



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 05:51 AM UTC

PDB ID : 7U9F / pdb_00007u9f
Title : Integrin alpha IIB beta3 complex with BMS compound 4 in Mn2+
Authors : Lin, F.-Y.; Zhu, J.; Zhu, J.; Springer, T.A.
Deposited on : 2022-03-10
Resolution : 2.70 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

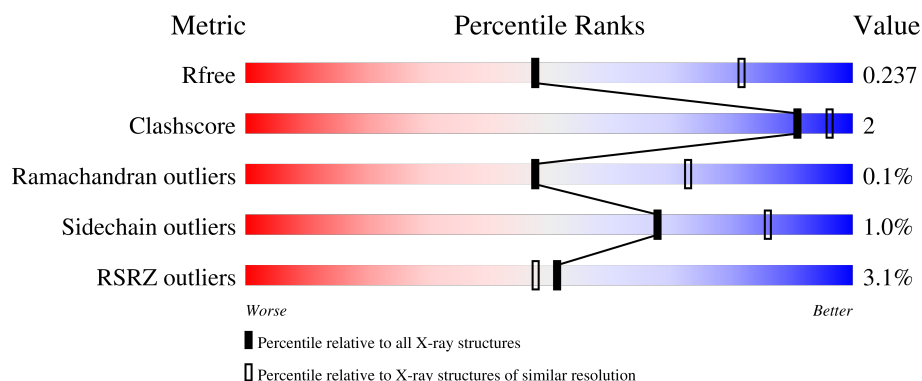
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



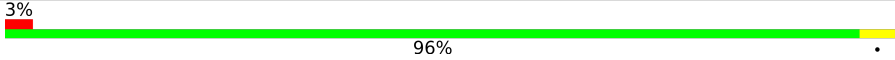
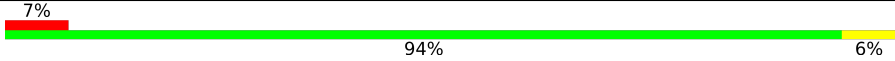
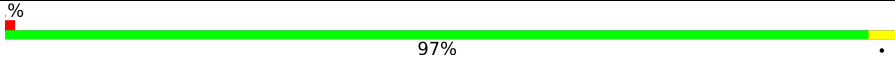
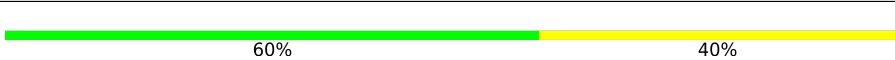
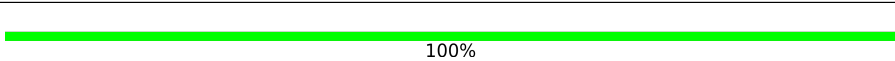
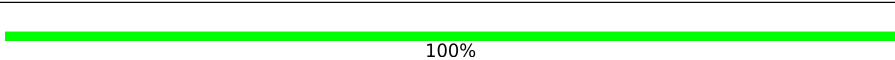
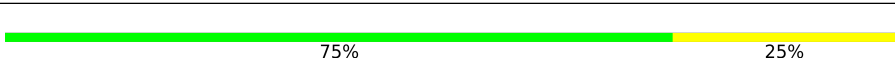
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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	454	95% 5%
1	C	454	2% 93% 7%
2	B	471	2% 93% 6%
2	D	471	2% 94% 6%
3	E	216	18% 94% 5%

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Mol	Chain	Length	Quality of chain
3	H	216	
4	F	214	
4	L	214	
5	G	5	
6	I	2	
6	K	2	
7	J	4	

2 Entry composition

There are 14 unique types of molecules in this entry. The entry contains 22211 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Integrin alpha-IIb.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	454	Total	C	N	O	S	0	4	0
			3499	2226	601	664	8			
1	C	453	Total	C	N	O	S	0	4	0
			3502	2224	604	666	8			

- Molecule 2 is a protein called Integrin beta-3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	466	Total	C	N	O	S	4	4	0
			3618	2252	617	715	34			
2	D	471	Total	C	N	O	S	3	0	0
			3623	2255	619	715	34			

- Molecule 3 is a protein called Fab heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	E	214	Total	C	N	O	S	0	0	0
			1631	1035	264	326	6			
3	H	216	Total	C	N	O	S	0	0	0
			1642	1041	266	329	6			

- Molecule 4 is a protein called Fab light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	F	214	Total	C	N	O	S	0	0	0
			1637	1019	268	341	9			
4	L	214	Total	C	N	O	S	0	0	0
			1637	1019	268	341	9			

- Molecule 5 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	G	5	Total	C	N	O	0	0	0
			61	34	2	25			

- Molecule 6 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



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

- Molecule 7 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
7	J	4	Total	C	N	O	0	0	0
			50	28	2	20			

- Molecule 8 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	A	1	Total	O	S	0	0
			5	4	1		
8	A	1	Total	O	S	0	0
			5	4	1		
8	A	1	Total	O	S	0	0
			5	4	1		
8	A	1	Total	O	S	0	0
			5	4	1		
8	C	1	Total	O	S	0	0
			5	4	1		
8	C	1	Total	O	S	0	0
			5	4	1		
8	C	1	Total	O	S	0	0
			5	4	1		
8	L	1	Total	O	S	0	0
			5	4	1		

- Molecule 9 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	4	Total	Ca	0	0
			4	4		
9	C	4	Total	Ca	0	0
			4	4		

- Molecule 10 is MANGANESE (II) ION (CCD ID: MN) (formula: Mn).

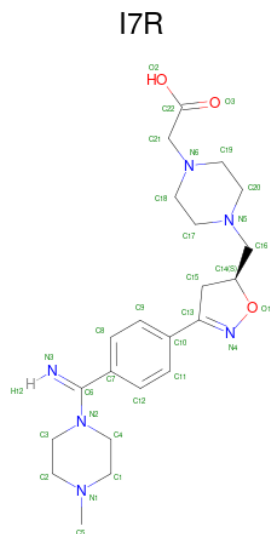
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	B	3	Total	Mn	0	0
			3	3		
10	D	3	Total	Mn	0	0
			3	3		

- Molecule 11 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



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

- Molecule 12 is (4-{[(5S)-3-{4-[(E)-imino(4-methylpiperazin-1-yl)methyl]phenyl}-4,5-dihydro-1,2-oxazol-5-yl]methyl}piperazin-1-yl)acetic acid (CCD ID: I7R) (formula: $C_{22}H_{32}N_6O_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
12	B	1	Total 31	C 22	N 6	O 3	0	0
12	D	1	Total 31	C 22	N 6	O 3	0	0

- Molecule 13 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
13	C	1	Total Cl 1 1	0	0
13	D	1	Total Cl 1 1	0	0

- Molecule 14 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
14	A	408	Total O 408 408	0	0
14	B	226	Total O 226 226	0	0
14	C	185	Total O 185 185	0	0
14	D	152	Total O 152 152	0	0
14	E	19	Total O 19 19	0	0

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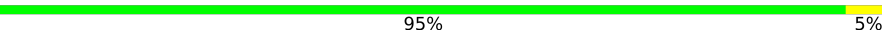
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
14	F	18	Total 18	O 18	0	0
14	H	34	Total 34	O 34	0	0
14	L	62	Total 62	O 62	0	0

3 Residue-property plots [i](#)

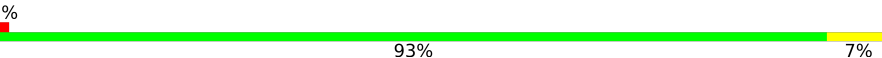
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

