



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 26, 2024 – 05:14 AM EDT

PDB ID : 6SWR
Title : Crystal structure of the lysosomal potassium channel MtTMEM175 T38A mutant soaked with zinc
Authors : Brunner, J.D.; Jakob, R.P.; Schulze, T.; Neldner, Y.; Moroni, A.; Thiel, G.; Maier, T.; Schenck, S.
Deposited on : 2019-09-23
Resolution : 3.20 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 : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.37.1
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.37.1

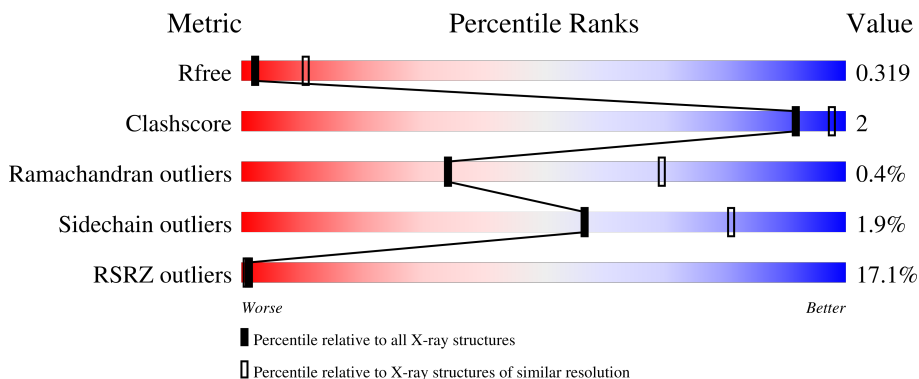
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 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.



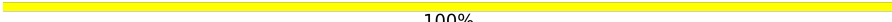
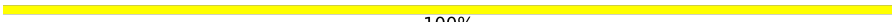
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1133 (3.20-3.20)
Clashscore	141614	1253 (3.20-3.20)
Ramachandran outliers	138981	1234 (3.20-3.20)
Sidechain outliers	138945	1233 (3.20-3.20)
RSRZ outliers	127900	1095 (3.20-3.20)

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	486	
1	D	486	
2	B	255	
2	E	255	

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Mol	Chain	Length	Quality of chain
3	C	2	 100%
3	F	2	 100%

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	K	B	502	-	-	-	X

2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 21866 atoms, of which 10922 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 Nanobody, Maltose/maltodextrin-binding periplasmic protein, Maltodextrin-binding protein, Maltose/maltodextrin-binding periplasmic protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
1	A	460	7080	2283	3517	592	678	10	0	0	0
1	D	460	7080	2283	3517	592	678	10	0	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	484	PRO	ARG	conflict	UNP P0AEX9
A	485	GLY	ILE	conflict	UNP P0AEX9
A	486	ALA	THR	conflict	UNP P0AEX9
D	484	PRO	ARG	conflict	UNP P0AEX9
D	485	GLY	ILE	conflict	UNP P0AEX9
D	486	ALA	THR	conflict	UNP P0AEX9

- Molecule 2 is a protein called Uncharacterized protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
2	B	230	3794	1265	1923	283	315	8	0	0	0
2	E	222	3664	1224	1855	272	305	8	0	0	0

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	0	MET	-	initiating methionine	UNP E4TN31
B	1	SER	-	expression tag	UNP E4TN31
B	38	ALA	THR	conflict	UNP E4TN31
B	248	ALA	-	expression tag	UNP E4TN31
B	249	LEU	-	expression tag	UNP E4TN31

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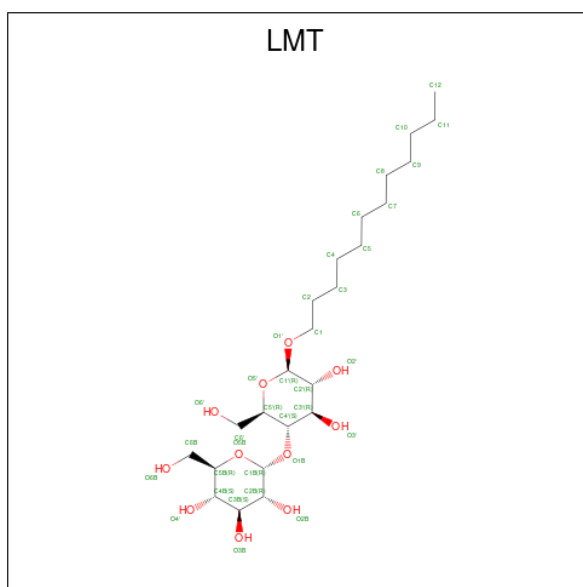
Chain	Residue	Modelled	Actual	Comment	Reference
B	250	GLU	-	expression tag	UNP E4TN31
B	251	VAL	-	expression tag	UNP E4TN31
B	252	LEU	-	expression tag	UNP E4TN31
B	253	PHE	-	expression tag	UNP E4TN31
B	254	GLN	-	expression tag	UNP E4TN31
E	0	MET	-	initiating methionine	UNP E4TN31
E	1	SER	-	expression tag	UNP E4TN31
E	38	ALA	THR	conflict	UNP E4TN31
E	248	ALA	-	expression tag	UNP E4TN31
E	249	LEU	-	expression tag	UNP E4TN31
E	250	GLU	-	expression tag	UNP E4TN31
E	251	VAL	-	expression tag	UNP E4TN31
E	252	LEU	-	expression tag	UNP E4TN31
E	253	PHE	-	expression tag	UNP E4TN31
E	254	GLN	-	expression tag	UNP E4TN31

- Molecule 3 is an oligosaccharide called alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose.



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

- Molecule 4 is DODECYL-BETA-D-MALTOSE (three-letter code: LMT) (formula: C₂₄H₄₆O₁₁).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	B	1	Total	C	H	O	0	0
			63	19	33	11		
4	E	1	Total	C	H	O	0	0
			63	19	33	11		

- Molecule 5 is POTASSIUM ION (three-letter code: K) (formula: K) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	B	1	Total	K	0	0
			1	1		

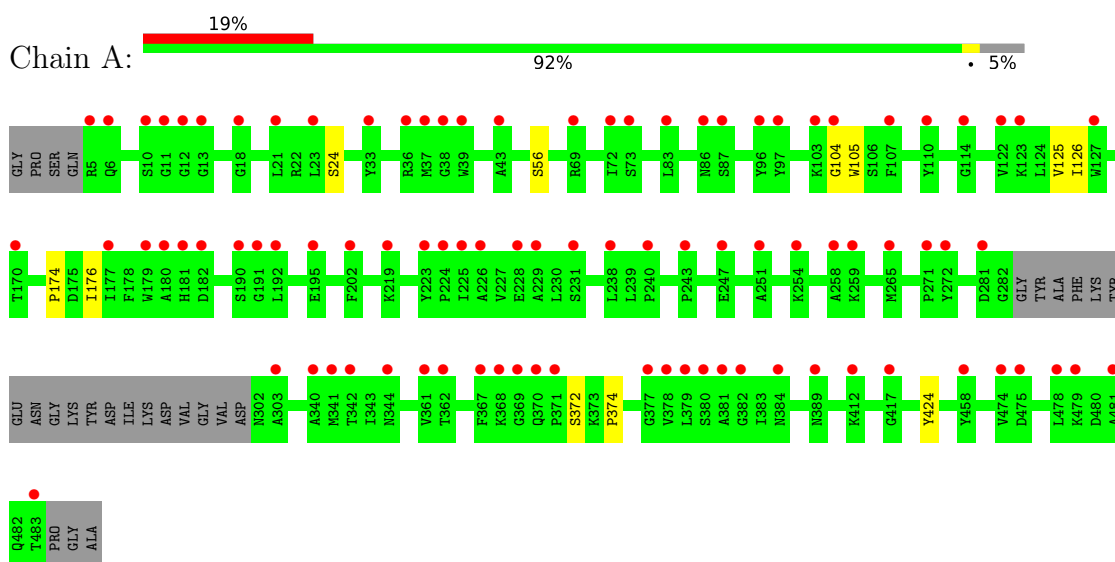
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	3	Total	O	0	0
			3	3		
6	B	8	Total	O	0	0
			8	8		
6	D	13	Total	O	0	0
			13	13		
6	E	7	Total	O	0	0
			7	7		

