



# Full wwPDB X-ray Structure Validation Report ⓘ

May 27, 2024 – 10:10 PM JST

PDB ID : 8X0Y  
Title : Crystal structure of JM-1A in complex with SARS-CoV-2 RBD  
Authors : Mohapatra, A.; Chen, X.  
Deposited on : 2023-11-06  
Resolution : 1.94 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](mailto: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>.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : 1.13  
EDS : 2.36.2  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36.2

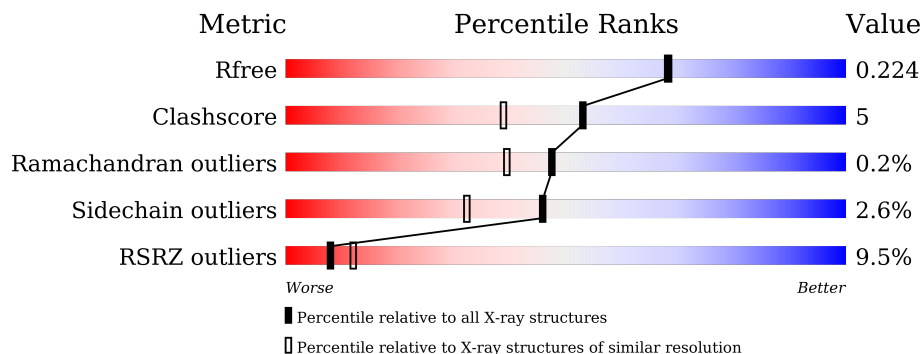
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

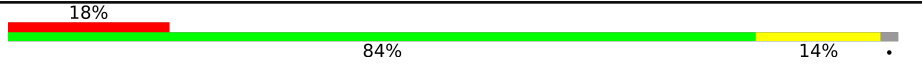


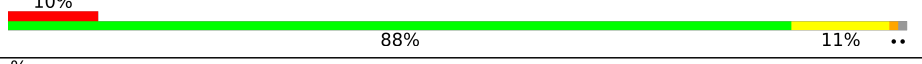
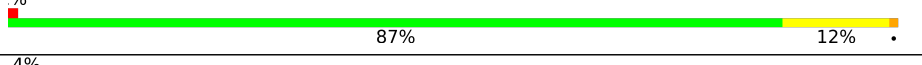
The reported resolution of this entry is 1.94 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	4310 (1.96-1.92)
Clashscore	141614	1023 (1.94-1.94)
Ramachandran outliers	138981	1007 (1.94-1.94)
Sidechain outliers	138945	1007 (1.94-1.94)
RSRZ outliers	127900	4250 (1.96-1.92)

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  $\geq 3$ , 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	196	
1	B	196	
2	E	219	
2	G	219	
3	F	212	
3	I	212	

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Mol	Chain	Length	Quality of chain
4	C	3	 33% 67%
4	D	3	 100%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	FUC	C	3	-	-	-	X
4	NAG	D	2	-	-	-	X
4	FUC	D	3	-	-	-	X

## 2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 10627 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 Spike protein S1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	B	195	Total 1532	C 980	N 255	O 289	S 8	0	0	0
1	A	192	Total 1497	C 958	N 250	O 281	S 8	0	0	0

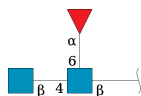
- Molecule 2 is a protein called Heavy chain of JM-1A Fab.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	E	219	Total 1620	C 1022	N 274	O 317	S 7	0	0	0
2	G	217	Total 1608	C 1016	N 272	O 314	S 6	0	0	0

- Molecule 3 is a protein called Light chain of JM-1A Fab.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	F	212	Total 1623	C 1019	N 270	O 330	S 4	0	0	0
3	I	212	Total 1623	C 1019	N 270	O 330	S 4	0	0	0

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
4	C	3	Total 38	C 22	N 2	O 14	0	0	0

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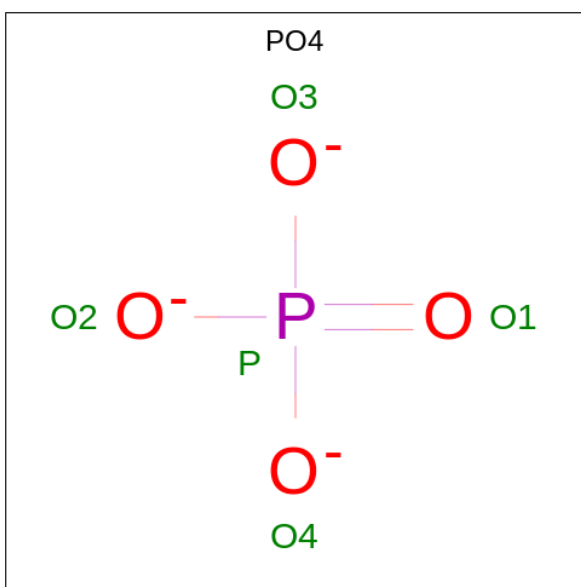
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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
4	D	3	38	22	2	14	0	0	0

- Molecule 5 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

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

- Molecule 6 is PHOSPHATE ION (three-letter code: PO4) (formula: O<sub>4</sub>P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	F	1	Total	O	P	5	0
			5	4	1		

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	B	189	Total	O	0	0
			189	189		
7	E	162	Total	O	0	0
			162	162		
7	F	187	Total	O	0	0
			187	187		
7	A	136	Total	O	0	0
			136	136		

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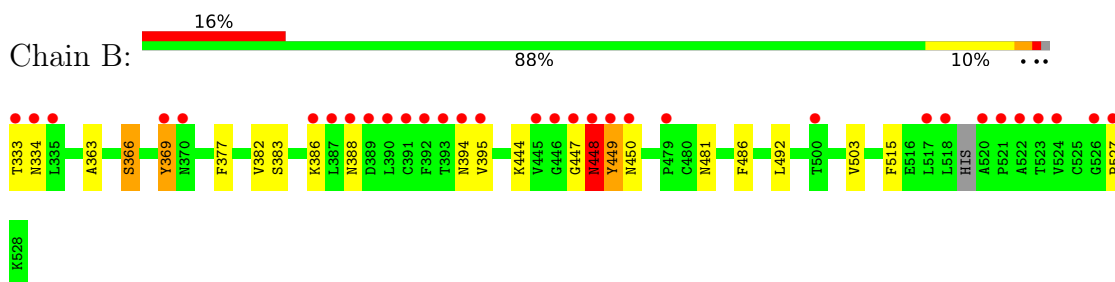
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<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
7	G	191	Total	O	0	0
			191	191		
7	I	177	Total	O	0	0
			177	177		