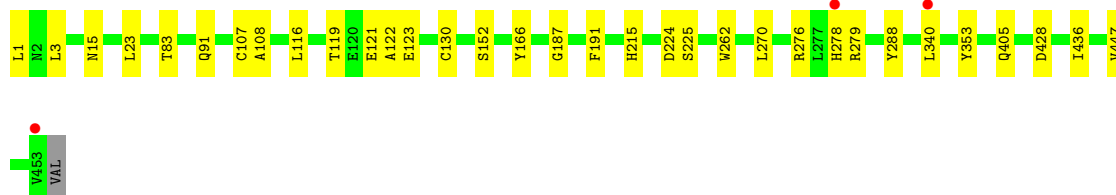
• Molecule 1: Integrin alpha-IIb

Chain A:  95% 5%

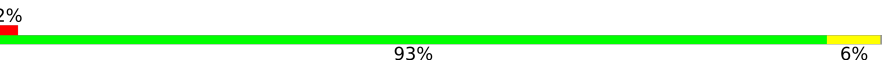


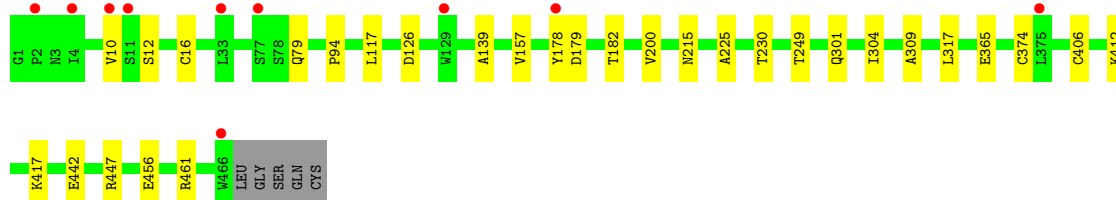
• Molecule 1: Integrin alpha-IIb

Chain C:  93% 7%

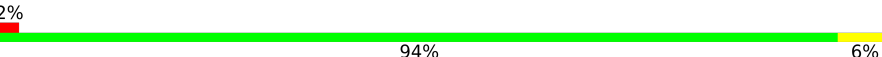


• Molecule 2: Integrin beta-3

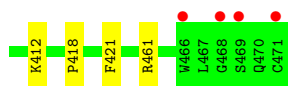
Chain B:  93% 6% 2%



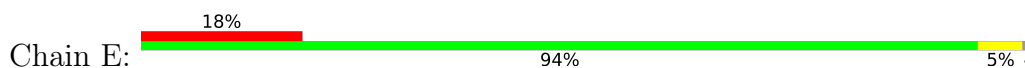
• Molecule 2: Integrin beta-3

Chain D:  94% 6%

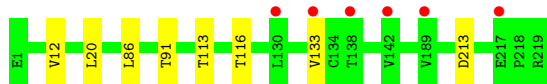




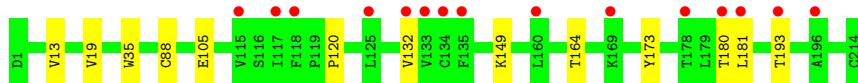
- Molecule 3: Fab heavy chain



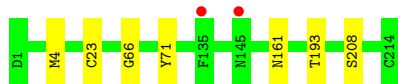
- Molecule 3: Fab heavy chain



- Molecule 4: Fab light chain



- Molecule 4: Fab light chain



- Molecule 5: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 6: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose





- Molecule 6: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain K:  100%



- Molecule 7: alpha-D-mannopyranose-(1-3)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain J:  75% 25%



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	259.40Å 144.29Å 104.92Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.09 – 2.70 46.09 – 2.70	Depositor EDS
% Data completeness (in resolution range)	98.7 (46.09-2.70) 89.4 (46.09-2.70)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.16 (at 2.69Å)	Xtriage
Refinement program	PHENIX 1.11.1 _2575	Depositor
R, R_{free}	0.217 , 0.237 0.215 , 0.237	Depositor DCC
R_{free} test set	1998 reflections (1.84%)	wwPDB-VP
Wilson B-factor (Å ²)	48.9	Xtriage
Anisotropy	0.366	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 55.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	22211	wwPDB-VP
Average B, all atoms (Å ²)	80.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.38% 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: CL, I7R, SO4, NAG, BMA, MN, CA, MAN

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	0.10	0/3608	0.33	0/4918
1	C	0.10	0/3605	0.33	0/4912
2	B	0.10	0/3688	0.31	0/5000
2	D	0.10	0/3690	0.30	0/5003
3	E	0.11	0/1673	0.29	0/2290
3	H	0.09	0/1684	0.29	0/2305
4	F	0.10	0/1673	0.28	0/2269
4	L	0.09	0/1673	0.28	0/2269
All	All	0.10	0/21294	0.31	0/28966

There are no bond length outliers.

There are no bond angle outliers.

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	3499	0	3345	10	0
1	C	3502	0	3334	16	0
2	B	3618	0	3533	15	0
2	D	3623	0	3540	14	0
3	E	1631	0	1590	8	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	H	1642	0	1600	4	0
4	F	1637	0	1553	7	0
4	L	1637	0	1553	4	0
5	G	61	0	52	0	0
6	I	28	0	25	0	0
6	K	28	0	25	0	0
7	J	50	0	43	0	0
8	A	20	0	0	0	0
8	C	20	0	0	0	0
8	L	5	0	0	0	0
9	A	4	0	0	0	0
9	C	4	0	0	0	0
10	B	3	0	0	0	0
10	D	3	0	0	0	0
11	B	14	0	13	0	0
11	D	14	0	13	0	0
12	B	31	0	0	0	0
12	D	31	0	0	1	0
13	C	1	0	0	0	0
13	D	1	0	0	0	0
14	A	408	0	0	0	1
14	B	226	0	0	1	0
14	C	185	0	0	1	1
14	D	152	0	0	0	0
14	E	19	0	0	0	0
14	F	18	0	0	0	0
14	H	34	0	0	0	0
14	L	62	0	0	1	0
All	All	22211	0	20219	72	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 (72) 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)
3:E:161:ASN:HB2	3:E:164:SER:HB3	1.67	0.75
3:E:165:LEU:HD21	3:E:187:VAL:HG21	1.82	0.60
2:D:12:SER:HB3	2:D:461:ARG:HD3	1.82	0.60
2:B:139:ALA:HB2	2:B:200:VAL:HG11	1.87	0.56
1:C:121:GLU:HG3	1:C:123:GLU:H	1.71	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:306:LEU:HB3	2:D:328:THR:HG22	1.89	0.55
2:D:121:SER:HB2	12:D:2006:I7R:O2	2.07	0.53
2:B:230:THR:HG23	2:B:304:ILE:HG13	1.91	0.52
1:C:83:THR:HB	1:C:116:LEU:HB2	1.91	0.52
3:E:160:TRP:HE1	3:E:169:VAL:HG11	1.75	0.51
1:A:262:TRP:HB3	2:B:317:LEU:HD13	1.91	0.51
2:B:10:VAL:HG21	2:B:16:CYS:HB2	1.92	0.50
1:A:9:THR:HB	1:A:447:VAL:HB	1.92	0.50
2:D:117:LEU:HD11	2:D:225:ALA:HB1	1.94	0.50
2:D:365:GLU:OE2	2:D:412:LYS:NZ	2.44	0.49
2:B:126[A]:ASP:OD1	2:B:126[A]:ASP:N	2.44	0.49
3:H:20:LEU:HD22	3:H:113:THR:HG21	1.94	0.49
1:A:394:GLY:HA2	1:A:399:LEU:HD23	1.95	0.49
1:C:262:TRP:HB3	2:D:317:LEU:HD13	1.94	0.48
1:A:377:ALA:HB2	1:A:421:LEU:HD11	1.96	0.48
1:A:187:GLY:HA2	1:A:191:PHE:HA	1.96	0.48
2:B:117:LEU:HD11	2:B:225:ALA:HB1	1.95	0.48
4:L:193:THR:HG23	4:L:208:SER:HB3	1.96	0.47
2:B:365:GLU:OE2	2:B:412:LYS:NZ	2.39	0.47
1:A:314:MET:HB3	1:A:322:LEU:HB3	1.97	0.47
2:D:319:GLN:HA	2:D:330:VAL:HG21	1.97	0.46
1:C:428:ASP:CG	14:C:602:HOH:O	2.59	0.46
2:D:354:LYS:HE2	2:D:387:MET:HE3	1.98	0.46
1:C:353:TYR:OH	2:D:297:GLU:OE1	2.27	0.45
4:F:13:VAL:HG11	4:F:19:VAL:HG11	1.99	0.45
3:H:12:VAL:HG21	3:H:86:LEU:HD13	1.97	0.45
4:F:120:PRO:HD3	4:F:132:VAL:HG22	1.99	0.45
3:H:91:THR:HG23	3:H:116:THR:HA	1.99	0.45
3:E:149:LYS:NZ	4:F:180:THR:HG21	2.31	0.45
1:C:224:ASP:OD1	1:C:225:SER:N	2.43	0.45
1:C:107:CYS:HA	1:C:130:CYS:HA	1.98	0.45
1:C:276:ARG:HD2	1:C:279:ARG:HB2	1.99	0.45
4:L:161:ASN:ND2	14:L:404:HOH:O	2.49	0.45
1:A:107:CYS:HA	1:A:130:CYS:HA	1.97	0.44
3:E:172:PHE:CD2	4:F:164:THR:HG23	2.52	0.44
1:A:3:LEU:O	1:A:5:PRO:HD3	2.18	0.44
1:C:278[A]:HIS:NE2	1:C:340:LEU:O	2.50	0.44
3:E:202:ASN:HA	3:E:213:ASP:HB3	1.99	0.44
1:C:187:GLY:HA2	1:C:191:PHE:HA	2.00	0.44
2:B:442:GLU:OE1	2:B:447:ARG:NH1	2.51	0.43
1:C:215:HIS:CE1	3:E:32:THR:HG22	2.53	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:22:MET:HG2	2:D:40:LEU:HD22	2.00	0.43
2:D:178:TYR:CG	2:D:179:ASP:N	2.86	0.43
3:H:213:ASP:OD1	3:H:213:ASP:N	2.52	0.43
4:L:4:MET:HE3	4:L:23:CYS:SG	2.58	0.43
2:B:456:GLU:OE2	2:B:461:ARG:NH1	2.52	0.43
1:A:122:ALA:O	1:A:123:GLU:HB2	2.19	0.42
3:E:67:LYS:HE3	3:E:67:LYS:HB2	1.90	0.42
2:B:301:GLN:NE2	14:B:2107:HOH:O	2.43	0.42
2:B:365:GLU:H	2:B:365:GLU:CD	2.27	0.42
1:C:123:GLU:HG3	1:C:152:SER:HB2	2.02	0.42
4:F:35:TRP:CZ3	4:F:88:CYS:HB3	2.55	0.42
1:C:122:ALA:O	1:C:123:GLU:HB2	2.18	0.42
2:D:311:THR:O	2:D:315:VAL:HG23	2.21	0.41
2:D:418:PRO:HB2	2:D:421:PHE:CD1	2.55	0.41
2:B:178:TYR:CG	2:B:179:ASP:N	2.88	0.41
2:B:249:THR:HA	2:B:309:ALA:O	2.19	0.41
1:C:3:LEU:O	1:C:405:GLN:NE2	2.47	0.41
4:F:105:GLU:OE1	4:F:173:TYR:OH	2.27	0.41
4:F:149:LYS:HB2	4:F:193:THR:HB	2.03	0.41
2:B:94:PRO:HG3	2:B:406:CYS:HB2	2.03	0.41
1:A:109:PRO:O	1:A:168:GLU:HA	2.21	0.41
2:B:12:SER:HB3	2:B:461:ARG:HD3	2.03	0.41
1:C:436:ILE:HG22	1:C:447:VAL:HG22	2.03	0.41
2:D:235:LYS:HE3	2:D:276:GLY:O	2.21	0.41
4:L:66:GLY:HA3	4:L:71:TYR:HA	2.03	0.41
1:C:91:GLN:HB2	1:C:108:ALA:HB1	2.04	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)
14:A:902:HOH:O	14:C:761:HOH:O[1_554]	2.19	0.01

