccharide Chain H



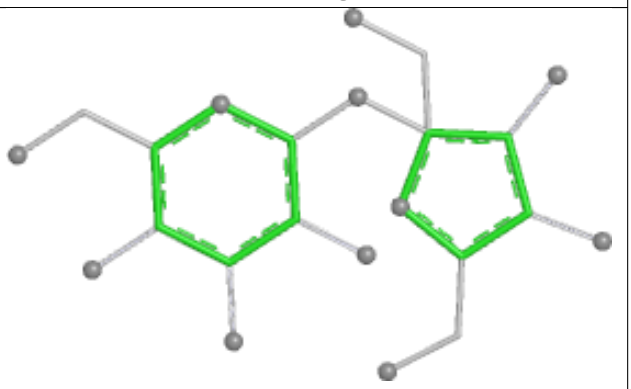
Bond lengths



Bond angles

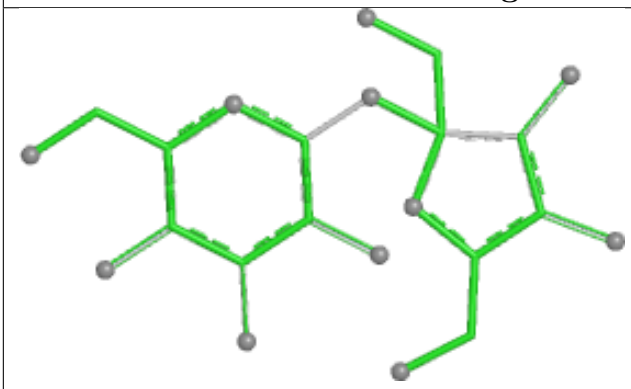


Torsions

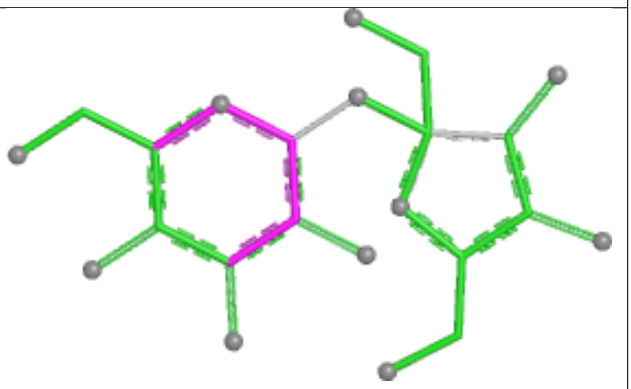


Rings

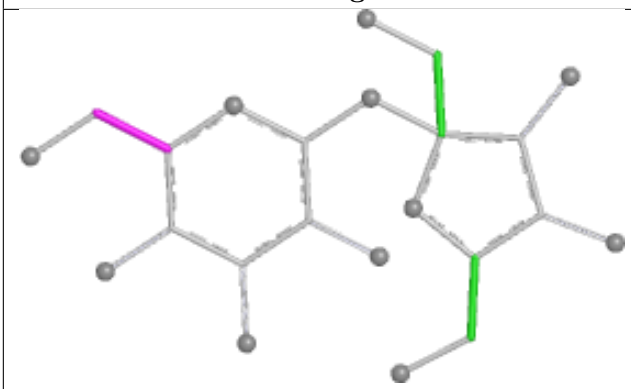
Oligosaccharide Chain I



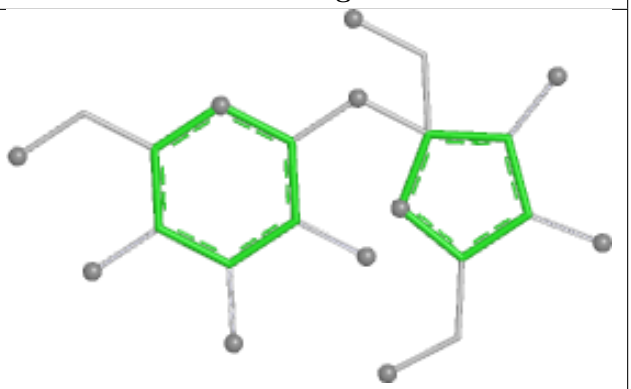
Bond lengths



Bond angles



Torsions



Rings

5.6 Ligand geometry (i)

12 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	1104	-	9,9,15	0.54	0	8,8,14	0.34	0
4	SO4	A	1106	-	4,4,4	0.26	0	6,6,6	0.33	0
4	SO4	A	1105	-	4,4,4	0.26	0	6,6,6	0.25	0
3	1PE	A	1101	-	15,15,15	0.53	0	14,14,14	0.35	0
4	SO4	B	1101	-	4,4,4	0.23	0	6,6,6	0.21	0
3	1PE	A	1102	-	9,9,15	0.51	0	8,8,14	0.52	0
4	SO4	A	1108	-	4,4,4	0.41	0	6,6,6	0.28	0
3	1PE	A	1103	-	15,15,15	0.55	0	14,14,14	0.34	0
4	SO4	B	1102	-	4,4,4	0.27	0	6,6,6	0.16	0
4	SO4	B	1103	-	4,4,4	0.25	0	6,6,6	0.26	0
4	SO4	A	1107	-	4,4,4	0.34	0	6,6,6	0.19	0
4	SO4	B	1104	-	4,4,4	0.32	0	6,6,6	0.17	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	1104	-	-	5/7/7/13	-
3	1PE	A	1102	-	-	4/7/7/13	-
3	1PE	A	1103	-	-	8/13/13/13	-
3	1PE	A	1101	-	-	9/13/13/13	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (26) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1104	1PE	OH6-C15-C25-OH5
3	A	1101	1PE	OH6-C15-C25-OH5
3	A	1102	1PE	OH4-C13-C23-OH3
3	A	1104	1PE	OH5-C14-C24-OH4
3	A	1101	1PE	OH4-C13-C23-OH3
3	A	1103	1PE	OH7-C16-C26-OH6
3	A	1103	1PE	OH6-C15-C25-OH5
3	A	1101	1PE	OH2-C12-C22-OH3
3	A	1101	1PE	OH5-C14-C24-OH4
3	A	1102	1PE	OH5-C14-C24-OH4
