



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 12:45 PM EDT

PDB ID : 9CH4 / pdb_00009ch4
Title : Crystal structure of shark nonclassical MHC CLASS I, UGA
Authors : Castro, C.D.; Adams, E.J.
Deposited on : 2024-07-01
Resolution : 2.67 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)
Xtrriage (Phenix) : 2.0
EDS : 3.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
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) : 2.48.1

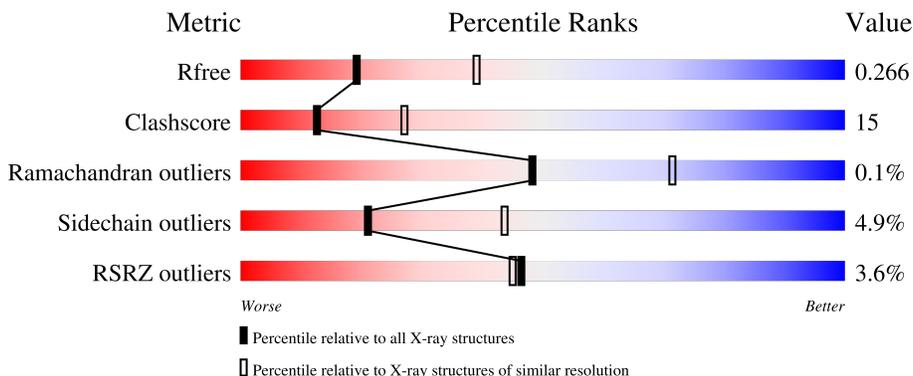
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.67 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	4708 (2.70-2.66)
Clashscore	180529	5138 (2.70-2.66)
Ramachandran outliers	177936	5071 (2.70-2.66)
Sidechain outliers	177891	5071 (2.70-2.66)
RSRZ outliers	164620	4708 (2.70-2.66)

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	268	 4% 66% 33%
1	C	268	 4% 61% 36%
1	E	268	 4% 66% 31%
2	B	94	 2% 77% 23%
2	D	94	 2% 62% 35%

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Mol	Chain	Length	Quality of chain
2	F	94	<p>3% 70% 26%</p>
3	G	6	<p>33% 67%</p>
3	J	6	<p>17% 50% 33%</p>
4	H	2	<p>50% 50%</p>
4	I	2	<p>100%</p>
4	K	2	<p>100%</p>
4	L	2	<p>50% 50%</p>
5	M	2	<p>50% 50%</p>

2 Entry composition i

There are 8 unique types of molecules in this entry. The entry contains 9578 atoms, of which 236 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.

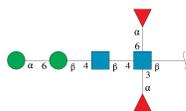
- Molecule 1 is a protein called Ig-like domain-containing protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	268	2178	1403	361	402	12	0	0	0
1	C	268	2178	1403	361	402	12	0	0	0
1	E	267	2161	1391	360	398	12	0	0	0

- Molecule 2 is a protein called Beta-2-microglobulin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	94	757	481	122	151	3	0	0	0
2	D	94	757	481	122	151	3	0	0	0
2	F	93	744	472	121	148	3	0	0	0

- Molecule 3 is an oligosaccharide called alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-3)][alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	G	6	70	40	2	28	0	0	0
3	J	6	70	40	2	28	0	0	0

- Molecule 4 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-a

cetamido-2-deoxy-beta-D-glucopyranose.



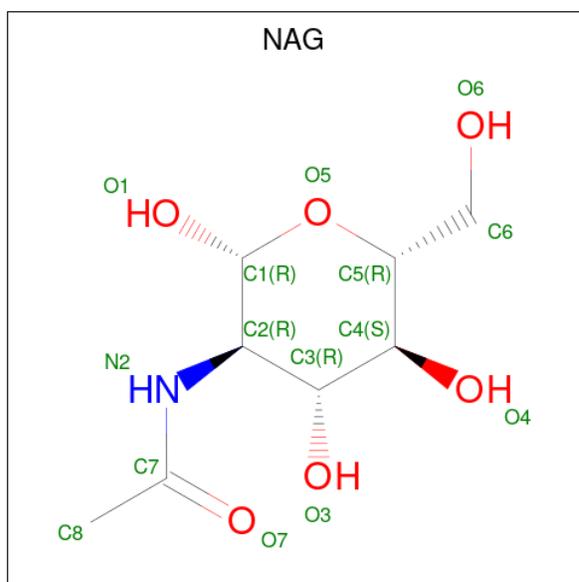
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
4	H	2	28	16	2	10	0	0	0
4	I	2	28	16	2	10	0	0	0
4	K	2	28	16	2	10	0	0	0
4	L	2	28	16	2	10	0	0	0

- Molecule 5 is an oligosaccharide called alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose.



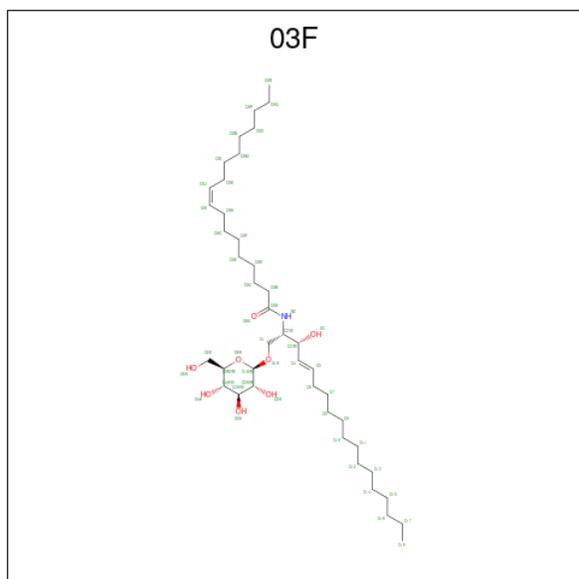
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
5	M	2	24	14	1	9	0	0	0

- Molecule 6 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
6	A	1	14	8	1	5	0	0
6	B	1	14	8	1	5	0	0
6	C	1	14	8	1	5	0	0

- Molecule 7 is (9Z)-N-[(2S,3R,4E)-1-(beta-D-glucopyranosyloxy)-3-hydroxyoctadec-4-en-2-yl]octadec-9-enamide (CCD ID: 03F) (formula: C₄₂H₇₉NO₈) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
7	A	1	Total	C	H	N	O	0	0
			129	42	78	1	8		
7	C	1	Total	C	H	N	O	0	0
			130	42	79	1	8		
7	E	1	Total	C	H	N	O	0	0
			130	42	79	1	8		

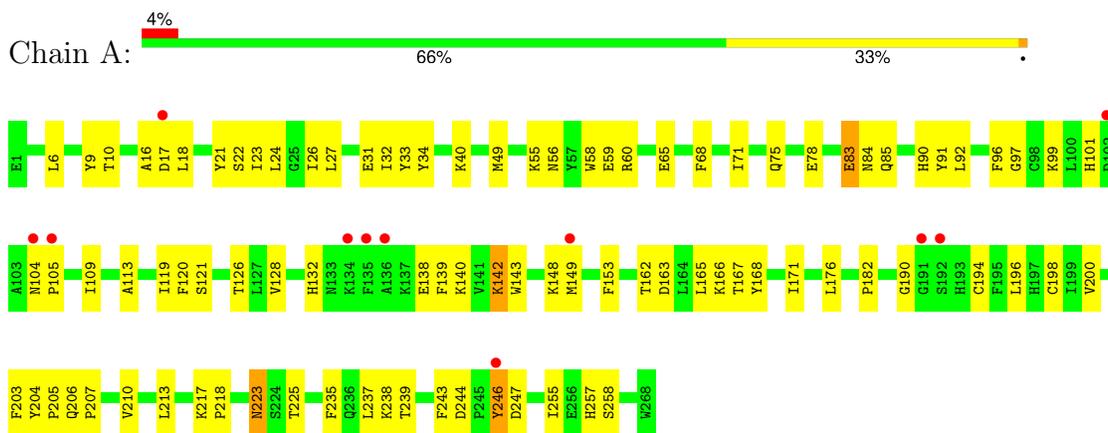
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	23	Total	O	0	0
			23	23		
8	B	8	Total	O	0	0
			8	8		
8	C	22	Total	O	0	0
			22	22		
8	D	9	Total	O	0	0
			9	9		
8	E	26	Total	O	0	0
			26	26		
8	F	8	Total	O	0	0
			8	8		

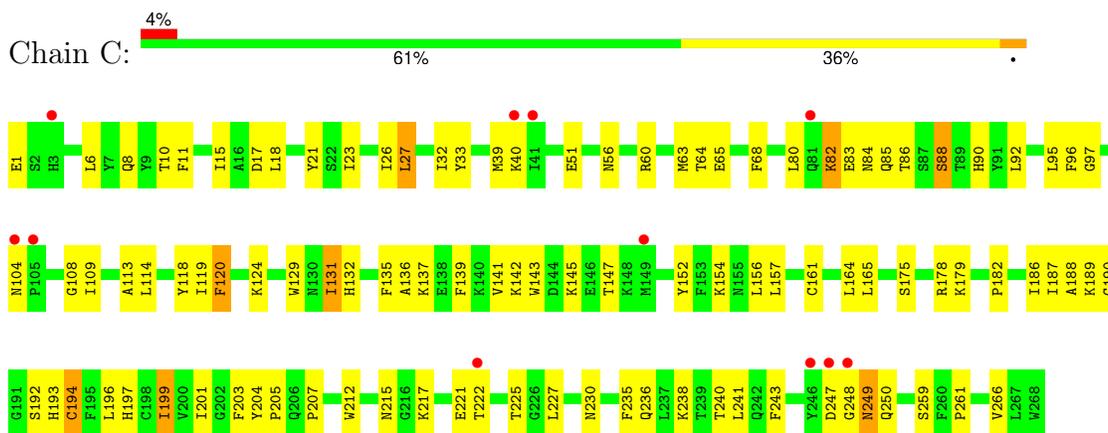
3 Residue-property plots [i](#)

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.

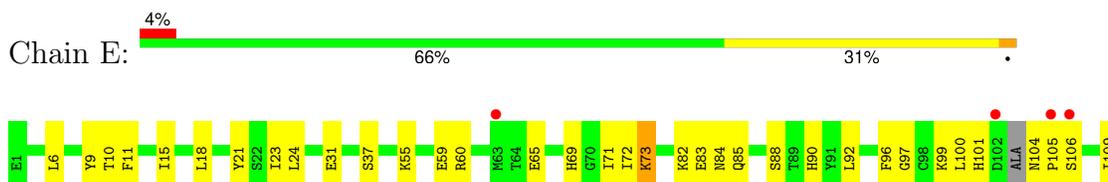
- Molecule 1: Ig-like domain-containing protein

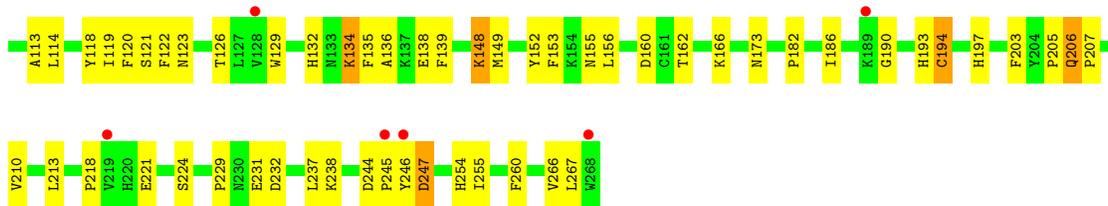


- Molecule 1: Ig-like domain-containing protein

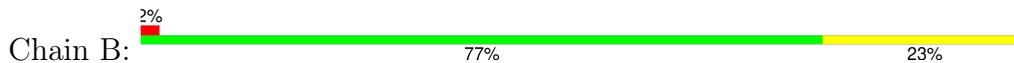


- Molecule 1: Ig-like domain-containing protein





- Molecule 2: Beta-2-microglobulin



- Molecule 2: Beta-2-microglobulin



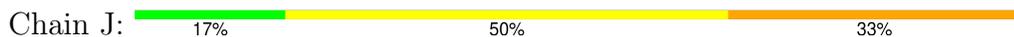
- Molecule 2: Beta-2-microglobulin



- Molecule 3: alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-3)][alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 3: alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-3)][alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 4: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain H:  50% 50%

MAG1
MAG2

- Molecule 4: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain I:  100%

MAG1
MAG2

- Molecule 4: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain K:  100%

MAG1
MAG2

- Molecule 4: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain L:  50% 50%

MAG1
MAG2

- Molecule 5: alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain M:  50% 50%

MAG1
FUC2

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	165.77Å 95.63Å 112.37Å 90.00° 123.96° 90.00°	Depositor
Resolution (Å)	93.20 – 2.67 93.20 – 2.67	Depositor EDS
% Data completeness (in resolution range)	99.4 (93.20-2.67) 99.5 (93.20-2.67)	Depositor EDS
R_{merge}	0.29	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.36 (at 2.65Å)	Xtrriage
Refinement program	PHENIX 1.21.1_5286	Depositor
R, R_{free}	0.239 , 0.262 0.244 , 0.266	Depositor DCC
R_{free} test set	1979 reflections (4.80%)	wwPDB-VP
Wilson B-factor (Å ²)	53.9	Xtrriage
Anisotropy	0.292	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 57.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	9578	wwPDB-VP
Average B, all atoms (Å ²)	61.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.86% 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: FUC, BMA, MAN, NAG, 03F

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	0.83	0/2243	1.16	1/3039 (0.0%)
1	C	0.83	0/2243	1.18	1/3039 (0.0%)
1	E	0.84	0/2224	1.19	3/3011 (0.1%)
2	B	0.83	0/775	1.19	0/1049
2	D	0.82	0/775	1.16	0/1049
2	F	0.84	0/761	1.20	2/1031 (0.2%)
All	All	0.83	0/9021	1.18	7/12218 (0.1%)

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	230	ASN	N-CA-C	-7.94	98.72	110.23
1	E	229	PRO	CB-CA-C	-6.96	106.02	111.87
1	E	106	SER	N-CA-C	5.60	121.54	114.31
2	F	69	THR	CB-CA-C	5.40	115.51	110.17
2	F	54	PHE	CA-CB-CG	5.39	119.19	113.80
1	E	247	ASP	N-CA-C	-5.37	107.98	114.75
1	A	223	ASN	CA-CB-CG	5.31	117.91	112.60

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	2178	0	2087	68	2
1	C	2178	0	2086	77	1
1	E	2161	0	2071	65	0
2	B	757	0	730	15	0
2	D	757	0	731	28	0
2	F	744	0	722	19	0
3	G	70	0	61	1	0
3	J	70	0	61	3	0
4	H	28	0	25	1	0
4	I	28	0	25	2	0
4	K	28	0	25	2	0
4	L	28	0	25	1	0
5	M	24	0	22	0	0
6	A	14	0	13	0	0
6	B	14	0	13	0	0
6	C	14	0	13	0	0
7	A	51	78	79	2	0
7	C	51	79	79	3	0
7	E	51	79	79	3	1
8	A	23	0	0	1	0
8	B	8	0	0	1	0
8	C	22	0	0	2	0
8	D	9	0	0	2	0
8	E	26	0	0	2	0
8	F	8	0	0	0	0
All	All	9342	236	8947	273	2

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 15.