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	456/454 (100%)	440 (96%)	15 (3%)	1 (0%)	43	68
1	C	455/454 (100%)	438 (96%)	17 (4%)	0	100	100
2	B	468/471 (99%)	451 (96%)	16 (3%)	1 (0%)	43	68
2	D	469/471 (100%)	445 (95%)	24 (5%)	0	100	100
3	E	210/216 (97%)	194 (92%)	16 (8%)	0	100	100
3	H	212/216 (98%)	203 (96%)	9 (4%)	0	100	100
4	F	212/214 (99%)	204 (96%)	8 (4%)	0	100	100
4	L	212/214 (99%)	205 (97%)	7 (3%)	0	100	100
All	All	2694/2710 (99%)	2580 (96%)	112 (4%)	2 (0%)	48	73

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	123	GLU
2	B	157	VAL

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	366/362 (101%)	362 (99%)	4 (1%)	65	85
1	C	365/362 (101%)	358 (98%)	7 (2%)	50	77
2	B	416/416 (100%)	411 (99%)	5 (1%)	63	84
2	D	416/416 (100%)	411 (99%)	5 (1%)	63	84
3	E	186/187 (100%)	185 (100%)	1 (0%)	81	92
3	H	187/187 (100%)	186 (100%)	1 (0%)	81	92
4	F	188/188 (100%)	187 (100%)	1 (0%)	81	92
4	L	188/188 (100%)	188 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	2312/2306 (100%)	2288 (99%)	24 (1%)	68 86

All (24) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	23	LEU
1	A	166	TYR
1	A	270	LEU
1	A	288	TYR
2	B	79	GLN
2	B	182	THR
2	B	215	ASN
2	B	374	CYS
2	B	417	LYS
1	C	1	LEU
1	C	15	ASN
1	C	23	LEU
1	C	119	THR
1	C	166	TYR
1	C	270	LEU
1	C	288	TYR
2	D	143	ARG
2	D	202	ARG
2	D	215	ASN
2	D	241	ASP
2	D	365	GLU
3	E	164	SER
4	F	181	LEU
3	H	133	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (27) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	197	GLN
1	A	249	ASN
1	A	333	GLN
1	A	372	ASN
1	A	444	GLN
2	B	82	GLN
2	B	303	ASN
1	C	30	HIS

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Mol	Chain	Res	Type
1	C	158	ASN
1	C	197	GLN
1	C	291	HIS
2	D	15	GLN
2	D	141	GLN
2	D	280	HIS
2	D	301	GLN
2	D	376	ASN
2	D	438	GLN
2	D	440	GLN
2	D	452	ASN
4	F	53	ASN
4	F	137	ASN
4	F	145	ASN
4	L	27	GLN
4	L	32	ASN
4	L	137	ASN
4	L	145	ASN
4	L	190	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](#)

13 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
5	NAG	G	1	2,5	14,14,15	0.34	0	17,19,21	0.49	0
5	NAG	G	2	5	14,14,15	0.15	0	17,19,21	0.47	0
5	BMA	G	3	5	11,11,12	0.94	0	15,15,17	0.86	0
5	MAN	G	4	5	11,11,12	0.70	0	15,15,17	1.05	2 (13%)
5	MAN	G	5	5	11,11,12	1.20	1 (9%)	15,15,17	2.07	1 (6%)
6	NAG	I	1	2,6	14,14,15	0.38	0	17,19,21	0.42	0
6	NAG	I	2	6	14,14,15	0.19	0	17,19,21	0.40	0
7	NAG	J	1	2,7	14,14,15	0.30	0	17,19,21	0.53	0
7	NAG	J	2	7	14,14,15	0.32	0	17,19,21	0.40	0
7	BMA	J	3	7	11,11,12	0.81	0	15,15,17	0.87	0
7	MAN	J	4	7	11,11,12	0.74	0	15,15,17	1.06	2 (13%)
6	NAG	K	1	2,6	14,14,15	0.31	0	17,19,21	0.43	0
6	NAG	K	2	6	14,14,15	0.18	0	17,19,21	0.47	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	G	1	2,5	-	0/6/23/26	0/1/1/1
5	NAG	G	2	5	-	0/6/23/26	0/1/1/1
5	BMA	G	3	5	-	2/2/19/22	0/1/1/1
5	MAN	G	4	5	-	0/2/19/22	0/1/1/1
5	MAN	G	5	5	-	1/2/19/22	0/1/1/1
6	NAG	I	1	2,6	-	1/6/23/26	0/1/1/1
6	NAG	I	2	6	-	3/6/23/26	0/1/1/1
7	NAG	J	1	2,7	-	0/6/23/26	0/1/1/1
7	NAG	J	2	7	-	0/6/23/26	0/1/1/1
7	BMA	J	3	7	-	2/2/19/22	0/1/1/1
7	MAN	J	4	7	-	2/2/19/22	0/1/1/1
6	NAG	K	1	2,6	-	2/6/23/26	0/1/1/1
6	NAG	K	2	6	-	4/6/23/26	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	G	5	MAN	O5-C5	3.44	1.50	1.43

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	G	5	MAN	C1-O5-C5	7.04	121.62	112.19
5	G	4	MAN	C1-O5-C5	2.96	116.16	112.19
7	J	4	MAN	C1-O5-C5	2.90	116.07	112.19
7	J	4	MAN	O2-C2-C3	-2.14	105.72	110.15
5	G	4	MAN	O2-C2-C3	-2.12	105.76	110.15

There are no chirality outliers.