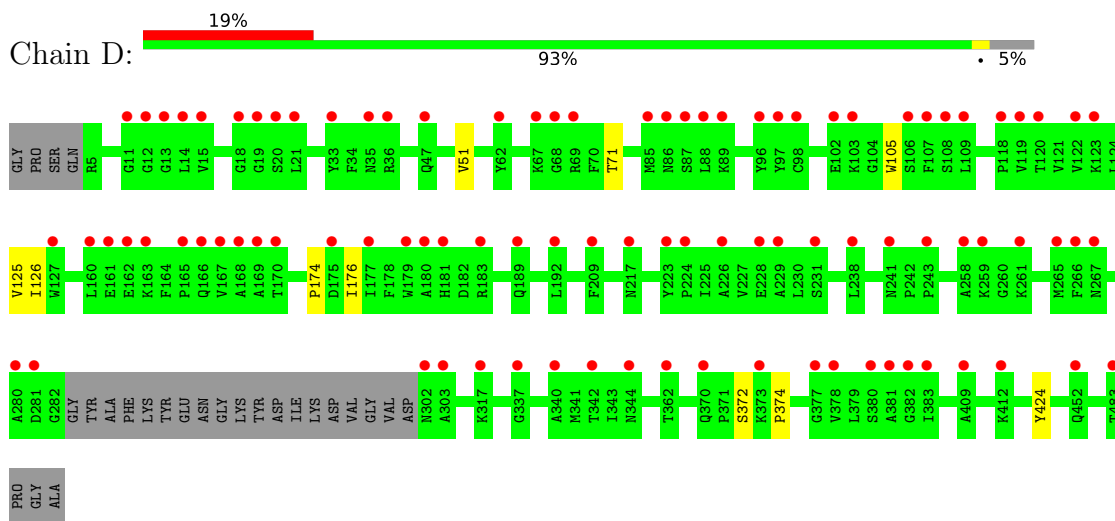
3 Residue-property plots [i](#)

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.

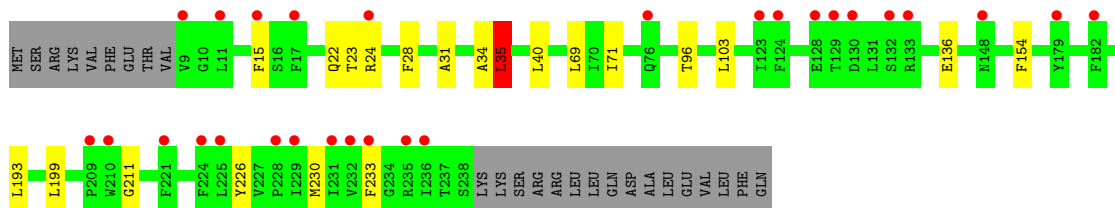
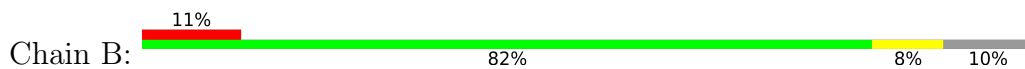
- Molecule 1: Nanobody, Maltose/maltodextrin-binding periplasmic protein, Maltodextrin-binding protein, Maltose/maltodextrin-binding periplasmic protein



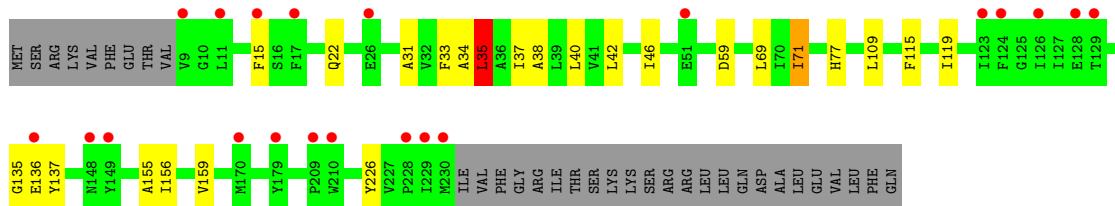
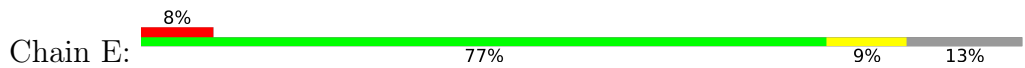
- Molecule 1: Nanobody, Maltose/maltodextrin-binding periplasmic protein, Maltodextrin-binding protein, Maltose/maltodextrin-binding periplasmic protein



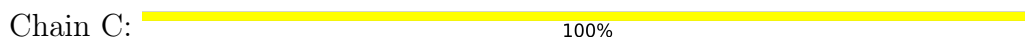
- Molecule 2: Uncharacterized protein



• Molecule 2: Uncharacterized protein



• Molecule 3: alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose



• Molecule 3: alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 2 21	Depositor
Cell constants a, b, c, α , β , γ	129.79Å 131.61Å 151.77Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.72 – 3.20 28.58 – 3.20	Depositor EDS
% Data completeness (in resolution range)	99.8 (49.72-3.20) 99.7 (28.58-3.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.17 (at 3.17Å)	Xtrriage
Refinement program	BUSTER	Depositor
R, R_{free}	0.269 , 0.299 0.296 , 0.319	Depositor DCC
R_{free} test set	2132 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å ²)	100.4	Xtrriage
Anisotropy	0.862	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 155.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.40$, $\langle L^2 \rangle = 0.23$	Xtrriage
Estimated twinning fraction	0.008 for k,h,-l	Xtrriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	21866	wwPDB-VP
Average B, all atoms (Å ²)	224.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.10% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: K, GLC, LMT

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	0.40	0/3649	0.67	1/4956 (0.0%)
1	D	0.34	0/3649	0.61	0/4956
2	B	0.69	3/1921 (0.2%)	0.74	1/2612 (0.0%)
2	E	0.64	2/1858 (0.1%)	0.67	1/2527 (0.0%)
All	All	0.49	5/11077 (0.0%)	0.67	3/15051 (0.0%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	35	LEU	CB-CG	13.98	1.93	1.52
2	E	35	LEU	CB-CG	13.89	1.92	1.52
2	E	34	ALA	C-N	8.53	1.53	1.34
2	B	34	ALA	C-N	7.08	1.50	1.34
2	B	35	LEU	CA-C	-5.17	1.39	1.52

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
2	B	35	LEU	CA-CB-CG	5.94	128.97	115.30
2	E	35	LEU	CA-CB-CG	5.62	128.23	115.30
1	A	104	GLY	N-CA-C	5.62	127.14	113.10

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	3563	3517	3518	4	1
1	D	3563	3517	3520	4	0
2	B	1871	1923	1935	19	1
2	E	1809	1855	1867	15	0
3	C	23	22	21	0	0
3	F	23	22	21	0	0
4	B	30	33	32	0	0
4	E	30	33	33	0	0
5	B	1	0	0	0	0
6	A	3	0	0	0	0
6	B	8	0	0	1	0
6	D	13	0	0	0	0
6	E	7	0	0	0	0
All	All	10944	10922	10947	34	1

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 2.