All (273) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:212:TRP:HD1	1:C:221:GLU:HG3	1.25	0.99
1:E:190:GLY:HA3	1:E:194:CYS:HA	1.53	0.89
1:A:27:LEU:CD1	1:A:165:LEU:CD1	2.52	0.87
1:A:27:LEU:HD11	1:A:165:LEU:CD1	2.05	0.86
1:C:6:LEU:HD23	1:C:97:GLY:HA3	1.58	0.86
2:F:29:SER:HB3	2:F:30:PRO:HD3	1.59	0.85
1:C:212:TRP:CD1	1:C:221:GLU:HG3	2.12	0.84
1:E:23:ILE:HD12	1:E:65:GLU:HB3	1.59	0.84
1:C:205:PRO:HG3	8:C:402:HOH:O	1.78	0.83

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:190:GLY:HA3	1:A:194:CYS:HA	1.58	0.82
1:A:6:LEU:HD23	1:A:97:GLY:HA3	1.62	0.80
1:C:190:GLY:HA2	1:C:194:CYS:HA	1.64	0.80
4:I:1:NAG:O3	4:I:2:NAG:H82	1.81	0.78
1:A:91:TYR:OH	2:B:29:SER:OG	2.01	0.77
1:C:118:TYR:O	1:C:132:HIS:HB2	1.86	0.76
1:C:131:ILE:HG13	1:C:135:PHE:HB3	1.67	0.76
1:C:199:ILE:HG23	1:C:238:LYS:HG2	1.67	0.75
1:A:83:GLU:HA	4:H:1:NAG:H82	1.67	0.75
1:A:91:TYR:HH	2:B:29:SER:HG	1.35	0.74
4:I:1:NAG:O3	4:I:2:NAG:H2	1.88	0.74
1:C:190:GLY:CA	1:C:194:CYS:HA	2.18	0.73
1:E:244:ASP:HB3	1:E:247:ASP:HB3	1.70	0.73
1:A:27:LEU:HD11	1:A:165:LEU:HD12	1.71	0.73
2:D:5:VAL:HG21	2:D:80:VAL:HG21	1.70	0.73
1:C:152:TYR:CZ	1:C:156:LEU:HD11	2.25	0.72
1:C:201:ILE:HD12	2:D:12:LEU:HD13	1.71	0.72
1:A:60:ARG:HB3	7:A:302:03F:HACA	1.72	0.70
1:E:105:PRO:HB2	8:E:408:HOH:O	1.92	0.69
1:C:179:LYS:HD3	8:C:402:HOH:O	1.91	0.69
1:C:56:ASN:O	1:C:60:ARG:HG3	1.93	0.68
2:D:79:MET:HE3	2:D:86:SER:HB3	1.74	0.68
1:A:23:ILE:HD12	1:A:65:GLU:HB3	1.76	0.67
2:F:30:PRO:HD2	2:F:82:HIS:CE1	2.29	0.67
1:E:99:LYS:NZ	1:E:101:HIS:HB2	2.09	0.67
1:E:69:HIS:CE1	1:E:73:LYS:HG3	2.30	0.67
1:E:182:PRO:HB3	1:E:203:PHE:HB3	1.76	0.66
2:F:4:ASN:HB3	2:F:26:LYS:HG3	1.77	0.65
1:E:60:ARG:HD2	7:E:301:03F:H3A	1.77	0.65
2:F:5:VAL:HG21	2:F:80:VAL:HG21	1.78	0.65
1:E:136:ALA:HB3	1:E:139:PHE:CD1	2.33	0.64
1:C:205:PRO:HB2	1:C:207:PRO:HD2	1.79	0.64
2:F:68:PHE:CZ	2:F:70:PRO:HG3	2.32	0.64
1:A:27:LEU:CD1	1:A:165:LEU:HD12	2.28	0.63
2:B:5:VAL:HG21	2:B:80:VAL:HG21	1.81	0.63
1:E:210:VAL:HG21	1:E:237:LEU:HD22	1.81	0.63
1:E:118:TYR:O	1:E:132:HIS:HB2	2.00	0.62
1:C:23:ILE:HD13	1:C:65:GLU:HG2	1.81	0.62
1:C:190:GLY:HA3	1:C:194:CYS:SG	2.40	0.62
1:C:182:PRO:HB3	1:C:203:PHE:HB3	1.82	0.61
1:C:23:ILE:CD1	1:C:65:GLU:HG2	2.30	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:53:SER:HB3	2:D:61:LYS:HE3	1.82	0.61
2:D:17:GLU:O	2:D:70:PRO:HD2	2.01	0.61
1:E:136:ALA:HB3	1:E:139:PHE:HD1	1.66	0.60
2:F:5:VAL:HG11	2:F:80:VAL:HG21	1.83	0.60
1:E:213:LEU:HD11	1:E:254:HIS:HB2	1.83	0.60
1:E:88:SER:HB2	1:E:90:HIS:NE2	2.16	0.60
1:A:162:THR:O	1:A:166:LYS:HG3	2.02	0.59
2:B:34:LYS:HE3	2:B:36:GLU:HG3	1.83	0.59
1:A:27:LEU:CD1	1:A:165:LEU:HD13	2.30	0.59
2:B:68:PHE:CZ	2:B:70:PRO:HG3	2.38	0.59
2:F:17:GLU:O	2:F:70:PRO:HD2	2.02	0.58
2:D:13:ILE:HD12	2:D:94:TYR:H	1.68	0.58
2:D:32:ASN:O	2:D:82:HIS:HD2	1.86	0.58
1:A:96:PHE:HA	1:A:109:ILE:O	2.04	0.58
2:D:92:ASP:HA	8:D:101:HOH:O	2.03	0.57
1:A:205:PRO:HB2	1:A:207:PRO:HD2	1.86	0.57
1:A:75:GLN:O	1:A:78:GLU:HB3	2.05	0.57
1:A:139:PHE:HA	1:A:142:LYS:HE3	1.87	0.57
2:F:7:VAL:O	2:F:91:LEU:HD23	2.04	0.57
1:E:99:LYS:HZ1	1:E:101:HIS:HB2	1.69	0.57
1:C:212:TRP:HD1	1:C:221:GLU:CG	2.10	0.57
1:C:15:ILE:HG21	1:C:18:LEU:HD12	1.88	0.56
1:E:266:VAL:O	1:E:267:LEU:HB3	2.04	0.56
1:A:163:ASP:O	1:A:167:THR:HG23	2.05	0.56
1:A:213:LEU:HD23	1:A:218:PRO:HA	1.88	0.56
2:F:30:PRO:HD2	2:F:82:HIS:HE1	1.71	0.56
1:A:182:PRO:HB3	1:A:203:PHE:HB3	1.88	0.55
1:E:10:THR:O	1:E:21:TYR:HA	2.07	0.55
1:C:196:LEU:HG	1:C:243:PHE:CE1	2.42	0.55
1:E:71:ILE:HD12	1:E:71:ILE:N	2.22	0.55
1:C:60:ARG:HA	1:C:63:MET:HE2	1.90	0.54
1:C:108:GLY:C	1:C:109:ILE:HD12	2.32	0.54
1:C:201:ILE:CD1	2:D:12:LEU:HD13	2.36	0.54
1:E:182:PRO:HD2	1:E:260:PHE:CZ	2.42	0.54
3:J:2:NAG:O5	3:J:5:FUC:H5	2.08	0.54
2:F:29:SER:HB3	2:F:30:PRO:CD	2.34	0.54
1:E:55:LYS:O	1:E:59:GLU:HG3	2.08	0.53
1:A:149:MET:HG3	1:A:153:PHE:CE2	2.44	0.53
2:F:27:ASP:HA	2:F:59:SER:HB2	1.91	0.53
1:C:222:THR:HG22	1:C:241:LEU:HA	1.89	0.53
1:A:225:THR:HG21	1:A:238:LYS:HD2	1.89	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:186:ILE:HA	1:C:197:HIS:O	2.09	0.53
1:C:8:GLN:O	1:C:23:ILE:HA	2.08	0.53
2:D:5:VAL:HB	2:D:89:ILE:HG13	1.90	0.53
1:C:60:ARG:HA	1:C:63:MET:CE	2.40	0.52
1:C:124:LYS:HB2	1:C:154:LYS:HG3	1.92	0.52
1:E:155:ASN:HB2	8:E:407:HOH:O	2.08	0.52
1:A:126:THR:OG1	1:A:128:VAL:HG22	2.09	0.52
2:D:10:TYR:CE2	2:D:11:LYS:HG2	2.45	0.52
1:A:31:GLU:OE2	1:A:34:TYR:HB2	2.09	0.52
2:D:30:PRO:HD2	2:D:82:HIS:NE2	2.25	0.52
1:A:85:GLN:HB3	1:A:90:HIS:NE2	2.25	0.51
1:C:247:ASP:O	1:C:248:GLY:C	2.52	0.51
1:C:141:VAL:O	1:C:145:LYS:HD3	2.10	0.51
1:C:114:LEU:HB2	1:C:119:ILE:HD13	1.92	0.51
2:D:53:SER:CB	2:D:61:LYS:HE3	2.40	0.51
1:E:121:SER:HB3	1:E:132:HIS:NE2	2.26	0.51
1:A:225:THR:HG23	1:A:238:LYS:HB2	1.91	0.51
1:C:96:PHE:HA	1:C:109:ILE:O	2.10	0.51
1:C:190:GLY:HA3	1:C:194:CYS:HA	1.93	0.51
1:E:205:PRO:HB2	1:E:207:PRO:HD2	1.92	0.51
1:A:104:ASN:HB3	1:A:105:PRO:HD2	1.93	0.50
1:E:100:LEU:CD2	1:E:105:PRO:HA	2.40	0.50
1:C:85:GLN:HB3	1:C:90:HIS:NE2	2.26	0.50
2:D:68:PHE:CZ	2:D:70:PRO:HG3	2.46	0.50
1:A:56:ASN:HB3	8:A:403:HOH:O	2.11	0.50
1:C:32:ILE:HG13	1:C:33:TYR:CD2	2.47	0.50
2:F:91:LEU:HD22	2:F:92:ASP:N	2.25	0.50
1:C:247:ASP:O	1:C:249:ASN:ND2	2.45	0.50
1:C:215:ASN:HA	1:C:250:GLN:HB3	1.92	0.50
1:A:10:THR:O	1:A:21:TYR:HA	2.11	0.49
3:J:2:NAG:H62	3:J:5:FUC:H3	1.94	0.49
2:B:30:PRO:HD2	2:B:82:HIS:CE1	2.47	0.49
2:B:81:THR:HA	2:B:85:ASP:O	2.11	0.49
1:E:15:ILE:HG21	1:E:18:LEU:HD12	1.94	0.49
1:E:96:PHE:HB3	7:E:301:03F:HAKA	1.94	0.49
1:A:162:THR:HG23	1:A:166:LYS:HE3	1.94	0.49
2:D:38:LEU:HD23	2:D:43:ILE:HA	1.93	0.49
1:A:55:LYS:HE2	1:A:59:GLU:OE2	2.12	0.49
1:E:92:LEU:HD12	1:E:113:ALA:O	2.13	0.49
1:C:64:THR:CG2	1:C:68:PHE:HE2	2.25	0.48
1:E:231:GLU:HG3	2:F:65:TYR:CD1	2.48	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:196:LEU:HG	1:A:243:PHE:CE1	2.48	0.48
2:D:23:CYS:HB2	2:D:37:LEU:HD21	1.95	0.48
1:A:168:TYR:HA	1:A:171:ILE:HD12	1.95	0.48
2:D:36:GLU:HB2	2:D:79:MET:HB3	1.95	0.48
1:E:71:ILE:HD12	1:E:71:ILE:H	1.78	0.48
1:E:148:LYS:H	1:E:148:LYS:HD3	1.78	0.48
1:E:244:ASP:HB3	1:E:247:ASP:CB	2.40	0.48
1:C:95:LEU:HG	1:C:109:ILE:HG21	1.95	0.48
1:C:136:ALA:HB3	1:C:139:PHE:CE2	2.48	0.48
3:J:3:BMA:H61	3:J:4:MAN:H2	1.70	0.48
1:A:210:VAL:HG13	1:A:255:ILE:HD13	1.94	0.48
2:B:17:GLU:O	2:B:70:PRO:HD2	2.14	0.48
2:B:36:GLU:O	2:B:78:CYS:HA	2.13	0.48
1:A:162:THR:HG22	1:A:166:LYS:NZ	2.29	0.48
1:C:6:LEU:HD23	1:C:97:GLY:CA	2.38	0.48
1:E:162:THR:O	1:E:166:LYS:HG3	2.14	0.48
1:C:11:PHE:HB3	1:C:92:LEU:HB3	1.97	0.47
1:C:222:THR:HG22	1:C:240:THR:O	2.14	0.47
1:A:6:LEU:HD23	1:A:97:GLY:CA	2.38	0.47
1:A:83:GLU:O	1:A:84:ASN:HB2	2.12	0.47
2:F:38:LEU:HB2	2:F:77:SER:OG	2.14	0.47
1:C:161:CYS:HB2	7:C:302:03F:C16	2.45	0.47
2:D:71:GLN:HB2	2:D:74:TYR:CG	2.50	0.47
1:C:39:MET:O	1:C:40:LYS:HB2	2.14	0.47
1:E:96:PHE:HA	1:E:109:ILE:O	2.15	0.47
1:E:11:PHE:HB3	1:E:92:LEU:HB3	1.97	0.47
1:E:237:LEU:HD23	1:E:238:LYS:N	2.30	0.47
1:A:206:GLN:N	1:A:207:PRO:CD	2.79	0.46
1:E:114:LEU:HB2	1:E:119:ILE:HD13	1.96	0.46
1:A:225:THR:CG2	1:A:238:LYS:HB2	2.44	0.46
2:F:89:ILE:N	2:F:89:ILE:HD12	2.31	0.46
1:A:237:LEU:HD23	1:A:238:LYS:N	2.31	0.46
1:C:175:SER:HA	1:C:178:ARG:HE	1.81	0.46
1:E:24:LEU:HD21	1:E:31:GLU:HG3	1.98	0.46
1:E:9:TYR:CE2	1:E:72:ILE:HG21	2.51	0.46
1:E:24:LEU:CD2	1:E:31:GLU:HG3	2.46	0.46
1:C:186:ILE:HD11	1:C:266:VAL:HG23	1.98	0.46
2:F:52:LEU:HD11	2:F:60:PHE:HB3	1.98	0.45
1:C:157:LEU:HD23	7:C:302:03F:H17	1.99	0.45
1:E:99:LYS:HZ3	1:E:101:HIS:HB2	1.80	0.45
1:A:24:LEU:CD2	1:A:26:ILE:HG12	2.47	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:206:GLN:HG2	1:A:207:PRO:HD3	1.98	0.45
2:D:11:LYS:HG3	2:D:19:ASN:ND2	2.32	0.45
1:C:203:PHE:CE1	1:C:235:PHE:HB2	2.52	0.45
1:E:122:PHE:HB2	1:E:129:TRP:CE3	2.51	0.45
1:C:88:SER:HB2	1:C:90:HIS:NE2	2.31	0.45
1:C:120:PHE:CE1	1:C:131:ILE:HD12	2.52	0.45
1:C:217:LYS:HD3	1:C:217:LYS:HA	1.73	0.45
1:A:244:ASP:O	1:A:246:TYR:N	2.50	0.45
1:C:27:LEU:HD11	1:C:165:LEU:HD12	1.99	0.45
1:C:137:LYS:O	1:C:141:VAL:HG23	2.17	0.44
1:C:201:ILE:HG12	1:C:236:GLN:HG3	2.00	0.44
1:C:136:ALA:HB3	1:C:139:PHE:CD2	2.52	0.44
1:E:84:ASN:HD21	4:L:1:NAG:C1	2.29	0.44
1:A:27:LEU:HD13	1:A:165:LEU:CD1	2.44	0.44
1:A:149:MET:HE3	1:A:153:PHE:CZ	2.52	0.44
1:E:149:MET:HG3	1:E:153:PHE:CE2	2.53	0.44
1:A:92:LEU:HD12	1:A:113:ALA:O	2.17	0.44
1:A:198:CYS:HB3	1:A:239:THR:HG22	2.00	0.44
2:D:10:TYR:CD2	2:D:11:LYS:HG2	2.52	0.44
1:A:32:ILE:HG13	1:A:33:TYR:CD2	2.52	0.44
1:A:55:LYS:O	1:A:59:GLU:HG3	2.18	0.44
1:E:173:ASN:C	1:E:173:ASN:HD22	2.25	0.44
1:C:196:LEU:O	1:C:240:THR:HA	2.17	0.44
1:A:198:CYS:HB3	1:A:239:THR:CG2	2.48	0.44
1:C:82:LYS:HZ2	1:C:82:LYS:HG3	1.30	0.44
1:E:156:LEU:HD23	1:E:160:ASP:OD2	2.18	0.44
2:D:3:PRO:HD3	8:D:103:HOH:O	2.17	0.43
2:D:5:VAL:HG11	2:D:80:VAL:HG21	1.99	0.43
1:E:206:GLN:N	1:E:207:PRO:CD	2.81	0.43
2:F:71:GLN:HB2	2:F:74:TYR:CG	2.52	0.43
1:A:237:LEU:HD23	1:A:237:LEU:C	2.43	0.43
1:E:123:ASN:HB3	1:E:126:THR:OG1	2.17	0.43
1:E:186:ILE:HA	1:E:197:HIS:O	2.18	0.43
1:A:205:PRO:HD2	1:A:257:HIS:CE1	2.53	0.43
1:E:104:ASN:HB3	1:E:105:PRO:HD3	1.99	0.43
2:B:9:THR:HA	2:B:20:VAL:O	2.18	0.43
1:C:175:SER:HA	1:C:178:ARG:NE	2.34	0.43
1:E:82:LYS:HG3	1:E:83:GLU:HG2	1.99	0.43
4:K:2:NAG:H83	4:K:2:NAG:H2	1.76	0.43
1:E:23:ILE:HG21	7:E:301:03F:H16	1.99	0.43
2:F:29:SER:O	2:F:30:PRO:C	2.59	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:176:LEU:HA	1:A:204:TYR:OH	2.19	0.43
1:E:135:PHE:O	1:E:136:ALA:C	2.61	0.43
1:A:99:LYS:HG2	1:A:101:HIS:CE1	2.54	0.42
1:A:244:ASP:C	1:A:246:TYR:H	2.27	0.42
2:B:13:ILE:HG23	2:B:70:PRO:HG2	2.00	0.42
1:C:92:LEU:HD12	1:C:113:ALA:O	2.19	0.42
1:A:203:PHE:CE1	1:A:235:PHE:HB2	2.54	0.42
1:C:164:LEU:HD12	7:C:302:03F:H13	2.01	0.42
1:E:71:ILE:H	1:E:71:ILE:CD1	2.32	0.42
1:A:71:ILE:N	1:A:71:ILE:HD12	2.34	0.42
1:A:142:LYS:HD2	1:A:143:TRP:CD1	2.55	0.42
2:D:47:THR:HG22	2:D:66:VAL:HB	2.01	0.42
1:C:109:ILE:HD12	1:C:109:ILE:N	2.35	0.42
1:C:225:THR:CG2	1:C:238:LYS:HB2	2.49	0.42
1:E:244:ASP:CB	1:E:247:ASP:HB3	2.46	0.42
2:B:27:ASP:HA	2:B:59:SER:HB2	2.02	0.42
1:C:187:ILE:HD12	1:C:188:ALA:H	1.85	0.42
1:E:6:LEU:HD23	1:E:97:GLY:HA3	2.01	0.42
3:G:2:NAG:C1	3:G:5:FUC:H5	2.50	0.42
1:C:23:ILE:HD13	1:C:65:GLU:CG	2.49	0.41
1:C:204:TYR:CG	1:C:205:PRO:HA	2.55	0.41
1:C:83:GLU:O	1:C:84:ASN:HB2	2.20	0.41
2:D:10:TYR:HB3	2:D:20:VAL:HB	2.01	0.41
1:E:134:LYS:HA	1:E:134:LYS:HD3	1.69	0.41
1:A:121:SER:HB3	1:A:132:HIS:NE2	2.35	0.41
1:A:196:LEU:HD23	1:A:196:LEU:HA	1.93	0.41
2:D:9:THR:HG21	2:D:13:ILE:HG12	2.00	0.41
1:A:68:PHE:HB3	7:A:302:03F:HARA	2.03	0.41
1:C:10:THR:O	1:C:21:TYR:HA	2.20	0.41
1:E:244:ASP:C	1:E:246:TYR:N	2.76	0.41
1:A:40:LYS:HE2	1:A:40:LYS:HB3	1.90	0.41
1:A:49:MET:HE3	1:A:58:TRP:HH2	1.85	0.41
2:B:5:VAL:HG11	2:B:80:VAL:HG21	2.02	0.41
1:C:8:GLN:HB3	2:D:54:PHE:CE2	2.56	0.41
1:C:259:SER:O	1:C:261:PRO:HD3	2.20	0.41
1:E:244:ASP:HB3	1:E:247:ASP:CG	2.46	0.41
2:B:38:LEU:HB2	2:B:77:SER:OG	2.21	0.41
1:C:80:LEU:HB3	1:C:86:THR:HG22	2.02	0.41
1:E:118:TYR:OH	1:E:121:SER:HB3	2.21	0.41
1:A:244:ASP:C	1:A:246:TYR:N	2.78	0.41
2:B:71:GLN:HA	8:B:203:HOH:O	2.19	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:129:TRP:CD1	1:C:143:TRP:HB3	2.56	0.41
1:C:178:ARG:O	1:C:204:TYR:HD1	2.04	0.41
2:D:29:SER:HA	2:D:30:PRO:C	2.44	0.41
2:D:44:ILE:HG21	2:D:66:VAL:HG11	2.03	0.41
1:E:232:ASP:OD1	1:E:232:ASP:N	2.53	0.41
1:A:16:ALA:O	1:A:17:ASP:HB2	2.20	0.41
1:C:225:THR:HG21	1:C:238:LYS:HB2	2.03	0.40
1:E:210:VAL:HG12	1:E:255:ILE:HG13	2.03	0.40
1:A:149:MET:HE3	1:A:153:PHE:HZ	1.87	0.40
1:A:200:VAL:HG21	1:A:255:ILE:HD12	2.04	0.40
1:E:152:TYR:CZ	1:E:156:LEU:HD11	2.57	0.40
2:F:6:GLN:HE22	4:K:1:NAG:H81	1.85	0.40
1:A:9:TYR:HA	1:A:22:SER:O	2.22	0.40
1:E:213:LEU:HD23	1:E:218:PRO:HA	2.03	0.40
1:C:15:ILE:CG2	1:C:18:LEU:HD12	2.50	0.40
1:E:221:GLU:OE1	1:E:224:SER:HB2	2.22	0.40
1:C:192:SER:OG	1:C:193:HIS:N	2.54	0.40
1:E:244:ASP:O	1:E:245:PRO:C	2.65	0.40