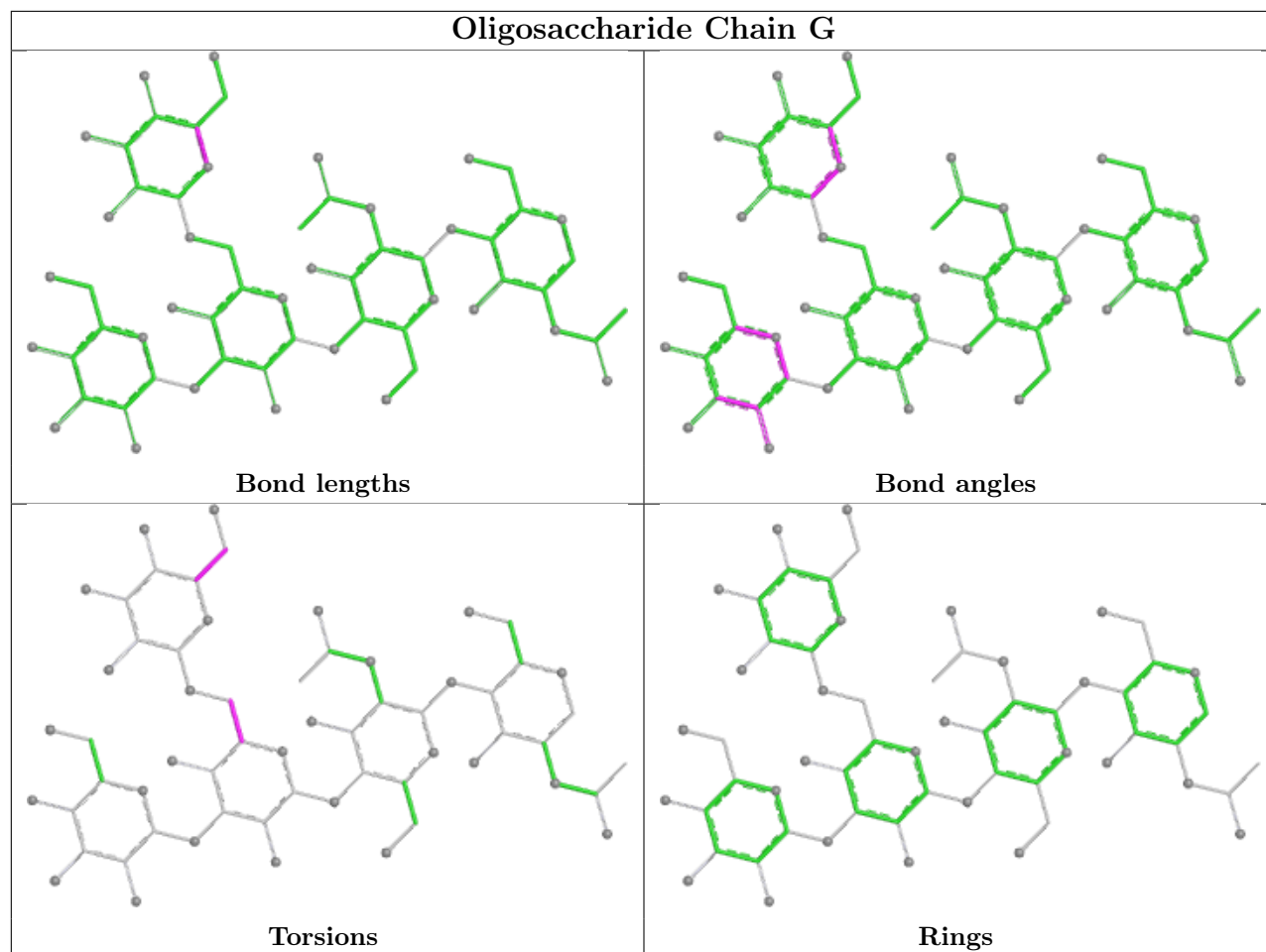
All (17) torsion outliers are listed below:

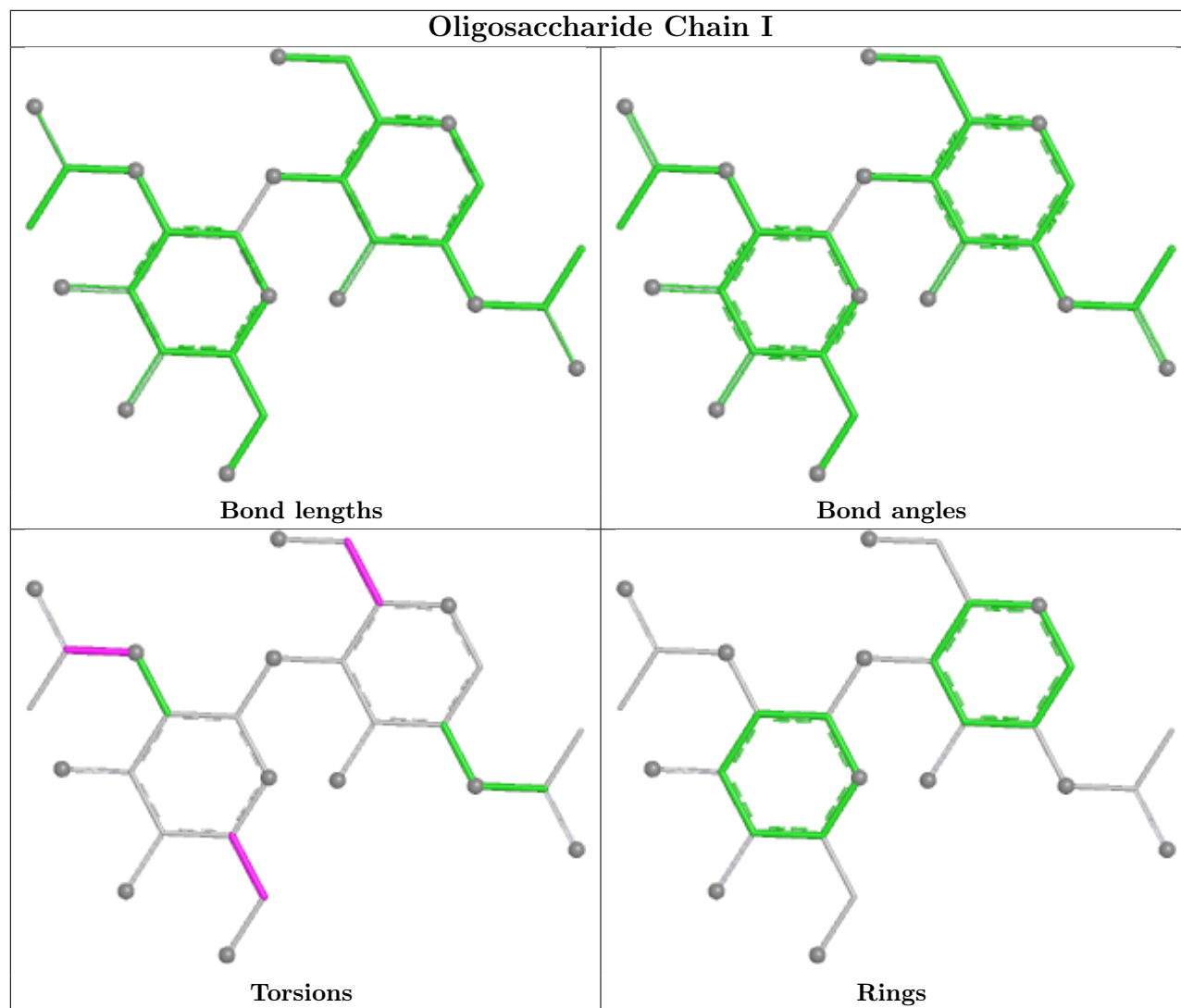
Mol	Chain	Res	Type	Atoms
5	G	3	BMA	O5-C5-C6-O6
5	G	3	BMA	C4-C5-C6-O6
7	J	3	BMA	O5-C5-C6-O6
6	K	1	NAG	O5-C5-C6-O6
7	J	3	BMA	C4-C5-C6-O6
6	K	2	NAG	O5-C5-C6-O6
6	I	2	NAG	C8-C7-N2-C2
6	I	2	NAG	O7-C7-N2-C2
6	K	2	NAG	C8-C7-N2-C2
6	K	2	NAG	O7-C7-N2-C2
6	K	1	NAG	C4-C5-C6-O6
6	K	2	NAG	C4-C5-C6-O6
7	J	4	MAN	O5-C5-C6-O6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

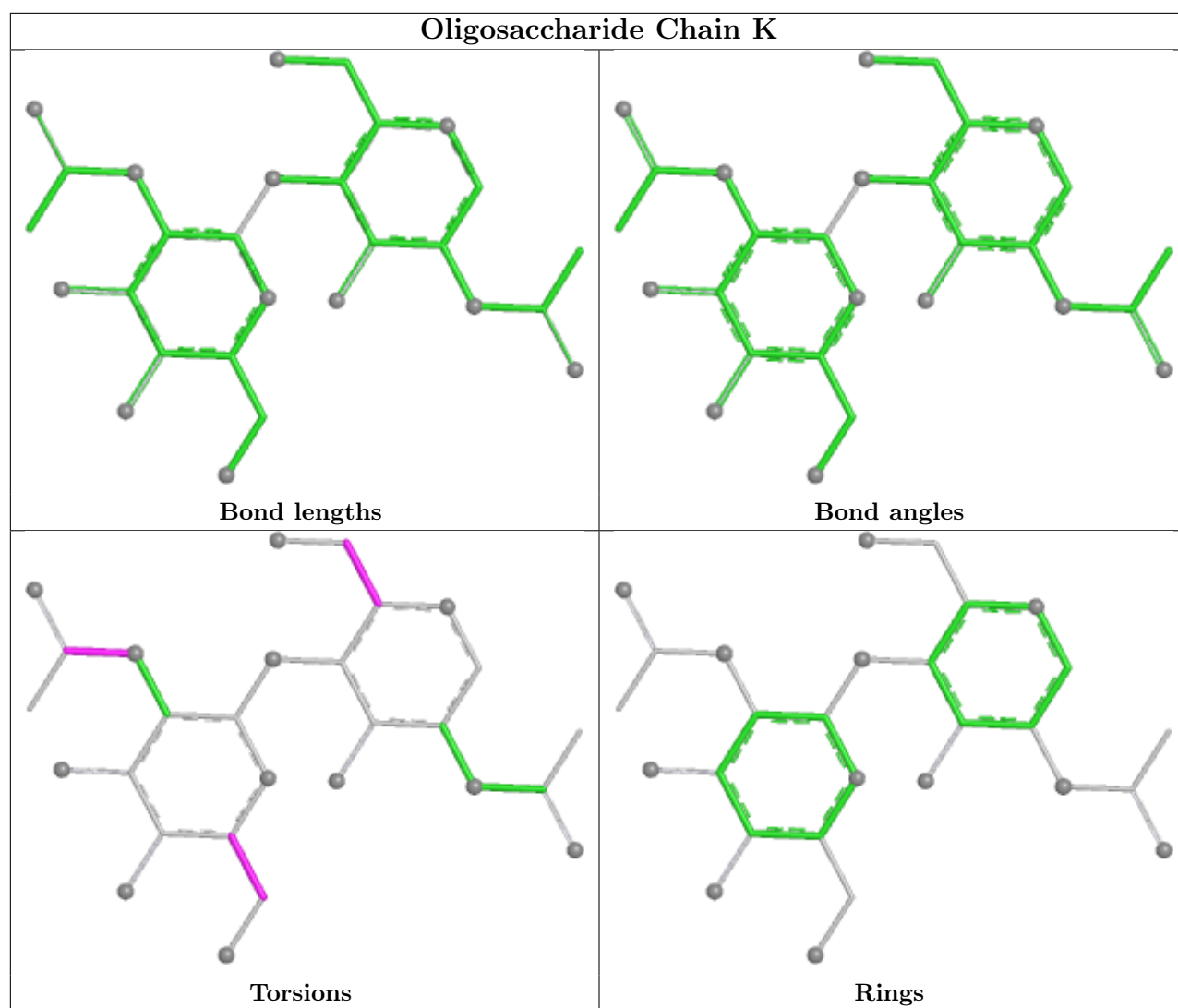
There are no ring outliers.