3	A	1101	1PE	OH7-C16-C26-OH6
3	A	1101	1PE	C15-C25-OH5-C14
3	A	1101	1PE	C24-C14-OH5-C25
3	A	1103	1PE	C24-C14-OH5-C25
3	A	1104	1PE	C15-C25-OH5-C14
3	A	1102	1PE	C14-C24-OH4-C13
3	A	1103	1PE	C25-C15-OH6-C26
3	A	1103	1PE	C12-C22-OH3-C23
3	A	1104	1PE	OH7-C16-C26-OH6
3	A	1103	1PE	C15-C25-OH5-C14
3	A	1101	1PE	C13-C23-OH3-C22
3	A	1102	1PE	C12-C22-OH3-C23
3	A	1104	1PE	C16-C26-OH6-C15
3	A	1103	1PE	C14-C24-OH4-C13
3	A	1103	1PE	C23-C13-OH4-C24
3	A	1101	1PE	C12-C22-OH3-C23

There are no ring outliers.

3 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1101	1PE	4	0
4	B	1101	SO4	1	0
3	A	1102	1PE	2	0

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.

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, 95^{th} 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%)	0.04	8 (1%)	69	67	31, 44, 59, 83	1 (0%)
1	B	468/512 (91%)	0.20	18 (3%)	44	44	28, 44, 65, 91	2 (0%)
All	All	936/1024 (91%)	0.12	26 (2%)	55	54	28, 44, 63, 91	3 (0%)

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	719	PHE	5.2
1	B	620	VAL	3.5
1	B	902	PHE	3.4
1	B	894	ALA	3.1
1	A	841	TYR	3.1
1	A	893	GLU	3.0
1	B	617	ALA	2.7
1	A	620	VAL	2.7
1	B	856	ARG	2.6
1	B	827	SER	2.5
1	B	596	GLU	2.5
1	B	697	GLN	2.5
1	B	1061	ARG	2.5
1	B	951	GLU	2.4
1	B	891	ARG	2.4
1	A	636	ARG	2.4
1	B	649	GLN	2.3
1	A	1063	LYS	2.2
1	B	898	PHE	2.2
1	B	621	THR	2.2
1	A	995	MET	2.2
1	A	1008	ASP	2.1
1	B	597	LEU	2.1
1	B	616	ALA	2.0

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Mol	Chain	Res	Type	RSRZ
1	B	893	GLU	2.0
1	B	828[A]	HIS	2.0