All (34) 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)
2:B:35:LEU:CG	2:B:35:LEU:CB	1.93	1.47
2:E:35:LEU:CB	2:E:35:LEU:CG	1.92	1.45
2:B:35:LEU:HD22	2:E:38:ALA:HB3	1.69	0.74
2:B:193:LEU:CD1	2:B:233:PHE:CD1	2.75	0.68
2:E:35:LEU:CB	2:E:35:LEU:CD2	2.70	0.65
2:B:35:LEU:CB	2:B:35:LEU:CD2	2.73	0.63
2:B:193:LEU:HD13	2:B:233:PHE:CD1	2.37	0.59
2:B:193:LEU:CD1	2:B:233:PHE:CG	2.86	0.59
6:B:601:HOH:O	2:E:42:LEU:HD13	2.03	0.59
1:D:125:VAL:HG13	1:D:174:PRO:HA	1.84	0.58
1:A:125:VAL:HG13	1:A:174:PRO:HA	1.85	0.58
2:B:193:LEU:HD11	2:B:233:PHE:CE1	2.41	0.56
2:B:31:ALA:O	2:B:35:LEU:N	2.34	0.55
2:B:193:LEU:HD11	2:B:233:PHE:CD1	2.42	0.55
2:B:23:THR:HA	2:E:22:GLN:NE2	2.21	0.55
2:E:31:ALA:O	2:E:35:LEU:N	2.30	0.55
2:B:96:THR:HG21	2:E:71:ILE:HG12	1.89	0.55
1:A:372:SER:O	1:A:374:PRO:HD3	2.08	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:372:SER:O	1:D:374:PRO:HD3	2.09	0.53
2:E:115:PHE:CZ	2:E:119:ILE:HD11	2.44	0.53
1:D:125:VAL:CG1	1:D:174:PRO:HA	2.43	0.49
1:A:125:VAL:CG1	1:A:174:PRO:HA	2.43	0.48
2:B:28:PHE:HE1	2:E:33:PHE:HB3	1.80	0.46
2:B:24:ARG:HH22	2:E:77:HIS:CE1	2.35	0.44
1:D:126:ILE:HG12	1:D:176:ILE:HG13	2.00	0.43
1:A:126:ILE:HG12	1:A:176:ILE:HG13	1.99	0.43
2:B:22:GLN:O	2:E:22:GLN:OE1	2.37	0.42
2:E:155:ALA:O	2:E:159:VAL:HG23	2.19	0.42
2:B:103:LEU:CD1	2:E:37:ILE:HD12	2.49	0.42
2:B:103:LEU:HD11	2:E:37:ILE:HD12	2.03	0.41
2:B:154:PHE:CE1	2:B:199:LEU:HD13	2.56	0.41
2:B:193:LEU:HD11	2:B:233:PHE:CG	2.56	0.41
2:B:193:LEU:HD11	2:B:233:PHE:CZ	2.56	0.41
2:E:46:ILE:N	2:E:46:ILE:HD12	2.36	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:56:SER:HG	2:B:211:GLY:O[1_545]	1.58	0.02

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	456/486 (94%)	437 (96%)	18 (4%)	1 (0%)	47 79
1	D	456/486 (94%)	437 (96%)	18 (4%)	1 (0%)	47 79
2	B	228/255 (89%)	218 (96%)	9 (4%)	1 (0%)	34 69
2	E	220/255 (86%)	210 (96%)	8 (4%)	2 (1%)	17 56

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	1360/1482 (92%)	1302 (96%)	53 (4%)	5 (0%)	34 69

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	136	GLU
1	A	105	TRP
1	D	105	TRP
2	E	136	GLU
2	E	135	GLY

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	370/389 (95%)	368 (100%)	2 (0%)	88 95
1	D	370/389 (95%)	367 (99%)	3 (1%)	81 93
2	B	206/230 (90%)	199 (97%)	7 (3%)	37 70
2	E	199/230 (86%)	189 (95%)	10 (5%)	24 60
All	All	1145/1238 (92%)	1123 (98%)	22 (2%)	57 81

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	24	SER
1	A	424	TYR
2	B	15	PHE
2	B	35	LEU
2	B	40	LEU
2	B	69	LEU
2	B	71	ILE
2	B	226	TYR
2	B	230	MET
1	D	51	VAL

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Mol	Chain	Res	Type
1	D	71	THR
1	D	424	TYR
2	E	15	PHE
2	E	35	LEU
2	E	40	LEU
2	E	59	ASP
2	E	69	LEU
2	E	71	ILE
2	E	109	LEU
2	E	137	TYR
2	E	156	ILE
2	E	226	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	61	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

4 monosaccharides are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	GLC	C	1	3	12,12,12	1.29	2 (16%)	17,17,17	1.82	4 (23%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	GLC	C	2	3	11,11,12	1.78	2 (18%)	15,15,17	2.07	4 (26%)
3	GLC	F	1	3	12,12,12	1.24	0	17,17,17	1.87	5 (29%)
3	GLC	F	2	3	11,11,12	1.77	2 (18%)	15,15,17	2.10	4 (26%)

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	GLC	C	1	3	-	0/2/22/22	0/1/1/1
3	GLC	C	2	3	-	0/2/19/22	0/1/1/1
3	GLC	F	1	3	-	0/2/22/22	0/1/1/1
3	GLC	F	2	3	-	0/2/19/22	0/1/1/1

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	2	GLC	O5-C1	-4.18	1.37	1.43
3	F	2	GLC	O5-C1	-4.15	1.37	1.43
3	C	2	GLC	O2-C2	-2.49	1.38	1.43
3	F	2	GLC	O2-C2	-2.41	1.38	1.43
3	C	1	GLC	O3-C3	-2.26	1.37	1.43
3	C	1	GLC	O5-C5	-2.06	1.39	1.44

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	F	2	GLC	C1-O5-C5	4.97	118.92	112.19
3	C	2	GLC	C1-O5-C5	4.84	118.75	112.19
3	F	2	GLC	O5-C5-C6	-4.40	100.30	107.20
3	C	2	GLC	O5-C5-C6	-4.24	100.56	107.20
3	C	1	GLC	C1-O5-C5	4.05	121.31	113.66
3	F	1	GLC	C1-O5-C5	4.01	121.22	113.66
3	C	1	GLC	O5-C1-C2	3.93	117.30	110.28
3	F	1	GLC	O5-C1-C2	3.91	117.25	110.28
3	F	2	GLC	O3-C3-C4	-2.69	104.13	110.35
3	C	2	GLC	O3-C3-C4	-2.67	104.17	110.35
3	C	2	GLC	O3-C3-C2	2.61	114.99	109.99
3	F	2	GLC	O3-C3-C2	2.36	114.52	109.99
3	F	1	GLC	O5-C5-C6	-2.24	100.87	106.44

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	1	GLC	O5-C5-C6	-2.21	100.95	106.44
3	F	1	GLC	O2-C2-C1	2.17	114.20	109.16
3	C	1	GLC	O2-C2-C1	2.08	113.99	109.16
3	F	1	GLC	C4-C3-C2	-2.02	107.30	110.82