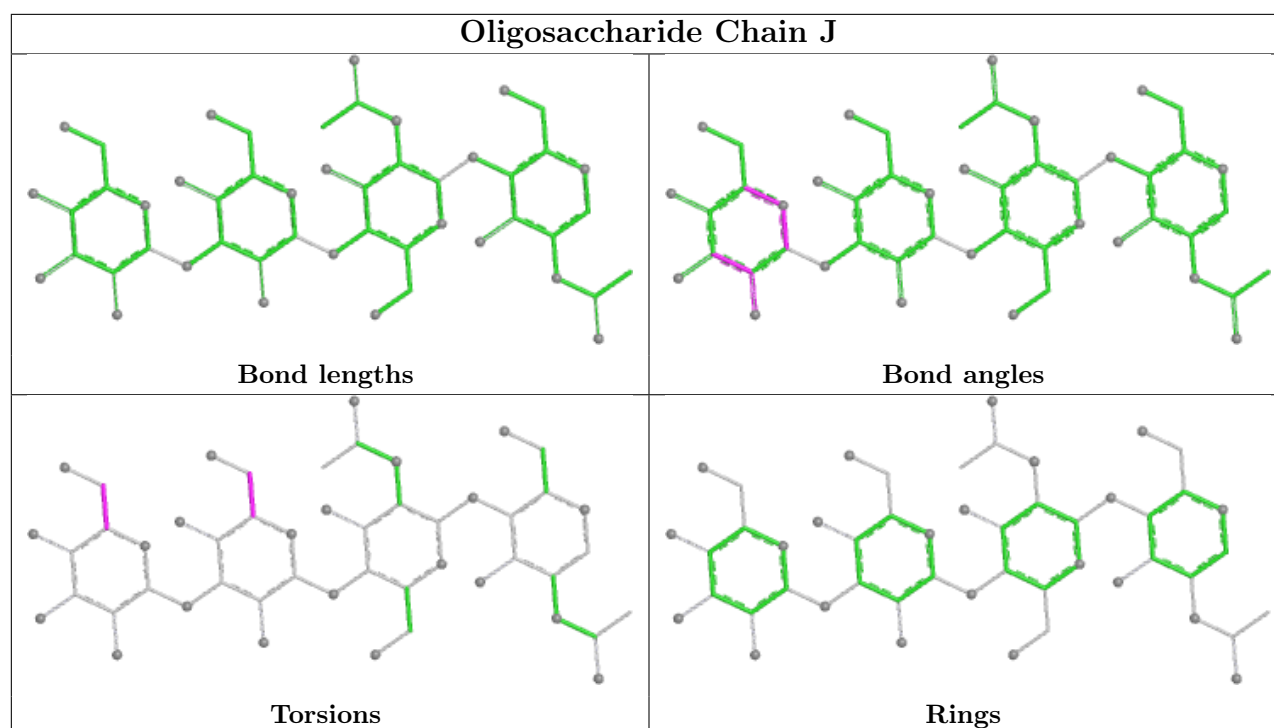
No monomer is involved in short contacts.

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









5.6 Ligand geometry [i](#)

Of 29 ligands modelled in this entry, 16 are monoatomic - leaving 13 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	$\# Z > 2$
8	SO4	L	301	-	4,4,4	0.24	0	6,6,6	0.09	0
8	SO4	C	509	-	4,4,4	0.22	0	6,6,6	0.10	0
11	NAG	B	2004	2	14,14,15	0.33	0	17,19,21	0.70	1 (5%)
8	SO4	A	501	-	4,4,4	0.25	0	6,6,6	0.07	0
8	SO4	A	508	-	4,4,4	0.24	0	6,6,6	0.07	0
8	SO4	C	503	-	4,4,4	0.24	0	6,6,6	0.07	0
8	SO4	C	501	-	4,4,4	0.23	0	6,6,6	0.08	0
12	I7R	D	2006	10	34,34,34	1.09	2 (5%)	44,47,47	0.96	1 (2%)
12	I7R	B	2005	10	34,34,34	1.10	2 (5%)	44,47,47	1.05	2 (4%)
8	SO4	C	502	-	4,4,4	0.24	0	6,6,6	0.09	0
11	NAG	D	2004	2	14,14,15	0.35	0	17,19,21	0.60	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
8	SO4	A	502	-	4,4,4	0.24	0	6,6,6	0.08	0
8	SO4	A	507	-	4,4,4	0.24	0	6,6,6	0.10	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
12	I7R	B	2005	10	-	4/18/49/49	0/4/4/4
12	I7R	D	2006	10	-	4/18/49/49	0/4/4/4
11	NAG	D	2004	2	-	2/6/23/26	0/1/1/1
11	NAG	B	2004	2	-	2/6/23/26	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
12	B	2005	I7R	C6-N3	2.83	1.34	1.27
12	D	2006	I7R	C6-N3	2.82	1.34	1.27
12	D	2006	I7R	O1-C14	-2.50	1.43	1.46
12	B	2005	I7R	O1-C14	-2.44	1.43	1.46

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
11	B	2004	NAG	C1-O5-C5	2.45	115.47	112.19
12	D	2006	I7R	C14-C15-C13	2.23	102.81	100.82
12	B	2005	I7R	C10-C13-N4	2.20	125.55	120.74
12	B	2005	I7R	C14-C15-C13	2.04	102.64	100.82
11	D	2004	NAG	C1-O5-C5	2.01	114.88	112.19

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
12	B	2005	I7R	C15-C14-C16-N5
12	B	2005	I7R	O1-C14-C16-N5
12	D	2006	I7R	O1-C14-C16-N5
11	B	2004	NAG	O5-C5-C6-O6
11	B	2004	NAG	C4-C5-C6-O6

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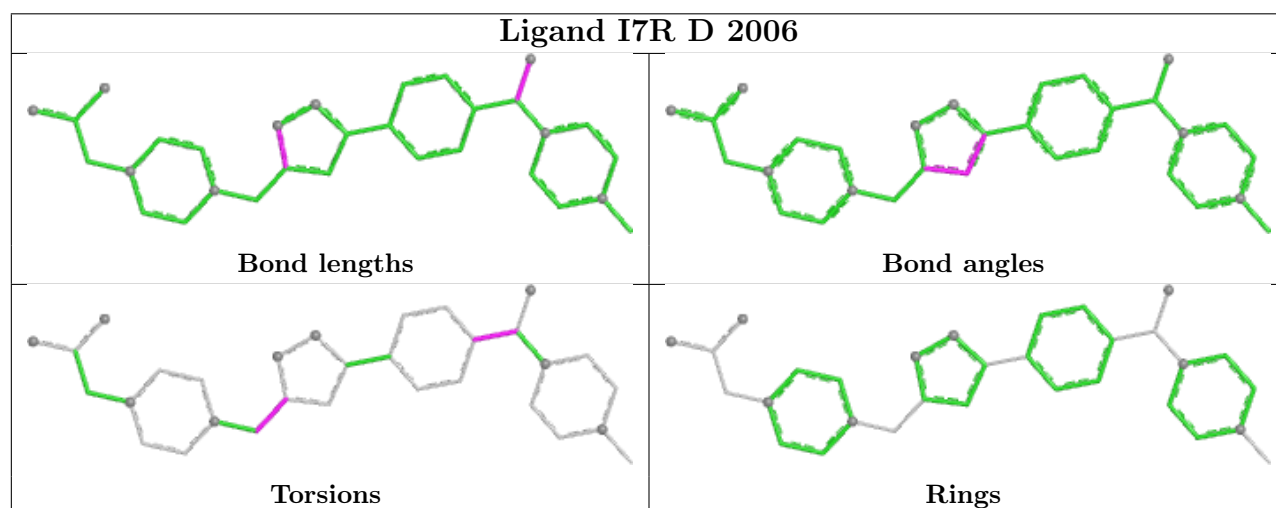
Mol	Chain	Res	Type	Atoms
11	D	2004	NAG	O5-C5-C6-O6
11	D	2004	NAG	C4-C5-C6-O6
12	B	2005	I7R	N3-C6-C7-C12
12	B	2005	I7R	N3-C6-C7-C8
12	D	2006	I7R	N3-C6-C7-C12
12	D	2006	I7R	N3-C6-C7-C8
12	D	2006	I7R	C15-C14-C16-N5