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

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

6.3 Carbohydrates (i)

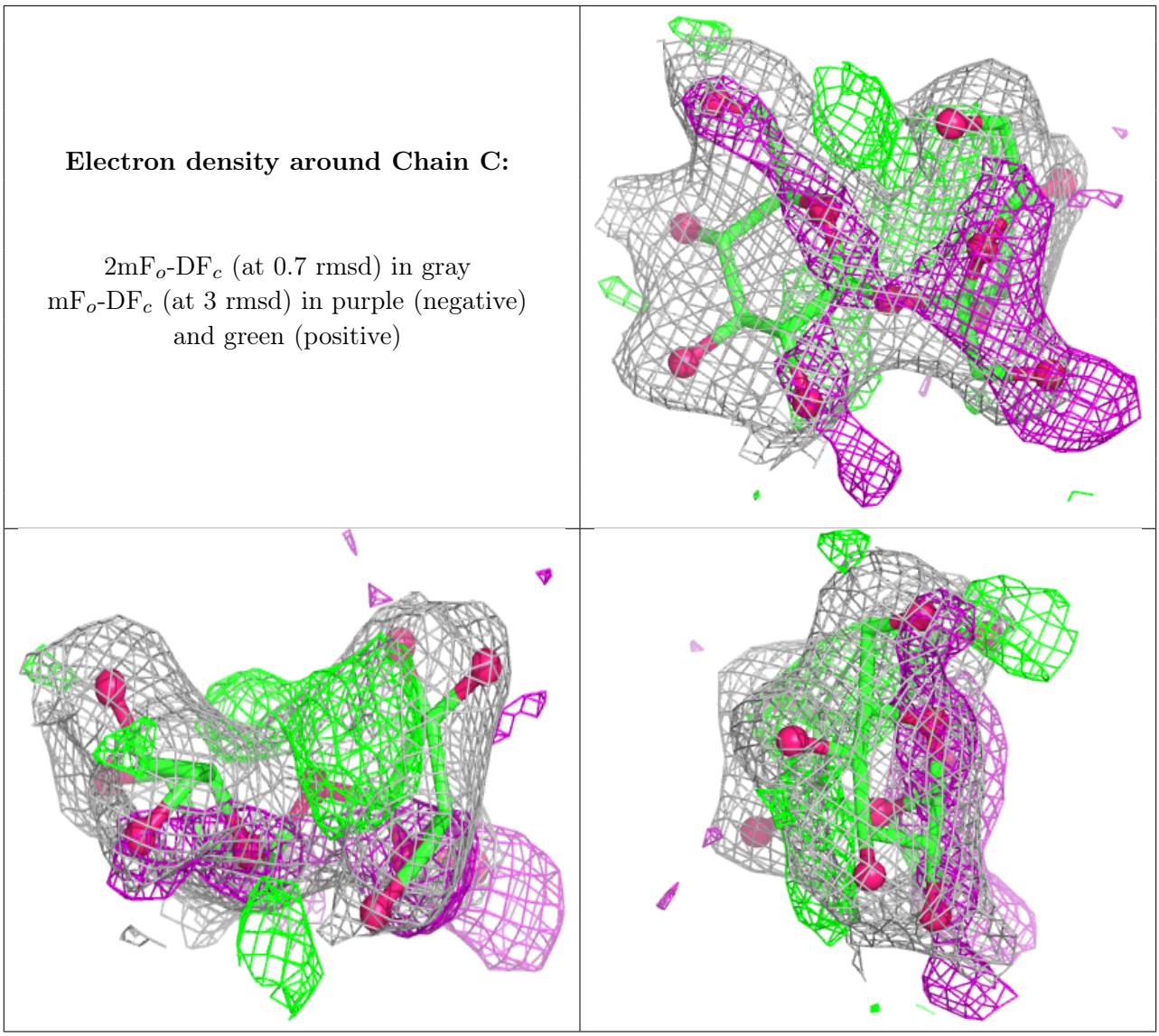
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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	G	2	12/12	0.59	0.20	42,60,72,81	0
2	FRU	H	2	12/12	0.69	0.19	41,59,71,75	0
2	FRU	C	2	12/12	0.72	0.18	31,40,54,60	0
2	GLC	G	1	11/12	0.72	0.18	34,47,55,57	0
2	GLC	E	1	11/12	0.78	0.15	24,38,45,45	0
2	GLC	H	1	11/12	0.81	0.15	31,42,51,56	0
2	GLC	F	1	11/12	0.81	0.12	39,42,48,49	0
2	GLC	D	1	11/12	0.83	0.13	27,34,45,61	0
2	FRU	E	2	12/12	0.86	0.14	26,46,58,64	0
2	GLC	C	1	11/12	0.88	0.10	25,29,30,31	0
2	FRU	F	2	12/12	0.90	0.11	28,41,48,54	0
2	GLC	I	1	11/12	0.91	0.10	21,25,35,48	0
2	FRU	D	2	12/12	0.92	0.09	26,30,32,33	0
2	FRU	I	2	12/12	0.93	0.08	19,22,24,26	0