All (2) 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:148:LYS:NZ	7:E:301:03F:H6AB[2_445]	1.37	0.23
1:A:167:THR:CG2	1:C:147:THR:OG1[4_445]	2.16	0.04

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	266/268 (99%)	254 (96%)	12 (4%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	266/268 (99%)	254 (96%)	12 (4%)	0	100	100
1	E	263/268 (98%)	247 (94%)	16 (6%)	0	100	100
2	B	92/94 (98%)	91 (99%)	1 (1%)	0	100	100
2	D	92/94 (98%)	91 (99%)	1 (1%)	0	100	100
2	F	91/94 (97%)	86 (94%)	4 (4%)	1 (1%)	12	27
All	All	1070/1086 (98%)	1023 (96%)	46 (4%)	1 (0%)	48	71

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	F	29	SER

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	237/237 (100%)	225 (95%)	12 (5%)	20	42
1	C	237/237 (100%)	221 (93%)	16 (7%)	13	29
1	E	235/237 (99%)	225 (96%)	10 (4%)	25	49
2	B	87/87 (100%)	86 (99%)	1 (1%)	70	86
2	D	87/87 (100%)	83 (95%)	4 (5%)	23	46
2	F	86/87 (99%)	82 (95%)	4 (5%)	22	45
All	All	969/972 (100%)	922 (95%)	47 (5%)	21	44

All (47) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	18	LEU
1	A	83	GLU
1	A	119	ILE
1	A	120	PHE
1	A	138	GLU

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Mol	Chain	Res	Type
1	A	140	LYS
1	A	142	LYS
1	A	217	LYS
1	A	223	ASN
1	A	246	TYR
1	A	247	ASP
1	A	258	SER
2	B	91	LEU
1	C	1	GLU
1	C	17	ASP
1	C	26	ILE
1	C	27	LEU
1	C	51	GLU
1	C	82	LYS
1	C	88	SER
1	C	104	ASN
1	C	120	PHE
1	C	131	ILE
1	C	142	LYS
1	C	189	LYS
1	C	194	CYS
1	C	199	ILE
1	C	227	LEU
1	C	249	ASN
2	D	10	TYR
2	D	11	LYS
2	D	12	LEU
2	D	14	LYS
1	E	37	SER
1	E	73	LYS
1	E	85	GLN
1	E	120	PHE
1	E	134	LYS
1	E	138	GLU
1	E	148	LYS
1	E	193	HIS
1	E	194	CYS
1	E	206	GLN
2	F	10	TYR
2	F	29	SER
2	F	91	LEU
2	F	92	ASP

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	13	HIS
1	A	56	ASN
1	A	250	GLN
2	B	32	ASN
1	C	75	GLN
1	C	133	ASN
1	C	236	GLN
1	C	250	GLN
2	D	6	GLN
2	D	71	GLN
1	E	13	HIS
1	E	173	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](#)