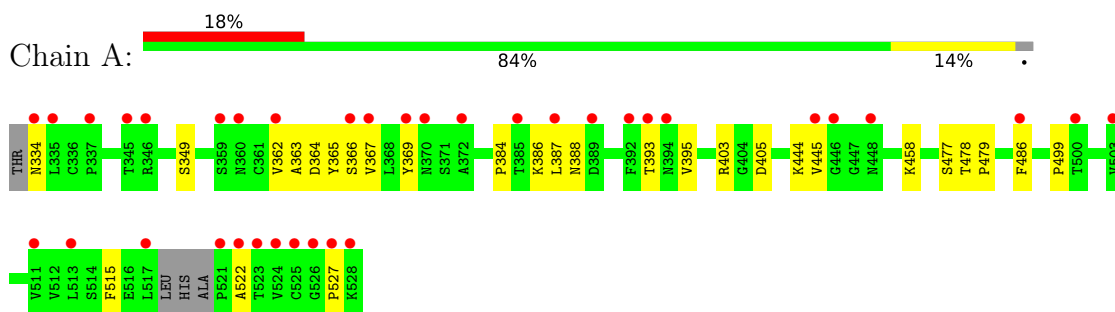
### 3 Residue-property plots [i](#)

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.

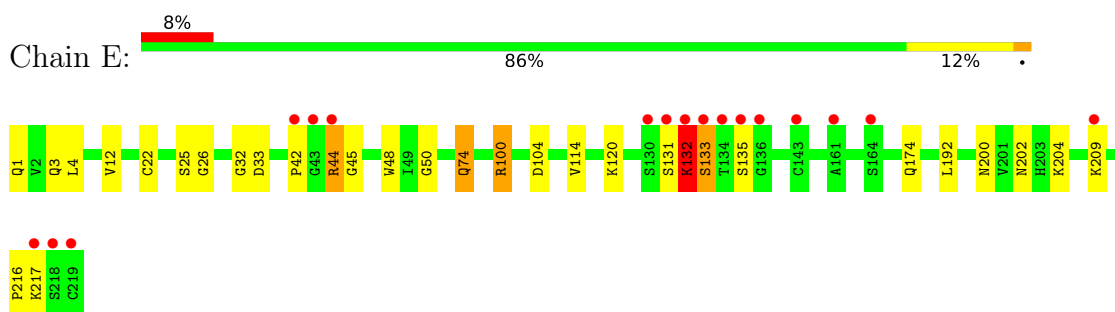
- Molecule 1: Spike protein S1



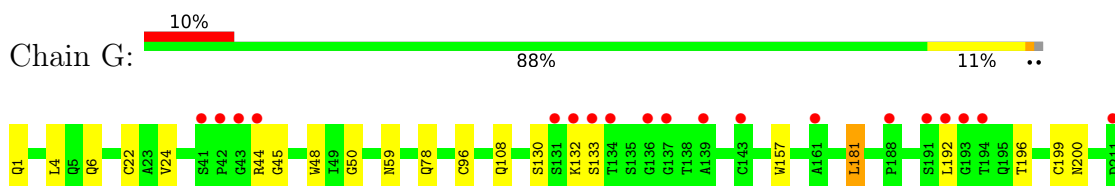
- Molecule 1: Spike protein S1

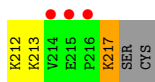


- Molecule 2: Heavy chain of JM-1A Fab

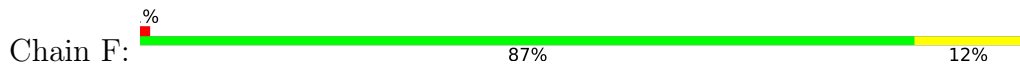


- Molecule 2: Heavy chain of JM-1A Fab

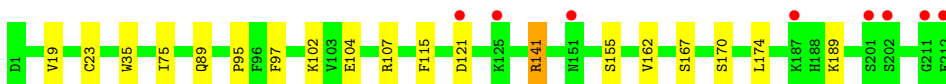
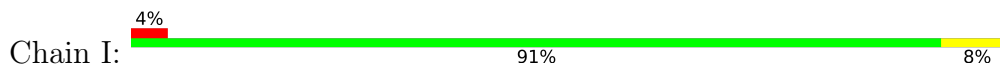




- Molecule 3: Light chain of JM-1A Fab



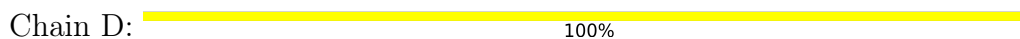
- Molecule 3: Light chain of JM-1A Fab



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



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





## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	148.36Å 107.03Å 87.34Å 90.00° 100.75° 90.00°	Depositor
Resolution (Å)	19.92 – 1.94 19.92 – 1.94	Depositor EDS
% Data completeness (in resolution range)	100.0 (19.92-1.94) 100.0 (19.92-1.94)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.51 (at 1.94Å)	Xtrriage
Refinement program	PHENIX (1.19.2_4158: ???)	Depositor
R, $R_{free}$	0.194 , 0.223 0.194 , 0.224	Depositor DCC
$R_{free}$ test set	4955 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	24.5	Xtrriage
Anisotropy	0.464	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 49.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	10627	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	35.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.10% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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, CL, NAG, PCA, PO4