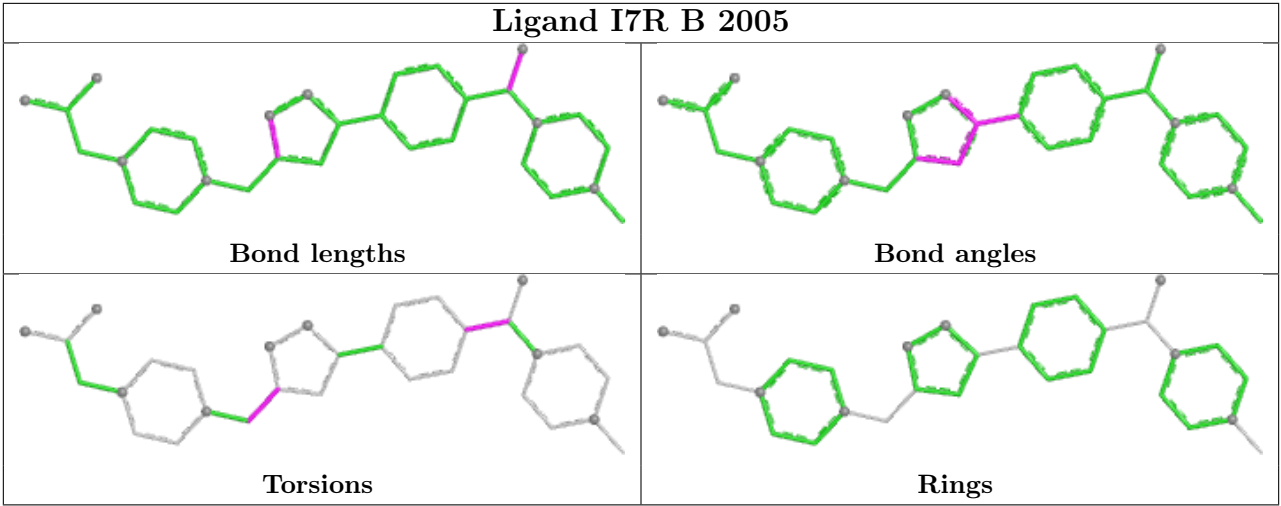
There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
12	D	2006	I7R	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

The following chains have linkage breaks:

Mol	Chain	Number of breaks
3	H	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	H	134:CYS	C	138:THR	N	6.94

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	454/454 (100%)	-0.28	1 (0%) 91 90	24, 43, 61, 76	4 (0%)
1	C	453/454 (99%)	0.06	3 (0%) 84 83	26, 64, 89, 111	4 (0%)
2	B	466/471 (98%)	0.17	10 (2%) 63 61	21, 66, 142, 157	5 (1%)
2	D	471/471 (100%)	0.43	10 (2%) 63 61	46, 82, 117, 132	1 (0%)
3	E	214/216 (99%)	1.18	38 (17%) 4 3	82, 127, 191, 194	0
3	H	216/216 (100%)	0.47	6 (2%) 55 51	54, 90, 138, 144	0
4	F	214/214 (100%)	0.81	15 (7%) 22 19	85, 131, 189, 194	0
4	L	214/214 (100%)	0.30	2 (0%) 81 80	59, 91, 111, 130	0
All	All	2702/2710 (99%)	0.29	85 (3%) 51 48	21, 76, 163, 194	14 (0%)

All (85) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	454	VAL	5.2
3	E	129	PRO	3.9
3	E	145	GLY	3.8
3	E	147	LEU	3.7
4	F	160	LEU	3.6
3	E	144	LEU	3.5
2	D	375	LEU	3.4
3	E	212	VAL	3.4
2	D	181	LYS	3.3
2	D	178	TYR	3.2
4	F	132	VAL	3.1
3	E	203	VAL	3.1
3	E	204	ALA	3.0
3	E	199	ILE	2.9
4	F	134	CYS	2.9
4	F	135	PHE	2.9

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Mol	Chain	Res	Type	RSRZ
4	F	133	VAL	2.9
2	D	471	CYS	2.8
4	F	178	THR	2.8
3	E	132	PRO	2.8
2	B	77	SER	2.8
3	E	54	ALA	2.8
3	E	127	VAL	2.8
3	E	201	CYS	2.8
3	E	148	VAL	2.8
3	E	130	LEU	2.8
3	E	133	VAL	2.7
4	F	115	VAL	2.7
2	B	10	VAL	2.7
4	F	196	ALA	2.7
4	F	180	THR	2.7
3	E	195	PRO	2.7
3	E	176	LEU	2.6
1	C	278[A]	HIS	2.6
3	E	128	TYR	2.6
2	B	375	LEU	2.6
4	F	181	LEU	2.6
2	B	129	TRP	2.5
4	F	118	PHE	2.5
3	E	194	TRP	2.5
2	B	33	LEU	2.5
2	D	129	TRP	2.5
3	E	187	VAL	2.5
1	C	340	LEU	2.4
3	E	165	LEU	2.4
3	E	216	ILE	2.4
3	E	168	GLY	2.4
4	F	125	LEU	2.4
3	E	158	LEU	2.4
1	C	453	VAL	2.4
4	L	135	PHE	2.4
3	E	200	THR	2.4
3	H	138	THR	2.4
2	D	466	TRP	2.4
3	E	155	PRO	2.3
3	E	167	SER	2.3
2	B	466	TRP	2.3
2	D	33	LEU	2.3

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Mol	Chain	Res	Type	RSRZ
3	E	171	THR	2.3
2	B	11	SER	2.3
3	E	146	CYS	2.3
3	H	189	VAL	2.3
2	B	4	ILE	2.2
4	F	117	ILE	2.2
3	E	217	GLU	2.2
4	F	193	THR	2.2
3	H	130	LEU	2.2
3	E	182	THR	2.2
3	E	160	TRP	2.2
3	H	217	GLU	2.2
2	B	2	PRO	2.2
4	L	145	ASN	2.2
3	E	149	LYS	2.2
3	H	142	VAL	2.1
4	F	169	LYS	2.1
2	D	45	LEU	2.1
2	D	468	GLY	2.1
3	E	189	VAL	2.1
2	D	469	SER	2.1
2	B	178	TYR	2.1
3	E	131	ALA	2.1
3	E	11	LEU	2.1
3	E	184	SER	2.0
3	E	183	LEU	2.0
3	H	133	VAL	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($\text{\AA}^2$)	Q<0.9
5	NAG	G	1	14/15	-	-	51,51,51,51	0

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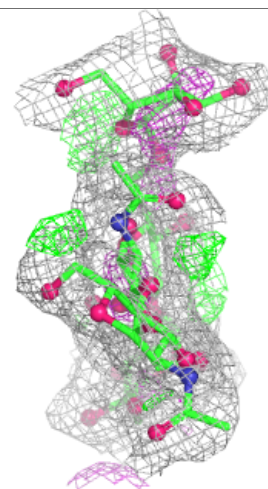
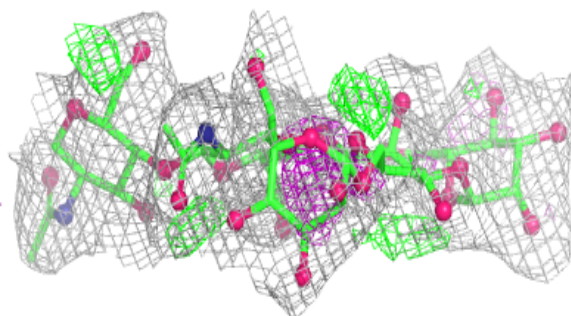
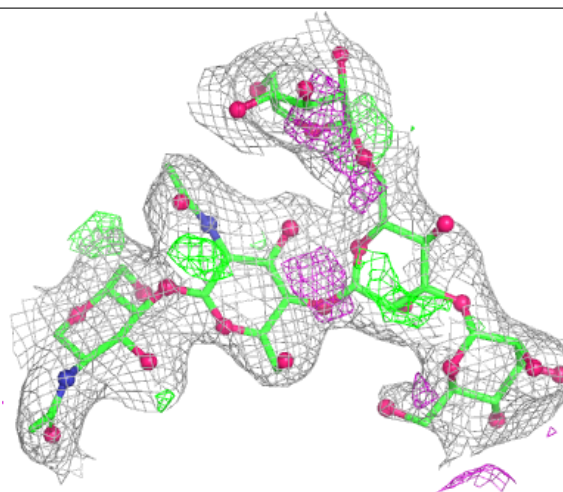
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
5	NAG	G	2	14/15	-	-	64,64,64,64	0
5	BMA	G	3	11/12	-	-	75,75,75,75	0
5	MAN	G	4	11/12	-	-	73,73,73,73	0
5	MAN	G	5	11/12	-	-	79,79,79,79	0
7	NAG	J	2	14/15	0.62	0.13	85,85,85,85	0
6	NAG	K	2	14/15	0.80	0.12	107,107,107,107	0
6	NAG	I	2	14/15	0.81	0.11	105,105,105,105	0
7	NAG	J	1	14/15	0.85	0.09	74,74,74,74	0
6	NAG	K	1	14/15	0.87	0.12	103,103,103,103	0
6	NAG	I	1	14/15	0.92	0.09	99,99,99,99	0
7	BMA	J	3	11/12	-	-	94,94,94,94	0
7	MAN	J	4	11/12	-	-	95,95,95,95	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.