22 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	NAG	G	1	3,1	14,14,15	0.53	0	17,19,21	1.03	1 (5%)
3	NAG	G	2	3	14,14,15	0.48	0	17,19,21	0.87	0
3	BMA	G	3	3	11,11,12	0.41	0	15,15,17	0.79	1 (6%)
3	MAN	G	4	3	11,11,12	0.27	0	15,15,17	0.60	0
3	FUC	G	5	3	10,10,11	0.25	0	14,14,16	0.59	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	FUC	G	6	3	10,10,11	0.20	0	14,14,16	0.65	0
4	NAG	H	1	4,1	14,14,15	0.42	0	17,19,21	0.72	0
4	NAG	H	2	4	14,14,15	0.36	0	17,19,21	0.90	0
4	NAG	I	1	4	14,14,15	0.85	0	17,19,21	1.19	1 (5%)
4	NAG	I	2	4	14,14,15	0.84	1 (7%)	17,19,21	2.05	4 (23%)
3	NAG	J	1	3,1	14,14,15	0.53	0	17,19,21	1.45	2 (11%)
3	NAG	J	2	3	14,14,15	0.53	0	17,19,21	0.76	0
3	BMA	J	3	3	11,11,12	0.40	0	15,15,17	0.86	1 (6%)
3	MAN	J	4	3	11,11,12	0.40	0	15,15,17	1.56	3 (20%)
3	FUC	J	5	3	10,10,11	0.20	0	14,14,16	0.44	0
3	FUC	J	6	3	10,10,11	0.36	0	14,14,16	0.72	0
4	NAG	K	1	4,1	14,14,15	0.41	0	17,19,21	1.22	2 (11%)
4	NAG	K	2	4	14,14,15	0.37	0	17,19,21	0.93	1 (5%)
4	NAG	L	1	4	14,14,15	0.43	0	17,19,21	1.58	4 (23%)
4	NAG	L	2	4	14,14,15	0.44	0	17,19,21	1.00	2 (11%)
5	NAG	M	1	5	14,14,15	0.47	0	17,19,21	1.40	3 (17%)
5	FUC	M	2	5	10,10,11	0.41	0	14,14,16	0.82	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	NAG	G	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	G	2	3	-	0/6/23/26	0/1/1/1
3	BMA	G	3	3	-	2/2/19/22	0/1/1/1
3	MAN	G	4	3	-	1/2/19/22	0/1/1/1
3	FUC	G	5	3	-	-	0/1/1/1
3	FUC	G	6	3	-	-	0/1/1/1
4	NAG	H	1	4,1	-	1/6/23/26	0/1/1/1
4	NAG	H	2	4	-	3/6/23/26	0/1/1/1
4	NAG	I	1	4	-	0/6/23/26	0/1/1/1
4	NAG	I	2	4	-	6/6/23/26	0/1/1/1
3	NAG	J	1	3,1	-	4/6/23/26	0/1/1/1
3	NAG	J	2	3	-	1/6/23/26	0/1/1/1
3	BMA	J	3	3	-	0/2/19/22	0/1/1/1
3	MAN	J	4	3	-	0/2/19/22	0/1/1/1
3	FUC	J	5	3	-	-	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	FUC	J	6	3	-	-	0/1/1/1
4	NAG	K	1	4,1	-	3/6/23/26	0/1/1/1
4	NAG	K	2	4	-	2/6/23/26	0/1/1/1
4	NAG	L	1	4	-	2/6/23/26	0/1/1/1
4	NAG	L	2	4	-	4/6/23/26	0/1/1/1
5	NAG	M	1	5	-	2/6/23/26	0/1/1/1
5	FUC	M	2	5	-	-	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	I	2	NAG	C1-C2	2.27	1.55	1.52

All (25) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	I	2	NAG	C2-N2-C7	5.84	130.72	122.90
4	L	1	NAG	C4-C3-C2	-4.36	104.62	111.02
4	I	2	NAG	C4-C3-C2	4.11	117.05	111.02
3	J	4	MAN	C1-O5-C5	3.98	117.52	112.19
5	M	1	NAG	O5-C1-C2	-3.81	105.39	111.29
3	J	1	NAG	C1-O5-C5	3.46	116.83	112.19
4	K	1	NAG	C4-C3-C2	-3.21	106.32	111.02
3	J	1	NAG	O4-C4-C3	-3.07	103.13	110.38
5	M	1	NAG	C1-O5-C5	-2.85	108.36	112.19
3	G	1	NAG	C1-O5-C5	2.69	115.79	112.19
5	M	1	NAG	C4-C3-C2	-2.67	107.10	111.02
4	I	1	NAG	C2-N2-C7	2.61	126.39	122.90
3	J	4	MAN	C3-C4-C5	2.48	114.73	110.23
4	L	1	NAG	C3-C4-C5	-2.47	105.75	110.23
4	K	2	NAG	C2-N2-C7	-2.32	119.80	122.90
4	K	1	NAG	C2-N2-C7	-2.31	119.81	122.90
4	L	2	NAG	C4-C3-C2	-2.29	107.66	111.02
4	L	1	NAG	C2-N2-C7	-2.28	119.84	122.90
3	G	3	BMA	C1-O5-C5	2.21	115.15	112.19
3	J	3	BMA	C1-O5-C5	2.19	115.12	112.19
4	I	2	NAG	O4-C4-C3	-2.15	105.30	110.38
4	L	2	NAG	C1-O5-C5	2.15	115.06	112.19
3	J	4	MAN	O5-C5-C6	2.07	111.69	107.66
4	L	1	NAG	O5-C5-C4	-2.04	105.86	110.83
4	I	2	NAG	C3-C4-C5	2.02	113.89	110.23

There are no chirality outliers.

All (31) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	H	2	NAG	C1-C2-N2-C7
4	K	1	NAG	C8-C7-N2-C2
4	K	1	NAG	O7-C7-N2-C2
4	K	2	NAG	C8-C7-N2-C2
4	K	2	NAG	O7-C7-N2-C2
4	L	1	NAG	C8-C7-N2-C2
4	L	1	NAG	O7-C7-N2-C2
4	L	2	NAG	C8-C7-N2-C2
4	L	2	NAG	O7-C7-N2-C2
4	L	2	NAG	O5-C5-C6-O6
4	L	2	NAG	C4-C5-C6-O6
3	J	1	NAG	C8-C7-N2-C2
3	J	1	NAG	O7-C7-N2-C2
4	H	2	NAG	C8-C7-N2-C2
4	I	2	NAG	C8-C7-N2-C2
4	I	2	NAG	O7-C7-N2-C2
4	H	2	NAG	O7-C7-N2-C2
3	G	3	BMA	O5-C5-C6-O6
4	I	2	NAG	C4-C5-C6-O6
5	M	1	NAG	C4-C5-C6-O6
5	M	1	NAG	O5-C5-C6-O6
4	I	2	NAG	O5-C5-C6-O6
3	G	4	MAN	O5-C5-C6-O6
4	K	1	NAG	O5-C5-C6-O6
4	H	1	NAG	O5-C5-C6-O6
3	J	2	NAG	O5-C5-C6-O6
3	G	3	BMA	C4-C5-C6-O6
4	I	2	NAG	C1-C2-N2-C7
3	J	1	NAG	C4-C5-C6-O6
3	J	1	NAG	O5-C5-C6-O6
4	I	2	NAG	C3-C2-N2-C7

There are no ring outliers.

12 monomers are involved in 10 short contacts:

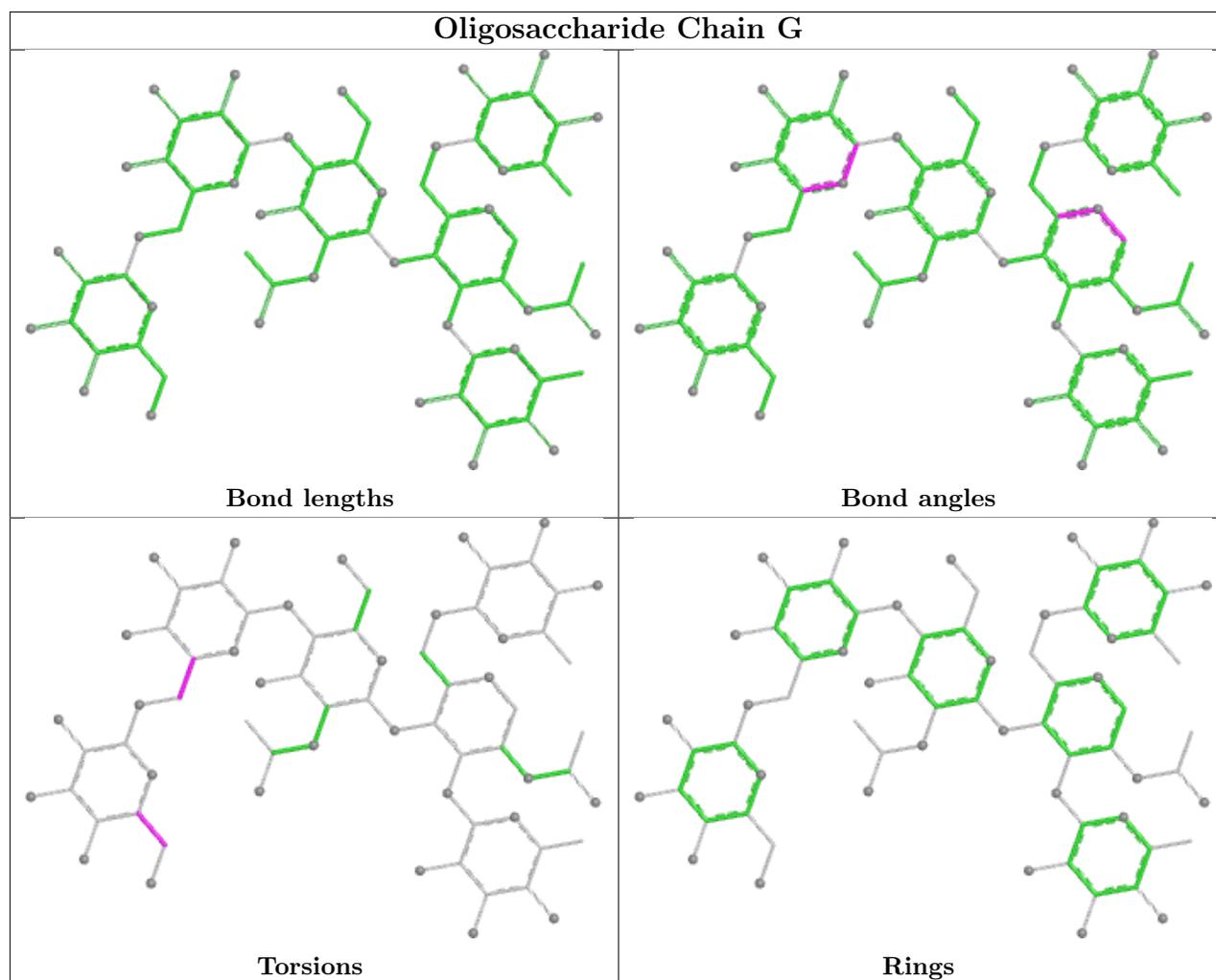
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	G	5	FUC	1	0
4	K	1	NAG	1	0
4	I	2	NAG	2	0
4	H	1	NAG	1	0