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	0.41	0/1538	0.64	1/2093 (0.0%)
1	B	0.47	0/1574	0.65	1/2142 (0.0%)
2	E	0.42	0/1655	0.67	1/2262 (0.0%)
2	G	0.43	0/1643	0.66	2/2246 (0.1%)
3	F	0.44	0/1659	0.66	0/2254
3	I	0.42	0/1659	0.63	0/2254
All	All	0.43	0/9728	0.65	5/13251 (0.0%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	G	181	LEU	CA-CB-CG	6.45	130.12	115.30
2	E	104	ASP	CB-CG-OD1	5.17	122.96	118.30
1	B	369	TYR	CA-CB-CG	5.16	123.20	113.40
1	A	477	SER	C-N-CA	-5.07	109.03	121.70
2	G	181	LEU	CB-CG-CD1	-5.03	102.45	111.00

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	1497	0	1396	19	1
1	B	1532	0	1435	19	0
2	E	1620	0	1594	17	0
2	G	1608	0	1584	16	1
3	F	1623	0	1578	24	1
3	I	1623	0	1578	16	1
4	C	38	0	34	0	0
4	D	38	0	34	0	0
5	B	1	0	0	1	0
6	F	5	0	0	0	0
7	A	136	0	0	2	1
7	B	189	0	0	4	1
7	E	162	0	0	3	0
7	F	187	0	0	8	2
7	G	191	0	0	3	0
7	I	177	0	0	5	1
All	All	10627	0	9233	101	5

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 5.

All (101) 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)
5:B:601:CL:CL	7:B:882:HOH:O	2.10	1.04
2:G:78:GLN:OE1	7:G:301:HOH:O	1.92	0.88
2:G:108:GLN:NE2	7:G:302:HOH:O	2.16	0.77
1:A:366:SER:HA	1:A:369:TYR:CD2	2.19	0.76
1:B:486:PHE:O	7:B:701:HOH:O	2.07	0.73
2:E:32:GLY:O	2:E:100:ARG:HD2	1.90	0.72
3:F:123:GLN:OE1	7:F:402:HOH:O	2.07	0.72
3:F:122:GLU:HA	3:F:125:LYS:HE3	1.75	0.69
1:B:382:VAL:HG23	1:B:386:LYS:HE2	1.76	0.67
1:B:447:GLY:HA3	2:E:26:GLY:HA2	1.80	0.64
1:B:377:PHE:HB3	1:A:384:PRO:HD2	1.80	0.63
1:B:492:LEU:O	2:E:100:ARG:NH2	2.30	0.63
3:F:141:ARG:NH2	7:F:403:HOH:O	2.32	0.62
2:E:42:PRO:O	2:E:44:ARG:NH2	2.25	0.61
3:F:13:VAL:HG23	3:F:78:LEU:HD22	1.81	0.61
2:E:131:SER:C	2:E:133:SER:H	2.06	0.59
2:E:45:GLY:HA2	7:E:424:HOH:O	2.02	0.58
2:E:3:GLN:HB2	2:E:25:SER:OG	2.03	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:74:GLN:HG2	7:E:421:HOH:O	2.02	0.58
3:F:141:ARG:HD2	3:F:162:VAL:HG11	1.86	0.56
1:B:383:SER:H	1:B:386:LYS:HD3	1.69	0.56
2:G:59:ASN:OD1	7:G:303:HOH:O	2.18	0.56
1:B:363:ALA:O	1:B:527:PRO:HD3	2.05	0.56
2:G:130:SER:H	2:G:133:SER:HB2	1.72	0.55
1:B:503:VAL:HG23	7:B:845:HOH:O	2.07	0.55
2:E:33:ASP:OD1	2:E:100:ARG:HD3	2.08	0.54
1:A:458:LYS:NZ	7:A:603:HOH:O	2.39	0.54
2:E:4:LEU:HB3	2:E:22:CYS:SG	2.48	0.54
3:I:141:ARG:NH2	7:I:306:HOH:O	2.42	0.53
1:B:366:SER:HA	1:B:369:TYR:CE1	2.44	0.53
1:B:449:TYR:HD1	1:B:450:ASN:H	1.55	0.53
2:G:133:SER:O	3:I:115:PHE:CE2	2.62	0.52
2:G:196:THR:HG23	2:G:213:LYS:HE3	1.92	0.51
1:B:383:SER:HB3	1:B:386:LYS:HD3	1.93	0.51
1:B:481:ASN:HB2	7:B:702:HOH:O	2.09	0.51
2:G:133:SER:O	3:I:115:PHE:CD2	2.63	0.51
1:B:448:ASN:OD1	1:B:448:ASN:N	2.41	0.51
1:A:403:ARG:NH1	1:A:405:ASP:OD2	2.44	0.51
1:A:486:PHE:HE2	3:I:95:PRO:HD3	1.75	0.50
1:B:486:PHE:HE2	3:F:95:PRO:HD3	1.75	0.50
3:I:162:VAL:HG21	7:I:440:HOH:O	2.12	0.50
1:A:369:TYR:HE1	1:A:384:PRO:O	1.95	0.50
1:A:369:TYR:CE1	1:A:384:PRO:O	2.65	0.49
1:A:349:SER:HA	7:A:661:HOH:O	2.13	0.48
1:A:395:VAL:HG22	1:A:515:PHE:HD1	1.78	0.48
1:A:444:LYS:O	1:A:499:PRO:HD3	2.14	0.48
3:F:162:VAL:HG22	3:F:174:LEU:HD12	1.95	0.48
2:E:132:LYS:HZ3	2:E:216:PRO:HB2	1.79	0.48
2:E:174:GLN:HA	3:F:159:GLN:OE1	2.13	0.48
3:I:162:VAL:HG22	3:I:174:LEU:HD12	1.94	0.48
3:F:80:PRO:HA	3:F:105:ILE:CD1	2.43	0.47
3:F:209:ASN:HB3	3:F:212:GLU:HG3	1.96	0.47
1:A:334:ASN:O	1:A:362:VAL:HG12	2.15	0.47
3:F:121:ASP:O	3:F:125:LYS:HG3	2.15	0.47
3:I:167:SER:HB3	7:I:449:HOH:O	2.14	0.47
3:F:209:ASN:CB	3:F:212:GLU:HG3	2.44	0.47
1:A:386:LYS:HE3	1:A:386:LYS:HB3	1.67	0.47
2:G:192:LEU:HD23	2:G:192:LEU:HA	1.79	0.47
3:F:118:PRO:HB3	3:F:208:PHE:CE1	2.50	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:G:48:TRP:CZ2	2:G:50:GLY:HA2	2.51	0.46
3:F:105:ILE:HD12	7:F:441:HOH:O	2.15	0.45
1:A:363:ALA:O	1:A:527:PRO:HD3	2.17	0.45
1:A:364:ASP:O	1:A:367:VAL:HG22	2.17	0.45
2:G:4:LEU:HB3	2:G:22:CYS:SG	2.56	0.45
3:F:23:CYS:HB2	3:F:35:TRP:CH2	2.52	0.45
3:F:210:ARG:NH2	7:F:413:HOH:O	2.50	0.45
1:A:393:THR:HA	1:A:522:ALA:HA	1.98	0.45
2:E:192:LEU:HA	2:E:192:LEU:HD23	1.82	0.45
1:B:486:PHE:CE2	3:F:95:PRO:HD3	2.52	0.44
3:I:104:GLU:OE2	7:I:301:HOH:O	2.21	0.44
3:I:107:ARG:HD2	3:I:170:SER:HB2	1.99	0.44
3:F:11:LEU:HD13	3:F:13:VAL:HG13	2.00	0.43
3:F:118:PRO:HB3	3:F:208:PHE:CD1	2.53	0.43
1:B:444:LYS:N	1:B:449:TYR:HE2	2.17	0.43
1:B:369:TYR:OH	1:B:388:ASN:ND2	2.52	0.43
1:B:395:VAL:HG22	1:B:515:PHE:HD1	1.83	0.43
3:I:102:LYS:NZ	7:I:305:HOH:O	2.51	0.43
1:B:444:LYS:HA	1:B:444:LYS:HD3	1.83	0.43
3:F:159:GLN:HG2	7:F:556:HOH:O	2.18	0.43
2:G:217:LYS:NZ	3:I:121:ASP:OD2	2.51	0.43
2:E:12:VAL:O	2:E:114:VAL:HA	2.20	0.42
2:E:202:ASN:OD1	2:E:209:LYS:HG2	2.18	0.42
2:E:48:TRP:CZ2	2:E:50:GLY:HA2	2.55	0.42
2:G:4:LEU:HD22	2:G:24:VAL:HG22	2.01	0.42
3:F:159:GLN:CG	7:F:556:HOH:O	2.68	0.42
2:G:6:GLN:HG2	2:G:96:CYS:SG	2.60	0.41
3:F:27:GLN:HG3	7:F:401:HOH:O	2.20	0.41
3:I:23:CYS:HB2	3:I:35:TRP:CH2	2.56	0.41
3:F:80:PRO:HA	3:F:105:ILE:HD13	2.02	0.41
3:F:24:ARG:NE	7:F:404:HOH:O	2.35	0.41
1:A:388:ASN:HB3	1:A:527:PRO:HD2	2.02	0.41
2:G:44:ARG:HB3	2:G:45:GLY:H	1.46	0.41
3:I:107:ARG:HH11	3:I:107:ARG:HG3	1.86	0.41
2:G:130:SER:O	2:G:133:SER:HB2	2.21	0.41
3:I:19:VAL:HB	3:I:75:ILE:HB	2.03	0.41
1:A:478:THR:HA	1:A:479:PRO:HD3	1.95	0.40
2:G:157:TRP:CH2	2:G:199:CYS:HB3	2.57	0.40
3:I:89:GLN:HB2	3:I:97:PHE:CD1	2.56	0.40
1:A:365:TYR:CD2	1:A:387:LEU:HB3	2.56	0.40
2:E:120:LYS:NZ	7:E:315:HOH:O	2.54	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:486:PHE:CE2	3:I:95:PRO:HD3	2.56	0.40