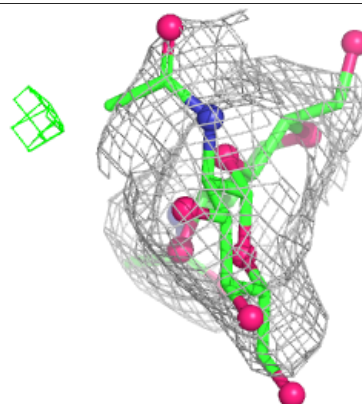
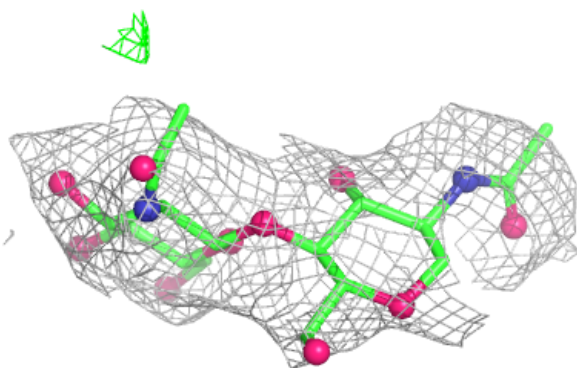
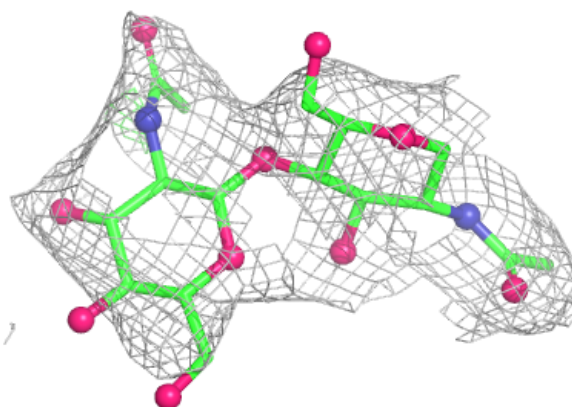
Electron density around Chain G:

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

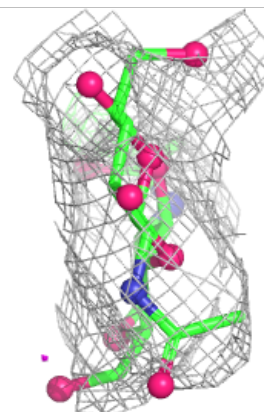
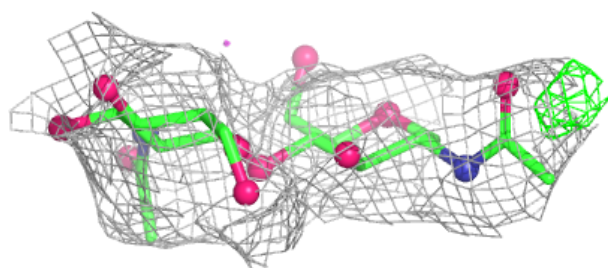
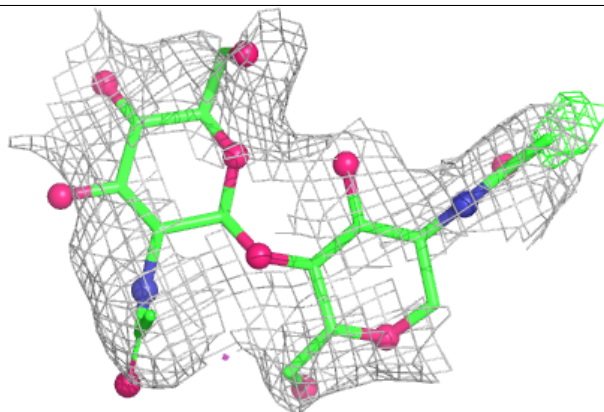


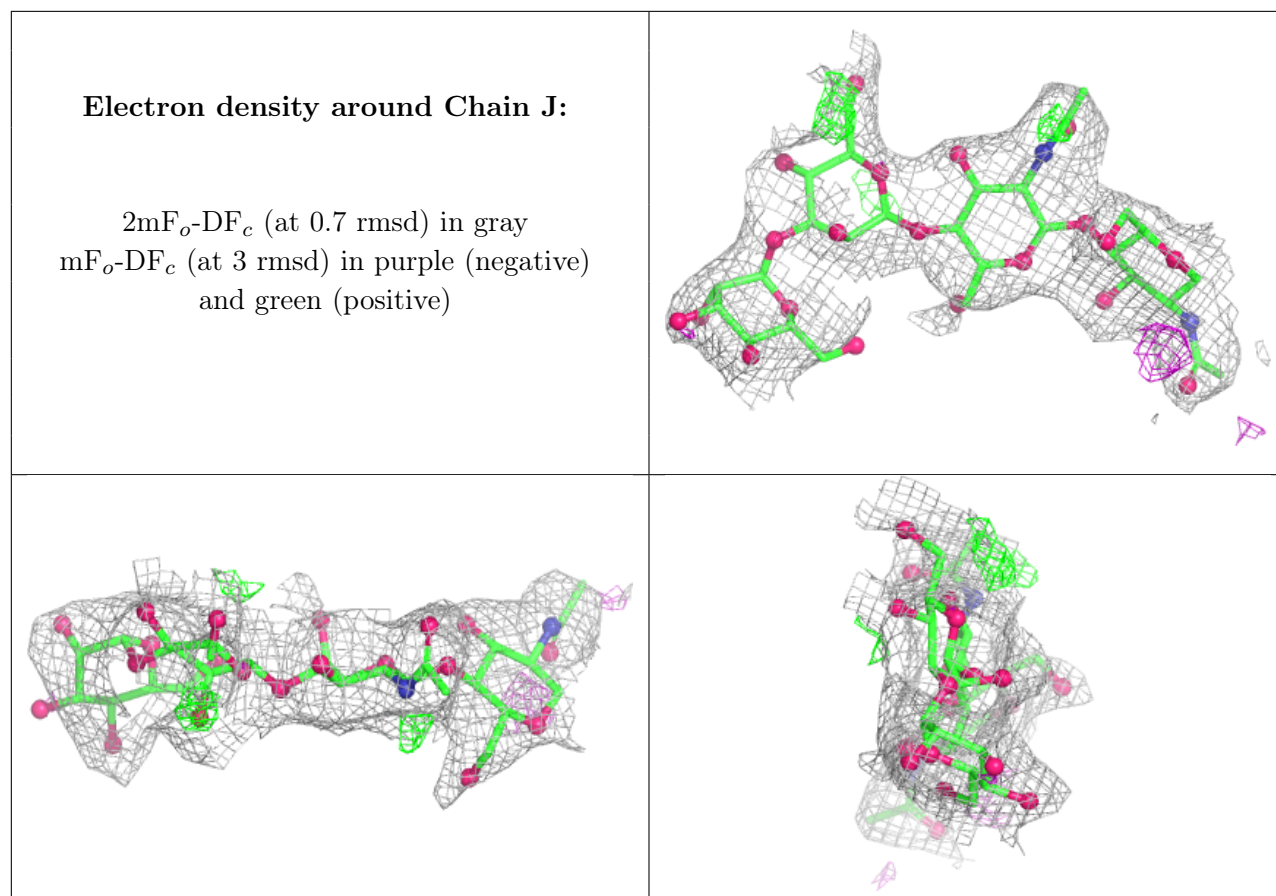
Electron density around Chain I:

$2mF_o-DF_c$ (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)





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.