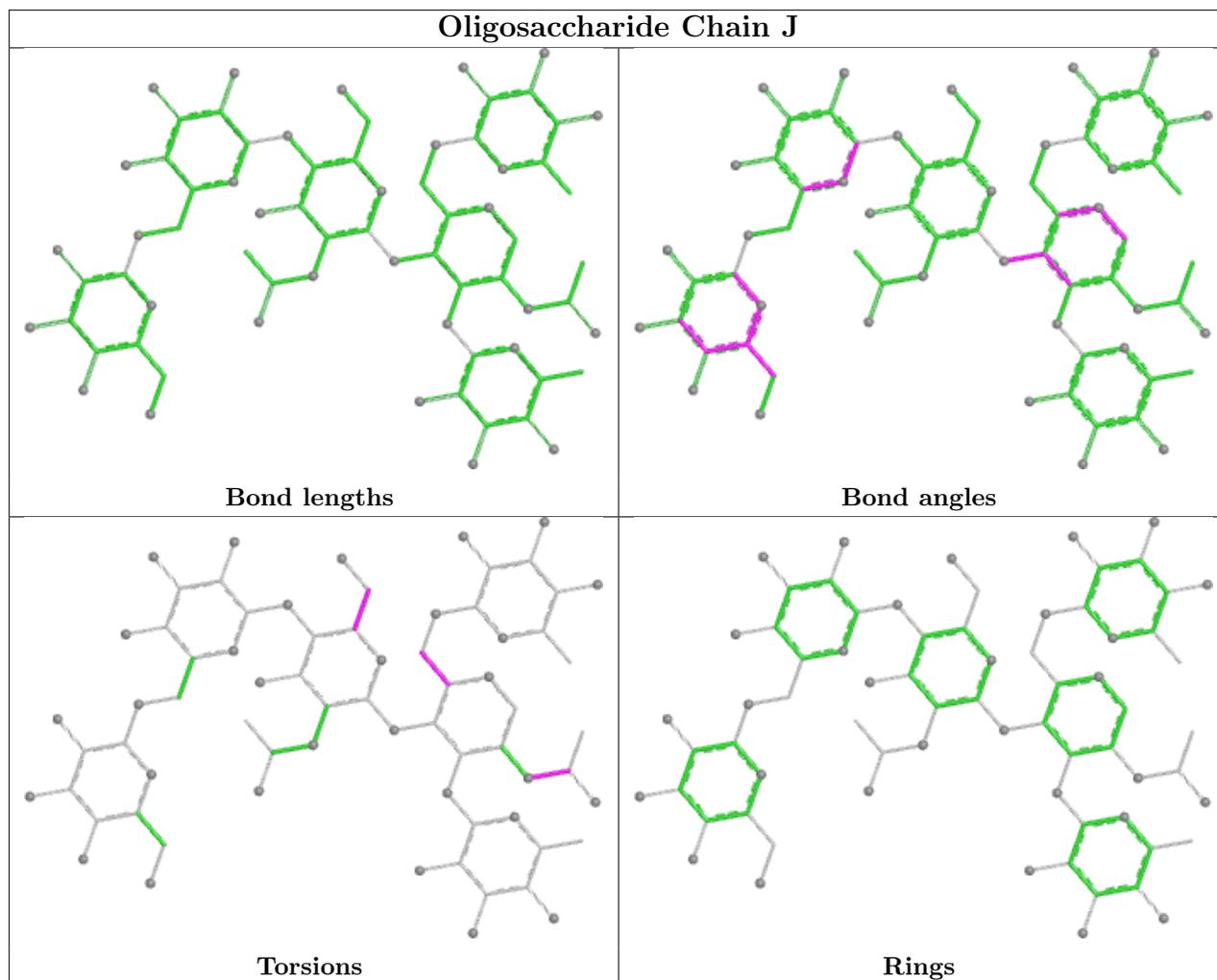
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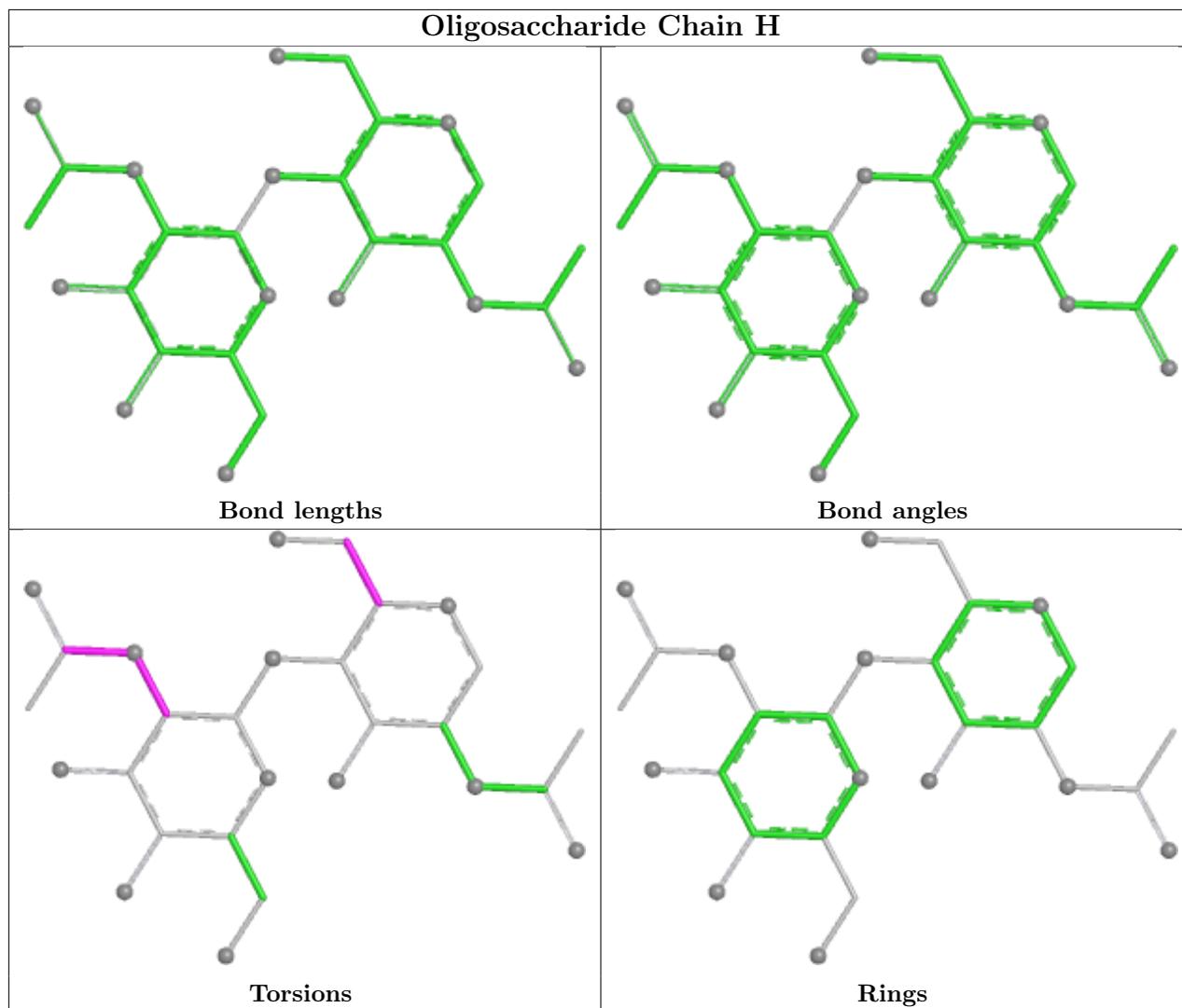
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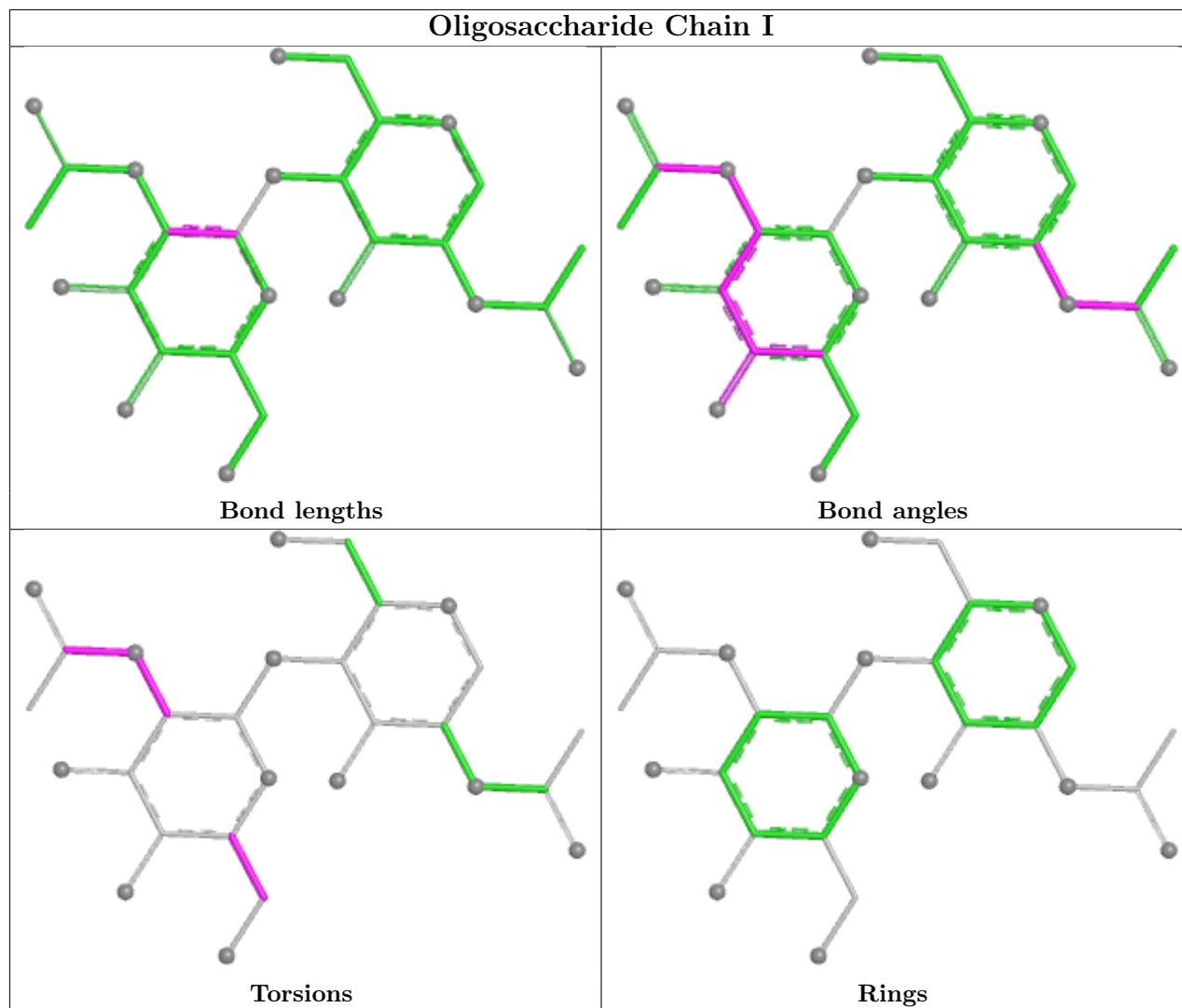
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	J	5	FUC	2	0
4	K	2	NAG	1	0
4	L	1	NAG	1	0
4	I	1	NAG	2	0
3	G	2	NAG	1	0
3	J	4	MAN	1	0
3	J	3	BMA	1	0
3	J	2	NAG	2	0

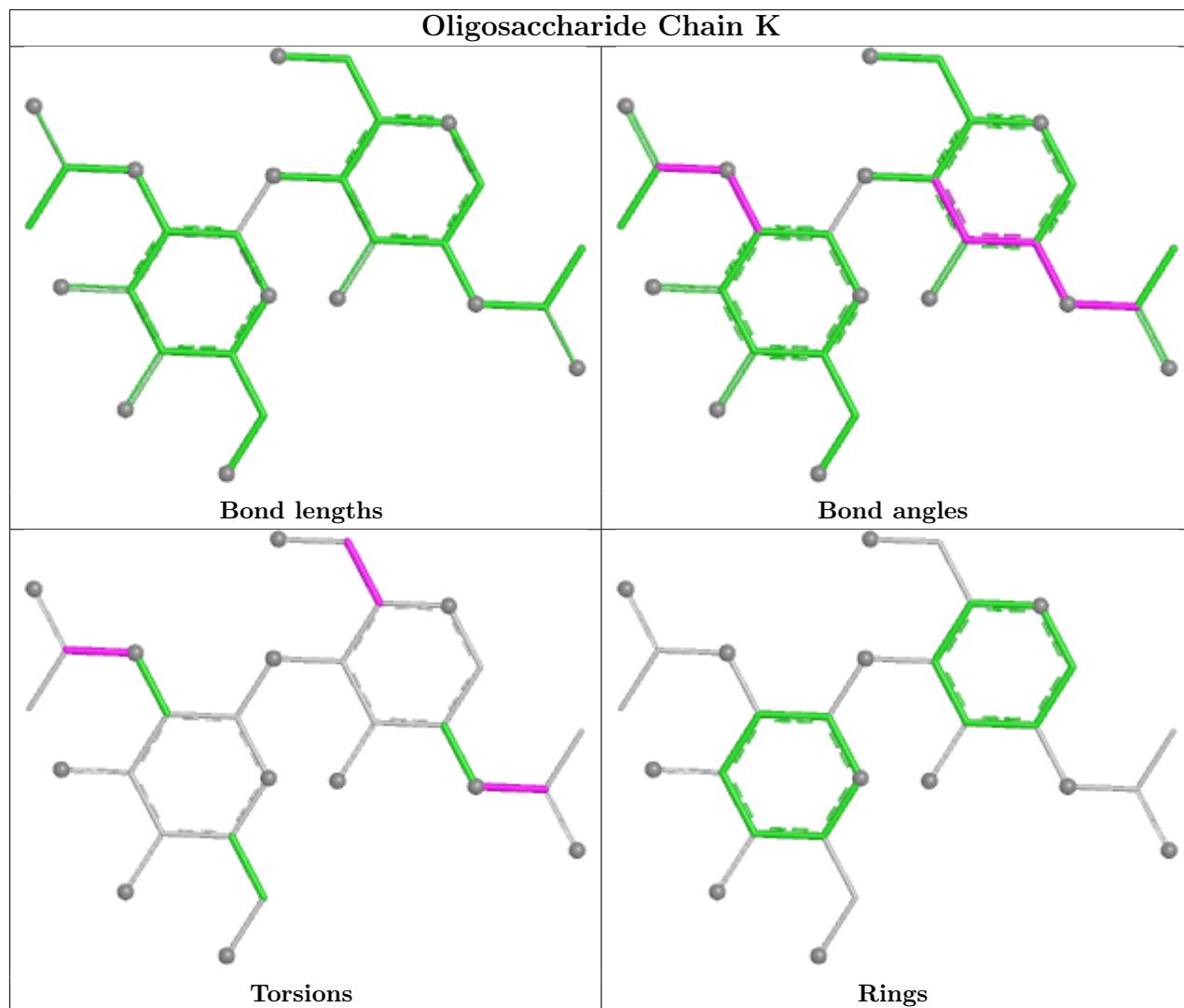
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