All (5) 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)
7:F:577:HOH:O	7:A:736:HOH:O[4_446]	2.05	0.15
1:A:334:ASN:OD1	2:G:196:THR:OG1[4_445]	2.11	0.09
7:B:799:HOH:O	7:B:800:HOH:O[2_555]	2.13	0.07
3:F:187:LYS:NZ	3:I:155:SER:O[2_546]	2.17	0.03
7:F:544:HOH:O	7:I:411:HOH:O[2_556]	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	188/196 (96%)	178 (95%)	10 (5%)	0	100	100
1	B	191/196 (97%)	179 (94%)	11 (6%)	1 (0%)	29	17
2	E	217/219 (99%)	212 (98%)	3 (1%)	2 (1%)	17	7
2	G	215/219 (98%)	207 (96%)	8 (4%)	0	100	100
3	F	210/212 (99%)	204 (97%)	6 (3%)	0	100	100
3	I	210/212 (99%)	204 (97%)	6 (3%)	0	100	100
All	All	1231/1254 (98%)	1184 (96%)	44 (4%)	3 (0%)	47	39

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	E	133	SER
1	B	448	ASN
2	E	132	LYS

### 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	160/169 (95%)	159 (99%)	1 (1%)	86	85
1	B	165/169 (98%)	159 (96%)	6 (4%)	35	20
2	E	185/185 (100%)	177 (96%)	8 (4%)	29	14
2	G	183/185 (99%)	178 (97%)	5 (3%)	44	31
3	F	185/185 (100%)	179 (97%)	6 (3%)	39	25
3	I	185/185 (100%)	183 (99%)	2 (1%)	73	67
All	All	1063/1078 (99%)	1035 (97%)	28 (3%)	46	32

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	333	THR
1	B	334	ASN
1	B	366	SER
1	B	394	ASN
1	B	448	ASN
1	B	449	TYR
2	E	44	ARG
2	E	74	GLN
2	E	100	ARG
2	E	132	LYS
2	E	135	SER
2	E	200	ASN
2	E	204	LYS
2	E	217	LYS
3	F	141	ARG
3	F	142	GLU
3	F	153	LEU
3	F	159	GLN
3	F	180	LEU
3	F	189	LYS
1	A	445	VAL
2	G	132	LYS

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Mol	Chain	Res	Type
2	G	181	LEU
2	G	200	ASN
2	G	212	LYS
2	G	217	LYS
3	I	141	ARG
3	I	189	LYS