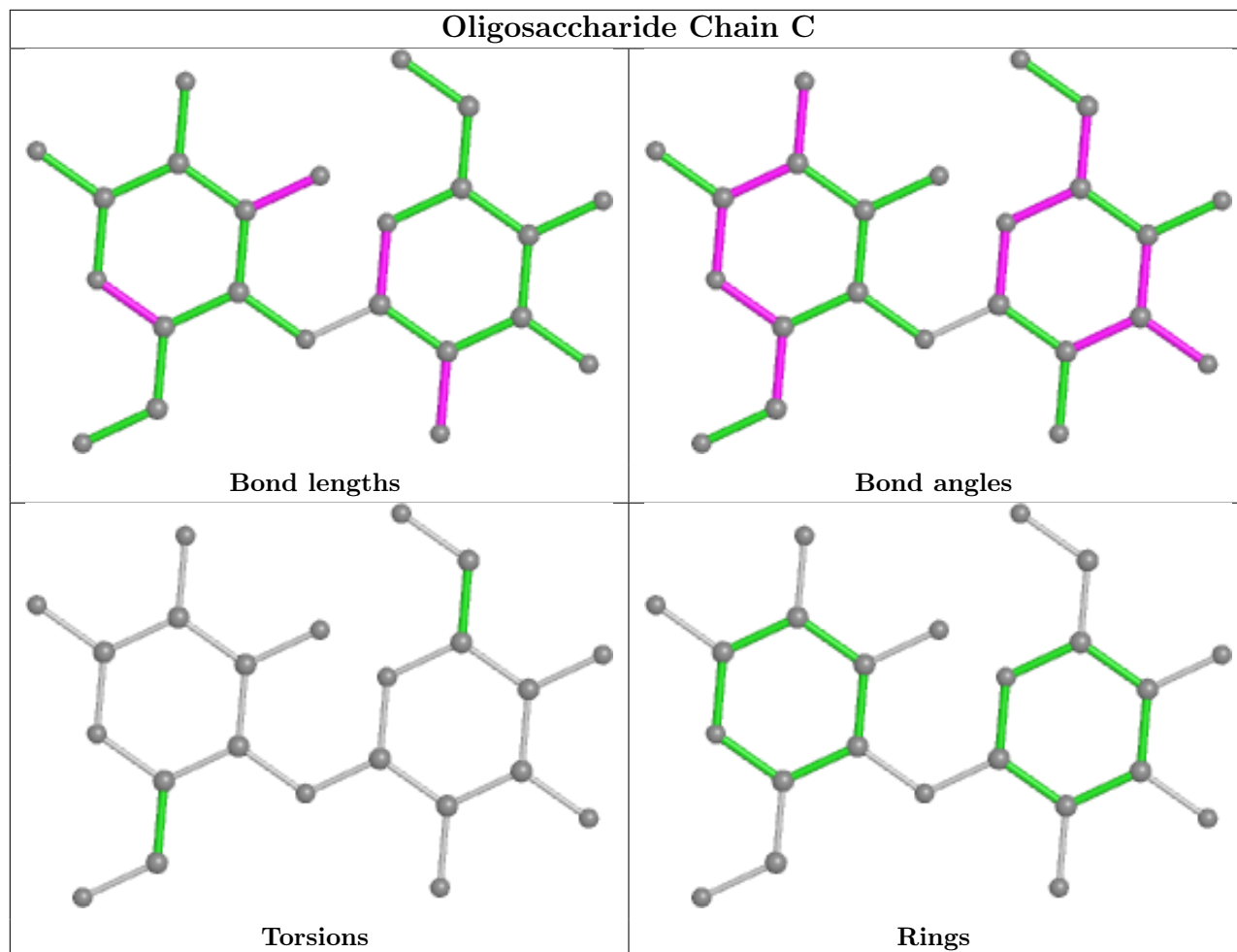
There are no chirality outliers.

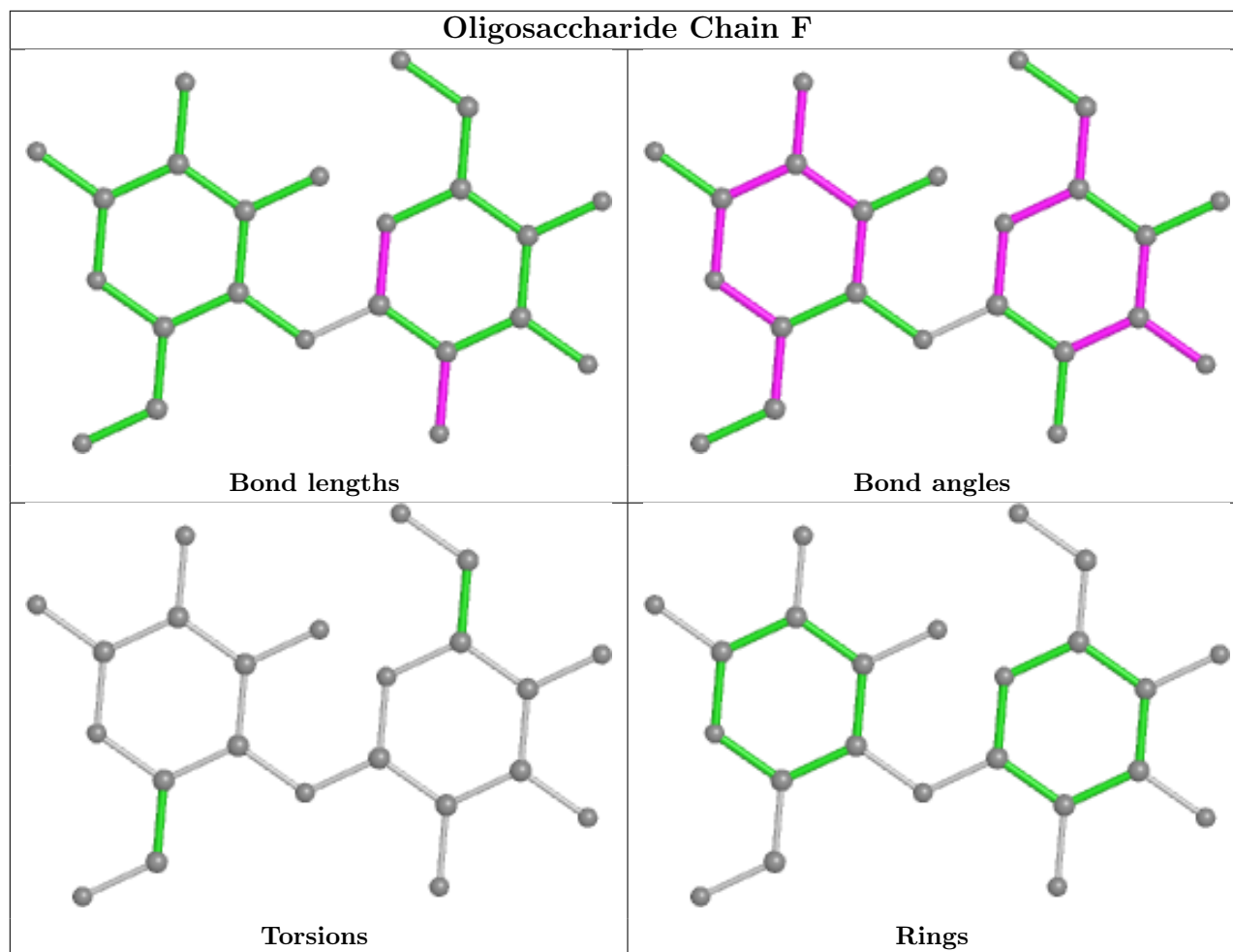
There are no torsion outliers.

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.