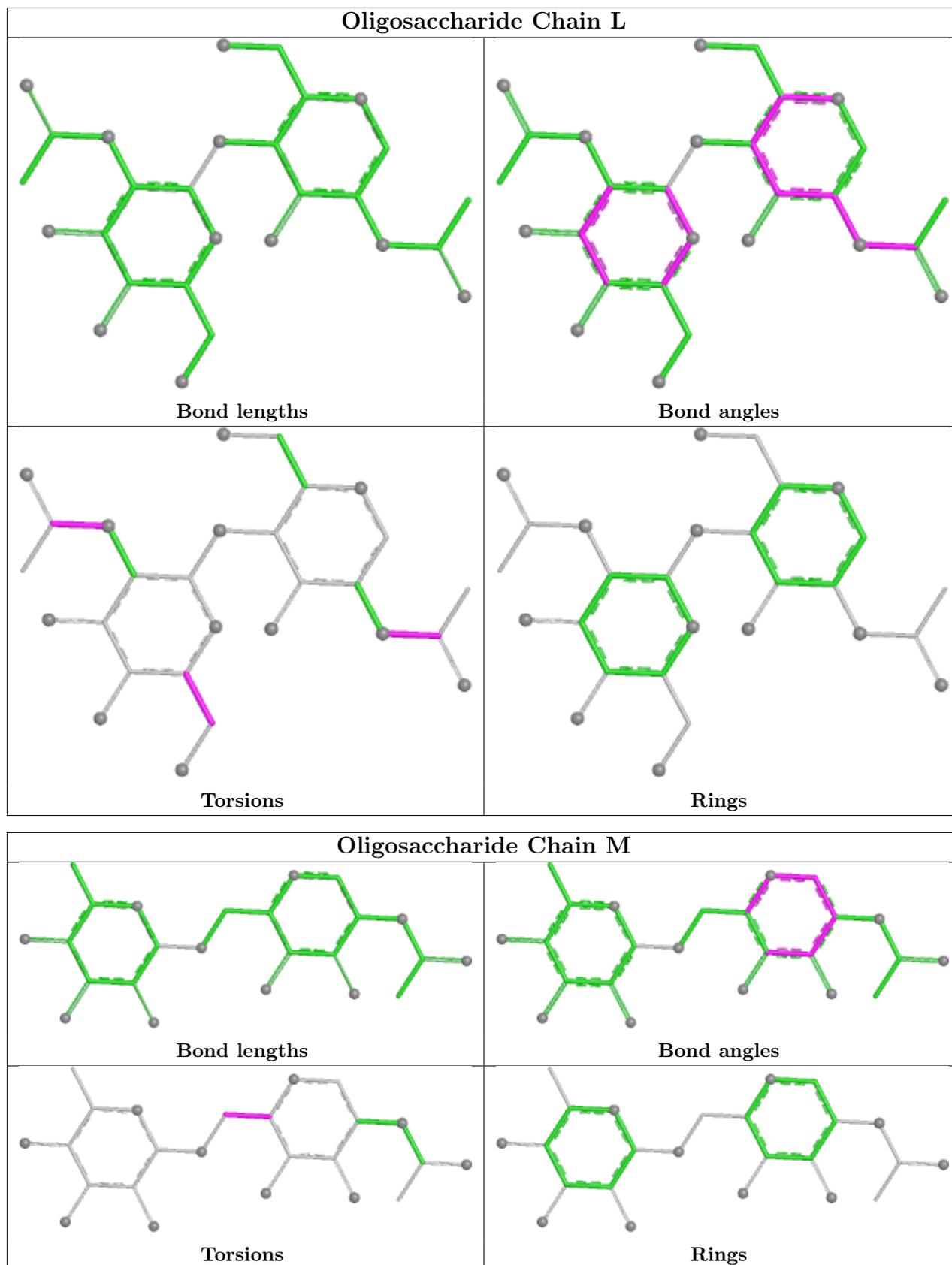












5.6 Ligand geometry

6 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
6	NAG	A	301	1	14,14,15	0.42	0	17,19,21	0.95	1 (5%)
6	NAG	C	301	1	14,14,15	0.80	1 (7%)	17,19,21	1.21	1 (5%)
6	NAG	B	101	2	14,14,15	0.42	0	17,19,21	0.84	1 (5%)
7	03F	A	302	-	50,51,51	0.32	0	57,59,59	0.42	0
7	03F	C	302	-	50,51,51	0.30	0	57,59,59	0.30	0
7	03F	E	301	-	50,51,51	0.31	0	57,59,59	0.44	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
6	NAG	A	301	1	-	2/6/23/26	0/1/1/1
6	NAG	C	301	1	-	3/6/23/26	0/1/1/1
6	NAG	B	101	2	-	2/6/23/26	0/1/1/1
7	03F	A	302	-	-	22/47/67/67	0/1/1/1
7	03F	C	302	-	-	19/47/67/67	0/1/1/1
7	03F	E	301	-	-	24/47/67/67	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	C	301	NAG	C1-C2	2.03	1.55	1.52

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	C	301	NAG	O5-C1-C2	-3.52	105.85	111.29

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	101	NAG	C1-O5-C5	-2.57	108.74	112.19
6	A	301	NAG	O5-C1-C2	-2.13	107.99	111.29

There are no chirality outliers.

All (72) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	B	101	NAG	C8-C7-N2-C2
6	B	101	NAG	O7-C7-N2-C2
7	A	302	03F	O1A-C1-C2-N2
7	A	302	03F	O1A-C1-C2-C3
7	A	302	03F	OAA-CAA-N2-C2
7	A	302	03F	CAB-CAA-N2-C2
7	C	302	03F	C1-C2-C3-O3
7	C	302	03F	OAA-CAA-N2-C2
7	C	302	03F	CAB-CAA-N2-C2
7	C	302	03F	C2-C3-C4-C5
7	C	302	03F	O3-C3-C4-C5
7	C	302	03F	C3-C4-C5-C6
7	E	301	03F	O1A-C1-C2-N2
7	E	301	03F	C1-C2-N2-CAA
7	E	301	03F	OAA-CAA-N2-C2
7	E	301	03F	CAB-CAA-N2-C2
7	E	301	03F	C3-C4-C5-C6
7	E	301	03F	O6A-C1A-O1A-C1
7	E	301	03F	CAH-CAI-CAJ-CAK
7	E	301	03F	O6A-C5M-C6A-O5A
7	C	302	03F	CAA-CAB-CAC-CAD
7	E	301	03F	CAA-CAB-CAC-CAD
6	C	301	NAG	C4-C5-C6-O6
6	C	301	NAG	O5-C5-C6-O6
7	A	302	03F	O3-C3-C4-C5
7	A	302	03F	C2A-C1A-O1A-C1
7	A	302	03F	O6A-C1A-O1A-C1
7	A	302	03F	C10-C11-C12-C13
7	E	301	03F	C6-C7-C8-C9
7	E	301	03F	C13-C14-C15-C16
7	E	301	03F	C7-C8-C9-C10
7	E	301	03F	C4A-C5M-C6A-O5A
7	A	302	03F	C12-C13-C14-C15
7	C	302	03F	CAE-CAF-CAG-CAH
7	C	302	03F	CAM-CAN-CAO-CAP

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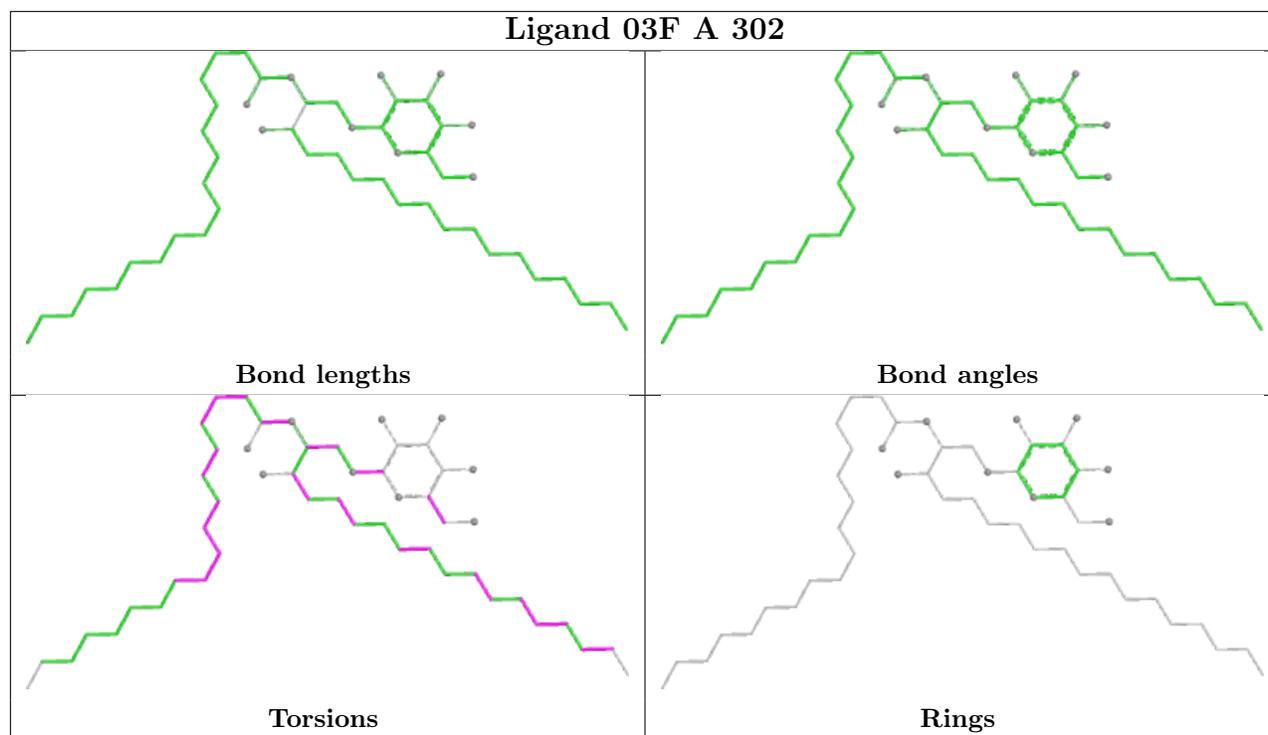
Mol	Chain	Res	Type	Atoms
7	A	302	03F	C7-C8-C9-C10
7	C	302	03F	C6-C7-C8-C9
7	A	302	03F	C13-C14-C15-C16
7	A	302	03F	C15-C16-C17-C18
7	E	301	03F	C15-C16-C17-C18
7	A	302	03F	CAF-CAG-CAH-CAI
7	A	302	03F	C4-C5-C6-C7
7	A	302	03F	CAH-CAI-CAJ-CAK
7	A	302	03F	CAD-CAE-CAF-CAG
6	A	301	NAG	C4-C5-C6-O6
7	A	302	03F	O6A-C5M-C6A-O5A
7	A	302	03F	CAB-CAC-CAD-CAE
7	E	301	03F	C9-C10-C11-C12
7	E	301	03F	C4-C5-C6-C7
7	E	301	03F	CAC-CAD-CAE-CAF
7	C	302	03F	CAC-CAD-CAE-CAF
7	C	302	03F	C11-C10-C9-C8
7	E	301	03F	CAN-CAO-CAP-CAQ
7	E	301	03F	CAL-CAM-CAN-CAO
7	C	302	03F	CAK-CAL-CAM-CAN
7	C	302	03F	O1A-C1-C2-N2
7	E	301	03F	C11-C12-C13-C14
7	A	302	03F	CAA-CAB-CAC-CAD
7	C	302	03F	CAH-CAI-CAJ-CAK
7	A	302	03F	C2-C3-C4-C5
7	C	302	03F	C12-C13-C14-C15
6	A	301	NAG	O5-C5-C6-O6
6	C	301	NAG	C1-C2-N2-C7
7	E	301	03F	C11-C10-C9-C8
7	A	302	03F	CAG-CAH-CAI-CAJ
7	C	302	03F	C2-C1-O1A-C1A
7	A	302	03F	CAI-CAJ-CAK-CAL
7	E	301	03F	CAI-CAJ-CAK-CAL
7	C	302	03F	C7-C8-C9-C10
7	E	301	03F	C3-C2-N2-CAA
7	E	301	03F	CAD-CAE-CAF-CAG
7	C	302	03F	C4-C5-C6-C7

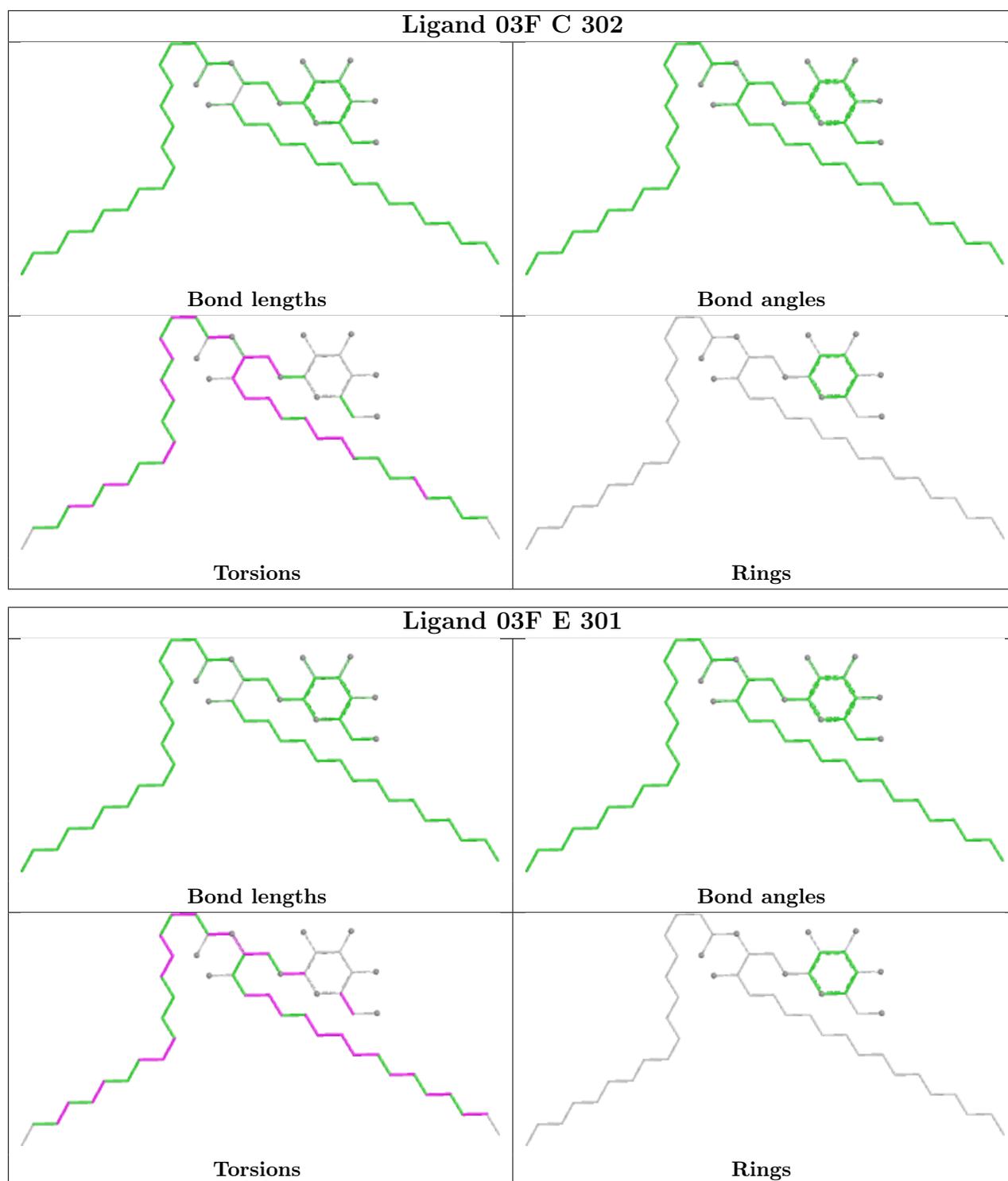
There are no ring outliers.