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

Mol	Chain	Res	Type
2	G	78	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
2	PCA	G	1	2	7,8,9	1.75	1 (14%)	9,10,12	2.17	2 (22%)
2	PCA	E	1	2	7,8,9	1.75	1 (14%)	9,10,12	2.46	4 (44%)

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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	PCA	G	1	2	-	0/0/11/13	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	PCA	E	1	2	-	0/0/11/13	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	1	PCA	CD-N	4.35	1.46	1.34
2	G	1	PCA	CD-N	4.20	1.45	1.34

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	1	PCA	OE-CD-CG	-5.45	117.26	126.76
2	G	1	PCA	OE-CD-CG	-4.73	118.50	126.76
2	E	1	PCA	CA-N-CD	-2.70	104.32	113.58
2	E	1	PCA	CG-CD-N	2.68	115.32	108.39
2	E	1	PCA	CB-CG-CD	-2.35	100.62	104.40
2	G	1	PCA	CA-N-CD	-2.34	105.58	113.58

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 5.5 Carbohydrates [i](#)

6 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
4	NAG	C	1	4,1	14,14,15	0.38	0	17,19,21	0.73	0
4	NAG	C	2	4	14,14,15	0.28	0	17,19,21	0.67	1 (5%)
4	FUC	C	3	4	10,10,11	1.06	0	14,14,16	1.21	1 (7%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	NAG	D	1	4,1	14,14,15	0.68	0	17,19,21	0.98	1 (5%)
4	NAG	D	2	4	14,14,15	0.80	1 (7%)	17,19,21	0.55	0
4	FUC	D	3	4	10,10,11	1.03	0	14,14,16	1.12	2 (14%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NAG	C	1	4,1	-	0/6/23/26	0/1/1/1
4	NAG	C	2	4	-	2/6/23/26	0/1/1/1
4	FUC	C	3	4	-	-	0/1/1/1
4	NAG	D	1	4,1	-	2/6/23/26	0/1/1/1
4	NAG	D	2	4	-	3/6/23/26	0/1/1/1
4	FUC	D	3	4	-	-	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	2	NAG	O5-C1	2.88	1.48	1.43

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	3	FUC	C1-C2-C3	3.42	113.87	109.67
4	D	1	NAG	O4-C4-C3	-2.67	104.18	110.35
4	D	3	FUC	O5-C5-C4	2.64	114.25	109.52
4	C	2	NAG	C1-O5-C5	2.07	114.99	112.19
4	D	3	FUC	O2-C2-C1	2.03	113.30	109.15

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	2	NAG	O5-C5-C6-O6
4	D	1	NAG	O5-C5-C6-O6
4	D	1	NAG	C4-C5-C6-O6
4	C	2	NAG	C4-C5-C6-O6
4	D	2	NAG	C8-C7-N2-C2