5.6 Ligand geometry [i](#)

Of 3 ligands modelled in this entry, 1 is monoatomic - leaving 2 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
4	LMT	B	501	-	31,31,36	1.12	3 (9%)	42,42,47	1.41	9 (21%)
4	LMT	E	501	-	31,31,36	1.19	3 (9%)	42,42,47	1.56	7 (16%)

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
4	LMT	B	501	-	-	4/16/56/61	0/2/2/2
4	LMT	E	501	-	-	5/16/56/61	0/2/2/2

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	E	501	LMT	C3'-C4'	2.40	1.58	1.52
4	B	501	LMT	C4B-C3B	2.31	1.58	1.52
4	B	501	LMT	O2'-C2'	-2.13	1.38	1.43
4	B	501	LMT	O1'-C1'	2.12	1.43	1.40
4	E	501	LMT	C4'-C5'	2.12	1.58	1.52
4	E	501	LMT	C4B-C5B	2.11	1.57	1.53

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	E	501	LMT	C1B-O5B-C5B	4.76	123.04	113.69
4	E	501	LMT	C1'-C2'-C3'	-3.29	103.14	110.00
4	B	501	LMT	O2B-C2B-C3B	-3.12	103.15	110.35
4	E	501	LMT	C3B-C4B-C5B	-3.05	104.80	110.24
4	B	501	LMT	O4'-C4B-C5B	-2.87	102.17	109.30
4	E	501	LMT	C4B-C3B-C2B	-2.76	106.01	110.82
4	B	501	LMT	C4B-C3B-C2B	2.60	115.37	110.82
4	E	501	LMT	O1B-C4'-C5'	-2.49	102.63	109.45
4	B	501	LMT	O3B-C3B-C4B	-2.29	105.06	110.35
4	B	501	LMT	O5'-C1'-C2'	-2.27	105.55	110.35
4	E	501	LMT	O5B-C1B-C2B	2.19	114.99	110.35
4	B	501	LMT	C1B-O5B-C5B	2.15	117.91	113.69
4	E	501	LMT	O5'-C1'-C2'	-2.12	105.85	110.35
4	B	501	LMT	C1B-C2B-C3B	2.08	114.33	110.00
4	B	501	LMT	O2B-C2B-C1B	2.08	115.09	110.05
4	B	501	LMT	O5'-C5'-C4'	2.03	114.03	109.75

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	501	LMT	O5'-C5'-C6'-O6'
4	E	501	LMT	O5'-C5'-C6'-O6'

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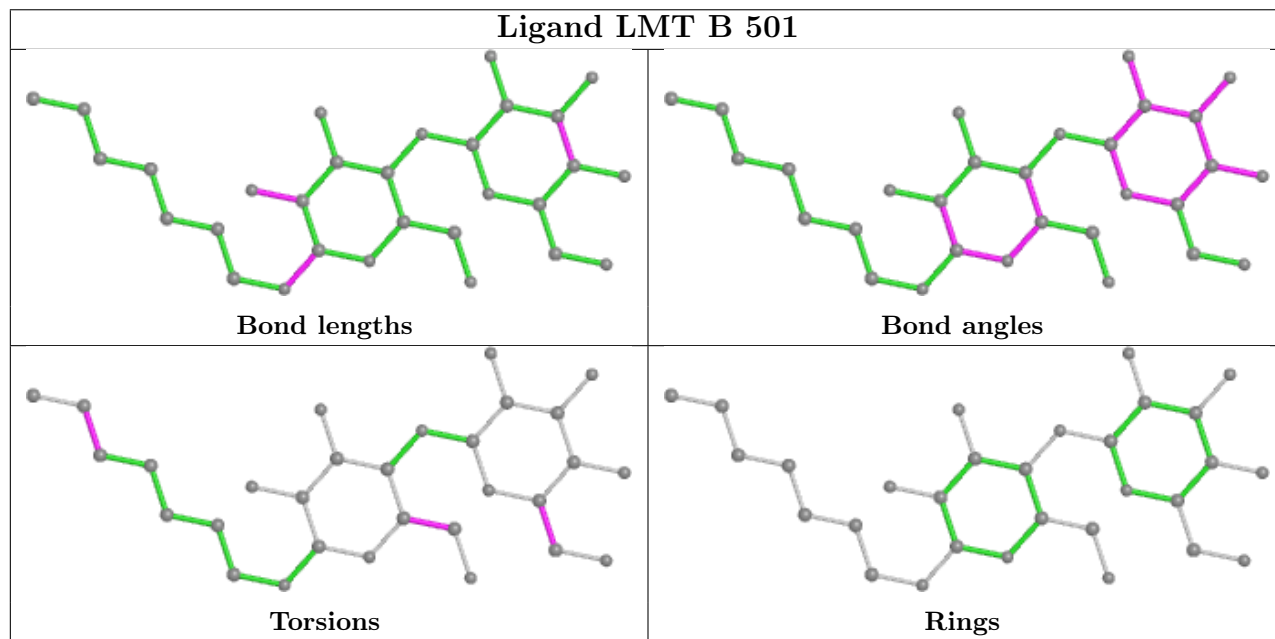
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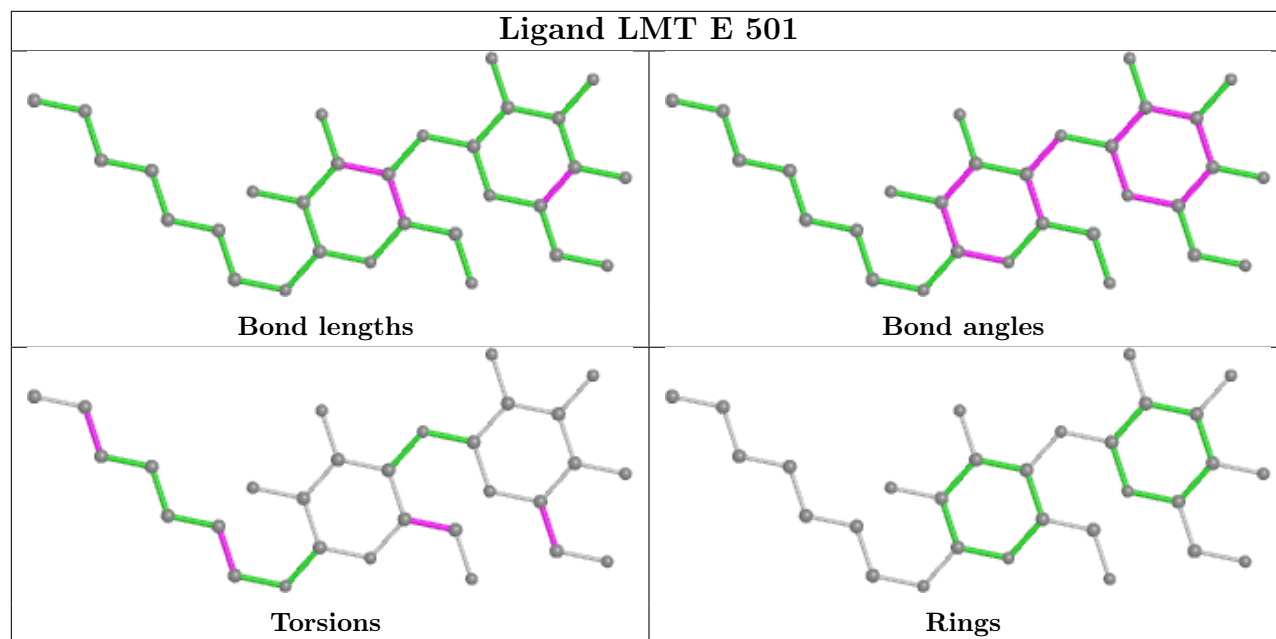
Mol	Chain	Res	Type	Atoms
4	E	501	LMT	C4'-C5'-C6'-O6'
4	E	501	LMT	O1'-C1-C2-C3
4	B	501	LMT	C4'-C5'-C6'-O6'
4	E	501	LMT	O5B-C5B-C6B-O6B
4	B	501	LMT	O5B-C5B-C6B-O6B
4	B	501	LMT	C4-C5-C6-C7
4	E	501	LMT	C4-C5-C6-C7