3 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	302	03F	2	0
7	C	302	03F	3	0
7	E	301	03F	3	1

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

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	268/268 (100%)	0.52	11 (4%) 42 40	36, 52, 88, 102	0
1	C	268/268 (100%)	0.57	11 (4%) 42 40	37, 54, 96, 117	0
1	E	267/268 (99%)	0.61	10 (3%) 45 44	30, 56, 94, 111	0
2	B	94/94 (100%)	0.22	2 (2%) 63 62	35, 53, 73, 85	0
2	D	94/94 (100%)	0.38	2 (2%) 63 62	38, 56, 81, 89	0
2	F	93/94 (98%)	0.40	3 (3%) 50 48	40, 54, 75, 91	0
All	All	1084/1086 (99%)	0.50	39 (3%) 46 45	30, 55, 89, 117	0

All (39) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	F	93	ALA	6.1
1	E	246	TYR	4.5
1	C	246	TYR	3.9
1	A	135	PHE	3.7
1	C	248	GLY	3.4
1	C	41	ILE	3.2
1	E	105	PRO	3.2
1	E	268	TRP	3.1
1	A	134	LYS	3.1
1	C	40	LYS	3.0
1	A	246	TYR	3.0
1	A	136	ALA	3.0
1	E	102	ASP	2.9
1	E	106	SER	2.7
2	B	94	TYR	2.6
1	C	247	ASP	2.6
1	A	17	ASP	2.5
1	C	149	MET	2.5
2	F	29	SER	2.4

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Mol	Chain	Res	Type	RSRZ
2	D	94	TYR	2.4
1	A	102	ASP	2.4
1	E	245	PRO	2.3
1	E	219	VAL	2.3
1	A	191	GLY	2.3
1	E	189	LYS	2.3
2	D	32	ASN	2.3
1	C	105	PRO	2.3
1	C	3	HIS	2.3
1	C	104	ASN	2.2
2	F	1	GLY	2.2
1	A	149	MET	2.2
1	C	81	GLN	2.2
1	A	105	PRO	2.1
1	A	192	SER	2.1
1	C	222	THR	2.1
1	E	63	MET	2.1
1	E	128	VAL	2.1
2	B	93	ALA	2.1
1	A	104	ASN	2.1

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.

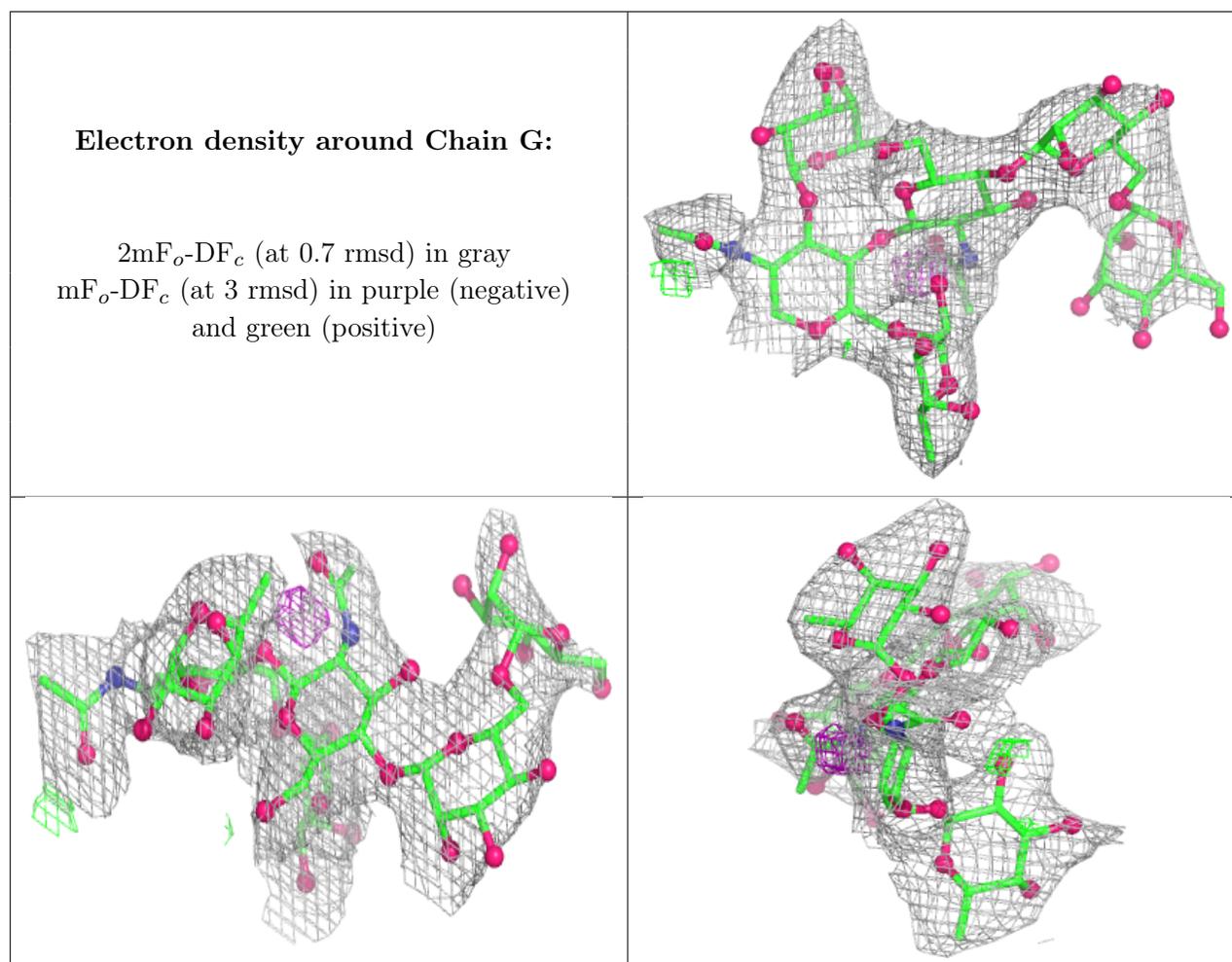
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	NAG	L	2	14/15	0.34	0.21	106,112,121,122	0
3	MAN	J	4	11/12	0.36	0.17	93,99,104,104	0
3	MAN	G	4	11/12	0.45	0.16	98,104,110,112	0
4	NAG	I	2	14/15	0.51	0.16	94,108,118,119	0
4	NAG	K	1	14/15	0.55	0.20	93,115,120,120	0
4	NAG	H	2	14/15	0.56	0.16	102,108,113,116	0
4	NAG	K	2	14/15	0.57	0.15	107,121,126,126	0
4	NAG	L	1	14/15	0.59	0.16	101,109,117,122	0

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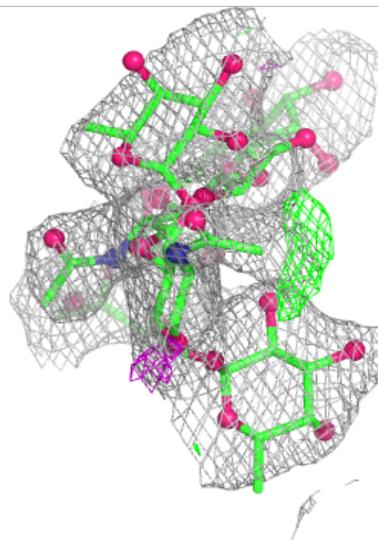
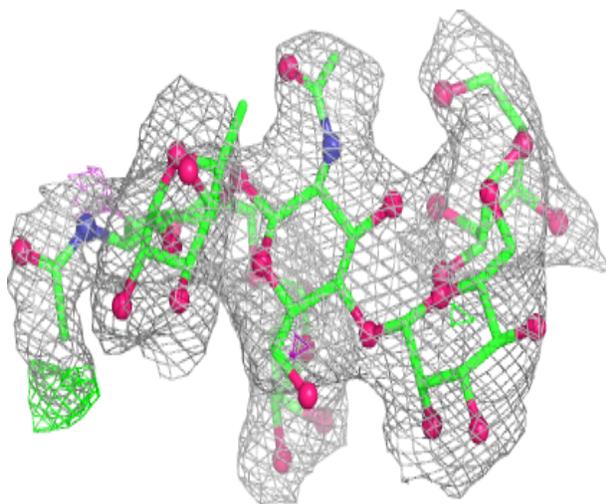
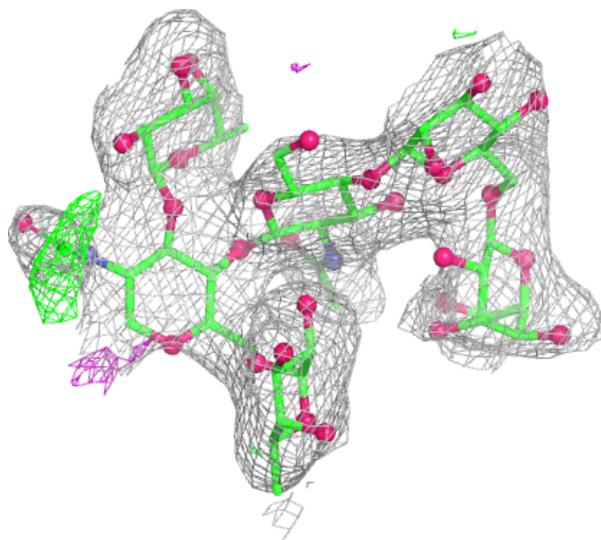
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
5	NAG	M	1	14/15	0.60	0.18	68,76,87,96	0
3	NAG	J	1	14/15	0.61	0.15	62,71,81,81	0
4	NAG	H	1	14/15	0.66	0.15	93,99,104,105	0
4	NAG	I	1	14/15	0.66	0.13	92,108,116,118	0
3	BMA	G	3	11/12	0.71	0.13	84,88,97,100	0
3	BMA	J	3	11/12	0.71	0.11	82,89,95,95	0
3	FUC	G	6	10/11	0.72	0.13	57,74,80,84	0
3	FUC	J	5	10/11	0.73	0.14	69,76,82,86	0
3	FUC	G	5	10/11	0.73	0.12	82,86,90,95	0
3	FUC	J	6	10/11	0.76	0.14	64,73,82,83	0
3	NAG	G	1	14/15	0.79	0.11	55,71,79,79	0
3	NAG	J	2	14/15	0.80	0.11	69,78,92,99	0
3	NAG	G	2	14/15	0.80	0.12	68,81,84,86	0
5	FUC	M	2	10/11	0.83	0.14	69,83,91,91	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.



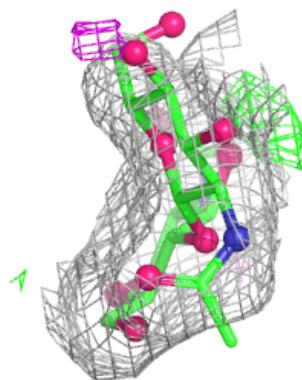
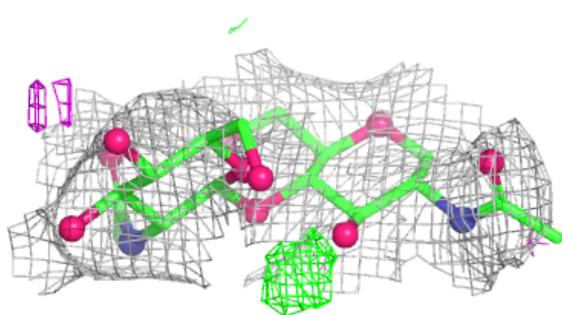
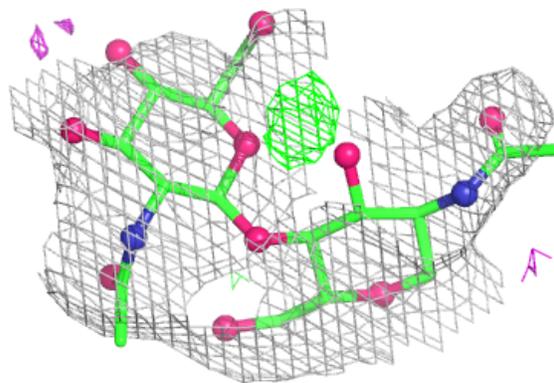
Electron density around Chain J:

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



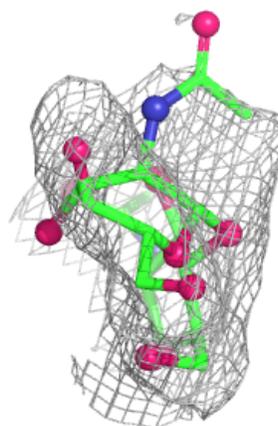
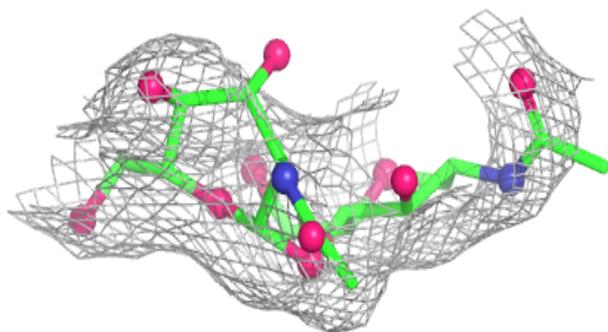
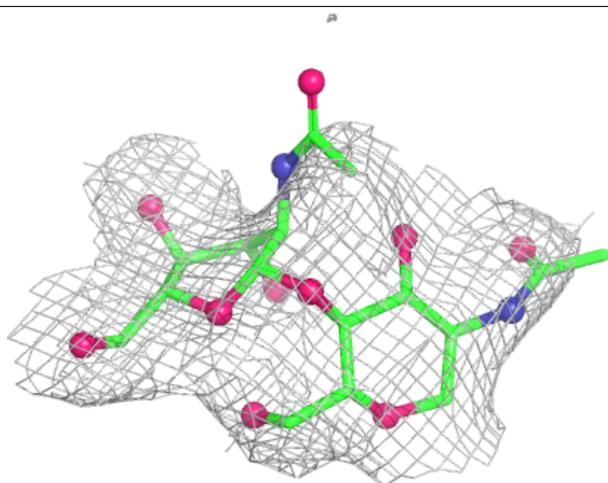
Electron density around Chain H:

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



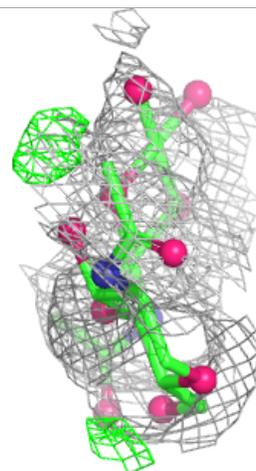
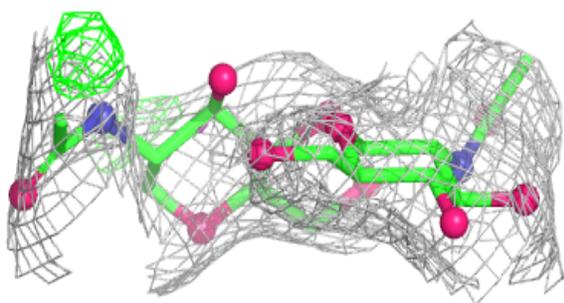
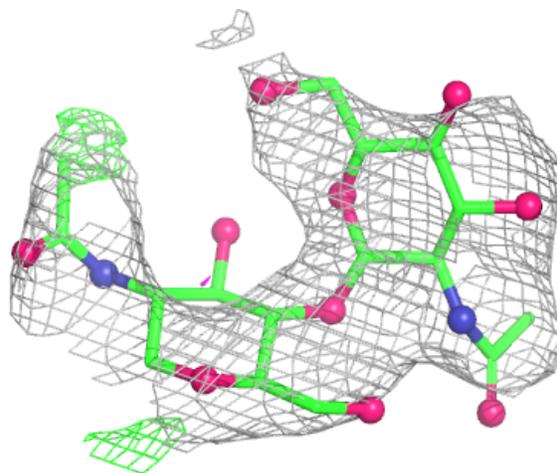
Electron density around Chain I:

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



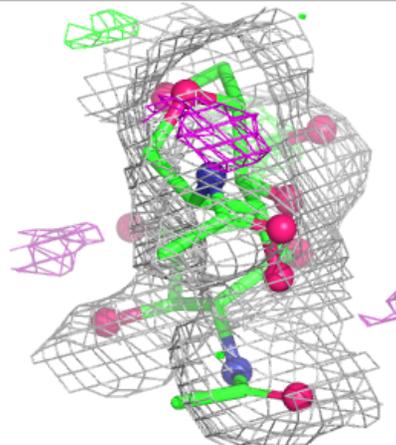
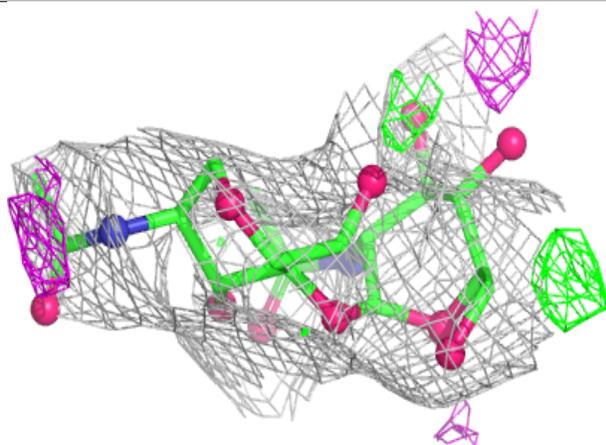
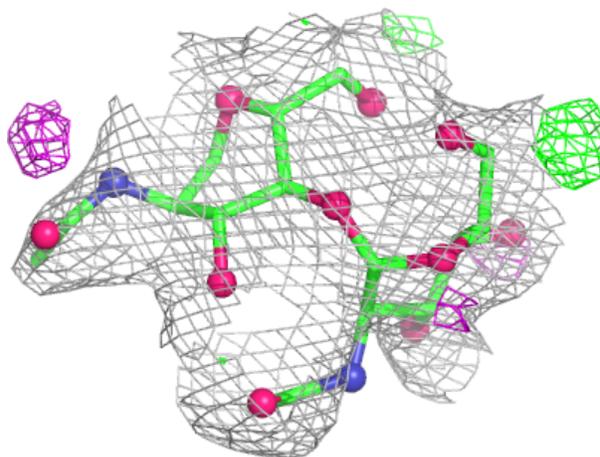
Electron density around Chain K:

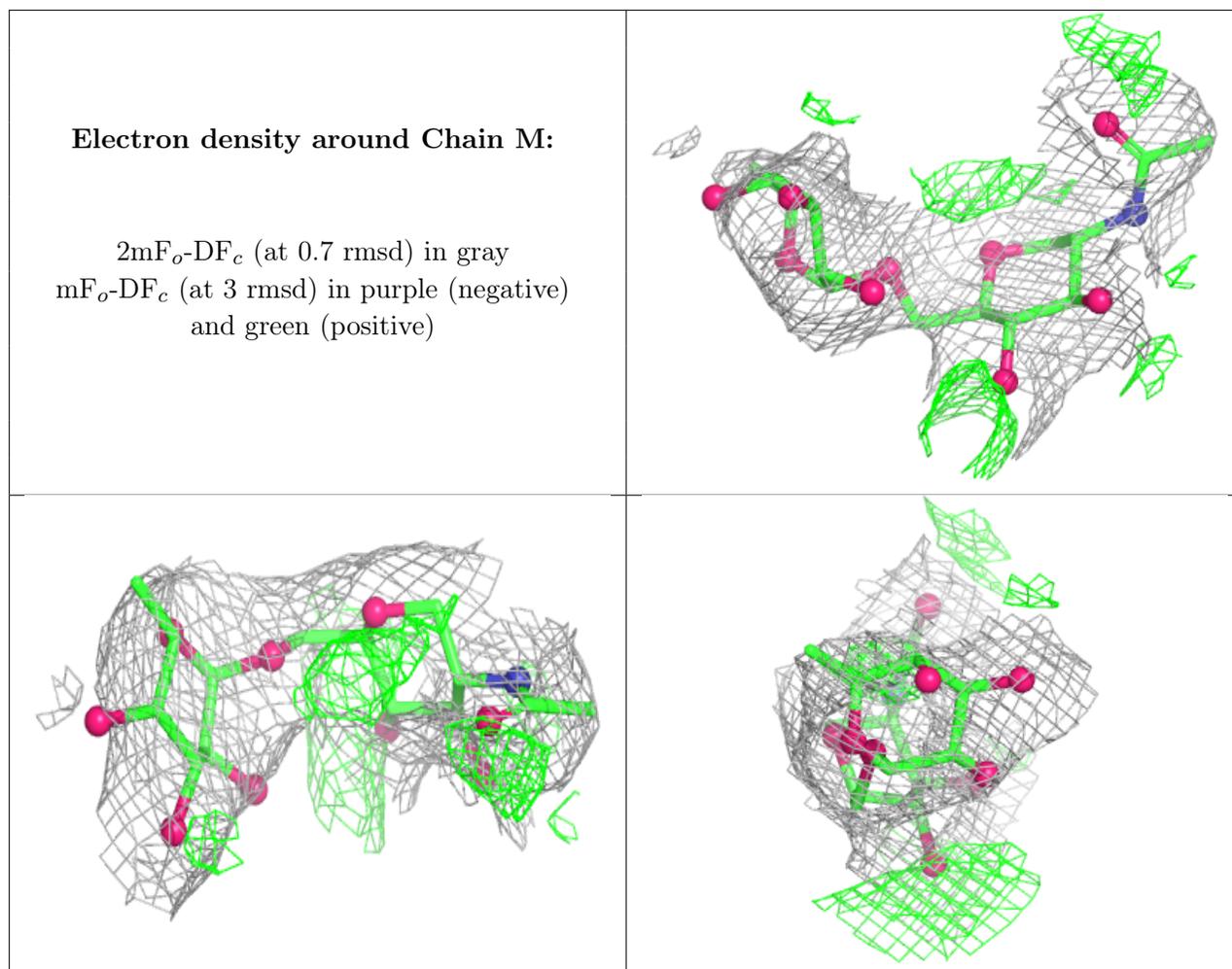
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain L:

$2mF_o-DF_c$ (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.

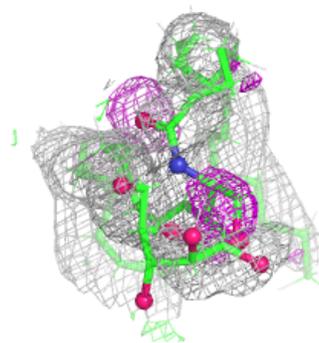
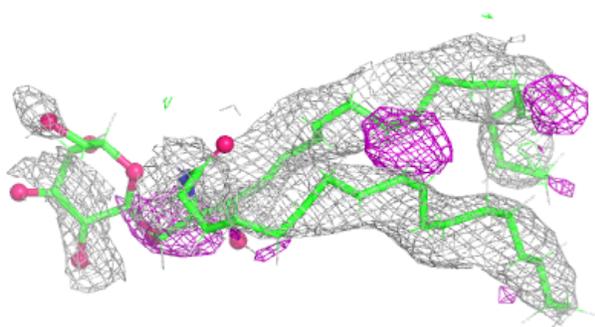
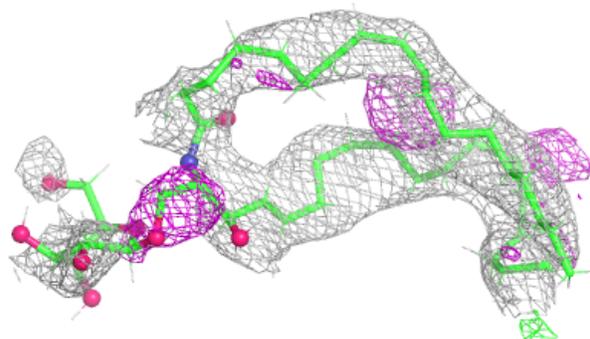
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q < 0.9
6	NAG	B	101	14/15	0.43	0.14	93,109,116,123	0
6	NAG	C	301	14/15	0.50	0.20	86,105,115,121	0
7	03F	A	302	51/51	0.63	0.18	51,77,162,191	0
7	03F	C	302	51/51	0.64	0.19	57,93,206,213	0
7	03F	E	301	51/51	0.70	0.20	43,90,151,169	0
6	NAG	A	301	14/15	0.71	0.14	85,96,106,109	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.

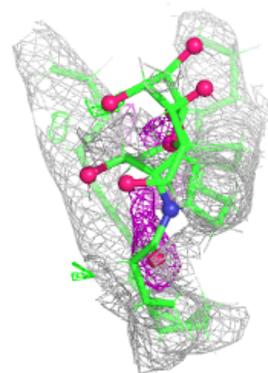
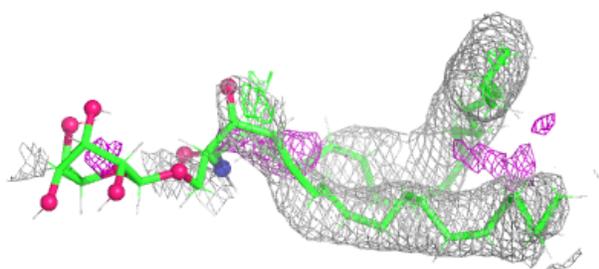
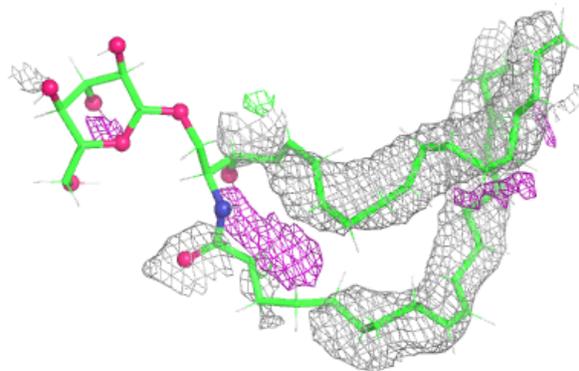
Electron density around 03F A 302:

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

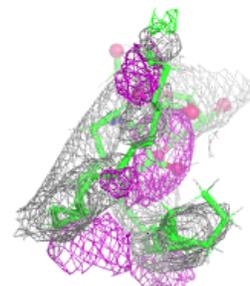
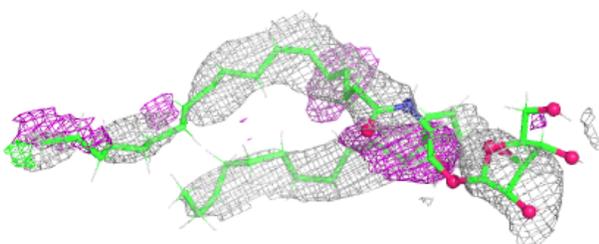
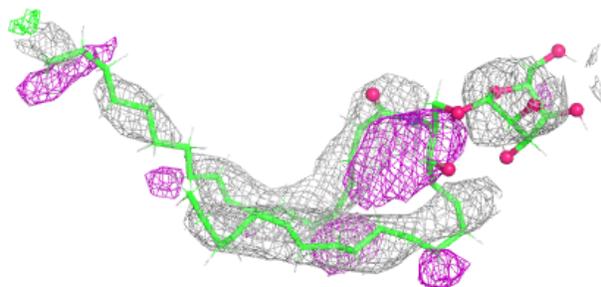


Electron density around 03F C 302:

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

**Electron density around 03F E 301:**

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



6.5 Other polymers [i](#)

There are no such residues in this entry.