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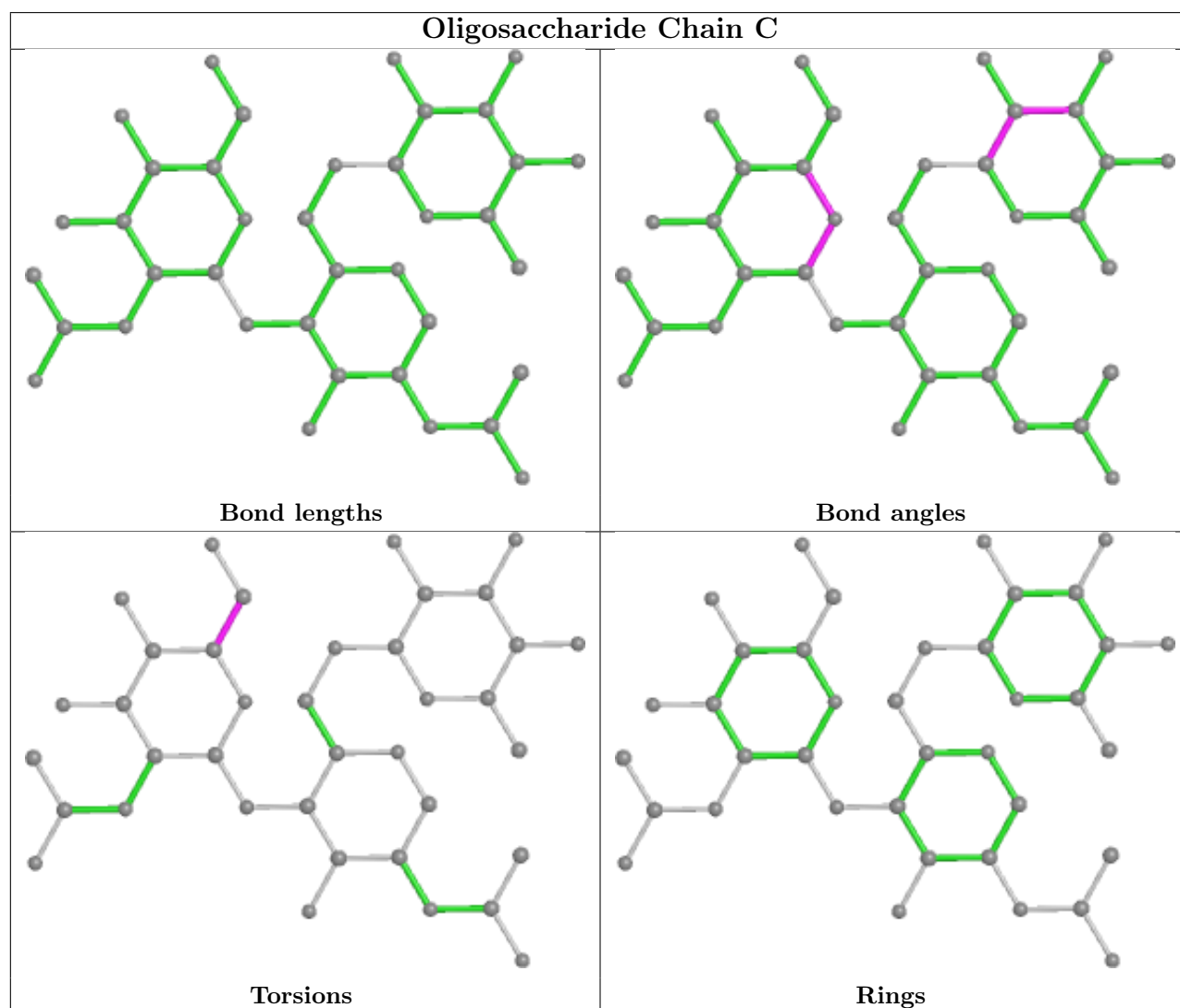
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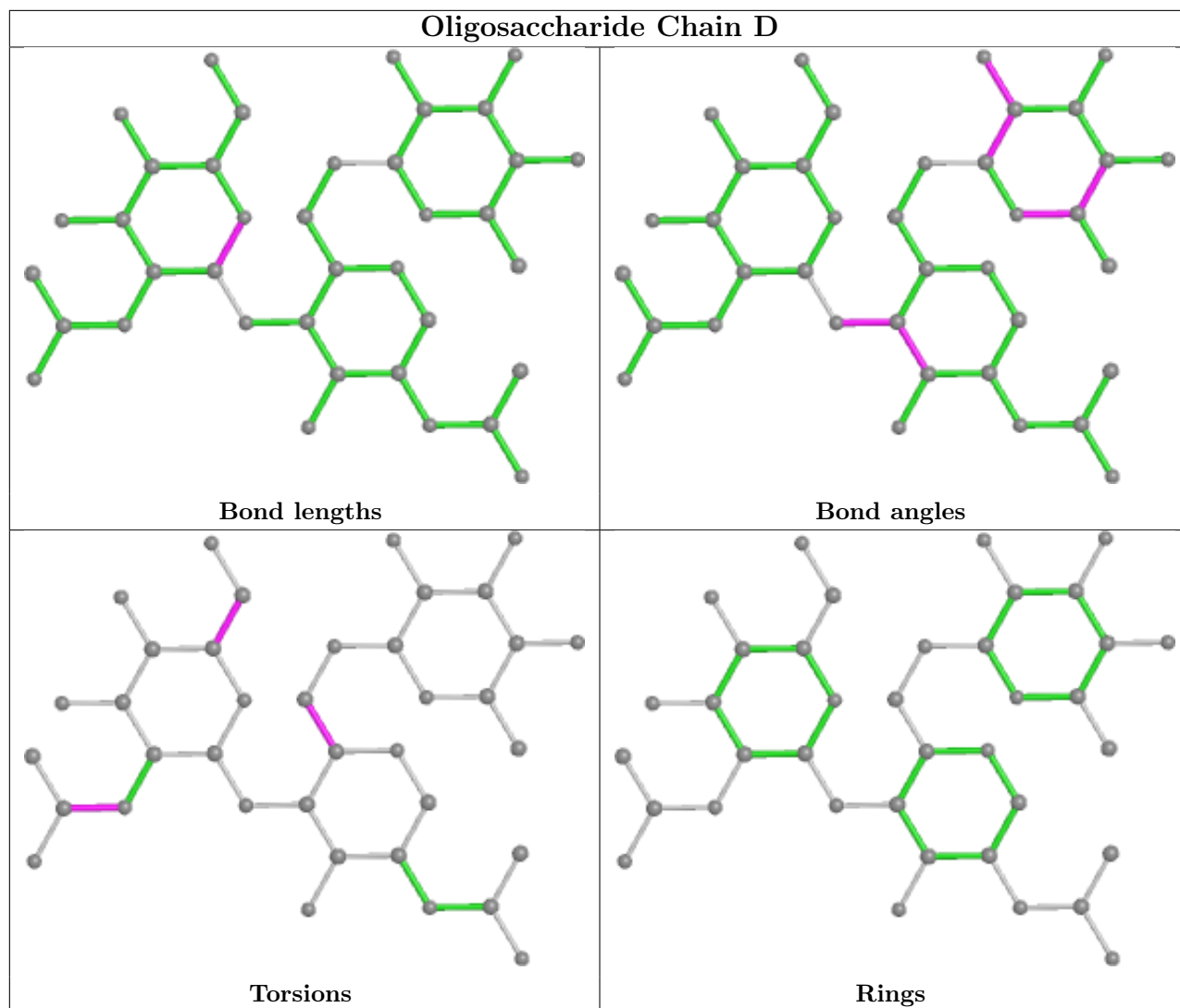
Mol	Chain	Res	Type	Atoms
4	D	2	NAG	O7-C7-N2-C2
4	D	2	NAG	O5-C5-C6-O6

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 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 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	$\# Z  > 2$
6	PO4	F	301	-	4,4,4	0.91	0	6,6,6	0.43	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 5.7 Other polymers

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	192/196 (97%)	0.77	36 (18%) <b>1</b> <b>1</b>	20, 32, 87, 124	0
1	B	195/196 (99%)	0.68	32 (16%) <b>1</b> <b>2</b>	17, 28, 88, 145	0
2	E	218/219 (99%)	0.42	17 (7%) <b>13</b> <b>18</b>	17, 30, 71, 113	0
2	G	216/219 (98%)	0.44	22 (10%) <b>6</b> <b>10</b>	18, 30, 82, 161	0
3	F	212/212 (100%)	0.01	3 (1%) <b>75</b> <b>80</b>	15, 27, 46, 108	0
3	I	212/212 (100%)	0.14	8 (3%) <b>40</b> <b>48</b>	17, 29, 59, 101	0
All	All	1245/1254 (99%)	0.40	118 (9%) <b>8</b> <b>12</b>	15, 29, 79, 161	0

All (118) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	G	133	SER	11.7
1	B	448	ASN	11.4
1	B	445	VAL	8.2
1	B	333	THR	7.7
2	E	219	CYS	7.1
2	E	133	SER	7.0
1	A	448	ASN	6.8
2	E	218	SER	6.5
2	G	131	SER	6.2
1	B	520	ALA	6.2
2	E	135	SER	6.1
1	A	523	THR	6.1
1	A	521	PRO	5.9
2	G	43	GLY	5.7
2	E	43	GLY	5.7
2	E	134	THR	5.7
1	A	522	ALA	5.6
1	B	521	PRO	5.4
1	B	518	LEU	5.4