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 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 [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, 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	460/486 (94%)	1.03	91 (19%) 1 1	189, 244, 271, 289	0
1	D	460/486 (94%)	0.98	94 (20%) 1 1	183, 244, 269, 278	0
2	B	230/255 (90%)	0.81	28 (12%) 4 2	40, 192, 258, 271	0
2	E	222/255 (87%)	0.56	21 (9%) 8 4	47, 187, 236, 259	0
All	All	1372/1482 (92%)	0.90	234 (17%) 1 1	40, 234, 266, 289	0

All (234) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	11	GLY	14.0
1	A	380	SER	13.7
1	D	380	SER	11.7
2	B	232	VAL	11.2
2	B	233	PHE	10.9
1	A	12	GLY	10.8
1	A	226	ALA	8.3
1	A	369	GLY	8.1
1	D	97	TYR	7.9
1	D	231	SER	7.8
1	A	180	ALA	7.8
1	D	20	SER	7.6
1	D	103	LYS	6.9
1	A	483	THR	6.8
1	A	368	LYS	6.7
1	D	382	GLY	6.5
1	D	21	LEU	6.3
1	A	381	ALA	6.3
1	D	180	ALA	6.1
1	D	11	GLY	6.1
2	B	228	PRO	5.9

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Mol	Chain	Res	Type	RSRZ
1	D	87	SER	5.9
1	D	86	ASN	5.9
2	B	229	ILE	5.9
1	D	12	GLY	5.8
1	D	108	SER	5.8
1	A	179	TRP	5.7
1	D	162	GLU	5.6
1	A	6	GLN	5.3
1	D	179	TRP	5.3
1	D	163	LYS	5.2
1	D	169	ALA	5.2
1	A	258	ALA	5.1
2	B	231	ILE	5.0
2	B	179	TYR	5.0
1	D	170	THR	5.0
1	D	13	GLY	5.0
1	A	379	LEU	5.0
2	B	129	THR	4.9
2	E	51	GLU	4.9
2	B	225	LEU	4.9
1	A	377	GLY	4.9
1	A	384	ASN	4.8
1	A	181	HIS	4.8
1	A	10	SER	4.8
1	D	161	GLU	4.8
1	D	259	LYS	4.7
1	D	166	GLN	4.7
1	D	189	GLN	4.6
1	D	119	VAL	4.6
1	A	370	GLN	4.6
1	D	35	ASN	4.6
1	D	344	ASN	4.6
2	E	124	PHE	4.5
1	A	21	LEU	4.5
1	D	107	PHE	4.5
2	E	229	ILE	4.5
1	A	127	TRP	4.4
1	D	88	LEU	4.3
1	A	481	ALA	4.3
2	B	130	ASP	4.3
1	D	122	VAL	4.3
1	A	103	LYS	4.2

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Mol	Chain	Res	Type	RSRZ
1	D	381	ALA	4.2
1	D	383	ILE	4.2
1	D	181	HIS	4.2
1	A	231	SER	4.2
1	A	96	TYR	4.2
1	A	474	VAL	4.2
1	A	114	GLY	4.1
1	D	127	TRP	4.1
2	B	235	ARG	4.1
2	B	11	LEU	4.0
1	A	281	ASP	4.0
2	E	210	TRP	4.0
1	A	13	GLY	3.9
1	D	19	GLY	3.8
1	D	342	THR	3.8
1	A	259	LYS	3.7
1	D	265	MET	3.7
1	D	14	LEU	3.7
1	A	342	THR	3.7
1	D	243	PRO	3.6
1	A	122	VAL	3.6
2	B	221	PHE	3.6
2	E	126	ILE	3.6
1	A	378	VAL	3.6
1	A	224	PRO	3.5
1	D	267	ASN	3.5
2	B	128	GLU	3.5
2	B	236	ILE	3.5
1	A	228	GLU	3.5
2	B	209	PRO	3.5
1	A	72	ILE	3.4
1	A	254	LYS	3.4
1	A	73	SER	3.4
1	A	479	LYS	3.4
2	E	128	GLU	3.4
2	E	209	PRO	3.4
1	D	69	ARG	3.4
1	A	225	ILE	3.3
2	E	26	GLU	3.3
1	A	344	ASN	3.3
1	A	389	ASN	3.3
1	A	190	SER	3.3

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Mol	Chain	Res	Type	RSRZ
1	A	240	PRO	3.3
2	E	170	MET	3.2
1	D	209	PHE	3.2
1	D	18	GLY	3.2
2	E	228	PRO	3.2
2	B	9	VAL	3.2
2	B	15	PHE	3.2
1	A	382	GLY	3.2
1	D	258	ALA	3.1
1	D	15	VAL	3.1
1	D	226	ALA	3.1
1	A	170	THR	3.1
1	A	23	LEU	3.1
1	A	182	ASP	3.0
1	A	229	ALA	3.0
1	D	167	VAL	3.0
1	A	97	TYR	2.9
1	A	38	GLY	2.9
2	E	230	MET	2.9
1	D	47	GLN	2.9
1	A	243	PRO	2.9
2	E	136	GLU	2.9
2	B	123	ILE	2.9
2	E	123	ILE	2.9
1	D	109	LEU	2.9
1	A	475	ASP	2.9
1	A	33	TYR	2.9
1	A	195	GLU	2.8
1	D	370	GLN	2.8
1	A	87	SER	2.8
2	B	124	PHE	2.8
1	D	266	PHE	2.8
1	D	33	TYR	2.8
1	D	229	ALA	2.8
1	D	68	GLY	2.8
1	D	302	ASN	2.8
1	D	96	TYR	2.8
1	D	409	ALA	2.8
1	D	412	LYS	2.7
1	D	168	ALA	2.7
1	D	89	LYS	2.7
1	D	340	ALA	2.7

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Mol	Chain	Res	Type	RSRZ
1	D	217	ASN	2.7
1	D	377	GLY	2.7
1	A	341	MET	2.7
1	D	36	ARG	2.7
1	A	219	LYS	2.6
1	D	223	TYR	2.6
1	A	238	LEU	2.6
2	B	182	PHE	2.6
1	D	362	THR	2.6
2	B	17	PHE	2.5
1	D	102	GLU	2.5
2	B	133	ARG	2.5
1	D	98	CYS	2.5
1	A	478	LEU	2.5
1	A	412	LYS	2.5
1	D	378	VAL	2.5
1	A	458	TYR	2.5
1	A	86	ASN	2.5
1	D	175	ASP	2.5
2	E	179	TYR	2.5
1	A	177	ILE	2.4
1	A	191	GLY	2.4
1	D	224	PRO	2.4
1	A	265	MET	2.4
1	D	373	LYS	2.4
1	A	271	PRO	2.4
2	B	224	PHE	2.4
1	D	483	THR	2.4
1	D	303	ALA	2.4
1	A	104	GLY	2.4
1	D	85	MET	2.4
1	A	107	PHE	2.4
1	A	43	ALA	2.4
1	A	192	LEU	2.3
2	E	129	THR	2.3
1	A	340	ALA	2.3
2	B	148	ASN	2.3
1	A	18	GLY	2.3
1	D	280	ALA	2.3
1	A	123	LYS	2.3
1	D	165	PRO	2.3
1	D	183	ARG	2.3