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

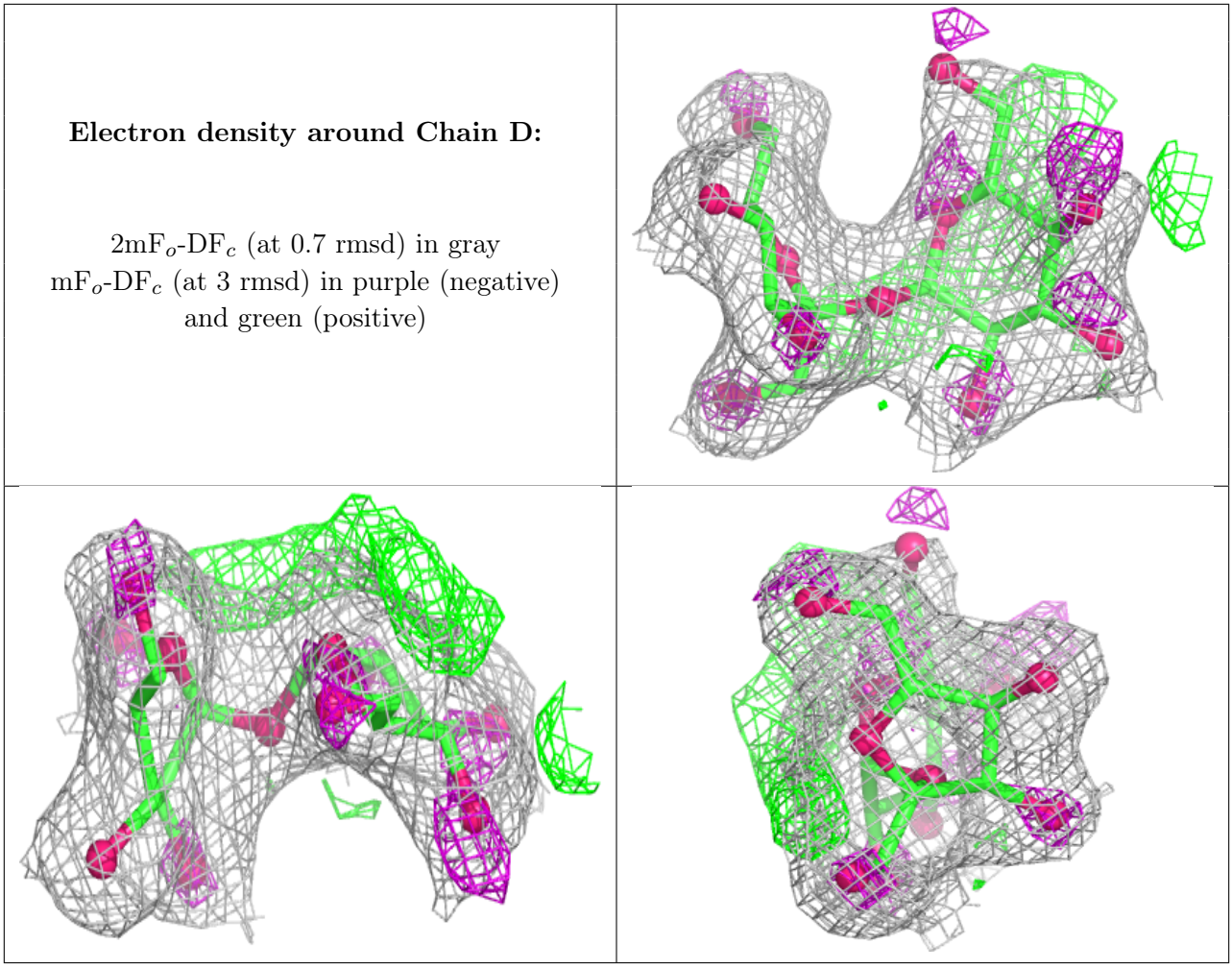
Electron density around Chain C:

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



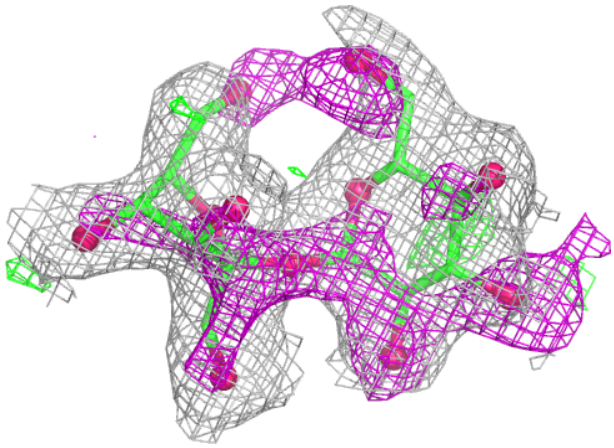
Electron density around Chain D:

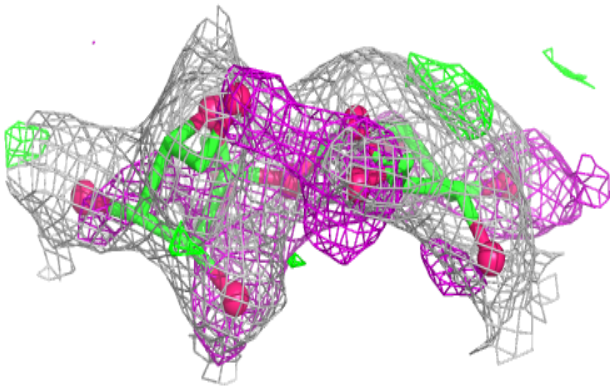
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

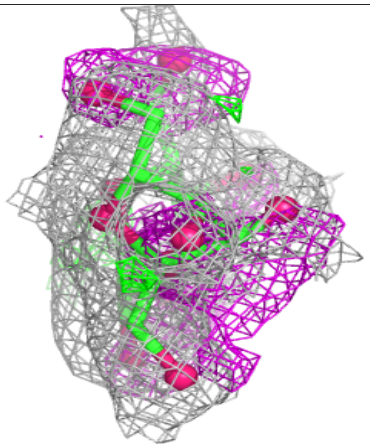


Electron density around Chain E:

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

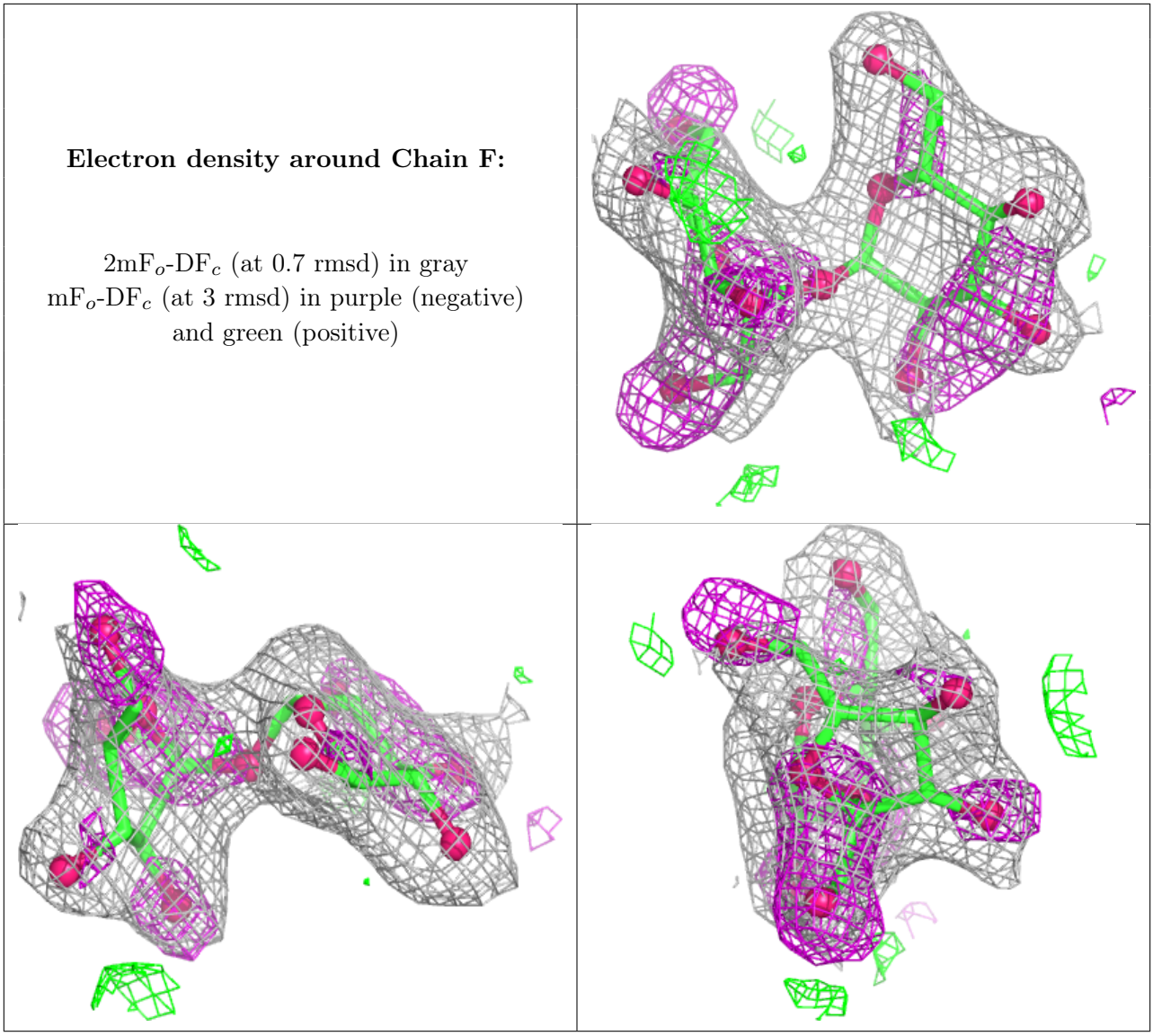






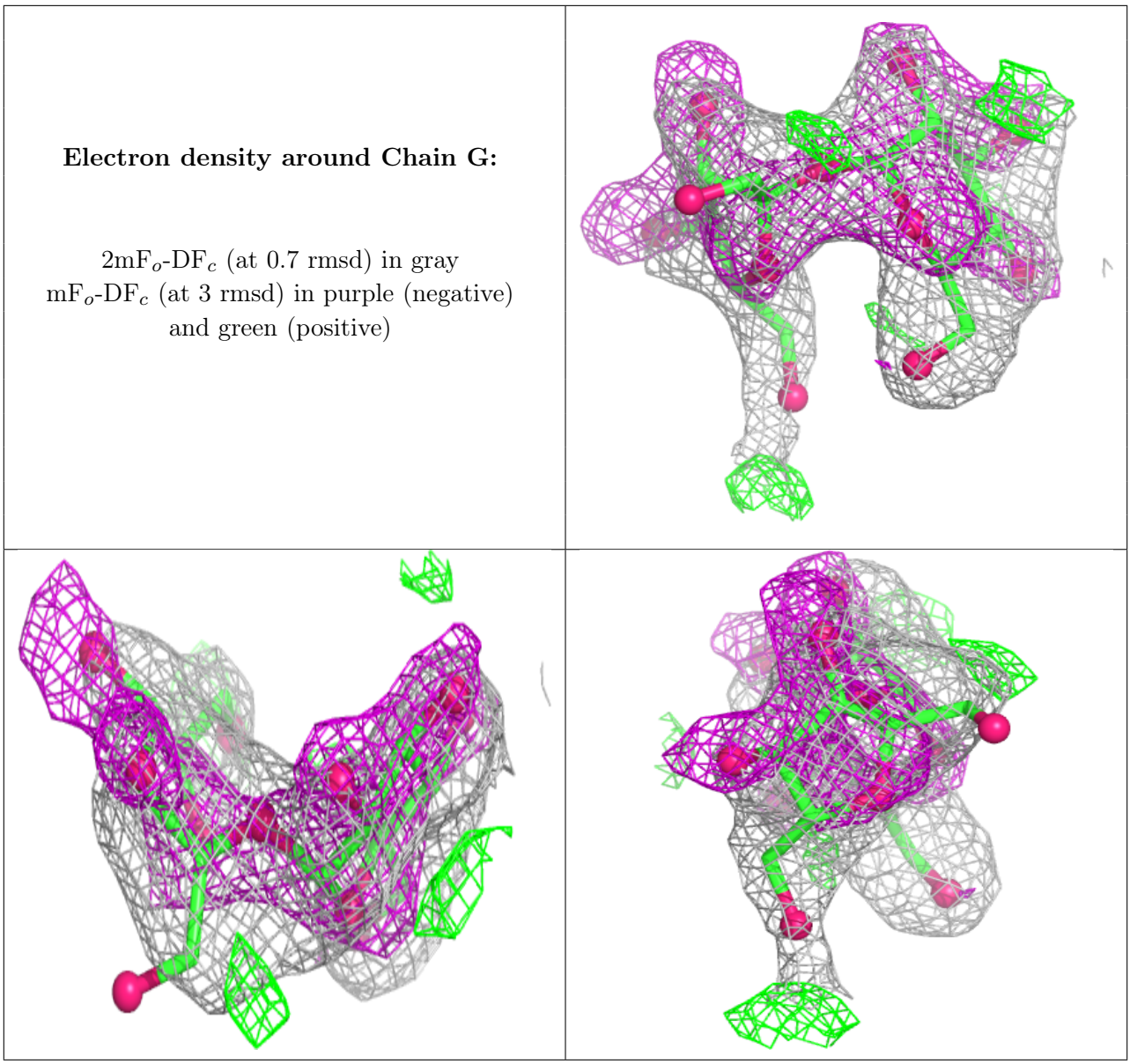
Electron density around Chain F:

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



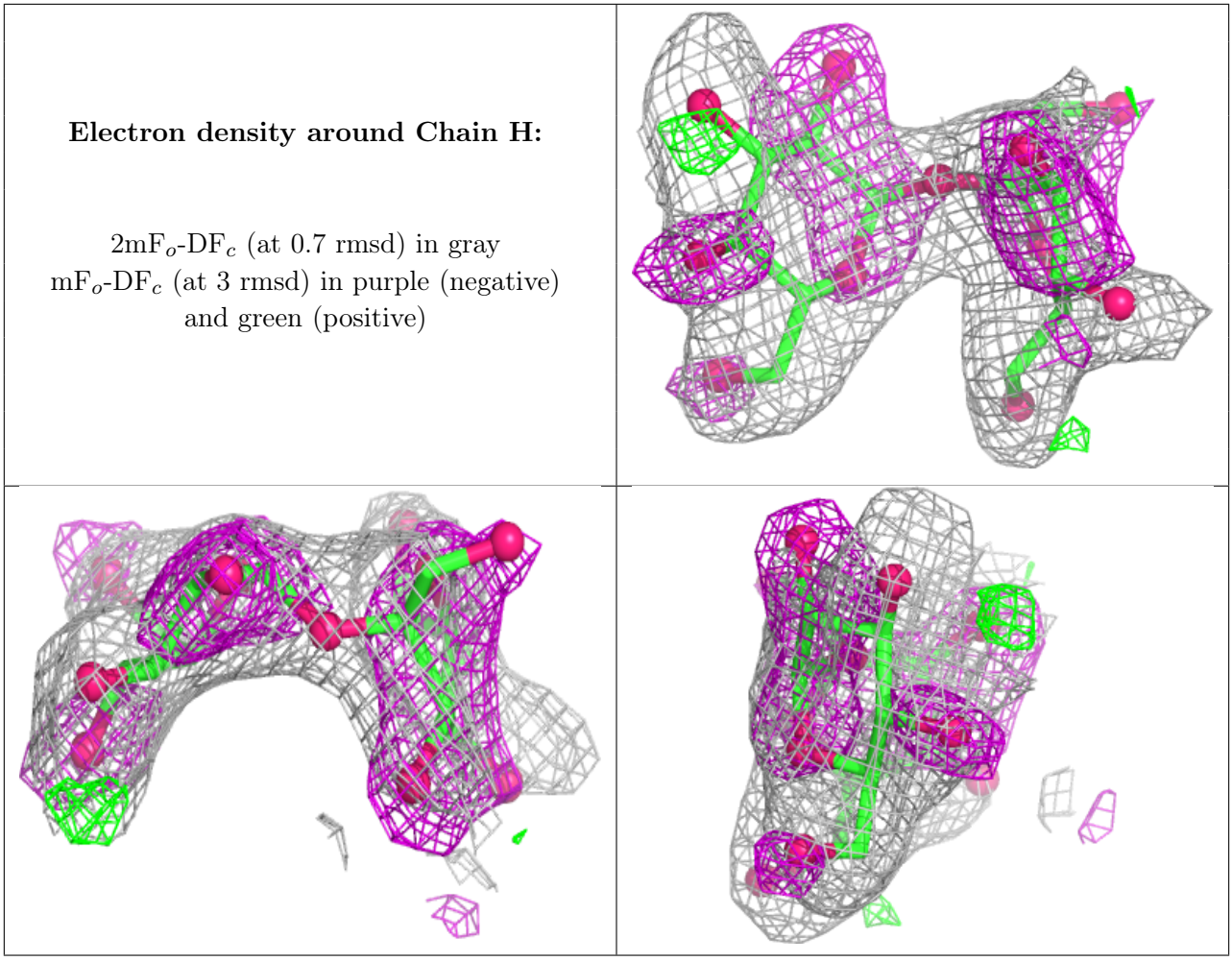
Electron density around Chain G:

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



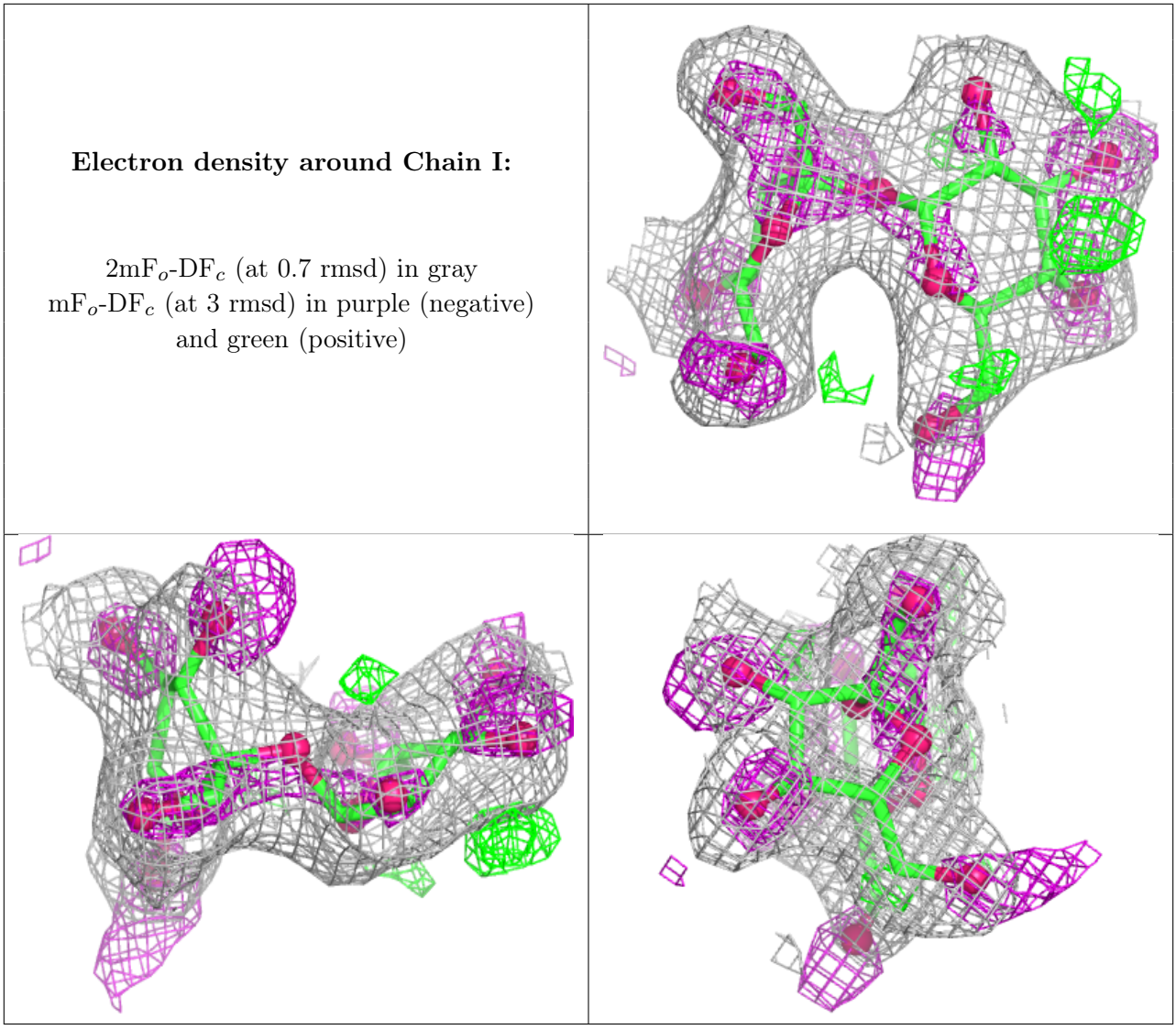
Electron density around Chain H:

$2mF_o$-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, 95^{th} 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
4	SO4	B	1104	5/5	0.74	0.14	82,89,111,116	0
4	SO4	B	1102	5/5	0.75	0.12	83,85,96,99	0
4	SO4	A	1107	5/5	0.78	0.14	71,75,90,95	0
4	SO4	A	1105	5/5	0.81	0.12	75,80,94,97	0
3	1PE	A	1103	16/16	0.82	0.20	58,72,79,84	0
4	SO4	A	1108	5/5	0.82	0.10	75,76,84,94	0
4	SO4	B	1103	5/5	0.83	0.11	90,93,111,119	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	1PE	A	1104	10/16	0.83	0.17	58,65,69,71	0
3	1PE	A	1102	10/16	0.84	0.19	46,56,70,78	0
4	SO4	A	1106	5/5	0.93	0.09	69,72,77,86	0
3	1PE	A	1101	16/16	0.93	0.12	42,47,59,66	0
4	SO4	B	1101	5/5	0.98	0.07	38,41,42,42	5

6.5 Other polymers (i)

There are no such residues in this entry.