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
2	G	137	GLY	5.3
1	B	449	TYR	5.2
1	A	393	THR	5.2
2	G	136	GLY	5.1
2	G	42	PRO	4.9
2	G	194	THR	4.9
1	B	517	LEU	4.7
1	A	389	ASP	4.6
2	G	132	LYS	4.6
2	G	191	SER	4.6
1	A	387	LEU	4.6
1	B	523	THR	4.5
1	A	334	ASN	4.3
1	B	389	ASP	4.1
2	E	136	GLY	4.1
1	A	527	PRO	4.0
3	I	211	GLY	4.0
1	A	372	ALA	3.9
2	G	193	GLY	3.8
1	A	360	ASN	3.8
2	E	42	PRO	3.8
1	A	362	VAL	3.6
1	A	525	CYS	3.6
1	B	335	LEU	3.5
1	B	393	THR	3.5
1	A	385	THR	3.5
1	B	446	GLY	3.5
2	G	44	ARG	3.5
1	A	445	VAL	3.4
2	E	130	SER	3.4
2	E	132	LYS	3.3
1	A	346	ARG	3.3
2	E	44	ARG	3.3
1	B	390	LEU	3.3
2	G	161	ALA	3.3
2	E	131	SER	3.2
1	A	524	VAL	3.2
1	B	334	ASN	3.1
1	A	392	PHE	3.0
1	B	369	TYR	2.9
2	G	139	ALA	2.9
1	B	450	ASN	2.9

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
3	I	121	ASP	2.8
1	B	395	VAL	2.8
1	A	335	LEU	2.8
1	B	522	ALA	2.8
1	B	388	ASN	2.8
1	B	387	LEU	2.7
2	G	215	GLU	2.7
2	G	216	PRO	2.7
1	B	447	GLY	2.7
3	I	201	SER	2.7
1	A	370	ASN	2.7
1	B	394	ASN	2.7
2	G	192	LEU	2.6
2	E	217	LYS	2.6
3	F	153	LEU	2.6
1	A	528	LYS	2.6
2	E	164	SER	2.6
3	I	125	LYS	2.6
1	A	446	GLY	2.6
2	E	209	LYS	2.5
3	I	151	ASN	2.5
2	E	143	CYS	2.5
1	A	513	LEU	2.4
3	I	187	LYS	2.4
1	B	526	GLY	2.4
1	A	369	TYR	2.4
1	B	392	PHE	2.4
1	A	486	PHE	2.4
1	A	337	PRO	2.4
1	A	517	LEU	2.3
1	A	345	THR	2.3
2	G	134	THR	2.3
1	A	359	SER	2.3
3	F	41	GLY	2.3
2	G	41	SER	2.3
2	G	211	ASP	2.3
1	B	527	PRO	2.3
2	E	161	ALA	2.3
2	G	188	PRO	2.3
2	G	143	CYS	2.2
1	B	500	THR	2.2
1	A	526	GLY	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	511	VAL	2.2
1	A	367	VAL	2.2
1	A	366	SER	2.1
1	B	386	LYS	2.1
1	A	503	VAL	2.1
1	B	479	PRO	2.1
1	A	500	THR	2.1
2	G	214	VAL	2.1
1	B	391	CYS	2.1
1	A	394	ASN	2.0
3	I	212	GLU	2.0
3	I	202	SER	2.0
1	B	524	VAL	2.0
1	B	370	ASN	2.0
3	F	155	SER	2.0

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

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> 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.

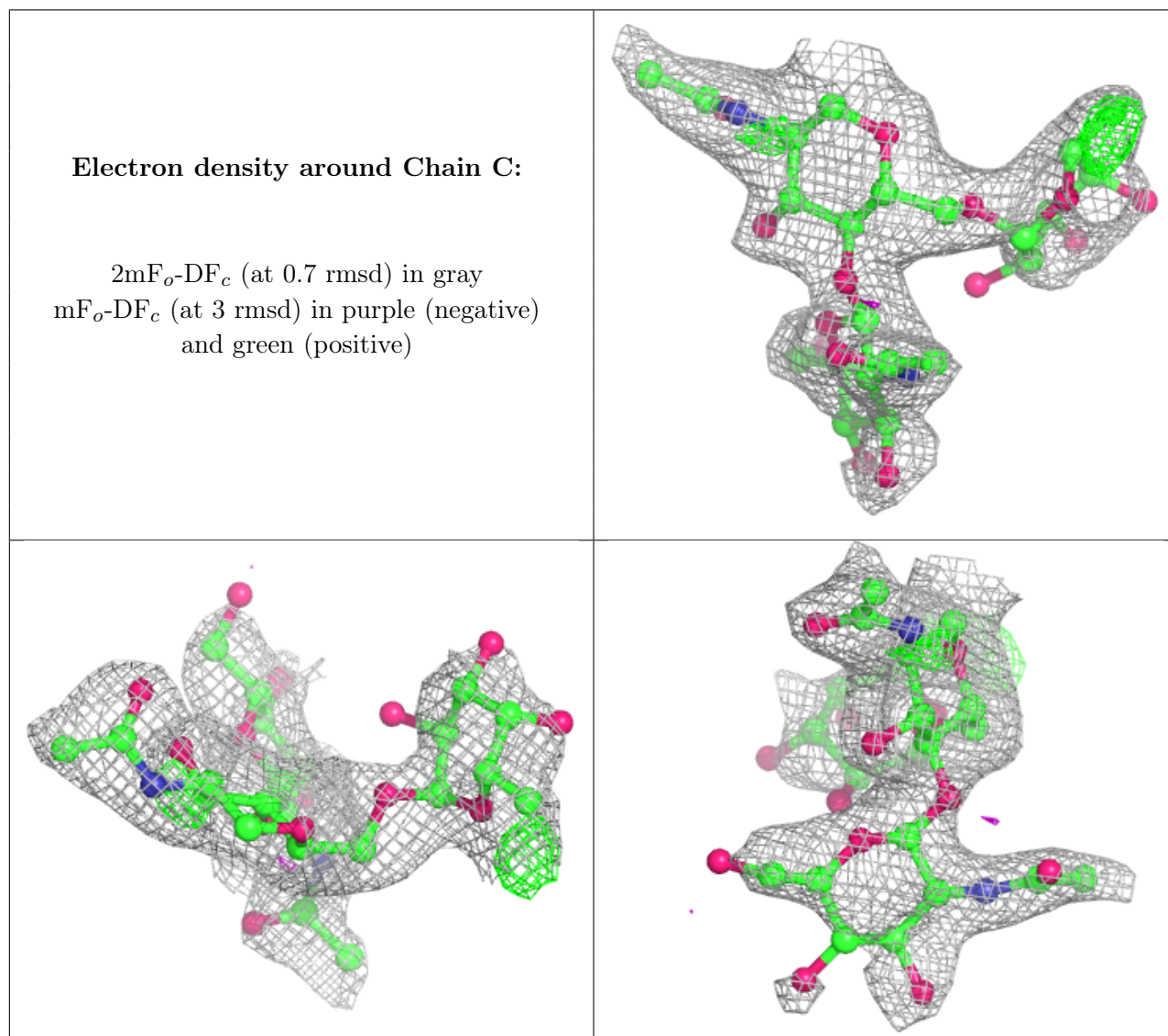
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	PCA	G	1	8/9	0.85	0.15	40,43,54,59	0
2	PCA	E	1	8/9	0.92	0.13	39,42,47,49	0