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Mol	Chain	Res	Type	RSRZ
2	E	11	LEU	2.3
1	D	67	LYS	2.3
1	A	272	TYR	2.2
1	D	118	PRO	2.2
1	D	261	LYS	2.2
2	E	9	VAL	2.2
2	B	76	GLN	2.2
1	D	228	GLU	2.2
1	A	223	TYR	2.2
1	D	281	ASP	2.2
1	A	69	ARG	2.2
1	A	303	ALA	2.2
1	D	177	ILE	2.2
2	B	132	SER	2.2
1	D	123	LYS	2.2
1	D	238	LEU	2.2
1	A	417	GLY	2.2
1	A	367	PHE	2.1
1	D	317	LYS	2.1
1	A	362	THR	2.1
2	E	148	ASN	2.1
2	E	149	TYR	2.1
2	E	17	PHE	2.1
1	A	361	VAL	2.1
1	D	106	SER	2.1
1	D	452	GLN	2.1
1	A	83	LEU	2.1
1	D	337	GLY	2.1
1	D	62	TYR	2.1
1	A	247	GLU	2.1
2	B	24	ARG	2.1
1	A	5	ARG	2.1
1	D	241	ASN	2.1
1	A	110	TYR	2.1
1	A	251	ALA	2.1
1	A	37	MET	2.1
1	A	202	PHE	2.1
1	A	39	TRP	2.0
2	B	210	TRP	2.0
1	D	120	THR	2.0
1	A	371	PRO	2.0
1	A	36	ARG	2.0

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Mol	Chain	Res	Type	RSRZ
1	D	160	LEU	2.0
1	D	192	LEU	2.0
2	E	15	PHE	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](#)

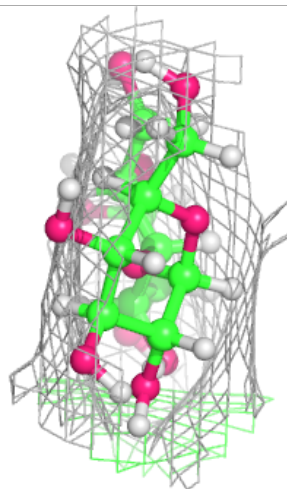
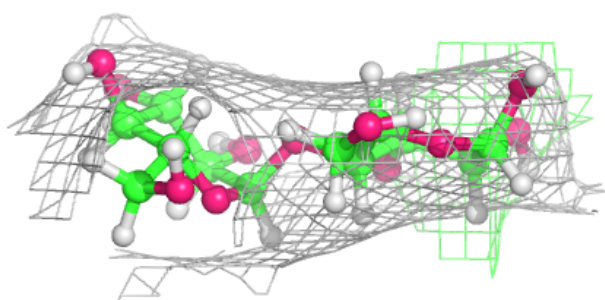
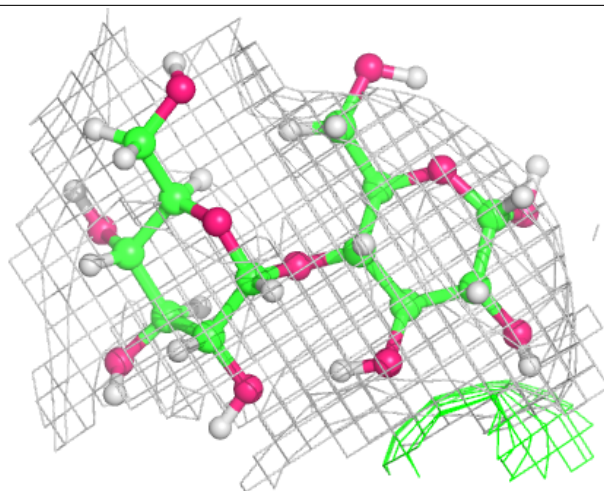
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

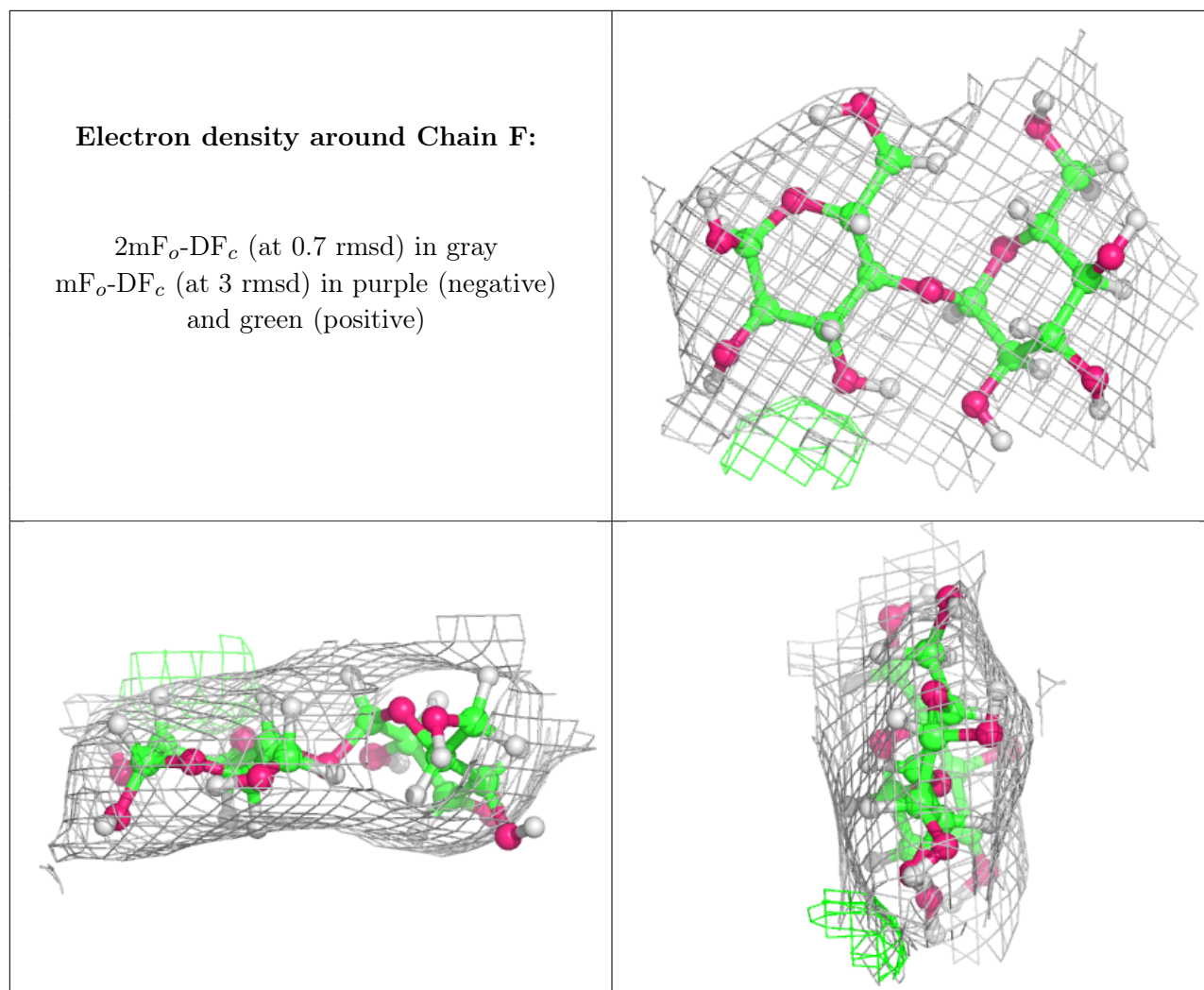
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	GLC	F	2	11/12	0.76	0.26	187,190,191,192	0
3	GLC	C	1	12/12	0.83	0.49	184,187,188,188	0
3	GLC	C	2	11/12	0.84	0.40	191,194,198,199	0
3	GLC	F	1	12/12	0.87	0.49	176,178,180,184	0

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)