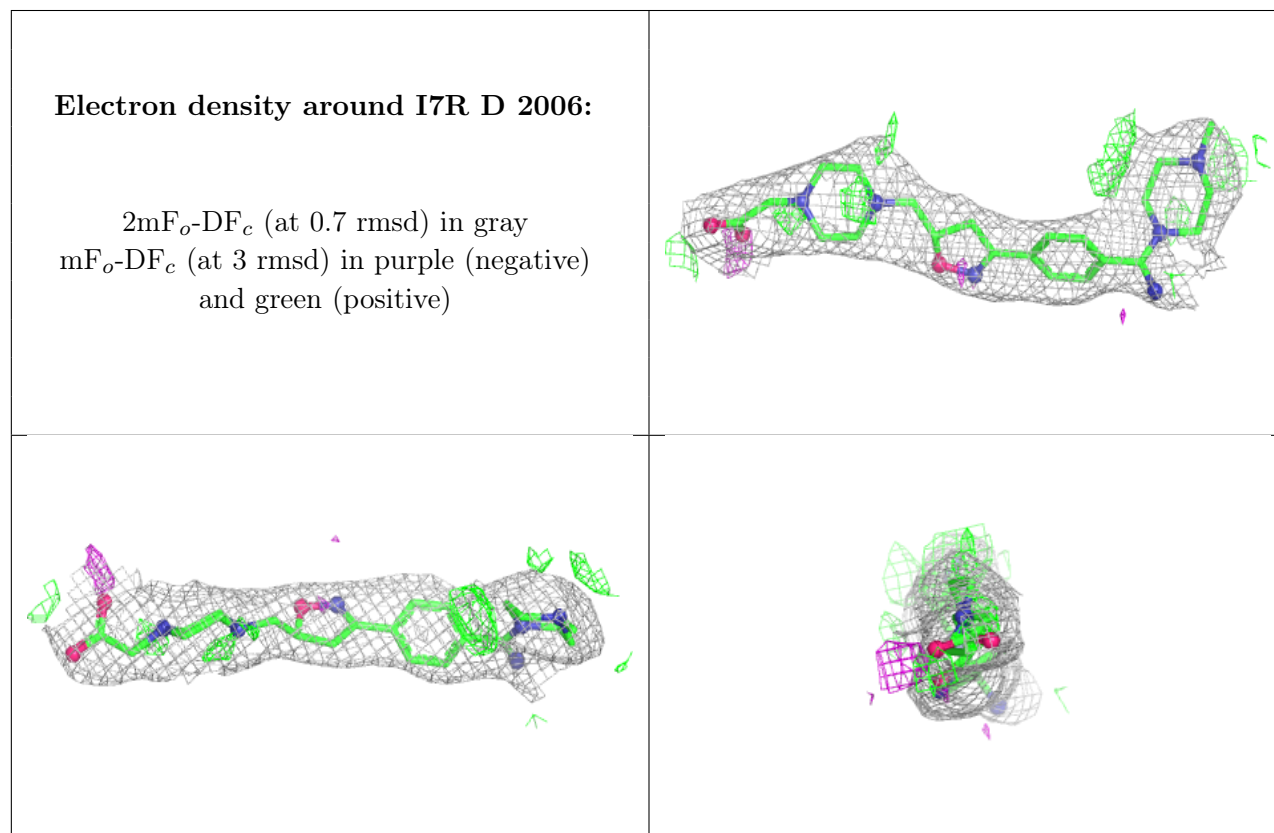
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
11	NAG	D	2004	14/15	0.63	0.15	96,96,96,96	0
11	NAG	B	2004	14/15	0.70	0.13	102,102,102,102	0
8	SO4	C	502	5/5	0.71	0.19	84,84,84,84	0
8	SO4	C	503	5/5	0.79	0.18	94,94,94,94	0
8	SO4	A	507	5/5	0.80	0.29	70,70,70,70	0
8	SO4	C	509	5/5	0.80	0.15	92,92,92,92	0
8	SO4	C	501	5/5	0.84	0.24	76,76,76,76	0
8	SO4	A	508	5/5	0.84	0.20	68,68,68,68	0
13	CL	D	2005	1/1	0.86	0.14	89,89,89,89	0
12	I7R	D	2006	31/31	0.88	0.14	69,69,69,69	0
8	SO4	A	502	5/5	0.90	0.09	56,56,56,56	0
12	I7R	B	2005	31/31	0.90	0.11	46,46,46,46	0
8	SO4	L	301	5/5	0.90	0.14	77,77,77,77	0

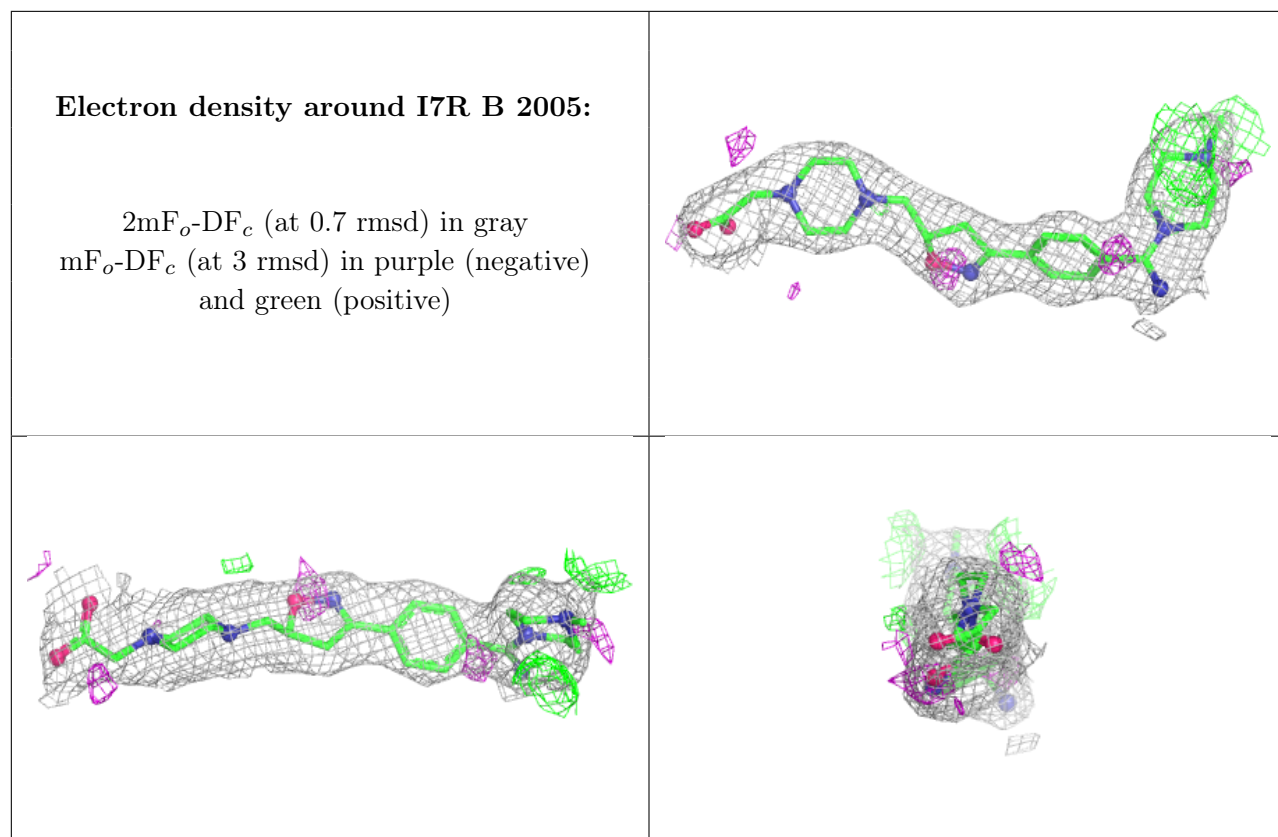
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
8	SO4	A	501	5/5	0.90	0.21	56,56,56,56	0
9	CA	C	505	1/1	0.93	0.08	94,94,94,94	0
9	CA	C	506	1/1	0.95	0.06	75,75,75,75	0
9	CA	C	507	1/1	0.96	0.05	66,66,66,66	0
13	CL	C	504	1/1	0.96	0.09	68,68,68,68	0
9	CA	A	503	1/1	0.96	0.04	48,48,48,48	0
10	MN	D	2001	1/1	0.97	0.07	64,64,64,64	0
10	MN	D	2002	1/1	0.97	0.08	73,73,73,73	0
9	CA	A	504	1/1	0.97	0.04	40,40,40,40	0
10	MN	B	2002	1/1	0.97	0.20	64,64,64,64	0
9	CA	A	505	1/1	0.98	0.04	38,38,38,38	0
10	MN	D	2003	1/1	0.98	0.08	62,62,62,62	0
10	MN	B	2001	1/1	0.99	0.03	35,35,35,35	0
9	CA	A	506	1/1	0.99	0.03	38,38,38,38	0
10	MN	B	2003	1/1	0.99	0.10	42,42,42,42	0
9	CA	C	508	1/1	0.99	0.03	59,59,59,59	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.





6.5 Other polymers [i](#)

There are no such residues in this entry.