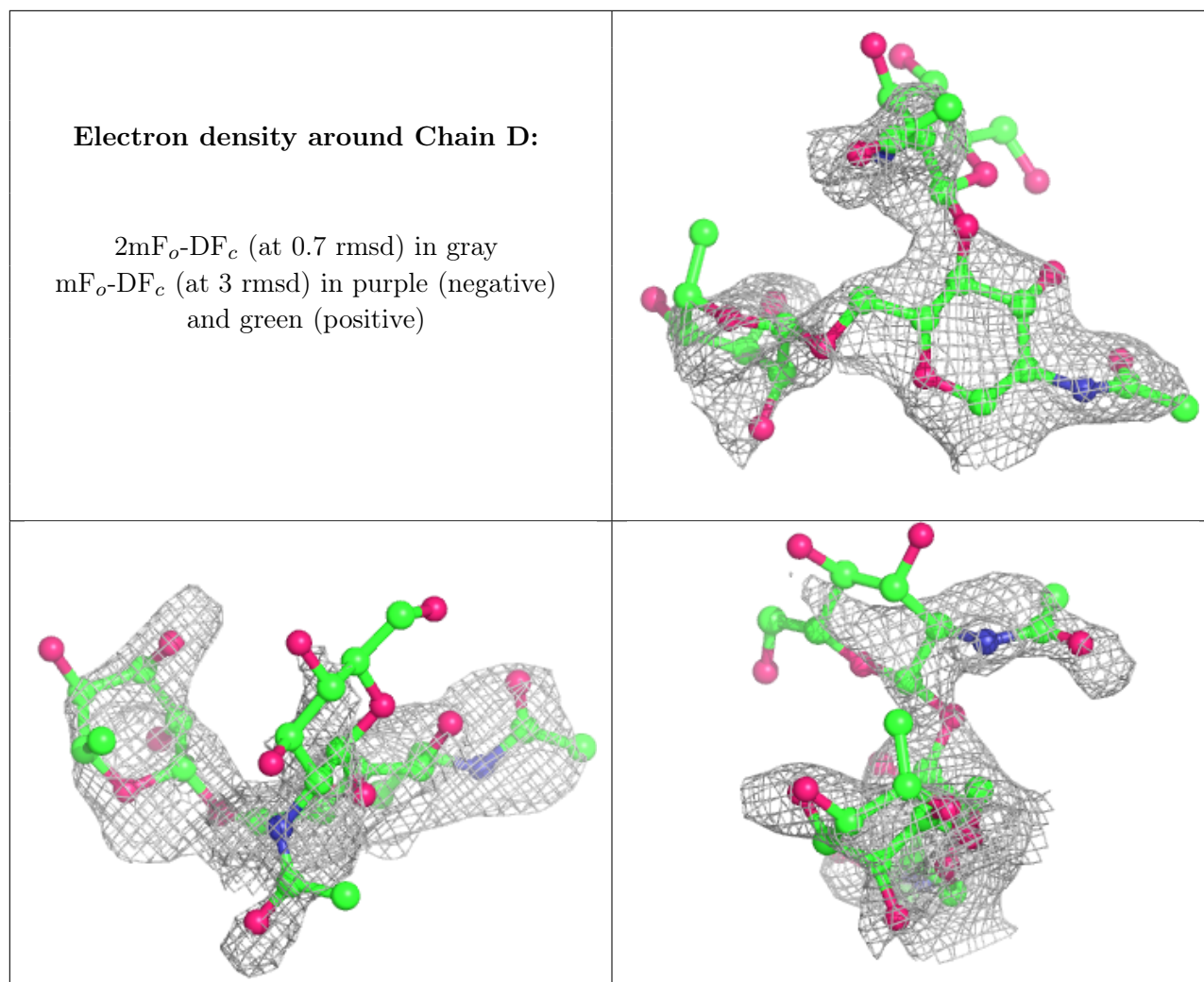
## 6.3 Carbohydrates [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
4	NAG	D	2	14/15	0.55	0.63	85,102,106,107	0
4	FUC	D	3	10/11	0.61	0.50	95,102,110,114	0
4	FUC	C	3	10/11	0.66	0.42	74,86,89,90	0
4	NAG	C	2	14/15	0.74	0.31	75,84,90,90	0
4	NAG	D	1	14/15	0.75	0.23	58,78,93,97	0
4	NAG	C	1	14/15	0.81	0.12	40,57,77,78	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.





## 6.4 Ligands [i](#)

LIGAND-RSR INFOmissingINFO

## 6.5 Other polymers [i](#)

There are no such residues in this entry.