6.4 Ligands [i](#)

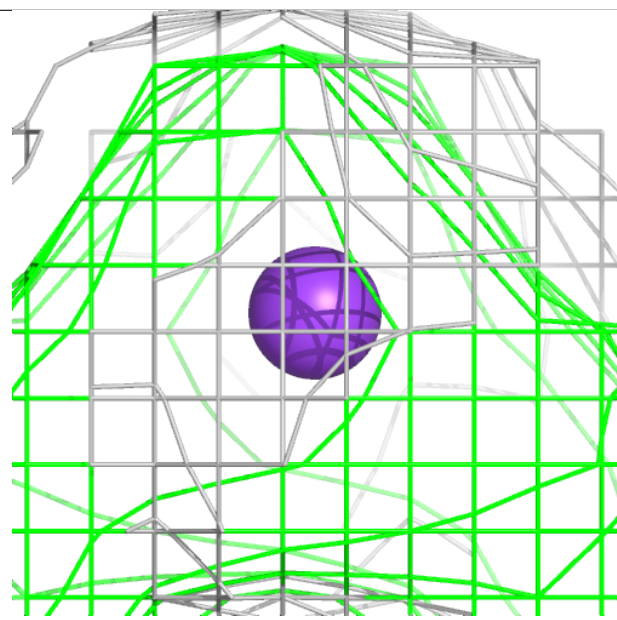
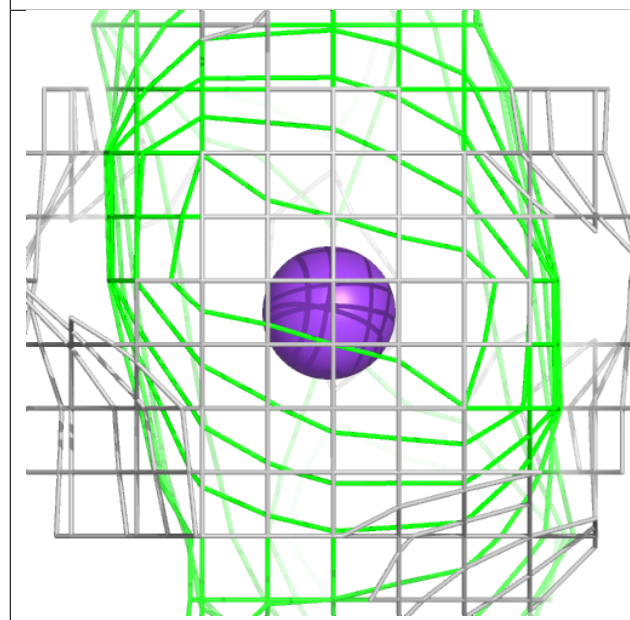
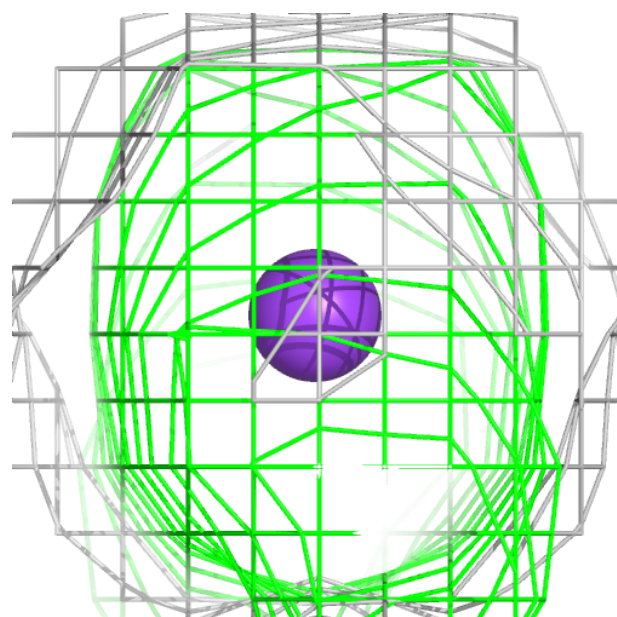
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	K	B	502	1/1	0.67	6.79	251,251,251,251	1
4	LMT	B	501	30/35	0.84	0.32	209,218,230,230	0
4	LMT	E	501	30/35	0.87	0.23	194,198,210,211	0

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.

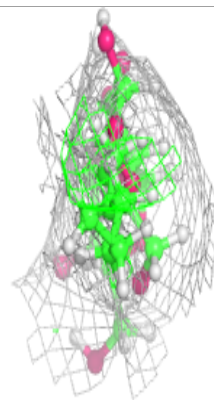
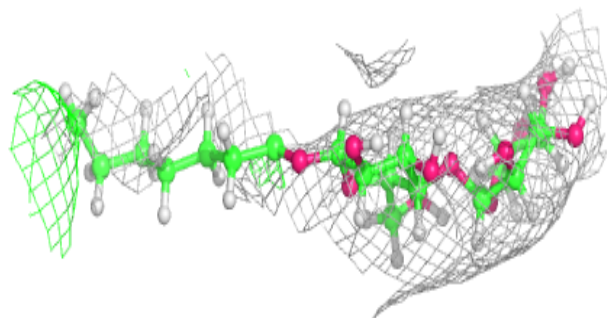
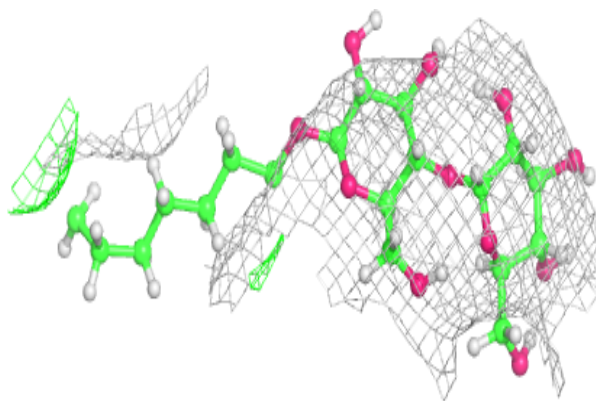
Electron density around K B 502:

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

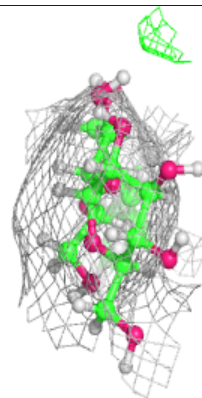
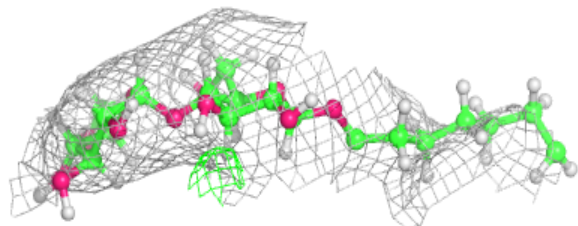
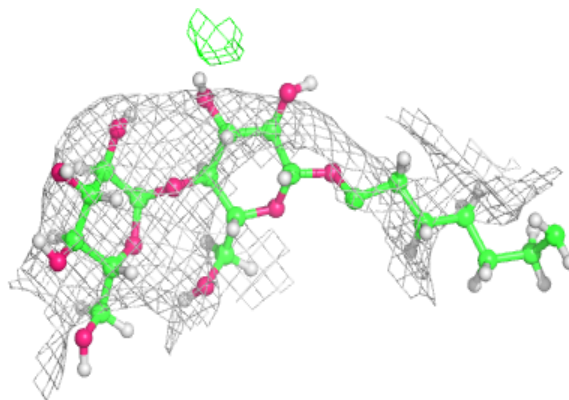


Electron density around LMT B 501:

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

**Electron density around LMT E 501:**

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



6.5 Other polymers [i](#)

There are no such residues in this entry.